volume 1

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TRADE MARK DIRECTORY

MANUFACTURERS' CATALOG PAGES
eem PRODUCT SECTIONS 1100-2400

SEE VOLUME 2 FOR:
• eem Product Sections 2450-6000

21st edition

eem 78 79

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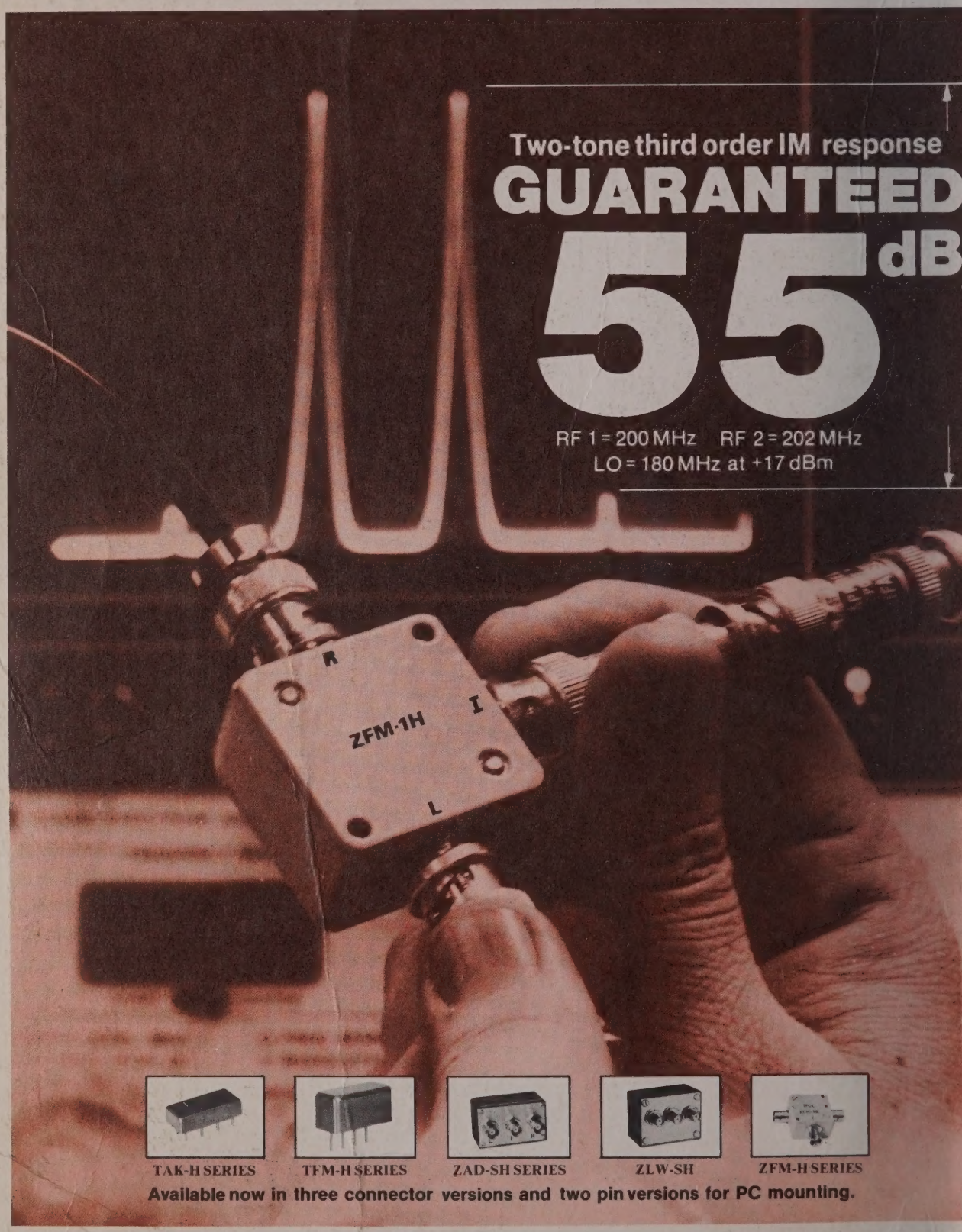

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SECTION 3450 PAGES 2890 TO 3058

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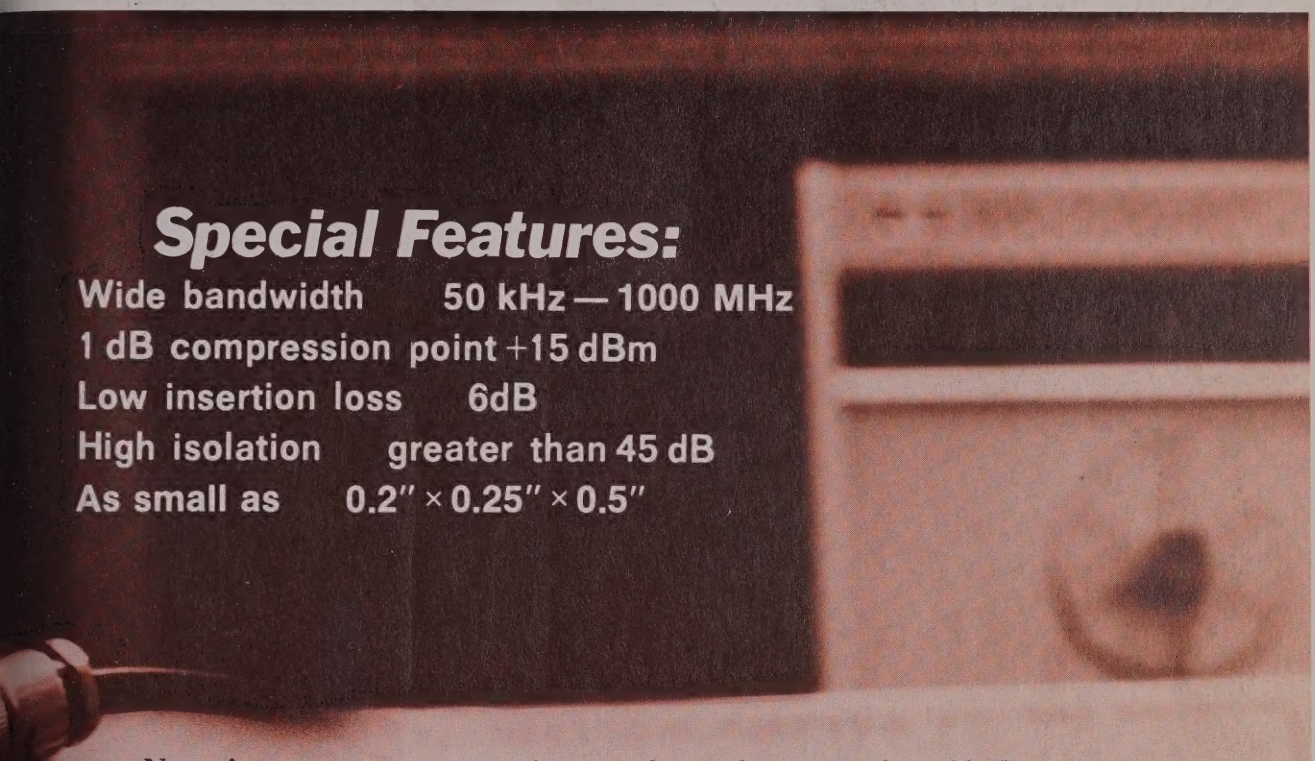
TAK-1H
5-24



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1 dB compression point +15 dBm
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High isolation greater than 45 dB
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when you specify Mini-Circuits newest state-of-the-art ultra-low distortion DOUBLE-BALANCED MIXERS. Each unit is guaranteed to meet a two-tone third-order IM level of 55 dB (below IF output) with 0 dBm input.

LO Power +17 dBm all models																											
	Frequency Range, MHz			Signal 1dB Compression level	Two-tone third order 0 dBm RF, each tone at 200 & 202 MHz, LO +17 dBm at 180 MHz		Conversion Loss, dB				Isolation, dB										VSWR							
							One Octave From Band Edge		Total Range		Lower Band Edge To One Decade Higher				Mid Range				Upper Band Edge To One Octave Lower				LO		RF		IF			
											LO-RF		LO-IF		LO-RF		LO-IF		LO-RF		LO-IF									
Model No.	LO	RF	IF	Min.	Typ.	Min.	Typ.	Max.	Typ.	Max.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Max.	Typ.	Max.	Typ.	Max.	Quantity	Price
TFM-3H	0.1-250	0.1-250	DC-250	+13 dBm	55	50	5.0	7.0	6.0	8.5	50	45	45	40	40	30	35	25	28	23	26	20	1.5		1.5		1.8		(5-24)	$23.95
TFM-1H	2-500	2-500	DC-500	+14 dBm	60	55	6.0	7.0	7.0	8.5	50	45	45	40	40	30	35	25	30	20	25	20	1.8		1.3		1.7		(5-24)	$23.95
TFM-2H	5-1000	5-1000	DC-1000	+14 dBm	60	55	6.2	7.0	7.0	10	50	45	45	40	40	30	35	25	30	20	25	17	1.8		1.3		1.7		(5-24)	$31.95
ZFM-2H																													(1-24)	$61.95
TAK-3H																													(5-24)	$21.95
ZAD-3SH	0.05-300	0.05-300	DC-300	+13 dBm	55	45	5.0	7.0	6.0	7.5	55	45	50	40	40	30	35	25	30	25	25	20	1.5	2.0	1.4	2.0	1.8	2.8	(4-24)	$42.95
ZFM-3H																													(1-24)	$54.95
ZLW-3SH																													(4-24)	$52.95
TAK-1H																													(5-24)	$19.95
ZAD-1SH	2-500	2-500	DC-500	+14 dBm	60	55	6.0	7.5	7.0	8.5	50	40	45	35	40	30	35	25	30	25	25	20	1.6	2.0	1.25	1.8	1.6	3.0	(4-24)	$40.95
ZFM-1H																													(1-24)	$53.95
ZLW-1SH																													(4-24)	$50.95
TAK-1WH																													(5-24)	$23.95
ZAD-1WSH	5-750	5-750	DC-750	+14 dBm	60	55	6.2	7.5	7.0	9.0	50	40	45	35	40	30	35	25	30	25	30	20	1.6	2.0	1.25	1.8	1.6	3.0	(4-24)	$44.95
ZLW-1WSH																													(4-24)	$54.95

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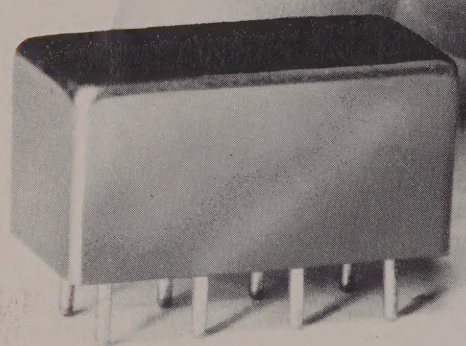

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		Typ.	Max.
Conversion loss (dB)			
One octave from band edge		5.5	7.0
Total range		6.5	8.5
Isolation (dB)		Typ.	Min.
Lower band edge to	LO-RF	50	45
one decade higher	LO-RF	45	35
Mid range	LO-RF	45	30
	LO-IF	40	25
Upper band edge to	LO-RF	35	25
one octave lower	LO-IF	30	20

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Signal, 1 dB compression level + 1 dBm

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- Trade Marks Directory
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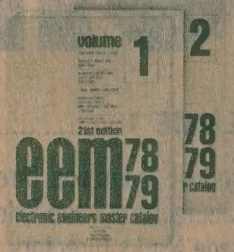

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2. MANUFACTURERS AND SALES OFFICES DIRECTORY

The Manufacturers and Sales Offices Directory begins on **Page 601 of Volume 1.**

To locate a manufacturer by name, refer to the alphabetical Manufacturers and Sales Offices Directory. Each listing contains complete address and phone numbers of main offices, branch offices, local representatives and local distributors.

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The Trade Mark Directory begins on **Page 861 of Volume 1.**

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NEW

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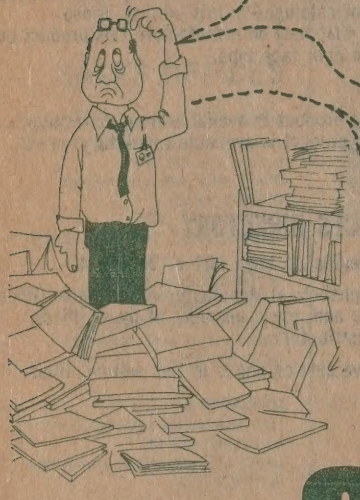

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ALPHABETICAL INDEX OF DISTRIBUTOR ADVERTISEMENTS

Many of the manufacturers who catalog their products in this edition of eem/Electronic Engineers Master offer their products to you through electronic parts distributors. To aid you in locating supplies, the following progressive distributors have placed their advertisements in **eem**.

Distributors' line cards are shown in the white catalog section, pages 1001 through 4666. In addition, distributors emphasizing their ability to supply specific manufacturers' items in depth have placed advertisements near the manufacturers' own listing in the Manufacturers and Sales Offices Directory, pages 601 through 860.

For your convenience, many manufacturers have included listings of their electronic parts distributors immediately following their local sales offices in the Manufacturers' Directory..

BARBEY ELECTRONICS 755, 783, 817, 4000
Reading, PA

DIPLOMAT 1062, 1705, 2460, 2657, 3441, 3696, 3884, 3922, 4018, 4553
Woodbury, NY
Farmington, MI
Totowa, NJ
Elk Grove Village, IL
Chicopee Falls, MA
Minneapolis, MN
Mt. Laurel, NJ
Salt Lake City, UT
St. Louis, MO
Holliston, MA
Sunnyvale, CA
Clearwater, FL
Ft. Lauderdale, FL

ELECTRIC SWITCHES, INC. 608, 621, 637, 643, 644, 679, 703, 729, 742, 756
Los Angeles, CA

FAIRMONT ELECTRONIC SALES CORP. 1169
Plainview, NY

FUSES UNLIMITED 639, 743
Chatsworth, CA.

GENESIS ELECTRONICS, INC. 1775
Subsidiary of Radio Distributing Co., Inc.
South Bend, IN
Dayton, OH
Cleveland, OH
Indianapolis, IN
Chicago, IL
St. Paul, MN

LECTRONIX 745
St. Charles, MO

MICROWAVE DISTRIBUTORS CO. 2875
Commack, NY

PARTS MASTERS 1321
Wayne, NJ

POCO SALES 709, 4258
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ZACK ELECTRONICS 615, 619, 705, 718, 748, 807
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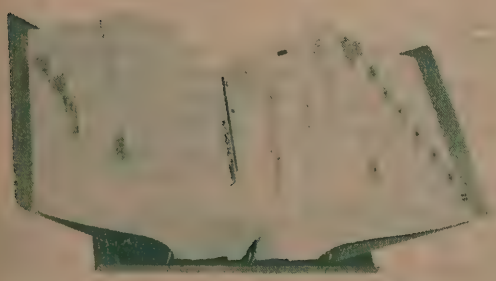

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MANUFACTURERS' INDEX TO CATALOG PAGES BY eem PRODUCT SECTION NUMBER

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- International Electro Magnetics, Inc.
- Lipps, Inc.
- Mallory Capacitor Co.
- Quam-Nichols Co.
- Star Micronics, Inc.

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- Chassis-Trak Div. General Devices Co., Inc.
- Compac
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- Equipto Electronics Corp.
- Formica Metal Products Co.
- Interlok
- La France
- Optima Scientific-Atlanta
- Premier Metal Products Co.
- Skydyne
- Stantron Div. Wyco Metal Products
- Techmar Corp.
- Unitrack Div. Calabro Plastics
- Vector Electronic Co.
- Vent-Rak Div. General Devices Co., Inc.

eem PRODUCT SECTION 1500

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- American Technical Ceramics
- Arco Electronics
- AVX Ceramics
- Axel Electronics, Inc.
- Capar Components Corp.
- Corning Glass Works
- Centre Engineering
- Cornell-Dubilier Electric Corp.
- Component Research Corp.
- Custom Electronics, Inc.
- Elpac
- F-Dyne Electronics Co.
- Fujitsu America, Inc.
- High Energy Corp.
- Illinois Capacitor, Inc.
- Iskra ISL Products Ltd.
- International Components Corp.
- ITT Components
- ITT Jennings
- Jackson Bros. (London) Ltd.
- Johanson Dielectrics
- Johanson Mfg.
- E. F. Johnson Co.
- Mallory Capacitor Co.
- Microplex
- Midwec
- Nytronics Components Group, Inc.
- Panasonic Electronic Components Div.
- PFC
- Republic Electronics Corp.
- Sangano Weston
- Semtech Corp.
- Soshin Electric Co., Ltd.
- Southern Electronics Co.
- Sprague Goodman
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- Union Carbide
- Varadyne Industries, Inc.
- Wesco Electrical Co.

eem PRODUCT SECTION 1600

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The Datak Corp.
E & L Instruments, Inc.
United Wiring & Mfg. Co.
Vector Electronic Co.
Vero Electronics, Inc.

eem PRODUCT SECTION 1800

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Bourns
Caddell-Burns
Cramer Coil Div.
Dale Electronics, Inc.
Delevan American Precision Div.
Endicott Coil Co., Inc.
Harbison Industrial Products, Inc.
North Hills
Nytronics Components Group, Inc.
Syntronic Instruments, Inc.
Torotel, Inc.

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GRN Corp.
Re-el Circuits, Inc.

eem PRODUCT SECTION 2000

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Baldwin Electronics, Inc.
Burr-Brown
Chrono-Log Corp.
Computer Conversions Corp.
Control Sciences, Inc.
Datametrics
Data Specialties, Inc.
Data Translation, Inc.
D-B Developments
Datel Systems, Inc.
Digital Equipment Corp.
Dynatech Microsystems
GNT Automatic, Inc.
Hickok Electrical Instrument Co.
ILC Data Device Corp.
Information Transfer Industrial, Inc.
C. Itoh Electronics, Inc.
Interface Engineering, Inc.
Kessler-Ellis Products
Litton Encoder Div.
Matrix Corp.
Itek Measurements Systems
Natel Engineering Co., Inc.
Neff Instrument Corp.
North Atlantic Industries, Inc.
Practical Automation, Inc.
Phoenix Data, Inc.
Preston Scientific, Inc.
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Vernitech Div. of Vernitron Corp.

eem PRODUCT SECTION 2100

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Aiden Products Co.
Allied Systems Corp.
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Amphenol
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Aries Electronics, Inc.
Augat, Inc.
AVA Electronics Corp.
Berg Electronics
Cable Concepts Corp.
Cambridge
Caton Connector Corp.
C W Industries
Concord Electronics Corp.
Connector Corp.
Continental Connector Corp.
Control Products Div. Amerace
Dale Electronics, Inc.
Dynatech Corp.
Eby
Elco Corp.
Electrical Components Div. Bendix
Elfab
Electronic Molding Corp.
Fujitsu America, Inc.
Excel
Garry Mfg. Co.
Grayhill, Inc.
GTE Sylvania, Inc.
Hiram Jones
Hughes Aircraft Co. Connecting Devices Div.
ITT Cannon
ITT Pomona
Jettron Products, Inc.
E. F. Johnson
Keystone Electronics Corp.
Lear Siegler, Inc.
3M Co. Electronic Products Div.
Mac/Panel Co.
Methode Electronics, Inc.
Molex, Inc.
Mueller Electric Co.
National Tel-Tronics
Pyle-National Co.
Raytheon Co. Distributor Products Operation
Rowe Industries
RDI/Reed Devices Inc.
Sealectro Corp.
H. H. Smith
The Superior Electric Co.
Texas Instruments
TRW Cinch Connectors
Trimm, Inc.
UID Electronics Div. AMF
Vector Electronic Co.
Vernitron Div. Beau Products
Virginia Panel Corp.
Waldom Electronics
W & M Mfg. Corp.

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Aeroflex Laboratories, Inc., Magnetics Products Div.
Airpax Controls Div.
Autronics Corp.
Bulova Electronics Div.
Electric Dynamics
General Magnetics, Inc.
Harrel, Inc.
IVO Industries, Inc.
Kessler-Ellis Products
Measurement Systems, Inc.
North American Philips Controls Corp.
North Hills Electronics, Inc.
Plessey Electro-Products
Vernitron Control Components
Vernitech Div. Vernitron Corp.

eem PRODUCT SECTION 2300

Crystals/Oscillators/ Crystal Filters 2280-2378

Accutronics
Alpha Components, Inc.
Austron
Bliley Electric Co.
Bulova Frequency Control Products
Colorado Crystal Corp.
Comstron-Seg
Croven Sub. of Walter Kidde & Co.
Connor-Winfield Corp.
Crystek
CTS Knights, Inc.
Dale Electronics, Inc.
Damon Electronics Div.
Erie Frequency Control
Frequency Electronics, Inc.
Frequency Selective Networks, Inc.
Filter Technology, Inc.
Greenray Industries, Inc.
Hope Electronics
Hughes Frequency Control Devices
International Crystal Mfg. Co., Inc.
Isotemp Research, Inc.
McCoy Electronics Co.
MF Electronics Corp.
Microsonics
Monitor Products Co., Inc.
Motorola, Inc.
Northern Engineering Laboratories, Inc.
Opt Industries, Inc.
Philamon, Inc.
Ovenaire Div. Walter Kidde Co.
Piezo Technology, Inc.
Q-Tech Corp.
Reeves Hoffman
Spectrum Technology
Statek Corp.
Toyo Communication Equipment Co., Ltd.
United States Crystal Corp.
Vectron Laboratories, Inc.

eem PRODUCT SECTION 2350

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Allen Avionics, Inc.
Bourns
Belfuse, Inc.
Computer Instruments Corp. Columbia Comps. Div.
Computer Devices Corp.
Control Electronics Co., Inc.
Data Delay Devices
ESC Electronics Corp.
Kappa Networks, Inc.
Nytronics Components Group, Inc.
RCL Electronics Div. AMF
Technitrol, Inc.

eem PRODUCT SECTION 2400

Knobs & Panel Components (excluding Lighting & Displays) 2418-2456

Alco Electronic Products, Inc.
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Datak Corp.
Electronic Hardware
Electronic Instrument & Specialty Corp. MC Div.
Interlok
Jan Hardware
RCL Electronics AMF Div.
Raytheon Co., Distributor Products Operation
Vemaline Products

eem PRODUCT SECTION 2450

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AND
Beckman Instruments, Inc. Helipot Div.
Chicago Miniature Lamp Works
Dialight
Display Devices, Inc.
Endicott Coil Co., Inc.
GTE Sylvania
Hamlin
Industrial Electronic Engineers, Inc.
Industrial Devices, inc.
Infodex, Inc.
Info-Lite Corp.
Ledco Div. of Wilbrecht Electronics
Leecraft Mfg. Co., Inc.
Litronix
Littelfuse
Minelco
Oak Industries
Oshino Electric Lamp Works, Ltd.
Refac Electronics Corp.
The Sloan Co.
Sorenson Lighted Controls, Inc.
Staver Co., Inc.
Visual Communications Co.

eem PRODUCT SECTION 2500

Mechanical Components (Bearings, Cores, Magnets, etc.) 2552-2569

Ad-Vance Magnetics, Inc.
Alberox
Amuneal Mfg. Corp.
Eagle Magnetic Co., Inc.
Fair-Rite Products Corp.
The Inter Technical Group, Inc.
Instrument Specialties Co., Inc.
ITT Thermotech
Krystinel Corp.
Metex Corp.
Mushield Co.
Perfection Mica Co.
Stackpole

eem PRODUCT SECTION 2550

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Cincinnati Sub. Zero Products, Inc.
Ransco Industries
Tenney Engineering, Inc.
Unholtz-Dickie Corp.

eem PRODUCT SECTION 2600

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Electro Impulse Inc.
The George Evans Corp.
ETRI
IMC Magnetics Corp.
Marlow Industries
McLean Engineering
Melcor
Pamotor
Rotron
Torin Corp.
TRW Globe Motors

eem PRODUCT SECTION 2700

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A. P. Circuit Corp.
All-Tronics, Inc.
Axel Electronics, Inc.
AMP, Inc.
Andersen Laboratories, Inc.
Chesterfield Products, Inc.
Comstron-Seg.
Corcom
Cornell-Dubilier
Data Delay Devices
Douglas Randall Div. Walter Kidde & Co., Inc.
ESC Electronics Corp.
Hertz Filter Corp.
Hisonic, Inc.
Hopkins Engineering Co.
Ithaco
KR Electronics, Inc.
Precision Filters
R-Tron Corp.
R F Interonics, Inc.
Spectrum Control, Inc.
Sterling Transformer
TRW/UTC Transformers
TT Electronics
Vernitron Piezoelectric Div.

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Raytheon Co., Dist. Products Operation

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Beede Electrical Instrument Co., Inc.
Boontoon Electronics Corp.
Bell, Inc., F. W.
Bird Electronic Corp.
B & K Precision
Chatsworth Data Corp.
Clark-Hess Communication Research Corp.
Comstron/Adret
Comstron/Seg
Continental Resources, Inc.
Curtis
Data Precision
Datel Systems
Dranetz Engineering Laboratories
Doric Scientific
Dytronics Co., Inc.
Ectron Corp.
Electro Impulse, Inc.
Electro Industries
Emico Sheller-Globe Corp.
Electronic Development
Elgenco Inc.
Empro Mfg. Co., Inc.
ESE
Exact Electronics, Inc.
Faria Meter Corp.
Fluke, John
Freed Transformer Co., Inc.
Gould
Gralex Industries
Guideline Instruments
Hipotronics, Inc.
Honeywell Test Instruments Div.
Hoyt Electrical
Hughes Aircraft Co., Industrial Products Div.
IBM Instrument Systems
Interstate Electronics Corp.
Instruments For Industry
ITT Jennings
Jewell Electrical Instruments, Inc.
Julie Research Laboratories, Inc.
Kay Elemetrics Corp.
Keithley Instruments, Inc.
Krohn Hite
Leader Instruments Corp.
Leeds and Northrup Co.
Marconi Instruments
Millivac Instruments
Modutec
Nationwide Electronic Systems
Newport Laboratories
Nicolet Instrument Corp.
Non-Linear Systems, Inc.
North Atlantic
Philps Test & Measuring Instruments
Polarad Electronics Corp.
PPM, Inc.
Pulsar Associates, Inc.
Radiometer Electronics (The London Co.)
RFL Industries. Inc.
Rockland Systems Corp.
Sangamo Weston
Sensitive Research
Simpson Electric Co.
Slaughter Co.
Texscan
Triplett Corp.
Torotron Corp.
United Systems Corp.
Viz Test Instruments Group
Wavetek Indiana
Wavetek San Diego
Yokogawa Corp. of America

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Instruments, Graphic Recording 2838-2846

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Gould, Inc.
Gulton Measurement & Control Systems Div.
Honeywell Test Instruments Div.
Houston Instrument
Leeds & Northrup Co.
Yokogawa Corp. of America

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Varflex Corp.
Zeus Industrial Products, Inc.

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Beckman Instruments, Inc. Helipot Div.
Burr-Brown
ITT North Microsystems
LSI Computer Systems, Inc.
Mini-Systems, Inc.

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MCL, Inc.
Vega Precision Laboratories, Inc.

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Daico Industries, Inc.
General Microwave
Hope Electronics
Matrix Systems Corp.
Midisco
Mini-Circuits
North Hills Electronics, Inc.
Telonic/Berkeley
Trak Microwave Corp.
Uniform Tubes, Inc.

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Barber-Colman Co.
Berger-Lahr Corp.
Bodine Electric Co.
Cannon U.S.A., Inc.
Clifton Precision
Delevan Div. American Precision
Eastern Air Devices
Electro-Craft Corp.
Fabricast, Inc.
General Electric
Graphite Metallizing Corp.
Gemcor — General Electro-Mechanical Corp.
IMC Magnetics Corp.
Japanese Products Corp.
Magnetic Technology
Micro Mo Electronics
North American Philips Controls Corp.
The Pittman Corp.
Portescap U.S.
Rapidsyn Co.
Servo-Tek Products Co.
The Superior Electric Co.
TRW Globe Motors
Torque Systems, Inc.
Vernitron Control Componemts
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EG&G Electro-Optics Div.
National Semiconductors LTD.
Raython Co., Distributor Products Operation
Vactec, Inc.

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Acopian Corp.
Advanced High Voltage Co., Inc.
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ALS Electronics Corp.
AMP, Inc.
Arnold Magnetics Corp.
Bertan Associaties, Inc.
Bikor Corp.
CEA A Div. of Berkleonics, Inc.
Crestronics, Inc.
Christie, Inc.
Datel Systems
Del Electronics Corp.
Dormeyer Industries
Dynamic Instrument Corp.
Eagle-Picher Industries, Inc.
Electrostatics, Inc.
Electronic Measurements, Inc.
Elpac Electronics, Inc.
Epsco, Inc.
Era Transpac Corp.
Ferrotran Electronics Co., Inc.
Gerator Corp.
Glassman High Voltage Computer Power
Gould
Hewlett-Packard
Hipotronics, Inc.
Hisonic, Inc.
Hope Electronics
Integrated Circuits, Inc.

Interelectronics Corp.
Jerome Industries
Kepco, Inc.
LH Research
Megavolt Corp.
Mid-Eastern Industries
North Hills Electronics, Inc.
NWL Transformers
Opt Industries, Inc.
Panasonic
Pioneer Magnetics
Polytron Devices, Inc.
Power Designs, Inc.
Power, Inc.
Power Mate
Power-One, Inc.
Power Technology, Inc.
Power Systems, Inc.
Powertec
Ro Associates, Inc.
Sanyo Electric, Inc.
Semiconductor Circuits, Inc.
Sigma Power
Spellman High Voltage Electronics Corp.
Standard Power, Inc.
Stevens Arnold, Inc.
Systron-Donner
Sola Electric
Tauber Electronics, Inc.
Technipower, Inc.
Tecnetics
Union Carbide Corp. Battery Products Div.
Universal Voltronics Corp.
Venus Scientific, Inc.
Wilmore Electronics Co., Inc.

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Avionic Instruments, Inc.
Avtel
Bulova Electronics Div.
Behlman Engineering Corp.
California Instruments
Clary Corp.
Computer Power, Inc.
Deltec Corp.
Elgar
Flite-Tronics Co., Inc.
Georator Corp.
Industrial Test Equipment Co.
KGS Electronics
Marine Electric RPD, Inc.
Nova Electric Mfg. Co.
Pacific Electronic Ent., Inc.
The Superior Electric Co.
Topaz Electronics
Varo, Inc.

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3M Co.

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C.P. Clare & Co.
Cornell Dubilier
Coto-Coil Co., Inc.
Deltrol Controls
Diversified Electronics, Inc.
Dormeyer Industries
Douglas Randall Div. Walter Kidde & Co., Inc.
Durakool, Inc.
Elec-Trol
Electronic Applications Co.
Electronic Instrument & Specialty Corp.
Electronic Specialty Div. Datron Systems, Inc.
Fifth Dimension, Inc.
Fujitsu America, Inc.
Gordos Corp.
Gould Inc., Controls Div.
Grayhill, Inc.
Guardian Electric
Hamlin, Inc.
Hi-G
ITT Components Group
ITT Jennings
International Rectifier
Kilovac Corp.
Leach Relays Div.
Ledex, Inc.
Liberty Controls, Inc.
Matrix Systems Corp.
Midtex, Inc.
North American Philips Controls Corp.
Oak Industries, Inc.
Ohmite Mfg. Co.
Omron Electronics, Inc.
Potter and Brumfield
Regdon Corp.
Ross Engineering Corp.
Schrack Electrical Sales Corp.
T-Bar, Inc.
Teledyne Relays
Wabash Relay & Electronics Div.

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Beman Mfg., Inc.
Bourns
Caddock Electronics, Inc.
Capar Components Corp.
The Carborundum Co.
Corning Glass Works
CTS of Berne
Cutler-Hammer/Shallcross
Dale Electronics, Inc.
E-Systems Memcor Div.
Charles Gamble Industries
IMS, Inc.
ISKRA/ISL Products Ltd.
Julie Research Laboratories, Inc.
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Kelvin
Microplex
Mills Resistor Co.
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Mini-Systems, Inc.
Nytronics Components Group, Inc.
Ohmite Mfg. Co.
Panasonic
Precision Resistor Co., Inc.
Pyrofilm
RCL Electronics
Resistors, Inc.
Rohm
Stackpole Components Co.
Tel Labs
TRW/IRC Resistors
Victoreen, Inc.
Vishay Resistive Systems Group

eem PRODUCT SECTION 4750

Resistors Variable 3783-3918

Allen Bradley
Beckman Instruments, Inc. Helipot Div.
Bourns
Bowmar/TIC, Inc.
Carter Mfg., Corp.
CTS of Berne
Dale
Duncan Electronics
E-Systems Memcor Div.
Electro-Techniques, Inc.
New England Instrument Co.
Ohmite Mfg. Co.
Sangamo Weston
Spectrol
Vishay Resistive Systems Group
VRN

eem PRODUCT SECTION 4800

Semiconductors 3919-3973

Aavid Engineering, Inc.
Aeg-Telefunken
Conditioning Semiconductor Devices Corp.
The Delbert Blinn Co.
Delco
International Rectifier
ISKRA/ISL Products Ltd.
Panasonic
Power Tech, Inc.
Sanford-Miller Corp.
Semtech Corp.
Thermalloy, Inc.
TRW Capacitors
TRW RF Semiconductors
Vemaline Products
Westinghouse

eem PRODUCT SECTION 4900

Servomechanisms 3974-3977

Bulova
Control Technology Co., Inc.
Industrial Control Co.

eem PRODUCT SECTION 5100

Switches/Keyboards/ Protective Components 3978-4269

Airpax Electronics
Alco Electronic Products, Inc.
American Switch Corp.
AMP, Inc.
APM-Hexseal
Amphenol
Arcolectric Corp.
Bussmann Mfg. Div.
Carlingswitch, Inc.
Cherry Electrical Products Corp.
Chicago Lock Co.
Chicago Switch, Inc.
Chomerics
C&K Components, Inc.
C.P. Clare & Co.
Cole Instrument Corp.
Crouse-Hinds
CW Industries
Cutler Hammer
Digitran Co.
Durakool, Inc.
Electro Switch Corp.
Electro-Mech Components, Inc.
Fifth Dimension, Inc.
Gordos Corp.
Grayhill
Hamlin
Heinemann Electric Co.
Info-Lite Corp.
Interswitch
ITT Jennings
ITT Schadow, Inc.
Janco Corp.
Ledex, Inc.
Littelfuse
LVC Industries, Inc.
Maxi-Switch Co.
MCG Electronics, Inc.
McGill Mfg. Co., Inc.
McGraw-Edison/Edison Electronics
Mechanical Enterprises, Inc.
Micro Switch
Minelco
Oak Industries, Inc.
Ohmite Mfg. Co.
Oslo Controls, Inc.
Otto Controls Div./Otto Engineering, Inc.
Protective Controls, Inc.
Raytheon Co. Distributor Products Operation
Refac
RCL Electronics
Shallco, Inc.
Shigoto Far East Ltd.
Stackpole Components Co.
Standard Grigsby, Inc.
Standex Electronics
Tapeswitch Corp. of America
T-Bar, Inc.
Tech Laboratories, Inc.
Uid Electronics Div.
Unimax Switch
Veetronix

eem PRODUCT SECTION 5300

Thermocouples, Elements & Accessories 4270-4286

The Carborundum Co.
Elmwood Sensors
Fenwal Electronics
Keystone Carbon Co.
Harry Levinson Co.
Midwest Components, Inc.
Omega Engineering, Inc.
RFL Industries, Inc.

eem PRODUCT SECTION 5400

Tools (Hand & Power)
Soldering Supplies 4287-4297

Channellock
Edsyn
Gardiner Solder Co.
Hexacon Electric Co.
Techni-Tool, Inc.

eem PRODUCT SECTION 5500

Transducers 4298-4324

American Aerospace Controls, Inc.
F. W. Bell, Inc.
BBN Instrument Co. A Div. of Bolt Beranek & Newman, Inc.
Kulite Semiconductor Products
Ohio Semitronics, Inc.
Relco Products, Inc.

eem PRODUCT SECTION 5600

Transformers 4325-4458

Abbott Transistor
Bourns
Dale Electronics, Inc.
Dormeyer Industries
EWC, Inc.
Freed Transformer Co., Inc.
Genrad
Hisonic, Inc.
Inductive Components, Inc.
JM Transformer Co.
Magnetico, Inc.
Microtran Co., Inc.
North Hills Electronics, Inc.
NWL Transformers
Ohmite Mfg. Co.
Perkin Elmer
Pico
Signal Transformer
Staco, Inc.
Sterling Transformers
The Superior Electric Co.
Technitrol, Inc.
Thordarson Meissner, Inc.
Todd Systems, Inc.
Torotel, Inc.
Torwico Electronics, Inc.
Triad/Utrad
TRW/UTC Transformers

eem PRODUCT SECTION 5700

Tubes & Tube Parts 4459-4463

Clinton Electronics Corp.
The Inter-Technical Group, Inc.

eem PRODUCT SECTION 6000

Wire/Cable/Harnesses & Accessories 4464-4666

Alpha Wire Corp.
Belden
Berk-Tek
Breeze Illinois, Inc.
Columbia Electronic Cables
Consolidated Wire
Daburn Electronics & Cable Corp.
Dearborn Wire and Cable Co.
Electro Weave, Inc.
Grayhill, Inc.
Heyman Mfg. Co.
Markel Corp.
National Wire and Cable Corp.
Panduit Corp.
Philadelphia Insulated Wire Co., Inc.
Rowe Industries
SGL Waber
Spectra Strip
Standard Wire & Cable Co.
TRW/Holyoke Wire & Cable
Whitmor Wire and Cable Corp.
Woven Electronics

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PRODUCT INDEX AND DIRECTORY

All products are listed alphabetically. Under each product heading, manufacturers are listed alphabetically. Those manufacturers with product information in the catalog are shown in **bold face** type with page numbers. For catalog information on this product, refer to the page numbers shown. Where a **bold face** listing appears with an asterisk, the product is not catalogued in this edition. Those manufacturers who have submitted data to verify that they do manufacture this product but have no further data in this edition are shown in light face type.

NOTE: The letter "D" preceding the listing indicates the product is available from distributors. The letter "M" preceding the listing indicates the product is available to military specifications.

Abrasive Belts, Compounds, Cords, Powders, etc.

Carborundum Co., Graphite Prods. Div., Dept. EM, Box 339, Niagara Falls, N.Y. 14302 ..... *
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
D Norton Co., Public Relations Dept., Dept. EM, One New Bond St., Worcester, Mass. 01606
SGL Abrasives, Dept. EM, North Pitt St. Ext., Carlisle, Pa. 17013

Absorbers, Microwave

Carborundum Co., Graphite Prods. Div., Dept. EM, Box 339, Niagara Falls, N.Y. 14302 ..... *
3M Co., Electronic Prods Div., Dept. EM, 3M Center, St. Paul, Minn. 55101 *
ANEMCO, INC., Dept. EM, 157 Freedom Ave, Anaheim, Cal. 92801
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
M Dielectric Comms, Unit of Gen Signal, Dept. EM, Raymond, Maine 04071
Electronautics, Dept. Dielectric Comm., Dept. EM, Newtown Rd., Littleton, Mass. 01460
General Semiconducter Industries, Inc., Dept. EM, 2001 W. 10 Pl., Box 3078, Tempe, Ariz. 85281
Plessey Inc., Dept. EM, 320 Long Island Expwy. S., Melville, N.Y. 11746
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Accelerometers

BBN Instruments Co., Div. Bolt Beranek & Newman, Inc., Dept. EM, 50 Moulton St., Cambridge, Mass. 02138 ..... **p. 4301**
Chatsworth Data Corp, Cablemaster Div., Dept. EM, 20710 Lassen St., Chatsworth, Cal 91311 ..... *
M **Cole Instrument, Div. F.H. Cole Entprs., Dept. EM, 2034 Placentia Ave., Costa Mesa, Cal. 92627** ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Kulite Semiconductor Prod., Dept. EM, 1030 Hoyt Ave., Ridgefield, N.J. 07657 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Unholtz-Dickie Corp., Dept. EM, 3000 Whitney Ave., Hamden, Conn. 06518 ..... **p. 2575**
A.L. Design Inc., Dept. EM, 2070 Niagara Falls Blvd., Tonawanda, NY 14150
Alpha-M Corp, Dept. EM, 3009 Wildflower Drive, Dallas, Tx. 75229
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
Bell & Howell Co., Elctrns. & Instrs. Grp., Dept. EM, 360 Sierra Madre Villa, Pasadena, Cal. 91109
Bourns, Inc., Instr. Div., Dept. EM, 6135 Magnolia, Riverside, Calif. 92506
M Columbia Resch. Labs., Dept. EM, Macdade Blvd. & Bullens La., Woodlyn, Pa. 19094
M Conrac Corp., Systems Sls Div., Dept. EM, Three Landmark Sq., Stamford, Conn. 06901
Endevco, Div. Becton, Dickinson & Co., Dept. EM, 30700 Rancho Viejo Rd., San Jaun Capistrano, Cal. 92675
Engdahl Enterprises, Dept. EM, 2850 Monterey Ave., Costa Mesa, Cal. 92626
Entran Devices, Inc., Dept. EM, 145 Paterson Ave., Little Falls, N.J. 07424
M Gulton Inds., Inc., Servonic/Instrumentation Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
M Humphrey, Inc., Dept. EM, 9212 Balboa Ave., San Diego, Calif. 92123
IRD Mechanalysis, Inc., Dept. EM, 6150 Huntley Rd., Columbus, Ohio 43229
M Kaman Sciences Corp., Dept. EM, 1500 Garden of the Gods Rd. P.O. Box 7463, Colorado Springs, Colo. 80933
Larson Aero Dev., Dept. EM, Box 135, Concord, Cal. 94522
Metrix Instrument Co., Metrix Instrument Co., Dept. EM, 1711 Townhurst, Houston, Tex. 77043
PCB Piezotronics, Inc., Dept. EM, 5800 Transit Rd., Depew, N.Y. 14043
M Raymond Engrg. Inc., Dept. EM, 217 Smith St., Middletown, Conn. 06457
Robinson-Halpern Co., Dept. EM, One Apollo Rd., Plymouth Meeting, Pa. 19462
M Schaevitz Engrg., Dept. EM, U.S. 130, Union Ave., Pennsauken, N.J. 08110
Shure Brothers, Inc., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204
Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
Spectral Dynamics Corp., Dept. EM, Box 671, San Diego, Cal. 92112
Sundstrand Data Control, Dept. EM, Overlake Ind'l. Pk., Redmond, Wash. 98052
D Vibra-Metrics, Inc., Dept. EM, 150 Bradley St., E. Haven, Conn. 06512
M West Coast Resch. Corp., Dept. EM, Box 25061, Los Angeles, Cal. 90025
Wilcoxon Research, Dept. EM, 12526 Parklawn Dr., Rockville, Md. 20852

Actuators, Servo, Linear

Bafco, Inc., Dept. EM, 717 Mearns Rd., Warminster, Pa. 18974 ..... *
M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101** .. **p. 3975**
M **Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735** ..... *
M **Ledex Inc., Dept. EM, 123 Webster St., Dayton, Ohio 45401** ..... *
M **Magnetic Technology, Vernitron Corp., Dept. EM, 21001 Kittridge St., Canoga Pk., Cal. 91303** ..... **p. 3098**
North American Philips Controls Corp., Dept. EM, Cheshire Industrial Pk. Box E, Cheshire, Conn. 06410 ..... *
Oak Inds. Inc., Switch Div., Dept. EM, Dept. DA, Crystal Lake, Ill. 60014 ..... *
M **Regdon Corp., Dept. EM, 3713 Grand Blvd., Brookfield, Ill 60513** ..... *
TRW/Globe Motors, Dept. EM, 2275 Stanley Ave., Dayton, Ohio 45404 ..... *
M Bendix Corp., Electrodynamics Div., Dept. EM, 11600 Sherman Way, N. Hollywood, Calif. 91605
M Glentek, Inc., Dept. EM, 1559 7th St., Santa Monica, Calif. 90401
Hartman Electrical Mfg., Div. A-T-O Inc., Dept. EM, 175 N. Diamond St., Mansfield, Ohio 44902
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
Icon Division, U.S.M. Corp., Dept. EM, 156 Sixth St., Cambridge, Mass. 02142
D ITT General Controls, Dept. EM, 801 Allen Ave., Glendale, Cal. 91201
Jordan Controls, Dept. EM, 5607 W. Douglas Ave., Milwaukee, Wisc. 53218
M Lisk, G.W. Co., Dept. EM, 2 South St., Clifton Springs, N.Y. 14432

M Lundy Elctrns. & Sys., Inc., Dept. EM, Robert La., Glen Head, N.Y. 11545
M MPC Prods. Corp., Dept. EM, 4200 W. Victoria Ave., Chicago, Ill. 60646
MTS Systems Corp., Dept. EM, Box 24012, Minneapolis, Minn 55424
M Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
M Powertron Corp., Dept. EM, 3821 Barringer Dr., Charlotte, N.C. 28210
M Precision Mechanisms Corp., Dept. EM, 44 Brooklyn Ave., Westbury, N.Y. 11590
M Raymond Engrg. Inc., Dept. EM, 217 Smith St., Middletown, Conn. 06457
M Sierracin/Magnedyne Inc., Dept. EM, 5580 El Camino Real, Box 458, Carlsbad, Cal. 92008
D Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
Teledyne Gurley, Dept. EM, 514 Fulton St., Troy, N.Y. 12181
Warner Elec. Brake & Clutch Co., Dept. EM, Beloit, Wisc. 53511
M Western Gear Corp., Applied Tech. Div., Dept. EM, 14724 E. Proctor, City of Industry, Cal. 91744
Western Gear Corp., Electro Prods. Oper., Dept. EM, 14724 East Proctor, City of Industry, Cal 91749
Zonic Technical Labs., Dept. EM, 8927 Rossash Ave., Cincinnati, Ohio 45236

Actuators, Servo, Rotary

Bafco, Inc., Dept. EM, 717 Mearns Rd., Warminster, Pa. 18974 ..... *
M Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 ..... *
Electro-Craft Corp., Dept. EM, 1600 2nd St. South, Hopkins, Minn. 55343 .. *
M Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735 ..... *
M Ledex Inc., Dept. EM, 123 Webster St., Dayton, Ohio 45401 ..... p. 3579
M Magnetic Technology, Vernitron Corp., Dept. EM, 21001 Kittridge St., Canoga Pk., Cal. 91303 ..... *
Oak Inds. Inc., Switch Div., Dept. EM, Dept. DA, Crystal Lake, Ill. 60014 ..... *
Torque Systems, Sub. Rotron/EG & G Co., Dept. EM, P.O. Box 588, 225-E. Crescent St., Waltham, Mass. 02154 ..... *
TRW/Globe Motors, Dept. EM, 2275 Stanley Ave., Dayton, Ohio 45404 ..... *
Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... *
Abex Corp, Dept. EM, 530 5th Ave, New York, NY 10036
Allard Instr., Div. of Applied Fluidics, Dept. EM, 770 Main St., Westbury, N.Y. 11590
M Bendix Corp., Electrodynamics Div., Dept. EM, 11600 Sherman Way, N. Hollywood, Calif. 91605
Benton Corp, Dept. EM, Race St Box 678, Manor, PA 15665
D Carco Elctrns., Dept. EM, 195 Constitution Dr., Menlo Park, Calif. 94025
Evershed & Vignoles Ltd., Dept. EM, Action Lane, Chiswick, London, England W4 5HJ
GAP Instr. Corp., Dept. EM, 110 Marcus Blvd., Hauppauge, N.Y. 11787
M Glentek, Inc., Dept. EM, 1559 7th St., Santa Monica, Calif. 90401
D Hills-McCanna Co., Dept. EM, 400 Maple Ave., Carpentersville, Ill. 60110
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
Icon Division, U.S.M. Corp., Dept. EM, 156 Sixth St., Cambridge, Mass. 02142
Inland Motor Div. Kollmorgen, Indl Drives Grp, Dept. EM, 609 Rock Rd., Radford, Va. 24141
D ITT General Controls, Dept. EM, 801 Allen Ave., Glendale, Cal. 91201
Jamesbury Corp., Dept. EM, 640 Lincoln St., Worcester, Mass. 01605
Jordan Controls, Dept. EM, 5607 W. Douglas Ave., Milwaukee, Wisc. 53218
M Lisk, G.W. Co., Dept. EM, 2 South St., Clifton Springs, N.Y. 14432
M Lundy Elctrns. & Sys., Inc., Dept. EM, Robert La., Glen Head, N.Y. 11545
M MPC Prods. Corp., Dept. EM, 4200 W. Victoria Ave., Chicago, Ill. 60646
MTS Systems Corp., Dept. EM, Box 24012, Minneapolis, Minn 55424
M Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
PMI Motors, Kollmorgen Corp., Dept. EM, 5 Aerial Way, Syosset, NY 11791
M Powertron Corp., Dept. EM, 3821 Barringer Dr., Charlotte, N.C. 28210
M Precision Mechanisms Corp., Dept. EM, 44 Brooklyn Ave., Westbury, N.Y. 11590
M Sawyer Inds., Dept. EM, 5649 Peck Rd., Arcadia, Cal. 91006
M Sierracin/Magnedyne Inc., Dept. EM, 5580 El Camino Real, Box 458, Carlsbad, Cal. 92008
D Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
Teledyne Gurley, Dept. EM, 514 Fulton St., Troy, N.Y. 12181
M Transicoil, Inc., Dept. EM, Worcester, Pa. 19490
M Western Gear Corp., Applied Tech. Div., Dept. EM, 14724 E. Proctor, City of Industry, Cal. 91744
Western Gear Corp., Electro Prods. Oper., Dept. EM, 14724 East Proctor, City of Industry, Cal 91749
Zonic Technical Labs., Dept. EM, 8927 Rossash Ave., Cincinnati, Ohio 45236

Adapters—See Connector Adapters, Plug Adapters; Socket Adapters; Etc.

Adapters, FM

Boonton Electronics Corp., Dept. EM, Route #287, Parsippany, N.J. 07054 *

Adapters, Panoramic—See Receivers, Panoramic

Adapters, Waveguide

Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
M Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706 ..... *
The Bendix Corp., Electrical Comp. Div., Dept. EM, Sidney, NY 13838 ..... *
DM Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725 ..... p. 2885,2886
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
M Aircom, Inc., Dept. EM, Rte. 16B, Union, N.H. 03887
Alford Mfg. Co., Dept. EM, 120 Cross St., Winchester, Mass. 01890
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
D Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
D Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
M Reeve Electronics, Inc., Dept. EM, 609 W. Lake St., Chicago, Ill 60606
Sivers Lab, Dept. EM, Box 90339, Los Angeles, Cal. 90009
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
TRG., Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006

Adhesives, Conducting

Chomerics, Inc., Dept. EM, 77 Dragon Court, Woburn, Mass. 01801 ..... *
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
M Hardman Inc., Dept. EM, 600 Cortlandt St., Belleville, N.J. 07109 ..... *
DM Metex Corp., Dept. EM, 970 New Durham Rd., Edison, N.J. 08817 ..... *
D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
D Thermalloy, Inc., Dept. EM, 2021 W. Valley View, Dallas, Tex 75234 ..... *
Union Carbide Corp., Battery Products Div., Dept. EM, 270 Park Ave., New York, N.Y. 10017 ..... *
Acme Chemical & Insulation Co., Dept. EM, 166 Chapel St., New Haven, Conn. 06513
Aerolix Corporation, Dept. EM, 720 So. Columbus Street, Mt. Vernon, NY 10550
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
Ambroid Co., Dept. EM, P.O. Box 1089, Taunton, MA 02780
M Armstrong Cork Co., Dept. EM, W. Liberty St., Lancaster, Pa. 17604
D Chemtronics, Inc., Dept. EM, 45 Hoffman Ave., Hauppauge, N.Y. 11787
DM Conap, Inc., Dept. EM, 1405 Buffalo St, Olean, N.Y. 14760
Cox & Co., Inc., Dept. EM, 215 Park Ave., S., New York, N.Y. 10003
DM Dynaloy, Inc., Dept. EM, 7 Great Meadow La., Hanover, N.J. 07936
Eastman Chem. Prods., Sub. Eastman Kodak Co., Dept. EM, Kingsport, Tenn. 37662
Edmund Scientific Co., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
Electro Mats. Corp. Amer., Dept. EM, 605 Center Ave., Mamaroneck, N.Y. 10543
D Electro-Science Labs., Dept. EM, 2211 Sherman Ave., Pennsauken, N. J. 08110
Emerson & Cuming, Inc., Dielectric Mat'ls. Div., Dept. EM, 869 Washington St., Canton, Mass. 02021
Formulated Resins Inc., Dept. EM, Box 508, Greenville, R.I. 02828
Injectorall Elctrns. Corp., Dept. EM, 98-100 Glen St., Glen Cove, N.Y. 11542
M Isochem Resins Co., Dept. EM, 99 Cook St., Lincoln, R.I. 02865
Leepoxy Plastics, Dept. EM, 3324 Ferguson Rd., Ft. Wayne, Ind. 46809
3M Co., Indl Elect Prods. Div., Dept. EM, 3M Center, St. Paul, Minn. 55101
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
Mereco Products Div., Metachem Resins, Dept. EM, 598 Wellington Ave., Cranston, R.I. 02910
Miller-Stephenson Chem. Co., Inc., Dept. EM, George Washington Hwy., Danbury, Conn. 06810
M Norelcom Electronics, Dept. EM, 200 Allen Blvd., Farmingdale, N.Y. 11735
DM Oneida Electronics Mfg., Dept. EM, POB 678, R.D. #3 Baldwin Ext., Meadville, Pa. 16335
M Packaged Resins Div., Bacon Inds., Inc., Dept. EM, 192 Pleasant St., Watertown, Mass. 02172
SermeTel Inc., Sub. Teleflex Inc., Dept. EM, 155 Limerick Rd., Limerick, Pa 19468
SGL Homalite, Div. of SGL Inds., Inc., Dept. EM, 11 Brookside Dr., Wilmington, Del. 19804
Sigma Plastronics, Inc., Dept. EM, 14531-33 Tireman Ave, Dearborn, Mich. 48126
SWS Silicones Corp., Dept. EM, Box 428, Adrian, Mich. 49221
Tapecon, Inc., Dept. EM, 475 River St., Rochester, N.Y. 14612
Tecknit, Dept. EM, 129 E. Dermody St., Cranford, N.J. 07016
M Tescom Instr. Div., Dept. EM, 2600 Niagara La. N., Minneapolis, Minn. 55441
Tra-Con, Inc., Dept. EM, 55 North St., Medford, Mass. 02155
D Uniroyal, Inc., Dept. EM, 1230 Ave. of Americas, New York, N.Y. 10020
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Adhesives, General Purpose

DM Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 ..... p. 4285
DM Allen Mfg. Co., Dept. EM, 22 E. Dudley Town Rd., Bloomfield, Conn. 06002
M Cadillac Plastic & Chemical, Dayco Co., Dept. EM, Box 810, Detroit, Mich. 48232
Hightemp Resins, Inc., Dept. EM, 225 Greenwich Ave., Stamford, Conn. 06902
Injectorall Elctrns. Corp., Dept. EM, 98-100 Glen St., Glen Cove, N.Y. 11542
Leepoxy Plastics, Dept. EM, 3324 Ferguson Rd., Ft. Wayne, Ind. 46809
Metron Optics, Dept. EM, P.O. Box 690, Solana Beach, Cal. 92075
D Norelcom Electronics, Dept. EM, 200 Allen Blvd., Farmingdale, N.Y. 11735
D Rexnord Inc., Specialty Chem Div, Dept. EM, 4300 N. 127th St, Brookfield, Wis. 53005
Sigma Plastronics, Inc., Dept. EM, 14531-33 Tireman Ave, Dearborn, Mich. 48126
SWS Silicones Corp., Dept. EM, Box 428, Adrian, Mich. 49221
DM Tech Spray, Inc., Dept. EM, Box 949, Amarillo, Tex. 79105
Tra-Con, Inc., Dept. EM, 55 North St., Medford, Mass. 02155

Adhesives, Insulating

DM Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Aerolix Corporation, Dept. EM, 720 So. Columbus Street, Mt. Vernon, NY 10550

D Cole-Flex Corp., Dept. EM, 91 Cabot St., W. Babylon, N.Y. 11704
Hightemp Resins, Inc., Dept. EM, 225 Greenwich Ave., Stamford, Conn. 06902
Leepoxy Plastics, Dept. EM, 3324 Ferguson Rd., Ft. Wayne, Ind. 46809
D Norelcom Electronics, Dept. EM, 200 Allen Blvd., Farmingdale, N.Y. 11735
D Rexnord Inc., Specialty Chem Div, Dept. EM, 4300 N. 127th St, Brookfield, Wis. 53005
Sigma Plastronics, Inc., Dept. EM, 14531-33 Tireman Ave, Dearborn, Mich. 48126
SWS Silicones Corp., Dept. EM, Box 428, Adrian, Mich. 49221
D Tech Spray, Inc., Dept. EM, Box 949, Amarillo, Tex. 79105
D Techcon Systems Inc., Dept. EM, 16016 So. Figueroa St., Gardena, Cal 90248
Tra-Con, Inc., Dept. EM, 55 North St., Medford, Mass. 02155

Adhesives, Liquid Spray

GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
D Norelcom Electronics, Dept. EM, 200 Allen Blvd., Farmingdale, N.Y. 11735

Adhesives, Optical

Sigma Plastronics, Inc., Dept. EM, 14531-33 Tireman Ave, Dearborn, Mich. 48126
Tra-Con, Inc., Dept. EM, 55 North St., Medford, Mass. 02155

Air Cleaners & Filters (Shielded & Unshielded)

Evans Corp., George, Dept. EM, 121 37th St., Moline, Ill. 61265 ..... **p. 2579**
M **McLean Engrg. Labs., Dept. EM, 70 Washington Rd., Princeton Jctn., N.J. 08550** ..... *
DM **Metex Corp., Dept. EM, 970 New Durham Rd., Edison, N.J. 08817** ..... **p. 2566**
Aluminum Filter Co., Dept. EM, PO Box 1311, Santa Barbara, Cal. 93102
M Atmosphere Controls Prdts., Dept. EM, 295 Polaris, Mt. View, Cal. 94043
Baker Co., Inc., Dept. EM, Drawer E - Sanford Airport, Sanford, Me. 04073
M Balston, Inc., Dept. EM, Box C, 703 Massachusetts Ave., Lexington, Mass 02173
D Bud Radio, Inc., Dept. EM, 4605 E. 355th St., Willoughby, Ohio 44094
Carey Elctrn. Engrg. Co., Dept. EM, 1880 Clifton Ave., Springfield, Ohio 45505
D Clean Room Prods., Dept. EM, 56 W. Penataquit Ave., Bay Shore, N.Y. 11706
D Columbus Electric Mfg. Co., Dept. EM, Box 289A Rt #2, Piney Flats, Tenn. 37686
Hobson Bros., Inc., Dept. EM, 4940 W. Lawrence Ave., Chicago, Ill. 60630
D Hollis Engrg., Inc., Dept. EM, Charron Ave., Box 1189, Nashua, N.H. 03061
Midget Louver Co., Dept. EM, 800 Main Ave., Norwalk, Conn. 06852
Mine Safety Appliances Co., Dept. EM, 600 Penn Center Blvd., Pittsburgh, Pa 15235
Pall Corp., Dept. EM, 30 Sea Cliff Ave., Glen Cove, N.Y. 11542
Pall Trinity Micro Corp., Dept. EM, Rte. 281, Cortland, N.Y. 13045
M Research Prods. Corp., Dept. EM, 1015 E Washington Ave., Madison, Wisc 53701
D Tecknit, Dept. EM, 129 E. Dermody St., Cranford, N.J. 07016
Terminal Data Corp. of Md, Dept. EM, 11878 Coakley Circle, Rockville, Md. 20852
Weber Tech Products, Dept. EM, 360 Merrimack St., Lawrence, Mass 01842
M Zero Corp., Dept. EM, 777 Front St., Burbank, Cal. 91502

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M **Electro Impulse, Dept. EM, Box 870, Red Bank, N.J. 07701** ..... **p. 2578,2720**
McLean Engrg. Labs., Dept. EM, 70 Washington Rd., Princeton Jctn., N.J. 08550 ..... **p. 2588**
M **McLean Engrg Midwest, Dept. EM, 9560 85th Ave N., Maple Grove, Minn. 55369** ..... **p. 2588**
FTS Systems Inc., Dept. EM, POB 158, Stone Ridge, N.Y. 12484
M Kooltronic Inc., Dept. EM, Hamilton Ave., Hopewell, N.J. 08525
Terminal Data Corp. of Md, Dept. EM, 11878 Coakley Circle, Rockville, Md. 20852

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Active Control Instrumentation, Dept. EM, PO Box 243-Wildwood Circle, Key Largo, Florida 33037 ..... *
BEI Elctrns., Inc., Dept. EM, 1101 McAlmont St., Little Rock, Ark. 72203 .... *
Bird Electronic Corp., Dept. EM, 30303 Aurora Rd., Solon, Ohio 44139 **p. 2668**
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Doric Sci., Div. Emerson Elec. Co., Dept. EM, 3883 Ruffin Rd., San Diego, Cal. 92123 ..... *
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
M **GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055** ..... **p. 1378**
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DM **Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101** ..... *
D **Mallory Capacitor Co., Div. P.R. Mallory, Dept. EM, 3029 E. Washington, Box 372, Indianapolis, Ind. 46201** ..... **p. 1014-1017**
Milwaukee Resistor Corp., Dept. EM, 700 W. Virginia St., Milwaukee, Wisc. 53204 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
PPM, Inc., Dept. EM, 7575 Bond St., Cleveland, Ohio 44139 ..... *
Re-el Circuits, Inc., Dept. EM, 520 Victor Street, Saddle Brook, N.J. 07662 **p. 1380**
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Star Micronics Inc., Dept. EM, Pan Am Building, Ste 2308, 200 Park Ave, New York, N.Y. 10017 ..... **p. 1020,1021**
D **Tapeswitch Corp. Amer., Dept. EM, 100 Schmitt Blvd., Farmingdale, N.Y. 11735** ..... *
M **Tenney Engrg., Inc., Dept. EM, 109 Springfield Rd., Union, N.J. 07083** **p. 2573**
Unholtz-Dickie Corp., Dept. EM, 3000 Whitney Ave., Hamden, Conn. 06518 *
D **Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629** .... *
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
M Acromag, Inc., Dept. EM, 30765 Wixom Rd., Wixom, Mich. 48096
D Acurex-Autodata, Dept. EM, 485 Clyde, Mountain View, Cal. 94042
D Adapter/Charger Prdts., Dept. EM, Box 3218, Peoria, Ill. 61614
ADC Prods, Dept. EM, 4900 W. 78th St., Minneapolis, Mn 55435
Aerolite Elexs Corp., Dept. EM, 2207 Summit Ave., Union City, N.J. 07087
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
I American Instr. Co., Div. Travenol Labs. Inc., Dept. EM, 8030 Georgia Ave. - Dept. D16-2, Silver Spring, Md. 20910
Applied Control Co., Dept. EM, 1275 Bloomfield Ave., Fairfield, N.J. 07006
Applied Systems Corp., Dept. EM, 26401 Harper Ave., St. Clair Shores, Mich. 48081
A.R.F. Products, Dept. EM, Box 3226, Boulder, Colo. 80303
M Atlantic Research Corp., Dept. EM, 5390 Cherokee Ave., Alexandria, Va 22314
D Atlas Sound Div., American Trading & Prod., Dept. EM, 10 Pomeroy Rd., Parsippany, N.J. 07054
I Autocon Inds., Sub. Control Data, Dept. EM, 2300 Berkshire La. N., Minneapolis, Minn. 55441
D Bacharach Instrument Co., Dept. EM, 2300 Leghorn St., Mountain View, Cal. 94043
Bailey Meter Co., Sub. Babcock & Wilcox, Dept. EM, 29801 Euclid Ave., Wickliffe, Ohio 44092
M Barnes Engrg. Co., Dept. EM, 30 Commerce Rd., Stamford, Conn. 06902
Beckman Instrs., (AISSD), Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634
Bell PA Products, Dept. EM, 1200 N. Fifth St. Box 8177, Columbus, Ohio 43201
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
D Chafitz Engineering, Dept. EM, P.O. Box 2188, Rockville, Md. 20852
M Columbia Resch. Labs., Dept. EM, Macdade Blvd. & Bullens La., Woodlyn, Pa. 19094
Control Products Corp., Dept. EM, 4431 W. Division St., Chicago, Ill. 60651
I Cordover & Co., Carl, Dept. EM, 3914 North 29th Ave., Hollywood, Fla. 33020
Cramer Division, Conrac Corporation, Dept. EM, Mill Rock Rd., Old Saybrook, Conn. 06475
Cybersonic Div., C. A. Briggs Co., Dept. EM, Box 151, Glenside, Pa. 19038
Data-Control Systems, Dept. EM, Commerce Dr., Box 860, Danbury, Conn. 06810
Data Signal Corp, Dept. EM, 40-44 Hunt St, Watertown, MA 02172
M Datacom, Inc., Dept. EM, Box 278, Ft. Walton Beach, Fla. 32548
D Delta Products, Dept. EM, Box 1147, Grand Junction, Colo. 81501
Devco Engrg., Control Sys. Div., Dept. EM, Pier La., W. Caldwell, N.J. 07006
Engdahl Enterprises, Dept. EM, 2850 Monterey Ave., Costa Mesa, Cal. 92626
GTE Lenkurt Inc., Dept. EM, 1105 County Rd., San Carlos, Cal. 94070
M GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
M Harshaw Chemical Co., A Kenanee Industry, Dept. EM, 6801 Cochran Rd., Solon, Ohio 44139
Henschel Corp., Dept. EM, 14 Cedar St., Amesbury, Mass. 01913
Honeywell Inc., Commerical Div., Dept. EM, Honeywell Plaza, Minneapolis, Minn. 55408
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
DM Hughes Aircraft Co., Ind'l. Prods. Div., Prod. Equip. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
IPAC Group, Inc., Dept. EM, POB 156 3047 Industrial Blvd., Bethel Park, PA 15102
IRD Mechanalysis, Inc., Dept. EM, 6150 Huntley Rd., Columbus, Ohio 43229
ITI Electronics, Inc., Dept. EM, 369 Lexington Ave., Clifton, N.J. 07015
Kidde, Walter & Co., Belleville Div., Dept. EM, 675 Main St., Belleville, N.J. 07109
Kolin Industries, Dept. EM, 59 W. Pondfield Rd., Bronxville, N.Y. 10708
Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
D LocAtor Electronics Co., Dept. EM, South Country Ind'l Pk., Drawer 10609, St. Louis, Mo. 63129
D L-Tronics, Dept. EM, 5546 Cathedral Oak Rd., Santa Barbara, Cal. 93111
Luft Instrs., Inc., Dept. EM, Hillside Rd, Lincoln, Mass. 01773
Mack Elec. Devices, Dept. EM, 32 Glenside Ave., Wyncote, Pa. 19095
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
Metrix Instrument Co., Metrix Instrument Co., Dept. EM, 1711 Townhurst, Houston, Tex. 77043
Micro Instrument Co., Marine & Power Instr. Div., Dept. EM, 2250 Micro Pl., Escondido, Cal. 92025
I Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
Mine Safety Appliances Co., Dept. EM, 600 Penn Center Blvd., Pittsburgh, Pa 15235
MRC Alarm Systems & Devices Co., Dept. EM, 700 W. Virginia St., Milwaukee, Wisc. 53204
D Multi-Elmac Co., Dept. EM, 22700 Heslip Dr., Novi, Mich. 48050
National Security Systems, Dept. EM, 20 Beechwood Ave., Port Washington, N.Y. 11050
D On-Guard Corp. of America, Dept. EM, 350 Gotham Pkwy., Carlstadt, NJ 07072
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D PASO Sound Products Inc., Dept. EM, 14 First St, Pelham, NY 10803
D Poly-Scientific, Litton Sys., Dept. EM, 1213 N. Main St., Blacksburg, Va. 24060
D Projects Unlimited, Inc., Dept. EM, 3680 Wyse Rd., Dayton, Ohio 45414
Puleo Electronics, Inc., Dept. EM, 39 Hutcheson Pl., Lynbrook, N.Y. 11563
Rochester Instr System, Dept. EM, 255 N. Union St., Rochester, N.Y. 14605
D Scientific Technology, Dept. EM, 1201 San Antonio Rd., Mountain View, Cal. 94043
I Seaboard Elctrns, Dept. EM, 70 Church St., New Rochelle, N.Y. 10805
SHOGYO International Corp., Dept. EM, 300 Northern Blvd., Great Neck, N.Y. 11021
Signatron, Inc., Dept. EM, 12 Hartwell Ave., Lexington, Mass. 02173
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
D Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
Sys-Tec Inc., Dept. EM, 877 Third St. S.W., New Brighton, Minn. 55112
D Telco Products Co., Dept. EM, 44 Sea Cliff, Glen Cove, NY 11542
M Telectro Sys. Corp., Dept. EM, 96-18 43rd Ave., Corona, N.Y. 11368
Teledyne/Geotech, Dept. EM, Box 28277, Dallas, Tex. 75228
Telmar, Inc., Dept. EM, 1150 W. Third Ave., Columbus, Ohio 43212

Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
Worner Elctrn. Devices, Dept. EM, 121 N. Main St., Rankin, Ill. 60960

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Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 ..... *
D **Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032** *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Star Micronics Inc., Dept. EM, Pan Am Building, Ste 2308, 200 Park Ave, New York, N.Y. 10017 ..... *
D **Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629** .... *
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
Applied Control Co., Dept. EM, 1275 Bloomfield Ave., Fairfield, N.J. 07006
D Autotron, Inc., Dept. EM, 3269 N. Vermilion St., Box 595, Danville, Ill. 61832
Cherry Semiconductor Corp, Dept. EM, 99 Bald Hill Rd., Cranston, RI 02920
Edmund Scientific Co., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007
HEI, Inc., Dept. EM, Jonathan Ind'l. Ctr., Chaska, Minn. 55318
Innovation Industries Inc., Dept. EM, 5012 S. Main St., Roswell, N.M. 88201
Lark Electronics, Inc., Dept. EM, Box 390, New York, N.Y. 10040
D Laser Systems Corp., Dept. EM, 117 N. First St., Ann Arbor, Mich. 48104
D LocAtor Electronics Co., Dept. EM, South Country Ind'l Pk., Drawer 10609, St. Louis, Mo. 63129
Meloy Labs Inc., Instrus. & Sys. Div., Dept. EM, 6715 Electronic Dr., Springfield, Va. 22151
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
D Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
D Photomation, Inc., Dept. EM, Box 460, Mountain View, Cal. 94041
Projects Unlimited, Inc., Dept. EM, 3680 Wyse Rd., Dayton, Ohio 45414
D Scientific Technology, Dept. EM, 1201 San Antonio Rd., Mountain View, Cal. 94043
Skan-A-Matic Corp., Dept. EM, Box S, Elbridge, N.Y. 13060
Tri-Tronics Co. Inc., Dept. EM, 619 Enterprise Drive, Dept. EE, Oak Brook, Ill. 60521

Alloys, Brazing

D Alpha Metals, Inc., Dept. EM, 600 Rte 440, Jersey City, N.J. 07304
DM Anaconda Company Brass Division, Dept. EM, 414 Meadow St., Waterbury, Conn. 06720
Atomergic Chemetals Corp Co., Dept. EM, 100 Fairchild Ave., Plainview, N.Y. 11803
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830.
Glidden Metals, Chem/Met Div. SCM Corp., Dept. EM, 900 Union Commerce Bldg., Cleveland, Ohio 44115
GTE Sylvania Inc., Western Gold & Platinum Sub., Dept. EM, 477 Harbor Blvd., Belmont, Cal. 94002
Handy & Harman, Dept. EM, 850 Third Ave., New York, N.Y. 10022
Indium Corp. of Amer, Dept. EM, 1676 Lincoln Ave, Box 269, Utica, NY 13503
M Kawecki Berylco Inds., Inc., Dept. EM, PO Box 1462, Reading, PA 19603
Plessey Inc., Dept. EM, 320 Long Island Expwy. S., Melville, N.Y. 11746
Westinghouse Elec., Process Equip./Consumables Dept, Dept. EM, Box 300, Sykesville, Md. 21784

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Inter-Tech. Grp., Inc., Dept. EM, Box 23, Irvington, N.Y. 10533 ..... *
Alpha Metals, Inc., Dept. EM, 600 Rte 440, Jersey City, N.J. 07304
Atomergic Chemetals Corp Co., Dept. EM, 100 Fairchild Ave., Plainview, N.Y. 11803
Carpenter Technology, Dept. EM, Box 662, Reading, Pa. 19603
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
GTE Sylvania, Inc., Chem. & Metallurgical Div., Dept. EM, Hawes St., Towanda, Pa. 18848
Indium Corp. of Amer, Dept. EM, 1676 Lincoln Ave, Box 269, Utica, NY 13503
M Kawecki Berylco Inds., Inc., Dept. EM, PO Box 1462, Reading, PA 19603
M Magnetics, Div/Spang Industries, Inc., Dept. EM, Box 391, Butler, Pa. 16001
Materials Resch. Corp., Dept. EM, Route 303, Orangeburg, N.Y. 10962
Plessey Inc., Dept. EM, 320 Long Island Expwy. S., Melville, N.Y. 11746
Plessey Ceramic Div., Dept. EM, 8th & Harrison Sts., Frenchtown, N.J. 08825
M Reynolds Metals Co., Dept. EM, Box 27003, Richmond, VA. 23261
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013
United Refining & Smelting Co., Dept. EM, 3700 N. Runge Ave., Franklin Park, Ill. 60131

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M **Gorator Corporation, Dept. EM, Box 70, Manassas, Va. 22110** p. 3263,3264,3387,3388
I M C Magnetics, Eastern Div., Dept. EM, 570 Main St., Westbury, N.Y. 11590 *
M American Electronics, Inc., Dept. EM, 1600 E Valencia Dr., Fullerton, Cal. 92631
M Columbia Electric Mfg. Co., Dept. EM, 4519 Hamilton Ave. N.W., Cleveland, Ohio 44114
M Electric Indicator Co., Inc., Dept. EM, 272 Main Avenue, Norwalk, Conn. 06851
Kato Engineering Co., Dept. EM, 1415 1st Ave., Mankato, Minn. 56001
D Leece Neville Div., Sheller Globe Corp., Dept. EM, 1374 East 51st St., Cleveland, Ohio 44103
Magnetic Products, Inc., Dept. EM, Box 1125, New London, N.H. 03257
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201

Aluminizers, Vacuum—See Deposition Equip.; Evaporation Equip.

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A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 ..... *
American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
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Bulova Watch Co., Servo Prods. Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734 ..... *
Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 ..... *
M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101** ..... *
Crown International, Dept. EM, Box 1000, Elkhart, Ind. 46514 ..... p. 1010
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Exact Electronics, Inc., Dept. EM, Box 160, 455 SE 2nd Ave., Hillsboro, Ore. 97123 ..... *
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
M **GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055** ..... *
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 .... *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... p. 3389
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M **Krohn-Hite Corp., Dept. EM, Avon Ind'l Pk, Bodwell St., Avon, Mass. 02322** p. 2773
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D **Opamp Labs, Inc., Dept. EM, 1033 N. Sycamore Ave, Los Angeles, Cal. 90038** ..... p. 1018
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DM **Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247** *
Unholtz-Dickie Corp., Dept. EM, 3000 Whitney Ave., Hamden, Conn. 06518 *
AEROCOM, Dept. EM, 3090 S.W. 37th Ave., Miami, Fla. 33133
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
Alpha-M Corp, Dept. EM, 3009 Wildflower Drive, Dallas, Tx. 75229
D Amperex Electronic Corp., Slatersville Div., Dept. EM, Providence Pike, Slatersville, R.I. 02876
D Amplifier Corp. of America, Dept. EM, 75 Frost St., Westbury, N.Y. 11590
D Ampro Corp., Dept. EM, 850 Pennsylvania Blvd., Feasterville, PA. 19047
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
D Barker & Williamson, Inc., Dept. EM, Canal St., Bristol, Pa. 19007
Beckman Instrs., (AISSD), Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634
D Bell PA Products, Dept. EM, 1200 N. Fifth St. Box 8177, Columbus, Ohio 43201
D Bogen Div., Lear Siegler, Inc., Dept. EM, Box 500, Paramus, N.J. 07652
C-COR Elctrns., Dept. EM, 60 Decibel Rd., State College, Pa. 16801
Cherry Semiconductor Corp, Dept. EM, 99 Bald Hill Rd., Cranston, RI 02920
D Communications Equip Co., Dept. EM, Box 700, Glen Arbor, Mich. 49636
Dantel, Inc., Dept. EM, 1922 North Helm, Fresno, Cal. 93727
Dexter Research Ctr, Inc., Dept. EM, 7300 Huron River Dr, Dexter, Mich 48130
D Dynaco Inc., Div Tyco Corp., Dept. EM, Box 88 Coles Rd., Blackwood, N.J. 08012
Electro-Optical Inds., Inc., Dept. EM, 839 Ward Dr., Santa Barbara, Cal. 93111
D Encom Prods. Co., Inc., Dept. EM, Lower Hopewell Rd., Box 300, Oxford, Pa. 19363
ENI Power Systems, Dept. EM, 3000 Winton Rd. S., Rochester, N.Y. 14623
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
D Frazier, Inc., Dept. EM, 1930 Valley View La., Dallas, Tex. 75234
M Glentek, Inc., Dept. EM, 1559 7th St., Santa Monica, Calif. 90401
HGA Elctrns., Inc., Dept. EM, 519 S. Fifth Ave., Mt. Vernon, N.Y. 10550
M Instruments, Inc., Dept. EM, 3432 Midway Dr., San Diego, Cal. 92110
D International Sensor Systems, Inc., Dept. EM, Aurora Industrial Pk., Box 345, Aurora, Neb. 68818
D ITI Electronics, Inc., Dept. EM, 369 Lexington Ave., Clifton, N.J. 07015
LogiMetrics Inc., Dept. EM, 121-03 Dupont St., Plainview, NY 11803
D Midwest Electronic Industries, Dept. EM, 4945 W. Belmont Ave., Chicago, Ill. 60641
D Mobil Electronics, Inc., Dept. EM, Box 1132, Anderson, Ind. 46015
Modular Audio Products, Dept. EM, 50 Orville Dr., Bohemia, N.Y. 11716
M Modular Devices, Inc., Dept. EM, 50 Orville Dr., Bohemia, N. Y. 11716
D Newcomb Audio Products Co., Dept. EM, 12881 Bradley Ave., Sylmar, Cal. 91342
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
Norton Assocs., Inc., Dept. EM, 10 Di Tomas Ct., Copiague, N.Y. 11726
D PASO Sound Products Inc., Dept. EM, 14 First St, Pelham, NY 10803
D Perma Power Elctrns, Dept. EM, 5615 W. Howard Ave., Chicago, Ill. 60648
M Perry Amplifier, Dept. EM, 138 Fuller St., Brookline, Mass. 02146
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
D Plessey Semiconductors, Dept. EM, 1674 McGaw Ave., Irvine, Cal. 92714
Precision Electronics, Inc., Dept. EM, 9101 King Ave., Franklin Park, Ill 60131
Princeton Applied Resch. Corp., Dept. EM, Box 2565, Princeton, N.J. 08540
M Projects Unlimited, Inc., Dept. EM, 3680 Wyse Rd., Dayton, Ohio 45414

RFL Inds., Comms. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005
Richard-Lee Co., Dept. EM, Box 724, New Providence, N.J. 07974
D Robins Broadcast & Sound Equipment Corp., Sub. Robins Inds., Dept. EM, 75 Austin Blvd., Commack, N.Y. 11725
D Sescom, Inc., Dept. EM, 12931 Budlong Ave. Box 590, Gardena, Cal. 90247
D Shure Brothers, Inc., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204
Solid State Inc., Dept. EM, 46 Farrand St., Bloomfield, N.J. 07003
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
D Spectra Sonics, Dept. EM, 770 Wall Ave., Ogden, Utah 84404
Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
D Tape-Athon Corp., Dept. EM, 502 S. Isis Ave., Inglewood, Cal 90301
M Telephonics Corp., Dept. EM, 770 Park Ave., Huntington, N.Y. 11743
Telesis Laboratory, Dept. EM, Box 387, Chillocothe, Ohio 45601
D Telex Communications, Inc., Dept. EM, 9600 Aldrich Ave., So., Minneapolis, Minn. 55420
Transmed Scientific, Dept. EM, 860-C Capitolio Way, San Luis Obispo, Cal. 93401
D Trutone Elctrns., Inc., Dept. EM, 7315 Fulton Ave., No. Hollywood, Cal. 91605
Turner Div., Conrac, Dept. EM, 716 Oakland Rd. N.E., Cedar Rapids, Iowa 52402
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Amplifiers, Antenna

D Ava Elctrns., Dept. EM, 4000 Bridge St., Dreyel Hill, Pa 19026 ..... *
Cober Elctrns., Inc., Dept. EM, 7 Gleason Ave., Stamford, Conn. 06902 ..... p. 2862
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North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
M , Trak Microwave Corp., Dept. E8, Dept. EM, 4726 Eisenhower Blvd.,, Tampa, Fla. 33614 ..... *
M Adams-Russell Co., Inc., Dept. EM, 280 Bear Hill Rd., Waltham, Mass. 02154
M Avantek, Inc., Dept. EM, 3175 Bowers Ave., Santa Clara, Cal. 95051
BF Elctrns., Dept. EM, 415 S. Nardo, Solana Beach, Calif. 92075
D Blonder-Tongue Labs., Inc., Dept. EM, One Jake Brown Rd., Old Bridge, N.J. 08857
C-COR Elctrns., Dept. EM, 60 Decibel Rd., State College, Pa. 16801
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Channel Master Div. Avnet, Dept. EM, Rte. 209, Ellenville, N.Y. 12428
Comdel, Inc., Dept. EM, Beverly Airport, Beverly, Mass. 01915
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
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D Finney Co., Dept. EM, 34 W. Interstate St., Bedford, Ohio 44014
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Mu-Del Elctrns., Dept. EM, 2426 Linden La., Silver Spring, Md. 20910
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Radiation Devices Co., Inc., Dept. EM, Box 8450, Baltimore, Md. 21234
D RCA Distr. & Special Prods. Div., Dept. EM, Deptford, N.J. 08096
Resdel Engineering Corp., Dept. EM, 300 E. Live Oak Ave., Arcadia, Cal. 91006
M RHG Elctrns. Lab., Dept. EM, 161 E. Industry Ct., Deer Park, N.Y. 11729
D Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
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Amplifiers, Charge

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Dynamics Elctrn. Prods., Waugh Controls, Dept. EM, 9001 Fullbright Ave., Chatsworth, Cal. 91311 ..... p. 1002
Ithaco, Inc., Dept. EM, 735 W. Clinton St., Ithaca, N.Y. 14850 ..... p. 1007
Precision Filters, Inc., Dept. EM, 303 W. Lincoln St., Ithaca, N.Y. 14850 ..... *
Unholtz-Dickie Corp., Dept. EM, 3000 Whitney Ave., Hamden, Conn. 06518 *
Alpha-M Corp, Dept. EM, 3009 Wildflower Drive, Dallas, Tx. 75229
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M Gulton Inds., Inc., Servonic/Instrumentation Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
Metrix Instrument Co., Metrix Instrument Co., Dept. EM, 1711 Townhurst, Houston, Tex. 77043
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
Optical Electronics, Inc., Dept. EM, Box 11140, Tucson, Ariz. 85734
PCB Piezotronics, Inc., Dept. EM, 5800 Transit Rd., Depew, N.Y. 14043
M Perry Amplifier, Dept. EM, 138 Fuller St., Brookline, Mass. 02146
Sundstrand Data Control, Dept. EM, Overlake Ind'l. Pk., Redmond, Wash. 98052
Wilcoxon Research, Dept. EM, 12526 Parklawn Dr., Rockville, Md. 20852

Amplifiers, Compressor

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M GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 ..... *
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D Opamp Labs, Inc., Dept. EM, 1033 N. Sycamore Ave, Los Angeles, Cal. 90038 ..... *
BF Elctrns., Dept. EM, 415 S. Nardo, Solana Beach, Calif. 92075
Comdel, Inc., Dept. EM, Beverly Airport, Beverly, Mass. 01915
D ITI Electronics, Inc., Dept. EM, 369 Lexington Ave., Clifton, N.J. 07015
D Midwest Electronic Industries, Dept. EM, 4945 W. Belmont Ave., Chicago, Ill. 60641
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M Modular Devices, Inc., Dept. EM, 50 Orville Dr., Bohemia, N. Y. 11716
MVP Electronics, Dept. EM, 1161 N. Tustin, Orange, Cal. 92667
Optical Electronics, Inc., Dept. EM, Box 11140, Tucson, Ariz. 85734
D Robins Broadcast & Sound Equipment Corp., Sub. Robins Inds., Dept. EM, 75 Austin Blvd., Commack, N.Y. 11725
Shure Brothers, Inc., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204
D Spectra Sonics, Dept. EM, 770 Wall Ave., Ogden, Utah 84404

Amplifiers, Current

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Bulova Watch Co., Servo Prods. Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
M Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 ..... *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
Infodex, Inc., Dept. EM, 7 Cherry Ave., Waterbury, Conn. 06702 ..... *
Ithaco, Inc., Dept. EM, 735 W. Clinton St., Ithaca, N.Y. 14850 ..... p. 1007
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
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M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
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M Modular Devices, Inc., Dept. EM, 50 Orville Dr., Bohemia, N. Y. 11716
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
Norton Assocs., Inc., Dept. EM, 10 Di Tomas Ct., Copiague, N.Y. 11726
Optical Electronics, Inc., Dept. EM, Box 11140, Tucson, Ariz. 85734
M Perry Amplifier, Dept. EM, 138 Fuller St., Brookline, Mass. 02146
Princeton Applied Resch. Corp., Dept. EM, Box 2565, Princeton, N.J. 08540
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M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Systems Research Labs. Inc., Dept. EM, 2800 Indian Ripple Rd. , Dayton, Ohio 45440

Amplifiers, D-C

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D Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Bulova Watch Co., Servo Prods. Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... p. 3974
M Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734 ..... *
M Clifton Precision, Litton Systems, Inc., Dept. EM, Marple at Brdway., Clifton Hgts., Pa. 19018 ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
M Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 .. p. 3975
M Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 ..... p. 1401
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Ectron Corp., Dept. EM, 8159 Engineer Rd., San Diego, Cal. 92111 .... p. 2719
Electro-Craft Corp., Dept. EM, 1600 2nd St. South, Hopkins, Minn. 55343 .. *
D General Magnetics, Dept. EM, 211 Grove St., Bloomfield, N.J. 07003 ..... *
Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 ..... *
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 ..... *
Honeywell, Inc., Test Instrs. Div., Dept. EM, 4800 E. Dry Creek Rd., Box 5227, Denver, Colo. 80217 ..... p. 2843
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 ..... p. 1006
Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735 ..... *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
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M Micro-Mo Electronics Inc., Dept. EM, 3691 Lee Rd., Cleveland, Ohio 44120 *
Millivac Instruments, Inc., Dept. EM, Box 997, Curry Rd. Ext., Schnectady, N.Y. 12301 ..... *
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D Opamp Labs, Inc., Dept. EM, 1033 N. Sycamore Ave, Los Angeles, Cal. 90038 ..... p. 1018
Polytron Devices Inc., Dept. EM, Box 398 - River St. Sta., Patterson, N.J. 07524 ..... *
PPM, Inc., Dept. EM, 7575 Bond St., Cleveland, Ohio 44139 ..... *
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M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
M Analog Devices, Inc., Dept EM, P.O. Box 280, Norwood, MA 02062
Analogic Corp., Dept. EM, Audubon Rd., Wakefield, Mass. 01880
M Bay Laboratories, Inc., Dept. EM, 20160 Center Ridge Rd., Cleveland, Ohio 44116
Bell & Howell Co., Elctrns. & Instrs. Grp., Dept. EM, 360 Sierra Madre Villa, Pasadena, Cal. 91109
Benton Corp, Dept. EM, Race St Box 678, Manor, PA 15665
Cherry Semiconductor Corp, Dept. EM, 99 Bald Hill Rd., Cranston, RI 02920
Control Systems Research, Inc., Dept. EM, CSR Bldg., 632 Fort Duquesne Blvd., Pittsburgh, Pa. 15222
Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Fogg System Co., Dept. EM, 15592 E. Batavia Dr., Aurora, Colo. 80011
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D General Computers, Inc., Dept. EM, 5990 W. Pico Blvd., Los Angeles, Calif. 90035
M Glentek, Inc., Dept. EM, 1559 7th St., Santa Monica, Calif. 90401
M Gulton Inds., Inc., Servonic/Instrumentation Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
M Hades Mfg Corp., Dept. EM, 151-A Verdi St., Farmingdale, N.Y. 11735
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Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704
M Inland Motor Div. Kollmorgen, Indl Drives Grp, Dept. EM, 609 Rock Rd., Radford, Va. 24141
M Inland Motor Div. Kollmorgen, Dept. EM, Spec Prods., 501 First St., Radford, Va. 24141
DM Intech/Function Modules, Dept. EM, 282 Brokaw, Santa Clara, Cal. 95050
IPAC Group, Inc., Dept. EM, POB 156 3047 Industrial Blvd., Bethel Park, PA 15102
Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962
McFadden Elctrns. Co., Dept. EM, 8953 S. Atlantic Blvd., South Gate, Cal. 90280
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MVP Electronics, Dept. EM, 1161 N. Tustin, Orange, Cal. 92667
Nuclear Resch. Corp., Dept. EM, 1105 Indl. Hwy., Southampton, Pa. 18966
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M Perry Amplifier, Dept. EM, 138 Fuller St., Brookline, Mass. 02146
DM Precision Monolithics Inc., Dept. EM, 1500 Space Dr., Santa Clara, Cal. 95050
Princeton Applied Resch. Corp., Dept. EM, Box 2565, Princeton, N.J. 08540
RFL Inds., Comms. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005
RIL Elctrns., Inc., Dept. EM, 1105 Ind'l. Hwy., Southampton, Pa. 18966
Rochester Instr System, Dept. EM, 255 N. Union St., Rochester, N.Y. 14605
D Spectra Sonics, Dept. EM, 770 Wall Ave., Ogden, Utah 84404
Sprengnether Instr. Co., W.F., Dept. EM, 4567 Swan St., St. Louis, Mo. 63110
Teledyne/Geotech, Dept. EM, Box 28277, Dallas, Tex. 75228
Teledyne Philbrick, Dept. EM, 17 Allied Dr. Rte 128, Dedham, Mass. 02026
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M Westamp, Inc., Dept. EM, 1542 15th St., Santa Monica, Cal. 90404
Zonic Technical Labs., Dept. EM, 8927 Rossash Ave., Cincinnati, Ohio 45236

Amplifiers, Data—See Amplifiers, Instrumentation

Amplifiers, Decade

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MVP Electronics, Dept. EM, 1161 N. Tustin, Orange, Cal. 92667
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DM Plessey Semiconductors, Dept. EM, 1674 McGaw Ave., Irvine, Cal. 92714

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Infodex, Inc., Dept. EM, 7 Cherry Ave., Waterbury, Conn. 06702 p. 2486
Design Automation, Dept. EM, 809 Massachusetts Ave., Lexington, Mass. 02173
Intronics Inc., Dept. EM, 57 Chapel St., Newton, Mass. 02158
Sierra Scientific Corp., Dept. EM, 2189 Laghorn St., Mountain View, Cal. 94043

Amplifiers, Delay Line

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
M **Microsonics, Div. Sangamo Elec. Co., Dept. EM, 60 Winter St., Weymouth, Mass. 02188** *
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Amplifiers, Differential

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Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 p. 1401
Dynamics Elctrn. Prods., Waugh Controls, Dept. EM, 9001 Fullbright Ave., Chatsworth, Cal. 91311 p. 1002
Ectron Corp., Dept. EM, 8159 Engineer Rd., San Diego, Cal. 92111 p. 2719
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Ithaco, Inc., Dept. EM, 735 W. Clinton St., Ithaca, N.Y. 14850 p. 1007
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 *
Kulite Semiconductor Prod., Dept. EM, 1030 Hoyt Ave., Ridgefield, N.J. 07657 *
Mini-Systems, Inc., Dept. EM, 20 David Rd., North Attleboro, Mass. 02761 *
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Unholtz-Dickie Corp., Dept. EM, 3000 Whitney Ave., Hamden, Conn. 06518 *
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Analogic Corp., Dept. EM, Audubon Rd., Wakefield, Mass. 01880
M Bay Laboratories, Inc., Dept. EM, 20160 Center Ridge Rd., Cleveland, Ohio 44116
Bell & Howell Co., Elctrns. & Instrs. Grp., Dept. EM, 360 Sierra Madre Villa, Pasadena, Cal. 91109
Brunswick Instr., Dept. EM, 6150 W. Mulford Street, Niles, Ill. 60648
C-COR Elctrns., Dept. EM, 60 Decibel Rd., State College, Pa. 16801
Cherry Semiconductor Corp, Dept. EM, 99 Bald Hill Rd., Cranston, RI 02920
Data, Inc., Dept. EM, 210 S. Mason, Box 2071, Ft. Collins, Colo. 80521
Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
D Dynair Elctrns. Inc., Dept. EM, 5275 Market St., San Diego, Calif. 92114
Dynamic Measurements Corp., Dept. EM, 6 Lowell Ave., Winchester, Mass. 01890
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
M Glentek, Inc., Dept. EM, 1559 7th St., Santa Monica, Calif. 90401
M Gulton Inds., Inc., Servonic/Instrumentation Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
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Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704
DM Intech/Function Modules, Dept. EM, 282 Brokaw, Santa Clara, Cal. 95050
Modular Audio Products, Dept. EM, 50 Orville Dr., Bohemia, N.Y. 11716
M Modular Devices, Inc., Dept. EM, 50 Orville Dr., Bohemia, N. Y. 11716
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Optical Electronics, Inc., Dept. EM, Box 11140, Tucson, Ariz. 85734
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Teledyne Philbrick, Dept. EM, 17 Allied Dr. Rte 128, Dedham, Mass. 02026
DM Teledyne Semiconductor, Dept. EM, 1300 Terra Bella Ave., Mountain View, Cal. 94040
Transmed Scientific, Dept. EM, 860-C Capitolio Way, San Luis Obispo, Cal. 93401
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Amplifiers, Distributed

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D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043** *
M **Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040** p. 2324
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M **Wavetek Indiana, Inc., Dept. EM, 66 N. First Ave., Beech Grove, Ind. 46107** *
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D Ampro Corp., Dept. EM, 850 Pennsylvania Blvd., Feasterville, PA. 19047
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M CATV Communications, Div. of Amer. Elctrn. Labs. Inc., Dept. EM, Box 552, Lansdale, Pa. 19446

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DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
D Apollo Lasers, Apollo Lasers, Inc., Dept. EM, 6357 Arizonia Cir., Los Angeles, Cal. 90045
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Radiation Devices Co., Inc., Dept. EM, Box 8450, Baltimore, Md. 21234
RCA Distr. & Special Prods. Div., Dept. EM, Deptford, N.J. 08096
M RHG Elctrns. Lab., Dept. EM, 161 E. Industry Ct., Deer Park, N.Y. 11729
RIL Elctrns., Inc., Dept. EM, 1105 Ind'l. Hwy., Southampton, Pa. 18966
D Robins Broadcast & Sound Equipment Corp., Sub. Robins Inds., Dept. EM, 75 Austin Blvd., Commack, N.Y. 11725
D Sescom, Inc., Dept. EM, 12931 Budlong Ave. Box 590, Gardena, Cal. 90247
Shure Brothers, Inc., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204
Spectracom Corp., Dept. EM, 1667 Penfield Rd., Rochester, N.Y. 14625
D Spectra Sonics, Dept. EM, 770 Wall Ave., Ogden, Utah 84404
Tracor, Inc., Dept. EM, 6500 Tracor La., Austin, Tex. 78721
D Winegard Co., Dept. EM, 3000 Kirkwood St., Burlington, Iowa 52601
M Zeta Laboratories, Inc., Dept. EM, 3265 Scott Blvd., Santa Clara, Cal. 95051

Amplifiers, Equalization

D Opamp Labs, Inc., Dept. EM, 1033 N. Sycamore Ave, Los Angeles, Cal. 90038 ..... *
C-COR Elctrns., Dept. EM, 60 Decibel Rd., State College, Pa. 16801
Convex Corp., Dept. EM, 2810 Dorr Ave., Fairfax, Va. 22031
Di-Tech Inc., Dept. EM, 315 Wyandanch Ave., North Babylon, N.Y. 11704
D Dynair Elctrns. Inc., Dept. EM, 5275 Market St., San Diego, Calif. 92114
D ITI Electronics, Inc., Dept. EM, 369 Lexington Ave., Clifton, N.J. 07015
Modular Audio Products, Dept. EM, 50 Orville Dr., Bohemia, N.Y. 11716
D Sescom, Inc., Dept. EM, 12931 Budlong Ave. Box 590, Gardena, Cal. 90247
Shure Brothers, Inc., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204

Amplifiers, I-F

A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 ..... *
American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 p. 1006
DM **Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725** ..... *
M **Trak Microwave Corp., Dept. E8, Dept. EM, 4726 Eisenhower Blvd., Tampa, Fla. 33614** ..... p. 3064
D **TRW RF Semiconductors, Dept. EM, 14520 Aviation Blvd., Lawndale, Cal. 90260** ..... *
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
AERCOM, Dept. EM, 405 Tasman Dr., Sunnyvale, Cal. 94086
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
D Ailtech, Dept. EM, 2070 Fifth Ave, Ronkonkoma, NY 11779
M Anzac Electronics, Dept. EM, 39 Green St., Waltham, Mass. 02154
M Avantek, Inc., Dept. EM, 3175 Bowers Ave., Santa Clara, Cal. 95051
BF Elctrns., Dept. EM, 415 S. Nardo, Solana Beach, Calif. 92075
C-COR Elctrns., Dept. EM, 60 Decibel Rd., State College, Pa. 16801
Cherry Semiconductor Corp, Dept. EM, 99 Bald Hill Rd., Cranston, RI 02920
Comdel, Inc., Dept. EM, Beverly Airport, Beverly, Mass. 01915
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Ferranti Elec., Dept. EM, East Bethpage Rd., Plainview, N.Y. 11803
FG Engineering Co., Dept. EM, Box 39, Black Canyon Stage, Mayer, Ariz. 86333
Frequency Engrg. Labs., Dept. EM, Box 527, Farmingdale, N.J. 07727
M Merrimac Inds., Inc., Dept. EM, 41 Fairfield Pl., West Caldwell, N.J. 07006
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
M Microwave Power Devices, Dept. EM, Adams Ct., Plainview, N.Y. 11803
Mu-Del Elctrns., Dept. EM, 2426 Linden La., Silver Spring, Md. 20910
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M Optimax, Inc., Optimax, Div. Alpha Industries, Inc., Dept. EM, Box 105, Advance Lane, Colmar, Pa. 18915
M Perry Amplifier, Dept. EM, 138 Fuller St., Brookline, Mass. 02146
DM Plessey Semiconductors, Dept. EM, 1674 McGaw Ave., Irvine, Cal. 92714
M RHG Elctrns. Lab., Dept. EM, 161 E. Industry Ct., Deer Park, N.Y. 11729
M Scientific Communications, Dept. EM, 3425 Kingsley, Garland, Tex. 75041
Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
M Technical Research & Mfg., Inc., Dept. EM, Kelly Ave. Grenier Field, R.F.D. #3, Manchester, N.H. 03103
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304
M Zeta Laboratories, Inc., Dept. EM, 3265 Scott Blvd., Santa Clara, Cal. 95051

Amplifiers, Instrumentation

Bulova Watch Co., Servo Prods. Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
M **Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734** ..... p. 2856
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Data Translation, Dept. EM, 4 Strathmore Rd., Natick, Mass. 01760 ..... *
M **Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021** p. 1401
Dynamics Elctrn. Prods., Waugh Controls, Dept. EM, 9001 Fullbright Ave., Chatsworth, Cal. 91311 ..... p. 1002
Ectron Corp., Dept. EM, 8159 Engineer Rd., San Diego, Cal. 92111 ..... *
Electronic Navigation Inds., Dept. EM, 3000 Winton Rd. S., Rochester, N.Y. 14623 ..... p. 1003,1005
Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 ..... *
Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 ..... *
Honeywell, Inc., Test Instrs. Div., Dept. EM, 4800 E. Dry Creek Rd., Box 5227, Denver, Colo. 80217 ..... *
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 ..... *
Ithaco, Inc., Dept. EM, 735 W. Clinton St., Ithaca, N.Y. 14850 ..... p. 1007
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
D **Mallory Capacitor Co., Div. P.R. Mallory, Dept. EM, 3029 E. Washington, Box 372, Indianapolis, Ind. 46201** ..... *
Marine Electric Railway Prods. Div., Inc., Dept. EM, 167 National Rd., Edison, N.J. 08817 ..... *
D **Midtex, Inc., AEMCO Div., Dept. EM, 1650 Tower Blvd., No. Mankato, Minn. 56001** ..... *
Millivac Instruments, Inc., Dept. EM, Box 997, Curry Rd. Ext., Schnectady, N.Y. 12301 ..... p. 2784
Mini-Systems, Inc., Dept. EM, 20 David Rd., North Attleboro, Mass. 02761 *
M **Natel Engineering Co., Dept. EM, 8954 Mason Ave., Canoga Park, Cal. 91306** *
Neff Instrument Corp., Dept. EM, 1088 E. Hamilton Rd., Duarte, Cal. 91010 p. 1657
Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705 ..... *
D **Opamp Labs, Inc., Dept. EM, 1033 N. Sycamore Ave, Los Angeles, Cal. 90038** ..... *
Polytron Devices Inc., Dept. EM, Box 398 - River St. Sta., Patterson, N.J. 07524 ..... *
PPM, Inc., Dept. EM, 7575 Bond St., Cleveland, Ohio 44139 ..... *
Precision Filters, Inc., Dept. EM, 303 W. Lincoln St., Ithaca, N.Y. 14850 p. 2637
Preston Scientific Inc., Dept. EM, 805 E. Cerritos Ave., Anaheim, Cal. 92805 p. 1008,1009
Re-el Circuits, Inc., Dept. EM, 520 Victor Street, Saddle Brook, N.J. 07662 p. 1380
DM **Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008** ..... *
M **Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735** *
D **TRW RF Semiconductors, Dept. EM, 14520 Aviation Blvd., Lawndale, Cal. 90260** ..... *
Unholtz-Dickie Corp., Dept. EM, 3000 Whitney Ave., Hamden, Conn. 06518 p. 2575
Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... *
M Acromag, Inc., Dept. EM, 30765 Wixom Rd., Wixom, Mich. 48096
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
M Avantek, Inc., Dept. EM, 3175 Bowers Ave., Santa Clara, Cal. 95051
M Bay Laboratories, Inc., Dept. EM, 20160 Center Ridge Rd., Cleveland, Ohio 44116
Bell & Howell Co., Elctrns. & Instrs. Grp., Dept. EM, 360 Sierra Madre Villa, Pasadena, Cal. 91109
C-COR Elctrns., Dept. EM, 60 Decibel Rd., State College, Pa. 16801
Cherry Semiconductor Corp, Dept. EM, 99 Bald Hill Rd., Cranston, RI 02920
M Conrac Corp., Systems Sls Div., Dept. EM, Three Landmark Sq., Stamford, Conn. 06901
Convex Corp., Dept. EM, 2810 Dorr Ave., Fairfax, Va. 22031
Data, Inc., Dept. EM, 210 S. Mason, Box 2071, Ft. Collins, Colo. 80521
Dynamic Measurements Corp., Dept. EM, 6 Lowell Ave., Winchester, Mass. 01890
Endevco, Div. Becton, Dickinson & Co., Dept. EM, 30700 Rancho Viejo Rd., San Jaun Capistrano, Cal. 92675
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Fogg System Co., Dept. EM, 15592 E. Batavia Dr., Aurora, Colo. 80011
M Hades Mfg Corp., Dept. EM, 151-A Verdi St., Farmingdale, N.Y. 11735
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Himmelstein & Co., S., Dept. EM, 2500 Estes Ave., Elk Grove Village, Ill. 60007
DM Hughes Aircraft Co., Electron Dynamics Div., Dept. EM, 3100 W. Lomita Blvd., Torrance, Cal. 90509
Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704
DM Intech/Function Modules, Dept. EM, 282 Brokaw, Santa Clara, Cal. 95050
Intronics Inc., Dept. EM, 57 Chapel St., Newton, Mass. 02158
IPAC Group, Inc., Dept. EM, POB 156 3047 Industrial Blvd., Bethel Park, PA 15102
Optical Electronics, Inc., Dept. EM, Box 11140, Tucson, Ariz. 85734
Paine Instruments, Inc., Dept. EM, 2401 S. Bayview St., Seattle, Wash. 98144
DM Precision Monolithics Inc., Dept. EM, 1500 Space Dr., Santa Clara, Cal. 95050
Princeton Applied Resch. Corp., Dept. EM, Box 2565, Princeton, N.J. 08540
Rochester Instr System, Dept. EM, 255 N. Union St., Rochester, N.Y. 14605
Signal Labs, Inc., Dept. EM, 202 N. State College Blvd., Orange, Cal. 92668
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Sprengnether Instr. Co., W.F., Dept. EM, 4567 Swan St., St. Louis, Mo. 63110
Systems Research Labs. Inc., Dept. EM, 2800 Indian Ripple Rd., Dayton, Ohio 45440
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Teledyne/Geotech, Dept. EM, Box 28277, Dallas, Tex. 75228
Teledyne Philbrick, Dept. EM, 17 Allied Dr. Rte 128, Dedham, Mass. 02026
Tri-Com, Inc., Dept. EM, 12216 Parklawn Dr., Rockville, Md. 20852
Wide Band Engrg. Co. Inc., Dept. EM, Box 21652, Phoenix, Ariz. 85036

Amplifiers, Integrating

Bulova Watch Co., Servo Prods. Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734 *
M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101** *
Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 *
Ithaco, Inc., Dept. EM, 735 W. Clinton St., Ithaca, N.Y. 14850 *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 *
Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 *
Unholtz-Dickie Corp., Dept. EM, 3000 Whitney Ave., Hamden, Conn. 06518 *
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Fogg System Co., Dept. EM, 15592 E. Batavia Dr., Aurora, Colo. 80011
M Glentek, Inc., Dept. EM, 1559 7th St., Santa Monica, Calif. 90401
M Modular Devices, Inc., Dept. EM, 50 Orville Dr., Bohemia, N. Y. 11716
Optical Electronics, Inc., Dept. EM, Box 11140, Tucson, Ariz. 85734
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Sundstrand Data Control, Dept. EM, Overlake Ind'l. Pk., Redmond, Wash. 98052
Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105

Amplifiers, Isolation

Bulova Watch Co., Servo Prods. Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734 p. 2857
M **Clifton Precision, Litton Systems, Inc., Dept. EM, Marple at Brdway., Clifton Hgts., Pa. 19018** *
M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101** *
Ectron Corp., Dept. EM, 8159 Engineer Rd., San Diego, Cal. 92111 *
D **General Magnetics, Dept. EM, 211 Grove St., Bloomfield, N.J. 07003** *
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 *
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 *
Neff Instrument Corp., Dept. EM, 1088 E. Hamilton Rd., Duarte, Cal. 91010 *
Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705 *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 *
D **Opamp Labs, Inc., Dept. EM, 1033 N. Sycamore Ave, Los Angeles, Cal. 90038** *
Polytron Devices Inc., Dept. EM, Box 398 - River St. Sta., Patterson, N.J. 07524 *
Preston Scientific Inc., Dept. EM, 805 E. Cerritos Ave., Anaheim, Cal. 92805 *
M Acromag, Inc., Dept. EM, 30765 Wixom Rd., Wixom, Mich. 48096
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Analogic Corp., Dept. EM, Audubon Rd., Wakefield, Mass. 01880
Brelonix, Inc., Dept. EM, 106 North 36th St., Seattle, Wash 98103
Cross Electronics Inc., Dept. EM, 100 Commonwealth Dr., Warrendale, Pa. 15086
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Fogg System Co., Dept. EM, 15592 E. Batavia Dr., Aurora, Colo. 80011
M Glentek, Inc., Dept. EM, 1559 7th St., Santa Monica, Calif. 90401
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704
D Intech/Function Modules, Dept. EM, 282 Brokaw, Santa Clara, Cal. 95050
IPAC Group, Inc., Dept. EM, POB 156 3047 Industrial Blvd., Bethel Park, PA 15102
M Microwave Power Devices, Dept. EM, Adams Ct., Plainview, N.Y. 11803
M Modular Devices, Inc., Dept. EM, 50 Orville Dr., Bohemia, N. Y. 11716
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
Optimax, Inc., Optimax, Div. Alpha Industries, Inc., Dept. EM, Box 105, Advance Lane, Colmar, Pa. 18915
M Perry Amplifier, Dept. EM, 138 Fuller St., Brookline, Mass. 02146
D Robins Broadcast & Sound Equipment Corp., Sub. Robins Inds., Dept. EM, 75 Austin Blvd., Commack, N.Y. 11725
Rochester Instr System, Dept. EM, 255 N. Union St., Rochester, N.Y. 14605
Signal Labs, Inc., Dept. EM, 202 N. State College Blvd., Orange, Cal. 92668
Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
D Spectra Sonics, Dept. EM, 770 Wall Ave., Ogden, Utah 84404
Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304

Amplifiers, Keying

Marine Electric Railway Prods. Div., Inc., Dept. EM, 167 National Rd., Edison, N.J. 08817 *

Amplifiers, Klystron

Cober Elctrns., Inc., Dept. EM, 7 Gleason Ave., Stamford, Conn. 06902 *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 *
M **MCL, Inc., Dept. EM, 10 North Beach Ave., LaGrange, Ill. 60525** *
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
M Keltec Florida, Sub Norlin Ind., Dept. EM, Box 1348, Fort Walton Beach, Fla. 32548
M Litton Inds., Electron Tube Div., Dept. EM, 960 Industrial Rd, San Carlos, Calif. 94070
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Amplifiers, Limiting

Bulova Watch Co., Servo Prods. Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101** *
D **Opamp Labs, Inc., Dept. EM, 1033 N. Sycamore Ave, Los Angeles, Cal. 90038** *
M **, Trak Microwave Corp., Dept. E8, Dept. EM, 4726 Eisenhower Blvd., Tampa, Fla. 33614** *
AERCOM, Dept. EM, 405 Tasman Dr., Sunnyvale, Cal. 94086
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
M Avantek, Inc., Dept. EM, 3175 Bowers Ave., Santa Clara, Cal. 95051
BF Elctrns., Dept. EM, 415 S. Nardo, Solana Beach, Calif. 92075
Comdel, Inc., Dept. EM, Beverly Airport, Beverly, Mass. 01915
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
FG Engineering Co., Dept. EM, Box 39, Black Canyon Stage, Mayer, Ariz. 86333
Gotham Audio Corp., Dept. EM, 741 Washington St., New York, N.Y. 10014
M Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
Optical Electronics, Inc., Dept. EM, Box 11140, Tucson, Ariz. 85734
Optimax, Inc., Optimax, Div. Alpha Industries, Inc., Dept. EM, Box 105, Advance Lane, Colmar, Pa. 18915
DM Plessey Semiconductors, Dept. EM, 1674 McGaw Ave., Irvine, Cal. 92714
RFL Inds., Comms. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005
M RHG Elctrns. Lab., Dept. EM, 161 E. Industry Ct., Deer Park, N.Y. 11729
D Robins Broadcast & Sound Equipment Corp., Sub. Robins Inds., Dept. EM, 75 Austin Blvd., Commack, N.Y. 11725
D Sescom, Inc., Dept. EM, 12931 Budlong Ave. Box 590, Gardena, Cal. 90247
Shure Brothers, Inc., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204
D Spectra Sonics, Dept. EM, 770 Wall Ave., Ogden, Utah 84404
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304

Amplifiers, Line

Amplifier Research Corp., Dept. EM, 160 School House Rd., Souderton, Pa 18964 p. 1001
Bulova Watch Co., Servo Prods. Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734 *
M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101** *
Dynamics Elctrn. Prods., Waugh Controls, Dept. EM, 9001 Fullbright Ave., Chatsworth, Cal. 91311 p. 1002
GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 *
Ithaco, Inc., Dept. EM, 735 W. Clinton St., Ithaca, N.Y. 14850 *
Neff Instrument Corp., Dept. EM, 1088 E. Hamilton Rd., Duarte, Cal. 91010 *
D **Opamp Labs, Inc., Dept. EM, 1033 N. Sycamore Ave, Los Angeles, Cal. 90038** *
Re-el Circuits, Inc., Dept. EM, 520 Victor Street, Saddle Brook, N.J. 07662 *
D Ampro Corp., Dept. EM, 850 Pennsylvania Blvd., Feasterville, PA. 19047
D Channel Master Div. Avnet, Dept. EM, Rte. 209, Ellenville, N.Y. 12428
Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
Di-Tech Inc., Dept. EM, 315 Wyandanch Ave., North Babylon, N.Y. 11704
D EMI Gencom Inc., Dept. EM, 80 Express St., Plainview, N.Y. 11803
D Finney Co., Dept. EM, 34 W. Interstate St., Bedford, Ohio 44014
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
D ITI Electronics, Inc., Dept. EM, 369 Lexington Ave., Cliffon, N.J. 07015
Modular Audio Products, Dept. EM, 50 Orville Dr., Bohemia, N.Y. 11716
D PASO Sound Products Inc., Dept. EM, 14 First St, Pelham, NY 10803
M Perry Amplifier, Dept. EM, 138 Fuller St., Brookline, Mass. 02146
Radiation Devices Co., Inc., Dept. EM, Box 8450, Baltimore, Md. 21234
RFL Inds., Comms. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005
D Robins Broadcast & Sound Equipment Corp., Sub. Robins Inds., Dept. EM, 75 Austin Blvd., Commack, N.Y. 11725
Shure Brothers, Inc., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204
D Spectra Sonics, Dept. EM, 770 Wall Ave., Ogden, Utah 84404
Tri-Com, Inc., Dept. EM, 12216 Parklawn Dr., Rockville, Md. 20852

Amplifiers, Lock-In

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101** *
Ithaco, Inc., Dept. EM, 735 W. Clinton St., Ithaca, N.Y. 14850 p. 1007
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 *
Electro-Optical Inds., Inc., Dept. EM, 839 Ward Dr., Santa Barbara, Cal. 93111
Evans Assocs., Dept. EM, Box 5055, Berkeley, Cal. 94705
Micro-Now Instr. Co., Dept. EM, 6104 N. Pulaski Rd., Chicago, Ill. 60646
Princeton Applied Resch. Corp., Dept. EM, Box 2565, Princeton, N.J. 08540

Amplifiers, Logarithmic

Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734 p. 2857
M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101** *
Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 *
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 *
Preston Scientific Inc., Dept. EM, 805 E. Cerritos Ave., Anaheim, Cal. 92805 *
Telonic/Berkeley, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715 *
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Analogic Corp., Dept. EM, Audubon Rd., Wakefield, Mass. 01880
BF Elctrns., Dept. EM, 415 S. Nardo, Solana Beach, Calif. 92075
Dexter Scientific, Dept. EM, 1526 Arnold Dr., Melbourne, Fla. 32935
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704
DM Intech/Function Modules, Dept. EM, 282 Brokaw, Santa Clara, Cal. 95050
Intronics Inc., Dept. EM, 57 Chapel St., Newton, Mass. 02158
D Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044

Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
M Modular Devices, Inc., Dept. EM, 50 Orville Dr., Bohemia, N. Y. 11716
MVP Electronics, Dept. EM, 1161 N. Tustin, Orange, Cal. 92667
Optical Electronics, Inc., Dept. EM, Box 11140, Tucson, Ariz. 85734
M Perry Amplifier, Dept. EM, 138 Fuller St., Brookline, Mass. 02146
DM Plessey Semiconductors, Dept. EM, 1674 McGaw Ave., Irvine, Cal. 92714
M RHG Elctrns. Lab., Dept. EM, 161 E. Industry Ct., Deer Park, N.Y. 11729
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Teledyne Philbrick, Dept. EM, 17 Allied Dr. Rte 128, Dedham, Mass. 02026
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
D Wiltron Co., Dept. EM, 825 E. Middlefield Rd., Mt. View, Cal 94043

Amplifiers, Magnetic

Abacus Controls Inc., Dept. EM, 89 Redington Rd., Somerville, N.J. 08876 *
Airpax Elctrns., Controls Div., Dept. EM, 6801 W. Sunrise Blvd., Ft. Lauderdale, Fla. 33313 *
Bulova Watch Co., Servo Prods. Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
EWC, Inc., Dept. EM, 725 Federal Ave., Kenilworth, N.J. 07033 *
M **Freed Transformer Co., Inc., Dept. EM, 1718 Weirfield St., Brooklyn, N.Y. 11227** p. 4349
D **General Magnetics, Dept. EM, 211 Grove St., Bloomfield, N.J. 07003** *
M **Harrel, Inc., Dept. EM, 16 Fitch St., E. Norwalk, Conn. 06855** *
M **Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735** *
KGS Electronics, Inc., Dept. EM, 2029 N. Lincoln Ave., Pasadena, Cal. 91103 *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
Magnetico, Inc., Dept. EM, 182 Morris Ave., Holtsville, N.Y. 11742 *
OPT Inds. Inc., Data Products Div., Dept. EM, 300 Red School Lane, Phillipsburg, N.J. 08865 p. 3291
M **Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030** *
M **Torwico Elctrns., Inc., Dept. EM, Rte. 70, Lakewood, N.J. 08701** *
M **Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735** *
M **TRW/UTC Transformers, Dept. EM, 150 Varick St., New York, N.Y. 10013** *
M **Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040** *
Adams-Russell Co., Inc., Dept. EM, 280 Bear Hill Rd., Waltham, Mass. 02154
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
Basler Electric Co., Dept. EM, Box 269, Rte. 143, Highland, Ill. 62249
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Coilcraft, Dept. EM, 1102 Siler Lake Rd., Cary, Ill. 60013
Cross Electronics Inc., Dept. EM, 100 Commonwealth Dr., Warrendale, Pa. 15086
Electro-Pacific, Inc., Dept. EM, 5782 Thornwood Dr., Goleta, Calif. 93017
Electrocom Inds., Dept. EM, 1105 N. Ironwood Dr., S. Bend, Ind. 46615
G & G Tresco Corp., Dept. EM, 1952 E. Allegheny Ave., Phila., PA 19134
HGA Elctrns., Inc., Dept. EM, 519 S. Fifth Ave., Mt. Vernon, N.Y. 10550
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Magnetic Specialties, Dept. EM, 10 Albemarle Ave., Trenton, N.J. 08638
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
M Telectro Sys. Corp., Dept. EM, 96-18 43rd Ave., Corona, N.Y. 11368
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Ward Leonard Elec. Co. Inc., Sub. Unimax Group Inc., Dept. EM, 31 South St., Mt. Vernon, N.Y. 10550

Amplifiers, Master Antenna—See Amplifiers, Distribution

Amplifiers, Microphone—See Amplifiers, A-F

Amplifiers, Microwave

D **A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876** *
American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 *
M **Applied Microwave, Div. Epsco Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090** *
Cober Elctrns., Inc., Dept. EM, 7 Gleason Ave., Stamford, Conn. 06902 *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 *
Electronic Navigation Inds., Dept. EM, 3000 Winton Rd. S., Rochester, N.Y. 14623 p. 1004
Epsco, Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 *
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 *
M **MCL, Inc., Dept. EM, 10 North Beach Ave., LaGrange, Ill. 60525** p. 2863
DM **Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725** *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 p. 3060
Telonic/Berkeley, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715 *
M **, Trak Microwave Corp., Dept. E8, Dept. EM, 4726 Eisenhower Blvd.,, Tampa, Fla. 33614** p. 3065
D **TRW RF Semiconductors, Dept. EM, 14520 Aviation Blvd., Lawndale, Cal. 90260** *
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 *
AERCOM, Dept. EM, 405 Tasman Dr., Sunnyvale, Cal. 94086
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
M Airtron, Div. Litton Inds., Dept. EM, 200 E. Hanover Ave., Morris Plains, N.J. 07950
M Avantek, Inc., Dept. EM, 3175 Bowers Ave., Santa Clara, Cal. 95051
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
FG Engineering Co., Dept. EM, Box 39, Black Canyon Stage, Mayer, Ariz. 86333
M HRB-Singer, Inc., Dept. EM, Science Park, Box 60, State College, Pa. 16801
DM Hughes Aircraft Co., Electron Dynamics Div., Dept. EM, 3100 W. Lomita Blvd., Torrance, Cal. 90509
M Keltec Florida, Sub Norlin Ind., Dept. EM, Box 1348, Fort Walton Beach, Fla. 32548
Litton Inds., Electron Tube Div., Dept. EM, 960 Industrial Rd, San Carlos, Calif. 94070
M LNR Communications, Inc., Dept. EM, 180 Marcus Blvd., Hauppauge, N.Y. 11787
M LogiMetrics Inc., Dept. EM, 121-03 Dupont St., Plainview, NY 11803
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
D Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
M Microwave Power Devices, Dept. EM, Adams Ct., Plainview, N.Y. 11803
Mu-Del Elctrns., Dept. EM, 2426 Linden La., Silver Spring, Md. 20910
M Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M Nurad, Inc., Dept. EM, 2165 Druid Pk. Dr., Baltimore, Md. 21211
M Optimax, Inc., Optimax, Div. Alpha Industries, Inc., Dept. EM, Box 105, Advance Lane, Colmar, Pa. 18915
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
Resdel Engineering Corp., Dept. EM, 300 E. Live Oak Ave., Arcadia, Cal. 91006
M RHG Elctrns. Lab., Dept. EM, 161 E. Industry Ct., Deer Park, N.Y. 11729
Scientific Communications, Dept. EM, 3425 Kingsley, Garland, Tex. 75041
Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
M Technical Research & Mfg., Inc., Dept. EM, Kelly Ave. Grenier Field, R.F.D. #3, Manchester, N.H. 03103
M Teledyne Micronetics, Dept. EM, 7155 Mission Gorge Rd., San Diego, Calif. 92120
Triangle Microwave Inc., Dept. EM, 9B Great Meadow La, East Hanover, NJ 07936
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304

Amplifiers, Mixing

Bulova Watch Co., Servo Prods. Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
Cober Elctrns., Inc., Dept. EM, 7 Gleason Ave., Stamford, Conn. 06902 p. 2862
GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 *
D **Opamp Labs, Inc., Dept. EM, 1033 N. Sycamore Ave, Los Angeles, Cal. 90038** *
Re-el Circuits, Inc., Dept. EM, 520 Victor Street, Saddle Brook, N.J. 07662 *
D Ampro Corp., Dept. EM, 850 Pennsylvania Blvd., Feasterville, PA. 19047
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
M Aydin, Vector Div., Dept. EM, Box 328, Newtown, PA 18940
D Communications Equip Co., Dept. EM, Box 700, Glen Arbor, Mich. 49636
Data-Control Systems, Dept. EM, Commerce Dr., Box 860, Danbury, Conn. 06810
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
HGA Elctrns., Inc., Dept. EM, 519 S. Fifth Ave., Mt. Vernon, N.Y. 10550
Modular Audio Products, Dept. EM, 50 Orville Dr., Bohemia, N.Y. 11716
Newcomb Audio Products Co., Dept. EM, 12881 Bradley Ave., Sylmar, Cal. 91342
D PASO Sound Products Inc., Dept. EM, 14 First St, Pelham, NY 10803
D Pulse Techniques, Inc., Dept. EM, 1411 Palisade Ave., Teaneck, N.J. 07666
D Robins Broadcast & Sound Equipment Corp., Sub. Robins Inds., Dept. EM, 75 Austin Blvd., Commack, N.Y. 11725
Shure Brothers, Inc., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
M Sonex, Dept. EM, 2337 Philmont Ave., Huntingdon Valley, Pa. 19006
D Spectra Sonics, Dept. EM, 770 Wall Ave., Ogden, Utah 84404
Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
Tri-Com, Inc., Dept. EM, 12216 Parklawn Dr., Rockville, Md. 20852
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal 94303

Amplifiers, Multichannel

Ithaco, Inc., Dept. EM, 735 W. Clinton St., Ithaca, N.Y. 14850 *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 *
Precision Filters, Inc., Dept. EM, 303 W. Lincoln St., Ithaca, N.Y. 14850 *
Preston Scientific Inc., Dept. EM, 805 E. Cerritos Ave., Anaheim, Cal. 92805 p. 1009,1664
M **, Trak Microwave Corp., Dept. E8, Dept. EM, 4726 Eisenhower Blvd.,, Tampa, Fla. 33614** *
Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704
Modular Audio Products, Dept. EM, 50 Orville Dr., Bohemia, N.Y. 11716
M RHG Elctrns. Lab., Dept. EM, 161 E. Industry Ct., Deer Park, N.Y. 11729
Signal Labs, Inc., Dept. EM, 202 N. State College Blvd., Orange, Cal. 92668

Amplifiers, Narrow-Band

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 *
Bulova Watch Co., Servo Prods. Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
Dynamics Elctrn. Prods., Waugh Controls, Dept. EM, 9001 Fullbright Ave., Chatsworth, Cal. 91311 p. 1002
Ectron Corp., Dept. EM, 8159 Engineer Rd., San Diego, Cal. 92111 *
Electronic Navigation Inds., Dept. EM, 3000 Winton Rd. S., Rochester, N.Y. 14623 p. 1005
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 *
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 *
Ithaco, Inc., Dept. EM, 735 W. Clinton St., Ithaca, N.Y. 14850 *
Marine Electric Railway Prods. Div., Inc., Dept. EM, 167 National Rd., Edison, N.J. 08817 *
Neff Instrument Corp., Dept. EM, 1088 E. Hamilton Rd., Duarte, Cal. 91010 *

M , Trak Microwave Corp., Dept. E8, Dept. EM, 4726 Eisenhower Blvd.,, Tampa, Fla. 33614 ..... *
AERCOM, Dept. EM, 405 Tasman Dr., Sunnyvale, Cal. 94086
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
Arenberg Ultrasonic Inc., Dept. EM, 94 Green, Jamaica Plain, Mass. 02130
M Avantek, Inc., Dept. EM, 3175 Bowers Ave., Santa Clara, Cal. 95051
C-COR Elctrns., Dept. EM, 60 Decibel Rd., State College, Pa. 16801
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
FG Engineering Co., Dept. EM, Box 39, Black Canyon Stage, Mayer, Ariz. 86333
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704
M Keltec Florida, Sub Norlin Ind., Dept. EM, Box 1348, Fort Walton Beach, Fla. 32548
M Microwave Power Devices, Dept. EM, Adams Ct., Plainview, N.Y. 11803
Mu-Del Elctrns., Dept. EM, 2426 Linden La., Silver Spring, Md. 20910
Optimax, Inc., Optimax, Div. Alpha Industries, Inc., Dept. EM, Box 105, Advance Lane, Colmar, Pa. 18915
M Perry Amplifier, Dept. EM, 138 Fuller St., Brookline, Mass. 02146
Princeton Applied Resch. Corp., Dept. EM, Box 2565, Princeton, N.J. 08540
Resdel Engineering Corp., Dept. EM, 300 E. Live Oak Ave., Arcadia, Cal. 91006
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
M Technical Research & Mfg., Inc., Dept. EM, Kelly Ave. Grenier Field, R.F.D. #3, Manchester, N.H. 03103
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
D Telco Products Co., Dept. EM, 44 Sea Cliff, Glen Cove, NY 11542
Transmed Scientific, Dept. EM, 860-C Capitolio Way, San Luis Obispo, Cal. 93401
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Amplifiers, Null

Bulova Watch Co., Servo Prods. Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
M Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 ..... *
Ectron Corp., Dept. EM, 8159 Engineer Rd., San Diego, Cal. 92111 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 ..... *
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
M Glentek, Inc., Dept. EM, 1559 7th St., Santa Monica, Calif. 90401
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006

Amplifiers, Operational

A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 ..... *
Behlman Engineering Corp., Dept. EM, Box 4518, 427 N. Nopal St., Santa Barbara, Cal. 93103 ..... p. 3368
Bulova Watch Co., Servo Prods. Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
M Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734 ..... p. 2856
Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 ..... p. 1401
D Delco Electronics Div., General Motors Corp., Dept. EM, 700 E. Firmin St., Kokomo, Ind. 46901 ..... *
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... *
Dynamics Elctrn. Prods., Waugh Controls, Dept. EM, 9001 Fullbright Ave., Chatsworth, Cal. 91311 ..... *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 ..... *
Mini-Systems, Inc., Dept. EM, 20 David Rd., North Attleboro, Mass. 02761 *
Neff Instrument Corp., Dept. EM, 1088 E. Hamilton Rd., Duarte, Cal. 91010 *
D Opamp Labs, Inc., Dept. EM, 1033 N. Sycamore Ave, Los Angeles, Cal. 90038 ..... p. 1018
Polytron Devices Inc., Dept. EM, Box 398 - River St. Sta., Patterson, N.J. 07524 ..... *
DM Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 ..... *
Torque Systems, Sub. Rotron/EG & G Co., Dept. EM, P.O. Box 588, 225-E. Crescent St., Waltham, Mass. 02154 ..... *
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Analogic Corp., Dept. EM, Audubon Rd., Wakefield, Mass. 01880
Cherry Semiconductor Corp, Dept. EM, 99 Bald Hill Rd., Cranston, RI 02920
Control Systems Research, Inc., Dept. EM, CSR Bldg., 632 Fort Duquesne Blvd., Pittsburgh, Pa. 15222
Dynamic Measurements Corp., Dept. EM, 6 Lowell Ave., Winchester, Mass. 01890
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
M Exar Integrated Systems, Dept. EM, P.O.B. 62229, Sunnyvale, Cal. 94088
Ferranti Elec., Dept. EM, East Bethpage Rd., Plainview, N.Y. 11803
D General Computers, Inc., Dept. EM, 5990 W. Pico Blvd., Los Angeles, Calif. 90035
M Glentek, Inc., Dept. EM, 1559 7th St., Santa Monica, Calif. 90401
Gotham Audio Corp., Dept. EM, 741 Washington St., New York, N.Y. 10014
M Halex, Inc., Dept. EM, 1202 McGaw Ave, Irvine, Ca. 92714
Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704
DM Intech/Function Modules, Dept. EM, 282 Brokaw, Santa Clara, Cal. 95050
DM Intersil, Inc., Dept. EM, 10900 N. Tantau Ave., Cupertino, Cal. 95014
Intronics Inc., Dept. EM, 57 Chapel St., Newton, Mass. 02158
Modular Audio Products, Dept. EM, 50 Orville Dr., Bohemia, N.Y. 11716
M Modular Devices, Inc., Dept. EM, 50 Orville Dr., Bohemia, N. Y. 11716
M Optical Electronics, Inc., Dept. EM, Box 11140, Tucson, Ariz. 85734
DM Precision Monolithics Inc., Dept. EM, 1500 Space Dr., Santa Clara, Cal. 95050
Princeton Applied Resch. Corp., Dept. EM, Box 2565, Princeton, N.J. 08540
D Sanken Elec. Co., Dept. EM, 1-22-8 Nishi-Ikebukuro, Toshima-Ku, Tokyo, Japan
D Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
DM Signetics Corp., Dept. EM, 811 E. Arques Ave., Sunnyvale, Cal. 94086
M Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Teledyne/Geotech, Dept. EM, Box 28277, Dallas, Tex. 75228
Teledyne Philbrick, Dept. EM, 17 Allied Dr. Rte 128, Dedham, Mass. 02026

Amplifiers, Parametric

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
Bulova Watch Co., Servo Prods. Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
M AIL, Div. Cutler-Hammer, Dept. EM, Comac Road, Deer Park, N.Y. 11729
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
M LNR Communications, Inc., Dept. EM, 180 Marcus Blvd., Hauppauge, N.Y. 11787
Scientific Communications, Dept. EM, 3425 Kingsley, Garland, Tex. 75041
Teledyne Philbrick, Dept. EM, 17 Allied Dr. Rte 128, Dedham, Mass. 02026
TRG,, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Amplifiers, Peak-Limiting

Bulova Watch Co., Servo Prods. Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
D Opamp Labs, Inc., Dept. EM, 1033 N. Sycamore Ave, Los Angeles, Cal. 90038 ..... *
Pacific Power Source Div, Dept. EM, 5291 Systems Dr, Huntington Bch, Cal 92649 ..... *
Control Systems Research, Inc., Dept. EM, CSR Bldg., 632 Fort Duquesne Blvd., Pittsburgh, Pa. 15222
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Gotham Audio Corp., Dept. EM, 741 Washington St., New York, N.Y. 10014
Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704
Optical Electronics, Inc., Dept. EM, Box 11140, Tucson, Ariz. 85734
Shure Brothers, Inc., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204

Amplifiers, Phase-Lock Loop

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Bulova Watch Co., Servo Prods. Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Cherry Semiconductor Corp, Dept. EM, 99 Bald Hill Rd., Cranston, RI 02920
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
DM Exar Integrated Systems, Dept. EM, P.O.B. 62229, Sunnyvale, Cal. 94088
M LogiMetrics Inc., Dept. EM, 121-03 Dupont St., Plainview, NY 11803
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
DM Plessey Semiconductors, Dept. EM, 1674 McGaw Ave., Irvine, Cal. 92714
D Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
Systems Research Labs. Inc., Dept. EM, 2800 Indian Ripple Rd. , Dayton, Ohio 45440
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Amplifiers, Photocell—See Amplifiers, Transducer

Amplifiers, Power

D A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 ..... *
American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
Amplifier Research Corp., Dept. EM, 160 School House Rd., Souderton, Pa 18964 ..... p. 1001
DM Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634 ..... p. 2853
Bulova Watch Co., Servo Prods. Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734 ..... *
D California Instrs., Dept. EM, 5150-Convoy St., San Diego, Cal. 92111 .. p. 3370
Cober Elctrns., Inc., Dept. EM, 7 Gleason Ave., Stamford, Conn. 06902 ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
M Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 ..... *
Crown International, Dept. EM, Box 1000, Elkhart, Ind. 46514 ..... p. 1010
Dynamics Elctrn. Prods., Waugh Controls, Dept. EM, 9001 Fullbright Ave., Chatsworth, Cal. 91311 ..... *
Electronic Navigation Inds., Dept. EM, 3000 Winton Rd. S., Rochester, N.Y. 14623 ..... p. 1003-1005
Elgar Corporation, Dept. EM, 8225 Mercury Ct., San Diego, Cal. 92111 ..... *
D Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 *
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 .... *
M Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735 ..... *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
Instruments for Industry, Inc., Dept. EM, 151 Toledo St., Farmingdale, N.Y. 11735 ..... *
Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 ..... p. 2769

M Krohn-Hite Corp., Dept. EM, Avon Ind'l Pk, Bodwell St., Avon, Mass. 02322 p. 2773
M Marine Electric Railway Prods. Div., Inc., Dept. EM, 167 National Rd., Edison, N.J. 08817 p. 3393
M MCL, Inc., Dept. EM, 10 North Beach Ave., LaGrange, Ill. 60525 p. 2863
D Opamp Labs, Inc., Dept. EM, 1033 N. Sycamore Ave, Los Angeles, Cal. 90038 p. 1018
Pacific Power Source Div, Dept. EM, 5291 Systems Dr, Huntington Bch, Cal 92649 p. 3398,3399
Re-el Circuits, Inc., Dept. EM, 520 Victor Street, Saddle Brook, N.J. 07662 *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 *
Torque Systems, Sub. Rotron/EG & G Co., Dept. EM, P.O. Box 588, 225-E. Crescent St., Waltham, Mass. 02154 *
M , Trak Microwave Corp., Dept. E8, Dept. EM, 4726 Eisenhower Blvd.,, Tampa, Fla. 33614 *
D TRW RF Semiconductors, Dept. EM, 14520 Aviation Blvd., Lawndale, Cal. 90260 *
Unholtz-Dickie Corp., Dept. EM, 3000 Whitney Ave., Hamden, Conn. 06518 *
AEROCOM, Dept. EM, 3090 S.W. 37th Ave., Miami, Fla. 33133
Aerospace Avionics, Inc., Dept. EM, Airport International Plaza, 110 Wilbur Pl., Bohemia, N.Y. 11716
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
D Ailtech, Dept. EM, 2070 Fifth Ave, Ronkonkoma, NY 11779
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
Alpha-M Corp, Dept. EM, 3009 Wildflower Drive, Dallas, Tx. 75229
D Amplifier Corp. of America, Dept. EM, 75 Frost St., Westbury, N.Y. 11590
Applied Control Co., Dept. EM, 1275 Bloomfield Ave., Fairfield, N.J. 07006
M Avantek, Inc., Dept. EM, 3175 Bowers Ave., Santa Clara, Cal. 95051
D Bell PA Products, Dept. EM, 1200 N. Fifth St. Box 8177, Columbus, Ohio 43201
Benton Corp, Dept. EM, Race St Box 678, Manor, PA 15665
D Bogen Div., Lear Siegler, Inc., Dept. EM, Box 500, Paramus, N.J. 07652
D Communitron Corp., Dept. EM, 1429 N. Halstead, Hutchinson, Kans 67501
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Electronic Navigation Inds., Dept. EM, 3000 Winton Rd. S., Rochester, N.Y. 14623 ..... p. 1005
D TRW RF Semiconductors, Dept. EM, 14520 Aviation Blvd., Lawndale, Cal. 90260 ..... *
AEROCOM, Dept. EM, 3090 S.W. 37th Ave., Miami, Fla. 33133
D Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
Avcom International, Dept. EM, 784 N. W. 57th Ct., Fort Lauderdale, Fla. 33309
D Barker & Williamson, Inc., Dept. EM, Canal St., Bristol, Pa. 19007
BF Elctrns., Dept. EM, 415 S. Nardo, Solana Beach, Calif. 92075
Comdel, Inc., Dept. EM, Beverly Airport, Beverly, Mass. 01915
Design Automation, Dept. EM, 809 Massachusetts Ave., Lexington, Mass. 02173
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
M Microwave Power Devices, Dept. EM, Adams Ct., Plainview, N.Y. 11803
DM Plessey Semiconductors, Dept. EM, 1674 McGaw Ave., Irvine, Cal. 92714
Resdel Engineering Corp., Dept. EM, 300 E. Live Oak Ave., Arcadia, Cal. 91006
M Technical Mat'l., Dept. EM, 700 Fenimore Rd., Mamaroneck, N.Y. 10543
D Telco Products Co., Dept. EM, 44 Sea Cliff, Glen Cove, NY 11542
D Ten-Tec Inc., Dept. EM, Industrial Park, Sevierville, Tenn. 37862
DM TPL Communications Co., Dept. EM, P.O. Box 1415, Gardena, Cal. 90247
VHF Engrg, Div. of Brownian Elctrns. Corp., Dept. EM, 320 Water St., Binghamton, N.Y. 13902

Amplifiers, Standing Wave

M General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
LogiMetrics Inc., Dept. EM, 121-03 Dupont St., Plainview, NY 11803
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760

Amplifiers, Strain Gauge—See Amplifiers, Transducer

Amplifiers, Sweep

Electronic Navigation Inds., Dept. EM, 3000 Winton Rd. S., Rochester, N.Y. 14623 ..... p. 1003-1005
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
DM Hughes Aircraft Co., Electron Dynamics Div., Dept. EM, 3100 W. Lomita Blvd., Torrance, Cal. 90509
D Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
M Microwave Power Devices, Dept. EM, Adams Ct., Plainview, N.Y. 11803
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Wide Band Engrg. Co. Inc., Dept. EM, Box 21652, Phoenix, Ariz. 85036

Amplifiers, Synchro

Bulova Watch Co., Servo Prods. Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
M Clifton Precision, Litton Systems, Inc., Dept. EM, Marple at Brdway., Clifton Hgts., Pa. 19018 ..... *
M Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731 ..... *
M Control Sciences, Inc., Dept. EM, 8399 Topanga Canyon Blvd., Canoga Park, Cal. 91304 ..... *
M Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 ..... *
M ILC Data Device Corp., Dept. EM, Airport Int'l. Plaza, Bohemia, N.Y. 11716 p. 1644,1645
M Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735 ..... p. 3976
M Interface Engineering Inc., Dept. EM, 386 Lindelof Ave., Stoughton, Mass. 02072 ..... *
Magnetico, Inc., Dept. EM, 182 Morris Ave., Holtsville, N.Y. 11742 ..... *
M Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735 *
M Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... *
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
C & A Products, Inc., Dept EM, 37-12 58th St., Woodside, N.Y. 11377
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
M Farrand Controls Div., Dept. EM, 99 Wall St., Valhalla, N.Y. 10595
M Glentek, Inc., Dept. EM, 1559 7th St., Santa Monica, Calif. 90401
M Henschel Corp., Dept. EM, 14 Cedar St., Amesbury, Mass. 01913
M Modular Devices, Inc., Dept. EM, 50 Orville Dr., Bohemia, N. Y. 11716
M Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
Princeton Applied Resch. Corp., Dept. EM, Box 2565, Princeton, N.J. 08540
M Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
D Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
M Transicoil, Inc., Dept. EM, Worcester, Pa. 19490

Amplifiers, Telemetering

M Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 ..... *
Ectron Corp., Dept. EM, 8159 Engineer Rd., San Diego, Cal. 92111 ..... *
Electronic Navigation Inds., Dept. EM, 3000 Winton Rd. S., Rochester, N.Y. 14623 ..... p. 1005
Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 ..... *
Neff Instrument Corp., Dept. EM, 1088 E. Hamilton Rd., Duarte, Cal. 91010 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
M Avantek, Inc., Dept. EM, 3175 Bowers Ave., Santa Clara, Cal. 95051
M Aydin, Vector Div., Dept. EM, Box 328, Newtown, PA 18940
Beukers Labs., Inc., Dept. EM, 30 Orville Drive, Bohemia, N.Y. 11716
BF Elctrns., Dept. EM, 415 S. Nardo, Solana Beach, Calif. 92075
Data-Control Systems, Dept. EM, Commerce Dr., Box 860, Danbury, Conn. 06810
EMR Telemetry, Div. Sangamo-Weston, Dept. EM, Box 3041, Sarasota, Fla. 33578
Fogg System Co., Dept. EM, 15592 E. Batavia Dr., Aurora, Colo. 80011
M Hades Mfg Corp., Dept. EM, 151-A Verdi St., Farmingdale, N.Y. 11735
Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704
M LNR Communications, Inc., Dept. EM, 180 Marcus Blvd., Hauppauge, N.Y. 11787
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
M Microwave Power Devices, Dept. EM, Adams Ct., Plainview, N.Y. 11803
Resdel Engineering Corp., Dept. EM, 300 E. Live Oak Ave., Arcadia, Cal. 91006
M RHG Elctrns. Lab., Dept. EM, 161 E. Industry Ct., Deer Park, N.Y. 11729
Rochester Instr System, Dept. EM, 255 N. Union St., Rochester, N.Y. 14605
M Scientific Communications, Dept. EM, 3425 Kingsley, Garland, Tex. 75041
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
M Sonex, Dept. EM, 2337 Philmont Ave., Huntingdon Valley, Pa. 19006
Teledyne/Geotech, Dept. EM, Box 28277, Dallas, Tex. 75228
Transmed Scientific, Dept. EM, 860-C Capitolio Way, San Luis Obispo, Cal. 93401
Tri-Com, Inc., Dept. EM, 12216 Parklawn Dr., Rockville, Md. 20852
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304
Wide Band Engrg. Co. Inc., Dept. EM, Box 21652, Phoenix, Ariz. 85036

Amplifiers, Thermocouple—See Amplifiers/Transducer

Amplifiers, Thyratron

Cober Elctrns., Inc., Dept. EM, 7 Gleason Ave., Stamford, Conn. 06902 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Westinghouse Electric Corp., Indl & Gov't Tube, Dept. EM, Westinghouse Circle, Horseheads, N.Y. 14845

Amplifiers, Transducer-Also See Signal Conditioners

Active Control Instrumentation, Dept. EM, PO Box 243-Wildwood Circle, Key Largo, Florida 33037 ..... *
Bulova Watch Co., Servo Prods. Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734 ..... *
M Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 ..... *
Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 p. 1401
Doric Sci., Div. Emerson Elec. Co., Dept. EM, 3883 Ruffin Rd., San Diego, Cal. 92123 ..... *
Ectron Corp., Dept. EM, 8159 Engineer Rd., San Diego, Cal. 92111 ..... *
EG&G, Inc., Electro-Optics Div., Dept. EM, 35 Congress St., Salem, Mass. 01970 ..... *
Electronic Navigation Inds., Dept. EM, 3000 Winton Rd. S., Rochester, N.Y. 14623 ..... p. 1004,1005
General Magnetics, Dept. EM, 211 Grove St., Bloomfield, N.J. 07003 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 ..... *
Gulton Inds., Inc., Measurement & Control Systems Div., Dept. EM, Gulton Ind'l. Pk., E. Greenwich, R.I. 02818 ..... p. 2840
Harrel, Inc., Dept. EM, 16 Fitch St., E. Norwalk, Conn. 06855 ..... *
Honeywell, Inc., Test Instrs. Div., Dept. EM, 4800 E. Dry Creek Rd., Box 5227, Denver, Colo. 80217 ..... *
M Integrated Circuits, Inc., Dept. EM, 13256 Northrup Way, Bellevue, Wash. 98005 ..... *
Ithaco, Inc., Dept. EM, 735 W. Clinton St., Ithaca, N.Y. 14850 ..... p. 1007
Marine Electric Railway Prods. Div., Inc., Dept. EM, 167 National Rd., Edison, N.J. 08817 ..... *
D Midtex, Inc., AEMCO Div., Dept. EM, 1650 Tower Blvd., No. Mankato, Minn. 56001 ..... *
Mini-Systems, Inc., Dept. EM, 20 David Rd., North Attleboro, Mass. 02761 *
M Natel Engineering Co., Dept. EM, 8954 Mason Ave., Canoga Park, Cal. 91306 *
Neff Instrument Corp., Dept. EM, 1088 E. Hamilton Rd., Duarte, Cal. 91010 *
Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705 ..... *
Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 ..... p. 4285
D Opamp Labs, Inc., Dept. EM, 1033 N. Sycamore Ave, Los Angeles, Cal. 90038 ..... *

Pacific Power Source Div, Dept. EM, 5291 Systems Dr, Huntington Bch, Cal 92649 ..... *
PPM, Inc., Dept. EM, 7575 Bond St., Cleveland, Ohio 44139 ..... *
Precision Filters, Inc., Dept. EM, 303 W. Lincoln St., Ithaca, N.Y. 14850 ..... *
Preston Scientific Inc., Dept. EM, 805 E. Cerritos Ave., Anaheim, Cal. 92805 *
Unholtz-Dickie Corp., Dept. EM, 3000 Whitney Ave., Hamden, Conn. 06518 p. 2575
M Acromag, Inc., Dept. EM, 30765 Wixom Rd., Wixom, Mich. 48096
Advance Weight Systems, Inc., Dept. EM, 715 W. Smith Rd., Medina, Ohio 44256
Advanced Kinetics, Dept. EM, 1231 Victoria St., Costa Mesa, Calif. 92627
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Analogic Corp., Dept. EM, Audubon Rd., Wakefield, Mass. 01880
Applied Control Co., Dept. EM, 1275 Bloomfield Ave., Fairfield, N.J. 07006
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
Bay Laboratories, Inc., Dept. EM, 20160 Center Ridge Rd., Cleveland, Ohio 44116
Bell & Howell Co., Elctrns. & Instrs. Grp., Dept. EM, 360 Sierra Madre Villa, Pasadena, Cal. 91109
BLH Elctrns., Dept. EM, 42 Fourth Ave., Waltham, Mass. 02154
Brunswick Instr., Dept. EM, 6150 W. Mulford Street, Niles, Ill. 60648
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
M Columbia Resch. Labs., Dept. EM, Macdade Blvd. & Bullens La., Woodlyn, Pa. 19094
M Conrac Corp., Systems Sls Div., Dept. EM, Three Landmark Sq., Stamford, Conn. 06901
Cross Electronics Inc., Dept. EM, 100 Commonwealth Dr., Warrendale, Pa. 15086
D Data Instruments Inc., Dept. EM, 4 Hartwell Pl., Lexington, Mass. 02173
Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
Dexter Research Ctr, Inc., Dept. EM, 7300 Huron River Dr, Dexter, Mich 48130
EMR Telemetry, Div. Sangamo-Weston, Dept. EM, Box 3041, Sarasota, Fla. 33578
Endevco, Div. Becton, Dickinson & Co., Dept. EM, 30700 Rancho Viejo Rd., San Juan Capistrano, Cal. 92675
ENI Power Systems, Dept. EM, 3000 Winton Rd. S., Rochester, N.Y. 14623
Fogg System Co., Dept. EM, 15592 E. Batavia Dr., Aurora, Colo. 80011
M Glentek, Inc., Dept. EM, 1559 7th St., Santa Monica, Calif. 90401
Gould, Inc., Meas. Sys. Div., Dept. EM, 2230 Statham Blvd., Oxnard, Cal. 93030
M Hades Mfg Corp., Dept. EM, 151-A Verdi St., Farmingdale, N.Y. 11735
Himmelstein & Co., S., Dept. EM, 2500 Estes Ave., Elk Grove Village, Ill. 60007
Hy-Cal Engrg, Dept. EM, 12105 Los Nietos Rd., Santa Fe Springs, Cal 90670
Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704
DM Intech/Function Modules, Dept. EM, 282 Brokaw, Santa Clara, Cal. 95050
IPAC Group, Inc., Dept. EM, POB 156 3047 Industrial Blvd., Bethel Park, PA 15102
Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962
Meret Inc., Dept. EM, 1815 24th St., Santa Monica, Cal. 90404
Metrix Instrument Co., Metrix Instrument Co., Dept. EM, 1711 Townhurst, Houston, Tex. 77043
M Moxon Inc., Dept. EM, 2222 Michelson Dr. Bldg. E, Irvine, Cal. 92715
Norton Assocs., Inc., Dept. EM, 10 Di Tomas Ct., Copiague, N.Y. 11726
Optoelectronics, Inc., Dept. EM, 1309 Dynamic St., Petaluma, Cal. 94952
Paine Instruments, Inc., Dept. EM, 2401 S. Bayview St., Seattle, Wash. 98144
PCB Piezotronics, Inc., Dept. EM, 5800 Transit Rd., Depew, N.Y. 14043
M Perry Amplifier, Dept. EM, 138 Fuller St., Brookline, Mass. 02146
Princeton Applied Resch. Corp., Dept. EM, Box 2565, Princeton, N.J. 08540
Radiation Devices Co., Inc., Dept. EM, Box 8450, Baltimore, Md. 21234
Rochester Instr System, Dept. EM, 255 N. Union St., Rochester, N.Y. 14605
Schaevitz Engrg., Dept. EM, U.S. 130, Union Ave., Pennsauken, N.J. 08110
Sensor Technology, Dept. EM, 21012 Lassen St., Chatsworth, Cal. 91311
Skan-A-Matic Corp., Dept. EM, Box S, Elbridge, N.Y. 13060
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
D Spectra Sonics, Dept. EM, 770 Wall Ave., Ogden, Utah 84404
Stow Labs., Inc., Dept. EM, Kane Ind'l. Dr., Hudson, Mass. 01749
Sundstrand Data Control, Dept. EM, Overlake Ind'l. Pk., Redmond, Wash. 98052
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Teledyne/Geotech, Dept. EM, Box 28277, Dallas, Tex. 75228
Teledyne Philbrick, Dept. EM, 17 Allied Dr. Rte 128, Dedham, Mass. 02026
Telmar, Inc., Dept. EM, 1150 W. Third Ave., Columbus, Ohio 43212
Transmed Scientific, Dept. EM, 860-C Capitolio Way, San Luis Obispo, Cal. 93401
Trans-Tek, Inc., Dept. EM, Rte. 83, Ellington, Conn. 06029
Tri-Com, Inc., Dept. EM, 12216 Parklawn Dr., Rockville, Md. 20852
United Detector Tech., Dept. EM, 2644 30th St., Santa Monica, Cal. 90405
D Vibra-Metrics, Inc., Dept. EM, 150 Bradley St., E. Haven, Conn. 06512
West Coast Resch. Corp., Dept. EM, Box 25061, Los Angeles, Cal. 90025
Wilcoxon Research, Dept. EM, 12526 Parklawn Dr., Rockville, Md. 20852
D Wilson Co., H. M., Dept. EM, 11501 Chimney Rock Rd., Houston, Tex. 77035
Zonic Technical Labs., Dept. EM, 8927 Rossash Ave., Cincinnati, Ohio 45236

Amplifiers, Traveling-Wave Tube

D **A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876** ..... *
Cober Elctrns., Inc., Dept. EM, 7 Gleason Ave., Stamford, Conn. 06902 ..... *
M **MCL, Inc., Dept. EM, 10 North Beach Ave., LaGrange, Ill. 60525** ..... *
DM Hughes Aircraft Co., Electron Dynamics Div., Dept. EM, 3100 W. Lomita Blvd., Torrance, Cal. 90509
M Keltec Florida, Sub Norlin Ind., Dept. EM, Box 1348, Fort Walton Beach, Fla. 32548
M Litton Inds., Electron Tube Div., Dept. EM, 960 Industrial Rd, San Carlos, Calif. 94070
M LogiMetrics Inc., Dept. EM, 121-03 Dupont St., Plainview, NY 11803
D Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Amplifiers, Tunnel Diode

D **General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345** ..... *
AERCOM, Dept. EM, 405 Tasman Dr., Sunnyvale, Cal. 94086
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086

Amplifiers, Ultrasonic

M **Control Elctrns. Co., Inc., Dept. EM, 153 Florida St., Farmingdale, N.Y. 11735** *
Electronic Navigation Inds., Dept. EM, 3000 Winton Rd. S., Rochester, N.Y. 14623 ..... p. 1004,1005
Exact Electronics, Inc., Dept. EM, Box 160, 455 SE 2nd Ave., Hillsboro, Ore. 97123 ..... *
M **Integrated Circuits, Inc., Dept. EM, 13256 Northrup Way, Bellevue, Wash. 98005** ..... *
M **Krohn-Hite Corp., Dept. EM, Avon Ind'l Pk, Bodwell St., Avon, Mass. 02322** *
Marine Electric Railway Prods. Div., Inc., Dept. EM, 167 National Rd., Edison, N.J. 08817 ..... p. 3393
Precision Filters, Inc., Dept. EM, 303 W. Lincoln St., Ithaca, N.Y. 14850 ..... *
Arenberg Ultrasonic Inc., Dept. EM, 94 Green, Jamaica Plain, Mass. 02130
ENI Power Systems, Dept. EM, 3000 Winton Rd. S., Rochester, N.Y. 14623
M Instruments, Inc., Dept. EM, 3432 Midway Dr., San Diego, Cal. 92110
MetroTek, Inc., Dept. EM, 80 Wellsian Way, Richland, Wash. 99352
Panametrics Inc., Dept. EM, 221 Cresent St., Waltham, Mass. 02154
M Perry Amplifier, Dept. EM, 138 Fuller St., Brookline, Mass. 02146
D Sonobond, Sub. Christiana Metals, Dept. EM, 200 E. Rosedale Ave., West Chester, Pa. 19380
Westinghouse Elec., Process Equip./Consumables Dept, Dept. EM, Box 300, Sykesville, Md. 21784

Amplifiers, Video

A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 ..... *
American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
Amplifier Research Corp., Dept. EM, 160 School House Rd., Souderton, Pa 18964 ..... *
D **Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005** ..... *
Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734 ..... *
Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 p. 1401
Electronic Navigation Inds., Dept. EM, 3000 Winton Rd. S., Rochester, N.Y. 14623 ..... p. 1005
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 ..... *
Infodex, Inc., Dept. EM, 7 Cherry Ave., Waterbury, Conn. 06702 ..... p. 2486
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 .. p. 3060
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 ..... *
DM **Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247** *
M **, Trak Microwave Corp., Dept. E8, Dept. EM, 4726 Eisenhower Blvd.,, Tampa, Fla. 33614** ..... *
Advanced Kinetics, Dept. EM, 1231 Victoria St., Costa Mesa, Calif. 92627
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
Arenberg Ultrasonic Inc., Dept. EM, 94 Green, Jamaica Plain, Mass. 02130
Astro-Geo-Marine Inc., Dept. EM, 2005 Palma Dr., Ventura, Cal. 93003
C-COR Elctrns., Dept. EM, 60 Decibel Rd., State College, Pa. 16801
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
Dantel, Inc., Dept. EM, 1922 North Helm, Fresno, Cal. 93727
Di-Tech Inc., Dept. EM, 315 Wyandanch Ave., North Babylon, N.Y. 11704
D Dynair Elctrns. Inc., Dept. EM, 5275 Market St., San Diego, Calif. 92114
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
DM Intech/Function Modules, Dept. EM, 282 Brokaw, Santa Clara, Cal. 95050
D ITI Electronics, Inc., Dept. EM, 369 Lexington Ave., Clifton, N.J. 07015
D Apollo Lasers, Apollo Lasers, Inc., Dept. EM, 6357 Arizonia Cir, Los Angeles, Cal. 90045
Meret Inc., Dept. EM, 1815 24th St., Santa Monica, Cal. 90404
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
MVP Electronics, Dept. EM, 1161 N. Tustin, Orange, Cal. 92667
Nuclear Resch. Corp., Dept. EM, 1105 Indl. Hwy., Southampton, Pa. 18966
Optical Electronics, Inc., Dept. EM, Box 11140, Tucson, Ariz. 85734
M Perry Amplifier, Dept. EM, 138 Fuller St., Brookline, Mass. 02146
DM Plessey Semiconductors, Dept. EM, 1674 McGaw Ave., Irvine, Cal. 92714
Radiation Devices Co., Inc., Dept. EM, Box 8450, Baltimore, Md. 21234
M RHG Elctrns. Lab., Dept. EM, 161 E. Industry Ct., Deer Park, N.Y. 11729
RIL Elctrns., Inc., Dept. EM, 1105 Ind'l. Hwy., Southampton, Pa. 18966
M Scientific Communications, Dept. EM, 3425 Kingsley, Garland, Tex. 75041
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Systems Research Labs. Inc., Dept. EM, 2800 Indian Ripple Rd. , Dayton, Ohio 45440
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Video Automation Systems Inc., Dept. EM, Rte 1—Box 21A, Pound Ridge, N.Y. 10576
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304

Amplifiers, Voltage Reference

Bulova Watch Co., Servo Prods. Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Dynamics Elctrn. Prods., Waugh Controls, Dept. EM, 9001 Fullbright Ave., Chatsworth, Cal. 91311 ..... *
General Magnetics, Dept. EM, 211 Grove St., Bloomfield, N.J. 07003 ..... *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
Mini-Systems, Inc., Dept. EM, 20 David Rd., North Attleboro, Mass. 02761 *
Neff Instrument Corp., Dept. EM, 1088 E. Hamilton Rd., Duarte, Cal. 91010 *
Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
D EMI Gencom Inc., Dept. EM, 80 Express St., Plainview, N.Y. 11803
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
M Glentek, Inc., Dept. EM, 1559 7th St., Santa Monica, Calif. 90401
Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704
D Intech/Function Modules, Dept. EM, 282 Brokaw, Santa Clara, Cal. 95050

M Micro Networks, Dept. EM, 324 Clark St., Worcester, Mass. 01606
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
DM Precision Monolithics Inc., Dept. EM, 1500 Space Dr., Santa Clara, Cal. 95050
Rochester Instr System, Dept. EM, 255 N. Union St., Rochester, N.Y. 14605
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Amplifiers, Wideband

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
Amplifier Research Corp., Dept. EM, 160 School House Rd., Souderton, Pa 18964 ..... p. 1001
D **Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005** ..... *
Bulova Watch Co., Servo Prods. Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734 ..... *
M **Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021** ..... p. 1401
Dynamics Elctrn. Prods., Waugh Controls, Dept. EM; 9001 Fullbright Ave., Chatsworth, Cal. 91311 ..... *
Ectron Corp., Dept. EM, 8159 Engineer Rd., San Diego, Cal. 92111 ..... *
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Biomation, Dept. EM, 10411 Bubb Rd., Cupertino, Cal. 95014
Data Acquisition Prods. Lab., AEL, Inc., Dept. EM, Box 552, Lansdale, Pa. 19446
E-H International, Inc., Dept. EM, 515 11th St Box 1289, Oakland, Cal 94604
E-H Resch. Labs., Inc., Dept. EM, Box 1289, Oakland, Cal. 94604
M Harshaw Chemical Co., A Kenanee Industry, Dept. EM, 6801 Cochran Rd., Solon, Ohio 44139
M Nelson Ross Elctrns., Dept. EM, 5 Delaware, Lake Success, N.Y. 11040
Systems Research Labs. Inc., Dept. EM, 2800 Indian Ripple Rd., Dayton, Ohio 45440
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409

Analyzers, SCR

Dantronics, Inc., Dept. EM, 3175 Hafner Ct., St. Paul, Minn 55112

Analyzers, Servo

Bafco, Inc., Dept. EM, 717 Mearns Rd., Warminster, Pa. 18974 ..... p. 2662
M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101** ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
M **Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735** ..... p. 3976
North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803 ..... *
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
EMI Technology, Dept. EM, 55, Kenosia Ave., Danbury, Conn 06810
M Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
D Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
Tasker Systems, Dept. EM, 20131 Sunburst St., Chatsworth, Cal. 91311
UFAD Corp., Dept. EM, 700 36th St. S.E., Grand Rapids, Mich. 49508

Analyzers, Sonic & Subsonic

A. P. Circuit Corp., Dept. EM, 865 West End Ave., New York, N.Y. 10025 .... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
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Rockland Sys. Corp., Dept. EM, 230 W. Nyack Rd., W. Nyack, N.Y. 10994 .. *
D **Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219** *
Data Acquisition Prods. Lab., AEL, Inc., Dept. EM, Box 552, Lansdale, Pa. 19446
Metrosonics, Inc., Dept. EM, Box 18090, Rochester, N.Y. 14618
M Multimetrics Div. of Comstro, Comstron-Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11580
M Nelson Ross Elctrns., Dept. EM, 5 Delaware, Lake Success, N.Y. 11040
Nicolet Scientific Corp., Dept. EM, 245 Livingston St., Northvale, N.J. 07647
Spectral Dynamics Corp., Dept. EM, Box 671, San Diego, Cal. 92112
UFAD Corp., Dept. EM, 700 36th St. S.E., Grand Rapids, Mich. 49508
Voice Identification Inc., Dept. EM, Box 714, Somerville, N.J. 08876

Analyzers, Spectrum (Including Oscilloscopes With Plug-Ins)

ADRET/COMSTRON, Dept. EM, 200 E. Sunrise Hwy, Freeport, NY 11520 p. 2682
A. P. Circuit Corp., Dept. EM, 865 West End Ave., New York, N.Y. 10025 p. 2613
Colorado Video, Inc., Dept. EM, Box 928, Boulder, Colo. 80306 ..... p. 1373
Comstron Corp., Dept. EM, 200 E. Sunrise Hwy., Freeport, N.Y. 11520 p. 2682
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... p. 2781
M **Polarad Elctrn. Instrs., Dept. EM, 5 Delaware Dr., Lake Success, N.Y. 11040** p. 2800
Rockland Sys. Corp., Dept. EM, 230 W. Nyack Rd., W. Nyack, N.Y. 10994 p. 2806
DM **Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518** ..... *
D **Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219** p. 2830
D Ailtech, Dept. EM, 2070 Fifth Ave, Ronkonkoma, NY 11779
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
M Bausch & Lomb, A.S. Div., Dept. EM, 820 Linden Ave., Box 9189, Rochester, N.Y. 14625
Beckman Instrs., (AISSD), Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634
M Electro-Metrics, Div. Penril Corp., Dept. EM, 100 Church St., Amsterdam, N.Y. 12010
Electro-Optical Inds., Inc., Dept. EM, 839 Ward Dr., Santa Barbara, Cal. 93111
D EMR Telemetry, Div. Sangamo-Weston, Dept. EM, Box 3041, Sarasota, Fla. 33578
Ferranti Elec., Dept. EM, East Bethpage Rd., Plainview, N.Y. 11803
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D Philips Audio Video Sys, Neutrik Prods, Dept. EM, 91 McKee Dr., Mahwah, N.J. 07430
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D Reticon Corp., Dept. EM, 910 Benicia Ave., Sunnyvale, Cal. 94086
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DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
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Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
UFAD Corp., Dept. EM, 700 36th St. S.E., Grand Rapids, Mich. 49508
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
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Analyzers, Telemetric Data

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M Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
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M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
M Sonex, Dept. EM, 2337 Philmont Ave., Huntingdon Valley, Pa. 19006

Analyzers, Transfer Function

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 .. p. 1381
Bafco, Inc., Dept. EM, 717 Mearns Rd., Warminster, Pa. 18974 ..... p. 2662
Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
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Techsonics, Dept. EM, Box 251, El Prado, N.M. 87529
UFAD Corp., Dept. EM, 700 36th St. S.E., Grand Rapids, Mich. 49508

Analyzers, Vibration

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Kay Elemetrics Corp., Dept. EM, 12 Maple Ave., Pine Brook, N.J. 07058 .... *
Rockland Sys. Corp., Dept. EM, 230 W. Nyack Rd., W. Nyack, N.Y. 10994 .. *
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Alpha-M Corp, Dept. EM, 3009 Wildflower Drive, Dallas, Tx. 75229
Applied Systems Corp., Dept. EM, 26401 Harper Ave., St. Clair Shores, Mich. 48081
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
D Bearing Inspection, Dept. EM, 10041 Shoemaker Ave., Santa Fe Springs, Cal. 90670
Datawest Corp., Dept. EM, 7333 E. Helm Dr., Scottsdale, Ariz. 85260
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UFAD Corp., Dept. EM, 700 36th St. S.E., Grand Rapids, Mich. 49508
M Vibra-Metrics, Inc., Dept. EM, 150 Bradley St., E. Haven, Conn. 06512
Zonic Technical Labs., Dept. EM, 8927 Rossash Ave., Cincinnati, Ohio 45236

Analyzers, Video—See Analyzers, Spectrum

Analyzers, Waveform—See Analyzers, Harmonic

Annunciators

M Industrial Elctrn. Engrs., Dept. EM, 7740 Lemona Ave., Van Nuys, Cal. 91405 *
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LVC Inds. Inc., Co-Ord Switch Bloc-Lite Divs., Dept. EM, 135-25 37th Ave., Flushing, N.Y. 11354 *
Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705 *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 *
Re-el Circuits, Inc., Dept. EM, 520 Victor Street, Saddle Brook, N.J. 07662 *
Star Micronics Inc., Dept. EM, Pan Am Building, Ste 2308, 200 Park Ave, New York, N.Y. 10017 **p. 1020,1021**
Staver Co., Inc., Dept. EM, 47 N. Saxon Ave., Bay Shore, N.Y. 11706 *
Aerolite Elexs Corp., Dept. EM, 2207 Summit Ave., Union City, N.J. 07087
Aerospace Avionics, Inc., Dept. EM, Airport International Plaza, 110 Wilbur Pl., Bohemia, N.Y. 11716
Allard Instr., Div. of Applied Fluidics, Dept. EM, 770 Main St., Westbury, N.Y. 11590
Applied Control Co., Dept. EM, 1275 Bloomfield Ave., Fairfield, N.J. 07006
Artisan Elctrns. Corp., Dept. EM, 5 Eastmans Rd., Parsippany, N.J. 07054
D Autocon Inds., Sub. Control Data, Dept. EM, 2300 Berkshire La. N., Minneapolis, Minn. 55441
Automation Displays Inc., Dept. EM, 3833 N. White Ave., Eau Claire, Wisc. 54701
D Communications Equip Co., Dept. EM, Box 700, Glen Arbor, Mich. 49636
Cramer Division, Conrac Corporation, Dept. EM, Mill Rock Rd., Old Saybrook, Conn. 06475
Cross Electronics Inc., Dept. EM, 100 Commonwealth Dr., Warrendale, Pa. 15086
Devco Engrg., Control Sys. Div., Dept. EM, Pier La., W. Caldwell, N.J. 07006
Electro Space Systems, Inc., Dept. EM, Box 1359, Richardson, Tex. 75080
Engdahl Enterprises, Dept. EM, 2850 Monterey Ave., Costa Mesa, Cal. 92626
Hathaway Instruments, Inc., Dept. EM, 5250 E. Evans Ave., Denver, Colo. 80222
Henschel Corp., Dept. EM, 14 Cedar St., Amesbury, Mass. 01913
KMC Systems Inc., Dept. EM, 200 State Highway 17, Mahwah, N.J. 07430
Knowles Elctrns., Inc., Dept. EM, 3100 N. Mannheim Rd., Franklin Park, Ill. 60131
Major Data Concepts, Inc., Dept. EM, 1796 Monrovia Ave., Costa Mesa, Cal. 92627
M Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
National Security Systems, Dept. EM, 20 Beechwood Ave., Port Washington, N.Y. 11050
D Onan Div-Onan Corp., Dept. EM, 1400 73rd Ave. N.E., Minneapolis, Minn. 55432
Penn Keystone Corp., Dept. EM, Division St., Ansonia, Conn. 06401
Princo Instrs., Dept. EM, Industrial Pk., Southampton, Pa. 18966
Puleo Electronics, Inc., Dept. EM, 39 Hutcheson Pl., Lynbrook, N.Y. 11563
Rochester Instr System, Dept. EM, 255 N. Union St., Rochester, N.Y. 14605
M Stacoswitch, Inc., Dept. EM, 1139 Baker St., Costa Mesa, Cal. 92626
Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
Tec, Inc., Dept. EM, 2727 N. Fairview, Tuscon, Ariz. 85705

Antenna Dummy Loads—See Dummy Loads

Antenna Feed Systems

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 *
DM Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543 *
M Airtron, Div. Litton Inds., Dept. EM, 200 E. Hanover Ave., Morris Plains, N.J. 07950
DM American Nucleonics Corp., Dept. EM, 6036 Variel Ave., Woodland Hills, Cal 91367
DM Anaren Microwave, Inc., Dept. EM, 1010 James St., Syracuse, N.Y. 13203
M Baldpate Electronics, Inc., Dept. EM, 225 E. Main St., Georgetown, Mass. 01833
Cablewave Systems Inc., Dept. EM, 60 Dodge Ave., North Haven, Conn. 06473
M Cubic Corp., Dept. EM, 9233 Balboa Ave., San Diego, Cal. 92123
Datron Systems, Dept. EM, 20700 Plummer St., Chatsworth, Cal. 91311
M Dielectric Comms, Unit of Gen Signal, Dept. EM, Raymond, Maine 04071
M E-Systems Inc., Garland Div., Dept. EM, Box 6118, Dallas, Tex. 75222
M Eastern Microwave Corp., Dept. EM, 4 Gill St., Woburn, MA 01801
D Finney Co., Dept. EM, 34 W. Interstate St., Bedford, Ohio 44014
Gabriel Elctrns. Inc., Dept. EM, Box 626, Scarborough Ind'l. Pk., Scarborough, Me. 04074
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
D Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Millifiect, Dept. EM, 1242 Birchwood Dr, Sunnyvale, Cal. 94086
M Nurad, Inc., Dept. EM, 2165 Druid Pk. Dr., Baltimore, Md. 21211
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
D Rantec Div., Emerson Elec. Co., Dept. EM, 24003 Ventura Blvd., Calabasas, Calif. 91302
M RF Systems, Inc., Dept. EM, 3100 Communications Rd., St Cloud, Fla. 32769
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
Tasker Systems, Dept. EM, 20131 Sunburst St., Chatsworth, Cal. 91311
M Teledyne Micronetics, Dept. EM, 7155 Mission Gorge Rd., San Diego, Calif. 92120
M Transco Prods., Inc., Dept. EM, 4241 Glencoe Ave., Venice, Cal. 90291
TRG,, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801

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M Aeroflex Labs., Magnetic Prods. Div., Dept. EM, South Service Rd., Plainview, N.Y. 11803 *
D Cornell-Dubilier Electronics, Dept. EM, 150 Avenue "L", Newark, N.J. 07105 *
M ABA Electromechanical Sys. Inc., Dept. EM, Box 500, Pinellas Pk., Fla. 33565
D Alliance Mfg. Co., North American Phillips Co., Dept. EM, Alliance, Ohio 44601
D Blonder-Tongue Labs., Inc., Dept. EM, One Jake Brown Rd., Old Bridge, N.J. 08857
D Channel Master Div. Avnet, Dept. EM, Rte. 209, Ellenville, N.Y. 12428
Datron Systems, Dept. EM, 20700 Plummer St., Chatsworth, Cal. 91311
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D Finney Co., Dept. EM, 34 W. Interstate St., Bedford, Ohio 44014
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D Lance Inds., Dept. EM, P.O. Box 4156, Sylmar, Calif. 91342
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Millifiect, Dept. EM, 1242 Birchwood Dr, Sunnyvale, Cal. 94086
PMI Motors, Kollmorgen Corp., Dept. EM, 5 Aerial Way, Syosset, NY 11791
D RCA Distr. & Special Prods. Div., Dept. EM, Deptford, N.J. 08096
D Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
Tasker Systems, Dept. EM, 20131 Sunburst St., Chatsworth, Cal. 91311
D Tri-Ex Tower Corp., Dept. EM, 7182 Rasmussen Ave., Visalia, Cal. 93277
D Wilson Electronics, Dept. EM, PO Box 19000, Las Vegas, Nev 89119

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M Daico Industries Inc., Dept. EM, Box 5225, Compton, Cal. 90220 **p. 2869**
Kilovac Corp., Dept. EM, Box 4422, Santa Barbara, Cal. 93103 *
LVC Inds. Inc., Co-Ord Switch Bloc-Lite Divs., Dept. EM, 135-25 37th Ave., Flushing, N.Y. 11354 *
M Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 *
M Dielectric Comms, Unit of Gen Signal, Dept. EM, Raymond, Maine 04071
Electro Space Systems, Inc., Dept. EM, Box 1359, Richardson, Tex. 75080
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
M Norlin Communications Inc., Dept. EM, 9125 Gaither Rd., Gaithersburg, Md. 20760
M Transco Prods., Inc., Dept. EM, 4241 Glencoe Ave., Venice, Cal. 90291

Antennas, Airborne

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American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 *
Vega Precision Labs., Dept. EM, 800 Follin La., Vienna, Va. 22180 *
M Aircom, Inc., Dept. EM, Rte. 16B, Union, N.H. 03887
DM American Nucleonics Corp., Dept. EM, 6036 Variel Ave., Woodland Hills, Cal 91367
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D Bendix Corp., Avionics Div, Dept. EM, Box 9414, Ft. Lauderdale, Fla. 33310
D Brelonix, Inc., Dept. EM, 106 North 36th St., Seattle, Wash 98103
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M E-Systems Inc., Garland Div., Dept. EM, Box 6118, Dallas, Tex. 75222
M Eastern Microwave Corp., Dept. EM, 4 Gill St., Woburn, MA 01801
D Finney Co., Dept. EM, 34 W. Interstate St., Bedford, Ohio 44014
D General Aviation Elctrns, Dept. EM, 4141 Kingman Dr., Indianapolis, Ind 46225
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M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
D King Radio Corp., Dept. EM, 400 N. Rogers Rd., Olathe, Kans. 66061
M Nurad, Inc., Dept. EM, 2165 Druid Pk. Dr., Baltimore, Md. 21211
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
D Rantec Div., Emerson Elec. Co., Dept. EM, 24003 Ventura Blvd., Calabasas, Calif. 91302
DM Rystl Electronics Corp., Dept. EM, 328 N.W. 170th St., N. Miami Beach, Fla. 33169
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
DM Teledyne Micronetics, Dept. EM, 7155 Mission Gorge Rd., San Diego, Calif. 92120
M Transco Prods., Inc., Dept. EM, 4241 Glencoe Ave., Venice, Cal. 90291
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Antennas, Citizens Band—See Antennas, Whip & Accessories (Including Marine & Mobile Types)

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Vega Precision Labs., Dept. EM, 800 Follin La., Vienna, Va. 22180 **p. 2864**
M Adams-Russell Co., Inc., Dept. EM, 280 Bear Hill Rd., Waltham, Mass. 02154
Aviatech Intl. Inc., Dept. EM, 75 Carlough Rd, Bohemia, N.Y. 11716
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M E-Systems Inc., Garland Div., Dept. EM, Box 6118, Dallas, Tex. 75222
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GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
D King Radio Corp., Dept. EM, 400 N. Rogers Rd., Olathe, Kans. 66061
D L-Tronics, Dept. EM, 5546 Cathedral Oak Rd., Santa Barbara, Cal. 93111
M Millitlect, Dept. EM, 1242 Birchwood Dr, Sunnyvale, Cal. 94086
M Nurad, Inc., Dept. EM, 2165 Druid Pk. Dr., Baltimore, Md. 21211
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
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M Transco Prods., Inc., Dept. EM, 4241 Glencoe Ave., Venice, Cal. 90291
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Antennas, Ground Plane

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D Antenna Incorporated, Dept. EM, 26301 Richmond Road, Cleveland, Ohio 44126
M Eastern Microwave Corp., Dept. EM, 4 Gill St., Woburn, MA 01801
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
Hytronics Corp., Dept. EM, 6231 72nd Ave. N., Pinellas Park, Fla. 33565
D Kreckman, Herb Co., Dept. EM, Cresco, Pa. 18326
D Kris Inc., Dept. EM, N144 W5660 Pioneer Rd., Cedarburg, Wisc. 53012
M Nurad, Inc., Dept. EM, 2165 Druid Pk. Dr., Baltimore, Md. 21211
D Premax Prods. Div., Chisholm-Ryder Co., Dept. EM, Highland & College Aves., Niagara Falls, N.Y. 14305
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
Rantec Div., Emerson Elec. Co., Dept. EM, 24003 Ventura Blvd., Calabasas, Calif. 91302
D Ratelco, Inc., Dept. EM, 610 Pontius Ave. N., Dept. EEM, Seattle, Wash. 98109
M RF Systems, Inc., Dept EM, 3100 Communications Rd., St Cloud, Fla 32769
D Robyn International Inc., Dept. EM, Box 478 10901 Northland Dr., Rockford, Mich 49341
D , Shakespeare, Elctrns & Fiberglass Div., Dept. EM, Box 246, Columbia, S.C. 29202
D Sinclair Radio Labs., Dept. EM, 122 Rayette Rd, Concord, Ontario, Can. L4K 1B6
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
D Wilson Electronics, Dept. EM, PO Box 19000, Las Vegas, Nev 89119

Antennas, Helical

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
Instruments for Industry, Inc., Dept. EM, 151 Toledo St., Farmingdale, N.Y. 11735 ..... *
Vega Precision Labs., Dept. EM, 800 Follin La., Vienna, Va. 22180 ..... **p. 2864**
DM American Nucleonics Corp., Dept. EM, 6036 Variel Ave., Woodland Hills, Cal 91367
Andrew Corp., Dept. EM, 10500 W. 153rd St., Orland Park, Ill. 60462
M Cubic Corp., Dept. EM, 9233 Balboa Ave., San Diego, Cal. 92123
Datron Systems, Dept. EM, 20700 Plummer St., Chatsworth, Cal. 91311
M E-Systems Inc., Garland Div., Dept. EM, Box 6118, Dallas, Tex. 75222
M Eastern Microwave Corp., Dept. EM, 4 Gill St., Woburn, MA 01801
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
Nurad, Inc., Dept. EM, 2165 Druid Pk. Dr., Baltimore, Md. 21211
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
M RF Systems, Inc., Dept. EM, 3100 Communications Rd., St Cloud, Fla. 32769
D , Shakespeare, Elctrns & Fiberglass Div., Dept. EM, Box 246, Columbia, S.C. 29202
D Sinclair Radio Labs., Dept. EM, 122 Rayette Rd, Concord, Ontario, Can. L4K 1B6
Tasker Systems, Dept. EM, 20131 Sunburst St., Chatsworth, Cal. 91311
M Transco Prods., Inc., Dept. EM, 4241 Glencoe Ave., Venice, Cal. 90291

Antennas, Log-Periodic

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
Instruments for Industry, Inc., Dept. EM, 151 Toledo St., Farmingdale, N.Y. 11735 ..... *
M Polarad Elctrn. Instrs., Dept. EM, 5 Delaware Dr., Lake Success, N.Y. 11040 ..... *
Vega Precision Labs., Dept. EM, 800 Follin La., Vienna, Va. 22180 ..... *
DM American Nucleonics Corp., Dept. EM, 6036 Variel Ave., Woodland Hills, Cal 91367
Andrew Corp., Dept. EM, 10500 W. 153rd St., Orland Park, Ill. 60462
D Blonder-Tongue Labs., Inc., Dept. EM, One Jake Brown Rd., Old Bridge, N.J. 08857
D Channel Master Div. Avnet, Dept. EM, Rte. 209, Ellenville, N.Y. 12428
M E-Systems Inc., Garland Div., Dept. EM, Box 6118, Dallas, Tex. 75222
M Eastern Microwave Corp., Dept. EM, 4 Gill St., Woburn, MA 01801
Electro Space Systems, Inc., Dept. EM, Box 1359, Richardson, Tex. 75080
D Finney Co., Dept. EM, 34 W. Interstate St., Bedford, Ohio 44014
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
D Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
Lance Inds., Dept. EM, P.O. Box 4156, Sylmar, Calif. 91342
M Nurad, Inc., Dept. EM, 2165 Druid Pk. Dr., Baltimore, Md. 21211
M RF Systems, Inc., Dept. EM, 3100 Communications Rd., St Cloud, Fla. 32769
D S & A Electronics, Div. Scott & Fetzer Co., Dept. EM, 202 W. Florence, Toledo, Ohio 43605
D Sinclair Radio Labs., Dept. EM, 122 Rayette Rd, Concord, Ontario, Can. L4K 1B6

Antennas, Loop

Austron, Inc., Dept. EM, 1915 Kramer La., Austin, Tex. 78758 ..... *
Connector Corp., Dept. EM, 6025 N. Keystone Ave., Chicago, Ill. 60646 ..... *
Instruments for Industry, Inc., Dept. EM, 151 Toledo St., Farmingdale, N.Y. 11735 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 ..... *
Electro Space Systems, Inc., Dept. EM, Box 1359, Richardson, Tex. 75080
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
D King Radio Corp., Dept. EM, 400 N. Rogers Rd., Olathe, Kans. 66061
McKay Dymek Co., Dept. EM, 111 S. College Ave Box 5000, Claremont, Cal. 91711
Palomar Engrs., Dept. EM, Box 455, Escondido, Cal. 92025
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D RCA Distr. & Special Prods. Div., Dept. EM, Deptford, N.J. 08096
D S & A Electronics, Div. Scott & Fetzer Co., Dept. EM, 202 W. Florence, Toledo, Ohio 43605
Solar Elctrns. Co., Dept. EM, 901 N. Highland, Hollywood, Cal. 90038
Spectracom Corp., Dept. EM, 1667 Penfield Rd., Rochester, N.Y. 14625
D Vidaire Electronics Mfg., Dept. EM, 150 Buffalo Ave., Freeport, N.Y. 11520
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Antennas, Phased Array

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
M Airtron, Div. Litton Inds., Dept. EM, 200 E. Hanover Ave., Morris Plains, N.J. 07950
DM American Nucleonics Corp., Dept. EM, 6036 Variel Ave., Woodland Hills, Cal 91367
D Channel Master Div. Avnet, Dept. EM, Rte. 209, Ellenville, N.Y. 12428
M Cubic Corp., Dept. EM, 9233 Balboa Ave., San Diego, Cal. 92123
Datron Systems, Dept. EM, 20700 Plummer St., Chatsworth, Cal. 91311
M E-Systems Inc., Garland Div., Dept. EM, Box 6118, Dallas, Tex. 75222
M Eastern Microwave Corp., Dept. EM, 4 Gill St., Woburn, MA 01801
Electro Space Systems, Inc., Dept. EM, Box 1359, Richardson, Tex. 75080
D Finney Co., Dept. EM, 34 W. Interstate St., Bedford, Ohio 44014
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Nurad, Inc., Dept. EM, 2165 Druid Pk. Dr., Baltimore, Md. 21211
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
D Rantec Div., Emerson Elec. Co., Dept. EM, 24003 Ventura Blvd., Calabasas, Calif. 91302
M RF Systems, Inc., Dept. EM, 3100 Communications Rd., St Cloud, Fla. 32769
D S & A Electronics, Div. Scott & Fetzer Co., Dept. EM, 202 W. Florence, Toledo, Ohio 43605
D Sinclair Radio Labs., Dept. EM, 122 Rayette Rd, Concord, Ontario, Can. L4K 1B6
Technical Mat'l., Dept. EM, 700 Fenimore Rd., Mamaroneck, N.Y. 10543
M Teledyne Micronetics, Dept. EM, 7155 Mission Gorge Rd., San Diego, Calif. 92120
M Transco Prods., Inc., Dept. EM, 4241 Glencoe Ave., Venice, Cal. 90291
TRG,, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
D Turner Div., Conrac, Dept. EM, 716 Oakland Rd. N.E., Cedar Rapids, Iowa 52402
D Winegard Co., Dept. EM, 3000 Kirkwood St., Burlington, Iowa 52601

Antennas, Rhombic

D Sinclair Radio Labs., Dept. EM, 122 Rayette Rd, Concord, Ontario, Can. L4K 1B6
Technical Mat'l., Dept. EM, 700 Fenimore Rd., Mamaroneck, N.Y. 10543

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Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Instruments for Industry, Inc., Dept. EM, 151 Toledo St., Farmingdale, N.Y. 11735 ..... *
Vega Precision Labs., Dept. EM, 800 Follin La., Vienna, Va. 22180 ..... *
DM American Nucleonics Corp., Dept. EM, 6036 Variel Ave., Woodland Hills, Cal 91367
M E-Systems Inc., Garland Div., Dept. EM, Box 6118, Dallas, Tex. 75222
M Eastern Microwave Corp., Dept. EM, 4 Gill St., Woburn, MA 01801
Frequency Engrg. Labs., Dept. EM, Box 527, Farmingdale, N.J. 07727
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
M Nurad, Inc., Dept. EM, 2165 Druid Pk. Dr., Baltimore, Md. 21211
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
M Teledyne Micronetics, Dept. EM, 7155 Mission Gorge Rd., San Diego, Calif. 92120
M Transco Prods., Inc., Dept. EM, 4241 Glencoe Ave., Venice, Cal. 90291

Antennas, Telescopic

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M Astro Research Corp., Astro Spar Corp., Dept. EM, Box 4128, Santa Barbara, Cal. 93103
M Craig Sys. Corp., Dept. EM, 360 Merrimack St., Lawrence, Mass. 01842
Materials for Elctrns., Dept. EM, 149-32 132nd St., Jamaica, N.Y. 11430
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Peerless Sales Co., Dept. EM, 4200 W. Chicago Ave., Chicago, Ill 60651
D Premax Prods. Div., Chisholm-Ryder Co., Dept. EM, Highland & College Aves., Niagara Falls, N.Y. 14305
M RF Systems, Inc., Dept. EM, 3100 Communications Rd., St Cloud, Fla. 32769
D Tri-Ex Tower Corp., Dept. EM, 7182 Rasmussen Ave., Visalia, Cal. 93277
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

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D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
Instruments for Industry, Inc., Dept. EM, 151 Toledo St., Farmingdale, N.Y. 11735 ..... *
M **Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612** ..... *
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
D Antenna Incorporated, Dept. EM, 26301 Richmond Road, Cleveland, Ohio 44126
D Barker & Williamson, Inc., Dept. EM, Canal St., Bristol, Pa. 19007
D Channel Master Div. Avnet, Dept. EM, Rte. 209, Ellenville, N.Y. 12428
Communication Assocs., Inc., Dept. EM, 200 McKay Rd., Huntington Station, N.Y. 11746
Electro Space Systems, Inc., Dept. EM, Box 1359, Richardson, Tex. 75080
D Fanon/Courier Corp., Subs., Resdel Engrg, Dept. EM, 990 S. Fair Oaks, Pasadena, Cal. 91105
D GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
Hytronics Corp., Dept. EM, 6231 72nd Ave. N., Pinellas Park, Fla. 33565
D Kris Inc., Dept. EM, N144 W5660 Pioneer Rd., Cedarburg, Wisc. 53012
McKay Dymek Co., Dept. EM, 111 S. College Ave Box 5000, Claremont, Cal. 91711
D New-Tronics Corp., Dept. EM, 15800 Commerce Park Dr., Brookpark, Ohio 44142
D Nuvox Elctrns. Corp., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Pearce-Simpson, Inc., Div/Gladding Corp., Dept. EM, 4701 N.W. 77th Ave., Miami, Fla. 33166
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
D Premax Prods. Div., Chisholm-Ryder Co., Dept. EM, Highland & College Aves., Niagara Falls, N.Y. 14305
D RCA Distr. & Special Prods. Div., Dept. EM, Deptford, N.J. 08096
D Robyn International Inc., Dept. EM, Box 478 10901 Northland Dr., Rockford, Mich 49341
DM Rysti Electronics Corp., Dept. EM, 328 N.W. 170th St., N. Miami Beach, Fla. 33169
D S G C Inc., Dept. EM, 13737 SE 26th St., Bellevue, Wash. 98005
DM Shakespeare, Elctrns & Fiberglass Div., Dept. EM, Box 246, Columbia, S.C. 29202
D Sinclair Radio Labs., Dept. EM, 122 Rayette Rd, Concord, Ontario, Can. L4K 1B6
D Telco Products Co., Dept. EM, 44 Sea Cliff, Glen Cove, NY 11542
Tracor, Inc., Dept. EM, 6500 Tracor La., Austin, Tex. 78721
D Turner Div., Conrac, Dept. EM, 716 Oakland Rd. N.E., Cedar Rapids, Iowa 52402
D Wilson Electronics, Dept. EM, PO Box 19000, Las Vegas, Nev 89119
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Armatures—See Motor & Generator Armatures, Rotors, Stators

Arms, Phono, Transcription—See Phonographs, Parts & Accessories

Arresters, Electrical Surge-Also See Suppressors, Arc; Protectors, Surge

D **Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645** ..... *
D **Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601** ..... *
Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 ..... *
D **General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345** ..... *
D **International Rectifier Corp., Semiconductor Div., Dept. EM, 233 Kansas St., El Segundo, Cal. 90245** ..... *
M **McG Electronics Inc., Dept. EM, 160 Brook Ave., Deer Park, N.Y. 11729** p. 4106
D **Midwest Components, Dept. EM, 1981 Port City Blvd., Muskegon, Mich. 49400** ..... *
Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 ..... *
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
M **Victoreen, Inc., Dept. EM, 10101 Woodland Ave., Cleveland, Ohio 44104** ..... *
Barber Corp., Dept. EM, Box 635, Waynesville, Ohio 45068
Centerflex Ceramics, Dept. EM, 221 Seventh Ave., Hawthorne, N.J. 07507
Eastern Delta Corp., Dept. EM, 29-09 S. Broadway, Fair Lawn, N.J. 07410
Edal Inds., Inc., Dept. EM, 4 Short Beach Rd., E. Haven, Conn. 06512
DM General Semiconductor Industries, Inc., Dept. EM, 2001 W. 10 Pl., Box 3078, Tempe, Ariz. 85281
Joslyn Elctrn. Sys., Div. Joslyn Mfg. & Supp, Dept. EM, 6868 Cortona Dr., Box 817, Goleta, Cal 93017
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
M Transtector Systems, Dept. EM, 532 Monterey Pass Rd., Monterey Park, Cal. 91754
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Attenuators, Audio

Allen Avionics, Inc., Div. A.K. Allen Co., Dept. EM, 255 E. 2nd St., Mineola, N.Y. 11501 ..... *
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M **Applied Research Inc., Dept. EM, 76 S. Bayles Ave., Port Washington, N.Y. 11050** ..... *
M **Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706** ..... *
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Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 ..... *
Dale Electronics, Inc., Dept. EM, Box 74, Norfolk, Nebr. 68701 ..... *
D **Duncan Electronics, Inc., Dept. EM, 2865 Fairview Rd., Costa Mesa, Cal. 92626** ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 ..... *
D **Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470** ..... *
Kay Elemetrics Corp., Dept. EM, 12 Maple Ave., Pine Brook, N.J. 07058 ..... *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... *
Matrix Systems Corp., Dept. EM, 9411 Lurline Ave., Chatsworth, Cal. 91311 ..... *
DM **Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725** ..... *
D **Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076** ..... *
Re-el Circuits, Inc., Dept. EM, 520 Victor Street, Saddle Brook, N.J. 07662 *
D **Shallco, Inc., Dept. EM, Box 1089, Smithfield, N.C. 27577** ..... *
Tech Labs., Inc., Dept. EM, Bergen & Edsall Blvds., Palisades Pk., N.J. 07650 ..... *
Telonic/Berkeley, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715 ..... *
D **Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219** *
D **Trimm, Inc., Dept. EM, 400 W. Lake, Box 489, Libertyville, Ill. 60048** ..... *
Vishay Resistive Systems Grp., Vishay Intertechnology Inc., Dept. EM, 63 Lincoln Hwy., Malvern, Pa. 19355 ..... *
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
Centralab, Electrns. Div. - Globe Union Inc., Dept. EM, 5757 N. Green Bay Ave., Milwaukee, Wisc. 53201
D Clarostat Mfg. Co., Inc., Dept. EM, Washington St., Dover, N.H. 03820
Dantel, Inc., Dept. EM, 1922 North Helm, Fresno, Cal. 93727
Elcom Systems, Inc., Dept. EM, 127F Brook Ave., Deer Pk., N.Y. 11729
D Electro-Voice, Sub. Gulton Inds., Dept. EM, 600 Cecil St., Buchanan, Mich. 49107
Engelmann Microwave, Dept. EM, Skyline Dr., Montville, N.J. 07045
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
Gotham Audio Corp., Dept. EM, 741 Washington St., New York, N.Y. 10014
Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704
DM Kings Electronics, Dept. EM, 40 Mabledale Rd., Tuckahoe, N.Y. 10707
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
D Robins Broadcast & Sound Equipment Corp., Sub. Robins Inds., Dept. EM, 75 Austin Blvd., Commack, N.Y. 11725
D Sescom, Inc., Dept. EM, 12931 Budlong Ave. Box 590, Gardena, Cal. 90247
D Shure Brothers, Inc., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204
D Spectra Sonics, Dept. EM, 770 Wall Ave., Ogden, Utah 84404
D Switchcraft, Inc., Dept. EM, 5555 N. Elston, Chicago, Ill. 60630
Telecommunications Techniques Corp., Dept. EM, 112 Frederick Ave., Rockville, Md. 20850
Waters Mfg., Inc., Dept. EM, Longfellow Ctr., Wayland, Mass. 01778
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578
D Xit Rod Co, Dept. EM, PO Box 128, Beaumont, Cal. 92223

Attenuators, Coaxial

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
M **Applied Research Inc., Dept. EM, 76 S. Bayles Ave., Port Washington, N.Y. 11050** ..... p. 2866
M **Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706** ..... *
D **Ava Elctrns., Dept. EM, 4000 Bridge St., Dreyel Hill, Pa 19026** ..... p. 1727
Bird Electronic Corp., Dept. EM, 30303 Aurora Rd., Solon, Ohio 44139 ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
M **Daico Industries Inc., Dept. EM, Box 5225, Compton, Cal. 90220** ..... p. 2869
Electro Impulse, Dept. EM, Box 870, Red Bank, N.J. 07701 ..... *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** p. 2871
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 ..... *
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 ..... *
Kay Elemetrics Corp., Dept. EM, 12 Maple Ave., Pine Brook, N.J. 07058 p. 2770
D **KDI Pyrofilm Corp, Dept. EM, 60 S. Jefferson Rd., Whippany, N.J. 07981** p. 3729
Matrix Systems Corp., Dept. EM, 9411 Lurline Ave., Chatsworth, Cal. 91311 p. 2874
DM **Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725** ..... p. 2878-2880
Mini-Circuits Lab., Div. Scientific Comps. Corp., Dept. EM, 2625 E 14th St., Brooklyn, N.Y. 11235 ..... p. 2890, Inside Front Cover, Vol. 1
D **Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543** ..... *
Telonic/Berkeley, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715 ..... p. 3063
D **Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219** p. 2830
Vishay Resistive Systems Grp., Vishay Intertechnology Inc., Dept. EM, 63 Lincoln Hwy., Malvern, Pa. 19355 ..... *
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
Aerolite Elexs Corp., Dept. EM, 2207 Summit Ave., Union City, N.J. 07087
D Ailtech, Dept. EM, 2070 Fifth Ave, Ronkonkoma, NY 11779
Alan Industries Inc., Dept. EM, PO Box 1203, Columbus, Ind. 47201
D Astrolab, Inc., Dept. EM, 345 Dalziel Rd., Linden, N.J. 07036
D Blonder-Tongue Labs., Inc., Dept. EM, One Jake Brown Rd., Old Bridge, N.J. 08857

D Channel Master Div. Avnet, Dept. EM, Rte. 209, Ellenville, N.Y. 12428
M Crown Microwave, Inc., Sub. Microwave Semiconductor Corp., Dept. EM, 6 Executive Park Dr., N. Billerica, Mass. 01862
M Dielectric Comms, Unit of Gen Signal, Dept. EM, Raymond, Maine 04071
Elcom Systems, Inc., Dept. EM, 127F Brook Ave., Deer Pk., N.Y. 11729
Engelmann Microwave, Dept. EM, Skyline Dr., Montville, N.J. 07045
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
D Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
DM Kings Electronics, Dept. EM, 40 Mabledale Rd., Tuckahoe, N.Y. 10707
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
D Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
Mu-Del Elctrns., Dept. EM, 2426 Linden La., Silver Spring, Md. 20910
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
M Nurad, Inc., Dept. EM, 2165 Druid Pk. Dr., Baltimore, Md. 21211
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
D R L C Elctrns., Inc., Dept. EM, 83 Radio Cir., Mt. Kisco, N.Y. 10549
D Solitron/Microwave, Dept. EM, Box 278, Port Salerno, Fla. 33492
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
M Transco Prods., Inc., Dept. EM, 4241 Glencoe Ave., Venice, Cal. 90291
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006
M Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760
D Winegard Co., Dept. EM, 3000 Kirkwood St., Burlington, Iowa 52601

Attenuators, Decade

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M **Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706** ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 ..... *
D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043** *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D **Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470** .... *
Kay Elemetrics Corp., Dept. EM, 12 Maple Ave., Pine Brook, N.J. 07058 .... *
D **Shallco, Inc., Dept. EM, Box 1089, Smithfield, N.C. 27577** ..... *
Tech Labs., Inc., Dept. EM, Bergen & Edsall Blvds., Palisades Pk., N.J. 07650 *
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
Engelmann Microwave, Dept. EM, Skyline Dr., Montville, N.J. 07045
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D **Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219** *
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M **Wavetek Indiana, Inc., Dept. EM, 66 N. First Ave., Beech Grove, Ind. 46107** *
Alan Industries Inc., Dept. EM, PO Box 1203, Columbus, Ind. 47201
Engelmann Microwave, Dept. EM, Skyline Dr., Montville, N.J. 07045
Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
D R L C Elctrns., Inc., Dept. EM, 83 Radio Cir., Mt. Kisco, N.Y. 10549
M Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760

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Allen Avionics, Inc., Div. A.K. Allen Co., Dept. EM, 255 E. 2nd St., Mineola, N.Y. 11501 ..... *
D **Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204** .. *
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D **Shallco, Inc., Dept. EM, Box 1089, Smithfield, N.C. 27577** ..... *
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DM Anaren Microwave, Inc., Dept. EM, 1010 James St., Syracuse, N.Y. 13203
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D Blonder-Tongue Labs., Inc., Dept. EM, One Jake Brown Rd., Old Bridge, N.J. 08857
D Clarostat Mfg. Co., Inc., Dept. EM, Washington St., Dover, N.H. 03820
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M Crown Microwave, Inc., Sub. Microwave Semiconductor Corp., Dept. EM, 6 Executive Park Dr., N. Billerica, Mass. 01862
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M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Gotham Audio Corp., Dept. EM, 741 Washington St., New York, N.Y. 10014
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
D Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
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M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
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D Robins Broadcast & Sound Equipment Corp., Sub. Robins Inds., Dept. EM, 75 Austin Blvd., Commack, N.Y. 11725
Scientific Communications, Dept. EM, 3425 Kingsley, Garland, Tex. 75041
D Sinclair Radio Labs., Dept. EM, 122 Rayette Rd, Concord, Ontario, Can. L4K 1B6
Sivers Lab, Dept. EM, Box 90339, Los Angeles, Cal. 90009
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
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TRG,, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
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Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006
M Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760
Wide Band Engrg. Co. Inc., Dept. EM, Box 21652, Phoenix, Ariz. 85036

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D **Mallory Capacitor Co., Div. P.R. Mallory, Dept. EM, 3029 E. Washington, Box 372, Indianapolis, Ind. 46201** ..... p. 1014-1017
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Kolin Industries, Dept. EM, 59 W. Pondfield Rd., Bronxville, N.Y. 10708
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Projects Unlimited, Inc., Dept. EM, 3680 Wyse Rd., Dayton, Ohio 45414
SHOGYO International Corp., Dept. EM, 300 Northern Blvd., Great Neck, N.Y. 11021

Audio Equipment—See Amplifiers; Microphones; Speakers; etc.

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M **Mac Panel Co., Dept. EM, Box 5027, 216 Pine St., High Pt., N.C. 27262** ..... *
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M Advanced Circuitry, Litton Systems Inc., Dept. EM, 4811 W. Kearney St., Springfield, Mo. 65803
Advanced Technology Sys., Dept. EM, 450 W. First Ave., Roselle, N.J. 07023
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GTE Sylvania, Tech Prods Div, Dept. EM, 816 Lexington Ave., Warren, Pa 16365
Information Control Corp., Abacus Div. Dept. EM7, Dept. EM, 9610 Bellanca Ave., Los Angeles, Cal. 90045
Kalmus & Assoc., Dept. EM, 2424 S. 25th Ave., Broadview, ILL. 60153
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D SAMTEC, Dept. EM, 810 Progress Blvd., New Albany, Indiana 47150
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
D T&B/Ansley Corp., Sub. Thomas & Betts, Dept. EM, 3208 Humboldt St., Los Angeles, Cal. 90031
M Teradyne Components, Dept. EM, 4 Pittsburgh Ave, Nashua, NH 03060

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D Fourjay Industries, Dept. EM, Box 1465 Northridge Br., Dayton, Ohio 45414
D Frazier, Inc., Dept. EM, 1930 Valley View La., Dallas, Tex. 75234
Midwest Electronic Industries, Dept. EM, 4945 W. Belmont Ave., Chicago, Ill. 60641
D Mobil Electronics, Inc., Dept. EM, Box 1132, Anderson, Ind. 46015
D Oaktron Inds., Inc., Dept. EM, Monroe, Wisconsin 53566
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D PASO Sound Products Inc., Dept. EM, 14 First St, Pelham, NY 10803
M Permaluster, Inc., Dept. EM, 1844 N. Keystone St., Burbank, Calif. 91504

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D **ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766** ..... p. 1990
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M **Blue M Electric Co., Dept. EM, 138th & Chatham St., Blue Island, Ill. 60406** *
DM **Cincinnati Sub-Zero Products, Dept. EM, 2612 Gilbert Ave., Cincinnati, Ohio 45206** ..... *
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 *
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D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
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Electrovert, Dept. EM, 86 Hartford Ave., Mt. Vernon, N.Y. 10553
M Fisher Scientific Co., Dept. EM, 711 Forbes Ave., Pittsburgh, Pa. 15219
Forma Scientific, Inc., Dept. EM, Box 649, Marietta, Ohio 45750
FTS Systems Inc., Dept. EM, POB 158, Stone Ridge, N.Y. 12484
D GCA/Precision Scientific, Dept. EM, 3737 W. Cortland St., Chicago, Ill. 60647
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D Temptronic Corporation, Dept. EM, 40 Glen Ave., Newton, Mass. 02159

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D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
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D Wonder Corp of America, Dept. EM, 24 Harborview Ave, Stamford, Conn. 06904

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DM Mallory Battery, P.R. Mallory, Dept. EM, S. Broadway, Tarrytown, N.Y. 10591
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D Wonder Corp of America, Dept. EM, 24 Harborview Ave, Stamford, Conn. 06904

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D Gates Energy Prods., Inc., Dept. EM, 1050 S. Broadway, Denver, Colo. 80217
D Power-Sonic Corp., Dept. EM, Box 5242, 3106 Spring St., Redwood City, Cal. 94063
SGL Batteries Manufacturing Co., A Subsidiary of SGL Industries, Inc., Dept. EM, 14650 Dequindre, Detroit, Mich. 48212
D Teledyne Big Beam, Dept. EM, 290 E. Prairie St., Crystal Lake, Ill. 60014

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Elpower Corp., Dept. EM, 2117 S. Anne St., Santa Ana, Cal. 92704
ESB Wisco Inc., Dept. EM, 1222 18th St., Racine, Wisc. 53403
D Gates Energy Prods., Inc., Dept. EM, 1050 S. Broadway, Denver, Colo. 80217
Mine Safety Appliances Co., Dept. EM, 600 Penn Center Blvd., Pittsburgh, Pa 15235
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Power-Sonic Corp., Dept. EM, Box 5242, 3106 Spring St., Redwood City, Cal. 94063
SGL Batteries Manufacturing Co., A Subsidiary of SGL Industries, Inc., Dept. EM, 14650 Dequindre, Detroit, Mich. 48213
D Teledyne Big Beam, Dept. EM, 290 E. Prairie St., Crystal Lake, Ill. 60014
D Terado Corp., Dept. EM, 1068 Raymond Ave., St. Paul, Minn. 55108
M UCE, Inc., Dept. EM, 20 N. Main St., Norwalk, Conn. 06854

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M GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
DM Mallory Battery, P.R. Mallory, Dept. EM, S. Broadway, Tarrytown, N.Y. 10591
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Power Conversion Inc., Dept. EM, 70 MacQuesten Pkwy. S., Mt. Vernon, N.Y. 10550

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Marathon Battery Co., c/o Marathon Manufacturing Co., Dept. EM, 1900 Marathon Bldg., 600 Jefferson Box 61589, Houston, Tex. 77002

Batteries, Manganese Alkaline

D **ISL Products Ltd. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803** *
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D Chafitz Engineering, Dept. EM, P.O. Box 2188, Rockville, Md. 20852
DM Mallory Battery, P.R. Mallory, Dept. EM, S. Broadway, Tarrytown, N.Y. 10591
Marathon Battery Co., c/o Marathon Manufacturing Co., Dept. EM, 1900 Marathon Bldg., 600 Jefferson Box 61589, Houston, Tex. 77002

Batteries, Mercury

Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... p. 3292
M Power, Inc., Marketing Div., Dept. EM, 12809 Eagle Ridge Dr., Burnsville, Minn. 55337 ..... *
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DM Mallory Battery, P.R. Mallory, Dept. EM, S. Broadway, Tarrytown, N.Y. 10591

Batteries, Nickel-Alkaline

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Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016

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D Marathon Battery Co., c/o Marathon Manufacturing Co., Dept. EM, 1900 Marathon Bldg., 600 Jefferson Box 61589, Houston, Tex. 77002
National Camera Inc., Dept. EM, 2000 W. Union Ave., Englewood, Colo. 80110
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Power-Sonic Corp., Dept. EM, Box 5242, 3106 Spring St., Redwood City, Cal. 94063
D Teledyne Big Beam, Dept. EM, 290 E. Prairie St., Crystal Lake, Ill. 60014
M Whittaker Corp., Dept. EM, 10880 Wilshire Blvd., Los Angeles, Cal. 90024

Batteries, Nickel-Zinc

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Batteries, Silver-Cadmium

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M Whittaker Corp., Dept. EM, 10880 Wilshire Blvd., Los Angeles Cal 90024

Batteries, Silver Oxide

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D Mallory Battery, P.R. Mallory, Dept. EM, S. Broadway, Tarrytown, N.Y. 10591

Batteries, Silver-Zinc

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M Whittaker Corp., Dept. EM, 10880 Wilshire Blvd., Los Angeles, Cal. 90024

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Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 .. *
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 p. 2753
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SGL Batteries Manufacturing Co., A Subsidiary of SGL Industries, Inc., Dept. EM, 14650 Dequindre, Detroit, Mich. 48212

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D Eagle-Picher Inds., Commercial Prods, Dept., Dept. EM, Box 130, Seneca, Mo. 64865 ..... p. 3247
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M Power, Inc., Marketing Div., Dept. EM, 12809 Eagle Ridge Dr., Burnsville, Minn. 55337 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Electronic Batteries, Inc., Dept. EM, Box 525, Lindenhurst, N.Y. 11757
D Gates Energy Prods., Inc., Dept. EM, 1050 S. Broadway, Denver, Colo. 80217
D Marathon Battery Co., c/o Marathon Manufacturing Co., Dept. EM, 1900 Marathon Bldg., 600 Jefferson Box 61589, Houston, Tex. 77002
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Power-Sonic Corp., Dept. EM, Box 5242, 3106 Spring St., Redwood City, Cal. 94063
SGL Batteries Manufacturing Co., A Subsidiary of SGL Industries, Inc., Dept. EM, 14650 Dequindre, Detroit, Mich. 48212
D Teledyne Big Beam, Dept. EM, 290 E. Prairie St., Crystal Lake, Ill. 60014

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D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
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Union Carbide Corp., Battery Products Div., Dept. EM, 270 Park Ave., New York, N.Y. 10017 ..... *

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M Graphite Metallizing Corp., Dept. EM, 1036 Nepperhan Ave., Yonkers, N.Y. 10702 ..... *
Keystone Carbon Co., Thermistor Div., Dept. EM, St. Marys, Pa. 15857 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 *
Abex Corp, Dept. EM, 530 5th Ave, New York, NY 10036
D Bearing Inspection, Dept. EM, 10041 Shoemaker Ave., Santa Fe Springs, Cal. 90670
Berg Inc., Winfred M., Dept. EM, 499 Ocean Ave., East Rockaway, N.Y. 11518
Bird, Richard H. & Co., Inc., Dept. EM, 1 Spruce St., Waltham, Mass. 02154
M Cadillac Plastic & Chemical, Dayco Co., Dept. EM, Box 810, Detroit, Mich. 48232
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
D Carco Elctrns., Dept. EM, 195 Constitution Dr., Menlo Park, Calif. 94025
Dresser Industries, Dept. EM, 1505 Elm St., Dallas, Tex. 75201
Emporium Specialties Co., Inc., Dept. EM, Box 65, Austin, Pa. 16720
General Elec., Carboloy Systems Dept., Dept. EM, Box 237, Detroit, Mich. 48232
Keene Corp, Dept. EM, 345 Park Ave, New York, N.Y. 10022
DM New Hampshire Ball Bearings, Inc., Dept. EM, Peterborough, N.H. 03458
M N.L. Inds., Inc., Bearings Div., Dept. EM, PO Box 934, Toledo, Ohio 43694
Ohio Carbon Co., Dept. EM, 12508 Berea Rd., Cleveland, Ohio 44111
PIC Design Div., Benrus Corp., Dept. EM, Benrus Center, Rte 7, Ridgefield, Conn. 06877
D Pure Carbon Co., Inc., Dept. EM, 441 Hall Ave., St. Marys, Pa. 15857
DM Raway Bearing Corp., Dept. EM, 8 Melnick Rd., Monsey, N.Y. 10952
Rogers Corp., Dept. EM, Rogers, Conn. 06263
DM Stock Drive Prods., Div. Designatronics, Inc., Dept. EM, 55 S. Denton Ave., New Hyde Pk., N.Y. 11040
Synthane Taylor Corp., An Alco Standard Corporate Partner, Dept. EM, Box 835, Valley Forge, Pa. 19482

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D Deltrol Controls, Dept. EM, 2745 S. 19th St., Milwaukee, Wisc. 53215 p. 3445
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D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
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D **Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629** .... *

Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035

Aerolite Elexs Corp., Dept. EM, 2207 Summit Ave., Union City, N.J. 07087

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D Atlas Sound Div., American Trading & Prod., Dept. EM, 10 Pomeroy Rd., Parsippany, N.J. 07054

M Cadillac Plastic & Chemical, Dayco Co., Dept. EM, Box 810, Detroit, Mich. 48232

Cramer Division, Conrac Corporation, Dept. EM, Mill Rock Rd., Old Saybrook, Conn. 06475

D General Elec. Co, Wiring Device Bus. Dept., Dept. EM, 95 Hathaway St., Providence, R.I. 02904

M Henschel Corp., Dept. EM, 14 Cedar St., Amesbury, Mass. 01913

Kolin Industries, Dept. EM, 59 W. Pondfield Rd., Bronxville, N.Y. 10708

DM Line Elec an Esterline Co., Dept. EM, U.S. Hwy. 287, Parsippany, N.J. 07054

D LocAtor Electronics Co., Dept. EM, South Country Ind'l Pk., Drawer 10609, St. Louis, Mo. 63129

National Security Systems, Dept. EM, 20 Beechwood Ave., Port Washington, N.Y. 11050

D On-Guard Corp. of America, Dept. EM, 350 Gotham Pkwy., Carlstadt, NJ 07072

D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016

D Projects Unlimited, Inc., Dept. EM, 3680 Wyse Rd., Dayton, Ohio 45414

Relay Service Co., Dept. EM, 1310 N. Pulaski Rd., Chicago, Ill. 60651

D Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410

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Southwood Electronic Co., Dept. EM, 7624 Lindenwood Dr., Indianapolis, Ind. 46227

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M **Amco Engineering Co., Dept. EM, 7333 W. Ainslie St., Chicago, Ill. 60656** .. *

Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... *

M **Formica Metal Prods. Co., Dept. EM, Corporation Way, Dept. M, Medford, Mass. 02155** ..... **p. 1031**

M **General Devices Co., Inc., Dept. EM, Box 19188, Indianapolis, Ind. 46219** .. *

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Stantron Div., Wyco Metal Products, Dept. EM, 6914 Beck Ave., N. Hollywood, Cal. 91605 ..... **p. 1048**

D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *

M **Vent-Rak, Div., General Devices Co., Dept. EM, P.O. Box 19188, Indianapolis, Ind. 46219** ..... *

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M Alden Sys. Co., Inc., Dept. EM, Box 500 Dept. 262, Westboro, Mass. 01581

M Atmosphere Controls Prdts., Dept. EM, 295 Polaris, Mt. View, Cal. 94043

Baker Co., Inc., Dept. EM, Drawer E - Sanford Airport, Sanford, Me. 04073

Bishop Graphics, Dept. EM, 5388 Sterling Center, Westlake Village, Cal. 91361

D Bud Radio, Inc., Dept. EM, 4605 E. 355th St., Willoughby, Ohio 44094

M Clean Room Prods., Dept. EM, 56 W. Penataquit Ave., Bay Shore, N.Y. 11706

M Craig Sys. Corp., Dept. EM, 360 Merrimack St., Lawrence, Mass. 01842

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DM Easy-Up Inc., Dept. EM, Racine, Wisc. 53401

M Electro-Rack Products Co., Dept. EM, 1742 So. Clementine St., Anaheim, Cal. 92802

D Equipto, Aurora Equipment Co., Dept. EM, 225 So. Highland Ave., Aurora, Ill. 60507

M Fisher Scientific Co., Dept. EM, 711 Forbes Ave., Pittsburgh, Pa. 15219

Forma Scientific, Inc., Dept. EM, Box 649, Marietta, Ohio 45750

D Hammond Mfg. Co., Dept. EM, 385 Nagel Dr., Buffalo, NY 14225

Kewaunee Scien. Equip. Corp., Dept. EM, 4012 Logan St., Adrian, Mich. 49221

D Lyon Metal products, Inc., Dept. EM, 47 Railroad Ave., Aurora, Ill. 60507

Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006

Mid-West Metal Prods., Inc., Dept. EM, 456 E. Donovan Rd., Kansas City, Kans. 66115

D Par-Metal Prods. Inc., Dept. EM, 1260 Atlantic Ave., Brooklyn, N.Y. 11216

Snap-On-Tools, Dept. EM, 8192-A 28th Ave., Kenosha, Wisc. 53140

D Sturdilite Angle Steel Div., Kewanee Scientific Equip. Corp., Dept. EM, Plainwell, Mich. 49080

D Unarco-Rohn, Div. Unarco Inds., Dept. EM, Box 2000, Peoria, Ill. 61656

D Zero Corp., Dept. EM, 777 Front St., Burbank, Cal. 91502

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M **Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706** ..... *

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Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155

Coleman Microwave Co., Dept. EM, Box 59, Rte. 22, Lebanon, N.J. 08833

M Eastern Microwave Corp., Dept. EM, 4 Gill St., Woburn, MA 01801

DM Hughes Aircraft Co., Electron Dynamics Div., Dept. EM, 3100 W. Lomita Blvd., Torrance, Cal. 90509

Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730

M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039

D Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803

D Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194

Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803

M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573

M Reeve Electronics, Inc., Dept. EM, 609 W. Lake St., Chicago, Ill 60606

M RF Systems, Inc., Dept. EM, 3100 Communications Rd., St Cloud, Fla. 32769

Sivers Lab, Dept. EM, Box 90339, Los Angeles, Cal. 90009

DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409

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Inter-Tech. Grp., Inc., Dept. EM, Box 23, Irvington, N.Y. 10533 ..... *

NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *

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D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013

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D Lyon Metal products, Inc., Dept. EM, 47 Railroad Ave., Aurora, Ill. 60507

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D Micro Electronic Systems, Inc., Dept. EM, 8 Kevin Drive, Danbury, Conn. 06810

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DM **Rotron, Inc., Dept. EM, Hasbrouck La., Woodstock, N.Y. 12498** .. **p. 2600-2605**

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D Master Appliance Corp., Dept. EM, 2420 18th St., Box 545, Racine, Wisc. 53403
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Static Inc., Dept. EM, Box 414, Lee, Mass. 01238
M Telectro Sys. Corp., Dept. EM, 96-18 43rd Ave., Corona, N.Y. 11368
M Zero Corp., Dept. EM, 777 Front St., Burbank, Cal. 91502

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Automation Displays Inc., Dept. EM, 3833 N. White Ave., Eau Claire, Wisc. 54701
M Eastern Electronics Mfg. Corp, Dept. EM, 180 Roberts St., East Hartford, Conn. 06108
KMC Systems Inc., Dept. EM, 200 State Highway 17, Mahwah, N.J. 07430
Methods Research Corp., Dept. EM, 34 Asbury Ave., Farmingdale, N.J. 07727
PCS., Inc., Dept. EM, 750 N. Maple Rd., Saline, Mich. 48176

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D Triad-Utrad, Distr Svcs., Dept. EM, 305 N. Briant St., Huntington, Ind. 46750 *
D TRW/Cinch Connectors, Electronic Comp. Div. of TRW Inc., Dept. EM, 1501 Morse Ave., Elk Grove Village, Ill. 60007 ..... *
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D A.P. Products, Dept. EM, 72 Corwin Dr. Box 110, Painesville, Ohio 44077
DM Applied Data Commun., Dept. EM, 1509 E. McFadden Ave., Santa Ana, Cal. 92705
Argus International, Dept. EM, Box 38, Hopewell, N.J. 08525
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Data General Corp., Dept. EM, 15 Turnpike Rd Rte 9, Westboro, Mass 01581
Datatex Corp., Dept. EM, 10935 S. Wilcrest Dr., Houston, Tex. 77099
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Defiance Circuit Corp., Sub. of Hi-G Inc., Dept. EM, 12 Shepherd St., Lawrence, Mass. 01843
Des Tek Ind., Dept. EM, Box 24163, Los Angeles, Cal. 90024
M Eastern Electronics Mfg. Corp, Dept. EM, 180 Roberts St., East Hartford, Conn. 06108
D EECO, Dept. EM, 1441 E. Chestnut Ave, Box 659, Santa Ana, Cal. 92701
D Electrol Co., Inc., Dept. EM, 321 Dewey St., York, Pa. 17404
GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Hybricon Corp., Dept. EM, 410 Crest Rd., Littleton, Mass. 01460
Information Control Corp., Abacus Div. Dept. EM7, Dept. EM, 9610 Bellanca Ave., Los Angeles, Cal. 90045
Innovative Electronics Inc., Dept. EM, 15200 NW 60th Ave., Miami Lakes, Fla. 33014
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Kantz Electronic Ind., Dept. EM, 229 W. 4th St., Clifton, N.J. 07011
M Lehighton Electronics, Inc., Dept. EM, RD 1Box 374 Dept M, Lehighton, Pa 18235
Methode Elctrns., Inc., Dept. EM, 7447 W. Wilson Ave., Chicago, Ill. 60656
Mid-West Metal Prods., Inc., Dept. EM, 456 E. Donovan Rd., Kansas City, Kans. 66115
Midgard Electronics, Dept. EM, 175 California St., Newton, Mass. 02158
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
Mupac Corp., Dept. EM, 646 Summer St., Brockton, Mass. 02402
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Pylon Co., Inc., Dept. EM, 51 Newcomb St., Attleboro, Mass. 02703
DM Scanbe Div., Zero Corp., Dept. EM, 3445 Fletcher Ave., El Monte, Cal. 91731
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
TRW/Cinch-Graphik, Elctrn. Comps., Div. TRW INC., Dept. EM, 200 S. Turnbull Canyon Rd., City of Industry, Cal. 91744
Wyle Computer Prods., Dept. EM, 3200 Magruder Blvd., Hampton, Va 23666
Ziatech Corp, Dept. EM, 10762 LaRoda Dr, Cupertino, Cal. 95014
Zonic Technical Labs., Dept. EM, 8927 Rossash Ave., Cincinnati, Ohio 45236

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D Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
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M AMP Special Industries, Dept. EM, Valley Forge, Pa. 19482
M Cubic Corp., Dept. EM, 9233 Balboa Ave., San Diego, Cal. 92123
Data General Corp., Dept. EM, 15 Turnpike Rd Rte 9, Westboro, Mass 01581
Datatex Corp., Dept. EM, 10935 S. Wilcrest Dr., Houston, Tex. 77099
Defiance Circuit Corp., Sub. of Hi-G Inc., Dept. EM, 12 Shepherd St., Lawrence, Mass. 01843
D Electrol Co., Inc., Dept. EM, 321 Dewey St., York, Pa. 17404
Electrovert, Dept. EM, 86 Hartford Ave., Mt. Vernon, N.Y. 10553
GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Information Control Corp., Abacus Div. Dept. EM7, Dept. EM, 9610 Bellanca Ave., Los Angeles, Cal. 90045
D Interdyne, Intercette Div., Dept. EM, 14761 Califa St., Van Nuys, Cal. 91411
M Lehighton Electronics, Inc., Dept. EM, RD 1Box 374 Dept M, Lehighton, Pa 18235
Masterite Corporation, Dept. EM, 2841 Lomita Blvd., Torrance, Cal. 90505
Methods Research Corp., Dept. EM, 34 Asbury Ave., Farmingdale, N.J. 07727
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
PCS., Inc., Dept. EM, 750 N. Maple Rd., Saline, Mich. 48176
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050

Bobbins, Winding, Coil & Transformer-Also See Coil Assemblies & Forms

Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 ..... *
Endicott Coil Co., Dept. EM, 24 Charlotte St., Binghamton, N.Y. 13905 ..... *
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M Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Accessories for Electronics, Dept. EM, 800 Merrick Road, Baldwin, N.Y. 11510
Cortec, Inc., Dept. EM, 15811 Chemical La., Huntington Bch, Cal. 92649
Cosmo Plastics Co., Dept. EM, 3239 W. 14th St., Cleveland, Ohio 44109
M D & L Sales Co. Inc., Dept. EM, 296 Preakness Ave., Paterson, N.J. 07502
Dia-Netics Inc., Dept. EM, 18823 Napa St., Northridge, Cal. 91324

Electrical Plastics Corp., Dept. EM, 500 Long Branch Ave., Long Branch, N.J. 07740
D Ferroxcube Corp., Dept. EM, 5083 Kings Hwy., Saugerties, N.Y. 12477
G & G Tresco Corp., Dept. EM, 1952 E. Allegheny Ave., Phila., PA 19134
D Gries Reproducer Co., Div. Coats & Clark Inc., Dept. EM, 162 Beechwood Ave., New Rochelle, N.Y. 10801
M Johnson Electric Coil Co., Dept. EM, Box 559, Elmhurst, Ill 60126
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
Precision Paper Tube Co., Dept. EM, 1049 S. Noel Ave., Wheeling, Ill. 60090
Resdel Corp., Dept. EM, Bldg. 22-County Airport, Rio Grande, N.J. 08242
Sag Harbor Inds., Inc., Dept. EM, Bayview St., Sag Harbor, N.Y. 11963
D Spec Plastics Inc., Dept. EM, 7224 Atoll Ave., No. Hollywood, Cal. 91605
Star Tron Corp., Dept. EM, 58 Curtis St., Providence, R.I. 02909
M Stevens Prods., Inc., Dept. EM, 128 N. Park St., E. Orange, N.J. 07019
Trans American Transformer, Dept. EM, 142 Peconic Ave., Medford, N.Y. 11763

Bolometers, Infrared

Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 ..... *
Advanced Kinetics, Dept. EM, 1231 Victoria St., Costa Mesa, Calif. 92627
M Barnes Engrg. Co., Dept. EM, 30 Commerce Rd., Stamford, Conn. 06902
Capintec Instruments, Inc., Dept. EM, 136 Summit Ave., Montvale, N.J. 07645
Mikron Instr. Co., Dept. EM, Box 211, Ridgewood, N.J. 07451
Optoelectronics, Inc., Dept. EM, 1309 Dynamic St., Petaluma, Cal. 94952
Raytek Div. Optical Coating Lab, Dept. EM, 325 E. Middlefield Rd., Mountain View, Cal. 94043
D Victory Engrg. Corp., Dept. EM, Victory Rd., Springfield, N.J. 07081
Yellow Springs Instrument Co., Dept. EM, Box 279, Yellow Springs, Ohio 45387

Bolometers, Microwave

M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
DM **Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725** ..... *
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
MSI Electronics, Inc., Dept. EM, 34-32 57th St., Woodside, N.Y. 11377
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
D Tau-Tron Inc., Dept. EM, 11 Esquire Rd., N. Billerica, Mass. 01862
TRG,, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760

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Books—See Technical Books

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ITT Cannon Electric, Dept. EM, 666 E. Dyer Rd., Santa Ana, Cal. 92702 **p. 1794,1844,1889,1892, Back Cover, Vol. 1**
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D **Trimm, Inc., Dept. EM, 400 W. Lake, Box 489, Libertyville, Ill. 60048** ..... *
D Adalet-PLM Div, Div. Scott & Fetzer Co., Dept. EM, 4801 W. 150th St., Cleveland, Ohio 44135
D Blonder-Tongue Labs., Inc., Dept. EM, One Jake Brown Rd., Old Bridge, N.J. 08857
D Brooks Mfg. Co., Dept. EM, Box 17602, Philadelphia, Pa 19135
D Bud Radio, Inc., Dept. EM, 4605 E. 355th St., Willoughby, Ohio 44094
D Davies Molding Co., Harry, Dept. EM, 4920 Bloomingdale Ave., , Chicago, Ill. 60639
D General Elec. Co, Wiring Device Bus. Dept., Dept. EM, 95 Hathaway St., Providence, R.I. 02904
D Hammond Mfg. Co., Dept. EM, 385 Nagel Dr., Buffalo, NY 14225
D Heeger Inc., Dept. EM, 725 Ceres Ave., Los Angeles, Cal. 90021
Hoffman Engrg Co., Federal Cartridge, Dept. EM, 9th & Tyler Sts., Anoka, Minn. 55303
Kole Enterprises, Inc., Dept. EM, 3553 N.W. 50th St., Miami, Fla. 33142
Leviton Mfg. Co., Inc., Dept. EM, 59-25 Little Neck Pkwy., Little Neck, N.Y. 11362
D LMB Heeger, Inc., Dept. EM, 725 Ceres Ave., Los Angeles, Cal. 90021
D Mobil Electronics, Inc., Dept. EM, Box 1132, Anderson, Ind. 46015
D Modpak, Dept. EM, 31 A Green St., Waltham, Mass. 02154
D Par-Metal Prods. Inc., Dept. EM, 1260 Atlantic Ave., Brooklyn, N.Y. 11216
SHOGYO International Corp., Dept. EM, 300 Northern Blvd., Great Neck, N.Y. 11021
Sjoberg, C. & Son, Inc., Dept. EM, 415 Station St., Cranston, R.I. 02910
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
D T & B/Thomas & Betts, Dept. EM, 36 Butler St., Elizabeth, N.J. 07207
D Wadsworth Electric Mfg. Co., Dept. EM, 20 W. 11th St., Covington, Ky. 41011
Wiremold Co., Dept. EM, West Hartford, Conn. 06110
M Zero Corp., Dept. EM, 777 Front St., Burbank, Cal. 91502

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DM **Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207** .... *
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DM **Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458** ..... *
DM **Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018** ..... *
GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Magnetic Shield Div., Perfection Mica, Dept. EM, 750 North Thomas Dr., Bensenville, Ill. 60106 ..... *
DM **Metex Corp., Dept. EM, 970 New Durham Rd., Edison, N.J. 08817** ..... *
M **Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612** ..... *
M **Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245** *
TRW/Holyoke Wire & Cable, Dept. EM, 775 New Ludlow Rd., South Hadley, Mass. 01075 ..... *
DM **Whitmor Wire & Cable, Dept. EM, 13161 Sherman Way Bldg. B, No. Hollywood, Cal. 91605** ..... *
M American Electric Cable Co., Dept. EM, 181 Appleton St., Holyoke, Mass. 01040
DM Astrolab, Inc., Dept. EM, 345 Dalziel Rd., Linden, N.J. 07036
D Baron Wire & Cable Corp., Dept. EM, 6019 W. Howard St., Chicago, Ill. 60648
DM Birnbach Co., Inc., Dept. EM, 177 Hanse Ave., Freeport, N.Y. 11520
Burndy Corporation, Dept. EM, Richards Ave., Norwalk, , Conn. 06852
D Custom Cable Co., Dept. EM, 242 Butler, Westbury, N.Y. 11590
Estes Engrg. Co., Dept. EM, 930 Marine Dr., Port Angeles, Wash. 98362
M Glenair, Inc., Dept. EM, 1211 Air Way, Glendale, Cal. 91201
Gore, W.L. & Assocs., Dept. EM, 555 Paper Mill Rd., Box 8734, Newark, Del. 19711
Gulton Inds., SCD Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
Lynn Elctrns. Corp., Dept. EM, 915 Pennsylvania Blvd., Feasterville, Pa. 19047
M Manger Elec. Co., Inc., Dept. EM, W. Henry St., Stamford, Conn. 06902
DM Manhattan Elec. Cable Corp., Dept. EM, 1 Station Plaza, Rye, N.Y. 10580
D Pace Wire & Cable Corp., Dept. EM, 3590 Oceanside Rd., Oceanside, N.Y. 11572
M Santa Fe Textiles Inc., Dept. EM, 3151 W. Adams St., Santa Ana, Cal. 92704
D Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
M Tensolite Co.,, Div. Carlisle Corp, Dept. EM, Old Post Rd., Rte. 9A, Buchanan, N.Y. 10511
Texas Instruments Control Prods. Div., Dept. EM, 34 Forrest St., Attleboro, Mass. 02703
M Thermax Wire Corp., Dept. EM, 32-02 Linden Pl., Flushing, N.Y. 11354
Wireflex Incorporated, Dept. EM, 502 Old Route 30 East, Bourbon, Ind. 46504
D Zippertubing Co., Dept. EM, 13000 S. Broadway, Los Angeles, Cal. 90061

Brakes, Magnetic

M **Bowmar/TIC, Inc., Dept. EM, 850 Lawrence Dr., Newbury Park, Calif. 91320** *
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
M **Delevan Div., American Prec. Inds., Clutch & Brake Prods., Dept. EM, 270 Quaker Road, E. Aurora, N.Y. 14052** ..... **p. 3080**
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Ambi-Tech Inds. Inc., Dept. EM, 319 Knickerbocker Ave, Hillsdale, NJ 07642
Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Eaton Corp., Ind'l. Drives Div., Dept. EM, 9919 Clinton Rd., Cleveland, Ohio 44111
Facet Enterprises Inc., Motor Comps. Div., Dept. EM, Elmira, N.Y. 14903
M Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
Perfect Gear & Instr. Corp., Sub. Designatronics, Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
M PIC Design Div., Benrus Corp., Dept. EM, Benrus Center, Rte 7, Ridgefield, Conn. 06877
M Powertron Corp., Dept. EM, 3821 Barringer Dr., Charlotte, N.C. 28210
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Vibrac Corp., Dept. EM, 11 Alpha Rd., Chelmsford, Mass. 01824
D Warner Elec. Brake & Clutch Co., Dept. EM, Beloit, Wisc. 53511
WER Industrial, Div. Emerson Elec. Co., Dept. EM, 3036 Alt Blvd., Grand Island, N.Y. 14072

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M **General-Electro Mechanical, Dept. EM, 785 Hertel Ave., Buffalo, N.Y. 14207** **p. 3090**

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DM Stock Drive Prods., Div. Designatronics, Inc., Dept. EM, 55 S. Denton Ave., New Hyde Pk., N.Y. 11040

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D Continental Specialties Corp., Dept. EM, Box 1942, 70 Fulton Terr, New Haven, Conn. 06509 ..... p. 1296,1297
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... *
GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
United Wiring & Mfg. Co., Dept. EM, 2608 Electonic La. #404, Dallas, Tex. 75220 ..... *
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D A.P. Products, Dept. EM, 72 Corwin Dr. Box 110, Painesville, Ohio 44077
Bishop Graphics, Dept. EM, 5388 Sterling Center, Westlake Village, Cal. 91361
M Eastern Electronics Mfg. Corp, Dept. EM, 180 Roberts St., East Hartford, Conn. 06108
D Hammond Mfg. Co., Dept. EM, 385 Nagel Dr., Buffalo, NY 14225
Kantz Electronic Ind., Dept. EM, 229 W. 4th St., Clifton, N.J. 07011
Multi-Tronix, Dept. EM, 3210 Terry Dr, Toledo, Ohio 43613
PCS., Inc., Dept. EM, 750 N. Maple Rd., Saline, Mich. 48176
D Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666

Breadboards & Breadboard Kits—See Kits, Breadboarding

Bridges, Admittance

Boonton Electronics Corp., Dept. EM, Route #287, Parsippany, N.J. 07054 p. 2665
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
E.S.I. Inc., Dept. EM, 13900 N.W. Science Park Dr., Portland, Oregon 97229
D Wiltron Co., Dept. EM, 825 E. Middlefield Rd., Mt. View, Cal 94043

Bridges, Antenna—See Bridges, R-F

Bridges, Audio

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... *
Brown Electro-Measurements Co., Brown Electro-Meas., Dept. EM, P.O. Box 55169, Seattle, Wash. 98155
Dantel, Inc., Dept. EM, 1922 North Helm, Fresno, Cal. 93727
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
D ITI Electronics, Inc., Dept. EM, 369 Lexington Ave., Clifton, N.J. 07015

Bridges, Calorimeter

M Electro Impulse, Dept. EM, Box 870, Red Bank, N.J. 07701 ..... *
M General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 *
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791

Bridges, Capacitance

Boonton Electronics Corp., Dept. EM, Route #287, Parsippany, N.J. 07054 p. 2665
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
D Continental Specialties Corp., Dept. EM, Box 1942, 70 Fulton Terr, New Haven, Conn. 06509 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803 p. 2775
London Co., Dept. EM, 811 Sharon Dr., Westlake, Ohio 44145 ..... *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... *
DM Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 *
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
Brown Electro-Measurements Co., Brown Electro-Meas., Dept. EM, P.O. Box 55169, Seattle, Wash. 98155
D Davidson Electronic Development Co., Dept. EM, 2211 Peninsula Dr., Erie, Pa. 16506
Dielectric Instr. Corp., Dept. EM, 761 Franklin Ave., Pittsburgh, Pa. 15221
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
D Epic, Inc., Dept. EM, 150 Nassau St., New York, N.Y. 10038
E.S.I. Inc., Dept. EM, 13900 N.W. Science Park Dr., Portland, Oregon 97229
Freudenberg, Inc. B., Dept. EM, 50 Rockefeller Plaza, New York, N.Y. 10020
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
Micro Instrument Co., Marine & Power Instr. Div., Dept. EM, 2250 Micro Pl., Escondido, Cal. 92025
Optimized Devices Inc., Dept. EM, 220 Marble Ave., Pleasantville, N.Y. 10570

Bridges, Deviation

D Cutler-Hammer, Shallcross Resistor Prods., Dept. EM, US 70 East, Smithfield, N.C. 27577 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
D Slaughter Co., Dept. EM, Moore & Hailey Sts., P.O. Box 1805, Ardmore, Okla. 73401 ..... p. 2823
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
Brown Electro-Measurements Co., Brown Electro-Meas., Dept. EM, P.O. Box 55169, Seattle, Wash. 98155
D Davidson Electronic Development Co., Dept. EM, 2211 Peninsula Dr., Erie, Pa. 16506
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
E.S.I. Inc., Dept. EM, 13900 N.W. Science Park Dr., Portland, Oregon 97229
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553

Bridges, Impedance

Boonton Electronics Corp., Dept. EM, Route #287, Parsippany, N.J. 07054 *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
M General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
Kay Elemetrics Corp., Dept. EM, 12 Maple Ave., Pine Brook, N.J. 07058 .... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
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Slaughter Co., Dept. EM, Moore & Hailey Sts., P.O. Box 1805, Ardmore, Okla. 73401 ..... *
D Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219 *
Alford Mfg. Co., Dept. EM, 120 Cross St., Winchester, Mass. 01890
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
Brown Electro-Measurements Co., Brown Electro-Meas., Dept. EM, P.O. Box 55169, Seattle, Wash. 98155
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
E.S.I. Inc., Dept. EM, 13900 N.W. Science Park Dr., Portland, Oregon 97229
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
RFL Inds., Comms. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005
Varo Semiconductor, Inc., Dept. EM, 1000 N. Shiloh Rd., Garland, Tex. 75040
Wide Band Engrg. Co. Inc., Dept. EM, Box 21652, Phoenix, Ariz. 85036
D Wiltron Co., Dept. EM, 825 E. Middlefield Rd., Mt. View, Cal 94043

Bridges, Inductance

Boonton Electronics Corp., Dept. EM, Route #287, Parsippany, N.J. 07054 p. 2665
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Freed Transformer Co., Inc., Dept. EM, 1718 Weirfield St., Brooklyn, N.Y. 11227 ..... p. 2749
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803 p. 2775
London Co., Dept. EM, 811 Sharon Dr., Westlake, Ohio 44145 ..... *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... *
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
Brown Electro-Measurements Co., Brown Electro-Meas., Dept. EM, P.O. Box 55169, Seattle, Wash. 98155
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
E.S.I. Inc., Dept. EM, 13900 N.W. Science Park Dr., Portland, Oregon 97229

Bridges, Kelvin

D Cutler-Hammer, Shallcross Resistor Prods., Dept. EM, US 70 East, Smithfield, N.C. 27577 ..... *
D Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 *
Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 .... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... *
DM Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
Brown Electro-Measurements Co., Brown Electro-Meas., Dept. EM, P.O. Box 55169, Seattle, Wash. 98155
D Davidson Electronic Development Co., Dept. EM, 2211 Peninsula Dr., Erie, Pa. 16506
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
D Epic, Inc., Dept. EM, 150 Nassau St., New York, N.Y. 10038
E.S.I. Inc., Dept. EM, 13900 N.W. Science Park Dr., Portland, Oregon 97229

General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
Penn Airborne Prods., Dept. EM, Industrial Hwy., Southampton, Pa. 18966

Bridges, Limit—See Bridges (Specific Types)

Bridges, Megohm—See Bridges, Resistance

Bridges, Power, R-F

Bird Electronic Corp., Dept. EM, 30303 Aurora Rd., Solon, Ohio 44139 ..... *
M **Electro Impulse, Dept. EM, Box 870, Red Bank, N.J. 07701** ..... *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
International Rectifier Corp., Semiconductor Div., Dept. EM, 233 Kansas St., El Segundo, Cal. 90245 ..... *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... *
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760

Bridges, Programmable—See Bridges (Specific Types)

Bridges, Q

Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... *
Brown Electro-Measurements Co., Brown Electro-Meas., Dept. EM, P.O. Box 55169, Seattle, Wash. 98155
E.S.I. Inc., Dept. EM, 13900 N.W. Science Park Dr., Portland, Oregon 97229

Bridges, Ratio—See Testers, Ratio Voltage; Meters, Ratio

Bridges, Resistance

D **Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204** .. *
Boonton Electronics Corp., Dept. EM, Route #287, Parsippany, N.J. 07054 *
D **Continental Specialties Corp., Dept. EM, Box 1942, 70 Fulton Terr, New Haven, Conn. 06509** ..... *
D **Cutler-Hammer, Shallcross Resistor Prods., Dept. EM, US 70 East, Smithfield, N.C. 27577** ..... *
Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 .. *
GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 .... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
London Co., Dept. EM, 811 Sharon Dr., Westlake, Ohio 44145 ..... *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... *
D **Slaughter Co., Dept. EM, Moore & Hailey Sts., P.O. Box 1805, Ardmore, Okla. 73401** ..... p. 2823
Vishay Resistive Systems Grp., Vishay Intertechnology Inc., Dept. EM, 63 Lincoln Hwy., Malvern, Pa. 19355 ..... *
D **Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523** ..... *
D American HV Voltage Test Sys., Inc., Dept. EM, Ctrl Garr Ind'l Pk, Accident, Md. 21520
Associated Testing Laboratories, Div of Walter Kidde & Co., Dept. EM, Northwest Ind'l. Pk., Burlington, Mass. 01803
Associated Testing Laboratories, Div. of Walter Kidde & Co., Dept. EM, 23 Vincent St., Wayne, N.J. 07470
Beckman Instrs., Cedar Grove Opers., Dept. EM, 89 Commerce Rd., Cedar Grove, N.J. 07009
DM Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
Brown Electro-Measurements Co., Brown Electro-Meas., Dept. EM, P.O. Box 55169, Seattle, Wash. 98155
Cox & Co., Inc., Dept. EM, 215 Park Ave., S., New York, N.Y. 10003
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
E.S.I. Inc., Dept. EM, 13900 N.W. Science Park Dr., Portland, Oregon 97229
Freudenberg, Inc. B., Dept. EM, 50 Rockefeller Plaza, New York, N.Y. 10020
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
Penn Airborne Prods., Dept. EM, Industrial Hwy., Southampton, Pa. 18966
RFL Inds., Comms. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005
Solatron Enterprises, Dept. EM, 421 E. Beach Ave., Inglewood, Calif. 90302
Sticht Co., Inc. Herman H., Dept. EM, 27 Park Pl., New York, N.Y. 10007
Yellow Springs Instrument Co., Dept. EM, Box 279, Yellow Springs, Ohio 45387

Bridges, R-F

Boonton Electronics Corp., Dept. EM, Route #287, Parsippany, N.J. 07054 *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
Telonic/Berkeley, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715 ..... *
D **Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219** p. 2830
Alford Mfg. Co., Dept. EM, 120 Cross St., Winchester, Mass. 01890
M Anzac Electronics, Dept. EM, 39 Green St., Waltham, Mass. 02154
D Blonder-Tongue Labs., Inc., Dept. EM, One Jake Brown Rd., Old Bridge, N.J. 08857
D Carco Elctrns., Dept. EM, 195 Constitution Dr., Menlo Park, Calif. 94025
D Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
Palomar Engrs., Dept. EM, Box 455, Escondido, Cal. 92025
D Telco Products Co., Dept. EM, 44 Sea Cliff, Glen Cove, NY 11542
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760
Wide Band Engrg. Co. Inc., Dept. EM, Box 21652, Phoenix, Ariz. 85036
D Wiltron Co., Dept. EM, 825 E. Middlefield Rd., Mt. View, Cal 94043

Bridges, Silicon Cell

A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 ..... *
D **International Rectifier Corp., Semiconductor Div., Dept. EM, 233 Kansas St., El Segundo, Cal. 90245** ..... *
D **Sanford-Miller Corp., Dept. EM, 8 John St., Lynbrook, N.Y. 11563** ..... *
DM **Semtech Corp., Dept. EM, 652 Mitchell Rd., Newbury Park, Cal. 91320** ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D **Westinghouse Elec. Corp., Semiconductor Div., Dept. EM, Armbrust Rd., Youngwood, Pa. 15697** ..... *
Edal Inds., Inc., Dept. EM, 4 Short Beach Rd., E. Haven, Conn. 06512
D General Instrument Corp., Discrete Semiconductor Div., Dept. EM, 600 West John St., Hicksville, N.Y. 11802
Gentron Corp., Dept. EM, 6667 N. Sydney Pl., Milwaukee, Wisc. 53209
Rectifier Components Corp., Dept. EM, 1112 Lousons Rd., Union, N.J. 07083
D RSM Sensitron Semiconductor, Div. RSM Electron Power, Inc., Dept. EM, 221 W. Industry Ct., Deer Park, N.Y. 11729
D Varo Semiconductor, Inc., Dept. EM, 1000 N. Shiloh Rd., Garland, Tex. 75040

Bridges, Strain Gauge

Doric Sci., Div. Emerson Elec. Co., Dept. EM, 3883 Ruffin Rd., San Diego, Cal. 92123 ..... *
Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 ..... *
Kulite Semiconductor Prod., Dept. EM, 1030 Hoyt Ave., Ridgefield, N.J. 07657 ..... *
M **Measurement Sys., Inc., Dept. EM, 121 Water St., Norwalk, Conn. 06854** .... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
PPM, Inc., Dept. EM, 7575 Bond St., Cleveland, Ohio 44139 ..... *
A.L. Design Inc., Dept. EM, 2070 Niagara Falls Blvd., Tonawanda, NY 14150
DM Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
BLH Elctrns., Dept. EM, 42 Fourth Ave., Waltham, Mass. 02154
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
Entran Devices, Inc., Dept. EM, 145 Paterson Ave., Little Falls, N.J. 07424
West Coast Resch. Corp., Dept. EM, Box 25061, Los Angeles, Cal. 90025

Bridges, Synchro & Resolver

M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101** ..... *
M **Interface Engineering Inc., Dept. EM, 386 Lindelof Ave., Stoughton, Mass. 02072** ..... *
M **North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803** p. 1658,2795
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006

Bridges, Temperature

Doric Sci., Div. Emerson Elec. Co., Dept. EM, 3883 Ruffin Rd., San Diego, Cal. 92123 ..... *
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 *
Harrel, Inc., Dept. EM, 16 Fitch St., E. Norwalk, Conn. 06855 ..... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 ..... *
DM Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
Climatronics Corp., Dept. EM, 1324 Motor Pkwy., Hauppauge, N.Y. 11787
Cox & Co., Inc., Dept. EM, 215 Park Ave., S., New York, N.Y. 10003
M Hades Mfg Corp., Dept. EM, 151-A Verdi St., Farmingdale, N.Y. 11735
Hy-Cal Engrg, Dept. EM, 12105 Los Nietos Rd., Santa Fe Springs, Cal 90670
Ircon Inc., Dept. EM, 7555 N. Linder Ave, Skokie, Ill. 60076
Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962
M Thermometrics, Inc., Dept. EM, 808 US Hwy No. 1, Edison, N.J. 08817
Transmed Scientific, Dept. EM, 860-C Capitolio Way, San Luis Obispo, Cal. 93401
D Victory Engrg. Corp., Dept. EM, Victory Rd., Springfield, N.J. 07081
West Coast Resch. Corp., Dept. EM, Box 25061, Los Angeles, Cal. 90025
Yellow Springs Instrument Co., Dept. EM, Box 279, Yellow Springs, Ohio 45387

Bridges, Wheatstone

D **Cutler-Hammer, Shallcross Resistor Prods., Dept. EM, US 70 East, Smithfield, N.C. 27577** ..... *
Freed Transformer Co., Inc., Dept. EM, 1718 Weirfield St., Brooklyn, N.Y. 11227 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *

D **Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523** ..... *
A.L. Design Inc., Dept. EM, 2070 Niagara Falls Blvd., Tonawanda, NY 14150
Beckman Instrs., Cedar Grove Opers., Dept. EM, 89 Commerce Rd., Cedar Grove, N.J. 07009
DM Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
Brown Electro-Measurements Co., Brown Electro-Meas. Dept. EM, P.O. Box 55169, Seattle, Wash. 98155
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
D Epic, Inc., Dept. EM, 150 Nassau St., New York, N.Y. 10038
E.S.I. Inc., Dept. EM, 13900 N.W. Science Park Dr., Portland, Oregon 97229
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
Penn Airborne Prods., Dept. EM, Industrial Hwy., Southampton, Pa. 18966
M Space Electronics, Inc, Dept. EM, Box 2166, Meriden, Conn. 06450
M Sticht Co., Inc. Herman H., Dept. EM, 27 Park Pl., New York, N.Y. 10007

Brushes & Brush Assemblies

D **Airflyte Elctrns. Co., Dept. EM, Box 207, 56 Hook Rd., Bayonne, N.J. 07002** *
M **Fabricast, Inc., Dept. EM, 2517 Seaman Ave., So. El Monte, Cal. 91733** ..... p. 3085,3086
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... p. 4350
Graphite Metallizing Corp., Dept. EM, 1036 Nepperhan Ave., Yonkers, N.Y. 10702 ..... p. 3088
Keystone Carbon Co., Thermistor Div., Dept. EM, St. Marys, Pa. 15857 ..... *
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
D **Union Carbide Corp., Battery Products Div., Dept. EM, 270 Park Ave., New York, N.Y. 10017** ..... *
Braun-Brush Co., Dept. EM, 43 Albertson Ave., Albertson, N.Y. 11507
Carbone Lorraine Industries Corp., Dept. EM, 400 Myrtle Ave., Boonton, N.J. 07005
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
D Eraser Co., Dept. EM, Box 1342, Syracuse, N.Y. 13201
Facet Enterprises Inc., Motor Comps. Div., Dept. EM, Elmira, N.Y. 14903
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
Micro Contacts Inc., Dept. EM, 62 Alpha Plaza, Hicksville, N.Y. 11801
Ohio Carbon Co., Dept. EM, 12508 Berea Rd., Cleveland, Ohio 44111
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Poly-Scientific, Litton Sys., Dept. EM, 1213 N. Main St., Blacksburg, Va. 24060
D Pure Carbon Co., Inc., Dept. EM, 441 Hall Ave., St. Marys, Pa. 15857
Stackpole Carbon Co., Carbon Div., Dept. EM, St. Marys, Pa. 15857
D Superior Carbon Prods., Inc., Dept. EM, 9115 George Ave., Cleveland, Ohio 44105
M Unit Industries, Inc., Dept. EM, 529 S. Raymond Ave., Fullerton, Cal. 92631

Bulbs—See Lamps

Bumpers

GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
DM **Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101** ..... p. 2428
D **Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207** *
D **Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629** .... *
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
D Amatom Electronic Hardware, Div. MITE Corp., Dept. EM, 446 Blake St., New Haven, Conn. 06515
D Caplugs Div., Protective Closures Co., Dept. EM, 2150 Elmwood Ave., Buffalo, N.Y. 14207
Federal Screw Products Inc., Dept. EM, 3917 N. Kedzie Ave., Chicago, Ill. 60618
Lord Kinematics, Lord Corp., Dept. EM, 1635 W. 12th St., Erie, Pa. 16512
Precision Paper Tube Co., Dept. EM, 1049 S. Noel Ave., Wheeling, Ill. 60090
Protective Enclosures Co., Dept. EM, 2150 G Elmwood Ave., Buffalo, N.Y. 14207
D Uniroyal, Inc., Dept. EM, 1230 Ave. of Americas, New York, N.Y. 10020

Burnishers, Contact

D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
D Adre Co., Dept. EM, Box 09415, Milwaukee, Wisc. 53209
Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
D Eraser Co., Dept. EM, Box 1342, Syracuse, N.Y. 13201
D Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
D Neuses, Inc. (P.K.), Dept. EM, 1401 Rohlwing Rd., Rolling Meadows, Ill. 60008

Bus Bars & Systems

Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
DM **Belden Corp., Electronic Div., Dept. EM, Box 1327, Richmond, Ind. 47374** .. *
Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 ..... p. 4583
Continental Specialties Corp., Dept. EM, Box 1942, 70 Fulton Terr, New Haven, Conn. 06509 ..... p. 1296
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
DM **Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018** ..... *
Elco Corp., Dept. EM, 2250 Park Pl., El Segundo, CAL 90245 ..... *
Elfab Corp., Dept. EM, 4200 Wiley Post Rd., Addison, Tex. 75001 ..... *
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
M **Janco Corp., Dept. EM, Box 3038-Glenoaks Sta., Burbank, Cal. 91504** p. 4096
DM **Lear Siegler, Elctrn. Instr. Div., Dept. EM, 714 N. Brookhurst St., Anaheim, Cal. 92803** ..... p. 2057
Methode Elctrns, Interconnect Prods Div, Dept. EM, 1700 Hicks Rd, Rolling Meadows, ILL 60008 ..... p. 2081
M **Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612** ..... *
D **Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342** ..... *
DM Anaconda Company Brass Division, Dept. EM, 414 Meadow St., Waterbury, Conn. 06720
Apahouser Corp. of N.E., Apahouser-Elcom, Dept. EM, 101 Walnut St., Watertown, Mass. 02172
D Atlee Corp., Dept. EM, 8 Gill St., Woburn, Mass. 01801.
Methode Elctrns., Inc., Dept. EM, 7447 W. Wilson Ave., Chicago, Ill. 60656
M Reynolds Metals Co., Dept. EM, Box 27003, Richmond, VA. 23261
M Rogers Corp., Dept. EM, Rogers, Conn. 06263
Seastrom Mfg. Co. Inc., Dept. EM, 701 Sonora Ave., Glendale, Cal. 91201
M Zero Corp., Dept. EM, 777 Front St., Burbank, Cal. 91502

Bushings, Glass, Plastic, Metal, Rubber, Etc.

Alberox Corp., Dept. EM, New Bedford Ind'l. Pk., New Bedford, Mass. 02745 ..... p. 2553
D **Bivar, Inc., Dept. EM, 1617 E. Edinger Ave., Santa Ana, Cal. 92705** ..... p. 1024
D **Concord Elctrns., Dept. EM, 37 Great Jones St., Dept. JE, New York, N.Y. 10012** ..... p. 1741
D **Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458** ..... *
Delbert Blinn. Co., Dept. EM, Box 2007, Pomona, Calif. 91766 ..... *
Elctrn. Molding Corp., Dept. EM, 96 Mill St., Woonsocket, R.I. 02895 ..... *
Graphite Metallizing Corp., Dept. EM, 1036 Nepperhan Ave., Yonkers, N.Y. 10702 ..... p. 3088
D **Heyman Mfg. Co., Dept. EM, 147 N. Michigan Ave., Kenilworth, N.J. 07033** ..... p. 4610
ITT Cannon Electric, Dept. EM, 666 E. Dyer Rd., Santa Ana, Cal. 92702 ..... p. 1844, Back Cover, Vol. 1
D **Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101** ..... p. 2427,2428,2430
D **Jones Elctrns., Hiram, Dept. EM, 11607 Vanowen St., No. Hollywood, Cal. 91605** ..... *
DM **Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012** .. *
Megavolt, Corp., Dept. EM, 110 Hobart St, Hackensack, N.J. 07601 .... p. 3286
Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543 .... p. 2157
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D **Thermalloy, Inc., Dept. EM, 2021 W. Valley View, Dallas, Tex 75234** ..... *
D **Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629** .... *
D Accessories for Electronics, Dept. EM, 800 Merrick Road, Baldwin, N.Y. 11510
Acme Model Engrg. Co., Dept. EM, 654 Bergen Blvd., Ridgefield, N.J. 07657
D Adalet-PLM Div, Div. Scott & Fetzer Co., Dept. EM, 4801 W. 150th St., Cleveland, Ohio 44135
Aerolix Corporation, Dept. EM, 720 So. Columbus Street, Mt. Vernon, NY 10550
DM Aimsco Inc., Dept. EM, 4000-4024 22nd Ave. W., Seattle, Wash. 98199
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
M Allmetal Screw Products Co., Inc., Dept. EM, 821 Stewart Ave., Garden City, N.Y. 11530
D Amatom Electronic Hardware, Div. MITE Corp., Dept. EM, 446 Blake St., New Haven, Conn. 06515
Anchor Plastics, Dept. EM, 36-36 36th, Long Island City, N.Y. 11106
M Atlantic Optical Moulding Co., Dept. EM, Ellis St., Dudley, Mass. 01570
M Atlas Fibre Co., Dept. EM, 6970 N. Central Park Ave., Chicago, Ill. 60645
Auburn Mfg., Dept. EM, Pease Ave. & Stack St., Middletown, Conn. 06457
M Avid Electronics Corp., Dept. EM, Box 426, Baldwin, Pl., N.Y. 10505
M Cadillac Plastic & Chemical, Dayco Co., Dept. EM, Box 810, Detroit, Mich. 48232
M Caplugs Div., Protective Closures Co., Dept. EM, 2150 Elmwood Ave., Buffalo, N.Y. 14207
Carbone Lorraine Industries Corp., Dept. EM, 400 Myrtle Ave., Boonton, N.J. 07005
Centerflex Ceramics, Dept. EM, 221 Seventh Ave., Hawthorne, N.J. 07507
M Chemplast, Inc., Dept. EM, 31-150 Dey Rd., Wayne, N.J. 07470
Cherry Fasteners, Townsend Div. Textron Inc., Dept. EM, Box 2157, Santa Ana, Cal. 92707
M Cleveland Mica Co., Dept. EM, 1360 Hird Ave., Lakewood, Ohio 44107
Control Inds. Inc., Dept. EM, 530 Burnside Ave., Inwood, N.Y. 11696
D Deutsch Fastener Corp., Dept. EM, 7001 W. Imperial Hwy., Los Angeles, Cal. 90045
Emporium Specialties Co., Inc., Dept. EM, Box 65, Austin, Pa. 16720
Federal Screw Products Inc., Dept. EM, 3917 N. Kedzie Ave., Chicago, Ill. 60618
Fibre Materials Corp., Dept. EM, 34 Dupont St., Plainview, N.Y. 11803
Fusite Div./Emerson Elec., Dept. EM, 6000 Fernview Ave., Cincinnati, Ohio 45212
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D Gries Reproducer Co., Div. Coats & Clark Inc., Dept. EM, 162 Beechwood Ave., New Rochelle, N.Y. 10801
M Instru-Lec Corp., Dept. EM, 520 Homestead Ave., Mt. Vernon, N.Y. 10550
DM Laminated Fabricators, Dept. EM, 1145 San Mateo Ave., San Bruno, Calif. 94066
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M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
M N.L. Inds., Inc., Bearings Div., Dept. EM, PO Box 934, Toledo, Ohio 43694
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D Penn Fibre & Specialty, Dept. EM, 2020 E. Westmoreland St., Phila., Pa. 19134
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D Uniroyal, Inc., Dept. EM, 1230 Ave. of Americas, New York, N.Y. 10020
M U.S. Terminals, Dept. EM, 7502 Camargo Rd., Cincinnati, Ohio 45243

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M Adams-Russell Co., Inc., Dept. EM, 280 Bear Hill Rd., Waltham, Mass. 02154
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D A.P. Products, Dept. EM, 72 Corwin Dr. Box 110, Painesville, Ohio 44077
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D E-Z-Hook, Div. Tektest, Dept. EM, Box 450 114 E. St. Joseph, Arcadia, Cal. 91006
M Eastern Electronics Mfg. Corp, Dept. EM, 180 Roberts St., East Hartford, Conn. 06108
M Electro-Prep, Dept. EM, 30 Cayuga Ave., E. Falmouth, Ma. 02536
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DM Electrovert, Dept. EM, 86 Hartford Ave., Mt. Vernon, N.Y. 10553
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Everett/Charles, Inc., Dept. EM, 2806 Metropolitan Pl., Pomona, Cal. 91767
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M Glenair, Inc., Dept. EM, 1211 Air Way, Glendale, Cal. 91201
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IEC Electronics Corp., Dept. EM, 105 Norton St., Newark, N.Y. 14513
D International Data Sciences, Dept. EM, 100 Nashua St., Providence, R.I. 02904
ITI Electronics, Inc., Dept. EM, 369 Lexington Ave., Clifton, N.J. 07015
D Jersey Specialty Co., Dept. EM, Box 248, Burgess Pl., Wayne, N.J. 07470
DM Kings Electronics, Dept. EM, 40 Marbledale Rd., Tuckahoe, N.Y. 10707
Lehighton Electronics, Inc., Dept. EM, RD 1Box 374 Dept M, Lehighton, Pa 18235
DM Linemaster Switch Corp., Dept. EM, Box 52, Woodstock, Conn. 06281
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M Manger Elec. Co., Inc., Dept. EM, W. Henry St., Stamford, Conn. 06902
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Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Mercury Electronics Corp., Dept. EM, 339 E Cottage Place, York, Pa. 17403
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M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Paraplegics Mfg., Dept. EM, 304 N. York Rd., Bensenville, Ill. 60106
M Poly-Scientific, Litton Sys., Dept. EM, 1213 N. Main St., Blacksburg, Va. 24060
M Ronor Systems, Dept. EM, Box 80, 145 N. Plains Ind. Park Rd., Wallingford, Conn. 06492
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Systems Research Labs. Inc., Dept. EM, 2800 Indian Ripple Rd. , Dayton, Ohio 45440
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
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D T & B/Thomas & Betts, Dept. EM, 36 Butler St., Elizabeth, N.J. 07207
M Teledyne Aerospace Systems, Dept. EM, 1007 E. 10th St., Fairmont, Minn. 56031
Terminal Data Corp. of Md, Dept. EM, 11878 Coakley Circle, Rockville, Md. 20852
M Times Fiber Comm. Inc., Sub. Insilco Corp. Times Wire & Cable Div., Dept. EM, 358 Hall Ave., Wallingford, Conn. 06492
Trompeter Electronics, Inc., Dept. EM, 8936 Comanche, Chatsworth, Cal. 91311
Wireflex Incorporated, Dept. EM, 502 Old Route 30 East, Bourbon, Ind. 46504
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578
M Zero Corp., Dept. EM, 777 Front St., Burbank, Cal. 91502
Zierick Mfg. Corp., Dept. EM, 44 Radio Circle, Mt. Kisco, N.Y. 10549

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D **Belden Corp., Electronic Div., Dept. EM, Box 1327, Richmond, Ind. 47374 p. 4480-4503,4516-4518**
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Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
American Electric Cable Co., Dept. EM, 181 Appleton St., Holyoke, Mass. 01040
D Birnbach Co., Inc., Dept. EM, 177 Hanse Ave., Freeport, N.Y. 11520
Boston Insulated Wire & Cable Co., Dept. EM, 65 Bay St., Dorchester, Mass. 02125
Brand-Rex Co., Dept. EM, Box 498, Willimantic, Conn. 06226
Chester Cable, Dept. EM, Oakland Ave., Chester, N.Y. 10918
D Custom Cable Co., Dept. EM, 242 Butler, Westbury, N.Y. 11590
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
D Duotone Co., Dept. EM, 6875 S.W. 81st St., S. Miami, Fla. 33143
Essex Int'l., Inc., Telecommunications Prods. Div., Dept. EM, 800 E. Garfield Ave., Decatur, Ill. 62526
Gore, W.L. & Assocs., Dept. EM, 555 Paper Mill Rd., Box 8734, Newark, Del. 19711
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D Hepco Wire & Cable, Dept. EM, Box 76, Garnvl.; Garnersville, N.Y. 10923
D Herald Electronics, Dept. EM, 6611 N. Lincoln Ave., Chicago, Ill. 60645
Lynn Elctrns. Corp., Dept. EM, 915 Pennsylvania Blvd., Feasterville, Pa. 19047
D Manhattan Elec. Cable Corp., Dept. EM, 1 Station Plaza, Rye, N.Y. 10580
Microtech; Dept. EM, 1420 Conchester Hwy, Boothwyn, Pa. 19061
D Norelcom Electronics, Dept. EM, 200 Allen Blvd., Farmingdale, N.Y. 11735
Okonite Co., Dept. EM, Box 340, Ramsey, N.J. 07446
D Pace Wire & Cable Corp., Dept. EM, 3590 Oceanside Rd., Oceanside, N.Y. 11572
D Pacific Electricord Co., Dept. EM, 747 W. Redondo Beach Blvd., Box 10, Gardena, Cal. 90247
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Phelps Dodge Communications Co., Dept. EM, 5 Corporate Park Dr., White Plains, N.Y. 10604
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
D Recoton Corp., Dept. EM, 46-23 Crane St., Long Island City, N.Y. 11101
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DM Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
Tensolite Co.,, Div. Carlisle Corp, Dept. EM, Old Post Rd., Rte. 9A, Buchanan, N.Y. 10511
DM Times Fiber Comm. Inc., Sub. Insilco Corp. Times Wire & Cable Div., Dept. EM, 358 Hall Ave., Wallingford, Conn. 06492
D Vidaire Electronics Mfg., Dept. EM, 150 Buffalo Ave., Freeport, N.Y. 11520
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

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D Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 *
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D Custom Cable Co., Dept. EM, 242 Butler, Westbury, N.Y. 11590
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
D Essex Grp - Indl Wire Prods Div., Sub. United Tech, Dept. EM, 6235 S. Harlem Ave., Chicago, Ill 60638
Lynn Elctrns. Corp., Dept. EM, 915 Pennsylvania Blvd., Feasterville, Pa. 19047
D Manhattan Elec. Cable Corp., Dept. EM, 1 Station Plaza, Rye, N.Y. 10580
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
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DM Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 p. 4562-4567
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DM ADC Prods, Dept. EM, 4900 W. 78th St., Minneapolis, Mn 55435
American Electric Cable Co., Dept. EM, 181 Appleton St., Holyoke, Mass. 01040
Andrew Corp., Dept. EM, 10500 W. 153rd St., Orland Park, Ill. 60462
DM Astrolab, Inc., Dept. EM, 345 Dalziel Rd., Linden, N.J. 07036
Berg Inc., Winfred M., Dept. EM, 499 Ocean Ave., East Rockaway, N.Y. 11518
D Birnbach Co., Inc., Dept. EM, 177 Hanse Ave., Freeport, N.Y. 11520
D Blonder-Tongue Labs., Inc., Dept. EM, One Jake Brown Rd., Old Bridge, N.J. 08857
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M Brand-Rex Co., Dept. EM, Box 498, Willimantic, Conn. 06226
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M Capcon, Inc., Dept. EM, 147 W. 25th St., New York, N.Y. 10001
D CATV Communications, Div. of Amer. Elctrn. Labs. Inc., Dept. EM, Box 552, Lansdale, Pa. 19446
D Channel Master Div. Avnet, Dept. EM, Rte. 209, Ellenville, N.Y. 12428
Chester Cable, Dept. EM, Oakland Ave., Chester, N.Y. 10918
DM Cimco Wire & Cable, Inc., Dept. EM, 250 W. Crescent Ave., Allendale, N.J. 07401
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
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D Finney Co., Dept. EM, 34 W. Interstate St., Bedford, Ohio 44014
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D Apollo Lasers, Apollo Lasers, Inc., Dept. EM, 6357 Arizonia Cir, Los Angeles, Cal. 90045
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D Lance Inds., Dept. EM, P.O. Box 4156, Sylmar, Calif. 91342
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Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
D New-Tronics Corp., Dept. EM, 15800 Commerce Park Dr., Brookpark, Ohio 44142
D Norelcom Electronics, Dept. EM, 200 Allen Blvd., Farmingdale, N.Y. 11735
Okonite Co., Dept. EM, Box 340, Ramsey, N.J. 07446
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
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M Precision Tube, Dept. EM, Church Rd. & Wissahickon, No. Wales, Pa. 19454
Raychem Corp., Dept. EM, 300 Constitution Dr., Menlo Park, Cal. 94025
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DM Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
M Storm Products Co., Dept. EM, 112 S. Glasgow St., Inglewood, Cal. 90301
Sundstrand Data Control, Dept. EM, Overlake Ind'l. Pk., Redmond, Wash. 98052
DM Tensolite Co.,, Div. Carlisle Corp, Dept. EM, Old Post Rd., Rte. 9A, Buchanan, N.Y. 10511
DM Times Fiber Comm. Inc., Sub. Insilco Corp. Times Wire & Cable Div., Dept. EM, 358 Hall Ave., Wallingford, Conn. 06492
Trompeter Electronics, Inc., Dept. EM, 8936 Comanche, Chatsworth, Cal. 91311
Victor Electric Wire & Cable, Dept. EM, 618 Main St., Coventry, R.I. 02816
Westinghouse Electric Corp., Indl & Gov't Tube, Dept. EM, Westinghouse Circle, Horseheads, N.Y. 14845
M Whittaker Corp., Dept. EM, 10880 Wilshire Blvd., Los Angeles, Cal. 90024
Winegard Co., Dept. EM, 3000 Kirkwood St., Burlington, Iowa 52601
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Cable, Dial—See Cords & Cable, Dial Drive

Cable Fault Locators

Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *

Chatsworth Data Corp, Cablemaster Div., Dept. EM, 20710 Lassen St., Chatsworth, Cal 91311 ..... p. 2680
Chatsworth Data Corp, Impact-o-Graph Div., Dept. EM, 20710 Lassen St., Chatsworth, Cal. 91311 ..... p. 2680
Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 ..... *
Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 ..... p. 4592
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
M Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509 ..... *
M International Electro-Magnetics, Dept. EM, 350 N. Eric Dr., Palatine, Ill. 60067 *
National Wire & Cable Corp., Dept EEM, Svc Div., Dept. EM, 136 San Fernando Rd., Los Angeles, Cal. 90031 ..... p. 4612,4626
Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245 p. 4656
Addison Div. Muirhead, Inc., Dept. EM, 1101 Bristol Rd., Mountainside, N.J. 07092
D American HV Voltage Test Sys., Inc., Dept. EM, Ctrl Garr Ind'l Pk, Accident, Md. 21520
DM Associated Research, Inc., Dept. EM, 6125 W. Howard St., Niles, Ill. 60648
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
Everett/Charles, Inc., Dept. EM, 2806 Metropolitan Pl., Pomona, Cal. 91767
M Peschel Instrs., Inc., Dept. EM, 1412 Viscaya Pkwy., Cape Coral, Fla. 33904
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
D Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803
D Wiltron Co., Dept. EM, 825 E. Middlefield Rd., Mt. View, Cal 94043

Cable, Flame Retardant

D Alpha Wire Corp., Dept, EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 p. 4472
D Belden Corp., Electronic Div., Dept. EM, Box 1327, Richmond, Ind. 47374 p. 4505-4512
D Columbia Elctrn. Cables, Dept. EM, 11 Cove St., New Bedford, Mass. 02744 p. 4544-4546,4548
D Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 ..... *
DM Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
D Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 ..... p. 4592
M Electroweave, Inc., Dept. EM, 27 E. Foundry St., Central Falls, R.I. 02863 .. *
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M Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 p. 4653
Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245 p. 4656
TRW/Holyoke Wire & Cable, Dept. EM, 775 New Ludlow Rd., South Hadley, Mass. 01075 ..... *
M Woven Elctrns., Southern Weaving Co., Dept. EM, Box 189, Mauldin, S. C. 29662 ..... *
American Electric Cable Co., Dept. EM, 181 Appleton St., Holyoke, Mass. 01040
Boston Insulated Wire & Cable Co., Dept. EM, 65 Bay St., Dorchester, Mass. 02125
DM Brand-Rex Co., Dept. EM, Box 498, Willimantic, Conn. 06226
Chester Cable, Dept. EM, Oakland Ave., Chester, N.Y. 10918
Cimco Wire & Cable, Inc., Dept. EM, 250 W. Crescent Ave., Allendale, N.J. 07401
D Custom Cable Co., Dept. EM, 242 Butler, Westbury, N.Y. 11590
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
DM General Electric Co., Wire & Cable, Dept. EM, 1285 Boston Ave., Bridgeport, Conn. 06602
M Gore, W.L. & Assocs., Dept. EM, 555 Paper Mill Rd., Box 8734, Newark, Del. 19711
Gulton Inds., SCD Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
D Hepco Wire & Cable, Dept. EM, Box 76, Garnvl., Garnersville, N.Y. 10923
Lynn Elctrns. Corp., Dept. EM, 915 Pennsylvania Blvd., Feasterville, Pa. 19047
D Manhattan Elec. Cable Corp., Dept. EM, 1 Station Plaza, Rye, N.Y. 10580
Okonite Co., Dept. EM, Box 340, Ramsey, N.J. 07446
M Parlex Corp, Dept. EM, 145 Milk St., Methuen, Mass. 01844
DM Phelps Dodge Cable & Wire Co., Dept. EM, Box 391 Point St., Yonkers, N.Y. 10702
Raychem Corp., Dept. EM, 300 Constitution Dr., Menlo Park, Cal. 94025
M Santa Fe Textiles Inc., Dept. EM, 3151 W. Adams St., Santa Ana, Cal. 92704
D T&B/Ansley Corp., Sub. Thomas & Betts, Dept. EM, 3208 Humboldt St., Los Angeles, Cal. 90031
M Tensolite Co.,, Div. Carlisle Corp, Dept. EM, Old Post Rd., Rte. 9A, Buchanan, N.Y. 10511
M Thermax Wire Corp., Dept. EM, 32-02 Linden Pl., Flushing, N.Y. 11354
DM Times Fiber Comm. Inc., Sub. Insilco Corp. Times Wire & Cable Div., Dept. EM, 358 Hall Ave., Wallingford, Conn. 06492
Victor Electric Wire & Cable, Dept. EM, 618 Main St., Coventry, R.I. 02816
Wireflex Incorporated, Dept. EM, 502 Old Route 30 East, Bourbon, Ind. 46504

Cable, Flat

D Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 p. 4473,4474
Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 ..... *
D Augat Interconnection Prods. Div., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703 ..... *
D Belden Corp., Electronic Div., Dept. EM, Box 1327, Richmond, Ind. 47374 p. 4519,4520
Berg Electronics, Div. E.I. DuPont de Nemours & Co., Dept. EM, York Expwy., New Cumberland, Pa. 17070 ..... *
D Berk Tek, Inc., Dept. EM, Box 60, RD 1, Reading, Pa. 19607 ..... p. 4541
Cable Concepts Corp., Dept. EM, 1610D Manning Blvd., Levittown, Pa. 19057 p. 1737
D Columbia Elctrn. Cables, Dept. EM, 11 Cove St., New Bedford, Mass. 02744 *
D Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 ..... *
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DM Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 ..... p. 4592
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M Electroweave, Inc., Dept. EM, 27 E. Foundry St., Central Falls, R.I. 02863 p. 4608
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Hughes Aircraft Co., Connecting Devices Div., Dept. EM, 17150 Von Karman Ave., Irvine, Cal. 92714 ..... *
ITT Cannon Electric, Dept. EM, 666 E. Dyer Rd., Santa Ana, Cal. 92702 ..... *
ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ..... p. 2000
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D Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... *
DM Spectra-Strip Corp., Dept. EM, 7100 Lampson Ave., Box 415, Garden Grove, Cal. 92642 ..... p. 4655
Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245 p. 4656
TRW/Cinch Connectors, Electronic Comp. Div. of TRW Inc., Dept. EM, 1501 Morse Ave., Elk Grove Village, Ill. 60007 ..... Inside Back Cover, Vol. 1
TRW/Holyoke Wire & Cable, Dept. EM, 775 New Ludlow Rd., South Hadley, Mass. 01075 ..... Inside Back Cover, Vol. 1
D Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342 ..... *
M Woven Elctrns., Southern Weaving Co., Dept. EM, Box 189, Mauldin, S. C. 29662 ..... p. 4663
Advance Electrical Mfg, Dept. EM, 1661 Industrial Way, Box 500, Belmont, CA 94002
Aero-Motive Mfg Co., Dept. EM, 1-94 At Miller Rd., Kalamazoo, Mich. 49001
M Assembled Products Co., Dept. EM, Box 750, St. Albans, Vt. 05478
Bishop Graphics, Dept. EM, 5388 Sterling Center, Westlake Village, Cal. 91361
Boston Insulated Wire & Cable Co., Dept. EM, 65 Bay St., Dorchester, Mass. 02125
Brand-Rex Co., Dept. EM, Box 498, Willimantic, Conn. 06226
D Burndy Corporation, Dept. EM, Richards Ave., Norwalk, , Conn. 06852
D Channel Master Div. Avnet, Dept. EM, Rte. 209, Ellenville, N.Y. 12428
Chester Cable, Dept. EM, Oakland Ave., Chester, N.Y. 10918
Cimco Wire & Cable, Inc., Dept. EM, 250 W. Crescent Ave., Allendale, N.J. 07401
Circuit Assembly Corp., Dept. EM, 3169 Red Hill Ave., Costa Mesa, Cal. 92626
D Custom Cable Co., Dept. EM, 242 Butler, Westbury, N.Y. 11590
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
M Geyer Systems, Inc., Dept. EM, 1917 Green Spring Dr., Timonium, Md. 21903
M Gore, W.L. & Assocs., Dept. EM, 555 Paper Mill Rd., Box 8734, Newark, Del. 19711
D Jersey Specialty Co., Dept. EM, Box 248, Burgess Pl., Wayne, N.J. 07470
D Lance Inds., Dept. EM, P.O. Box 4156, Sylmar, Calif. 91342
Lynn Elctrns. Corp., Dept. EM, 915 Pennsylvania Blvd., Feasterville, Pa. 19047
DM Manhattan Elec. Cable Corp., Dept. EM, 1 Station Plaza, Rye, N.Y. 10580
Methode Elctrns., Inc., Dept. EM, 7447 W. Wilson Ave., Chicago, Ill. 60656
Mupac Corp., Dept. EM, 646 Summer St., Brockton, Mass. 02402
D Norelcom Electronics, Dept. EM, 200 Allen Blvd., Farmingdale, N.Y. 11735
Okonite Co., Dept. EM, Box 340, Ramsey, N.J. 07446
M Parlex Corp, Dept. EM, 145 Milk St., Methuen, Mass. 01844
Phoenix Wire, Inc., Dept. EM, 100 Teflon Ave., S. Hero, Vt. 05486
Raychem Corp., Dept. EM, 300 Constitution Dr., Menlo Park, Cal. 94025
D SAMTEC, Dept. EM, 810 Progress Blvd., New Albany, Indiana 47150
M Santa Fe Textiles Inc., Dept. EM, 3151 W. Adams St., Santa Ana, Cal. 92704
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
DM Storm Products Co., Dept. EM, 112 S. Glasgow St., Inglewood, Cal. 90301
D T&B/Ansley Corp., Sub. Thomas & Betts, Dept. EM, 3208 Humboldt St., Los Angeles, Cal. 90031
Tensolite Co.,, Div. Carlisle Corp, Dept. EM, Old Post Rd., Rte. 9A, Buchanan, N.Y. 10511

Cable, Heater

Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
D Belden Corp., Electronic Div., Dept. EM, Box 1327, Richmond, Ind. 47374 .. *
D Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 ..... *
D Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 ..... p. 4592
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Philadelphia Insulated Wire Co. Inc., Dept. EM, 333 New Albany Rd., Moorestown, N.J. 08057 ..... p. 4634
D Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... *
Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245 p. 4656
Acme Elec. Heating Corp., Dept. EM, 4685 E. 11th, Hialeah, Fla. 33013
D Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
M ARI Inds., Inc., Dept. EM, 9000 King St., Franklin Pk., Ill. 60131
D Birnbach Co., Inc., Dept. EM, 177 Hansé Ave., Freeport, N.Y. 11520
Chester Cable, Dept. EM, Oakland Ave., Chester, N.Y. 10918

Cimco Wire & Cable, Inc., Dept. EM, 250 W. Crescent Ave., Allendale, N.J. 07401
DM Cox & Co., Inc., Dept. EM, 215 Park Ave., S., New York, N.Y. 10003
D Custom Cable Co., Dept. EM, 242 Butler, Westbury, N.Y. 11590
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
D Essex Grp. - Indl. Wire Prods. Div., Sub. United Tech., Dept. EM, 6235 S. Harlem Ave., Chicago, Ill. 60638
D General Electric Co., Wire & Cable, Dept. EM, 1285 Boston Ave., Bridgeport, Conn. 06602
Gore, W.L. & Assocs., Dept. EM, 555 Paper Mill Rd., Box 8734, Newark, Del. 19711
Jones & Laughlin Steel Corp., Dept. EM, 3 Gateway Ctr., Pittsburgh, PA 15263
Leviton Mfg. Co., Inc., Dept. EM, 59-25 Little Neck Pkwy., Little Neck, N.Y. 11362
D Manhattan Elec. Cable Corp., Dept. EM, 1 Station Plaza, Rye, N.Y. 10580
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Parlex Corp., Dept. EM, 145 Milk St., Methuen, Mass. 01844
Tensolite Co.,, Div. Carlisle Corp, Dept. EM, Old Post Rd., Rte. 9A, Buchanan, N.Y. 10511
D Thermax Wire Corp., Dept. EM, 32-02 Linden Pl., Flushing, N.Y. 11354
Victor Electric Wire & Cable, Dept. EM, 618 Main St., Coventry, R.I. 02816
Wireflex Incorporated, Dept. EM, 502 Old Route 30 East, Bourbon, Ind. 46504

Cable, High Temperature (Over 125ί C)

DM Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
D Belden Corp., Electronic Div., Dept. EM, Box 1327, Richmond, Ind. 47374 .. *
D Berk Tek, Inc., Dept. EM, Box 60, RD 1, Reading, Pa. 19607 ..... p. 4541
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Cable Concepts Corp., Dept. EM, 1610D Manning Blvd., Levittown, Pa. 19057 *
D Columbia Elctrn. Cables, Dept. EM, 11 Cove St., New Bedford, Mass. 02744 *
DM Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 ..... *
DM Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... p. 4588
DM Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 ..... p. 4592,4601
M Electroweave, Inc., Dept. EM, 27 E. Foundry St., Central Falls, R.I. 02863 .. *
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M Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 p. 4653
Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245 p. 4656
TRW/Holyoke Wire & Cable, Dept. EM, 775 New Ludlow Rd., South Hadley, Mass. 01075 ..... Inside Back Cover, Vol. 1
Uniform Tubes Inc., MicroDelay Division, Dept. EM, Collegeville, Pa. 19426 *
M Woven Elctrns., Southern Weaving Co., Dept. EM, Box 189, Mauldin, S. C. 29662 ..... *
DM Astrolab, Inc., Dept. EM, 345 Dalziel Rd., Linden, N.J. 07036
Boston Insulated Wire & Cable Co., Dept. EM, 65 Bay St., Dorchester, Mass. 02125
DM Brand-Rex Co., Dept. EM, Box 498, Willimantic, Conn. 06226
DM Cimco Wire & Cable, Inc., Dept. EM, 250 W. Crescent Ave., Allendale, N.J. 07401
D Custom Cable Co., Dept. EM, 242 Butler, Westbury, N.Y. 11590
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
M Galileo Electro-Optics Corp., Dept. EM, Galileo Pk., Sturbridge, Mass. 01518
M General Electric Co., Wire & Cable, Dept. EM, 1285 Boston Ave., Bridgeport, Conn. 06602
M Gore, W.L. & Assocs., Dept. EM, 555 Paper Mill Rd., Box 8734, Newark, Del. 19711
Gulton Inds., SCD Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Kaman Sciences Corp., Dept. EM, 1500 Garden of the Gods Rd. P.O. Box 7463, Colorado Springs, Colo. 80933
D Manhattan Elec. Cable Corp., Dept. EM, 1 Station Plaza, Rye, N.Y. 10580
Masterite Corporation, Dept. EM, 2841 Lomita Blvd., Torrance, Cal. 90505
D Norelcom Electronics, Dept. EM, 200 Allen Blvd., Farmingdale, N.Y. 11735
Okonite Co., Dept. EM, Box 340, Ramsey, N.J. 07446
Phelps Dodge Communications Co., Dept. EM, 5 Corporate Park Dr., White Plains, N.Y. 10604
M Phoenix Wire, Inc., Dept. EM, 100 Teflon Ave., S. Hero, Vt. 05486
Raychem Corp., Dept. EM, 300 Constitution Dr., Menlo Park, Cal. 94025
M Reynolds Metals Co., Dept. EM, Box 27003, Richmond, VA. 23261
Santa Fe Textiles Inc., Dept. EM, 3151 W. Adams St., Santa Ana, Cal. 92704
Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
M Storm Products Co., Dept. EM, 112 S. Glasgow St., Inglewood, Cal. 90301
DM Tensolite Co.,, Div. Carlisle Corp, Dept. EM, Old Post Rd., Rte. 9A, Buchanan, N.Y. 10511
DM Thermax Wire Corp., Dept. EM, 32-02 Linden Pl., Flushing, N.Y. 11354
DM Times Fiber Comm. Inc., Sub. Insilco Corp. Times Wire & Cable Div., Dept. EM, 358 Hall Ave., Wallingford, Conn. 06492
Wireflex Incorporated, Dept. EM, 502 Old Route 30 East, Bourbon, Ind. 46504

Cable, High Voltage (1,000 Volts & Over)

Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 ..... *
D Belden Corp., Electronic Div., Dept. EM, Box 1327, Richmond, Ind. 47374 .. *
Bertan Assocs., Inc., Dept. EM, 3 Aerial Way, Syosset, N.Y. 11791 ..... *
Caton Connector Corp., Dept. EM, Cordage Pk, Plymouth, Mass 02360 ..... *
D Columbia Elctrn. Cables, Dept. EM, 11 Cove St., New Bedford, Mass. 02744 *
DM Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 ..... p. 4579
DM Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... p. 4588
DM Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 ..... p. 4592
M Electroweave, Inc., Dept. EM, 27 E. Foundry St., Central Falls, R.I. 02863 .. *
DM Markel Corp., Dept. EM, P.O. Box 572, Norristown, Pa. 19404 ..... *
Megavolt, Corp., Dept. EM, 110 Hobart St, Hackensack, N.J. 07601 ..... *
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M Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 p. 4653
Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245 p. 4656
TRW/Holyoke Wire & Cable, Dept. EM, 775 New Ludlow Rd., South Hadley, Mass. 01075 ..... *
Universal Voltronics Corp., Dept. EM, 27 Radio Circle Dr., Mt. Kisco, N.Y. 10549 ..... *
DM Whitmor Wire & Cable, Dept. EM, 13161 Sherman Way Bldg. B, No. Hollywood, Cal. 91605 ..... p. 4662
M Woven Elctrns., Southern Weaving Co., Dept. EM, Box 189, Mauldin, S. C. 29662 ..... *
Boston Insulated Wire & Cable Co., Dept. EM, 65 Bay St., Dorchester, Mass. 02125
Chester Cable, Dept. EM, Oakland Ave., Chester, N.Y. 10918
D Cimco Wire & Cable, Inc., Dept. EM, 250 W. Crescent Ave., Allendale, N.J. 07401
D Custom Cable Co., Dept. EM, 242 Butler, Westbury, N.Y. 11590
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
Essex Grp, Power Conductor Div., Dept. EM, 2601 S. Adams, Marion, Ind. 46953
Estes Engrg. Co., Dept. EM, 930 Marine Dr., Port Angeles, Wash. 98362
M Galileo Electro-Optics Corp., Dept. EM, Galileo Pk., Sturbridge, Mass. 01518
D General Electric Co., Wire & Cable, Dept. EM, 1285 Boston Ave., Bridgeport, Conn. 06602
M Gore, W.L. & Assocs., Dept. EM, 555 Paper Mill Rd., Box 8734, Newark, Del. 19711
Gulton Inds., SCD Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
Lynn Elctrns. Corp., Dept. EM, 915 Pennsylvania Blvd., Feasterville, Pa. 19047
D Manhattan Elec. Cable Corp., Dept. EM, 1 Station Plaza, Rye, N.Y. 10580
D Norelcom Electronics, Dept. EM, 200 Allen Blvd., Farmingdale, N.Y. 11735
Okonite Co., Dept. EM, Box 340, Ramsey, N.J. 07446
M Parlex Corp, Dept. EM, 145 Milk St., Methuen, Mass. 01844
DM Phelps Dodge Cable & Wire Co., Dept. EM, Box 391 Point St., Yonkers, N.Y. 10702
Raychem Corp., Dept. EM, 300 Constitution Dr., Menlo Park, Cal. 94025
M Reynolds Metals Co., Dept. EM, Box 27003, Richmond, VA. 23261
Simmonds Precision, Engine Systems Div., Dept. EM, Norwich, N.Y. 13815
M Tensolite Co.,, Div. Carlisle Corp, Dept. EM, Old Post Rd., Rte. 9A, Buchanan, N.Y. 10511
Times Fiber Comm. Inc., Sub. Insilco Corp. Times Wire & Cable Div., Dept. EM, 358 Hall Ave., Wallingford, Conn. 06492
D Triangle PWC, Dept. EM, Box 711, New Brunswick, N.J. 08903

Cable, Intercommunication & Sound System—See Cable, Audio

Cable, Irradiated

D Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
D Belden Corp., Electronic Div., Dept. EM, Box 1327, Richmond, Ind. 47374 .. *
Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 ..... *
DM Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
DM Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 ..... p. 4592
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D Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... *
Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245 p. 4656
M Woven Elctrns., Southern Weaving Co., Dept. EM, Box 189, Mauldin, S. C. 29662 ..... *
M American Electric Cable Co., Dept. EM, 181 Appleton St., Holyoke, Mass. 01040
Boston Insulated Wire & Cable Co., Dept. EM, 65 Bay St., Dorchester, Mass. 02125
D Brand-Rex Co., Dept. EM, Box 498, Willimantic, Conn. 06226
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
D Hepco Wire & Cable, Dept. EM, Box 76, Garnvl., Garnersville, N.Y. 10923
Lynn Elctrns. Corp., Dept. EM, 915 Pennsylvania Blvd., Feasterville, Pa. 19047
D Manhattan Elec. Cable Corp., Dept. EM, 1 Station Plaza, Rye, N.Y. 10580
D Norelcom Electronics, Dept. EM, 200 Allen Blvd., Farmingdale, N.Y. 11735
Raychem Corp., Dept. EM, 300 Constitution Dr., Menlo Park, Cal. 94025
M Storm Products Co., Dept. EM, 112 S. Glasgow St., Inglewood, Cal. 90301
Times Fiber Comm. Inc., Sub. Insilco Corp. Times Wire & Cable Div., Dept. EM, 358 Hall Ave., Wallingford, Conn. 06492

Cable, Low-Capacitance

D Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 p. 4467
D Belden Corp., Electronic Div., Dept. EM, Box 1327, Richmond, Ind. 47374 p. 4516-4518
D Columbia Elctrn. Cables, Dept. EM, 11 Cove St., New Bedford, Mass. 02744 *
D Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 ..... p. 4569
D Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *

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D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Parlex Corp, Dept. EM, 145 Milk St., Methuen, Mass. 01844
DM Phelps Dodge Cable & Wire Co., Dept. EM, Box 391 Point St., Yonkers, N.Y. 10702
Phelps Dodge Communications Co., Dept. EM, 5 Corporate Park Dr., White Plains, N.Y. 10604
M Precision Tube, Dept. EM, Church Rd. & Wissahickon, No. Wales, Pa. 19454
Raychem Corp., Dept. EM, 300 Constitution Dr., Menlo Park, Cal. 94025
D Revere Corp. of America, Neptune International Corp., Dept. EM, 845 N. Colony Rd., Wallingford, Conn. 06492
M Reynolds Metals Co., Dept. EM, Box 27003, Richmond, VA. 23261
M Rockland Insulated Wire & Cable, Dept. EM, 87 Broadway, Haverstraw, N.Y. 10927
M Santa Fe Textiles Inc., Dept. EM, 3151 W. Adams St., Santa Ana, Cal. 92704
DM Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
M Storm Products Co., Dept. EM, 112 S. Glasgow St., Inglewood, Cal. 90301
D , Superior Cable Corp, Dept. EM, Box 489, Hickory, N.C. 28601
M Teledyne Aerospace Systems, Dept. EM, 1007 E. 10th St., Fairmont, Minn. 56031
DM Tensolite Co.,, Div. Carlisle Corp, Dept. EM, Old Post Rd., Rte. 9A, Buchanan, N Y 10511
Thermo Elec. Co., Inc., Dept. EM, 109 Fifth St., Saddle Brook, N.J. 07662
DM Times Fiber Comm. Inc., Sub. Insilco Corp. Times Wire & Cable Div., Dept. EM, 358 Hall Ave., Wallingford, Conn. 06492
D Triangle PWC, Dept. EM, Box 711, New Brunswick, N.J. 08903
Trompeter Electronics, Inc., Dept. EM, 8936 Comanche Chatsworth, Cal. 91311
Victor Electric Wire & Cable, Dept. EM, 618 Main St., Coventry, R.I. 02816
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578
D Zippertubing Co., Dept. EM, 13000 S. Broadway, Los Angeles, Cal. 90061

Cable, Telephone

D Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
D Belden Corp., Electronic Div., Dept. EM, Box 1327, Richmond, Ind. 47374 p. 4504
D Columbia Elctrn. Cables, Dept. EM, 11 Cove St., New Bedford, Mass. 02744 p. 4544,4545,4547,4548
D Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 ..... p. 4568,4569
D Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 ..... p. 4592
M Electroweave, Inc., Dept. EM, 27 E. Foundry St., Central Falls, R.I. 02863 .. *
GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245 p. 4656
TRW/Holyoke Wire & Cable, Dept. EM, 775 New Ludlow Rd., South Hadley, Mass. 01075 ..... Inside Back Cover, Vol. 1
M Woven Elctrns., Southern Weaving Co., Dept. EM, Box 189, Mauldin, S. C. 29662 ..... *
D Birnbach Co., Inc., Dept. EM, 177 Hanse Ave., Freeport, N.Y. 11520
M Brand-Rex Co., Dept. EM, Box 498, Willimantic, Conn. 06226
Chester Cable, Dept. EM, Oakland Ave., Chester, N.Y. 10918
D Custom Cable Co., Dept. EM, 242 Butler, Westbury, N.Y. 11590
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
Essex Int'l., Inc., Telecommunications Prods. Div., Dept. EM, 800 E. Garfield Ave., Decatur, Ill. 62526
D Hepco Wire & Cable, Dept. EM, Box 76, Garnvl., Garnersville, N.Y. 10923
Lynn Elctrns. Corp., Dept. EM, 915 Pennsylvania Blvd., Feasterville, Pa. 19047
D Manhattan Elec. Cable Corp., Dept. EM, 1 Station Plaza, Rye, N.Y. 10580
Okonite Co., Dept. EM, Box 340, Ramsey, N.J. 07446
D Pace Wire & Cable Corp., Dept. EM, 3590 Oceanside Rd., Oceanside, N.Y. 11572
D Pacific Electricord Co., Dept. EM, 747 W. Redondo Beach Blvd., Box 10, Gardena, Cal. 90247
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Phelps Dodge Communications Co., Dept. EM, 5 Corporate Park Dr., White Plains, N.Y. 10604
DM Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
D , Superior Cable Corp, Dept. EM, Box 489, Hickory, N.C. 28601
D Triangle PWC, Dept. EM, Box 711, New Brunswick, N.J. 08903
Victor Electric Wire & Cable, Dept. EM, 618 Main St., Coventry, R.I. 02816
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Cable, TFE Insulated

D Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
D Belden Corp., Electronic Div., Dept. EM, Box 1327, Richmond, Ind. 47374 .. *
D Columbia Elctrn. Cables, Dept. EM, 11 Cove St., New Bedford, Mass. 02744 *
DM Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 ..... p. 4566,4567
DM Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
DM Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 ..... p. 4592
M Electroweave, Inc., Dept. EM, 27 E. Foundry St., Central Falls, R.I. 02863 .. *
DM Markel Corp., Dept. EM, P.O. Box 572, Norristown, Pa. 19404 ..... p. 4611
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Philadelphia Insulated Wire Co. Inc., Dept. EM, 333 New Albany Rd., Moorestown, N.J. 08057 ..... p. 4633,4642,4649
M Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245 p. 4656
DM Uniform Tubes Inc., MicroDelay Division, Dept. EM, Collegeville, Pa. 19426 *
M Woven Elctrns., Southern Weaving Co., Dept. EM, Box 189, Mauldin, S. C. 29662 ..... *
D Astrolab, Inc., Dept. EM, 345 Dalziel Rd., Linden, N.J. 07036
Boston Insulated Wire & Cable Co., Dept. EM, 65 Bay St., Dorchester, Mass. 02125
Chester Cable, Dept. EM, Oakland Ave., Chester, N.Y. 10918
DM Cimco Wire & Cable, Inc., Dept. EM, 250 W. Crescent Ave., Allendale, N.J. 07401
D Custom Cable Co., Dept. EM, 242 Butler, Westbury, N.Y. 11590
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
M Essex Grp - Indl Wire Prods Div., Sub. United Tech, Dept. EM, 6235 S. Harlem Ave., Chicago, Ill 60638
M Galileo Electro-Optics Corp., Dept. EM, Galileo Pk., Sturbridge, Mass. 01518
M Gore, W.L. & Assocs., Dept. EM, 555 Paper Mill Rd., Box 8734, Newark, Del. 19711
DM Manhattan Elec. Cable Corp., Dept. EM, 1 Station Plaza, Rye, N.Y. 10580
Microtech, Dept. EM, 1420 Conchester Hwy, Boothwyn, Pa. 19061
D Norelcom Electronics, Dept. EM, 200 Allen Blvd., Farmingdale, N.Y. 11735
M Phoenix Wire, Inc., Dept. EM, 100 Teflon Ave., S. Hero, Vt. 05486
Santa Fe Textiles Inc., Dept. EM, 3151 W. Adams St., Santa Ana, Cal. 92704
D Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
DM Tensolite Co.,, Div. Carlisle Corp, Dept. EM, Old Post Rd., Rte. 9A, Buchanan, N.Y. 10511
DM Thermax Wire Corp., Dept. EM, 32-02 Linden Pl., Flushing, N.Y. 11354
Thermo Elec. Co., Inc., Dept. EM, 109 Fifth St., Saddle Brook, N.J. 07662
DM Times Fiber Comm. Inc., Sub. Insilco Corp. Times Wire & Cable Div., Dept. EM, 358 Hall Ave., Wallingford, Conn. 06492

Cable, Transmission Line

DM Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
D Belden Corp., Electronic Div., Dept. EM, Box 1327, Richmond, Ind. 47374 p. 4513,4514,4527,4528
Cable Concepts Corp., Dept. EM, 1610D Manning Blvd., Levittown, Pa. 19057 p. 1737
D Columbia Elctrn. Cables, Dept. EM, 11 Cove St., New Bedford, Mass. 02744 p. 4544,4545
D Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 ..... *
D Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 ..... p. 4592
M Electroweave, Inc., Dept. EM, 27 E. Foundry St., Central Falls, R.I. 02863 .. *
GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
DM Markel Corp., Dept. EM, P.O. Box 572, Norristown, Pa. 19404 ..... *
National Wire & Cable Corp., Dept EEM, Svc Div., Dept. EM, 136 San Fernando Rd., Los Angeles, Cal. 90031 ..... p. 4624,4625
DM Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... *
DM Spectra-Strip Corp., Dept. EM, 7100 Lampson Ave., Box 415, Garden Grove, Cal. 92642 ..... *
Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245 p. 4656
TRW/Holyoke Wire & Cable, Dept. EM, 775 New Ludlow Rd., South Hadley, Mass. 01075 ..... *
DM Uniform Tubes Inc., MicroDelay Division, Dept. EM, Collegeville, Pa. 19426 *
M Woven Elctrns., Southern Weaving Co., Dept. EM, Box 189, Mauldin, S. C. 29662 ..... *
Andrew Corp., Dept. EM, 10500 W. 153rd St., Orland Park, Ill. 60462
DM Astrolab, Inc., Dept. EM, 345 Dalziel Rd., Linden, N.J. 07036
D Birnbach Co., Inc., Dept. EM, 177 Hanse Ave., Freeport, N.Y. 11520
Brand-Rex Co., Dept. EM, Box 498, Willimantic, Conn. 06226
DM Cablewave Systems Inc., Dept. EM, 60 Dodge Ave., North Haven, Conn. 06473
M Capcon, Inc., Dept. EM, 147 W. 25th St., New York, N.Y. 10001
Chester Cable, Dept. EM, Oakland Ave., Chester, N.Y. 10918
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
Essex Int'l., Inc., Telecommunications Prods. Div., Dept. EM, 800 E. Garfield Ave., Decatur, Ill. 62526
Essex Grp, Power Conductor Div., Dept. EM, 2601 S. Adams, Marion, Ind. 46953
M Gore, W.L. & Assocs., Dept. EM, 555 Paper Mill Rd., Box 8734, Newark, Del. 19711
D Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
D Jersey Specialty Co., Dept. EM, Box 248, Burgess Pl., Wayne, N.J. 07470
Jones & Laughlin Steel Corp, Dept. EM, 3 Gateway Ctr, Pittsburgh, PA 15263
M Kaman Sciences Corp., Dept. EM, 1500 Garden of the Gods Rd. P.O. Box 7463, Colorado Springs, Colo. 80933
DM Manhattan Elec. Cable Corp., Dept. EM, 1 Station Plaza, Rye, N.Y. 10580
Okonite Co., Dept. EM, Box 340, Ramsey, N.J. 07446
D Pace Wire & Cable Corp., Dept. EM, 3590 Oceanside Rd., Oceanside, N.Y. 11572
D Pacific Electricord Co., Dept. EM, 747 W. Redondo Beach Blvd., Box 10, Gardena, Cal. 90247
Phelps Dodge Cable & Wire Co., Dept. EM, Box 391 Point St., Yonkers, N.Y. 10702
Phelps Dodge Communications Co., Dept. EM, 5 Corporate Park Dr., White Plains, N.Y. 10604
Precision Tube, Dept. EM, Church Rd. & Wissahickon, No. Wales, Pa. 19454
M Reynolds Metals Co., Dept. EM, Box 27003, Richmond, VA. 23261
M RF Systems, Inc., Dept. EM, 3100 Communications Rd., St Cloud, Fla. 32769
DM Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
DM T&B/Ansley Corp., Sub. Thomas & Betts, Dept. EM, 3208 Humboldt St., Los Angeles, Cal. 90031

Tensolite Co., Div. Carlisle Corp. Dept. EM, Old Post Rd., Rte. 9A, Buchanan, N.Y. 10511
DM Times Fiber Comm. Inc., Sub. Insilco Corp. Times Wire & Cable Div., Dept. EM, 358 Hall Ave., Wallingford, Conn. 06492

Cable, Triaxial

Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
D Belden Corp., Electronic Div., Dept. EM, Box 1327, Richmond, Ind. 47374 p. 4528
D Columbia Elctrn. Cables, Dept. EM, 11 Cove St., New Bedford, Mass. 02744 *
D Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 *
DM Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 *
DM Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 p. 4592
M Electroweave, Inc., Dept. EM, 27 E. Foundry St., Central Falls, R.I. 02863 .. *
DM Markel Corp., Dept. EM, P.O. Box 572, Norristown, Pa. 19404 *
National Wire & Cable Corp., Dept EEM, Svc Div., Dept. EM, 136 San Fernando Rd., Los Angeles, Cal. 90031 *
DM Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... *
Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245 *
TRW/Holyoke Wire & Cable, Dept. EM, 775 New Ludlow Rd., South Hadley, Mass. 01075 *
Uniform Tubes Inc., MicroDelay Division, Dept. EM, Collegeville, Pa. 19426 *
DM Whitmor Wire & Cable, Dept. EM, 13161 Sherman Way Bldg. B, No. Hollywood, Cal. 91605 *
M Woven Elctrns., Southern Weaving Co., Dept. EM, Box 189, Mauldin, S. C. 29662 *
D Boston Insulated Wire & Cable Co., Dept. EM, 65 Bay St., Dorchester, Mass. 02125
Brand-Rex Co., Dept. EM, Box 498, Willimantic, Conn. 06226
Chester Cable, Dept. EM, Oakland Ave., Chester, N.Y. 10918
D Cimco Wire & Cable, Inc., Dept. EM, 250 W. Crescent Ave., Allendale, N.J. 07401
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
Essex Int'l., Inc., Telecommunications Prods. Div., Dept. EM, 800 E. Garfield Ave., Decatur, Ill. 62526
M Gore, W.L. & Assocs., Dept. EM, 555 Paper Mill Rd., Box 8734, Newark, Del. 19711
Gulton Inds., SCD Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
M Kaman Sciences Corp., Dept. EM, 1500 Garden of the Gods Rd. P.O. Box 7463, Colorado Springs, Colo. 80933
D Manhattan Elec. Cable Corp., Dept. EM, 1 Station Plaza, Rye, N.Y. 10580
Precision Tube, Dept. EM, Church Rd. & Wissahickon, No. Wales, Pa. 19454
Raychem Corp., Dept. EM, 300 Constitution Dr., Menlo Park, Cal. 94025
DM Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
M Tensolite Co., Div. Carlisle Corp, Dept. EM, Old Post Rd., Rte. 9A, Buchanan, N.Y. 10511
M Thermax Wire Corp., Dept. EM, 32-02 Linden Pl., Flushing, N.Y. 11354
DM Times Fiber Comm. Inc., Sub. Insilco Corp. Times Wire & Cable Div., Dept. EM, 358 Hall Ave., Wallingford, Conn. 06492
Trompeter Electronics, Inc., Dept. EM, 8936 Comanche, Chatsworth, Cal. 91311

Cable, TV (Including Camera)

D Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
AMP Capitron Div./AMP Inc., Dept. EM, 1595 S. Mt. Joy St., Elizabethtown, Pa. 17022 *
D Belden Corp., Electronic Div., Dept. EM, Box 1327, Richmond, Ind. 47374 .. *
D Columbia Elctrn. Cables, Dept. EM, 11 Cove St., New Bedford, Mass. 02744 *
D Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 p. 4563,4573
Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 p. 4592
GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 *
National Wire & Cable Corp., Dept EEM, Svc Div., Dept. EM, 136 San Fernando Rd., Los Angeles, Cal. 90031 *
DM Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245 p. 4656
TRW/Holyoke Wire & Cable, Dept. EM, 775 New Ludlow Rd., South Hadley, Mass. 01075 *
DM Uniform Tubes Inc., MicroDelay Division, Dept. EM, Collegeville, Pa. 19426 *
DM Whitmor Wire & Cable, Dept. EM, 13161 Sherman Way Bldg. B, No. Hollywood, Cal. 91605 *
Boston Insulated Wire & Cable Co., Dept. EM, 65 Bay St., Dorchester, Mass. 02125
Brand-Rex Co., Dept. EM, Box 498, Willimantic, Conn. 06226
Chester Cable, Dept. EM, Oakland Ave., Chester, N.Y. 10918
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
Essex Grp - Indl Wire Prods Div., Sub. United Tech, Dept. EM, 6235 S. Harlem Ave., Chicago, Ill 60638
General Electric Co., Wire & Cable, Dept. EM, 1285 Boston Ave., Bridgeport, Conn. 06602
D Apollo Lasers, Apollo Lasers, Inc., Dept. EM, 6357 Arizonia Cir, Los Angeles, Cal. 90045
D Jersey Specialty Co., Dept. EM, Box 248, Burgess Pl., Wayne, N.J. 07470
D Manhattan Elec. Cable Corp., Dept. EM, 1 Station Plaza, Rye, N.Y. 10580
D Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
D Temtron Elctrns Ltd., Dept. EM, 138-69 Fran Lewis Blvd., Rosedale, N.Y. 12472
Victor Electric Wire & Cable, Dept. EM, 618 Main St., Coventry, R.I. 02816

Cable, Twisted Pair

D Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 p. 4465,4467-4469,4471,4473
D Augat Interconnection Prods. Div., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703 *
D Belden Corp., Electronic Div., Dept. EM, Box 1327, Richmond, Ind. 47374 p. 4486-4491,4497-4504,4509-4511,4515
D Berk Tek, Inc., Dept. EM, Box 60, RD 1, Reading, Pa. 19607 *
Breeze-Illinois, Inc., Dept. EM, Main & Agard Sts., Wyoming, Ill. 61491 *
D Columbia Elctrn. Cables, Dept. EM, 11 Cove St., New Bedford, Mass. 02744 p. 4543,4545,4546
D Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 p. 4558-4561,4569,4570
DM Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 *
DM Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 p. 4592,4596,4598
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 p. 1469
M Electroweave, Inc., Dept. EM, 27 E. Foundry St., Central Falls, R.I. 02863 p. 4608
ITT Cannon Electric, Dept. EM, 666 E. Dyer Rd., Santa Ana, Cal. 92702 ..... *
DM Markel Corp., Dept. EM, P.O. Box 572, Norristown, Pa. 19404 *
National Wire & Cable Corp., Dept EEM, Svc Div., Dept. EM, 136 San Fernando Rd., Los Angeles, Cal. 90031 p. 4616,4617,4625
Philadelphia Insulated Wire Co. Inc., Dept. EM, 333 New Albany Rd., Moorestown, N.J. 08057 p. 4639,4651
DM Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... *
Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245 p. 4656
TRW/Holyoke Wire & Cable, Dept. EM, 775 New Ludlow Rd., South Hadley, Mass. 01075 *
United Wiring & Mfg. Co., Dept. EM, 2608 Electonic La. #404, Dallas, Tex. 75220 p. 1302,1311
DM Whitmor Wire & Cable, Dept. EM, 13161 Sherman Way Bldg. B, No. Hollywood, Cal. 91605 *
M Woven Elctrns., Southern Weaving Co., Dept. EM, Box 189, Mauldin, S. C. 29662 *
American Electric Cable Co., Dept. EM, 181 Appleton St., Holyoke, Mass. 01040
DM Baron Wire & Cable Corp., Dept. EM, 6019 W. Howard St., Chicago, Ill. 60648
Boston Insulated Wire & Cable Co., Dept. EM, 65 Bay St., Dorchester, Mass. 02125
D Brand-Rex Co., Dept. EM, Box 498, Willimantic, Conn. 06226
Chester Cable, Dept. EM, Oakland Ave., Chester, N.Y. 10918
DM Cimco Wire & Cable, Inc., Dept. EM, 250 W. Crescent Ave., Allendale, N.J. 07401
Circuit Assembly Corp., Dept. EM, 3169 Red Hill Ave., Costa Mesa, Cal. 92626
D Custom Cable Co., Dept. EM, 242 Butler, Westbury, N.Y. 11590
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
M Galileo Electro-Optics Corp., Dept. EM, Galileo Pk., Sturbridge, Mass. 01518
M Gore, W.L. & Assocs., Dept. EM, 555 Paper Mill Rd., Box 8734, Newark, Del. 19711
Gulton Inds., SCD Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
D Hepco Wire & Cable, Dept. EM, Box 76, Garnvl., Garnersville, N.Y. 10923
Interdyne, Intercette Div., Dept. EM, 14761 Califa St., Van Nuys, Cal. 91411
Lynn Elctrns. Corp., Dept. EM, 915 Pennsylvania Blvd., Feasterville, Pa. 19047
D Manhattan Elec. Cable Corp., Dept. EM, 1 Station Plaza, Rye, N.Y. 10580
Microtech, Dept. EM, 1420 Conchester Hwy, Boothwyn, Pa. 19061
D Norelcom Electronics, Dept. EM, 200 Allen Blvd., Farmingdale, N.Y. 11735
Okonite Co., Dept. EM, Box 340, Ramsey, N.J. 07446
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Raychem Corp., Dept. EM, 300 Constitution Dr., Menlo Park, Cal. 94025
M Rockland Insulated Wire & Cable, Dept. EM, 87 Broadway, Haverstraw, N.Y. 10927
D SAMTEC, Dept. EM, 810 Progress Blvd., New Albany, Indiana 47150
Santa Fe Textiles Inc., Dept. EM, 3151 W. Adams St., Santa Ana, Cal. 92704
DM Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
M Storm Products Co., Dept. EM, 112 S. Glasgow St., Inglewood, Cal. 90301
D , Superior Cable Corp, Dept. EM, Box 489, Hickory, N.C. 28601
M Tensolite Co., Div. Carlisle Corp, Dept. EM, Old Post Rd., Rte. 9A, Buchanan, N.Y. 10511
DM Thermax Wire Corp., Dept. EM, 32-02 Linden Pl., Flushing, N.Y. 11354
Thermo Elec. Co., Inc., Dept. EM, 109 Fifth St., Saddle Brook, N.J. 07662
DM Times Fiber Comm. Inc., Sub. Insilco Corp. Times Wire & Cable Div., Dept. EM, 358 Hall Ave., Wallingford, Conn. 06492
D Triangle PWC, Dept. EM, Box 711, New Brunswick, N.J. 08903
Trompeter Electronics, Inc., Dept. EM, 8936 Comanche, Chatsworth, Cal. 91311
Victor Electric Wire & Cable, Dept. EM, 618 Main St., Coventry, R.I. 02816

Cable, Woven Conductor

Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 *
Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 p. 4592
M Electroweave, Inc., Dept. EM, 27 E. Foundry St., Central Falls, R.I. 02863 p. 4608
M Magnetic Shield Div., Perfection Mica, Dept. EM, 750 North Thomas Dr., Bensenville, Ill. 60106 *
Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245 p. 4656
Woven Elctrns., Southern Weaving Co., Dept. EM, Box 189, Mauldin, S. C. 29662 p. 4663
Advance Electrical Mfg, Dept. EM, 1661 Industrial Way, Box 500, Belmont, CA 94002
Circuit Assembly Corp., Dept. EM, 3169 Red Hill Ave., Costa Mesa, Cal. 92626
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007

M Geyer Systems, Inc., Dept. EM, 1917 Green Spring Dr., Timonium, Md. 21903
Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
Tensolite Co.,, Div. Carlisle Corp, Dept. EM, Old Post Rd., Rte. 9A, Buchanan, N.Y. 10511

Cages, Circuit Board—See Racks, Circuit Board

Calculators, Electrical & Electronic-Also See Computers, Desk Top

Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Itoh Electronics, Inc. (C.), Dept. EM, 280 Park Ave., New York, N.Y. 10017 *
Litronix, Dept. EM, 19000 Homestead Rd., Cupertino, Cal. 95014 ..... *
Neff Instrument Corp., Dept. EM, 1088 E. Hamilton Rd., Duarte, Cal. 91010 p. 1657
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Addmaster Corp., Dept. EM, 416 Junipero Serra Dr., San Gabriel, Cal. 91776
D Chafitz Engineering, Dept. EM, P.O. Box 2188, Rockville, Md. 20852
Diversified Electronics Co., Dept. EM, 260 Wolfe Rd., Sunnyvale, Cal. 94086
Edmund Scientific Co., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007
D Facit-Addo, Inc., Dept. EM, 66 Field Point Rd., Greenwich, Conn. 06830
Keuffel & Esser Co., Dept. EM, 20 Whippany Rd., Morristown, N.J. 07960

Calibrators, Accelerometer

NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Unholtz-Dickie Corp., Dept. EM, 3000 Whitney Ave., Hamden, Conn. 06518 *
Alpha-M Corp, Dept. EM, 3009 Wildflower Drive, Dallas, Tx. 75229
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
Endevco, Div. Becton, Dickinson & Co., Dept. EM, 30700 Rancho Viejo Rd., San Jaun Capistrano, Cal. 92675
IRD Mechanalysis, Inc., Dept. EM, 6150 Huntley Rd., Columbus, Ohio 43229
Robinson-Halpern Co., Dept. EM, One Apolio Rd., Plymouth Meeting, Pa. 19462
Schaevitz Engrg., Dept. EM, U.S. 130, Union Ave., Pennsauken, N.J. 08110
Sundstrand Data Control, Dept. EM, Overlake Ind'l. Pk., Redmond, Wash. 98052
Wilcoxon Research, Dept. EM, 12526 Parklawn Dr., Rockville, Md. 20852

Calibrators, Attenuation

M **Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706** ..... *
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D Ailtech, Dept. EM, 2070 Fifth Ave, Ronkonkoma, NY 11779
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760

Calibrators, Crystal

Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
PPM, Inc., Dept. EM, 7575 Bond St., Cleveland, Ohio 44139 ..... *
M **RFL Inds., Instr. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005** ..... *
Data-Control Systems, Dept. EM, Commerce Dr., Box 860, Danbury, Conn. 06810
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
T-F Electronics Inc., Dept. EM, 9415 Neils Thompson Dr., Austin, Tex. 78759
D Ten-Tec Inc., Dept. EM, Industrial Park, Sevierville, Tenn. 37862

Calibrators, Current

Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 .. *
Electronic Dev. Corp., Dept. EM, 11 Hamlin St., Boston, Mass. 02127 p. 2724
D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043** p. 2743,2744
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
RFL Inds., Instr. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005 ..... *
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** ..... *
United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403 ..... *
Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... *
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
Meguro Electronics Corp, Dept. EM, No. 5-1 2-Chome Chuo Meguro-ku, Tokyo, Japan
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
Valhalla Scientific, Inc., Dept. EM, 7707 Convoy Ct., San Diego, Cal. 92111
Zi-Tech Div., Aikenwood Corp., Dept. EM, Box 26, 2151 Park Blvd., Palo Alto, Cal. 94302

Calibrators, Frequency

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Applied Microwave, Div. Epsco Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 ..... p. 2861
Austron, Inc., Dept. EM, 1915 Kramer La., Austin, Tex. 78758 ..... p. 2283
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Epsco, Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 p. 2861
D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043** *
M **Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040** .. *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
PPM, Inc., Dept. EM, 7575 Bond St., Cleveland, Ohio 44139 ..... *
Data-Control Systems, Dept. EM, Commerce Dr., Box 860, Danbury, Conn. 06810
Dynatron Co., Dept. EM, Box 48822, Los Angeles, Cal. 90048
D EMR Telemetry, Div. Sangamo-Weston, Dept. EM, Box 3041, Sarasota, Fla. 33578
Frequency Engrg. Labs., Dept. EM, Box 527, Farmingdale, N.J. 07727
FSI/Fork Standards Inc., Dept. EM, 211 Main St., W. Chicago, Ill. 60185
Hades Mfg Corp., Dept. EM, 151-A Verdi St., Farmingdale, N.Y. 11735
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
Spectracom Corp., Dept. EM, 1667 Penfield Rd., Rochester, N.Y. 14625
Teledyne/Geotech, Dept. EM, Box 28277, Dallas, Tex. 75228
Tri-Com, Inc., Dept. EM, 12216 Parklawn Dr., Rockville, Md. 20852
True Time Instr Co., Dept. EM, 429 Olive St, Santa Rosa, Cal. 95401

Calibrators, LVDT

North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803 ..... *
Robinson-Halpern Co., Dept. EM, One Apollo Rd., Plymouth Meeting, Pa. 19462
Schaevitz Engrg., Dept. EM, U.S. 130, Union Ave., Pennsauken, N.J. 08110

Calibrators, Magnetic Field

RFL Inds., Instr. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005 ..... *
Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... *
Advanced Kinetics, Dept. EM, 1231 Victoria St., Costa Mesa, Calif. 92627
LDJ Electronics, Dept. EM, 1064 Naughton Ave., Troy, Mich. 48084
DM Magnos, Incorporated, Dept. EM, Old School House Rd., Harvard, Mass. 01451
Thomas & Skinner, Inc., Dept. EM, Box 150-B,, Indianapolis, Ind. 46206

Calibrators, Meter—See Testers, Meter

Calibrators, Sound Level

Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** ..... *
D **Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817** ..... *
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
IRD Mechanalysis, Inc., Dept. EM, 6150 Huntley Rd., Columbus, Ohio 43229
Metrosonics, Inc., Dept. EM, Box 18090, Rochester, N.Y. 14618
Mine Safety Appliances Co., Dept. EM, 600 Penn Center Blvd., Pittsburgh, Pa 15235

Calibrators, Sweep—See Generators, Sweep

Calibrators, Synchro

M **Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731** ..... *
M **ILC Data Device Corp., Dept. EM, Airport Int'l. Plaza, Bohemia, N.Y. 11716** *
M **North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803** ..... *
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006

Calibrators, Time-Base

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Austron, Inc., Dept. EM, 1915 Kramer La., Austin, Tex. 78758 ..... *
D **Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005** ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
PPM, Inc., Dept. EM, 7575 Bond St., Cleveland, Ohio 44139 ..... *
T-F Electronics Inc., Dept. EM, 9415 Neils Thompson Dr., Austin, Tex. 78759

Calibrators, Voltage

D **Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005** ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 p. 2687
Ectron Corp., Dept. EM, 8159 Engineer Rd., San Diego, Cal. 92111 .... p. 2719
Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 p. 2825
Electronic Dev. Corp., Dept. EM, 11 Hamlin St., Boston, Mass. 02127 p. 2724
D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043** p. 2743,2744
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 p. 2753
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 p. 3267
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 p. 2769
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
Power Designs, Inc., Dept. EM, 1700 Shames Dr., Westbury, N.Y. 11590 .... *
RFL Inds., Instr. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005 ..... *
Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... *

Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 p. 2825

United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403 *

D Analogic Corp., Dept. EM, Audubon Rd., Wakefield, Mass. 01880
Electro-Optical Inds., Inc., Dept. EM, 839 Ward Dr., Santa Barbara, Cal. 93111
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
D EMR Telemetry, Div. Sangamo-Weston, Dept. EM, Box 3041, Sarasota, Fla. 33578
Fogg System Co., Dept. EM, 15592 E. Batavia Dr., Aurora, Colo. 80011
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
D Linear Instrs. Corp., Dept. EM, 17282 Eastman Ave., Irvine, Cal. 92714
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
Pioneer Instrumentation, Dept. EM, 4800 E. 131st St., Cleveland, Ohio 44105
M Sonex, Dept. EM, 2337 Philmont Ave., Huntingdon Valley, Pa. 19006
Stoelting Co., Dept. EM, 1350 S. Kostner Ave., Chicago, Ill. 60623
Sundstrand Data Control, Dept. EM, Overlake Ind'l. Pk., Redmond, Wash. 98052
Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803
Tri-Com, Inc., Dept. EM, 12216 Parklawn Dr., Rockville, Md. 20852
Valhalla Scientific, Inc., Dept. EM, 7707 Convoy Ct., San Diego, Cal. 92111
Zi-Tech Div., Aikenwood Corp., Dept. EM, Box 26, 2151 Park Blvd., Palo Alto, Cal. 94302

Calibrators, VSWR

Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 *
Alford Mfg. Co., Dept. EM, 120 Cross St., Winchester, Mass. 01890
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760

Calling Systems—See Intercom Systems

Calorimeters, Microwave

Bird Electronic Corp., Dept. EM, 30303 Aurora Rd., Solon, Ohio 44139 *
M **Electro Impulse, Dept. EM, Box 870, Red Bank, N.J. 07701** *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** *
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
Raytheon Co., Microwave & Power Tube Div., Dept. EM, 190 Willow St., Waltham, Mass 02154
M Reeve Electronics, Inc., Dept. EM, 609 W. Lake St., Chicago, Ill 60606
TRG,, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Cameras, Data Recording

DM CAI, Div. Bourns Inc., Dept. EM, 550 W. Northwest Hwy., Barrington, Ill. 60010
Dest Data Corp., Dept. EM, 1285 Forgewood Ave., Sunnyvale, Cal. 94085
Electro Optical Mechanisms, Dept. EM, 2865 Metropolitan Pl., Pomona, Cal. 91767
Fairchild Camera & Instr., Federal Systems Group, Dept. EM, 300 Robbins La., Syosset, N.Y. 11791
Heitz, Inc., Karl, Dept. EM, 979 Third Ave., New York, N.Y. 10022
Princeton Elctrn. Prods., Dept. EM, Box 101, New Brunswick, N.J. 08902
D Reticon Corp., Dept. EM, 910 Benicia Ave., Sunnyvale, Cal. 94086
D Teledyne Camera Sys., Dept. EM, 131 N. Fifth Ave., Arcadia, Cal. 91006

Cameras, Image Converter

General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 *
DM CAI, Div. Bourns Inc., Dept. EM, 550 W. Northwest Hwy., Barrington, Ill. 60010
Chemical Etching Equip. & Supply, Dept. EM, 6905 Beulah St, Alexandria, Va. 22310
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
Electro Optical Mechanisms, Dept. EM, 2865 Metropolitan Pl., Pomona, Cal. 91767
Integrated Photomatrix, Dept. EM, 1101 Bristol Rd., Mountainside, N.J. 07092
Princeton Elctrn. Prods., Dept. EM, Box 101, New Brunswick, N.J. 08902
D Reticon Corp., Dept. EM, 910 Benicia Ave., Sunnyvale, Cal. 94086
Westinghouse Electric Corp., Indl & Gov't Tube, Dept. EM, Westinghouse Circle, Horseheads, N.Y. 14845

Cameras, Infrared

M Barnes Engrg. Co., Dept. EM, 30 Commerce Rd., Stamford, Conn. 06902
Edmund Scientific Co., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007
Research Devices, Dept. EM, 616 Springfield Ave., Berkeley Heights, N.J. 07922

Cameras, Oscilloscope

Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 *
D **Philips Test & Measuring Instrs., Dept. EM, 85 McKee Dr., Mahwah, NJ 07430** *
DM CAI, Div. Bourns Inc., Dept. EM, 550 W. Northwest Hwy., Barrington, Ill. 60010
Dumont Oscilloscope Labs., Dept. EM, 40 Fairfield Pl., W. Caldwell, N.J. 07006
Edmund Scientific Co., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007
Heitz, Inc., Karl, Dept. EM, 979 Third Ave., New York, N.Y. 10022
Stoelting Co., Dept. EM, 1350 S. Kostner Ave., Chicago, Ill. 60623
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077

Cameras, Television

Colorado Video, Inc., Dept. EM, Box 928, Boulder, Colo. 80306 p. 1373
Ampex Corp., Dept. EM, 401 Broadway, Redwood City, Cal. 94063
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
D Apollo Lasers, Apollo Lasers, Inc., Dept. EM, 6357 Arizonia Cir, Los Angeles, Cal. 90045
National Security Systems, Dept. EM, 20 Beechwood Ave., Port Washington, N.Y. 11050
Sierra Scientific Corp., Dept. EM, 2189 Leghorn St., Mountain View, Cal. 94043
Teledyne Camera Sys., Dept. EM, 131 N. Fifth Ave., Arcadia, Cal. 91006
Trax Video Labs, Dept. EM, 2020 Milvia St., Berkeley, Cal. 94704
Video Automation Systems Inc., Dept. EM, Rte 1—Box 21A, Pound Ridge, N.Y. 10576
Westinghouse Electric Corp., Indl & Gov't Tube, Dept. EM, Westinghouse Circle, Horseheads, N.Y. 14845

Cameras, Video

Colorado Video, Inc., Dept. EM, Box 928, Boulder, Colo. 80306 p. 1373
DM CAI, Div. Bourns Inc., Dept. EM, 550 W. Northwest Hwy., Barrington, Ill. 60010
D Chafitz Engineering, Dept. EM, P.O. Box 2188, Rockville, Md. 20852
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
D Apollo Lasers, Apollo Lasers, Inc., Dept. EM, 6357 Arizonia Cir, Los Angeles, Cal. 90045
National Security Systems, Dept. EM, 20 Beechwood Ave., Port Washington, N.Y. 11050
Sierra Scientific Corp., Dept. EM, 2189 Leghorn St., Mountain View, Cal. 94043
Teledyne Camera Sys., Dept. EM, 131 N. Fifth Ave., Arcadia, Cal. 91006
Trax Video Labs, Dept. EM, 2020 Milvia St., Berkeley, Cal. 94704
Video Automation Systems Inc., Dept. EM, Rte 1—Box 21A, Pound Ridge, N.Y. 10576

Cams

Berg Inc., Winfred M., Dept. EM, 499 Ocean Ave., East Rockaway, N.Y. 11518
Emporium Specialties Co., Inc., Dept. EM, Box 65, Austin, Pa. 16720
Kahle Engrg. Co., Dept. EM, 3344 Hudson Ave., Union City, N.J. 07087
Kwikset Powdered Metal Prods., Kwikset Div-Emhart Inds. Inc., Dept. EM, Box 4250P, Anaheim, Cal. 92803
D Mechanical Engraving Co., Inc., Dept. EM, 4500 Bullard Ave, Bronx, New York 10470
PIC Design Div., Benrus Corp., Dept. EM, Benrus Center, Rte 7, Ridgefield, Conn. 06877

Cans & Flat Packs, Integrated Circuit—See Packages, Integrated Circuit

Cans, Capacitor, Relay, Semiconductor, Transformer, etc

Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 *
DM **Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012** *
Potter & Brumfield, Div of AMF, Dept. EM, P.O. Box 322, Princeton, Ind. 47671 *
D Heeger Inc., Dept. EM, 725 Ceres Ave., Los Angeles, Cal. 90021
Kentucky Electronics, Dept. EM, 1204 Ind'l Dr., Box 507, Owensboro, Ky. 42301
M Kinetron Corp., Dept. EM, 1416 Roller Rd, Asbury Park, N.J. 07712
M Plastic Capacitors, Inc., Dept. EM, 2623 N. Pulaski Rd., Chicago, Ill. 60639
Plessey Inc., Dept. EM, 320 Long Island Expwy. S., Melville, N.Y. 11746
D South Shore Metal Prods., Inc., Dept. EM, 88 E Allen Blvd., Farmingdale, N.Y. 11735
D Wadsworth Electric Mfg. Co., Dept. EM, 20 W. 11th St., Covington, Ky. 41011
M Zero Corp., Dept. EM, 777 Front St., Burbank, Cal. 91502

Capacitance Comparators—See Bridges, Capacitance

Capacitor Hardware

D **AAVID Engrg, Inc., Dept. EM, 30 Cook Ct., Laconia, N.H. 03246** *
D **Bivar, Inc., Dept. EM, 1617 E. Edinger Ave., Santa Ana, Cal. 92705** p. 1024
D **Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247** *
D **Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629** *
D Accessories for Electronics, Dept. EM, 800 Merrick Road, Baldwin, N.Y. 11510
DM Amrad Corp., Dept. EM, Box 876, Paris, Tex. 75460
D National Capacitor Supply, Dept. EM, 11731 Markon Dr, Garden Grove, Cal. 92641
Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247

Capacitor Leakage Indicators—See Testers, Capacitor

Capacitors, Air Cooled

M **Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550** *
High Energy Corp., Dept. EM, Lower Valley Rd., Parkesburg, Pa. 19365 p. 1150
M Condenser Products Corp., Dept. EM, Box 997, Brooksville, Fla. 33512
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013

Capacitors, Chip (For Microcircuits)

American Components, Inc., Dept. EM, 8th Avenue at Harry St., Conshohocken, Pa. 19428 p. 1058
M **American Technical Ceramics, Dept. EM, 1 Norden La., Huntington Sta., N.Y. 11746** p. 1060,1061
DM **AVX Ceramics, Dept. EM, Box 867, Myrtle Beach, S.C. 29577** p. 1066,1067
D **Centre Engrg., Dept. EM, 2820 E. College Ave., State College, Pa. 16801** *
Corning Glass Works, Corning Electronics, Dept. EM, Houghton Pk., Bldg. A-2, Corning, N.Y. 14830 *
High Energy Corp., Dept. EM, Lower Valley Rd., Parkesburg, Pa. 19365 p. 1150
International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 p. 1155
D **ITT Comps. Capacitors, Dept. EM, 1551 Osgood St., N. Andover, Mass. 01845** *
M **Johanson Dielectrics Inc., Dept. EM, Box 6456, Burbank, Cal. 91510** p. 1165

Microplex, Inc., Dept. EM, 2126 S. Lyon St., Santa Ana, Cal. 92705 p. 1186,1187
Nytronics Comps. Group Inc., Sub Nytronics, Dept. EM, Orange St., Darlington, S.C. 29532 p. 1197
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 *
M Republic Elctrns. Corp., Dept. EM, 176 E. 7th St., Paterson, NJ 07524 p. 1208
Semtech Corp., Dept. EM, 652 Mitchell Rd., Newbury Park, Cal. 91320 p. 1210,1211,3945
D Soshin Elec. Co., Dept. EM, 1-18-18 Nakamogome, Ota-Ku, Tokyo, Japan *
Spectrum Control, Inc., Dept. EM, 152 E. Main St., Fairview, Pa. 16415 *
DM Union Carbide Corp. Elctrns. Div., Components Dept., Dept. EM, Box 5928, Greenville, S.C. 29606 p. 1222-1224,1264,1265,1277,1278
DM Varadyne Industries, Inc., Dept. EM, 1520 Cloverfield Blvd., Santa Monica, Cal. 90404 p. 1284
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
Cal-R, Inc., Dept. EM, P.O. Box 1397, Santa Monica, Cal. 90406
D Centralab/USCC, Div. of Globe-Union Inc., Dept. EM, 4561 Colorado Blvd., Los Angeles, Cal. 90039
M Compex Corp., Dept. EM, 383 Kings Highway, Cherry Hill, N.J. 08034
Dielectric Laboratories, Inc., Dept. EM, 64 Clinton Rd, Fairfield, NJ 07006
Dionics, Dept. EM, 65 Rushmore St., Westbury, N.Y. 11590
Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
GTI/Capacitor Div., Dept. EM, 10060 Willow Creek Rd., San Diego, Cal. 92131
DM JFD Electronics Components Corp., Dept. EM, 1462 62nd St., Bklyn., N.Y. 11219
3M Company, Tech Ceramic Prods., Dept. EM, 3M Center 223-4S, St. Paul, MN. 55101
D MATSUO ELCTRNS, Dept. EM, 12831 Western Ave, Ste A, Garden Grove, Cal 92641
D Mepco/Electra, Inc., Dept. EM, Columbia Rd., Morristown, N.J. 07960
M.I.A.L. U.S.A., Inc., Dept. EM, 173 Franklin Ave., Nutley, N.J. 07110
Murata Corporation of America, Dept. EM, 1148 Franklin Rd., S.E., Marietta, Ga. 30067
M Murata Mfg. Co. Ltd., Dept. EM, 16, Kaiden Nishijin-cho, Nagaoka-Kyo-Shi, Kyoto, Japan
National Micronetics, Dept. EM, Route 28, West Hurley, NY 12136
D NCI, Inc., Dept. EM, 5900 Australian Ave., W. Palm Beach, Fla. 33407
M San Fernando Elec. Mfg., Dept. EM, 1501 1st St., San Fernando, Cal. 91341
DM Skottie Electronics Inc., Dept. EM, Line St., Archbold, Pa. 18403
Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
M Thinco Div. Hull Corp., Dept. EM, Davisville Rd., Hatboro, Pa. 19040
M Viclan Inc., Dept. EM, Box 81403, 7373A Engineer Rd., San Diego, Cal. 92138
M Vitramon North America, Div. Vitramon, Inc., Dept. EM, P. O. Box 544, Bridgeport, Conn 06601

Capacitors, Fixed, Air

M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 *
High Energy Corp., Dept. EM, Lower Valley Rd., Parkesburg, Pa. 19365 p. 1150
Jackson Bros., (London) Ltd., Dept. EM, 258 Bway., New York, N.Y. 10007 *
Johanson Mfg. Corp., Dept. EM, Box 329, Boonton, N.J. 07005 *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 *
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016

Capacitors, Fixed, Bathtub

Component Resch., Dept. EM, 1655-26 St., Santa Monica, Cal. 90404 *
D Elpac Components, Div. Elpac Elctrns., Dept. EM, 3131 So. Standard Ave., Santa Ana, Cal. 92705 *
M F-Dyne Elctrns., Dept. EM, 449 Howard Ave., Bridgeport, Conn. 06605 p. 1213
High Energy Corp., Dept. EM, Lower Valley Rd., Parkesburg, Pa. 19365 p. 1150
DM Nytronics Comps. Group Inc., Sub Nytronics, Dept. EM, Orange St., Darlington, S.C. 29532 *
PFC, Dept. EM, Community Dr., Great Neck, NY 11022 p. 1206,1207
M RF Interonics, Dept. EM, 100 Pine Air Dr., Bay Shore, N.Y. 11706 *
Southern Electronics Co., Dept. EM, 726 So. Flower St., Burbank, Cal. 91502 p. 1213
DM Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 *
M Wesco Electrical Co., Dept. EM, 201 Munson St., Greenfield, Mass. 01301 *
M Condenser Products Corp., Dept. EM, Box 997, Brooksville, Fla. 33512
Electrocube Inc., Dept. EM, 1710 So. Del Mar Ave., San Gabriel, Cal. 91776
Film Capacitors, Inc., Dept. EM, 100 8th St., Passaic, N.J. 07055
D Industrial Condenser Corp., Dept. EM, 3243 N. California Ave., Chicago, Ill. 60618
D National Capacitor Supply, Dept. EM, 11731 Markon Dr, Garden Grove, Cal. 92641
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
DM Plastic Capacitors, Inc., Dept. EM, 2623 N. Pulaski Rd., Chicago, Ill. 60639
DM San Fernando Elec. Mfg., Dept. EM, 1501 1st St., San Fernando, Cal. 91341
D Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
Standard Condenser Corp., Dept. EM, 1065 W. Addison St., Chicago, Ill. 60613

Capacitors, Fixed, Ceramic

DM American Components, Inc., Dept. EM, 8th Avenue at Harry St., Conshohocken, Pa. 19428 p. 1058,1059
M American Technical Ceramics, Dept. EM, 1 Norden La., Huntington Sta., N.Y. 11746 p. 1060,1061
Arco Electronics Inc., Dept. EM, 400 Moreland Rd., Commack, N.Y. 11725 p. 1057
DM AVX Ceramics, Dept. EM, Box 867, Myrtle Beach, S.C. 29577 p. 1063,1066-1071
Capar, Dept. EM, 303 Crossways Park Dr., Woodbury, N.Y. 11797 p. 1085
D Centre Engrg., Dept. EM, 2820 E. College Ave., State College, Pa. 16801 p. 1088,1089
DM Corning Glass Works, Corning Electronics, Dept. EM, Houghton Pk., Bldg. A-2, Corning, N.Y. 14830 p. 1087
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 *
High Energy Corp., Dept. EM, Lower Valley Rd., Parkesburg, Pa. 19365 p. 1150
Illinois Capacitor Inc., Dept. EM, 6284 W. Oakton, Morton Grove, Ill. 60053 p. 1151
D International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 p. 1155
D ISL Products Ltd. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803 p. 1154
D ITT Comps. Capacitors, Dept. EM, 1551 Osgood St., N. Andover, Mass. 01845 *
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 p. 1160,1162
DM Johanson Mfg. Corp., Dept. EM, Box 329, Boonton, N.J. 07005 *
M Johanson Dielectrics Inc., Dept. EM, Box 6456, Burbank, Cal. 91510 p. 1165
Microplex, Inc., Dept. EM, 2126 S. Lyon St., Santa Ana, Cal. 92705 p. 1186,1187
D Nytronics Comps. Group Inc., Sub Nytronics, Dept. EM, Orange St., Darlington, S.C. 29532 p. 1197
D Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 p. 1204
M Republic Elctrns. Corp., Dept. EM, 176 E. 7th St., Paterson, NJ 07524 p. 1208
M Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 *
Semtech Corp., Dept. EM, 652 Mitchell Rd., Newbury Park, Cal. 91320 p. 3945
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 *
D Spectrum Control, Inc., Dept. EM, 152 E. Main St., Fairview, Pa. 16415 p. 2642,2647,2648
DM Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 p. 1217
DM Union Carbide Corp. Elctrns. Div., Components Dept., Dept. EM, Box 5928, Greenville, S.C. 29606 p. 1222-1224,1266-1278
DM Varadyne Industries, Inc., Dept. EM, 1520 Cloverfield Blvd., Santa Monica, Cal. 90404 p. 1284,1285
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
DM Cal-R, Inc., Dept. EM, P.O. Box 1397, Santa Monica, Cal. 90406
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
M Capcon, Inc., Dept. EM, 147 W. 25th St., New York, N.Y. 10001
DM Centralab/USCC, Div. of Globe-Union Inc., Dept. EM, 4561 Colorado Blvd., Los Angeles, Cal. 90039
M Compex Corp., Dept. EM, 383 Kings Highway, Cherry Hill, N.J. 08034
Dielectric Laboratories, Inc., Dept. EM, 64 Clinton Rd, Fairfield, NJ 07006
DM Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
GTI/Capacitor Div., Dept. EM, 10060 Willow Creek Rd., San Diego, Cal. 92131
DM JFD Electronics Components Corp., Dept. EM, 1462 62nd St., Bklyn., N.Y. 11219
DM KD Components, Inc., Dept. EM, 3016 S. Orange Ave., Santa Ana, Cal. 92707
DM Mepco/Electra, Inc., Dept. EM, Columbia Rd., Morristown, N.J. 07960
M.I.A.L. U.S.A., Inc., Dept. EM, 173 Franklin Ave., Nutley, N.J. 07110
Morris Entprs, Dept. EM, 16799 Schoenborn St, Sepulveda, Cal. 91343
Murata Corporation of America, Dept. EM, 1148 Franklin Rd., S.E., Marietta, Ga. 30067
D Murata Mfg. Co. Ltd., Dept. EM, 16, Kaiden Nishijin-cho, Nagaoka-Kyo-Shi, Kyoto, Japan
D National Capacitor Supply, Dept. EM, 11731 Markon Dr, Garden Grove, Cal. 92641
D Nucleonic Prods., Dept. EM, Box 1454, 6660 Variel Ave., Canoga Pk., Cal. 91303
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Radio Materials Co., Div. P.R. Mallory, Dept. EM, 4242 W. Bryn Mawr Ave., Chicago, Ill. 60646
DM San Fernando Elec. Mfg., Dept. EM, 1501 1st St., San Fernando, Cal. 91341
DM Skottie Electronics Inc., Dept. EM, Line St., Archbold, Pa. 18403
DM Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
M Thinco Div. Hull Corp., Dept. EM, Davisville Rd., Hatboro, Pa. 19040
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013
M Viclan Inc., Dept. EM, Box 81403, 7373A Engineer Rd., San Diego, Cal. 92138
DM Vitramon North America, Div. Vitramon, Inc., Dept. EM, P. O. Box 544, Bridgeport, Conn. 06601

Capacitors, Fixed, Ceramic Disc—See Capacitor, Fixed, Ceramic

Capacitors, Fixed, Decade

Component Resch., Dept. EM, 1655-26 St., Santa Monica, Cal. 90404 *
D Cornell-Dubilier Electronics, Dept. EM, 150 Avenue "L", Newark, N.J. 07105 *
M F-Dyne Elctrns., Dept. EM, 449 Howard Ave., Bridgeport, Conn. 06605 p. 1213
Freed Transformer Co., Inc., Dept. EM, 1718 Weirfield St., Brooklyn, N.Y. 11227 p. 2749
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 *
High Energy Corp., Dept. EM, Lower Valley Rd., Parkesburg, Pa. 19365 p. 1150
Interelectronics Corp., Dept. EM, Interelectronics Park, 550 U.S. Rte. 303, Congers, N.Y. 10920 *
PFC, Dept. EM, Community Dr., Great Neck, NY 11022 *
Southern Electronics Co., Dept. EM, 726 So. Flower St., Burbank, Cal. 91502 p. 1213
DM Union Carbide Corp. Elctrns. Div., Components Dept., Dept. EM, Box 5928, Greenville, S.C. 29606 *

Wesco Electrical Co., Dept. EM, 201 Munson St., Greenfield, Mass. 01301 *
Electrocube Inc., Dept. EM, 1710 So. Del Mar Ave., San Gabriel, Cal. 91776
Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
Film Capacitors, Inc., Dept. EM, 100 8th St., Passaic, N.J. 07055
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
D San Fernando Elec. Mfg., Dept. EM, 1501 1st St., San Fernando, Cal. 91341

Capacitors, Fixed, Electrolytic (All Types)

D Arco Electronics Inc., Dept. EM, 400 Moreland Rd., Commack, N.Y. 11725 p. 1057
Capar, Dept. EM, 303 Crossways Park Dr., Woodbury, N.Y. 11797 p. 1079-1083
DM Cornell-Dubilier Electronics, Dept. EM, 150 Avenue "L", Newark, N.J. 07105 p. 1091-1099
D Corning Glass Works, Corning Electronics, Dept. EM, Houghton Pk., Bldg. A-2, Corning, N.Y. 14830 p. 1087
Fujitsu America, Inc., Component Sales Div., Dept. EM, 910 Sherwood Dr., Lake Bluff, Ill. 60044 p. 1149
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 *
High Energy Corp., Dept. EM, Lower Valley Rd., Parkesburg, Pa. 19365 p. 1150
D Illinois Capacitor Inc., Dept. EM, 6284 W. Oakton, Morton Grove, Ill. 60053 p. 1151
Inter-Tech. Grp., Inc., Dept. EM, Box 23, Irvington, N.Y. 10533 *
D International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 p. 1155
D ITT Comps. Capacitors, Dept. EM, 1551 Osgood St., N. Andover, Mass. 01845 p. 1156-1158
D Mallory Capacitor Co., Div. P.R. Mallory, Dept. EM, 3029 E. Washington, Box 372, Indianapolis, Ind. 46201 p. 1170-1185
D Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 p. 1203,1204
DM Sangamo Capacitor Div., Dept. EM, Box 128, Pickens, S.C. 29671 p. 1209
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 *
Southern Electronics Co., Dept. EM, 726 So. Flower St., Burbank, Cal. 91502 *
DM Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 p. 1216
DM Union Carbide Corp. Elctrns. Div., Components Dept., Dept. EM, Box 5928, Greenville, S.C. 29606 p. 1222-1265
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
D Callins Industries, Dept. EM, Box C, Greenfield, Tenn. 38230
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
M Hunter Stanley Elec., Dept. EM, 208 Russell St., Nashville, Tenn. 37213
D Industrial Condenser Corp., Dept. EM, 3243 N. California Ave., Chicago, Ill. 60618
DM Kahgan Electronics Corp., Dept. EM, 556 Peninsula Blvd., Hempstead, NY 11550
D Mepco/Electra, Inc., Dept. EM, Columbia Rd., Morristown, N.J. 07960
Murata Corporation of America, Dept. EM, 1148 Franklin Rd., S.E., Marietta, Ga. 30067
D National Capacitor Supply, Dept. EM, 11731 Markon Dr, Garden Grove, Cal. 92641
NCI, Inc., Dept. EM, 5900 Australian Ave., W. Palm Beach, Fla. 33407
DM Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
D SPECO Div, Components Specialties, Inc., Dept. EM, PO Box 624 1172 Rte 109, Linderhurst, NY 11757
DM Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
D Temtron Elctrns Ltd., Dept. EM, 138-69 Fran Lewis Blvd., Rosedale, N.Y. 12472
Tran Spectra Inc., Dept. EM, Box 9, Airport Rd., Greenfield, Tenn. 38230
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013

Capacitors, Fixed, Feedthru

M All-Tronics Inc., Dept. EM, 45 Bond St., Westbury, N.Y. 11590 *
DM AVX Ceramics, Dept. EM, Box 867, Myrtle Beach, S.C. 29577 *
Component Resch., Dept. EM, 1655-26 St., Santa Monica, Cal. 90404 *
D Cornell-Dubilier Electronics, Dept. EM, 150 Avenue "L", Newark, N.J. 07105 *
M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 *
D Elpac Components, Div. Elpac Elctrns., Dept. EM, 3131 So. Standard Ave., Santa Ana, Cal. 92705 *
M F-Dyne Elctrns., Dept. EM, 449 Howard Ave., Bridgeport, Conn. 06605 *
High Energy Corp., Dept. EM, Lower Valley Rd., Parkesburg, Pa. 19365 p. 1150
International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 *
D ISL Products Ltd. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803 p. 1154
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 *
Johanson Mfg. Corp., Dept. EM, Box 329, Boonton, N.J. 07005 *
M Johanson Dielectrics Inc., Dept. EM, Box 6456, Burbank, Cal. 91510 p. 1165
D Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 *
M RF Interonics, Dept. EM, 100 Pine Air Dr., Bay Shore, N.Y. 11706 *
M Rtron Corp., Dept. EM, 7324 Lawndale, Skokie, Ill. 60076 *
M Southern Electronics Co., Dept. EM, 726 So. Flower St., Burbank, Cal. 91502 *
D Spectrum Control, Inc., Dept. EM, 152 E. Main St., Fairview, Pa. 16415 p. 2642,2647,2648
D Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 *
Wesco Electrical Co., Dept. EM, 201 Munson St., Greenfield, Mass. 01301 *
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
M Capcon, Inc., Dept. EM, 147 W. 25th St., New York, N.Y. 10001
M Centralab/USCC, Div. of Globe-Union Inc., Dept. EM, 4561 Colorado Blvd., Los Angeles, Cal. 90039
Dielectric Laboratories, Inc., Dept. EM, 64 Clinton Rd, Fairfield, NJ 07006
M Dynamic Air Engrg, Inc., EMC Filter Div., Dept. EM, 620 E. Dyer Rd., Santa Ana, Cal. 92705
Electrocube Inc., Dept. EM, 1710 So. Del Mar Ave., San Gabriel, Cal. 91776
DM Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
Estes Engrg. Co., Dept. EM, 930 Marine Dr., Port Angeles, Wash. 98362
Film Capacitors, Inc., Dept. EM, 100 8th St., Passaic, N.J. 07055
Industrial Condenser Corp., Dept. EM, 3243 N. California Ave., Chicago, Ill. 60618
D Mepco/Electra, Inc., Dept. EM, Columbia Rd., Morristown, N.J. 07960
D Murata Mfg. Co. Ltd., Dept. EM, 16, Kaiden Nishijin-cho, Nagaoka-Kyo-Shi, Kyoto, Japan
D NCI, Inc., Dept. EM, 5900 Australian Ave., W. Palm Beach, Fla. 33407
Radio Materials Co., Div. P.R. Mallory, Dept. EM, 4242 W. Bryn Mawr Ave., Chicago, Ill. 60646
San Fernando Elec. Mfg., Dept. EM, 1501 1st St., San Fernando, Cal. 91341
Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648
DM Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
Standard Condenser Corp., Dept. EM, 1065 W. Addison St., Chicago, Ill. 60613
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013
Viclan Inc., Dept. EM, Box 81403, 7373A Engineer Rd., San Diego, Cal. 92138

Capacitors, Fixed, Film/Metalized

D Arco Electronics Inc., Dept. EM, 400 Moreland Rd., Commack, N.Y. 11725 *
M Axel Elctrns., Unit of General Signal, Dept. EM, 134-20 Jamaica Ave., Jamaica, N.Y. 11418 *
D Centre Engrg., Dept. EM, 2820 E. College Ave., State College, Pa. 16801 *
M Component Resch., Dept. EM, 1655-26 St., Santa Monica, Cal. 90404 p. 1100,1102,1103,1105-1110,1113-1141,1143
DM Cornell-Dubilier Electronics, Dept. EM, 150 Avenue "L", Newark, N.J. 07105 p. 1091
D Custom Elctrns., Dept. EM, Browne St., Oneonta, N.Y. 13820 p. 1146
D Datak Corp., Dept. EM, 65 Seventy-First St., Guttenberg, N.J. 07093 *
M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 *
D Elpac Components, Div. Elpac Elctrns., Dept. EM, 3131 So. Standard Ave., Santa Ana, Cal. 92705 p. 1147
M F-Dyne Elctrns., Dept. EM, 449 Howard Ave., Bridgeport, Conn. 06605 p. 1148
Fujitsu America, Inc., Component Sales Div., Dept. EM, 910 Sherwood Dr., Lake Bluff, Ill. 60044 p. 1149
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 *
High Energy Corp., Dept. EM, Lower Valley Rd., Parkesburg, Pa. 19365 p. 1150
D Illinois Capacitor Inc., Dept. EM, 6284 W. Oakton, Morton Grove, Ill. 60053 p. 1151
D , Independent Cable/Midwec, Dept. EM, Box 417 G, Scottsbluff, Neb. 69361 p. 1188
Inter-Tech. Grp., Inc., Dept. EM, Box 23, Irvington, N.Y. 10533 *
Interelectronics Corp., Dept. EM, Interelectronics Park, 550 U.S. Rte. 303, Congers, N.Y. 10920 *
D International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 p. 1155
D ISL Products Ltd. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803 p. 1153
D ITT Comps. Capacitors, Dept. EM, 1551 Osgood St., N. Andover, Mass. 01845 p. 1156
KDI Pyrofilm Corp, Dept. EM, 60 S. Jefferson Rd., Whippany, N.J. 07981 *
DM Nytronics Comps. Group Inc., Sub Nytronics, Dept. EM, Orange St., Darlington, S.C. 29532 p. 1190,1192-1196
D Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 *
PFC, Dept. EM, Community Dr., Great Neck, NY 11022 p. 1206,1207
M RF Interonics, Dept. EM, 100 Pine Air Dr., Bay Shore, N.Y. 11706 *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 *
M Southern Electronics Co., Dept. EM, 726 So. Flower St., Burbank, Cal. 91502 *
D Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 p. 1217
DM TRW Capacitors, Dept. EM, 301 West 'O' Str., Ogallala, Neb. 69153 Inside Back Cover, Vol. 1
DM Union Carbide Corp. Elctrns. Div., Components Dept., Dept. EM, Box 5928, Greenville, S.C. 29606 p. 1222,1223,1281,1282
M Wesco Electrical Co., Dept. EM, 201 Munson St., Greenfield, Mass. 01301 p. 1286
D Callins Industries, Dept. EM, Box C, Greenfield, Tenn. 38230
M Condenser Products Corp., Dept. EM, Box 997, Brooksville, Fla. 33512
Electrocube Inc., Dept. EM, 1710 So. Del Mar Ave., San Gabriel, Cal. 91776
Engineered Components Co., Dept. EM, 3580 Sacramento Dr., San Luis Obispo, Cal. 93401
Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
Film Capacitors, Inc., Dept. EM, 100 8th St., Passaic, N.J. 07055
D Industrial Condenser Corp., Dept. EM, 3243 N. California Ave., Chicago, Ill. 60618
D Matsuo Elec. Co., Dept. EM, 3-5, 3-chome, Sennari-chu, Toyonaka-shi, Osaka, Japan
Mepco/Electra, Inc., Dept. EM, Columbia Rd., Morristown, N.J. 07960
D National Capacitor Supply, Dept. EM, 11731 Markon Dr, Garden Grove, Cal. 92641
D Ill Tool Works, Illinois Tool Works, Inc., Dept. EM, 900 Follin La, S.E., Vienna, Va. 22180
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
DM Plastic Capacitors, Inc., Dept. EM, 2623 N. Pulaski Rd., Chicago, Ill. 60639
D Plessey Capacitors, Dept. EM, 5334 Sterling Center Dr., Westlake Village, Cal. 91361

Plessey Inc., Dept. EM, 320 Long Island Expwy. S., Melville, N.Y. 11746
Potter Co., Dept. EM, Box 337 North Hwy 51, Wesson, Miss. 39191
DM San Fernando Elec. Mfg., Dept. EM, 1501 1st St., San Fernando, Cal. 91341
Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648
DM Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
Standard Condenser Corp., Dept. EM, 1065 W. Addison St., Chicago, Ill. 60613
Tobe Deutschmann Labs., Inc., Dept. EM, Box 74, Canton, Mass. 02021
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013

Capacitors, Fixed for A-C Applications (Including Motor Start)

Axel Elctrns., Unit of General Signal, Dept. EM, 134-20 Jamaica Ave., Jamaica, N.Y. 11418 ..... *
M Component Resch., Dept. EM, 1655-26 St., Santa Monica, Cal. 90404 p. 1100, 1104, 1106, 1107, 1109, 1111, 1114-1129, 1134-1141, 1143
D Cornell-Dubilier Electronics, Dept. EM, 150 Avenue "L", Newark, N.J. 07105 p. 1091
D Elpac Components, Div. Elpac Elctrns., Dept. EM, 3131 So. Standard Ave., Santa Ana, Cal. 92705 ..... *
M F-Dyne Elctrns., Dept. EM, 449 Howard Ave., Bridgeport, Conn. 06605 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
High Energy Corp., Dept. EM, Lower Valley Rd., Parkesburg, Pa. 19365 p. 1150
Inter-Tech. Grp., Inc., Dept. EM, Box 23, Irvington, N.Y. 10533 ..... *
International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 p. 1155
D Mallory Capacitor Co., Div. P.R. Mallory, Dept. EM, 3029 E. Washington, Box 372, Indianapolis, Ind. 46201 ..... p. 1173,1185
D Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
M RF Interonics, Dept. EM, 100 Pine Air Dr., Bay Shore, N.Y. 11706 ..... *
DM Sangamo Capacitor Div., Dept. EM, Box 128, Pickens, S.C. 29671 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 ..... *
M Southern Electronics Co., Dept. EM, 726 So. Flower St., Burbank, Cal. 91502 *
D Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 p. 1216
TRW Capacitors, Dept. EM, 301 West 'O' Str., Ogallala, Neb. 69153 ..... *
D Varadyne Industries, Inc., Dept. EM, 1520 Cloverfield Blvd., Santa Monica, Cal. 90404 ..... *
M Wesco Electrical Co., Dept. EM, 201 Munson St., Greenfield, Mass. 01301 *
DM Aerovox Inds., Inc., Dept. EM, 740 Belleville Ave., New Bedford, Mass. 02741
M Capacitor Specialists, Dept. EM, P.O. Box 2052, Escondido, Cal. 92025
M Centralab/USCC, Div. of Globe-Union Inc., Dept. EM, 4561 Colorado Blvd., Los Angeles, Cal. 90039
D Electrocube Inc., Dept. EM, 1710 So. Del Mar Ave., San Gabriel, Cal. 91776
D Film Capacitors, Inc., Dept. EM, 100 8th St., Passaic, N.J. 07055
GTI/Capacitor Div., Dept. EM, 10060 Willow Creek Rd., San Diego, Cal. 92131
Industrial Condenser Corp., Dept. EM, 3243 N. California Ave., Chicago, Ill. 60618
D Mepco/Electra, Inc., Dept. EM, Columbia Rd., Morristown, N.J. 07960
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Plastic Capacitors, Inc., Dept. EM, 2623 N. Pulaski Rd., Chicago, Ill. 60639
Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648
D Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
D Temtron Elctrns Ltd., Dept. EM, 138-69 Fran Lewis Blvd., Rosedale, N.Y. 12472
Tran Spectra Inc., Dept. EM, Box 9, Airport Rd., Greenfield, Tenn. 38230
United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013

Capacitors, Fixed, Glass

American Technical Ceramics, Dept. EM, 1 Norden La., Huntington Sta., N.Y. 11746 ..... *
D Centre Engrg., Dept. EM, 2820 E. College Ave., State College, Pa. 16801 p. 1088
DM Corning Glass Works, Corning Electronics, Dept. EM, Houghton Pk., Bldg. A-2, Corning, N.Y. 14830 ..... p. 1087
M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 .. *
High Energy Corp., Dept. EM, Lower Valley Rd., Parkesburg, Pa. 19365 p. 1150
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 ..... p. 1160
D Varadyne Industries, Inc., Dept. EM, 1520 Cloverfield Blvd., Santa Monica, Cal. 90404 ..... p. 1285
Cal-R, Inc., Dept. EM, P.O. Box 1397, Santa Monica, Cal. 90406
Centralab/USCC, Div. of Globe-Union Inc., Dept. EM, 4561 Colorado Blvd., Los Angeles, Cal. 90039
D National Capacitor Supply, Dept. EM, 11731 Markon Dr, Garden Grove, Cal. 92641
M Thinco Div. Hull Corp., Dept. EM, Davisville Rd., Hatboro, Pa. 19040
DM Vitramon North America, Div. Vitramon, Inc., Dept. EM, P. O. Box 544, Bridgeport, Conn. 06601

Capacitors, Fixed, High Capacitance-Low Voltage (50 Volts & Under)

American Technical Ceramics, Dept. EM, 1 Norden La., Huntington Sta., N.Y. 11746 ..... p. 1061
DM Arco Electronics Inc., Dept. EM, 400 Moreland Rd., Commack, N.Y. 11725 *
AVX Ceramics, Dept. EM, Box 867, Myrtle Beach, S.C. 29577 .... p. 1063-1067
D Centre Engrg., Dept. EM, 2820 E. College Ave., State College, Pa. 16801 p. 1088,1089
M Component Resch., Dept. EM, 1655-26 St., Santa Monica, Cal. 90404 p. 1104,1111
D Cornell-Dubilier Electronics, Dept. EM, 150 Avenue "L", Newark, N.J. 07105 p. 1094-1099
D Corning Glass Works, Corning Electronics, Dept. EM, Houghton Pk., Bldg. A-2, Corning, N.Y. 14830 ..... *
D Custom Elctrns., Dept. EM, Browne St., Oneonta, N.Y. 13820 ..... p. 1146
M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 .. *
D Elpac Components, Div. Elpac Elctrns., Dept. EM, 3131 So. Standard Ave., Santa Ana, Cal. 92705 ..... *
M F-Dyne Elctrns., Dept. EM, 449 Howard Ave., Bridgeport, Conn. 06605 p. 1148
Fujitsu America, Inc., Component Sales Div., Dept. EM, 910 Sherwood Dr., Lake Bluff, Ill. 60044 ..... p. 1149
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
High Energy Corp., Dept. EM, Lower Valley Rd., Parkesburg, Pa. 19365 p. 1150
D Illinois Capacitor Inc., Dept. EM, 6284 W. Oakton, Morton Grove, Ill. 60053 p. 1151
D Independent Cable/Midwec, Dept. EM, Box 417 G, Scottsbluff, Neb. 69361 p. 1188
Inter-Tech. Grp., Inc., Dept. EM, Box 23, Irvington, N.Y. 10533 ..... *
Interelectronics Corp., Dept. EM, Interelectronics Park, 550 U.S. Rte. 303, Congers, N.Y. 10920 ..... *
D International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 *
D ITT Comps. Capacitors, Dept. EM, 1551 Osgood St., N. Andover, Mass. 01845 ..... *
Johanson Mfg. Corp., Dept. EM, Box 329, Boonton, N.J. 07005 ..... *
M Johanson Dielectrics Inc., Dept. EM, Box 6456, Burbank, Cal. 91510 .. p. 1165
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Nytronics Comps. Group Inc., Sub Nytronics, Dept. EM, Orange St., Darlington, S.C. 29532 ..... *
D Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
M Republic Elctrns. Corp., Dept. EM, 176 E. 7th St., Paterson, NJ 07524 p. 1208
M RF Interonics, Dept. EM, 100 Pine Air Dr., Bay Shore, N.Y. 11706 ..... *
DM Sangamo Capacitor Div., Dept. EM, Box 128, Pickens, S.C. 29671 ..... p. 1209
Semtech Corp., Dept. EM, 652 Mitchell Rd., Newbury Park, Cal. 91320 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Soshin Elec. Co., Dept. EM, 1-18-18 Nakamogome, Ota-Ku, Tokyo, Japan .. *
M Southern Electronics Co., Dept. EM, 726 So. Flower St., Burbank, Cal. 91502 *
Spectrum Control, Inc., Dept. EM, 152 E. Main St., Fairview, Pa. 16415 ..... *
D Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 p. 1216
TRW Capacitors, Dept. EM, 301 West 'O' Str., Ogallala, Neb. 69153 ..... *
DM Union Carbide Corp. Elctrns. Div., Components Dept., Dept. EM, Box 5928, Greenville, S.C. 29606 p. 1222-1231,1236-1240,1244-1246,1249-1262,1264,1265
DM Varadyne Industries, Inc., Dept. EM, 1520 Cloverfield Blvd., Santa Monica, Cal. 90404 ..... *
Wesco Electrical Co., Dept. EM, 201 Munson St., Greenfield, Mass. 01301 p. 1288
D Callins Industries, Dept. EM, Box C, Greenfield, Tenn. 38230
M Centralab/USCC, Div. of Globe-Union Inc., Dept. EM, 4561 Colorado Blvd., Los Angeles, Cal. 90039
Dielectric Laboratories, Inc., Dept. EM, 64 Clinton Rd, Fairfield, NJ 07006
D Electrocube Inc., Dept. EM, 1710 So. Del Mar Ave., San Gabriel, Cal. 91776
DM Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
Film Capacitors, Inc., Dept. EM, 100 8th St., Passaic, N.J. 07055
GTI/Capacitor Div., Dept. EM, 10060 Willow Creek Rd., San Diego, Cal. 92131
M Hunter Stanley Elec., Dept. EM, 208 Russell St., Nashville, Tenn. 37213
D Industrial Condenser Corp., Dept. EM, 3243 N. California Ave., Chicago, Ill. 60618
DM JFD Electronics Components Corp., Dept. EM, 1462 62nd St., Bklyn., N.Y. 11219
Murata Corporation of America, Dept. EM, 1148 Franklin Rd., S.E., Marietta, Ga. 30067
D Murata Mfg. Co. Ltd., Dept. EM, 16, Kaiden Nishijin-cho, Nagaoka-Kyo-Shi, Kyoto, Japan
D National Capacitor Supply, Dept. EM, 11731 Markon Dr, Garden Grove, Cal. 92641
NCI, Inc., Dept. EM, 5900 Australian Ave., W. Palm Beach, Fla. 33407
D Radio Materials Co., Div. P.R. Mallory, Dept. EM, 4242 W. Bryn Mawr Ave., Chicago, Ill. 60646
DM San Fernando Elec. Mfg., Dept. EM, 1501 1st St., San Fernando, Cal. 91341
Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648
DM Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
Standard Condenser Corp., Dept. EM, 1065 W. Addison St., Chicago, Ill. 60613
Tran Spectra Inc., Dept. EM, Box 9, Airport Rd., Greenfield, Tenn. 38230
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013
Vitramon North America, Div. Vitramon, Inc., Dept. EM, P. O. Box 544, Bridgeport, Conn. 06601

Capacitors, Fixed, High-Temperature (Over 125 C)

American Technical Ceramics, Dept. EM, 1 Norden La., Huntington Sta., N.Y. 11746 ..... p. 1061
DM Arco Electronics Inc., Dept. EM, 400 Moreland Rd., Commack, N.Y. 11725 *
AVX Ceramics, Dept. EM, Box 867, Myrtle Beach, S.C. 29577 ..... *
M Axel Elctrns., Unit of General Signal, Dept. EM, 134-20 Jamaica Ave., Jamaica, N.Y. 11418 ..... *
Component Resch., Dept. EM, 1655-26 St., Santa Monica, Cal. 90404 p. 1100,1126,1127,1134-1137
Cornell-Dubilier Electronics, Dept. EM, 150 Avenue "L", Newark, N.J. 07105 p. 1091,1097-1099
DM Custom Elctrns., Dept. EM, Browne St., Oneonta, N.Y. 13820 ..... p. 1146
M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 .. *
D Elpac Components, Div. Elpac Elctrns., Dept. EM, 3131 So. Standard Ave., Santa Ana, Cal. 92705 ..... *
M F-Dyne Elctrns., Dept. EM, 449 Howard Ave., Bridgeport, Conn. 06605 p. 1148
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *

High Energy Corp., Dept. EM, Lower Valley Rd., Parkesburg, Pa. 19365 p. 1150
, Independent Cable/Midwec, Dept. EM, Box 417 G, Scottsbluff, Neb. 69361 *
Interelectronics Corp., Dept. EM, Interelectronics Park, 550 U.S. Rte. 303, Congers, N.Y. 10920 *
Johanson Mfg. Corp., Dept. EM, Box 329, Boonton, N.J. 07005 *
M Johanson Dielectrics Inc., Dept. EM, Box 6456, Burbank, Cal. 91510 *
DM Mallory Capacitor Co., Div. P.R. Mallory, Dept. EM, 3029 E. Washington, Box 372, Indianapolis, Ind. 46201 p. 1171
D Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 *
M Republic Elctrns. Corp., Dept. EM, 176 E. 7th St., Paterson, NJ 07524 *
M RF Interonics, Dept. EM, 100 Pine Air Dr., Bay Shore, N.Y. 11706 *
Semtech Corp., Dept. EM, 652 Mitchell Rd., Newbury Park, Cal. 91320 *
DM Soshin Elec. Co., Dept. EM, 1-18-18 Nakamogome, Ota-Ku, Tokyo, Japan *
M Southern Electronics Co., Dept. EM, 726 So. Flower St., Burbank, Cal. 91502 *
D Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 p. 1216,1217
TRW Capacitors, Dept. EM, 301 West 'O' Str., Ogallala, Neb. 69153 *
Varadyne Industries, Inc., Dept. EM, 1520 Cloverfield Blvd., Santa Monica, Cal. 90404 *
Wesco Electrical Co., Dept. EM, 201 Munson St., Greenfield, Mass. 01301 *
D Callins Industries, Dept. EM, Box C, Greenfield, Tenn. 38230
M Centralab/USCC, Div. of Globe-Union Inc., Dept. EM, 4561 Colorado Blvd., Los Angeles, Cal. 90039
M Condenser Products Corp., Dept. EM, Box 997, Brooksville, Fla. 33512
Dielectric Laboratories, Inc., Dept. EM, 64 Clinton Rd, Fairfield, NJ 07006
Electrocube Inc., Dept. EM, 1710 So. Del Mar Ave., San Gabriel, Cal. 91776
D Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
Film Capacitors, Inc., Dept. EM, 100 8th St., Passaic, N.J. 07055
DM JFD Electronics Components Corp., Dept. EM, 1462 62nd St., Bklyn., N.Y. 11219
DM KD Components, Inc., Dept. EM, 3016 S. Orange Ave., Santa Ana, Cal. 92707
Murata Corporation of America, Dept. EM, 1148 Franklin Rd., S.E., Marietta, Ga. 30067
D Murata Mfg. Co. Ltd., Dept. EM, 16, Kaiden Nishijin-cho, Nagaoka-Kyo-Shi, Kyoto, Japan
D National Capacitor Supply, Dept. EM, 11731 Markon Dr, Garden Grove, Cal. 92641
NCI, Inc., Dept. EM, 5900 Australian Ave., W. Palm Beach, Fla. 33407
M Plastic Capacitors, Inc., Dept. EM, 2623 N. Pulaski Rd., Chicago, Ill. 60639
DM San Fernando Elec. Mfg., Dept. EM, 1501 1st St., San Fernando, Cal. 91341
Simmonds Precision, Engine Systems Div., Dept. EM, Norwich, N.Y. 13815
M Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
Tobe Deutschmann Labs., Inc., Dept. EM, Box 74, Canton, Mass. 02021
Tran Spectra Inc., Dept. EM, Box 9, Airport Rd., Greenfield, Tenn. 38230
DM Vitramon North America, Div. Vitramon, Inc., Dept. EM, P. O. Box 544, Bridgeport, Conn. 06601

Capacitors, Fixed, High Voltage (1,000 Volts or Over)

American Technical Ceramics, Dept. EM, 1 Norden La., Huntington Sta., N.Y. 11746 p. 1061
D Arco Electronics Inc., Dept. EM, 400 Moreland Rd., Commack, N.Y. 11725 p. 1057
M Axel Elctrns., Unit of General Signal, Dept. EM, 134-20 Jamaica Ave., Jamaica, N.Y. 11418 p. 1074-1077
Component Resch., Dept. EM, 1655-26 St., Santa Monica, Cal. 90404 *
D Cornell-Dubilier Electronics, Dept. EM, 150 Avenue "L", Newark, N.J. 07105 p. 1091
DM Custom Elctrns., Dept. EM, Browne St., Oneonta, N.Y. 13820 *
M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 *
D Elpac Components, Div. Elpac Elctrns., Dept. EM, 3131 So. Standard Ave., Santa Ana, Cal. 92705 *
M F-Dyne Elctrns., Dept. EM, 449 Howard Ave., Bridgeport, Conn. 06605 p. 1148,1213
General Elec. Co., Elctrn. Comp. Sis., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 *
High Energy Corp., Dept. EM, Lower Valley Rd., Parkesburg, Pa. 19365 p. 1150
M Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509 *
D Illinois Capacitor Inc., Dept. EM, 6284 W. Oakton, Morton Grove, Ill. 60053 p. 1151
, Independent Cable/Midwec, Dept. EM, Box 417 G, Scottsbluff, Neb. 69361 p. 1188
Inter-Tech. Grp., Inc., Dept. EM, Box 23, Irvington, N.Y. 10533 *
Interelectronics Corp., Dept. EM, Interelectronics Park, 550 U.S. Rte. 303, Congers, N.Y. 10920 *
D ISL Products Ltd. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803 *
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 p. 1162
Johanson Mfg. Corp., Dept. EM, Box 329, Boonton, N.J. 07005 *
M Johanson Dielectrics Inc., Dept. EM, Box 6456, Burbank, Cal. 91510 p. 1165
Nytronics Comps. Group Inc., Sub Nytronics, Dept. EM, Orange St., Darlington, S.C. 29532 p. 1195,1199-1201
D Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 p. 1202
PFC, Dept. EM, Community Dr., Great Neck, NY 11022 p. 1206
M RF Interonics, Dept. EM, 100 Pine Air Dr., Bay Shore, N.Y. 11706 *
M Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 *
Sangamo Capacitor Div., Dept. EM, Box 128, Pickens, S.C. 29671 *
Semtech Corp., Dept. EM, 652 Mitchell Rd., Newbury Park, Cal. 91320 p. 1210,1211,3945
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 *
Southern Electronics Co., Dept. EM, 726 So. Flower St., Burbank, Cal. 91502 p. 1213
D Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 p. 1217
TRW Capacitors, Dept. EM, 301 West 'O' Str., Ogallala, Neb. 69153 *
Wesco Electrical Co., Dept. EM, 201 Munson St., Greenfield, Mass. 01301 *
M Aerovox Inds., Inc., Dept. EM, 740 Belleville Ave., New Bedford, Mass. 02741
DM Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
M Capacitor Specialists, Dept. EM, P.O. Box 2052, Escondido, Cal. 92025
M Condenser Products Corp., Dept. EM, Box 997, Brooksville, Fla. 33512
Dielectric Laboratories, Inc., Dept. EM, 64 Clinton Rd, Fairfield, NJ 07006
D Electrocube Inc., Dept. EM, 1710 So. Del Mar Ave., San Gabriel, Cal. 91776
D Epic, Inc., Dept. EM, 150 Nassau St., New York, N.Y. 10038
D Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
Film Capacitors, Inc., Dept. EM, 100 8th St., Passaic, N.J. 07055
GTI/Capacitor Div., Dept. EM, 10060 Willow Creek Rd., San Diego, Cal. 92131
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St., Culver City, Cal. 90230
D Industrial Condenser Corp., Dept. EM, 3243 N. California Ave., Chicago, Ill. 60618
DM KD Components, Inc., Dept. EM, 3016 S. Orange Ave., Santa Ana, Cal. 92707
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602
M.I.A.L. U.S.A., Inc., Dept. EM, 173 Franklin Ave., Nutley, N.J. 07110
Murata Corporation of America, Dept. EM, 1148 Franklin Rd., S.E., Marietta, Ga. 30067
D Murata Mfg. Co. Ltd., Dept. EM, 16, Kaiden Nishijin-cho, Nagaoka-Kyo-Shi, Kyoto, Japan
D Nucleonic Prods., Dept. EM, Box 1454, 6660 Variel Ave., Canoga Pk., Cal. 91303
DM Plastic Capacitors, Inc., Dept. EM, 2623 N. Pulaski Rd., Chicago, Ill. 60639
Potter Co., Dept. EM, Box 337 North Hwy 51, Wesson, Miss. 39191
D Radio Materials Co., Div. P.R. Mallory, Dept. EM, 4242 W. Bryn Mawr Ave., Chicago, Ill. 60646
DM San Fernando Elec. Mfg., Dept. EM, 1501 1st St., San Fernando, Cal. 91341
Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648
Simmonds Precision, Engine Systems Div., Dept. EM, Norwich, N.Y. 13815
DM Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
Standard Condenser Corp., Dept. EM, 1065 W. Addison St., Chicago, Ill. 60613
Tobe Deutschmann Labs., Inc., Dept. EM, Box 74, Canton, Mass. 02021
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013
Vitramon North America, Div. Vitramon, Inc., Dept. EM, P. O. Box 544, Bridgeport, Conn. 06601

Capacitors, Fixed, Laboratory Standard

American Technical Ceramics, Dept. EM, 1 Norden La., Huntington Sta., N.Y. 11746 *
D Arco Electronics Inc., Dept. EM, 400 Moreland Rd., Commack, N.Y. 11725 *
Component Resch., Dept. EM, 1655-26 St., Santa Monica, Cal. 90404 p. 1100,1126,1127,1130-1141
M F-Dyne Elctrns., Dept. EM, 449 Howard Ave., Bridgeport, Conn. 06605 *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 *
High Energy Corp., Dept. EM, Lower Valley Rd., Parkesburg, Pa. 19365 p. 1150
PFC, Dept. EM, Community Dr., Great Neck, NY 11022 *
M Southern Electronics Co., Dept. EM, 726 So. Flower St., Burbank, Cal. 91502 *
Wesco Electrical Co., Dept. EM, 201 Munson St., Greenfield, Mass. 01301 *
M Centralab/USCC, Div. of Globe-Union Inc., Dept. EM, 4561 Colorado Blvd., Los Angeles, Cal. 90039
Dielectric Laboratories, Inc., Dept. EM, 64 Clinton Rd, Fairfield, NJ 07006
Electrocube Inc., Dept. EM, 1710 So. Del Mar Ave., San Gabriel, Cal. 91776
Film Capacitors, Inc., Dept. EM, 100 8th St., Passaic, N.J. 07055
Standard Condenser Corp., Dept. EM, 1065 W. Addison St., Chicago, Ill. 60613

Capacitors, Fixed, Mica

DM Arco Electronics Inc., Dept. EM, 400 Moreland Rd., Commack, N.Y. 11725 p. 1057
M Axel Elctrns., Unit of General Signal, Dept. EM, 134-20 Jamaica Ave., Jamaica, N.Y. 11418 p. 1073-1077
DM Cornell-Dubilier Electronics, Dept. EM, 150 Avenue "L", Newark, N.J. 07105 *
DM Custom Elctrns., Dept. EM, Browne St., Oneonta, N.Y. 13820 *
M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 *
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 *
High Energy Corp., Dept. EM, Lower Valley Rd., Parkesburg, Pa. 19365 p. 1150
DM Sangamo Capacitor Div., Dept. EM, Box 128, Pickens, S.C. 29671 *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 *
DM Soshin Elec. Co., Dept. EM, 1-18-18 Nakamogome, Ota-Ku, Tokyo, Japan p. 1212
DM Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 p. 1217
Standex Electronics, Dept. EM, 4538 Camberwell Rd., Cincinnati, Ohio 45209 *
M Capcon, Inc., Dept. EM, 147 W. 25th St., New York, N.Y. 10001
DM Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
DM Kahgan Electronics Corp., Dept. EM, 556 Peninsula Blvd., Hempstead, NY 11550
Materials for Elctrns., Dept. EM, 149-32 132nd St., Jamaica, N.Y. 11430
D National Capacitor Supply, Dept. EM, 11731 Markon Dr, Garden Grove, Cal. 92641
DM Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Simmonds Precision, Engine Systems Div., Dept. EM, Norwich, N.Y. 13815
DM Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
D Temtron Elctrns Ltd., Dept. EM, 138-69 Fran Lewis Blvd., Rosedale, N.Y. 12472
Tobe Deutschmann Labs., Inc., Dept. EM, Box 74, Canton, Mass. 02021

Capacitors, Fixed, Molded Composition

Arco Electronics Inc., Dept. EM, 400 Moreland Rd., Commack, N.Y. 11725 p. 1057
AVX Ceramics, Dept. EM, Box 867, Myrtle Beach, S.C. 29577 .... p. 1068-1071
Axel Elctrns., Unit of General Signal, Dept. EM, 134-20 Jamaica Ave., Jamaica, N.Y. 11418 ..... *
D Centre Engrg., Dept. EM, 2820 E. College Ave., State College, Pa. 16801 p. 1089
Cornell-Dubilier Electronics, Dept. EM, 150 Avenue "L", Newark, N.J. 07105 *
F-Dyne Elctrns., Dept. EM, 449 Howard Ave., Bridgeport, Conn. 06605 ..... *
Fujitsu America, Inc., Component Sales Div., Dept. EM, 910 Sherwood Dr., Lake Bluff, Ill. 60044 ..... *
High Energy Corp., Dept. EM, Lower Valley Rd., Parkesburg, Pa. 19365 p. 1150
, Independent Cable/Midwec, Dept. EM, Box 417 G, Scottsbluff, Neb. 69361 *
Inter-Tech. Grp., Inc., Dept. EM, Box 23, Irvington, N.Y. 10533 ..... *
International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 *
D ISL Products Ltd. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803 p. 1152
D Mallory Capacitor Co., Div. P.R. Mallory, Dept. EM, 3029 E. Washington, Box 372, Indianapolis, Ind. 46201 ..... p. 1170
Nytronics Comps. Group Inc., Sub Nytronics, Dept. EM, Orange St., Darlington, S.C. 29532 ..... p. 1191,1197
DM Sangamo Capacitor Div., Dept. EM, Box 128, Pickens, S.C. 29671 ..... *
Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 p. 1216
TRW Capacitors, Dept. EM, 301 West 'O' Str., Ogallala, Neb. 69153 ..... *
D Union Carbide Corp. Elctrns. Div., Components Dept., Dept. EM, Box 5928, Greenville, S.C. 29606 ..... p. 1222
Centralab/USCC, Div. of Globe-Union Inc., Dept. EM, 4561 Colorado Blvd., Los Angeles, Cal. 90039
D Electrocube Inc., Dept. EM, 1710 So. Del Mar Ave., San Gabriel, Cal. 91776
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648

Capacitors, Fixed, Monolithic

DM American Components, Inc., Dept. EM, 8th Avenue at Harry St., Conshohocken, Pa. 19428 ..... p. 1058,1059
M American Technical Ceramics, Dept. EM, 1 Norden La., Huntington Sta., N.Y. 11746 ..... p. 1060,1061
D Arco Electronics Inc., Dept. EM, 400 Moreland Rd., Commack, N.Y. 11725 *
DM AVX Ceramics, Dept. EM, Box 867, Myrtle Beach, S.C. 29577 .... p. 1064,1065
D Centre Engrg., Dept. EM, 2820 E. College Ave., State College, Pa. 16801 .... *
DM Corning Glass Works, Corning Electronics, Dept. EM, Houghton Pk., Bldg. A-2, Corning, N.Y. 14830 ..... *
High Energy Corp., Dept. EM, Lower Valley Rd., Parkesburg, Pa. 19365 p. 1150
D ITT Comps. Capacitors, Dept. EM, 1551 Osgood St., N. Andover, Mass. 01845 ..... *
Johanson Mfg. Corp., Dept. EM, Box 329, Boonton, N.J. 07005 ..... *
Johanson Dielectrics Inc., Dept. EM, Box 6456, Burbank, Cal. 91510 .. p. 1165
M Republic Elctrns. Corp., Dept. EM, 176 E. 7th St., Paterson, NJ 07524 p. 1208
M Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... *
Semtech Corp., Dept. EM, 652 Mitchell Rd., Newbury Park, Cal. 91320 p. 3945
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Spectrum Control, Inc., Dept. EM, 152 E. Main St., Fairview, Pa. 16415 ..... *
DM Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 *
DM Union Carbide Corp. Elctrns. Div., Components Dept., Dept. EM, Box 5928, Greenville, S.C. 29606 ..... p. 1222,1266
DM Varadyne Industries, Inc., Dept. EM, 1520 Cloverfield Blvd., Santa Monica, Cal. 90404 ..... p. 1284,1285
DM Centralab/USCC, Div. of Globe-Union Inc., Dept. EM, 4561 Colorado Blvd., Los Angeles, Cal. 90039
Dielectric Laboratories, Inc., Dept. EM, 64 Clinton Rd, Fairfield, NJ 07006
DM Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
GTI/Capacitor Div., Dept. EM, 10060 Willow Creek Rd., San Diego, Cal. 92131
DM JFD Electronics Components Corp., Dept. EM, 1462 62nd St., Bklyn., N.Y. 11219
DM KD Components, Inc., Dept. EM, 3016 S. Orange Ave., Santa Ana, Cal. 92707
D Mepco/Electra, Inc., Dept. EM, Columbia Rd., Morristown, N.J. 07960
M.I.A.L. U.S.A., Inc., Dept. EM, 173 Franklin Ave., Nutley, N.J. 07110
Murata Corporation of America, Dept. EM, 1148 Franklin Rd., S.E., Marietta, Ga. 30067
D National Capacitor Supply, Dept. EM, 11731 Markon Dr, Garden Grove, Cal. 92641
Radio Materials Co., Div. P.R. Mallory, Dept. EM, 4242 W. Bryn Mawr Ave., Chicago, Ill. 60646
DM Skottie Electronics Inc., Dept. EM, Line St., Archbold, Pa. 18403
DM Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
M Thinco Div. Hull Corp., Dept. EM, Davisville Rd., Hatboro, Pa. 19040
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013
Unitrode, Dept. EM, 21044 Ventura Blvd., Box 548, Woodland Hills, Cal. 91364
M Viclan Inc., Dept. EM, Box 81403, 7373A Engineer Rd., San Diego, Cal. 92138
DM Vitramon North America, Div. Vitramon, Inc., Dept. EM, P. O. Box 544, Bridgeport, Conn. 06601

Capacitors, Fixed, Mylar, Metallized & Non-Metallized

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D Cornell-Dubilier Electronics, Dept. EM, 150 Avenue "L", Newark, N.J. 07105 *
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D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
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M Engineered Components Co., Dept. EM, 3580 Sacramento Dr., San Luis Obispo, Cal. 93401
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D Industrial Condenser Corp., Dept. EM, 3243 N. California Ave., Chicago, Ill. 60618
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D Nucleonic Prods., Dept. EM, Box 1454, 6660 Variel Ave., Canoga Pk., Cal. 91303
D Ill Tool Works, Illinois Tool Works, Inc., Dept. EM, 900 Follin La, S.E., Vienna, Va. 22180
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
DM Plastic Capacitors, Inc., Dept. EM, 2623 N. Pulaski Rd., Chicago, Ill. 60639
D Plessey Capacitors, Dept. EM, 5334 Sterling Center Dr., Westlake Village, Cal. 91361
Plessey Inc., Dept. EM, 320 Long Island Expwy. S., Melville, N.Y. 11746
Potter Co., Dept. EM, Box 337 North Hwy 51, Wesson, Miss. 39191
DM San Fernando Elec. Mfg., Dept. EM, 1501 1st St., San Fernando, Cal. 91341
Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648
D Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
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Capacitors, Fixed, Oil

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High Energy Corp., Dept. EM, Lower Valley Rd., Parkesburg, Pa. 19365 p. 1150
Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509 ..... *
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D Mallory Capacitor Co., Div. P.R. Mallory, Dept. EM, 3029 E. Washington, Box 372, Indianapolis, Ind. 46201 ..... p. 1185
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M RF Interonics, Dept. EM, 100 Pine Air Dr., Bay Shore, N.Y. 11706 ..... *
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M Condenser Products Corp., Dept. EM, Box 997, Brooksville, Fla. 33512

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D National Capacitor Supply, Dept. EM, 11731 Markon Dr, Garden Grove, Cal. 92641
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M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 *
D Elpac Components, Div. Elpac Elctrns., Dept. EM, 3131 So. Standard Ave., Santa Ana, Cal. 92705 *
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 *
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D International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 *
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DM Nytronics Comps. Group Inc., Sub Nytronics, Dept. EM, Orange St., Darlington, S.C. 29532 p. 1195,1198,1199
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D Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
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Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509 *
Inter-Tech. Grp., Inc., Dept. EM, Box 23, Irvington, N.Y. 10533 *
D Mallory Capacitor Co., Div. P.R. Mallory, Dept. EM, 3029 E. Washington, Box 372, Indianapolis, Ind. 46201 *
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 *
D Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 *
TRW Capacitors, Dept. EM, 301 West 'O' Str., Ogallala, Neb. 69153 *
Capacitor Specialists, Dept. EM, P.O. Box 2052, Escondido, Cal. 92025
M Condenser Products Corp., Dept. EM, Box 997, Brooksville, Fla. 33512
Electrocube Inc., Dept. EM, 1710 So. Del Mar Ave., San Gabriel, Cal. 91776
Film Capacitors, Inc., Dept. EM, 100 8th St., Passaic, N.J. 07055
D Industrial Condenser Corp., Dept. EM, 3243 N. California Ave., Chicago, Ill. 60618
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Plastic Capacitors, Inc., Dept. EM, 2623 N. Pulaski Rd., Chicago, Ill. 60639
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Capacitors, Fixed Plastic

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M Component Resch., Dept. EM, 1655-26 St., Santa Monica, Cal. 90404 p. 1100,1102-1111,1113-1125,1130-1142
D Elpac Components, Div. Elpac Elctrns., Dept. EM, 3131 So. Standard Ave., Santa Ana, Cal. 92705 *
F-Dyne Elctrns., Dept. EM, 449 Howard Ave., Bridgeport, Conn. 06605 p. 1148,1213
Fujitsu America, Inc., Component Sales Div., Dept. EM, 910 Sherwood Dr., Lake Bluff, Ill. 60044 *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 *
High Energy Corp., Dept. EM, Lower Valley Rd., Parkesburg, Pa. 19365 p. 1150
, Independent Cable/Midwec, Dept. EM, Box 417 G, Scottsbluff, Neb. 69361 p. 1188
Inter-Tech. Grp., Inc., Dept. EM, Box 23, Irvington, N.Y. 10533 *
International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 *
I ISL Products Ltd. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803 p. 1153
ITT Comps. Capacitors, Dept. EM, 1551 Osgood St., N. Andover, Mass. 01845 *
Mallory Capacitor Co., Div. P.R. Mallory, Dept. EM, 3029 E. Washington, Box 372, Indianapolis, Ind. 46201 p. 1170
Nytronics Comps. Group Inc., Sub Nytronics, Dept. EM, Orange St., Darlington, S.C. 29532 p. 1192,1196
PFC, Dept. EM, Community Dr., Great Neck, NY 11022 p. 1206
Southern Electronics Co., Dept. EM, 726 So. Flower St., Burbank, Cal. 91502 p. 1213
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M Wesco Electrical Co., Dept. EM, 201 Munson St., Greenfield, Mass. 01301 p. 1288,1289
M Capacitor Specialists, Dept. EM, P.O. Box 2052, Escondido, Cal. 92025
M Capcon, Inc., Dept. EM, 147 W. 25th St., New York, N.Y. 10001
D Electrocube Inc., Dept. EM, 1710 So. Del Mar Ave., San Gabriel, Cal. 91776
D Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
Film Capacitors, Inc., Dept. EM, 100 8th St., Passaic, N.J. 07055
Industrial Condenser Corp., Dept. EM, 3243 N. California Ave., Chicago, Ill. 60618
M.I.A.L. U.S.A., Inc., Dept. EM, 173 Franklin Ave., Nutley, N.J. 07110
D National Capacitor Supply, Dept. EM, 11731 Markon Dr, Garden Grove, Cal. 92641
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Plastic Capacitors, Inc., Dept. EM, 2623 N. Pulaski Rd., Chicago, Ill. 60639
D Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666

Capacitors, Fixed, Polycarbonate, Metallized & Non-Metallized—See Capacitors, Fixed, Plastic

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Capacitors, Fixed, Polypropylene—See Capacitors, Fixed, Plastic

Capacitors, Fixed, Polystyrene—See Capacitors, Fixed, Plastic

Capacitors, Fixed, Polysulfone

Component Resch., Dept. EM, 1655-26 St., Santa Monica, Cal. 90404 p. 1100,1102,1110,1126-1129,1142,1143
D Elpac Components, Div. Elpac Elctrns., Dept. EM, 3131 So. Standard Ave., Santa Ana, Cal. 92705 *
M F-Dyne Elctrns., Dept. EM, 449 Howard Ave., Bridgeport, Conn. 06605 p. 1148,1213
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 *
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Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 *
TRW Capacitors, Dept. EM, 301 West 'O' Str., Ogallala, Neb. 69153 *
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Industrial Condenser Corp., Dept. EM, 3243 N. California Ave., Chicago, Ill. 60618
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
Standard Condenser Corp., Dept. EM, 1065 W. Addison St., Chicago, Ill. 60613

Capacitors, Fixed, Porcelain, Enamel

M American Technical Ceramics, Dept. EM, 1 Norden La., Huntington Sta., N.Y. 11746 p. 1060,1061
High Energy Corp., Dept. EM, Lower Valley Rd., Parkesburg, Pa. 19365 p. 1150
M Johanson Dielectrics Inc., Dept. EM, Box 6456, Burbank, Cal. 91510 *
M Republic Elctrns. Corp., Dept. EM, 176 E. 7th St., Paterson, NJ 07524 *
Dielectric Laboratories, Inc., Dept. EM, 64 Clinton Rd, Fairfield, NJ 07006
DM JFD Electronics Components Corp., Dept. EM, 1462 62nd St., Bklyn., N.Y. 11219
DM Vitramon North America, Div. Vitramon, Inc., Dept. EM, P. O. Box 544, Bridgeport, Conn. 06601

Capacitors, Fixed, Power Factor Correction

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M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 .. *
D Elpac Components, Div. Elpac Elctrns., Dept. EM, 3131 So. Standard Ave., Santa Ana, Cal. 92705 *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 *
High Energy Corp., Dept. EM, Lower Valley Rd., Parkesburg, Pa. 19365 ..... *
Interelectronics Corp., Dept. EM, Interelectronics Park, 550 U.S. Rte. 303, Congers, N.Y. 10920 *
M RF Interonics, Dept. EM, 100 Pine Air Dr., Bay Shore, N.Y. 11706 ..... *
Sangamo Capacitor Div., Dept. EM, Box 128, Pickens, S.C. 29671 ..... *
Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 *
TRW Capacitors, Dept. EM, 301 West 'O' Str., Ogallala, Neb. 69153 ..... *
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Engineered Components Co., Dept. EM, 3580 Sacramento Dr., San Luis Obispo, Cal. 93401
Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Plastic Capacitors, Inc., Dept. EM, 2623 N. Pulaski Rd., Chicago, Ill. 60639
D Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013

Capacitors, Fixed, Pulse-Forming Network

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D Arco Electronics Inc., Dept. EM, 400 Moreland Rd., Commack, N.Y. 11725 *
M Axel Elctrns., Unit of General Signal, Dept. EM, 134-20 Jamaica Ave., Jamaica, N.Y. 11418 *
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Cornell-Dubilier Electronics, Dept. EM, 150 Avenue "L", Newark, N.J. 07105 *
DM Custom Elctrns., Dept. EM, Browne St., Oneonta, N.Y. 13820 ..... *
M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 .. *
D Elpac Components, Div. Elpac Elctrns., Dept. EM, 3131 So. Standard Ave., Santa Ana, Cal. 92705 *
M F-Dyne Elctrns., Dept. EM, 449 Howard Ave., Bridgeport, Conn. 06605 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 *
High Energy Corp., Dept. EM, Lower Valley Rd., Parkesburg, Pa. 19365 p. 1150
Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509 ..... *
Inter-Tech. Grp., Inc., Dept. EM, Box 23, Irvington, N.Y. 10533 ..... *
PFC, Dept. EM, Community Dr., Great Neck, NY 11022 ..... *
D Soshin Elec. Co., Dept. EM, 1-18-18 Nakamogome, Ota-Ku, Tokyo, Japan .. *
M Southern Electronics Co., Dept. EM, 726 So. Flower St., Burbank, Cal. 91502 *
M Capacitor Specialists, Dept. EM, P.O. Box 2052, Escondido, Cal. 92025
Centralab/USCC, Div. of Globe-Union Inc., Dept. EM, 4561 Colorado Blvd., Los Angeles, Cal. 90039
M Condenser Products Corp., Dept. EM, Box 997, Brooksville, Fla. 33512
Engineered Components Co., Dept. EM, 3580 Sacramento Dr., San Luis Obispo, Cal. 93401
Film Capacitors, Inc., Dept. EM, 100 8th St., Passaic, N.J. 07055
D MATSUO ELCTRNS, Dept. EM, 12831 Western Ave, Ste A, Garden Grove, Cal 92641
Matsuo Elec. Co., Dept. EM, 3-5, 3-chome, Sennari-chu, Toyonaka-shi, Osaka, Japan
M.I.A.L. U.S.A., Inc., Dept. EM, 173 Franklin Ave., Nutley, N.J. 07110
D Nucleonic Prods., Dept. EM, Box 1454, 6660 Variel Ave., Canoga Pk., Cal. 91303
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Plastic Capacitors, Inc., Dept. EM, 2623 N. Pulaski Rd., Chicago, Ill. 60639
San Fernando Elec. Mfg., Dept. EM, 1501 1st St., San Fernando, Cal. 91341
Simmonds Precision, Engine Systems Div., Dept. EM, Norwich, N.Y. 13815
Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
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Capacitors, Fixed, TFE, & TFE, Metallized

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M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 .. *
D Elpac Components, Div. Elpac Elctrns., Dept. EM, 3131 So. Standard Ave., Santa Ana, Cal. 92705 *
M F-Dyne Elctrns., Dept. EM, 449 Howard Ave., Bridgeport, Conn. 06605 ..... *
High Energy Corp., Dept. EM, Lower Valley Rd., Parkesburg, Pa. 19365 p. 1150
Interelectronics Corp., Dept. EM, Interelectronics Park, 550 U.S. Rte. 303, Congers, N.Y. 10920 *
PFC, Dept. EM, Community Dr., Great Neck, NY 11022 ..... *
M Southern Electronics Co., Dept. EM, 726 So. Flower St., Burbank, Cal. 91502 *
Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 p. 1216
TRW Capacitors, Dept. EM, 301 West 'O' Str., Ogallala, Neb. 69153 ..... *
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Plastic Capacitors, Inc., Dept. EM, 2623 N. Pulaski Rd., Chicago, Ill. 60639
San Fernando Elec. Mfg., Dept. EM, 1501 1st St., San Fernando, Cal. 91341
Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
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Capacitors, Fixed, TFE, Metallized—Capacitors, Fixed, TFE, & TFE, Metallized

Capacitors, Fixed, Temperature Compensating

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DM AVX Ceramics, Dept. EM, Box 867, Myrtle Beach, S.C. 29577 ..... *
D Centre Engrg., Dept. EM, 2820 E. College Ave., State College, Pa. 16801 .... *
Component Resch., Dept. EM, 1655-26 St., Santa Monica, Cal. 90404 p. 1100,1114-1131,1133-1141
D Cornell-Dubilier Electronics, Dept. EM, 150 Avenue "L", Newark, N.J. 07105 *
D Custom Elctrns., Dept. EM, Browne St., Oneonta, N.Y. 13820 ..... *
D Elpac Components, Div. Elpac Elctrns., Dept. EM, 3131 So. Standard Ave., Santa Ana, Cal. 92705 *
M F-Dyne Elctrns., Dept. EM, 449 Howard Ave., Bridgeport, Conn. 06605 ..... *
High Energy Corp., Dept. EM, Lower Valley Rd., Parkesburg, Pa. 19365 p. 1150
Interelectronics Corp., Dept. EM, Interelectronics Park, 550 U.S. Rte. 303, Congers, N.Y. 10920 *
D International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 *
D ISL Products Ltd. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803 *
Johanson Mfg. Corp., Dept. EM, Box 329, Boonton, N.J. 07005 ..... *
Johanson Dielectrics Inc., Dept. EM, Box 6456, Burbank, Cal. 91510 ..... *
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PFC, Dept. EM, Community Dr., Great Neck, NY 11022 ..... *
M Republic Elctrns. Corp., Dept. EM, 176 E. 7th St., Paterson, NJ 07524 p. 1208
Semtech Corp., Dept. EM, 652 Mitchell Rd., Newbury Park, Cal. 91320 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
DM Soshin Elec. Co., Dept. EM, 1-18-18 Nakamogome, Ota-Ku, Tokyo, Japan .. *
M Southern Electronics Co., Dept. EM, 726 So. Flower St., Burbank, Cal. 91502 *
D Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 p. 1217
TRW Capacitors, Dept. EM, 301 West 'O' Str., Ogallala, Neb. 69153 ..... *
DM Centralab/USCC, Div. of Globe-Union Inc., Dept. EM, 4561 Colorado Blvd., Los Angeles, Cal. 90039
Dielectric Laboratories, Inc., Dept. EM, 64 Clinton Rd, Fairfield, NJ 07006
Engineered Components Co., Dept. EM, 3580 Sacramento Dr., San Luis Obispo, Cal. 93401
DM Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
Murata Corporation of America, Dept. EM, 1148 Franklin Rd., S.E., Marietta, Ga. 30067
D Murata Mfg. Co. Ltd., Dept. EM, 16, Kaiden Nishijin-cho, Nagaoka-Kyo-Shi, Kyoto, Japan
D Nucleonic Prods., Dept. EM, Box 1454, 6660 Variel Ave., Canoga Pk., Cal. 91303
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Radio Materials Co., Div. P.R. Mallory, Dept. EM, 4242 W. Bryn Mawr Ave., Chicago, Ill. 60646
Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648
D Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013
D Vitramon North America, Div. Vitramon, Inc., Dept. EM, P. O. Box 544, Bridgeport, Conn. 06601

Capacitors, Fixed, Vacuum

High Energy Corp., Dept. EM, Lower Valley Rd., Parkesburg, Pa. 19365 p. 1150
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 ..... p. 1160,1162
DM Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802

Capacitors, Overvoltage Protected

M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 .. *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 *
High Energy Corp., Dept. EM, Lower Valley Rd., Parkesburg, Pa. 19365 p. 1150
Inter-Tech. Grp., Inc., Dept. EM, Box 23, Irvington, N.Y. 10533 ..... *
D Varadyne Industries, Inc., Dept. EM, 1520 Cloverfield Blvd., Santa Monica, Cal. 90404 ..... *
Centralab/USCC, Div. of Globe-Union Inc., Dept. EM, 4561 Colorado Blvd., Los Angeles, Cal. 90039
Engineered Components Co., Dept. EM, 3580 Sacramento Dr., San Luis Obispo, Cal. 93401
D Film Capacitors, Inc., Dept. EM, 100 8th St., Passaic, N.J. 07055
Radio Materials Co., Div. P.R. Mallory, Dept. EM, 4242 W. Bryn Mawr Ave., Chicago, Ill. 60646

Capacitors, Variable, Air

Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... *
GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
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DM Johanson Mfg. Corp., Dept. EM, Box 329, Boonton, N.J. 07005 ..... p. 1164
D Johnson Co., E.F., Dept. EM, 299 10th SW Ave., Waseca, Minn. 56093 p. 1168
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *

D **Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094** ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
DM **Sprague-Goodman Electronics, Inc., Dept. EM, 134 Fulton Ave., Garden City Park, N.Y. 11040** ..... *
D Barker & Williamson, Inc., Dept. EM, Canal St., Bristol, Pa. 19007
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
D Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
Hopt-Co., Karl, Dept. EM, 118 First Ave., Atlantic Highlands, N.J. 07716
DM JFD Electronics Components Corp., Dept. EM, 1462 62nd St., Bklyn., N.Y. 11219
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
TRW Auto-E, Dept. EM, Davis & Copewood Sts., Camden, N.J. 08103
DM Voltronics Corp., Dept. EM, West St., E. Hanover, N.J. 07936

Capacitors, Variable, Ceramic

D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
D **ISL Products Ltd. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803** p. 1154
DM **Johanson Mfg. Corp., Dept. EM, Box 329, Boonton, N.J. 07005** ..... p. 1164
D **Johnson Co., E.F., Dept. EM, 299 10th SW Ave., Waseca, Minn. 56093** p. 1166,1167
D **Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094** ..... p. 1204
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Spectrum Control, Inc., Dept. EM, 152 E. Main St., Fairview, Pa. 16415 ..... *
D **Sprague-Goodman Electronics, Inc., Dept. EM, 134 Fulton Ave., Garden City Park, N.Y. 11040** ..... p. 1215
Automatic Coil Corp., Sub. Designatronics Inc., Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
M Compex Corp., Dept. EM, 383 Kings Highway, Cherry Hill, N.J. 08034
DM Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
D JFD Electronics Components Corp., Dept. EM, 1462 62nd St., Bklyn., N.Y. 11219
D Mepco/Electra, Inc., Dept. EM, Columbia Rd., Morristown, N.J. 07960
Murata Corporation of America, Dept. EM, 1148 Franklin Rd., S.E., Marietta, Ga. 30067
D Murata Mfg. Co. Ltd., Dept. EM, 16, Kaiden Nishijin-cho, Nagaoka-Kyo-Shi, Kyoto, Japan
Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
DM Voltronics Corp., Dept. EM, West St., E. Hanover, N.J. 07936

Capacitors, Variable, Film

M **Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550** .. *
M **F-Dyne Elctrns., Dept. EM, 449 Howard Ave., Bridgeport, Conn. 06605** ..... *
Jackson Bros., (London) Ltd., Dept. EM, 258 Bway., New York, N.Y. 10007 *
D **Johnson Co., E.F., Dept. EM, 299 10th SW Ave., Waseca, Minn. 56093** ..... *
M **Southern Electronics Co., Dept. EM, 726 So. Flower St., Burbank, Cal. 91502** *
D **Sprague-Goodman Electronics, Inc., Dept. EM, 134 Fulton Ave., Garden City Park, N.Y. 11040** ..... p. 1215
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
Film Capacitors, Inc., Dept. EM, 100 8th St., Passaic, N.J. 07055
D Mepco/Electra, Inc., Dept. EM, Columbia Rd., Morristown, N.J. 07960
D Mitsumi Elec. Co., Ltd., Dept. EM, 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan
D National Capacitor Supply, Dept. EM, 11731 Markon Dr, Garden Grove, Cal. 92641
Plastic Capacitors, Inc., Dept. EM, 2623 N. Pulaski Rd., Chicago, Ill. 60639
D Voltronics Corp., Dept. EM, West St., E. Hanover, N.J. 07936

Capacitors, Variable, Gas

ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 ..... p. 1161

Capacitors, Variable, Glass

ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 ..... p. 1161
D **Johanson Mfg. Corp., Dept. EM, Box 329, Boonton, N.J. 07005** ..... *
DM **Sprague-Goodman Electronics, Inc., Dept. EM, 134 Fulton Ave., Garden City Park, N.Y. 11040** ..... p. 1215
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
D Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
DM JFD Electronics Components Corp., Dept. EM, 1462 62nd St., Bklyn., N.Y. 11219
D Murata Mfg. Co. Ltd., Dept. EM, 16, Kaiden Nishijin-cho, Nagaoka-Kyo-Shi, Kyoto, Japan
DM Voltronics Corp., Dept. EM, West St., E. Hanover, N.J. 07936

Capacitors, Variable, H-V (Lab Type) -Also See Decade Boxes, Capacitance

Arco Electronics Inc., Dept. EM, 400 Moreland Rd., Commack, N.Y. 11725 p. 1057
M **Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550** .. *
M **F-Dyne Elctrns., Dept. EM, 449 Howard Ave., Bridgeport, Conn. 06605** ..... *
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 ..... p. 1161
Jackson Bros., (London) Ltd., Dept. EM, 258 Bway., New York, N.Y. 10007 p. 1163
Johanson Mfg. Corp., Dept. EM, Box 329, Boonton, N.J. 07005 ..... *
PFC, Dept. EM, Community Dr., Great Neck, NY 11022 ..... *
M **Southern Electronics Co., Dept. EM, 726 So. Flower St., Burbank, Cal. 91502** *
DM **Sprague-Goodman Electronics, Inc., Dept. EM, 134 Fulton Ave., Garden City Park, N.Y. 11040** ..... *
DM JFD Electronics Components Corp., Dept. EM, 1462 62nd St., Bklyn., N.Y. 11219

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M **F-Dyne Elctrns., Dept. EM, 449 Howard Ave., Bridgeport, Conn. 06605** p. 1213
Johanson Mfg. Corp., Dept. EM, Box 329, Boonton, N.J. 07005 ..... *
M **Southern Electronics Co., Dept. EM, 726 So. Flower St., Burbank, Cal. 91502** p. 1213
DM **Sprague-Goodman Electronics, Inc., Dept. EM, 134 Fulton Ave., Garden City Park, N.Y. 11040** ..... *
D Film Capacitors, Inc., Dept. EM, 100 8th St., Passaic, N.J. 07055
DM JFD Electronics Components Corp., Dept. EM, 1462 62nd St., Bklyn., N.Y. 11219
D Mepco/Electra, Inc., Dept. EM, Columbia Rd., Morristown, N.J. 07960
DM Voltronics Corp., Dept. EM, West St., E. Hanover, N.J. 07936

Capacitors, Variable, Mica

D **Arco Electronics Inc., Dept. EM, 400 Moreland Rd., Commack, N.Y. 11725** p. 1057
D **Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094** ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Standex Electronics, Dept. EM, 4538 Camberwell Rd., Cincinnati, Ohio 45209 *
DM Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016

Capacitors, Variable, Neutralizing

Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... *
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 ..... *
Jackson Bros., (London) Ltd., Dept. EM, 258 Bway., New York, N.Y. 10007 *
DM **Sprague-Goodman Electronics, Inc., Dept. EM, 134 Fulton Ave., Garden City Park, N.Y. 11040** ..... *
DM JFD Electronics Components Corp., Dept. EM, 1462 62nd St., Bklyn., N.Y. 11219
D Voltronics Corp., Dept. EM, West St., E. Hanover, N.J. 07936

Capacitors, Variable, Padder

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DM **Sprague-Goodman Electronics, Inc., Dept. EM, 134 Fulton Ave., Garden City Park, N.Y. 11040** ..... p. 1215
Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
DM JFD Electronics Components Corp., Dept. EM, 1462 62nd St., Bklyn., N.Y. 11219
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Voltronics Corp., Dept. EM, West St., E. Hanover, N.J. 07936

Capacitors, Variable, Piston—See Capacitors, Variable, Trimmer (All Types)

Capacitors, Variable, Quartz

Johanson Mfg. Corp., Dept. EM, Box 329, Boonton, N.J. 07005 ..... *
DM **Sprague-Goodman Electronics, Inc., Dept. EM, 134 Fulton Ave., Garden City Park, N.Y. 11040** ..... p. 1215
D Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
DM JFD Electronics Components Corp., Dept. EM, 1462 62nd St., Bklyn., N.Y. 11219
DM Voltronics Corp., Dept. EM, West St., E. Hanover, N.J. 07936

Capacitors, Variable, TFE

M **F-Dyne Elctrns., Dept. EM, 449 Howard Ave., Bridgeport, Conn. 06605** ..... *
Jackson Bros., (London) Ltd., Dept. EM, 258 Bway., New York, N.Y. 10007 p. 1163
Johanson Mfg. Corp., Dept. EM, Box 329, Boonton, N.J. 07005 ..... *
D **Johnson Co., E.F., Dept. EM, 299 10th SW Ave., Waseca, Minn. 56093** ..... *
M **Southern Electronics Co., Dept. EM, 726 So. Flower St., Burbank, Cal. 91502** *
D **Sprague-Goodman Electronics, Inc., Dept. EM, 134 Fulton Ave., Garden City Park, N.Y. 11040** ..... p. 1215
Film Capacitors, Inc., Dept. EM, 100 8th St., Passaic, N.J. 07055
DM Voltronics Corp., Dept. EM, West St., E. Hanover, N.J. 07936

Capacitors, Variable, Temperature Compensating

M **F-Dyne Elctrns., Dept. EM, 449 Howard Ave., Bridgeport, Conn. 06605** ..... *
Interelectronics Corp., Dept. EM, Interelectronics Park, 550 U.S. Rte. 303, Congers, N.Y. 10920 ..... *
M **Southern Electronics Co., Dept. EM, 726 So. Flower St., Burbank, Cal. 91502** *
DM **Sprague-Goodman Electronics, Inc., Dept. EM, 134 Fulton Ave., Garden City Park, N.Y. 11040** ..... *
D Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
D Murata Mfg. Co. Ltd., Dept. EM, 16, Kaiden Nishijin-cho, Nagaoka-Kyo-Shi, Kyoto, Japan
D Voltronics Corp., Dept. EM, West St., E. Hanover, N.J. 07936

Capacitors, Variable, Trimmer (All Types)

M **Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550** .. *
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
Jackson Bros., (London) Ltd., Dept. EM, 258 Bway., New York, N.Y. 10007 p. 1163
M **Johanson Mfg. Corp., Dept. EM, Box 329, Boonton, N.J. 07005** ..... p. 1164
D **Johnson Co., E.F., Dept. EM, 299 10th SW Ave., Waseca, Minn. 56093** ..... *
D **Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094** ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *

Southern Electronics Co., Dept. EM, 726 So. Flower St., Burbank, Cal. 91502 *
D **Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247** *
DM **Sprague-Goodman Electronics, Inc., Dept. EM, 134 Fulton Ave., Garden City Park, N.Y. 11040** ... p. 1215
Standex Electronics, Dept. EM, 4538 Camberwell Rd., Cincinnati, Ohio 45209 *
M Compex Corp., Dept. EM, 383 Kings Highway, Cherry Hill, N.J. 08034
D Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
Hopt Co., Karl, Dept. EM, 118 First Ave., Atlantic Highlands, N.J. 07716
DM JFD Electronics Components Corp., Dept. EM, 1462 62nd St., Bklyn., N.Y. 11219
Mepco/Electra, Inc., Dept. EM, Columbia Rd., Morristown, N.J. 07960
D Mitsumi Elec. Co., Ltd., Dept. EM, 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan
Murata Corporation of America, Dept. EM, 1148 Franklin Rd., S.E., Marietta, Ga. 30067
D Murata Mfg. Co. Ltd., Dept. EM, 16, Kaiden Nishijin-cho, Nagaoka-Kyo-Shi, Kyoto, Japan
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
DM Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
DM Voltronics Corp., Dept. EM, West St., E. Hanover, N.J. 07936

Capacitors, Variable, Vacuum

ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 ... p. 1161
DM Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802

Capacitors, Water Cooled

M **Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550** ... *
High Energy Corp., Dept. EM, Lower Valley Rd., Parkesburg, Pa. 19365 p. 1150
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 ... p. 1161
M Capacitor Specialists, Dept. EM, P.O. Box 2052, Escondido, Cal. 92025
Plastic Capacitors, Inc., Dept. EM, 2623 N. Pulaski Rd., Chicago, Ill. 60639
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013

Caps, Connector

DM **Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521** ... p. 1698,1702,1704
DM **Arco Electronics Inc., Dept. EM, 400 Moreland Rd., Commack, N.Y. 11725** *
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DM **The Bendix Corp., Electrical Comp. Div., Dept. EM, Sidney, NY 13838** ... *
D **Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101** ... *
Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ... *
GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ... *
ITT Cannon Electric, Dept. EM, 666 E. Dyer Rd., Santa Ana, Cal. 92702 p. 1794,1817,1826,1845,1855,1889,1893, Back Cover, Vol. 1
ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ... p. 1977,1981
M **Jettron Prods., Dept. EM, P.O. Box 337, E. Hanover, N.J. 07936** ... *
DM **Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725** ... *
M **Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612** ... *
TRW/Cinch Connectors, Electronic Comp. Div. of TRW Inc., Dept. EM, 1501 Morse Ave., Elk Grove Village, Ill. 60007 ... Inside Back Cover, Vol. 1
DM Associated Engrg. & Mfg. Corp., Dept. EM, 546 Valley Rd., Upper Montclair, N.J. 07043
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
D General Elec. Co, Wiring Device Bus. Dept., Dept. EM, 95 Hathaway St., Providence, R.I. 02904
M Glenair, Inc., Dept. EM, 1211 Air Way, Glendale, Cal. 91201
D Ideal Industries Inc., Dept. EM, 4450 Becker Pl., Sycamore, Ill. 60178
Kentucky Electronics, Dept. EM, 1204 Ind'l Dr., Box 507, Owensboro, Ky. 42301
Leviton Mfg. Co., Inc., Dept. EM, 59-25 Little Neck Pkwy., Little Neck, N.Y. 11362
M Sunbank Elctrns., Inc., Dept. EM, 3110 Winona, Box 6669, Burbank, Cal. 91505
D T & B/Thomas & Betts, Dept. EM, 36 Butler St., Elizabeth, N.J. 07207
Teledyne Mecca, Dept. EM, Box 36393, Houston, Tex. 77036
Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578
D Xit Rod Co, Dept. EM, PO Box 128, Beaumont, Cal. 92223

Caps, Forms & Tapes, Heat Shrinkable-Also See Tubing, Heat Shrinkable

D **Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207** ... *
D **Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10469** ... *
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
D AMP Special Industries, Dept. EM, Valley Forge, Pa. 19482
M Antex Div., M M Newman Corp., Dept. EM, Marblehead, Mass. 01945
DM Carborundum Co., Plastics Div., Dept. EM, Carborundum Center, Niagara Falls, New York 14302
M Chemplast, Inc., Dept. EM, 31-150 Dey Rd., Wayne, N.J. 07470
D Cole-Flex Corp., Dept. EM, 91 Cabot St., W. Babylon, N.Y. 11704
Precision Paper Tube Co., Dept. EM, 1049 S. Noel Ave., Wheeling, Ill. 60090
Raychem Corp., Dept. EM, 300 Constitution Dr., Menlo Park, Cal. 94025

Caps, Grid & Plate—See Clips & Caps, Grid & Plate

Caps, Lenses, Indicator Light

Airpax Elctrns., Inc., Cambridge Div., Dept. EM, Woods Rd., Cambridge, Md. 21613 ... p. 1022
D **ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845** ... *
D **Arcolectric Corp., Dept. EM, Box 348, 11120 Chandler Blvd., No. Hollywood, Cal. 91603** ... *
DM **Chicago Miniature/Drake, Dept. EM, 4433 N Ravenswood Ave., Chicago, Ill. 60640** ... p. 2470,2473
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ... *
Display Devices, Dept. EM, Box 667, Encinitas, Cal. 92024 ... *
D **Electro-Mech Components, Dept. EM, 1826 N. Floradale Ave., So. El Monte, Cal. 91733** ... *
GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ... *
D **GTE Sylvania Inc., Miniature Lighting Prods., Dept. EM, W. Main St., Hillsboro, N.H. 03244** ... *
D **Industrial Devices, Dept. EM, Edgewater, N.J. 07020** ... *
D **IEE/Schadow, Inc., Dept. EM, 8081 Wallace Rd., Eden Prairie, Minn. 55344** *
LVC Inds. Inc., Co-Ord Switch Bloc-Lite Divs., Dept. EM, 135-25 37th Ave., Flushing, N.Y. 11354 ... *
D **Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032** *
DM **Oak Inds. Inc., Switch Div., Dept. EM, Dept. DA, Crystal Lake, Ill. 60014** p. 4187-4189
D **Sloan Company, Dept. EM, 7704 San Fernando Rd., Sun Valley, Cal. 91352** *
D **Staver Co., Inc., Dept. EM, 47 N. Saxon Ave., Bay Shore, N.Y. 11706** ... *
D **Trimm, Inc., Dept. EM, 400 W. Lake, Box 489, Libertyville, Ill. 60048** ... *
M Atlantic Optical Moulding Co., Dept. EM, Ellis St., Dudley, Mass. 01570
Centralab Elctrns. Div., Globe-Union Inc., Dept. EM, Box 858, Hwy. 20 W., Fort Dodge, Iowa 50501
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
Control Inds. Inc., Dept. EM, 530 Burnside Ave., Inwood, N.Y. 11696
DM Electrical Inds., Div. Philips Elctrns. Inc., Dept. EM, 691 Central Ave., Murray Hill, N.J. 07974
Kopp Glass, Inc., Dept. EM, Box 8255, Swissvale, Pittsburgh, Pa. 15218
D Licon Div., Illinois Tool Works, Dept. EM, 6615 W. Irving Park Rd., Chicago, Ill. 60634
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Penn Keystone Corp., Dept. EM, Division St., Ansonia, Conn. 06401
M Photo Chemical Prods. Cal., Dept. EM, 1715 Berkeley, Santa Monica, Cal. 90404
Precision Paper Tube Co., Dept. EM, 1049 S. Noel Ave., Wheeling, Ill. 60090

Caps, Wire-Splicing—See Splicers, Wire

Card Holders, Circuit Board—See Enclosures, Circuit Board, Module, & Relay Mounting

Card Readers—See Punched Card Equipment

Cards, Linear Function (With Discrete Components)

Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634 ... p. 2854
Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 ... *
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ... p. 1469
Elco Corp., Dept. EM, 2250 Park Pl., El Segundo, CAL 90245 ... *
Elgenco, Inc., Dept. EM, Box 460, Hurricane, Utah 84737 ... p. 2726
M Acromag, Inc., Dept. EM, 30765 Wixom Rd., Wixom, Mich. 48096
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
Dattilo Enterprises, Inc., Dept. EM, 2302 Taylorsville Rd., Louisville, Ky. 40205
M Eastern Electronics Mfg. Corp, Dept. EM, 180 Roberts St., East Hartford, Conn. 06108
GTE Sylvania, Circuit Module Oper., Elctrn. Comps. Grp., Dept. EM, Box 360, Muncy, Pa. 17756
GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
Information Control Corp., Abacus Div. Dept. EM7, Dept. EM, 9610 Bellanca Ave., Los Angeles, Cal. 90045
D Intech/Function Modules, Dept. EM, 282 Brokaw, Santa Clara, Cal. 95050
ITT, Semiconductor Div., Dept. EM, 500 Broadway, Lawrence, MASS 01841
DM Jaesic Industries Co., Dept. EM, 29830 Beck, Wixom, Mich. 48096
M Lehighton Electronics, Inc., Dept. EM, RD 1Box 374 Dept M, Lehighton, Pa 18235
M Metric Systems Corp., Dept. EM, 736 N. Beaf St., Ft. Walton Beach, Fla. 32548
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
Modular Devices, Inc., Dept. EM, 50 Orville Dr., Bohemia, N. Y. 11716
MVP Electronics, Dept. EM, 1161 N. Tustin, Orange, Cal. 92667
Paraplegics Mfg., Dept. EM, 304 N. York Rd., Bensenville, Ill. 60106
Wyle Computer Prods., Dept. EM, 3200 Magruder Blvd., Hampton, Va 23666
Zonic Technical Labs., Dept. EM, 8927 Rossash Ave., Cincinnati, Ohio 45236

Cards, Linear Function (With IC'S)

Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634 ... p. 2854
Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 ... *
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ... p. 1469
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M Acromag, Inc., Dept. EM, 30765 Wixom Rd., Wixom, Mich. 48096
M Eastern Electronics Mfg. Corp, Dept. EM, 180 Roberts St., East Hartford, Conn. 06108
GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854
GTE Sylvania, Circuit Module Oper., Elctrn. Comps. Grp., Dept. EM, Box 360, Muncy, Pa. 17756
GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730

Information Control Corp., Abacus Div. Dept. EM7, Dept. EM, 9610 Bellanca Ave., Los Angeles, Cal. 90045
D Intech/Function Modules, Dept. EM, 282 Brokaw, Santa Clara, Cal. 95050
M Jaesic Industries Co., Dept. EM, 29830 Beck, Wixom, Mich. 48096
M Lehighton Electronics, Inc., Dept. EM, RD 1Box 374 Dept M, Lehighton, Pa 18235
M Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
Modular Devices, Inc., Dept. EM, 50 Orville Dr., Bohemia, N. Y. 11716
MVP Electronics, Dept. EM, 1161 N. Tustin, Orange, Cal. 92667
Paraplegics Mfg., Dept. EM, 304 N. York Rd., Bensenville, Ill. 60106
UFAD Corp., Dept. EM, 700 36th St. S.E., Grand Rapids, Mich. 49508
Wyle Computer Prods., Dept. EM, 3200 Magruder Blvd., Hampton, Va 23666
Zonic Technical Labs., Dept. EM, 8927 Rossash Ave., Cincinnati, Ohio 45236

Cards, Logic (With Discrete Components)

Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... **p. 1469**
Elgenco, Inc., Dept. EM, Box 460, Huricane, Utah 84737 ..... **p. 2726**
DM **Excel Products Co., Inc., Dept. EM, 401 Joyce Kilmer Ave., New Brunswick, N.J. 08903** ..... *
D **Superior Electric Co., Dept. EM, 1000 Middle St., Bristol, Conn. 06010** ..... **p. 3110**
Wabash Relay & Elctrns., Dept. EM, Box 708, Wabash, Ind. 46992 ..... *
Anaheim Automation, Dept. EM, 922 Orangefair La., Anaheim, Cal. 92801
Data General Corp., Dept. EM, 15 Turnpike Rd Rte 9, Westboro, Mass 01581
Dattilo Enterprises, Inc., Dept. EM, 2302 Taylorsville Rd., Louisville, Ky. 40205
Dynage, Inc. Control Prods Grp., Dept. EM, 1331 Blue Hills Ave., Bloomfield, Conn. 06002
M Eastern Electronics Mfg. Corp, Dept. EM, 180 Roberts St., East Hartford, Conn. 06108
GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854
GTE Sylvania, Circuit Module Oper., Elctrn. Comps. Grp., Dept. EM, Box 360, Muncy, Pa. 17756
GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
Information Control Corp., Abacus Div. Dept. EM7, Dept. EM, 9610 Bellanca Ave., Los Angeles, Cal. 90045
M Jaesic Industries Co., Dept. EM, 29830 Beck, Wixom, Mich. 48096
M Lehighton Electronics, Inc., Dept. EM, RD 1Box 374 Dept M, Lehighton, Pa 18235
M Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
Paraplegics Mfg., Dept. EM, 304 N. York Rd., Bensenville, Ill. 60106
Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
Tech Serv., Inc., BRS/LVE Div, Dept. EM, 5301 Holland Dr., Beltsville, Md 20705
Wyle Computer Prods., Dept. EM, 3200 Magruder Blvd., Hampton, Va 23666
Zero Corp., Dept. EM, 777 Front St., Burbank, Cal. 91502

Cards, Logic (With IC'S)

Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... **p. 1469**
Elgenco, Inc., Dept. EM, Box 460, Huricane, Utah 84737 ..... **p. 2726**
DM **Excel Products Co., Inc., Dept. EM, 401 Joyce Kilmer Ave., New Brunswick, N.J. 08903** ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Texas Instruments, Connector Systems, Dept. EM, 34 Forest St., Attleboro, Mass. 02703 ..... *
Anaheim Automation, Dept. EM, 922 Orangefair La., Anaheim, Cal. 92801
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
Data General Corp., Dept. EM, 15 Turnpike Rd Rte 9, Westboro, Mass 01581
Dattilo Enterprises, Inc., Dept. EM, 2302 Taylorsville Rd., Louisville, Ky. 40205
Dynage, Inc. Control Prods Grp., Dept. EM, 1331 Blue Hills Ave., Bloomfield, Conn. 06002
M Eastern Electronics Mfg. Corp, Dept. EM, 180 Roberts St., East Hartford, Conn. 06108
D EECO, Dept. EM, 1441 E. Chestnut Ave, Box 659, Santa Ana, Cal. 92701
D Electronic Counters & Controls Inc., Dept. EM, 1500 McCormick Blvd., Mundelein, Ill. 60060
GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854
GTE Sylvania, Circuit Module Oper., Elctrn. Comps. Grp., Dept. EM, Box 360, Muncy, Pa. 17756
D GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
Information Control Corp., Abacus Div. Dept. EM7, Dept. EM, 9610 Bellanca Ave., Los Angeles, Cal. 90045
D Intel Corp., Dept. EM, 3065 Bowers Ave., Santa Clara, Cal. 95051
M Jaesic Industries Co., Dept. EM, 29830 Beck, Wixom, Mich. 48096
M Lehighton Elegtronics, Inc., Dept. EM, RD 1Box 374 Dept M, Lehighton, Pa 18235
D Martin Research, Dept. EM, 3336 Commercial Ave., Northbrook, Ill. 60062
MDB Systems Inc., Dept. EM, 1995 N. Batavia St., Orange, Cal. 92665
M Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
MilerTronics, Dept. EM, 303 Airport Rd, Greenville, S.C. 29607
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
Paraplegics Mfg., Dept. EM, 304 N. York Rd., Bensenville, Ill. 60106
PCS., Inc., Dept. EM, 750 N. Maple Rd., Saline, Mich. 48176
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
D Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
Systems Integration Assoc., Dept. EM, RD #1 Box 126, Glenmoor, Pa. 19343
Tech Serv., Inc., BRS/LVE Div, Dept. EM, 5301 Holland Dr., Beltsville, Md 20705
Tenor Co., Inc., Dept. EM, 17020 W. Rogers Dr., New Berlin, Wisc. 53151
Wyle Computer Prods., Dept. EM, 3200 Magruder Blvd., Hampton, Va 23666
Zlatech Corp, Dept. EM, 10762 LaRoda Dr, Cupertino, Cal. 95014
Zonic Technical Labs., Dept. EM, 8927 Rossash Ave., Cincinnati, Ohio 45236

Carriers—See Holders & Carriers

Carts & Dollies, Instrument & Equipment

Equipto Enclosure Systems, Div/Equipto Elec. Corp., Dept. EM, 435 Woodlawn Ave., Aurora, Ill. 60507 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 ..... *
Optima Enclosures, Div. Scientific Atlanta, Dept. EM, 2166 Mountain Ind'l Blvd., Tucker, Ga. 30084 ..... *
DM **SGL Waber Electric, Dept. EM, 300 Harvard Avenue, Westville, NJ 08093** ..... *
Skydyne,, Div. Brooks & Perkins Inc., Dept. EM, River Rd., Port Jervis, N.Y. 12771 ..... **p. 1047**
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
D Clean Room Prods., Dept. EM, 56 W. Penataquit Ave., Bay Shore, N.Y. 11706
D Davies Molding Co., Harry, Dept. EM, 4920 Bloomingdale Ave., , Chicago, Ill. 60639
D Easy-Up Inc., Dept. EM, Racine, Wisc. 53401
M Electro-Rack Products Co., Dept. EM, 1742 So. Clementine St., Anaheim, Cal. 92802
Equipto, Aurora Equipment Co., Dept. EM, 225 So. Highland Ave., Aurora, Ill. 60507
D Hammond Mfg. Co., Dept. EM, 385 Nagel Dr., Buffalo, NY 14225
Kole Enterprises, Inc., Dept. EM, 3553 N.W. 50th St., Miami, Fla. 33142
D Lyon Metal products, Inc., Dept. EM, 47 Railroad Ave., Aurora, Ill. 60507
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
D Metropolitan Wire Corp., Industrial Div., Dept. EM, Washington & George, Wilkes-Barre, Pa. 18705
Mid-West Metal Prods., Inc., Dept. EM, 456 E. Donovan Rd., Kansas City, Kans. 66115
D Mobil Electronics, Inc., Dept. EM, Box 1132, Anderson, Ind. 46015
Mobil-Tronics, Dept. EM, Box 1022, Tustin, Cal. 92680
D Par-Metal Prods. Inc., Dept. EM, 1260 Atlantic Ave., Brooklyn, N.Y. 11216
Parsons Mfg. Corp., Dept. EM, 1055 O'Brien Dr., Menlo Park, Cal. 94025
D Peerless Sales Co., Dept. EM, 4200 W. Chicago Ave., Chicago, Ill 60651
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
TTS, Dept. EM, 2928 Nebraska Ave., Santa Monica, Cal. 90404
M Zero Corp., Dept. EM, 777 Front St., Burbank, Cal. 91502

Cases, Equipment, Instrument, Meter (Portable)—See Enclosures, Portable, Metallic & Non-Metallic

Cases, Equipment, Instrument, Meter (Stationary)—See Enclosures, Equipment & Panel Mounting

Cases, Shielded—See Enclosures, Shielded

Cases, Transit—See Enclosures, Portable, Metallic & Non-Metallic

Cathode-Ray Readout Tubes—See Tubes, Readout

CATV Systems & Equipment

ITT Cannon Electric, Dept. EM, 666 E. Dyer Rd., Santa Ana, Cal. 92702 ..... *
Power Designs, Inc., Dept. EM, 1700 Shames Dr., Westbury, N.Y. 11590 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 ..... *
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
M **Wavetek Indiana, Inc., Dept. EM, 66 N. First Ave., Beech Grove, Ind. 46107** *
Aerolite Elexs Corp., Dept. EM, 2207 Summit Ave., Union City, N.J. 07087
Ampex Corp., Dept. EM, 401 Broadway, Redwood City, Cal. 94063
Ann Arbor Terminals, Inc., Dept. EM, 6107 Jackson Rd., Ann Arbor, Mich. 48103
M Atlantic Research Corp., Dept. EM, 5390 Cherokee Ave., Alexandria, Va 22314
Avantek, Inc., Dept. EM, 3175 Bowers Ave., Santa Clara, Cal. 95051
D Blonder-Tongue Labs., Inc., Dept. EM, One Jake Brown Rd., Old Bridge, N.J. 08857
C-COR Elctrns., Dept. EM, 60 Decibel Rd., State College, Pa. 16801
M CATV Communications, Div. of Amer. Elctrn. Labs. Inc., Dept. EM, Box 552, Lansdale, Pa. 19446
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
Cohu, Inc., Elctrns. Div., San Diego Div., Dept. EM, Box 623, San Diego, , Cal. 92112
Conrac Div., Conrac Corp., Dept. EM, 600 N. Rimsdale Ave., Covina, Calif. 91722
D Dynair Elctrns. Inc., Dept. EM, 5275 Market St., San Diego, Calif. 92114
DM Electrovert, Dept. EM, 86 Hartford Ave., Mt. Vernon, N.Y. 10553
D GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Hughes Aircraft Co., Electron Dynamics Div., Dept. EM, 3100 W. Lomita Blvd., Torrance, Cal. 90509
Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
M Kalart Victor Corp., Dept. EM, Hultenius St., Plainville, Conn. 06062
D Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
M Nurad, Inc., Dept. EM, 2165 Druid Pk. Dr., Baltimore, Md. 21211
M RF Systems, Inc., Dept. EM, 3100 Communications Rd., St Cloud, Fla. 32769
M Sawyer Inds., Dept. EM, 5649 Peck Rd., Arcadia, Cal. 91006
D Tape-Athon Corp., Dept. EM, 502 S. Isis Ave., Inglewood, Cal 90301
Trax Video Labs, Dept. EM, 2020 Milvia St., Berkeley, Cal. 94704
Video Automation Systems Inc., Dept. EM, Rte 1—Box 21A, Pound Ridge, N.Y. 10576
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006
Wide Band Engrg. Co. Inc., Dept. EM, Box 21652, Phoenix, Ariz. 85036
Winegard Co., Dept. EM, 3000 Kirkwood St., Burlington, Iowa 52601
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Cavities, Microwave

M Applied Microwave, Div. Epsco Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 ..... p. 2861
Epsco, Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 p. 2861
M MCL, Inc., Dept. EM, 10 North Beach Ave., LaGrange, Ill. 60525 ..... *
M , Trak Microwave Corp., Dept. E8, Dept. EM, 4726 Eisenhower Blvd.,, Tampa, Fla. 33614 ..... *
Vega Precision Labs., Dept. EM, 800 Follin La., Vienna, Va. 22180 ..... p. 2864
D Ailtech, Dept. EM, 2070 Fifth Ave, Ronkonkoma, NY 11779
M Aircom, Inc., Dept. EM, Rte. 16B, Union, N.H. 03887
M Cir-Q-Tel, Inc., Dept. EM, 10504 Wheatley St., Kensington, Md. 20795
M Coleman Microwave Co., Dept. EM, Box 59, Rte. 22, Lebanon, N.J. 08833
Frequency Engrg. Labs., Dept. EM, Box 527, Farmingdale, N.J. 07727
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
D Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
D Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
M Reeve Electronics, Inc., Dept. EM, 609 W. Lake St., Chicago, Ill 60606
M UTE Microwave, Dept. EM, 3500 Sunset Ave., Asbury Park, N.J. 07712
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304
M Wavecom, Dept. EM, 9036 Winnetna Ave., Northridge, Cal. 91324
Zero Corp., Dept. EM, 777 Front St., Burbank, Cal. 91502

Cavities, Power Device

Applied Microwave, Div. Epsco Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 ..... p. 2861
Epsco, Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 p. 2861

Cells, Electrolytic (Timing)—See Timers, Electrolytic Cell

Cells, Load

Kulite Semiconductor Prod., Dept. EM, 1030 Hoyt Ave., Ridgefield, N.J. 07657 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Advance Weight Systems, Inc., Dept. EM, 715 W. Smith Rd., Medina, Ohio 44256
A.L. Design Inc., Dept. EM, 2070 Niagara Falls Blvd., Tonawanda, NY 14150
Automatic Timing &-Controls Co., Dept. EM, King of Prussia, Pa. 19406
BLH Elctrns., Dept. EM, 42 Fourth Ave., Waltham, Mass. 02154
D Data Instruments Inc., Dept. EM, 4 Hartwell Pl., Lexington, Mass. 02173
DM Dillon, W.C. & Co., Dept. EM, 14620-EP Keswick St., Van Nuys 340, Cal. 91407
Entran Devices, Inc., Dept. EM, 145 Paterson Ave., Little Falls, N.J. 07424
Gould, Inc., Meas. Sys. Div., Dept. EM, 2230 Statham Blvd., Oxnard, Cal. 93030
Himmelstein & Co., S., Dept. EM, 2500 Estes Ave., Elk Grove Village, Ill. 60007
D Interface, Inc., Dept. EM, 7401 Butherus Dr., Scottsdale, Ariz. 85260
PCB Piezotronics, Inc., Dept. EM, 5800 Transit Rd., Depew, N.Y. 14043
D Revere Corp. of America, Neptune International Corp., Dept. EM, 845 N. Colony Rd., Wallingford, Conn. 06492
Schaevitz Engrg., Dept. EM, U.S. 130, Union Ave., Pennsauken, N.J. 08110
Sundstrand Data Control, Dept. EM, Overlake Ind'l. Pk., Redmond, Wash. 98052
M West Coast Resch. Corp., Dept EM, Box 25061, Los Angeles, Cal. 90025
Zonic Technical Labs., Dept. EM, 8927 Rossash Ave., Cincinnati, Ohio 45236

Cells, Photoconductive

A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 ..... p. 3920
D Clairex Elctrns. Inc., Dept. EM, 560 S. 3rd Ave., Mt. Vernon, N.Y. 10550 p. 3132,3134
EG&G, Inc., Electro-Optics Div., Dept. EM, 35 Congress St., Salem, Mass. 01970 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Kessler-Ellis Prods., Dept. EM, 120 1st Ave., Atlantic Highlands, N.J. 07716 p. 1651
National Semiconductors, Ltd., Dept. EM, 331 Cornelia St., Plattsburgh, N.Y. 12901 ..... p. 3138
D Raytheon Co., Distributor Prods. Oper., Dept. EM, Fourth Ave., Burlington, Mass. 01803 ..... p. 3139-3146
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Vactec, Inc., Dept. EM, 2423 Northline Blvd., Maryland Heights, Mo. 63043 p. 3148,3149
D Amperex Electronic Corp., Slatersville Div., Dept. EM, Providence Pike, Slatersville, R.I. 02876
D EMI Gencom Inc., Dept. EM, 80 Express St., Plainview, N.Y. 11803
M Harshaw Chemical Co., A Kenanee Industry, Dept. EM, 6801 Cochran Rd., Solon, Ohio 44139
Moririca Elctrns., Ltd., Dept. EM, 205 Tozuka-machi, Tozuka-Ku, Yokohama, Japan
Optoelectronics, Inc., Dept. EM, 1309 Dynamic St., Petaluma, Cal. 94952
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
D Raytheon Co., Indl. Comps. Oper., Dept. EM, 465 Centre St., Quincy, Mass. 02169
M Santa Barbara Resch. Ctr., Dept. EM, 75 Coromar Dr., Goleta, Cal. 93017
D Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
T. C. Centronic, Dept. EM, King Henry's Dr, Addington, Croydon CR9 0BG, Great Britain
United Detector Tech., Dept. EM, 2644 30th St., Santa Monica, Cal. 90405

Cells, Photoemissive

A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 ..... p. 3920
GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Kessler-Ellis Prods., Dept. EM, 120 1st Ave., Atlantic Highlands, N.J. 07716 p. 1651
D Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
D EMI Gencom Inc., Dept. EM, 80 Express St., Plainview, N.Y. 11803

Cells, Photovoltaic

D A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 ..... p. 3920
Clairex Elctrns. Inc., Dept. EM, 560 S. 3rd Ave., Mt. Vernon, N.Y. 10550 ..... *
EG&G, Inc., Electro-Optics Div., Dept. EM, 35 Congress St., Salem, Mass. 01970 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
D International Rectifier Corp., Semiconductor Div., Dept. EM, 233 Kansas St., El Segundo, Cal. 90245 ..... *
National Semiconductors, Ltd., Dept. EM, 331 Cornelia St., Plattsburgh, N.Y. 12901 ..... p. 3138
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... p. 3293
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Vactec, Inc., Dept. EM, 2423 Northline Blvd., Maryland Heights, Mo. 63043 p. 3148,3149
Dionics, Dept. EM, 65 Rushmore St., Westbury, N.Y. 11590
Edmund Scientific Co., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007
Ferranti Elec., Dept. EM, East Bethpage Rd., Plainview, N.Y. 11803
General Elec., Semiconductor Prods., Dept. EM, Electronics Pk., Box 1122, Syracuse, NY 13201
Integrated Photomatrix, Dept. EM, 1101 Bristol Rd., Mountainside, N.J. 07092
Moririca Elctrns., Ltd., Dept. EM, 205 Tozuka-machi, Tozuka-Ku, Yokohama, Japan
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
Optoelectronics, Inc., Dept. EM, 1309 Dynamic St., Petaluma, Cal. 94952
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Santa Barbara Resch. Ctr., Dept. EM, 75 Coromar Dr., Goleta, Cal. 93017
D Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
Sensor Technology, Dept. EM, 21012 Lassen St., Chatsworth, Cal. 91311
Spectrolab, Inc., Dept. EM, 12500 Gladstone Ave., Sylmar, Cal. 91342
T. C. Centronic, Dept. EM, King Henry's Dr, Addington, Croydon CR9 0BG, Great Britain
M UCE, Inc., Dept. EM, 20 N. Main St., Norwalk, Conn. 06854
United Detector Tech., Dept. EM, 2644 30th St., Santa Monica, Cal. 90405

Cells, Solar—See Cells, Photovoltaic

Cements—See Adhesives, (All Types)

Ceramic Resonators

Standex Electronics, Dept. EM, 4538 Camberwell Rd., Cincinnati, Ohio 45209 *
D Vernitron Piezoelectric Div., Dept. EM, 232 Forbes Rd., Bedford, Ohio 44146 p. 2659
Centerflex Ceramics, Dept. EM, 221 Seventh Ave., Hawthorne, N.J. 07507
Gulton Inds., Piezo Prods. Div., Dept. EM, Box 4300, Fullerton, Cal. 92634
Linden Labs., Inc., Dept. EM, Box 920, State College, Pa. 16801
Radio Materials Co., Div. P.R. Mallory, Dept. EM, 4242 W. Bryn Mawr Ave., Chicago, Ill. 60646

Chambers, Altitude

DM Cincinnati Sub-Zero Products, Dept. EM, 2612 Gilbert Ave., Cincinnati, Ohio 45206 ..... *
Ransco Industries, Dept. EM, 2221 Statham Blvd., Oxnard, Cal. 93030 p. 2572
Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... *
M Tenney Engrg., Inc., Dept. EM, 109 Springfield Rd., Union, N.J. 07083 p. 2573
D Associated Environmental Systems, Dept. EM, 360 Merrimack St., Lawrence, Mass. 01842
M Atlas Engrg. Corp., Dept. EM, 26 Custer St., W. Hartford, Conn. 06110
M Bemco, Inc., Dept. EM, 9908 San Fernando Rd., Pacoima, Cal. 91331
D CVC Products, Inc., Dept. EM, 525 Lee Rd., Box 1886, Rochester, N.Y. 14603
D GCA/Precision Scientific, Dept. EM, 3737 W. Cortland St., Chicago, Ill. 60647
High Vacuum Equip. Corp., Dept. EM, 110 Industrial Pk Rd, Hingham, Mass. 02043
D Hull Corp., Dept. EM, Davisville Rd., Hatboro, Pa. 19040
T-M Vacuum Prods., Dept. EM, Warrington & Rowland, Riverton, N.J. 08077
M Thermotron Corp., Dept. EM, Kollen Park Dr., Holland, Mich 49423
Vactronic Lab. Equip., Inc., Dept. EM, 65 Brightside Ave., E. Northport, N.Y. 11731
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Webber Manufacturing Co., Dept. EM, P.O. Box 217, Indianapolis, Ind. 46206

Chambers, Environmental

M Blue M Electric Co., Dept. EM, 138th & Chatham St., Blue Island, Ill. 60406 p. 2570
DM Cincinnati Sub-Zero Products, Dept. EM, 2612 Gilbert Ave., Cincinnati, Ohio 45206 ..... p. 2571
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Ransco Industries, Dept. EM, 2221 Statham Blvd., Oxnard, Cal. 93030 p. 2572
Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... *

D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
M **Tenney Engrg., Inc., Dept. EM, 109 Springfield Rd., Union, N.J. 07083** p. 2573
Alpha-M Corp, Dept. EM, 3009 Wildflower Drive, Dallas, Tx. 75229
D Associated Environmental Systems, Dept. EM, 360 Merrimack St., Lawrence, Mass. 01842
Atlas Electric Devices, Dept. EM, 4114 N. Ravenswood Ave., Chicago, Ill. 60613
M Atlas Engrg. Corp., Dept. EM, 26 Custer St., W. Hartford, Conn. 06110
M Bemco, Inc., Dept. EM, 9908 San Fernando Rd., Pacoima, Cal. 91331
Caig Labs., Inc., Dept. EM, 1175-0 Industrial Ave., Box 64, Escondido, Cal. 92025
D Delta Design, Inc., Dept. EM, 5725 Kearny Villa Road, San Diego, Cal 92123
Dillon, W.C. & Co., Dept. EM, 14620-EP Keswick St., Van Nuys 340, Cal. 91407
Forma Scientific, Inc., Dept. EM, Box 649, Marietta, Ohio 45750
Formulated Resins Inc., Dept. EM, Box 508, Greenville, R.I. 02828
GCA/Burlington Div., Dept. EM, 174 Middlesex Tpke., Burlington, Mass. 01803
D GCA/Precision Scientific, Dept. EM, 3737 W. Cortland St., Chicago, Ill. 60647
Hotpack Corp., Dept. EM, 5148 Cottman Ave., Phila., Pa. 19135
Lab-Line Instrs, Dept. EM, 15th & Bloomingdale, Melrose Park, Ill. 60160
OAL Assocs., Inc., Dept. EM, P.O. Box 64, Escondido, Cal. 92025
M Thermotron Corp., Dept. EM, Kollen Park Dr., Holland, Mich 49423
M Webber Manufacturing Co., Dept. EM, P.O. Box 217, Indianapolis, Ind. 46206

Chambers, Explosion

M **Blue M Electric Co., Dept. EM, 138th & Chatham St., Blue Island, Ill. 60406** *
M **Tenney Engrg., Inc., Dept. EM, 109 Springfield Rd., Union, N.J. 07083** ..... *
M Atlas Engrg. Corp., Dept. EM, 26 Custer St., W. Hartford, Conn. 06110
M Bemco, Inc., Dept. EM, 9908 San Fernando Rd., Pacoima, Cal. 91331
M Webber Manufacturing Co., Dept. EM, P.O. Box 217, Indianapolis, Ind. 46206

Chambers, Fluid Conditioner

Ransco Industries, Dept. EM, 2221 Statham Blvd., Oxnard, Cal. 93030 ..... *
M **Tenney Engrg., Inc., Dept. EM, 109 Springfield Rd., Union, N.J. 07083** ..... *
Atlas Engrg. Corp., Dept. EM, 26 Custer St., W. Hartford, Conn. 06110
M Thermotron Corp., Dept. EM, Kollen Park Dr., Holland, Mich 49423
M Webber Manufacturing Co., Dept. EM, P.O. Box 217, Indianapolis, Ind. 46206

Chambers, Humidity

M **Blue M Electric Co., Dept. EM, 138th & Chatham St., Blue Island, Ill. 60406** p. 2570
M **Cincinnati Sub-Zero Products, Dept. EM, 2612 Gilbert Ave., Cincinnati, Ohio 45206** ..... p. 2571
Ransco Industries, Dept. EM, 2221 Statham Blvd., Oxnard, Cal. 93030 ..... *
M **Tenney Engrg., Inc., Dept. EM, 109 Springfield Rd., Union, N.J. 07083** p. 2573
Atlas Engrg. Corp., Dept. EM, 26 Custer St., W. Hartford, Conn. 06110
Forma Scientific, Inc., Dept. EM, Box 649, Marietta, Ohio 45750
Lab-Line Instrs, Dept. EM, 15th & Bloomingdale, Melrose Park, Ill. 60160
M Thermotron Corp., Dept. EM, Kollen Park Dr., Holland, Mich 49423
Thunder Sci Corp, Dept. EM, 623 Wyoming S.E., Albuquerque, NM 87123
M Webber Manufacturing Co., Dept. EM, P.O. Box 217, Indianapolis, Ind. 46206

Chambers, Magnetic Environment

M **Ad-Vance Magnetics, Dept. EM, 226 E. 7th St., Rochester, Ind. 46975** p. 2552
Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 ..... *
M **Magnetic Shield Div., Perfection Mica, Dept. EM, 750 North Thomas Dr., Bensenville, Ill. 60106** ..... p. 2565
M **MuShield Co., Dept. EM, 121 Madison St., Malden, Mass. 02148** ..... *
Advanced Kinetics, Dept. EM, 1231 Victoria St., Costa Mesa, Calif. 92627
ANEMCO, INC., Dept. EM, 157 Freedom Ave, Anaheim, Cal. 92801
M Atlas Engrg. Corp., Dept. EM, 26 Custer St., W. Hartford, Conn. 06110
High Voltage Engrg. Corp., Dept. EM, S. Bedford St., Burlington, Mass. 01803
Lab-Line Instrs, Dept. EM, 15th & Bloomingdale, Melrose Park, Ill. 60160
D Rantec Div., Emerson Elec. Co., Dept. EM, 24003 Ventura Blvd., Calabasas, Calif. 91302

Chambers, Pressure

DM **Cincinnati Sub-Zero Products, Dept. EM, 2612 Gilbert Ave., Cincinnati, Ohio 45206** ..... p. 2571
M **Tenney Engrg., Inc., Dept. EM, 109 Springfield Rd., Union, N.J. 07083** ..... *
M Atlas Engrg. Corp., Dept. EM, 26 Custer St., W. Hartford, Conn. 06110
M Bemco, Inc., Dept. EM, 9908 San Fernando Rd., Pacoima, Cal. 91331
Benthos, Inc., Dept. EM, Edgerton Dr., N. Falmouth, Mass. 02556
Red Point Corp., Dept. EM, 105 W. Spazier, Burbank, Cal. 91502

Chambers, Radiation

Instruments for Industry, Inc., Dept. EM, 151 Toledo St., Farmingdale, N.Y. 11735 ..... *
M **Tenney Engrg., Inc., Dept. EM, 109 Springfield Rd., Union, N.J. 07083** ..... *
Victoreen, Inc., Dept. EM, 10101 Woodland Ave., Cleveland, Ohio 44104 ..... *
ANEMCO, INC., Dept. EM, 157 Freedom Ave, Anaheim, Cal. 92801
Nuclear Resch. Corp., Dept. EM, 1105 Indl. Hwy., Southampton, Pa. 18966
D Rantec Div., Emerson Elec. Co., Dept. EM, 24003 Ventura Blvd., Calabasas, Calif. 91302
T. C. Centronic, Dept. EM, King Henry's Dr, Addington, Croydon CR9 0BG, Great Britain

Chambers, Shock

M **Blue M Electric Co., Dept. EM, 138th & Chatham St., Blue Island, Ill. 60406** p. 2570
M **Cincinnati Sub-Zero Products, Dept. EM, 2612 Gilbert Ave., Cincinnati, Ohio 45206** ..... p. 2571
Ransco Industries, Dept. EM, 2221 Statham Blvd., Oxnard, Cal. 93030 p. 2572
M **Tenney Engrg., Inc., Dept. EM, 109 Springfield Rd., Union, N.J. 07083** p. 2573
M Atlas Engrg. Corp., Dept. EM, 26 Custer St., W. Hartford, Conn. 06110
D Delta Design, Inc., Dept. EM, 5725 Kearny Villa Road, San Diego, Cal 92123
M Thermotron Corp., Dept. EM, Kollen Park Dr., Holland, Mich 49423
M Webber Manufacturing Co., Dept. EM, P.O. Box 217, Indianapolis, Ind. 46206

Chambers, Space Simulation

Ransco Industries, Dept. EM, 2221 Statham Blvd., Oxnard, Cal. 93030 ..... *
M **Tenney Engrg., Inc., Dept. EM, 109 Springfield Rd., Union, N.J. 07083** p. 2573
M Spectrolab, Inc., Dept. EM, 12500 Gladstone Ave., Sylmar, Cal. 91342
T-M Vacuum Prods., Dept. EM, Warrington & Rowland, Riverton, N.J. 08077
M Thermotron Corp., Dept. EM, Kollen Park Dr., Holland, Mich 49423
Vactronic Lab. Equip., Inc., Dept. EM, 65 Brightside Ave., E. Northport, N.Y. 11731

Chambers, Temperature

M **Blue M Electric Co., Dept. EM, 138th & Chatham St., Blue Island, Ill. 60406** p. 2570
DM **Cincinnati Sub-Zero Products, Dept. EM, 2612 Gilbert Ave., Cincinnati, Ohio 45206** ..... p. 2571
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Ransco Industries, Dept. EM, 2221 Statham Blvd., Oxnard, Cal. 93030 p. 2572
Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... *
M **Tenney Engrg., Inc., Dept. EM, 109 Springfield Rd., Union, N.J. 07083** p. 2573
Aerotronic Assocs., Inc., Dept. EM, Riverside Dr., Contoocook, N.H. 03229
Alpha-M Corp, Dept. EM, 3009 Wildflower Drive, Dallas, Tx. 75229
Associated Environmental Systems, Dept. EM, 360 Merrimack St., Lawrence, Mass. 01842
M Atlas Engrg. Corp., Dept. EM, 26 Custer St., W. Hartford, Conn. 06110
M Bemco, Inc., Dept. EM, 9908 San Fernando Rd., Pacoima, Cal. 91331
Caig Labs., Inc., Dept. EM, 1175-0 Industrial Ave., Box 64, Escondido, Cal. 92025
M Cox & Co., Inc., Dept. EM, 215 Park Ave., S., New York, N.Y. 10003
Custom Scientific Instrs., Dept. EM, 13 Wing Dr., Box A, Whippany, N.J. 07981
D Delta Design, Inc., Dept. EM, 5725 Kearny Villa Road, San Diego, Cal 92123
D Despatch Oven Co., Dept. EM, P.O. Box 1320, Minneapolis, Minn. 55440
Dillon, W.C. & Co., Dept. EM, 14620-EP Keswick St., Van Nuys 340, Cal. 91407
DM Elctrn. Control Co., Dept. EM, Box S150, Dresher, Pa. 19025
Forma Scientific, Inc., Dept. EM, Box 649, Marietta, Ohio 45750
FTS Systems Inc., Dept. EM, POB 158, Stone Ridge, N.Y. 12484
D GCA/Precision Scientific, Dept. EM, 3737 W. Cortland St., Chicago, Ill. 60647
High Vacuum Equip. Corp., Dept. EM, 110 Industrial Pk Rd, Hingham, Mass. 02043
Hotpack Corp., Dept. EM, 5148 Cottman Ave., Phila., Pa. 19135
D Hull Corp., Dept. EM, Davisville Rd., Hatboro, Pa. 19040
Lab-Line Instrs, Dept. EM, 15th & Bloomingdale, Melrose Park, Ill. 60160
OAL Assocs., Inc., Dept. EM, P.O. Box 64, Escondido, Cal. 92025
Reliability Inc., Dept. EM, Box 37409, Houston, Tex. 77036
D Research, Inc., Dept. EM, Box 24064, Minneapolis, Minn. 55424
Sigma Sys. Corp., Dept. EM, 3163 Adams Ave., San Diego, Calif. 92116
D Temptronic Corporation, Dept. EM, 40 Glen Ave., Newton, Mass. 02159
M Thermotron Corp., Dept. EM, Kollen Park Dr., Holland, Mich 49423
M Webber Manufacturing Co., Dept. EM, P.O. Box 217, Indianapolis, Ind. 46206

Chambers, Vacuum

Blue M Electric Co., Dept. EM, 138th & Chatham St., Blue Island, Ill. 60406 *
DM **Cincinnati Sub-Zero Products, Dept. EM, 2612 Gilbert Ave., Cincinnati, Ohio 45206** ..... *
Ransco Industries, Dept. EM, 2221 Statham Blvd., Oxnard, Cal. 93030 p. 2572
M **Tenney Engrg., Inc., Dept. EM, 109 Springfield Rd., Union, N.J. 07083** p. 2573
M Astro Dynamics, Dept. EM, 2 Gill St., Woburn, Mass. 01801
M Atlas Engrg. Corp., Dept. EM, 26 Custer St., W. Hartford, Conn. 06110
M Bemco, Inc., Dept. EM, 9908 San Fernando Rd., Pacoima, Cal. 91331
D CVC Products, Inc., Dept. EM, 525 Lee Rd., Box 1886, Rochester, N.Y. 14603
Forma Scientific, Inc., Dept. EM, Box 649, Marietta, Ohio 45750
FTS Systems Inc., Dept. EM, POB 158, Stone Ridge, N.Y. 12484
D GCA/Precision Scientific, Dept. EM, 3737 W. Cortland St., Chicago, Ill. 60647
High Vacuum Equip. Corp., Dept. EM, 110 Industrial Pk Rd, Hingham, Mass. 02043
High Voltage Engrg. Corp., Dept. EM, S. Bedford St., Burlington, Mass. 01803
Hotpack Corp., Dept. EM, 5148 Cottman Ave., Phila., Pa. 19135
D Hull Corp., Dept. EM, Davisville Rd., Hatboro, Pa. 19040
Lab-Line Instrs, Dept. EM, 15th & Bloomingdale, Melrose Park, Ill. 60160
Materials Resch. Corp., Dept. EM, Route 303, Orangeburg, N.Y. 10962
Perkin-Elmer Ultek Inc., Dept. EM, Box 10920, Palo Alto, Cal. 94303
Red Point Corp., Dept. EM, 105 W. Spazier, Burbank, Cal. 91502
D Sloan Technology Corp., Dept. EM, 535 E. Montecito St., Santa Barbara, Cal. 93103
T-M Vacuum Prods., Dept. EM, Warrington & Rowland, Riverton, N.J. 08077
M Thermotron Corp., Dept. EM, Kollen Park Dr., Holland, Mich 49423
DM Ulvac North America, Dept. EM, Colchester Plaza, Colchester, VT 05446
Vactronic Lab. Equip., Inc., Dept. EM, 65 Brightside Ave., E. Northport, N.Y. 11731
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Webber Manufacturing Co., Dept. EM, P.O. Box 217, Indianapolis, Ind. 46206

Chambers, Vibration

M **Cincinnati Sub-Zero Products, Dept. EM, 2612 Gilbert Ave., Cincinnati, Ohio 45206** ..... *
Ransco Industries, Dept. EM, 2221 Statham Blvd., Oxnard, Cal. 93030 p. 2572
M **Tenney Engrg., Inc., Dept. EM, 109 Springfield Rd., Union, N.J. 07083** p. 2573
M Bemco, Inc., Dept. EM, 9908 San Fernando Rd., Pacoima, Cal. 91331
M Thermotron Corp., Dept. EM, Kollen Park Dr., Holland, Mich 49423
M Webber Manufacturing Co., Dept. EM, P.O. Box 217, Indianapolis, Ind. 46206

Chargers, Battery

Abacus Controls Inc., Dept. EM, 89 Redington Rd., Somerville, N.J. 08876 *
Advance Conversion Devices Co., Dept. EM, 109 Eighth St., Passaic, N. J. 07055 ..... p. 3354
D **ATR Electronics, Inc., Dept. EM, 300 E. 4th St., St. Paul, Minn. 55101** p. 3357
CEA, Div. Berkleonics, Inc., Dept. EM, 1 Aerovista Pk., San Luis Obispo, Cal. 93401 ..... p. 3213
Christie Elec., Dept. EM, 3404A W. 67th St., Los Angeles, Cal. 90043 p. 3220

Computer Power, Inc., Dept. EM, 124E West Main Street, High Bridge, New Jersey 08829 ..... p. 3375
D **Dormeyer Industries, Dept. EM, 3418 N. Milwaukee, Chicago, Ill. 60641** p. 3244,3245
D **Dynamic Instr. Corp., Dept. EM, 933 Ll. Motor Pkwy., Hauppauge, N.Y. 11787** p. 3246
M **Eanco, Inc., Mid-Eastern Prods., Dept. EM, 539 Jacksonville Rd., Warminster, Pa. 18974** ..... *
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 ..... p. 1378
Jerome Industries Corp., Dept. EM, 391 Lakeside Ave., Orange, N.J. 07050 p. 3277
KGS Electronics, Inc., Dept. EM, 2029 N. Lincoln Ave., Pasadena, Cal. 91103 *
M **Marine Electric Railway Prods. Div., Inc., Dept. EM, 167 National Rd., Edison, N.J. 08817** ..... p. 3395
Power Designs, Inc., Dept. EM, 1700 Shames Dr., Westbury, N.Y. 11590 .... *
M **Power, Inc., Marketing Div., Dept. EM, 12809 Eagle Ridge Dr., Burnsville, Minn. 55337** ..... *
Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... *
Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... *
Sanford-Miller Corp., Dept. EM, 8 John St., Lynbrook, N.Y. 11563 ..... *
Sanyo Electric Inc., Dept. EM, 51 Joseph St., Moonachie, N.J. 07074 p. 3315
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Technipower, Inc., Dept. EM, Commerce Pk Box 222, Danbury, Ct 06810 .. *
Trak Systems, Div. TRAK Microwave Corp., Dept. EM, 4722 Eisenhower Blvd., Dept. E8, Tampa, Fla. 33614 ..... *
Triad-Utrad, Distr Svcs., Dept. EM, 305 N. Briant St., Huntington, Ind. 46750 *
M **Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040** *

M Accurate Instrument Co., Dept. EM, Box No. 925, Westbury, N.Y. 11590
D Adapter/Charger Prdts., Dept. EM, Box 3218, Peoria, Ill. 61614
Aerolite Elexs Corp., Dept. EM, 2207 Summit Ave., Union City, N.J. 07087
Alpha Components Corp., Dept. EM, 115 Eucalyptus Dr., El Segundo, Cal. 90245
DM American Electronics, Inc., Dept. EM, 1600 E Valencia Dr., Fullerton, Cal. 92631
M American Monarch Corp., Dept. EM, 2801-37th Ave., N.E., Minneapolis, Minn. 55421
Applied Control Co., Dept. EM, 1275 Bloomfield Ave., Fairfield, N.J. 07006
Baldpate Electronics, Inc., Dept. EM, 225 E. Main St., Georgetown, Mass. 01833
M Barnes & Reinecke, Inc., Dept. EM, 2375 Estes Ave., Elk Grove Village, Ill. 60007
Basler Electric Co., Dept. EM, Box 269, Rte. 143, Highland, Ill. 62249
M Cal-Power Corp., Dept. EM, 140 Kansas St., El Segundo, Calif. 90245
D Chafitz Engineering, Dept. EM, P.O. Box 2188, Rockville, Md. 20852
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
DM Collins Elecs, Inc., Dept. EM, Old Love Pt. Rd., Stevensville, Md. 21666
Cyberex, Inc., Dept. EM, 7171 Industrial Park Blvd., Mentor, Ohio 44060
De Coursey Engrg. Lab., Dept. EM, 11828 W. Jefferson, Culver City, Cal. 90230
Eastern Delta Corp., Dept. EM, 29-09 S. Broadway, Fair Lawn, N.J. 07410
M Edmund Scientific Co., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007
M Eldec Corp., Dept. EM, Box 100, 16700 13th Ave. W., Lynnwood, Wash. 98036
Elgin Elctrns., Inc., Sub. Basic, Inc., Dept. EM, Walnut St., Waterford, PA. 16441
D Elpower Corp., Dept. EM, 2117 S. Anne St., Santa Ana, Cal. 92704
Gates Elctrn. Co., Dept. EM, 526 Van Nest Ave., Bronx, N.Y. 10460
G & G Tresco Corp., Dept. EM, 1952 E. Allegheny Ave., Phila., PA 19134
HGA Elctrns., Inc., Dept. EM, 519 S. Fifth Ave., Mt. Vernon, N.Y. 10550
D Jaesic Industries Co., Dept. EM, 29830 Beck, Wixom, Mich. 48096
Lakeshore Electric Corp., Dept. EM, 205 Willis, Bedford, Ohio 44146
D La Marche Mfg. Co., Dept. EM, 106 Bradrock Drive, Des Plaines, Ill. 60018
Lark Electronics, Inc., Dept. EM, Box 390, New York, N.Y. 10040
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
D Marathon Battery Co., c/o Marathon Manufacturing Co., Dept. EM, 1900 Marathon Bldg., 600 Jefferson Box 61589, Houston, Tex. 77002
Mine Safety Appliances Co., Dept. EM, 600 Penn Center Blvd., Pittsburgh, Pa 15235
North Electric Co., Power Sys Div., Dept. EM, Box 688, Galion, Ohio 44833
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
D Onan Div-Onan Corp., Dept. EM, 1400 73rd Ave. N.E., Minneapolis, Minn. 55432
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
D Power Control Corp., Dept. EM, 122 Gamma Dr., Pittsburgh, Pa. 15238
Power Conversion Products Inc., Dept. EM, 42 East St., Crystal Lake, Ill. 60014
D Power-Sonic Corp., Dept. EM, Box 5242, 3106 Spring St., Redwood City, Cal. 94063
D Ratelco, Inc., Dept. EM, 610 Pontius Ave. N., Dept. EEM, Seattle, Wash. 98109
RIL Elctrns., Inc., Dept. EM, 1105 Ind'l. Hwy., Southampton, Pa. 18966
D Sanken Elec. Co., Dept. EM, 1-22-8 Nishi-Ikebukuro, Toshima-Ku, Tokyo, Japan
M Sawyer Inds., Dept. EM, 5649 Peck Rd., Arcadia, Cal. 91006
Schauer Mfg. Corp., Dept. EM, 4500 Alpine Ave., Cincinnati, Ohio 45242
Snap-On-Tools, Dept. EM, 8192-A 28th Ave., Kenosha, Wisc. 53140
Solidstate Controls, Inc., Dept. EM, 600 Oakland Park Ave., Columbus, Ohio 43214
D Telco Products Co., Dept. EM, 44 Sea Cliff, Glen Cove, NY 11542
D Teledyne Big Beam, Dept. EM, 290 E. Prairie St., Crystal Lake, Ill. 60014
DM Terado Corp., Dept. EM, 1068 Raymond Ave., St. Paul, Minn. 55108
M UCE, Inc., Dept. EM, 20 N. Main St., Norwalk, Conn. 06854
Ward Leonard Elec. Co. Inc., Sub. Unimax Group Inc., Dept. EM, 31 South St., Mt. Vernon, N.Y. 10550

Chargers, Magnet—See Magnetizers

Chassis, Circuit Board Mounting

D **Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207** .... *
DM **Buckeye Stamping Co., Dept. EM, 555 Marion Rd., Columbus, Ohio 43207** *
Compac, Dept. EM, 279-I Skidmore Rd., Deer Park, N.Y. 11729 ..... *
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... *
E & L Instruments, Inc., Dept. EM, 61 First St., Derby, Conn. 06418 ..... *
D **Elco Corp., Dept. EM, 2250 Park Pl., El Segundo, CAL 90245** ..... p. 1754
D **Elctrn. Molding Corp., Dept. EM, 96 Mill St., Woonsocket, R.I. 02895** ..... *
DM **Excel Products Co., Inc., Dept. EM, 401 Joyce Kilmer Ave., New Brunswick, N.J. 08903** ..... *
GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
D **Interlok, Dept. EM, 770 Airport Blvd., Burlingame, Cal. 94010** ..... *
Re-el Circuits, Inc., Dept. EM, 520 Victor Street, Saddle Brook, N.J. 07662 *
Techmar Corp., Dept. EM, 2232 S. Cotner Ave., Los Angeles, Cal. 90064 .... *
United Wiring & Mfg. Co., Dept. EM, 2608 Electonic La. #404, Dallas, Tex. 75220 ..... *
UNITRACK Div., Calabro Plastics, Inc., Dept. EM, 8738 W. Chester Pike, Upper Darby, Pa. 19082 ..... *
D **Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342** ..... *
D **Vero Electronics, Dept. EM, 171 Bridge Rd., Hauppauge, N.Y. 11787** ..... *
D Bud Radio, Inc., Dept. EM, 4605 E. 355th St., Willoughby, Ohio 44094
M Calmark Corp., Dept. EM, 4947 Walnut Grove, 4947 Walnut Grove, Cal. 91776
Circuit Structures Lab., Div. D-Cemco Inc Inc., Dept. EM, 3200 N. San Fernando Blvd., Burbank, Calif. 91504
Des Tek Ind., Dept. EM, Box 24163, Los Angeles, Cal. 90024
D EECO, Dept. EM, 1441 E. Chestnut Ave, Box 659, Santa Ana, Cal. 92701
D Hammond Mfg. Co., Dept. EM, 385 Nagel Dr., Buffalo, NY 14225
Information Control Corp., Abacus Div. Dept. EM7, Dept. EM, 9610 Bellanca Ave., Los Angeles, Cal. 90045
Int'l. Elctrn. Resch., Dept. EM, 135 W. Magnolia Blvd., Burbank, Cal. 91502
M Lansing Research Corp., Dept. EM, 730-705 Willow Ave, Ithaca, N.Y. 14850
D LMB Heeger, Inc., Dept. EM, 725 Ceres Ave., Los Angeles, Cal. 90021
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
Mid-West Metal Prods., Inc., Dept. EM, 456 E. Donovan Rd., Kansas City, Kans. 66115
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
Mobil Electronics, Inc., Dept. EM, Box 1132, Anderson, Ind. 46015
D Modpak, Dept. EM, 31 A Green St., Waltham, Mass. 02154
Mupac Corp., Dept. EM, 646 Summer St., Brockton, Mass. 02402
Overly-Hautz Co., Dept. EM, 8617 Clinton Rd., Cleveland, Ohio 44144
D Par-Metal Prods. Inc., Dept. EM, 1260 Atlantic Ave., Brooklyn, N.Y. 11216
D Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
Wyle Computer Prods., Dept. EM, 3200 Magruder Blvd., Hampton, Va 23666
Zero Corp., Dept. EM, 777 Front St., Burbank, Cal. 91502

Chassis Marking Kits—See Kits, Marking (Dial, Instrument, Equipment, etc.)

Chassis, Metal

Alden Products Co, Dept. EM, 117 N Main St, Brockton, Mass. 02403 ..... *
D **Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207** .... *
DM **Buckeye Stamping Co., Dept. EM, 555 Marion Rd., Columbus, Ohio 43207** *
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Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... *
GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
M **General Devices Co., Inc., Dept. EM, Box 19188, Indianapolis, Ind. 46219** .. *
DM **Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101** ..... *
Optima Enclosures, Div. Scientific Atlanta, Dept. EM, 2166 Mountain Ind'l Blvd., Tucker, Ga. 30084 ..... *
D **Premier Metal Prods. Co., Div. Sunshine Mining Co., Dept. EM, 381 Canal Place, Bronx, N.Y. 10451** ..... *
Techmar Corp., Dept. EM, 2232 S. Cotner Ave., Los Angeles, Cal. 90064 .... *
UNITRACK Div., Calabro Plastics, Inc., Dept. EM, 8738 W. Chester Pike, Upper Darby, Pa. 19082 ..... *
Vent-Rak, Div., General Devices Co., Dept. EM, P.O. Box 19188, Indianapolis, Ind. 46219 ..... *
D **Vero Electronics, Dept. EM, 171 Bridge Rd., Hauppauge, N.Y. 11787** ..... *
AAK Corp, Dept. EM, POB 1, Methuen, Mass 01844
Acme Model Engrg. Co., Dept. EM, 654 Bergen Blvd., Ridgefield, N.J. 07657
Apahouser Corp. of N.E., Apahouser-Elcom, Dept. EM, 101 Walnut St., Watertown, Mass. 02172
D Bud Radio, Inc., Dept. EM, 4605 E. 355th St., Willoughby, Ohio 44094
M Calmark Corp., Dept. EM, 4947 Walnut Grove, 4947 Walnut Grove, Cal. 91776
Des Tek Ind., Dept. EM, Box 24163, Los Angeles, Cal. 90024
Electro Space Fabricators, Inc., Dept. EM, Topton, Pa. 19562
M Electro-Rack Products Co., Dept. EM, 1742 So. Clementine St., Anaheim, Cal. 92802
Framar Metal Prods Co., Dept. EM, 124 W Main St Dept 1201, High Bridge, N.J. 08829
D Hammond Mfg. Co., Dept. EM, 385 Nagel Dr., Buffalo, NY 14225
D Heeger Inc., Dept. EM, 725 Ceres Ave., Los Angeles, Cal. 90021
M Kinetron Corp., Dept. EM, 1416 Roller Rd, Asbury Park, N.J. 07712
D LMB Heeger, Inc., Dept. EM, 725 Ceres Ave., Los Angeles, Cal. 90021
D Mechanical Engraving Co., Inc., Dept. EM, 4500 Bullard Ave, Bronx, New York 10470
Mid-West Metal Prods., Inc., Dept. EM, 456 E. Donovan Rd., Kansas City, Kans. 66115
D Mobil Electronics, Inc., Dept. EM, Box 1132, Anderson, Ind. 46015
Mupac Corp., Dept. EM, 646 Summer St., Brockton, Mass. 02402
Overly-Hautz Co., Dept. EM, 8617 Clinton Rd., Cleveland, Ohio 44144
M Zero Corp., Dept. EM, 777 Front St., Burbank, Cal. 91502

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GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Acheson Colloids Co., Div. Acheson Inds., Dept. EM, P.O. Box 288, Port Huron, Mich. 48060
M Allied Chemical Corp., Specialty Chemicals Div., Dept. EM, Box 1087R, Morristown, N.J. 07960
Alpha Metals, Inc., Dept. EM, 600 Rte 440, Jersey City, N.J. 07304
Atomergic Chemetals Corp Co., Dept. EM, 100 Fairchild Ave., Plainview, N.Y. 11803
Auric Corp., Dept. EM, 470 Frelinghuysen Ave., Newark, N.J. 07114
Baker Chemical Co., J.T., Dept. EM, Phillipsburg, N.J. 08865
D Barco Chem. Prods. Inc., Dept. EM, 525 So. Dearborn St., Chicago, Ill. 60605
Bariod Div., N L Inds., Inc., Dept. EM, Box 1675, Houston, Tex. 77001
Edmund Scientific Co., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
Fidelity Chem. Prods. Corp., Dept. EM, 472 Frelinghuysen Ave., Newark, N.J. 07114
Indium Corp. of Amer, Dept. EM, 1676 Lincoln Ave, Box 269, Utica, NY 13503
D London Chemical Co., Dept. EM, 240 Foster Ave., Bensenville, Ill. 60106
M M & T Chemicals Inc., Dept. EM, Rahway, N.J. 07065
M Mallinckrodt, Inc., Dept. EM, P. O. Box 5840, St. Louis, Mo. 63134
Pace Inc., Dept. EM, 9329 Fraser Ave., Silver Spring, Md. 20910
Sel-Rex Div. Oxy Metal Industries Corp., Dept. EM, 75 River Rd., Nutley, N.J. 07110
D Sifco Metachemical, Div. Steel Improv. & Forging, Dept. EM, 5708 Schaaf Rd., Independence, Ohio 44131
M Technic, Inc., Dept. EM, Box 965, Providence, R.I. 02901
D Uniroyal, Inc., Dept. EM, 1230 Ave. of Americas, New York, N.Y. 10020
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013

Chemicals, Epoxy Stripping

M Hardman Inc., Dept. EM, 600 Cortlandt St., Belleville, N.J. 07109 ..... *
Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W.P Q, Can. H4X 1M8
Bariod Div., N L Inds., Inc., Dept. EM, Box 1675, Houston, Tex. 77001
Diamond Shamrock Corp, Dept. EM, 1100 Superior Ave, Cleveland, Ohio 44114
Dolph, John C. Co., Dept. EM, New Rd., Monmouth Junction, N.J. 08852
DM Dynaloy, Inc., Dept. EM, 7 Great Meadow La., Hanover, N.J. 07936
Formulated Resins Inc., Dept. EM, Box 508, Greenville, R.I. 02828
M Isochem Resins Co., Dept. EM, 99 Cook St., Lincoln, R.I. 02865
D London Chemical Co., Dept. EM, 240 Foster Ave., Bensenville, Ill. 60106
Mereco Products Div., Metachem Resins, Dept. EM, 538 Wellington Ave., Cranston, R.I. 02910
M Miller-Stephenson Chem. Co., Inc., Dept. EM, George Washington Hwy., Danbury, Conn. 06810
D Pennwalt Corp., Chemical Specialties Div., Dept. EM, Three Pkwy., Philadelphia, Pa. 19102
D Ram Chems., Div. Whittaker Corp., Dept. EM, 210 E. Alondra Blvd., Gardena, Calif. 90248
Sigma Plastronics, Inc., Dept. EM, 14531-33 Tireman Ave, Dearborn, Mich. 48126

Chemicals, Etching

D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
D Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342 ..... *
Adre Co., Dept. EM, Box 09415, Milwaukee, Wisc. 53209
Airco Industrial Gases, Dept. EM, 575 Mountain Ave., Murray Hill, N.J. 07974
M Allied Chemical Corp., Specialty Chemicals Div., Dept. EM, Box 1087R, Morristown, N.J. 07960
Atomergic Chemetals Corp Co., Dept. EM, 100 Fairchild Ave., Plainview, N.Y. 11803
Auric Corp., Dept. EM, 470 Frelinghuysen Ave., Newark, N.J. 07114
Baker Chemical Co., J.T., Dept. EM, Phillipsburg, N.J. 08865
M Chemplast, Inc., Dept. EM, 31-150 Dey Rd., Wayne, N.J. 07470
Diamond Shamrock Corp, Dept. EM, 1100 Superior Ave, Cleveland, Ohio 44114
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
Fidelity Chem. Prods. Corp., Dept. EM, 472 Frelinghuysen Ave., Newark, N.J. 07114
M Film Microelectronics, Inc., Dept. EM, 17 A St., Burlington, Mass 01803
FMC Corp., Ind'l. Chemical Grp, Dept. EM, 2000 Market St., Philadelphia, Pa 19103
Gates & Co., Inc., Geo. W., Dept. EM, Hempstead Tpke. & Lucille Ave., Franklin Sq., N.Y. 11010
M Gore, W.L. & Assocs., Dept. EM, 555 Paper Mill Rd., Box 8734, Newark, Del. 19711
D Injectorall Elctrns. Corp., Dept. EM, 98-100 Glen St., Glen Cove, N.Y. 11542
M Mallinckrodt, Inc., Dept. EM, P. O. Box 5840, St. Louis, Mo. 63134
DM Matheson Gas Products, Dept. EM, Box 85, East Rutherford, N.J. 07073
D Pennwalt Corp., Chemical Specialties Div., Dept. EM, Three Pkwy., Philadelphia, Pa. 19102
D Sifco Metachemical, Div. Steel Improv. & Forging, Dept. EM, 5708 Schaaf Rd., Independence, Ohio 44131
Technic, Inc., Dept. EM, Box 965, Providence, R.I. 02901
Tra-Con, Inc., Dept. EM, 55 North St., Medford, Mass. 02155
Union Carbide, Chemicals & Plastics, Dept. EM, 270 Park Ave., New York, N.Y. 10017

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D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
M Allied Chemical Corp., Specialty Chemicals Div., Dept. EM, Box 1087R, Morristown, N.J. 07960
Auric Corp., Dept. EM, 470 Frelinghuysen Ave., Newark, N.J. 07114
D Eraser Co., Dept. EM, Box 1342, Syracuse, N.Y. 13201
Fidelity Chem. Prods. Corp., Dept. EM, 472 Frelinghuysen Ave., Newark, N.J. 07114
Formulated Resins Inc., Dept. EM, Box 508, Greenville, R.I. 02828
D Kenco Alloy & Chemical Co., Inc., Dept. EM, 418 W. Belden Ave., Addison, Ill. 60101
D London Chemical Co., Dept. EM, 240 Foster Ave., Bensenville, Ill. 60106
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
Methode Elctrns., Inc., Dept. EM, 7447 W. Wilson Ave., Chicago, Ill. 60656

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M Bourns Magnetic Prods., Trimpot Div., Dept. EM, Box 1398, Romoland, Cal. 92380 ..... *
M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 ..... *
EWC, Inc., Dept. EM, 725 Federal Ave., Kenilworth, N.J. 07033 ..... *
M Freed Transformer Co., Inc., Dept. EM, 1718 Weirfield St., Brooklyn, N.Y. 11227 ..... *
Magnetico, Inc., Dept. EM, 182 Morris Ave., Holtsville, N.Y. 11742 ..... *
DM Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 *
NWL Transformers, Dept. EM, Rising Sun Rd., Bordentown, N.J. 08505 ..... *
M Pico Elctrns. Inc., Dept. EM, 453 North MacQuesten Parkway, Mount Vernon, N.Y. 10552 ..... *
M Sigmapower, Inc., Dept. EM, 20790 Leapwood Ave., Carson, Cal. 90746 .... *
Signal Transformer Co., Dept. EM, 500 Bayview Ave., Inwood, N.Y. 11696 *
DM Thordarson Meissner, Electronic Ctr., Dept. EM, Mt. Carmel, Ill. 62863 ..... *
D Todd Systems, Dept. EM, 4 Radford Pl., Yonkers, N.Y. 10701 ..... p. 4432
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... *
M Torwico Elctrns., Inc., Dept. EM, Rte. 70, Lakewood, N.J. 08701 ..... *
D Triad-Utrad, Distr Svcs., Dept. EM, 305 N. Briant St., Huntington, Ind. 46750 *
M Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040 *
American Magnetics Corp., Dept. EM, P.O. Box 8, Carterville, Ill. 62918
American Monarch Corp., Dept. EM, 2801-37th Ave., N.E., Minneapolis, Minn. 55421
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Datatex Corp., Dept. EM, 10935 S. Wilcrest Dr., Houston, Tex. 77099
M Dietz Design, Inc., Dept. EM, 100 Electronics Pkwy., Belton, Mo. 64012
Eastern Delta Corp., Dept. EM, 29-09 S. Broadway, Fair Lawn, N.J. 07410
Electrocube Inc., Dept. EM, 1710 So. Del Mar Ave., San Gabriel, Cal. 91776
G & G Tresco Corp., Dept. EM, 1952 E. Allegheny Ave., Phila., PA 19134
D Hammond Mfg. Co., Dept. EM, 385 Nagel Dr., Buffalo, NY 14225
M Johnson Electric Coil Co., Dept. EM, Box 559, Elmhurst, Ill 60126
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
M Magnetic Circuit Elements, Dept. EM, 2455A Garden Rd., Monterey, Cal. 93940
Neshaminy Transformer, Div. Neshaminy Elctrn., Dept. EM, Edison-Furlong Rd., Furlong, Pa. 18925
M Northlake Engineering, Dept. EM, 999 Anita Ave., Antioch, Ill. 60002
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Phoenix Transformer Co., Dept. EM, 1818 E. Madison, Phoenix, Ariz. 85034
M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
M Prototype Transformer Corp., Dept. EM, 545 N Arlington Ave, East Orange, N.J. 07017
Schott Corp., Dept. EM, 3140 B Harbor Lane No., Minneapolis, Minn. 55441
DM Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
Tranex Inc., Dept. EM, 1599 Stierlin Rd., Mountain View, Cal. 94043

Chokes, Waveguide

M Airtron, Div. Litton Inds., Dept. EM, 200 E. Hanover Ave., Morris Plains, N.J. 07950
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
D Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
D Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
M Reeve Electronics, Inc., Dept. EM, 609 W. Lake St., Chicago, Ill 60606
M RF Systems, Inc., Dept. EM, 3100 Communications Rd., St Cloud, Fla. 32769
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
TRG, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006

Choppers-Also See Light Choppers

M Airpax Elctrns., Inc., Cambridge Div., Dept. EM, Woods Rd., Cambridge, Md. 21613 ..... *
American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Bulova Watch Co., Servo Prods. Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
D General Magnetics, Dept. EM, 211 Grove St., Bloomfield, N.J. 07003 ..... *
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 *
Ithaco, Inc., Dept. EM, 735 W. Clinton St., Ithaca, N.Y. 14850 ..... *
Millivac Instruments, Inc., Dept. EM, Box 997, Curry Rd. Ext., Schnectady, N.Y. 12301 ..... *
M Philamon, Inc., Dept. EM, 33 Dubon Ct., Farmingdale, N.Y. 11735 ..... p. 2353
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Advanced Kinetics, Dept. EM, 1231 Victoria St., Costa Mesa, Calif. 92627
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
Cherry Semiconductor Corp, Dept. EM, 99 Bald Hill Rd., Cranston, RI 02920
Climatronics Corp., Dept. EM, 1324 Motor Pkwy., Hauppauge, N.Y. 11787
DM Collins Elecs, Inc., Dept. EM, Old Love Pt. Rd., Stevensville, Md. 21666
Electro-Optical Inds., Inc., Dept. EM, 839 Ward Dr., Santa Barbara, Cal. 93111
Scientech, Inc., Dept. EM, 5649 Arapahoe Ave, Boulder, Colo. 80303
Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Universal Relay Corp., Dept. EM, 42 White St., New York, N.Y. 10013

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Circuit Breakers

M Airpax Elctrns., Inc., Cambridge Div., Dept. EM, Woods Rd., Cambridge, Md. 21613 ..... p. 3978,3979
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D Control Products Div., Amerace Corp., Dept. EM, 2330 Vauxhall Rd., Union, N.J. 07083 ..... p. 1749
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D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
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D Littelfuse, Inc., Dept. EM, 800 E. Northwest Hwy., Des Plaines, Ill. 60016 p. 4101
D Potter & Brumfield, Div of AMF, Dept. EM, P.O. Box 322, Princeton, Ind. 47671 ..... *
D Pyle-National Co, Dept. EM, 1334 N. Kostner Ave, Chicago, Ill 60651 ..... *
M Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... p. 3609
D SGL Waber Electric, Dept. EM, 300 Harvard Avenue, Westville, NJ 08093 .. *
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
D Birnbach Co., Inc., Dept. EM, 177 Hanse Ave., Freeport, N.Y. 11520
Bryant Electric, Dept. EM, 1421 State St., Bridgeport, Conn. 06602
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Curtis Industries Inc., Dept. EM, 8000 West Tower Ave., Milwaukee, Wisc. 53223
M E-T-A Circuit Breakers, Dept. EM, 7400 N. Croname Rd., Chicago, Ill. 60648
GTE Sylvania Inc., Dept. EM, Rte. 35, Standish, Maine 04084
DM Mechanical Products, Inc., A Norlin Tech Co, Dept. EM, 1824 River St. Box 729, Jackson, Mich. 49204
Micro, Emerson Electric Co. Devices Div, Dept. EM, Box 501 Wright Bros Br, Dayton, Ohio 45409
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Telephonics Corp., Dept. EM, 770 Park Ave., Huntington, N.Y. 11743
D Texas Instruments Control Prods. Div., Dept. EM, 34 Forrest St., Attleboro, Mass. 02703
D Underwriters Safety Device, An Eltra Co., Dept. EM, 7300 W. Wilson Ave., Chicago, Ill. 60656
D Wadsworth Electric Mfg. Co., Dept. EM, 20 W. 11th St., Covington, Ky. 41011
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

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Circuits, Hybrid, Thick Film

M Aeroflex Labs, Integrated Microsystems Div., Eastern Opers., Dept. EM, 35 S. Service Rd., Painview, N. Y. 11803 ..... p. 2851
M Aeroflex Labs, Integrated Microsystems Div., Western Opers., Dept. EM, 1215 Terra Bella Ave, Mountain View, Cal. 94043 ..... p. 2851
D Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
DM Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634 ..... p. 2853,3646,3647
BEI Elctrns., Inc., Dept. EM, 1101 McAlmont St., Little Rock, Ark. 72203 .... *
Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734 ..... *
D Dale Electronics, Inc., Dept. EM, Box 74, Norfolk, Nebr. 68701 ..... *
M Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... *
M ILC Data Device Corp., Dept. EM, Airport Int'l. Plaza, Bohemia, N.Y. 11716 p. 1644,1645
M Integrated Circuits, Inc., Dept. EM, 13256 Northrup Way, Bellevue, Wash. 98005 ..... *
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D International Rectifier Corp., Semiconductor Div., Dept. EM, 233 Kansas St., El Segundo, Cal. 90245 ..... *
M ITT North, Microsystems Div, Dept. EM, 700 Hillsboro Pl., Deerfield Beach, Fla. 33441 ..... p. 2858
M Leach Corp., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003 ..... *
Mini-Systems, Inc., Dept. EM, 20 David Rd., North Attleboro, Mass. 02761 *
Ovenaire, Div. Walter Kidde & Co., Dept. EM, 706 Forrest St., Charlottesville, Va. 22901 ..... *
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 *
D TRW RF Semiconductors, Dept. EM, 14520 Aviation Blvd., Lawndale, Cal. 90260 ..... Inside Back Cover, Vol. 1
DM American Microsignal Corp, Dept. EM, 8431 Monroe Ave., Stanton, Cal. 90680
D Amperex Electronic Corp., Slatersville Div., Dept. EM, Providence Pike, Slatersville, R.I. 02876
M Aydin, Vector Div., Dept. EM, Box 328, Newtown, PA 18940
D Centralab, Electrns. Div. - Globe Union Inc., Dept. EM, 5757 N. Green Bay Ave., Milwaukee, Wisc. 53201
Cermetek, Inc., Dept. EM, 660 National Ave., Mountain View, Cal. 94040
M Circuit Technology, Dept. EM, 160 Smith St., Farmingdale, N.Y. 11735
CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
M CTS Microelectronics, Inc., Dept. EM, 1201 Cumberland Ave., W. Lafayette, Ind. 47906
D Electro-Science Labs., Dept. EM, 2211 Sherman Ave., Pennsauken, N. J. 08110
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
D Fuji Electrochemical Co., Dept. EM, Hamagomu Bld. 5 36-11 Shinbashi, Minato-ku, Tokyo, Japan
General Instr. Corp., Microelectronics Div., Dept. EM, 600 W. John St., Hicksville, N.Y. 11802
Gentron Corp., Dept. EM, 6667 N. Sydney Pl., Milwaukee, Wisc. 53209
HEI, Inc., Dept. EM, Jonathan Ind'l. Ctr., Chaska, Minn. 55318
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Hybrid Electronics Inc., Dept. EM, 142 Adams St., Newton, Mass. 02158
M Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
Integrated Photomatrix, Dept. EM, 1101 Bristol Rd., Mountainside, N.J. 07092
D International Sensor Systems, Inc., Dept. EM, Aurora Industrial Pk., Box 345, Aurora, Neb. 68818
M Kates Scientific Instruments, Dept. EM, 142 Adam St, Newton, Mass. 02158
Kennedy Corp., M.S., Dept. EM, Pickard Dr., Syracuse, N.Y. 13211
Lambda Elctrns., Dept. EM, 515 Brd. Hollow Rd., Melville, N.Y. 11746
D Mepco/Electra, Inc., Dept. EM, Columbia Rd., Morristown, N.J. 07960
Modular Devices, Inc., Dept. EM, 50 Orville Dr., Bohemia, N. Y. 11716
D Murata Mfg. Co. Ltd., Dept. EM, 16, Kaiden Nishijin-cho, Nagaoka-Kyo-Shi, Kyoto, Japan
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
Optical Electronics, Inc., Dept. EM, Box 11140, Tucson, Ariz. 85734
M Parlex Corp, Dept. EM, 145 Milk St., Methuen, Mass. 01844
Plessey Ceramic Div., Dept. EM, 8th & Harrison Sts., Frenchtown, N.J. 08825
Radio Materials Co., Div. P.R. Mallory, Dept. EM, 4242 W. Bryn Mawr Ave., Chicago, Ill. 60646
M Raytheon Co., Indl. Comps. Oper., Dept. EM, 465 Centre St., Quincy, Mass. 02169
Sensor Technology, Dept. EM, 21012 Lassen St., Chatsworth, Cal. 91311
DM Solitron Devices, Transistor Div., Dept. EM, 1177 Blue Heron Rd., Riviera Beach, Fla. 33404
Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
Thickfilm Int'l, Dept. EM, 1610 Mt Vernon Ave., Alexandria, VA 22301

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DM Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634 ..... p. 2853,3646,3647
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M Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 p. 1401
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M Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... *
Mini-Systems, Inc., Dept. EM, 20 David Rd., North Attleboro, Mass. 02761 *
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D Amperex Electronic Corp., Slatersville Div., Dept. EM, Providence Pike, Slatersville, R.I. 02876
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
CTS Microelectronics, Inc., Dept. EM, 1201 Cumberland Ave., W. Lafayette, Ind. 47906
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Essex Group, Dept. EM, 3501 W. Addison, Ft. Wayne, IN. 46809
D Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
M Film Microelectronics, Inc., Dept. EM, 17 A St., Burlington, Mass 01803

D Fuji Electrochemical Co., Dept. EM, Hamagomu Bld. 5 36-11 Shinbashi, Minato-ku, Tokyo, Japan
Gentron Corp., Dept. EM, 6667 N. Sydney Pl., Milwaukee, Wisc. 53209
M Halex, Inc., Dept. EM, 1202 McGaw Ave, Irvine, Ca. 92714
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M HyComp Inc., Dept. EM, Box 250, Maynard, Mass. 01754
Hybrid Electronics Inc., Dept. EM, 142 Adams St., Newton, Mass. 02158
M Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
M Kates Scientific Instruments, Dept. EM, 142 Adam St, Newton, Mass. 02158
Meret Inc., Dept. EM, 1815 24th St., Santa Monica, Cal. 90404
M Micro Networks, Dept. EM, 324 Clark St., Worcester, Mass. 01606
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
Sensor Technology, Dept. EM, 21012 Lassen St., Chatsworth, Cal. 91311
DM Solitron Devices, Transistor Div., Dept. EM, 1177 Blue Heron Rd., Riviera Beach, Fla 33404
D Tau-Tron Inc., Dept. EM, 11 Esquire Rd., N. Billerica, Mass. 01862

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D Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... *
M LSI Computer Systems, Inc., Dept. EM, 1235 Walt Whitman Rd., Melville, N.Y. 11746 ..... *
Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 ..... *
D American Microsystems, Inc., Dept. EM, 3800 Homestead Rd., Santa Clara, Cal. 95051
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Cherry Semiconductor Corp, Dept. EM, 99 Bald Hill Rd., Cranston, RI 02920
Dionics, Dept. EM, 65 Rushmore St., Westbury, N.Y. 11590
D Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
Ferranti Elec., Dept. EM, East Bethpage Rd., Plainview, N.Y. 11803
D Fuji Electrochemical Co., Dept. EM, Hamagomu Bld. 5 36-11 Shinbashi, Minato-ku, Tokyo, Japan
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Interdesign Inc., Dept. EM, 1255 Reamwood Ave., Sunnyvale, Cal. 94086
M Intersil, Inc., Dept. EM, 10900 N. Tantau Ave., Cupertino, Cal. 95014
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
DM Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
DM Plessey Semiconductors, Dept. EM, 1674 McGaw Ave., Irvine, Cal. 92714
DM Precision Monolithics Inc., Dept. EM, 1500 Space Dr., Santa Clara, Cal. 95050
DM Signetics Corp., Dept. EM, 811 E. Arques Ave., Sunnyvale, Cal. 94086
D Siliconix, Inc., Dept. EM, 2201 Laurelwood Rd., Santa Clara, Cal 95054
DM SMC Microsystems Corp., Dept. EM, 35 Marcus Blvd, Hauppauge, N.Y. 11787
DM Solitron Devices, Transistor Div., Dept. EM, 1177 Blue Heron Rd., Riviera Beach, Fla. 33404
D Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
DM Teledyne Semiconductor, Dept. EM, 1300 Terra Bella Ave., Mountain View, Cal. 94040
Xciton Corp, Dept. EM, Shaker Park, 5 Hemlock St, Latham, NY 12110

Circuits, Printed Flexible

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3M Co., Electronic Prods Div., Dept. EM, 3M Center, St. Paul, Minn. 55101 *
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Spectra-Strip Corp., Dept. EM, 7100 Lampson Ave., Box 415, Garden Grove, Cal. 92642 ..... *
United Wiring & Mfg. Co., Dept. EM, 2608 Electonic La. #404, Dallas, Tex. 75220 ..... *
Bishop Graphics, Dept. EM, 5388 Sterling Center, Westlake Village, Cal. 91361
Buckbee Mears Co., Dept. EM, 245 E. 6th St., St. Paul, Minn. 55101
M Bureau Engraving, Inc., Ind'l. Div., Dept. EM, 219 N. Second St., Minneapolis, Minn. 55401
Defiance Circuit Corp., Sub. of Hi-G Inc., Dept. EM, 12 Shepherd St., Lawrence, Mass. 01843
Methode Elctrns., Inc., Dept. EM, 7447 W. Wilson Ave., Chicago, Ill. 60656
Mid-West Metal Prods., Inc., Dept. EM, 456 E. Donovan Rd., Kansas City, Kans. 66115
M Minco Products Inc., Dept. EM, 7300 Commerce Lane, Minneapolis, Minn. 55432
M Parlex Corp, Dept. EM, 145 Milk St., Methuen, Mass. 01844
M Photronic Labs., Dept. EM, Commerce Park, Danbury, Conn. 06810
M Rogers Corp., Dept. EM, Rogers, Conn. 06263
DM SGL Printed Circuits, Div. SGL Inds., Inc., Dept. EM, 827 Black Oak Ridge Rd., Wayne, N.J. 07470
Sheldahl, Inc., Electrical Prods. Div., Dept. EM, Box 170, Northfield, Minn. 55057
M Tech-Etch/Braun, Dept. EM, 45 Aldrin Rd., Plymouth, Mass. 02360

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M Advanced Circuitry, Litton Systems Inc., Dept. EM, 4811 W. Kearney St., Springfield, Mo. 65803
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M Bureau Engraving, Inc., Ind'l. Div., Dept. EM, 219 N. Second St., Minneapolis, Minn. 55401
Centralab, Electrns. Div. - Globe Union Inc., Dept. EM, 5757 N. Green Bay Ave., Milwaukee, Wisc. 53201
Circuits, Inc., Dept. EM, 59 Deming Rd., Berlin, Conn. 06037
Dattilo Enterprises, Inc., Dept. EM, 2302 Taylorsville Rd., Louisville, Ky. 40205
Defiance Circuit Corp., Sub. of Hi-G Inc., Dept. EM, 12 Shepherd St., Lawrence, Mass. 01843
GTE Sylvania, Circuit Module Oper., Elctrn. Comps. Grp., Dept. EM, Box 360, Muncy, Pa. 17756
GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
MBC Engineering Inc., Dept. EM, 2501 Walsh Ave., Santa Clara, Cal. 95050
Memorex Corp., Dept. EM, San Thomas at Central Expwy., Santa Clara, Cal. 95052
Methode Elctrns., Inc., Dept. EM, 7447 W. Wilson Ave., Chicago, Ill. 60656
E Metropolitan Circuits Inc., Dept. EM, 1261 Logan, Costa Mesa, Cal 92626
Micro Multi Circuits, Dept. EM, P.O. Box 17024, Irvine, Calif. 92703
Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
M Parlex Corp, Dept. EM, 145 Milk St., Methuen, Mass. 01844
M Photocircuits Div., Kollmorgen, Dept. EM, 31 Sea Cliff Ave., Glen Cove, N.Y. 11542
Rogers Corp., Dept. EM, Rogers, Conn. 06263
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DM SGL Printed Circuits, Div. SGL Inds., Inc., Dept. EM, 827 Black Oak Ridge Rd., Wayne, N.J. 07470
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DM Excel Products Co., Inc., Dept. EM, 401 Joyce Kilmer Ave., New Brunswick, N.J. 08903 ..... *
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Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 *
D Triad-Utrad, Distr Svcs., Dept. EM, 305 N. Briant St., Huntington, Ind. 46750 *
DM Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342 ..... *
D Vero Electronics, Dept. EM, 171 Bridge Rd., Hauppauge, N.Y. 11787 .. p. 1320
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
Acme Model Engrg. Co., Dept. EM, 654 Bergen Blvd., Ridgefield, N.J. 07657
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M Avionics Ltd., Dept. EM, Box 200, Niagara-On-Lake, Ont., Can.
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Buckbee Mears Co., Dept. EM, 245 E. 6th St., St. Paul, Minn. 55101
D Bud Radio, Inc., Dept. EM, 4605 E. 355th St., Willoughby, Ohio 44094
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Chemical Etching Equip. & Supply, Dept. EM, 6905 Beulah St, Alexandria, Va. 22310
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Control Systems Research, Inc., Dept. EM, CSR Bldg., 632 Fort Duquesne Blvd., Pittsburgh, Pa. 15222
Cybernetics Medical, Inc., Dept. EM, 206 5th St., Lynchburg, Va. 24504
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GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854
Gore, W.L. & Assocs., Dept. EM, 555 Paper Mill Rd., Box 8734, Newark, Del. 19711
GTE Sylvania, Circuit Module Oper., Elctrn. Comps. Grp., Dept. EM, Box 360, Muncy, Pa. 17756
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Kalmus & Assoc., Dept. EM, 2424 S. 25th Ave., Broadview, ILL. 60153
Kantz Electronic Ind., Dept. EM, 229 W. 4th St., Clifton, N.J. 07011
M Lehighton Electronics, Inc., Dept. EM, RD 1Box 374 Dept M, Lehighton, Pa 18235
Masterite Corporation, Dept. EM, 2841 Lomita Blvd., Torrance, Cal. 90505
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M Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
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M Photronic Labs., Dept. EM, Commerce Park, Danbury, Conn. 06810
D Power Control Corp., Dept. EM, 122 Gamma Dr., Pittsburgh, Pa. 15238
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M Solid State Circuits, Dept. EM, 616 Boonville, Springfield, Mo. 65806
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Triangle Microwave Inc., Dept. EM, 9B Great Meadow La, East Hanover, NJ 07936
TRW/Cinch-Graphik, Elctrn. Comps., Div. TRW INC., Dept. EM, 200 S. Turnbull Canyon Rd., City of Industry, Cal. 91744
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578
Wyle Computer Prods., Dept. EM, 3200 Magruder Blvd., Hampton, Va 23666
D Zenrad Controls Co., Dept. EM, 529 E. Gutierrez St., Santa Barbara, Ca. 93103
Zero Corp., Dept. EM, 777 Front St., Burbank, Cal. 91502

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M , Trak Microwave Corp., Dept. E8, Dept. EM, 4726 Eisenhower Blvd.,, Tampa, Fla. 33614 ..... p. 3065
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
AERCOM, Dept. EM, 405 Tasman Dr., Sunnyvale, Cal. 94086
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
M Airtron, Div. Litton Inds., Dept. EM, 200 E. Hanover Ave., Morris Plains, N.J. 07950
D Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
M Cir-Q-Tel, Inc., Dept. EM, 10504 Wheatley St., Kensington, Md. 20795
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Merrimac Inds., Inc., Dept. EM, 41 Fairfield Pl., West Caldwell, N.J. 07006
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
D Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
Sivers Lab, Dept. EM, Box 90339, Los Angeles, Cal. 90009
DM Systron-Donner, Advanced Components Div., Dept. EM, 735 Palomar Ave., Sunnyvale, Cal. 94086
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
M Teledyne Microwave, Dept. EM, 1290 Terra Bella Ave., Mountain View, Cal. 94040
TRG,, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
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M UTE Microwave, Dept. EM, 3500 Sunset Ave., Asbury Park, N.J. 07712

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M Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
Beman Mfg., Inc., Dept. EM, PO Box 370, New Cumberland, Pa. 17070 ..... *
DM Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... *
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
D Grayhill Inc., Dept. EM, 569 Hillgrove Ave., LaGrange, Ill. 60525 ..... p. 4609
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D 3M Co., Electronic Prods Div., Dept. EM, 3M Center, St. Paul, Minn. 55101 *
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DM Panduit Corp., Dept. EM, 17301 Ridgeland Ave., Tinley Park, Ill. 60477 p. 4629,4630
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D Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2123,2143
D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
D TRW/Cinch Connectors, Electronic Comp. Div. of TRW Inc., Dept. EM, 1501 Morse Ave., Elk Grove Village, Ill. 60007 ..... Inside Back Cover, Vol. 1
DM Vemaline Prods. Div., Ostbys & Barton Co., Dept. EM, 487 Jefferson Blvd., Warwick, R.I. 02886 ..... *
D Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 .... *
D Zeus Ind'l. Prods., Dept. EM, Foot of Thompson St., Raritan, N.J. 08869 .... *
D Accessories for Electronics, Dept. EM, 800 Merrick Road, Baldwin, N.Y. 11510
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
Acme Model Engrg. Co., Dept. EM, 654 Bergen Blvd., Ridgefield, N.J. 07657
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M Allmetal Screw Products Co., Inc., Dept. EM, 821 Stewart Ave., Garden City, N.Y. 11530
DM Amrad Corp., Dept. EM, Box 876, Paris, Tex. 75460
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Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
D Birnbach Co., Inc., Dept. EM, 177 Hanse Ave., Freeport, N.Y. 11520
Dek, Inc., Dept. EM, 1555-A Hawthorne La., W. Chicago, Ill. 60185
M Dennison Mfg. Co., Fastener Division, Dept. EM, Framingham, Mass. 01701
D Eaton Corp., Engineered Fasteners Oper., Dept. EM, Box 6688, Cleveland, Ohio 44101
DM Electrovert, Dept. EM, 86 Hartford Ave., Mt. Vernon, N.Y. 10553
Federal Screw Products Inc., Dept. EM, 3917 N. Kedzie Ave., Chicago, Ill. 60618
Globe Plastics, Dept. EM, 1342 S. Signal Dr., Pomona, Cal. 91766
D Gries Reproducer Co., Div. Coats & Clark Inc., Dept. EM, 162 Beechwood Ave., New Rochelle, N.Y. 10801
Hartwell Corp., Dept. EM, 900 S. Richfield Rd., Placentia, Cal. 92670
D Holub Industries, Dept. EM, 413 DeKalb Ave., Sycamore, Ill. 60178
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Clamps & Clips, Component

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D Int'l. Elctrn. Resch., Dept. EM, 135 W. Magnolia Blvd., Burbank, Cal. 91502
Micro Instrument Co., Marine & Power Instr. Div., Dept. EM, 2250 Micro Pl., Escondido, Cal. 92025
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
M Quantum, Inc., Dept. EM, Barnes Industrial Pk, Wallingford, CT. 06492
Seastrom Mfg. Co. Inc., Dept. EM, 701 Sonora Ave., Glendale, Cal. 91201
M Sjoberg, C. & Son, Inc., Dept. EM, 415 Station St., Cranston, R.I. 02910

M Timber-Top, Inc., Dept. EM, Hopkins Rd., Box 517E, Watertown, Conn. 06795
D Viking Inds., Inc., Dept. EM, 9324 Topanga Cyn Blvd., Chatsworth, Cal. 91311
DM Zierick Mfg. Corp., Dept. EM, 44 Radio Circle, Mt. Kisco, N.Y. 10549

Clamps & Clips, Ground

GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
ITT Cannon Electric, Dept. EM, 666 E. Dyer Rd., Santa Ana, Cal. 92702 p. 1889, Back Cover, Vol. 1
DM Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012 .. *
DM Mueller Electric, Dept. EM, 1583 E 31st St. Dept. 20, Cleveland, Ohio 44114 p. 2086
M Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... *
D Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 *
D Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342 ..... *
D Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 .... *
DM Accessories for Electronics, Dept. EM, 800 Merrick Road, Baldwin, N.Y. 11510
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
Copperweld Bimetallics, Div. Copperweld Corp., Dept. EM, Glassport, PA 15045
Sjoberg, C. & Son, Inc., Dept. EM, 415 Station St., Cranston, R.I. 02910
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
D T & B/Thomas & Betts, Dept. EM, 36 Butler St., Elizabeth, N.J. 07207
D Zierick Mfg. Corp., Dept. EM, 44 Radio Circle, Mt. Kisco, N.Y. 10549

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Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 ..... p. 2426
M Timber-Top, Inc., Dept. EM, Hopkins Rd., Box 517E, Watertown, Conn. 06795

Clean Room Equipment & Supplies

Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
Alconox Inc., Dept. EM, 215 Park Ave. S., New York, N.Y. 10003
Lenape Equipment Co, Dept. EM, 558 Lincoln Blvd., Middlesex, NJ. 08846
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
Static Inc., Dept. EM, Box 414, Lee, Mass. 01238
Weber Tech Products, Dept. EM, 360 Merrimack St., Lawrence, Mass 01842
Westinghouse Elec., Process Equip./Consumables Dept, Dept. EM, Box 300, Sykesville, Md. 21784

Cleaners & Solvents

D Gardiner Solder Co., Div. of Gardiner Metal Co., Dept. EM, 4820 S. Campbell Ave., Chicago, Ill 60632 ..... p. 4291
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... p. 1290
D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
Air Products & Chemicals, Dept. EM, Box 538, Allentown, PA 18105
D Alconox Inc., Dept. EM, 215 Park Ave. S., New York, N.Y. 10003
M Allied Chemical Corp., Specialty Chemicals Div., Dept. EM, Box 1087R, Morristown, N.J. 07960
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
D Alpha Metals, Inc., Dept. EM, 600 Rte 440, Jersey City, N.J. 07304
Ambroid Co., Dept. EM, P.O. Box 1089, Taunton, MA 02780
Argus International, Dept. EM, Box 38, Hopewell, N.J. 08525
D Audio-Technica U.S., Inc., Dept. EM, 33 Shiawassee Ave., Fairlawn, Ohio 44313
Auric Corp., Dept. EM, 470 Frelinghuysen Ave., Newark, N.J. 07114
Baker Chemical Co., J.T., Dept. EM, Phillipsburg, N.J. 08865
D Barco Chem. Prods. Inc., Dept. EM, 525 So. Dearborn St., Chicago, Ill. 60605
Bariod Div., N L Inds., Inc., Dept. EM, Box 1675, Houston, Tex. 77001
Baron-Blakeslee, Dept. EM, 1620 S. Laramie Ave., Chicago, Ill. 60650
D Caig Labs., Inc., Dept. EM, 1175-0 Industrial Ave., Box 64, Escondido, Cal. 92025
D Chemtronics, Inc., Dept. EM, 45 Hoffman Ave., Hauppauge, N.Y. 11787
D Clean Room Prods., Dept. EM, 56 W. Penataquit Ave., Bay Shore, N.Y. 11706
DM Cobehn, Inc., Dept. EM, 226 Passaic Ave., Fairfield, N.J. 07006
DM Conap, Inc., Dept. EM, 1405 Buffalo St, Olean, N.Y. 14760
Diamond Shamrock Corp, Dept. EM, 1100 Superior Ave, Cleveland, Ohio 44114
D Dolph, John C. Co., Dept. EM, New Rd., Monmouth Junction, N.J. 08852
D Dynaloy, Inc., Dept. EM, 7 Great Meadow La., Hanover, N.J. 07936
Eastman Chem. Prods., Sub. Eastman Kodak Co., Dept. EM, Kingsport, Tenn. 37662
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
D Eraser Co., Dept. EM, Box 1342, Syracuse, N.Y. 13201
Fidelity Chem. Prods. Corp., Dept. EM, 472 Frelinghuysen Ave., Newark, N.J. 07114
Formulated Resins Inc., Dept. EM, Box 508, Greenville, R.I. 02828
D Friend's Mfg., Dept. EM, Rd. 5, Box 74, Williamstown, N.J. 08094
D Heeger Inc., Dept. EM, 725 Ceres Ave., Los Angeles, Cal. 90021
M Hightemp Resins, Inc., Dept. EM, 225 Greenwich Ave., Stamford, Conn. 06902
D Hollis Engrg., Inc., Dept. EM, Charron Ave., Box 1189, Nashua, N.H. 03061
D Injectorall Elctrns. Corp., Dept. EM, 98-100 Glen St., Glen Cove, N.Y. 11542
M Isochem Resins Co., Dept. EM, 99 Cook St., Lincoln, R.I. 02865
D Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
D Kenco Alloy & Chemical Co., Inc., Dept. EM, 418 W. Belden Ave., Addison, Ill. 60101
DM Kester Solder Div., Litton Systems Inc., Dept. EM, 4201 Wrightwood Ave., Chicago, Ill. 60639
Lenape Equipment Co, Dept. EM, 558 Lincoln Blvd., Middlesex, NJ. 08846
D LMB Heeger, Inc., Dept. EM, 725 Ceres Ave., Los Angeles, Cal. 90021
D London Chemical Co., Dept. EM, 240 Foster Ave., Bensenville, Ill. 60106
DM LPS Research Labs, Dept. EM, 2050 Cotner Ave., Los Angeles, Cal. 90025
M M & T Chemicals Inc., Dept. EM, Rahway, N.J. 07065
M Mallinckrodt, Inc., Dept. EM, P. O. Box 5840, St. Louis, Mo. 63134
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
Markem Corp., Dept. EM, 1000 Congress St., Keene, NH 03431
DM Merix Chem. Co., Dept. EM, 2234 East 75th St., Chicago, Ill. 60649
M Miller-Stephenson Chem. Co., Inc., Dept. EM, George Washington Hwy., Danbury, Conn. 06810
National Camera Inc., Dept. EM, 2000 W. Union Ave., Englewood, Colo. 80110
Odell Co., M. P., Dept. EM, 26612 Center Ridge Rd., Cleveland, Ohio 44145
D Pennwalt Corp., Chemical Specialties Div., Dept. EM, Three Pkwy., Philadelphia, Pa. 19102
Phillips Mfg. Co., National Ultrasonic Div., Dept. EM, 7334 N. Clark St., Chicago, Ill. 60626
P Q Corp., Dept. EM, PQ Corp, Valley Forge, Pa. 19482
D Quietrole Co., Dept. EM, 395 St. John, Spartenburg, S.C. 29302
D R-Columbia Products, Inc., Dept. EM, 2008 St. John's Ave., Highland Park, Ill. 60035
D Ram Chems., Div. Whittaker Corp., Dept. EM, 210 E. Alondra Blvd., Gardena, Calif. 90248
D Regmo Data Corp., Dept. EM, 7275 Bush Lk Rd., Minneapolis, Minn. 55435
Sara Sales Co., Dept. EM, P.O. Box 321, San Francisco, Calif. 94101
Sel-Rex Div. Oxy Metal Industries Corp., Dept. EM, 75 River Rd., Nutley, N.J. 07110
Sigma Plastronics, Inc., Dept. EM, 14531-33 Tireman Ave, Dearborn, Mich. 48126
DM Tech Spray, Inc., Dept. EM, Box 949, Amarillo, Tex. 79105
Ultrasonic Corp., Dept. EM, Box 672, Pipestone, Minn. 56164
Union Carbide, Chemicals & Plastics, Dept. EM, 270 Park Ave., New York, N.Y. 10017
Westinghouse Elec., Process Equip./Consumables Dept, Dept. EM, Box 300, Sykesville, Md. 21784
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Cleaners, Ultrasonic

Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 ..... *
D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
D Alpha Metals, Inc., Dept. EM, 600 Rte 440, Jersey City, N.J. 07304
Auric Corp., Dept. EM, 470 Frelinghuysen Ave., Newark, N.J. 07114
D Barco Chem. Prods. Inc., Dept. EM, 525 So. Dearborn St., Chicago, Ill. 60605
Baron-Blakeslee, Dept. EM, 1620 S. Laramie Ave., Chicago, Ill. 60650
Branson Cleaning Equip. Co., Dept. EM, Parrott Dr., Shelton, Conn. 06484
D Clean Room Prods., Dept. EM, 56 W. Penataquit Ave., Bay Shore, N.Y. 11706
M Edmund Scientific Co., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
Electrovert, Dept. EM, 86 Hartford Ave., Mt. Vernon, N.Y. 10553
Fidelity Chem. Prods. Corp., Dept. EM, 472 Frelinghuysen Ave., Newark, N.J. 07114
M Isochem Resins Co., Dept. EM, 99 Cook St., Lincoln, R.I. 02865
M Keuffel & Esser Co., Dept. EM, 20 Whippany Rd., Morristown, N.J. 07960
Koh-I-Noor Rapidograph, Dept. EM, 100 North St., Bloomsbury, N.J. 08804
Lenape Equipment Co, Dept. EM, 558 Lincoln Blvd., Middlesex, NJ. 08846
D London Chemical Co., Dept. EM, 240 Foster Ave., Bensenville, Ill. 60106
DM LPS Research Labs, Dept. EM, 2050 Cotner Ave., Los Angeles, Cal. 90025
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
M Miller-Stephenson Chem. Co., Inc., Dept. EM, George Washington Hwy., Danbury, Conn. 06810
National Camera Inc., Dept. EM, 2000 W. Union Ave., Englewood, Colo. 80110
Phillips Mfg. Co., National Ultrasonic Div., Dept. EM, 7334 N. Clark St., Chicago, Ill. 60626
Sara Sales Co., Dept. EM, P.O. Box 321, San Francisco, Calif. 94101
Static Inc., Dept. EM, Box 414, Lee, Mass. 01238
D Tech Spray, Inc., Dept. EM, Box 949, Amarillo, Tex. 79105
D Tronic Corp., Dept. EM, Box 247-C, Belmont, Cal. 94002
D Ultrasonic Corp., Dept. EM, Box 672, Pipestone, Minn. 56164
Westinghouse Elec., Process Equip./Consumables Dept, Dept. EM, Box 300, Sykesville, Md. 21784

Clips, Alligator

D Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
Elctrn. Molding Corp., Dept. EM, 96 Mill St., Woonsocket, R.I. 02895 ..... *
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Grayhill Inc., Dept. EM, 569 Hillgrove Ave., LaGrange, Ill. 60525 ..... *
D Industrial Devices, Dept. EM, Edgewater, N.J. 07020 ..... *
D ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ..... p. 1989,1992
DM Mueller Electric, Dept. EM, 1583 E 31st St. Dept. 20, Cleveland, Ohio 44114 p. 2086,2087
D National Tel-Tronics, Div. Electro Audio Dynamics, Inc., Dept. EM, State Road Hill, Meadville, Pa. 16335 ..... p. 2088
M Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2120
D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
D Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342 ..... *
Aerolite Elexs Corp., Dept. EM, 2207 Summit Ave., Union City, N.J. 07087
D AMP Special Industries, Dept. EM, Valley Forge, Pa. 19482
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
SHOGYO International Corp., Dept. EM, 300 Northern Blvd., Great Neck, N.Y. 11021
Zierick Mfg. Corp., Dept. EM, 44 Radio Circle, Mt. Kisco, N.Y. 10549

Clips & Holders, Fuse-Also See Panels, Fuse

Alden Products Co, Dept. EM, 117 N Main St, Brockton, Mass. 02403 ..... *
Buchanan Crimp Tool Prods., Amerace, Control Prods., Dept. EM, 1065 Floral Ave., Union, N.J. 07083 ..... p. 1749
DM **Bussmann Manufacturing, Div. McGraw-Edison Co., Dept. EM, P.O. Box 14460, St. Louis, Mo. 63178 ..... p. 4002,4004-4007**
Chicago Miniature/Drake, Dept. EM, 4433 N Ravenswood Ave., Chicago, Ill. 60640 ..... p. 2473
Connector Corp., Dept. EM, 6025 N. Keystone Ave., Chicago, Ill. 60646 ..... *
Control Products Div., Amerace Corp., Dept. EM, 2330 Vauxhall Rd., Union, N.J. 07083 ..... p. 1749
D **Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... ***
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... ***
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ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ..... *
DM **Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012 p. 2055**
DM **Littelfuse, Inc., Dept. EM, 800 E. Northwest Hwy., Des Plaines, Ill. 60016 p. 4100,4101**
D **National Tel-Tronics, Div. Electro Audio Dynamics, Inc., Dept. EM, State Road Hill, Meadville, Pa. 16335 ..... p. 2089**
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D **Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2143**
D Accessories for Electronics, Dept. EM, 800 Merrick Road, Baldwin, N.Y. 11510
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
Acme Model Engrg. Co., Dept. EM, 654 Bergen Blvd., Ridgefield, N.J. 07657
Aerolite Elexs Corp., Dept. EM, 2207 Summit Ave., Union City, N.J. 07087
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
DM Amrad Corp., Dept. EM, Box 876, Paris, Tex. 75460
Anchor Plastics, Dept. EM, 36-36 36th, Long Island City, N.Y. 11106
D Atlee Corp., Dept. EM, 8 Gill St., Woburn, Mass. 01801
Auto-Swage Products Inc., Dept. EM, 726 River Rd., Shelton, Conn. 06484
Carbone Lorraine Industries Corp., Dept. EM, 400 Myrtle Ave., Boonton, N.J. 07005
Components Corp., Dept. EM, 6 Kinsey Pl., Denville, N.J. 07834
D General Elec. Co, Wiring Device Bus. Dept., Dept. EM, 95 Hathaway St., Providence, R.I. 02904
D Holub Industries, Dept. EM, 413 DeKalb Ave., Sycamore, Ill. 60178
Leviton Mfg. Co., Inc., Dept. EM, 59-25 Little Neck Pkwy., Little Neck, N.Y. 11362
D Marathon Special Prods. Corp., Dept. EM, 13300 Van Camp Rd., Bowling Green, Ohio 43402
Oneida Electronics Mfg., Dept. EM, POB 678, R.D. #3 Baldwin Ext., Meadville, Pa. 16335
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Panel Components Corp., Dept. EM, 2015 Second St., Berkeley, Cal. 94710
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
San-O Industrial Corp., Dept. EM, 35-P Orville Dr., Bohemia, N.Y. 11716
Seastrom Mfg. Co. Inc., Dept. EM, 701 Sonora Ave., Glendale, Cal. 91201
SHOGYO International Corp., Dept. EM, 300 Northern Blvd., Great Neck, N.Y. 11021
Taylor Electric, Inc., Dept. EM, 2410 Hwy 281 N., Marble Falls, Tex. 78654
M Tech-Etch/Braun, Dept. EM, 45 Aldrin Rd., Plymouth, Mass. 02360
D Underwriters Safety Device, An Eltra Co., Dept. EM, 7300 W. Wilson Ave., Chicago, Ill. 60656
DM Zierick Mfg. Corp., Dept. EM, 44 Radio Circle, Mt. Kisco, N.Y. 10549

Clips, Battery

D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... ***
DM **Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012 p. 2055**
DM **Mueller Electric, Dept. EM, 1583 E 31st St. Dept. 20, Cleveland, Ohio 44114 ***
M **Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... ***
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D **Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2120,2124,2143**
D **Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 .... ***
Aerolite Elexs Corp., Dept. EM, 2207 Summit Ave., Union City, N.J. 07087
M Atlee Corp., Dept. EM, 8 Gill St., Woburn, Mass. 01801
Kentucky Electronics, Dept. EM, 1204 Ind'l Dr., Box 507, Owensboro, Ky. 42301
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
SHOGYO International Corp., Dept. EM, 300 Northern Blvd., Great Neck, N.Y. 11021
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578
Zierick Mfg. Corp., Dept. EM, 44 Radio Circle, Mt. Kisco, N.Y. 10549

Clips, Board, Harness

Beman Mfg., Inc., Dept. EM, PO Box 370, New Cumberland, Pa. 17070 ..... *
DM **Panduit Corp., Dept. EM, 17301 Ridgeland Ave., Tinley Park, Ill. 60477 p. 4629**
D **Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 ***
Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342 ..... *
D E-Z-Hook, Div. Tektest, Dept. EM, Box 450 114 E. St. Joseph, Arcadia, Cal. 91006
D Eaton Corp., Engineered Fasteners Oper., Dept. EM, Box 6688, Cleveland, Ohio 44101
DM Electrovert, Dept. EM, 86 Hartford Ave., Mt. Vernon, N.Y. 10553
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
Sjoberg, C. & Son, Inc., Dept. EM, 415 Station St., Cranston, R I 02910
D T & B/Thomas & Betts, Dept. EM, 36 Butler St., Elizabeth, N.J. 07207
Zierick Mfg. Corp., Dept. EM, 44 Radio Circle, Mt. Kisco, N.Y. 10549

Clips, Breadboard

Bussmann Manufacturing, Div. McGraw-Edison Co., Dept. EM, P.O. Box 14460, St. Louis, Mo. 63178 ..... p. 4005
E & L Instruments, Inc., Dept. EM, 61 First St., Derby, Conn. 06418 ..... *
ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ..... p. 2001,2002
D **Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342 ..... ***
Vero Electronics, Dept. EM, 171 Bridge Rd., Hauppauge, N.Y. 11787 ..... *
D Accessories for Electronics, Dept. EM, 800 Merrick Road, Baldwin, N.Y. 11510
Bishop Graphics, Dept. EM, 5388 Sterling Center, Westlake Village, Cal. 91361
E-Z-Hook, Div. Tektest, Dept. EM, Box 450 114 E. St. Joseph, Arcadia, Cal. 91006

Clips, Fahnestock, Spring Wire

D **Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... ***
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... ***
D **Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 ***
D **Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 .... ***
Acme Model Engrg. Co., Dept. EM, 654 Bergen Blvd., Ridgefield, N.J. 07657
D Eaton Corp., Engineered Fasteners Oper., Dept. EM, Box 6688, Cleveland, Ohio 44101
Federal Screw Products Inc., Dept. EM, 3917 N. Kedzie Ave., Chicago, Ill. 60618
D Zierick Mfg. Corp., Dept. EM, 44 Radio Circle, Mt. Kisco, N.Y. 10549

Clips, Logic Test

D **Continental Specialties Corp., Dept. EM, Box 1942, 70 Fulton Terr, New Haven, Conn. 06509 ..... ***
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ..... p. 2001,2002
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... ***
Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
D A.P. Products, Dept. EM, 72 Corwin Dr. Box 110, Painesville, Ohio 44077
D E-Z-Hook, Div. Tektest, Dept. EM, Box 450 114 E. St. Joseph, Arcadia, Cal. 91006
D Micro Electronic Systems, Inc., Dept. EM, 8 Kevin Drive, Danbury, Conn. 06810
DM Trendar, Dept. EM, 630 Clyde Ave., Mountain View, Cal. 94040

Clips, Test

D **Augat Interconnection Prods. Div., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703 ..... ***
D **Continental Specialties Corp., Dept. EM, Box 1942, 70 Fulton Terr, New Haven, Conn. 06509 ..... ***
D **Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... ***
E & L Instruments, Inc., Dept. EM, 61 First St., Derby, Conn. 06418 ..... *
M **Elctrn. Molding Corp., Dept. EM, 96 Mill St., Woonsocket, R.I. 02895 ..... ***
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
D **Grayhill Inc., Dept. EM, 569 Hillgrove Ave., LaGrange, Ill. 60525 ..... ***
D **Industrial Devices, Dept. EM, Edgewater, N.J. 07020 ..... ***
D **ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ..... p. 2001,2002,2006**
M **Jettron Prods., Dept. EM, P.O. Box 337, E. Hanover, N.J. 07936 ..... ***
DM **Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012 .. ***
DM **Mueller Electric, Dept. EM, 1583 E 31st St. Dept. 20, Cleveland, Ohio 44114 ***
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D **Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2117,2120**
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... ***
D **Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342 ..... ***
Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
Aerotronic Assocs., Inc., Dept. EM, Riverside Dr., Contoocook, N.H. 03229
M Anchor Specialty Mfg. Inc., Dept. EM, 300 Hollister Rd., Teterboro, N.J. 07608
D A.P. Products, Dept. EM, 72 Corwin Dr. Box 110, Painesville, Ohio 44077
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
M Avid Electronics Corp., Dept. EM, Box 426, Baldwin, Pl., N.Y. 10505
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
D E-Z-Hook, Div. Tektest, Dept. EM, Box 450 114 E. St. Joseph, Arcadia, Cal. 91006
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
Everett/Charles, Inc., Dept. EM, 2806 Metropolitan Pl., Pomona, Cal. 91767
D Micro Electronic Systems, Inc., Dept. EM, 8 Kevin Drive, Danbury, Conn. 06810
Micro Instrument Co., Marine & Power Instr. Div., Dept. EM, 2250 Micro Pl., Escondido, Cal. 92025
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
Pylon Co., Inc., Dept. EM, 51 Newcomb St., Attleboro, Mass. 02703
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578
Zierick Mfg. Corp., Dept. EM, 44 Radio Circle, Mt. Kisco, N.Y. 10549

Clips, Transistor & Diode—See Retainers, Transistor & Diode

Clocks (All Types)

A. D. Data Sys., Inc., Dept. EM, POB 9209, Rochester, N.Y. 14625 ..... *

M American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Austron, Inc., Dept. EM, 1915 Kramer La., Austin, Tex. 78758 ..... p. 2283
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... p. 2291
M Chrono-log Corp., Dept. EM, 2 W. Park Rd., Havertown, Pa. 19083 .... p. 1391
Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 ..... *
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... *
Dynatech R/D Co., Microsystems Dept., Dept. EM, 99 Erie St., Cambridge, Mass. 02139 ..... p. 1641
Electro-Mechanical Instru. Div., Sheller-Globe Corp., Dept. EM, Box 368, Dublin, PA 18917 ..... p. 2723
D ESE, Dept. EM, 505½ Centinela Ave., Inglewood, Cal. 90302 ..... p. 2734,2735
M Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040 .. *
M Greenray Inds., Inc., Dept. EM, 840 W. Church Rd., Mechanicsburg, Pa. 17055 ..... *
Isotemp Research Inc, Dept. EM, 711 Henry Ave, Charlottesville, VA. 22901 ..... p. 2337
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 ..... *
Monitor Prods., Dept. EM, Box 1986, 502 Via Delmonte, Oceanside, Cal. 92054 ..... p. 2349
Motorola, Inc., Compt. Prods. Clock Oscillator Dept., Dept. EM, 2553 N. Edgington, Franklin Park, Ill. 60131 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... p. 2790
D Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705 ..... p. 2793
North American Philips Controls Corp., Dept. EM, Cheshire Industrial Pk. Box E, Cheshire, Conn. 06410 ..... p. 2274
PPM, Inc., Dept. EM, 7575 Bond St., Cleveland, Ohio 44139 ..... *
Preston Scientific Inc., Dept. EM, 805 E. Cerritos Ave., Anaheim, Cal. 92805 ..... p. 1665
Star Micronics Inc., Dept. EM, Pan Am Building, Ste 2308, 200 Park Ave, New York, N.Y. 10017 ..... *
DM Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518 ..... *
M Trak Systems, Div. TRAK Microwave Corp., Dept. EM, 4722 Eisenhower Blvd., Dept. E8, Tampa, Fla. 33614 ..... *
United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403 ..... *
M Vectron Labs., Inc., Dept. EM, 166 Glover Ave., Norwalk, Conn. 06850 ..... *
Applied Electro Technology, Inc., Dept. EM, 2220 S. Anne St., Santa Ana, Cal. 92704
Ashley-Butler, Inc., ASHA, Dept. EM, 208 Route 206 South, Somerville, N.J. 08876
Baumker Mfg. Co., Dept. EM, 5144 Enterprise, Toledo, Ohio 43612
Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
Devco Engrg., Control Sys. Div., Dept. EM, Pier La., W. Caldwell, N.J. 07006
D Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
Harris Circuits Mfg. Co., Dept. EM, 2712 Colley Ave., Norfolk, VA. 23517
Haydon Switch & Instr., Inc., Dept. EM, 1500 Meriden Rd., Waterbury, Conn. 06705
HGA Elctrns., Inc., Dept. EM, 519 S. Fifth Ave., Mt. Vernon, N.Y. 10550
Moxon Inc., Dept. EM, 2222 Michelson Dr. Bldg. E, Irvine, Cal. 92715
D Nuvox Elctrns. Corp., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
D PCS., Inc., Dept. EM, 750 N. Maple Rd., Saline, Mich. 48176
D Precision Timer Co., Dept. EM, 13 Westbrook Ind'l. Park, Westbrook, Conn. 06498
Sprengnether Instr. Co., W.F., Dept. EM, 4567 Swan St., St. Louis, Mo. 63110
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
DM Systron Donner, Data Products Div., Dept. EM, 735 Detroit Ave., Concord, Cal. 94518
True Time Instr Co., Dept. EM, 429 Olive St, Santa Rosa, Cal. 95401
UCE, Inc., Dept. EM, 20 N. Main St., Norwalk, Conn. 06854
UFAD Corp., Dept. EM, 700 36th St. S.E., Grand Rapids, Mich. 49508

Clutches, Friction

M Delevan Div., American Prec. Inds., Clutch & Brake Prods., Dept. EM, 270 Quaker Road, E. Aurora, N.Y. 14052 ..... *
M General-Electro Mechanical, Dept. EM, 785 Hertel Ave., Buffalo, N.Y. 14207 ..... p. 3090
Graphite Metallizing Corp., Dept. EM, 1036 Nepperhan Ave., Yonkers, N.Y. 10702 ..... p. 3088
Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 ..... p. 2425
TRW/Globe Motors, Dept. EM, 2275 Stanley Ave., Dayton, Ohio 45404 ..... *
D Vemaline Prods. Div., Ostbys & Barton Co., Dept. EM, 487 Jefferson Blvd., Warwick, R.I. 02886 ..... *
M Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... p. 3131
Eaton Corp., Ind'l. Drives Div., Dept. EM, 9919 Clinton Rd., Cleveland, Ohio 44111
Facet Enterprises Inc., Motor Comps. Div., Dept. EM, Elmira, N.Y. 14903
Kwikset Powdered Metal Prods., Kwikset Div-Emhart Inds. Inc., Dept. EM, Box 4250P, Anaheim, Cal. 92803
Perfect Gear & Instr. Corp., Sub. Designatronics, Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
M Precision Mechanisms Corp., Dept. EM, 44 Brooklyn Ave., Westbury, N.Y. 11590
D Warner Elec. Brake & Clutch Co., Dept. EM, Beloit, Wisc. 53511
WER Industrial, Div. Emerson Elec. Co., Dept. EM, 3036 Alt Blvd., Grand Island, N.Y. 14072

Clutches, Magnetic

M Bowmar/TIC, Inc., Dept. EM, 850 Lawrence Dr., Newbury Park, Calif. 91320 ..... *
M Delevan Div., American Prec. Inds., Clutch & Brake Prods., Dept. EM, 270 Quaker Road, E. Aurora, N.Y. 14052 ..... p. 3080
M General-Electro Mechanical, Dept. EM, 785 Hertel Ave., Buffalo, N.Y. 14207 ..... p. 3090
M Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... *
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Component Specialties, Dept. EM, 9143 E. La Rosa Dr., Temple City, Cal. 91780
Eaton Corp., Ind'l. Drives Div., Dept. EM, 9919 Clinton Rd., Cleveland, Ohio 44111
Facet Enterprises Inc., Motor Comps. Div., Dept. EM, Elmira, N.Y. 14903
M Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
Perfect Gear & Instr. Corp., Sub. Designatronics, Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
PIC Design Div., Benrus Corp., Dept. EM, Benrus Center, Rte 7, Ridgefield, Conn. 06877
DM Stock Drive Prods., Div. Designatronics, Inc., Dept. EM, 55 S. Denton Ave., New Hyde Pk., N.Y. 11040
Vibrac Corp., Dept. EM, 11 Alpha Rd., Chelmsford, Mass. 01824
D Warner Elec. Brake & Clutch Co., Dept. EM, Beloit, Wisc. 53511
D WER Industrial, Div. Emerson Elec. Co., Dept. EM, 3036 Alt Blvd., Grand Island, N.Y. 14072

Clutches, Positive

Delevan Div., American Prec. Inds., Clutch & Brake Prods., Dept. EM, 270 Quaker Road, E. Aurora, N.Y. 14052 ..... *
M General-Electro Mechanical, Dept. EM, 785 Hertel Ave., Buffalo, N.Y. 14207 ..... *
M Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... *
Facet Enterprises Inc., Motor Comps. Div., Dept. EM, Elmira, N.Y. 14903
Perfect Gear & Instr. Corp., Sub. Designatronics, Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
DM Stock Drive Prods., Div. Designatronics, Inc., Dept. EM, 55 S. Denton Ave., New Hyde Pk., N.Y. 11040
D Warner Elec. Brake & Clutch Co., Dept. EM, Beloit, Wisc. 53511
WER Industrial, Div. Emerson Elec. Co., Dept. EM, 3036 Alt Blvd., Grand Island, N.Y. 14072

Coatings, Anti-Static

Chomerics, Inc., Dept. EM, 77 Dragon Court, Woburn, Mass. 01801 ..... *
GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... p. 1290
Humiseal Div., Columbia Chase Corp., Dept. EM, 26-60 Bklyn-Queens Expwy., Woodside, N.Y. 11377 ..... p. 1292,1293
D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
Acheson Colloids Co., Div. Acheson Inds., Dept. EM, P.O. Box 288, Port Huron, Mich. 48060
D Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
D Barco Chem. Prods. Inc., Dept. EM, 525 So. Dearborn St., Chicago, Ill. 60605
D Caig Labs., Inc., Dept. EM, 1175-0 Industrial Ave., Box 64, Escondido, Cal. 92025
D Chemtronics, Inc., Dept. EM, 45 Hoffman Ave., Hauppauge, N.Y. 11787
Diamond Shamrock Corp, Dept. EM, 1100 Superior Ave, Cleveland, Ohio 44114
Evaporated Coatings, Inc., Dept. EM, 798 Welsh Rd., Huntingdon Valley, Pa. 19006
D Injectorall Elctrns. Corp., Dept. EM, 98-100 Glen St., Glen Cove, N.Y. 11542
Libbey Owens-Ford Co., Liberty Mirror Div., Dept. EM, 811 Madison Ave., Toledo, Ohio 43695
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
DM Merix Chem. Co., Dept. EM, 2234 East 75th St., Chicago, Ill. 60649
M Micro-Circuits Co., Inc., Dept EEM I, Dept. EM, New Buffalo, Mich. 49117
Miller-Stephenson Chem. Co., Inc., Dept. EM, George Washington Hwy., Danbury, Conn. 06810
D Regmo Data Corp., Dept. EM, 7275 Bush Lk Rd., Minneapolis, Minn. 55435
DM Tech Spray, Inc., Dept. EM, Box 949, Amarillo, Tex. 79105
D Tecknit, Dept. EM, 129 E. Dermody St., Cranford, N.J. 07016
Union Carbide, Chemicals & Plastics, Dept. EM, 270 Park Ave., New York, N.Y. 10017
D Uniroyal, Inc., Dept. EM, 1230 Ave. of Americas, New York, N.Y. 10020
D Zippertubing Co., Dept. EM, 13000 S. Broadway, Los Angeles, Cal. 90061

Coatings, Compounds, Lubricants, etc., Heat Conductive

Carborundum Co., Graphite Prods. Div., Dept. EM, Box 339, Niagara Falls, N.Y. 14302 ..... *
Chomerics, Inc., Dept. EM, 77 Dragon Court, Woburn, Mass. 01801 ..... *
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
M Hardman Inc., Dept. EM, 600 Cortlandt St., Belleville, N.J. 07109 ..... *
Humiseal Div., Columbia Chase Corp., Dept. EM, 26-60 Bklyn-Queens Expwy., Woodside, N.Y. 11377 ..... p. 1292,1293
D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
Acheson Colloids Co., Div. Acheson Inds., Dept. EM, P.O. Box 288, Port Huron, Mich. 48060
Aerolix Corporation, Dept. EM, 720 So. Columbus Street, Mt. Vernon, NY 10550
Astrodyne, Inc., Sub. Roanwell Corp., Dept. EM, 353 Middlesex Ave., Wilmington, Mass. 01887
DM Carborundum Co., Plastics Div., Dept. EM, Carborundum Center, Niagara Falls, New York 14302
D Chemtronics, Inc., Dept. EM, 45 Hoffman Ave., Hauppauge, N.Y. 11787
Dolph, John C. Co., Dept. EM, New Rd., Monmouth Junction, N.J. 08852
D Dynaloy, Inc., Dept. EM, 7 Great Meadow La., Hanover, N.J. 07936
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
Electro Mats. Corp. Amer., Dept. EM, 605 Center Ave., Mamaroneck, N.Y. 10543
D Electro-Science Labs., Dept. EM, 2211 Sherman Ave., Pennsauken, N. J. 08110
Emerson & Cuming, Inc., Dielectric Mat'ls. Div., Dept. EM, 869 Washington St., Canton, Mass. 02021

Formulated Resins Inc., Dept. EM, Box 508, Greenville, R.I. 02828
D Injectorall Elctrns. Corp., Dept. EM, 98-100 Glen St., Glen Cove, N.Y. 11542
Int'l. Elctrn. Resch., Dept. EM, 135 W. Magnolia Blvd., Burbank, Cal. 91502
M Isochem Resins Co., Dept. EM, 99 Cook St., Lincoln, R.I. 02865
DM LPS Research Labs, Dept. EM, 2050 Cotner Ave., Los Angeles, Cal. 90025
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
Materials Resch. Corp., Dept. EM, Route 303, Orangeburg, N.Y. 10962
Mereco Products Div., Metachem Resins, Dept. EM, 538 Wellington Ave., Cranston, R.I. 02910
DM Merix Chem. Co., Dept. EM, 2234 East 75th St., Chicago, Ill. 60649
Miller-Stephenson Chem. Co., Inc., Dept. EM, George Washington Hwy., Danbury, Conn. 06810
M Packaged Resins Div., Bacon Inds., Inc., Dept. EM, 192 Pleasant St., Watertown, Mass. 02172
SermeTel Inc., Sub. Teleflex Inc., Dept. EM, 155 Limerick Rd., Limerick, Pa 19468
Sigma Plastronics, Inc., Dept. EM, 14531-33 Tireman Ave, Dearborn, Mich. 48126
DM Stock Drive Prods., Div. Designatronics, Inc., Dept. EM, 55 S. Denton Ave., New Hyde Pk., N.Y. 11040
SWS Silicones Corp., Dept. EM, Box 428, Adrian, Mich. 49221
DM Tech Spray, Inc., Dept. EM, Box 949, Amarillo, Tex. 79105
D Tecknit, Dept. EM, 129 E. Dermody St., Cranford, N.J. 07016
D Uniroyal, Inc., Dept. EM, 1230 Ave. of Americas, New York, N.Y. 10020
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Coatings, Conductive, Electric

Chomerics, Inc., Dept. EM, 77 Dragon Court, Woburn, Mass. 01801 ..... *
GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... **p. 1290**
M **Hardman Inc., Dept. EM, 600 Cortlandt St., Belleville, N.J. 07109** ..... *
Humiseal Div., Columbia Chase Corp., Dept. EM, 26-60 Bklyn-Queens Expwy., Woodside, N.Y. 11377 ..... **p. 1292,1293**
D **3M Co., Static Control Systems, Dept. EM, 3M Center Bldg. 223-25, St. Paul, Minn. 55119** ..... **p. 3408,3409**
DM **Metex Corp., Dept. EM, 970 New Durham Rd., Edison, N.J. 08817** ..... *
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
Acheson Colloids Co., Div. Acheson Inds., Dept. EM, P.O. Box 288, Port Huron, Mich. 48060
D Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
Alpha Metals, Inc., Dept. EM, 600 Rte 440, Jersey City, N.J. 07304
DM Dynaloy, Inc., Dept. EM, 7 Great Meadow La., Hanover, N.J. 07936
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
Electro Mats. Corp. Amer., Dept. EM, 605 Center Ave., Mamaroneck, N.Y. 10543
D Electro-Science Labs., Dept. EM, 2211 Sherman Ave., Pennsauken, N. J. 08110
Emerson & Cuming, Inc., Dielectric Mat'ls. Div., Dept. EM, 869 Washington St., Canton, Mass. 02021
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
Evaporated Coatings, Inc., Dept. EM, 798 Welsh Rd., Huntingdon Valley, Pa. 19006
Formulated Resins Inc., Dept. EM, Box 508, Greenville, R.I. 02828
Int'l. Elctrn. Resch., Dept. EM, 135 W. Magnolia Blvd., Burbank, Cal. 91502
M Isochem Resins Co., Dept. EM, 99 Cook St., Lincoln, R.I. 02865
Libbey Owens-Ford Co., Liberty Mirror Div., Dept. EM, 811 Madison Ave., Toledo, Ohio 43695
Materials for Elctrns., Dept. EM, 149-32 132nd St., Jamaica, N.Y. 11430
Materials Resch. Corp., Dept. EM, Route 303, Orangeburg, N.Y. 10962
Mereco Products Div., Metachem Resins, Dept. EM, 538 Wellington Ave., Cranston, R.I. 02910
DM Merix Chem. Co., Dept. EM, 2234 East 75th St., Chicago, Ill. 60649
M Micro-Circuits Co., Inc., Dept EEM I, Dept. EM, New Buffalo, Mich. 49117
M Packaged Resins Div., Bacon Inds., Inc., Dept. EM, 192 Pleasant St., Watertown, Mass. 02172
D Regmo Data Corp., Dept. EM, 7275 Bush Lk Rd., Minneapolis, Minn. 55435
Sel-Rex Div. Oxy Metal Industries Corp., Dept. EM, 75 River Rd., Nutley, N.J. 07110
SermeTel Inc., Sub. Teleflex Inc., Dept. EM, 155 Limerick Rd., Limerick, Pa 19468
Sigma Plastronics, Inc., Dept. EM, 14531-33 Tireman Ave, Dearborn, Mich. 48126
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
D T & B/Thomas & Betts, Dept. EM, 36 Butler St., Elizabeth, N.J. 07207
DM Tech Spray, Inc., Dept. EM, Box 949, Amarillo, Tex. 79105
D Tecknit, Dept. EM, 129 E. Dermody St., Cranford, N.J. 07016
Tra-Con, Inc., Dept. EM, 55 North St., Medford, Mass. 02155
D Uniroyal, Inc., Dept. EM, 1230 Ave. of Americas, New York, N.Y. 10020

Coatings, Corrosion Resistant

Humiseal Div., Columbia Chase Corp., Dept. EM, 26-60 Bklyn-Queens Expwy., Woodside, N.Y. 11377 ..... **p. 1292,1293**
Acheson Colloids Co., Div. Acheson Inds., Dept. EM, P.O. Box 288, Port Huron, Mich. 48060
Aerolix Corporation, Dept. EM, 720 So. Columbus Street, Mt. Vernon, NY 10550
M Chemplast, Inc., Dept. EM, 31-150 Dey Rd., Wayne, N.J. 07470
M Electrofilm, Inc., Dept. EM, 7116 Laurel Canyon Blvd., No. Hollywood, Cal. 91605
D Kenco Alloy & Chemical Co., Inc., Dept. EM, 418 W. Belden Ave., Addison, Ill. 60101
Permaluster, Inc., Dept. EM, 1844 N. Keystone St., Burbank, Calif. 91504
SermeTel Inc., Sub. Teleflex Inc., Dept. EM, 155 Limerick Rd., Limerick, Pa 19468
Sigma Plastronics, Inc., Dept. EM, 14531-33 Tireman Ave, Dearborn, Mich. 48126
DM Tech Spray, Inc., Dept. EM, Box 949, Amarillo, Tex. 79105
Tempil Div., Big Three Inds, Dept. EM, Hamilton Blvd., So. Plainfield, N.J. 07080

Coatings, Electromagnetic Wave-Absorbing

Humiseal Div., Columbia Chase Corp., Dept. EM, 26-60 Bklyn-Queens Expwy., Woodside, N.Y. 11377 ..... **p. 1292,1293**
Acheson Colloids Co., Div. Acheson Inds., Dept. EM, P.O. Box 288, Port Huron, Mich. 48060
Esco Products, Dept. EM, Oak Ridge Rd., Oak Ridge, NJ 07438
Evaporated Coatings, Inc., Dept. EM, 798 Welsh Rd., Huntingdon Valley, Pa. 19006
M Micro-Circuits Co., Inc., Dept EEM I, Dept. EM, New Buffalo, Mich. 49117
Tecknit, Dept. EM, 129 E. Dermody St., Cranford, N.J. 07016

Coatings, Fungicidal

D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
Humiseal Div., Columbia Chase Corp., Dept. EM, 26-60 Bklyn-Queens Expwy., Woodside, N.Y. 11377 ..... **p. 1292,1293**
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
DM Conap, Inc., Dept. EM, 1405 Buffalo St, Olean, N.Y. 14760
D Dolph, John C. Co., Dept. EM, New Rd., Monmouth Junction, N.J. 08852
Formulated Resins Inc., Dept. EM, Box 508, Greenville, R.I. 02828
D Injectorall Elctrns. Corp., Dept. EM, 98-100 Glen St., Glen Cove, N.Y. 11542
D Kenco Alloy & Chemical Co., Inc., Dept. EM, 418 W. Belden Ave., Addison, Ill. 60101
M Miller-Stephenson Chem. Co., Inc., Dept. EM, George Washington Hwy., Danbury, Conn. 06810
M Permaluster, Inc., Dept. EM, 1844 N. Keystone St., Burbank, Calif. 91504
Sigma Plastronics, Inc., Dept. EM, 14531-33 Tireman Ave, Dearborn, Mich. 48126
D Sterling, Div. Reichhold Chems., Inc., Dept. EM, Sewickley, Pa. 15143
Uniroyal, Inc., Dept. EM, 1230 Ave. of Americas, New York, N.Y. 10020

Coatings, High-Temperature, Ceramic, Plasma Spray

—See Services, Coating

Coatings, Insulating

D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
M **Hardman Inc., Dept. EM, 600 Cortlandt St., Belleville, N.J. 07109** ..... *
DM **Humiseal Div., Columbia Chase Corp., Dept. EM, 26-60 Bklyn-Queens Expwy., Woodside, N.Y. 11377** ..... **p. 1292,1293**
M **Krystinel Corp., Dept. EM, Fox Island Rd., Port Chester, N. Y. 10573** ..... *
Acheson Colloids Co., Div. Acheson Inds., Dept. EM, P.O. Box 288, Port Huron, Mich. 48060
D Acme Chemical & Insulation Co., Dept. EM, 166 Chapel St., New Haven, Conn. 06513
Aerolix Corporation, Dept. EM, 720 So. Columbus Street, Mt. Vernon, NY 10550
Ambroid Co., Dept. EM, P.O. Box 1089, Taunton, MA 02780
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
D Caig Labs., Inc., Dept. EM, 1175-0 Industrial Ave., Box 64, Escondido, Cal. 92025
DM Carborundum Co., Plastics Div., Dept. EM, Carborundum Center, Niagara Falls, New York 14302
M Chemplast, Inc., Dept. EM, 31-150 Dey Rd., Wayne, N.J. 07470
D Chemtronics, Inc., Dept. EM, 45 Hoffman Ave., Hauppauge, N.Y. 11787
DM Conap, Inc., Dept. EM, 1405 Buffalo St, Olean, N.Y. 14760
D Dolph, John C. Co., Dept. EM, New Rd., Monmouth Junction, N.J. 08852
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
Electro Mats. Corp. Amer., Dept. EM, 605 Center Ave., Mamaroneck, N.Y. 10543
D Electro-Science Labs., Dept. EM, 2211 Sherman Ave., Pennsauken, N. J. 08110
Emerson & Cuming, Inc., Dielectric Mat'ls. Div., Dept. EM, 869 Washington St., Canton, Mass. 02021
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
Evaporated Coatings, Inc., Dept. EM, 798 Welsh Rd., Huntingdon Valley, Pa. 19006
Formulated Resins Inc., Dept. EM, Box 508, Greenville, R.I. 02828
M Hightemp Resins, Inc., Dept. EM, 225 Greenwich Ave., Stamford, Conn. 06902
D Injectorall Elctrns. Corp., Dept. EM, 98-100 Glen St., Glen Cove, N.Y. 11542
Int'l. Elctrn. Resch., Dept. EM, 135 W. Magnolia Blvd., Burbank, Cal. 91502
M Isochem Resins Co., Dept. EM, 99 Cook St., Lincoln, R.I. 02865
D Kenco Alloy & Chemical Co., Inc., Dept. EM, 418 W. Belden Ave., Addison, Ill. 60101
D London Chemical Co., Dept. EM, 240 Foster Ave., Bensenville, Ill. 60106
3M Co., Indl Elect Prods. Div., Dept. EM, 3M Center, St. Paul, Minn. 55101
M M & T Chemicals Inc., Dept. EM, Rahway, N.J. 07065
Materials Resch. Corp., Dept. EM, Route 303, Orangeburg, N.Y. 10962
Mereco Products Div., Metachem Resins, Dept. EM, 538 Wellington Ave., Cranston, R.I. 02910
Mine Safety Appliances Co., Dept. EM, 600 Penn Center Blvd., Pittsburgh, Pa 15235
D Murata Mfg. Co. Ltd., Dept. EM, 16, Kaiden Nishijin-cho, Nagaoka-Kyo-Shi, Kyoto, Japan
M Nova Tran Corp., Dept. EM, 360 4th St., Clear Lake, Wisc. 54005
M Permaluster, Inc., Dept. EM, 1844 N. Keystone St., Burbank, Calif. 91504
D Ram Chems., Div. Whittaker Corp., Dept. EM, 210 E. Alondra Blvd., Gardena, Calif. 90248
D Regmo Data Corp., Dept. EM, 7275 Bush Lk Rd., Minneapolis, Minn. 55435
SermeTel Inc., Sub. Teleflex Inc., Dept. EM, 155 Limerick Rd., Limerick, Pa 19468
SGL Homalite, Div. of SGL Inds., Inc., Dept. EM, 11 Brookside Dr., Wilmington, Del. 19804
Sigma Plastronics, Inc., Dept. EM, 14531-33 Tireman Ave, Dearborn, Mich. 48126
DM Sterling, Div. Reichhold Chems., Inc., Dept. EM, Sewickley, Pa. 15143
SWS Silicones Corp., Dept. EM, Box 428, Adrian, Mich. 49221
DM Tech Spray, Inc., Dept. EM, Box 949, Amarillo, Tex. 79105
Tra-Con, Inc., Dept. EM, 55 North St., Medford, Mass. 02155
Union Carbide, Chemicals & Plastics, Dept. EM, 270 Park Ave., New York, N.Y. 10017
Union Carbide Corp., Linde Div., Dept. EM, 270 Park Ave., New York, N.Y. 10017
D Uniroyal, Inc., Dept. EM, 1230 Ave. of Americas, New York, N.Y. 10020

Coatings, Moisture Repellant & Waterproofing

Datak Corp., Dept. EM, 65 Seventy-First St., Guttenberg, N.J. 07093 ..... **p. 2420**
GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *

Humiseal Div., Columbia Chase Corp., Dept. EM, 26-60 Bklyn-Queens Expwy., Woodside, N.Y. 11377 ..... p. 1292,1293
D Electro-Science Labs., Dept. EM, 2211 Sherman Ave., Pennsauken, N. J. 08110
D Kenco Alloy & Chemical Co., Inc., Dept. EM, 418 W. Belden Ave., Addison, Ill. 60101
Sigma Plastronics, Inc., Dept. EM, 14531-33 Tireman Ave, Dearborn, Mich. 48126
SWS Silicones Corp., Dept. EM, Box 428, Adrian, Mich. 49221
DM Tech Spray, Inc., Dept. EM, Box 949, Amarillo, Tex. 79105
M Union Carbide Corp., Crystal Prods. Dept., Elctrns Div, Dept. EM, 8888 Balboa Ave., San Diego, Cal. 92123
Uniroyal, Inc., Dept. EM, 1230 Ave. of Americas, New York, N.Y. 10020

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Datak Corp., Dept. EM, 65 Seventy-First St., Guttenberg, N.J. 07093 .. p. 2420
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
M Hardman Inc., Dept. EM, 600 Cortlandt St., Belleville, N.J. 07109 ..... *
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3M Co., Electronic Prods Div., Dept. EM, 3M Center, St. Paul, Minn. 55101 *
Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
Acheson Colloids Co., Div. Acheson Inds., Dept. EM, P.O. Box 288, Port Huron, Mich. 48060
Aerolix Corporation, Dept. EM, 720 So. Columbus Street, Mt. Vernon, NY 10550
D Alpha Metals, Inc., Dept. EM, 600 Rte 440, Jersey City, N.J. 07304
Ambroid Co., Dept. EM, P.O. Box 1089, Taunton, MA 02780
Auric Corp., Dept. EM, 470 Frelinghuysen Ave., Newark, N.J. 07114
D Caig Labs., Inc., Dept. EM, 1175-0 Industrial Ave., Box 64, Escondido, Cal. 92025
DM Carborundum Co., Plastics Div., Dept. EM, Carborundum Center, Niagara Falls, New York 14302
DM Conap, Inc., Dept. EM, 1405 Buffalo St, Olean, N.Y. 14760
Diamond Shamrock Corp, Dept. EM, 1100 Superior Ave, Cleveland, Ohio 44114
Dolph, John C. Co., Dept. EM, New Rd., Monmouth Junction, N.J. 08852
Eastman Chem. Prods., Sub. Eastman Kodak Co., Dept. EM, Kingsport, Tenn. 37662
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
D Electro-Science Labs., Dept. EM, 2211 Sherman Ave., Pennsauken, N. J. 08110
Emerson & Cuming, Inc., Dielectric Mat'ls. Div., Dept. EM, 869 Washington St., Canton, Mass. 02021
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So., Iselin, NJ 08830
Fidelity Chem. Prods. Corp., Dept. EM, 472 Frelinghuysen Ave., Newark, N.J. 07114
Formulated Resins Inc., Dept. EM, Box 508, Greenville, R.I. 02828
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
D Injectorall Elctrns. Corp., Dept. EM, 98-100 Glen St., Glen Cove, N.Y. 11542
Int'l. Elctrn. Resch., Dept. EM, 135 W. Magnolia Blvd., Burbank, Cal. 91502
M Isochem Resins Co., Dept. EM, 99 Cook St., Lincoln, R.I. 02865
D Kenco Alloy & Chemical Co., Inc., Dept. EM, 418 W. Belden Ave., Addison, Ill. 60101
D London Chemical Co., Dept. EM, 240 Foster Ave., Bensenville, Ill. 60106
M LPS Research Labs, Dept. EM, 2050 Cotner Ave., Los Angeles, Cal. 90025
M M & T Chemicals Inc., Dept. EM, Rahway, N.J. 07065
Materials Resch. Corp., Dept. EM, Route 303, Orangeburg, N.Y. 10962
Mereco Products Div., Metachem Resins, Dept. EM, 538 Wellington Ave., Cranston, R.I. 02910
DM Merix Chem. Co., Dept. EM, 2234 East 75th St., Chicago, Ill. 60649
M Miller-Stephenson Chem. Co., Inc., Dept. EM, George Washington Hwy., Danbury, Conn. 06810
M Nova Tran Corp., Dept. EM, 360 4th St., Clear Lake, Wisc. 54005
D Pennwalt Corp., Chemical Specialties Div., Dept. EM, Three Pkwy., Philadelphia, Pa. 19102
Permaluster, Inc., Dept. EM, 1844 N. Keystone St., Burbank, Calif. 91504
M Photo Chemical Prods. Cal., Dept. EM, 1715 Berkeley, Santa Monica, Cal. 90404
D Ram Chems., Div. Whittaker Corp., Dept. EM, 210 E. Alondra Blvd., Gardena, Calif. 90248
D Regmo Data Corp., Dept. EM, 7275 Bush Lk Rd., Minneapolis, Minn. 55435
M Seal-Peel, Inc., Dept. EM, Box 250, Troy, Mich. 48099
Sel-Rex Div. Oxy Metal Industries Corp., Dept. EM, 75 River Rd., Nutley, N.J. 07110
SermeTel Inc., Sub. Teleflex Inc., Dept. EM, 155 Limerick Rd., Limerick, Pa 19468
SGL Homalite, Div. of SGL Inds., Inc., Dept. EM, 11 Brookside Dr., Wilmington, Del. 19804
Sigma Plastronics, Inc., Dept. EM, 14531-33 Tireman Ave, Dearborn, Mich. 48126
D Solder Removal Co., Dept. EM, 1077 E. Edna Pl., Covina, Cal. 91724
D Sterling, Div. Reichhold Chems., Inc., Dept. EM, Sewickley, Pa. 15143
SWS Silicones Corp., Dept. EM, Box 428, Adrian, Mich. 49221
DM Tech Spray, Inc., Dept. EM, Box 949, Amarillo, Tex. 79105
M Technic, Inc., Dept. EM, Box 965, Providence, R.I. 02901
Tempil Div., Big Three Inds, Dept. EM, Hamilton Blvd., So. Plainfield, N.J. 07080
M Union Carbide Corp., Crystal Prods. Dept., Elctrns Div, Dept. EM, 8888 Balboa Ave., San Diego, Cal. 92123
Union Carbide Corp., Linde Div., Dept. EM, 270 Park Ave., New York, N.Y. 10017
D Uniroyal, Inc., Dept. EM, 1230 Ave. of Americas, New York, N.Y. 10020
DM Western Coating Co., Dept. EM, 1287 Combermere, Troy, Mich 48084
Whittaker Corp., Dept. EM, 10880 Wilshire Blvd., Los Angeles, Cal. 90024

Coatings, Radioactive

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Acheson Colloids Co., Div. Acheson Inds., Dept. EM, P.O. Box 288, Port Huron, Mich. 48060

Code & Tab Markers—See Wire Markers (All Types)

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American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... *
M Jaesic Industries Co., Dept. EM, 29830 Beck, Wixom, Mich. 48096
RFL Inds., Comms. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343

Coders, Beacon

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M GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 ..... *
Vega Precision Labs., Dept. EM, 800 Follin La., Vienna, Va. 22180 ..... *
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209

Coders, Transponder

M Computer Devices Corp., Dept. EM, 63 Austin Blvd., Commack, N.Y. 11725 *
Vega Precision Labs., Dept. EM, 800 Follin La., Vienna, Va. 22180 ..... *
D Seaboard Elctrns, Dept. EM, 70 Church St., New Rochelle, N.Y. 10805

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D Bell Industries, J.W. Miller Div., Dept. EM, 19070 Reyes Ave., Compton, Cal. 90221 ..... *
Berg Electronics, Div. E.I. DuPont de Nemours & Co., Dept. EM, York Expwy., New Cumberland, Pa. 17070 ..... *
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Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 ..... *
D Dormeyer Industries, Dept. EM, 3418 N. Milwaukee, Chicago, Ill. 60641 ..... *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... *
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M Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 *
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Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... *
D Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342 ..... *
D Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 .... *
Anchor Plastics, Dept. EM, 36-36 36th, Long Island City, N.Y. 11106
A. P. W. Co., Inc., Dept. EM, 72 W. Main, Rockaway, N. J. 07866
Artisan Elctrns. Corp., Dept. EM, 5 Eastmans Rd., Parsippany, N.J. 07054
Automatic Coil Corp., Sub. Designatronics Inc., Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
Caddell Coil Corp., Dept. EM, 35 Main St., Poultney, Vt. 05764
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Coil Specialty Co., Dept. EM, Box 978, 2730 Carolean Ind'l. Dr., State College, Pa. 16801
Cortec, Inc., Dept. EM, 15811 Chemical La., Huntington Bch, Cal. 92649
Cosmo Plastics Co., Dept. EM, 3239 W. 14th St., Cleveland, Ohio 44109
M D & L Sales Co. Inc., Dept. EM, 296 Preakness Ave., Paterson, N.J. 07502
Dia-Netics Inc., Dept. EM, 18823 Napa St., Northridge, Cal. 91324
Electrical Plastics Corp., Dept. EM, 500 Long Branch Ave., Long Branch, N.J. 07740
D Electronic Coil Corp., Dept. EM, 347 New Britain Ave., Plainville, Conn. 06062
D Fuji Electrochemical Co., Dept. EM, Hamagomu Bld. 5 36-11 Shinbashi, Minato-ku, Tokyo, Japan
M Gowanda Electronics Corp., Dept. EM, 179 Broadway Rd., Gowanda, N.Y. 14070
Gries Reproducer Co., Div. Coats & Clark Inc., Dept. EM, 162 Beechwood Ave., New Rochelle, N.Y. 10801
High Voltage Engrg. Corp., Dept. EM, S. Bedford St., Burlington, Mass. 01803
Micrometals, Dept. EM, 1190 N. Hawk, Anaheim, Cal. 92807
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
M Ogallala Elctrns., Div. Arnold Engrg. Co., Dept. EM, Box 59, Ogallala, Neb. 69153
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Paraplegics Mfg., Dept. EM, 304 N. York Rd., Bensenville, Ill. 60106
PCA Elctrns., Inc., Dept. EM, 16799 Schoenborn St., Sepulveda, Cal. 91343

DM Perfect Gear & Instr. Corp., Sub. Designatronics, Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
Permaluster, Inc., Dept. EM, 1844 N. Keystone St., Burbank, Calif. 91504
Plessey Ceramic Div., Dept. EM, 8th & Harrison Sts., Frenchtown, N.J. 08825
Precision Paper Tube Co., Dept. EM, 1049 S. Noel Ave., Wheeling, Ill. 60090
Renco Electronics Inc., Dept. EM, 240 Old Country Rd, Hicksville, N.Y. 11801
Resdel Corp., Dept. EM, Bldg. 22–County Airport, Rio Grande, N.J. 08242
M Sag Harbor Inds., Inc., Dept. EM, Bayview St., Sag Harbor, N.Y. 11963
D Spec Plastics Inc., Dept. EM, 7224 Atoll Ave., No. Hollywood, Cal. 91605
M Stevens Prods., Inc., Dept. EM, 128 N. Park St., E. Orange, N.J. 07019
M Syscon Int'l., Inc., Dept. EM, 1239 South Bend Ave., So. Bend, Ind. 46617
M Telectro Sys. Corp., Dept. EM, 96-18 43rd Ave., Corona, N.Y. 11368
U.S. Elctrns., Dept. EM, 500 Long Branch Ave., Long Branch, N.J. 07740
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

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Bel Fuse, Dept. EM, 203 Van Vorst, Jersey City, N.J. 07302 ..... *
M **Bourns Magnetic Prods., Trimpot Div., Dept. EM, Box 1398, Romoland, Cal. 92380** ..... p. 1324-1327,4331, Back Cover, Vol. 2
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Chesterfield Prods. Inc., Dept. EM, 511A Victor St., Saddle Brook, N.J. 07662 *
D **Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601** ..... *
Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 ..... *
Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... *
M **ESC Elctrns. Corp., Dept. EM, 534 Bergen Blvd., Palisades Pk., N.J. 07650** *
EWC, Inc., Dept. EM, 725 Federal Ave., Kenilworth, N.J. 07033 ..... *
M **Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061** ..... *
M **Inductive Components, Inc., Dept. EM, 181 Bridge Rd., Hauppauge, N.Y. 11787** ..... *
KGS Electronics, Inc., Dept. EM, 2029 N. Lincoln Ave., Pasadena, Cal. 91103 *
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NWL Transformers, Dept. EM, Rising Sun Rd., Bordentown, N.J. 08505 ..... *
M **Pico Elctrns. Inc., Dept. EM, 453 North MacQuesten Parkway, Mount Vernon, N.Y. 10552** ..... p. 4371,4373
M **Sterling Transformer Corp., Dept. EM, 510 Driggs Ave., Brooklyn, N.Y. 11211** *
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M **Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030** ..... *
M **Torwico Elctrns., Inc., Dept. EM, Rte. 70, Lakewood, N.J. 08701** ..... *
Triad-Utrad, Distr Svcs., Dept. EM, 305 N. Briant St., Huntington, Ind. 46750 *
M **TRW/UTC Transformers, Dept. EM, 150 Varick St., New York, N.Y. 10013** ..... *
American Magnetics Corp., Dept. EM, P.O. Box 8, Carterville, Ill. 62918
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
Automatic Coil Corp., Sub. Designatronics Inc., Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
M Coil-Q Corp., Dept. EM, 340 Bronxville Rd., Bronxville, N.Y. 10708
Coil Specialty Co., Dept. EM, Box 978, 2730 Carolean Ind'l. Dr., State College, Pa. 16801
Computer Comps., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
De Coursey Engrg. Lab., Dept. EM, 11828 W. Jefferson, Culver City, Cal. 90230
M Dietz Design, Inc., Dept. EM, 100 Electronics Pkwy., Belton, Mo. 64012
Electro-Pacific, Inc., Dept. EM, 5782 Thornwood Dr., Goleta, Calif. 93017
Electrocom Inds., Dept. EM, 1105 N. Ironwood Dr., S. Bend, Ind. 46615
DM JB Elctrn, Transformers, Inc., Dept. EM, 2300 W. Armitage Ave., Chicago, Ill 60647
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
Magnetic Products, Inc., Dept. EM, Box 1125, New London, N.H. 03257
Midcom Inc., Dept. EM, 1650 Tower Blvd., N. Mankato, Minn. 56001
Neshaminy Transformer, Div. Neshaminy Elctrn., Dept. EM, Edison-Furlong Rd., Furlong, Pa. 18925
M Northlake Engineering, Dept. EM, 999 Anita Ave., Antioch, Ill. 60002
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
PCA Elctrns., Inc., Dept. EM, 16799 Schoenborn St., Sepulveda, Cal. 91343
DM Perfect Gear & Instr. Corp., Sub. Designatronics, Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
Phoenix Transformer Co., Dept. EM, 1818 E. Madison, Phoenix, Ariz. 85034
M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
M Prototype Transformer Corp., Dept. EM, 545 N Arlington Ave, East Orange, N.J. 07017
Pulse Engrg., Inc., Dept. EM, Box 12235, San Diego, Cal 92112
Renco Electronics Inc., Dept. EM, 240 Old Country Rd, Hicksville, N.Y. 11801
Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
D Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
Tranex Inc., Dept. EM, 1599 Stierlin Rd., Mountain View, Cal. 94043
U.S. Elctrns., Dept. EM, 500 Long Branch Ave., Long Branch, N.J. 07740
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Coils, Antenna (Including Loading Type)

Bel Fuse, Dept. EM, 203 Van Vorst, Jersey City, N.J. 07302 ..... *
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M **Cramer Coil, Div Digital Magnetics Inc, Dept. EM, Box 32, Grafton, Wisc. 53024** ..... *
Delevan Div., Coil Prods., American Precision Inds., Dept. EM, 270 Quaker Rd., E. Aurora, N.Y. 14052 ..... *
Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... *
GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
M **Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612** ..... *
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
D Antenna Incorporated, Dept. EM, 26301 Richmond Road, Cleveland, Ohio 44126
Automatic Coil Corp., Sub. Designatronics Inc., Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
D Barker & Williamson, Inc., Dept. EM, Canal St., Bristol, Pa. 19007
M Caddell Coil Corp., Dept. EM, 35 Main St., Poultney, Vt. 05764
Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Coil Specialty Co., Dept. EM, Box 978, 2730 Carolean Ind'l. Dr., State College, Pa. 16801
Computer Comps., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
D Lattin Radio Labs., Dept. EM, 1431 Sweeney, Box 44, Owensboro, Ky. 42301
D Mitsumi Elec. Co., Ltd., Dept. EM, 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
DM Perfect Gear & Instr. Corp., Sub. Designatronics, Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
M Piconics Inc., Dept. EM, Cummings Rd., Tyngsboro, Mass. 01879
Renco Electronics Inc., Dept. EM, 240 Old Country Rd, Hicksville, N.Y. 11801
U.S. Elctrns., Dept. EM, 500 Long Branch Ave., Long Branch, N.J. 07740
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Coils, Broadcast

D **Bell Industries, J.W. Miller Div., Dept. EM, 19070 Reyes Ave., Compton, Cal. 90221** ..... *
Caddel-Burns Mfg. Co., Inc., Dept. EM, 40 E. 2nd St., Mineola, N. Y. 11501 *
Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 ..... *
Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... *
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
A. P. W. Co., Inc., Dept. EM, 72 W. Main, Rockaway, N. J. 07866
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M Caddell Coil Corp., Dept. EM, 35 Main St., Poultney, Vt. 05764
Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Coil-Q Corp., Dept. EM, 340 Bronxville Rd., Bronxville, N.Y. 10708
Coil Specialty Co., Dept. EM, Box 978, 2730 Carolean Ind'l. Dr., State College, Pa. 16801
J.D.N. Electronics Inc., Dept. EM, Box 156, 239 Morristown Rd., Gillette, N.J. 07933
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
D Mitsumi Elec. Co., Ltd., Dept. EM, 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan
DM Perfect Gear & Instr. Corp., Sub. Designatronics, Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
M Piconics Inc., Dept. EM, Cummings Rd., Tyngsboro, Mass. 01879
Renco Electronics Inc., Dept. EM, 240 Old Country Rd, Hicksville, N.Y. 11801

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DM **Delevan Div., Coil Prods., American Precision Inds., Dept. EM, 270 Quaker Rd., E. Aurora, N.Y. 14052** ..... p. 1340,1341
M **Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030** ..... *
Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Coilcraft, Dept. EM, 1102 Siler Lake Rd., Cary, Ill. 60013
M Compex Corp., Dept. EM, 383 Kings Highway, Cherry Hill, N.J. 08034
D Fuji Electrochemical Co., Dept. EM, Hamagomu Bld. 5 36-11 Shinbashi, Minato-ku, Tokyo, Japan
Gowanda Electronics Corp., Dept. EM, 179 Broadway Rd., Gowanda, N.Y. 14070
M Thinco Div. Hull Corp., Dept. EM, Davisville Rd., Hatboro, Pa. 19040

Coils, Degaussing

D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
D **Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582** *
DM **Thordarson Meissner, Electronic Ctr., Dept. EM, Mt. Carmel, Ill. 62863** ..... *
Annis R B Co., Dept. EM, 1101 N. Delaware, Indianapolis, Ind. 46202
Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Coil Specialty Co., Dept. EM, Box 978, 2730 Carolean Ind'l. Dr., State College, Pa. 16801
Elma Engineering, Dept. EM, 1066 E. Meadow Circle, Palo Alto, Cal. 94303
LDJ Electronics, Dept. EM, 1064 Naughton Ave., Troy, Mich. 48084
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
Walker Scientific, Inc., Dept. EM, Rockdale St., Worcester, Mass. 01606

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D **Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629** ..... *
Abex Corp, Dept. EM, 530 5th Ave, New York, NY 10036
Advanced Kinetics, Dept. EM, 1231 Victoria St., Costa Mesa, Calif 92627
A. P. W. Co., Inc., Dept. EM, 72 W. Main, Rockaway, N. J. 07866
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
D Electronic Coil Corp., Dept. EM, 347 New Britain Ave., Plainville, Conn 06062
LDJ Electronics, Dept. EM, 1064 Naughton Ave., Troy, Mich. 48084
DM Magnos, Incorporated, Dept. EM, Old School House Rd., Harvard, Mass. 01451

Ogallala Elctrns., Div Arnold Engrg Co., Dept. EM, Box 59, Ogallala, Neb. 69153
DM Perfect Gear & Instr Corp., Sub Designatronics, Dept EM, 455 E 10th Ave., Hialeah, Fla 33010
Sag Harbor Inds., Inc., Dept. EM, Bayview St., Sag Harbor, N.Y. 11963
U.S. Elctrns., Dept. EM, 500 Long Branch Ave., Long Branch, N.J. 07740
Walker Scientific, Inc., Dept. EM, Rockdale St., Worcester, Mass. 01606

Coils, Focusing

Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Syntronic Instruments Inc., Dept. EM, 100 Industrial Rd., Addison, Ill. 60101 p. 1363
DM **Thordarson Meissner, Electronic Ctr., Dept. EM, Mt. Carmel, Ill. 62863 ..... ***
Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
M Display Components Inc., Dept. EM, 550 Newton Rd, Box 488, Littleton, Mass. 01460
Elma Engineering, Dept. EM, 1066 E. Meadow Circle, Palo Alto, Cal 94303
M Ferranti Elec., Dept. EM, East Bethpage Rd., Plainview, N.Y. 11803
Litton Inds., Electron Tube Div., Dept. EM, 960 Industrial Rd, San Carlos, Calif. 94070
M Ogallala Elctrns., Div. Arnold Engrg. Co., Dept. EM, Box 59, Ogallala, Neb. 69153
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Walker Scientific, Inc., Dept. EM, Rockdale St., Worcester, Mass. 01606
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Coils, Foil-Wound

EWC, Inc., Dept. EM, 725 Federal Ave., Kenilworth, N.J. 07033 ..... *
Magnetico, Inc., Dept. EM, 182 Morris Ave., Holtsville, N.Y. 11742 ..... *
M **Sterling Transformer Corp., Dept. EM, 510 Driggs Ave., Brooklyn, N.Y. 11211 ***
Technitrol, Inc., Dept. EM, 1952 E. Allegheny, Philadelphia, Pa. 19134 ..... *
M **Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... ***
M **Torwico Elctrns., Inc., Dept. EM, Rte. 70, Lakewood, N.J. 08701 ..... ***
D **Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 .... ***
American Magnetics Corp., Dept. EM, P.O. Box 8, Carterville, Ill. 62918
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Electro-Pacific, Inc., Dept. EM, 5782 Thornwood Dr., Goleta, Calif. 93017
Electrocube Inc., Dept. EM, 1710 So. Del Mar Ave., San Gabriel, Cal. 91776
Elma Engineering, Dept. EM, 1066 E. Meadow Circle, Palo Alto, Cal. 94303
M Johnson Electric Coil Co., Dept. EM, Box 559, Elmhurst, Ill 60126
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
M Ogallala Elctrns., Div. Arnold Engrg. Co., Dept. EM, Box 59, Ogallala, Neb. 69153
M Osborne Transformer Corp., Dept. EM, 19636 Derby St., Detroit, Mich. 48203
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Permaluster, Inc., Dept. EM, 1844 N. Keystone St., Burbank, Calif. 91504
D Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
Tapecon, Inc., Dept. EM, 475 River St., Rochester, N.Y. 14612
Tranex Inc., Dept. EM, 1599 Stierlin Rd., Mountain View, Cal. 94043
Walker Scientific, Inc., Dept. EM, Rockdale St., Worcester, Mass. 01606

Coils, High-Q, Low-Frequency

Allen Avionics, Inc., Div. A.K. Allen Co., Dept. EM, 255 E. 2nd St., Mineola, N.Y. 11501 ..... *
Bel Fuse, Dept. EM, 203 Van Vorst, Jersey City, N.J. 07302 ..... *
M **Bourns Magnetic Prods., Trimpot Div., Dept. EM, Box 1398, Romoland, Cal. 92380 ..... p. 1324,1325, Back Cover, Vol. 2**
Caddel-Burns Mfg. Co., Inc., Dept. EM, 40 E. 2nd St., Mineola, N. Y. 11501 *
Chesterfield Prods. Inc., Dept. EM, 511A Victor St., Saddle Brook, N.J. 07662 *
DM **Cramer Coil, Div Digital Magnetics Inc, Dept. EM, Box 32, Grafton, Wisc. 53024 ..... ***
D **Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 ..... ***
Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 ..... *
Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 .. *
D **Dormeyer Industries, Dept. EM, 3418 N. Milwaukee, Chicago, Ill. 60641 ..... ***
Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... *
M **ESC Elctrns. Corp., Dept. EM, 534 Bergen Blvd., Palisades Pk., N.J. 07650 ***
EWC, Inc., Dept. EM, 725 Federal Ave., Kenilworth, N.J. 07033 ..... *
M **Freed Transformer Co., Inc., Dept. EM, 1718 Weirfield St., Brooklyn, N.Y. 11227 ..... ***
M **Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 ..... p. 4353**
M **Inductive Components, Inc., Dept. EM, 181 Bridge Rd., Hauppauge, N.Y. 11787 ..... ***
KGS Electronics, Inc., Dept. EM, 2029 N. Lincoln Ave., Pasadena, Cal. 91103 *
Magnetico, Inc., Dept. EM, 182 Morris Ave., Holtsville, N.Y. 11742 ..... *
DM **Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 ***
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 .. p. 1361
NWL Transformers, Dept. EM, Rising Sun Rd., Bordentown, N.J. 08505 ..... *
DM **Nytronics Comps. Group Inc., Sub Nytronics, Dept. EM, Orange St., Darlington, S.C. 29532 ..... ***
OPT Inds. Inc., Data Products Div., Dept. EM, 300 Red School Lane, Phillipsburg, N.J. 08865 ..... p. 3291
M **Pico Elctrns. Inc., Dept. EM, 453 North MacQuesten Parkway, Mount Vernon, N.Y. 10552 ..... ***
M **Sigmapower, Inc., Dept. EM, 20790 Leapwood Ave., Carson, Cal. 90746 p. 3329**
Signal Transformer Co., Dept. EM, 500 Bayview Ave., Inwood, N.Y. 11696 p. 4399,4403
M **Sterling Transformer Corp., Dept. EM, 510 Driggs Ave., Brooklyn, N.Y. 11211 p. 4410**
Thordarson Meissner, Electronic Ctr., Dept. EM, Mt. Carmel, Ill. 62863 p. 4421
M **Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 p. 1364-1368**
M **Torwico Elctrns., Inc., Dept. EM, Rte. 70, Lakewood, N.J. 08701 ..... ***
D **Triad-Utrad, Distr Svcs., Dept. EM, 305 N. Briant St., Huntington, Ind. 46750 ***
M **TRW/UTC Transformers, Dept. EM, 150 Varick St., New York, N.Y. 10013 Inside Back Cover, Vol. 1**
M **Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040 ***
Aladdin Elctrns., Dept. EM, 701 Murfreesboro Rd., Nashville, Tenn. 37210
American Magnetics Corp., Dept. EM, P.O. Box 8, Carterville, Ill. 62918
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
Automatic Coil Corp., Sub. Designatronics Inc., Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
M Caddell Coil Corp., Dept. EM, 35 Main St., Poultney, Vt. 05764
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Coilcraft, Dept. EM, 1102 Silver Lake Rd., Cary, Ill. 60013
M Coil-Q Corp., Dept. EM, 340 Bronxville Rd., Bronxville, N.Y. 10708
Coil Specialty Co., Dept. EM, Box 978, 2730 Carolean Ind'l. Dr., State College, Pa. 16801
M Dietz Design, Inc., Dept. EM, 100 Electronics Pkwy., Belton, Mo. 64012
Electro-Pacific, Inc., Dept. EM, 5782 Thornwood Dr., Goleta, Calif. 93017
Electrocom Inds., Dept. EM, 1105 N. Ironwood Dr., S. Bend, Ind. 46615
Elma Engineering, Dept. EM, 1066 E. Meadow Circle, Palo Alto, Cal. 94303
Gowanda Electronics Corp., Dept. EM, 179 Broadway Rd., Gowanda, N.Y. 14070
J.D.N. Electronics Inc., Dept. EM, Box 156, 239 Morristown Rd., Gillette, N.J. 07933
M Lenox-Fugle Elctrns., Inc., Dept. EM, 100 Sylvania Pl., S. Plainfield, N.J. 07080
Neshaminy Transformer, Div. Neshaminy Elctrn., Dept. EM, Edison-Furlong Rd., Furlong, Pa. 18925
M Northlake Engineering, Dept. EM, 999 Anita Ave., Antioch, Ill. 60002
PCA Elctrns., Inc., Dept. EM, 16799 Schoenborn St., Sepulveda, Cal. 91343
Phoenix Transformer Co., Dept. EM, 1818 E. Madison, Phoenix, Ariz. 85034
M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
Renco Electronics Inc., Dept. EM, 240 Old Country Rd, Hicksville, N.Y. 11801
M San Fernando Elec. Mfg., Dept. EM, 1501 1st St., San Fernando, Cal. 91341
Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
M Syscon Int'l., Inc., Dept. EM, 1239 South Bend Ave., So. Bend, Ind. 46617
Torelco Inc., Dept. EM, 14 Paine Ave., Irvington, N.J. 07111
Tranex Inc., Dept. EM, 1599 Stierlin Rd., Mountain View, Cal. 94043
U.S. Elctrns., Dept. EM, 500 Long Branch Ave., Long Branch, N.J. 07740
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Coils, Hybrid & Repeater

Chesterfield Prods. Inc., Dept. EM, 511A Victor St., Saddle Brook, N.J. 07662 *
Delevan Div., Coil Prods., American Precision Inds., Dept. EM, 270 Quaker Rd., E. Aurora, N.Y. 14052 ..... *
EWC, Inc., Dept. EM, 725 Federal Ave., Kenilworth, N.J. 07033 ..... *
M **Inductive Components, Inc., Dept. EM, 181 Bridge Rd., Hauppauge, N.Y. 11787 ..... ***
Magnetico, Inc., Dept. EM, 182 Morris Ave., Holtsville, N.Y. 11742 ..... *
DM **Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 ***
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
Nytronics Comps. Group Inc., Sub Nytronics, Dept. EM, Orange St., Darlington, S.C. 29532 ..... *
M **Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... ***
M **TRW/UTC Transformers, Dept. EM, 150 Varick St., New York, N.Y. 10013 .. ***
DM ADC Prods, Dept. EM, 4900 W. 78th St., Minneapolis, Mn 55435
Aladdin Elctrns., Dept. EM, 701 Murfreesboro Rd., Nashville, Tenn. 37210
American Magnetics Corp., Dept. EM, P.O. Box 8, Carterville, Ill. 62918
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Coil-Q Corp., Dept. EM, 340 Bronxville Rd., Bronxville, N.Y. 10708
Computer Comps., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
M Dietz Design, Inc., Dept. EM, 100 Electronics Pkwy., Belton, Mo. 64012
D ITI Electronics, Inc., Dept. EM, 369 Lexington Ave., Clifton, N.J. 07015
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
Midcom Inc., Dept. EM, 1650 Tower Blvd., N. Mankato, Minn. 56001
DM Perfect Gear & Instr. Corp., Sub. Designatronics, Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
Phoenix Transformer Co., Dept. EM, 1818 E. Madison, Phoenix, Ariz. 85034
Renco Electronics Inc., Dept. EM, 240 Old Country Rd, Hicksville, N.Y. 11801
U.S. Elctrns., Dept. EM, 500 Long Branch Ave., Long Branch, N.J. 07740

Coils, I-F

Bel Fuse, Dept. EM, 203 Van Vorst, Jersey City, N.J. 07302 ..... *
D **Bell Industries, J.W. Miller Div., Dept. EM, 19070 Reyes Ave., Compton, Cal. 90221 ..... ***
Caddel-Burns Mfg. Co., Inc., Dept. EM, 40 E. 2nd St., Mineola, N. Y. 11501 *
DM **Cramer Coil, Div Digital Magnetics Inc, Dept. EM, Box 32, Grafton, Wisc. 53024 ..... ***
D **Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 ..... ***
D **Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 ..... ***
Delevan Div., Coil Prods., American Precision Inds., Dept. EM, 270 Quaker Rd., E. Aurora, N.Y. 14052 ..... *
Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... *

EWC, Inc., Dept. EM, 725 Federal Ave., Kenilworth, N.J. 07033 ..... *
M Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 ..... *
D Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
DM Thordarson Meissner, Electronic Ctr., Dept. EM, Mt. Carmel, Ill. 62863 ..... *
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... *
M Torwico Elctrns., Inc., Dept. EM, Rte. 70, Lakewood, N.J. 08701 ..... *
M Aladdin Elctrns., Dept. EM, 701 Murfreesboro Rd., Nashville, Tenn. 37210
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
Automatic Coil Corp., Sub. Designatronics Inc., Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
M Caddell Coil Corp., Dept. EM, 35 Main St., Poultney, Vt. 05764
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Coilcraft, Dept. EM, 1102 Siler Lake Rd., Cary, Ill. 60013
M Coil-Q Corp., Dept. EM, 340 Bronxville Rd., Bronxville, N.Y. 10708
Coil Specialty Co., Dept. EM, Box 978, 2730 Carolean Ind'l. Dr., State College, Pa. 16801
Computer Comps., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
M Dietz Design, Inc., Dept. EM, 100 Electronics Pkwy., Belton, Mo. 64012
Hytronics Corp., Dept. EM, 6231 72nd Ave. N., Pinellas Park, Fla. 33565
J.D.N. Electronics Inc., Dept. EM, Box 156, 239 Morristown Rd., Gillette, N.J. 07933
D Mitsumi Elec. Co., Ltd., Dept. EM, 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan
DM Perfect Gear & Instr. Corp., Sub. Designatronics, Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
M Piconics Inc., Dept. EM, Cummings Rd., Tyngsboro, Mass. 01879
M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
Renco Electronics Inc., Dept. EM, 240 Old Country Rd, Hicksville, N.Y. 11801
DM San Fernando Elec. Mfg., Dept. EM, 1501 1st St., San Fernando, Cal. 91341
M Syscon Int'l., Inc., Dept. EM, 1239 South Bend Ave., So. Bend, Ind. 46617
U.S. Elctrns., Dept. EM, 500 Long Branch Ave., Long Branch, N.J. 07740
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Coils, Metallized Glass

M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... *
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
DM JFD Electronics Components Corp., Dept. EM, 1462 62nd St., Bklyn., N.Y. 11219
M Thinco Div. Hull Corp., Dept. EM, Davisville Rd., Hatboro, Pa. 19040

Coils, Molded

DM Bell Industries, J.W. Miller Div., Dept. EM, 19070 Reyes Ave., Compton, Cal. 90221 ..... p. 1323
Caddel-Burns Mfg. Co., Inc., Dept. EM, 40 E. 2nd St., Mineola, N. Y. 11501 *
Coto-Coil Co., Dept. EM, 65 Pavilion Ave., Providence, R.I. 02905 ..... *
DM Cramer Coil, Div Digital Magnetics Inc, Dept. EM, Box 32, Grafton, Wisc. 53024 ..... p. 1335
Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 ..... *
D Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 ..... *
DM Delevan Div., Coil Prods., American Precision Inds., Dept. EM, 270 Quaker Rd., E. Aurora, N.Y. 14052 ..... *
D Dormeyer Industries, Dept. EM, 3418 N. Milwaukee, Chicago, Ill. 60641 ..... *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... *
Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... *
D Elctrn. Molding Corp., Dept. EM, 96 Mill St., Woonsocket, R.I. 02895 ..... *
Endicott Coil Co., Dept. EM, 24 Charlotte St., Binghamton, N.Y. 13905 ..... *
M ESC Elctrns. Corp., Dept. EM, 534 Bergen Blvd., Palisades Pk., N.J. 07650 *
EWC, Inc., Dept. EM, 725 Federal Ave., Kenilworth, N.J. 07033 ..... *
M Freed Transformer Co., Inc., Dept. EM, 1718 Weirfield St., Brooklyn, N.Y. 11227 ..... p. 4348
M Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 ..... *
M Kappa Networks, Dept. EM, 165 Roosevelt Ave, Carteret, N.J. 07008 ..... *
KGS Electronics, Inc., Dept. EM, 2029 N. Lincoln Ave., Pasadena, Cal. 91103 *
Magnetico, Inc., Dept. EM, 182 Morris Ave., Holtsville, N.Y. 11742 ..... *
Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
DM Nytronics Comps. Group Inc., Sub Nytronics, Dept. EM, Orange St., Darlington, S.C. 29532 ..... p. 1345-1360
M Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... *
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 p. 1367,1369
Torotron, Dept. EM, 255 Washington St., Mt. Vernon, N.Y. 10553 ..... *
M Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040 *
M Aladdin Elctrns., Dept. EM, 701 Murfreesboro Rd., Nashville, Tenn. 37210
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
Automatic Coil Corp., Sub. Designatronics Inc., Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
M Bicron Elctrns. Co., Dept. EM, Box 807, Barlow St., Canaan, Conn. 06018
Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Coilcraft, Dept. EM, 1102 Siler Lake Rd., Cary, Ill. 60013
M Component Specialties, Dept. EM, 9143 E. La Rosa Dr., Temple City, Cal. 91780
Cosmo Plastics Co., Dept. EM, 3239 W. 14th St., Cleveland, Ohio 44109
Electrical Plastics Corp., Dept. EM, 500 Long Branch Ave., Long Branch, N.J. 07740
Electro-Pacific, Inc., Dept. EM, 5782 Thornwood Dr., Goleta, Calif. 93017
G & G Tresco Corp., Dept. EM, 1952 E. Allegheny Ave., Phila., PA 19134
DM Gowanda Electronics Corp., Dept. EM, 179 Broadway Rd., Gowanda, N.Y. 14070
DM JB Elctrn, Transformers, Inc., Dept. EM, 2300 W. Armitage Ave., Chicago, Ill 60647
M Johnson Electric Coil Co., Dept. EM, Box 559, Elmhurst, Ill. 60126
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
PCA Elctrns., Inc., Dept. EM, 16799 Schoenborn St., Sepulveda, Cal. 91343
DM Perfect Gear & Instr. Corp., Sub. Designatronics, Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
Pulse Engrg., Inc., Dept. EM, Box 12235, San Diego, Cal 92112
Renco Electronics Inc., Dept. EM, 240 Old Country Rd, Hicksville, N.Y. 11801
M Sag Harbor Inds., Inc., Dept. EM, Bayview St., Sag Harbor, N.Y. 11963
M Schott Corp., Dept. EM, 3140 B Harbor Lane No., Minneapolis, Minn. 55441
Torelco Inc., Dept. EM, 14 Paine Ave., Irvington, N.J. 07111
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013
U.S. Elctrns., Dept. EM, 500 Long Branch Ave., Long Branch, N.J. 07740

Coils, Oscillator

D Bell Industries, J.W. Miller Div., Dept. EM, 19070 Reyes Ave., Compton, Cal. 90221 ..... *
Caddel-Burns Mfg. Co., Inc., Dept. EM, 40 E. 2nd St., Mineola, N. Y. 11501 p. 1328
Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... *
EWC, Inc., Dept. EM, 725 Federal Ave., Kenilworth, N.J. 07033 ..... *
M Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 ..... *
Magnetico, Inc., Dept. EM, 182 Morris Ave., Holtsville, N.Y. 11742 ..... *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... *
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
Arenberg Ultrasonic Inc., Dept. EM, 94 Green, Jamaica Plain, Mass. 02130
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Coilcraft, Dept. EM, 1102 Siler Lake Rd., Cary, Ill. 60013
Coil-Q Corp., Dept. EM, 340 Bronxville Rd., Bronxville, N.Y. 10708
Coil Specialty Co., Dept. EM, Box 978, 2730 Carolean Ind'l. Dr., State College, Pa. 16801
Gowanda Electronics Corp., Dept. EM, 179 Broadway Rd., Gowanda, N.Y. 14070
J.D.N. Electronics Inc., Dept. EM, Box 156, 239 Morristown Rd., Gillette, N.J. 07933
D Mitsumi Elec. Co., Ltd., Dept. EM, 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan
Renco Electronics Inc., Dept. EM, 240 Old Country Rd, Hicksville, N.Y. 11801
Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Coils, R-F

Bel Fuse, Dept. EM, 203 Van Vorst, Jersey City, N.J. 07302 ..... *
D Bell Industries, J.W. Miller Div., Dept. EM, 19070 Reyes Ave., Compton, Cal. 90221 ..... p. 1322,1323
Caddel-Burns Mfg. Co., Inc., Dept. EM, 40 E. 2nd St., Mineola, N. Y. 11501 p. 1330-1333
DM Cramer Coil, Div Digital Magnetics Inc, Dept. EM, Box 32, Grafton, Wisc. 53024 ..... p. 1335
D Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 ..... *
Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 ..... p. 1336,1337
DM Delevan Div., Coil Prods., American Precision Inds., Dept. EM, 270 Quaker Rd., E. Aurora, N.Y. 14052 ..... p. 1340,1341
Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... *
EWC, Inc., Dept. EM, 725 Federal Ave., Kenilworth, N.J. 07033 ..... *
Freed Transformer Co., Inc., Dept. EM, 1718 Weirfield St., Brooklyn, N.Y. 11227 ..... *
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
M Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 ..... *
M Inductive Components, Inc., Dept. EM, 181 Bridge Rd., Hauppauge, N.Y. 11787 ..... *
Kappa Networks, Dept. EM, 165 Roosevelt Ave, Carteret, N.J. 07008 ..... *
Magnetico, Inc., Dept. EM, 182 Morris Ave., Holtsville, N.Y. 11742 ..... *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 p. 1361,4364
DM Nytronics Comps. Group Inc., Sub Nytronics, Dept. EM, Orange St., Darlington, S.C. 29532 ..... p. 1344-1360
M RF Interonics, Dept. EM, 100 Pine Air Dr., Bay Shore, N.Y. 11706 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Signal Transformer Co., Dept. EM, 500 Bayview Ave., Inwood, N.Y. 11696 p. 4398,4403
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 p. 1365-1367
TRW/UTC Transformers, Dept. EM, 150 Varick St., New York, N.Y. 10013 .. *
M Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040 *
M Aladdin Elctrns., Dept. EM, 701 Murfreesboro Rd., Nashville, Tenn. 37210
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
Automatic Coil Corp., Sub. Designatronics Inc., Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
D Barker & Williamson, Inc., Dept. EM, Canal St., Bristol, Pa. 19007
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
DM Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
Ceramic Magnetics, Inc., Dept. EM, 87 Fairfield Rd., Fairfield, N.J. 07006
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647

Coilcraft, Dept. EM, 1102 Siler Lake Rd., Cary, Ill. 60013
M Coil-Q Corp., Dept. EM, 340 Bronxville Rd., Bronxville, N.Y. 10708
Coil Specialty Co., Dept. EM, Box 978, 2730 Carolean Ind'l. Dr., State College, Pa. 16801
M Compex Corp., Dept. EM, 383 Kings Highway, Cherry Hill, N.J. 08034
Computer Comps., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
M Dietz Design, Inc., Dept. EM, 100 Electronics Pkwy., Belton, Mo. 64012
Elma Engineering, Dept. EM, 1066 E. Meadow Circle, Palo Alto, Cal. 94303
Ferroxcube Corp., Dept. EM, 5083 Kings Hwy., Saugerties, N.Y. 12477
DM Gowanda Electronics Corp., Dept. EM, 179 Broadway Rd., Gowanda, N.Y. 14070
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Hytronics Corp., Dept. EM, 6231 72nd Ave. N., Pinellas Park, Fla. 33565
M J.D.N. Electronics Inc., Dept. EM, Box 156, 239 Morristown Rd., Gillette, N.J. 07933
M Lenox-Fugle Elctrns., Inc., Dept. EM, 100 Sylvania Pl., S. Plainfield, N.J. 07080
Lepel Corp, Dept. EM, 59-21 Queens-Midtown Expwy., Maspeth, N.Y. 11378
D Mitsumi Elec. Co., Ltd., Dept. EM, 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan
PCA Elctrns., Inc., Dept. EM, 16799 Schoenborn St., Sepulveda, Cal. 91343
DM Perfect Gear & Instr. Corp., Sub. Designatronics, Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
M Piconics Inc., Dept. EM, Cummings Rd., Tyngsboro, Mass. 01879
Raytheon Co., Microwave & Power Tube Div., Dept. EM, 190 Willow St., Waltham, Mass 02154
Renco Electronics Inc., Dept. EM, 240 Old Country Rd, Hicksville, N.Y. 11801
DM San Fernando Elec. Mfg., Dept. EM, 1501 1st St., San Fernando, Cal. 91341
Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
Superex Electronics Corp., Dept. EM, 151 Ludlow St., Yonkers, N.Y. 10705
M Syscon Int'l., Inc., Dept. EM, 1239 South Bend Ave., So. Bend, Ind. 46617
M Thinco Div. Hull Corp., Dept. EM, Davisville Rd., Hatboro, Pa. 19040
U.S. Elctrns., Dept. EM, 500 Long Branch Ave., Long Branch, N.J. 07740
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Coils, Relay

D Bell Industries, J.W. Miller Div., Dept. EM, 19070 Reyes Ave., Compton, Cal. 90221 *
Coto-Coil Co., Dept. EM, 65 Pavilion Ave., Providence, R.I. 02905 *
D Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 *
Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 *
D Dormeyer Industries, Dept. EM, 3418 N. Milwaukee, Chicago, Ill. 60641 *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 *
Endicott Coil Co., Dept. EM, 24 Charlotte St., Binghamton, N.Y. 13905 *
M Inductive Components, Inc., Dept. EM, 181 Bridge Rd., Hauppauge, N.Y. 11787 *
Kappa Networks, Dept. EM, 165 Roosevelt Ave, Carteret, N.J. 07008 *
Kilovac Corp., Dept. EM, Box 4422, Santa Barbara, Cal. 93103 *
Liberty Controls, Inc., Dept. EM, 500 Brookforest Ave., Shorewood, Ill. 60431 p. 3580
Midtex, Inc., AEMCO Div., Dept. EM, 1650 Tower Blvd., No. Mankato, Minn. 56001 *
M Regdon Corp., Dept. EM, 3713 Grand Blvd., Brookfield, Ill 60513 *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 *
Standex Electronics, Dept. EM, 4538 Camberwell Rd., Cincinnati, Ohio 45209 *
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 *
American Magnetics Corp., Dept. EM, P.O. Box 8, Carterville, Ill. 62918
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
A. P. W. Co., Inc., Dept. EM, 72 W. Main, Rockaway, N. J. 07866
Artisan Elctrns. Corp., Dept. EM, 5 Eastmans Rd., Parsippany, N.J. 07054
Automatic Coil Corp., Sub. Designatronics Inc., Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Coilcraft, Dept. EM, 1102 Siler Lake Rd., Cary, Ill. 60013
Coil Specialty Co., Dept. EM, Box 978, 2730 Carolean Ind'l. Dr., State College, Pa. 16801
Component Specialties, Dept. EM, 9143 E. La Rosa Dr., Temple City, Cal. 91780
Computer Comps., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
Custom Coil & Transformer Co., Dept. EM, Box 2369, Zanesville, Ohio 43701
Dia-Netics Inc., Dept. EM, 18823 Napa St., Northridge, Cal. 91324
Electro Design Systems, Dept. EM, 401 W. 35th St., Ste. K, National City, CA 92050
D Electronic Coil Corp., Dept. EM, 347 New Britain Ave., Plainville, Conn. 06062
Guardian California, Dept. EM, 4030 W. Spencer St., Torrance, Cal. 90503
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
DM Perfect Gear & Instr. Corp., Sub. Designatronics, Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
Relay Service Co., Dept. EM, 1310 N. Pulaski Rd., Chicago, Ill. 60651
Renco Electronics Inc., Dept. EM, 240 Old Country Rd, Hicksville, N.Y. 11801
M Sag Harbor Inds., Inc., Dept. EM, Bayview St., Sag Harbor, N.Y. 11963
M San Fernando Elec. Mfg., Dept. EM, 1501 1st St., San Fernando, Cal. 91341
Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
U.S. Elctrns., Dept. EM, 500 Long Branch Ave., Long Branch, N.J. 07740

Coils, Saturable Reactor

Abacus Controls Inc., Dept. EM, 89 Redington Rd., Somerville, N.J. 08876 *
Caddel-Burns Mfg. Co., Inc., Dept. EM, 40 E. 2nd St., Mineola, N. Y. 11501 p. 1328
Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 *
M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 *
EWC, Inc., Dept. EM, 725 Federal Ave., Kenilworth, N.J. 07033 *
M Freed Transformer Co., Inc., Dept. EM, 1718 Weirfield St., Brooklyn, N.Y. 11227 *
M Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 *
M Inductive Components, Inc., Dept. EM, 181 Bridge Rd., Hauppauge, N.Y. 11787 *
M Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735 *
KGS Electronics, Inc., Dept. EM, 2029 N. Lincoln Ave., Pasadena, Cal. 91103 *
DM Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 *
NWL Transformers, Dept. EM, Rising Sun Rd., Bordentown, N.J. 08505 *
Rtron Corp., Dept. EM, 7324 Lawndale, Skokie, Ill. 60076 *
M Sterling Transformer Corp., Dept. EM, 510 Driggs Ave., Brooklyn, N.Y. 11211 *
Technitrol, Inc., Dept. EM, 1952 E. Allegheny, Philadelphia, Pa. 19134 *
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 *
Torotron, Dept. EM, 255 Washington St., Mt. Vernon, N.Y. 10553 *
M Torwico Elctrns., Inc., Dept. EM, Rte. 70, Lakewood, N.J. 08701 *
M TRW/UTC Transformers, Dept. EM, 150 Varick St., New York, N.Y. 10013 *
M Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040 *
Aladdin Elctrns., Dept. EM, 701 Murfreesboro Rd., Nashville, Tenn. 37210
D American HV Voltage Test Sys., Inc., Dept. EM, Ctrl Garr Ind'l Pk, Accident, Md. 21520
American Magnetics Corp., Dept. EM, P.O. Box 8, Carterville, Ill. 62918
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
M Bicron Elctrns. Co., Dept. EM, Box 807, Barlow St., Canaan, Conn. 06018
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Coilcraft, Dept. EM, 1102 Siler Lake Rd., Cary, Ill. 60013
Cross Electronics Inc., Dept. EM, 100 Commonwealth Dr., Warrendale, Pa. 15086
M Dietz Design, Inc., Dept. EM, 100 Electronics Pkwy., Belton, Mo. 64012
Electro-Pacific, Inc., Dept. EM, 5782 Thornwood Dr., Goleta, Calif. 93017
Electrocom Inds., Dept. EM, 1105 N. Ironwood Dr., S. Bend, Ind. 46615
Electrocube Inc., Dept. EM, 1710 So. Del Mar Ave., San Gabriel, Cal. 91776
Elma Engineering, Dept. EM, 1066 E. Meadow Circle, Palo Alto, Cal. 94303
G & G Tresco Corp., Dept. EM, 1952 E. Allegheny Ave., Phila., PA 19134
M Johnson Electric Coil Co., Dept. EM, Box 559, Elmhurst, Ill 60126
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
Magnetic Products, Inc., Dept. EM, Box 1125, New London, N.H. 03257
Neshaminy Transformer, Div. Neshaminy Elctrn., Dept. EM, Edison-Furlong Rd., Furlong, Pa. 18925
M Northlake Engineering, Dept. EM, 999 Anita Ave., Antioch, Ill. 60002
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
M Osborne Transformer Corp., Dept. EM, 19636 Derby St., Detroit, Mich. 48203
Phoenix Transformer Co., Dept. EM, 1818 E. Madison, Phoenix, Ariz. 85034
M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
Renco Electronics Inc., Dept. EM, 240 Old Country Rd, Hicksville, N.Y. 11801
D Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
Torelco Inc., Dept. EM, 14 Paine Ave., Irvington, N.J. 07111

Coils, Shielded

Bel Fuse, Dept. EM, 203 Van Vorst, Jersey City, N.J. 07302 *
DM Bell Industries, J.W. Miller Div., Dept. EM, 19070 Reyes Ave., Compton, Cal. 90221 p. 1322
Caddel-Burns Mfg. Co., Inc., Dept. EM, 40 E. 2nd St., Mineola, N. Y. 11501 p. 1328,1330-1333
DM Cramer Coil, Div Digital Magnetics Inc, Dept. EM, Box 32, Grafton, Wisc. 53024 p. 1335
Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 *
D Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 p. 1336,1337
DM Delevan Div., Coil Prods., American Precision Inds., Dept. EM, 270 Quaker Rd., E. Aurora, N.Y. 14052 p. 1340,1341
Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 *
EWC, Inc., Dept. EM, 725 Federal Ave., Kenilworth, N.J. 07033 *
M Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 *
Kappa Networks, Dept. EM, 165 Roosevelt Ave, Carteret, N.J. 07008 *
Magnetico, Inc., Dept. EM, 182 Morris Ave., Holtsville, N.Y. 11742 *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 p. 1361
NWL Transformers, Dept. EM, Rising Sun Rd., Bordentown, N.J. 08505 *
DM Nytronics Comps. Group Inc., Sub Nytronics, Dept. EM, Orange St., Darlington, S.C. 29532 p. 1344-1350,1359
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 *
M Torwico Elctrns., Inc., Dept. EM, Rte. 70, Lakewood, N.J. 08701 *
M Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040 *
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
Automatic Coil Corp., Sub. Designatronics Inc., Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
M Bicron Elctrns. Co., Dept. EM, Box 807, Barlow St., Canaan, Conn. 06018
Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Coilcraft, Dept. EM, 1102 Siler Lake Rd., Cary, Ill. 60013
Coil-Q Corp., Dept. EM, 340 Bronxville Rd., Bronxville, N.Y. 10708
Coil Specialty Co., Dept. EM, Box 978, 2730 Carolean Ind'l. Dr., State College, Pa. 16801
Computer Comps., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
M Dietz Design, Inc., Dept. EM, 100 Electronics Pkwy., Belton, Mo. 64012

Elma Engineering, Dept. EM, 1066 E. Meadow Circle, Palo Alto, Cal. 94303
D Gowanda Electronics Corp., Dept. EM, 179 Broadway Rd., Gowanda, N.Y. 14070
DM JB Elctrn, Transformers, Inc., Dept. EM, 2300 W. Armitage Ave., Chicago, Ill 60647
M J.D.N. Electronics Inc., Dept. EM, Box 156, 239 Morristown Rd., Gillette, N.J. 07933
M Lenox-Fugle Elctrns., Inc., Dept. EM, 100 Sylvania Pl., S. Plainfield, N.J. 07080
DM Perfect Gear & Instr. Corp., Sub. Designatronics, Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
M Piconics Inc., Dept. EM, Cummings Rd., Tyngsboro, Mass. 01879
Renco Electronics Inc., Dept. EM, 240 Old Country Rd, Hicksville, N.Y. 11801
M Syscon Int'l., Inc., Dept. EM, 1239 South Bend Ave., So. Bend, Ind. 46617

Coils, Solenoid

Bel Fuse, Dept. EM, 203 Van Vorst, Jersey City, N.J. 07302 ..... *
Coto-Coil Co., Dept. EM, 65 Pavilion Ave., Providence, R.I. 02905 ..... *
DM Cramer Coil, Div Digital Magnetics Inc, Dept. EM, Box 32, Grafton, Wisc. 53024 ..... **p. 1335**
D Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 ..... *
Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 ..... *
D Dormeyer Industries, Dept. EM, 3418 N. Milwaukee, Chicago, Ill. 60641 ..... *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... *
Endicott Coil Co., Dept. EM, 24 Charlotte St., Binghamton, N.Y. 13905 ..... *
M ESC Elctrns. Corp., Dept. EM, 534 Bergen Blvd., Palisades Pk., N.J. 07650 *
M Inductive Components, Inc., Dept. EM, 181 Bridge Rd., Hauppauge, N.Y. 11787 ..... *
M Kappa Networks, Dept. EM, 165 Roosevelt Ave, Carteret, N.J. 07008 ..... *
Liberty Controls, Inc., Dept. EM, 500 Brookforest Ave., Shorewood, Ill. 60431 **p. 3580**
Magnetec Corp., Sub of Hi-G Inc, Dept. EM, 96 Granby St., Bloomfield, Conn. 06002 ..... **p. 3529**
Magnetico, Inc., Dept. EM, 182 Morris Ave., Holtsville, N.Y. 11742 ..... *
NWL Transformers, Dept. EM, Rising Sun Rd., Bordentown, N.J. 08505 ..... *
Nytronics Comps. Group Inc., Sub Nytronics, Dept. EM, Orange St., Darlington, S.C. 29532 ..... *
M Regdon Corp., Dept. EM, 3713 Grand Blvd., Brookfield, Ill 60513 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... *
M Torwico Elctrns., Inc., Dept. EM, Rte. 70, Lakewood, N.J. 08701 ..... *
Advanced Kinetics, Dept. EM, 1231 Victoria St., Costa Mesa, Calif. 92627
American Magnetics Corp., Dept. EM, P.O. Box 8, Carterville, Ill. 62918
American Magnetics, Dept. EM, Box R, Oak Ridge, Tenn. 37830
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
A. P. W. Co., Inc., Dept. EM, 72 W. Main, Rockaway, N. J. 07866
Artisan Elctrns. Corp., Dept. EM, 5 Eastmans Rd., Parsippany, N.J. 07054
Automatic Coil Corp., Sub. Designatronics Inc., Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
Bicron Elctrns. Co., Dept. EM, Box 807, Barlow St., Canaan, Conn. 06018
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Coil Specialty Co., Dept. EM, Box 978, 2730 Carolean Ind'l. Dr., State College, Pa. 16801
M Component Specialties, Dept. EM, 9143 E. La Rosa Dr., Temple City, Cal. 91780
Computer Comps., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
Custom Coil & Transformer Co., Dept. EM, Box 2369, Zanesville, Ohio 43701
Dia-Netics Inc., Dept. EM, 18823 Napa St., Northridge, Cal. 91324
M Dietz Design, Inc., Dept. EM, 100 Electronics Pkwy., Belton, Mo. 64012
Electro Design Systems, Dept. EM, 401 W. 35th St., Ste. K, National City, CA 92050
Electrocom Inds., Dept. EM, 1105 N. Ironwood Dr., S. Bend, Ind. 46615
D Electronic Coil Corp., Dept. EM, 347 New Britain Ave., Plainville, Conn. 06062
Elma Engineering, Dept. EM, 1066 E. Meadow Circle, Palo Alto, Cal. 94303
Gowanda Electronics Corp., Dept. EM, 179 Broadway Rd., Gowanda, N.Y. 14070
M J.D.N. Electronics Inc., Dept. EM, Box 156, 239 Morristown Rd., Gillette, N.J. 07933
D JPI, Inc., Dept. EM, 1507 San Vicente Blvd., Santa Monica, Cal. 90402
LDJ Electronics, Dept. EM, 1064 Naughton Ave., Troy, Mich. 48084
M Lisk, G.W. Co., Dept. EM, 2 South St., Clifton Springs, N.Y. 14432
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
DM Magnos, Incorporated, Dept. EM, Old School House Rd., Harvard, Mass. 01451
D Namco Controls, Acme-Cleveland Co., Dept. EM, 170 E. 131st St., Cleveland, Ohio 44108
M Northlake Engineering, Dept. EM, 999 Anita Ave., Antioch, Ill. 60002
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
PCA Elctrns., Inc., Dept. EM, 16799 Schoenborn St., Sepulveda, Cal. 91343
DM Perfect Gear & Instr. Corp., Sub. Designatronics, Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
Phoenix Transformer Co., Dept. EM, 1818 E. Madison, Phoenix, Ariz. 85034
M Piconics Inc., Dept. EM, Cummings Rd., Tyngsboro, Mass. 01879
Relay Service Co., Dept. EM, 1310 N. Pulaski Rd., Chicago, Ill. 60651
Renco Electronics Inc., Dept. EM, 240 Old Country Rd, Hicksville, N.Y. 11801
M Sag Harbor Inds., Inc., Dept. EM, Bayview St., Sag Harbor, N.Y. 11963
M San Fernando Elec. Mfg., Dept. EM, 1501 1st St., San Fernando, Cal. 91341
U.S. Elctrns., Dept. EM, 500 Long Branch Ave., Long Branch, N.J. 07740
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Walker Scientific, Inc., Dept. EM, Rockdale St., Worcester, Mass. 01606

Coils, Telephone

Bourns Magnetic Prods., Trimpot Div., Dept. EM, Box 1398, Romoland, Cal. 92380 ..... *
Kappa Networks, Dept. EM, 165 Roosevelt Ave, Carteret, N.J. 07008 ..... *
Magnetico, Inc., Dept. EM, 182 Morris Ave., Holtsville, N.Y. 11742 ..... *
DM Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 *
M Regdon Corp., Dept. EM, 3713 Grand Blvd., Brookfield, Ill 60513 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... *
M TRW/UTC Transformers, Dept. EM, 150 Varick St., New York, N.Y. 10013 .. *
DM ADC Prods, Dept. EM, 4900 W. 78th St., Minneapolis, Mn 55435
Aladdin Elctrns., Dept. EM, 701 Murfreesboro Rd., Nashville, Tenn. 37210
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
A. P. W. Co., Inc., Dept. EM, 72 W. Main, Rockaway, N. J. 07866
Automatic Coil Corp., Sub. Designatronics Inc., Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Coil-Q Corp., Dept. EM, 340 Bronxville Rd., Bronxville, N.Y. 10708
Computer Comps., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
Dia-Netics Inc., Dept. EM, 18823 Napa St., Northridge, Cal. 91324
Electrocom Inds., Dept. EM, 1105 N. Ironwood Dr., S. Bend, Ind. 46615
D Electronic Coil Corp., Dept. EM, 347 New Britain Ave., Plainville, Conn. 06062
DM JB Elctrn, Transformers, Inc., Dept. EM, 2300 W. Armitage Ave., Chicago, Ill 60647
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
Midcom Inc., Dept. EM, 1650 Tower Blvd., N. Mankato, Minn. 56001
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
U.S. Elctrns., Dept. EM, 500 Long Branch Ave., Long Branch, N.J. 07740

Coils, Telephone Pickup (For Recording)—See Pickups, Telephone

Coils, Toroidal

All-Tronics Inc., Dept. EM, 45 Bond St., Westbury, N.Y. 11590 ..... *
Bel Fuse, Dept. EM, 203 Van Vorst, Jersey City, N.J. 07302 ..... *
DM Bell Industries, J.W. Miller Div., Dept. EM, 19070 Reyes Ave., Compton, Cal. 90221 ..... **p. 1323**
M Bourns Magnetic Prods., Trimpot Div., Dept. EM, Box 1398, Romoland, Cal. 92380 ..... *
Caddel-Burns Mfg. Co., Inc., Dept. EM, 40 E. 2nd St., Mineola, N. Y. 11501 **p. 1328**
Corcom, Inc., Dept. EM, 2635 No. Kildare Ave., Chicago, Ill. 60639 ..... *
DM Cramer Coil, Div Digital Magnetics Inc, Dept. EM, Box 32, Grafton, Wisc. 53024 ..... *
DM Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 ..... *
D Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 ..... *
M Data Delay Devices, Dept. EM, 253 Crooks Ave., Clifton, N.J. 07011 ..... *
Delevan Div., Coil Prods., American Precision Inds., Dept. EM, 270 Quaker Rd., E. Aurora, N.Y. 14052 ..... *
M ESC Elctrns. Corp., Dept. EM, 534 Bergen Blvd., Palisades Pk., N.J. 07650 *
EWC, Inc., Dept. EM, 725 Federal Ave., Kenilworth, N.J. 07033 ..... *
M Freed Transformer Co., Inc., Dept. EM, 1718 Weirfield St., Brooklyn, N.Y. 11227 ..... **p. 4348**
M Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 ..... **p. 4353**
M Inductive Components, Inc., Dept. EM, 181 Bridge Rd., Hauppauge, N.Y. 11787 ..... *
Kappa Networks, Dept. EM, 165 Roosevelt Ave, Carteret, N.J. 07008 ..... *
KGS Electronics, Inc., Dept. EM, 2029 N. Lincoln Ave., Pasadena, Cal. 91103 *
Magnetico, Inc., Dept. EM, 182 Morris Ave., Holtsville, N.Y. 11742 ..... **p. 4359**
Megavolt, Corp., Dept. EM, 110 Hobart St, Hackensack, N.J. 07601 .... **p. 3286**
DM Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
DM Nytronics Comps. Group Inc., Sub Nytronics, Dept. EM, Orange St., Darlington, S.C. 29532 ..... *
M OPT Inds. Inc., Data Products Div., Dept. EM, 300 Red School Lane, Phillipsburg, N.J. 08865 ..... *
M RF Interonics, Dept. EM, 100 Pine Air Dr., Bay Shore, N.Y. 11706 ..... *
Rtron Corp., Dept. EM, 7324 Lawndale, Skokie, Ill. 60076 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
M Sigmapower, Inc., Dept. EM, 20790 Leapwood Ave., Carson, Cal. 90746 **p. 3329**
M Sterling Transformer Corp., Dept. EM, 510 Driggs Ave., Brooklyn, N.Y. 11211 *
M Technitrol, Inc., Dept. EM, 1952 E. Alleghany, Philadelphia, Pa. 19134 ..... *
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 p. 1368,1369
Torotron, Dept. EM, 255 Washington St., Mt. Vernon, N.Y. 10553 ..... *
M Torwico Elctrns., Inc., Dept. EM, Rte. 70, Lakewood, N.J. 08701 ..... *
D Triad-Utrad, Distr Svcs., Dept. EM, 305 N. Briant St., Huntington, Ind. 46750 *
M TRW/UTC Transformers, Dept. EM, 150 Varick St., New York, N.Y. 10013 Inside Back Cover, Vol. 1
M Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040 *
M Aladdin Elctrns., Dept. EM, 701 Murfreesboro Rd., Nashville, Tenn. 37210
Allen Elctrns. Div., Allen Organ Co., Dept. EM, Macungie, Pa. 18062
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
Automatic Coil Corp., Sub. Designatronics Inc., Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
D Barker & Williamson, Inc., Dept. EM, Canal St., Bristol, Pa. 19007
Bicron Elctrns. Co., Dept. EM, Box 807, Barlow St., Canaan, Conn. 06018
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Coilcraft, Dept. EM, 1102 Silver Lake Rd., Cary, Ill. 60013

Coil-Q Corp., Dept. EM, 340 Bronxville Rd., Bronxville, N.Y. 10708
Coil Specialty Co., Dept. EM, Box 978, 2730 Carolean Ind'l. Dr., State College, Pa. 16801
Cross Electronics Inc., Dept. EM, 100 Commonwealth Dr., Warrendale, Pa. 15086
D De Coursey Engrg. Lab., Dept. EM, 11828 W. Jefferson, Culver City, Cal. 90230
M Dietz Design, Inc., Dept. EM, 100 Electronics Pkwy., Belton, Mo. 64012
Dynamic Air Engrg, Inc., EMC Filter Div., Dept. EM, 620 E. Dyer Rd., Santa Ana, Cal. 92705
Electro-Pacific, Inc., Dept. EM, 5782 Thornwood Dr., Goleta, Calif. 93017
Electrocom Inds., Dept. EM, 1105 N. Ironwood Dr., S. Bend, Ind. 46615
Electrocube Inc., Dept. EM, 1710 So. Del Mar Ave., San Gabriel, Cal. 91776
G & G Tresco Corp., Dept. EM, 1952 E. Allegheny Ave., Phila., PA 19134
Gowanda Electronics Corp., Dept. EM, 179 Broadway Rd., Gowanda, N.Y. 14070
Hytronics Corp., Dept. EM, 6231 72nd Ave. N., Pinellas Park, Fla. 33565
DM JB Elctrn, Transformers, Inc., Dept. EM, 2300 W. Armitage Ave., Chicago, Ill 60647
M J.D.N. Electronics Inc., Dept. EM, Box 156, 239 Morristown Rd., Gillette, N.J. 07933
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
M Magnetic Circuit Elements, Dept. EM, 2455A Garden Rd., Monterey, Cal. 93940
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Paraplegics Mfg., Dept. EM, 304 N. York Rd., Bensenville, Ill. 60106
PCA Elctrns., Inc., Dept. EM, 16799 Schoenborn St., Sepulveda, Cal. 91343
DM Perfect Gear & Instr. Corp., Sub. Designatronics, Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
Pulse Engrg., Inc., Dept. EM, Box 12235, San Diego, Cal 92112
Renco Electronics Inc., Dept. EM, 240 Old Country Rd, Hicksville, N.Y. 11801
Sag Harbor Inds., Inc., Dept. EM, Bayview St., Sag Harbor, N.Y. 11963
M San Fernando Elec. Mfg., Dept. EM, 1501 1st St., San Fernando, Cal. 91341
M Sara Sales Co., Dept. EM, P.O. Box 321, San Francisco, Calif. 94101
M Schott Corp., Dept. EM, 3140 B Harbor Lane No., Minneapolis, Minn. 55441
Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
M Syscon Int'l., Inc., Dept. EM, 1239 South Bend Ave., So. Bend, Ind. 46617
Torelco Inc., Dept. EM, 14 Paine Ave., Irvington, N.J. 07111
Trans American Transformer, Dept. EM, 142 Peconic Ave., Medford, N.Y. 11763

Coils, Transducer

Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 *
Endicott Coil Co., Dept. EM, 24 Charlotte St., Binghamton, N.Y. 13905 *
Magnetico, Inc., Dept. EM, 182 Morris Ave., Holtsville, N.Y. 11742 *
D Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 *
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 *
M Torwico Elctrns., Inc., Dept. EM, Rte. 70, Lakewood, N.J. 08701 *
M TRW/UTC Transformers, Dept. EM, 150 Varick St., New York, N.Y. 10013 *
D Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 *
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
Automatic Coil Corp., Sub. Designatronics Inc., Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Dia-Netics Inc., Dept. EM, 18823 Napa St., Northridge, Cal. 91324
D Electronic Coil Corp., Dept. EM, 347 New Britain Ave., Plainville, Conn. 06062
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn, 55113
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
Sag Harbor Inds., Inc., Dept. EM, Bayview St., Sag Harbor, N.Y. 11963
Trans-Tek, Inc., Dept. EM, Rte. 83, Ellington, Conn. 06029
U.S. Elctrns., Dept. EM, 500 Long Branch Ave., Long Branch, N.J. 07740

Coils, Transformer

Abacus Controls Inc., Dept. EM, 89 Redington Rd., Somerville, N.J. 08876 *
Bel Fuse, Dept. EM, 203 Van Vorst, Jersey City, N.J. 07302 *
D Bell Industries, J.W. Miller Div., Dept. EM, 19070 Reyes Ave., Compton, Cal. 90221 *
Bourns Magnetic Prods., Trimpot Div., Dept. EM, Box 1398, Romoland, Cal. 92380 *
Caddel-Burns Mfg. Co., Inc., Dept. EM, 40 E. 2nd St., Mineola, N. Y. 11501 *
Coto-Coil Co., Dept. EM, 65 Pavilion Ave., Providence, R.I. 02905 *
DM Cramer Coil, Div Digital Magnetics Inc, Dept. EM, Box 32, Grafton, Wisc. 53024 *
D Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 *
D Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 *
M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 *
Delevan Div., Coil Prods., American Precision Inds., Dept. EM, 270 Quaker Rd., E. Aurora, N.Y. 14052 p. 1340,1341
D Dormeyer Industries, Dept. EM, 3418 N. Milwaukee, Chicago, Ill. 60641 p. 4340
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 *
D Dynamic Instr. Corp., Dept. EM, 933 L.I. Motor Pkwy., Hauppauge, N.Y. 11787 *
Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 *
Endicott Coil Co., Dept. EM, 24 Charlotte St., Binghamton, N.Y. 13905 *
EWC, Inc., Dept. EM, 725 Federal Ave., Kenilworth, N.J. 07033 *
Freed Transformer Co., Inc., Dept. EM, 1718 Weirfield St., Brooklyn, N.Y. 11227 *
General Magnetics, Dept. EM, 211 Grove St., Bloomfield, N.J. 07003 *
M Inductive Components, Inc., Dept. EM, 181 Bridge Rd., Hauppauge, N.Y. 11787 *
KGS Electronics, Inc., Dept. EM, 2029 N. Lincoln Ave., Pasadena, Cal. 91103 *
Magnetico, Inc., Dept. EM, 182 Morris Ave., Holtsville, N.Y. 11742 *
Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 p. 4360
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 *
NWL Transformers, Dept. EM, Rising Sun Rd., Bordentown, N.J. 08505 *
M OPT Inds. Inc., Data Products Div., Dept. EM, 300 Red School Lane, Phillipsburg, N.J. 08865 *
M Pico Elctrns. Inc., Dept. EM, 453 North MacQuesten Parkway, Mount Vernon, N.Y. 10552 *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 *
M Sigmapower, Inc., Dept. EM, 20790 Leapwood Ave., Carson, Cal. 90746 *
Signal Transformer Co., Dept. EM, 500 Bayview Ave., Inwood, N.Y. 11696 p. 4398,4403
M Technitrol, Inc., Dept. EM, 1952 E. Allegheny, Philadelphia, Pa. 19134 *
DM Thordarson Meissner, Electronic Ctr., Dept. EM, Mt. Carmel, Ill. 62863 *
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 *
Torotron, Dept. EM, 255 Washington St., Mt. Vernon, N.Y. 10553 *
M Torwico Elctrns., Inc., Dept. EM, Rte. 70, Lakewood, N.J. 08701 *
M TRW/UTC Transformers, Dept. EM, 150 Varick St., New York, N.Y. 10013 *
M Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040 *
M Aladdin Elctrns., Dept. EM, 701 Murfreesboro Rd., Nashville, Tenn. 37210
D American HV Voltage Test Sys., Inc., Dept. EM, Ctrl Garr Ind'l Pk, Accident, Md. 21520
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
A. P. W. Co., Inc., Dept. EM, 72 W. Main, Rockaway, N. J. 07866
Automatic Coil Corp., Sub. Designatronics Inc., Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
M Caddell Coil Corp., Dept. EM, 35 Main St., Poultney, Vt. 05764
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Coilcraft, Dept. EM, 1102 Siler Lake Rd., Cary, Ill. 60013
Coil-Q Corp., Dept. EM, 340 Bronxville Rd., Bronxville, N.Y. 10708
Coil Specialty Co., Dept. EM, Box 978, 2730 Carolean Ind'l. Dr., State College, Pa. 16801
M Component Specialties, Dept. EM, 9143 E. La Rosa Dr., Temple City, Cal. 91780
Computer Comps., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
Cross Electronics Inc., Dept. EM, 100 Commonwealth Dr., Warrendale, Pa. 15086
Custom Coil & Transformer Co., Dept. EM, Box 2369, Zanesville, Ohio 43701
Datatex Corp., Dept. EM, 10935 S. Wilcrest Dr., Houston, Tex. 77099
Dia-Netics Inc., Dept. EM, 18823 Napa St., Northridge, Cal. 91324
M Dietz Design, Inc., Dept. EM, 100 Electronics Pkwy., Belton, Mo. 64012
Electro-Pacific, Inc., Dept. EM, 5782 Thornwood Dr., Goleta, Calif. 93017
Electrocom Inds., Dept. EM, 1105 N. Ironwood Dr., S. Bend, Ind. 46615
Electrocube Inc., Dept. EM, 1710 So. Del Mar Ave., San Gabriel, Cal. 91776
D Electronic Coil Corp., Dept. EM, 347 New Britain Ave., Plainville, Conn. 06062
Elma Engineering, Dept. EM, 1066 E. Meadow Circle, Palo Alto, Cal. 94303
G & G Tresco Corp., Dept. EM, 1952 E. Allegheny Ave., Phila., PA 19134
Gowanda Electronics Corp., Dept. EM, 179 Broadway Rd., Gowanda, N.Y. 14070
Hytronics Corp., Dept. EM, 6231 72nd Ave. N., Pinellas Park, Fla. 33565
DM JB Elctrn, Transformers, Inc., Dept. EM, 2300 W. Armitage Ave., Chicago, Ill 60647
M J.D.N. Electronics Inc., Dept. EM, Box 156, 239 Morristown Rd., Gillette, N.J. 07933
M Johnson Electric Coil Co., Dept. EM, Box 559, Elmhurst, Ill 60126
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
North Electric Co., Power Sys Div., Dept. EM, Box 688, Galion, Ohio 44833
M Northlake Engineering, Dept. EM, 999 Anita Ave., Antioch, Ill. 60002
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
M Osborne Transformer Corp., Dept. EM, 19636 Derby St., Detroit, Mich. 48203
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
PCA Elctrns., Inc., Dept. EM, 16799 Schoenborn St., Sepulveda, Cal. 91343
DM Perfect Gear & Instr. Corp., Sub. Designatronics, Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
Permaluster, Inc., Dept. EM, 1844 N. Keystone St., Burbank, Calif. 91504
M Prototype Transformer Corp., Dept. EM, 545 N Arlington Ave, East Orange, N.J. 07017
Pulse Engrg., Inc., Dept. EM, Box 12235, San Diego, Cal 92112
Renco Electronics Inc., Dept. EM, 240 Old Country Rd, Hicksville, N.Y. 11801
M Sag Harbor Inds., Inc., Dept. EM, Bayview St., Sag Harbor, N.Y. 11963
Schott Corp., Dept. EM, 3140 B Harbor Lane No., Minneapolis, Minn. 55441
Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
DM Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
M Syscon Int'l., Inc., Dept. EM, 1239 South Bend Ave., So. Bend, Ind. 46617
Tranex Inc., Dept. EM, 1599 Stierlin Rd., Mountain View, Cal. 94043
Trans American Transformer, Dept. EM, 142 Peconic Ave., Medford, N.Y. 11763
U.S. Elctrns., Dept. EM, 500 Long Branch Ave., Long Branch, N.J. 07740

Coils, TV (All Types)

Bel Fuse, Dept. EM, 203 Van Vorst, Jersey City, N.J. 07302 *
D Bell Industries, J.W. Miller Div., Dept. EM, 19070 Reyes Ave., Compton, Cal. 90221 *
Caddel-Burns Mfg. Co., Inc., Dept. EM, 40 E. 2nd St., Mineola, N. Y. 11501 *
DM Cramer Coil, Div Digital Magnetics Inc, Dept. EM, Box 32, Grafton, Wisc. 53024 *
Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 *
D Nytronics Comps. Group Inc., Sub Nytronics, Dept. EM, Orange St., Darlington, S.C. 29532 *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 *

Syntronic Instruments Inc., Dept. EM, 100 Industrial Rd., Addison, Ill. 60101 p. 1363
DM **Thordarson Meissner, Electronic Ctr., Dept. EM, Mt. Carmel, Ill. 62863** ..... *
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
Automatic Coil Corp., Sub. Designatronics Inc., Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
Barker & Williamson, Inc., Dept. EM, Canal St., Bristol, Pa. 19007
Caddell Coil Corp., Dept. EM, 35 Main St., Poultney, Vt. 05764
Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Coilcraft, Dept. EM, 1102 Siler Lake Rd., Cary, Ill. 60013
Coil Specialty Co., Dept. EM, Box 978, 2730 Carolean Ind'l. Dr., State College, Pa. 16801
Gowanda Electronics Corp., Dept. EM, 179 Broadway Rd., Gowanda, N.Y. 14070
J.D.N. Electronics Inc., Dept. EM, Box 156, 239 Morristown Rd., Gillette, N.J. 07933
D Mitsumi Elec. Co., Ltd., Dept. EM, 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
U.S. Elctrns., Dept. EM, 500 Long Branch Ave., Long Branch, N.J. 07740
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Coils, Variable

D **Bell Industries, J.W. Miller Div., Dept. EM, 19070 Reyes Ave., Compton, Cal. 90221** ..... *
Caddel-Burns Mfg. Co., Inc., Dept. EM, 40 E. 2nd St., Mineola, N. Y. 11501 p. 1333
Chesterfield Prods. Inc., Dept. EM, 511A Victor St., Saddle Brook, N.J. 07662 *
DM **Cramer Coil, Div Digital Magnetics Inc, Dept. EM, Box 32, Grafton, Wisc. 53024** ..... p. 1335
Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 ..... *
DM **Delevan Div., Coil Prods., American Precision Inds., Dept. EM, 270 Quaker Rd., E. Aurora, N.Y. 14052** ..... p. 1340,1341
M **Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061** ..... *
M **Inductive Components, Inc., Dept. EM, 181 Bridge Rd., Hauppauge, N.Y. 11787** ..... *
D **Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582** *
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TRW/UTC Transformers, Dept. EM, 150 Varick St., New York, N.Y. 10013 Inside Back Cover, Vol. 1
M **Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040** *
M Aladdin Elctrns., Dept. EM, 701 Murfreesboro Rd., Nashville, Tenn. 37210
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
Automatic Coil Corp., Sub. Designatronics Inc., Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
M Caddell Coil Corp., Dept. EM, 35 Main St., Poultney, Vt. 05764
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Coilcraft, Dept. EM, 1102 Siler Lake Rd., Cary, Ill. 60013
M Coil-Q Corp., Dept. EM, 340 Bronxville Rd., Bronxville, N.Y. 10708
Coil Specialty Co., Dept. EM, Box 978, 2730 Carolean Ind'l. Dr., State College, Pa. 16801
Component Specialties, Dept. EM, 9143 E. La Rosa Dr., Temple City, Cal. 91780
Computer Comps., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
M Dietz Design, Inc., Dept. EM, 100 Electronics Pkwy., Belton, Mo. 64012
Electrocom Inds., Dept. EM, 1105 N. Ironwood Dr., S. Bend, Ind. 46615
Elma Engineering, Dept. EM, 1066 E. Meadow Circle, Palo Alto, Cal. 94303
D Gowanda Electronics Corp., Dept. EM, 179 Broadway Rd., Gowanda, N.Y. 14070
Hytronics Corp., Dept. EM, 6231 72nd Ave. N., Pinellas Park, Fla. 33565
M J.D.N. Electronics Inc., Dept. EM, Box 156, 239 Morristown Rd., Gillette, N.J. 07933
DM JFD Electronics Components Corp., Dept. EM, 1462 62nd St., Bklyn., N.Y. 11219
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Piconics Inc., Dept. EM, Cummings Rd., Tyngsboro, Mass. 01879
Renco Electronics Inc., Dept. EM, 240 Old Country Rd, Hicksville, N.Y. 11801
D San Fernando Elec. Mfg., Dept. EM, 1501 1st St., San Fernando, Cal. 91341
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
M Syscon Int'l., Inc., Dept. EM, 1239 South Bend Ave., So. Bend, Ind. 46617
U.S. Elctrns., Dept. EM, 500 Long Branch Ave., Long Branch, N.J. 07740
Walker Scientific, Inc., Dept. EM, Rockdale St., Worcester, Mass. 01606

Coils, Vidicon Alignment

Syntronic Instruments Inc., Dept. EM, 100 Industrial Rd., Addison, Ill. 60101 p. 1363
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
D Amperex Electronic Corp., Slatersville Div., Dept. EM, Providence Pike, Slatersville, R.I. 02876
Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647

Cold-Cathode Readout Tubes—See Tubes, Readout

Color Filters, Panel Light Assembly

Schott Optical Glass Inc., Dept. EM, York Ave., Duryea, Pa. 18642

Combiners, Microwave—See Couplers, Microwave

Comm. Systems, F-M

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 ..... *
D **Johnson Co., E.F., Dept. EM, 299 10th SW Ave., Waseca, Minn. 56093** ..... *
Avcom International, Dept. EM, 784 N. W. 57th Ct., Fort Lauderdale, Fla. 33309
M Aydin, Vector Div., Dept. EM, Box 328, Newtown, PA 18940
Coastcom, Dept. EM, 2312 Stanwell Dr., Concord, Cal. 94520
D General Aviation Elctrns, Dept. EM, 4141 Kingman Dr., Indianapolis, Ind 46225
General Electric Co., Mobile Radio Dept, Dept. EM, Box 4197, Lynchburg, Va. 24502
GTE Lenkurt Inc., Dept. EM, 1105 County Rd., San Carlos, Cal. 94070
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
IEC Electronics Corp., Dept. EM, 105 Norton St., Newark, N.Y. 14513
M LNR Communications, Inc., Dept. EM, 180 Marcus Blvd., Hauppauge, N.Y. 11787
Pacific Communications, Dept. EM, 2041 S. Grand Ave. #A, Santa Ana, Cal. 92705
D Regency Electronics, Inc., Dept. EM, 7707 Records St., Indianapolis, Ind. 46226
D REPCO Inc., Dept. EM, Box 7065, Orlando, Fla. 32854
M RHG Elctrns. Lab., Dept. EM, 161 E. Industry Ct., Deer Park, N.Y. 11729
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
M Sonex, Dept. EM, 2337 Philmont Ave., Huntingdon Valley, Pa. 19006
D Teaberry Electronics, Dept. EM, 6330 Castleplace Dr., Indianapolis, Ind. 46250
D Telco Products Co., Dept. EM, 44 Sea Cliff, Glen Cove, NY 11542
VHF Engrg, Div. of Brownian Elctrns. Corp., Dept. EM, 320 Water St., Binghamton, N.Y. 13902
D Wilson Electronics, Dept. EM, PO Box 19000, Las Vegas, Nev 89119

Comm. Systems, Land Mobile Networks

GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 ..... p. 1378
Avcom International, Dept. EM, 784 N. W. 57th Ct., Fort Lauderdale, Fla. 33309
D General Aviation Elctrns, Dept. EM, 4141 Kingman Dr., Indianapolis, Ind 46225
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
D SYT Corporation, Dept. EM, 1220 Barranca, El Paso, Tex. 79935
D Telco Products Co., Dept. EM, 44 Sea Cliff, Glen Cove, NY 11542

Comm. Systems, Laser

Power Technology, Inc., Dept. EM, Box 4403, 7925 Mablewave Cutoff, Little Rock, Ark. 72204 ..... *
Galileo Electro-Optics Corp., Dept. EM, Galileo Pk., Sturbridge, Mass. 01518
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Meret Inc., Dept. EM, 1815 24th St., Santa Monica, Cal. 90404
Uniroyal, Inc., Dept. EM, 1230 Ave. of Americas, New York, N.Y. 10020

Comm. Systems, Message Switching Centers

GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 ..... p. 1378
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Data General Corp., Dept. EM, 15 Turnpike Rd Rte 9, Westboro, Mass 01581
Electro Space Systems, Inc., Dept. EM, Box 1359, Richardson, Tex. 75080
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Memorex Corp., Dept. EM, San Thomas at Central Expwy., Santa Clara, Cal. 95052

Comm. Systems, Microwave

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
Cober Elctrns., Inc., Dept. EM, 7 Gleason Ave., Stamford, Conn. 06902 p. 2862
GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 ..... *
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
M A.R.F. Products, Dept. EM, Box 3226, Boulder, Colo. 80303
M Cubic Corp., Dept. EM, 9233 Balboa Ave., San Diego, Cal. 92123
M Cushman Electronics, Dept. EM, 2400 N. 1st St., San Jose, Cal. 95112
Epsilon-Lambda Elctrn. Corp., Dept. EM, 28-S. Water St., Batavia, Ill. 60510
Farinon Electric, Dept. EM, 1691 Bayport, San Carlos, Calif. 94070
FG Engineering Co., Dept. EM, Box 39, Black Canyon Stage, Mayer, Ariz. 86333
GTE Lenkurt Inc., Dept. EM, 1105 County Rd., San Carlos, Cal. 94070
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
D Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
Pacific Communications, Dept. EM, 2041 S. Grand Ave. #A, Santa Ana, Cal. 92705
Resdel Engineering Corp., Dept. EM, 300 E. Live Oak Ave., Arcadia, Cal. 91006
M RHG Elctrns. Lab., Dept. EM, 161 E. Industry Ct., Deer Park, N.Y. 11729
Tasker Systems, Dept. EM, 20131 Sunburst St., Chatsworth, Cal. 91311
Uniroyal, Inc., Dept. EM, 1230 Ave. of Americas, New York, N.Y. 10020
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006

Comm. Systems, Multiplex

Fifth Dimension, Dept. EM, 707 Alexander Rd., Princeton, N.J. 08540 ..... *
GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 ..... *
Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
M **Trak Systems, Div. TRAK Microwave Corp., Dept. EM, 4722 Eisenhower Blvd., Dept. E8, Tampa, Fla. 33614** ..... *
Applied Systems Corp., Dept. EM, 26401 Harper Ave., St. Clair Shores, Mich 48081

D Autocon Inds., Sub. Control Data, Dept. EM, 2300 Berkshire La. N., Minneapolis, Minn. 55441
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
Coastcom, Dept. EM, 2312 Stanwell Dr., Concord, Cal. 94520
M Cubic Corp., Dept. EM, 9233 Balboa Ave., San Diego, Cal. 92123
Data-Control Systems, Dept. EM, Commerce Dr., Box 860, Danbury, Conn. 06810
Dataprobe, Inc., Dept. EM, 254 Green St., So. Hackensack, N.J. 07606
Digital Communications Assoc., Inc., Dept. EM, 135 Technology Park/Atlanta, Norcross, Ga 30071
Electro Space Systems, Inc., Dept. EM, Box 1359, Richardson, Tex. 75080
Farinon Electric, Dept. EM, 1691 Bayport, San Carlos, Calif. 94070
GTE Lenkurt Inc., Dept. EM, 1105 County Rd., San Carlos, Cal. 94070
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Omnitec Corporation, Dept. EM, 2405 S. 20th St., Phoenix, Ariz. 85034
RFL Inds., Comms. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005
M RHG Elctrns. Lab., Dept. EM, 161 E. Industry Ct., Deer Park, N.Y. 11729
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
M Sonex, Dept. EM, 2337 Philmont Ave., Huntingdon Valley, Pa. 19006
Telecommunications Techniques Corp., Dept. EM, 112 Frederick Ave., Rockville, Md. 20850
Telephonics Corp., Dept. EM, 770 Park Ave., Huntington, N.Y. 11743

Comm. Systems, Telemetering

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
Fifth Dimension, Dept. EM, 707 Alexander Rd., Princeton, N.J. 08540 ..... *
GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 ..... *
M Interface Engineering Inc., Dept. EM, 386 Lindelof Ave., Stoughton, Mass. 02072 ..... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
D Phoenix Data Inc., Dept. EM, 3384 W. Osborn Rd., Phoenix, Ariz. 85017 .... *
Re-el Circuits, Inc., Dept. EM, 520 Victor Street, Saddle Brook, N.J. 07662 *
D Autocon Inds., Sub. Control Data, Dept. EM, 2300 Berkshire La. N., Minneapolis, Minn. 55441
Avcom International, Dept. EM, 784 N. W. 57th Ct., Fort Lauderdale, Fla. 33309
M Aydin, Vector Div., Dept. EM, Box 328, Newtown, PA 18940
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
Beukers Labs., Inc., Dept. EM, 30 Orville Drive, Bohemia, N.Y. 11716
BF Elctrns., Dept. EM, 415 S. Nardo, Solana Beach, Calif. 92075
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
Dantel, Inc., Dept. EM, 1922 North Helm, Fresno, Cal. 93727
Data-Control Systems, Dept. EM, Commerce Dr., Box 860, Danbury, Conn. 06810
Data Signal Corp, Dept. EM, 40-44 Hunt St, Watertown, MA 02172
Dataprobe, Inc., Dept. EM, 254 Green St., So. Hackensack, N.J. 07606
Decom Systems, Inc., Dept. EM, 1404 Descanso Rd., San Marcos, Ca. 92069
M Assocs. Inc., Dept. EM, 333 W. Commercial St., East Rochester, N.Y. 14445
Electro Space Systems, Inc., Dept. EM, Box 1359, Richardson, Tex. 75080
D EMR Telemetry, Div. Sangamo-Weston, Dept. EM, Box 3041, Sarasota, Fla. 33578
Epsilon-Lambda Elctrn. Corp., Dept. EM, 28 S. Water St., Batavia, Ill. 60510
Fairchild Camera & Instr., Federal Systems Group, Dept. EM, 300 Robbins La., Syosset, N.Y. 11791
FG Engineering Co., Dept. EM, Box 39, Black Canyon Stage, Mayer, Ariz. 86333
Futronix, Inc., Dept. EM, Box 2269, Sunnyvale, Cal. 94087
GTE Lenkurt Inc., Dept. EM, 1105 County Rd., San Carlos, Cal. 94070
Hathaway Instruments, Inc., Dept. EM, 5250 E. Evans Ave., Denver, Colo. 80222
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
Midgard Electronics, Dept. EM, 175 California St., Newton, Mass. 02158
National Security Systems, Dept. EM, 20 Beechwood Ave., Port Washington, N.Y. 11050
Pacific Communications, Dept. EM, 2041 S. Grand Ave. #A, Santa Ana, Cal. 92705
D REPCO Inc., Dept. EM, Box 7065, Orlando, Fla. 32854
Resdel Engineering Corp., Dept. EM, 300 E. Live Oak Ave., Arcadia, Cal. 91006
RFL Inds., Comms. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005
M RHG Elctrns. Lab., Dept. EM, 161 E. Industry Ct., Deer Park, N.Y. 11729
Schneider Instr. Co., Dept. EM, 8115 Camargo Rd., Cincinnati, Ohio 45243
D Seaboard Elctrns, Dept. EM, 70 Church St., New Rochelle, N.Y. 10805
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
M Sonex, Dept. EM, 2337 Philmont Ave., Huntingdon Valley, Pa. 19006
Sprengnether Instr. Co., W.F., Dept. EM, 4567 Swan St., St. Louis, Mo. 63110
Tasker Systems, Dept. EM, 20131 Sunburst St., Chatsworth, Cal. 91311
Teledyne/Geotech, Dept. EM, Box 28277, Dallas, Tex. 75228
Transmed Scientific, Dept. EM, 860-C Capitolio Way, San Luis Obispo, Cal. 93401
Tri-Com, Inc., Dept. EM, 12216 Parklawn Dr., Rockville, Md. 20852
Video Research Corporation, Dept. EM, 6985 Garden Rd., Riviera Beach, Fla. 33404

Comm. Systems, Telephone

Elco Corp., Dept. EM, 2250 Park Pl., El Segundo, CAL 90245 ..... *
GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 ..... p. 1378
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Re-el Circuits, Inc., Dept. EM, 520 Victor Street, Saddle Brook, N.J. 07662 *
T-Bar Inc., Dept. EM, 141 Danbury Rd., Wilton, Conn. 06897 ..... *
ADC Prods, Dept. EM, 4900 W. 78th St., Minneapolis, Mn 55435
M Amtron Div., Sippican Corp., Dept. EM, 14820 S. Kedzie Ave., Midlothian, Ill. 60445
D Bogen Div., Lear Siegler, Inc., Dept. EM, Box 500, Paramus, N.J. 07652
D Channel Master Div. Avnet, Dept. EM, Rte. 209, Ellenville, N.Y. 12428
D Communications Equip Co., Dept. EM, Box 700, Glen Arbor, Mich. 49636
D Communitron Corp., Dept. EM, 1429 N. Halstead, Hutchinson, Kans 67501
M Cushman Electronics, Dept. EM, 2400 N. 1st St., San Jose, Cal. 95112
Dantel, Inc., Dept. EM, 1922 North Helm, Fresno, Cal. 93727
Dataproducts Corp., Dept. EM, 6219 DeSoto Ave., Woodland Hills, Cal. 91365
Elcom Industries, Inc., Dept. EM, 10268 Bach Blvd., St. Louis, Mo. 63132
M Electronic Counters, Inc., Dept. EM, 240 Humphrey St., Englewood, N.J. 07631
D Encom Prods. Co., Inc., Dept. EM, Lower Hopewell Rd., Box 300, Oxford, Pa. 19363
Farinon Electric, Dept. EM, 1691 Bayport, San Carlos, Calif. 94070
GTE Lenkurt Inc., Dept. EM, 1105 County Rd., San Carlos, Cal. 94070
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
Henschel Corp., Dept. EM, 14 Cedar St., Amesbury, Mass. 01913
D ITI Electronics, Inc., Dept. EM, 369 Lexington Ave., Clifton, N.J. 07015
D ITT Telecommunications, Apparatus Dept., Dept. EM, Fulton Dr., Corinth, Miss. 38834
M LNR Communications, Inc., Dept. EM, 180 Marcus Blvd., Hauppauge, N.Y. 11787
D LocAtor Electronics Co., Dept. EM, South Country Ind'l Pk., Drawer 10609, St. Louis, Mo. 63129
Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
D OKI Electronics of America, Dept. EM, 4031 N.E. 12th Terr., Ft. Lauderdale, Fla. 33334
Omnitec Corporation, Dept. EM, 2405 S. 20th St., Phoenix, Ariz. 85034
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D PASO Sound Products Inc., Dept. EM, 14 First St, Pelham, NY 10803
D Philips Audiocom Prods, Philips Audio Video Sys, Dept. EM, 91 McKee Dr, Mahwah, N.J. 07430
D Primo Company Ltd., Dept. EM, 25-1, 6-Chome, Mure, Mitakashi, Tokyo, Japan
RFL Inds., Comms. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005
Robins Ind's. Corp., Consumer Products Div., Dept. EM, 75 Austin Blvd., Commack, N.Y. 11725
Schneider Instr. Co., Dept. EM, 8115 Camargo Rd., Cincinnati, Ohio 45243
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
SYT Corporation, Dept. EM, 1220 Barranca, El Paso, Tex. 79935
Telecommunications Techniques Corp., Dept. EM, 112 Frederick Ave., Rockville, Md. 20850
Telephonics Corp., Dept. EM, 770 Park Ave., Huntington, N.Y. 11743
Viking Electronics, Dept. EM, 406 2nd St., Hudson, Wisc. 54016

Commutators

Airflyte Elctrns. Co., Dept. EM, Box 207, 56 Hook Rd., Bayonne, N.J. 07002 *
D Canon U.S.A., Inc., Dept. EM, 10 Nevada Dr., Lake Success, N.Y. 11040 ..... *
D Phoenix Data Inc., Dept. EM, 3384 W. Osborn Rd., Phoenix, Ariz. 85017 .... *
M Aydin, Vector Div., Dept. EM, Box 328, Newtown, PA 18940
D Intech/Function Modules, Dept. EM, 282 Brokaw, Santa Clara, Cal. 95050
M Sonex, Dept. EM, 2337 Philmont Ave., Huntingdon Valley, Pa. 19006

Comparators, Analog—See Comparators, Voltage

Comparators, Attenuation

DM American Nucleonics Corp., Dept. EM, 6036 Variel Ave., Woodland Hills, Cal 91367
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760
Wide Band Engrg. Co. Inc., Dept. EM, Box 21652, Phoenix, Ariz. 85036

Comparators, Capacitance—See Bridges, Capacitance

Comparators, Density—See Densitometers, Electronic

Comparators, Digital

Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 ..... *
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... *
D ESE, Dept. EM, 505½ Centinela Ave., Inglewood, Cal. 90302 ..... p. 2735
M General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
M Interface Engineering Inc., Dept. EM, 386 Lindelof Ave., Stoughton, Mass. 02072 ..... *
Kessler-Ellis Prods., Dept. EM, 120 1st Ave., Atlantic Highlands, N.J. 07716 *
M LSI Computer Systems, Inc., Dept. EM, 1235 Walt Whitman Rd., Melville, N.Y. 11746 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705 p. 2793
Servo-Tek Prods. Co., Dept. EM, 1086 Goffle Rd., Hawthorne, N.J. 07506 p. 3109
United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403 ..... *
Anadex Inc., Dept. EM, 9825 De Soto, Chatsworth, Cal. 91311
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
M ATEC, Inc., Dept. EM, Box 19426, Houston, Tex. 77024
M Automation Dynamics, Div. ABC Digital, Inc., Dept. EM, 25 Charles St., Westwood, N.J. 07675
Chemical Etching Equip. & Supply, Dept. EM, 6905 Beulah St, Alexandria, Va. 22310
Consolidated Controls Corp., Dept. EM, 15 Durant Ave., Bethel, Conn. 06801
Dynage, Inc. Control Prods Grp., Dept. EM, 1331 Blue Hills Ave., Bloomfield, Conn. 06002
E-H International, Inc., Dept. EM, 515 11th St Box 1289, Oakland, Cal 94604
E-H Resch. Labs., Inc., Dept. EM, Box 1289, Oakland, Cal. 94604
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
D Electronic Counters & Controls Inc., Dept. EM, 1500 McCormick Blvd., Mundelein, Ill. 60060

M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
GAP Instr. Corp., Dept. EM, 110 Marcus Blvd., Hauppauge, N.Y. 11787
GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854
IET Labs Inc., Dept. EM, 761 Old Country Rd, Westbury, N.Y. 11590
Indl Timer An Esterline Co., Dept. EM, U.S. Hwy 287, Parsippany, N.J. 07054
Innovatek Microsystems, Inc., Dept. EM, Smithfield Rd., Millerton, N.Y. 12546
Leitz, Inc. E., Dept. EM, Link Crescent, Rockleigh, N.J. 07647
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Metron Optics, Dept. EM, P.O. Box 690, Solana Beach, Cal. 92075
Micro Instrument Co., Marine & Power Instr. Div., Dept. EM, 2250 Micro Pl., Escondido, Cal. 92025
M Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
D Tau-Tron Inc., Dept. EM, 11 Esquire Rd., N. Billerica, Mass. 01862
DM Teledyne Semiconductor, Dept. EM, 1300 Terra Bella Ave., Mountain View, Cal. 94040
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
Trendar, Dept. EM, 630 Clyde Ave., Mountain View, Cal. 94040

Comparators, Frequency

ADRET/COMSTRON, Dept. EM, 200 E. Sunrise Hwy, Freeport, NY 11520 p. 2682
American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734 *
Comstron Corp., Dept. EM, 200 E. Sunrise Hwy., Freeport, N.Y. 11520 p. 2682
D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 ***
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 *
DM Anaren Microwave, Inc., Dept. EM, 1010 James St., Syracuse, N.Y. 13203
Dynatron Co., Dept. EM, Box 48822, Los Angeles, Cal. 90048
Engelmann Microwave, Dept. EM, Skyline Dr., Montville, N.J. 07045
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Frequency Engrg. Labs., Dept. EM, Box 527, Farmingdale, N.J. 07727
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Spectracom Corp., Dept. EM, 1667 Penfield Rd., Rochester, N.Y. 14625
Telesis Laboratory, Dept. EM, Box 387, Chillocothe, Ohio 45601
Tracor, Inc., Dept. EM, 6500 Tracor La., Austin, Tex. 78721

Comparators, Impedance—See Bridges, Impedance

Comparators, Inductance—See Bridges, Inductance

Comparators, Logic Test

Continental Specialties Corp., Dept. EM, Box 1942, 70 Fulton Terr, New Haven, Conn. 06509 *
D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 ***
D **Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ***
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
E-H International, Inc., Dept. EM, 515 11th St Box 1289, Oakland, Cal 94604
E-H Resch. Labs., Inc., Dept. EM, Box 1289, Oakland, Cal. 94604
DM Hughes Aircraft Co., Ind'l. Prods. Div., Prod. Equip. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
Moxon Inc., Dept. EM, 2222 Michelson Dr. Bldg. E, Irvine, Cal. 92715
DM Trendar, Dept. EM, 630 Clyde Ave., Mountain View, Cal. 94040

Comparators, Phase

Corcom, Inc., Dept. EM, 2635 No. Kildare Ave., Chicago, Ill. 60639 *
M **Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ***
M **Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040 ***
DM **Hi-G Co., Inc., Dept. EM, 580 Spring St., Windsor Locks, Conn. 06096 ***
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803 *
D American Nucleonics Corp., Dept. EM, 6036 Variel Ave., Woodland Hills, Cal 91367
DM Anaren Microwave, Inc., Dept. EM, 1010 James St., Syracuse, N.Y. 13203
Engelmann Microwave, Dept. EM, Skyline Dr., Montville, N.J. 07045
M Merrimac Inds., Inc., Dept. EM, 41 Fairfield Pl., West Caldwell, N.J. 07006
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Spectracom Corp., Dept. EM, 1667 Penfield Rd., Rochester, N.Y. 14625
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
True Time Instr Co., Dept. EM, 429 Olive St, Santa Rosa, Cal. 95401
Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304

Comparators, Reluctance

NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *

Comparators, Resistance—See Bridges, Resistance

Comparators, Voltage

Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734 p. 2857
M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 ***
Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 *
D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 p. 2743,2744**
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 p. 2753
DM **Hi-G Co., Inc., Dept. EM, 580 Spring St., Windsor Locks, Conn. 06096 ***
M **ILC Data Device Corp., Dept. EM, Airport Int'l. Plaza, Bohemia, N.Y. 11716 ***
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
D **Slaughter Co., Dept. EM, Moore & Hailey Sts., P.O. Box 1805, Ardmore, Okla. 73401 ***
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Applied Control Co., Dept. EM, 1275 Bloomfield Ave., Fairfield, N.J. 07006
Dynamic Measurements Corp., Dept. EM, 6 Lowell Ave., Winchester, Mass. 01890
E-H International, Inc., Dept. EM, 515 11th St Box 1289, Oakland, Cal 94604
E-H Resch. Labs., Inc., Dept. EM, Box 1289, Oakland, Cal. 94604
GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
Optical Electronics, Inc., Dept. EM, Box 11140, Tucson, Ariz. 85734
Pioneer Instrumentation, Dept. EM, 4800 E. 131st St., Cleveland, Ohio 44105
DM Precision Monolithics Inc., Dept. EM, 1500 Space Dr., Santa Clara, Cal. 95050
D Siliconix, Inc., Dept. EM, 2201 Laurelwood Rd., Santa Clara, Cal 95054
Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
Systems Research Labs. Inc., Dept. EM, 2800 Indian Ripple Rd., Dayton, Ohio 45440
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
DM Teledyne Semiconductor, Dept. EM, 1300 Terra Bella Ave., Mountain View, Cal. 94040
Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803
Zi-Tech Div., Aikenwood Corp., Dept. EM, Box 26, 2151 Park Blvd., Palo Alto, Cal. 94302

Compounds, Encapsulating, Molding, Potting-Also See Plastic Raw Materials

M **Freed Transformer Co., Inc., Dept. EM, 1718 Weirfield St., Brooklyn, N.Y. 11227 ***
M **Hardman Inc., Dept. EM, 600 Cortlandt St., Belleville, N.J. 07109 p. 1291**
D Acme Chemical & Insulation Co., Dept. EM, 166 Chapel St., New Haven, Conn. 06513
Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
Aerolix Corporation, Dept. EM, 720 So. Columbus Street, Mt. Vernon, NY 10550
Allied Chemical Corp., Specialty Chemicals Div., Dept. EM, Box 1087R, Morristown, N.J. 07960
Armstrong Cork Co., Dept. EM, W. Liberty St., Lancaster, Pa. 17604
Astrodyne, Inc., Sub. Roanwell Corp., Dept. EM, 353 Middlesex Ave., Wilmington, Mass. 01887
M BFGoodrich Chemical Div, Dept. EM, 6100 Oak Tree Blvd., Cleveland, Ohio 44131
Brand Dielectrics, Inc., Dept. EM, Route 203, N. Windham, Conn. 06256
M Castall, Inc., Dept. EM, Weymouth Ind. Park, E. Weymouth, Mass. 02188
D Chemtronics, Inc., Dept. EM, 45 Hoffman Ave., Hauppauge, N.Y. 11787
D Cole-Flex Corp., Dept. EM, 91 Cabot St., W. Babylon, N.Y. 11704
DM Conap, Inc., Dept. EM, 1405 Buffalo St, Olean, N.Y. 14760
D Dolph, John C. Co., Dept. EM, New Rd., Monmouth Junction, N.J. 08852
Eastman Chem. Prods., Sub. Eastman Kodak Co., Dept. EM, Kingsport, Tenn. 37662
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
D Electro-Science Labs., Dept. EM, 2211 Sherman Ave., Pennsauken, N. J. 08110
Emerson & Cuming, Inc., Dielectric Mat'ls. Div., Dept. EM, 869 Washington St., Canton, Mass. 02021
Formulated Resins Inc., Dept. EM, Box 508, Greenville, R.I. 02828
Glastic Corp., Dept. EM, 4321 Glenridge Rd., Cleveland, Ohio 44121
M Hightemp Resins, Inc., Dept. EM, 225 Greenwich Ave., Stamford, Conn. 06902
M Isochem Resins Co., Dept. EM, 99 Cook St., Lincoln, R.I. 02865
Leepoxy Plastics, Dept. EM, 3324 Ferguson Rd., Ft. Wayne, Ind. 46809
3M Co., Indl Elect Prods. Div., Dept. EM, 3M Center, St. Paul, Minn. 55101
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
Mereco Products Div., Metachem Resins, Dept. EM, 538 Wellington Ave., Cranston, R.I. 02910
M Miller-Stephenson Chem. Co., Inc., Dept. EM, George Washington Hwy., Danbury, Conn. 06810
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
M Packaged Resins Div., Bacon Inds., Inc., Dept. EM, 192 Pleasant St., Watertown, Mass. 02172
Plastics Engrg. Co., Dept. EM, 3518 Lakeshore Rd., Sheboygan, Wisc. 53081
D Ram Chems., Div. Whittaker Corp., Dept. EM, 210 E. Alondra Blvd., Gardena, Calif. 90248
D Rexnord Inc., Specialty Chem Div, Dept. EM, 4300 N. 127th St, Brookfield, Wis. 53005
M Seal-Peel, Inc., Dept. EM, Box 250, Troy, Mich. 48099
SermeTel Inc., Sub. Teleflex Inc., Dept. EM, 155 Limerick Rd., Limerick, Pa 19468
SGL Homalite, Div. of SGL Inds., Inc., Dept. EM, 11 Brookside Dr., Wilmington, Del. 19804
M Sigma Plastronics, Inc., Dept. EM, 14531-33 Tireman Ave, Dearborn, Mich. 48126
D Sterling, Div. Reichhold Chems., Inc., Dept. EM, Sewickley, Pa. 15143
SWS Silicones Corp., Dept. EM, Box 428, Adrian, Mich. 49221
D Techcon Systems Inc., Dept. EM, 16016 So. Figueroa St., Gardena, Cal 90248
Tra-Con, Inc., Dept. EM, 55 North St., Medford, Mass. 02155
Union Carbide, Chemicals & Plastics, Dept. EM, 270 Park Ave., New York, N.Y. 10017
D Uniroyal, Inc., Dept. EM, 1230 Ave. of Americas, New York, N.Y. 10020
D Western Coating Co., Dept. EM, 1287 Combermere, Troy, Mich 48084
D Zippertubing Co., Dept. EM, 13000 S. Broadway, Los Angeles, Cal. 90061

Compounds, Insulating

Chomerics, Inc., Dept. EM, 77 Dragon Court, Woburn, Mass. 01801 *
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ***
M **Hardman Inc., Dept. EM, 600 Cortlandt St., Belleville, N.J. 07109 ***
D **Thermalloy, Inc., Dept. EM, 2021 W. Valley View, Dallas, Tex 75234 ***
Acheson Colloids Co., Div. Acheson Inds., Dept. EM, P.O. Box 288, Port Huron, Mich. 48060
D AMP Special Industries, Dept. EM, Valley Forge, Pa. 19482

M Astrodyne, Inc., Sub Roanwell Corp., Dept. EM, 353 Middlesex Ave., Wilmington, Mass. 01887
M BFGoodrich Chemical Div, Dept. EM, 6100 Oak Tree Blvd., Cleveland, Ohio 44131
Brand Dielectrics, Inc., Dept. EM, Route 203, N. Windham, Conn. 06256
M Castall, Inc., Dept. EM, Weymouth Ind. Park, E. Weymouth, Mass. 02188
D Chemtronics, Inc., Dept. EM, 45 Hoffman Ave., Hauppauge, N.Y. 11787
DM Conap, Inc., Dept. EM, 1405 Buffalo St, Olean, N.Y. 14760
Dolph, John C. Co., Dept. EM, New Rd., Monmouth Junction, N.J. 08852
Eastman Chem. Prods., Sub. Eastman Kodak Co., Dept. EM, Kingsport, Tenn. 37662
Electro-Science Labs., Dept. EM, 2211 Sherman Ave., Pennsauken, N. J. 08110
Emerson & Cuming, Inc., Dielectric Mat'ls. Div., Dept. EM, 869 Washington St., Canton, Mass. 02021
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
Leepoxy Plastics, Dept. EM, 3324 Ferguson Rd., Ft. Wayne, Ind. 46809
3M Co., Indl Elect Prods. Div., Dept. EM, 3M Center, St. Paul, Minn. 55101
Mereco Products Div., Metachem Resins, Dept. EM, 538 Wellington Ave., Cranston, R.I. 02910
D Norelcom Electronics, Dept. EM, 200 Allen Blvd., Farmingdale, N.Y. 11735
M Packaged Resins Div., Bacon Inds., Inc., Dept. EM, 192 Pleasant St., Watertown, Mass. 02172
SermeTel Inc., Sub. Teleflex Inc., Dept. EM, 155 Limerick Rd., Limerick, Pa 19468
SGL Homalite, Div. of SGL Inds., Inc., Dept. EM, 11 Brookside Dr., Wilmington, Del. 19804
M Sigma Plastronics, Inc., Dept. EM, 14531-33 Tireman Ave, Dearborn, Mich. 48126
D Sterling, Div. Reichhold Chems., Inc., Dept. EM, Sewickley, Pa. 15143
SWS Silicones Corp., Dept. EM, Box 428, Adrian, Mich. 49221
DM Tech Spray, Inc., Dept. EM, Box 949, Amarillo, Tex. 79105
Tra-Con, Inc., Dept. EM, 55 North St., Medford, Mass. 02155
Union Carbide, Chemicals & Plastics, Dept. EM, 270 Park Ave., New York, N.Y. 10017
D Uniroyal, Inc., Dept. EM, 1230 Ave. of Americas, New York, N.Y. 10020

Compressors, Data

Colorado Video, Inc., Dept. EM, Box 928, Boulder, Colo. 80306 p. 1370-1377
Hardman Inc., Dept. EM, 600 Cortlandt St., Belleville, N.J. 07109 ..... p. 1291
International Electro-Magnetics, Dept. EM, 350 N. Eric Dr., Palatine, Ill. 60067 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Dest Data Corp., Dept. EM, 1285 Forgewood Ave., Sunnyvale, Cal. 94085
MTS Systems Corp., Dept. EM, Box 24012, Minneapolis, Minn 55424
DM Systems Data Inc., Dept. EM, 1941 W. Market St., Akron, Ohio 44313

Computer Logic Circuits—See Cards, Logic; Circuits, Hybrid; Circuits, Integrated; Modules, Logic

Computer Tape Recorders—See Recorders, Computer Data

Computer Type Indicators—See Lights; Dials

Computers, Analog

M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 ..... ***
Data Translation, Dept. EM, 4 Strathmore Rd., Natick, Mass. 01760 ..... *
D **E & L Instruments, Inc., Dept. EM, 61 First St., Derby, Conn. 06418 ..... ***
D **General Magnetics, Dept. EM, 211 Grove St., Bloomfield, N.J. 07003 ..... ***
M **Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735 ..... ***
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
Bailey Meter Co., Sub. Babcock & Wilcox, Dept. EM, 29801 Euclid Ave., Wickliffe, Ohio 44092
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
Datron Systems, Dept. EM, 20700 Plummer St., Chatsworth, Cal. 91311
Decom Systems, Inc., Dept. EM, 1404 Descanso Rd., San Marcos, Ca. 92069
GAP Instr. Corp., Dept. EM, 110 Marcus Blvd., Hauppauge, N.Y. 11787
D General Computers, Inc., Dept. EM, 5990 W. Pico Blvd., Los Angeles, Calif. 90035
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
IPAC Group, Inc., Dept. EM, POB 156 3047 Industrial Blvd., Bethel Park, PA 15102
Midland Standrad Inc., Dept. EM, 603 E. Chicago St. Box 38, Elgin, ILL 60120
D Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
DM Systems Data Inc., Dept. EM, 1941 W. Market St., Akron, Ohio 44313
M Telectro Sys. Corp., Dept. EM, 96-18 43rd Ave., Corona, N.Y. 11368

Computers, Desk Top

Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Data Translation, Dept. EM, 4 Strathmore Rd., Natick, Mass. 01760 ..... *
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... p. 1469
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Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Interface Engineering Inc., Dept. EM, 386 Lindelof Ave., Stoughton, Mass. 02072 ..... p. 1649
Itoh Electronics, Inc. (C.), Dept. EM, 280 Park Ave., New York, N.Y. 10017 *
Neff Instrument Corp., Dept. EM, 1088 E. Hamilton Rd., Duarte, Cal. 91010 p. 1657
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Re-el Circuits, Inc., Dept. EM, 520 Victor Street, Saddle Brook, N.J. 07662 p. 1380
D Aircom, Inc., Dept. EM, Rte. 16B, Union, N.H. 03887
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
DM Applied Data Commun., Dept. EM, 1509 E. McFadden Ave., Santa Ana, Cal. 92705
Applied Systems Corp., Dept. EM, 26401 Harper Ave., St. Clair Shores, Mich. 48081
Beckman Instrs., (AISSD), Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634
Diversified Electronics Co., Dept. EM, 260 Wolfe Rd., Sunnyvale, Cal. 94086
ECD Corp., Dept. EM, 196 Broadway, Cambridge, MA 02139
Electronic Memories & Magnetics Corp., Dept. EM, 12621 Chadron Ave., Hawthorne, Cal. 90250
Honeywell Information Sys Inc, Dept. EM, 200 Smith St M5440, Waltham, Mass. 02154
Information Control Corp., Abacus Div. Dept. EM7, Dept. EM, 9610 Bellanca Ave., Los Angeles, Cal. 90045
Laser Technology, Inc., Dept. EM, 10624 Ventura Blvd., N. Hollywood, Calif. 91604
D PCS., Inc., Dept. EM, 750 N. Maple Rd., Saline, Mich. 48176
D Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Computers, Digital

M **Delco Electronics Div., General Motors Corp., Dept. EM, 700 E. Firmin St., Kokomo, Ind. 46901 ..... ***
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... p. 1469
D **E & L Instruments, Inc., Dept. EM, 61 First St., Derby, Conn. 06418 ..... ***
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M **Interface Engineering Inc., Dept. EM, 386 Lindelof Ave., Stoughton, Mass. 02072 ..... p. 1649**
Itoh Electronics, Inc. (C.), Dept. EM, 280 Park Ave., New York, N.Y. 10017 *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Adams-Smith Inc., Dept. EM, Summer Rd., Boxboro, Mass. 01719
D Aircom, Inc., Dept. EM, Rte. 16B, Union, N.H. 03887
DM Applied Data Commun., Dept. EM, 1509 E. McFadden Ave., Santa Ana, Cal. 92705
Applied Systems Corp., Dept. EM, 26401 Harper Ave., St. Clair Shores, Mich. 48081
M Autocon Inds., Sub. Control Data, Dept. EM, 2300 Berkshire La. N., Minneapolis, Minn. 55441
Bailey Meter Co., Sub. Babcock & Wilcox, Dept. EM, 29801 Euclid Ave., Wickliffe, Ohio 44092
Beckman Instrs., (AISSD), Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634
California Computer Prods., Dept. EM, 2411 W. La Palma Ave., Anaheim, Cal 92801
Computer Talk Inc., Dept. EM, Box 145, Idledale, Colo. 80453
Cybersystems, Inc, Digital Broadcast Sys. Div, Dept. EM, 4306 Gov. Dr., Ste O, Huntsville, Ala. 35805
DM Data General Corp., Dept. EM, 15 Turnpike Rd Rte 9, Westboro, Mass 01581
Datacom, Inc., Dept. EM, Box 278, Ft. Walton Beach, Fla. 32548
Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
Decom Systems, Inc., Dept. EM, 1404 Descanso Rd., San Marcos, Ca. 92069
D Digiac Corp., Dept. EM, 175 Engineers Rd., Smithtown, N.Y. 11787
Digital Scientific, Dept. EM, 11425 Sorrento Valley Rd, San Diego, Cal. 92121
Dynapar Corp., Dept. EM, 1675 Delany Rd., Gurnee, Ill. 60031
ECD Corp., Dept. EM, 196 Broadway, Cambridge, MA 02139
Electronic Memories & Magnetics Corp., Dept. EM, 12621 Chadron Ave., Hawthorne, Cal. 90250
Fabri-Tek, Inc., Dept. EM, 5901 S County Rd. #18, Minneapolis, Minn. 55436
Fairchild Camera & Instr., Federal Systems Group, Dept. EM, 300 Robbins La., Syosset, N.Y. 11791
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
Harris Corp., Computer Systems Div., Dept. EM, PO Box 23550, Fort Lauderdale, Fla. 33307
Honeywell Information Sys Inc, Dept. EM, 200 Smith St M5440, Waltham, Mass. 02154
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Information Control Corp., Abacus Div. Dept. EM7, Dept. EM, 9610 Bellanca Ave., Los Angeles, Cal. 90045
DM Intel Corp., Dept. EM, 3065 Bowers Ave., Santa Clara, Cal. 95051
Intern'l. Computer Prods., Inc., Dept. EM, 2925 Merrell Rd., Dallas, Tex. 75229
Major Data Concepts, Inc., Dept. EM, 1796 Monrovia Ave., Costa Mesa, Cal. 92627
D Martin Research, Dept. EM, 3336 Commercial Ave., Northbrook, Ill. 60062
M Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
MFE Corp., Dept. EM, Keewaydin Dr., Salem, N.H. 03079
Midland Standrad Inc., Dept. EM, 603 E. Chicago St. Box 38, Elgin, ILL 60120
MilerTronics, Dept. EM, 303 Airport Rd, Greenville, S.C. 29607
D Mylee Digital Sciences, Dept. EM, 155 Weldon Pkwy., Maryland Heights, Mo. 63043
D PCS., Inc., Dept. EM, 750 N. Maple Rd., Saline, Mich. 48176
D Perkin-Elmer Data Systems, Terminals Div., Dept. EM, Rt. 10 & Emery Ave., Randolph, N.J. 07801
Potter Instr. Co. Inc., Dept. EM, 151 Sunnyside Blvd., Plainview, N.Y. 11803
D Robertshaw Controls Co., Ind'l. Instr. Div., Dept. EM, 1910 Byrd Ave Ste 200, Richmond, Va. 23230
D Rockwell Int'l., Microelectronic Devices, Dept. EM, Box 3669, 3310 Miraloma Ave., Anaheim, Cal. 92803
Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
DM Systems Data Inc., Dept. EM, 1941 W. Market St., Akron, Ohio 44313
Tech Serv., Inc., BRS/LVE Div, Dept. EM, 5301 Holland Dr., Beltsville, Md 20705
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006

Unico, Inc., Dept. EM, 3725 Nicholson Rd., Franksville, Wisc. 53126
D Uniroyal, Inc., Dept. EM, 1230 Ave. of Americas, New York, N.Y. 10020
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Wyle Computer Prods., Dept. EM, 3200 Magruder Blvd., Hampton, Va 23666
Zonic Technical Labs., Dept. EM, 8927 Rossash Ave., Cincinnati, Ohio 45236

Computers, Hybrid, Analog-Digital

Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 ..... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Bailey Meter Co., Sub. Babcock & Wilcox, Dept. EM, 29801 Euclid Ave., Wickliffe, Ohio 44092
Decom Systems, Inc., Dept. EM, 1404 Descanso Rd., San Marcos, Ca. 92069
D General Computers, Inc., Dept. EM, 5990 W. Pico Blvd., Los Angeles, Calif. 90035
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
PCS., Inc., Dept. EM, 750 N. Maple Rd., Saline, Mich. 48176
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409

Computers, Programmable

Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 .. p. 3975
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Interface Engineering Inc., Dept. EM, 386 Lindelof Ave., Stoughton, Mass. 02072 ..... p. 1649
Neff Instrument Corp., Dept. EM, 1088 E. Hamilton Rd., Duarte, Cal. 91010 p. 1657 *
DM Applied Data Commun., Dept. EM, 1509 E. McFadden Ave., Santa Ana, Cal. 92705
Applied Systems Corp., Dept. EM, 26401 Harper Ave., St. Clair Shores, Mich. 48081
D Autocon Inds., Sub. Control Data, Dept. EM, 2300 Berkshire La. N., Minneapolis, Minn. 55441
Carroll Mfg. Co., Dept. EM, 1212 Hagan, Champaign, Ill. 61820
D Chafitz Engineering, Dept. EM, P.O. Box 2188, Rockville, Md. 20852
Computer Devices, Dept. EM, 25 North Avenue, Burlington, Mass. 01803
Data General Corp., Dept. EM, 15 Turnpike Rd Rte 9, Westboro, Mass 01581
Datawest Corp., Dept. EM, 7333 E. Helm Dr., Scottsdale, Ariz. 85260
Decom Systems, Inc., Dept. EM, 1404 Descanso Rd., San Marcos, Ca. 92069
Diversified Electronics Co., Dept. EM, 260 Wolfe Rd., Sunnyvale, Cal. 94086
Dynage, Inc. Control Prods Grp., Dept. EM, 1331 Blue Hills Ave., Bloomfield, Conn. 06002
ECD Corp., Dept. EM, 196 Broadway, Cambridge, MA 02139
Electronic Memories & Magnetics Corp., Dept. EM, 12621 Chadron Ave., Hawthorne, Cal. 90250
Honeywell Information Sys Inc, Dept. EM, 200 Smith St M5440, Waltham, Mass. 02154
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Information Control Corp., Abacus Div. Dept. EM7, Dept. EM, 9610 Bellanca Ave., Los Angeles, Cal. 90045
D Intel Corp., Dept. EM, 3065 Bowers Ave., Santa Clara, Cal. 95051
Omnitec Corporation, Dept. EM, 2405 S. 20th St., Phoenix, Ariz. 85034
PCS., Inc., Dept. EM, 750 N. Maple Rd., Saline, Mich. 48176
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
Systems Integration Assoc., Dept. EM, RD #1 Box 126, Glenmoor, Pa. 19343
Telesis Laboratory, Dept. EM, Box 387, Chillocothe, Ohio 45601
Unico, Inc., Dept. EM, 3725 Nicholson Rd., Franksville, Wisc. 53126
Wyle Computer Prods., Dept. EM, 3200 Magruder Blvd., Hampton, Va 23666
Zlatech Corp, Dept. EM, 10762 LaRoda Dr, Cupertino, Cal. 95014
Zonic Technical Labs., Dept. EM, 8927 Rossash Ave., Cincinnati, Ohio 45236

Computing Equipment, Peripheral—See Converters, Digital To Paper Tape; Printers; Terminals, Data Display

Condensers—See Capacitors

Conditioners, Power Line—See Regulators & Stablizers, Voltage

Conductive Fabrics, Films & Tapes—See Fabrics, Conductive

Conductive Plastic Materials & Parts

Chomerics, Inc., Dept. EM, 77 Dragon Court, Woburn, Mass. 01801 ..... *
D 3M Co., Static Control Systems, Dept. EM, 3M Center Bldg. 223-25, St. Paul, Minn. 55119 ..... p. 3408,3409
DM Metex Corp., Dept. EM, 970 New Durham Rd., Edison, N.J. 08817 ..... p. 2566
Acme Chemical & Insulation Co., Dept. EM, 166 Chapel St., New Haven, Conn. 06513
D Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W.P.Q. Can. H4X 1M8
M Cadillac Plastic & Chemical, Dayco Co., Dept. EM, Box 810, Detroit, Mich. 48232
DM Conap, Inc., Dept. EM, 1405 Buffalo St, Olean, N.Y. 14760
D Dynaloy, Inc., Dept. EM, 7 Great Meadow La., Hanover, N.J. 07936
Electro Mats. Corp. Amer., Dept. EM, 605 Center Ave., Mamaroneck, N.Y. 10543
Emerson & Cuming, Inc., Dielectric Mat'ls. Div., Dept. EM, 869 Washington St., Canton, Mass. 02021
Formulated Resins Inc., Dept. EM, Box 508, Greenville, R.I. 02828
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
Mereco Products Div., Metachem Resins, Dept. EM, 538 Wellington Ave., Cranston, R.I. 02910
DM Merix Chem. Co., Dept. EM, 2234 East 75th St., Chicago, Ill. 60649
M Packaged Resins Div., Bacon Inds., Inc., Dept. EM, 192 Pleasant St., Watertown, Mass. 02172
Sigma Plastronics, Inc., Dept. EM, 14531-33 Tireman Ave, Dearborn, Mich. 48126
D Tecknit, Dept. EM, 129 E. Dermody St., Cranford, N.J. 07016
Tra-Con, Inc., Dept. EM, 55 North St., Medford, Mass. 02155
M Zippertubing Co., Dept. EM, 13000 S. Broadway, Los Angeles, Cal. 90061

Conduit, Electrical

Breeze-Illinois, Inc., Dept. EM, Main & Agard Sts., Wyoming, Ill. 61491 ..... *
Magnetic Shield Div., Perfection Mica, Dept. EM, 750 North Thomas Dr., Bensenville, Ill. 60106 ..... *
M Metex Corp., Dept. EM, 970 New Durham Rd., Edison, N.J. 08817 ..... *
D Pyle-National Co, Dept. EM, 1334 N. Kostner Ave, Chicago, Ill 60651 ..... *
M Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... *
DM Anaconda Company Brass Division, Dept. EM, 414 Meadow St., Waterbury, Conn. 06720
D Gould Inc., Electrical Comps. Div., Dept. EM, 123 Smith St., E. Farmingdale, N.Y. 11735
Jones & Laughlin Steel Corp, Dept. EM, 3 Gateway Ctr, Pittsburgh, PA 15263
D Triangle PWC, Dept. EM, Box 711, New Brunswick, N.J. 08903
Wiremold Co., Dept. EM, West Hartford, Conn. 06110
D Zippertubing Co., Dept. EM, 13000 S. Broadway, Los Angeles, Cal. 90061

Connector Adapters

AMP Capitron Div./AMP Inc., Dept. EM, 1595 S. Mt. Joy St., Elizabethtown, Pa. 17022 ..... p. 1684,1685
Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 ..... *
DM Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... p. 1688,1689,1693,1698,1702,1704
D Arco Electronics Inc., Dept. EM, 400 Moreland Rd., Commack, N.Y. 11725 *
D Augat Interconnection Prods. Div., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703 ..... p. 1721
D Ava Elctrns., Dept. EM, 4000 Bridge St., Dreyel Hill, Pa 19026 .... p. 1724-1727
Beman Mfg., Inc., Dept. EM, PO Box 370, New Cumberland, Pa. 17070 ..... *
DM The Bendix Corp., Electrical Comp. Div., Dept. EM, Sidney, NY 13838 ..... *
Berg Electronics, Div. E.I. DuPont de Nemours & Co., Dept. EM, York Expwy., New Cumberland, Pa. 17070 ..... p. 1736
M Bird Electronic Corp., Dept. EM, 30303 Aurora Rd., Solon, Ohio 44139 ..... *
Breeze-Illinois, Inc., Dept. EM, Main & Agard Sts., Wyoming, Ill. 61491 ..... *
Compac, Dept. EM, 279-I Skidmore Rd., Deer Park, N.Y. 11729 ..... *
Connector Corp., Dept. EM, 6025 N. Keystone Ave., Chicago, Ill. 60646 ..... *
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... p. 1469
DM Excel Products Co., Inc., Dept. EM, 401 Joyce Kilmer Ave., New Brunswick, N.J. 08903 ..... *
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
ITT Cannon Electric, Dept. EM, 666 E. Dyer Rd., Santa Ana, Cal. 92702 p. 1793,1836,1837, Back Cover, Vol. 1
D ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 p. 1965, 1969, 1971, 1972, 1976, 1978, 1981, 1982, 1984, 1985, 1992, 2032
M Jettron Prods., Dept. EM, P.O. Box 337, E. Hanover, N.J. 07936 ..... p. 2045
DM Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725 ..... p. 2885,2887
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M Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... *
DM Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543 .... p. 2157
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2116-2119,2145
Sola Electric, Dept. EM, 1717 Busse Rd., Elk Grove Village, Ill. 60007 ..... *
D TRW/Cinch Connectors, Electronic Comp. Div. of TRW Inc., Dept. EM, 1501 Morse Ave., Elk Grove Village, Ill. 60007 ..... *
D Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342 ..... *
D Vernitron Elec. Comps., Beau Prods., Dept. EM, Box 10, Laconia, N.H. 03246 *
W & M Mfg., Dept. EM, 187 Lafayette St., New York, N.Y. 10013 ..... p. 2255
D Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 .... *
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
Air-O-Tronics Prods., Dept. EM, Box K, Morrisville, N.Y. 13408
Air Products & Chemicals, Dept. EM, Box 538, Allentown, PA 18105
M Alford Mfg. Co., Dept. EM, 120 Cross St., Winchester, Mass. 01890
Ark-Les Switch Corp., Dept. EM, 51 Water St., Watertown, Mass. 02172
D Astrolab, Inc., Dept. EM, 345 Dalziel Rd., Linden, N.J. 07036
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
D Blonder-Tongue Labs., Inc., Dept. EM, One Jake Brown Rd., Old Bridge, N.J. 08857
Boston Insulated Wire & Cable Co., Dept. EM, 65 Bay St., Dorchester, Mass. 02125
D Cablewave Systems Inc., Dept. EM, 60 Dodge Ave., North Haven, Conn. 06473
M Detoronics Corp., Dept. EM, 10660 E. Rush St., P.O. Box 3805, S. El Monte, Cal. 91733
D General Elec. Co, Wiring Device Bus. Dept., Dept. EM, 95 Hathaway St., Providence, R.I. 02904
M Glenair, Inc., Dept. EM, 1211 Air Way, Glendale, Cal. 91201
Hypertronics Corp., Dept. EM, 2352 Main St, Concord, Mass. 01742
Industrial Electronic Hardware, Dept. EM, 109 Prince St., New York, N.Y. 10012
Jolo Industries, Inc., Dept. EM, 11861 Cardinal Circle, Garden Grove, Cal. 92643
Lemo USA, Dept. EM, 2015 Second St., Berkeley, Cal. 94710
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803

D Philips Audio Video Sys. Neutrik Prods. Dept. EM, 91 McKee Dr., Mahwah, N.J. 07430
D Recoton Corp., Dept. EM, 46-23 Crane St., Long Island City, N.Y. 11101
Reynolds Inds., Inc., Dept. EM, Box 1170, Marina Del Rey, Cal. 90291
SHOGYO International Corp., Dept. EM, 300 Northern Blvd., Great Neck, N.Y. 11021
DM Solitron/Microwave, Dept. EM, Box 278, Port Salerno, Fla. 33492
M Sunbank Elctrns., Inc., Dept. EM, 3110 Winona, Box 6669, Burbank, Cal. 91505
Sundstrand Data Control, Dept. EM, Overlake Ind'l. Pk., Redmond, Wash. 98052
D Switchcraft, Inc., Dept. EM, 5555 N. Elston, Chicago, Ill. 60630
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D Excel Products Co., Inc., Dept. EM, 401 Joyce Kilmer Ave., New Brunswick, N.J. 08903 ..... *

D – Product sold through distributors M – Product meets MIL specs eem/78
* – Company has information in this edition but not on this product.

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D AMP Special Industries, Dept. EM, Valley Forge, Pa. 19482
M Armel Electronics, Dept. EM, 1601 75th St., N. Bergen, N.J. 07047
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D Teka Prods. Inc., Dept. EM, 15-04 130th St., College Point, N.Y. 11356
M Teradyne Components, Dept. EM, 4 Pittsburgh Ave, Nashua, NH 03060
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D Viking Inds., Inc., Dept EM, 9324 Topanga Cyn Blvd , Chatsworth, Cal 91311

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M Cadillac Plastic & Chemical, Dayco Co., Dept. EM, Box 810, Detroit, Mich. 48232
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DM Uniroyal, Inc., Dept. EM, 1230 Ave. of Americas, New York, N.Y. 10020
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M **Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735** ..... *
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D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
Cross Electronics Inc., Dept. EM, 100 Commonwealth Dr., Warrendale, Pa. 15086
D CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
D CVC Products, Inc., Dept. EM, 525 Lee Rd., Box 1886, Rochester, N.Y. 14603
Data General Corp., Dept. EM, 15 Turnpike Rd Rte 9, Westboro, Mass 01581
Datawest Corp., Dept. EM, 7333 E. Helm Dr., Scottsdale, Ariz. 85260
D Delta Design, Inc., Dept. EM, 5725 Kearny Villa Road, San Diego, Cal 92123
Dillon, W.C. & Co., Dept. EM, 14620-EP Keswick St., Van Nuys 340, Cal. 91407
Dynage, Inc. Control Prods Grp., Dept. EM, 1331 Blue Hills Ave., Bloomfield, Conn. 06002
D Eagle Signal, Mfg. Div. Gulf & Western Inds., Dept. EM, Box 3585, Davenport, Iowa 52808
Electro Space Systems, Inc., Dept. EM, Box 1359, Richardson, Tex. 75080
D Electronic Counters & Controls Inc., Dept. EM, 1500 McCormick Blvd., Mundelein, Ill. 60060
ESSCO Industries, Dept. EM, PO Box 515, Sierra Madre, Cal. 91024
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D Hecon Corp., Dept. EM, 31 Park Rd., Tinton Falls, N.J. 07724
M Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
DM Hughes Aircraft Co., Ind'l. Prods. Div., Prod. Equip. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
M Lehighton Electronics, Inc., Dept. EM, RD 1Box 374 Dept M, Lehighton, Pa 18235
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National Instruments, Dept. EM, 83330 Burnet Rd., Austin, Tex 78758
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Zonic Technical Labs., Dept. EM, 8927 Rossash Ave., Cincinnati, Ohio 45236

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Tasker Systems, Dept. EM, 20131 Sunburst St., Chatsworth, Cal. 91311

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Modular Audio Products, Dept. EM, 50 Orville Dr., Bohemia, N.Y. 11716

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DM CAI, Div. Bourns Inc., Dept. EM, 550 W. Northwest Hwy., Barrington, Ill. 60010
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111

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M Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470 p. 2259
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Centralab, Electrns. Div. - Globe Union Inc., Dept. EM, 5757 N. Green Bay Ave., Milwaukee, Wisc. 53201
D Delavan Electronics, Inc., Dept. EM, 14605 No. 73rd St., Scottsdale, Ariz. 85260
Electron-Machine Corp., Dept. EM, Box M, Umatilla, Fla. 32784
D Gordon Engineering Corp., Dept. EM, 67 Del Mar Dr., Brookfield, Conn. 06804
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
Princo Instrs., Dept. EM, Industrial Pk., Southampton, Pa. 18966
D Robertshaw Controls Co., Ind'l. Instr. Div., Dept. EM, 1910 Byrd Ave Ste 200, Richmond, Va. 23230
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Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 ..... *
Electro-Craft Corp., Dept. EM, 1600 2nd St. South, Hopkins, Minn. 55343 .. *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
M Accurate Instrument Co., Dept. EM, Box No. 925, Westbury, N.Y. 11590
Applied Control Co., Dept. EM, 1275 Bloomfield Ave., Fairfield, N.J. 07006
Applied Systems Corp., Dept. EM, 26401 Harper Ave., St. Clair Shores, Mich. 48081
D Autotron, Inc., Dept. EM, 3269 N. Vermilion St., Box 595, Danville, Ill. 61832
Control Systems Research, Inc., Dept. EM, CSR Bldg., 632 Fort Duquesne Blvd., Pittsburgh, Pa. 15222
Curtis Industries Inc., Dept. EM, 8000 West Tower Ave., Milwaukee, Wisc 53223
D Dolan-Jenner Inds., Inc., Dept. EM, Box 1020, Woburn, Mass. 01801
Dynage, Inc. Control Prods Grp., Dept. EM, 1331 Blue Hills Ave., Bloomfield, Conn. 06002
D Dynapar Corp., Dept. EM, 1675 Delany Rd., Gurnee, Ill 60031

D Eagle Signal, Mfg. Div. Gulf & Western Inds., Dept. EM, Box 3585, Davenport, Iowa 52808
D Electronic Counters & Controls Inc., Dept. EM, 1500 McCormick Blvd., Mundelein, Ill. 60060
ESSCO Industries, Dept. EM, PO Box 515, Sierra Madre, Cal. 91024
Essex Group, Dept. EM, 3501 W. Addison, Ft. Wayne, IN. 46809
D Ferranti-Packard, Ltd. Elec. Div., Dept. EM, 6030 Ambler Dr, Mississauga, Ont. Can. L4W 2P1
FSI/Fork Standards Inc., Dept. EM, 211 Main St., W. Chicago, Ill. 60185
D Gagne Assocs., Inc., Dept. EM, 1080 Chenango St., Dept. 3EE-27, Binghamton, N.Y. 13901
D Hecon Corp., Dept. EM, 31 Park Rd., Tinton Falls, N.J. 07724
M Jaesic Industries Co., Dept. EM, 29830 Beck, Wixom, Mich. 48096
Luft Instrs., Inc., Dept. EM, Hillside Rd, Lincoln, Mass. 01773
Midland Standrad Inc., Dept. EM, 603 E. Chicago St. Box 38, Elgin, ILL 60120
D National Sonics, Div. Envirotech Corp., Dept. EM, 250 Marcus Blvd., Hauppauge, N.Y. 11787
D Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
D Photomation, Inc., Dept. EM, Box 460, Mountain View, Cal. 94041
Redington Counters, Inc., Dept. EM, 130 Addison Rd., Windsor, Conn. 06095
D Scientific Technology, Dept. EM, 1201 San Antonio Rd., Mountain View, Cal. 94043
Siltran Digital, Dept. EM, 14831 Kitterman, Box 437, Silverado, Cal. 92676
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Tri-Tronics Co. Inc., Dept. EM, 619 Enterprise Drive, Dept. EE, Oak Brook, Ill. 60521
D Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102
Warner Elec. Brake & Clutch Co., Dept. EM, Beloit, Wisc. 53511

Controls, Density

Automation Prdts., Dept. EM, 3030 Max Roy, Houston, Tex. 77008
Dolan-Jenner Inds., Inc., Dept. EM, Box 1020, Woburn, Mass. 01801
Electron-Machine Corp., Dept. EM, Box M, Umatilla, Fla. 32784
Heitz, Inc., Karl, Dept. EM, 979 Third Ave., New York, N.Y. 10022
D National Sonics, Div. Envirotech Corp., Dept. EM, 250 Marcus Blvd., Hauppauge, N.Y. 11787
Nuclear Resch. Corp., Dept. EM, 1105 Indl. Hwy., Southampton, Pa. 18966
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
Princo Instrs., Dept. EM, Industrial Pk., Southampton, Pa. 18966
RIL Elctrns., Inc., Dept. EM, 1105 Ind'l. Hwy., Southampton, Pa. 18966
D Robertshaw Controls Co., Ind'l. Instr. Div., Dept. EM, 1910 Byrd Ave Ste 200, Richmond, Va. 23230

Controls, Dimension

International Electro-Magnetics, Dept. EM, 350 N. Eric Dr., Palatine, Ill. 60067 *
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
Automatic Timing & Controls Co., Dept. EM, King of Prussia, Pa. 19406
Brunswick Instr., Dept. EM, 6150 W. Mulford Street, Niles, Ill. 60648
M Columbia Resch. Labs., Dept. EM, Macdade Blvd. & Bullens La., Woodlyn, Pa. 19094
D Dynapar Corp., Dept. EM, 1675 Delany Rd., Gurnee, Ill. 60031
Electron-Machine Corp., Dept. EM, Box M, Umatilla, Fla. 32784
DM Hughes Aircraft Co., Ind'l. Prods. Div., Prod. Equip. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
Luft Instrs., Inc., Dept. EM, Hillside Rd, Lincoln, Mass. 01773
Magnetoelastic Devices, Dept. EM, 74 North St Box 625, Pittsfield, MA 01201
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
Schaevitz Engrg., Dept. EM, U.S. 130, Union Ave., Pennsauken, N.J. 08110
D Scientific Technology, Dept. EM, 1201 San Antonio Rd., Mountain View, Cal. 94043
Siltran Digital, Dept. EM, 14831 Kitterman, Box 437, Silverado, Cal. 92676
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
Trans-Tek, Inc., Dept. EM, Rte. 83, Ellington, Conn. 06029
Worner Elctrn. Devices, Dept. EM, 121 N. Main St., Rankin, Ill. 60960

Controls, Door Opening & Closing (Industrial)

D Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101 *
A.R.F. Products, Dept. EM, Box 3226, Boulder, Colo. 80303
Elcom Industries, Inc., Dept. EM, 10268 Bach Blvd., St. Louis, Mo. 63132
D Furnas Elec. Co., Dept. EM, 1197 McKee St., Batavia, Ill. 60510
Innovation Industries Inc., Dept. EM, 5012 S. Main St., Roswell, N.M. 88201
D Multi-Elmac Co., Dept. EM, 22700 Heslip Dr., Novi, Mich. 48050
D Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
D Photomation, Inc., Dept. EM, Box 460, Mountain View, Cal. 94041
DM Pres-Air-Trol Corp., Dept. EM, 695 Mamaroneck Av., Mamaroneck, N.Y. 10543
D Scientific Technology, Dept. EM, 1201 San Antonio Rd., Mountain View, Cal. 94043
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Tri-Tronics Co. Inc., Dept. EM, 619 Enterprise Drive, Dept. EE, Oak Brook, Ill. 60521

Controls, Environmental Test Equipment

M Blue M Electric Co., Dept. EM, 138th & Chatham St., Blue Island, Ill. 60406 *
M Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 *
Harrel, Inc., Dept. EM, 16 Fitch St., E. Norwalk, Conn. 06855 p. 2267
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
M Tenney Engrg., Inc., Dept. EM, 109 Springfield Rd., Union, N.J. 07083 *
Unholtz-Dickie Corp., Dept. EM, 3000 Whitney Ave., Hamden, Conn. 06518 p. 2575
Alpha-M Corp, Dept. EM, 3009 Wildflower Drive, Dallas, Tx. 75229
M Analytical Measurements, Dept. EM, 31 Willow St., Chatham, N.J. 07928
D Delta Design, Inc., Dept. EM, 5725 Kearny Villa Road, San Diego, Cal 92123
Dillon, W.C. & Co., Dept. EM, 14620-EP Keswick St., Van Nuys 340, Cal. 91407
DM Elctrn. Control Co., Dept. EM, Box S150, Dresher, Pa. 19025
Hotpack Corp., Dept. EM, 5148 Cottman Ave., Phila., Pa. 19135
Lab-Line Instrs, Dept. EM, 15th & Bloomingdale, Melrose Park, Ill. 60160
Luft Instrs., Inc., Dept. EM, Hillside Rd, Lincoln, Mass. 01773
Metrosonics, Inc., Dept. EM, Box 18090, Rochester, N.Y. 14618
MFE Corp., Dept. EM, Keewaydin Dr., Salem, N.H. 03079
OAL Assocs., Inc., Dept. EM, P.O. Box 64, Escondido, Cal. 92025
Oven Industries, Inc., Dept. EM, 800 New Holland Ave., Mechanicsburg, Pa. 17055
D Precision Timer Co., Dept. EM, 13 Westbrook Ind'l. Park, Westbrook, Conn. 06498
D Research, Inc., Dept. EM, Box 24064, Minneapolis, Minn. 55424
Robicon Corp., Dept. EM, Plus Ind'l. Pk., Pittsburgh, Pa. 15239
Spectral Dynamics Corp., Dept. EM, Box 671, San Diego, Cal. 92112
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
Tech Serv., Inc., BRS/LVE Div, Dept. EM, 5301 Holland Dr., Beltsville, Md 20705
D Temptronic Corporation, Dept. EM, 40 Glen Ave., Newton, Mass. 02159
D United Elec. Controls Co., Dept. EM, 85A School St., Watertown, Mass. 02172
D Watlow Elec. Mfg. Co., Dept. EM, 12001 Lackland Rd., St. Louis, Mo. 63141
Whittaker Corp., Dept. EM, 10880 Wilshire Blvd., Los Angeles, Cal. 90024

Controls, Fader

D Duncan Electronics, Inc., Dept. EM, 2865 Fairview Rd., Costa Mesa, Cal. 92626 *
GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 *
D Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543 *
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
D Oaktron Inds., Inc., Dept. EM, Monroe, Wisconsin 53566
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696

Controls, Fluid Conductivity

Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
Applied Control Co., Dept. EM, 1275 Bloomfield Ave., Fairfield, N.J. 07006
Beckman Instrs., Cedar Grove Opers., Dept. EM, 89 Commerce Rd., Cedar Grove, N.J. 07009
Curtis Industries Inc., Dept. EM, 8000 West Tower Ave., Milwaukee, Wisc. 53223
DM Delaval Turbine Inc., Gems Sensors Div., Dept. EM, Spring La., Farmington, Conn. 06032
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
D Robertshaw Controls Co., Ind'l. Instr. Div., Dept. EM, 1910 Byrd Ave Ste 200, Richmond, Va. 23230
Tempo Instrument, Inc., Dept, EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803

Controls, Fluid Flow

M Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470 *
Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
Abex Corp, Dept. EM, 530 5th Ave, New York, NY 10036
M Accurate Instrument Co., Dept. EM, Box No. 925, Westbury, N.Y. 11590
Aitken Communications Inc., Dept. EM, 214 Harrison St, Taft, Cal 93268
M Astro Dynamics, Dept. EM, 2 Gill St., Woburn, Mass. 01801
D Autocon Inds., Sub. Control Data, Dept. EM, 2300 Berkshire La. N., Minneapolis, Minn. 55441
Bailey Meter Co., Sub. Babcock & Wilcox, Dept. EM, 29801 Euclid Ave., Wickliffe, Ohio 44092
M Bendix Corp., Electrodynamics Div., Dept. EM, 11600 Sherman Way, N. Hollywood, Calif. 91605
Delaval Turbine Inc., Gems Sensors Div., Dept. EM, Spring La., Farmington, Conn. 06032
M Dietz, Henry G. Co., Inc., Dept. EM, 14-26 28th Ave., Long Island City, N.Y. 11102
General Valve Corp., Dept. EM, 110 Rte. 10 Box 342, E. Hanover, N.J. 07936
Harwil Co., Dept. EM, 1548 17th St., Santa Monica, Calif. 90404
Hills-McCanna Co., Dept. EM, 400 Maple Ave., Carpentersville, Ill. 60110
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
Innovatek Microsystems, Inc., Dept. EM, Smithfield Rd., Millerton, N.Y. 12546
Instr. & Control Sys., Inc., Dept. EM, 520 Interstate Rd, Addison, Ill. 60101
M ITT General Controls, Dept. EM, 801 Allen Ave., Glendale, Cal. 91201
Luft Instrs., Inc., Dept. EM, Hillside Rd, Lincoln, Mass. 01773
M Marotta Sci. Controls, Inc., Dept. EM, Boonton Ave., Boonton, N.J. 07005
DM Matheson Gas Products, Dept. EM, Box 85, East Rutherford, N.J. 07073
M Pressure Controls, Inc., Dept. EM, 681 Main St., Belleville, N.J. 07109
D Robertshaw Controls Co., Ind'l. Instr. Div., Dept. EM, 1910 Byrd Ave Ste 200, Richmond, Va. 23230
Robicon Corp., Dept. EM, Plus Ind'l. Pk., Pittsburgh, Pa. 15239
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
D United Elec. Controls Co., Dept. EM, 85A School St., Watertown, Mass. 02172
D Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102
West Coast Resch. Corp., Dept. EM, Box 25061, Los Angeles, Cal. 90025
M Whittaker Corp., Dept. EM, 10880 Wilshire Blvd., Los Angeles, Cal. 90024
Zi-Tech Div., Aikenwood Corp., Dept. EM, Box 26, 2151 Park Blvd., Palo Alto, Cal. 94302

Controls, Frequency

Abacus Controls Inc., Dept. EM, 89 Redington Rd., Somerville, N.J. 08876 *

Active Control Instrumentation, Dept. EM, PO Box 243-Wildwood Circle, Key Largo, Florida 33037 ..... p. 2256
American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Austron, Inc., Dept. EM, 1915 Kramer La., Austin, Tex. 78758 ..... *
M **Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470** p. 2259
M **Avtel Div, Unitron Corp., Dept. EM, 2826 W. Kingsley Rd, Box 1331, Garland, Tex. 75040** ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101** ..... *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... *
M **Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040** .. *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
M **Marine Electric Railway Prods. Div., Inc., Dept. EM, 167 National Rd., Edison, N.J. 08817** ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
Ovenaire, Div. Walter Kidde & Co., Dept. EM, 706 Forrest St., Charlottesville, Va. 22901 ..... *
M **Unitron Inc., Dept. EM, 2826 W. Kingsley Rd., Box 2159, Garland, Tex. 75041** *
M Acromag, Inc., Dept. EM, 30765 Wixom Rd., Wixom, Mich. 48096
Applied Electro Technology, Inc., Dept. EM, 2220 S. Anne St., Santa Ana, Cal. 92704
CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
D Electro Corp., Dept. EM, Box 3049, Sarasota, Fla. 33578
DM Guardian California, Dept. EM, 4030 W. Spencer St., Torrance, Cal. 90503
Hartman Electrical Mfg., Div. A-T-O Inc., Dept. EM, 175 N. Diamond St., Mansfield, Ohio 44902
D King Radio Corp., Dept. EM, 400 N. Rogers Rd., Olathe, Kans. 66061
MFE Corp., Dept. EM, Keewaydin Dr., Salem, N.H. 03079
Robicon Corp., Dept. EM, Plus Ind'l. Pk., Pittsburgh, Pa. 15239
D Scientific Technology, Dept. EM, 1201 San Antonio Rd., Mountain View, Cal. 94043
Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803

Controls, Gas

M **Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470** ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
M Accurate Instrument Co., Dept. EM, Box No. 925, Westbury, N.Y. 11590
Airco Industrial Gases, Dept. EM, 575 Mountain Ave., Murray Hill, N.J. 07974
Bailey Meter Co., Sub. Babcock & Wilcox, Dept. EM, 29801 Euclid Ave., Wickliffe, Ohio 44092
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
Devco Engrg., Control Sys. Div., Dept. EM, Pier La., W. Caldwell, N.J. 07006
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
M ITT General Controls, Dept. EM, 801 Allen Ave., Glendale, Cal. 91201
Lab-Line Instrs, Dept. EM, 15th & Bloomingdale, Melrose Park, Ill. 60160
Lektra Labs., Inc., Dept. EM, 129-07 18th Ave., College Point, N.Y. 11356
Marotta Sci. Controls, Inc., Dept. EM, Boonton Ave., Boonton, N.J. 07005
DM Matheson Gas Products, Dept. EM, Box 85, East Rutherford, N.J. 07073
DM Pres-Air-Trol Corp., Dept. EM, 895 Mamaroneck Av., Mamaroneck, N.Y. 10543
D Singer Co., American Meter Div., Dept. EM, 13500 Philmont Ave., Philadelphia, Pa. 19116
Teledyne/Geotech, Dept. EM, Box 28277, Dallas, Tex. 75228
Union Carbide Corp., Linde Div., Dept. EM, 270 Park Ave., New York, N.Y. 10017
D United Elec. Controls Co., Dept. EM, 85A School St., Watertown, Mass. 02172

Controls, Hardware, Shafts & Accessories—See Shafts; Dials;etc.

Controls, Humidity

M **Blue M Electric Co., Dept. EM, 138th & Chatham St., Blue Island, Ill. 60406** *
Harrel, Inc., Dept. EM, 16 Fitch St., E. Norwalk, Conn. 06855 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... *
D American Instr. Co., Div. Travenol Labs. Inc., Dept. EM, 8030 Georgia Ave. - Dept. D16-2, Silver Spring, Md. 20910
Applied Control Co., Dept. EM, 1275 Bloomfield Ave., Fairfield, N.J. 07006
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
Honeywell Inc., Commerical Div., Dept. EM, Honeywell Plaza, Minneapolis, Minn. 55408
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
Hotpack Corp., Dept. EM, 5148 Cottman Ave., Phila., Pa. 19135
M ITT General Controls, Dept. EM, 801 Allen Ave., Glendale, Cal. 91201
Lab-Line Instrs, Dept. EM, 15th & Bloomingdale, Melrose Park, Ill. 60160
MFE Corp., Dept. EM, Keewaydin Dr., Salem, N.H. 03079
MKC Electronics, Dept. EM, 454 E. Donovan Rd., Kansas City, Kans. 66115
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
Thunder Sci Corp, Dept. EM, 623 Wyoming S.E., Albuquerque, NM 87123
D Watlow Elec. Mfg. Co., Dept. EM, 12001 Lackland Rd., St. Louis, Mo. 63141

Controls, Ignitron Firing

D Delta Products, Dept. EM, Box 1147, Grand Junction, Colo. 81501
D Research, Inc., Dept. EM, Box 24064, Minneapolis, Minn. 55424
Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105

Controls, Joystick

M **Aeroflex Labs., Magnetic Prods. Div., Dept. EM, South Service Rd., Plainview, N.Y. 11803** ..... *
D **ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845** ..... *
GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Measurement Sys., Inc., Dept. EM, 121 Water St., Norwalk, Conn. 06854 p. 2273
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
Alessi Inds., Dept. EM, 3195-C Airport Loop Dr., Costa Mesa, Cal. 92626
Magnetoelastic Devices, Dept. EM, 74 North St Box 625, Pittsfield, MA 01201
Marotta Sci. Controls, Inc., Dept. EM, Boonton Ave., Boonton, N.J. 07005
Summit Engineering Corp., Dept. EM, Box 938, Bozeman, Mont. 59715

Controls, Lamp Dimming, Flashing

A. D. Data Sys., Inc., Dept. EM, POB 9209, Rochester, N.Y. 14625 ..... *
M **Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470** p. 2259
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
M **Hi-G Co., Inc., Dept. EM, 580 Spring St., Windsor Locks, Conn. 06096** ..... *
KGS Electronics, Inc., Dept. EM, 2029 N. Lincoln Ave., Pasadena, Cal. 91103 *
Leach Corp., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003 ..... *
Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076 .... p. 4162
D **Superior Electric Co., Dept. EM, 1000 Middle St., Bristol, Conn. 06010** ..... *
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
M Accurate Instrument Co., Dept. EM, Box No. 925, Westbury, N.Y. 11590
Aerospace Avionics, Inc., Dept. EM, Airport International Plaza, 110 Wilbur Pl., Bohemia, N.Y. 11716
Applied Electro Technology, Inc., Dept. EM, 2220 S. Anne St., Santa Ana, Cal. 92704
Argus International, Dept. EM, Box 38, Hopewell, N.J. 08525
General Elec. Co, Wiring Device Bus. Dept., Dept. EM, 95 Hathaway St., Providence, R.I. 02904
D Hughey & Phillips, Inc., Dept. EM, 3050 N. California St., Burbank, Cal. 91505
KB Electronics Inc., Dept. EM, 5801 Foster Ave., Brooklyn, N.Y. 11234
Leviton Mfg. Co., Inc., Dept. EM, 59-25 Little Neck Pkwy., Little Neck, N.Y. 11362
Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
Midland Standrad Inc., Dept. EM, 603 E. Chicago St. Box 38, Elgin, ILL 60120
D Omnetics, Inc., Dept. EM, Box 113, Syracuse, N.Y. 13211
Payne Engrg. Co., Dept. EM, Box 70, Scott Depot, W. Va. 25560
D Precision Timer Co., Dept. EM, 13 Westbrook Ind'l. Park, Westbrook, Conn. 06498
S S A C Inc., Dept. EM, Box 395, Liverpool, N.Y. 13088
Teccor Electronics, Inc., Dept. EM, 1101 Pamela Dr., Box 669, Euless, Tex. 76039
Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803

Controls, Level, Dry Material

M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101** ..... *
D **Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032** *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Amtron Div., Sippican Corp., Dept. EM, 14820 S. Kedzie Ave., Midlothian, Ill. 60445
Automation Prdts., Dept. EM, 3030 Max Roy, Houston, Tex. 77008
D Autotron, Inc., Dept. EM, 3269 N. Vermilion St., Box 595, Danville, Ill. 61832
D Delavan Electronics, Inc., Dept. EM, 14605 No. 73rd St., Scottsdale, Ariz. 85260
M Dietz, Henry G. Co., Inc., Dept. EM, 14-26 28th Ave., Long Island City, N.Y. 11102
Dillon, W.C. & Co., Dept. EM, 14620-EP Keswick St., Van Nuys 340, Cal. 91407
D Fairchild Industrial Prods. Div., Dept. EM, 75 Mall Dr., Commack, N.Y. 11725
Innovation Industries Inc., Dept. EM, 5012 S. Main St., Roswell, N.M. 88201
D ITT General Controls, Dept. EM, 801 Allen Ave., Glendale, Cal. 91201
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
D National Sonics, Div. Envirotech Corp., Dept. EM, 250 Marcus Blvd., Hauppauge, N.Y. 11787
Nuclear Resch. Corp., Dept. EM, 1105 Indl. Hwy., Southampton, Pa. 18966
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
DM Pres-Air-Trol Corp., Dept. EM, 895 Mamaroneck Av., Mamaroneck, N.Y. 10543
Princo Instrs., Dept. EM, Industrial Pk., Southampton, Pa. 18966
RIL Elctrns., Inc., Dept. EM, 1105 Ind'l. Hwy., Southampton, Pa. 18966
D Robertshaw Controls Co., Ind'l. Instr. Div., Dept. EM, 1910 Byrd Ave Ste 200, Richmond, Va. 23230
D Scientific Technology, Dept. EM, 1201 San Antonio Rd., Mountain View, Cal. 94043
Skan-A-Matic Corp., Dept. EM, Box S, Elbridge, N.Y. 13060
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
Worner Elctrn. Devices, Dept. EM, 121 N. Main St., Rankin, Ill. 60960

Controls, Level, Liquid

Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470 ..... *
Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 ..... *
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
D **Kessler-Ellis Prods., Dept. EM, 120 1st Ave., Atlantic Highlands, N.J. 07716** *
Keystone Carbon Co., Thermistor Div., Dept. EM, St. Marys, Pa. 15857 ..... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
D **Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032** *
Midwest Components, Dept. EM, 1981 Port City Blvd., Muskegon, Mich. 49400 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *

M Accurate Instrument Co., Dept. EM, Box No. 925, Westbury, N.Y. 11590
Air-O-Tronics Prods., Dept. EM, Box K, Morrisville, N.Y. 13408
Amtron Div., Sippican Corp., Dept. EM, 14820 S. Kedzie Ave., Midlothian, Ill. 60445
D Autocon Inds., Sub. Control Data, Dept. EM, 2300 Berkshire La. N., Minneapolis, Minn. 55441
Automation Prdts., Dept. EM, 3030 Max Roy, Houston, Tex. 77008
D Autotron, Inc., Dept. EM, 3269 N. Vermilion St., Box 595, Danville, Ill. 61832
Bailey Meter Co., Sub. Babcock & Wilcox, Dept. EM, 29801 Euclid Ave., Wickliffe, Ohio 44092
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
M Consolidated Controls Corp., Dept. EM, 15 Durant Ave., Bethel, Conn. 06801
D Curtis Industries Inc., Dept. EM, 8000 West Tower Ave., Milwaukee, Wisc. 53223
Delaval Turbine Inc., Gems Sensors Div., Dept. EM, Spring La., Farmington, Conn. 06032
D Delavan Electronics, Inc., Dept. EM, 14605 No. 73rd St., Scottsdale, Ariz. 85260
M Dietz, Henry G. Co., Inc., Dept. EM, 14-26 28th Ave., Long Island City, N.Y. 11102
Dillon, W.C. & Co., Dept. EM, 14620-EP Keswick St., Van Nuys 340, Cal. 91407
Electric Machinery Mfg. Co., Dept. EM, 800 Central Ave., Minneapolis, Minn. 55413
D Fairchild Industrial Prods. Div., Dept. EM, 75 Mall Dr., Commack, N.Y. 11725
D Furnas Elec. Co., Dept. EM, 1197 McKee St., Batavia, Ill. 60510
Gagne Assocs., Inc., Dept. EM, 1080 Chenango St., Dept. 3EE-27, Binghamton, N.Y. 13901
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
Innovation Industries Inc., Dept. EM, 5012 S. Main St., Roswell, N.M. 88201
D ITT General Controls, Dept. EM, 801 Allen Ave., Glendale, Cal. 91201
Luft Instrs., Inc., Dept. EM, Hillside Rd, Lincoln, Mass. 01773
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
Magnetoelastic Devices, Dept. EM, 74 North St Box 625, Pittsfield, MA 01201
D Master Elctrn. Controls, Dept. EM, 1651-19th St., Santa Monica, Cal. 90404
Midland Standrad Inc., Dept. EM, 603 E. Chicago St. Box 38, Elgin, ILL 60120
D National Sonics, Div. Envirotech Corp., Dept. EM, 250 Marcus Blvd., Hauppauge, N.Y. 11787
Nuclear Resch. Corp., Dept. EM, 1105 Indl. Hwy., Southampton, Pa. 18966
Omnetics, Inc., Dept. EM, Box 113, Syracuse, N.Y. 13211
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
DM Pres-Air-Trol Corp., Dept. EM, 895 Mamaroneck Av., Mamaroneck, N.Y. 10543
Princo Instrs., Dept. EM, Industrial Pk., Southampton, Pa. 18966
RIL Elctrns., Inc., Dept. EM, 1105 Ind'l. Hwy., Southampton, Pa. 18966
D Robertshaw Controls Co., Ind'l. Instr. Div., Dept. EM, 1910 Byrd Ave. Ste 200, Richmond, Va. 23230
Robinson-Halpern Co., Dept. EM, One Apolio Rd., Plymouth Meeting, Pa. 19462
D Scientific Technology, Dept. EM, 1201 San Antonio Rd., Mountain View, Cal. 94043
D Siemens-Allis, Inc., Dept. EM, Box 2168, Milwaukee, Wisc. 53201
Skan-A-Matic Corp., Dept. EM, Box S, Elbridge, N.Y. 13060
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803
Temposonics Inc., Dept. EM, 131 East Ames Ct, Plainview, N.Y. 11803
M Thermometrics, Inc., Dept. EM, 808 US Hwy No. 1, Edison, N.J. 08817
D United Elec. Controls Co., Dept. EM, 85A School St., Watertown, Mass. 02172
Worner Elctrn. Devices, Dept. EM, 121 N. Main St., Rankin, Ill. 60960
D Zi-Tech Div., Aikenwood Corp., Dept. EM, Box 26, 2151 Park Blvd., Palo Alto, Cal. 94302

Controls, Machine Tool

Active Control Instrumentation, Dept. EM, PO Box 243-Wildwood Circle, Key Largo, Florida 33037 ..... *
ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845 ..... *
Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
BEI Elctrns., Inc., Dept. EM, 1101 McAlmont St., Little Rock, Ark. 72203 p. 1384-1387
M **Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731** ..... *
M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101** ..... *
D **Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101** ..... *
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
LVC Inds. Inc., Co-Ord Switch Bloc-Lite Divs., Dept. EM, 135-25 37th Ave., Flushing, N.Y. 11354 ..... *
Measurement Sys., Inc., Dept. EM, 121 Water St., Norwalk, Conn. 06854 p. 2273
D **Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032** *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D **Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076** ..... *
D **Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543** ..... *
D **Tapeswitch Corp. Amer., Dept. EM, 100 Schmitt Blvd., Farmingdale, N.Y. 11735** ..... *
Abex Corp, Dept. EM, 530 5th Ave, New York, NY 10036
Aerotech, Inc., Dept. EM, 101 Zeta Dr., Pittsburgh, Pa. 15238
Allen Bradley, Sys. Div., Dept. EM, 747 Alpha Dr., Highland Heights, Ohio 44143
Ambi-Tech Inds. Inc., Dept. EM, 319 Knickerbocker Ave, Hillsdale, NJ 07642
Amtron Div., Sippican Corp., Dept. EM, 14820 S. Kedzie Ave., Midlothian, Ill. 60445
Applied Control Co., Dept. EM, 1275 Bloomfield Ave., Fairfield, N.J. 07006
Applied Systems Corp., Dept. EM, 26401 Harper Ave., St. Clair Shores, Mich 48081
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
Automatic Timing & Controls Co., Dept. EM, King of Prussia, Pa. 19406
C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Control Products Corp., Dept. EM, 4431 W. Division St., Chicago, Ill. 60651
Control Systems Research, Inc., Dept. EM, CSR Bldg., 632 Fort Duquesne Blvd., Pittsburgh, Pa. 15222
Cross Electronics Inc., Dept. EM, 100 Commonwealth Dr., Warrendale, Pa. 15086
Curtis Industries Inc., Dept. EM, 8000 West Tower Ave., Milwaukee, Wisc. 53223
Datametrics Inc, Dept. EM, 340 Fordham St., Wilmington, Mass. 01887
Devco Engrg., Control Sys. Div., Dept. EM, Pier La., W. Caldwell, N.J. 07006
Dynage, Inc. Control Prods Grp., Dept. EM, 1331 Blue Hills Ave., Bloomfield, Conn. 06002
D Dynapar Corp., Dept. EM, 1675 Delany Rd., Gurnee, Ill. 60031
D Eagle Signal, Mfg. Div. Gulf & Western Inds., Dept. EM, Box 3585, Davenport, Iowa 52808
ESSCO Industries, Dept. EM, PO Box 515, Sierra Madre, Cal. 91024
D Farrand Controls Div., Dept. EM, 99 Wall St., Valhalla, N.Y. 10595
D Furnas Elec. Co., Dept. EM, 1197 McKee St., Batavia, Ill. 60510
Glentek, Inc., Dept. EM, 1559 7th St., Santa Monica, Calif. 90401
D Gordon Engineering Corp., Dept. EM, 67 Del Mar Dr., Brookfield, Conn. 06804
Guardian California, Dept. EM, 4030 W. Spencer St., Torrance, Cal. 90503
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
DM Hughes Aircraft Co., Ind'l. Prods. Div., Prod. Equip. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
Icon Division, U.S.M. Corp., Dept. EM, 156 Sixth St., Cambridge, Mass. 02142
Innovatek Microsystems, Inc., Dept. EM, Smithfield Rd., Millerton, N.Y. 12546
Instr. & Control Sys., Inc., Dept. EM, 520 Interstate Rd, Addison, Ill. 60101
KB Electronics Inc., Dept. EM, 5801 Foster Ave., Brooklyn, N.Y. 11234
Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
Magnetic Products, Inc., Dept. EM, Box 1125, New London, N.H. 03257
Mesur-Matic Electronics Corp., Dept. EM, 50 Grove St., Salem, Mass. 01970
Midland Standrad Inc., Dept. EM, 603 E. Chicago St. Box 38, Elgin, ILL 60120
D Namco Controls, Acme-Cleveland Co., Dept. EM, 170 E. 131st St., Cleveland, Ohio 44108
Parametrics, Div. Zero-Max Inds., Dept. EM, 284 Racebrook Rd., Orange, Conn. 06477
Payne Engrg. Co., Dept. EM, Box 70, Scott Depot, W. Va. 25560
D PCS., Inc., Dept. EM, 750 N. Maple Rd., Saline, Mich. 48176
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
D Precision Timer Co., Dept. EM, 13 Westbrook Ind'l. Park, Westbrook, Conn. 06498
Robicon Corp., Dept. EM, Plus Ind'l. Pk., Pittsburgh, Pa. 15239
D Scientific Technology, Dept. EM, 1201 San Antonio Rd., Mountain View, Cal. 94043
Skan-A-Matic Corp., Dept. EM, Box S, Elbridge, N.Y. 13060
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
Summit Engineering Corp., Dept. EM, Box 938, Bozeman, Mont. 59715
D Teccor Electronics, Inc., Dept. EM, 1101 Pamela Dr., Box 669, Euless, Tex. 76039
Teledyne Gurley, Dept. EM, 514 Fulton St., Troy, N.Y. 12181
Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803
Temposonics Inc., Dept. EM, 131 East Ames Ct, Plainview, N.Y. 11803
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
Unico, Inc., Dept. EM, 3725 Nicholson Rd., Franksville, Wisc. 53126
D Ward Leonard Elec. Co. Inc., Sub. Unimax Group Inc., Dept. EM, 31 South St., Mt. Vernon, N.Y. 10550
Warner Elec. Brake & Clutch Co., Dept. EM, Beloit, Wisc. 53511
Westamp, Inc., Dept. EM, 1542 15th St., Santa Monica, Cal. 90404

Controls, Moisture—See Controls, Humidity

Controls, Motor Speed

Abacus Controls Inc., Dept. EM, 89 Redington Rd., Somerville, N.J. 08876 *
Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
M **Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470** ..... *
Barber-Colman Co., Motor Div., Dept. EM, Dept. F, 14116 Rock St., Rockford, Ill. 61101 ..... *
D **Bodine Electric Co., Dept. EM, 2500 W. Bradley Pl., Chicago, Ill. 60618** p. 3077
Bulova Watch Co., Servo Prods. Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
D **Canon U.S.A., Inc., Dept. EM, 10 Nevada Dr., Lake Success, N.Y. 11040** ..... *
M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101** ..... *
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... *
Duncan Electronics, Inc., Dept. EM, 2865 Fairview Rd., Costa Mesa, Cal. 92626 ..... *
D **Electro-Craft Corp., Dept. EM, 1600 2nd St. South, Hopkins, Minn. 55343** p. 3083
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 .... *
M **Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735** ..... p. 3977
Japanese Prods. Corp., Dept. EM, 7 Westchester Plaza, Elmsford, N.Y. 10523 ..... *
Leach Corp., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003 ..... *
LVC Inds. Inc., Co-Ord Switch Bloc-Lite Divs., Dept. EM, 135-25 37th Ave., Flushing, N.Y. 11354 ..... *
Marine Electric Railway Prods. Div., Inc., Dept. EM, 167 National Rd., Edison, N.J. 08817 ..... *
Measurement Sys., Inc., Dept. EM, 121 Water St., Norwalk, Conn. 06854 p. 2273

M **Micro-Mo Electronics Inc., Dept. EM, 3691 Lee Rd., Cleveland, Ohio 44120** *
D **Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076** .... p. 4162
Rapidsyn Co, Div of Dana Corp, Dept. EM, 11901 Burke St., Santa Fe Springs, Cal. 90670 *
Servo-Tek Prods. Co., Dept. EM, 1086 Goffle Rd., Hawthorne, N.J. 07506 p. 3109
D **Superior Electric Co., Dept. EM, 1000 Middle St., Bristol, Conn. 06010** p. 3110,3111
Torque Systems, Sub. Rotron/EG & G Co., Dept. EM, P.O. Box 588, 225-E. Crescent St., Waltham, Mass. 02154 *
M Accurate Instrument Co., Dept. EM, Box No. 925, Westbury, N.Y. 11590
AcroSys, Dept. EM, Box 687, Philomath, Ore. 97370
Amtron Div., Sippican Corp., Dept. EM, 14820 S. Kedzie Ave., Midlothian, Ill. 60445
Anaheim Automation, Dept. EM, 922 Orangefair La., Anaheim, Cal. 92801
Applied Control Co., Dept. EM, 1275 Bloomfield Ave., Fairfield, N.J. 07006
Argus International, Dept. EM, Box 38, Hopewell, N.J. 08525
D Autocon Inds., Sub. Control Data, Dept. EM, 2300 Berkshire La. N., Minneapolis, Minn. 55441
B & B Motor & Control, Dept. EM, 96 Spring St., New York, N.Y. 10012
Basler Electric Co., Dept. EM, Box 269, Rte. 143, Highland, Ill. 62249
Benton Corp, Dept. EM, Race St Box 678, Manor, PA 15665
Carson Mfg. Co., Dept. EM, 5453 N. Rural St., Indianapolis, Ind. 46220
Control Products Corp., Dept. EM, 4431 W. Division St., Chicago, Ill. 60651
Control Systems Research, Inc., Dept. EM, CSR Bldg., 632 Fort Duquesne Blvd., Pittsburgh, Pa. 15222
Cross Electronics Inc., Dept. EM, 100 Commonwealth Dr., Warrendale, Pa. 15086
Cyberex, Inc., Dept. EM, 7171 Industrial Park Blvd., Mentor, Ohio 44060
Datron Systems, Dept. EM, 20700 Plummer St., Chatsworth, Cal. 91311
Dynapar Corp., Dept. EM, 1675 Delany Rd., Gurnee, Ill. 60031
Dynetic Systems, Dept. EM, 19128 Indl Blvd., Elk River, Minn 55330
Eaton Corp., Ind'l. Drives Div., Dept. EM, 9919 Clinton Rd., Cleveland, Ohio 44111
Electro-Devices, Inc., Dept. EM, 4-6 Godwin Ave., Paterson, N.J. 07509
Electro-Pacific, Inc., Dept. EM, 5782 Thornwood Dr., Goleta, Calif. 93017
Electro Space Systems, Inc., Dept. EM, Box 1359, Richardson, Tex. 75080
D Electrol Co., Inc., Dept. EM, 321 Dewey St., York, Pa. 17404
DM Elctrn. Control Co., Dept. EM, Box S150, Dresher, Pa. 19025
D Emerson, Industrial Controls Div., Dept. EM, 3300 Standard St., Santa Ana, Cal. 92702
Firing Circuits Inc., Dept. EM, Muller Ave., Box 2007, Norwalk, Conn. 06852
D Furnas Elec. Co., Dept. EM, 1197 McKee St., Batavia, Ill. 60510
Gentron Corp., Dept. EM, 6667 N. Sydney Pl., Milwaukee, Wisc. 53209
M Glentek, Inc., Dept. EM, 1559 7th St., Santa Monica, Calif. 90401
Hartman Electrical Mfg., Div. A-T-O Inc., Dept. EM, 175 N. Diamond St., Mansfield, Ohio 44902
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft Washington, Pa. 19034
Icon Division, U.S.M. Corp., Dept. EM, 156 Sixth St., Cambridge, Mass. 02142
Inland Motor Div. Kollmorgen, Indl Drives Grp, Dept. EM, 609 Rock Rd., Radford, Va. 24141
Innovatek Microsystems, Inc., Dept. EM, Smithfield Rd., Millerton, N.Y. 12546
Instr. & Control Sys., Inc., Dept. EM, 520 Interstate Rd, Addison, Ill. 60101
KB Electronics Inc., Dept. EM, 5801 Foster Ave., Brooklyn, N.Y. 11234
Leviton Mfg. Co., Inc., Dept. EM, 59-25 Little Neck Pkwy., Little Neck, N.Y. 11362
Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
Marotta Sci. Controls, Inc., Dept. EM, Boonton Ave., Boonton, N.J. 07005
D Master Elctrn. Controls, Dept. EM, 1651-19th St., Santa Monica, Cal. 90404
Mesur-Matic Electronics Corp., Dept. EM, 50 Grove St., Salem, Mass. 01970
Midland Standrad Inc., Dept. EM, 603 E. Chicago St. Box 38, Elgin, ILL 60120
Minnesota Electric Tech. Inc., Dept. EM, 1821 University Ave., St. Paul, Minn. 55104
D Omnetics, Inc., Dept. EM, Box 113, Syracuse, N.Y. 13211
Parametrics, Div. Zero-Max Inds., Dept. EM, 284 Racebrook Rd., Orange, Conn. 06477
Payne Engrg. Co., Dept. EM, Box 70, Scott Depot, W. Va. 25560
PIC Design Div., Benrus Corp., Dept. EM, Benrus Center, Rte 7, Ridgefield, Conn. 06877
PMI Motors, Kollmorgen Corp., Dept. EM, 5 Aerial Way, Syosset, NY 11791
D Power Control Corp., Dept. EM, 122 Gamma Dr., Pittsburgh, Pa. 15238
Randtronics, Dept. EM, 150 Constitution Dr, Menlo Park, Cal, 94025
Rhino Sales Corp, Dept. EM, Box 367, 620 Andrews Ave, Kewanee, Ill. 61443
Robicon Corp., Dept. EM, Plus Ind'l. Pk., Pittsburgh, Pa. 15239
M Sawyer Inds., Dept. EM, 5649 Peck Rd., Arcadia, Cal. 91006
D Siemens-Allis, Inc., Dept. EM, Box 2168, Milwaukee, Wisc. 53201
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
D Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
M Teccor Electronics, Inc., Dept. EM, 1101 Pamela Dr., Box 669, Euless, Tex. 76039
Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
Torq Engineered Products, Inc., Dept. EM, 32 W. Monroe St., Bedford, Ohio 44146
M Transicoil, Inc., Dept. EM, Worcester, Pa. 19490
Unico, Inc., Dept. EM, 3725 Nicholson Rd., Franksville, Wisc. 53126
Vectrol, Inc., Dept. EM, 110 Douglas Rd, Oldsmar, Fla. 33557
Voltex Co., Inc., Dept. EM, 115 Marine St., Farmingdale, N.Y. 11735
Ward Leonard Elec. Co. Inc., Sub. Unimax Group Inc., Dept. EM, 31 South St., Mt. Vernon, N.Y. 10550
DM Welco Inds. Inc., Dept. EM, 9027 Shell Ave., Cincinnati, Ohio 45236
D WER Industrial, Div. Emerson Elec. Co., Dept. EM, 3036 Alt Blvd., Grand Island, N.Y. 14072
West Coast Resch. Corp., Dept. EM, Box 25061, Los Angeles, Cal. 90025
Westamp, Inc., Dept. EM, 1542 15th St., Santa Monica, Cal. 90404

Controls, Oscillator

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
M **Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470** *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 *
M Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040 *
Unholtz-Dickie Corp., Dept. EM, 3000 Whitney Ave., Hamden, Conn. 06518 *
M **Vectron Labs., Inc., Dept. EM, 166 Glover Ave., Norwalk, Conn. 06850** *
CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
FSI/Fork Standards Inc., Dept. EM, 211 Main St., W. Chicago, Ill. 60185
Meloy Labs Inc., Instrus. & Sys. Div., Dept. EM, 6715 Electronic Dr., Springfield, Va. 22151

Controls, Photoelectric

A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 *
M **Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470** p. 2259
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 *
D **Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032** p. 4156
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
D **Omron Electronics, Dept. EM, 233 S. Wacker Dr., Chicago, Ill. 60606** *
Vactec, Inc., Dept. EM, 2423 Northline Blvd., Maryland Heights, Mo. 63043 *
M Accurate Instrument Co., Dept. EM, Box No. 925, Westbury, N.Y. 11590
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
Amtron Div., Sippican Corp., Dept. EM, 14820 S. Kedzie Ave., Midlothian, Ill. 60445
Applied Control Co., Dept. EM, 1275 Bloomfield Ave., Fairfield, N.J. 07006
Automatic Timing & Controls Co., Dept. EM, King of Prussia, Pa. 19406
D Autotron, Inc., Dept. EM, 3269 N. Vermilion St., Box 595, Danville, Ill. 61832
D Curtis Industries Inc., Dept. EM, 8000 West Tower Ave., Milwaukee, Wisc. 53223
D Dolan-Jenner Inds., Inc., Dept. EM, Box 1020, Woburn, Mass. 01801
D Eagle Signal, Mfg. Div. Gulf & Western Inds., Dept. EM, Box 3585, Davenport, Iowa 52808
Evershed & Vignoles Ltd., Dept. EM, Action Lane, Chiswick, London, England W4 5HJ
FSI/Fork Standards Inc., Dept. EM, 211 Main St., W. Chicago, Ill. 60185
D H-B Instr. Co., Dept. EM, 4306 N. American St, Philadelphia, Pa. 19140
HEI, Inc., Dept. EM, Jonathan Ind'l. Ctr., Chaska, Minn. 55318
D Hughey & Phillips, Inc., Dept. EM, 3050 N. California St., Burbank, Cal. 91505
Innovation Industries Inc., Dept. EM, 5012 S. Main St., Roswell, N.M. 88201
D Intermatic, Inc., Dept. EM, Intermatic Plaza, Spring Grove, Ill. 60081
Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962
Luft Instrs., Inc., Dept. EM, Hillside Rd, Lincoln, Mass. 01773
D Master Elctrn. Controls, Dept. EM, 1651-19th St., Santa Monica, Cal. 90404
Midland Standrad Inc., Dept. EM, 603 E. Chicago St. Box 38, Elgin, ILL 60120
D Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
D Photomation, Inc., Dept. EM, Box 460, Mountain View, Cal. 94041
DM Power Instrs., Inc., Dept. EM, 7352 N. Lawndale Ave., Skokie, Ill. 60076
Qualco, Dept. EM, One First St., Los Altos, Cal. 94022
D Ripley Co., Inc., Dept. EM, 46 Nooks Hill Road, Cromwell, Conn. 06416
D Scientific Technology, Dept. EM, 1201 San Antonio Rd., Mountain View, Cal. 94043
Skan-A-Matic Corp., Dept. EM, Box S, Elbridge, N.Y. 13060
Tri-Tronics Co. Inc., Dept. EM, 619 Enterprise Drive, Dept. EE, Oak Brook, Ill. 60521
Unico, Inc., Dept. EM, 3725 Nicholson Rd., Franksville, Wisc. 53126
United Detector Tech., Dept. EM, 2644 30th St., Santa Monica, Cal. 90405
D Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102
Warner Elec. Brake & Clutch Co., Dept. EM, Beloit, Wisc. 53511

Controls, Positioning

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
M **Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470** p. 2259
BEI Elctrns., Inc., Dept. EM, 1101 McAlmont St., Little Rock, Ark. 72203 p. 1384-1387
D **Bodine Electric Co., Dept. EM, 2500 W. Bradley Pl., Chicago, Ill. 60618** *
M **Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731** *
Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 *
M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101** *
Electro-Craft Corp., Dept. EM, 1600 2nd St. South, Hopkins, Minn. 55343 *
Industrial Control Co., Dept. EM, Centraf Ave. at Pinelawn, Farmingdale, N.Y. 11735 *
International Electro-Magnetics, Dept. EM, 350 N. Eric Dr., Palatine, Ill. 60067 *
Jackson Bros., (London) Ltd., Dept. EM, 258 Bway., New York, N.Y. 10007 *
Ledex Inc., Dept. EM, 123 Webster St., Dayton, Ohio 45401 *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
LVC Inds. Inc., Co-Ord Switch Bloc-Lite Divs., Dept. EM, 135-25 37th Ave., Flushing, N.Y. 11354 *
Measurement Sys., Inc., Dept. EM, 121 Water St., Norwalk, Conn. 06854 p. 2273
D **Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032** *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
Rapidsyn Co, Div of Dana Corp, Dept. EM, 11901 Burke St., Santa Fe Springs, Cal. 90670 *
Servo-Tek Prods. Co., Dept. EM, 1086 Goffle Rd., Hawthorne, N.J. 07506 p. 3109

D **Superior Electric Co., Dept. EM, 1000 Middle St., Bristol, Conn. 06010** ..... *
Torque Systems, Sub. Rotron/EG & G Co., Dept. EM, P.O. Box 588, 225-E. Crescent St., Waltham, Mass. 02154 ..... *
United Wiring & Mfg. Co., Dept. EM, 2608 Electonic La. #404, Dallas, Tex. 75220 ..... *
Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... *
M ABA Electromechanical Sys. Inc., Dept. EM, Box 500, Pinellas Pk., Fla. 33565
Amtron Div., Sippican Corp., Dept. EM, 14820 S. Kedzie Ave., Midlothian, Ill. 60445
Anaheim Automation, Dept. EM, 922 Orangefair La., Anaheim, Cal. 92801
Applied Control Co., Dept. EM, 1275 Bloomfield Ave., Fairfield, N.J. 07006
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
Automatic Timing & Controls Co., Dept. EM, King of Prussia, Pa. 19406
Bailey Meter Co., Sub. Babcock & Wilcox, Dept. EM, 29801 Euclid Ave., Wickliffe, Ohio 44092
M Bendix Corp., Electrodynamics Div., Dept. EM, 11600 Sherman Way, N. Hollywood, Calif. 91605
Benton Corp, Dept. EM, Race St Box 678, Manor, PA 15665
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
Brunswick Instr., Dept. EM, 6150 W. Mulford Street, Niles, Ill. 60648
C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
Candy Mfg. Co., Dept. EM, 626 Grove St., Evanston, Ill 60201
M Columbia Resch. Labs., Dept. EM, Macdade Blvd. & Bullens La., Woodlyn, Pa. 19094
Control Systems Research, Inc., Dept. EM, CSR Bldg., 632 Fort Duquesne Blvd., Pittsburgh, Pa. 15222
Cross Electronics Inc., Dept. EM, 100 Commonwealth Dr., Warrendale, Pa. 15086
Datron Systems, Dept. EM, 20700 Plummer St., Chatsworth, Cal. 91311
Delaval Turbine Inc., Gems Sensors Div., Dept. EM, Spring La., Farmington, Conn. 06032
D Dolan-Jenner Inds., Inc., Dept. EM, Box 1020, Woburn, Mass. 01801
D Dynapar Corp., Dept. EM, 1675 Delany Rd., Gurnee, Ill. 60031
Eaton Corp., Ind'l. Drives Div., Dept. EM, 9919 Clinton Rd., Cleveland, Ohio 44111
D Electro Corp., Dept. EM, Box 3049, Sarasota, Fla. 33578
Electro Space Systems, Inc., Dept. EM, Box 1359, Richardson, Tex. 75080
D Electrol Co., Inc., Dept. EM, 321 Dewey St., York, Pa. 17404
D Electronic Counters & Controls Inc., Dept. EM, 1500 McCormick Blvd., Mundelein, Ill. 60060
Evershed & Vignoles Ltd., Dept. EM, Action Lane, Chiswick, London, England W4 5HJ
D Farrand Controls Div., Dept. EM, 99 Wall St., Valhalla, N.Y. 10595
GAP Instr. Corp., Dept. EM, 110 Marcus Blvd., Hauppauge, N.Y. 11787
M Glentek, Inc., Dept. EM, 1559 7th St., Santa Monica, Calif. 90401
D Hecon Corp., Dept. EM, 31 Park Rd., Tinton Falls, N.J. 07724
Hills-McCanna Co., Dept. EM, 400 Maple Ave., Carpentersville, Ill. 60110
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
DM Hughes Aircraft Co., Ind'l. Prods. Div., Prod. Equip. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
Icon Division, U.S.M. Corp., Dept. EM, 156 Sixth St., Cambridge, Mass. 02142
Innovatek Microsystems, Inc., Dept. EM, Smithfield Rd., Millerton, N.Y. 12546
Instr. & Control Sys., Inc., Dept. EM, 520 Interstate Rd, Addison, Ill. 60101
IRD Mechanalysis, Inc., Dept. EM, 6150 Huntley Rd., Columbus, Ohio 43229
D ITT General Controls, Dept. EM, 801 Allen Ave., Glendale, Cal. 91201
Jordan Controls, Dept. EM, 5607 W. Douglas Ave., Milwaukee, Wisc. 53218
Luft Instrs., Inc., Dept. EM, Hillside Rd, Lincoln, Mass. 01773
Magnetoelastic Devices, Dept. EM, 74 North St Box 625, Pittsfield, MA 01201
Marotta Sci. Controls, Inc., Dept. EM, Boonton Ave., Boonton, N.J. 07005
Mesur-Matic Electronics Corp., Dept. EM, 50 Grove St., Salem, Mass. 01970
MKC Electronics, Dept. EM, 454 E. Donovan Rd., Kansas City, Kans. 66115
D National Sonics, Div. Envirotech Corp., Dept. EM, 250 Marcus Blvd., Hauppauge, N.Y. 11787
Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
Parametrics, Div. Zero-Max Inds., Dept. EM, 284 Racebrook Rd., Orange, Conn. 06477
PCS., Inc., Dept. EM, 750 N. Maple Rd., Saline, Mich. 48176
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
PIC Design Div., Benrus Corp., Dept. EM, Benrus Center, Rte 7, Ridgefield, Conn. 06877
PMI Motors, Kollmorgen Corp., Dept. EM, 5 Aerial Way, Syosset, NY 11791
M Precision Mechanisms Corp., Dept. EM, 44 Brooklyn Ave., Westbury, N.Y. 11590
Robicon Corp., Dept. EM, Plus Ind'l. Pk., Pittsburgh, Pa. 15239
Robinson-Halpern Co., Dept. EM, One Apollo Rd., Plymouth Meeting, Pa. 19462
Schaevitz Engrg., Dept. EM, U.S. 130, Union Ave., Pennsauken, N.J. 08110
D Scientific Technology, Dept. EM, 1201 San Antonio Rd., Mountain View, Cal. 94043
Skan-A-Matic Corp., Dept. EM, Box S, Elbridge, N.Y. 13060
Summit Engineering Corp., Dept. EM, Box 938, Bozeman, Mont. 59715
Teledyne Gurley, Dept. EM, 514 Fulton St., Troy, N.Y. 12181
Temposonics Inc., Dept. EM, 131 East Ames Ct, Plainview, N.Y. 11803
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
Trans-Tek, Inc., Dept. EM, Rte. 83, Ellington, Conn. 06029
M Transicoil, Inc., Dept. EM, Worcester, Pa. 19490
Unico, Inc., Dept. EM, 3725 Nicholson Rd., Franksville, Wisc. 53126
D Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102
D Warner Elec. Brake & Clutch Co., Dept. EM, Beloit, Wisc. 53511
D WER Industrial, Div. Emerson Elec. Co., Dept. EM, 3036 Alt Blvd., Grand Island, N.Y. 14072
Westamp, Inc., Dept. EM, 1542 15th St., Santa Monica, Cal. 90404
Worner Electm. Devices, Dept. EM, 121 N. Main St., Rankin, Ill. 60960
Zonic Technical Labs., Dept. EM, 8927 Rossash Ave., Cincinnati, Ohio 45236

Controls, Pressure

Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
M **Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470** p. 2259
Bafco, Inc., Dept. EM, 717 Mearns Rd., Warminster, Pa. 18974 ..... *
Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 ..... *
M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101** ..... *
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
M **Harrel, Inc., Dept. EM, 16 Fitch St., E. Norwalk, Conn. 06855** ..... p. 2267
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
M Accurate Instrument Co., Dept. EM, Box No. 925, Westbury, N.Y. 11590
Airco Industrial Gases, Dept. EM, 575 Mountain Ave., Murray Hill, N.J. 07974
M ATEC, Inc., Dept. EM, Box 19426, Houston, Tex. 77024
D Autocon Inds., Sub. Control Data, Dept. EM, 2300 Berkshire La. N., Minneapolis, Minn. 55441
Bailey Meter Co., Sub. Babcock & Wilcox, Dept. EM, 29801 Euclid Ave., Wickliffe, Ohio 44092
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
M Columbia Resch. Labs., Dept. EM, Macdade Blvd. & Bullens La., Woodlyn, Pa. 19094
Columbus Electric Mfg. Co., Dept. EM, Box 289A Rt #2, Piney Flats, Tenn. 37686
M Conrac Corp., Systems Sls Div., Dept. EM, Three Landmark Sq., Stamford, Conn. 06901
M Consolidated Controls Corp., Dept. EM, 15 Durant Ave., Bethel, Conn. 06801
D CVC Products, Inc., Dept. EM, 525 Lee Rd., Box 1886, Rochester, N.Y. 14603
D Data Instruments Inc., Dept. EM, 4 Hartwell Pl., Lexington, Mass. 02173
M Dietz, Henry G. Co., Inc., Dept. EM, 14-26 28th Ave., Long Island City, N.Y. 11102
D Dynisco, Dept. EM, 20 S. West Pk., Westwood, Mass. 02090
D Furnas Elec. Co., Dept. EM, 1197 McKee St., Batavia, Ill. 60510
D Gagne Assocs., Inc., Dept. EM, 1080 Chenango St., Dept. 3EE-27, Binghamton, N.Y. 13901
Honeywell Inc., Commerical Div., Dept. EM, Honeywell Plaza, Minneapolis, Minn. 55408
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
IRD Mechanalysis, Inc., Dept. EM, 6150 Huntley Rd., Columbus, Ohio 43229
Kollsman Instr. Co., Dept. EM, Daniel Webster Hwy., Merrimack, N.H. 03054
Luft Instrs., Inc., Dept. EM, Hillside Rd, Lincoln, Mass. 01773
Magnetoelastic Devices, Dept. EM, 74 North St Box 625, Pittsfield, MA 01201
M Marotta Sci. Controls, Inc., Dept. EM, Boonton Ave., Boonton, N.J. 07005
DM Matheson Gas Products, Dept. EM, Box 85, East Rutherford, N.J. 07073
MKS Instrs., Inc., Dept. EM, 22 Third Ave., Burlington, Mass. 01803
D OTC Div Owatonna Tool Co, Dept. EM, 395 Eisenhower Dr., Owatonna, Minn. 55060
M Pressure Controls, Inc., Dept. EM, 681 Main St., Belleville, N.J. 07109
D Robertshaw Controls Co., Ind'l. Instr. Div., Dept. EM, 1910 Byrd Ave Ste 200, Richmond, Va. 23230
Robicon Corp., Dept. EM, Plus Ind'l. Pk., Pittsburgh, Pa. 15239
Robinson-Halpern Co., Dept. EM, One Apollo Rd., Plymouth Meeting, Pa. 19462
D Singer Co., American Meter Div., Dept. EM, 13500 Philmont Ave., Philadelphia, Pa. 19116
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
M Tescom Instr. Div., Dept. EM, 2600 Niagara La. N., Minneapolis, Minn. 55441
Texas Instruments Control Prods. Div., Dept. EM, 34 Forrest St., Attleboro, Mass. 02703
D United Elec. Controls Co., Dept. EM, 85A School St., Watertown, Mass. 02172

Controls, Proportional

M **Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470** ..... *
M **Blue M Electric Co., Dept. EM, 138th & Chatham St., Blue Island, Ill. 60406** *
M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101** ..... *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... p. 3463
Gould Inc. Circuit Protection & Controls Div., Dept. EM, 100 Relay Rd., Plantsville, Conn. 06479 ..... *
D **Gulton Inds., Inc., Measurement & Control Systems Div., Dept. EM, Gulton Ind'l. Pk., E. Greenwich, R.I. 02818** ..... *
Harrel, Inc., Dept. EM, 16 Fitch St., E. Norwalk, Conn. 06855 ..... *
M **Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735** ..... *
Ledex Inc., Dept. EM, 123 Webster St., Dayton, Ohio 45401 ..... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
M **Measurement Sys., Inc., Dept. EM, 121 Water St., Norwalk, Conn. 06854** .... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D **RFL Inds., Thermocontrol Div., Dept. EM, Boonton, N.J. 07005** ..... p. 4286
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** ..... *
Amtron Div., Sippican Corp., Dept. EM, 14820 S. Kedzie Ave., Midlothian, Ill. 60445
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
Applied Control Co., Dept. EM, 1275 Bloomfield Ave., Fairfield, N.J. 07006
Automation Prdts., Dept. EM, 3030 Max Roy, Houston, Tex. 77008
Bailey Meter Co., Sub. Babcock & Wilcox, Dept. EM, 29801 Euclid Ave., Wickliffe, Ohio 44092
M Bendix Corp., Electrodynamics Div., Dept. EM, 11600 Sherman Way, N Hollywood, Calif. 91605
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
Control Systems Research, Inc., Dept. EM, CSR Bldg., 632 Fort Duquesne Blvd., Pittsburgh, Pa. 15222
M Cox & Co., Inc., Dept. EM, 215 Park Ave., S., New York, N.Y. 10003
Cross Electronics Inc., Dept. EM, 100 Commonwealth Dr., Warrendale, Pa. 15086
Dantronics, Inc., Dept. EM, 3175 Hafner Ct., St. Paul, Minn 55112
D Dolan-Jenner Inds., Inc., Dept. EM, Box 1020, Woburn, Mass. 01801

Dynapar Corp., Dept. EM, 1675 Delany Rd., Gurnee, Ill. 60031
D Eagle Signal, Mfg. Div. Gulf & Western Inds., Dept. EM, Box 3585, Davenport, Iowa 52808
D Electrol Co., Inc., Dept. EM, 321 Dewey St., York, Pa. 17404
DM Elctrn. Control Co., Dept. EM, Box S150, Dresher, Pa. 19025
Elma Engineering, Dept. EM, 1066 E. Meadow Circle, Palo Alto, Cal. 94303
Guardian California, Dept. EM, 4030 W. Spencer St., Torrance, Cal. 90503
Hartman Electrical Mfg., Div. A-T-O Inc., Dept. EM, 175 N. Diamond St., Mansfield, Ohio 44902
D Hills-McCanna Co., Dept. EM, 400 Maple Ave., Carpentersville, Ill. 60110
Honeywell Inc., Commerical Div., Dept. EM, Honeywell Plaza, Minneapolis, Minn. 55408
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
Ircon Inc., Dept. EM, 7555 N. Linder Ave, Skokie, Ill. 60076
M ITT General Controls, Dept. EM, 801 Allen Ave., Glendale, Cal. 91201
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
M Marotta Sci. Controls, Inc., Dept. EM, Boonton Ave., Boonton, N.J. 07005
DM Matheson Gas Products, Dept. EM, Box 85, East Rutherford, N.J. 07073
MKC Electronics, Dept. EM, 454 E. Donovan Rd., Kansas City, Kans. 66115
D National Sonics, Div. Envirotech Corp., Dept. EM, 250 Marcus Blvd., Hauppauge, N.Y. 11787
M Oven Industries, Inc., Dept. EM, 800 New Holland Ave., Mechanicsburg, Pa. 17055
Payne Engrg. Co., Dept. EM, Box 70, Scott Depot, W. Va. 25560
D Precision Timer Co., Dept. EM, 13 Westbrook Ind'l. Park, Westbrook, Conn. 06498
D Research, Inc., Dept. EM, Box 24064, Minneapolis, Minn. 55424
D Robertshaw Controls Co., Ind'l. Instr. Div., Dept. EM, 1910 Byrd Ave Ste 200, Richmond, Va. 23230
Robicon Corp., Dept. EM, Plus Ind'l. Pk., Pittsburgh, Pa. 15239
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
Unico, Inc., Dept. EM, 3725 Nicholson Rd., Franksville, Wisc. 53126
D Vectrol, Inc., Dept. EM, 110 Douglas Rd. Oldsmar, Fla. 33557
D Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102
D Watlow Elec. Mfg. Co., Dept. EM, 12001 Lackland Rd., St. Louis, Mo. 63141
D West Instrs, Gulton Inds, M. C. S. Div., Dept. EM, Gulton Indl Pk, E. Greenwich, RI 02818

Controls, Proximity-Also See Controls, Capacitance Operated

D ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845 *
Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 *
M Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470 *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 *
Leach Corp., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003 *
D Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032 p. 4154-4156
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
D Omron Electronics, Dept. EM, 233 S. Wacker Dr., Chicago, Ill. 60606 *
Automatic Timing & Controls Co., Dept. EM, King of Prussia, Pa. 19406
D Autotron, Inc., Dept. EM, 3269 N. Vermilion St., Box 595, Danville, Ill. 61832
Bishop Graphics, Dept. EM, 5388 Sterling Center, Westlake Village, Cal. 91361
Brunswick Instr., Dept. EM, 6150 W. Mulford Street, Niles, Ill. 60648
D Crouzet/Cridland, Dept. EM, 118 Barrington Commons Ct Ste 207, Barrington, Ill. 60010
Curtis Industries Inc., Dept. EM, 8000 West Tower Ave., Milwaukee, Wisc. 53223
D Delavan Electronics, Inc., Dept. EM, 14605 No. 73rd St., Scottsdale, Ariz. 85260
Dolan-Jenner Inds., Inc., Dept. EM, Box 1020, Woburn, Mass. 01801
M Eldec Corp., Dept. EM, Box 100, 16700 13th Ave. W., Lynnwood, Wash. 98036
D Electro Corp., Dept. EM, Box 3049, Sarasota, Fla. 33578
D Electrol Co., Inc., Dept. EM, 321 Dewey St., York, Pa. 17404
Essex Group, Dept. EM, 3501 W. Addison, Ft. Wayne, IN. 46809
D Gagne Assocs., Inc., Dept. EM, 1080 Chenango St., Dept. 3EE-27, Binghamton, N.Y. 13901
D Gordon Engineering Corp., Dept. EM, 67 Del Mar Dr., Brookfield, Conn. 06804
Instr. & Control Sys., Inc., Dept. EM, 520 Interstate Rd, Addison, Ill. 60101
IRD Mechanalysis, Inc., Dept. EM, 6150 Huntley Rd., Columbus, Ohio 43229
Midland Standrad Inc., Dept. EM, 603 E. Chicago St. Box 38, Elgin, ILL. 60120
D Namco Controls, Acme-Cleveland Co., Dept. EM, 170 E. 131st St., Cleveland, Ohio 44108
D National Sonics, Div. Envirotech Corp., Dept. EM, 250 Marcus Blvd., Hauppauge, N.Y. 11787
Photobell Co., Inc., Dept. EM, 162 Fifth Ave. New York, N.Y. 10010
Princo Instrs., Dept. EM, Industrial Pk., Southampton, Pa. 18966
D Reed Switch Dev. Co. Inc., Dept. EM, PO Box 1464, Kerrville, Tex. 78028
D Robertshaw Controls Co., Ind'l. Instr. Div., Dept. EM, 1910 Byrd Ave Ste 200, Richmond, Va. 23230
Schaevitz Engrg., Dept. EM, U.S. 130, Union Ave., Pennsauken, N.J. 08110
D Scientific Technology, Dept. EM, 1201 San Antonio Rd., Mountain View, Cal. 94043
Skan-A-Matic Corp., Dept. EM, Box S, Elbridge, N.Y. 13060
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
D Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102
Whittaker Corp., Dept. EM, 10880 Wilshire Blvd., Los Angeles, Cal. 90024

Controls, Remote

M Aeroflex Labs., Magnetic Prods. Div., Dept. EM, South Service Rd., Plainview, N.Y. 11803 *
D ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845 *
Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 *
Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470 *
D Bodine Electric Co., Dept. EM, 2500 W. Bradley Pl., Chicago, Ill. 60618 *
Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734 *
M Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 *
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 *
Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 *
Electro-Craft Corp., Dept. EM, 1600 2nd St. South, Hopkins, Minn. 55343 *
GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 *
M Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735 *
Ledex Inc., Dept. EM, 123 Webster St., Dayton, Ohio 45401 *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
Measurement Sys., Inc., Dept. EM, 121 Water St., Norwalk, Conn. 06854 p. 2273
D Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
Oak Inds. Inc., Switch Div., Dept. EM, Dept. DA, Crystal Lake, Ill. 60014 *
D Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076 *
Re-el Circuits, Inc., Dept. EM, 520 Victor Street, Saddle Brook, N.J. 07662 *
Servo-Tek Prods. Co., Dept. EM, 1086 Goffle Rd., Hawthorne, N.J. 07506 p. 3109
AEROCOM, Dept. EM, 3090 S.W. 37th Ave., Miami, Fla. 33133
A.R.F. Products, Dept. EM, Box 3226, Boulder, Colo. 80303
D Autocon Inds., Sub. Control Data, Dept. EM, 2300 Berkshire La. N., Minneapolis, Minn. 55441
Automatic Timing & Controls Co., Dept. EM, King of Prussia, Pa. 19406
Bailey Meter Co., Sub. Babcock & Wilcox, Dept. EM, 29801 Euclid Ave., Wickliffe, Ohio 44092
Carson Mfg. Co., Dept. EM, 5453 N. Rural St., Indianapolis, Ind. 46220
Centralab, Electrns. Div. - Globe Union Inc., Dept. EM, 5757 N. Green Bay Ave., Milwaukee, Wisc. 53201
M Columbia Resch. Labs., Dept. EM, Macdade Blvd. & Bullens La., Woodlyn, Pa. 19094
Control Systems Research, Inc., Dept. EM, CSR Bldg., 632 Fort Duquesne Blvd., Pittsburgh, Pa. 15222
Dantel, Inc., Dept. EM, 1922 North Helm, Fresno, Cal. 93727
Data-Control Systems, Dept. EM, Commerce Dr., Box 860, Danbury, Conn. 06810
Dataprobe, Inc., Dept. EM, 254 Green St., So. Hackensack, N.J. 07606
Datron Systems, Dept. EM, 20700 Plummer St., Chatsworth, Cal. 91311
D Dolan-Jenner Inds., Inc., Dept. EM, Box 1020, Woburn, Mass. 01801
D Dynair Elctrns. Inc., Dept. EM, 5275 Market St., San Diego, Calif. 92114
Electro Space Systems, Inc., Dept. EM, Box 1359, Richardson, Tex. 75080
D Electrol Co., Inc., Dept. EM, 321 Dewey St., York, Pa. 17404
Evershed & Vignoles Ltd., Dept. EM, Action Lane, Chiswick, London, England W4 5HJ
D Furnas Elec. Co., Dept. EM, 1197 McKee St., Batavia, Ill. 60510
Futronix, Inc., Dept. EM, Box 2269, Sunnyvale, Cal. 94087
General Electric Co., Mobile Radio Dept, Dept. EM, Box 4197, Lynchburg, Va. 24502
D General Elec. Co, Wiring Device Bus. Dept., Dept. EM, 95 Hathaway St., Providence, R.I. 02904
Hills-McCanna Co., Dept. EM, 400 Maple Ave., Carpentersville, Ill. 60110
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
DM Hughes Aircraft Co., Ind'l. Prods. Div., Prod. Equip. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
Innovatek Microsystems, Inc., Dept. EM, Smithfield Rd., Millerton, N.Y. 12546
Lakeshore Electric Corp., Dept. EM, 205 Willis, Bedford, Ohio 44146
Luft Instrs., Inc., Dept. EM, Hillside Rd, Lincoln, Mass. 01773
M Marotta Sci. Controls, Inc., Dept. EM, Boonton Ave., Boonton, N.J. 07005
Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
D Multi-Elmac Co., Dept. EM, 22700 Heslip Dr., Novi, Mich. 48050
D Precision Timer Co., Dept. EM, 13 Westbrook Ind'l. Park, Westbrook, Conn. 06498
DM Pres-Air-Trol Corp., Dept. EM, 895 Mamaroneck Av., Mamaroneck, N.Y. 10543
D Robertshaw Controls Co., Ind'l. Instr. Div., Dept. EM, 1910 Byrd Ave Ste 200, Richmond, Va. 23230
Robicon Corp., Dept. EM, Plus Ind'l. Pk., Pittsburgh, Pa. 15239
D Scientific Technology, Dept. EM, 1201 San Antonio Rd., Mountain View, Cal. 94043
D Siemens-Allis, Inc., Dept. EM, Box 2168, Milwaukee, Wisc. 53201
Southwood Electronic Co., Dept. EM, 7624 Lindenwood Dr., Indianapolis, Ind. 46227
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Teledyne/Geotech, Dept. EM, Box 28277, Dallas, Tex. 75228
Theta instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
D Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102
Warner Elec. Brake & Clutch Co., Dept. EM, Beloit, Wisc. 53511
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Controls, Run, Shutdown Command, Start

Active Control Instrumentation, Dept. EM, PO Box 243-Wildwood Circle, Key Largo, Florida 33037 *
Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 *
M Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470 *
D Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101 *
Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 *
Ledex Inc., Dept. EM, 123 Webster St., Dayton, Ohio 45401 p. 4099
Measurement Sys., Inc., Dept. EM, 121 Water St., Norwalk, Conn. 06854 p. 2273
D Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032 *

NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Trak Systems, Div. TRAK Microwave Corp., Dept. EM, 4722 Eisenhower Blvd., Dept. E8, Tampa, Fla. 33614 ..... *
Ambi-Tech Inds. Inc., Dept. EM, 319 Knickerbocker Ave, Hillsdale, NJ 07642
Amtron Div., Sippican Corp., Dept. EM, 14820 S. Kedzie Ave., Midlothian, Ill. 60445
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
Applied Control Co., Dept. EM, 1275 Bloomfield Ave., Fairfield, N.J. 07006
Applied Systems Corp., Dept. EM, 26401 Harper Ave., St. Clair Shores, Mich. 48081
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
DM Delaval Turbine Inc., Gems Sensors Div., Dept. EM, Spring La., Farmington, Conn. 06032
Dynage, Inc. Control Prods Grp., Dept. EM, 1331 Blue Hills Ave., Bloomfield, Conn. 06002
D Furnas Elec. Co., Dept. EM, 1197 McKee St., Batavia, Ill. 60510
GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854
Hartman Electrical Mfg., Div. A-T-O Inc., Dept. EM, 175 N. Diamond St., Mansfield, Ohio 44902
Innovation Industries Inc., Dept. EM, 5012 S. Main St., Roswell, N.M. 88201
Instr. & Control Sys., Inc., Dept. EM, 520 Interstate Rd, Addison, Ill. 60101
D LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
D Precision Timer Co., Dept. EM, 13 Westbrook Ind'l. Park, Westbrook, Conn. 06498
Robicon Corp., Dept. EM, Plus Ind'l. Pk., Pittsburgh, Pa. 15239
D Scientific Technology, Dept. EM, 1201 San Antonio Rd., Mountain View, Cal. 94043
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201

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Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470 ..... *
M **Blue M Electric Co., Dept. EM, 138th & Chatham St., Blue Island, Ill. 60406** *
D **Bodine Electric Co., Dept. EM, 2500 W. Bradley Pl., Chicago, Ill. 60618** ..... *
Conditioning Semiconductor Devices, Dept. EM, Box 816, Wayne, N.J. 07470 p. 3921
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
D **General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345** ..... *
Gulton Inds., Inc., Measurement & Control Systems Div., Dept. EM, Gulton Ind'l, Pk., E. Greenwich, R.I. 02818 ..... *
International Rectifier Corp., Semiconductor Div., Dept. EM, 233 Kansas St., El Segundo, Cal. 90245 ..... *
NWL Transformers, Dept. EM, Rising Sun Rd., Bordentown, N.J. 08505 ..... *
D **RFL Inds., Thermocontrol Div., Dept. EM, Boonton, N.J. 07005** ..... *
Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... *
Servo-Tek Prods. Co., Dept. EM, 1086 Goffle Rd., Hawthorne, N.J. 07506 .. *
API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
Applied Control Co., Dept. EM, 1275 Bloomfield Ave., Fairfield, N.J. 07006
B & B Motor & Control, Dept. EM, 96 Spring St., New York, N.Y. 10012
Basler Electric Co., Dept. EM, Box 269, Rte. 143, Highland, Ill. 62249
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
Caig Labs., Inc., Dept. EM, 1175-0 Industrial Ave., Box 64, Escondido, Cal. 92025
M Cal-Power Corp., Dept. EM, 140 Kansas St., El Segundo, Calif. 90245
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Control Products Corp., Dept. EM, 4431 W. Division St., Chicago, Ill. 60651
M Cox & Co., Inc., Dept. EM, 215 Park Ave., S., New York, N.Y. 10003
Cross Electronics Inc., Dept. EM, 100 Commonwealth Dr., Warrendale, Pa. 15086
Datron Systems, Dept. EM, 20700 Plummer St., Chatsworth, Cal. 91311
D Despatch Oven Co., Dept. EM, P.O. Box 1320, Minneapolis, Minn. 55440
Eaton Corp., Ind'l. Drives Div., Dept. EM, 9919 Clinton Rd., Cleveland, Ohio 44111
Electro-Devices, Inc., Dept. EM, 4-6 Godwin Ave., Paterson, N.J. 07509
Electro-Pacific, Inc., Dept. EM, 5782 Thornwood Dr., Goleta, Calif. 93017
Electro Space Systems, Inc., Dept. EM, Box 1359, Richardson, Tex. 75080
D Electrol Co., Inc., Dept. EM, 321 Dewey St., York, Pa. 17404
DM Elctrn. Control Co., Dept. EM, Box S150, Dresher, Pa. 19025
Elma Engineering, Dept. EM, 1066 E. Meadow Circle, Palo Alto, Cal. 94303
Essex Group, Dept. EM, 3501 W. Addison, Ft. Wayne, IN. 46809
Firing Circuits Inc., Dept. EM, Muller Ave., Box 2007, Norwalk, Conn. 06852
Gentron Corp., Dept. EM, 6667 N. Sydney Pl., Milwaukee, Wisc. 53209
M Glentek, Inc., Dept. EM, 1559 7th St., Santa Monica, Calif. 90401
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
Hotpack Corp., Dept. EM, 5148 Cottman Ave., Phila., Pa. 19135
DM Hughes Aircraft Co., Ind'l. Prods. Div., Prod. Equip. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
Inland Motor Div. Kollmorgen, Indl Drives Grp, Dept. EM, 609 Rock Rd., Radford, Va. 24141
Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
KB Electronics Inc., Dept. EM, 5801 Foster Ave., Brooklyn, N.Y. 11234
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Magnetic Specialties, Dept. EM, 10 Albemarle Ave., Trenton, N.J. 08638
D Master Elctrn. Controls, Dept. EM, 1651-19th St., Santa Monica, Cal. 90404
Midland Standrad Inc., Dept. EM, 603 E. Chicago St. Box 38, Elgin, ILL 60120
Minnesota Electric Tech. Inc., Dept. EM, 1821 University Ave., St. Paul, Minn. 55104
Parametrics, Div. Zero-Max Inds., Dept. EM, 284 Racebrook Rd., Orange, Conn. 06477
Payne Engrg. Co., Dept. EM, Box 70, Scott Depot, W. Va. 25560
PIL Electronics, Dept. EM, 10211 Vinemont St., Dallas, Tex. 75218
PMI Motors, Kollmorgen Corp., Dept. EM, 5 Aerial Way, Syosset, NY 11791
D Power Control Corp., Dept. EM, 122 Gamma Dr., Pittsburgh, Pa. 15238
Randtronics, Dept. EM, 150 Constitution Dr., Menlo Park, Cal. 94025
D Research, Inc., Dept. EM, Box 24064, Minneapolis, Minn. 55424
Robicon Corp., Dept. EM, Plus Ind'l. Pk., Pittsburgh, Pa. 15239
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
D Teccor Electronics, Inc., Dept. EM, 1101 Pamela Dr., Box 669, Euless, Tex. 76039
Unico, Inc., Dept. EM, 3725 Nicholson Rd., Franksville, Wisc. 53126
D Vectrol, Inc., Dept. EM, 110 Douglas Rd, Oldsmar, Fla. 33557
Voltex Co., Inc., Dept. EM, 115 Marine St., Farmingdale, N.Y. 11735
Ward Leonard Elec. Co. Inc., Sub. Unimax Group Inc., Dept. EM, 31 South St., Mt. Vernon, N.Y. 10550
D Watlow Elec. Mfg. Co., Dept. EM, 12001 Lackland Rd., St. Louis, Mo. 63141
D Welco Inds. Inc., Dept. EM, 9027 Shell Ave., Cincinnati, Ohio 45236
D WER Industrial, Div. Emerson Elec. Co., Dept. EM, 3036 Alt Blvd., Grand Island, N.Y. 14072
D West Instrs, Gulton Inds, M. C. S. Div., Dept. EM, Gulton Indl Pk, E. Greenwich, RI 02818
M Westamp, Inc., Dept. EM, 1542 15th St., Santa Monica, Cal. 90404

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M **Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470** p. 2259
M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101** ..... *
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
D **Diversified Electronics Inc., Dept. EM, 119 N. Morton Ave., Evansville, Ind. 47711** ..... p. 3448
Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
DM **Hi-G Co., Inc., Dept. EM, 580 Spring St., Windsor Locks, Conn. 06096** p. 3545
Leach Corp., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003 ..... *
D **Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582** *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
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D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** ..... *
M Acromag, Inc., Dept. EM, 30765 Wixom Rd., Wixom, Mich. 48096
Applied Electro Technology, Inc., Dept. EM, 2220 S. Anne St., Santa Ana, Cal. 92704
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
Coilcraft, Dept. EM, 1102 Siler Lake Rd., Cary, Ill. 60013
M Columbia Resch. Labs., Dept. EM, Macdade Blvd. & Bullens La., Woodlyn, Pa. 19094
Cross Electronics Inc., Dept. EM, 100 Commonwealth Dr., Warrendale, Pa. 15086
Curtis Industries Inc., Dept. EM, 8000 West Tower Ave., Milwaukee, Wisc. 53223
Data-Control Systems, Dept. EM, Commerce Dr., Box 860, Danbury, Conn. 06810
D Dolan-Jenner Inds., Inc., Dept. EM, Box 1020, Woburn, Mass. 01801
Dynapar Corp., Dept. EM, 1675 Delany Rd., Gurnee, Ill. 60031
D Guardian California, Dept. EM, 4030 W. Spencer St., Torrance, Cal. 90503
M Hartman Electrical Mfg., Div. A-T-O Inc., Dept. EM, 175 N. Diamond St., Mansfield, Ohio 44902
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Hughey & Phillips, Inc., Dept. EM, 3050 N. California St., Burbank, Cal. 91505
Instr. & Control Sys., Inc., Dept. EM, 520 Interstate Rd, Addison, Ill. 60101
Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
IRD Mechanalysis, Inc., Dept. EM, 6150 Huntley Rd., Columbus, Ohio 43229
KB Electronics Inc., Dept. EM, 5801 Foster Ave., Brooklyn, N.Y. 11234
Lakeshore Electric Corp., Dept. EM, 205 Willis, Bedford, Ohio 44146
Lark Electronics, Inc., Dept. EM, Box 390, New York, N.Y. 10040
Midland Standrad Inc., Dept. EM, 603 E. Chicago St. Box 38, Elgin, ILL 60120
M NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
OAS Inc., Dept. EM, 145 Palasades St., Dobbs Ferry, N.Y. 10522
Payne Engrg. Co., Dept. EM, Box 70, Scott Depot, W. Va. 25560
D Power Control Corp., Dept. EM, 122 Gamma Dr., Pittsburgh, Pa. 15238
Richard-Lee Co., Dept. EM, Box 724, New Providence, N.J. 07974
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Teccor Electronics, Inc., Dept. EM, 1101 Pamela Dr., Box 669, Euless, Tex. 76039
D West Instrs, Gulton Inds, M. C. S. Div., Dept. EM, Gulton Indl Pk, E. Greenwich, RI 02818
M Wilmar Elctrns. Inc., Dept. EM, 2430 Amsler St., Torrance, Cal. 90505

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M **Aeroflex Labs., Magnetic Prods. Div., Dept. EM, South Service Rd., Plainview, N.Y. 11803** ..... *
American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
M **Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470** ..... *
Bafco, Inc., Dept. EM, 717 Mearns Rd., Warminster, Pa. 18974 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Bulova Watch Co., Servo Prods. Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101** .. p. 3975
D **Electro-Craft Corp., Dept. EM, 1600 2nd St. South, Hopkins, Minn. 55343** p. 3083

I M C Magnetics, Eastern Div., Dept. EM, 570 Main St., Westbury, N.Y. 11590 *
M **Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735** ..... **p. 3976,3977**
M **Interface Engineering Inc., Dept. EM, 386 Lindelof Ave., Stoughton, Mass. 02072** ..... *
Ledex Inc., Dept. EM, 123 Webster St., Dayton, Ohio 45401 ..... *
Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032 *
Servo-Tek Prods. Co., Dept. EM, 1086 Goffle Rd., Hawthorne, N.J. 07506 **p. 3109**
Torque Systems, Sub. Rotron/EG & G Co., Dept. EM, P.O. Box 588, 225-E. Crescent St., Waltham, Mass. 02154 ..... *
M **Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735** *
Unholtz-Dickie Corp., Dept. EM, 3000 Whitney Ave., Hamden, Conn. 06518 **p. 2575**
M **Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729** ..... *
M ABA Electromechanical Sys. Inc., Dept. EM, Box 500, Pinellas Pk., Fla. 33565
M Accurate Instrument Co., Dept. EM, Box No. 925, Westbury, N.Y. 11590
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
B & B Motor & Control, Dept. EM, 96 Spring St., New York, N.Y. 10012
M Bendix Corp., Electrodynamics Div., Dept. EM, 11600 Sherman Way, N. Hollywood, Calif 91605
Benton Corp, Dept. EM, Race St Box 678, Manor, PA 15665
C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
Control Systems Research, Inc., Dept. EM, CSR Bldg., 632 Fort Duquesne Blvd., Pittsburgh, Pa. 15222
Dantronics, Inc., Dept. EM, 3175 Hafner Ct., St. Paul, Minn 55112
Datron Systems, Dept. EM, 20700 Plummer St., Chatsworth, Cal. 91311
D Digiac Corp., Dept. EM, 175 Engineers Rd., Smithtown, N.Y. 11787
D Dillon, W.C. & Co., Dept. EM, 14620-EP Keswick St., Van Nuys 340, Cal. 91407
Dynapar Corp., Dept. EM, 1675 Delany Rd., Gurnee, Ill. 60031
Dynetic Systems, Dept. EM, 19128 Ind! Blvd., Elk River, Minn 55330
Electro Space Systems, Inc., Dept. EM, Box 1359, Richardson, Tex. 75080
Evershed & Vignoles Ltd., Dept. EM, Action Lane, Chiswick, London, England W4 5HJ
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
Inland Motor Div. Kollmorgen, Indl Drives Grp, Dept. EM, 609 Rock Rd., Radford, Va. 24141
Innovatek Microsystems, Inc., Dept. EM, Smithfield Rd., Millerton, N.Y. 12546
Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
Jordan Controls, Dept. EM, 5607 W. Douglas Ave., Milwaukee, Wisc. 53218
Magnetoelastic Devices, Dept. EM, 74 North St Box 625, Pittsfield, MA 01201
McFadden Elctrns. Co., Dept. EM, 8953 S. Atlantic Blvd., South Gate, Cal. 90280
M MPC Prods. Corp., Dept. EM, 4200 W. Victoria Ave., Chicago, Ill. 60646
Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
PMI Motors, Kollmorgen Corp., Dept. EM, 5 Aerial Way, Syosset, NY 11791
Robicon Corp., Dept. EM, Plus Ind'l. Pk., Pittsburgh, Pa. 15239
D Scientific Technology, Dept. EM, 1201 San Antonio Rd., Mountain View, Cal. 94043
Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
D Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
Temposonics Inc., Dept. EM, 131 East Ames Ct, Plainview, N.Y. 11803
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
M Transicoil, Inc., Dept. EM, Worcester, Pa. 19490
Unico, Inc., Dept. EM, 3725 Nicholson Rd., Franksville, Wisc. 53126
Westamp, Inc., Dept. EM, 1542 15th St., Santa Monica, Cal. 90404

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M **Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470** ..... *
Berger-Lahr Corp, Dept. EM, Peterborough Rd, Jaffrey, N.H. 03452 .. **p. 3076**
Bulova Watch Co., Servo Prods. Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
M **Clifton Precision, Litton Systems, Inc., Dept. EM, Marple at Brdway., Clifton Hgts., Pa. 19018** ..... **p. 3079**
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
Eastern Air Devices Motor Div., Electro Audio Dynamics, Inc., Dept. EM, 1 Progress Dr., Dover, N.H. 03820 ..... *
M **Interface Engineering Inc., Dept. EM, 386 Lindelof Ave., Stoughton, Mass. 02072** ..... *
Ledex Inc., Dept. EM, 123 Webster St., Dayton, Ohio 45401 ..... *
Measurement Sys., Inc., Dept. EM, 121 Water St., Norwalk, Conn. 06854 **p. 2273**
North American Philips Controls Corp., Dept. EM, Cheshire Industrial Pk. Box E, Cheshire, Conn. 06410 ..... *
D **Rapidsyn Co, Div of Dana Corp, Dept. EM, 11901 Burke St., Santa Fe Springs, Cal. 90670** ..... **p. 3106,3107**
D **Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543** ..... *
D **Superior Electric Co., Dept. EM, 1000 Middle St., Bristol, Conn. 06010** ..... *
M **Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729** ..... *
M ABA Electromechanical Sys. Inc., Dept. EM, Box 500, Pinellas Pk., Fla. 33565
Automatic Timing & Controls Co., Dept. EM, King of Prussia, Pa. 19406
B & B Motor & Control, Dept. EM, 96 Spring St., New York, N.Y. 10012
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
Datron Systems, Dept. EM, 20700 Plummer St., Chatsworth, Cal. 91311
Dynapar Corp., Dept. EM, 1675 Delany Rd., Gurnee, Ill. 60031
Electronic Counters & Controls Inc., Dept. EM, 1500 McCormick Blvd., Mundelein, Ill. 60060
Evershed & Vignoles Ltd., Dept. EM, Action Lane, Chiswick, London, England W4 5HJ
D Furnas Elec. Co., Dept. EM, 1197 McKee St., Batavia, Ill. 60510
GAP Instr. Corp., Dept. EM, 110 Marcus Blvd., Hauppauge, N.Y. 11787
M Glentek, Inc., Dept. EM, 1559 7th St., Santa Monica, Calif. 90401
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
DM Hughes Aircraft Co., Ind'l. Prods. Div., Prod. Equip. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
Icon Division, U.S.M. Corp., Dept. EM, 156 Sixth St., Cambridge, Mass. 02142
M IMC Magnetics Corp., Western Div., Dept. EM, 6058 Walker Ave., Maywood, Cal. 90270
Mesur-Matic Electronics Corp., Dept. EM, 50 Grove St., Salem, Mass. 01970
Midland Standrad Inc., Dept. EM, 603 E. Chicago St. Box 38, Elgin, ILL 60120
M MPC Prods. Corp., Dept. EM, 4200 W. Victoria Ave., Chicago, Ill. 60646
Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
D PCS., Inc., Dept. EM, 750 N. Maple Rd., Saline, Mich. 48176
D Power Control Corp., Dept. EM, 122 Gamma Dr., Pittsburgh, Pa. 15238
D Siemens-Allis, Inc., Dept. EM, Box 2168, Milwaukee, Wisc. 53201
Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
Summit Engineering Corp., Dept. EM, Box 938, Bozeman, Mont. 59715
D Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
Teledyne Gurley, Dept. EM, 514 Fulton St., Troy, N.Y. 12181
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
Warner Elec. Brake & Clutch Co., Dept. EM, Beloit, Wisc. 53511

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Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
M **Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470** **p. 2259**
M **Blue M Electric Co., Dept. EM, 138th & Chatham St., Blue Island, Ill. 60406** *
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Doric Sci., Div. Emerson Elec. Co., Dept. EM, 3883 Ruffin Rd., San Diego, Cal. 92123 ..... *
Elmwood Sensors, Inc., Dept. EM, 1655 Elmwood Ave., Cranston, RI 02907 *
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 *
D **Gulton Inds., Inc., Measurement & Control Systems Div., Dept. EM, Gulton Ind'l. Pk., E. Greenwich, R.I. 02818** ..... *
M **Harrel, Inc., Dept. EM, 16 Fitch St., E. Norwalk, Conn. 06855** ..... **p. 2267**
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D **Jewell Electrical Instruments, Inc., Dept. EM, Grenier Field, Manchester, N.H. 03108** ..... *
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Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
M **Marlow Industries, Inc., Dept. EM, 1021 S. Jupiter Rd., Garland, Tex. 75042** *
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M **McLean Engrg. Labs., Dept. EM, 70 Washington Rd., Princeton Jctn., N.J. 08550** ..... **p. 2590**
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North American Philips Controls, Dept. EM, Husky Park, Frederick, Md. 21701 ..... *
Ohio Semitronics, Inc., Dept. EM, 1205 Chesapeake Ave., Columbus, Ohio 43212 ..... *
Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 ..... *
D **Omron Electronics, Dept. EM, 233 S. Wacker Dr., Chicago, Ill. 60606** ..... *
Ovenaire, Div. Walter Kidde & Co., Dept. EM, 706 Forrest St., Charlottesville, Va. 22901 ..... *
D **RFL Inds., Thermocontrol Div., Dept. EM, Boonton, N.J. 07005** ..... **p. 4286**
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** ..... *
M Accurate Instrument Co., Dept. EM, Box No. 925, Westbury, N.Y. 11590
M Acromag, Inc., Dept. EM, 30765 Wixom Rd., Wixom, Mich. 48096
Advanced Kinetics, Dept. EM, 1231 Victoria St., Costa Mesa, Calif. 92627
D Alnor Instrument Co., Dept. EM, 7301 N. Caldwell Ave., Niles, Ill. 60648
M Analytical Measurements, Dept. EM, 31 Willow St., Chatham, N.J. 07928
M Andersen & Assoc., Walther M.A., Dept. EM, 4 Main St. Ext., Tariffville, Conn. 06081
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
M ARI Inds., Inc., Dept. EM, 9000 King St., Franklin Pk., Ill. 60131
Assembled Products Co., Dept. EM, Box 750, St. Albans, Vt. 05478
M ATEC, Inc., Dept. EM, Box 19426, Houston, Tex. 77024
Bailey Meter Co., Sub. Babcock & Wilcox, Dept. EM, 29801 Euclid Ave., Wickliffe, Ohio 44092
M Barnes Engrg. Co., Dept. EM, 30 Commerce Rd., Stamford, Conn. 06902
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
Bryant Electric, Dept. EM, 1421 State St., Bridgeport, Conn. 06602
Burling Instr. Co., Dept. EM, 16 River Rd., Box 298, Chatham, N.J. 07928
Caig Labs., Inc., Dept. EM, 1175-0 Industrial Ave., Box 64, Escondido, Cal. 92025
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
Capintec Instruments, Inc., Dept. EM, 136 Summit Ave., Montvale, N.J. 07645
Climatronics Corp., Dept. EM, 1324 Motor Pkwy., Hauppauge, N.Y. 11787
M Columbia Resch. Labs., Dept. EM, Macdade Blvd. & Bullens La., Woodlyn, Pa 19094
Columbus Electric Mfg. Co., Dept. EM, Box 289A Rt #2, Piney Flats, Tenn 37686
DM Cox & Co., Inc., Dept. EM, 215 Park Ave. S., New York, N.Y. 10003
Cross Electronics Inc., Dept. EM, 100 Commonwealth Dr., Warrendale, Pa. 15086

Degussa Corporation, Metals Div , Dept EM, Route 46 & Hollister Rd , Teterboro, NJ 07608
D Delta Design Inc , Dept EM, 5725 Kearny Villa Road, San Diego, Cal 92123
Devco Engrg., Control Sys. Div., Dept. EM, Pier La., W. Caldwell, N.J. 07006
D Eagle Signal, Mfg. Div. Gulf & Western Inds., Dept. EM, Box 3585, Davenport, Iowa 52808
D Electrol Co., Inc., Dept. EM, 321 Dewey St., York, Pa. 17404
DM Elctrn. Control Co., Dept. EM, Box S150, Dresher, Pa. 19025
Elma Engineering, Dept. EM, 1066 E. Meadow Circle, Palo Alto, Cal. 94303
FTS Systems Inc., Dept. EM, POB 158, Stone Ridge, N.Y. 12484
D GCA/Precision Scientific, Dept EM, 3737 W Cortland St , Chicago, Ill 60647
M Glentek, Inc., Dept. EM, 1559 7th St., Santa Monica, Calif. 90401
D H-B Instr. Co., Dept. EM, 4306 N. American St, Philadelphia, Pa. 19140
Honeywell Inc., Commerical Div., Dept. EM, Honeywell Plaza, Minneapolis, Minn. 55408
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
Hy-Cal Engrg, Dept. EM, 12105 Los Nietos Rd., Santa Fe Springs, Cal 90670
D Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
Ircon Inc., Dept. EM, 7555 N. Linder Ave, Skokie, Ill. 60076
IRD Mechanalysis, Inc., Dept. EM, 6150 Huntley Rd., Columbus, Ohio 43229
M ITT General Controls, Dept. EM, 801 Allen Ave., Glendale, Cal. 91201
KB Electronics Inc., Dept. EM, 5801 Foster Ave., Brooklyn, N.Y. 11234
Lab-Line Instrs, Dept. EM, 15th & Bloomingdale, Melrose Park, Ill. 60160
Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Luft Instrs., Inc., Dept. EM, Hillside Rd, Lincoln, Mass. 01773
3M Co., Indl Elect Prods. Div., Dept. EM, 3M Center, St. Paul, Minn. 55101
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
D Master Elctrn. Controls, Dept. EM, 1651-19th St., Santa Monica, Cal. 90404
Micro, Emerson Electric Co. Devices Div, Dept. EM, Box 501 Wright Bros Br, Dayton, Ohio 45409
Mikron Instr. Co., Dept. EM, Box 211, Ridgewood, N.J. 07451
MKC Electronics, Dept. EM, 454 E. Donovan Rd., Kansas City, Kans. 66115
Murata Corporation of America, Dept. EM, 1148 Franklin Rd., S.E., Marietta, Ga. 30067
NAN MAC, Dept. EM, 9 Mayhew St., Framingham, Mass. 01701
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
Nuclear Resch. Corp., Dept. EM, 1105 Indl. Hwy., Southampton, Pa. 18966
OAL Assocs., Inc., Dept. EM, P.O. Box 64, Escondido, Cal. 92025
M Oven Industries, Inc., Dept. EM, 800 New Holland Ave., Mechanicsburg, Pa. 17055
Payne Engrg. Co., Dept. EM, Box 70, Scott Depot, W. Va. 25560
PIL Electronics, Dept. EM, 10211 Vinemont St., Dallas, Tex. 75218
D Power Control Corp., Dept. EM, 122 Gamma Dr., Pittsburgh, Pa. 15238
Princeton Applied Resch. Corp., Dept. EM, Box 2565, Princeton, N.J. 08540
Princo Instrs., Dept. EM, Industrial Pk., Southampton, Pa. 18966
D Research, Inc., Dept. EM, Box 24064, Minneapolis, Minn. 55424
RIL Elctrns., Inc., Dept. EM, 1105 Ind'l. Hwy., Southampton, Pa. 18966
D Robertshaw Controls Co., Ind'l. Instr. Div., Dept. EM, 1910 Byrd Ave Ste 200, Richmond, Va. 23230
Robicon Corp., Dept. EM, Plus Ind'l. Pk., Pittsburgh, Pa. 15239
M Sierracin/Thermal Sys., Dept. EM, 13920 S. Broadway, Los Angeles, Cal. 90061
Sigma Sys. Corp., Dept. EM, 3163 Adams Ave., San Diego, Calif. 92116
D Singer Co., American Meter Div., Dept. EM, 13500 Philmont Ave., Philadelphia, Pa. 19116
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711, Box 472, Milwaukee, Wisc. 53201
Sundstrand Data Control, Dept. EM, Overlake Ind'l. Pk., Redmond, Wash. 98052
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
M Syscon Int'l., Inc., Dept. EM, 1239 South Bend Ave., So. Bend, Ind. 46617
Sys-Tec Inc., Dept. EM, 877 Third St. S.W., New Brighton, Minn. 55112
Tempkey Inc., Dept. EM, 2155 Park Blvd., Palo Alto, Cal. 94306
Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803
D Temptronic Corporation, Dept. EM, 40 Glen Ave., Newton, Mass. 02159
Texas Instruments Control Prods. Div., Dept. EM, 34 Forrest St., Attleboro, Mass. 02703
Therm-O-Disc, Inc., Dept. EM, South Main St., Mansfield, Ohio 44907
Thermo Elec. Co., Inc., Dept. EM, 109 Fifth St., Saddle Brook, N.J. 07662
M Thermometrics, Inc., Dept. EM, 808 US Hwy No. 1, Edison, N.J. 08817
M Thermotron Corp., Dept. EM, Kollen Park Dr., Holland, Mich 49423
Tracor, Inc., Dept. EM, 6500 Tracor La., Austin, Tex. 78721
Trans-Met Engrg., Dept. EM, 601 S. Palm St., La Habra, Cal. 90631
UFAD Corp., Dept. EM, 700 36th St. S.E., Grand Rapids, Mich. 49508
DM Ulvac North America, Dept. EM, Colchester Plaza, Colchester, VT 05446
D United Elec. Controls Co., Dept. EM, 85A School St., Watertown, Mass. 02172
Vectrol, Inc., Dept. EM, 110 Douglas Rd, Oldsmar, Fla. 33557
D Victory Engrg. Corp., Dept. EM, Victory Rd., Springfield, N.J. 07081
VirTis Co., Dept. EM, Rte. 208, Gardiner, N.Y. 12525
Voltex Co., Inc., Dept. EM, 115 Marine St., Farmingdale, N.Y. 11735
D Watlow Elec. Mfg. Co., Dept. EM, 12001 Lackland Rd., St. Louis, Mo. 63141
West Coast Resch. Corp., Dept. EM, Box 25061, Los Angeles, Cal. 90025
D West Instrs, Gulton Inds, M. C. S. Div., Dept. EM, Gulton Indl Pk, E. Greenwich, RI 02818
D Yellow Springs Instrument Co., Dept. EM, Box 279, Yellow Springs, Ohio 45387

Controls, Thyratron Grid

Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 .... *
Vectrol, Inc., Dept. EM, 110 Douglas Rd, Oldsmar, Fla. 33557

Controls, Timing—See Timers

Controls, Torque-Electronic

Advance Conversion Devices Co., Dept. EM, 109 Eighth St., Passaic, N. J. 07055 ..... *
M Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470 ..... *
D Bodine Electric Co., Dept. EM, 2500 W. Bradley Pl., Chicago, Ill. 60618 ..... *
M Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 ..... *
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
M Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735 ..... *
Torque Systems, Sub. Rotron/EG & G Co., Dept. EM, P.O. Box 588, 225-E. Crescent St., Waltham, Mass. 02154 ..... *
M ABA Electromechanical Sys. Inc., Dept. EM, Box 500, Pinellas Pk., Fla. 33565
D Acurex-Autodata, Dept. EM, 485 Clyde, Mountain View, Cal. 94042
Ambi-Tech Inds. Inc., Dept. EM, 319 Knickerbocker Ave, Hillsdale, NJ 07642
Applied Systems Corp., Dept. EM, 26401 Harper Ave., St. Clair Shores, Mich. 48081
B & B Motor & Control, Dept. EM, 96 Spring St., New York, N.Y. 10012
M Columbia Resch. Labs., Dept. EM, Macdade Blvd. & Bullens La., Woodlyn, Pa. 19094
Control Systems Research, Inc., Dept. EM, CSR Bldg., 632 Fort Duquesne Blvd., Pittsburgh, Pa. 15222
D Dillon, W.C. & Co., Dept. EM, 14620-EP Keswick St., Van Nuys 340, Cal. 91407
D Electrol Co., Inc., Dept. EM, 321 Dewey St., York, Pa. 17404
Himmelstein & Co., S., Dept. EM, 2500 Estes Ave., Elk Grove Village, Ill. 60007
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
KB Electronics Inc., Dept. EM, 5801 Foster Ave., Brooklyn, N.Y. 11234
Magnetoelastic Devices, Dept. EM, 74 North St Box 625, Pittsfield, MA 01201
Moxon Inc., Dept. EM, 2222 Michelson Dr. Bldg. E, Irvine, Cal. 92715
Payne Engrg. Co., Dept. EM, Box 70, Scott Depot, W. Va. 25560
D PCS., Inc., Dept. EM, 750 N. Maple Rd., Saline, Mich. 48176
PMI Motors, Kollmorgen Corp., Dept. EM, 5 Aerial Way, Syosset, NY 11791
Robicon Corp., Dept. EM, Plus Ind'l. Pk., Pittsburgh, Pa. 15239
Vibrac Corp., Dept. EM, 11 Alpha Rd., Chelmsford, Mass. 01824
WER Industrial, Div. Emerson Elec. Co., Dept. EM, 3036 Alt Blvd., Grand Island, N.Y. 14072
West Coast Resch. Corp., Dept. EM, Box 25061, Los Angeles, Cal. 90025

Controls, Vibrator

Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
D Staco, Inc., Dept. EM, 301 Gaddis Blvd., Dayton, Ohio 45403 ..... *

Controls, Voltage Regulating—See Regulators & Stabilizers,Voltage

Controls, Volume & Tone—See Potentiometers; Rheostats

Convection Cooling Packages, Semiconductor—See Transistor, Diode, Thyristor Heat Dissipators

Converters, A-C to D-C (Non-Rotary)—See Power Supplies, A-C to D-C

Converters, Analog To Digital

A. D. Data Sys., Inc., Dept. EM, POB 9209, Rochester, N.Y. 14625 ..... *
Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470 p. 2259
DM Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634 ..... p. 2852
M BEI Elctrns., Inc., Dept. EM, 1101 McAlmont St., Little Rock, Ark. 72203 .... *
M Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734 p. 1388,1389
M Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731 ..... *
M Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 .. p. 3975
Data Translation, Dept. EM, 4 Strathmore Rd., Natick, Mass. 01760 ..... *
M Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 p. 1401
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... p. 1469
Doric Sci., Div. Emerson Elec. Co., Dept. EM, 3883 Ruffin Rd., San Diego, Cal. 92123 ..... *
M Epsco, Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 ..... *
Fifth Dimension, Dept. EM, 707 Alexander Rd., Princeton, N.J. 08540 ..... *
M General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
IBM Instrument Systems, Dept. EM, 1000 Westchester Ave., White Plains, N. Y. 10604 ..... *
M ILC Data Device Corp., Dept. EM, Airport Int'l. Plaza, Bohemia, N.Y. 11716 p. 1644,1645
M Integrated Circuits, Inc., Dept. EM, 13256 Northrup Way, Bellevue, Wash. 98005 ..... *
M Interface Engineering Inc., Dept. EM, 386 Lindelof Ave., Stoughton, Mass. 02072 ..... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
Measurement Sys., Inc., Dept. EM, 121 Water St., Norwalk, Conn. 06854 .... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705 ..... *
North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803 ..... *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 .. p. 2275
M Perkin-Elmer Corp., Elctrn. Prods. Dept., Dept. EM, Main Ave., Norwalk, Conn. 06856 ..... *
DM Phoenix Data Inc., Dept. EM, 3384 W. Osborn Rd., Phoenix, Ariz. 85017 p. 1661,1662

Preston Scientific Inc., Dept. EM, 805 E. Cerritos Ave., Anaheim, Cal. 92805 p. 1009,1664,1665
Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 *
M **Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729** *
D Acurex-Autodata, Dept. EM, 485 Clyde, Mountain View, Cal. 94042
Anadex Inc., Dept. EM, 9825 De Soto, Chatsworth, Cal. 91311
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Analogic Corp., Dept. EM, Audubon Rd., Wakefield, Mass. 01880
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
M Aydin, Vector Div., Dept. EM, Box 328, Newtown, PA 18940
M Bay Laboratories, Inc., Dept. EM, 20160 Center Ridge Rd., Cleveland, Ohio 44116
Biomation, Dept. EM, 10411 Bubb Rd., Cupertino, Cal. 95014
C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
M Circuit Technology, Dept. EM, 160 Smith St., Farmingdale, N.Y. 11735
Consolidated Controls Corp., Dept. EM, 15 Durant Ave., Bethel, Conn. 06801
M Data Acquisition Prods. Lab., AEL, Inc., Dept. EM, Box 552, Lansdale, Pa. 19446
Data General Corp., Dept. EM, 15 Turnpike Rd Rte 9, Westboro, Mass 01581
Data Tech, Div. of Penril Corp., Dept. EM, 2700 S. Fairview, Santa Ana, Cal. 92704
Datawest Corp., Dept. EM, 7333 E. Helm Dr., Scottsdale, Ariz. 85260
Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
Dynamic Measurements Corp., Dept. EM, 6 Lowell Ave., Winchester, Mass. 01890
E-H International, Inc., Dept. EM, 515 11th St Box 1289, Oakland, Cal 94604
E-H Resch. Labs., Inc., Dept. EM, Box 1289, Oakland, Cal. 94604
D EMR Telemetry, Div. Sangamo-Weston, Dept. EM, Box 3041, Sarasota, Fla. 33578
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Fairchild Camera & Instr., Federal Systems Group, Dept. EM, 300 Robbins La., Syosset, N.Y. 11791
Ferranti Elec., Dept. EM, East Bethpage Rd., Plainview, N.Y. 11803
GAP Instr. Corp., Dept. EM, 110 Marcus Blvd., Hauppauge, N.Y. 11787
GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
Innovatek Microsystems, Inc., Dept. EM, Smithfield Rd., Millerton, N.Y. 12546
DM Intech/Function Modules, Dept. EM, 282 Brokaw, Santa Clara, Cal. 95050
D Intersil, Inc., Dept. EM, 10900 N. Tantau Ave., Cupertino, Cal. 95014
Intronics Inc., Dept. EM, 57 Chapel St., Newton, Mass. 02158
IPAC Group, Inc., Dept. EM, POB 156 3047 Industrial Blvd., Bethel Park, PA 15102
D Macrodyne Inc., Dept. EM, 1900 Maxon Rd., Box 1079, Schenectady, N.Y. 12301
Micro Instrument Co., Marine & Power Instr. Div., Dept. EM, 2250 Micro Pl., Escondido, Cal. 92025
M Micro Networks, Dept. EM, 324 Clark St., Worcester, Mass. 01606
Midland Standrad Inc., Dept. EM, 603 E. Chicago St. Box 38, Elgin, ILL 60120
M Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
Novatronics, Inc., Dept. EM, Box 878, Pompano Beach, Fla. 33061
D PCS., Inc., Dept. EM, 750 N. Maple Rd., Saline, Mich. 48176
RFL Inds., Comms. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005
Rochester Instr System, Dept. EM, 255 N. Union St., Rochester, N.Y. 14605
D Signetics Corp., Dept. EM, 811 E. Arques Ave., Sunnyvale, Cal. 94086
D Siliconix, Inc., Dept. EM, 2201 Laurelwood Rd., Santa Clara, Cal 95054
Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
D Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
Systems Research Labs. Inc., Dept. EM, 2800 Indian Ripple Rd., Dayton, Ohio 45440
M Systems Solvers, Dept. EM, Box 873, Lake Elmo, Minn. 55042
Teledyne Gurley, Dept. EM, 514 Fulton St., Troy, N.Y. 12181
Teledyne Philbrick, Dept. EM, 17 Allied Dr. Rte 128, Dedham, Mass. 02026
DM Teledyne Semiconductor, Dept. EM, 1300 Terra Bella Ave., Mountain View, Cal. 94040
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
TRW LSI Products, Dept. EM, One Space Pk., Redondo Beach, Cal. 90278
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
D Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102
D Velonex, Display Prods., Dept. EM, 560 Robert Ave., Santa Clara, Cal. 95050
M Westinghouse Canada Ltd., Dept. EM, Box 510, Hamilton, Ont., Can.
Wyle Computer Prods., Dept. EM, 3200 Magruder Blvd., Hampton, Va 23666

Converters, Analog To Pulse

M **Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731** *
M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101** *
Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 p. 1401
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** *
M **Measurement Sys., Inc., Dept. EM, 121 Water St., Norwalk, Conn. 06854** *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 *
M Acromag, Inc., Dept. EM, 30765 Wixom Rd., Wixom, Mich. 48096
Anadex Inc., Dept. EM, 9825 De Soto, Chatsworth, Cal. 91311
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
Dynamic Measurements Corp., Dept. EM, 6 Lowell Ave., Winchester, Mass. 01890
GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
IPAC Group, Inc., Dept. EM, POB 156 3047 Industrial Blvd., Bethel Park, PA 15102
Midgard Electronics, Dept. EM, 175 California St., Newton, Mass. 02158
Optical Electronics, Inc., Dept. EM, Box 11140, Tucson, Ariz. 85734
M Power Instrs., Inc., Dept. EM, 7352 N. Lawndale Ave., Skokie, Ill. 60076
Richard-Lee Co., Dept. EM, Box 724, New Providence, N.J. 07974
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
DM Teledyne Semiconductor, Dept. EM, 1300 Terra Bella Ave., Mountain View, Cal. 94040
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Converters, Binary To Decimal

M **Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731** *
M **Control Sciences, Inc., Dept. EM, 8399 Topanga Canyon Blvd., Canoga Park, Cal. 91304** *
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 p. 1469
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** *
IBM Instrument Systems, Dept. EM, 1000 Westchester Ave., White Plains, N. Y. 10604 *
M **Interface Engineering Inc., Dept. EM, 386 Lindelof Ave., Stoughton, Mass. 02072** *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
Refac Elctrns. Pinlite®, Wild Rover®, Dept. EM, Box 809, W. Hill Rd., Winsted, Conn 06098 *
M **Trak Systems, Div. TRAK Microwave Corp., Dept. EM, 4722 Eisenhower Blvd., Dept. E8, Tampa, Fla. 33614** *
Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735 p. 1673
M **Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729** *
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
Decom Systems, Inc., Dept. EM, 1404 Descanso Rd., San Marcos, Ca. 92069
Dynamic Measurements Corp., Dept. EM, 6 Lowell Ave., Winchester, Mass. 01890
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
Tech Serv., Inc., BRS/LVE Div, Dept. EM, 5301 Holland Dr., Beltsville, Md 20705
DM Teledyne Semiconductor, Dept. EM, 1300 Terra Bella Ave., Mountain View, Cal. 94040
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
Wyle Computer Prods., Dept. EM, 3200 Magruder Blvd., Hampton, Va 23666

Converters, Card To Tape

Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
Decom Systems, Inc., Dept. EM, 1404 Descanso Rd., San Marcos, Ca. 92069
Lundy Elctrns. & Sys., Inc., Dept. EM, Robert La., Glen Head, N.Y. 11545
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Converters, CRT Display

M **AMP Capitron Div./AMP Inc., Dept. EM, 1595 S. Mt. Joy St., Elizabethtown, Pa. 17022** *
Bertan Assocs., Inc., Dept. EM, 3 Aerial Way, Syosset, N.Y. 11791 *
Data Translation, Dept. EM, 4 Strathmore Rd., Natick, Mass. 01760 *
M **Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550** *
EWC, Inc., Dept. EM, 725 Federal Ave., Kenilworth, N.J. 07033 *
Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
Power Systems, Inc., Dept. EM, 12 Tobey Rd., Bloomfield, Conn. 06002 *
M **Spellman High Voltage Elctrns. Corp., Dept. EM, 7 Fairchild Ave., Plainview, N.Y. 11803** *
D **Venus Scientific, Inc., Dept. EM, 399 Smith St., Farmingdale, N.Y. 11735** *
M C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
Conrac Div., Conrac Corp., Dept. EM, 600 N. Rimsdale Ave., Covina, Calif. 91722
Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
Dynamic Measurements Corp., Dept. EM, 6 Lowell Ave., Winchester, Mass. 01890
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
Information Displays, Inc., Dept. EM, 150 Clearbrook Rd., Elmsford, N.Y. 10523
Intronics Inc., Dept. EM, 57 Chapel St., Newton, Mass. 02158
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Pacific Atlantic Trading Co., Dept. EM, Box 754, El Cerrito, C.A. 94530
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Peschel Instrs., Inc., Dept. EM, 1412 Viscaya Pkwy., Cape Coral, Fla. 33904
Reich Associates Inc., Dept. EM, PO Box 73, Plano, Tex 75074
M Sawyer Inds., Dept. EM, 5649 Peck Rd., Arcadia, Cal. 91006
M Universal Elctrns. Corp., Dept. EM, 20747 Dearborn St., Chatsworth, Cal. 91311
M Velonex, Instrument Div., Dept. EM, 560 Robert Ave., Santa Clara, Cal. 95050

Converters, D-C to Frequency (Power)—See Inverters, D-C to A-C

Converters, D-C to Sine-Cosine

Abacus Controls Inc., Dept. EM, 89 Redington Rd., Somerville, N.J. 08876 *
Abbott Transistor Labs., Industrial Div., Dept. EM, 5200 W. Jefferson Blvd., Los Angeles, Cal. 90016 ..... p. 3150
Abbott Transistor Labs, Power Supply Div., Dept. EM, 5200 W. Jefferson Blvd., Los Angeles, Cal. 90016 ..... p. 3150,3162
M **Avtel Div, Unitron Corp., Dept. EM, 2826 W. Kingsley Rd, Box 1331, Garland, Tex. 75040** ..... p. 3362-3364

Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
M Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731 ..... *
Deltec Corp., Dept. EM, 980 Buenos Ave., San Diego, Cal. 92110 ..... p. 3376
EWC, Inc., Dept. EM, 725 Federal Ave., Kenilworth, N.J. 07033 ..... *
General Magnetics, Dept. EM, 211 Grove St., Bloomfield, N.J. 07003 p. 2266
M Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735 ..... *
M Interface Engineering Inc., Dept. EM, 386 Lindelof Ave., Stoughton, Mass. 02072 ..... *
M Sigmapower, Inc., Dept. EM, 20790 Leapwood Ave., Carson, Cal. 90746 ..... *
Topaz Electronics, Dept. EM, 3855 Ruffin Rd., San Diego, Cal. 92123 p. 3406
M Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735 p. 1673
M Unitron Inc., Dept. EM, 2826 W. Kingsley Rd., Box 2159, Garland, Tex. 75041 p. 3362-3364
M Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... *
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
Intronics Inc., Dept. EM, 57 Chapel St., Newton, Mass. 02158
Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
Optical Electronics, Inc., Dept. EM, Box 11140, Tucson, Ariz. 85734
M Welco Inds. Inc., Dept. EM, 9027 Shell Ave., Cincinnati, Ohio 45236

Converters, Digital To Analog

DM Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634 ..... p. 2852
M Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734 p. 1388,1389
M Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731 ..... *
M Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 ..... *
Data Translation, Dept. EM, 4 Strathmore Rd., Natick, Mass. 01760 ..... *
M Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 p. 1401
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... p. 1469
Electronic Dev. Corp., Dept. EM, 11 Hamlin St., Boston, Mass. 02127 ..... *
Elgar Corporation, Dept. EM, 8225 Mercury Ct., San Diego, Cal. 92111 ..... *
M Epsco, Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 ..... *
Fifth Dimension, Dept. EM, 707 Alexander Rd., Princeton, N.J. 08540 ..... *
D Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
IBM Instrument Systems, Dept. EM, 1000 Westchester Ave., White Plains, N. Y. 10604 ..... *
M ILC Data Device Corp., Dept. EM, Airport Int'l. Plaza, Bohemia, N.Y. 11716 p. 1644,1645
M Integrated Circuits, Inc., Dept. EM, 13256 Northrup Way, Bellevue, Wash. 98005 ..... *
M Interface Engineering Inc., Dept. EM, 386 Lindelof Ave., Stoughton, Mass. 02072 ..... p. 1648
Kepco, Inc., Dept. EM, 131-38 Sanford Ave., Flushing, N.Y. 11352 ..... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
M Perkin-Elmer Corp., Elctrn. Prods. Dept., Dept. EM, Main Ave., Norwalk, Conn. 06856 ..... *
DM Phoenix Data Inc., Dept. EM, 3384 W. Osborn Rd., Phoenix, Ariz. 85017 p. 1663
Preston Scientific Inc., Dept. EM, 805 E. Cerritos Ave., Anaheim, Cal. 92805 p. 1665
Trak Systems, Div. TRAK Microwave Corp., Dept. EM, 4722 Eisenhower Blvd., Dept. E8, Tampa, Fla. 33614 ..... *
M Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... *
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Analogic Corp., Dept. EM, Audubon Rd., Wakefield, Mass. 01880
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
Cherry Semiconductor Corp, Dept. EM, 99 Bald Hill Rd., Cranston, RI 02920
M Circuit Technology, Dept. EM, 160 Smith St., Farmingdale, N.Y. 11735
Conrac Corp., Systems Sls Div., Dept. EM, Three Landmark Sq., Stamford, Conn. 06901
M Data Acquisition Prods. Lab., AEL, Inc., Dept. EM, Box 552, Lansdale, Pa. 19446
Data General Corp., Dept. EM, 15 Turnpike Rd Rte 9, Westboro, Mass 01581
Data Tech, Div. of Penril Corp., Dept. EM, 2700 S. Fairview, Santa Ana, Cal. 92704
Datawest Corp., Dept. EM, 7333 E. Helm Dr., Scottsdale, Ariz. 85260
Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
Decom Systems, Inc., Dept. EM, 1404 Descanso Rd., San Marcos, Ca. 92069
D Digiac Corp., Dept. EM, 175 Engineers Rd., Smithtown, N.Y. 11787
Dynamic Measurements Corp., Dept. EM, 6 Lowell Ave., Winchester, Mass. 01890
E-H International, Inc., Dept. EM, 515 11th St Box 1289, Oakland, Cal 94604
E-H Resch. Labs., Inc., Dept. EM, Box 1289, Oakland, Cal. 94604
D EMR Telemetry, Div. Sangamo-Weston, Dept. EM, Box 3041, Sarasota, Fla. 33578
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal 92627
Fairchild Camera & Instr., Federal Systems Group, Dept. EM, 300 Robbins La., Syosset, N.Y. 11791
Ferranti Elec., Dept. EM, East Bethpage Rd., Plainview, N.Y. 11803
GAP Instr. Corp., Dept. EM, 110 Marcus Blvd., Hauppauge, N.Y. 11787
GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854
Halex, Inc., Dept. EM, 1202 McGaw Ave, Irvine, Ca. 92714
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M HyComp Inc., Dept. EM, Box 250, Maynard, Mass. 01754
M Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
DM Intech/Function Modules, Dept. EM, 282 Brokaw, Santa Clara, Cal. 95050
D Intersil, Inc., Dept. EM, 10900 N. Tantau Ave., Cupertino, Cal. 95014
Intronics Inc., Dept. EM, 57 Chapel St., Newton, Mass. 02158
Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
M Micro Networks, Dept. EM, 324 Clark St., Worcester, Mass. 01606
Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
Novatronics, Inc., Dept. EM, Box 878, Pompano Beach, Fla. 33061
Optical Electronics, Inc., Dept. EM, Box 11140, Tucson, Ariz. 85734
D PCS., Inc., Dept. EM, 750 N. Maple Rd., Saline, Mich. 48176
DM Precision Monolithics Inc., Dept. EM, 1500 Space Dr., Santa Clara, Cal. 95050
RFL Inds., Comms. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005
Rochester Instr System, Dept. EM, 255 N. Union St., Rochester, N.Y. 14605
Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
Sorensen Co., Dept. EM, 676 Island Pond Rd., Manchester, N.H. 03103
D Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
Teledyne Philbrick, Dept. EM, 17 Allied Dr. Rte 128, Dedham, Mass. 02026
TRW LSI Products, Dept. EM, One Space Pk., Redondo Beach, Cal. 90278
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Wyle Computer Prods., Dept. EM, 3200 Magruder Blvd., Hampton, Va 23666
M Zeta Laboratories, Inc., Dept. EM, 3265 Scott Blvd., Santa Clara, Cal. 95051

Converters, Digital To Paper Tape

A. D. Data Sys., Inc., Dept. EM, POB 9209, Rochester, N.Y. 14625 ..... *
Data Specialties, Dept. EM, 3455 Commercial Ave., Northbrook, Ill. 60062 *
Itoh Electronics, Inc. (C.), Dept. EM, 280 Park Ave., New York, N.Y. 10017 p. 1647
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403 ..... *
Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
Decom Systems, Inc., Dept. EM, 1404 Descanso Rd., San Marcos, Ca. 92069
GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006

Converters, Digital To Resolver

M Clifton Precision, Litton Systems, Inc., Dept. EM, Marple at Brdway., Clifton Hgts., Pa. 19018 ..... *
M Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731 ..... *
M Control Sciences, Inc., Dept. EM, 8399 Topanga Canyon Blvd., Canoga Park, Cal. 91304 ..... p. 1395
M Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 ..... *
M Epsco, Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 ..... *
M ILC Data Device Corp., Dept. EM, Airport Int'l. Plaza, Bohemia, N.Y. 11716 p. 1645
M Interface Engineering Inc., Dept. EM, 386 Lindelof Ave., Stoughton, Mass. 02072 ..... *
M Natel Engineering Co., Dept. EM, 8954 Mason Ave., Canoga Park, Cal. 91306 p. 1656
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
M North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803 ..... *
M Perkin-Elmer Corp., Elctrn. Prods. Dept., Dept. EM, Main Ave., Norwalk, Conn. 06856 ..... *
M Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735 p. 1673
M Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... p. 1674
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
M C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
Fairchild Camera & Instr., Federal Systems Group, Dept. EM, 300 Robbins La., Syosset, N.Y. 11791
GAP Instr. Corp., Dept. EM, 110 Marcus Blvd., Hauppauge, N.Y. 11787
Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Converters, Digital To Synchro

M Applied Microwave, Div. Epsco Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 ..... *
M Clifton Precision, Litton Systems, Inc., Dept. EM, Marple at Brdway., Clifton Hgts., Pa. 19018 ..... *
M Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731 ..... *
M Control Sciences, Inc., Dept. EM, 8399 Topanga Canyon Blvd., Canoga Park, Cal. 91304 ..... p. 1395
M Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 ..... *
M Epsco, Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 ..... *
M ILC Data Device Corp., Dept. EM, Airport Int'l. Plaza, Bohemia, N.Y. 11716 p. 1644,1645
M Interface Engineering Inc., Dept. EM, 386 Lindelof Ave., Stoughton, Mass. 02072 ..... p. 1648
M Natel Engineering Co., Dept. EM, 8954 Mason Ave., Canoga Park, Cal. 91306 p. 1656
M North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803 p. 1658,2795
M Perkin-Elmer Corp., Elctrn. Prods. Dept., Dept. EM, Main Ave., Norwalk, Conn. 06856 ..... *
M Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735 p. 1673
M Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... p. 1674
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062

Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
GAP Instr. Corp., Dept. EM, 110 Marcus Blvd., Hauppauge, N.Y. 11787
Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
M Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Converters, Frequency, Logarithmic

Avtel Div, Unitron Corp., Dept. EM, 2826 W. Kingsley Rd, Box 1331, Garland, Tex. 75040 ..... p. 3362-3364
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735 *
Unitron Inc., Dept. EM, 2826 W. Kingsley Rd., Box 2159, Garland, Tex. 75041 p. 3362-3364
Analogic Corp., Dept. EM, Audubon Rd., Wakefield, Mass. 01880
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Spectral Dynamics Corp., Dept. EM, Box 671, San Diego, Cal. 92112

Converters, Frequency Shift Keying

Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Georator Corporation, Dept. EM, Box 70, Manassas, Va. 22110 p. 3262,3386
GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 ..... *
M Alden Elctrn. & Impulse Recording Equip. Co., Dept. EM, Washington St., Westboro, Mass. 01581
Cal-Tek Engrg, Dept. EM, 29 Pemberton Rd., Wayland, Mass. 01778
Communication Assocs., Inc., Dept. EM, 200 McKay Rd., Huntington Station, N.Y. 11746
Dantel, Inc., Dept. EM, 1922 North Helm, Fresno, Cal. 93727
Decom Systems, Inc., Dept. EM, 1404 Descanso Rd., San Marcos, Ca. 92069
Electrocom Inds., Dept. EM, 1105 N. Ironwood Dr., S. Bend, Ind. 46615
Novatronics, Inc., Dept. EM, Box 878, Pompano Beach, Fla. 33061
RFL Inds., Comms. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343

Converters, Frequency, Test

Abacus Controls Inc., Dept. EM, 89 Redington Rd., Somerville, N.J. 08876 *
M A.L.S. Electronics Corp., Dept. EM, 1400 N. Baxter St., Anaheim, Cal. 92806 *
M Avtel Div, Unitron Corp., Dept. EM, 2826 W. Kingsley Rd, Box 1331, Garland, Tex. 75040 ..... *
Behlman Engineering Corp., Dept. EM, Box 4518, 427 N. Nopal St., Santa Barbara, Cal. 93103 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
D California Instrs., Dept. EM, 5150-Convoy St., San Diego, Cal. 92111 ..... *
Elgar Corporation, Dept. EM, 8225 Mercury Ct., San Diego, Cal. 92111 ..... *
Era Transpac Corp., Sub. Elctrn. Research Assocs., Dept. EM, 311 B East Park St. Dept. 1202, Moonachie, N.J. 07074 ..... *
Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040 p. 2324
M Georator Corporation, Dept. EM, Box 70, Manassas, Va. 22110 p. 3262,3386
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
M Marine Electric Railway Prods. Div., Inc., Dept. EM, 167 National Rd., Edison, N.J. 08817 ..... *
Nova Electric Mfg. Co., Dept. EM, 263 Hillside Ave., Nutley, N.J. 07110 ..... *
Topaz Electronics, Dept. EM, 3855 Ruffin Rd., San Diego, Cal. 92123 ..... *
M Unitron Inc., Dept. EM, 2826 W. Kingsley Rd., Box 2159, Garland, Tex. 75041 *
Aerospace Avionics, Inc., Dept. EM, Airport International Plaza, 110 Wilbur Pl., Bohemia, N.Y. 11716
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
Novatronics, Inc., Dept. EM, Box 878, Pompano Beach, Fla. 33061
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343

Converters, Frequency to D-C-Also See Power Supplies A-C Input, D-C Output

Active Control Instrumentation, Dept. EM, PO Box 243-Wildwood Circle, Key Largo, Florida 33037 ..... *
Advance Conversion Devices Co., Dept. EM, 109 Eighth St., Passaic, N. J. 07055 ..... *
Airpax Elctrns., Controls Div., Dept. EM, 6801 W. Sunrise Blvd., Ft. Lauderdale, Fla. 33313 ..... *
Almond Instrs. Co., Dept. EM, 1223 East Edna Pl., Covina, Cal. 91724 ..... *
A.L.S. Electronics Corp., Dept. EM, 1400 N. Baxter St., Anaheim, Cal. 92806 p. 3204,3205
M AMP Capitron Div./AMP Inc., Dept. EM, 1595 S. Mt. Joy St., Elizabethtown, Pa. 17022 ..... *
M Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 ..... *
D ATR Electronics, Inc., Dept. EM, 300 E. 4th St., St. Paul, Minn. 55101 ..... *
M Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470 ..... *
Avionic Instrs. Inc., Dept. EM, 943 E. Hazelwood Ave., Rahway, N.J. 07065 *
Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734 ..... *
M Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731 ..... *
Computer Power, Inc., Dept. EM, 124E West Main Street, High Bridge, New Jersey 08829 ..... *
M Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 ..... *
D-B Developments, Dept. EM, 7709 Kilbourne Rd., Rome, NY 13440 .. p. 1399
Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 p. 1401
Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 .. *
D Dormeyer Industries, Dept. EM, 3418 N. Milwaukee, Chicago, Ill. 60641 ..... *
M Eanco, Inc., Mid-Eastern Prods., Dept. EM, 539 Jacksonville Rd., Warminster, Pa. 18974 ..... *
Era Transpac Corp., Sub. Elctrn. Research Assocs., Dept. EM, 311 B East Park St. Dept. 1202, Moonachie, N.J. 07074 ..... *
EWC, Inc., Dept. EM, 725 Federal Ave., Kenilworth, N.J. 07033 ..... *
M Georator Corporation, Dept. EM, Box 70, Manassas, Va. 22110 p. 3262,3386
Interelectronics Corp., Dept. EM, Interelectronics Park, 550 U.S. Rte. 303, Congers, N.Y. 10920 ..... *
Magnetico, Inc., Dept. EM, 182 Morris Ave., Holtsville, N.Y. 11742 ..... *
M Marine Electric Railway Prods. Div., Inc., Dept. EM, 167 National Rd., Edison, N.J. 08817 ..... *
Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 .. p. 2275
Topaz Electronics, Dept. EM, 3855 Ruffin Rd., San Diego, Cal. 92123 p. 3402
M Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040 *
Wilmore Elctrns. Co., Dept. EM, Box 2973, W. Durham Sta., Durham, N.C. 27705 ..... *
M Acromag, Inc., Dept. EM, 30765 Wixom Rd., Wixom, Mich. 48096
Aerospace Avionics, Inc., Dept. EM, Airport International Plaza, 110 Wilbur Pl., Bohemia, N.Y. 11716
Anadex Inc., Dept. EM, 9825 De Soto, Chatsworth, Cal. 91311
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Basler Electric Co., Dept. EM, Box 269, Rte. 143, Highland, Ill. 62249
M Cal-Power Corp., Dept. EM, 140 Kansas St., El Segundo, Calif. 90245
Dantronics, Inc., Dept. EM, 3175 Hafner Ct., St. Paul, Minn 55112
Dynamic Measurements Corp., Dept. EM, 6 Lowell Ave., Winchester, Mass. 01890
M Electric Indicator Co., Inc., Dept. EM, 272 Main Avenue, Norwalk, Conn. 06851
D Electro Corp., Dept. EM, Box 3049, Sarasota, Fla. 33578
M Flow Technology, Inc., Dept. EM, Box 21346, Phoenix, Ariz. 85036
GAP Instr. Corp., Dept. EM, 110 Marcus Blvd., Hauppauge, N.Y. 11787
Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704
Intech/Function Modules, Dept. EM, 282 Brokaw, Santa Clara, Cal. 95050
IPAC Group, Inc., Dept. EM, POB 156 3047 Industrial Blvd., Bethel Park, PA 15102
Metrix Instrument Co., Metrix Instrument Co., Dept. EM, 1711 Townhurst, Houston, Tex. 77043
Novatronics, Inc., Dept. EM, Box 878, Pompano Beach, Fla. 33061
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
DM Raytheon Semiconductor, Dept. EM, 350 Ellis St., Mountain View, Cal. 94042
RFL Inds., Comms. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005
Richard-Lee Co., Dept. EM, Box 724, New Providence, N.J. 07974
M Sawyer Inds., Dept. EM, 5649 Peck Rd., Arcadia, Cal. 91006
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Teledyne Philbrick, Dept. EM, 17 Allied Dr. Rte 128, Dedham, Mass. 02026
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Vibrac Corp., Dept. EM, 11 Alpha Rd., Chelmsford, Mass. 01824

Converters, Graphic To Digital

Measurement Sys., Inc., Dept. EM, 121 Water St., Norwalk, Conn. 06854 .... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Altek Corp., Dept. EM, 2150 Industrial Pkwy, Silver Spring, MD 20904
Dest Data Corp., Dept. EM, 1285 Forgewood Ave., Sunnyvale, Cal. 94085
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Information Displays, Inc., Dept. EM, 150 Clearbrook Rd., Elmsford, N.Y. 10523
Lundy Elctrns. & Sys., Inc., Dept. EM, Robert La., Glen Head, N.Y. 11545

Converters, High-Frequency

A.L.S. Electronics Corp., Dept. EM, 1400 N. Baxter St., Anaheim, Cal. 92806 p. 3204,3205
M Applied Research Inc., Dept. EM, 76 S. Bayles Ave., Port Washington, N.Y. 11050 ..... *
M Avtel Div, Unitron Corp., Dept. EM, 2826 W. Kingsley Rd, Box 1331, Garland, Tex. 75040 ..... *
Behlman Engineering Corp., Dept. EM, Box 4518, 427 N. Nopal St., Santa Barbara, Cal. 93103 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Era Transpac Corp., Sub. Elctrn. Research Assocs., Dept. EM, 311 B East Park St. Dept. 1202, Moonachie, N.J. 07074 ..... *
M Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040 p. 2324
M Georator Corporation, Dept. EM, Box 70, Manassas, Va. 22110 p. 3263,3387
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Interelectronics Corp., Dept. EM, Interelectronics Park, 550 U.S. Rte. 303, Congers, N.Y. 10920 ..... *
Magnetico, Inc., Dept. EM, 182 Morris Ave., Holtsville, N.Y. 11742 ..... *
Marine Electric Railway Prods. Div., Inc., Dept. EM, 167 National Rd., Edison, N.J. 08817 ..... *
Topaz Electronics, Dept. EM, 3855 Ruffin Rd., San Diego, Cal. 92123 p. 3406
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... *
M Unitron Inc., Dept. EM, 2826 W. Kingsley Rd., Box 2159, Garland, Tex. 75041 *
M Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040 p. 3407
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
M Ajax Magnethermic Corp., Dept. EM, 1745 Overland Ave., N.E., Warren, Ohio 44482
DM Anaren Microwave, Inc., Dept. EM, 1010 James St., Syracuse, N.Y. 13203
D Blonder-Tongue Labs., Inc., Dept. EM, One Jake Brown Rd., Old Bridge, N.J. 08857
M Cal-Power Corp., Dept. EM, 140 Kansas St., El Segundo, Calif. 90245

M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
D Intech/Function Modules, Dept. EM, 282 Brokaw, Santa Clara, Cal. 95050
Jerrold Electronics Corp., Distr Sls. Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
Mobil Electronics, Inc., Dept. EM, Box 1132, Anderson, Ind. 46015
M RHG Elctrns. Lab., Dept. EM, 161 E. Industry Ct., Deer Park, N.Y. 11729
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304
M Welco Inds. Inc., Dept. EM, 9027 Shell Ave., Cincinnati, Ohio 45236

Converters, Low-Frequency

Abacus Controls Inc., Dept. EM, 89 Redington Rd., Somerville, N.J. 08876 *
Advance Conversion Devices Co., Dept. EM, 109 Eighth St., Passaic, N. J. 07055 ..... **p. 3354**
M A.L.S. Electronics Corp., Dept. EM, 1400 N. Baxter St., Anaheim, Cal. 92806 **p. 3204,3205**
M Applied Research Inc., Dept. EM, 76 S. Bayles Ave., Port Washington, N.Y. 11050 ..... *
M Avtel Div, Unitron Corp., Dept. EM, 2826 W. Kingsley Rd, Box 1331, Garland, Tex. 75040 ..... *
Behlman Engineering Corp., Dept. EM, Box 4518, 427 N. Nopal St., Santa Barbara, Cal. 93103 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
D California Instrs., Dept. EM, 5150-Convoy St., San Diego, Cal. 92111 .. p. 3370
M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 .. *
Elgar Corporation, Dept. EM, 8225 Mercury Ct., San Diego, Cal. 92111 ..... *
General Magnetics, Dept. EM, 211 Grove St., Bloomfield, N.J. 07003 ..... *
M Georator Corporation, Dept. EM, Box 70, Manassas, Va. 22110 p. 3263,3387
Interelectronics Corp., Dept. EM, Interelectronics Park, 550 U.S. Rte. 303, Congers, N.Y. 10920 ..... *
Magnetico, Inc., Dept. EM, 182 Morris Ave., Holtsville, N.Y. 11742 ..... *
Marine Electric Railway Prods. Div., Inc., Dept. EM, 167 National Rd., Edison, N.J. 08817 ..... *
Topaz Electronics, Dept. EM, 3855 Ruffin Rd., San Diego, Cal. 92123 p. 3406
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... *
M Unitron Inc., Dept. EM, 2826 W. Kingsley Rd., Box 2159, Garland, Tex. 75041 *
M Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040 **p. 3407**
M Cal-Power Corp., Dept. EM, 140 Kansas St., El Segundo, Calif. 90245
Guardian California, Dept. EM, 4030 W. Spencer St., Torrance, Cal. 90503
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
D Intech/Function Modules, Dept. EM, 282 Brokaw, Santa Clara, Cal. 95050
Meloy Labs Inc., Instrus. & Sys. Div., Dept. EM, 6715 Electronic Dr., Springfield, Va. 22151
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
RFL Inds., Comms. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
D Welco Inds. Inc., Dept. EM, 9027 Shell Ave., Cincinnati, Ohio 45236

Converters, Microwave Frequency

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
M Applied Research Inc., Dept. EM, 76 S. Bayles Ave., Port Washington, N.Y. 11050 ..... **p. 2866**
M Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040 .. *
M General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Telonic/Berkeley, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715 ..... *
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
D Ailtech, Dept. EM, 2070 Fifth Ave, Ronkonkoma, NY 11779
DM Anaren Microwave, Inc., Dept. EM, 1010 James St., Syracuse, N.Y. 13203
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Frequency Engrg. Labs., Dept. EM, Box 527, Farmingdale, N.J. 07727
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M LNR Communications, Inc., Dept. EM, 180 Marcus Blvd., Hauppauge, N.Y. 11787
Micro-Now Instr. Co., Dept. EM, 6104 N. Pulaski Rd., Chicago, Ill. 60646
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
Mu-Del Elctrns., Dept. EM, 2426 Linden La., Silver Spring, Md. 20910
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
M RHG Elctrns. Lab., Dept. EM, 161 E. Industry Ct., Deer Park, N.Y. 11729
Scientific Communications, Dept. EM, 3425 Kingsley, Garland, Tex. 75041
Triangle Microwave Inc., Dept. EM, 9B Great Meadow La, East Hanover, NJ 07936
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Zeta Laboratories, Inc., Dept. EM, 3265 Scott Blvd., Santa Clara, Cal. 95051

Converters, Multiplying, Analog to Digital and Digital to Analog

Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 **p. 1401**
M Epsco, Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 ..... *
M ILC Data Device Corp., Dept. EM, Airport Int'l. Plaza, Bohemia, N.Y. 11716 **p. 1644,1645**
M Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735 *
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Analogic Corp., Dept. EM, Audubon Rd., Wakefield, Mass. 01880
Dynamic Measurements Corp., Dept. EM, 6 Lowell Ave., Winchester, Mass. 01890
DM Precision Monolithics Inc., Dept. EM, 1500 Space Dr., Santa Clara, Cal. 95050

Converters, Paper Tape To Magnetic Tape

NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Altek Corp., Dept. EM, 2150 Industrial Pkwy, Silver Spring, MD 20904
Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
Lundy Elctrns. & Sys., Inc., Dept. EM, Robert La., Glen Head, N.Y. 11545
Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Converters, Paper Tape To Paper Tape

GNT Automatic Inc., Dept. EM, 440 Totten Pond Rd., Waltham, Mass 02154 **p. 1642**
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Converters, Phase

M Avtel Div, Unitron Corp., Dept. EM, 2826 W. Kingsley Rd, Box 1331, Garland, Tex. 75040 ..... *
D California Instrs., Dept. EM, 5150-Convoy St., San Diego, Cal. 92111 .. p. 3370
M Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731 ..... *
Dynamic Instr. Corp., Dept. EM, 933 L.I. Motor Pkwy., Hauppauge, N.Y. 11787 *
D Flite-Tronics Co., Inc., Dept. EM, 2525 No. Naomi St., Burbank, Cal. 91504 *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
M Georator Corporation, Dept. EM, Box 70, Manassas, Va. 22110 ..... *
M Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735 ..... *
M North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803 ..... *
Topaz Electronics, Dept. EM, 3855 Ruffin Rd., San Diego, Cal. 92123 p. 3406
M Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735 *
M Unitron Inc., Dept. EM, 2826 W. Kingsley Rd., Box 2159, Garland, Tex. 75041 *
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
Guardian California, Dept. EM, 4030 W. Spencer St., Torrance, Cal. 90503
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006

Converters, Polar To Rectangular Coordinates

M Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731 ..... **p. 1392**
D General Magnetics, Dept. EM, 211 Grove St., Bloomfield, N.J. 07003 ..... *
M Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735 ..... *
M Interface Engineering Inc., Dept. EM, 386 Lindelof Ave., Stoughton, Mass. 02072 ..... **p. 1649**
Natel Engineering Co., Dept. EM, 8954 Mason Ave., Canoga Park, Cal. 91306 *
M Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735 **p. 1673**
M C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
Datacom, Inc., Dept. EM, Box 278, Ft. Walton Beach, Fla. 32548
Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
M Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
Princeton Elctrn. Prods., Dept. EM, Box 101, New Brunswick, N.J. 08902
M Transicoil, Inc., Dept. EM, Worcester, Pa. 19490

Converters, Power Frequency, Electronic

Abacus Controls Inc., Dept. EM, 89 Redington Rd., Somerville, N.J. 08876 **p. 3163**
M A.L.S. Electronics Corp., Dept. EM, 1400 N. Baxter St., Anaheim, Cal. 92806 **p. 3204,3205**
American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
M Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 ..... *
M Avtel Div, Unitron Corp., Dept. EM, 2826 W. Kingsley Rd, Box 1331, Garland, Tex. 75040 ..... *
Behlman Engineering Corp., Dept. EM, Box 4518, 427 N. Nopal St., Santa Barbara, Cal. 93103 ..... *
Bikor Corporation, Dept. EM, 23970 Madison St., Torrance, Cal. 90505 **p. 3211**
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
D California Instrs., Dept. EM, 5150-Convoy St., San Diego, Cal. 92111 .. p. 3370
Computer Power, Inc., Dept. EM, 124E West Main Street, High Bridge, New Jersey 08829 ..... *
M Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 ..... *
Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 .. *
M Eanco, Inc., Mid-Eastern Prods., Dept. EM, 539 Jacksonville Rd., Warminster, Pa. 18974 ..... *
Elgar Corporation, Dept. EM, 8225 Mercury Ct., San Diego, Cal. 92111 **p. 3382**
Era Transpac Corp., Sub. Elctrn. Research Assocs., Dept. EM, 311 B East Park St. Dept. 1202, Moonachie, N.J. 07074 ..... *
EWC, Inc., Dept. EM, 725 Federal Ave., Kenilworth, N.J. 07033 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *

Interelectronics Corp., Dept. EM, Interelectronics Park, 550 U.S. Rte. 303, Congers, N.Y. 10920 ..... *
M **Marine Electric Railway Prods. Div., Inc., Dept. EM, 167 National Rd., Edison, N.J. 08817** ..... *
D **Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582** *
Nova Electric Mfg. Co., Dept. EM, 263 Hillside Ave., Nutley, N.J. 07110 ..... *
M **Topaz Electronics, Dept. EM, 3855 Ruffin Rd., San Diego, Cal. 92123** ..... *
M **Unitron Inc., Dept. EM, 2826 W. Kingsley Rd., Box 2159, Garland, Tex. 75041** *
M **Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040** *
Aerospace Avionics, Inc., Dept. EM, Airport International Plaza, 110 Wilbur Pl., Bohemia, N.Y. 11716
Basler Electric Co., Dept. EM, Box 269, Rte. 143, Highland, Ill. 62249
D B. H. Industries, Dept. EM, 5784 Venice Blvd., Los Angeles, Cal 90019
M Cal-Power Corp., Dept. EM, 140 Kansas St., El Segundo, Calif. 90245
M Cycle-Dyne, Inc., Sub. Axel Elctrns., Inc., Dept. EM, 134-20 Jamaica Ave., Jamaica, N.Y. 11418
Design Automation, Dept. EM, 809 Massachusetts Ave., Lexington, Mass. 02173
M Eldec Corp., Dept. EM, Box 100, 16700 13th Ave. W., Lynnwood, Wash. 98036
Electro-Pacific, Inc., Dept. EM, 5782 Thornwood Dr., Goleta, Calif. 93017
M International Power Machines Corp., Dept. EM, 3328 Executive Blvd., Box 724, Mesquite, Tex. 75149
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
Technology Dev Corp, NJE Div, Dept. EM, Box 50, Culver Rd., Dayton, N.J. 08810
Novatronics, Inc., Dept. EM, Box 878, Pompano Beach, Fla. 33061
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
D Power Control Corp., Dept. EM, 122 Gamma Dr., Pittsburgh, Pa. 15238
RFL Inds., Comms. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005
Telmar, Inc., Dept. EM, 1150 W. Third Ave., Columbus, Ohio 43212
D Terado Corp., Dept. EM, 1068 Raymond Ave., St. Paul, Minn. 55108
Todd Products Corp., Dept. EM, 123 Milbar Blvd., Farmingdale, N.Y. 11735

Converters, Power Frequency, Rotary

A.L.S. Electronics Corp., Dept. EM, 1400 N. Baxter St., Anaheim, Cal. 92806 p. 3204,3205
M **Avtel Div, Unitron Corp., Dept. EM, 2826 W. Kingsley Rd, Box 1331, Garland, Tex. 75040** ..... *
M **Georator Corporation, Dept. EM, Box 70, Manassas, Va. 22110** p. 3262,3386
Marine Electric Railway Prods. Div., Inc., Dept. EM, 167 National Rd., Edison, N.J. 08817 ..... *
M **Unitron Inc., Dept. EM, 2826 W. Kingsley Rd., Box 2159, Garland, Tex. 75041** *
M American Electronics, Inc., Dept. EM, 1600 E Valencia Dr., Fullerton, Cal. 92631
D Atlas Energy Systems, Dept. EM, 9459 Rush St., S. El Monte, Cal. 91733
D Carter Motor Co., Dept. EM, 2707 W. George St., Chicago, Ill. 60618
Control Products Corp., Dept. EM, 4431 W. Division St., Chicago, Ill. 60651
Electric Machinery Mfg. Co., Dept. EM, 800 Central Ave., Minneapolis, Minn. 55413
Kato Engineering Co., Dept. EM, 1415 1st Ave., Mankato, Minn. 56001

Converters, Pressure To D-C, Pressure To Frequency—See Transducers, Pressure

Converters, Pulse To Analog

Airpax Elctrns., Controls Div., Dept. EM, 6801 W. Sunrise Blvd., Ft. Lauderdale, Fla. 33313 ..... *
M **Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470** ..... *
M **Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731** ..... *
M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101** ..... *
Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 p. 1401
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
M **Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735** *
Anadex Inc., Dept. EM, 9825 De Soto, Chatsworth, Cal. 91311
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
Data Acquisition Prods. Lab., AEL, Inc., Dept. EM, Box 552, Lansdale, Pa. 19446
Dynamic Measurements Corp., Dept. EM, 6 Lowell Ave., Winchester, Mass. 01890
M Flow Technology, Inc., Dept. EM, Box 21346, Phoenix, Ariz. 85036
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
IPAC Group, Inc., Dept. EM, POB 156 3047 Industrial Blvd., Bethel Park, PA 15102
Micro Instrument Co., Marine & Power Instr. Div., Dept. EM, 2250 Micro Pl., Escondido, Cal. 92025
Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
Optical Electronics, Inc., Dept. EM, Box 11140, Tucson, Ariz. 85734
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
West Coast Resch. Corp., Dept. EM, Box 25061, Los Angeles, Cal. 90025

Converters, Pulse To Digital

Airpax Elctrns., Controls Div., Dept. EM, 6801 W. Sunrise Blvd., Ft. Lauderdale, Fla. 33313 ..... *
M **Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470** ..... *
M **Chrono-log Corp., Dept. EM, 2 W. Park Rd., Havertown, Pa. 19083** ..... *
M **Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731** ..... *
Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 ..... *
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... p. 1469
M **Measurement Sys., Inc., Dept. EM, 121 Water St., Norwalk, Conn. 06854** .... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Re-el Circuits, Inc., Dept. EM, 520 Victor Street, Saddle Brook, N.J. 07662 *
M **Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735** *
Data Acquisition Prods. Lab., AEL, Inc., Dept. EM, Box 552, Lansdale, Pa. 19446
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
IPAC Group, Inc., Dept. EM, POB 156 3047 Industrial Blvd., Bethel Park, PA 15102
Micro Instrument Co., Marine & Power Instr. Div., Dept. EM, 2250 Micro Pl., Escondido, Cal. 92025
Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
D Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102

Converters, Resolver To Digital

M **Clifton Precision, Litton Systems, Inc., Dept. EM, Marple at Brdway., Clifton Hgts., Pa. 19018** ..... *
M **Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731** ..... p. 1392
M **Control Sciences, Inc., Dept. EM, 8399 Topanga Canyon Blvd., Canoga Park, Cal. 91304** ..... p. 1395
M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101** ..... *
M **Epsco, Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090** ..... *
M **ILC Data Device Corp., Dept. EM, Airport Int'l. Plaza, Bohemia, N.Y. 11716** p. 1645
M **Natel Engineering Co., Dept. EM, 8954 Mason Ave., Canoga Park, Cal. 91306** p. 1656
M **North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803** ..... *
M **Perkin-Elmer Corp., Elctrn. Prods. Dept., Dept. EM, Main Ave., Norwalk, Conn. 06856** ..... *
M **Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735** p. 1673
M **Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729** ..... p. 1674
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
M C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
GAP Instr. Corp., Dept. EM, 110 Marcus Blvd., Hauppauge, N.Y. 11787
Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
Innovatek Microsystems, Inc., Dept. EM, Smithfield Rd., Millerton, N.Y. 12546
Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
M Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Converters, Rotary—See Motor Electric Generator Sets

Converters, Scan

Fairchild Camera & Instr., Federal Systems Group, Dept. EM, 300 Robbins La., Syosset, N.Y. 11791
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Hughes Aircraft Co., Image Devices Ind'l. Prods. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
D Princeton Elctrn. Prods., Dept. EM, Box 101, New Brunswick, N.J. 08902

Converters, Synchro To Digital

M **Clifton Precision, Litton Systems, Inc., Dept. EM, Marple at Brdway., Clifton Hgts., Pa. 19018** ..... *
M **Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731** ..... p. 1392,1393
M **Control Sciences, Inc., Dept. EM, 8399 Topanga Canyon Blvd., Canoga Park, Cal. 91304** ..... p. 1395
M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101** ..... *
M **Epsco, Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090** ..... *
M **ILC Data Device Corp., Dept. EM, Airport Int'l. Plaza, Bohemia, N.Y. 11716** p. 1644,1645
M **Interface Engineering Inc., Dept. EM, 386 Lindelof Ave., Stoughton, Mass. 02072** ..... p. 1648
M **Natel Engineering Co., Dept. EM, 8954 Mason Ave., Canoga Park, Cal. 91306** p. 1656
M **North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803** p. 1658,2795
M **Perkin-Elmer Corp., Elctrn. Prods. Dept., Dept. EM, Main Ave., Norwalk, Conn. 06856** ..... *
M **Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735** p. 1673
M **Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729** ..... p. 1674
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
M C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
Fairchild Camera & Instr., Federal Systems Group, Dept. EM, 300 Robbins La., Syosset, N.Y. 11791
GAP Instr. Corp., Dept. EM, 110 Marcus Blvd., Hauppauge, N.Y. 11787
M Glentek, Inc., Dept. EM, 1559 7th St., Santa Monica, Calif. 90401
Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
Innovatek Microsystems, Inc., Dept. EM, Smithfield Rd., Millerton, N.Y. 12546
Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
M Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
D Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal 94303

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M **Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731** ..... p. 1392,1393
M **Control Sciences, Inc., Dept. EM, 8399 Topanga Canyon Blvd., Canoga Park, Cal. 91304** ..... *
M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101** ..... *
D **General Magnetics, Dept. EM, 211 Grove St., Bloomfield, N.J. 07003** ..... p. 2262,2264,2266
M **ILC Data Device Corp., Dept. EM, Airport Int'l. Plaza, Bohemia, N.Y. 11716** ..... p. 1644,1645
M **Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735** ..... *
M **Interface Engineering Inc., Dept. EM, 386 Lindelof Ave., Stoughton, Mass. 02072** ..... *
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M **Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735** ..... p. 1673
M **Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729** ..... p. 1674
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
M C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
GAP Instr. Corp., Dept. EM, 110 Marcus Blvd., Hauppauge, N.Y. 11787
M Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
M Transicoil, Inc., Dept. EM, Worcester, Pa. 19490

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M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101** ..... *
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M **Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735** ..... *
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M **Natel Engineering Co., Dept. EM, 8954 Mason Ave., Canoga Park, Cal. 91306** ..... p. 1656
M **Perkin-Elmer Corp., Elctrn. Prods. Dept., Dept. EM, Main Ave., Norwalk, Conn. 06856** ..... *
M **Sigmapower, Inc., Dept. EM, 20790 Leapwood Ave., Carson, Cal. 90746** ..... *
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M C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
GAP Instr. Corp., Dept. EM, 110 Marcus Blvd., Hauppauge, N.Y. 11787
Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
M Transicoil, Inc., Dept. EM, Worcester, Pa. 19490

Converters, Tape To Card

NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

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M **Applied Research Inc., Dept. EM, 76 S. Bayles Ave., Port Washington, N.Y. 11050** ..... p. 2866
M **Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731** ..... *
Interelectronics Corp., Dept. EM, Interelectronics Park, 550 U.S. Rte. 303, Congers, N.Y. 10920 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
DM Anaren Microwave, Inc., Dept. EM, 1010 James St., Syracuse, N.Y. 13203
BF Elctrns., Dept. EM, 415 S. Nardo, Solana Beach, Calif. 92075
Decom Systems, Inc., Dept. EM, 1404 Descanso Rd., San Marcos, Ca. 92069
FG Engineering Co., Dept. EM, Box 39, Black Canyon Stage, Mayer, Ariz. 86333
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Mu-Del Elctrns., Dept. EM, 2426 Linden La., Silver Spring, Md. 20910
RFL Inds., Comms. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005
M RHG Elctrns. Lab., Dept. EM, 161 E. Industry Ct., Deer Park, N.Y. 11729
Scientific Communications, Dept. EM, 3425 Kingsley, Garland, Tex. 75041
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343

Converters UHF To VHF

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
M **Applied Research Inc., Dept. EM, 76 S. Bayles Ave., Port Washington, N.Y. 11050** ..... *
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
D Blonder-Tongue Labs., Inc., Dept. EM, One Jake Brown Rd., Old Bridge, N.J. 08857
D Channel Master Div. Avnet, Dept. EM, Rte. 209, Ellenville, N.Y. 12428
FG Engineering Co., Dept. EM, Box 39, Black Canyon Stage, Mayer, Ariz. 86333
D Finney Co., Dept. EM, 34 W. Interstate St., Bedford, Ohio 44014
D Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
M Microwave Power Devices, Dept. EM, Adams Ct., Plainview, N.Y. 11803
Mu-Del Elctrns., Dept. EM, 2426 Linden La., Silver Spring, Md. 20910
M Norlin Communications Inc., Dept. EM, 9125 Gaither Rd., Gaithersburg, Md. 20760
VHF Engrg, Div. of Brownian Elctrns. Corp., Dept. EM, 320 Water St., Binghamton, N.Y. 13902
Winegard Co., Dept. EM, 3000 Kirkwood St., Burlington, Iowa 52601

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American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... p. 3365
M **Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470** ..... *
M **Avtel Div, Unitron Corp., Dept. EM, 2826 W. Kingsley Rd, Box 1331, Garland, Tex. 75040** ..... *
Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634 ..... *
Beckman Instrs., Information Displays Oper., Dept. EM, Box 3579, Scottsdale, Ariz. 85257 ..... p. 2466
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Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734 ..... p. 1388
M **Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731** ..... *
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Dynamic Instr. Corp., Dept. EM, 933 L.I. Motor Pkwy., Hauppauge, N.Y. 11787 ..... *
Era Transpac Corp., Sub. Elctrn. Research Assocs., Dept. EM, 311 B East Park St. Dept. 1202, Moonachie, N.J. 07074 ..... *
M **Georator Corporation, Dept. EM, Box 70, Manassas, Va. 22110** ..... *
D **Midtex, Inc., AEMCO Div., Dept. EM, 1650 Tower Blvd., No. Mankato, Minn. 56001** ..... *
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North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... p. 2275
M **Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735** *
M **Unitron Inc., Dept. EM, 2826 W. Kingsley Rd., Box 2159, Garland, Tex. 75041** *
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Anadex Inc., Dept. EM, 9825 De Soto, Chatsworth, Cal. 91311
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Cal-Tek Engrg, Dept. EM, 29 Pemberton Rd., Wayland, Mass. 01778
Dynamic Measurements Corp., Dept. EM, 6 Lowell Ave., Winchester, Mass. 01890
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Exar Integrated Systems, Dept. EM, P.O.B. 62229, Sunnyvale, Cal. 94088
Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
DM Intech/Function Modules, Dept. EM, 282 Brokaw, Santa Clara, Cal. 95050
Intronics Inc., Dept. EM, 57 Chapel St., Newton, Mass. 02158
IPAC Group, Inc., Dept. EM, POB 156 3047 Industrial Blvd., Bethel Park, PA 15102
Meloy Labs Inc., Instrus. & Sys. Div., Dept. EM, 6715 Electronic Dr., Springfield, Va. 22151
Neshaminy Transformer, Div. Neshaminy Elctrn., Dept. EM, Edison-Furlong Rd., Furlong, Pa. 18925
DM Raytheon Semiconductor, Dept. EM, 350 Ellis St., Mountain View, Cal. 94042
RFL Inds., Comms. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005
Richard-Lee Co., Dept. EM, Box 724, New Providence, N.J. 07974
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Teledyne Philbrick, Dept. EM, 17 Allied Dr, Rte 128, Dedham, Mass. 02026
D Terado Corp., Dept. EM, 1068 Raymond Ave., St. Paul, Minn. 55108
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
D Welco Inds. Inc., Dept. EM, 9027 Shell Ave., Cincinnati, Ohio 45236

Coolants, Circuit & Components-Also See Refrigerants, Spray

GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... p. 1290
D Chemtronics, Inc., Dept. EM, 45 Hoffman Ave., Hauppauge, N.Y. 11787
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
D Heeger Inc., Dept. EM, 725 Ceres Ave., Los Angeles, Cal. 90021
D LMB Heeger, Inc., Dept. EM, 725 Ceres Ave., Los Angeles, Cal. 90021
Lytron, Inc., Dept. EM, 3 Dragon Ct., Woburn, Mass. 01801
M Miller-Stephenson Chem. Co., Inc., Dept. EM, George Washington Hwy., Danbury, Conn. 06810
SWS Silicones Corp., Dept. EM, Box 428, Adrian, Mich. 49221
Union Carbide, Chemicals & Plastics, Dept. EM, 270 Park Ave., New York, N.Y. 10017
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Cooling Equipment—See Air Conditioners; Blowers & Fans; Heat Exchangers & Systems

D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016

Cooling/Heating Modules, Thermoelectric

Borg-Warner Thermoelectrics, Dept. Borg-Warner, Dept. EM, Wolf & Algonquin Rds., Des Plaines, Ill. 60018 ..... p. 2576,2577
M **Marlow Industries, Inc., Dept. EM, 1021 S. Jupiter Rd., Garland, Tex. 75042** ..... p. 2587
M **Melcor/Materials Elctrn. Prods., Dept. EM, 990 Spruce St., Trenton, N.J. 08648** ..... p. 2592,2593
M **Ohio Semitronics, Inc., Dept. EM, 1205 Chesapeake Ave., Columbus, Ohio 43212** ..... p. 4304
M Bailey Instrs., Inc., Dept. EM, 515 Victor St., Saddle Brook, N.J. 07662
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
FTS Systems Inc., Dept. EM, POB 158, Stone Ridge, N.Y. 12484

D Temptronic Corporation, Dept. EM, 40 Glen Ave., Newton, Mass. 02159

Cooling Sprays—See Coolants, Circuit & Components; Refrigerants, Spray

Cords & Cable, Dial Drive

D Columbia Elctrn. Cables, Dept. EM, 11 Cove St., New Bedford, Mass. 02744 *

Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 *

D Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 *

D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 *

Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 *

M Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 *

Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 *

DM Amrad Corp., Dept. EM, Box 876, Paris, Tex. 75460

Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010

Berg Inc., Winfred M., Dept. EM, 499 Ocean Ave., East Rockaway, N.Y. 11518

D Birnbach Co., Inc., Dept. EM, 177 Hanse Ave., Freeport, N.Y. 11520

D Carolina Steel & Wire Corp., Dept. EM, I-20 and S.C. 6, Lexington, S.C. 29072

D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016

D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696

Cords & Tapes, Lacing

DM Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 *

DM Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 *

DM Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 p. 4600

D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 *

DM Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2144

D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 *

D Varflex Corp., Dept. EM, 514 W. Court St., Rome, N.Y. 13440 *

DM Amrad Corp., Dept. EM, Box 876, Paris, Tex. 75460

D Birnbach Co., Inc., Dept. EM, 177 Hanse Ave., Freeport, N.Y. 11520

M Chemplast, Inc., Dept. EM, 31-150 Dey Rd., Wayne, N.J. 07470

DM Cole-Flex Corp., Dept. EM, 91 Cabot St., W. Babylon, N.Y. 11704

M Gudebrod Inc., Electronics Div., Dept. EM, 12 S. 12th St., Philadelphia, Pa. 19107

DM ICO/Rally Corp., Dept. EM, Edward J. Bush, Palo Alto, Cal. 94303

D Norelcom Electronics, Dept. EM, 200 Allen Blvd., Farmingdale, N.Y. 11735

M Santa Fe Textiles Inc., Dept. EM, 3151 W. Adams St., Santa Ana, Cal. 92704

Cords, Communication, Control, Microphone, etc.—See Cable, Specific Type

Cords, Line & Set, Extension

Alden Products Co, Dept. EM, 117 N Main St, Brockton, Mass. 02403 *

Allied Systems Corp., Dept. EM, Box 11005, Greensboro, N.C. 27409 *

D Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 *

AMP Capitron Div./AMP Inc., Dept. EM, 1595 S. Mt. Joy St., Elizabethtown, Pa. 17022 p. 1685

D Belden Corp., Electronic Div., Dept. EM, Box 1327, Richmond, Ind. 47374 *

Beman Mfg., Inc., Dept. EM, PO Box 370, New Cumberland, Pa. 17070 *

CEA, Div. Berkleonics, Inc., Dept. EM, 1 Aerovista Pk., San Luis Obispo, Cal. 93401 *

D Columbia Elctrn. Cables, Dept. EM, 11 Cove St., New Bedford, Mass. 02744 p. 4552

D Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 p. 4585

DM Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 *

D Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 *

GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 *

M Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 *

D SGL Waber Electric, Dept. EM, 300 Harvard Avenue, Westville, NJ 08093 *

Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 *

Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245 *

TRW/Holyoke Wire & Cable, Dept. EM, 775 New Ludlow Rd., South Hadley, Mass. 01075 *

D Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 *

D Birnbach Co., Inc., Dept. EM, 177 Hanse Ave., Freeport, N.Y. 11520

D Cable Sys & Assembly Co., Dept. EM, 210 Broadway, Everett, Mass. 02149

Essex Grp - Indl Wire Prods Div., Sub. United Tech, Dept. EM, 6235 S. Harlem Ave., Chicago, Ill 60638

Excel Specialty Corp., Dept. EM, 6335 N. Broadway, Chicago, Ill. 60660

D General Elec. Co, Wiring Device Bus. Dept., Dept. EM, 95 Hathaway St., Providence, R.I. 02904

D Jersey Specialty Co., Dept. EM, Box 248, Burgess Pl., Wayne, N.J. 07470

Leviton Mfg. Co., Inc., Dept. EM, 59-25 Little Neck Pkwy., Little Neck, N.Y. 11362

Lynn Elctrns. Corp., Dept. EM, 915 Pennsylvania Blvd., Feasterville, Pa. 19047

D Manhattan Elec. Cable Corp., Dept. EM, 1 Station Plaza, Rye, N.Y. 10580

Neshaminy Transformer, Div. Neshaminy Elctrn., Dept. EM, Edison-Furlong Rd., Furlong, Pa. 18925

D Pacific Electricord Co., Dept. EM, 747 W. Redondo Beach Blvd., Box 10, Gardena, Cal. 90247

D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016

DM Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618

M Storm Products Co., Dept. EM, 112 S. Glasgow St., Inglewood, Cal. 90301

D Triangle PWC, Dept. EM, Box 711, New Brunswick, N.J. 08903

Victor Electric Wire & Cable, Dept. EM, 618 Main St., Coventry, R.I. 02816

D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla 33578

Cords, Line (Lamp)—See Cable, Multiconductor

Cords, Line, Resistance

Beman Mfg., Inc., Dept. EM, PO Box 370, New Cumberland, Pa. 17070 *

Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 *

Lynn Elctrns. Corp., Dept. EM, 915 Pennsylvania Blvd., Feasterville, Pa. 19047

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Cords, Patch

Alden Products Co, Dept. EM, 117 N Main St, Brockton, Mass. 02403 *

Allied Systems Corp., Dept. EM, Box 11005, Greensboro, N.C. 27409 p. 1683

Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 *

D Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 *

D Beman Mfg., Inc., Dept. EM, PO Box 370, New Cumberland, Pa. 17070 *

D Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 *

Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 *

Dynatech Corp., Dept. EM, 1225 E. Wakeham Ave., Santa Ana, Cal. 92702 *

D Elctrn. Molding Corp., Dept. EM, 96 Mill St., Woonsocket, R.I. 02895 *

D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 *

Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 *

GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 *

Info-Lite Corp., Dept. EM, 46-10 104 St., Corona, N.Y. 11368 *

D ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 p. 1965,1994,1995,2004,2021-2023,2025,2034-2041

LVC Inds. Inc., Co-Ord Switch Bloc-Lite Divs., Dept. EM, 135-25 37th Ave., Flushing, N.Y. 11354 *

M Mac Panel Co., Dept. EM, Box 5027, 216 Pine St., High Pt., N.C. 27262 p. 2079

M Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 *

Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 *

D Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2116,2117,2119

Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245 *

D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 *

D Trimm, Inc., Dept. EM, 400 W. Lake, Box 489, Libertyville, Ill. 60048 .. p. 2247

Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342 *

M Virginia Panel Corp., Dept. EM, Box 1106, 1400 New Hope Rd., Waynesboro, Va. 22980 *

DM ADC Prods, Dept. EM, 4900 W. 78th St., Minneapolis, Mn 55435

Advance Electrical Mfg, Dept. EM, 1661 Industrial Way, Box 500, Belmont, CA 94002

D AMP Special Industries, Dept. EM, Valley Forge, Pa. 19482

D A.P. Products, Dept. EM, 72 Corwin Dr. Box 110, Painesville, Ohio 44077

Brooks Mfg. Co., Dept. EM, Box 17602, Philadelphia, Pa 19135

DM Cable Sys & Assembly Co., Dept. EM, 210 Broadway, Everett, Mass. 02149

D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138

M Dynatech Data Sys, A Dynatech Co, Dept. EM, 900 Slaters La., Alexandria, Va. 22314

D E-Z-Hook, Div. Tektest, Dept. EM, Box 450 114 E. St. Joseph, Arcadia, Cal. 91006

Essex Grp - Indl Wire Prods Div., Sub. United Tech, Dept. EM, 6235 S. Harlem Ave., Chicago, Ill 60638

Excel Specialty Corp., Dept. EM, 6335 N. Broadway, Chicago, Ill. 60660

GTE Lenkurt Inc., Dept. EM, 1105 County Rd., San Carlos, Cal. 94070

Lynn Elctrns. Corp., Dept. EM, 915 Pennsylvania Blvd., Feasterville, Pa. 19047

Manger Elec. Co., Inc., Dept. EM, W. Henry St., Stamford, Conn. 06902

M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966

D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016

Paraplegics Mfg., Dept. EM, 304 N. York Rd., Bensenville, Ill. 60106

M Robins Ind's. Corp., Consumer Products Div., Dept. EM, 75 Austin Blvd., Commack, N.Y. 11725

D Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105

D Switchcraft, Inc., Dept. EM, 5555 N. Elston, Chicago, Ill. 60630

M Technical Mat'l., Dept. EM, 700 Fenimore Rd., Mamaroneck, N.Y. 10543

Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077

D Triangle PWC, Dept. EM, Box 711, New Brunswick, N.J. 08903

Trompeter Electronics, Inc., Dept. EM, 8936 Comanche, Chatsworth, Cal. 91311

M U.S. Terminals, Dept. EM, 7502 Camargo Rd., Cincinnati, Ohio 45243

D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Cords, Power—See Cable, Power

Cords, Retractile

D Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 *

AMP Capitron Div./AMP Inc., Dept. EM, 1595 S. Mt. Joy St., Elizabethtown, Pa. 17022 p. 1685

D Belden Corp., Electronic Div., Dept. EM, Box 1327, Richmond, Ind. 47374 p. 4539

D Columbia Elctrn. Cables, Dept. EM, 11 Cove St., New Bedford, Mass. 02744 *

D Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 p. 4585

DM **Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458** ..... p. 4590
D **Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018** ..... *
M **Electroweave, Inc., Dept. EM, 27 E. Foundry St., Central Falls, R.I. 02863** .. *
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
Interelectronics Corp., Dept. EM, Interelectronics Park, 550 U.S. Rte. 303, Congers, N.Y. 10920 ..... *
D **ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766** ..... p. 2004,2023,2034
National Wire & Cable Corp., Dept EEM, Svc Div., Dept. EM, 136 San Fernando Rd., Los Angeles, Cal. 90031 ..... *
M **Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612** ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245 *
TRW/Holyoke Wire & Cable, Dept. EM, 775 New Ludlow Rd., South Hadley, Mass. 01075 ..... *
D Birnbach Co., Inc., Dept. EM, 177 Hanse Ave., Freeport, N.Y. 11520
Boston Insulated Wire & Cable Co., Dept. EM, 65 Bay St., Dorchester, Mass. 02125
Lynn Elctrns. Corp., Dept. EM, 915 Pennsylvania Blvd., Feasterville, Pa. 19047
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
D Russell Inds., Inc., Dept. EM, 3069 Lawson Blvd., Oceanside, N.Y. 11572
SHOGYO International Corp., Dept. EM, 300 Northern Blvd., Great Neck, N.Y. 11021
Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
M Storm Products Co., Dept. EM, 112 S. Glasgow St., Inglewood, Cal. 90301
D Superior Cable Corp, Dept. EM, Box 489, Hickory, N.C. 28601
M Times Fiber Comm. Inc., Sub. Insilco Corp. Times Wire & Cable Div., Dept. EM, 358 Hall Ave., Wallingford, Conn. 06492
D Triangle PWC, Dept. EM, Box 711, New Brunswick, N.J. 08903
Victor Electric Wire & Cable, Dept. EM, 618 Main St., Coventry, R.I. 02816

Cords, Speaker Extension—See Cable, Audio

Cords, Twin Lead—See Cable, Multiconductor

Cores, Ceramic

Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... *
Stackpole Carbon Co., Electronic Comps. Div./Soft Ferrites/Special Purpose Resistors, Dept. EM, St. Mary's, Pa. 15857 ..... p. 2568,2569
Stackpole Carbon Co., Elctrn. Comps. Div.-Fixed Comp. Resistors & Carbon Film Resistors, Dept. EM, Kane, Pa. 16735 ..... *
Automatic Coil Corp., Sub. Designatronics Inc., Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
Centerflex Ceramics, Dept. EM, 221 Seventh Ave., Hawthorne, N.J. 07507
Ceramic Magnetics, Inc., Dept. EM, 87 Fairfield Rd., Fairfield, N.J. 07006
Diamonite Products Div., Dept. EM, Box 567, Shreve, Ohio 44676
M Kawecki Berylco Inds., Inc., Dept. EM, PO Box 1462, Reading, PA 19603
3M Company, Tech Ceramic Prods., Dept. EM, 3M Center 223-4S, St. Paul, MN. 55101
M Magnetic Dielectrics, Dept. EM, Industrial Dr., W. Milford, N.J. 07480
D Mepco/Electra, Inc., Dept. EM, Columbia Rd., Morristown, N.J. 07960
Norton Co., Public Relations Dept., Dept. EM, One New Bond St., Worcester, Mass. 01606
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Permag Corp., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
D Plessey Ceramic Div., Dept. EM, 8th & Harrison Sts., Frenchtown, N.J. 08825
Quartzite Processing, Inc., Dept. EM, 6 Holyoke St., Malden, Mass. 02148
Star Porcelain Co., Dept. EM, 71 Muirhead Ave., Box 1267, Trenton, N.J. 08638
D Trans-Tech, Dept. EM, 12 Meem Ave., Gaithersburg, Md. 20760

Cores, Magnetic, Ferrite, EL & E

Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
Fair-Rite Prods. Corp., Dept. EM, Wallkill, N.Y. 12589 ..... p. 2556
Krystinel Corp., Dept. EM, Fox Island Rd., Port Chester, N. Y. 10573 .. p. 2562
Stackpole Carbon Co., Electronic Comps. Div./Soft Ferrites/Special Purpose Resistors, Dept. EM, St. Mary's, Pa. 15857 ..... p. 2568,2569
Stackpole Carbon Co., Elctrn. Comps. Div.-Fixed Comp. Resistors & Carbon Film Resistors, Dept. EM, Kane, Pa. 16735 ..... *
Ampex Corp., Dept. EM, 401 Broadway, Redwood City, Cal. 94063
Ceramic Magnetics, Inc., Dept. EM, 87 Fairfield Rd., Fairfield, N.J. 07006
Electrical Plastics Corp., Dept. EM, 500 Long Branch Ave., Long Branch, N.J. 07740
Ferronics, Inc., Dept. EM, 60 N. Lincoln Rd., East Rochester, N.Y. 14445
D Ferroxcube Corp., Dept. EM, 5083 Kings Hwy., Saugerties, N.Y. 12477
D Indiana General, Ferrite Prods, Dept. EM, Crows Mill Rd., Keasbey, N.J. 08832
M Magnetics, Div/Spang Industries, Inc., Dept. EM, Box 391, Butler, Pa. 16001
D Murata Mfg. Co. Ltd., Dept. EM, 16, Kaiden Nishijin-cho, Nagaoka-Kyo-Shi, Kyoto, Japan
Permag Corp., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013

Cores, Magnetic, Ferrite, Pot/Cup

Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
Caddel-Burns Mfg. Co., Inc., Dept. EM, 40 E. 2nd St., Mineola, N. Y. 11501 p. 1328
Fair-Rite Prods. Corp., Dept. EM, Wallkill, N.Y. 12589 ..... p. 2556
D **ISL Products Ltd. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803** *
Krystinel Corp., Dept. EM, Fox Island Rd., Port Chester, N. Y. 10573 .. p. 2562
Stackpole Carbon Co., Electronic Comps. Div./Soft Ferrites/Special Purpose Resistors, Dept. EM, St. Mary's, Pa. 15857 ..... p. 2568,2569
Stackpole Carbon Co., Elctrn. Comps. Div.-Fixed Comp. Resistors & Carbon Film Resistors, Dept. EM, Kane, Pa. 16735 ..... *
Ceramic Magnetics, Inc., Dept. EM, 87 Fairfield Rd., Fairfield, N.J. 07006
Ferronics, Inc., Dept. EM, 60 N. Lincoln Rd., East Rochester, N.Y. 14445
D Ferroxcube Corp., Dept. EM, 5083 Kings Hwy., Saugerties, N.Y. 12477
D Indiana General, Ferrite Prods, Dept. EM, Crows Mill Rd., Keasbey, N.J. 08832
M Magnetics, Div/Spang Industries, Inc., Dept. EM, Box 391, Butler, Pa. 16001
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Permag Corp., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648
United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013

Cores, Magnetic, Ferrite, Slug

Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
Caddel-Burns Mfg. Co., Inc., Dept. EM, 40 E. 2nd St., Mineola, N. Y. 11501 p. 1328-1332
Fair-Rite Prods. Corp., Dept. EM, Wallkill, N.Y. 12589 ..... p. 2556
D **ISL Products Ltd. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803** *
Krystinel Corp., Dept. EM, Fox Island Rd., Port Chester, N. Y. 10573 .. p. 2562
Stackpole Carbon Co., Electronic Comps. Div./Soft Ferrites/Special Purpose Resistors, Dept. EM, St. Mary's, Pa. 15857 ..... p. 2568,2569
Stackpole Carbon Co., Elctrn. Comps. Div.-Fixed Comp. Resistors & Carbon Film Resistors, Dept. EM, Kane, Pa. 16735 ..... *
Ceramic Magnetics, Inc., Dept. EM, 87 Fairfield Rd., Fairfield, N.J. 07006
Ferronics, Inc., Dept. EM, 60 N. Lincoln Rd., East Rochester, N.Y. 14445
D Ferroxcube Corp., Dept. EM, 5083 Kings Hwy., Saugerties, N.Y. 12477
D Indiana General, Ferrite Prods, Dept. EM, Crows Mill Rd., Keasbey, N.J. 08832
M Magnetics, Div/Spang Industries, Inc., Dept. EM, Box 391, Butler, Pa. 16001
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Permag Corp., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648
United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013

Cores, Magnetic, Ferrite, Toroid

Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
Fair-Rite Prods. Corp., Dept. EM, Wallkill, N.Y. 12589 ..... *
D **ISL Products Ltd. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803** *
Krystinel Corp., Dept. EM, Fox Island Rd., Port Chester, N. Y. 10573 .. p. 2562
Stackpole Carbon Co., Electronic Comps. Div./Soft Ferrites/Special Purpose Resistors, Dept. EM, St. Mary's, Pa. 15857 ..... p. 2568,2569
Stackpole Carbon Co., Elctrn. Comps. Div.-Fixed Comp. Resistors & Carbon Film Resistors, Dept. EM, Kane, Pa. 16735 ..... *
Ampex Corp., Dept. EM, 401 Broadway, Redwood City, Cal. 94063
Ceramic Magnetics, Inc., Dept. EM, 87 Fairfield Rd., Fairfield, N.J. 07006
M Electronic Memories & Magnetics Corp., Dept. EM, 12621 Chadron Ave., Hawthorne, Cal. 90250
M Fabri-Tek, Inc., Computer Systems Div., Dept. EM, 5901 S. County Rd. 18, Minneapolis, Minn. 55436
Ferronics, Inc., Dept. EM, 60 N. Lincoln Rd., East Rochester, N.Y. 14445
D Ferroxcube Corp., Dept. EM, 5083 Kings Hwy., Saugerties, N.Y. 12477
D Indiana General, Ferrite Prods, Dept. EM, Crows Mill Rd., Keasbey, N.J. 08832
M Magnetic Dielectrics, Dept. EM, Industrial Dr., W. Milford, N.J. 07480
Magnetic Metals Co., Dept. EM, Hayes Ave. at 21st St., Camden, N.J. 08105
M Magnetics, Div/Spang Industries, Inc., Dept. EM, Box 391, Butler, Pa. 16001
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Permag Corp., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648
D Trans-Tech, Dept. EM, 12 Meem Ave., Gaithersburg, Md. 20760
United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013

Cores, Magnetic, Ferrite, Yoke Section

Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
Fair-Rite Prods. Corp., Dept. EM, Wallkill, N.Y. 12589 ..... *
D **ISL Products Ltd. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803** *
Krystinel Corp., Dept. EM, Fox Island Rd., Port Chester, N. Y. 10573 .. p. 2562
Stackpole Carbon Co., Electronic Comps. Div./Soft Ferrites/Special Purpose Resistors, Dept. EM, St. Mary's, Pa. 15857 ..... p. 2568,2569
Stackpole Carbon Co., Elctrn. Comps. Div.-Fixed Comp. Resistors & Carbon Film Resistors, Dept. EM, Kane, Pa. 16735 ..... *
Ceramic Magnetics, Inc., Dept. EM, 87 Fairfield Rd., Fairfield, N.J. 07006
Ferronics, Inc., Dept. EM, 60 N. Lincoln Rd., East Rochester, N.Y. 14445
D Indiana General, Ferrite Prods, Dept. EM, Crows Mill Rd., Keasbey, N.J. 08832
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013

Cores, Magnetic, Metal Alloy (Other Than Silicon & Nickel-Iron)

Fair-Rite Prods. Corp., Dept. EM, Wallkill, N.Y. 12589 ..... *
Inter-Tech. Grp., Inc., Dept. EM, Box 23, Irvington, N.Y. 10533 ..... *
D **ISL Products Ltd. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803** *
Stackpole Carbon Co., Electronic Comps. Div./Soft Ferrites/Special Purpose Resistors, Dept. EM, St. Mary's, Pa. 15857 ..... p. 2568,2569
Stackpole Carbon Co., Elctrn. Comps. Div.-Fixed Comp. Resistors & Carbon Film Resistors, Dept. EM, Kane, Pa. 16735 ..... *
Arnold Engineering Co., Dept. EM, Box "G", Marengo, Ill. 60152
Fuji Electrochemical Co., Dept. EM, Hamagomu Bld. 5 36-11 Shinbashi, Minato-ku, Tokyo, Japan
Magnetic Metals Co., Dept. EM, Hayes Ave. at 21st St., Camden, N.J. 08105
M Magnetics, Div/Spang Industries, Inc., Dept. EM, Box 391, Butler, Pa. 16001
Permag Corp., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
SGL Electronics, Dept. EM, 300 Harvard Avenue, Westville, N.J. 08093

Cores, Magnetic, Nickel-Iron, EL, EE, F & Ring Laminations

Inter-Tech. Grp., Inc., Dept. EM, Box 23, Irvington, N.Y. 10533 ..... *
Stackpole Carbon Co., Electronic Comps. Div./Soft Ferrites/Special Purpose Resistors, Dept. EM, St. Mary's, Pa. 15857 ..... p. 2568,2569
Stackpole Carbon Co., Elctrn. Comps. Div.-Fixed Comp. Resistors & Carbon Film Resistors, Dept. EM, Kane, Pa. 16735 ..... *
Arnold Engineering Co., Dept. EM, Box "G", Marengo, Ill. 60152
Barker Elec. Sls., Dept. EM, Box 405, Ship Bottom, NJ 08008
Framar Metal Prods Co., Dept. EM, 124 W Main St Dept 1201, High Bridge, N.J. 08829
Magnetic Metals Co., Dept. EM, Hayes Ave. at 21st St., Camden, N.J. 08105
M Magnetics, Div/Spang Industries, Inc., Dept. EM, Box 391, Butler, Pa. 16001
Permag Corp., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
SGL Electronics, Dept. EM, 300 Harvard Avenue, Westville, N.J. 08093

Cores, Magnetic, Nickel-Iron, Toroid

Inter-Tech. Grp., Inc., Dept. EM, Box 23, Irvington, N.Y. 10533 ..... *
Krystinel Corp., Dept. EM, Fox Island Rd., Port Chester, N. Y. 10573 ..... *
Stackpole Carbon Co., Electronic Comps. Div./Soft Ferrites/Special Purpose Resistors, Dept. EM, St. Mary's, Pa. 15857 ..... p. 2568,2569
Stackpole Carbon Co., Elctrn. Comps. Div.-Fixed Comp. Resistors & Carbon Film Resistors, Dept. EM, Kane, Pa. 16735 ..... *
Arnold Engineering Co., Dept. EM, Box "G", Marengo, Ill. 60152
Barker Elec. Sls., Dept. EM, Box 405, Ship Bottom, NJ 08008
Magnetic Metals Co., Dept. EM, Hayes Ave. at 21st St., Camden, N.J. 08105
M Magnetics, Div/Spang Industries, Inc., Dept. EM, Box 391, Butler, Pa. 16001
Permag Corp., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
SGL Electronics, Dept. EM, 300 Harvard Avenue, Westville, N.J. 08093

Cores, Magnetic, Powdered Iron, Pot/Cup

D **ISL Products Ltd. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803** *
Stackpole Carbon Co., Electronic Comps. Div./Soft Ferrites/Special Purpose Resistors, Dept. EM, St. Mary's, Pa. 15857 ..... p. 2568,2569
Stackpole Carbon Co., Elctrn. Comps. Div.-Fixed Comp. Resistors & Carbon Film Resistors, Dept. EM, Kane, Pa. 16735 ..... *
Arnold Engineering Co., Dept. EM, Box "G", Marengo, Ill. 60152
Cortec, Inc., Dept. EM, 15811 Chemical La., Huntington Bch, Cal. 92649
D Fuji Electrochemical Co., Dept. EM, Hamagomu Bld. 5 36-11 Shinbashi, Minato-ku, Tokyo, Japan
Micrometals, Dept. EM, 1190 N. Hawk, Anaheim, Cal. 92807

Cores, Magnetic, Powdered Iron, Slug

Caddel-Burns Mfg. Co., Inc., Dept. EM, 40 E. 2nd St., Mineola, N. Y. 11501 p. 1332
Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... *
D **ISL Products Ltd. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803** *
Stackpole Carbon Co., Electronic Comps. Div./Soft Ferrites/Special Purpose Resistors, Dept. EM, St. Mary's, Pa. 15857 ..... p. 2568,2569
Stackpole Carbon Co., Elctrn. Comps. Div.-Fixed Comp. Resistors & Carbon Film Resistors, Dept. EM, Kane, Pa. 16735 ..... *
Arnold Engineering Co., Dept. EM, Box "G", Marengo, Ill. 60152
Cortec, Inc., Dept. EM, 15811 Chemical La., Huntington Bch, Cal. 92649
Micrometals, Dept. EM, 1190 N. Hawk, Anaheim, Cal. 92807
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Cores, Magnetic, Powdered Iron, Toroid

Stackpole Carbon Co., Electronic Comps. Div./Soft Ferrites/Special Purpose Resistors, Dept. EM, St. Mary's, Pa. 15857 ..... p. 2568,2569
Stackpole Carbon Co., Elctrn. Comps. Div.-Fixed Comp. Resistors & Carbon Film Resistors, Dept. EM, Kane, Pa. 16735 ..... *
Arnold Engineering Co., Dept. EM, Box "G", Marengo, Ill. 60152
Cortec, Inc., Dept. EM, 15811 Chemical La., Huntington Bch, Cal. 92649
Micrometals, Dept. EM, 1190 N. Hawk, Anaheim, Cal. 92807
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016

Cores, Magnetic, Powdered Permalloy, Toroid

Stackpole Carbon Co., Electronic Comps. Div./Soft Ferrites/Special Purpose Resistors, Dept. EM, St. Mary's, Pa. 15857 ..... p. 2568,2569
Stackpole Carbon Co., Elctrn. Comps. Div.-Fixed Comp. Resistors & Carbon Film Resistors, Dept. EM, Kane, Pa. 16735 ..... *
Arnold Engineering Co., Dept. EM, Box "G", Marengo, Ill. 60152
M Magnetics, Div/Spang Industries, Inc., Dept. EM, Box 391, Butler, Pa. 16001

Cores, Magnetic, Silicon Ci

Inter-Tech. Grp., Inc., Dept. EM, Box 23, Irvington, N.Y. 10533 ..... *
Stackpole Carbon Co., Electronic Comps. Div./Soft Ferrites/Special Purpose Resistors, Dept. EM, St. Mary's, Pa. 15857 ..... p. 2568,2569
Stackpole Carbon Co., Elctrn. Comps. Div.-Fixed Comp. Resistors & Carbon Film Resistors, Dept. EM, Kane, Pa. 16735 ..... *
Arnold Engineering Co., Dept. EM, Box "G", Marengo, Ill. 60152
Barker Elec. Sls., Dept. EM, Box 405, Ship Bottom, NJ 08008
Magnetic Metals Co., Dept. EM, Hayes Ave. at 21st St., Camden, N.J. 08105
M Magnetics, Div/Spang Industries, Inc., Dept. EM, Box 391, Butler, Pa. 16001
SGL Electronics, Dept. EM, 300 Harvard Avenue, Westville, N.J. 08093

Cores, Magnetic, Silicon El, EE & F, Laminations

Inter-Tech. Grp., Inc., Dept. EM, Box 23, Irvington, N.Y. 10533 ..... *
Stackpole Carbon Co., Electronic Comps. Div./Soft Ferrites/Special Purpose Resistors, Dept. EM, St. Mary's, Pa. 15857 ..... p. 2568,2569
Stackpole Carbon Co., Elctrn. Comps. Div.-Fixed Comp. Resistors & Carbon Film Resistors, Dept. EM, Kane, Pa. 16735 ..... *
Arnold Engineering Co., Dept. EM, Box "G", Marengo, Ill. 60152
Framar Metal Prods Co., Dept. EM, 124 W Main St Dept 1201, High Bridge, N.J. 08829
Magnetic Metals Co., Dept. EM, Hayes Ave. at 21st St., Camden, N.J. 08105
M Magnetics, Div/Spang Industries, Inc., Dept. EM, Box 391, Butler, Pa. 16001
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
SGL Electronics, Dept. EM, 300 Harvard Avenue, Westville, N.J. 08093
Thomas & Skinner, Inc., Dept. EM, Box 150-B,, Indianapolis, Ind. 46206

Cores, Magnetic, Silicon, Toroid

Inter-Tech. Grp., Inc., Dept. EM, Box 23, Irvington, N.Y. 10533 ..... p. 2557
Stackpole Carbon Co., Electronic Comps. Div./Soft Ferrites/Special Purpose Resistors, Dept. EM, St. Mary's, Pa. 15857 ..... p. 2568,2569
Stackpole Carbon Co., Elctrn. Comps. Div.-Fixed Comp. Resistors & Carbon Film Resistors, Dept. EM, Kane, Pa. 16735 ..... *
Arnold Engineering Co., Dept. EM, Box "G", Marengo, Ill. 60152
Barker Elec. Sls., Dept. EM, Box 405, Ship Bottom, NJ 08008
Magnetic Metals Co., Dept. EM, Hayes Ave. at 21st St., Camden, N.J. 08105
M Magnetics, Div/Spang Industries, Inc., Dept. EM, Box 391, Butler, Pa. 16001
SGL Electronics, Dept. EM, 300 Harvard Avenue, Westville, N.J. 08093

Corners, Waveguide—See Bends & Twists, Microwave

Coulometers—See Timers, Electrolytic Cell

Counters, Bidirectional

D **ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845** ..... *
BEI Elctrns., Inc., Dept. EM, 1101 McAlmont St., Little Rock, Ark. 72203 .... *
M **Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731** ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... *
Info-Lite Corp., Dept. EM, 46-10 104 St., Corona, N.Y. 11368 ..... *
Itek Corp. Meas. Sys. Div., Dept. EM, Christina St., Newton, Mass. 02161 .. *
D **IVO Industries, Dept. EM, 1109 Green Grove Rd., Neptune, N.J. 07753** p. 2268,2269
D **Kessler-Ellis Prods., Dept. EM, 120 1st Ave., Atlantic Highlands, N.J. 07716** p. 1650,2271,2272
M **LSI Computer Systems, Inc., Dept. EM, 1235 Walt Whitman Rd., Melville, N.Y. 11746** ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D **Non-Linear Sys., Inc., Dept. EM, 533 Stevens Ave., Solana Beach, Cal. 92075** *
M **North American Philips Controls Corp., Dept. EM, Cheshire Industrial Pk. Box E, Cheshire, Conn. 06410** ..... *
United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403 ..... *
M Abrams Instr., Dept. EM, 606 E. Shiawassee, Lansing, Mich. 48901
Amtron Div., Sippican Corp., Dept. EM, 14820 S. Kedzie Ave., Midlothian, Ill. 60445
Anadex Inc., Dept. EM, 9825 De Soto, Chatsworth, Cal. 91311
M ATEC, Inc., Dept. EM, Box 19426, Houston, Tex. 77024
B & B Motor & Control, Dept. EM, 96 Spring St., New York, N.Y. 10012
D Durant Digital Instruments, Cutler Hammer Co., Dept. EM, 901 S. 12th St., Watertown, Wisc. 53094
D Dynapar Corp., Dept. EM, 1675 Delany Rd., Gurnee, Ill. 60031
D Electronic Counters & Controls Inc., Dept. EM, 1500 McCormick Blvd., Mundelein, Ill. 60060
Ferranti Elec., Dept. EM, East Bethpage Rd., Plainview, N.Y. 11803
GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854
D Hecon Corp., Dept. EM, 31 Park Rd., Tinton Falls, N.J. 07724
HEI, Inc., Dept. EM, Jonathan Ind'l. Ctr., Chaska, Minn. 55318
Indl Timer An Esterline Co., Dept. EM, U.S. Hwy 287, Parsippany, N.J. 07054
Keltron Instrument Displays Div., Dept. EM, 223 Crescent St., Waltham, Mass. 02154
Nu-Metrics, Dept. EM, P.O. Box 800, Connellsville, Pa. 15425
Parametrics, Div. Zero-Max Inds., Dept. EM, 284 Racebrook Rd., Orange, Conn. 06477
D PCS., Inc., Dept. EM, 750 N. Maple Rd., Saline, Mich. 48176
Redington Counters, Inc., Dept. EM, 130 Addison Rd., Windsor, Conn. 06095
D Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
Summit Engineering Corp., Dept. EM, Box 938, Bozeman, Mont. 59715
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
Tri-Tronics Co. Inc., Dept. EM, 619 Enterprise Drive, Dept. EE, Oak Brook, Ill. 60521
DM Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102
WER Industrial, Div. Emerson Elec. Co., Dept. EM, 3036 Alt Blvd., Grand Island, N.Y. 14072
Wyle Computer Prods., Dept. EM, 3200 Magruder Blvd., Hampton, Va 23666

Counters, Coil Winding

M **Arnold Magnetics Corp., Dept. EM, 11520 Jefferson Blvd., Culver City, Cal. 90230** ..... *
D **IVO Industries, Dept. EM, 1109 Green Grove Rd., Neptune, N.J. 07753** ..... *
D **Kessler-Ellis Prods., Dept. EM, 120 1st Ave., Atlantic Highlands, N.J. 07716** *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D **Non-Linear Sys., Inc., Dept. EM, 533 Stevens Ave., Solana Beach, Cal. 92075** *
M ATEC, Inc., Dept. EM, Box 19426, Houston, Tex. 77024

Durant Digital Instruments, Cutler Hammer Co., Dept. EM, 901 S. 12th St., Watertown, Wisc. 53094
D Dynapar Corp., Dept. EM, 1675 Delany Rd., Gurnee, Ill. 60031
D Eagle Signal, Mfg. Div. Gulf & Western Inds., Dept. EM, Box 3585, Davenport, Iowa 52808
Elden Mfg. Co., Dept. EM, 2712 N. Elston Ave., Chicago, Ill. 60647
D Electronic Counters & Controls Inc., Dept. EM, 1500 McCormick Blvd., Mundelein, Ill. 60060
D Hecon Corp., Dept. EM, 31 Park Rd., Tinton Falls, N.J. 07724
Keltron Instrument Displays Div., Dept. EM, 223 Crescent St., Waltham, Mass. 02154
Redington Counters, Inc., Dept. EM, 130 Addison Rd., Windsor, Conn. 06095
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
D Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102
D Vorne Inds., Inc., Dept. EM, 5023 W. Belmont Ave., Chicago, Ill. 60641

Counter, Decode

Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... *
Luff Research, Dept. EM, Box 449, Jackson Hgts., N.Y. 11372
Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071

Counters, Directional

Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
M **Info-Lite Corp., Dept. EM, 46-10 104 St., Corona, N.Y. 11368** ..... *
D **IVO Industries, Dept. EM, 1109 Green Grove Rd., Neptune, N.J. 07753** p. 2268,2269
D **Kessler-Ellis Prods., Dept. EM, 120 1st Ave., Atlantic Highlands, N.J. 07716** p. 2270-2272
M **LSI Computer Systems, Inc., Dept. EM, 1235 Walt Whitman Rd., Melville, N.Y. 11746** ..... *
A Talley Ind's Co., , Dept. EM, 135 S. Main St., Thomaston, Conn. 06787 .... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
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B & B Motor & Control, Dept. EM, 96 Spring St., New York, N.Y. 10012
Berg Inc., Winfred M., Dept. EM, 499 Ocean Ave., East Rockaway, N.Y. 11518
D Durant Digital Instruments, Cutler Hammer Co., Dept. EM, 901 S. 12th St., Watertown, Wisc. 53094
Dynage, Inc. Control Prods Grp., Dept. EM, 1331 Blue Hills Ave., Bloomfield, Conn. 06002
D Dynapar Corp., Dept. EM, 1675 Delany Rd., Gurnee, Ill. 60031
D Electronic Counters & Controls Inc., Dept. EM, 1500 McCormick Blvd., Mundelein, Ill. 60060
D Hecon Corp., Dept. EM, 31 Park Rd., Tinton Falls, N.J. 07724
HEI, Inc., Dept. EM, Jonathan Ind'l. Ctr., Chaska, Minn. 55318
Keltron Instrument Displays Div., Dept. EM, 223 Crescent St., Waltham, Mass. 02154
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
DM Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102
WER Industrial, Div. Emerson Elec. Co., Dept. EM, 3036 Alt Blvd., Grand Island, N.Y. 14072

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M **Info-Lite Corp., Dept. EM, 46-10 104 St., Corona, N.Y. 11368** ..... *
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D **Kessler-Ellis Prods., Dept. EM, 120 1st Ave., Atlantic Highlands, N.J. 07716** *
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North American Philips Controls Corp., Dept. EM, Cheshire Industrial Pk. Box E, Cheshire, Conn. 06410 ..... *
Practical Automation, Inc., Dept. EM, Trap Falls Rd., Shelton, Conn. 06484 *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
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Automatic Timing & Controls Co., Dept. EM, King of Prussia, Pa. 19406
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Electric Tachometer Corp., Dept. EM, 68th & Upland Sts., Philadelphia, Pa. 19142
DM ENM, Dept. EM, 5350 Northwest Hwy., Chicago, Ill. 60630
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D Master Elctrn. Controls, Dept. EM, 1651-19th St., Santa Monica, Cal. 90404
Redington Counters, Inc., Dept. EM, 130 Addison Rd., Windsor, Conn. 06095
D Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
DM Stock Drive Prods., Div. Designatronics, Inc., Dept. EM, 55 S. Denton Ave., New Hyde Pk., N.Y. 11040
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M Whittaker Corp., Dept. EM, 10880 Wilshire Blvd., Los Angeles, Cal. 90024

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D Durant Digital Instruments, Cutler Hammer Co., Dept. EM, 901 S. 12th St., Watertown, Wisc. 53094
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Assocs. Inc., Dept. EM, 333 W. Commercial St., East Rochester, N.Y. 14445
Electro-Numerics Inc., Dept. EM, 1811 Reynolds, Irvine, Cal. 92714
D Electronic Counters & Controls Inc., Dept. EM, 1500 McCormick Blvd., Mundelein, Ill. 60060
DM ENM, Dept. EM, 5350 Northwest Hwy., Chicago, Ill. 60630
ESSCO Industries, Dept. EM, PO Box 515, Sierra Madre, Cal. 91024
Ferranti Elec., Dept. EM, East Bethpage Rd., Plainview, N.Y. 11803
FSI/Fork Standards Inc., Dept. EM, 211 Main St., W. Chicago, Ill. 60185
GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854
Haydon Switch & Instr., Inc., Dept. EM, 1500 Meriden Rd., Waterbury, Conn. 06705
D Hecon Corp., Dept. EM, 31 Park Rd., Tinton Falls, N.J. 07724
HEI, Inc., Dept. EM, Jonathan Ind'l. Ctr., Chaska, Minn. 55318
Indl Timer An Esterline Co., Dept. EM, U.S. Hwy 287, Parsippany, N.J. 07054
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Nu-Metrics, Dept. EM, P.O. Box 800, Connellsville, Pa. 15425
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
Redington Counters, Inc., Dept. EM, 130 Addison Rd., Windsor, Conn. 06095
Richard-Lee Co., Dept. EM, Box 724, New Providence, N.J. 07974
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
Telesis Laboratory, Dept. EM, Box 387, Chillocothe, Ohio 45601
UFAD Corp., Dept. EM, 700 36th St. S.E., Grand Rapids, Mich. 49508
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D Vorne Inds., Inc., Dept. EM, 5023 W. Belmont Ave., Chicago, Ill. 60641

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Refac Elctrns. Pinlite+, Wild Rover+, Dept. EM, Box 809, W. Hill Rd., Winsted, Conn 06098 ..... *
Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... *
DM **Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518** ..... *
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M ATEC, Inc., Dept. EM, Box 19426, Houston, Tex. 77024
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D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
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EIP, Incorporated, Dept. EM, 3230 Scott Blvd., Santa Clara, Cal. 95051
Electro-Numerics Inc., Dept. EM, 1811 Reynolds, Irvine, Cal. 92714
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Keltron Instrument Displays Div., Dept. EM, 223 Crescent St., Waltham, Mass. 02154
D Lectrotech, Inc., Dept. EM, 5810 N. Western Ave., Chicago, Ill. 60659
Luff Research, Dept. EM, Box 449, Jackson Hgts., N.Y. 11372
M Norlin Communications Inc., Dept. EM, 9125 Gaither Rd., Gaithersburg, Md. 20760
Plessey Enviromental Sys., Dept. EM, 3939 Ruffin Rd., San Diego, Cal. 92123
DM Plessey Semiconductors, Dept. EM, 1674 McGaw Ave., Irvine, Cal. 92714
D Racal-Dana Instrus Inc., Dept. EM, 18912 Von Karman Ave., Irvine, Cal. 92715
D Regency Electronics, Inc., Dept. EM, 7707 Records St., Indianapolis, Ind. 46226
D Sencore, Dept. EM, 3200 Sencore Dr., Sioux Falls, S.D. 57107
Sivers Lab, Dept. EM, Box 90339, Los Angeles, Cal. 90009
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
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Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
D Telco Products Co., Dept. EM, 44 Sea Cliff, Glen Cove, NY 11542
Telesis Laboratory, Dept. EM, Box 387, Chillocothe, Ohio 45601
D Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304
WER Industrial, Div. Emerson Elec. Co., Dept. EM, 3036 Alt Blvd., Grand Island, N.Y. 14072
M Wilson Electronics, Dept. EM, PO Box 19000, Las Vegas, Nev 89119

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Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... *
D **ISL Products Ltd. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803** *
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D **Kessler-Ellis Prods., Dept. EM, 120 1st Ave., Atlantic Highlands, N.J. 07716** *
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Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
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Automatic Timing & Controls Co., Dept. EM, King of Prussia, Pa. 19406
D Barker & Williamson, Inc., Dept. EM, Canal St., Bristol, Pa. 19007
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D Durant Digital Instruments, Cutler Hammer Co., Dept. EM, 901 S. 12th St., Watertown, Wisc. 53094
D Eagle Signal, Mfg. Div. Gulf & Western Inds., Dept. EM, Box 3585, Davenport, Iowa 52808
Elden Mfg. Co., Dept. EM, 2712 N. Elston Ave., Chicago, Ill. 60647
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D JPI, Inc., Dept. EM, 1507 San Vicente Blvd., Santa Monica, Cal. 90402
M Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
D Master Elctrn. Controls, Dept. EM, 1651–19th St., Santa Monica, Cal. 90404
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
PIC Design Div., Benrus Corp., Dept. EM, Benrus Center, Rte 7, Ridgefield, Conn. 06877
Redington Counters, Inc., Dept. EM, 130 Addison Rd., Windsor, Conn. 06095
D Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
DM Stock Drive Prods., Div. Designatronics, Inc., Dept. EM, 55 S. Denton Ave., New Hyde Pk., N.Y. 11040
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Galileo Electro-Optics Corp., Dept. EM, Galileo Pk., Sturbridge, Mass. 01518
M Harshaw Chemical Co., A Kenanee Industry, Dept. EM, 6801 Cochran Rd., Solon, Ohio 44139
Keltron Instrument Displays Div., Dept. EM, 223 Crescent St., Waltham, Mass. 02154
D Macrodyne Inc., Dept. EM, 1900 Maxon Rd., Box 1079, Schenectady, N.Y. 12301
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M Nuclear Resch. Corp., Dept. EM, 1105 Indl. Hwy., Southampton, Pa. 18966
Princeton Elctrn. Prods., Dept. EM, Box 101, New Brunswick, N.J. 08902
T. C. Centronic, Dept. EM, King Henry's Dr, Addington, Croydon CR9 0BG, Great Britain
D TSI Inc, Dept. EM, 500 Cardigan Rd., Box 3394, St. Paul, Minn. 55165
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Counters, Photoelectric

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D Autotron, Inc., Dept. EM, 3269 N. Vermilion St., Box 595, Danville, Ill. 61832
Dolan-Jenner Inds., Inc., Dept. EM, Box 1020, Woburn, Mass. 01801
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M Power Instrs., Inc., Dept. EM, 7352 N. Lawndale Ave., Skokie, Ill. 60076
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D Scientific Technology, Dept. EM, 1201 San Antonio Rd., Mountain View, Cal. 94043
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Tri-Tronics Co. Inc., Dept. EM, 619 Enterprise Drive, Dept. EE, Oak Brook, Ill. 60521
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D Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102
D Vorne Inds., Inc., Dept. EM, 5023 W. Belmont Ave., Chicago, Ill. 60641
WER Industrial, Div. Emerson Elec. Co., Dept. EM, 3036 Alt Blvd., Grand Island, N.Y. 14072
Worner Elctrn. Devices, Dept. EM, 121 N. Main St., Rankin, Ill. 60960

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Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex 76102
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Anadex Inc., Dept. EM, 9825 De Soto, Chatsworth, Cal. 91311
M ATEC, Inc., Dept. EM, Box 19426, Houston, Tex. 77024

Automatic Timing & Controls Co., Dept. EM, King of Prussia, Pa. 19406
B & B Motor & Control, Dept. EM, 96 Spring St., New York, N.Y. 10012
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D Crouzet/Cridland, Dept. EM, 118 Barrington Commons Ct Ste 207, Barrington, Ill. 60010
D Durant Digital Instruments, Cutler Hammer Co., Dept. EM, 901 S. 12th St., Watertown, Wisc. 53094
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D Electronic Counters & Controls Inc., Dept. EM, 1500 McCormick Blvd., Mundelein, Ill. 60060
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Midland Standrad Inc., Dept. EM, 603 E. Chicago St. Box 38, Elgin, ILL 60120
MKC Electronics, Dept. EM, 454 E. Donovan Rd., Kansas City, Kans. 66115
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D Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
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D Scientific Technology, Dept. EM, 1201 San Antonio Rd., Mountain View, Cal. 94043
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WER Industrial, Div. Emerson Elec. Co., Dept. EM, 3036 Alt Blvd., Grand Island, N.Y. 14072

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ENM, Dept. EM, 5350 Northwest Hwy., Chicago, Ill. 60630
Hecon Corp., Dept. EM, 31 Park Rd., Tinton Falls, N.J. 07724
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M RHG Elctrns. Lab., Dept. EM, 161 E. Industry Ct., Deer Park, N.Y. 11729
D R L C Elctrns., Inc., Dept. EM, 83 Radio Cir., Mt. Kisco, N.Y. 10549
Sivers Lab, Dept. EM, Box 90339, Los Angeles, Cal. 90009
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
M Technical Research & Mfg., Inc., Dept. EM, Kelly Ave. Grenier Field, R.F.D. #3, Manchester, N.H. 03103
M Transco Prods., Inc., Dept. EM, 4241 Glencoe Ave., Venice, Cal. 90291
TRG, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
Triangle Microwave Inc., Dept. EM, 9B Great Meadow La, East Hanover, NJ 07936
TRW Auto-E, Dept. EM, Davis & Copewood Sts., Camden, N.J. 08103
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Wavecom, Dept. EM, 9036 Winnetna Ave., Northridge, Cal. 91324
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760

Couplers, Multi-Set—See Couplers, Antenna

Couplers, Rotary

Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... *
Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 *
M Airtron, Div. Litton Inds., Dept. EM, 200 E. Hanover Ave., Morris Plains, N.J. 07950
M Eastern Microwave Corp., Dept. EM, 4 Gill St., Woburn, MA 01801
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
D Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
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Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006

Couplings, Quick-Disconnect, Liquid or Gas

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High Voltage Engrg. Corp., Dept. EM, S. Bedford St., Burlington, Mass. 01803
OTC Div Owatonna Tool Co, Dept. EM, 395 Eisenhower Dr., Owatonna, Minn. 55060
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
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D Pyle-National Co, Dept. EM, 1334 N. Kostner Ave, Chicago, Ill 60651 ..... *
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D Vemaline Prods. Div., Ostbys & Barton Co., Dept. EM, 487 Jefferson Blvd., Warwick, R.I. 02886 ..... *
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Anchor Plastics, Dept. EM, 36-36 36th, Long Island City, N.Y. 11106
Berg Inc., Winfred M., Dept. EM, 499 Ocean Ave., East Rockaway, N.Y. 11518
Eaton Corp., Ind'l. Drives Div., Dept. EM, 9919 Clinton Rd., Cleveland, Ohio 44111
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Federal Screw Products Inc., Dept. EM, 3917 N. Kedzie Ave., Chicago, Ill. 60618
Helical Prods. Co., Inc., Dept. EM, Box 2296, Santa Maria, Cal. 93456
M Instru-Lec Corp., Dept. EM, 520 Homestead Ave., Mt. Vernon, N.Y. 10550
Lord Kinematics, Lord Corp., Dept. EM, 1635 W. 12th St., Erie, Pa. 16512
D Naugler Engrg., Inc., Dept. EM, Off Dunham Rd., Beverly, Mass. 01915
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M PIC Design Div., Benrus Corp., Dept. EM, Benrus Center, Rte 7, Ridgefield, Conn. 06877
M Precision Mechanisms Corp., Dept. EM, 44 Brooklyn Ave., Westbury, N.Y. 11590
Renbrandt, Inc., Dept. EM, 6 Parmelee St., Boston, Mass. 02118
M Servometer Corp., Dept. EM, 501 Little Falls Rd., Cedar Grove, N.J. 07009
DM Stock Drive Prods., Div. Designatronics, Inc., Dept. EM, 55 S. Denton Ave., New Hyde Pk., N.Y. 11040
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006

Covers, Protective (Including Dust)

Allied Systems Corp., Dept. EM, Box 11005, Greensboro, N.C. 27409 ..... *
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M Cadillac Plastic & Chemical, Dayco Co., Dept. EM, Box 810, Detroit, Mich. 48232
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M Harshaw Chemical Co., A Kenanee Industry, Dept. EM, 6801 Cochran Rd., Solon, Ohio 44139
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M Savoy Electronics, Dept. EM, P.O. Box 5727, Ft. Lauderdale, Fla. 33310
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Valtec Corp, Valpey-Fischer Div, Dept. EM, 75 South St, Hopkinton, Mass. 01748

Crystals, Frequency Control

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DM M-tron Industries, Dept. EM, P.O. Box 630, E. Hwy 50, Yankton, S.D. 57078
Projects Unlimited, Inc., Dept. EM, 3680 Wyse Rd., Dayton, Ohio 45414
D Regency Electronics, Inc., Dept. EM, 7707 Records St., Indianapolis, Ind. 46226
R/T Labs., Inc., Dept. EM, 4126 Colerain Ave., Cincinnati, Ohio 45223
M Savoy Electronics, Dept. EM, P.O. Box 5727, Ft. Lauderdale, Fla. 33310
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Crystals, Piezoelectric

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M Crystonic Labs, Dept. EM, 10418 La Cienega Blvd., Inglewood, Calif. 90304
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Gulton Inds., Piezo Prods. Div., Dept. EM, Box 4300, Fullerton, Cal. 92634
Linden Labs., Inc., Dept. EM, Box 920, State College, Pa. 16801
DM M-tron Industries, Dept. EM, P.O. Box 630, E. Hwy 50, Yankton, S.D. 57078
DM Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Radio Materials Co., Div. P.R. Mallory, Dept. EM, 4242 W. Bryn Mawr Ave., Chicago, Ill. 60646
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M Savoy Electronics, Dept. EM, P.O. Box 5727, Ft. Lauderdale, Fla. 33310
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D Valtec Corp, Valpey-Fischer Div, Dept. EM, 75 South St, Hopkinton, Mass. 01748

Crystals, Quartz

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M Crystonic Labs, Dept. EM, 10418 La Cienega Blvd., Inglewood, Calif. 90304
DM CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
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D Regency Electronics, Inc., Dept. EM, 7707 Records St., Indianapolis, Ind. 46226
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M Savoy Electronics, Dept. EM, P.O. Box 5727, Ft. Lauderdale, Fla. 33310
D S G C Inc., Dept. EM, 13737 SE 26th St., Bellevue, Wash. 98005
D Sloan Technology Corp., Dept. EM, 535 E. Montecito St., Santa Barbara, Cal. 93103
D Sneigrove, C. R. Ltd., Dept. EM, 141 Bond Ave., Don Mills 404 Ont., Ont. Can.
Solitron Devices, Transistor Div., Dept. EM, 1177 Blue Heron Rd., Riviera Beach, Fla. 33404
Thermal Amer. Fused Quartz, Dept. EM, Change Bridge Rd., Montville, N.J. 07045
D Valtec Corp, Valpey-Fischer Div, Dept. EM, 75 South St, Hopkinton, Mass. 01748

Crystals, Quartz, for Watches

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CTS Knights, Inc., Dept. EM, 400 Reimann Ave., Sandwich, Ill. 60548 ..... *
Reeves-Hoffman Div., Dynamics Corp. of Amer., Dept. EM, 400 W. North St., Carlisle, Pa. 17013 ..... *
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D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016

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Litronix, Dept. EM, 19000 Homestead Rd., Cupertino, Cal. 95014 ..... *
Ohio Semitronics, Inc., Dept. EM, 1205 Chesapeake Ave., Columbus, Ohio 43212 ..... *
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D **Union Carbide Corp., Battery Products Div., Dept. EM, 270 Park Ave., New York, N.Y. 10017** ..... *
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Materials Resch. Corp., Dept. EM, Route 303, Orangeburg, N.Y. 10962
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
Nucleonic Prods., Dept. EM, Box 1454, 6660 Variel Ave., Canoga Pk., Cal. 91303
M Solitron Devices, Transistor Div., Dept. EM, 1177 Blue Heron Rd., Riviera Beach, Fla. 33404
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Xciton Corp, Dept. EM, Shaker Park, 5 Hemlock St, Latham, NY 12110

Crystals, Yig

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M Harshaw Chemical Co., A Kenanee Industry, Dept. EM, 6801 Cochran Rd., Solon, Ohio 44139
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304

Cups, Encapsulation

ITT Cannon Electric, Dept. EM, 666 E. Dyer Rd., Santa Ana, Cal. 92702 ..... *
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M Claude Engrg, Dept. EM, 1320 Grand Ave-Unit 12, San Marcos, CA 92069
Electrical Plastics Corp., Dept. EM, 500 Long Branch Ave., Long Branch, N.J. 07740
EpoxyCast Electronic Case Co., Dept. EM, 222 Lake Ave., Yonkers, N.Y. 10701
Gibson/Egan Co., Dept. EM, 2666 East Huntington Dr., Duarte, CA. 91010
Globe Plastics, Dept. EM, 1342 S. Signal Dr., Pomona, Cal. 91766
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Resdel Corp., Dept. EM, Bldg. 22–County Airport, Rio Grande, N.J. 08242
M Robison Elctrns., Dept. EM, 3580 Sacramento Dr., San Luis Obispo, Cal. 93401
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Active Control Instrumentation, Dept. EM, PO Box 243-Wildwood Circle, Key Largo, Florida 33037 ..... *
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Decade Boxes, Resistance

Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
D Cutler-Hammer, Shallcross Resistor Prods., Dept. EM, US 70 East, Smithfield, N.C. 27577 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 .... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
D Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076 .... p. 3721
Tech Labs., Inc., Dept. EM, Bergen & Edsall Blvds., Palisades Pk., N.J. 07650 *
D Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... *
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
Beckman Instrs., Cedar Grove Opers., Dept. EM, 89 Commerce Rd., Cedar Grove, N.J. 07009
DM Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
D Clarostat Mfg. Co., Inc., Dept. EM, Washington St., Dover, N.H. 03820
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
E.S.I. Inc., Dept. EM, 13900 N.W. Science Park Dr., Portland, Oregon 97229
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
IET Labs Inc., Dept. EM, 761 Old Country Rd, Westbury, N.Y. 11590
D Wide Range Electronics Corp., Dept. EM, 2119 Schultz Rd., St. Louis, Mo. 63141
Zi-Tech Div., Aikenwood Corp., Dept. EM, Box 26, 2151 Park Blvd., Palo Alto, Cal. 94302

Decade Boxes, Transformer

Magnetico, Inc., Dept. EM, 182 Morris Ave., Holtsville, N.Y. 11742 ..... *
M North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803 ..... *
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
E.S.I. Inc., Dept. EM, 13900 N.W. Science Park Dr., Portland, Oregon 97229
Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343

Decalcomania-Also See Labels, Pressure Sensitive

D Datak Corp., Dept. EM, 65 Seventy-First St., Guttenberg, N.J. 07093 ..... *
D Decalcraft Corp., Dept. EM, Rte. 309, Hatfield, Pa. 19440
M Photo Chemical Prods. Cal., Dept. EM, 1715 Berkeley, Santa Monica, Cal. 90404
Stanpat Products Inc., Dept. EM, 366 Main St., Port Washington, N.Y. 11050
Tapecon, Inc., Dept. EM, 475 River St., Rochester, N.Y. 14612

Decoders, Binary To Decimal—See Converters, Binary To Decimal

Decoders, Digital To Analog—See Converters, Digital To Analog

Decoders, Pulse

Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... *
Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Vega Precision Labs., Dept. EM, 800 Follin La., Vienna, Va. 22180 ..... *
D American Microsignal Corp, Dept. EM, 8431 Monroe Ave., Stanton, Cal. 90680
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Tasker Systems, Dept. EM, 20131 Sunburst St., Chatsworth, Cal. 91311
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
Voice Identification Inc., Dept. EM, Box 714, Somerville, N.J. 08876

Decoders, Readout—See Drivers & Decoders For Readouts

Decoders, Telemetry—See Decoders, Tone

Decoders, Tone

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... *
Re-el Circuits, Inc., Dept. EM, 520 Victor Street, Saddle Brook, N.J. 07662 *
D American Microsignal Corp, Dept. EM, 8431 Monroe Ave., Stanton, Cal. 90680
M Atlantic Research Corp., Dept. EM, 5390 Cherokee Ave., Alexandria, Va 22314
Dantel, Inc., Dept. EM, 1922 North Helm, Fresno, Cal. 93727
Data Signal Corp, Dept. EM, 40-44 Hunt St, Watertown, MA 02172
Di-Tech Inc., Dept. EM, 315 Wyandanch Ave., North Babylon, N.Y. 11704
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
DM Exar Integrated Systems, Dept. EM, P.O.B. 62229, Sunnyvale, Cal. 94088
Gorman-Redlich Mfg. Co., Dept. EM, 6 Curtis St., Athens, Ohio 45701
Mobil Electronics, Inc., Dept. EM, Box 1132, Anderson, Ind. 46015
Palomar Engrs., Dept. EM, Box 455, Escondido, Cal. 92025
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
VHF Engrg, Div. of Brownian Elctrns. Corp., Dept. EM, 320 Water St., Binghamton, N.Y. 13902

Decoders, Video

Di-Tech Inc., Dept. EM, 315 Wyandanch Ave., North Babylon, N.Y. 11704
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Video Automation Systems Inc., Dept. EM, Rte 1—Box 21A, Pound Ridge, N.Y. 10576
Video Research Corporation, Dept. EM, 6985 Garden Rd., Riviera Beach, Fla. 33404

Decontaminants—See Cleaners & Solvents

Degaussers—See Demagnetizers; Coils, Degaussing

Degreasing Chemicals—See Cleaners & Solvents

Dehumidifiers (For Equipment)

M Tenney Engrg., Inc., Dept. EM, 109 Springfield Rd., Union, N.J. 07083 ..... *
M Atmosphere Controls Prdts., Dept. EM, 295 Polaris, Mt. View, Cal. 94043
Daco Instr. Co., Dept. EM, 30 Stran Rd., Milford, Conn. 06460
Hotpack Corp., Dept. EM, 5148 Cottman Ave., Phila., Pa. 19135
Pall Corp., Dept. EM, 30 Sea Cliff Ave., Glen Cove, N.Y. 11542
Pall Trinity Micro Corp., Dept. EM, Rte. 281, Cortland, N.Y. 13045

Dehydrators

Andrew Corp., Dept. EM, 10500 W. 153rd St., Orland Park, Ill. 60462
Cablewave Systems Inc., Dept. EM, 60 Dodge Ave., North Haven, Conn. 06473
D Daco Instr. Co., Dept. EM, 30 Stran Rd., Milford, Conn. 06460
M Dielectric Comms, Unit of Gen Signal, Dept. EM, Raymond, Maine 04071

FTS Systems Inc., Dept. EM, POB 158, Stone Ridge, N.Y. 12484
Gabriel Elctrns. Inc., Dept. EM, Box 626, Scarborough Ind'l. Pk., Scarborough, Me. 04074
D GCA/Precision Scientific, Dept. EM, 3737 W. Cortland St., Chicago, Ill. 60647
Keene Corp, Dept. EM, 345 Park Ave, New York, N.Y. 10022
Pall Trinity Micro Corp., Dept. EM, Rte. 281, Cortland, N.Y. 13045

Delay Lines, All Types

Allen Avionics, Inc., Div. A.K. Allen Co., Dept. EM, 255 E. 2nd St., Mineola, N.Y. 11501 ..... p. 2380-2382,2610
DM Andersen Laboratories Inc., Dept. EM, 1280 Blue Hills Ave., Bloomfield, Conn. 06002 ..... p. 2618,2619
Artronic Instr. Co., Dept. EM, 11232 Triangle La., Silver Spring, Md. 20902 p. 2379
Bel Fuse, Dept. EM, 203 Van Vorst, Jersey City, N.J. 07302 p. 2386,2387,2389
Caddel-Burns Mfg. Co., Inc., Dept. EM, 40 E. 2nd St., Mineola, N. Y. 11501 p. 1328
Columbia Components, Div. Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 ..... p. 2391
Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 p. 2391
Control Elctrns. Co., Inc., Dept. EM, 153 Florida St., Farmingdale, N.Y. 11735 p. 2393
Damon Corp., Elctrns. Div., Dept. EM, 80 Wilson Way, Westwood, Mass. 02090 ..... *
Data Delay Devices, Dept. EM, 253 Crooks Ave., Clifton, N.J. 07011 p. 2395-2400
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... *
Frequency Selective Networks, Inc, Dept. EM, 69-20 Garfield Ave., Woodside, N.Y. 11377 ..... p. 2326
Kappa Networks, Dept. EM, 165 Roosevelt Ave, Carteret, N.J. 07008 ..... *
Leach Corp., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003 p. 3576,3577
Nytronics Comps. Group Inc., Sub Nytronics, Dept. EM, Orange St., Darlington, S.C. 29532 ..... p. 2406,2407
RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102 ..... p. 2408-2411,2413
RCL Electronics Div., AMF Incorporated, Dept. EM, 700 S. 21st St., Irvington, N.J. 07111 ..... p. 2414
Convex Corp., Dept. EM, 2810 Dorr Ave., Fairfax, Va. 22031
D Philips Audio Video Sys, Neutrik Prods, Dept. EM, 91 McKee Dr., Mahwah, N.J. 07430

Delay Lines, Cable

Allen Avionics, Inc., Div. A.K. Allen Co., Dept. EM, 255 E. 2nd St., Mineola, N.Y. 11501 ..... *
Artronic Instr. Co., Dept. EM, 11232 Triangle La., Silver Spring, Md. 20902 p. 2379
Bel Fuse, Dept. EM, 203 Van Vorst, Jersey City, N.J. 07302 ..... p. 2387
M Columbia Components, Div. Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 ..... *
M Computer Devices Corp., Dept. EM, 63 Austin Blvd., Commack, N.Y. 11725 *
Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 ..... *
M Control Elctrns. Co., Inc., Dept. EM, 153 Florida St., Farmingdale, N.Y. 11735 *
M Data Delay Devices, Dept. EM, 253 Crooks Ave., Clifton, N.J. 07011 ..... *
M Kappa Networks, Dept. EM, 165 Roosevelt Ave, Carteret, N.J. 07008 ..... *
DM Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725 ..... *
D RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102 ..... *
DM Uniform Tubes Inc., MicroDelay Division, Dept. EM, Collegeville, Pa. 19426 *
Astrolab, Inc., Dept. EM, 345 Dalziel Rd., Linden, N.J. 07036
Cablewave Systems Inc., Dept. EM, 60 Dodge Ave., North Haven, Conn. 06473
Precision Tube, Dept. EM, Church Rd. & Wissahickon, No. Wales, Pa. 19454
Standard Engineering, Dept. EM, 44800 Industrial Dr., Fremont, Cal. 94538
Times Fiber Comm. Inc., Sub. Insilco Corp. Times Wire & Cable Div., Dept. EM, 358 Hall Ave., Wallingford, Conn. 06492

Delay Lines, Distributed, Constant (Fixed)

Allen Avionics, Inc., Div. A.K. Allen Co., Dept. EM, 255 E. 2nd St., Mineola, N.Y. 11501 ..... p. 2381
DM Andersen Laboratories Inc., Dept. EM, 1280 Blue Hills Ave., Bloomfield, Conn. 06002 ..... p. 2618,2619
M Artronic Instr. Co., Dept. EM, 11232 Triangle La., Silver Spring, Md. 20902 p. 2379
Bel Fuse, Dept. EM, 203 Van Vorst, Jersey City, N.J. 07302 ..... p. 2387
M Columbia Components, Div. Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 ..... *
M Computer Devices Corp., Dept. EM, 63 Austin Blvd., Commack, N.Y. 11725 *
Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 ..... *
M Control Elctrns. Co., Inc., Dept. EM, 153 Florida St., Farmingdale, N.Y. 11735 *
M Data Delay Devices, Dept. EM, 253 Crooks Ave., Clifton, N.J. 07011 ..... *
M ESC Elctrns. Corp., Dept. EM, 534 Bergen Blvd., Palisades Pk., N.J. 07650 *
M Frequency Selective Networks, Inc, Dept. EM, 69-20 Garfield Ave., Woodside, N.Y. 11377 ..... *
M Kappa Networks, Dept. EM, 165 Roosevelt Ave, Carteret, N.J. 07008 p. 2405
D Nytronics Comps. Group Inc., Sub Nytronics, Dept. EM, Orange St., Darlington, S.C. 29532 ..... *
RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102 ..... p. 2412
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... *
PCA Elctrns., Inc., Dept. EM, 16799 Schoenborn St., Sepulveda, Cal. 91343
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
Television Equip. Assocs., Dept. EM, Box 260, South Salem, N.Y. 10590

Delay Lines, Distributed, Constant (Variable)

Allen Avionics, Inc., Div. A.K. Allen Co., Dept. EM, 255 E. 2nd St., Mineola, N.Y. 11501 ..... *
DM Andersen Laboratories Inc., Dept. EM, 1280 Blue Hills Ave., Bloomfield, Conn. 06002 ..... p. 2618,2619
M Artronic Instr. Co., Dept. EM, 11232 Triangle La., Silver Spring, Md. 20902 p. 2379
Bel Fuse, Dept. EM, 203 Van Vorst, Jersey City, N.J. 07302 p. 2387,2388,2390
M Columbia Components, Div. Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 ..... *
M Computer Devices Corp., Dept. EM, 63 Austin Blvd., Commack, N.Y. 11725 *
Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 ....., *
M Control Elctrns. Co., Inc., Dept. EM, 153 Florida St., Farmingdale, N.Y. 11735 *
M Data Delay Devices, Dept. EM, 253 Crooks Ave., Clifton, N.J. 07011 p. 2398-2400
M ESC Elctrns. Corp., Dept. EM, 534 Bergen Blvd., Palisades Pk., N.J. 07650 p. 2402
M Kappa Networks, Dept. EM, 165 Roosevelt Ave, Carteret, N.J. 07008 ..... *
RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102 ..... p. 2412
Coilcraft, Dept. EM, 1102 Siler Lake Rd., Cary, Ill. 60013
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
D Tau-Tron Inc., Dept. EM, 11 Esquire Rd., N. Billerica, Mass. 01862
Television Equip. Assocs., Dept. EM, Box 260, South Salem, N.Y. 10590
D Wiltron Co., Dept. EM, 825 E. Middlefield Rd., Mt. View, Cal 94043

Delay Lines, Glass & Quartz

DM Andersen Laboratories Inc., Dept. EM, 1280 Blue Hills Ave., Bloomfield, Conn. 06002 ..... p. 2618
Artronic Instr. Co., Dept. EM, 11232 Triangle La., Silver Spring, Md. 20902 p. 2379
Bel Fuse, Dept. EM, 203 Van Vorst, Jersey City, N.J. 07302 ..... p. 2387
M Control Elctrns. Co., Inc., Dept. EM, 153 Florida St., Farmingdale, N.Y. 11735 *
Damon Corp., Elctrns. Div., Dept. EM, 80 Wilson Way, Westwood, Mass. 02090 ..... p. 2319
M Microsonics, Div. Sangamo Elec. Co., Dept. EM, 60 Winter St., Weymouth, Mass. 02188 ..... *
Amperex Electronic Corp., Slatersville Div., Dept. EM, Providence Pike, Slatersville, R.I. 02876
M Andersen & Assoc., Walther M.A., Dept. EM, 4 Main St. Ext., Tariffville, Conn. 06081
Corning Glass Works, Memory Prods Dept., Dept. EM, 3900 Electronic Dr., Raleigh, N.C. 27602
M Optics Group-East, Valtec Corp., Dept. EM, Holliston, Mass. 01746

Delay Lines, Liquid

Artronic Instr. Co., Dept. EM, 11232 Triangle La., Silver Spring, Md. 20902 p. 2379
Bel Fuse, Dept. EM, 203 Van Vorst, Jersey City, N.J. 07302 ..... p. 2387
M Microsonics, Div. Sangamo Elec. Co., Dept. EM, 60 Winter St., Weymouth, Mass. 02188 ..... *

Delay Lines, Lumped-Constant (Electrically Variable)

Allen Avionics, Inc., Div. A.K. Allen Co., Dept. EM, 255 E. 2nd St., Mineola, N.Y. 11501 ..... p. 2380
DM Andersen Laboratories Inc., Dept. EM, 1280 Blue Hills Ave., Bloomfield, Conn. 06002 ..... p. 2618,2619
M Artronic Instr. Co., Dept. EM, 11232 Triangle La., Silver Spring, Md. 20902 p. 2379
Bel Fuse, Dept. EM, 203 Van Vorst, Jersey City, N.J. 07302 ..... p. 2387,2388
Bourns, Inc., Trimpot Prods. Div., Dept. EM, 1200 Columbia Ave., Riverside, Cal. 92507 ..... *
M Columbia Components, Div. Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 ..... p. 2391
M Computer Devices Corp., Dept. EM, 63 Austin Blvd., Commack, N.Y. 11725 *
Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 p. 2391
M Control Elctrns. Co., Inc., Dept. EM, 153 Florida St., Farmingdale, N.Y. 11735 p. 2393
M Data Delay Devices, Dept. EM, 253 Crooks Ave., Clifton, N.J. 07011 p. 2398-2400
M ESC Elctrns. Corp., Dept. EM, 534 Bergen Blvd., Palisades Pk., N.J. 07650 *
M Frequency Selective Networks, Inc, Dept. EM, 69-20 Garfield Ave., Woodside, N.Y. 11377 ..... *
M Kappa Networks, Dept. EM, 165 Roosevelt Ave, Carteret, N.J. 07008 p. 2405
RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102 ..... *
M Technitrol, Inc., Dept. EM, 1952 E. Allegheny, Philadelphia, Pa. 19134 ..... *
Fuji Electrochemical Co., Dept. EM, Hamagomu Bld. 5 36-11 Shinbashi, Minato-ku, Tokyo, Japan
G & G Tresco Corp., Dept. EM, 1952 E. Allegheny Ave., Phila., PA 19134

Delay Lines, Lumped-Constant (Fixed)

Allen Avionics, Inc., Div. A.K. Allen Co., Dept. EM, 255 E. 2nd St., Mineola, N.Y. 11501 ..... p. 2380,2382
DM Andersen Laboratories Inc., Dept. EM, 1280 Blue Hills Ave., Bloomfield, Conn. 06002 ..... p. 2618
M Artronic Instr. Co., Dept. EM, 11232 Triangle La., Silver Spring, Md. 20902 p. 2379
Bel Fuse, Dept. EM, 203 Van Vorst, Jersey City, N.J. 07302 ..... p. 2387
Bourns, Inc., Trimpot Prods. Div., Dept. EM, 1200 Columbia Ave., Riverside, Cal. 92507 ..... *
Bourns Magnetic Prods., Trimpot Div., Dept. EM, Box 1398, Romoland, Cal. 92380 ..... p. 2383, Back Cover, Vol. 2
Caddel-Burns Mfg. Co., Inc., Dept. EM, 40 E. 2nd St., Mineola, N. Y. 11501 p. 1328

Chesterfield Prods. Inc., Dept. EM, 511A Victor St., Saddle Brook, N.J. 07662 *
M Columbia Components, Div. Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 ... p. 2391
M Computer Devices Corp., Dept. EM, 63 Austin Blvd., Commack, N.Y. 11725 p. 2392
Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 p. 2391
M Control Elctrns. Co., Inc., Dept. EM, 153 Florida St., Farmingdale, N.Y. 11735 p. 2393
M Data Delay Devices, Dept. EM, 253 Crooks Ave., Clifton, N.J. 07011 ... *
M ESC Elctrns. Corp., Dept. EM, 534 Bergen Blvd., Palisades Pk., N.J. 07650 p. 2402
M Frequency Selective Networks, Inc, Dept. EM, 69-20 Garfield Ave., Woodside, N.Y. 11377 ... *
M Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 ... *
M Kappa Networks, Dept. EM, 165 Roosevelt Ave, Carteret, N.J. 07008 p. 2405
Nytronics Comps. Group Inc., Sub Nytronics, Dept. EM, Orange St., Darlington, S.C. 29532 ... p. 2406
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ... *
RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102 ... p. 2411,2412
M Technitrol, Inc., Dept. EM, 1952 E. Allegheny, Philadelphia, Pa. 19134 p. 2416
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ... *
M BG Electronics, Inc., Dept. EM, 9 Elm Ave., Mount Vernon, N.Y. 10550
Coilcraft, Dept. EM, 1102 Siler Lake Rd., Cary, Ill. 60013
M Engineered Components Co., Dept. EM, 3580 Sacramento Dr., San Luis Obispo, Cal. 93401
Fuji Electrochemical Co., Dept. EM, Hamagomu Bld. 5 36-11 Shinbashi, Minato-ku, Tokyo, Japan
G & G Tresco Corp., Dept. EM, 1952 E. Allegheny Ave., Phila., PA 19134
PCA Elctrns., Inc., Dept. EM, 16799 Schoenborn St., Sepulveda, Cal. 91343
Pulse Engrg., Inc., Dept. EM, Box 12235, San Diego, Cal 92112
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
Television Equip. Assocs., Dept. EM, Box 260, South Salem, N.Y. 10590

Delay Lines, Lumped-Constant (Mechanically Variable)

Allen Avionics, Inc., Div. A.K. Allen Co., Dept. EM, 255 E. 2nd St., Mineola, N.Y. 11501 ... p. 2380
DM Andersen Laboratories Inc., Dept. EM, 1280 Blue Hills Ave., Bloomfield, Conn. 06002 ... *
M Artronic Instr. Co., Dept. EM, 11232 Triangle La., Silver Spring, Md. 20902 p. 2379
Bel Fuse, Dept. EM, 203 Van Vorst, Jersey City, N.J. 07302 ... p. 2387,2390
Bourns, Inc., Trimpot Prods. Div., Dept. EM, 1200 Columbia Ave., Riverside, Cal. 92507 ... *
M Columbia Components, Div. Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 ... p. 2391
M Computer Devices Corp., Dept. EM, 63 Austin Blvd., Commack, N.Y. 11725 p. 2392
Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 p. 2391
M Control Elctrns. Co., Inc., Dept. EM, 153 Florida St., Farmingdale, N.Y. 11735 p. 2393
M Data Delay Devices, Dept. EM, 253 Crooks Ave., Clifton, N.J. 07011 .. p. 2398
M ESC Elctrns. Corp., Dept. EM, 534 Bergen Blvd., Palisades Pk., N.J. 07650 p. 2402
M Kappa Networks, Dept. EM, 165 Roosevelt Ave, Carteret, N.J. 07008 p. 2405
RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102 ... p. 2412
Technitrol, Inc., Dept. EM, 1952 E. Alleghany, Philadelphia, Pa. 19134 ... *
Television Equip. Assocs., Dept. EM, Box 260, South Salem, N.Y. 10590

Delay Lines, Magnetostrictive

DM Andersen Laboratories Inc., Dept. EM, 1280 Blue Hills Ave., Bloomfield, Conn. 06002 ... *
Artronic Instr. Co., Dept. EM, 11232 Triangle La., Silver Spring, Md. 20902 p. 2379
Bel Fuse, Dept. EM, 203 Van Vorst, Jersey City, N.J. 07302 ... p. 2387
M Computer Devices Corp., Dept. EM, 63 Austin Blvd., Commack, N.Y. 11725 *
M Control Elctrns. Co., Inc., Dept. EM, 153 Florida St., Farmingdale, N.Y. 11735 p. 2393
M Microsonics, Div. Sangamo Elec. Co., Dept. EM, 60 Winter St., Weymouth, Mass. 02188 ... *
RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102 ... *
D Rockwell Int'l., Microelectronic Devices, Dept. EM, Box 3669, 3310 Miraloma Ave., Anaheim, Cal. 92803

Delay Lines, Miniature & Subminiature-Also See Specific Types Of Delay Lines

Allen Avionics, Inc., Div. A.K. Allen Co., Dept. EM, 255 E. 2nd St., Mineola, N.Y. 11501 ... p. 2382
DM Andersen Laboratories Inc., Dept. EM, 1280 Blue Hills Ave., Bloomfield, Conn. 06002 ... p. 2618
M Artronic Instr. Co., Dept. EM, 11232 Triangle La., Silver Spring, Md. 20902 p. 2379
Bel Fuse, Dept. EM, 203 Van Vorst, Jersey City, N.J. 07302 p. 2384,2385,2387
Bourns, Inc., Trimpot Prods. Div., Dept. EM, 1200 Columbia Ave., Riverside, Cal. 92507 ... *
Bourns Magnetic Prods., Trimpot Div., Dept. EM, Box 1398, Romoland, Cal. 92380 ... p. 2383, Back Cover, Vol. 2
M Columbia Components, Div. Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 ... p. 2391
M Computer Devices Corp., Dept. EM, 63 Austin Blvd., Commack, N.Y. 11725 p. 2392
Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 p. 2391
M Control Elctrns. Co., Inc., Dept. EM, 153 Florida St., Farmingdale, N.Y. 11735 p. 2393
M Damon Corp., Elctrns. Div., Dept. EM, 80 Wilson Way, Westwood, Mass. 02090 ... p. 2319
M Data Delay Devices, Dept. EM, 253 Crooks Ave., Clifton, N.J. 07011 p. 2395-2398,2400
M ESC Elctrns. Corp., Dept. EM, 534 Bergen Blvd., Palisades Pk., N.J. 07650 p. 2402,2403
M Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 ... *
M Kappa Networks, Dept. EM, 165 Roosevelt Ave, Carteret, N.J. 07008 p. 2405
Leach Corp., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003 .. p. 3576
M Microsonics, Div. Sangamo Elec. Co., Dept. EM, 60 Winter St., Weymouth, Mass. 02188 ... *
Nytronics Comps. Group Inc., Sub Nytronics, Dept. EM, Orange St., Darlington, S.C. 29532 ... p. 2406,2407
RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102 ... p. 2408-2413
RCL Electronics Div., AMF Incorporated, Dept. EM, 700 S. 21st St., Irvington, N.J. 07111 ... p. 2414
M Technitrol, Inc., Dept. EM, 1952 E. Alleghany, Philadelphia, Pa. 19134 p. 2416,2417
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ... *
M Uniform Tubes Inc., MicroDelay Division, Dept. EM, Collegeville, Pa. 19426 *
M Andersen & Assoc., Walther M.A., Dept. EM, 4 Main St. Ext., Tariffville, Conn. 06081
Cablewave Systems Inc., Dept. EM, 60 Dodge Ave., North Haven, Conn. 06473
Coilcraft, Dept. EM, 1102 Siler Lake Rd., Cary, Ill. 60013
Corning Glass Works, Memory Prods Dept., Dept. EM, 3900 Electronic Dr., Raleigh, N.C. 27602
Engineered Components Co., Dept. EM, 3580 Sacramento Dr., San Luis Obispo, Cal. 93401
G & G Tresco Corp., Dept. EM, 1952 E. Allegheny Ave., Phila., PA 19134
PCA Elctrns., Inc., Dept. EM, 16799 Schoenborn St., Sepulveda, Cal. 91343
Pulse Engrg., Inc., Dept. EM, Box 12235, San Diego, Cal 92112
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
Tasker Systems, Dept. EM, 20131 Sunburst St., Chatsworth, Cal. 91311

Delay Lines, Solid Blank

Artronic Instr. Co., Dept. EM, 11232 Triangle La., Silver Spring, Md. 20902 p. 2379
Bel Fuse, Dept. EM, 203 Van Vorst, Jersey City, N.J. 07302 ... p. 2387
M Computer Devices Corp., Dept. EM, 63 Austin Blvd., Commack, N.Y. 11725 *
M Control Elctrns. Co., Inc., Dept. EM, 153 Florida St., Farmingdale, N.Y. 11735 *
M Microsonics, Div. Sangamo Elec. Co., Dept. EM, 60 Winter St., Weymouth, Mass. 02188 ... *
M Andersen & Assoc., Walther M.A., Dept. EM, 4 Main St. Ext., Tariffville, Conn. 06081
G & G Tresco Corp., Dept. EM, 1952 E. Allegheny Ave., Phila., PA 19134
Optics Group-East, Valtec Corp., Dept. EM, Holliston, Mass. 01746

Delay Lines, Strip

DM Andersen Laboratories Inc., Dept. EM, 1280 Blue Hills Ave., Bloomfield, Conn. 06002 ... *
Artronic Instr. Co., Dept. EM, 11232 Triangle La., Silver Spring, Md. 20902 p. 2379
Bel Fuse, Dept. EM, 203 Van Vorst, Jersey City, N.J. 07302 ... p. 2387
M Control Elctrns. Co., Inc., Dept. EM, 153 Florida St., Farmingdale, N.Y. 11735 *
M ESC Elctrns. Corp., Dept. EM, 534 Bergen Blvd., Palisades Pk., N.J. 07650 *
M Microsonics, Div. Sangamo Elec. Co., Dept. EM, 60 Winter St., Weymouth, Mass. 02188 ... *
RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102 ... *
G & G Tresco Corp., Dept. EM, 1952 E. Allegheny Ave., Phila., PA 19134
DM Solitron/Microwave, Dept. EM, Box 278, Port Salerno, Fla. 33492
Television Equip. Assocs., Dept. EM, Box 260, South Salem, N.Y. 10590

Delay Lines, Trimmer

Allen Avionics, Inc., Div. A.K. Allen Co., Dept. EM, 255 E. 2nd St., Mineola, N.Y. 11501 ... p. 2380
DM Andersen Laboratories Inc., Dept. EM, 1280 Blue Hills Ave., Bloomfield, Conn. 06002 ... *
Bel Fuse, Dept. EM, 203 Van Vorst, Jersey City, N.J. 07302 ... p. 2387
M Columbia Components, Div. Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 ... *
M Computer Devices Corp., Dept. EM, 63 Austin Blvd., Commack, N.Y. 11725 *
Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 ... *
M Control Elctrns. Co., Inc., Dept. EM, 153 Florida St., Farmingdale, N.Y. 11735 *
M Data Delay Devices, Dept. EM, 253 Crooks Ave., Clifton, N.J. 07011 p. 2397,2399
M ESC Elctrns. Corp., Dept. EM, 534 Bergen Blvd., Palisades Pk., N.J. 07650 p. 2402
M Kappa Networks, Dept. EM, 165 Roosevelt Ave, Carteret, N.J. 07008 p. 2405
RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102 ... *
M Technitrol, Inc., Dept. EM, 1952 E. Alleghany, Philadelphia, Pa. 19134 ... *
M Andersen & Assoc., Walther M.A., Dept. EM, 4 Main St. Ext., Tariffville, Conn. 06081
M Engineered Components Co., Dept. EM, 3580 Sacramento Dr., San Luis Obispo, Cal. 93401
D Fuji Electrochemical Co., Dept. EM, Hamagomu Bld. 5 36-11 Shinbashi, Minato-ku, Tokyo, Japan

Television Equip. Assocs., Dept. EM, Box 260, South Salem, N.Y. 10590

Delay Lines, Ultrasonic

Allen Avionics, Inc., Div. A.K. Allen Co., Dept. EM, 255 E. 2nd St., Mineola, N.Y. 11501 ..... **p. 2380**
DM **Andersen Laboratories Inc., Dept. EM, 1280 Blue Hills Ave., Bloomfield, Conn. 06002** ..... *
Artronic Instr. Co., Dept. EM, 11232 Triangle La., Silver Spring, Md. 20902 ..... **p. 2379**
Bel Fuse, Dept. EM, 203 Van Vorst, Jersey City, N.J. 07302 ..... **p. 2387**
Columbia Components, Div. Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 ..... **p. 2391**
Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 ..... **p. 2391**
M **Control Elctrns. Co., Inc., Dept. EM, 153 Florida St., Farmingdale, N.Y. 11735** ..... **p. 2393**
M **Damon Corp., Elctrns. Div., Dept. EM, 80 Wilson Way, Westwood, Mass. 02090** ..... *
M **Microsonics, Div. Sangamo Elec. Co., Dept. EM, 60 Winter St., Weymouth, Mass. 02188** ..... *
RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102 ..... *
M Andersen & Assoc., Walther M.A., Dept. EM, 4 Main St. Ext., Tariffville, Conn. 06081
Corning Glass Works, Memory Prods Dept., Dept. EM, 3900 Electronic Dr., Raleigh, N.C. 27602
Crystal Technology, Dept. EM, 2510 Old Middlefield Way, Mountain View, Cal 94043
D Mitsumi Elec. Co., Ltd., Dept. EM, 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan

Delay Lines, Video—See Delay Lines, Ultrasonic

Delay Lines, Waveguide

DM **Andersen Laboratories Inc., Dept. EM, 1280 Blue Hills Ave., Bloomfield, Conn. 06002** ..... *
Bel Fuse, Dept. EM, 203 Van Vorst, Jersey City, N.J. 07302 ..... **p. 2387**
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
M **Uniform Tubes Inc., MicroDelay Division, Dept. EM, Collegeville, Pa. 19426** *
M Aircom, Inc., Dept. EM, Rte. 16B, Union, N.H. 03887
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
TRG,, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801

Delay Lines, Wire

DM **Andersen Laboratories Inc., Dept. EM, 1280 Blue Hills Ave., Bloomfield, Conn. 06002** ..... *
Bel Fuse, Dept. EM, 203 Van Vorst, Jersey City, N.J. 07302 ..... **p. 2387**
M **Computer Devices Corp., Dept. EM, 63 Austin Blvd., Commack, N.Y. 11725** *
M **Control Elctrns. Co., Inc., Dept. EM, 153 Florida St., Farmingdale, N.Y. 11735** *
M **Microsonics, Div. Sangamo Elec. Co., Dept. EM, 60 Winter St., Weymouth, Mass. 02188** ..... *
RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102 ..... *
M **Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030** ..... *
Astrolab, Inc., Dept. EM, 345 Dalziel Rd., Linden, N.J. 07036

Delays, Time (Excluding Delay Lines, Time Delay Relays)

M **Artronic Instr. Co., Dept. EM, 11232 Triangle La., Silver Spring, Md. 20902** *
M **Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470** ..... *
Bel Fuse, Dept. EM, 203 Van Vorst, Jersey City, N.J. 07302 ..... **p. 2387**
Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 ..... *
Colorado Video, Inc., Dept. EM, Box 928, Boulder, Colo. 80306 ..... **p. 1376**
M **Control Elctrns. Co., Inc., Dept. EM, 153 Florida St., Farmingdale, N.Y. 11735** *
DM **Hi-G Co., Inc., Dept. EM, 580 Spring St., Windsor Locks, Conn. 06096** ..... *
D **Midtex, Inc., AEMCO Div., Dept. EM, 1650 Tower Blvd., No. Mankato, Minn. 56001** ..... *
D **Midwest Components, Dept. EM, 1981 Port City Blvd., Muskegon, Mich. 49400** ..... **p. 4280**
Artisan Elctrns. Corp., Dept. EM, 5 Eastmans Rd., Parsippany, N.J. 07054
Automatic Timing & Controls Co., Dept. EM, King of Prussia, Pa. 19406
Berkeley Nucleonics, Dept. EM, 1198 Tenth St., Berkeley, Cal. 94710
D Bristol Saybrook Co., Dept. EM, 97 Coulter St., Old Saybrook, Conn. 06475
M Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
Evans Assocs., Dept. EM, Box 5055, Berkeley, Cal. 94705
D Fuji Electrochemical Co., Dept. EM, Hamagomu Bld. 5 36-11 Shinbashi, Minato-ku, Tokyo, Japan
Gotham Audio Corp., Dept. EM, 741 Washington St., New York, N.Y. 10014
Hoagland Instr Co, Div Tech Dev, Dept. EM, Box 550, Dayton, N.J. 08810
Jay-El Prods., Dept. EM, 1859 W. 169th St., Gardena, Calif. 90247
Princeton Elctrn. Prods., Dept. EM, Box 101, New Brunswick, N.J. 08902
Telecommunications Techniques Corp., Dept. EM, 112 Frederick Ave., Rockville, Md. 20850
Worner Elctrn. Devices, Dept. EM, 121 N. Main St., Rankin, Ill. 60960
D Zenith Controls Inc., Dept. EM, 830 West 40th St., Chicago, Ill. 60609

Demagnetizers

Bell, Inc., F.W., Dept. EM, 4949 Freeway Dr. E., Columbus, Ohio 43229 ..... *
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 ..... *
D **Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582** *
RFL Inds., Instr. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005 ..... *
RFL Inds., Thermocontrol Div., Dept. EM, Boonton, N.J. 07005 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
Advanced Kinetics, Dept. EM, 1231 Victoria St., Costa Mesa, Calif. 92627
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
Ampex Corp., Dept. EM, 401 Broadway, Redwood City, Cal. 94063
D Amplifier Corp. of America, Dept. EM, 75 Frost St., Westbury, N.Y. 11590
D Annis R B Co., Dept. EM, 1101 N. Delaware, Indianapolis, Ind. 46202
D Chemtronics, Inc., Dept. EM, 45 Hoffman Ave., Hauppauge, N.Y. 11787
D Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Eastern Delta Corp., Dept. EM, 29-09 S. Broadway, Fair Lawn, N.J. 07410
Edmund Scientific Co., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007
Ideal Industries Inc., Dept. EM, 4450 Becker Pl., Sycamore, Ill. 60178
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
Magnaflux Corp. , Dept. EM, 7328 W. Lawrence Ave., Chicago, Ill 60656
DM Magnos, Incorporated, Dept. EM, Old School House Rd., Harvard, Mass. 01451
D Nortronics Co., Inc., Dept. EM, 8101 Tenth Ave., N., Minneapolis, Minn. 55427
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Permag Corp., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
D Recoton Corp., Dept. EM, 46-23 Crane St., Long Island City, N.Y. 11101
M Robins Ind's. Corp., Consumer Products Div., Dept. EM, 75 Austin Blvd., Commack, N.Y. 11725
Schonstedt Instr. Co., Dept. EM, 1775 Wiehle Ave., Reston, Va. 22090
DM Stearns Magnetics Inc., Sub. Magnetics Int'l., Dept. EM, 6001 S. General Ave., Cudahy, Wisc. 53110
Thomas & Skinner, Inc., Dept. EM, Box 150-B,, Indianapolis, Ind. 46206
Walker Scientific, Inc., Dept. EM, Rockdale St., Worcester, Mass. 01606
D Wide Range Electronics Corp., Dept. EM, 2119 Schultz Rd., St. Louis, Mo. 63141

Demodulators

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
M **Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731** ..... *
M **Control Sciences, Inc., Dept. EM, 8399 Topanga Canyon Blvd., Canoga Park, Cal. 91304** ..... *
M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101** ..... *
D **General Magnetics, Dept. EM, 211 Grove St., Bloomfield, N.J. 07003 p. 2265**
M **Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735** ..... *
Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 *
M **Natel Engineering Co., Dept. EM, 8954 Mason Ave., Canoga Park, Cal. 91306** *
North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803 ..... *
M **Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735 p. 1673**
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
DM Anaren Microwave, Inc., Dept. EM, 1010 James St., Syracuse, N.Y. 13203
Automatic Timing & Controls Co., Dept. EM, King of Prussia, Pa. 19406
C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
Cermetek, Inc., Dept. EM, 660 National Ave., Mountain View, Cal. 94040
ComData Corp., Dept. EM, 8115 N. Monticello, Skokie, ILL. 60076
Comdel, Inc., Dept. EM, Beverly Airport, Beverly, Mass. 01915
Dantel, Inc., Dept. EM, 1922 North Helm, Fresno, Cal. 93727
Data-Control Systems, Dept. EM, Commerce Dr., Box 860, Danbury, Conn. 06810
Decom Systems, Inc., Dept. EM, 1404 Descanso Rd., San Marcos, Ca. 92069
D Dynair Elctrns. Inc., Dept. EM, 5275 Market St., San Diego, Calif. 92114
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
DM Exar Integrated Systems, Dept. EM, P.O.B. 62229, Sunnyvale, Cal. 94088
FG Engineering Co., Dept. EM, Box 39, Black Canyon Stage, Mayer, Ariz. 86333
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
M Glentek, Inc., Dept. EM, 1559 7th St., Santa Monica, Calif. 90401
GTE Lenkurt Inc., Dept. EM, 1105 County Rd., San Carlos, Cal. 94070
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Intronics Inc., Dept. EM, 57 Chapel St., Newton, Mass. 02158
D Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
DM Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
DM Plessey Semiconductors, Dept. EM, 1674 McGaw Ave., Irvine, Cal. 92714
Resdel Engineering Corp., Dept. EM, 300 E. Live Oak Ave., Arcadia, Cal. 91006
M RHG Elctrns. Lab., Dept. EM, 161 E. Industry Ct., Deer Park, N.Y. 11729
Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Transmed Scientific, Dept. EM, 860-C Capitolio Way, San Luis Obispo, Cal. 93401
Tri-Com, Inc., Dept. EM, 12216 Parklawn Dr., Rockville, Md. 20852
Video Research Corporation, Dept. EM, 6985 Garden Rd., Riviera Beach, Fla. 33404
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304

Demodulators, Magnetic

M **Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731** ..... *
Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 .. **p. 3975**
General Magnetics, Dept. EM, 211 Grove St., Bloomfield, N.J. 07003 p. 2265
M **Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735** *

Deposition Equipment, Vacuum & Accessories-Also See Evaporation Equipment, Electron Beam

API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
D CVC Products, Inc., Dept. EM, 525 Lee Rd., Box 1886, Rochester, N.Y. 14603
High Vacuum Equip. Corp., Dept. EM, 110 Industrial Pk Rd, Hingham, Mass. 02043
Inficon Inc., Inficon Leybold-Heraeus Inc., Dept. EM, 6500 Fly Rd, E Syracuse, N.Y. 13057
LFE Corp., Process Control Div., Dept EM, 1601 Trapelo Rd., Waltham, Mass. 02154
D Perkin-Elmer Ultek Inc., Dept. EM, Box 10920, Palo Alto, Cal. 94303
D Sloan Technology Corp., Dept. EM, 535 E. Montecito St., Santa Barbara, Cal. 93103
T-M Vacuum Prods., Dept. EM, Warrington & Rowland, Riverton, N.J. 08077
DM Ulvac North America, Dept. EM, Colchester Plaza, Colchester, VT 05446
Vactronic Lab. Equip., Inc., Dept. EM, 65 Brightside Ave., E. Northport, N.Y. 11731
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Desiccators—See Dehumidifiers

Desoldering Tools & Equipment—See Soldering Accessories; Soldering Equip.; Soldering Guns; etc.

Detectors, A-F—See Detectors, Frequency

Detectors, Coaxial

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
Bird Electronic Corp., Dept. EM, 30303 Aurora Rd., Solon, Ohio 44139 ..... *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
DM **Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725** ..... *
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
Alan Industries Inc., Dept. EM, PO Box 1203, Columbus, Ind. 47201
Alford Mfg. Co., Dept. EM, 120 Cross St., Winchester, Mass. 01890
Engelmann Microwave, Dept. EM, Skyline Dr., Montville, N.J. 07045
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
DM Intech/Function Modules, Dept. EM, 282 Brokaw, Santa Clara, Cal. 95050
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
D R L C Elctrns., Inc., Dept. EM, 83 Radio Cir., Mt. Kisco, N.Y. 10549
Sivers Lab, Dept. EM, Box 90339, Los Angeles, Cal. 90009
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760
Wide Band Engrg. Co. Inc., Dept. EM, Box 21652, Phoenix, Ariz. 85036

Detectors, Corona—See Testers, Corona

Detectors, Crystal

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
M **Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040** .. *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 .... *
Kay Elemetrics Corp., Dept. EM, 12 Maple Ave., Pine Brook, N.J. 07058 .... *
D **3M Co., Static Control Systems, Dept. EM, 3M Center Bldg. 223-25, St. Paul, Minn. 55119** ..... p. 3408,3409
DM **Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725** ..... *
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
Alford Mfg. Co., Dept. EM, 120 Cross St., Winchester, Mass. 01890
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
M Harshaw Chemical Co., A Kenanee Industry, Dept. EM, 6801 Cochran Rd., Solon, Ohio 44139
Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
Linden Labs., Inc., Dept. EM, Box 920, State College, Pa. 16801
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
D R L C Elctrns., Inc., Dept. EM, 83 Radio Cir., Mt. Kisco, N.Y. 10549
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760
D Wiltron Co., Dept. EM, 825 E. Middlefield Rd., Mt. View, Cal 94043

Detectors, F-M—See Detectors, Frequency

Detectors, Flaw & Defect-Also See Locators, Open-Short

Gulton Inds., Inc., Measurement & Control Systems Div., Dept. EM, Gulton Ind'l. Pk., E. Greenwich, R.I. 02818 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509 ..... *
M **North American Philips Controls Corp., Dept. EM, Cheshire Industrial Pk. Box E, Cheshire, Conn. 06410** ..... *
Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... *
Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2119
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
Dolan-Jenner Inds., Inc., Dept. EM, Box 1020, Woburn, Mass. 01801
Dunegan/Endevco, Dept. EM, Rancho Viejo Rd., San Juan Capistrano, Cal. 92675
Endevco, Div. Becton, Dickinson & Co., Dept. EM, 30700 Rancho Viejo Rd., San Jaun Capistrano, Cal. 92675
Magnaflux Corp., Dept. EM, 7328 W. Lawrence Ave., Chicago, Ill 60656
Panametrics Inc., Dept. EM, 221 Cresent St., Waltham, Mass. 02154
M Peschel Instrs., Inc., Dept. EM, 1412 Viscaya Pkwy., Cape Coral, Fla. 33904
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
Princeton Elctrn. Prods., Dept. EM, Box 101, New Brunswick, N.J. 08902
D Scientific Technology, Dept. EM, 1201 San Antonio Rd., Mountain View, Cal. 94043
Skan-A-Matic Corp., Dept. EM, Box S, Elbridge, N.Y. 13060
D Sotcher Measurement, Inc., Dept. EM, 1120 Stewart Court, Sunnyvale, Cal. 94086
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
D Ultra-Violet Prods., Inc., Dept. EM, 5100 Walnut Grove Ave., San Gabriel, Cal. 91778

Detectors, Frequency

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
M **Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470** ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734 ..... *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... *
M **Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040** .. *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** *
M **Hi-G Co., Inc., Dept. EM, 580 Spring St., Windsor Locks, Conn. 06096** p. 3542
Kay Elemetrics Corp., Dept. EM, 12 Maple Ave., Pine Brook, N.J. 07058 .... *
D **Non-Linear Sys., Inc., Dept. EM, 533 Stevens Ave., Solana Beach, Cal. 92075** *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
Telonic/Berkeley, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715 ..... p. 3063
D **Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219** p. 2830
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
Wavetek Indiana, Inc., Dept. EM, 66 N. First Ave., Beech Grove, Ind. 46107 *
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Arenberg Ultrasonic Inc., Dept. EM, 94 Green, Jamaica Plain, Mass. 02130
M Atlantic Research Corp., Dept. EM, 5390 Cherokee Ave., Alexandria, Va 22314
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
D Blonder-Tongue Labs., Inc., Dept. EM, One Jake Brown Rd., Old Bridge, N.J. 08857
Data-Control Systems, Dept. EM, Commerce Dr., Box 860, Danbury, Conn. 06810
Engelmann Microwave, Dept. EM, Skyline Dr., Montville, N.J. 07045
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Evershed & Vignoles Ltd., Dept. EM, Action Lane, Chiswick, London, England W4 5HJ
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
DM Guardian California, Dept. EM, 4030 W. Spencer St., Torrance, Cal. 90503
Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
DM Plessey Semiconductors, Dept. EM, 1674 McGaw Ave., Irvine, Cal. 92714
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
M Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803
M Wilmar Elctrns. Inc., Dept. EM, 2430 Amsler St., Torrance, Cal. 90505

Detectors, Impedance—See Meters, Impedance

Detectors, Infrared

D **A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876** ..... *
EG&G, Inc., Electro-Optics Div., Dept. EM, 35 Congress St., Salem, Mass. 01970 ..... *
Kessler-Ellis Prods., Dept. EM, 120 1st Ave., Atlantic Highlands, N.J. 07716 p. 1651
Litronix, Dept. EM, 19000 Homestead Rd., Cupertino, Cal. 95014 ..... p. 2493
Ohio Semitronics, Inc., Dept. EM, 1205 Chesapeake Ave., Columbus, Ohio 43212 ..... *
Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 ..... *
Advanced Kinetics, Dept. EM, 1231 Victoria St., Costa Mesa, Calif. 92627
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M Barnes Engrg. Co., Dept. EM, 30 Commerce Rd., Stamford, Conn. 06902
Capintec Instruments, Inc., Dept. EM, 136 Summit Ave., Montvale, N.J. 07645
Cramer Division, Conrac Corporation, Dept. EM, Mill Rock Rd., Old Saybrook, Conn. 06475
Crystal Technology, Dept. EM, 2510 Old Middlefield Way, Mountain View, Cal 94043
Dexter Research Ctr, Inc., Dept. EM, 7300 Huron River Dr, Dexter, Mich 48130
Dolan-Jenner Inds., Inc., Dept. EM, Box 1020, Woburn, Mass. 01801
Eltec Instruments Inc., Dept. EM, P.O. Box 9610, Daytona Beach, Fla. 32020

D EMI Gencom Inc., Dept. EM, 80 Express St., Plainview, N.Y. 11803
FJW Industries, Dept. EM, 215 E. Prospect Ave., Mt. Prospect, Ill. 60056
Gamma Scientific Inc., Dept. EM, 3777 Ruffin Rd., San Diego, Cal. 92123
M Harshaw Chemical Co., A Kenanee Industry, Dept. EM, 6801 Cochran Rd., Solon, Ohio 44139
HEI, Inc., Dept. EM, Jonathan Ind'l. Ctr., Chaska, Minn. 55318
Hughes Aircraft Co., Image Devices Ind'l. Prods. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
Hy-Cal Engrg, Dept. EM, 12105 Los Nietos Rd., Santa Fe Springs, Cal 90670
D Apollo Lasers, Apollo Lasers, Inc., Dept. EM, 6357 Arizonia Cir, Los Angeles, Cal. 90045
Meret Inc., Dept. EM, 1815 24th St., Santa Monica, Cal. 90404
Mikron Instr. Co., Dept. EM, Box 211, Ridgewood, N.J. 07451
Optoelectronics, Inc., Dept. EM, 1309 Dynamic St., Petaluma, Cal. 94952
Optron, Inc., Dept. EM, 1201 Tappon Cir., Carrollton, Tex. 75006
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
Radiation Devices Co., Inc., Dept. EM, Box 8450, Baltimore, Md. 21234
M Santa Barbara Resch. Ctr., Dept. EM, 75 Coromar Dr., Goleta, Cal. 93017
Scientech, Inc., Dept. EM, 5649 Arapahoe Ave, Boulder, Colo. 80303
D Scientific Technology, Dept. EM, 1201 San Antonio Rd., Mountain View, Cal. 94043
Sensor Technology, Dept. EM, 21012 Lassen St., Chatsworth, Cal. 91311
Sensors, Inc., Dept. EM, 3908 Varsity Dr., Ann Arbor, Mich. 48104
Skan-A-Matic Corp., Dept. EM, Box S, Elbridge, N.Y. 13060
T. C. Centronic, Dept. EM, King Henry's Dr, Addington, Croydon CR9 0BG, Great Britain
M Thermometrics, Inc., Dept. EM, 808 US Hwy No. 1, Edison, N.J. 08817
United Detector Tech., Dept. EM, 2644 30th St., Santa Monica, Cal. 90405
D Victory Engrg. Corp., Dept. EM, Victory Rd., Springfield, N.J. 07081

Detectors, Light Intensity—See Meters, Light, Nonphotographic

Detectors, Magnetic—See Meters, Gauss

Detectors, Microwave

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
Bird Electronic Corp., Dept. EM, 30303 Aurora Rd., Solon, Ohio 44139 ..... *
M General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
DM Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725 ..... *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 .. p. 3060
D Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... *
Telonic/Berkeley, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715 ..... p. 3063
D Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219 *
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
M AIL, Div. Cutler-Hammer, Dept. EM, Comac Road, Deer Park, N.Y. 11729
M Aircom, Inc., Dept. EM, Rte. 16B, Union, N.H. 03887
M Airtron, Div. Litton Inds., Dept. EM, 200 E. Hanover Ave., Morris Plains, N.J. 07950
DM Anaren Microwave, Inc., Dept. EM, 1010 James St., Syracuse, N.Y. 13203
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
M Cir-Q-Tel, Inc., Dept. EM, 10504 Wheatley St., Kensington, Md. 20795
M Eastern Microwave Corp., Dept. EM, 4 Gill St., Woburn, MA 01801
Engelmann Microwave, Dept. EM, Skyline Dr., Montville, N.J. 07045
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
DM Hughes Aircraft Co., Electron Dynamics Div., Dept. EM, 3100 W. Lomita Blvd., Torrance, Cal. 90509
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
D Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
D Parametric Inds., Inc., Dept. EM, 742 Main St., Winchester, Mass. 01890
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
D R L C Elctrns., Inc., Dept. EM, 83 Radio Cir., Mt. Kisco, N.Y. 10549
Sivers Lab, Dept. EM, Box 90339, Los Angeles, Cal. 90009
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
M Technical Research & Mfg., Inc., Dept. EM, Kelly Ave. Grenier Field, R.F.D. #3, Manchester, N.H. 03103
TRG,, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
Triangle Microwave Inc., Dept. EM, 98 Great Meadow La, East Hanover, NJ 07936
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760
D Wiltron Co., Dept. EM, 825 E. Middlefield Rd., Mt. View, Cal 94043

Detectors, Null—See Indicators, Null

Detectors, Phase-Sensitive

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M Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 ..... *
Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ..... *
D General Magnetics, Dept. EM, 211 Grove St., Bloomfield, N.J. 07003 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
DM Hi-G Co., Inc., Dept. EM, 580 Spring St., Windsor Locks, Conn. 06096 p. 3542
M Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735 ..... *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
Mini-Circuits Lab., Div. Scientific Comps. Corp., Dept. EM, 2625 E 14th St., Brooklyn, N.Y. 11235 ..... **p. 2890, Inside Front Cover, Vol. 1**
M Natel Engineering Co., Dept. EM, 8954 Mason Ave., Canoga Park, Cal. 91306 *
M North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803 ..... *
Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... *
C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
Climatronics Corp., Dept. EM, 1324 Motor Pkwy., Hauppauge, N.Y. 11787
Datron Systems, Dept. EM, 20700 Plummer St., Chatsworth, Cal. 91311
Engelmann Microwave, Dept. EM, Skyline Dr., Montville, N.J. 07045
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Evans Assocs., Dept. EM, Box 5055, Berkeley, Cal. 94705
D Guardian California, Dept. EM, 4030 W. Spencer St., Torrance, Cal. 90503
Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
Princeton Applied Resch. Corp., Dept. EM, Box 2565, Princeton, N.J. 08540
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304

Detectors, Photovoltaic —See Cells, Photovoltaic

Detectors, R-F—See Detectors, Frequency

Detectors, Radiation

M General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 *
Ohio Semitronics, Inc., Dept. EM, 1205 Chesapeake Ave., Columbus, Ohio 43212 ..... *
M Victoreen, Inc., Dept. EM, 10101 Woodland Ave., Cleveland, Ohio 44104 .... *
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D Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
Capintec Instruments, Inc., Dept. EM, 136 Summit Ave., Montvale, N.J. 07645
Crystal Technology, Dept. EM, 2510 Old Middlefield Way, Mountain View, Cal 94043
D EMI Gencom Inc., Dept. EM, 80 Express St., Plainview, N.Y. 11803
Galileo Electro-Optics Corp., Dept. EM, Galileo Pk., Sturbridge, Mass. 01518
Gamma Scientific Inc., Dept. EM, 3777 Ruffin Rd., San Diego, Cal. 92123
M Harshaw Chemical Co., A Kenanee Industry, Dept. EM, 6801 Cochran Rd., Solon, Ohio 44139
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
Nuclear Resch. Corp., Dept. EM, 1105 Indl. Hwy., Southampton, Pa. 18966
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Detectors, Standing Wave

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M General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 *
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Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
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D Wiltron Co., Dept. EM, 825 E. Middlefield Rd., Mt. View, Cal 94043

Detectors, Ultraviolet

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Scientech, Inc., Dept. EM, 5649 Arapahoe Ave, Boulder, Colo. 80303
Sensor Technology, Dept. EM, 21012 Lassen St., Chatsworth, Cal. 91311
DM Shannon Luminous Mat'ls., Div. Shannon-Glow Inc., Dept. EM, 7356 Santa Monica Blvd., Hollywood, Cal. 90046
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D Ultra-Violet Prods., Inc., Dept. EM, 5100 Walnut Grove Ave., San Gabriel, Cal. 91778

United Detector Tech., Dept. EM, 2644 30th St., Santa Monica, Cal. 90405
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Westinghouse Electric Corp., Indl & Gov't Tube, Dept. EM, Westinghouse Circle, Horseheads, N.Y. 14845

Detectors, Vacuum

NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
Perkin-Elmer Ultek Inc., Dept. EM, Box 10920, Palo Alto, Cal. 94303
D United Elec. Controls Co., Dept. EM, 85A School St., Watertown, Mass. 02172
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Detectors,Vibration—See Transducers, Vibration

Detectors, Video

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
Colorado Video, Inc., Dept. EM, Box 928, Boulder, Colo. 80306 p. 1372,1376
DM **Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725** ..... *
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
DM Plessey Semiconductors, Dept. EM, 1674 McGaw Ave., Irvine, Cal. 92714
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Wide Band Engrg. Co. Inc., Dept. EM, Box 21652, Phoenix, Ariz. 85036

Detectors, Voltage

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D **General Magnetics, Dept. EM, 211 Grove St., Bloomfield, N.J. 07003** ..... *
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Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 ..... *
Guardian Electric Co., Dept. EM, 1550 W. Carroli Ave., Chicago, Ill. 60607 p. 3519
DM **Hi-G Co., Inc., Dept. EM, 580 Spring St., Windsor Locks, Conn. 06096 p. 3542,3545**
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D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
DM Guardian California, Dept. EM, 4030 W. Spencer St., Torrance, Cal. 90503
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
Micro Instrument Co., Marine & Power Instr. Div., Dept. EM, 2250 Micro Pl., Escondido, Cal. 92025
D Parametric Inds., Inc., Dept. EM, 742 Main St., Winchester, Mass. 01890
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
M Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803
Transtector Systems, Dept. EM, 532 Monterey Pass Rd., Monterey Park, Cal. 91754
M Wilmar Elctrns. Inc., Dept. EM, 2430 Amsler St., Torrance, Cal. 90505

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D **Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101** ..... *
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Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... *
Jackson Bros., (London) Ltd., Dept. EM, 258 Bway., New York, N.Y. 10007 *
D **Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101** ..... p. 2426
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D **Spectrol Electronics Corp., Dept. EM, 17070 East Gale Ave., City of Industry, Cal. 91745** ..... p. 3910
D **Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817** ..... *
DM **Vemaline Prods. Div., Ostbys & Barton Co., Dept. EM, 487 Jefferson Blvd., Warwick, R.I. 02886** ..... p. 2454
D **Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629** .... *
Anchor Plastics, Dept. EM, 36-36 36th, Long Island City, N.Y. 11106
Apahouser Corp. of N.E., Apahouser-Elcom, Dept. EM, 101 Walnut St., Watertown, Mass. 02172
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
Clarostat Mfg. Co., Inc., Dept. EM, Washington St., Dover, N.H. 03820
D Davies Molding Co., Harry, Dept. EM, 4920 Bloomingdale Ave., , Chicago, Ill 60639
D LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
DM Matheson Gas Products, Dept. EM, Box 85, East Rutherford, N.J. 07073
D Mechanical Engraving Co., Inc., Dept. EM, 4500 Bullard Ave, Bronx, New York 10470
Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
Paraplegics Mfg., Dept. EM, 304 N. York Rd., Bensenville, Ill. 60106
Perfect Gear & Instr. Corp., Sub. Designatronics, Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
M Photo Chemical Prods. Cal., Dept. EM, 1715 Berkeley, Santa Monica, Cal. 90404
M PIC Design Div., Benrus Corp., Dept. EM, Benrus Center, Rte 7, Ridgefield, Conn. 06877
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SGL Homalite, Div. of SGL Inds., Inc., Dept. EM, 11 Brookside Dr., Wilmington, Del. 19804
DM Stock Drive Prods., Div. Designatronics, Inc., Dept. EM, 55 S. Denton Ave., New Hyde Pk., N.Y. 11040
M Tech-Etch/Braun, Dept. EM, 45 Aldrin Rd., Plymouth, Mass. 02360
Teledyne Gurley, Dept. EM, 514 Fulton St., Troy, N.Y. 12181
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006

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D ITT Telecommunications, Apparatus Dept., Dept. EM, Fulton Dr., Corinth, Miss. 38834
D LocAtor Electronics Co., Dept. EM, South Country Ind'l Pk.; Drawer 10609, St. Louis, Mo. 63129
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016

Dials, Turns-Counting

DM **Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634** ..... p. 3790
D **Bourns, Inc., Trimpot Prods. Div., Dept. EM, 1200 Columbia Ave., Riverside, Cal. 92507** ..... *
D **Duncan Electronics, Inc., Dept. EM, 2865 Fairview Rd., Costa Mesa, Cal. 92626** ..... p. 3880
D **Electro-Techniques, Inc., Dept. EM, 215 Via Del Norte, Oceanside, Cal. 92054 p. 3885**
Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... *
Harrel, Inc., Dept. EM, 16 Fitch St., E. Norwalk, Conn. 06855 ..... *
Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 ..... *
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DM **Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518** ..... *
D **VRN St Petersburg, Div. Vernitron, Dept. EM, 2801 72nd St N. Box 44000, St. Petersburg, FL 33743** ..... *
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
D Clarostat Mfg. Co., Inc., Dept. EM, Washington St., Dover, N.H. 03820
M Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
D Mechanical Engraving Co., Inc., Dept. EM, 4500 Bullard Ave, Bronx, New York 10470

Dielectric Heating Equipment

Cober Elctrns., Inc., Dept. EM, 7 Gleason Ave., Stamford, Conn. 06902 ..... *
M Cycle-Dyne, Inc., Sub. Axel Elctrns., Inc., Dept. EM, 134-20 Jamaica Ave., Jamaica, N.Y. 11418
M Reeve Electronics, Inc., Dept. EM, 609 W. Lake St., Chicago, Ill 60606

Dielectrics—See Films; Insulation Materials

Differentials, Mechanical—See Gears & Gear Mechanisms

Digital Tape Recorders—See Recorders, Computer Data

Digitizers, Pencil Follower (Inc. Coordinate & Graphic)

Colorado Video, Inc., Dept. EM, Box 928, Boulder, Colo. 80306 p. 1371,1376
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Altek Corp., Dept. EM, 2150 Industrial Pkwy, Silver Spring, MD 20904
D Auto-trol Corp., Dept. EM, 5650 N. Pecos St., Denver, Colo. 80221
D Bendix Corp., Aerospace Sys. Div., Dept. EM, 3621 S. State Rd., Ann Arbor, Mich. 48107
M California Computer Prods., Dept. EM, 2411 W. La Palma Ave., Anaheim, Cal 92801
Computer Talk Inc., Dept. EM, Box 145, Idledale, Colo. 80453
D Spatial Data Systems, Inc., Dept. EM, P.O. Box 249 508 S. Fairview, Goleta, Cal. 93017

Dimmers, Light—See Controls, Lamp Dimming, Flashing

Diode Arrays (Including Photo)

D **A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876** ..... *
American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
M **Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634** ..... *
DM **Chicago Miniature/Drake, Dept. EM, 4433 N Ravenswood Ave., Chicago, Ill. 60640** ..... *
DM **Conditioning Semiconductor Devices, Dept. EM, Box 816, Wayne, N.J. 07470** *
EG&G, Inc., Electro-Optics Div., Dept. EM, 35 Congress St., Salem, Mass. 01970 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *

D **International Rectifier Corp., Semiconductor Div., Dept. EM, 233 Kansas St., El Segundo, Cal. 90245** ..... *
D **Litronix, Dept. EM, 19000 Homestead Rd., Cupertino, Cal. 95014** ..... **p. 2493**
Mini-Systems, Inc., Dept. EM, 20 David Rd., North Attleboro, Mass. 02761 *
National Semiconductors, Ltd., Dept. EM, 331 Cornelia St., Plattsburgh, N.Y. 12901 ..... *
D **Semtech Corp., Dept. EM, 652 Mitchell Rd., Newbury Park, Cal. 91320** ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D **Vactec, Inc., Dept. EM, 2423 Northline Blvd., Maryland Heights, Mo. 63043** *
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
D Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
General Elec., Semiconductor Prods., Dept. EM, Electronics Pk., Box 1122, Syracuse, NY 13201
HEI, Inc., Dept. EM, Jonathan Ind'l. Ctr., Chaska, Minn. 55318
Hughes Aircraft Co., Image Devices Ind'l. Prods. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
Integrated Photomatrix, Dept. EM, 1101 Bristol Rd., Mountainside, N.J. 07092
M Levit Electronics, C. M., Dept. EM, 200 Park Ave. S., New York, N.Y. 10003
Meret Inc., Dept. EM, 1815 24th St., Santa Monica, Cal. 90404
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
Optoelectronics, Inc., Dept. EM, 1309 Dynamic St., Petaluma, Cal. 94952
Optron, Inc., Dept. EM, 1201 Tappon Cir., Carrollton, Tex. 75006
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Rectifier Components Corp., Dept. EM, 1112 Lousons Rd., Union, N.J. 07083
D Reticon Corp., Dept. EM, 910 Benicia Ave., Sunnyvale, Cal. 94086
D Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
Sensor Technology, Dept. EM, 21012 Lassen St., Chatsworth, Cal. 91311
DM Solitron Devices, Transistor Div., Dept. EM, 1177 Blue Heron Rd., Riviera Beach, Fla. 33404
T. C. Centronic, Dept. EM, King Henry's Dr, Addington, Croydon CR9 0BG, Great Britain
DM Teledyne Semiconductor, Dept. EM, 1300 Terra Bella Ave., Mountain View, Cal. 94040

Diodes, Avalanche

D **A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876** ..... **p. 3920**
D **Conditioning Semiconductor Devices, Dept. EM, Box 816, Wayne, N.J. 07470** *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
DM **Semtech Corp., Dept. EM, 652 Mitchell Rd., Newbury Park, Cal. 91320** ..... *
TRW RF Semiconductors, Dept. EM, 14520 Aviation Blvd., Lawndale, Cal. 90260 ..... *
D Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
Edal Inds., Inc., Dept. EM, 4 Short Beach Rd., E. Haven, Conn. 06512
M EMI Gencom Inc., Dept. EM, 80 Express St., Plainview, N.Y. 11803
D Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
D FMC Corp., Semiconductor Products Div., Dept. EM, 800 Hoyt St., Broomfield, Colo. 80020
Galileo Electro-Optics Corp., Dept. EM, Galileo Pk., Sturbridge, Mass. 01518
M High Voltage Devices, Inc., Dept. EM, 7435 Ave., Visalia, Cal. 93277
DM Hughes Aircraft Co., Electron Dynamics Div., Dept. EM, 3100 W. Lomita Blvd., Torrance, Cal. 90509
M Levit Electronics, C. M., Dept. EM, 200 Park Ave. S., New York, N.Y. 10003
Meret Inc., Dept. EM, 1815 24th St., Santa Monica, Cal. 90404
M Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Parametric Inds., Inc., Dept. EM, 742 Main St., Winchester, Mass. 01890
DM RSM Sensitron Semiconductor, Div. RSM Electron Power, Inc., Dept. EM, 221 W. Industry Ct., Deer Park, N.Y. 11729
D Semicon Inc., Dept. EM, 10 North Ave., Burlington, Mass. 01803
D Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
D Solid State Inc., Dept. EM, 46 Farrand St., Bloomfield, N.J. 07003
DM St-Semicon Inc, Semiconductor Div., Dept. EM, 415 No. College Ave., Bloomington, Ind. 47401
TRW Power Semiconductors, Dept. EM, 14520 Aviation Blvd., Lawndale, Cal. 90260
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
D Varo Semiconductor, Inc., Dept. EM, 1000 N. Shiloh Rd., Garland, Tex. 75040

Diodes, Backward

D **General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345** ..... *
DM **Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725** ..... *
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
General Elec., Semiconductor Prods., Dept. EM, Electronics Pk., Box 1122, Syracuse, NY 13201
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
D Parametric Inds., Inc., Dept. EM, 742 Main St., Winchester, Mass. 01890
D RSM Sensitron Semiconductor, Div. RSM Electron Power, Inc., Dept. EM, 221 W. Industry Ct., Deer Park, N.Y. 11729
D Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
Solid State Inc., Dept. EM, 46 Farrand St., Bloomfield, N.J. 07003
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Diodes, Breakdown—See Diodes Avalanche

Diodes, Electroluminescent (Radiating)

D **A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876** ..... *
D Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
DM **Leecraft Mfg. Co., Inc., Dept. EM, 21-16 44th Rd., Long Island City, N.Y. 11101** ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Meret Inc., Dept. EM, 1815 24th St., Santa Monica, Cal. 90404
Sensor Technology, Dept. EM, 21012 Lassen St., Chatsworth, Cal. 91311
Xciton Corp, Dept. EM, Shaker Park, 5 Hemlock St, Latham, NY 12110

Diodes, Frequency Multiplier

D **A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876** ..... *
DM **Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725** ..... *
Semtech Corp., Dept. EM, 652 Mitchell Rd., Newbury Park, Cal. 91320 ..... *
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
M Crown Microwave, Inc., Sub. Microwave Semiconductor Corp., Dept. EM, 6 Executive Park Dr., N. Billerica, Mass. 01862
DM ITT, Semiconductor Div., Dept. EM, 500 Broadway, Lawrence, MASS 01841
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
D Parametric Inds., Inc., Dept. EM, 742 Main St., Winchester, Mass. 01890
M United Microtronics, Inc., Dept. EM, 5-15 48th Ave., Long Island City, N.Y. 11101
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Diodes, Germanium

D **A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876** ..... **p. 3920**
D **Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094** ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
American Microsemiconductor, Dept. EM, 145 Main St, Madison, NJ 07940
D Amperex Electronic Corp., Slatersville Div., Dept. EM, Providence Pike, Slatersville, R.I. 02876
DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Cordover & Co., Carl, Dept. EM, 3914 North 29th Ave., Hollywood, Fla. 33020
CSR Industries Inc., Semiconductor Div., Dept. EM, 35 Central Ave., E. Farmingdale, N.Y. 11735
D Dutrex Inds., Inc., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
General Elec., Semiconductor Prods., Dept. EM, Electronics Pk., Box 1122, Syracuse, NY 13201
D GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
DM ITT, Semiconductor Div., Dept. EM, 500 Broadway, Lawrence, MASS 01841
ITT Semiconductors Discrete Devices, Dept. EM, 500 Broadway, Lawrence, Mass 01841
Kemtron Electron Prods., Inc., Dept. EM, 14 Prince Pl., Newburyport, Mass. 01950
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
D Microwave Diode Corp., Dept. EM, Washington St-Box 250, W. Stewartstown, NH 03597
D Nucleonic Prods., Dept. EM, Box 1454, 6660 Variel Ave., Canoga Pk., Cal. 91303
Optoelectronics, Inc., Dept. EM, 1309 Dynamic St., Petaluma, Cal. 94952
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Parametric Inds., Inc., Dept. EM, 742 Main St., Winchester, Mass. 01890
D Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
D Semiconductor Technology, Inc., Dept. EM, 124-14 22nd Ave., College Point, N.Y. 11356
D Solid State Inc., Dept. EM, 46 Farrand St., Bloomfield, N.J. 07003
D Temtron Elctrns Ltd., Dept. EM, 138-69 Fran Lewis Blvd., Rosedale, N.Y. 12472

Diodes, Gunn

DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
DM Hughes Aircraft Co., Electron Dynamics Div., Dept. EM, 3100 W. Lomita Blvd., Torrance, Cal. 90509
M Levit Electronics, C. M., Dept. EM, 200 Park Ave. S., New York, N.Y. 10003
Litton Inds., Electron Tube Div., Dept. EM, 960 Industrial Rd, San Carlos, Calif. 94070
M Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M United Microtronics, Inc., Dept. EM, 5-15 48th Ave., Long Island City, N.Y. 11101
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304

Diodes, High-Voltage (1,000 Volts & Over)

D **A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876** ..... **p. 3920**
D **Conditioning Semiconductor Devices, Dept. EM, Box 816, Wayne, N.J. 07470** *
D **International Rectifier Corp., Semiconductor Div., Dept. EM, 233 Kansas St., El Segundo, Cal. 90245** ..... *
DM **Semtech Corp., Dept. EM, 652 Mitchell Rd., Newbury Park, Cal. 91320** ..... *
TRW RF Semiconductors, Dept. EM, 14520 Aviation Blvd., Lawndale, Cal. 90260 ..... *
M **Victoreen, Inc., Dept. EM, 10101 Woodland Ave., Cleveland, Ohio 44104** **p. 3778**
D **Westinghouse Elec. Corp., Semiconductor Div., Dept. EM, Armbrust Rd., Youngwood, Pa. 15697** ..... *
American Microsemiconductor, Dept. EM, 145 Main St, Madison, NJ 07940
D Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
D Amperex Electronic Corp., Slatersville Div., Dept. EM, Providence Pike, Slatersville, R.I. 02876
DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
Edal Inds., Inc., Dept. EM, 4 Short Beach Rd., E. Haven, Conn. 06512
D FMC Corp., Semiconductor Products Div., Dept. EM, 800 Hoyt St., Broomfield, Colo. 80020
Galileo Electro-Optics Corp., Dept. EM, Galileo Pk., Sturbridge, Mass. 01518

General Elec., Semiconductor Prods., Dept. EM, Electronics Pk., Box 1122, Syracuse, NY 13201
DM General Instrument Corp., Discrete Semiconductor Div., Dept. EM, 600 West John St., Hicksville, N.Y. 11802
M High Voltage Devices, Inc., Dept. EM, 7435 Ave., Visalia, Cal. 93277
D ITT, Semiconductor Div., Dept. EM, 500 Broadway, Lawrence, MASS 01841
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602
M Levit Electronics, C. M., Dept. EM, 200 Park Ave. S., New York, N.Y. 10003
M Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Parametric Inds., Inc., Dept. EM, 742 Main St., Winchester, Mass. 01890
Rectifier Components Corp., Dept. EM, 1112 Lousons Rd., Union, N.J. 07083
DM RSM Sensitron Semiconductor, Div. RSM Electron Power, Inc., Dept. EM, 221 W. Industry Ct., Deer Park, N.Y. 11729
D Sanken Elec. Co., Dept. EM, 1-22-8 Nishi-Ikebukuro, Toshima-Ku, Tokyo, Japan
D Semicon Inc., Dept. EM, 10 North Ave., Burlington, Mass. 01803
D Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
D Semiconductor Technology, Inc., Dept. EM, 124-14 22nd Ave., College Point, N.Y. 11356
D Solid State Inc., Dept. EM, 46 Farrand St., Bloomfield, N.J. 07003
DM Solitron Devices, Transistor Div., Dept. EM, 1177 Blue Heron Rd., Riviera Beach, Fla. 33404
DM St-Semicon Inc, Semiconductor Div., Dept. EM, 415 No. College Ave., Bloomington, Ind. 47401
TRW Power Semiconductors, Dept. EM, 14520 Aviation Blvd., Lawndale, Cal. 90260
M United Microtronics, Inc., Dept. EM, 5-15 48th Ave., Long Island City, N.Y. 11101
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
D Varo Semiconductor, Inc., Dept. EM, 1000 N. Shiloh Rd., Garland, Tex. 75040

Diodes, Hot Carrier

DM Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D International Rectifier Corp., Semiconductor Div., Dept. EM, 233 Kansas St., El Segundo, Cal. 90245 *
DM Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725 *
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
D Nucleonic Prods., Dept. EM, Box 1454, 6660 Variel Ave., Canoga Pk., Cal. 91303
D Parametric Inds., Inc., Dept. EM, 742 Main St., Winchester, Mass. 01890
D Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
DM Solitron Devices, Transistor Div., Dept. EM, 1177 Blue Heron Rd., Riviera Beach, Fla. 33404
M United Microtronics, Inc., Dept. EM, 5-15 48th Ave., Long Island City, N.Y. 11101

Diodes, Impatt

Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
DM Hughes Aircraft Co., Electron Dynamics Div., Dept. EM, 3100 W. Lomita Blvd., Torrance, Cal. 90509
D Parametric Inds., Inc., Dept. EM, 742 Main St., Winchester, Mass. 01890
M United Microtronics, Inc., Dept. EM, 5-15 48th Ave., Long Island City, N.Y. 11101

Diodes, Light-Emitting (LED's)

D A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 ..... p. 3920
ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845 ..... p. 2457
AND, Dept. EM, 770 Airport Blvd. Bx 4188, Burlingame, Cal. 94010 .... p. 2459
Arcolectric Corp., Dept. EM, Box 348, 11120 Chandler Blvd., No. Hollywood, Cal. 91603 ..... p. 4001
DM Chicago Miniature/Drake, Dept. EM, 4433 N Ravenswood Ave., Chicago, Ill. 60640 ..... p. 2468,2469
D Dialight, Dept. EM, 203 Harrison Pl., Brooklyn, N.Y. 11237 *
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 *
D Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D Industrial Devices, Dept. EM, Edgewater, N.J. 07020 ..... p. 2485
DM Industrial Elctrn. Engrs., Dept. EM, 7740 Lemona Ave., Van Nuys, Cal. 91405 p. 2483
D Ledco Div., Wilbrecht Elctrns., Dept. EM, 240 Plato Blvd., St. Paul, Minn. 55107 ..... p. 2489-2491
D Leecraft Mfg. Co., Inc., Dept. EM, 21-16 44th Rd., Long Island City, N.Y. 11101 ..... p. 2492
D Litronix, Dept. EM, 19000 Homestead Rd., Cupertino, Cal. 95014 ..... p. 2493
Oak Inds. Inc., Switch Div., Dept. EM, Dept. DA, Crystal Lake, Ill. 60014 p. 2497,2519
D Oshino Electric Lamp Works, Ltd, Dept. EM, 2-5-2, Minami-Shinagawa, Shinagawa-Ku, Tokyo, Japan *
D Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 *
Refac Elctrns. Pinlite®, Wild Rover®, Dept. EM, Box 809, W. Hill Rd., Winsted, Conn 06098 ..... p. 2541
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 ....*
D Sloan Company, Dept. EM, 7704 San Fernando Rd., Sun Valley, Cal. 91352 p. 2544,2545
D Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 *
Visual Communications Co, Dept. EM, PO Box 986, El Segundo, CA 90245 *
DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
Data Display Products, Dept. EM, Box 91072, Los Angeles, Cal. 90009
D Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
General Sensors, Inc., Dept. EM, P. O. Box 401347, Garland, Tex. 75040
HEI, Inc., Dept. EM, Jonathan Ind'l. Ctr., Chaska, Minn. 55318
Injectorall Elctrns. Corp., Dept. EM, 98-100 Glen St., Glen Cove, N.Y. 11542
Korry Mfg. Co., Dept. EM, 223 8th Ave. N., Seattle, Wash. 98109
Meret Inc., Dept. EM, 1815 24th St., Santa Monica, Cal. 90404
M Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
Optron, Inc., Dept. EM, 1201 Tappon Cir., Carrollton, Tex. 75006
DM Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Sanken Elec. Co., Dept. EM, 1-22-8 Nishi-Ikebukuro, Toshima-Ku, Tokyo, Japan
D Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
Sensor Technology, Dept. EM, 21012 Lassen St., Chatsworth, Cal. 91311
SHOGYO International Corp., Dept. EM, 300 Northern Blvd., Great Neck, N.Y. 11021
D Tec, Inc., Dept. EM, 2727 N. Fairview, Tuscon, Ariz. 85705
D Temtron Elctrns Ltd., Dept. EM, 138-69 Fran Lewis Blvd., Rosedale, N.Y. 12472
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
D Xciton Corp, Dept. EM, Shaker Park, 5 Hemlock St, Latham, NY 12110

Diodes, Limiting

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
TRW RF Semiconductors, Dept. EM, 14520 Aviation Blvd., Lawndale, Cal. 90260 *
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
Eastern Delta Corp., Dept. EM, 29-09 S. Broadway, Fair Lawn, N.J. 07410
Edal Inds., Inc., Dept. EM, 4 Short Beach Rd., E. Haven, Conn. 06512
General Elec., Semiconductor Prods., Dept. EM, Electronics Pk., Box 1122, Syracuse, NY 13201
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
D Microwave Diode Corp., Dept. EM, Washington St-Box 250, W. Stewartstown, NH 03597
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
D Parametric Inds., Inc., Dept. EM, 742 Main St., Winchester, Mass. 01890
Schauer Mfg. Corp., Dept. EM, 4500 Alpine Ave., Cincinnati, Ohio 45242
D Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
D Semiconductor Technology, Inc., Dept. EM, 124-14 22nd Ave., College Point, N.Y. 11356
D Solid State Inc., Dept. EM, 46 Farrand St., Bloomfield, N.J. 07003
DM Teledyne Semiconductor, Dept. EM, 1300 Terra Bella Ave., Mountain View, Cal. 94040
TRW Power Semiconductors, Dept. EM, 14520 Aviation Blvd., Lawndale, Cal. 90260
M United Microtronics, Inc., Dept. EM, 5-15 48th Ave., Long Island City, N.Y. 11101
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Diodes, Matched Pairs

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American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 *
D Conditioning Semiconductor Devices, Dept. EM, Box 816, Wayne, N.J. 07470 *
D Delco Electronics Div., General Motors Corp., Dept. EM, 700 E. Firmin St., Kokomo, Ind. 46901 *
D Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 *
M Semtech Corp., Dept. EM, 652 Mitchell Rd., Newbury Park, Cal. 91320 *
D Westinghouse Elec. Corp., Semiconductor Div., Dept. EM, Armbrust Rd., Youngwood, Pa. 15697 *
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
D Amperex Electronic Corp., Slatersville Div., Dept. EM, Providence Pike, Slatersville, R.I. 02876
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
Edal Inds., Inc., Dept. EM, 4 Short Beach Rd., E. Haven, Conn. 06512
D Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
FMC Corp., Semiconductor Products Div., Dept. EM, 800 Hoyt St., Broomfield, Colo. 80020
General Elec., Semiconductor Prods., Dept. EM, Electronics Pk., Box 1122, Syracuse, NY 13201
D GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
D ITT, Semiconductor Div., Dept. EM, 500 Broadway, Lawrence, MASS 01841
M Kemtron Electron Prods., Inc., Dept. EM, 14 Prince Pl., Newburyport, Mass. 01950
M Levit Electronics, C. M., Dept. EM, 200 Park Ave. S., New York, N.Y. 10003
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
M Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
D Nucleonic Prods., Dept. EM, Box 1454, 6660 Variel Ave., Canoga Pk., Cal. 91303
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
DM Parametric Inds., Inc., Dept. EM, 742 Main St., Winchester, Mass. 01890
D RSM Sensitron Semiconductor, Div. RSM Electron Power, Inc., Dept. EM, 221 W. Industry Ct., Deer Park, N.Y. 11729
D Semicoa, Inc., Dept. EM, 333 McCormick Ave., Costa Mesa, Cal. 92626
D Semicon Inc., Dept. EM, 10 North Ave., Burlington, Mass. 01803
D Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
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DM Solitron Devices, Transistor Div., Dept. EM, 1177 Blue Heron Rd., Riviera Beach, Fla. 33404
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DM Teledyne Semiconductor, Dept. EM, 1300 Terra Bella Ave., Mountain View, Cal. 94040
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Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
Dionics, Dept. EM, 65 Rushmore St., Westbury, N.Y. 11590
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D ITT, Semiconductor Div., Dept. EM, 500 Broadway, Lawrence, MASS 01841
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M Levit Electronics, C. M., Dept. EM, 200 Park Ave. S., New York, N.Y. 10003
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M Kemtron Electron Prods., Inc., Dept. EM, 14 Prince Pl., Newburyport, Mass. 01950
M Levit Electronics, C. M., Dept. EM, 200 Park Ave. S., New York, N.Y. 10003
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Diodes, Silicon

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Galileo Electro-Optics Corp., Dept. EM, Galileo Pk., Sturbridge, Mass. 01518
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Diodes, Switching

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International Rectifier Corp., Semiconductor Div., Dept. EM, 233 Kansas St., El Segundo, Cal. 90245 ..... p. 3927
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DM General Semiconductor Industries, Inc., Dept. EM, 2001 W. 10 Pl., Box 3078, Tempe, Ariz. 85281
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
Murata Corporation of America, Dept. EM, 1148 Franklin Rd., S.E., Marietta, Ga. 30067
TRW Power Semiconductors, Dept. EM, 14520 Aviation Blvd., Lawndale, Cal. 90260

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General Elec., Semiconductor Prods., Dept. EM, Electronics Pk., Box 1122, Syracuse, NY 13201
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
M Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
D Parametric Inds., Inc., Dept. EM, 742 Main St., Winchester, Mass. 01890
D Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
D Solid State Inc., Dept. EM, 46 Farrand St., Bloomfield, N.J. 07003

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D Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
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KSW Electronics Corp., Dept. EM, South Bedford St., Burlington, Mass. 01803
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MSI Electronics, Inc., Dept. EM, 34-32 57th St., Woodside, N.Y. 11377
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M Zeta Laboratories, Inc., Dept. EM, 3265 Scott Blvd., Santa Clara, Cal. 95051

Disc Packs, Magnetic

Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... p. 1469
California Computer Prods., Dept. EM, 2411 W. La Palma Ave., Anaheim, Cal 92801
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Electronic Memories & Magnetics Corp., Dept. EM, 12621 Chadron Ave., Hawthorne, Cal. 90250
DM Memorex Corp., Dept. EM, San Thomas at Central Expwy., Santa Clara, Cal. 95052

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M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
M RHG Elctrns. Lab., Dept. EM, 161 E. Industry Ct., Deer Park, N.Y. 11729
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M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304
DM Yig-Tek Corp., Dept. EM, 1725 De La Cruz Blvd., Santa Clara, Cal. 95050

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Memorex Corp., Dept. EM, San Thomas at Central Expwy., Santa Clara, Cal. 95052
MFE Corp., Dept. EM, Keewaydin Dr., Salem, N.H. 03079
Shugart Assocs., Dept. EM, 415 Oakmead Pkwy, Sunnyvale, Cal. 94086
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DM Master Specialties Co , Dept. EM, 1640 Monrovia St., Costa Mesa, Cal. 92627
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M UCE, Inc., Dept. EM, 20 N. Main St., Norwalk, Conn. 06854
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M Westinghouse Canada Ltd., Dept. EM, Box 510, Hamilton, Ont., Can.

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Automation Displays Inc., Dept. EM, 3833 N. White Ave., Eau Claire, Wisc. 54701
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Lundy Elctrns. & Sys., Inc., Dept. EM, Robert La., Glen Head, N.Y. 11545
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DM Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102

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California Instrs., Dept. EM, 5150-Convoy St., San Diego, Cal. 92111 ..... *
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DM **Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304** .. *
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D Scientific Technology, Dept. EM, 1201 San Antonio Rd., Mountain View, Cal. 94043
D Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
Sensor Technology, Dept. EM, 21012 Lassen St., Chatsworth, Cal. 91311
D Tec, Inc., Dept. EM, 2727 N. Fairview, Tuscon, Ariz. 85705
Teledyne Gurley, Dept. EM, 514 Fulton St., Troy, N.Y. 12181
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
UFAD Corp., Dept. EM, 700 36th St. S.E., Grand Rapids, Mich. 49508
D Xciton Corp, Dept. EM, Shaker Park, 5 Hemlock St, Latham, NY 12110

Displays, Lighted Segment

D **A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876** ..... *
D **ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845** ..... *
American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
D **Beckman Instrs., Information Displays Oper., Dept. EM, Box 3579, Scottsdale, Ariz. 85257** ..... *
DM **Chicago Miniature/Drake, Dept. EM, 4433 N Ravenswood Ave., Chicago, Ill. 60640** ..... *
D **Dialight, Dept. EM, 203 Harrison Pl., Brooklyn, N.Y. 11237** ..... *
DM **Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304** .. *
M **Industrial Elctrn. Engrs., Dept. EM, 7740 Lemona Ave., Van Nuys, Cal. 91405** p. 2483
Info-Lite Corp., Dept. EM, 46-10 104 St., Corona, N.Y. 11368 ..... *
D **Litronix, Dept. EM, 19000 Homestead Rd., Cupertino, Cal. 95014** ..... p. 2493
LVC Inds. Inc., Co-Ord Switch Bloc-Lite Divs., Dept. EM, 135-25 37th Ave., Flushing, N.Y. 11354 ..... *
Refac Elctrns. Pinlite[A], Wild Rover[A], Dept. EM, Box 809, W. Hill Rd., Winsted, Conn 06098 ..... *
Sorenson Lighted Controls, Dept. EM, 530 Oakwood Ave., W. Hartford, Conn. 06110 ..... *
M Aerospace Optics Inc., Dept. EM, 7112 Burns St., Fort Worth, Tex. 76118
Automation Displays Inc., Dept. EM, 3833 N. White Ave., Eau Claire, Wisc. 54701
M Day-light Display Corp., Dept. EM, 11 Fairfield Pl., Box 1231, W. Caldwell, N.J. 07006
Evershed & Vignoles Ltd., Dept. EM, Action Lane, Chiswick, London, England W4 5HJ
D Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
Futaba Corp., Dept. EM, Daido Keori Bldg., 3-1-16 Sotokanda,, Chiyoda-ku, Tokyo, Japan
D Inter-Market, Inc., Dept. EM, 1946 Lehigh Ave., Glenview, Ill. 60025
JKL Components Corp., Dept. EM, 2226 Barry Ave., W. Los Angeles, CA 90064
Master Specialties Co., Dept. EM, 1640 Monrovia St., Costa Mesa, Cal. 92627
D National Electronics, Div. Varian Assoc. Inc., Dept. EM, Box 269, Geneva, Ill. 60134
Penn Keystone Corp., Dept. EM, Division St., Ansonia, Conn. 06401
D Tec, Inc., Dept. EM, 2727 N. Fairview, Tuscon, Ariz. 85705
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
M UCE, Inc., Dept. EM, 20 N. Main St., Norwalk, Conn. 06854
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
D Xciton Corp, Dept. EM, Shaker Park, 5 Hemlock St, Latham, NY 12110

Displays, Liquid Crystal

AND, Dept. EM, 770 Airport Blvd. Bx 4188, Burlingame, Cal. 94010 .... p. 2458
Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634 ..... p. 2461
D **Hamlin Inc., Dept. EM, Lake & Grove Sts., Lake Mills, Wisc. 53551** .... p. 2482
Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... *
Industrial Elctrn. Engrs., Dept. EM, 7740 Lemona Ave., Van Nuys, Cal. 91405 p. 2483
Ashley-Butler, Inc., ASHA, Dept. EM, 208 Route 206 South, Somerville, N.J. 08876
Atomergic Chemetals Corp Co., Dept. EM, 100 Fairchild Ave., Plainview, N.Y. 11803
Evershed & Vignoles Ltd., Dept. EM, Action Lane, Chiswick, London, England W4 5HJ
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Hughes Aircraft Co., Image Devices Ind'l. Prods. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
DM Transparent Conductors Inc., Dept. EM, 26 Coromar Dr., Box 549, Goleta, Cal. 93017
M UCE, Inc., Dept. EM, 20 N. Main St., Norwalk, Conn. 06854

Displays, Planar Gas Discharge

D **Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634** ..... *
D **Beckman Instrs., Information Displays Oper., Dept. EM, Box 3579, Scottsdale, Ariz. 85257** ..... *
Cherry Electrical Prods. Corp., Dept. EM, 3623 Sunset Ave., Waukegan, Ill. 60085 ..... *
Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 ..... *
General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 *
Industrial Elctrn. Engrs., Dept. EM, 7740 Lemona Ave., Van Nuys, Cal. 91405 *
M **Info-Lite Corp., Dept. EM, 46-10 104 St., Corona, N.Y. 11368** ..... *
M **Interstate Electronics, Dept. EM, Box 3117, Anaheim, Cal. 92803** ..... *
Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705 ..... *
D Burroughs Corp., Electronic Components Div., Dept. EM, Box 1226 - Mt. Bethel Rd., Plainfield, N.J. 07061
Evershed & Vignoles Ltd., Dept. EM, Action Lane, Chiswick, London, England W4 5HJ
D Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
Transparent Conductors Inc., Dept. EM, 26 Coromar Dr., Box 549, Goleta, Cal. 93017

Displays, Projection Type (CRT; Electromechanical; Film; Light Valve)

D **ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845** ..... *
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... p. 1469
Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 ..... *
M **Industrial Elctrn. Engrs., Dept. EM, 7740 Lemona Ave., Van Nuys, Cal. 91405** p. 2483
Infodex, Inc., Dept. EM, 7 Cherry Ave., Waterbury, Conn. 06702 p. 2486,2487
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
LVC Inds. Inc., Co-Ord Switch Bloc-Lite Divs., Dept. EM, 135-25 37th Ave., Flushing, N.Y. 11354 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D **Omron Electronics, Dept. EM, 233 S. Wacker Dr., Chicago, Ill. 60606** ..... *
Rockland Sys. Corp., Dept. EM, 230 W. Nyack Rd., W. Nyack, N.Y. 10994 .. *
Staver Co., Inc., Dept. EM, 47 N. Saxon Ave., Bay Shore, N.Y. 11706 ..... *
Allard Instr., Div. of Applied Fluidics, Dept. EM, 770 Main St., Westbury, N.Y. 11590
Ann Arbor Terminals, Inc., Dept. EM, 6107 Jackson Rd., Ann Arbor, Mich. 48103
Conrac Div., Conrac Corp., Dept. EM, 600 N. Rimsdale Ave., Covina, Calif. 91722
Conrac Corp., Systems Sls Div., Dept. EM, Three Landmark Sq., Stamford, Conn. 06901
Daco Instr. Co., Dept. EM, 30 Stran Rd., Milford, Conn. 06460
Data General Corp., Dept. EM, 15 Turnpike Rd Rte 9, Westboro, Mass 01581
Devco Engrg., Control Sys. Div., Dept. EM, Pier La., W. Caldwell, N.J. 07006
M E-Systems Inc., Garland Div., Dept. EM, Box 6118, Dallas, Tex. 75222
Holex Corp, Dept. EM, 2544 W. Main St., Norristown, Pa. 19401
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Hughes Aircraft Co., Image Devices Ind'l. Prods. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
Information Displays, Inc., Dept. EM, 150 Clearbrook Rd., Elmsford, N.Y. 10523
Lexidata Corp, Dept. EM, 215 Middlesex Tpke., Burlington, MASS. 01803
Lundy Elctrns. & Sys., Inc., Dept. EM, Robert La., Glen Head, N.Y. 11545
Major Data Concepts, Inc., Dept. EM, 1796 Monrovia Ave., Costa Mesa, Cal. 92627
Memorex Corp., Dept. EM, San Thomas at Central Expwy., Santa Clara, Cal. 95052
Optical Electronics, Inc., Dept. EM, Box 11140, Tucson, Ariz. 85734
Princeton Elctrn. Prods., Dept. EM, Box 101, New Brunswick, N.J. 08902
M Singer Co., Librascope Div., Dept. EM, 833 Sonora Ave., Glendale, Cal. 91201
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Terminal Data Corp. of Md, Dept. EM, 11878 Coakley Circle, Rockville, Md. 20852
M Watkins-Johnson Co , Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304

Wyle Computer Prods., Dept EM, 3200 Magruder Blvd , Hampton, Va 23666

Displays, Status

D **A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876** ..... *
American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
Beckman Instrs., Information Displays Oper., Dept. EM, Box 3579, Scottsdale, Ariz. 85257 ..... *
D **Cherry Electrical Prods. Corp., Dept. EM, 3623 Sunset Ave., Waukegan, Ill. 60085** ..... *
D **Dialight, Dept. EM, 203 Harrison Pl., Brooklyn, N.Y. 11237** ..... *
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... *
Industrial Elctrn. Engrs., Dept. EM, 7740 Lemona Ave., Van Nuys, Cal. 91405 p. 2483
M **Info-Lite Corp., Dept. EM, 46-10 104 St., Corona, N.Y. 11368** ..... *
Infodex, Inc., Dept. EM, 7 Cherry Ave., Waterbury, Conn. 06702 ..... *
D **IEE/Schadow, Inc., Dept. EM, 8081 Wallace Rd., Eden Prairie, Minn. 55344** *
LVC Inds. Inc., Co-Ord Switch Bloc-Lite Divs., Dept. EM, 135-25 37th Ave., Flushing, N.Y. 11354 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Sorenson Lighted Controls, Dept. EM, 530 Oakwood Ave., W. Hartford, Conn. 06110 ..... *
Staver Co., Inc., Dept. EM, 47 N. Saxon Ave., Bay Shore, N.Y. 11706 ..... *
M Aerospace Optics Inc., Dept. EM, 7112 Burns St., Fort Worth, Tex. 76118
Ashley-Butler, Inc., ASHA, Dept. EM, 208 Route 206 South, Somerville, N.J. 08876
Automation Displays inc., Dept. EM, 3833 N. White Ave., Eau Claire, Wisc. 54701
D Burroughs Corp., Electronic Components Div., Dept. EM, Box 1226 - Mt. Bethel Rd., Plainfield, N.J. 07061
Daco Instr. Co., Dept. EM, 30 Stran Rd., Milford, Conn. 06460
Data Panel, Inc, Dept. EM, 7313 S. Washington, Edina, Minn. 55435
M Day-light Display Corp., Dept. EM, 11 Fairfield Pl., Box 1231, W. Caldwell, N.J. 07006
M E-Systems Inc., Garland Div., Dept. EM, Box 6118, Dallas, Tex. 75222
D Ferranti-Packard, Ltd. Elec. Div., Dept. EM, 6030 Ambler Dr, Mississauga, Ont. Can. L4W 2P1
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
D Apollo Lasers, Apollo Lasers, Inc., Dept. EM, 6357 Arizonia Cir, Los Angeles, Cal. 90045
JKL Components Corp., Dept. EM, 2226 Barry Ave., W. Los Angeles, CA 90064
KMC Systems Inc., Dept. EM, 200 State Highway 17, Mahwah, N.J. 07430
Penn Keystone Corp., Dept. EM, Division St., Ansonia, Conn. 06401
M Photo Chemical Prods. Cal., Dept. EM, 1715 Berkeley, Santa Monica, Cal. 90404
M Singer Co., Librascope Div., Dept. EM, 833 Sonora Ave., Glendale, Cal. 91201
D Tec, Inc., Dept. EM, 2727 N. Fairview, Tuscon, Ariz. 85705
Telesis Laboratory, Dept. EM, Box 387, Chillocothe, Ohio 45601

Displays, Tube—See Tubes, Readout

Dissipators, Heat—See Transistors, Diode, Thyristor Heat Dissipators; Heat Sinks, Soldering

Distortion Analyzers, Indicators—See Analyzers, A-F

Dividers, Analog

M **Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734** ..... p. 2857
D **General Magnetics, Dept. EM, 211 Grove St., Bloomfield, N.J. 07003** ..... *
M **Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735** *
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
Intronics Inc., Dept. EM, 57 Chapel St., Newton, Mass. 02158
Optical Electronics, Inc., Dept. EM, Box 11140, Tucson, Ariz. 85734
Rochester Instr System, Dept. EM, 255 N. Union St., Rochester, N.Y. 14605
Systems Research Labs. Inc., Dept. EM, 2800 Indian Ripple Rd. , Dayton, Ohio 45440
Teledyne Philbrick, Dept. EM, 17 Allied Dr. Rte 128, Dedham, Mass. 02026

Dividers, Frequency

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734 ..... *
M **Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040** .. *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
M **LSI Computer Systems, Inc., Dept. EM, 1235 Walt Whitman Rd., Melville, N.Y. 11746** ..... *
LVC Inds. Inc., Co-Ord Switch Bloc-Lite Divs., Dept. EM, 135-25 37th Ave., Flushing, N.Y. 11354 ..... *
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
D Finney Co., Dept. EM, 34 W. Interstate St., Bedford, Ohio 44014
D Lectrotech, Inc., Dept. EM, 5810 N. Western Ave., Chicago, Ill. 60659
Luff Research, Dept. EM, Box 449, Jackson Hgts., N.Y. 11372
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
DM Plessey Semiconductors, Dept. EM, 1674 McGaw Ave., Irvine, Cal. 92714
Spectracom Corp., Dept. EM, 1667 Penfield Rd., Rochester, N.Y. 14625
Systems Research Labs. Inc., Dept. EM, 2800 Indian Ripple Rd. , Dayton, Ohio 45440
Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803

Dividers, Magnetic Analog

D **General Magnetics, Dept. EM, 211 Grove St., Bloomfield, N.J. 07003** ..... *
M **Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735** *

Dividers, Power (LF, HF, VHF, UHF)

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
M **Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706** ..... p. 2865
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
DM **Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725** ..... *
Mini-Circuits Lab., Div. Scientific Comps. Corp., Dept. EM, 2625 E 14th St., Brooklyn, N.Y. 11235 ..... p. 2890, Inside Front Cover, Vol. 1
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 .. p. 3061
Vega Precision Labs., Dept. EM, 800 Follin La., Vienna, Va. 22180 ..... p. 2864
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
Alan Industries Inc., Dept. EM, PO Box 1203, Columbus, Ind. 47201
Alford Mfg. Co., Dept. EM, 120 Cross St., Winchester, Mass. 01890
DM Anaren Microwave, Inc., Dept. EM, 1010 James St., Syracuse, N.Y. 13203
M Anzac Electronics, Dept. EM, 39 Green St., Waltham, Mass. 02154
M Baldpate Electronics, Inc., Dept. EM, 225 E. Main St., Georgetown, Mass. 01833
M Coil-Q Corp., Dept. EM, 340 Bronxville Rd., Bronxville, N.Y. 10708
Comdel, Inc., Dept. EM, Beverly Airport, Beverly, Mass. 01915
M Dielectric Comms, Unit of Gen Signal, Dept. EM, Raymond, Maine 04071
Elcom Systems, Inc., Dept. EM, 127F Brook Ave., Deer Pk., N.Y. 11729
Engelmann Microwave, Dept. EM, Skyline Dr., Montville, N.J. 07045
M Merrimac Inds., Inc., Dept. EM, 41 Fairfield Pl., West Caldwell, N.J. 07006
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
Mu-Del Elctrns., Dept. EM, 2426 Linden La., Silver Spring, Md. 20910
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M Norlin Communications Inc., Dept. EM, 9125 Gaither Rd., Gaithersburg, Md. 20760
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
Radiation Devices Co., Inc., Dept. EM, Box 8450, Baltimore, Md. 21234
Summit Engineering Corp., Dept. EM, Box 938, Bozeman, Mont. 59715
M Technical Research & Mfg., Inc., Dept. EM, Kelly Ave. Grenier Field, R.F.D. #3, Manchester, N.H. 03103
Trompeter Electronics, Inc., Dept. EM, 8936 Comanche, Chatsworth, Cal. 91311
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304
M Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760
Wide Band Engrg. Co. Inc., Dept. EM, Box 21652, Phoenix, Ariz. 85036
M Zeta Laboratories, Inc., Dept. EM, 3265 Scott Blvd., Santa Clara, Cal. 95051

Dividers, Power, Microwave

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
M **Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706** ..... *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
DM **Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725** ..... p. 2877
Mini-Circuits Lab., Div. Scientific Comps. Corp., Dept. EM, 2625 E 14th St., Brooklyn, N.Y. 11235 ..... p. 2890, Inside Front Cover, Vol. 1
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M **Vega Precision Labs., Dept. EM, 800 Follin La., Vienna, Va. 22180** ..... *
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
M Aircom, Inc., Dept. EM, Rte. 16B, Union, N.H. 03887
M Airtron, Div. Litton Inds., Dept. EM, 200 E. Hanover Ave., Morris Plains, N.J. 07950
DM Anaren Microwave, Inc., Dept. EM, 1010 James St., Syracuse, N.Y. 13203
M Anzac Electronics, Dept. EM, 39 Green St., Waltham, Mass. 02154
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
M Eastern Microwave Corp., Dept. EM, 4 Gill St., Woburn, MA 01801
Elcom Systems, Inc., Dept. EM, 127F Brook Ave., Deer Pk., N.Y. 11729
Engelmann Microwave, Dept. EM, Skyline Dr., Montville, N.J. 07045
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Merrimac Inds., Inc., Dept. EM, 41 Fairfield Pl., West Caldwell, N.J. 07006
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
D Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
D Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
Mu-Del Elctrns., Dept. EM, 2426 Linden La., Silver Spring, Md. 20910
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
M Reeve Electronics, Inc., Dept. EM, 609 W. Lake St., Chicago, Ill 60606
Republic Elctrn. Inds. Corp., Dept. EM, 575 Broad Hollow Rd., Melville, N.Y. 11746
M RHG Elctrns. Lab., Dept. EM, 161 E. Industry Ct., Deer Park, N.Y. 11729
D R L C Elctrns., Inc., Dept. EM, 83 Radio Cir., Mt. Kisco, N.Y. 10549
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
M Technical Research & Mfg., Inc., Dept. EM, Kelly Ave. Grenier Field, R.F.D. #3, Manchester, N.H. 03103
M Transco Prods., Inc., Dept. EM, 4241 Glencoe Ave., Venice, Cal. 90291
TRG,, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
Trompeter Electronics, Inc., Dept. EM, 8936 Comanche, Chatsworth, Cal. 91311
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Wavecom, Dept. EM, 9036 Winnetna Ave., Northridge, Cal. 91324
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760
M Zeta Laboratories, Inc., Dept. EM, 3265 Scott Blvd., Santa Clara, Cal. 95051

Dividers, Voltage-Also See Networks, Resistance; Transformers, Voltage Dividing

D **Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204** p. 3631
DM **Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634** ..... *

D **Caddock Electronics, Inc., Dept. EM, 3127 Chicago Ave., Riverside, Cal. 92507** ..... p. 3659,3662,3665
Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 .. *
DM **Digitran Co., Dept. EM, 855 So. Arroyo Pkwy., Pasadena, Cal. 91105** ..... *
Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 p. 2825
D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043** *
Gamble, Charles T. Inds., Dept. EM, 605 Perkins La., Delanco, N.J. 08075 p. 3698
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 *
Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509 ..... *
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 ..... p. 2762
Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 p. 2767,2768
KDI Pyrofilm Corp, Dept. EM, 60 S. Jefferson Rd., Whippany, N.J. 07981 .... *
Kelvin, Dept. EM, 5919 Noble Avenue, Van Nuys, Cal. 91411 ..... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
LVC Inds. Inc., Co-Ord Switch Bloc-Lite Divs., Dept. EM, 135-25 37th Ave., Flushing, N.Y. 11354 ..... *
Megavolt, Corp., Dept. EM, 110 Hobart St, Hackensack, N.J. 07601 ..... *
M **North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803** ..... *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
D **Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076** ..... *
Power Designs, Inc., Dept. EM, 1700 Shames Dr., Westbury, N.Y. 11590 .... *
M **Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008** ..... p. 3609
M **Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550** p. 2825
TRW/IRC Resistors, Dept. EM, Greenway Rd., Boone, N.C. 28607 Inside Back Cover, Vol. 1
Universal Voltronics Corp., Dept. EM, 27 Radio Circle Dr., Mt. Kisco, N.Y. 10549 ..... p. 3349
M **Victoreen, Inc., Dept. EM, 10101 Woodland Ave., Cleveland, Ohio 44104** .... *
Vishay Resistive Systems Grp., Vishay Intertechnology Inc., Dept. EM, 63 Lincoln Hwy., Malvern, Pa. 19355 ..... p. 3781
D American HV Voltage Test Sys., Inc., Dept. EM, Ctrl Garr Ind'l Pk, Accident, Md. 21520
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
Beckman Instrs., Cedar Grove Opers., Dept. EM, 89 Commerce Rd., Cedar Grove, N.J. 07009
Brown Electro-Measurements Co., Brown Electro-Meas., Dept. EM, P.O. Box 55169, Seattle, Wash. 98155
Centralab, Electrns. Div. - Globe Union Inc., Dept. EM, 5757 N. Green Bay Ave., Milwaukee, Wisc. 53201
D EECO, Dept. EM, 1441 E. Chestnut Ave, Box 659, Santa Ana, Cal. 92701
Electrical Standards Div., E.S.R.S., Inc., Dept. EM, 7337 Greenbush, N. Hollywood, Cal. 91605
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
D EMI Gencom Inc., Dept. EM, 80 Express St., Plainview, N.Y. 11803
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
E.S.I. Inc., Dept. EM, 13900 N.W. Science Park Dr., Portland, Oregon 97229
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
IPAC Group, Inc., Dept. EM, POB 156 3047 Industrial Blvd., Bethel Park, PA 15102
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602
M Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
DM Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Pearson Elctrns. Inc., Dept. EM, 4007 Transport St., Palo Alto, Cal. 94303
Zi-Tech Div., Aikenwood Corp., Dept. EM, Box 26, 2151 Park Blvd., Palo Alto, Cal. 94302

Doors, Cabinet, Metal—See Cabinets & Accessories, Metal

Doublers, Frequency—See Multipliers, Frequency

Drafting Machines

D Auto-trol Corp., Dept. EM, 5650 N. Pecos St., Denver, Colo. 80221
D Bendix Corp., Aerospace Sys. Div., Dept. EM, 3621 S. State Rd., Ann Arbor, Mich. 48107
Chemical Etching Equip. & Supply, Dept. EM, 6905 Beulah St, Alexandria, Va. 22310
D Dietzgen Corp., Dept. EM, 250 Wille Rd., Des Plaines, Ill 60018
HAPCO, Dept. EM, Box 1205, Boulder, Colo. 80302
Information Displays, Inc., Dept. EM, 150 Clearbrook Rd., Elmsford, N.Y. 10523
M Keuffel & Esser Co., Dept. EM, 20 Whippany Rd., Morristown, N.J. 07960
Zi-Tech Div., Aikenwood Corp., Dept. EM, Box 26, 2151 Park Blvd., Palo Alto, Cal. 94302

Drafting Symbols, Dry Transfer, Pressure Sensitive, etc. (Including Lettering)

Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634 ..... *
Beckman Instrs., Information Displays Oper., Dept. EM, Box 3579, Scottsdale, Ariz. 85257 ..... p. 2466
DM **Datak Corp., Dept. EM, 65 Seventy-First St., Guttenberg, N.J. 07093** ..... *
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
D Bishop Graphics, Dept. EM, 5388 Sterling Center, Westlake Village, Cal. 91361
D Chartpak, A Times Mirror Co., Dept. EM, 1 River Rd., Leeds, Mass. 01053
HAPCO, Dept. EM, Box 1205, Boulder, Colo. 80302
D Injectorall Elctrns. Corp., Dept. EM, 98-100 Glen St., Glen Cove, N.Y. 11542
M Keuffel & Esser Co., Dept. EM, 20 Whippany Rd., Morristown, N.J. 07960
D Russell Inds., Inc., Dept. EM, 3069 Lawson Blvd., Oceanside, N.Y. 11572
Stanpat Products Inc., Dept. EM, 366 Main St., Port Washington, N.Y. 11050

Drawers, Cash

Sweda Int'l., OEM Prods., Dept. EM, 34 Maple Ave., Pine Brook, N.J. 07058

Drawers, Sliding

D **Augat Interconnection Prods. Div., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703** ..... *
Chassis-Trak, Div., General Devices Co., Inc., Dept. EM, 525 S. Webster Ave., Indianapolis, Ind. 46219 ..... *
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... *
M **General Devices Co., Inc., Dept. EM, Box 19188, Indianapolis, Ind. 46219** .. *
Optima Enclosures, Div. Scientific Atlanta, Dept. EM, 2166 Mountain Ind'l Blvd., Tucker, Ga. 30084 ..... *
Premier Metal Prods. Co., Div. Sunshine Mining Co., Dept. EM, 381 Canal Place, Bronx, N.Y. 10451 ..... *
Vent-Rak, Div., General Devices Co., Dept. EM, P.O. Box 19188, Indianapolis, Ind. 46219 ..... *
D Bud Radio, Inc., Dept. EM, 4605 E. 355th St., Willoughby, Ohio 44094
M Electro-Rack Products Co., Dept. EM, 1742 So. Clementine St., Anaheim, Cal. 92802
Equipto, Aurora Equipment Co., Dept. EM, 225 So. Highland Ave., Aurora, Ill. 60507
G. F. Business Equipment, Inc., Emcor Prods., Dept. EM, 1600 Fourth Ave. N.W., Rochester, Minn. 55901
Mupac Corp., Dept. EM, 646 Summer St., Brockton, Mass. 02402
DM Scanbe Div., Zero Corp., Dept. EM, 3445 Fletcher Ave., El Monte, Cal. 91731
M Zero Corp., Dept. EM, 777 Front St., Burbank, Cal. 91502

Drills & Accessories, Hand & Power

GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... p. 1290
Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
Chemical Etching Equip. & Supply, Dept. EM, 6905 Beulah St, Alexandria, Va. 22310
Dresser Industries, Dept. EM, 1505 Elm St., Dallas, Tex. 75201
HAPCO, Dept. EM, Box 1205, Boulder, Colo. 80302
DM High Speed Hammer Co., Inc., Dept. EM, 313 Norton St., Rochester, N.Y. 14621
D Klein Tools, Inc, Dept. EM, 7200 McCormick Rd., Chicago, Ill. 60645
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
D Micro Electronic Systems, Inc., Dept. EM, 8 Kevin Drive, Danbury, Conn. 06810
D Moody Tools, Inc., Dept. EM, 1 Culver St., Providence, R.I. 02905
National Camera Inc., Dept. EM, 2000 W. Union Ave., Englewood, Colo. 80110
Snap-On-Tools, Dept. EM, 8192-A 28th Ave., Kenosha, Wisc. 53140
D Wahl Clipper Corp., Dept. EM, 2902 Locust St., Sterling, Ill. 61081

Drivers & Decoders For Readouts

D **ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845** ..... *
DM **Andersen Laboratories Inc., Dept. EM, 1280 Blue Hills Ave., Bloomfield, Conn. 06002** ..... p. 2619
M **Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634** ..... *
D **Beckman Instrs., Information Displays Oper., Dept. EM, Box 3579, Scottsdale, Ariz. 85257** ..... p. 2466
D **Dialight, Dept. EM, 203 Harrison Pl., Brooklyn, N.Y. 11237** ..... *
D **Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304** .. *
Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... *
M **Industrial Elctrn. Engrs., Dept. EM, 7740 Lemona Ave., Van Nuys, Cal. 91405** *
M **ITT North, Microsystems Div, Dept. EM, 700 Hillsboro Pl., Deerfield Beach, Fla. 33441** ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Refac Elctrns. Pinlite', Wild Rover', Dept. EM, Box 809, W. Hill Rd., Winsted, Conn 06098 ..... *
Staver Co., Inc., Dept. EM, 47 N. Saxon Ave., Bay Shore, N.Y. 11706 ..... *
Anaheim Automation, Dept. EM, 922 Orangefair La., Anaheim, Cal. 92801
Automation Displays Inc., Dept. EM, 3833 N. White Ave., Eau Claire, Wisc. 54701
Dionics, Dept. EM, 65 Rushmore St., Westbury, N.Y. 11590
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
D Exar Integrated Systems, Dept. EM, P.O.B. 62229, Sunnyvale, Cal. 94088
Executone, Printact Relay Div., Dept. EM, 29-10 Thomson Ave., Long Island City, N.Y. 11101
Facit-Addo, Inc., Dept. EM, 66 Field Point Rd., Greenwich, Conn. 06830
Keltron Instrument Displays Div., Dept. EM, 223 Crescent St., Waltham, Mass. 02154
National Electronics, Div. Varian Assoc. Inc., Dept. EM, Box 269, Geneva, Ill. 60134
D Tec, Inc., Dept. EM, 2727 N. Fairview, Tuscon, Ariz. 85705
DM Teledyne Semiconductor, Dept. EM, 1300 Terra Bella Ave., Mountain View, Cal. 94040
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Wyle Computer Prods., Dept. EM, 3200 Magruder Blvd., Hampton, Va 23666

Drivers, Chopper

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *

Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343

Drivers, Nut

D **Channellock, Inc., Dept. EM, 1306 S. Main St., Meadville, Pa. 16335** .... p. 4287
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
Megavolt, Corp., Dept. EM, 110 Hobart St, Hackensack, N.J. 07601 ..... *
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
D Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
D Klein Tools, Inc, Dept. EM, 7200 McCormick Rd., Chicago, Ill. 60645
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
D Marshall Industries, Hunter Tools, Dept. EM, 9674 Telstar Ave., El Monte, Cal. 91731
D Moody Tools, Inc., Dept. EM, 1 Culver St., Providence, R.I. 02905
D Porter, H.K., Inc., Dept. EM, 74 Foley St., Somerville, Mass. 02143
Snap-On-Tools, Dept. EM, 8192-A 28th Ave., Kenosha, Wisc. 53140
Standard Pneumatic Motor Co., Dept. EM, Box 10030, Reno, Nev. 89510
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Drivers, Solenoid

Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731 ..... p. 1392
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... *
M **Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008** ..... p. 3609
Artisan Elctrns. Corp., Dept. EM, 5 Eastmans Rd., Parsippany, N.J. 07054
Circuit Technology, Dept. EM, 160 Smith St., Farmingdale, N.Y. 11735
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
DM Guardian California, Dept. EM, 4030 W. Spencer St., Torrance, Cal. 90503
MKC Electronics, Dept. EM, 454 E. Donovan Rd., Kansas City, Kans. 66115
D Namco Controls, Acme-Cleveland Co., Dept. EM, 170 E. 131st St., Cleveland, Ohio 44108
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Tech Serv., Inc., BRS/LVE Div, Dept. EM, 5301 Holland Dr., Beltsville, Md 20705
Voltex Co., Inc., Dept. EM, 115 Marine St., Farmingdale, N.Y. 11735

Drivers, Speaker

D **Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094** ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Fanon/Courier Corp., Subs., Resdel Engrg. Dept. EM, 990 S. Fair Oaks, Pasadena, Cal. 91105
D Frazier, Inc., Dept. EM, 1930 Valley View La., Dallas, Tex. 75234
DM Oaktron Inds., Inc., Dept. EM, Monroe, Wisconsin 53566
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Rola Co., Div. Pemcor, Inc., Dept. EM, 21010 Miles Pkwy., Cleveland, Ohio 44128
SHOGYO International Corp., Dept. EM, 300 Northern Blvd., Great Neck, N.Y. 11021

Drivers, Switch

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
M **Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706** ..... p. 2865
General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 p. 2871
Circuit Technology, Dept. EM, 160 Smith St., Farmingdale, N.Y. 11735
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
Plessey Semiconductors, Dept. EM, 1674 McGaw Ave., Irvine, Cal. 92714
D Siliconix, Inc., Dept. EM, 2201 Laurelwood Rd., Santa Clara, Cal 95054
M Technical Research & Mfg., Inc., Dept. EM, Kelly Ave. Grenier Field, R.F.D. #3, Manchester, N.H. 03103

Drivers, Tube—See Drivers & Decoders for Readouts

Drives & Drive Mechanisms (Dial)

Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 ..... *
Jackson Bros., (London) Ltd., Dept. EM, 258 Bway., New York, N.Y. 10007 *
D **Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101** ..... p. 2424,2425
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
Servo-Tek Prods. Co., Dept. EM, 1086 Goffle Rd., Hawthorne, N.J. 07506 .. *
DM **Vemaline Prods. Div., Ostbys & Barton Co., Dept. EM, 487 Jefferson Blvd., Warwick, R.I. 02886** ..... p. 2456
D **Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629** .... *
M ABA Electromechanical Sys. Inc., Dept. EM, Box 500, Pinellas Pk., Fla. 33565
Bailey Meter Co., Sub. Babcock & Wilcox, Dept. EM, 29801 Euclid Ave., Wickliffe, Ohio 44092
Berg Inc., Winfred M., Dept. EM, 499 Ocean Ave., East Rockaway, N.Y. 11518
Electro Space Systems, Inc., Dept. EM, Box 1359, Richardson, Tex. 75080
M MPC Prods. Corp., Dept. EM, 4200 W. Victoria Ave., Chicago, Ill. 60646
Perfect Gear & Instr. Corp., Sub. Designatronics, Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
PIC Design Div., Benrus Corp., Dept. EM, Benrus Center, Rte 7, Ridgefield, Conn. 06877
DM Stock Drive Prods., Div. Designatronics, Inc., Dept. EM, 55 S. Denton Ave., New Hyde Pk., N.Y. 11040
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
Transicoil, Inc., Dept. EM, Worcester, Pa. 19490

Dry Transfer Letters & Numbers—See Kits, Marking-Drafting Symbols

Ducts, Wiring

D **Panduit Corp., Dept. EM, 17301 Ridgeland Ave., Tinley Park, Ill. 60477** p. 4631
D AMP Special Industries, Dept. EM, Valley Forge, Pa. 19482
Dek, Inc., Dept. EM, 1555-A Hawthorne La., W. Chicago, Ill. 60185
DM Electrovert, Dept. EM, 86 Hartford Ave., Mt. Vernon, N.Y. 10553
Hoffman Engrg Co., Federal Cartridge, Dept. EM, 9th & Tyler Sts., Anoka, Minn. 55303
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Taylor Electric, Inc., Dept. EM, 2410 Hwy 281 N., Marble Falls, Tex. 78654
D Wadsworth Electric Mfg. Co., Dept. EM, 20 W. 11th St., Covington, Ky. 41011
Wiremold Co., Dept. EM, West Hartford, Conn. 06110

Dummy Loads

D **Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521** ..... *
M **Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706** ..... p. 2865
M **Bird Electronic Corp., Dept. EM, 30303 Aurora Rd., Solon, Ohio 44139** ..... *
Carborundum Co., Graphite Prods. Div., Dept. EM, Box 339, Niagara Falls, N.Y. 14302 ..... *
M **Electro Impulse, Dept. EM, Box 870, Red Bank, N.J. 07701** ..... p. 2720
Elgar Corporation, Dept. EM, 8225 Mercury Ct., San Diego, Cal. 92111 ..... *
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 ..... *
DM **Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725** ..... *
Milwaukee Resistor Corp., Dept. EM, 700 W. Virginia St., Milwaukee, Wisc. 53204 ..... *
D **Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076** .... p. 3721
M **Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030** ..... *
Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342 ..... *
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
M Aircom, Inc., Dept. EM, Rte. 16B, Union, N.H. 03887
M Airtron, Div. Litton Inds., Dept. EM, 200 E. Hanover Ave., Morris Plains, N.J. 07950
Alan Industries Inc., Dept. EM, PO Box 1203, Columbus, Ind. 47201
Alford Mfg. Co., Dept. EM, 120 Cross St., Winchester, Mass. 01890
D Astrolab, Inc., Dept. EM, 345 Dalziel Rd., Linden, N.J. 07036
D Barker & Williamson, Inc., Dept. EM, Canal St., Bristol, Pa. 19007
M Coleman Microwave Co., Dept. EM, Box 59, Rte. 22, Lebanon, N.J. 08833
M Connecticut Microwave Corp., Dept. EM, 106 Powder Mill Rd Box 389, Canton, Conn. 06019
M Dielectric Comms, Unit of Gen Signal, Dept. EM, Raymond, Maine 04071
Elcom Systems, Inc., Dept. EM, 127F Brook Ave., Deer Pk., N.Y. 11729
Electronautics, Dept. Dielectric Comm., Dept. EM, Newtown Rd., Littleton, Mass. 01460
Engelmann Microwave, Dept. EM, Skyline Dr., Montville, N.J. 07045
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
D Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
Quartzite Processing, Inc., Dept. EM, 6 Holyoke St., Malden, Mass. 02148
M Reeve Electronics, Inc., Dept. EM, 609 W. Lake St., Chicago, Ill 60606
D R-L C Elctrns., Inc., Dept. EM, 83 Radio Cir., Mt. Kisco, N.Y. 10549
Scientific Communications, Dept. EM, 3425 Kingsley, Garland, Tex. 75041
D Sinclair Radio Labs., Dept. EM, 122 Rayette Rd, Concord, Ontario, Can. L4K 1B6
Sivers Lab, Dept. EM, Box 90339, Los Angeles, Cal. 90009
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
M Technical Mat'l., Dept. EM, 700 Fenimore Rd., Mamaroneck, N.Y. 10543
TRG,, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006
M Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Duplexers, Microwave

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
M **Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706** ..... *
DM **Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518** ..... *
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
D Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
D Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573

DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
M Technical Research & Mfg., Inc., Dept. EM, Kelly Ave. Grenier Field, R.F.D. #3, Manchester, N.H. 03103
Triangle Microwave Inc., Dept. EM, 9B Great Meadow La, East Hanover, NJ 07936
M UTE Microwave, Dept. EM, 3500 Sunset Ave., Asbury Park, N.J. 07712
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Duplicators, Magnetic Tape

Ampex Corp., Dept. EM, 401 Broadway, Redwood City, Cal. 94063
M Telectro Sys. Corp., Dept. EM, 96-18 43rd Ave., Corona, N.Y. 11368
D Telex Communications, Inc., Dept. EM, 9600 Aldrich Ave., So., Minneapolis, Minn. 55420

Dust Covers—See Covers, Protective

DVM'S—See Meters, Volt, Digital

Earphones—See Headphones

Editing Equipment, Tape

D Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 *

AcroSys, Dept. EM, Box 687, Philomath, Ore. 97370
Adams-Smith Inc., Dept. EM, Summer Rd., Boxboro, Mass. 01719
Ampex Corp., Dept. EM, 401 Broadway, Redwood City, Cal. 94063
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
D EECO, Dept. EM, 1441 E. Chestnut Ave, Box 659, Santa Ana, Cal. 92701
D Nortronics Co., Inc., Dept. EM, 8101 Tenth Ave., N., Minneapolis, Minn. 55427
Video Research Corporation, Dept. EM, 6985 Garden Rd., Riviera Beach, Fla. 33404

Ejectors & Extractors, P-C Boards—See Pullers, Circuit Board

Elastomers, Heat Shrinkable—See Caps, Forms & Tapes, Heat Shrinkable

Electrodes, Electroplating—See Electroplating Equipment & Supplies

M PIC Design Div., Benrus Corp., Dept. EM, Benrus Center, Rte 7, Ridgefield, Conn. 06877

Electrodes, High-Voltage

M Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... *
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602

Electronic Switches (Oscilloscope)

Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
Kay Elemetrics Corp., Dept. EM, 12 Maple Ave., Pine Brook, N.J. 07058 .... *
Mini-Circuits Lab., Div. Scientific Comps. Corp., Dept. EM, 2625 E 14th St., Brooklyn, N.Y. 11235 ..... **p. 2890, Inside Front Cover, Vol. 1**
Centralab Elctrns. Div., Globe-Union Inc., Dept. EM, Box 858, Hwy. 20 W., Fort Dodge, Iowa 50501

Electroplating Equipment & Supplies

Sanford-Miller Corp., Dept. EM, 8 John St., Lynbrook, N.Y. 11563 ..... *
D Union Carbide Corp., Battery Products Div., Dept. EM, 270 Park Ave., New York, N.Y. 10017 ..... *
Auric Corp., Dept. EM, 470 Frelinghuysen Ave., Newark, N.J. 07114
Chemical Etching Equip. & Supply, Dept. EM, 6905 Beulah St, Alexandria, Va. 22310
Cohn Corp., Sigmund, Dept. EM, 121 S. Columbus Ave., Mt. Vernon, N.Y. 10553
Corning Science Products, Corning Glass Works, Dept. EM, Corning, N.Y. 14830
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
Federated Metals Corp., Dept. EM, 120 Broadway, New York, N.Y. 10005
Fidelity Chem. Prods. Corp., Dept. EM, 472 Frelinghuysen Ave., Newark, N.J. 07114
M Holly Productions, Dept. EM, 1442 Tzena Way, Encinitas, Cal. 92024
Lehighton Electronics, Inc., Dept. EM, RD 1Box 374 Dept M, Lehighton, Pa 18235
Luft Instrs., Inc., Dept. EM, Hillside Rd, Lincoln, Mass. 01773
M M & T Chemicals Inc., Dept. EM, Rahway, N.J. 07065
Metal Fabricators, Inc., Dept. EM, Box 1946, Greenville, S.C. 29602
Pace Inc., Dept. EM, 9329 Fraser Ave., Silver Spring, Md. 20910
Sel-Rex Div. Oxy Metal Industries Corp., Dept. EM, 75 River Rd., Nutley, N.J. 07110
D Sifco Metachemical, Div. Steel Improv. & Forging, Dept. EM, 5708 Schaaf Rd., Independence, Ohio 44131
M Technic, Inc., Dept. EM, Box 965, Providence, R.I. 02901

Elements, Sensing—See Transducers

Eliminators, Battery-Also See Power Supplies

Acme Electric, Dept. EM, 614 Water St., Cuba, N.Y. 14727 ..... *
D ATR Electronics, Inc., Dept. EM, 300 E. 4th St., St. Paul, Minn. 55101 p. 3357
Christie Elec., Dept. EM, 3404A W. 67th St., Los Angeles, Cal. 90043 ..... *
D Dynamic Instr. Corp., Dept. EM, 933 L.I. Motor Pkwy., Hauppauge, N.Y. 11787 *
M Eanco, Inc., Mid-Eastern Prods., Dept. EM, 539 Jacksonville Rd., Warminster, Pa. 18974 ..... *
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Zero Corp., Dept. EM, 777 Front St., Burbank, Cal. 91502

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M Langley Corp., Dept. EM, P. O. Box 2911, San Diego, Cal. 92112
M Lansing Research Corp., Dept. EM, 730-705 Willow Ave, Ithaca, N.Y. 14850
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Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
M Conrac Corp., Systems Sls Div., Dept. EM, Three Landmark Sq., Stamford, Conn. 06901
Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
Perfect Gear & Instr. Corp., Sub. Designatronics, Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
Siltran Digital, Dept. EM, 14831 Kitterman, Box 437, Silverado, Cal. 92676
Temposonics Inc., Dept. EM, 131 East Ames Ct, Plainview, N.Y. 11803
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006

Encoders, Keyboard

M Tech-Etch/Braun, Dept. EM, 45 Aldrin Rd., Plymouth, Mass. 02360

Encoders, Magnetic Strip

Clifton Precision, Litton Systems, Inc., Dept. EM, Marple at Brdway., Clifton Hgts., Pa. 19018 ..... *
Elcom Industries, Inc., Dept. EM, 10268 Bach Blvd., St. Louis, Mo. 63132

Encoders, Shaft Angle, Contacting

Airflyte Elctrns. Co., Dept. EM, Box 207, 56 Hook Rd., Bayonne, N.J. 07002 p. 3072,3073
M Clifton Precision, Litton Systems, Inc., Dept. EM, Marple at Brdway., Clifton Hgts., Pa. 19018 ..... *
M Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731 ..... *
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M Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... p. 1675,2279
C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
M Conrac Corp., Systems Sls Div., Dept. EM, Three Landmark Sq., Stamford, Conn. 06901
Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
Trans-Tek, Inc., Dept. EM, Rte. 83, Ellington, Conn. 06029

Encoders, Shaft Angle, Magnetic

Clifton Precision, Litton Systems, Inc., Dept. EM, Marple at Brdway., Clifton Hgts., Pa. 19018 ..... *
M Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731 ..... *
ILC Data Device Corp., Dept. EM, Airport Int'l. Plaza, Bohemia, N.Y. 11716 p. 1645
Jackson Bros., (London) Ltd., Dept. EM, 258 Bway., New York, N.Y. 10007 *
D Kessler-Ellis Prods., Dept. EM, 120 1st Ave., Atlantic Highlands, N.J. 07716 *
M Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735 *
Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... *
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
Benton Corp, Dept. EM, Race St Box 678, Manor, PA 15665
C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
M Singer Co., Librascope Div., Dept. EM, 833 Sonora Ave., Glendale, Cal. 91201
Temposonics Inc., Dept. EM, 131 East Ames Ct, Plainview, N.Y. 11803

Encoders, Shaft Angle, Optical

BEI Elctrns., Inc., Dept. EM, 1101 McAlmont St., Little Rock, Ark. 72203 p. 1384-1387
M Clifton Precision, Litton Systems, Inc., Dept. EM, Marple at Brdway., Clifton Hgts., Pa. 19018 ..... p. 3079
M Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731 ..... p. 1392,1393
Datametrics/Trump Ross, Dept. EM, 340 Fordham Road, Wilmington, Mass. 01887 ..... p. 1396
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D General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Itek Corp. Meas. Sys. Div., Dept. EM, Christina St., Newton, Mass. 02161 p. 1655
Kessler-Ellis Prods., Dept. EM, 120 1st Ave., Atlantic Highlands, N.J. 07716 p. 1651
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M Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... p. 1674,1675,2279
DM American Electronics, Inc., Dept. EM, 1600 E Valencia Dr., Fullerton, Cal. 92631
M Conrac Corp., Systems Sls Div., Dept. EM, Three Landmark Sq., Stamford, Conn. 06901
DATA TECHnology, Inc., Dept. EM, 4 Gill St., Woburn, Mass. 01801
Datametrics Inc, Dept. EM, 340 Fordham St., Wilmington, Mass. 01887
D Dynapar Corp., Dept. EM, 1675 Delany Rd., Gurnee, Ill. 60031
Electro Optical Mechanisms, Dept. EM, 2865 Metropolitan Pl., Pomona, Cal. 91767
Electronic Counters & Controls Inc., Dept. EM, 1500 McCormick Blvd., Mundelein, Ill. 60060
GCA/Burlington Div., Dept. EM, 174 Middlesex Tpke., Burlington, Mass. 01803
HEI, Inc., Dept. EM, Jonathan Ind'l. Ctr., Chaska, Minn. 55318
Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
Optron, Inc., Dept. EM, 1201 Tappon Cir., Carrollton, Tex. 75006
PMI Motors, Kollmorgen Corp., Dept. EM, 5 Aerial Way, Syosset, NY 11791
D Teledyne Gurley, Dept. EM, 514 Fulton St., Troy, N.Y. 12181
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006

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Encoders, Tone

Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... *
GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Re-el Circuits, Inc., Dept. EM, 520 Victor Street, Saddle Brook, N.J. 07662 *
D American Microsignal Corp, Dept. EM, 8431 Monroe Ave., Stanton, Cal. 90680
M Aydin, Vector Div., Dept. EM, Box 328, Newtown, PA 18940
Dantel, Inc., Dept. EM, 1922 North Helm, Fresno, Cal. 93727
Data Signal Corp, Dept. EM, 40-44 Hunt St, Watertown, MA 02172
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Gorman-Redlich Mfg. Co., Dept. EM, 6 Curtis St., Athens, Ohio 45701
IEC Electronics Corp., Dept. EM, 105 Norton St., Newark, N.Y. 14513
D LocAtor Electronics Co., Dept. EM, South Country Ind'l Pk., Drawer 10609, St. Louis, Mo. 63129
Mobil Electronics, Inc., Dept. EM, Box 1132, Anderson, Ind. 46015

Engineering Reference Books—See Technical Books

Epoxies—See Compounds, Enscapsulating, Molding, Potting; Adhesives

Equalizers, Audio

Allen Avionics, Inc., Div. A.K. Allen Co., Dept. EM, 255 E. 2nd St., Mineola, N.Y. 11501 ..... p. 2380
M **Alpha Components, Inc., Dept. EM, 1106 E. Simpson Rd., Mechanicsburg, Pa. 17055** ..... *
Chesterfield Prods. Inc., Dept. EM, 511A Victor St., Saddle Brook, N.J. 07662 p. 2620
M **ESC Elctrns. Corp., Dept. EM, 534 Bergen Blvd., Palisades Pk., N.J. 07650** *
M **Frequency Selective Networks, Inc, Dept. EM, 69-20 Garfield Ave., Woodside, N.Y. 11377** ..... *
M **Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061** ..... *
International Electro-Magnetics, Dept. EM, 350 N. Eric Dr., Palatine, Ill. 60067 p. 1011
Kappa Networks, Dept. EM, 165 Roosevelt Ave, Carteret, N.J. 07008 ..... *
M **OPT Inds. Inc., Data Products Div., Dept. EM, 300 Red School Lane, Phillipsburg, N.J. 08865** ..... *
Rockland Sys. Corp., Dept. EM, 230 W. Nyack Rd., W. Nyack, N.Y. 10994 .. *
M **Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030** ..... *
TT Elctrns., Inc., Dept. EM, 2214 S. Barry Ave., Los Angeles, Cal. 90064 .... *
Unholtz-Dickie Corp., Dept. EM, 3000 Whitney Ave., Hamden, Conn. 06518 *
M BG Electronics, Inc., Dept. EM, 9 Elm Ave., Mount Vernon, N.Y. 10550
D Bogen Div., Lear Siegler, Inc., Dept. EM, Box 500, Paramus, N.J. 07652
Convex Corp., Dept. EM, 2810 Dorr Ave., Fairfax, Va. 22031
D Frazier, Inc., Dept. EM, 1930 Valley View La., Dallas, Tex. 75234
Gotham Audio Corp., Dept. EM, 741 Washington St., New York, N.Y. 10014
D ITI Electronics, Inc., Dept. EM, 369 Lexington Ave., Clifton, N.J. 07015
Modular Audio Products, Dept. EM, 50 Orville Dr., Bohemia, N.Y. 11716
M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
D Pulse Techniques, Inc., Dept. EM, 1411 Palisade Ave., Teaneck, N.J. 07666
RFL Inds., Comms. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005
D Robins Broadcast & Sound Equipment Corp., Sub. Robins Inds., Dept. EM, 75 Austin Blvd., Commack, N.Y. 11725
D Shure Brothers, Inc., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204
D Spectra Sonics, Dept. EM, 770 Wall Ave., Ogden, Utah 84404
White Instrs., Inc., Dept. EM, Box 698, Austin, Tex. 78767

Equalizers, Delay

Allen Avionics, Inc., Div. A.K. Allen Co., Dept. EM, 255 E. 2nd St., Mineola, N.Y. 11501 ..... *
M **Alpha Components, Inc., Dept. EM, 1106 E. Simpson Rd., Mechanicsburg, Pa. 17055** ..... *
Chesterfield Prods. Inc., Dept. EM, 511A Victor St., Saddle Brook, N.J. 07662 *
M **Computer Devices Corp., Dept. EM, 63 Austin Blvd., Commack, N.Y. 11725** *
M **Data Delay Devices, Dept. EM, 253 Crooks Ave., Clifton, N.J. 07011** ..... *
M **ESC Elctrns. Corp., Dept. EM, 534 Bergen Blvd., Palisades Pk., N.J. 07650** *
M **Frequency Selective Networks, Inc, Dept. EM, 69-20 Garfield Ave., Woodside, N.Y. 11377** ..... p. 2326
M **Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061** ..... *
Kappa Networks, Dept. EM, 165 Roosevelt Ave, Carteret, N.J. 07008 ..... *
K R Electronics, Inc., Dept. EM, 91 Avenel St., Avenel, N.J. 07001 ..... p. 2635
M **OPT Inds. Inc., Data Products Div., Dept. EM, 300 Red School Lane, Phillipsburg, N.J. 08865** ..... *
TT Elctrns., Inc., Dept. EM, 2214 S. Barry Ave., Los Angeles, Cal. 90064 .... *
M BG Electronics, Inc., Dept. EM, 9 Elm Ave., Mount Vernon, N.Y. 10550
Convex Corp., Dept. EM, 2810 Dorr Ave., Fairfax, Va. 22031
RFL Inds., Comms. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005
M Wavecom, Dept. EM, 9036 Winnetna Ave., Northridge, Cal. 91324

Equalizers, Phase

Allen Avionics, Inc., Div. A.K. Allen Co., Dept. EM, 255 E. 2nd St., Mineola, N.Y. 11501 ..... *
M **Alpha Components, Inc., Dept. EM, 1106 E. Simpson Rd., Mechanicsburg, Pa. 17055** ..... *
Chesterfield Prods. Inc., Dept. EM, 511A Victor St., Saddle Brook, N.J. 07662 *
M **Computer Devices Corp., Dept. EM, 63 Austin Blvd., Commack, N.Y. 11725** *
M **ESC Elctrns. Corp., Dept. EM, 534 Bergen Blvd., Palisades Pk., N.J. 07650** *
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M **OPT Inds. Inc., Data Products Div., Dept. EM, 300 Red School Lane, Phillipsburg, N.J. 08865** ..... *
M **Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030** ..... *
TT Elctrns., Inc., Dept. EM, 2214 S. Barry Ave., Los Angeles, Cal. 90064 .... *
M AIL, Div. Cutler-Hammer, Dept. EM, Comac Road, Deer Park, N.Y. 11729
M BG Electronics, Inc., Dept. EM, 9 Elm Ave., Mount Vernon, N.Y. 10550
Convex Corp., Dept. EM, 2810 Dorr Ave., Fairfax, Va. 22031
GTE Lenkurt Inc., Dept. EM, 1105 County Rd., San Carlos, Cal. 94070
M Wavecom, Dept. EM, 9036 Winnetna Ave., Northridge, Cal. 91324

Erasers, Magnetic Tape (Bulk)

D **Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582** *
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
Ampex Corp., Dept. EM, 401 Broadway, Redwood City, Cal. 94063
Annis R B Co., Dept. EM, 1101 N. Delaware, Indianapolis, Ind. 46202
DM Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
D Duotone Co., Dept. EM, 6875 S.W. 81st St., S. Miami, Fla. 33143
D Nortronics Co., Inc., Dept. EM, 8101 Tenth Ave., N., Minneapolis, Minn. 55427
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
M Robins Ind's. Corp., Consumer Products Div., Dept. EM, 75 Austin Blvd., Commack, N.Y. 11725
D Wide Range Electronics Corp., Dept. EM, 2119 Schultz Rd., St. Louis, Mo. 63141

Escutcheons

D **Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101** ..... p. 2434
Photo Chemical Prods. Cal., Dept. EM, 1715 Berkeley, Santa Monica, Cal. 90404
D South Shore Metal Prods., Inc., Dept. EM, 88 E Allen Blvd., Farmingdale, N.Y. 11735

Etchants, Printed Circuit

Datak Corp., Dept. EM, 65 Seventy-First St., Guttenberg, N.J. 07093 .. p. 1298
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
D **Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342** ..... *
Allied Chemical Corp., Specialty Chemicals Div., Dept. EM, Box 1087R, Morristown, N.J. 07960
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
D Injectorall Elctrns. Corp., Dept. EM, 98-100 Glen St., Glen Cove, N.Y. 11542
Union Carbide, Chemicals & Plastics, Dept. EM, 270 Park Ave., New York, N.Y. 10017

Evaporation Equipment, Electron Beam

D CVC Products, Inc., Dept. EM, 525 Lee Rd., Box 1886, Rochester, N.Y. 14603
Perkin-Elmer Ultek Inc., Dept. EM, Box 10920, Palo Alto, Cal. 94303
D Sloan Technology Corp., Dept. EM, 535 E. Montecito St., Santa Barbara, Cal. 93103
DM Ulvac North America, Dept. EM, Colchester Plaza, Colchester, VT 05446
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

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Colorado Video, Inc., Dept. EM, Box 928, Boulder, Colo. 80306 ..... p. 1371
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Mark Eyelet & Stamping, Dept. EM, 185 Wakelee Rd., Wolcott, Conn. 06716

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Explosive Gas Indicators—See Detectors, Gas Leak

Extractors, Circuit Board, Tube—See Pullers, Circuit Board

Eyelets

Beman Mfg., Inc., Dept. EM, PO Box 370, New Cumberland, Pa. 17070 ..... *
DM **Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012** .. *
Staver Co., Inc., Dept. EM, 47 N. Saxon Ave., Bay Shore, N.Y. 11706 ..... *
D **Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342** ..... *
Acme Model Engrg. Co., Dept. EM, 654 Bergen Blvd., Ridgefield, N.J. 07657
DM Aimsco Inc., Dept. EM, 4000-4024 22nd Ave. W., Seattle, Wash. 98199
M Allmetal Screw Products Co., Inc., Dept. EM, 821 Stewart Ave., Garden City, N.Y. 11530
Auto-Swage Products Inc., Dept. EM, 726 River Rd., Shelton, Conn. 06484
Bead Elctrns., Div. Bead Chain Mfg. Co., Dept. EM, 110 Mountain Grove St., Bridgeport, Conn. 06605
M Braxton Mfg. Co., Dept. EM, Echo Lake Rd. N., Watertown, Conn. 06795
Centerflex Ceramics, Dept. EM, 221 Seventh Ave., Hawthorne, N.J. 07507
D Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
Federal Screw Products Inc., Dept. EM, 3917 N. Kedzie Ave., Chicago, Ill. 60618
General Mfg. Co., Dept. EM, 724 Ruberta Ave., Glendale, Calif. 91201
GTE Sylvania, Tech Prods Div, Dept. EM, 816 Lexington Ave., Warren, Pa 16365
M Kawecki Berylco Inds., Inc., Dept. EM, PO Box 1462, Reading, PA 19603
Kentucky Electronics, Dept. EM, 1204 Ind'l Dr., Box 507, Owensboro, Ky. 42301
M Mark Eyelet & Stamping, Dept. EM, 185 Wakelee Rd., Wolcott, Conn. 06716
Nutronics, Inc., Dept. EM, 1515 N. Harlem Ave., Oak Park, Ill. 60302
Pace Inc., Dept. EM, 9329 Fraser Ave., Silver Spring, Md. 20910
Pylon Co., Inc., Dept. EM, 51 Newcomb St., Attleboro, Mass. 02703
Sjoberg, C. & Son, Inc., Dept. EM, 415 Station St., Cranston, R.I. 02910

D USM Corp., "POP" Rivet & Eyelet Divs., Dept. EM, 510 River Rd., Shelton, Conn. 06484
D Zierick Mfg. Corp., Dept. EM, 44 Radio Circle, Mt. Kisco, N.Y. 10549

Fabrics, Conductive

M McLean Engrg Midwest, Dept. EM, 9560 85th Ave N., Maple Grove, Minn. 55369 ..... *
D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
D Union Carbide Corp., Battery Products Div., Dept. EM, 270 Park Ave., New York, N.Y. 10017 ..... *
M Capcon, Inc., Dept. EM, 147 W. 25th St., New York, N.Y. 10001
Carbone Lorraine Industries Corp., Dept. EM, 400 Myrtle Ave., Boonton, N.J. 07005
Hartwell Corp., Dept. EM, 900 S. Richfield Rd., Placentia, Cal. 92670
DM Merix Chem. Co., Dept. EM, 2234 East 75th St., Chicago, Ill. 60649
D Tecknit, Dept. EM, 129 E. Dermody St., Cranford, N.J. 07016
D Zippertubing Co., Dept. EM, 13000 S. Broadway, Los Angeles, Cal. 90061

Facsimile Equipment—See Comm. Systems, Facsimile

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Fasteners, Metal

Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
M APM-Hexseal, Dept. EM, 44 Honeck St., Englewood, N.J. 07631 ..... *
Breeze-Illinois, Inc., Dept. EM, Main & Agard Sts., Wyoming, Ill. 61491 ..... *
Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101 ..... *
D Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
Delbert Blinn. Co., Dept. EM, Box 2007, Pomona, Calif. 91766 ..... *
D Elctrn. Molding Corp., Dept. EM, 96 Mill St., Woonsocket, R.I. 02895 ..... *
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
ITT Cannon Electric, Dept. EM, 666 E. Dyer Rd., Santa Ana, Cal. 92702 p. 1837,1891,1892, Back Cover, Vol. 1
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DM Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012 .. *
DM Raytheon Co., Distributor Prods. Oper., Dept. EM, Fourth Ave., Burlington, Mass. 01803 ..... p. 2660
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D Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2121,2123,2126,2131,2137
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DM Vemaline Prods. Div., Ostbys & Barton Co., Dept. EM, 487 Jefferson Blvd., Warwick, R.I. 02886 ..... *
D Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 .... *
Abbott Screw & Mfg. Co., Dept. EM, 6525 N. Clark St., Chicago, Ill. 60626
M Accessories for Electronics, Dept. EM, 800 Merrick Road, Baldwin, N.Y. 11510
Acme Model Engrg. Co., Dept. EM, 654 Bergen Blvd., Ridgefield, N.J. 07657
DM Aimsco Inc., Dept. EM, 4000-4024 22nd Ave. W., Seattle, Wash. 98199
Alinabal, Div. of MPB Corp., Dept. EM, 28 Woodmont Rd., Milford, Conn. 06460
DM Allen Mfg. Co., Dept. EM, 22 E. Dudley Town Rd., Bloomfield, Conn. 06002
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
M Allmetal Screw Products Co., Inc., Dept. EM, 821 Stewart Ave., Garden City, N.Y. 11530
D Amatom Electronic Hardware, Div. MITE Corp., Dept. EM, 446 Blake St., New Haven, Conn. 06515
Armco Steel Corp., Dept. EM, Middletown, Ohio 45043
Associated Spring-Barnes Group Inc., Dept. EM, 18 Main St., Bristol, Conn. 06010
DM Aurich F W & Co, Dept. EM, 4000 22nd Av. W., Seattle, Wash. 98199
Auto-Swage Products Inc., Dept. EM, 726 River Rd., Shelton, Conn. 06484
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
DM Avibank Mfg. Inc., Dept. EM, 210 S. Victory Blvd., Burbank, Calif. 91503
M Avid Electronics Corp., Dept. EM, Box 426, Baldwin, Pl., N.Y. 10505
Bead Elctrns., Div. Bead Chain Mfg. Co., Dept. EM, 110 Mountain Grove St., Bridgeport, Conn. 06605
D Bostitch, Div. of Textron, Inc., Dept. EM, Briggs Dr., E. Greenwich, R.I. 02818
M Cherry Fasteners, Townsend Div. Textron Inc., Dept. EM, Box 2157, Santa Ana, Cal. 92707
D Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
Control Inds. Inc., Dept. EM, 530 Burnside Ave., Inwood, N.Y. 11696
D Deutsch Fastener Corp., Dept. EM, 7001 W. Imperial Hwy., Los Angeles, Cal. 90045
D Dimco-Gray Company, Dept. EM, 8200 S. Suburban Rd., Dayton, Ohio 45459
Dupree, Inc., Dept. EM, 9835 Dupree St., So. El Monte, Cal. 91733
DM Dzus Fastener Co., Inc., Dept. EM, 425 Union Blvd., West Islip, N.Y. 11795
DM ESNA Division, Amerace Corp., Dept. EM, 2330 Vauxhall Rd., Union, N.J. 07083
D Eaton Corp., Engineered Fasteners Oper., Dept. EM, Box 6688, Cleveland, Ohio 44101
Federal Screw Products Inc., Dept. EM, 3917 N. Kedzie Ave., Chicago, Ill. 60618
Globe Plastics, Dept. EM, 1342 S. Signal Dr., Pomona, Cal. 91766
D Gries Reproducer Co., Div. Coats & Clark Inc., Dept. EM, 162 Beechwood Ave., New Rochelle, N.Y. 10801
Hartwell Corp., Dept. EM, 900 S. Richfield Rd., Placentia, Cal. 92670
M ICO/Rally Corp., Dept. EM, Edward J. Bush, Palo Alto, Cal. 94303
DM ITT Harper, Dept. EM, 8200 Lehigh Ave., Morton Grove, ILL. 60053
Kentucky Electronics, Dept. EM, 1204 Ind'l Dr., Box 507, Owensboro, Ky. 42301
M Kinetron Corp., Dept. EM, 1416 Roller Rd. Asbury Park, N.J. 07712
M Mark Eyelet & Stamping, Dept. EM, 185 Wakelee Rd., Wolcott, Conn. 06716
Micro Contacts Inc., Dept. EM, 62 Alpha Plaza, Hicksville, N.Y. 11801
M Milford Rivet & Mach., Dept. EM, 857 Bridgeport Ave., Milford, Conn. 06460
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
M Morris, J.I. Co., Dept. EM, 372 Elm St., Southbridge, Mass. 01550
D Nelson Stud Welding TRW Inc., Dept. EM, 28th & Toledo Ave., Lorain, Ohio 44035
N.K.R. Precision Mfg. Corp., Dept. EM, Rte. 17M, Box 333, Harriman, N.Y. 10926
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Penn Engrg. & Mfg. Corp., Dept. EM, Doylestown, Pa. 18901
D Penn Fibre & Specialty, Dept. EM, 2020 E. Westmoreland St., Phila., Pa. 19134
PIC Design Div., Benrus Corp., Dept. EM, Benrus Center, Rte 7, Ridgefield, Conn. 06877
M Positronic Inds., Dept. EM, 208 W. Center St., Drawer H, Rogerville, Mo. 65742
DM Precision Metal Prods. Co., Dept. EM, 41 Elm St., Stoneham, Mass. 02180
Pylon Co., Inc., Dept. EM, 51 Newcomb St., Attleboro, Mass. 02703
Seastrom Mfg. Co. Inc., Dept. EM, 701 Sonora Ave., Glendale, Cal. 91201
Sjoberg, C. & Son, Inc., Dept. EM, 415 Station St., Cranston, R.I. 02910
DM Stock Drive Prods., Div. Designatronics, Inc., Dept. EM, 55 S. Denton Ave., New Hyde Pk., N.Y. 11040
Tridair Inds., Rexnord Co., Dept. EM, 3000 W. Lomita Blvd., Torrance, Calif. 90505
D USM Corp., "POP" Rivet & Eyelet Divs., Dept. EM, 510 River Rd., Shelton, Conn. 06484
M Waldes Kohinoor, Inc., Dept. EM, 47-16 Austel Pl., Long Island City, N.Y. 11101
M Waldman Corp., Dept. EM, 3 Eastmans Rd, Parsippany, NJ 07054
D Wrought Washer Mfg., Inc., Dept. EM, 2100 S. Bay St., Milwaukee, Wisc. 53207
D Zierick Mfg. Corp., Dept. EM, 44 Radio Circle, Mt. Kisco, N.Y. 10549

Fasteners, Non-Metallic

Alberox Corp., Dept. EM, New Bedford Ind'l. Pk., New Bedford, Mass. 02745 *
Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 ..... *
APM-Hexseal, Dept. EM, 44 Honeck St., Englewood, N.J. 07631 ..... *
D Bivar, Inc., Dept. EM, 1617 E. Edinger Ave., Santa Ana, Cal. 92705 ..... p. 1024
D Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
Delbert Blinn. Co., Dept. EM, Box 2007, Pomona, Calif. 91766 ..... *
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
D Grayhill Inc., Dept. EM, 569 Hillgrove Ave., LaGrange, Ill. 60525 ..... *
D Heyman Mfg. Co., Dept. EM, 147 N. Michigan Ave., Kenilworth, N.J. 07033 *
DM Panduit Corp., Dept. EM, 17301 Ridgeland Ave., Tinley Park, Ill. 60477 p. 4629
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D Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2121,2123
D Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 .... *
DM Accessories for Electronics, Dept. EM, 800 Merrick Road, Baldwin, N.Y. 11510
Acme Model Engrg. Co., Dept. EM, 654 Bergen Blvd., Ridgefield, N.J. 07657
DM Aimsco Inc., Dept. EM, 4000-4024 22nd Ave. W., Seattle, Wash. 98199
M Allmetal Screw Products Co., Inc., Dept. EM, 821 Stewart Ave., Garden City, N.Y. 11530
D Amatom Electronic Hardware, Div. MITE Corp., Dept. EM, 446 Blake St., New Haven, Conn. 06515
DM Amrad Corp., Dept. EM, Box 876, Paris, Tex. 75460
M Avid Electronics Corp., Dept. EM, Box 426, Baldwin, Pl., N.Y. 10505
M Dennison Mfg. Co., Fastener Division, Dept. EM, Framingham, Mass. 01701
D Dzus Fastener Co., Inc., Dept. EM, 425 Union Blvd., West Islip, N.Y. 11795
D Eaton Corp., Engineered Fasteners Oper., Dept. EM, Box 6688, Cleveland, Ohio 44101
DM Electrovert, Dept. EM, 86 Hartford Ave., Mt. Vernon, N.Y. 10553
Federal Screw Products Inc., Dept. EM, 3917 N. Kedzie Ave., Chicago, Ill. 60618
D Fibre Materials Corp., Dept. EM, 34 Dupont St., Plainview, N.Y. 11803
Fischer Special Mfg. Co., Dept. EM, 446 Morgan St., Cincinnati, Ohio 45206
Globe Plastics, Dept, EM, 1342 S. Signal Dr., Pomona, Cal. 91766
D Gries Reproducer Co., Div. Coats & Clark Inc., Dept. EM, 162 Beechwood Ave., New Rochelle, N.Y. 10801
Hanscom, H.F. Co., Inc., Dept. EM, 225 Chapman St., Providence, R.I. 02905
Hartwell Corp., Dept. EM, 900 S. Richfield Rd., Placentia, Cal. 92670
M ICO/Rally Corp., Dept. EM, Edward J. Bush, Palo Alto, Cal. 94303
D ITT Harper, Dept. EM, 8200 Lehigh Ave., Morton Grove, ILL. 60053
D Penn Fibre & Specialty, Dept. EM, 2020 E. Westmoreland St., Phila., Pa. 19134
M PIC Design Div., Benrus Corp., Dept. EM, Benrus Center, Rte 7, Ridgefield, Conn. 06877
Pylon Co., Inc., Dept. EM, 51 Newcomb St., Attleboro, Mass. 02703
DM Stock Drive Prods., Div. Designatronics, Inc., Dept. EM, 55 S. Denton Ave., New Hyde Pk., N.Y. 11040
Taylor Electric, Inc., Dept. EM, 2410 Hwy 281 N., Marble Falls, Tex. 78654
Tridair Inds., Rexnord Co., Dept. EM, 3000 W. Lomita Blvd., Torrance, Calif. 90505

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Feedthrus & Seals, Environmental

M Alberox Corp., Dept. EM, New Bedford Ind'l. Pk., New Bedford, Mass. 02745 p. 2553
M Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
M APM-Hexseal, Dept. EM, 44 Honeck St., Englewood, N.J. 07631 ..... *
The Bendix Corp., Electrical Comp. Div., Dept. EM, Sidney, NY 13838 ..... *
D Elctrn. Molding Corp., Dept. EM, 96 Mill St., Woonsocket, R.I. 02895 ..... *
M Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... *
D Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2136
Conax Corp., Dept. EM, 2300 Walden Ave., Buffalo, N.Y. 14225
Corning Glass Works, Dept. EM, Main Plant, Bldg. 21-3, Corning, NY 14830
M Detoronics Corp., Dept. EM, 10660 E. Rush St., P.O. Box 3805, S. El Monte, Cal. 91733
Eltec Instruments Inc., Dept. EM, P.O. Box 9610, Daytona Beach, Fla. 32020

Fusite Div./Emerson Elec., Dept. EM, 6000 Fernview Ave., Cincinnati, Ohio 45212
Gulton Inds., SCD Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
Materials Resch. Corp., Dept. EM, Route 303, Orangeburg, N.Y. 10962
Minnesota Rubber Co., Dept. EM, 3630 Wooddale Ave., Minneapolis, Minn. 55416
Perkin-Elmer Ultek Inc., Dept. EM, Box 10920, Palo Alto, Cal. 94303
Pylon Co., Inc., Dept. EM, 51 Newcomb St., Attleboro, Mass. 02703
M Servometer Corp., Dept. EM, 501 Little Falls Rd., Cedar Grove, N.J. 07009
Simmonds Precision, Engine Systems Div., Dept. EM, Norwich, N.Y. 13815
D Sloan Technology Corp., Dept. EM, 535 E. Montecito St., Santa Barbara, Cal. 93103
Teledyne Mécca, Dept. EM, Box 36393, Houston, Tex. 77036
Vactronic Lab. Equip., Inc., Dept. EM, 65 Brightside Ave., E. Northport, N.Y. 11731
Vacuum Resch. Mfg., Dept. EM, 3100 Crow Canyon Rd., San Ramon, Cal. 94583
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Ferrite Material & Parts

Fair-Rite Prods. Corp., Dept. EM, Wallkill, N.Y. 12589 ..... p. 2556
Krystinel Corp., Dept. EM, Fox Island Rd., Port Chester, N. Y. 10573 ..... *
Stackpole Carbon Co., Electronic Comps. Div./Soft Ferrites/Special Purpose Resistors, Dept. EM, St. Mary's, Pa. 15857 ..... p. 2568,2569
M , Trak Microwave Corp., Dept. E8, Dept. EM, 4726 Eisenhower Blvd.,, Tampa, Fla. 33614 ..... *
Atomergic Chemetals Corp Co., Dept. EM, 100 Fairchild Ave., Plainview, N.Y. 11803
M Capcon, Inc., Dept. EM, 147 W. 25th St., New York, N.Y. 10001
Centerflex Ceramics, Dept. EM, 221 Seventh Ave., Hawthorne, N.J. 07507
Ceramic Magnetics, Inc., Dept. EM, 87 Fairfield Rd., Fairfield, N.J. 07006
D Countis Inds., Dept. EM, Box 1444, San Luis Obispo, Cal. 93406
Deltronic Crystal Inds., Inc., Dept. EM, Box 323, Denville, N.J. 07834
Ferronics, Inc., Dept. EM, 60 N. Lincoln Rd., East Rochester, N.Y. 14445
Ferroxcube Corp., Dept. EM, 5083 Kings Hwy., Saugerties, N.Y. 12477
M Harshaw Chemical Co., A Kenanee Industry, Dept. EM, 6801 Cochran Rd., Solon, Ohio 44139
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
D Indiana General, Ferrite Prods, Dept. EM, Crows Mill Rd., Keasbey, N.J. 08832
M Magnetic Dielectrics, Dept. EM, Industrial Dr., W. Milford, N.J. 07480
M Magnetics, Div/Spang Industries, Inc., Dept. EM, Box 391, Butler, Pa. 16001
D Murata Mfg. Co. Ltd., Dept. EM, 16, Kaiden Nishijin-cho, Nagaoka-Kyo-Shi, Kyoto, Japan
National Micronetics, Dept. EM, Route 28, West Hurley, NY 12136
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Permag Corp., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
Quartzite Processing, Inc., Dept. EM, 6 Holyoke St., Malden, Mass. 02148
D Trans-Tech, Dept. EM, 12 Meem Ave., Gaithersburg, Md. 20760
United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013
U.S. Elctrns., Dept. EM, 500 Long Branch Ave., Long Branch, N.J. 07740

Fiber Optic Bundles

D Canon U.S.A., Inc., Dept. EM, 10 Nevada Dr., Lake Success, N.Y. 11040 ..... *
Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
Corning Glass Works, Telecomm Prods Dept., Dept. EM, Corning, NY 14830
D Dolan-Jenner Inds., Inc., Dept. EM, Box 1020, Woburn, Mass. 01801
Edmund Scientific Co., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
M Galileo Electro-Optics Corp., Dept. EM, Galileo Pk., Sturbridge, Mass. 01518
Laser Inc., Dept. EM, Laser Lane, Box 537, Sturbridge, Mass. 01566
D Lenox Instr. Co., Dept. EM, 121 E. Luray St., Philadelphia, Pa. 19120
Meret Inc., Dept. EM, 1815 24th St., Santa Monica, Cal. 90404
Radiation Devices Co., Inc., Dept. EM, Box 8450, Baltimore, Md. 21234
D Rank Precision Inds., Dept. EM, 411 Jarvis Ave., Des Plaines, Ill. 60018
Sensor Technology, Dept. EM, 21012 Lassen St., Chatsworth, Cal. 91311
Welch Allyn, Inc., Indl. Prods. Div., Dept. EM, Skaneateles Falls, N.Y. 13153

Fiber Optic Cables & Components

Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 ..... *
Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
D Augat Interconnection Prods. Div., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703 ..... *
D Canon U.S.A., Inc., Dept. EM, 10 Nevada Dr., Lake Success, N.Y. 11040 ..... *
D Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
D Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 ..... p. 2434
Power Technology, Inc., Dept. EM, Box 4403, 7925 Mablewave Cutoff, Little Rock, Ark. 72204 ..... *
American Optical Corp., Sci. Instr. Div., Dept. EM, Eggert & Sugar Rds., Buffalo, N.Y. 14215
Dolan-Jenner Inds., Inc., Dept. EM, Box 1020, Woburn, Mass. 01801
FG Engineering Co., Dept. EM, Box 39, Black Canyon Stage, Mayer, Ariz. 86333
Galileo Electro-Optics Corp., Dept. EM, Galileo Pk., Sturbridge, Mass. 01518
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Meret Inc., Dept. EM, 1815 24th St., Santa Monica, Cal. 90404
Pacific Communications, Dept. EM, 2041 S. Grand Ave. #A, Santa Ana, Cal. 92705
Radiation Devices Co., Inc., Dept. EM, Box 8450, Baltimore, Md. 21234
Schott Optical Glass Inc., Dept. EM, York Ave., Duryea, Pa. 18642
Siecor Optical Cable, Inc, Dept. EM, 631 Miracle Mile, Horseheads, N.Y. 14845
Skan-A-Matic Corp., Dept. EM, Box S, Elbridge, N.Y. 13060
T. C. Centronic, Dept. EM, King Henry's Dr, Addington, Croydon CR9 0BG, Great Britain
Thermal Amer. Fused Quartz, Dept. EM, Change Bridge Rd., Montville, N.J. 07045
Welch Allyn, Inc., Indl. Prods. Div., Dept. EM, Skaneateles Falls, N.Y. 13153

Films, Capacitor

D Electro-Science Labs., Dept. EM, 2211 Sherman Ave., Pennsauken, N. J. 08110
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
3M Co., Indl Elect Prods. Div., Dept. EM, 3M Center, St. Paul, Minn. 55101
Permaluster, Inc., Dept. EM, 1844 N. Keystone St., Burbank, Calif. 91504
Schweitzer, Div., Kimberly Clark Corp., Dept. EM, Lee, Mass. 01238
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013

Films, Masking (Incl. Photographic)

D AGFA-Gevaert, Inc., Dept. EM, 275 North St., Teterboro, N.J. 07608
Conforming Matrix Corp., Dept. EM, Box 5126, Pt. Pl. Sta., Toledo, Ohio 43611
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
M Keuffel & Esser Co., Dept. EM, 20 Whippany Rd., Morristown, N.J. 07960
Photronic Labs., Dept. EM, Commerce Park, Danbury, Conn. 06810
M Seal-Peel, Inc., Dept. EM, Box 250, Troy, Mich. 48099
D Western Coating Co., Dept. EM, 1287 Combermere, Troy, Mich 48084

Films, Resistance

D Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
Datak Corp., Dept. EM, 65 Seventy-First St., Guttenberg, N.J. 07093 .. p. 1298
DM Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725 ..... *
Acheson Colloids Co., Div. Acheson Inds., Dept. EM, P.O. Box 288, Port Huron, Mich. 48060
D Electro-Science Labs., Dept. EM, 2211 Sherman Ave., Pennsauken, N. J. 08110
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
M HyComp Inc., Dept. EM, Box 250, Maynard, Mass. 01754
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717

Filter Synthesizers

Comstron Seg., Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520 ..... *
Rockland Sys. Corp., Dept. EM, 230 W. Nyack Rd., W. Nyack, N.Y. 10994 .. *
Toyo Comm. Equip. Co. Ltd., Dept. EM, 484 Tsukakoshi 3-Chome Saiwai-Ku, Kawasaki, 210 Japan ..... p. 2374

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M Aeroflex Labs, Integrated Microsystems Div., Eastern Opers., Dept. EM, 35 S. Service Rd., Painview, N. Y. 11803 ..... *
M Aeroflex Labs, Integrated Microsystems Div., Western Opers., Dept. EM, 1215 Terra Bella Ave, Mountain View, Cal. 94043 ..... *
A. P. Circuit Corp., Dept. EM, 865 West End Ave., New York, N.Y. 10025 .... *
Austron, Inc., Dept. EM, 1915 Kramer La., Austin, Tex. 78758 ..... *
M Axel Elctrns., Unit of General Signal, Dept. EM, 134-20 Jamaica Ave., Jamaica, N.Y. 11418 ..... p. 2615
D Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634 ..... *
M Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734 ..... p. 2857
M Comstron Seg., Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520 ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
D-B Developments, Dept. EM, 7709 Kilbourne Rd., Rome, NY 13440 ..... *
M Data Delay Devices, Dept. EM, 253 Crooks Ave., Clifton, N.J. 07011 ..... *
Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 p. 1401
Dynamics Elctrn. Prods., Waugh Controls, Dept. EM, 9001 Fullbright Ave., Chatsworth, Cal. 91311 ..... *
Filter Technology, Dept. EM, 6241 Yarrow Dr, Ste D, Carlsbad, Cal 92008 p. 2327
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
M Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 ..... *
M ILC Data Device Corp., Dept. EM, Airport Int'l. Plaza, Bohemia, N.Y. 11716 *
M Integrated Circuits, Inc., Dept. EM, 13256 Northrup Way, Bellevue, Wash. 98005 ..... *
Ithaco, Inc., Dept. EM, 735 W. Clinton St., Ithaca, N.Y. 14850 ..... p. 2634
ITT North, Microsystems Div, Dept. EM, 700 Hillsboro Pl., Deerfield Beach, Fla. 33441 ..... *
M Krohn-Hite Corp., Dept. EM, Avon Ind'l Pk, Bodwell St., Avon, Mass. 02322 *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
OPT Inds. Inc., Data Products Div., Dept. EM, 300 Red School Lane, Phillipsburg, N.J. 08865 ..... p. 2352
Precision Filters, Inc., Dept. EM, 303 W. Lincoln St., Ithaca, N.Y. 14850 p. 2637
RF Interonics, Dept. EM, 100 Pine Air Dr., Bay Shore, N.Y. 11706 ..... *
Rockland Sys. Corp., Dept. EM, 230 W. Nyack Rd., W. Nyack, N.Y. 10994 .. *
Torotron, Dept. EM, 255 Washington St., Mt. Vernon, N.Y. 10553 ..... *
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
Cermetek, Inc., Dept. EM, 660 National Ave., Mountain View, Cal. 94040
M Circuit Technology, Dept. EM, 160 Smith St., Farmingdale, N.Y. 11735
M Cirtech Corp, Dept. EM, 15237 Cherry St, Stanley, Kan. 66223
ComData Corp., Dept. EM, 8115 N. Monticello, Skokie, ILL. 60076
Control Concepts Corp., Dept. EM, 333 Front St., Binghamton, N.Y. 13905
Dantel, Inc., Dept. EM, 1922 North Helm, Fresno, Cal. 93727
De Coursey Engrg. Lab., Dept. EM, 11828 W. Jefferson, Culver City, Cal. 90230
Assocs. Inc., Dept. EM, 333 W. Commercial St., East Rochester, N.Y. 14445
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Fogg System Co., Dept. EM, 15592 E. Batavia Dr., Aurora, Colo. 80011

Gotham Audio Corp., Dept. EM, 741 Washington St., New York, N.Y. 10014
Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
M Iwata Electric Co., Ltd., Dept. EM, 1-16, I-Chome Soto-Kanda, Chiyoda-ku Tokyo, Japan
Linear Networks Co., Dept. EM, Box 775, Westminster, Cal. 92683
M Multimetrics Div. of Comstro, Comstron-Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11580
M Murata Corporation of America, Dept. EM, 1148 Franklin Rd., S.E., Marietta, Ga. 30067
MVP Electronics, Dept. EM, 1161 N. Tustin, Orange, Cal. 92667
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
Optical Electronics, Inc., Dept. EM, Box 11140, Tucson, Ariz. 85734
Pall Corp., Dept. EM, 30 Sea Cliff Ave., Glen Cove, N.Y. 11542
Palomar Engrs., Dept. EM, Box 455, Escondido, Cal. 92025
M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
M Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648
M Seg Subsidiary, Comstron Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
UFAD Corp., Dept. EM, 700 36th St. S.E., Grand Rapids, Mich. 49508
White Instrs., Inc., Dept. EM, Box 698, Austin, Tex. 78767

Filters, A-F

M Alpha Components, Inc., Dept. EM, 1106 E. Simpson Rd., Mechanicsburg, Pa. 17055 ..... *
A. P. Circuit Corp., Dept. EM, 865 West End Ave., New York, N.Y. 10025 .... *
M Applied Research Inc., Dept. EM, 76 S. Bayles Ave., Port Washington, N.Y. 11050 ..... *
M Axel Elctrns., Unit of General Signal, Dept. EM, 134-20 Jamaica Ave., Jamaica, N.Y. 11418 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Chesterfield Prods. Inc., Dept. EM, 511A Victor St., Saddle Brook, N.J. 07662 p. 2620
M Comstron Seg., Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520 ..... *
Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 ..... p. 1338
Data Delay Devices, Dept. EM, 253 Crooks Ave., Clifton, N.J. 07011 ..... *
M ESC Elctrns. Corp., Dept. EM, 534 Bergen Blvd., Palisades Pk., N.J. 07650 *
M Freed Transformer Co., Inc., Dept. EM, 1718 Weirfield St., Brooklyn, N.Y. 11227 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hertz Filter, Dept. EM, 3 Aerial Way, Syosset, N.Y. 11791 ..... *
M Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 ..... *
Hopkins Engrg., Dept. EM, 12900 Foothill Blvd., San Fernando, Cal. 91342 p. 2632
Integrated Circuits, Inc., Dept. EM, 13256 Northrup Way, Bellevue, Wash. 98005 ..... *
Ithaco, Inc., Dept. EM, 735 W. Clinton St., Ithaca, N.Y. 14850 ..... p. 2634
M Kappa Networks, Dept. EM, 165 Roosevelt Ave, Carteret, N.J. 07008 ..... *
M K R Electronics, Inc., Dept. EM, 91 Avenel St., Avenel, N.J. 07001 ..... *
M Krohn-Hite Corp., Dept. EM, Avon Ind'l Pk, Bodwell St., Avon, Mass. 02322 p. 2772
Magnetico, Inc., Dept. EM, 182 Morris Ave., Holtsville, N.Y. 11742 ..... p. 4359
McCoy Electronics, Sub Oak Inds. Inc., Dept. EM, Chestnut & Watts, Mt Holly Spr., Pa. 17065 ..... *
M OPT Inds. Inc., Data Products Div., Dept. EM, 300 Red School Lane, Phillipsburg, N.J. 08865 ..... *
Precision Filters, Inc., Dept. EM, 303 W. Lincoln St., Ithaca, N.Y. 14850 p. 2637
M Reeves-Hoffman Div., Dynamics Corp. of Amer., Dept. EM, 400 W. North St., Carlisle, Pa. 17013 ..... *
RF Interonics, Dept. EM, 100 Pine Air Dr., Bay Shore, N.Y. 11706 ..... *
Rockland Sys. Corp., Dept. EM, 230 W. Nyack Rd., W. Nyack, N.Y. 10994 .. *
Sterling Transformer Corp., Dept. EM, 510 Driggs Ave., Brooklyn, N.Y. 11211 *
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... *
M TRW/UTC Transformers, Dept. EM, 150 Varick St., New York, N.Y. 10013 .. *
TT Elctrns., Inc., Dept. EM, 2214 S. Barry Ave., Los Angeles, Cal. 90064 .... *
M BG Electronics, Inc., Dept. EM, 9 Elm Ave., Mount Vernon, N.Y. 10550
M Cirtech Corp, Dept. EM, 15237 Cherry St, Stanley, Kan. 66223
Convex Corp., Dept. EM, 2810 Dorr Ave., Fairfax, Va. 22031
Dantel, Inc., Dept. EM, 1922 North Helm, Fresno, Cal. 93727
Electrocom Inds., Dept. EM, 1105 N. Ironwood Dr., S. Bend, Ind. 46615
Fogg System Co., Dept. EM, 15592 E. Batavia Dr., Aurora, Colo. 80011
M Frazier, Inc., Dept. EM, 1930 Valley View La., Dallas, Tex. 75234
Gotham Audio Corp., Dept. EM, 741 Washington St., New York, N.Y. 10014
Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704
M Multimetrics Div. of Comstro, Comstron-Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11580
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
Pall Corp., Dept. EM, 30 Sea Cliff Ave., Glen Cove, N.Y. 11542
Palomar Engrs., Dept. EM, Box 455, Escondido, Cal. 92025
D Pulse Techniques, Inc., Dept. EM, 1411 Palisade Ave., Teaneck, N.J. 07666
M Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648
M Seg Subsidiary, Comstron Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520
D Shure Brothers, Inc., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204
Solar Elctrns. Co., Dept. EM, 901 N. Highland, Hollywood, Cal. 90038
Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
T-F Electronics Inc., Dept. EM, 9415 Neils Thompson Dr., Austin, Tex. 78759
UFAD Corp., Dept. EM, 700 36th St. S.E., Grand Rapids, Mich. 49508
White Instrs., Inc., Dept. EM, Box 698, Austin, Tex. 78767

Filters, Air—See Air Cleaners & Filters

Filters, Analog—See Filters, Continuously Variable

Filters, Antenna

M Alpha Components, Inc., Dept. EM, 1106 E. Simpson Rd., Mechanicsburg, Pa. 17055 ..... *
American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
M Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706 ..... *
D Bell Industries, J.W. Miller Div., Dept. EM, 19070 Reyes Ave., Compton, Cal. 90221 ..... *
M Bird Electronic Corp., Dept. EM, 30303 Aurora Rd., Solon, Ohio 44139 ..... *
Chesterfield Prods. Inc., Dept. EM, 511A Victor St., Saddle Brook, N.J. 07662 *
M Comstron Seg., Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520 ..... *
M Frequency Selective Networks, Inc, Dept. EM, 69-20 Garfield Ave., Woodside, N.Y. 11377 ..... *
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Hertz Filter, Dept. EM, 3 Aerial Way, Syosset, N.Y. 11791 ..... p. 2633
M K R Electronics, Inc., Dept. EM, 91 Avenel St., Avenel, N.J. 07001 ..... *
McCoy Electronics, Sub Oak Inds. Inc., Dept. EM, Chestnut & Watts, Mt Holly Spr., Pa. 17065 ..... *
M MCL, Inc., Dept. EM, 10 North Beach Ave., LaGrange, Ill. 60525 ..... *
Piezo Technology Inc., Dept. EM, 2525 Shader Rd., Orlando, Fla. 32804 .... *
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Assocs. Inc., Dept. EM, 333 W. Commercial St., East Rochester, N.Y. 14445
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Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
D Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
Mu-Del Elctrns., Dept. EM, 2426 Linden La., Silver Spring, Md. 20910
M Multimetrics Div. of Comstro, Comstron-Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11580
M Murata Corporation of America, Dept. EM, 1148 Franklin Rd., S.E., Marietta, Ga. 30067
D Murata Mfg. Co. Ltd., Dept. EM, 16, Kaiden Nishijin-cho, Nagaoka-Kyo-Shi, Kyoto, Japan
M Norlin Communications Inc., Dept. EM, 9125 Gaither Rd., Gaithersburg, Md. 20760
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
M Optics Group-East, Valtec Corp., Dept. EM, Holliston, Mass. 01746
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
Radiation Devices Co., Inc., Dept. EM, Box 8450, Baltimore, Md. 21234
Resdel Engineering Corp., Dept. EM, 300 E. Live Oak Ave., Arcadia, Cal. 91006
D Reticon Corp., Dept. EM, 910 Benicia Ave., Sunnyvale, Cal. 94086
D R L C Elctrns., Inc., Dept. EM, 83 Radio Cir., Mt. Kisco, N.Y. 10549
M Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648
M Seg Subsidiary, Comstron Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520
D Sinclair Radio Labs., Dept. EM, 122 Rayette Rd, Concord, Ontario, Can. L4K 1B6
Solar Elctrns. Co., Dept. EM, 901 N. Highland, Hollywood, Cal. 90038
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
M Sonex, Dept. EM, 2337 Philmont Ave., Huntingdon Valley, Pa. 19006
D Spectra Sonics, Dept. EM, 770 Wall Ave., Ogden, Utah 84404
Spectral Dynamics Corp., Dept. EM, Box 671, San Diego, Cal. 92112
Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
Systems Research Labs. Inc., Dept. EM, 2800 Indian Ripple Rd. , Dayton, Ohio 45440
DM Systron-Donner, Advanced Components Div., Dept. EM, 735 Palomar Ave., Sunnyvale, Cal. 94086
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
T-F Electronics Inc., Dept. EM, 9415 Neils Thompson Dr., Austin, Tex. 78759
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
M Teledyne Microwave, Dept. EM, 1290 Terra Bella Ave., Mountain View, Cal. 94040
Texscan Microwave, Dept. EM, 2446 N. Shadeland, Indianapolis, Ind. 46219
TRG,, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
TRW Auto-E, Dept. EM, Davis & Copewood Sts., Camden, N.J. 08103
UFAD Corp., Dept. EM, 700 36th St. S.E., Grand Rapids, Mich. 49508
M UTE Microwave, Dept. EM, 3500 Sunset Ave., Asbury Park, N.J. 07712
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304
M Wavecom, Dept. EM, 9036 Winnetna Ave., Northridge, Cal. 91324
White Instrs., Inc., Dept. EM, Box 698, Austin, Tex. 78767
Wide Band Engrg. Co. Inc., Dept. EM, Box 21652, Phoenix, Ariz. 85036
DM Yig-Tek Corp., Dept. EM, 1725 De La Cruz Blvd., Santa Clara, Cal. 95050
M Zeta Laboratories, Inc., Dept. EM, 3265 Scott Blvd., Santa Clara, Cal. 95051

Filters, Band Reject, Band Stop—See Filters, Band, Elimination

Filters, Ceramic

A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 *
All-Tronics Inc., Dept. EM, 45 Bond St., Westbury, N.Y. 11590 *
M AMP Capitron Div./AMP Inc., Dept. EM, 1595 S. Mt. Joy St., Elizabethtown, Pa. 17022 *
DM AVX Ceramics, Dept. EM, Box 867, Myrtle Beach, S.C. 29577 *
Centre Engrg., Dept. EM, 2820 E. College Ave., State College, Pa. 16801 p. 1090
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 *
RF Interonics, Dept. EM, 100 Pine Air Dr., Bay Shore, N.Y. 11706 *
M Vernitron Piezoelectric Div., Dept. EM, 232 Forbes Rd., Bedford, Ohio 44146 p. 2658,2659
M Capcon, Inc., Dept. EM, 147 W. 25th St., New York, N.Y. 10001

M Centralab/USCC, Div. of Globe-Union Inc., Dept. EM, 4561 Colorado Blvd., Los Angeles, Cal. 90039
D Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
D Mitsumi Elec. Co., Ltd., Dept. EM, 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan
M Murata Corporation of America, Dept. EM, 1148 Franklin Rd., S.E., Marietta, Ga. 30067
D Murata Mfg. Co. Ltd., Dept. EM, 16, Kaiden Nishijin-cho, Nagaoka-Kyo-Shi, Kyoto, Japan
Norton Co., Public Relations Dept., Dept. EM, One New Bond St., Worcester, Mass. 01606
Pall Corp., Dept. EM, 30 Sea Cliff Ave., Glen Cove, N.Y. 11542
DM San Fernando Elec. Mfg., Dept. EM, 1501 1st St., San Fernando, Cal. 91341
Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
M Star Porcelain Co., Dept. EM, 71 Muirhead Ave., Box 1267, Trenton, N.J. 08638
Viclan Inc., Dept. EM, Box 81403, 7373A Engineer Rd., San Diego, Cal. 92138

Filters, Coaxial

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
M **Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706** ..... *
M **Bird Electronic Corp., Dept. EM, 30303 Aurora Rd., Solon, Ohio 44139** ..... p. 2668
Cornell-Dubilier Electronics, Dept. EM, 150 Avenue "L", Newark, N.J. 07105 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
McCoy Electronics, Sub Oak Inds. Inc., Dept. EM, Chestnut & Watts, Mt Holly Spr., Pa. 17065 ..... *
M **MCL, Inc., Dept. EM, 10 North Beach Ave., LaGrange, Ill. 60525** ..... *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
RF Interonics, Dept. EM, 100 Pine Air Dr., Bay Shore, N.Y. 11706 ..... *
D **Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543** ..... *
Telonic/Berkeley, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715 ..... p. 3063
D **Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219** ..... p. 2830
TT Elctrns., Inc., Dept. EM, 2214 S. Barry Ave., Los Angeles, Cal. 90064 .... *
Uniform Tubes Inc., MicroDelay Division, Dept. EM, Collegeville, Pa. 19426 *
M AIL, Div. Cutler-Hammer, Dept. EM, Comac Road, Deer Park, N.Y. 11729
M Capcon, Inc., Dept. EM, 147 W. 25th St., New York, N.Y. 10001
M Centralab/USCC, Div. of Globe-Union Inc., Dept. EM, 4561 Colorado Blvd., Los Angeles, Cal. 90039
M Cir-Q-Tel, Inc., Dept. EM, 10504 Wheatley St., Kensington, Md. 20795
M Daden Assocs, Inc., Dept. EM, 23011 Moulton Pky, Ste A12, Laguna Hills, CA 92653
D Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
D Finney Co., Dept. EM, 34 W. Interstate St., Bedford, Ohio 44014
Frequency Engrg. Labs., Dept. EM, Box 527, Farmingdale, N.J. 07727
D Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
D Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
Mu-Del Elctrns., Dept. EM, 2426 Linden La., Silver Spring, Md. 20910
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
D R L C Elctrns., Inc., Dept. EM, 83 Radio Cir., Mt. Kisco, N.Y. 10549
D Sinclair Radio Labs., Dept. EM, 122 Rayette Rd, Concord, Ontario, Can. L4K 1B6
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
Telco Products Co., Dept. EM, 44 Sea Cliff, Glen Cove, NY 11542
M Teledyne Microwave, Dept. EM, 1290 Terra Bella Ave., Mountain View, Cal. 94040
Texscan Microwave, Dept. EM, 2446 N. Shadeland, Indianapolis, Ind. 46219
M Transco Prods., Inc., Dept. EM, 4241 Glencoe Ave., Venice, Cal. 90291
Triangle Microwave Inc., Dept. EM, 9B Great Meadow La, East Hanover, NJ 07936
M UTE Microwave, Dept. EM, 3500 Sunset Ave., Asbury Park, N.J. 07712
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Viclan Inc., Dept. EM, Box 81403, 7373A Engineer Rd., San Diego, Cal. 92138
M Wavecom, Dept. EM, 9036 Winnetna Ave., Northridge, Cal. 91324
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006
M Zeta Laboratories, Inc., Dept. EM, 3265 Scott Blvd., Santa Clara, Cal. 95051

Filters, Color, Panel Light

RF Interonics, Dept. EM, 100 Pine Air Dr., Bay Shore, N.Y. 11706 ..... *
Corning Glass Works, Dept. EM, Main Plant, Bldg. 21-3, Corning, NY 14830

Filters, Comb

M **Alpha Components, Inc., Dept. EM, 1106 E. Simpson Rd., Mechanicsburg, Pa. 17055** ..... *
American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
DM **Andersen Laboratories Inc., Dept. EM, 1280 Blue Hills Ave., Bloomfield, Conn. 06002** ..... p. 2619
M **Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706** ..... *
M **Artronic Instr. Co., Dept. EM, 11232 Triangle La., Silver Spring, Md. 20902** *
M **Axel Elctrns., Unit of General Signal, Dept. EM, 134-20 Jamaica Ave., Jamaica, N.Y. 11418** ..... *
Chesterfield Prods. Inc., Dept. EM, 511A Victor St., Saddle Brook, N.J. 07662 ..... *
CTS Knights, Inc., Dept. EM, 400 Reimann Ave., Sandwich, Ill. 60548 ..... *
Dale Electronics, Inc., Frequency Control Group, Dept. EM, 930 West 23rd St., Tempe, Ariz. 85282 ..... *
M **Damon Corp., Elctrns. Div., Dept. EM, 80 Wilson Way, Westwood, Mass. 02090** ..... p. 2319
M **ESC Elctrns. Corp., Dept. EM, 534 Bergen Blvd., Palisades Pk., N.J. 07650** ..... p. 2628
Filter Technology, Dept. EM, 6241 Yarrow Dr, Ste D, Carlsbad, Cal 92008 .. *
M **Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040** .. *
M **Frequency Selective Networks, Inc, Dept. EM, 69-20 Garfield Ave., Woodside, N.Y. 11377** ..... *
Hertz Filter, Dept. EM, 3 Aerial Way, Syosset, N.Y. 11791 ..... *
M **Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061** ..... *
M **Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663** ..... *
M **K R Electronics, Inc., Dept. EM, 91 Avenel St., Avenel, N.J. 07001** ..... *
McCoy Electronics, Sub Oak Inds. Inc., Dept. EM, Chestnut & Watts, Mt Holly Spr., Pa. 17065 ..... *
M **Microsonics, Div. Sangamo Elec. Co., Dept. EM, 60 Winter St., Weymouth, Mass. 02188** ..... *
M **Monitor Prods., Dept. EM, Box 1966, 502 Via Delmonte, Oceanside, Cal. 92054** ..... p. 2349
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
M **Reeves-Hoffman Div., Dynamics Corp. of Amer., Dept. EM, 400 W. North St., Carlisle, Pa. 17013** ..... *
RF Interonics, Dept. EM, 100 Pine Air Dr., Bay Shore, N.Y. 11706 ..... *
Telonic/Berkeley, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715 ..... p. 3063
M **Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030** ..... *
Torotron, Dept. EM, 255 Washington St., Mt. Vernon, N.Y. 10553 ..... *
TT Elctrns., Inc., Dept. EM, 2214 S. Barry Ave., Los Angeles, Cal. 90064 .... *
Vernitron Piezoelectric Div., Dept. EM, 232 Forbes Rd., Bedford, Ohio 44146 *
M AIL, Div. Cutler-Hammer, Dept. EM, Comac Road, Deer Park, N.Y. 11729
M Aladdin Elctrns., Dept. EM, 701 Murfreesboro Rd., Nashville, Tenn. 37210
DM American Nucleonics Corp., Dept. EM, 6036 Variel Ave., Woodland Hills, Cal 91367
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
M Blackhawk Networks Corp., Dept. EM, 14 N. Parker Dr., Janesville, Wisc. 53545
M Cir-Q-Tel, Inc., Dept. EM, 10504 Wheatley St., Kensington, Md. 20795
M Cirtech Corp, Dept. EM, 15237 Cherry St, Stanley, Kan. 66223
M Coleman Microwave Co., Dept. EM, Box 59, Rte. 22, Lebanon, N.J. 08833
CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
Dale Electronics, Inc., Dept. EM, 930 West 23rd St., Tempe, Ariz. 85282
Electrocom Inds., Dept. EM, 1105 N. Ironwood Dr., S. Bend, Ind. 46615
Frequency Engrg. Labs., Dept. EM, Box 527, Farmingdale, N.J. 07727
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
Mu-Del Elctrns., Dept. EM, 2426 Linden La., Silver Spring, Md. 20910
M Multimetrics Div. of Comstro, Comstron-Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11580
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
D Sinclair Radio Labs., Dept. EM, 122 Rayette Rd, Concord, Ontario, Can. L4K 1B6
Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
T-F Electronics Inc., Dept. EM, 9415 Neils Thompson Dr., Austin, Tex. 78759
M Teledyne Microwave, Dept. EM, 1290 Terra Bella Ave., Mountain View, Cal. 94040
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
White Instrs., Inc., Dept. EM, Box 698, Austin, Tex. 78767
M Zeta Laboratories, Inc., Dept. EM, 3265 Scott Blvd., Santa Clara, Cal. 95051

Filters, Continuously Variable

A. P. Circuit Corp., Dept. EM, 865 West End Ave., New York, N.Y. 10025 .... *
M **Applied Research Inc., Dept. EM, 76 S. Bayles Ave., Port Washington, N.Y. 11050** ..... *
M **Axel Elctrns., Unit of General Signal, Dept. EM, 134-20 Jamaica Ave., Jamaica, N.Y. 11418** ..... p. 2615
Bafco, Inc., Dept. EM, 717 Mearns Rd., Warminster, Pa. 18974 ..... *
Comstron Seg., Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520 ..... *
D-B Developments, Dept. EM, 7709 Kilbourne Rd., Rome, NY 13440 ..... *
Dynamics Elctrn. Prods., Waugh Controls, Dept. EM, 9001 Fullbright Ave., Chatsworth, Cal. 91311 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Ithaco, Inc., Dept. EM, 735 W. Clinton St., Ithaca, N.Y. 14850 ..... p. 2634
M **Krohn-Hite Corp., Dept. EM, Avon Ind'l Pk, Bodwell St., Avon, Mass. 02322** ..... p. 2772
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
Precision Filters, Inc., Dept. EM, 303 W. Lincoln St., Ithaca, N.Y. 14850 ..... p. 2637
Reeves-Hoffman Div., Dynamics Corp. of Amer., Dept. EM, 400 W. North St., Carlisle, Pa. 17013 ..... p. 2364
RF Interonics, Dept. EM, 100 Pine Air Dr., Bay Shore, N.Y. 11706 ..... *
Rockland Sys. Corp., Dept. EM, 230 W. Nyack Rd., W. Nyack, N.Y. 10994 .. *
Telonic/Berkeley, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715 ..... p. 3063
D **Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219** ..... p. 2830
M AIL, Div. Cutler-Hammer, Dept. EM, Comac Road, Deer Park, N.Y. 11729
AMF Inc., AMF Cuno Div., Dept. EM, 400 Research Pkwy., Meriden, Conn. 06450
M Cirtech Corp, Dept. EM, 15237 Cherry St, Stanley, Kan. 66223
M Coleman Microwave Co., Dept. EM, Box 59, Rte. 22, Lebanon, N.J. 08833
Convex Corp., Dept. EM, 2810 Dorr Ave., Fairfax, Va. 22031
M Daden Assocs, Inc., Dept. EM, 23011 Moulton Pky, Ste A12, Laguna Hills, CA 92653
M Deltronic Crystal Inds., Inc., Dept. EM, Box 323, Denville, N.J. 07834
Assocs. Inc., Dept. EM, 333 W. Commercial St., East Rochester, N.Y. 14445
Fogg System Co., Dept. EM, 15592 E. Batavia Dr., Aurora, Colo. 80011
Frequency Engrg. Labs., Dept. EM, Box 527, Farmingdale, N.J. 07727

Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
M Multimetrics Div. of Comstro, Comstron-Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11580
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
D Reticon Corp., Dept. EM, 910 Benicia Ave., Sunnyvale, Cal. 94086
D R L C Elctrns., Inc., Dept. EM, 83 Radio Cir., Mt. Kisco, N.Y. 10549
M Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648
Seg Subsidiary, Comstron Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520
Systems Research Labs. Inc., Dept. EM, 2800 Indian Ripple Rd. , Dayton, Ohio 45440
DM Systron-Donner, Advanced Components Div., Dept. EM, 735 Palomar Ave., Sunnyvale, Cal. 94086
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
M Teledyne Microwave, Dept. EM, 1290 Terra Bella Ave., Mountain View, Cal. 94040
Texscan Microwave, Dept. EM, 2446 N. Shadeland, Indianapolis, Ind. 46219
TRW Auto-E, Dept. EM, Davis & Copewood Sts., Camden, N.J. 08103
UFAD Corp., Dept. EM, 700 36th St. S.E., Grand Rapids, Mich. 49508
M Wavecom, Dept. EM, 9036 Winnetna Ave., Northridge, Cal. 91324
DM Yig-Tek Corp., Dept. EM, 1725 De La Cruz Blvd., Santa Clara, Cal. 95050
M Zeta Laboratories, Inc., Dept. EM, 3265 Scott Blvd., Santa Clara, Cal. 95051

Filters, Crystal (Incl. Monolithic Devices)

M Alpha Components, Inc., Dept. EM, 1106 E. Simpson Rd., Mechanicsburg, Pa. 17055 ..... p. 2282
Comstron Corp., Dept. EM, 200 E. Sunrise Hwy., Freeport, N.Y. 11520 p. 2294,2621
M Comstron Seg., Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520 p. 2294,2621
M CTS Knights, Inc., Dept. EM, 400 Reimann Ave., Sandwich, Ill. 60548 p. 2310-2313
Dale Electronics, Inc., Frequency Control Group, Dept. EM, 930 West 23rd St., Tempe, Ariz. 85282 ..... *
M Damon Corp., Elctrns. Div., Dept. EM, 80 Wilson Way, Westwood, Mass. 02090 ..... p. 2319
Erie Frequency Control, Div. Erie Technological Prods., Dept. EM, 453 Lincoln St., Carlisle, Pa. 17013 ..... p. 2323
M Filter Technology, Dept. EM, 6241 Yarrow Dr, Ste D, Carlsbad, Cal 92008 p. 2327
M Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040 p. 2325
M Frequency Selective Networks, Inc, Dept. EM, 69-20 Garfield Ave., Woodside, N.Y. 11377 ..... p. 2326
M Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... p. 2331
M Kappa Networks, Dept. EM, 165 Roosevelt Ave, Carteret, N.J. 07008 ..... *
M McCoy Electronics, Sub Oak Inds. Inc., Dept. EM, Chestnut & Watts, Mt Holly Spr., Pa. 17065 ..... p. 2338,2341-2343
M Microsonics, Div. Sangamo Elec. Co., Dept. EM, 60 Winter St., Weymouth, Mass. 02188 ..... p. 2348
M Monitor Prods., Dept. EM, Box 1966, 502 Via Delmonte, Oceanside, Cal. 92054 ..... p. 2349
M OPT Inds. Inc., Data Products Div., Dept. EM, 300 Red School Lane, Phillipsburg, N.J. 08865 ..... p. 2352
Piezo Technology Inc., Dept. EM, 2525 Shader Rd., Orlando, Fla. 32804 p. 2358,2359
M Reeves-Hoffman Div., Dynamics Corp. of Amer., Dept. EM, 400 W. North St., Carlisle, Pa. 17013 ..... p. 2363-2365
RF Interonics, Dept. EM, 100 Pine Air Dr., Bay Shore, N.Y. 11706 ..... *
Soshin Elec. Co., Dept. EM, 1-18-18 Nakamogome, Ota-Ku, Tokyo, Japan .. *
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... *
Toyo Comm. Equip. Co. Ltd., Dept. EM, 484 Tsukakoshi 3-Chome Saiwai-Ku, Kawasaki, 210 Japan ..... p. 2374
TT Elctrns., Inc., Dept. EM, 2214 S. Barry Ave., Los Angeles, Cal. 90064 .... *
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
M Blackhawk Networks Corp., Dept. EM, 14 N. Parker Dr., Janesville, Wisc. 53545
Centralab/USCC, Div. of Globe-Union Inc., Dept. EM, 4561 Colorado Blvd., Los Angeles, Cal. 90039
M Cirtech Corp, Dept. EM, 15237 Cherry St, Stanley, Kan. 66223
CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
Dale Electronics, Inc., Dept. EM, 930 West 23rd St., Tempe, Ariz. 85282
Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
M-tron Industries, Dept. EM, P.O. Box 630, E. Hwy 50, Yankton, S.D. 57078
M Multimetrics Div. of Comstro, Comstron-Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11580
M Optics Group-East, Valtec Corp., Dept. EM, Holliston, Mass. 01746
Radiation Devices Co., Inc., Dept. EM, Box 8450, Baltimore, Md. 21234
M Seg Subsidiary, Comstron Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520
D Snelgrove, C. R. Ltd., Dept. EM, 141 Bond Ave., Don Mills 404 Ont., Ont. Can.

Filters, Digital

M Aeroflex Labs, Integrated Microsystems Div., Eastern Opers., Dept. EM, 35 S. Service Rd., Painview, N. Y. 11803 ..... *
M Aeroflex Labs, Integrated Microsystems Div., Western Opers., Dept. EM, 1215 Terra Bella Ave, Mountain View, Cal. 94043 ..... *
DM Andersen Laboratories Inc., Dept. EM, 1280 Blue Hills Ave., Bloomfield, Conn. 06002 ..... p. 2619
McCoy Electronics, Sub Oak Inds. Inc., Dept. EM, Chestnut & Watts, Mt Holly Spr., Pa. 17065 ..... *
RF Interonics, Dept. EM, 100 Pine Air Dr., Bay Shore, N.Y. 11706 ..... *
Rockland Sys. Corp., Dept. EM, 230 W. Nyack Rd., W. Nyack, N.Y. 10994 .. *
Telonic/Berkeley, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715 ..... *
M Cirtech Corp, Dept. EM, 15237 Cherry St, Stanley, Kan. 66223
M Dietz Design, Inc., Dept. EM, 100 Electronics Pkwy., Belton, Mo. 64012
Engineered Components Co., Dept. EM, 3580 Sacramento Dr., San Luis Obispo, Cal. 93401
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Systems Research Labs. Inc., Dept. EM, 2800 Indian Ripple Rd. , Dayton, Ohio 45440
DM Systron-Donner, Advanced Components Div., Dept. EM, 735 Palomar Ave., Sunnyvale, Cal. 94086
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Zeta Laboratories, Inc., Dept. EM, 3265 Scott Blvd., Santa Clara, Cal. 95051

Filters, EMI/RFI

M All-Tronics Inc., Dept. EM, 45 Bond St., Westbury, N.Y. 11590 ..... p. 2614
M AMP Capitron Div./AMP Inc., Dept. EM, 1595 S. Mt. Joy St., Elizabethtown, Pa. 17022 ..... p. 2616,2617
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Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
D Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
Mu-Del Elctrns., Dept. EM, 2426 Linden La., Silver Spring, Md. 20910
M Multimetrics Div. of Comstro, Comstron-Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11580
Neshaminy Transformer, Div. Neshaminy Elctrn., Dept. EM, Edison-Furlong Rd., Furlong, Pa. 18925
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
Phoenix Transformer Co., Dept. EM, 1818 E. Madison, Phoenix, Ariz. 85034
M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
M Potter Co., Dept. EM, Box 337 North Hwy 51, Wesson, Miss. 39191
Radiation Devices Co., Inc., Dept. EM, Box 8450, Baltimore, Md. 21234
D Reticon Corp., Dept. EM, 910 Benicia Ave., Sunnyvale, Cal. 94086
D R L C Elctrns., Inc., Dept. EM, 83 Radio Cir., Mt. Kisco, N.Y. 10549
M San Fernando Elec. Mfg., Dept. EM, 1501 1st St., San Fernando, Cal. 91341
M Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648
M Seg Subsidiary, Comstron Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520
D Sescom, Inc., Dept. EM, 12931 Budlong Ave. Box 590, Gardena, Cal. 90247
Sivers Lab, Dept. EM, Box 90339, Los Angeles, Cal. 90009
Solar Elctrns. Co., Dept. EM, 901 N. Highland, Hollywood, Cal. 90038
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
D Spectra Sonics, Dept. EM, 770 Wall Ave., Ogden, Utah 84404
D Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
Systems Research Labs. Inc., Dept. EM, 2800 Indian Ripple Rd. , Dayton, Ohio 45440
DM Systron-Donner, Advanced Components Div., Dept. EM, 735 Palomar Ave., Sunnyvale, Cal. 94086
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
M Technical Mat'l., Dept. EM, 700 Fenimore Rd., Mamaroneck, N.Y. 10543
M Teledyne Microwave, Dept. EM, 1290 Terra Bella Ave., Mountain View, Cal. 94040
Texscan Microwave, Dept. EM, 2446 N. Shadeland, Indianapolis, Ind. 46219
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Viclan Inc., Dept. EM, Box 81403, 7373A Engineer Rd., San Diego, Cal. 92138
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304
M Wavecom, Dept. EM, 9036 Winnetna Ave., Northridge, Cal. 91324
White Instrs., Inc., Dept. EM, Box 698, Austin, Tex. 78767
Wide Band Engrg. Co. Inc., Dept. EM, Box 21652, Phoenix, Ariz. 85036

Filters, Mechanical

A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 *
RF Interonics, Dept. EM, 100 Pine Air Dr., Bay Shore, N.Y. 11706 *
AMF Inc., AMF Cuno Div., Dept. EM, 400 Research Pkwy., Meriden, Conn. 06450
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
Pall Trinity Micro Corp., Dept. EM, Rte. 281, Cortland, N.Y. 13045
D Rockwell Int'l., Microelectronic Devices, Dept. EM, Box 3669, 3310 Miraloma Ave., Anaheim, Cal. 92803
DM Systron-Donner, Advanced Components Div., Dept. EM, 735 Palomar Ave., Sunnyvale, Cal. 94086
T-F Electronics Inc., Dept. EM, 9415 Neils Thompson Dr., Austin, Tex. 78759

Filters, Microwave

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 *
AMP Capitron Div./AMP Inc., Dept. EM, 1595 S. Mt. Joy St., Elizabethtown, Pa. 17022 p. 2616,2617
M **Applied Research Inc., Dept. EM, 76 S. Bayles Ave., Port Washington, N.Y. 11050** *
M **Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706** p. 2865
Centre Engrg., Dept. EM, 2820 E. College Ave., State College, Pa. 16801 p. 1090
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 *
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 *
M **RF Interonics, Dept. EM, 100 Pine Air Dr., Bay Shore, N.Y. 11706** p. 2640
Telonic/Berkeley, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715 p. 3063
D **Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219** *
TT Elctrns., Inc., Dept. EM, 2214 S. Barry Ave., Los Angeles, Cal. 90064 *
Uniform Tubes Inc., MicroDelay Division, Dept. EM, Collegeville, Pa. 19426 *
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 *
M AIL, Div. Cutler-Hammer, Dept. EM, Comac Road, Deer Park, N.Y. 11729
M Aircom, Inc., Dept. EM, Rte. 16B, Union, N.H. 03887
M Airtron, Div. Litton Inds., Dept. EM, 200 E. Hanover Ave., Morris Plains, N.J. 07950
DM American Nucleonics Corp., Dept. EM, 6036 Variel Ave., Woodland Hills, Cal 91367
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
M Capcon, Inc., Dept. EM, 147 W. 25th St., New York, N.Y. 10001

M Centralab/USCC, Div. of Globe-Union Inc., Dept. EM, 4561 Colorado Blvd., Los Angeles, Cal. 90039
M Cir-Q-Tel, Inc., Dept. EM, 10504 Wheatley St., Kensington, Md. 20795
M Coleman Microwave Co., Dept. EM, Box 59, Rte. 22, Lebanon, N.J. 08833
M Crown Microwave, Inc., Sub. Microwave Semiconductor Corp., Dept. EM, 6 Executive Park Dr., N. Billerica, Mass. 01862
M Daden Assocs, Inc., Dept. EM, 23011 Moulton Pky, Ste A12, Laguna Hills, CA 92653
Engelmann Microwave, Dept. EM, Skyline Dr., Montville, N.J. 07045
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Epsilon-Lambda Elctrn. Corp., Dept. EM, 28 S. Water St., Batavia, Ill. 60510
Frequency Engrg. Labs., Dept. EM, Box 527, Farmingdale, N.J. 07727
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
D Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
D Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
Mu-Del Elctrns., Dept. EM, 2426 Linden La., Silver Spring, Md. 20910
D Murata Mfg. Co. Ltd., Dept. EM, 16, Kaiden Nishijin-cho, Nagaoka-Kyo-Shi, Kyoto, Japan
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
D R L C Elctrns., Inc., Dept. EM, 83 Radio Cir., Mt. Kisco, N.Y. 10549
DM Systron-Donner, Advanced Components Div., Dept. EM, 735 Palomar Ave., Sunnyvale, Cal. 94086
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
M Teledyne Microwave, Dept. EM, 1290 Terra Bella Ave., Mountain View, Cal. 94040
Texscan Microwave, Dept. EM, 2446 N. Shadeland, Indianapolis, Ind. 46219
M Transco Prods., Inc., Dept. EM, 4241 Glencoe Ave., Venice, Cal. 90291
TRG., Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
Triangle Microwave Inc., Dept. EM, 9B Great Meadow La, East Hanover, NJ 07936
M UTE Microwave, Dept. EM, 3500 Sunset Ave., Asbury Park, N.J. 07712
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304
M Wavecom, Dept. EM, 9036 Winnetna Ave., Northridge, Cal. 91324
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006
DM Yig-Tek Corp., Dept. EM, 1725 De La Cruz Blvd., Santa Clara, Cal. 95050
M Zeta Laboratories, Inc., Dept. EM, 3265 Scott Blvd., Santa Clara, Cal. 95051

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Filters, Optical

Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 ..... p. 2434
Evaporated Coatings, Inc., Dept. EM, 798 Welsh Rd., Huntingdon Valley, Pa. 19006
Pomfret Research Optics Inc., Dept. EM, 817 Long Ridge Rd, Stamford, Conn 06902
Schott Optical Glass Inc., Dept. EM, York Ave., Duryea, Pa. 18642

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M All-Tronics Inc., Dept. EM, 45 Bond St., Westbury, N.Y. 11590 ..... p. 2614
Allen Avionics, Inc., Div. A.K. Allen Co., Dept. EM, 255 E. 2nd St., Mineola, N.Y. 11501 ..... *
M Alpha Components, Inc., Dept. EM, 1106 E. Simpson Rd., Mechanicsburg, Pa. 17055 ..... p. 2282
American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
DM Andersen Laboratories Inc., Dept. EM, 1280 Blue Hills Ave., Bloomfield, Conn. 06002 ..... p. 2619
M Applied Research Inc., Dept. EM, 76 S. Bayles Ave., Port Washington, N.Y. 11050 ..... p. 2866,2867
M Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706 ..... *
D AVX Ceramics, Dept. EM, Box 867, Myrtle Beach, S.C. 29577 ..... *
M Axel Elctrns., Unit of General Signal, Dept. EM, 134-20 Jamaica Ave., Jamaica, N.Y. 11418 ..... *
D Bell Industries, J.W. Miller Div., Dept. EM, 19070 Reyes Ave., Compton, Cal. 90221 ..... *
M Bird Electronic Corp., Dept. EM, 30303 Aurora Rd., Solon, Ohio 44139 ..... p. 2668
Caddel-Burns Mfg. Co., Inc., Dept. EM, 40 E. 2nd St., Mineola, N. Y. 11501 ..... *
Chesterfield Prods. Inc., Dept. EM, 511A Victor St., Saddle Brook, N.J. 07662 ..... *
Compac, Dept. EM, 279-I Skidmore Rd., Deer Park, N.Y. 11729 ..... *
M Comstron Sec., Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520 ..... *
D Corcom, Inc., Dept. EM, 2635 No. Kildare Ave., Chicago, Ill. 60639 ..... p. 2622,2623
D Cornell-Dubilier Electronics, Dept. EM, 150 Avenue "L", Newark, N.J. 07105 ..... p. 2624
CTS Knights, Inc., Dept. EM, 400 Reimann Ave., Sandwich, Ill. 60548 ..... p. 2310-2312
Dale Electronics, Inc., Frequency Control Group, Dept. EM, 930 West 23rd St., Tempe, Ariz. 85282 ..... *
Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 ..... p. 1336,1337
M Damon Corp., Elctrns. Div., Dept. EM, 80 Wilson Way, Westwood, Mass. 02090 ..... p. 2319
M Data Delay Devices, Dept. EM, 253 Crooks Ave., Clifton, N.J. 07011 ..... *
M ESC Elctrns. Corp., Dept. EM, 534 Bergen Blvd., Palisades Pk., N.J. 07650 *
Filter Technology, Dept. EM, 6241 Yarrow Dr, Ste D, Carlsbad, Cal 92008 ..... p. 2327
M Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040 .. *
M Frequency Selective Networks, Inc, Dept. EM, 69-20 Garfield Ave., Woodside, N.Y. 11377 ..... *
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hertz Filter, Dept. EM, 3 Aerial Way, Syosset, N.Y. 11791 ..... p. 2633
M Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 ..... *
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 .... *
M Hopkins Engrg., Dept. EM, 12900 Foothill Blvd., San Fernando, Cal. 91342 ..... p. 2632
M Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... *
Ithaco, Inc., Dept. EM, 735 W. Clinton St., Ithaca, N.Y. 14850 ..... p. 2634
M Kappa Networks, Dept. EM, 165 Roosevelt Ave, Carteret, N.J. 07008 ..... *
M K R Electronics, Inc., Dept. EM, 91 Avenel St., Avenel, N.J. 07001 ..... p. 2635
M Krohn-Hite Corp., Dept. EM, Avon Ind'l Pk, Bodwell St., Avon, Mass. 02322 ..... p. 2772
Magnetico, Inc., Dept. EM, 182 Morris Ave., Holtsville, N.Y. 11742 ..... *
McCoy Electronics, Sub Oak Inds. Inc., Dept. EM, Chestnut & Watts, Mt Holly Spr., Pa. 17065 ..... *
DM Metex Corp., Dept. EM, 970 New Durham Rd., Edison, N.J. 08817 ..... *
Monitor Prods., Dept. EM, Box 1966, 502 Via Delmonte, Oceanside, Cal. 92054 ..... p. 2349
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
Piezo Technology Inc., Dept. EM, 2525 Shader Rd., Orlando, Fla. 32804 .... *
M Reeves-Hoffman Div., Dynamics Corp. of Amer., Dept. EM, 400 W. North St., Carlisle, Pa. 17013 ..... *
M RF Interonics, Dept. EM, 100 Pine Air Dr., Bay Shore, N.Y. 11706 ..... p. 2640
Rockland Sys. Corp., Dept. EM, 230 W. Nyack Rd., W. Nyack, N.Y. 10994 .. *
M Rtron Corp., Dept. EM, 7324 Lawndale, Skokie, Ill. 60076 ..... *
D Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543 ..... *
D Soshin Elec. Co., Dept. EM, 1-18-18 Nakamogome, Ota-Ku, Tokyo, Japan ..... p. 1212
D Spectrum Control, Inc., Dept. EM, 152 E. Main St., Fairview, Pa. 16415 ..... *
DM Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 ..... *
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D Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219 ..... p. 2830
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... *
Toyo Comm. Equip. Co. Ltd., Dept. EM, 484 Tsukakoshi 3-Chome Saiwai-Ku, Kawasaki, 210 Japan ..... p. 2374
D TRW/UTC Transformers, Dept. EM, 150 Varick St., New York, N.Y. 10013 .. *
TT Elctrns., Inc., Dept. EM, 2214 S. Barry Ave., Los Angeles, Cal. 90064 .... *
Uniform Tubes Inc., MicroDelay Division, Dept. EM, Collegeville, Pa. 19426 *
M Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040 ..... *
D Vernitron Piezoelectric Div., Dept. EM, 232 Forbes Rd., Bedford, Ohio 44146 ..... *
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
M AIL, Div. Cutler-Hammer, Dept. EM, Comac Road, Deer Park, N.Y. 11729
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
M A.R.F. Products, Dept. EM, Box 3226, Boulder, Colo. 80303
M Aviatech Intl. Inc., Dept. EM, 75 Carlough Rd, Bohemia, N.Y. 11716
D Barker & Williamson, Inc., Dept. EM, Canal St., Bristol, Pa. 19007
BF Elctrns., Dept. EM, 415 S. Nardo, Solana Beach, Calif. 92075
M BG Electronics, Inc., Dept. EM, 9 Elm Ave., Mount Vernon, N.Y. 10550
D Blonder-Tongue Labs., Inc., Dept. EM, One Jake Brown Rd., Old Bridge, N.J. 08857
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
M Capcon, Inc., Dept. EM, 147 W. 25th St., New York, N.Y. 10001
Centralab, Electrns. Div. - Globe Union Inc., Dept. EM, 5757 N. Green Bay Ave., Milwaukee, Wisc. 53201
Centralab/USCC, Div. of Globe-Union Inc., Dept. EM, 4561 Colorado Blvd., Los Angeles, Cal. 90039
D Channel Master Div. Avnet, Dept. EM, Rte. 209, Ellenville, N.Y. 12428
M Cir-Q-Tel, Inc., Dept. EM, 10504 Wheatley St., Kensington, Md. 20795
M Cirtech Corp, Dept. EM, 15237 Cherry St, Stanley, Kan. 66223
Coilcraft, Dept. EM, 1102 Silver Lake Rd., Cary, Ill. 60013
Coil-Q Corp., Dept. EM, 340 Bronxville Rd., Bronxville, N.Y. 10708
Coil Specialty Co., Dept. EM, Box 978, 2730 Carolean Ind'l. Dr., State College, Pa. 16801
M Coleman Microwave Co., Dept. EM, Box 59, Rte. 22, Lebanon, N.J. 08833
CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
M Daden Assocs, Inc., Dept. EM, 23011 Moulton Pky, Ste A12, Laguna Hills, CA 92653
Dale Electronics, Inc., Dept. EM, 930 West 23rd St., Tempe, Ariz. 85282
M Dietz Design, Inc., Dept. EM, 100 Electronics Pkwy., Belton, Mo. 64012
M Dynamic Air Engrg, Inc., EMC Filter Div., Dept. EM, 620 E. Dyer Rd., Santa Ana, Cal. 92705
Electro-Metrics, Div. Penril Corp., Dept. EM, 100 Church St., Amsterdam, N.Y. 12010
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
D Finney Co., Dept. EM, 34 W. Interstate St., Bedford, Ohio 44014
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Industrial Condenser Corp., Dept. EM, 3243 N. California Ave., Chicago, Ill. 60618
D Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730

Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
D Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
D Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
Mu-Del Elctrns., Dept. EM, 2426 Linden La., Silver Spring, Md. 20910
M Multimetrics Div. of Comstro, Comstron-Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11580
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
M Potter Co., Dept. EM, Box 337 North Hwy 51, Wesson, Miss. 39191
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
Projects Unlimited, Inc., Dept. EM, 3680 Wyse Rd., Dayton, Ohio 45414
Radiation Devices Co., Inc., Dept. EM, Box 8450, Baltimore, Md. 21234
Resdel Engineering Corp., Dept. EM, 300 E. Live Oak Ave., Arcadia, Cal. 91006
D R L C Elctrns., Inc., Dept. EM, 83 Radio Cir., Mt. Kisco, N.Y. 10549
M San Fernando Elec. Mfg., Dept. EM, 1501 1st St., San Fernando, Cal. 91341
M Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648
M Seg Subsidiary, Comstron Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520
DM Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
M Systron-Donner, Advanced Components Div., Dept. EM, 735 Palomar Ave., Sunnyvale, Cal. 94086
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
M Teledyne Microwave, Dept. EM, 1290 Terra Bella Ave., Mountain View, Cal. 94040
Texscan Microwave, Dept. EM, 2446 N. Shadeland, Indianapolis, Ind. 46219
M Transco Prods., Inc., Dept. EM, 4241 Glencoe Ave., Venice, Cal. 90291
D TRW Auto-E, Dept. EM, Davis & Copewood Sts., Camden, N.J. 08103
Viclan Inc., Dept. EM, Box 81403, 7373A Engineer Rd., San Diego, Cal. 92138
M Wavecom, Dept. EM, 9036 Winnetna Ave., Northridge, Cal. 91324
Wide Band Engrg. Co. Inc., Dept. EM, Box 21652, Phoenix, Ariz. 85036
D Wiltron Co., Dept. EM, 825 E. Middlefield Rd., Mt. View, Cal 94043
Winegard Co., Dept. EM, 3000 Kirkwood St., Burlington, Iowa 52601
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

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M Alpha Components, Inc., Dept. EM, 1106 E. Simpson Rd., Mechanicsburg, Pa. 17055 ..... **p. 2282**
DM Andersen Laboratories Inc., Dept. EM, 1280 Blue Hills Ave., Bloomfield, Conn. 06002 ..... *
M Axel Elctrns., Unit of General Signal, Dept. EM, 134-20 Jamaica Ave., Jamaica, N.Y. 11418 ..... *
M Comstron Seg., Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520 ..... *
CTS Knights, Inc., Dept. EM, 400 Reimann Ave., Sandwich, Ill. 60548 ..... *
Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 ..... *
Dale Electronics, Inc., Frequency Control Group, Dept. EM, 930 West 23rd St., Tempe, Ariz. 85282 ..... *
M Damon Corp., Elctrns. Div., Dept. EM, 80 Wilson Way, Westwood, Mass. 02090 ..... *
M ESC Elctrns. Corp., Dept. EM, 534 Bergen Blvd., Palisades Pk., N.J. 07650 *
Filter Technology, Dept. EM, 6241 Yarrow Dr, Ste D, Carlsbad, Cal 92008 .. *
M Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040 .. *
M Frequency Selective Networks, Inc, Dept. EM, 69-20 Garfield Ave., Woodside, N.Y. 11377 ..... **p. 2326**
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Hertz Filter, Dept. EM, 3 Aerial Way, Syosset, N.Y. 11791 ..... *
M Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 ..... *
M Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... *
M K R Electronics, Inc., Dept. EM, 91 Avenel St., Avenel, N.J. 07001 ..... *
M McCoy Electronics, Sub Oak Inds. Inc., Dept. EM, Chestnut & Watts, Mt Holly Spr., Pa. 17065 ..... **p. 2342**
Monitor Prods., Dept. EM, Box 1966, 502 Via Delmonte, Oceanside, Cal. 92054 ..... **p. 2349**
M OPT Inds. Inc., Data Products Div., Dept. EM, 300 Red School Lane, Phillipsburg, N.J. 08865 ..... *
Piezo Technology Inc., Dept. EM, 2525 Shader Rd., Orlando, Fla. 32804 .... *
M Reeves-Hoffman Div., Dynamics Corp. of Amer., Dept. EM, 400 W. North St., Carlisle, Pa. 17013 ..... **p. 2364**
M RF Interonics, Dept. EM, 100 Pine Air Dr., Bay Shore, N.Y. 11706 ..... *
Torotron, Dept. EM, 255 Washington St., Mt. Vernon, N.Y. 10553 ..... *
TT Elctrns., Inc., Dept. EM, 2214 S. Barry Ave., Los Angeles, Cal. 90064 .... *
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
Automatic Coil Corp., Sub. Designatronics Inc., Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
M Blackhawk Networks Corp., Dept. EM, 14 N. Parker Dr., Janesville, Wisc. 53545
M Cir-Q-Tel, Inc., Dept. EM, 10504 Wheatley St., Kensington, Md. 20795
M Cirtech Corp, Dept. EM, 15237 Cherry St, Stanley, Kan. 66223
M Coleman Microwave Co., Dept. EM, Box 59, Rte. 22, Lebanon, N.J. 08833
CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
Dale Electronics, Inc., Dept. EM, 930 West 23rd St., Tempe, Ariz. 85282
M Dietz Design, Inc., Dept. EM, 100 Electronics Pkwy., Belton, Mo. 64012
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
M Multimetrics Div. of Comstro, Comstron-Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11580
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
D Rockwell Int'l., Microelectronic Devices, Dept. EM, Box 3669, 3310 Miraloma Ave., Anaheim, Cal. 92803
M Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648
M Seg Subsidiary, Comstron Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520

Filters, Synchronous Tracking

Austron, Inc., Dept. EM, 1915 Kramer La., Austin, Tex. 78758 ..... *
M Axel Elctrns., Unit of General Signal, Dept. EM, 134-20 Jamaica Ave., Jamaica, N.Y. 11418 ..... *
Bird Electronic Corp., Dept. EM, 30303 Aurora Rd., Solon, Ohio 44139 ..... **p. 2669**
M ESC Elctrns. Corp., Dept. EM, 534 Bergen Blvd., Palisades Pk., N.J. 07650 *
M K R Electronics, Inc., Dept. EM, 91 Avenel St., Avenel, N.J. 07001 ..... *
RF Interonics, Dept. EM, 100 Pine Air Dr., Bay Shore, N.Y. 11706 ..... *
TT Elctrns., Inc., Dept. EM, 2214 S. Barry Ave., Los Angeles, Cal. 90064 .... *
Unholtz-Dickie Corp., Dept. EM, 3000 Whitney Ave., Hamden, Conn. 06518 *
M Cirtech Corp, Dept. EM, 15237 Cherry St, Stanley, Kan. 66223
M Coleman Microwave Co., Dept. EM, Box 59, Rte. 22, Lebanon, N.J. 08833
Endevco, Div. Becton, Dickinson & Co., Dept. EM, 30700 Rancho Viejo Rd., San Jaun Capistrano, Cal. 92675
Frequency Engrg. Labs., Dept. EM, Box 527, Farmingdale, N.J. 07727
M Multimetrics Div. of Comstro, Comstron-Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11580
Spectral Dynamics Corp., Dept. EM, Box 671, San Diego, Cal. 92112
Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
M Systron-Donner, Advanced Components Div., Dept. EM, 735 Palomar Ave., Sunnyvale, Cal. 94086
UFAD Corp., Dept. EM, 700 36th St. S.E., Grand Rapids, Mich. 49508
M UTE Microwave, Dept. EM, 3500 Sunset Ave., Asbury Park, N.J. 07712
M Wavecom, Dept. EM, 9036 Winnetna Ave., Northridge, Cal. 91324

Filters, Telemetering

M Alpha Components, Inc., Dept. EM, 1106 E. Simpson Rd., Mechanicsburg, Pa. 17055 ..... **p. 2282**
American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
DM Andersen Laboratories Inc., Dept. EM, 1280 Blue Hills Ave., Bloomfield, Conn. 06002 ..... *
A. P. Circuit Corp., Dept. EM, 865 West End Ave., New York, N.Y. 10025 .... *
M Axel Elctrns., Unit of General Signal, Dept. EM, 134-20 Jamaica Ave., Jamaica, N.Y. 11418 ..... *
Chesterfield Prods. Inc., Dept. EM, 511A Victor St., Saddle Brook, N.J. 07662 ..... **p. 2620**
Comstron Corp., Dept. EM, 200 E. Sunrise Hwy., Freeport, N.Y. 11520 **p. 2684**
M Comstron Seg., Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520 .. **p. 2684**
Dynamics Elctrn. Prods., Waugh Controls, Dept. EM, 9001 Fullbright Ave., Chatsworth, Cal. 91311 ..... *
M ESC Elctrns. Corp., Dept. EM, 534 Bergen Blvd., Palisades Pk., N.J. 07650 *
D EWC, Inc., Dept. EM, 725 Federal Ave., Kenilworth, N.J. 07033 ..... *
Filter Technology, Dept. EM, 6241 Yarrow Dr, Ste D, Carlsbad, Cal 92008 .. *
M Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040 .. *
M Frequency Selective Networks, Inc, Dept. EM, 69-20 Garfield Ave., Woodside, N.Y. 11377 ..... *
M Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 ..... *
M Kappa Networks, Dept. EM, 165 Roosevelt Ave, Carteret, N.J. 07008 ..... *
M K R Electronics, Inc., Dept. EM, 91 Avenel St., Avenel, N.J. 07001 ..... *
McCoy Electronics, Sub Oak Inds. Inc., Dept. EM, Chestnut & Watts, Mt Holly Spr., Pa. 17065 ..... *
M OPT Inds. Inc., Data Products Div., Dept. EM, 300 Red School Lane, Phillipsburg, N.J. 08865 ..... *
M RF Interonics, Dept. EM, 100 Pine Air Dr., Bay Shore, N.Y. 11706 ..... *
Rockland Sys. Corp., Dept. EM, 230 W. Nyack Rd., W. Nyack, N.Y. 10994 .. *
Telonic/Berkeley, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715 ..... *
D Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219 *
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... *
Torotron, Dept. EM, 255 Washington St., Mt. Vernon, N.Y. 10553 ..... *
M TRW/UTC Transformers, Dept. EM, 150 Varick St., New York, N.Y. 10013 .. *
TT Elctrns., Inc., Dept. EM, 2214 S. Barry Ave., Los Angeles, Cal. 90064 .... *
Vernitron Piezoelectric Div., Dept. EM, 232 Forbes Rd., Bedford, Ohio 44146 *
M Aladdin Elctrns., Dept. EM, 701 Murfreesboro Rd., Nashville, Tenn. 37210
BF Elctrns., Dept. EM, 415 S. Nardo, Solana Beach, Calif. 92075
M BG Electronics, Inc., Dept. EM, 9 Elm Ave., Mount Vernon, N.Y. 10550
M Cir-Q-Tel, Inc., Dept. EM, 10504 Wheatley St., Kensington, Md. 20795
M Cirtech Corp, Dept. EM, 15237 Cherry St, Stanley, Kan. 66223
M Coleman Microwave Co., Dept. EM, Box 59, Rte. 22, Lebanon, N.J. 08833
ComData Corp., Dept. EM, 8115 N. Monticello, Skokie, ILL. 60076
Dantel, Inc., Dept. EM, 1922 North Helm, Fresno, Cal. 93727
Data-Control Systems, Dept. EM, Commerce Dr., Box 860, Danbury, Conn. 06810
D De Coursey Engrg. Lab., Dept. EM, 11828 W. Jefferson, Culver City, Cal. 90230
M Dietz Design, Inc., Dept. EM, 100 Electronics Pkwy., Belton, Mo. 64012
D EMR Telemetry, Div. Sangamo-Weston, Dept. EM, Box 3041, Sarasota, Fla. 33578
Fogg System Co., Dept. EM, 15592 E. Batavia Dr., Aurora, Colo. 80011
Linear Networks Co., Dept. EM, Box 775, Westminster, Cal. 92683
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
M Multimetrics Div. of Comstro, Comstron-Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11580
M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
M Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648
M Seg Subsidiary, Comstron Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
M Sonex, Dept. EM, 2337 Philmont Ave., Huntingdon Valley, Pa. 19006
Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
M Systron-Donner, Advanced Components Div., Dept. EM, 735 Palomar Ave., Sunnyvale, Cal. 94086
T-F Electronics Inc., Dept. EM, 9415 Neils Thompson Dr., Austin, Tex. 78759
M Teledyne Microwave, Dept. EM, 1290 Terra Bella Ave., Mountain View, Cal. 94040

Texscan Microwave, Dept. EM, 2446 N. Shadeland, Indianapolis, Ind. 46219
M Wavecom, Dept. EM, 9036 Winnetna Ave., Northridge, Cal. 91324
Wide Band Engrg. Co. Inc., Dept. EM, Box 21652, Phoenix, Ariz. 85036

Filters, Tone, Telegraph

A. P. Circuit Corp., Dept. EM, 865 West End Ave., New York, N.Y. 10025 .... *
M Axel Elctrns., Unit of General Signal, Dept. EM, 134-20 Jamaica Ave., Jamaica, N.Y. 11418 ..... *
D Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634 ..... p. 2854
Comstron Corp., Dept. EM, 200 E. Sunrise Hwy., Freeport, N.Y. 11520 p. 2684
M Comstron Seg., Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520 .. p. 2684
M Data Delay Devices, Dept. EM, 253 Crooks Ave., Clifton, N.J. 07011 .. p. 2626
M ESC Elctrns. Corp., Dept. EM, 534 Bergen Blvd., Palisades Pk., N.J. 07650 *
M Frequency Selective Networks, Inc, Dept. EM, 69-20 Garfield Ave., Woodside, N.Y. 11377 ..... *
M Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 ..... *
M Integrated Circuits, Inc., Dept. EM, 13256 Northrup Way, Bellevue, Wash. 98005 ..... *
ITT North, Microsystems Div, Dept. EM, 700 Hillsboro Pl., Deerfield Beach, Fla. 33441 ..... *
M K R Electronics, Inc., Dept. EM, 91 Avenel St., Avenel, N.J. 07001 ..... *
Magnetico, Inc., Dept. EM, 182 Morris Ave., Holtsville, N.Y. 11742 ..... *
McCoy Electronics, Sub Oak Inds. Inc., Dept. EM, Chestnut & Watts, Mt Holly Spr., Pa. 17065 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
M OPT Inds. Inc., Data Products Div., Dept. EM, 300 Red School Lane, Phillipsburg, N.J. 08865 ..... *
M RF Interonics, Dept. EM, 100 Pine Air Dr., Bay Shore, N.Y. 11706 ..... *
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... *
Torotron, Dept. EM, 255 Washington St., Mt. Vernon, N.Y. 10553 ..... *
TT Elctrns., Inc., Dept. EM, 2214 S. Barry Ave., Los Angeles, Cal. 90064 .... *
M Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040 *
D Vernitron Piezoelectric Div., Dept. EM, 232 Forbes Rd., Bedford, Ohio 44146 *
M Aladdin Elctrns., Dept. EM, 701 Murfreesboro Rd., Nashville, Tenn. 37210
M BG Electronics, Inc., Dept. EM, 9 Elm Ave., Mount Vernon, N.Y. 10550
M Cirtech Corp, Dept. EM, 15237 Cherry St, Stanley, Kan. 66223
M Coleman Microwave Co., Dept. EM, Box 59, Rte. 22, Lebanon, N.J. 08833
ComData Corp., Dept. EM, 8115 N. Monticello, Skokie, ILL. 60076
Convex Corp., Dept. EM, 2810 Dorr Ave., Fairfax, Va. 22031
Dantel, Inc., Dept. EM, 1922 North Helm, Fresno, Cal. 93727
Data Signal Corp, Dept. EM, 40-44 Hunt St, Watertown, MA 02172
D De Coursey Engrg. Lab., Dept. EM, 11828 W. Jefferson, Culver City, Cal. 90230
M Dietz Design, Inc., Dept. EM, 100 Electronics Pkwy., Belton, Mo. 64012
Electrocom Inds., Dept. EM, 1105 N. Ironwood Dr., S. Bend, Ind. 46615
Engineered Components Co., Dept. EM, 3580 Sacramento Dr., San Luis Obispo, Cal. 93401
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
M Multimetrics Div. of Comstro, Comstron-Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11580
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
M Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648
M Seg Subsidiary, Comstron Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520
Solar Elctrns. Co., Dept. EM, 901 N. Highland, Hollywood, Cal. 90038
Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
T-F Electronics Inc., Dept. EM, 9415 Neils Thompson Dr., Austin, Tex. 78759

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Filters, Tuning Fork

Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
McCoy Electronics, Sub Oak Inds. Inc., Dept. EM, Chestnut & Watts, Mt Holly Spr., Pa. 17065 ..... *
D Vernitron Piezoelectric Div., Dept. EM, 232 Forbes Rd., Bedford, Ohio 44146 *
M Murata Corporation of America, Dept. EM, 1148 Franklin Rd., S.E., Marietta, Ga. 30067
D Murata Mfg. Co. Ltd., Dept. EM, 16, Kaiden Nishijin-cho, Nagaoka-Kyo-Shi, Kyoto, Japan
T-F Electronics Inc., Dept. EM, 9415 Neils Thompson Dr., Austin, Tex. 78759

Filters, UHF & VHF

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
DM Andersen Laboratories Inc., Dept. EM, 1280 Blue Hills Ave., Bloomfield, Conn. 06002 ..... *
M Applied Research Inc., Dept. EM, 76 S. Bayles Ave., Port Washington, N.Y. 11050 ..... p. 2866,2867
M Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706 ..... *
M Bird Electronic Corp., Dept. EM, 30303 Aurora Rd., Solon, Ohio 44139 p. 2668
Centre Engrg., Dept. EM, 2820 E. College Ave., State College, Pa. 16801 p. 1090
M Comstron Seg., Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520 ..... *
CTS Knights, Inc., Dept. EM, 400 Reimann Ave., Sandwich, Ill. 60548 p. 2310-2312
Dale Electronics, Inc., Frequency Control Group, Dept. EM, 930 West 23rd St., Tempe, Ariz. 85282 ..... *
Filter Technology, Dept. EM, 6241 Yarrow Dr, Ste D, Carlsbad, Cal 92008 p. 2327
M Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040 .. *
M Frequency Selective Networks, Inc, Dept. EM, 69-20 Garfield Ave., Woodside, N.Y. 11377 ..... *
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
M Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 ..... *
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 .... *
M Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... *
M K R Electronics, Inc., Dept. EM, 91 Avenel St., Avenel, N.J. 07001 ..... p. 2635
McCoy Electronics, Sub Oak Inds. Inc., Dept. EM, Chestnut & Watts, Mt Holly Spr., Pa. 17065 ..... *
M MCL, Inc., Dept. EM, 10 North Beach Ave., LaGrange, Ill. 60525 ..... *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
Piezo Technology Inc., Dept. EM, 2525 Shader Rd., Orlando, Fla. 32804 .... *
M Reeves-Hoffman Div., Dynamics Corp. of Amer., Dept. EM, 400 W. North St., Carlisle, Pa. 17013 ..... *
M RF Interonics, Dept. EM, 100 Pine Air Dr., Bay Shore, N.Y. 11706 ..... p. 2640
D Soshin Elec. Co., Dept. EM, 1-18-18 Nakamogome, Ota-Ku, Tokyo, Japan .. *
Telonic/Berkeley, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715 ..... p. 3063
D Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219 p. 2830
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... *
TT Elctrns., Inc., Dept. EM, 2214 S. Barry Ave., Los Angeles, Cal. 90064 .... *
Uniform Tubes Inc., MicroDelay Division, Dept. EM, Collegeville, Pa. 19426 *
M AIL, Div. Cutler-Hammer, Dept. EM, Comac Road, Deer Park, N.Y. 11729
M Aladdin Elctrns., Dept. EM, 701 Murfreesboro Rd., Nashville, Tenn. 37210
DM American Nucleonics Corp., Dept. EM, 6036 Variel Ave., Woodland Hills, Cal 91367
M A.R.F. Products, Dept. EM, Box 3226, Boulder, Colo. 80303
M Aviatech Intl. Inc., Dept. EM, 75 Carlough Rd, Bohemia, N.Y. 11716
D Blonder-Tongue Labs., Inc., Dept. EM, One Jake Brown Rd., Old Bridge, N.J. 08857
M Centralab/USCC, Div. of Globe-Union Inc., Dept. EM, 4561 Colorado Blvd., Los Angeles, Cal. 90039
M Cir-Q-Tel, Inc., Dept. EM, 10504 Wheatley St., Kensington, Md. 20795
M Cirtech Corp, Dept. EM, 15237 Cherry St, Stanley, Kan. 66223
M Coleman Microwave Co., Dept. EM, Box 59, Rte. 22, Lebanon, N.J. 08833
M Daden Assocs, Inc., Dept. EM, 23011 Moulton Pky, Ste A12, Laguna Hills, CA 92653
M Dielectric Comms, Unit of Gen Signal, Dept. EM, Raymond, Maine 04071
M Dietz Design, Inc., Dept. EM, 100 Electronics Pkwy., Belton, Mo. 64012
Engelmann Microwave, Dept. EM, Skyline Dr., Montville, N.J. 07045
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
D Finney Co., Dept. EM, 34 W. Interstate St., Bedford, Ohio 44014
D Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
Mu-Del Elctrns., Dept. EM, 2426 Linden La., Silver Spring, Md. 20910
M Multimetrics Div. of Comstro, Comstron-Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11580
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
Radiation Devices Co., Inc., Dept. EM, Box 8450, Baltimore, Md. 21234
D R L C Elctrns., Inc., Dept. EM, 83 Radio Cir., Mt. Kisco, N.Y. 10549
M Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648
Seg Subsidiary, Comstron Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520
D Sinclair Radio Labs., Dept. EM, 122 Rayette Rd, Concord, Ontario, Can. L4K 1B6
Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
M Systron-Donner, Advanced Components Div., Dept. EM, 735 Palomar Ave., Sunnyvale, Cal. 94086
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
M Teledyne Microwave, Dept. EM, 1290 Terra Bella Ave., Mountain View, Cal. 94040
Texscan Microwave, Dept. EM, 2446 N. Shadeland, Indianapolis, Ind. 46219
TRW Auto-E, Dept. EM, Davis & Copewood Sts., Camden, N.J. 08103
M Wavecom, Dept. EM, 9036 Winnetna Ave., Northridge, Cal. 91324
Wide Band Engrg. Co. Inc., Dept. EM, Box 21652, Phoenix, Ariz. 85036
Winegard Co., Dept. EM, 3000 Kirkwood St., Burlington, Iowa 52601
M Zeta Laboratories, Inc., Dept. EM, 3265 Scott Blvd., Santa Clara, Cal. 95051

Filters, Variable

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
A. P. Circuit Corp., Dept. EM, 865 West End Ave., New York, N.Y. 10025 .... *
M Axel Elctrns., Unit of General Signal, Dept. EM, 134-20 Jamaica Ave., Jamaica, N.Y. 11418 ..... *
M Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734 ..... *
Comstron Seg., Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520 ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
D-B Developments, Dept. EM, 7709 Kilbourne Rd., Rome, NY 13440 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hopkins Engrg., Dept. EM, 12900 Foothill Blvd., San Fernando, Cal. 91342 p. 2632
M Integrated Circuits, Inc., Dept. EM, 13256 Northrup Way, Bellevue, Wash. 98005 ..... *
Ithaco, Inc., Dept. EM, 735 W. Clinton St., Ithaca, N.Y. 14850 ..... p. 2634
M Krohn-Hite Corp., Dept. EM, Avon Ind'l Pk, Bodwell St., Avon, Mass. 02322 p. 2772
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *

Precision Filters, Inc., Dept. EM, 303 W. Lincoln St., Ithaca, N.Y. 14850 p. 2637
RF Interonics, Dept. EM, 100 Pine Air Dr., Bay Shore, N.Y. 11706 ..... *
Rockland Sys. Corp., Dept. EM, 230 W. Nyack Rd., W. Nyack, N.Y. 10994 p. 2804
Telonic/Berkeley, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715 ..... p. 3063
D **Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219 ***
M AIL, Div. Cutler-Hammer, Dept. EM, Comac Road, Deer Park, N.Y. 11729
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
Coil-Q Corp., Dept. EM, 340 Bronxville Rd., Bronxville, N.Y. 10708
M Coleman Microwave Co., Dept. EM, Box 59, Rte. 22, Lebanon, N.J. 08833
Convex Corp., Dept. EM, 2810 Dorr Ave., Fairfax, Va. 22031
M Daden Assocs, Inc., Dept. EM, 23011 Moulton Pky, Ste A12, Laguna Hills, CA 92653
M Deltronic Crystal Inds., Inc., Dept. EM, Box 323, Denville, N.J. 07834
Fogg System Co., Dept. EM, 15592 E. Batavia Dr., Aurora, Colo. 80011
Frequency Engrg. Labs., Dept. EM, Box 527, Farmingdale, N.J. 07727
Gotham Audio Corp., Dept. EM, 741 Washington St., New York, N.Y. 10014
Linear Networks Co., Dept. EM, Box 775, Westminster, Cal. 92683
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
D Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
Multimetrics Div. of Comstro, Comstron-Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11580
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
D Reticon Corp., Dept. EM, 910 Benicia Ave., Sunnyvale, Cal. 94086
D R L C Elctrns., Inc., Dept. EM, 83 Radio Cir., Mt. Kisco, N.Y. 10549
M Seg Subsidiary, Comstron Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520
Sivers Lab, Dept. EM, Box 90339, Los Angeles, Cal. 90009
Systems Research Labs. Inc., Dept. EM, 2800 Indian Ripple Rd., Dayton, Ohio 45440
DM Systron-Donner, Advanced Components Div., Dept. EM, 735 Palomar Ave., Sunnyvale, Cal. 94086
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
Texscan Microwave, Dept. EM, 2446 N. Shadeland, Indianapolis, Ind. 46219
TRW Auto-E, Dept. EM, Davis & Copewood Sts., Camden, N.J. 08103
UFAD Corp., Dept. EM, 700 36th St. S.E., Grand Rapids, Mich. 49508
Voltex Co., Inc., Dept. EM, 115 Marine St., Farmingdale, N.Y. 11735
M Wavecom, Dept. EM, 9036 Winnetna Ave., Northridge, Cal. 91324
DM Yig-Tek Corp., Dept. EM, 1725 De La Cruz Blvd., Santa Clara, Cal. 95050
M Zeta Laboratories, Inc., Dept. EM, 3265 Scott Blvd., Santa Clara, Cal. 95051

Filters, Vestigial Sideband

DM **Andersen Laboratories Inc., Dept. EM, 1280 Blue Hills Ave., Bloomfield, Conn. 06002 ..... ***
M **Axel Elctrns., Unit of General Signal, Dept. EM, 134-20 Jamaica Ave., Jamaica, N.Y. 11418 ..... ***
M **Comstron Seg., Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520 ..... ***
CTS Knights, Inc., Dept. EM, 400 Reimann Ave., Sandwich, Ill. 60548 ..... *
M **ESC Elctrns. Corp., Dept. EM, 534 Bergen Blvd., Palisades Pk., N.J. 07650 ***
M **Frequency Selective Networks, Inc, Dept. EM, 69-20 Garfield Ave., Woodside, N.Y. 11377 ..... ***
M **Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 ..... ***
M **Kappa Networks, Dept. EM, 165 Roosevelt Ave, Carteret, N.J. 07008 ..... ***
M **K R Electronics, Inc., Dept. EM, 91 Avenel St., Avenel, N.J. 07001 ..... ***
RF Interonics, Dept. EM, 100 Pine Air Dr., Bay Shore, N.Y. 11706 ..... *
TT Elctrns., Inc., Dept. EM, 2214 S. Barry Ave., Los Angeles, Cal. 90064 .... *
M Cir-Q-Tel, Inc., Dept. EM, 10504 Wheatley St., Kensington, Md. 20795
M Cirtech Corp, Dept. EM, 15237 Cherry St, Stanley, Kan. 66223
M Coleman Microwave Co., Dept. EM, Box 59, Rte. 22, Lebanon, N.J. 08833
Crystal Technology, Dept. EM, 2510 Old Middlefield Way, Mountain View, Cal 94043
Dale Electronics, Inc., Dept. EM, 930 West 23rd St., Tempe, Ariz. 85282
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal 90230
Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
M Multimetrics Div. of Comstro, Comstron-Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11580
M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
M Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648
M Seg Subsidiary, Comstron Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520

Filters, Waveguide

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
M **Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706 ..... ***
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
McCoy Electronics, Sub Oak Inds. Inc., Dept. EM, Chestnut & Watts, Mt Holly Spr., Pa. 17065 ..... *
M **Metex Corp., Dept. EM, 970 New Durham Rd., Edison, N.J. 08817 ..... ***
RF Interonics, Dept. EM, 100 Pine Air Dr., Bay Shore, N.Y. 11706 ..... *
D **Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219 p. 2830**
M AIL, Div. Cutler-Hammer, Dept. EM, Comac Road, Deer Park, N.Y. 11729
M Aircom, Inc., Dept. EM, Rte. 16B, Union, N.H. 03887
M Airtron, Div. Litton Inds., Dept. EM, 200 E. Hanover Ave., Morris Plains, N.J. 07950
ANEMCO, INC., Dept. EM, 157 Freedom Ave, Anaheim, Cal. 92801
M Cir-Q-Tel, Inc., Dept. EM, 10504 Wheatley St., Kensington, Md. 20795
M Coleman Microwave Co., Dept. EM, Box 59, Rte. 22, Lebanon, N.J. 08833
Frequency Engrg. Labs., Dept. EM, Box 527, Farmingdale, N.J. 07727
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
D Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
D Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
M RF Systems, Inc., Dept. EM, 3100 Communications Rd., St Cloud, Fla. 32769
D R-L C Elctrns., Inc., Dept. EM, 83 Radio Cir., Mt. Kisco, N.Y. 10549
DM Systron-Donner, Advanced Components Div., Dept. EM, 735 Palomar Ave., Sunnyvale, Cal. 94086
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
M Teledyne Microwave, Dept. EM, 1290 Terra Bella Ave., Mountain View, Cal. 94040
Texscan Microwave, Dept. EM, 2446 N. Shadeland, Indianapolis, Ind. 46219
TRG,, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
M UTE Microwave, Dept. EM, 3500 Sunset Ave., Asbury Park, N.J. 07712
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Wavecom, Dept. EM, 9036 Winnetna Ave., Northridge, Cal. 91324
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006
M Zeta Laboratories, Inc., Dept. EM, 3265 Scott Blvd., Santa Clara, Cal. 95051

Flanges, Waveguide

KDI Pyrofilm Corp, Dept. EM, 60 S. Jefferson Rd., Whippany, N.J. 07981 .... *
M **Metex Corp., Dept. EM, 970 New Durham Rd., Edison, N.J. 08817 ..... ***
M Airtron, Div. Litton Inds., Dept. EM, 200 E. Hanover Ave., Morris Plains, N.J. 07950
M Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
Gabriel Elctrns. Inc., Dept. EM, Box 626, Scarborough Ind'l. Pk., Scarborough, Me. 04074
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
D Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
DM Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
M RF Systems, Inc., Dept. EM, 3100 Communications Rd., St Cloud, Fla. 32769
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
TRG,, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006

Flashers

M **Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470 ..... ***
Durakool, Dept. EM, 1010 N. Main St., Elkhart, Ind. 46514 ..... p. 3465
Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040 p. 2325
DM **Hi-G Co., Inc., Dept. EM, 580 Spring St., Windsor Locks, Conn. 06096 ..... ***
M **Info-Lite Corp., Dept. EM, 46-10 104 St., Corona, N.Y. 11368 ..... ***
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
M **Sigmapower, Inc., Dept. EM, 20790 Leapwood Ave., Carson, Cal. 90746 .... ***
Star Micronics Inc., Dept. EM, Pan Am Building, Ste 2308, 200 Park Ave, New York, N.Y. 10017 ..... *
D **Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 .... ***
Abex Corp, Dept. EM, 530 5th Ave, New York, NY 10036
Applied Electro Technology, Inc., Dept. EM, 2220 S. Anne St., Santa Ana, Cal. 92704
Artisan Elctrns. Corp., Dept. EM, 5 Eastmans Rd., Parsippany, N.J. 07054
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
M Electro-Module, Inc., Dept. EM, 2855 Metropolitan Place, Pomona, Cal. 91767
GTE Sylvania Inc., Dept. EM, Rte. 35, Standish, Maine 04084
D Hughey & Phillips, Inc., Dept. EM, 3050 N. California St., Burbank, Cal. 91505
Innovatek Microsystems, Inc., Dept. EM, Smithfield Rd., Millerton, N.Y. 12546
Lark Electronics, Inc., Dept. EM, Box 390, New York, N.Y. 10040
M Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Precision Timer Co., Dept. EM, 13 Westbrook Ind'l. Park, Westbrook, Conn. 06498
D Projects Unlimited, Inc., Dept. EM, 3680 Wyse Rd., Dayton, Ohio 45414
S S A C Inc., Dept. EM, Box 395, Liverpool, N.Y. 13088
D Teledyne Big Beam, Dept. EM, 290 E. Prairie St., Crystal Lake, Ill. 60014
Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803
M Wilmar Elctrns. Inc., Dept. EM, 2430 Amsler St., Torrance, Cal. 90505

Flashlights & Lanterns

D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... ***
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Power Conversion Inc., Dept. EM, 70 MacQuesten Pkwy, S., Mt. Vernon, N.Y. 10550
Snap-On-Tools, Dept. EM, 8192-A 28th Ave., Kenosha, Wisc. 53140
D Teledyne Big Beam, Dept. EM, 290 E. Prairie St., Crystal Lake, Ill. 60014
Whittaker Corp., Dept. EM, 10880 Wilshire Blvd., Los Angeles, Cal. 90024
D Wonder Corp of America, Dept. EM, 24 Harborview Ave, Stamford, Conn. 06904

Flat Packages, Integrated Circuit—See Packages, Integrated Circuit

Fluid Flow Indicators—See Meters, Fluid Flow

Flux, Brazing & Soldering Materials

D **Gardiner Solder Co., Div. of Gardiner Metal Co., Dept. EM, 4820 S. Campbell Ave., Chicago, Ill 60632** ..... p. 4291
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P.Q. Can. H4X 1M8
Air Products & Chemicals, Dept. EM, Box 538, Allentown, PA 18105
D Alpha Metals, Inc., Dept. EM, 600 Rte 440, Jersey City, N.J. 07304
D Bow Solder Products, Dept. EM, P.O. Box 488, 900 Hobson St., Union, N.J. 07083
D Caig Labs., Inc., Dept. EM, 1175-0 Industrial Ave., Box 64, Escondido, Cal. 92025
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
Federated Metals Corp., Dept. EM, 120 Broadway, New York, N.Y. 10005
GTE Sylvania Inc., Western Gold & Platinum Sub., Dept. EM, 477 Harbor Blvd., Belmont, Cal. 94002
Handy & Harman, Dept. EM, 850 Third Ave., New York, N.Y. 10022
D Heeger Inc., Dept. EM, 725 Ceres Ave., Los Angeles, Cal. 90021
Indium Corp. of Amer, Dept. EM, 1676 Lincoln Ave, Box 269, Utica, NY 13503
DM Kenco Alloy & Chemical Co., Inc., Dept. EM, 418 W. Belden Ave., Addison, Ill. 60101
DM Kester Solder Div., Litton Systems Inc., Dept. EM, 4201 Wrightwood Ave., Chicago, Ill. 60639
Lake Chemical Co., Dept. EM, 250 N. Washtenaw Ave, Chicago, Ill. 60612
D LMB Heeger, Inc., Dept. EM, 725 Ceres Ave., Los Angeles, Cal. 90021
D London Chemical Co., Dept. EM, 240 Foster Ave., Bensenville, Ill. 60106
NL Industries, Inc., Metal Div., Dept. EM, 1221 Ave. of Americas, New York, N.Y. 10020
Plessey Inc., Dept. EM, 320 Long Island Expwy. S., Melville, N.Y. 11746
D Superior Flux & Mfg. Co., Dept. EM, 95 Alpha Park, Cleveland, Ohio 44143
DM Tech Spray, Inc., Dept. EM, Box 949, Amarillo, Tex. 79105
Union Carbide Corp., Linde Div., Dept. EM, 270 Park Ave., New York, N.Y. 10017
D Wall-Lenk Mfg. Co., Dept. EM, Box 3349, Dept. EEM-71, Kinston, N.C. 28501

Foil, Capacitor

Fansteel Inc., Dept. EM, One Tantalum Pl., N Chicago, Ill. 60064
M Reynolds Metals Co., Dept. EM, Box 27003, Richmond, VA. 23261
Schweitzer, Div., Kimberly Clark Corp., Dept. EM, Lee, Mass. 01238
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013

Foil, Magnetic

M **Ad-Vance Magnetics, Dept. EM, 226 E. 7th St., Rochester, Ind. 46975** p. 2552
M **Amuneal Mfg. Corp., Dept. EM, 4737 Darrah St., Philadelphia, Pa. 19124** .... *
M **Eagle Magnetic Co., Dept. EM, Box 24282, 7421 Crawfordsville Rd., Indianapolis, Ind. 46224** ..... p. 2555
Inter-Tech. Grp., Inc., Dept. EM, Box 23, Irvington, N.Y. 10533 ..... p. 2557
D **Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101** ..... *
Magnetic Shield Div., Perfection Mica, Dept. EM, 750 North Thomas Dr., Bensenville, Ill. 60106 ..... *
M Allegheny Ludlam Steel Co., Dept. EM, 2000 Oliver Bldg., Pittsburgh, Pa. 15222
Arnold Engineering Co., Dept. EM, Box "G", Marengo, Ill. 60152
Framar Metal Prods Co., Dept. EM, 124 W Main St Dept 1201, High Bridge, N.J. 08829
GTE Sylvania, Wilbur B. Driver Co Sub., Dept. EM, 1875 McCarter Hwy., Newark, N.J. 07104
M Kawecki Berylco Inds., Inc., Dept. EM, PO Box 1462, Reading, PA 19603
D Magnetic Metals Co., Dept. EM, Hayes Ave. at 21st St., Camden, N.J. 08105
M Magnetics, Div/Spang Industries, Inc., Dept. EM, Box 391, Butler, Pa. 16001
Permaluster, Inc., Dept. EM, 1844 N. Keystone St., Burbank, Calif. 91504
D Russell Inds., Inc., Dept. EM, 3069 Lawson Blvd., Oceanside, N.Y. 11572
SGL Electronics, Dept. EM, 300 Harvard Avenue, Westville, N.J. 08093
Soundcoat, Dept. EM, 175 Pearl St., Brooklyn, N.Y. 11201
D Zippertubing Co., Dept. EM, 13000 S. Broadway, Los Angeles, Cal. 90061

Foil, Magnetic Shielding—See Shields, Magnetic

Forks, Tuning—See Tuning Forks

Forms, Coil—See Coil Assemblies & Forms

Forms, Wire

Alpha Metals, Inc., Dept. EM, 600 Rte 440, Jersey City, N.J. 07304
M Art Wire/Doduco, Dept. EM, 9 Wing Dr., Cedar Knolls, N.J. 07927
Associated Spring-Barnes Group Inc., Dept. EM, 18 Main St., Bristol, Conn. 06010
Auto-Swage Products Inc., Dept. EM, 726 River Rd., Shelton, Conn. 06484
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
Calmark Corp., Dept. EM, 4947 Walnut Grove, 4947 Walnut Grove, Cal. 91776
Copperweld Bimetallics, Div. Copperweld Corp., Dept. EM, Glassport, PA 15045
D Eaton Corp., Engineered Fasteners Oper., Dept. EM, Box 6688, Cleveland, Ohio 44101
Emporium Specialties Co., Inc., Dept. EM, Box 65, Austin, Pa. 16720
GTE Sylvania, Tech Prods Div, Dept. EM, 816 Lexington Ave., Warren, Pa 16365
DM Helix Spring Corp., Dept. EM, 35-10 10th St., Long Island City, N.Y. 11106
Kentucky Electronics, Dept. EM, 1204 Ind'l Dr., Box 507, Owensboro, Ky. 42301
Materials Resch. Corp., Dept. EM, Route 303, Orangeburg, N.Y. 10962
Micro Contacts Inc., Dept. EM, 62 Alpha Plaza, Hicksville, N.Y. 11801
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
Permaluster, Inc., Dept. EM, 1844 N. Keystone St., Burbank, Calif. 91504
D SAMTEC, Dept. EM, 810 Progress Blvd., New Albany, Indiana 47150
M Squires Electronics Inc., Dept. EM, 8900 S.W. Burnham Rd. F-13, Tigard, Ore. 97223

Frames, Cabinet & Rack

M **Amco Engineering Co., Dept. EM, 7333 W. Ainslie St., Chicago, Ill. 60656** .. *
D **Augat Interconnection Prods. Div., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703** ..... p. 1722
M **Buckeye Stamping Co., Dept. EM, 555 Marion Rd., Columbus, Ohio 43207** *
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... p. 1469
Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040 .. *
Optima Enclosures, Div. Scientific Atlanta, Dept. EM, 2166 Mountain Ind'l Blvd., Tucker, Ga. 30084 ..... *
Premier Metal Prods. Co., Div. Sunshine Mining Co., Dept. EM, 381 Canal Place, Bronx, N.Y. 10451 ..... *
Skydyne,, Div. Brooks & Perkins Inc., Dept. EM, River Rd., Port Jervis, N.Y. 12771 ..... p. 1047
D **Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342** ..... *
D **Vero Electronics, Dept. EM, 171 Bridge Rd., Hauppauge, N.Y. 11787** .. p. 1320
D Bud Radio, Inc., Dept. EM, 4605 E. 355th St., Willoughby, Ohio 44094
M Craig Sys. Corp., Dept. EM, 360 Merrimack St., Lawrence, Mass. 01842
D-Cemco, Inc., Dept. EM, 3200 N. San Fernando Blvd., Burbank, Calif. 91504
Forma Scientific, Inc., Dept. EM, Box 649, Marietta, Ohio 45750
M G. F. Business Equipment, Inc., Emcor Prods., Dept. EM, 1600 Fourth Ave. N.W., Rochester, Minn. 55901
D Hammond Mfg. Co., Dept. EM, 385 Nagel Dr., Buffalo, NY 14225
High Voltage Engrg. Corp., Dept. EM, S. Bedford St., Burlington, Mass. 01803
Mid-West Metal Prods., Inc., Dept. EM, 456 E. Donovan Rd., Kansas City, Kans. 66115
Modpak, Dept. EM, 31 A Green St., Waltham, Mass. 02154
Overly-Hautz Co., Dept. EM, 8617 Clinton Rd., Cleveland, Ohio 44144
D Par-Metal Prods. Inc., Dept. EM, 1260 Atlantic Ave., Brooklyn, N.Y. 11216
Rostone Corp., Dept. EM, 2781 S. Concord Rd., Lafayette, Ind. 47902
Standard Engineering, Dept. EM, 44800 Industrial Dr., Fremont, Cal. 94538
Zero Corp., Dept. EM, 777 Front St., Burbank, Cal. 91502

Freeze Spray—See Refrigerants, Spray; Coolants, Circuit & Component

Freezer Cabinets—See Refrigerators, Environmental Test

Frequency Analyzers—See Analyzers, Spectrum

Frequency Extenders—See Dividers, Frequency

Frequency Sources—See Oscillators

Function, Modules—See Modules, Logic

Furnaces, Electric

Blue M Electric Co., Dept. EM, 138th & Chatham St., Blue Island, Ill. 60406 *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
Acme Elec. Heating Corp., Dept. EM, 4685 E. 11th, Hialeah, Fla. 33013
M Ajax Magnethermic Corp., Dept. EM, 1745 Overland Ave., N.E., Warren, Ohio 44482
Argus International, Dept. EM, Box 38, Hopewell, N.J. 08525
Casso-Solar Corp., Dept. EM, 125-10 Queens Blvd., Kew Gardens, N.Y. 11415
Chemical Etching Equip. & Supply, Dept. EM, 6905 Beulah St, Alexandria, Va. 22310
D Despatch Oven Co., Dept. EM, P.O. Box 1320, Minneapolis, Minn. 55440
D GCA/Sunnyvale Div., Dept. EM, 1050 Kifer Rd., Sunnyvale, Cal. 94086
Hotpack Corp., Dept. EM, 5148 Cottman Ave., Phila., Pa. 19135
DM L & L Special Furnace Co., Dept. EM, 166 Conchester Rd., Twin Oaks, Pa. 19016
OAL Assocs., Inc., Dept. EM, P.O. Box 64, Escondido, Cal. 92025

Furnaces, Gas (Production)

Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
Chemical Etching Equip. & Supply, Dept. EM, 6905 Beulah St, Alexandria, Va. 22310
D Despatch Oven Co., Dept. EM, P.O. Box 1320, Minneapolis, Minn. 55440
Kahle Engrg. Co., Dept. EM, 3344 Hudson Ave., Union City, N.J. 07087
Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304

Furnaces, Vacuum

M Ajax Magnethermic Corp., Dept. EM, 1745 Overland Ave., N.E., Warren, Ohio 44482
D CVC Products, Inc., Dept. EM, 525 Lee Rd., Box 1886, Rochester, N.Y. 14603
High Vacuum Equip. Corp., Dept. EM, 110 Industrial Pk Rd, Hingham, Mass. 02043
D Hull Corp., Dept. EM, Davisville Rd., Hatboro, Pa. 19040
Kahle Engrg. Co., Dept. EM, 3344 Hudson Ave., Union City, N.J. 07087
T-M Vacuum Prods., Dept. EM, Warrington & Rowland, Riverton, N.J. 08077
DM Ulvac North America, Dept. EM, Colchester Plaza, Colchester, VT 05446
Vactronic Lab. Equip., Inc., Dept. EM, 65 Brightside Ave., E. Northport, N.Y. 11731
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Furniture, Electronic Lab.—See Benches, Consoles, Stools, Tables (Lab & Shop)

Fuse Clips—See Clips & Holders, Fuse

Fuses

Alden Products Co, Dept. EM, 117 N Main St, Brockton, Mass. 02403 ..... *
D **Bel Fuse, Dept. EM, 203 Van Vorst, Jersey City, N.J. 07302** ..... *
DM **Bussmann Manufacturing, Div. McGraw-Edison Co., Dept. EM, P.O. Box 14460, St. Louis, Mo. 63178** ..... p. 4002-4004,4007

D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
D **International Rectifier Corp., Semiconductor Div., Dept. EM, 233 Kansas St., El Segundo, Cal. 90245** ..... *
D **Littelfuse, Inc., Dept. EM, 800 E. Northwest Hwy., Des Plaines, Ill. 60016** p. 4101
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
D Carbone Lorraine Industries Corp., Dept. EM, 400 Myrtle Ave., Boonton, N.J. 07005
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So. Iselin, NJ 08830
D General Elec. Co, Wiring Device Bus. Dept., Dept. EM, 95 Hathaway St., Providence, R.I. 02904
Leviton Mfg. Co., Inc., Dept. EM, 59-25 Little Neck Pkwy., Little Neck, N.Y. 11362
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Panel Components Corp., Dept. EM, 2015 Second St., Berkeley, Cal. 94710
Payne Engrg. Co., Dept. EM, Box 70, Scott Depot, W. Va. 25560
M Raymond Engrg. Inc., Dept. EM, 217 Smith St., Middletown, Conn. 06457
San-O Industrial Corp., Dept. EM, 35-P Orville Dr., Bohemia, N.Y. 11716
SHOGYO International Corp., Dept. EM, 300 Northern Blvd., Great Neck, N.Y. 11021
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Fuses, Failure Indicating

Alden Products Co, Dept. EM, 117 N Main St, Brockton, Mass. 02403 ..... *
DM **Bussmann Manufacturing, Div. McGraw-Edison Co., Dept. EM, P.O. Box 14460, St. Louis, Mo. 63178** ..... p. 4002-4004,4007
D **International Rectifier Corp., Semiconductor Div., Dept. EM, 233 Kansas St., El Segundo, Cal. 90245** ..... p. 3928
D **Littelfuse, Inc., Dept. EM, 800 E. Northwest Hwy., Des Plaines, Ill. 60016** .... *
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
D Carbone Lorraine Industries Corp., Dept. EM, 400 Myrtle Ave., Boonton, N.J. 07005
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Puleo Electronics, Inc., Dept. EM, 39 Hutcheson Pl., Lynbrook, N.Y. 11563
M Raymond Engrg. Inc., Dept. EM, 217 Smith St., Middletown, Conn. 06457

Fuses, Thermal

DM **Bussmann Manufacturing, Div. McGraw-Edison Co., Dept. EM, P.O. Box 14460, St. Louis, Mo. 63178** ..... *
D **Littelfuse, Inc., Dept. EM, 800 E. Northwest Hwy., Des Plaines, Ill. 60016** .... *
D **Midwest Components, Dept. EM, 1981 Port City Blvd., Muskegon, Mich. 49400** ..... p. 4280
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
Micro, Emerson Electric Co. Devices Div, Dept. EM, Box 501 Wright Bros Br, Dayton, Ohio 45409
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Raymond Engrg. Inc., Dept. EM, 217 Smith St., Middletown, Conn. 06457
San-O Industrial Corp., Dept. EM, 35-P Orville Dr., Bohemia, N.Y. 11716
Therm-O-Disc, Inc., Dept. EM, South Main St., Mansfield, Ohio 44907
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Fuses, Time Delay

DM **Bussmann Manufacturing, Div. McGraw-Edison Co., Dept. EM, P.O. Box 14460, St. Louis, Mo. 63178** ..... p. 4003
D **Littelfuse, Inc., Dept. EM, 800 E. Northwest Hwy., Des Plaines, Ill. 60016** .... *
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
D General Elec. Co, Wiring Device Bus. Dept., Dept. EM, 95 Hathaway St., Providence, R.I. 02904
Micro, Emerson Electric Co. Devices Div, Dept. EM, Box 501 Wright Bros Br, Dayton, Ohio 45409
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Panel Components Corp., Dept. EM, 2015 Second St., Berkeley, Cal. 94710
M Raymond Engrg. Inc., Dept. EM, 217 Smith St., Middletown, Conn. 06457
San-O Industrial Corp., Dept. EM, 35-P Orville Dr., Bohemia, N.Y. 11716

Gages, Displacement, Linear

Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Marlow Industries, Inc., Dept. EM, 1021 S. Jupiter Rd., Garland, Tex. 75042 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Applied Control Co., Dept. EM, 1275 Bloomfield Ave., Fairfield, N.J. 07006
Automatic Timing & Controls Co., Dept. EM, King of Prussia, Pa. 19406
M Bicron Elctrns. Co., Dept. EM, Box 807, Barlow St., Canaan, Conn. 06018
Bourns, Inc., Instr. Div., Dept. EM, 6135 Magnolia, Riverside, Calif. 92506
Gould, Inc., Meas. Sys. Div., Dept. EM, 2230 Statham Blvd., Oxnard, Cal. 93030
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
M Kaman Sciences Corp., Dept. EM, 1500 Garden of the Gods Rd. P.O. Box 7463, Colorado Springs, Colo. 80933
Leitz, Inc. E., Dept. EM, Link Crescent, Rockleigh, N.J. 07647
M Moxon Inc., Dept. EM, 2222 Michelson Dr. Bldg. E, Irvine, Cal. 92715
Nuclear Resch. Corp., Dept. EM, 1105 Indl. Hwy., Southampton, Pa. 18966
Robinson-Halpern Co., Dept. EM, One Apollo Rd., Plymouth Meeting, Pa. 19462
Schaevitz Engrg., Dept. EM, U.S. 130, Union Ave., Pennsauken, N.J. 08110
Siltran Digital, Dept. EM, 14831 Kitterman, Box 437, Silverado, Cal. 92676
Temposonics Inc., Dept. EM, 131 East Ames Ct, Plainview, N.Y. 11803
Trans-Tek, Inc., Dept. EM, Rte. 83, Ellington, Conn. 06029
West Coast Resch. Corp., Dept. EM, Box 25061, Los Angeles, Cal. 90025

Gages, Ionization

NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D CVC Products, Inc., Dept. EM, 525 Lee Rd., Box 1886, Rochester, N.Y. 14603
Fredericks Co., Dept. EM, Philmont & Anne Sts., Huntingdon Valley, Pa. 19006
M Harshaw Chemical Co., A Kenanee Industry, Dept. EM, 6801 Cochran Rd., Solon, Ohio 44139
High Voltage Engrg. Corp., Dept. EM, S. Bedford St., Burlington, Mass. 01803
Nuclear Resch. Corp., Dept. EM, 1105 Indl. Hwy., Southampton, Pa. 18966
D Perkin-Elmer Ultek Inc., Dept. EM, Box 10920, Palo Alto, Cal. 94303
T-M Vacuum Prods., Dept. EM, Warrington & Rowland, Riverton, N.J. 08077
DM Ulvac North America, Dept. EM, Colchester Plaza, Colchester, VT 05446
Vactronic Lab. Equip., Inc., Dept. EM, 65 Brightside Ave., E. Northport, N.Y. 11731
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Gages, Pressure-Also See Transducers, Pressure

BBN Instruments Co., Div. Bolt Beranek & Newman, Inc., Dept. EM, 50 Moulton St., Cambridge, Mass. 02138 ..... *
Faria Meter Corp., Dept. EM, 19 Faria Lane, Uncasville, Conn. 06382 ..... *
Harrel, Inc., Dept. EM, 16 Fitch St., E. Norwalk, Conn. 06855 ..... p. 2267
Kulite Semiconductor Prod., Dept. EM, 1030 Hoyt Ave., Ridgefield, N.J. 07657 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... p. 2278
M Accurate Instrument Co., Dept. EM, Box No. 925, Westbury, N.Y. 11590
Air Products & Chemicals, Dept. EM, Box 538, Allentown, PA 18105
Airco Industrial Gases, Dept. EM, 575 Mountain Ave., Murray Hill, N.J. 07974
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
Bailey Meter Co., Sub. Babcock & Wilcox, Dept. EM, 29801 Euclid Ave., Wickliffe, Ohio 44092
Bourns, Inc., Instr. Div., Dept. EM, 6135 Magnolia, Riverside, Calif. 92506
Consolidated Controls Corp., Dept. EM, 15 Durant Ave., Bethel, Conn. 06801
Dillon, W.C. & Co., Dept. EM, 14620-EP Keswick St., Van Nuys 340, Cal. 91407
D Dynisco, Dept. EM, 20 S. West Pk., Westwood, Mass. 02090
Gould, Inc., Meas. Sys. Div., Dept. EM, 2230 Statham Blvd., Oxnard, Cal. 93030
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
Kollsman Instr. Co., Dept. EM, Daniel Webster Hwy., Merrimack, N.H. 03054
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Magnaflux Corp., Dept. EM, 7328 W. Lawrence Ave., Chicago, Ill 60656
DM Matheson Gas Products, Dept. EM, Box 85, East Rutherford, N.J. 07073
MKS Instrs., Inc., Dept. EM, 22 Third Ave., Burlington, Mass. 01803
OTC Div Owatonna Tool Co, Dept. EM, 395 Eisenhower Dr., Owatonna, Minn. 55060
Plessey Enviromental Sys., Dept. EM, 3939 Ruffin Rd., San Diego, Cal. 92123
D Robertshaw Controls Co., Ind'l. Instr. Div., Dept. EM, 1910 Byrd Ave Ste 200, Richmond, Va. 23230
Rosemount Inc., Dept. EM, Box 35129, Minneapolis, Minn. 55435
Schaevitz Engrg., Dept. EM, U.S. 130, Union Ave., Pennsauken, N.J. 08110
Schauer Mfg. Corp., Dept. EM, 4500 Alpine Ave., Cincinnati, Ohio 45242
Siltran Digital, Dept. EM, 14831 Kitterman, Box 437, Silverado, Cal. 92676
Sundstrand Data Control, Dept. EM, Overlake Ind'l. Pk., Redmond, Wash. 98052
Tescom Instr. Div., Dept. EM, 2600 Niagara La. N., Minneapolis, Minn. 55441
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
D Yellow Springs Instrument Co., Dept. EM, Box 279, Yellow Springs, Ohio 45387

Gages, Strain

Kulite Semiconductor Prod., Dept. EM, 1030 Hoyt Ave., Ridgefield, N.J. 07657 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D Ailtech, Dept. EM, 2070 Fifth Ave, Ronkonkoma, NY 11779
BLH Elctrns., Dept. EM, 42 Fourth Ave., Waltham, Mass. 02154
Entran Devices, Inc., Dept. EM, 145 Paterson Ave., Little Falls, N.J. 07424
Gould, Inc., Meas. Sys. Div., Dept. EM, 2230 Statham Blvd., Oxnard, Cal. 93030
Gulton Inds., Inc., Servonic/Instrumentation Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
Magnaflux Corp., Dept. EM, 7328 W. Lawrence Ave., Chicago, Ill 60656
Micro-Measurements Div., Vishay Intertechnology, Inc., Dept. EM, Box 306, Romulus, Mich. 48174
West Coast Resch. Corp., Dept. EM, Box 25061, Los Angeles, Cal. 90025

Galvanometers—See Meters, Galvanometer

Gaskets—See Seals

Gaskets, Shielding, R-F-Also See Shields, R-F

Chomerics, Inc., Dept. EM, 77 Dragon Court, Woburn, Mass. 01801 ..... *
Compac, Dept. EM, 279-I Skidmore Rd., Deer Park, N.Y. 11729 ..... p. 1026
Instrument Specialties, Dept. EM, 276 Bergen Blvd., Little Falls, N.J. 07424 p. 2558,2559
M **McLean Engrg. Labs., Dept. EM, 70 Washington Rd., Princeton Jctn., N.J. 08550** ..... *
M **Metex Corp., Dept. EM, 970 New Durham Rd., Edison, N.J. 08817** ..... p. 2566
Portescap US, Dept. EM, 730 Fifth Ave., New York, N.Y. 10019 ..... *
M **Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612** ..... *
Spectrum Control, Inc., Dept. EM, 152 E. Main St., Fairview, Pa. 16415 ..... *
D **Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342** ..... *
M Airtron, Div. Litton Inds., Dept. EM, 200 E. Hanover Ave., Morris Plains, N.J. 07950
Anchor Plastics, Dept. EM, 36-36 36th, Long Island City, N.Y. 11106
M Auburn Mfg., Dept. EM, Pease Ave. & Stack St., Middletown, Conn. 06457
Connecticut Hard Rubber Co., Dept. EM, 407 East St., New Haven, Conn. 06509
Emerson & Cuming, Inc., Dielectric Mat'ls. Div., Dept. EM, 869 Washington St., Canton, Mass. 02021
Hartwell Corp., Dept. EM, 900 S. Richfield Rd., Placentia, Cal. 92670

D Penn Fibre & Specialty, Dept. EM, 2020 E. Westmoreland St., Phila., Pa. 19134
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
Tapecon, Inc., Dept. EM, 475 River St., Rochester, N.Y. 14612
D Tecknit, Dept. EM, 129 E. Dermody St., Cranford, N.J. 07016

Gates, Computer Circuit (AND, OR, NOR, ETC.)—See Cards, Logic; IC's, Logic Circuits

Gearheads & Speed Reducers

D **Canon U.S.A., Inc., Dept. EM, 10 Nevada Dr., Lake Success, N.Y. 11040** ..... *
Eastern Air Devices Motor Div., Electro Audio Dynamics, Inc., Dept. EM, 1 Progress Dr., Dover, N.H. 03820 ..... *
I M C Magnetics, Eastern Div., Dept. EM, 570 Main St., Westbury, N.Y. 11590 *
D **Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101** ..... *
M **Micro-Mo Electronics Inc., Dept. EM, 3691 Lee Rd., Cleveland, Ohio 44120** *
Portescap US, Dept. EM, 730 Fifth Ave., New York, N.Y. 10019 ..... p. 3105
TRW/Globe Motors, Dept. EM, 2275 Stanley Ave., Dayton, Ohio 45404 ..... *
M **Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729** ..... *
Eaton Corp., Ind'l. Drives Div., Dept. EM, 9919 Clinton Rd., Cleveland, Ohio 44111
Evershed & Vignoles Ltd., Dept. EM, Action Lane, Chiswick, London, England W4 5HJ
M MPC Prods. Corp., Dept. EM, 4200 W. Victoria Ave., Chicago, Ill. 60646
PIC Design Div., Benrus Corp., Dept. EM, Benrus Center, Rte 7, Ridgefield, Conn. 06877
Precision Mechanisms Corp., Dept. EM, 44 Brooklyn Ave., Westbury, N.Y. 11590
Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424

Gears & Gear Mechanisms (Precision)

Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... p. 2422
Graphite Metallizing Corp., Dept. EM, 1036 Nepperhan Ave., Yonkers, N.Y. 10702 ..... p. 3088
I M C Magnetics, Eastern Div., Dept. EM, 570 Main St., Westbury, N.Y. 11590 *
Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735 ..... *
Jackson Bros., (London) Ltd., Dept. EM, 258 Bway., New York, N.Y. 10007 *
D **Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101** ..... p. 2424
M **Micro-Mo Electronics Inc., Dept. EM, 3691 Lee Rd., Cleveland, Ohio 44120** *
Portescap US, Dept. EM, 730 Fifth Ave., New York, N.Y. 10019 ..... p. 3105
Berg Inc., Winfred M., Dept. EM, 499 Ocean Ave., East Rockaway, N.Y. 11518
Eaton Corp., Ind'l. Drives Div., Dept. EM, 9919 Clinton Rd., Cleveland, Ohio 44111
Evershed & Vignoles Ltd., Dept. EM, Action Lane, Chiswick, London, England W4 5HJ
Gibson/Egan Co., Dept. EM, 2666 East Huntington Dr., Duarte, CA. 91010
M Instru-Lec Corp., Dept. EM, 520 Homestead Ave., Mt. Vernon, N.Y. 10550
Invincible Gear Co., Dept. EM, 14938 Telegraph Rd., Detroit, Mich. 48239
Kwikset Powdered Metal Prods., Kwikset Div-Emhart Inds. Inc., Dept. EM, Box 4250P, Anaheim, Cal. 92803
M MPC Prods. Corp., Dept. EM, 4200 W. Victoria Ave., Chicago, Ill. 60646
Perfect Gear & Instr. Corp., Sub. Designatronics, Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
PIC Design Div., Benrus Corp., Dept. EM, Benrus Center, Rte 7, Ridgefield, Conn. 06877
M Precision Mechanisms Corp., Dept. EM, 44 Brooklyn Ave., Westbury, N.Y. 11590
DM Stock Drive Prods., Div. Designatronics, Inc., Dept. EM, 55 S. Denton Ave., New Hyde Pk., N.Y. 11040
D Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
M Transicoil, Inc., Dept. EM, Worcester, Pa. 19490
M Western Gear Corp., Applied Tech. Div., Dept. EM, 14724 E. Proctor, City of Industry, Cal. 91744
Western Gear Corp., Electro Prods. Oper., Dept. EM, 14724 East Proctor, City of Industry, Cal 91749

Generators, A-M

ADRET/COMSTRON, Dept. EM, 200 E. Sunrise Hwy, Freeport, NY 11520 p. 2682,2683
American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
D **B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635** ..... p. 2678
Boonton Electronics Corp., Dept. EM, Route #287, Parsippany, N.J. 07054 *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 ..... *
Comstron Corp., Dept. EM, 200 E. Sunrise Hwy., Freeport, N.Y. 11520 p. 2682,2683
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Exact Electronics, Inc., Dept. EM, Box 160, 455 SE 2nd Ave., Hillsboro, Ore. 97123 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 ..... *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803 p. 2775
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Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... p. 2780
M **MCL, Inc., Dept. EM, 10 North Beach Ave., LaGrange, Ill. 60525** ..... *
Rockland Sys. Corp., Dept. EM, 230 W. Nyack Rd., W. Nyack, N.Y. 10994 ..... *
DM **Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518** ..... *
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... p. 2836
Wavetek Indiana, Inc., Dept. EM, 66 N. First Ave., Beech Grove, Ind. 46107 *
Clemens Mfg. Co., Dept. EM, 630 So. Berry Rd., St. Louis, Mo. 63122
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
M LogiMetrics Inc., Dept. EM, 121-03 Dupont St., Plainview, NY 11803
Meguro Electronics Corp, Dept. EM, No. 5-1 2-Chome Chuo Meguro-ku, Tokyo, Japan
Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
D Wilson Co., H. M., Dept. EM, 11501 Chimney Rock Rd., Houston, Tex. 77035

Generators, A-M/F-M

ADRET/COMSTRON, Dept. EM, 200 E. Sunrise Hwy, Freeport, NY 11520 p. 2682
American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Boonton Electronics Corp., Dept. EM, Route #287, Parsippany, N.J. 07054 *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 ..... *
Comstron Corp., Dept. EM, 200 E. Sunrise Hwy., Freeport, N.Y. 11520 p. 2682
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Exact Electronics, Inc., Dept. EM, Box 160, 455 SE 2nd Ave., Hillsboro, Ore. 97123 ..... *
D **Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108** *
Interstate Electronics, Dept. EM, Box 3117, Anaheim, Cal. 92803 ..... *
London Co., Dept. EM, 811 Sharon Dr., Westlake, Ohio 44145 ..... p. 2803
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... p. 2780
Rockland Sys. Corp., Dept. EM, 230 W. Nyack Rd., W. Nyack, N.Y. 10994 ..... *
Telonic/Berkeley, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715 ..... p. 3063
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
M **Wavetek Indiana, Inc., Dept. EM, 66 N. First Ave., Beech Grove, Ind. 46107** *
M Cushman Electronics, Dept. EM, 2400 N. 1st St., San Jose, Cal. 95112
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
M LogiMetrics Inc., Dept. EM, 121-03 Dupont St., Plainview, NY 11803
Meguro Electronics Corp, Dept. EM, No. 5-1 2-Chome Chuo Meguro-ku, Tokyo, Japan
D REI Sales Co., Dept. EM, 1 North Ave, Burlington, Mass. 01803
D Sencore, Dept. EM, 3200 Sencore Dr., Sioux Falls, S.D. 57107
D Tau-Tron Inc., Dept. EM, 11 Esquire Rd., N. Billerica, Mass. 01862
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
D Wiltron Co., Dept. EM, 825 E. Middlefield Rd., Mt. View, Cal 94043

Generators, Audio

M **Accutronics-A Hammond Corp., Dept. EM, 628 North St., Box 590, Geneva, Ill. 60134** ..... *
ADRET/COMSTRON, Dept. EM, 200 E. Sunrise Hwy, Freeport, NY 11520 p. 2683
American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
D **California Instrs., Dept. EM, 5150-Convoy St., San Diego, Cal. 92111** ..... *
Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 ..... *
Comstron Corp., Dept. EM, 200 E. Sunrise Hwy., Freeport, N.Y. 11520 p. 2683
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Exact Electronics, Inc., Dept. EM, Box 160, 455 SE 2nd Ave., Hillsboro, Ore. 97123 ..... *
M **Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040** ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 ..... *
D **Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108** *
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 ..... *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
Interstate Electronics, Dept. EM, Box 3117, Anaheim, Cal. 92803 ..... *
M **Krohn-Hite Corp., Dept. EM, Avon Ind'l Pk, Bodwell St., Avon, Mass. 02322** p. 2773
D **Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803** *
London Co., Dept. EM, 811 Sharon Dr., Westlake, Ohio 44145 ..... *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... *
Marine Electric Railway Prods. Div., Inc., Dept. EM, 167 National Rd., Edison, N.J. 08817 ..... *
Rockland Sys. Corp., Dept. EM, 230 W. Nyack Rd., W. Nyack, N.Y. 10994 ..... *
Telonic/Berkeley, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715 ..... *
VIZ Manufacturing Co., Dept. EM, 335 E. Price St., Phila, Pa. 19144 ..... p. 2833
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
Wavetek Indiana, Inc., Dept. EM, 66 N. First Ave., Beech Grove, Ind. 46107 *
D Ailtech, Dept. EM, 2070 Fifth Ave, Ronkonkoma, NY 11779
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
Alpha-M Corp, Dept. EM, 3009 Wildflower Drive, Dallas, Tx. 75229
D Barker & Williamson, Inc., Dept. EM, Canal St., Bristol, Pa. 19007
Cal-Tek Engrg, Dept. EM, 29 Pemberton Rd., Wayland, Mass. 01778
M Cushman Electronics, Dept. EM, 2400 N. 1st St., San Jose, Cal. 95112
M Digitech Data Inds., Dept. EM, 66 Grove St., Box 547, Ridgefield, Conn. 06877

FSI/Fork Standards Inc., Dept. EM, 211 Main St., W. Chicago, Ill. 60185
Meguro Electronics Corp, Dept. EM, No. 5-1 2-Chome Chuo Meguro-ku, Tokyo, Japan
M Nelson Ross Elctrns., Dept. EM, 5 Delaware, Lake Success, N.Y. 11040
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
D Projects Unlimited, Inc., Dept. EM, 3680 Wyse Rd., Dayton, Ohio 45414
Real Time Systems Inc., Dept. EM, 152 S. MacQuesten Pkwy., Mt. Vernon, N.Y. 10550
Shure Brothers, Inc., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204
Solar Elctrns. Co., Dept. EM, 901 N. Highland, Hollywood, Cal. 90038
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
T-F Electronics Inc., Dept. EM, 9415 Neils Thompson Dr., Austin, Tex. 78759
Tech Serv., Inc., BRS/LVE Div, Dept. EM, 5301 Holland Dr., Beltsville, Md 20705
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
D Wilson Co., H. M., Dept. EM, 11501 Chimney Rock Rd., Houston, Tex. 77035

Generators, Bar, Dot & Crosshatch

D B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 ..... *
Colorado Video, Inc., Dept. EM, Box 928, Boulder, Colo. 80306 p. 1370,1375
D Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803 p. 2775
D Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... *
Nuclear Resch. Corp., Dept. EM, 1105 Indl. Hwy., Southampton, Pa. 18966
D Sencore, Dept. EM, 3200 Sencore Dr., Sioux Falls, S.D. 57107
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Visual Information Institute Inc., Dept. EM, Box 33, Xenia, Ohio 45385

Generators, Character

M Chrono-log Corp., Dept. EM, 2 W. Park Rd., Havertown, Pa. 19083 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Ann Arbor Terminals, Inc., Dept. EM, 6107 Jackson Rd., Ann Arbor, Mich. 48103
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
M Digitech Data Inds., Dept. EM, 66 Grove St., Box 547, Ridgefield, Conn. 06877
Information Displays, Inc., Dept. EM, 150 Clearbrook Rd., Elmsford, N.Y. 10523
Moxon Inc., Dept. EM, 2222 Michelson Dr. Bldg. E, Irvine, Cal. 92715
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Generators, Citizens Band

D B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 ..... *
D Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... *
Meguro Electronics Corp, Dept. EM, No. 5-1 2-Chome Chuo Meguro-ku, Tokyo, Japan
D Sencore, Dept. EM, 3200 Sencore Dr., Sioux Falls, S.D. 57107

Generators, Color Bar

D B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
D Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
D Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803 *
D Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... *
D Lectrotech, Inc., Dept. EM, 5810 N. Western Ave., Chicago, Ill. 60659
D Sencore, Dept. EM, 3200 Sencore Dr., Sioux Falls, S.D. 57107
D Tau-Tron Inc., Dept. EM, 11 Esquire Rd., N. Billerica, Mass. 01862
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077

Generators, Digital Delay—See Generators Pulse

Generators, Electrical Power

Abacus Controls Inc., Dept. EM, 89 Redington Rd., Somerville, N.J. 08876 *
Behlman Engineering Corp., Dept. EM, Box 4518, 427 N. Nopal St., Santa Barbara, Cal. 93103 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
M Georator Corporation, Dept. EM, Box 70, Manassas, Va. 22110 p. 3262,3264,3386,3388
Marine Electric Railway Prods. Div., Inc., Dept. EM, 167 National Rd., Edison, N.J. 08817 ..... *
TRW/Globe Motors, Dept. EM, 2275 Stanley Ave., Dayton, Ohio 45404 ..... *
M Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040 *
M American Electronics, Inc., Dept. EM, 1600 E Valencia Dr., Fullerton, Cal. 92631
D Atlas Energy Systems, Dept. EM, 9459 Rush St., S. El Monte, Cal. 91733
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
M Columbia Electric Mfg. Co., Dept. EM, 4519 Hamilton Ave. N.W., Cleveland, Ohio 44114
Dresser Industries, Dept. EM, 1505 Elm St., Dallas, Tex. 75201
M Electric Machinery Mfg. Co., Dept. EM, 800 Central Ave., Minneapolis, Minn. 55413
Electro-Pacific, Inc., Dept. EM, 5782 Thornwood Dr., Goleta, Calif. 93017
Kato Engineering Co., Dept. EM, 1415 1st Ave., Mankato, Minn. 56001
Magnetic Products, Inc., Dept. EM, Box 1125, New London, N.H. 03257
D Onan Div-Onan Corp., Dept. EM, 1400 73rd Ave. N.E., Minneapolis, Minn. 55432

Generators, F-M

ADRET/COMSTRON, Dept. EM, 200 E. Sunrise Hwy, Freeport, NY 11520 p. 2682
American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
Boonton Electronics Corp., Dept. EM, Route #287, Parsippany, N.J. 07054 *
Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 ..... *
Comstron Corp., Dept. EM, 200 E. Sunrise Hwy., Freeport, N.Y. 11520 p. 2682
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Exact Electronics, Inc., Dept. EM, Box 160, 455 SE 2nd Ave., Hillsboro, Ore. 97123 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
Interstate Electronics, Dept. EM, Box 3117, Anaheim, Cal. 92803 ..... *
M Krohn-Hite Corp., Dept. EM, Avon Ind'l Pk, Bodwell St., Avon, Mass. 02322 *
London Co., Dept. EM, 811 Sharon Dr., Westlake, Ohio 44145 ..... p. 2803
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M Polarad Elctrn. Instrs., Dept. EM, 5 Delaware Dr., Lake Success, N.Y. 11040 *
Rockland Sys. Corp., Dept. EM, 230 W. Nyack Rd., W. Nyack, N.Y. 10994 .. *
DM Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518 ..... *
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... p. 2836
Wavetek Indiana, Inc., Dept. EM, 66 N. First Ave., Beech Grove, Ind. 46107 *
Cal-Tek Engrg, Dept. EM, 29 Pemberton Rd., Wayland, Mass. 01778
M Cushman Electronics, Dept. EM, 2400 N. 1st St., San Jose, Cal. 95112
M Assocs. Inc., Dept. EM, 333 W. Commercial St., East Rochester, N.Y. 14445
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
M LogiMetrics Inc., Dept. EM, 121-03 Dupont St., Plainview, NY 11803
Meguro Electronics Corp, Dept. EM, No. 5-1 2-Chome Chuo Meguro-ku, Tokyo, Japan
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Video Research Corporation, Dept. EM, 6985 Garden Rd., Riviera Beach, Fla. 33404

Generators, FM/Stereo

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
D Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803 *
London Co., Dept. EM, 811 Sharon Dr., Westlake, Ohio 44145 ..... p. 2803
D Philips Test & Measuring Instrs., Dept. EM, 85 McKee Dr., Mahwah, NJ 07430 ..... *
M LogiMetrics Inc., Dept. EM, 121-03 Dupont St., Plainview, NY 11803
Meguro Electronics Corp, Dept. EM, No. 5-1 2-Chome Chuo Meguro-ku, Tokyo, Japan
D Sencore, Dept. EM, 3200 Sencore Dr., Sioux Falls, S.D. 57107

Generators, Function

M Accutronics-A Hammond Corp., Dept. EM, 628 North St., Box 590, Geneva, Ill. 60134 ..... *
D B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 ..... p. 2678
Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734 ..... *
Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 ..... p. 2681
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
D Continental Specialties Corp., Dept. EM, Box 1942, 70 Fulton Terr, New Haven, Conn. 06509 ..... *
E & L Instruments, Inc., Dept. EM, 61 First St., Derby, Conn. 06418 ..... *
Exact Electronics, Inc., Dept, EM, Box 160, 455 SE 2nd Ave., Hillsboro, Ore. 97123 ..... p. 2733
D General Magnetics, Dept. EM, 211 Grove St., Bloomfield, N.J. 07003 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
Infodex, Inc., Dept. EM, 7 Cherry Ave., Waterbury, Conn. 06702 ..... p. 2486
Interstate Electronics, Dept. EM, Box 3117, Anaheim, Cal. 92803 p. 2760,2761
M Kepco, Inc., Dept. EM, 131-38 Sanford Ave., Flushing, N.Y. 11352 ..... *
M Krohn-Hite Corp., Dept. EM, Avon Ind'l Pk, Bodwell St., Avon, Mass. 02322 p. 2773
M Perkin-Elmer Corp., Elctrn. Prods. Dept., Dept. EM, Main Ave., Norwalk, Conn. 06856 ..... *
Philamon, Inc., Dept. EM, 33 Dubon Ct., Farmingdale, N.Y. 11735 ..... p. 2353
D Philips Test & Measuring Instrs., Dept. EM, 85 McKee Dr., Mahwah, NJ 07430 ..... *
DM Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518 ..... *
VIZ Manufacturing Co., Dept. EM, 335 E. Price St., Phila, Pa. 19144 .... p. 2833
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... p. 2836
M Wavetek Indiana, Inc., Dept. EM, 66 N. First Ave., Beech Grove, Ind. 46107 *
Anadex Inc., Dept. EM, 9825 De Soto, Chatsworth, Cal. 91311
M A.R.F. Products, Dept. EM, Box 3226, Boulder, Colo. 80303
Bailey Meter Co., Sub. Babcock & Wilcox, Dept. EM, 29801 Euclid Ave., Wickliffe, Ohio 44092
Cal-Tek Engrg, Dept. EM, 29 Pemberton Rd., Wayland, Mass. 01778
D Digiac Corp., Dept. EM, 175 Engineers Rd., Smithtown, N.Y. 11787
GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854
D General Computers, Inc., Dept. EM, 5990 W. Pico Blvd., Los Angeles, Calif. 90035
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Instrument Research Co., Dept. EM, Box 40207, Santa Barbara, Cal. 93103

Kikusui Elctrns Corp., Dept EM, 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
M Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
McFadden Elctrns. Co., Dept. EM, 8953 S. Atlantic Blvd., South Gate, Cal. 90280
M Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
MTS Systems Corp., Dept. EM, Box 24012, Minneapolis, Minn 55424
Real Time Systems Inc., Dept. EM, 152 S. MacQuesten Pkwy., Mt. Vernon, N.Y. 10550
Shapiro Scientific Inst., Dept. EM, 3500 E. Coast Hwy., Corona del Mar, Cal. 92625
D Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Teledyne Philbrick, Dept. EM, 17 Allied Dr. Rte 128, Dedham, Mass. 02026

Generators, Gating/Timing

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Austron, Inc., Dept. EM, 1915 Kramer La., Austin, Tex. 78758 ..... *
M **Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470** ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
M **Computer Devices Corp., Dept. EM, 63 Austin Blvd., Commack, N.Y. 11725** *
Comstron Seg., Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520 ..... *
Exact Electronics, Inc., Dept. EM, Box 160, 455 SE 2nd Ave., Hillsboro, Ore. 97123 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735 ..... p. 3977
M **Trak Systems, Div. TRAK Microwave Corp., Dept. EM, 4722 Eisenhower Blvd., Dept. E8, Tampa, Fla. 33614** ..... p. 1669,1670
Berkeley Nucleonics, Dept. EM, 1198 Tenth St., Berkeley, Cal. 94710
FSI/Fork Standards Inc., Dept. EM, 211 Main St., W. Chicago, Ill. 60185
M Harshaw Chemical Co., A Kenanee Industry, Dept. EM, 6801 Cochran Rd., Solon, Ohio 44139
Instrument Research Co., Dept. EM, Box 40207, Santa Barbara, Cal. 93103
Meloy Labs Inc., Instrus. & Sys. Div., Dept. EM, 6715 Electronic Dr., Springfield, Va. 22151
M Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
Moxon Inc., Dept. EM, 2222 Michelson Dr. Bldg. E, Irvine, Cal. 92715
Multimetrics Div. of Comstro, Comstron-Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11580
Rantec Div., Emerson Elec. Co., Dept. EM, 24003 Ventura Blvd., Calabasas, Calif. 91302
Seg Subsidiary, Comstron Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520
Spectracom Corp., Dept. EM, 1667 Penfield Rd., Rochester, N.Y. 14625
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803

Generators, Hall

M **American Aerospace Controls, Dept. EM, 131 Verdi St., Farmingdale, N.Y. 11735** ..... *
M **Bell, Inc., F.W., Dept. EM, 4949 Freeway Dr. E., Columbus, Ohio 43229** p. 2666,2667
M **Ohio Semitronics, Inc., Dept. EM, 1205 Chesapeake Ave., Columbus, Ohio 43212** ..... *
Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 *
LDJ Electronics, Dept. EM, 1064 Naughton Ave., Troy, Mich. 48084
D Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102

Generators, Harmonic

ADRET/COMSTRON, Dept. EM, 200 E. Sunrise Hwy, Freeport, NY 11520 .... *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
Marine Electric Railway Prods. Div., Inc., Dept. EM, 167 National Rd., Edison, N.J. 08817 ..... *
M **, Trak Microwave Corp., Dept. E8, Dept. EM, 4726 Eisenhower Blvd.,, Tampa, Fla. 33614** ..... p. 3064
M Addington Labs., Inc., Solid State Prods Div., Dept EM, 783 Palomar Ave., Sunnyvale, Cal. 94086
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
Micro-Now Instr. Co., Dept. EM, 6104 N. Pulaski Rd., Chicago, Ill. 60646
M Scientific Communications, Dept. EM, 3425 Kingsley, Garland, Tex. 75041
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Generators, Infrared—See Lamps, Infrared

Generators, Low-Frequency

M **Accutronics-A Hammond Corp., Dept. EM, 628 North St., Box 590, Geneva, Ill. 60134** ..... *
ADRET/COMSTRON, Dept. EM, 200 E. Sunrise Hwy, Freeport, NY 11520 p. 2682,2683
American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Austron, Inc., Dept. EM, 1915 Kramer La., Austin, Tex. 78758 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
D **California Instrs., Dept. EM, 5150-Convoy St., San Diego, Cal. 92111** ..... *
Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 ..... *
Comstron Corp., Dept. EM, 200 E. Sunrise Hwy., Freeport, N.Y. 11520 p. 2682,2683
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Exact Electronics, Inc., Dept. EM, Box 160, 455 SE 2nd Ave., Hillsboro, Ore. 97123 ..... *
M **Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040** .. *
M **Georator Corporation, Dept. EM, Box 70, Manassas, Va. 22110** p. 3262,3264,3386,3388
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 .... *
Interstate Electronics, Dept. EM, Box 3117, Anaheim, Cal. 92803 ..... *
M **Krohn-Hite Corp., Dept. EM, Avon Ind'l Pk, Bodwell St., Avon, Mass. 02322** p. 2773
Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803 *
Marine Electric Railway Prods. Div., Inc., Dept. EM, 167 National Rd., Edison, N.J. 08817 ..... *
MCL, Inc., Dept. EM, 10 North Beach Ave., LaGrange, Ill. 60525 ..... p. 2863
Rockland Sys. Corp., Dept. EM, 230 W. Nyack Rd., W. Nyack, N.Y. 10994 .. *
D **Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219** p. 2830
M **Vectron Labs., Inc., Dept. EM, 166 Glover Ave., Norwalk, Conn. 06850** ..... *
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
M **Wavetek Indiana, Inc., Dept. EM, 66 N. First Ave., Beech Grove, Ind. 46107** *
D Ailtech, Dept. EM, 2070 Fifth Ave, Ronkonkoma, NY 11779
M American Electronics, Inc., Dept. EM, 1600 E Valencia Dr., Fullerton, Cal. 92631
Anadex Inc., Dept. EM, 9825 De Soto, Chatsworth, Cal. 91311
Cal-Tek Engrg, Dept. EM, 29 Pemberton Rd., Wayland, Mass. 01778
M Electric Indicator Co., Inc., Dept. EM, 272 Main Avenue, Norwalk, Conn. 06851
FSI/Fork Standards Inc., Dept. EM, 211 Main St., W. Chicago, Ill. 60185
Kikusui Elctrns. Corp., Dept. EM, 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
Meguro Electronics Corp, Dept. EM, No. 5-1 2-Chome Chuo Meguro-ku, Tokyo, Japan
Meloy Labs Inc., Instrus. & Sys. Div., Dept. EM, 6715 Electronic Dr., Springfield, Va. 22151
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
Real Time Systems Inc., Dept. EM, 152 S. MacQuesten Pkwy., Mt. Vernon, N.Y. 10550
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
T-F Electronics Inc., Dept. EM, 9415 Neils Thompson Dr., Austin, Tex. 78759
Taylor-Winfield Corp., Dept. EM, 1052 Mahoning Ave. NW, Warren, Ohio 44482
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Tracor, Inc., Dept. EM, 6500 Tracor La., Austin, Tex. 78721
Westinghouse Elec., Process Equip./Consumables Dept, Dept. EM, Box 300, Sykesville, Md. 21784

Generators, Marker

ADRET/COMSTRON, Dept. EM, 200 E. Sunrise Hwy, Freeport, NY 11520 .... *
American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
D **B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635** ..... *
D **Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005** ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D **Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108** *
Kay Elemetrics Corp., Dept. EM, 12 Maple Ave., Pine Brook, N.J. 07058 .... *
D **Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803** *
PPM, Inc., Dept. EM, 7575 Bond St., Cleveland, Ohio 44139 ..... *
Telonic/Berkeley, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715 ..... p. 3063
M **, Trak Microwave Corp., Dept. E8, Dept. EM, 4726 Eisenhower Blvd.,, Tampa, Fla. 33614** ..... *
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
D Blonder-Tongue Labs., Inc., Dept. EM, One Jake Brown Rd., Old Bridge, N.J. 08857
Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
D Lectrotech, Inc., Dept. EM, 5810 N. Western Ave., Chicago, Ill. 60659
Meguro Electronics Corp, Dept. EM, No. 5-1 2-Chome Chuo Meguro-ku, Tokyo, Japan
Meloy Labs Inc., Instrus. & Sys. Div., Dept. EM, 6715 Electronic Dr., Springfield, Va. 22151
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
D Wiltron Co., Dept. EM, 825 E. Middlefield Rd., Mt. View, Cal 94043

Generators, Microwave

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
M **Applied Microwave, Div. Epsco Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090** ..... *
Applied Research Inc., Dept. EM, 76 S. Bayles Ave., Port Washington, N.Y. 11050 ..... *
Cober Elctrns., Inc., Dept. EM, 7 Gleason Ave., Stamford, Conn. 06902 p. 2862
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Epsco, Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 ..... *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** p. 2870
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 .... *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... *
M **MCL, Inc., Dept. EM, 10 North Beach Ave., LaGrange, Ill. 60525** ..... p. 2863
M **Polarad Elctrn. Instrs., Dept. EM, 5 Delaware Dr., Lake Success, N.Y. 11040** *

Telonic/Berkeley, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715 ..... p. 3063
M **, Trak Microwave Corp., Dept. E8, Dept. EM, 4726 Eisenhower Blvd.., Tampa, Fla. 33614 ..... ***
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
Wavetek Indiana, Inc., Dept. EM, 66 N. First Ave., Beech Grove, Ind. 46107 *
M Addington Labs., Inc., Solid State Prods. Div., Dept. EM, 783 Palomar Ave., Sunnyvale, Cal. 94086
D Ailtech, Dept. EM, 2070 Fifth Ave, Ronkonkoma, NY 11779
M Aircom, Inc., Dept. EM, Rte. 16B, Union, N.H. 03887
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
M Frequency West, Inc., Dept. EM, 3140 Alfred St., Santa Clara, Cal. 95050
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Litton Inds., Electron Tube Div., Dept. EM, 960 Industrial Rd, San Carlos, Calif. 94070
Micro-Now Instr. Co., Dept. EM, 6104 N. Pulaski Rd., Chicago, Ill. 60646
D Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M Racal-Dana Instrus Inc., Dept. EM, 18912 Von Karman Ave., Irvine, Cal. 92715
M Reeve Electronics, Inc., Dept. EM, 609 W. Lake St., Chicago, Ill 60606
D REI Sales Co., Dept. EM, 1 North Ave, Burlington, Mass. 01803
M Republic Elctrn. Inds. Corp., Dept. EM, 575 Broad Hollow Rd., Melville, N.Y. 11746
D Tau-Tron Inc., Dept. EM, 11 Esquire Rd., N. Billerica, Mass. 01862
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760
D Wiltron Co., Dept. EM, 825 E. Middlefield Rd., Mt. View, Cal 94043
M Zeta Laboratories, Inc., Dept. EM, 3265 Scott Blvd., Santa Clara, Cal. 95051

Generators, Noise, Random (Electrical)

Applied Microwave, Div. Epsco Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 ..... p. 2861
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Elgar Corporation, Dept. EM, 8225 Mercury Ct., San Diego, Cal. 92111 ..... *
Elgenco, Inc., Dept. EM, Box 460, Huricane, Utah 84737 .... p. 2726,2728-2730
Epsco, Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 p. 2861
M **Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040 p. 2324**
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... p. 2781
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
M **Wavetek Indiana, Inc., Dept. EM, 66 N. First Ave., Beech Grove, Ind. 46107 ***
D Ailtech, Dept. EM, 2070 Fifth Ave, Ronkonkoma, NY 11779
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
Beckman Instrs., Ectrn. Instrs. Div. Ectrn. Instrumentation, Dept. EM, 3900 N. River Rd., Schiller Park, Ill. 60176
Berkeley Instruments, Inc., Dept. EM, 2700 Dupont Dr., Irvine, Cal. 92715
Control Concepts Corp., Dept. EM, 333 Front St., Binghamton, N.Y. 13905
Electro-Optical Inds., Inc., Dept. EM, 839 Ward Dr., Santa Barbara, Cal. 93111
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
D International Data Sciences, Dept. EM, 100 Nashua St., Providence, R.I. 02904
Optical Electronics, Inc., Dept. EM, Box 11140, Tucson, Ariz. 85734
D Sadelco, Inc. , Dept. EM, 299 Park Ave., Weehawken, NJ 07087
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
D Tau-Tron Inc., Dept. EM, 11 Esquire Rd., N. Billerica, Mass. 01862
Tech Serv., Inc., BRS/LVE Div, Dept. EM, 5301 Holland Dr., Beltsville, Md 20705
Telecommunications Techniques Corp., Dept. EM, 112 Frederick Ave., Rockville, Md. 20850
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006
White Instrs., Inc., Dept. EM, Box 698, Austin, Tex. 78767

Generators, Phase

ADRET/COMSTRON, Dept. EM, 200 E. Sunrise Hwy, Freeport, NY 11520 p. 2682
Chesterfield Prods. Inc., Dept. EM, 511A Victor St., Saddle Brook, N.J. 07662 *
Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 ..... *
Comstron Corp., Dept. EM, 200 E. Sunrise Hwy., Freeport, N.Y. 11520 p. 2682
Comstron Seg., Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520 ..... *
M **Dytronics Co., Inc., Dept. EM, 4800 Evanswood Dr., Columbus, Ohio 43229 p. 2718**
Exact Electronics, Inc., Dept. EM, Box 160, 455 SE 2nd Ave., Hillsboro, Ore. 97123 ..... p. 2733
M **Georator Corporation, Dept. EM, Box 70, Manassas, Va. 22110 ..... ***
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
M **Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... ***
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
Wavetek Indiana, Inc., Dept. EM, 66 N. First Ave., Beech Grove, Ind. 46107 *
Engineered Components Co., Dept. EM, 3580 Sacramento Dr., San Luis Obispo, Cal. 93401
Evans Assocs., Dept. EM, Box 5055, Berkeley, Cal. 94705
Multimetrics Div. of Comstro, Comstron-Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11580
Real Time Systems Inc., Dept. EM, 152 S. MacQuesten Pkwy., Mt. Vernon, N.Y. 10550
Seg Subsidiary, Comstron Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006

Generators, Pulse

Airflyte Elctrns. Co., Dept. EM, Box 207, 56 Hook Rd., Bayonne, N.J. 07002 *
American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
M **Applied Microwave, Div. Epsco Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 ..... p. 2861**
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Cober Elctrns., Inc., Dept. EM, 7 Gleason Ave., Stamford, Conn. 06902 p. 2862
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
D **Continental Specialties Corp., Dept. EM, Box 1942, 70 Fulton Terr, New Haven, Conn. 06509 ..... ***
E & L Instruments, Inc., Dept. EM, 61 First St., Derby, Conn. 06418 ..... *
Epsco, Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 p. 2861
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M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 ***
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Interstate Electronics, Dept. EM, Box 3117, Anaheim, Cal. 92803 p. 2760,2761
Kay Elemetrics Corp., Dept. EM, 12 Maple Ave., Pine Brook, N.J. 07058 .... *
Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803 *
Magnetic Technology, Vernitron Corp., Dept. EM, 21001 Kittridge St., Canoga Pk., Cal. 91303 ..... *
M **MCL, Inc., Dept. EM, 10 North Beach Ave., LaGrange, Ill. 60525 ..... ***
D **Philips Test & Measuring Instrs., Dept. EM, 85 McKee Dr., Mahwah, NJ 07430 ..... ***
M **Polarad Elctrn. Instrs., Dept. EM, 5 Delaware Dr., Lake Success, N.Y. 11040 ***
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Arenberg Ultrasonic Inc., Dept. EM, 94 Green, Jamaica Plain, Mass. 02130
Berkeley Nucleonics, Dept. EM, 1198 Tenth St., Berkeley, Cal. 94710
Cal-Tek Engrg, Dept. EM, 29 Pemberton Rd., Wayland, Mass. 01778
Control Concepts Corp., Dept. EM, 333 Front St., Binghamton, N.Y. 13905
D Dynapar Corp., Dept. EM, 1675 Delany Rd., Gurnee, Ill. 60031
E-H International, Inc., Dept. EM, 515 11th St Box 1289, Oakland, Cal 94604
E-H Resch. Labs., Inc., Dept. EM, Box 1289, Oakland, Cal. 94604
GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854
M Hecon Corp., Dept. EM, 31 Park Rd., Tinton Falls, N.J. 07724
Instrument Research Co., Dept. EM, Box 40207, Santa Barbara, Cal. 93103
Kappa Scientific Corp., Dept. EM, Box 30585, Santa Barbara, Cal. 93105
LogiMetrics Inc., Dept. EM, 121-03 Dupont St., Plainview, NY 11803
MEI Engineering, Dept. EM, 662 N. Pottstown Pk., Exton, Pa. 19341
MetroTek, Inc., Dept. EM, 80 Wellsian Way, Richland, Wash. 99352
Moxon Inc., Dept. EM, 2222 Michelson Dr. Bldg. E, Irvine, Cal. 92715
Pacific Atlantic Trading Co., Dept. EM, Box 754, El Cerrito, C.A. 94530
Panametrics Inc., Dept. EM, 221 Cresent St., Waltham, Mass. 02154
D REI Sales Co., Dept. EM, 1 North Ave, Burlington, Mass. 01803
Republic Elctrn. Inds. Corp., Dept. EM, 575 Broad Hollow Rd., Melville, N.Y. 11746
M Scientific Communications, Dept. EM, 3425 Kingsley, Garland, Tex. 75041
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Systems Research Labs. Inc., Dept. EM, 2800 Indian Ripple Rd. , Dayton, Ohio 45440
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
D Tau-Tron Inc., Dept. EM, 11 Esquire Rd., N. Billerica, Mass. 01862
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Teledyne Gurley, Dept. EM, 514 Fulton St., Troy, N.Y. 12181
Tobe Deutschmann Labs., Inc., Dept. EM, Box 74, Canton, Mass. 02021
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Velonex, Instrument Div., Dept. EM, 560 Robert Ave., Santa Clara, Cal. 95050

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M **Accutronics-A Hammond Corp., Dept. EM, 628 North St., Box 590, Geneva, Ill. 60134 ..... ***
ADRET/COMSTRON, Dept. EM, 200 E. Sunrise Hwy, Freeport, NY 11520 p. 2682,2683
American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
M **Applied Microwave, Div. Epsco Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 ..... ***
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Cober Elctrns., Inc., Dept. EM, 7 Gleason Ave., Stamford, Conn. 06902 ..... *

Comstron Corp., Dept. EM, 200 E. Sunrise Hwy., Freeport, N.Y. 11520 p. 2682,2683
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 *
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Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 *
D **Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108** *
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M **Kay Elemetrics Corp., Dept. EM, 12 Maple Ave., Pine Brook, N.J. 07058** *
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D **Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803** *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 *
M **MCL, Inc., Dept. EM, 10 North Beach Ave., LaGrange, Ill. 60525** *
M **Polarad Elctrn. Instrs., Dept. EM, 5 Delaware Dr., Lake Success, N.Y. 11040** *
Rockland Sys. Corp., Dept. EM, 230 W. Nyack Rd., W. Nyack, N.Y. 10994 *
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M **Wavetek Indiana, Inc., Dept. EM, 66 N. First Ave., Beech Grove, Ind. 46107** *
M Addington Labs., Inc., Solid State Prods. Div., Dept. EM, 783 Palomar Ave., Sunnyvale, Cal. 94086
D Ailtech, Dept. EM, 2070 Fifth Ave, Ronkonkoma, NY 11779
M Ajax Magnethermic Corp., Dept. EM, 1745 Overland Ave., N.E., Warren, Ohio 44482
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
Arenberg Ultrasonic Inc., Dept. EM, 94 Green, Jamaica Plain, Mass. 02130
BF Elctrns., Dept. EM, 415 S. Nardo, Solana Beach, Calif. 92075
Clemens Mfg. Co., Dept. EM, 630 So. Berry Rd., St. Louis, Mo. 63122
M Cushman Electronics, Dept. EM, 2400 N. 1st St., San Jose, Cal. 95112
M Cycle-Dyne, Inc., Sub. Axel Elctrns., Inc., Dept. EM, 134-20 Jamaica Ave., Jamaica, N.Y. 11418
D Digiac Corp., Dept. EM, 175 Engineers Rd., Smithtown, N.Y. 11787
M Frequency West, Inc., Dept. EM, 3140 Alfred St., Santa Clara, Cal. 95050
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
M Lepel Corp, Dept. EM, 59-21 Queens-Midtown Expwy., Maspeth, N.Y. 11378
Litton Inds., Electron Tube Div., Dept. EM, 960 Industrial Rd, San Carlos, Calif. 94070
M LogiMetrics Inc., Dept. EM, 121-03 Dupont St., Plainview, NY 11803
Meguro Electronics Corp, Dept. EM, No. 5-1 2-Chome Chuo Meguro-ku, Tokyo, Japan
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
Pacific Meas., Inc., Dept. EM, 470 San Antonio Rd, Palo Alto, Calif. 94306
M Racal-Dana Instrus Inc., Dept. EM, 18912 Von Karman Ave., Irvine, Cal. 92715
Real Time Systems Inc., Dept. EM, 152 S. MacQuesten Pkwy., Mt. Vernon, N.Y. 10550
M Reeve Electronics, Inc., Dept. EM, 609 W. Lake St., Chicago, Ill 60606
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
T-F Electronics Inc., Dept. EM, 9415 Neils Thompson Dr., Austin, Tex. 78759
D Tau-Tron Inc., Dept. EM, 11 Esquire Rd., N. Billerica, Mass. 01862
Taylor-Winfield Corp., Dept. EM, 1052 Mahoning Ave. NW, Warren, Ohio 44482
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760
Westinghouse Elec., Process Equip./Consumables Dept, Dept. EM, Box 300, Sykesville, Md. 21784
D Wiltron Co., Dept. EM, 825 E. Middlefield Rd., Mt. View, Cal 94043

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M **Sigmapower, Inc., Dept. EM, 20790 Leapwood Ave., Carson, Cal. 90746** *
VIZ Manufacturing Co., Dept. EM, 335 E. Price St., Phila, Pa. 19144 p. 2833
Wavetek Indiana, Inc., Dept. EM, 66 N. First Ave., Beech Grove, Ind. 46107 *

Generators, Single-Sideband

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 *
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M LogiMetrics Inc., Dept. EM, 121-03 Dupont St., Plainview, NY 11803
D Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
DM Plessey Semiconductors, Dept. EM, 1674 McGaw Ave., Irvine, Cal. 92714
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
D Sencore, Dept. EM, 3200 Sencore Dr., Sioux Falls, S.D. 57107
Triangle Microwave Inc., Dept. EM, 9B Great Meadow La, East Hanover, NJ 07936
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

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Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 *
D **Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108** *
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 *
Instruments for Industry, Inc., Dept. EM, 151 Toledo St., Farmingdale, N.Y. 11735 p. 2763
Interstate Electronics, Dept. EM, Box 3117, Anaheim, Cal. 92803 p. 2760
M **Kay Elemetrics Corp., Dept. EM, 12 Maple Ave., Pine Brook, N.J. 07058** *
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D **Philips Test & Measuring Instrs., Dept. EM, 85 McKee Dr., Mahwah, NJ 07430** *
Rockland Sys. Corp., Dept. EM, 230 W. Nyack Rd., W. Nyack, N.Y. 10994 *
DM **Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518** *
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D Blonder-Tongue Labs., Inc., Dept. EM, One Jake Brown Rd., Old Bridge, N.J. 08857
Cal-Tek Engrg, Dept. EM, 29 Pemberton Rd., Wayland, Mass. 01778
D Gamma Elctrn Research Co., RF & Microwave Lab., Dept. EM, 991 Commercial St. Ste. 4, Palo Alto, Cal 94303
D Gamma Elctrn Research Co., Tech. Pubs. Sect., Dept. EM, Box 482, Newark, CA 94560
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
DM Hughes Aircraft Co., Electron Dynamics Div., Dept. EM, 3100 W. Lomita Blvd., Torrance, Cal. 90509
D Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
Kikusui Elctrns. Corp., Dept. EM, 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
D Lectrotech, Inc., Dept. EM, 5810 N. Western Ave., Chicago, Ill. 60659
Meguro Electronics Corp, Dept. EM, No. 5-1 2-Chome Chuo Meguro-ku, Tokyo, Japan
Micro-Now Instr. Co., Dept. EM, 6104 N. Pulaski Rd., Chicago, Ill. 60646
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
Pacific Meas., Inc., Dept. EM, 470 San Antonio Rd, Palo Alto, Calif. 94306
D Philips Audio Video Sys, Neutrik Prods, Dept. EM, 91 McKee Dr., Mahwah, N.J. 07430
Real Time Systems Inc., Dept. EM, 152 S. MacQuesten Pkwy., Mt. Vernon, N.Y. 10550
Solar Elctrns. Co., Dept. EM, 901 N. Highland, Hollywood, Cal. 90038
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Walker Scientific, Inc., Dept. EM, Rockdale St., Worcester, Mass. 01606
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760
D Wilson Co., H. M., Dept. EM, 11501 Chimney Rock Rd., Houston, Tex. 77035
D Wiltron Co., Dept. EM, 825 E. Middlefield Rd., Mt. View, Cal 94043

Generators, Time Code

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
M **Chrono-log Corp., Dept. EM, 2 W. Park Rd., Havertown, Pa. 19083** p. 1391
M **Computer Devices Corp., Dept. EM, 63 Austin Blvd., Commack, N.Y. 11725** *
GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 *
LVC Inds. Inc., Co-Ord Switch Bloc-Lite Divs., Dept. EM, 135-25 37th Ave., Flushing, N.Y. 11354 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
DM **Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518** *

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AcroSys, Dept. EM, Box 687, Philomath, Ore. 97370
Datametrics Inc, Dept. EM, 340 Fordham St., Wilmington, Mass. 01887
Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
Hathaway Instruments, Inc., Dept. EM, 5250 E. Evans Ave., Denver, Colo. 80222
M Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
Moxon Inc., Dept. EM, 2222 Michelson Dr. Bldg. E, Irvine, Cal. 92715
Spectracom Corp., Dept. EM, 1667 Penfield Rd., Rochester, N.Y. 14625
DM Systron Donner, Data Products Div., Dept. EM, 735 Detroit Ave., Concord, Cal. 94518

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Airflyte Elctrns. Co., Dept. EM, Box 207, 56 Hook Rd., Bayonne, N.J. 07002 *
American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 .....*
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 .....*
M **Chrono-log Corp., Dept. EM, 2 W. Park Rd., Havertown, Pa. 19083** .....*
M **Computer Devices Corp., Dept. EM, 63 Austin Blvd., Commack, N.Y. 11725** *
GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 .....*
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 .....*
PPM, Inc., Dept. EM, 7575 Bond St., Cleveland, Ohio 44139 .....*
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Berkeley Nucleonics, Dept. EM, 1198 Tenth St., Berkeley, Cal. 94710
Dataprobe, Inc., Dept. EM, 254 Green St., So. Hackensack, N.J. 07606
Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
M Digitech Data Inds., Dept. EM, 66 Grove St., Box 547, Ridgefield, Conn. 06877
Engineered Components Co., Dept. EM, 3580 Sacramento Dr., San Luis Obispo, Cal. 93401
FSI/Fork Standards Inc., Dept. EM, 211 Main St., W. Chicago, Ill. 60185
GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854
Instrument Research Co., Dept. EM, Box 40207, Santa Barbara, Cal. 93103
M Jaesic Industries Co., Dept. EM, 29830 Beck, Wixom, Mich. 48096
Meloy Labs Inc., Instrus. & Sys. Div., Dept. EM, 6715 Electronic Dr., Springfield, Va. 22151
M Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
Moxon Inc., Dept. EM, 2222 Michelson Dr. Bldg. E, Irvine, Cal. 92715
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
D Tau-Tron Inc., Dept. EM, 11 Esquire Rd., N. Billerica, Mass. 01862
Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803
Terminal Data Corp. of Md, Dept. EM, 11878 Coakley Circle, Rockville, Md. 20852

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American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 .....*
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 .....*
Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 .....*
Exact Electronics, Inc., Dept. EM, Box 160, 455 SE 2nd Ave., Hillsboro, Ore. 97123 .....*
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 .....*
GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 .....*
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 .....*
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 .....*
Rockland Sys. Corp., Dept. EM, 230 W. Nyack Rd., W. Nyack, N.Y. 10994 .. *
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 .....*
D American Microsignal Corp, Dept. EM, 8431 Monroe Ave , Stanton, Cal. 90680
M Applied Electro Technology, Inc., Dept. EM, 2220 S. Anne St., Santa Ana, Cal. 92704
Astro-Geo-Marine Inc., Dept. EM, 2005 Palma Dr., Ventura, Cal. 93003
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
Convex Corp., Dept. EM, 2810 Dorr Ave., Fairfax, Va. 22031
M Cushman Electronics, Dept. EM, 2400 N. 1st St., San Jose, Cal. 95112
M Digitech Data Inds., Dept. EM, 66 Grove St., Box 547, Ridgefield, Conn. 06877
Elgin Elctrns., Inc., Sub. Basic, Inc., Dept. EM, Walnut St., Waterford, PA. 16441
Engineered Components Co., Dept. EM, 3580 Sacramento Dr., San Luis Obispo, Cal. 93401
Gorman-Redlich Mfg. Co., Dept. EM, 6 Curtis St., Athens, Ohio 45701
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
D LocAtor Electronics Co., Dept. EM, South Country Ind'l Pk., Drawer 10609, St. Louis, Mo. 63129
Meloy Labs Inc., Instrus. & Sys. Div., Dept. EM, 6715 Electronic Dr., Springfield, Va. 22151
D Mobil Electronics, Inc., Dept. EM, Box 1132, Anderson, Ind. 46015
Modular Audio Products, Dept. EM, 50 Orville Dr., Bohemia, N.Y. 11716
M Nelson Ross Elctrns., Dept. EM, 5 Delaware, Lake Success, N.Y. 11040
D Robins Broadcast & Sound Equipment Corp., Sub. Robins Inds., Dept. EM, 75 Austin Blvd., Commack, N.Y. 11725
Shure Brothers, Inc., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
T-F Electronics Inc., Dept. EM, 9415 Neils Thompson Dr., Austin, Tex. 78759
M Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803

Generators, Tone-Burst

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 .....*
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 .....*
Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 .....*
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Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 .....*
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 .....*
Rockland Sys. Corp., Dept. EM, 230 W. Nyack Rd., W. Nyack, N.Y. 10994 .. *
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 .....*
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D American Microsignal Corp, Dept. EM, 8431 Monroe Ave., Stanton, Cal. 90680
M Cushman Electronics, Dept. EM, 2400 N. 1st St., San Jose, Cal. 95112
Real Time Systems Inc., Dept. EM, 152 S. MacQuesten Pkwy., Mt. Vernon, N.Y. 10550

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Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 p. 2742
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Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Kay Elemetrics Corp., Dept. EM, 12 Maple Ave., Pine Brook, N.J. 07058 .... *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 .....*
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M **Vectron Labs., Inc., Dept. EM, 166 Glover Ave., Norwalk, Conn. 06850** ..... *
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M Magnusonic Devices, Inc., Dept. EM, 290 Duffy Ave., Hicksville, N.Y. 11801
MFE Corp., Dept. EM, Keewaydin Dr., Salem, N.H. 03079
Michigan Magnetics, Dept. EM, 203 W. Third St., Vermontville, Mich 49096
D Mitsumi Elec. Co., Ltd., Dept. EM, 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan
National Micronetics, Dept. EM, Route 28, West Hurley, NY 12136
Norton Assocs., Inc., Dept. EM, 10 Di Tomas Ct., Copiague, N.Y. 11726
D Nortronics Co., Inc., Dept. EM, 8101 Tenth Ave., N., Minneapolis, Minn. 55427
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Potter Instr. Co. Inc., Dept. EM, 151 Sunnyside Blvd., Plainview, N.Y. 11803
D Saki Magnetics Inc., Dept. EM, 1649 12th St., Santa Monica, Cal. 90404
Teledyne/Geotech, Dept. EM, Box 28277, Dallas, Tex. 75228

Heads, Reflective

Lipps, Inc., Dept. EM, 1630 Euclid St., Santa Monica, Cal. 90404 p. 1012,1013

Heads, Video (Recording, Playback & Erase)

D **Canon U.S.A., Inc., Dept. EM, 10 Nevada Dr., Lake Success, N.Y. 11040** ..... *
International Electro-Magnetics, Dept. EM, 350 N. Eric Dr., Palatine, Ill. 60067 *
M **Lipps, Inc., Dept. EM, 1630 Euclid St., Santa Monica, Cal. 90404** p. 1012,1013
Oak Inds. Inc., Switch Div., Dept. EM, Dept. DA, Crystal Lake, Ill. 60014 p. 2499
Ampex Corp., Dept. EM, 401 Broadway, Redwood City, Cal. 94063
Applied Magnetics Corp., Magnetic Head Div., Dept. EM, 75 Robin Hill Rd., Goleta, Calif. 93017
Ceramic Magnetics, Inc., Dept. EM, 87 Fairfield Rd., Fairfield, N.J. 07006
Ferronics, Inc., Dept. EM, 60 N. Lincoln Rd., East Rochester, N.Y. 14445
M Magnusonic Devices, Inc., Dept. EM, 290 Duffy Ave., Hicksville, N.Y. 11801
D Mitsumi Elec. Co., Ltd., Dept. EM, 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan
Norton Assocs., Inc., Dept. EM, 10 Di Tomas Ct., Copiague, N.Y. 11726
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Saki Magnetics Inc., Dept. EM, 1649 12th St., Santa Monica, Cal. 90404

Video Research Corporation, Dept. EM, 6985 Garden Rd., Riviera Beach, Fla. 33404

Heat Dissipators—See Transistor, Diode, Thyristor, Heat Dissipators; Heat Sinks, Soldering

Heat Exchangers & Systems

Bird Electronic Corp., Dept. EM, 30303 Aurora Rd., Solon, Ohio 44139 ..... *
Borg-Warner Thermoelectrics, Dept. Borg-Warner, Dept. EM, Wolf & Algonquin Rds., Des Plaines, Ill. 60018 ..... p. 2576
Cober Elctrns., Inc., Dept. EM, 7 Gleason Ave., Stamford, Conn. 06902 ..... p. 2862
M **Electro Impulse, Dept. EM, Box 870, Red Bank, N.J. 07701 ..... p. 2578**
D **International Rectifier Corp., Semiconductor Div., Dept. EM, 233 Kansas St., El Segundo, Cal. 90245 ..... ***
Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 ..... *
M **McLean Engrg. Labs., Dept. EM, 70 Washington Rd., Princeton Jctn., N.J. 08550 ..... p. 2588,2590**
M **McLean Engrg Midwest, Dept. EM, 9560 85th Ave N., Maple Grove, Minn. 55369 ..... p. 2588,2590**
Rotron, Inc., Dept. EM, Hasbrouck La., Woodstock, N.Y. 12498 ..... *
Technipower, Inc., Dept. EM, Commerce Pk Box 222, Danbury, Ct 06810 .. *
D **Thermalloy, Inc., Dept. EM, 2021 W. Valley View, Dallas, Tex 75234 ..... ***
D **Union Carbide Corp., Battery Products Div., Dept. EM, 270 Park Ave., New York, N.Y. 10017 ..... ***
Aerotronic Assocs., Inc., Dept. EM, Riverside Dr., Contoocook, N.H. 03229
Air Products & Chemicals, Dept. EM, Box 538, Allentown, PA 18105
Argus International, Dept. EM, Box 38, Hopewell, N.J. 08525
D Astrodyne, Inc., Sub. Roanwell Corp., Dept. EM, 353 Middlesex Ave., Wilmington, Mass. 01887
M Bemco, Inc., Dept. EM, 9908 San Fernando Rd., Pacoima, Cal. 91331
Corning Science Products, Corning Glass Works, Dept. EM, Corning, N.Y. 14830
Des Tek Ind., Dept. EM, Box 24163, Los Angeles, Cal. 90024
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
Electro-Optical Inds., Inc., Dept. EM, 839 Ward Dr., Santa Barbara, Cal. 93111
Fansteel Inc., Dept. EM, One Tantalum Pl., N Chicago, Ill. 60064
Int'l. Elctrn. Resch., Dept. EM, 135 W. Magnolia Blvd., Burbank, Cal. 91502
M Kooltronic Inc., Dept. EM, Hamilton Ave., Hopewell, N.J. 08525
M Lepel Corp, Dept. EM, 59-21 Queens-Midtown Expwy., Maspeth, N.Y. 11378
M Lytron, Inc., Dept. EM, 3 Dragon Ct., Woburn, Mass. 01801
D Temptronic Corporation, Dept. EM, 40 Glen Ave., Newton, Mass. 02159

Heat Guns, Production

Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
DM **Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... ***
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... ***
D Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
Antex Div., M M Newman Corp., Dept. EM, Marblehead, Mass. 01945
M Brady Co., W. H., Industrial Prods. Div., Dept. EM, 2221 W. Camden Rd. Box 2131, Milwaukee, Wis. 53201
Caig Labs., Inc., Dept. EM, 1175-0 Industrial Ave., Box 64, Escondido, Cal. 92025
M Chemplast, Inc., Dept. EM, 31-150 Dey Rd., Wayne, N.J. 07470
D Clements National Co., Dept. EM, 6650 S. Narragansett Ave., Chicago, Ill. 60638
D Cole-Flex Corp., Dept. EM, 91 Cabot St., W. Babylon, N.Y. 11704
DM Commercial Elec. Heating Devices & Mfg., Inc., Dept. EM, 1008 E. Garvey Blvd., Monterey Park, Cal. 91754
Hanes Products Corp., Dept. EM, 4301 E. Madison St., Phoenix, Ariz. 85034
D ICO/Rally Corp., Dept. EM, Edward J. Bush, Palo Alto, Cal. 94303
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
DM Master Appliance Corp., Dept. EM, 2420 18th St., Box 545, Racine, Wisc. 53403
Penntube Plastics, Dept. EM, Madison Ave. & Holly St., Clifton Heights, Pa. 19018
Raychem Corp., Dept. EM, 300 Constitution Dr., Menlo Park, Cal. 94025
Sara Sales Co., Dept. EM, P.O. Box 321, San Francisco, Calif. 94101
Sigma Sys. Corp., Dept. EM, 3163 Adams Ave., San Diego, Calif. 92116
D T & B/Thomas & Betts, Dept. EM, 36 Butler St., Elizabeth, N.J. 07207
D UNGAR, Div., Eldon Inds., Inc., Dept. EM, 233 E. Manville St., Compton, Cal. 90220
D Wahl Clipper Corp., Dept. EM, 2902 Locust St., Sterling, Ill. 61081
Wall-Lenk Mfg. Co., Dept. EM, Box 3349, Dept. EEM-71, Kinston, N.C. 28501

Heat Pumps—See Cooling/Heating Modules, Thermoelectric

Heat Shrinkable Elastomers, Plastics—See Caps, Forms & Tapes, Heat Shrinkable; Tubing, Heat Shrinkable

Heat Sinks—See Heat Sinks, Soldering; Transistor, Diode, Thyristor, Heat Dissipators

Heat Sinks, Soldering

D AAVID Engrg, Inc., Dept. EM, 30 Cook Ct., Laconia, N.H. 03246 ..... p. 3919
D **Augat Interconnection Prods. Div., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703 ..... ***
Borg-Warner Thermoelectrics, Dept. Borg-Warner, Dept. EM, Wolf & Algonquin Rds., Des Plaines, Ill. 60018 ..... p. 2577
D **Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... ***
Delbert Blinn. Co., Dept. EM, Box 2007, Pomona, Calif. 91766 ..... p. 3923
D **Delco Electronics Div., General Motors Corp., Dept. EM, 700 E. Firmin St., Kokomo, Ind. 46901 ..... ***
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... ***
Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 ..... *
DM **Metex Corp., Dept. EM, 970 New Durham Rd., Edison, N.J. 08817 ..... ***
D **Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 ***
Staver Co., Inc., Dept. EM, 47 N. Saxon Ave., Bay Shore, N.Y. 11706 ..... *
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... ***
D **Thermalloy, Inc., Dept. EM, 2021 W. Valley View, Dallas, Tex 75234 .. p. 3966**
D **Union Carbide Corp., Battery Products Div., Dept. EM, 270 Park Ave., New York, N.Y. 10017 ..... ***
UNITRACK Div., Calabro Plastics, Inc., Dept. EM, 8738 W. Chester Pike, Upper Darby, Pa. 19082 ..... p. 1051
D Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
Dressen-Barnes Electronics, Div. American Elctrns., Dept. EM, 1600 E. Valencia Dr., Fullerton, Cal. 92631
Fansteel Inc., Dept. EM, One Tantalum Pl., N Chicago, Ill. 60064
DM Int'l. Elctrn. Resch., Dept. EM, 135 W. Magnolia Blvd., Burbank, Cal. 91502
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
D Marshall Industries, Hunter Tools, Dept. EM, 9674 Telstar Ave., El Monte, Cal. 91731
D Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
D South Shore Metal Prods., Inc., Dept. EM, 88 E Allen Blvd., Farmingdale, N.Y. 11735
D Tech Spray, Inc., Dept. EM, Box 949, Amarillo, Tex. 79105
Tempil Div., Big Three Inds, Dept. EM, Hamilton Blvd., So. Plainfield, N.J. 07080
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Heaters & Accessories, Induction

M Ajax Magnethermic Corp., Dept. EM, 1745 Overland Ave., N.E., Warren, Ohio 44482
Chemical Etching Equip. & Supply, Dept. EM, 6905 Beulah St, Alexandria, Va. 22310
M Cycle-Dyne, Inc., Sub. Axel Elctrns., Inc., Dept. EM, 134-20 Jamaica Ave., Jamaica, N.Y. 11418
Elma Engineering, Dept. EM, 1066 E. Meadow Circle, Palo Alto, Cal. 94303
ENI Power Systems, Dept. EM, 3000 Winton Rd. S., Rochester, N.Y. 14623
M Lepel Corp, Dept. EM, 59-21 Queens-Midtown Expwy., Maspeth, N.Y. 11378
Miller, Co. L.C., Dept. EM, 717 Monterey Pass Rd., Monterey Park, Cal. 91754
M Reeve Electronics, Inc., Dept. EM, 609 W. Lake St., Chicago, Ill 60606
M Research, Inc., Dept. EM, Box 24064, Minneapolis, Minn. 55424
M Sierracin/Thermal Sys., Dept. EM, 13920 S. Broadway, Los Angeles, Cal. 90061
Taylor-Winfield Corp., Dept. EM, 1052 Mahoning Ave. NW, Warren, Ohio 44482
M Therm-O-Lab Corp., Dept. EM, 6940 Farmdale Ave., N. Hollywood, Cal. 91605
Westinghouse Elec., Process Equip./Consumables Dept, Dept. EM, Box 300, Sykesville, Md. 21784

Heaters & Heating Elements (For Components & Equipment) -Also See Ovens

M **Blue M Electric Co., Dept. EM, 138th & Chatham St., Blue Island, Ill. 60406 ***
Carborundum Co., Graphite Prods. Div., Dept. EM, Box 339, Niagara Falls, N.Y. 14302 ..... *
McLean Engrg. Labs., Dept. EM, 70 Washington Rd., Princeton Jctn., N.J. 08550 ..... p. 2590
M **McLean Engrg Midwest, Dept. EM, 9560 85th Ave N., Maple Grove, Minn. 55369 ..... p. 2590**
D **Midwest Components, Dept. EM, 1981 Port City Blvd., Muskegon, Mich. 49400 ..... p. 4280**
Acme Elec. Heating Corp., Dept. EM, 4685 E. 11th, Hialeah, Fla. 33013
Argus International, Dept. EM, Box 38, Hopewell, N.J. 08525
M Armstrong Cork Co., Dept. EM, W. Liberty St., Lancaster, Pa. 17604
Casso-Solar Corp., Dept. EM, 125-10 Queens Blvd., Kew Gardens, N.Y. 11415
Chemical Etching Equip. & Supply, Dept. EM, 6905 Beulah St, Alexandria, Va. 22310
M Cox & Co., Inc., Dept. EM, 215 Park Ave., S., New York, N.Y. 10003
Electrofilm, Inc., Dept. EM, 7116 Laurel Canyon Blvd., No. Hollywood, Cal. 91605
Micro Technical Industries, Dept. EM, 1999 S. Coast Hwy., Laguna Beach, Cal. 92651
M Minco Products Inc., Dept. EM, 7300 Commerce Lane, Minneapolis, Minn. 55432
M Murata Corporation of America, Dept. EM, 1148 Franklin Rd., S.E., Marietta, Ga. 30067
NAN MAC, Dept. EM, 9 Mayhew St., Framingham, Mass. 01701
OAL Assocs., Inc., Dept. EM, P.O. Box 64, Escondido, Cal. 92025
Philips Elmet Corp., Dept. EM, 1560 Lisbon Rd., Lewiston, Me. 04240
DM Safeway Products, Dept. EM, 440 Middlefield St., Middletown, Conn. 06457
M Sierracin/Thermal Sys., Dept. EM, 13920 S. Broadway, Los Angeles, Cal. 90061
Sta-Warm Elec. Co., Dept. EM, 116 N. Chestnut St., Ravenna, Ohio 44266
M Therm-O-Lab Corp., Dept. EM, 6940 Farmdale Ave., N. Hollywood, Cal. 91605
Ultra Carbon Corp., Dept. EM, Box 747, Bay City, Mich. 48707
D Watlow Elec. Mfg. Co., Dept. EM, 12001 Lackland Rd., St. Louis, Mo. 63141
Wireflex Incorporated, Dept. EM, 502 Old Route 30 East, Bourbon, Ind. 46504

Heaters, Immersion

D Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
Fansteel Inc., Dept. EM, One Tantalum Pl., N Chicago, Ill. 60064
Lab-Line Instrs, Dept. EM, 15th & Bloomingdale, Melrose Park, Ill. 60160
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016

Hermetic Sealing—See Machines, Hermetic Sealing; Seals, Hermetic; Services, Hermetic Sealing

Hinges—See Fasteners

Holders & Carriers, Chip (Capacitor, IC, LSI)

DM **Excel Products Co., Inc., Dept. EM, 401 Joyce Kilmer Ave., New Brunswick, N.J. 08903** ..... *
Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012 p. 2055
D **Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629** .... *
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
D GCA/Sunnyvale Div., Dept. EM, 1050 Kifer Rd., Sunnyvale, Cal. 94086
Gibson/Egan Co., Dept. EM, 2666 East Huntington Dr., Duarte, CA. 91010
3M Company, Tech Ceramic Prods., Dept. EM, 3M Center 223-4S, St. Paul, MN. 55101
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
Pylon Co., Inc., Dept. EM, 51 Newcomb St., Attleboro, Mass. 02703

Holders & Carriers, IC, LSI (Packaged)

D **Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521** ..... *
D **Augat Interconnection Prods. Div., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703** ..... *
D **Bivar, Inc., Dept. EM, 1617 E. Edinger Ave., Santa Ana, Cal. 92705** ..... *
M **Jettron Prods., Dept. EM, P.O. Box 337, E. Hanover, N.J. 07936** ..... *
Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012 p. 2055
Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543 ..... *
D Accessories for Electronics, Dept. EM, 800 Merrick Road, Baldwin, N.Y. 11510
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
Acme Model Engrg. Co., Dept. EM, 654 Bergen Blvd., Ridgefield, N.J. 07657
Ark-Les Switch Corp., Dept. EM, 51 Water St., Watertown, Mass. 02172
Burndy Corporation, Dept. EM, Richards Ave., Norwalk, , Conn. 06852
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
M Detoronics Corp., Dept. EM, 10660 E. Rush St., P.O. Box 3805, S. El Monte, Cal. 91733
D GCA/Sunnyvale Div., Dept. EM, 1050 Kifer Rd., Sunnyvale, Cal. 94086
Gibson/Egan Co., Dept. EM, 2666 East Huntington Dr., Duarte, CA. 91010
M Hybricon Corp., Dept. EM, 410 Crest Rd., Litteton, Mass. 01460
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
D Metropolitan Wire Corp., Industrial Div., Dept. EM, Washington & George, Wilkes-Barre, Pa. 18705
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
Pylon Co., Inc., Dept. EM, 51 Newcomb St., Attleboro, Mass. 02703
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050

Holders, Battery—See Retainers, Battery; Connectors, Battery

Holders, Brush—See Brushes & Brush Assemblies

Holders, Circuit Board (Production Type)

D **Bivar, Inc., Dept. EM, 1617 E. Edinger Ave., Santa Ana, Cal. 92705** ..... p. 1024
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
UNITRACK Div., Calabro Plastics, Inc., Dept. EM, 8738 W. Chester Pike, Upper Darby, Pa. 19082 ..... *
D **Vero Electronics, Dept. EM, 171 Bridge Rd., Hauppauge, N.Y. 11787** ..... *
D **Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629** .... *
D Accessories for Electronics, Dept. EM, 800 Merrick Road, Baldwin, N.Y. 11510
D Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
Atlee Corp., Dept. EM, 8 Gill St., Woburn, Mass. 01801
D Bud Radio, Inc., Dept. EM, 4605 E. 355th St., Willoughby, Ohio 44094
Chemical Etching Equip. & Supply, Dept. EM, 6905 Beulah St, Alexandria, Va. 22310
Electrovert, Dept. EM, 86 Hartford Ave., Mt. Vernon, N.Y. 10553
Gibson/Egan Co., Dept. EM, 2666 East Huntington Dr., Duarte, CA. 91010
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
D Matrix Engineering Corp., Dept. EM, 17000 S. Western Ave. 19, Gardena, Cal. 90247
D Metropolitan Wire Corp., Industrial Div., Dept. EM, Washington & George, Wilkes-Barre, Pa. 18705
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
D Modpak, Dept. EM, 31 A Green St., Waltham, Mass. 02154
Pace Inc., Dept. EM, 9329 Fraser Ave., Silver Spring, Md. 20910
D , PanaVise, Dept. EM, 10107 Adella Ave., South Gate, Cal 90280
Parsons Mfg. Corp., Dept. EM, 1055 O'Brien Dr., Menlo Park, Cal. 94025
D Tech. Devices Co., Dept. EM, 11250 Playa Ct., Culver City, Calif. 90230

Holders, Crystal

Bliley Electric Co., Dept. EM, 2545 W. Grandview Blvd., Box 3428, Erie, Pa. 16508 ..... p. 2287
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... p. 2290
Connector Corp., Dept. EM, 6025 N. Keystone Ave., Chicago, Ill. 60646 ..... *
Elctrn. Molding Corp., Dept. EM, 96 Mill St., Woonsocket, R.I. 02895 ..... *
Erie Frequency Control, Div. Erie Technological Prods., Dept. EM, 453 Lincoln St., Carlisle, Pa. 17013 ..... p. 2320
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
M **Jettron Prods., Dept. EM, P.O. Box 337, E. Hanover, N.J. 07936** ..... *
DM **Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012** p. 2055
McCoy Electronics, Sub Oak Inds. Inc., Dept. EM, Chestnut & Watts, Mt Holly Spr., Pa. 17065 ..... p. 2339,2340
DM **Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725** ..... *
M **Reeves-Hoffman Div., Dynamics Corp. of Amer., Dept. EM, 400 W. North St., Carlisle, Pa. 17013** ..... p. 2363,2365
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
D Atlee Corp., Dept. EM, 8 Gill St., Woburn, Mass. 01801
M M-tron Industries, Dept. EM, P.O. Box 630, E. Hwy 50, Yankton, S.D. 57078
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
D Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
TRG,, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006

Holders, Fuse—See Clips & Holders, Fuse; Panels, Fuse

Holders, Lamp—See Sockets, Lamp & Lamp Assemblies

Holders, Test Lead

D **ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766** ..... p. 1985
D **Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207** p. 2117
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *

Holders, Tube—See Retainers, Tube

Honeycomb Sheets, Panels, etc.

M **McLean Engrg. Labs., Dept. EM, 70 Washington Rd., Princeton Jctn., N.J. 08550** ..... *
DM **Metex Corp., Dept. EM, 970 New Durham Rd., Edison, N.J. 08817** ..... p. 2566
Altek Corp., Dept. EM, 2150 Industrial Pkwy, Silver Spring, MD 20904
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
DM Met-L-Wood Corp., Dept. EM, 6755 65th St., Chicago, Ill. 60638
M Nurad, Inc., Dept. EM, 2165 Druid Pk. Dr., Baltimore, Md. 21211
D Tecknit, Dept. EM, 129 E. Dermody St., Cranford, N.J. 07016

Housings, Circuit Module—See Enclosures, Circuit Board, Module & Relay Mounting

Housings, Photomultiplier Tube—See Photomultiplier Tube Housings

Hybrid Voltage Regulators

DM **Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634** ..... *
M **Integrated Circuits, Inc., Dept. EM, 13256 Northrup Way, Bellevue, Wash. 98005** ..... *
ITT North, Microsystems Div, Dept. EM, 700 Hillsboro Pl., Deerfield Beach, Fla. 33441 ..... *
M Circuit Technology, Dept. EM, 160 Smith St., Farmingdale, N.Y. 11735
CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
M Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
D Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
Lambda Elctrns., Dept. EM, 515 Brd. Hollow Rd., Melville, N.Y. 11746
M Micro Networks, Dept. EM, 324 Clark St., Worcester, Mass. 01606
M Raytheon Co., Indl. Comps. Oper., Dept. EM, 465 Centre St., Quincy, Mass. 02169
D Sanken Elec. Co., Dept. EM, 1-22-8 Nishi-Ikebukuro, Toshima-Ku, Tokyo, Japan
Solid State Inc., Dept. EM, 46 Farrand St., Bloomfield, N.J. 07003
DM Solitron Devices, Transistor Div., Dept. EM, 1177 Blue Heron Rd., Riviera Beach, Fla. 33404

Hydrophones & Accessories

BBN Instruments Co., Div. Bolt Beranek & Newman, Inc., Dept. EM, 50 Moulton St., Cambridge, Mass. 02138 ..... *
M Bendix Corp., Electrodynamics Div., Dept. EM, 11600 Sherman Way, N. Hollywood, Calif. 91605
Benthos, Inc., Dept. EM, Edgerton Dr., N. Falmouth, Mass. 02556
Channel Inds., Dept. EM, 839 Ward Dr., Santa Barbara, Cal. 93111
Linden Labs., Inc., Dept. EM, Box 920, State College, Pa. 16801
Wilcoxon Research, Dept. EM, 12526 Parklawn Dr., Rockville, Md. 20852

Hysteresisgraphs

DM Magnos, Incorporated, Dept. EM, Old School House Rd., Harvard, Mass. 01451
Thomas & Skinner, Inc., Dept. EM, Box 150-B,, Indianapolis, Ind. 46206
Walker Scientific, Inc., Dept. EM, Rockdale St., Worcester, Mass. 01606

Igniters, Arc Lamp—See Power Supplies For Arc Lamp

Image Expanders, Oscilloscope

M Dumont Electronics, Dept EM, 750 Bloomfield Ave., Clifton, N.J. 07015

Impedance Comparators—See Bridges, Impedance

Impedance Converters, Microwave

Uniform Tubes Inc., MicroDelay Division, Dept. EM, Collegeville, Pa. 19426 *
M Aircom, Inc., Dept. EM, Rte. 16B, Union, N.H. 03887
Eltec Instruments Inc , Dept. EM, P.O. Box 9610, Daytona Beach, Fla. 32020

Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
M Technical Research & Mfg., Inc., Dept. EM, Kelly Ave. Grenier Field, R.F.D. #3, Manchester, N.H. 03103

Incremental Magnetic Recorders—Recorders, Computer Data

Indicator Lights—See Lights, Dial, Panel, etc.

Indicators, Angle—Also See Encoders, Shaft Position

Airflyte Elctrns. Co., Dept. EM, Box 207, 56 Hook Rd., Bayonne, N.J. 07002 *
M BEI Elctrns., Inc., Dept. EM, 1101 McAlmont St., Little Rock, Ark. 72203 p. 1384-1387
M Clifton Precision, Litton Systems, Inc., Dept. EM, Marple at Brdway., Clifton Hgts., Pa. 19018 *
M Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731 p. 1392
Control Sciences, Inc., Dept. EM, 8399 Topanga Canyon Blvd., Canoga Park, Cal. 91304 *
M Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 .. p. 3975
Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 *
M ILC Data Device Corp., Dept. EM, Airport Int'l. Plaza, Bohemia, N.Y. 11716 *
M Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735 *
M Interface Engineering Inc., Dept. EM, 386 Lindelof Ave., Stoughton, Mass. 02072 *
Itek Corp. Meas. Sys. Div., Dept. EM, Christina St., Newton, Mass. 02161 p. 1655
M Natel Engineering Co., Dept. EM, 8954 Mason Ave., Canoga Park, Cal. 91306 *
M North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803 p. 1658,2795
M Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735 p. 1673
M Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 *
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
Benton Corp, Dept. EM, Race St Box 678, Manor, PA 15665
M C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
M Conrac Corp., Systems Sls Div., Dept. EM, Three Landmark Sq., Stamford, Conn. 06901
Dillon, W.C. & Co., Dept. EM, 14620-EP Keswick St., Van Nuys 340, Cal. 91407
Electric Tachometer Corp., Dept. EM, 68th & Upland Sts., Philadelphia, Pa. 19142
Evershed & Vignoles Ltd., Dept. EM, Action Lane, Chiswick, London, England W4 5HJ
Howell Inst. Inc., Dept. EM, 3479 W. Vickery Blvd., Ft. Worth, Tex. 76107
M Humphrey, Inc., Dept. EM, 9212 Balboa Ave., San Diego, Calif. 92123
Innovatek Microsystems, Inc., Dept. EM, Smithfield Rd., Millerton, N.Y. 12546
Larson Aero Dev., Dept. EM, Box 135, Concord, Cal. 94522
D Mechanical Engraving Co., Inc., Dept. EM, 4500 Bullard Ave, Bronx, New York 10470
M Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
M Northern Precision Labs., inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
M Pickering & Co., Meas. & Controls Div., Dept. EM, 101 Sunnyside Blvd., Plainview, N.Y. 11803
Schaevitz Engrg., Dept. EM, U.S. 130, Union Ave., Pennsauken, N.J. 08110
M Singer Co., Librascope Div., Dept. EM, 833 Sonora Ave., Glendale, Cal. 91201
D Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
Teledyne Gurley, Dept. EM, 514 Fulton St., Troy, N.Y. 12181
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
Trans-Tek, Inc., Dept. EM, Rte. 83, Ellington, Conn. 06029
M Transicoil, Inc., Dept. EM, Worcester, Pa. 19490
DM Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102
West Coast Resch. Corp., Dept. EM, Box 25061, Los Angeles, Cal. 90025

Indicators, Azimuth

D ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845 *
M Clifton Precision, Litton Systems, Inc., Dept. EM, Marple at Brdway., Clifton Hgts., Pa. 19018 *
M Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731 *
M Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 .. p. 3975
M Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735 p. 3976
M Interface Engineering Inc., Dept. EM, 386 Lindelof Ave., Stoughton, Mass. 02072 *
M Natel Engineering Co., Dept. EM, 8954 Mason Ave., Canoga Park, Cal. 91306 *
North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803 *
M Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735 *
Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 *
D Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 *
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
D Bendix Corp., Avionics Div, Dept. EM, Box 9414, Ft. Lauderdale, Fla. 33310
M C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
GAP Instr. Corp., Dept. EM, 110 Marcus Blvd., Hauppauge, N.Y. 11787
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Humphrey, Inc., Dept. EM, 9212 Balboa Ave., San Diego, Calif. 92123
D King Radio Corp., Dept. EM, 400 N. Rogers Rd., Olathe, Kans. 66061
Larson Aero Dev., Dept. EM, Box 135, Concord, Cal. 94522
D Mechanical Engraving Co., Inc., Dept. EM, 4500 Bullard Ave, Bronx, New York 10470
M Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
M Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
D Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
M Transicoil, Inc., Dept. EM, Worcester, Pa. 19490
DM Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102

Indicators, Capacitor Leakage—See Testers, Capacitor

Indicators, Circuit Condition, On, Off etc. (Electro-Mechanical)-Also See Indicators, Instrument, Flag, Pointer, etc.

DM Bussmann Manufacturing, Div. McGraw-Edison Co., Dept. EM, P.O. Box 14460, St. Louis, Mo. 63178 p. 4003,4004,4006,4007
DM Chicago Miniature/Drake, Dept. EM, 4433 N Ravenswood Ave., Chicago, Ill. 60640 *
Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101 *
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 *
D Electro-Mech Components, Dept. EM, 1826 N. Floradale Ave., So. El Monte, Cal. 91733 *
Electro-Mechanical Instru. Div., Sheller-Globe Corp., Dept. EM, Box 368, Dublin, PA 18917 p. 2723
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 *
D Industrial Devices, Dept. EM, Edgewater, N.J. 07020 *
D IEE/Schadow, Inc., Dept. EM, 8081 Wallace Rd., Eden Prairie, Minn. 55344 *
D Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032 p. 4156
M A Talley Ind's Co., , Dept. EM, 135 S. Main St., Thomaston, Conn. 06787 *
D Modutec, Inc., Dept. EM, 18 Marshall St., Norwalk, Conn. 06854 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
Sorenson Lighted Controls, Dept. EM, 530 Oakwood Ave., W. Hartford, Conn. 06110 *
Star Micronics Inc., Dept. EM, Pan Am Building, Ste 2308, 200 Park Ave, New York, N.Y. 10017 *
Staver Co., Inc., Dept. EM, 47 N. Saxon Ave., Bay Shore, N.Y. 11706 *
D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 *
DM Unimax Switch Corp., Sub. Unimax Group, Inc., Dept. EM, Ives Rd., Wallingford, Conn. 06492 *
D Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 *
Allard Instr., Div. of Applied Fluidics, Dept. EM, 770 Main St., Westbury, N.Y. 11590
Applied Control Co., Dept. EM, 1275 Bloomfield Ave., Fairfield, N.J. 07006
Applied Electro Technology, Inc., Dept. EM, 2220 S. Anne St., Santa Ana, Cal. 92704
Artisan Elctrns. Corp., Dept. EM, 5 Eastmans Rd., Parsippany, N.J. 07054
M Control Switch, A Cutler Hammer Co., Dept. EM, 1420 Delmar Dr., Folcroft, Pa. 19032
Daco Instr. Co., Dept. EM, 30 Stran Rd., Milford, Conn. 06460
M IMC Magnetics Corp., Western Div., Dept. EM, 6058 Walker Ave., Maywood, Cal. 90270
Jay-El Prods., Dept. EM, 1859 W. 169th St., Gardena, Calif. 90247
Korry Mfg. Co., Dept. EM, 223 8th Ave. N., Seattle, Wash. 98109
Lark Electronics, Inc., Dept. EM, Box 390, New York, N.Y. 10040
PCS., Inc., Dept. EM, 750 N. Maple Rd., Saline, Mich. 48176
M Penn Keystone Corp., Dept. EM, Division St., Ansonia, Conn. 06401
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
D Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
UCE, Inc., Dept. EM, 20 N. Main St., Norwalk, Conn. 06854

Indicators, Computer Type & Data Display—See Lights, Dial, Panel pilot & Accessories, Display Devices; Displays

Indicators, Distortion—See Analyzers, A-F

Indicators, Elapsed-Time

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
Austron, Inc., Dept. EM, 1915 Kramer La., Austin, Tex. 78758 p. 2283
M Chrono-log Corp., Dept. EM, 2 W. Park Rd., Havertown, Pa. 19083 p. 1391
Curtis Instrs., Inc., Dept. EM, 200 Kisco Ave., Mt. Kisco, N.Y. 10549 .. p. 2686
Data Precision Corporation, Dept. EM, Audubon Rd., Wakefield, Mass 01880 *
DM Electrodynamics, A Talley Inds. Co, Dept. EM, 1200 Hicks Rd, Rolling Meadows, Ill. 60008 p. 2260
D ESE, Dept. EM, 505½ Centinela Ave., Inglewood, Cal. 90302 *
Freed Transformer Co., Inc., Dept. EM, 1718 Weirfield St., Brooklyn, N.Y. 11227 *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 *
D IVO Industries, Dept. EM, 1109 Green Grove Rd., Neptune, N.J. 07753 p. 2269
D Jewell Electrical Instruments, Inc., Dept. EM, Grenier Field, Manchester, N.H. 03108 p. 2764
D Kessler-Ellis Prods., Dept. EM, 120 1st Ave., Atlantic Highlands, N.J. 07716 p. 2271

Leach Corp., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003 .. p. 3577
A Talley Ind's Co., , Dept. EM, 135 S. Main St., Thomaston, Conn. 06787 .... *
D Modutec, Inc., Dept. EM, 18 Marshall St., Norwalk, Conn. 06854 ..... p. 2788
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705 ..... *
M North American Philips Controls Corp., Dept. EM, Cheshire Industrial Pk. Box E, Cheshire, Conn. 06410 ..... p. 2274
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... *
Trak Systems, Div. TRAK Microwave Corp., Dept. EM, 4722 Eisenhower Blvd., Dept. E8, Tampa, Fla. 33614 ..... *
United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403 ..... *
A & D Electrical Instruments, Dept. EM, 73-07 88th St., Glendale, N.Y. 11227
Automatic Timing & Controls Co., Dept. EM, King of Prussia, Pa. 19406
Bailey Meter Co., Sub. Babcock & Wilcox, Dept. EM, 29801 Euclid Ave., Wickliffe, Ohio 44092
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
D Bristol Saybrook Co., Dept. EM, 97 Coulter St., Old Saybrook, Conn. 06475
Cramer Division, Conrac Corporation, Dept. EM, Mill Rock Rd., Old Saybrook, Conn. 06475
D Dynapar Corp., Dept. EM, 1675 Delany Rd., Gurnee, Ill. 60031
D Eagle Signal, Mfg. Div. Gulf & Western Inds., Dept. EM, Box 3585, Davenport, Iowa 52808
Electric Tachometer Corp., Dept. EM, 68th & Upland Sts., Philadelphia, Pa. 19142
D Epic, Inc., Dept. EM, 150 Nassau St., New York, N.Y. 10038
Haydon Switch & Instr., Inc., Dept. EM, 1500 Meriden Rd., Waterbury, Conn. 06705
M Ideal Precision Meter Co., Dept. EM, 214 Franklin St., Brooklyn, N. Y. 11222
Indl Timer An Esterline Co., Dept. EM, U.S. Hwy 287, Parsippany, N.J. 07054
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Plessey Inc., Dept. EM, 320 Long Island Expwy. S., Melville, N.Y. 11746
D Precision Timer Co., Dept. EM, 13 Westbrook Ind'l. Park, Westbrook, Conn. 06498
DM Pres-Air-Trol Corp., Dept. EM, 895 Mamaroneck Av., Mamaroneck, N.Y. 10543
DM Sticht Co., Inc. Herman H., Dept. EM, 27 Park Pl., New York, N.Y. 10007
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
UFAD Corp., Dept. EM, 700 36th St. S.E., Grand Rapids, Mich. 49508
D Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102

Indicators, Electromechanical—See Indicators, Circuit Condition, On / Off

Indicators, Frequency—See Meters, Frequency

Indicators, Illumination—See Meters, Light (Non Photographic)

Indicators, Instrument, Flag, Pointer, etc.

Airpax Elctrns., Controls Div., Dept. EM, 6801 W. Sunrise Blvd., Ft. Lauderdale, Fla. 33313 ..... *
Beede Electrical Instr. Co., Dept. EM, S. Main St., Penacook, N.H. 03301 .... *
M Clifton Precision, Litton Systems, Inc., Dept. EM, Marple at Brdway., Clifton Hgts., Pa. 19018 ..... *
Electro-Mechanical Instru. Div., Sheller-Globe Corp., Dept. EM, Box 368, Dublin, PA 18917 ..... *
Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
Jewell Electrical Instruments, Inc., Dept. EM, Grenier Field, Manchester, N.H. 03108 ..... p. 2764
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
M A Talley Ind's Co., , Dept. EM, 135 S. Main St., Thomaston, Conn. 06787 p. 2496
D Modutec, Inc., Dept. EM, 18 Marshall St., Norwalk, Conn. 06854 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
North American Philips Controls Corp., Dept. EM, Cheshire Industrial Pk. Box E, Cheshire, Conn. 06410 ..... p. 2274
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *
Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... *
D Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 .... *
M Abrams Instr., Dept. EM, 606 E. Shiawassee, Lansing, Mich. 48901
Allard Instr., Div. of Applied Fluidics, Dept. EM, 770 Main St., Westbury, N.Y. 11590
M Analytical Measurements, Dept. EM, 31 Willow St., Chatham, N.J. 07928
D Bendix Corp., Avionics Div, Dept. EM, Box 9414, Ft. Lauderdale, Fla. 33310
Daco Instr. Co., Dept. EM, 30 Stran Rd., Milford, Conn. 06460
M Ideal Precision Meter Co., Dept. EM, 214 Franklin St., Brooklyn, N. Y. 11222
M IMC Magnetics Corp., Western Div., Dept. EM, 6058 Walker Ave., Maywood, Cal. 90270
Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
D JPI, Inc., Dept. EM, 1507 San Vicente Blvd., Santa Monica, Cal. 90402
D King Radio Corp., Dept. EM, 400 N. Rogers Rd., Olathe, Kans. 66061
Larson Aero Dev., Dept. EM, Box 135, Concord, Cal. 94522
M Mark Eyelet & Stamping, Dept. EM, 185 Wakelee Rd., Wolcott, Conn. 06716
Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
M Penn Keystone Corp., Dept. EM, Division St., Ansonia, Conn. 06401
D Robertshaw Controls Co., Ind'l. Instr. Div., Dept. EM, 1910 Byrd Ave Ste 200, Richmond, Va. 23230
M Transicoil, Inc., Dept. EM, Worcester, Pa. 19490

Indicators, Liquid Level

Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735 ..... *
Keystone Carbon Co., Thermistor Div., Dept. EM, St. Marys, Pa. 15857 ..... *
D Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032 *
Midwest Components, Dept. EM, 1981 Port City Blvd., Muskegon, Mich. 49400 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
M Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735 *
M Accurate Instrument Co., Dept. EM, Box No. 925, Westbury, N.Y. 11590
Advanced Kinetics, Dept. EM, 1231 Victoria St., Costa Mesa, Calif. 92627
D Autocon Inds., Sub. Control Data, Dept. EM, 2300 Berkshire La. N., Minneapolis, Minn. 55441
Automation Prdts., Dept. EM, 3030 Max Roy, Houston, Tex. 77008
Bailey Meter Co., Sub. Babcock & Wilcox, Dept. EM, 29801 Euclid Ave., Wickliffe, Ohio 44092
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
M Consolidated Controls Corp., Dept. EM, 15 Durant Ave., Bethel, Conn. 06801
D Curtis Industries Inc., Dept. EM, 8000 West Tower Ave., Milwaukee, Wisc. 53223
M Delaval Turbine Inc., Gems Sensors Div., Dept. EM, Spring La., Farmington, Conn. 06032
D Delavan Electronics, Inc., Dept. EM, 14605 No. 73rd St., Scottsdale, Ariz. 85260
M Flow Technology, Inc., Dept. EM, Box 21346, Phoenix, Ariz. 85036
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
Mark Eyelet & Stamping, Dept. EM, 185 Wakelee Rd., Wolcott, Conn. 06716
D National Sonics, Div. Envirotech Corp., Dept. EM, 250 Marcus Blvd., Hauppauge, N.Y. 11787
Nuclear Resch. Corp., Dept. EM, 1105 Indl. Hwy., Southampton, Pa. 18966
M Penn Airborne Prods., Dept. EM, Industrial Hwy., Southampton, Pa. 18966
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
Princo Instrs., Dept. EM, Industrial Pk., Southampton, Pa. 18966
D Robertshaw Controls Co., Ind'l. Instr. Div., Dept. EM, 1910 Byrd Ave Ste 200, Richmond, Va. 23230
Robinson-Halpern Co., Dept. EM, One Apollo Rd., Plymouth Meeting, Pa. 19462
D Scientific Technology, Dept. EM, 1201 San Antonio Rd., Mountain View, Cal. 94043
Skan-A-Matic Corp., Dept. EM, Box S, Elbridge, N.Y. 13060
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
United Detector Tech., Dept. EM, 2644 30th St., Santa Monica, Cal. 90405
Westronics, Dept. EM, 5050 Mark IV Pkwy. Box 4619, Fort Worth, Tex. 76106
D Zi-Tech Div., Aikenwood Corp., Dept. EM, Box 26, 2151 Park Blvd., Palo Alto, Cal. 94302

Indicators, Noise-Figure—See Meters, Noise-Figure

Indicators, Null

M Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 ..... *
Doric Sci., Div. Emerson Elec. Co., Dept. EM, 3883 Ruffin Rd., San Diego, Cal. 92123 ..... *
Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 .. *
Electronic Dev. Corp., Dept. EM, 11 Hamlin St., Boston, Mass. 02127 ..... *
Freed Transformer Co., Inc., Dept. EM, 1718 Weirfield St., Brooklyn, N.Y. 11227 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 p. 2753
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D Jewell Electrical Instruments, Inc., Dept. EM, Grenier Field, Manchester, N.H. 03108 ..... p. 2764
Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 p. 2768
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
A Talley Ind's Co., , Dept. EM, 135 S. Main St., Thomaston, Conn. 06787 .... *
Mini-Circuits Lab., Div. Scientific Comps. Corp., Dept. EM, 2625 E 14th St., Brooklyn, N.Y. 11235 ..... p. 2890, Inside Front Cover, Vol. 1
M North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803 ..... *
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
M Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735 *
D Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817 ..... *
Beckman Instrs., (AISSD), Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634
DM Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
Brown Electro-Measurements Co., Brown Electro-Meas., Dept. EM, P.O. Box 55169, Seattle, Wash. 98155
M Greibach Instr. Div., Electrical Inst. Svc., Inc., Dept. EM, 25 Dock St., Mt Vernon, N.Y. 10550
Mura Corp., Dept. EM, 177 Cantiague Rock Rd, Westbury, NY 11590
Penn Airborne Prods., Dept. EM, Industrial Hwy., Southampton, Pa. 18966
Princeton Applied Resch. Corp., Dept. EM, Box 2565, Princeton, N.J. 08540
DM Stock Drive Prods., Div. Designatronics, Inc., Dept. EM, 55 S. Denton Ave., New Hyde Pk., N.Y. 11040
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760
Westronics, Dept. EM, 5050 Mark IV Pkwy. Box 4619, Fort Worth, Tex. 76106
Zi-Tech Div., Aikenwood Corp., Dept. EM, Box 26, 2151 Park Blvd., Palo Alto, Cal. 94302

Indicators, Numeric Readout—See Display Devices & Displays; Tubes, Readout

Indicators, Positioning

M Clifton Precision, Litton Systems, Inc., Dept. EM, Marple at Brdway., Clifton Hgts., Pa. 19018 ..... *

M **Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731** ..... *
M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101** ..... *
Electro-Craft Corp., Dept. EM, 1600 2nd St. South, Hopkins, Minn. 55343 .. *
Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 ..... *
Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 ..... *
M **Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735** ..... p. 3977
M **Interface Engineering Inc., Dept. EM, 386 Lindelof Ave., Stoughton, Mass. 02072** ..... *
Itek Corp. Meas. Sys. Div., Dept. EM, Christina St., Newton, Mass. 02161 p. 1655
D **Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032** *
M **Natel Engineering Co., Dept. EM, 8954 Mason Ave., Canoga Park, Cal. 91306** *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
M **North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803** ..... *
Servo-Tek Prods. Co., Dept. EM, 1086 Goffle Rd., Hawthorne, N.J. 07506 p. 3109
M **Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735** p. 1673
Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... *
M **Vernitron Corp., Control Components Div., Dept. EM, 1601 Precision Park La., San Diego, Cal. 92013** ..... *
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
M ATEC, Inc., Dept. EM, Box 19426, Houston, Tex. 77024
Bailey Meter Co., Sub. Babcock & Wilcox, Dept. EM, 29801 Euclid Ave., Wickliffe, Ohio 44092
Brunswick Instr., Dept. EM, 6150 W. Mulford Street, Niles, Ill. 60648
M C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
Datron Systems, Dept. EM, 20700 Plummer St., Chatsworth, Cal. 91311
Delaval Turbine Inc., Gems Sensors Div., Dept. EM, Spring La., Farmington, Conn. 06032
Dolan-Jenner Inds., Inc., Dept. EM, Box 1020, Woburn, Mass. 01801
Dupree, Inc., Dept. EM, 9835 Dupree St., So. El Monte, Cal. 91733
D Dynapar Corp., Dept. EM, 1675 Delany Rd., Gurnee, Ill. 60031
M Electric Tachometer Corp., Dept. EM, 68th & Upland Sts., Philadelphia, Pa. 19142
Electro-Numerics Inc., Dept. EM, 1811 Reynolds, Irvine, Cal. 92714
D Electronic Counters & Controls Inc., Dept. EM, 1500 McCormick Blvd., Mundelein, Ill. 60060
D Farrand Controls Div., Dept. EM, 99 Wall St., Valhalla, N.Y. 10595
GAP Instr. Corp., Dept. EM, 110 Marcus Blvd., Hauppauge, N.Y. 11787
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
DM Hughes Aircraft Co., Ind'l. Prods. Div., Prod. Equip. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
M Humphrey, Inc., Dept. EM, 9212 Balboa Ave., San Diego, Calif. 92123
Magnetoelastic Devices, Dept. EM, 74 North St Box 625, Pittsfield, MA 01201
M Mark Eyelet & Stamping, Dept. EM, 185 Wakelee Rd., Wolcott, Conn. 06716
Moxon Inc., Dept. EM, 2222 Michelson Dr. Bldg. E, Irvine, Cal. 92715
Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
Parametrics, Div. Zero-Max Inds., Dept. EM, 284 Racebrook Rd., Orange, Conn. 06477
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
Robinson-Halpern Co., Dept. EM, One Apollo Rd., Plymouth Meeting, Pa. 19462
Schaevitz Engrg., Dept. EM, U.S. 130, Union Ave., Pennsauken, N.J. 08110
D Scientific Technology, Dept. EM, 1201 San Antonio Rd., Mountain View, Cal. 94043
Siltran Digital, Dept. EM, 14831 Kitterman, Box 437, Silverado, Cal. 92676
Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
Skan-A-Matic Corp., Dept. EM, Box S, Elbridge, N.Y. 13060
D Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
Teledyne Gurley, Dept. EM, 514 Fulton St., Troy, N.Y. 12181
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
Trans-Tek, Inc., Dept. EM, Rte. 83, Ellington, Conn. 06029
M Transicoil, Inc., Dept. EM, Worcester, Pa. 19490
United Detector Tech., Dept. EM, 2644 30th St., Santa Monica, Cal. 90405
DM Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102
West Coast Resch. Corp., Dept. EM, Box 25061, Los Angeles, Cal. 90025

Indicators, Power Level—See Monitors, Power

Indicators, Pressure—See Gages, Pressure

Indicators, Proximity

D **Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032** *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Brunswick Instr., Dept. EM, 6150 W. Mulford Street, Niles, Ill. 60648
D Delavan Electronics, Inc., Dept. EM, 14605 No. 73rd St., Scottsdale, Ariz. 85260
Dolan-Jenner Inds., Inc., Dept. EM, Box 1020, Woburn, Mass. 01801
D Electro Corp., Dept. EM, Box 3049, Sarasota, Fla. 33578
Electronic Counters & Controls Inc., Dept. EM, 1500 McCormick Blvd., Mundelein, Ill. 60060
FSI/Fork Standards Inc., Dept. EM, 211 Main St., W. Chicago, Ill. 60185
D Gordon Engineering Corp., Dept. EM, 67 Del Mar Dr., Brookfield, Conn. 06804
Larson Aero Dev., Dept. EM, Box 135, Concord, Cal. 94522
Metrix Instrument Co., Metrix Instrument Co., Dept. EM, 1711 Townhurst, Houston, Tex. 77043
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
D Robertshaw Controls Co., Ind'l. Instr. Div., Dept. EM, 1910 Byrd Ave Ste 200, Richmond, Va. 23230
Schaevitz Engrg., Dept. EM, U.S. 130, Union Ave., Pennsauken, N.J. 08110
D Scientific Technology, Dept. EM, 1201 San Antonio Rd., Mountain View, Cal. 94043
D Seaboard Elctrns, Dept. EM, 70 Church St., New Rochelle, N.Y. 10805
Siltran Digital, Dept. EM, 14831 Kitterman, Box 437, Silverado, Cal. 92676
Skan-A-Matic Corp., Dept. EM, Box S, Elbridge, N.Y. 13060
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201

Indicators, R-F—See Meters, Frequency

Indicators, Rotary Shaft Position—See Encoders, Shaft Angle

Indicators, Servo

M **Clifton Precision, Litton Systems, Inc., Dept. EM, Marple at Brdway., Clifton Hgts., Pa. 19018** ..... *
M **Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731** ..... *
M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101** .. p. 3975
Electro-Craft Corp., Dept. EM, 1600 2nd St. South, Hopkins, Minn. 55343 .. *
Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 ..... *
M **Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735** ..... p. 3977
M **Interface Engineering Inc., Dept. EM, 386 Lindelof Ave., Stoughton, Mass. 02072** ..... *
North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803 ..... *
M **Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735** *
Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... *
M **Vernitron Corp., Control Components Div., Dept. EM, 1601 Precision Park La., San Diego, Cal. 92013** ..... *
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
Beckman Instrs., Cedar Grove Opers., Dept. EM, 89 Commerce Rd., Cedar Grove, N.J. 07009
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
Datron Systems, Dept. EM, 20700 Plummer St., Chatsworth, Cal. 91311
D Dillon, W.C. & Co., Dept. EM, 14620-EP Keswick St., Van Nuys 340, Cal. 91407
Evershed & Vignoles Ltd., Dept. EM, Action Lane, Chiswick, London, England W4 5HJ
GAP Instr. Corp., Dept. EM, 110 Marcus Blvd., Hauppauge, N.Y. 11787
M Henschel Corp., Dept. EM, 14 Cedar St., Amesbury, Mass. 01913
M Howell Inst. Inc., Dept. EM, 3479 W. Vickery Blvd., Ft. Worth, Tex. 76107
Innovatek Microsystems, Inc., Dept. EM, Smithfield Rd., Millerton, N.Y. 12546
Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
Kollsman Instr. Co., Dept. EM, Daniel Webster Hwy., Merrimack, N.H. 03054
McFadden Elctrns. Co., Dept. EM, 8953 S. Atlantic Blvd., South Gate, Cal. 90280
M Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
M Penn Airborne Prods., Dept. EM, Industrial Hwy., Southampton, Pa. 18966
M Precision Mechanisms Corp., Dept. EM, 44 Brooklyn Ave., Westbury, N.Y. 11590
Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
D Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
Teledyne Gurley, Dept. EM, 514 Fulton St., Troy, N.Y. 12181
M Transicoil, Inc., Dept. EM, Worcester, Pa. 19490
Westronics, Dept. EM, 5050 Mark IV Pkwy. Box 4619, Fort Worth, Tex. 76106

Indicators, Shorted Turn—See Testers, Coil

Indicators, Sound Level—See Meters, Audio Level

Indicators, Speed

Airpax Elctrns., Controls Div., Dept. EM, 6801 W. Sunrise Blvd., Ft. Lauderdale, Fla. 33313 ..... p. 2258
Electro-Craft Corp., Dept. EM, 1600 2nd St. South, Hopkins, Minn. 55343 .. *
Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 ..... *
Harrel, Inc., Dept. EM, 16 Fitch St., E. Norwalk, Conn. 06855 ..... *
D **IVO Industries, Dept. EM, 1109 Green Grove Rd., Neptune, N.J. 07753** ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
Servo-Tek Prods. Co., Dept. EM, 1086 Goffle Rd., Hawthorne, N.J. 07506 p. 3109
United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403 ..... *
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
M ATEC, Inc., Dept. EM, Box 19426, Houston, Tex. 77024
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
D Dynapar Corp., Dept. EM, 1675 Delany Rd., Gurnee, Ill. 60031
M Electric Tachometer Corp., Dept. EM, 68th & Upland Sts., Philadelphia, Pa. 19142
Electro-Devices, Inc., Dept. EM, 4-6 Godwin Ave., Paterson, N.J. 07509
D Electronic Counters & Controls Inc., Dept. EM, 1500 McCormick Blvd., Mundelein, Ill. 60060
Evershed & Vignoles Ltd., Dept. EM, Action Lane, Chiswick, London, England W4 5HJ
Himmelstein & Co., S., Dept. EM, 2500 Estes Ave., Elk Grove Village, Ill. 60007
Howell Inst. Inc., Dept. EM, 3479 W. Vickery Blvd., Ft. Worth, Tex. 76107
Kollsman Instr. Co., Dept. EM, Daniel Webster Hwy., Merrimack, N.H. 03054
D LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
Metrix Instrument Co., Metrix Instrument Co., Dept. EM, 1711 Townhurst, Houston, Tex. 77043
M Power Instrs., Inc., Dept. EM, 7352 N. Lawndale Ave., Skokie, Ill. 60076
Sticht Co., Inc. Herman H., Dept. EM, 27 Park Pl., New York, N.Y. 10007
West Coast Resch. Corp., Dept. EM, Box 25061, Los Angeles, Cal. 90025
Westronics, Dept. EM, 5050 Mark IV Pkwy. Box 4619, Fort Worth, Tex. 76106

Indicators, Telemetering—See Analyzers, Telemetric Data

Indicators, Temperature—See Meters, Temperature

Indicators, Temperature (Non-Meter Type)

Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 ..... *
Gulton Inds., Inc., Measurement & Control Systems Div., Dept. EM, Gulton Ind'l. Pk., E. Greenwich, R.I. 02818 ..... *
M **Harrel, Inc., Dept. EM, 16 Fitch St., E. Norwalk, Conn. 06855 ..... ***
Keystone Carbon Co., Thermistor Div., Dept. EM, St. Marys, Pa. 15857 ..... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 ..... *
M Acromag, Inc., Dept. EM, 30765 Wixom Rd., Wixom, Mich. 48096
D Acurex-Autodata, Dept. EM, 485 Clyde, Mountain View, Cal. 94042
Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
Ashley-Butler, Inc., ASHA, Dept. EM, 208 Route 206 South, Somerville, N.J. 08876
M ATEC, Inc., Dept. EM, Box 19426, Houston, Tex. 77024
Bailey Instrs., Inc., Dept. EM, 515 Victor St., Saddle Brook, N.J. 07662
Bailey Meter Co., Sub. Babcock & Wilcox, Dept. EM, 29801 Euclid Ave., Wickliffe, Ohio 44092
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
Capintec Instruments, Inc., Dept. EM, 136 Summit Ave., Montvale, N.J. 07645
M Cox & Co., Inc., Dept. EM, 215 Park Ave., S., New York, N.Y. 10003
D Eagle Signal, Mfg. Div. Gulf & Western Inds., Dept. EM, Box 3585, Davenport, Iowa 52808
DM H-B Instr. Co., Dept. EM, 4306 N. American St, Philadelphia, Pa. 19140
M Howell Inst. Inc., Dept. EM, 3479 W. Vickery Blvd., Ft. Worth, Tex. 76107
Hy-Cal Engrg, Dept. EM, 12105 Los Nietos Rd., Santa Fe Springs, Cal 90670
Indl Timer An Esterline Co., Dept. EM, U.S. Hwy 287, Parsippany, N.J. 07054
Ircon Inc., Dept. EM, 7555 N. Linder Ave, Skokie, Ill. 60076
D LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
M Mark Eyelet & Stamping, Dept. EM, 185 Wakelee Rd., Wolcott, Conn. 06716
Metrix Instrument Co., Metrix Instrument Co., Dept. EM, 1711 Townhurst, Houston, Tex. 77043
Micro, Emerson Electric Co. Devices Div, Dept. EM, Box 501 Wright Bros Br, Dayton, Ohio 45409
Pace Inc., Dept. EM, 9329 Fraser Ave., Silver Spring, Md. 20910
Plessey Enviromental Sys., Dept. EM, 3939 Ruffin Rd., San Diego, Cal. 92123
Siltran Digital, Dept. EM, 14831 Kitterman, Box 437, Silverado, Cal. 92676
Stow Labs., Inc., Dept. EM, Kane Ind'l. Dr., Hudson, Mass. 01749
Tempil Div., Big Three Inds, Dept. EM, Hamilton Blvd., So. Plainfield, N.J. 07080
D West Instrs, Gulton Inds, M. C. S. Div., Dept. EM, Gulton Indl Pk, E. Greenwich, RI 02818

Indicators, Transducer Output, Analog

M **Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731 ..... ***
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
BLH Elctrns., Dept. EM, 42 Fourth Ave., Waltham, Mass. 02154
D Dillon, W.C. & Co., Dept. EM, 14620-EP Keswick St., Van Nuys 340, Cal. 91407
Electro-Numerics Inc., Dept. EM, 1811 Reynolds, Irvine, Cal. 92714
D LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
M Mark Eyelet & Stamping, Dept. EM, 185 Wakelee Rd., Wolcott, Conn. 06716
D Philips Audio Video Sys, Neutrik Prods, Dept. EM, 91 McKee Dr., Mahwah, N.J. 07430
Schaevitz Engrg., Dept. EM, U.S. 130, Union Ave., Pennsauken, N.J. 08110
West Coast Resch. Corp., Dept. EM, Box 25061, Los Angeles, Cal. 90025

Indicators, Vacuum—See Gages, Vacuum

Indicators, VSWR—See Meters, Standing Wave Ratio

Inductance Comparators—See Bridges, Inductance

Inductance Standards—See Standards, Inductance

Induction Potentiometers—See Resolvers, Synchro

Inductors—See Coils

Inks For Thick Film Microcircuits

Acheson Colloids Co., Div. Acheson Inds., Dept. EM, P.O. Box 288, Port Huron, Mich. 48060
M E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
D Electro-Science Labs., Dept. EM, 2211 Sherman Ave., Pennsauken, N. J. 08110
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
Methode Elctrns., Inc., Dept. EM, 7447 W. Wilson Ave., Chicago, Ill. 60656
M Micro-Circuits Co., Inc., Dept EEM I, Dept. EM, New Buffalo, Mich. 49117
Plessey Inc., Dept. EM, 320 Long Island Expwy. S., Melville, N.Y. 11746

Insertion Loss Measurement Systems

M **All-Tronics Inc., Dept. EM, 45 Bond St., Westbury, N.Y. 11590 ..... ***
Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ..... *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 ***
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D Ailtech, Dept. EM, 2070 Fifth Ave, Ronkonkoma, NY 11779
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
D Blonder-Tongue Labs., Inc., Dept. EM, One Jake Brown Rd., Old Bridge, N.J. 08857
Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
Solar Elctrns. Co., Dept. EM, 901 N. Highland, Hollywood, Cal. 90038
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760
Wide Band Engrg. Co. Inc., Dept. EM, Box 21652, Phoenix, Ariz. 85036

Inserts—See Bushings, etc.

Instrument Parts, Precision—See Bearings; Gears & Gear Mechanisms, Springs; etc.

Insulation Materials

Carborundum Co., Graphite Prods. Div., Dept. EM, Box 339, Niagara Falls, N.Y. 14302 ..... *
Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 ..... *
DM **Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... ***
Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 ..... p. 4607
M **Hardman Inc., Dept. EM, 600 Cortlandt St., Belleville, N.J. 07109 ..... ***
DM **Humiseal Div., Columbia Chase Corp., Dept. EM, 26-60 Bklyn-Queens Expwy., Woodside, N.Y. 11377 ..... ***
M **Magnetic Shield Div., Perfection Mica, Dept. EM, 750 North Thomas Dr., Bensenville, Ill. 60106 ..... ***
Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 *
D **Varflex Corp., Dept. EM, 514 W. Court St., Rome, N.Y. 13440 ..... p. 2848**
DM **Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342 ..... ***
Aerolix Corporation, Dept. EM, 720 So. Columbus Street, Mt. Vernon, NY 10550
Armstrong Cork Co., Dept. EM, W. Liberty St., Lancaster, Pa. 17604
M Atlas Fibre Co., Dept. EM, 6970 N. Central Park Ave., Chicago, Ill. 60645
M Auburn Mfg., Dept. EM, Pease Ave. & Stack St., Middletown, Conn. 06457
Bird, Richard H. & Co., Inc., Dept. EM, 1 Spruce St., Waltham, Mass. 02154
Brand Dielectrics, Inc., Dept. EM, Route 203, N. Windham, Conn. 06256
DM Brand-Rex Co., Dept. EM, Box 498, Willimantic, Conn. 06226
DM Carborundum Co., Plastics Div., Dept. EM, Carborundum Center, Niagara Falls, New York 14302
M Chemplast, Inc., Dept. EM, 31-150 Dey Rd., Wayne, N.J. 07470
M Cleveland Mica Co., Dept. EM, 1360 Hird Ave., Lakewood, Ohio 44107
DM Cole-Flex Corp., Dept. EM, 91 Cabot St., W. Babylon, N.Y. 11704
DM Conap, Inc., Dept. EM, 1405 Buffalo St, Olean, N.Y. 14760
Diamonite Products Div., Dept. EM, Box 567, Shreve, Ohio 44676
Dolph, John C. Co., Dept. EM, New Rd., Monmouth Junction, N.J. 08852
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
D Electro-Science Labs., Dept. EM, 2211 Sherman Ave., Pennsauken, N. J. 08110
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
M Fibre Materials Corp., Dept. EM, 34 Dupont St., Plainview, N.Y. 11803
Formulated Resins Inc., Dept. EM, Box 508, Greenville, R.I. 02828
Glastic Corp., Dept. EM, 4321 Glenridge Rd., Cleveland, Ohio 44121
GTE Sylvania Inc., Western Gold & Platinum Sub., Dept. EM, 477 Harbor Blvd., Belmont, Cal. 94002
DM ICO/Rally Corp., Dept. EM, Edward J. Bush, Palo Alto, Cal. 94303
Industrial Mica Div., Columbia Chase Corp., Dept. EM, 223 S. Van Brunt St., Englewood, N.J. 07631
M Isochem Resins Co., Dept. EM, 99 Cook St., Lincoln, R.I. 02865
Keene Corp, Dept. EM, 345 Park Ave, New York, N.Y. 10022
DM Laminated Fabricators, Dept. EM, 1145 San Mateo Ave., San Bruno, Calif. 94066
3M Co., Indl Elect Prods. Div., Dept. EM, 3M Center, St. Paul, Minn. 55101
D Murata Mfg. Co. Ltd., Dept. EM, 16, Kaiden Nishijin-cho, Nagaoka-Kyo-Shi, Kyoto, Japan
Nat'l Ceramic Co., Dept. EM, 500 Southard St., Trenton, N.J. 08602
D Norelcom Electronics, Dept. EM, 200 Allen Blvd., Farmingdale, N.Y. 11735
NVF Co., Dept. EM, Box 68, Yorklyn, Del. 19736
DM Owens Corning Fiberglas Corp., Dept. EM, Fiberglas Tower Bldg., Toledo, Ohio 43659
D Penn Fibre & Specialty, Dept. EM, 2020 E. Westmoreland St., Phila., Pa. 19134
Precision Paper Tube Co., Dept. EM, 1049 S. Noel Ave., Wheeling, Ill. 60090
Raychem Corp., Dept. EM, 300 Constitution Dr., Menlo Park, Cal. 94025
D Rexnord Inc., Specialty Chem Div, Dept. EM, 4300 N. 127th St, Brookfield, Wis. 53005
M Rogers Corp., Dept. EM, Rogers, Conn. 06263
Rostone Corp., Dept. EM, 2781 S. Concord Rd., Lafayette, Ind. 47902
Schweitzer, Div., Kimberly Clark Corp., Dept. EM, Lee, Mass. 01238
SWS Silicones Corp., Dept. EM, Box 428, Adrian, Mich. 49221
Synthane Taylor Corp., An Alco Standard Corporate Partner, Dept. EM, Box 835, Valley Forge, Pa. 19482
Thermal Amer. Fused Quartz, Dept. EM, Change Bridge Rd., Montville, N.J. 07045
Union Carbide, Chemicals & Plastics, Dept. EM, 270 Park Ave., New York, N.Y. 10017
Union Carbide Corp., Linde Div., Dept. EM, 270 Park Ave., New York, N.Y. 10017
D Uniroyal, Inc., Dept. EM, 1230 Ave. of Americas, New York, N.Y. 10020
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578
D Zippertubing Co., Dept. EM, 13000 S. Broadway, Los Angeles, Cal. 90061

Insulation Parts, Fabricated

Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
D **Bivar, Inc., Dept. EM, 1617 E. Edinger Ave., Santa Ana, Cal. 92705 ..... ***

DM **Concord Elctrns., Dept. EM, 37 Great Jones St., Dept. JE, New York, N.Y. 10012** ..... *
DM **Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458** ..... *
Delbert Blinn. Co., Dept. EM, Box 2007, Pomona, Calif. 91766 ..... p. 3923
Elctrn. Molding Corp., Dept. EM, 96 Mill St., Woonsocket, R.I. 02895 ..... *
D **Excel Products Co., Inc., Dept. EM, 401 Joyce Kilmer Ave., New Brunswick, N.J. 08903** ..... *
Grayhill Inc., Dept. EM, 569 Hillgrove Ave., LaGrange, Ill. 60525 ..... *
Heyman Mfg. Co., Dept. EM, 147 N. Michigan Ave., Kenilworth, N.J. 07033 p. 4610
ITT Thermotech, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 1203 S. 5th St., Hopkins, Minn. 55343 ..... p. 2560,2561
D **Jones Elctrns., Hiram, Dept. EM, 11607 Vanowen St., No. Hollywood, Cal. 91605** ..... *
M **Magnetic Shield Div., Perfection Mica, Dept. EM, 750 North Thomas Dr., Bensenville, Ill. 60106** ..... p. 2565
National Tel-Tronics, Div. Electro Audio Dynamics, Inc., Dept. EM, State Road Hill, Meadville, Pa. 16335 ..... *
Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2122,2136,2137
M **Thermalloy, Inc., Dept. EM, 2021 W. Valley View, Dallas, Tex 75234** ..... *
D **Varflex Corp., Dept. EM, 514 W. Court St., Rome, N.Y. 13440** ..... p. 2848
D **Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342** ..... *
D Accessories for Electronics, Dept. EM, 800 Merrick Road, Baldwin, N.Y. 11510
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
Aerolix Corporation, Dept. EM, 720 So. Columbus Street, Mt. Vernon, NY 10550
D Amatom Electronic Hardware, Div. MITE Corp., Dept. EM, 446 Blake St., New Haven, Conn. 06515
M Atlantic Optical Moulding Co., Dept. EM, Ellis St., Dudley, Mass. 01570
M Atlas Fibre Co., Dept. EM, 6970 N. Central Park Ave., Chicago, Ill. 60645
M Auburn Mfg., Dept. EM, Pease Ave. & Stack St., Middletown, Conn. 06457
M Avid Electronics Corp., Dept. EM, Box 426, Baldwin, Pl., N.Y. 10505
Brand Dielectrics, Inc., Dept. EM, Route 203, N. Windham, Conn. 06256
DM Carborundum Co., Plastics Div., Dept. EM, Carborundum Center, Niagara Falls, New York 14302
M Chemplast, Inc., Dept. EM, 31-150 Dey Rd., Wayne, N.J. 07470
M Cleveland Mica Co., Dept. EM, 1360 Hird Ave., Lakewood, Ohio 44107
D Cole-Flex Corp., Dept. EM, 91 Cabot St., W. Babylon, N.Y. 11704
M Comco Plastics, Inc., Dept. EM, 98-36 C. Jamaica Ave., Richmond Hill, N.Y. 11418
Diamonite Products Div., Dept. EM, Box 567, Shreve, Ohio 44676
Fibre Materials Corp., Dept. EM, 34 Dupont St., Plainview, N.Y. 11803
Garner Glass Co., Dept. EM, 177 S. Indian Hill Blvd., Claremont, Calif. 91711
Industrial Mica Div., Columbia Chase Corp., Dept. EM, 223 S. Van Brunt St., Englewood, N.J. 07631
DM Laminated Fabricators, Dept. EM, 1145 San Mateo Ave., San Bruno, Calif. 94066
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
Nat'l Ceramic Co., Dept. EM, 500 Southard St., Trenton, N.J. 08602
NVF Co., Dept. EM, Box 68, Yorklyn, Del. 19736
DM Owens Corning Fiberglas Corp., Dept. EM, Fiberglas Tower Bldg., Toledo, Ohio 43659
D Penn Fibre & Specialty, Dept. EM, 2020 E. Westmoreland St., Phila., Pa. 19134
Precision Paper Tube Co., Dept. EM, 1049 S. Noel Ave., Wheeling, Ill. 60090
Quartzite Processing, Inc., Dept. EM, 6 Holyoke St., Malden, Mass. 02148
Rostone Corp., Dept. EM, 2781 S. Concord Rd., Lafayette, Ind. 47902
Sjoberg, C. & Son, Inc., Dept. EM, 415 Station St., Cranston, R.I. 02910
Star Porcelain Co., Dept. EM, 71 Muirhead Ave., Box 1267, Trenton, N.J. 08638
M Stevens Prods., Inc., Dept. EM, 128 N. Park St., E. Orange, N.J. 07019
Synthane Taylor Corp., An Alco Standard Corporate Partner, Dept. EM, Box 835, Valley Forge, Pa. 19482
Tran-Tec Corporation, Dept. EM, Box 1022, Columbus, Neb. 68601
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013
M U.S. Terminals, Dept. EM, 7502 Camargo Rd., Cincinnati, Ohio 45243
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Insulators, Antenna

Alberox Corp., Dept. EM, New Bedford Ind'l. Pk., New Bedford, Mass. 02745 *
DM **Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458** ..... *
Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... *
Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 *
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
M Avid Electronics Corp., Dept. EM, Box 426, Baldwin, Pl., N.Y. 10505
D Birnbach Co., Inc., Dept. EM, 177 Hanse Ave., Freeport, N.Y. 11520
Calvert Elctrns., inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
Caplugs Div., Protective Closures Co., Dept. EM, 2150 Elmwood Ave., Buffalo, N.Y. 14207
Centerflex Ceramics, Dept. EM, 221 Seventh Ave., Hawthorne, N.J. 07507
DM Nat'l Ceramic Co., Dept. EM, 500 Southard St., Trenton, N.J. 08602
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
D S & A Electronics, Div. Scott & Fetzer Co., Dept. EM, 202 W. Florence, Toledo, Ohio 43605
Star Porcelain Co., Dept. EM, 71 Muirhead Ave., Box 1267, Trenton, N.J. 08638
Synthane Taylor Corp., An Alco Standard Corporate Partner, Dept. EM, Box 835, Valley Forge, Pa. 19482
D Unarco-Rohn, Div. Unarco Inds., Dept. EM, Box 2000, Peoria, Ill. 61656

Insulators, Bushing (Metallized)—See Bushings, etc.

Insulators, Clip, Test & Battery

D **Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458** ..... *
DM **Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012** .. *
DM **Mueller Electric, Dept. EM, 1583 E 31st St. Dept. 20, Cleveland, Ohio 44114** *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D **Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207** *
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035

Integrated Circuit Packaging Systems

D **Augat Interconnection Prods. Div., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703** ..... *
Berg Electronics, Div. E.I. DuPont de Nemours & Co., Dept. EM, York Expwy., New Cumberland, Pa. 17070 ..... *
D **Bivar, Inc., Dept. EM, 1617 E. Edinger Ave., Santa Ana, Cal. 92705** ..... *
D **Continental Connector Corp., Dept. EM, 34-63 56th St., Woodside, N.Y. 11377** ..... *
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... *
Dynatech Corp., Dept. EM, 1225 E. Wakeham Ave., Santa Ana, Cal. 92702 p. 1751
M **Elctrn. Molding Corp., Dept. EM, 96 Mill St., Woonsocket, R.I. 02895** ..... *
DM **Excel Products Co., Inc., Dept. EM, 401 Joyce Kilmer Ave., New Brunswick, N.J. 08903** ..... *
DM **Garry Mfg., Inc., Dept. EM, 1010 Jersey Ave., New Brunswick, N.J. 08902** p. 1768
Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... *
3M Co., Electronic Prods Div., Dept. EM, 3M Center, St. Paul, Minn. 55101 *
D **Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342** ..... *
Vero Electronics, Dept. EM, 171 Bridge Rd., Hauppauge, N.Y. 11787 ..... *
D AMP Special Industries, Dept. EM, Valley Forge, Pa. 19482
Ark-Les Switch Corp., Dept. EM, 51 Water St., Watertown, Mass. 02172,
D Burndy Corporation, Dept. EM, Richards Ave., Norwalk, , Conn. 06852
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
Des Tek Ind., Dept. EM, Box 24163, Los Angeles, Cal. 90024
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
Information Control Corp., Abacus Div. Dept. EM7, Dept. EM, 9610 Bellanca Ave., Los Angeles, Cal. 90045
D Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
D Modpak, Dept. EM, 31 A Green St., Waltham, Mass. 02154
D SAMTEC, Dept. EM, 810 Progress Blvd., New Albany, Indiana 47150
DM Scanbe Div., Zero Corp., Dept. EM, 3445 Fletcher Ave., El Monte, Cal. 91731
Solid State Equipment Corp., Dept. EM, 430 Delaware Drive, Fort Washington, Pa. 19034
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050

IC's, Calculator Kits—See Kits, Breadboarding

IC's, Design Aids

Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... p. 1469
Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... *
DM Advanced Micro Devices, Dept. EM, 901 Thompson Pl., Sunnyvale, Cal. 94086
Exar Integrated Systems, Dept. EM, P.O.B. 62229, Sunnyvale, Cal. 94088
Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
D Intel Corp., Dept. EM, 3065 Bowers Ave., Santa Clara, Cal. 95051
DM Raytheon Semiconductor, Dept. EM, 350 Ellis St., Mountain View, Cal. 94042
D Rockwell Int'l., Microelectronic Devices, Dept. EM, Box 3669, 3310 Miraloma Ave., Anaheim, Cal. 92803
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077

IC's, Digital

Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734 ..... p. 2857
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... p. 1469
Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... *
LSI Computer Systems, Inc., Dept. EM, 1235 Walt Whitman Rd., Melville, N.Y. 11746 ..... p. 2859
Motorola, Inc., Compt. Prods. Clock Oscillator Dept., Dept. EM, 2553 N. Edgington, Franklin Park, Ill. 60131 ..... p. 2350
DM Advanced Micro Devices, Dept. EM, 901 Thompson Pl., Sunnyvale, Cal. 94086
D American Microsystems, Inc., Dept. EM, 3800 Homestead Rd., Santa Clara, Cal. 95051
Data General Corp., Dept. EM, 15 Turnpike Rd Rte 9, Westboro, Mass 01581
Exar Integrated Systems, Dept. EM, P.O.B. 62229, Sunnyvale, Cal. 94088
Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
Ferranti Elec., Dept. EM, East Bethpage Rd., Plainview, N.Y. 11803
General Instr. Corp., Microelectronics Div., Dept. EM, 600 W. John St., Hicksville N.Y. 11802
DM Harris Semiconductor, Dept. EM, Box 883, Melbourne, Fla. 32901
D Intersil, Inc., Dept. EM, 10900 N. Tantau Ave., Cupertino, Cal. 95014
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
M Nitron, Inc., Dept. EM, 10420 Bubb Rd., Cupertino, Cal. 95014
DM Raytheon Semiconductor, Dept. EM, 350 Ellis St., Mountain View, Cal. 94042
D Rockwell Int'l., Microelectronic Devices, Dept. EM, Box 3669, 3310 Miraloma Ave., Anaheim, Cal. 92803
D Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666

SGS-ATES Semiconductor Corp., Dept. EM, 79 Massasoit St., Waltham, Mass. 02154
DM Signetics Corp., Dept. EM, 811 E. Arques Ave., Sunnyvale, Cal. 94086
DM SMC Microsystems Corp., Dept. EM, 35 Marcus Blvd, Hauppauge, N.Y. 11787
Western Digital Corp., Dept. EM, 3128 Red Hill Ave. Box 2180, Newport Beach, Cal. 92663

IC's, Interface

Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734 p. 1388,1389
Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 p. 1401
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 p. 1469
Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 *
LSI Computer Systems, Inc., Dept. EM, 1235 Walt Whitman Rd., Melville, N.Y. 11746 p. 2859
Motorola, Inc., Compt. Prods. Clock Oscillator Dept., Dept. EM, 2553 N. Edgington, Franklin Park, Ill. 60131 p. 2350
DM Advanced Micro Devices, Dept. EM, 901 Thompson Pl., Sunnyvale, Cal. 94086
D American Microsystems, Inc., Dept. EM, 3800 Homestead Rd., Santa Clara, Cal. 95051
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Exar Integrated Systems, Dept. EM, P.O.B. 62229, Sunnyvale, Cal. 94088
Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
DM Harris Semiconductor, Dept. EM, Box 883, Melbourne, Fla. 32901
D Intel Corp., Dept. EM, 3065 Bowers Ave., Santa Clara, Cal. 95051
D Intersil, Inc., Dept. EM, 10900 N. Tantau Ave., Cupertino, Cal. 95014
MilerTronics, Dept. EM, 303 Airport Rd, Greenville, S.C. 29607
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
NEC Microcomputers, Inc., Dept. EM, 173 Worcester Rd, Wellesley, Mass 02181
DM Precision Monolithics Inc., Dept. EM, 1500 Space Dr., Santa Clara, Cal. 95050
DM Raytheon Semiconductor, Dept. EM, 350 Ellis St., Mountain View, Cal. 94042
D Rockwell Int'l., Microelectronic Devices, Dept. EM, Box 3669, 3310 Miraloma Ave., Anaheim, Cal. 92803
D Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
SGS-ATES Semiconductor Corp., Dept. EM, 79 Massasoit St., Waltham, Mass. 02154
DM Signetics Corp., Dept. EM, 811 E. Arques Ave., Sunnyvale, Cal. 94086
DM SMC Microsystems Corp., Dept. EM, 35 Marcus Blvd, Hauppauge, N.Y. 11787

IC's, Linear

Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734 p. 1389
M **Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 p. 1401**
Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 *
DM Advanced Micro Devices, Dept. EM, 901 Thompson Pl., Sunnyvale, Cal. 94086
Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
M Aydin, Vector Div., Dept. EM, Box 328, Newtown, PA 18940
Exar Integrated Systems, Dept. EM, P.O.B. 62229, Sunnyvale, Cal. 94088
Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
Ferranti Elec., Dept. EM, East Bethpage Rd., Plainview, N.Y. 11803
DM Harris Semiconductor, Dept. EM, Box 883, Melbourne, Fla. 32901
D Intersil, Inc., Dept. EM, 10900 N. Tantau Ave., Cupertino, Cal. 95014
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
DM Precision Monolithics Inc., Dept. EM, 1500 Space Dr., Santa Clara, Cal. 95050
DM Raytheon Semiconductor, Dept. EM, 350 Ellis St., Mountain View, Cal. 94042
D Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
SGS-ATES Semiconductor Corp., Dept. EM, 79 Massasoit St., Waltham, Mass. 02154
DM Signetics Corp., Dept. EM, 811 E. Arques Ave., Sunnyvale, Cal. 94086

IC's Memory

Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 *
DM Advanced Micro Devices, Dept. EM, 901 Thompson Pl., Sunnyvale, Cal. 94086
D American Microsystems, Inc., Dept. EM, 3800 Homestead Rd., Santa Clara, Cal. 95051
Data General Corp., Dept. EM, 15 Turnpike Rd Rte 9, Westboro, Mass 01581
Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
General Instr. Corp., Microelectronics Div., Dept. EM, 600 W. John St., Hicksville, N.Y. 11802
DM Harris Semiconductor, Dept. EM, Box 883, Melbourne, Fla. 32901
D Intel Corp., Dept. EM, 3065 Bowers Ave., Santa Clara, Cal. 95051
D Intersil, Inc., Dept. EM, 10900 N. Tantau Ave., Cupertino, Cal. 95014
ITT Semiconductors Discrete Devices, Dept. EM, 500 Broadway, Lawrence, Mass 01841
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
NEC Microcomputers, Inc., Dept. EM, 173 Worcester Rd, Wellesley, Mass 02181
M Nitron, Inc., Dept. EM, 10420 Bubb Rd., Cupertino, Cal. 95014
DM Raytheon Semiconductor, Dept. EM, 350 Ellis St., Mountain View, Cal. 94042
D Rockwell Int'l., Microelectronic Devices, Dept. EM, Box 3669, 3310 Miraloma Ave., Anaheim, Cal. 92803
D Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
SGS-ATES Semiconductor Corp., Dept. EM, 79 Massasoit St., Waltham, Mass. 02154
DM Signetics Corp., Dept. EM, 811 E. Arques Ave., Sunnyvale, Cal. 94086

IC's Microprocessor

Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 *
Motorola, Inc., Compt. Prods. Clock Oscillator Dept., Dept. EM, 2553 N. Edgington, Franklin Park, Ill. 60131 p. 2350
DM Advanced Micro Devices, Dept. EM, 901 Thompson Pl., Sunnyvale, Cal. 94086
American Microsystems, Inc., Dept. EM, 3800 Homestead Rd., Santa Clara, Cal. 95051
Data General Corp., Dept. EM, 15 Turnpike Rd Rte 9, Westboro, Mass 01581
Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
Ferranti Elec., Dept. EM, East Bethpage Rd., Plainview, N.Y. 11803
General Instr. Corp., Microelectronics Div., Dept. EM, 600 W. John St., Hicksville, N.Y. 11802
DM Harris Semiconductor, Dept. EM, Box 883, Melbourne, Fla. 32901
D Intel Corp., Dept. EM, 3065 Bowers Ave., Santa Clara, Cal. 95051
D Intersil, Inc., Dept. EM, 10900 N. Tantau Ave., Cupertino, Cal. 95014
MilerTronics, Dept. EM, 303 Airport Rd, Greenville, S.C. 29607
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
NEC Microcomputers, Inc., Dept. EM, 173 Worcester Rd, Wellesley, Mass 02181
DM Raytheon Semiconductor, Dept. EM, 350 Ellis St., Mountain View, Cal. 94042
D Rockwell Int'l., Microelectronic Devices, Dept. EM, Box 3669, 3310 Miraloma Ave., Anaheim, Cal. 92803
D Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
SGS-ATES Semiconductor Corp., Dept. EM, 79 Massasoit St., Waltham, Mass. 02154
Signetics Corp., Dept. EM, 811 E. Arques Ave., Sunnyvale, Cal. 94086

Integrators, Electronic

Colorado Video, Inc., Dept. EM, Box 928, Boulder, Colo. 80306 p. 1372
M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 ***
Curtis Instrs., Inc., Dept. EM, 200 Kisco Ave., Mt. Kisco, N.Y. 10549 p. 2686
Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 *
Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 *
M **Ohio Semitronics, Inc., Dept. EM, 1205 Chesapeake Ave., Columbus, Ohio 43212 ***
Plessey Electro-Products, Dept. EM, 3860 Centinela Ave., Los Angeles, Cal. 90066 p. 2276
Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 p. 3130
M Acromag, Inc., Dept. EM, 30765 Wixom Rd., Wixom, Mich. 48096
Advanced Kinetics, Dept. EM, 1231 Victoria St., Costa Mesa, Calif. 92627
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
D Centralab, Electrns. Div. - Globe Union Inc., Dept. EM, 5757 N. Green Bay Ave., Milwaukee, Wisc. 53201
M Circuit Technology, Dept. EM, 160 Smith St., Farmingdale, N.Y. 11735
D Control Equip. Corp., Dept. EM, 220 Tanner St., Lowell, Mass. 01851
Elcor Prods. Neotec Elctrns. Inc., Dept. EM, 2431 Linden La., Silver Spring, Md. 20910
Electro-Optical Inds., Inc., Dept. EM, 839 Ward Dr., Santa Barbara, Cal. 93111
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Evans Assocs., Dept. EM, Box 5055, Berkeley, Cal. 94705
Fogg System Co., Dept. EM, 15592 E. Batavia Dr., Aurora, Colo. 80011
Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704
Innovatek Microsystems, Inc., Dept. EM, Smithfield Rd., Millerton, N.Y. 12546
IPAC Group, Inc., Dept. EM, POB 156 3047 Industrial Blvd., Bethel Park, PA 15102
Laboratory Data Control, Div. M. Roy Corp., Dept. EM, Box 10235, Riviera Beach, Fla. 33404
LDJ Electronics, Dept. EM, 1064 Naughton Ave., Troy, Mich. 48084
Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
Optical Electronics, Inc., Dept. EM, Box 11140, Tucson, Ariz. 85734
Princeton Applied Resch. Corp., Dept. EM, Box 2565, Princeton, N.J. 08540
Princeton Elctrn. Prods., Dept. EM, Box 101, New Brunswick, N.J. 08902
Richard-Lee Co., Dept. EM, Box 724, New Providence, N.J. 07974
D Robertshaw Controls Co., Ind'l. Instr. Div., Dept. EM, 1910 Byrd Ave Ste 200, Richmond, Va. 23230
Sundstrand Data Control, Dept. EM, Overlake Ind'l. Pk., Redmond, Wash. 98052
D Vibra-Metrics, Inc., Dept. EM, 150 Bradley St., E. Haven, Conn. 06512
Walker Scientific, Inc., Dept. EM, Rockdale St., Worcester, Mass. 01606
West Coast Resch. Corp., Dept. EM, Box 25061, Los Angeles, Cal. 90025
Zonic Technical Labs., Dept. EM, 8927 Rossash Ave., Cincinnati, Ohio 45236

Integrators, Mechanical & Electro-Mechanical

M **Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735 ***
M **Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 p. 3130**
M Transicoil, Inc., Dept. EM, Worcester, Pa. 19490

Intensifiers, Image

A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 *
Interelectronics Corp., Dept. EM, Interelectronics Park, 550 U.S. Rte. 303, Congers, N.Y. 10920 *
Amperex Electronic Corp., Slatersville Div., Dept. EM, Providence Pike, Slatersville, R.I. 02876
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
D Apollo Lasers, Apollo Lasers, Inc., Dept. EM, 6357 Arizonia Cir, Los Angeles, Cal. 90045

Litton Inds., Electron Tube Div., Dept. EM, 960 Industrial Rd, San Carlos, Calif. 94070
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Varo Electron Devices, Inc., Dept. EM, 2203 W. Walnut St., Garland, Tex. 75040
Whittaker Corp., Dept. EM, 10880 Wilshire Blvd., Los Angeles, Cal. 90024

Intercom Systems-Also See Comm. Systems, Selective Paging

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
D Bogen Div., Lear Siegler, Inc., Dept. EM, Box 500, Paramus, N.J. 07652
D Communications Equip Co., Dept. EM, Box 700, Glen Arbor, Mich. 49636
D Encom Prods. Co., Inc., Dept. EM, Lower Hopewell Rd., Box 300, Oxford, Pa. 19363
D LocAtor Electronics Co., Dept. EM, South Country Ind'l Pk., Drawer 10609, St. Louis, Mo. 63129
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D PASO Sound Products Inc., Dept. EM, 14 First St, Pelham, NY 10803
D Philips Audiocom Prods, Philips Audio Video Sys, Dept. EM, 91 McKee Dr, Mahwah, N.J. 07430
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
D R-Columbia Products, Inc., Dept. EM, 2008 St. John's Ave., Highland Park, Ill. 60035
Ratelco, Inc., Dept. EM, 610 Pontius Ave. N., Dept. EEM, Seattle, Wash. 98109
D SPECO Div, Components Specialties, Inc., Dept. EM, PO Box 624 1172 Rte 109, Linderhurst, NY 11757
D Talk-A-Phone Co., Dept. EM, 5013 No. Kedzie Ave., Chicago, Ill. 60625
M Telectro Sys. Corp., Dept. EM, 96-18 43rd Ave., Corona, N.Y. 11368
M Telephonics Corp., Dept. EM, 770 Park Ave., Huntington, N.Y. 11743
D Telex Communications, Inc., Dept. EM, 9600 Aldrich Ave., So., Minneapolis, Minn. 55420
D Vidaire Electronics Mfg., Dept. EM, 150 Buffalo Ave., Freeport, N.Y. 11520
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Intervalometers—See Timers

Inverters, A-C to D-C—See Power Supplies, A-C to D-C

Inverters, D-C to A-C—See Power Supplies, A-C Output

Isolators, D-C/D-C Signal

Active Control Instrumentation, Dept. EM, PO Box 243-Wildwood Circle, Key Largo, Florida 33037 ..... *
Harrel, Inc., Dept. EM, 16 Fitch St., E. Norwalk, Conn. 06855 ..... *
M **Integrated Circuits, Inc., Dept. EM, 13256 Northrup Way, Bellevue, Wash. 98005** ..... *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
M Acromag, Inc., Dept. EM, 30765 Wixom Rd., Wixom, Mich. 48096
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704
IPAC Group, Inc., Dept. EM, POB 156 3047 Industrial Blvd., Bethel Park, PA 15102
Rochester Instr System, Dept. EM, 255 N. Union St., Rochester, N.Y. 14605
Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343

Isolators, Ferrite

DM **Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725** ..... *
M **, Trak Microwave Corp., Dept. E8, Dept. EM, 4726 Eisenhower Blvd.,, Tampa, Fla. 33614** ..... p. 3065
AERCOM, Dept. EM, 405 Tasman Dr., Sunnyvale, Cal. 94086
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
Triangle Microwave Inc., Dept. EM, 9B Great Meadow La, East Hanover, NJ 07936

Isolators, Line

Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
D **California Instrs., Dept. EM, 5150-Convoy St., San Diego, Cal. 92111** ..... *
CEA, Div. Berkleonics, Inc., Dept. EM, 1 Aerovista Pk., San Luis Obispo, Cal. 93401 ..... p. 3213
Deltec Corp., Dept. EM, 980 Buenos Ave., San Diego, Cal. 92110 ..... *
Dynamic Instr. Corp., Dept. EM, 933 L.I. Motor Pkwy., Hauppauge, N.Y. 11787 *
Elgar Corporation, Dept. EM, 8225 Mercury Ct., San Diego, Cal. 92111 p. 3379
M **Georator Corporation, Dept. EM, Box 70, Manassas, Va. 22110** p. 3262,3386
M **Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612** ..... *
Topaz Electronics, Dept. EM, 3855 Ruffin Rd., San Diego, Cal. 92123 p. 3402
M Acromag, Inc., Dept. EM, 30765 Wixom Rd., Wixom, Mich. 48096
D Atlas Energy Systems, Dept. EM, 9459 Rush St., S. El Monte, Cal. 91733
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
DM Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618

Isolators, Microwave (All Types)

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ..... p. 1983,1984
DM **Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725** ..... *
M **, Trak Microwave Corp., Dept. E8, Dept. EM, 4726 Eisenhower Blvd.,, Tampa, Fla. 33614** ..... p. 3065
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
M Airtron, Div. Litton Inds., Dept. EM, 200 E. Hanover Ave., Morris Plains, N.J. 07950
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
M Cir-Q-Tel, Inc., Dept. EM, 10504 Wheatley St., Kensington, Md. 20795
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
DM Hughes Aircraft Co., Electron Dynamics Div., Dept. EM, 3100 W. Lomita Blvd., Torrance, Cal. 90509
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Merrimac Inds., Inc., Dept. EM, 41 Fairfield Pl., West Caldwell, N.J. 07006
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
D Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
DM Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
Sivers Lab, Dept. EM, Box 90339, Los Angeles, Cal. 90009
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
M Teledyne Microwave, Dept. EM, 1290 Terra Bella Ave., Mountain View, Cal. 94040
TRG,, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
M UTE Microwave, Dept. EM, 3500 Sunset Ave., Asbury Park, N.J. 07712
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Isolators, Opto

D **A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876** ..... *
D **Clairex Elctrns. Inc., Dept. EM, 560 S. 3rd Ave., Mt. Vernon, N.Y. 10550** p. 3134
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... *
D **General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345** ..... *
D **Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304** .. *
D **Litronix, Dept. EM, 19000 Homestead Rd., Cupertino, Cal. 95014** ..... p. 2493
National Semiconductors, Ltd., Dept. EM, 331 Cornelia St., Plattsburgh, N.Y. 12901 ..... *
D **Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094** ..... *
DM **Raytheon Co., Distributor Prods. Oper., Dept. EM, Fourth Ave., Burlington, Mass. 01803** ..... p. 3139-3146
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Teledyne Relays, Dept. EM, 3155 W. El Segundo Blvd., Hawthorne, Cal 90250 ..... p. 3621
D **Vactec, Inc., Dept. EM, 2423 Northline Blvd., Maryland Heights, Mo. 63043** p. 3148,3149
General Elec., Semiconductor Prods., Dept. EM, Electronics Pk., Box 1122, Syracuse, NY, 13201
Meret Inc., Dept. EM, 1815 24th St., Santa Monica, Cal. 90404
Moririca Elctrns., Ltd., Dept. EM, 205 Tozuka-machi, Tozuka-Ku, Yokohama, Japan
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
Optron, Inc., Dept. EM, 1201 Tappon Cir., Carrollton, Tex. 75006
D Raytheon Co., Indl. Comps. Oper., Dept. EM, 465 Centre St., Quincy, Mass. 02169
Sensor Technology, Dept. EM, 21012 Lassen St., Chatsworth, Cal. 91311

Isolators, Source—See Isolators, Line

Jack Adapters (All Types)

Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
D **Ava Elctrns., Dept. EM, 4000 Bridge St., Dreyel Hill, Pa 19026** ..... *
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
D **ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766** ..... p. 1973,1983,1987-1990,1992,2032
DM **Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725** ..... *
D **National Tel-Tronics, Div. Electro Audio Dynamics, Inc., Dept. EM, State Road Hill, Meadville, Pa. 16335** ..... *
M **Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612** ..... *
Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D **Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207** p. 2104,2116-2119,2145
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
DM Astrolab, Inc., Dept. EM, 345 Dalziel Rd., Linden, N.J. 07036
D Blonder-Tongue Labs., Inc., Dept. EM, One Jake Brown Rd., Old Bridge, N.J. 08857
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Duotone Co., Dept. EM, 6875 S.W. 81st St., S. Miami, Fla. 33143
Methode Elctrns., Inc., Dept. EM, 7447 W. Wilson Ave., Chicago, Ill. 60656
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Switchcraft, Inc., Dept. EM, 5555 N. Elston, Chicago, Ill. 60630
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Jack Covers

Allied Systems Corp., Dept. EM, Box 11005, Greensboro, N.C. 27409 ..... *

ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ..... *
D **Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101** ..... *
DM **Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012** .. *
D **Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629** .... *
Astrolab, Inc., Dept. EM, 345 Dalziel Rd., Linden, N.J. 07036
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
Mid-West Metal Prods., Inc., Dept. EM, 456 E. Donovan Rd., Kansas City, Kans. 66115
Mupac Corp., Dept. EM, 646 Summer St., Brockton, Mass. 02402
D Switchcraft, Inc., Dept. EM, 5555 N. Elston, Chicago, Ill. 60630

Jack Panel Assemblies & Accessories—See Panels, Jack

Jacks (All Types)

Alden Products Co, Dept. EM, 117 N Main St, Brockton, Mass. 02403 ..... *
Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 ..... *
Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... **p. 1692,1695,1696,1700,1701**
DM **Augat Interconnection Prods. Div., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703** ..... *
Ava Elctrns., Dept. EM, 4000 Bridge St., Dreyel Hill, Pa 19026 ..... **p. 1725**
Beman Mfg., Inc., Dept. EM, PO Box 370, New Cumberland, Pa. 17070 ..... *
D **Concord Elctrns., Dept. EM, 37 Great Jones St., Dept. JE, New York, N.Y. 10012** ..... **p. 1741**
Connector Corp., Dept. EM, 6025 N. Keystone Ave., Chicago, Ill. 60646 **p. 1743**
DM **Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458** ..... *
Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 ..... *
D **Eby Company, Dept. EM, 4701 Germantown, Philadelphia, Pa. 19144** ..... *
Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... *
DM **Elctrn. Molding Corp., Dept. EM, 96 Mill St., Woonsocket, R.I. 02895** .. **p. 1764**
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
ITT Cannon Electric, Dept. EM, 666 E. Dyer Rd., Santa Ana, Cal. 92702 **p. 1918-1920, Back Cover, Vol. 1**
D **ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766** ..... **p. 1967, 1972-1975, 1977-1979, 1983, 1984, 1987-1992, 1994, 1995**
Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 ..... *
D **Johnson Co., E.F., Dept. EM, 299 10th SW Ave., Waseca, Minn. 56093** **p. 2046-2049**
D **Jones Elctrns., Hiram, Dept. EM, 11607 Vanowen St., No. Hollywood, Cal. 91605** ..... **p. 1772,1773**
DM **Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012** .. *
M **Mac Panel Co., Dept. EM, Box 5027, 216 Pine St., High Pt., N.C. 27262** ..... *
DM **Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725** ..... *
National Tel-Tronics, Div. Electro Audio Dynamics, Inc., Dept. EM, State Road Hill, Meadville, Pa. 16335 ..... **p. 2088**
DM **Raytheon Co., Distributor Prods. Oper., Dept. EM, Fourth Ave., Burlington, Mass. 01803** ..... **p. 2096,2097**
M **Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612** ..... *
Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 **p. 4244**
D **Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207** **p. 2104-2109,2115-2118,2145,2148,2149**
D **Superior Electric Co., Dept. EM, 1000 Middle St., Bristol, Conn. 06010** ..... *
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
D **Trimm, Inc., Dept. EM, 400 W. Lake, Box 489, Libertyville, Ill. 60048** .. **p. 2247**
D **TRW/Cinch Connectors, Electronic Comp. Div. of TRW Inc., Dept. EM, 1501 Morse Ave., Elk Grove Village, Ill. 60007** ..... *
Vernitron Elec. Comps., Beau Prods., Dept. EM, Box 10, Laconia, N.H. 03246 *
M **Virginia Panel Corp., Dept. EM, Box 1106, 1400 New Hope Rd., Waynesboro, Va. 22980** ..... *
D **W & M Mfg., Dept. EM, 187 Lafayette St., New York, N.Y. 10013** ..... **p. 2255**
D **Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629** .... *
DM Accessories for Electronics, Dept. EM, 800 Merrick Road, Baldwin, N.Y. 11510
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
DM ADC Prods, Dept. EM, 4900 W. 78th St., Minneapolis, Mn 55435
Aerolite Elexs Corp., Dept. EM, 2207 Summit Ave., Union City, N.J. 07087
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
Astrolab, Inc., Dept. EM, 345 Dalziel Rd., Linden, N.J. 07036
Auto-Swage Products Inc., Dept. EM, 726 River Rd., Shelton, Conn. 06484
Bead Elctrns., Div. Bead Chain Mfg. Co., Dept. EM, 110 Mountain Grove St., Bridgeport, Conn. 06605
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
M Dynatech Data Sys, A Dynatech Co, Dept. EM, 900 Slaters La., Alexandria, Va. 22314
Hypertronics Corp., Dept. EM, 2352 Main St, Concord, Mass. 01742
D Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
D Jolo Industries, Inc., Dept. EM, 11861 Cardinal Circle, Garden Grove, Cal. 92643
Methode Elctrns., Inc., Dept. EM, 7447 W. Wilson Ave., Chicago, Ill. 60656
Nutronics, Inc., Dept. EM, 1515 N. Harlem Ave., Oak Park, Ill. 60302
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Philips Audio Video Sys, Neutrik Prods, Dept. EM, 91 McKee Dr., Mahwah, N.J. 07430
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
D Porter, H.K., Inc., Dept. EM, 74 Foley St., Somerville, Mass. 02143
M Robins Ind's. Corp., Consumer Products Div., Dept. EM, 75 Austin Blvd., Commack, N.Y. 11725
D SAMTEC, Dept. EM, 810 Progress Blvd., New Albany, Indiana 47150
SHOGYO International Corp., Dept. EM, 300 Northern Blvd., Great Neck, N.Y. 11021
D Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
DM Switchcraft, Inc., Dept. EM, 5555 N. Elston, Chicago, Ill. 60630
Trompeter Electronics, Inc., Dept. EM, 8936 Comanche, Chatsworth, Cal. 91311
M U.S. Terminals, Dept. EM, 7502 Camargo Rd., Cincinnati, Ohio 45243

Jigs And Fixtures, Chassis & Circuit Board

Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 ..... *
M **Jettron Prods., Dept. EM, P.O. Box 337, E. Hanover, N.J. 07936** ..... *
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
Union Carbide Corp., Battery Products Div., Dept. EM, 270 Park Ave., New York, N.Y. 10017 ..... *
Aerolix Corporation, Dept. EM, 720 So. Columbus Street, Mt. Vernon, NY 10550
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
M Anchor Specialty Mfg. Inc., Dept. EM, 300 Hollister Rd., Teterboro, N.J. 07608
Berg Inc., Winfred M., Dept. EM, 499 Ocean Ave., East Rockaway, N.Y. 11518
Carbone Lorraine Industries Corp., Dept. EM, 400 Myrtle Ave., Boonton, N.J. 07005
Centerflex Ceramics, Dept. EM, 221 Seventh Ave., Hawthorne, N.J. 07507
Electronic Sys & Programm, Dept. EM, 12901 Crenshaw Blvd., Hawthorne, Cal. 90250
Everett/Charles, Inc., Dept. EM, 2806 Metropolitan Pl., Pomona, Cal. 91767
M Kawecki Berylco Inds., Inc., Dept. EM, PO Box 1462, Reading, PA 19603
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
D Matrix Engineering Corp., Dept. EM, 17000 S. Western Ave. 19, Gardena, Cal. 90247
Mid-West Metal Prods., Inc., Dept. EM, 456 E. Donovan Rd., Kansas City, Kans. 66115
D , PanaVise, Dept. EM, 10107 Adella Ave., South Gate, Cal 90280
M PIC Design Div., Benrus Corp., Dept. EM, Benrus Center, Rte 7, Ridgefield, Conn. 06877
Pylon Co., Inc., Dept. EM, 51 Newcomb St., Attleboro, Mass. 02703
Ultra Carbon Corp., Dept. EM, Box 747, Bay City, Mich. 48707
DM Western Coil & Elec. Co., Dept. EM, 215 State St., Racine, Wisc. 53403

Joint Compounds, Semiconductor—See Coatings, Compounds, Lubricants, Etc., Heat Conductive

Joints, Rotary, Microwave

Graphite Metallizing Corp., Dept. EM, 1036 Nepperhan Ave., Yonkers, N.Y. 10702 ..... *
M Eastern Microwave Corp., Dept. EM, 4 Gill St., Woburn, MA 01801
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
D Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
Sivers Lab, Dept. EM, Box 90339, Los Angeles, Cal. 90009
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
TRG, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006

Jumpers, Bonding

ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ..... **p. 2026-2028**
M **Janco Corp., Dept. EM, Box 3038-Glenoaks Sta., Burbank, Cal. 91504** **p. 4096**
Mini-Systems, Inc., Dept. EM, 20 David Rd., North Attleboro, Mass. 02761 *
TRW/Cinch Connectors, Electronic Comp. Div. of TRW Inc., Dept. EM, 1501 Morse Ave., Elk Grove Village, Ill. 60007 ..... *
Vernitron Elec. Comps., Beau Prods., Dept. EM, Box 10, Laconia, N.H. 03246 *
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
Estes Engrg. Co., Dept. EM, 930 Marine Dr., Port Angeles, Wash. 98362
Excel Specialty Corp., Dept. EM, 6335 N. Broadway, Chicago, Ill. 60660

Jumpers, Circuit Board

Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
Aries Electronics, Dept. EM, Box 231, Frenchtown, N.J. 08825 .. **p. 1716,1717**
D **Augat Interconnection Prods. Div., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703** ..... *
D **Beman Mfg., Inc., Dept. EM, PO Box 370, New Cumberland, Pa. 17070** ..... *
Berg Electronics, Div. E.I. DuPont de Nemours & Co., Dept. EM, York Expwy., New Cumberland, Pa. 17070 ..... **p. 1732**
CTS of Berne, Dept. EM, 406 Parr Rd., Berne, Ind. 46711 ..... *
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... *
E & L Instruments, Inc., Dept. EM, 61 First St., Derby, Conn. 06418 ..... *
Eby Company, Dept. EM, 4701 Germantown, Philadelphia, Pa. 19144 **p. 1752**
D **Elctrn. Molding Corp., Dept. EM, 96 Mill St., Woonsocket, R.I. 02895** ..... *
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
D **ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766** ..... **p. 2001,2024,2026-2028**
DM **Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012** .. *
Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543 .... **p. 2157**

D **Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207** *
D **Spectra-Strip Corp., Dept. EM, 7100 Lampson Ave., Box 415, Garden Grove, Cal. 92642** *
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** *
TRW/Cinch Connectors, Electronic Comp. Div. of TRW Inc., Dept. EM, 1501 Morse Ave., Elk Grove Village, Ill. 60007 ... Inside Back Cover, Vol. 1
D **Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342** *
M **Virginia Panel Corp., Dept. EM, Box 1106, 1400 New Hope Rd., Waynesboro, Va. 22980** *
Abex Corp, Dept. EM, 530 5th Ave, New York, NY 10036
D Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
D A.P. Products, Dept. EM, 72 Corwin Dr. Box 110, Painesville, Ohio 44077
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
D Circuit Assembly Corp., Dept. EM, 3169 Red Hill Ave., Costa Mesa, Cal. 92626
Cross Electronics Inc., Dept. EM, 100 Commonwealth Dr., Warrendale, Pa. 15086
D E-Z-Hook, Div. Tektest, Dept. EM, Box 450 114 E. St. Joseph, Arcadia, Cal. 91006
Kantz Electronic Ind., Dept. EM, 229 W. 4th St., Clifton, N.J. 07011
M Manger Elec. Co., Inc., Dept. EM, W. Henry St., Stamford, Conn. 06902
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
Mupac Corp., Dept. EM, 646 Summer St., Brockton, Mass. 02402
Sag Harbor Inds., Inc., Dept. EM, Bayview St., Sag Harbor, N.Y. 11963
DM T&B/Ansley Corp., Sub. Thomas & Betts, Dept. EM, 3208 Humboldt St., Los Angeles, Cal. 90031

Jumpers, Wire, Terminated—See Cords, Patch

Junctions, Hybrid, Microwave

M **Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706** *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** *
DM **Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725** *
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 *
M Aircom, Inc., Dept. EM, Rte. 16B, Union, N.H. 03887
M Airtron, Div. Litton Inds., Dept. EM, 200 E. Hanover Ave., Morris Plains, N.J. 07950
Alford Mfg. Co., Dept. EM, 120 Cross St., Winchester, Mass. 01890
DM Arlaren Microwave, Inc., Dept. EM, 1010 James St., Syracuse, N.Y. 13203
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
M Eastern Microwave Corp., Dept. EM, 4 Gill St., Woburn, MA 01801
Engelmann Microwave, Dept. EM, Skyline Dr., Montville, N.J. 07045
Frequency Engrg. Labs., Dept. EM, Box 527, Farmingdale, N.J. 07727
Hades Mfg Corp., Dept. EM, 151-A Verdi St., Farmingdale, N.Y. 11735
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Merrimac Inds., Inc., Dept. EM, 41 Fairfield Pl., West Caldwell, N.J. 07006
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
D Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
M Reeve Electronics, Inc., Dept. EM, 609 W. Lake St., Chicago, Ill 60606
Sivers Lab, Dept. EM, Box 90339, Los Angeles, Cal. 90009
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
M Technical Research & Mfg., Inc., Dept. EM, Kelly Ave. Grenier Field, R.F.D. #3, Manchester, N.H. 03103
M Transco Prods., Inc., Dept. EM, 4241 Glencoe Ave., Venice, Cal. 90291
TRG., Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
Triangle Microwave Inc., Dept. EM, 9B Great Meadow La, East Hanover, NJ 07936
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006

Keyers, Tone

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 *
Electrocom Inds., Dept. EM, 1105 N. Ironwood Dr., S. Bend, Ind. 46615
Flex Key Corp., Dept. EM, 18 Sargent St., Gloucester, Mass. 01930
Palomar Engrs., Dept. EM, Box 455, Escondido, Cal. 92025
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Sonex, Dept. EM, 2337 Philmont Ave., Huntingdon Valley, Pa. 19006

Keyboards, Alphanumeric & Decimal

ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845 *
D **Cherry Electrical Prods. Corp., Dept. EM, 3623 Sunset Ave., Waukegan, Ill. 60085** p. 4014
Chomerics, Inc., Dept. EM, 77 Dragon Court, Woburn, Mass. 01801 .. p. 4019
DM **Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645** p. 4022
D **Digitran Co., Dept. EM, 855 So. Arroyo Pkwy., Pasadena, Cal. 91105** p. 4044
Fujitsu America, Inc., Component Sales Div., Dept. EM, 910 Sherwood Dr., Lake Bluff, Ill. 60044 *
Grayhill Inc., Dept. EM, 569 Hillgrove Ave., LaGrange, Ill. 60525 p. 4064-4066
Industrial Elctrn. Engrs., Dept. EM, 7740 Lemona Ave., Van Nuys, Cal. 91405 *
ITT Thermotech, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 1203 S. 5th St., Hopkins, Minn. 55343 p. 2561
Maxi-Switch Co., Dept. EM, 9697 East River Road, Minneapolis, Minn. 55433 p. 4104,4105
D **Mechanical Enterprises, Dept. EM, 8000 Forbes Pl., Springfield, VA 22151** *
M **Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032** p. 4134
M **Refac Elctrns. Pinlite®, Wild Rover®, Dept. EM, Box 809, W. Hill Rd., Winsted, Conn 06098** p. 4220
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Veetronix, Dept. EM, Box 209, 136 W. 7th St., Cozad, Neb. 69130 p. 4269
Ann Arbor Terminals, Inc., Dept. EM, 6107 Jackson Rd., Ann Arbor, Mich. 48103
Brynlaw Prods., Inc., Dept. EM, 1707 U.S. Hwy. 130 S., Burlington, N.J. 08016
Centralab, Electrns. Div. - Globe Union Inc., Dept. EM, 5757 N. Green Bay Ave., Milwaukee, Wisc. 53201
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
Cortron Div., Illinois Tool, Dept. EM, 6601 W. Irving Park Rd., Chicago, Ill. 60634
M Flex Key Corp., Dept. EM, 18 Sargent St., Gloucester, Mass. 01930
Futaba Corp., Dept. EM, Daido Keori Bldg., 3-1-16 Sotokanda,, Chiyoda-ku, Tokyo, Japan
D Key Tronic Corp., Dept. EM, Bldg. 14, Spokane Ind'l. Pk., Spokane, Wash. 99216
Moxon Inc., Dept. EM, 2222 Michelson Dr. Bldg. E, Irvine, Cal. 92715
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Spec Plastics Inc., Dept. EM, 7224 Atoll Ave., No. Hollywood, Cal. 91605
M Stacoswitch, Inc., Dept. EM, 1139 Baker St., Costa Mesa, Cal. 92626
Tec, Inc., Dept. EM, 2727 N. Fairview, Tuscon, Ariz. 85705
Telesis Laboratory, Dept. EM, Box 387, Chillocothe, Ohio 45601
Texas Instruments Control Prods. Div., Dept. EM, 34 Forrest St., Attleboro, Mass. 02703

Kits, Breadboarding (For Engineers)

Alden Products Co, Dept. EM, 117 N Main St, Brockton, Mass. 02403 *
D **Augat Interconnection Prods. Div., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703** *
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D **Continental Specialties Corp., Dept. EM, Box 1942, 70 Fulton Terr, New Haven, Conn. 06509** p. 1296,1297
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D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** *
Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 *
D **International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746** *
DM **Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012** .. *
M **LVC Inds. Inc., Co-Ord Switch Bloc-Lite Divs., Dept. EM, 135-25 37th Ave., Flushing, N.Y. 11354** *
D **Magnetec Corp., Sub of Hi-G Inc, Dept. EM, 96 Granby St., Bloomfield, Conn. 06002** *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2127
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** *
United Wiring & Mfg. Co., Dept. EM, 2608 Electonic La. #404, Dallas, Tex. 75220 p. 1301,1302,1309
D **Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342** *
D **Vero Electronics, Dept. EM, 171 Bridge Rd., Hauppauge, N.Y. 11787** *
Vishay Resistive Systems Grp., Vishay Intertechnology Inc., Dept. EM, 63 Lincoln Hwy., Malvern, Pa. 19355 *
D A.P. Products, Dept. EM, 72 Corwin Dr. Box 110, Painesville, Ohio 44077
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
Berg Inc., Winfred M., Dept. EM, 499 Ocean Ave., East Rockaway, N.Y. 11518
Bishop Graphics, Dept. EM, 5388 Sterling Center, Westlake Village, Cal. 91361
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
Circuit Structures Lab., Div. D-Cemco Inc Inc., Dept. EM, 3200 N. San Fernando Blvd., Burbank, Calif. 91504
Clarostat Mfg. Co., Inc., Dept. EM, Washington St., Dover, N.H. 03820
D-Cemco, Inc., Dept. EM, 3200 N. San Fernando Blvd., Burbank, Calif. 91504
D E-Z-Hook, Div. Tektest, Dept. EM, Box 450 114 E. St. Joseph, Arcadia, Cal. 91006
D Hammond Mfg. Co., Dept. EM, 385 Nagel Dr., Buffalo, NY 14225
M Hybricon Corp., Dept. EM, 410 Crest Rd., Litteton, Mass. 01460
D Injectorall Elctrns. Corp., Dept. EM, 98-100 Glen St., Glen Cove, N.Y. 11542
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
D Modpak, Dept. EM, 31 A Green St., Waltham, Mass. 02154
Multi-Tronix, Dept. EM, 3210 Terry Dr, Toledo, Ohio 43613
Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
Squires Electronics Inc., Dept. EM, 8900 S.W. Burnham Rd. F-13, Tigard, Ore. 97223
D Victory Engrg. Corp., Dept. EM, Victory Rd., Springfield, N.J. 07081

Kits, Cable-End Sealing

D **Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458** *
M **Hardman Inc., Dept. EM, 600 Cortlandt St., Belleville, N.J. 07109** *
LVC Inds. Inc., Co-Ord Switch Bloc-Lite Divs., Dept. EM, 135-25 37th Ave., Flushing, N.Y. 11354 *
M Antex Div., M M Newman Corp., Dept. EM, Marblehead, Mass. 01945
Cablewave Systems Inc., Dept. EM, 60 Dodge Ave., North Haven, Conn. 06473
D Cole-Flex Corp., Dept. EM, 91 Cabot St., W. Babylon, N.Y. 11704
Tra-Con, Inc., Dept. EM, 55 North St., Medford, Mass. 02155

Kits, Connector

Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 p. 4476

D Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *

D Augat Interconnection Prods. Div., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703 ..... *

ITT Cannon Electric, Dept. EM, 666 E. Dyer Rd., Santa Ana, Cal. 92702 p. 1939, Back Cover, Vol. 1

D 3M Co., Electronic Prods Div., Dept. EM, 3M Center, St. Paul, Minn. 55101 *

D Methode Elctrns, Interconnect Prods Div, Dept. EM, 1700 Hicks Rd, Rolling Meadows, ILL 60008 ..... *

M Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... *

D Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2117

TRW/Cinch Connectors, Electronic Comp. Div. of TRW Inc., Dept. EM, 1501 Morse Ave., Elk Grove Village, Ill. 60007 ..... *

D Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 p. 2254

D AMP Special Industries, Dept. EM, Valley Forge, Pa. 19482

M Hollingsworth Solderless Terminal Co., Dept. EM, 85 Benjamin Franklin Hwy, P.O. Box 499, Pottstown, Pa. 19464

Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730

D Philips Audio Video Sys, Neutrik Prods, Dept. EM, 91 McKee Dr., Mahwah, N.J. 07430

D Switchcraft, Inc., Dept. EM, 5555 N. Elston, Chicago, Ill. 60630

D T&B/Ansley Corp., Sub. Thomas & Betts, Dept. EM, 3208 Humboldt St., Los Angeles, Cal. 90031

D Zippertubing Co., Dept. EM, 13000 S. Broadway, Los Angeles, Cal. 90061

Kits, Marking (Dial, Instrument, Equipment, etc.)

D Datak Corp., Dept. EM, 65 Seventy-First St., Guttenberg, N.J. 07093 p. 1298,2420

D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *

D Brady Co., W. H., Industrial Prods. Div., Dept. EM, 2221 W. Camden Rd. Box 2131, Milwaukee, Wis. 53201

Chartpak, A Times Mirror Co., Dept. EM, 1 River Rd., Leeds, Mass. 01053

D Eastern Marking Machine Corp., Dept. EM, 30 Alabama Ave., Island Park, N.Y. 11558

Globe Plastics, Dept. EM, 1342 S. Signal Dr., Pomona, Cal. 91766

Lectroetch, Dept. EM, 14925 Elderwood Ave., E. Cleveland, Ohio 44112

Markem Corp., Dept. EM, 1000 Congress St., Keene, NH 03431

Matthews Intl Corp., Marking Systems Div., Dept. EM, 6515 Penn. Ave., Pittsburgh, Pa. 15206

Metron Optics, Dept. EM, P.O. Box 690, Solana Beach, Cal. 92075

D Neuses, Inc. (P.K.), Dept. EM, 1401 Rohlwing Rd., Rolling Meadows, Ill. 60008

M Photo Chemical Prod ts. Cal., Dept. EM, 1715 Berkeley, Santa Monica, Cal. 90404

D Russell Inds., Inc., Dept. EM, 3069 Lawson Blvd., Oceanside, N.Y. 11572

D Switchcraft, Inc., Dept. EM, 5555 N. Elston, Chicago, Ill. 60630

D Zippertubing Co., Dept. EM, 13000 S. Broadway, Los Angeles, Cal. 90061

Kits, Potentiometer, Rheostat

D Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *

Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 ..... *

E-Systems, Inc., Memcor Div., Dept. EM, 1320 Flaxmill Rd., Huntington, Ind. 46750 ..... *

Kits, Power Supply

E & L Instruments, Inc., Dept. EM, 61 First St., Derby, Conn. 06418 ..... *

Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 *

Sanford-Miller Corp., Dept. EM, 8 John St., Lynbrook, N.Y. 11563 ..... *

AAK Corp, Dept. EM, POB 1, Methuen, Mass 01844

BF Elctrns., Dept. EM, 415 S. Nardo, Solana Beach, Calif. 92075

D Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042

D Teledyne Big Beam, Dept. EM, 290 E. Prairie St., Crystal Lake, Ill. 60014

VHF Engrg, Div. of Brownian Elctrns. Corp., Dept. EM, 320 Water St., Binghamton, N.Y. 13902

Kits, Printed Circuit

Continental Specialties Corp., Dept. EM, Box 1942, 70 Fulton Terr, New Haven, Conn. 06509 ..... *

E & L Instruments, Inc., Dept. EM, 61 First St., Derby, Conn. 06418 .... p. 1299

D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *

DM Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012 .. *

Statek Corp., Dept. EM, 512 N. Main St., Orange, Cal. 92668 ..... p. 2372

D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *

DM Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342 ..... *

D Vero Electronics, Dept. EM, 171 Bridge Rd., Hauppauge, N.Y. 11787 ..... *

Bishop Graphics, Dept. EM, 5388 Sterling Center, Westlake Village, Cal. 91361

D Cordover & Co., Carl, Dept. EM, 3914 North 29th Ave., Hollywood, Fla. 33020

D Electro-Science Labs., Dept. EM, 2211 Sherman Ave., Pennsauken, N. J. 08110

D Injectorall Elctrns. Corp., Dept. EM, 98-100 Glen St., Glen Cove, N.Y. 11542

M Lehighton Electronics, Inc., Dept. EM, RD 1Box 374 Dept M, Lehighton, Pa 18235

Pace Inc., Dept. EM, 9329 Fraser Ave., Silver Spring, Md. 20910

DM Scanbe Div., Zero Corp., Dept. EM, 3445 Fletcher Ave., El Monte, Cal. 91731

Kits, Programming Board

Allied Systems Corp., Dept. EM, Box 11005, Greensboro, N.C. 27409 ..... *

Continental Specialties Corp., Dept. EM, Box 1942, 70 Fulton Terr, New Haven, Conn. 06509 ..... p. 1296,1297

Datak Corp., Dept. EM, 65 Seventy-First St., Guttenberg, N.J. 07093 .. p. 1298

E & L Instruments, Inc., Dept. EM, 61 First St., Derby, Conn. 06418 .... p. 1299

M Info-Lite Corp., Dept. EM, 46-10 104 St., Corona, N.Y. 11368 ..... *

M LVC Inds. Inc., Co-Ord Switch Bloc-Lite Divs., Dept. EM, 135-25 37th Ave., Flushing, N.Y. 11354 ..... *

M Mac Panel Co., Dept. EM, Box 5027, 216 Pine St., High Pt., N.C. 27262 ..... *

Kits, Shielding

Breeze-Illinois, Inc., Dept. EM, Main & Agard Sts., Wyoming, Ill. 61491 ..... *

Instrument Specialties, Dept. EM, 276 Bergen Blvd., Little Falls, N.J. 07424 p. 2559

M Magnetic Shield Div., Perfection Mica, Dept. EM, 750 North Thomas Dr., Bensenville, Ill. 60106 ..... p. 2565

DM Metex Corp., Dept. EM, 970 New Durham Rd., Edison, N.J. 08817 ..... *

M Craig Sys. Corp., Dept. EM, 360 Merrimack St., Lawrence, Mass. 01842

Emerson & Cuming, Inc., Dielectric Mat'ls. Div., Dept. EM, 869 Washington St., Canton, Mass. 02021

DM Estes Engrg. Co., Dept. EM, 930 Marine Dr., Port Angeles, Wash. 98362

Ferronics, Inc., Dept. EM, 60 N. Lincoln Rd., East Rochester, N.Y. 14445

D Modpak, Dept. EM, 31 A Green St., Waltham, Mass. 02154

D Russell Inds., Inc., Dept. EM, 3069 Lawson Blvd., Oceanside, N.Y. 11572

D Tecknit, Dept. EM, 129 E. Dermody St., Cranford, N.J. 07016

D Zippertubing Co., Dept. EM, 13000 S. Broadway, Los Angeles, Cal. 90061

Kits, Switch Assembling

Cherry Electrical Prods. Corp., Dept. EM, 3623 Sunset Ave., Waukegan, Ill. 60085 ..... *

Fifth Dimension, Dept. EM, 707 Alexander Rd., Princeton, N.J. 08540 p. 4056

Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707

D Key Tronic Corp., Dept. EM, Bldg. 14, Spokane Ind'l. Pk., Spokane, Wash. 99216

Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648

D Switchcraft, Inc., Dept. EM, 5555 N. Elston, Chicago, Ill. 60630

Kits, Terminal

Alden Products Co, Dept. EM, 117 N Main St, Brockton, Mass. 02403 ..... *

Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 ..... *

D Augat Interconnection Prods. Div., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703 ..... *

DM Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012 .. *

D Panduit Corp., Dept. EM, 17301 Ridgeland Ave., Tinley Park, Ill. 60477 ..... *

D Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 *

D Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342 ..... *

D Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 .... *

Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035

D AMP Special Industries, Dept. EM, Valley Forge, Pa. 19482

D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138

Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111

M Hollingsworth Solderless Terminal Co., Dept. EM, 85 Benjamin Franklin Hwy, P.O. Box 499, Pottstown, Pa. 19464

Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618

D T & B/Thomas & Betts, Dept. EM, 36 Butler St., Elizabeth, N.J. 07207

D Teledyne Penn-Union Elec., Dept. EM, Box 723, Edinboro, Pa. 16412

Kits, Test Equipment

D Continental Specialties Corp., Dept. EM, Box 1942, 70 Fulton Terr, New Haven, Conn. 06509 ..... *

E & L Instruments, Inc., Dept. EM, 61 First St., Derby, Conn. 06418 ..... *

ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ..... p. 2032

DM Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012 .. *

D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *

D Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817 ..... *

D Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342 ..... *

M Analytical Measurements, Dept. EM, 31 Willow St., Chatham, N.J. 07928

B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142

D Bacharach Instrument Co., Dept. EM, 2300 Leghorn St., Mountain View, Cal. 94043

D E-Z-Hook, Div. Tektest, Dept. EM, Box 450 114 E. St. Joseph, Arcadia, Cal. 91006

Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707

Magnaflux Corp. , Dept. EM, 7328 W. Lawrence Ave., Chicago, Ill 60656

Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730

M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039

D Modpak, Dept. EM, 31 A Green St., Waltham, Mass. 02154

DM Shannon Luminous Mat'ls., Div. Shannon-Glow Inc., Dept. EM, 7356 Santa Monica Blvd., Hollywood, Cal. 90046

Tech Serv., inc., BRS/LVE Div, Dept. EM, 5301 Holland Dr., Beltsville, Md 20705

Kits, Training Aid

M Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706 ..... *

D Continental Specialties Corp., Dept. EM, Box 1942, 70 Fulton Terr, New Haven, Conn. 06509 ..... *

E & L Instruments, Inc., Dept. EM, 61 First St., Derby, Conn. 06418 .... p. 1299

Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *

Interlok, Dept. EM, 770 Airport Blvd., Burlingame, Cal. 94010 ..... *

D Midwest Components, Dept. EM, 1981 Port City Blvd., Muskegon, Mich. 49400 ..... *

Philips Test & Measuring Instrs., Dept. EM, 85 McKee Dr., Mahwah, NJ 07430 ..... *

Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *

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D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
D **Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342** ..... *
Aerolite Elexs Corp., Dept. EM, 2207 Summit Ave., Union City, N.J. 07087
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
D Chartpak, A Times Mirror Co., Dept. EM, 1 River Rd., Leeds, Mass. 01053
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Multi-Tronix, Dept. EM, 3210 Terry Dr, Toledo, Ohio 43613
PIC Design Div., Benrus Corp., Dept. EM, Benrus Center, Rte 7, Ridgefield, Conn. 06877
Worner Elctrn. Devices, Dept. EM, 121 N. Main St., Rankin, Ill. 60960

Knives & Knife Sets

D **Channellock, Inc., Dept. EM, 1306 S. Main St., Meadville, Pa. 16335** .... p. 4287
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
Bishop Graphics, Dept. EM, 5388 Sterling Center, Westlake Village, Cal. 91361
Chartpak, A Times Mirror Co., Dept. EM, 1 River Rd., Leeds, Mass. 01053
Chemical Etching Equip. & Supply, Dept. EM, 6905 Beulah St, Alexandria, Va. 22310
D Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
D Klein Tools, Inc, Dept. EM, 7200 McCormick Rd., Chicago, Ill. 60645
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Uber Grafic Instrs., Dept. EM, Box 4, Palo Alto, Cal. 94302
D Weller-Xcelite Wiss, The Cooper Group, Dept. EM, Box 728, Apex, NC 27505

Knobs, All Types

D **ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845** ..... p. 2418
M **Buckeye Stamping Co., Dept. EM, 555 Marion Rd., Columbus, Ohio 43207** ..... p. 2419
Electronic Hardware Corp., Dept. EM, 320 Broad Hollow Rd., Farmingdale, N.Y. 11735 ..... p. 2421
Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... *
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IEE/Schadow, Inc., Dept. EM, 8081 Wallace Rd., Eden Prairie, Minn. 55344 ..... p. 4092
Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 ..... p. 2424,2435-2439
DM **Raytheon Co., Distributor Prods. Oper., Dept. EM, Fourth Ave., Burlington, Mass. 01803** ..... p. 2443-2451
D **RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102** ..... *
RCL Electronics Div., AMF Incorporated, Dept. EM, 700 S. 21st St., Irvington, N.J. 07111 ..... p. 2440-2442
Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 ..... p. 2110,2139
Vemaline Prods. Div., Ostbys & Barton Co., Dept. EM, 487 Jefferson Blvd., Warwick, R.I. 02886 ..... p. 2454,2455
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
DM Davies Molding Co., Harry, Dept. EM, 4920 Bloomingdale Ave., , Chicago, Ill. 60639
DM Kurz-Kasch, Inc., Knob Div., Dept. EM, 711 Hunter Dr., Wilmington, Ohio 45177
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Radial Controls, Dept. EM, 2555 E. 55th Place, Indianapolis, Ind. 46220
Spec Plastics Inc., Dept. EM, 7224 Atoll Ave., No. Hollywood, Cal. 91605

Knobs, Limit Stop

Electronic Hardware Corp., Dept. EM, 320 Broad Hollow Rd., Farmingdale, N.Y. 11735 ..... *
D **Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101** ..... p. 2439
D **RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102** ..... *
D **RCL Electronics Div., AMF Incorporated, Dept. EM, 700 S. 21st St., Irvington, N.J. 07111** ..... *
Kurz-Kasch, Inc., Knob Div., Dept. EM, 711 Hunter Dr., Wilmington, Ohio 45177
DM Rogan Corp., Dept. EM, 3455 Woodhead Dr., Northbrook, Ill. 60062

Knobs, Locking, Control Shaft

Electronic Hardware Corp., Dept. EM, 320 Broad Hollow Rd., Farmingdale, N.Y. 11735 ..... *
Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... p. 2422
DM **Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101** ..... *
DM **Raytheon Co., Distributor Prods. Oper., Dept. EM, Fourth Ave., Burlington, Mass. 01803** ..... p. 2443,2446-2452
D **RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102** ..... *
D **RCL Electronics Div., AMF Incorporated, Dept. EM, 700 S. 21st St., Irvington, N.J. 07111** ..... *
Control Inds. Inc., Dept. EM, 530 Burnside Ave., Inwood, N.Y. 11696
M Dupree, Inc., Dept. EM, 9835 Dupree St., So. El Monte, Cal. 91733
Kurz-Kasch, Inc., Knob Div., Dept. EM, 711 Hunter Dr., Wilmington, Ohio 45177
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966

Knobs, Slip Clutch

Electronic Hardware Corp., Dept. EM, 320 Broad Hollow Rd., Farmingdale, N.Y. 11735 ..... *
DM **Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101** ..... p. 2439
D **RCL Electronics Div., AMF Incorporated, Dept. EM, 700 S. 21st St., Irvington, N.J. 07111** ..... *
Kurz-Kasch, Inc., Knob Div., Dept. EM, 711 Hunter Dr., Wilmington, Ohio 45177

Knobs, Torque, Incremental, Ratio Drive

DM **Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101** ..... p. 2439
D **RCL Electronics Div., AMF Incorporated, Dept. EM, 700 S. 21st St., Irvington, N.J. 07111** ..... *
Kurz-Kasch, Inc., Knob Div., Dept. EM, 711 Hunter Dr., Wilmington, Ohio 45177
DM Rogan Corp., Dept. EM, 3455 Woodhead Dr., Northbrook, Ill. 60062

Labels, Pressure-Sensitive, Adhesive

D **Datak Corp., Dept. EM, 65 Seventy-First St., Guttenberg, N.J. 07093** ..... *
Display Devices, Dept. EM, Box 667, Encinitas, Cal. 92024 ..... p. 2477
Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012 .. *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Acme Model Engrg. Co., Dept. EM, 654 Bergen Blvd., Ridgefield, N.J. 07657
Bishop Graphics, Dept. EM, 5388 Sterling Center, Westlake Village, Cal. 91361
Brady Co., W. H., Industrial Prods. Div., Dept. EM, 2221 W. Camden Rd. Box 2131, Milwaukee, Wis. 53201
D Decalcraft Corp., Dept. EM, Rte. 309, Hatfield, Pa. 19440
M Holly Productions, Dept. EM, 1442 Tzena Way, Encinitas, Cal. 92024
D Labelon Corp., Dept. EM, 10 Chapin St., Canandaigua, N.Y. 14424
M Manger Elec. Co., Inc., Dept. EM, W. Henry St., Stamford, Conn. 06902
M Markem Corp., Dept. EM, 1000 Congress St., Keene, NH 03431
M Monarch Marking Sys., Dept. EM, Box 608, Dayton, Ohio 45401
Paraplegics Mfg., Dept. EM, 304 N. York Rd., Bensenville, Ill. 60106
M Photo Chemical Prods. Cal., Dept. EM, 1715 Berkeley, Santa Monica, Cal. 90404
M Robins Ind's. Corp., Consumer Products Div., Dept. EM, 75 Austin Blvd., Commack, N.Y. 11725
Stanpat Products Inc., Dept. EM, 366 Main St., Port Washington, N.Y. 11050
D T & B/Thomas & Betts, Dept. EM, 36 Butler St., Elizabeth, N.J. 07207
Tapecon, Inc., Dept. EM, 475 River St., Rochester, N.Y. 14612
D Uniroyal, Inc., Dept. EM, 1230 Ave. of Americas, New York, N.Y. 10020

Labels, Temperature Indicating

Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 ..... *
Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
Ashley-Butler, Inc., ASHA, Dept. EM, 208 Route 206 South, Somerville, N.J. 08876
D Tempil Div., Big Three Inds, Dept. EM, Hamilton Blvd., So. Plainfield, N.J. 07080

Laboratories, Testing—See Services, Electrical Measurement & Test

Lacing, Cable—See Cords & Tapes, Lacing

Laminates, Metal Clad (Including Copper)

DM **Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012** .. *
3M Co., Electronic Prods Div., Dept. EM, 3M Center, St. Paul, Minn. 55101 *
D **Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342** ..... *
Alinabal, Div. of MPB Corp., Dept. EM, 28 Woodmont Rd., Milford, Conn. 06460
Alpha Metals, Inc., Dept. EM, 600 Rte 440, Jersey City, N.J. 07304
M Atlantic Laminates, Dept. EM, 174 N. Main St., Franklin, N.H. 03235
Bishop Graphics, Dept. EM, 5388 Sterling Center, Westlake Village, Cal. 91361
Cincinnati Milacron, Molded Plastics Division, Dept. EM, P.O. Box 246, Blanchester, Ohio 45107
Devco Engrg., Control Sys. Div., Dept. EM, Pier La., W. Caldwell, N.J. 07006
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
DM General Elec. Co., Laminated & Insulating Matls. Bus. Dep., Dept. EM, Coshocton, Ohio 43812
D Injectorall Elctrns. Corp., Dept. EM, 98-100 Glen St., Glen Cove, N.Y. 11542
Keene Corp, Dept. EM, 345 Park Ave, New York, N.Y. 10022
DM Met-L-Wood Corp., Dept. EM, 6755 65th St., Chicago, Ill. 60638
M Mica Corporation, Dept. EM, 10900 Washington Blvd., P.O. Box 2578, Culver City, Calif. 90230
NVF Co., Dept. EM, Box 68, Yorklyn, Del. 19736
D Penn Fibre & Specialty, Dept. EM, 2020 E. Westmoreland St., Phila., Pa. 19134
Plessey Inc., Dept. EM, 320 Long Island Expwy. S., Melville, N.Y. 11746
M Rogers Corp., Dept. EM, Rogers, Conn. 06263
Sheldahl, Inc., Electrical Prods. Div., Dept. EM, Box 170, Northfield, Minn. 55057
M Stevens Prods., Inc., Dept. EM, 128 N. Park St., E. Orange, N.J. 07019
M Synthane Taylor Corp., An Alco Standard Corporate Partner, Dept. EM, Box 835, Valley Forge, Pa. 19482
Tapecon, Inc., Dept. EM, 475 River St., Rochester, N.Y. 14612
Tech Materials Inc., Dept. EM, 5 Wellington Rd., Lincoln, R.I. 02865

Laminates, Plastic Impregnated (Unclad)

Display Devices, Dept. EM, Box 667, Encinitas, Cal. 92024 ..... p. 2477
DM **Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012** .. *
DM **Metex Corp., Dept. EM, 970 New Durham Rd., Edison, N.J. 08817** ..... *
M Atlantic Laminates, Dept. EM, 174 N. Main St., Franklin, N.H. 03235
M Atlas Fibre Co., Dept. EM, 6970 N. Central Park Ave., Chicago, Ill. 60645
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
M Cadillac Plastic & Chemical, Dayco Co., Dept. EM, Box 810, Detroit, Mich. 48232
Cincinnati Milacron, Molded Plastics Division, Dept. EM, P.O. Box 246, Blanchester, Ohio 45107
D Comco Plastics, Inc., Dept. EM, 98-36 C. Jamaica Ave., Richmond Hill, N.Y. 11418
Fibre Materials Corp., Dept. EM, 34 Dupont St., Plainview, N.Y. 11803

M General Elec. Co., Laminated & Insulating Matls. Bus. Dep., Dept. EM, Coshocton, Ohio 43812
D Glastic Corp., Dept. EM, 4321 Glenridge Rd., Cleveland, Ohio 44121
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Keene Corp, Dept. EM, 345 Park Ave, New York, N.Y. 10022
DM Laminated Fabricators, Dept. EM, 1145 San Mateo Ave., San Bruno, Calif. 94066
M Mica Corporation, Dept. EM, 10900 Washington Blvd., P.O. Box 2578, Culver City, Calif. 90230
NVF Co., Dept. EM, Box 68, Yorklyn, Del. 19736
D Penn Fibre & Specialty, Dept. EM, 2020 E. Westmoreland St., Phila., Pa. 19134
M Photo Chemical Prods. Cal., Dept. EM, 1715 Berkeley, Santa Monica, Cal. 90404
Precision Paper Tube Co., Dept. EM, 1049 S. Noel Ave., Wheeling, Ill. 60090
Rogers Corp., Dept. EM, Rogers, Conn. 06263
Sheldahl, Inc., Electrical Prods. Div., Dept. EM, Box 170, Northfield, Minn. 55057
M Stevens Prods., Inc., Dept. EM, 128 N. Park St., E. Orange, N.J. 07019
M Synthane Taylor Corp., An Alco Standard Corporate Partner, Dept. EM, Box 835, Valley Forge, Pa. 19482

Laminates, Plastic (With Integral Heating Elements)

M Cox & Co., Inc., Dept. EM, 215 Park Ave., S., New York, N.Y. 10003
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Sheldahl, Inc., Electrical Prods. Div., Dept. EM, Box 170, Northfield, Minn. 55057

Laminations, Magnetic Recording Head

Inter-Tech. Grp., Inc., Dept. EM, Box 23, Irvington, N.Y. 10533 ..... *
Buckbee Mears Co., Dept. EM, 245 E. 6th St., St. Paul, Minn. 55101
M Magnetics, Div/Spang Industries, Inc., Dept. EM, Box 391, Butler, Pa. 16001
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Plessey Inc., Dept. EM, 320 Long Island Expwy. S., Melville, N.Y. 11746
SGL Electronics, Dept. EM, 300 Harvard Avenue, Westville, N.J. 08093

Laminations, Transformer & Inductor

Inter-Tech. Grp., Inc., Dept. EM, Box 23, Irvington, N.Y. 10533 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Alinabal, Div. of MPB Corp., Dept. EM, 28 Woodmont Rd., Milford, Conn. 06460
M Allegheny Ludlam Steel Co., Dept. EM, 2000 Oliver Bldg., Pittsburgh, Pa. 15222
Arnold Engineering Co., Dept. EM, Box "G", Marengo, Ill. 60152
Framar Metal Prods Co., Dept. EM, 124 W Main St Dept 1201, High Bridge, N.J. 08829
Magnetic Metals Co., Dept. EM, Hayes Ave. at 21st St., Camden, N.J. 08105
M Magnetics, Div/Spang Industries, Inc., Dept. EM, Box 391, Butler, Pa. 16001
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
SGL Electronics, Dept. EM, 300 Harvard Avenue, Westville, N.J. 08093
Thomas & Skinner, Inc., Dept. EM, Box 150-B,, Indianapolis, Ind. 46206

Lamp Adapters

D Arcolectric Corp., Dept. EM, Box 348, 11120 Chandler Blvd., No. Hollywood, Cal. 91603 ..... *
Display Devices, Dept. EM, Box 667, Encinitas, Cal. 92024 ..... p. 2476
D Elctrn. Molding Corp., Dept. EM, 96 Mill St., Woonsocket, R.I. 02895 ..... *
LVC Inds. Inc., Co-Ord Switch Bloc-Lite Divs., Dept. EM, 135-25 37th Ave., Flushing, N.Y. 11354 ..... *
D Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
Keene Corp, Dept. EM, 345 Park Ave, New York, N.Y. 10022
Leviton Mfg. Co., Inc., Dept. EM, 59-25 Little Neck Pkwy., Little Neck, N.Y. 11362
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Switchcraft, Inc., Dept. EM, 5555 N. Elston, Chicago, Ill. 60630
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Lamp Assembly Color Filters, Lens Mountable

APM-Hexseal, Dept. EM, 44 Honeck St., Englewood, N.J. 07631 ..... *
Arcolectric Corp., Dept. EM, Box 348, 11120 Chandler Blvd., No. Hollywood, Cal. 91603 ..... *
Leecraft Mfg. Co., Inc., Dept. EM, 21-16 44th Rd., Long Island City, N.Y. 11101 ..... *
Oak Inds. Inc., Switch Div., Dept. EM, Dept. DA, Crystal Lake, Ill. 60014 ..... p. 2526
Sorenson Lighted Controls, Dept. EM, 530 Oakwood Ave., W. Hartford, Conn. 06110 ..... *
D Visual Communications Co, Dept. EM, PO Box 986, El Segundo, CA 90245 ..... p. 2551
Penn Keystone Corp., Dept. EM, Division St., Ansonia, Conn. 06401
D Teledyne Big Beam, Dept. EM, 290 E. Prairie St., Crystal Lake, Ill. 60014

Lamp Drivers

D Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634 ..... *
Industrial Devices, Dept. EM, Edgewater, N.J. 07020 ..... *
Industrial Elctrn. Engrs., Dept. EM, 7740 Lemona Ave., Van Nuys, Cal. 91405 *
Applied Electro Technology, Inc., Dept. EM, 2220 S. Anne St., Santa Ana, Cal. 92704
Automation Displays Inc., Dept. EM, 3833 N. White Ave., Eau Claire, Wisc. 54701
Cermetek, Inc., Dept. EM, 660 National Ave., Mountain View, Cal. 94040
M Circuit Technology, Dept. EM, 160 Smith St., Farmingdale, N.Y. 11735
Data Display Products, Dept. EM, Box 91072, Los Angeles, Cal. 90009
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
D Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
Hamai Electric Lamp Co., Ltd., Dept. EM, 9-26, Kasuga 1-chome, Bunkyo-Ku, Tokyo, Japan 112
Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass 01730
S S A C Inc., Dept. EM, Box 395, Liverpool, N.Y. 13088
Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
D Tec, Inc., Dept. EM, 2727 N. Fairview, Tuscon, Ariz. 85705

Lamp Holders—See Sockets, Lamp & Lamp Assemblies

Lamps, Arc

EG&G, Inc., Electro-Optics Div., Dept. EM, 35 Congress St., Salem, Mass. 01970 ..... *
American Ultraviolet, Dept. EM, 320 Commerce St., Chatham, N.J. 07928
Gates & Co., Inc., Geo. W., Dept. EM, Hempstead Tpke. & Lucille Ave., Franklin Sq., N.Y. 11010
Keene Corp, Dept. EM, 345 Park Ave, New York, N.Y. 10022
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Westinghouse Elec., Lamp Div., Dept. EM, Parts Sls., 1 Westghse Plaza, Bloomfield, N. J. 07003

Lamps, Dial, Panel, Pilot Incandescent & Accessories

D ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845 ..... p. 2457
D Arcolectric Corp., Dept. EM, Box 348, 11120 Chandler Blvd., No. Hollywood, Cal. 91603 ..... p. 4001
DM Chicago Miniature/Drake, Dept. EM, 4433 N Ravenswood Ave., Chicago, Ill. 60640 ..... p. 2467,2470-2473
Chicago Switch, Inc., Dept. EM, 1714 N. Damen, Chicago, Ill. 60647 .. p. 4017
Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645 ..... p. 4023
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
D Dialight, Dept. EM, 203 Harrison Pl., Brooklyn, N.Y. 11237 ..... p. 2474,2475
Display Devices, Dept. EM, Box 667, Encinitas, Cal. 92024 ..... p. 2476
D Electro-Mech Components, Dept. EM, 1826 N. Floradale Ave., So. El Monte, Cal. 91733 ..... *
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
DM GTE Sylvania Inc., Miniature Lighting Prods., Dept. EM, W. Main St., Hillsboro, N.H. 03244 ..... p. 2479-2481
D Industrial Devices, Dept. EM, Edgewater, N.J. 07020 ..... p. 2484,2485
DM Industrial Elctrn. Engrs., Dept. EM, 7740 Lemona Ave., Van Nuys, Cal. 91405 p. 2483
Info-Lite Corp., Dept. EM, 46-10 104 St., Corona, N.Y. 11368 ..... *
International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 p. 1155
D IEE/Schadow, Inc., Dept. EM, 8081 Wallace Rd., Eden Prairie, Minn. 55344 *
DM Ledco Div., Wilbrecht Elctrns., Dept. EM, 240 Plato Blvd., St. Paul, Minn. 55107 ..... p. 2490,2491
DM Leecraft Mfg. Co., Inc., Dept. EM, 21-16 44th Rd., Long Island City, N.Y. 11101 ..... p. 2492
DM Littelfuse, Inc., Dept. EM, 800 E. Northwest Hwy., Des Plaines, Ill. 60016 p. 2494,2495
M LVC Inds. Inc., Co-Ord Switch Bloc-Lite Divs., Dept. EM, 135-25 37th Ave., Flushing, N.Y. 11354 ..... p. 4103
D Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032 p. 4113,4114,4121,4129
DM Oak Inds. Inc., Switch Div., Dept. EM, Dept. DA, Crystal Lake, Ill. 60014 p. 2497-2515,2520-2537,4179,4180,4182,4183,4195
D Oshino Electric Lamp Works, Ltd, Dept. EM, 2-5-2, Minami-Shinagawa, Shinagawa-Ku, Tokyo, Japan ..... p. 2539
D Oslo Controls, Dept. EM, 328 Industrial Ave, Cheshire, Conn. 06410 ..... *
Refac Elctrns. Pinlite®, Wild Rover®, Dept. EM, Box 809, W. Hill Rd., Winsted, Conn 06098 ..... p. 2541
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Sloan Company, Dept. EM, 7704 San Fernando Rd., Sun Valley, Cal. 91352 p. 2542-2545
Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2140,2141
Sorenson Lighted Controls, Dept. EM, 530 Oakwood Ave., W. Hartford, Conn. 06110 ..... p. 2546,2547
D Visual Communications Co, Dept. EM, PO Box 986, El Segundo, CA 90245 p. 2550,2551
Aerolite Elexs Corp., Dept. EM, 2207 Summit Ave., Union City, N.J. 07087
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
D AMP Special Industries, Dept. EM, Valley Forge, Pa. 19482
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
DM Control Switch, A Cutler Hammer Co., Dept. EM, 1420 Delmar Dr., Folcroft, Pa. 19032
Data Display Products, Dept. EM, Box 91072, Los Angeles, Cal. 90009
Devco Engrg., Control Sys. Div., Dept. EM, Pier La., W. Caldwell, N.J. 07006
M Hamai Electric Lamp Co., Ltd., Dept. EM, 9-26, Kasuga 1-chome, Bunkyo-Ku, Tokyo, Japan 112
D Inter-Market, Inc., Dept. EM, 1946 Lehigh Ave., Glenview, Ill. 60025
D JKL Components Corp., Dept. EM, 2226 Barry Ave., W. Los Angeles, CA 90064
Licon Div., Illinois Tool Works, Dept. EM, 6615 W. Irving Park Rd., Chicago, Ill. 60634
DM Master Specialties Co., Dept. EM, 1640 Monrovia St., Costa Mesa, Cal. 92627
D Mura Corp., Dept. EM, 177 Cantiague Rock Rd, Westbury, NY 11590
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Penn Keystone Corp., Dept. EM, Division St., Ansonia, Conn. 06401
DM Precision Lamp, Inc., Dept. EM, 950 N. Rengstorff Ave., Mountain View, Cal. 94043
SHOGYO International Corp., Dept. EM, 300 Northern Blvd., Great Neck, N.Y. 11021

Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
D Tec, Inc., Dept. EM, 2727 N. Fairview, Tuscon, Ariz. 85705
D Teledyne Big Beam, Dept. EM, 290 E. Prairie St., Crystal Lake, Ill. 60014
Westinghouse Elec., Lamp Div., Dept. EM, Parts Sls., 1 Westghse Plaza, Bloomfield, N. J. 07003
Wilbrecht Electronics, Inc., Dept. EM, 240 Plato Blvd., St. Paul, Minn. 55107
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578
D Xciton Corp, Dept. EM, Shaker Park, 5 Hemlock St, Latham, NY 12110

Lamps, Edge Lighting, Panel

EG&G, Inc., Electro-Optics Div., Dept. EM, 35 Congress St., Salem, Mass. 01970 ..... p. 3137
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Oak Inds. Inc., Switch Div., Dept. EM, Dept. DA, Crystal Lake, Ill. 60014 p. 2531,2533-2536
Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2141
D Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
Wilbrecht Electronics, Inc., Dept. EM, 240 Plato Blvd., St. Paul, Minn. 55107

Lamps, Electroluminescent—See Panels

Lamps, Exciter, Photographic

Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 *
Gilway Technical Lamp, Dept. EM, 272 New Boston Park, Woburn, Mass. 01801
D North American Philips Lighting Corp., Dept. EM, Bank St., Hightstown, N.J. 08520
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Westinghouse Elec., Lamp Div., Dept. EM, Parts Sls., 1 Westghse Plaza, Bloomfield, N. J. 07003

Lamps, Flashtube

EG&G, Inc., Electro-Optics Div., Dept. EM, 35 Congress St., Salem, Mass. 01970 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Edmund Scientific Co., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007
General Electric Co., Miniature Lamp Dept., Dept. EM, Nela Park, Clevland, Ohio 44112
D Mura Corp., Dept. EM, 177 Cantiague Rock Rd, Westbury, NY 11590
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
SHOGYO International Corp., Dept. EM, 300 Northern Blvd., Great Neck, N.Y. 11021
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Voltarc Tubes, Dept. EM, 102 Linwood Ave., Fairfield, Conn. 06430

Lamps, Indicator—See Lamps, Dial, Panel, Pilot, Incandescent, & Accessories

Lamps, Glow—See Lamps, Neon

Lamps, Infrared

EG&G, Inc., Electro-Optics Div., Dept. EM, 35 Congress St., Salem, Mass. 01970 ..... *
D General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
D Litronix, Dept. EM, 19000 Homestead Rd., Cupertino, Cal. 95014 ..... *
Advanced Kinetics, Dept. EM, 1231 Victoria St., Costa Mesa, Calif. 92627
Argus International, Dept. EM, Box 38, Hopewell, N.J. 08525
Caig Labs., Inc., Dept. EM, 1175-0 Industrial Ave., Box 64, Escondido, Cal. 92025
Canrad-Hanovia, Inc., Dept. EM, 100 Chestnut St., Newark, N.J. 07105
D Casso-Solar Corp., Dept. EM, 125-10 Queens Blvd., Kew Gardens, N.Y. 11415
D Fusion Systems Corp., Dept. EM, 11810 Parklawn Dr., Rockville, Md. 20852
Gamma Scientific Inc., Dept. EM, 3777 Ruffin Rd., San Diego, Cal. 92123
D Apollo Lasers, Apollo Lasers, Inc., Dept. EM, 6357 Arizonia Cir, Los Angeles, Cal. 90045
D North American Philips Lighting Corp., Dept. EM, Bank St., Hightstown, N.J. 08520
OAL Assocs., Inc., Dept. EM, P.O. Box 64, Escondido, Cal. 92025
Optron, Inc., Dept. EM, 1201 Tappon Cir., Carrollton, Tex. 75006
D Scientific Technology, Dept. EM, 1201 San Antonio Rd., Mountain View, Cal. 94043
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
DM Western Coil & Elec. Co., Dept. EM, 215 State St., Racine, Wisc. 53403
Westinghouse Elec., Lamp Div., Dept. EM, Parts Sls., 1 Westghse Plaza, Bloomfield, N. J. 07003
D Xciton Corp, Dept. EM, Shaker Park, 5 Hemlock St, Latham, NY 12110

Lamps, Magnifying, Inspection

D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
D Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
D Luxo Lamp Corp., Dept. EM, Monument Park, Port Chester, N.Y. 10573
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
Pace Inc., Dept. EM, 9329 Fraser Ave., Silver Spring, Md. 20910
Welch Allyn, Inc., Indl. Prods. Div., Dept. EM, Skaneateles Falls, N.Y. 13153

Lamps, Mercury Vapor

Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Advanced Kinetics, Dept. EM, 1231 Victoria St., Costa Mesa, Calif. 92627
D American Ultraviolet, Dept. EM, 320 Commerce St., Chatham, N.J. 07928
Canrad-Hanovia, Inc., Dept. EM, 100 Chestnut St., Newark, N.J. 07105
Chemical Etching Equip. & Supply, Dept. EM, 6905 Beulah St, Alexandria, Va. 22310
Edmund Scientific Co., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007
D Fusion Systems Corp., Dept. EM, 11810 Parklawn Dr., Rockville, Md. 20852
Gates & ¢o., Inc., Geo. W., Dept. EM, Hempstead Tpke. & Lucille Ave., Franklin Sq., N.Y. 11010
D Illumination Industries, Dept. EM, 825 E. Evelyn Ave., Sunnyvale, Cal. 94086
Keene Corp, Dept. EM, 345 Park Ave, New York, N.Y. 10022
D North American Philips Lighting Corp., Dept. EM, Bank St., Hightstown, N.J. 08520
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
DM Shannon Luminous Mat'ls., Div. Shannon-Glow Inc., Dept. EM, 7356 Santa Monica Blvd., Hollywood, Cal. 90046
Thermal Amer. Fused Quartz, Dept. EM, Change Bridge Rd., Montville, N.J. 07045
D Ultra-Violet Prods., Inc., Dept. EM, 5100 Walnut Grove Ave., San Gabriel, Cal. 91778
Voltarc Tubes, Dept. EM, 102 Linwood Ave., Fairfield, Conn. 06430
Westinghouse Elec., Lamp Div., Dept. EM, Parts Sls., 1 Westghse Plaza, Bloomfield, N. J. 07003

Lamps, Miniature & Subminiature

D ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845 ..... *
D Arcolectric Corp., Dept. EM, Box 348, 11120 Chandler Blvd., No. Hollywood, Cal. 91603 ..... p. 4001
Chicago Miniature/Drake, Dept. EM, 4433 N Ravenswood Ave., Chicago, Ill. 60640 ..... p. 2467-2473
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
D Dialight, Dept. EM, 203 Harrison Pl., Brooklyn, N.Y. 11237 ..... *
D Electro-Mech Components, Dept. EM, 1826 N. Floradale Ave., So. El Monte, Cal. 91733 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
DM GTE Sylvania Inc., Miniature Lighting Prods., Dept. EM, W. Main St., Hillsboro, N.H. 03244 ..... *
D Industrial Devices, Dept. EM, Edgewater, N.J. 07020 ..... p. 2484,2485
DM Industrial Elctrn. Engrs., Dept. EM, 7740 Lemona Ave., Van Nuys, Cal. 91405 p. 2483
Info-Lite Corp., Dept. EM, 46-10 104 St., Corona, N.Y. 11368 ..... *
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Control Switch, A Cutler Hammer Co., Dept. EM, 1420 Delmar Dr., Folcroft, Pa. 19032
Data Display Products, Dept. EM, Box 91072, Los Angeles, Cal. 90009
Dupree, Inc., Dept. EM, 9835 Dupree St., So. El Monte, Cal. 91733
M Edmund Scientific Co., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007
D General Electric Co., Miniature Lamp Dept., Dept. EM, Nela Park, Clevland, Ohio 44112
Gilway Technical Lamp, Dept. EM, 272 New Boston Park, Woburn, Mass. 01801
M Hamai Electric Lamp Co., Ltd., Dept. EM, 9-26, Kasuga 1-chome, Bunkyo-Ku, Tokyo, Japan 112
D Inter-Market, Inc., Dept. EM, 1946 Lehigh Ave., Glenview, Ill. 60025
DM JKL Components Corp., Dept. EM, 2226 Barry Ave., W. Los Angeles, CA 90064
D JPI, Inc., Dept. EM, 1507 San Vicente Blvd., Santa Monica, Cal. 90402
M Lenox Instr. Co., Dept. EM, 121 E. Luray St., Philadelphia, Pa. 19120
M Lumitron Corp, Dept. EM, 326 Broad St, Summit, N.J. 07901
D Mura Corp., Dept. EM, 177 Cantiague Rock Rd, Westbury, NY 11590
D North American Philips Lighting Corp., Dept. EM, Bank St., Hightstown, N.J. 08520
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Panel Components Corp., Dept. EM, 2015 Second St., Berkeley, Cal. 94710
DM Precision Lamp, Inc., Dept. EM, 950 N. Rengstorff Ave., Mountain View, Cal. 94043
M Radatron Corp., Dept. EM, 2424 Niagara Falls Blvd., N. Tonawanda, NY 14120
SHOGYO International Corp., Dept. EM, 300 Northern Blvd., Great Neck, N.Y. 11021
D Tec, Inc., Dept. EM, 2727 N. Fairview, Tuscon, Ariz. 85705
D Titan Tool Supply Co., Inc., Dept. EM, 68 Comet, Buffalo, N.Y. 14216
Welch Allyn, Inc., Indl. Prods. Div., Dept. EM, Skaneateles Falls, N.Y. 13153

Westinghouse Elec., Lamp Div., Dept. EM, Parts Sls., 1 Westghse Plaza, Bloomfield, N. J. 07003
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578
D Xciton Corp, Dept. EM, Shaker Park, 5 Hemlock St, Latham, NY 12110

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D ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845 ..... *
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Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
Data Display Products, Dept. EM, Box 91072, Los Angeles, Cal. 90009
Glowlite Corp., Sub. Div. Inc., Dept. EM, Dutch Bay, Inc., Pauls Valley, Okla. 73075
D Inter-Market, Inc., Dept. EM, 1946 Lehigh Ave., Glenview, Ill. 60025
DM JKL Components Corp., Dept. EM, 2226 Barry Ave., W. Los Angeles, CA 90064
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
D Mura Corp., Dept. EM, 177 Cantiague Rock Rd, Westbury, NY 11590
D Oneida Electronics Mfg., Dept. EM, POB 678, R.D. #3 Baldwin Ext., Meadville, Pa. 16335
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Panel Components Corp., Dept. EM, 2015 Second St., Berkeley, Cal. 94710
SHOGYO International Corp., Dept. EM, 300 Northern Blvd., Great Neck, N.Y. 11021
D Tec, Inc., Dept. EM, 2727 N. Fairview, Tuscon, Ariz. 85705
Voltarc Tubes, Dept. EM, 102 Linwood Ave., Fairfield, Conn. 06430
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

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DM Chicago Miniature/Drake, Dept. EM, 4433 N Ravenswood Ave., Chicago, Ill. 60640 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
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General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Oak Inds. Inc., Switch Div., Dept. EM, Dept. DA, Crystal Lake, Ill. 60014 p. 2505-2508,2510-2514,2520,2521,2523
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Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 *
D American Ultraviolet, Dept. EM, 320 Commerce St., Chatham, N.J. 07928
Canrad-Hanovia, Inc., Dept. EM, 100 Chestnut St., Newark, N.J. 07105
M Edmund Scientific Co., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007
D General Electric Co., Miniature Lamp Dept., Dept. EM, Nela Park, Cleviland, Ohio 44112
Gilway Technical Lamp, Dept. EM, 272 New Boston Park, Woburn, Mass. 01801
D Illumination Industries, Dept. EM, 825 E. Evelyn Ave., Sunnyvale, Cal. 94086
ITT Electron Tube, Dept. EM, Box 100, Easton, Pa. 18042
D North American Philips Lighting Corp., Dept. EM, Bank St., Hightstown, N.J. 08520
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
DM Precision Lamp, Inc., Dept. EM, 950 N. Rengstorff Ave., Mountain View, Cal. 94043
SHOGYO International Corp., Dept. EM, 300 Northern Blvd., Great Neck, N.Y. 11021
Westinghouse Elec., Lamp Div., Dept. EM, Parts Sls., 1 Westghse Plaza, Bloomfield, N. J. 07003

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D A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 ..... *
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DM Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
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Data Display Products, Dept. EM, Box 91072, Los Angeles, Cal. 90009
D Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
Hamai Electric Lamp Co., Ltd., Dept. EM, 9-26, Kasuga 1-chome, Bunkyo-Ku, Tokyo, Japan 112
D Inter-Market, Inc., Dept. EM, 1946 Lehigh Ave., Glenview, Ill. 60025
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
Switchcraft, Inc., Dept. EM, 5555 N. Elston, Chicago, Ill. 60630
D Tec, Inc., Dept. EM, 2727 N. Fairview, Tuscon, Ariz. 85705
D Xciton Corp, Dept. EM, Shaker Park, 5 Hemlock St, Latham, NY 12110

Lamps, Stroboscopic Source

EG&G, Inc., Electro-Optics Div., Dept. EM, 35 Congress St., Salem, Mass. 01970 ..... *
Slaughter Co., Dept. EM, Moore & Hailey Sts., P.O. Box 1805, Ardmore, Okla. 73401 ..... p. 2822
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016

Lamps, Tungsten Halogen

International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 *
Leecraft Mfg. Co., Inc., Dept. EM, 21-16 44th Rd., Long Island City, N.Y. 11101 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
American Ultraviolet, Dept. EM, 320 Commerce St., Chatham, N.J. 07928
D Dolan-Jenner Inds., Inc., Dept. EM, Box 1020, Woburn, Mass. 01801
Edmund Scientific Co., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007
Gamma Scientific Inc., Dept. EM, 3777 Ruffin Rd., San Diego, Cal. 92123
Gates & Co., Inc., Geo. W., Dept. EM, Hempstead Tpke. & Lucille Ave., Franklin Sq., N.Y. 11010
D General Electric Co., Miniature Lamp Dept., Dept. EM, Nela Park, Cleviland, Ohio 44112
Gilway Technical Lamp, Dept. EM, 272 New Boston Park, Woburn, Mass. 01801
JKL Components Corp., Dept. EM, 2226 Barry Ave., W. Los Angeles, CA 90064
Keene Corp, Dept. EM, 345 Park Ave, New York, N.Y. 10022
D North American Philips Lighting Corp., Dept. EM, Bank St., Hightstown, N.J. 08520
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Welch Allyn, Inc., Indl, Prods. Div., Dept. EM, Skaneateles Falls, N.Y. 13153

Lamps, Ultraviolet

EG&G, Inc., Electro-Optics Div., Dept. EM, 35 Congress St., Salem, Mass. 01970 ..... *
D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
D American Ultraviolet, Dept. EM, 320 Commerce St., Chatham, N.J. 07928
Argus International, Dept. EM, Box 38, Hopewell, N.J. 08525
Canrad-Hanovia, Inc., Dept. EM, 100 Chestnut St., Newark, N.J. 07105
D Fusion Systems Corp., Dept. EM, 11810 Parklawn Dr., Rockville, Md. 20852
Gates & Co., Inc., Geo. W., Dept. EM, Hempstead Tpke. & Lucille Ave., Franklin Sq., N.Y. 11010
D Illumination Industries, Dept. EM, 825 E. Evelyn Ave., Sunnyvale, Cal. 94086
Magnaflux Corp. , Dept. EM, 7328 W. Lawrence Ave., Chicago, Ill 60656
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
DM Shannon Luminous Mat'ls., Div. Shannon-Glow Inc., Dept. EM, 7356 Santa Monica Blvd., Hollywood, Cal. 90046
Ultra-Violet Prods., Inc., Dept. EM, 5100 Walnut Grove Ave., San Gabriel, Cal. 91778
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Voltarc Tubes, Dept. EM, 102 Linwood Ave., Fairfield, Conn. 06430
DM Western Coil & Elec. Co., Dept. EM, 215 State St., Racine, Wisc. 53403
Westinghouse Elec., Lamp Div., Dept. EM, Parts Sls., 1 Westghse Plaza, Bloomfield, N. J. 07003

Lamps, Xenon

D **Christie Elec., Dept. EM, 3404A W. 67th St., Los Angeles, Cal. 90043** ..... *
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Atlas Electric Devices, Dept. EM, 4114 N. Ravenswood Ave., Chicago, Ill. 60613
M Canrad-Hanovia, Inc., Dept. EM, 100 Chestnut St., Newark, N.J. 07105
Chemical Etching Equip. & Supply, Dept. EM, 6905 Beulah St, Alexandria, Va. 22310
Gates & Co., Inc., Geo. W., Dept. EM, Hempstead Tpke. & Lucille Ave., Franklin Sq., N.Y. 11010
D Illumination Industries, Dept. EM, 825 E. Evelyn Ave., Sunnyvale, Cal. 94086
JKL Components Corp., Dept. EM, 2226 Barry Ave., W. Los Angeles, CA 90064
D Mura Corp., Dept. EM, 177 Cantiague Rock Rd, Westbury, NY 11590
D North American Philips Lighting Corp., Dept. EM, Bank St., Hightstown, N.J. 08520
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Spectrolab, Inc., Dept. EM, 12500 Gladstone Ave., Sylmar, Cal. 91342
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Voltarc Tubes, Dept. EM, 102 Linwood Ave., Fairfield, Conn. 06430

Laser Crystal & Rods

Allied Chemical Corp., Specialty Chemicals Div., Dept. EM, Box 1087R, Morristown, N.J. 07960
Cleveland Crystals, Inc., Dept. EM, Box 17157, Euclid, Ohio 44117
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Union Carbide Corp., Crystal Prods. Dept., Elctrns Div, Dept. EM, 8888 Balboa Ave., San Diego, Cal. 92123

Lasers & Laser Systems

DM **Andersen Laboratories Inc., Dept. EM, 1280 Blue Hills Ave., Bloomfield, Conn. 06002** ..... **p. 2619**
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Power Technology, Inc., Dept. EM, Box 4403, 7925 Mablewave Cutoff, Little Rock, Ark. 72204 ..... *
Advanced Kinetics, Dept. EM, 1231 Victoria St., Costa Mesa, Calif. 92627
Aerotech, Inc., Dept. EM, 101 Zeta Dr., Pittsburgh, Pa. 15238
D Apollo Lasers Inc., Dept. EM, 6357 Arizona Cir., Los Angeles, Cal. 90045
M Atlantic Research Corp., Dept. EM, 5390 Cherokee Ave., Alexandria, Va 22314
Avcom International, Dept. EM, 784 N. W. 57th Ct., Fort Lauderdale, Fla. 33309
M Edmund Scientific Co., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
High Voltage Engrg. Corp., Dept. EM, S. Bedford St., Burlington, Mass. 01803
Holex Corp, Dept. EM, 2544 W. Main St., Norristown, Pa. 19401
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Laser Inc., Dept. EM, Laser Lane, Box 537, Sturbridge, Mass. 01566
Laser Systems Corp., Dept. EM, 117 N. First St., Ann Arbor, Mich. 48104
D Macrodyne Inc., Dept. EM, 1900 Maxon Rd., Box 1079, Schenectady, N.Y. 12301
Meret Inc., Dept. EM, 1815 24th St., Santa Monica, Cal. 90404
D Metrologic Instruments, Inc., Dept. EM, 143 Harding Ave., Bellmawr, N.J. 08030
Quantronix Corp., Dept. EM, 225 Engineers Rd., Smithtown, N.Y. 11787
D Raytheon Co., Spec. Microwave & Device Oper., Dept. EM, Fourth Ave., Burlington, Mass. 01803
Scientific Technology, Dept. EM, 1201 San Antonio Rd., Mountain View, Cal. 94043
S.I.R. Atlanta, Inc., Dept. EM, 331 Luckie St., N.W., Atlanta, Ga. 30313
Thermal Amer. Fused Quartz, Dept. EM, Change Bridge Rd., Montville, N.J. 07045
Tobe Deutschmann Labs., Inc., Dept. EM, Box 74, Canton, Mass. 02021

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Power Technology, Inc., Dept. EM, Box 4403, 7925 Mablewave Cutoff, Little Rock, Ark. 72204 ..... *
Pulsar Assocs., Dept. EM, 11491 Sorrento Valley Rd., San Diego, Cal. 92121 *
Advanced Kinetics, Dept. EM, 1231 Victoria St., Costa Mesa, Calif. 92627
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Laser Technology, Inc., Dept. EM, 10624 Ventura Blvd., N. Hollywood, Calif. 91604
Quantronix Corp., Dept. EM, 225 Engineers Rd., Smithtown, N.Y. 11787
Scientech, Inc., Dept. EM, 5649 Arapahoe Ave, Boulder, Colo. 80303
Scientific Technology, Dept. EM, 1201 San Antonio Rd., Mountain View, Cal. 94043

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Alberox Corp., Dept. EM, New Bedford Ind'l. Pk., New Bedford, Mass. 02745 *
M **Alden Products Co, Dept. EM, 117 N Main St, Brockton, Mass. 02403** ..... *
Allied Systems Corp., Dept. EM, Box 11005, Greensboro, N.C. 27409 ..... *
AMP Capitron Div./AMP Inc., Dept. EM, 1595 S. Mt. Joy St., Elizabethtown, Pa. 17022 ..... *
Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 ..... *
D **Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521** ..... *
D **Beman Mfg., Inc., Dept. EM, PO Box 370, New Cumberland, Pa. 17070** ..... *
Breeze-Illinois, Inc., Dept. EM, Main & Agard Sts., Wyoming, Ill. 61491 ..... *
Caton Connector Corp., Dept. EM, Cordage Pk, Plymouth, Mass 02360 ..... *
ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ..... **p. 1965**
M **Jettron Prods., Dept. EM, P.O. Box 337, E. Hanover, N.J. 07936** ..... **p. 2045**
M **Mac Panel Co., Dept. EM, Box 5027, 216 Pine St., High Pt., N.C. 27262** ..... *
M **Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612** ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 **p. 2114,2115**
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
Aerolite Elexs Corp., Dept. EM, 2207 Summit Ave., Union City, N.J. 07087
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
D Electronic Coil Corp., Dept. EM, 347 New Britain Ave., Plainville, Conn. 06062
Estes Engrg. Co., Dept. EM, 930 Marine Dr., Port Angeles, Wash. 98362
Excel Specialty Corp., Dept. EM, 6335 N. Broadway, Chicago, Ill. 60660
Gulton Inds., SCD Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
Lynn Elctrns. Corp., Dept. EM, 915 Pennsylvania Blvd., Feasterville, Pa. 19047
M Manger Elec. Co., Inc., Dept. EM, W. Henry St., Stamford, Conn. 06902
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Paraplegics Mfg., Dept. EM, 304 N. York Rd., Bensenville, Ill. 60106
Reynolds Inds., Inc., Dept. EM, Box 1170, Marina Del Rey, Cal. 90291
Simmonds Precision, Engine Systems Div., Dept. EM, Norwich, N.Y. 13815
Tobe Deutschmann Labs., Inc., Dept. EM, Box 74, Canton, Mass. 02021

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Alden Products Co, Dept. EM, 117 N Main St, Brockton, Mass. 02403 ..... *
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D **Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616** ..... *
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D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
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DM **Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725** ..... *
D **National Tel-Tronics, Div. Electro Audio Dynamics, Inc., Dept. EM, State Road Hill, Meadville, Pa. 16335** ..... *
M **Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612** ..... *
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Aerolite Elexs Corp., Dept. EM, 2207 Summit Ave., Union City, N.J. 07087
Air-O-Tronics Prods., Dept. EM, Box K, Morrisville, N.Y. 13408
M Anchor Specialty Mfg. Inc., Dept. EM, 300 Hollister Rd., Teterboro, N.J. 07608
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
Desco Mfg. Co., Dept. EM, 1530 Flower St., Glendale, Cal. 91201
D E-Z-Hook, Div. Tektest, Dept. EM, Box 450 114 E. St. Joseph, Arcadia, Cal. 91006
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
Excel Specialty Corp., Dept. EM, 6335 N. Broadway, Chicago, Ill. 60660
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
Lynn Elctrns. Corp., Dept. EM, 915 Pennsylvania Blvd., Feasterville, Pa. 19047
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
Pylon Co., Inc., Dept. EM, 51 Newcomb St., Attleboro, Mass. 02703
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077

LED's—See Diodes, Light-Emitting (LED's)

Lenses, Filters, Windows, Infrared

Capintec Instruments, Inc., Dept. EM, 136 Summit Ave., Montvale, N.J. 07645
Cleveland Crystals, Inc., Dept. EM, Box 17157, Euclid, Ohio 44117
FJW Industries, Dept. EM, 215 E. Prospect Ave., Mt. Prospect, Ill. 60056
Melles Griot, Dept. EM, 1770 Kettering St., Irvine, Cal. 92714
Rank Precision Inds., Dept. EM, 411 Jarvis Ave., Des Plaines, Ill. 60018
Schott Optical Glass Inc., Dept. EM, York Ave., Duryea, Pa. 18642
Sigma Plastronics, Inc., Dept. EM, 14531-33 Tireman Ave, Dearborn, Mich. 48126

Lenses, Optical & Camera

Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
AGFA-Gevaert, Inc., Dept. EM, 275 North St., Teterboro, N.J. 07608
D Bishop Graphics, Dept. EM, 5388 Sterling Center, Westlake Village, Cal. 91361
DM CAI, Div. Bourns Inc., Dept. EM, 550 W. Northwest Hwy., Barrington, Ill. 60010
Chemical Etching Equip. & Supply, Dept. EM, 6905 Beulah St, Alexandria, Va. 22310
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
M Edmund Scientific Co., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007
Esco Products, Dept. EM, Oak Ridge Rd., Oak Ridge, NJ 07438
Fairchild Camera & Instr., Federal Systems Group, Dept. EM, 300 Robbins La., Syosset, N.Y. 11791
FJW Industries, Dept. EM, 215 E. Prospect Ave., Mt. Prospect, Ill. 60056
M Harshaw Chemical Co., A Kenanee Industry, Dept. EM, 6801 Cochran Rd., Solon, Ohio 44139
Heitz, Inc., Karl, Dept. EM, 979 Third Ave., New York, N.Y. 10022
D Apollo Lasers, Apollo Lasers, Inc., Dept. EM, 6357 Arizonia Cir, Los Angeles, Cal. 90045
Laser Inc., Dept. EM, Laser Lane, Box 537, Sturbridge, Mass. 01566

Leitz, Inc. E., Dept. EM, Link Crescent, Rockleigh, N.J. 07647
M Lenox Instr. Co., Dept. EM, 121 E. Luray St., Philadelphia, Pa. 19120
Melles Griot, Dept. EM, 1770 Kettering St., Irvine, Cal. 92714
D Nikon, Inc., Instr. Div. Ehrenreich Photo-Optical Ind., Dept. EM, 623 Stewart Ave., Garden City, N.Y. 11530
D Olympus Corp. America, Dept. EM, Two Nevada Dr., New Hyde Park, N.Y. 11040
M Optics Group-East, Valtec Corp., Dept. EM, Holliston, Mass. 01746
D Rank Precision Inds., Dept. EM, 411 Jarvis Ave., Des Plaines, Ill. 60018
Schott Optical Glass Inc., Dept. EM, York Ave., Duryea, Pa. 18642

Lenses, Readout & Display

Chicago Miniature/Drake, Dept. EM, 4433 N Ravenswood Ave., Chicago, Ill. 60640 ..... *
D **Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645** ..... p. 4023
Display Devices, Dept. EM, Box 667, Encinitas, Cal. 92024 ..... *
Electro-Mech Components, Dept. EM, 1826 N. Floradale Ave., So. El Monte, Cal. 91733 ..... p. 4055
Georator Corporation, Dept. EM, Box 70, Manassas, Va. 22110 ..... p. 3264
D **Industrial Devices, Dept. EM, Edgewater, N.J. 07020** ..... *
M **Industrial Elctrn. Engrs., Dept. EM, 7740 Lemona Ave., Van Nuys, Cal. 91405** *
Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032 p. 4114,4124
Oak Inds. Inc., Switch Div., Dept. EM, Dept. DA, Crystal Lake, Ill. 60014 ..... *
Philamon, Inc., Dept. EM, 33 Dubon Ct., Farmingdale, N.Y. 11735 ..... p. 2353
Sloan Company, Dept. EM, 7704 San Fernando Rd., Sun Valley, Cal. 91352 p. 2542-2545
Sorenson Lighted Controls, Dept. EM, 530 Oakwood Ave., W. Hartford, Conn. 06110 ..... *
Atlantic Optical Moulding Co., Dept. EM, Ellis St., Dudley, Mass. 01570
Edmund Scientific Co., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007
Esco Products, Dept. EM, Oak Ridge Rd., Oak Ridge, NJ 07438
Melles Griot, Dept. EM, 1770 Kettering St., Irvine, Cal. 92714
Photo Chemical Prods. Cal., Dept. EM, 1715 Berkeley, Santa Monica, Cal. 90404

Light Choppers

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Ithaco, Inc., Dept. EM, 735 W. Clinton St., Ithaca, N.Y. 14850 ..... *
M **Philamon, Inc., Dept. EM, 33 Dubon Ct., Farmingdale, N.Y. 11735** ..... *
Electro-Optical Inds., Inc., Dept. EM, 839 Ward Dr., Santa Barbara, Cal. 93111
Scientech, Inc., Dept. EM, 5649 Arapahoe Ave, Boulder, Colo. 80303

Light Sources, Photoelectric

D **Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032** *
Vactec, Inc., Dept. EM, 2423 Northline Blvd., Maryland Heights, Mo. 63043 *
D Autotron, Inc., Dept. EM, 3269 N. Vermilion St., Box 595, Danville, Ill. 61832
D Dolan-Jenner Inds., Inc., Dept. EM, Box 1020, Woburn, Mass. 01801
D Eagle Signal, Mfg. Div. Gulf & Western Inds., Dept. EM, Box 3585, Davenport, Iowa 52808
Edmund Scientific Co., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007
D Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
FSI/Fork Standards Inc., Dept. EM, 211 Main St., W. Chicago, Ill. 60185
Optron, Inc., Dept. EM, 1201 Tappon Cir., Carrollton, Tex. 75006
D Photo Research Corp., Division Kollmorgen Corp., Dept. EM, 3000 N. Hollywood Way, Burbank, Cal. 91505
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
M Power Instrs., Inc., Dept. EM, 7352 N. Lawndale Ave., Skokie, Ill. 60076
Skan-A-Matic Corp., Dept. EM, Box S, Elbridge, N.Y. 13060
Tri-Tronics Co. Inc., Dept. EM, 619 Enterprise Drive, Dept. EE, Oak Brook, Ill. 60521

Light Sources, Stroboscopic—See Lights, Stroboscopic, Source

Lighting Equipment, Emergency

Era Transpac Corp., Sub. Elctrn. Research Assocs., Dept. EM, 311 B East Park St. Dept. 1202, Moonachie, N.J. 07074 ..... *
Power, Inc., Marketing Div., Dept. EM, 12809 Eagle Ridge Dr., Burnsville, Minn. 55337 ..... *
Abex Corp, Dept. EM, 530 5th Ave, New York, NY 10036
D Bodine Co., Dept. EM, 236 Mt. Pleasant Rd., Collierville, Tenn. 38017
D Cole-Flex Corp., Dept. EM, 91 Cabot St., W. Babylon, N.Y. 11704
Exide Safety Systems Div., ESB Inc., Dept. EM, 39 Teed Dr, Randolph, Mass. 02368
Keene Corp, Dept. EM, 345 Park Ave, New York, N.Y. 10022
D Teledyne Big Beam, Dept. EM, 290 E. Prairie St., Crystal Lake, Ill. 60014
Tri-Ex Tower Corp., Dept. EM, 7182 Rasmussen Ave., Visalia, Cal. 93277
D Tripp-Lite, Dept. EM, 133 N. Jefferson, Chicago, Ill. 60606
Whittaker Corp., Dept. EM, 10880 Wilshire Blvd., Los Angeles, Cal. 90024

Limit Stops—See Knobs, Limit Stop

Limit Stops, Mechanical

D **Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101** ..... p. 2425
D **Tapeswitch Corp. Amer., Dept. EM, 100 Schmitt Blvd., Farmingdale, N.Y. 11735** ..... *
Datron Systems, Dept. EM, 20700 Plummer St., Chatsworth, Cal. 91311
Dillon, W.C. & Co., Dept. EM, 14620-EP Keswick St., Van Nuys 340, Cal. 91407
Perfect Gear & Instr. Corp., Sub. Designatronics, Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
M PIC Design Div., Benrus Corp., Dept. EM, Benrus Center, Rte 7, Ridgefield, Conn. 06877
M Precision Mechanisms Corp., Dept. EM, 44 Brooklyn Ave., Westbury, N.Y. 11590
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
D Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105

Limiters, Current

Airpax Elctrns., Inc., Cambridge Div., Dept. EM, Woods Rd., Cambridge, Md. 21613 ..... *
M **Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706** ..... *
Keystone Carbon Co., Thermistor Div., Dept. EM, St. Marys, Pa. 15857 ..... *
D **Midwest Components, Dept. EM, 1981 Port City Blvd., Muskegon, Mich. 49400** ..... p. 4280
D Burndy Corporation, Dept. EM, Richards Ave., Norwalk, , Conn. 06852
D Carbone Lorraine Industries Corp., Dept. EM, 400 Myrtle Ave., Boonton, N.J. 07005
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
GTE Sylvania Inc., Dept. EM, Rte. 35, Standish, Maine 04084
Lambda Elctrns., Dept. EM, 515 Brd. Hollow Rd., Melville, N.Y. 11746
Micro, Emerson Electric Co. Devices Div, Dept. EM, Box 501 Wright Bros Br, Dayton, Ohio 45409
Payne Engrg. Co., Dept. EM, Box 70, Scott Depot, W. Va. 25560
Texas Instruments Control Prods. Div., Dept. EM, 34 Forrest St., Attleboro, Mass. 02703
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Limiters, Microwave

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
M **Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706** ..... *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** *
DM **Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725** ..... *
Mini-Circuits Lab., Div. Scientific Comps. Corp., Dept. EM, 2625 E 14th St., Brooklyn, N.Y. 11235 ..... p. 2890, Inside Front Cover, Vol. 1
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
M Airtron, Div. Litton Inds., Dept. EM, 200 E. Hanover Ave., Morris Plains, N.J. 07950
M Crown Microwave, Inc., Sub. Microwave Semiconductor Corp., Dept. EM, 6 Executive Park Dr., N. Billerica, Mass. 01862
Engelmann Microwave, Dept. EM, Skyline Dr., Montville, N.J. 07045
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Merrimac Inds., Inc., Dept. EM, 41 Fairfield Pl., West Caldwell, N.J. 07006
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
D Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
Radiation Devices Co., Inc., Dept. EM, Box 8450, Baltimore, Md. 21234
TRG, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
Triangle Microwave Inc., Dept. EM, 9B Great Meadow La, East Hanover, NJ 07936
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304

Limiters, Surge

Delco Electronics Div., General Motors Corp., Dept. EM, 700 E. Firmin St., Kokomo, Ind. 46901 ..... *
Keystone Carbon Co., Thermistor Div., Dept. EM, St. Marys, Pa. 15857 ..... *
D **Midwest Components, Dept. EM, 1981 Port City Blvd., Muskegon, Mich. 49400** ..... *
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
Control Concepts Corp., Dept. EM, 333 Front St., Binghamton, N.Y. 13905
Eastern Delta Corp., Dept. EM, 29-09 S. Broadway, Fair Lawn, N.J. 07410
Edal Inds., Inc., Dept. EM, 4 Short Beach Rd., E. Haven, Conn. 06512
DM General Semiconductor Industries, Inc., Dept. EM, 2001 W. 10 Pl., Box 3078, Tempe, Ariz. 85281
Joslyn Elctrn. Sys., Div. Joslyn Mfg. & Supp, Dept. EM, 6868 Cortona Dr., Box 817, Goleta, Cal. 93017
Micro, Emerson Electric Co. Devices Div, Dept. EM, Box 501 Wright Bros Br, Dayton, Ohio 45409
RFL Inds., Comms. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005
M Transtector Systems, Dept. EM, 532 Monterey Pass Rd., Monterey Park, Cal. 91754

Line Strechers, Microwave

M **Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706** ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
DM **Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518** ..... *
M Aircom, Inc., Dept. EM, Rte. 16B, Union, N.H. 03887
Alford Mfg. Co., Dept. EM, 120 Cross St., Winchester, Mass. 01890
Astrolab, Inc., Dept. EM, 345 Dalziel Rd., Linden, N.J. 07036
Convex Corp., Dept. EM, 2810 Dorr Ave., Fairfax, Va. 22031
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
D R L C Elctrns., Inc., Dept. EM, 83 Radio Cir., Mt. Kisco, N.Y. 10549
Triangle Microwave Inc., Dept. EM, 9B Great Meadow La, East Hanover, NJ 07936

Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006

Liners, Tube Shield—See Shields, Tube

Loads, Electronic, Variable-Also See Dummy Loads

ACDC Electronics, Dept. EM, 401 Jones Rd., Oceanside, Cal. 92054 ..... *
Acme Electric, Dept. EM, 614 Water St., Cuba, N.Y. 14727 ..... p. 3197
Elgar Corporation, Dept. EM, 8225 Mercury Ct., San Diego, Cal. 92111 ..... *
Power Designs, Inc., Dept. EM, 1700 Shames Dr., Westbury, N.Y. 11590 .... *
Electronautics, Dept. Dielectric Comm., Dept. EM, Newtown Rd., Littleton, Mass. 01460
Emerson & Cuming, Inc., Dielectric Mat'ls. Div., Dept. EM, 869 Washington St., Canton, Mass. 02021
Engelmann Microwave, Dept. EM, Skyline Dr., Montville, N.J. 07045
Raytheon Co., Microwave & Power Tube Div., Dept. EM, 190 Willow St., Waltham, Mass 02154
M Reeve Electronics, Inc., Dept. EM, 609 W. Lake St., Chicago, Ill 60606
Sara Sales Co., Dept. EM, P.O. Box 321, San Francisco, Calif. 94101
D Sotcher Measurement, Inc., Dept. EM, 1120 Stewart Court, Sunnyvale, Cal. 94086
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006
Wide Band Engrg. Co. Inc., Dept. EM, Box 21652, Phoenix, Ariz. 85036

Locators, Open-Short

Chatsworth Data Corp, Cablemaster Div., Dept. EM, 20710 Lassen St., Chatsworth, Cal 91311 ..... p. 2680
Chatsworth Data Corp, Impact-o-Graph Div., Dept. EM, 20710 Lassen St., Chatsworth, Cal. 91311 ..... p. 2680
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
M Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509 ..... *
Slaughter Co., Dept. EM, Moore & Hailey Sts., P.O. Box 1805, Ardmore, Okla. 73401 ..... *
Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2119
M Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
D LocAtor Electronics Co., Dept. EM, South Country Ind'l Pk., Drawer 10609, St. Louis, Mo. 63129
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803

Locks, Dial & Shaft

Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... *
Jackson Bros., (London) Ltd., Dept. EM, 258 Bway., New York, N.Y. 10007 *
D Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 ..... p. 2428
DM Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012 .. *
D Raytheon Co., Distributor Prods. Oper., Dept. EM, Fourth Ave., Burlington, Mass. 01803 ..... *
D Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 *
DM Vemaline Prods. Div., Ostbys & Barton Co., Dept. EM, 487 Jefferson Blvd., Warwick, R.I. 02886 ..... *
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
DM Almsco Inc., Dept. EM, 4000-4024 22nd Ave. W., Seattle, Wash. 98199
Federal Screw Products Inc., Dept. EM, 3917 N. Kedzie Ave., Chicago, Ill. 60618
Kwikset Powdered Metal Prods., Kwikset Div-Emhart Inds. Inc., Dept. EM, Box 4250P, Anaheim, Cal. 92803
Lambda Elctrns., Dept. EM, 515 Brd. Hollow Rd., Melville, N.Y. 11746

Logic Cards (without Components)—See Boards, Plug-In

Logic Circuits—See Cards, Logic; IC's, Logic Circuits; Modules, Logic

Loudspeakers—See Speakers

Louvers, Vents, & Windows (For Equipment)—See Cabinets & Accessories, Metal

Lubricants

D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... p. 1290
M General Devices Co., Inc., Dept. EM, Box 19188, Indianapolis, Ind. 46219 .. *
Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
Acheson Colloids Co., Div. Acheson Inds., Dept. EM, P.O. Box 288, Port Huron, Mich. 48060
Atomergic Chemetals Corp Co., Dept. EM, 100 Fairchild Ave., Plainview, N.Y. 11803
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
D Caig Labs., Inc., Dept. EM, 1175-0 Industrial Ave., Box 64, Escondido, Cal. 92025
M Chemplast, Inc., Dept. EM, 31-150 Dey Rd., Wayne, N.J. 07470
D Chemtronics, Inc., Dept. EM, 45 Hoffman Ave., Hauppauge, N.Y. 11787
D CVC Products, Inc., Dept. EM, 525 Lee Rd., Box 1886, Rochester, N.Y. 14603
Diamond Shamrock Corp, Dept. EM, 1100 Superior Ave, Cleveland, Ohio 44114
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
M Electrofilm, Inc., Dept. EM, 7116 Laurel Canyon Blvd., No. Hollywood, Cal. 91605
Formulated Resins Inc., Dept. EM, Box 508, Greenville, R.I. 02828
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
Krylon Dept., Borden Chemical, Dept. EM, 180 E. Broad St, Columbus, Ohio 43215
DM LPS Research Labs, Dept. EM, 2050 Cotner Ave., Los Angeles, Cal. 90025
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
DM Merix Chem. Co., Dept. EM, 2234 East 75th St., Chicago, Ill. 60649
Metron Optics, Dept. EM, P.O. Box 690, Solana Beach, Cal. 92075
M Miller-Stephenson Chem. Co., Inc., Dept. EM, George Washington Hwy., Danbury, Conn. 06810
D Norelcom Electronics, Dept. EM, 200 Allen Blvd., Farmingdale, N.Y. 11735
M Nye, William F., Inc., Dept. EM, P.O. Box G-927, New Bedford, Mass. 02742
D Pennwalt Corp., Chemical Specialties Div., Dept. EM, Three Pkwy., Philadelphia, Pa. 19102
D Quietrole Co., Dept. EM, 395 St. John, Spartenburg, S.C. 29302
D Ram Chems., Div. Whittaker Corp., Dept. EM, 210 E. Alondra Blvd., Gardena, Calif. 90248
DM Shannon Luminous Mat'ls., Div. Shannon-Glow Inc., Dept. EM, 7356 Santa Monica Blvd., Hollywood, Cal. 90046
SWS Silicones Corp., Dept. EM, Box 428, Adrian, Mich. 49221
DM Tech Spray, Inc., Dept. EM, Box 949, Amarillo, Tex. 79105
Tecknit, Dept. EM, 129 E. Dermody St., Cranford, N.J. 07016
Union Carbide, Chemicals & Plastics, Dept. EM, 270 Park Ave., New York, N.Y. 10017
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Lugs, Terminal—See Terminals, Lug

LVDT's—See Transducers, Displacement

Machines & Accessories, Semiconductor Manufacturing

Argus International, Dept. EM, Box 38, Hopewell, N.J. 08525
Branson Cleaning Equip. Co., Dept. EM, Parrott Dr., Shelton, Conn. 06484
Crouzet/Cridland, Dept. EM, 118 Barrington Commons Ct Ste 207, Barrington, Ill. 60010
D GCA/Sunnyvale Div., Dept. EM, 1050 Kifer Rd., Sunnyvale, Cal. 94086
M Heraeus-Amersil, Inc., Dept. EM, 650 Jernees Mill Rd., Sayreville, NJ 08872
HM Hughes Aircraft Co., Ind'l. Prods. Div., Prod. Equip. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
D Hull Corp., Dept. EM, Davisville Rd., Hatboro, Pa. 19040
J & S Tool Co., Inc., Dept. EM, 70 Okner Pkwy., Livingston, N.J. 07039
Kahle Engrg. Co., Dept. EM, 3344 Hudson Ave., Union City, N.J. 07087
Laser Technology, Inc., Dept. EM, 10624 Ventura Blvd., N. Hollywood, Calif. 91604
Leitz, Inc. E., Dept. EM, Link Crescent, Rockleigh, N.J. 07647
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Princeton Applied Resch. Corp., Dept. EM, Box 2565, Princeton, N.J. 08540
Qualco, Dept. EM, One First St., Los Altos, Cal. 94022
Quantronix Corp., Dept. EM, 225 Engineers Rd., Smithtown, N.Y. 11787
Red Point Corp., Dept. EM, 105 W. Spazier, Burbank, Cal. 91502
Research Devices, Dept. EM, 616 Springfield Ave., Berkeley Heights, N.J. 07922
Solid State Equipment Corp., Dept. EM, 430 Delaware Drive, Fort Washington, Pa. 19034
DM Systonics, Inc., Dept. EM, Box 121, Winchester, Mass. 01890
D Temptronic Corporation, Dept. EM, 40 Glen Ave., Newton, Mass. 02159

Machines & Tools, Crimping—See Tools, Crimping & Swaging

Machines, Cleaning & Degreasing-Also See Cleaners, Ultrasonic

D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
Argus International, Dept. EM, Box 38, Hopewell, N.J. 08525
Baron-Blakeslee, Dept. EM, 1620 S. Laramie Ave., Chicago, Ill. 60650
Branson Cleaning Equip. Co., Dept. EM, Parrott Dr., Shelton, Conn. 06484
D Chemcut Corp., Dept. EM, 500 Science Pk., State College, Pa. 16801
Chemical Etching Equip. & Supply, Dept. EM, 6905 Beulah St, Alexandria, Va. 22310
D Clean Room Prods., Dept. EM, 56 W. Penataquit Ave., Bay Shore, N.Y. 11706
DM Cobehn, Inc., Dept. EM, 226 Passaic Ave., Fairfield, N.J. 07006
M Cyclo-Tronics, Inc., Dept. EM, 3858 N. Cicero Ave., Chicago, Ill. 60641
Electrovert, Dept. EM, 86 Hartford Ave., Mt. Vernon, N.Y. 10553
D GCA/Sunnyvale Div., Dept. EM, 1050 Kifer Rd., Sunnyvale, Cal. 94086
D Hollis Engrg., Inc., Dept. EM, Charron Ave., Box 1189, Nashua, N.H. 03061
Inland Mfg. Co., Dept. EM, 1108 Jackson St., Omaha, Neb. 68102
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
D London Chemical Co., Dept. EM, 240 Foster Ave., Bensenville, Ill. 60106
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
Odell Co., M. P., Dept. EM, 26612 Center Ridge Rd., Cleveland, Ohio 44145
Phillips Mfg. Co., National Ultrasonic Div., Dept. EM, 7334 N. Clark St., Chicago, Ill. 60626
Sara Sales Co., Dept. EM, P.O. Box 321, San Francisco, Calif. 94101
Snap-On-Tools, Dept. EM, 8192-A 28th Ave., Kenosha, Wisc. 53140
Static Inc., Dept. EM, Box 414, Lee, Mass. 01238
DM Tech Spray, Inc., Dept. EM, Box 949, Amarillo, Tex. 79105
Technic, Inc., Dept. EM, Box 965, Providence, R.I. 02901
D Tronic Corp., Dept. EM, Box 247-C, Belmont, Cal. 94002
Westinghouse Elec., Process Equip./Consumables Dept, Dept. EM, Box 300, Sykesville, Md. 21784

Machines, Coil-Winding

M Arnold Magnetics Corp., Dept. EM, 11520 Jefferson Blvd., Culver City, Cal. 90230 ..... p. 3209
D Coil Winding Equip. Co. Inc., Dept. EM, Railroad Plaza, Oyster Bay, N.Y. 11771

Elden Mfg. Co., Dept. EM, 2712 N. Elston Ave., Chicago, Ill. 60647
Electrovert, Dept. EM, 86 Hartford Ave., Mt. Vernon, N.Y. 10553
Essex Grp, Essex Terminals/Connectors, Dept. EM, 3405 Engle Rd., Box 9216, Ft. Wayne, Ind. 46809
Kahle Engrg. Co., Dept. EM, 3344 Hudson Ave., Union City, N.J. 07087
D Possis Corp., Dept. EM, 825 Rhode Island Ave., S., Minneapolis, Minn. 55426
Solatron Enterprises, Dept. EM, 421 E. Beach Ave., Inglewood, Calif. 90302
D Universal Mfg. Co., Inc., Dept. EM, 1168 Grove St., Irvington, N.J. 07111

Machines, Component Handling, Feeding, Insertion & Sorting

Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
Berg Electronics, Div. E.I. DuPont de Nemours & Co., Dept. EM, York Expwy., New Cumberland, Pa. 17070 ..... **p. 1730,1734**
Molex Inc., Dept. EM, 2222 Wellington Ct., Lisle, Ill. 60532 ..... *
United Wiring & Mfg. Co., Dept. EM, 2608 Electonic La. #404, Dallas, Tex. 75220 ..... **p. 1301,1310**
Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
Black & Webster, Inc., Dept. EM, 281 Winter St., Waltham, Mass. 02154
Bulova Systems & Instrument Corp., Dept. EM, Green Acres Rd., W., Valley Stream, N.Y. 11582
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
Conforming Matrix Corp., Dept. EM, Box 5126, Pt. Pl. Sta., Toledo, Ohio 43611
D Delta Design, Inc., Dept. EM, 5725 Kearny Villa Road, San Diego, Cal 92123
Electrovert, Dept. EM, 86 Hartford Ave., Mt. Vernon, N.Y. 10553
Freudenberg, Inc. B., Dept. EM, 50 Rockefeller Plaza, New York, N.Y. 10020
Gagne Assocs., Inc., Dept. EM, 1080 Chenango St., Dept. 3EE-27, Binghamton, N.Y. 13901
D GCA/Sunnyvale Div., Dept. EM, 1050 Kifer Rd., Sunnyvale, Cal. 94086
DM Gluco, Inc., Dept. EM, Box 336, Monroeville, Pa. 15146
D Hollis Engrg., Inc., Dept. EM, Charron Ave., Box 1189, Nashua, N.H. 03061
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
Penn Engrg. & Mfg. Corp., Dept. EM, Doylestown, Pa. 18901
Tridak, Inc., Dept. EM, Del Mar Dr., Brookfield, Conn. 06804
Trio-Tech, Inc. of Calif., Trio-Tech Int., Dept. EM, 2435 N. Naomi St., Burbank, Calif. 91504

Machines, Hermetic Sealing

Associate General Labs., Dept. EM, 8934 W. Ogden Ave., Brookfield, Ill. 60513
Kahle Engrg. Co., Dept. EM, 3344 Hudson Ave., Union City, N.J. 07087
Laser Inc., Dept. EM, Laser Lane, Box 537, Sturbridge, Mass. 01566
M Lepel Corp, Dept. EM, 59-21 Queens-Midtown Expwy., Maspeth, N.Y. 11378
Solid State Equipment Corp., Dept. EM, 430 Delaware Drive, Fort Washington, Pa. 19034

Machines, Induction Heating (Electronic)

Cober Elctrns., Inc., Dept. EM, 7 Gleason Ave., Stamford, Conn. 06902 ..... *
M Cycle-Dyne, Inc., Sub. Axel Elctrns., Inc., Dept. EM, 134-20 Jamaica Ave., Jamaica, N.Y. 11418
M Lepel Corp, Dept. EM, 59-21 Queens-Midtown Expwy., Maspeth, N.Y. 11378
M Reeve Electronics, Inc., Dept. EM, 609 W. Lake St., Chicago, Ill 60606
Westinghouse Elec., Process Equip./Consumables Dept, Dept. EM, Box 300, Sykesville, Md. 21784

Machines, Lead Cutting & Forming

D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
Burndy Corporation, Dept. EM, Richards Ave., Norwalk, , Conn. 06852
Electrovert, Dept. EM, 86 Hartford Ave., Mt. Vernon, N.Y. 10553
D Eraser Co., Dept. EM, Box 1342, Syracuse, N.Y. 13201
Harwil Co., Dept. EM, 1548 17th St., Santa Monica, Calif. 90404
Hollis Engrg., Inc., Dept. EM, Charron Ave., Box 1189, Nashua, N.H. 03061
Laser Technology, Inc., Dept. EM, 10624 Ventura Blvd., N. Hollywood, Calif. 91604
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
PTX-Pentronix, Inc., Dept. EM, 1737 Cicotte, Lincoln Park, Mich. 48146
Tech. Devices Co., Dept. EM, 11250 Playa Ct., Culver City, Calif. 90230

Machines, Marking & Numbering

Allen Avionics, Inc., Div. A.K. Allen Co., Dept. EM, 255 E. 2nd St., Mineola, N.Y. 11501 ..... *
Acromark Co., Dept. EM, 60 Locust/Dept. 397, Berkeley Hts., N.J. 07922
American Can Co, Packaging Oper, Dept. EM, Box 1126-Wall St. Sta, NY, NY 10005
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
Black & Webster, Inc., Dept. EM, 281 Winter St., Waltham, Mass. 02154
Brady Co., W. H., Industrial Prods. Div., Dept. EM, 2221 W. Camden Rd. Box 2131, Milwaukee, Wis. 53201
Burndy Corporation, Dept. EM, Richards Ave., Norwalk, , Conn. 06852
Conrac Corp., Machine Tool Div., Dept. EM, 9200 Bolsa Ave., Westminster, Cal. 92683
D Eastern Marking Machine Corp., Dept. EM, 30 Alabama Ave., Island Park, N.Y. 11558
M Geyer Systems, Inc., Dept. EM, 1917 Green Spring Dr., Timonium, Md. 21903
Laser Inc., Dept. EM, Laser Lane, Box 537, Sturbridge, Mass. 01566
Lectroetch, Dept. EM, 14925 Elderwood Ave., E. Cleveland, Ohio 44112
M Markem Corp., Dept. EM, 1000 Congress St., Keene, NH 03431
Matthews Intl Corp., Marking Systems Div., Dept. EM, 6515 Penn. Ave., Pittsburgh, Pa. 15206
M Monarch Marking Sys., Dept. EM, Box 608, Dayton, Ohio 45401
Quantronix Corp., Dept. EM, 225 Engineers Rd., Smithtown, N.Y. 11787
Solatron Enterprises, Dept. EM, 421 E. Beach Ave., Inglewood, Calif. 90302

Machines, Mask Alignment & Exposure

Argus International, Dept. EM, Box 38, Hopewell, N.J. 08525
Black & Webster, Inc., Dept. EM, 281 Winter St., Waltham, Mass. 02154
Chemical Etching Equip. & Supply, Dept. EM, 6905 Beulah St, Alexandria, Va. 22310
M E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
Grover Photo Prods., Dept. EM, 341 Arden Ave., Glendale, Cal. 91203
Leitz, Inc. E., Dept. EM, Link Crescent, Rockleigh, N.J. 07647
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Research Devices, Dept. EM, 616 Springfield Ave., Berkeley Heights, N.J. 07922

Machines, Metallizing, Vacuum—See Deposition Equipment, Vacuum & Accessories

Machines, Plastic Molding

American Can Co, Packaging Oper, Dept. EM, Box 1126-Wall St. Sta, NY, NY 10005
Chemical Etching Equip. & Supply, Dept. EM, 6905 Beulah St, Alexandria, Va. 22310
D Di-Acro, Div. Houdaille Inds., Inc., Dept. EM, 316 8th Ave., Lake City, Minn. 55041
Essex Grp, Essex Terminals/Connectors, Dept. EM, 3405 Engle Rd., Box 9216, Ft. Wayne, Ind. 46809
DM Gluco, Inc., Dept. EM, Box 336, Monroeville, Pa. 15146
D Hull Corp., Dept. EM, Davisville Rd., Hatboro, Pa. 19040
Wabash Metal Prods., Dept. EM, 1569 Morris St., Wabash, Ind. 46992

Machines, Plating

Auric Corp., Dept. EM, 470 Frelinghuysen Ave., Newark, N.J. 07114
Chemical Etching Equip. & Supply, Dept. EM, 6905 Beulah St, Alexandria, Va. 22310
Electrovert, Dept. EM, 86 Hartford Ave., Mt. Vernon, N.Y. 10553
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
HBS Equipment Div., Dept. EM, 3000 Supply Ave., Los Angeles, Calif. 90040
Magnetic Products, Inc., Dept. EM, Box 1125, New London, N.H. 03257
Metal Fabricators, Inc., Dept. EM, Box 1946, Greenville, S.C. 29602
D Nova Tran Corp., Dept. EM, 360 4th St., Clear Lake, Wisc. 54005
Sel-Rex Div. Oxy Metal Industries Corp., Dept. EM, 75 River Rd., Nutley, N.J. 07110
M Technic, Inc., Dept. EM, Box 965, Providence, R.I. 02901

Machines, Printed Circuit Drilling, Etching & Punching

Berg Electronics, Div. E.I. DuPont de Nemours & Co., Dept. EM, York Expwy., New Cumberland, Pa. 17070 ..... **p. 1730**
D Garry Mfg., Inc., Dept. EM, 1010 Jersey Ave., New Brunswick, N.J. 08902 .. *
Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
D Chemcut Corp., Dept. EM, 500 Science Pk., State College, Pa. 16801
Chemical Etching Equip. & Supply, Dept. EM, 6905 Beulah St, Alexandria, Va. 22310
M Cyclo-Tronics, Inc., Dept. EM, 3858 N. Cicero Ave., Chicago, Ill. 60641
D Di-Acro, Div. Houdaille Inds., Inc., Dept. EM, 316 8th Ave., Lake City, Minn. 55041
DM High Speed Hammer Co., Inc., Dept. EM, 313 Norton St., Rochester, N.Y. 14621
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Metal Fabricators, Inc., Dept. EM, Box 1946, Greenville, S.C. 29602

Machines, Spinner, Photo-Resist

Argus International, Dept. EM, Box 38, Hopewell, N.J. 08525
Black & Webster, Inc., Dept. EM, 281 Winter St., Waltham, Mass. 02154
D GCA/Sunnyvale Div., Dept. EM, 1050 Kifer Rd., Sunnyvale, Cal. 94086
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Macronetics, Dept. EM, 570 Maude Ct., Sunnyvale, Cal. 94086
Solid State Equipment Corp., Dept. EM, 430 Delaware Drive, Fort Washington, Pa. 19034

Machines, Terminal Installing

Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 ..... *
Berg Electronics, Div. E.I. DuPont de Nemours & Co., Dept. EM, York Expwy., New Cumberland, Pa. 17070 ..... *
D Elco Corp., Dept. EM, 2250 Park Pl., El Segundo, CAL 90245 ..... *
D Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 .... *
M AMP Special Industries, Dept. EM, Valley Forge, Pa. 19482
Ark-Les Switch Corp., Dept. EM, 51 Water St., Watertown, Mass. 02172
Artos Engrg. Co., Dept. EM, 15600 W. Lincoln Ave., New Berlin, Wisc. 53151
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
Black & Webster, Inc., Dept. EM, 281 Winter St., Waltham, Mass. 02154
Burndy Corporation, Dept. EM, Richards Ave., Norwalk, , Conn. 06852
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
Essex Grp, Essex Terminals/Connectors, Dept. EM, 3405 Engle Rd., Box 9216, Ft. Wayne, Ind. 46809
DM Gluco, Inc., Dept. EM, Box 336, Monroeville, Pa. 15146
M Hollingsworth Solderless Terminal Co., Dept. EM, 85 Benjamin Franklin Hwy, P.O. Box 499, Pottstown, Pa. 19464
Precision Paper Tube Co., Dept. EM, 1049 S. Noel Ave., Wheeling, Ill. 60090
Sjoberg, C. & Son, Inc., Dept. EM, 415 Station St., Cranston, R.I. 02910
Zierick Mfg. Corp., Dept. EM, 44 Radio Circle, Mt. Kisco, N.Y. 10549

Machines, Transistor Assembling

Kahle Engrg. Co., Dept. EM, 3344 Hudson Ave., Union City, N.J. 07087
Solid State Equipment Corp., Dept. EM, 430 Delaware Drive, Fort Washington, Pa. 19034

Machines, Ultrasonic Bonding

D GCA/Sunnyvale Div., Dept. EM, 1050 Kifer Rd., Sunnyvale, Cal. 94086
DM Hughes Aircraft Co., Ind'l. Prods. Div., Prod. Equip. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
DM Sonobond, Sub. Christiana Metals, Dept. EM, 200 E. Rosedale Ave., West Chester, Pa. 19380

Machines, Vibration Fatigue Testing—See Testers, Vibration

Machines, Wafer Alignment—See Machines, Mask Alignment & Exposure

Machines, Wire Marking, Hand & Automatic

Garry Mfg., Inc., Dept. EM, 1010 Jersey Ave., New Brunswick, N.J. 08902 .. *
United Wiring & Mfg. Co., Dept. EM, 2608 Electonic La. #404, Dallas, Tex. 75220 ..... *
Acromark Co., Dept. EM, 60 Locust/Dept. 397, Berkeley Hts., N.J. 07922
Artos Engrg. Co., Dept. EM, 15600 W. Lincoln Ave., New Berlin, Wisc. 53151
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
Brady Co., W. H., Industrial Prods. Div., Dept. EM, 2221 W. Camden Rd. Box 2131, Milwaukee, Wis. 53201
Burndy Corporation, Dept. EM, Richards Ave., Norwalk, , Conn. 06852
Conrac Corp., Machine Tool Div., Dept. EM, 9200 Bolsa Ave., Westminister, Cal. 92683
M Geyer Systems, Inc., Dept. EM, 1917 Green Spring Dr., Timonium, Md. 21903
M Markem Corp., Dept. EM, 1000 Congress St., Keene, NH 03431
Nat'l. Band & Tag, Dept. EM, 721 York St., Newport, Ky. 41072
D Zippertubing Co., Dept. EM, 13000 S. Broadway, Los Angeles, Cal. 90061

Machines, Wire Measuring & Cutting

Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
Excel Products Co., Inc., Dept. EM, 401 Joyce Kilmer Ave., New Brunswick, N.J. 08903 ..... p. 1767
D **Garry Mfg., Inc., Dept. EM, 1010 Jersey Ave., New Brunswick, N.J. 08902 .. ***
Molex Inc., Dept. EM, 2222 Wellington Ct., Lisle, Ill. 60532 ..... *
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... ***
United Wiring & Mfg. Co., Dept. EM, 2608 Electonic La. #404, Dallas, Tex. 75220 ..... p. 1301,1310
Artos Engrg. Co., Dept. EM, 15600 W. Lincoln Ave., New Berlin, Wisc. 53151
M Automatic Die Cutting Mch, Dept. EM, 28 Warrel St., New York, N.Y. 10007
Burndy Corporation, Dept. EM, Richards Ave., Norwalk, , Conn. 06852
Conrac Corp., Machine Tool Div., Dept. EM, 9200 Bolsa Ave., Westminster, Cal. 92683
D Eraser Co., Dept. EM, Box 1342, Syracuse, N.Y. 13201
Eubanks Engrg., Dept. EM, 1307 So. Myrtle Ave., Monrovia, Calif. 91016
Gardner-Denver Co., Pneutronics Div., Dept. EM, 1333 Fulton St., Grand Haven, Mich. 49417
DM Hykon Mfg. Co., Dept. EM, 163 E. State St., Box 923, Alliance, Ohio 44601
ITT Cannon/ETC Terminal Products, Dept. EM, 29000 Aurora Rd., Solon, Ohio 44139
Laser Technology, Inc., Dept. EM, 10624 Ventura Blvd., N. Hollywood, Calif. 91604
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
Western Electronic Prods. Co., Dept. EM, 107 Los Molinos, San Clemente, Cal. 92672

Machines, Wire Wrapping—See Tools, Wire Wrapping

Magnetizers

Bell, Inc., F.W., Dept. EM, 4949 Freeway Dr. E., Columbus, Ohio 43229 ..... *
GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 ..... *
RFL Inds., Instr. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005 ..... *
RFL Inds., Thermocontrol Div., Dept. EM, Boonton, N.J. 07005 ..... *
Advanced Kinetics, Dept. EM, 1231 Victoria St., Costa Mesa, Calif. 92627
Annis R B Co., Dept. EM, 1101 N. Delaware, Indianapolis, Ind. 46202
Arnold Engineering Co., Dept. EM, Box "G", Marengo, Ill. 60152
Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
LDJ Electronics, Dept. EM, 1064 Naughton Ave., Troy, Mich. 48084
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
Magnaflux Corp. , Dept. EM, 7328 W. Lawrence Ave., Chicago, Ill 60656
DM Magnos, Incorporated, Dept. EM, Old School House Rd., Harvard, Mass. 01451
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Permag Corp., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
DM Stearns Magnetics Inc., Sub. Magnetics Int'l., Dept. EM, 6001 S. General Ave., Cudahy, Wisc. 53110
Thomas & Skinner, Inc., Dept. EM, Box 150-B,, Indianapolis, Ind. 46206
Walker Scientific, Inc., Dept. EM, Rockdale St., Worcester, Mass. 01606

Magnetodiodes—See Magnetoresistors, Hall

Magnetometers

Bell, Inc., F.W., Dept. EM, 4949 Freeway Dr. E., Columbus, Ohio 43229 p. 4300
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
RFL Inds., Instr. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005 p. 2807
RFL Inds., Thermocontrol Div., Dept. EM, Boonton, N.J. 07005 ..... *
Advanced Kinetics, Dept. EM, 1231 Victoria St., Costa Mesa, Calif. 92627
D Annis R B Co., Dept. EM, 1101 N. Delaware, Indianapolis, Ind. 46202
, Develco Inc., Dept. EM, 404 Tasman Dr., Sunnyvale, Cal. 94086
LDJ Electronics, Dept. EM, 1064 Naughton Ave., Troy, Mich. 48084
Princeton Applied Resch. Corp., Dept. EM, Box 2565, Princeton, N.J. 08540
Schonstedt Instr. Co., Dept. EM, 1775 Wiehle Ave., Reston, Va. 22090
Walker Scientific, Inc., Dept. EM, Rockdale St., Worcester, Mass. 01606

Magnetoresistors, Hall

M **American Aerospace Controls, Dept. EM, 131 Verdi St., Farmingdale, N.Y. 11735 ..... ***
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
LDJ Electronics, Dept. EM, 1064 Naughton Ave., Troy, Mich. 48084
D Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105

Magnetrons—See Tubes, Magnetron

Magnets, Focusing—See Magnets, Permanent

Magnets (Lab. Type)

RFL Inds., Instr. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005 p. 2807
RFL Inds., Thermocontrol Div., Dept. EM, Boonton, N.J. 07005 ..... *
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... ***
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Elma Engineering, Dept. EM, 1066 E. Meadow Circle, Palo Alto, Cal. 94303
High Voltage Engrg. Corp., Dept. EM, S. Bedford St., Burlington, Mass. 01803
LDJ Electronics, Dept. EM, 1064 Naughton Ave., Troy, Mich. 48084
DM Magnos, Incorporated, Dept. EM, Old School House Rd., Harvard, Mass. 01451
Permag Corp., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Varian Assocs., Instrument Div., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Walker Scientific, Inc., Dept. EM, Rockdale St., Worcester, Mass. 01606

Magnets, Permanent

Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
D **ISL Products Ltd. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803 ***
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
Arnold Engineering Co., Dept. EM, Box "G", Marengo, Ill. 60152
M Barker Elec. Sls., Dept. EM, Box 405, Ship Bottom, NJ 08008
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
Ceramic Magnetics, Inc., Dept. EM, 87 Fairfield Rd., Fairfield, N.J. 07006
D Colt Industries, Crucible Magnetics Div., Dept. EM, Box 100, Elizabethtown, Ky. 42701
M Edmund Scientific Co., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007
Ferronics, Inc., Dept. EM, 60 N. Lincoln Rd., East Rochester, N.Y. 14445
Ferroxcube Corp., Dept. EM, 5083 Kings Hwy., Saugerties, N.Y. 12477
3M Co., Indl Elect Prods. Div., Dept. EM, 3M Center, St. Paul, Minn. 55101
D Murata Mfg. Co. Ltd., Dept. EM, 16, Kaiden Nishijin-cho, Nagaoka-Kyo-Shi, Kyoto, Japan
Nucleonic Prods., Dept. EM, Box 1454, 6660 Variel Ave., Canoga Pk., Cal. 91303
Ogallala Elctrns., Div. Arnold Engrg. Co., Dept. EM, Box 59, Ogallala, Neb. 69153
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Permag Corp., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
M Permanent Magnet Co., Dept. EM, 4437 Bragdon St., Indianapolis, Ind. 46226
R-Columbia Products, Inc., Dept. EM, 2008 St. John's Ave., Highland Park, Ill. 60035
Raytheon Co., Microwave & Power Tube Div., Dept. EM, 190 Willow St., Waltham, Mass 02154
D Reed Switch Dev. Co. Inc., Dept. EM, PO Box 1464, Kerrville, Tex. 78028
Rol-a-chart Div., Wm. A. Steward Co., Dept. EM, Box 367, Diamond Springs, Cal. 95619
SHOGYO International Corp., Dept. EM, 300 Northern Blvd., Great Neck, N.Y. 11021
Stackpole Carbon Co/Perm Ceramic Magnets & Magnetizable Powder, Magnet Div., Dept. EM, Kane, Pa. 16735
DM Stearns Magnetics Inc., Sub. Magnetics Int'l., Dept. EM, 6001 S. General Ave., Cudahy, Wisc. 53110
Thomas & Skinner, Inc., Dept. EM, Box 150-B,, Indianapolis, Ind. 46206
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Varian Assocs., Instrument Div., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Magnets, Superconducting

Advanced Kinetics, Dept. EM, 1231 Victoria St., Costa Mesa, Calif. 92627
American Magnetics, Dept. EM, Box R, Oak Ridge, Tenn. 37830
Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Elma Engineering, Dept. EM, 1066 E. Meadow Circle, Palo Alto, Cal. 94303
Permag Corp., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Varian Assocs., Instrument Div., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Magnifying Glasses, Inspection

Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2142
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... ***
United Wiring & Mfg. Co., Dept. EM, 2608 Electonic La. #404, Dallas, Tex. 75220 ..... p. 1302
Bausch & Lomb, S.O.P.D. Div, Dept. EM, 1400 N. Goodman St., Rochester, N.Y. 14602
Bishop Graphics, Dept. EM, 5388 Sterling Center, Westlake Village, Cal. 91361
Edmund Scientific Co., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007
Heitz, Inc., Karl, Dept. EM, 979 Third Ave., New York, N.Y. 10022
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
Melles Griot, Dept. EM, 1770 Kettering St., Irvine, Cal. 92714

National Camera Inc., Dept. EM, 2000 W. Union Ave., Englewood, Colo. 80110

Markers, Dry Transfer—See Kits, Marking

Markers, Identification—See Labels; Nameplates

Markers, R-F—See Generators, Marker

Markers, Terminal—See Kits, Marking, etc.

Markers, Wire, Tab & Sleeve—See Wire Markers

Masers

Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230

Mask Alignment & Exposure Systems—See Machines, Mask Alignment & Exposure

Masts, Antenna—See Antenna Towers & Supports

Materials-Glass, Ceramic

Star Micronics Inc., Dept. EM, Pan Am Building, Ste 2308, 200 Park Ave, New York, N.Y. 10017 ..... *
Aerolix Corporation, Dept. EM, 720 So. Columbus Street, Mt. Vernon, NY 10550
Centerflex Ceramics, Dept. EM, 221 Seventh Ave., Hawthorne, N.J. 07507
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
Fusite Div./Emerson Elec., Dept. EM, 6000 Fernview Ave., Cincinnati, Ohio 45212
GTE Sylvania, Inc., Chem. & Metallurgical Div., Dept. EM, Hawes St., Towanda, Pa. 18848
GTE Sylvania Inc., Western Gold & Platinum Sub., Dept. EM, 477 Harbor Blvd., Belmont, Cal. 94002
Plessey Inc., Dept. EM, 320 Long Island Expwy. S., Melville, N.Y. 11746
Valtec Corp, Valpey-Fischer Div, Dept. EM, 75 South St, Hopkinton, Mass. 01748

Materials, Graphite

Acheson Colloids Co., Div. Acheson Inds., Dept. EM, P.O. Box 288, Port Huron, Mich. 48060
Aerolix Corporation, Dept. EM, 720 So. Columbus Street, Mt. Vernon, NY 10550
M Atlantic Research Corp., Dept. EM, 5390 Cherokee Ave., Alexandria, Va 22314
Atomergic Chemetals Corp Co., Dept. EM, 100 Fairchild Ave., Plainview, N.Y. 11803
Framar Metal Prods Co., Dept. EM, 124 W Main St Dept 1201, High Bridge, N.J. 08829
Laser Technology, Inc., Dept. EM, 10624 Ventura Blvd., N. Hollywood, Calif. 91604
Ohio Carbon Co., Dept. EM, 12508 Berea Rd., Cleveland, Ohio 44111
Stackpole Carbon Co., Carbon Div., Dept. EM, St. Marys, Pa. 15857
Ultra Carbon Corp., Dept. EM, Box 747, Bay City, Mich. 48707
United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013

Materials, Magnetic—See Shields, Magnetic

Materials, Self-Lubricating

Carborundum Co., Graphite Prods. Div., Dept. EM, Box 339, Niagara Falls, N.Y. 14302 ..... *
Acheson Colloids Co., Div. Acheson Inds., Dept. EM, P.O. Box 288, Port Huron, Mich. 48060
Atomergic Chemetals Corp Co., Dept. EM, 100 Fairchild Ave., Plainview, N.Y. 11803
M Cadillac Plastic & Chemical, Dayco Co., Dept. EM, Box 810, Detroit, Mich. 48232
Carbone Lorraine Industries Corp., Dept. EM, 400 Myrtle Ave., Boonton, N.J. 07005
M Chemplast, Inc., Dept. EM, 31-150 Dey Rd., Wayne, N.J. 07470
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Isochem Resins Co., Dept. EM, 99 Cook St., Lincoln, R.I. 02865
Materials Resch. Corp., Dept. EM, Route 303, Orangeburg, N.Y. 10962
Ohio Carbon Co., Dept. EM, 12508 Berea Rd., Cleveland, Ohio 44111
D Pure Carbon Co., Inc., Dept. EM, 441 Hall Ave., St. Marys, Pa. 15857
Rogers Corp., Dept. EM, Rogers, Conn. 06263

Matrices, Computer-Also See Boards, Programming

A. D. Data Sys., Inc., Dept. EM, POB 9209, Rochester, N.Y. 14625 ..... *
D Cherry Electrical Prods. Corp., Dept. EM, 3623 Sunset Ave., Waukegan, Ill. 60085 ..... *
D Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645 ..... *
Info-Lite Corp., Dept. EM, 46-10 104 St., Corona, N.Y. 11368 ..... p. 4081
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Interswitch, Dept. EM, 770 Airport Blvd., Burlingame, Cal. 94010 ..... p. 4084
M LVC Inds. Inc., Co-Ord Switch Bloc-Lite Divs., Dept. EM, 135-25 37th Ave., Flushing, N.Y. 11354 ..... p. 4102
M Mac Panel Co., Dept. EM, Box 5027, 216 Pine St., High Pt., N.C. 27262 ..... p. 2079
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Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543 ..... *
M Virginia Panel Corp., Dept. EM, Box 1106, 1400 New Hope Rd., Waynesboro, Va. 22980 ..... p. 2253

Memories, Buffer

M Computer Devices Corp., Dept. EM, 63 Austin Blvd., Commack, N.Y. 11725 *
Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Computer Devices, Dept. EM, 25 North Avenue, Burlington, Mass. 01803
M Fabri-Tek, Inc., Computer Systems Div., Dept. EM, 5901 S. County Rd. 18, Minneapolis, Minn. 55436
DM Intel Corp., Dept. EM, 3065 Bowers Ave., Santa Clara, Cal. 95051
Lexidata Corp, Dept. EM, 215 Middlesex Tpke., Burlington, MASS. 01803
D Macrodyne Inc., Dept. EM, 1900 Maxon Rd., Box 1079, Schenectady, N.Y. 12301
D Princeton Elctrn. Prods., Dept. EM, Box 101, New Brunswick, N.J. 08902
Telecommunications Techniques Corp., Dept. EM, 112 Frederick Ave., Rockville, Md. 20850
Trax Video Labs, Dept. EM, 2020 Milvia St., Berkeley, Cal. 94704
DM Western Digital Corp., Dept. EM, 3128 Red Hill Ave. Box 2180, Newport Beach, Cal. 92663

Memory Systems, Core

Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... p. 1469
Ampex Corp., Dept. EM, 401 Broadway, Redwood City, Cal. 94063
Data General Corp., Dept. EM, 15 Turnpike Rd Rte 9, Westboro, Mass 01581
Dataproducts Corp., Dept. EM, 6219 DeSoto Ave., Woodland Hills, Cal. 91365
Digital Data Systems, Dept. EM, 6501 N.W. 14th St., Plantation, Fla. 33313
M Electronic Memories & Magnetics Corp., Dept. EM, 12621 Chadron Ave., Hawthorne, Cal. 90250
Fabri-Tek, Inc., Dept. EM, 5901 S County Rd. #18, Minneapolis, Minn. 55436
M Fabri-Tek, Inc., Computer Systems Div., Dept. EM, 5901 S. County Rd. 18, Minneapolis, Minn. 55436
Harris Corp., Computer Systems Div., Dept. EM, PO Box 23550, Fort Lauderdale, Fla. 33307
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Information Control Corp., Abacus Div. Dept. EM7, Dept. EM, 9610 Bellanca Ave., Los Angeles, Cal. 90045
Lexidata Corp, Dept. EM, 215 Middlesex Tpke., Burlington, MASS. 01803
Memorex Corp., Dept. EM, San Thomas at Central Expwy., Santa Clara, Cal. 95052
National Micronetics, Dept. EM, Route 28, West Hurley, NY 12136
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Memory Systems, Delay Line

DM Andersen Laboratories Inc., Dept. EM, 1280 Blue Hills Ave., Bloomfield, Conn. 06002 ..... *
M Computer Devices Corp., Dept. EM, 63 Austin Blvd., Commack, N.Y. 11725 p. 2392
M Control Elctrns. Co., Inc., Dept. EM, 153 Florida St., Farmingdale, N.Y. 11735 *
M Microsonics, Div. Sangamo Elec. Co., Dept. EM, 60 Winter St., Weymouth, Mass. 02188 ..... *
Andersen & Assoc., Walther M.A., Dept. EM, 4 Main St. Ext., Tariffville, Conn. 06081
Corning Glass Works, Memory Prods Dept., Dept. EM, 3900 Electronic Dr., Raleigh, N.C. 27602
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Telecommunications Techniques Corp., Dept. EM, 112 Frederick Ave., Rockville, Md. 20850
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

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Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D Alpha Data Incorporated, Dept. EM, 20750 Marilla St., Chatsworth, Cal 91311
Amcomp, Inc., Dept. EM, 686 W. Maude Ave., Sunnyvale, Cal. 94086
Ampex Corp., Dept. EM, 401 Broadway, Redwood City, Cal. 94063
DM Applied Data Commun., Dept. EM, 1509 E. McFadden Ave., Santa Ana, Cal. 92705
M California Computer Prods., Dept. EM, 2411 W. La Palma Ave., Anaheim, Cal 92801
Computer Talk Inc., Dept. EM, Box 145, Idledale, Colo. 80453
Data General Corp., Dept. EM, 15 Turnpike Rd Rte 9, Westboro, Mass 01581
Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
Electronic Memories & Magnetics Corp., Dept. EM, 12621 Chadron Ave., Hawthorne, Cal. 90250
General Systems International Inc., Dept. EM, 1440 Allec, Anaheim, Cal. 92805
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Memorex Corp., Dept. EM, San Thomas at Central Expwy., Santa Clara, Cal. 95052
Potter Instr. Co. Inc., Dept. EM, 151 Sunnyside Blvd., Plainview, N.Y. 11803
Shaffstall Corp., Dept. EM, 5148 E. 65th St., Indianapolis, Ind. 46220
Shugart Assocs., Dept. EM, 415 Oakmead Pkwy, Sunnyvale, Cal. 94086
M Singer Co., Librascope Div., Dept. EM, 833 Sonora Ave., Glendale, Cal. 91201
Systems Integration Assoc., Dept. EM, RD #1 Box 126, Glenmoor, Pa. 19343
Trax Video Labs, Dept. EM, 2020 Milvia St., Berkeley, Cal. 94704
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Memory Systems, Tape

Almond Instrs. Co., Dept. EM, 1223 East Edna Pl., Covina, Cal. 91724 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Honeywell, Inc., Test Instrs. Div., Dept. EM, 4800 E. Dry Creek Rd., Box 5227, Denver, Colo. 80217 ..... p. 2756
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Telonic/Berkeley, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715 ..... *
Amcomp, Inc., Dept. EM, 686 W. Maude Ave., Sunnyvale, Cal. 94086
Amilon Corp., Dept. EM, 49-12 30th Ave., Woodside, N.Y. 11377
Ampex Corp., Dept. EM, 401 Broadway, Redwood City, Cal. 94063

Braemar Computer Devices, Dept. EM, 11950 Twelfth Ave. S., Burnsville, Minn. 55337
M California Computer Prods., Dept. EM, 2411 W. La Palma Ave., Anaheim, Cal 92801
Data General Corp., Dept. EM, 15 Turnpike Rd Rte 9, Westboro, Mass 01581
Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
Memorex Corp., Dept. EM, San Thomas at Central Expwy., Santa Clara, Cal. 95052
DM Raymond Engrg. Inc., Dept. EM, 217 Smith St., Middletown, Conn. 06457
Trax Video Labs, Dept. EM, 2020 Milvia St., Berkeley, Cal. 94704

Memory Systems, Thin-Film, Planar

NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230

Memory Systems, Thin-Film, Plated Wire

M Consolidated Refining Co. Inc., Dept. EM, 116 Hoyt Ave., Mamaroneck, N.Y. 10543
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230

Memory Systems, Semiconductor

Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 ..... *
M **Computer Devices Corp., Dept. EM, 63 Austin Blvd., Commack, N.Y. 11725** *
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... **p. 1469**
Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... *
Alpha Data Incorporated, Dept. EM, 20750 Marilla St., Chatsworth, Cal 91311
Ampex Corp., Dept. EM, 401 Broadway, Redwood City, Cal. 94063
M Bay Laboratories, Inc., Dept. EM, 20160 Center Ridge Rd., Cleveland, Ohio 44116
Data General Corp., Dept. EM, 15 Turnpike Rd Rte 9, Westboro, Mass 01581
Digital Data Systems, Dept. EM, 6501 N.W. 14th St., Plantation, Fla. 33313
M Electronic Memories & Magnetics Corp., Dept. EM, 12621 Chadron Ave., Hawthorne, Cal. 90250
D Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
Harris Corp., Computer Systems Div., Dept. EM, PO Box 23550, Fort Lauderdale, Fla. 33307
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
D Intel Corp., Dept. EM, 3065 Bowers Ave., Santa Clara, Cal. 95051
Lexidata Corp, Dept. EM, 215 Middlesex Tpke., Burlington, MASS. 01803
M Memorex Corp., Dept. EM, San Thomas at Central Expwy., Santa Clara, Cal. 95052
Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
Pacific Technology, Dept. EM, 235 Airport Way, Renton, Wash. 98055
D Rockwell Int'l., Microelectronic Devices, Dept. EM, Box 3669, 3310 Miraloma Ave., Anaheim, Cal. 92803
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Wyle Computer Prods., Dept. EM, 3200 Magruder Blvd., Hampton, Va 23666

Metal Compounds, Foils, Powders, Sheet, Stock

M **Ad-Vance Magnetics, Dept. EM, 226 E. 7th St., Rochester, Ind. 46975** **p. 2552**
Adre Co., Dept. EM, Box 09415, Milwaukee, Wisc. 53209
D Alpha Metals, Inc., Dept. EM, 600 Rte 440, Jersey City, N.J. 07304
Atomergic Chemetals Corp Co., Dept. EM, 100 Fairchild Ave., Plainview, N.Y. 11803
M Consolidated Refining Co. Inc., Dept. EM, 116 Hoyt Ave., Mamaroneck, N.Y. 10543
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
Fansteel Inc., Dept. EM, One Tantalum Pl., N Chicago, Ill. 60064
General Electric Co., Lamp Components Sls. Oper., Dept. EM, 21800 Tungsten Rd., Cleveland, Ohio 44117
Glidden Metals, Chem/Met Div. SCM Corp., Dept. EM, 900 Union Commerce Bldg., Cleveland, Ohio 44115
GTE Sylvania, Inc., Chem. & Metallurgical Div., Dept. EM, Hawes St., Towanda, Pa. 18848
Handy & Harman, Dept. EM, 850 Third Ave., New York, N.Y. 10022
Indium Corp. of Amer, Dept. EM, 1676 Lincoln Ave, Box 269, Utica, NY 13503
M Kawecki Berylco Inds., Inc., Dept. EM, PO Box 1462, Reading, PA 19603
M Magnetics, Div/Spang Industries, Inc., Dept. EM, Box 391, Butler, Pa. 16001
Materials Resch. Corp., Dept. EM, Route 303, Orangeburg, N.Y. 10962
NL Industries, Inc., Metal Div., Dept. EM, 1221 Ave. of Americas, New York, N.Y. 10020
Philips Elmet Corp., Dept. EM, 1560 Lisbon Rd., Lewiston, Me. 04240
M Reynolds Metals Co., Dept. EM, Box 27003, Richmond, VA. 23261
DM Ulvac North America, Dept. EM, Colchester Plaza, Colchester, VT 05446
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013

Metal Oxides

Art Wire/Doduco, Dept. EM, 9 Wing Dr., Cedar Knolls, N.J. 07927
Atomergic Chemetals Corp Co., Dept. EM, 100 Fairchild Ave., Plainview, N.Y. 11803
Baker Chemical Co., J.T., Dept. EM, Phillipsburg, N.J. 08865
DF Goldsmith Chem & Metal Corp., Dept. EM, 909 Pitner Ave, Evanston, Ill. 60602
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
Fansteel Inc., Dept. EM, One Tantalum Pl., N Chicago, Ill. 60064
Fusite Div./Emerson Elec., Dept. EM, 6000 Fernview Ave., Cincinnati, Ohio 45212
M Glidden Metals, Chem/Met Div. SCM Corp., Dept. EM, 900 Union Commerce Bldg., Cleveland, Ohio 44115
GTE Sylvania, Inc., Chem. & Metallurgical Div., Dept. EM, Hawes St., Towanda, Pa. 18848
Handy & Harman, Dept. EM, 850 Third Ave., New York, N.Y. 10022
Indium Corp. of Amer, Dept. EM, 1676 Lincoln Ave, Box 269, Utica, NY 13503
Int'l. Elctrn. Resch., Dept. EM, 135 W. Magnolia Blvd., Burbank, Cal. 91502
M Kawecki Berylco Inds., Inc., Dept. EM, PO Box 1462, Reading, PA 19603
M Mallinckrodt, Inc., Dept. EM, P. O. Box 5840, St. Louis, Mo. 63134
Materials Resch. Corp., Dept. EM, Route 303, Orangeburg, N.Y. 10962
P Q Corp., Dept. EM, PQ Corp, Valley Forge, Pa. 19482
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013

Metal Parts—See Services, Metal Parts Fabrication

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Metals, Clad

M Advanced Materials Systems, Dept. EM, 72 Elm St. N., Atteboro, Mass. 02703
D Alpha Metals, Inc., Dept. EM, 600 Rte 440, Jersey City, N.J. 07304
Atomergic Chemetals Corp Co., Dept. EM, 100 Fairchild Ave., Plainview, N.Y. 11803
M Consolidated Refining Co. Inc., Dept. EM, 116 Hoyt Ave., Mamaroneck, N.Y. 10543
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
Fansteel Inc., Dept. EM, One Tantalum Pl., N Chicago, Ill. 60064
GTE Sylvania, Inc., W.M. Chace Co., Dept. EM, 1600 Beard Ave., Detroit, Mich. 48209
Handy & Harman, Dept. EM, 850 Third Ave., New York, N.Y. 10022
Indium Corp. of Amer, Dept. EM, 1676 Lincoln Ave, Box 269, Utica, NY 13503
Jones & Laughlin Steel Corp, Dept. EM, 3 Gateway Ctr, Pittsburgh, PA 15263
Micro Contacts Inc., Dept. EM, 62 Alpha Plaza, Hicksville, N.Y. 11801
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Permaluster, Inc., Dept. EM, 1844 N. Keystone St., Burbank, Calif. 91504
Plessey Inc., Dept. EM, 320 Long Island Expwy. S., Melville, N.Y. 11746
M Reynolds Metals Co., Dept. EM, Box 27003, Richmond, VA. 23261
Tech Materials Inc., Dept. EM, 5 Wellington Rd., Lincoln, R.I. 02865
Texas Instruments Control Prods. Div., Dept. EM, 34 Forrest St., Attleboro, Mass. 02703
Wall A. T. Co., Dept. EM, 55 Service Ave., Warwick, R.I. 02889
Williams Precious Metal Div., Williams Gold Refining, Dept. EM, 2978 Main St., Buffalo, N.Y. 14214

Metals, High Purity

Alpha Metals, Inc., Dept. EM, 600 Rte 440, Jersey City, N.J. 07304
Atomergic Chemetals Corp Co., Dept. EM, 100 Fairchild Ave., Plainview, N.Y. 11803
Cohn Corp., Sigmund, Dept. EM, 121 S. Columbus Ave., Mt. Vernon, N.Y. 10553
M Consolidated Refining Co. Inc., Dept. EM, 116 Hoyt Ave., Mamaroneck, N.Y. 10543
DF Goldsmith Chem & Metal Corp., Dept. EM, 909 Pitner Ave, Evanston, Ill. 60602
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
Fansteel Inc., Dept. EM, One Tantalum Pl., N Chicago, Ill. 60064
Glidden Metals, Chem/Met Div. SCM Corp., Dept. EM, 900 Union Commerce Bldg., Cleveland, Ohio 44115
GTE Sylvania, Inc., Chem. & Metallurgical Div., Dept. EM, Hawes St., Towanda, Pa. 18848
GTE Sylvania, Wilbur B. Driver Co Sub., Dept. EM, 1875 McCarter Hwy., Newark, N.J. 07104
GTE Sylvania Inc., Western Gold & Platinum Sub., Dept. EM, 477 Harbor Blvd., Belmont, Cal. 94002
Indium Corp. of Amer, Dept. EM, 1676 Lincoln Ave, Box 269, Utica, NY 13503
M Kawecki Berylco Inds., Inc., Dept. EM, PO Box 1462, Reading, PA 19603
Materials Resch. Corp., Dept. EM, Route 303, Orangeburg, N.Y. 10962
NL Industries, Inc., Metal Div., Dept. EM, 1221 Ave. of Americas, New York, N.Y. 10020
Nucleonic Prods., Dept. EM, Box 1454, 6660 Variel Ave., Canoga Pk., Cal. 91303
Permaluster, Inc., Dept. EM, 1844 N. Keystone St., Burbank, Calif. 91504
Plessey Inc., Dept. EM, 320 Long Island Expwy. S., Melville, N.Y. 11746
DM Ulvac North America, Dept. EM, Colchester Plaza, Colchester, VT 05446
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013

Metals, Precious

M Advanced Materials Systems, Dept. EM, 72 Elm St. N., Atteboro, Mass. 02703
Art Wire/Doduco, Dept. EM, 9 Wing Dr., Cedar Knolls, N.J. 07927
Atomergic Chemetals Corp Co., Dept. EM, 100 Fairchild Ave., Plainview, N.Y. 11803
Auric Corp., Dept. EM, 470 Frelinghuysen Ave., Newark, N.J. 07114
Cohn Corp., Sigmund, Dept. EM, 121 S. Columbus Ave., Mt. Vernon, N.Y. 10553
M Consolidated Refining Co. Inc., Dept. EM, 116 Hoyt Ave., Mamaroneck, N.Y. 10543
DF Goldsmith Chem & Metal Corp., Dept. EM, 909 Pitner Ave, Evanston, Ill. 60602
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
Fansteel Inc., Dept. EM, One Tantalum Pl., N Chicago, Ill. 60064
GTE Sylvania Inc., Western Gold & Platinum Sub., Dept. EM, 477 Harbor Blvd., Belmont, Cal. 94002
Handy & Harman, Dept. EM, 850 Third Ave., New York, N.Y. 10022
Indium Corp. of Amer, Dept. EM, 1676 Lincoln Ave, Box 269, Utica, NY 13503
M Kawecki Berylco Inds., Inc., Dept. EM, PO Box 1462, Reading, PA 19603
Materials for Elctrns., Dept. EM, 149-32 132nd St., Jamaica, N.Y. 11430

Materials Resch. Corp., Dept. EM, Route 303, Orangeburg, N.Y. 10962
Micro Contacts Inc., Dept. EM, 62 Alpha Plaza, Hicksville, N.Y. 11801
Plessey Inc., Dept. EM, 320 Long Island Expwy. S., Melville, N.Y. 11746
Sel-Rex Div. Oxy Metal Industries Corp., Dept. EM, 75 River Rd., Nutley, N.J. 07110
Tech Materials Inc., Dept. EM, 5 Wellington Rd., Lincoln, R.I. 02865
D Technic, Inc., Dept. EM, Box 965, Providence, R.I. 02901
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013
United Refining & Smelting Co., Dept. EM, 3700 N. Runge Ave., Franklin Park, Ill. 60131
Wall A. T. Co., Dept. EM, 55 Service Ave., Warwick, R.I. 02889
Williams Precious Metal Div., Williams Gold Refining, Dept. EM, 2978 Main St., Buffalo, N.Y. 14214

Metals, Rare

Alpha Metals, Inc., Dept. EM, 600 Rte 440, Jersey City, N.J. 07304
DM Associated Engrg. & Mfg. Corp., Dept. EM, 546 Valley Rd., Upper Montclair, N.J. 07043
Atomergic Chemetals Corp Co., Dept. EM, 100 Fairchild Ave., Plainview, N.Y. 11803
Cohn Corp., Sigmund, Dept. EM, 121 S. Columbus Ave., Mt. Vernon, N.Y. 10553
DF Goldsmith Chem & Metal Corp., Dept. EM, 909 Pitner Ave, Evanston, Ill. 60602
GTE Sylvania, Inc., Chem. & Metallurgical Div., Dept. EM, Hawes St., Towanda, Pa. 18848
GTE Sylvania Inc., Western Gold & Platinum Sub., Dept. EM, 477 Harbor Blvd., Belmont, Cal. 94002
Indium Corp. of Amer, Dept. EM, 1676 Lincoln Ave, Box 269, Utica, NY 13503
M Kawecki Berylco Inds., Inc., Dept. EM, PO Box 1462, Reading, PA 19603
Materials for Elctrns., Dept. EM, 149-32 132nd St., Jamaica, N.Y. 11430
Materials Resch. Corp., Dept. EM, Route 303, Orangeburg, N.Y. 10962
Sel-Rex Div. Oxy Metal Industries Corp., Dept. EM, 75 River Rd., Nutley, N.J. 07110
M Technic, Inc., Dept. EM, Box 965, Providence, R.I. 02901
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013

Metals, Refractory

Atomergic Chemetals Corp Co., Dept. EM, 100 Fairchild Ave., Plainview, N.Y. 11803
DF Goldsmith Chem & Metal Corp., Dept. EM, 909 Pitner Ave, Evanston, Ill. 60602
Fansteel Inc., Dept. EM, One Tantalum Pl., N Chicago, Ill. 60064
General Electric Co., Lamp Components Sls. Oper., Dept. EM, 21800 Tungsten Rd., Cleveland, Ohio 44117
GTE Sylvania, Inc., Chem. & Metallurgical Div., Dept. EM, Hawes St., Towanda, Pa. 18848
GTE Sylvania Inc., Western Gold & Platinum Sub., Dept. EM, 477 Harbor Blvd., Belmont, Cal. 94002
M Kawecki Berylco Inds., Inc., Dept. EM, PO Box 1462, Reading, PA 19603
Materials Resch. Corp., Dept. EM, Route 303, Orangeburg, N.Y. 10962
Philips Elmet Corp., Dept. EM, 1560 Lisbon Rd., Lewiston, Me. 04240
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013
United Refining & Smelting Co., Dept. EM, 3700 N. Runge Ave., Franklin Park, Ill. 60131

Metals, Semiconductor—See Crystals, Semiconductor

Meter Cases—See Cases, Equipment

Meter Controllers—See Relays, Meter

Meter Expanders—See Multipliers, Meter

Meters, A-C Leakage Including Adapters

Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005 ..... p. 2663
Chatsworth Data Corp, Cablemaster Div., Dept. EM, 20710 Lassen St., Chatsworth, Cal 91311 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... *
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... ***
D **Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817 ..... ***
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
D Associated Research, Inc., Dept. EM, 6125 W. Howard St., Niles, Ill. 60648
Edmund Scientific Co., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
D Sotcher Measurement, Inc., Dept. EM, 1120 Stewart Court, Sunnyvale, Cal. 94086

Meters, Acceleration

Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Unholtz-Dickie Corp., Dept. EM, 3000 Whitney Ave., Hamden, Conn. 06518 p. 2575
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
Alpha-M Corp, Dept. EM, 3009 Wildflower Drive, Dallas, Tx. 75229
M Columbia Resch. Labs., Dept. EM, Macdade Blvd. & Bullens La., Woodlyn, Pa. 19094
Endevco, Div. Becton, Dickinson & Co., Dept. EM, 30700 Rancho Viejo Rd., San Jaun Capistrano, Cal. 92675
Larson Aero Dev., Dept. EM, Box 135, Concord, Cal. 94522
Schaevitz Engrg., Dept. EM, U.S. 130, Union Ave., Pennsauken, N.J. 08110
Spectral Dynamics Corp., Dept. EM, Box 671, San Diego, Cal. 92112
West Coast Resch. Corp., Dept. EM, Box 25061, Los Angeles, Cal. 90025

Meters, Admittance

Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *

Meters, Air Velocity

Climatronics Corp., Dept. EM, 1324 Motor Pkwy., Hauppauge, N.Y. 11787
Datametrics Inc, Dept. EM, 340 Fordham St., Wilmington, Mass. 01887
TSI Inc, Dept. EM, 500 Cardigan Rd., Box 3394, St. Paul, Minn. 55165
Zi-Tech Div., Aikenwood Corp., Dept. EM, Box 26, 2151 Park Blvd., Palo Alto, Cal. 94302

Meters, Ampere, A-C

Airpax Elctrns., Controls Div., Dept. EM, 6801 W. Sunrise Blvd., Ft. Lauderdale, Fla. 33313 ..... *
D **Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005 ..... ***
D **Beede Electrical Instr. Co., Dept. EM, S. Main St., Penacook, N.H. 03301 .... ***
Bell, Inc., F.W., Dept. EM, 4949 Freeway Dr. E., Columbus, Ohio 43229 p. 2666,2667
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M **Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 .. ***
Electro Industries, Dept. EM, 109 Nassau Dr., Albertson, NY 11507 ..... *
D **Electro-Mechanical Instru. Div., Sheller-Globe Corp., Dept. EM, Box 368, Dublin, PA 18917 ..... p. 2722,2723**
D **Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 ..... ***
Faria Meter Corp., Dept. EM, 19 Faria Lane, Uncasville, Conn. 06382 p. 2747
D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 p. 2736-2738**
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... ***
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 ***
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
D **Hoyt Electrical Instr. Works, Dept. EM, 19 Linden St., Penacook, N.H. 03301 ***
D **Jewell Electrical Instruments, Inc., Dept. EM, Grenier Field, Manchester, N.H. 03108 ..... p. 2764**
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803 *
D **Modutec, Inc., Dept. EM, 18 Marshall St., Norwalk, Conn. 06854 p. 2788,2789**
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... p. 2790
Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705 p. 2792
D **Non-Linear Sys., Inc., Dept. EM, 533 Stevens Ave., Solana Beach, Cal. 92075 ***
Ohio Semitronics, Inc., Dept. EM, 1205 Chesapeake Ave., Columbus, Ohio 43212 ..... *
Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... *
M **Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 ***
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 .... p. 2821**
DM **Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518 ..... ***
D **Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817 p. 2826,2827**
D **Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... p. 2815,2818**
D **Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... ***
A & D Electrical Instruments, Dept. EM, 73-07 88th St., Glendale, N.Y. 11227
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
Ampower Electronic Instr. Co., Dept. EM, 500 Union Blvd., Totowa, N. J. 07512
D Amprobe Instrument, Div. SOS Consolidated Inc., Dept. EM, 630 Merrick Rd., Lynbrook, N.Y. 11563
Analogic Corp., Dept. EM, Audubon Rd., Wakefield, Mass. 01880
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
Assembled Products Co., Dept. EM, Box 750, St. Albans, Vt. 05478
D Associated Research, Inc., Dept. EM, 6125 W. Howard St., Niles, Ill. 60648
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
D Data Tech, Div. of Penril Corp., Dept. EM, 2700 S. Fairview, Santa Ana, Cal. 92704
Electrical Standards Div., E.S.R.S., Inc., Dept. EM, 7337 Greenbush, N. Hollywood, Cal. 91605
D Greibach Instr. Div., Electrical Inst. Svc., Inc., Dept. EM, 25 Dock St., Mt Vernon, N.Y. 10550
Hioki New York Corp., Dept. EM, 42-16 235th St., Douglaston, N.Y. 11363
M Ideal Precision Meter Co., Dept. EM, 214 Franklin St., Brooklyn, N. Y. 11222
IET Labs Inc., Dept. EM, 761 Old Country Rd, Westbury, N.Y. 11590
D Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962

LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
Racal-Dana Instrus Inc., Dept. EM, 18912 Von Karman Ave., Irvine, Cal. 92715
D Shunte Meters, Dept. EM, 428 Chapel St., New Haven, Conn. 06508
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Sticht Co., Inc. Herman H., Dept. EM, 27 Park Pl., New York, N.Y. 10007
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Westinghouse Elec. Corp., Relay-Instr. Div., Dept. EM, 95 Orange St., Newark, N.J. 07101

Meters, Ampere, R-F

D Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005 ..... *
Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 .. *
D Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D Modutec, Inc., Dept. EM, 18 Marshall St., Norwalk, Conn. 06854 ..... *
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *
Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... *
D Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817 ..... *
D Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
D Bartlett-Emery Instrument Corp., Dept. EM, 14th & Ave. "M", Ft. Madison, Iowa 52627
D Greibach Instr. Div., Electrical Inst. Svc., Inc., Dept. EM, 25 Dock St., Mt Vernon, N.Y. 10550
M Ideal Precision Meter Co., Dept. EM, 214 Franklin St., Brooklyn, N. Y. 11222
Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962
D LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
M Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
Westinghouse Elec. Corp., Relay-Instr. Div., Dept. EM, 95 Orange St., Newark, N.J. 07101

Meters, Ampere, True RMS

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Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Data Precision Corporation, Dept. EM, Audubon Rd., Wakefield, Mass 01880 p. 2706,2707
Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ..... *
Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 .. *
Electro Industries, Dept. EM, 109 Nassau Dr., Albertson, NY 11507 ..... *
Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 ..... *
Faria Meter Corp., Dept. EM, 19 Faria Lane, Uncasville, Conn. 06382 ..... *
D Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 p. 2736-2738
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
M General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D Jewell Electrical Instruments, Inc., Dept. EM, Grenier Field, Manchester, N.H. 03108 ..... p. 2764
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NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D Non-Linear Sys., Inc., Dept. EM, 533 Stevens Ave., Solana Beach, Cal. 92075 *
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... *
D Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817 ..... *
D United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403 ..... p. 2832
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
D Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... *
Ampower Electronic Instr. Co., Dept. EM, 500 Union Blvd., Totowa, N. J. 07512
D Bartlett-Emery Instrument Corp., Dept. EM, 14th & Ave. "M", Ft. Madison, Iowa 52627
Electrical Standards Div., E.S.R.S., Inc., Dept. EM, 7337 Greenbush, N. Hollywood, Cal. 91605
D Greibach Instr. Div., Electrical Inst. Svc., Inc., Dept. EM, 25 Dock St., Mt Vernon, N.Y. 10550
Hioki New York Corp., Dept. EM, 42-16 235th St., Douglaston, N.Y. 11363
Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Telco Products Co., Dept. EM, 44 Sea Cliff, Glen Cove, NY 11542
Valhalla Scientific, Inc., Dept. EM, 7707 Convoy Ct., San Diego, Cal. 92111

Meters, Ampere-Hour

Curtis Instrs., Inc., Dept. EM, 200 Kisco Ave., Mt. Kisco, N.Y. 10549 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
M Ohio Semitronics, Inc., Dept. EM, 1205 Chesapeake Ave., Columbus, Ohio 43212 ..... p. 4303,4309
D Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
A & D Electrical Instruments, Dept. EM, 73-07 88th St., Glendale, N.Y. 11227
Ampower Electronic Instr. Co., Dept. EM, 500 Union Blvd., Totowa, N. J. 07512
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
HBS Equipment Div., Dept. EM, 3000 Supply Ave., Los Angeles, Calif. 90040
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Magnetic Products, Inc., Dept. EM, Box 1125, New London, N.H. 03257
D Nova Tran Corp., Dept. EM, 360 4th St., Clear Lake, Wisc. 54005
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Technic, Inc., Dept. EM, Box 965, Providence, R.I. 02901

Meters, Attenuation

M General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
D Ailtech, Dept. EM, 2070 Fifth Ave, Ronkonkoma, NY 11779
M Cushman Electronics, Dept EM, 2400 N. 1st St., San Jose, Cal. 95112
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760
Westinghouse Elec. Corp., Relay-Instr. Div., Dept. EM, 95 Orange St., Newark, N.J. 07101

Meters, Audio Level

D Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005 ..... *
BBN Instruments Co., Div. Bolt Beranek & Newman, Inc., Dept. EM, 50 Moulton St., Cambridge, Mass. 02138 ..... *
Electro Industries, Dept. EM, 109 Nassau Dr., Albertson, NY 11507 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 *
D Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... *
D Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817 p. 2826,2827
D United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403 ..... *
D Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
D Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... *
A & D Electrical Instruments, Dept. EM, 73-07 88th St., Glendale, N.Y. 11227
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
D Bartlett-Emery Instrument Corp., Dept. EM, 14th & Ave. "M", Ft. Madison, Iowa 52627
DM Columbia Resch. Labs., Dept. EM, Macdade Blvd. & Bullens La., Woodlyn, Pa. 19094
Convex Corp., Dept. EM, 2810 Dorr Ave., Fairfax, Va. 22031
Dixson, Inc., Dept. EM, Box 1449, Grand Junction, Colo. 81501
Electro-Dynamics Dev. Co., Dept. EM, 475 Mt. Hood Dr. S.W., Issaquah, Wash 98027
Hioki New York Corp., Dept. EM, 42-16 235th St., Douglaston, N.Y. 11363
M Ideal Precision Meter Co., Dept. EM, 214 Franklin St., Brooklyn, N. Y. 11222
D Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
IRD Mechanalysis, Inc., Dept. EM, 6150 Huntley Rd., Columbus, Ohio 43229
D LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Meguro Electronics Corp, Dept. EM, No. 5-1 2-Chome Chuo Meguro-ku, Tokyo, Japan
Mine Safety Appliances Co., Dept. EM, 600 Penn Center Blvd., Pittsburgh, Pa 15235
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
TSI Inc, Dept. EM, 500 Cardigan Rd., Box 3394, St. Paul, Minn. 55165

Meters, Capacitance, Inductance

B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 ..... p. 2672
Boonton Electronics Corp., Dept. EM, Route #287, Parsippany, N.J. 07054 p. 2665
Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 ..... *
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Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
London Co., Dept. EM, 811 Sharon Dr., Westlake, Ohio 44145 ..... p. 2803

Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
D Data Tech, Div. of Penril Corp., Dept. EM, 2700 S. Fairview, Santa Ana, Cal. 92704
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
Hioki New York Corp., Dept. EM, 42-16 235th St., Douglaston, N.Y. 11363
IET Labs Inc., Dept. EM, 761 Old Country Rd, Westbury, N.Y. 11590
Kikusui Elctrns. Corp., Dept. EM, 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
MSI Electronics, Inc., Dept. EM, 34-32 57th St., Woodside, N.Y. 11377
Penn Airborne Prods., Dept. EM, Industrial Hwy., Southampton, Pa. 18966
D Robertshaw Controls Co., Ind'l. Instr. Div., Dept. EM, 1910 Byrd Ave Ste 200, Richmond, Va. 23230
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
Valhalla Scientific, Inc., Dept. EM, 7707 Convoy Ct., San Diego, Cal. 92111

Meters, Clamp-On

Bell, Inc., F.W., Dept. EM, 4949 Freeway Dr. E., Columbus, Ohio 43229 p. 2666,2667
D Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 ..... *
D Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 p. 2738
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Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
M Ohio Semitronics, Inc., Dept. EM, 1205 Chesapeake Ave., Columbus, Ohio 43212 ..... *
D Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... *
D Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817 ..... *
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Amprobe Instrument, Div. SOS Consolidated Inc., Dept. EM, 630 Merrick Rd., Lynbrook, N.Y. 11563
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
M Columbia Electric Mfg. Co., Dept. EM, 4519 Hamilton Ave. N.W., Cleveland, Ohio 44114
Ferranti Elec., Dept. EM, East Bethpage Rd., Plainview, N.Y. 11803
Hioki New York Corp., Dept. EM, 42-16 235th St., Douglaston, N.Y. 11363
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
D Sticht Co., Inc. Herman H., Dept. EM, 27 Park Pl., New York, N.Y. 10007

Meters, Conductance

Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
Magnaflux Corp. , Dept. EM, 7328 W. Lawrence Ave., Chicago, Ill 60656
Yellow Springs Instrument Co., Dept. EM, Box 279, Yellow Springs, Ohio 45387

Meters, Counting Rate, Nuclear

Electro Industries, Dept. EM, 109 Nassau Dr., Albertson, NY 11507 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Victoreen, Inc., Dept. EM, 10101 Woodland Ave., Cleveland, Ohio 44104 .... *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
D Capintec Instruments, Inc., Dept. EM, 136 Summit Ave., Montvale, N.J. 07645
M Harshaw Chemical Co., A Kenanee Industry, Dept. EM, 6801 Cochran Rd., Solon, Ohio 44139
M Nuclear Resch. Corp., Dept. EM, 1105 Indl. Hwy., Southampton, Pa. 18966

Meters, DC

Airpax Elctrns., Controls Div., Dept. EM, 6801 W. Sunrise Blvd., Ft. Lauderdale, Fla. 33313 ..... *
California Instrs., Dept. EM, 5150-Convoy St., San Diego, Cal. 92111 ..... *
M Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 ..... *
Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ..... *
Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 .. *
Electro Industries, Dept. EM, 109 Nassau Dr., Albertson, NY 11507 ..... *
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Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509 ..... p. 2754,2755
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D ISL Products Ltd. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803 *
D Jewell Electrical Instruments, Inc., Dept. EM, Grenier Field, Manchester, N.H. 03108 ..... p. 2764,2765
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Non-Linear Sys., Inc., Dept. EM, 533 Stevens Ave., Solana Beach, Cal. 92075 *
Ohio Semitronics, Inc., Dept. EM, 1205 Chesapeake Ave., Columbus, Ohio 43212 ..... *
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *
D Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... *
D Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817 p. 2826,2827
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... p. 2810,2814-2816
Analogic Corp., Dept. EM, Audubon Rd., Wakefield, Mass. 01880
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
D Data Tech, Div. of Penril Corp., Dept. EM, 2700 S. Fairview, Santa Ana, Cal. 92704
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
Hioki New York Corp., Dept. EM, 42-16 235th St., Douglaston, N.Y. 11363
D Holub Industries, Dept. EM, 413 DeKalb Ave., Sycamore, Ill. 60178
D LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Tektronix; Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Westinghouse Elec., Process Equip./Consumables Dept, Dept. EM, Box 300, Sykesville, Md. 21784
Westinghouse Elec. Corp., Relay-Instr. Div., Dept. EM, 95 Orange St., Newark, N.J. 07101

Meters, Decibel Indicating

ADRET/COMSTRON, Dept. EM, 200 E. Sunrise Hwy, Freeport, NY 11520 .... *
D Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005 ..... *
BBN Instruments Co., Div. Bolt Beranek & Newman, Inc., Dept. EM, 50 Moulton St., Cambridge, Mass. 02138 ..... *
Boonton Electronics Corp., Dept. EM, Route #287, Parsippany, N.J. 07054 *
Chesterfield Prods. Inc., Dept. EM, 511A Victor St., Saddle Brook, N.J. 07662 *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ..... *
Electro-Mechanical Instru. Div., Sheller-Globe Corp., Dept. EM, Box 368, Dublin, PA 18917 ..... *
D Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 *
M General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 p. 2870
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... *
D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
D Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817 p. 2826,2827
D United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403 ..... *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
A & D Electrical Instruments, Dept. EM, 73-07 88th St., Glendale, N.Y. 11227
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
D Bartlett-Emery Instrument Corp., Dept. EM, 14th & Ave. "M", Ft. Madison, Iowa 52627
Convex Corp., Dept. EM, 2810 Dorr Ave., Fairfax, Va. 22031
Dixson, Inc., Dept. EM, Box 1449, Grand Junction, Colo. 81501
Edmund Scientific Co., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007
Electro-Dynamics Dev. Co., Dept. EM, 475 Mt. Hood Dr. S.W., Issaquah, Wash 98027
Gotham Audio Corp., Dept. EM, 741 Washington St., New York, N.Y. 10014
M Ideal Precision Meter Co., Dept. EM, 214 Franklin St., Brooklyn, N. Y. 11222
D Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
D LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Pacific Meas., Inc., Dept. EM, 470 San Antonio Rd, Palo Alto, Calif. 94306
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
D REI Sales Co., Dept. EM, 1 North Ave, Burlington, Mass. 01803
D Shurite Meters, Dept. EM, 428 Chapel St., New Haven, Conn. 06508
Tracor, Inc., Dept. EM, 6500 Tracor La., Austin, Tex. 78721
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760

Meters, Deviation

M General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 *
London Co., Dept. EM, 811 Sharon Dr., Westlake, Ohio 44145 ..... *
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
D LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016

Meters, Differential

Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 ..... *
Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 .. *
Electronic Dev. Corp., Dept. EM, 11 Hamlin St., Boston, Mass. 02127 p. 2724

D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043** *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** *
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *
Hy-Cal Engrg, Dept. EM, 12105 Los Nietos Rd., Santa Fe Springs, Cal 90670

Meters, Digital ESR

Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 *
Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 p. 2687
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229

Meters, Distortion & Noise

Bafco, Inc., Dept. EM, 717 Mearns Rd., Warminster, Pa. 18974 *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 *
London Co., Dept. EM, 811 Sharon Dr., Westlake, Ohio 44145 p. 2803
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 *
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** *
D **Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817** *
D **Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114** *
M Atlantic Research Corp., Dept. EM, 5390 Cherokee Ave., Alexandria, Va 22314
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
D Barker & Williamson, Inc., Dept. EM, Canal St., Bristol, Pa. 19007
Convex Corp., Dept. EM, 2810 Dorr Ave., Fairfax, Va. 22031
M Cushman Electronics, Dept. EM, 2400 N. 1st St., San Jose, Cal. 95112
Digitech Data Inds., Dept. EM, 66 Grove St., Box 547, Ridgefield, Conn. 06877
Meguro Electronics Corp, Dept. EM, No. 5-1 2-Chome Chuo Meguro-ku, Tokyo, Japan
Tracor, Inc., Dept. EM, 6500 Tracor La., Austin, Tex. 78721

Meters, Edge-Wise

Airpax Elctrns., Controls Div., Dept. EM, 6801 W. Sunrise Blvd., Ft. Lauderdale, Fla. 33313 *
D **Beede Electrical Instr. Co., Dept. EM, S. Main St., Penacook, N.H. 03301** *
Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 *
D **Electro-Mechanical Instru. Div., Sheller-Globe Corp., Dept. EM, Box 368, Dublin, PA 18917** p. 2723
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 *
D **Jewell Electrical Instruments, Inc., Dept. EM, Grenier Field, Manchester, N.H. 03108** p. 2765
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 *
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** *
D **Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817** p. 2827
D **Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114** *
A & D Electrical Instruments, Dept. EM, 73-07 88th St., Glendale, N.Y. 11227
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
Assembled Products Co., Dept. EM, Box 750, St. Albans, Vt. 05478
D Greibach Instr. Div., Electrical Inst. Svc., Inc., Dept. EM, 25 Dock St., Mt Vernon, N.Y. 10550
Ideal Precision Meter Co., Dept. EM, 214 Franklin St., Brooklyn, N. Y. 11222
D Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
D JPI, Inc., Dept. EM, 1507 San Vicente Blvd., Santa Monica, Cal. 90402
D Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Mura Corp., Dept. EM, 177 Cantiague Rock Rd, Westbury, NY 11590
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
SHOGYO International Corp., Dept. EM, 300 Northern Blvd., Great Neck, N.Y. 11021
D Shurite Meters, Dept. EM, 428 Chapel St., New Haven, Conn. 06508
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
Westinghouse Elec. Corp., Relay-Instr. Div., Dept. EM, 95 Orange St., Newark, N.J. 07101

Meters, Elapsed Time—See Indicators, Elapsed Time

Meters, Electrometer

Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** *
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
RFL Inds., Instr. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005 p. 2807
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 *
D **Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523** *
Beckman Instrs., (AISSD), Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634
D Capintec Instruments, Inc., Dept. EM, 136 Summit Ave., Montvale, N.J. 07645
Electron-Machine Corp., Dept. EM, Box M, Umatilla, Fla. 32784
D Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
Princeton Applied Resch. Corp., Dept. EM, Box 2565, Princeton, N.J. 08540
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Meters, F-M Deviation

London Co., Dept. EM, 811 Sharon Dr., Westlake, Ohio 44145 p. 2803
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 *
M A.R.F. Products, Dept. EM, Box 3226, Boulder, Colo. 80303
M Cushman Electronics, Dept. EM, 2400 N. 1st St., San Jose, Cal. 95112
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Video Research Corporation, Dept. EM, 6985 Garden Rd., Riviera Beach, Fla. 33404

Meters, Field Strength

Bell, Inc., F.W., Dept. EM, 4949 Freeway Dr. E., Columbus, Ohio 43229 *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** p. 2870
Instruments for Industry, Inc., Dept. EM, 151 Toledo St., Farmingdale, N.Y. 11735 p. 2763
M **Polarad Elctrn. Instrs., Dept. EM, 5 Delaware Dr., Lake Success, N.Y. 11040** *
Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219 *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 *
D Blonder-Tongue Labs., Inc., Dept. EM, One Jake Brown Rd., Old Bridge, N.J. 08857
D Channel Master Div. Avnet, Dept. EM, Rte. 209, Ellenville, N.Y. 12428
M Electro-Metrics, Div. Penril Corp., Dept. EM, 100 Church St., Amsterdam, N.Y. 12010
D Finney Co., Dept. EM, 34 W. Interstate St., Bedford, Ohio 44014
D Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
LDJ Electronics, Dept. EM, 1064 Naughton Ave., Troy, Mich. 48084
D Mobil Electronics, Inc., Dept. EM, Box 1132, Anderson, Ind. 46015
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
D Sadelco, Inc. , Dept. EM, 299 Park Ave., Weehawken, NJ 07087
D Sencore, Dept. EM, 3200 Sencore Dr., Sioux Falls, S.D. 57107
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Walker Scientific, Inc., Dept. EM, Rockdale St., Worcester, Mass. 01606
Winegard Co., Dept. EM, 3000 Kirkwood St., Burlington, Iowa 52601

Meters, Fluid Flow

Electro-Mechanical Instru. Div., Sheller-Globe Corp., Dept. EM, Box 368, Dublin, PA 18917 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403 *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 *
M Accurate Instrument Co., Dept. EM, Box No. 925, Westbury, N.Y. 11590
Anadex Inc., Dept. EM, 9825 De Soto, Chatsworth, Cal. 91311
M Astro Dynamics, Dept. EM, 2 Gill St., Woburn, Mass. 01801
Bailey Meter Co., Sub. Babcock & Wilcox, Dept. EM, 29801 Euclid Ave., Wickliffe, Ohio 44092
Carolina Medical Elctrns., Inc., Dept. EM, U.S. 52 Expwy., Box 307, King, N.C. 27021
Dresser Industries, Dept. EM, 1505 Elm St., Dallas, Tex. 75201
M Eldec Corp., Dept. EM, Box 100, 16700 13th Ave. W., Lynnwood, Wash. 98036
M Flow Technology, Inc., Dept. EM, Box 21346, Phoenix, Ariz. 85036
Keene Corp, Dept. EM, 345 Park Ave, New York, N.Y. 10022
Ocean Research Equipment, Inc., Dept. EM, Box 709, Falmouth, Mass. 02541
D Robertshaw Controls Co., Ind'l. Instr. Div., Dept. EM, 1910 Byrd Ave Ste 200, Richmond, Va. 23230
D Singer Co., American Meter Div., Dept. EM, 13500 Philmont Ave., Philadelphia, Pa. 19116
Teledyne Gurley, Dept. EM, 514 Fulton St., Troy, N.Y. 12181
Tridak, Inc., Dept. EM, Del Mar Dr., Brookfield, Conn. 06804
D TSI Inc, Dept. EM, 500 Cardigan Rd., Box 3394, St. Paul, Minn. 55165
M West Coast Resch. Corp., Dept. EM, Box 25061, Los Angeles, Cal. 90025

Meters, Flux

EG&G, Inc., Electro-Optics Div., Dept. EM, 35 Congress St., Salem, Mass. 01970 *
Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 *
RFL Inds., Instr. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005 *
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 *
D **Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523** *
D Annis R B Co., Dept. EM, 1101 N. Delaware, Indianapolis, Ind. 46202
High Voltage Engrg. Corp., Dept. EM, S. Bedford St., Burlington, Mass. 01803
LDJ Electronics, Dept. EM, 1064 Naughton Ave., Troy, Mich. 48084
DM Magnos, Incorporated, Dept. EM, Old School House Rd., Harvard, Mass. 01451
Thomas & Skinner, Inc., Dept. EM, Box 150-B,, Indianapolis, Ind. 46206
Walker Scientific, Inc., Dept. EM, Rockdale St., Worcester, Mass. 01606

Meters, Frequency

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
California Instrs., Dept. EM, 5150-Convoy St., San Diego, Cal. 92111 *
D-B Developments, Dept. EM, 7709 Kilbourne Rd., Rome, NY 13440 *
Data Precision Corporation, Dept. EM, Audubon Rd., Wakefield, Mass 01880 p. 2708

Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ..... p. 2710-2712
Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 .. *
Electro Impulse, Dept. EM, Box 870, Red Bank, N.J. 07701 ..... *
Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 ..... *
D Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 *
M Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040 .. *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
M General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
Instruments for Industry, Inc., Dept. EM, 151 Toledo St., Farmingdale, N.Y. 11735 ..... p. 2763
International Crystal Mfg., Dept. EM, 10 N. Lee St., Oklahoma City, Okla. 73102 ..... *
Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803 *
D Modutec, Inc., Dept. EM, 18 Marshall St., Norwalk, Conn. 06854 ..... p. 2788
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705 ..... *
D Non-Linear Sys., Inc., Dept. EM, 533 Stevens Ave., Solana Beach, Cal. 92075 *
Ohio Semitronics, Inc., Dept. EM, 1205 Chesapeake Ave., Columbus, Ohio 43212 ..... *
Philips Test & Measuring Instrs., Dept. EM, 85 McKee Dr., Mahwah, NJ 07430 ..... p. 2799
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
D Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... *
Anadex Inc., Dept. EM, 9825 De Soto, Chatsworth, Cal. 91311
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
DM Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
M Coleman Microwave Co., Dept. EM, Box 59, Rte. 22, Lebanon, N.J. 08833
Convex Corp., Dept. EM, 2810 Dorr Ave., Fairfax, Va. 22031
M Cushman Electronics, Dept. EM, 2400 N. 1st St., San Jose, Cal. 95112
Frequency Engrg. Labs., Dept. EM, Box 527, Farmingdale, N.J. 07727
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Hioki New York Corp., Dept. EM, 42-16 235th St., Douglaston, N.Y. 11363
D LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
M Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
Richard-Lee Co., Dept. EM, Box 724, New Providence, N.J. 07974
Sivers Lab, Dept. EM, Box 90339, Los Angeles, Cal. 90009
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
DM Sticht Co., Inc. Herman H., Dept. EM, 27 Park Pl., New York, N.Y. 10007
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
Telesis Laboratory, Dept. EM, Box 387, Chillocothe, Ohio 45601
Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803
TRG,, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
M UTE Microwave, Dept. EM, 3500 Sunset Ave., Asbury Park, N.J. 07712
Video Research Corporation, Dept. EM, 6985 Garden Rd., Riviera Beach, Fla. 33404
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006
Westinghouse Elec. Corp., Relay-Instr. Div., Dept. EM, 95 Orange St., Newark, N.J. 07101

Meters, Frequency Deviation

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
M Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040 .. *
General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 *
Instruments for Industry, Inc., Dept. EM, 151 Toledo St., Farmingdale, N.Y. 11735 ..... p. 2763
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... p. 2780
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
Anadex Inc., Dept. EM, 9825 De Soto, Chatsworth, Cal. 91311
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
M Cushman Electronics, Dept. EM, 2400 N. 1st St., San Jose, Cal. 95112
D LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Meguro Electronics Corp, Dept. EM, No. 5-1_2-Chome Chuo Meguro-ku, Tokyo, Japan
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Tracor, Inc., Dept. EM, 6500 Tracor La., Austin, Tex. 78721
Video Research Corporation, Dept. EM, 6985 Garden Rd., Riviera Beach, Fla. 33404

Meters, Frequency (Digital)

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
D B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 ..... *
D Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
D California Instrs., Dept. EM, 5150-Convoy St., San Diego, Cal. 92111 ..... *
Data Precision Corporation, Dept. EM, Audubon Rd., Wakefield, Mass 01880 *
Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ..... p. 2710-2712
Electro Industries, Dept. EM, 109 Nassau Dr., Albertson, NY 11507 ..... *
D Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 *
M Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040 .. *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
Kessler-Ellis Prods., Dept. EM, 120 1st Ave., Atlantic Highlands, N.J. 07716 *
D Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... p. 2790
D Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705 ..... *
D Non-Linear Sys., Inc., Dept. EM, 533 Stevens Ave., Solana Beach, Cal. 92075 *
Philips Test & Measuring Instrs., Dept. EM, 85 McKee Dr., Mahwah, NJ 07430 ..... *
D Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... *
DM Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518 ..... *
United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403 ..... *
D Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
Anadex Inc., Dept. EM, 9825 De Soto, Chatsworth, Cal. 91311
DM Anaren Microwave, Inc., Dept. EM, 1010 James St., Syracuse, N.Y. 13203
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
Convex Corp., Dept. EM, 2810 Dorr Ave., Fairfax, Va. 22031
M Cushman Electronics, Dept. EM, 2400 N. 1st St., San Jose, Cal. 95112
D Dynapar Corp., Dept. EM, 1675 Delany Rd., Gurnee, Ill. 60031
Electro-Numerics Inc., Dept. EM, 1811 Reynolds, Irvine, Cal. 92714
Electronic Counters & Controls Inc., Dept. EM, 1500 McCormick Blvd., Mundelein, Ill. 60060
D LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
D Racal-Dana Instrus Inc., Dept. EM, 18912 Von Karman Ave., Irvine, Cal. 92715
D Sencore, Dept. EM, 3200 Sencore Dr., Sioux Falls, S.D. 57107
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
Valhalla Scientific, Inc., Dept. EM, 7707 Convoy Ct., San Diego, Cal. 92111

Meters, Galvanometer

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Bulova Watch Co., Servo Prods. Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Cutler-Hammer, Shallcross Resistor Prods., Dept. EM, US 70 East, Smithfield, N.C. 27577 ..... *
Electronic Dev. Corp., Dept. EM, 11 Hamlin St., Boston, Mass. 02127 ..... *
Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 ..... *
D Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 *
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 *
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
D Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... *
A & D Electrical Instruments, Dept. EM, 73-07 88th St., Glendale, N.Y. 11227
D Bartlett-Emery Instrument Corp., Dept. EM, 14th & Ave. "M", Ft. Madison, Iowa 52627
Dixson, Inc., Dept. EM, Box 1449, Grand Junction, Colo. 81501
D Greibach Instr. Div., Electrical Inst. Svc., Inc., Dept. EM, 25 Dock St., Mt Vernon, N.Y. 10550
Hathaway Instruments Inc., Dept. EM, 11616 51st St., Tulsa, Okla. 74145
Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962
Penn Airborne Prods., Dept. EM, Industrial Hwy., Southampton, Pa. 18966
M Photron Instrument Co., Dept. EM, 6516 Detroit Ave., Cleveland, Ohio 44102
M Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115

Meters, Gauss

Bell, Inc., F.W., Dept. EM, 4949 Freeway Dr. E., Columbus, Ohio 43229 p. 4300
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
RFL Inds., Instr. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005 p. 2807
RFL Inds., Thermocontrol Div., Dept. EM, Boonton, N.J. 07005 ..... *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *

D **Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523** ..... *
Advanced Kinetics, Dept. EM, 1231 Victoria St., Costa Mesa, Calif. 92627
D Annis R B Co., Dept. EM, 1101 N. Delaware, Indianapolis, Ind. 46202
LDJ Electronics, Dept. EM, 1064 Naughton Ave., Troy, Mich. 48084
Magnaflux Corp. , Dept. EM, 7328 W. Lawrence Ave., Chicago, Ill 60656
DM Magnos, Incorporated, Dept. EM, Old School House Rd., Harvard, Mass. 01451
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
Thomas & Skinner, Inc., Dept. EM, Box 150-B,, Indianapolis, Ind. 46206
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Varian Assocs., Instrument Div., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Walker Scientific, Inc., Dept. EM, Rockdale St., Worcester, Mass. 01606

Meters, Grid Dip

D **Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803** *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *

Meters, Illuminated Scale

Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005 ..... p. 2663
D **Beede Electrical Instr. Co., Dept. EM, S. Main St., Penacook, N.H. 03301** .... *
Bell, Inc., F.W., Dept. EM, 4949 Freeway Dr. E., Columbus, Ohio 43229 ..... *
Bird Electronic Corp., Dept. EM, 30303 Aurora Rd., Solon, Ohio 44139 ..... *
Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 ..... p. 2681
Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 ..... *
Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ..... p. 2710-2712
Dytronics Co., Inc., Dept. EM, 4800 Evanswood Dr., Columbus, Ohio 43229 p. 2718
Electro Industries, Dept. EM, 109 Nassau Dr., Albertson, NY 11507 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Gralex Inds., Div. Gen. Microwave, Dept. EM, 155 Marine St., Farmingdale, N.Y. 11735 ..... p. 2750,2751
Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509 ..... p. 2754
D **Jewell Electrical Instruments, Inc., Dept. EM, Grenier Field, Manchester, N.H. 03108** ..... p. 2764
D **Modutec, Inc., Dept. EM, 18 Marshall St., Norwalk, Conn. 06854** ..... p. 2787
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705 p. 2792
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** ..... *
D **Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817** ..... *
D **Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114** ..... p. 2815,2816,2819
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
D Associated Research, Inc., Dept. EM, 6125 W. Howard St., Niles, Ill. 60648
M Ideal Precision Meter Co., Dept. EM, 214 Franklin St., Brooklyn, N. Y. 11222
D Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115

Meters, Impedance

Bafco, Inc., Dept. EM, 717 Mearns Rd., Warminster, Pa. 18974 ..... *
Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
M **Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080** ..... *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D **Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803** *
London Co., Dept. EM, 811 Sharon Dr., Westlake, Ohio 44145 ..... *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
RFL Inds., Instr. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005 p. 2807
RFL Inds., Thermocontrol Div., Dept. EM, Boonton, N.J. 07005 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D **Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817** ..... *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
Electro-Dynamics Dev. Co., Dept. EM, 475 Mt. Hood Dr. S.W., Issaquah, Wash 98027
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Sennheiser Elctrn. Corp., Dept. EM, 10 W. 37th St., New York, N.Y. 10018
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518

Meters, Inductance

Boonton Electronics Corp., Dept. EM, Route #287, Parsippany, N.J. 07054 p. 2665
Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ..... *
Electro-Mechanical Instru. Div., Sheller-Globe Corp., Dept. EM, Box 368, Dublin, PA 18917 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
London Co., Dept. EM, 811 Sharon Dr., Westlake, Ohio 44145 ..... p. 2803
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
Dillon, W.C. & Co., Dept. EM, 14620-EP Keswick St., Van Nuys 340, Cal. 91407
Kikusui Elctrns. Corp., Dept. EM, 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518

Meters, Kilovolt

D **Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005** ..... *
D **Beede Electrical Instr. Co., Dept. EM, S. Main St., Penacook, N.H. 03301** .... *
Bertan Assocs., Inc., Dept. EM, 3 Aerial Way, Syosset, N.Y. 11791 ..... *
Data Precision Corporation, Dept. EM, Audubon Rd., Wakefield, Mass 01880 *
Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 p. 2825
Electro Industries, Dept. EM, 109 Nassau Dr., Albertson, NY 11507 ..... *
D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043** p. 2738
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
M **Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509** ..... p. 2755
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 ..... *
D **ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766** ..... p. 2031
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
Megavolt, Corp., Dept. EM, 110 Hobart St, Hackensack, N.J. 07601 ..... *
D **Modutec, Inc., Dept. EM, 18 Marshall St., Norwalk, Conn. 06854** ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
M **Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008** ..... p. 3609
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 p. 2825
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D **Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817** p. 2826,2827
Universal Voltronics Corp., Dept. EM, 27 Radio Circle Dr., Mt. Kisco, N.Y. 10549 ..... *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
A & D Electrical Instruments, Dept. EM, 73-07 88th St., Glendale, N.Y. 11227
D American HV Voltage Test Sys., Inc., Dept. EM, Ctrl Garr Ind'l Pk, Accident, Md. 21520
D Associated Research, Inc., Dept. EM, 6125 W. Howard St., Niles, Ill. 60648
D Bartlett-Emery Instrument Corp., Dept. EM, 14th & Ave. "M", Ft. Madison, Iowa 52627
Beckman Instrs., Cedar Grove Opers., Dept. EM, 89 Commerce Rd., Cedar Grove, N.J. 07009
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
D Data Tech, Div. of Penril Corp., Dept. EM, 2700 S. Fairview, Santa Ana, Cal. 92704
Electrical Standards Div., E.S.R.S., Inc., Dept. EM, 7337 Greenbush, N. Hollywood, Cal. 91605
D Greibach Instr. Div., Electrical Inst. Svc., Inc., Dept. EM, 25 Dock St., Mt Vernon, N.Y. 10550
M Ideal Precision Meter Co., Dept. EM, 214 Franklin St., Brooklyn, N. Y. 11222
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602
Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
Racal-Dana Instrus Inc., Dept. EM, 18912 Von Karman Ave., Irvine, Cal. 92715
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Westinghouse Elec. Corp., Relay-Instr. Div., Dept. EM, 95 Orange St., Newark, N.J. 07101
Zi-Tech Div., Aikenwood Corp., Dept. EM, Box 26, 2151 Park Blvd., Palo Alto, Cal. 94302

Meters, Kilowatt

Bird Electronic Corp., Dept. EM, 30303 Aurora Rd., Solon, Ohio 44139 p. 2668
Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 ..... *
Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 .. *
Electro Industries, Dept. EM, 109 Nassau Dr., Albertson, NY 11507 ..... *
Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 ..... *
Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Ohio Semitronics, Inc., Dept. EM, 1205 Chesapeake Ave., Columbus, Ohio 43212 ..... p. 4305

RFL Inds., Instr. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005 ..... *
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *
D **Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817** ..... *
D **Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114** ..... *
Ampower Electronic Instr. Co., Dept. EM, 500 Union Blvd., Totowa, N. J. 07512
ENI Power Systems, Dept. EM, 3000 Winton Rd: S., Rochester, N.Y. 14623
D Greibach Instr. Div., Electrical Inst. Svc., Inc., Dept. EM, 25 Dock St., Mt Vernon, N.Y. 10550
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Westinghouse Elec. Corp., Relay-Instr. Div., Dept. EM, 95 Orange St., Newark, N.J. 07101
Zi-Tech Div., Aikenwood Corp., Dept. EM, Box 26, 2151 Park Blvd., Palo Alto, Cal. 94302

Meters, Laser Energy—See Monitors, Laser Energy

Meters, Light (Non Photographic)

EG&G, Inc., Electro-Optics Div., Dept. EM, 35 Congress St., Salem, Mass. 01970 ..... **p. 3135**
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** ..... *
D **Vactec, Inc., Dept. EM, 2423 Northline Blvd., Maryland Heights, Mo. 63043** *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... **p. 2818**
D **Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523** ..... *
D Apollo Lasers Inc., Dept. EM, 6357 Arizona Cir., Los Angeles, Cal. 90045
Bromberg Engineering, Dept. EM, 461 Conant Rd., Weston, Mass. 02193
COSAR Corp., Dept. EM, 3121 Benton St., Garland, Tex. 75042
Electro-Optical Inds., Inc., Dept. EM, 839 Ward Dr., Santa Barbara, Cal. 93111
Gamma Scientific Inc., Dept. EM, 3777 Ruffin Rd., San Diego, Cal. 92123
D JPI, Inc., Dept. EM, 1507 San Vicente Blvd., Santa Monica, Cal. 90402
D Metrologic Instruments, Inc., Dept. EM, 143 Harding Ave., Bellmawr, N.J. 08030
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
DM Photo Research Corp., Division Kollmorgen Corp., Dept. EM, 3000 N. Hollywood Way, Burbank, Cal. 91505
Radiation Devices Co., Inc., Dept. EM, Box 8450, Baltimore, Md. 21234
Sticht Co., Inc. Herman H., Dept. EM, 27 Park Pl., New York, N.Y. 10007
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
M UCE, Inc., Dept. EM, 20 N. Main St., Norwalk, Conn. 06854
Ultra-Violet Prods., Inc., Dept. EM, 5100 Walnut Grove Ave., San Gabriel, Cal. 91778
United Detector Tech., Dept. EM, 2644 30th St., Santa Monica, Cal. 90405
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006
Westinghouse Electric Corp., Indl & Gov't Tube, Dept. EM, Westinghouse Circle, Horseheads, N.Y. 14845

Meters, Megohm

Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Data Precision Corporation, Dept. EM, Audubon Rd., Wakefield, Mass 01880 **p. 2706,2707**
Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 .. *
D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043** **p. 2736-2738**
Freed Transformer Co., Inc., Dept. EM, 1718 Weirfield St., Brooklyn, N.Y. 11227 ..... **p. 2748**
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
M **Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509** ..... **p. 2754,2755**
Interelectronics Corp., Dept. EM, Interelectronics Park, 550 U.S. Rte. 303, Congers, N.Y. 10920 ..... *
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 ..... **p. 2762**
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
London Co., Dept. EM, 811 Sharon Dr., Westlake, Ohio 44145 ..... **p. 2803**
Megavolt, Corp., Dept. EM, 110 Hobart St, Hackensack, N.J. 07601 .... **p. 3286**
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D **Non-Linear Sys., Inc., Dept. EM, 533 Stevens Ave., Solana Beach, Cal. 92075** *
D **Philips Test & Measuring Instrs., Dept. EM, 85 McKee Dr., Mahwah, NJ 07430** ..... *
Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** ..... *
D **Slaughter Co., Dept. EM, Moore & Hailey Sts., P.O. Box 1805, Ardmore, Okla. 73401** ..... **p. 2823**
Torotron, Dept. EM, 255 Washington St., Mt. Vernon, N.Y. 10553 ..... **p. 2831**
D **Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817** **p. 2828,2829**
D **Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114** ..... **p. 2812**
D **Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523** ..... *
D American HV Voltage Test Sys., Inc., Dept. EM, Ctrl Garr Ind'l Pk, Accident, Md. 21520
Amprobe Instrument, Div. SOS Consolidated Inc., Dept. EM, 630 Merrick Rd., Lynbrook, N.Y. 11563
DM Associated Research, Inc., Dept. EM, 6125 W. Howard St., Niles, Ill. 60648
Beckman Instrs., Cedar Grove Opers., Dept. EM, 89 Commerce Rd., Cedar Grove, N.J. 07009
DM Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
D Data Tech, Div. of Penril Corp., Dept. EM, 2700 S. Fairview, Santa Ana, Cal. 92704
Eltec Instruments Inc., Dept. EM, P.O. Box 9610, Daytona Beach, Fla. 32020
Hioki New York Corp., Dept. EM, 42-16 235th St., Douglaston, N.Y. 11363
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Penn Airborne Prods., Dept. EM, Industrial Hwy., Southampton, Pa. 18966
M Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
DM Sticht Co., Inc. Herman H., Dept. EM, 27 Park Pl., New York, N.Y. 10007
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
Valhalla Scientific, Inc., Dept. EM, 7707 Convoy Ct., San Diego, Cal. 92111

Meters, Micro-Microampere—See Meters, Nanoampere

Meters, Micro-Microvolt—See Meters, Nanovolt

Meters, Microampere

Airpax Elctrns., Controls Div., Dept. EM, 6801 W. Sunrise Blvd., Ft. Lauderdale, Fla. 33313 ..... *
D **Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005** ..... *
D **Beede Electrical Instr. Co., Dept. EM, S. Main St., Penacook, N.H. 03301** .... *
Data Precision Corporation, Dept. EM, Audubon Rd., Wakefield, Mass 01880 **p. 2706,2707**
Doric Sci., Div. Emerson Elec. Co., Dept. EM, 3883 Ruffin Rd., San Diego, Cal. 92123 ..... **p. 2715**
Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 .. *
Electro Industries, Dept. EM, 109 Nassau Dr., Albertson, NY 11507 ..... *
Electro-Mechanical Instru. Div., Sheller-Globe Corp., Dept. EM, Box 368, Dublin, PA 18917 ..... **p. 2722,2723**
Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 ..... *
Faria Meter Corp., Dept. EM, 19 Faria Lane, Uncasville, Conn. 06382 ..... *
D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043** *
General Elec. Co., Elctrn. Comp. Sis., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** *
Gralex Inds., Div. Gen. Microwave, Dept. EM, 155 Marine St., Farmingdale, N.Y. 11735 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
D **Hoyt Electrical Instr. Works, Dept. EM, 19 Linden St., Penacook, N.H. 03301** *
D **Jewell Electrical Instruments, Inc., Dept. EM, Grenier Field, Manchester, N.H. 03108** ..... **p. 2764**
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
Millivac Instruments, Inc., Dept. EM, Box 997, Curry Rd. Ext., Schnectady, N.Y. 12301 ..... *
D **Modutec, Inc., Dept. EM, 18 Marshall St., Norwalk, Conn. 06854** **p. 2786,2789**
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705 ..... *
North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803 ..... *
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... *
D **Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817** **p. 2826-2829**
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... **p. 2808,2810,2811,2813,2815,2816**
D **Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523** ..... *
A & D Electrical Instruments, Dept. EM, 73-07 88th St., Glendale, N.Y. 11227
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
D Amprobe Instrument, Div. SOS Consolidated Inc., Dept. EM, 630 Merrick Rd., Lynbrook, N.Y. 11563
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
Assembled Products Co., Dept. EM, Box 750, St. Albans, Vt. 05478
D Bartlett-Emery Instrument Corp., Dept. EM, 14th & Ave. "M", Ft. Madison, Iowa 52627
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
D Data Tech, Div. of Penril Corp., Dept. EM, 2700 S. Fairview, Santa Ana, Cal. 92704
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
D Greibach Instr. Div., Electrical Inst. Svc., Inc., Dept. EM, 25 Dock St., Mt Vernon, N.Y. 10550
Hioki New York Corp., Dept. EM, 42-16 235th St., Douglaston, N.Y. 11363
M Ideal Precision Meter Co., Dept. EM, 214 Franklin St., Brooklyn, N. Y. 11222
DM Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Mura Corp., Dept. EM, 177 Cantiague Rock Rd, Westbury, NY 11590
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
Westinghouse Elec. Corp., Relay-Instr. Div., Dept. EM, 95 Orange St., Newark, N.J. 07101

Meters, Microhm

Data Precision Corporation, Dept. EM, Audubon Rd., Wakefield, Mass 01880 *

D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043** *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *

Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... p. 2771
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** ..... *
DM **Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518** ..... *
D **Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114** ..... *
D **Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523** ..... *
D Associated Research, Inc., Dept. EM, 6125 W. Howard St., Niles, Ill. 60648
Beckman Instrs., Cedar Grove Opers., Dept. EM, 89 Commerce Rd., Cedar Grove, N.J. 07009
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
Gotham Audio Corp., Dept. EM, 741 Washington St., New York, N.Y. 10014
D Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
Valhalla Scientific, Inc., Dept. EM, 7707 Convoy Ct., San Diego, Cal. 92111

Meters, Microvolt

D **Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005** ..... *
Data Precision Corporation, Dept. EM, Audubon Rd., Wakefield, Mass 01880 p. 2706,2707
Doric Sci., Div. Emerson Elec. Co., Dept. EM, 3883 Ruffin Rd., San Diego, Cal. 92123 ..... *
Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 ..... *
D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043** *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** *
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 p. 2753
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
Hoyt Electrical Instr. Works, Dept. EM, 19 Linden St., Penacook, N.H. 03301 *
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
Millivac Instruments, Inc., Dept. EM, Box 997, Curry Rd. Ext., Schnectady, N.Y. 12301 ..... p. 2784
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D **Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705** ..... *
Non-Linear Sys., Inc., Dept. EM, 533 Stevens Ave., Solana Beach, Cal. 92075 *
North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803 ..... *
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *
DM **Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518** ..... *
D **Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114** ..... *
D **Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523** ..... *
Analogic Corp., Dept. EM, Audubon Rd., Wakefield, Mass. 01880
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
D Bartlett-Emery Instrument Corp., Dept. EM, 14th & Ave. "M", Ft. Madison, Iowa 52627
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
Consolidated Controls Corp., Dept. EM, 15 Durant Ave., Bethel, Conn. 06801
D Data Tech, Div. of Penril Corp., Dept. EM, 2700 S. Fairview, Santa Ana, Cal. 92704
D Greibach Instr. Div., Electrical Inst. Svc., Inc., Dept. EM, 25 Dock St., Mt Vernon, N.Y. 10550
Hy-Cal Engrg, Dept. EM, 12105 Los Nietos Rd., Santa Fe Springs, Cal 90670
D Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Mura Corp., Dept. EM, 177 Cantiague Rock Rd, Westbury, NY 11590
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Racal-Dana Instrus Inc., Dept. EM, 18912 Von Karman Ave., Irvine, Cal. 92715
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
UCE, Inc., Dept. EM, 20 N. Main St., Norwalk, Conn. 06854

Meters, Microwave

The Bendix Corp., Electrical Comp. Div., Dept. EM, Sidney, NY 13838 ..... *
Bird Electronic Corp., Dept. EM, 30303 Aurora Rd., Solon, Ohio 44139 ..... *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** p. 2870
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
M **Polarad Elctrn. Instrs., Dept. EM, 5 Delaware Dr., Lake Success, N.Y. 11040** *
Baytron, Dept EM, 344 Salem St., Medford, Mass. 02155
Frequency Engrg. Labs., Dept. EM, Box 527, Farmingdale, N.J. 07727
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
Pacific Meas., Inc., Dept. EM, 470 San Antonio Rd, Palo Alto, Calif. 94306
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
Racal-Dana Instrus Inc., Dept. EM, 18912 Von Karman Ave., Irvine, Cal. 92715
Republic Elctrn. Inds. Corp., Dept. EM, 575 Broad Hollow Rd., Melville, N.Y. 11746
Sivers Lab, Dept. EM, Box 90339, Los Angeles, Cal. 90009
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
UCE, Inc., Dept. EM, 20 N. Main St., Norwalk, Conn. 06854
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760

Meters, Milliampere

Airpax Elctrns., Controls Div., Dept. EM, 6801 W. Sunrise Blvd., Ft. Lauderdale, Fla. 33313 ..... *
D **Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005** ..... *
D **Beede Electrical Instr. Co., Dept. EM, S. Main St., Penacook, N.H. 03301** p. 2664
Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 ..... *
Data Precision Corporation, Dept. EM, Audubon Rd., Wakefield, Mass 01880 p. 2706,2707
Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 ..... *
Doric Sci., Div. Emerson Elec. Co., Dept. EM, 3883 Ruffin Rd., San Diego, Cal. 92123 ..... p. 2715
M **Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550** .. *
Electro Industries, Dept. EM, 109 Nassau Dr., Albertson, NY 11507 ..... *
D **Electro-Mechanical Instru. Div., Sheller-Globe Corp., Dept. EM, Box 368, Dublin, PA 18917** ..... p. 2722,2723
Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 ..... *
Faria Meter Corp., Dept. EM, 19 Faria Lane, Uncasville, Conn. 06382 p. 2747
D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043** p. 2736-2738
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** *
Gralex Inds., Div. Gen. Microwave, Dept. EM, 155 Marine St., Farmingdale, N.Y. 11735 ..... p. 2750
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
D **Hoyt Electrical Instr. Works, Dept. EM, 19 Linden St., Penacook, N.H. 03301** p. 2757
D **Jewell Electrical Instruments, Inc., Dept. EM, Grenier Field, Manchester, N.H. 03108** ..... p. 2764
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
Millivac Instruments, Inc., Dept. EM, Box 997, Curry Rd. Ext., Schnectady, N.Y. 12301 ..... *
D **Modutec, Inc., Dept. EM, 18 Marshall St., Norwalk, Conn. 06854** p. 2786,2788,2789
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705 ..... *
D **Philips Test & Measuring Instrs., Dept. EM, 85 McKee Dr., Mahwah, NJ 07430** ..... *
M **Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550** *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... *
D **Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817** p. 2826,2827
United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403 ..... *
D **Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114** ..... p. 2808-2813,2815,2816
D **Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523** ..... *
A & D Electrical Instruments, Dept. EM, 73-07 88th St., Glendale, N.Y. 11227
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
D Amprobe Instrument, Div. SOS Consolidated Inc., Dept. EM, 630 Merrick Rd., Lynbrook, N.Y. 11563
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
Assembled Products Co., Dept. EM, Box 750, St. Albans, Vt. 05478
D Bartlett-Emery Instrument Corp., Dept. EM, 14th & Ave. "M", Ft. Madison, Iowa 52627
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
D Data Tech, Div. of Penril Corp., Dept. EM, 2700 S. Fairview, Santa Ana, Cal. 92704
Dixson, Inc., Dept. EM, Box 1449, Grand Junction, Colo. 81501
Electrical Standards Div., E.S.R.S., Inc., Dept. EM, 7337 Greenbush, N. Hollywood, Cal. 91605
D Greibach Instr. Div., Electrical Inst. Svc., Inc., Dept. EM, 25 Dock St., Mt Vernon, N.Y. 10550
Hioki New York Corp., Dept. EM, 42-16 235th St., Douglaston, N.Y. 11363
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
M Ideal Precision Meter Co., Dept. EM, 214 Franklin St., Brooklyn, N. Y. 11222
IET Labs Inc., Dept. EM, 761 Old Country Rd, Westbury, N.Y. 11590
DM Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
Kikusui Elctrns. Corp., Dept. EM, 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154

Mura Corp., Dept. EM, 177 Cantiague Rock Rd, Westbury, NY 11590
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
D Shurite Meters, Dept. EM, 428 Chapel St., New Haven, Conn. 06508
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
D Velonex, Display Prods., Dept. EM, 560 Robert Ave., Santa Clara, Cal. 95050
Westinghouse Elec. Corp., Relay-Instr. Div., Dept. EM, 95 Orange St., Newark, N.J. 07101

Meters, Milliohm

Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 ..... *
Data Precision Corporation, Dept. EM, Audubon Rd., Wakefield, Mass 01880 p. 2706,2707
D Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D Non-Linear Sys., Inc., Dept. EM, 533 Stevens Ave., Solana Beach, Cal. 92075 *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... *
DM Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518 ..... *
D Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817 ..... *
D Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
D Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... *
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
DM Associated Research, Inc., Dept. EM, 6125 W. Howard St., Niles, Ill. 60648
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
D Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Mura Corp., Dept. EM, 177 Cantiague Rock Rd, Westbury, NY 11590
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Racal-Dana Instrus Inc., Dept. EM, 18912 Von Karman Ave., Irvine, Cal. 92715
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
UCE, Inc., Dept. EM, 20 N. Main St., Norwalk, Conn. 06854
Valhalla Scientific, Inc., Dept. EM, 7707 Convoy Ct., San Diego, Cal. 92111

Meters, Millivolt

Airpax Elctrns., Controls Div., Dept. EM, 6801 W. Sunrise Blvd., Ft. Lauderdale, Fla. 33313 ..... p. 2258
D Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005 ..... *
D Beede Electrical Instr. Co., Dept. EM, S. Main St., Penacook, N.H. 03301 .... *
Boonton Electronics Corp., Dept. EM, Route #287, Parsippany, N.J. 07054 *
Data Precision Corporation, Dept. EM, Audubon Rd., Wakefield, Mass 01880 p. 2706,2707
Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 ..... *
Doric Sci., Div. Emerson Elec. Co., Dept. EM, 3883 Ruffin Rd., San Diego, Cal. 92123 ..... p. 2715
Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ..... *
Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 .. *
Electro-Mechanical Instru. Div., Sheller-Globe Corp., Dept. EM, Box 368, Dublin, PA 18917 ..... *
D Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 ..... *
D Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 p. 2736-2738,2740
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
M General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 *
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 p. 2753
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
Hoyt Electrical Instr. Works, Dept. EM, 19 Linden St., Penacook, N.H. 03301 *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
D Jewell Electrical Instruments, Inc., Dept. EM, Grenier Field, Manchester, N.H. 03108 ..... p. 2764
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... *
Millivac Instruments, Inc., Dept. EM, Box 997, Curry Rd. Ext., Schnectady, N.Y. 12301 ..... p. 2784
D Modutec, Inc., Dept. EM, 18 Marshall St., Norwalk, Conn. 06854 p. 2788,2789
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D Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705 ..... *
D Philips Test & Measuring Instrs., Dept. EM, 85 McKee Dr., Mahwah, NJ 07430 ..... *
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... *
DM Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518 ..... *
D Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817 p. 2826,2827
D United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403 ..... *
D Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... p. 2808
D Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... *
A & D Electrical Instruments, Dept. EM, 73-07 88th St., Glendale, N.Y. 11227
D Amprobe Instrument, Div. SOS Consolidated Inc., Dept. EM, 630 Merrick Rd., Lynbrook, N.Y. 11563
Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
Assembled Products Co., Dept. EM, Box 750, St. Albans, Vt. 05478
D Bartlett-Emery Instrument Corp., Dept. EM, 14th & Ave. "M", Ft. Madison, Iowa 52627
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
D Data Tech, Div. of Penril Corp., Dept. EM, 2700 S. Fairview, Santa Ana, Cal. 92704
D Greibach Instr. Div., Electrical Inst. Svc., Inc., Dept. EM, 25 Dock St., Mt Vernon, N.Y. 10550
Hioki New York Corp., Dept. EM, 42-16 235th St., Douglaston, N.Y. 11363
Hy-Cal Engrg, Dept. EM, 12105 Los Nietos Rd., Santa Fe Springs, Cal 90670
M Ideal Precision Meter Co., Dept. EM, 214 Franklin St., Brooklyn, N. Y. 11222
D Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
Kikusui Elctrns. Corp., Dept. EM, 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Mura Corp., Dept. EM, 177 Cantiague Rock Rd, Westbury, NY 11590
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
Racal-Dana Instrus Inc., Dept. EM, 18912 Von Karman Ave., Irvine, Cal. 92715
D Shurite Meters, Dept. EM, 428 Chapel St., New Haven, Conn. 06508
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
D Velonex, Display Prods., Dept. EM, 560 Robert Ave., Santa Clara, Cal. 95050
Westinghouse Elec. Corp., Relay-Instr. Div., Dept. EM, 95 Orange St., Newark, N.J. 07101

Meters, Modulation

Boonton Electronics Corp., Dept. EM, Route #287, Parsippany, N.J. 07054 p. 2665
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
London Co., Dept. EM, 811 Sharon Dr., Westlake, Ohio 44145 ..... *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... p. 2780,2781
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
M Racal-Dana Instrus Inc., Dept. EM, 18912 Von Karman Ave., Irvine, Cal. 92715

Meters, Moving Scale

Hoyt Electrical Instr. Works, Dept. EM, 19 Linden St., Penacook, N.H. 03301 p. 2757
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Servo-Tek Prods. Co., Dept. EM, 1086 Goffle Rd., Hawthorne, N.J. 07506 .. *
D Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017

Meters, Multitester

D B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Data Precision Corporation, Dept. EM, Audubon Rd., Wakefield, Mass 01880 p. 2706,2707
D Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 p. 2736-2738
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 *
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
D Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803 p. 2774
Millivac Instruments, Inc., Dept. EM, Box 997, Curry Rd. Ext., Schnectady, N.Y. 12301 ..... p. 2785
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Non-Linear Sys., Inc., Dept. EM, 533 Stevens Ave., Solana Beach, Cal. 92075 *
D Philips Test & Measuring Instrs., Dept. EM, 85 McKee Dr., Mahwah, NJ 07430 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 .... p. 2820
DM Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518 ..... *

D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
D Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817 p. 2828,2829
D Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
D Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... *
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
D Amprobe Instrument, Div. SOS Consolidated Inc., Dept. EM, 630 Merrick Rd., Lynbrook, N.Y. 11563
DM Associated Research, Inc., Dept. EM, 6125 W. Howard St., Niles, Ill. 60648
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Epic, Inc., Dept. EM, 150 Nassau St., New York, N.Y. 10038
D Herald Electronics, Dept. EM, 6611 N. Lincoln Ave., Chicago, Ill. 60645
Hioki New York Corp., Dept. EM, 42-16 235th St., Douglaston, N.Y. 11363
D Mura Corp., Dept. EM, 177 Cantiague Rock Rd, Westbury, NY 11590
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
M Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
Schauer Mfg. Corp., Dept. EM, 4500 Alpine Ave., Cincinnati, Ohio 45242
D Sencore, Dept. EM, 3200 Sencore Dr., Sioux Falls, S.D. 57107
D SPECO Div, Components Specialties, Inc., Dept. EM, PO Box 624 1172 Rte 109, Linderhurst, NY 11757
Sticht Co., Inc. Herman H., Dept. EM, 27 Park Pl., New York, N.Y. 10007
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518

Meters, Multitester (Digital)

D B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 ..... p. 2674,2675
D Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005 ..... *
D California Instrs., Dept. EM, 5150-Convoy St., San Diego, Cal. 92111 ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Data Precision Corporation, Dept. EM, Audubon Rd., Wakefield, Mass 01880 p. 2706,2707
Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ..... p. 2713
Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 .. *
DM Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 p. 2736-2738,2740
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 p. 2767
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803 p. 2775
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D Non-Linear Sys., Inc., Dept. EM, 533 Stevens Ave., Solana Beach, Cal. 92075 p. 2794
Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... p. 3609
D Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 .... p. 2820
DM Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518 ..... *
D Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817 ..... p. 2829
United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403 ..... p. 2832
VIZ Manufacturing Co., Dept. EM, 335 E. Price St., Phila, Pa. 19144 ..... *
D Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... p. 2808
D Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... *
M Cubic Corp., Dept. EM, 9233 Balboa Ave., San Diego, Cal. 92123
Data Tech, Div. of Penril Corp., Dept. EM, 2700 S. Fairview, Santa Ana, Cal. 92704
D Dumont Oscilloscope Labs., Dept. EM, 40 Fairfield Pl., W. Caldwell, N.J. 07006
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
Hioki New York Corp., Dept. EM, 42-16 235th St., Douglaston, N.Y. 11363
IET Labs Inc., Dept. EM, 761 Old Country Rd, Westbury, N.Y. 11590
Kikusui Elctrns. Corp., Dept. EM, 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
Racal-Dana Instrus Inc., Dept. EM, 18912 Von Karman Ave., Irvine, Cal. 92715
D REI Sales Co., Dept. EM, 1 North Ave, Burlington, Mass. 01803
D Sencore, Dept. EM, 3200 Sencore Dr., Sioux Falls, S.D. 57107
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077

Meters, Multitester (Potentiometric)

D Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 *
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 p. 2753
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
DM Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518 ..... *
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462

Meters, Nanoampere

D Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 *
M General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 *
Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
Modutec, Inc., Dept. EM, 18 Marshall St., Norwalk, Conn. 06854 ..... p. 2788
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705 ..... *
Capintec Instruments, Inc., Dept. EM, 136 Summit Ave., Montvale, N.J. 07645
Dantronics, Inc., Dept. EM, 3175 Hafner Ct., St. Paul, Minn 55112
D EMI Gencom Inc., Dept. EM, 80 Express St., Plainview, N.Y. 11803
D Greibach Instr. Div., Electrical Inst. Svc., Inc., Dept. EM, 25 Dock St., Mt Vernon, N.Y. 10550

Meters, Nanovolt

D Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 *
M General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 *
Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... p. 2771
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *

Meters, Noise-Figure

BBN Instruments Co., Div. Bolt Beranek & Newman, Inc., Dept. EM, 50 Moulton St., Cambridge, Mass. 02138 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... *
D Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817 ..... *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
D Ailtech, Dept. EM, 2070 Fifth Ave, Ronkonkoma, NY 11779
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
Electro-Metrics, Div. Penril Corp., Dept. EM, 100 Church St., Amsterdam, N.Y. 12010

Meters, Noise & Sound Level

BBN Instruments Co., Div. Bolt Beranek & Newman, Inc., Dept. EM, 50 Moulton St., Cambridge, Mass. 02138 ..... *
Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 ..... *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... *
Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... *
D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
D Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817 p. 2826,2827
API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
Edmund Scientific Co., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
IRD Mechanalysis, Inc., Dept. EM, 6150 Huntley Rd., Columbus, Ohio 43229
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Metrosonics, Inc., Dept. EM, Box 18090, Rochester, N.Y. 14618
Mine Safety Appliances Co., Dept. EM, 600 Penn Center Blvd., Pittsburgh, Pa 15235
TSI Inc, Dept. EM, 500 Cardigan Rd., Box 3394, St. Paul, Minn. 55165

Meters, Null

D Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005 ..... *
Doric Sci., Div. Emerson Elec. Co., Dept. EM, 3883 Ruffin Rd., San Diego, Cal. 92123 ..... *
Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ..... p. 2710-2712
Electronic Dev. Corp., Dept. EM, 11 Hamlin St., Boston, Mass. 02127 ..... *
D Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 *
Freed Transformer Co., Inc., Dept. EM, 1718 Weirfield St., Brooklyn, N.Y. 11227 ..... p. 2749
M General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
D Jewell Electrical Instruments, Inc., Dept. EM, Grenier Field, Manchester, N.H. 03108 ..... p. 2764
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
D Modutec, Inc., Dept. EM, 18 Marshall St., Norwalk, Conn. 06854 ..... p. 2788
M North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803 ..... *
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... *
D Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817 p. 2826,2827
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
A & D Electrical Instruments, Dept. EM, 73-07 88th St., Glendale, N.Y. 11227
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
Assembled Products Co., Dept. EM, Box 750, St. Albans, Vt. 05478
D Bartlett-Emery Instrument Corp., Dept. EM, 14th & Ave. "M", Ft. Madison, Iowa 52627
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
Dixson, Inc., Dept. EM, Box 1449, Grand Junction, Colo. 81501

Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
D Greibach Instr. Div., Electrical Inst. Svc., Inc., Dept. EM, 25 Dock St., Mt Vernon, N.Y. 10550
D Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962
D LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Mura Corp., Dept. EM, 177 Cantiague Rock Rd, Westbury, NY 11590
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760
Westinghouse Elec. Corp., Relay-Instr. Div., Dept. EM, 95 Orange St., Newark, N.J. 07101
Zi-Tech Div., Aikenwood Corp., Dept. EM, Box 26, 2151 Park Blvd., Palo Alto, Cal. 94302

Meters, Ohm

Airpax Elctrns., Controls Div., Dept. EM, 6801 W. Sunrise Blvd., Ft. Lauderdale, Fla. 33313 ..... *
D B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 ..... *
D California Instrs., Dept. EM, 5150-Convoy St., San Diego, Cal. 92111 ..... *
D Cutler-Hammer, Shallcross Resistor Prods., Dept. EM, US 70 East, Smithfield, N.C. 27577 ..... *
Data Precision Corporation, Dept. EM, Audubon Rd., Wakefield, Mass 01880 p. 2706,2707
Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ..... *
D Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 p. 2736-2738
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 p. 2753
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
D Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803 *
London Co., Dept. EM, 811 Sharon Dr., Westlake, Ohio 44145 ..... p. 2803
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... p. 2790
D Philips Test & Measuring Instrs., Dept. EM, 85 McKee Dr., Mahwah, NJ 07430 ..... *
Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 .... p. 2820
Slaughter Co., Dept. EM, Moore & Hailey Sts., P.O. Box 1805, Ardmore, Okla. 73401 ..... p. 2823
DM Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518 ..... *
D Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817 p. 2828,2829
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
D Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... *
D Amprobe Instrument, Div. SOS Consolidated Inc., Dept. EM, 630 Merrick Rd., Lynbrook, N.Y. 11563
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
D Associated Research, Inc., Dept. EM, 6125 W. Howard St., Niles, Ill. 60648
Beckman Instrs., Cedar Grove Opers., Dept. EM, 89 Commerce Rd., Cedar Grove, N.J. 07009
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
D Data Tech, Div. of Penril Corp., Dept. EM, 2700 S. Fairview, Santa Ana, Cal. 92704
D Davidson Electronic Development Co., Dept. EM, 2211 Peninsula Dr., Erie, Pa. 16506
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
Hioki New York Corp., Dept. EM, 42-16 235th St., Douglaston, N.Y. 11363
D Holub Industries, Dept. EM, 413 DeKalb Ave., Sycamore, Ill. 60178
IET Labs Inc., Dept. EM, 761 Old Country Rd, Westbury, N.Y. 11590
D Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
Kikusui Elctrns. Corp., Dept. EM, 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Meguro Electronics Corp, Dept. EM, No. 5-1 2-Chome Chuo Meguro-ku, Tokyo, Japan
Mura Corp., Dept. EM, 177 Cantiague Rock Rd, Westbury, NY 11590
National Camera Inc., Dept. EM, 2000 W. Union Ave., Englewood, Colo. 80110
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
Racal-Dana Instrus Inc., Dept. EM, 18912 Von Karman Ave., Irvine, Cal. 92715
Sticht Co., Inc. Herman H., Dept. EM, 27 Park Pl., New York, N.Y. 10007
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
D T & B/Thomas & Betts, Dept. EM, 36 Butler St., Elizabeth, N.J. 07207
Valhalla Scientific, Inc., Dept. EM, 7707 Convoy Ct., San Diego, Cal. 92111

Meters, Output

D Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... *
D Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817 p. 2826,2827
Electro-Dynamics Dev. Co., Dept. EM, 475 Mt. Hood Dr. S.W., Issaquah, Wash 98027
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016

Meters, Panel (Analog)

Airpax Elctrns., Controls Div., Dept. EM, 6801 W. Sunrise Blvd., Ft. Lauderdale, Fla. 33313 ..... *
D Beede Electrical Instr. Co., Dept. EM, S. Main St., Penacook, N.H. 03301 .... *
Faria Meter Corp., Dept. EM, 19 Faria Lane, Uncasville, Conn. 06382 p. 2747
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Gulton Inds., Inc., Measurement & Control Systems Div., Dept. EM, Gulton Ind'l. Pk., E. Greenwich, R.I. 02818 ..... *
Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
Hoyt Electrical Instr. Works, Dept. EM, 19 Linden St., Penacook, N.H. 03301 *
D Jewell Electrical Instruments, Inc., Dept. EM, Grenier Field, Manchester, N.H. 03108 ..... p. 2764
Modutec, Inc., Dept. EM, 18 Marshall St., Norwalk, Conn. 06854 ..... *
D Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 .... p. 2821
D Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817 p. 2826,2827
Assembled Products Co., Dept. EM, Box 750, St. Albans, Vt. 05478
Hioki New York Corp., Dept. EM, 42-16 235th St., Douglaston, N.Y. 11363
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201

Meters, Panel (D'Arsonval Movement)

Airpax Elctrns., Controls Div., Dept. EM, 6801 W. Sunrise Blvd., Ft. Lauderdale, Fla. 33313 ..... *
D Beede Electrical Instr. Co., Dept. EM, S. Main St., Penacook, N.H. 03301 p. 2664
Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 p. 2825
D Electro-Mechanical Instru. Div., Sheller-Globe Corp., Dept. EM, Box 368, Dublin, PA 18917 ..... p. 2722
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
Hoyt Electrical Instr. Works, Dept. EM, 19 Linden St., Penacook, N.H. 03301 p. 2757
D ISL Products Ltd. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803 *
D Jewell Electrical Instruments, Inc., Dept. EM, Grenier Field, Manchester, N.H. 03108 ..... p. 2764,2765
D Modutec, Inc., Dept. EM, 18 Marshall St., Norwalk, Conn. 06854 p. 2786-2789
Ohio Semitronics, Inc., Dept. EM, 1205 Chesapeake Ave., Columbus, Ohio 43212 ..... *
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 p. 2825
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... *
D Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817 p. 2826,2827
D Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... p. 2809,2812-2816,2819
A & D Electrical Instruments, Dept. EM, 73-07 88th St., Glendale, N.Y. 11227
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
D Bartlett-Emery Instrument Corp., Dept. EM, 14th & Ave. "M", Ft. Madison, Iowa 52627
Dixson, Inc., Dept. EM, Box 1449, Grand Junction, Colo. 81501
M Ideal Precision Meter Co., Dept. EM, 214 Franklin St., Brooklyn, N. Y. 11222
D Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
D JPI, Inc., Dept. EM, 1507 San Vicente Blvd., Santa Monica, Cal. 90402
Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Mura Corp., Dept. EM, 177 Cantiague Rock Rd, Westbury, NY 11590
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
M Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
Westinghouse Elec. Corp., Relay-Instr. Div., Dept. EM, 95 Orange St., Newark, N.J. 07101

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Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005 ..... p. 2663
D California Instrs., Dept. EM, 5150-Convoy St., San Diego, Cal. 92111 ..... *
Data Precision Corporation, Dept. EM, Audubon Rd., Wakefield, Mass 01880 *
Data Translation, Dept. EM, 4 Strathmore Rd., Natick, Mass. 01760 ..... *
Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 p. 2687
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Electro Industries, Dept. EM, 109 Nassau Dr., Albertson, NY 11507 ..... *
D Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 *
M General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 *
Gralex Inds., Div. Gen. Microwave, Dept. EM, 155 Marine St., Farmingdale, N.Y. 11735 ..... p. 2750,2751
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705 p. 2792

D **Non-Linear Sys., Inc., Dept. EM, 533 Stevens Ave., Solana Beach, Cal. 92075 p. 2794**
North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803 ..... *
Ohio Semitronics, Inc., Dept. EM, 1205 Chesapeake Ave., Columbus, Ohio 43212 ..... *
Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 ..... p. 4285
Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 p. 2820,2821
DM **Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518 ..... ***
United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403 ..... p. 2832
D **Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... p. 2808**
Ampower Electronic Instr. Co., Dept. EM, 500 Union Blvd., Totowa, N. J. 07512
Anadex Inc., Dept. EM, 9825 De Soto, Chatsworth, Cal. 91311
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
D Analogic Corp., Dept. EM, Audubon Rd., Wakefield, Mass. 01880
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
Assembled Products Co., Dept. EM, Box 750, St. Albans, Vt. 05478
C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
Consolidated Controls Corp., Dept. EM, 15 Durant Ave., Bethel, Conn. 06801
Data Tech, Div. of Penril Corp., Dept. EM, 2700 S. Fairview, Santa Ana, Cal. 92704
Electro-Numerics Inc., Dept. EM, 1811 Reynolds, Irvine, Cal. 92714
Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
Haydon Switch & Instr., Inc., Dept. EM, 1500 Meriden Rd., Waterbury, Conn. 06705
Indl Timer An Esterline Co., Dept. EM, U.S. Hwy 287, Parsippany, N.J. 07054
D JPI, Inc., Dept. EM, 1507 San Vicente Blvd., Santa Monica, Cal. 90402
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Meterex Corp., Dept. EM, 646 Summer St., Brockton, Mass. 02402
Siltran Digital, Dept. EM, 14831 Kitterman, Box 437, Silverado, Cal. 92676
Sunshine Sci. Instrs., Inc., Dept EM, 1810 Grant Ave., Philadelphia, Pa. 19115
D Velonex, Display Prods., Dept. EM, 560 Robert Ave., Santa Clara, Cal. 95050

Meters, Peak Power

Bird Electronic Corp., Dept. EM, 30303 Aurora Rd., Solon, Ohio 44139 p. 2668
Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 ..... *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 ***
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
Pacific Meas., Inc., Dept. EM, 470 San Antonio Rd, Palo Alto, Calif. 94306
Republic Elctrn. Inds. Corp., Dept. EM, 575 Broad Hollow Rd., Melville, N.Y. 11746
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760

Meters, Phase-Angle

Bafco, Inc., Dept. EM, 717 Mearns Rd., Warminster, Pa. 18974 ..... *
Chesterfield Prods. Inc., Dept. EM, 511A Victor St., Saddle Brook, N.J. 07662 *
M **Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731 ..... ***
Comstron Seg., Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520 ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
M **Control Elctrns. Co., Inc., Dept. EM, 153 Florida St., Farmingdale, N.Y. 11735 ***
M **Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ..... p. 2710-2713**
M **Dytronics Co., Inc., Dept. EM, 4800 Evanswood Dr., Columbus, Ohio 43229 p. 2718**
Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
M **Krohn-Hite Corp., Dept. EM, Avon Ind'l Pk, Bodwell St., Avon, Mass. 02322 p. 2772**
M **North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803 ..... ***
Ohio Semitronics, Inc., Dept. EM, 1205 Chesapeake Ave., Columbus, Ohio 43212 ..... *
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
Wavetek Indiana, Inc., Dept. EM, 66 N. First Ave., Beech Grove, Ind. 46107 *
D **Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... ***
Evans Assocs., Dept. EM, Box 5055, Berkeley, Cal. 94705
Gorman-Redlich Mfg. Co., Dept. EM, 6 Curtis St., Athens, Ohio 45701
Multimetrics Div. of Comstro, Comstron-Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11580
Seg Subsidiary, Comstron Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
Tracor, Inc., Dept. EM, 6500 Tracor La., Austin, Tex. 78721
Video Research Corporation, Dept. EM, 6985 Garden Rd., Riviera Beach, Fla. 33404
Westinghouse Elec. Corp., Relay-Instr. Div., Dept. EM, 95 Orange St., Newark, N.J. 07101

Meters, Phase Vector Volt

Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ..... p. 2710-2712
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803 p. 1658,2795
RFL Inds., Instr. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005 p. 2807
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
Gorman-Redlich Mfg. Co., Dept. EM, 6 Curtis St., Athens, Ohio 45701
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
Princeton Applied Resch. Corp., Dept. EM, Box 2565, Princeton, N.J. 08540
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
D Wiltron Co., Dept. EM, 825 E. Middlefield Rd., Mt. View, Cal 94043

Meters, Picoampere

M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 ***
Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... p. 2771
London Co., Dept. EM, 811 Sharon Dr., Westlake, Ohio 44145 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
Capintec Instruments, Inc., Dept. EM, 136 Summit Ave., Montvale, N.J. 07645
D EMI Gencom Inc., Dept. EM, 80 Express St., Plainview, N.Y. 11803
D Greibach Instr. Div., Electrical Inst. Svc., Inc., Dept. EM, 25 Dock St., Mt Vernon, N.Y. 10550
M Harshaw Chemical Co., A Kenanee Industry, Dept. EM, 6801 Cochran Rd., Solon, Ohio 44139

Meters, Power, AC

Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005 ..... p. 2663
Electro Industries, Dept. EM, 109 Nassau Dr., Albertson, NY 11507 ..... *
Hoyt Electrical Instr. Works, Dept. EM, 19 Linden St., Penacook, N.H. 03301 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Ohio Semitronics, Inc., Dept. EM, 1205 Chesapeake Ave., Columbus, Ohio 43212 ..... p. 4303,4305
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... ***
Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817 p. 2826,2827
D **Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... ***
Ampower Electronic Instr. Co., Dept. EM, 500 Union Blvd., Totowa, N. J. 07512
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Zi-Tech Div., Aikenwood Corp., Dept. EM, Box 26, 2151 Park Blvd., Palo Alto, Cal. 94302

Meters, Power DC

NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Ohio Semitronics, Inc., Dept. EM, 1205 Chesapeake Ave., Columbus, Ohio 43212 ..... *
Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817 ..... *
D **Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... ***
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016

Meters, Power Factor

Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 ..... *
Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ..... *
Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 .. *
Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 ..... *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Ohio Semitronics, Inc., Dept. EM, 1205 Chesapeake Ave., Columbus, Ohio 43212 ..... p. 4303
RFL Inds., Instr. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005 p. 2807
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
D **Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... ***
Beckman Instrs., Cedar Grove Opers., Dept. EM, 89 Commerce Rd., Cedar Grove, N.J. 07009
Hioki New York Corp., Dept. EM, 42-16 235th St., Douglaston, N.Y. 11363
Micro Instrument Co., Marine & Power Instr. Div., Dept. EM, 2250 Micro Pl., Escondido, Cal. 92025
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201

Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
Westinghouse Elec. Corp., Relay-Instr. Div., Dept. EM, 95 Orange St., Newark, N.J. 07101

Meters, Power, R-F

D **Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005** ..... *
The Bendix Corp., Electrical Comp. Div., Dept. EM, Sidney, NY 13838 ..... *
M **Bird Electronic Corp., Dept. EM, 30303 Aurora Rd., Solon, Ohio 44139** p. 2668
Boonton Electronics Corp., Dept. EM, Route #287, Parsippany, N.J. 07054 p. 2665
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
M **Electro Impulse, Dept. EM, Box 870, Red Bank, N.J. 07701** ..... p. 2720
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** p. 2870
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D **Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108** *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *
DM **Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518** ..... *
D **Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817** ..... *
D **Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114** ..... *
D Antenna Incorporated, Dept. EM, 26301 Richmond Road, Cleveland, Ohio 44126
Comdel, Inc., Dept. EM, Beverly Airport, Beverly, Mass. 01915
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
D Mobil Electronics, Inc., Dept. EM, Box 1132, Anderson, Ind. 46015
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
Pacific Meas., Inc., Dept. EM, 470 San Antonio Rd, Palo Alto, Calif. 94306
Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
M Reeve Electronics, Inc., Dept. EM, 609 W. Lake St., Chicago, Ill 60606
D REI Sales Co., Dept. EM, 1 North Ave, Burlington, Mass. 01803
Sivers Lab, Dept. EM, Box 90339, Los Angeles, Cal. 90009
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518

Meters, Pyrometer

D **Beede Electrical Instr. Co., Dept. EM, S. Main St., Penacook, N.H. 03301** .... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
D **Jewell Electrical Instruments, Inc., Dept. EM, Grenier Field, Manchester, N.H. 03108** ..... p. 2764
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
London Co., Dept. EM, 811 Sharon Dr., Westlake, Ohio 44145 ..... *
D **Modutec, Inc., Dept. EM, 18 Marshall St., Norwalk, Conn. 06854** ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D **Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705** ..... *
Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 ..... *
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** ..... *
D **Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817** p. 2826,2827
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
DM Alnor Instrument Co., Dept. EM, 7301 N. Caldwell Ave., Niles, Ill. 60648
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
Bailey Instrs., Inc., Dept. EM, 515 Victor St., Saddle Brook, N.J. 07662
D Bartlett-Emery Instrument Corp., Dept. EM, 14th & Ave. "M", Ft. Madison, Iowa 52627
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
Caig Labs., Inc., Dept. EM, 1175-0 Industrial Ave., Box 64, Escondido, Cal. 92025
Capintec Instruments, Inc., Dept. EM, 136 Summit Ave., Montvale, N.J. 07645
D Epic, Inc., Dept. EM, 150 Nassau St., New York, N.Y. 10038
Hades Mfg Corp., Dept. EM, 151-A Verdi St., Farmingdale, N.Y. 11735
D Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
Ircon Inc., Dept. EM, 7555 N. Linder Ave, Skokie, Ill. 60076
Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
NAN MAC, Dept. EM, 9 Mayhew St., Framingham, Mass. 01701
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
Thermo Elec. Co., Inc., Dept. EM, 109 Fifth St., Saddle Brook, N.J. 07662
Trans-Met Engrg., Dept. EM, 601 S. Palm St., La Habra, Cal. 90631

Meters, Q

Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... p. 2782
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
Meguro Electronics Corp, Dept. EM, No. 5-1 2-Chome Chuo Meguro-ku, Tokyo, Japan

Meters, R-F

D **Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005** ..... *
The Bendix Corp., Electrical Comp. Div., Dept. EM, Sidney, NY 13838 ..... *
M **Bird Electronic Corp., Dept. EM, 30303 Aurora Rd., Solon, Ohio 44139** p. 2668
Boonton Electronics Corp., Dept. EM, Route #287, Parsippany, N.J. 07054 p. 2665
D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043** *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** p. 2870
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 *
International Crystal Mfg., Dept. EM, 10 N. Lee St., Oklahoma City, Okla. 73102 ..... *
D **Modutec, Inc., Dept. EM, 18 Marshall St., Norwalk, Conn. 06854** ..... p. 2788
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** ..... *
D **Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817** ..... *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
D **Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523** ..... *
D Antenna Incorporated, Dept. EM, 26301 Richmond Road, Cleveland, Ohio 44126
D Bartlett-Emery Instrument Corp., Dept. EM, 14th & Ave. "M", Ft. Madison, Iowa 52627
M Coleman Microwave Co., Dept. EM, Box 59, Rte. 22, Lebanon, N.J. 08833
Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962
Pacific Meas., Inc., Dept. EM, 470 San Antonio Rd, Palo Alto, Calif. 94306
M Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
Reeve Electronics, Inc., Dept. EM, 609 W. Lake St., Chicago, Ill 60606

Meters, Ratio

Bafco, Inc., Dept. EM, 717 Mearns Rd., Warminster, Pa. 18974 ..... *
California Instrs., Dept. EM, 5150-Convoy St., San Diego, Cal. 92111 ..... *
Data Precision Corporation, Dept. EM, Audubon Rd., Wakefield, Mass 01880 *
Doric Sci., Div. Emerson Elec. Co., Dept. EM, 3883 Ruffin Rd., San Diego, Cal. 92123 ..... *
Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 ..... *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** *
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 p. 2753
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Ithaco, Inc., Dept. EM, 735 W. Clinton St., Ithaca, N.Y. 14850 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D **Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705** p. 2792
M **North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803** ..... *
Philips Test & Measuring Instrs., Dept. EM, 85 McKee Dr., Mahwah, NJ 07430 ..... p. 2799
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *
D **United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403** ..... *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
Bailey Meter Co., Sub. Babcock & Wilcox, Dept. EM, 29801 Euclid Ave., Wickliffe, Ohio 44092
Data Tech, Div. of Penril Corp., Dept. EM, 2700 S. Fairview, Santa Ana, Cal. 92704
D Dynapar Corp., Dept. EM, 1675 Delany Rd., Gurnee, Ill. 60031
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
Evans Assocs., Dept. EM, Box 5055, Berkeley, Cal. 94705
MSI Electronics, Inc., Dept. EM, 34-32 57th St., Woodside, N.Y. 11377
Pacific Meas., Inc., Dept. EM, 470 San Antonio Rd, Palo Alto, Calif. 94306
Racal-Dana Instrus Inc., Dept. EM, 18912 Von Karman Ave., Irvine, Cal. 92715
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760

Meters, Reflectometer

M **Bird Electronic Corp., Dept. EM, 30303 Aurora Rd., Solon, Ohio 44139** ..... *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
Beckman Instrs., (AISSD), Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634
M Dielectric Comms, Unit of Gen Signal, Dept. EM, Raymond, Maine 04071
Gamma Scientific Inc., Dept. EM, 3777 Ruffin Rd., San Diego, Cal. 92123
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
Pacific Meas., Inc., Dept. EM, 470 San Antonio Rd, Palo Alto, Calif. 94306
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
D Sencore, Dept. EM, 3200 Sencore Dr., Sioux Falls, S.D. 57107
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760

Meters, RFI

Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043** *
Instruments for Industry, Inc., Dept. EM, 151 Toledo St., Farmingdale, N.Y. 11735 ..... *
M **Polarad Elctrn. Instrs., Dept. EM, 5 Delaware Dr., Lake Success, N.Y. 11040** *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
M Electro-Metrics, Div. Penril Corp., Dept. EM, 100 Church St., Amsterdam, N.Y. 12010
M Norlin Communications Inc., Dept. EM, 9125 Gaither Rd., Gaithersburg, Md. 20760

Meters, S-Unit

D **Jewell Electrical Instruments, Inc., Dept. EM, Grenier Field, Manchester, N.H. 03108** ..... p. 2764
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Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
A & D Electrical Instruments, Dept. EM, 73-07 88th St., Glendale, N.Y. 11227
D Bartlett-Emery Instrument Corp., Dept. EM, 14th & Ave. "M", Ft. Madison, Iowa 52627

D Kris Inc., Dept. EM, N144 W5660 Pioneer Rd., Cedarburg, Wisc. 53012
Mura Corp., Dept. EM, 177 Cantiague Rock Rd, Westbury, NY 11590
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696

Meters, Snap-around—See Meters, Clamp-on

Meters, Standing Wave Ratio

M Bird Electronic Corp., Dept. EM, 30303 Aurora Rd., Solon, Ohio 44139 ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
M General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 *
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D Antenna Incorporated, Dept. EM, 26301 Richmond Road, Cleveland, Ohio 44126
M Dielectric Comms, Unit of Gen Signal, Dept. EM, Raymond, Maine 04071
D GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
D Kris Inc., Dept. EM, N144 W5660 Pioneer Rd., Cedarburg, Wisc. 53012
D Sencore, Dept. EM, 3200 Sencore Dr., Sioux Falls, S.D. 57107
Sivers Lab, Dept. EM, Box 90339, Los Angeles, Cal. 90009
Telco Products Co., Dept. EM, 44 Sea Cliff, Glen Cove, NY 11542
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Meters, Temperature (Contacting)

D Beede Electrical Instr. Co., Dept. EM, S. Main St., Penacook, N.H. 03301 p. 2664
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Doric Sci., Div. Emerson Elec. Co., Dept. EM, 3883 Ruffin Rd., San Diego, Cal. 92123 ..... p. 2714-2717
Ectron Corp., Dept. EM, 8159 Engineer Rd., San Diego, Cal. 92111 .... p. 2719
D Edsyn, Inc., Dept. EM, 15958 Arminta St., Van Nuys, Cal. 91406 ..... *
Faria Meter Corp., Dept. EM, 19 Faria Lane, Uncasville, Conn. 06382 ..... *
D Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 p. 2738,2739
Harrel, Inc., Dept. EM, 16 Fitch St., E. Norwalk, Conn. 06855 ..... p. 2267
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Modutec, Inc., Dept. EM, 18 Marshall St., Norwalk, Conn. 06854 ..... p. 2787
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... p. 2790
D Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705 p. 2793
Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 ..... *
RFL Inds., Thermocontrol Div., Dept. EM, Boonton, N.J. 07005 ..... p. 4286
D Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... *
D Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817 ..... *
United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403 ..... p. 2832
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
A & D Electrical Instruments, Dept. EM, 73-07 88th St., Glendale, N.Y. 11227
D Alnor Instrument Co., Dept. EM, 7301 N. Caldwell Ave., Niles, Ill. 60648
D Amprobe Instrument, Div. SOS Consolidated Inc., Dept. EM, 630 Merrick Rd., Lynbrook, N.Y. 11563
Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
D Analogic Corp., Dept. EM, Audubon Rd., Wakefield, Mass. 01880
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
Assembled Products Co., Dept. EM, Box 750, St. Albans, Vt. 05478
M Bailey Instrs., Inc., Dept. EM, 515 Victor St., Saddle Brook, N.J. 07662
Bailey Meter Co., Sub. Babcock & Wilcox, Dept. EM, 29801 Euclid Ave., Wickliffe, Ohio 44092
Capintec Instruments, Inc., Dept. EM, 136 Summit Ave., Montvale, N.J. 07645
M Columbia Resch. Labs., Dept. EM, Macdade Blvd. & Bullens La., Woodlyn, Pa. 19094
Control Products Corp., Dept. EM, 4431 W. Division St., Chicago, Ill. 60651
D EMI Gencom Inc., Dept. EM, 80 Express St., Plainview, N.Y. 11803
H-B Instr. Co., Dept. EM, 4306 N. American St, Philadelphia, Pa. 19140
Hy-Cal Engrg, Dept. EM, 12105 Los Nietos Rd., Santa Fe Springs, Cal 90670
Instrulab, Inc., Dept. EM, P.O.B 426 N.D. Sta., Dayton, Ohio 45404
Ircon Inc., Dept. EM, 7555 N. Linder Ave, Skokie, Ill. 60076
Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Mack Elec. Devices, Dept. EM, 32 Glenside Ave., Wyncote, Pa. 19095
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
Pace Inc., Dept. EM, 9329 Fraser Ave., Silver Spring, Md. 20910
Pak-Tronic Inc., Dept. EM, 4044 N Rockwell St, Chicago, Ill 60618
Stow Labs., Inc., Dept. EM, Kane Ind'l. Dr., Hudson, Mass. 01749
D Syscon Int'l., Inc., Dept. EM, 1239 South Bend Ave., So. Bend, Ind. 46617
Sys-Tec Inc., Dept. EM, 877 Third St. S.W., New Brighton, Minn. 55112
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Tempkey Inc., Dept. EM, 2155 Park Blvd., Palo Alto, Cal. 94306
Trans-Met Engrg., Dept. EM, 601 S. Palm St., La Habra, Cal. 90631
Valhalla Scientific, Inc., Dept. EM, 7707 Convoy Ct., San Diego, Cal. 92111
VirTis Co., Dept. EM, Rte. 208, Gardiner, N.Y. 12525
D West Instrs, Gulton Inds, M. C. S. Div., Dept. EM, Gulton Indl Pk, E. Greenwich, RI 02818
D Yellow Springs Instrument Co., Dept. EM, Box 279, Yellow Springs, Ohio 45387

Meters, Temperature, Dial-Type (Non-Contacting)—See Pyrometers

Meters, Thermal Transfer

D Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005 ..... p. 2663
Doric Sci., Div. Emerson Elec. Co., Dept. EM, 3883 Ruffin Rd., San Diego, Cal. 92123 ..... *
Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 .. *
D Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
Hy-Cal Engrg, Dept. EM, 12105 Los Nietos Rd., Santa Fe Springs, Cal 90670
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
Pak-Tronic Inc., Dept. EM, 4044 N Rockwell St, Chicago, Ill 60618
D TSI Inc, Dept. EM, 500 Cardigan Rd., Box 3394, St. Paul, Minn. 55165

Meters, Time Interval—See Timers, Interval

Meters, Vacuum Tube Volt (VTVM)

D B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 ..... p. 2675
D Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005 ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803 *
Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... *
D Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817 ..... *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
Kikusui Elctrns. Corp., Dept. EM, 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115

Meters, VAR

Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ..... *
Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Ohio Semitronics, Inc., Dept. EM, 1205 Chesapeake Ave., Columbus, Ohio 43212 ..... *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
Micro Instrument Co., Marine & Power Instr. Div., Dept. EM, 2250 Micro Pl., Escondido, Cal. 92025
TransData Inc., Dept. EM, P.O. Box 518, Dublin, Ohio 43017

Meters, Vibration

Chatsworth Data Corp, Cablemaster Div., Dept. EM, 20710 Lassen St., Chatsworth, Cal 91311 ..... p. 2680
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Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
M Dytronics Co., Inc., Dept. EM, 4800 Evanswood Dr., Columbus, Ohio 43229 *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Unholtz-Dickie Corp., Dept. EM, 3000 Whitney Ave., Hamden, Conn. 06518 p. 2575
D Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
Alpha-M Corp, Dept. EM, 3009 Wildflower Drive, Dallas, Tx. 75229
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
Bell & Howell Co., Elctrns. & Instrs. Grp., Dept. EM, 360 Sierra Madre Villa, Pasadena, Cal. 91109
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
M Columbia Resch. Labs., Dept. EM, Macdade Blvd. & Bullens La., Woodlyn, Pa. 19094
Endevco, Div. Becton, Dickinson & Co., Dept. EM, 30700 Rancho Viejo Rd., San Jaun Capistrano, Cal. 92675
D Epic, Inc., Dept. EM, 150 Nassau St., New York, N.Y. 10038
IRD Mechanalysis, Inc., Dept. EM, 6150 Huntley Rd., Columbus, Ohio 43229
Larson Aero Dev., Dept. EM, Box 135, Concord, Cal. 94522

Metrix Instrument Co., Metrix Instrument Co., Dept. EM, 1711 Townhurst, Houston, Tex. 77043
D Robertshaw Controls Co., Ind'l. Instr. Div., Dept. EM, 1910 Byrd Ave Ste 200, Richmond, Va. 23230
Spectral Dynamics Corp., Dept. EM, Box 671, San Diego, Cal. 92112
Sprengnether Instr. Co., W.F., Dept. EM, 4567 Swan St., St. Louis, Mo. 63110
D Vibra-Metrics, Inc., Dept. EM, 150 Bradley St., E. Haven, Conn. 06512

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Airpax Elctrns., Controls Div., Dept. EM, 6801 W. Sunrise Blvd., Ft. Lauderdale, Fla. 33313 ..... p. 2258
D ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845 ..... *
American Aerospace Controls, Dept. EM, 131 Verdi St., Farmingdale, N.Y. 11735 ..... p. 4299
D B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 ..... *
D Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005 ..... p. 2663
D Beede Electrical Instr. Co., Dept. EM, S. Main St., Penacook, N.H. 03301 .... *
Boonton Electronics Corp., Dept. EM, Route #287, Parsippany, N.J. 07054 *
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Data Precision Corporation, Dept. EM, Audubon Rd., Wakefield, Mass 01880 p. 2706,2707
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M Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 p. 2825
Electro Industries, Dept. EM, 109 Nassau Dr., Albertson, NY 11507 ..... *
D Electro-Mechanical Instru. Div., Sheller-Globe Corp., Dept. EM, Box 368, Dublin, PA 18917 ..... p. 2722,2723
Electronic Dev. Corp., Dept. EM, 11 Hamlin St., Boston, Mass. 02127 ..... *
D Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 ..... *
D Faria Meter Corp., Dept. EM, 19 Faria Lane, Uncasville, Conn. 06382 ..... *
D Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 p. 2736-2738,2745
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
D General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
M General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 *
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Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 p. 2753
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
Instruments for Industry, Inc., Dept. EM, 151 Toledo St., Farmingdale, N.Y. 11735 ..... p. 2763
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D Modutec, Inc., Dept. EM, 18 Marshall St., Norwalk, Conn. 06854 p. 2788,2789
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M Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... *
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D Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... *
DM Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518 ..... *
D Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817 p. 2826-2829
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D Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... *
A & D Electrical Instruments, Dept. EM, 73-07 88th St., Glendale, N.Y. 11227
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
D Amprobe Instrument, Div. SOS Consolidated Inc., Dept. EM, 630 Merrick Rd., Lynbrook, N.Y. 11563
Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Analogic Corp., Dept. EM, Audubon Rd., Wakefield, Mass. 01880
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
Assembled Products Co., Dept. EM, Box 750, St. Albans, Vt. 05478
D Associated Research, Inc., Dept. EM, 6125 W. Howard St., Niles, Ill. 60648
D Bartlett-Emery Instrument Corp., Dept. EM, 14th & Ave. "M", Ft. Madison, Iowa 52627
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
Data Tech, Div. of Penril Corp., Dept. EM, 2700 S. Fairview, Santa Ana, Cal. 92704
Edmund Scientific Co., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007
Electrical Standards Div., E.S.R.S., Inc., Dept. EM, 7337 Greenbush, N. Hollywood, Cal. 91605
D Greibach Instr. Div., Electrical Inst. Svc., Inc., Dept. EM, 25 Dock St., Mt Vernon, N.Y. 10550
D Holub Industries, Dept. EM, 413 DeKalb Ave., Sycamore, Ill. 60178
M Ideal Precision Meter Co., Dept. EM, 214 Franklin St., Brooklyn, N. Y. 11222
IET Labs Inc., Dept. EM, 761 Old Country Rd, Westbury, N.Y. 11590
D Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
Kikusui Elctrns. Corp., Dept. EM, 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
Lambda Elctrns., Dept. EM, 515 Brd. Hollow Rd., Melville, N.Y. 11746
Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Meguro Electronics Corp, Dept. EM, No. 5-1 2-Chome Chuo Meguro-ku, Tokyo, Japan
Micro Instrument Co., Marine & Power Instr. Div., Dept. EM, 2250 Micro Pl., Escondido, Cal. 92025
Mura Corp., Dept. EM, 177 Cantiague Rock Rd, Westbury, NY 11590
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Power-Science, Inc., Dept. EM, 8076 Engineer Rd., San Diego, Cal. 92111
M Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
D Shurite Meters, Dept. EM, 428 Chapel St., New Haven, Conn. 06508
Snap-On-Tools, Dept. EM, 8192-A 28th Ave., Kenosha, Wisc. 53140
Sticht Co., Inc. Herman H., Dept. EM, 27 Park Pl., New York, N.Y. 10007
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
D Velonex, Display Prods., Dept. EM, 560 Robert Ave., Santa Clara, Cal. 95050
Westinghouse Elec. Corp., Relay-Instr. Div., Dept. EM, 95 Orange St., Newark, N.J. 07101

Meters, Volt, Deviation

Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ..... p. 2709
Electronic Dev. Corp., Dept. EM, 11 Hamlin St., Boston, Mass. 02127 ..... *
ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ..... p. 2030,2031
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A & D Electrical Instruments, Dept. EM, 73-07 88th St., Glendale, N.Y. 11227
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
D Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
D JPI, Inc., Dept. EM, 1507 San Vicente Blvd., Santa Monica, Cal. 90402
Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962
D LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
UFAD Corp., Dept. EM, 700 36th St. S.E., Grand Rapids, Mich. 49508
Voltex Co., Inc., Dept. EM, 115 Marine St., Farmingdale, N.Y. 11735

Meters, Volt, Differential—See Meters, Volt

Meters, Volt, Digital (DVM) & Accessories

D B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 ..... *
D Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005 ..... *
Boonton Electronics Corp., Dept. EM, Route #287, Parsippany, N.J. 07054 *
D California Instrs., Dept. EM, 5150-Convoy St., San Diego, Cal. 92111 ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Data Precision Corporation, Dept. EM, Audubon Rd., Wakefield, Mass 01880 p. 2706,2707
Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 p. 2687
Doric Sci., Div. Emerson Elec. Co., Dept. EM, 3883 Ruffin Rd., San Diego, Cal. 92123 ..... *
Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ..... *
M Dytronics Co., Inc., Dept. EM, 4800 Evanswood Dr., Columbus, Ohio 43229 *
Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 .. *
Electro Industries, Dept. EM, 109 Nassau Dr., Albertson, NY 11507 .... p. 2721
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M General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 p. 2870
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Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 p. 2753
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 .... *
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Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803 *

Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *

Millivac Instruments, Inc., Dept. EM, Box 997, Curry Rd. Ext., Schnectady, N.Y. 12301 ... p. 2785

NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ... *

D **Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705** ... *

D **Non-Linear Sys., Inc., Dept. EM, 533 Stevens Ave., Solana Beach, Cal. 92075** *

D **Philips Test & Measuring Instrs., Dept. EM, 85 McKee Dr., Mahwah, NJ 07430** ... *

M **Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008** ... p. 3609

D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** ... *

DM **Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518** ... *

D **Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817** ... p. 2829

United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403 ... p. 2832

VIZ Manufacturing Co., Dept. EM, 335 E. Price St., Phila, Pa. 19144 ... *

D **Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114** ... p. 2808

D **Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523** ... *

D Analogic Corp., Dept. EM, Audubon Rd., Wakefield, Mass. 01880

D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154

D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462

Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720

D Data Tech, Div. of Penril Corp., Dept. EM, 2700 S. Fairview, Santa Ana, Cal. 92704

EMI Technology, Dept. EM, 55, Kenosia Ave., Danbury, Conn 06810

Hioki New York Corp., Dept. EM, 42-16 235th St., Douglaston, N.Y. 11363

IET Labs Inc., Dept. EM, 761 Old Country Rd, Westbury, N.Y. 11590

Indl Timer An Esterline Co., Dept. EM, U.S. Hwy 287, Parsippany, N.J. 07054

Innovatek Microsystems, Inc., Dept. EM, Smithfield Rd., Millerton, N.Y. 12546

D JPI, Inc., Dept. EM, 1507 San Vicente Blvd., Santa Monica, Cal. 90402

Kikusui Elctrns. Corp., Dept. EM, 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan

D LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154

Power-Science, Inc., Dept. EM, 8076 Engineer Rd., San Diego, Cal. 92111

M Racal-Dana Instrus Inc., Dept. EM, 18912 Von Karman Ave., Irvine, Cal. 92715

D REI Sales Co., Dept. EM, 1 North Ave, Burlington, Mass. 01803

D Sencore, Dept. EM, 3200 Sencore Dr., Sioux Falls, S.D. 57107

Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115

DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518

Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077

D TSI Inc, Dept. EM, 500 Cardigan Rd., Box 3394, St. Paul, Minn. 55165

Valhalla Scientific, Inc., Dept. EM, 7707 Convoy Ct., San Diego, Cal. 92111

Meters, Volt, Frequency Selective

Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ... *

Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 ... *

Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ... *

Ithaco, Inc., Dept. EM, 735 W. Clinton St., Ithaca, N.Y. 14850 ... p. 1007

Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ... *

NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ... *

D **Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114** ... *

D Blonder-Tongue Labs., Inc., Dept. EM, One Jake Brown Rd., Old Bridge, N.J. 08857

Gorman-Redlich Mfg. Co., Dept. EM, 6 Curtis St., Athens, Ohio 45701

Princeton Applied Resch. Corp., Dept. EM, Box 2565, Princeton, N.J. 08540

Meters, Volt, Log-Conversion

D **Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005** ... *

Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ... *

D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043** *

M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** *

Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 ... *

Ithaco, Inc., Dept. EM, 735 W. Clinton St., Ithaca, N.Y. 14850 ... *

NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ... *

Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ... p. 2818

Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707

Pacific Meas., Inc., Dept. EM, 470 San Antonio Rd, Palo Alto, Calif. 94306

M Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017

Meters, Volt, Peak

Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ... *

Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 ... *

ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 ... *

NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ... *

M **Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008** ... *

Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *

D **Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114** ... *

D American HV Voltage Test Sys., Inc., Dept. EM, Ctrl Garr Ind'l Pk, Accident, Md. 21520

D Associated Research, Inc., Dept. EM, 6125 W. Howard St., Niles, Ill. 60648

D Data Tech, Div. of Penril Corp., Dept. EM, 2700 S. Fairview, Santa Ana, Cal. 92704

Micro Instrument Co., Marine & Power Instr. Div., Dept. EM, 2250 Micro Pl., Escondido, Cal. 92025

Meters, Volt, Potentiometric

Doric Sci., Div. Emerson Elec. Co., Dept. EM, 3883 Ruffin Rd., San Diego, Cal. 92123 ... *

Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 ... *

Electronic Dev. Corp., Dept. EM, 11 Hamlin St., Boston, Mass. 02127 ... *

Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 ... *

D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043** *

Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 p. 2753

Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *

NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ... *

Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *

Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ... *

Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720

Brown Electro-Measurements Co., Brown Electro-Meas., Dept. EM, P.O. Box 55169, Seattle, Wash. 98155

Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229

Meters, Volt, R-F

D **Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005** ... *

The Bendix Corp., Electrical Comp. Div., Dept. EM, Sidney, NY 13838 ... *

Boonton Electronics Corp., Dept. EM, Route #287, Parsippany, N.J. 07054 p. 2665

Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 ... *

M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** *

Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 ... *

ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 ... p. 2762

Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ... *

Millivac Instruments, Inc., Dept. EM, Box 997, Curry Rd. Ext., Schnectady, N.Y. 12301 ... p. 2785

M **Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008** ... *

Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *

Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ... *

D **Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817** ... *

D **Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114** ... *

D Bartlett-Emery Instrument Corp., Dept. EM, 14th & Ave. "M", Ft. Madison, Iowa 52627

D Blonder-Tongue Labs., Inc., Dept. EM, One Jake Brown Rd., Old Bridge, N.J. 08857

Gorman-Redlich Mfg. Co., Dept. EM, 6 Curtis St., Athens, Ohio 45701

D Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044

M Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017

Racal-Dana Instrus Inc., Dept. EM, 18912 Von Karman Ave., Irvine, Cal. 92715

Telco Products Co., Dept. EM, 44 Sea Cliff, Glen Cove, NY 11542

Westinghouse Elec. Corp., Relay-Instr. Div., Dept. EM, 95 Orange St., Newark, N.J. 07101

Meters, Volt, Sampling

Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 ... *

NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ... *

D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** ... *

Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ... *

Micro Instrument Co., Marine & Power Instr. Div., Dept. EM, 2250 Micro Pl., Escondido, Cal. 92025

Meters, Volt, True RMS

D **Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005** ... *

D **Beede Electrical Instr. Co., Dept. EM, S. Main St., Penacook, N.H. 03301** ... *

Boonton Electronics Corp., Dept. EM, Route #287, Parsippany, N.J. 07054 p. 2665

Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 ... *

Data Precision Corporation, Dept. EM, Audubon Rd., Wakefield, Mass 01880 p. 2706,2707

Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ... *

Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 p. 2825

D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043** *

General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ... *

Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 ... *

Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *

Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ... *

D **Jewell Electrical Instruments, Inc., Dept. EM, Grenier Field, Manchester, N.H. 03103** ... *

D **Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803** *

Millivac Instruments, Inc., Dept. EM, Box 997, Curry Rd. Ext., Schnectady, N.Y. 12301 ... p. 2784

NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ... *

D **Non-Linear Sys., Inc., Dept. EM, 533 Stevens Ave., Solana Beach, Cal. 92075** *
M **Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008** *
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 p. 2825
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 *
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** *
D **Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817** *
D **Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114** p. 2814
D **Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523** *
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
D Bartlett-Emery Instrument Corp., Dept. EM, 14th & Ave. "M", Ft. Madison, Iowa 52627
Data Tech, Div. of Penril Corp., Dept. EM, 2700 S. Fairview, Santa Ana, Cal. 92704
D Dumont Oscilloscope Labs., Dept. EM, 40 Fairfield Pl., W. Caldwell, N.J. 07006
Electrical Standards Div., E.S.R.S., Inc., Dept. EM, 7337 Greenbush, N. Hollywood, Cal. 91605
Electro-Optical Inds., Inc., Dept. EM, 839 Ward Dr., Santa Barbara, Cal. 93111
D Greibach Instr. Div., Electrical Inst. Svc., Inc., Dept. EM, 25 Dock St., Mt Vernon, N.Y. 10550
Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Power-Science, Inc., Dept. EM, 8076 Engineer Rd., San Diego, Cal. 92111
Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
Racal-Dana Instrus Inc., Dept. EM, 18912 Von Karman Ave., Irvine, Cal. 92715
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
Telco Products Co., Dept. EM, 44 Sea Cliff, Glen Cove, NY 11542
D TSI Inc, Dept. EM, 500 Cardigan Rd., Box 3394, St. Paul, Minn. 55165
UFAD Corp., Dept. EM, 700 36th St. S.E., Grand Rapids, Mich. 49508
Valhalla Scientific, Inc., Dept. EM, 7707 Convoy Ct., San Diego, Cal. 92111

Meters, Volt-Ohm-Milliampere (VOM)

D **B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635** p. 2676
D **Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005** p. 2663
Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 *
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 *
Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803 p. 2774
Millivac Instruments, Inc., Dept. EM, Box 997, Curry Rd. Ext., Schnectady, N.Y. 12301 p. 2785
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 *
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** p. 2820,2821
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** *
D **Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817** p. 2828,2829
VIZ Manufacturing Co., Dept. EM, 335 E. Price St., Phila, Pa. 19144 *
D **Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114** p. 2818
D **Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523** *
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
D Amprobe Instrument, Div. SOS Consolidated Inc., Dept. EM, 630 Merrick Rd., Lynbrook, N.Y. 11563
Beckman Instrs., Ectrn. Instrs. Div. Ectrn. Instrumentation, Dept. EM, 3900 N. River Rd., Schiller Park, Ill. 60176
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
D Chafitz Engineering, Dept. EM, P.O. Box 2188, Rockville, Md. 20852
Hioki New York Corp., Dept. EM, 42-16 235th St., Douglaston, N.Y. 11363
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
D Mura Corp., Dept. EM, 177 Cantiague Rock Rd, Westbury, NY 11590
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
M Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
D Sencore, Dept. EM, 3200 Sencore Dr., Sioux Falls, S.D. 57107
Sunshine Sci. Instrs., Inc.; Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
D Vidaire Electronics Mfg., Dept. EM, 150 Buffalo Ave., Freeport, N.Y. 11520
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Meters, Volt-Ohm-Milliamperes (Vom) Digital

D **B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635** p. 2674,2675
Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005 p. 2663
D **California Instrs., Dept. EM, 5150-Convoy St., San Diego, Cal. 92111** *
Data Precision Corporation, Dept. EM, Audubon Rd., Wakefield, Mass 01880 p. 2706,2707
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 *
Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 *
Millivac Instruments, Inc., Dept. EM, Box 997, Curry Rd. Ext., Schnectady, N.Y. 12301 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
D **Non-Linear Sys., Inc., Dept. EM, 533 Stevens Ave., Solana Beach, Cal. 92075** *
Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 *
Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 *
D **Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817** p. 2829
United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403 p. 2832
VIZ Manufacturing Co., Dept. EM, 335 E. Price St., Phila, Pa. 19144 *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 p. 2817
Data Tech, Div. of Penril Corp., Dept. EM, 2700 S. Fairview, Santa Ana, Cal. 92704
D Dumont Oscilloscope Labs., Dept. EM, 40 Fairfield Pl., W. Caldwell, N.J. 07006
Hioki New York Corp., Dept. EM, 42-16 235th St., Douglaston, N.Y. 11363
IET Labs Inc., Dept. EM, 761 Old Country Rd, Westbury, N.Y. 11590
D JPI, Inc., Dept. EM, 1507 San Vicente Blvd., Santa Monica, Cal. 90402
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Sencore, Dept. EM, 3200 Sencore Dr., Sioux Falls, S.D. 57107
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Valhalla Scientific, Inc., Dept. EM, 7707 Convoy Ct., San Diego, Cal. 92111

Meters, VU

D **Beede Electrical Instr. Co., Dept. EM, S. Main St., Penacook, N.H. 03301** *
Electro-Mechanical Instru. Div., Sheller-Globe Corp., Dept. EM, Box 368, Dublin, PA 18917 *
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** *
Hoyt Electrical Instr. Works, Dept. EM, 19 Linden St., Penacook, N.H. 03301 p. 2757
D **Jewell Electrical Instruments, Inc., Dept. EM, Grenier Field, Manchester, N.H. 03108** p. 2764
D **Modutec, Inc., Dept. EM, 18 Marshall St., Norwalk, Conn. 06854** p. 2787-2789
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 *
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** *
D **Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817** p. 2826,2827
D **Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114** p. 2811
A & D Electrical Instruments, Dept. EM, 73-07 88th St., Glendale, N.Y. 11227
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
Assembled Products Co., Dept. EM, Box 750, St. Albans, Vt. 05478
Data Check Corp., Dept. EM, 10070 Willow Creek Rd., San Diego, Cal 92131
Dixson, Inc., Dept. EM, Box 1449, Grand Junction, Colo. 81501
Gotham Audio Corp., Dept. EM, 741 Washington St., New York, N.Y. 10014
Hioki New York Corp., Dept. EM, 42-16 235th St., Douglaston, N.Y. 11363
M Ideal Precision Meter Co., Dept. EM, 214 Franklin St., Brooklyn, N. Y. 11222
D Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Mura Corp., Dept. EM, 177 Cantiague Rock Rd, Westbury, NY 11590
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
M Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
D Shurite Meters, Dept. EM, 428 Chapel St., New Haven, Conn. 06508
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115

Meters, Watt

Bird Electronic Corp., Dept. EM, 30303 Aurora Rd., Solon, Ohio 44139 p. 2668,2669
Boonton Electronics Corp., Dept. EM, Route #287, Parsippany, N.J. 07054 *
Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 p. 2681
Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 *
M **Electro Impulse, Dept. EM, Box 870, Red Bank, N.J. 07701** p. 2720
Electronic Navigation Inds., Dept. EM, 3000 Winton Rd. S., Rochester, N.Y. 14623 *
Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 *
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** *
D **General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345** *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** p. 2870
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 p. 2790
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 *
Ohio Semitronics, Inc., Dept. EM, 1205 Chesapeake Ave., Columbus, Ohio 43212 p. 4303,4305
RFL Inds., Instr. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005 *
RFL Inds., Thermocontrol Div., Dept. EM, Boonton, N.J. 07005 *
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 *
Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 p. 2820
D **Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817** p. 2826,2827
D **Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114** *
D **Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523** *
A & D Electrical Instruments, Dept. EM, 73-07 88th St., Glendale, N.Y. 11227
Ampower Electronic Instr. Co., Dept. EM, 500 Union Blvd., Totowa, N. J. 07512
D Antenna Incorporated, Dept. EM, 26301 Richmond Road, Cleveland, Ohio 44126
D Barker & Williamson, Inc., Dept. EM, Canal St., Bristol, Pa. 19007
Barnes & Reinecke, Inc., Dept. EM, 2375 Estes Ave., Elk Grove Village, Ill. 60007
M Cubic Corp., Dept. EM, 9233 Balboa Ave., San Diego, Cal. 92123
Dixson, Inc., Dept. EM, Box 1449, Grand Junction, Colo. 81501
ENI Power Systems, Dept. EM, 3000 Winton Rd. S., Rochester, N.Y. 14623
D Greibach Instr. Div., Electrical Inst. Svc., Inc., Dept. EM, 25 Dock St., Mt Vernon, N.Y. 10550

Hioki New York Corp., Dept. EM, 42-16 235th St., Douglaston, N.Y. 11363
D Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Scientech, Inc., Dept. EM, 5649 Arapahoe Ave, Boulder, Colo. 80303
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
Telco Products Co., Dept. EM, 44 Sea Cliff, Glen Cove, NY 11542
TransData Inc., Dept. EM, P.O. Box 518, Dublin, Ohio 43017
Valhalla Scientific, Inc., Dept. EM, 7707 Convoy Ct., San Diego, Cal. 92111
D West Instrs, Gulton Inds, M. C. S. Div., Dept. EM, Gulton Indl Pk, E. Greenwich, RI 02818
Westinghouse Elec. Corp., Relay-Instr. Div., Dept. EM, 95 Orange St., Newark, N.J. 07101
Zi-Tech Div., Aikenwood Corp., Dept. EM, Box 26, 2151 Park Blvd., Palo Alto, Cal. 94302

Meters, Watt-Hour

D General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
Ohio Semitronics, Inc., Dept. EM, 1205 Chesapeake Ave., Columbus, Ohio 43212 ..... p. 4303,4306-4308
D Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016

Meters, Watt, RF Directional

The Bendix Corp., Electrical Comp. Div., Dept. EM, Sidney, NY 13838 ..... *
M Bird Electronic Corp., Dept. EM, 30303 Aurora Rd., Solon, Ohio 44139 p. 2668
D Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
Ohio Semitronics, Inc., Dept. EM, 1205 Chesapeake Ave., Columbus, Ohio 43212 ..... *
D Antenna Incorporated, Dept. EM, 26301 Richmond Road, Cleveland, Ohio 44126
M Dielectric Comms, Unit of Gen Signal, Dept. EM, Raymond, Maine 04071
D Sencore, Dept. EM, 3200 Sencore Dr., Sioux Falls, S.D. 57107

Meters, Wave

M General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
Frequency Engrg. Labs., Dept. EM, Box 527, Farmingdale, N.J. 07727
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573

Meters, Waveguide—See Meters, Microwave

Microcircuit Production Equip.

Chemical Etching Equip. & Supply, Dept. EM, 6905 Beulah St, Alexandria, Va. 22310
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
D CVC Products, Inc., Dept. EM, 525 Lee Rd., Box 1886, Rochester, N.Y. 14603
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
GCA/Burlington Div., Dept. EM, 174 Middlesex Tpke., Burlington, Mass. 01803
DM Hughes Aircraft Co., Ind'l. Prods. Div., Prod. Equip. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
D Hull Corp., Dept. EM, Davisville Rd., Hatboro, Pa. 19040
D Intel Corp., Dept. EM, 3065 Bowers Ave., Santa Clara, Cal. 95051
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
Materials Resch. Corp., Dept. EM, Route 303, Orangeburg, N.Y. 10962
Qualco, Dept. EM, One First St., Los Altos, Cal. 94022
Solid State Equipment Corp., Dept. EM, 430 Delaware Drive, Fort Washington, Pa. 19034

Microcircuits—See IC's; Circuits, Hybrid

Microcomputers

Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... p. 1469
Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... *
D American Microsystems, Inc., Dept. EM, 3800 Homestead Rd., Santa Clara, Cal. 95051
Anaheim Automation, Dept. EM, 922 Orangefair La., Anaheim, Cal. 92801
Applied Systems Corp., Dept. EM, 26401 Harper Ave., St. Clair Shores, Mich. 48081
Computer Devices, Dept. EM, 25 North Avenue, Burlington, Mass. 01803
ECD Corp., Dept. EM, 196 Broadway, Cambridge, MA 02139
Electronic Memories & Magnetics Corp., Dept. EM, 12621 Chadron Ave., Hawthorne, Cal. 90250
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Information Control Corp., Abacus Div. Dept. EM7, Dept. EM, 9610 Bellanca Ave., Los Angeles, Cal. 90045
D Intel Corp., Dept. EM, 3065 Bowers Ave., Santa Clara, Cal. 95051
Martin Research, Dept. EM, 3336 Commercial Ave., Northbrook, Ill. 60062
Midland Standrad Inc., Dept. EM, 603 E. Chicago St. Box 38, Elgin, ILL 60120
MilerTronics, Dept. EM, 303 Airport Rd, Greenville, S.C. 29607
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
NEC Microcomputers, Inc., Dept. EM, 173 Worcester Rd, Wellesley, Mass 02181
PCS., Inc., Dept. EM, 750 N. Maple Rd., Saline, Mich. 48176
Standard Engineering, Dept. EM, 44800 Industrial Dr., Fremont, Cal. 94538
Wintek Corp., Dept. EM, 902 N. 9th St., Lafayette, Ind. 47904
Wyle Computer Prods., Dept. EM, 3200 Magruder Blvd., Hampton, Va 23666
Ziatech Corp, Dept. EM, 10762 LaRoda Dr, Cupertino, Cal. 95014
Zonic Technical Labs., Dept. EM, 8927 Rossash Ave., Cincinnati, Ohio 45236

Micrometers—See Testers, Thickness (All Types)

Microphone Accessories (Including Stands, Holders, Booms)

D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
D Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 *
Trimm, Inc., Dept. EM, 400 W. Lake, Box 489, Libertyville, Ill. 60048 .. p. 2247
M Adec Inc., Dept. EM, 12 Kulick Rd., Fairfield, N.J. 07006
D AKG Acoustics, Philips Audio Video Sys. Corp., Dept. EM, 91 McKee Dr, Manwah, N.J. 07430
D Atlas Sound Div., American Trading & Prod., Dept. EM, 10 Pomeroy Rd., Parsippany, N.J. 07054
M Audiosears Corp., Dept. EM, South St., Stamford, N.Y. 12167
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
D Bogen Div., Lear Siegler, Inc., Dept. EM, Box 500, Paramus, N.J. 07652
D Electro-Voice, Sub. Gulton Inds., Dept. EM, 600 Cecil St., Buchanan, Mich. 49107
D Gotham Audio Corp., Dept. EM, 741 Washington St., New York, N.Y. 10014
D Herald Electronics, Dept. EM, 6611 N. Lincoln Ave., Chicago, Ill. 60645
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D PASO Sound Products Inc., Dept. EM, 14 First St, Pelham, NY 10803
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
Precision Electronics, Inc., Dept. EM, 9101 King Ave., Franklin Park, Ill 60131
DM Primo Company Ltd., Dept. EM, 25-1, 6-Chome, Mure, Mitakashi, Tokyo, Japan
D Primo Microphone Inc., Dept. EM, 2468 Delta La., Elk Grove Village, Ill. 60007
D R-Columbia Products, Inc., Dept. EM, 2008 St. John's Ave., Highland Park, Ill. 60035
D Sennheiser Elctrn. Corp., Dept. EM, 10 W. 37th St., New York, N.Y. 10018
D Shure Brothers, Inc., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204
D Turner Div., Conrac, Dept. EM, 716 Oakland Rd. N.E., Cedar Rapids, Iowa 52402
D University Sound, Altec Corp., Dept. EM, 1515 S. Manchester, Anaheim, Cal. 92803

Microphones, Carbon

D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
M Audiosears Corp., Dept. EM, South St., Stamford, N.Y. 12167
Aviatech Intl. Inc., Dept. EM, 75 Carlough Rd, Bohemia, N.Y. 11716
DM Electro-Voice, Sub. Gulton Inds., Dept. EM, 600 Cecil St., Buchanan, Mich. 49107
D General Aviation Elctrns, Dept. EM, 4141 Kingman Dr., Indianapolis, Ind 46225
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D R-Columbia Products, Inc., Dept. EM, 2008 St. John's Ave., Highland Park, Ill. 60035
Shure Brothers, Inc., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204
DM Telephonics Corp., Dept. EM, 770 Park Ave., Huntington, N.Y. 11743
D Telex Communications, Inc., Dept. EM, 9600 Aldrich Ave., So., Minneapolis, Minn. 55420
D Turner Div., Conrac, Dept. EM, 716 Oakland Rd. N.E., Cedar Rapids, Iowa 52402

Microphones, Cardioid

D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D AKG Acoustics, Philips Audio Video Sys. Corp., Dept. EM, 91 McKee Dr, Manwah, N.J. 07430
D Audio-Technica U.S., Inc., Dept. EM, 33 Shiawassee Ave., Fairlawn, Ohio 44313
Audiotronics Corp., Dept. EM, 7428 Bellaire Ave., N. Hollywood, Cal. 91605
D Bogen Div., Lear Siegler, Inc., Dept. EM, Box 500, Paramus, N.J. 07652
DM Electro-Voice, Sub. Gulton Inds., Dept. EM, 600 Cecil St., Buchanan, Mich. 49107
D Gotham Audio Corp., Dept. EM, 741 Washington St., New York, N.Y. 10014
Knowles Elctrns., Inc., Dept. EM, 3100 N. Mannheim Rd., Franklin Park, Ill. 60131
D Mura Corp., Dept. EM, 177 Cantiague Rock Rd, Westbury, NY 11590
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D PASO Sound Products Inc., Dept. EM, 14 First St, Pelham, NY 10803
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
Primo Company Ltd., Dept. EM, 25-1, 6-Chome, Mure, Mitakashi, Tokyo, Japan
D Primo Microphone Inc., Dept. EM, 2468 Delta La., Elk Grove Village, Ill. 60007
D R-Columbia Products, Inc., Dept. EM, 2008 St. John's Ave., Highland Park, Ill. 60035
D Recoton Corp., Dept. EM, 46-23 Crane St., Long Island City, N.Y. 11101
D Sennheiser Elctrn. Corp., Dept. EM, 10 W. 37th St., New York, N.Y. 10018
D Shure Brothers, Inc., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204
D Turner Div., Conrac, Dept. EM, 716 Oakland Rd. N.E., Cedar Rapids, Iowa 52402
D Vidaire Electronics Mfg., Dept. EM, 150 Buffalo Ave., Freeport, N.Y. 11520

Microphones, Ceramic

D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Columbia Resch. Labs., Dept. EM, Macdade Blvd. & Bullens La., Woodlyn, Pa. 19094
D Electro-Voice, Sub. Gulton Inds., Dept. EM, 600 Cecil St., Buchanan, Mich. 49107
D Fanon/Courier Corp., Subs., Resdel Engrg, Dept. EM, 990 S. Fair Oaks, Pasadena, Cal. 91105
GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
Knowles Elctrns., Inc., Dept. EM, 3100 N. Mannheim Rd., Franklin Park, Ill. 60131
Linden Labs., Inc., Dept. EM, Box 920, State College, Pa. 16801
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Primo Company Ltd., Dept. EM, 25-1, 6-Chome, Mure, Mitakashi, Tokyo, Japan
D Shure Brothers, Inc., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204
Superex Electronics Corp., Dept. EM, 151 Ludlow St., Yonkers, N.Y. 10705
D Telex Communications, Inc., Dept. EM, 9600 Aldrich Ave., So., Minneapolis, Minn. 55420
D Turner Div., Conrac, Dept. EM, 716 Oakland Rd. N.E., Cedar Rapids, Iowa 52402

Microphones, Condenser

D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D AKG Acoustics, Philips Audio Video Sys. Corp., Dept. EM, 91 McKee Dr, Manwah, N.J. 07430
D Audio-Technica U.S., Inc., Dept. EM, 33 Shiawassee Ave., Fairlawn, Ohio 44313
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
DM Electro-Voice, Sub. Gulton Inds., Dept. EM, 600 Cecil St., Buchanan, Mich. 49107
D Gotham Audio Corp., Dept. EM, 741 Washington St., New York, N.Y. 10014
D Herald Electronics, Dept. EM, 6611 N. Lincoln Ave., Chicago, Ill. 60645
Knowles Elctrns., Inc., Dept. EM, 3100 N. Mannheim Rd., Franklin Park, Ill. 60131
D Mura Corp., Dept. EM, 177 Cantiague Rock Rd, Westbury, NY 11590
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
DM Primo Company Ltd., Dept. EM, 25-1, 6-Chome, Mure, Mitakashi, Tokyo, Japan
D Primo Microphone Inc., Dept. EM, 2468 Delta La., Elk Grove Village, Ill. 60007
D R-Columbia Products, Inc., Dept. EM, 2008 St. John's Ave., Highland Park, Ill. 60035
D Sennheiser Elctrn. Corp., Dept. EM, 10 W. 37th St., New York, N.Y. 10018
Shure Brothers, Inc., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204
D Telex Communications, Inc., Dept. EM, 9600 Aldrich Ave., So., Minneapolis, Minn. 55420

Microphones, Crystal

D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
M Columbia Resch. Labs., Dept. EM, Macdade Blvd. & Bullens La., Woodlyn, Pa. 19094
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
M Primo Company Ltd., Dept. EM, 25-1, 6-Chome, Mure, Mitakashi, Tokyo, Japan
D R-Columbia Products, Inc., Dept. EM, 2008 St. John's Ave., Highland Park, Ill. 60035
D Vidaire Electronics Mfg., Dept. EM, 150 Buffalo Ave., Freeport, N.Y. 11520

Microphones, Dynamic

D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Kulite Semiconductor Prod., Dept. EM, 1030 Hoyt Ave., Ridgefield, N.J. 07657 ..... *
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
RFL Inds., Instr. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005 p. 2807
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
M Adec Inc., Dept. EM, 12 Kulick Rd., Fairfield, N.J. 07006
D AKG Acoustics, Philips Audio Video Sys. Corp., Dept. EM, 91 McKee Dr, Manwah, N.J. 07430
D Audio-Technica U.S., Inc., Dept. EM, 33 Shiawassee Ave., Fairlawn, Ohio 44313
M Audiosears Corp., Dept. EM, South St., Stamford, N.Y. 12167
Audiotronics Corp., Dept. EM, 7428 Bellaire Ave., N. Hollywood, Cal. 91605
Aviatech Intl. Inc., Dept. EM, 75 Carlough Rd, Bohemia, N.Y. 11716
D Bogen Div., Lear Siegler, Inc., Dept. EM, Box 500, Paramus, N.J. 07652
DM Electro-Voice, Sub. Gulton Inds., Dept. EM, 600 Cecil St., Buchanan, Mich. 49107
GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
M Gulton Inds., Inc., Servonic/Instrumentation Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
D Herald Electronics, Dept. EM, 6611 N. Lincoln Ave., Chicago, Ill. 60645
D Midwest Electronic Industries, Dept. EM, 4945 W. Belmont Ave., Chicago, Ill. 60641
D Mura Corp., Dept. EM, 177 Cantiague Rock Rd, Westbury, NY 11590
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D PASO Sound Products Inc., Dept. EM, 14 First St, Pelham, NY 10803
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
DM Primo Company Ltd., Dept. EM, 25-1, 6-Chome, Mure, Mitakashi, Tokyo, Japan
D Primo Microphone Inc., Dept. EM, 2468 Delta La., Elk Grove Village, Ill. 60007
D R-Columbia Products, Inc., Dept. EM, 2008 St. John's Ave., Highland Park, Ill. 60035
D Recoton Corp., Dept. EM, 46-23 Crane St., Long Island City, N.Y. 11101
D Sennheiser Elctrn. Corp., Dept. EM, 10 W. 37th St., New York, N.Y. 10018
D Shure Brothers, Inc., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204
Superex Electronics Corp., Dept. EM, 151 Ludlow St., Yonkers, N.Y. 10705
DM Telephonics Corp., Dept. EM, 770 Park Ave., Huntington, N.Y. 11743
Television Equip. Assocs., Dept. EM, Box 260, South Salem, N.Y. 10590
D Telex Communications, Inc., Dept. EM, 9600 Aldrich Ave., So., Minneapolis, Minn. 55420
D Turner Div., Conrac, Dept. EM, 716 Oakland Rd. N.E., Cedar Rapids, Iowa 52402
D Vidaire Electronics Mfg., Dept. EM, 150 Buffalo Ave., Freeport, N.Y. 11520
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Microphones, Lavalier

D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
D AKG Acoustics, Philips Audio Video Sys. Corp., Dept. EM, 91 McKee Dr, Manwah, N.J. 07430
D Audio-Technica U.S., Inc., Dept. EM, 33 Shiawassee Ave., Fairlawn, Ohio 44313
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
D Electro-Voice, Sub. Gulton Inds., Dept. EM, 600 Cecil St., Buchanan, Mich. 49107
D Gotham Audio Corp., Dept. EM, 741 Washington St., New York, N.Y. 10014
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D PASO Sound Products Inc., Dept. EM, 14 First St, Pelham, NY 10803
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
Primo Company Ltd., Dept. EM, 25-1, 6-Chome, Mure, Mitakashi, Tokyo, Japan
D Primo Microphone Inc., Dept. EM, 2468 Delta La., Elk Grove Village, Ill. 60007
D Sennheiser Elctrn. Corp., Dept. EM, 10 W. 37th St., New York, N.Y. 10018
D Shure Brothers, Inc., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204
D Turner Div., Conrac, Dept. EM, 716 Oakland Rd. N.E., Cedar Rapids, Iowa 52402
D Vidaire Electronics Mfg., Dept. EM, 150 Buffalo Ave., Freeport, N.Y. 11520
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Microphones, Magnetic

Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Audiosears Corp., Dept. EM, South St., Stamford, N.Y. 12167
Aviatech Intl. Inc., Dept. EM, 75 Carlough Rd, Bohemia, N.Y. 11716
Knowles Elctrns., Inc., Dept. EM, 3100 N. Mannheim Rd., Franklin Park, Ill. 60131
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Primo Company Ltd., Dept. EM, 25-1, 6-Chome, Mure, Mitakashi, Tokyo, Japan
D Primo Microphone Inc., Dept. EM, 2468 Delta La., Elk Grove Village, Ill. 60007
D Sennheiser Elctrn. Corp., Dept. EM, 10 W. 37th St., New York, N.Y. 10018
D Shure Brothers, Inc., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Microphones, Omnidirectional

D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Trimm, Inc., Dept. EM, 400 W. Lake, Box 489, Libertyville, Ill. 60048 .. p. 2247
D AKG Acoustics, Philips Audio Video Sys. Corp., Dept. EM, 91 McKee Dr, Manwah, N.J. 07430
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
D Audio-Technica U.S., Inc., Dept. EM, 33 Shiawassee Ave., Fairlawn, Ohio 44313
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
D Columbia Resch. Labs., Dept. EM, Macdade Blvd. & Bullens La., Woodlyn, Pa. 19094
D Electro-Voice, Sub. Gulton Inds., Dept. EM, 600 Cecil St., Buchanan, Mich. 49107
D Gotham Audio Corp., Dept. EM, 741 Washington St., New York, N.Y. 10014
Knowles Elctrns., Inc., Dept. EM, 3100 N. Mannheim Rd., Franklin Park, Ill. 60131
Metrosonics, Inc., Dept. EM, Box 18090, Rochester, N.Y. 14618
D PASO Sound Products Inc., Dept. EM, 14 First St, Pelham, NY 10803
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
DM Primo Company Ltd., Dept. EM, 25-1, 6-Chome, Mure, Mitakashi, Tokyo, Japan
D Primo Microphone Inc., Dept. EM, 2468 Delta La., Elk Grove Village, Ill. 60007
D R-Columbia Products, Inc., Dept. EM, 2008 St. John's Ave., Highland Park, Ill. 60035
D Sennheiser Elctrn. Corp., Dept. EM, 10 W. 37th St., New York, N.Y. 10018
D Shure Brothers, Inc., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204
D Turner Div., Conrac, Dept. EM, 716 Oakland Rd. N.E., Cedar Rapids, Iowa 52402
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Microphones, Velocity

Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
Shure Brothers, Inc., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204

Microphones, Wireless

Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
Midwest Electronic Industries, Dept. EM, 4945 W. Belmont Ave., Chicago, Ill. 60641
D Mura Corp., Dept. EM, 177 Cantiague Rock Rd, Westbury, NY 11590
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Perma Power Elctrns, Dept. EM, 5615 W. Howard Ave., Chicago, Ill. 60648
DM Primo Company Ltd., Dept. EM, 25-1, 6-Chome, Mure, Mitakashi, Tokyo, Japan
D Sennheiser Elctrn. Corp., Dept. EM, 10 W. 37th St., New York, N.Y. 10018
Television Equip. Assocs., Dept. EM, Box 260, South Salem, N.Y. 10590

Microprocessor—See IC's Microprocessor

Microscopes

Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
American Optical Corp., Sci. Instr. Div., Dept. EM, Eggert & Sugar Rds., Buffalo, N.Y. 14215
D Bausch & Lomb, S.O.P.D. Div, Dept. EM, 1400 N. Goodman St., Rochester, N.Y. 14602
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
M Edmund Scientific Co., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007
Gamma Scientific Inc., Dept. EM, 3777 Ruffin Rd., San Diego, Cal. 92123
D Hacker Instrs., Inc., Dept. EM, Box 657, Fairfield, N.J. 07006
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
Laser Inc., Dept. EM, Laser Lane, Box 537, Sturbridge, Mass. 01566
Leitz, Inc. E., Dept. EM, Link Crescent, Rockleigh, N.J. 07647
D Nikon, Inc., Instr. Div. Ehrenreich Photo-Optical Ind., Dept. EM, 623 Stewart Ave., Garden City, N.Y. 11530
D Olympus Corp. America, Dept. EM, Two Nevada Dr., New Hyde Park, N.Y. 11040
D Titan Tool Supply Co., Inc., Dept. EM, 68 Comet, Buffalo, N.Y. 14216
Zi-Tech Div., Aikenwood Corp., Dept. EM, Box 26, 2151 Park Blvd., Palo Alto, Cal. 94302

Microscopes, Infrared

M Barnes Engrg. Co., Dept. EM, 30 Commerce Rd., Stamford, Conn. 06902
Research Devices, Dept. EM, 616 Springfield Ave., Berkeley Heights, N.J. 07922

Microscopes, Measuring

American Optical Corp., Sci. Instr. Div., Dept. EM, Eggert & Sugar Rds., Buffalo, N.Y. 14215
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
M Edmund Scientific Co., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007
M Hacker Instrs., Inc., Dept. EM, Box 657, Fairfield, N.J. 07006
Laser Inc., Dept. EM, Laser Lane, Box 537, Sturbridge, Mass. 01566
Leitz, Inc. E., Dept. EM, Link Crescent, Rockleigh, N.J. 07647
M Lenox Instr. Co., Dept. EM, 121 E. Luray St., Philadelphia, Pa. 19120
National Camera Inc., Dept. EM, 2000 W. Union Ave., Englewood, Colo. 80110
D Nikon, Inc., Instr. Div, Ehrenreich Photo-Optical Ind., Dept. EM, 623 Stewart Ave., Garden City, N.Y. 11530
D Olympus Corp. America, Dept. EM, Two Nevada Dr., New Hyde Park, N.Y. 11040
D Titan Tool Supply Co., Inc., Dept. EM, 68 Comet, Buffalo, N.Y. 14216

Microwave Comb Generator—See Generators, Microwave

Microwave Integrated Circuits (MIC's)

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
M Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040 .. *
M General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 p. 2871
DM Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725 ..... *
Telonic/Berkeley, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715 ..... *
M , Trak Microwave Corp., Dept. E8, Dept. EM, 4726 Eisenhower Blvd., Tampa, Fla. 33614 ..... *
D TRW RF Semiconductors, Dept. EM, 14520 Aviation Blvd., Lawndale, Cal. 90260 ..... *
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
M Avantek, Inc., Dept. EM, 3175 Bowers Ave., Santa Clara, Cal. 95051
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
D Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
DM Plessey Semiconductors, Dept. EM, 1674 McGaw Ave., Irvine, Cal. 92714
M RHG Elctrns. Lab., Dept. EM, 161 E. Industry Ct., Deer Park, N.Y. 11729
Triangle Microwave Inc., Dept. EM, 9B Great Meadow La, East Hanover, NJ 07936

Microwave Prod. Equip. (including modules)

Telonic/Berkeley, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715 ..... *
AERCOM, Dept. EM, 405 Tasman Dr., Sunnyvale, Cal. 94086
D Delavan Electronics, Inc., Dept. EM, 14605 No. 73rd St., Scottsdale, Ariz. 85260

Microwave, Mismatches, Precision

M Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706 ..... *
DM Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725 ..... *
Telonic/Berkeley, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715 ..... *
D Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219 *
M Aircom, Inc., Dept. EM, Rte. 16B, Union, N.H. 03887
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Merrimac Inds., Inc., Dept. EM, 41 Fairfield Pl., West Caldwell, N.J. 07006
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760

Mixers, Audio

M GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 ..... *
Ampex Corp., Dept. EM, 401 Broadway, Redwood City, Cal. 94063
D Bogen Div., Lear Siegler, Inc., Dept. EM, Box 500, Paramus, N.J. 07652
Engelmann Microwave, Dept. EM, Skyline Dr., Montville, N.J. 07045
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
D Frazier, Inc., Dept. EM, 1930 Valley View La., Dallas, Tex. 75234
Gotham Audio Corp., Dept. EM, 741 Washington St., New York, N.Y. 10014
D Herald Electronics, Dept. EM, 6611 N. Lincoln Ave., Chicago, Ill. 60645
Modular Audio Products, Dept. EM, 50 Orville Dr., Bohemia, N.Y. 11716
D Nuvox Elctrns. Corp., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
D PASO Sound Products Inc., Dept. EM, 14 First St, Pelham, NY 10803
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
D Plessey Semiconductors, Dept. EM, 1674 McGaw Ave., Irvine, Cal. 92714
D Primo Microphone Inc., Dept. EM, 2468 Delta La., Elk Grove Village, Ill. 60007
D Robins Broadcast & Sound Equipment Corp., Sub. Robins Inds., Dept. EM, 75 Austin Blvd., Commack, N.Y. 11725
D Shure Brothers, Inc., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
D Spectra Sonics, Dept. EM, 770 Wall Ave., Ogden, Utah 84404
D Switchcraft, Inc., Dept. EM, 5555 N. Elston, Chicago, Ill. 60630
D Vidaire Electronics Mfg., Dept. EM, 150 Buffalo Ave., Freeport, N.Y. 11520

Mixers, Microwave

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
General Elec. Co., Elctrn. Comp. Sis., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
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Epsilon-Lambda Elctrn. Corp., Dept. EM, 28 S. Water St., Batavia, Ill. 60510
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Modulation Transfer Analyzers—See Analyzers, Transfer Function

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IBM Instrument Systems, Dept. EM, 1000 Westchester Ave., White Plains, N. Y. 10604 ..... p. 2759
M Natel Engineering Co., Dept. EM, 8954 Mason Ave., Canoga Park, Cal. 91306 *
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Dynatech Data Sys, A Dynatech Co, Dept. EM, 900 Slaters La., Alexandria, Va. 22314
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Futronix, Inc., Dept. EM, Box 2269, Sunnyvale, Cal. 94087
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D Omnitec Corporation, Dept. EM, 2405 S. 20th St., Phoenix, Ariz. 85034
Racal-Milgo Corp., Racal-Milgo, Inc., Dept. EM, 8600 N.W. 41st St., Miami, Fla. 33166
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M Sonex, Dept. EM, 2337 Philmont Ave., Huntingdon Valley, Pa. 19006
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TTS, Dept. EM, 2928 Nebraska Ave., Santa Monica, Cal. 90404

Modulator/Demodulators, Laser

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
DM Andersen Laboratories Inc., Dept. EM, 1280 Blue Hills Ave., Bloomfield, Conn. 06002 ..... p. 2619
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
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Kappa Scientific Corp., Dept. EM, Box 30585, Santa Barbara, Cal. 93105
Radiation Devices Co., Inc., Dept. EM, Box 8450, Baltimore, Md. 21234

Modulators, A-M

Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 ..... *
Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731 ..... p. 1393
M Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 ..... *
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London Co., Dept. EM, 811 Sharon Dr., Westlake, Ohio 44145 ..... *
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Modulators, F-M

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Modulators, Light

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Crystal Technology, Dept. EM, 2510 Old Middlefield Way, Mountain View, Cal 94043
Electro-Optical Inds., Inc., Dept. EM, 839 Ward Dr., Santa Barbara, Cal. 93111
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D Carco Elctrns., Dept. EM, 195 Constitution Dr., Menlo Park, Calif. 94025
Comdel, Inc., Dept. EM, Beverly Airport, Beverly, Mass. 01915
Instrument Research Co., Dept. EM, Box 40207, Santa Barbara, Cal. 93103
Litton Inds., Electron Tube Div., Dept. EM, 960 Industrial Rd, San Carlos, Calif. 94070
Microwave Power Devices, Dept. EM, Adams Ct., Plainview, N.Y. 11803
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
Novatronics, Inc., Dept. EM, Box 878, Pompano Beach, Fla. 33061
Rantec Div., Emerson Elec. Co., Dept. EM, 24003 Ventura Blvd., Calabasas, Calif. 91302
Raytheon Co., Microwave & Power Tube Div., Dept. EM, 190 Willow St., Waltham, Mass 02154
Tasker Systems, Dept. EM, 20131 Sunburst St., Chatsworth, Cal. 91311
Tobe Deutschmann Labs., Inc., Dept. EM, Box 74, Canton, Mass. 02021
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Velonex, Instrument Div., Dept. EM, 560 Robert Ave., Santa Clara, Cal. 95050

Modulators, R-F

M Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706 ..... *
M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 .. *
M General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 *
M Spectrum Technology Inc., Dept. EM, 300 Frederic Lopez Rd., Goleta, Cal. 93017 ..... *
DM Anaren Microwave, Inc., Dept. EM, 1010 James St., Syracuse, N.Y. 13203
M Baldpate Electronics, Inc., Dept. EM, 225 E. Main St., Georgetown, Mass. 01833
Blonder-Tongue Labs., Inc., Dept. EM, One Jake Brown Rd., Old Bridge, N.J. 08857
D Dynair Elctrns. Inc., Dept. EM, 5275 Market St., San Diego, Calif. 92114
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
FG Engineering Co., Dept. EM, Box 39, Black Canyon Stage, Mayer, Ariz. 86333
D Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
M Merrimac Inds., Inc., Dept. EM, 41 Fairfield Pl., West Caldwell, N.J. 07006
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Microwave Power Devices, Dept. EM, Adams Ct., Plainview, N.Y. 11803
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
DM Plessey Semiconductors, Dept. EM, 1674 McGaw Ave., Irvine, Cal. 92714
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
Summit Engineering Corp., Dept. EM, Box 938, Bozeman, Mont. 59715
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760
Winegard Co., Dept. EM, 3000 Kirkwood St., Burlington, Iowa 52601

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M Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634 ..... *
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M Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 **p. 1401**
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M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... *
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Analogic Corp., Dept. EM, Audubon Rd., Wakefield, Mass. 01880
D Dynair Elctrns. Inc., Dept. EM, 5275 Market St., San Diego, Calif. 92114
Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704
Modular Audio Products, Dept. EM, 50 Orville Dr., Bohemia, N.Y. 11716
Modular Devices, Inc., Dept. EM, 50 Orville Dr., Bohemia, N. Y. 11716
MVP Electronics, Dept. EM, 1161 N. Tustin, Orange, Cal. 92667
Skan-A-Matic Corp., Dept. EM, Box S, Elbridge, N.Y. 13060
Systems Research Labs. Inc., Dept. EM, 2800 Indian Ripple Rd. , Dayton, Ohio 45440

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M Acromag, Inc., Dept. EM, 30765 Wixom Rd., Wixom, Mich. 48096
Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
Wyle Computer Prods., Dept. EM, 3200 Magruder Blvd., Hampton, Va 23666

Modules, Analog-to-Digital Conversion

M Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634 ..... *
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M ILC Data Device Corp., Dept. EM, Airport Int'l. Plaza, Bohemia, N.Y. 11716 **p. 1644,1645**
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Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
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Datawest Corp., Dept. EM, 7333 E. Helm Dr., Scottsdale, Ariz. 85260
Dynamic Measurements Corp., Dept. EM, 6 Lowell Ave., Winchester, Mass. 01890
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
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Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102
Wintek Corp., Dept. EM, 902 N. 9th St., Lafayette, Ind. 47904
Wyle Computer Prods., Dept. EM, 3200 Magruder Blvd., Hampton, Va 23666

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M Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731 ..... *
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
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D Midtex, Inc., AEMCO Div., Dept. EM, 1650 Tower Blvd., No. Mankato, Minn. 56001 ..... *
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... *
Dynage, Inc. Control Prods Grp., Dept. EM, 1331 Blue Hills Ave., Bloomfield, Conn. 06002
D Dynair Elctrns. Inc., Dept. EM, 5275 Market St., San Diego, Calif. 92114
E-H International, Inc., Dept. EM, 515 11th St Box 1289, Oakland, Cal 94604
E-H Resch. Labs., Inc., Dept. EM, Box 1289, Oakland, Cal. 94604
Electro Space Systems, Inc., Dept. EM, Box 1359, Richardson, Tex. 75080
GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
Modular Audio Products, Dept. EM, 50 Orville Dr., Bohemia, N.Y. 11716
Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
PCS., Inc., Dept. EM, 750 N. Maple Rd., Saline, Mich. 48176
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
Skan-A-Matic Corp., Dept. EM, Box S, Elbridge, N.Y. 13060
Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102
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M Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634 ..... *
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Datawest Corp., Dept. EM, 7333 E. Helm Dr., Scottsdale, Ariz. 85260
Dynamic Measurements Corp., Dept. EM, 6 Lowell Ave., Winchester, Mass. 01890
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
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M **ESC Elctrns. Corp., Dept. EM, 534 Bergen Blvd., Palisades Pk., N.J. 07650** *
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M **Integrated Circuits, Inc., Dept. EM, 13256 Northrup Way, Bellevue, Wash. 98005** ..... *
ITT North, Microsystems Div, Dept. EM, 700 Hillsboro Pl., Deerfield Beach, Fla. 33441 ..... *
M **Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030** ..... *
Analogic Corp., Dept. EM, Audubon Rd., Wakefield, Mass. 01880
Convex Corp., Dept. EM, 2810 Dorr Ave., Fairfax, Va. 22031
Data-Control Systems, Dept. EM, Commerce Dr., Box 860, Danbury, Conn. 06810
M Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
MVP Electronics, Dept. EM, 1161 N. Tustin, Orange, Cal. 92667
Systems Research Labs. Inc., Dept. EM, 2800 Indian Ripple Rd. , Dayton, Ohio 45440
Wyle Computer Prods., Dept. EM, 3200 Magruder Blvd., Hampton, Va 23666

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M **Columbia Components, Div. Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550** ..... *
Data Translation, Dept. EM, 4 Strathmore Rd., Natick, Mass. 01760 ..... *
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Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
D Cordover & Co., Carl, Dept. EM, 3914 North 29th Ave., Hollywood, Fla. 33020
Dynage, Inc. Control Prods Grp., Dept. EM, 1331 Blue Hills Ave., Bloomfield, Conn. 06002
E-H International, Inc., Dept. EM, 515 11th St Box 1289, Oakland, Cal 94604
E-H Resch. Labs., Inc., Dept. EM, Box 1289, Oakland, Cal. 94604
Electronic Counters & Controls Inc., Dept. EM, 1500 McCormick Blvd., Mundelein, Ill. 60060
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
GTE Sylvania, Circuit Module Oper., Elctrn. Comps. Grp., Dept. EM, Box 360, Muncy, Pa. 17756
M GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Information Control Corp., Abacus Div. Dept. EM7, Dept. EM, 9610 Bellanca Ave., Los Angeles, Cal. 90045
DM Intech/Function Modules, Dept. EM, 282 Brokaw, Santa Clara, Cal. 95050
D Namco Controls, Acme-Cleveland Co., Dept. EM, 170 E. 131st St., Cleveland, Ohio 44108
PCS., Inc., Dept. EM, 750 N. Maple Rd., Saline, Mich. 48176
Penn Airborne Prods., Dept. EM, Industrial Hwy., Southampton, Pa. 18966
M Raytheon Co., Indl. Comps. Oper., Dept. EM, 465 Centre St., Quincy, Mass. 02169
D REPCO Inc., Dept. EM, Box 7065, Orlando, Fla. 32854
Skan-A-Matic Corp., Dept. EM, Box S, Elbridge, N.Y. 13060
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Standard Engineering, Dept. EM, 44800 Industrial Dr., Fremont, Cal. 94538
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
Systems Research Labs. inc., Dept. EM, 2800 Indian Ripple Rd. , Dayton, Ohio 45440
Tech Serv., Inc., BRS/LVE Div, Dept. EM, 5301 Holland Dr., Beltsville, Md 20705
Tenor Co., Inc., Dept. EM, 17020 W. Rogers Dr., New Berlin, Wisc. 53151
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M Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
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M **Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470** ..... *
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M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** *
Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 ..... *
D **Gulton Inds., Inc., Measurement & Control Systems Div., Dept. EM, Gulton Ind'l. Pk., E. Greenwich, R.I. 02818** ..... *
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
Leach Corp., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D **Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705** ..... *
D **Non-Linear Sys., Inc., Dept. EM, 533 Stevens Ave., Solana Beach, Cal. 92075** *
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M Acromag, Inc., Dept. EM, 30765 Wixom Rd., Wixom, Mich. 48096
Applied Electro Technology, Inc., Dept. EM, 2220 S. Anne St., Santa Ana, Cal. 92704
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Hartman Electrical Mfg., Div. A-T-O Inc., Dept. EM, 175 N. Diamond St., Mansfield, Ohio 44902
Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
Metrix Instrument Co., Metrix Instrument Co., Dept. EM, 1711 Townhurst, Houston, Tex. 77043
Micro, Emerson Electric Co. Devices Div, Dept. EM, Box 501 Wright Bros Br, Dayton, Ohio 45409
Sotcher Measurement, Inc., Dept. EM, 1120 Stewart Court, Sunnyvale, Cal. 94086
M Wilmar Elctrns. Inc., Dept. EM, 2430 Amsler St., Torrance, Cal. 90505

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M **Polarad Elctrn. Instrs., Dept. EM, 5 Delaware Dr., Lake Success, N.Y. 11040** *
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** ..... *
United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403 ..... *
D **Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114** ..... *
Applied Electro Technology, Inc., Dept. EM, 2220 S. Anne St., Santa Ana, Cal. 92704
Basler Electric Co., Dept. EM, Box 269, Rte. 143, Highland, Ill. 62249
Electronic Counters & Controls Inc., Dept. EM, 1500 McCormick Blvd., Mundelein, Ill. 60060
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Frequency Engrg. Labs., Dept. EM, Box 527, Farmingdale, N.J. 07727
Hartman Electrical Mfg., Div. A-T-O Inc., Dept. EM, 175 N. Diamond St., Mansfield, Ohio 44902
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M Nelson Ross Elctrns., Dept. EM, 5 Delaware, Lake Success, N.Y. 11040
Richard-Lee Co., Dept. EM, Box 724, New Providence, N.J. 07974
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803
Video Research Corporation, Dept. EM, 6985 Garden Rd., Riviera Beach, Fla. 33404
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304

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EG&G, Inc., Electro-Optics Div., Dept. EM, 35 Congress St., Salem, Mass. 01970 ..... *
Advanced Kinetics, Dept. EM, 1231 Victoria St., Costa Mesa, Calif. 92627
D Apollo Lasers Inc., Dept. EM, 6357 Arizona Cir., Los Angeles, Cal. 90045
Electro-Optical Inds., Inc., Dept. EM, 839 Ward Dr., Santa Barbara, Cal. 93111
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Laser Inc., Dept. EM, Laser Lane, Box 537, Sturbridge, Mass. 01566
D Metrologic Instruments, Inc., Dept. EM, 143 Harding Ave., Bellmawr, N.J. 08030
Quantronix Corp., Dept. EM, 225 Engineers Rd., Smithtown, N.Y. 11787
Scientech, Inc., Dept. EM, 5649 Arapahoe Ave, Boulder, Colo. 80303
United Detector Tech., Dept. EM, 2644 30th St., Santa Monica, Cal. 90405

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Modular Audio Products, Dept. EM, 50 Orville Dr., Bohemia, N.Y. 11716

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Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343

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Austron, Inc., Dept. EM, 1915 Kramer La., Austin, Tex. 78758 ..... *
Chesterfield Prods. Inc., Dept. EM, 511A Victor St., Saddle Brook, N.J. 07662 *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
M **Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080** ..... p. 2710-2713
Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 ..... *
DM **Hi-G Co., Inc., Dept. EM, 580 Spring St., Windsor Locks, Conn. 06096** ..... *
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
Ohio Semitronics, Inc., Dept. EM, 1205 Chesapeake Ave., Columbus, Ohio 43212 ..... *
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Gorman-Redlich Mfg. Co., Dept. EM, 6 Curtis St., Athens, Ohio 45701
Hartman Electrical Mfg., Div. A-T-O Inc., Dept. EM, 175 N. Diamond St., Mansfield, Ohio 44902
IRD Mechanalysis, Inc., Dept. EM, 6150 Huntley Rd., Columbus, Ohio 43229
Rochester Instr System, Dept. EM, 255 N. Union St., Rochester, N.Y. 14605
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803

Monitors, Phase Sequence & Loss

Active Control Instrumentation, Dept. EM, PO Box 243-Wildwood Circle, Key Largo, Florida 33037 ..... *
M **Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470** ..... *
D **Diversified Electronics Inc., Dept. EM, 119 N. Morton Ave., Evansville, Ind. 47711** ..... p. 3448
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DM **Hi-G Co., Inc., Dept. EM, 580 Spring St., Windsor Locks, Conn. 06096** ..... *
Leach Corp., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
M **Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735** *
Applied Electro Technology, Inc., Dept. EM, 2220 S. Anne St., Santa Ana, Cal. 92704
Basler Electric Co., Dept. EM, Box 269, Rte. 143, Highland, Ill. 62249
Hartman Electrical Mfg., Div. A-T-O Inc., Dept. EM, 175 N. Diamond St., Mansfield, Ohio 44902
Lark Electronics, Inc., Dept. EM, Box 390, New York, N.Y. 10040
M Wilmar Elctrns. Inc., Dept. EM, 2430 Amsler St., Torrance, Cal. 90505

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D **ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845** ..... *
M **American Aerospace Controls, Dept. EM, 131 Verdi St., Farmingdale, N.Y. 11735** ..... p. 4299
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 ..... *
Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 ..... *
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D **Gulton Inds., Inc., Measurement & Control Systems Div., Dept. EM, Gulton Ind'l. Pk., E. Greenwich, R.I. 02818** ..... *
DM **Hi-G Co., Inc., Dept. EM, 580 Spring St., Windsor Locks, Conn. 06096** ..... *
Leach Corp., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003 ..... *
D **Midtex, Inc., AEMCO Div., Dept. EM, 1650 Tower Blvd., No. Mankato, Minn. 56001** ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
Ohio Semitronics, Inc., Dept. EM, 1205 Chesapeake Ave., Columbus, Ohio 43212 ..... p. 4303,4305-4308
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** ..... *
M Acromag, Inc., Dept. EM, 30765 Wixom Rd., Wixom, Mich. 48096
Ampower Electronic Instr. Co., Dept. EM, 500 Union Blvd., Totowa, N. J. 07512
Applied Control Co., Dept. EM, 1275 Bloomfield Ave., Fairfield, N.J. 07006
Applied Electro Technology, Inc., Dept. EM, 2220 S. Anne St., Santa Ana, Cal. 92704
Applied Systems Corp., Dept. EM, 26401 Harper Ave., St. Clair Shores, Mich. 48081
Basler Electric Co., Dept. EM, Box 269, Rte. 143, Highland, Ill. 62249
M Cal-Power Corp., Dept. EM, 140 Kansas St., El Segundo, Calif. 90245
Hartman Electrical Mfg., Div. A-T-O Inc., Dept. EM, 175 N. Diamond St., Mansfield, Ohio 44902
Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
Lark Electronics, Inc., Dept. EM, Box 390, New York, N.Y. 10040
D LocAtor Electronics Co., Dept. EM, South Country Ind'l Pk., Drawer 10609, St. Louis, Mo. 63129
Micro Instrument Co., Marine & Power Instr. Div., Dept. EM, 2250 Micro Pl., Escondido, Cal. 92025
Pacific Technology, Dept. EM, 235 Airport Way, Renton, Wash. 98055
Sotcher Measurement, Inc., Dept. EM, 1120 Stewart Court, Sunnyvale, Cal. 94086
M Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803
D West Instrs, Gulton Inds, M. C. S. Div., Dept. EM, Gulton Indl Pk, E. Greenwich, RI 02818
M Wilmar Elctrns. Inc., Dept. EM, 2430 Amsler St., Torrance, Cal. 90505

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Electro Industries, Dept. EM, 109 Nassau Dr., Albertson, NY 11507 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
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Electro-Dynamics Dev. Co., Dept. EM, 475 Mt. Hood Dr. S.W., Issaquah, Wash 98027
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
D Robins Broadcast & Sound Equipment Corp., Sub. Robins Inds., Dept. EM, 75 Austin Blvd., Commack, N.Y. 11725

Monitors, Power Failure

Active Control Instrumentation, Dept. EM, PO Box 243-Wildwood Circle, Key Largo, Florida 33037 ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *

Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ..... p. 2709
Ampower Electronic Instr. Co., Dept. EM, 500 Union Blvd., Totowa, N. J. 07512
Lark Electronics, Inc., Dept. EM, Box 390, New York, N.Y. 10040
Mack Elec. Devices, Dept. EM, 32 Glenside Ave., Wyncote, Pa. 19095
Wilmar Elctrns. Inc., Dept. EM, 2430 Amsler St., Torrance, Cal. 90505

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Bird Electronic Corp., Dept. EM, 30303 Aurora Rd., Solon, Ohio 44139 p. 2668,2669
M **Electro Impulse, Dept. EM, Box 870, Red Bank, N.J. 07701** ..... p. 2720
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** p. 2870
GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 ..... *
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
M Dielectric Comms, Unit of Gen Signal, Dept. EM, Raymond, Maine 04071
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
Micro Instrument Co., Marine & Power Instr. Div., Dept. EM, 2250 Micro Pl., Escondido, Cal. 92025
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
Pacific Meas., Inc., Dept. EM, 470 San Antonio Rd, Palo Alto, Calif. 94306

Monitors, Pulse Code Modulation

Vega Precision Labs., Dept. EM, 800 Follin La., Vienna, Va. 22180 ..... *
Data-Control Systems, Dept. EM, Commerce Dr., Box 860, Danbury, Conn. 06810
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071

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Active Control Instrumentation, Dept. EM, PO Box 243-Wildwood Circle, Key Largo, Florida 33037 ..... *
D **Beede Electrical Instr. Co., Dept. EM, S. Main St., Penacook, N.H. 03301** .... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101** ..... *
Doric Sci., Div. Emerson Elec. Co., Dept. EM, 3883 Ruffin Rd., San Diego, Cal. 92123 ..... p. 2716,2717
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Harrel, Inc., Dept. EM, 16 Fitch St., E. Norwalk, Conn. 06855 ..... *
Keystone Carbon Co., Thermistor Div., Dept. EM, St. Marys, Pa. 15857 ..... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
PPM, Inc., Dept. EM, 7575 Bond St., Cleveland, Ohio 44139 ..... *
D **RFL Inds., Thermocontrol Div., Dept. EM, Boonton, N.J. 07005** ..... *
United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403 ..... p. 2832
D **Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523** ..... *
M Acromag, Inc., Dept. EM, 30765 Wixom Rd., Wixom, Mich. 48096
D Acurex-Autodata, Dept. EM, 485 Clyde, Mountain View, Cal. 94042
D Amprobe Instrument, Div. SOS Consolidated Inc., Dept. EM, 630 Merrick Rd., Lynbrook, N.Y. 11563
Analogic Corp., Dept. EM, Audubon Rd., Wakefield, Mass. 01880
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
Applied Systems Corp., Dept. EM, 26401 Harper Ave., St. Clair Shores, Mich. 48081
M Bailey Instrs., Inc., Dept. EM, 515 Victor St., Saddle Brook, N.J. 07662
Burling Instr. Co., Dept. EM, 16 River Rd., Box 298, Chatham, N.J. 07928
Climatronics Corp., Dept. EM, 1324 Motor Pkwy., Hauppauge, N.Y. 11787
M Cox & Co., Inc., Dept. EM, 215 Park Ave., S., New York, N.Y. 10003
D Delta Design, Inc., Dept. EM, 5725 Kearny Villa Road, San Diego, Cal 92123
Howell Inst. Inc., Dept. EM, 3479 W. Vickery Blvd., Ft. Worth, Tex. 76107
Hy-Cal Engrg, Dept. EM, 12105 Los Nietos Rd., Santa Fe Springs, Cal 90670
Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704
Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
IPAC Group, Inc., Dept. EM, POB 156 3047 Industrial Blvd., Bethel Park, PA 15102
IRD Mechanalysis, Inc., Dept. EM, 6150 Huntley Rd., Columbus, Ohio 43229
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Mack Elec. Devices, Dept. EM, 32 Glenside Ave., Wyncote, Pa. 19095
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
D Marathon Battery Co., c/o Marathon Manufacturing Co., Dept. EM, 1900 Marathon Bldg., 600 Jefferson Box 61589, Houston, Tex. 77002
M Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
Metrix Instrument Co., Metrix Instrument Co., Dept. EM, 1711 Townhurst, Houston, Tex. 77043
Micro, Emerson Electric Co. Devices Div, Dept. EM, Box 501 Wright Bros Br, Dayton, Ohio 45409
Princeton Applied Resch. Corp., Dept. EM, Box 2565, Princeton, N.J. 08540
D Robertshaw Controls Co., Ind'l. Instr. Div., Dept. EM, 1910 Byrd Ave Ste 200, Richmond, Va. 23230
Rochester Instr System, Dept. EM, 255 N. Union St., Rochester, N.Y. 14605
D Sloan Technology Corp., Dept. EM, 535 E. Montecito St., Santa Barbara, Cal. 93103
Spectral Dynamics Corp., Dept. EM, Box 671, San Diego, Cal. 92112
M Syscon Int'l., Inc., Dept. EM, 1239 South Bend Ave., So. Bend, Ind. 46617
D Tempil Div., Big Three Inds, Dept. EM, Hamilton Blvd., So. Plainfield, N.J. 07080
Tempkey Inc., Dept. EM, 2155 Park Blvd., Palo Alto, Cal. 94306
Thermo Elec. Co., Inc., Dept. EM, 109 Fifth St., Saddle Brook, N.J. 07662
Trans-Met Engrg., Dept. EM, 601 S. Palm St., La Habra, Cal. 90631
D Victory Engrg. Corp., Dept. EM, Victory Rd., Springfield, N.J. 07081
VirTis Co., Dept. EM, Rte. 208, Gardiner, N.Y. 12525
West Coast Resch. Corp., Dept. EM, Box 25061, Los Angeles, Cal. 90025
D Yellow Springs Instrument Co., Dept. EM, Box 279, Yellow Springs, Ohio 45387

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D **Beede Electrical Instr. Co., Dept. EM, S. Main St., Penacook, N.H. 03301** .... *
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Harrel, Inc., Dept. EM, 16 Fitch St., E. Norwalk, Conn. 06855 ..... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
PPM, Inc., Dept. EM, 7575 Bond St., Cleveland, Ohio 44139 ..... *
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** ..... *
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D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
Bailey Instrs., Inc., Dept. EM, 515 Victor St., Saddle Brook, N.J. 07662
M Bay Laboratories, Inc., Dept. EM, 20160 Center Ridge Rd., Cleveland, Ohio 44116
Consolidated Controls Corp., Dept. EM, 15 Durant Ave., Bethel, Conn. 06801
Howell Inst. Inc., Dept. EM, 3479 W. Vickery Blvd., Ft. Worth, Tex. 76107
Hy-Cal Engrg, Dept. EM, 12105 Los Nietos Rd., Santa Fe Springs, Cal 90670
Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704
Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Metrix Instrument Co., Metrix Instrument Co., Dept. EM, 1711 Townhurst, Houston, Tex. 77043
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
Spectral Dynamics Corp., Dept. EM, Box 671, San Diego, Cal. 92112
Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
Trans-Met Engrg., Dept. EM, 601 S. Palm St., La Habra, Cal. 90631

Monitors, Video

D **A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876** ..... *
Colorado Video, Inc., Dept. EM, Box 928, Boulder, Colo. 80306 ..... p. 1375
Infodex, Inc., Dept. EM, 7 Cherry Ave., Waterbury, Conn. 06702 ..... *
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American Optical Corp., Sci. Instr. Div., Dept. EM, Eggert & Sugar Rds., Buffalo, N.Y. 14215
Ann Arbor Terminals, Inc., Dept. EM, 6107 Jackson Rd., Ann Arbor, Mich. 48103
Ball Bros. Research Corp., Electronic Display Div., Dept. EM, Box 43376, St Paul, Minn. 55164
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
Conrac Div., Conrac Corp., Dept. EM, 600 N. Rimsdale Ave., Covina, Calif. 91722
Dumont Oscilloscope Labs., Dept. EM, 40 Fairfield Pl., W. Caldwell, N.J. 07006
M GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
D Apollo Lasers, Apollo Lasers, Inc., Dept. EM, 6357 Arizonia Cir, Los Angeles, Cal. 90045
M LNR Communications, Inc., Dept. EM, 180 Marcus Blvd., Hauppauge, N.Y. 11787
D Redactron Corp., Dept. EM, 100 Parkway Dr. S., Hauppauge, N.Y. 11787
Sierra Scientific Corp., Dept. EM, 2189 Leghorn St., Mountain View, Cal. 94043
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077

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Eastern Air Devices Motor Div., Electro Audio Dynamics, Inc., Dept. EM, 1 Progress Dr., Dover, N.H. 03820 ..... *
Electro-Craft Corp., Dept. EM, 1600 2nd St. South, Hopkins, Minn. 55343 .. *
M **Fabricast, Inc., Dept. EM, 2517 Seaman Ave., So. El Monte, Cal. 91733** ..... *
M **Georator Corporation, Dept. EM, Box 70, Manassas, Va. 22110** p. 3264,3388
I M C Magnetics, Eastern Div., Dept. EM, 570 Main St., Westbury, N.Y. 11590 *
Magnetic Technology, Vernitron Corp., Dept. EM, 21001 Kittridge St., Canoga Pk., Cal. 91303 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
TRW/Globe Motors, Dept. EM, 2275 Stanley Ave., Dayton, Ohio 45404 ..... *
M American Electronics, Inc., Dept. EM, 1600 E Valencia Dr., Fullerton, Cal. 92631
M Ashland Elec. Prods., Dept. EM, 32-02 Queens Blvd., L.I.C., N.Y. 11101
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
Dynetic Systems, Dept. EM, 19128 Indl Blvd., Elk River, Minn 55330
Framar Metal Prods Co., Dept. EM, 124 W Main St Dept 1201, High Bridge, N.J. 08829
HICO Horizons Int'l Co., Dept. EM, 716 Willow Rd, Menlo Park, Cal. 94025
Howard Industries, Div. of MSL, Dept. EM, Box 287, Milford, Ill. 60953
Inland Motor Div. Kollmorgen, Dept. EM, Spec Prods., 501 First St., Radford, Va. 24141
Kato Engineering Co., Dept. EM, 1415 1st Ave., Mankato, Minn. 56001
D Leece Neville Div., Sheller Globe Corp., Dept. EM, 1374 East 51st St., Cleveland, Ohio 44103
Magnetic Metals Co., Dept. EM, Hayes Ave. at 21st St., Camden, N.J. 08105
Minnesota Electric Tech. Inc., Dept. EM, 1821 University Ave., St. Paul, Minn. 55104
Scott & Fetzer Co., Northland Div, Dept. EM, 968 Bradley St, Watertown, N.Y. 13601
PMI Motors, Kollmorgen Corp., Dept. EM, 5 Aerial Way, Syosset, NY 11791
M Powertron Corp., Dept. EM, 3821 Barringer Dr., Charlotte, N.C. 28210

D Siemens-Allis, Inc., Dept. EM, Box 2168, Milwaukee, Wisc. 53201
Transicoil, Inc., Dept. EM, Worcester, Pa. 19490

Motor Electric Generator Sets

D Electro-Craft Corp., Dept. EM, 1600 2nd St. South, Hopkins, Minn. 55343 .. *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
M Georator Corporation, Dept. EM, Box 70, Manassas, Va. 22110 p. 3262,3263,3386-3388
Magnetic Technology, Vernitron Corp., Dept. EM, 21001 Kittridge St., Canoga Pk., Cal. 91303 ..... *
Marine Electric Railway Prods. Div., Inc., Dept. EM, 167 National Rd., Edison, N.J. 08817 ..... *
M Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... *
M Ajax Magnethermic Corp., Dept. EM, 1745 Overland Ave., N.E., Warren, Ohio 44482
M American Electronics, Inc., Dept. EM, 1600 E Valencia Dr., Fullerton, Cal. 92631
D Atlas Energy Systems, Dept. EM, 9459 Rush St., S. El Monte, Cal. 91733
M Electric Indicator Co., Inc., Dept. EM, 272 Main Avenue, Norwalk, Conn. 06851
Electric Machinery Mfg. Co., Dept. EM, 800 Central Ave., Minneapolis, Minn. 55413
Inland Motor Div. Kollmorgen, Indl Drives Grp, Dept. EM, 609 Rock Rd., Radford, Va. 24141
Inland Motor Div. Kollmorgen, Dept. EM, Spec Prods., 501 First St., Radford, Va. 24141
Kato Engineering Co., Dept. EM, 1415 1st Ave., Mankato, Minn. 56001
D Leece Neville Div., Sheller Globe Corp., Dept. EM, 1374 East 51st St., Cleveland, Ohio 44103
D Siemens-Allis, Inc., Dept. EM, Box 2168, Milwaukee, Wisc. 53201
WER Industrial, Div. Emerson Elec. Co., Dept. EM, 3036 Alt Blvd., Grand Island, N.Y. 14072

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M Aeroflex Labs., Magnetic Prods. Div., Dept. EM, South Service Rd., Plainview, N.Y. 11803 ..... p. 3069-3071
Bodine Electric Co., Dept. EM, 2500 W. Bradley Pl., Chicago, Ill. 60618 p. 3077
D Canon U.S.A., Inc., Dept. EM, 10 Nevada Dr., Lake Success, N.Y. 11040 p. 3078
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ITT Comps. Relays, Dept. EM, 1551 Osgood St., N. Andover, Mass. 01845 *
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Torque Systems, Sub. Rotron/EG & G Co., Dept. EM, P.O. Box 588, 225-E. Crescent St., Waltham, Mass. 02154 ..... p. 3128
TRW/Globe Motors, Dept. EM, 2275 Stanley Ave., Dayton, Ohio 45404 ..... *
M Vernitron Corp., Control Components Div., Dept. EM, 1601 Precision Park La., San Diego, Cal. 92013 ..... p. 2277,3129
M Astro Dynamics, Dept. EM, 2 Gill St., Woburn, Mass. 01801
Brailsford & Co., Dept. EM, 670 Milton Rd., Rye, N.Y. 10580
Dynetic Systems, Dept. EM, 19128 Indl Blvd., Elk River, Minn 55330
Evershed & Vignoles Ltd., Dept. EM, Action Lane, Chiswick, London, England W4 5HJ
Haydon Switch & Instr., Inc., Dept. EM, 1500 Meriden Rd., Waterbury, Conn. 06705
M Inland Motor Div. Kollmorgen, Dept. EM, Spec Prods., 501 First St., Radford, Va. 24141
Nidec America Corp., Dept. EM, 1821 University Ave., St. Paul, Minn. 55104
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
PMI Motors, Kollmorgen Corp., Dept. EM, 5 Aerial Way, Syosset, NY 11791
M Sierracin/Magnedyne Inc., Dept. EM, 5580 El Camino Real, Box 458, Carlsbad, Cal. 92008
Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
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D Bristol Saybrook Co., Dept. EM, 97 Coulter St., Old Saybrook, Conn. 06475
Controls Plant, McGraw Edison Co., Dept EM, 210 Redstone Hill Rd., Bristol, Conn. 06010
D Cramer Division, Conrac Corporation, Dept. EM, Mill Rock Rd., Old Saybrook, Conn. 06475
Crouzet/Cridland, Dept. EM, 118 Barrington Commons Ct Ste 207, Barrington, Ill. 60010
Haydon Switch & Instr., Inc., Dept. EM, 1500 Meriden Rd., Waterbury, Conn. 06705
DM Hurst Mfg. Corp., Dept. EM, Box 326, Princeton, Ind. 47670
IMC Magnetics Corp., Hansen Mfg. Co., Dept. EM, Dept. EM, Box 23, Princeton, Ind. 47670
D Mitsumi Elec. Co., Ltd., Dept. EM, 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Paragon Elect. Co., Inc., Sub. of AMF, Dept. EM, 606 Parkway Blvd. P.O. Box 28, Two Rivers, Wisc. 54241
D Precision Timer Co., Dept. EM, 13 Westbrook Ind'l. Park, Westbrook, Conn 06498

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D Bodine Electric Co., Dept. EM, 2500 W. Bradley Pl., Chicago, Ill. 60618 ..... *
D Canon U.S.A., Inc., Dept. EM, 10 Nevada Dr., Lake Success, N.Y. 11040 ..... *
D Control Products Div., Amerace Corp., Dept. EM, 2330 Vauxhall Rd., Union, N.J. 07083 ..... *
D Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101 ..... *
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Gentron Corp., Dept. EM, 6667 N. Sydney Pl., Milwaukee, Wisc. 53209
Hartman Electrical Mfg., Div. A-T-O Inc., Dept. EM, 175 N. Diamond St., Mansfield, Ohio 44902
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M IMC Magnetics Corp., Western Div., Dept. EM, 6058 Walker Ave., Maywood, Cal. 90270
DM Inertial Motors Corp., Dept. EM, 280 N. Broad St., Doylestown, Pa. 18901
Inland Motor Div. Kollmorgen, Indl Drives Grp, Dept. EM, 609 Rock Rd., Radford, Va. 24141
Link Communications Inc., Dept. EM, 260 W. Broadway, New York, N.Y. 10013
M MPC Prods. Corp., Dept. EM, 4200 W. Victoria Ave., Chicago, Ill. 60646
PMI Motors, Kollmorgen Corp., Dept. EM, 5 Aerial Way, Syosset, NY 11791
Powertron Corp., Dept. EM, 3821 Barringer Dr., Charlotte, N.C. 28210
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M Transicoil, Inc., Dept. EM, Worcester, Pa. 19490
D Vectrol, Inc., Dept. EM, 110 Douglas Rd, Oldsmar, Fla. 33557
D Wadsworth Electric Mfg. Co., Dept. EM, 20 W. 11th St., Covington, Ky. 41011
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M Electric Indicator Co., Inc., Dept. EM, 272 Main Avenue, Norwalk, Conn. 06851
Evershed & Vignoles Ltd., Dept. EM, Action Lane, Chiswick, London, England W4 5HJ
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D Control Products Div., Amerace Corp., Dept. EM, 2330 Vauxhall Rd., Union, N.J. 07083 ..... *
Eastern Air Devices Motor Div., Electro Audio Dynamics, Inc., Dept. EM, 1 Progress Dr., Dover, N.H. 03820 ..... *
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M North American Philips Controls Corp., Dept. EM, Cheshire Industrial Pk. Box E, Cheshire, Conn. 06410 ..... *
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D Carter Motor Co., Dept. EM, 2707 W. George St., Chicago, Ill. 60618
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Elden Mfg. Co., Dept. EM, 2712 N. Elston Ave., Chicago, Ill. 60647
M Electric Indicator Co., Inc., Dept. EM, 272 Main Avenue, Norwalk, Conn. 06851
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Standard Pneumatic Motor Co., Dept. EM, Box 10030, Reno, Nev. 89510
D Telex Communications, Inc., Dept. EM, 9600 Aldrich Ave., So., Minneapolis, Minn. 55420
Vibrac Corp., Dept. EM, 11 Alpha Rd., Chelmsford, Mass. 01824
DM Welco Inds. Inc., Dept. EM, 9027 Shell Ave., Cincinnati, Ohio 45236
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D Bodine Electric Co., Dept. EM, 2500 W. Bradley Pl., Chicago, Ill. 60618 p. 3077
D Canon U.S.A., Inc., Dept. EM, 10 Nevada Dr., Lake Success, N.Y. 11040 p. 3078
M Clifton Precision, Litton Systems, Inc., Dept. EM, Marple at Brdway., Clifton Hgts., Pa. 19018 ..... *
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M North American Philips Controls Corp., Dept. EM, Cheshire Industrial Pk. Box E, Cheshire, Conn. 06410 ..... *
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M **McLean Engrg. Labs., Dept. EM, 70 Washington Rd., Princeton Jctn., N.J. 08550** ..... *
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B & B Motor & Control, Dept. EM, 96 Spring St., New York, N.Y. 10012
Controls Plant, McGraw Edison Co., Dept. EM, 210 Redstone Hill Rd., Bristol, Conn. 06010
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D General Scanning, Dept. EM, 150 Coolidge Ave., Watertown, Mass. 02172
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D Hurst Mfg. Corp., Dept. EM, Box 326, Princeton, Ind. 47670
Indiana General, Dept. EM, 1168 Barranca Dr, El Paso, Tx 79935
M Inland Motor Div. Kollmorgen, Indl Drives Grp, Dept. EM, 609 Rock Rd., Radford, Va. 24141
M Inland Motor Div. Kollmorgen, Dept. EM, Spec Prods., 501 First St., Radford, Va. 24141
M MFE Corp., Dept. EM, Keewaydin Dr., Salem, N.H. 03079
M MPC Prods. Corp., Dept. EM, 4200 W. Victoria Ave., Chicago, Ill. 60646
Nidec America Corp., Dept. EM, 1821 University Ave., St. Paul, Minn. 55104
PMI Motors, Kollmorgen Corp., Dept. EM, 5 Aerial Way, Syosset, NY 11791
Powertron Corp., Dept. EM, 3821 Barringer Dr., Charlotte, N.C. 28210
M Sawyer Inds., Dept. EM, 5649 Peck Rd., Arcadia, Cal. 91006
M Sierracin/Magnedyne Inc., Dept. EM, 5580 El Camino Real, Box 458, Carlsbad, Cal. 92008
Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
Transicoil, Inc., Dept. EM, Worcester, Pa. 19490
DM Welco Inds. Inc., Dept. EM, 9027 Shell Ave., Cincinnati, Ohio 45236
Western Gear Corp., Electro Prods. Oper., Dept. EM, 14724 East Proctor, City of Industry, Cal 91749

Motors, Universal, A-C Or D-C Operation

D Bodine Electric Co., Dept. EM, 2500 W. Bradley Pl., Chicago, Ill. 60618 ..... *
Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 ..... *
D ISL Products Ltd. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803 *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
TRW/Globe Motors, Dept. EM, 2275 Stanley Ave., Dayton, Ohio 45404 ..... *
M American Electronics, Inc., Dept. EM, 1600 E Valencia Dr., Fullerton, Cal. 92631
Ametek/Lamb Electric, Dept. EM, 627 Lake St., Kent, Ohio 44240
B & B Motor & Control, Dept. EM, 96 Spring St., New York, N.Y. 10012
D Carter Motor Co., Dept. EM, 2707 W. George St., Chicago, Ill. 60618
Eaton Corp., Ind'l. Drives Div., Dept. EM, 9919 Clinton Rd., Cleveland, Ohio 44111
Elden Mfg. Co., Dept. EM, 2712 N. Elston Ave., Chicago, Ill. 60647
M Electric Indicator Co., Inc., Dept. EM, 272 Main Avenue, Norwalk, Conn. 06851
Howard Industries, Div. of MSL, Dept. EM, Box 287, Milford, Ill. 60953
D Leece Neville Div., Sheller Globe Corp., Dept. EM, 1374 East 51st St., Cleveland, Ohio 44103
M MPC Prods. Corp., Dept. EM, 4200 W. Victoria Ave., Chicago, Ill. 60646
Nidec America Corp., Dept. EM, 1821 University Ave., St. Paul, Minn. 55104
Scott & Fetzer Co., Northland Div, Dept. EM, 968 Bradley St, Watertown, N.Y. 13601
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Sawyer Inds., Dept. EM, 5649 Peck Rd., Arcadia, Cal. 91006
Servo-Instruments Corp., Dept. EM, R.R. 1, Box 75B, Spring Valley, Ill. 61362
Vibrac Corp., Dept. EM, 11 Alpha Rd., Chelmsford, Mass. 01824

Mounts, Antenna

M **Aeroflex Labs., Magnetic Prods. Div., Dept. EM, South Service Rd., Plainview, N.Y. 11803** ..... *
American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735 ..... *
M ABA Electromechanical Sys. Inc., Dept. EM, Box 500, Pinellas Pk., Fla. 33565
DM Ametek, Inc, Hunter Spring Division, Dept. EM, 1 Spring Ave., Hatfield, Pa. 19440
D Antenna Incorporated, Dept. EM, 26301 Richmond Road, Cleveland, Ohio 44126
D Channel Master Div. Avnet, Dept. EM, Rte. 209, Ellenville, N.Y. 12428
M Craig Sys. Corp., Dept. EM, 360 Merrimack St., Lawrence, Mass. 01842
Datron Systems, Dept. EM, 20700 Plummer St., Chatsworth, Cal. 91311
DM Easy-Up Inc., Dept. EM, Racine, Wisc. 53401
D Finney Co., Dept. EM, 34 W. Interstate St., Bedford, Ohio 44014
Gabriel Elctrns. Inc., Dept. EM, Box 626, Scarborough Ind'l. Pk., Scarborough, Me. 04074
D Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
Lord Kinematics, Lord Corp., Dept. EM, 1635 W. 12th St., Erie, Pa. 16512
M Nurad, Inc., Dept. EM, 2165 Druid Pk. Dr., Baltimore, Md. 21211
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
D Premax Prods. Div., Chisholm-Ryder Co., Dept. EM, Highland & College Aves., Niagara Falls, N.Y. 14305
D RCA Distr. & Special Prods. Div., Dept. EM, Deptford, N.J. 08096
M RF Systems, Inc., Dept. EM, 3100 Communications Rd., St Cloud, Fla. 32769
D Sinclair Radio Labs., Dept. EM, 122 Rayette Rd, Concord, Ontario, Can. L4K 1B6
D South River Metal Prods. Co., Dept. EM, P.O. Box 394, Matawan, N.J. 07747
Telco Products Co., Dept. EM, 44 Sea Cliff, Glen Cove, NY 11542
Tri-Ex Tower Corp., Dept. EM, 7182 Rasmussen Ave., Visalia, Cal. 93277
Turner Div., Conrac, Dept. EM, 716 Oakland Rd. N.E., Cedar Rapids, Iowa 52402
D Unarco-Rohn, Div. Unarco Inds., Dept. EM, Box 2000, Peoria, Ill. 61656

Mounts, CRT & Accessories

Infodex, Inc., Dept. EM, 7 Cherry Ave., Waterbury, Conn. 06702 ..... *
D **Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101** ..... *
Syntronic Instruments Inc., Dept. EM, 100 Industrial Rd., Addison, Ill. 60101 p. 1363
Conrac Div., Conrac Corp., Dept. EM, 600 N. Rimsdale Ave., Covina, Calif. 91722
Corning Glass Works, Dept. EM, Main Plant, Bldg. 21-3, Corning, NY 14830
D Apollo Lasers, Apollo Lasers, Inc., Dept. EM, 6357 Arizonia Cir, Los Angeles, Cal. 90045

Mounts, Crystal

Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D **Methode Elctrns, Interconnect Prods Div, Dept. EM, 1700 Hicks Rd, Rolling Meadows, ILL 60008** ..... *
M **Reeves-Hoffman Div., Dynamics Corp. of Amer., Dept. EM, 400 W. North St., Carlisle, Pa. 17013** ..... *
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
M Aircom, Inc., Dept. EM, Rte. 16B, Union, N.H. 03887
D Atlee Corp., Dept. EM, 8 Gill St., Woburn, Mass. 01801
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
Engelmann Microwave, Dept. EM, Skyline Dr., Montville, N.J. 07045
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
Quaker Elctrns., Dept. EM, Box 215, Hunlock Creek, Pa. 18621
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
TRG,, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006

Mounts, Integrated Circuit—See Sockets, Integrated Circuit; Boards, Plug-In

Mounts, Microwave

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
M Aircom, Inc., Dept. EM, Rte. 16B, Union, N.H. 03887
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
Gabriel Elctrns. Inc., Dept. EM, Box 626, Scarborough Ind'l. Pk., Scarborough, Me. 04074
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
D Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
M RF Systems, Inc., Dept. EM, 3100 Communications Rd., St Cloud, Fla. 32769
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006

Mounts, Mobile Antenna—See Mounts, Antenna

Mounts, Shock & Vibration

Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 ..... *
Panduit Corp., Dept. EM, 17301 Ridgeland Ave., Tinley Park, Ill. 60477 ..... *
UNITRACK Div., Calabro Plastics, Inc., Dept. EM, 8738 W. Chester Pike, Upper Darby, Pa. 19082 ..... *
Auburn Mfg., Dept. EM, Pease Ave. & Stack St., Middletown, Conn. 06457
Federal Screw Products Inc., Dept. EM, 3917 N. Kedzie Ave., Chicago, Ill. 60618
M Grant Hardware Co., Div. Buildex Inc., Dept. EM, 525 High St., W. Nyack, N.Y. 10994
Lord Kinematics, Lord Corp., Dept. EM, 1635 W. 12th St., Erie, Pa. 16512
D Nikon, Inc., Instr. Div. Ehrenreich Photo-Optical Ind., Dept. EM, 623 Stewart Ave., Garden City, N.Y. 11530
DM Stock Drive Prods., Div. Designatronics, Inc., Dept. EM, 55 S. Denton Ave., New Hyde Pk., N.Y. 11040
D Uniroyal, Inc., Dept. EM, 1230 Ave. of Americas, New York, N.Y. 10020
M Zero Corp., Dept. EM, 777 Front St., Burbank, Cal. 91502

Mounts, Tape Head

International Electro-Magnetics, Dept. EM, 350 N. Eric Dr., Palatine, Ill. 60067 *

Mounts, Thermistor

Fenwal Elctrns., Dept. EM, 63 Fountain St., Framingham, Mass. 01701 ..... *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 ..... *
RFL Inds., Thermocontrol Div., Dept. EM, Boonton, N.J. 07005 ..... *
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760

Mounts, Transistor (Including Kits)—See Pads, Transistor Mounting

Multiplexers, Analog

A. D. Data Sys., Inc., Dept. EM, POB 9209, Rochester, N.Y. 14625 ..... *
Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734 ..... *
M **Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021** p. 1401
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... *
Doric Sci., Div. Emerson Elec. Co., Dept. EM, 3883 Ruffin Rd., San Diego, Cal. 92123 ..... *
Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 ..... *
Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... *
Information Transfer Industrial, Inc., Dept. EM, Box 357, Holcomb, N.Y. 14469 ..... p. 1646
M **Interface Engineering Inc., Dept. EM, 386 Lindelof Ave., Stoughton, Mass. 02072** ..... *
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
Neff Instrument Corp., Dept. EM, 1088 E. Hamilton Rd., Duarte, Cal. 91010 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
DM **Phoenix Data Inc., Dept. EM, 3384 W. Osborn Rd., Phoenix, Ariz. 85017** .... *
Preston Scientific Inc., Dept. EM, 805 E. Cerritos Ave., Anaheim, Cal. 92805 p. 1664
M **Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735** *
D **United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403** ..... *
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Analogic Corp., Dept. EM, Audubon Rd., Wakefield, Mass. 01880
M Bay Laboratories, Inc., Dept. EM, 20160 Center Ridge Rd., Cleveland, Ohio 44116
Brunswick Instr., Dept. EM, 6150 W. Mulford Street, Niles, Ill. 60648
D Bug Electronics, Dept. EM, 151 Grove St, Westwood, Mass. 02090
Coastcom, Dept. EM, 2312 Stanwell Dr., Concord, Cal. 94520
ComData Corp., Dept. EM, 8115 N. Monticello, Skokie, ILL. 60076
Consolidated Controls Corp., Dept. EM, 15 Durant Ave., Bethel, Conn. 06801
M Data Acquisition Prods. Lab., AEL, Inc., Dept. EM, Box 552, Lansdale, Pa. 19446
Datawest Corp., Dept. EM, 7333 E. Helm Dr., Scottsdale, Ariz. 85260
Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
D EMR Telemetry, Div. Sangamo-Weston, Dept. EM, Box 3041, Sarasota, Fla. 33578
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
M Frequency Engrg. Labs., Dept. EM, Box 527, Farmingdale, N.J. 07727
GTE Lenkurt Inc., Dept. EM, 1105 County Rd., San Carlos, Cal. 94070
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
IPAC Group, Inc., Dept. EM, POB 156 3047 Industrial Blvd., Bethel Park, PA 15102
Midland Standrad Inc., Dept. EM, 603 E. Chicago St. Box 38, Elgin, ILL 60120
DM Precision Monolithics Inc., Dept. EM, 1500 Space Dr., Santa Clara, Cal. 95050
Rochester Instr System, Dept. EM, 255 N. Union St., Rochester, N.Y. 14605
Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
D Siliconix, Inc., Dept. EM, 2201 Laurelwood Rd., Santa Clara, Cal 95054
M Sonex, Dept. EM, 2337 Philmont Ave., Huntingdon Valley, Pa. 19006
DM Systems Data Inc., Dept. EM, 1941 W. Market St., Akron, Ohio 44313

Teledyne/Geotech, Dept. EM, Box 28277, Dallas, Tex. 75228
Tenor Co., Inc., Dept. EM, 17020 W. Rogers Dr., New Berlin, Wisc. 53151

Multiplexers, Digital

A. D. Data Sys., Inc., Dept. EM, POB 9209, Rochester, N.Y. 14625 ..... *
Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731 ..... *
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... **p. 1469**
Doric Sci., Div. Emerson Elec. Co., Dept. EM, 3883 Ruffin Rd., San Diego, Cal. 92123 ..... *
Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 ..... *
Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... *
Information Transfer Industrial, Inc., Dept. EM, Box 357, Holcomb, N.Y. 14469 ..... **p. 1646**
M **Interface Engineering Inc., Dept. EM, 386 Lindelof Ave., Stoughton, Mass. 02072** ..... *
Neff Instrument Corp., Dept. EM, 1088 E. Hamilton Rd., Duarte, Cal. 91010 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D **Phoenix Data Inc., Dept. EM, 3384 W. Osborn Rd., Phoenix, Ariz. 85017** .... *
Preston Scientific Inc., Dept. EM, 805 E. Cerritos Ave., Anaheim, Cal. 92805 **p. 1664**
Re-el Circuits, Inc., Dept. EM, 520 Victor Street, Saddle Brook, N.J. 07662 *
M **Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735** *
Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... *
M ABA Electromechanical Sys. Inc., Dept. EM, Box 500, Pinellas Pk., Fla. 33565
Automation Displays Inc., Dept. EM, 3833 N. White Ave., Eau Claire, Wisc. 54701
M Aydin, Vector Div., Dept. EM, Box 328, Newtown, PA 18940
ComData Corp., Dept. EM, 8115 N. Monticello, Skokie, ILL. 60076
M Cushman Electronics, Dept. EM, 2400 N. 1st St., San Jose, Cal. 95112
Dantel, Inc., Dept. EM, 1922 North Helm, Fresno, Cal. 93727
M Data Acquisition Prods. Lab., AEL, Inc., Dept. EM, Box 552, Lansdale, Pa. 19446
Data General Corp., Dept. EM, 15 Turnpike Rd Rte 9, Westboro, Mass 01581
Dataprobe, Inc., Dept. EM, 254 Green St., So. Hackensack, N.J. 07606
Datawest Corp., Dept. EM, 7333 E. Helm Dr., Scottsdale, Ariz. 85260
Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
Decom Systems, Inc., Dept. EM, 1404 Descanso Rd., San Marcos, Ca. 92069
Digital Communications Assoc., Inc., Dept. EM, 135 Technology Park/Atlanta, Norcross, Ga 30071
D EMR Telemetry, Div. Sangamo-Weston, Dept. EM, Box 3041, Sarasota, Fla. 33578
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Futronix, Inc., Dept. EM, Box 2269, Sunnyvale, Cal. 94087
GTE Lenkurt Inc., Dept. EM, 1105 County Rd., San Carlos, Cal. 94070
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
IPAC Group, Inc., Dept. EM, POB 156 3047 Industrial Blvd., Bethel Park, PA 15102
LFE Control System Industries, Dept. EM, 2920 Sand Ysidro Way, Santa Clara, Cal. 95051
Livermore Data Systems, Inc., Dept. EM, 2050 Research Dr., Livermore, Cal. 94550
Midland Standrad Inc., Dept. EM, 603 E. Chicago St. Box 38, Elgin, ILL 60120
D PCS., Inc., Dept. EM, 750 N. Maple Rd., Saline, Mich. 48176
Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
Sonex, Dept. EM, 2337 Philmont Ave., Huntingdon Valley, Pa. 19006
DM Systems Data Inc., Dept. EM, 1941 W. Market St., Akron, Ohio 44313
D Tau-Tron Inc., Dept. EM, 11 Esquire Rd., N. Billerica, Mass. 01862
Telecommunications Techniques Corp., Dept. EM, 112 Frederick Ave., Rockville, Md. 20850
DM Teledyne Semiconductor, Dept. EM, 1300 Terra Bella Ave., Mountain View, Cal. 94040
Tenor Co., Inc., Dept. EM, 17020 W. Rogers Dr., New Berlin, Wisc. 53151
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
TRW LSI Products, Dept. EM, One Space Pk., Redondo Beach, Cal. 90278
Wyle Computer Prods., Dept. EM, 3200 Magruder Blvd., Hampton, Va 23666

Multiplexers, Radio

North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
Mu-Del Elctrns., Dept. EM, 2426 Linden La., Silver Spring, Md. 20910

Multiplexers, Transmission

A. D. Data Sys., Inc., Dept. EM, POB 9209, Rochester, N.Y. 14625 ..... *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 .. **p. 3060**
Re-el Circuits, Inc., Dept. EM, 520 Victor Street, Saddle Brook, N.J. 07662 *
DM Anaren Microwave, Inc., Dept. EM, 1010 James St., Syracuse, N.Y. 13203
D Bug Electronics, Dept. EM, 151 Grove St, Westwood, Mass. 02090
M Cir-Q-Tel, Inc., Dept. EM, 10504 Wheatley St., Kensington, Md. 20795
M Coleman Microwave Co., Dept. EM, Box 59, Rte. 22, Lebanon, N.J. 08833
D ComData Corp., Dept. EM, 8115 N. Monticello, Skokie, ILL. 60076
M Cushman Electronics, Dept. EM, 2400 N. 1st St., San Jose, Cal. 95112
Futronix, Inc., Dept. EM, Box 2269, Sunnyvale, Cal. 94087
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
IPAC Group, Inc., Dept. EM, POB 156 3047 Industrial Blvd., Bethel Park, PA 15102
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
Mu-Del Elctrns., Dept. EM, 2426 Linden La., Silver Spring, Md. 20910
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Teledyne/Geotech, Dept. EM, Box 28277, Dallas, Tex. 75228

Multiplexers, Video

Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730

Multipliers, Analog

M **Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734** ..... **p. 1389**
Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 ..... *
D **General Magnetics, Dept. EM, 211 Grove St., Bloomfield, N.J. 07003** **p. 2263**
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
M **Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735** *
M Acromag, Inc., Dept. EM, 30765 Wixom Rd., Wixom, Mich. 48096
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
M Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
Intronics Inc., Dept. EM, 57 Chapel St., Newton, Mass. 02158
IPAC Group, Inc., Dept. EM, POB 156 3047 Industrial Blvd., Bethel Park, PA 15102
M Mark Eyelet & Stamping, Dept. EM, 185 Wakelee Rd., Wolcott, Conn. 06716
Optical Electronics, Inc., Dept. EM, Box 11140, Tucson, Ariz. 85734
Princeton Applied Resch. Corp., Dept. EM, Box 2565, Princeton, N.J. 08540
Rochester Instr System, Dept. EM, 255 N. Union St., Rochester, N.Y. 14605
Signal Labs, Inc., Dept. EM, 202 N. State College Blvd., Orange, Cal. 92668
Signatron, Inc., Dept. EM, 12 Hartwell Ave., Lexington, Mass. 02173

Multipliers, Crystal

M **Applied Research Inc., Dept. EM, 76 S. Bayles Ave., Port Washington, N.Y. 11050** ..... *
M **, Trak Microwave Corp., Dept. E8, Dept. EM, 4726 Eisenhower Blvd.,, Tampa, Fla. 33614** ..... *
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039

Multipliers, Diode

M **Semtech Corp., Dept. EM, 652 Mitchell Rd., Newbury Park, Cal. 91320** ..... *
M **, Trak Microwave Corp., Dept. E8, Dept. EM, 4726 Eisenhower Blvd.,, Tampa, Fla. 33614** ..... *
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
BF Elctrns., Dept. EM, 415 S. Nardo, Solana Beach, Calif. 92075
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Galileo Electro-Optics Corp., Dept. EM, Galileo Pk., Sturbridge, Mass. 01518
M Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
Rectifier Components Corp., Dept. EM, 1112 Lousons Rd., Union, N.J. 07083
M Somerset Radiation Lab., Dept. EM, Box 17066, Washington, DC 20041
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
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Multipliers, Frequency

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M **Applied Research Inc., Dept. EM, 76 S. Bayles Ave., Port Washington, N.Y. 11050** ..... **p. 2867**
Austron, Inc., Dept. EM, 1915 Kramer La., Austin, Tex. 78758 ..... *
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M **Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040** .. *
M **Greenray Inds., Inc., Dept. EM, 840 W. Church Rd., Mechanicsburg, Pa. 17055** ..... *
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M **Polarad Elctrn. Instrs., Dept. EM, 5 Delaware Dr., Lake Success, N.Y. 11040** *
M **, Trak Microwave Corp., Dept. E8, Dept. EM, 4726 Eisenhower Blvd.,, Tampa, Fla. 33614** ..... *
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M Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 ..... *
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M Axel Elctrns., Unit of General Signal, Dept. EM, 134-20 Jamaica Ave., Jamaica, N.Y. 11418 ..... *
Cober Elctrns., Inc., Dept. EM, 7 Gleason Ave., Stamford, Conn. 06902 ..... *
M Columbia Components, Div. Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 ..... *
Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 ..... *
M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 .. *
M ESC Elctrns. Corp., Dept. EM, 534 Bergen Blvd., Palisades Pk., N.J. 07650 *
M Frequency Selective Networks, Inc, Dept. EM, 69-20 Garfield Ave., Woodside, N.Y. 11377 ..... *
M Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 ..... *
Kelvin, Dept. EM, 5919 Noble Avenue, Van Nuys, Cal. 91411 ..... *
M OPT Inds. Inc., Data Products Div., Dept. EM, 300 Red School Lane, Phillipsburg, N.J. 08865 ..... *
RCL Electronics Div., AMF Incorporated, Dept. EM, 700 S. 21st St., Irvington, N.J. 07111 ..... *
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... *
TT Elctrns., Inc., Dept. EM, 2214 S. Barry Ave., Los Angeles, Cal. 90064 .... *
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138

Centralab, Electrns. Div. - Globe Union Inc., Dept. EM, 5757 N. Green Bay Ave., Milwaukee, Wisc. 53201
Engineered Components Co., Dept. EM, 3580 Sacramento Dr., San Luis Obispo, Cal. 93401
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Kappa Scientific Corp., Dept. EM, Box 30585, Santa Barbara, Cal. 93105
M Plastic Capacitors, Inc., Dept. EM, 2623 N. Pulaski Rd., Chicago, Ill. 60639
M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
M Projects Unlimited, Inc., Dept. EM, 3680 Wyse Rd., Dayton, Ohio 45414
Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
Tobe Deutschmann Labs., Inc., Dept. EM, Box 74, Canton, Mass. 02021

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Networks, RC

All-Tronics Inc., Dept. EM, 45 Bond St., Westbury, N.Y. 11590 ..... *
D Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
American Components, Inc., Dept. EM, 8th Avenue at Harry St., Conshohocken, Pa. 19428 ..... *
D Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634 ..... *
Bourns, Inc., Trimpot Prods. Div., Dept. EM, 1200 Columbia Ave., Riverside, Cal. 92507 ..... *
CTS of Berne, Dept. EM, 406 Parr Rd., Berne, Ind. 46711 ..... *
D Custom Elctrns., Dept. EM, Browne St., Oneonta, N.Y. 13820 ..... *
Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 .. *
M ESC Elctrns. Corp., Dept. EM, 534 Bergen Blvd., Palisades Pk., N.J. 07650 *
M F-Dyne Elctrns., Dept. EM, 449 Howard Ave., Bridgeport, Conn. 06605 ..... *
M Frequency Selective Networks, Inc, Dept. EM, 69-20 Garfield Ave., Woodside, N.Y. 11377 ..... *
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M Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 ..... *
M Integrated Circuits, Inc., Dept. EM, 13256 Northrup Way, Bellevue, Wash. 98005 ..... *
KDI Pyrofilm Corp, Dept. EM, 60 S. Jefferson Rd., Whippany, N.J. 07981 .... *
Kelvin, Dept. EM, 5919 Noble Avenue, Van Nuys, Cal. 91411 ..... *
M KRL Electronics, Dept. EM, 28 Bridge St., Manchester, N.H. 03101 ..... *
Mills Resistor Co., Dept. EM, 3840 Catalina St., Los Alamitos, Cal. 90720 .... *
PFC, Dept. EM, Community Dr., Great Neck, NY 11022 ..... *
RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102 ..... *
D RCL Electronics Div., AMF Incorporated, Dept. EM, 700 S. 21st St., Irvington, N.J. 07111 ..... *
Rtron Corp., Dept. EM, 7324 Lawndale, Skokie, Ill. 60076 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
M Southern Electronics Co., Dept. EM, 726 So. Flower St., Burbank, Cal. 91502 *
Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 *
Tel Labs, Inc., Dept. EM, 154 Harvey Rd., Londonderry, N.H. 03053 ..... *
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... *
TT Elctrns., Inc., Dept. EM, 2214 S. Barry Ave., Los Angeles, Cal. 90064 .... *
D Centralab, Electrns. Div. - Globe Union Inc., Dept. EM, 5757 N. Green Bay Ave., Milwaukee, Wisc. 53201
CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
M CTS Microelectronics, Inc., Dept. EM, 1201 Cumberland Ave., W. Lafayette, Ind. 47906
Electrocube Inc., Dept. EM, 1710 So. Del Mar Ave., San Gabriel, Cal. 91776
Engineered Components Co., Dept. EM, 3580 Sacramento Dr., San Luis Obispo, Cal. 93401
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
D International Sensor Systems, Inc., Dept. EM, Aurora Industrial Pk., Box 345, Aurora, Neb. 68818
D Mepco/Electra, Inc., Dept. EM, Columbia Rd., Morristown, N.J. 07960
D Murata Mfg. Co. Ltd., Dept. EM, 16, Kaiden Nishijin-cho, Nagaoka-Kyo-Shi, Kyoto, Japan
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Plessey Ceramic Div., Dept. EM, 8th & Harrison Sts., Frenchtown, N.J. 08825
Radio Materials Co., Div. P.R. Mallory, Dept. EM, 4242 W. Bryn Mawr Ave., Chicago, Ill. 60646
D Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
Thickfilm Int'l, Dept. EM, 1610 Mt Vernon Ave., Alexandria, VA 22301
M Thinco Div. Hull Corp., Dept. EM, Davisville Rd., Hatboro, Pa. 19040
White Instrs., Inc., Dept. EM, Box 698, Austin, Tex. 78767

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D Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 p. 3629-3632
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D Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634 ..... p. 2852,3646,3647
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M Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 .... *
KDI Pyrofilm Corp, Dept. EM, 60 S. Jefferson Rd., Whippany, N.J. 07981 p. 3729
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M KRL Electronics, Dept. EM, 28 Bridge St., Manchester, N.H. 03101 ..... *
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Stackpole Components Co., Dept. EM, Box 14466, Raleigh, N.C. 27610 p. 3743
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Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... *
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M TRW/IRC Resistors, Dept. EM, Greenway Rd., Boone, N.C. 28607 Inside Back Cover, Vol. 1
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M Ametek/Rodan Div., Dept. EM, 2905 Blue Star St., Anaheim, Cal. 92806
Beckman Instrs., (AISSD), Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634
C-F Electronics, Inc., Dept. EM, 14709 Keswick St., Van Nuys, Cal. 91405
D Centralab, Electrns. Div. - Globe Union Inc., Dept. EM, 5757 N. Green Bay Ave., Milwaukee, Wisc. 53201
M Circuit Technology, Dept. EM, 160 Smith St., Farmingdale, N.Y. 11735
D CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
M CTS Microelectronics, Inc., Dept. EM, 1201 Cumberland Ave., W. Lafayette, Ind. 47906
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
E.S.I. Inc., Dept. EM, 13900 N.W. Science Park Dr., Portland, Oregon 97229
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
Gentron Corp., Dept. EM, 6667 N. Sydney Pl., Milwaukee, Wisc. 53209
M Halex, Inc., Dept. EM, 1202 McGaw Ave, Irvine, Ca. 92714
Hy-Cal Engrg, Dept. EM, 12105 Los Nietos Rd., Santa Fe Springs, Cal 90670
M Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
D International Sensor Systems, Inc., Dept. EM, Aurora Industrial Pk., Box 345, Aurora, Neb. 68818
D Mepco/Electra, Inc., Dept. EM, Columbia Rd., Morristown, N.J. 07960
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Plessey Ceramic Div., Dept. EM, 8th & Harrison Sts., Frenchtown, N.J. 08825
Res-Net Corp., Dept. EM, 110 Route 10, Whippany, N.J. 07981
RFL Inds., Comms. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005
DM Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
DM Ultronix, Inc., Dept. EM, P.O. Box 1090, Grand Junction, Col. 81501

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Nuts, Metal—See Fasteners, Metal

Nuts, Plastic—See Fasteners, Non-Metallic

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Optical Component Mounts & Accessories

Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 ..... *
Aerotech, Inc., Dept. EM, 101 Zeta Dr., Pittsburgh, Pa. 15238
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
FJW Industries, Dept. EM, 215 E. Prospect Ave., Mt. Prospect, Ill. 60056
M Harshaw Chemical Co., A Kenanee Industry, Dept. EM, 6801 Cochran Rd., Solon, Ohio 44139
Melles Griot, Dept. EM, 1770 Kettering St., Irvine, Cal. 92714
Pomfret Research Optics Inc., Dept. EM, 817 Long Ridge Rd, Stamford, Conn 06902
Skan-A-Matic Corp., Dept. EM, Box S, Elbridge, N.Y. 13060
Teledyne Camera Sys., Dept. EM, 131 N. Fifth Ave., Arcadia, Cal. 91006

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Oscillators, Audio (Module)

M Accutronics-A Hammond Corp., Dept. EM, 628 North St., Box 590, Geneva, Ill. 60134 ..... *
M American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Connor-Winfield Corp., Dept. EM, W. Chicago, Ill. 60185 ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Continental Specialties Corp., Dept. EM, Box 1942, 70 Fulton Terr, New Haven, Conn. 06509 ..... *
M Damon Corp., Elctrns. Div., Dept. EM, 80 Wilson Way, Westwood, Mass. 02090 ..... *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... *
General Magnetics, Dept. EM, 211 Grove St., Bloomfield, N.J. 07003 ..... *
M Greenray Inds., Inc., Dept. EM, 840 W. Church Rd., Mechanicsburg, Pa. 17055 ..... *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
International Crystal Mfg., Dept. EM, 10 N. Lee St., Oklahoma City, Okla. 73102 ..... *
M McCoy Electronics, Sub Oak Inds. Inc., Dept. EM, Chestnut & Watts, Mt Holly Spr., Pa. 17065 ..... *
MCL, Inc., Dept. EM, 10 North Beach Ave., LaGrange, Ill. 60525 ..... *
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Q-Tech Corp., Dept. EM, 2201 Carmelina Ave., Los Angeles, Cal. 90064 ..... *
M Spectrum Technology Inc., Dept. EM, 300 Frederic Lopez Rd., Goleta, Cal. 93017 ..... *
Star Micronics Inc., Dept. EM, Pan Am Building, Ste 2308, 200 Park Ave, New York, N.Y. 10017 ..... *
M Vectron Labs., Inc., Dept. EM, 166 Glover Ave., Norwalk, Conn. 06850 ..... *
Allen Elctrns. Div., Allen Organ Co., Dept. EM, Macungie, Pa. 18062
Dale Electronics, Inc., Dept. EM, 930 West 23rd St., Tempe, Ariz. 85282
M Digitech Data Inds., Dept. EM, 66 Grove St., Box 547, Ridgefield, Conn. 06877
M Electronic Research Co., Dept. EM, Box 913, Shawnee Mission, Kans. 66201
Engineered Components Co., Dept. EM, 3580 Sacramento Dr., San Luis Obispo, Cal. 93401
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
FSI/Fork Standards Inc., Dept. EM, 211 Main St., W. Chicago, Ill. 60185
Meloy Labs Inc., Instrus. & Sys. Div., Dept. EM, 6715 Electronic Dr., Springfield, Va. 22151
Modular Audio Products, Dept. EM, 50 Orville Dr., Bohemia, N.Y. 11716
D Robins Broadcast & Sound Equipment Corp., Sub. Robins Inds., Dept. EM, 75 Austin Blvd., Commack, N.Y. 11725
D Sescom, Inc., Dept. EM, 12931 Budlong Ave. Box 590, Gardena, Cal. 90247
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
M T-F Electronics Inc., Dept. EM, 9415 Neils Thompson Dr., Austin, Tex. 78759
Telesis Laboratory, Dept. EM, Box 387, Chillocothe, Ohio 45601
UFAD Corp., Dept. EM, 700 36th St. S.E., Grand Rapids, Mich. 49508
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
D Wilson Co., H. M., Dept. EM, 11501 Chimney Rock Rd., Houston, Tex. 77035

Oscillators, Audio (Test)—See Generators, Audio

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American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Connor-Winfield Corp., Dept. EM, W. Chicago, Ill. 60185 ..... *
M Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040 .. *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 .... *
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
M Electronic Research Co., Dept. EM, Box 913, Shawnee Mission, Kans. 66201
RFL Inds., Comms. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005

Oscillators, Bias

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
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M Addington Labs., Inc., Solid State Prods. Div., Dept. EM, 783 Palomar Ave., Sunnyvale, Cal. 94086
M Electronic Research Co., Dept. EM, Box 913, Shawnee Mission, Kans. 66201
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
DM Systron-Donner, Advanced Components Div., Dept. EM, 735 Palomar Ave., Sunnyvale, Cal. 94086

Oscillators, Bridge (Test)

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
Krohn-Hite Corp., Dept. EM, Avon Ind'l Pk, Bodwell St., Avon, Mass. 02322 p. 2773

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M Applied Microwave, Div. Epsco Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 ..... p. 2861
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M MCL, Inc., Dept. EM, 10 North Beach Ave., LaGrange, Ill. 60525 ..... *
M Polarad Elctrn. Instrs., Dept. EM, 5 Delaware Dr., Lake Success, N.Y. 11040 *
D Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219 *
M , Trak Microwave Corp., Dept. E8, Dept. EM, 4726 Eisenhower Blvd.,, Tampa, Fla. 33614 ..... *
M Addington Labs., Inc., Solid State Prods. Div., Dept. EM, 783 Palomar Ave., Sunnyvale, Cal. 94086
M Frequency West, Inc., Dept. EM, 3140 Alfred St., Santa Clara, Cal. 95050
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
DM Systron-Donner, Advanced Components Div., Dept. EM, 735 Palomar Ave., Sunnyvale, Cal. 94086
M Zeta Laboratories, Inc., Dept. EM, 3265 Scott Blvd., Santa Clara, Cal. 95051

Oscillators, Crystal Controlled (Module)

M Accutronics-A Hammond Corp., Dept. EM, 628 North St., Box 590, Geneva, Ill. 60134 ..... *
M American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
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M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... *
Toyo Comm. Equip. Co. Ltd., Dept. EM, 484 Tsukakoshi 3-Chome Saiwai-Ku, Kawasaki, 210 Japan ..... *
M , Trak Microwave Corp., Dept. E8, Dept. EM, 4726 Eisenhower Blvd.,, Tampa, Fla. 33614 ..... p. 3064
M Vectron Labs., Inc., Dept. EM, 166 Glover Ave., Norwalk, Conn. 06850 p. 2376-2378
Vernitron Piezoelectric Div., Dept. EM, 232 Forbes Rd., Bedford, Ohio 44146 p. 2659

M Addington Labs., Inc., Solid State Prods. Div., Dept. EM, 783 Palomar Ave., Sunnyvale, Cal. 94086
M Airtron, Div. Litton Inds., Dept. EM, 200 E. Hanover Ave., Morris Plains, N.J. 07950
M A.R.F. Products, Dept. EM, Box 3226, Boulder, Colo. 80303
M Cirtech Corp, Dept. EM, 15237 Cherry St, Stanley, Kan. 66223
Crystonic Labs, Dept. EM, 10418 La Cienega Blvd., Inglewood, Calif. 90304
CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
Dale Electronics, Inc., Dept. EM, 930 West 23rd St., Tempe, Ariz. 85282
M Electronic Research Co., Dept. EM, Box 913, Shawnee Mission, Kans. 66201
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
M Frequency West, Inc., Dept. EM, 3140 Alfred St., Santa Clara, Cal. 95050
FSI/Fork Standards Inc., Dept. EM, 211 Main St., W. Chicago, Ill. 60185
DM Gorman-Redlich Mfg. Co., Dept. EM, 6 Curtis St., Athens, Ohio 45701
M Halex, Inc., Dept. EM, 1202 McGaw Ave, Irvine, Ca. 92714
Meloy Labs Inc., Instrus. & Sys. Div., Dept. EM, 6715 Electronic Dr., Springfield, Va. 22151
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
D Snelgrove, C. R. Ltd., Dept. EM, 141 Bond Ave., Don Mills 404 Ont., Ont. Can.
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
DM Systron-Donner, Advanced Components Div., Dept. EM, 735 Palomar Ave., Sunnyvale, Cal. 94086
M T-F Electronics Inc., Dept. EM, 9415 Neils Thompson Dr., Austin, Tex. 78759
Valtec Corp, Valpey-Fischer Div, Dept. EM, 75 South St, Hopkinton, Mass. 01748
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Zeta Laboratories, Inc., Dept. EM, 3265 Scott Blvd., Santa Clara, Cal. 95051

Oscillators, Decade (Test)

Connor-Winfield Corp., Dept. EM, W. Chicago, Ill. 60185 ..... *
Elgar Corporation, Dept. EM, 8225 Mercury Ct., San Diego, Cal. 92111 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
Krohn-Hite Corp., Dept. EM, Avon Ind'l Pk, Bodwell St., Avon, Mass. 02322 p. 2773
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343

Oscillators, Klystron—See Tubes, Klystron

Oscillators, LC

M **Accutronics-A Hammond Corp., Dept. EM, 628 North St., Box 590, Geneva, Ill. 60134** ..... *
American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Dale Electronics, Inc., Frequency Control Group, Dept. EM, 930 West 23rd St., Tempe, Ariz. 85282 ..... *
M **Damon Corp., Elctrns. Div., Dept. EM, 80 Wilson Way, Westwood, Mass. 02090** ..... *
M **Greenray Inds., Inc., Dept. EM, 840 W. Church Rd., Mechanicsburg, Pa. 17055** ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 p. 2329
Isotemp Research Inc, Dept. EM, 711 Henry Ave, Charlottesville, VA. 22901 *
Spectrum Technology Inc., Dept. EM, 300 Frederic Lopez Rd., Goleta, Cal. 93017 ..... *
M Cirtech Corp, Dept. EM, 15237 Cherry St, Stanley, Kan. 66223
Dale Electronics, Inc., Dept. EM, 930 West 23rd St., Tempe, Ariz. 85282
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
DM Systron-Donner, Advanced Components Div., Dept. EM, 735 Palomar Ave., Sunnyvale, Cal. 94086

Oscillators, Low-Frequency (Module)

M **Accutronics-A Hammond Corp., Dept. EM, 628 North St., Box 590, Geneva, Ill. 60134** ..... p. 2280,2281
M **American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377** ..... *
Behlman Engineering Corp., Dept. EM, Box 4518, 427 N. Nopal St., Santa Barbara, Cal. 93103 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Bulova Watch Co., Servo Prods. Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
California Instrs., Dept. EM, 5150-Convoy St., San Diego, Cal. 92111 .. p. 3371
Connor-Winfield Corp., Dept. EM, W. Chicago, Ill. 60185 ..... p. 2296
CTS Knights, Inc., Dept. EM, 400 Reimann Ave., Sandwich, Ill. 60548 p. 2304
Dale Electronics, Inc., Frequency Control Group, Dept. EM, 930 West 23rd St., Tempe, Ariz. 85282 ..... *
M **Damon Corp., Elctrns. Div., Dept. EM, 80 Wilson Way, Westwood, Mass. 02090** ..... *
M **Data Delay Devices, Dept. EM, 253 Crooks Ave., Clifton, N.J. 07011** ..... *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... *
Elgar Corporation, Dept. EM, 8225 Mercury Ct., San Diego, Cal. 92111 p. 3383
M **Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040** .. *
M **Greenray Inds., Inc., Dept. EM, 840 W. Church Rd., Mechanicsburg, Pa. 17055** ..... *
Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... p. 2331
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... p. 3389
International Crystal Mfg., Dept. EM, 10 N. Lee St., Oklahoma City, Okla. 73102 ..... *
M **Isotemp Research Inc, Dept. EM, 711 Henry Ave, Charlottesville, VA. 22901** p. 2337
Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 p. 2769
M **Krohn-Hite Corp., Dept. EM, Avon Ind'l Pk, Bodwell St., Avon, Mass. 02322** *
Marine Electric Railway Prods. Div., Inc., Dept. EM, 167 National Rd., Edison, N.J. 08817 ..... p. 3392
M **McCoy Electronics, Sub Oak Inds. Inc., Dept. EM, Chestnut & Watts, Mt Holly Spr., Pa. 17065** ..... *
M **Monitor Prods., Dept. EM, Box 1966, 502 Via Delmonte, Oceanside, Cal. 92054** ..... p. 2349
D **Motorola, Inc., Compt. Prods. Clock Oscillator Dept., Dept. EM, 2553 N. Edgington, Franklin Park, Ill. 60131** ..... *
Ovenaire, Div. Walter Kidde & Co., Dept. EM, 706 Forrest St., Charlottesville, Va. 22901 ..... *
Q-Tech Corp., Dept. EM, 2201 Carmelina Ave., Los Angeles, Cal. 90064 p. 2361
Reeves-Hoffman Div., Dynamics Corp. of Amer., Dept. EM, 400 W. North St., Carlisle, Pa. 17013 ..... p. 2365
M **Spectrum Technology Inc., Dept. EM, 300 Frederic Lopez Rd., Goleta, Cal. 93017** ..... *
M **Statek Corp., Dept. EM, 512 N. Main St., Orange, Cal. 92668** ..... p. 2372,2373
D **Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219** *
Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... *
M **Vectron Labs., Inc., Dept. EM, 166 Glover Ave., Norwalk, Conn. 06850** p. 2377
M Addington Labs., Inc., Solid State Prods. Div., Dept. EM, 783 Palomar Ave., Sunnyvale, Cal. 94086
M Cirtech Corp, Dept. EM, 15237 Cherry St, Stanley, Kan. 66223
Dale Electronics, Inc., Dept. EM, 930 West 23rd St., Tempe, Ariz. 85282
M Electronic Research Co., Dept. EM, Box 913, Shawnee Mission, Kans. 66201
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
FSI/Fork Standards Inc., Dept. EM, 211 Main St., W. Chicago, Ill. 60185
Meloy Labs Inc., Instrus. & Sys. Div., Dept. EM, 6715 Electronic Dr., Springfield, Va. 22151
Richard-Lee Co., Dept. EM, Box 724, New Providence, N.J. 07974
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
DM Systron-Donner, Advanced Components Div., Dept. EM, 735 Palomar Ave., Sunnyvale, Cal. 94086
M T-F Electronics Inc., Dept. EM, 9415 Neils Thompson Dr., Austin, Tex. 78759
UFAD Corp., Dept. EM, 700 36th St. S.E., Grand Rapids, Mich. 49508

Oscillators, Magnetron—See Tubes, Magnetron

Oscillators, Microwave

Accutronics-A Hammond Corp., Dept. EM, 628 North St., Box 590, Geneva, Ill. 60134 ..... p. 2280,2281
M **Applied Microwave, Div. Epsco Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090** ..... *
M **Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706** ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Epsco, Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 .... *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... p. 2782
M **MCL, Inc., Dept. EM, 10 North Beach Ave., LaGrange, Ill. 60525** ..... *
Motorola, Inc., Compt. Prods. Clock Oscillator Dept., Dept. EM, 2553 N. Edgington, Franklin Park, Ill. 60131 ..... *
Ovenaire, Div. Walter Kidde & Co., Dept. EM, 706 Forrest St., Charlottesville, Va. 22901 ..... *
M **Polarad Elctrn. Instrs., Dept. EM, 5 Delaware Dr., Lake Success, N.Y. 11040** *
D **Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219** p. 2830
M **, Trak Microwave Corp., Dept. E8, Dept. EM, 4726 Eisenhower Blvd.,, Tampa, Fla. 33614** ..... p. 3064
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
DM Addington Labs., Inc., Solid State Prods. Div., Dept. EM, 783 Palomar Ave., Sunnyvale, Cal. 94086
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
D Ailtech, Dept. EM, 2070 Fifth Ave, Ronkonkoma, NY 11779
M Aircom, Inc., Dept. EM, Rte. 16B, Union, N.H. 03887
M Airtron, Div. Litton Inds., Dept. EM, 200 E. Hanover Ave., Morris Plains, N.J. 07950
M Avantek, Inc., Dept. EM, 3175 Bowers Ave., Santa Clara, Cal. 95051
M Deltronic Crystal Inds., Inc., Dept. EM, Box 323, Denville, N.J. 07834
M Electronic Research Co., Dept. EM, Box 913, Shawnee Mission, Kans. 66201
Engelmann Microwave, Dept. EM, Skyline Dr., Montville, N.J. 07045
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Epsilon-Lambda Elctrn. Corp., Dept. EM, 28 S. Water St., Batavia, Ill. 60510
M Frequency West, Inc., Dept. EM, 3140 Alfred St., Santa Clara, Cal. 95050

Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Litton Inds., Electron Tube Div., Dept. EM, 960 Industrial Rd, San Carlos, Calif. 94070
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
DM Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Parametric Inds., Inc., Dept. EM, 742 Main St., Winchester, Mass. 01890
M Racal-Dana Instrus Inc., Dept. EM, 18912 Von Karman Ave., Irvine, Cal. 92715
M Reeve Electronics, Inc., Dept. EM, 609 W. Lake St., Chicago, Ill 60606
D REI Sales Co., Dept. EM, 1 North Ave, Burlington, Mass. 01803
Sivers Lab, Dept. EM, Box 90339, Los Angeles, Cal. 90009
M Somerset Radiation Lab., Dept. EM, Box 17066, Washington, DC 20041
DM Systron-Donner, Advanced Components Div., Dept. EM, 735 Palomar Ave., Sunnyvale, Cal. 94086
M Teledyne Microwave, Dept. EM, 1290 Terra Bella Ave., Mountain View, Cal. 94040
TRG,, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760
D Wiltron Co., Dept. EM, 825 E. Middlefield Rd., Mt. View, Cal 94043
DM Yig-Tek Corp., Dept. EM, 1725 De La Cruz Blvd., Santa Clara, Cal. 95050
M Zeta Laboratories, Inc., Dept. EM, 3265 Scott Blvd., Santa Clara, Cal. 95051

Oscillators, Power (Module)

Abacus Controls Inc., Dept. EM, 89 Redington Rd., Somerville, N.J. 08876 p. 3163
American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
M Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706 *
Behlman Engineering Corp., Dept. EM, Box 4518, 427 N. Nopal St., Santa Barbara, Cal. 93103 p. 3368
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
D California Instrs., Dept. EM, 5150-Convoy St., San Diego, Cal. 92111 .. p. 3371
Elgar Corporation, Dept. EM, 8225 Mercury Ct., San Diego, Cal. 92111 p. 3383
M Greenray Inds., Inc., Dept. EM, 840 W. Church Rd., Mechanicsburg, Pa. 17055 *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 *
Isotemp Research Inc, Dept. EM, 711 Henry Ave, Charlottesville, VA. 22901 p. 2337
Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 p. 2769
Marine Electric Railway Prods. Div., Inc., Dept. EM, 167 National Rd., Edison, N.J. 08817 *
M MCL, Inc., Dept. EM, 10 North Beach Ave., LaGrange, Ill. 60525 *
Pacific Power Source Div, Dept. EM, 5291 Systems Dr, Huntington Bch, Cal 92649 *
Q-Tech Corp., Dept. EM, 2201 Carmelina Ave., Los Angeles, Cal. 90064 p. 2360,2361
M Electronic Research Co., Dept. EM, Box 913, Shawnee Mission, Kans. 66201
Gentron Corp., Dept. EM, 6667 N. Sydney Pl., Milwaukee, Wisc. 53209
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
D REI Sales Co., Dept. EM, 1 North Ave, Burlington, Mass. 01803
DM Systron-Donner, Advanced Components Div., Dept. EM, 735 Palomar Ave., Sunnyvale, Cal. 94086
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
D Wilson Co., H.M., Dept. EM, 11501 Chimney Rock Rd., Houston, Tex. 77035

Oscillators, Pulse (Module)

M Accutronics-A Hammond Corp., Dept. EM, 628 North St., Box 590, Geneva, Ill. 60134 *
American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 *
M American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
Applied Microwave, Div. Epsco Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 p. 2861
M Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706 *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
M Computer Devices Corp., Dept. EM, 63 Austin Blvd., Commack, N.Y. 11725 *
Connor-Winfield Corp., Dept. EM, W. Chicago, Ill. 60185 p. 2296,2297
CTS Knights, Inc., Dept. EM, 400 Reimann Ave., Sandwich, Ill. 60548 *
Dale Electronics, Inc., Frequency Control Group, Dept. EM, 930 West 23rd St., Tempe, Ariz. 85282 p. 2314-2317
Damon Corp., Elctrns. Div., Dept. EM, 80 Wilson Way, Westwood, Mass. 02090 p. 2319
Epsco, Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 p. 2861
M Greenray Inds., Inc., Dept. EM, 840 W. Church Rd., Mechanicsburg, Pa. 17055 *
Isotemp Research Inc, Dept. EM, 711 Henry Ave, Charlottesville, VA. 22901 p. 2337
M McCoy Electronics, Sub Oak Inds. Inc., Dept. EM, Chestnut & Watts, Mt Holly Spr., Pa. 17065 *
M MCL, Inc., Dept. EM, 10 North Beach Ave., LaGrange, Ill. 60525 *
Motorola, Inc., Compt. Prods. Clock Oscillator Dept., Dept. EM, 2553 N. Edgington, Franklin Park, Ill. 60131 *
Ovenaire, Div. Walter Kidde & Co., Dept. EM, 706 Forrest St., Charlottesville, Va. 22901 *
Q-Tech Corp., Dept. EM, 2201 Carmelina Ave., Los Angeles, Cal. 90064 *
D Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219 *
M Vectron Labs., Inc., Dept. EM, 166 Glover Ave., Norwalk, Conn. 06850 *
M Addington Labs., Inc., Solid State Prods. Div., Dept. EM, 783 Palomar Ave., Sunnyvale, Cal. 94086
Berkeley Nucleonics, Dept. EM, 1198 Tenth St., Berkeley, Cal. 94710
Cermetek, Inc., Dept. EM, 660 National Ave., Mountain View, Cal. 94040
M Electronic Research Co., Dept. EM, Box 913, Shawnee Mission, Kans. 66201
Engineered Components Co., Dept. EM, 3580 Sacramento Dr., San Luis Obispo, Cal. 93401
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
Richard-Lee Co., Dept. EM, Box 724, New Providence, N.J. 07974
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
D Tau-Tron Inc., Dept. EM, 11 Esquire Rd., N. Billerica, Mass. 01862
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Oscillators, Pulse (Test)—See Generators, Pulse

Oscillators, RC (Module)

M Accutronics-A Hammond Corp., Dept. EM, 628 North St., Box 590, Geneva, Ill. 60134 *
American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
Connor-Winfield Corp., Dept. EM, W. Chicago, Ill. 60185 *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 p. 2627
General Magnetics, Dept. EM, 211 Grove St., Bloomfield, N.J. 07003 *
M Greenray Inds., Inc., Dept. EM, 840 W. Church Rd., Mechanicsburg, Pa. 17055 *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Isotemp Research Inc, Dept. EM, 711 Henry Ave, Charlottesville, VA. 22901 *
M Krohn-Hite Corp., Dept. EM, Avon Ind'l Pk, Bodwell St., Avon, Mass. 02322 *
M Cirtech Corp, Dept. EM, 15237 Cherry St, Stanley, Kan. 66223
Dantel, Inc., Dept. EM, 1922 North Helm, Fresno, Cal. 93727
Engineered Components Co., Dept. EM, 3580 Sacramento Dr., San Luis Obispo, Cal. 93401
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
DM Systron-Donner, Advanced Components Div., Dept. EM, 735 Palomar Ave., Sunnyvale, Cal. 94086
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077

Oscillators, Reed

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *

Oscillators, R-F (Module)

M Accutronics-A Hammond Corp., Dept. EM, 628 North St., Box 590, Geneva, Ill. 60134 *
M American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
M Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706 *
M Austron, Inc., Dept. EM, 1915 Kramer La., Austin, Tex. 78758 *
M Bliley Electric Co., Dept. EM, 2545 W. Grandview Blvd., Box 3428, Erie, Pa. 16508 *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
California Instrs., Dept. EM, 5150-Convoy St., San Diego, Cal. 92111 .. p. 3371
Connor-Winfield Corp., Dept. EM, W. Chicago, Ill. 60185 p. 2296,2297
Crystek Crystals Corp., Dept. EM, 1000 Crystal Dr., Ft. Myers, Fla. 33901 p. 2299
CTS Knights, Inc., Dept. EM, 400 Reimann Ave., Sandwich, Ill. 60548 p. 2304-2308
Dale Electronics, Inc., Frequency Control Group, Dept. EM, 930 West 23rd St., Tempe, Ariz. 85282 *
M Damon Corp., Elctrns. Div., Dept. EM, 80 Wilson Way, Westwood, Mass. 02090 p. 2319
Erie Frequency Control, Div. Erie Technological Prods., Dept. EM, 453 Lincoln St., Carlisle, Pa. 17013 p. 2321-2323
M Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040 .. *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 *
M Greenray Inds., Inc., Dept. EM, 840 W. Church Rd., Mechanicsburg, Pa. 17055 *
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 .... *
Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 p. 3389
International Crystal Mfg., Dept. EM, 10 N. Lee St., Oklahoma City, Okla. 73102 *
Isotemp Research Inc, Dept. EM, 711 Henry Ave, Charlottesville, VA. 22901 p. 2337
Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 p. 2769
M Krohn-Hite Corp., Dept. EM, Avon Ind'l Pk, Bodwell St., Avon, Mass. 02322 *
M McCoy Electronics, Sub Oak Inds. Inc., Dept. EM, Chestnut & Watts, Mt Holly Spr., Pa. 17065 *
M MCL, Inc., Dept. EM, 10 North Beach Ave., LaGrange, Ill. 60525 *
MF Electronics Corp., Dept. EM, 118 E. 25th St., New York, N.Y. 10010 p. 2347
M Monitor Prods., Dept. EM, Box 1966, 502 Via Delmonte, Oceanside, Cal. 92054 p. 2349
D Motorola, Inc., Compt. Prods. Clock Oscillator Dept., Dept. EM, 2553 N. Edgington, Franklin Park, Ill. 60131 *

Ovenaire, Div. Walter Kidde & Co., Dept. EM, 706 Forrest St., Charlottesville, Va. 22901 ..... *
Q-Tech Corp., Dept. EM, 2201 Carmelina Ave., Los Angeles, Cal. 90064 ..... *
Spectrum Technology Inc., Dept. EM, 300 Frederic Lopez Rd., Goleta, Cal. 93017 ..... p. 2367
D Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219 p. 2830
M , Trak Microwave Corp., Dept. E8, Dept. EM, 4726 Eisenhower Blvd.,, Tampa, Fla. 33614 ..... p. 3064
M Vectron Labs., Inc., Dept. EM, 166 Glover Ave., Norwalk, Conn. 06850 ..... *
M Addington Labs., Inc., Solid State Prods. Div., Dept. EM, 783 Palomar Ave., Sunnyvale, Cal. 94086
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
Dale Electronics, Inc., Dept. EM, 930 West 23rd St., Tempe, Ariz. 85282
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
M Frequency West, Inc., Dept. EM, 3140 Alfred St.; Santa Clara, Cal. 95050
DM Gorman-Redlich Mfg. Co., Dept. EM, 6 Curtis St., Athens, Ohio 45701
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Racal-Dana Instrus Inc., Dept. EM, 18912 Von Karman Ave., Irvine, Cal. 92715
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
DM Systron-Donner, Advanced Components Div., Dept. EM, 735 Palomar Ave., Sunnyvale, Cal. 94086
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
M T-F Electronics Inc., Dept. EM, 9415 Neils Thompson Dr., Austin, Tex. 78759
M Teledyne Microwave, Dept. EM, 1290 Terra Bella Ave., Mountain View, Cal. 94040
TRW Auto-E, Dept. EM, Davis & Copewood Sts., Camden, N.J. 08103
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Oscillators, R-F (Test)—See Generators, R-F

Oscillators, Sinusoidal (Module)

M Accutronics-A Hammond Corp., Dept. EM, 628 North St., Box 590, Geneva, Ill. 60134 ..... *
American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
M Austron, Inc., Dept. EM, 1915 Kramer La., Austin, Tex. 78758 ..... *
M Bliley Electric Co., Dept. EM, 2545 W. Grandview Blvd., Box 3428, Erie, Pa. 16508 ..... p. 2289
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
M Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731 ..... *
Connor-Winfield Corp., Dept. EM, W. Chicago, Ill. 60185 ..... p. 2296,2297
CTS Knights, Inc., Dept. EM, 400 Reimann Ave., Sandwich, Ill. 60548 p. 2306-2308
Dale Electronics, Inc., Frequency Control Group, Dept. EM, 930 West 23rd St., Tempe, Ariz. 85282 ..... *
M Damon Corp., Elctrns. Div., Dept. EM, 80 Wilson Way, Westwood, Mass. 02090 ..... *
M Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040 .. *
General Magnetics, Dept. EM, 211 Grove St., Bloomfield, N.J. 07003 ..... *
M Greenray Inds., Inc., Dept. EM, 840 W. Church Rd., Mechanicsburg, Pa. 17055 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 .... *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
Isotemp Research Inc, Dept. EM, 711 Henry Ave, Charlottesville, VA. 22901 p. 2337
Krohn-Hite Corp., Dept. EM, Avon Ind'l Pk, Bodwell St., Avon, Mass. 02322 *
M McCoy Electronics, Sub Oak Inds. Inc., Dept. EM, Chestnut & Watts, Mt Holly Spr., Pa. 17065 ..... *
M Monitor Prods., Dept. EM, Box 1966, 502 Via Delmonte, Oceanside, Cal. 92054 ..... *
Ovenaire, Div. Walter Kidde & Co., Dept. EM, 706 Forrest St., Charlottesville, Va. 22901 ..... *
Q-Tech Corp., Dept. EM, 2201 Carmelina Ave., Los Angeles, Cal. 90064 p. 2360
M Vectron Labs., Inc., Dept. EM, 166 Glover Ave., Norwalk, Conn. 06850 p. 2377
M Cirtech Corp, Dept. EM, 15237 Cherry St, Stanley, Kan. 66223
Dale Electronics, Inc., Dept. EM, 930 West 23rd St., Tempe, Ariz. 85282
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
FSI/Fork Standards Inc., Dept. EM, 211 Main St., W. Chicago, Ill. 60185
DM Gorman-Redlich Mfg. Co., Dept. EM, 6 Curtis St., Athens, Ohio 45701
Meloy Labs Inc., Instrus. & Sys. Div., Dept. EM, 6715 Electronic Dr., Springfield, Va. 22151
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
Optical Electronics, Inc., Dept. EM, Box 11140, Tucson, Ariz. 85734
Real Time Systems Inc., Dept. EM, 152 S. MacQuesten Pkwy., Mt. Vernon, N.Y. 10550
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Southwood Electronic Co., Dept. EM, 7624 Lindenwood Dr., Indianapolis, Ind. 46227
M T-F Electronics Inc., Dept. EM, 9415 Neils Thompson Dr., Austin, Tex. 78759
D Tau-Tron Inc., Dept. EM, 11 Esquire Rd., N. Billerica, Mass. 01862
Telesis Laboratory, Dept. EM, Box 387, Chillocothe, Ohio 45601
UFAD Corp., Dept. EM, 700 36th St. S.E., Grand Rapids, Mich. 49508

Oscillators, Sinusoidal (Test)—See Generators, Function

Oscillators, Square-Wave (Module)

M Accutronics-A Hammond Corp., Dept. EM, 628 North St., Box 590, Geneva, Ill. 60134 ..... *
M American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Austron, Inc., Dept. EM, 1915 Kramer La., Austin, Tex. 78758 ..... *
M Bliley Electric Co., Dept. EM, 2545 W. Grandview Blvd., Box 3428, Erie, Pa. 16508 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
California Instrs., Dept. EM, 5150-Convoy St., San Diego, Cal. 92111 ..... *
M Computer Devices Corp., Dept. EM, 63 Austin Blvd., Commack, N.Y. 11725 *
Connor-Winfield Corp., Dept. EM, W. Chicago, Ill. 60185 ..... *
D CTS Knights, Inc., Dept. EM, 400 Reimann Ave., Sandwich, Ill. 60548 p. 2306-2308
Dale Electronics, Inc., Frequency Control Group, Dept. EM, 930 West 23rd St., Tempe, Ariz. 85282 ..... p. 2314-2317
M Damon Corp., Elctrns. Div., Dept. EM, 80 Wilson Way, Westwood, Mass. 02090 ..... p. 2319
Erie Frequency Control, Div. Erie Technological Prods., Dept. EM, 453 Lincoln St., Carlisle, Pa. 17013 ..... p. 2322,2323
M Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040 .. *
M Greenray Inds., Inc., Dept. EM, 840 W. Church Rd., Mechanicsburg, Pa. 17055 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 .... *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
Isotemp Research Inc, Dept. EM, 711 Henry Ave, Charlottesville, VA. 22901 p. 2337
Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 .... *
M McCoy Electronics, Sub Oak Inds. Inc., Dept. EM, Chestnut & Watts, Mt Holly Spr., Pa. 17065 ..... *
MF Electronics Corp., Dept. EM, 118 E. 25th St., New York, N.Y. 10010 ..... *
M Monitor Prods., Dept. EM, Box 1966, 502 Via Delmonte, Oceanside, Cal. 92054 ..... *
D Motorola, Inc., Compt. Prods. Clock Oscillator Dept., Dept. EM, 2553 N. Edgington, Franklin Park, Ill. 60131 ..... *
Ovenaire, Div. Walter Kidde & Co., Dept. EM, 706 Forrest St., Charlottesville, Va. 22901 ..... p. 2356
Q-Tech Corp., Dept. EM, 2201 Carmelina Ave., Los Angeles, Cal. 90064 ..... *
M Spectrum Technology Inc., Dept. EM, 300 Frederic Lopez Rd., Goleta, Cal. 93017 ..... p. 2366,2367
M Statek Corp., Dept. EM, 512 N. Main St., Orange, Cal. 92668 ..... *
Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219 *
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... *
M Vectron Labs., Inc., Dept. EM, 166 Glover Ave., Norwalk, Conn. 06850 ..... *
Berkeley Nucleonics, Dept. EM, 1198 Tenth St., Berkeley, Cal. 94710
Cermetek, Inc., Dept. EM, 660 National Ave., Mountain View, Cal. 94040
M Cirtech Corp, Dept. EM, 15237 Cherry St, Stanley, Kan. 66223
Dale Electronics, Inc., Dept. EM, 930 West 23rd St., Tempe, Ariz. 85282
M Electronic Research Co., Dept. EM, Box 913, Shawnee Mission, Kans. 66201
Engineered Components Co., Dept. EM, 3580 Sacramento Dr., San Luis Obispo, Cal. 93401
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
FSI/Fork Standards Inc., Dept. EM, 211 Main St., W. Chicago, Ill. 60185
Gentron Corp., Dept. EM, 6667 N. Sydney Pl., Milwaukee, Wisc. 53209
Meloy Labs Inc., Instrus. & Sys. Div., Dept. EM, 6715 Electronic Dr., Springfield, Va. 22151
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
Richard-Lee Co., Dept. EM, Box 724, New Providence, N.J. 07974
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
M T-F Electronics Inc., Dept. EM, 9415 Neils Thompson Dr., Austin, Tex. 78759
D Tau-Tron Inc., Dept. EM, 11 Esquire Rd., N. Billerica, Mass. 01862
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760

Oscillators, Square-Wave (Test)—See Generators, Function

Oscillators, Sweep—See Generators, Sweep

Oscillators, Telemetry

ADRET/COMSTRON, Dept. EM, 200 E. Sunrise Hwy, Freeport, NY 11520 .... *
American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
M Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Connor-Winfield Corp., Dept. EM, W. Chicago, Ill. 60185 ..... *
CTS Knights, Inc., Dept. EM, 400 Reimann Ave., Sandwich, Ill. 60548 ..... *
Dale Electronics, Inc., Frequency Control Group, Dept. EM, 930 West 23rd St., Tempe, Ariz. 85282 ..... *
M Damon Corp., Elctrns. Div., Dept. EM, 80 Wilson Way, Westwood, Mass. 02090 ..... *
M Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040 .. *
M Greenray Inds., Inc., Dept. EM, 840 W. Church Rd., Mechanicsburg, Pa. 17055 ..... *
Isotemp Research Inc, Dept. EM, 711 Henry Ave, Charlottesville, VA. 22901 *
McCoy Electronics, Sub Oak Inds. Inc., Dept. EM, Chestnut & Watts, Mt Holly Spr., Pa. 17065 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *

Ovenaire, Div. Walter Kidde & Co., Dept. EM, 706 Forrest St., Charlottesville, Va. 22901 ..... *
Q-Tech Corp., Dept. EM, 2201 Carmelina Ave., Los Angeles, Cal. 90064 ..... *
D **Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219** *
M **, Trak Microwave Corp., Dept. E8, Dept. EM, 4726 Eisenhower Blvd.,, Tampa, Fla. 33614** ..... *
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
M Addington Labs., Inc., Solid State Prods. Div., Dept. EM, 783 Palomar Ave., Sunnyvale, Cal. 94086
M Aydin, Vector Div., Dept. EM, Box 328, Newtown, PA 18940
Beukers Labs., Inc., Dept. EM, 30 Orville Drive, Bohemia, N.Y. 11716
CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
Dantel, Inc., Dept. EM, 1922 North Helm, Fresno, Cal. 93727
Data-Control Systems, Dept. EM, Commerce Dr., Box 860, Danbury, Conn. 06810
, Develco Inc., Dept. EM, 404 Tasman Dr., Sunnyvale, Cal. 94086
Frequency West, Inc., Dept. EM, 3140 Alfred St., Santa Clara, Cal. 95050
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
M Sonex, Dept. EM, 2337 Philmont Ave., Huntingdon Valley, Pa. 19006
DM Systron-Donner, Advanced Components Div., Dept. EM, 735 Palomar Ave., Sunnyvale, Cal. 94086
T-F Electronics Inc., Dept. EM, 9415 Neils Thompson Dr., Austin, Tex. 78759
Transmed Scientific, Dept. EM, 860-C Capitolio Way, San Luis Obispo, Cal. 93401
Tri-Com, Inc., Dept. EM, 12216 Parklawn Dr., Rockville, Md. 20852
M Zeta Laboratories, Inc., Dept. EM, 3265 Scott Blvd., Santa Clara, Cal. 95051

Oscillators, Temperature Compensated

M **American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377** ..... *
M **Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706** ..... *
M **Bliley Electric Co., Dept. EM, 2545 W. Grandview Blvd., Box 3428, Erie, Pa. 16508** ..... p. 2289
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... p. 2291
Bulova Watch Co., Servo Prods. Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Connor-Winfield Corp., Dept. EM, W. Chicago, Ill. 60185 ..... p. 2296
M **CTS Knights, Inc., Dept. EM, 400 Reimann Ave., Sandwich, Ill. 60548** p. 2308
Dale Electronics, Inc., Frequency Control Group, Dept. EM, 930 West 23rd St., Tempe, Ariz. 85282 ..... p. 2316
M **Damon Corp., Elctrns. Div., Dept. EM, 80 Wilson Way, Westwood, Mass. 02090** ..... *
Erie Frequency Control, Div. Erie Technological Prods., Dept. EM, 453 Lincoln St., Carlisle, Pa. 17013 ..... p. 2322
M **Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040** .. *
M **Greenray Inds., Inc., Dept. EM, 840 W. Church Rd., Mechanicsburg, Pa. 17055** ..... p. 2328
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... *
International Crystal Mfg., Dept. EM, 10 N. Lee St., Oklahoma City, Okla. 73102 ..... *
M **Isotemp Research Inc, Dept. EM, 711 Henry Ave, Charlottesville, VA. 22901** p. 2337
M **McCoy Electronics, Sub Oak Inds. Inc., Dept. EM, Chestnut & Watts, Mt Holly Spr., Pa. 17065** ..... p. 2338,2344
MF Electronics Corp., Dept. EM, 118 E. 25th St., New York, N.Y. 10010 p. 2346
M **Microsonics, Div. Sangamo Elec. Co., Dept. EM, 60 Winter St., Weymouth, Mass. 02188** ..... p. 2348
M **Monitor Prods., Dept. EM, Box 1966, 502 Via Delmonte, Oceanside, Cal. 92054** ..... p. 2349
Ovenaire, Div. Walter Kidde & Co., Dept. EM, 706 Forrest St., Charlottesville, Va. 22901 ..... p. 2354,2355
Q-Tech Corp., Dept. EM, 2201 Carmelina Ave., Los Angeles, Cal. 90064 ..... *
Reeves-Hoffman Div., Dynamics Corp. of Amer., Dept. EM, 400 W. North St., Carlisle, Pa. 17013 ..... p. 2365
M **Spectrum Technology Inc., Dept. EM, 300 Frederic Lopez Rd., Goleta, Cal. 93017** ..... p. 2367
D **Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219** *
M **, Trak Microwave Corp., Dept. E8, Dept. EM, 4726 Eisenhower Blvd.,, Tampa, Fla. 33614** ..... *
M **Vectron Labs., Inc., Dept. EM, 166 Glover Ave., Norwalk, Conn. 06850** p. 2377
DM Addington Labs., Inc., Solid State Prods. Div., Dept. EM, 783 Palomar Ave., Sunnyvale, Cal. 94086
M Cirtech Corp, Dept. EM, 15237 Cherry St, Stanley, Kan. 66223
Crystonic Labs, Dept. EM, 10418 La Cienega Blvd., Inglewood, Calif. 90304
CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
Dale Electronics, Inc., Dept. EM, 930 West 23rd St., Tempe, Ariz. 85282
M Electronic Research Co., Dept. EM, Box 913, Shawnee Mission, Kans. 66201
Gorman-Redlich Mfg. Co., Dept. EM, 6 Curtis St., Athens, Ohio 45701
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
D Snelgrove, C. R. Ltd., Dept. EM, 141 Bond Ave., Don Mills 404 Ont., Ont. Can.
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
T-F Electronics Inc., Dept. EM, 9415 Neils Thompson Dr., Austin, Tex. 78759
M Zeta Laboratories, Inc., Dept. EM, 3265 Scott Blvd., Santa Clara, Cal. 95051

Oscillators, Test Equipment—See Generators (Specific Types)

Oscillators, Tuning-Fork Controlled

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... p. 2291
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
M **Philamon, Inc., Dept. EM, 33 Dubon Ct., Farmingdale, N.Y. 11735** ..... p. 2353
Q-Tech Corp., Dept. EM, 2201 Carmelina Ave., Los Angeles, Cal. 90064 ..... *
M **Spectrum Technology Inc., Dept. EM, 300 Frederic Lopez Rd., Goleta, Cal. 93017** ..... *
Statek Corp., Dept. EM, 512 N. Main St., Orange, Cal. 92668 ..... p. 2373
FSI/Fork Standards Inc., Dept. EM, 211 Main St., W. Chicago, Ill. 60185
Meloy Labs Inc., Instrus. & Sys. Div., Dept. EM, 6715 Electronic Dr., Springfield, Va. 22151
Murata Corporation of America, Dept. EM, 1148 Franklin Rd., S.E., Marietta, Ga. 30067
D Murata Mfg. Co. Ltd., Dept. EM, 16, Kaiden Nishijin-cho, Nagaoka-Kyo-Shi, Kyoto, Japan
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
M T-F Electronics Inc., Dept. EM, 9415 Neils Thompson Dr., Austin, Tex. 78759
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760

Oscillators, UHF/VHF (Module)

M **Accutronics-A Hammond Corp., Dept. EM, 628 North St., Box 590, Geneva, Ill. 60134** ..... *
M **American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377** ..... *
M **Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706** ..... *
M **Bliley Electric Co., Dept. EM, 2545 W. Grandview Blvd., Box 3428, Erie, Pa. 16508** ..... p. 2289
Connor-Winfield Corp., Dept. EM, W. Chicago, Ill. 60185 ..... p. 2296
Crystek Crystals Corp., Dept. EM, 1000 Crystal Dr., Ft. Myers, Fla. 33901 p. 2299
CTS Knights, Inc., Dept. EM, 400 Reimann Ave., Sandwich, Ill. 60548 ..... *
Dale Electronics, Inc., Frequency Control Group, Dept. EM, 930 West 23rd St., Tempe, Ariz. 85282 ..... *
M **Damon Corp., Elctrns. Div., Dept. EM, 80 Wilson Way, Westwood, Mass. 02090** ..... *
M **Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040** .. *
M **Greenray Inds., Inc., Dept. EM, 840 W. Church Rd., Mechanicsburg, Pa. 17055** ..... *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
International Crystal Mfg., Dept. EM, 10 N. Lee St., Oklahoma City, Okla. 73102 ..... *
Isotemp Research Inc, Dept. EM, 711 Henry Ave, Charlottesville, VA. 22901 p. 2337
McCoy Electronics, Sub Oak Inds. Inc., Dept. EM, Chestnut & Watts, Mt Holly Spr., Pa. 17065 ..... *
MF Electronics Corp., Dept. EM, 118 E. 25th St., New York, N.Y. 10010 p. 2347
Monitor Prods., Dept. EM, Box 1966, 502 Via Delmonte, Oceanside, Cal. 92054 ..... p. 2349
Ovenaire, Div. Walter Kidde & Co., Dept. EM, 706 Forrest St., Charlottesville, Va. 22901 ..... *
Q-Tech Corp., Dept. EM, 2201 Carmelina Ave., Los Angeles, Cal. 90064 ..... *
D **Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219** p. 2830
M **, Trak Microwave Corp., Dept. E8, Dept. EM, 4726 Eisenhower Blvd.,, Tampa, Fla. 33614** ..... p. 3064
M **Vectron Labs., Inc., Dept. EM, 166 Glover Ave., Norwalk, Conn. 06850** p. 2378
M Addington Labs., Inc., Solid State Prods. Div., Dept. EM, 783 Palomar Ave., Sunnyvale, Cal. 94086
M Cirtech Corp, Dept. EM, 15237 Cherry St, Stanley, Kan. 66223
CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
M Electronic Research Co., Dept. EM, Box 913, Shawnee Mission, Kans. 66201
/M Frequency West, Inc., Dept. EM, 3140 Alfred St., Santa Clara, Cal. 95050
Gorman-Redlich Mfg. Co., Dept. EM, 6 Curtis St., Athens, Ohio 45701
DM Systron-Donner, Advanced Components Div., Dept. EM, 735 Palomar Ave., Sunnyvale, Cal. 94086
D Tau-Tron Inc., Dept. EM, 11 Esquire Rd., N. Billerica, Mass. 01862
M Teledyne Microwave, Dept. EM, 1290 Terra Bella Ave., Mountain View, Cal. 94040
TRW Auto-E, Dept. EM, Davis & Copewood Sts., Camden, N.J. 08103
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Zeta Laboratories, Inc., Dept. EM, 3265 Scott Blvd., Santa Clara, Cal. 95051

Oscillators, UHF/VHF (Test)—See Generators, UHF/VHF

Oscillators, Ultrasonic (Module)

Connor-Winfield Corp., Dept. EM, W. Chicago, Ill. 60185 ..... *
Electronic Navigation Inds., Dept. EM, 3000 Winton Rd. S., Rochester, N.Y. 14623 ..... *
Isotemp Research Inc, Dept. EM, 711 Henry Ave, Charlottesville, VA. 22901 p. 2337
M **Spectrum Technology Inc., Dept. EM, 300 Frederic Lopez Rd., Goleta, Cal. 93017** ..... *
Addington Labs., Inc., Solid State Prods. Div., Dept. EM, 783 Palomar Ave., Sunnyvale, Cal. 94086
Branson Cleaning Equip. Co., Dept. EM, Parrott Dr., Shelton, Conn. 06484
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
DM Systron-Donner, Advanced Components Div., Dept. EM, 735 Palomar Ave., Sunnyvale, Cal. 94086
M T-F Electronics Inc., Dept. EM, 9415 Neils Thompson Dr., Austin, Tex. 78759
UFAD Corp., Dept. EM, 700 36th St. S.E., Grand Rapids, Mich. 49508

Oscillators, Ultrasonic (Test)—See Generators, Ultrasonic

Oscillators, Voltage Controlled (Module)

M Accutronics-A Hammond Corp., Dept. EM, 628 North St., Box 590, Geneva, Ill. 60134 ..... *
American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
M Applied Research Inc., Dept. EM, 76 S. Bayles Ave., Port Washington, N.Y. 11050 ..... p. 2866
M Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706 ..... *
Austron, Inc., Dept. EM, 1915 Kramer La., Austin, Tex. 78758 ..... *
M Bliley Electric Co., Dept. EM, 2545 W. Grandview Blvd., Box 3428, Erie, Pa. 16508 ..... p. 2289
Connor-Winfield Corp., Dept. EM, W. Chicago, Ill. 60185 ..... *
M CTS Knights, Inc., Dept. EM, 400 Reimann Ave., Sandwich, Ill. 60548 ..... *
Dale Electronics, Inc., Frequency Control Group, Dept. EM, 930 West 23rd St., Tempe, Ariz. 85282 ..... *
M Damon Corp., Elctrns. Div., Dept. EM, 80 Wilson Way, Westwood, Mass. 02090 ..... p. 2319
Erie Frequency Control, Div. Erie Technological Prods., Dept. EM, 453 Lincoln St., Carlisle, Pa. 17013 ..... p. 2323
M Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040 p. 2325
M Greenray Inds., Inc., Dept. EM, 840 W. Church Rd., Mechanicsburg, Pa. 17055 ..... p. 2328
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 p. 2329
Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
M Isotemp Research Inc, Dept. EM, 711 Henry Ave, Charlottesville, VA. 22901 *
Marine Electric Railway Prods. Div., Inc., Dept. EM, 167 National Rd., Edison, N.J. 08817 ..... p. 3392
M McCoy Electronics, Sub Oak Inds. Inc., Dept. EM, Chestnut & Watts, Mt Holly Spr., Pa. 17065 ..... p. 2338
M Microsonics, Div. Sangamo Elec. Co., Dept. EM, 60 Winter St., Weymouth, Mass. 02188 ..... *
M Monitor Prods., Dept. EM, Box 1966, 502 Via Delmonte, Oceanside, Cal. 92054 ..... p. 2349
Ovenaire, Div. Walter Kidde & Co., Dept. EM, 706 Forrest St., Charlottesville, Va. 22901 ..... p. 2355,2356
Reeves-Hoffman Div., Dynamics Corp. of Amer., Dept. EM, 400 W. North St., Carlisle, Pa. 17013 ..... p. 2365
M Spectrum Technology Inc., Dept. EM, 300 Frederic Lopez Rd., Goleta, Cal. 93017 ..... *
D Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219 *
M Vectron Labs., Inc., Dept. EM, 166 Glover Ave., Norwalk, Conn. 06850 p. 2377
M Addington Labs., Inc., Solid State Prods. Div., Dept. EM, 783 Palomar Ave., Sunnyvale, Cal. 94086
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
M Avantek, Inc., Dept. EM, 3175 Bowers Ave., Santa Clara, Cal. 95051
M Aydin, Vector Div., Dept. EM, Box 328, Newtown, PA 18940
Crystonic Labs, Dept. EM, 10418 La Cienega Blvd., Inglewood, Calif. 90304
CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
Dale Electronics, Inc., Dept. EM, 930 West 23rd St., Tempe, Ariz. 85282
Data-Control Systems, Dept. EM, Commerce Dr., Box 860, Danbury, Conn. 06810
M Electronic Research Co., Dept. EM, Box 913, Shawnee Mission, Kans. 66201
D EMR Telemetry, Div. Sangamo-Weston, Dept. EM, Box 3041, Sarasota, Fla. 33578
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Frequency West, Inc., Dept. EM, 3140 Alfred St., Santa Clara, Cal. 95050
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Litton Inds., Electron Tube Div., Dept. EM, 960 Industrial Rd, San Carlos, Calif. 94070
Luff Research, Dept. EM, Box 449, Jackson Hgts., N.Y. 11372
Meloy Labs Inc., Instrus. & Sys. Div., Dept. EM, 6715 Electronic Dr., Springfield, Va. 22151
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
Richard-Lee Co., Dept. EM, Box 724, New Providence, N.J. 07974
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
DM Sonex, Dept. EM, 2337 Philmont Ave., Huntingdon Valley, Pa. 19006
Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
DM Systron-Donner, Advanced Components Div., Dept. EM, 735 Palomar Ave., Sunnyvale, Cal. 94086
T-F Electronics Inc., Dept. EM, 9415 Neils Thompson Dr., Austin, Tex. 78759
D Tau-Tron Inc., Dept. EM, 11 Esquire Rd., N. Billerica, Mass. 01862
Teledyne/Geotech, Dept. EM, Box 28277, Dallas, Tex. 75228
M Teledyne Microwave, Dept. EM, 1290 Terra Bella Ave., Mountain View, Cal. 94040
UFAD Corp., Dept. EM, 700 36th St. S.E., Grand Rapids, Mich. 49508
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
DM Yig-Tek Corp., Dept. EM, 1725 De La Cruz Blvd., Santa Clara, Cal. 95050
M Zeta Laboratories, Inc., Dept. EM, 3265 Scott Blvd., Santa Clara, Cal. 95051

Oscillographs, Direct Writing

Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 p. 2842
Gulton Inds., Inc., Measurement & Control Systems Div., Dept. EM, Gulton Ind'l. Pk., E. Greenwich, R.I. 02818 ..... p. 2840
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Honeywell, Inc., Test Instrs. Div., Dept. EM, 4800 E. Dry Creek Rd., Box 5227, Denver, Colo. 80217 ..... p. 2843
Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... p. 2846
M Accurate Instrument Co., Dept. EM, Box No. 925, Westbury, N.Y. 11590
Beckman Instrs., (AISSD), Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634
Bell & Howell Co., Elctrns. & Instrs. Grp., Dept. EM, 360 Sierra Madre Villa, Pasadena, Cal. 91109
EMI Technology, Dept. EM, 55, Kenosia Ave., Danbury, Conn 06810
Hathaway Instruments, Inc., Dept. EM, 5250 E. Evans Ave., Denver, Colo. 80222
Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704
Micro Instrument Co., Marine & Power Instr. Div., Dept. EM, 2250 Micro Pl., Escondido, Cal. 92025
M Photron Instrument Co., Dept. EM, 6516 Detroit Ave., Cleveland, Ohio 44102
D Soltec Corp., Dept. EM, Box 49, Sun Valley, Cal. 91352

Oscilloscope Plug-Ins

Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Nicolet Instruments Corp., Dept. EM, 5225 Verona Rd., Madison, Wisc. 53711 p. 2791
M Dumont Oscilloscope Labs., Dept. EM, 40 Fairfield Pl., W. Caldwell, N.J. 07006
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077

Oscilloscopes, Digital Readout

B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 ..... *
D Nicolet Instruments Corp., Dept. EM, 5225 Verona Rd., Madison, Wisc. 53711 *
Telonic/Berkeley, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715 ..... *
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077

Oscilloscopes, General Purpose

D B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 ..... p. 2670-2672
D Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005 ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 p. 2752
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
M Infodex, Inc., Dept. EM, 7 Cherry Ave., Waterbury, Conn. 06702 ..... *
D Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803 p. 2774
D Nicolet Instruments Corp., Dept. EM, 5225 Verona Rd., Madison, Wisc. 53711 *
D Non-Linear Sys., Inc., Dept. EM, 533 Stevens Ave., Solana Beach, Cal. 92075 *
D Philips Test & Measuring Instrs., Dept. EM, 85 McKee Dr., Mahwah, NJ 07430 ..... p. 2796-2798
D Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... *
Telonic/Berkeley, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715 ..... *
D Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219 p. 2830
VIZ Manufacturing Co., Dept. EM, 335 E. Price St., Phila, Pa. 19144 .... p. 2833
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
Wavetek Indiana, Inc., Dept. EM, 66 N. First Ave., Beech Grove, Ind. 46107 p. 2835
M Dumont Oscilloscope Labs., Dept. EM, 40 Fairfield Pl., W. Caldwell, N.J. 07006
Kikusui Elctrns. Corp., Dept. EM, 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
D Lectrotech, Inc., Dept. EM, 5810 N. Western Ave., Chicago, Ill. 60659
D Sencore, Dept. EM, 3200 Sencore Dr., Sioux Falls, S.D. 57107
Snap-On-Tools, Dept. EM, 8192-A 28th Ave., Kenosha, Wisc. 53140
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
D Vu-data Corp., Dept. EM, 7170 Convoy Ct., San Diego, Cal. 92111

Oscilloscopes, High-Frequency (Above 75 MHZ)

Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D Philips Test & Measuring Instrs., Dept. EM, 85 McKee Dr., Mahwah, NJ 07430 ..... p. 2796-2798
Wavetek Indiana, Inc., Dept. EM, 66 N. First Ave., Beech Grove, Ind. 46107 p. 2835
M Dumont Oscilloscope Labs., Dept. EM, 40 Fairfield Pl., W. Caldwell, N.J. 07006
D REI Sales Co., Dept. EM, 1 North Ave, Burlington, Mass. 01803
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077

Oscilloscopes, Low-Frequency (D-C to 3 MHZ)

B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 ..... *
D Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005 ..... p. 2663
D California Instrs., Dept. EM, 5150-Convoy St., San Diego, Cal. 92111 ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
M Infodex, Inc., Dept. EM, 7 Cherry Ave., Waterbury, Conn. 06702 ..... *
D Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803 *

D **Nicolet Instruments Corp., Dept. EM, 5225 Verona Rd., Madison, Wisc. 53711** *
Non-Linear Sys., Inc., Dept. EM, 533 Stevens Ave., Solana Beach, Cal. 92075 p. 2794
D **Philips Test & Measuring Instrs., Dept. EM, 85 McKee Dr., Mahwah, NJ 07430** ..... p. 2796-2798
Telonic/Berkeley, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715 ..... p. 3063
D **Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219** *
M **Wavetek Indiana, Inc., Dept. EM, 66 N. First Ave., Beech Grove, Ind. 46107** *
Dumont Oscilloscope Labs., Dept. EM, 40 Fairfield Pl., W. Caldwell, N.J. 07006
Kikusui Elctrns. Corp., Dept. EM, 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
D Lectrotech, Inc., Dept. EM, 5810 N. Western Ave., Chicago, Ill. 60659
D Sencore. Dept. EM, 3200 Sencore Dr., Sioux Falls, S.D. 57107
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
D Vu-data Corp., Dept. EM, 7170 Convoy Ct., San Diego, Cal. 92111

Oscilloscopes, Mid-Frequency (D-C to 75 MHZ)

D **B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635** ..... p. 2670-2672
D **Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005** ..... p. 2663
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 p. 2752
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803 p. 2774
Nicolet Instruments Corp., Dept. EM, 5225 Verona Rd., Madison, Wisc. 53711 *
Philips Test & Measuring Instrs., Dept. EM, 85 McKee Dr., Mahwah, NJ 07430 ..... p. 2796-2798
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** ..... *
D **Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219** *
D Dumont Oscilloscope Labs., Dept. EM, 40 Fairfield Pl., W. Caldwell, N.J. 07006
D REI Sales Co., Dept. EM, 1 North Ave, Burlington, Mass. 01803
D Soltec Corp., Dept. EM, Box 49, Sun Valley, Cal. 91352
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
D Vu-data Corp., Dept. EM, 7170 Convoy Ct., San Diego, Cal. 92111

Oscilloscopes, Multi-Beam

B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 ..... p. 2671
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 p. 2752
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803 p. 2774
D **Philips Test & Measuring Instrs., Dept. EM, 85 McKee Dr., Mahwah, NJ 07430** ..... *
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
Wavetek Indiana, Inc., Dept. EM, 66 N. First Ave., Beech Grove, Ind. 46107 *
Dumont Oscilloscope Labs., Dept. EM, 40 Fairfield Pl., W. Caldwell, N.J. 07006
GCA/Precision Scientific, Dept. EM, 3737 W. Cortland St., Chicago, Ill. 60647
D REI Sales Co., Dept. EM, 1 North Ave, Burlington, Mass. 01803
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077

Oscilloscopes, Multiple Channel

D **B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635** ..... p. 2670
D **Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005** ..... *
D **California Instrs., Dept. EM, 5150-Convoy St., San Diego, Cal. 92111** ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 p. 2752
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D **Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108** *
Infodex, Inc., Dept. EM, 7 Cherry Ave., Waterbury, Conn. 06702 ..... *
D **Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803** p. 2774
D **Nicolet Instruments Corp., Dept. EM, 5225 Verona Rd., Madison, Wisc. 53711** *
D **Philips Test & Measuring Instrs., Dept. EM, 85 McKee Dr., Mahwah, NJ 07430** ..... p. 2797,2798
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** ..... *
Telonic/Berkeley, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715 ..... p. 3063
D **Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219** *
VIZ Manufacturing Co., Dept. EM, 335 E. Price St., Phila, Pa. 19144 ..... *
M **Wavetek Indiana, Inc., Dept. EM, 66 N. First Ave., Beech Grove, Ind. 46107** *
Beckman Instrs., (AISSD), Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634
Data Check Corp., Dept. EM, 10070 Willow Creek Rd., San Diego, Cal 92131
M Dumont Oscilloscope Labs., Dept. EM, 40 Fairfield Pl., W. Caldwell, N.J. 07006
D Lectrotech, Inc., Dept. EM, 5810 N. Western Ave., Chicago, Ill. 60659
D REI Sales Co., Dept. EM, 1 North Ave, Burlington, Mass. 01803
D Soltec Corp., Dept. EM, Box 49, Sun Valley, Cal. 91352
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Voltex Co., Inc., Dept. EM, 115 Marine St., Farmingdale, N.Y. 11735

Oscilloscopes, Portable, Battery Operated

D **B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635** ..... p. 2670
Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005 ..... p. 2663
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Infodex, Inc., Dept. EM, 7 Cherry Ave., Waterbury, Conn. 06702 ..... *
D **Non-Linear Sys., Inc., Dept. EM, 533 Stevens Ave., Solana Beach, Cal. 92075** p. 2794
D **Philips Test & Measuring Instrs., Dept. EM, 85 McKee Dr., Mahwah, NJ 07430** ..... p. 2796-2798
Telonic/Berkeley, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715 ..... *
D REI Sales Co., Dept. EM, 1 North Ave, Burlington, Mass. 01803
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Transmed Scientific, Dept. EM, 860-C Capitolio Way, San Luis Obispo, Cal. 93401
D Vu-data Corp., Dept. EM, 7170 Convoy Ct., San Diego, Cal. 92111

Oscilloscopes, Programmable

Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 ..... *
Nicolet Instruments Corp., Dept. EM, 5225 Verona Rd., Madison, Wisc. 53711 *
Dumont Oscilloscope Labs., Dept. EM, 40 Fairfield Pl., W. Caldwell, N.J. 07006
E-H International, Inc., Dept. EM, 515 11th St Box 1289, Oakland, Cal 94604
E-H Resch. Labs., Inc., Dept. EM, Box 1289, Oakland, Cal. 94604

Oscilloscopes, Sampling

Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D **Nicolet Instruments Corp., Dept. EM, 5225 Verona Rd., Madison, Wisc. 53711** *
E-H International, Inc., Dept. EM, 515 11th St Box 1289, Oakland, Cal 94604
E-H Resch. Labs., Inc., Dept. EM, Box 1289, Oakland, Cal. 94604
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077

Oscilloscopes, Storage

Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 p. 2752
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D **Nicolet Instruments Corp., Dept. EM, 5225 Verona Rd., Madison, Wisc. 53711** p. 2791
D **Philips Test & Measuring Instrs., Dept. EM, 85 McKee Dr., Mahwah, NJ 07430** ..... p. 2798
D REI Sales Co., Dept. EM, 1 North Ave, Burlington, Mass. 01803
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077

Outlets, Electrical—See Boxes, Junction, Outlets & Wall Plates

Ovens, Aging, Burn-In, Life Test

M **Blue M Electric Co., Dept. EM, 138th & Chatham St., Blue Island, Ill. 60406** p. 2570
M **Cincinnati Sub-Zero Products, Dept. EM, 2612 Gilbert Ave., Cincinnati, Ohio 45206** ..... p. 2571
Ransco Industries, Dept. EM, 2221 Statham Blvd., Oxnard, Cal. 93030 p. 2572
M **Tenney Engrg., Inc., Dept. EM, 109 Springfield Rd., Union, N.J. 07083** ..... *
M Aerotronic Assocs., Inc., Dept. EM, Riverside Dr., Contoocook, N.H. 03229
Alpha-M Corp, Dept. EM, 3009 Wildflower Drive, Dallas, Tx. 75229
Associated Environmental Systems, Dept. EM, 360 Merrimack St., Lawrence, Mass. 01842
M Bemco, Inc., Dept. EM, 9908 San Fernando Rd., Pacoima, Cal. 91331
D Delta Design, Inc., Dept. EM, 5725 Kearny Villa Road, San Diego, Cal 92123
D Despatch Oven Co., Dept. EM, P.O. Box 1320, Minneapolis, Minn. 55440
Forma Scientific, Inc., Dept. EM, Box 649, Marietta, Ohio 45750
Lehighton Electronics, Inc., Dept. EM, RD 1Box 374 Dept M, Lehighton, Pa 18235
Loranger Mfg. Corp., Dept. EM, Box 948, Warren, Pa. 16365
Reliability Inc., Dept. EM, Box 37409, Houston, Tex. 77036
M Trio-Tech, Inc. of Calif., Trio-Tech Int., Dept. EM, 2435 N. Naomi St., Burbank, Calif. 91504

Ovens, Crystal & Component

M **CTS Knights, Inc., Dept. EM, 400 Reimann Ave., Sandwich, Ill. 60548** p. 2309
Erie Frequency Control, Div. Erie Technological Prods., Dept. EM, 453 Lincoln St., Carlisle, Pa. 17013 ..... *
M **Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040** .. *
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 .... *
Isotemp Research Inc, Dept. EM, 711 Henry Ave, Charlottesville, VA. 22901 p. 2337
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D **Midwest Components, Dept. EM, 1981 Port City Blvd., Muskegon, Mich. 49400** ..... *
M **Monitor Prods., Dept. EM, Box 1966, 502 Via Delmonte, Oceanside, Cal. 92054** ..... p. 2349
Northern Engineering Labs., Dept. EM, 357 Beloit St., Burlington, Wisc. 53105 ..... *
Ovenaire, Div. Walter Kidde & Co., Dept. EM, 706 Forrest St., Charlottesville, Va. 22901 ..... p. 2357
Acme Elec. Heating Corp., Dept. EM, 4685 E. 11th, Hialeah, Fla. 33013
M A.R.F. Products, Dept. EM, Box 3226, Boulder, Colo. 80303
M Cox & Co., Inc., Dept. EM, 215 Park Ave., S., New York, N.Y. 10003
CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
Hotpack Corp., Dept. EM, 5148 Cottman Ave., Phila., Pa. 19135

Kahle Engrg. Co., Dept. EM, 3344 Hudson Ave., Union City, N.J. 07087
Micro Technical Industries, Dept. EM, 1999 S. Coast Hwy., Laguna Beach, Cal. 92651
Odell Co., M. P., Dept. EM, 26612 Center Ridge Rd., Cleveland, Ohio 44145
M Oven Industries, Inc., Dept. EM, 800 New Holland Ave., Mechanicsburg, Pa. 17055
M Sawyer Inds., Dept. EM, 5649 Peck Rd., Arcadia, Cal. 91006
D Snelgrove, C. R. Ltd., Dept. EM, 141 Bond Ave., Don Mills 404 Ont., Ont. Can.
Texas Instruments Control Prods. Div., Dept. EM, 34 Forrest St., Attleboro, Mass. 02703

Ovens, Electric—See Furnaces, Electric

Ovens, Vacuum

Blue M Electric Co., Dept. EM, 138th & Chatham St., Blue Island, Ill. 60406 *
Cincinnati Sub-Zero Products, Dept. EM, 2612 Gilbert Ave., Cincinnati, Ohio 45206 *
Micro-Mo Electronics Inc., Dept. EM, 3691 Lee Rd., Cleveland, Ohio 44120 *
Baker Co., Inc., Dept. EM, Drawer E - Sanford Airport, Sanford, Me. 04073
M Bemco, Inc., Dept. EM, 9908 San Fernando Rd., Pacoima, Cal. 91331
Forma Scientific, Inc., Dept. EM, Box 649, Marietta, Ohio 45750
D GCA/Precision Scientific, Dept. EM, 3737 W. Cortland St., Chicago, Ill. 60647
High Vacuum Equip. Corp., Dept. EM, 110 Industrial Pk Rd, Hingham, Mass. 02043
Hotpack Corp., Dept. EM, 5148 Cottman Ave., Phila., Pa. 19135
D Hull Corp., Dept. EM, Davisville Rd., Hatboro, Pa. 19040
Kahle Engrg. Co., Dept. EM, 3344 Hudson Ave., Union City, N.J. 07087
Lab-Line Instrs, Dept. EM, 15th & Bloomingdale, Melrose Park, Ill. 60160
Materials Resch. Corp., Dept. EM, Route 303, Orangeburg, N.Y. 10962
Perkin-Elmer Ultek Inc., Dept. EM, Box 10920, Palo Alto, Cal. 94303
Red Point Corp., Dept. EM, 105 W. Spazier, Burbank, Cal. 91502
T-M Vacuum Prods., Dept. EM, Warrington & Rowland, Riverton, N.J. 08077
DM Ulvac North America, Dept. EM, Colchester Plaza, Colchester, VT 05446
Vactronic Lab. Equip., Inc., Dept. EM, 65 Brightside Ave., E. Northport, N.Y. 11731
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Packages, Integrated Circuit

Airpax Elctrns., Inc., Cambridge Div., Dept. EM, Woods Rd., Cambridge, Md. 21613 p. 1022
Aromat Corp., Dept. EM, 250 Sheffield Ave., Mountainside, N.J. 07092 p. 3418-3421
M **Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634** *
Bivar, Inc., Dept. EM, 1617 E. Edinger Ave., Santa Ana, Cal. 92705 *
Caddock Electronics, Inc., Dept. EM, 3127 Chicago Ave., Riverside, Cal. 92507 *
Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 *
Dialight, Dept. EM, 203 Harrison Pl., Brooklyn, N.Y. 11237 p. 2475
Elctrn. Molding Corp., Dept. EM, 96 Mill St., Woonsocket, R.I. 02895 *
DM **Garry Mfg., Inc., Dept. EM, 1010 Jersey Ave., New Brunswick, N.J. 08902** *
Industrial Elctrn. Engrs., Dept. EM, 7740 Lemona Ave., Van Nuys, Cal. 91405 *
3M Co., Electronic Prods Div., Dept. EM, 3M Center, St. Paul, Minn. 55101 *
Mini-Systems, Inc., Dept. EM, 20 David Rd., North Attleboro, Mass. 02761 p. 2860
Telonic/Berkeley, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715 *
D **Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629** *
D Accessories for Electronics, Dept. EM, 800 Merrick Road, Baldwin, N.Y. 11510
Coors Porcelain Co., Dept. EM, 600 Ninth St., Golden, Colo. 80401
M Detoronics Corp., Dept. EM, 10660 E. Rush St., P.O. Box 3805, S. El Monte, Cal. 91733
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Information Control Corp., Abacus Div. Dept. EM7, Dept. EM, 9610 Bellanca Ave., Los Angeles, Cal. 90045
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
D Modpak, Dept. EM, 31 A Green St., Waltham, Mass. 02154
Morris Entprs, Dept. EM, 16799 Schoenborn St, Sepulveda, Cal. 91343
Plessey Inc., Dept. EM, 320 Long Island Expwy. S., Melville, N.Y. 11746
Plessey Ceramic Div., Dept. EM, 8th & Harrison Sts., Frenchtown, N.J. 08825
DM Plessey Chatsworth, Dept. EM, 20245 Sunburst St., Chatsworth, Cal. 91311
Pylon Co., Inc., Dept. EM, 51 Newcomb St., Attleboro, Mass. 02703
D Rosenthal Metceram Corp, Dept. EM, Huntington Industrial Pk., Providence, R.I. 02907
Solid State Equipment Corp., Dept. EM, 430 Delaware Drive, Fort Washington, Pa. 19034
United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013

Packaging Panels, IC—See Boards, Plug-In

Pads, L, T, & H—See Attenuators, Audio

Pads, Transistor Mounting

DM **Bivar, Inc., Dept. EM, 1617 E. Edinger Ave., Santa Ana, Cal. 92705** p. 1024
Chomerics, Inc., Dept. EM, 77 Dragon Court, Woburn, Mass. 01801 *
Delbert Blinn. Co., Dept. EM, Box 2007, Pomona, Calif. 91766 p. 3923
Elctrn. Molding Corp., Dept. EM, 96 Mill St., Woonsocket, R.I. 02895 *
DM **Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012** *
Mini-Systems, Inc., Dept. EM, 20 David Rd., North Attleboro, Mass. 02761 *
D **Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543** *
D **Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207** *
Staver Co., Inc., Dept. EM, 47 N. Saxon Ave., Bay Shore, N.Y. 11706 *
DM **Teledyne Relays, Dept. EM, 3155 W. El Segundo Blvd., Hawthorne, Cal 90250** *
DM **Thermalloy, Inc., Dept. EM, 2021 W. Valley View, Dallas, Tex 75234** *
D **Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629** *
DM Accessories for Electronics, Dept. EM, 800 Merrick Road, Baldwin, N.Y. 11510
D Amatom Electronic Hardware, Div. MITE Corp., Dept. EM, 446 Blake St., New Haven, Conn. 06515
DM Amrad Corp., Dept. EM, Box 876, Paris, Tex. 75460
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
D Circuit Structures Lab., Div. D-Cemco Inc Inc., Dept. EM, 3200 N. San Fernando Blvd., Burbank, Calif. 91504
D D-Cemco, Inc., Dept. EM, 3200 N. San Fernando Blvd., Burbank, Calif. 91504
D Dynaloy, Inc., Dept. EM, 7 Great Meadow La., Hanover, N.J. 07936
D Globe Plastics, Dept. EM, 1342 S. Signal Dr., Pomona, Cal. 91766
DM Gudebrod Inc., Electronics Div., Dept. EM, 12 S. 12th St., Philadelphia, Pa. 19107
Industrial Mica Div., Columbia Chase Corp., Dept. EM, 223 S. Van Brunt St., Englewood, N.J. 07631
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
D Norelcom Electronics, Dept. EM, 200 Allen Blvd., Farmingdale, N.Y. 11735
Plessey Inc., Dept. EM, 320 Long Island Expwy. S., Melville, N.Y. 11746
M Robison Elctrns., Dept. EM, 3580 Sacramento Dr., San Luis Obispo, Cal. 93401
D SAMTEC, Dept. EM, 810 Progress Blvd., New Albany, Indiana 47150
D Spec Plastics Inc., Dept. EM, 7224 Atoll Ave., No. Hollywood, Cal. 91605

Paging Systems—See Comm. Systems, Selective Paging

Paints, Conductive, Electric—See Coatings, Conductive, Electric

Paints, Metallic

GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 *
Acheson Colloids Co., Div. Acheson Inds., Dept. EM, P.O. Box 288, Port Huron, Mich. 48060
D Electro-Science Labs., Dept. EM, 2211 Sherman Ave., Pennsauken, N. J. 08110
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
M Micro-Circuits Co., Inc., Dept EEM I, Dept. EM, New Buffalo, Mich. 49117
SermeTel Inc., Sub. Teleflex Inc., Dept. EM, 155 Limerick Rd., Limerick, Pa 19468
D Tecknit, Dept. EM, 129 E. Dermody St., Cranford, N.J. 07016

Paints, Radioactive—See Coatings, Radioactive

Paints, Reflective

Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230

Paints, Resistive-Also See Inks for Thick-Film Microcircuits

GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 *
Acheson Colloids Co., Div. Acheson Inds., Dept. EM, P.O. Box 288, Port Huron, Mich. 48060
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
Electro Mats. Corp. Amer., Dept. EM, 605 Center Ave., Mamaroneck, N.Y. 10543
D Electro-Science Labs., Dept. EM, 2211 Sherman Ave., Pennsauken, N. J. 08110
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Isochem Resins Co., Dept. EM, 99 Cook St., Lincoln, R.I. 02865
Krylon Dept., Borden Chemical, Dept. EM, 180 E. Broad St, Columbus, Ohio 43215
Mereco Products Div., Metachem Resins, Dept. EM, 538 Wellington Ave., Cranston, R.I. 02910
M Micro-Circuits Co., Inc., Dept EEM I, Dept. EM, New Buffalo, Mich. 49117
D Murata Mfg. Co. Ltd., Dept. EM, 16, Kaiden Nishijin-cho, Nagaoka-Kyo-Shi, Kyoto, Japan
Plessey Inc., Dept. EM, 320 Long Island Expwy. S., Melville, N.Y. 11746
SermeTel Inc., Sub. Teleflex Inc., Dept. EM, 155 Limerick Rd., Limerick, Pa 19468
Tempil Div., Big Three Inds, Dept. EM, Hamilton Blvd., So. Plainfield, N.J. 07080

Panel Equipment—See Dials; Connectors; Jacks; Lights; etc.

Panel Marking Kits—See Kits, Marking (Dial, Instrument, Equipment, etc.)

Panels, Back-Lit & Edge-Lit

Display Devices, Dept. EM, Box 667, Encinitas, Cal. 92024 p. 2477
M Aerospace Optics Inc., Dept. EM, 7112 Burns St., Fort Worth, Tex. 76118
Automation Displays Inc., Dept. EM, 3833 N. White Ave., Eau Claire, Wisc. 54701
Photo Chemical Prods. Cal., Dept. EM, 1715 Berkeley, Santa Monica, Cal. 90404

Panels, Electroluminescent

Display Devices, Dept. EM, Box 667, Encinitas, Cal. 92024 p. 2477
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M UCE, Inc., Dept. EM, 20 N. Main St., Norwalk, Conn. 06854

Panels, Fuse

GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 *
ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 *
D **Littelfuse, Inc., Dept. EM, 800 E. Northwest Hwy., Des Plaines, Ill. 60016** *
National Tel-Tronics, Div. Electro Audio Dynamics, Inc., Dept. EM, State Road Hill, Meadville, Pa. 16335 *
D **Trimm, Inc., Dept. EM, 400 W. Lake, Box 489, Libertyville, Ill. 60048** *

Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
M Anchor Specialty Mfg. Inc., Dept. EM, 300 Hollister Rd., Teterboro, N.J. 07608
Doran Mfg. Co., Dept. EM, 1033 Bader St., Cincinnati, Ohio 45225
D Mechanical Engraving Co., Inc., Dept. EM, 4500 Bullard Ave, Bronx, New York 10470
D Mobil Electronics, Inc., Dept. EM, Box 1132, Anderson, Ind. 46015
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Ratelco, Inc., Dept. EM, 610 Pontius Ave. N., Dept. EEM, Seattle, Wash. 98109
San-O Industrial Corp., Dept. EM, 35-P Orville Dr., Bohemia, N.Y. 11716
Taylor Electric, Inc., Dept. EM, 2410 Hwy 281 N., Marble Falls, Tex. 78654
D Underwriters Safety Device, An Eltra Co., Dept. EM, 7300 W. Wilson Ave., Chicago, Ill. 60656
D Wadsworth Electric Mfg. Co., Dept. EM, 20 W. 11th St., Covington, Ky. 41011

Panels, IC Packaging—See Boards, Plug-In

Panels, Jack

Allied Systems Corp., Dept. EM, Box 11005, Greensboro, N.C. 27409 ..... *
Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 ..... *
D **Ava Elctrns., Dept. EM, 4000 Bridge St., Dreyel Hill, Pa 19026** ..... *
Dynatech Corp., Dept. EM, 1225 E. Wakeham Ave., Santa Ana, Cal. 92702 *
M **Elctrn. Molding Corp., Dept. EM, 96 Mill St., Woonsocket, R.I. 02895** ..... *
Excel Products Co., Inc., Dept. EM, 401 Joyce Kilmer Ave., New Brunswick, N.J. 08903 ..... p. 1767
M **GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055** ..... *
Info-Lite Corp., Dept. EM, 46-10 104 St., Corona, N.Y. 11368 ..... *
Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 ..... *
LVC Inds. Inc., Co-Ord Switch Bloc-Lite Divs., Dept. EM, 135-25 37th Ave., Flushing, N.Y. 11354 ..... *
M **Mac Panel Co., Dept. EM, Box 5027, 216 Pine St., High Pt., N.C. 27262** p. 2079
National Tel-Tronics, Div. Electro Audio Dynamics, Inc., Dept. EM, State Road Hill, Meadville, Pa. 16335 ..... *
Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 ..... *
D **Trimm, Inc., Dept. EM, 400 W. Lake, Box 489, Libertyville, Ill. 60048** .. p. 2247
D **Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342** ..... *
M **Virginia Panel Corp., Dept. EM, Box 1106, 1400 New Hope Rd., Waynesboro, Va. 22980** ..... *
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
DM ADC Prods, Dept. EM, 4900 W. 78th St., Minneapolis, Mn 55435
M Anchor Specialty Mfg. Inc., Dept. EM, 300 Hollister Rd., Teterboro, N.J. 07608
Apahouser Corp. of N.E., Apahouser-Elcom, Dept. EM, 101 Walnut St., Watertown, Mass. 02172
Artisan Elctrns. Corp., Dept. EM, 5 Eastmans Rd., Parsippany, N.J. 07054
D Bud Radio, Inc., Dept. EM, 4605 E. 355th St., Willoughby, Ohio 44094
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
M Dynatech Data Sys, A Dynatech Co, Dept. EM, 900 Slaters La., Alexandria, Va. 22314
M Electro-Rack Products Co., Dept. EM, 1742 So. Clementine St., Anaheim, Cal. 92802
D Heeger Inc., Dept. EM, 725 Ceres Ave., Los Angeles, Cal. 90021
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
D International Data Sciences, Dept. EM, 100 Nashua St., Providence, R.I. 02904
D ITI Electronics, Inc., Dept. EM, 369 Lexington Ave., Clifton, N.J. 07015
D LMB Heeger, Inc., Dept. EM, 725 Ceres Ave., Los Angeles, Cal. 90021
Marlin Manufacturing Corp., Dept. EM, 12404 Triskett Rd., Cleveland, Ohio 44111
D Mechanical Engraving Co., Inc., Dept. EM, 4500 Bullard Ave, Bronx, New York 10470
Methode Elctrns., Inc., Dept. EM, 7447 W. Wilson Ave., Chicago, Ill. 60656
Mid-West Metal Prods., Inc., Dept. EM, 456 E. Donovan Rd., Kansas City, Kans. 66115
D Mobil Electronics, Inc., Dept. EM, Box 1132, Anderson, Ind. 46015
Mupac Corp., Dept. EM, 646 Summer St., Brockton, Mass. 02402
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Puleo Electronics, Inc., Dept. EM, 39 Hutcheson Pl., Lynbrook, N.Y. 11563
D Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
DM Switchcraft, Inc., Dept. EM, 5555 N. Elston, Chicago, Ill. 60630
M Technical Mat'l., Dept. EM, 700 Fenimore Rd., Mamaroneck, N.Y. 10543
Trompeter Electronics, Inc., Dept. EM, 8936 Comanche, Chatsworth, Cal. 91311

Panels, Metal—See Enclosures, Circuit Board, Module & Relay Mounting

Panels, Meter—See Enclosures, Circuit Board, Module, & Relay Mounting

Panels, Patch—See Panels, Jack

Panels, Power Bus For IC's

Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... *
Excel Products Co., Inc., Dept. EM, 401 Joyce Kilmer Ave., New Brunswick, N.J. 08903 ..... p. 1767
D **Garry Mfg., Inc., Dept. EM, 1010 Jersey Ave., New Brunswick, N.J. 08902** .. *
M Anchor Specialty Mfg. Inc., Dept. EM, 300 Hollister Rd., Teterboro, N.J. 07608
Control Products Corp., Dept. EM, 4431 W. Division St., Chicago, Ill. 60651
M Electro-Rack Products Co., Dept. EM, 1742 So. Clementine St., Anaheim, Cal. 92802
Lakeshore Electric Corp., Dept. EM, 205 Willis, Bedford, Ohio 44146
D Mechanical Engraving Co., Inc., Dept. EM, 4500 Bullard Ave, Bronx, New York 10470
Methode Elctrns., Inc., Dept. EM, 7447 W. Wilson Ave., Chicago, Ill. 60656
Mupac Corp., Dept. EM, 646 Summer St., Brockton, Mass. 02402

Panels, Relay Rack—See Enclosures, Circuit Board, Module, & Relay Mounting

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Paper Tape Preparation Systems

Data Specialties, Dept. EM, 3455 Commercial Ave., Northbrook, Ill. 60062 p. 1397
GNT Automatic Inc., Dept. EM, 440 Totten Pond Rd., Waltham, Mass 02154 p. 1642
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Computer Transceiver Systems, Dept. EM, 66 E. Midland Ave., Paramus, N.J. 07652
EECO, Dept. EM, 1441 E. Chestnut Ave, Box 659, Santa Ana, Cal. 92701
GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854
Sweda Int'l., OEM Prods., Dept. EM, 34 Maple Ave., Pine Brook, N.J. 07058
Teleterminal Corp., Dept. EM, 12 Cambridge St., Burlington, Mass. 01803

Paper, Graphic Recording

Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 ..... *
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... p. 1469
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 ..... *
Gulton Inds., Inc., Measurement & Control Systems Div., Dept. EM, Gulton Ind'l. Pk., E. Greenwich, R.I. 02818 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
AGFA-Gevaert, Inc., Dept. EM, 275 North St., Teterboro, N.J. 07608
M Alden Elctrn. & Impulse Recording Equip. Co., Dept. EM, Washington St., Westboro, Mass. 01581
I Astro-Med, Div Atlan-Tol Inds. Inc., Dept. EM, 639 E. Greenwich Ave., West Warwick, R.I. 02893
Beckman Instrs., (AISSD), Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
California Computer Prods., Dept. EM, 2411 W. La Palma Ave., Anaheim, Cal 92801
Graphic Controls Corp., Recording Chart Div., Dept. EM, P.O. Box 1271, Buffalo, N.Y. 14240
Hathaway Instruments Inc., Dept. EM, 11616 51st St., Tulsa, Okla. 74145
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
M Keuffel & Esser Co., Dept. EM, 20 Whippany Rd., Morristown, N.J. 07960
D Linear Instrs. Corp., Dept. EM, 17282 Eastman Ave., Irvine, Cal. 92714
MFE Corp., Dept. EM, Keewaydin Dr., Salem, N.H. 03079
Soltec Corp., Dept. EM, Box 49, Sun Valley, Cal. 91352
Telautograph Corp., Dept. EM, 8700 Bellanca Ave., Los Angeles, Cal. 90045
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Varian Assocs., Instrument Div., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Patch Boards—See Boards, Programming

Peltier (Thermoelectric) Heat Pumps—See Cooling/Heating Modules, Thermoelectric

Perforators, Paper Tape (Electrically Powered)

Data Specialties, Dept. EM, 3455 Commercial Ave., Northbrook, Ill. 60062 p. 1397
GNT Automatic Inc., Dept. EM, 440 Totten Pond Rd., Waltham, Mass 02154 p. 1642
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403 ..... *
D EECO, Dept. EM, 1441 E. Chestnut Ave, Box 659, Santa Ana, Cal. 92701
D Facit-Addo, Inc., Dept. EM, 66 Field Point Rd., Greenwich, Conn. 06830
Sweda Int'l., OEM Prods., Dept. EM, 34 Maple Ave., Pine Brook, N.J. 07058
Teleterminal Corp., Dept. EM, 12 Cambridge St., Burlington, Mass. 01803

Peripheral Interface Elements

Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734 ..... p. 1390
Data Specialties, Dept. EM, 3455 Commercial Ave., Northbrook, Ill. 60062 p. 1397
Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 ..... *
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... p. 1469
Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... *
IBM Instrument Systems, Dept. EM, 1000 Westchester Ave., White Plains, N. Y. 10604 ..... p. 2759
Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
Innovative Electronics Inc., Dept. EM, 15200 NW 60th Ave., Miami Lakes, Fla. 33014
Intersil, Inc., Dept. EM, 10900 N. Tantau Ave., Cupertino, Cal. 95014
MDB Systems Inc., Dept. EM, 1995 N. Batavia St., Orange, Cal. 92665
National Instruments, Dept. EM, 83330 Burnet Rd., Austin, Tex 78758
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077

Phones—See Handsets, Chestsets, Headphones, Headsets, etc.

Phonographs, Parts & Accessories

Connector Corp., Dept. EM, 6025 N. Keystone Ave., Chicago, Ill. 60646 ..... *
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... ***
National Tel-Tronics, Div. Electro Audio Dynamics, Inc., Dept. EM, State Road Hill, Meadville, Pa. 16335 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2105
Aldshir Mfg., Dept. EM, 111 Lake, Tuckahoe, N.Y. 10707
Anchor Plastics, Dept. EM, 36-36 36th, Long Island City, N.Y. 11106
D Audio-Technica U.S., Inc., Dept. EM, 33 Shiawassee Ave., Fairlawn, Ohio 44313
Audiotronics Corp., Dept. EM, 7428 Bellaire Ave., N. Hollywood, Cal. 91605
D Duotone Co., Dept. EM, 6875 S.W. 81st St., S. Miami, Fla. 33143
Gotham Audio Corp., Dept. EM, 741 Washington St., New York, N.Y. 10014
D Herald Electronics, Dept. EM, 6611 N. Lincoln Ave., Chicago, Ill. 60645
DM Merix Chem. Co., Dept. EM, 2234 East 75th St., Chicago, Ill. 60649
Newcomb Audio Products Co., Dept. EM, 12881 Bradley Ave., Sylmar, Cal. 91342
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Recoton Corp., Dept. EM, 46-23 Crane St., Long Island City, N.Y. 11101
M Robins Ind's. Corp., Consumer Products Div., Dept. EM, 75 Austin Blvd., Commack, N.Y. 11725
Shure Brothers, Inc., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204
Stanton Magnetics, Inc., Dept. EM, Terminal Dr., Plainview, N.Y. 11803
Vidaire Electronics Mfg., Dept. EM, 150 Buffalo Ave., Freeport, N.Y. 11520

Photocells & Phototubes—See Cells, Photoconductive, etc.

Photoelectric Equipment—See Alarms, Controls, Photoelectric

Photoelectric Tubes—See Cells, Photoconductive

Photoemissive Detectors—See Cells, Photoemissive

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Photomultiplier Tube Housings

D **IVO Industries, Dept. EM, 1109 Green Grove Rd., Neptune, N.J. 07753 ..... ***
Magnetic Shield Div., Perfection Mica, Dept. EM, 750 North Thomas Dr., Bensenville, Ill. 60106 ..... *
Marlow Industries, Inc., Dept. EM, 1021 S. Jupiter Rd., Garland, Tex. 75042 *
Melcor/Materials Elctrn. Prods., Dept. EM, 990 Spruce St., Trenton, N.J. 08648 ..... *
D Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
Dexter Scientific, Dept. EM, 1526 Arnold Dr., Melbourne, Fla. 32935
D EMI Gencom Inc., Dept. EM, 80 Express St., Plainview, N.Y. 11803
Gamma Scientific Inc., Dept. EM, 3777 Ruffin Rd., San Diego, Cal. 92123
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Stanton Magnetics, Inc., Dept. EM, Terminal Dr., Plainview, N.Y. 11803

Pickups, Magnetic, Proximity, Torque, Vibration, etc. —See Transducers, Specific Type

Pickups, Telephone (For Recording)

Airpax Elctrns., Controls Div., Dept. EM, 6801 W. Sunrise Blvd., Ft. Lauderdale, Fla. 33313 ..... p. 2258
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... ***
D **Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 ***
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

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Pin Straighteners, Tube

D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... ***
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... ***

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Allied Systems Corp., Dept. EM, Box 11005, Greensboro, N.C. 27409 ..... *
D **Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... ***
Appleton Electronic Div., Appleton Electric Co., Dept. EM, 2205 12th Ave., So. Milwaukee, Wisc. 53172 ..... p. 1709
D **Augat Interconnection Prods. Div., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703 ..... ***
D **Beman Mfg., Inc., Dept. EM, PO Box 370, New Cumberland, Pa. 17070 ..... ***
Berg Electronics, Div. E.I. DuPont de Nemours & Co., Dept. EM, York Expwy., New Cumberland, Pa. 17070 ..... p. 1730,1732
D **Concord Elctrns., Dept. EM, 37 Great Jones St., Dept. JE, New York, N.Y. 10012 ..... p. 1741**
Connector Corp., Dept. EM, 6025 N. Keystone Ave., Chicago, Ill. 60646 ..... *
Elctrn. Molding Corp., Dept. EM, 96 Mill St., Woonsocket, R.I. 02895 ..... *
D **Excel Products Co., Inc., Dept. EM, 401 Joyce Kilmer Ave., New Brunswick, N.J. 08903 ..... ***
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Interswitch, Dept. EM, 770 Airport Blvd., Burlingame, Cal. 94010 ..... *
ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ..... p. 1983
LVC Inds. Inc., Co-Ord Switch Bloc-Lite Divs., Dept. EM, 135-25 37th Ave., Flushing, N.Y. 11354 ..... *
D **Methode Elctrns, Interconnect Prods Div, Dept. EM, 1700 Hicks Rd, Rolling Meadows, ILL 60008 ..... ***
D **Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342 ..... p. 1315**
D **Vero Electronics, Dept. EM, 171 Bridge Rd., Hauppauge, N.Y. 11787 ..... ***
D **Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 .... ***
M Accessories for Electronics, Dept. EM, 800 Merrick Road, Baldwin, N.Y. 11510
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
D A.P. Products, Dept. EM, 72 Corwin Dr. Box 110, Painesville, Ohio 44077
M Art Wire/Doduco, Dept. EM, 9 Wing Dr., Cedar Knolls, N.J. 07927
Auto-Swage Products Inc., Dept. EM, 726 River Rd., Shelton, Conn. 06484
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
M Avid Electronics Corp., Dept. EM, Box 426, Baldwin, Pl., N.Y. 10505
Bead Elctrns., Div. Bead Chain Mfg. Co., Dept. EM, 110 Mountain Grove St., Bridgeport, Conn. 06605
D Circuit Assembly Corp., Dept. EM, 3169 Red Hill Ave., Costa Mesa, Cal. 92626
GTE Sylvania, Tech Prods Div, Dept. EM, 816 Lexington Ave., Warren, Pa 16365
Kentucky Electronics, Dept. EM, 1204 Ind'l Dr., Box 507, Owensboro, Ky. 42301
Micro Contacts Inc., Dept. EM, 62 Alpha Plaza, Hicksville, N.Y. 11801
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
D Precision Metal Prods. Co., Dept. EM, 41 Elm St., Stoneham, Mass. 02180
Pylon Co., Inc., Dept. EM, 51 Newcomb St., Attleboro, Mass. 02703
M U.S. Terminals, Dept. EM, 7502 Camargo Rd., Cincinnati, Ohio 45243
M Waldman Corp., Dept. EM, 3 Eastmans Rd, Parsippany, NJ 07054

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DM **Garry Mfg., Inc., Dept. EM, 1010 Jersey Ave., New Brunswick, N.J. 08902 .. ***
DM **Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012 .. ***
Lear Siegler, Elctrn. Instr. Div., Dept. EM, 714 N. Brookhurst St., Anaheim, Cal. 92803 ..... p. 2057
TRW/Cinch Connectors, Electronic Comp. Div. of TRW Inc., Dept. EM, 1501 Morse Ave., Elk Grove Village, Ill. 60007 ..... Inside Back Cover, Vol. 1
D **Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342 ..... ***
Abbott Screw & Mfg. Co., Dept. EM, 6525 N. Clark St., Chicago, Ill. 60626
DM Allen Mfg. Co., Dept. EM, 22 E. Dudley Town Rd., Bloomfield, Conn. 06002
M Allmetal Screw Products Co., Inc., Dept. EM, 821 Stewart Ave., Garden City, N.Y. 11530
M Art Wire/Doduco, Dept. EM, 9 Wing Dr., Cedar Knolls, N.J. 07927
Auto-Swage Products Inc., Dept. EM, 726 River Rd., Shelton, Conn. 06484
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
DM Avibank Mfg. Inc., Dept. EM, 210 S. Victory Blvd., Burbank, Calif. 91503
M Avid Electronics Corp., Dept. EM, Box 426, Baldwin, Pl., N.Y. 10505
Bead Elctrns., Div. Bead Chain Mfg. Co., Dept. EM, 110 Mountain Grove St., Bridgeport, Conn. 06605
Berg Inc., Winfred M., Dept. EM, 499 Ocean Ave., East Rockaway, N.Y. 11518
Bird, Richard H. & Co., Inc., Dept. EM, 1 Spruce St., Waltham, Mass. 02154
Centerflex Ceramics, Dept. EM, 221 Seventh Ave., Hawthorne, N.J. 07507
Control Inds. Inc., Dept. EM, 530 Burnside Ave., Inwood, N.Y. 11696
D Deutsch Fastener Corp., Dept. EM, 7001 W. Imperial Hwy., Los Angeles, Cal. 90045
DM ESNA Division, Amerace Corp., Dept. EM, 2330 Vauxhall Rd., Union, N.J. 07083
Hartwell Corp., Dept. EM, 900 S. Richfield Rd., Placentia, Cal. 92670
M Hybricon Corp., Dept. EM, 410 Crest Rd., Litteton, Mass. 01460
Kentucky Electronics, Dept. EM, 1204 Ind'l Dr., Box 507, Owensboro, Ky. 42301
D Precision Metal Prods. Co., Dept. EM, 41 Elm St., Stoneham, Mass. 02180
Tridair Inds., Rexnord Co., Dept. EM, 3000 W. Lomita Blvd., Torrance, Calif. 90505
M U.S. Terminals, Dept. EM, 7502 Camargo Rd., Cincinnati, Ohio 45243

Plastic Raw Materials, Liquids, Pellets, Powders, Resins

M **Hardman Inc., Dept. EM, 600 Cortlandt St., Belleville, N.J. 07109 ..... ***
ITT Thermotech, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 1203 S. 5th St., Hopkins, Minn. 55343 ..... *
Air Products & Chemicals, Dept. EM, Box 538, Allentown, PA 18105
M BFGoodrich Chemical Div, Dept. EM, 6100 Oak Tree Blvd., Cleveland, Ohio 44131
M Cadillac Plastic & Chemical, Dayco Co., Dept. EM, Box 810, Detroit, Mich. 48232
Conap, Inc., Dept. EM, 1405 Buffalo St, Olean, N.Y. 14760
Dek, Inc., Dept. EM, 1555-A Hawthorne La., W. Chicago, Ill. 60185
Diamond Shamrock Corp, Dept. EM, 1100 Superior Ave, Cleveland, Ohio 44114
D Dolph, John C. Co., Dept. EM, New Rd., Monmouth Junction, N.J. 08852
DM Dynaloy, Inc., Dept. EM, 7 Great Meadow La., Hanover, N.J. 07936
Eastman Chem. Prods., Sub. Eastman Kodak Co., Dept. EM, Kingsport, Tenn. 37662
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
M Fiberfil Div. Dart Ind., Dept. EM, P.O. Box 3333, Evansville, Ind. 47732
FMC Corp., Ind'l. Chemical Grp, Dept. EM, 2000 Market St., Philadelphia, Pa 19103
Formulated Resins Inc., Dept. EM, Box 508, Greenville, R.I. 02828
M Hightemp Resins, Inc., Dept. EM, 225 Greenwich Ave., Stamford, Conn. 06902

M Isochem Resins Co., Dept. EM, 99 Cook St., Lincoln, R.I. 02865
M M & T Chemicals Inc., Dept. EM, Rahway, N.J. 07065
Mereco Products Div., Metachem Resins, Dept. EM, 538 Wellington Ave., Cranston, R.I. 02910
DM Merix Chem. Co., Dept. EM, 2234 East 75th St., Chicago, Ill. 60649
M Packaged Resins Div., Bacon Inds., Inc., Dept. EM, 192 Pleasant St., Watertown, Mass. 02172
Plastics Engrg. Co., Dept. EM, 3518 Lakeshore Rd., Sheboygan, Wisc. 53081
D Ram Chems., Div. Whittaker Corp., Dept. EM, 210 E. Alondra Blvd., Gardena, Calif. 90248
SGL Homalite, Div. of SGL Inds., Inc., Dept. EM, 11 Brookside Dr., Wilmington, Del. 19804
SHOGYO International Corp., Dept. EM, 300 Northern Blvd., Great Neck, N.Y. 11021
M Sigma Plastronics, Inc., Dept. EM, 14531-33 Tireman Ave, Dearborn, Mich. 48126
Tra-Con, Inc., Dept. EM, 55 North St., Medford, Mass. 02155
Union Carbide, Chemicals & Plastics, Dept. EM, 270 Park Ave., New York, N.Y. 10017
D Uniroyal, Inc., Dept. EM, 1230 Ave. of Americas, New York, N.Y. 10020
Whittaker Corp., Dept. EM, 10880 Wilshire Blvd., Los Angeles, Cal. 90024

Plastics, Encapsulating—See Compounds, Encapsulating, Molding, Potting

Plastics, Heat Shrinkable—See Caps, Forms & Tapes, Heat Shrinkable-Also See Tubing, Heat Shrinkable

Plastics, Custom Molding—See Services, Custom Molding, Plastic

Plated Wire Memory Systems—See Memory Systems

Plates, Instructional, Name, Silk Screen—See Nameplates

Players, Magnetic Tape—See Recorders, Magnetic Tape

Pliers

D Channellock, Inc., Dept. EM, 1306 S. Main St., Meadville, Pa. 16335 .... p. 4287
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
D Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
Emporium Specialties Co., Inc., Dept. EM, Box 65, Austin, Pa. 16720
D Erikson Specialized Tool Co., Dept. EM, Box 424, Pico-Rivera, Cal. 90660
D Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
M Kawecki Berylco Inds., Inc., Dept. EM, PO Box 1462, Reading, PA 19603
D Klein Tools, Inc, Dept. EM, 7200 McCormick Rd., Chicago, Ill. 60645
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
D Marshall Industries, Hunter Tools, Dept. EM, 9674 Telstar Ave., El Monte, Cal. 91731
Milbar, Dept. EM, 530 Washington St., Chagrin Falls, Ohio 44022
National Camera Inc., Dept. EM, 2000 W. Union Ave., Englewood, Colo. 80110
D Plato Products, Inc., Dept. EM, El Monte, Cal. 91731
Sjoberg, C. & Son, Inc., Dept. EM, 415 Station St., Cranston, R.I. 02910
Snap-On-Tools, Dept. EM, 8192-A 28th Ave., Kenosha, Wisc. 53140
M Waldes Kohinoor, Inc., Dept. EM, 47-16 Austel Pl., Long Island City, N.Y. 11101

Plotters, X-Y, & Accessories—See Recorders, X-Y

Plug & Jack Sets

Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
Beman Mfg., Inc., Dept. EM, PO Box 370, New Cumberland, Pa. 17070 ..... *
Connector Corp., Dept. EM, 6025 N. Keystone Ave., Chicago, Ill. 60646 ..... *
Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... *
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
ITT Cannon Electric, Dept. EM, 666 E. Dyer Rd., Santa Ana, Cal. 92702 ..... *
D ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ..... p. 1966-1971,1974,1979,1990,1992
Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 ..... *
Johnson Co., E.F., Dept. EM, 299 10th SW Ave., Waseca, Minn. 56093 ..... *
Jones Elctrns., Hiram, Dept. EM, 11607 Vanowen St., No. Hollywood, Cal. 91605 ..... p. 1772,1773
DM Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012 .. *
M Mac Panel Co., Dept. EM, Box 5027, 216 Pine St., High Pt., N.C. 27262 ..... *
DM National Tel-Tronics, Div. Electro Audio Dynamics, Inc., Dept. EM, State Road Hill, Meadville, Pa. 16335 ..... p. 2088
M Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... *
DM Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2104,2115,2118,2145,2148
D Superior Electric Co., Dept. EM, 1000 Middle St., Bristol, Conn. 06010 p. 2159
Trimm, Inc., Dept. EM, 400 W. Lake, Box 489, Libertyville, Ill. 60048 .. p. 2247
D TRW/Cinch Connectors, Electronic Comp. Div. of TRW Inc., Dept. EM, 1501 Morse Ave., Elk Grove Village, Ill. 60007 ..... *
D W & M Mfg., Dept. EM, 187 Lafayette St., New York, N.Y. 10013 ..... p. 2255
D Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 .... *
Accessories for Electronics, Dept. EM, 800 Merrick Road, Baldwin, N.Y. 11510
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
DM ADC Prods, Dept. EM, 4900 W. 78th St., Minneapolis, Mn 55435
Aerolite Elexs Corp., Dept. EM, 2207 Summit Ave., Union City, N.J. 07087
Astrolab, Inc., Dept. EM, 345 Dalziel Rd., Linden, N.J. 07036
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
Control Inds. Inc., Dept. EM, 530 Burnside Ave., Inwood, N.Y. 11696
M Dynatech Data Sys, A Dynatech Co, Dept. EM, 900 Slaters La., Alexandria, Va. 22314
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
Hypertronics Corp., Dept. EM, 2352 Main St, Concord, Mass. 01742
Marlin Manufacturing Corp., Dept. EM, 12404 Triskett Rd., Cleveland, Ohio 44111
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
D SAMTEC, Dept. EM, 810 Progress Blvd., New Albany, Indiana 47150
SHOGYO International Corp., Dept. EM, 300 Northern Blvd., Great Neck, N.Y. 11021
D Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
D Switchcraft, Inc., Dept. EM, 5555 N. Elston, Chicago, Ill. 60630
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Trompeter Electronics, Inc., Dept. EM, 8936 Comanche, Chatsworth, Cal. 91311
M U.S. Terminals, Dept. EM, 7502 Camargo Rd., Cincinnati, Ohio 45243
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760

Plug Adapters

M Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
D Augat Interconnection Prods. Div., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703 ..... *
Ava Elctrns., Dept. EM, 4000 Bridge St., Dreyel Hill, Pa 19026 ..... p. 1726
Connector Corp., Dept. EM, 6025 N. Keystone Ave., Chicago, Ill. 60646 ..... *
DM Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
D Dynamic Instr. Corp., Dept. EM, 933 L.I. Motor Pkwy., Hauppauge, N.Y. 11787 *
D Elctrn. Molding Corp., Dept. EM, 96 Mill St., Woonsocket, R.I. 02895 ..... *
Garry Mfg., Inc., Dept. EM, 1010 Jersey Ave., New Brunswick, N.J. 08902 .. *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
ITT Cannon Electric, Dept. EM, 666 E. Dyer Rd., Santa Ana, Cal. 92702 ..... *
D ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ..... p. 1969-1972,1985
Jerome Industries Corp., Dept. EM, 391 Lakeside Ave., Orange, N.J. 07050 *
DM Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012 .. *
DM Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725 ..... *
National Tel-Tronics, Div. Electro Audio Dynamics, Inc., Dept. EM, State Road Hill, Meadville, Pa. 16335 ..... *
M Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... *
Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2117,2142
D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
Todd Systems, Dept. EM, 4 Radford Pl., Yonkers, N.Y. 10701 ..... p. 4433
TRW/Cinch Connectors, Electronic Comp. Div. of TRW Inc., Dept. EM, 1501 Morse Ave., Elk Grove Village, Ill. 60007 ..... *
D Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342 ..... *
D W & M Mfg., Dept. EM, 187 Lafayette St., New York, N.Y. 10013 ..... *
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
Air-O-Tronics Prods., Dept. EM, Box K, Morrisville, N.Y. 13408
Astrolab, Inc., Dept. EM, 345 Dalziel Rd., Linden, N.J. 07036
D Cablewave Systems Inc., Dept. EM, 60 Dodge Ave., North Haven, Conn. 06473
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
Control Inds. Inc., Dept. EM, 530 Burnside Ave., Inwood, N.Y. 11696
D Jolo Industries, Inc., Dept. EM, 11861 Cardinal Circle, Garden Grove, Cal. 92643
Marlin Manufacturing Corp., Dept. EM, 12404 Triskett Rd., Cleveland, Ohio 44111
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Philips Audio Video Sys, Neutrik Prods, Dept. EM, 91 McKee Dr., Mahwah, N.J. 07430
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
D Switchcraft, Inc., Dept. EM, 5555 N. Elston, Chicago, Ill. 60630
Trompeter Electronics, Inc., Dept. EM, 8936 Comanche, Chatsworth, Cal. 91311
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Plug Buttons

D Heyman Mfg. Co., Dept. EM, 147 N. Michigan Ave., Kenilworth, N.J. 07033 *
D Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2143
D Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 .... *
M Allmetal Screw Products Co., Inc., Dept. EM, 821 Stewart Ave., Garden City, N.Y. 11530
D Caplugs Div., Protective Closures Co., Dept. EM, 2150 Elmwood Ave., Buffalo, N.Y. 14207
Protective Enclosures Co., Dept. EM, 2150 G Elmwood Ave., Buffalo, N.Y. 14207
D Switchcraft, Inc., Dept. EM, 5555 N. Elston, Chicago, Ill. 60630

Plug Caps & Shells

Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
ITT Cannon Electric, Dept. EM, 666 E. Dyer Rd., Santa Ana, Cal. 92702 p. 1846,1889-1891,1893,1939, Back Cover, Vol. 1
ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ..... p. 1981
National Tel-Tronics, Div. Electro Audio Dynamics, Inc., Dept. EM, State Road Hill, Meadville, Pa. 16335 ..... p. 2088
M Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... *
Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2143
TRW/Cinch Connectors, Electronic Comp. Div. of TRW Inc., Dept. EM, 1501 Morse Ave., Elk Grove Village, Ill. 60007 ..... Inside Back Cover, Vol. 1
D Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342 ..... *
Control Inds. Inc., Dept. EM, 530 Burnside Ave., Inwood, N.Y. 11696
Leviton Mfg. Co., Inc., Dept. EM, 59-25 Little Neck Pkwy., Little Neck, N.Y. 11362
D Pacific Electricord Co., Dept. EM, 747 W. Redondo Beach Blvd., Box 10, Gardena, Cal. 90247

Plugboard Programming Systems—See Boards, Programming

Plugs, Electrical (All Types)

Allied Systems Corp., Dept. EM, Box 11005, Greensboro, N.C. 27409 ..... *
AMP Capitron Div./AMP Inc., Dept. EM, 1595 S. Mt. Joy St., Elizabethtown, Pa. 17022 ..... *
Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 ..... *
DM Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
D Augat Interconnection Prods. Div., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703 ..... *
D Beman Mfg., Inc., Dept. EM, PO Box 370, New Cumberland, Pa. 17070 ..... *
Connector Corp., Dept. EM, 6025 N. Keystone Ave., Chicago, Ill. 60646 ..... *
DM Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 ..... *
D Eby Company, Dept. EM, 4701 Germantown, Philadelphia, Pa. 19144 p. 1752
D Elco Corp., Dept. EM, 2250 Park Pl., El Segundo, CAL 90245 ..... p. 1754
D Excel Products Co., Inc., Dept. EM, 401 Joyce Kilmer Ave., New Brunswick, N.J. 08903 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
ITT Cannon Electric, Dept. EM, 666 E. Dyer Rd., Santa Ana, Cal. 92702 p. 1856,1917-1920, Back Cover, Vol. 1
ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ..... p. 1966,1967,1969,1970,1974,1979,1990
D Johnson Co., E.F., Dept. EM, 299 10th SW Ave., Waseca, Minn. 56093 p. 2046,2048,2049
DM Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012 .. *
M Mac Panel Co., Dept. EM, Box 5027, 216 Pine St., High Pt., N.C. 27262 ..... *
D Methode Elctrns, Interconnect Prods Div, Dept. EM, 1700 Hicks Rd, Rolling Meadows, ILL 60008 ..... p. 2080
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M Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... *
Schrack Electrical Sales Corp., Dept. EM, 1140 Broadway Rm 205, New York, N.Y. 10001 ..... *
Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543 ..... *
DM SGL Waber Electric, Dept. EM, 300 Harvard Avenue, Westville, NJ 08093 .. *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2104,2116-2119,2143,2145,2148
D Superior Electric Co., Dept. EM, 1000 Middle St., Bristol, Conn. 06010 ..... *
Trimm, Inc., Dept. EM, 400 W. Lake, Box 489, Libertyville, Ill. 60048 ..... *
D TRW/Cinch Connectors, Electronic Comp. Div. of TRW Inc., Dept. EM, 1501 Morse Ave., Elk Grove Village, Ill. 60007 ..... *
D Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342 ..... *
Vernitron Elec. Comps., Beau Prods., Dept. EM, Box 10, Laconia, N.H. 03246 *
D Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 .... *
DM ADC Prods, Dept. EM, 4900 W. 78th St., Minneapolis, Mn 55435
D Blonder-Tongue Labs., Inc., Dept. EM, One Jake Brown Rd., Old Bridge, N.J. 08857
Burndy Corporation, Dept. EM, Richards Ave., Norwalk, , Conn. 06852
D General Elec. Co, Wiring Device Bus. Dept., Dept. EM, 95 Hathaway St., Providence, R.I. 02904
Gulton Inds., SCD Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
Hypertronics Corp., Dept. EM, 2352 Main St, Concord, Mass. 01742
Leviton Mfg. Co., Inc., Dept. EM, 59-25 Little Neck Pkwy., Little Neck, N.Y. 11362
Lynn Elctrns. Corp., Dept. EM, 915 Pennsylvania Blvd., Feasterville, Pa. 19047
Methode Elctrns., Inc., Dept. EM, 7447 W. Wilson Ave., Chicago, Ill. 60656
Nutronics, Inc., Dept. EM, 1515 N. Harlem Ave., Oak Park, Ill. 60302
D Pacific Electricord Co., Dept. EM, 747 W. Redondo Beach Blvd., Box 10, Gardena, Cal. 90247
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Philips Audio Video Sys, Neutrik Prods, Dept. EM, 91 McKee Dr., Mahwah, N.J. 07430
SHOGYO International Corp., Dept. EM, 300 Northern Blvd., Great Neck, N.Y. 11021
D Specialties Mfg. Co., Inc., Dept. EM, 23425 Harper, St. Clair Shores, Mich. 48080
Switchcraft, Inc., Dept. EM, 5555 N. Elston, Chicago, Ill. 60630
D T & B/Thomas & Betts, Dept. EM, 36 Butler St., Elizabeth, N.J. 07207
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Plugs, Fused

Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Gulton Inds., SCD Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Potter Co., Dept. EM, Box 337 North Hwy 51, Wesson, Miss. 39191

Pointers, Dial

Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... *
D Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 ..... *
DM Raytheon Co., Distributor Prods. Oper., Dept. EM, Fourth Ave., Burlington, Mass. 01803 ..... *
RCL Electronics Div., AMF Incorporated, Dept. EM, 700 S. 21st St., Irvington, N.J. 07111 ..... p. 2440-2442
D Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 .... *
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
PIC Design Div., Benrus Corp., Dept. EM, Benrus Center, Rte 7, Ridgefield, Conn. 06877
Zierick Mfg. Corp., Dept. EM, 44 Radio Circle, Mt. Kisco, N.Y. 10549

Position Control Systems, Servo—See Controls, Serve Systems

Posts, Binding

Ava Elctrns., Dept. EM, 4000 Bridge St., Dreyel Hill, Pa 19026 .... p. 1724,1725
D Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
D Eby Company, Dept. EM, 4701 Germantown, Philadelphia, Pa. 19144 p. 1753
Elco Corp., Dept. EM, 2250 Park Pl., El Segundo, CAL 90245 ..... *
Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... *
M Elctrn. Molding Corp., Dept. EM, 96 Mill St., Woonsocket, R.I. 02895 ..... *
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Graphite Metallizing Corp., Dept. EM, 1036 Nepperhan Ave., Yonkers, N.Y. 10702 ..... p. 3088,3089
D Grayhill Inc., Dept. EM, 569 Hillgrove Ave., LaGrange, Ill. 60525 ..... p. 1769
D Interlok, Dept. EM, 770 Airport Blvd., Burlingame, Cal. 94010 ..... *
D ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ..... p. 1967,1969-1972,1974,1975,1986,1990,1991,1994,1995
D Johnson Co., E.F., Dept. EM, 299 10th SW Ave., Waseca, Minn. 56093 p. 2046
DM National Tel-Tronics, Div. Electro Audio Dynamics, Inc., Dept. EM, State Road Hill, Meadville, Pa. 16335 ..... *
DM Raytheon Co., Distributor Prods. Oper., Dept. EM, Fourth Ave., Burlington, Mass. 01803 ..... p. 2452
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DM Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2110-2112,2118
D Superior Electric Co., Dept. EM, 1000 Middle St., Bristol, Conn. 06010 p. 2159
W & M Mfg., Dept. EM, 187 Lafayette St., New York, N.Y. 10013 ..... p. 2255
D Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 .... *
Auto-Swage Products Inc., Dept. EM, 726 River Rd., Shelton, Conn. 06484
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
Federal Screw Products Inc., Dept. EM, 3917 N. Kedzie Ave., Chicago, Ill. 60618
Multi-Tronix, Dept. EM, 3210 Terry Dr, Toledo, Ohio 43613
Nutronics, Inc., Dept. EM, 1515 N. Harlem Ave., Oak Park, Ill. 60302
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
D Projects Unlimited, Inc., Dept. EM, 3680 Wyse Rd., Dayton, Ohio 45414
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
D Zierick Mfg. Corp., Dept. EM, 44 Radio Circle, Mt. Kisco, N.Y. 10549

Posts, Harness Board

D Panduit Corp., Dept. EM, 17301 Ridgeland Ave., Tinley Park, Ill. 60477 ..... *
D Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 *
Auto-Swage Products Inc., Dept. EM, 726 River Rd., Shelton, Conn. 06484
D T & B/Thomas & Betts, Dept. EM, 36 Butler St., Elizabeth, N.J. 07207

Potentiometer, Elements

M Bowmar/TIC, Inc., Dept. EM, 850 Lawrence Dr., Newbury Park, Calif. 91320 *
Carter Mfg. Corp., Dept. EM, Sugar Rd., Bolton, Mass. 01740 ..... *
Electro-Techniques, Inc., Dept. EM, 215 Via Del Norte, Oceanside, Cal. 92054 *
D Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 ..... *
M New England Instr., Dept. EM, 14 Kendal Lane, Natick, Mass. 01760 ..... *
Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... *
M Betatronix, Inc., Dept. EM, 110 Nicon Ct, Hauppauge, N.Y. 11787
M Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
M Maurey Instrument Corp., Dept. EM, 4555 W. 60th St., Chicago, Ill. 60629
M Unimetrics Corp., Mektron Div., Dept. EM, 1853 Raymond Ave., Anaheim, Cal. 92801
Waters Mfg., Inc., Dept. EM, Longfellow Ctr., Wayland, Mass. 01778

Potentiometers, Carbon Ceramic

D Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
DM Bourns, Inc., Trimpot Prods. Div., Dept. EM, 1200 Columbia Ave., Riverside, Cal. 92507 ..... *
D ISL Products Ltd. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803 *

Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
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M CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
M Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013

Potentiometers, Carbon Film

D **Bourns, Inc., Trimpot Prods. Div., Dept. EM, 1200 Columbia Ave., Riverside, Cal. 92507** ..... *
Electro-Techniques, Inc., Dept. EM, 215 Via Del Norte, Oceanside, Cal. 92054 *
D **ISL Products Ltd. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803** *
New England Instr., Dept. EM, 14 Kendal Lane, Natick, Mass. 01760 ..... *
D **Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094** ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... *
Centralab Elctrns. Div., Globe-Union Inc., Dept. EM, Box 858, Hwy. 20 W., Fort Dodge, Iowa 50501
Clarostat Mfg. Co., Inc., Dept. EM, Washington St., Dover, N.H. 03820
M Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
Murata Corporation of America, Dept. EM, 1148 Franklin Rd., S.E., Marietta, Ga. 30067
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013
Wilbrecht Electronics, Inc., Dept. EM, 240 Plato Blvd., St. Paul, Minn. 55107

Potentiometers, Ceramic-Metal (Cermet)

Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 p. 3783-3785
DM **Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634** ..... p. 3788
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Dale Electronics, Inc., Dept. EM, Box 74, Norfolk, Nebr. 68701 ..... *
D **Electro-Techniques, Inc., Dept. EM, 215 Via Del Norte, Oceanside, Cal. 92054** p. 3886
A Talley Ind's Co., , Dept. EM, 135 S. Main St., Thomaston, Conn. 06787 .... *
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
DM **Spectrol Electronics Corp., Dept. EM, 17070 East Gale Ave., City of Industry, Cal. 91745** ..... p. 3908
Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... *
DM **VRN St Petersburg, Div. Vernitron, Dept. EM, 2801 72nd St N. Box 44000, St. Petersburg, FL 33743** ..... p. 3914,3916
DM **Weston Components & Controls, Div. Sangamo Weston Inc., Dept. EM, Archbald, Pa. 18403** ..... p. 3896-3901
M Betatronix, Inc., Dept. EM, 110 Nicon Ct, Hauppauge, N.Y. 11787
D Clarostat Mfg. Co., Inc., Dept. EM, Washington St., Dover, N.H. 03820
DM CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
D Diplohmatic Div., Harry Levinson Co., Dept. EM, 1211 E. Denny Way, Seattle, Wash. 98122
Murata Corporation of America, Dept. EM, 1148 Franklin Rd., S.E., Marietta, Ga. 30067
DM Techno-Comps. Corp., Dept. EM, 7803 Lemona, Van Nuys, Cal. 91405
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013

Potentiometers, Composition, Carbon

D **Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204** p. 3784
DM **Bourns, Inc., Trimpot Prods. Div., Dept. EM, 1200 Columbia Ave., Riverside, Cal. 92507** ..... p. 3802,3803,3825
D **ISL Products Ltd. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803** *
D **Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076** .... p. 3895
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Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
DM **Spectrol Electronics Corp., Dept. EM, 17070 East Gale Ave., City of Industry, Cal. 91745** ..... *
Stackpole Components Co., Dept. EM, Box 14466, Raleigh, N.C. 27610 ..... *
Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... *
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
Centralab Elctrns. Div., Globe-Union Inc., Dept. EM, Box 858, Hwy. 20 W., Fort Dodge, Iowa 50501
DM Clarostat Mfg. Co., Inc., Dept. EM, Washington St., Dover, N.H. 03820
DM CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
D SPECO Div, Components Specialties, Inc., Dept. EM, PO Box 624 1172 Rte 109, Linderhurst, NY 11757
United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013
Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Potentiometers, Conductive Plastic

D **Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204** p. 3784
DM **Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634** ..... *
DM **Bourns, Inc., Trimpot Prods. Div., Dept. EM, 1200 Columbia Ave., Riverside, Cal. 92507** p. 3818, 3819, 3826, 3827, 3829-3831, 3836, 3837, 3840, 3842, 3848, 3849, 3856, 3862-3867, 3870, 3871, Back Cover, Vol. 2
M **Bowmar/TIC, Inc., Dept. EM, 850 Lawrence Dr., Newbury Park, Calif. 91320** *
M **Carter Mfg. Corp., Dept. EM, Sugar Rd., Bolton, Mass. 01740** ..... p. 3873
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D **Electro-Techniques, Inc., Dept. EM, 215 Via Del Norte, Oceanside, Cal. 92054** p. 3885,3886
M **New England Instr., Dept. EM, 14 Kendal Lane, Natick, Mass. 01760** p. 3888-3893
DM **Spectrol Electronics Corp., Dept. EM, 17070 East Gale Ave., City of Industry, Cal. 91745** ..... p. 3908
DM **Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518** ..... *
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D Clarostat Mfg. Co., Inc., Dept. EM, Washington St., Dover, N.H. 03820
M Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
M Maurey Instrument Corp., Dept. EM, 4555 W. 60th St., Chicago, Ill. 60629
PIC Design Div., Benrus Corp., Dept. EM, Benrus Center, Rte 7, Ridgefield, Conn. 06877
Samarius, Inc., Dept. EM, 300 Seymour Ave., Derby, Conn. 06418
M Unimetrics Corp., Mektron Div., Dept. EM, 1853 Raymond Ave., Anaheim, Cal. 92801
Waters Mfg., Inc., Dept. EM, Longfellow Ctr., Wayland, Mass. 01778

Potentiometers, Hot Molded

Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 p. 3783,3785
D **Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076** ..... *
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
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D Clarostat Mfg. Co., Inc., Dept. EM, Washington St., Dover, N.H. 03820
M Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550

Potentiometers, Lab Type

D **Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634** ..... *
D **Bourns, Inc., Trimpot Prods. Div., Dept. EM, 1200 Columbia Ave., Riverside, Cal. 92507** ..... *
Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 ..... *
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
DM **Spectrol Electronics Corp., Dept. EM, 17070 East Gale Ave., City of Industry, Cal. 91745** ..... *
Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... *
DM **VRN St Petersburg, Div. Vernitron, Dept. EM, 2801 72nd St N. Box 44000, St. Petersburg, FL 33743** ..... *
Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... *
DM Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
M Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
Penn Airborne Prods., Dept. EM, Industrial Hwy., Southampton, Pa. 18966
Samarius, Inc., Dept. EM, 300 Seymour Ave., Derby, Conn. 06418
D West Instrs, Gulton Inds, M. C. S. Div., Dept. EM, Gulton Indl Pk, E. Greenwich, RI 02818

Potentiometers, Linear

D **Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204** .. *
Angstrohm Precision, Inc., Dept. EM, 1 Precision Pl., Hagerstown, Md. 21740 *
DM **Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634** ..... *
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M **Carter Mfg. Corp., Dept. EM, Sugar Rd., Bolton, Mass. 01740** ..... *

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D Electro-Techniques, Inc., Dept. EM, 215 Via Del Norte, Oceanside, Cal. 92054 p. 3885,3886
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 ..... p. 2426
M New England Instr., Dept. EM, 14 Kendal Lane, Natick, Mass. 01760 p. 3888-3893
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DM Spectrol Electronics Corp., Dept. EM, 17070 East Gale Ave., City of Industry, Cal. 91745 ..... p. 3908
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D Vishay Resistive Systems Grp., Vishay Intertechnology Inc., Dept. EM, 63 Lincoln Hwy., Malvern, Pa. 19355 ..... *
DM VRN St Petersburg, Div. Vernitron, Dept. EM, 2801 72nd St N. Box 44000, St. Petersburg, FL 33743 ..... *
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M Betatronix, Inc., Dept. EM, 110 Nicon Ct, Hauppauge, N.Y. 11787
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Consolidated Resistance Co. America, Dept. EM, 222 Lake Ave., Yonkers, N.Y. 10701
DM CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
CTS Microelectronics, Inc., Dept. EM, 1201 Cumberland Ave., W. Lafayette, Ind. 47906
M Humphrey, Inc., Dept. EM, 9212 Balboa Ave., San Diego, Calif. 92123
M Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
DM Maurey Instrument Corp., Dept. EM, 4555 W. 60th St., Chicago, Ill. 60629
M MPC Prods. Corp., Dept. EM, 4200 W. Victoria Ave., Chicago, Ill. 60646
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
Temposonics Inc., Dept. EM, 131 East Ames Ct, Plainview, N.Y. 11803
M Unimetrics Corp., Mektron Div., Dept. EM, 1853 Raymond Ave., Anaheim, Cal. 92801
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Potentiometers, Metal Film

D Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
Electro-Techniques, Inc., Dept. EM, 215 Via Del Norte, Oceanside, Cal. 92054 p. 3887
A Talley Ind's Co., , Dept. EM, 135 S. Main St., Thomaston, Conn. 06787 .... *
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
D Vishay Resistive Systems Grp., Vishay Intertechnology Inc., Dept. EM, 63 Lincoln Hwy., Malvern, Pa. 19355 ..... p. 3781,3911
DM VRN St Petersburg, Div. Vernitron, Dept. EM, 2801 72nd St N. Box 44000, St. Petersburg, FL 33743 ..... *
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M Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
Moririca Elctrns., Ltd., Dept. EM, 205 Tozuka-machi, Tozuka-Ku, Yokohama, Japan
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016

Potentiometers, Metal, Glazed—See Potentiometers, Ceramic-Metal

Potentiometers, Motorized

Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 ..... *
Electro-Techniques, Inc., Dept. EM, 215 Via Del Norte, Oceanside, Cal. 92054 p. 3887
Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735 ..... *
Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... *
M Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550

Potentiometers, Multiturn

Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 p. 3783
DM Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634 ..... p. 3789
DM Bourns, Inc., Trimpot Prods. Div., Dept. EM, 1200 Columbia Ave., Riverside, Cal. 92507 p. 3802-3809, 3812, 3813, 3822-3825, 3829-3833, 3844-3853, 3856-3863, 3868-3871, Back Cover, Vol. 2
M Bowmar/TIC, Inc., Dept. EM, 850 Lawrence Dr., Newbury Park, Calif. 91320 p. 3872
M Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731 ..... *
CTS of Berne, Dept. EM, 406 Parr Rd., Berne, Ind. 46711 ..... *
Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 ..... *
Dale Electronics, Inc., Dept. EM, Box 74, Norfolk, Nebr. 68701 ..... *
D Duncan Electronics, Inc., Dept. EM, 2865 Fairview Rd., Costa Mesa, Cal. 92626 ..... p. 3880
D Electro-Techniques, Inc., Dept. EM, 215 Via Del Norte, Oceanside, Cal. 92054 p. 3885,3887
D ISL Products Ltd. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803 *
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A Talley Ind's Co., , Dept. EM, 135 S. Main St., Thomaston, Conn. 06787 .... *
M Perkin-Elmer Corp., Elctrn. Prods. Dept., Dept. EM, Main Ave., Norwalk, Conn. 06856 ..... *
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D Clarostat Mfg. Co., Inc., Dept. EM, Washington St., Dover, N.H. 03820
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M Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
M Maurey Instrument Corp., Dept. EM, 4555 W. 60th St., Chicago, Ill. 60629
D Mepco/Electra, Inc., Dept. EM, Columbia Rd., Morristown, N.J. 07960
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
DM Techno-Comps. Corp., Dept. EM, 7803 Lemona, Van Nuys, Cal. 91405
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Potentiometers, Nonlinear

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M Bowmar/TIC, Inc., Dept. EM, 850 Lawrence Dr., Newbury Park, Calif. 91320 *
M Carter Mfg. Corp., Dept. EM, Sugar Rd., Bolton, Mass. 01740 ..... *
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D Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076 ..... *
M Perkin-Elmer Corp., Elctrn. Prods. Dept., Dept. EM, Main Ave., Norwalk, Conn. 06856 ..... *
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M CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
M Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
M Maurey Instrument Corp., Dept. EM, 4555 W. 60th St., Chicago, Ill. 60629
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
M Unimetrics Corp., Mektron Div., Dept. EM, 1853 Raymond Ave., Anaheim, Cal. 92801
Waters Mfg., Inc., Dept. EM, Longfellow Ctr., Wayland, Mass. 01778

Potentiometers, Rectilinear

D Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
DM Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634 ..... *
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M Bowmar/TIC, Inc., Dept. EM, 850 Lawrence Dr., Newbury Park, Calif. 91320 *
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D Electro-Techniques, Inc., Dept. EM, 215 Via Del Norte, Oceanside, Cal. 92054 *
D Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 ..... *
M New England Instr., Dept. EM, 14 Kendal Lane, Natick, Mass. 01760 ..... *

DM **Spectrol Electronics Corp., Dept. EM, 17070 East Gale Ave., City of Industry, Cal. 91745** ..... *
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D **Vishay Resistive Systems Grp., Vishay Intertechnology Inc., Dept. EM, 63 Lincoln Hwy., Malvern, Pa. 19355** ..... p. 3781
DM **Weston Components & Controls, Div. Sangamo Weston Inc., Dept. EM, Archbald, Pa. 18403** ..... *
M Betatronix, Inc., Dept. EM, 110 Nicon Ct, Hauppauge, N.Y. 11787
Bourns, Inc., Instr. Div., Dept. EM, 6135 Magnolia, Riverside, Calif. 92506
Clarostat Mfg. Co., Inc., Dept. EM, Washington St., Dover, N.H. 03820
M Conrac Corp., Systems Sls Div., Dept. EM, Three Landmark Sq., Stamford, Conn. 06901
Consolidated Resistance Co. America, Dept. EM, 222 Lake Ave., Yonkers, N.Y. 10701
CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
M Humphrey, Inc., Dept. EM, 9212 Balboa Ave., San Diego, Calif. 92123
M Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
DM Maurey Instrument Corp., Dept. EM, 4555 W. 60th St., Chicago, Ill. 60629
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Samarius, Inc., Dept. EM, 300 Seymour Ave., Derby, Conn. 06418
Temposonics Inc., Dept. EM, 131 East Ames Ct, Plainview, N.Y. 11803
M Unimetrics Corp., Mektron Div., Dept. EM, 1853 Raymond Ave., Anaheim, Cal. 92801

Potentiometers, Servo Mount

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M Keltec Florida, Sub Norlin Ind., Dept. EM, Box 1348, Fort Walton Beach, Fla. 32548
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Rantec Div., Emerson Elec. Co., Dept. EM, 24003 Ventura Blvd., Calabasas, Calif. 91302
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Power Systems, Inc., Dept. EM, 12 Tobey Rd., Bloomfield, Conn. 06002 .... *
Power Technology, Inc., Dept. EM, Box 4403, 7925 Mablewave Cutoff, Little Rock, Ark. 72204 ..... *
M Sigmapower, Inc., Dept. EM, 20790 Leapwood Ave., Carson, Cal. 90746 .... *
Sola Electric, Dept. EM, 1717 Busse Rd., Elk Grove Village, Ill. 60007 ..... *
M Spellman High Voltage Elctrns. Corp., Dept. EM, 7 Fairchild Ave., Plainview, N.Y. 11803 ..... *
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Venus Scientific, Inc., Dept. EM, 399 Smith St., Farmingdale, N.Y. 11735 .... *
Wilmore Elctrns. Co., Dept. EM, Box 2973, W. Durham Sta., Durham, N.C. 27705 ..... *
M Accurate Instrument Co., Dept. EM, Box No. 925, Westbury, N.Y. 11590
Advanced Kinetics, Dept. EM, 1231 Victoria St., Costa Mesa, Calif. 92627
D American HV Voltage Test Sys., Inc., Dept. EM, Ctrl Garr Ind'l Pk, Accident, Md. 21520
Arenberg Ultrasonic Inc., Dept. EM, 94 Green, Jamaica Plain, Mass. 02130
D Associated Research, Inc., Dept. EM, 6125 W. Howard St., Niles, Ill. 60648
Astro-Geo-Marine Inc., Dept. EM, 2005 Palma Dr., Ventura, Cal. 93003
Beckman Instrs., Cedar Grove Opers., Dept. EM, 89 Commerce Rd., Cedar Grove, N.J. 07009
Capacitor Specialists, Dept. EM, P.O. Box 2052, Escondido, Cal. 92025
Chemical Etching Equip. & Supply, Dept. EM, 6905 Beulah St, Alexandria, Va. 22310
M Condenser Products Corp., Dept. EM, Box 997, Brooksville, Fla. 33512
D CVC Products, Inc., Dept. EM, 525 Lee Rd., Box 1886, Rochester, N.Y. 14603
DM Eldec Corp., Dept. EM, Box 100, 16700 13th Ave. W., Lynnwood, Wash. 98036
Electro-Pacific, Inc., Dept. EM, 5782 Thornwood Dr., Goleta, Calif. 93017
Elma Engineering, Dept. EM, 1066 E. Meadow Circle, Palo Alto, Cal. 94303
EMCO High Voltage, Dept. EM, 2444 Old Middlefield Way, Mt. View, Cal. 94043
Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
D Fuji Electrochemical Co., Dept. EM, Hamagomu Bld. 5 36-11 Shinbashi, Minato-ku, Tokyo, Japan
Gates Elctrn. Co., Dept. EM, 526 Van Nest Ave., Bronx, N.Y. 10460
Instrument Research Co., Dept. EM, Box 40207, Santa Barbara, Cal. 93103
M Keltec Florida, Sub Norlin Ind., Dept. EM, Box 1348, Fort Walton Beach, Fla. 32548
Keltron Corp., Walden Div., Dept. EM, 225 Crescent St., Waltham, Mass. 02154
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602
M Lehighton Electronics, Inc., Dept. EM, RD 1Box 374 Dept M, Lehighton, Pa 18235
M LogiMetrics Inc., Dept. EM, 121-03 Dupont St., Plainview, NY 11803
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
Magnetic Products, Inc., Dept. EM, Box 1125, New London, N.H. 03257
M Micron Industries Corp., Constant Voltage Div., Dept. EM, 1830 N. 32nd Ave., Stone Park, Ill. 60165
North Electric Co., Power Sys Div., Dept. EM, Box 688, Galion, Ohio 44833
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
Pacific Atlantic Trading Co., Dept. EM, Box 754, El Cerrito, C.A. 94530
DM Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Peschel Instrs., Inc., Dept. EM, 1412 Viscaya Pkwy., Cape Coral, Fla. 33904
D Plastic Capacitors, Inc., Dept. EM, 2623 N. Pulaski Rd., Chicago, Ill. 60639
Rantec Div., Emerson Elec. Co., Dept. EM, 24003 Ventura Blvd., Calabasas, Calif. 91302
Reich Associates Inc., Dept. EM, PO Box 73, Plano, Tex 75074
Tobe Deutschmann Labs., Inc., Dept. EM, Box 74, Canton, Mass. 02021
M Universal Elctrns. Corp., Dept. EM, 20747 Dearborn St., Chatsworth, Cal. 91311
Velonex, Instrument Div., Dept. EM, 560 Robert Ave., Santa Clara, Cal. 95050
Voltex Co., Inc., Dept. EM, 115 Marine St., Farmingdale, N.Y. 11735
Zi-Tech Div., Aikenwood Corp., Dept. EM, Box 26, 2151 Park Blvd., Palo Alto, Cal. 94302

Power Supplies, A-C Output

Abacus Controls Inc., Dept. EM, 89 Redington Rd., Somerville, N.J. 08876 p. 3163
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M A.L.S. Electronics Corp., Dept. EM, 1400 N. Baxter St., Anaheim, Cal. 92806 *
American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
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D Flite-Tronics Co., Inc., Dept. EM, 2525 No. Naomi St., Burbank, Cal. 91504 p. 3384,3385
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
M Georator Corporation, Dept. EM, Box 70, Manassas, Va. 22110 ..... *
GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 ..... *
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M **Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030** ..... *
M **Unitron Inc., Dept. EM, 2826 W. Kingsley Rd., Box 2159, Garland, Tex. 75041** *
M **Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040** p. 3407
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D American HV Voltage Test Sys., Inc., Dept. EM, Ctrl Garr Ind'l Pk, Accident, Md. 21520
American Monarch Corp., Dept. EM, 2801-37th Ave., N.E., Minneapolis, Minn. 55421
AMPSCO Power Systems Inc, Dept. EM, 95 Grand St, Worcester, Mass. 01608
Astro-Geo-Marine Inc., Dept. EM, 2005 Palma Dr., Ventura, Cal. 93003
Baldpate Electronics, Inc., Dept. EM, 225 E. Main St., Georgetown, Mass. 01833
Basler Electric Co., Dept. EM, Box 269, Rte. 143, Highland, Ill. 62249
M Bendix, Electric & Fluid Power Div., Dept. EM, Hwy. 35, Eatontown, N.J. 07724
D Carter Motor Co., Dept. EM, 2707 W. George St., Chicago, Ill. 60618
Cross Electronics Inc., Dept. EM, 100 Commonwealth Dr., Warrendale, Pa. 15086
Cyberex, Inc., Dept. EM, 7171 Industrial Park Blvd., Mentor, Ohio 44060
Design Automation, Dept. EM, 809 Massachusetts Ave., Lexington, Mass. 02173
Elma Engineering, Dept. EM, 1066 E. Meadow Circle, Palo Alto, Cal. 94303
Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
D Fuji Electrochemical Co., Dept. EM, Hamagomu Bld. 5 36-11 Shinbashi, Minato-ku, Tokyo, Japan
Gates Elctrn. Co., Dept. EM, 526 Van Nest Ave., Bronx, N.Y. 10460
Gould, Inc. Instr. Sys. Div. Power Supply Dept., Dept. EM, 3631 Perkins Ave., Cleveland, Ohio 44114
Instr. & Control Sys., Inc., Dept. EM, 520 Interstate Rd, Addison, Ill. 60101
M International Power Machines Corp., Dept. EM, 3328 Executive Blvd., Box 724, Mesquite, Tex. 75149
James Electronics Inc., Dept. EM, 4050 N Rockwell St, Chicago, Ill. 60618
D JPI, Inc., Dept. EM, 1507 San Vicente Blvd., Santa Monica, Cal. 90402
Kato Engineering Co., Dept. EM, 1415 1st Ave., Mankato, Minn. 56001
D La Marche Mfg. Co., Dept. EM, 106 Bradrock Drive, Des Plaines, Ill. 60018
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
Magnetic Products, Inc., Dept. EM, Box 1125, New London, N.H. 03257
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
Technology Dev Corp, NJE Div, Dept. EM, Box 50, Culver Rd., Dayton, N.J. 08810
North Electric Co., Power Sys Div., Dept. EM, Box 688, Galion, Ohio 44833
Payne Engrg. Co., Dept. EM, Box 70, Scott Depot, W. Va. 25560
M Peschel Instrs., Inc., Dept. EM, 1412 Viscaya Pkwy., Cape Coral, Fla. 33904
D Power Control Corp., Dept. EM, 122 Gamma Dr., Pittsburgh, Pa. 15238
Power Conversion Products Inc., Dept. EM, 42 East St., Crystal Lake, Ill. 60014
Power Electronics Corp., Dept. EM, 96 Milton Rd., Rochester, New Hampshire 03867
Power-Matic Inc., Dept. EM, 8076 Engineer Rd., San Diego, Cal. 92111
Rantec Div., Emerson Elec. Co., Dept. EM, 24003 Ventura Blvd., Calabasas, Calif. 91302
Ratelco, Inc., Dept. EM, 610 Pontius Ave. N., Dept. EEM, Seattle, Wash. 98109
Reich Associates Inc., Dept. EM, PO Box 73, Plano, Tex 75074
D Research, Inc., Dept. EM, Box 24064, Minneapolis, Minn. 55424
Robicon Corp., Dept. EM, Plus Ind'l. Pk., Pittsburgh, Pa. 15239
M Sawyer Inds., Dept. EM, 5649 Peck Rd., Arcadia, Cal. 91006
DM Sorensen Co., Dept. EM, 676 Island Pond Rd., Manchester, N.H. 03103
Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
Telesis Laboratory, Dept. EM, Box 387, Chillocothe, Ohio 45601
M Transistor Devices, Dept. EM, 85 Horsehill Rd., Cedar Knolls, N.J. 07927
Tripp-Lite, Dept. EM, 133 N. Jefferson, Chicago, Ill. 60606
M Universal Elctrns. Corp., Dept. EM, 20747 Dearborn St., Chatsworth, Cal. 91311
D Wilson Co., H. M., Dept. EM, 11501 Chimney Rock Rd., Houston, Tex. 77035

Power Supplies for Antenna Amplifiers—

Power Supplies, Arc Lamp

Acme Electric, Dept. EM, 614 Water St., Cuba, N.Y. 14727 ..... *
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Bikor Corporation, Dept. EM, 23970 Madison St., Torrance, Cal. 90505 ..... *
Christie Elec., Dept. EM, 3404A W. 67th St., Los Angeles, Cal. 90043 ..... *
M **Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550** .. *
M **Eanco, Inc., Mid-Eastern Prods., Dept. EM, 539 Jacksonville Rd., Warminster, Pa. 18974** ..... *
Electronic Measurements, Dept. EM, 405 Essex Rd., Neptune, N.J. 07753 p. 3249,3252
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
M **Marine Electric Railway Prods. Div., Inc., Dept. EM, 167 National Rd., Edison, N.J. 08817** ..... *
Megavolt, Corp., Dept. EM, 110 Hobart St, Hackensack, N.J. 07601 ..... *
NWL Transformers, Dept. EM, Rising Sun Rd., Bordentown, N.J. 08505 ..... *
Sola Electric, Dept. EM, 1717 Busse Rd., Elk Grove Village, Ill. 60007 ..... *
Technipower, Inc., Dept. EM, Commerce Pk Box 222, Danbury, Ct 06810 p. 3344
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Universal Voltronics Corp., Dept. EM, 27 Radio Circle Dr., Mt. Kisco, N.Y. 10549 ..... *
Wilmore Elctrns. Co., Dept. EM, Box 2973, W. Durham Sta., Durham, N.C. 27705 ..... *
Advanced Kinetics, Dept. EM, 1231 Victoria St., Costa Mesa, Calif. 92627
Applied Control Co., Dept. EM, 1275 Bloomfield Ave., Fairfield, N.J. 07006
Canrad-Hanovia, Inc., Dept. EM, 100 Chestnut St., Newark, N.J. 07105
D Eldec Corp., Dept. EM, Box 100, 16700 13th Ave. W., Lynnwood, Wash. 98036
Electro-Optical Inds., Inc., Dept. EM, 839 Ward Dr., Santa Barbara, Cal. 93111
Gates & Co., Inc., Geo. W., Dept. EM, Hempstead Tpke. & Lucille Ave., Franklin Sq., N.Y. 11010
D Illumination Industries, Dept. EM, 825 E. Evelyn Ave., Sunnyvale, Cal. 94086
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
M Micron Industries Corp., Constant Voltage Div., Dept. EM, 1830 N. 32nd Ave., Stone Park, Ill. 60165
Technology Dev Corp, NJE Div, Dept. EM, Box 50, Culver Rd., Dayton, N.J. 08810
M Peschel Instrs., Inc., Dept. EM, 1412 Viscaya Pkwy., Cape Coral, Fla. 33904
Ultra-Violet Prods., Inc., Dept. EM, 5100 Walnut Grove Ave., San Gabriel, Cal. 91778
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Velonex, Instrument Div., Dept. EM, 560 Robert Ave., Santa Clara, Cal. 95050

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Abbott Transistor Labs., Industrial Div., Dept. EM, 5200 W. Jefferson Blvd., Los Angeles, Cal. 90016 ..... *
M **Abbott Transistor Labs, Power Supply Div., Dept. EM, 5200 W. Jefferson Blvd., Los Angeles, Cal. 90016** ..... *
ACDC Electronics, Dept. EM, 401 Jones Rd., Oceanside, Cal. 92054 ..... *
M **Acopian Corp., Dept. EM, Box 585, Easton, Pa. 18042** ..... *
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CEA, Div. Berkleonics, Inc., Dept. EM, 1 Aerovista Pk., San Luis Obispo, Cal. 93401 ..... *
Cober Elctrns., Inc., Dept. EM, 7 Gleason Ave., Stamford, Conn. 06902 ..... *
Continental Specialties Corp., Dept. EM, Box 1942, 70 Fulton Terr, New Haven, Conn. 06509 ..... *
Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 ..... *
M **Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550** .. *
Electronic Measurements, Dept. EM, 405 Essex Rd., Neptune, N.J. 07753 .. *
Electrostatics Inc., Dept. EM, 7718 Clairemont Mesa Blvd., San Diego, Cal. 92111 ..... *
D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043** *
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Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509 ..... *
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Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 .... *
Infodex, Inc., Dept. EM, 7 Cherry Ave., Waterbury, Conn. 06702 ..... *
Interelectronics Corp., Dept. EM, Interelectronics Park, 550 U.S. Rte. 303, Congers, N.Y. 10920 ..... *
M **Kepco, Inc., Dept. EM, 131-38 Sanford Ave., Flushing, N.Y. 11352** ..... *
Megavolt, Corp., Dept. EM, 110 Hobart St, Hackensack, N.J. 07601 ..... *
Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
NWL Transformers, Dept. EM, Rising Sun Rd., Bordentown, N.J. 08505 ..... *
D **Opamp Labs, Inc., Dept. EM, 1033 N. Sycamore Ave, Los Angeles, Cal. 90038** ..... *
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Polytron Devices Inc., Dept. EM, Box 398 - River St. Sta., Patterson, N.J. 07524 ..... p. 3296,3297
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Spellman High Voltage Elctrns. Corp., Dept. EM, 7 Fairchild Ave., Plainview, N.Y. 11803 ..... *
D **Standard Power, Inc., Dept. EM, 1400 S. Village Way, Santa Ana, Cal. 92705** *
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AAK Corp, Dept. EM, POB 1, Methuen, Mass 01844
Advanced Kinetics, Dept. EM, 1231 Victoria St., Costa Mesa, Calif. 92627
AMPSCO Power Systems inc, Dept. EM, 95 Grand St, Worcester, Mass. 01608
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Berkeley Nucleonics, Dept. EM, 1198 Tenth St., Berkeley, Cal. 94710
D Bug Electronics, Dept. EM, 151 Grove St, Westwood, Mass. 02090
M Eldec Corp., Dept. EM, Box 100, 16700 13th Ave. W., Lynnwood, Wash. 98036
M Electro-Module, Inc., Dept. EM, 2855 Metropolitan Place, Pomona, Cal. 91767
GAP Instr. Corp., Dept. EM, 110 Marcus Blvd., Hauppauge, N.Y. 11787
Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602
Modular Audio Products, Dept. EM, 50 Orville Dr., Bohemia, N.Y. 11716

Modular Devices, Inc., Dept. EM, 50 Orville Dr., Bohemia, N. Y. 11716
Moxon Inc., Dept. EM, 2222 Michelson Dr. Bldg. E, Irvine, Cal. 92715
M Peschel Instrs., Inc., Dept. EM, 1412 Viscaya Pkwy., Cape Coral, Fla. 33904
Power Electronics Corp., Dept. EM, 96 Milton Rd., Rochester, New Hampshire 03867
M Powercube Corp., Dept. EM, 214 Calvary St., Waltham, Mass. 02154
Sorensen Co., Dept. EM, 676 Island Pond Rd., Manchester, N.H. 03103
D Spectra Sonics, Dept. EM, 770 Wall Ave., Ogden, Utah 84404
Teledyne Philbrick, Dept. EM, 17 Allied Dr. Rte 128, Dedham, Mass. 02026
M Todd Products Corp., Dept. EM, 123 Milbar Blvd., Farmingdale, N.Y. 11735
Trans-Tek, Inc., Dept. EM, Rte. 83, Ellington, Conn. 06029
M Transistor Devices, Dept. EM, 85 Horsehill Rd., Cedar Knolls, N.J. 07927
M Universal Elctrns. Corp., Dept. EM, 20747 Dearborn St., Chatsworth, Cal. 91311
Velonex, Instrument Div., Dept. EM, 560 Robert Ave., Santa Clara, Cal. 95050
Viking Modules, Div. of Keltron Corp., Dept. EM, 223 Cresent St., Waltham, Mass. 02154
Walker Scientific, Inc., Dept. EM, Rockdale St., Worcester, Mass. 01606
D Wilson Co., H. M., Dept. EM, 11501 Chimney Rock Rd., Houston, Tex. 77035

Power Supplies, CRT

ACDC Electronics, Dept. EM, 401 Jones Rd., Oceanside, Cal. 92054 ..... *
Acme Electric, Dept. EM, 614 Water St., Cuba, N.Y. 14727 ..... *
Advanced High Voltage Inc., Dept. EM, 14532 Arminta St., Van Nuys, Cal. 91402 ..... *
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M **OPT Inds. Inc., Data Products Div., Dept. EM, 300 Red School Lane, Phillipsburg, N.J. 08865** ..... *
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D American HV Voltage Test Sys., Inc., Dept. EM, Ctrl Garr Ind'l Pk, Accident, Md. 21520
D Atlas Energy Systems, Dept. EM, 9459 Rush St., S. El Monte, Cal. 91733
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Dexter Scientific, Dept. EM, 1526 Arnold Dr., Melbourne, Fla. 32935
M Eldec Corp., Dept. EM, Box 100, 16700 13th Ave. W., Lynnwood, Wash. 98036
M Electro-Module, Inc., Dept. EM, 2855 Metropolitan Place, Pomona, Cal. 91767
M International Power Machines Corp., Dept. EM, 3328 Executive Blvd., Box 724, Mesquite, Tex. 75149
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602
Laser Inc., Dept. EM, Laser Lane, Box 537, Sturbridge, Mass. 01566
Magnetic Products, Inc., Dept. EM, Box 1125, New London, N.H. 03257
M Microwave Power Devices, Dept. EM, Adams Ct., Plainview, N.Y. 11803
Technology Dev Corp, NJE Div, Dept. EM, Box 50, Culver Rd., Dayton, N.J. 08810
M Peschel Instrs., Inc., Dept. EM, 1412 Viscaya Pkwy., Cape Coral, Fla. 33904
Reich Associates Inc., Dept. EM, PO Box 73, Plano, Tex 75074
Spectrolab, Inc., Dept. EM, 12500 Gladstone Ave., Sylmar, Cal. 91342
M UCE, Inc., Dept. EM, 20 N. Main St., Norwalk, Conn. 06854
Wabash Transformer Corp., Dept. EM, 1375 Swan St., Huntington, Ind. 46750
M Whittaker Corp., Dept. EM, 10880 Wilshire Blvd., Los Angeles, Cal. 90024

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Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
American Monarch Corp., Dept. EM, 2801-37th Ave., N.E., Minneapolis, Minn. 55421
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D Bug Electronics, Dept. EM, 151 Grove St, Westwood, Mass. 02090
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Deltron, Inc., Dept. EM, Wissahickon Ave., N. Wales, Pa. 19454
DM Dressen-Barnes Electronics, Div. American Elctrns., Dept. EM, 1600 E. Valencia Dr., Fullerton, Cal. 92631
D Dynage, Inc., Power Supply Corp., Dept. EM, 1331 Blue Hills Ave., Bloomfield, Conn. 06002
Dynetic Systems, Dept. EM, 19128 Indl Blvd., Elk River, Minn 55330
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Elma Engineering, Dept. EM, 1066 E. Meadow Circle, Palo Alto, Cal. 94303
M Etatech, Inc., Dept. EM, 187M W. Orangethorpe Ave., Placentia, Cal. 92670
Faratron Corp., Dept. EM, 280 Green St., S. Hackensack, N.J. 07606
Gates Elctrn. Co., Dept. EM, 526 Van Nest Ave., Bronx, N.Y. 10460
Gould, Inc. Instr. Sys. Div. Power Supply Dept., Dept. EM, 3631 Perkins Ave., Cleveland, Ohio 44114
HBS Equipment Div., Dept. EM, 3000 Supply Ave., Los Angeles, Calif. 90040
M International Power Machines Corp., Dept. EM, 3328 Executive Blvd., Box 724, Mesquite, Tex. 75149
M Keltec Florida, Sub Norlin Ind., Dept. EM, Box 1348, Fort Walton Beach, Fla. 32548
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
Magnetic Products, Inc., Dept. EM, Box 1125, New London, N.H. 03257
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D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
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North Electric Co., Power Sys Div., Dept. EM, Box 688, Galion, Ohio 44833
D Nova Tran Corp., Dept. EM, 360 4th St., Clear Lake, Wisc. 54005
Payne Engrg. Co., Dept. EM, Box 70, Scott Depot, W. Va. 25560
M Peschel Instrs., Inc., Dept. EM, 1412 Viscaya Pkwy., Cape Coral, Fla. 33904
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M Powercube Corp., Dept. EM, 214 Calvary St., Waltham, Mass. 02154
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Schauer Mfg. Corp., Dept. EM, 4500 Alpine Ave., Cincinnati, Ohio 45242
Sorensen Co., Dept. EM, 676 Island Pond Rd., Manchester, N.H. 03103
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D Ten-Tec Inc., Dept. EM, Industrial Park, Sevierville, Tenn. 37862
M Todd Products Corp., Dept. EM, 123 Milbar Blvd., Farmingdale, N.Y. 11735
M Transistor Devices, Dept. EM, 85 Horsehill Rd., Cedar Knolls, N.J. 07927
M Universal Elctrns. Corp., Dept. EM, 20747 Dearborn St., Chatsworth, Cal. 91311
VHF Engrg, Div. of Brownian Elctrns. Corp., Dept. EM, 320 Water St., Binghamton, N.Y. 13902
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M Acopian Corp., Dept. EM, Box 585, Easton, Pa. 18042 ..... *
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M Integrated Circuits, Inc., Dept. EM, 13256 Northrup Way, Bellevue, Wash. 98005 ..... *
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M Kepco, Inc., Dept. EM, 131-38 Sanford Ave., Flushing, N.Y. 11352 ..... *
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RO Assocs., Dept. EM, 3705 Haven Ave., Menlo Park, Cal. 94025 ..... *
Sanford-Miller Corp., Dept. EM, 8 John St., Lynbrook, N.Y. 11563 ..... *
Semiconductor Circuits, Inc., Dept. EM, 306 River St., Haverhill, Mass. 01830 *
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M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... *
Universal Voltronics Corp., Dept. EM, 27 Radio Circle Dr., Mt. Kisco, N.Y. 10549 ..... *
Wilmore Elctrns. Co., Dept. EM, Box 2973, W. Durham Sta., Durham, N.C. 27705 ..... *
AAK Corp, Dept. EM, POB 1, Methuen, Mass 01844
American Monarch Corp., Dept. EM, 2801-37th Ave., N.E., Minneapolis, Minn. 55421
AMPSCO Power Systems Inc, Dept. EM, 95 Grand St, Worcester, Mass. 01608
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Astro-Geo-Marine Inc., Dept. EM, 2005 Palma Dr., Ventura, Cal. 93003
Barber Corp., Dept. EM, Box 635, Waynesville, Ohio 45068
D B. H. Industries, Dept. EM, 5784 Venice Blvd., Los Angeles, Cal 90019
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D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
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ESSCO Industries, Dept. EM, PO Box 515, Sierra Madre, Cal. 91024
Etatech, Inc., Dept. EM, 187M W. Orangethorpe Ave., Placentia, Cal. 92670
D Fuji Electrochemical Co., Dept. EM, Hamagomu Bld. 5 36-11 Shinbashi, Minato-ku, Tokyo, Japan
Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
Intronics Inc., Dept. EM, 57 Chapel St., Newton, Mass. 02158
James Electronics Inc., Dept. EM, 4050 N Rockwell St, Chicago, Ill. 60618
M Keltec Florida, Sub Norlin Ind., Dept. EM, Box 1348, Fort Walton Beach, Fla. 32548
Lambda Elctrns., Dept. EM, 515 Brd. Hollow Rd., Melville, N.Y. 11746
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
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Power Electronics Corp., Dept. EM, 96 Milton Rd., Rochester, New Hampshire 03867
Power Labs, Inc., Dept. EM, 5 Towle Ave., Dover, NH 03820

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Reliability Inc., Dept. EM, Box 37409, Houston, Tex. 77036
D Robins Broadcast & Sound Equipment Corp., Sub. Robins Inds., Dept. EM, 75 Austin Blvd., Commack, N.Y. 11725
M Sawyer Inds., Dept. EM, 5649 Peck Rd., Arcadia, Cal. 91006
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
DM Sorensen Co., Dept. EM, 676 Island Pond Rd., Manchester, N.H. 03103
Telco Products Co., Dept. EM, 44 Sea Cliff, Glen Cove, NY 11542
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Viking Modules, Div. of Keltron Corp., Dept. EM, 223 Cresent St., Waltham, Mass. 02154

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Bertan Assocs., Inc., Dept. EM, 3 Aerial Way, Syosset, N.Y. 11791 ..... *
Bikor Corporation, Dept. EM, 23970 Madison St., Torrance, Cal. 90505 ..... *
Computer Power, Inc., Dept. EM, 124E West Main Street, High Bridge, New Jersey 08829 ..... *
Ferrotran Elctrn., Dept. EM, 683 Broadway, New York, N.Y. 10012 ..... *
NWL Transformers, Dept. EM, Rising Sun Rd., Bordentown, N.J. 08505 ..... *
Power Designs, Inc., Dept. EM, 1700 Shames Dr., Westbury, N.Y. 11590 .... *
Spellman High Voltage Elctrns. Corp., Dept. EM, 7 Fairchild Ave., Plainview, N.Y. 11803 ..... *
Technipower, Inc., Dept. EM, Commerce Pk Box 222, Danbury, Ct 06810 p. 3344
M Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040 *
Elma Engineering, Dept. EM, 1066 E. Meadow Circle, Palo Alto, Cal. 94303
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Keltec Florida, Sub Norlin Ind., Dept. EM, Box 1348, Fort Walton Beach, Fla. 32548
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
Micro-Now Instr. Co., Dept. EM, 6104 N. Pulaski Rd., Chicago, Ill. 60646
Micron Industries Corp., Constant Voltage Div., Dept. EM, 1830 N. 32nd Ave., Stone Park, Ill. 60165
M Peschel Instrs., Inc., Dept. EM, 1412 Viscaya Pkwy., Cape Coral, Fla. 33904
Reich Associates Inc., Dept. EM, PO Box 73, Plano, Tex 75074
M Transistor Devices, Dept. EM, 85 Horsehill Rd., Cedar Knolls, N.J. 07927
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760

Power Supplies, Lab (Including Metered Units)

Abacus Controls Inc., Dept. EM, 89 Redington Rd., Somerville, N.J. 08876 *
ACDC Electronics, Dept. EM, 401 Jones Rd., Oceanside, Cal. 92054 ..... *
Acopian Corp., Dept. EM, Box 585, Easton, Pa. 18042 p. 3194,3195, Inside Front Cover, Vol. 2
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Cober Elctrns., Inc., Dept. EM, 7 Gleason Ave., Stamford, Conn. 06902 ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
D Continental Specialties Corp., Dept. EM, Box 1942, 70 Fulton Terr, New Haven, Conn. 06509 ..... *
Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 ..... *
M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 p. 3243
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Elgar Corporation, Dept. EM, 8225 Mercury Ct., San Diego, Cal. 92111 ..... *
D Epsco, Inc., Dept. EM, 920 Westwood Dr., Addison, Ill. 60101 ..... p. 3260
M Georator Corporation, Dept. EM, Box 70, Manassas, Va. 22110 ..... *
Glassman High Voltage, Dept. EM, 124 W. Main St., High Bridge, N.J. 08829 p. 3265
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 p. 3267
M Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509 ..... p. 3269
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 .... *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... p. 3389
Interelectronics Corp., Dept. EM, Interelectronics Park, 550 U.S. Rte. 303, Congers, N.Y. 10920 ..... *
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
M Kepco, Inc., Dept. EM, 131-38 Sanford Ave., Flushing, N.Y. 11352 p. 3280-3282
M Marine Electric Railway Prods. Div., Inc., Dept. EM, 167 National Rd., Edison, N.J. 08817 ..... *
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D Power/Mate Corp., Dept. EM, 514 S. River St., Hackensack, N.J. 07601 p. 3304
RFL Inds., Instr. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005 ..... *
Sanford-Miller Corp., Dept. EM, 8 John St., Lynbrook, N.Y. 11563 ..... *
Sola Electric, Dept. EM, 1717 Busse Rd., Elk Grove Village, Ill. 60007 p. 3342
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DM Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518 p. 3340
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M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... *
M Unitron Inc., Dept. EM, 2826 W. Kingsley Rd., Box 2159, Garland, Tex. 75041 *
Universal Voltronics Corp., Dept. EM, 27 Radio Circle Dr., Mt. Kisco, N.Y. 10549 ..... p. 3349
D AAK Corp, Dept. EM, POB 1, Methuen, Mass 01844
Alpha Components Corp., Dept. EM, 115 Eucalyptus Dr., El Segundo, Cal. 90245
D American HV Voltage Test Sys., Inc., Dept. EM, Ctrl Garr Ind'l Pk, Accident, Md. 21520
Argus International, Dept. EM, Box 38, Hopewell, N.J. 08525
Astro-Geo-Marine Inc., Dept. EM, 2005 Palma Dr., Ventura, Cal. 93003
Deltron, Inc., Dept. EM, Wissahickon Ave., N. Wales, Pa. 19454
D Digiac Corp., Dept. EM, 175 Engineers Rd., Smithtown, N.Y. 11787
D Dressen-Barnes Electronics, Div. American Elctrns., Dept. EM, 1600 E. Valencia Dr., Fullerton, Cal. 92631
M Electro-Module, Inc., Dept. EM, 2855 Metropolitan Place, Pomona, Cal. 91767
Elma Engineering, Dept. EM, 1066 E. Meadow Circle, Palo Alto, Cal. 94303
Gates Elctrn. Co., Dept. EM, 526 Van Nest Ave., Bronx, N.Y. 10460
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602
Lambda Elctrns., Dept. EM, 515 Brd. Hollow Rd., Melville, N.Y. 11746
D Lectrotech, Inc., Dept. EM, 5810 N. Western Ave., Chicago, Ill. 60659
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
M Microwave Power Devices, Dept. EM, Adams Ct., Plainview, N.Y. 11803
Moxon Inc., Dept. EM, 2222 Michelson Dr. Bldg. E, Irvine, Cal. 92715
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
Technology Dev Corp, NJE Div, Dept. EM, Box 50, Culver Rd., Dayton, N.J. 08810
North Electric Co., Power Sys Div., Dept. EM, Box 688, Galion, Ohio 44833
Novatronics, Inc., Dept. EM, Box 878, Pompano Beach, Fla. 33061
M Peschel Instrs., Inc., Dept. EM, 1412 Viscaya Pkwy., Cape Coral, Fla. 33904
Plastic Capacitors, Inc., Dept. EM, 2623 N. Pulaski Rd., Chicago, Ill. 60639
Ratelco, Inc., Dept. EM, 610 Pontius Ave. N., Dept. EEM, Seattle, Wash. 98109
M Sawyer Inds., Dept. EM, 5649 Peck Rd., Arcadia, Cal. 91006
D Sencore, Dept. EM, 3200 Sencore Dr., Sioux Falls, S.D. 57107
DM Sorensen Co., Dept. EM, 676 Island Pond Rd., Manchester, N.H. 03103
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
Telco Products Co., Dept. EM, 44 Sea Cliff, Glen Cove, NY 11542
Trans-Tek, Inc., Dept. EM, Rte. 83, Ellington, Conn. 06029
M Transistor Devices, Dept. EM, 85 Horsehill Rd., Cedar Knolls, N.J. 07927
Velonex, Instrument Div., Dept. EM, 560 Robert Ave., Santa Clara, Cal. 95050
Viking Electronics, Dept. EM, 406 2nd St., Hudson, Wisc. 54016
Walker Scientific, Inc., Dept. EM, Rockdale St., Worcester, Mass. 01606

Power Supplies, Laser

Advanced High Voltage Inc., Dept. EM, 14532 Arminta St., Van Nuys, Cal. 91402 ..... *
M AMP Capitron Div./AMP Inc., Dept. EM, 1595 S. Mt. Joy St., Elizabethtown, Pa. 17022 ..... p. 3206
M Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 ..... *
Bertan Assocs., Inc., Dept. EM, 3 Aerial Way, Syosset, N.Y. 11791 ..... *
Bikor Corporation, Dept. EM, 23970 Madison St., Torrance, Cal. 90505 ..... *
CEA, Div. Berkleonics, Inc., Dept. EM, 1 Aerovista Pk., San Luis Obispo, Cal. 93401 ..... *
Christie Elec., Dept. EM, 3404A W. 67th St., Los Angeles, Cal. 90043 ..... *
Cober Elctrns., Inc., Dept. EM, 7 Gleason Ave., Stamford, Conn. 06902 ..... *
Computer Power, Inc., Dept. EM, 124E West Main Street, High Bridge, New Jersey 08829 ..... *
Crestronics Inc, Dept. EM, 1470 Hammer Rd RR#1 Mohave Mesa, Bullhead City, Ariz. 86430 ..... *
M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 .. *
Electronic Measurements, Dept. EM, 405 Essex Rd., Neptune, N.J. 07753 p. 3250

Glassman High Voltage, Dept. EM, 124 W. Main St., High Bridge, N.J. 08829 p. 3265
M Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509 *
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 *
Megavolt, Corp., Dept. EM, 110 Hobart St, Hackensack, N.J. 07601 *
NWL Transformers, Dept. EM, Rising Sun Rd., Bordentown, N.J. 08505 *
M OPT Inds. Inc., Data Products Div., Dept. EM, 300 Red School Lane, Phillipsburg, N.J. 08865 *
Power Designs, Inc., Dept. EM, 1700 Shames Dr., Westbury, N.Y. 11590 *
Power Technology, Inc., Dept. EM, Box 4403, 7925 Mablewave Cutoff, Little Rock, Ark. 72204 p. 3307
Pulsar Assocs., Dept. EM, 11491 Sorrento Valley Rd., San Diego, Cal. 92121 p. 2802
Spellman High Voltage Elctrns. Corp., Dept. EM, 7 Fairchild Ave., Plainview, N.Y. 11803 p. 3331
Technipower, Inc., Dept. EM, Commerce Pk Box 222, Danbury, Ct 06810 p. 3344
Tecnetics, Inc., Dept. EM, Box 910,, Boulder, Colo. 80306 *
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 *
Torotron, Dept. EM, 255 Washington St., Mt. Vernon, N.Y. 10553 *
Universal Voltronics Corp., Dept. EM, 27 Radio Circle Dr., Mt. Kisco, N.Y. 10549 *
M Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040 *
Wilmore Elctrns. Co., Dept. EM, Box 2973, W. Durham Sta., Durham, N.C. 27705 p. 3353
Advanced Kinetics, Dept. EM, 1231 Victoria St., Costa Mesa, Calif. 92627
Capacitor Specialists, Dept. EM, P.O. Box 2052, Escondido, Cal. 92025
Electro-Pacific, Inc., Dept. EM, 5782 Thornwood Dr., Goleta, Calif. 93017
Elma Engineering, Dept. EM, 1066 E. Meadow Circle, Palo Alto, Cal. 94303
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Keltec Florida, Sub Norlin Ind., Dept. EM, Box 1348, Fort Walton Beach, Fla. 32548
Keltron Corp., Walden Div., Dept. EM, 225 Crescent St., Waltham, Mass. 02154
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602
D Metrologic Instruments, Inc., Dept. EM, 143 Harding Ave., Bellmawr, N.J. 08030
M Micron Industries Corp., Constant Voltage Div., Dept. EM, 1830 N. 32nd Ave., Stone Park, Ill. 60165
M Peschel Instrs., Inc., Dept. EM, 1412 Viscaya Pkwy., Cape Coral, Fla. 33904
Plastic Capacitors, Inc., Dept. EM, 2623 N. Pulaski Rd., Chicago, Ill. 60639
Tobe Deutschmann Labs., Inc., Dept. EM, Box 74, Canton, Mass. 02021
M Todd Products Corp., Dept. EM, 123 Milbar Blvd., Farmingdale, N.Y. 11735
M Universal Elctrns. Corp., Dept. EM, 20747 Dearborn St., Chatsworth, Cal. 91311
Velonex, Instrument Div., Dept. EM, 560 Robert Ave., Santa Clara, Cal. 95050

Power Supplies, Low Current (Less Than 0.4 Ampere)

Abbott Transistor Labs., Industrial Div., Dept. EM, 5200 W. Jefferson Blvd., Los Angeles, Cal. 90016 p. 3151-3154
M Abbott Transistor Labs, Power Supply Div., Dept. EM, 5200 W. Jefferson Blvd., Los Angeles, Cal. 90016 p. 3155-3161
ACDC Electronics, Dept. EM, 401 Jones Rd., Oceanside, Cal. 92054 *
Acme Electric, Dept. EM, 614 Water St., Cuba, N.Y. 14727 *
M Acopian Corp., Dept. EM, Box 585, Easton, Pa. 18042 p. 3166-3185,3190-3195, Inside Front Cover, Vol. 2
Advanced High Voltage Inc., Dept. EM, 14532 Arminta St., Van Nuys, Cal. 91402 p. 3199
ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845 *
D Alpha Power, Inc., Dept. EM, 20536 Plummer St, Chatsworth, Cal. 91311 p. 3202,3203
M AMP Capitron Div./AMP Inc., Dept. EM, 1595 S. Mt. Joy St., Elizabethtown, Pa. 17022 p. 3206
M Arnold Magnetics Corp., Dept. EM, 11520 Jefferson Blvd., Culver City, Cal. 90230 p. 3208
M Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470 *
Bertan Assocs., Inc., Dept. EM, 3 Aerial Way, Syosset, N.Y. 11791 *
Bikor Corporation, Dept. EM, 23970 Madison St., Torrance, Cal. 90505 p. 3210,3211
Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734 *
CEA, Div. Berkleonics, Inc., Dept. EM, 1 Aerovista Pk., San Luis Obispo, Cal. 93401 p. 3213,3216
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 *
Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 p. 3225
M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 *
D Dynamic Instr. Corp., Dept. EM, 933 L.I. Motor Pkwy., Hauppauge, N.Y. 11787 *
M Eanco, Inc., Mid-Eastern Prods., Dept. EM, 539 Jacksonville Rd., Warminster, Pa. 18974 *
Electronic Measurements, Dept. EM, 405 Essex Rd., Neptune, N.J. 07753 *
Electrostatics Inc., Dept. EM, 7718 Clairemont Mesa Blvd., San Diego, Cal. 92111 p. 3248
D Epsco, Inc., Dept. EM, 920 Westwood Dr., Addison, Ill. 60101 p. 3260
M Era Transpac Corp., Sub. Elctrn. Research Assocs., Dept. EM, 311 B East Park St. Dept. 1202, Moonachie, N.J. 07074 p. 3254,3255,3257,3258
M Ferrotran Elctrn., Dept. EM, 683 Broadway, New York, N.Y. 10012 p. 3261
Freed Transformer Co., Inc., Dept. EM, 1718 Weirfield St., Brooklyn, N.Y. 11227 p. 2749
Glassman High Voltage, Dept. EM, 124 W. Main St., High Bridge, N.J. 08829 p. 3265
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 *
Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509 p. 3268
Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 *
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 p. 3273
M Integrated Circuits, Inc., Dept. EM, 13256 Northrup Way, Bellevue, Wash. 98005 *
Jerome Industries Corp., Dept. EM, 391 Lakeside Ave., Orange, N.J. 07050 *
Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 *
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 *
M Kepco, Inc., Dept. EM, 131-38 Sanford Ave., Flushing, N.Y. 11352 p. 3278,3279,3281,3282
KGS Electronics, Inc., Dept. EM, 2029 N. Lincoln Ave., Pasadena, Cal. 91103 *
Magnetico, Inc., Dept. EM, 182 Morris Ave., Holtsville, N.Y. 11742 *
Marine Electric Railway Prods. Div., Inc., Dept. EM, 167 National Rd., Edison, N.J. 08817 p. 3391,3392
Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 *
NWL Transformers, Dept. EM, Rising Sun Rd., Bordentown, N.J. 08505 p. 3289
D Opamp Labs, Inc., Dept. EM, 1033 N. Sycamore Ave, Los Angeles, Cal. 90038 *
M OPT Inds. Inc., Data Products Div., Dept. EM, 300 Red School Lane, Phillipsburg, N.J. 08865 *
Pacific Power Source Div, Dept. EM, 5291 Systems Dr, Huntington Bch, Cal 92649 *
Polytron Devices Inc., Dept. EM, Box 398 - River St. Sta., Patterson, N.J. 07524 p. 3296,3297
Power Designs, Inc., Dept. EM, 1700 Shames Dr., Westbury, N.Y. 11590 *
D Power/Mate Corp., Dept. EM, 514 S. River St., Hackensack, N.J. 07601 *
D Power One, Dept. EM, Power-One Dr, Camarillo, Cal. 93010 p. 3306
Power Systems, Inc., Dept. EM, 12 Tobey Rd., Bloomfield, Conn. 06002 *
Power Technology, Inc., Dept. EM, Box 4403, 7925 Mablewave Cutoff, Little Rock, Ark. 72204 *
D Powertec, Inc., Dept. EM, 9168 DeSoto Ave., Chatsworth, Cal. 91311 *
D RDI/Reed Devices, Inc., Dept. EM, 525 Randy Rd., Carol Stream, Ill. 60187 *
RO Assocs., Dept. EM, 3705 Haven Ave., Menlo Park, Cal. 94025 p. 3314
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Spellman High Voltage Elctrns. Corp., Dept. EM, 7 Fairchild Ave., Plainview, N.Y. 11803 *
D Standard Power, Inc., Dept. EM, 1400 S. Village Way, Santa Ana, Cal. 92705 p. 3333
M Stevens-Arnold, Inc., DC Input Pwr. Supply Div., Dept. EM, 7 Elkins St., So. Boston, Mass. 0212? p. 3336,3338
M Technipower, Inc., Dept. EM, Commerce Pk Box 222, Danbury, Ct 06810 p. 3344
Tecnetics, Inc., Dept. EM, Box 910,, Boulder, Colo. 80306 *
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 *
M Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040 *
D Venus Scientific, Inc., Dept. EM, 399 Smith St., Farmingdale, N.Y. 11735 *
Wilmore Elctrns. Co., Dept. EM, Box 2973, W. Durham Sta., Durham, N.C. 27705 *
AAK Corp, Dept. EM, POB 1, Methuen, Mass 01844
D Adapter/Charger Prdts., Dept. EM, Box 3218, Peoria, Ill. 61614
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
AMPSCO Power Systems Inc, Dept. EM, 95 Grand St, Worcester, Mass. 01608
M Anadyne, Dept. EM, 14830 Valley View Ave., LaMirada, Cal. 90638
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Astro-Geo-Marine Inc., Dept. EM, 2005 Palma Dr., Ventura, Cal. 93003
Beckman Instrs., Cedar Grove Opers., Dept. EM, 89 Commerce Rd., Cedar Grove, N.J. 07009
D Bug Electronics, Dept. EM, 151 Grove St, Westwood, Mass. 02090
Deltron, Inc., Dept. EM, Wissahickon Ave., N. Wales, Pa. 19454
Dexter Scientific, Dept. EM, 1526 Arnold Dr., Melbourne, Fla. 32935
DM Dressen-Barnes Electronics, Div. American Elctrns., Dept. EM, 1600 E. Valencia Dr., Fullerton, Cal. 92631
Dynage, Inc., Power Supply Corp., Dept. EM, 1331 Blue Hills Ave., Bloomfield, Conn. 06002
Elcor Prods. Neotec Elctrns. Inc., Dept. EM, 2431 Linden La., Silver Spring, Md. 20910
M Eldec Corp., Dept. EM, Box 100, 16700 13th Ave. W., Lynnwood, Wash. 98036
Electro-Pacific, Inc., Dept. EM, 5782 Thornwood Dr., Goleta, Calif. 93017
EMCO High Voltage, Dept. EM, 2444 Old Middlefield Way, Mt. View, Cal. 94043
Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
ESSCO Industries, Dept. EM, PO Box 515, Sierra Madre, Cal. 91024
Faratron Corp., Dept. EM, 280 Green St., S. Hackensack, N.J. 07606
Galileo Electro-Optics Corp., Dept. EM, Galileo Pk., Sturbridge, Mass. 01518
Gates Elctrn. Co., Dept. EM, 526 Van Nest Ave., Bronx, N.Y. 10460
Gould, Inc. Instr. Sys. Div. Power Supply Dept., Dept. EM, 3631 Perkins Ave., Cleveland, Ohio 44114
Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704
Intronics Inc., Dept. EM, 57 Chapel St., Newton, Mass. 02158
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
Modular Audio Products, Dept. EM, 50 Orville Dr., Bohemia, N.Y. 11716
Moxon Inc., Dept. EM, 2222 Michelson Dr. Bldg. E, Irvine, Cal. 92715
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
Technology Dev Corp, NJE Div, Dept. EM, Box 50, Culver Rd., Dayton, N.J. 08810
North Electric Co., Power Sys Div., Dept. EM, Box 688, Galion, Ohio 44833
M Peschel Instrs., Inc., Dept. EM, 1412 Viscaya Pkwy., Cape Coral, Fla. 33904
Plastic Capacitors, Inc., Dept. EM, 2623 N. Pulaski Rd., Chicago, Ill. 60639
Power Electronics Corp., Dept. EM, 96 Milton Rd., Rochester, New Hampshire 03867

Power Labs, Inc., Dept. EM, 5 Towle Ave., Dover, NH 03820
M Powercube Corp., Dept. EM, 214 Calvary St., Waltham, Mass. 02154
Prototype Transformer Corp., Dept. EM, 545 N Arlington Ave, East Orange, N.J. 07017
Reich Associates Inc., Dept. EM, PO Box 73, Plano, Tex 75074
D Reliability Inc., Dept. EM, Box 37409, Houston, Tex. 77036
DM Sorensen Co., Dept. EM, 676 Island Pond Rd., Manchester, N.H. 03103
Teledyne Philbrick, Dept EM, 17 Allied Dr. Rte 128, Dedham, Mass. 02026
M Todd Products Corp., Dept. EM, 123 Milbar Blvd., Farmingdale, N.Y. 11735
Trans-Tek, Inc., Dept. EM, Rte. 83, Ellington, Conn. 06029 *
M Universal Elctrns. Corp., Dept. EM, 20747 Dearborn St., Chatsworth, Cal. 91311
M Velonex, Instrument Div., Dept. EM, 560 Robert Ave., Santa Clara, Cal. 95050
Viking Electronics, Dept. EM, 406 2nd St., Hudson, Wisc. 54016
Viking Modules, Div. of Keltron Corp., Dept. EM, 223 Cresent St., Waltham, Mass. 02154

Power Supplies, Medium Current (O.4 to 8 Amperes)

Abbott Transistor Labs., Industrial Div., Dept. EM, 5200 W. Jefferson Blvd., Los Angeles, Cal. 90016 ..... p. 3151-3154
M Abbott Transistor Labs, Power Supply Div., Dept. EM, 5200 W. Jefferson Blvd., Los Angeles, Cal. 90016 ..... p. 3155-3161
ACDC Electronics, Dept. EM, 401 Jones Rd., Oceanside, Cal. 92054 ..... *
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M Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040 *
Venus Scientific, Inc., Dept. EM, 399 Smith St., Farmingdale, N.Y. 11735 .... *
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Astro-Geo-Marine Inc., Dept. EM, 2005 Palma Dr., Ventura, Cal. 93003
M Cal-Power Corp., Dept. EM, 140 Kansas St., El Segundo, Calif. 90245
Dexter Scientific, Dept. EM, 1526 Arnold Dr., Melbourne, Fla. 32935
M Electro-Module, Inc., Dept. EM, 2855 Metropolitan Place, Pomona, Cal. 91767
EMCO High Voltage, Dept. EM, 2444 Old Middlefield Way, Mt. View, Cal. 94043
D EMI Gencom Inc., Dept. EM, 80 Express St., Plainview, N.Y. 11803
Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
Galileo Electro-Optics Corp., Dept. EM, Galileo Pk., Sturbridge, Mass. 01518
Intronics Inc., Dept. EM, 57 Chapel St., Newton, Mass. 02158
Keltron Corp., Walden Div., Dept. EM, 225 Crescent St., Waltham, Mass. 02154
Lambda Elctrns., Dept. EM, 515 Brd. Hollow Rd., Melville, N.Y. 11746
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
M Micron Industries Corp., Constant Voltage Div., Dept. EM, 1830 N. 32nd Ave., Stone Park, Ill. 60165
M Peschel Instrs., Inc., Dept. EM, 1412 Viscaya Pkwy., Cape Coral, Fla. 33904
M Powercube Corp., Dept. EM, 214 Calvary St., Waltham, Mass. 02154
Reich Associates Inc., Dept. EM, PO Box 73, Plano, Tex 75074
M Velonex, Instrument Div., Dept. EM, 560 Robert Ave., Santa Clara, Cal. 95050
Voltex Co., Inc., Dept. EM, 115 Marine St., Farmingdale, N.Y. 11735
Zi-Tech Div., Aikenwood Corp., Dept. EM, Box 26, 2151 Park Blvd., Palo Alto, Cal. 94302

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D Alpha Power, Inc., Dept. EM, 20536 Plummer St, Chatsworth, Cal. 91311 .... *
M Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470 ..... *
Bikor Corporation, Dept. EM, 23970 Madison St., Torrance, Cal. 90505 ..... *
CEA, Div. Berkleonics, Inc., Dept. EM, 1 Aerovista Pk., San Luis Obispo, Cal. 93401 ..... *
Cober Elctrns., Inc., Dept. EM, 7 Gleason Ave., Stamford, Conn. 06902 ..... *
Computer Power, Inc., Dept. EM, 124E West Main Street, High Bridge, New Jersey 08829 ..... *
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M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 .. *
E & L Instruments, Inc., Dept. EM, 61 First St., Derby, Conn. 06418 ..... *
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Electronic Measurements, Dept. EM, 405 Essex Rd., Neptune, N.J. 07753 .. *
Electrostatics Inc., Dept. EM, 7718 Clairemont Mesa Blvd., San Diego, Cal. 92111 ..... *
Elgenco, Inc., Dept. EM, Box 460, Huricane, Utah 84737 ..... *
D Endicott Coil Co., Dept. EM, 24 Charlotte St., Binghamton, N.Y. 13905 ..... *
EWC, Inc., Dept. EM, 725 Federal Ave., Kenilworth, N.J. 07033 ..... *
Glassman High Voltage, Dept. EM, 124 W. Main St., High Bridge, N.J. 08829 *
GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 ..... *
Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 ..... *
D Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 .... *
Interelectronics Corp., Dept. EM, Interelectronics Park, 550 U.S. Rte. 303, Congers, N.Y. 10920 ..... *
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Megavolt, Corp., Dept. EM, 110 Hobart St, Hackensack, N.J. 07601 ..... *
Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 *
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D Standard Power, Inc., Dept. EM, 1400 S. Village Way, Santa Ana, Cal. 92705 p. 3335
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United Wiring & Mfg. Co., Dept. EM, 2608 Electonic La. #404, Dallas, Tex. 75220 ..... *
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Wilmore Elctrns. Co., Dept. EM, Box 2973, W. Durham Sta., Durham, N.C. 27705 ..... *
D AAK Corp, Dept. EM, POB 1, Methuen, Mass 01844
Anaheim Automation, Dept. EM, 922 Orangefair La., Anaheim, Cal. 92801
Analogic Corp., Dept. EM, Audubon Rd., Wakefield, Mass. 01880
Argus International, Dept. EM, Box 38, Hopewell, N.J. 08525
Astro-Geo-Marine Inc., Dept. EM, 2005 Palma Dr., Ventura, Cal. 93003
D B. H. Industries, Dept. EM, 5784 Venice Blvd., Los Angeles, Cal 90019
D Bug Electronics, Dept. EM, 151 Grove St, Westwood, Mass. 02090
M Cal-Power Corp., Dept. EM, 140 Kansas St., El Segundo, Calif. 90245
Computer Power Source, Dept. EM, 370 Park Ave, Worcester, MA 01610
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Eldec Corp., Dept. EM, Box 100, 16700 13th Ave. W., Lynnwood, Wash. 98036
M Electro-Module, Inc., Dept. EM, 2855 Metropolitan Place, Pomona, Cal. 91767
ESSCO Industries, Dept. EM, PO Box 515, Sierra Madre, Cal. 91024
Etatech, Inc., Dept. EM, 187M W. Orangethorpe Ave., Placentia, Cal. 92670
Faratron Corp., Dept. EM, 280 Green St., S. Hackensack, N.J. 07606
M Glentek, Inc., Dept. EM, 1559 7th St., Santa Monica, Calif. 90401
Lambda Elctrns., Dept. EM, 515 Brd. Hollow Rd., Melville, N.Y. 11746
Modular Audio Products, Dept. EM, 50 Orville Dr., Bohemia, N.Y. 11716
Modular Devices, Inc., Dept. EM, 50 Orville Dr., Bohemia, N. Y. 11716
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
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Power Electronics Corp., Dept. EM, 96 Milton Rd., Rochester, New Hampshire 03867
M Powercube Corp., Dept. EM, 214 Calvary St., Waltham, Mass. 02154
Prototype Transformer Corp., Dept. EM, 545 N Arlington Ave, East Orange, N.J. 07017
Reliability Inc., Dept. EM, Box 37409, Houston, Tex. 77036
M Sawyer Inds., Dept. EM, 5649 Peck Rd., Arcadia, Cal. 91006
M Transistor Devices, Dept. EM, 85 Horsehill Rd., Cedar Knolls, N.J. 07927
Voltex Co., Inc., Dept. EM, 115 Marine St., Farmingdale, N.Y. 11735

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M Acopian Corp., Dept. EM, Box 585, Easton, Pa. 18042 ..... *
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Almond Instrs. Co., Dept. EM, 1223 East Edna Pl., Covina, Cal. 91724 ..... *
M AMP Capitron Div./AMP Inc., Dept. EM, 1595 S. Mt. Joy St., Elizabethtown, Pa. 17022 ..... p. 3206
M Arnold Magnetics Corp., Dept. EM, 11520 Jefferson Blvd., Culver City, Cal. 90230 ..... *
M Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470 p. 2259
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Christie Elec., Dept. EM, 3404A W. 67th St., Los Angeles, Cal. 90043 ..... *
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M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 .. *
M Eanco, Inc., Mid-Eastern Prods., Dept. EM, 539 Jacksonville Rd., Warminster, Pa. 18974 ..... *
Electronic Dev. Corp., Dept. EM, 11 Hamlin St., Boston, Mass. 02127 p. 2725
Electronic Measurements, Dept. EM, 405 Essex Rd., Neptune, N.J. 07753 p. 3250
Elgar Corporation, Dept. EM, 8225 Mercury Ct., San Diego, Cal. 92111 ..... *
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D Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 *
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Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 p. 3267
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
Interelectronics Corp., Dept. EM, Interelectronics Park, 550 U.S. Rte. 303, Congers, N.Y. 10920 ..... *
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
M Kepco, Inc., Dept. EM, 131-38 Sanford Ave., Flushing, N.Y. 11352 p. 3278,3280-3282
KGS Electronics, Inc., Dept. EM, 2029 N. Lincoln Ave., Pasadena, Cal. 91103 *
Marine Electric Railway Prods. Div., Inc., Dept. EM, 167 National Rd., Edison, N.J. 08817 ..... *

Megavolt, Corp., Dept. EM, 110 Hobart St, Hackensack, N.J. 07601 ..... *
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Power Designs, Inc., Dept. EM, 1700 Shames Dr., Westbury, N.Y. 11590 .... *
D **Power/Mate Corp., Dept. EM, 514 S. River St., Hackensack, N.J. 07601** ..... *
Power One, Dept. EM, Power-One Dr, Camarillo, Cal. 93010 ..... *
Powertec, Inc., Dept. EM, 9168 DeSoto Ave., Chatsworth, Cal. 91311 ..... *
RO Assocs., Dept. EM, 3705 Haven Ave., Menlo Park, Cal. 94025 ..... *
M **Spellman High Voltage Elctrns. Corp., Dept. EM, 7 Fairchild Ave., Plainview, N.Y. 11803** ..... p. 3330
D **Standard Power, Inc., Dept. EM, 1400 S. Village Way, Santa Ana, Cal. 92705** *
DM **Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518** p. 3340
Technipower, Inc., Dept. EM, Commerce Pk Box 222, Danbury, Ct 06810 p. 3344
D **United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403** ..... *
Universal Voltronics Corp., Dept. EM, 27 Radio Circle Dr., Mt. Kisco, N.Y. 10549 ..... *
AAK Corp, Dept. EM, POB 1, Methuen, Mass 01844
Advanced Kinetics, Dept. EM, 1231 Victoria St., Costa Mesa, Calif. 92627
Aerospace Avionics, Inc., Dept. EM, Airport International Plaza, 110 Wilbur Pl., Bohemia, N.Y. 11716
M Anadyne, Dept. EM, 14830 Valley View Ave., LaMirada, Cal. 90638
Astro-Geo-Marine Inc., Dept. EM, 2005 Palma Dr., Ventura, Cal. 93003
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
Basler Electric Co., Dept. EM, Box 269, Rte. 143, Highland, Ill. 62249
Bug Electronics, Dept. EM, 151 Grove St, Westwood, Mass. 02090
Capacitor Specialists, Dept. EM, P.O. Box 2052, Escondido, Cal. 92025
Deltron, Inc., Dept. EM, Wissahickon Ave., N. Wales, Pa. 19454
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Dynetic Systems, Dept. EM, 19128 Indl Blvd., Elk River, Minn 55330
M Electro-Module, Inc., Dept. EM, 2855 Metropolitan Place, Pomona, Cal. 91767
D EMI Gencom Inc., Dept. EM, 80 Express St., Plainview, N.Y. 11803
Faratron Corp., Dept. EM, 280 Green St., S. Hackensack, N.J. 07606
D Fuji Electrochemical Co., Dept. EM, Hamagomu Bld. 5 36-11 Shinbashi, Minato-ku, Tokyo, Japan
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General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
M Keltec Florida, Sub Norlin Ind., Dept. EM, Box 1348, Fort Walton Beach, Fla. 32548
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D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
Technology Dev Corp, NJE Div, Dept. EM, Box 50, Culver Rd., Dayton, N.J. 08810
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Novatronics, Inc., Dept. EM, Box 878, Pompano Beach, Fla. 33061
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Power Electronics Corp., Dept. EM, 96 Milton Rd., Rochester, New Hampshire 03867
M Powercube Corp., Dept. EM, 214 Calvary St., Waltham, Mass. 02154
D Rantec Div., Emerson Elec. Co., Dept. EM, 24003 Ventura Blvd., Calabasas, Calif. 91302
DM Sorensen Co., Dept. EM, 676 Island Pond Rd., Manchester, N.H. 03103
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
M Todd Products Corp., Dept. EM, 123 Milbar Blvd., Farmingdale, N.Y. 11735
M Transistor Devices, Dept. EM, 85 Horsehill Rd., Cedar Knolls, N.J. 07927
M Universal Elctrns. Corp., Dept. EM, 20747 Dearborn St., Chatsworth, Cal. 91311
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Velonex, Instrument Div., Dept. EM, 560 Robert Ave., Santa Clara, Cal. 95050
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M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304

Power Supplies, Radar, Sonar

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American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
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M **Axel Elctrns., Unit of General Signal, Dept. EM, 134-20 Jamaica Ave., Jamaica, N.Y. 11418** ..... *
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Cober Elctrns., Inc., Dept. EM, 7 Gleason Ave., Stamford, Conn. 06902 ..... *
Computer Power, Inc., Dept. EM, 124E West Main Street, High Bridge, New Jersey 08829 ..... *
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M **Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509** ..... *
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NWL Transformers, Dept. EM, Rising Sun Rd., Bordentown, N.J. 08505 ..... *
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M **Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030** ..... *
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M Electro-Module, Inc., Dept. EM, 2855 Metropolitan Place, Pomona, Cal. 91767
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Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Keltec Florida, Sub Norlin Ind., Dept. EM, Box 1348, Fort Walton Beach, Fla. 32548
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602
M Powercube Corp., Dept. EM, 214 Calvary St., Waltham, Mass. 02154
Tobe Deutschmann Labs., Inc., Dept. EM, Box 74, Canton, Mass. 02021
M Transistor Devices, Dept. EM, 85 Horsehill Rd., Cedar Knolls, N.J. 07927
M Universal Elctrns. Corp., Dept. EM, 20747 Dearborn St., Chatsworth, Cal. 91311

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DM **Powertec, Inc., Dept. EM, 9168 DeSoto Ave., Chatsworth, Cal. 91311** ..... *
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Coilcraft, Dept. EM, 1102 Siler Lake Rd., Cary, Ill. 60013
M Eldec Corp., Dept. EM, Box 100, 16700 13th Ave. W., Lynnwood, Wash. 98036
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Lambda Elctrns., Dept. EM, 515 Brd. Hollow Rd., Melville, N.Y. 11746
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North Electric Co., Power Sys Div., Dept. EM, Box 688, Galion, Ohio 44833
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M Powercube Corp., Dept. EM, 214 Calvary St., Waltham, Mass. 02154
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D Teledyne Big Beam, Dept. EM, 290 E. Prairie St., Crystal Lake, Ill. 60014
DM Terado Corp., Dept. EM, 1068 Raymond Ave., St. Paul, Minn. 55108
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NWL Transformers, Dept. EM, Rising Sun Rd., Bordentown, N.J. 08505 ..... *
Polytron Devices Inc., Dept. EM, Box 398 - River St. Sta., Patterson, N.J. 07524 ..... p. 3296,3297
Power Designs, Inc., Dept. EM, 1700 Shames Dr., Westbury, N.Y. 11590 .... *
D **Power/Mate Corp., Dept. EM, 514 S. River St., Hackensack, N.J. 07601** ..... *
M **Technipower, Inc., Dept. EM, Commerce Pk Box 222, Danbury, Ct 06810** p. 3344
M **Unitron Inc., Dept. EM, 2826 W. Kingsley Rd., Box 2159, Garland, Tex. 75041** *
Universal Voltronics Corp., Dept. EM, 27 Radio Circle Dr., Mt. Kisco, N.Y. 10549 ..... p. 3348,3349
M **Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040** *
AAK Corp, Dept. EM, POB 1, Methuen, Mass 01844
Advanced Kinetics, Dept. EM, 1231 Victoria St., Costa Mesa, Calif. 92627
Alpha-M Corp, Dept. EM, 3009 Wildflower Drive, Dallas, Tx. 75229
Argus International, Dept. EM, Box 38, Hopewell, N.J. 08525
Astro-Geo-Marine Inc., Dept. EM, 2005 Palma Dr., Ventura, Cal. 93003
D Brooks Mfg. Co., Dept. EM, Box 17602, Philadelphia, Pa 19135
Dynetic Systems, Dept. EM, 19128 Indl Blvd., Elk River, Minn 55330
Ferranti Elec., Dept. EM, East Bethpage Rd., Plainview, N.Y. 11803
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602
Lambda Elctrns., Dept. EM, 515 Brd. Hollow Rd., Melville, N.Y. 11746
Technology Dev Corp, NJE Div, Dept. EM, Box 50, Culver Rd., Dayton, N.J. 08810
Novatronics, Inc., Dept. EM, Box 878, Pompano Beach, Fla. 33061
M Perry Amplifier, Dept. EM, 138 Fuller St., Brookline, Mass. 02146
M Powercube Corp., Dept. EM, 214 Calvary St., Waltham, Mass. 02154
Prototype Transformer Corp., Dept. EM, 545 N Arlington Ave, East Orange, N.J. 07017
D Robins Broadcast & Sound Equipment Corp., Sub. Robins Inds., Dept. EM, 75 Austin Blvd., Commack, N.Y. 11725
DM Sorensen Co., Dept. EM, 676 Island Pond Rd., Manchester, N.H. 03103
D Spectra Sonics, Dept. EM, 770 Wall Ave., Ogden, Utah 84404
M Universal Elctrns. Corp., Dept. EM, 20747 Dearborn St., Chatsworth, Cal. 91311

Preamplifiers

Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Ithaco, Inc., Dept. EM, 735 W. Clinton St., Ithaca, N.Y. 14850 ..... p. 1007
Opamp Labs, Inc., Dept. EM, 1033 N. Sycamore Ave, Los Angeles, Cal. 90038 ..... p. 1018
M **, Trak Microwave Corp., Dept. E8, Dept. EM, 4726 Eisenhower Blvd.,, Tampa, Fla. 33614** ..... *
Unholtz-Dickie Corp., Dept. EM, 3000 Whitney Ave., Hamden, Conn. 06518 *
Advanced Kinetics, Dept. EM, 1231 Victoria St., Costa Mesa, Calif. 92627
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
D Bogen Div., Lear Siegler, Inc., Dept. EM, Box 500, Paramus, N.J. 07652
D Dynair Elctrns. Inc., Dept. EM, 5275 Market St., San Diego, Calif. 92114
M Harshaw Chemical Co., A Kenanee Industry, Dept. EM, 6801 Cochran Rd., Solon, Ohio 44139
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
IPAC Group, Inc., Dept. EM, POB 156 3047 Industrial Blvd., Bethel Park, PA 15102
Modular Audio Products, Dept. EM, 50 Orville Dr., Bohemia, N.Y. 11716
Modular Devices, Inc., Dept. EM, 50 Orville Dr., Bohemia, N. Y. 11716
Mu-Del Elctrns., Dept. EM, 2426 Linden La., Silver Spring, Md. 20910
M Norlin Communications Inc., Dept. EM, 9125 Gaither Rd., Gaithersburg, Md. 20760
Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
Scientific Communications, Dept. EM, 3425 Kingsley, Garland, Tex. 75041
Telco Products Co., Dept. EM, 44 Sea Cliff, Glen Cove, NY 11542
D Telex Communications, Inc., Dept. EM, 9600 Aldrich Ave., So., Minneapolis, Minn. 55420

Prebonding Etchants—See Chemicals, Etching

Preforms, Precious Metal

D **Gardiner Solder Co., Div. of Gardiner Metal Co., Dept. EM, 4820 S. Campbell Ave., Chicago, Ill 60632** ..... *
Hughes Aircraft Co., Ind'l. Prods. Div. FACT Sys., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008 ..... p. 2758
Cohn Corp., Sigmund, Dept. EM, 121 S. Columbus Ave., Mt. Vernon, N.Y. 10553
M Consolidated Refining Co. Inc., Dept. EM, 116 Hoyt Ave., Mamaroneck, N.Y. 10543
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
GTE Sylvania Inc., Western Gold & Platinum Sub., Dept. EM, 477 Harbor Blvd., Belmont, Cal. 94002
Handy & Harman, Dept. EM, 850 Third Ave., New York, N.Y. 10022
Indium Corp. of Amer, Dept. EM, 1676 Lincoln Ave, Box 269, Utica, NY 13503
Plessey Inc., Dept. EM, 320 Long Island Expwy. S., Melville, N.Y. 11746
Sara Sales Co., Dept. EM, P.O. Box 321, San Francisco, Calif. 94101
Williams Precious Metal Div., Williams Gold Refining, Dept. EM, 2978 Main St., Buffalo, N.Y. 14214

Prescalers

NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
M Harshaw Chemical Co., A Kenanee Industry, Dept. EM, 6801 Cochran Rd., Solon, Ohio 44139
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518

Preselector-Mixers

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
M Coleman Microwave Co., Dept. EM, Box 59, Rte. 22, Lebanon, N.J. 08833
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
FG Engineering Co., Dept. EM, Box 39, Black Canyon Stage, Mayer, Ariz. 86333
Frequency Engrg. Labs., Dept. EM, Box 527, Farmingdale, N.J. 07727
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
M RHG Elctrns. Lab., Dept. EM, 161 E. Industry Ct., Deer Park, N.Y. 11729
Triangle Microwave Inc., Dept. EM, 9B Great Meadow La, East Hanover, NJ 07936
M UTE Microwave, Dept. EM, 3500 Sunset Ave., Asbury Park, N.J. 07712
DM Yig-Tek Corp., Dept. EM, 1725 De La Cruz Blvd., Santa Clara, Cal. 95050

Preselectors

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
M **MCL, Inc., Dept. EM, 10 North Beach Ave., LaGrange, Ill. 60525** ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D Ailtech, Dept. EM, 2070 Fifth Ave, Ronkonkoma, NY 11779
M Coleman Microwave Co., Dept. EM, Box 59, Rte. 22, Lebanon, N.J. 08833
Frequency Engrg. Labs., Dept. EM, Box 527, Farmingdale, N.J. 07727
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
Mu-Del Elctrns., Dept. EM, 2426 Linden La., Silver Spring, Md. 20910
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
D Techcon Systems Inc., Dept. EM, 16016 So. Figueroa St., Gardena, Cal 90248
M Telectro Sys. Corp., Dept. EM, 96-18 43rd Ave., Corona, N.Y. 11368
TRW Auto-E, Dept. EM, Davis & Copewood Sts., Camden, N.J. 08103
M UTE Microwave, Dept. EM, 3500 Sunset Ave., Asbury Park, N.J. 07712

Pressure Vessels—See Chambers, Pressure

Pressure Indicators—See Gages, Pressure

Pressurization Units—See Chambers, Pressure

Printers, Digital

D **Canon U.S.A., Inc., Dept. EM, 10 Nevada Dr., Lake Success, N.Y. 11040** ..... *
M **Clary Corp., Precision Instrs. Div., Dept. EM, 320 W. Clary Ave., San Gabriel, Cal. 91776** ..... p. 3373
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 p. 2687
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... *
D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043** *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 ..... *
Gulton Inds., Inc., Measurement & Control Systems Div., Dept. EM, Gulton Ind'l. Pk., E. Greenwich, R.I. 02818 ..... p. 2841
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D **Houston Instrument, Div. Bausch & Lomb, Dept. EM, 8500 Cameron Rd., Austin, Tex. 78753** ..... p. 2844
D **Itoh Electronics, Inc. (C.), Dept. EM, 280 Park Ave., New York, N.Y. 10017** p. 1647
D **IVO Industries, Dept. EM, 1109 Green Grove Rd., Neptune, N.J. 07753** p. 2268,2269
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D **Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705** p. 2793
Philips Test & Measuring Instrs., Dept. EM, 85 McKee Dr., Mahwah, NJ 07430 ..... *
PPM, Inc., Dept. EM, 7575 Bond St., Cleveland, Ohio 44139 ..... p. 2801
Practical Automation, Inc., Dept. EM, Trap Falls Rd., Shelton, Conn. 06484 p. 1659
DM **Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518** ..... *
United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403 ..... p. 2832
Acme Model Engrg. Co., Dept. EM, 654 Bergen Blvd., Ridgefield, N.J. 07657
Addmaster Corp., Dept. EM, 416 Junipero Serra Dr., San Gabriel, Cal. 91776
D Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
Anadex Inc., Dept. EM, 9825 De Soto, Chatsworth, Cal. 91311
Beckman Instrs., Ectrn. Instrs. Div. Ectrn. Instrumentation, Dept. EM, 3900 N. River Rd., Schiller Park, Ill. 60176
Berkeley Instruments, Inc., Dept. EM, 2700 Dupont Dr., Irvine, Cal. 92715
M California Computer Prods., Dept. EM, 2411 W. La Palma Ave., Anaheim, Cal 92801
Centronics Data Computer Corp., Dept. EM, Wall St., Hudson, N.H. 03051
Computer Devices, Dept. EM, 25 North Avenue, Burlington, Mass. 01803
Computer Terminal Sys., Dept. EM, 52 Newtown Plaza, Plainview, N.Y. 11803
Computer Transceiver Systems, Dept. EM, 66 E. Midland Ave., Paramus, N.J. 07652
Consolidated Controls Corp., Dept. EM, 15 Durant Ave., Bethel, Conn. 06801
DM Data General Corp., Dept. EM, 15 Turnpike Rd Rte 9, Westboro, Mass 01581
Dataproducts Corp., Dept. EM, 6219 DeSoto Ave., Woodland Hills, Cal. 91365
D Datadyne Corp., Dept. EM, Box 247, King of Prussia, Pa. 19406

Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
Electronic Counters & Controls Inc., Dept. EM, 1500 McCormick Blvd., Mundelein, Ill. 60060
D Facit-Addo, Inc., Dept. EM, 66 Field Point Rd., Greenwich, Conn. 06830
Hecon Corp., Dept. EM, 31 Park Rd., Tinton Falls, N.J. 07724
Honeywell Information Sys Inc, Dept. EM, 200 Smith St M5440, Waltham, Mass. 02154
Innovative Electronics Inc., Dept. EM, 15200 NW 60th Ave., Miami Lakes, Fla. 33014
D International Data Sciences, Dept. EM, 100 Nashua St., Providence, R.I. 02904
M ITT General Controls, Dept. EM, 801 Allen Ave., Glendale, Cal. 91201
Keltron Corp., Dept. EM, 225 Crescent St., Waltham, Mass. 02154
Markem Corp., Dept. EM, 1000 Congress St., Keene, NH 03431
Nu-Metrics, Dept. EM, P.O. Box 800, Connellsville, Pa. 15425
D Omnitec Corporation, Dept. EM, 2405 S. 20th St., Phoenix, Ariz. 85034
Perkin-Elmer Data Systems, Terminals Div., Dept. EM, Rt. 10 & Emery Ave., Randolph, N.J. 07801
Potter Instr. Co. Inc., Dept. EM, 151 Sunnyside Blvd., Plainview, N.Y. 11803
Sweda Int'l., OEM Prods., Dept. EM, 34 Maple Ave., Pine Brook, N.J. 07058
DM Systron Donner, Data Products Div., Dept. EM, 735 Detroit Ave., Concord, Cal. 94518
Tally Corp., Dept. EM, 8301 S. 180th St., Kent, Wash. 98103
Tech Serv., Inc., BRS/LVE Div, Dept. EM, 5301 Holland Dr., Beltsville, Md 20705
Teledyne Gurley, Dept. EM, 514 Fulton St., Troy, N.Y. 12181
Trivex, Dept. EM, 3180 Redhill Ave., Costa Mesa, Cal. 92626
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
D Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102

Printers, Line, Tape-Listing—See Printers, Digital

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Probes, Hall

Active Control Instrumentation, Dept. EM, PO Box 243-Wildwood Circle, Key Largo, Florida 33037 ..... *
Airpax Elctrns., Controls Div., Dept. EM, 6801 W. Sunrise Blvd., Ft. Lauderdale, Fla. 33313 ..... *
Bell, Inc., F.W., Dept. EM, 4949 Freeway Dr. E., Columbus, Ohio 43229 p. 2666,2667
D Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032 *
M Ohio Semitronics, Inc., Dept. EM, 1205 Chesapeake Ave., Columbus, Ohio 43212 ..... p. 4304
RFL Inds., Instr. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005 ..... *
LDJ Electronics, Dept. EM, 1064 Naughton Ave., Troy, Mich. 48084
DM Magnos, Incorporated, Dept. EM, Old School House Rd., Harvard, Mass. 01451
Walker Scientific, Inc., Dept. EM, Rockdale St., Worcester, Mass. 01606

Probes, High-Voltage (1,000 Volts & Over)

Alden Products Co, Dept. EM, 117 N Main St, Brockton, Mass. 02403 ..... *
D B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 ..... p. 2679
D Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005 ..... *
Bertan Assocs., Inc., Dept. EM, 3 Aerial Way, Syosset, N.Y. 11791 ..... *
Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 ..... *
Data Precision Corporation, Dept. EM, Audubon Rd., Wakefield, Mass 01880 *
D Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 p. 2738
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
M Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509 ..... *
D ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ..... p. 2030,2031
D Non-Linear Sys., Inc., Dept. EM, 533 Stevens Ave., Solana Beach, Cal. 92075 *
M Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... p. 3609
M Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... *
D Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... *
D Slaughter Co., Dept. EM, Moore & Hailey Sts., P.O. Box 1805, Ardmore, Okla. 73401 ..... *
D Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2113
D Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817 ..... *
Beckman Instrs., (AISSD), Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634
Dexter Scientific, Dept. EM, 1526 Arnold Dr., Melbourne, Fla. 32935
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602
D Lectrotech, Inc., Dept. EM, 5810 N. Western Ave., Chicago, Ill. 60659
Micro Instrument Co., Marine & Power Instr. Div., Dept. EM, 2250 Micro Pl., Escondido, Cal. 92025
M Peschel Instrs., Inc., Dept. EM, 1412 Viscaya Pkwy., Cape Coral, Fla. 33904
D Sencore, Dept. EM, 3200 Sencore Dr., Sioux Falls, S.D. 57107
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Test Probes, Inc., Dept. EM, Box 2113, La Jolla, Cal. 92038
Zi-Tech Div., Aikenwood Corp., Dept. EM, Box 26, 2151 Park Blvd., Palo Alto, Cal. 94302

Probes, Logic Test

D ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845 ..... *
B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 ..... p. 2679
D Continental Specialties Corp., Dept. EM, Box 1942, 70 Fulton Terr, New Haven, Conn. 06509 ..... *
E & L Instruments, Inc., Dept. EM, 61 First St., Derby, Conn. 06418 ..... *
D Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 p. 2745
D Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ..... p. 2027,2028
D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
Kurz-Kasch, Inc., Knob Div., Dept. EM, 711 Hunter Dr., Wilmington, Ohio 45177
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077

Probes, Microwave

M General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 p. 2870
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
M Aircom, Inc., Dept. EM, Rte. 16B, Union, N.H. 03887
Alessi Inds., Dept. EM, 3195-C Airport Loop Dr., Costa Mesa, Cal. 92626
Alford Mfg. Co., Dept. EM, 120 Cross St., Winchester, Mass. 01890
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
D Nu-Concept Computer Systems, Inc., Dept. EM, Route 309 and Advance Lane, Colmar, Pa. 18915
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006

Probes, Oscilloscopes

Active Control Instrumentation, Dept. EM, PO Box 243-Wildwood Circle, Key Largo, Florida 33037 ..... *
D B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 ..... p. 2679
D Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
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D Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803 *
D Philips Test & Measuring Instrs., Dept. EM, 85 McKee Dr., Mahwah, NJ 07430 ..... *
VIZ Manufacturing Co., Dept. EM, 335 E. Price St., Phila, Pa. 19144 ..... *
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
M Dumont Oscilloscope Labs., Dept. EM, 40 Fairfield Pl., W. Caldwell, N.J. 07006
D Lectrotech, Inc., Dept. EM, 5810 N. Western Ave., Chicago, Ill. 60659
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Test Probes, Inc., Dept. EM, Box 2113, La Jolla, Cal. 92038
D Vu-data Corp., Dept. EM, 7170 Convoy Ct., San Diego, Cal. 92111

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D B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 ..... p. 2679
Bird Electronic Corp., Dept. EM, 30303 Aurora Rd., Solon, Ohio 44139 ..... *
Boonton Electronics Corp., Dept. EM, Route #287, Parsippany, N.J. 07054 *
D Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 *
M General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Magnetic Shield Div., Perfection Mica, Dept. EM, 750 North Thomas Dr., Bensenville, Ill. 60106 ..... *
D Philips Test & Measuring Instrs., Dept. EM, 85 McKee Dr., Mahwah, NJ 07430 ..... *
Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... *
D Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... *
Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2148
D Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219 *
D Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817 ..... *
Alford Mfg. Co., Dept. EM, 120 Cross St., Winchester, Mass. 01890
M Atlantic Research Corp., Dept. EM, 5390 Cherokee Ave., Alexandria, Va 22314
Electro-Metrics, Div. Penril Corp., Dept. EM, 100 Church St., Amsterdam, N.Y. 12010
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
Pylon Co., Inc., Dept. EM, 51 Newcomb St., Attleboro, Mass. 02703
Solar Elctrns. Co., Dept. EM, 901 N. Highland, Hollywood, Cal. 90038
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Test Probes, Inc., Dept. EM, Box 2113, La Jolla, Cal. 92038

Probes, Temperature

D Edsyn, Inc., Dept. EM, 15958 Arminta St., Van Nuys, Cal. 91406 ..... *
Fenwal Elctrns., Dept. EM, 63 Fountain St., Framingham, Mass. 01701 p. 4273
D Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 p. 2738,2739
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *

D **Gulton Inds., Inc., Measurement & Control Systems Div., Dept. EM, Gulton Ind'l. Pk., E. Greenwich, R.I. 02818** ..... *
Harrel, Inc., Dept. EM, 16 Fitch St., E. Norwalk, Conn. 06855 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Keystone Carbon Co., Thermistor Div., Dept. EM, St. Marys, Pa. 15857 ..... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
D **Midwest Components, Dept. EM, 1981 Port City Blvd., Muskegon, Mich. 49400** ..... p. 4281
Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 ..... p. 4284
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M **Relco Prods., Dept. EM, 5594 E. Jefferson Ave., Denver, Colo. 80237** ..... *
RFL Inds., Instr. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005 ..... *
D **RFL Inds., Thermocontrol Div., Dept. EM, Boonton, N.J. 07005** ..... *
D **Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817** ..... *
D **United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403** ..... p. 2832
M Ametek/Rodan Div., Dept. EM, 2905 Blue Star St., Anaheim, Cal. 92806
D Amprobe Instrument, Div. SOS Consolidated Inc., Dept. EM, 630 Merrick Rd., Lynbrook, N.Y. 11563
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
M Bailey Instrs., Inc., Dept. EM, 515 Victor St., Saddle Brook, N.J. 07662
Burns Engrg., Inc., Dept. EM, 10201 Bren Rd. East, Minnetonka, Minn. 55343
Climatronics Corp., Dept. EM, 1324 Motor Pkwy., Hauppauge, N.Y. 11787
Conax Corp., Dept. EM, 2300 Walden Ave., Buffalo, N.Y. 14225
Consolidated Controls Corp., Dept. EM, 15 Durant Ave., Bethel, Conn. 06801
M Cox & Co., Inc., Dept. EM, 215 Park Ave., S., New York, N.Y. 10003
D Degussa Corporation, Metals Div., Dept. EM, Route 46 & Hollister Rd., Teterboro, NJ 07608
Gow-Mac Instr. Co., Dept. EM, P. O. Box 32, Bound Brook, N.J. 08805
Gulton Inds., Inc., Elctrn. Comps. Div., Dept. EM, Piezo Products Div., Metuchen, N.J. 08840
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
Hy-Cal Engrg, Dept. EM, 12105 Los Nietos Rd., Santa Fe Springs, Cal 90670
Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962
D LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
Marlin Manufacturing Corp., Dept. EM, 12404 Triskett Rd., Cleveland, Ohio 44111
NAN MAC, Dept. EM, 9 Mayhew St., Framingham, Mass. 01701
Pace Inc., Dept. EM, 9329 Fraser Ave., Silver Spring, Md. 20910
Raytek Div. Optical Coating Lab, Dept. EM, 325 E. Middlefield Rd., Mountain View, Cal. 94043
Simmonds Precision, Engine Systems Div., Dept. EM, Norwich, N.Y. 13815
M Syscon Int'l., Inc., Dept. EM, 1239 South Bend Ave., So. Bend, Ind. 46617
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Tempkey Inc., Dept. EM, 2155 Park Blvd., Palo Alto, Cal. 94306
Thermo Elec. Co., Inc., Dept. EM, 109 Fifth St., Saddle Brook, N.J. 07662
Trans-Met Engrg., Dept. EM, 601 S. Palm St., La Habra, Cal. 90631
D United Elec. Controls Co., Dept. EM, 85A School St., Watertown, Mass. 02172
D Victory Engrg. Corp., Dept. EM, Victory Rd., Springfield, N.J. 07081
VirTis Co., Dept. EM, Rte. 208, Gardiner, N.Y. 12525
West Coast Resch. Corp., Dept. EM, Box 25061, Los Angeles, Cal. 90025
D Yellow Springs Instrument Co., Dept. EM, Box 279, Yellow Springs, Ohio 45387

Probes, Test Lead

Alden Products Co, Dept. EM, 117 N Main St, Brockton, Mass. 02403 ..... *
Allied Systems Corp., Dept. EM, Box 11005, Greensboro, N.C. 27409 ..... *
D **B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635** ..... p. 2679
D **Belden Corp., Electronic Div., Dept. EM, Box 1327, Richmond, Ind. 47374** .. *
Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 ..... *
Continental Specialties Corp., Dept. EM, Box 1942, 70 Fulton Terr, New Haven, Conn. 06509 ..... *
D **Cutler-Hammer, Shallcross Resistor Prods., Dept. EM, US 70 East, Smithfield, N.C. 27577** ..... *
D **Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458** ..... *
D **Elctrn. Molding Corp., Dept. EM, 96 Mill St., Woonsocket, R.I. 02895** ..... *
D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043** *
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D **ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766** ..... p. 2027-2029,2031
DM **Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012** .. *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
M **Mac Panel Co., Dept. EM, Box 5027, 216 Pine St., High Pt., N.C. 27262** ..... *
National Tel-Tronics, Div. Electro Audio Dynamics, Inc., Dept. EM, State Road Hill, Meadville, Pa. 16335 ..... *
Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... *
M **Rowe Industries, inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612** ..... *
Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543 ..... *
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** ..... *
D **Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207** p. 2113-2115,2117,2118,2145,2148
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
D **Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817** ..... *
VIZ Manufacturing Co., Dept. EM, 335 E. Price St., Phila, Pa. 19144 ..... *
Aerolite Elexs Corp., Dept. EM, 2207 Summit Ave., Union City, N.J. 07087
Air-O-Tronics Prods., Dept. EM, Box K, Morrisville, N.Y. 13408
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
Control Inds Inc., Dept EM, 530 Burnside Ave., Inwood, N.Y. 11696
E-Z-Hook, Div. Tektest, Dept. EM, Box 450 114 E. St. Joseph, Arcadia, Cal. 91006
D Everett/Charles, Inc., Dept. EM, 2806 Metropolitan Pl., Pomona, Cal. 91767
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
M Nelson Ross Elctrns., Dept. EM, 5 Delaware, Lake Success, N.Y. 11040
M Projects Unlimited, Inc., Dept. EM, 3680 Wyse Rd., Dayton, Ohio 45414
Pylon Co., Inc., Dept. EM, 51 Newcomb St., Attleboro, Mass. 02703
D SPECO Div, Components Specialties, Inc., Dept. EM, PO Box 624 1172 Rte 109, Linderhurst, NY 11757
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077

Process Control Systems

M **Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470** ..... *
Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 .. p. 3975
Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 ..... p. 2839
Harrel, Inc., Dept. EM, 16 Fitch St., E. Norwalk, Conn. 06855 ..... p. 2267
M **Info-Lite Corp., Dept. EM, 46-10 104 St., Corona, N.Y. 11368** ..... *
Information Transfer Industrial, Inc., Dept. EM, Box 357, Holcomb, N.Y. 14469 ..... p. 1646
International Electro-Magnetics, Dept. EM, 350 N. Eric Dr., Palatine, Ill. 60067 p. 1011
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 p. 2778
Matrix Corp., Dept. EM, 2260 Distributors Dr., Indianapolis, Ind. 46241 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
Servo-Tek Prods. Co., Dept. EM, 1086 Goffle Rd., Hawthorne, N.J. 07506 .. *
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Applied Systems Corp., Dept. EM, 26401 Harper Ave., St. Clair Shores, Mich. 48081
Benton Corp, Dept. EM, Race St Box 678, Manor, PA 15665
BLH Elctrns., Dept. EM, 42 Fourth Ave., Waltham, Mass. 02154
Cross Electronics Inc., Dept. EM, 100 Commonwealth Dr., Warrendale, Pa. 15086
Data Acquisition Prods. Lab., AEL, Inc., Dept. EM, Box 552, Lansdale, Pa. 19446
Data General Corp., Dept. EM, 15 Turnpike Rd Rte 9, Westboro, Mass 01581
Datawest Corp., Dept. EM, 7333 E. Helm Dr., Scottsdale, Ariz. 85260
D Dillon, W.C. & Co., Dept. EM, 14620-EP Keswick St., Van Nuys 340, Cal. 91407
Dynapar Corp., Dept. EM, 1675 Delany Rd., Gurnee, Ill. 60031
Electronic Counters & Controls Inc., Dept. EM, 1500 McCormick Blvd., Mundelein, Ill. 60060
Haydon Switch & Instr., Inc., Dept. EM, 1500 Meriden Rd., Waterbury, Conn. 06705
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
DM Hughes Aircraft Co., Ind'l. Prods. Div., Prod. Equip. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
Instr. & Control Sys., Inc., Dept. EM, 520 Interstate Rd, Addison, Ill. 60101
IPAC Group, Inc., Dept. EM, POB 156 3047 Industrial Blvd., Bethel Park, PA 15102
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
MilerTronics, Dept. EM, 303 Airport Rd, Greenville, S.C. 29607
OAS Inc., Dept. EM, 145 Palasades St., Dobbs Ferry, N.Y. 10522
PCS., Inc., Dept. EM, 750 N. Maple Rd., Saline, Mich. 48176
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
D Precision Timer Co., Dept. EM, 13 Westbrook Ind'l. Park, Westbrook, Conn. 06498
M Production Process, Div. Ind'l. Marine Elctrns. Inc., Dept. EM, Grenier Ind'l. Park, Londonderry, N.H. 03053
D Regmo Data Corp., Dept. EM, 7275 Bush Lk Rd., Minneapolis, Minn. 55435
Rochester Instr System, Dept. EM, 255 N. Union St., Rochester, N.Y. 14605
Rosemount Inc., Dept. EM, Box 35129, Minneapolis, Minn. 55435
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Standard Engineering, Dept. EM, 44800 Industrial Dr., Fremont, Cal. 94538
Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071

Program Board Connectors—See Connectors, Plug-In Program Board

Programmers, Cam & Drum

Blue M Electric Co., Dept. EM, 138th & Chatham St., Blue Island, Ill. 60406 *
Chicago Miniature/Drake, Dept. EM, 4433 N Ravenswood Ave., Chicago, Ill. 60640 ..... *
M **Cole Instrument, Div. F.H. Cole Entprs., Dept. EM, 2034 Placentia Ave., Costa Mesa, Cal. 92627** ..... p. 4025
Matrix Corp., Dept. EM, 2260 Distributors Dr., Indianapolis, Ind. 46241 p. 1654
D **Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543** ..... *
Automatic Timing & Controls Co., Dept. EM, King of Prussia, Pa. 19406
C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
Crouzet/Cridland, Dept. EM, 118 Barrington Commons Ct Ste 207, Barrington, Ill. 60010
D Delta Design, Inc., Dept. EM, 5725 Kearny Villa Road, San Diego, Cal 92123
D Eagle Signal, Mfg. Div. Gulf & Western Inds., Dept. EM, Box 3585, Davenport, Iowa 52808
Indl Timer An Esterline Co., Dept. EM, U.S. Hwy 287, Parsippany, N.J. 07054
Precision Timer Co., Dept. EM, 13 Westbrook Ind'l. Park, Westbrook, Conn. 06498
D Research, Inc., Dept. EM, Box 24064, Minneapolis, Minn. 55424
Tenor Co., Inc., Dept. EM, 17020 W. Rogers Dr., New Berlin, Wisc. 53151

Programmers, Matrix Boards—See Boards, Programming

Programmers, IC Memory & Logic Array

Allied Systems Corp., Dept. EM, Box 11005, Greensboro, N.C. 27409 p. 1683
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 p. 1469
Harrel, Inc., Dept. EM, 16 Fitch St., E. Norwalk, Conn. 06855 p. 2267
Matrix Corp., Dept. EM, 2260 Distributors Dr., Indianapolis, Ind. 46241 p. 1654
PPM, Inc., Dept. EM, 7575 Bond St., Cleveland, Ohio 44139 p. 2801
Tenney Engrg., Inc., Dept. EM, 109 Springfield Rd., Union, N.J. 07083 p. 2573
Applied Systems Corp., Dept. EM, 26401 Harper Ave., St. Clair Shores, Mich. 48081
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Martin Research, Dept. EM, 3336 Commercial Ave., Northbrook, Ill. 60062
MilerTronics, Dept. EM, 303 Airport Rd, Greenville, S.C. 29607
PCS., Inc., Dept. EM, 750 N. Maple Rd., Saline, Mich. 48176
D Rockwell Int'l., Microelectronic Devices, Dept. EM, Box 3669, 3310 Miraloma Ave., Anaheim, Cal. 92803
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201

Programmers, Punched Card

M AMP Capitron Div./AMP Inc., Dept. EM, 1595 S. Mt. Joy St., Elizabethtown, Pa. 17022 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
D Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543 *
M Taurus Corp., Dept. EM, Academy Hill, Lambertville, N.J. 08530 *
Automatic Timing & Controls Co., Dept. EM, King of Prussia, Pa. 19406
D Crouzet/Cridland, Dept. EM, 118 Barrington Commons Ct Ste 207, Barrington, Ill. 60010

Programmers, Tape

Harrel, Inc., Dept. EM, 16 Fitch St., E. Norwalk, Conn. 06855 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
Amilon Corp., Dept. EM, 49-12 30th Ave., Woodside, N.Y. 11377
Electronic Counters & Controls Inc., Dept. EM, 1500 McCormick Blvd., Mundelein, Ill. 60060
Indl Timer An Esterline Co., Dept. EM, U.S. Hwy 287, Parsippany, N.J. 07054

Protectors, Brownout

Abacus Controls Inc., Dept. EM, 89 Redington Rd., Somerville, N.J. 08876 *
Active Control Instrumentation, Dept. EM, PO Box 243-Wildwood Circle, Key Largo, Florida 33037 *
Deltec Corp., Dept. EM, 980 Buenos Ave., San Diego, Cal. 92110 *
D Diversified Electronics Inc., Dept. EM, 119 N. Morton Ave., Evansville, Ind. 47711 p. 3448
Heinemann Elec. Co., Dept. EM, Trenton, N.J. 08650 p. 4080
Pioneer Magnetics, Dept. EM, 1745 Berkeley St., Santa Monica, Cal. 90404 p. 3294,3295
Power One, Dept. EM, Power-One Dr, Camarillo, Cal. 93010 p. 3306
Coilcraft, Dept. EM, 1102 Siler Lake Rd., Cary, Ill. 60013
GTE Sylvania Inc., Dept. EM, Rte. 35, Standish, Maine 04084
Transtector Systems, Dept. EM, 532 Monterey Pass Rd., Monterey Park, Cal. 91754
VHF Engrg, Div. of Brownian Elctrns. Corp., Dept. EM, 320 Water St., Binghamton, N.Y. 13902

Protectors, Contact—See Suppressors, Arc

Protectors, Surge-Also See Suppressors, Arc; Arresters, Electrical Surge; Suppressors, Transient Voltage

D Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634 *
D Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645 p. 4024
Cober Elctrns., Inc., Dept. EM, 7 Gleason Ave., Stamford, Conn. 06902 *
Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 *
Deltec Corp., Dept. EM, 980 Buenos Ave., San Diego, Cal. 92110 *
Heinemann Elec. Co., Dept. EM, Trenton, N.J. 08650 p. 4080
D International Rectifier Corp., Semiconductor Div., Dept. EM, 233 Kansas St., El Segundo, Cal. 90245 *
M McG Electronics Inc., Dept. EM, 160 Brook Ave., Deer Park, N.Y. 11729 p. 4106
D Midwest Components, Dept. EM, 1981 Port City Blvd., Muskegon, Mich. 49400 *
D Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 *
Power One, Dept. EM, Power-One Dr, Camarillo, Cal. 93010 p. 3306
Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 *
Sanford-Miller Corp., Dept. EM, 8 John St., Lynbrook, N.Y. 11563 *
D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 *
Victoreen, Inc., Dept. EM, 10101 Woodland Ave., Cleveland, Ohio 44104 *
Barber Corp., Dept. EM, Box 635, Waynesville, Ohio 45068
Control Concepts Corp., Dept. EM, 333 Front St., Binghamton, N.Y. 13905
Eastern Delta Corp., Dept. EM, 29-09 S. Broadway, Fair Lawn, N.J. 07410
DM General Semiconductor Industries, Inc., Dept. EM, 2001 W. 10 Pl., Box 3078, Tempe, Ariz. 85281
GTE Sylvania Inc., Dept. EM, Rte. 35, Standish, Maine 04084
Joslyn Elctrn. Sys., Div. Joslyn Mfg. & Supp, Dept. EM, 6868 Cortona Dr., Box 817, Goleta, Cal. 93017
D Mechanical Products, Inc., A Norlin Tech Co, Dept. EM, 1824 River St. Box 729, Jackson, Mich. 49204
Micro, Emerson Electric Co. Devices Div, Dept. EM, Box 501 Wright Bros Br, Dayton, Ohio 45409
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Texas Instruments Control Prods. Div., Dept. EM, 34 Forrest St., Attleboro, Mass. 02703
M Transtector Systems, Dept. EM, 532 Monterey Pass Rd., Monterey Park, Cal. 91754
VHF Engrg, Div. of Brownian Elctrns. Corp., Dept. EM, 320 Water St., Binghamton, N.Y. 13902
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Public Address Systems

Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 *
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
D Argos Products Co., Inc., Dept. EM, 600 S. Sycamore St., Genoa, Ill. 60135
Audio Equip., Div. W. Kidde & Co., Inc., Dept. EM, 706 Forrest St., Charlottesville, Va. 22901
Audiotronics Corp., Dept. EM, 7428 Bellaire Ave., N. Hollywood, Cal. 91605
D Bogen Div., Lear Siegler, Inc., Dept. EM, Box 500, Paramus, N.J. 07652
D Encom Prods. Co., Inc., Dept. EM, Lower Hopewell Rd., Box 300, Oxford, Pa. 19363
Midwest Electronic Industries, Dept. EM, 4945 W. Belmont Ave., Chicago, Ill. 60641
D Newcomb Audio Products Co., Dept. EM, 12881 Bradley Ave., Sylmar, Cal. 91342
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D PASO Sound Products Inc., Dept. EM, 14 First St, Pelham, NY 10803
D Perma Power Elctrns, Dept. EM, 5615 W. Howard Ave., Chicago, Ill. 60648
Precision Electronics, Inc., Dept. EM, 9101 King Ave., Franklin Park, Ill 60131
D Robins Broadcast & Sound Equipment Corp., Sub. Robins Inds., Dept. EM, 75 Austin Blvd., Commack, N.Y. 11725
D Shure Brothers, Inc., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204
D Spectra Sonics, Dept. EM, 770 Wall Ave., Ogden, Utah 84404
Tape-Athon Corp., Dept. EM, 502 S. Isis Ave., Inglewood, Cal 90301

Pullers, Circuit Board

D Augat Interconnection Prods. Div., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703 *
D Bivar, Inc., Dept. EM, 1617 E. Edinger Ave., Santa Ana, Cal. 92705 p. 1024
D Excel Products Co., Inc., Dept. EM, 401 Joyce Kilmer Ave., New Brunswick, N.J. 08903 *
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D Thermalloy, Inc., Dept. EM, 2021 W. Valley View, Dallas, Tex 75234 *
D Triad-Utrad, Distr Svcs., Dept. EM, 305 N. Briant St., Huntington, Ind. 46750 *
UNITRACK Div., Calabro Plastics, Inc., Dept. EM, 8738 W. Chester Pike, Upper Darby, Pa. 19082 p. 1050
D Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342 *
D Vero Electronics, Dept. EM, 171 Bridge Rd., Hauppauge, N.Y. 11787 *
D Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 *
Accessories for Electronics, Dept. EM, 800 Merrick Road, Baldwin, N.Y. 11510
DM Amrad Corp., Dept. EM, Box 876, Paris, Tex. 75460
DM Calmark Corp., Dept. EM, 4947 Walnut Grove, 4947 Walnut Grove, Cal. 91776
Des Tek Ind., Dept. EM, Box 24163, Los Angeles, Cal. 90024
Gibson/Egan Co., Dept. EM, 2666 East Huntington Dr., Duarte, CA. 91010
M Hybricon Corp., Dept. EM, 410 Crest Rd., Litteton, Mass. 01460
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
Loranger Mfg. Corp., Dept. EM, Box 948, Warren, Pa. 16365
DM Scanbe Div., Zero Corp., Dept. EM, 3445 Fletcher Ave., El Monte, Cal. 91731
D Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050

Pullers, Tube

Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 *
D Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016

Pulsers, Diode—See Power Supplies for Lasers

Pulsers, Logic Test

NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
E-H International, Inc., Dept. EM, 515 11th St Box 1289, Oakland, Cal 94604
E-H Resch. Labs., Inc., Dept. EM, Box 1289, Oakland, Cal. 94604
Moxon Inc., Dept. EM, 2222 Michelson Dr. Bldg. E, Irvine, Cal. 92715

Pumps, Vacuum

D Edsyn, Inc., Dept. EM, 15958 Arminta St., Van Nuys, Cal. 91406 p. 4289
D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 *
M Air-Vac Engrg. Co., Dept. EM, 100 Gulf St., Milford, Conn. 06460
Ametek/Lamb Electric, Dept. EM, 627 Lake St., Kent, Ohio 44240
Brailsford & Co., Dept. EM, 670 Milton Rd., Rye, N.Y. 10580
D CVC Products, Inc., Dept. EM, 525 Lee Rd., Box 1886, Rochester, N.Y. 14603
Dresser Industries, Dept. EM, 1505 Elm St., Dallas, Tex. 75201
Everett/Charles, Inc., Dept. EM, 2806 Metropolitan Pl., Pomona, Cal. 91767
FTS Systems Inc., Dept. EM, POB 158, Stone Ridge, N.Y. 12484
Gardner-Denver Co., Pneutronics Div., Dept. EM, 1333 Fulton St., Grand Haven, Mich. 49417
D GCA/Precision Scientific, Dept. EM, 3737 W. Cortland St., Chicago, Ill. 60647
High Voltage Engrg. Corp., Dept. EM, S. Bedford St., Burlington, Mass. 01803
D Hull Corp., Dept. EM, Davisville Rd., Hatboro, Pa. 19040

Materials Resch. Corp., Dept. EM, Route 303, Orangeburg, N.Y. 10962
Molon Motors & Coil Corp., Dept. EM, 3737 Industrial Ave., Rolling Meadows, Ill. 60008
Perkin-Elmer Ultek Inc., Dept. EM, Box 10920, Palo Alto, Cal. 94303
Red Point Corp., Dept. EM, 105 W. Spazier, Burbank, Cal. 91502
Snap-On-Tools, Dept. EM, 8192-A 28th Ave., Kenosha, Wisc. 53140
T-M Vacuum Prods., Dept. EM, Warrington & Rowland, Riverton, N.J. 08077
DM Ulvac North America, Dept. EM, Colchester Plaza, Colchester, VT 05446
Vactronic Lab. Equip., Inc., Dept. EM, 65 Brightside Ave., E. Northport, N.Y. 11731
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Punched Card Equipment

M AMP Capitron Div./AMP Inc., Dept. EM, 1595 S. Mt. Joy St., Elizabethtown, Pa. 17022 ..... p. 1382,1383
Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 p. 1643
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D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
M AMP Special Industries, Dept. EM, Valley Forge, Pa. 19482
D Crouzet/Cridland, Dept. EM, 118 Barrington Commons Ct Ste 207, Barrington, Ill. 60010
HEI, Inc., Dept. EM, Jonathan Ind'l. Ctr., Chaska, Minn. 55318
Micro Multi Circuits, Card Reader Div, Dept. EM, POB 17024, Irvine, Cal. 92713
Optron, Inc., Dept. EM, 1201 Tappon Cir., Carrollton, Tex. 75006
Sensor Technology, Dept. EM, 21012 Lassen St., Chatsworth, Cal. 91311

Punches, Chassis

AMP Capitron Div./AMP Inc., Dept. EM, 1595 S. Mt. Joy St., Elizabethtown, Pa. 17022 ..... *
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... p. 1290
D Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2123
D Di-Acro, Div. Houdaille Inds., Inc., Dept. EM, 316 8th Ave., Lake City, Minn. 55041
D Greenlee Tool Co., Dept. EM, 2136-12th St., Rockford, Ill. 61101
Switchcraft, Inc., Dept. EM, 5555 N. Elston, Chicago, Ill. 60630

Pyrometers, Infrared

Harrel, Inc., Dept. EM, 16 Fitch St., E. Norwalk, Conn. 06855 ..... *
Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 ..... *
M Barnes Engrg. Co., Dept. EM, 30 Commerce Rd., Stamford, Conn. 06902
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
Capintec Instruments, Inc., Dept. EM, 136 Summit Ave., Montvale, N.J. 07645
Electro-Optical Inds., Inc., Dept. EM, 839 Ward Dr., Santa Barbara, Cal. 93111
D Epic, Inc., Dept. EM, 150 Nassau St., New York, N.Y. 10038
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Hy-Cal Engrg, Dept. EM, 12105 Los Nietos Rd., Santa Fe Springs, Cal 90670
Ircon Inc., Dept. EM, 7555 N. Linder Ave, Skokie, Ill. 60076
Kollsman Instr. Co., Dept. EM, Daniel Webster Hwy., Merrimack, N.H. 03054
Mikron Instr. Co., Dept. EM, Box 211, Ridgewood, N.J. 07451
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
Raytek Div. Optical Coating Lab, Dept. EM, 325 E. Middlefield Rd., Mountain View, Cal. 94043
Sensors, Inc., Dept. EM, 3908 Varsity Dr., Ann Arbor, Mich. 48104

Pyrometers, Optical, Non-Infrared

Beede Electrical Instr. Co., Dept. EM, S. Main St., Penacook, N.H. 03301 p. 2664
Gulton Inds., Inc., Measurement & Control Systems Div., Dept. EM, Gulton Ind'l. Pk., E. Greenwich, R.I. 02818 ..... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
Modutec, Inc., Dept. EM, 18 Marshall St., Norwalk, Conn. 06854 ..... p. 2787
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 ..... p. 4284
D Capintec Instruments, Inc., Dept. EM, 136 Summit Ave., Montvale, N.J. 07645
Edmund Scientific Co., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007
D Epic, Inc., Dept. EM, 150 Nassau St., New York, N.Y. 10038
Ircon Inc., Dept. EM, 7555 N. Linder Ave, Skokie, Ill. 60076
Kollsman Instr. Co., Dept. EM, Daniel Webster Hwy., Merrimack, N.H. 03054
D Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962
Mikron Instr. Co., Dept. EM, Box 211, Ridgewood, N.J. 07451
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
D Syscon Int'l., Inc., Dept. EM, 1239 South Bend Ave., So. Bend, Ind. 46617

Pyrometers, Recording

General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Gulton Inds., Inc., Measurement & Control Systems Div., Dept. EM, Gulton Ind'l. Pk., E. Greenwich, R.I. 02818 ..... *
Harrel, Inc., Dept. EM, 16 Fitch St., E. Norwalk, Conn. 06855 ..... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
Modutec, Inc., Dept. EM, 18 Marshall St., Norwalk, Conn. 06854 ..... p. 2787
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 ..... *
D Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... *
D Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... *
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
Capintec Instruments, Inc., Dept. EM, 136 Summit Ave., Montvale, N.J. 07645
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
James Electronics Inc., Dept. EM, 4050 N Rockwell St, Chicago, Ill. 60618
Mikron Instr. Co., Dept. EM, Box 211, Ridgewood, N.J. 07451
NAN MAC, Dept. EM, 9 Mayhew St., Framingham, Mass. 01701
Syscon Int'l., Inc., Dept. EM, 1239 South Bend Ave., So. Bend, Ind. 46617
Thermo Elec. Co., Inc., Dept. EM, 109 Fifth St., Saddle Brook, N.J. 07662
D West Instrs, Gulton Inds, M. C. S. Div., Dept. EM, Gulton Ind! Pk, E. Greenwich, RI 02818

Quartz, Fused

Atomergic Chemetals Corp Co., Dept. EM, 100 Fairchild Ave., Plainview, N.Y. 11803
Centerflex Ceramics, Dept. EM, 221 Seventh Ave., Hawthorne, N.J. 07507
Corning Glass Works, Dept. EM, Main Plant, Bldg. 21-3, Corning, NY 14830
Esco Products, Dept. EM, Oak Ridge Rd., Oak Ridge, NJ 07438
General Electric Co., Lamp Components Sls. Oper., Dept. EM, 21800 Tungsten Rd., Cleveland, Ohio 44117
M Heraeus-Amersil, Inc., Dept. EM, 650 Jernees Mill Rd., Sayreville, NJ 08872
Materials Resch. Corp., Dept. EM, Route 303, Orangeburg, N.Y. 10962
M Optics Group-East, Valtec Corp., Dept. EM, Holliston, Mass. 01746
DM Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Quartzite Processing, Inc., Dept. EM, 6 Holyoke St., Malden, Mass. 02148
Thermal Amer. Fused Quartz, Dept. EM, Change Bridge Rd., Montville, N.J. 07045

Quartz, Raw—See Crystals, Quartz

Racks, Aging—See Ovens, Aging, Burn-In, Life Test

Racks, Cabinet—See Enclosures, Equipment & Panel Mounting

Racks, Circuit Board—See Enclosures, Circuit Board, Module & Relay Mounting

Racks, Desk & Console—See Enclosures, Equipment & Panel Mounting

Racks, Module—See Enclosures, Circuit Board, Module & Relay Mounting

Racks, Relay & Mounting—See Enclosures, Circuit Board, Module & Relay Mounting

Radar Equipment—See Analyzers; Testers; Simulators; etc.

Radar Systems

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
Cober Elctrns., Inc., Dept. EM, 7 Gleason Ave., Stamford, Conn. 06902 ..... *
M Vega Precision Labs., Dept. EM, 800 Follin La., Vienna, Va. 22180 ..... p. 2864
M AIL, Div. Cutler-Hammer, Dept. EM, Comac Road, Deer Park, N.Y. 11729
D Bendix Corp., Avionics Div, Dept. EM, Box 9414, Ft. Lauderdale, Fla. 33310
Datron Systems, Dept. EM, 20700 Plummer St., Chatsworth, Cal. 91311
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M ITT Gilfillan Div. of ITT, Dept. EM, 7821 Orion Ave., Van Nuys, Calif. 91409
D King Radio Corp., Dept. EM, 400 N. Rogers Rd., Olathe, Kans. 66061
Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
M Tasker Systems, Dept. EM, 20131 Sunburst St., Chatsworth, Cal. 91311
M Teledyne Micronetics, Dept. EM, 7155 Mission Gorge Rd., San Diego, Calif. 92120
M Whittaker Corp., Dept. EM, 10880 Wilshire Blvd., Los Angeles, Cal. 90024

Radio Comm. Systems—See Comm. Systems (specific type)

Radiographic Equipment—See X-Ray Inspection Equipment

Radiometers

EG&G, Inc., Electro-Optics Div., Dept. EM, 35 Congress St., Salem, Mass. 01970 ..... p. 3135
General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 *
M AIL, Div. Cutler-Hammer, Dept. EM, Comac Road, Deer Park, N.Y. 11729
D American Ultraviolet, Dept. EM, 320 Commerce St., Chatham, N.J. 07928
M Barnes Engrg. Co., Dept. EM, 30 Commerce Rd., Stamford, Conn. 06902
Beckman Instrs., (AISSD), Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634
M Edmund Scientific Co., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007
Electro-Optical Inds., Inc., Dept. EM, 839 Ward Dr., Santa Barbara, Cal. 93111
Electron-Machine Corp., Dept. EM, Box M, Umatilla, Fla. 32784
Gamma Scientific Inc., Dept. EM, 3777 Ruffin Rd., San Diego, Cal. 92123
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Hy-Cal Engrg, Dept. EM, 12105 Los Nietos Rd., Santa Fe Springs, Cal 90670
M LNR Communications, Inc., Dept. EM, 180 Marcus Blvd., Hauppauge, N.Y. 11787
D Metrologic Instruments, Inc., Dept. EM, 143 Harding Ave., Bellmawr, N.J. 08030
Mikron Instr. Co., Dept. EM, Box 211, Ridgewood, N.J. 07451

DM Photo Research Corp., Division Kollmorgen Corp., Dept. EM, 3000 N. Hollywood Way, Burbank, Cal. 91505
Raytek Div. Optical Coating Lab, Dept. EM, 325 E. Middlefield Rd., Mountain View, Cal. 94043
M Santa Barbara Resch. Ctr., Dept. EM, 75 Coromar Dr., Goleta, Cal. 93017
Scientech, Inc., Dept. EM, 5649 Arapahoe Ave, Boulder, Colo. 80303
Sensors, Inc., Dept. EM, 3908 Varsity Dr., Ann Arbor, Mich. 48104
Spectrolab, Inc., Dept. EM, 12500 Gladstone Ave., Sylmar, Cal. 91342
Teledyne/Geotech, Dept. EM, Box 28277, Dallas, Tex. 75228
TRG,, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
D Ultra-Violet Prods., Inc., Dept. EM, 5100 Walnut Grove Ave., San Gabriel, Cal. 91778
United Detector Tech., Dept. EM, 2644 30th St., Santa Monica, Cal. 90405
Yellow Springs Instrument Co., Dept. EM, Box 279, Yellow Springs, Ohio 45387

Radomes & Windows, Microwave

Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
Gabriel Elctrns. Inc., Dept. EM, Box 626, Scarborough Ind'l. Pk., Scarborough, Me. 04074
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Milliflect, Dept. EM, 1242 Birchwood Dr, Sunnyvale, Cal. 94086

Rare Earths—See Metals, Rare

Reactors, Charging

Computer Power, Inc., Dept. EM, 124E West Main Street, High Bridge, New Jersey 08829 ..... *
M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 .. *
Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509 ..... *
M Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 ..... *
NWL Transformers, Dept. EM, Rising Sun Rd., Bordentown, N.J. 08505 ..... *
DM Thordarson Meissner, Electronic Ctr., Dept. EM, Mt. Carmel, Ill. 62863 ..... *
Basler Electric Co., Dept. EM, Box 269, Rte. 143, Highland, Ill. 62249
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Coilcraft, Dept. EM, 1102 Siler Lake Rd., Cary, Ill. 60013
Electrocom Inds., Dept. EM, 1105 N. Ironwood Dr., S. Bend, Ind. 46615
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
M Peschel Instrs., Inc., Dept. EM, 1412 Viscaya Pkwy., Cape Coral, Fla. 33904
M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
Prototype Transformer Corp., Dept. EM, 545 N Arlington Ave, East Orange, N.J. 07017
Torelco Inc., Dept. EM, 14 Paine Ave., Irvington, N.J. 07111

Reactors, Epitaxial—See Machines & Accessories, Semiconductor Manufacturing

Reactors, Filter

Abacus Controls Inc., Dept. EM, 89 Redington Rd., Somerville, N.J. 08876 *
Computer Power, Inc., Dept. EM, 124E West Main Street, High Bridge, New Jersey 08829 ..... *
M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 .. *
Freed Transformer Co., Inc., Dept. EM, 1718 Weirfield St., Brooklyn, N.Y. 11227 ..... *
M Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 ..... *
DM Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 *
NWL Transformers, Dept. EM, Rising Sun Rd., Bordentown, N.J. 08505 ..... *
OPT Inds. Inc., Data Products Div., Dept. EM, 300 Red School Lane, Phillipsburg, N.J. 08865 ..... p. 3291
M Pico Elctrns. Inc., Dept. EM, 453 North MacQuesten Parkway, Mount Vernon, N.Y. 10552 ..... *
M Sterling Transformer Corp., Dept. EM, 510 Driggs Ave., Brooklyn, N.Y. 11211 *
DM Thordarson Meissner, Electronic Ctr., Dept. EM, Mt. Carmel, Ill. 62863 ..... *
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... *
Triad-Utrad, Distr Svcs., Dept. EM, 305 N. Briant St., Huntington, Ind. 46750 *
American Magnetics Corp., Dept. EM, P.O. Box 8, Carterville, Ill. 62918
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
Basler Electric Co., Dept. EM, Box 269, Rte. 143, Highland, Ill. 62249
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Electrocom Inds., Dept. EM, 1105 N. Ironwood Dr., S. Bend, Ind. 46615
Electrocube Inc., Dept. EM, 1710 So. Del Mar Ave., San Gabriel, Cal. 91776
M Kenyon Magnetics Inc., Dept. EM, 1040 Grand St, Hoboken, N.J. 07030
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
Magnetic Products, Inc., Dept. EM, Box 1125, New London, N.H. 03257
M Northlake Engineering, Dept. EM, 999 Anita Ave., Antioch, Ill. 60002
M Osborne Transformer Corp., Dept. EM, 19636 Derby St., Detroit, Mich. 48203
M Peschel Instrs., Inc., Dept. EM, 1412 Viscaya Pkwy., Cape Coral, Fla. 33904
M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
Prototype Transformer Corp., Dept. EM, 545 N Arlington Ave, East Orange, N.J. 07017
Pulse Engrg., Inc., Dept. EM, Box 12235, San Diego, Cal 92112
M Schott Corp., Dept. EM, 3140 B Harbor Lane No., Minneapolis, Minn. 55441
DM Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
Torelco Inc., Dept. EM, 14 Paine Ave., Irvington, N.J. 07111
Tranex Inc., Dept. EM, 1599 Stierlin Rd., Mountain View, Cal. 94043

Reactors, Loading

M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 .. *
M Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 ..... *
DM Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 *
NWL Transformers, Dept. EM, Rising Sun Rd., Bordentown, N.J. 08505 ..... *
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Coilcraft, Dept. EM, 1102 Siler Lake Rd., Cary, Ill. 60013
Electrocom Inds., Dept. EM, 1105 N. Ironwood Dr., S. Bend, Ind. 46615
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
Osborne Transformer Corp., Dept. EM, 19636 Derby St., Detroit, Mich. 48203
M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
Prototype Transformer Corp., Dept. EM, 545 N Arlington Ave, East Orange, N.J. 07017

Reactors, Saturable

Abacus Controls Inc., Dept. EM, 89 Redington Rd., Somerville, N.J. 08876 *
M Artronic Instr. Co., Dept. EM, 11232 Triangle La., Silver Spring, Md. 20902 *
Caddel-Burns Mfg. Co., Inc., Dept. EM, 40 E. 2nd St., Mineola, N. Y. 11501 *
M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 .. *
Freed Transformer Co., Inc., Dept. EM, 1718 Weirfield St., Brooklyn, N.Y. 11227 ..... p. 4349
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509 ..... *
M Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 ..... *
M Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735 ..... *
D Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 *
NWL Transformers, Dept. EM, Rising Sun Rd., Bordentown, N.J. 08505 p. 4365
Sola Electric, Dept. EM, 1717 Busse Rd., Elk Grove Village, Ill. 60007 ..... *
M Sterling Transformer Corp., Dept. EM, 510 Driggs Ave., Brooklyn, N.Y. 11211 *
M Technitrol, Inc., Dept. EM, 1952 E. Alleghany, Philadelphia, Pa. 19134 ..... *
DM Thordarson Meissner, Electronic Ctr., Dept. EM, Mt. Carmel, Ill. 62863 ..... *
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... *
M Torwico Elctrns., Inc., Dept. EM, Rte. 70, Lakewood, N.J. 08701 ..... *
M Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040 *
D American HV Voltage Test Sys., Inc., Dept. EM, Ctrl Garr Ind'l Pk, Accident, Md. 21520
American Magnetics Corp., Dept. EM, P.O. Box 8, Carterville, Ill. 62918
Basler Electric Co., Dept. EM, Box 269, Rte. 143, Highland, Ill. 62249
Bicron Elctrns. Co., Dept. EM, Box 807, Barlow St., Canaan, Conn. 06018
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Coilcraft, Dept. EM, 1102 Siler Lake Rd., Cary, Ill. 60013
Cross Electronics Inc., Dept. EM, 100 Commonwealth Dr., Warrendale, Pa. 15086
M Dietz Design, Inc., Dept. EM, 100 Electronics Pkwy., Belton, Mo. 64012
Electro-Pacific, Inc., Dept. EM, 5782 Thornwood Dr., Goleta, Calif. 93017
Electrocom Inds., Dept. EM, 1105 N. Ironwood Dr., S. Bend, Ind. 46615
Electrocube Inc., Dept. EM, 1710 So. Del Mar Ave., San Gabriel, Cal. 91776
Elma Engineering, Dept. EM, 1066 E. Meadow Circle, Palo Alto, Cal. 94303
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
Magnetic Products, Inc., Dept. EM, Box 1125, New London, N.H. 03257
M Northlake Engineering, Dept. EM, 999 Anita Ave., Antioch, Ill. 60002
M Osborne Transformer Corp., Dept. EM, 19636 Derby St., Detroit, Mich. 48203
M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
D Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
Torelco Inc., Dept. EM, 14 Paine Ave., Irvington, N.J. 07111
Tranex Inc., Dept. EM, 1599 Stierlin Rd., Mountain View, Cal. 94043

Readers, Badge

M AMP Capitron Div./AMP Inc., Dept. EM, 1595 S. Mt. Joy St., Elizabethtown, Pa. 17022 ..... p. 1382,1383
Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 p. 1643
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543 .... p. 1666
Taurus Corp., Dept. EM, Academy Hill, Lambertville, N.J. 08530 ..... p. 1667
M AMP Special Industries, Dept. EM, Valley Forge, Pa. 19482
Elcom Industries, Inc., Dept. EM, 10268 Bach Blvd., St. Louis, Mo. 63132
Honeywell Inc., Commerical Div., Dept. EM, Honeywell Plaza, Minneapolis, Minn. 55408
Innovative Electronics Inc., Dept. EM, 15200 NW 60th Ave., Miami Lakes, Fla. 33014

Readers, Character

Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543 ..... *
Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
Dest Data Corp., Dept. EM, 1285 Forgewood Ave., Sunnyvale, Cal. 94085
Facit-Addo, Inc., Dept. EM, 66 Field Point Rd., Greenwich, Conn. 06830
D Key Tronic Corp., Dept. EM, Bldg. 14, Spokane Ind'l. Pk., Spokane, Wash. 99216
Lundy Elctrns. & Sys., Inc., Dept. EM, Robert La., Glen Head, N.Y. 11545
Optron, Inc., Dept. EM, 1201 Tappon Cir., Carrollton, Tex. 75006
Sensor Technology, Dept. EM, 21012 Lassen St., Chatsworth, Cal. 91311
United Detector Tech., Dept. EM, 2644 30th St., Santa Monica, Cal. 90405

Readers, Punched Card—See Punched Card Equipment

Readers, Punched Tape

Clary Corp., Precision Instrs. Div., Dept. EM, 320 W. Clary Ave., San Gabriel, Cal. 91776 ..... *
Data Specialties, Dept. EM, 3455 Commercial Ave., Northbrook, Ill. 60062 p. 1397
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... *
GNT Automatic Inc., Dept. EM, 440 Totten Pond Rd., Waltham, Mass 02154 p. 1642
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *

International Rectifier Corp., Semiconductor Div., Dept. EM, 233 Kansas St., El Segundo, Cal. 90245 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D **Superior Electric Co., Dept. EM, 1000 Middle St., Bristol, Conn. 06010** ..... *
DM **Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518** ..... *
Taurus Corp., Dept. EM, Academy Hill, Lambertville, N.J. 08530 ..... **p. 1667**
Addmaster Corp., Dept. EM, 416 Junipero Serra Dr., San Gabriel, Cal. 91776
Data General Corp., Dept. EM, 15 Turnpike Rd Rte 9, Westboro, Mass 01581
Decitek, Div. Jamesbury Corp., Dept. EM, 250 Chandler St., Worcester, Mass. 01602
DM EECO, Dept. EM, 1441 E. Chestnut Ave, Box 659, Santa Ana, Cal. 92701
D Facit-Addo, Inc., Dept. EM, 66 Field Point Rd., Greenwich, Conn. 06830
HEI, Inc., Dept. EM, Jonathan Ind'l. Ctr., Chaska, Minn. 55318
D Intel Corp., Dept. EM, 3065 Bowers Ave., Santa Clara, Cal. 95051
DM Jamesbury Corp., Dept. EM, 640 Lincoln St., Worcester, Mass. 01605
D JPI, Inc., Dept. EM, 1507 San Vicente Blvd., Santa Monica, Cal. 90402
Optron, Inc., Dept. EM, 1201 Tappon Cir., Carrollton, Tex. 75006
Sensor Technology, Dept. EM, 21012 Lassen St., Chatsworth, Cal. 91311
Sweda Int'l., OEM Prods., Dept. EM, 34 Maple Ave., Pine Brook, N.J. 07058
DM Systems Data Inc., Dept. EM, 1941 W. Market St., Akron, Ohio 44313
Tech Serv., Inc., BRS/LVE Div, Dept. EM, 5301 Holland Dr., Beltsville, Md 20705
Teleterminal Corp., Dept. EM, 12 Cambridge St., Burlington, Mass. 01803
TTS, Dept. EM, 2928 Nebraska Ave., Santa Monica, Cal. 90404

Readouts—See Tubes, Readout

Reamers

D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
Dresser Industries, Dept. EM, 1505 Elm St., Dallas, Tex. 75201
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Receivers, A-M/F-M (Including Precision Test)

D **Delco Electronics Div., General Motors Corp., Dept. EM, 700 E. Firmin St., Kokomo, Ind. 46901** ..... *
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
BF Elctrns., Dept. EM, 415 S. Nardo, Solana Beach, Calif. 92075
D Bogen Div., Lear Siegler, Inc., Dept. EM, Box 500, Paramus, N.J. 07652
D Channel Master Div. Avnet, Dept. EM, Rte. 209, Ellenville, N.Y. 12428
M Cushman Electronics, Dept. EM, 2400 N. 1st St., San Jose, Cal. 95112
FG Engineering Co., Dept. EM, Box 39, Black Canyon Stage, Mayer, Ariz. 86333
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
McKay Dymek Co., Dept. EM, 111 S. College Ave Box 5000, Claremont, Cal. 91711
D Nuvox Elctrns. Corp., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Precision Electronics, Inc., Dept. EM, 9101 King Ave., Franklin Park, Ill 60131
M RHG Elctrns. Lab., Dept. EM, 161 E. Industry Ct., Deer Park, N.Y. 11729
D Teaberry Electronics, Dept. EM, 6330 Castleplace Dr., Indianapolis, Ind. 46250
D Trutone Elctrns., Inc., Dept. EM, 7315 Fulton Ave., No. Hollywood, Cal. 91605

Receivers, Communication

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
Data Specialties, Dept. EM, 3455 Commercial Ave., Northbrook, Ill. 60062 *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... **p. 2782**
AEROCOM, Dept. EM, 3090 S.W. 37th Ave., Miami, Fla. 33133
M AIL, Div. Cutler-Hammer, Dept. EM, Comac Road, Deer Park, N.Y. 11729
Avcom International, Dept. EM, 784 N. W. 57th Ct., Fort Lauderdale, Fla. 33309
M Aydin, Vector Div., Dept. EM, Box 328, Newtown, PA 18940
D Bendix Corp., Avionics Div, Dept. EM, Box 9414, Ft. Lauderdale, Fla. 33310
D Brelonix, Inc., Dept. EM, 106 North 36th St., Seattle, Wash 98103
Communication Assocs., Inc., Dept. EM, 200 McKay Rd., Huntington Station, N.Y. 11746
M Cushman Electronics, Dept. EM, 2400 N. 1st St., San Jose, Cal. 95112
Epsilon-Lambda Elctrn. Corp., Dept. EM, 28 S. Water St., Batavia, Ill. 60510
D Fanon/Courier Corp., Subs., Resdel Engrg, Dept. EM, 990 S. Fair Oaks, Pasadena, Cal. 91105
D General Aviation Elctrns, Dept. EM, 4141 Kingman Dr., Indianapolis, Ind 46225
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
IEC Electronics Corp., Dept. EM, 105 Norton St., Newark, N.Y. 14513
M Iwata Electric Co., Ltd., Dept. EM, 1-16, I-Chome Soto-Kanda, Chiyoda-ku Tokyo, Japan
D King Radio Corp., Dept. EM, 400 N. Rogers Rd., Olathe, Kans. 66061
M LNR Communications, Inc., Dept. EM, 180 Marcus Blvd., Hauppauge, N.Y. 11787
McKay Dymek Co., Dept. EM, 111 S. College Ave Box 5000, Claremont, Cal. 91711
Mobil Electronics, Inc., Dept. EM, Box 1132, Anderson, Ind. 46015
M Norlin Communications Inc., Dept. EM, 9125 Gaither Rd., Gaithersburg, Md. 20760
Pacific Communications, Dept. EM, 2041 S. Grand Ave. #A, Santa Ana, Cal. 92705
D REPCO Inc., Dept. EM, Box 7065, Orlando, Fla. 32854
Scientific Communications, Dept. EM, 3425 Kingsley, Garland, Tex. 75041
D S G C Inc., Dept. EM, 13737 SE 26th St., Bellevue, Wash. 98005
Signatron, Inc., Dept. EM, 12 Hartwell Ave., Lexington, Mass. 02173
D Teaberry Electronics, Dept. EM, 6330 Castleplace Dr., Indianapolis, Ind. 46250
M Technical Mat'l., Dept. EM, 700 Fenimore Rd., Mamaroneck, N.Y. 10543
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304

Receivers, Field Intensity, Microwave—See Receivers, Microwave

Receivers, Fixed Frequency

ADRET/COMSTRON, Dept. EM, 200 E. Sunrise Hwy, Freeport, NY 11520 **p. 2683**
American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
M **Applied Research Inc., Dept. EM, 76 S. Bayles Ave., Port Washington, N.Y. 11050** ..... *
Austron, Inc., Dept. EM, 1915 Kramer La., Austin, Tex. 78758 ..... *
Comstron Corp., Dept. EM, 200 E. Sunrise Hwy., Freeport, N.Y. 11520 p. 2683
AEROCOM, Dept. EM, 3090 S.W. 37th Ave., Miami, Fla. 33133
M A.R.F. Products, Dept. EM, Box 3226, Boulder, Colo. 80303
D Autocon Inds., Sub. Control Data, Dept. EM, 2300 Berkshire La. N., Minneapolis, Minn. 55441
Avcom International, Dept. EM, 784 N. W. 57th Ct., Fort Lauderdale, Fla. 33309
M Beukers Labs., Inc., Dept. EM, 30 Orville Drive, Bohemia, N.Y. 11716
BF Elctrns., Dept. EM, 415 S. Nardo, Solana Beach, Calif. 92075
D Brelonix, Inc., Dept. EM, 106 North 36th St., Seattle, Wash 98103
Communication Assocs., Inc., Dept. EM, 200 McKay Rd., Huntington Station, N.Y. 11746
M Assocs. Inc., Dept. EM, 333 W. Commercial St., East Rochester, N.Y. 14445
FG Engineering Co., Dept. EM, Box 39, Black Canyon Stage, Mayer, Ariz. 86333
Gorman-Redlich Mfg. Co., Dept. EM, 6 Curtis St., Athens, Ohio 45701
GTE Lenkurt Inc., Dept. EM, 1105 County Rd., San Carlos, Cal. 94070
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
IEC Electronics Corp., Dept. EM, 105 Norton St., Newark, N.Y. 14513
Mu-Del Elctrns., Dept. EM, 2426 Linden La., Silver Spring, Md. 20910
D Multi-Elmac Co., Dept. EM, 22700 Heslip Dr., Novi, Mich. 48050
M Norlin Communications Inc., Dept. EM, 9125 Gaither Rd., Gaithersburg, Md. 20760
Pacific Communications, Dept. EM, 2041 S. Grand Ave. #A, Santa Ana, Cal. 92705
D Regency Electronics, Inc., Dept. EM, 7707 Records St., Indianapolis, Ind. 46226
D REPCO Inc., Dept. EM, Box 7065, Orlando, Fla. 32854
Resdel Engineering Corp., Dept. EM, 300 E. Live Oak Ave., Arcadia, Cal. 91006
M RHG Elctrns. Lab., Dept. EM, 161 E. Industry Ct., Deer Park, N.Y. 11729
D S G C Inc., Dept. EM, 13737 SE 26th St., Bellevue, Wash. 98005
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Spectracom Corp., Dept. EM, 1667 Penfield Rd., Rochester, N.Y. 14625
M Technical Mat'l., Dept. EM, 700 Fenimore Rd., Mamaroneck, N.Y. 10543
True Time Instr Co., Dept. EM, 429 Olive St, Santa Rosa, Cal. 95401
VHF Engrg, Div. of Brownian Elctrns. Corp., Dept. EM, 320 Water St., Binghamton, N.Y. 13902
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304

Receivers, Frequency Shift

ADRET/COMSTRON, Dept. EM, 200 E. Sunrise Hwy, Freeport, NY 11520 .... *
GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 ..... *
AEROCOM, Dept. EM, 3090 S.W. 37th Ave., Miami, Fla. 33133
D Autocon Inds., Sub. Control Data, Dept. EM, 2300 Berkshire La. N., Minneapolis, Minn. 55441
Avcom International, Dept. EM, 784 N. W. 57th Ct., Fort Lauderdale, Fla. 33309
Communication Assocs., Inc., Dept. EM, 200 McKay Rd., Huntington Station, N.Y. 11746
Dantel, Inc., Dept. EM, 1922 North Helm, Fresno, Cal. 93727
Electrocom Inds., Dept. EM, 1105 N. Ironwood Dr., S. Bend, Ind. 46615
FG Engineering Co., Dept. EM, Box 39, Black Canyon Stage, Mayer, Ariz. 86333
GTE Lenkurt Inc., Dept. EM, 1105 County Rd., San Carlos, Cal. 94070
RFL Inds., Comms. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005
D S G C Inc., Dept. EM, 13737 SE 26th St., Bellevue, Wash. 98005
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
M Technical Mat'l., Dept. EM, 700 Fenimore Rd., Mamaroneck, N.Y. 10543

Receivers, Headphone—See Handsets, Etc.

Receivers, Loran & Omega

Austron, Inc., Dept. EM, 1915 Kramer La., Austin, Tex. 78758 ..... **p. 2283**
Epsco, Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 ..... *
Communication Assocs., Inc., Dept. EM, 200 McKay Rd., Huntington Station, N.Y. 11746
Tracor, Inc., Dept. EM, 6500 Tracor La., Austin, Tex. 78721

Receivers, Microwave

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
M **Polarad Elctrn. Instrs., Dept. EM, 5 Delaware Dr., Lake Success, N.Y. 11040** *
M **, Trak Microwave Corp., Dept. E8, Dept. EM, 4726 Eisenhower Blvd.,, Tampa, Fla. 33614** ..... *
M **Vega Precision Labs., Dept. EM, 800 Follin La., Vienna, Va. 22180** ..... *
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
M AIL, Div. Cutler-Hammer, Dept. EM, Comac Road, Deer Park, N.Y. 11729
D Ailtech, Dept. EM, 2070 Fifth Ave, Ronkonkoma, NY 11779
M Cubic Corp., Dept. EM, 9233 Balboa Ave., San Diego, Cal. 92123
M E-Systems Inc., Garland Div., Dept. EM, Box 6118, Dallas, Tex. 75222
M Electro-Metrics, Div. Penril Corp., Dept. EM, 100 Church St., Amsterdam, N.Y. 12010
Epsilon-Lambda Elctrn. Corp., Dept. EM, 28 S. Water St., Batavia, Ill. 60510
Farinon Electric, Dept. EM, 1691 Bayport, San Carlos, Calif. 94070
FG Engineering Co., Dept. EM, Box 39, Black Canyon Stage, Mayer, Ariz. 86333
GTE Lenkurt Inc., Dept. EM, 1105 County Rd., San Carlos, Cal. 94070
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
M HRB-Singer, Inc., Dept. EM, Science Park, Box 60, State College, Pa. 16801
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M ITT Gilfillan Div. of ITT, Dept. EM, 7821 Orion Ave., Van Nuys, Calif. 91409
M LNR Communications, Inc., Dept. EM, 180 Marcus Blvd., Hauppauge, N.Y. 11787

Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
Micro-Now Instr. Co., Dept. EM, 6104 N. Pulaski Rd., Chicago, Ill. 60646
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
D Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
M Norlin Communications Inc., Dept. EM, 9125 Gaither Rd., Gaithersburg, Md. 20760
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
Resdel Engineering Corp., Dept. EM, 300 E. Live Oak Ave., Arcadia, Cal. 91006
M RHG Elctrns. Lab., Dept. EM, 161 E. Industry Ct., Deer Park, N.Y. 11729
Scientific Communications, Dept. EM, 3425 Kingsley, Garland, Tex. 75041
M Technical Research & Mfg., Inc., Dept. EM, Kelly Ave. Grenier Field, R.F.D. #3, Manchester, N.H. 03103
M Teledyne Micronetics, Dept. EM, 7155 Mission Gorge Rd., San Diego, Calif. 92120
M Transco Prods., Inc., Dept. EM, 4241 Glencoe Ave., Venice, Cal. 90291
TRG,, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760

Receivers, Monitoring, Communications

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... **p. 2782**
AEROCOM, Dept. EM, 3090 S.W. 37th Ave., Miami, Fla. 33133
Avcom International, Dept. EM, 784 N. W. 57th Ct., Fort Lauderdale, Fla. 33309
D Brelonix, Inc., Dept. EM, 106 North 36th St., Seattle, Wash 98103
Communication Assocs., Inc., Dept. EM, 200 McKay Rd., Huntington Station, N.Y. 11746
Conrac Div., Conrac Corp., Dept. EM, 600 N. Rimsdale Ave., Covina, Calif. 91722
M Cushman Electronics, Dept. EM, 2400 N. 1st St., San Jose, Cal. 95112
M E-Systems Inc., Garland Div., Dept. EM, Box 6118, Dallas, Tex. 75222
Gorman-Redlich Mfg. Co., Dept. EM, 6 Curtis St., Athens, Ohio 45701
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
M HRB-Singer, Inc., Dept. EM, Science Park, Box 60, State College, Pa. 16801
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
IEC Electronics Corp., Dept. EM, 105 Norton St., Newark, N.Y. 14513
D King Radio Corp., Dept. EM, 400 N. Rogers Rd., Olathe, Kans. 66061
M LNR Communications, Inc., Dept. EM, 180 Marcus Blvd., Hauppauge, N.Y. 11787
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
McKay Dymek Co., Dept. EM, 111 S. College Ave Box 5000, Claremont, Cal. 91711
M Norlin Communications Inc., Dept. EM, 9125 Gaither Rd., Gaithersburg, Md. 20760
D Pearce-Simpson, Inc., Div/Gladding Corp., Dept. EM, 4701 N.W. 77th Ave., Miami, Fla 33166
D Regency Electronics, Inc., Dept. EM, 7707 Records St., Indianapolis, Ind. 46226
Resdel Engineering Corp., Dept. EM, 300 E. Live Oak Ave., Arcadia, Cal. 91006
D Robyn International Inc., Dept. EM, Box 478 10901 Northland Dr., Rockford, Mich 49341
M Scientific Communications, Dept. EM, 3425 Kingsley, Garland, Tex. 75041
D S G C Inc., Dept. EM, 13737 SE 26th St., Bellevue, Wash. 98005
Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304

Receivers, NBS

ADRET/COMSTRON, Dept. EM, 200 E. Sunrise Hwy, Freeport, NY 11520 .... *
Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
D Efratom California, Inc., Dept. EM, 18851 Bardeen Ave, Irvine, CAL. 92715
Spectracom Corp., Dept. EM, 1667 Penfield Rd., Rochester, N.Y. 14625
True Time Instr Co., Dept. EM, 429 Olive St, Santa Rosa, Cal. 95401
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304

Receivers, Tone

D **Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634** ..... *
GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 ..... *
ITT North, Microsystems Div, Dept. EM, 700 Hillsboro Pl., Deerfield Beach, Fla. 33441 ..... *
LVC Inds. Inc., Co-Ord Switch Bloc-Lite Divs., Dept. EM, 135-25 37th Ave., Flushing, N.Y. 11354 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Re-el Circuits, Inc., Dept. EM, 520 Victor Street, Saddle Brook, N.J. 07662 **p. 1380**
D American Microsignal Corp, Dept. EM, 8431 Monroe Ave., Stanton, Cal. 90680
D Autocon Inds., Sub. Control Data, Dept. EM, 2300 Berkshire La. N., Minneapolis, Minn. 55441
BF Elctrns., Dept. EM, 415 S. Nardo, Solana Beach, Calif. 92075
D Bogen Div., Lear Siegler, Inc., Dept. EM, Box 500, Paramus, N.J. 07652
Cermetek, Inc., Dept. EM, 660 National Ave., Mountain View, Cal. 94040
Dantel, Inc., Dept. EM, 1922 North Helm, Fresno, Cal. 93727
Gorman-Redlich Mfg. Co., Dept. EM, 6 Curtis St., Athens, Ohio 45701
IEC Electronics Corp., Dept. EM, 105 Norton St., Newark, N.Y. 14513
D Regency Electronics, Inc., Dept. EM, 7707 Records St., Indianapolis, Ind. 46226
D REPCO Inc., Dept. EM, Box 7065, Orlando, Fla. 32854
Resdel Engineering Corp., Dept. EM, 300 E. Live Oak Ave., Arcadia, Cal. 91006
RFL Inds., Comms. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
M Sonex, Dept. EM, 2337 Philmont Ave., Huntingdon Valley, Pa. 19006

Receivers, TV—See Monitors, Video

Receptacles—See Connectors; Jacks; Sockets

Recorders, Computer Data

D **Canon U.S.A., Inc., Dept. EM, 10 Nevada Dr., Lake Success, N.Y. 11040** ..... *
M **Clary Corp., Precision Instrs. Div., Dept. EM, 320 W. Clary Ave., San Gabriel, Cal. 91776** ..... *
Data Specialties, Dept. EM, 3455 Commercial Ave., Northbrook, Ill. 60062 *
Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 **p. 2687**
Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 **p. 2838,2839**
Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 **p. 2842**
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D **Houston Instrument, Div. Bausch & Lomb, Dept. EM, 8500 Cameron Rd., Austin, Tex. 78753** ..... **p. 2844**
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Practical Automation, Inc., Dept. EM, Trap Falls Rd., Shelton, Conn. 06484 *
Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... **p. 2846**
Amilon Corp., Dept. EM, 49-12 30th Ave., Woodside, N.Y. 11377
Ampex Corp., Dept. EM, 401 Broadway, Redwood City, Cal. 94063
Applied Systems Corp., Dept. EM, 26401 Harper Ave., St. Clair Shores, Mich. 48081
I Auto-trol Corp., Dept. EM, 5650 N. Pecos St., Denver, Colo. 80221
Bell & Howell Co., Elctrns. & Instrs. Grp., Dept. EM, 360 Sierra Madre Villa, Pasadena, Cal. 91109
Braemar Computer Devices, Dept. EM, 11950 Twelfth Ave. S., Burnsville, Minn. 55337
ComData Corp., Dept. EM, 8115 N. Monticello, Skokie, ILL. 60076
Computer Devices, Dept. EM, 25 North Avenue, Burlington, Mass. 01803
Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
Digi-Data Corp., Dept. EM, 8580 Dorsey Rd., Jessup, Md. 20794
Assocs. Inc., Dept. EM, 333 W. Commercial St., East Rochester, N.Y. 14445
Epicom, Inc., Dept. EM, 592 N. Douglas Ave., Altamonte Springs, Fla. 32701
I Facit-Addo, Inc., Dept. EM, 66 Field Point Rd., Greenwich, Conn. 06830
Farrand Controls Div., Dept. EM, 99 Wall St., Valhalla, N.Y. 10595
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Image Graphics, Inc., Dept. EM, 1525 Kings Hwy., Fairfield, Conn. 06430
D Intern'l. Computer Prods., Inc., Dept. EM, 2925 Merrell Rd., Dallas, Tex. 75229
Memodyne Corp., Dept. EM, 369 Elliot St., Newton Upper Falls, Mass 02164
M Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
MFE Corp., Dept. EM, Keewaydin Dr., Salem, N.H. 03079
Micro Communications Corp., Dept. EM, 80 Bacon St., Waltham, Mass. 02154
Potter Instr. Co. Inc., Dept. EM, 151 Sunnyside Blvd., Plainview, N.Y. 11803
DM Qantex, div. North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803
D Redactron Corp., Dept. EM, 100 Parkway Dr. S., Hauppauge, N.Y. 11787
DM Systems Data Inc., Dept. EM, 1941 W. Market St., Akron, Ohio 44313
Video Research Corporation, Dept. EM, 6985 Garden Rd., Riviera Beach, Fla. 33404

Recorders, Electrostatic

Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 ..... *
D **Houston Instrument, Div. Bausch & Lomb, Dept. EM, 8500 Cameron Rd., Austin, Tex. 78753** ..... **p. 2844**
Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... *
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Recorders, Event

Chatsworth Data Corp, Impact-o-Graph Div., Dept. EM, 20710 Lassen St., Chatsworth, Cal. 91311 ..... *
M **Clary Corp., Precision Instrs. Div., Dept. EM, 320 W. Clary Ave., San Gabriel, Cal. 91776** ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 **p. 2687**
Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ..... **p. 2709**
D **Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224** **p. 2838,2839**
Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 **p. 2842**
D **Gulton Inds., Inc., Measurement & Control Systems Div., Dept. EM, Gulton Ind'l. Pk., E. Greenwich, R.I. 02818** ..... **p. 2840,2841**
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Honeywell, Inc., Test Instrs. Div., Dept. EM, 4800 E. Dry Creek Rd., Box 5227, Denver, Colo. 80217 ..... **p. 2756**
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
PPM, Inc., Dept. EM, 7575 Bond St., Cleveland, Ohio 44139 ..... *
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** ..... *
M Alden Sys. Co., Inc., Dept. EM, Box 500 Dept. 262, Westboro, Mass. 01581
D Amprobe Instrument, Div. SOS Consolidated Inc., Dept. EM, 630 Merrick Rd., Lynbrook, N.Y. 11563
Artisan Elctrns. Corp., Dept. EM, 5 Eastmans Rd., Parsippany, N.J. 07054
D Astro-Med, Div Atlan-Tol Inds. Inc., Dept. EM, 639 E. Greenwich Ave., West Warwick, R.I. 02893
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
Bailey Meter Co., Sub. Babcock & Wilcox, Dept. EM, 29801 Euclid Ave., Wickliffe, Ohio 44092
Biomation, Dept. EM, 10411 Bubb Rd., Cupertino, Cal. 95014
Carolina Medical Elctrns., Inc., Dept. EM, U.S. 52 Expwy., Box 307, King, N.C. 27021
Data, Inc., Dept. EM, 210 S. Mason, Box 2071, Ft. Collins, Colo. 80521
Assocs. Inc., Dept. EM, 333 W. Commercial St., East Rochester, N.Y. 14445
Electric Tachometer Corp., Dept. EM, 68th & Upland Sts., Philadelphia, Pa. 19142
Engdahl Enterprises, Dept. EM, 2850 Monterey Ave., Costa Mesa, Cal. 92626

Epicom, Inc., Dept. EM, 592 N. Douglas Ave., Altamonte Springs, Fla. 32701
D General Scanning, Dept. EM, 150 Coolidge Ave., Watertown, Mass. 02172
Hathaway Instruments, Inc., Dept. EM, 5250 E. Evans Ave., Denver, Colo. 80222
Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704
Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962
Linear Instrs. Corp., Dept. EM, 17282 Eastman Ave., Irvine, Cal. 92714
Memodyne Corp., Dept. EM, 369 Elliot St., Newton Upper Falls, Mass 02164
MFE Corp., Dept. EM, Keewaydin Dr., Salem, N.H. 03079
D Philips Audio Video Sys, Neutrik Prods, Dept. EM, 91 McKee Dr., Mahwah, N.J. 07430
M Photron Instrument Co., Dept. EM, 6516 Detroit Ave., Cleveland, Ohio 44102
D Precision Timer Co., Dept. EM, 13 Westbrook Ind'l. Park, Westbrook, Conn. 06498
Resdel Engineering Corp., Dept. EM, 300 E. Live Oak Ave., Arcadia, Cal. 91006
Rochester Instr System, Dept. EM, 255 N. Union St., Rochester, N.Y. 14605
D Soltec Corp., Dept. EM, Box 49, Sun Valley, Cal. 91352
Sprengnether Instr. Co., W.F., Dept. EM, 4567 Swan St., St. Louis, Mo. 63110
Stoelting Co., Dept. EM, 1350 S. Kostner Ave., Chicago, Ill. 60623
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
Tech Serv., Inc., BRS/LVE Div, Dept. EM, 5301 Holland Dr., Beltsville, Md 20705
M Telectro Sys. Corp., Dept. EM, 96-18 43rd Ave., Corona, N.Y. 11368
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
DM Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102
Westronics, Dept. EM, 5050 Mark IV Pkwy. Box 4619, Fort Worth, Tex. 76106

Recorders, F-M—See Recorders, Magnetic Tape

Recorders, Film Strip, Magnetic

International Electro-Magnetics, Dept. EM, 350 N. Eric Dr., Palatine, Ill. 60067 *
Electro Optical Mechanisms, Dept. EM, 2865 Metropolitan Pl., Pomona, Cal. 91767
Image Graphics, Inc., Dept. EM, 1525 Kings Hwy., Fairfield, Conn. 06430
D Intern'l. Computer Prods., Inc., Dept. EM, 2925 Merrell Rd., Dallas, Tex. 75229
D Wide Range Electronics Corp., Dept. EM, 2119 Schultz Rd., St. Louis, Mo. 63141

Recorders, Graphic—See Recorders, Specific Types

Recorders, Magnetic Tape (Reel & Cartridge)

D **Canon U.S.A., Inc., Dept. EM, 10 Nevada Dr., Lake Success, N.Y. 11040** ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 p. 2687
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 p. 2842
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Honeywell, Inc., Test Instrs. Div., Dept. EM, 4800 E. Dry Creek Rd., Box 5227, Denver, Colo. 80217 ..... p. 2756
IBM Instrument Systems, Dept. EM, 1000 Westchester Ave., White Plains, N. Y. 10604 ..... *
International Electro-Magnetics, Dept. EM, 350 N. Eric Dr., Palatine, Ill. 60067 p. 1011
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D **Philips Test & Measuring Instrs., Dept. EM, 85 McKee Dr., Mahwah, NJ 07430** ..... *
Star Micronics Inc., Dept. EM, Pan Am Building, Ste 2308, 200 Park Ave, New York, N.Y. 10017 ..... *
Amilon Corp., Dept. EM, 49-12 30th Ave., Woodside, N.Y. 11377
Ampex Corp., Dept. EM, 401 Broadway, Redwood City, Cal. 94063
D Ampro Corp., Dept. EM, 850 Pennsylvania Blvd., Feasterville, PA. 19047
Audiotronics Corp., Dept. EM, 7428 Bellaire Ave., N. Hollywood, Cal. 91605
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
Bell & Howell Co., Elctrns. & Instrs. Grp., Dept. EM, 360 Sierra Madre Villa, Pasadena, Cal. 91109
Braemar Computer Devices, Dept. EM, 11950 Twelfth Ave. S., Burnsville, Minn. 55337
California Computer Prods., Dept. EM, 2411 W. La Palma Ave., Anaheim, Cal 92801
Carolina Medical Elctrns., Inc., Dept. EM, U.S. 52 Expwy., Box 307, King, N.C. 27021
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
Conrac Corp., Systems Sls Div., Dept. EM, Three Landmark Sq., Stamford, Conn. 06901
Data, Inc., Dept. EM, 210 S. Mason, Box 2071, Ft. Collins, Colo. 80521
Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
Digi-Data Corp., Dept. EM, 8580 Dorsey Rd., Jessup, Md. 20794
Assocs. Inc., Dept. EM, 333 W. Commercial St., East Rochester, N.Y. 14445
D Emerson, Industrial Controls Div., Dept. EM, 3300 Standard St., Santa Ana, Cal. 92702
EMI Technology, Dept. EM, 55, Kenosia Ave., Danbury, Conn 06810
EMR Telemetry, Div. Sangamo-Weston, Dept. EM, Box 3041, Sarasota, Fla. 33578
Epicom, Inc., Dept. EM, 592 N. Douglas Ave., Altamonte Springs, Fla. 32701
Heitz, Inc., Karl, Dept. EM, 979 Third Ave., New York, N.Y. 10022
D Interdyne, Intercette Div., Dept. EM, 14761 Califa St., Van Nuys, Cal. 91411
D Intern'l. Computer Prods., Inc., Dept. EM, 2925 Merrell Rd., Dallas, Tex. 75229
D Macrodyne Inc., Dept. EM, 1900 Maxon Rd., Box 1079, Schenectady, N.Y. 12301
M MFE Corp., Dept. EM, Keewaydin Dr., Salem, N.H. 03079
Micro Communications Corp., Dept. EM, 80 Bacon St., Waltham, Mass. 02154
Newcomb Audio Products Co., Dept. EM, 12881 Bradley Ave., Sylmar, Cal. 91342
D Nuvox Elctrns. Corp., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
Plessey Enviromental Sys., Dept. EM, 3939 Ruffin Rd., San Diego, Cal. 92123
Potter Instr. Co. Inc., Dept. EM, 151 Sunnyside Blvd., Plainview, N.Y. 11803
DM Qantex, div. North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803
D Raymond Engrg. Inc., Dept. EM, 217 Smith St., Middletown, Conn. 06457
D Redactron Corp., Dept. EM, 100 Parkway Dr. S., Hauppauge, N.Y. 11787
D REI Sales Co., Dept. EM, 1 North Ave, Burlington, Mass. 01803
RIL Elctrns., Inc., Dept. EM, 1105 Ind'l. Hwy., Southampton, Pa. 18966
Sprengnether Instr. Co., W.F., Dept. EM, 4567 Swan St., St. Louis, Mo. 63110
M Telectro Sys. Corp., Dept. EM, 96-18 43rd Ave., Corona, N.Y. 11368
Teledyne/Geotech, Dept. EM, Box 28277, Dallas, Tex. 75228
D Telex Communications, Inc., Dept. EM, 9600 Aldrich Ave., So., Minneapolis, Minn. 55420
Tri-Com, Inc., Dept. EM, 12216 Parklawn Dr., Rockville, Md. 20852
Video Automation Systems Inc., Dept. EM, Rte 1—Box 21A, Pound Ridge, N.Y. 10576
Video Research Corporation, Dept. EM, 6985 Garden Rd., Riviera Beach, Fla. 33404

Recorders, Polar

Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 ..... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
Astro-Med, Div Atlan-Tol Inds. Inc., Dept. EM, 639 E. Greenwich Ave., West Warwick, R.I. 02893
Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704

Recorders, Pyrometer—See Pyrometers, Recording

Recorders, Sound Level

Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
D **Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803** *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** ..... *
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
Bell & Howell Co., Elctrns. & Instrs. Grp., Dept. EM, 360 Sierra Madre Villa, Pasadena, Cal. 91109
D Columbia Resch. Labs., Dept. EM, Macdade Blvd. & Bullens La., Woodlyn, Pa. 19094
D Emerson, Industrial Controls Div., Dept. EM, 3300 Standard St., Santa Ana, Cal. 92702
Epicom, Inc., Dept. EM, 592 N. Douglas Ave., Altamonte Springs, Fla. 32701
Metrosonics, Inc., Dept. EM, Box 18090, Rochester, N.Y. 14618
D Philips Audio Video Sys, Neutrik Prods, Dept. EM, 91 McKee Dr., Mahwah, N.J. 07430
Sprengnether Instr. Co., W.F., Dept. EM, 4567 Swan St., St. Louis, Mo. 63110
Westronics, Dept. EM, 5050 Mark IV Pkwy. Box 4619, Fort Worth, Tex. 76106

Recorders, Strip-Chart

Chatsworth Data Corp, Impact-o-Graph Div., Dept. EM, 20710 Lassen St., Chatsworth, Cal. 91311 ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
D **Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224** ..... p. 2839
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 p. 2842
D **Gulton Inds., Inc., Measurement & Control Systems Div., Dept. EM, Gulton Ind'l. Pk., E. Greenwich, R.I. 02818** ..... p. 2840,2841
Harrel, Inc., Dept. EM, 16 Fitch St., E. Norwalk, Conn. 06855 ..... p. 2267
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Honeywell, Inc., Test Instrs. Div., Dept. EM, 4800 E. Dry Creek Rd., Box 5227, Denver, Colo. 80217 ..... *
D **Houston Instrument, Div. Bausch & Lomb, Dept. EM, 8500 Cameron Rd., Austin, Tex. 78753** ..... p. 2844
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 p. 2845
London Co., Dept. EM, 811 Sharon Dr., Westlake, Ohio 44145 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D **Philips Test & Measuring Instrs., Dept. EM, 85 McKee Dr., Mahwah, NJ 07430** ..... *
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** .... p. 2821
Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... *
M Accurate Instrument Co., Dept. EM, Box No. 925, Westbury, N.Y. 11590
D Amprobe Instrument, Div. SOS Consolidated Inc., Dept. EM, 630 Merrick Rd., Lynbrook, N.Y. 11563
M Analytical Measurements, Dept. EM, 31 Willow St., Chatham, N.J. 07928
Annis R B Co., Dept. EM, 1101 N. Delaware, Indianapolis, Ind. 46202
D Astro-Med, Div Atlan-Tol Inds. Inc., Dept. EM, 639 E. Greenwich Ave., West Warwick, R.I. 02893
D Auto-trol Corp., Dept. EM, 5650 N. Pecos St., Denver, Colo. 80221
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
M Bailey Instrs., Inc., Dept. EM, 515 Victor St., Saddle Brook, N.J. 07662
Bailey Meter Co., Sub. Babcock & Wilcox, Dept. EM, 29801 Euclid Ave., Wickliffe, Ohio 44092
M Bausch & Lomb, A.S. Div., Dept. EM, 820 Linden Ave., Box 9189, Rochester, N.Y. 14625
Beckman Instrs., (AISSD), Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634
Beckman Instrs., Cedar Grove Opers., Dept. EM, 89 Commerce Rd., Cedar Grove, N.J. 07009
Bell & Howell Co., Elctrns. & Instrs. Grp., Dept. EM, 360 Sierra Madre Villa, Pasadena, Cal. 91109
BLH Elctrns., Dept. EM, 42 Fourth Ave., Waltham, Mass. 02154
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
Carolina Medical Elctrns., Inc., Dept. EM, U.S. 52 Expwy., Box 307, King, N.C. 27021

Electric Tachometer Corp., Dept. EM, 68th & Upland Sts., Philadelphia, Pa. 19142
D General Scanning, Dept. EM, 150 Coolidge Ave., Watertown, Mass. 02172
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704
James Electronics Inc., Dept. EM, 4050 N Rockwell St, Chicago, Ill. 60618
Kikusui Elctrns. Corp., Dept. EM, 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
DM Laboratory Data Control, Div. M. Roy Corp., Dept. EM, Box 10235, Riviera Beach, Fla. 33404
Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962
D Linear Instrs. Corp., Dept. EM, 17282 Eastman Ave., Irvine, Cal. 92714
Marlin Manufacturing Corp., Dept. EM, 12404 Triskett Rd., Cleveland, Ohio 44111
Metrosonics, Inc., Dept. EM, Box 18090, Rochester, N.Y. 14618
MFE Corp., Dept. EM, Keewaydin Dr., Salem, N.H. 03079
D Philips Audio Video Sys, Neutrik Prods, Dept. EM, 91 McKee Dr., Mahwah, N.J. 07430
M Photron Instrument Co., Dept. EM, 6516 Detroit Ave., Cleveland, Ohio 44102
D REI Sales Co., Dept. EM, 1 North Ave, Burlington, Mass. 01803
D Robertshaw Controls Co., Ind'l. Instr. Div., Dept. EM, 1910 Byrd Ave Ste 200, Richmond, Va. 23230
D Sloan Technology Corp., Dept. EM, 535 E. Montecito St., Santa Barbara, Cal. 93103
D Soltec Corp., Dept. EM, Box 49, Sun Valley, Cal. 91352
Sprengnether Instr. Co., W.F., Dept. EM, 4567 Swan St., St. Louis, Mo. 63110
Stoelting Co., Dept. EM, 1350 S. Kostner Ave., Chicago, Ill. 60623
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
Tracor, Inc., Dept. EM, 6500 Tracor La., Austin, Tex. 78721
Varian Assocs., Instrument Div., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
VirTis Co., Dept. EM, Rte. 208, Gardiner, N.Y. 12525
D West Instrs, Gulton Inds, M. C. S. Div., Dept. EM, Gulton Indl Pk, E. Greenwich, RI 02818
Westinghouse Elec. Corp., Relay-Instr. Div., Dept. EM, 95 Orange St., Newark, N.J. 07101
Westronics, Dept. EM, 5050 Mark IV Pkwy. Box 4619, Fort Worth, Tex. 76106
Yellow Springs Instrument Co., Dept. EM, Box 279, Yellow Springs, Ohio 45387

Recorders, Transient

D Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005 ..... *
Comstron Seg., Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520 ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ..... *
Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 ..... *
Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 p. 2842
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... *
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
Biomation, Dept. EM, 10411 Bubb Rd., Cupertino, Cal. 95014
Data Acquisition Prods. Lab., AEL, Inc., Dept. EM, Box 552, Lansdale, Pa. 19446
Endevco, Div. Becton, Dickinson & Co., Dept. EM, 30700 Rancho Viejo Rd., San Jaun Capistrano, Cal. 92675
Hathaway Instruments, Inc., Dept. EM, 5250 E. Evans Ave., Denver, Colo. 80222
Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704
D Macrodyne Inc., Dept. EM, 1900 Maxon Rd., Box 1079, Schenectady, N.Y. 12301
Micro Instrument Co., Marine & Power Instr. Div., Dept. EM, 2250 Micro Pl., Escondido, Cal. 92025
Multimetrics Div. of Comstro, Comstron-Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11580
D Philips Audio Video Sys, Neutrik Prods, Dept. EM, 91 McKee Dr., Mahwah, N.J. 07430
Physical Data, Inc., Dept. EM, 8220 S.W. Nimbus Ave., Beaverton, Ore. 97005
D REI Sales Co., Dept. EM, 1 North Ave, Burlington, Mass. 01803
Seg Subsidiary, Comstron Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520
Sprengnether Instr. Co., W.F., Dept. EM, 4567 Swan St., St. Louis, Mo. 63110
Transtector Systems, Dept. EM, 532 Monterey Pass Rd., Monterey Park, Cal. 91754
Westronics, Dept. EM, 5050 Mark IV Pkwy. Box 4619, Fort Worth, Tex. 76106
Zonic Technical Labs., Dept. EM, 8927 Rossash Ave., Cincinnati, Ohio 45236

Recorders, Vibration

Chatsworth Data Corp, Cablemaster Div., Dept. EM, 20710 Lassen St., Chatsworth, Cal 91311 ..... p. 2680
Chatsworth Data Corp, Impact-o-Graph Div., Dept. EM, 20710 Lassen St., Chatsworth, Cal. 91311 ..... p. 2680
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
D Astro-Med, Div Atlan-Tol Inds. Inc., Dept. EM, 639 E. Greenwich Ave., West Warwick, R.I. 02893
Assocs. Inc., Dept. EM, 333 W. Commercial St., East Rochester, N.Y. 14445
D Epic, Inc., Dept. EM, 150 Nassau St., New York, N.Y. 10038
Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704
D Macrodyne Inc., Dept. EM, 1900 Maxon Rd., Box 1079, Schenectady, N.Y. 12301
D Robertshaw Controls Co., Ind'l. Instr. Div., Dept. EM, 1910 Byrd Ave Ste 200, Richmond, Va. 23230
Sprengnether Instr. Co., W.F., Dept. EM, 4567 Swan St., St. Louis, Mo. 63110
Westronics, Dept. EM, 5050 Mark IV Pkwy. Box 4619, Fort Worth, Tex. 76106
Zonic Technical Labs., Dept. EM, 8927 Rossash Ave., Cincinnati, Ohio 45236

Recorders, Video (including Tape & Disc)

Ampex Corp., Dept. EM, 401 Broadway, Redwood City, Cal. 94063
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
Image Graphics, Inc., Dept. EM, 1525 Kings Hwy., Fairfield, Conn. 06430
D Apollo Lasers, Apollo Lasers, Inc., Dept. EM, 6357 Arizonia Cir, Los Angeles, Cal. 90045
M Telectro Sys. Corp., Dept. EM, 96-18 43rd Ave., Corona, N.Y. 11368
Teledyne Camera Sys., Dept. EM, 131 N. Fifth Ave., Arcadia, Cal. 91006
Trax Video Labs, Dept. EM, 2020 Milvia St., Berkeley, Cal. 94704
Video Research Corporation, Dept. EM, 6985 Gardon Rd., Riviera Beach, Fla. 33404

Recorders, X-Y

Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
D Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 p. 2838,2839
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D Houston Instrument, Div. Bausch & Lomb, Dept. EM, 8500 Cameron Rd., Austin, Tex. 78753 ..... p. 2844
Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803 p. 2775
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D Philips Test & Measuring Instrs., Dept. EM, 85 McKee Dr., Mahwah, NJ 07430 ..... *
D Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... *
Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... p. 2846
D Auto-trol Corp., Dept. EM, 5650 N. Pecos St., Denver, Colo. 80221
Bailey Meter Co., Sub. Babcock & Wilcox, Dept. EM, 29801 Euclid Ave., Wickliffe, Ohio 44092
California Computer Prods., Dept. EM, 2411 W. La Palma Ave., Anaheim, Cal 92801
DATA TECHnology, Inc., Dept. EM, 4 Gill St., Woburn, Mass. 01801
Gamma Scientific Inc., Dept. EM, 3777 Ruffin Rd., San Diego, Cal. 92123
Image Graphics, Inc., Dept. EM, 1525 Kings Hwy., Fairfield, Conn. 06430
Larson Aero Dev., Dept. EM, Box 135, Concord, Cal. 94522
M MFE Corp., Dept. EM, Keewaydin Dr., Salem, N.H. 03079
D Soltec Corp., Dept. EM, Box 49, Sun Valley, Cal. 91352
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Records, Frequency Test

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 p. 2845
Gotham Audio Corp., Dept. EM, 741 Washington St., New York, N.Y. 10014

Rectifiers, Bridges & Assemblies

D A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 ..... *
D Conditioning Semiconductor Devices, Dept. EM, Box 816, Wayne, N.J. 07470 *
D International Rectifier Corp., Semiconductor Div., Dept. EM, 233 Kansas St., El Segundo, Cal. 90245 ..... *
D ISL Products Ltd. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803 *
Sanford-Miller Corp., Dept. EM, 8 John St., Lynbrook, N.Y. 11563 ..... *
DM Semtech Corp., Dept. EM, 652 Mitchell Rd., Newbury Park, Cal. 91320 p. 3944,3946-3953,3956,3960,3962
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Westinghouse Elec. Corp., Semiconductor Div., Dept. EM. Armbrust Rd., Youngwood, Pa. 15697 ..... p. 3973
D Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
Eastern Delta Corp., Dept. EM, 29-09 S. Broadway, Fair Lawn, N.J. 07410
Edal Inds., Inc., Dept. EM, 4 Short Beach Rd., E. Haven, Conn. 06512
Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
D FMC Corp., Semiconductor Products Div., Dept. EM, 800 Hoyt St., Broomfield, Colo. 80020
Galileo Electro-Optics Corp., Dept. EM, Galileo Pk., Sturbridge, Mass. 01518
M High Voltage Devices, Inc., Dept. EM, 7435 Ave., Visalia, Cal. 93277
D ITT, Semiconductor Div., Dept. EM, 500 Broadway, Lawrence, MASS 01841
Lark Electronics, Inc., Dept. EM, Box 390, New York, N.Y. 10040
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
D National Electronics, Div. Varian Assoc. Inc., Dept. EM, Box 269, Geneva, Ill. 60134
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Payne Engrg. Co., Dept. EM, Box 70, Scott Depot, W. Va. 25560
Power Conversion Products Inc., Dept. EM, 42 East St., Crystal Lake, Ill. 60014
Rectifier Components Corp., Dept. EM, 1112 Lousons Rd., Union, N.J. 07083
D RSM Sensitron Semiconductor, Div. RSM Electron Power, Inc., Dept. EM, 221 W. Industry Ct., Deer Park, N.Y. 11729
D Semiconductor Technology, Inc., Dept. EM, 124-14 22nd Ave., College Point, N.Y. 11356
DM Solitron Devices, Transistor Div., Dept. EM, 1177 Blue Heron Rd., Riviera Beach, Fla. 33404
DM St-Semicon Inc, Semiconductor Div., Dept. EM, 415 No. College Ave., Bloomington, Ind. 47401
D Varo Semiconductor, Inc., Dept. EM, 1000 N. Shiloh Rd., Garland, Tex. 75040

Rectifiers, Copper Oxide

D General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Edal Inds., Inc., Dept. EM, 4 Short Beach Rd., E. Haven, Conn. 06512
Mura Corp., Dept. EM, 177 Cantiague Rock Rd, Westbury, NY 11590
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016

Rectifiers, Copper Sulfide

D General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
General Elec., Semiconductor Prods., Dept. EM, Electronics Pk., Box 1122, Syracuse, NY 13201
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016

Rectifiers, Electron Tube—See Tubes, Rectifying

Rectifiers, Germanium

D A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 ..... **p. 3920**
D Conditioning Semiconductor Devices, Dept. EM, Box 816, Wayne, N.J. 07470 *
D General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
American Microsemiconductor, Dept. EM, 145 Main St, Madison, NJ 07940
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Cordover & Co., Carl, Dept. EM, 3914 North 29th Ave., Hollywood, Fla. 33020
CSR Industries Inc., Semiconductor Div., Dept. EM, 35 Central Ave., E. Farmingdale, N.Y. 11735
D GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
D Nucleonic Prods., Dept. EM, Box 1454, 6660 Variel Ave., Canoga Pk., Cal. 91303
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Rectifier Components Corp., Dept. EM, 1112 Lousons Rd., Union, N.J. 07083
D Solid State Inc., Dept. EM, 46 Farrand St., Bloomfield, N.J. 07003
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Rectifiers, Selenium

A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 ..... **p. 3920**
D Conditioning Semiconductor Devices, Dept. EM, Box 816, Wayne, N.J. 07470 *
D General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 *
D International Rectifier Corp., Semiconductor Div., Dept. EM, 233 Kansas St., El Segundo, Cal. 90245 ..... *
D Sanford-Miller Corp., Dept. EM, 8 John St., Lynbrook, N.Y. 11563 ..... **p. 3935**
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
Chemical Etching Equip. & Supply, Dept. EM, 6905 Beulah St, Alexandria, Va. 22310
Eastern Delta Corp., Dept. EM, 29-09 S. Broadway, Fair Lawn, N.J. 07410
Edal Inds., Inc., Dept. EM, 4 Short Beach Rd., E. Haven, Conn. 06512
D FMC Corp., Semiconductor Products Div., Dept. EM, 800 Hoyt St., Broomfield, Colo. 80020
D GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
Lark Electronics, Inc., Dept. EM, Box 390, New York, N.Y. 10040
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Power Conversion Products Inc., Dept. EM, 42 East St., Crystal Lake, Ill. 60014
D St-Semicon Inc, Semiconductor Div., Dept. EM, 415 No. College Ave., Bloomington, Ind. 47401

Rectifiers, Silicon

D A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 ..... **p. 3920**
American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
Christie Elec., Dept. EM, 3404A W. 67th St., Los Angeles, Cal. 90043 ..... *
D Conditioning Semiconductor Devices, Dept. EM, Box 816, Wayne, N.J. 07470 **p. 3921**
D Delco Electronics Div., General Motors Corp., Dept. EM, 700 E. Firmin St., Kokomo, Ind. 46901 ..... **p. 3924,3925**
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 *
D International Rectifier Corp., Semiconductor Div., Dept. EM, 233 Kansas St., El Segundo, Cal. 90245 ..... **p. 3926**
D ISL Products Ltd. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803 **p. 3929**
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
Sanford-Miller Corp., Dept. EM, 8 John St., Lynbrook, N.Y. 11563 ..... **p. 3935**
DM Semtech Corp., Dept. EM, 652 Mitchell Rd., Newbury Park, Cal. 91320 **p. 3936-3944,3946-3959,3961-3964**
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
TRW Capacitors, Dept. EM, 301 West 'O' Str., Ogallala, Neb. 69153 ..... *
M Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040 *
DM Westinghouse Elec. Corp., Semiconductor Div., Dept. EM, Armbrust Rd., Youngwood, Pa. 15697 ..... **p. 3973**
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
American Microsemiconductor, Dept. EM, 145 Main St, Madison, NJ 07940
D Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
D Amperex Electronic Corp., Slatersville Div., Dept. EM, Providence Pike, Slatersville, R.I. 02876
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
Chemical Etching Equip. & Supply, Dept. EM, 6905 Beulah St, Alexandria, Va. 22310
D Cordover & Co., Carl, Dept. EM, 3914 North 29th Ave., Hollywood, Fla. 33020
CSR Industries Inc., Semiconductor Div., Dept. EM, 35 Central Ave., E. Farmingdale, N.Y. 11735
Edal Inds., Inc., Dept. EM, 4 Short Beach Rd., E. Haven, Conn. 06512
D Electronic Transistors, Dept. EM, 112-15 Northern Blvd., Flushing, N.Y. 11368
Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
D Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
D FMC Corp., Semiconductor Products Div., Dept. EM, 800 Hoyt St., Broomfield, Colo. 80020
Galileo Electro-Optics Corp., Dept. EM, Galileo Pk., Sturbridge, Mass. 01518
General Elec., Semiconductor Prods., Dept. EM, Electronics Pk., Box 1122, Syracuse, NY 13201
DM General Instrument Corp., Discrete Semiconductor Div., Dept. EM, 600 West John St., Hicksville, N.Y. 11802
M High Voltage Devices, Inc., Dept. EM, 7435 Ave., Visalia, Cal. 93277
DM ITT, Semiconductor Div., Dept. EM, 500 Broadway, Lawrence, MASS 01841
Lark Electronics, Inc., Dept. EM, Box 390, New York, N.Y. 10040
M Levit Electronics, C. M., Dept. EM, 200 Park Ave. S., New York, N.Y. 10003
M Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
D National Electronics, Div. Varian Assoc. Inc., Dept. EM, Box 269, Geneva, Ill. 60134
D Nucleonic Prods., Dept. EM, Box 1454, 6660 Variel Ave., Canoga Pk., Cal. 91303
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Power Conversion Products Inc., Dept. EM, 42 East St., Crystal Lake, Ill. 60014
Rectifier Components Corp., Dept. EM, 1112 Lousons Rd., Union, N.J. 07083
DM RSM Sensitron Semiconductor, Div. RSM Electron Power, Inc., Dept. EM, 221 W. Industry Ct., Deer Park, N.Y. 11729
D Semicon Inc., Dept. EM, 10 North Ave., Burlington, Mass. 01803
D Semiconductor Technology, Inc., Dept. EM, 124-14 22nd Ave., College Point, N.Y. 11356
D Solid State Inc., Dept. EM, 46 Farrand St., Bloomfield, N.J. 07003
DM Solitron Devices, Transistor Div., Dept. EM, 1177 Blue Heron Rd., Riviera Beach, Fla. 33404
DM St-Semicon Inc, Semiconductor Div., Dept. EM, 415 No. College Ave., Bloomington, Ind. 47401
TRW Power Semiconductors, Dept. EM, 14520 Aviation Blvd., Lawndale, Cal. 90260
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
D Varo Semiconductor, Inc., Dept. EM, 1000 N. Shiloh Rd., Garland, Tex. 75040
D Vidaire Electronics Mfg., Dept. EM, 150 Buffalo Ave., Freeport, N.Y. 11520
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

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Rectifiers, Thyratron—See Tubes, Thyratron

Reducers, Speed-Also See Gears & Gear Mechanisms

Eastern Air Devices Motor Div., Electro Audio Dynamics, Inc., Dept. EM, 1 Progress Dr., Dover, N.H. 03820 ..... *
D Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 ..... *
TRW/Globe Motors, Dept. EM, 2275 Stanley Ave., Dayton, Ohio 45404 ..... *
D Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 .... *
Dresser Industries, Dept. EM, 1505 Elm St., Dallas, Tex. 75201
Eaton Corp., Ind'l. Drives Div., Dept. EM, 9919 Clinton Rd., Cleveland, Ohio 44111
Evershed & Vignoles Ltd., Dept. EM, Action Lane, Chiswick, London, England W4 5HJ
M Instru-Lec Corp., Dept. EM, 520 Homestead Ave., Mt. Vernon, N.Y. 10550
M PIC Design Div., Benrus Corp., Dept. EM, Benrus Center, Rte 7, Ridgefield, Conn. 06877
M Precision Mechanisms Corp., Dept. EM, 44 Brooklyn Ave., Westbury, N.Y. 11590
Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424

Reels, Cord & Cable

Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 ..... *
Aero-Motive Mfg Co., Dept. EM, 1-94 At Miller Rd., Kalamazoo, Mich. 49001
DM Ametek, Inc, Hunter Spring Division, Dept. EM, 1 Spring Ave., Hatfield, Pa. 19440
DM Hykon Mfg. Co., Dept. EM, 163 E. State St., Box 923, Alliance, Ohio 44601
D T & B/Thomas & Betts, Dept. EM, 36 Butler St., Elizabeth, N.J. 07207

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CEA, Div. Berkleonics, Inc., Dept. EM, 1 Aerovista Pk., San Luis Obispo, Cal. 93401 ..... *
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D International Rectifier Corp., Semiconductor Div., Dept. EM, 233 Kansas St., El Segundo, Cal. 90245 ..... *
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North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
Power Designs, Inc., Dept. EM, 1700 Shames Dr., Westbury, N.Y. 11590 .... *

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M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Analogic Corp., Dept. EM, Audubon Rd., Wakefield, Mass. 01880
Dynage, Inc., Power Supply Corp., Dept. EM, 1331 Blue Hills Ave., Bloomfield, Conn. 06002
Elcor Prods. Neotec Elctrns. Inc., Dept. EM, 2431 Linden La., Silver Spring, Md. 20910
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Ferranti Elec., Dept. EM, East Bethpage Rd., Plainview, N.Y. 11803
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
Instrulab, Inc., Dept. EM, P.O.B 426 N.D. Sta., Dayton, Ohio 45404
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
DM Precision Monolithics Inc., Dept. EM, 1500 Space Dr., Santa Clara, Cal. 95050
Velonex, Instrument Div., Dept. EM, 560 Robert Ave., Santa Clara, Cal. 95050
Zi-Tech Div., Aikenwood Corp., Dept. EM, Box 26, 2151 Park Blvd., Palo Alto, Cal. 94302

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GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
D Heeger Inc., Dept. EM, 725 Ceres Ave., Los Angeles, Cal. 90021
M Miller-Stephenson Chem. Co., Inc., Dept. EM, George Washington Hwy., Danbury, Conn. 06810
D Tech Spray, Inc., Dept. EM, Box 949, Amarillo, Tex. 79105
Union Carbide, Chemicals & Plastics, Dept. EM, 270 Park Ave., New York, N.Y. 10017
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

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M Blue M Electric Co., Dept. EM, 138th & Chatham St., Blue Island, Ill. 60406 p. 2570
M Cincinnati Sub-Zero Products, Dept. EM, 2612 Gilbert Ave., Cincinnati, Ohio 45206 ..... p. 2571
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M Tenney Engrg., Inc., Dept. EM, 109 Springfield Rd., Union, N.J. 07083 ..... *
D Associated Environmental Systems, Dept. EM, 360 Merrimack St., Lawrence, Mass. 01842
Atlas Engrg. Corp., Dept. EM, 26 Custer St., W. Hartford, Conn. 06110
Forma Scientific, Inc., Dept. EM, Box 649, Marietta, Ohio 45750
FTS Systems Inc., Dept. EM, POB 158, Stone Ridge, N.Y. 12484
D GCA/Precision Scientific, Dept. EM, 3737 W. Cortland St., Chicago, Ill. 60647
Lab-Line Instrs, Dept. EM, 15th & Bloomingdale, Melrose Park, Ill. 60160
Temptronic Corporation, Dept. EM, 40 Glen Ave., Newton, Mass. 02159
Webber Manufacturing Co., Dept. EM, P.O. Box 217, Indianapolis, Ind. 46206

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D A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 ..... *
D General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
D International Rectifier Corp., Semiconductor Div., Dept. EM, 233 Kansas St., El Segundo, Cal. 90245 ..... *
Power Designs, Inc., Dept. EM, 1700 Shames Dr., Westbury, N.Y. 11590 .... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Amperex Electronic Corp., Slatersville Div., Dept. EM, Providence Pike, Slatersville, R.I. 02876
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Bug Electronics, Dept. EM, 151 Grove St, Westwood, Mass. 02090
Elcor Prods. Neotec Elctrns. Inc., Dept. EM, 2431 Linden La., Silver Spring, Md. 20910
D Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
Ferranti Elec., Dept. EM, East Bethpage Rd., Plainview, N.Y. 11803
DM General Semiconductor Industries, Inc., Dept. EM, 2001 W. 10 Pl., Box 3078, Tempe, Ariz. 85281
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Semicon Inc., Dept. EM, 10 North Ave., Burlington, Mass. 01803
Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
DM Teledyne Semiconductor, Dept. EM, 1300 Terra Bella Ave., Mountain View, Cal. 94040

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Abbott Transistor Labs., Industrial Div., Dept. EM, 5200 W. Jefferson Blvd., Los Angeles, Cal. 90016 ..... p. 3150
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M Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470 ..... *
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M Eanco, Inc., Mid-Eastern Prods., Dept. EM, 539 Jacksonville Rd., Warminster, Pa. 18974 ..... *
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D General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
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Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
M Georator Corporation, Dept. EM, Box 70, Manassas, Va. 22110 ..... *
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M Kepco, Inc., Dept. EM, 131-38 Sanford Ave., Flushing, N.Y. 11352 p. 3278,3279,3281,3282
Magnetico, Inc., Dept. EM, 182 Morris Ave., Holtsville, N.Y. 11742 ..... *
Megavolt, Corp., Dept. EM, 110 Hobart St, Hackensack, N.J. 07601 ..... *
Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 *
NWL Transformers, Dept. EM, Rising Sun Rd., Bordentown, N.J. 08505 p. 4365
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D Superior Electric Co., Dept. EM, 1000 Middle St., Bristol, Conn. 06010 p. 3401
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D Triad-Utrad, Distr Svcs., Dept. EM, 305 N. Briant St., Huntington, Ind. 46750 *
Universal Voltronics Corp., Dept. EM, 27 Radio Circle Dr., Mt. Kisco, N.Y. 10549 ..... *
M Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040 *
M Victoreen, Inc., Dept. EM, 10101 Woodland Ave., Cleveland, Ohio 44104 p. 3778
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Basler Electric Co., Dept. EM, Box 269, Rte. 143, Highland, Ill. 62249
Bug Electronics, Dept. EM, 151 Grove St, Westwood, Mass. 02090
M Cal-Power Corp., Dept. EM, 140 Kansas St., El Segundo, Calif. 90245
Circuit Technology, Dept. EM, 160 Smith St., Farmingdale, N.Y. 11735
Cyberex, Inc., Dept. EM, 7171 Industrial Park Blvd., Mentor, Ohio 44060
Elcor Prods. Neotec Elctrns. Inc., Dept. EM, 2431 Linden La., Silver Spring, Md. 20910
M Electro-Module, Inc., Dept. EM, 2855 Metropolitan Place, Pomona, Cal. 91767
Ferranti Elec., Dept. EM, East Bethpage Rd., Plainview, N.Y. 11803
GAR Enterprises, Dept. EM, 2031 N. Lincoln Ave., Pasadena, Cal. 91103
Lambda Elctrns., Dept. EM, 515 Brd. Hollow Rd., Melville, N.Y. 11746
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
M Micron Industries Corp., Constant Voltage Div., Dept. EM, 1830 N. 32nd Ave., Stone Park, Ill. 60165
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
Neshaminy Transformer, Div. Neshaminy Elctrn., Dept. EM, Edison-Furlong Rd., Furlong, Pa. 18925
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
D Perma Power Elctrns, Dept. EM, 5615 W. Howard Ave., Chicago, Ill. 60648
Phoenix Transformer Co., Dept. EM, 1818 E. Madison, Phoenix, Ariz. 85034
Power-Matic Inc., Dept. EM, 8076 Engineer Rd., San Diego, Cal. 92111
DM Precision Monolithics Inc., Dept. EM, 1500 Space Dr., Santa Clara, Cal. 95050
Prototype Transformer Corp., Dept. EM, 545 N Arlington Ave, East Orange, N.J. 07017
D Ratelco, Inc., Dept. EM, 610 Pontius Ave. N., Dept. EEM, Seattle, Wash. 98109

Raytheon Co., Indl. Comps. Oper., Dept. EM, 465 Centre St., Quincy, Mass. 02169
D Sanken Elec. Co., Dept. EM, 1-22-8 Nishi-Ikebukuro, Toshima-Ku, Tokyo, Japan
M Sawyer Inds., Dept. EM, 5649 Peck Rd., Arcadia, Cal. 91006
Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
DM Siemens-Allis, Inc., Dept. EM, Box 2168, Milwaukee, Wisc. 53201
Solidstate Controls, Inc., Dept. EM, 600 Oakland Park Ave., Columbus, Ohio 43214
DM Sorensen Co., Dept. EM, 676 Island Pond Rd., Manchester, N.H. 03103
DM Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
St-Semicon Inc, Semiconductor Div., Dept. EM, 415 No. College Ave., Bloomington, Ind. 47401
M Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803
D Terado Corp., Dept. EM, 1068 Raymond Ave., St. Paul, Minn. 55108
M Todd Products Corp., Dept. EM, 123 Milbar Blvd., Farmingdale, N.Y. 11735
VHF Engrg, Div. of Brownian Elctrns. Corp., Dept. EM, 320 Water St., Binghamton, N.Y. 13902
M Ward Leonard Elec. Co. Inc., Sub. Unimax Group Inc., Dept. EM, 31 South St., Mt. Vernon, N.Y. 10550
M Wilmar Elctrns. Inc., Dept. EM, 2430 Amsler St., Torrance, Cal. 90505

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DM Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634 ..... *
Bikor Corporation, Dept. EM, 23970 Madison St., Torrance, Cal. 90505 ..... *
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NWL Transformers, Dept. EM, Rising Sun Rd., Bordentown, N.J. 08505 p. 4365
Power Designs, Inc., Dept. EM, 1700 Shames Dr., Westbury, N.Y. 11590 .... *
M Sigmapower, Inc., Dept. EM, 20790 Leapwood Ave., Carson, Cal. 90746 .... *
Topaz Electronics, Dept. EM, 3855 Ruffin Rd., San Diego, Cal. 92123 ..... *
Applied Control Co., Dept. EM, 1275 Bloomfield Ave., Fairfield, N.J. 07006
M Atlantic Research Corp., Dept. EM, 5390 Cherokee Ave., Alexandria, Va 22314
M Bendix, Electric & Fluid Power Div., Dept. EM, Hwy. 35, Eatontown, N.J. 07724
Cross Electronics Inc., Dept. EM, 100 Commonwealth Dr., Warrendale, Pa. 15086
M Electro-Module, Inc., Dept. EM, 2855 Metropolitan Place, Pomona, Cal. 91767
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
Lambda Elctrns., Dept. EM, 515 Brd. Hollow Rd., Melville, N.Y. 11746
D Leece Neville Div., Sheller Globe Corp., Dept. EM, 1374 East 51st St., Cleveland, Ohio 44103
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
Micron Industries Corp., Constant Voltage Div., Dept. EM, 1830 N. 32nd Ave., Stone Park, Ill. 60165
Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
DM Solitron Devices, Transistor Div., Dept. EM, 1177 Blue Heron Rd., Riviera Beach, Fla. 33404
DM Sorensen Co., Dept. EM, 676 Island Pond Rd., Manchester, N.H. 03103
M Todd Products Corp., Dept. EM, 123 Milbar Blvd., Farmingdale, N.Y. 11735

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Abacus Controls Inc., Dept. EM, 89 Redington Rd., Somerville, N.J. 08876 *
American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Behlman Engineering Corp., Dept. EM, Box 4518, 427 N. Nopal St., Santa Barbara, Cal. 93103 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... *
Elgar Corporation, Dept. EM, 8225 Mercury Ct., San Diego, Cal. 92111 ..... *
Era Transpac Corp., Sub. Elctrn. Research Assocs., Dept. EM, 311 B East Park St. Dept. 1202, Moonachie, N.J. 07074 ..... *
M Georator Corporation, Dept. EM, Box 70, Manassas, Va. 22110 ..... *
Nova Electric Mfg. Co., Dept. EM, 263 Hillside Ave., Nutley, N.J. 07110 ..... *
Power Designs, Inc., Dept. EM, 1700 Shames Dr., Westbury, N.Y. 11590 .... *
Topaz Electronics, Dept. EM, 3855 Ruffin Rd., San Diego, Cal. 92123 ..... *
M Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040 *
Basler Electric Co., Dept. EM, Box 269, Rte. 143, Highland, Ill. 62249
M Bendix, Electric & Fluid Power Div., Dept. EM, Hwy. 35, Eatontown, N.J. 07724
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627

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D American Zettler, Inc., Dept. EM, 16881 Hale Ave., Irvine, Cal. 92714 ..... *
D Aromat Corp., Dept. EM, 250 Sheffield Ave., Mountainside, N.J. 07092 ..... *
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D Potter & Brumfield, Div of AMF, Dept. EM, P.O. Box 322, Princeton, Ind. 47671 ..... *
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D Magnecraft Elec. Co., Dept. EM, 5575 N. Lynch Ave., Chicago, Ill. 60630
D Master Elctrn. Controls, Dept. EM, 1651-19th St., Santa Monica, Cal. 90404
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016

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DM Leach Corp., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003 ..... *
DM North American Philips Controls, Dept. EM, Husky Park, Frederick, Md. 21731 ..... *
DM Potter & Brumfield, Div of AMF, Dept. EM, P.O. Box 322, Princeton, Ind. 47671 ..... *
M Branson Corp., Dept. EM, Box 147, Newton, N.J. 07860
Computer Comps., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
Kurman Relay, Dept. EM, 120 Wilbur Place, Bohemia, N.Y. 11716
D Magnecraft Elec. Co., Dept. EM, 5575 N. Lynch Ave., Chicago, Ill. 60630
M Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
DM Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
D Universal Relay Corp., Dept. EM, 42 White St., New York, N.Y. 10013

Relays, Current Sensing

Airpax Elctrns., Controls Div., Dept. EM, 6801 W. Sunrise Blvd., Ft. Lauderdale, Fla. 33313 ..... *
D ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845 ..... *
M American Aerospace Controls, Dept. EM, 131 Verdi St., Farmingdale, N.Y. 11735 ..... p. 4298,4299
D American Zettler, Inc., Dept. EM, 16881 Hale Ave., Irvine, Cal. 92714 ..... *
D Aromat Corp., Dept. EM, 250 Sheffield Ave., Mountainside, N.J. 07092 ..... *
M Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470 ..... *
D Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645 ..... *
Coto-Coil Co., Dept. EM, 65 Pavilion Ave., Providence, R.I. 02905 ..... *
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
D Diversified Electronics Inc., Dept. EM, 119 N. Morton Ave., Evansville, Ind. 47711 ..... p. 3449
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... *
D Durakool, Dept. EM, 1010 N. Main St., Elkhart, Ind. 46514 ..... *
M Elec-Trol, Inc., Dept. EM, 26477 N. Golden Valley Rd., Saugus, Cal. 91350 .. *
D Electronic Applications Co., Dept. EM, 4918 Santa Anita Ave., El Monte, Cal. 91734 ..... *
Elctrn. Instr. & Specialty, Dept. EM, 42 Pleasant St., Stoneham, Mass. 02180 *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
D Gould Inc. Circuit Protection & Controls Div., Dept. EM, 100 Relay Rd., Plantsville, Conn. 06479 ..... p. 3500,3501
Guardian Electric Co., Dept. EM, 1550 W. Carroll Ave., Chicago, Ill. 60607 .. *
D Heinemann Elec. Co., Dept. EM, Trenton, N.J. 08650 ..... *
DM Hi-G Co., Inc., Relay Div, Dept. EM, Spring St. & Rte. 75, Windsor Locks, Conn. 06096 ..... *
D ITT Comps. Relays, Dept. EM, 1551 Osgood St., N. Andover, Mass. 01845 *
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 ..... *
Leach Corp., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003 ..... *
Liberty Controls, Inc., Dept. EM, 500 Brookforest Ave., Shorewood, Ill. 60431 p. 3581
D Midtex, Inc., AEMCO Div., Dept. EM, 1650 Tower Blvd., No. Mankato, Minn. 56001 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
North American Philips Controls, Dept. EM, Husky Park, Frederick, Md. 21701 ..... *
D Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076 .... p. 3589
D Potter & Brumfield, Div of AMF, Dept. EM, P.O. Box 322, Princeton, Ind. 47671 ..... *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *

M Acromag, Inc., Dept. EM, 30765 Wixom Rd., Wixom, Mich. 48096
Alpha Components Corp., Dept. EM, 115 Eucalyptus Dr., El Segundo, Cal. 90245
Applied Electro Technology, Inc., Dept. EM, 2220 S. Anne St., Santa Ana, Cal. 92704
Basler Electric Co., Dept. EM, Box 269, Rte. 143, Highland, Ill. 62249
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
D Essex Controls Div., Essex Grp, Dept. EM, 131 Godfrey St., Logansport, Ind. 46947
D Furnas Elec. Co., Dept. EM, 1197 McKee St., Batavia, Ill. 60510
DM General Automatic Corp., Dept. EM, 70 Liberty St., Metuchen, N.J. 08840
Hartman Electrical Mfg., Div. A-T-O Inc., Dept. EM, 175 N. Diamond St., Mansfield, Ohio 44902
Instr. & Control Sys., Inc., Dept. EM, 520 Interstate Rd, Addison, Ill. 60101
D Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962
D Magnecraft Elec. Co., Dept. EM, 5575 N. Lynch Ave., Chicago, Ill. 60630
D Master Elctrn. Controls, Dept. EM, 1651–19th St., Santa Monica, Cal. 90404
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Projects Unlimited, Inc., Dept. EM, 3680 Wyse Rd., Dayton, Ohio 45414
Relay Service Co., Dept. EM, 1310 N. Pulaski Rd., Chicago, Ill. 60651
D Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803
Universal Relay Corp., Dept. EM, 42 White St., New York, N.Y. 10013
M Wilmar Elctrns. Inc., Dept. EM, 2430 Amsler St., Torrance, Cal. 90505

Relays, Differential

Barber-Colman Co., Motor Div., Dept. EM, Dept. F, 14116 Rock St., Rockford, Ill. 61101 ..... *
D **Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645** ..... *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... *
Fifth Dimension, Dept. EM, 707 Alexander Rd., Princeton, N.J. 08540 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
D **HI-G Co., Inc., Relay Div, Dept. EM, Spring St. & Rte. 75, Windsor Locks, Conn. 06096** ..... *
Leach Corp., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D **Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076** ..... *
D **Potter & Brumfield, Div of AMF, Dept. EM, P.O. Box 322, Princeton, Ind. 47671** ..... *
Basler Electric Co., Dept. EM, Box 269, Rte. 143, Highland, Ill. 62249
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
Computer Comps., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
D Essex Controls Div., Essex Grp, Dept. EM, 131 Godfrey St., Logansport, Ind. 46947
DM General Automatic Corp., Dept. EM, 70 Liberty St., Metuchen, N.J. 08840
DM Guardian California, Dept. EM, 4030 W. Spencer St., Torrance, Cal. 90503
Hartman Electrical Mfg., Div. A-T-O Inc., Dept. EM, 175 N. Diamond St., Mansfield, Ohio 44902
D La Marche Mfg. Co., Dept. EM, 106 Bradrock Drive, Des Plaines, Ill. 60018
D Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962
D Siemens-Allis, Inc., Dept. EM, Box 2168, Milwaukee, Wisc. 53201
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
Universal Relay Corp., Dept. EM, 42 White St., New York, N.Y. 10013
Westinghouse Elec. Corp., Relay-Instr. Div., Dept. EM, 95 Orange St., Newark, N.J. 07101
M Wilmar Elctrns. Inc., Dept. EM, 2430 Amsler St., Torrance, Cal. 90505

Relays, Frequency Selective

M **Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470** ..... *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Guardian Electric Co., Dept. EM, 1550 W. Carroll Ave., Chicago, Ill. 60607 .. *
M **Hi-G Co., Inc., Dept. EM, 580 Spring St., Windsor Locks, Conn. 06096** ..... *
Hi-G Co., Inc., Relay Div, Dept. EM, Spring St. & Rte. 75, Windsor Locks, Conn. 06096 ..... *
Leach Corp., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Applied Electro Technology, Inc., Dept. EM, 2220 S. Anne St., Santa Ana, Cal. 92704
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
DM Guardian California, Dept. EM, 4030 W. Spencer St., Torrance, Cal. 90503
Hartman Electrical Mfg., Div. A-T-O Inc., Dept. EM, 175 N. Diamond St., Mansfield, Ohio 44902
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Southwood Electronic Co., Dept. EM, 7624 Lindenwood Dr., Indianapolis, Ind. 46227
M Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803
M Wilmar Elctrns. Inc., Dept. EM, 2430 Amsler St., Torrance, Cal. 90505

Relays, General Purpose

D **ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845** ..... *
Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
D **American Zettler, Inc., Dept. EM, 16881 Hale Ave., Irvine, Cal. 92714** p. 3412,3413
Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 ..... *
D **Aromat Corp., Dept. EM, 250 Sheffield Ave., Mountainside, N.J. 07092** p. 3414,3415,3418,3419,3424,3425
D **Bell Industries, J.W. Miller Div., Dept. EM, 19070 Reyes Ave., Compton, Cal. 90221** ..... *
DM **Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645** ..... *
Connector Corp., Dept. EM, 6025 N. Keystone Ave., Chicago, Ill. 60646 ..... *
D **Control Products Div., Amerace Corp., Dept. EM, 2330 Vauxhall Rd., Union, N.J. 07083** ..... *
D **Cornell-Dubilier Electronics, Dept. EM, 150 Avenue "L", Newark, N.J. 07105** p. 3433
Coto-Coil Co., Dept. EM, 65 Pavilion Ave., Providence, R.I. 02905 ..... *
D **Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101** ..... *
D **Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216** ..... p. 4043
D **Deltrol Controls, Dept. EM, 2745 S. 19th St., Milwaukee, Wisc. 53215** p. 3442-3444
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... *
Durakool, Dept. EM, 1010 N. Main St., Elkhart, Ind. 46514 .. p. 3466-3468,3473
D **Electronic Applications Co., Dept. EM, 4918 Santa Anita Ave., El Monte, Cal. 91734** ..... p. 3479
Elctrn. Instr. & Specialty, Dept. EM, 42 Pleasant St., Stoneham, Mass. 02180 *
DM **Electronic Specialty Div., Datron Systems Inc., Dept. EM, 18900 N.E. Sandy Blvd., Portland, Ore. 97220** ..... *
Elmwood Sensors, Inc., Dept. EM, 1655 Elmwood Ave., Cranston, RI 02907 *
Fujitsu America, Inc., Component Sales Div., Dept. EM, 910 Sherwood Dr., Lake Bluff, Ill. 60044 ..... p. 3490
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Gould Inc. Circuit Protection & Controls Div., Dept. EM, 100 Relay Rd., Plantsville, Conn. 06479 ..... p. 3500-3502
Guardian Electric Co., Dept. EM, 1550 W. Carroll Ave., Chicago, Ill. 60607 p. 3514-3518
Heinemann Elec. Co., Dept. EM, Trenton, N.J. 08650 ..... *
D **Hi-G Co., Inc., Relay Div, Dept. EM, Spring St. & Rte. 75, Windsor Locks, Conn. 06096** ..... p. 3530-3533,3537-3539
D **ISL Products Ltd. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803** *
ITT Comps. Capacitors, Dept. EM, 1551 Osgood St., N. Andover, Mass. 01845 ..... *
ITT Comps. Relays, Dept. EM, 1551 Osgood St., N. Andover, Mass. 01845 p. 3554-3556,3558,3559
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 ..... *
Leach Corp., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003 p. 3570,3571
Liberty Controls, Inc., Dept. EM, 500 Brookforest Ave., Shorewood, Ill. 60431 p. 3581
Littelfuse, Inc., Dept. EM, 800 E. Northwest Hwy., Des Plaines, Ill. 60016 .... *
Matrix Systems Corp., Dept. EM, 9411 Lurline Ave., Chatsworth, Cal. 91311 *
D **Midtex, Inc., AEMCO Div., Dept. EM, 1650 Tower Blvd., No. Mankato, Minn. 56001** ..... p. 3583
D **North American Philips Controls, Dept. EM, Husky Park, Frederick, Md. 21701** ..... p. 3584,3585
D **Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076** .... p. 3589
D **Omron Electronics, Dept. EM, 233 S. Wacker Dr., Chicago, Ill. 60606** p. 3591
DM **Potter & Brumfield, Div of AMF, Dept. EM, P.O. Box 322, Princeton, Ind. 47671** ..... p. 3593,3594,3596-3600
D **Schrack Electrical Sales Corp., Dept. EM, 1140 Broadway Rm 205, New York, N.Y. 10001** ..... p. 3610
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D **T-Bar Inc., Dept. EM, 141 Danbury Rd., Wilton, Conn. 06897** ..... p. 3611
Teledyne Relays, Dept. EM, 3155 W. El Segundo Blvd., Hawthorne, Cal 90250 ..... *
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
Artisan Elctrns. Corp., Dept. EM, 5 Eastmans Rd., Parsippany, N.J. 07054
DM Associated Engrg. & Mfg. Corp., Dept. EM, 546 Valley Rd., Upper Montclair, N.J. 07043
M Branson Corp., Dept. EM, Box 147, Newton, N.J. 07860
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
Davis Elec. Co., Dept. EM, Box 38, Cape Girardeau, Mo. 63701
I Eagle Signal, Mfg. Div. Gulf & Western Inds., Dept. EM, Box 3585, Davenport, Iowa 52808
DM Essex Controls Div., Essex Grp, Dept. EM, 131 Godfrey St., Logansport, Ind. 46947
Executone, Printact Relay Div., Dept. EM, 29-10 Thomson Ave., Long Island City, N.Y. 11101
D Furnas Elec. Co., Dept. EM, 1197 McKee St., Batavia, Ill. 60510
DM General Automatic Corp., Dept. EM, 70 Liberty St., Metuchen, N.J. 08840
D General Elec. Co, Wiring Device Bus. Dept., Dept. EM, 95 Hathaway St., Providence, R.I. 02904
Guardian California, Dept. EM, 4030 W. Spencer St., Torrance, Cal. 90503
Hartman Electrical Mfg., Div. A-T-O Inc., Dept. EM, 175 N. Diamond St., Mansfield, Ohio 44902
I H-B Instr. Co., Dept. EM, 4306 N. American St, Philadelphia, Pa. 19140
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
InResCo, Dept. EM, 503 Adamston Rd., Bricktown, N. J. 08723
James Electronics Inc., Dept. EM, 4050 N Rockwell St, Chicago, Ill. 60618
Kurman Relay, Dept. EM, 120 Wilbur Place, Bohemia, N.Y. 11716
DM Line Elec an Esterline Co., Dept. EM, U.S. Hwy. 287, Parsippany, N.J. 07054
Mack Elec. Devices, Dept. EM, 32 Glenside Ave., Wyncote, Pa. 19095
D Magnecraft Elec. Co., Dept. EM, 5575 N. Lynch Ave., Chicago, Ill. 60630

D Master Elctrn. Controls, Dept. EM, 1651-19th St., Santa Monica, Cal. 90404
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
Relay Service Co., Dept. EM, 1310 N. Pulaski Rd., Chicago, Ill. 60651
M Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
D Siemens-Allis, Inc., Dept. EM, Box 2168, Milwaukee, Wisc. 53201
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
DM Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
DM Syracuse Elctrns. Corp., Dept. EM, Box 566, Syracuse, N.Y. 13201
Universal Relay Corp., Dept. EM, 42 White St., New York, N.Y. 10013
Vanguard Relay Corp., Dept. EM, 225 Cortland St., Lindenhurst, N.Y. 11757
D Ward Leonard Elec. Co. Inc., Sub. Unimax Group Inc., Dept. EM, 31 South St., Mt. Vernon, N.Y. 10550
Westinghouse Elec. Corp., Relay-Instr. Div., Dept. EM, 95 Orange St., Newark, N.J. 07101

Relays, High-Voltage (500 Volts & Over)

D Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645 ..... p. 3426,3427
Cober Elctrns., Inc., Dept. EM, 7 Gleason Ave., Stamford, Conn. 06902 ..... *
Coto-Coil Co., Dept. EM, 65 Pavilion Ave., Providence, R.I. 02905 ..... *
Crydom Controls, Int'l. Rectifier, Dept. EM, 1521 Grand Ave., El Segundo, Cal. 90245 ..... *
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 .. *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... p. 3458,3459
Durakool, Dept. EM, 1010 N. Main St., Elkhart, Ind. 46514 ..... p. 3472
M Elec-Trol, Inc., Dept. EM, 26477 N. Golden Valley Rd., Saugus, Cal. 91350 .. *
D Electronic Applications Co., Dept. EM, 4918 Santa Anita Ave., El Monte, Cal. 91734 ..... p. 3479
Elctrn. Instr. & Specialty, Dept. EM, 42 Pleasant St., Stoneham, Mass. 02180 *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
D Gordos Corp., Dept. EM, 250 Glenwood Ave., Bloomfield, N.J. 07003 p. 3494-3496
Hamlin Inc., Dept. EM, Lake & Grove Sts., Lake Mills, Wisc. 53551 .... p. 3523
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 ..... p. 3547,3550,3551
M Kilovac Corp., Dept. EM, Box 4422, Santa Barbara, Cal. 93103 ..... p. 3565
Megavolt, Corp., Dept. EM, 110 Hobart St, Hackensack, N.J. 07601 ..... *
Midtex, Inc., AEMCO Div., Dept. EM, 1650 Tower Blvd., No. Mankato, Minn. 56001 ..... *
North American Philips Controls, Dept. EM, Husky Park, Frederick, Md. 21701 ..... *
D Omron Electronics, Dept. EM, 233 S. Wacker Dr., Chicago, Ill. 60606 ..... *
D Potter & Brumfield, Div of AMF, Dept. EM, P.O. Box 322, Princeton, Ind. 47671 ..... *
DM Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... p. 3609
Standex Electronics, Dept. EM, 4538 Camberwell Rd., Cincinnati, Ohio 45209 *
Teledyne Relays, Dept. EM, 3155 W. El Segundo Blvd., Hawthorne, Cal 90250 ..... p. 3616
Wabash Relay & Elctrns., Dept. EM, Box 708, Wabash, Ind. 46992 ..... *
Computer Comps., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
D Electronic Relays, Inc., Dept. EM, 7106-08 W. Touhy Ave., Niles, Ill. 60648
Hartman Electrical Mfg., Div. A-T-O Inc., Dept. EM, 175 N. Diamond St., Mansfield, Ohio 44902
D H-B Instr. Co., Dept. EM, 4306 N. American St, Philadelphia, Pa. 19140
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602
Mack Elec. Devices, Dept. EM, 32 Glenside Ave., Wyncote, Pa. 19095
D Magnecraft Elec. Co., Dept. EM, 5575 N. Lynch Ave., Chicago, Ill. 60630
D Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Solid State Relays Intl, Dept. EM, Box 48149, Chicago, Ill. 60648
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
D Triridge Corp., Dept. EM, Box 12420, Pittsburgh, Pa. 15231
Universal Relay Corp., Dept. EM, 42 White St., New York, N.Y. 10013

Relays, Hybrid

D Adams & Westlake Co., Dept. EM, 1025 W. Michigan St., Elkhart, Ind. 46514 p. 3411
D American Zettler, Inc., Dept. EM, 16881 Hale Ave., Irvine, Cal. 92714 ..... *
D Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645 ..... *
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... *
Elec-Trol, Inc., Dept. EM, 26477 N. Golden Valley Rd., Saugus, Cal. 91350 .. *
Electronic Specialty Div., Datron Systems Inc., Dept. EM, 18900 N.E. Sandy Blvd., Portland, Ore. 97220 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Gordos Corp., Dept. EM, 250 Glenwood Ave., Bloomfield, N.J. 07003 p. 3497,3499
Grayhill Inc., Dept. EM, 569 Hillgrove Ave., LaGrange, Ill. 60525 ..... *
Guardian Electric Co., Dept. EM, 1550 W. Carroll Ave., Chicago, Ill. 60607 .. *
Hamlin Inc., Dept. EM, Lake & Grove Sts., Lake Mills, Wisc. 53551 .... p. 3522
D Hi-G Co., Inc., Relay Div, Dept. EM, Spring St. & Rte. 75, Windsor Locks, Conn. 06096 ..... *
D ITT Comps. Relays, Dept. EM, 1551 Osgood St., N. Andover, Mass. 01845 *
D Midtex, Inc., AEMCO Div., Dept. EM, 1650 Tower Blvd., No. Mankato, Minn. 56001 ..... *
D Potter & Brumfield, Div of AMF, Dept. EM, P.O. Box 322, Princeton, Ind. 47671 ..... *
Standex Electronics, Dept. EM, 4538 Camberwell Rd., Cincinnati, Ohio 45209 *
DM Teledyne Relays, Dept. EM, 3155 W. El Segundo Blvd., Hawthorne, Cal 90250 ..... p. 3612-3614
Wabash Relay & Elctrns., Dept. EM, Box 708, Wabash, Ind. 46992 ..... *
M Argent Electronics, Inc., Dept. EM, 477 E. Wenger Rd., Englewood, Ohio 45322
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
D Electronic Relays, Inc., Dept. EM, 7106-08 W. Touhy Ave., Niles, Ill. 60648
D Essex Controls Div., Essex Grp, Dept. EM, 131 Godfrey St., Logansport, Ind. 46947
Gentron Corp., Dept. EM, 6667 N. Sydney Pl., Milwaukee, Wisc. 53209
Hartman Electrical Mfg., Div. A-T-O Inc., Dept. EM, 175 N. Diamond St., Mansfield, Ohio 44902
D La Marche Mfg. Co., Dept. EM, 106 Bradrock Drive, Des Plaines, Ill. 60018
D Magnecraft Elec. Co., Dept. EM, 5575 N. Lynch Ave., Chicago, Ill. 60630
MKC Electronics, Dept. EM, 454 E. Donovan Rd., Kansas City, Kans. 66115
M Projects Unlimited, Inc., Dept. EM, 3680 Wyse Rd., Dayton, Ohio 45414
Solid State Relays Intl, Dept. EM, Box 48149, Chicago, Ill. 60648
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
D Teccor Electronics, Inc., Dept. EM, 1101 Pamela Dr., Box 669, Euless, Tex. 76039
Vanguard Relay Corp., Dept. EM, 225 Cortland St., Lindenhurst, N.Y. 11757

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Relays, Latching

A. D. Data Sys., Inc., Dept. EM, POB 9209, Rochester, N.Y. 14625 ..... *
D Adams & Westlake Co., Dept. EM, 1025 W. Michigan St., Elkhart, Ind. 46514 *
Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
D American Zettler, Inc., Dept. EM, 16881 Hale Ave., Irvine, Cal. 92714 ..... *
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Cornell-Dubilier Electronics, Dept. EM, 150 Avenue "L", Newark, N.J. 07105 *
Coto-Coil Co., Dept. EM, 65 Pavilion Ave., Providence, R.I. 02905 ..... *
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D Deltrol Controls, Dept. EM, 2745 S. 19th St., Milwaukee, Wisc. 53215 ..... *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... *
M Elec-Trol, Inc., Dept. EM, 26477 N. Golden Valley Rd., Saugus, Cal. 91350 .. *
D Electronic Applications Co., Dept. EM, 4918 Santa Anita Ave., El Monte, Cal. 91734 ..... *
D Elctrn. Instr. & Specialty, Dept. EM, 42 Pleasant St., Stoneham, Mass. 02180 *
DM Electronic Specialty Div., Datron Systems Inc., Dept. EM, 18900 N.E. Sandy Blvd., Portland, Ore. 97220 ..... p. 3484,3485
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D Gordos Corp., Dept. EM, 250 Glenwood Ave., Bloomfield, N.J. 07003 ..... *
D Gould Inc. Circuit Protection & Controls Div., Dept. EM, 100 Relay Rd., Plantsville, Conn. 06479 ..... p. 3502,3504
Guardian Electric Co., Dept. EM, 1550 W. Carroll Ave., Chicago, Ill. 60607 .. *
D Hi-G Co., Inc., Relay Div, Dept. EM, Spring St. & Rte. 75, Windsor Locks, Conn. 06096 ..... *
Information Transfer Industrial, Inc., Dept. EM, Box 357, Holcomb, N.Y. 14469 ..... *
ITT Comps. Capacitors, Dept. EM, 1551 Osgood St., N. Andover, Mass. 01845 ..... *
ITT Comps. Relays, Dept. EM, 1551 Osgood St., N. Andover, Mass. 01845 p. 3556
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 ..... *
M Kilovac Corp., Dept. EM, Box 4422, Santa Barbara, Cal. 93103 ..... *
DM Leach Corp., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003 p. 3571-3573,3575
Liberty Controls, Inc., Dept. EM, 500 Brookforest Ave., Shorewood, Ill. 60431 p. 3581
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Matrix Systems Corp., Dept. EM, 9411 Lurline Ave., Chatsworth, Cal. 91311 *
D Midtex, Inc., AEMCO Div., Dept. EM, 1650 Tower Blvd., No. Mankato, Minn. 56001 ..... p. 3583
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D Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076 .... p. 3589
D Omron Electronics, Dept. EM, 233 S. Wacker Dr., Chicago, Ill. 60606 p. 3591
DM Potter & Brumfield, Div of AMF, Dept. EM, P.O. Box 322, Princeton, Ind. 47671 ..... *

Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... *
Schrack Electrical Sales Corp., Dept. EM, 1140 Broadway Rm 205, New York, N.Y. 10001 ..... p. 3610
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Standex Electronics, Dept. EM, 4538 Camberwell Rd., Cincinnati, Ohio 45209 *
D **T-Bar Inc., Dept. EM, 141 Danbury Rd., Wilton, Conn. 06897** ..... p. 3611
DM **Teledyne Relays, Dept. EM, 3155 W. El Segundo Blvd., Hawthorne, Cal 90250** ..... p. 3612,3613
Wabash Relay & Elctrns., Dept. EM, Box 708, Wabash, Ind. 46992 ..... p. 3623
M Branson Corp., Dept. EM, Box 147, Newton, N.J. 07860
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
Computer Comps., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
DM Delaval Turbine Inc., Gems Sensors Div., Dept. EM, Spring La., Farmington, Conn. 06032
D Eagle Signal, Mfg. Div. Gulf & Western Inds., Dept. EM, Box 3585, Davenport, Iowa 52808
Electro Design Systems, Dept. EM, 401 W. 35th St., Ste. K, National City, CA 92050
Electronic Relays, Inc., Dept. EM, 7106-08 W. Touhy Ave., Niles, Ill. 60648
Executone, Printact Relay Div., Dept. EM, 29-10 Thomson Ave., Long Island City, N.Y. 11101
D Furnas Elec. Co., Dept. EM, 1197 McKee St., Batavia, Ill. 60510
Hartman Electrical Mfg., Div. A-T-O Inc., Dept. EM, 175 N. Diamond St., Mansfield, Ohio 44902
DM Line Elec an Esterline Co., Dept. EM, U.S. Hwy. 287, Parsippany, N.J. 07054
D Magnecraft Elec. Co., Dept. EM, 5575 N. Lynch Ave., Chicago, Ill. 60630
D Master Elctrn. Controls, Dept. EM, 1651-19th St., Santa Monica, Cal. 90404
DM Meko Instrument Co., Dept. EM, 1311 Air Way, Glendale, Cal. 91201
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Payne Engrg. Co., Dept. EM, Box 70, Scott Depot, W. Va. 25560
Relay Service Co., Dept. EM, 1310 N. Pulaski Rd., Chicago, Ill. 60651
M Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Solid State Relays Intl, Dept. EM, Box 48149, Chicago, Ill. 60648
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
D Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
D Triridge Corp., Dept. EM, Box 12420, Pittsburgh, Pa. 15231
D Universal Relay Corp., Dept. EM, 42 White St., New York, N.Y. 10013
Vanguard Relay Corp., Dept. EM, 225 Cortland St., Lindenhurst, N.Y. 11757
D Ward Leonard Elec. Co. Inc., Sub. Unimax Group Inc., Dept. EM, 31 South St., Mt. Vernon, N.Y. 10550

Relays, Mercury Displacement

D **Adams & Westlake Co., Dept. EM, 1025 W. Michigan St., Elkhart, Ind. 46514** p. 3411
D **Durakool, Dept. EM, 1010 N. Main St., Elkhart, Ind. 46514** ..... p. 3465
Electronic Applications Co., Dept. EM, 4918 Santa Anita Ave., El Monte, Cal. 91734 ..... p. 3479
D H-B Instr. Co., Dept. EM, 4306 N. American St, Philadelphia, Pa. 19140
D Mack Elec. Devices, Dept. EM, 32 Glenside Ave., Wyncote, Pa. 19095
D Magnecraft Elec. Co., Dept. EM, 5575 N. Lynch Ave., Chicago, Ill. 60630
Solid State Relays Intl, Dept. EM, Box 48149, Chicago, Ill. 60648
Universal Relay Corp., Dept. EM, 42 White St., New York, N.Y. 10013

Relays, Mercury-Wetted Contacts

D **Adams & Westlake Co., Dept. EM, 1025 W. Michigan St., Elkhart, Ind. 46514** p. 3411
D **Aromat Corp., Dept. EM, 250 Sheffield Ave., Mountainside, N.J. 07092** ..... *
DM **Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645** ..... p. 3426,3427
Coto-Coil Co., Dept. EM, 65 Pavilion Ave., Providence, R.I. 02905 ..... *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... *
DM **Elec-Trol, Inc., Dept. EM, 26477 N. Golden Valley Rd., Saugus, Cal. 91350** .. *
D **Electronic Applications Co., Dept. EM, 4918 Santa Anita Ave., El Monte, Cal. 91734** ..... p. 3479
D **Elctrn. Instr. & Specialty, Dept. EM, 42 Pleasant St., Stoneham, Mass. 02180** p. 3482
D **Electronic Specialty Div., Datron Systems Inc., Dept. EM, 18900 N.E. Sandy Blvd., Portland, Ore. 97220** ..... p. 3486,3487
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Fujitsu America, Inc., Component Sales Div., Dept. EM, 910 Sherwood Dr., Lake Bluff, Ill. 60044 ..... *
D **Gordos Corp., Dept. EM, 250 Glenwood Ave., Bloomfield, N.J. 07003** p. 3495,3496
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Matrix Systems Corp., Dept. EM, 9411 Lurline Ave., Chatsworth, Cal. 91311 *
D **Midtex, Inc., AEMCO Div., Dept. EM, 1650 Tower Blvd., No. Mankato, Minn. 56001** ..... p. 3583
D **Potter & Brumfield, Div of AMF, Dept. EM, P.O. Box 322, Princeton, Ind. 47671** ..... *
Standex Electronics, Dept. EM, 4538 Camberwell Rd., Cincinnati, Ohio 45209 *
Wabash Relay & Elctrns., Dept. EM, Box 708, Wabash, Ind. 46992 ..... *
Computer Comps., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
COSAR Corp., Dept. EM, 3121 Benton St., Garland, Tex. 75042
Electro Design Systems, Dept. EM, 401 W. 35th St., Ste. K, National City, CA 92050
Electronic Relays, Inc., Dept. EM, 7106-08 W. Touhy Ave., Niles, Ill. 60648
D H-B Instr. Co., Dept. EM, 4306 N. American St, Philadelphia, Pa. 19140
inResCo, Dept. EM, 503 Adamston Rd., Bricktown, N. J. 08723
D Magnecraft Elec. Co., Dept. EM, 5575 N. Lynch Ave., Chicago, Ill. 60630
DM Meko Instrument Co., Dept. EM, 1311 Air Way, Glendale, Cal. 91201
MKC Electronics, Dept. EM, 454 E. Donovan Rd., Kansas City, Kans. 66115
D Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
Solid State Relays Intl, Dept. EM, Box 48149, Chicago, Ill. 60648
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
D Triridge Corp., Dept. EM, Box 12420, Pittsburgh, Pa. 15231
Universal Relay Corp., Dept. EM, 42 White St., New York, N.Y. 10013

Relays, Meter

Airpax Elctrns., Controls Div., Dept. EM, 6801 W. Sunrise Blvd., Ft. Lauderdale, Fla. 33313 ..... *
Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
D **Beede Electrical Instr. Co., Dept. EM, S. Main St., Penacook, N.H. 03301** .... *
Electro Industries, Dept. EM, 109 Nassau Dr., Albertson, NY 11507 ..... *
D **Electronic Applications Co., Dept. EM, 4918 Santa Anita Ave., El Monte, Cal. 91734** ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
D **Jewell Electrical Instruments, Inc., Dept. EM, Grenier Field, Manchester, N.H. 03108** ..... p. 2765
Servo-Tek Prods. Co., Dept. EM, 1086 Goffle Rd., Hawthorne, N.J. 07506 p. 3109
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Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... p. 2819
A & D Electrical Instruments, Dept. EM, 73-07 88th St., Glendale, N.Y. 11227
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
Assembled Products Co., Dept. EM, Box 750, St. Albans, Vt. 05478
D Int'l. Instrs., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477
Jones & Laughlin Steel Corp, Dept. EM, 3 Gateway Ctr, Pittsburgh, PA 15263
D Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
Universal Relay Corp., Dept. EM, 42 White St., New York, N.Y. 10013

Relays, Motor Start

D **Adams & Westlake Co., Dept. EM, 1025 W. Michigan St., Elkhart, Ind. 46514** *
D **ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845** ..... *
D **Aromat Corp., Dept. EM, 250 Sheffield Ave., Mountainside, N.J. 07092** ..... *
D **Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645** ..... p. 3429
D **Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101** ..... *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... *
D **Durakool, Dept. EM, 1010 N. Main St., Elkhart, Ind. 46514** ..... *
Elmwood Sensors, Inc., Dept. EM, 1655 Elmwood Ave., Cranston, RI 02907 *
Fujitsu America, Inc., Component Sales Div., Dept. EM, 910 Sherwood Dr., Lake Bluff, Ill. 60044 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
D **Gould Inc. Circuit Protection & Controls Div., Dept. EM, 100 Relay Rd., Plantsville, Conn. 06479** ..... *
Guardian Electric Co., Dept. EM, 1550 W. Carroll Ave., Chicago, Ill. 60607 .. *
D **ITT Comps. Relays, Dept. EM, 1551 Osgood St., N. Andover, Mass. 01845** *
DM **Leach Corp., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003** ..... *
D **Midtex, Inc., AEMCO Div., Dept. EM, 1650 Tower Blvd., No. Mankato, Minn. 56001** ..... *
D **North American Philips Controls, Dept. EM, Husky Park, Frederick, Md. 21701** ..... *
D **Omron Electronics, Dept. EM, 233 S. Wacker Dr., Chicago, Ill. 60606** ..... *
D **Potter & Brumfield, Div of AMF, Dept. EM, P.O. Box 322, Princeton, Ind. 47671** ..... *
D **Teledyne Relays, Dept. EM, 3155 W. El Segundo Blvd., Hawthorne, Cal 90250** ..... *
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
E-T-A Circuit Breakers, Dept. EM, 7400 N. Croname Rd., Chicago, Ill. 60648
DM Essex Controls Div., Essex Grp, Dept. EM, 131 Godfrey St., Logansport, Ind. 46947
D Furnas Elec. Co., Dept. EM, 1197 McKee St., Batavia, Ill. 60510
Hartman Electrical Mfg., Div. A-T-O Inc., Dept. EM, 175 N. Diamond St., Mansfield, Ohio 44902
H-B Instr. Co., Dept. EM, 4306 N. American St, Philadelphia, Pa. 19140
KB Electronics Inc., Dept. EM, 5801 Foster Ave., Brooklyn, N.Y. 11234
D Magnecraft Elec. Co., Dept. EM, 5575 N. Lynch Ave., Chicago, Ill. 60630
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Payne Engrg. Co., Dept. EM, Box 70, Scott Depot, W. Va. 25560
D Siemens-Allis, Inc., Dept. EM, Box 2168, Milwaukee, Wisc. 53201
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
M Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
Texas Instruments Control Prods. Div., Dept. EM, 34 Forrest St., Attleboro, Mass. 02703
Vanguard Relay Corp., Dept. EM, 225 Cortland St., Lindenhurst, N.Y. 11757
D Vectrol, Inc., Dept. EM, 110 Douglas Rd, Oldsmar, Fla. 33557
Ward Leonard Elec. Co. Inc., Sub. Unimax Group Inc., Dept. EM, 31 South St., Mt. Vernon, N.Y. 10550

Relays, Overload

D ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845 ..... *
Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
M Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470 ..... *
D Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645 ..... *
Coto-Coil Co., Dept. EM, 65 Pavilion Ave., Providence, R.I. 02905 ..... *
D Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101 ..... *
Crydom Controls, Int'l. Rectifier, Dept. EM, 1521 Grand Ave., El Segundo, Cal. 90245 ..... *
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Guardian Electric Co., Dept. EM, 1550 W. Carroll Ave., Chicago, Ill. 60607 .. *
D Heinemann Elec. Co., Dept. EM, Trenton, N.J. 08650 ..... *
Hi-G Co., Inc., Relay Div, Dept. EM, Spring St. & Rte. 75, Windsor Locks, Conn. 06096 ..... *
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 ..... *
Leach Corp., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003 ..... *
DM Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... *
Schrack Electrical Sales Corp., Dept. EM, 1140 Broadway Rm 205, New York, N.Y. 10001 ..... *
Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114 ..... *
Basler Electric Co., Dept. EM, Box 269, Rte. 143, Highland, Ill. 62249
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
E-T-A Circuit Breakers, Dept. EM, 7400 N. Croname Rd., Chicago, Ill. 60648
D Essex Controls Div., Essex Grp, Dept. EM, 131 Godfrey St., Logansport, Ind. 46947
D Furnas Elec. Co., Dept. EM, 1197 McKee St., Batavia, Ill. 60510
DM General Automatic Corp., Dept. EM, 70 Liberty St., Metuchen, N.J. 08840
Hartman Electrical Mfg., Div. A-T-O Inc., Dept. EM, 175 N. Diamond St., Mansfield, Ohio 44902
D Hoagland Instr Co, Div Tech Dev, Dept. EM, Box 550, Dayton, N.J. 08810
D Magnecraft Elec. Co., Dept. EM, 5575 N. Lynch Ave., Chicago, Ill. 60630
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
D Siemens-Allis, Inc., Dept. EM, Box 2168, Milwaukee, Wisc. 53201
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803
Universal Relay Corp., Dept. EM, 42 White St., New York, N.Y. 10013
D Ward Leonard Elec. Co. Inc., Sub. Unimax Group Inc., Dept. EM, 31 South St., Mt. Vernon, N.Y. 10550
Westinghouse Elec. Corp., Relay-Instr. Div., Dept. EM, 95 Orange St., Newark, N.J. 07101
M Wilmar Elctrns. Inc., Dept. EM, 2430 Amsler St., Torrance, Cal. 90505

Relays, Phase-Sensing

Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
M Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470 ..... *
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
D Diversified Electronics Inc., Dept. EM, 119 N. Morton Ave., Evansville, Ind. 47711 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Guardian Electric Co., Dept. EM, 1550 W. Carroll Ave., Chicago, Ill. 60607 .. *
DM Hi-G Co., Inc., Dept. EM, 580 Spring St., Windsor Locks, Conn. 06096 ..... *
Leach Corp., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003 ..... *
Schrack Electrical Sales Corp., Dept. EM, 1140 Broadway Rm 205, New York, N.Y. 10001 ..... *
Applied Electro Technology, Inc., Dept. EM, 2220 S. Anne St., Santa Ana, Cal. 92704
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
M Electro-Module, Inc., Dept. EM, 2855 Metropolitan Place, Pomona, Cal. 91767
D Furnas Elec. Co., Dept. EM, 1197 McKee St., Batavia, Ill. 60510
DM Guardian California, Dept. EM, 4030 W. Spencer St., Torrance, Cal. 90503
Hartman Electrical Mfg., Div. A-T-O Inc., Dept. EM, 175 N. Diamond St., Mansfield, Ohio 44902
D Master Elctrn. Controls, Dept. EM, 1651–19th St., Santa Monica, Cal. 90404
D Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
M Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803
Westinghouse Elec. Corp., Relay-Instr. Div., Dept. EM, 95 Orange St., Newark, N.J. 07101
M Wilmar Elctrns. Inc., Dept. EM, 2430 Amsler St., Torrance, Cal. 90505

Relays, Plate Circuit

D Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645 ..... *
Deltrol Controls, Dept. EM, 2745 S. 19th St., Milwaukee, Wisc. 53215 ..... *
Guardian Electric Co., Dept. EM, 1550 W. Carroll Ave., Chicago, Ill. 60607 ..... p. 3514
D Hi-G Co., Inc., Relay Div, Dept. EM, Spring St. & Rte. 75, Windsor Locks, Conn. 06096 ..... *
Liberty Controls, Inc., Dept. EM, 500 Brookforest Ave., Shorewood, Ill. 60431 *
Midtex, Inc., AEMCO Div., Dept. EM, 1650 Tower Blvd., No. Mankato, Minn. 56001 ..... *
D Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076 .... p. 3589
D Potter & Brumfield, Div of AMF, Dept. EM, P.O. Box 322, Princeton, Ind. 47671 ..... *
DM Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... *
D Schrack Electrical Sales Corp., Dept. EM, 1140 Broadway Rm 205, New York, N.Y. 10001 ..... *
Artisan Elctrns. Corp., Dept. EM, 5 Eastmans Rd., Parsippany, N.J. 07054
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
Computer Comps., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
Davis Elec. Co., Dept. EM, Box 38, Cape Girardeau, Mo. 63701
Executone, Printact Relay Div., Dept. EM, 29-10 Thomson Ave., Long Island City, N.Y. 11101
DM General Automatic Corp., Dept. EM, 70 Liberty St., Metuchen, N.J. 08840
Guardian California, Dept. EM, 4030 W. Spencer St., Torrance, Cal. 90503
InResCo, Dept. EM, 503 Adamston Rd., Bricktown, N. J. 08723
DM Line Elec an Esterline Co., Dept. EM, U.S. Hwy. 287, Parsippany, N.J. 07054
Magnecraft Elec. Co., Dept. EM, 5575 N. Lynch Ave., Chicago, Ill. 60630
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Relay Service Co., Dept. EM, 1310 N. Pulaski Rd., Chicago, Ill. 60651
M Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
Universal Relay Corp., Dept. EM, 42 White St., New York, N.Y. 10013
Vanguard Relay Corp., Dept. EM, 225 Cortland St., Lindenhurst, N.Y. 11757
D Ward Leonard Elec. Co. Inc., Sub. Unimax Group Inc., Dept. EM, 31 South St., Mt. Vernon, N.Y. 10550

Relays, Plug-In

D American Zettler, Inc., Dept. EM, 16881 Hale Ave., Irvine, Cal. 92714 p. 3412,3413
D Aromat Corp., Dept. EM, 250 Sheffield Ave., Mountainside, N.J. 07092 p. 3419,3420,3422-3424
D Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645 ..... p. 3426,3427,3431
Cornell-Dubilier Electronics, Dept. EM, 150 Avenue "L", Newark, N.J. 07105 *
Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101 ..... *
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DM Electronic Specialty Div., Datron Systems Inc., Dept. EM, 18900 N.E. Sandy Blvd., Portland, Ore. 97220 ..... *
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DM Hi-G Co., Inc., Relay Div, Dept. EM, Spring St. & Rte. 75, Windsor Locks, Conn. 06096 ..... *
Information Transfer Industrial, Inc., Dept. EM, Box 357, Holcomb, N.Y. 14469 ..... *
D ISL Products Ltd. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803 *
ITT Comps. Capacitors, Dept. EM, 1551 Osgood St., N. Andover, Mass. 01845 ..... *
D ITT Comps. Relays, Dept. EM, 1551 Osgood St., N. Andover, Mass. 01845 p. 3558,3559
DM Leach Corp., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003 ..... *
Liberty Controls, Inc., Dept. EM, 500 Brookforest Ave., Shorewood, Ill. 60431 *
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T-Bar Inc., Dept. EM, 141 Danbury Rd., Wilton, Conn. 06897 ..... *
DM Teledyne Relays, Dept. EM, 3155 W. El Segundo Blvd., Hawthorne, Cal 90250 ..... *
Wabash Relay & Elctrns., Dept. EM, Box 708, Wabash, Ind. 46992 ..... *
Assembled Products Co., Dept. EM, Box 750, St. Albans, Vt. 05478
M Branson Corp., Dept. EM, Box 147, Newton, N.J. 07860
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
Computer Comps., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
DM Essex Controls Div., Essex Grp, Dept. EM, 131 Godfrey St., Logansport, Ind. 46947
Executone, Printact Relay Div., Dept. EM, 29-10 Thomson Ave., Long Island City, N.Y. 11101
D La Marche Mfg. Co., Dept. EM, 106 Bradrock Drive, Des Plaines, Ill. 60018
D Magnecraft Elec. Co., Dept. EM, 5575 N. Lynch Ave., Chicago, Ill. 60630
D Master Elctrn. Controls, Dept. EM, 1651–19th St., Santa Monica, Cal. 90404
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016

Relay Service Co., Dept. EM, 1310 N. Pulaski Rd., Chicago, Ill. 60651
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
DM Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
DM Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
Vanguard Relay Corp., Dept. EM, 225 Cortland St., Lindenhurst, N.Y. 11757

Relays, Polarized

D Adams & Westlake Co., Dept. EM, 1025 W. Michigan St., Elkhart, Ind. 46514 *
D American Zettler, Inc., Dept. EM, 16881 Hale Ave., Irvine, Cal. 92714 ..... *
D Aromat Corp., Dept. EM, 250 Sheffield Ave., Mountainside, N.J. 07092 ..... *
Barber-Colman Co., Motor Div., Dept. EM, Dept. F, 14116 Rock St., Rockford, Ill. 61101 ..... *
D Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645 ..... *
Coto-Coil Co., Dept. EM, 65 Pavilion Ave., Providence, R.I. 02905 ..... *
D Deltrol Controls, Dept. EM, 2745 S. 19th St., Milwaukee, Wisc. 53215 ..... *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... *
D Electronic Applications Co., Dept. EM, 4918 Santa Anita Ave., El Monte, Cal. 91734 ..... *
D Elctrn. Instr. & Specialty, Dept. EM, 42 Pleasant St., Stoneham, Mass. 02180 *
Fifth Dimension, Dept. EM, 707 Alexander Rd., Princeton, N.J. 08540 ..... *
Fujitsu America, Inc., Component Sales Div., Dept. EM, 910 Sherwood Dr., Lake Bluff, Ill. 60044 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
D Hi-G Co., Inc., Relay Div, Dept. EM, Spring St. & Rte. 75, Windsor Locks, Conn. 06096 ..... *
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 ..... *
DM Leach Corp., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003 ..... *
Liberty Controls, Inc., Dept. EM, 500 Brookforest Ave., Shorewood, Ill. 60431 *
D Midtex, Inc., AEMCO Div., Dept. EM, 1650 Tower Blvd., No. Mankato, Minn. 56001 ..... *
North American Philips Controls, Dept. EM, Husky Park, Frederick, Md. 21701 ..... *
D Potter & Brumfield, Div of AMF, Dept. EM, P.O. Box 322, Princeton, Ind. 47671 ..... *
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M Branson Corp., Dept. EM, Box 147, Newton, N.J. 07860
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
Computer Comps., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
Executone, Printact Relay Div., Dept. EM, 29-10 Thomson Ave., Long Island City, N.Y. 11101
DM General Automatic Corp., Dept. EM, 70 Liberty St., Metuchen, N.J. 08840
Hartman Electrical Mfg., Div. A-T-O Inc., Dept. EM, 175 N. Diamond St., Mansfield, Ohio 44902
James Electronics Inc., Dept. EM, 4050 N Rockwell St, Chicago, Ill. 60618
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
M Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
Universal Relay Corp., Dept. EM, 42 White St., New York, N.Y. 10013
Westinghouse Elec. Corp., Relay-Instr. Div., Dept. EM, 95 Orange St., Newark, N.J. 07101

Relays, Power

D Adams & Westlake Co., Dept. EM, 1025 W. Michigan St., Elkhart, Ind. 46514 *
Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
D American Zettler, Inc., Dept. EM, 16881 Hale Ave., Irvine, Cal. 92714 ..... *
D Aromat Corp., Dept. EM, 250 Sheffield Ave., Mountainside, N.J. 07092 p. 3421,3425
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D Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101 ..... *
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D Electronic Applications Co., Dept. EM, 4918 Santa Anita Ave., El Monte, Cal. 91734 ..... *
Elmwood Sensors, Inc., Dept. EM, 1655 Elmwood Ave., Cranston, RI 02907 *
Fujitsu America, Inc., Component Sales Div., Dept. EM, 910 Sherwood Dr., Lake Bluff, Ill. 60044 ..... *
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
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D Grayhill Inc., Dept. EM, 569 Hillgrove Ave., LaGrange, Ill. 60525 ..... *
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D ITT Comps. Relays, Dept. EM, 1551 Osgood St., N. Andover, Mass. 01845 p. 3561
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D T-Bar Inc., Dept. EM, 141 Danbury Rd., Wilton, Conn. 06897 ..... *
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Artisan Elctrns. Corp., Dept. EM, 5 Eastmans Rd., Parsippany, N.J. 07054
Basler Electric Co., Dept. EM, Box 269, Rte. 143, Highland, Ill. 62249
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
Cross Electronics Inc., Dept. EM, 100 Commonwealth Dr., Warrendale, Pa. 15086
Davis Elec. Co., Dept. EM, Box 38, Cape Girardeau, Mo. 63701
Delaval Turbine Inc., Gems Sensors Div., Dept. EM, Spring La., Farmington, Conn. 06032
DM Essex Controls Div., Essex Grp, Dept. EM, 131 Godfrey St., Logansport, Ind. 46947
DM General Automatic Corp., Dept. EM, 70 Liberty St., Metuchen, N.J. 08840
DM Guardian California, Dept. EM, 4030 W. Spencer St., Torrance, Cal. 90503
M Hartman Electrical Mfg., Div. A-T-O Inc., Dept. EM, 175 N. Diamond St., Mansfield, Ohio 44902
D H-B Instr. Co., Dept. EM, 4306 N. American St, Philadelphia, Pa. 19140
Hoagland Instr Co, Div Tech Dev, Dept. EM, Box 550, Dayton, N.J. 08810
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
Kurman Relay, Dept. EM, 120 Wilbur Place, Bohemia, N.Y. 11716
DM Line Elec an Esterline Co., Dept. EM, U.S. Hwy. 287, Parsippany, N.J. 07054
Mack Elec. Devices, Dept. EM, 32 Glenside Ave., Wyncote, Pa. 19095
D Magnecraft Elec. Co., Dept. EM, 5575 N. Lynch Ave., Chicago, Ill. 60630
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Payne Engrg. Co., Dept. EM, Box 70, Scott Depot, W. Va. 25560
D Power Control Corp., Dept. EM, 122 Gamma Dr., Pittsburgh, Pa. 15238
D Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
DM Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
Universal Relay Corp., Dept. EM, 42 White St., New York, N.Y. 10013
Vanguard Relay Corp., Dept. EM, 225 Cortland St., Lindenhurst, N.Y. 11757
D Ward Leonard Elec. Co. Inc., Sub. Unimax Group Inc., Dept. EM, 31 South St., Mt. Vernon, N.Y. 10550
Westinghouse Elec. Corp., Relay-Instr. Div., Dept. EM, 95 Orange St., Newark, N.J. 07101
Wilmar Elctrns. Inc., Dept. EM, 2430 Amsler St., Torrance, Cal. 90505
D Zenith Controls Inc., Dept. EM, 830 West 40th St., Chicago, Ill. 60609

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D American Zettler, Inc., Dept. EM, 16881 Hale Ave., Irvine, Cal. 92714 p. 3412,3413
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D Aromat Corp., Dept. EM, 250 Sheffield Ave., Mountainside, N.J. 07092 p. 3414-3417,3419,3420,3422-3424
D Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645 ..... p. 3426-3431
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Deltrol Controls, Dept. EM, 2745 S. 19th St., Milwaukee, Wisc. 53215 p. 3444,3445
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... p. 3459-3461,3464
D Durakool, Dept. EM, 1010 N. Main St., Elkhart, Ind. 46514 ..... *
DM Elec-Trol, Inc., Dept. EM, 26477 N. Golden Valley Rd., Saugus, Cal. 91350 p. 3474,3475,3477
D Electronic Applications Co., Dept. EM, 4918 Santa Anita Ave., El Monte, Cal. 91734 ..... p. 3479
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Electronic Specialty Div., Datron Systems Inc., Dept. EM, 18900 N.E. Sandy Blvd., Portland, Ore. 97220 ..... *
Fifth Dimension, Dept. EM, 707 Alexander Rd., Princeton, N.J. 08540 ..... *
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DM Gordos Corp., Dept. EM, 250 Glenwood Ave., Bloomfield, N.J. 07003 ..... *
D Gould Inc. Circuit Protection & Controls Div., Dept. EM, 100 Relay Rd., Plantsville, Conn. 06479 ..... p. 3504,3506
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DM Hi-G Co., Inc., Dept. EM, 580 Spring St., Windsor Locks, Conn. 06096 ..... *
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ITT Comps. Capacitors, Dept. EM, 1551 Osgood St., N. Andover, Mass. 01845 ..... *
D ITT Comps. Relays, Dept. EM, 1551 Osgood St., N. Andover, Mass. 01845 p. 3554-3556,3558-3561
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Midtex, Inc., AEMCO Div., Dept. EM, 1650 Tower Blvd., No. Mankato, Minn. 56001 ..... p. 3583
Mini-Systems, Inc., Dept. EM, 20 David Rd., North Attleboro, Mass. 02761 *
D North American Philips Controls, Dept. EM, Husky Park, Frederick, Md. 21701 ..... *
D Omron Electronics, Dept. EM, 233 S. Wacker Dr., Chicago, Ill. 60606 ..... *
DM Potter & Brumfield, Div of AMF, Dept. EM, P.O. Box 322, Princeton, Ind. 47671 ..... *
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Standex Electronics, Dept. EM, 4538 Camberwell Rd., Cincinnati, Ohio 45209 *
DM Teledyne Relays, Dept. EM, 3155 W. El Segundo Blvd., Hawthorne, Cal 90250 ..... p. 3612-3614,3616-3620
Wabash Relay & Elctrns., Dept. EM, Box 708, Wabash, Ind. 46992 p. 3622-3624
D AMP Special Industries, Dept. EM, Valley Forge, Pa. 19482
M Branson Corp., Dept. EM, Box 147, Newton, N.J. 07860
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
Computer Comps., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
COSAR Corp., Dept. EM, 3121 Benton St., Garland, Tex. 75042
Electro Design Systems, Dept. EM, 401 W. 35th St., Ste. K, National City, CA 92050
D Electronic Relays, Inc., Dept. EM, 7106-08 W. Touhy Ave., Niles, Ill. 60648
DM Essex Controls Div., Essex Grp, Dept. EM, 131 Godfrey St., Logansport, Ind. 46947
Executone, Printact Relay Div., Dept. EM, 29-10 Thomson Ave., Long Island City, N.Y. 11101
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
InResCo, Dept. EM, 503 Adamston Rd., Bricktown, N. J. 08723
D Magnecraft Elec. Co., Dept. EM, 5575 N. Lynch Ave., Chicago, Ill. 60630
D Master Elctrn. Controls, Dept. EM, 1651–19th St., Santa Monica, Cal. 90404
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Relay Service Co., Dept. EM, 1310 N. Pulaski Rd., Chicago, Ill. 60651
Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
DM Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
Thermosen, Inc., Dept. EM, 375 Fairfield Ave., Stamford, Conn. 06904
Vanguard Relay Corp., Dept. EM, 225 Cortland St., Lindenhurst, N.Y. 11757

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General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
D Hi-G Co., Inc., Dept. EM, 580 Spring St., Windsor Locks, Conn. 06096 p. 3544
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Matrix Systems Corp., Dept. EM, 9411 Lurline Ave., Chatsworth, Cal. 91311 p. 2874
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D Bristol Saybrook Co., Dept. EM, 97 Coulter St., Old Saybrook, Conn. 06475
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
D Eagle Signal, Mfg. Div. Gulf & Western Inds., Dept. EM, Box 3585, Davenport, Iowa 52808
D Magnecraft Elec. Co., Dept. EM, 5575 N. Lynch Ave., Chicago, Ill. 60630
D Master Elctrn. Controls, Dept. EM, 1651–19th St., Santa Monica, Cal. 90404
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
D Precision Timer Co., Dept. EM, 13 Westbrook Ind'l. Park, Westbrook, Conn. 06498

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Adams & Westlake Co., Dept. EM, 1025 W. Michigan St., Elkhart, Ind. 46514 p. 3411
American Zettler, Inc., Dept. EM, 16881 Hale Ave., Irvine, Cal. 92714 ..... *
Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
D Arco Electronics Inc., Dept. EM, 400 Moreland Rd., Commack, N.Y. 11725 *
D Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645 ..... *
M Daico Industries Inc., Dept. EM, Box 5225, Compton, Cal. 90220 ..... p. 2869
D Electronic Applications Co., Dept. EM, 4918 Santa Anita Ave., El Monte, Cal. 91734 ..... *
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M Electronic Specialty Div., Datron Systems Inc., Dept. EM, 18900 N.E. Sandy Blvd., Portland, Ore. 97220 ..... p. 3485
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ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 ..... p. 3547,3548,4086
DM Kilovac Corp., Dept. EM, Box 4422, Santa Barbara, Cal. 93103 p. 3563,3566-3568
Matrix Systems Corp., Dept. EM, 9411 Lurline Ave., Chatsworth, Cal. 91311 p. 2874
D Midtex, Inc., AEMCO Div., Dept. EM, 1650 Tower Blvd., No. Mankato, Minn. 56001 ..... p. 3583
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DM Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... *
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Wabash Relay & Elctrns., Dept. EM, Box 708, Wabash, Ind. 46992 ..... *
Barker & Williamson, Inc., Dept. EM, Canal St., Bristol, Pa. 19007
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
COSAR Corp., Dept. EM, 3121 Benton St., Garland, Tex. 75042
Electronic Relays, Inc., Dept. EM, 7106-08 W. Touhy Ave., Niles, Ill. 60648
Executone, Printact Relay Div., Dept. EM, 29-10 Thomson Ave., Long Island City, N.Y. 11101
James Electronics Inc., Dept. EM, 4050 N Rockwell St, Chicago, Ill. 60618
D Magnecraft Elec. Co., Dept. EM, 5575 N. Lynch Ave., Chicago, Ill. 60630
Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
Vanguard Relay Corp., Dept. EM, 225 Cortland St., Lindenhurst, N.Y. 11757

Relays, Reed

D Adams & Westlake Co., Dept. EM, 1025 W. Michigan St., Elkhart, Ind. 46514 p. 3411
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D Aromat Corp., Dept. EM, 250 Sheffield Ave., Mountainside, N.J. 07092 p. 3416,3417
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DM Elec-Trol, Inc., Dept. EM, 26477 N. Golden Valley Rd., Saugus, Cal. 91350 p. 3474-3476
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Matrix Systems Corp., Dept. EM, 9411 Lurline Ave., Chatsworth, Cal. 91311 *
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DM Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... *
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Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
Component Specialties, Dept. EM, 9143 E. La Rosa Dr., Temple City, Cal. 91780
Computer Comps., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
COSAR Corp., Dept. EM, 3121 Benton St., Garland, Tex. 75042
Electro Design Systems, Dept. EM, 401 W. 35th St., Ste. K, National City, CA 92050
D Electronic Relays, Inc., Dept. EM, 7106-08 W. Touhy Ave., Niles, Ill. 60648
Essex Controls Div., Essex Grp, Dept. EM, 131 Godfrey St., Logansport, Ind. 46947
DM General Automatic Corp., Dept. EM, 70 Liberty St., Metuchen, N.J. 08840
InResCo, Dept. EM, 503 Adamston Rd., Bricktown, N. J. 08723

D Magnecraft Elec. Co., Dept. EM, 5575 N. Lynch Ave., Chicago, Ill. 60630
D Master Elctrn. Controls, Dept. EM, 1651–19th St., Santa Monica, Cal. 90404
DM Meko Instrument Co., Dept. EM, 1311 Air Way, Glendale, Cal. 91201
Micronel U. S., Dept. EM, 8 Kane Ind. Park, Hudson, Mass. 01749
MKC Electronics, Dept. EM, 454 E. Donovan Rd., Kansas City, Kans. 66115
D OKI Electronics of America, Dept. EM, 4031 N.E. 12th Terr., Ft. Lauderdale, Fla. 33334
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Solid State Relays Intl, Dept. EM, Box 48149, Chicago, Ill. 60648
Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
Thermosen, Inc., Dept. EM, 375 Fairfield Ave., Stamford, Conn. 06904
D Triridge Corp., Dept. EM, Box 12420, Pittsburgh, Pa. 15231
Trompeter Electronics, Inc., Dept. EM, 8936 Comanche, Chatsworth, Cal. 91311
Universal Relay Corp., Dept. EM, 42 White St., New York, N.Y. 10013

Relays, Rotary

M Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
D Hi-G Co., Inc., Relay Div, Dept. EM, Spring St. & Rte. 75, Windsor Locks, Conn. 06096 ..... *
Leach Corp., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003 ..... *
M Ledex Inc., Dept. EM, 123 Webster St., Dayton, Ohio 45401 ..... *
D Omron Electronics, Dept. EM, 233 S. Wacker Dr., Chicago, Ill. 60606 ..... *
M Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... *
Schrack Electrical Sales Corp., Dept. EM, 1140 Broadway Rm 205, New York, N.Y. 10001 ..... *
M Branson Corp., Dept. EM, Box 147, Newton, N.J. 07860
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Siemens-Allis, Inc., Dept. EM, Box 2168, Milwaukee, Wisc. 53201
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
Universal Relay Corp., Dept. EM, 42 White St., New York, N.Y. 10013

Relays, Sensitive

D Adams & Westlake Co., Dept. EM, 1025 W. Michigan St., Elkhart, Ind. 46514 *
D American Zettler, Inc., Dept. EM, 16881 Hale Ave., Irvine, Cal. 92714 p. 3412,3413
D Aromat Corp., Dept. EM, 250 Sheffield Ave., Mountainside, N.J. 07092 p. 3421,3422
Barber-Colman Co., Motor Div., Dept. EM, Dept. F, 14116 Rock St., Rockford, Ill. 61101 ..... *
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Cornell-Dubilier Electronics, Dept. EM, 150 Avenue "L", Newark, N.J. 07105 *
Coto-Coil Co., Dept. EM, 65 Pavilion Ave., Providence, R.I. 02905 ..... *
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... *
DM Elec-Trol, Inc., Dept. EM, 26477 N. Golden Valley Rd., Saugus, Cal. 91350 .. *
D Electronic Applications Co., Dept. EM, 4918 Santa Anita Ave., El Monte, Cal. 91734 ..... *
D Elctrn. Instr. & Specialty, Dept. EM, 42 Pleasant St., Stoneham, Mass. 02180 *
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Fifth Dimension, Dept. EM, 707 Alexander Rd., Princeton, N.J. 08540 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
DM Gordos Corp., Dept. EM, 250 Glenwood Ave., Bloomfield, N.J. 07003 p. 3497,3499
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D Grayhill Inc., Dept. EM, 569 Hillgrove Ave., LaGrange, Ill. 60525 ..... *
DM Hi-G Co., Inc., Relay Div, Dept. EM, Spring St. & Rte. 75, Windsor Locks, Conn. 06096 ..... *
ITT Comps. Capacitors, Dept. EM, 1551 Osgood St., N. Andover, Mass. 01845 ..... *
D ITT Comps. Relays, Dept. EM, 1551 Osgood St., N. Andover, Mass. 01845 p. 3554-3556,3558,3559
Liberty Controls, Inc., Dept. EM, 500 Brookforest Ave., Shorewood, Ill. 60431 *
North American Philips Controls, Dept. EM, Husky Park, Frederick, Md. 21701 ..... *
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Wabash Relay & Elctrns., Dept. EM, Box 708, Wabash, Ind. 46992 ..... *
Artisan Elctrns. Corp., Dept. EM, 5 Eastmans Rd., Parsippany, N.J. 07054
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
Computer Comps., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
DM Delaval Turbine Inc., Gems Sensors Div., Dept. EM, Spring La., Farmington, Conn. 06032
D Eagle Signal, Mfg. Div. Gulf & Western Inds., Dept. EM, Box 3585, Davenport, Iowa 52808
Electro Design Systems, Dept. EM, 401 W. 35th St., Ste. K, National City, CA 92050
DM Essex Controls Div., Essex Grp, Dept. EM, 131 Godfrey St., Logansport, Ind. 46947
DM General Automatic Corp., Dept. EM, 70 Liberty St., Metuchen, N.J. 08840
Hartman Electrical Mfg., Div. A-T-O Inc., Dept. EM, 175 N. Diamond St., Mansfield, Ohio 44902
H-B Instr. Co., Dept. EM, 4306 N. American St, Philadelphia, Pa. 19140
InResCo, Dept. EM, 503 Adamston Rd., Bricktown, N. J. 08723
Kurman Relay, Dept. EM, 120 Wilbur Place, Bohemia, N.Y. 11716
D La Marche Mfg. Co., Dept. EM, 106 Bradrock Drive, Des Plaines, Ill. 60018
Larson Aero Dev., Dept. EM, Box 135, Concord, Cal. 94522
DM Line Elec an Esterline Co., Dept. EM, U.S. Hwy. 287, Parsippany, N.J. 07054
Mack Elec. Devices, Dept. EM, 32 Glenside Ave., Wyncote, Pa. 19095
D Magnecraft Elec. Co., Dept. EM, 5575 N. Lynch Ave., Chicago, Ill. 60630
D Master Elctrn. Controls, Dept. EM, 1651–19th St., Santa Monica, Cal. 90404
Princo Instrs., Dept. EM, Industrial Pk., Southampton, Pa. 18966
Relay Service Co., Dept. EM, 1310 N. Pulaski Rd., Chicago, Ill. 60651
D Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
DM Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
Universal Relay Corp., Dept. EM, 42 White St., New York, N.Y. 10013
Vanguard Relay Corp., Dept. EM, 225 Cortland St., Lindenhurst, N.Y. 11757
D Ward Leonard Elec. Co. Inc., Sub. Unimax Group Inc., Dept. EM, 31 South St., Mt. Vernon, N.Y. 10550
D Zenith Controls Inc., Dept. EM, 830 West 40th St., Chicago, Ill. 60609

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D Adams & Westlake Co., Dept. EM, 1025 W. Michigan St., Elkhart, Ind. 46514 p. 3411
Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 ..... *
Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
Aromat Corp., Dept. EM, 250 Sheffield Ave., Mountainside, N.J. 07092 p. 3419,3423
M Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470 ..... *
D Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645 ..... p. 3429,3430
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D Deltrol Controls, Dept. EM, 2745 S. 19th St., Milwaukee, Wisc. 53215 ..... *
D Diversified Electronics Inc., Dept. EM, 119 N. Morton Ave., Evansville, Ind. 47711 ..... *
D Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... p. 3458,3461-3464
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Electronic Specialty Div., Datron Systems Inc., Dept. EM, 18900 N.E. Sandy Blvd., Portland, Ore. 97220 ..... *
D General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
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M Integrated Circuits, Inc., Dept. EM, 13256 Northrup Way, Bellevue, Wash. 98005 ..... *
International Rectifier Corp., Semiconductor Div., Dept. EM, 233 Kansas St., El Segundo, Cal. 90245 ..... *
ITT Comps. Capacitors, Dept. EM, 1551 Osgood St., N. Andover, Mass. 01845 ..... *
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Wabash Relay & Elctrns., Dept. EM, Box 708, Wabash, Ind. 46992 p. 3622-3624
Alpha Components Corp., Dept. EM, 115 Eucalyptus Dr., El Segundo, Cal. 90245
Applied Control Co., Dept. EM, 1275 Bloomfield Ave., Fairfield, N.J. 07006
Applied Electro Technology, Inc., Dept. EM, 2220 S. Anne St., Santa Ana, Cal. 92704
Artisan Elctrns. Corp., Dept. EM, 5 Eastmans Rd., Parsippany, N.J. 07054

Basler Electric Co., Dept. EM, Box 269, Rte. 143, Highland, Ill. 62249
M Branson Corp., Dept. EM, Box 147, Newton, N.J. 07860
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
M Cox & Co., Inc., Dept. EM, 215 Park Ave., S., New York, N.Y. 10003
Cross Electronics Inc., Dept. EM, 100 Commonwealth Dr., Warrendale, Pa. 15086
Delaval Turbine Inc., Gems Sensors Div., Dept. EM, Spring La., Farmington, Conn. 06032
Digitech Data Inds., Dept. EM, 66 Grove St., Box 547, Ridgefield, Conn. 06877
DM Elctrn. Control Co., Dept. EM, Box S150, Dresher, Pa. 19025
D Electronic Relays, Inc., Dept. EM, 7106-08 W. Touhy Ave., Niles, Ill. 60648
Essex Controls Div., Essex Grp, Dept. EM, 131 Godfrey St., Logansport, Ind. 46947
Executone, Printact Relay Div., Dept. EM, 29-10 Thomson Ave., Long Island City, N.Y. 11101
D Fairchild Industrial Prods. Div., Dept. EM, 75 Mall Dr., Commack, N.Y. 11725
D Furnas Elec. Co., Dept. EM, 1197 McKee St., Batavia, Ill. 60510
DM General Automatic Corp., Dept. EM, 70 Liberty St., Metuchen, N.J. 08840
Gentron Corp., Dept. EM, 6667 N. Sydney Pl., Milwaukee, Wisc. 53209
DM Guardian California, Dept. EM, 4030 W. Spencer St., Torrance, Cal. 90503
Hartman Electrical Mfg., Div. A-T-O Inc., Dept. EM, 175 N. Diamond St., Mansfield, Ohio 44902
D H-B Instr. Co., Dept. EM, 4306 N. American St, Philadelphia, Pa. 19140
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
D International Sensor Systems, Inc., Dept. EM, Aurora Industrial Pk., Box 345, Aurora, Neb. 68818
IPAC Group, Inc., Dept. EM, POB 156 3047 Industrial Blvd., Bethel Park, PA 15102
DM Kings Electronics, Dept. EM, 40 Mabledale Rd., Tuckahoe, N.Y. 10707
DM Line Elec an Esterline Co., Dept. EM, U.S. Hwy. 287, Parsippany, N.J. 07054
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
D Magnecraft Elec. Co., Dept. EM, 5575 N. Lynch Ave., Chicago, Ill. 60630
D Master Elctrn. Controls, Dept. EM, 1651–19th St., Santa Monica, Cal. 90404
MKC Electronics, Dept. EM, 454 E. Donovan Rd., Kansas City, Kans. 66115
Moririca Elctrns., Ltd., Dept. EM, 205 Tozuka-machi, Tozuka-Ku, Yokohama, Japan
Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
Payne Engrg. Co., Dept. EM, Box 70, Scott Depot, W. Va. 25560
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
Princo Instrs., Dept. EM, Industrial Pk., Southampton, Pa. 18966
M Projects Unlimited, Inc., Dept. EM, 3680 Wyse Rd., Dayton, Ohio 45414
M Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Solid State Relays Intl, Dept. EM, Box 48149, Chicago, Ill. 60648
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
S S A C Inc., Dept. EM, Box 395, Liverpool, N.Y. 13088
DM Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
DM Syracuse Elctrns. Corp., Dept. EM, Box 566, Syracuse, N.Y. 13201
Sys-Tec Inc., Dept. EM, 877 Third St. S.W., New Brighton, Minn. 55112
D Teccor Electronics, Inc., Dept. EM, 1101 Pamela Dr., Box 669, Euless, Tex. 76039
D Teledyne-Crystalonics, Dept. EM, 147 Sherman St., Cambridge, Mass. 02140
Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803
Theta-J Relays, Inc., Dept. EM, 1 De Angelo Drive, Bedford, Mass 01730
M Transco Prods., Inc., Dept. EM, 4241 Glencoe Ave., Venice, Cal. 90291
Universal Relay Corp., Dept. EM, 42 White St., New York, N.Y. 10013
D Vectrol, Inc., Dept. EM, 110 Douglas Rd, Oldsmar, Fla. 33557
Y-L Products Co., Inc., Dept. EM, Box 188, Yeadon, Pa. 19050

Relays, Stepping

D Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645 ..... *
D Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 ..... *
D Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 ..... *
Electro Switch Corp., Dept. EM, King Ave., Weymouth, Mass. 02188 .. p. 4053
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M Ledex Inc., Dept. EM, 123 Webster St., Dayton, Ohio 45401 ..... *
North American Philips Controls, Dept. EM, Husky Park, Frederick, Md. 21701 ..... *
D Omron Electronics, Dept. EM, 233 S. Wacker Dr., Chicago, Ill. 60606 ..... *
D Potter & Brumfield, Div of AMF, Dept. EM, P.O. Box 322, Princeton, Ind. 47671 ..... *
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D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
Universal Relay Corp., Dept. EM, 42 White St., New York, N.Y. 10013

Relays, Telephone

D American Zettler, Inc., Dept. EM, 16881 Hale Ave., Irvine, Cal. 92714 ..... *
D Aromat Corp., Dept. EM, 250 Sheffield Ave., Mountainside, N.J. 07092 ..... *
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D Gould Inc. Circuit Protection & Controls Div., Dept. EM, 100 Relay Rd., Plantsville, Conn. 06479 ..... *
ITT Comps. Capacitors, Dept. EM, 1551 Osgood St., N. Andover, Mass. 01845 ..... *
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Liberty Controls, Inc., Dept. EM, 500 Brookforest Ave., Shorewood, Ill. 60431 *
Midtex, Inc., AEMCO Div., Dept. EM, 1650 Tower Blvd., No. Mankato, Minn. 56001 ..... *
North American Philips Controls, Dept. EM, Husky Park, Frederick, Md. 21701 ..... *
D Omron Electronics, Dept. EM, 233 S. Wacker Dr., Chicago, Ill. 60606 ..... *
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D T-Bar Inc., Dept. EM, 141 Danbury Rd., Wilton, Conn. 06897 ..... *
Wabash Relay & Elctrns., Dept. EM, Box 708, Wabash, Ind. 46992 ..... *
Alpha Components Corp., Dept. EM, 115 Eucalyptus Dr., El Segundo, Cal. 90245
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
Davis Elec. Co., Dept. EM, Box 38, Cape Girardeau, Mo. 63701
D Essex Controls Div., Essex Grp, Dept. EM, 131 Godfrey St., Logansport, Ind. 46947
Executone, Printact Relay Div., Dept. EM, 29-10 Thomson Ave., Long Island City, N.Y. 11101
DM General Automatic Corp., Dept. EM, 70 Liberty St., Metuchen, N.J. 08840
DM Guardian California, Dept. EM, 4030 W. Spencer St., Torrance, Cal. 90503
D Magnecraft Elec. Co., Dept. EM, 5575 N. Lynch Ave., Chicago, Ill. 60630
D Master Elctrn. Controls, Dept. EM, 1651–19th St., Santa Monica, Cal. 90404
OKI Electronics of America, Dept. EM, 4031 N.E. 12th Terr., Ft. Lauderdale, Fla. 33334
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Relay Service Co., Dept. EM, 1310 N. Pulaski Rd., Chicago, Ill. 60651
D Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Universal Relay Corp., Dept. EM, 42 White St., New York, N.Y. 10013

Relays, Thermal

D Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645 ..... *
Coto-Coil Co., Dept. EM, 65 Pavilion Ave., Providence, R.I. 02905 p. 3436,3437
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
Elctrn. Instr. & Specialty, Dept. EM, 42 Pleasant St., Stoneham, Mass. 02180 *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
M Jettron Prods., Dept. EM, P.O. Box 337, E. Hanover, N.J. 07936 ..... *
M Branson Corp., Dept. EM, Box 147, Newton, N.J. 07860
M Cox & Co., Inc., Dept. EM, 215 Park Ave., S., New York, N.Y. 10003
GTE Sylvania Inc., Dept. EM, Rte. 35, Standish, Maine 04084
D Hoagland Instr Co, Div Tech Dev, Dept. EM, Box 550, Dayton, N.J. 08810
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
D Magnecraft Elec. Co., Dept. EM, 5575 N. Lynch Ave., Chicago, Ill. 60630
D Master Elctrn. Controls, Dept. EM, 1651–19th St., Santa Monica, Cal. 90404
Princo Instrs., Dept. EM, Industrial Pk., Southampton, Pa. 18966
M Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
D Siemens-Allis, Inc., Dept. EM, Box 2168, Milwaukee, Wisc. 53201
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
D Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
Texas Instruments Control Prods. Div., Dept. EM, 34 Forrest St., Attleboro, Mass. 02703
Therm-O-Disc, Inc., Dept. EM, South Main St., Mansfield, Ohio 44907
Universal Relay Corp., Dept. EM, 42 White St., New York, N.Y. 10013

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D Adams & Westlake Co., Dept. EM, 1025 W. Michigan St., Elkhart, Ind. 46514 *
Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
D American Zettler, Inc., Dept. EM, 16881 Hale Ave., Irvine, Cal. 92714 ..... *
M Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470 ..... *
Connor-Winfield Corp., Dept. EM, W. Chicago, Ill. 60185 ..... *
D Control Products Div., Amerace Corp., Dept. EM, 2330 Vauxhall Rd., Union, N.J. 07083 ..... *
D Cornell-Dubilier Electronics, Dept. EM, 150 Avenue "L", Newark, N.J. 07105 *
D Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101 ..... *
D Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... p. 4043
D Deltrol Controls, Dept. EM, 2745 S. 19th St., Milwaukee, Wisc. 53215 ..... *
D Diversified Electronics Inc., Dept. EM, 119 N. Morton Ave., Evansville, Ind. 47711 ..... p. 3448,3449
D Durakool, Dept. EM, 1010 N. Main St., Elkhart, Ind. 46514 ..... p. 3465
DM Electronic Specialty Div., Datron Systems Inc., Dept. EM, 18900 N.E. Sandy Blvd., Portland, Ore. 97220 ..... *
Fujitsu America, Inc., Component Sales Div., Dept. EM, 910 Sherwood Dr., Lake Bluff, Ill. 60044 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *

D Gould Inc. Circuit Protection & Controls Div., Dept. EM, 100 Relay Rd., Plantsville, Conn. 06479 ..... *
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D Heinemann Elec. Co., Dept. EM, Trenton, N.J. 08650 ..... *
DM Hi-G Co., Inc., Dept. EM, 580 Spring St., Windsor Locks, Conn. 06096 p. 3543-3546
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 .... *
M Jettron Prods., Dept. EM, P.O. Box 337, E. Hanover, N.J. 07936 ..... *
DM Leach Corp., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003 ..... *
D Midtex, Inc., AEMCO Div., Dept. EM, 1650 Tower Blvd., No. Mankato, Minn. 56001 ..... p. 3583
M North American Philips Controls Corp., Dept. EM, Cheshire Industrial Pk. Box E, Cheshire, Conn. 06410 ..... *
D Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076 ..... *
D Omron Electronics, Dept. EM, 233 S. Wacker Dr., Chicago, Ill. 60606 p. 3591
D Potter & Brumfield, Div of AMF, Dept. EM, P.O. Box 322, Princeton, Ind. 47671 ..... p. 3604-3607
M Sigmapower, Inc., Dept. EM, 20790 Leapwood Ave., Carson, Cal. 90746 .... *
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Air-O-Tronics Prods., Dept EM, Box K, Morrisville, N.Y. 13408
Alpha Components Corp., Dept. EM, 115 Eucalyptus Dr., El Segundo, Cal. 90245
Applied Electro Technology, Inc., Dept. EM, 2220 S. Anne St., Santa Ana, Cal. 92704
M Argent Electronics, Inc., Dept. EM, 477 E. Wenger Rd., Englewood, Ohio 45322
Artisan Elctrns. Corp., Dept. EM, 5 Eastmans Rd., Parsippany, N.J. 07054
Automatic Timing & Controls Co., Dept. EM, King of Prussia, Pa. 19406
M Branson Corp., Dept. EM, Box 147, Newton, N.J. 07860
D Bristol Saybrook Co., Dept. EM, 97 Coulter St., Old Saybrook, Conn. 06475
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
Computer Comps., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
Cramer Division, Conrac Corporation, Dept. EM, Mill Rock Rd., Old Saybrook, Conn. 06475
D Eagle Signal, Mfg. Div. Gulf & Western Inds., Dept. EM, Box 3585, Davenport, Iowa 52808
M Electro-Module, Inc., Dept. EM, 2855 Metropolitan Place, Pomona, Cal. 91767
DM Essex Controls Div., Essex Grp, Dept. EM, 131 Godfrey St., Logansport, Ind. 46947
DM General Automatic Corp., Dept. EM, 70 Liberty St., Metuchen, N.J. 08840
DM Guardian California, Dept. EM, 4030 W. Spencer St., Torrance, Cal. 90503
Hartman Electrical Mfg., Div. A-T-O Inc., Dept. EM, 175 N. Diamond St., Mansfield, Ohio 44902
Haydon Switch & Instr., Inc., Dept. EM, 1500 Meriden Rd., Waterbury, Conn. 06705
D Hoagland Instr Co, Div Tech Dev, Dept. EM, Box 550, Dayton, N.J. 08810
Instr. & Control Sys., Inc., Dept. EM, 520 Interstate Rd, Addison, Ill. 60101
Jay-El Prods., Dept. EM, 1859 W. 169th St., Gardena, Calif. 90247
D La Marche Mfg. Co., Dept. EM, 106 Bradrock Drive, Des Plaines, Ill. 60018
DM Line Elec an Esterline Co., Dept. EM, U.S. Hwy. 287, Parsippany, N.J. 07054
Mack Elec. Devices, Dept. EM, 32 Glenside Ave., Wyncote, Pa. 19095
D Magnecraft Elec. Co., Dept. EM, 5575 N. Lynch Ave., Chicago, Ill. 60630
D Master Elctrn. Controls, Dept. EM, 1651-19th St., Santa Monica, Cal. 90404
Midland Standrad Inc., Dept. EM, 603 E. Chicago St. Box 38, Elgin, ILL 60120
MKC Electronics, Dept. EM, 454 E. Donovan Rd., Kansas City, Kans. 66115
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
D Precision Timer Co., Dept. EM, 13 Westbrook Ind'l. Park, Westbrook, Conn. 06498
M Projects Unlimited, Inc., Dept. EM, 3680 Wyse Rd., Dayton, Ohio 45414
M Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Solid State Relays Intl, Dept. EM, Box 48149, Chicago, Ill. 60648
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
S S A C Inc., Dept. EM, Box 395, Liverpool, N.Y. 13088
DM Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
DM Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
DM Syracuse Elctrns. Corp., Dept. EM, Box 566, Syracuse, N.Y. 13201
M Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803
Texas Instruments Control Prods. Div., Dept. EM, 34 Forrest St., Attleboro, Mass. 02703
Therm-O-Disc, Inc., Dept. EM, South Main St., Mansfield, Ohio 44907
Universal Relay Corp., Dept. EM, 42 White St., New York, N.Y. 10013
Vanguard Relay Corp., Dept. EM, 225 Cortland St., Lindenhurst, N.Y. 11757
D Ward Leonard Elec. Co. Inc., Sub. Unimax Group Inc., Dept. EM, 31 South St., Mt. Vernon, N.Y. 10550
Westinghouse Elec. Corp., Relay-Instr. Div., Dept. EM, 95 Orange St., Newark, N.J. 07101
M Wilmar Elctrns. Inc., Dept. EM, 2430 Amsler St., Torrance, Cal. 90505
Y-L Products Co., Inc., Dept. EM, Box 188, Yeadon, Pa. 19050
D Zenith Controls Inc., Dept. EM, 830 West 40th St., Chicago, Ill. 60609

Relays, Transistor & DIP Case Types—See Relays, Printed Circuit Mounting

Relays, Vacuum Contact

D Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645 ..... *
DM Gordos Corp., Dept. EM, 250 Glenwood Ave., Bloomfield, N.J. 07003 ..... *
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 ..... p. 3547,3548,3550,3551
M Jettron Prods., Dept. EM, P.O. Box 337, E. Hanover, N.J. 07936 ..... *
DM Kilovac Corp., Dept. EM, Box 4422, Santa Barbara, Cal. 93103 .. p. 3563-3565
M Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... *
Computer Comps., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
D H-B Instr. Co., Dept. EM, 4306 N. American St, Philadelphia, Pa. 19140
Mack Elec. Devices, Dept. EM, 32 Glenside Ave., Wyncote, Pa. 19095
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
Universal Relay Corp., Dept. EM, 42 White St., New York, N.Y. 10013

Relays, Vibrating Reed

Leader Instruments Corp., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803 p. 2775
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Universal Relay Corp., Dept. EM, 42 White St., New York, N.Y. 10013

Relays, Voltage Sensitive

D American Zettler, Inc., Dept. EM, 16881 Hale Ave., Irvine, Cal. 92714 ..... *
M Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470 ..... *
D Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645 ..... p. 3428
Crydom Controls, Int'l. Rectifier, Dept. EM, 1521 Grand Ave., El Segundo, Cal. 90245 ..... *
D Diversified Electronics Inc., Dept. EM, 119 N. Morton Ave., Evansville, Ind. 47711 ..... p. 3448,3449
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... p. 3458
D Durakool, Dept. EM, 1010 N. Main St., Elkhart, Ind. 46514 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
D Gould Inc. Circuit Protection & Controls Div., Dept. EM, 100 Relay Rd., Plantsville, Conn. 06479 ..... p. 3500
D Grayhill Inc., Dept. EM, 569 Hillgrove Ave., LaGrange, Ill. 60525 ..... *
Guardian Electric Co., Dept. EM, 1550 W. Carroll Ave., Chicago, Ill. 60607 .. *
D Heinemann Elec. Co., Dept. EM, Trenton, N.J. 08650 ..... *
DM Hi-G Co., Inc., Dept. EM, 580 Spring St., Windsor Locks, Conn. 06096 ..... *
DM Hi-G Co., Inc., Relay Div, Dept. EM, Spring St. & Rte. 75, Windsor Locks, Conn. 06096 ..... p. 3534,3536
M ILC Data Device Corp., Dept. EM, Airport Int'l. Plaza, Bohemia, N.Y. 11716 *
ITT Comps. Capacitors, Dept. EM, 1551 Osgood St., N. Andover, Mass. 01845 ..... *
D ITT Comps. Relays, Dept. EM, 1551 Osgood St., N. Andover, Mass. 01845 p. 3554-3556,3558,3559
Leach Corp., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
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DM Potter & Brumfield, Div of AMF, Dept. EM, P.O. Box 322, Princeton, Ind. 47671 ..... *
DM Teledyne Relays, Dept. EM, 3155 W. El Segundo Blvd., Hawthorne, Cal 90250 ..... *
Applied Electro Technology, Inc., Dept. EM, 2220 S. Anne St., Santa Ana, Cal. 92704
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
M Electro-Module, Inc., Dept. EM, 2855 Metropolitan Place, Pomona, Cal. 91767
Essex Controls Div., Essex Grp, Dept. EM, 131 Godfrey St., Logansport, Ind. 46947
DM General Automatic Corp., Dept. EM, 70 Liberty St., Metuchen, N.J. 08840
D Guardian California, Dept. EM, 4030 W. Spencer St., Torrance, Cal. 90503
Hartman Electrical Mfg., Div. A-T-O Inc., Dept. EM, 175 N. Diamond St., Mansfield, Ohio 44902
Hoagland Instr Co, Div Tech Dev, Dept. EM, Box 550, Dayton, N.J. 08810
InResCo, Dept. EM, 503 Adamston Rd., Bricktown, N. J. 08723
Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962
DM Line Elec an Esterline Co., Dept. EM, U.S. Hwy. 287, Parsippany, N.J. 07054
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
D Magnecraft Elec. Co., Dept. EM, 5575 N. Lynch Ave., Chicago, Ill. 60630
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Relay Service Co., Dept. EM, 1310 N. Pulaski Rd., Chicago, Ill. 60651
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803
Universal Relay Corp., Dept. EM, 42 White St., New York, N.Y. 10013
D Ward Leonard Elec. Co. Inc., Sub. Unimax Group Inc., Dept. EM, 31 South St., Mt. Vernon, N.Y. 10550
M Wilmar Elctrns. Inc., Dept. EM, 2430 Amsler St., Torrance, Cal. 90505
D Zenith Controls Inc., Dept. EM, 830 West 40th St., Chicago, Ill. 60609

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M Clifton Precision, Litton Systems, Inc., Dept. EM, Marple at Brdway., Clifton Hgts., Pa. 19018 ..... *
M Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 .. p. 3975
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M Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735 *
M Vernitron Corp., Control Components Div., Dept. EM, 1601 Precision Park La., San Diego, Cal. 92013 ..... *
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
Control Systems Research, Inc., Dept. EM, CSR Bldg., 632 Fort Duquesne Blvd., Pittsburgh, Pa. 15222
GAP Instr. Corp., Dept. EM, 110 Marcus Blvd., Hauppauge, N.Y. 11787
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
D Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
M Transicoil, Inc., Dept. EM, Worcester, Pa. 19490

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D **Bivar, Inc., Dept. EM, 1617 E. Edinger Ave., Santa Ana, Cal. 92705 ..... p. 1024**
Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 ..... p. 3685
Milwaukee Resistor Corp., Dept. EM, 700 W. Virginia St., Milwaukee, Wisc. 53204 ..... *
TRW/IRC Resistors, Dept. EM, 401 N. Broad St., Philadelphia, Pa. 19108 .... *
D **Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 .... ***
D Accessories for Electronics, Dept. EM, 800 Merrick Road, Baldwin, N.Y. 11510
D International Sensor Systems, Inc., Dept. EM, Aurora Industrial Pk., Box 345, Aurora, Neb. 68818

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D **Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 p. 3784**
Angstrohm Precision, Inc., Dept. EM, 1 Precision Pl., Hagerstown, Md. 21740 *
DM **Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634 ..... p. 3786-3789**
M **Bourns, Inc., Trimpot Prods. Div., Dept. EM, 1200 Columbia Ave., Riverside, Cal. 92507 ..... p. 3791-3871, Back Cover, Vol. 2**
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DM **Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 ..... p. 3878,3879**
Dale Electronics, Inc., Dept. EM, Box 74, Norfolk, Nebr. 68701 ..... *
Duncan Electronics, Inc., Dept. EM, 2865 Fairview Rd., Costa Mesa, Cal. 92626 ..... p. 3882
E-Systems, Inc., Memcor Div., Dept. EM, 1320 Flaxmill Rd., Huntington, Ind. 46750 ..... p. 3697
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Gamble, Charles T. Inds., Dept. EM, 605 Perkins La., Delanco, N.J. 08075 p. 3699
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 *
D **International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 ***
M **Milwaukee Resistor Corp., Dept. EM, 700 W. Virginia St., Milwaukee, Wisc. 53204 ..... p. 3711**
A Talley Ind's Co., , Dept. EM, 135 S. Main St., Thomaston, Conn. 06787 .... *
M **New England Instr., Dept. EM, 14 Kendal Lane, Natick, Mass. 01760 ..... ***
D **Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076 .... p. 3719**
D **Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... ***
M **Resistors, Inc., Dept. EM, 5226 W. 26th St., Chicago, Ill. 60650 ..... p. 3741**
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
DM **Spectrol Electronics Corp., Dept. EM, 17070 East Gale Ave., City of Industry, Cal. 91745 ..... ***
TRW/IRC Resistors, Dept. EM, Greenway Rd., Boone, N.C. 28607 ..... *
Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... *
D **Vishay Resistive Systems Grp., Vishay Intertechnology Inc., Dept. EM, 63 Lincoln Hwy., Malvern, Pa. 19355 ..... p. 3781**
D **VRN St Petersburg, Div. Vernitron, Dept. EM, 2801 72nd St N. Box 44000, St. Petersburg, FL 33743 ..... p. 3914-3917**
Weston Components & Controls, Div. Sangamo Weston Inc., Dept. EM, Archbald, Pa. 18403 ..... p. 3896,3897
Centralab Elctrns. Div., Globe-Union Inc., Dept. EM, Box 858, Hwy. 20 W., Fort Dodge, Iowa 50501
D Clarostat Mfg. Co., Inc., Dept. EM, Washington St., Dover, N.H. 03820
Consolidated Resistance Co. America, Dept. EM, 222 Lake Ave., Yonkers, N.Y. 10701
DM CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
Diplohmatic Div., Harry Levinson Co., Dept. EM, 1211 E. Denny Way, Seattle, Wash. 98122
M Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
M Maurey Instrument Corp., Dept. EM, 4555 W. 60th St., Chicago, Ill. 60629
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Samarius, Inc., Dept. EM, 300 Seymour Ave., Derby, Conn. 06418
DM Techno-Comps. Corp., Dept. EM, 7803 Lemona, Van Nuys, Cal. 91405
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013
DM Ward Leonard Elec. Co. Inc., Sub. Unimax Group Inc., Dept. EM, 31 South St., Mt. Vernon, N.Y. 10550
Wilbrecht Electronics, Inc., Dept. EM, 240 Plato Blvd., St. Paul, Minn. 55107

Resistors, Ballast (Including Tube & Solid State Devices)

D **E-Systems, Inc., Memcor Div., Dept. EM, 1320 Flaxmill Rd., Huntington, Ind. 46750 ..... ***
Milwaukee Resistor Corp., Dept. EM, 700 W. Virginia St., Milwaukee, Wisc. 53204 ..... *
D **TRW/IRC Resistors, Dept. EM, Greenway Rd., Boone, N.C. 28607 ..... ***
Electrocube Inc., Dept. EM, 1710 So. Del Mar Ave., San Gabriel, Cal. 91776
DM Taiyo Denki Co., Ltd., Dept. EM, 225-3 7-cho Nakamachi, Ohtori, Sakai City, Japan 593

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M **American Components, Inc., Dept. EM, 8th Avenue at Harry St., Conshohocken, Pa. 19428 ..... p. 3634**
D **Beman Mfg., Inc., Dept. EM, PO Box 370, New Cumberland, Pa. 17070 p. 3648**
D **Capar, Dept. EM, 303 Crossways Park Dr., Woodbury, N.Y. 11797 p. 3666-3668**
M **Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 ..... ***
D **Dale Electronics, Inc., Dept. EM, Box 74, Norfolk, Nebr. 68701 ..... ***
D **International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 p. 1155**
D **ISL Products Ltd. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803 p. 3701**
KDI Pyrofilm Corp, Dept. EM, 60 S. Jefferson Rd., Whippany, N.J. 07981 p. 3729
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D **Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... p. 3722**
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Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D **Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 ***
Stackpole Carbon Co., Elctrn. Comps. Div.-Fixed Comp. Resistors & Carbon Film Resistors, Dept. EM, Kane, Pa. 16735 ..... p. 3744
D **TRW/IRC Resistors, Dept. EM, 2850 Mt. Pleasant St., Burlington, Iowa 52601 ***
Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... *
M **Victoreen, Inc., Dept. EM, 10101 Woodland Ave., Cleveland, Ohio 44104 .... ***
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
DM Kahgan Electronics Corp., Dept. EM, 556 Peninsula Blvd., Hempstead, NY 11550
M Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
DM Mepco/Electra, Inc., Dept. EM, Columbia Rd., Morristown, N.J. 07960
M MICRO OHM CORP., Dept. EM, P.O. Box 287, S. Laguna, Cal. 92677
D Mitsumi Elec. Co., Ltd., Dept. EM, 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan
DM Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
DM Solitron/Microwave, Dept. EM, Box 278, Port Salerno, Fla. 33492
DM Taiyo Denki Co., Ltd., Dept. EM, 225-3 7-cho Nakamachi, Ohtori, Sakai City, Japan 593
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

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D **Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. ***
D **Caddock Electronics, Inc., Dept. EM, 3127 Chicago Ave., Riverside, Cal. 92507 ..... p. 3654-3656**
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D **Cutler-Hammer, Shallcross Resistor Prods., Dept. EM, US 70 East, Smithfield, N.C. 27577 ..... ***
Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 ..... *
Dale Electronics, Inc., Dept. EM, Box 74, Norfolk, Nebr. 68701 ..... *
E-Systems, Inc., Memcor Div., Dept. EM, 1320 Flaxmill Rd., Huntington, Ind. 46750 ..... *
D **Gamble, Charles T. Inds., Dept. EM, 605 Perkins La., Delanco, N.J. 08075 p. 3699**
Kelvin, Dept. EM, 5919 Noble Avenue, Van Nuys, Cal. 91411 ..... *
Mills Resistor Co., Dept. EM, 3840 Catalina St., Los Alamitos, Cal. 90720 .... *
M **Milwaukee Resistor Corp., Dept. EM, 700 W. Virginia St., Milwaukee, Wisc. 53204 ..... p. 3711**
DM **Nytronics Comps. Group Inc., Sub Nytronics, Dept. EM, Orange St., Darlington, S.C. 29532 ..... p. 3715**
Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076 p. 3718,3720
DM **RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102 ..... p. 3731,3738**
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Stackpole Carbon Co., Electronic Comps. Div./Soft Ferrites/Special Purpose Resistors, Dept. EM, St. Mary's, Pa. 15857 ..... p. 3745
Tel Labs, Inc., Dept. EM, 154 Harvey Rd., Londonderry, N.H. 03053 p. 3750,3751
TRW/IRC Resistors, Dept. EM, 2850 Mt. Pleasant St., Burlington, Iowa 52601 *
Victoreen, Inc., Dept. EM, 10101 Woodland Ave., Cleveland, Ohio 44104 .... *
C-F Electronics, Inc., Dept. EM, 14709 Keswick St., Van Nuys, Cal. 91405
Cal-R, Inc., Dept. EM, P.O. Box 1397, Santa Monica, Cal. 90406
D Carbone Lorraine Industries Corp., Dept. EM, 400 Myrtle Ave., Boonton, N.J. 07005
Detoronics Corp., Dept. EM, 10660 E. Rush St., P.O. Box 3805, S. El Monte, Cal. 91733
D Electro-Science Labs., Dept. EM, 2211 Sherman Ave., Pennsauken, N. J. 08110
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
InResCo, Dept. EM, 503 Adamston Rd., Bricktown, N. J. 08723
M Jordan Electric Co., Dept. EM, 14707 Keswick St., Van Nuys, Cal. 91405

D Mepco/Electra, Inc., Dept. EM, Columbia Rd., Morristown, N.J. 07960
MICRO OHM CORP., Dept. EM, P.O. Box 287, S. Laguna, Cal. 92677
Murata Mfg. Co. Ltd., Dept. EM, 16, Kaiden Nishijin-cho, Nagaoka-Kyo-Shi, Kyoto, Japan
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Resistors, Ceramic Metal (Cermet)

Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 p. 3627
American Components, Inc., Dept. EM, 8th Avenue at Harry St., Conshohocken, Pa. 19428 *
Angstrohm Precision, Inc., Dept. EM, 1 Precision Pl., Hagerstown, Md. 21740 *
Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634 p. 3786-3788
Bourns, Inc., Trimpot Prods. Div., Dept. EM, 1200 Columbia Ave., Riverside, Cal. 92507 *
CTS of Berne, Dept. EM, 406 Parr Rd., Berne, Ind. 46711 p. 3675-3679
Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 p. 3878,3879
International Mfg Svcs Inc., Dept. EM, 50 Schoolhouse La, Portsmouth, R.I. 02871 p. 3700
Mini-Systems, Inc., Dept. EM, 20 David Rd., North Attleboro, Mass. 02761 *
DM **RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102** *
R-OHM Corp, Dept. EM, 16931 Milliken Ave, POB 4455, Irvine, Cal. 92716 .. *
Varadyne Industries, Inc., Dept. EM, 1520 Cloverfield Blvd., Santa Monica, Cal. 90404 p. 1285
Victoreen, Inc., Dept. EM, 10101 Woodland Ave., Cleveland, Ohio 44104 .... *
Weston Components & Controls, Div. Sangamo Weston Inc., Dept. EM, Archbald, Pa. 18403 *
Centralab, Electrns. Div. - Globe Union Inc., Dept. EM, 5757 N. Green Bay Ave., Milwaukee, Wisc. 53201
DM CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
M CTS Microelectronics, Inc., Dept. EM, 1201 Cumberland Ave., W. Lafayette, Ind. 47906
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
DM Mepco/Electra, Inc., Dept. EM, Columbia Rd., Morristown, N.J. 07960
MICRO OHM CORP., Dept. EM, P.O. Box 287, S. Laguna, Cal. 92677
Morris Entprs, Dept. EM, 16799 Schoenborn St, Sepulveda, Cal. 91343
DM Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Thickfilm Int'l, Dept. EM, 1610 Mt Vernon Ave., Alexandria, VA 22301

Resistors, Chip (For Microcircuits)

D **Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204** .. *
M **American Components, Inc., Dept. EM, 8th Avenue at Harry St., Conshohocken, Pa. 19428** *
D **Caddock Electronics, Inc., Dept. EM, 3127 Chicago Ave., Riverside, Cal. 92507** *
CTS of Berne, Dept. EM, 406 Parr Rd., Berne, Ind. 46711 *
D **Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601** *
Dale Electronics, Inc., Dept. EM, Box 74, Norfolk, Nebr. 68701 *
International Mfg Svcs Inc., Dept. EM, 50 Schoolhouse La, Portsmouth, R.I. 02871 p. 3700
D **KDI Pyrofilm Corp, Dept. EM, 60 S. Jefferson Rd., Whippany, N.J. 07981** p. 3729
Microplex, Inc., Dept. EM, 2126 S. Lyon St., Santa Ana, Cal. 92705 p. 3706,3707
DM **Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725** *
M **Mini-Systems, Inc., Dept. EM, 20 David Rd., North Attleboro, Mass. 02761** p. 3709
DM **RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102** *
R-OHM Corp, Dept. EM, 16931 Milliken Ave, POB 4455, Irvine, Cal. 92716 .. *
Tel Labs, Inc., Dept. EM, 154 Harvey Rd., Londonderry, N.H. 03053 .... p. 3750
TRW/IRC Resistors, Dept. EM, 2850 Mt. Pleasant St., Burlington, Iowa 52601 *
TRW/IRC Resistors, Dept. EM, 401 N. Broad St., Philadelphia, Pa. 19108 .... *
Varadyne Industries, Inc., Dept. EM, 1520 Cloverfield Blvd., Santa Monica, Cal. 90404 p. 1285
Vishay Resistive Systems Grp., Vishay Intertechnology Inc., Dept. EM, 63 Lincoln Hwy., Malvern, Pa. 19355 p. 3780
D Cal-R, Inc., Dept. EM, P.O. Box 1397, Santa Monica, Cal. 90406
CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
M CTS Microelectronics, Inc., Dept. EM, 1201 Cumberland Ave., W. Lafayette, Ind. 47906
Eltec Instruments Inc., Dept. EM, P.O. Box 9610, Daytona Beach, Fla. 32020
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
M Film Microelectronics, Inc., Dept. EM, 17 A St., Burlington, Mass 01803
M HyComp Inc., Dept. EM, Box 250, Maynard, Mass. 01754
M Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
Morris Entprs, Dept. EM, 16799 Schoenborn St, Sepulveda, Cal. 91343
National Micronetics, Dept. EM, Route 28, West Hurley, NY 12136
DM Precision Monolithics Inc., Dept. EM, 1500 Space Dr., Santa Clara, Cal. 95050
Thickfilm Int'l, Dept. EM, 1610 Mt Vernon Ave., Alexandria, VA 22301

Resistors, Composition, Carbon

D **Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204** p. 3626
Carborundum Co., Graphite Prods. Div., Dept. EM, Box 339, Niagara Falls, N.Y. 14302 p. 3670-3672
CTS of Berne, Dept. EM, 406 Parr Rd., Berne, Ind. 46711 *
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** *
D **International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746** p. 1155
ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 p. 1967
D **Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076** *
D **Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094** *
Resistors, Inc., Dept. EM, 5226 W. 26th St., Chicago, Ill. 60650 *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Stackpole Carbon Co., Electronic Comps. Div./Soft Ferrites/Special Purpose Resistors, Dept. EM, St. Mary's, Pa. 15857 *
D **Stackpole Carbon Co., Elctrn. Comps. Div.-Fixed Comp. Resistors & Carbon Film Resistors, Dept. EM, Kane, Pa. 16735** p. 3744
TRW/IRC Networks, Dept. EM, 4222 S. Staples St., Corpus Christi, Tex. 78411 Inside Back Cover, Vol. 1
DM **TRW/IRC Resistors, Dept. EM, 401 N. Broad St., Philadelphia, Pa. 19108** Inside Back Cover, Vol. 1
Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 *
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
M CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
Ohio Carbon Co., Dept. EM, 12508 Berea Rd., Cleveland, Ohio 44111
DM Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Resistors, Decade

D **Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204** .. *
D **Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634** *
D **Caddock Electronics, Inc., Dept. EM, 3127 Chicago Ave., Riverside, Cal. 92507** p. 3651,3665
Carborundum Co., Graphite Prods. Div., Dept. EM, Box 339, Niagara Falls, N.Y. 14302 p. 3673
Cutler-Hammer, Shallcross Resistor Prods., Dept. EM, US 70 East, Smithfield, N.C. 27577 *
D **Gamble, Charles T. Inds., Dept. EM, 605 Perkins La., Delanco, N.J. 08075** .. *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 *
Kelvin, Dept. EM, 5919 Noble Avenue, Van Nuys, Cal. 91411 *
Mc Graw-Edison, Edison Elctrns. Div., Daven Comps., Dept. EM, Grenier Field, Manchester, N.H. 03103 *
Mills Resistor Co., Dept. EM, 3840 Catalina St., Los Alamitos, Cal. 90720 .... *
D **Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076** *
DM **RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102** *
Shallco, Inc., Dept. EM, Box 1089, Smithfield, N.C. 27577 *
Tech Labs., Inc., Dept. EM, Bergen & Edsall Blvds., Palisades Pk., N.J. 07650 *
Victoreen, Inc., Dept. EM, 10101 Woodland Ave., Cleveland, Ohio 44104 .... *
Vishay Resistive Systems Grp., Vishay Intertechnology Inc., Dept. EM, 63 Lincoln Hwy., Malvern, Pa. 19355 p. 3781
Centralab, Electrns. Div. - Globe Union Inc., Dept. EM, 5757 N. Green Bay Ave., Milwaukee, Wisc. 53201
D Clarostat Mfg. Co., Inc., Dept. EM, Washington St., Dover, N.H. 03820
Consolidated Resistance Co. America, Dept. EM, 222 Lake Ave., Yonkers, N.Y. 10701
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
E.S.I. Inc., Dept. EM, 13900 N.W. Science Park Dr., Portland, Oregon 97229
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
Jordan Electric Co., Dept. EM, 14707 Keswick St., Van Nuys, Cal. 91405
MICRO OHM CORP., Dept. EM, P.O. Box 287, S. Laguna, Cal. 92677

Resistors, Disc, Rod & Tube

D **Caddock Electronics, Inc., Dept. EM, 3127 Chicago Ave., Riverside, Cal. 92507** *
Carborundum Co., Graphite Prods. Div., Dept. EM, Box 339, Niagara Falls, N.Y. 14302 p. 3671
Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 *
Dale Electronics, Inc., Dept. EM, Box 74, Norfolk, Nebr. 68701 *
D **KDI Pyrofilm Corp, Dept. EM, 60 S. Jefferson Rd., Whippany, N.J. 07981** p. 3729
Milwaukee Resistor Corp., Dept. EM, 700 W. Virginia St., Milwaukee, Wisc. 53204 *
DM **RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102** *
M **TRW/IRC Resistors, Dept. EM, Greenway Rd., Boone, N.C. 28607** *
TRW/IRC Resistors, Dept. EM, 401 N. Broad St., Philadelphia, Pa. 19108 Inside Back Cover, Vol. 1
D Clarostat Mfg. Co., Inc., Dept. EM, Washington St., Dover, N.H. 03820
Ohio Carbon Co., Dept. EM, 12508 Berea Rd., Cleveland, Ohio 44111
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
DM Solitron/Microwave, Dept. EM, Box 278, Port Salerno, Fla. 33492

Resistors, Film, Metallized & Non-Metallized

Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 p. 3627,3628
DM **American Components, Inc., Dept. EM, 8th Avenue at Harry St., Conshohocken, Pa. 19428** p. 3635-3637
DM **Angstrohm Precision, Inc., Dept. EM, 1 Precision Pl., Hagerstown, Md. 21740** p. 3638
D **Caddock Electronics, Inc., Dept. EM, 3127 Chicago Ave., Riverside, Cal. 92507** p. 3650-3664
DM **Corning Glass Works, Corning Electronics, Dept. EM, Houghton Pk., Bldg. A-2, Corning, N.Y. 14830** p. 3669

M Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 ..... *
D Dale Electronics, Inc., Dept. EM, Box 74, Norfolk, Nebr. 68701 .. p. 3688-3692
D International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 p. 1155
KDI Pyrofilm Corp, Dept. EM, 60 S. Jefferson Rd., Whippany, N.J. 07981 p. 3728
DM Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725 ..... *
Mini-Systems, Inc., Dept. EM, 20 David Rd., North Attleboro, Mass. 02761 p. 3709
D Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... p. 3722
R-OHM Corp, Dept. EM, 16931 Milliken Ave, POB 4455, Irvine, Cal. 92716 p. 3742
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Stackpole Components Co., Dept. EM, Box 14466, Raleigh, N.C. 27610 p. 3743
TRW/IRC Networks, Dept. EM, 4222 S. Staples St., Corpus Christi, Tex. 78411 ..... Inside Back Cover, Vol. 1
D TRW/IRC Resistors, Dept. EM, 2850 Mt. Pleasant St., Burlington, Iowa 52601 Inside Back Cover, Vol. 1
M TRW/IRC Resistors, Dept. EM, Greenway Rd., Boone, N.C. 28607 Inside Back Cover, Vol. 1
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Varadyne Industries, Inc., Dept. EM, 1520 Cloverfield Blvd., Santa Monica, Cal. 90404 ..... p. 1285
M Victoreen, Inc., Dept. EM, 10101 Woodland Ave., Cleveland, Ohio 44104 .... *
M Vishay Resistive Systems Grp., Vishay Intertechnology Inc., Dept. EM, 63 Lincoln Hwy., Malvern, Pa. 19355 ..... *
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
M Halex, Inc., Dept. EM, 1202 McGaw Ave, Irvine, Ca. 92714
D International Sensor Systems, Inc., Dept. EM, Aurora Industrial Pk., Box 345, Aurora, Neb. 68818
DM Kahgan Electronics Corp., Dept. EM, 556 Peninsula Blvd., Hempstead, NY 11550
DM Mepco/Electra, Inc., Dept. EM, Columbia Rd., Morristown, N.J. 07960
M.I.A.L. U.S.A., Inc., Dept. EM, 173 Franklin Ave., Nutley, N.J. 07110
Mica Corporation, Dept. EM, 10900 Washington Blvd., P.O. Box 2578, Culver City, Calif. 90230
M MICRO OHM CORP., Dept. EM, P.O. Box 287, S. Laguna, Cal. 92677
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D RCA Distr. & Special Prods. Div., Dept. EM, Deptford, N.J. 08096
M Res-Net Corp., Dept. EM, 110 Route 10, Whippany, N.J. 07981
DM Solitron/Microwave, Dept. EM, Box 278, Port Salerno, Fla. 33492
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013

Resistors, Flame Retardant

D Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
Angstrohm Precision, Inc., Dept. EM, 1 Precision Pl., Hagerstown, Md. 21740 *
D Caddock Electronics, Inc., Dept. EM, 3127 Chicago Ave., Riverside, Cal. 92507 ..... *
Carborundum Co., Graphite Prods. Div., Dept. EM, Box 339, Niagara Falls, N.Y. 14302 ..... *
DM Corning Glass Works, Corning Electronics, Dept. EM, Houghton Pk., Bldg. A-2, Corning, N.Y. 14830 ..... *
DM Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 ..... *
Dale Electronics, Inc., Dept. EM, Box 74, Norfolk, Nebr. 68701 ..... *
D E-Systems, Inc., Memcor Div., Dept. EM, 1320 Flaxmill Rd., Huntington, Ind. 46750 ..... *
Gamble, Charles T. Inds., Dept. EM, 605 Perkins La., Delanco, N.J. 08075 .. *
D International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 *
Kelvin, Dept. EM, 5919 Noble Avenue, Van Nuys, Cal. 91411 ..... *
M KRL Electronics, Dept. EM, 28 Bridge St., Manchester, N.H. 03101 ..... *
Mc Graw-Edison, Edison Elctrns. Div., Daven Comps., Dept. EM, Grenier Field, Manchester, N.H. 03103 ..... *
Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076 .... p. 3720
D Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
DM RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Tel Labs, Inc., Dept. EM, 154 Harvey Rd., Londonderry, N.H. 03053 ..... *
D TRW/IRC Resistors, Dept. EM, 2850 Mt. Pleasant St., Burlington, Iowa 52601 *
M TRW/IRC Resistors, Dept. EM, Greenway Rd., Boone, N.C. 28607 Inside Back Cover, Vol. 1
DM TRW/IRC Resistors, Dept. EM, 401 N. Broad St., Philadelphia, Pa. 19108 Inside Back Cover, Vol. 1
C-F Electronics, Inc., Dept. EM, 14709 Keswick St., Van Nuys, Cal. 91405
D Clarostat Mfg. Co., Inc., Dept. EM, Washington St., Dover, N.H. 03820
Jordan Electric Co., Dept. EM, 14707 Keswick St., Van Nuys, Cal. 91405
DM Kahgan Electronics Corp., Dept. EM, 556 Peninsula Blvd., Hempstead, NY 11550
DM Mepco/Electra, Inc., Dept. EM, Columbia Rd., Morristown, N.J. 07960
MICRO OHM CORP., Dept. EM, P.O. Box 287, S. Laguna, Cal. 92677
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Thickfilm Int'l, Dept. EM, 1610 Mt Vernon Ave., Alexandria, VA 22301
United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013

Resistors, Fuse

Corning Glass Works, Corning Electronics, Dept. EM, Houghton Pk., Bldg. A-2, Corning, N.Y. 14830 ..... *
D Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 ..... *
D Dale Electronics, Inc., Dept. EM, Box 74, Norfolk, Nebr. 68701 ..... *
D E-Systems, Inc., Memcor Div., Dept. EM, 1320 Flaxmill Rd., Huntington, Ind. 46750 ..... *
D Gamble, Charles T. Inds., Dept. EM, 605 Perkins La., Delanco, N.J. 08075 .. *
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
D ISL Products Ltd. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803 p. 3701
Kelvin, Dept. EM, 5919 Noble Avenue, Van Nuys, Cal. 91411 ..... *
Mc Graw-Edison, Edison Elctrns. Div., Daven Comps., Dept. EM, Grenier Field, Manchester, N.H. 03103 ..... p. 4108
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Tel Labs, Inc., Dept. EM, 154 Harvey Rd., Londonderry, N.H. 03053 ..... *
D TRW/IRC Resistors, Dept. EM, 2850 Mt. Pleasant St., Burlington, Iowa 52601 *
M TRW/IRC Resistors, Dept. EM, Greenway Rd., Boone, N.C. 28607 Inside Back Cover, Vol. 1
DM TRW/IRC Resistors, Dept. EM, 401 N. Broad St., Philadelphia, Pa. 19108 Inside Back Cover, Vol. 1
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
D Mepco/Electra, Inc., Dept. EM, Columbia Rd., Morristown, N.J. 07960
MICRO OHM CORP., Dept. EM, P.O. Box 287, S. Laguna, Cal. 92677
Ohio Carbon Co., Dept. EM, 12508 Berea Rd., Cleveland, Ohio 44111
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Resistors, Glass

DM Angstrohm Precision, Inc., Dept. EM, 1 Precision Pl., Hagerstown, Md. 21740 *
Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 ..... *
Dale Electronics, Inc., Dept. EM, Box 74, Norfolk, Nebr. 68701 ..... *
M Victoreen, Inc., Dept. EM, 10101 Woodland Ave., Cleveland, Ohio 44104 p. 3778
Eltec Instruments Inc., Dept. EM, P.O. Box 9610, Daytona Beach, Fla. 32020
DM Mepco/Electra, Inc., Dept. EM, Columbia Rd., Morristown, N.J. 07960
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Resistors, Heat Sink Encased—See Resistors, Integral Heat Dissipator

Resistors, High Frequency

D Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
M American Components, Inc., Dept. EM, 8th Avenue at Harry St., Conshohocken, Pa. 19428 ..... *
Angstrohm Precision, Inc., Dept. EM, 1 Precision Pl., Hagerstown, Md. 21740 *
Beman Mfg., Inc., Dept. EM, PO Box 370, New Cumberland, Pa. 17070 p. 3649
D Caddock Electronics, Inc., Dept. EM, 3127 Chicago Ave., Riverside, Cal. 92507 ..... p. 3650,3652
Carborundum Co., Graphite Prods. Div., Dept. EM, Box 339, Niagara Falls, N.Y. 14302 ..... *
D Corning Glass Works, Corning Electronics, Dept. EM, Houghton Pk., Bldg. A-2, Corning, N.Y. 14830 ..... *
Cutler-Hammer, Shallcross Resistor Prods., Dept. EM, US 70 East, Smithfield, N.C. 27577 ..... *
Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 ..... *
Dale Electronics, Inc., Dept. EM, Box 74, Norfolk, Nebr. 68701 ..... *
D E-Systems, Inc., Memcor Div., Dept. EM, 1320 Flaxmill Rd., Huntington, Ind. 46750 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
D KDI Pyrofilm Corp, Dept. EM, 60 S. Jefferson Rd., Whippany, N.J. 07981 .... *
Kelvin, Dept. EM, 5919 Noble Avenue, Van Nuys, Cal. 91411 ..... *
M KRL Electronics, Dept. EM, 28 Bridge St., Manchester, N.H. 03101 ..... *
Mills Resistor Co., Dept. EM, 3840 Catalina St., Los Alamitos, Cal. 90720 .... *
Mini-Systems, Inc., Dept. EM, 20 David Rd., North Attleboro, Mass. 02761 *
DM RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102 ..... *
Resistors, Inc., Dept. EM, 5226 W. 26th St., Chicago, Ill. 60650 ..... p. 3741
Tel Labs, Inc., Dept. EM, 154 Harvey Rd., Londonderry, N.H. 03053 ..... *
M TRW/IRC Resistors, Dept. EM, 2850 Mt. Pleasant St., Burlington, Iowa 52601 *
M TRW/IRC Resistors, Dept. EM, Greenway Rd., Boone, N.C. 28607 ..... *
Varadyne Industries, Inc., Dept. EM, 1520 Cloverfield Blvd., Santa Monica, Cal. 90404 ..... *
M Victoreen, Inc., Dept. EM, 10101 Woodland Ave., Cleveland, Ohio 44104 .... *
M Vishay Resistive Systems Grp., Vishay Intertechnology Inc., Dept. EM, 63 Lincoln Hwy., Malvern, Pa. 19355 ..... *
D Carbone Lorraine Industries Corp., Dept. EM, 400 Myrtle Ave., Boonton, N.J. 07005
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
M Jordan Electric Co., Dept. EM, 14707 Keswick St., Van Nuys, Cal. 91405
D Mepco/Electra, Inc., Dept. EM, Columbia Rd., Morristown, N.J. 07960
M MICRO OHM CORP., Dept. EM, P.O. Box 287, S. Laguna, Cal. 92677
Thickfilm Int'l, Dept. EM, 1610 Mt Vernon Ave., Alexandria, VA 22301

Resistors, High Megohm (Over 22 Megohms)

D Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
M American Components, Inc., Dept. EM, 8th Avenue at Harry St., Conshohocken, Pa. 19428 ..... p. 3636
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DM RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102 ..... *
M Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... *
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CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
Eltec Instruments Inc., Dept. EM, P.O. Box 9610, Daytona Beach, Fla. 32020
Jordan Electric Co., Dept. EM, 14707 Keswick St., Van Nuys, Cal. 91405
DM Mepco/Electra, Inc., Dept. EM, Columbia Rd., Morristown, N.J. 07960
M MICRO OHM CORP., Dept. EM, P.O. Box 287, S. Laguna, Cal. 92677
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Penn Airborne Prods., Dept. EM, Industrial Hwy., Southampton, Pa. 18966
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Resistors, High Temperature (Over 125 C)

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D Corning Glass Works, Corning Electronics, Dept. EM, Houghton Pk., Bldg. A-2, Corning, N.Y. 14830 ..... *
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M KRL Electronics, Dept. EM, 28 Bridge St., Manchester, N.H. 03101 ..... *
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Eltec Instruments Inc., Dept. EM, P.O. Box 9610, Daytona Beach, Fla. 32020
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Gentron Corp., Dept. EM, 6667 N. Sydney Pl., Milwaukee, Wisc. 53209
M Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
DM Mepco/Electra, Inc., Dept. EM, Columbia Rd., Morristown, N.J. 07960
MICRO OHM CORP., Dept. EM, P.O. Box 287, S. Laguna, Cal. 92677
Ohio Carbon Co., Dept. EM, 12508 Berea Rd., Cleveland, Ohio 44111
Thickfilm Int'l, Dept. EM, 1610 Mt Vernon Ave., Alexandria, VA 22301
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013

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Clarostat Mfg. Co., Inc., Dept. EM, Washington St., Dover, N.H. 03820
CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
M CTS Microelectronics, Inc., Dept. EM, 1201 Cumberland Ave., W. Lafayette, Ind. 47906
Gentron Corp., Dept. EM, 6667 N. Sydney Pl., Milwaukee, Wisc. 53209
Jordan Electric Co., Dept. EM, 14707 Keswick St., Van Nuys, Cal. 91405
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602
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D Oneida Electronics Mfg., Dept. EM, POB 678, R.D. #3 Baldwin Ext., Meadville, Pa. 16335
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Thickfilm Int'l, Dept. EM, 1610 Mt Vernon Ave., Alexandria, VA 22301
D Ward Leonard Elec. Co. Inc., Sub. Unimax Group Inc., Dept. EM, 31 South St., Mt. Vernon, N.Y. 10550
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

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Eltec Instruments Inc., Dept. EM, P.O. Box 9610, Daytona Beach, Fla. 32020
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M Jordan Electric Co., Dept. EM, 14707 Keswick St., Van Nuys, Cal. 91405
M Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
D Mepco/Electra, Inc., Dept. EM, Columbia Rd., Morristown, N.J. 07960
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D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Resistors, Metal Glazed

American Components, Inc., Dept. EM, 8th Avenue at Harry St., Conshohocken, Pa. 19428 ..... *
D Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634 ..... *
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D Moririca Elctrns., Ltd., Dept. EM, 205 Tozuka-machi, Tozuka-Ku, Yokohama, Japan
M Res-Net Corp., Dept. EM, 110 Route 10, Whippany, N.J. 07981
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Resistors, Microwave

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M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717

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Consolidated Resistance Co. America, Dept. EM, 222 Lake Ave., Yonkers, N.Y. 10701
Cox & Co., Inc., Dept. EM, 215 Park Ave., S., New York, N.Y. 10003
Eltec Instruments Inc., Dept. EM, P.O. Box 9610, Daytona Beach, Fla. 32020
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
D Mepco/Electra, Inc., Dept. EM, Columbia Rd., Morristown, N.J. 07960
M Res-Net Corp., Dept. EM, 110 Route 10, Whippany, N.J. 07981
Thickfilm Int'l, Dept. EM, 1610 Mt Vernon Ave., Alexandria, VA 22301
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013
D Victory Engrg. Corp., Dept. EM, Victory Rd., Springfield, N.J. 07081
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Resistors, Non-Inductive

D Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
Angstrohm Precision, Inc., Dept. EM, 1 Precision Pl., Hagerstown, Md. 21740 *
D Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634 ..... *
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Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
E.S.I. Inc., Dept. EM, 13900 N.W. Science Park Dr., Portland, Oregon 97229
D General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
Gentron Corp., Dept. EM, 6667 N. Sydney Pl., Milwaukee, Wisc. 53209
InResCo, Dept. EM, 503 Adamston Rd., Bricktown, N. J. 08723
M Jordan Electric Co., Dept. EM, 14707 Keswick St., Van Nuys, Cal. 91405
M Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
M MICRO OHM CORP., Dept. EM, P.O. Box 287, S. Laguna, Cal. 92677
M Res-Net Corp., Dept. EM, 110 Route 10, Whippany, N.J. 07981
Samarius, Inc., Dept. EM, 300 Seymour Ave., Derby, Conn. 06418
Thickfilm Int'l, Dept. EM, 1610 Mt Vernon Ave., Alexandria, VA 22301
D Ward Leonard Elec. Co. Inc., Sub. Unimax Group Inc., Dept. EM, 31 South St., Mt. Vernon, N.Y. 10550
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Kelvin, Dept. EM, 5919 Noble Avenue, Van Nuys, Cal. 91411 ..... *
M KRL Electronics, Dept. EM, 28 Bridge St., Manchester, N.H. 03101 ..... *
Mc Graw-Edison, Edison Elctrns. Div., Daven Comps., Dept. EM, Grenier Field, Manchester, N.H. 03103 ..... *
Mills Resistor Co., Dept. EM, 3840 Catalina St., Los Alamitos, Cal. 90720 .... *
Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... *
Vishay Resistive Systems Grp., Vishay Intertechnology Inc., Dept. EM, 63 Lincoln Hwy., Malvern, Pa. 19355 ..... *
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Resistors, Plug-In

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Caddock Electronics, Inc., Dept. EM, 3127 Chicago Ave., Riverside, Cal. 92507 ..... *
CTS of Berne, Dept. EM, 406 Parr Rd., Berne, Ind. 46711 ..... *
Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 ..... *
Dale Electronics, Inc., Dept. EM, Box 74, Norfolk, Nebr. 68701 ..... *
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DM KDI Pyrofilm Corp, Dept. EM, 60 S. Jefferson Rd., Whippany, N.J. 07981 .... *
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GTE Sylvania Inc., Dept. EM, Rte. 35, Standish, Maine 04084
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M MICRO OHM CORP., Dept. EM, P.O. Box 287, S. Laguna, Cal. 92677
M Murata Corporation of America, Dept. EM, 1148 Franklin Rd., S.E., Marietta, Ga. 30067
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DM Ultronix, Inc., Dept. EM, P.O. Box 1090, Grand Junction, Col. 81501
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Cal-R, Inc., Dept. EM, P.O. Box 1397, Santa Monica, Cal. 90406
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
Consolidated Resistance Co. America, Dept. EM, 222 Lake Ave., Yonkers, N.Y. 10701
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
E.S.I. Inc., Dept. EM, 13900 N.W. Science Park Dr., Portland, Oregon 97229
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
M Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730

Jordan Electric Co., Dept. EM, 14707 Keswick St., Van Nuys, Cal. 91405
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Resistors, Rectilinear

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M KRL Electronics, Dept. EM, 28 Bridge St., Manchester, N.H. 03101 ..... *
New England Instr., Dept. EM, 14 Kendal Lane, Natick, Mass. 01760 ..... *
Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... *
Bourns, Inc., Instr. Div., Dept. EM, 6135 Magnolia, Riverside, Calif. 92506
D Carbone Lorraine Industries Corp., Dept. EM, 400 Myrtle Ave., Boonton, N.J. 07005
Consolidated Resistance Co. America, Dept. EM, 222 Lake Ave., Yonkers, N.Y. 10701
M CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
Diplohmatic Div., Harry Levinson Co., Dept. EM, 1211 E. Denny Way, Seattle, Wash. 98122
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
M Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
DM Maurey Instrument Corp., Dept. EM, 4555 W. 60th St., Chicago, Ill. 60629
Samarius, Inc., Dept. EM, 300 Seymour Ave., Derby, Conn. 06418
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013

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D Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076 ..... *
DM RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102 ..... *
Tel Labs, Inc., Dept. EM, 154 Harvey Rd., Londonderry, N.H. 03053 ..... *
TRW/IRC Resistors, Dept. EM, 2850 Mt. Pleasant St., Burlington, Iowa 52601 *
M TRW/IRC Resistors, Dept. EM, Greenway Rd., Boone, N.C. 28607 ..... *
TRW/IRC Resistors, Dept. EM, 401 N. Broad St., Philadelphia, Pa. 19108 .... *
Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... *
InResCo, Dept. EM, 503 Adamston Rd., Bricktown, N. J. 08723
M Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013
D Ward Leonard Elec. Co. Inc., Sub. Unimax Group Inc., Dept. EM, 31 South St., Mt. Vernon, N.Y. 10550

Resistors, Suppressor

Carborundum Co., Graphite Prods. Div., Dept. EM, Box 339, Niagara Falls, N.Y. 14302 ..... *
D Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
Estes Engrg. Co., Dept. EM, 930 Marine Dr., Port Angeles, Wash. 98362
Ohio Carbon Co., Dept. EM, 12508 Berea Rd., Cleveland, Ohio 44111
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Resistors, Surge

Beman Mfg., Inc., Dept. EM, PO Box 370, New Cumberland, Pa. 17070 ..... *
D Caddock Electronics, Inc., Dept. EM, 3127 Chicago Ave., Riverside, Cal. 92507 ..... *
Gamble, Charles T. Inds., Dept. EM, 605 Perkins La., Delanco, N.J. 08075 .. *
Keystone Carbon Co., Thermistor Div., Dept. EM, St. Marys, Pa. 15857 ..... *
Milwaukee Resistor Corp., Dept. EM, 700 W. Virginia St., Milwaukee, Wisc. 53204 ..... *
D Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076 ..... *
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M Ametek/Rodan Div., Dept. EM, 2905 Blue Star St., Anaheim, Cal. 92806
MICRO OHM CORP., Dept. EM, P.O. Box 287, S. Laguna, Cal. 92677
D Ward Leonard Elec. Co. Inc., Sub. Unimax Group Inc., Dept. EM, 31 South St., Mt. Vernon, N.Y. 10550

Resistors, Tapped

D Caddock Electronics, Inc., Dept. EM, 3127 Chicago Ave., Riverside, Cal. 92507 ..... *
CTS of Berne, Dept. EM, 406 Parr Rd., Berne, Ind. 46711 ..... *
Cutler-Hammer, Shallcross Resistor Prods., Dept. EM, US 70 East, Smithfield, N.C. 27577 ..... *
Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 ..... *
D Dale Electronics, Inc., Dept. EM, Box 74, Norfolk, Nebr. 68701 ..... *
D E-Systems, Inc., Memcor Div., Dept. EM, 1320 Flaxmill Rd., Huntington, Ind. 46750 ..... *
DM Gamble, Charles T. Inds., Dept. EM, 605 Perkins La., Delanco, N.J. 08075 .. *
D International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 *
M Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 .... *
Kelvin, Dept. EM, 5919 Noble Avenue, Van Nuys, Cal. 91411 ..... *
Mc Graw-Edison, Edison Elctrns. Div., Daven Comps., Dept. EM, Grenier Field, Manchester, N.H. 03103 ..... *
M Milwaukee Resistor Corp., Dept. EM, 700 W. Virginia St., Milwaukee, Wisc. 53204 ..... p. 3710,3711
D Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076 ..... *
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
DM RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102 ..... *
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Tel Labs, Inc., Dept. EM, 154 Harvey Rd., Londonderry, N.H. 03053 ..... *
M TRW/IRC Resistors, Dept. EM, 2850 Mt. Pleasant St., Burlington, Iowa 52601 *
D TRW/IRC Resistors, Dept. EM, Greenway Rd., Boone, N.C. 28607 ..... *
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Victoreen, Inc., Dept. EM, 10101 Woodland Ave., Cleveland, Ohio 44104 p. 3775
D Clarostat Mfg. Co., Inc., Dept. EM, Washington St., Dover, N.H. 03820
Consolidated Resistance Co. America, Dept. EM, 222 Lake Ave., Yonkers, N.Y. 10701
CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
M Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
Jordan Electric Co., Dept. EM, 14707 Keswick St., Van Nuys, Cal. 91405
M MICRO OHM CORP., Dept. EM, P.O. Box 287, S. Laguna, Cal. 92677
M Quality Thermistor, Dept. EM, 2096 S. Cole Rd. Ste 7, Boise, Idaho 83705
Samarius, Inc., Dept. EM, 300 Seymour Ave., Derby, Conn. 06418
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
D Ward Leonard Elec. Co. Inc., Sub. Unimax Group Inc., Dept. EM, 31 South St., Mt. Vernon, N.Y. 10550

Resistors, Temperature Sensitive—See Thermistors

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DM Corning Glass Works, Corning Electronics, Dept. EM, Houghton Pk., Bldg. A-2, Corning, N.Y. 14830 ..... *
D Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 ..... *
Dale Electronics, Inc., Dept. EM, Box 74, Norfolk, Nebr. 68701 ..... *
Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076 ..... *
Stackpole Components Co., Dept. EM, P.O. Box M, Farmville, Va. 23901 .... *
Victoreen, Inc., Dept. EM, 10101 Woodland Ave., Cleveland, Ohio 44104 .... *

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General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Gould Inc. Circuit Protection & Controls Div., Dept. EM, 100 Relay Rd., Plantsville, Conn. 06479 ..... *
D International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 *
D Midwest Components, Dept. EM, 1981 Port City Blvd., Muskegon, Mich. 49400 ..... p. 4281
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Teledyne Relays, Dept. EM, 3155 W. El Segundo Blvd., Hawthorne, Cal 90250 ..... p. 3617
D Carbone Lorraine Industries Corp., Dept. EM, 400 Myrtle Ave., Boonton, N.J. 07005
General Elec., Semiconductor Prods., Dept. EM, Electronics Pk., Box 1122, Syracuse, NY 13201
D Mepco/Electra, Inc., Dept. EM, Columbia Rd., Morristown, N.J. 07960
D Sanken Elec. Co., Dept. EM, 1-22-8 Nishi-Ikebukuro, Toshima-Ku, Tokyo, Japan
Schauer Mfg. Corp., Dept. EM, 4500 Alpine Ave., Cincinnati, Ohio 45242
D Siliconix, Inc., Dept. EM, 2201 Laurelwood Rd., Santa Clara, Cal 95054
D Victory Engrg. Corp., Dept. EM, Victory Rd., Springfield, N.J. 07081
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

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Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634 ..... p. 3789
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D E-Systems, Inc., Memcor Div., Dept. EM, 1320 Flaxmill Rd., Huntington, Ind. 46750 ..... p. 3697
DM Gamble, Charles T. Inds., Dept. EM, 605 Perkins La., Delanco, N.J. 08075 p. 3698,3699
Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 .... *
M Kelvin, Dept. EM, 5919 Noble Avenue, Van Nuys, Cal. 91411 ..... p. 3704,3705
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M Mc Graw-Edison, Edison Elctrns. Div., Daven Comps., Dept. EM, Grenier Field, Manchester, N.H. 03103 ..... p. 4108

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M Milwaukee Resistor Corp., Dept. EM, 700 W. Virginia St., Milwaukee, Wisc. 53204 ..... p. 3710,3711
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D Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
M Precision Resistor Co., Inc., Dept. EM, 109 U.S. Hwy. 22, Hillside, N.J. 07205 p. 3723-3727
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D Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 *
M Tel Labs, Inc., Dept. EM, 154 Harvey Rd., Londonderry, N.H. 03053 p. 3747-3749
M TRW/IRC Resistors, Dept. EM, Greenway Rd., Boone, N.C. 28607 Inside Back Cover, Vol. 1
DM TRW/IRC Resistors, Dept. EM, 401 N. Broad St., Philadelphia, Pa. 19108 Inside Back Cover, Vol. 1
Weston Components & Controls, Div. Sangamo Weston Inc., Dept. EM, Archbald, Pa. 18403 ..... *
C-F Electronics, Inc., Dept. EM, 14709 Keswick St., Van Nuys, Cal. 91405
DM Cal-R, Inc., Dept. EM, P.O. Box 1397, Santa Monica, Cal. 90406
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Clarostat Mfg. Co., Inc., Dept. EM, Washington St., Dover, N.H. 03820
Coil Specialty Co., Dept. EM, Box 978, 2730 Carolean Ind'l. Dr., State College, Pa. 16801
Consolidated Resistance Co. America, Dept. EM, 222 Lake Ave., Yonkers, N.Y. 10701
DM CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
Diplohmatic Div., Harry Levinson Co., Dept. EM, 1211 E. Denny Way, Seattle, Wash. 98122
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
E.S.I. Inc., Dept. EM, 13900 N.W. Science Park Dr., Portland, Oregon 97229
D General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
InResCo, Dept. EM, 503 Adamston Rd., Bricktown, N. J. 08723
M Jordan Electric Co., Dept. EM, 14707 Keswick St., Van Nuys, Cal. 91405
M Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
M MICRO OHM CORP., Dept. EM, P.O. Box 287, S. Laguna, Cal. 92677
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Samarius, Inc., Dept. EM, 300 Seymour Ave., Derby, Conn. 06418
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Standard Condenser Corp., Dept. EM, 1065 W. Addison St., Chicago, Ill. 60613
DM Ultronix, Inc., Dept. EM, P.O. Box 1090, Grand Junction, Col. 81501
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013
DM Ward Leonard Elec. Co. Inc., Sub. Unimax Group Inc., Dept. EM, 31 South St., Mt. Vernon, N.Y. 10550
Waters Mfg., Inc., Dept. EM, Longfellow Ctr., Wayland, Mass. 01778
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

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Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 ..... *
Dale Electronics, Inc., Dept. EM, Box 74, Norfolk, Nebr. 68701 ..... *

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M Clifton Precision, Litton Systems, Inc., Dept. EM, Marple at Brdway., Clifton Hgts., Pa. 19018 ..... *
M Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731 ..... p. 1392
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Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... *
M Vernitron Corp., Control Components Div., Dept. EM, 1601 Precision Park La., San Diego, Cal. 92013 ..... p. 2277
M American Electronics, Inc., Dept. EM, 1600 E Valencia Dr., Fullerton, Cal. 92631
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
M Electric Indicator Co., Inc., Dept. EM, 272 Main Avenue, Norwalk, Conn. 06851
M Farrand Controls Div., Dept. EM, 99 Wall St., Valhalla, N.Y. 10595
M IMC Magnetics Corp., Western Div., Dept. EM, 6058 Walker Ave., Maywood, Cal. 90270
M Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
M Transicoil, Inc., Dept. EM, Worcester, Pa. 19490

Retainers, Battery

DM Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012 p. 2055,2056
Acme Model Engrg. Co., Dept. EM, 654 Bergen Blvd., Ridgefield, N.J. 07657
Aerolite Elexs Corp., Dept. EM, 2207 Summit Ave., Union City, N.J. 07087
DM Amrad Corp., Dept. EM, Box 876, Paris, Tex. 75460
Anchor Plastics, Dept. EM, 36-36 36th, Long Island City, N.Y. 11106
SHOGYO International Corp., Dept. EM, 300 Northern Blvd., Great Neck, N.Y. 11021
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Retainers, Relay

D American Zettler, Inc., Dept. EM, 16881 Hale Ave., Irvine, Cal. 92714 ..... *
Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012 p. 2055
Potter & Brumfield, Div of AMF, Dept. EM, P.O. Box 322, Princeton, Ind. 47671 ..... *

Retainers, Transistor & Diode

M Jettron Prods., Dept. EM, P.O. Box 337, E. Hanover, N.J. 07936 ..... *
DM Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012 p. 2055
TRW/Cinch Connectors, Electronic Comp. Div. of TRW Inc., Dept. EM, 1501 Morse Ave., Elk Grove Village, Ill. 60007 ..... Inside Back Cover, Vol. 1
D Visual Communications Co, Dept. EM, PO Box 986, El Segundo, CA 90245 *
DM Amrad Corp., Dept. EM, Box 876, Paris, Tex. 75460
Gibson/Egan Co., Dept. EM, 2666 East Huntington Dr., Duarte, CA. 91010
D Gudebrod Inc., Electronics Div., Dept. EM, 12 S. 12th St., Philadelphia, Pa. 19107
DM Int'l. Elctrn. Resch., Dept. EM, 135 W. Magnolia Blvd., Burbank, Cal. 91502
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

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ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ..... p. 2042
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DM Amrad Corp., Dept. EM, Box 876, Paris, Tex. 75460
M Int'l. Elctrn. Resch., Dept. EM, 135 W. Magnolia Blvd., Burbank, Cal. 91502

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Reverberation Modules—

RFI Measuring Equipment

All-Tronics Inc., Dept. EM, 45 Bond St., Westbury, N.Y. 11590 ..... *
Bird Electronic Corp., Dept. EM, 30303 Aurora Rd., Solon, Ohio 44139 ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Instrument Specialties, Dept. EM, 276 Bergen Blvd., Little Falls, N.J. 07424 p. 2558,2559
Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247

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Rheostats

D Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
Angstrohm Precision, Inc., Dept. EM, 1 Precision Pl., Hagerstown, Md. 21740 *
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D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
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D Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076 p. 3894,3895
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M Betatronix, Inc., Dept. EM, 110 Nicon Ct, Hauppauge, N.Y. 11787
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M Clarostat Mfg. Co., Inc., Dept. EM, Washington St., Dover, N.H. 03820
CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016

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D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
ITT Cannon Electric, Dept. EM, 666 E. Dyer Rd., Santa Ana, Cal. 92702 ..... *
TRW/Cinch Connectors, Electronic Comp. Div. of TRW Inc., Dept. EM, 1501 Morse Ave., Elk Grove Village, Ill. 60007 ..... Inside Back Cover, Vol. 1
M Allmetal Screw Products Co., Inc., Dept. EM, 821 Stewart Ave., Garden City, N.Y. 11530
M Atlantic Research Corp., Dept. EM, 5390 Cherokee Ave., Alexandria, Va 22314
D Eaton Corp., Engineered Fasteners Oper., Dept. EM, Box 6688, Cleveland, Ohio 44101
Federal Screw Products Inc., Dept. EM, 3917 N. Kedzie Ave., Chicago, Ill. 60618
National Camera Inc., Dept. EM, 2000 W. Union Ave., Englewood, Colo. 80110
M PIC Design Div., Benrus Corp., Dept. EM, Benrus Center, Rte 7, Ridgefield, Conn. 06877
D Superior Carbon Prods., Inc., Dept. EM, 9115 George Ave., Cleveland, Ohio 44105
Tridair Inds., Rexnord Co., Dept. EM, 3000 W. Lomita Blvd., Torrance, Calif. 90505
M Waldes Kohinoor, Inc., Dept. EM, 47-16 Austel Pl., Long Island City, N.Y. 11101

Rivets

M Allmetal Screw Products Co., Inc., Dept. EM, 821 Stewart Ave., Garden City, N.Y. 11530
M Art Wire/Doduco, Dept. EM, 9 Wing Dr., Cedar Knolls, N.J. 07927
Auto-Swage Products Inc., Dept. EM, 726 River Rd., Shelton, Conn. 06484
D Channel Master Div. Avnet, Dept. EM, Rte. 209, Ellenville, N.Y. 12428
M Cherry Fasteners, Townsend Div. Textron Inc., Dept. EM, Box 2157, Santa Ana, Cal. 92707
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
D Deutsch Fastener Corp., Dept. EM, 7001 W. Imperial Hwy., Los Angeles, Cal. 90045

Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
Federal Screw Products Inc., Dept. EM, 3917 N. Kedzie Ave., Chicago, Ill. 60618
D Gries Reproducer Co., Div. Coats & Clark Inc., Dept. EM, 162 Beechwood Ave., New Rochelle, N.Y. 10801
DM ITT Harper, Dept. EM, 8200 Lehigh Ave., Morton Grove, ILL. 60053
Mark Eyelet & Stamping, Dept. EM, 185 Wakelee Rd., Wolcott, Conn. 06716
M Milford Rivet & Mach., Dept. EM, 857 Bridgeport Ave., Milford, Conn. 06460
National Camera Inc., Dept. EM, 2000 W. Union Ave., Englewood, Colo. 80110
Plessey Inc., Dept. EM, 320 Long Island Expwy. S., Melville, N.Y. 11746
Pylon Co., Inc., Dept. EM, 51 Newcomb St., Attleboro, Mass. 02703
Taylor Electric, Inc., Dept. EM, 2410 Hwy 281 N., Marble Falls, Tex. 78654
D USM Corp., "POP" Rivet & Eyelet Divs., Dept. EM, 510 River Rd., Shelton, Conn. 06484

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D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
D Channel Master Div. Avnet, Dept. EM, Rte. 209, Ellenville, N.Y. 12428
Copperweld Bimetallics, Div. Copperweld Corp., Dept. EM, Glassport, PA 15045
D Premax Prods. Div., Chisholm-Ryder Co., Dept. EM, Highland & College Aves., Niagara Falls, N.Y. 14305
D RCA Distr. & Special Prods. Div., Dept. EM, Deptford, N.J. 08096
M Stevens Prods., Inc., Dept. EM, 128 N. Park St., E. Orange, N.J. 07019

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Rubber, Conductive

Chomerics, Inc., Dept. EM, 77 Dragon Court, Woburn, Mass. 01801 ..... *
M Hardman Inc., Dept. EM, 600 Cortlandt St., Belleville, N.J. 07109 ..... *
D 3M Co., Static Control Systems, Dept. EM, 3M Center Bldg. 223-25, St. Paul, Minn. 55119 ..... **p. 3408,3409**
DM Metex Corp., Dept. EM, 970 New Durham Rd., Edison, N.J. 08817 ..... **p. 2566**
D Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
SWS Silicones Corp., Dept. EM, Box 428, Adrian, Mich. 49221
D Tecknit, Dept. EM, 129 E. Dermody St., Cranford, N.J. 07016

Rubber Guards (For Equipment)—See Bumpers

Rubber, Silicone

M APM-Hexseal, Dept. EM, 44 Honeck St., Englewood, N.J. 07631 ..... *
M Hardman Inc., Dept. EM, 600 Cortlandt St., Belleville, N.J. 07109 ..... *
M Varflex Corp., Dept. EM, 514 W. Court St., Rome, N.Y. 13440 ..... *
M Cadillac Plastic & Chemical, Dayco Co., Dept. EM, Box 810, Detroit, Mich. 48232
Connecticut Hard Rubber Co., Dept. EM, 407 East St., New Haven, Conn. 06509
Emerson & Cuming, Inc., Dielectric Mat'ls. Div., Dept. EM, 869 Washington St., Canton, Mass. 02021
Formulated Resins Inc., Dept. EM, Box 508, Greenville, R.I. 02828
Keene Corp, Dept. EM, 345 Park Ave, New York, N.Y. 10022
Minnesota Rubber Co., Dept. EM, 3630 Wooddale Ave., Minneapolis, Minn. 55416
D Norelcom Electronics, Dept. EM, 200 Allen Blvd., Farmingdale, N.Y. 11735
D Ram Chems., Div. Whittaker Corp., Dept. EM, 210 E. Alondra Blvd., Gardena, Calif. 90248
SWS Silicones Corp., Dept. EM, Box 428, Adrian, Mich. 49221
Tra-Con, Inc., Dept. EM, 55 North St., Medford, Mass. 02155

Scale Expanders, Meter—See Multipliers, Meter

Scalers, Binary, Decade

M Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731 ..... *
M Control Sciences, Inc., Dept. EM, 8399 Topanga Canyon Blvd., Canoga Park, Cal. 91304 ..... *
Dynapar Corp., Dept. EM, 1675 Delany Rd., Gurnee, Ill. 60031
M Harshaw Chemical Co., A Kenanee Industry, Dept. EM, 6801 Cochran Rd., Solon, Ohio 44139
Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
M Nuclear Resch. Corp., Dept. EM, 1105 Indl. Hwy., Southampton, Pa. 18966

Scales, Dial

D Datak Corp., Dept. EM, 65 Seventy-First St., Guttenberg, N.J. 07093 ..... *
D Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 ..... *
RCL Electronics Div., AMF Incorporated, Dept. EM, 700 S. 21st St., Irvington, N.J. 07111 ..... *
D Vemaline Prods. Div., Ostbys & Barton Co., Dept. EM, 487 Jefferson Blvd., Warwick, R.I. 02886 ..... *
D Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 ..... *
Anchor Plastics, Dept. EM, 36-36 36th, Long Island City, N.Y. 11106
Apahouser Corp. of N.E., Apahouser-Elcom, Dept. EM, 101 Walnut St., Watertown, Mass. 02172
Beckman Instrs., (AISSD), Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634
D Chatillon John & Sons, Dept. EM, 83-30 Kew Gardens Rd., Kew Gardens, N.Y. 11415
Dillon, W.C. & Co., Dept. EM, 14620-EP Keswick St., Van Nuys 340, Cal. 91407
D Mechanical Engraving Co., Inc., Dept. EM, 4500 Bullard Ave, Bronx, New York 10470
M Photo Chemical Prods. Cal., Dept. EM, 1715 Berkeley, Santa Monica, Cal. 90404
SGL Homalite, Div. of SGL Inds., Inc., Dept. EM, 11 Brookside Dr., Wilmington, Del. 19804
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
M Tech-Etch/Braun, Dept. EM, 45 Aldrin Rd., Plymouth, Mass. 02360
Teledyne Gurley, Dept. EM, 514 Fulton St., Troy, N.Y. 12181
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006

Scanners, Crossbar

A. D. Data Sys., Inc., Dept. EM, POB 9209, Rochester, N.Y. 14625 ..... *
Information Transfer Industrial, Inc., Dept. EM, Box 357, Holcomb, N.Y. 14469 ..... **p. 1646**
Matrix Corp., Dept. EM, 2260 Distributors Dr., Indianapolis, Ind. 46241 ..... *
Matrix Systems Corp., Dept. EM, 9411 Lurline Ave., Chatsworth, Cal. 91311 *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
PPM, Inc., Dept. EM, 7575 Bond St., Cleveland, Ohio 44139 ..... *

Scanners, Flying Spot

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Infodex, Inc., Dept. EM, 7 Cherry Ave., Waterbury, Conn. 06702 ..... *
Syntronic Instruments Inc., Dept. EM, 100 Industrial Rd., Addison, Ill. 60101 *
M Alden Elctrn. & Impulse Recording Equip. Co., Dept. EM, Washington St., Westboro, Mass. 01581
D Amperex Electronic Corp., Slatersville Div., Dept. EM, Providence Pike, Slatersville, R.I. 02876
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010

Scanners, Infrared

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
M Barnes Engrg. Co., Dept. EM, 30 Commerce Rd., Stamford, Conn. 06902
Bendix Corp., Aerospace Sys. Div., Dept. EM, 3621 S. State Rd., Ann Arbor, Mich. 48107
Dolan-Jenner Inds., Inc., Dept. EM, Box 1020, Woburn, Mass. 01801
FJW Industries, Dept. EM, 215 E. Prospect Ave., Mt. Prospect, Ill. 60056
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Innovation Industries Inc., Dept. EM, 5012 S. Main St., Roswell, N.M. 88201
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
M Santa Barbara Resch. Ctr., Dept. EM, 75 Coromar Dr., Goleta, Cal. 93017
D Scientific Technology, Dept. EM, 1201 San Antonio Rd., Mountain View, Cal. 94043
Skan-A-Matic Corp., Dept. EM, Box S, Elbridge, N.Y. 13060
Unico, Inc., Dept. EM, 3725 Nicholson Rd., Franksville, Wisc. 53126

Scanners, Instrument, Input/Output

A. D. Data Sys., Inc., Dept. EM, POB 9209, Rochester, N.Y. 14625 ..... *
AMP Capitron Div./AMP Inc., Dept. EM, 1595 S. Mt. Joy St., Elizabethtown, Pa. 17022 ..... *
Fifth Dimension, Dept. EM, 707 Alexander Rd., Princeton, N.J. 08540 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 ..... *
Information Transfer Industrial, Inc., Dept. EM, Box 357, Holcomb, N.Y. 14469 ..... **p. 1646**
Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 ..... *
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... **p. 2771**
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
Matrix Corp., Dept. EM, 2260 Distributors Dr., Indianapolis, Ind. 46241 **p. 1654**
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705 **p. 2793**
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
D Philips Test & Measuring Instrs., Dept. EM, 85 McKee Dr., Mahwah, NJ 07430 ..... *
PPM, Inc., Dept. EM, 7575 Bond St., Cleveland, Ohio 44139 ..... *
M ATEC, Inc., Dept. EM, Box 19426, Houston, Tex. 77024
D Autocon Inds., Sub. Control Data, Dept. EM, 2300 Berkshire La. N., Minneapolis, Minn. 55441
Dest Data Corp., Dept. EM, 1285 Forgewood Ave., Sunnyvale, Cal. 94085
Dolan-Jenner Inds., Inc., Dept. EM, Box 1020, Woburn, Mass. 01801
Hy-Cal Engrg, Dept. EM, 12105 Los Nietos Rd., Santa Fe Springs, Cal 90670
IPAC Group, Inc., Dept. EM, POB 156 3047 Industrial Blvd., Bethel Park, PA 15102
Kollsman Instr. Co., Dept. EM, Daniel Webster Hwy., Merrimack, N.H. 03054
M Monarch Marking Sys., Dept. EM, Box 608, Dayton, Ohio 45401
D Princeton Elctrn. Prods., Dept. EM, Box 101, New Brunswick, N.J. 08902
Skan-A-Matic Corp., Dept. EM, Box S, Elbridge, N.Y. 13060
DM Systems Data Inc., Dept. EM, 1941 W. Market St., Akron, Ohio 44313

Scanners, Optical

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Bulova Watch Co., Servo Prods. Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
D Canon U.S.A., Inc., Dept. EM, 10 Nevada Dr., Lake Success, N.Y. 11040 ..... *
Automatic Timing & Controls Co., Dept. EM, King of Prussia, Pa. 19406
Dest Data Corp., Dept. EM, 1285 Forgewood Ave., Sunnyvale, Cal. 94085
D Dolan-Jenner Inds., Inc., Dept. EM, Box 1020, Woburn, Mass. 01801
FSI/Fork Standards Inc., Dept. EM, 211 Main St., W. Chicago, Ill. 60185
D General Scanning, Dept. EM, 150 Coolidge Ave., Watertown, Mass. 02172
Image Graphics, Inc., Dept. EM, 1525 Kings Hwy., Fairfield, Conn. 06430
D Key Tronic Corp., Dept. EM, Bldg. 14, Spokane Ind'l. Pk., Spokane, Wash. 99216
Lundy Elctrns. & Sys., Inc., Dept. EM, Robert La., Glen Head, N.Y. 11545
Metrologic Instruments, Inc., Dept. EM, 143 Harding Ave., Bellmawr, N.J. 08030
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010

D Photomation, Inc., Dept. EM, Box 460, Mountain View, Cal. 94041
D Reticon Corp., Dept. EM, 910 Benicia Ave., Sunnyvale, Cal. 94086
Skan-A-Matic Corp., Dept. EM, Box S, Elbridge, N.Y. 13060
D Spatial Data Systems, Inc., Dept. EM, P.O. Box 249 508 S. Fairview, Goleta, Cal. 93017
Unico, Inc., Dept. EM, 3725 Nicholson Rd., Franksville, Wisc. 53126
Welch Allyn, Inc., Indl. Prods. Div., Dept. EM, Skaneateles Falls, N.Y. 13153

Scanners, Reed

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Information Transfer Industrial, Inc., Dept. EM, Box 357, Holcomb, N.Y. 14469 ..... *
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
Matrix Corp., Dept. EM, 2260 Distributors Dr., Indianapolis, Ind. 46241 ..... *
Matrix Systems Corp., Dept. EM, 9411 Lurline Ave., Chatsworth, Cal. 91311 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705 ..... *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403 ..... *
Consolidated Controls Corp., Dept. EM, 15 Durant Ave., Bethel, Conn. 06801

Scissors

Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
D Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
Clauss Cutlery Co., Dept. EM, Box 667, Fremont, Ohio 43420
D Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
D Klein Tools, Inc, Dept. EM, 7200 McCormick Rd., Chicago, Ill. 60645
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Weller-Xcelite Wiss, The Cooper Group, Dept. EM, Box 728, Apex, NC 27505

Scope Dollies—See Carts & Dollies, Instrument & Equipment

SCR's—See Thyristors

SCR Firing Controls—See Controls, SCR

Scramblers, Data

NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
M Atlantic Research Corp., Dept. EM, 5390 Cherokee Ave., Alexandria, Va 22314
Com/Tech Systems Inc., Dept. EM, 44 Beaver St., New York, N.Y. 10004
Datotek, Inc., Dept. EM, 13740 Midway Rd., Dallas, Tex. 75240
Decom Systems, Inc., Dept. EM, 1404 Descanso Rd., San Marcos, Ca. 92069
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Terminal Data Corp. of Md, Dept. EM, 11878 Coakley Circle, Rockville, Md. 20852

Scramblers, Speech

Datotek, Inc., Dept. EM, 13740 Midway Rd., Dallas, Tex. 75240
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230

Screens, Printed Circuit

D Chemcut Corp., Dept. EM, 500 Science Pk., State College, Pa. 16801
GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
NAZ-DAR International, Dept. EM, 1087 N. Branch St., Chicago, Ill 60622
Photronic Labs., Dept. EM, Commerce Park, Danbury, Conn. 06810
TRW/Cinch-Graphik, Elctrn. Comps., Div. TRW INC., Dept. EM, 200 S. Turnbull Canyon Rd., City of Industry, Cal. 91744
M Wells Electronics, Inc., Weltek Div., Dept. EM, 1801 S. Main St., South Bend, Ind. 46613
D Zenrad Controls Co., Dept. EM, 529 E. Gutierrez St., Santa Barbara, Ca. 93103

Screwdrivers

D Channellock, Inc., Dept. EM, 1306 S. Main St., Meadville, Pa. 16335 .... p. 4287
ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ..... **p. 1990**
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
D Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
DM Allen Mfg. Co., Dept. EM, 22 E. Dudley Town Rd., Bloomfield, Conn. 06002
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
DM Bondhus Corporation, Dept. EM, Monticello, Minn 55362
D Erikson Specialized Tool Co., Dept. EM, Box 424, Pico-Rivera, Cal. 90660
Gardner-Denver Co., Pneutronics Div., Dept. EM, 1333 Fulton St., Grand Haven, Mich. 49417
DM High Speed Hammer Co., Inc., Dept. EM, 313 Norton St., Rochester, N.Y. 14621
M H.J.J. Co., Dept. EM, Box 905, Los Gatos, Cal. 95030
D Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
M Kawecki Berylco Inds., Inc., Dept. EM, PO Box 1462, Reading, PA 19603
Kedman Co., Dept. EM, Box 25667, Salt Lake City, Utah 84125
D Klein Tools, Inc, Dept. EM, 7200 McCormick Rd., Chicago, Ill. 60645
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
D Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
D Marshall Industries, Hunter Tools, Dept. EM, 9674 Telstar Ave., El Monte, Cal. 91731
DM Moody Tools, Inc., Dept. EM, 1 Culver St., Providence, R.I. 02905
National Camera Inc., Dept. EM, 2000 W. Union Ave., Englewood, Colo. 80110
D Neuses, Inc. (P.K.), Dept. EM, 1401 Rohlwing Rd., Rolling Meadows, Ill. 60008
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Snap-On-Tools, Dept. EM, 8192-A 28th Ave., Kenosha, Wisc. 53140
Standard Pneumatic Motor Co., Dept. EM, Box 10030, Reno, Nev. 89510

Screws, Lead, Feed & Translatory—See Drives & Drives Mechanisms (Dial)

Screws—See Fasteners

Scribers

D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
Aerolix Corporation, Dept. EM, 720 So. Columbus Street, Mt. Vernon, NY 10550
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
DM Moody Tools, Inc., Dept. EM, 1 Culver St., Providence, R.I. 02905

Scribers, Wafer-Also See Machines & Accessories, Semiconductor Manufacturing

Aerolix Corporation, Dept. EM, 720 So. Columbus Street, Mt. Vernon, NY 10550
Materials Resch. Corp., Dept. EM, Route 303, Orangeburg, N.Y. 10962
Quantronix Corp., Dept. EM, 225 Engineers Rd., Smithtown, N.Y. 11787

Sealers—See Coatings

Sealing Equipment, Metal-Glass/Ceramic

Argus International, Dept. EM, Box 38, Hopewell, N.J. 08525
Carpenter Technology, Dept. EM, Box 662, Reading, Pa. 19603

Seals & Feedthrus, Environmental—See Feedthrus & Seals, Environmental

Seals, Ceramic To Metal

M Airpax Elctrns., Inc., Cambridge Div., Dept. EM, Woods Rd., Cambridge, Md. 21613 ..... **p. 1022**
M Alberox Corp., Dept. EM, New Bedford Ind'l. Pk., New Bedford, Mass. 02745 *
The Bendix Corp., Electrical Comp. Div., Dept. EM, Sidney, NY 13838 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
M Atlantic Research Corp., Dept. EM, 5390 Cherokee Ave., Alexandria, Va 22314
M Cadillac Plastic & Chemical, Dayco Co., Dept. EM, Box 810, Detroit, Mich. 48232
Centerflex Ceramics, Dept. EM, 221 Seventh Ave., Hawthorne, N.J. 07507
Coors Porcelain Co., Dept. EM, 600 Ninth St., Golden, Colo. 80401
Corning Glass Works, Dept. EM, Main Plant, Bldg. 21-3, Corning, NY 14830
M Detoronics Corp., Dept. EM, 10660 E. Rush St., P.O. Box 3805, S. El Monte, Cal. 91733
Diamonite Products Div., Dept. EM, Box 567, Shreve, Ohio 44676
Gulton Inds., SCD Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
Indium Corp. of Amer, Dept. EM, 1676 Lincoln Ave, Box 269, Utica, NY 13503
Materials for Elctrns., Dept. EM, 149-32 132nd St., Jamaica, N.Y. 11430
Plessey Inc., Dept. EM, 320 Long Island Expwy. S., Melville, N.Y. 11746
D Plessey Ceramic Div., Dept. EM, 8th & Harrison Sts., Frenchtown, N.J. 08825
SermeTel Inc., Sub. Teleflex Inc., Dept. EM, 155 Limerick Rd., Limerick, Pa 19468
Simmonds Precision, Engine Systems Div., Dept. EM, Norwich, N.Y. 13815
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Seals, Glass To Metal

M Airpax Elctrns., Inc., Cambridge Div., Dept. EM, Woods Rd., Cambridge, Md. 21613 ..... **p. 1022**
The Bendix Corp., Electrical Comp. Div., Dept. EM, Sidney, NY 13838 ..... *
ITT Cannon Electric, Dept. EM, 666 E. Dyer Rd., Santa Ana, Cal. 92702 **p. 1809, Back Cover, Vol. 1**
Reeves-Hoffman Div., Dynamics Corp. of Amer., Dept. EM, 400 W. North St., Carlisle, Pa. 17013 ..... *
D Union Carbide Corp., Battery Products Div., Dept. EM, 270 Park Ave., New York, N.Y. 10017 ..... *
M Allegheny Ludlam Steel Co., Dept. EM, 2000 Oliver Bldg., Pittsburgh, Pa. 15222
DM Armstrong Cork Co., Dept. EM, W. Liberty St., Lancaster, Pa. 17604
Auburn Mfg., Dept. EM, Pease Ave. & Stack St., Middletown, Conn. 06457
M Cadillac Plastic & Chemical, Dayco Co., Dept. EM, Box 810, Detroit, Mich. 48232
Connector Inds. of America, Dept. EM, 639 N. Wayne, Cincinnati, Ohio 45215
Corning Glass Works, Dept. EM, Main Plant, Bldg. 21-3, Corning, NY 14830
M Detoronics Corp., Dept. EM, 10660 E. Rush St., P.O. Box 3805, S. El Monte, Cal. 91733
DM Electrical Inds., Div. Philips Elctrns. Inc., Dept. EM, 691 Central Ave., Murray Hill, N.J. 07974
Elctrn. Seals, Dept. EM, 13766 Saticoy St., Van Nuys, Cal. 91402
Fredericks Co., Dept. EM, Philmont & Anne Sts., Huntingdon Valley, Pa. 19006
Fusite Div./Emerson Elec., Dept. EM, 6000 Fernview Ave., Cincinnati, Ohio 45212
Gulton Inds., SCD Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
High Voltage Engrg. Corp., Dept. EM, S. Bedford St., Burlington, Mass. 01803
Indium Corp. of Amer, Dept. EM, 1676 Lincoln Ave, Box 269, Utica, NY 13503
M Magnetics, Div/Spang Industries, Inc., Dept. EM, Box 391, Butler, Pa. 16001
DM Plessey Chatsworth, Dept. EM, 20245 Sunburst St., Chatsworth, Cal. 91311
SermeTel Inc., Sub. Teleflex Inc., Dept. EM, 155 Limerick Rd., Limerick, Pa 19468
Thermal Amer. Fused Quartz, Dept. EM, Change Bridge Rd., Montville, N.J. 07045
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
D Viking Inds., Inc., Dept. EM, 9324 Topanga Cyn Blvd., Chatsworth, Cal. 91311
Wall A. T. Co., Dept. EM, 55 Service Ave., Warwick, R.I. 02889
M Wilmad Glass Co., Inc., Dept. EM, Buena, N.J. 08310

Seals, Hermetic-Also See Services, Hermetic Sealing

M **Alberox Corp., Dept. EM, New Bedford Ind'l. Pk., New Bedford, Mass. 02745 p. 2553**
APM-Hexseal, Dept. EM, 44 Honeck St., Englewood, N.J. 07631 ..... p. 3997
ITT Cannon Electric, Dept. EM, 666 E. Dyer Rd., Santa Ana, Cal. 92702 p. 1889,1893, Back Cover, Vol. 1
Mini-Systems, Inc., Dept. EM, 20 David Rd., North Attleboro, Mass. 02761 *
Centerflex Ceramics, Dept. EM, 221 Seventh Ave., Hawthorne, N.J. 07507
Connector Inds. of America, Dept. EM, 639 N. Wayne, Cincinnati, Ohio 45215
Corning Glass Works, Dept. EM, Main Plant, Bldg. 21-3, Corning, NY 14830
M Detoronics Corp., Dept. EM, 10660 E. Rush St., P.O. Box 3805, S. El Monte, Cal. 91733
DM Electrical Inds., Div. Philips Elctrns. Inc., Dept. EM, 691 Central Ave., Murray Hill, N.J. 07974
D Electro-Science Labs., Dept. EM, 2211 Sherman Ave., Pennsauken, N. J. 08110
Elctrn. Seals, Dept. EM, 13766 Saticoy St., Van Nuys, Cal. 91402
Fusite Div./Emerson Elec., Dept. EM, 6000 Fernview Ave., Cincinnati, Ohio 45212
Gulton Inds., SCD Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
Minnesota Rubber Co., Dept. EM, 3630 Wooddale Ave., Minneapolis, Minn. 55416
Plessey Ceramic Div., Dept. EM, 8th & Harrison Sts., Frenchtown, N.J. 08825
Simmonds Precision, Engine Systems Div., Dept. EM, Norwich, N.Y. 13815
Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
Solid State Equipment Corp., Dept. EM, 430 Delaware Drive, Fort Washington, Pa. 19034
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
D Zippertubing Co., Dept. EM, 13000 S. Broadway, Los Angeles, Cal. 90061

Seals, Microwave—See Gaskets, Shielding, R-F; Seals, Waveguide

Seals, Waveguide

DM **Metex Corp., Dept. EM, 970 New Durham Rd., Edison, N.J. 08817 ..... p. 2566**
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
Detoronics Corp., Dept. EM, 10660 E. Rush St., P.O. Box 3805, S. El Monte, Cal. 91733
Emerson & Cuming, Inc., Dielectric Mat'ls. Div., Dept. EM, 869 Washington St., Canton, Mass. 02021
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006

Search Unit, Magnetic Tape—See Tape Search Equipment

Seizers

D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... ***
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... ***
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006

Selsyns—See Motors, Synchronous

Semiconductor Material—See Crystals, Semiconductor

Semiconductor Wafer Fabrication, Assembling (Packaging)

Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... *
M **LSI Computer Systems, Inc., Dept. EM, 1235 Walt Whitman Rd., Melville, N.Y. 11746 ..... ***
M American Microsystems, Inc., Dept. EM, 3800 Homestead Rd., Santa Clara, Cal. 95051
Atomergic Chemetals Corp Co., Dept. EM, 100 Fairchild Ave., Plainview, N.Y. 11803
D Electroglas Inc., Dept. EM, 2901 Coronado Dr., Santa Clara, Cal. 95050
DM Solitron Devices, Transistor Div., Dept. EM, 1177 Blue Heron Rd., Riviera Beach, Fla. 33404

Semiconductor Wafer Fabrication, Designing (Topological)

M American Microsystems, Inc., Dept. EM, 3800 Homestead Rd., Santa Clara, Cal. 95051
Laser Technology, Inc., Dept. EM, 10624 Ventura Blvd., N. Hollywood, Calif. 91604
M Nitron, Inc., Dept. EM, 10420 Bubb Rd., Cupertino, Cal. 95014
DM Teledyne Semiconductor, Dept. EM, 1300 Terra Bella Ave., Mountain View, Cal. 94040

Semiconductor Wafer Fabrication, Maskmaking (Tooling)

M **LSI Computer Systems, Inc., Dept. EM, 1235 Walt Whitman Rd., Melville, N.Y. 11746 ..... ***
Union Carbide Corp., Battery Products Div., Dept. EM, 270 Park Ave., New York, N.Y. 10017 ..... *
M American Microsystems, Inc., Dept. EM, 3800 Homestead Rd., Santa Clara, Cal. 95051
Corning Glass Works, Dept. EM, Main Plant, Bldg. 21-3, Corning, NY 14830
D GCA/Sunnyvale Div., Dept. EM, 1050 Kifer Rd., Sunnyvale, Cal. 94086
D Illumination Industries, Dept. EM, 825 E. Evelyn Ave., Sunnyvale, Cal. 94086
M Nitron, Inc., Dept. EM, 10420 Bubb Rd., Cupertino, Cal. 95014
Quantronix Corp., Dept. EM, 225 Engineers Rd., Smithtown, N.Y. 11787

Semiconductor Wafer Fabrication, Processing

Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... *
LSI Computer Systems, Inc., Dept. EM, 1235 Walt Whitman Rd., Melville, N.Y. 11746 ..... *
D **Union Carbide Corp., Battery Products Div., Dept. EM, 270 Park Ave., New York, N.Y. 10017 ..... ***
Accumet Engineering Corp., Dept. EM, 1 Kane Industrial Dr., Hudson, Mass. 01749
M American Microsystems, Inc., Dept. EM, 3800 Homestead Rd., Santa Clara, Cal. 95051
Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Atomergic Chemetals Corp Co., Dept. EM, 100 Fairchild Ave., Plainview, N.Y. 11803
Cherry Semiconductor Corp, Dept. EM, 99 Bald Hill Rd., Cranston, RI 02920
D Electroglas Inc., Dept. EM, 2901 Coronado Dr., Santa Clara, Cal. 95050
D GCA/Sunnyvale Div., Dept. EM, 1050 Kifer Rd., Sunnyvale, Cal. 94086
General Instrument Corp., Discrete Semiconductor Div., Dept. EM, 600 West John St., Hicksville, N.Y. 11802
KSW Electronics Corp., Dept. EM, South Bedford St., Burlington, Mass. 01803
LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Macronetics, Dept. EM, 570 Maude Ct., Sunnyvale, Cal. 94086
Materials Resch. Corp., Dept. EM, Route 303, Orangeburg, N.Y. 10962
MSI Electronics, Inc., Dept. EM, 34-32 57th St., Woodside, N.Y. 11377
M Nitron, Inc., Dept. EM, 10420 Bubb Rd., Cupertino, Cal. 95014
P Q Corp., Dept. EM, PQ Corp, Valley Forge, Pa. 19482
Qualco, Dept. EM, One First St., Los Altos, Cal. 94022
Research Devices, Dept. EM, 616 Springfield Ave., Berkeley Heights, N.J. 07922
DM Teledyne Semiconductor, Dept. EM, 1300 Terra Bella Ave., Mountain View, Cal. 94040
D UCE, Inc., Dept. EM, 20 N. Main St., Norwalk, Conn. 06854
Union Carbide Corp., Crystal Prods. Dept., Elctrns Div, Dept. EM, 8888 Balboa Ave., San Diego, Cal. 92123
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Semiconductor Wafer Fabrication, Testing

Boonton Electronics Corp., Dept. EM, Route #287, Parsippany, N.J. 07054 *
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... ***
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
M **LSI Computer Systems, Inc., Dept. EM, 1235 Walt Whitman Rd., Melville, N.Y. 11746 ..... ***
Alessi Inds., Dept. EM, 3195-C Airport Loop Dr., Costa Mesa, Cal. 92626
M American Microsystems, Inc., Dept. EM, 3800 Homestead Rd., Santa Clara, Cal. 95051
Atomergic Chemetals Corp Co., Dept. EM, 100 Fairchild Ave,, Plainview, N.Y. 11803
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
D Electroglas Inc., Dept. EM, 2901 Coronado Dr., Santa Clara, Cal. 95050
D GCA/Sunnyvale Div., Dept. EM, 1050 Kifer Rd., Sunnyvale, Cal. 94086
Laser Technology, Inc., Dept. EM, 10624 Ventura Blvd., N. Hollywood, Calif. 91604
Lehighton Electronics, Inc., Dept. EM, RD 1Box 374 Dept M, Lehighton, Pa 18235
Research Devices, Dept. EM, 616 Springfield Ave., Berkeley Heights, N.J. 07922
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
D Temptronic Corporation, Dept. EM, 40 Glen Ave., Newton, Mass. 02159
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Semiconductors—See Diodes; Rectifiers; Transistors

Sensors—See Transducer Listings

Sensors, Light

Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470 p. 2259
D **International Rectifier Corp., Semiconductor Div., Dept. EM, 233 Kansas St., El Segundo, Cal. 90245 ..... ***
D **Litronix, Dept. EM, 19000 Homestead Rd., Cupertino, Cal. 95014 ..... p. 2493**
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... ***
D Eagle Signal, Mfg. Div. Gulf & Western Inds., Dept. EM, Box 3585, Davenport, Iowa 52808
D Electronic Counters & Controls Inc., Dept. EM, 1500 McCormick Blvd., Mundelein, Ill. 60060
D EMI Gencom Inc., Dept. EM, 80 Express St., Plainview, N.Y. 11803
Evershed & Vignoles Ltd., Dept. EM, Action Lane, Chiswick, London, England W4 5HJ
D Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
FSI/Fork Standards Inc., Dept. EM, 211 Main St., W. Chicago, Ill. 60185
M Harshaw Chemical Co., A Kenanee Industry, Dept. EM, 6801 Cochran Rd., Solon, Ohio 44139
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Information Control Corp., Light Pen Div., Dept. EM7, Dept. EM, 9610 Bellanca Ave., Los Angeles, Cal. 90045
Meloy Labs Inc., Instrus. & Sys. Div., Dept. EM, 6715 Electronic Dr., Springfield, Va. 22151
Meret Inc., Dept. EM, 1815 24th St., Santa Monica, Cal. 90404
Optron, Inc., Dept. EM, 1201 Tappon Cir., Carrollton, Tex. 75006
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
D Reticon Corp., Dept. EM, 910 Benicia Ave., Sunnyvale, Cal. 94086
Sensor Technology, Dept. EM, 21012 Lassen St., Chatsworth, Cal. 91311
Skan-A-Matic Corp., Dept. EM, Box S, Elbridge, N.Y. 13060
United Detector Tech., Dept. EM, 2644 30th St., Santa Monica, Cal. 90405

Sensors, Temperature—See Bolometers; Thermistors; Transducers

Sequence Controllers—See Controllers, Programmable

Services, Assembly & Fabrication (Including R & D)

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
M **Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521** ..... *
Amuneal Mfg. Corp., Dept. EM, 4737 Darrah St., Philadelphia, Pa. 19124 p. 2554
Connector Corp., Dept. EM, 6025 N. Keystone Ave., Chicago, Ill. 60646 p. 1742,1743
D **Elctrn. Molding Corp., Dept. EM, 96 Mill St., Woonsocket, R.I. 02895** .. p. 1765
DM **Excel Products Co., Inc., Dept. EM, 401 Joyce Kilmer Ave., New Brunswick, N.J. 08903** ..... *
GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 ..... *
ITT Thermotech, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 1203 S. 5th St., Hopkins, Minn. 55343 ..... *
M **Jettron Prods., Dept. EM, P.O. Box 337, E. Hanover, N.J. 07936** ..... *
M **Metex Corp., Dept. EM, 970 New Durham Rd., Edison, N.J. 08817** ..... *
DM **Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725** ..... *
Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 p. 2100
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
Technitrol, Inc., Dept. EM, 1952 E. Alleghany, Philadelphia, Pa. 19134 ..... *
United Wiring & Mfg. Co., Dept. EM, 2608 Electonic La. #404, Dallas, Tex. 75220 ..... p. 1300,1301,1308-1310
M ABA Electromechanical Sys. Inc., Dept. EM, Box 500, Pinellas Pk., Fla. 33565
M Abrams Instr., Dept. EM, 606 E. Shiawassee, Lansing, Mich. 48901
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
Action Labs Inc., Dept. EM, 3238 Washington Ave. N., Minneapolis, Minn. 55412
M Aec - Able Engrg Co., Dept. EM, P.O. Box C, 350 S So. Kellogg, Goleta, Cal 93017
Aerolite Elexs Corp., Dept. EM, 2207 Summit Ave., Union City, N.J. 07087
Aerolix Corporation, Dept. EM, 720 So. Columbus Street, Mt. Vernon, NY 10550
American Electric Cable Co., Dept. EM, 181 Appleton St., Holyoke, Mass. 01040
Apahouser Corp. of N.E., Apahouser-Elcom, Dept. EM, 101 Walnut St., Watertown, Mass. 02172
Applied Control Co., Dept. EM, 1275 Bloomfield Ave., Fairfield, N.J. 07006
Applied Systems Corp., Dept. EM, 26401 Harper Ave., St. Clair Shores, Mich. 48081
M Argent Electronics, Inc., Dept. EM, 477 E. Wenger Rd., Englewood, Ohio 45322
Associated Spring-Barnes Group Inc., Dept. EM, 18 Main St., Bristol, Conn. 06010
Astro-Geo-Marine Inc., Dept. EM, 2005 Palma Dr., Ventura, Cal. 93003
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
M Avid Electronics Corp., Dept. EM, Box 426, Baldwin, Pl., N.Y. 10505
Barnes & Reinecke, Inc., Dept. EM, 2375 Estes Ave., Elk Grove Village, Ill. 60007
D Bud Radio, Inc., Dept. EM, 4605 E. 355th St., Willoughby, Ohio 44094
Bug Electronics, Dept. EM, 151 Grove St, Westwood, Mass. 02090
Bulova Systems & Instrument Corp., Dept. EM, Green Acres Rd., W., Valley Stream, N.Y. 11582
M Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
Com/Tech Systems Inc., Dept. EM, 44 Beaver St., New York, N.Y. 10004
Crestron Elec., Dept. EM, 40 John Strt, Closter, NJ 07624
Datacom, Inc., Dept. EM, Box 278, Ft. Walton Beach, Fla. 32548
Datatex Corp., Dept. EM, 10935 S. Wilcrest Dr., Houston, Tex. 77099
Dattilo Enterprises, Inc., Dept. EM, 2302 Taylorsville Rd., Louisville, Ky. 40205
Design Automation, Dept. EM, 809 Massachusetts Ave., Lexington, Mass. 02173
Detoronics Corp., Dept. EM, 10660 E. Rush St., P.O. Box 3805, S. El Monte, Cal. 91733
Digital Data Systems, Dept. EM, 6501 N.W. 14th St., Plantation, Fla. 33313
D EECO, Dept. EM, 1441 E. Chestnut Ave, Box 659, Santa Ana, Cal. 92701
Electro-Prep, Dept. EM, 30 Cayuga Ave., E. Falmouth, Ma. 02536
Electrocom Inds., Dept. EM, 1105 N. Ironwood Dr., S. Bend, Ind. 46615
Elgin Elctrns., Inc., Sub. Basic, Inc., Dept. EM, Walnut St., Waterford, PA. 16441
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Estes Engrg. Co., Dept. EM, 930 Marine Dr., Port Angeles, Wash. 98362
GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854
M Geyer Systems, Inc., Dept. EM, 1917 Green Spring Dr., Timonium, Md. 21903
Grand Transformers, Dept. EM, Box 188, Grand Haven, Mich. 49417
D Hobson Bros., Inc., Dept. EM, 4940 W. Lawrence Ave., Chicago, Ill. 60630
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Hybricon Corp., Dept. EM, 410 Crest Rd., Litteton, Mass. 01460
IEC Electronics Corp., Dept. EM, 105 Norton St., Newark, N.Y. 14513
InResCo, Dept. EM, 503 Adamston Rd., Bricktown, N. J. 08723
ITI Electronics, Inc., Dept. EM, 369 Lexington Ave., Clifton, N.J. 07015
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
Kantz Electronic Ind., Dept. EM, 229 W. 4th St., Clifton, N.J. 07011
Kentucky Electronics, Dept. EM, 1204 Ind'l Dr., Box 507, Owensboro, Ky. 42301
M Kinetron Corp., Dept. EM, 1416 Roller Rd, Asbury Park, N.J. 07712
M Lehighton Electronics, Inc., Dept. EM, RD 1Box 374 Dept M, Lehighton, Pa 18235
LocAtor Electronics Co., Dept. EM, South Country Ind'l Pk., Drawer 10609, St. Louis, Mo. 63129
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
Matrix Engineering Corp., Dept. EM, 17000 S. Western Ave. 19, Gardena, Cal. 90247
Metal Fabricators, Inc., Dept. EM, Box 1946, Greenville, S.C. 29602
Mid-West Metal Prods., Inc., Dept. EM, 456 E. Donovan Rd., Kansas City, Kans. 66115
Midland Standrad Inc., Dept. EM, 603 E. Chicago St. Box 38, Elgin, ILL 60120
Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
Mobil Electronics, Inc., Dept. EM, Box 1132, Anderson, Ind. 46015
N.K.R. Precision Mfg. Corp., Dept. EM, Rte. 17M, Box 333, Harriman, N.Y. 10926
Omnicomp, Inc., Dept. EM, 5150 N 16th St, Ste 253, Phoenix, Ariz. 85016
Paraplegics Mfg., Dept. EM, 304 N. York Rd., Bensenville, Ill. 60106
Photo Chemical Prods. Cal., Dept. EM, 1715 Berkeley, Santa Monica, Cal. 90404
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
Process & Instrs. Corp., Dept. EM, 1943 Broadway, Brooklyn, N.Y. 11207
M RCA Service Co., Div. RCA Corp., Dept. EM, Govt. Svcs. 202-1, Camden, N.J. 08101
M Ronor Systems, Dept. EM, Box 80, 145 N. Plains Ind. Park Rd., Wallingford, Conn. 06492
Schneider Instr. Co., Dept. EM, 8115 Camargo Rd., Cincinnati, Ohio 45243
D Sonex, Dept. EM, 2337 Philmont Ave., Huntingdon Valley, Pa. 19006
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
DM Systems Data Inc., Dept. EM, 1941 W. Market St., Akron, Ohio 44313
M Teledyne Aerospace Systems, Dept. EM, 1007 E. 10th St., Fairmont, Minn. 56031
Thickfilm Int'l, Dept. EM, 1610 Mt Vernon Ave., Alexandria, VA 22301
UFAD Corp., Dept. EM, 700 36th St. S.E., Grand Rapids, Mich. 49508
Ultra Carbon Corp., Dept. EM, Box 747, Bay City, Mich. 48707
Venture Development Corp., Dept. EM, One Washington St., Wellesley, Mass. 02181
Video Automation Systems Inc., Dept. EM, Rte 1—Box 21A, Pound Ridge, N.Y. 10576
D Viking Inds., Inc., Dept. EM, 9324 Topanga Cyn Blvd., Chatsworth, Cal. 91311
D Wilson Co., H. M., Dept. EM, 11501 Chimney Rock Rd., Houston, Tex. 77035
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578
M Zero Corp., Dept. EM, 777 Front St., Burbank, Cal. 91502
Zonic Technical Labs., Dept. EM, 8927 Rossash Ave., Cincinnati, Ohio 45236

Services, Backplane Wiring

Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
Augat Interconnection Prods. Div., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703 ..... *
DM **Excel Products Co., Inc., Dept. EM, 401 Joyce Kilmer Ave., New Brunswick, N.J. 08903** ..... *
DM **Garry Mfg., Inc., Dept. EM, 1010 Jersey Ave., New Brunswick, N.J. 08902** p. 1768
United Wiring & Mfg. Co., Dept. EM, 2608 Electonic La. #404, Dallas, Tex. 75220 ..... p. 1300,1301,1308-1310
Vero Electronics, Dept. EM, 171 Bridge Rd., Hauppauge, N.Y. 11787 ..... *
Action Labs Inc., Dept. EM, 3238 Washington Ave. N., Minneapolis, Minn. 55412
Applied Systems Corp., Dept. EM, 26401 Harper Ave., St. Clair Shores, Mich. 48081
M Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
Datatex Corp., Dept. EM, 10935 S. Wilcrest Dr., Houston, Tex. 77099
D EECO, Dept. EM, 1441 E. Chestnut Ave, Box 659, Santa Ana, Cal. 92701
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Hybricon Corp., Dept. EM, 410 Crest Rd., Litteton, Mass. 01460
M Lehighton Electronics, Inc., Dept. EM, RD 1Box 374 Dept M, Lehighton, Pa 18235
Mid-West Metal Prods., Inc., Dept. EM, 456 E. Donovan Rd., Kansas City, Kans. 66115
Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
Paraplegics Mfg., Dept. EM, 304 N. York Rd., Bensenville, Ill. 60106
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050

Services, Calibration & Instrument Repair

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
Delevan Div., Coil Prods., American Precision Inds., Dept. EM, 270 Quaker Rd., E. Aurora, N.Y. 14052 ..... *
EG&G, Inc., Electro-Optics Div., Dept. EM, 35 Congress St., Salem, Mass. 01970 ..... *
Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 .. *
D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043** *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
DM Ampower Electronic Instr. Co., Dept. EM, 500 Union Blvd., Totowa, N. J. 07512
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
BLH Elctrns., Dept. EM, 42 Fourth Ave., Waltham, Mass. 02154
M CATV Communications, Div. of Amer. Elctrn. Labs. Inc., Dept. EM, Box 552, Lansdale, Pa. 19446
Columbia Resch. Labs., Dept. EM, Macdade Blvd. & Bullens La., Woodlyn, Pa. 19094
Dielectric Comms, Unit of Gen Signal, Dept. EM, Raymond, Maine 04071
Dillon, W.C. & Co., Dept. EM, 14620-EP Keswick St., Van Nuys 340, Cal. 91407
M Flow Technology, Inc., Dept. EM, Box 21346, Phoenix, Ariz. 85036
Gamma Elctrn Research Co., RF & Microwave Lab., Dept. EM, 991 Commercial St. Ste. 4, Palo Alto, Cal 94303
Gamma Elctrn Research Co., Tech. Pubs. Sect., Dept. EM, Box 482, Newark, CA 94560
H-B Instr. Co., Dept. EM, 4306 N. American St, Philadelphia, Pa. 19140
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Incal Service Corp., Dept. EM, 81 Camp Ave, Box 4683, Stamford, Conn 06907
M Lehighton Electronics, Inc., Dept. EM, RD 1Box 374 Dept M, Lehighton, Pa 18235
Magnetic Products, Inc., Dept. EM, Box 1125, New London, N.H. 03257
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
National Camera Inc., Dept. EM, 2000 W. Union Ave., Englewood, Colo. 80110
N.Y. Testing Labs., Inc., Dept. EM, 81 Urban Ave., Westbury, N.Y. 11590
M RCA Service Co., Div. RCA Corp., Dept. EM, Govt. Svcs. 202-1, Camden, N.J. 08101
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
Thwing-Albert Instr. Co., Dept. EM, 10960 Dutton Rd., Philadelphia, Pa. 19154

Services, Coating (All-Types)

Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 ..... p. 4285
M **Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... ***
Aerolix Corporation, Dept. EM, 720 So. Columbus Street, Mt. Vernon, NY 10550
Alpha Metals, Inc., Dept. EM, 600 Rte 440, Jersey City, N.J. 07304
M Atlantic Research Corp., Dept. EM, 5390 Cherokee Ave., Alexandria, Va 22314
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
DM Carborundum Co., Plastics Div., Dept. EM, Carborundum Center, Niagara Falls, New York 14302
M Chemplast, Inc., Dept. EM, 31-150 Dey Rd., Wayne, N.J. 07470
Evaporated Coatings, Inc., Dept. EM, 798 Welsh Rd., Huntingdon Valley, Pa. 19006
High Voltage Engrg. Corp., Dept. EM, S. Bedford St., Burlington, Mass. 01803
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Int'l. Elctrn. Resch., Dept. EM, 135 W. Magnolia Blvd., Burbank, Cal. 91502
Materials Resch. Corp., Dept. EM, Route 303, Orangeburg, N.Y. 10962
Melles Griot, Dept. EM, 1770 Kettering St., Irvine, Cal. 92714
Mid-West Metal Prods., Inc., Dept. EM, 456 E. Donovan Rd., Kansas City, Kans. 66115
M Nova Tran Corp., Dept. EM, 360 4th St., Clear Lake, Wisc. 54005
M Optics Group-East, Valtec Corp., Dept. EM, Holliston, Mass. 01746
Phoenix Wire, Inc., Dept. EM, 100 Teflon Ave., S. Hero, Vt. 05486
M Photo Chemical Prods. Cal., Dept. EM, 1715 Berkeley, Santa Monica, Cal. 90404
SermeTel Inc., Sub. Teleflex Inc., Dept. EM, 155 Limerick Rd., Limerick, Pa 19468
Union Carbide Corp., Linde Div., Dept. EM, 270 Park Ave., New York, N.Y. 10017
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Zero Corp., Dept. EM, 777 Front St., Burbank, Cal. 91502

Services, Computer-Aided Design (CAD)

Comstron Corp., Dept. EM, 200 E. Sunrise Hwy., Freeport, N.Y. 11520 p. 2294
Comstron Seg., Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520 .. p. 2294
United Wiring & Mfg. Co., Dept. EM, 2608 Electonic La. #404, Dallas, Tex. 75220 ..... *
M Accurate Instrument Co., Dept. EM, Box No. 925, Westbury, N.Y. 11590
Barnes & Reinecke, Inc., Dept. EM, 2375 Estes Ave., Elk Grove Village, Ill. 60007
Design Automation, Dept. EM, 809 Massachusetts Ave., Lexington, Mass. 02173
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Uniroyal, Inc., Dept. EM, 1230 Ave. of Americas, New York, N.Y. 10020
University Computing Co., Dept. EM, 8303 Elmbrook Dr. Box 4791, Dallas, Tex. 75247
Zonic Technical Labs., Dept. EM, 8927 Rossash Ave., Cincinnati, Ohio 45236

Services, Crimping

Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
Connector Corp., Dept. EM, 6025 N. Keystone Ave., Chicago, Ill. 60646 ..... *
M **Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... ***
Action Labs Inc., Dept. EM, 3238 Washington Ave. N., Minneapolis, Minn. 55412
American Electric Cable Co., Dept. EM, 181 Appleton St., Holyoke, Mass. 01040
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
M Electro-Prep, Dept. EM, 30 Cayuga Ave., E. Falmouth, Ma. 02536
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
IEC Electronics Corp., Dept. EM, 105 Norton St., Newark, N.Y. 14513
M Manger Elec. Co., Inc., Dept. EM, W. Henry St., Stamford, Conn. 06902
Zierick Mfg. Corp., Dept. EM, 44 Radio Circle, Mt. Kisco, N.Y. 10549

Services, Custom Molding, Plastics

Alden Products Co, Dept. EM, 117 N Main St, Brockton, Mass. 02403 ..... *
Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
Connector Corp., Dept. EM, 6025 N. Keystone Ave., Chicago, Ill. 60646 p. 1742,1743
Delbert Blinn. Co., Dept. EM, Box 2007, Pomona, Calif. 91766 ..... p. 3923
Eby Company, Dept. EM, 4701 Germantown, Philadelphia, Pa. 19144 ..... *
Harbison Ind'l. Prods., Inc., Sub Polymer Corp, Dept. EM, 7205 Hibbs La., Levittown, Pa. 19057 ..... *
Industrial Elctrn. Engrs., Dept. EM, 7740 Lemona Ave., Van Nuys, Cal. 91405 *
ITT Thermotech, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 1203 S. 5th St., Hopkins, Minn. 55343 ..... p. 2560,2561
LaFrance Corp., Dept. EM, Entprs & Exec Aves, Phila., PA. 19153 ..... p. 1039
M **Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... ***
Skydyne,, Div. Brooks & Perkins Inc., Dept. EM, River Rd., Port Jervis, N.Y. 12771 ..... p. 1047
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... ***
Accessories for Electronics, Dept. EM, 800 Merrick Road, Baldwin, N.Y. 11510
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
M Acme Plastic Products Co., Inc., Dept. EM, 9629 N. 22nd Ave., Phoenix, Ariz. 85021
Air Products & Chemicals, Dept. EM, Box 538, Allentown, PA 18105
American Electric Cable Co., Dept. EM, 181 Appleton St., Holyoke, Mass. 01040
M Applied Design Co., Dept. EM, 2465 Sheridan Dr., Tonawanda, N.Y. 14150
Armco Steel Corp., Dept. EM, Middletown, Ohio 45043
M Atlantic Research Corp., Dept. EM, 5390 Cherokee Ave., Alexandria, Va 22314
D Caplugs Div., Protective Closures Co., Dept. EM, 2150 Elmwood Ave., Buffalo, N.Y. 14207
DM Carborundum Co., Plastics Div., Dept. EM, Carborundum Center, Niagara Falls, New York 14302
M Chemplast, Inc., Dept. EM, 31-150 Dey Rd., Wayne, N.J. 07470
M Claude Engrg, Dept. EM, 1320 Grand Ave-Unit 12, San Marcos, CA 92069
Conap, Inc., Dept. EM, 1405 Buffalo St, Olean, N.Y. 14760
General Industries Co., Dept. EM, Taylor & Olive St., Elyria, Ohio 44035
D Gries Reproducer Co., Div. Coats & Clark Inc., Dept. EM, 162 Beechwood Ave., New Rochelle, N.Y. 10801
Gulton Inds., SCD Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
D Hobson Bros., Inc., Dept. EM, 4940 W. Lawrence Ave., Chicago, Ill. 60630
M Holly Productions, Dept. EM, 1442 Tzena Way, Encinitas, Cal. 92024
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
Kurz-Kasch, Inc., Knob Div., Dept. EM, 711 Hunter Dr., Wilmington, Ohio 45177
Macronetics, Dept. EM, 570 Maude Ct., Sunnyvale, Cal. 94086
Manger Elec. Co., Inc., Dept. EM, W. Henry St., Stamford, Conn. 06902
Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
Minnesota Rubber Co., Dept. EM, 3630 Wooddale Ave., Minneapolis, Minn. 55416
NVF Co., Dept. EM, Box 68, Yorklyn, Del. 19736
Parabam, Inc., Dept. EM, 3017 E. Las Hermanas St., Compton, Cal. 90221
Parsons Mfg. Corp., Dept. EM, 1055 O'Brien Dr., Menlo Park, Cal. 94025
M Projects Unlimited, Inc., Dept. EM, 3680 Wyse Rd., Dayton, Ohio 45414
M Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
M Quantum, Inc., Dept. EM, Barnes Industrial Pk, Wallingford, CT. 06492
M Ronor Systems, Dept. EM, Box 80, 145 N. Plains Ind. Park Rd., Wallingford, Conn. 06492
Rostone Corp., Dept. EM, 2781 S. Concord Rd., Lafayette, Ind. 47902
D SAMTEC, Dept. EM, 810 Progress Blvd., New Albany, Indiana 47150
DM SGL Plastics, Dept. EM, Route 248, Nazareth, Pa. 18064
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
Star Tron Corp., Dept. EM, 58 Curtis St., Providence, R.I. 02909
M Stevens Prods., Inc., Dept. EM, 128 N. Park St., E. Orange, N.J. 07019
M Teledyne Aerospace Systems, Dept. EM, 1007 E. 10th St., Fairmont, Minn. 56031
D Teledyne Mecca, Dept. EM, Box 36393, Houston, Tex. 77036
Textool Products, Inc., Dept. EM, 1410 W. Pioneer Dr., Irving, Tex. 75061
M Unit Industries, Inc., Dept. EM, 529 S. Raymond Ave., Fullerton, Cal. 92631
DM Van Norman Molding Co., Dept. EM, 9599 S. 76th Ave., Bridgeview, Ill. 60455
Vichek Plastics Co., Dept. EM, Middlefield, Ohio 44062
Whitso, Inc., Dept. EM, 9326 Byron St., Schiller Park, Ill. 60176
Zero Corp., Dept. EM, 777 Front St., Burbank, Cal. 91502

Services, Decapsulation

Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Sigma Plastronics, Inc., Dept. EM, 14531-33 Tireman Ave, Dearborn, Mich. 48126

Services, Electrical Measurement & Test

Active Control Instrumentation, Dept. EM, PO Box 243-Wildwood Circle, Key Largo, Florida 33037 ..... *
M **All-Tronics Inc., Dept. EM, 45 Bond St., Westbury, N.Y. 11590 ..... p. 2614**
American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005 ..... *
Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 .. *
Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509 ..... *
M **Hopkins Engrg., Dept. EM, 12900 Foothill Blvd., San Fernando, Cal. 91342 ***
Pulsar Assocs., Dept. EM, 11491 Sorrento Valley Rd., San Diego, Cal. 92121 *
Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... *
M **Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 p. 2100**
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *
Spectrum Control, Inc., Dept. EM, 152 E. Main St., Fairview, Pa. 16415 p. 2642
Aetna Engrg., Dept. EM, P.O. Box 7749, Van Nuys, Cal. 91409
DM Ampower Electronic Instr. Co., Dept. EM, 500 Union Blvd., Totowa, N. J. 07512
M Associated Testing Laboratories, Div of Walter Kidde & Co., Dept. EM, Northwest Ind'l. Pk., Burlington, Mass. 01803
M Associated Testing Laboratories, Div. of Walter Kidde & Co., Dept. EM, 23 Vincent St., Wayne, N.J. 07470
M Atlantic Research Corp., Dept. EM, 5390 Cherokee Ave., Alexandria, Va 22314
Barnes & Reinecke, Inc., Dept. EM, 2375 Estes Ave., Elk Grove Village, Ill. 60007
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
M Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
M CATV Communications, Div. of Amer. Elctrn. Labs. Inc., Dept. EM, Box 552, Lansdale, Pa. 19446
Design Automation, Dept. EM, 809 Massachusetts Ave., Lexington, Mass. 02173
Detoronics Corp., Dept. EM, 10660 E. Rush St., P.O. Box 3805, S. El Monte, Cal. 91733
Dielectric Instr. Corp., Dept. EM, 761 Franklin Ave., Pittsburgh, Pa. 15221
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Gabriel Elctrns. Inc., Dept. EM, Box 626, Scarborough Ind'l. Pk., Scarborough, Me. 04074
Gamma Elctrn Research Co., RF & Microwave Lab., Dept. EM, 991 Commercial St. Ste. 4, Palo Alto, Cal 94303
Gamma Elctrn Research Co., Tech. Pubs. Sect., Dept. EM, Box 482, Newark, CA 94560
M Incal Service Corp., Dept. EM, 81 Camp Ave, Box 4683, Stamford, Conn 06907
M Lehighton Electronics, Inc., Dept. EM, RD 1Box 374 Dept M, Lehighton, Pa 18235
N.Y. Testing Labs., Inc., Dept. EM, 81 Urban Ave., Westbury, N.Y. 11590
M Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
M RCA Service Co., Div. RCA Corp., Dept. EM, Govt. Svcs. 202-1, Camden, N.J. 08101
Signatron, Inc., Dept. EM, 12 Hartwell Ave., Lexington, Mass. 02173
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115

M Technical Research & Mfg., Inc., Dept. EM, Kelly Ave. Grenier Field, R.F.D. #3, Manchester, N.H. 03103
M Teledyne Micronetics, Dept. EM, 7155 Mission Gorge Rd., San Diego, Calif. 92120
Venture Development Corp., Dept. EM, One Washington St., Wellesley, Mass. 02181
Zonic Technical Labs., Dept. EM, 8927 Rossash Ave., Cincinnati, Ohio 45236

Services, Encapsulation

D Airflyte Elctrns. Co., Dept. EM, Box 207, 56 Hook Rd., Bayonne, N.J. 07002 *
American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
D Beman Mfg., Inc., Dept. EM, PO Box 370, New Cumberland, Pa. 17070 ..... *
Elctrn. Molding Corp., Dept. EM, 96 Mill St., Woonsocket, R.I. 02895 ..... *
Endicott Coil Co., Dept. EM, 24 Charlotte St., Binghamton, N.Y. 13905 ..... *
M Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... *
Bug Electronics, Dept. EM, 151 Grove St, Westwood, Mass. 02090
D Cable Sys & Assembly Co., Dept. EM, 210 Broadway, Everett, Mass. 02149
Eastern Delta Corp., Dept. EM, 29-09 S. Broadway, Fair Lawn, N.J. 07410
Electrical Plastics Corp., Dept. EM, 500 Long Branch Ave., Long Branch, N.J. 07740
Estes Engrg. Co., Dept. EM, 930 Marine Dr., Port Angeles, Wash. 98362
Glenmarc Mfg. Inc., Dept. EM, 330 Melvin Dr., Northbrook, Ill. 60062
H-B Instr. Co., Dept. EM, 4306 N. American St, Philadelphia, Pa. 19140
Hightemp Resins, Inc., Dept. EM, 225 Greenwich Ave., Stamford, Conn. 06902
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Manger Elec. Co., Inc., Dept. EM, W. Henry St., Stamford, Conn. 06902
Midland Standrad Inc., Dept. EM, 603 E. Chicago St. Box 38, Elgin, ILL 60120
Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
M Nova Tran Corp., Dept. EM, 360 4th St., Clear Lake, Wisc. 54005
Paraplegics Mfg., Dept. EM, 304 N. York Rd., Bensenville, Ill. 60106
M Ronor Systems, Dept. EM, Box 80, 145 N. Plains Ind. Park Rd., Wallingford, Conn. 06492
D Techcon Systems Inc., Dept. EM, 16016 So. Figueroa St., Gardena, Cal 90248
M Teledyne Aerospace Systems, Dept. EM, 1007 E. 10th St., Fairmont, Minn. 56031
U.S. Elctrns., Dept. EM, 500 Long Branch Ave., Long Branch, N.J. 07740

Services, Environmental Testing

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
Delevan Div., Coil Prods., American Precision Inds., Dept. EM, 270 Quaker Rd., E. Aurora, N.Y. 14052 ..... *
Grayhill Inc., Dept. EM, 569 Hillgrove Ave., LaGrange, Ill. 60525 ..... *
M Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 **p. 2100**
M Torwico Elctrns., Inc., Dept. EM, Rte. 70, Lakewood, N.J. 08701 ..... *
Unholtz-Dickie Corp., Dept. EM, 3000 Whitney Ave., Hamden, Conn. 06518 *
M Abrams Instr., Dept. EM, 606 E. Shiawassee, Lansing, Mich. 48901
D Apollo Lasers Inc., Dept. EM, 6357 Arizona Cir., Los Angeles, Cal. 90045
M Associated Testing Laboratories, Div of Walter Kidde & Co., Dept. EM, Northwest Ind'l. Pk., Burlington, Mass. 01803
M Associated Testing Laboratories, Div. of Walter Kidde & Co., Dept. EM, 23 Vincent St., Wayne, N.J. 07470
M Atlantic Research Corp., Dept. EM, 5390 Cherokee Ave., Alexandria, Va 22314
Atlas Engrg. Corp., Dept. EM, 26 Custer St., W. Hartford, Conn. 06110
Atmosphere Controls Prdts., Dept. EM, 295 Polaris, Mt. View, Cal. 94043
Barnes & Reinecke, Inc., Dept. EM, 2375 Estes Ave., Elk Grove Village, Ill. 60007
Beckman Instrs., Cedar Grove Opers., Dept. EM, 89 Commerce Rd., Cedar Grove, N.J. 07009
Detoronics Corp., Dept. EM, 10660 E. Rush St., P.O. Box 3805, S. El Monte, Cal. 91733
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
Environmental Research Grp., Dept. EM, 117 N. First St., Ann Arbor, Mich. 48103
Fairchild Camera & Instr., Federal Systems Group, Dept. EM, 300 Robbins La., Syosset, N.Y. 11791
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
IRD Mechanalysis, Inc., Dept. EM, 6150 Huntley Rd., Columbus, Ohio 43229
N.Y. Testing Labs., Inc., Dept. EM, 81 Urban Ave., Westbury, N.Y. 11590
M Preformed Line Products Co., Dept. EM, Box 91129, Cleveland, Ohio 44101
M Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
M RCA Service Co., Div. RCA Corp., Dept. EM, Govt. Svcs. 202-1, Camden, N.J. 08101
M Trio-Tech, Inc. of Calif., Trio-Tech Int., Dept. EM, 2435 N. Naomi St., Burbank, Calif. 91504
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Whittaker Corp., Dept. EM, 10880 Wilshire Blvd., Los Angeles, Cal. 90024

Services, Hermetic Sealing

Alberox Corp., Dept. EM, New Bedford Ind'l. Pk., New Bedford, Mass. 02745 *
Mini-Systems, Inc., Dept. EM, 20 David Rd., North Attleboro, Mass. 02761 *
Associate General Labs., Dept. EM, 8934 W. Ogden Ave., Brookfield, Ill. 60513
Centerflex Ceramics, Dept. EM, 221 Seventh Ave., Hawthorne, N.J. 07507
Connector Inds. of America, Dept. EM, 639 N. Wayne, Cincinnati, Ohio 45215
Detoronics Corp., Dept. EM, 10660 E. Rush St., P.O. Box 3805, S. El Monte, Cal. 91733
DM Electrical Inds., Div. Philips Elctrns. Inc., Dept. EM, 691 Central Ave., Murray Hill, N.J. 07974
Elctrn. Seals, Dept. EM, 13766 Saticoy St., Van Nuys, Cal. 91402
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Fusite Div./Emerson Elec., Dept. EM, 6000 Fernview Ave., Cincinnati, Ohio 45212
Gulton Inds., SCD Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Kinetron Corp., Dept. EM, 1416 Roller Rd, Asbury Park, N.J. 07712
Laser Inc., Dept. EM, Laser Lane, Box 537, Sturbridge, Mass. 01566
Solid State Equipment Corp., Dept. EM, 430 Delaware Drive, Fort Washington, Pa. 19034
D Viking Inds., Inc., Dept. EM, 9324 Topanga Cyn Blvd., Chatsworth, Cal. 91311

Services, High Vacuum

Alberox Corp., Dept. EM, New Bedford Ind'l. Pk., New Bedford, Mass. 02745 *
M Associated Testing Laboratories, Div of Walter Kidde & Co., Dept. EM, Northwest Ind'l. Pk., Burlington, Mass. 01803
M Associated Testing Laboratories, Div. of Walter Kidde & Co., Dept. EM, 23 Vincent St., Wayne, N.J. 07470
M Bemco, Inc., Dept. EM, 9908 San Fernando Rd., Pacoima, Cal. 91331
D CVC Products, Inc., Dept. EM, 525 Lee Rd., Box 1886, Rochester, N.Y. 14603
Evaporated Coatings, Inc., Dept. EM, 798 Welsh Rd., Huntingdon Valley, Pa. 19006
High Voltage Engrg. Corp., Dept. EM, S. Bedford St., Burlington, Mass. 01803
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Materials Resch. Corp., Dept. EM, Route 303, Orangeburg, N.Y. 10962
N.Y. Testing Labs., Inc., Dept. EM, 81 Urban Ave., Westbury, N.Y. 11590
Perkin-Elmer Ultek Inc., Dept. EM, Box 10920, Palo Alto, Cal. 94303
Process & Instrs. Corp., Dept. EM, 1943 Broadway, Brooklyn, N.Y. 11207
DM Ulvac North America, Dept. EM, Colchester Plaza, Colchester, VT 05446
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Services, Instrument Design (Industrial)

Active Control Instrumentation, Dept. EM, PO Box 243-Wildwood Circle, Key Largo, Florida 33037 ..... *
Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005 ..... *
NES, inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Aetna Engrg., Dept. EM, P.O. Box 7749, Van Nuys, Cal. 91409
Astro-Geo-Marine Inc., Dept. EM, 2005 Palma Dr., Ventura, Cal. 93003
Barnes & Reinecke, Inc., Dept. EM, 2375 Estes Ave., Elk Grove Village, Ill. 60007
Bromberg Engineering, Dept. EM, 461 Conant Rd., Weston, Mass. 02193
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
Crestron Elec., Dept. EM, 40 John Strt, Closter, NJ 07624
Design Automation, Dept. EM, 809 Massachusetts Ave., Lexington, Mass. 02173
Dexter Scientific, Dept. EM, 1526 Arnold Dr., Melbourne, Fla. 32935
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Information Handling Services, Dept. EM, 15 Inverness Way East, Englewood, Colo. 80150
IPAC Group, Inc., Dept. EM, POB 156 3047 Industrial Blvd., Bethel Park, PA 15102
M Lehighton Electronics, Inc., Dept. EM, RD 1Box 374 Dept M, Lehighton, Pa 18235
D Macrodyne Inc., Dept. EM, 1900 Maxon Rd., Box 1079, Schenectady, N.Y. 12301
Magnetic Products, Inc., Dept. EM, Box 1125, New London, N.H. 03257
Omnicomp, Inc., Dept. EM, 5150 N 16th St, Ste 253, Phoenix, Ariz. 85016
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
Process & Instrs. Corp., Dept. EM, 1943 Broadway, Brooklyn, N.Y. 11207
Schneider Instr. Co., Dept. EM, 8115 Camargo Rd., Cincinnati, Ohio 45243
Sonex, Dept. EM, 2337 Philmont Ave., Huntingdon Valley, Pa. 19006
Thomas & Skinner, Inc., Dept. EM, Box 150-B,, Indianapolis, Ind. 46206
UFAD Corp., Dept. EM, 700 36th St. S.E., Grand Rapids, Mich. 49508
Venture Development Corp., Dept. EM, One Washington St., Wellesley, Mass. 02181
D Wilson Co., H. M., Dept. EM, 11501 Chimney Rock Rd., Houston, Tex. 77035
Zonic Technical Labs., Dept. EM, 8927 Rossash Ave., Cincinnati, Ohio 45236

Services, Metal Etching, Engraving

DM Excel Products Co., Inc., Dept. EM, 401 Joyce Kilmer Ave., New Brunswick, N.J. 08903 ..... *
DM Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725 ..... *
Apahouser Corp. of N.E., Apahouser-Elcom, Dept. EM, 101 Walnut St., Watertown, Mass. 02172
Buckbee Mears Co., Dept. EM, 245 E. 6th St., St. Paul, Minn. 55101
GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Mechanical Engraving Co., Inc., Dept. EM, 4500 Bullard Ave, Bronx, New York 10470
Micro Parts, Dept. EM, 1051 Pierce Butler Rte., St. Paul, MN 55104
M Photo Chemical Prods. Cal., Dept. EM, 1715 Berkeley, Santa Monica, Cal. 90404
Plessey Inc., Dept. EM, 320 Long Island Expwy. S., Melville, N.Y. 11746
M Tech-Etch/Braun, Dept. EM, 45 Aldrin Rd., Plymouth, Mass. 02360
Zero Corp., Dept. EM, 777 Front St., Burbank, Cal. 91502

Services, Metal Parts Fabrication

Alden Products Co, Dept. EM, 117 N Main St, Brockton, Mass. 02403 ..... *
American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
Connector Corp., Dept. EM, 6025 N. Keystone Ave., Chicago, Ill. 60646 ..... *
Delbert Blinn. Co., Dept. EM, Box 2007, Pomona, Calif. 91766 ..... **p. 3923**
M Equipto Enclosure Systems, Div/Equipto Elec. Corp., Dept. EM, 435 Woodlawn Ave., Aurora, Ill. 60507 ..... *
DM Excel Products Co., Inc., Dept. EM, 401 Joyce Kilmer Ave., New Brunswick, N.J. 08903 ..... *
Staver Co., Inc., Dept. EM, 47 N. Saxon Ave., Bay Shore, N.Y. 11706 ..... *
D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
M Abrams Instr., Dept. EM, 606 E. Shiawassee, Lansing, Mich. 48901
Accessories for Electronics, Dept. EM, 800 Merrick Road, Baldwin, N.Y. 11510
Accumet Engineering Corp., Dept. EM, 1 Kane Industrial Dr., Hudson, Mass. 01749

Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
Acme Model Engrg. Co., Dept. EM, 654 Bergen Blvd., Ridgefield, N.J. 07657
M Advanced Materials Systems, Dept. EM, 72 Elm St. N., Atteboro, Mass. 02703
Apahouser Corp. of N.E., Apahouser-Elcom, Dept. EM, 101 Walnut St., Watertown, Mass. 02172
M Applied Design Co., Dept. EM, 2465 Sheridan Dr., Tonawanda, N.Y. 14150
Art Wire/Doduco, Dept. EM, 9 Wing Dr., Cedar Knolls, N.J. 07927
Associated Spring-Barnes Group Inc., Dept. EM, 18 Main St., Bristol, Conn. 06010
M Astro Dynamics, Dept. EM, 2 Gill St., Woburn, Mass. 01801
M Atlantic Research Corp., Dept. EM, 5390 Cherokee Ave., Alexandria, Va 22314
M Atlas Fibre Co., Dept. EM, 6970 N. Central Park Ave., Chicago, Ill. 60645
Auto-Swage Products Inc., Dept. EM, 726 River Rd., Shelton, Conn. 06484
M Avid Electronics Corp., Dept. EM, Box 426, Baldwin, Pl., N.Y. 10505
M Braxton Mfg. Co., Dept. EM, Echo Lake Rd. N., Watertown, Conn. 06795
D Brooks Mfg. Co., Dept. EM, Box 17602, Philadelphia, Pa 19135
Buckbee Mears Co., Dept. EM, 245 E. 6th St., St. Paul, Minn. 55101
D Bud Radio, Inc., Dept. EM, 4605 E. 355th St., Willoughby, Ohio 44094
Digital Data Systems, Dept. EM, 6501 N.W. 14th St., Plantation, Fla. 33313
Emporium Specialties Co., Inc., Dept. EM, Box 65, Austin, Pa. 16720
Framar Metal Prods Co., Dept. EM, 124 W Main St Dept 1201, High Bridge, N.J. 08829
Fusite Div./Emerson Elec., Dept. EM, 6000 Fernview Ave., Cincinnati, Ohio 45212
Gabriel Elctrns. Inc., Dept. EM, Box 626, Scarborough Ind'l. Pk., Scarborough, Me. 04074
D Hobson Bros., Inc., Dept. EM, 4940 W. Lawrence Ave., Chicago, Ill. 60630
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Int'l. Elctrn. Resch., Dept. EM, 135 W. Magnolia Blvd., Burbank, Cal. 91502
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
DM K & S Engineering, Dept. EM, 6917 W. 59th St., Chicago, ILL. 60638
Kentucky Electronics, Dept. EM, 1204 Ind'l Dr., Box 507, Owensboro, Ky. 42301
M Kinetron Corp., Dept. EM, 1416 Roller Rd, Asbury Park, N.J. 07712
M Kwikset Powdered Metal Prods., Kwikset Div-Emhart Inds. Inc., Dept. EM, Box 4250P, Anaheim, Cal. 92803
Matrix Engineering Corp., Dept. EM, 17000 S. Western Ave. 19, Gardena, Cal. 90247
Mechanical Engraving Co., Inc., Dept. EM, 4500 Bullard Ave, Bronx, New York 10470
Metal Fabricators, Inc., Dept. EM, Box 1946, Greenville, S.C. 29602
Micro Contacts Inc., Dept. EM, 62 Alpha Plaza, Hicksville, N.Y. 11801
Micro Parts, Dept. EM, 1051 Pierce Butler Rte., St. Paul, MN 55104
Mid-West Metal Prods., Inc., Dept. EM, 456 E. Donovan Rd., Kansas City, Kans. 66115
Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
Mobil Electronics, Inc., Dept. EM, Box 1132, Anderson, Ind. 46015
D Modpak, Dept. EM, 31 A Green St., Waltham, Mass. 02154
N.K.R. Precision Mfg. Corp., Dept. EM, Rte. 17M, Box 333, Harriman, N.Y. 10926
Overly-Hautz Co., Dept. EM, 8617 Clinton Rd., Cleveland, Ohio 44144
Philips Elmet Corp., Dept. EM, 1560 Lisbon Rd., Lewiston, Me. 04240
M Photo Chemical Prods. Cal., Dept. EM, 1715 Berkeley, Santa Monica, Cal. 90404
Plessey Inc., Dept. EM, 320 Long Island Expwy. S., Melville, N.Y. 11746
Process & Instrs. Corp., Dept. EM, 1943 Broadway, Brooklyn, N.Y. 11207
M Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
SGL Electronics, Dept. EM, 300 Harvard Avenue, Westville, N.J. 08093
Sjoberg, C. & Son, Inc., Dept. EM, 415 Station St., Cranston, R.I. 02910
South River Metal Prods. Co., Dept. EM, P.O. Box 394, Matawan, N.J. 07747
D South Shore Metal Prods., Inc., Dept. EM, 88 E Allen Blvd., Farmingdale, N.Y. 11735
Star Tron Corp., Dept. EM, 58 Curtis St., Providence, R.I. 02909
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Waterbury Pressed Metal Div., WPM, Inc., Dept. EM, 407 Brookside Rd., Waterbury, Conn. 06720
D Zenrad Controls Co., Dept. EM, 529 E. Gutierrez St., Santa Barbara, Ca. 93103
M Zero Corp., Dept. EM, 777 Front St., Burbank, Cal. 91502
Zierick Mfg. Corp., Dept. EM, 44 Radio Circle, Mt. Kisco, N.Y. 10549

Services, Metallizing (Including Electroforming)

Alberox Corp., Dept. EM, New Bedford Ind'l. Pk., New Bedford, Mass. 02745 ..... **p. 2553**
American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040 .. *
Mini-Systems, Inc., Dept. EM, 20 David Rd., North Attleboro, Mass. 02761 *
Buckbee Mears Co., Dept. EM, 245 E. 6th St., St. Paul, Minn. 55101
M Craig Sys. Corp., Dept. EM, 360 Merrimack St., Lawrence, Mass. 01842
Evaporated Coatings, Inc., Dept. EM, 798 Welsh Rd., Huntingdon Valley, Pa. 19006
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Materials Resch. Corp., Dept. EM, Route 303, Orangeburg, N.Y. 10962
Rosenthal Metceram Corp, Dept. EM, Huntington Industrial Pk., Providence, R.I. 02907
M Servometer Corp., Dept. EM, 501 Little Falls Rd., Cedar Grove, N.J. 07009
Thickfilm Int'l, Dept. EM, 1610 Mt Vernon Ave., Alexandria, VA 22301
Union Carbide Corp., Linde Div., Dept. EM, 270 Park Ave., New York, N.Y. 10017
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Services, Microprocessor

Applied Systems Corp., Dept. EM, 26401 Harper Ave., St. Clair Shores, Mich. 48081
Barnes & Reinecke, Inc., Dept. EM, 2375 Estes Ave., Elk Grove Village, Ill. 60007
Crestron Elec., Dept. EM, 40 John Strt, Closter, NJ 07624
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Innovative Electronics Inc., Dept. EM, 15200 NW 60th Ave., Miami Lakes, Fla. 33014
Midland Standrad Inc., Dept. EM, 603 E. Chicago St. Box 38, Elgin, ILL 60120
MilerTronics, Dept. EM, 303 Airport Rd, Greenville, S.C. 29607
PCS., Inc., Dept. EM, 750 N. Maple Rd., Saline, Mich. 48176
Schneider Instr. Co., Dept. EM, 8115 Camargo Rd., Cincinnati, Ohio 45243
Wyle Computer Prods., Dept. EM, 3200 Magruder Blvd., Hampton, Va 23666
Zonic Technical Labs., Dept. EM, 8927 Rossash Ave., Cincinnati, Ohio 45236

Services, Molding

Alden Products Co, Dept. EM, 117 N Main St, Brockton, Mass. 02403 ..... *
Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
D **Beman Mfg., Inc., Dept. EM, PO Box 370, New Cumberland, Pa. 17070** ..... *
Delbert Blinn. Co., Dept. EM, Box 2007, Pomona, Calif. 91766 ..... **p. 3923**
M **Elctrn. Molding Corp., Dept. EM, 96 Mill St., Woonsocket, R.I. 02895** ..... *
ITT Thermotech, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 1203 S. 5th St., Hopkins, Minn. 55343 ..... **p. 2560,2561**
National Wire & Cable Corp., Dept EEM, Svc Div., Dept. EM, 136 San Fernando Rd., Los Angeles, Cal. 90031 ..... *
M **Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612** ..... *
D **Skydyne,, Div. Brooks & Perkins Inc., Dept. EM, River Rd., Port Jervis, N.Y. 12771** ..... *
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
Accessories for Electronics, Dept. EM, 800 Merrick Road, Baldwin, N.Y. 11510
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
M Acme Plastic Products Co., Inc., Dept. EM, 9629 N. 22nd Ave., Phoenix, Ariz. 85021
American Electric Cable Co., Dept. EM, 181 Appleton St., Holyoke, Mass. 01040
M Atlantic Optical Moulding Co., Dept. EM, Ellis St., Dudley, Mass. 01570
M Atlantic Research Corp., Dept. EM, 5390 Cherokee Ave., Alexandria, Va 22314
D Cable Sys & Assembly Co., Dept. EM, 210 Broadway, Everett, Mass. 02149
M Chemplast, Inc., Dept. EM, 31-150 Dey Rd., Wayne, N.J. 07470
Electrical Plastics Corp., Dept. EM, 500 Long Branch Ave., Long Branch, N.J. 07740
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Loranger Mfg. Corp., Dept. EM, Box 948, Warren, Pa. 16365
Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
Minnesota Rubber Co., Dept. EM, 3630 Wooddale Ave., Minneapolis, Minn. 55416
Precision Paper Tube Co., Dept. EM, 1049 S. Noel Ave., Wheeling, Ill. 60090
M Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
M Quantum, Inc., Dept. EM, Barnes Industrial Pk, Wallingford, CT. 06492
M Ronor Systems, Dept. EM, Box 80, 145 N. Plains Ind. Park Rd., Wallingford, Conn. 06492
Rostone Corp., Dept. EM, 2781 S. Concord Rd., Lafayette, Ind. 47902
D SAMTEC, Dept. EM, 810 Progress Blvd., New Albany, Indiana 47150
DM SGL Plastics, Dept. EM, Route 248, Nazareth, Pa. 18064
M Teledyne Aerospace Systems, Dept. EM, 1007 E. 10th St., Fairmont, Minn. 56031
Textool Products, Inc., Dept. EM, 1410 W. Pioneer Dr., Irving, Tex. 75061
DM Van Norman Molding Co., Dept. EM, 9599 S. 76th Ave., Bridgeview, Ill. 60455

Services, Packaging

D **Augat Interconnection Prods. Div., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703** ..... *
M **Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612** ..... *
Skydyne,, Div. Brooks & Perkins Inc., Dept. EM, River Rd., Port Jervis, N.Y. 12771 ..... **p. 1047**
American Can Co, Packaging Oper, Dept. EM, Box 1126-Wall St. Sta, NY, NY 10005
M Automatic Die Cutting Mch, Dept. EM, 28 Warrel St., New York, N.Y. 10007
Datatex Corp., Dept. EM, 10935 S. Wilcrest Dr., Houston, Tex. 77099
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854
GTE Sylvania, Circuit Module Oper., Elctrn. Comps. Grp., Dept. EM, Box 360, Muncy, Pa. 17756
M Holly Productions, Dept. EM, 1442 Tzena Way, Encinitas, Cal. 92024
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
D Modpak, Dept. EM, 31 A Green St., Waltham, Mass. 02154
Omnicomp, Inc., Dept. EM, 5150 N 16th St, Ste 253, Phoenix, Ariz. 85016
Parsons Mfg. Corp., Dept. EM, 1055 O'Brien Dr., Menlo Park, Cal. 94025
Plessey Inc., Dept. EM, 320 Long Island Expwy. S., Melville, N.Y. 11746
Solid State Equipment Corp., Dept. EM, 430 Delaware Drive, Fort Washington, Pa. 19034
Venture Development Corp., Dept. EM, One Washington St., Wellesley, Mass. 02181
M Zero Corp., Dept. EM, 777 Front St., Burbank, Cal. 91502

Services, Photographic

Gamma Elctrn Research Co., Tech. Pubs. Sect., Dept. EM, Box 482, Newark, CA 94560
Photronic Labs., Dept. EM, Commerce Park, Danbury, Conn. 06810

Services, Plastics Fabrication

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
Harbison Ind'l. Prods., Inc., Sub Polymer Corp, Dept. EM, 7205 Hibbs La., Levittown, Pa. 19057 ..... *
ITT Thermotech, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 1203 S. 5th St., Hopkins, Minn. 55343 ..... **p. 2560,2561**
DM **Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012** .. *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D **Skydyne,, Div. Brooks & Perkins Inc., Dept. EM, River Rd., Port Jervis, N.Y. 12771** ..... **p. 1047**
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
Accessories for Electronics, Dept. EM, 800 Merrick Road, Baldwin, N.Y. 11510

Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O Box R, Elyria, Ohio 44035
M Acme Plastic Products Co., Inc., Dept. EM, 9629 N. 22nd Ave., Phoenix, Ariz. 85021
Aerolix Corporation, Dept. EM, 720 So. Columbus Street, Mt. Vernon, NY 10550
Anchor Plastics, Dept. EM, 36-36 36th, Long Island City, N.Y. 11106
M Anchor Specialty Mfg. Inc., Dept. EM, 300 Hollister Rd., Teterboro, N.J. 07608
Apahouser Corp. of N.E., Apahouser-Elcom, Dept. EM, 101 Walnut St., Watertown, Mass. 02172
M Atlantic Research Corp., Dept. EM, 5390 Cherokee Ave., Alexandria, Va 22314
M Atlas Fibre Co., Dept. EM, 6970 N. Central Park Ave., Chicago, Ill. 60645
Atmosphere Controls Prdts., Dept. EM, 295 Polaris, Mt. View, Cal. 94043
M Automatic Die Cutting Mch, Dept. EM, 28 Warrel St., New York, N.Y. 10007
M Avid Electronics Corp., Dept. EM, Box 426, Baldwin, Pl., N.Y. 10505
M Cadillac Plastic & Chemical, Dayco Co., Dept. EM, Box 810, Detroit, Mich. 48232
DM Carborundum Co., Plastics Div., Dept. EM, Carborundum Center, Niagara Falls, New York 14302
M Chemplast, Inc., Dept. EM, 31-150 Dey Rd., Wayne, N.J. 07470
M Comco Plastics, Inc., Dept. EM, 98-36 C. Jamaica Ave., Richmond Hill, N.Y. 11418
Conap, Inc., Dept. EM, 1405 Buffalo St, Olean, N.Y. 14760
Devco Engrg., Control Sys. Div., Dept. EM, Pier La., W. Caldwell, N.J. 07006
Estes Engrg. Co., Dept. EM, 930 Marine Dr., Port Angeles, Wash. 98362
Globe Plastics, Dept. EM, 1342 S. Signal Dr., Pomona, Cal. 91766
M Holly Productions, Dept. EM, 1442 Tzena Way, Encinitas, Cal. 92024
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Industrial Mica Div., Columbia Chase Corp., Dept. EM, 223 S. Van Brunt St., Englewood, N.J. 07631
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
DM Laminated Fabricators, Dept. EM, 1145 San Mateo Ave., San Bruno, Calif. 94066
D Mechanical Engraving Co., Inc., Dept EM, 4500 Bullard Ave, Bronx, New York 10470
Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
NVF Co., Dept. EM, Box 68, Yorklyn, Del. 19736
Parabam, Inc., Dept. EM, 3017 E. Las Hermanas St., Compton, Cal. 90221
Parsons Mfg. Corp., Dept. EM, 1055 O'Brien Dr., Menlo Park, Cal. 94025
M Photo Chemical Prods. Cal., Dept. EM, 1715 Berkeley, Santa Monica, Cal. 90404
Precision Paper Tube Co., Dept. EM, 1049 S. Noel Ave., Wheeling, Ill. 60090
Process & Instrs. Corp., Dept. EM, 1943 Broadway, Brooklyn, N.Y. 11207
Quartzite Processing, Inc., Dept. EM, 6 Holyoke St., Malden, Mass. 02148
Reynolds Inds., Inc., Dept. EM, Box 1170, Marina Del Rey, Cal. 90291
Rogers Corp., Dept. EM, Rogers, Conn. 06263
D SAMTEC, Dept. EM, 810 Progress Blvd., New Albany, Indiana 47150
SGL Homalite, Div. of SGL Inds., Inc., Dept. EM, 11 Brookside Dr., Wilmington, Del. 19804
DM SGL Plastics, Dept. EM, Route 248, Nazareth, Pa. 18064
SHOGYO International Corp., Dept. EM, 300 Northern Blvd., Great Neck, N.Y. 11021
Sjoberg, C. & Son, Inc., Dept. EM, 415 Station St., Cranston, R.I. 02910
Teledyne Mecca, Dept. EM, Box 36393, Houston, Tex. 77036
DM Western Coil & Elec. Co., Dept. EM, 215 State St., Racine, Wisc. 53403
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578
Zero Corp., Dept. EM, 777 Front St., Burbank, Cal. 91502

ervices, Plating

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
DM Excel Products Co., Inc., Dept. EM, 401 Joyce Kilmer Ave., New Brunswick, N.J. 08903 ..... *
ITT Thermotech, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 1203 S. 5th St., Hopkins, Minn. 55343 ..... *
M Advanced Materials Systems, Dept. EM, 72 Elm St. N., Atteboro, Mass. 02703
M Auto-Swage Products Inc., Dept. EM, 726 River Rd., Shelton, Conn. 06484
Buckbee Mears Co., Dept. EM, 245 E. 6th St., St. Paul, Minn. 55101
M Consolidated Refining Co. Inc., Dept. EM, 116 Hoyt Ave., Mamaroneck, N.Y. 10543
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Kawecki Berylco Inds., Inc., Dept. EM, PO Box 1462, Reading, PA 19603
M Lehighton Electronics, Inc., Dept. EM, RD 1Box 374 Dept M, Lehighton, Pa 18235
Micro Parts, Dept. EM, 1051 Pierce Butler Rte., St. Paul, MN 55104
Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
Plessey Inc., Dept. EM, 320 Long Island Expwy. S., Melville, N.Y. 11746
D Sifco Metachemical, Div. Steel Improv. & Forging, Dept. EM, 5708 Schaaf Rd., Independence, Ohio 44131
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
M Star Tron Corp., Dept. EM, 58 Curtis St., Providence, R.I. 02909
Union Carbide Corp., Linde Div., Dept. EM, 270 Park Ave., New York, N.Y. 10017
D Zenrad Controls Co., Dept. EM, 529 E. Gutierrez St., Santa Barbara, Ca. 93103

ervices, Qualification—See Services, Environmental Testing

ervices, Rental, Electronic Instrumentation

Active Control Instrumentation, Dept. EM, PO Box 243-Wildwood Circle, Key Largo, Florida 33037 ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... p. 2685
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Ampex Corp., Dept. EM, 401 Broadway, Redwood City, Cal. 94063
D Atlas Energy Systems, Dept. EM, 9459 Rush St., S. El Monte, Cal. 91733
Electro-Rent Corp., Dept. EM, 4131 Van Owen Place, Burbank, Cal. 91505
D Gamma Elctrn Research Co., RF & Microwave Lab., Dept. EM, 991 Commercial St. Ste. 4, Palo Alto, Cal 94303
D Gamma Elctrn Research Co., Tech. Pubs. Sect., Dept. EM, Box 482, Newark, CA 94560
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
D REI Sales Co., Dept. EM, 1 North Ave, Burlington, Mass. 01803
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
U.S. Instr. Rentals, Inc., Dept. EM, 951 Industrial Rd., San Carlos, Cal. 94070

Services, RFI Measuring—See Services, Electrical Measurement & Test

Services, Silk Screening

Allied Systems Corp., Dept. EM, Box 11005, Greensboro, N.C. 27409 ..... *
American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
LVC Inds. Inc., Co-Ord Switch Bloc-Lite Divs., Dept. EM, 135-25 37th Ave., Flushing, N.Y. 11354 ..... *
Mac Panel Co., Dept. EM, Box 5027, 216 Pine St., High Pt., N.C. 27262 ..... *
Mini-Systems, Inc., Dept. EM, 20 David Rd., North Attleboro, Mass. 02761 *
M Virginia Panel Corp., Dept. EM, Box 1106, 1400 New Hope Rd., Waynesboro, Va. 22980 ..... *
M Abrams Instr., Dept. EM, 606 E. Shiawassee, Lansing, Mich. 48901
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
Acme Model Engrg. Co., Dept. EM, 654 Bergen Blvd., Ridgefield, N.J. 07657
Apahouser Corp. of N.E., Apahouser-Elcom, Dept. EM, 101 Walnut St., Watertown, Mass. 02172
M Automatic Die Cutting Mch, Dept. EM, 28 Warrel St., New York, N.Y. 10007
D Decalcraft Corp., Dept. EM, Rte. 309, Hatfield, Pa. 19440
Devco Engrg., Control Sys. Div., Dept. EM, Pier La., W. Caldwell, N.J. 07006
Elgin Elctrns., Inc., Sub. Basic, Inc., Dept. EM, Walnut St., Waterford, PA. 16441
GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854
M Holly Productions, Dept. EM, 1442 Tzena Way, Encinitas, Cal. 92024
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Lehighton Electronics, Inc., Dept. EM, RD 1Box 374 Dept M, Lehighton, Pa 18235
D Mechanical Engraving Co., Inc., Dept. EM, 4500 Bullard Ave, Bronx, New York 10470
Mid-West Metal Prods., Inc., Dept. EM, 456 E. Donovan Rd., Kansas City, Kans. 66115
Mobil Electronics, Inc., Dept. EM, Box 1132, Anderson, Ind. 46015
M Photo Chemical Prods. Cal., Dept. EM, 1715 Berkeley, Santa Monica, Cal. 90404
Photronic Labs., Dept. EM, Commerce Park, Danbury, Conn. 06810
Star Tron Corp., Dept. EM, 58 Curtis St., Providence, R.I. 02909
Thickfilm Int'l, Dept. EM, 1610 Mt Vernon Ave., Alexandria, VA 22301
DM Western Coil & Elec. Co., Dept. EM, 215 State St., Racine, Wisc. 53403
D Zenrad Controls Co., Dept. EM, 529 E. Gutierrez St., Santa Barbara, Ca. 93103
M Zero Corp., Dept. EM, 777 Front St., Burbank, Cal. 91502

Services, Vibration Surveys

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
M Torwico Elctrns., Inc., Dept. EM, Rte. 70, Lakewood, N.J. 08701 ..... *
M Associated Testing Laboratories, Div of Walter Kidde & Co., Dept. EM, Northwest Ind'l. Pk., Burlington, Mass. 01803
M Associated Testing Laboratories, Div. of Walter Kidde & Co., Dept. EM, 23 Vincent St., Wayne, N.J. 07470
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
IRD Mechanalysis, Inc., Dept. EM, 6150 Huntley Rd., Columbus, Ohio 43229
N.Y. Testing Labs., Inc., Dept. EM, 81 Urban Ave., Westbury, N.Y. 11590
M Preformed Line Products Co., Dept. EM, Box 91129, Cleveland, Ohio 44101

Services, Wire Cutting & Stripping

Allied Systems Corp., Dept. EM, Box 11005, Greensboro, N.C. 27409 ..... *
Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
D Beman Mfg., Inc., Dept. EM, PO Box 370, New Cumberland, Pa. 17070 ..... *
Connector Corp., Dept. EM, 6025 N. Keystone Ave., Chicago, Ill. 60646 ..... *
DM Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
DM Excel Products Co., Inc., Dept. EM, 401 Joyce Kilmer Ave., New Brunswick, N.J. 08903 ..... *
Leecraft Mfg. Co., Inc., Dept. EM, 21-16 44th Rd., Long Island City, N.Y. 11101 ..... *
National Wire & Cable Corp., Dept EEM, Svc Div., Dept. EM, 136 San Fernando Rd., Los Angeles, Cal. 90031 ..... *
TRW/Holyoke Wire & Cable, Dept. EM, 775 New Ludlow Rd., South Hadley, Mass. 01075 ..... *
United Wiring & Mfg. Co., Dept. EM, 2608 Electonic La. #404, Dallas, Tex. 75220 ..... *
DM Whitmor Wire & Cable, Dept. EM, 13161 Sherman Way Bldg. B, No. Hollywood, Cal. 91605 ..... *
Acme Model Engrg. Co., Dept. EM, 654 Bergen Blvd., Ridgefield, N.J. 07657
Action Labs Inc., Dept. EM, 3238 Washington Ave. N., Minneapolis, Minn. 55412
American Electric Cable Co., Dept. EM, 181 Appleton St., Holyoke, Mass. 01040
M Art Wire/Doduco, Dept. EM, 9 Wing Dr., Cedar Knolls, N.J. 07927
D Cable Sys & Assembly Co., Dept. EM, 210 Broadway, Everett, Mass. 02149
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
M Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
Datatex Corp., Dept. EM, 10935 S. Wilcrest Dr., Houston, Tex. 77099
Electro-Prep, Dept. EM, 30 Cayuga Ave., E. Falmouth, Ma. 02536
D Electronic Coil Corp., Dept. EM, 347 New Britain Ave., Plainville, Conn. 06062
Estes Engrg. Co., Dept. EM, 930 Marine Dr., Port Angeles, Wash. 98362
Excel Specialty Corp., Dept. EM, 6335 N. Broadway, Chicago, Ill. 60660
M Geyer Systems, Inc., Dept. EM, 1917 Green Spring Dr., Timonium, Md. 21903
D Hobson Bros., Inc., Dept. EM, 4940 W. Lawrence Ave., Chicago, Ill. 60630
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
IEC Electronics Corp., Dept. EM, 105 Norton St., Newark, N.Y. 14513
M Manger Elec. Co., Inc., Dept. EM, W. Henry St., Stamford, Conn. 06902

Mid-West Metal Prods., Inc., Dept. EM, 456 E. Donovan Rd., Kansas City, Kans. 66115
D Neuses, Inc. (P.K.), Dept. EM, 1401 Rohlwing Rd., Rolling Meadows, Ill. 60008
Nova Tran Corp., Dept. EM, 360 4th St., Clear Lake, Wisc. 54005
Paraplegics Mfg., Dept. EM, 304 N. York Rd., Bensenville, Ill. 60106
Phoenix Wire, Inc., Dept. EM, 100 Teflon Ave., S. Hero, Vt. 05486
D Ripley Co., Inc., Dept. EM, 46 Nooks Hill Road, Cromwell, Conn. 06416
M Squires Electronics Inc., Dept. EM, 8900 S.W. Burnham Rd. F-13, Tigard, Ore. 97223
DM Storm Products Co., Dept. EM, 112 S. Glasgow St., Inglewood, Cal. 90301
M Teledyne Aerospace Systems, Dept. EM, 1007 E. 10th St., Fairmont, Minn. 56031

Services, Wirewrapping -Also See Services, Backplane Wiring

M Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
Augat Interconnection Prods. Div., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703 ..... *
D Excel Products Co., Inc., Dept. EM, 401 Joyce Kilmer Ave., New Brunswick, N.J. 08903 ..... *
DM Garry Mfg., Inc., Dept. EM, 1010 Jersey Ave., New Brunswick, N.J. 08902 p. 1768
United Wiring & Mfg. Co., Dept. EM, 2608 Electonic La. #404, Dallas, Tex. 75220 ..... p. 1300,1301,1308-1310
Vero Electronics, Dept. EM, 171 Bridge Rd., Hauppauge, N.Y. 11787 ..... *
Action Labs Inc., Dept. EM, 3238 Washington Ave. N., Minneapolis, Minn. 55412
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
Datatex Corp., Dept. EM, 10935 S. Wilcrest Dr., Houston, Tex. 77099
DM EECO, Dept. EM, 1441 E. Chestnut Ave, Box 659, Santa Ana, Cal. 92701
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Lehighton Electronics, Inc., Dept. EM, RD 1Box 374 Dept M, Lehighton, Pa 18235
Methode Elctrns., Inc., Dept. EM, 7447 W. Wilson Ave., Chicago, Ill. 60656
Midland Standrad Inc., Dept. EM, 603 E. Chicago St. Box 38, Elgin, ILL 60120
Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
Nova Tran Corp., Dept. EM, 360 4th St., Clear Lake, Wisc. 54005
Paraplegics Mfg., Dept. EM, 304 N. York Rd., Bensenville, Ill. 60106
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
Zonic Technical Labs., Dept. EM, 8927 Rossash Ave., Cincinnati, Ohio 45236

Servo Systems

M Aeroflex Labs., Magnetic Prods. Div., Dept. EM, South Service Rd., Plainview, N.Y. 11803 ..... *
American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Bafco, Inc., Dept. EM, 717 Mearns Rd., Warminster, Pa. 18974 ..... *
D Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634 ..... *
BEI Elctrns., Inc., Dept. EM, 1101 McAlmont St., Little Rock, Ark. 72203 p. 1387
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Bulova Watch Co., Servo Prods. Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
M Clifton Precision, Litton Systems, Inc., Dept. EM, Marple at Brdway., Clifton Hgts., Pa. 19018 ..... *
M Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 .. p. 3975
D Electro-Craft Corp., Dept. EM, 1600 2nd St. South, Hopkins, Minn. 55343 p. 3083
M Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735 ..... *
Ledex Inc., Dept. EM, 123 Webster St., Dayton, Ohio 45401 ..... *
North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803 ..... *
Servo-Tek Prods. Co., Dept. EM, 1086 Goffle Rd., Hawthorne, N.J. 07506 .. *
Torque Systems, Sub. Rotron/EG & G Co., Dept. EM, P.O. Box 588, 225-E. Crescent St., Waltham, Mass. 02154 ..... p. 3128
Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... *
M Vernitron Corp., Control Components Div., Dept. EM, 1601 Precision Park La., San Diego, Cal. 92013 ..... *
M ABA Electromechanical Sys. Inc., Dept. EM, Box 500, Pinellas Pk., Fla. 33565
Aerotech, Inc., Dept. EM, 101 Zeta Dr., Pittsburgh, Pa. 15238
M American Electronics, Inc., Dept. EM, 1600 E Valencia Dr., Fullerton, Cal. 92631
Applied Control Co., Dept. EM, 1275 Bloomfield Ave., Fairfield, N.J. 07006
M Bendix Corp., Electrodynamics Div., Dept. EM, 11600 Sherman Way, N. Hollywood, Calif. 91605
Benton Corp, Dept. EM, Race St Box 678, Manor, PA 15665
Berg Inc., Winfred M., Dept. EM, 499 Ocean Ave., East Rockaway, N.Y. 11518
C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
Control Systems Research, Inc., Dept. EM, CSR Bldg., 632 Fort Duquesne Blvd., Pittsburgh, Pa. 15222
Datron Systems, Dept. EM, 20700 Plummer St., Chatsworth, Cal. 91311
D Digiac Corp., Dept. EM, 175 Engineers Rd., Smithtown, N.Y. 11787
Electro Space Systems, Inc., Dept. EM, Box 1359, Richardson, Tex. 75080
Evershed & Vignoles Ltd., Dept. EM, Action Lane, Chiswick, London, England W4 5HJ
M Farrand Controls Div., Dept. EM, 99 Wall St., Valhalla, N.Y. 10595
GAP Instr. Corp., Dept. EM, 110 Marcus Blvd., Hauppauge, N.Y. 11787
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Jordan Controls, Dept. EM, 5607 W. Douglas Ave., Milwaukee, Wisc. 53218
Kollsman Instr. Co., Dept. EM, Daniel Webster Hwy., Merrimack, N.H. 03054
Luft Instrs., Inc., Dept. EM, Hillside Rd, Lincoln, Mass. 01773
McFadden Elctrns. Co., Dept. EM, 8953 S. Atlantic Blvd., South Gate, Cal. 90280
M MPC Prods. Corp., Dept. EM, 4200 W. Victoria Ave., Chicago, Ill. 60646
M Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
Parabam, Inc., Dept. EM, 3017 E. Las Hermanas St., Compton, Cal. 90221
Perfect Gear & Instr. Corp., Sub. Designatronics, Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
PMI Motors, Kollmorgen Corp., Dept. EM, 5 Aerial Way, Syosset, NY 11791
M Precision Mechanisms Corp., Dept. EM, 44 Brooklyn Ave., Westbury, N.Y. 11590
Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
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D Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
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M Transicoil, Inc., Dept. EM, Worcester, Pa. 19490
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M Westamp, Inc., Dept. EM, 1542 15th St., Santa Monica, Cal. 90404

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Midwest Aluminum, Dept. EM, 7696 W. Michigan Ave., Kalamazoo, MI 49009
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Precision Paper Tube Co., Dept. EM, 1049 S. Noel Ave., Wheeling, Ill. 60090

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M Allegheny Ludlam Steel Co., Dept. EM, 2000 Oliver Bldg., Pittsburgh, Pa. 15222
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M Kinetron Corp., Dept. EM, 1416 Roller Rd, Asbury Park, N.J. 07712
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Precision Paper Tube Co., Dept. EM, 1049 S. Noel Ave., Wheeling, Ill. 60090
SGL Electronics, Dept. EM, 300 Harvard Avenue, Westville, N.J. 08093
Tapecon, Inc., Dept. EM, 475 River St., Rochester, N.Y. 14612

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IRD Mechanalysis, Inc., Dept. EM, 6150 Huntley Rd., Columbus, Ohio 43229
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M Magnetics, Div/Spang Industries, Inc., Dept. EM, Box 391, Butler, Pa. 16001
Permaluster, Inc., Dept. EM, 1844 N. Keystone St., Burbank, Calif. 91504
D Russell Inds., Inc., Dept. EM, 3069 Lawson Blvd., Oceanside, N.Y. 11572
Schonstedt Instr. Co., Dept. EM, 1775 Wiehle Ave., Reston, Va. 22090
SGL Electronics, Dept. EM, 300 Harvard Avenue, Westville, N.J. 08093
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M Micro-Circuits Co., Inc., Dept EEM I, Dept. EM, New Buffalo, Mich. 49117
D Modpak, Dept. EM, 31 A Green St., Waltham, Mass. 02154
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D Tecknit, Dept. EM, 129 E. Dermody St., Cranford, N.J. 07016
M Zippertubing Co., Dept. EM, 13000 S. Broadway, Los Angeles, Cal. 90061

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Frequency Engrg. Labs., Dept. EM, Box 527, Farmingdale, N.J. 07727
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif: 91730
M Merrimac Inds., Inc., Dept. EM, 41 Fairfield Pl., West Caldwell, N.J. 07006
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
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Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
Reeve Electronics, Inc., Dept. EM, 609 W. Lake St., Chicago, Ill 60606
Sivers Lab, Dept. EM, Box 90339, Los Angeles, Cal. 90009
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
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M Baldpate Electronics, Inc., Dept. EM, 225 E. Main St., Georgetown, Mass. 01833
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Shunts, Meter

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Nicolet Instruments Corp., Dept. EM, 5225 Verona Rd., Madison, Wisc. 53711 *
Unholtz-Dickie Corp., Dept. EM, 3000 Whitney Ave., Hamden, Conn. 06518 *
Princeton Applied Resch. Corp., Dept. EM, Box 2565, Princeton, N.J. 08540
Rochester Instr System, Dept. EM, 255 N. Union St., Rochester, N.Y. 14605
Spectral Dynamics Corp., Dept. EM, Box 671, San Diego, Cal. 92112

Signal Conditioners & Equipment

A. P. Circuit Corp., Dept. EM, 865 West End Ave., New York, N.Y. 10025 *
Data Translation, Dept. EM, 4 Strathmore Rd., Natick, Mass. 01760 *
Dynamics Elctrn. Prods., Waugh Controls, Dept. EM, 9001 Fullbright Ave., Chatsworth, Cal. 91311 *
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Fifth Dimension, Dept. EM, 707 Alexander Rd., Princeton, N.J. 08540 *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 *
Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 *
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Honeywell, Inc., Test Instrs. Div., Dept. EM, 4800 E. Dry Creek Rd., Box 5227, Denver, Colo. 80217 ..... p. 2843
M Integrated Circuits, Inc., Dept. EM, 13256 Northrup Way, Bellevue, Wash. 98005 *
M Interface Engineering Inc., Dept. EM, 386 Lindelof Ave., Stoughton, Mass. 02072 *
Ithaco, Inc., Dept. EM, 735 W. Clinton St., Ithaca, N.Y. 14850 *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 *
D Midtex, Inc., AEMCO Div., Dept. EM, 1650 Tower Blvd., No. Mankato, Minn. 56001 *
M Natel Engineering Co., Dept. EM, 8954 Mason Ave., Canoga Park, Cal. 91306 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
Ohio Semitronics, Inc., Dept. EM, 1205 Chesapeake Ave., Columbus, Ohio 43212 ..... p. 4320
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PPM, Inc., Dept. EM, 7575 Bond St., Cleveland, Ohio 44139 *
Precision Filters, Inc., Dept. EM, 303 W. Lincoln St., Ithaca, N.Y. 14850 *
Preston Scientific Inc., Dept. EM, 805 E. Cerritos Ave., Anaheim, Cal. 92805 *
Rockland Sys. Corp., Dept. EM, 230 W. Nyack Rd., W. Nyack, N.Y. 10994 p. 2804
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Advance Weight Systems, Inc., Dept. EM, 715 W. Smith Rd., Medina, Ohio 44256
Anadex Inc., Dept. EM, 9825 De Soto, Chatsworth, Cal. 91311
Analogic Corp., Dept. EM, Audubon Rd., Wakefield, Mass. 01880
Applied Control Co., Dept. EM, 1275 Bloomfield Ave., Fairfield, N.J. 07006
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
M Aydin, Vector Div., Dept. EM, Box 328, Newtown, PA 18940
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
M Bay Laboratories, Inc., Dept. EM, 20160 Center Ridge Rd., Cleveland, Ohio 44116
Beckman Instrs., Ectrn. Instrs. Div. Ectrn. Instrumentation, Dept. EM, 3900 N. River Rd., Schiller Park, Ill. 60176
BLH Elctrns., Dept. EM, 42 Fourth Ave., Waltham, Mass. 02154
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
Columbia Resch. Labs., Dept. EM, Macdade Blvd. & Bullens La., Woodlyn, Pa. 19094
Convex Corp., Dept. EM, 2810 Dorr Ave., Fairfax, Va. 22031
Data-Control Systems, Dept. EM, Commerce Dr., Box 860, Danbury, Conn. 06810
D Data Instruments Inc., Dept. EM, 4 Hartwell Pl., Lexington, Mass. 02173
Assocs. Inc., Dept. EM, 333 W. Commercial St., East Rochester, N.Y. 14445
EMR Telemetry, Div. Sangamo-Weston, Dept. EM, Box 3041, Sarasota, Fla. 33578
Endevco, Div. Becton, Dickinson & Co., Dept. EM, 30700 Rancho Viejo Rd., San Jaun Capistrano, Cal. 92675
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
M Hades Mfg Corp., Dept. EM, 151-A Verdi St., Farmingdale, N.Y. 11735
Himmelstein & Co., S., Dept. EM, 2500 Estes Ave., Elk Grove Village, Ill. 60007
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704
IPAC Group, Inc., Dept. EM, POB 156 3047 Industrial Blvd., Bethel Park, PA 15102

M Mark Eyelet & Stamping, Dept. EM, 185 Wakelee Rd., Wolcott, Conn. 06716
M Moxon Inc., Dept. EM, 2222 Michelson Dr. Bldg. E, Irvine, Cal. 92715
MTS Systems Corp., Dept. EM, Box 24012, Minneapolis, Minn 55424
Multimetrics Div. of Comstro, Comstron-Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11580
Novatronics, Inc., Dept. EM, Box 878, Pompano Beach, Fla. 33061
PCB Piezotronics, Inc., Dept. EM, 5800 Transit Rd., Depew, N.Y. 14043
Plessey Enviromental Sys., Dept. EM, 3939 Ruffin Rd., San Diego, Cal. 92123
Princeton Applied Resch. Corp., Dept. EM, Box 2565, Princeton, N.J. 08540
Rochester Instr System, Dept. EM, 255 N. Union St., Rochester, N.Y. 14605
Schaevitz Engrg., Dept. EM, U.S. 130, Union Ave., Pennsauken, N.J. 08110
Signal Labs, Inc., Dept. EM, 202 N. State College Blvd., Orange, Cal. 92668
Telmar, Inc., Dept. EM, 1150 W. Third Ave., Columbus, Ohio 43212
Trans-Tek, Inc., Dept. EM, Rte. 83, Ellington, Conn. 06029
Tri-Com, Inc., Dept. EM, 12216 Parklawn Dr., Rockville, Md. 20852
D TSI Inc, Dept. EM, 500 Cardigan Rd., Box 3394, St. Paul, Minn. 55165
West Coast Resch. Corp., Dept. EM, Box 25061, Los Angeles, Cal. 90025
Whittaker Corp., Dept. EM, 10880 Wilshire Blvd., Los Angeles, Cal. 90024
Wilcoxon Research, Dept. EM, 12526 Parklawn Dr., Rockville, Md. 20852
Zonic Technical Labs., Dept. EM, 8927 Rossash Ave., Cincinnati, Ohio 45236

Signal Generators—See Generators, Specific Type

Signal Tracers—See Testers, Signal Tracing

Silica, Fused

Atomergic Chemetals Corp Co., Dept. EM, 100 Fairchild Ave., Plainview, N.Y. 11803
Esco Products, Dept. EM, Oak Ridge Rd., Oak Ridge, NJ 07438
General Electric Co., Lamp Components Sls. Oper., Dept. EM, 21800 Tungsten Rd., Cleveland, Ohio 44117
M Heraeus-Amersil, Inc., Dept. EM, 650 Jernees Mill Rd., Sayreville, NJ 08872
Thermal Amer. Fused Quartz, Dept. EM, Change Bridge Rd., Montville, N.J. 07045

Simulators, Motion

M Aeroflex Labs., Magnetic Prods. Div., Dept. EM, South Service Rd., Plainview, N.Y. 11803 ..... *
M Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 ..... *
North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803 ..... *
Accuride, Div. Standard Precision, Dept. EM, 12311 S. Shoemaker, Santa Fe Springs, Cal. 90670
Advanced Technology Sys., Dept. EM, 450 W. First Ave., Roselle, N.J. 07023
Aerotech, Inc., Dept. EM, 101 Zeta Dr., Pittsburgh, Pa. 15238
Benton Corp, Dept. EM, Race St Box 678, Manor, PA 15665
D Carco Elctrns., Dept. EM, 195 Constitution Dr., Menlo Park, Calif. 94025
Leitz, Inc. E., Dept. EM, Link Crescent, Rockleigh, N.J. 07647
McFadden Elctrns. Co., Dept. EM, 8953 S. Atlantic Blvd., South Gate, Cal. 90280
MTS Systems Corp., Dept. EM, Box 24012, Minneapolis, Minn 55424
Summit Engineering Corp., Dept. EM, Box 938, Bozeman, Mont. 59715

Simulators, Radar

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
M Applied Microwave, Div. Epsco Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 ..... *
M Interface Engineering Inc., Dept. EM, 386 Lindelof Ave., Stoughton, Mass. 02072 ..... *
M Vega Precision Labs., Dept. EM, 800 Follin La., Vienna, Va. 22180 ..... **p. 2864**
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M AIL, Div. Cutler-Hammer, Dept. EM, Comac Road, Deer Park, N.Y. 11729
Berkeley Nucleonics, Dept. EM, 1198 Tenth St., Berkeley, Cal. 94710
M Cubic Corp., Dept. EM, 9233 Balboa Ave., San Diego, Cal. 92123
Evershed & Vignoles Ltd., Dept. EM, Action Lane, Chiswick, London, England W4 5HJ
GAP Instr. Corp., Dept. EM, 110 Marcus Blvd., Hauppauge, N.Y. 11787
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
Republic Elctrn. Inds. Corp., Dept. EM, 575 Broad Hollow Rd., Melville, N.Y. 11746
D Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
M Tasker Systems, Dept. EM, 20131 Sunburst St., Chatsworth, Cal. 91311
M Whittaker Corp., Dept. EM, 10880 Wilshire Blvd., Los Angeles, Cal. 90024
M Zeta Laboratories, Inc., Dept. EM, 3265 Scott Blvd., Santa Clara, Cal. 95051

Sinks, Heat—See Transistor, Diode, Thyristor, Heat Dissipators; Heat Sinks, Soldering

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Slide Rules (Circuitry Computing)

D Fenwal Elctrns., Dept. EM, 63 Fountain St., Framingham, Mass. 01701 ..... *
Anchor Plastics, Dept. EM, 36-36 36th, Long Island City, N.Y. 11106
Shure Brothers, Inc., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204

Slides, Cabinet & Chassis

M Chassis-Trak, Div., General Devices Co., Inc., Dept. EM, 525 S. Webster Ave., Indianapolis, Ind. 46219 ..... **p. 1032,1033**
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... *
M General Devices Co., Inc., Dept. EM, Box 19188, Indianapolis, Ind. 46219 **p. 1032,1033**
Optima Enclosures, Div. Scientific Atlanta, Dept. EM, 2166 Mountain Ind'l Blvd., Tucker, Ga. 30084 ..... *
D Premier Metal Prods. Co., Div. Sunshine Mining Co., Dept. EM, 381 Canal Place, Bronx, N.Y. 10451 ..... *
Stantron Div., Wyco Metal Products, Dept. EM, 6914 Beck Ave., N. Hollywood, Cal. 91605 ..... *
DM Accuride, Div. Standard Precision, Dept. EM, 12311 S. Shoemaker, Santa Fe Springs, Cal. 90670
DM Barnes Engrg. Co., Dept. EM, 1645 So. Claudina Way, Anaheim, Calif. 92805
D Bud Radio, Inc., Dept. EM, 4605 E. 355th St., Willoughby, Ohio 44094
G. F. Business Equipment, Inc., Emcor Prods., Dept. EM, 1600 Fourth Ave. N.W., Rochester, Minn. 55901
M Grant Hardware Co., Div. Buildex Inc., Dept. EM, 525 High St., W. Nyack, N.Y. 10994
Gries Reproducer Co., Div. Coats & Clark Inc., Dept. EM, 162 Beechwood Ave., New Rochelle, N.Y. 10801
Johnathan Mfg., Dept. EM, 1101 South Acacia Ave., Fullerton, Calif. 92631
Lambda Elctrns., Dept. EM, 515 Brd. Hollow Rd., Melville, N.Y. 11746
D Par-Metal Prods. Inc., Dept. EM, 1260 Atlantic Ave., Brooklyn, N.Y. 11216
D South River Metal Prods. Co., Dept. EM, P.O. Box 394, Matawan, N.J. 07747
M Zero Corp., Dept. EM, 777 Front St., Burbank, Cal. 91502

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Slip-Rings & Assemblies

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M Fabricast, Inc., Dept. EM, 2517 Seaman Ave., So. El Monte, Cal. 91733 **p. 3084,3085**
Graphite Metallizing Corp., Dept. EM, 1036 Nepperhan Ave., Yonkers, N.Y. 10702 ..... **p. 3088,3089**
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
IEC Corporation, Dept. EM, 3100 Longhorn Blvd., Austin, Tex 78759
IMC Magnetics Corp., Hansen Mfg. Co., Dept. EM, Dept. EM, Box 23, Princeton, Ind. 47670
M Maurey Instrument Corp., Dept. EM, 4555 W. 60th St., Chicago, Ill. 60629
Meridian Lab., Dept. EM, 2415 Evergreen Rd., Box 156, Middleton, Wisc. 53562
M Poly-Scientific, Litton Sys., Dept. EM, 1213 N. Main St., Blacksburg, Va. 24060
D Superior Carbon Prods., Inc., Dept. EM, 9115 George Ave., Cleveland, Ohio 44105
M Unit Industries, Inc., Dept. EM, 529 S. Raymond Ave., Fullerton, Cal. 92631
West Coast Resch. Corp., Dept. EM, Box 25061, Los Angeles, Cal. 90025

Slotted Lines, Microwave

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M Aircom, Inc., Dept. EM, Rte. 16B, Union, N.H. 03887
M Alford Mfg. Co., Dept. EM, 120 Cross St., Winchester, Mass. 01890
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
M RF Systems, Inc., Dept. EM, 3100 Communications Rd., St Cloud, Fla. 32769
Sivers Lab, Dept. EM, Box 90339, Los Angeles, Cal. 90009
TRG,, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760

Smith Chart Impedance Plotters, Automatic

Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
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Socket Adapters

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D Augat Interconnection Prods. Div., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703 ..... *
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DM Garry Mfg., Inc., Dept. EM, 1010 Jersey Ave., New Brunswick, N.J. 08902 .. *
ITT Cannon Electric, Dept. EM, 666 E. Dyer Rd., Santa Ana, Cal. 92702 ..... *
D ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ..... **p. 1969,1985,2042-2044**
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D Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 *
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Cablewave Systems Inc., Dept. EM, 60 Dodge Ave., North Haven, Conn. 06473
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Des Tek Ind., Dept. EM, Box 24163, Los Angeles, Cal. 90024
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Erie Technological Products, Dept. EM, PO Box 961, Erie, Pa. 16512
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M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
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M Jettron Prods., Dept. EM, P.O. Box 337, E. Hanover, N.J. 07936 ..... *
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Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
Auto-Swage Products Inc., Dept. EM, 726 River Rd., Shelton, Conn. 06484
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Loranger Mfg. Corp., Dept. EM, Box 948, Warren, Pa. 16365
Methode Elctrns., Inc., Dept. EM, 7447 W. Wilson Ave., Chicago, Ill. 60656
D SAMTEC, Dept. EM, 810 Progress Blvd., New Albany, Indiana 47150
D Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
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Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 ..... *
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D Burndy Corporation, Dept. EM, Richards Ave., Norwalk, , Conn. 06852
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
D Circuit Assembly Corp., Dept. EM, 3169 Red Hill Ave., Costa Mesa, Cal. 92626
Des Tek Ind., Dept. EM, Box 24163, Los Angeles, Cal. 90024
Gibson/Egan Co., Dept. EM, 2666 East Huntington Dr., Duarte, CA. 91010
Industrial Electronic Hardware, Dept. EM, 109 Prince St., New York, N.Y. 10012
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M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
Nutronics, Inc., Dept. EM, 1515 N. Harlem Ave., Oak Park, Ill. 60302
D SAMTEC, Dept. EM, 810 Progress Blvd., New Albany, Indiana 47150
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D Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 .... *
DM Associated Engrg. & Mfg. Corp., Dept. EM, 546 Valley Rd., Upper Montclair, N.J. 07043
D EMI Gencom Inc., Dept. EM, 80 Express St., Plainview, N.Y. 11803
D Master Elctrn. Controls, Dept. EM, 1651–19th St., Santa Monica, Cal. 90404
Methode Elctrns., Inc., Dept. EM, 7447 W. Wilson Ave., Chicago, Ill. 60656
Nutronics, Inc., Dept. EM, 1515 N. Harlem Ave., Oak Park, Ill. 60302
D Oneida Electronics Mfg., Dept. EM, POB 678, R.D. #3 Baldwin Ext., Meadville, Pa. 16335
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Solar Cells—See Cells, Photovoltaic

Solder (All Types)

DM Gardiner Solder Co., Div. of Gardiner Metal Co., Dept. EM, 4820 S. Campbell Ave., Chicago, Ill 60632 ..... p. 4290
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Hexacon Elec. Co., Dept. EM, 621 W. Clay Ave., Roselle Park, N.J. 07204 p. 4296
D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
D Alpha Metals, Inc., Dept. EM, 600 Rte 440, Jersey City, N.J. 07304
Bow Solder Products, Dept. EM, P.O. Box 488, 900 Hobson St., Union, N.J. 07083
D Caig Labs., Inc., Dept. EM, 1175-0 Industrial Ave., Box 64, Escondido, Cal. 92025
Chemical Etching Equip. & Supply, Dept. EM, 6905 Beulah St, Alexandria, Va. 22310
D Chemtronics, Inc., Dept. EM, 45 Hoffman Ave., Hauppauge, N.Y. 11787
D Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
M Consolidated Refining Co. Inc., Dept. EM, 116 Hoyt Ave., Mamaroneck, N.Y. 10543
M E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
Electro Mats. Corp. Amer., Dept. EM, 605 Center Ave., Mamaroneck, N.Y. 10543
D Electro-Science Labs., Dept. EM, 2211 Sherman Ave., Pennsauken, N. J. 08110
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
Federated Metals Corp., Dept. EM, 120 Broadway, New York, N.Y. 10005
D Glenmarc Mfg. Inc., Dept. EM, 330 Melvin Dr., Northbrook, Ill. 60062
Glidden Metals, Chem/Met Div. SCM Corp., Dept. EM, 900 Union Commerce Bldg., Cleveland, Ohio 44115
Indium Corp. of Amer, Dept. EM, 1676 Lincoln Ave, Box 269, Utica, NY 13503
DM Kenco Alloy & Chemical Co., Inc., Dept. EM, 418 W. Belden Ave., Addison, Ill. 60101
DM Kester Solder Div., Litton Systems Inc., Dept. EM, 4201 Wrightwood Ave., Chicago, Ill. 60639
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
Microflame Inc., Dept. EM, 3724 Oregon Ave. S., Minneapolis, Minn 55426
National Camera Inc., Dept. EM, 2000 W. Union Ave., Englewood, Colo. 80110
NL Industries, Inc., Metal Div., Dept. EM, 1221 Ave. of Americas, New York, N.Y. 10020
Plessey Inc., Dept. EM, 320 Long Island Expwy. S., Melville, N.Y. 11746
Sara Sales Co., Dept. EM, P.O. Box 321, San Francisco, Calif. 94101
DM Tech Spray, Inc., Dept. EM, Box 949, Amarillo, Tex. 79105
Wall-Lenk Mfg. Co., Dept. EM, Box 3349, Dept. EEM-71, Kinston, N.C. 28501
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Solder Lugs—See Terminals, Lug (All Types)

Solder Pots & Baths

D Gardiner Solder Co., Div. of Gardiner Metal Co., Dept. EM, 4820 S. Campbell Ave., Chicago, Ill 60632 .....
D Hexacon Elec. Co., Dept. EM, 621 W. Clay Ave., Roselle Park, N.J. 07204 p. 429

D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
M Acme Elec. Heating Corp., Dept. EM, 4685 E. 11th, Hialeah, Fla. 33013
D Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
D Caig Labs., Inc., Dept. EM, 1175-0 Industrial Ave., Box 64, Escondido, Cal. 92025
Chemical Etching Equip. & Supply, Dept. EM, 6905 Beulah St, Alexandria, Va. 22310
Electrovert, Dept. EM, 86 Hartford Ave., Mt. Vernon, N.Y. 10553
D ESICO, Inc., Dept. EM, Box 247, Deep River, Conn. 06417
D Hollis Engrg., Inc., Dept. EM, Charron Ave., Box 1189, Nashua, N.H. 03061
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
D Micro Electronic Systems, Inc., Dept. EM, 8 Kevin Drive, Danbury, Conn. 06810
D Plato Products, Inc., Dept. EM, El Monte, Cal. 91731
Raychem Corp., Dept. EM, 300 Constitution Dr., Menlo Park, Cal. 94025

Soldering Accessories

D **Edsyn, Inc., Dept. EM, 15958 Arminta St., Van Nuys, Cal. 91406 p. 4288,4289**
D **Gardiner Solder Co., Div. of Gardiner Metal Co., Dept. EM, 4820 S. Campbell Ave., Chicago, Ill 60632** ..... **p. 4290,4291**
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... **p. 1290**
D **Hexacon Elec. Co., Dept. EM, 621 W. Clay Ave., Roselle Park, N.J. 07204 p. 4293-4296**
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... **p. 4297**
D Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
Air-O-Tronics Prods., Dept. EM, Box K, Morrisville, N.Y. 13408
M Air-Vac Engrg. Co., Dept. EM, 100 Gulf St., Milford, Conn. 06460
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
Antex Div., M M Newman Corp., Dept. EM, Marblehead, Mass. 01945
Argus International, Dept. EM, Box 38, Hopewell, N.J. 08525
DM Beau Tech, Inc., Dept. EM, P.O. Box 523, Portland, Me. 04122
D Caig Labs., Inc., Dept. EM, 1175-0 Industrial Ave., Box 64, Escondido, Cal. 92025
Chemtronics, Inc., Dept. EM, 45 Hoffman Ave., Hauppauge, N.Y. 11787
D Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
Enterprise Development Corp, Dept. EM, 5127 E. 65th St., Indianapolis, Ind. 46220
D Erikson Specialized Tool Co., Dept. EM, Box 424, Pico-Rivera, Cal. 90660
D ESICO, Inc., Dept. EM, Box 247, Deep River, Conn. 06417
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
Kahle Engrg. Co., Dept. EM, 3344 Hudson Ave., Union City, N.J. 07087
D Kenco Alloy & Chemical Co., Inc., Dept. EM, 418 W. Belden Ave., Addison, Ill. 60101
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
D Marshall Industries, Hunter Tools, Dept. EM, 9674 Telstar Ave., El Monte, Cal. 91731
D Matrix Engineering Corp., Dept. EM, 17000 S. Western Ave. 19, Gardena, Cal. 90247
Miller, Co. L.C., Dept. EM, 717 Monterey Pass Rd., Monterey Park, Cal. 91754
National Camera Inc., Dept. EM, 2000 W. Union Ave., Englewood, Colo. 80110
Plato Products, Inc., Dept. EM, El Monte, Cal. 91731
DM Solder Removal Co., Dept. EM, 1077 E. Edna Pl., Covina, Cal. 91724
D Techcon Systems Inc., Dept. EM, 16016 So. Figueroa St., Gardena, Cal 90248
D Telvac Instr. Co., Dept. EM, 7534 Atoll Ave. F, N. Hollywood, Cal. 91605
Tescom Instr. Div., Dept. EM, 2600 Niagara La. N., Minneapolis, Minn. 55441
D UNGAR, Div., Eldon Inds., Inc., Dept. EM, 233 E. Manville St., Compton, Cal. 90220
Union Carbide Corp., Linde Div., Dept. EM, 270 Park Ave., New York, N.Y. 10017
D Wahl Clipper Corp., Dept. EM, 2902 Locust St., Sterling, Ill. 61081
Wall-Lenk Mfg. Co., Dept. EM, Box 3349, Dept. EEM-71, Kinston, N.C. 28501
D H. F. Wilson Engrg. Co., Dept. EM, 475 Taft Ave, Box 2938, Glen Ellyn, Ill. 60137
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Soldering Equip., Induction Heating

Edsyn, Inc., Dept. EM, 15958 Arminta St., Van Nuys, Cal. 91406 p. 4288,4289
Hexacon Elec. Co., Dept. EM, 621 W. Clay Ave., Roselle Park, N.J. 07204 p. 4293,4294
M Cycle-Dyne, Inc., Sub. Axel Elctrns., Inc., Dept. EM, 134-20 Jamaica Ave., Jamaica, N.Y. 11418
Electrovert, Dept. EM, 86 Hartford Ave., Mt. Vernon, N.Y. 10553
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Lepel Corp, Dept. EM, 59-21 Queens-Midtown Expwy., Maspeth, N.Y. 11378
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
Miller, Co. L.C., Dept. EM, 717 Monterey Pass Rd., Monterey Park, Cal. 91754
M Reeve Electronics, Inc., Dept. EM, 609 W. Lake St., Chicago, Ill 60606

Soldering Equip., Printed Circuit

D **Edsyn, Inc., Dept. EM, 15958 Arminta St., Van Nuys, Cal. 91406 p. 4288,4289**
D **Gardiner Solder Co., Div. of Gardiner Metal Co., Dept. EM, 4820 S. Campbell Ave., Chicago, Ill 60632** ..... **p. 4290,4291**
D **Hexacon Elec. Co., Dept. EM, 621 W. Clay Ave., Roselle Park, N.J. 07204** .. *
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
United Wiring & Mfg. Co., Dept. EM, 2608 Electonic La. #404, Dallas, Tex. 75220 ..... *
Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
M Air-Vac Engrg. Co., Dept. EM, 100 Gulf St., Milford, Conn. 06460
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
Argus International, Dept. EM, Box 38, Hopewell, N.J. 08525
D Caig Labs., Inc., Dept. EM, 1175-0 Industrial Ave., Box 64, Escondido, Cal. 92025
Chemical Etching Equip. & Supply, Dept. EM, 6905 Beulah St, Alexandria, Va. 22310
D Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
Electrovert, Dept. EM, 86 Hartford Ave., Mt. Vernon, N.Y. 10553
Enterprise Development Corp, Dept. EM, 5127 E. 65th St., Indianapolis, Ind. 46220
D ESICO, Inc., Dept. EM, Box 247, Deep River, Conn. 06417
Hollis Engrg., Inc., Dept. EM, Charron Ave., Box 1189, Nashua, N.H. 03061
DM Hughes Aircraft Co., Ind'l. Prods. Div., Prod. Equip. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
D Matrix Engineering Corp., Dept. EM, 17000 S. Western Ave. 19, Gardena, Cal. 90247
OAL Assocs., Inc., Dept. EM, P.O. Box 64, Escondido, Cal. 92025
D Plato Products, Inc., Dept. EM, El Monte, Cal. 91731
Tech. Devices Co., Dept. EM, 11250 Playa Ct., Culver City, Calif. 90230
D Wahl Clipper Corp., Dept. EM, 2902 Locust St., Sterling, Ill. 61081
Wall-Lenk Mfg. Co., Dept. EM, Box 3349, Dept. EEM-71, Kinston, N.C. 28501
D H. F. Wilson Engrg. Co., Dept. EM, 475 Taft Ave, Box 2938, Glen Ellyn, Ill. 60137

Soldering Equip., Resistance

D **Edsyn, Inc., Dept. EM, 15958 Arminta St., Van Nuys, Cal. 91406** ..... *
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
United Wiring & Mfg. Co., Dept. EM, 2608 Electonic La. #404, Dallas, Tex. 75220 ..... *
Ewald Instrs. Corp., Dept. EM, Rte. 7R, Kent, Conn. 06757
DM Hughes Aircraft Co., Ind'l. Prods. Div., Prod. Equip. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
D Ideal Industries Inc., Dept. EM, 4450 Becker Pl., Sycamore, Ill. 60178
Kahle Engrg. Co., Dept. EM, 3344 Hudson Ave., Union City, N.J. 07087
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
Pace Inc., Dept. EM, 9329 Fraser Ave., Silver Spring, Md. 20910
Solid State Equipment Corp., Dept. EM, 430 Delaware Drive, Fort Washington, Pa. 19034
M Wells Electronics, Inc., Weltek Div., Dept. EM, 1801 S. Main St., South Bend, Ind. 46613

Soldering Systems, Temperature Controlled

D **Edsyn, Inc., Dept. EM, 15958 Arminta St., Van Nuys, Cal. 91406** ..... **p. 4289**
D **Gardiner Solder Co., Div. of Gardiner Metal Co., Dept. EM, 4820 S. Campbell Ave., Chicago, Ill 60632** ..... **p. 4290**
D **Hexacon Elec. Co., Dept. EM, 621 W. Clay Ave., Roselle Park, N.J. 07204 p. 4293,4294,4296**
Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
Argus International, Dept. EM, Box 38, Hopewell, N.J. 08525
D Caig Labs., Inc., Dept. EM, 1175-0 Industrial Ave., Box 64, Escondido, Cal. 92025
Chemical Etching Equip. & Supply, Dept. EM, 6905 Beulah St, Alexandria, Va. 22310
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
Electrovert, Dept. EM, 86 Hartford Ave., Mt. Vernon, N.Y. 10553
D Hollis Engrg., Inc., Dept. EM, Charron Ave., Box 1189, Nashua, N.H. 03061
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Kahle Engrg. Co., Dept. EM, 3344 Hudson Ave., Union City, N.J. 07087
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
OAL Assocs., Inc., Dept. EM, P.O. Box 64, Escondido, Cal. 92025
Pace Inc., Dept. EM, 9329 Fraser Ave., Silver Spring, Md. 20910
Tech. Devices Co., Dept. EM, 11250 Playa Ct., Culver City, Calif. 90230
D Weller-Xcelite Wiss, The Cooper Group, Dept. EM, Box 728, Apex, NC 27505
M Wells Electronics, Inc., Weltek Div., Dept. EM, 1801 S. Main St., South Bend, Ind. 46613

Soldering Equip., Ultrasonic

D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
Electrovert, Dept. EM, 86 Hartford Ave., Mt. Vernon, N.Y. 10553
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
D Sonobond, Sub. Christiana Metals, Dept. EM, 200 E. Rosedale Ave., West Chester, Pa. 19380

Soldering Guns, Irons & Desoldering Tools

D **Edsyn, Inc., Dept. EM, 15958 Arminta St., Van Nuys, Cal. 91406 p. 4288,4289**
D **Gardiner Solder Co., Div. of Gardiner Metal Co., Dept. EM, 4820 S. Campbell Ave., Chicago, Ill 60632** ..... *
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... **p. 1290**
D **Hexacon Elec. Co., Dept. EM, 621 W. Clay Ave., Roselle Park, N.J. 07204 p. 4293,4294,4296**
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
United Wiring & Mfg. Co., Dept. EM, 2608 Electonic La. #404, Dallas, Tex. 75220 ..... **p. 1302**
D Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
M Air-Vac Engrg. Co., Dept. EM, 100 Gulf St., Milford, Conn. 06460
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
Antex Div., M M Newman Corp., Dept. EM, Marblehead, Mass. 01945
Chemtronics, Inc., Dept. EM, 45 Hoffman Ave., Hauppauge, N.Y. 11787
D Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
DM Enterprise Development Corp, Dept. EM, 5127 E. 65th St., Indianapolis, Ind. 46220
D ESICO, Inc., Dept. EM, Box 247, Deep River, Conn. 06417
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
Kahle Engrg. Co., Dept. EM, 3344 Hudson Ave., Union City, N.J. 07087
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
D Micro Electronic Systems, Inc., Dept. EM, 8 Kevin Drive, Danbury, Conn. 06810

D Microflame Inc., Dept. EM, 3724 Oregon Ave. S., Minneapolis, Minn 55426
National Camera Inc., Dept. EM, 2000 W. Union Ave., Englewood, Colo. 80110
D Nu-Concept Computer Systems, Inc., Dept. EM, Route 309 and Advance Lane, Colmar, Pa. 18915
Pace Inc., Dept. EM, 9329 Fraser Ave., Silver Spring, Md. 20910
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
D Plato Products, Inc., Dept. EM, El Monte, Cal. 91731
Snap-On-Tools, Dept. EM, 8192-A 28th Ave., Kenosha, Wisc. 53140
D UNGAR, Div., Eldon Inds., Inc., Dept. EM, 233 E. Manville St., Compton, Cal. 90220
Union Carbide Corp., Linde Div., Dept. EM, 270 Park Ave., New York, N.Y. 10017
D Wahl Clipper Corp., Dept. EM, 2902 Locust St., Sterling, Ill. 61081
D Wall-Lenk Mfg. Co., Dept. EM, Box 3349, Dept. EEM-71, Kinston, N.C. 28501
D Weller-Xcelite Wiss, The Cooper Group, Dept. EM, Box 728, Apex, NC 27505
D H. F. Wilson Engrg. Co., Dept. EM, 475 Taft Ave, Box 2938, Glen Ellyn, Ill. 60137
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Solenoids, Linear

Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
D Canon U.S.A., Inc., Dept. EM, 10 Nevada Dr., Lake Success, N.Y. 11040 ..... *
D Deltrol Controls, Dept. EM, 2745 S. 19th St., Milwaukee, Wisc. 53215 p. 3446,3447
D Dormeyer Industries, Dept. EM, 3418 N. Milwaukee, Chicago, Ill. 60641 p. 3450-3457
Endicott Coil Co., Dept. EM, 24 Charlotte St., Binghamton, N.Y. 13905 p. 1342
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Guardian Electric Co., Dept. EM, 1550 W. Carroll Ave., Chicago, Ill. 60607 p. 3509-3512
M Ledex Inc., Dept. EM, 123 Webster St., Dayton, Ohio 45401 ..... p. 3579
Liberty Controls, Inc., Dept. EM, 500 Brookforest Ave., Shorewood, Ill. 60431 p. 3580
D Magnetec Corp., Sub of Hi-G Inc, Dept. EM, 96 Granby St., Bloomfield, Conn. 06002 ..... p. 3524-3529
North American Philips Controls, Dept. EM, Husky Park, Frederick, Md. 21701 ..... *
D Oak Inds. Inc., Switch Div., Dept. EM, Dept. DA, Crystal Lake, Ill. 60014 p. 3586,3587
Potter & Brumfield, Div of AMF, Dept. EM, P.O. Box 322, Princeton, Ind. 47671 ..... *
M Regdon Corp., Dept. EM, 3713 Grand Blvd., Brookfield, Ill 60513 ..... p. 3608
Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... p. 3609
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
A. P. W. Co., Inc., Dept. EM, 72 W. Main, Rockaway, N. J. 07866
Artisan Elctrns. Corp., Dept. EM, 5 Eastmans Rd., Parsippany, N.J. 07054
Bicron Elctrns. Co., Dept. EM, Box 807, Barlow St., Canaan, Conn. 06018
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Component Specialties, Dept. EM, 9143 E. La Rosa Dr., Temple City, Cal. 91780
Facet Enterprises Inc., Motor Comps. Div., Dept. EM, Elmira, N.Y. 14903
Hartman Electrical Mfg., Div. A-T-O Inc., Dept. EM, 175 N. Diamond St., Mansfield, Ohio 44902
IMC Magnetics Corp., Arizona Div., Dept. EM, 1900 East Fifth St., Tempe, Ariz. 85281
M IMC Magnetics Corp., Western Div., Dept. EM, 6058 Walker Ave., Maywood, Cal. 90270
InResCo, Dept. EM, 503 Adamston Rd., Bricktown, N. J. 08723
Linear Motions Co., Dept. EM, 17025 Dubesor St., Valinda, Cal. 91744
M Lisk, G.W. Co., Dept. EM, 2 South St., Clifton Springs, N.Y. 14432
D Namco Controls, Acme-Cleveland Co., Dept. EM, 170 E. 131st St., Cleveland, Ohio 44108
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Universal Relay Corp., Dept. EM, 42 White St., New York, N.Y. 10013
U.S. Elctrns., Dept. EM, 500 Long Branch Ave., Long Branch, N.J. 07740
M West Coast Electrical Mfg. Co., Dept. EM, 14045 Garfield Ave, Paramount, Cal. 90723

Solenoids, Proportional

Deltrol Controls, Dept. EM, 2745 S. 19th St., Milwaukee, Wisc. 53215 p. 3446,3447
Endicott Coil Co., Dept. EM, 24 Charlotte St., Binghamton, N.Y. 13905 p. 1342
Ledex Inc., Dept. EM, 123 Webster St., Dayton, Ohio 45401 ..... *
Regdon Corp., Dept. EM, 3713 Grand Blvd., Brookfield, Ill 60513 ..... p. 3608
Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
InResCo, Dept. EM, 503 Adamston Rd., Bricktown, N. J. 08723
M Lisk, G.W. Co., Dept. EM, 2 South St., Clifton Springs, N.Y. 14432

Solenoids, Rotary

Deltrol Controls, Dept. EM, 2745 S. 19th St., Milwaukee, Wisc. 53215 p. 3446
Endicott Coil Co., Dept. EM, 24 Charlotte St., Binghamton, N.Y. 13905 p. 1342
M Ledex Inc., Dept. EM, 123 Webster St., Dayton, Ohio 45401 ..... p. 3578,4099
M Oak Inds. Inc., Switch Div., Dept. EM, Dept. DA, Crystal Lake, Ill. 60014 ..... *
Regdon Corp., Dept. EM, 3713 Grand Blvd., Brookfield, Ill 60513 ..... p. 3608
Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
D Daco Instr. Co., Dept. EM, 30 Stran Rd., Milford, Conn. 06460
IMC Magnetics Corp., Arizona Div., Dept. EM, 1900 East Fifth St., Tempe, Ariz. 85281
M IMC Magnetics Corp., Western Div., Dept. EM, 6058 Walker Ave., Maywood, Cal. 90270
M Lisk, G.W. Co., Dept. EM, 2 South St., Clifton Springs, N.Y. 14432
Universal Relay Corp., Dept. EM, 42 White St., New York, N.Y. 10013

Solvents—See Cleaners & Solvents

Sound Absorbing Materials

Auburn Mfg., Dept. EM, Pease Ave. & Stack St., Middletown, Conn. 06457
Edmund Scientific Co., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
M Holly Productions, Dept. EM, 1442 Tzena Way, Encinitas, Cal. 92024
DM Owens Corning Fiberglas Corp., Dept. EM, Fiberglas Tower Bldg., Toledo, Ohio 43659
D Soundcoat, Dept. EM, 175 Pearl St., Brooklyn, N.Y. 11201
D Zippertubing Co., Dept. EM, 13000 S. Broadway, Los Angeles, Cal. 90061

Sound Level Indicators—See Meters, Audio Level

Sound Recording Equip.—See Microphones; Recorders; etc.

Spacers

Alberox Corp., Dept. EM, New Bedford Ind'l. Pk., New Bedford, Mass. 02745 *
D Bivar, Inc., Dept. EM, 1617 E. Edinger Ave., Santa Ana, Cal. 92705 ..... p. 1024
D Concord Elctrns., Dept. EM, 37 Great Jones St., Dept. JE, New York, N.Y. 10012 ..... p. 1741
D Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
Delbert Blinn. Co., Dept. EM, Box 2007, Pomona, Calif. 91766 ..... *
Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... *
M Elctrn. Molding Corp., Dept. EM, 96 Mill St., Woonsocket, R.I. 02895 .. p. 1764
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
D Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 ..... *
DM Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012 p. 2053,2054
D Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2123,2125,2134,2135
D Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 .... *
DM Accessories for Electronics, Dept. EM, 800 Merrick Road, Baldwin, N.Y. 11510
D Amatom Electronic Hardware, Div. MITE Corp., Dept. EM, 446 Blake St., New Haven, Conn. 06515
DM Amrad Corp., Dept. EM, Box 876, Paris, Tex. 75460
Auburn Mfg., Dept. EM, Pease Ave. & Stack St., Middletown, Conn. 06457
Auto-Swage Products Inc., Dept. EM, 726 River Rd., Shelton, Conn. 06484
M Avid Electronics Corp., Dept. EM, Box 426, Baldwin, Pl., N.Y. 10505
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
Control Inds. Inc., Dept. EM, 530 Burnside Ave., Inwood, N.Y. 11696
D D-Cemco, Inc., Dept. EM, 3200 N. San Fernando Blvd., Burbank, Calif. 91504
D Dynaloy, Inc., Dept. EM, 7 Great Meadow La., Hanover, N.J. 07936
Federal Screw Products Inc., Dept. EM, 3917 N. Kedzie Ave., Chicago, Ill. 60618
General Mfg. Co., Dept. EM, 724 Ruberta Ave., Glendale, Calif. 91201
D ICO/Rally Corp., Dept. EM, Edward J. Bush, Palo Alto, Cal. 94303
Industrial Mica Div., Columbia Chase Corp., Dept. EM, 223 S. Van Brunt St., Englewood, N.J. 07631
Midwest Aluminum, Dept. EM, 7696 W. Michigan Ave., Kalamazoo, MI 49009
M PIC Design Div., Benrus Corp., Dept. EM, Benrus Center, Rte 7, Ridgefield, Conn 06877
D Plessey Ceramic Div., Dept. EM, 8th & Harrison Sts., Frenchtown, N.J. 08825
M Positronic Inds., Dept. EM, 208 W. Center St., Drawer H, Rogerville, Mo. 65742
D Precision Metal Prods. Co., Dept. EM, 41 Elm St., Stoneham, Mass. 02180
Precision Paper Tube Co., Dept. EM, 1049 S. Noel Ave., Wheeling, Ill. 60090
M Preformed Line Products Co., Dept. EM, Box 91129, Cleveland, Ohio 44101
Resdel Corp., Dept. EM, Bldg. 22-County Airport, Rio Grande, N.J. 08242
D SAMTEC, Dept. EM, 810 Progress Blvd., New Albany, Indiana 47150
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578
Zero Corp., Dept. EM, 777 Front St., Burbank, Cal. 91502

Spaghetti—See Tubing, Spaghetti

Spark Gaps

The Bendix Corp., Electrical Comp. Div., Dept. EM, Sidney, NY 13838 .....
Connector Corp., Dept. EM, 6025 N. Keystone Ave., Chicago, Ill. 60646 .....
Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 .....
EG&G, Inc., Electro-Optics Div., Dept. EM, 35 Congress St., Salem, Mass. 01970 .....
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 .....
Megavolt, Corp., Dept. EM, 110 Hobart St, Hackensack, N.J. 07601 .... p. 321
Pulsar Assocs., Dept. EM, 11491 Sorrento Valley Rd., San Diego, Cal. 9212
Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... p. 36
M Victoreen, Inc., Dept. EM, 10101 Woodland Ave., Cleveland, Ohio 44104 ....
D Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
Joslyn Elctrn. Sys., Div. Joslyn Mfg. & Supp, Dept. EM, 6868 Cortona Dr., Box 817, Goleta, Cal. 93017
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602
M Lepel Corp, Dept. EM, 59-21 Queens-Midtown Expwy., Maspeth, N.Y. 11378
D Murata Mfg. Co. Ltd., Dept. EM, 16, Kaiden Nishijin-cho, Nagaoka-Kyo-Shi, Kyot Japan
D Radio Materials Co., Div. P.R. Mallory, Dept. EM, 4242 W. Bryn Mawr Ave., Chicago, Ill. 60646
Reynolds Inds., Inc., Dept. EM, Box 1170, Marina Del Rey, Cal. 90291
Simmonds Precision, Engine Systems Div., Dept. EM, Norwich, N.Y. 13815
Tobe Deutschmann Labs., Inc., Dept. EM, Box 74, Canton, Mass. 02021

Speaker Systems

Era Transpac Corp., Sub. Elctrn. Research Assocs., Dept. EM, 311 B East Park St. Dept. 1202, Moonachie, N.J. 07074 ..... *
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
M Adec Inc., Dept. EM, 12 Kulick Rd., Fairfield, N.J. 07006
D Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
D Argos Products Co., Inc., Dept. EM, 600 S. Sycamore St., Genoa, Ill. 60135
D Atlas Sound Div., American Trading & Prod., Dept. EM, 10 Pomeroy Rd., Parsippany, N.J. 07054
Audiotronics Corp., Dept. EM, 7428 Bellaire Ave., N. Hollywood, Cal. 91605
D Bogen Div., Lear Siegler, Inc., Dept. EM, Box 500, Paramus, N.J. 07652
D Dynaco Inc., Div Tyco Corp., Dept. EM, Box 88 Coles Rd., Blackwood, N.J. 08012
D Electro-Voice, Sub. Gulton Inds., Dept. EM, 600 Cecil St., Buchanan, Mich. 49107
D Fanon/Courier Corp., Subs., Resdel Engrg, Dept. EM, 990 S. Fair Oaks, Pasadena, Cal. 91105
D Frazier, Inc., Dept. EM, 1930 Valley View La., Dallas, Tex. 75234
Gotham Audio Corp., Dept. EM, 741 Washington St., New York, N.Y. 10014
D Herald Electronics, Dept. EM, 6611 N. Lincoln Ave., Chicago, Ill. 60645
D JPI, Inc., Dept. EM, 1507 San Vicente Blvd., Santa Monica, Cal. 90402
D Minneapolis Speaker Co., Dept. EM, 3806 Grand Ave. S., Minneapolis, Minn. 55409
Mobil Electronics, Inc., Dept. EM, Box 1132, Anderson, Ind. 46015
Newcomb Audio Products Co., Dept. EM, 12881 Bradley Ave., Sylmar, Cal. 91342
D Nuvox Elctrns. Corp., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
D Oaktron Inds., Inc., Dept. EM, Monroe, Wisconsin 53566
D Oxford Speaker Co., Dept. EM, 4237 West 42nd Pl., Chicago, Ill. 60632
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D PASO Sound Products Inc., Dept. EM, 14 First St, Pelham, NY 10803
D Perma Power Elctrns, Dept. EM, 5615 W. Howard Ave., Chicago, Ill. 60648
Precision Electronics, Inc., Dept. EM, 9101 King Ave., Franklin Park, Ill 60131
Shure Brothers, Inc., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204
D SPECO Div, Components Specialties, Inc., Dept. EM, PO Box 624 1172 Rte 109, Linderhurst, NY 11757
D Spectra Sonics, Dept. EM, 770 Wall Ave., Ogden, Utah 84404
D University Sound, Altec Corp., Dept. EM, 1515 S. Manchester, Anaheim, Cal. 92803
D Vidaire Electronics Mfg., Dept. EM, 150 Buffalo Ave., Freeport, N.Y. 11520
Wilder Engrg. Prods, Inc., Dept. EM, 1948 Ridge Ave., Evanston, ILL 60201

Speakers, Explosion & Flame Proof

D **Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094** ..... *
D **Quam-Nichols Co., Dept. EM, 234 E. Marquette Rd., Chicago, Ill. 60637** ..... *
M Adec Inc., Dept. EM, 12 Kulick Rd., Fairfield, N.J. 07006
D Atlas Sound Div., American Trading & Prod., Dept. EM, 10 Pomeroy Rd., Parsippany, N.J. 07054
M Oaktron Inds., Inc., Dept. EM, Monroe, Wisconsin 53566
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D University Sound, Altec Corp., Dept. EM, 1515 S. Manchester, Anaheim, Cal. 92803

Speakers, Horn

D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
D **International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746** *
Mueller Electric, Dept. EM, 1583 E 31st St. Dept. 20, Cleveland, Ohio 44114 p. 2086
D **Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094** ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Atlas Sound Div., American Trading & Prod., Dept. EM, 10 Pomeroy Rd., Parsippany, N.J. 07054
D Bogen Div., Lear Siegler, Inc., Dept. EM, Box 500, Paramus, N.J. 07652
D Electro-Voice, Sub. Gulton Inds., Dept. EM, 600 Cecil St., Buchanan, Mich. 49107
D Fanon/Courier Corp., Subs., Resdel Engrg, Dept. EM, 990 S. Fair Oaks, Pasadena, Cal. 91105
D Fourjay Industries, Dept. EM, Box 1465 Northridge Br., Dayton, Ohio 45414
D Frazier, Inc., Dept. EM, 1930 Valley View La., Dallas, Tex. 75234
D Herald Electronics, Dept. EM, 6611 N. Lincoln Ave., Chicago, Ill. 60645
Kolin Industries, Dept. EM, 59 W. Pondfield Rd., Bronxville, N.Y. 10708
D Midwest Electronic Industries, Dept. EM, 4945 W. Belmont Ave., Chicago, Ill. 60641
D Oxford Speaker Co., Dept. EM, 4237 West 42nd Pl., Chicago, Ill. 60632
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D PASO Sound Products Inc., Dept. EM, 14 First St, Pelham, NY 10803
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
SHOGYO International Corp., Dept. EM, 300 Northern Blvd., Great Neck, N.Y. 11021
D SPECO Div, Components Specialties, Inc., Dept. EM, PO Box 624 1172 Rte 109, Linderhurst, NY 11757
D University Sound, Altec Corp., Dept. EM, 1515 S. Manchester, Anaheim, Cal. 92803
D Vidaire Electronics Mfg., Dept. EM, 150 Buffalo Ave., Freeport, N.Y. 11520
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Speakers, Intercom

Era Transpac Corp., Sub. Elctrn. Research Assocs., Dept. EM, 311 B East Park St. Dept. 1202, Moonachie, N.J. 07074 ..... *
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
D **International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746** p. 1155
D **Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094** ..... *
D **Quam-Nichols Co., Dept. EM, 234 E. Marquette Rd., Chicago, Ill. 60637** p. 1019
M Adec Inc., Dept. EM, 12 Kulick Rd., Fairfield, N.J. 07006
D Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
D Atlas Sound Div., American Trading & Prod., Dept. EM, 10 Pomeroy Rd., Parsippany, N.J. 07054
CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
DM Electro-Voice, Sub. Gulton Inds., Dept. EM, 600 Cecil St., Buchanan, Mich. 49107
D Minneapolis Speaker Co., Dept. EM, 3806 Grand Ave. S., Minneapolis, Minn. 55409
DM Oaktron Inds., Inc., Dept. EM, Monroe, Wisconsin 53566
D Oxford Speaker Co., Dept. EM, 4237 West 42nd Pl., Chicago, Ill. 60632
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D PASO Sound Products Inc., Dept. EM, 14 First St, Pelham, NY 10803
D Philips Audiocom Prods, Philips Audio Video Sys, Dept. EM, 91 McKee Dr, Mahwah, N.J. 07430
Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
D Rola Co., Div. Pemcor, Inc., Dept. EM, 21010 Miles Pkwy., Cleveland, Ohio 44128
D SPECO Div, Components Specialties, Inc., Dept. EM, PO Box 624 1172 Rte 109, Linderhurst, NY 11757
Telephonics Corp., Dept. EM, 770 Park Ave., Huntington, N.Y. 11743
DM University Sound, Altec Corp., Dept. EM, 1515 S. Manchester, Anaheim, Cal. 92803

Speakers, Midrange

Era Transpac Corp., Sub. Elctrn. Research Assocs., Dept. EM, 311 B East Park St. Dept. 1202, Moonachie, N.J. 07074 ..... *
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
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D **Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094** ..... *
D **Quam-Nichols Co., Dept. EM, 234 E. Marquette Rd., Chicago, Ill. 60637** p. 1019
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 p. 4244
M Adec Inc., Dept. EM, 12 Kulick Rd., Fairfield, N.J. 07006
D Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
D Atlas Sound Div., American Trading & Prod., Dept. EM, 10 Pomeroy Rd., Parsippany, N.J. 07054
D CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
D Electro-Voice, Sub. Gulton Inds., Dept. EM, 600 Cecil St., Buchanan, Mich. 49107
D Frazier, Inc., Dept. EM, 1930 Valley View La., Dallas, Tex. 75234
D Minneapolis Speaker Co., Dept. EM, 3806 Grand Ave. S., Minneapolis, Minn. 55409
D Oaktron Inds., Inc., Dept. EM, Monroe, Wisconsin 53566
D Oxford Speaker Co., Dept. EM, 4237 West 42nd Pl., Chicago, Ill. 60632
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Rola Co., Div. Pemcor, Inc., Dept. EM, 21010 Miles Pkwy., Cleveland, Ohio 44128
SHOGYO International Corp., Dept. EM, 300 Northern Blvd., Great Neck, N.Y. 11021
D SPECO Div, Components Specialties, Inc., Dept. EM, PO Box 624 1172 Rte 109, Linderhurst, NY 11757
Wilder Engrg. Prods, Inc., Dept. EM, 1948 Ridge Ave., Evanston, ILL 60201

Speakers, Musical Instrument

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CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
D Electro-Voice, Sub. Gulton Inds., Dept. EM, 600 Cecil St., Buchanan, Mich. 49107
D Herald Electronics, Dept. EM, 6611 N. Lincoln Ave., Chicago, Ill. 60645
D Minneapolis Speaker Co., Dept. EM, 3806 Grand Ave. S., Minneapolis, Minn. 55409
DM Oaktron Inds., Inc., Dept. EM, Monroe, Wisconsin 53566
D Oxford Speaker Co., Dept. EM, 4237 West 42nd Pl., Chicago, Ill. 60632
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Precision Electronics, Inc., Dept. EM, 9101 King Ave., Franklin Park, Ill 60131
D Rola Co., Div. Pemcor, Inc., Dept. EM, 21010 Miles Pkwy., Cleveland, Ohio 44128
D SPECO Div, Components Specialties, Inc., Dept. EM, PO Box 624 1172 Rte 109, Linderhurst, NY 11757
Wilder Engrg. Prods, Inc., Dept. EM, 1948 Ridge Ave., Evanston, ILL 60201

Speakers, Paging—See Speakers, Intercom

Speakers, Pillow

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D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
D SPECO Div, Components Specialties, Inc., Dept. EM, PO Box 624 1172 Rte 109, Linderhurst, NY 11757
D Telex Communications, Inc., Dept. EM, 9600 Aldrich Ave., So., Minneapolis, Minn. 55420
D Vidaire Electronics Mfg., Dept. EM, 150 Buffalo Ave., Freeport, N.Y. 11520
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Speakers, Public Address

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D Atlas Sound Div., American Trading & Prod., Dept. EM, 10 Pomeroy Rd., Parsippany, N.J. 07054
D Bogen Div., Lear Siegler, Inc., Dept. EM, Box 500, Paramus, N.J. 07652
D CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
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D Frazier, Inc., Dept. EM, 1930 Valley View La., Dallas, Tex. 75234
D Herald Electronics, Dept. EM, 6611 N. Lincoln Ave., Chicago, Ill. 60645
Kolin Industries, Dept. EM, 59 W. Pondfield Rd., Bronxville, N.Y. 10708
Kris Inc., Dept. EM, N144 W5660 Pioneer Rd., Cedarburg, Wisc. 53012
D Midwest Electronic Industries, Dept. EM, 4945 W. Belmont Ave., Chicago, Ill. 60641
D Minneapolis Speaker Co., Dept. EM, 3806 Grand Ave. S., Minneapolis, Minn. 55409
DM Oaktron Inds., Inc., Dept. EM, Monroe, Wisconsin 53566
D Oxford Speaker Co., Dept. EM, 4237 West 42nd Pl., Chicago, Ill. 60632
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D PASO Sound Products Inc., Dept. EM, 14 First St, Pelham, NY 10803
D Perma Power Elctrns, Dept. EM, 5615 W. Howard Ave., Chicago, Ill. 60648
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
Precision Electronics, Inc., Dept. EM, 9101 King Ave., Franklin Park, Ill 60131
D Rola Co., Div. Pemcor, Inc., Dept. EM, 21010 Miles Pkwy., Cleveland, Ohio 44128
D Shure Brothers, Inc., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204
D SPECO Div, Components Specialties, Inc., Dept. EM, PO Box 624 1172 Rte 109, Linderhurst, NY 11757
D University Sound, Altec Corp., Dept. EM, 1515 S. Manchester, Anaheim, Cal. 92803
D Vidaire Electronics Mfg., Dept. EM, 150 Buffalo Ave., Freeport, N.Y. 11520
Wilder Engrg. Prods, Inc., Dept. EM, 1948 Ridge Ave., Evanston, ILL 60201

Speakers, Replacement (Including Aircraft, Automotive & TV)

Era Transpac Corp., Sub. Elctrn. Research Assocs., Dept. EM, 311 B East Park St. Dept. 1202, Moonachie, N.J. 07074 ..... *
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D International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 p. 1155
D Quam-Nichols Co., Dept. EM, 234 E. Marquette Rd., Chicago, Ill. 60637 p. 1019
M Adec Inc., Dept. EM, 12 Kulick Rd., Fairfield, N.J. 07006
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
D Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
D Herald Electronics, Dept. EM, 6611 N. Lincoln Ave., Chicago, Ill. 60645
Kris Inc., Dept. EM, N144 W5660 Pioneer Rd., Cedarburg, Wisc. 53012
D Minneapolis Speaker Co., Dept. EM, 3806 Grand Ave. S., Minneapolis, Minn. 55409
DM Oaktron Inds., Inc., Dept. EM, Monroe, Wisconsin 53566
DM Oxford Speaker Co., Dept. EM, 4237 West 42nd Pl., Chicago, Ill. 60632
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
SHOGYO International Corp., Dept. EM, 300 Northern Blvd., Great Neck, N.Y. 11021
D SPECO Div, Components Specialties, Inc., Dept. EM, PO Box 624 1172 Rte 109, Linderhurst, NY 11757

Speakers, Submergence-Proof

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M Adec Inc., Dept. EM, 12 Kulick Rd., Fairfield, N.J. 07006
D Oaktron Inds., Inc., Dept. EM, Monroe, Wisconsin 53566
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Telectro Sys. Corp., Dept. EM, 96-18 43rd Ave., Corona, N.Y. 11368
DM University Sound, Altec Corp., Dept. EM, 1515 S. Manchester, Anaheim, Cal. 92803

Speakers, Tweeter

D Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
D Quam-Nichols Co., Dept. EM, 234 E. Marquette Rd., Chicago, Ill. 60637 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 p. 4244
D Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
D Atlas Sound Div., American Trading & Prod., Dept. EM, 10 Pomeroy Rd., Parsippany, N.J. 07054
D CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
D Electro-Voice, Sub. Gulton Inds., Dept. EM, 600 Cecil St., Buchanan, Mich. 49107
D Frazier, Inc., Dept. EM, 1930 Valley View La., Dallas, Tex. 75234
D Herald Electronics, Dept. EM, 6611 N. Lincoln Ave., Chicago, Ill. 60645
D Minneapolis Speaker Co., Dept. EM, 3806 Grand Ave. S., Minneapolis, Minn. 55409
DM Oaktron Inds., Inc., Dept. EM, Monroe, Wisconsin 53566
D Oxford Speaker Co., Dept. EM, 4237 West 42nd Pl., Chicago, Ill. 60632
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D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
D Rola Co., Div. Pemcor, Inc., Dept. EM, 21010 Miles Pkwy., Cleveland, Ohio 44128
SHOGYO International Corp., Dept. EM, 300 Northern Blvd., Great Neck, N.Y. 11021
D SPECO Div, Components Specialties, Inc., Dept. EM, PO Box 624 1172 Rte 109, Linderhurst, NY 11757
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Wilder Engrg. Prods, Inc., Dept. EM, 1948 Ridge Ave., Evanston, ILL 60201

Speakers, Weatherproof

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Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
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D Bogen Div., Lear Siegler, Inc., Dept. EM, Box 500, Paramus, N.J. 07652
CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
DM Electro-Voice, Sub. Gulton Inds., Dept. EM, 600 Cecil St., Buchanan, Mich. 49107
D Herald Electronics, Dept. EM, 6611 N. Lincoln Ave., Chicago, Ill. 60645
Kolin Industries, Dept. EM, 59 W. Pondfield Rd., Bronxville, N.Y. 10708
D Midwest Electronic Industries, Dept. EM, 4945 W. Belmont Ave., Chicago, Ill. 60641
D Minneapolis Speaker Co., Dept. EM, 3806 Grand Ave. S., Minneapolis, Minn. 55409
DM Oaktron Inds., Inc., Dept. EM, Monroe, Wisconsin 53566
DM Oxford Speaker Co., Dept. EM, 4237 West 42nd Pl., Chicago, Ill. 60632
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D PASO Sound Products Inc., Dept. EM, 14 First St, Pelham, NY 10803
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
Shure Brothers, Inc., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204
D SPECO Div, Components Specialties, Inc., Dept. EM, PO Box 624 1172 Rte 109, Linderhurst, NY 11757
M Telectro Sys. Corp., Dept. EM, 96-18 43rd Ave., Corona, N.Y. 11368
D University Sound, Altec Corp., Dept. EM, 1515 S. Manchester, Anaheim, Cal. 92803

Speakers, Woofer

D Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
D Quam-Nichols Co., Dept. EM, 234 E. Marquette Rd., Chicago, Ill. 60637 ..... *
D Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
D CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
D Electro-Voice, Sub. Gulton Inds., Dept. EM, 600 Cecil St., Buchanan, Mich. 49107
D Frazier, Inc., Dept. EM, 1930 Valley View La., Dallas, Tex. 75234
D Herald Electronics, Dept. EM, 6611 N. Lincoln Ave., Chicago, Ill. 60645
D Minneapolis Speaker Co., Dept. EM, 3806 Grand Ave. S., Minneapolis, Minn. 55409
D Oaktron Inds., Inc., Dept. EM, Monroe, Wisconsin 53566
D Oxford Speaker Co., Dept. EM, 4237 West 42nd Pl., Chicago, Ill. 60632
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Rola Co., Div. Pemcor, Inc., Dept. EM, 21010 Miles Pkwy., Cleveland, Ohio 44128
SHOGYO International Corp., Dept. EM, 300 Northern Blvd., Great Neck, N.Y. 11021
D SPECO Div, Components Specialties, Inc., Dept. EM, PO Box 624 1172 Rte 109, Linderhurst, NY 11757
Wilder Engrg. Prods, Inc., Dept. EM, 1948 Ridge Ave., Evanston, ILL 60201

Spectrometers

EG&G, Inc., Electro-Optics Div., Dept. EM, 35 Congress St., Salem, Mass. 01970 ..... p. 313
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 ..
Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219
Advanced Kinetics, Dept. EM, 1231 Victoria St., Costa Mesa, Calif. 92627
M Bausch & Lomb, A.S. Div., Dept. EM, 820 Linden Ave., Box 9189, Rochester, N.Y. 14625
Bromberg Engineering, Dept. EM, 461 Conant Rd., Weston, Mass. 02193
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
Micro-Now Instr. Co., Dept. EM, 6104 N. Pulaski Rd., Chicago, Ill. 60646
Rank Precision Inds., Dept. EM, 411 Jarvis Ave., Des Plaines, Ill. 60018
DM Ulvac North America, Dept. EM, Colchester Plaza, Colchester, VT 05446
Varian Assocs., Instrument Div., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Speed Drives, Motor—See Controls, Motor Speed

Spiral Wrap—See Tubing, Spiral Wrap

Splicers, Coaxial Cable

Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 .....

Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ..... p. 1976
M **Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612** ..... *
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
D Blonder-Tongue Labs., Inc., Dept. EM, One Jake Brown Rd., Old Bridge, N.J. 08857
D Burndy Corporation, Dept. EM, Richards Ave., Norwalk, , Conn. 06852
Cablewave Systems Inc., Dept. EM, 60 Dodge Ave., North Haven, Conn. 06473
D Finney Co., Dept. EM, 34 W. Interstate St., Bedford, Ohio 44014
ITT Cannon/ETC Terminal Products, Dept. EM, 29000 Aurora Rd., Solon, Ohio 44139
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
D T & B/Thomas & Betts, Dept. EM, 36 Butler St., Elizabeth, N.J. 07207
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Splices, Wire (Including, Butt & Cap Types)

Allied Systems Corp., Dept. EM, Box 11005, Greensboro, N.C. 27409 ..... *
Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 ..... *
Appleton Electronic Div., Appleton Electric Co., Dept. EM, 2205 12th Ave., So. Milwaukee, Wisc. 53172 ..... p. 1709
Excel Products Co., Inc., Dept. EM, 401 Joyce Kilmer Ave., New Brunswick, N.J. 08903 ..... *
ITT Cannon Electric, Dept. EM, 666 E. Dyer Rd., Santa Ana, Cal. 92702 ..... *
ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ..... p. 1976
D **Panduit Corp., Dept. EM, 17301 Ridgeland Ave., Tinley Park, Ill. 60477** ..... p. 4632
M **Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612** ..... *
Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 ..... p. 2143
D **Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629** ..... *
D AMP Special Industries, Dept. EM, Valley Forge, Pa. 19482
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
D Burndy Corporation, Dept. EM, Richards Ave., Norwalk, , Conn. 06852
Essex Grp, Essex Terminals/Connectors, Dept. EM, 3405 Engle Rd., Box 9216, Ft. Wayne, Ind. 46809
D Gould Inc., Electrical Comps. Div., Dept. EM, 123 Smith St., E. Farmingdale, N.Y. 11735
DM Hollingsworth Solderless Terminal Co., Dept. EM, 85 Benjamin Franklin Hwy, P.O. Box 499, Pottstown, Pa. 19464
D Ideal Industries Inc., Dept. EM, 4450 Becker Pl., Sycamore, Ill. 60178
DM ITT Cannon/ETC Terminal Products, Dept. EM, 29000 Aurora Rd., Solon, Ohio 44139
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
3M Co., Indl Elect Prods. Div., Dept. EM, 3M Center, St. Paul, Minn. 55101
D Preformed Line Products Co., Dept. EM, Box 91129, Cleveland, Ohio 44101
Sjoberg, C. & Son, Inc., Dept. EM, 415 Station St., Cranston, R.I. 02910
D Sonobond, Sub. Christiana Metals, Dept. EM, 200 E. Rosedale Ave., West Chester, Pa. 19380
D T & B/Thomas & Betts, Dept. EM, 36 Butler St., Elizabeth, N.J. 07207
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578
Zierick Mfg. Corp., Dept. EM, 44 Radio Circle, Mt. Kisco, N.Y. 10549
D Zippertubing Co., Dept. EM, 13000 S. Broadway, Los Angeles, Cal. 90061

Splicing Equipment, Magnetic Tape

D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
Ampex Corp., Dept. EM, 401 Broadway, Redwood City, Cal. 94063
M Robins Ind's. Corp., Consumer Products Div., Dept. EM, 75 Austin Blvd., Commack, N.Y. 11725

Splitters/Combiners, Power—See Dividers, Power (LF, HF, VHF, UHF)

Spoolers, Punched Tape—See Readers, Punched Tape

Springs (All Types)

D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
Graphite Metallizing Corp., Dept. EM, 1036 Nepperhan Ave., Yonkers, N.Y. 10702 ..... *
Instrument Specialties, Dept. EM, 276 Bergen Blvd., Little Falls, N.J. 07424 ..... p. 2558,2559
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 ..... *
TRW/Cinch Connectors, Electronic Comp. Div. of TRW Inc., Dept. EM, 1501 Morse Ave., Elk Grove Village, Ill. 60007 ..... *
Acme Model Engrg. Co., Dept. EM, 654 Bergen Blvd., Ridgefield, N.J. 07657
M Ametek, Inc, Hunter Spring Division, Dept. EM, 1 Spring Ave., Hatfield, Pa. 19440
Associated Spring-Barnes Group Inc., Dept. EM, 18 Main St., Bristol, Conn. 06010
Auto-Swage Products Inc., Dept. EM, 726 River Rd., Shelton, Conn. 06484
D Chatillon John & Sons, Dept. EM, 83-30 Kew Gardens Rd., Kew Gardens, N.Y. 11415
D Eaton Corp., Engineered Fasteners Oper., Dept. EM, Box 6688, Cleveland, Ohio 44101
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
Helical Prods. Co., Inc., Dept. EM, Box 2296, Santa Maria, Cal. 93456
M Helix Spring Corp., Dept. EM, 35-10 10th St., Long Island City, N.Y. 11106
Micro Contacts Inc., Dept. EM, 62 Alpha Plaza, Hicksville, N.Y. 11801
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M PIC Design Div., Benrus Corp., Dept. EM, Benrus Center, Rte 7, Ridgefield, Conn. 06877

Stablizers, Current—See Current Sources; Power Supplies, D-C Output, Current Regulated; Power Supplies, Constant Current; Regulators, Current

Stabilizers, Line Impedance

M **Georator Corporation, Dept. EM, Box 70, Manassas, Va. 22110** ..... *
Power Designs, Inc., Dept. EM, 1700 Shames Dr., Westbury, N.Y. 11590 ..... *
Sola Electric, Dept. EM, 1717 Busse Rd., Elk Grove Village, Ill. 60007 ..... *
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705

Stablizers, Voltage—See Regulators & Stablizers, Voltage; Transformers, Voltage Regulating; Voltage Sources

Stablizers, Voltage/Current, Automatic—See Power Supplies, Constant Voltage/Constant Current

Stalos (Stabilized Local Oscillators)—See Oscillators, Microwave

Standards, Atomic Beam

M **Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040** ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 ..... *
Tracor, Inc., Dept. EM, 6500 Tracor La., Austin, Tex. 78721

Standards, Capacitance

Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 ..... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 ..... *

Standards, Current

CEA, Div. Berkleonics, Inc., Dept. EM, 1 Aerovista Pk., San Luis Obispo, Cal. 93401 ..... *
Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 ..... *
Electronic Dev. Corp., Dept. EM, 11 Hamlin St., Boston, Mass. 02127 p. 2725
D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043** p. 2743,2744
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 ..... *
Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 ..... *
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
RFL Inds., Instr. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005 ..... *
RFL Inds., Thermocontrol Div., Dept. EM, Boonton, N.J. 07005 ..... *
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** ..... *
D **United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403** ..... *
Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... *
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
M Sawyer Inds., Dept. EM, 5649 Peck Rd., Arcadia, Cal. 91006
Zi-Tech Div., Aikenwood Corp., Dept. EM, Box 26, 2151 Park Blvd., Palo Alto, Cal. 94302

Standards, Delay Line

M **Computer Devices Corp., Dept. EM, 63 Austin Blvd., Commack, N.Y. 11725** p. 2392
M Andersen & Assoc., Walther M.A., Dept. EM, 4 Main St. Ext., Tariffville, Conn. 06081

Standards, Frequency

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Applied Microwave, Div. Epsco Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 ..... p. 2861
Austron, Inc., Dept. EM, 1915 Kramer La., Austin, Tex. 78758 ..... p. 2283
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Connor-Winfield Corp., Dept. EM, W. Chicago, Ill. 60185 ..... *
Dytronics Co., Inc., Dept. EM, 4800 Evanswood Dr., Columbus, Ohio 43229 p. 2718
Epsco, Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 p. 2861
D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043** *
M **Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040** p. 2324
M **Greenray Inds., Inc., Dept. EM, 840 W. Church Rd., Mechanicsburg, Pa. 17055** ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 ..... *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
M **Monitor Prods., Dept. EM, Box 1966, 502 Via Delmonte, Oceanside, Cal. 92054** ..... p. 2349
Ovenaire, Div. Walter Kidde & Co., Dept. EM, 706 Forrest St., Charlottesville, Va. 22901 ..... *
PPM, Inc., Dept. EM, 7575 Bond St., Cleveland, Ohio 44139 ..... *
RFL Inds., Instr. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005 p. 2807
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *
M **Spectrum Technology Inc., Dept. EM, 300 Frederic Lopez Rd., Goleta, Cal. 93017** ..... *
M **Vectron Labs., Inc., Dept. EM, 166 Glover Ave., Norwalk, Conn. 06850** p. 2378
M Cox & Co., Inc., Dept. EM, 215 Park Ave., S., New York, N.Y. 10003

Standards, Frequency (Cont'd)

CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
Dynatron Co., Dept. EM, Box 48822, Los Angeles, Cal. 90048
D Efratom California, Inc., Dept. EM, 18851 Bardeen Ave, Irvine, CAL. 92715
Fairchild Camera & Instr., Federal Systems Group, Dept. EM, 300 Robbins La., Syosset, N.Y. 11791
FSI/Fork Standards Inc., Dept. EM, 211 Main St., W. Chicago, Ill. 60185
Meloy Labs Inc., Instrus. & Sys. Div., Dept. EM, 6715 Electronic Dr., Springfield, Va. 22151
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
Palomar Engrs., Dept. EM, Box 455, Escondido, Cal. 92025
Spectracom Corp., Dept. EM, 1667 Penfield Rd., Rochester, N.Y. 14625
T-F Electronics Inc., Dept. EM, 9415 Neils Thompson Dr., Austin, Tex. 78759
Tracor, Inc., Dept. EM, 6500 Tracor La., Austin, Tex. 78721

Standards, Inductance

Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
M Dietz Design, Inc., Dept. EM, 100 Electronics Pkwy., Belton, Mo. 64012

Standards, Noise

D Ailtech, Dept. EM, 2070 Fifth Ave, Ronkonkoma, NY 11779
M LNR Communications, Inc., Dept. EM, 180 Marcus Blvd., Hauppauge, N.Y. 11787
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730

Standards, Phase

Austron, Inc., Dept. EM, 1915 Kramer La., Austin, Tex. 78758 ..... *
Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ..... *
M **Dytronics Co., Inc., Dept. EM, 4800 Evanswood Dr., Columbus, Ohio 43229** p. 2718
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006

Standards, Resistance

Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 *
Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 p. 2768,3702
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
M **Precision Resistor Co., Inc., Dept. EM, 109 U.S. Hwy. 22, Hillside, N.J. 07205** p. 3723
RFL Inds., Instr. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005 ..... *
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *
Shallco, Inc., Dept. EM, Box 1089, Smithfield, N.C. 27577 ..... *
Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... *
DM Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
E.S.I. Inc., Dept. EM, 13900 N.W. Science Park Dr., Portland, Oregon 97229
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
Penn Airborne Prods., Dept. EM, Industrial Hwy., Southampton, Pa. 18966

Standards, Temperature

Doric Sci., Div. Emerson Elec. Co., Dept. EM, 3883 Ruffin Rd., San Diego, Cal. 92123 ..... *
Ectron Corp., Dept. EM, 8159 Engineer Rd., San Diego, Cal. 92111 ..... *
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 *
Harrel, Inc., Dept. EM, 16 Fitch St., E. Norwalk, Conn. 06855 ..... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
Cox & Co., Inc., Dept. EM, 215 Park Ave., S., New York, N.Y. 10003
Electro-Optical Inds., Inc., Dept. EM, 839 Ward Dr., Santa Barbara, Cal. 93111
M H-B Instr. Co., Dept. EM, 4306 N. American St, Philadelphia, Pa. 19140
Hy-Cal Engrg, Dept. EM, 12105 Los Nietos Rd., Santa Fe Springs, Cal 90670
Oven Industries, Inc., Dept. EM, 800 New Holland Ave., Mechanicsburg, Pa. 17055
Rosemount Inc., Dept. EM, Box 35129, Minneapolis, Minn. 55435
D Yellow Springs Instrument Co., Dept. EM, Box 279, Yellow Springs, Ohio 45387

Standards, Time

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Austron, Inc., Dept. EM, 1915 Kramer La., Austin, Tex. 78758 ..... p. 2283
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
M **Chrono-log Corp., Dept. EM, 2 W. Park Rd., Havertown, Pa. 19083** ..... *
D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043** *
M **Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040** p. 2324
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
PPM, Inc., Dept. EM, 7575 Bond St., Cleveland, Ohio 44139 ..... *
M **Trak Systems, Div. TRAK Microwave Corp., Dept. EM, 4722 Eisenhower Blvd., Dept. E8, Tampa, Fla. 33614** ..... p. 1668,1670,1671
D Efratom California, Inc., Dept. EM, 18851 Bardeen Ave, Irvine, CAL. 92715
Spectracom Corp., Dept. EM, 1667 Penfield Rd., Rochester, N.Y. 14625
True Time Instr Co., Dept. EM, 429 Olive St, Santa Rosa, Cal. 95401

Standards, Voltage

Applied Microwave, Div. Epsco Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 ..... p. 2861
D **Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005** ..... *
CEA, Div. Berkleonics, Inc., Dept. EM, 1 Aerovista Pk., San Luis Obispo, Cal. 93401 ..... *
Connor-Winfield Corp., Dept. EM, W. Chicago, Ill. 60185 ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Ectron Corp., Dept. EM, 8159 Engineer Rd., San Diego, Cal. 92111 ..... *
Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 p. 2825
Electronic Dev. Corp., Dept. EM, 11 Hamlin St., Boston, Mass. 02127 p. 2724,2725
Epsco, Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 p. 2861
D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043** p. 2743,2744
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 p. 2753
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 p. 2768
Megavolt, Corp., Dept. EM, 110 Hobart St, Hackensack, N.J. 07601 ..... *
RFL Inds., Instr. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005 p. 2807
RFL Inds., Thermocontrol Div., Dept. EM, Boonton, N.J. 07005 ..... *
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 p. 2825
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** ..... *
D **United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403** ..... *
Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... *
D Analogic Corp., Dept. EM, Audubon Rd., Wakefield, Mass. 01880
Beckman Instrs., (AISSD), Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634
DM Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
EMI Technology, Dept. EM, 55, Kenosia Ave., Danbury, Conn 06810
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
Pioneer Instrumentation, Dept. EM, 4800 E. 131st St., Cleveland, Ohio 44105
M Sawyer Inds., Dept. EM, 5649 Peck Rd., Arcadia, Cal. 91006
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
Velonex, Instrument Div., Dept. EM, 560 Robert Ave., Santa Clara, Cal. 95050
Zi-Tech Div., Aikenwood Corp., Dept. EM, Box 26, 2151 Park Blvd., Palo Alto, Cal. 94302

Standards, Voltage Ratio

Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553

Standoffs—See Bushings, Glass, Plastic, Metal, etc.

Stands, Instruments

DM **Buckeye Stamping Co., Dept. EM, 555 Marion Rd., Columbus, Ohio 43207** *
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... p. 1469
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
M Electro-Rack Products Co., Dept. EM, 1742 So. Clementine St., Anaheim, Cal. 92802
Overly-Hautz Co., Dept. EM, 8617 Clinton Rd., Cleveland, Ohio 44144
D Peerless Sales Co., Dept. EM, 4200 W. Chicago Ave., Chicago, Ill 60651
Snap-On-Tools, Dept. EM, 8192-A 28th Ave., Kenosha, Wisc. 53140
M Zero Corp., Dept. EM, 777 Front St., Burbank, Cal. 91502

Stators, Motor & Generator—See Motor & Generator Armatures, Rotors, Stators

Stools—See Benches, Consoles, Stools, Tables (Lab & Shop)

Strain Reliefs, Cable & Wire

Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 .....
D **Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458** .....
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** .....
D **Heyman Mfg. Co., Dept. EM, 147 N. Michigan Ave., Kenilworth, N.J. 07033** p. 461
Johnson Co., E.F., Dept. EM, 299 10th SW Ave., Waseca, Minn. 56093 .....
D **3M Co., Electronic Prods Div., Dept. EM, 3M Center, St. Paul, Minn. 55101** p. 2060,2067,2068,207
DM **Panduit Corp., Dept. EM, 17301 Ridgeland Ave., Tinley Park, Ill. 60477** .....
D **Pyle-National Co, Dept. EM, 1334 N. Kostner Ave, Chicago, Ill 60651** .....
M **Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612** .....
D **Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207** p. 2123,213
D **Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629** p. 225

D – Product sold through distributors M – Product meets MIL specs
* – Company has information in this edition but not on this product.

DM Amrad Corp., Dept. EM, Box 876, Paris, Tex. 75460
Autosplice/Dv Gen Staple, Dept EM, 220 E. 23rd St., New York City, N.Y. 10010
D Eaton Corp., Engineered Fasteners Oper., Dept. EM, Box 6688, Cleveland, Ohio 44101
D Gould Inc., Electrical Comps. Div., Dept. EM, 123 Smith St., E. Farmingdale, N.Y. 11735
D ICO/Rally Corp., Dept. EM, Edward J. Bush, Palo Alto, Cal. 94303
M Merrimac Inds., Inc., Dept. EM, 41 Fairfield Pl., West Caldwell, N.J. 07006
Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
Raychem Corp., Dept. EM, 300 Constitution Dr., Menlo Park, Cal. 94025
Sjoberg, C. & Son, Inc., Dept. EM, 415 Station St., Cranston, R.I. 02910
D T&B/Ansley Corp., Sub. Thomas & Betts, Dept. EM, 3208 Humboldt St., Los Angeles, Cal. 90031
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Relay Service Co., Dept. EM, 1310 N. Pulaski Rd., Chicago, Ill. 60651
D Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
D Zenith Controls Inc., Dept. EM, 830 West 40th St., Chicago, Ill. 60609

Switches, Centrifugal

Torq Engineered Products, Inc., Dept. EM, 32 W. Monroe St., Bedford, Ohio 44146

Switches, Coaxial Cable

A. D. Data Sys., Inc., Dept. EM, POB 9209, Rochester, N.Y. 14625 ..... *
D Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... p. 3998,3999
M Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706 ..... *
Bird Electronic Corp., Dept. EM, 30303 Aurora Rd., Solon, Ohio 44139 p. 2668
M Daico Industries Inc., Dept. EM, Box 5225, Compton, Cal. 90220 ..... *
D Electronic Specialty Div., Datron Systems Inc., Dept. EM, 18900 N.E. Sandy Blvd., Portland, Ore. 97220 ..... *
Fifth Dimension, Dept. EM, 707 Alexander Rd., Princeton, N.J. 08540 ..... *
M General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 p. 2871
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 ..... p. 3549
DM Kilovac Corp., Dept. EM, Box 4422, Santa Barbara, Cal. 93103 ..... p. 3568
Matrix Systems Corp., Dept. EM, 9411 Lurline Ave., Chatsworth, Cal. 91311 p. 2874,3582
Oak Inds. Inc., Switch Div., Dept. EM, Dept. DA, Crystal Lake, Ill. 60014 ..... *
M Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... *
D Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219 *
D Barker & Williamson, Inc., Dept. EM, Canal St., Bristol, Pa. 19007
D Blonder-Tongue Labs., Inc., Dept. EM, One Jake Brown Rd., Old Bridge, N.J. 08857
M Crown Microwave, Inc., Sub. Microwave Semiconductor Corp., Dept. EM, 6 Executive Park Dr., N. Billerica, Mass. 01862
E-H International, Inc., Dept. EM, 515 11th St Box 1289, Oakland, Cal 94604
E-H Resch. Labs., Inc., Dept. EM, Box 1289, Oakland, Cal. 94604
Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
DM Kings Electronics, Dept. EM, 40 Mabledale Rd., Tuckahoe, N.Y. 10707
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
M RF Systems, Inc., Dept. EM, 3100 Communications Rd., St Cloud, Fla. 32769
D R L C Elctrns., Inc., Dept. EM, 83 Radio Cir., Mt. Kisco, N.Y. 10549
Sivers Lab, Dept. EM, Box 90339, Los Angeles, Cal. 90009
M Teledyne Microwave, Dept. EM, 1290 Terra Bella Ave., Mountain View, Cal. 94040
M Transco Prods., Inc., Dept. EM, 4241 Glencoe Ave., Venice, Cal. 90291
Triangle Microwave Inc., Dept. EM, 9B Great Meadow La, East Hanover, NJ 07936
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760

Switches, Coded

Airflyte Elctrns. Co., Dept. EM, Box 207, 56 Hook Rd., Bayonne, N.J. 07002 *
M Applied Research Inc., Dept. EM, 76 S. Bayles Ave., Port Washington, N.Y. 11050 ..... *
D Cherry Electrical Prods. Corp., Dept. EM, 3623 Sunset Ave., Waukegan, Ill. 60085 ..... p. 4014,4015
M Cole Instrument, Div. F.H. Cole Entprs., Dept. EM, 2034 Placentia Ave., Costa Mesa, Cal. 92627 ..... *
DM Digitran Co., Dept. EM, 855 So. Arroyo Pkwy., Pasadena, Cal. 91105 ..... *
D Grayhill Inc., Dept. EM, 569 Hillgrove Ave., LaGrange, Ill. 60525 ..... *
D Interswitch, Dept. EM, 770 Airport Blvd., Burlingame, Cal. 94010 ..... *
M Janco Corp., Dept. EM, Box 3038-Glenoaks Sta., Burbank, Cal. 91504 p. 4097
LVC Inds. Inc., Co-Ord Switch Bloc-Lite Divs., Dept. EM, 135-25 37th Ave., Flushing, N.Y. 11354 ..... *
D Molex Inc., Dept. EM, 2222 Wellington Ct., Lisle, Ill. 60532 ..... *
Oak Inds. Inc., Switch Div., Dept. EM, Dept. DA, Crystal Lake, Ill. 60014 ..... *
M RCL Electronics Div., AMF Incorporated, Dept. EM, 700 S. 21st St., Irvington, N.J. 07111 ..... *
Refac Elctrns. Pinlite®, Wild Rover®, Dept. EM, Box 809, W. Hill Rd., Winsted, Conn 06098 ..... *
M Standard Grigsby Inc., Dept. EM, 920 Rathbone Ave., Aurora, Ill. 60507 ..... *
M Tech Labs., Inc., Dept. EM, Bergen & Edsall Blvds., Palisades Pk., N.J. 07650 *
Cramer Division, Conrac Corporation, Dept. EM, Mill Rock Rd., Old Saybrook, Conn. 06475
DM EECO, Dept. EM, 1441 E. Chestnut Ave, Box 659, Santa Ana, Cal. 92701
M Flex Key Corp., Dept. EM, 18 Sargent St., Gloucester, Mass. 01930
D Key Tronic Corp., Dept. EM, Bldg. 14, Spokane Ind'l. Pk., Spokane, Wash. 99216
North Electric Co., Power Sys Div., Dept. EM, Box 688, Galion, Ohio 44833

Switches, Crossbar

A. D. Data Sys., Inc., Dept. EM, POB 9209, Rochester, N.Y. 14625 ..... *
Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 ..... p. 3994
M Applied Research Inc., Dept. EM, 76 S. Bayles Ave., Port Washington, N.Y. 11050 ..... *
D Chicago Switch, Inc., Dept. EM, 1714 N. Damen, Chicago, Ill. 60647 ..... *
M Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040 .. *
Information Transfer Industrial, Inc., Dept. EM, Box 357, Holcomb, N.Y. 14469 ..... *
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 ..... p. 3548
LVC Inds. Inc., Co-Ord Switch Bloc-Lite Divs., Dept. EM, 135-25 37th Ave., Flushing, N.Y. 11354 ..... *
Matrix Systems Corp., Dept. EM, 9411 Lurline Ave., Chatsworth, Cal. 91311 *
Megavolt, Corp., Dept. EM, 110 Hobart St, Hackensack, N.J. 07601 .... p. 3286
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
M Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... *
T-Bar Inc., Dept. EM, 141 Danbury Rd., Wilton, Conn. 06897 ..... *
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
North Electric Co., Power Sys Div., Dept. EM, Box 688, Galion, Ohio 44833
OKI Electronics of America, Dept. EM, 4031 N.E. 12th Terr., Ft. Lauderdale, Fla. 33334
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Universal Relay Corp., Dept. EM, 42 White St., New York, N.Y. 10013

Switches, Data-Sampling

A. D. Data Sys., Inc., Dept. EM, POB 9209, Rochester, N.Y. 14625 ..... *
D Airflyte Elctrns. Co., Dept. EM, Box 207, 56 Hook Rd., Bayonne, N.J. 07002 *
Fifth Dimension, Dept. EM, 707 Alexander Rd., Princeton, N.J. 08540 ..... *
Information Transfer Industrial, Inc., Dept. EM, Box 357, Holcomb, N.Y. 14469 ..... p. 1646
LVC Inds. Inc., Co-Ord Switch Bloc-Lite Divs., Dept. EM, 135-25 37th Ave., Flushing, N.Y. 11354 ..... *
Matrix Systems Corp., Dept. EM, 9411 Lurline Ave., Chatsworth, Cal. 91311 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Oak Inds. Inc., Switch Div., Dept. EM, Dept. DA, Crystal Lake, Ill. 60014 ..... *
RCL Electronics Div., AMF Incorporated, Dept. EM, 700 S. 21st St., Irvington, N.J. 07111 ..... *
D T-Bar Inc., Dept. EM, 141 Danbury Rd., Wilton, Conn. 06897 ..... *
Dynatech Data Sys, A Dynatech Co, Dept. EM, 900 Slaters La., Alexandria, Va. 22314
M Poly-Scientific, Litton Sys., Dept. EM, 1213 N. Main St., Blacksburg, Va. 24060
M Transco Prods., Inc., Dept. EM, 4241 Glencoe Ave., Venice, Cal. 90291

Switches, Decade

Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 ..... *
D Cherry Electrical Prods. Corp., Dept. EM, 3623 Sunset Ave., Waukegan, Ill. 60085 ..... *
M Cole Instrument, Div. F.H. Cole Entprs., Dept. EM, 2034 Placentia Ave., Costa Mesa, Cal. 92627 ..... *
DM Digitran Co., Dept. EM, 855 So. Arroyo Pkwy., Pasadena, Cal. 91105 p. 4045-4049
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Grayhill Inc., Dept. EM, 569 Hillgrove Ave., LaGrange, Ill. 60525 ..... *
LVC Inds. Inc., Co-Ord Switch Bloc-Lite Divs., Dept. EM, 135-25 37th Ave., Flushing, N.Y. 11354 ..... *
A Talley Ind's Co., , Dept. EM, 135 S. Main St., Thomaston, Conn. 06787 p. 4159
D Oak Inds. Inc., Switch Div., Dept. EM, Dept. DA, Crystal Lake, Ill. 60014 ..... *
DM RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102 ..... *
RCL Electronics Div., AMF Incorporated, Dept. EM, 700 S. 21st St., Irvington, N.J. 07111 ..... *

Shallco, Inc., Dept. EM, Box 1089, Smithfield, N.C. 27577 ..... *
Standard Grigsby Inc., Dept. EM, 920 Rathbone Ave., Aurora, Ill. 60507 ..... *
M Tech Labs., Inc., Dept. EM, Bergen & Edsall Blvds., Palisades Pk., N.J. 07650 *

D EECO, Dept. EM, 1441 E. Chestnut Ave, Box 659, Santa Ana, Cal. 92701
D Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102

Switches, Dip

D ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845 ..... p. 3983
Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 p. 3988-3993
D Augat Interconnection Prods. Div., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703 ..... *
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
CW Industries, Dept. EM, 550 Davisville Rd., Warminster, Pa. 18974 .. p. 4040
D Electronic Applications Co., Dept. EM, 4918 Santa Anita Ave., El Monte, Cal. 91734 ..... *
DM Grayhill Inc., Dept. EM, 569 Hillgrove Ave., LaGrange, Ill. 60525 p. 4057-4059
Guardian Electric Co., Dept. EM, 1550 W. Carroll Ave., Chicago, Ill. 60607 p. 3518
D IEE/Schadow, Inc., Dept. EM, 8081 Wallace Rd., Eden Prairie, Minn. 55344 p. 4090,4091
A Talley Ind's Co., , Dept. EM, 135 S. Main St., Thomaston, Conn. 06787 p. 4159
D Molex Inc., Dept. EM, 2222 Wellington Ct., Lisle, Ill. 60532 ..... p. 2085
DM RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102 ..... *
Standex Electronics, Dept. EM, 4538 Camberwell Rd., Cincinnati, Ohio 45209 p. 4256
VRN St Petersburg, Div. Vernitron, Dept. EM, 2801 72nd St N. Box 44000, St. Petersburg, FL 33743 ..... p. 3913
Circuit Assembly Corp., Dept. EM, 3169 Red Hill Ave., Costa Mesa, Cal. 92626
D EECO, Dept. EM, 1441 E. Chestnut Ave, Box 659, Santa Ana, Cal. 92701
D Specialties Mfg. Co., Inc., Dept. EM, 23425 Harper, St. Clair Shores, Mich. 48080

Switches, Feed-Through Cord

Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101 ..... *
General Elec. Co, Wiring Device Bus. Dept., Dept. EM, 95 Hathaway St., Providence, R.I. 02904
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Specialties Mfg. Co., Inc., Dept. EM, 23425 Harper, St. Clair Shores, Mich. 48080

Switches, Foot-Pedal, Mat, Ribbon, etc.

Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
Fifth Dimension, Dept. EM, 707 Alexander Rd., Princeton, N.J. 08540 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Tapeswitch Corp. Amer., Dept. EM, 100 Schmitt Blvd., Farmingdale, N.Y. 11735 ..... p. 4257
DM Vemaline Prods. Div., Ostbys & Barton Co., Dept. EM, 487 Jefferson Blvd., Warwick, R.I. 02886 ..... *
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
D Furnas Elec. Co., Dept. EM, 1197 McKee St., Batavia, Ill. 60510
Lektra Labs., Inc., Dept. EM, 129-07 18th Ave., College Point, N.Y. 11356
DM Line Elec an Esterline Co., Dept. EM, U.S. Hwy. 287, Parsippany, N.J. 07054
DM Linemaster Switch Corp., Dept. EM, Box 52, Woodstock, Conn. 06281
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
DM Pres-Air-Trol Corp., Dept. EM, 895 Mamaroneck Av., Mamaroneck, N.Y. 10543
D Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Switches, High-Voltage (Over 250 Volts)

Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
M Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
Arcolectric Corp., Dept. EM, Box 348, 11120 Chandler Blvd., No. Hollywood, Cal. 91603 ..... *
M Cole Instrument, Div. F.H. Cole Entprs., Dept. EM, 2034 Placentia Ave., Costa Mesa, Cal. 92627 ..... *
Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101 ..... *
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 .. *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... *
D Durakool, Dept. EM, 1010 N. Main St., Elkhart, Ind. 46514 ..... p. 4051
EG&G, Inc., Electro-Optics Div., Dept. EM, 35 Congress St., Salem, Mass. 01970 ..... *
DM Electro Switch Corp., Dept. EM, King Ave., Weymouth, Mass. 02188 .. p. 4053
Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... p. 2422
Fifth Dimension, Dept. EM, 707 Alexander Rd., Princeton, N.J. 08540 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
DM Gordos Corp., Dept. EM, 250 Glenwood Ave., Bloomfield, N.J. 07003 p. 4076
Hamlin Inc., Dept. EM, Lake & Grove Sts., Lake Mills, Wisc. 53551 .... p. 4079
Interswitch, Dept. EM, 770 Airport Blvd., Burlingame, Cal. 94010 ..... p. 4082
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 ..... p. 4087
M Janco Corp., Dept. EM, Box 3038-Glenoaks Sta., Burbank, Cal. 91504 ..... *
M Kilovac Corp., Dept. EM, Box 4422, Santa Barbara, Cal. 93103 ..... *
Mc Graw-Edison, Edison Elctrns. Div., Daven Comps., Dept. EM, Grenier Field, Manchester, N.H. 03103 ..... p. 4108
Megavolt, Corp., Dept. EM, 110 Hobart St, Hackensack, N.J. 07601 ..... *
D Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032 *
D Omron Electronics, Dept. EM, 233 S. Wacker Dr., Chicago, Ill. 60606 ..... *
Oslo Controls, Dept. EM, 328 Industrial Ave, Cheshire, Conn. 06410 .. p. 4218
Pulsar Assocs., Dept. EM, 11491 Sorrento Valley Rd., San Diego, Cal. 92121 p. 2602
M Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... p. 3609
Stackpole Components Co., Dept. EM, Box 14466, Raleigh, N.C. 27610 p. 4245
Standard Grigsby Inc., Dept. EM, 920 Rathbone Ave., Aurora, Ill. 60507 p. 4255
Standex Electronics, Dept. EM, 4538 Camberwell Rd., Cincinnati, Ohio 45209 *
M Tech Labs., Inc., Dept. EM, Bergen & Edsall Blvds., Palisades Pk., N.J. 07650 *
Wabash Relay & Elctrns., Dept. EM, Box 708, Wabash, Ind. 46992 ..... *
DM ASM Corp, Dept. EM, Box 860, 525 Truck Lane, Smithfield, N.C. 27577
Centralab Elctrns. Div., Globe-Union Inc., Dept. EM, Box 858, Hwy. 20 W., Fort Dodge, Iowa 50501
Hermetic Switch, Inc., Dept. EM, Box 1325, Hwy 92 W., Chickasha, Okla. 73018
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602
Lakeshore Electric Corp., Dept. EM, 205 Willis, Bedford, Ohio 44146
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Precision Mechanisms Corp., Dept. EM, 44 Brooklyn Ave., Westbury, N.Y. 11590
M Radio Switch, Dept. EM, State Hwy. 79, Marlboro, N.J. 07746
Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Switches, Illuminated

D ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845 ..... *
American Zettler, Inc., Dept. EM, 16881 Hale Ave., Irvine, Cal. 92714 ..... *
D Arcolectric Corp., Dept. EM, Box 348, 11120 Chandler Blvd., No. Hollywood, Cal. 91603 ..... p. 4001
D C & K Components, Inc., Dept. EM, 103 Morse St., Watertown, Mass. 02172 *
Carlingswitch Inc., Dept. EM, 505 New Park Ave., W. Hartford, Conn. 06110 p. 4011-4013
D Cherry Electrical Prods. Corp., Dept. EM, 3623 Sunset Ave., Waukegan, Ill. 60085 ..... *
Chicago Miniature/Drake, Dept. EM, 4433 N Ravenswood Ave., Chicago, Ill. 60640 ..... *
D Chicago Switch, Inc., Dept. EM, 1714 N. Damen, Chicago, Ill. 60647 ..... *
D Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645 ..... *
M Cole Instrument, Div. F.H. Cole Entprs., Dept. EM, 2034 Placentia Ave., Costa Mesa, Cal. 92627 ..... *
D Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101 ..... p. 4026
D Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... p. 4043
D Dialight, Dept. EM, 203 Harrison Pl., Brooklyn, N.Y. 11237 ..... p. 2474
DM Digitran Co., Dept. EM, 855 So. Arroyo Pkwy., Pasadena, Cal. 91105 ..... *
D Electro-Mech Components, Dept. EM, 1826 N. Floradale Ave., So. El Monte, Cal. 91733 ..... p. 4054,4055
Electro Switch Corp., Dept. EM, King Ave., Weymouth, Mass. 02188 .. p. 4053
Electronic Measurements, Dept. EM, 405 Essex Rd., Neptune, N.J. 07753 .. *
Fujitsu America, Inc., Component Sales Div., Dept. EM, 910 Sherwood Dr., Lake Bluff, Ill. 60044 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
D Grayhill Inc., Dept. EM, 569 Hillgrove Ave., LaGrange, Ill. 60525 ..... p. 4063
Industrial Elctrn. Engrs., Dept. EM, 7740 Lemona Ave., Van Nuys, Cal. 91405 p. 2483
M Info-Lite Corp., Dept. EM, 46-10 104 St., Corona, N.Y. 11368 ..... *
D Interswitch, Dept. EM, 770 Airport Blvd., Burlingame, Cal. 94010 ..... *
D IEE/Schadow, Inc., Dept. EM, 8081 Wallace Rd., Eden Prairie, Minn. 55344 p. 4089,4090
M Janco Corp., Dept. EM, Box 3038-Glenoaks Sta., Burbank, Cal. 91504 ..... *
Ledex Inc., Dept. EM, 123 Webster St., Dayton, Ohio 45401 ..... p. 4099
D Leecraft Mfg. Co., Inc., Dept. EM, 21-16 44th Rd., Long Island City, N.Y. 11101 ..... p. 2492
D Littelfuse, Inc., Dept. EM, 800 E. Northwest Hwy., Des Plaines, Ill. 60016 .... *
LVC Inds. Inc., Co-Ord Switch Bloc-Lite Divs., Dept. EM, 135-25 37th Ave., Flushing, N.Y. 11354 ..... *
Maxi-Switch Co., Dept. EM, 9697 East River Road, Minneapolis, Minn. 55433 *
D McGill Mfg. Co. Inc., Electrical Div., Dept. EM, 909 Lafayette St., Valparaiso, Ind. 46383 ..... *
D Mechanical Enterprises, Dept. EM, 8000 Forbes Pl., Springfield, VA 22151 p. 4160,4161
DM Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 6103 p. 4110-4112, 4114-4116, 4118-4120, 4122, 4123, 4126, 4128-4130, 4133, 415
D Molex Inc., Dept. EM, 2222 Wellington Ct., Lisle, Ill. 60532 ..... p. 208
D Oak Inds. Inc., Switch Div., Dept. EM, Dept. DA, Crystal Lake, Ill. 60014 p. 4179-4204,4206-4208,4213,421
D Oshino Electric Lamp Works, Ltd, Dept. EM, 2-5-2, Minami-Shinagawa, Shinagawa-Ku, Tokyo, Japan ..... *
D Oslo Controls, Dept. EM, 328 Industrial Ave, Cheshire, Conn. 06410 .. p. 421

D Raytheon Co., Distributor Prods. Oper., Dept. EM, Fourth Ave., Burlington, Mass. 01803 ..... p. 4222
Refac Elctrns. Pinlite², Wild Rover², Dept. EM, Box 809, W. Hill Rd., Winsted, Conn 06098 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 *
D UID Electronics Div., AMF Inc., Dept. EM, 4105 Pembroke Rd., Hollywood, Fla. 33021 ..... *
DM Unimax Switch Corp., Sub. Unimax Group, Inc., Dept. EM, Ives Rd., Wallingford, Conn. 06492 ..... p. 4268
Veetronix, Dept. EM, Box 209, 136 W. 7th St., Cozad, Neb. 69130 ..... p. 4269
D Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 .... *
M Aerospace Optics Inc., Dept. EM, 7112 Burns St., Fort Worth, Tex. 76118
Capitol Machine & Switch Co., Dept. EM, Box 890, Danbury, Conn. 06810
Centralab Elctrns. Div., Globe-Union Inc., Dept. EM, Box 858, Hwy. 20 W., Fort Dodge, Iowa 50501
DM Control Switch, A Cutler Hammer Co., Dept. EM, 1420 Delmar Dr., Folcroft, Pa. 19032
D EECO, Dept. EM, 1441 E. Chestnut Ave, Box 659, Santa Ana, Cal. 92701
M Flex Key Corp., Dept. EM, 18 Sargent St., Gloucester, Mass. 01930
D Furnas Elec. Co., Dept. EM, 1197 McKee St., Batavia, Ill. 60510
Galileo Electro-Optics Corp., Dept. EM, Galileo Pk., Sturbridge, Mass. 01518
DM General Automatic Corp., Dept. EM, 70 Liberty St., Metuchen, N.J. 08840
M Jay-El Prods., Dept. EM, 1859 W 169th St., Gardena, Calif. 90247
D Key Tronic Corp., Dept. EM, Bldg. 14, Spokane Ind'l. Pk., Spokane, Wash. 99216
M Korry Mfg. Co., Dept. EM, 223 8th Ave. N., Seattle, Wash. 98109
Leviton Mfg. Co., Inc., Dept. EM, 59-25 Little Neck Pkwy., Little Neck, N.Y. 11362
DM Licon Div., Illinois Tool Works, Dept. EM, 6615 W. Irving Park Rd., Chicago, Ill. 60634
DM Master Specialties Co., Dept. EM, 1640 Monrovia St., Costa Mesa, Cal. 92627
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
D Robertshaw Controls Co., Dept. EM, 3705 Marlane Dr, Grove City, Ohio 43123
Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648
D Specialties Mfg. Co., Inc., Dept. EM, 23425 Harper, St. Clair Shores, Mich. 48080
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
DM Stacoswitch, Inc., Dept. EM, 1139 Baker St., Costa Mesa, Cal. 92626
D Switchcraft, Inc., Dept. EM, 5555 N. Elston, Chicago, Ill. 60630
D Tec, Inc., Dept. EM, 2727 N. Fairview, Tuscon, Ariz. 85705

Switches, Inertia—See Accelerometers

Switches, Joystick

Fifth Dimension, Dept. EM, 707 Alexander Rd., Princeton, N.J. 08540 ..... *
Guardian Electric Co., Dept. EM, 1550 W. Carroll Ave., Chicago, Ill. 60607 .. *
M Measurement Sys., Inc., Dept. EM, 121 Water St., Norwalk, Conn. 06854 .... *
DM Otto Engrg., Inc., Otto Controls Div., Dept. EM, 36 Main St., Carpentersville, Ill. 60110 ..... *
D Furnas Elec. Co., Dept. EM, 1197 McKee St., Batavia, Ill. 60510
Magnetoelastic Devices, Dept. EM, 74 North St Box 625, Pittsfield, MA 01201
Methode Elctrns., Inc., Dept. EM, 7447 W. Wilson Ave., Chicago, Ill. 60656
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Specialties Mfg. Co., Inc., Dept. EM, 23425 Harper, St. Clair Shores, Mich. 48080
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201

Switches, Keyboard

D ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845 ..... *
Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 ..... *
D Cherry Electrical Prods. Corp., Dept. EM, 3623 Sunset Ave., Waukegan, Ill. 60085 ..... p. 4014
D Chicago Switch, Inc., Dept. EM, 1714 N. Damen, Chicago, Ill. 60647 .. p. 4016
Chomerics, Inc., Dept. EM, 77 Dragon Court, Woburn, Mass. 01801 ..... *
M Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645 ..... p. 4022
Digitran Co., Dept. EM, 855 So. Arroyo Pkwy., Pasadena, Cal. 91105 p. 4044
M Elec-Trol, Inc., Dept. EM, 26477 N. Golden Valley Rd., Saugus, Cal. 91350 .. *
Fujitsu America, Inc., Component Sales Div., Dept. EM, 910 Sherwood Dr., Lake Bluff, Ill. 60044 ..... *
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
D Grayhill Inc., Dept. EM, 569 Hillgrove Ave., LaGrange, Ill. 60525 ..... *
M GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 ..... *
D Hamlin Inc., Dept. EM, Lake & Grove Sts., Lake Mills, Wisc. 53551 ..... *
M Info-Lite Corp., Dept. EM, 46-10 104 St., Corona, N.Y. 11368 ..... *
D IEE/Schadow, Inc., Dept. EM, 8081 Wallace Rd., Eden Prairie, Minn. 55344 *
Ledex Inc., Dept. EM, 123 Webster St., Dayton, Ohio 45401 ..... *
Maxi-Switch Co., Dept. EM, 9697 East River Road, Minneapolis, Minn. 55433 p. 4104
D Mechanical Enterprises, Dept. EM, 8000 Forbes Pl., Springfield, VA 22151 p. 4160,4161
Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032 p. 4133,4134
D Oak Inds. Inc., Switch Div., Dept. EM, Dept. DA, Crystal Lake, Ill. 60014 p. 4209-4212
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
Refac Elctrns. Pinlite², Wild Rover², Dept. EM, Box 809, W. Hill Rd., Winsted, Conn 06098 ..... p. 4220
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Stackpole Components Co., Dept. EM, Box 14466, Raleigh, N.C. 27610 ..... *
Veetronix, Dept. EM, Box 209, 136 W. 7th St., Cozad, Neb. 69130 ..... p. 4269
AMP Special Industries, Dept. EM, Valley Forge, Pa. 19482
D Centralab, Electrns. Div. - Globe Union Inc., Dept. EM, 5757 N. Green Bay Ave., Milwaukee, Wisc. 53201
Centralab Elctrns. Div., Globe-Union Inc., Dept. EM, Box 858, Hwy. 20 W., Fort Dodge, Iowa 50501
Cortron Div., Illinois Tool, Dept. EM, 6601 W. Irving Park Rd., Chicago, Ill. 60634
M Flex Key Corp., Dept. EM, 18 Sargent St., Gloucester, Mass. 01930
Futaba Corp., Dept. EM, Daido Keori Bldg., 3-1-16 Sotokanda,, Chiyoda-ku, Tokyo, Japan
D Key Tronic Corp., Dept. EM, Bldg. 14, Spokane Ind'l. Pk., Spokane, Wash. 99216
Korry Mfg. Co., Dept. EM, 223 8th Ave. N., Seattle, Wash. 98109
D Mitsumi Elec. Co., Ltd., Dept. EM, 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan
Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648
D Stacoswitch, Inc., Dept. EM, 1139 Baker St., Costa Mesa, Cal. 92626
Telesis Laboratory, Dept. EM, Box 387, Chillocothe, Ohio 45601
Texas Instruments Control Prods. Div., Dept. EM, 34 Forrest St., Attleboro, Mass. 02703

Switches, Key-Lock

D ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845 ..... *
D Chicago Lock Co., Dept. EM, 4311 W. Belmont Ave., Chicago, Ill. 60641 p. 4008
M Cole Instrument, Div. F.H. Cole Entprs., Dept. EM, 2034 Placentia Ave., Costa Mesa, Cal. 92627 ..... *
D Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101 ..... p. 4026
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
Electro Switch Corp., Dept. EM, King Ave., Weymouth, Mass. 02188 .. p. 4053
Fujitsu America, Inc., Component Sales Div., Dept. EM, 910 Sherwood Dr., Lake Bluff, Ill. 60044 ..... *
D Grayhill Inc., Dept. EM, 569 Hillgrove Ave., LaGrange, Ill. 60525 ..... *
IEE/Schadow, Inc., Dept. EM, 8081 Wallace Rd., Eden Prairie, Minn. 55344 *
M Janco Corp., Dept. EM, Box 3038-Glenoaks Sta., Burbank, Cal. 91504 ..... *
Ledex Inc., Dept. EM, 123 Webster St., Dayton, Ohio 45401 ..... p. 4099
D Leecraft Mfg. Co., Inc., Dept. EM, 21-16 44th Rd., Long Island City, N.Y. 11101 ..... *
D Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032 *
D Oak Inds. Inc., Switch Div., Dept. EM, Dept. DA, Crystal Lake, Ill. 60014 p. 4215
DM RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102 ..... *
D RCL Electronics Div., AMF Incorporated, Dept. EM, 700 S. 21st St., Irvington, N.J. 07111 ..... p. 4239
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2146
D Trimm, Inc., Dept. EM, 400 W. Lake, Box 489, Libertyville, Ill. 60048 ..... *
D Unimax Switch Corp., Sub. Unimax Group, Inc., Dept. EM, Ives Rd., Wallingford, Conn. 06492 ..... *
Ark-Les Switch Corp., Dept. EM, 51 Water St., Watertown, Mass. 02172
Cramer Division, Conrac Corporation, Dept. EM, Mill Rock Rd., Old Saybrook, Conn. 06475
D Furnas Elec. Co., Dept. EM, 1197 McKee St., Batavia, Ill. 60510
D General Elec. Co, Wiring Device Bus. Dept., Dept. EM, 95 Hathaway St., Providence, R.I. 02904
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
Leviton Mfg. Co., Inc., Dept. EM, 59-25 Little Neck Pkwy., Little Neck, N.Y. 11362
D On-Guard Corp. of America, Dept. EM, 350 Gotham Pkwy , Carlstadt, NJ 07072
D Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
D Specialties Mfg. Co., Inc., Dept. EM, 23425 Harper, St. Clair Shores, Mich. 48080
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618

Switches, Leaf—See Switches, Stack

Switches, Lever

D ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845 ..... *
Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
American Switch Corp., Dept. EM, 134 Water St., Wakefield, Mass. 01880 p. 3984
Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 ..... p. 3993
D Arcolectric Corp., Dept. EM, Box 348, 11120 Chandler Blvd., No. Hollywood, Cal. 91603 ..... p. 4001
C & K Components, Inc., Dept. EM, 103 Morse St., Watertown, Mass. 02172 *
D Cherry Electrical Prods. Corp., Dept. EM, 3623 Sunset Ave., Waukegan, Ill. 60085 ..... p. 4015
D Chicago Switch, Inc., Dept. EM, 1714 N. Damen, Chicago, Ill. 60647 ..... *
M Cole Instrument, Div. F.H. Cole Entprs., Dept. EM, 2034 Placentia Ave., Costa Mesa, Cal. 92627 ..... *
D Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101 ..... p. 4026
D Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... p. 4041-4043
D Digitran Co., Dept. EM, 855 So. Arroyo Pkwy., Pasadena, Cal. 91105 p. 4046,4048,4049
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
D IEE/Schadow, Inc., Dept. EM, 8081 Wallace Rd., Eden Prairie, Minn. 55344 *
J-B-T- Switches, A Cutler Hammer Co., Dept. EM, Box 1904, New Haven, Conn. 06509 ..... p. 4041

D **Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032 p. 4143-4145,4147-4151**
D **Oak Inds. Inc., Switch Div., Dept. EM, Dept. DA, Crystal Lake, Ill. 60014 p. 4173,4205**
D **Otto Engrg., Inc., Otto Controls Div., Dept. EM, 36 Main St., Carpentersville, Ill. 60110 ..... p. 4216**
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
D **Raytheon Co., Distributor Prods. Oper., Dept. EM, Fourth Ave., Burlington, Mass. 01803 ..... p. 4221,4223**
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 *
D **Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 ***
M **Standard Grigsby Inc., Dept. EM, 920 Rathbone Ave., Aurora, Ill. 60507 ..... ***
D **T-Bar Inc., Dept. EM, 141 Danbury Rd., Wilton, Conn. 06897 ..... ***
Tech Labs., Inc., Dept. EM, Bergen & Edsall Blvds., Palisades Pk., N.J. 07650 *
D **Unimax Switch Corp., Sub. Unimax Group, Inc., Dept. EM, Ives Rd., Wallingford, Conn. 06492 ..... ***
Capitol Machine & Switch Co., Dept. EM, Box 890, Danbury, Conn. 06810
Centralab Elctrns. Div., Globe-Union Inc., Dept. EM, Box 858, Hwy. 20 W., Fort Dodge, Iowa 50501
DM Control Switch, A Cutler Hammer Co., Dept. EM, 1420 Delmar Dr., Folcroft, Pa. 19032
D Crouzet/Cridland, Dept. EM, 118 Barrington Commons Ct Ste 207, Barrington, Ill. 60010
Essex Controls Div., Essex Grp, Dept. EM, 131 Godfrey St., Logansport, Ind. 46947
D Furnas Elec. Co., Dept. EM, 1197 McKee St., Batavia, Ill. 60510
DM Licon Div., Illinois Tool Works, Dept. EM, 6615 W. Irving Park Rd., Chicago, Ill. 60634
M Milli-Switch Corp., Dept. EM, Box 67, Gladwyne, Pa 19035
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
D Mitsumi Elec. Co., Ltd., Dept. EM, 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Radio Switch, Dept. EM, State Hwy. 79, Marlboro, N.J. 07746
D Reed Switch Dev. Co. Inc., Dept. EM, PO Box 1464, Kerrville, Tex. 78028
D Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
D Robertshaw Controls Co., Dept. EM, 3705 Marlane Dr, Grove City, Ohio 43123
Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648
D Specialties Mfg. Co., Inc., Dept. EM, 23425 Harper, St. Clair Shores, Mich. 48080
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
D Switchcraft, Inc., Dept. EM, 5555 N. Elston, Chicago, Ill. 60630
Texas Instruments Control Prods. Div., Dept. EM, 34 Forrest St., Attleboro, Mass. 02703

Switches, Limit

Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
D **Cherry Electrical Prods. Corp., Dept. EM, 3623 Sunset Ave., Waukegan, Ill. 60085 ..... ***
D **Chicago Switch, Inc., Dept. EM, 1714 N. Damen, Chicago, Ill. 60647 ..... ***
Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731 ..... *
D **Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101 ..... ***
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
Datametrics/Trump Ross, Dept. EM, 340 Fordham Road, Wilmington, Mass. 01887 ..... p. 1396
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... *
Fifth Dimension, Dept. EM, 707 Alexander Rd., Princeton, N.J. 08540 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
D **Grayhill Inc., Dept. EM, 569 Hillgrove Ave., LaGrange, Ill. 60525 ..... ***
iLC Data Device Corp., Dept. EM, Airport Int'l. Plaza, Bohemia, N.Y. 11716 *
M **Janco Corp., Dept. EM, Box 3038-Glenoaks Sta., Burbank, Cal. 91504 ..... ***
London Co., Dept. EM, 811 Sharon Dr., Westlake, Ohio 44145 ..... *
McGill Mfg. Co. Inc., Electrical Div., Dept. EM, 909 Lafayette St., Valparaiso, Ind. 46383 ..... *
D **Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032 p. 4156**
D **Omron Electronics, Dept. EM, 233 S. Wacker Dr., Chicago, Ill. 60606 p. 3591**
D **Otto Engrg., Inc., Otto Controls Div., Dept. EM, 36 Main St., Carpentersville, Ill. 60110 ..... ***
DM **RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102 ..... ***
Refac Elctrns. Pinlite®, Wild Rover®, Dept. EM, Box 809, W. Hill Rd., Winsted, Conn 06098 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D **Unimax Switch Corp., Sub. Unimax Group, Inc., Dept. EM, Ives Rd., Wallingford, Conn. 06492 ..... ***
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
DM Control Switch, A Cutler Hammer Co., Dept. EM, 1420 Delmar Dr., Folcroft, Pa. 19032
D Crouzet/Cridland, Dept. EM, 118 Barrington Commons Ct Ste 207, Barrington, Ill. 60010
D Dillon, W.C. & Co., Dept. EM, 14620-EP Keswick St., Van Nuys 340, Cal. 91407
D Furnas Elec. Co., Dept. EM, 1197 McKee St., Batavia, Ill. 60510
M Haydon Switch & Instr., Inc., Dept. EM, 1500 Meriden Rd., Waterbury, Conn. 06705
D Licon Div., Illinois Tool Works, Dept. EM, 6615 W. Irving Park Rd , Chicago, Ill. 60634
Magnetoelastic Devices, Dept. EM, 74 North St Box 625, Pittsfield, MA 01201
D Namco Controls, Acme-Cleveland Co., Dept. EM, 170 E. 131st St., Cleveland, Ohio 44108
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
M Precision Mechanisms Corp., Dept. EM, 44 Brooklyn Ave., Westbury, N.Y. 11590
DM Pres-Air-Trol Corp., Dept. EM, 895 Mamaroneck Av., Mamaroneck, N.Y. 10543
D Reed Switch Dev. Co. Inc., Dept. EM, PO Box 1464, Kerrville, Tex. 78028
D Relay Specialties Inc., Dept. EM; 1300 Plaza Rd., Fair Lawn, N.J. 07410
San-O Industrial Corp., Dept. EM, 35-P Orville Dr., Bohemia, N.Y. 11716
Skan-A-Matic Corp., Dept. EM, Box S, Elbridge, N.Y. 13060
D Specialties Mfg. Co., Inc., Dept. EM, 23425 Harper, St. Clair Shores, Mich. 48080
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Temposonics Inc., Dept. EM, 131 East Ames Ct, Plainview, N.Y. 11803
Texas Instruments Control Prods. Div., Dept. EM, 34 Forrest St., Attleboro, Mass. 02703

Switches, Liquid Level/Pressure

Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 ..... *
Fifth Dimension, Dept. EM, 707 Alexander Rd., Princeton, N.J. 08540 ..... *
Fujitsu America, Inc., Component Sales Div., Dept. EM, 910 Sherwood Dr., Lake Bluff, Ill. 60044 ..... *
Gordos Corp., Dept. EM, 250 Glenwood Ave., Bloomfield, N.J. 07003 ..... *
D **Kessler-Ellis Prods., Dept. EM, 120 1st Ave., Atlantic Highlands, N.J. 07716 ***
D **Midwest Components, Dept. EM, 1981 Port City Blvd., Muskegon, Mich. 49400 ..... ***
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Automation Prdts., Dept. EM, 3030 Max Roy, Houston, Tex. 77008
Bourns, Inc., Instr. Div., Dept. EM, 6135 Magnolia, Riverside, Calif. 92506
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
M Consolidated Controls Corp., Dept. EM, 15 Durant Ave., Bethel, Conn. 06801
Delaval Turbine Inc., Gems Sensors Div., Dept. EM, Spring La., Farmington, Conn. 06032
D Delavan Electronics, Inc., Dept. EM, 14605 No. 73rd St., Scottsdale, Ariz. 85260
M Dietz, Henry G. Co., Inc., Dept. EM, 14-26 28th Ave., Long Island City, N.Y. 11102
D Furnas Elec. Co., Dept. EM, 1197 McKee St., Batavia, Ill. 60510
D Gagne Assocs., Inc., Dept. EM, 1080 Chenango St., Dept. 3EE-27, Binghamton, N.Y. 13901
M Giannini Institute, Dept. EM, 51555 Madison St., Indio, Ca. 92201
Harwil Co., Dept. EM, 1548 17th St., Santa Monica, Calif. 90404
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
Magnetoelastic Devices, Dept. EM, 74 North St Box 625, Pittsfield, MA 01201
D National Sonics, Div. Envirotech Corp., Dept. EM, 250 Marcus Blvd., Hauppauge, N.Y. 11787
Perkin-Elmer Ultek Inc., Dept. EM, Box 10920, Palo Alto, Cal. 94303
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
DM Pres-Air-Trol Corp., Dept. EM, 895 Mamaroneck Av., Mamaroneck, N.Y. 10543
D Revere Corp. of America, Neptune International Corp., Dept. EM, 845 N. Colony Rd., Wallingford, Conn. 06492
D Robertshaw Controls Co., Ind'l. Instr. Div., Dept. EM, 1910 Byrd Ave Ste 200, Richmond, Va. 23230
Robinson-Halpern Co., Dept. EM, One Apolio Rd., Plymouth Meeting, Pa. 19462
D Scientific Technology, Dept. EM, 1201 San Antonio Rd., Mountain View, Cal. 94043
Skan-A-Matic Corp., Dept. EM, Box S, Elbridge, N.Y. 13060
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
D United Elec. Controls Co., Dept. EM, 85A School St., Watertown, Mass. 02172
D Zi-Tech Div., Aikenwood Corp., Dept. EM, Box 26, 2151 Park Blvd., Palo Alto, Cal. 94302

Switches, Lock—See Switches, Key-Lock

Switches, Magnetic Reed

D **ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845 .....**
Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 ..
D **Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645 ..... p. 342**
Coto-Coil Co., Dept. EM, 65 Pavilion Ave., Providence, R.I. 02905 .....
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck Conn. 02891 .....
Fujitsu America, Inc., Component Sales Div., Dept. EM, 910 Sherwood Dr., Lake Bluff, Ill. 60044 .....
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 .....**
DM **Gordos Corp., Dept. EM, 250 Glenwood Ave., Bloomfield, N.J. 07003 p. 407**
DM **Hamlin Inc., Dept. EM, Lake & Grove Sts., Lake Mills, Wisc. 53551 .... p. 407**
Information Transfer Industrial, Inc., Dept. EM, Box 357, Holcomb, N.Y. 14469 .....
Matrix Systems Corp., Dept. EM, 9411 Lurline Ave., Chatsworth, Cal. 91311
Maxi-Switch Co., Dept. EM, 9697 East River Road, Minneapolis, Minn. 55433
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 .....
D **North American Philips Controls, Dept. EM, Husky Park, Frederick, Md. 21701 .....**
D **Potter & Brumfield, Div of AMF, Dept. EM, P.O. Box 322, Princeton, Ind. 47671 .....**
M **Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 .....**
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 ....
Standex Electronics, Dept. EM, 4538 Camberwell Rd., Cincinnati, Ohio 4520
Veetronix, Dept. EM, Box 209, 136 W. 7th St., Cozad, Neb. 69130 .....
Wabash Relay & Elctrns., Dept. EM, Box 708, Wabash, Ind. 46992 .....
Hermetic Switch, Inc , Dept. EM, Box 1325, Hwy 92 W., Chickasha, Okla. 7301

M Key Tronic Corp., Dept. EM, Bldg. 14, Spokane Ind'l. Pk., Spokane, Wash. 99216
D On-Guard Corp. of America, Dept. EM, 350 Gotham Pkwy., Carlstadt, NJ 07072
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
D Teledyne-Crystalonics, Dept. EM, 147 Sherman St., Cambridge, Mass. 02140

Switches, Magnetically Actuated

D Adams & Westlake Co., Dept. EM, 1025 W. Michigan St., Elkhart, Ind. 46514 *
Airpax Elctrns., Inc., Cambridge Div., Dept. EM, Woods Rd., Cambridge, Md. 21613 *
D ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845 *
Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
D Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101 *
D Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 *
D Durakool, Dept. EM, 1010 N. Main St., Elkhart, Ind. 46514 *
D Electronic Applications Co., Dept. EM, 4918 Santa Anita Ave., El Monte, Cal. 91734 *
Elmwood Sensors, Inc., Dept. EM, 1655 Elmwood Ave., Cranston, RI 02907 *
Fifth Dimension, Dept. EM, 707 Alexander Rd., Princeton, N.J. 08540 *
DM Gordos Corp., Dept. EM, 250 Glenwood Ave., Bloomfield, N.J. 07003 p. 4076,4077
D Hamlin Inc., Dept. EM, Lake & Grove Sts., Lake Mills, Wisc. 53551 *
Information Transfer Industrial, Inc., Dept. EM, Box 357, Holcomb, N.Y. 14469 *
D Kessler-Ellis Prods., Dept. EM, 120 1st Ave., Atlantic Highlands, N.J. 07716 *
DM Kilovac Corp., Dept. EM, Box 4422, Santa Barbara, Cal. 93103 *
Matrix Systems Corp., Dept. EM, 9411 Lurline Ave., Chatsworth, Cal. 91311 *
Maxi-Switch Co., Dept. EM, 9697 East River Road, Minneapolis, Minn. 55433 *
D Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032 p. 4148,4154
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
D North American Philips Controls, Dept. EM, Husky Park, Frederick, Md. 21701 *
D Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076 *
D Potter & Brumfield, Div of AMF, Dept. EM, P.O. Box 322, Princeton, Ind. 47671 *
M Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 *
Schrack Electrical Sales Corp., Dept. EM, 1140 Broadway Rm 205, New York, N.Y. 10001 *
Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 *
Standex Electronics, Dept. EM, 4538 Camberwell Rd., Cincinnati, Ohio 45209 *
Aerolite Elexs Corp., Dept EM, 2207 Summit Ave., Union City, N.J. 07087
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
D Crouzet/Cridland, Dept. EM, 118 Barrington Commons Ct Ste 207, Barrington, Ill. 60010
Delaval Turbine Inc., Gems Sensors Div., Dept. EM, Spring La., Farmington, Conn. 06032
D Furnas Elec. Co., Dept. EM, 1197 McKee St., Batavia, Ill. 60510
M Giannini Institute, Dept. EM, 51555 Madison St., Indio, Ca. 92201
Hermetic Switch, Inc., Dept. EM, Box 1325, Hwy 92 W., Chickasha, Okla. 73018
M Key Tronic Corp., Dept. EM, Bldg. 14, Spokane Ind'l. Pk., Spokane, Wash. 99216
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
D Namco Controls, Acme-Cleveland Co., Dept. EM, 170 E. 131st St., Cleveland, Ohio 44108
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Reed Switch Dev. Co. Inc., Dept. EM, PO Box 1464, Kerrville, Tex. 78028
D Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
Sivers Lab, Dept. EM, Box 90339, Los Angeles, Cal. 90009
D Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071

Switches, Matrix—See Switches, Crossbar; Switches, Reed; Boards, Programming

Switches, Mercury Displacement

D Adams & Westlake Co., Dept. EM, 1025 W. Michigan St., Elkhart, Ind. 46514 p. 3411
D Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101 *
D Durakool, Dept. EM, 1010 N. Main St., Elkhart, Ind. 46514 p. 4050-4052
Fifth Dimension, Dept. EM, 707 Alexander Rd., Princeton, N.J. 08540 p. 4056
D Mechanical Enterprises, Dept. EM, 8000 Forbes Pl., Springfield, VA 22151 *
D Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032 p. 4109,4153
M Thordarson Meissner, Electronic Ctr., Dept. EM, Mt. Carmel, Ill. 62863 *
H-B Instr. Co., Dept. EM, 4306 N. American St, Philadelphia, Pa. 19140
Mack Elec. Devices, Dept. EM, 32 Glenside Ave., Wyncote, Pa. 19095

Switches, Mercury Wetted Contacts

D Adams & Westlake Co., Dept. EM, 1025 W. Michigan St., Elkhart, Ind. 46514 p. 3411
D Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645 p. 3427
Coto-Coil Co., Dept. EM, 65 Pavilion Ave., Providence, R.I. 02905 *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 *
Fifth Dimension, Dept. EM, 707 Alexander Rd., Princeton, N.J. 08540 p. 4056
DM Gordos Corp., Dept. EM, 250 Glenwood Ave., Bloomfield, N.J. 07003 p. 4077
D Hamlin Inc., Dept. EM, Lake & Grove Sts., Lake Mills, Wisc. 53551 .... p. 4079
Matrix Systems Corp., Dept. EM, 9411 Lurline Ave., Chatsworth, Cal. 91311 *
Midtex, Inc., AEMCO Div., Dept. EM, 1650 Tower Blvd., No. Mankato, Minn. 56001 *
D H-B Instr. Co., Dept. EM, 4306 N. American St, Philadelphia, Pa. 19140
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071

Switches, Microwave—See Switches, Coaxial Cable; Switches, Waveguide

Switches, Motor-Driven

D Airflyte Elctrns. Co., Dept. EM, Box 207, 56 Hook Rd., Bayonne, N.J. 07002 *
M Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706 *
M Cole Instrument, Div. F.H. Cole Entprs., Dept. EM, 2034 Placentia Ave., Costa Mesa, Cal. 92627 p. 4025
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 *
D Electro Switch Corp., Dept. EM, King Ave., Weymouth, Mass. 02188 .. p. 4053
Fifth Dimension, Dept. EM, 707 Alexander Rd., Princeton, N.J. 08540 *
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 *
M Janco Corp., Dept. EM, Box 3038-Glenoaks Sta., Burbank, Cal. 91504 *
North American Philips Controls Corp., Dept. EM, Cheshire Industrial Pk. Box E, Cheshire, Conn. 06410 *
M Oak Inds. Inc., Switch Div., Dept. EM, Dept. DA, Crystal Lake, Ill. 60014 *
D Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076 *
M Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 *
Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543 *
Tech Labs., Inc., Dept. EM, Bergen & Edsall Blvds., Palisades Pk., N.J. 07650 *
Automatic Timing & Controls Co., Dept. EM, King of Prussia, Pa. 19406
D Bristol Saybrook Co., Dept. EM, 97 Coulter St., Old Saybrook, Conn. 06475
Controls Plant, McGraw Edison Co., Dept. EM, 210 Redstone Hill Rd., Bristol, Conn. 06010
Crouzet/Cridland, Dept. EM, 118 Barrington Commons Ct Ste 207, Barrington, Ill. 60010
D Eagle Signal, Mfg. Div. Gulf & Western Inds., Dept. EM, Box 3585, Davenport, Iowa 52808
Lakeshore Electric Corp., Dept. EM, 205 Willis, Bedford, Ohio 44146
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M Precision Mechanisms Corp., Dept. EM, 44 Brooklyn Ave., Westbury, N.Y. 11590
Precision Timer Co., Dept. EM, 13 Westbrook Ind'l. Park, Westbrook, Conn. 06498
Sivers Lab, Dept. EM, Box 90339, Los Angeles, Cal. 90009
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Tenor Co., Inc., Dept. EM, 17020 W. Rogers Dr., New Berlin, Wisc. 53151
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760

Switches, Paddle Handle

D ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845 *
D American Switch Corp., Dept. EM, 134 Water St., Wakefield, Mass. 01880 p. 3984
D Arcolectric Corp., Dept. EM, Box 348, 11120 Chandler Blvd., No. Hollywood, Cal. 91603 p. 4001
D C & K Components, Inc., Dept. EM, 103 Morse St., Watertown, Mass. 02172 *
Carlingswitch Inc., Dept. EM, 505 New Park Ave., W. Hartford, Conn. 06110 p. 4012,4013
D Chicago Switch, Inc., Dept. EM, 1714 N. Damen, Chicago, Ill. 60647 .. p. 4017
D Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101 p. 4026
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 p. 4041
J-B-T- Switches, A Cutler Hammer Co., Dept. EM, Box 1904, New Haven, Conn. 06509 p. 4041
McGill Mfg. Co. Inc., Electrical Div., Dept. EM, 909 Lafayette St., Valparaiso, Ind. 46383 p. 4107
D Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032 p. 4114-4116,4136
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 *
D Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 *
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648
D Specialties Mfg. Co., Inc., Dept. EM, 23425 Harper, St. Clair Shores, Mich. 48080
D Switchcraft, Inc., Dept. EM, 5555 N. Elston, Chicago, Ill. 60630

Switches, Photoelectric—See Cells, Photoconductive; Controls, Photoelectric

Switches, Power

D ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845 *
Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
D American Switch Corp., Dept. EM, 134 Water St., Wakefield, Mass. 01880 .. *
Arcolectric Corp., Dept. EM, Box 348, 11120 Chandler Blvd., No. Hollywood, Cal. 91603 *

M Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706 ..... *
C & K Components, Inc., Dept. EM, 103 Morse St., Watertown, Mass. 02172 ..... *
D Cherry Electrical Prods. Corp., Dept. EM, 3623 Sunset Ave., Waukegan, Ill. 60085 ..... *
D Chicago Switch, Inc., Dept. EM, 1714 N. Damen, Chicago, Ill. 60647 ..... p. 4016,4017
D Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645 ..... p. 4023
D Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101 ..... p. 4026
Crydom Controls, Int'l. Rectifier, Dept. EM, 1521 Grand Ave., El Segundo, Cal. 90245 ..... p. 3553
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
D CW Industries, Dept. EM, 550 Davisville Rd., Warminster, Pa. 18974 ..... *
D Durakool, Dept. EM, 1010 N. Main St., Elkhart, Ind. 46514 ..... *
Electro-Mech Components, Dept. EM, 1826 N. Floradale Ave., So. El Monte, Cal. 91733 ..... p. 4054,4055
DM Electro Switch Corp., Dept. EM, King Ave., Weymouth, Mass. 02188 .. p. 4053
Electronic Measurements, Dept. EM, 405 Essex Rd., Neptune, N.J. 07753 .. *
Fifth Dimension, Dept. EM, 707 Alexander Rd., Princeton, N.J. 08540 ..... *
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 ..... *
D IEE/Schadow, Inc., Dept. EM, 8081 Wallace Rd., Eden Prairie, Minn. 55344 ..... p. 4089
M Janco Corp., Dept. EM, Box 3038-Glenoaks Sta., Burbank, Cal. 91504 ..... *
Ledex Inc., Dept. EM, 123 Webster St., Dayton, Ohio 45401 ..... p. 4098,4099
Littelfuse, Inc., Dept. EM, 800 E. Northwest Hwy., Des Plaines, Ill. 60016 ..... p. 4101
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D Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032 ..... p. 4112,4116,4120,4128
A Talley Ind's Co., , Dept. EM, 135 S. Main St., Thomaston, Conn. 06787 ..... p. 4159
D Molex Inc., Dept. EM, 2222 Wellington Ct., Lisle, Ill. 60532 ..... *
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D Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076 .... p. 4162
Oslo Controls, Dept. EM, 328 Industrial Ave, Cheshire, Conn. 06410 .. p. 4218
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
RCL Electronics Div., AMF Incorporated, Dept. EM, 700 S. 21st St., Irvington, N.J. 07111 ..... p. 4231
M Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... p. 3609
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 ..... p. 2146
Stackpole Components Co., Dept. EM, Box 14466, Raleigh, N.C. 27610 ..... p. 4249,4251,4278
T-Bar Inc., Dept. EM, 141 Danbury Rd., Wilton, Conn. 06897 ..... p. 4259
Tech Labs., Inc., Dept. EM, Bergen & Edsall Blvds., Palisades Pk., N.J. 07650 ..... p. 4260,4261
Unimax Switch Corp., Sub. Unimax Group, Inc., Dept. EM, Ives Rd., Wallingford, Conn. 06492 ..... *
D Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 .... *
DM ASM Corp, Dept. EM, Box 860, 525 Truck Lane, Smithfield, N.C. 27577
Centralab Elctrns. Div., Globe-Union Inc., Dept. EM, Box 858, Hwy. 20 W., Fort Dodge, Iowa 50501
M Control Switch, A Cutler Hammer Co., Dept. EM, 1420 Delmar Dr., Folcroft, Pa. 19032
D CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
Dressen-Barnes Electronics, Div. American Elctrns., Dept. EM, 1600 E. Valencia Dr., Fullerton, Cal. 92631
D Furnas Elec. Co., Dept. EM, 1197 McKee St., Batavia, Ill. 60510
H-B Instr. Co., Dept. EM, 4306 N. American St, Philadelphia, Pa. 19140
Lakeshore Electric Corp., Dept. EM, 205 Willis, Bedford, Ohio 44146
DM Licon Div., Illinois Tool Works, Dept. EM, 6615 W. Irving Park Rd., Chicago, Ill. 60634
Mack Elec. Devices, Dept. EM, 32 Glenside Ave., Wyncote, Pa. 19095
Master Specialties Co., Dept. EM, 1640 Monrovia St., Costa Mesa, Cal. 92627
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Payne Engrg. Co., Dept. EM, Box 70, Scott Depot, W. Va. 25560
M Radio Switch, Dept. EM, State Hwy. 79, Marlboro, N.J. 07746
D Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648
D Specialties Mfg. Co., Inc., Dept. EM, 23425 Harper, St. Clair Shores, Mich. 48080
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
D Wadsworth Electric Mfg. Co., Dept. EM, 20 W. 11th St., Covington, Ky. 41011

Switches, Pressure

Airflyte Elctrns. Co., Dept. EM, Box 207, 56 Hook Rd., Bayonne, N.J. 07002 *
Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
D Cherry Electrical Prods. Corp., Dept. EM, 3623 Sunset Ave., Waukegan, Ill. 60085 ..... *
Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 ..... *
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
Faria Meter Corp., Dept. EM, 19 Faria Lane, Uncasville, Conn. 06382 ..... *
General Elec. Co., Elctrn. Comp. Sis., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Oak Inds. Inc., Switch Div., Dept. EM, Dept. DA, Crystal Lake, Ill. 60014 ..... *
Tapeswitch Corp. Amer., Dept. EM, 100 Schmitt Blvd., Farmingdale, N.Y. 11735 ..... *
M Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
Bourns, Inc., Instr. Div., Dept. EM, 6135 Magnolia, Riverside, Calif. 92506
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
Columbus Electric Mfg. Co., Dept. EM, Box 289A Rt #2, Piney Flats, Tenn. 37686
M Conrac Corp., Systems Sls Div., Dept. EM, Three Landmark Sq., Stamford, Conn. 06901
M Consolidated Controls Corp., Dept. EM, 15 Durant Ave., Bethel, Conn. 06801
M Dietz, Henry G. Co., Inc., Dept. EM, 14-26 28th Ave., Long Island City, N.Y. 11102
Dresser Industries, Dept. EM, 1505 Elm St., Dallas, Tex. 75201
M Essex Controls Div., Essex Grp, Dept. EM, 131 Godfrey St., Logansport, Ind. 46947
D Fairchild Industrial Prods. Div., Dept. EM, 75 Mall Dr., Commack, N.Y. 11725
M Flex Key Corp., Dept. EM, 18 Sargent St., Gloucester, Mass. 01930
D Furnas Elec. Co., Dept. EM, 1197 McKee St., Batavia, Ill. 60510
D Gagne Assocs., Inc., Dept. EM, 1080 Chenango St., Dept. 3EE-27, Binghamton, N.Y. 13901
M Giannini Institute, Dept. EM, 51555 Madison St., Indio, Ca. 92201
M Gulton Inds., Inc., Servonic/Instrumentation Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
Korry Mfg. Co., Dept. EM, 223 8th Ave. N., Seattle, Wash. 98109
Magnetoelastic Devices, Dept. EM, 74 North St Box 625, Pittsfield, MA 01201
DM Pres-Air-Trol Corp., Dept. EM, 895 Mamaroneck Av., Mamaroneck, N.Y. 10543
M Pressure Controls, Inc., Dept. EM, 681 Main St., Belleville, N.J. 07109
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Stow Labs., Inc., Dept. EM, Kane Ind'l. Dr., Hudson, Mass. 01749
D Superior Mfg. & Instrument Corp., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105
Texas Instruments Control Prods. Div., Dept. EM, 34 Forrest St., Attleboro, Mass. 02703
D United Elec. Controls Co., Dept. EM, 85A School St., Watertown, Mass. 02172

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D ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845 ..... p. 3980-3983
D Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
D American Switch Corp., Dept. EM, 134 Water St., Wakefield, Mass. 01880 .. *
American Zettler, Inc., Dept. EM, 16881 Hale Ave., Irvine, Cal. 92714 ..... *
Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 ..... p. 3986,3988-3996
Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
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D C & K Components, Inc., Dept. EM, 103 Morse St., Watertown, Mass. 02172 ..... *
D Cherry Electrical Prods. Corp., Dept. EM, 3623 Sunset Ave., Waukegan, Ill. 60085 ..... p. 4014
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D Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645 ..... p. 3428
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Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... *
Electro-Mech Components, Dept. EM, 1826 N. Floradale Ave., So. El Monte, Cal. 91733 ..... *
Fifth Dimension, Dept. EM, 707 Alexander Rd., Princeton, N.J. 08540 ..... *
Grayhill Inc., Dept. EM, 569 Hillgrove Ave., LaGrange, Ill. 60525 ..... p. 4063,4067,4071
Interswitch, Dept. EM, 770 Airport Blvd., Burlingame, Cal. 94010 ..... p. 4082
D IEE/Schadow, Inc., Dept. EM, 8081 Wallace Rd., Eden Prairie, Minn. 55344 ..... p. 4088,4091
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M Janco Corp., Dept. EM, Box 3038-Glenoaks Sta., Burbank, Cal. 91504 ..... *
Ledex Inc., Dept. EM, 123 Webster St., Dayton, Ohio 45401 ..... *
Maxi-Switch Co., Dept. EM, 9697 East River Road, Minneapolis, Minn. 55433 ..... *
Mc Graw-Edison, Edison Elctrns. Div., Daven Comps., Dept. EM, Grenier Field, Manchester, N.H. 03103 ..... *
D Mechanical Enterprises, Dept. EM, 8000 Forbes Pl., Springfield, VA 22151 ..... p. 4160,4161
D Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 6103 ..... p. 4109,4121
A Talley Ind's Co., , Dept. EM, 135 S. Main St., Thomaston, Conn. 06787 ..... p. 415
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Otto Engrg., Inc., Otto Controls Div., Dept. EM, 36 Main St., Carpentersville, Ill. 60110 ..... *
Potter & Brumfield, Div of AMF, Dept. EM, P.O. Box 322, Princeton, Ind. 47671 ..... *
D Raytheon Co., Distributor Prods. Oper., Dept. EM, Fourth Ave., Burlington, Mass. 01803 ..... p. 4224-422
DM RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102 .....

DM **RCL Electronics Div., AMF Incorporated, Dept. EM, 700 S. 21st St., Irvington, N.J. 07111** ..... p. 4230,4232-4234
Refac Elctrns. Pinlite®, Wild Rover®, Dept. EM, Box 809, W. Hill Rd., Winsted, Conn 06098 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 *
Stackpole Components Co., Dept. EM, Box 14466, Raleigh, N.C. 27610 p. 4247,4249-4253,4278
M **Standard Grigsby Inc., Dept. EM, 920 Rathbone Ave., Aurora, Ill. 60507** p. 4254
Standex Electronics, Dept. EM, 4538 Camberwell Rd., Cincinnati, Ohio 45209 *
UID Electronics Div., AMF Inc., Dept. EM, 4105 Pembroke Rd., Hollywood, Fla. 33021 ..... *
Veetronix, Dept. EM, Box 209, 136 W. 7th St., Cozad, Neb. 69130 ..... *
D **Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629** .... *
D AMP Special Industries, Dept. EM, Valley Forge, Pa. 19482
Centralab Elctrns. Div., Globe-Union Inc., Dept. EM, Box 858, Hwy. 20 W., Fort Dodge, Iowa 50501
D Control Switch, A Cutler Hammer Co., Dept. EM, 1420 Delmar Dr., Folcroft, Pa. 19032
EECO, Dept. EM, 1441 E. Chestnut Ave, Box 659, Santa Ana, Cal. 92701
Essex Controls Div., Essex Grp, Dept. EM, 131 Godfrey St., Logansport, Ind. 46947
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648
D Specialties Mfg. Co., Inc., Dept. EM, 23425 Harper, St. Clair Shores, Mich. 48080
DM Stacoswitch, Inc., Dept. EM, 1139 Baker St., Costa Mesa, Cal. 92626
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
D Switchcraft, Inc., Dept. EM, 5555 N. Elston, Chicago, Ill. 60630
D Tec, Inc., Dept. EM, 2727 N. Fairview, Tuscon, Ariz. 85705

Switches, Program

D **Airflyte Elctrns. Co., Dept. EM, Box 207, 56 Hook Rd., Bayonne, N.J. 07002** *
Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 p. 3992,3995
D **Cherry Electrical Prods. Corp., Dept. EM, 3623 Sunset Ave., Waukegan, Ill. 60085** ..... *
M **Cole Instrument, Div. F.H. Cole Entprs., Dept. EM, 2034 Placentia Ave., Costa Mesa, Cal. 92627** ..... p. 4025
D **Control Products Div., Amerace Corp., Dept. EM, 2330 Vauxhall Rd., Union, N.J. 07083** ..... *
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
Datametrics/Trump Ross, Dept. EM, 340 Fordham Road, Wilmington, Mass. 01887 ..... p. 1396
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Info-Lite Corp., Dept. EM, 46-10 104 St., Corona, N.Y. 11368 ..... *
Information Transfer Industrial, Inc., Dept. EM, Box 357, Holcomb, N.Y. 14469 ..... *
D **Interswitch, Dept. EM, 770 Airport Blvd., Burlingame, Cal. 94010** ..... *
D **IEE/Schadow, Inc., Dept. EM, 8081 Wallace Rd., Eden Prairie, Minn. 55344** *
M **Ledex Inc., Dept. EM, 123 Webster St., Dayton, Ohio 45401** ..... *
M **LVC Inds. Inc., Co-Ord Switch Bloc-Lite Divs., Dept. EM, 135-25 37th Ave., Flushing, N.Y. 11354** ..... *
D **Molex Inc., Dept. EM, 2222 Wellington Ct., Lisle, Ill. 60532** ..... p. 2085
Oak Inds. Inc., Switch Div., Dept. EM, Dept. DA, Crystal Lake, Ill. 60014 p. 4170
DM **RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102** ..... p. 4237
RCL Electronics Div., AMF Incorporated, Dept. EM, 700 S. 21st St., Irvington, N.J. 07111 ..... *
D **Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543** .... p. 1666
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D **Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629** .... *
Automatic Timing & Controls Co., Dept. EM, King of Prussia, Pa. 19406
D Bristol Saybrook Co., Dept. EM, 97 Coulter St., Old Saybrook, Conn. 06475
C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
Candy Mfg. Co., Dept. EM, 626 Grove St., Evanston, Ill 60201
Controls Plant, McGraw Edison Co., Dept. EM, 210 Redstone Hill Rd., Bristol, Conn. 06010
D CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
D Eagle Signal, Mfg. Div. Gulf & Western Inds., Dept. EM, Box 3585, Davenport, Iowa 52808
Electro Space Systems, Inc., Dept. EM, Box 1359, Richardson, Tex. 75080
M Precision Mechanisms Corp., Dept. EM, 44 Brooklyn Ave., Westbury, N.Y. 11590
D Precision Timer Co., Dept. EM, 13 Westbrook Ind'l. Park, Westbrook, Conn. 06498
M Raymond Engrg. Inc., Dept. EM, 217 Smith St., Middletown, Conn. 06457
D Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
Tenor Co., Inc., Dept. EM, 17020 W. Rogers Dr., New Berlin, Wisc. 53151
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D **Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458** ..... *
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D Crouzet/Cridland, Dept. EM, 118 Barrington Commons Ct Ste 207, Barrington, Ill. 60010
D Delavan Electronics, Inc., Dept. EM, 14605 No. 73rd St., Scottsdale, Ariz. 85260
Dolan-Jenner Inds., Inc., Dept. EM, Box 1020, Woburn, Mass. 01801
M Eldec Corp., Dept. EM, Box 100, 16700 13th Ave. W., Lynnwood, Wash. 98036
D Electro Corp., Dept. EM, Box 3049, Sarasota, Fla. 33578
D Electronic Counters & Controls Inc., Dept. EM, 1500 McCormick Blvd., Mundelein, Ill. 60060
FSI/Fork Standards Inc., Dept. EM, 211 Main St., W. Chicago, Ill. 60185
M Giannini Institute, Dept. EM, 51555 Madison St., Indio, Ca. 92201
D Gordon Engineering Corp., Dept. EM, 67 Del Mar Dr., Brookfield, Conn. 06804
M Gulton Inds., Inc., Servonic/Instrumentation Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
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D Namco Controls, Acme-Cleveland Co., Dept. EM, 170 E. 131st St., Cleveland, Ohio 44108
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
M Raymond Engrg. Inc., Dept. EM, 217 Smith St., Middletown, Conn. 06457
D Reed Switch Dev. Co. Inc., Dept. EM, PO Box 1464, Kerrville, Tex. 78028
D Scientific Technology, Dept. EM, 1201 San Antonio Rd., Mountain View, Cal. 94043
Skan-A-Matic Corp., Dept. EM, Box S, Elbridge, N.Y. 13060
D Specialties Mfg. Co., Inc., Dept. EM, 23425 Harper, St. Clair Shores, Mich. 48080
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D **Omron Electronics, Dept. EM, 233 S. Wacker Dr., Chicago, Ill. 60606** *

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D **Raytheon Co., Distributor Prods. Oper., Dept. EM, Fourth Ave., Burlington, Mass. 01803** p. 4228,4229

Refac Elctrns. Pinlite®, Wild Rover®, Dept. EM, Box 809, W. Hill Rd., Winsted, Conn 06098 *

Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 *

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Stackpole Components Co., Dept. EM, Box 14466, Raleigh, N.C. 27610 p. 4247,4252

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D **Trimm, Inc., Dept. EM, 400 W. Lake, Box 489, Libertyville, Ill. 60048** *

D **UID Electronics Div., AMF Inc., Dept. EM, 4105 Pembroke Rd., Hollywood, Fla. 33021** p. 4267

D **Unimax Switch Corp., Sub. Unimax Group, Inc., Dept. EM, Ives Rd., Wallingford, Conn. 06492** p. 4268

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D **Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629** *

D Adalet-PLM Div, Div. Scott & Fetzer Co., Dept. EM, 4801 W. 150th St., Cleveland, Ohio 44135

Ark-Les Switch Corp., Dept. EM, 51 Water St., Watertown, Mass. 02172

Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010

Capitol Machine & Switch Co., Dept. EM, Box 890, Danbury, Conn. 06810

Centralab Elctrns. Div., Globe-Union Inc., Dept. EM, Box 858, Hwy. 20 W., Fort Dodge, Iowa 50501

M Control Prods., Inc., Dept. EM, E. Hanover, N.J. 07936

DM Control Switch, A Cutler Hammer Co., Dept. EM, 1420 Delmar Dr., Folcroft, Pa. 19032

Controls Plant, McGraw Edison Co., Dept. EM, 210 Redstone Hill Rd., Bristol, Conn. 06010

D Crouzet/Cridland, Dept. EM, 118 Barrington Commons Ct Ste 207, Barrington, Ill. 60010

M Essex Controls Div., Essex Grp, Dept. EM, 131 Godfrey St., Logansport, Ind. 46947

D Furnas Elec. Co., Dept. EM, 1197 McKee St., Batavia, Ill. 60510

DM General Automatic Corp., Dept. EM, 70 Liberty St., Metuchen, N.J. 08840

M Haydon Switch & Instr., Inc., Dept. EM, 1500 Meriden Rd., Waterbury, Conn. 06705

Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034

M Jay-El Prods., Dept. EM, 1859 W. 169th St., Gardena, Calif. 90247

D Key Tronic Corp., Dept. EM, Bldg. 14, Spokane Ind'l. Pk., Spokane, Wash. 99216

M Korry Mfg. Co., Dept. EM, 223 8th Ave. N., Seattle, Wash. 98109

Leviton Mfg. Co., Inc., Dept. EM, 59-25 Little Neck Pkwy., Little Neck, N.Y. 11362

D Licon Div., Illinois Tool Works, Dept. EM, 6615 W. Irving Park Rd., Chicago, Ill. 60634

D Luminator Div., Gulton Industries, Dept. EM, 1200 E. Dallas N. Pkwy., Plano, Tex 75074

DM Master Specialties Co., Dept. EM, 1640 Monrovia St., Costa Mesa, Cal. 92627

Methode Elctrns., Inc., Dept. EM, 7447 W. Wilson Ave., Chicago, Ill. 60656

M Milli-Switch Corp., Dept. EM, Box 67, Gladwyne, Pa. 19035

D On-Guard Corp. of America, Dept. EM, 350 Gotham Pkwy., Carlstadt, NJ 07072

D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016

M Panel Components Corp., Dept. EM, 2015 Second St., Berkeley, Cal. 94710

D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696

D Pres-Air-Trol Corp., Dept. EM, 895 Mamaroneck Av., Mamaroneck, N.Y. 10543

D Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410

D Robertshaw Controls Co., Dept. EM, 3705 Marlane Dr, Grove City, Ohio 43123

Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648

SHOGYO International Corp., Dept. EM, 300 Northern Blvd., Great Neck, N.Y. 11021

D Siemens-Allis, Inc., Dept. EM, Box 2168, Milwaukee, Wisc. 53201

D Specialties Mfg. Co., Inc., Dept. EM, 23425 Harper, St. Clair Shores, Mich. 48080

Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201

DM Stacoswitch, Inc., Dept. EM, 1139 Baker St., Costa Mesa, Cal. 92626

Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618

Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050

D Switchcraft, Inc., Dept. EM, 5555 N. Elston, Chicago, Ill. 60630

D Tec, Inc., Dept. EM, 2727 N. Fairview, Tuscon, Ariz. 85705

Texas Instruments Control Prods. Div., Dept. EM, 34 Forrest St., Attleboro, Mass. 02703

Thermo Elec. Co., Inc., Dept. EM, 109 Fifth St., Saddle Brook, N.J. 07662

M Waldman Corp., Dept. EM, 3 Eastmans Rd, Parsippany, NJ 07054

Wilbrecht Electronics, Inc., Dept. EM, 240 Plato Blvd., St. Paul, Minn. 55107

D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

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D **ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845** *

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D Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802

Capitol Machine & Switch Co., Dept. EM, Box 890, Danbury, Conn. 06810

Essex Controls Div., Essex Grp, Dept. EM, 131 Godfrey St., Logansport, Ind. 46947

Hermetic Switch, Inc., Dept. EM, Box 1325, Hwy 92 W., Chickasha, Okla. 73018

M Key Tronic Corp., Dept. EM, Bldg. 14, Spokane Ind'l. Pk., Spokane, Wash. 99216

D Namco Controls, Acme-Cleveland Co., Dept. EM, 170 E. 131st St., Cleveland, Ohio 44108

D OKI Electronics of America, Dept. EM, 4031 N.E. 12th Terr., Ft. Lauderdale, Fla. 33334

D On-Guard Corp. of America, Dept. EM, 350 Gotham Pkwy., Carlstadt, NJ 07072

D Revere Corp. of America, Neptune International Corp., Dept. EM, 845 N. Colony Rd., Wallingford, Conn. 06492

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A. D. Data Sys., Inc., Dept. EM, POB 9209, Rochester, N.Y. 14625 *

Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 *

M **Applied Research Inc., Dept. EM, 76 S. Bayles Ave., Port Washington, N.Y. 11050** *

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North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 *

Re-el Circuits, Inc., Dept. EM, 520 Victor Street, Saddle Brook, N.J. 07662 *

Electro Space Systems, Inc., Dept. EM, Box 1359, Richardson, Tex. 75080

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M Baldpate Electronics, Inc., Dept. EM, 225 E. Main St., Georgetown, Mass. 01833
D Control Switch, A Cutler Hammer Co., Dept. EM, 1420 Delmar Dr., Folcroft, Pa. 19032
M Crown Microwave, Inc., Sub. Microwave Semiconductor Corp., Dept. EM, 6 Executive Park Dr., N. Billerica, Mass. 01862
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Hermetic Switch, Inc., Dept. EM, Box 1325, Hwy 92 W., Chickasha, Okla. 73018
D Mobil Electronics, Inc., Dept. EM, Box 1132, Anderson, Ind. 46015
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M Norlin Communications Inc., Dept. EM, 9125 Gaither Rd., Gaithersburg, Md. 20760
M Radio Switch, Dept. EM, State Hwy. 79, Marlboro, N.J. 07746
Reeve Electronics, Inc., Dept. EM, 609 W. Lake St., Chicago, Ill 60606
M Scientific Communications, Dept. EM, 3425 Kingsley, Garland, Tex. 75041
Summit Engineering Corp., Dept. EM, Box 938, Bozeman, Mont. 59715
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760
Wide Band Engrg. Co. Inc., Dept. EM, Box 21652, Phoenix, Ariz. 85036

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D **Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207** *
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D Control Switch, A Cutler Hammer Co., Dept. EM, 1420 Delmar Dr., Folcroft, Pa. 19032
CTS Corp., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514
D EECO, Dept. EM, 1441 E. Chestnut Ave, Box 659, Santa Ana, Cal. 92701
Essex Controls Div., Essex Grp, Dept. EM, 131 Godfrey St., Logansport, Ind. 46947
Leviton Mfg. Co., Inc., Dept. EM, 59-25 Little Neck Pkwy., Little Neck, N.Y. 11362
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DM American Nucleonics Corp., Dept. EM, 6036 Variel Ave., Woodland Hills, Cal 91367
Astro-Geo-Marine Inc., Dept. EM, 2005 Palma Dr., Ventura, Cal. 93003
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
M Baldpate Electronics, Inc., Dept. EM, 225 E. Main St., Georgetown, Mass. 01833
Barber Corp., Dept. EM, Box 635, Waynesville, Ohio 45068
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
Centralab, Electrns. Div. - Globe Union Inc., Dept. EM, 5757 N. Green Bay Ave., Milwaukee, Wisc. 53201
Cross Electronics Inc., Dept. EM, 100 Commonwealth Dr., Warrendale, Pa. 15086
D Crouzet/Cridland, Dept. EM, 118 Barrington Commons Ct Ste 207, Barrington, Ill. 60010
M Crown Microwave, Inc., Sub. Microwave Semiconductor Corp., Dept. EM, 6 Executive Park Dr., N. Billerica, Mass. 01862
Delaval Turbine Inc., Gems Sensors Div., Dept. EM, Spring La., Farmington, Conn. 06032
Dynage, Inc. Control Prods Grp., Dept. EM, 1331 Blue Hills Ave., Bloomfield, Conn. 06002
D Dynair Elctrns. Inc., Dept. EM, 5275 Market St., San Diego, Calif. 92114
D Electro Corp., Dept. EM, Box 3049, Sarasota, Fla. 33578
Electro Space Systems, Inc., Dept. EM, Box 1359, Richardson, Tex. 75080
Engelmann Microwave, Dept. EM, Skyline Dr., Montville, N.J. 07045
D Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
Gentron Corp., Dept. EM, 6667 N. Sydney Pl., Milwaukee, Wisc. 53209
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
H-B Instr. Co., Dept. EM, 4306 N. American St, Philadelphia, Pa. 19140
HEI, Inc., Dept. EM, Jonathan Ind'l. Ctr., Chaska, Minn. 55318
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Integrated Photomatrix, Dept. EM, 1101 Bristol Rd., Mountainside, N.J. 07092
Jay-El Prods., Dept. EM, 1859 W. 169th St., Gardena, Calif. 90247
D Key Tronic Corp., Dept. EM, Bldg. 14, Spokane Ind'l. Pk., Spokane, Wash. 99216
Leviton Mfg. Co., Inc., Dept. EM, 59-25 Little Neck Pkwy., Little Neck, N.Y. 11362
Licon Div., Illinois Tool Works, Dept. EM, 6615 W. Irving Park Rd., Chicago, Ill. 60634
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
Master Specialties Co., Dept. EM, 1640 Monrovia St., Costa Mesa, Cal. 92627
M Merrimac Inds., Inc., Dept. EM, 41 Fairfield Pl., West Caldwell, N.J. 07006
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
D Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
Modular Audio Products, Dept. EM, 50 Orville Dr., Bohemia, N.Y. 11716
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
Payne Engrg. Co., Dept. EM, Box 70, Scott Depot, W. Va. 25560
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
M Reed Switch Dev. Co. Inc., Dept. EM, PO Box 1464, Kerrville, Tex. 78028
M Scientific Communications, Dept. EM, 3425 Kingsley, Garland, Tex. 75041
D Siliconix, Inc., Dept. EM, 2201 Laurelwood Rd., Santa Clara, Cal 95054
Solidstate Controls, Inc., Dept. EM, 600 Oakland Park Ave., Columbus, Ohio 43214
M Somerset Radiation Lab., Dept. EM, Box 17066, Washington, DC 20041
S S A C Inc., Dept. EM, Box 395, Liverpool, N.Y. 13088
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
D Tec, Inc., Dept. EM, 2727 N. Fairview, Tuscon, Ariz. 85705
D Teccor Electronics, Inc., Dept. EM, 1101 Pamela Dr., Box 669, Euless, Tex. 76039
Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803
M Transco Prods., Inc., Dept. EM, 4241 Glencoe Ave., Venice, Cal. 90291
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304
Wide Band Engrg. Co. Inc., Dept. EM, Box 21652, Phoenix, Ariz. 85036

Switches, Stack

Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 ..... p. 3996
D Cherry Electrical Prods. Corp., Dept. EM, 3623 Sunset Ave., Waukegan, Ill. 60085 ..... *
Chicago Switch, Inc., Dept. EM, 1714 N. Damen, Chicago, Ill. 60647 .. p. 4017
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... p. 4043
Grayhill Inc., Dept. EM, 569 Hillgrove Ave., LaGrange, Ill. 60525 p. 4070,4072
Guardian Electric Co., Dept. EM, 1550 W. Carroll Ave., Chicago, Ill. 60607 .. *
Oak Inds. Inc., Switch Div., Dept. EM, Dept. DA, Crystal Lake, Ill. 60014 ..... *
Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076 ..... *
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
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D T-Bar Inc., Dept. EM, 141 Danbury Rd., Wilton, Conn. 06897 ..... p. 4259
DM ASM Corp, Dept. EM, Box 860, 525 Truck Lane, Smithfield, N.C. 27577
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
Licon Div., Illinois Tool Works, Dept. EM, 6615 W. Irving Park Rd., Chicago, Ill. 60634
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Switchcraft, Inc., Dept. EM, 5555 N. Elston, Chicago, Ill. 60630

Switches, Step Type

D Airflyte Elctrns. Co., Dept. EM, Box 207, 56 Hook Rd., Bayonne, N.J. 07002 *
D Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645 ..... p. 3432
M Cole Instrument, Div. F.H. Cole Entprs., Dept. EM, 2034 Placentia Ave., Costa Mesa, Cal. 92627 ..... p. 4025
D Control Products Div., Amerace Corp., Dept. EM, 2330 Vauxhall Rd., Union, N.J. 07083 ..... *
Fifth Dimension, Dept. EM, 707 Alexander Rd., Princeton, N.J. 08540 ..... *

Guardian Electric Co., Dept. EM, 1550 W. Carroll Ave., Chicago, Ill. 60607 .. *
M **Janco Corp., Dept. EM, Box 3038-Glenoaks Sta., Burbank, Cal. 91504 ..... ***
M **Ledex Inc., Dept. EM, 123 Webster St., Dayton, Ohio 45401 ..... p. 4098**
DM **Oak Inds. Inc., Switch Div., Dept. EM, Dept. DA, Crystal Lake, Ill. 60014 ..... ***
D **Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076 ..... ***
DM **RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102 ..... ***
M **RCL Electronics Div., AMF Incorporated, Dept. EM, 700 S. 21st St., Irvington, N.J. 07111 ..... ***
Schrack Electrical Sales Corp., Dept. EM, 1140 Broadway Rm 205, New York, N.Y. 10001 ..... p. 3610
Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543 ..... *
Shallco, Inc., Dept. EM, Box 1089, Smithfield, N.C. 27577 ..... *
M **Tech Labs., Inc., Dept. EM, Bergen & Edsall Blvds., Palisades Pk., N.J. 07650 ***
DM ASM Corp, Dept. EM, Box 860, 525 Truck Lane, Smithfield, N.C. 27577
Centralab Elctrns. Div., Globe-Union Inc., Dept. EM, Box 858, Hwy. 20 W., Fort Dodge, Iowa 50501
Leviton Mfg. Co., Inc., Dept. EM, 59-25 Little Neck Pkwy., Little Neck, N.Y. 11362
D Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
D R L C Elctrns., Inc., Dept. EM, 83 Radio Cir., Mt. Kisco, N.Y. 10549
Tenor Co., Inc., Dept. EM, 17020 W. Rogers Dr., New Berlin, Wisc. 53151
Universal Relay Corp., Dept. EM, 42 White St., New York, N.Y. 10013

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Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
Elmwood Sensors, Inc., Dept. EM, 1655 Elmwood Ave., Cranston, RI 02907 p. 4272
Mc Graw-Edison, Edison Elctrns. Div., Daven Comps., Dept. EM, Grenier Field, Manchester, N.H. 03103 ..... *
D **Midwest Components, Dept. EM, 1981 Port City Blvd., Muskegon, Mich. 49400 ..... p. 4279**
North American Philips Controls, Dept. EM, Husky Park, Frederick, Md. 21701 ..... p. 4219
Burling Instr. Co., Dept. EM, 16 River Rd., Box 298, Chatham, N.J. 07928
M Control Prods., Inc., Dept. EM, E. Hanover, N.J. 07936
M Cox & Co., Inc., Dept. EM, 215 Park Ave., S., New York, N.Y. 10003
GTE Sylvania Inc., Dept. EM, Rte. 35, Standish, Maine 04084
H-B Instr. Co., Dept. EM, 4306 N. American St, Philadelphia, Pa. 19140
Mack Elec. Devices, Dept. EM, 32 Glenside Ave., Wyncote, Pa. 19095
D On-Guard Corp. of America, Dept. EM, 350 Gotham Pkwy., Carlstadt, NJ 07072
Princo Instrs., Dept. EM, Industrial Pk., Southampton, Pa. 18966
D Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
Sundstrand Data Control, Dept. EM, Overlake Ind'l. Pk., Redmond, Wash. 98052
Therm-O-Disc, Inc., Dept. EM, South Main St., Mansfield, Ohio 44907
D United Elec. Controls Co., Dept. EM, 85A School St., Watertown, Mass. 02172
D West Instrs, Gulton Inds, M. C. S. Div., Dept. EM, Gulton Indl Pk, E. Greenwich, RI 02818

Switches, Thumbwheel

Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 p. 3985-3987
D **Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634 ..... ***
D **C & K Components, Inc., Dept. EM, 103 Morse St., Watertown, Mass. 02172 ***
D **Cherry Electrical Prods. Corp., Dept. EM, 3623 Sunset Ave., Waukegan, Ill. 60085 ..... p. 4015**
DM **Digitran Co., Dept. EM, 855 So. Arroyo Pkwy., Pasadena, Cal. 91105 p. 4045-4049**
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... ***
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
D **Interswitch, Dept. EM, 770 Airport Blvd., Burlingame, Cal. 94010 ..... p. 4083**
LVC Inds. Inc., Co-Ord Switch Bloc-Lite Divs., Dept. EM, 135-25 37th Ave., Flushing, N.Y. 11354 ..... *
Mc Graw-Edison, Edison Elctrns. Div., Daven Comps., Dept. EM, Grenier Field, Manchester, N.H. 03103 ..... *
Oak Inds. Inc., Switch Div., Dept. EM, Dept. DA, Crystal Lake, Ill. 60014 ..... *
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
M **Tech Labs., Inc., Dept. EM, Bergen & Edsall Blvds., Palisades Pk., N.J. 07650 p. 4260**
D **Unimax Switch Corp., Sub. Unimax Group, Inc., Dept. EM, Ives Rd., Wallingford, Conn. 06492 ..... p. 4268**
D AMP Special Industries, Dept. EM, Valley Forge, Pa. 19482
Centralab Elctrns. Div., Globe-Union Inc., Dept. EM, Box 858, Hwy. 20 W., Fort Dodge, Iowa 50501
D Crouzet/Cridland, Dept. EM, 118 Barrington Commons Ct Ste 207, Barrington, Ill. 60010
DM EECO, Dept. EM, 1441 E. Chestnut Ave, Box 659, Santa Ana, Cal. 92701
HEI, Inc., Dept. EM, Jonathan Ind'l. Ctr., Chaska, Minn. 55318
D Inter-Market, Inc., Dept. EM, 1946 Lehigh Ave., Glenview, Ill. 60025
Leviton Mfg. Co., Inc., Dept. EM, 59-25 Little Neck Pkwy., Little Neck, N.Y. 11362
Master Specialties Co., Dept. EM, 1640 Monrovia St., Costa Mesa, Cal. 92627
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Philips Audio Video Sys, Neutrik Prods, Dept. EM, 91 McKee Dr., Mahwah, N.J. 07430
Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648
D Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
Switchcraft, Inc., Dept. EM, 5555 N. Elston, Chicago, Ill. 60630

Switches, Time Delay

D **Adams & Westlake Co., Dept. EM, 1025 W. Michigan St., Elkhart, Ind. 46514 p. 3411**
M **Airpax Elctrns., Inc., Cambridge Div., Dept. EM, Woods Rd., Cambridge, Md. 21613 ..... ***
Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
M **Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470 ..... ***
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Durakool, Dept. EM, 1010 N. Main St., Elkhart, Ind. 46514 ..... *
DM **Leach Corp., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003 ..... ***
D **Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032 ***
North American Philips Controls Corp., Dept. EM, Cheshire Industrial Pk. Box E, Cheshire, Conn. 06410 ..... *
D **Omron Electronics, Dept. EM, 233 S. Wacker Dr., Chicago, Ill. 60606 ..... ***
M **Sigmapower, Inc., Dept. EM, 20790 Leapwood Ave., Carson, Cal. 90746 .... ***
Advanced Technology Sys., Dept. EM, 450 W. First Ave., Roselle, N.J. 07023
DM Associated Engrg. & Mfg. Corp., Dept. EM, 546 Valley Rd., Upper Montclair, N.J. 07043
Automatic Timing & Controls Co., Dept. EM, King of Prussia, Pa. 19406
D Bristol Saybrook Co., Dept. EM, 97 Coulter St., Old Saybrook, Conn. 06475
Bulova Systems & Instrument Corp., Dept. EM, Green Acres Rd., W., Valley Stream, N.Y. 11582
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
D Crouzet/Cridland, Dept. EM, 118 Barrington Commons Ct Ste 207, Barrington, Ill. 60010
D Eagle Signal, Mfg. Div. Gulf & Western Inds., Dept. EM, Box 3585, Davenport, Iowa 52808
M Electro-Module, Inc., Dept. EM, 2855 Metropolitan Place, Pomona, Cal. 91767
Hartman Electrical Mfg., Div. A-T-O Inc., Dept. EM, 175 N. Diamond St., Mansfield, Ohio 44902
Hoagland Instr Co, Div Tech Dev, Dept. EM, Box 550, Dayton, N.J. 08810
M Raymond Engrg. Inc., Dept. EM, 217 Smith St., Middletown, Conn. 06457
M Regmo Data Corp., Dept. EM, 7275 Bush Lk Rd., Minneapolis, Minn. 55435
D Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
S S A C Inc., Dept. EM, Box 395, Liverpool, N.Y. 13088
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
M Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803
Therm-O-Disc, Inc., Dept. EM, South Main St., Mansfield, Ohio 44907
D Zenith Controls Inc., Dept. EM, 830 West 40th St., Chicago, Ill. 60609

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M **Airpax Elctrns., Inc., Cambridge Div., Dept. EM, Woods Rd., Cambridge, Md. 21613 ..... ***
D **ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845 ..... p. 3980,3982**
Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
D **American Switch Corp., Dept. EM, 134 Water St., Wakefield, Mass. 01880 p. 3984**
Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 ..... p. 3990
D **Arcolectric Corp., Dept. EM, Box 348, 11120 Chandler Blvd., No. Hollywood, Cal. 91603 ..... ***
D **C & K Components, Inc., Dept. EM, 103 Morse St., Watertown, Mass. 02172 p. 4020**
D **Carlingswitch Inc., Dept. EM, 505 New Park Ave., W. Hartford, Conn. 06110 p. 4009,4010,4012,4013**
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D **Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101 ..... p. 4026**
D **Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... p. 4041,4042**
D **CW Industries, Dept. EM, 550 Davisville Rd., Warminster, Pa. 18974 .. p. 4040**
Dialight, Dept. EM, 203 Harrison Pl., Brooklyn, N.Y. 11237 ..... *
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... ***
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D **IEE/Schadow, Inc., Dept. EM, 8081 Wallace Rd., Eden Prairie, Minn. 55344 ***
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D **McGill Mfg. Co. Inc., Electrical Div., Dept. EM, 909 Lafayette St., Valparaiso, Ind. 46383 ..... p. 4107**
Mc Graw-Edison, Edison Elctrns. Div., Daven Comps., Dept. EM, Grenier Field, Manchester, N.H. 03103 ..... *
DM **Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032 p. 4109,4135,4137,4138,4140,4141**
D **Oak Inds. Inc., Switch Div., Dept. EM, Dept. DA, Crystal Lake, Ill. 60014 ..... ***
D **Omron Electronics, Dept. EM, 233 S. Wacker Dr., Chicago, Ill. 60606 ..... ***
DM **Otto Engrg., Inc., Otto Controls Div., Dept. EM, 36 Main St., Carpentersville, Ill. 60110 ..... p. 4216,4217**
D **Raytheon Co., Distributor Prods. Oper., Dept. EM, Fourth Ave., Burlington, Mass. 01803 ..... p. 4224-4226**
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
DM **Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2146,2147**
D **Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 ***
D **T-Bar Inc., Dept. EM, 141 Danbury Rd., Wilton, Conn. 06897 ..... p. 4258**
M **Tech Labs., Inc., Dept. EM, Bergen & Edsall Blvds., Palisades Pk., N.J. 07650 ***
UID Electronics Div., AMF Inc., Dept. EM, 4105 Pembroke Rd., Hollywood, Fla. 33021 ..... *
D **Unimax Switch Corp., Sub. Unimax Group, Inc., Dept. EM, Ives Rd., Wallingford, Conn. 06492 ..... p. 4268**

Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
Ark-Les Switch Corp., Dept. EM, 51 Water St., Watertown, Mass. 02172
Bryant Electric, Dept. EM, 1421 State St., Bridgeport, Conn. 06602
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
Centralab Elctrns. Div., Globe-Union Inc., Dept. EM, Box 858, Hwy. 20 W., Fort Dodge, Iowa 50501
M Control Prods., Inc., Dept. EM, E. Hanover, N.J. 07936
DM Control Switch, A Cutler Hammer Co., Dept. EM, 1420 Delmar Dr., Folcroft, Pa. 19032
D Crouzet/Cridland, Dept. EM, 118 Barrington Commons Ct Ste 207, Barrington, Ill. 60010
Essex Controls Div., Essex Grp, Dept. EM, 131 Godfrey St., Logansport, Ind. 46947
D General Elec. Co, Wiring Device Bus. Dept., Dept. EM, 95 Hathaway St., Providence, R.I. 02904
M Haydon Switch & Instr., Inc., Dept. EM, 1500 Meriden Rd., Waterbury, Conn. 06705
Leviton Mfg. Co., Inc., Dept. EM, 59-25 Little Neck Pkwy., Little Neck, N.Y. 11362
M Milli-Switch Corp., Dept. EM, Box 67, Gladwyne, Pa. 19035
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
D Mitsumi Elec. Co., Ltd., Dept. EM, 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan
D On-Guard Corp. of America, Dept. EM, 350 Gotham Pkwy., Carlstadt, NJ 07072
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Philmore Mfg. Co. Inc., Dept. EM, 40 Inip Dr., Inwood, N.Y. 11696
D Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
Seacor, Inc., Dept. EM, 598 Broadway, Norwood, N.J. 07648
D Specialties Mfg. Co., Inc., Dept. EM, 23425 Harper, St. Clair Shores, Mich. 48080
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
D Tec, Inc., Dept. EM, 2727 N. Fairview, Tuscon, Ariz. 85705
Texas Instruments Control Prods. Div., Dept. EM, 34 Forrest St., Attleboro, Mass. 02703
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

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ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845 ..... *
D Cherry Electrical Prods. Corp., Dept. EM, 3623 Sunset Ave., Waukegan, Ill. 60085 ..... *
Chomerics, Inc., Dept. EM, 77 Dragon Court, Woburn, Mass. 01801 ..... *
D Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101 ..... *
Fifth Dimension, Dept. EM, 707 Alexander Rd., Princeton, N.J. 08540 ..... *
Guardian Electric Co., Dept. EM, 1550 W. Carroll Ave., Chicago, Ill. 60607 .. *
Industrial Elctrn. Engrs., Dept. EM, 7740 Lemona Ave., Van Nuys, Cal. 91405 *
IEE/Schadow, Inc., Dept. EM, 8081 Wallace Rd., Eden Prairie, Minn. 55344 p. 4093
D Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032 p. 4125,4132
RCL Electronics Div., AMF Incorporated, Dept. EM, 700 S. 21st St., Irvington, N.J. 07111 ..... *
Refac Elctrns. Pinlite®, Wild Rover®, Dept. EM, Box 809, W. Hill Rd., Winsted, Conn 06098 ..... p. 4220
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Automation Displays Inc., Dept. EM, 3833 N. White Ave., Eau Claire, Wisc. 54701
D Centralab, Electrns. Div. - Globe Union Inc., Dept. EM, 5757 N. Green Bay Ave., Milwaukee, Wisc. 53201
M Flex Key Corp., Dept. EM, 18 Sargent St., Gloucester, Mass. 01930
D Key Tronic Corp., Dept. EM, Bldg. 14, Spokane Ind'l. Pk., Spokane, Wash. 99216
Master Specialties Co., Dept. EM, 1640 Monrovia St., Costa Mesa, Cal. 92627
D Pacific Electricord Co., Dept. EM, 747 W. Redondo Beach Blvd., Box 10, Gardena, Cal. 90247
DM Pres-Air-Trol Corp., Dept. EM, 895 Mamaroneck Av., Mamaroneck, N.Y. 10543
Relay Service Co., Dept. EM, 1310 N. Pulaski Rd., Chicago, Ill. 60651
Sheldahl, Inc., Electrical Prods. Div., Dept. EM, Box 170, Northfield, Minn. 55057

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Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
M Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706 ..... *
M Cole Instrument, Div. F.H. Cole Entprs., Dept. EM, 2034 Placentia Ave., Costa Mesa, Cal. 92627 ..... *
D Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101 ..... *
M Daico Industries Inc., Dept. EM, Box 5225, Compton, Cal. 90220 ..... p. 2869
M Electro Switch Corp., Dept. EM, King Ave., Weymouth, Mass. 02188 .. p. 4053
Fifth Dimension, Dept. EM, 707 Alexander Rd., Princeton, N.J. 08540 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
M General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 *
M Janco Corp., Dept. EM, Box 3038-Glenoaks Sta., Burbank, Cal. 91504 ..... *
M Kilovac Corp., Dept. EM, Box 4422, Santa Barbara, Cal. 93103 ..... *
Ledex Inc., Dept. EM, 123 Webster St., Dayton, Ohio 45401 ..... *
Matrix Systems Corp., Dept. EM, 9411 Lurline Ave., Chatsworth, Cal. 91311 *
M Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... *
Tech Labs., Inc., Dept. EM, Bergen & Edsall Blvds., Palisades Pk., N.J. 07650 *
Hartman Electrical Mfg., Div. A-T-O Inc., Dept. EM, 175 N. Diamond St., Mansfield, Ohio 44902
Lakeshore Electric Corp., Dept. EM, 205 Willis, Bedford, Ohio 44146
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
Relay Service Co., Dept. EM, 1310 N. Pulaski Rd., Chicago, Ill. 60651
D R L C Elctrns., Inc., Dept. EM, 83 Radio Cir., Mt. Kisco, N.Y. 10549
Solidstate Controls, Inc., Dept. EM, 600 Oakland Park Ave., Columbus, Ohio 43214
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
D Zenith Controls Inc., Dept. EM, 830 West 40th St., Chicago, Ill. 60609

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Faria Meter Corp., Dept. EM, 19 Faria Lane, Uncasville, Conn. 06382 ..... *
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 ..... p. 4087
DM Kilovac Corp., Dept. EM, Box 4422, Santa Barbara, Cal. 93103 ..... *
M Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... p. 3609
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Columbus Electric Mfg. Co., Dept. EM, Box 289A Rt #2, Piney Flats, Tenn. 37686
Consolidated Controls Corp., Dept. EM, 15 Durant Ave., Bethel, Conn. 06801
Fredericks Co., Dept. EM, Philmont & Anne Sts., Huntingdon Valley, Pa. 19006
D Gagne Assocs., Inc., Dept. EM, 1080 Chenango St., Dept. 3EE-27, Binghamton, N.Y. 13901
Magnetoelastic Devices, Dept. EM, 74 North St Box 625, Pittsfield, MA 01201
DM Pres-Air-Trol Corp., Dept. EM, 895 Mamaroneck Av., Mamaroneck, N.Y. 10543
M Pressure Controls, Inc., Dept. EM, 681 Main St., Belleville, N.J. 07109
D United Elec. Controls Co., Dept. EM, 85A School St., Watertown, Mass. 02172
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Westinghouse Electric Corp., Indl & Gov't Tube, Dept. EM, Westinghouse Circle, Horseheads, N.Y. 14845

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American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
M Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706 ..... *
Fifth Dimension, Dept. EM, 707 Alexander Rd., Princeton, N.J. 08540 ..... *
M General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 p. 2871
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
M Aircom, Inc., Dept. EM, Rte. 16B, Union, N.H. 03887
M Airtron, Div. Litton Inds., Dept. EM, 200 E. Hanover Ave., Morris Plains, N.J. 07950
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
M Eastern Microwave Corp., Dept. EM, 4 Gill St., Woburn, MA 01801
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
D Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
D Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
M Nurad, Inc., Dept. EM, 2165 Druid Pk. Dr., Baltimore, Md. 21211
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
M RF Systems, Inc., Dept. EM, 3100 Communications Rd., St Cloud, Fla. 32769
Sivers Lab, Dept. EM, Box 90339, Los Angeles, Cal. 90009
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
M Teledyne Microwave, Dept. EM, 1290 Terra Bella Ave., Mountain View, Cal. 94040
M Transco Prods., Inc., Dept. EM, 4241 Glencoe Ave., Venice, Cal. 90291
TRG,, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
Triangle Microwave Inc., Dept. EM, 9B Great Meadow La, East Hanover, NJ 07936
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006

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Synchro Transmitters, Solid-State

M Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731 ..... *
M Control Sciences, Inc., Dept. EM, 8399 Topanga Canyon Blvd., Canoga Park, Cal. 91304 ..... *
M Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 ..... *
M ILC Data Device Corp., Dept. EM, Airport Int'l. Plaza, Bohemia, N.Y. 11716 *
M Interface Engineering Inc., Dept. EM, 386 Lindelof Ave., Stoughton, Mass. 02072 ..... *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... *
M Natel Engineering Co., Dept. EM, 8954 Mason Ave., Canoga Park, Cal. 91306 *
M North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803 ..... *
M Transmagnetics, Inc., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735 p. 1673
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424

Synchronizers, Klystron & BWO

Frequency Engrg. Labs., Dept. EM, Box 527, Farmingdale, N.J. 07727
Micro-Now Instr. Co., Dept. EM, 6104 N. Pulaski Rd., Chicago, Ill. 60646

Synchros

M Clifton Precision, Litton Systems, Inc., Dept. EM, Marple at Brdway., Clifton Hgts., Pa. 19018 ..... *
M Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731 ..... *
ILC Data Device Corp., Dept. EM, Airport Int'l. Plaza, Bohemia, N.Y. 11716 p. 1644,1645

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M **Vernitron Corp., Control Components Div., Dept. EM, 1601 Precision Park La., San Diego, Cal. 92013** ..... p. 2277
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
M Electric Indicator Co., Inc., Dept. EM, 272 Main Avenue, Norwalk, Conn. 06851
Henschel Corp., Dept. EM, 14 Cedar St., Amesbury, Mass. 01913
M IMC Magnetics Corp., Western Div., Dept. EM, 6058 Walker Ave., Maywood, Cal. 90270
M Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
M Transicoil, Inc., Dept. EM, Worcester, Pa. 19490

Synthesizers, Delay Line

M **Computer Devices Corp., Dept. EM, 63 Austin Blvd., Commack, N.Y. 11725** *
M **Control Elctrns. Co., Inc., Dept. EM, 153 Florida St., Farmingdale, N.Y. 11735** *
M **Data Delay Devices, Dept. EM, 253 Crooks Ave., Clifton, N.J. 07011** ..... *
M **ESC Elctrns. Corp., Dept. EM, 534 Bergen Blvd., Palisades Pk., N.J. 07650** *
Exact Electronics, Inc., Dept. EM, Box 160, 455 SE 2nd Ave., Hillsboro, Ore. 97123 ..... *
Kappa Networks, Dept. EM, 165 Roosevelt Ave, Carteret, N.J. 07008 ..... *
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230

Synthesizers, Frequency

Abacus Controls Inc., Dept. EM, 89 Redington Rd., Somerville, N.J. 08876 *
ADRET/COMSTRON, Dept. EM, 200 E. Sunrise Hwy, Freeport, NY 11520 p. 2682
M **Applied Microwave, Div. Epsco Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090** ..... *
Applied Research Inc., Dept. EM, 76 S. Bayles Ave., Port Washington, N.Y. 11050 ..... p. 2866,2867
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M **Comstron Seg., Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520** ..... *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
M **Epsco, Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090** ..... *
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D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043** p. 2742
M **Frequency Elctrns., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040** p. 2324
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
M **ILC Data Device Corp., Dept. EM, Airport Int'l. Plaza, Bohemia, N.Y. 11716** *
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Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
Wavetek Indiana, Inc., Dept. EM, 66 N. First Ave., Beech Grove, Ind. 46107 *
D Ailtech, Dept. EM, 2070 Fifth Ave, Ronkonkoma, NY 11779
Anadex Inc., Dept. EM, 9825 De Soto, Chatsworth, Cal. 91311
M A.R.F. Products, Dept. EM, Box 3226, Boulder, Colo. 80303
Dynatron Co., Dept. EM, Box 48822, Los Angeles, Cal. 90048
M Assocs. Inc., Dept. EM, 333 W. Commercial St., East Rochester, N.Y. 14445
Frequency West, Inc., Dept. EM, 3140 Alfred St., Santa Clara, Cal. 95050
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
M LogiMetrics Inc., Dept. EM, 121-03 Dupont St., Plainview, NY 11803
Luff Research, Dept. EM, Box 449, Jackson Hgts., N.Y. 11372
Multimetrics Div. of Comstro, Comstron-Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11580
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
Programmed Test Sources, Dept. EM, 194 Old Pickard Rd., Concord, Mass. 01742
Racal-Dana Instrus Inc., Dept. EM, 18912 Von Karman Ave., Irvine, Cal. 92715
Real Time Systems Inc., Dept. EM, 152 S. MacQuesten Pkwy., Mt. Vernon, N.Y. 10550
Resdel Engineering Corp., Dept. EM, 300 E. Live Oak Ave., Arcadia, Cal. 91006
Scientific Communications, Dept. EM, 3425 Kingsley, Garland, Tex. 75041
Seg Subsidiary, Comstron Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520
D Snelgrove, C. R. Ltd., Dept. EM, 141 Bond Ave., Don Mills 404 Ont., Ont. Can.
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
D Tau-Tron Inc., Dept. EM, 11 Esquire Rd., N. Billerica, Mass. 01862
M Technical Mat'l., Dept. EM, 700 Fenimore Rd., Mamaroneck, N.Y. 10543
VHF Engrg, Div. of Brownian Elctrns. Corp., Dept. EM, 320 Water St., Binghamton, N.Y. 13902
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760
M Zeta Laboratories, Inc., Dept. EM, 3265 Scott Blvd., Santa Clara, Cal. 95051

Synthesizers, Waveform

Abacus Controls Inc., Dept. EM, 89 Redington Rd., Somerville, N.J. 08876 *
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Wavetek Indiana, Inc., Dept. EM, 66 N. First Ave., Beech Grove, Ind. 46107 *
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
Real Time Systems Inc., Dept. EM, 152 S. MacQuesten Pkwy., Mt. Vernon, N.Y. 10550

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M **Aeroflex Labs., Magnetic Prods. Div., Dept. EM, South Service Rd., Plainview, N.Y. 11803** ..... *
Airpax Elctrns., Controls Div., Dept. EM, 6801 W. Sunrise Blvd., Ft. Lauderdale, Fla. 33313 ..... p. 2258
D **Beede Electrical Instr. Co., Dept. EM, S. Main St., Penacook, N.H. 03301** p. 2664
M **BEI Elctrns., Inc., Dept. EM, 1101 McAlmont St., Little Rock, Ark. 72203** p. 1384-1387
Datametrics/Trump Ross, Dept. EM, 340 Fordham Road, Wilmington, Mass. 01887 ..... *
Electro-Craft Corp., Dept. EM, 1600 2nd St. South, Hopkins, Minn. 55343 .. *
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D **Kessler-Ellis Prods., Dept. EM, 120 1st Ave., Atlantic Highlands, N.J. 07716** p. 1650
M **Magnetic Technology, Vernitron Corp., Dept. EM, 21001 Kittridge St., Canoga Pk., Cal. 91303** ..... *
M **Micro-Mo Electronics Inc., Dept. EM, 3691 Lee Rd., Cleveland, Ohio 44120** *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D **Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705** ..... *
D **United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403** ..... *
D **Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114** ..... *
Aetna Engrg., Dept. EM, P.O. Box 7749, Van Nuys, Cal. 91409
D Dynapar Corp., Dept. EM, 1675 Delany Rd., Gurnee, Ill. 60031
Dynetic Systems, Dept. EM, 19128 Indl Blvd., Elk River, Minn 55330
M Electric Tachometer Corp., Dept. EM, 68th & Upland Sts., Philadelphia, Pa. 19142
D Electro Corp., Dept. EM, Box 3049, Sarasota, Fla. 33578
D Electronic Counters & Controls Inc., Dept. EM, 1500 McCormick Blvd., Mundelein, Ill. 60060
M Howell Inst. Inc., Dept. EM, 3479 W. Vickery Blvd., Ft. Worth, Tex. 76107
D JPI, Inc., Dept. EM, 1507 San Vicente Blvd., Santa Monica, Cal. 90402
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
Parametrics, Div. Zero-Max Inds., Dept. EM, 284 Racebrook Rd., Orange, Conn. 06477
DM Pioneer Elec. & Resch. Co., Dept. EM, 743 Circle Dr., Forest Park, Ill. 60130
DM Power Instrs., Inc., Dept. EM, 7352 N. Lawndale Ave., Skokie, Ill. 60076
Richard-Lee Co., Dept. EM, Box 724, New Providence, N.J. 07974
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Spectral Dynamics Corp., Dept. EM, Box 671, San Diego, Cal. 92112
UFAD Corp., Dept. EM, 700 36th St. S.E., Grand Rapids, Mich. 49508
D Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102
West Coast Resch. Corp., Dept. EM, Box 25061, Los Angeles, Cal. 90025

Tachometers, Generator

M **Aeroflex Labs., Magnetic Prods. Div., Dept. EM, South Service Rd., Plainview, N.Y. 11803** ..... p. 3070,3071
Beede Electrical Instr. Co., Dept. EM, S. Main St., Penacook, N.H. 03301 p. 2664
D **Canon U.S.A., Inc., Dept. EM, 10 Nevada Dr., Lake Success, N.Y. 11040** p. 3078
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D **Electro-Craft Corp., Dept. EM, 1600 2nd St. South, Hopkins, Minn. 55343** p. 3083
Esterline Angus, Dept. EM, Box 24000, Indianapolis, Ind. 46224 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
M **Gerator Corporation, Dept. EM, Box 70, Manassas, Va. 22110** ..... *
I M C Magnetics, Eastern Div., Dept. EM, 570 Main St., Westbury, N.Y. 11590 *
M **Magnetic Technology, Vernitron Corp., Dept. EM, 21001 Kittridge St., Canoga Pk., Cal. 91303** ..... p. 3098
M **Micro-Mo Electronics Inc., Dept. EM, 3691 Lee Rd., Cleveland, Ohio 44120** p. 3100,3101
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M **Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729** ..... p. 3130
D **Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114** ..... *
D **Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523** ..... *
M American Electronics, Inc., Dept. EM, 1600 E Valencia Dr., Fullerton, Cal. 92631
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
D Carter Motor Co., Dept. EM, 2707 W. George St., Chicago, Ill. 60618
Dynetic Systems, Dept. EM, 19128 Indl Blvd., Elk River, Minn 55330
M Electric Indicator Co., Inc., Dept. EM, 272 Main Avenue, Norwalk, Conn. 06851
Electric Tachometer Corp., Dept. EM, 68th & Upland Sts., Philadelphia, Pa. 19142
Evershed & Vignoles Ltd., Dept. EM, Action Lane, Chiswick, London, England W4 5HJ
Hathaway Instruments Inc., Dept. EM, 11616 51st St., Tulsa, Okla. 74145
Howell Inst. Inc., Dept. EM, 3479 W. Vickery Blvd., Ft. Worth, Tex. 76107
– Indiana General, Dept. EM, 1168 Barranca Dr, El Paso, Tx 79935

M Inland Motor Div. Kollmorgen, Indl Drives Grp, Dept. EM, 609 Rock Rd., Radford, Va. 24141
M Inland Motor Div. Kollmorgen, Dept. EM, Spec Prods., 501 First St., Radford, Va. 24141
Kollsman Instr. Co., Dept. EM, Daniel Webster Hwy., Merrimack, N.H. 03054
D LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
M MPC Prods. Corp., Dept. EM, 4200 W. Victoria Ave., Chicago, Ill. 60646
Parametrics, Div. Zero-Max Inds., Dept. EM, 284 Racebrook Rd., Orange, Conn. 06477
PMI Motors, Kollmorgen Corp., Dept. EM, 5 Aerial Way, Syosset, NY 11791
M Powertron Corp., Dept. EM, 3821 Barringer Dr., Charlotte, N.C. 28210
M Sierracin/Magnedyne Inc., Dept. EM, 5580 El Camino Real, Box 458, Carlsbad, Cal. 92008
Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
DM Sticht Co., Inc. Herman H., Dept. EM, 27 Park Pl., New York, N.Y. 10007
M Transicoil, Inc., Dept. EM, Worcester, Pa. 19490
Vibrac Corp., Dept. EM, 11 Alpha Rd., Chelmsford, Mass. 01824

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D Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
D Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... *
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Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
Harris Circuits Mfg. Co., Dept. EM, 2712 Colley Ave., Norfolk, VA. 23517
National Camera Inc., Dept. EM, 2000 W. Union Ave., Englewood, Colo. 80110
DM Pioneer Elec. & Resch. Co., Dept. EM, 743 Circle Dr., Forest Park, Ill. 60130
M Power Instrs., Inc., Dept. EM, 7352 N. Lawndale Ave., Skokie, Ill. 60076
DM Sticht Co., Inc. Herman H., Dept. EM, 27 Park Pl., New York, N.Y. 10007

Tape Decks—See Recorders, Magnetic Tape; Transports, Tape

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Tape Recording Accessories

D California Instrs., Dept. EM, 5150-Convoy St., San Diego, Cal. 92111 ..... *
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
M International Electro-Magnetics, Dept. EM, 350 N. Eric Dr., Palatine, Ill. 60067 *
Mac Panel Co., Dept. EM, Box 5027, 216 Pine St., High Pt., N.C. 27262 ..... *
Alinabal, Div. of MPB Corp., Dept. EM, 28 Woodmont Rd., Milford, Conn. 06460
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
Amilon Corp., Dept. EM, 49-12 30th Ave., Woodside, N.Y. 11377
Ampex Corp., Dept. EM, 401 Broadway, Redwood City, Cal. 94063
D Ampro Corp., Dept. EM, 850 Pennsylvania Blvd., Feasterville, PA. 19047
D Annis R B Co., Dept. EM, 1101 N. Delaware, Indianapolis, Ind. 46202
Bell & Howell Co., Elctrns. & Instrs. Grp., Dept. EM, 360 Sierra Madre Villa, Pasadena, Cal. 91109
Data Check Corp., Dept. EM, 10070 Willow Creek Rd., San Diego, Cal 92131
Data General Corp., Dept. EM, 15 Turnpike Rd Rte 9, Westboro, Mass 01581
Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
D Duotone Co., Dept. EM, 6875 S.W. 81st St., S. Miami, Fla. 33143
D Electro-Voice, Sub. Gulton Inds., Dept. EM, 600 Cecil St., Buchanan, Mich. 49107
D Intern'l. Computer Prods., Inc., Dept. EM, 2925 Merrell Rd., Dallas, Tex. 75229
M Kenton Engrg. Corp., Dept. EM, 8232 Christiana Ave., Skokie, Ill. 60076
MFE Corp., Dept. EM, Keewaydin Dr., Salem, N.H. 03079
D Nortronics Co., Inc., Dept. EM, 8101 Tenth Ave., N., Minneapolis, Minn. 55427
Potter Instr. Co. Inc., Dept. EM, 151 Sunnyside Blvd., Plainview, N.Y. 11803
DM Qantex, div. North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803
D Recoton Corp., Dept. EM, 46-23 Crane St., Long Island City, N.Y. 11101
M Robins Ind's. Corp., Consumer Products Div., Dept. EM, 75 Austin Blvd., Commack, N.Y. 11725
M Telectro Sys. Corp., Dept. EM, 96-18 43rd Ave., Corona, N.Y. 11368
Television Equip. Assocs., Dept. EM, Box 260, South Salem, N.Y. 10590
D Telex Communications, Inc., Dept. EM, 9600 Aldrich Ave., So., Minneapolis, Minn. 55420
Video Research Corporation, Dept. EM, 6985 Garden Rd., Riviera Beach, Fla. 33404
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Tape Search Equipment

M Chrono-log Corp., Dept. EM, 2 W. Park Rd., Havertown, Pa. 19083 ..... *
Data Specialties, Dept. EM, 3455 Commercial Ave., Northbrook, Ill. 60062 p. 1397
M Trak Systems, Div. TRAK Microwave Corp., Dept. EM, 4722 Eisenhower Blvd., Dept. E8, Tampa, Fla. 33614 ..... p. 1670
Altek Corp., Dept. EM, 2150 Industrial Pkwy, Silver Spring, MD 20904
Ampex Corp., Dept. EM, 401 Broadway, Redwood City, Cal. 94063
D Ampro Corp., Dept. EM, 850 Pennsylvania Blvd., Feasterville, PA. 19047
Data General Corp., Dept. EM, 15 Turnpike Rd Rte 9, Westboro, Mass 01581
Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
D Kyros Corp., Dept. EM, Box 406, Madison, Wisc. 53701
M Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
Moxon Inc., Dept. EM, 2222 Michelson Dr. Bldg. E, Irvine, Cal. 92715
DM Systron Donner, Data Products Div., Dept. EM, 735 Detroit Ave., Concord, Cal. 94518
M Telectro Sys. Corp., Dept. EM, 96-18 43rd Ave., Corona, N.Y. 11368
Television Equip. Assocs., Dept. EM, Box 260, South Salem, N.Y. 10590
Video Research Corporation, Dept. EM, 6985 Garden Rd., Riviera Beach, Fla. 33404
Voice Identification Inc., Dept. EM, Box 714, Somerville, N.J. 08876

Tape Winders

D Data Specialties, Dept. EM, 3455 Commercial Ave., Northbrook, Ill. 60062 *
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Data General Corp., Dept. EM, 15 Turnpike Rd Rte 9, Westboro, Mass 01581
D Possis Corp., Dept. EM, 825 Rhode Island Ave., S., Minneapolis, Minn. 55426
M Telectro Sys. Corp., Dept. EM, 96-18 43rd Ave., Corona, N.Y. 11368
Television Equip. Assocs., Dept. EM, Box 260, South Salem, N.Y. 10590

Tapes, Electrical Insulation

DM Markel Corp., Dept. EM, P.O. Box 572, Norristown, Pa. 19404 ..... *
M Automatic Die Cutting Mch, Dept. EM, 28 Warrel St., New York, N.Y. 10007
Brand Dielectrics, Inc., Dept. EM, Route 203, N. Windham, Conn. 06256
M Cadillac Plastic & Chemical, Dayco Co., Dept. EM, Box 810, Detroit, Mich. 48232
M Chemplast, Inc., Dept. EM, 31-150 Dey Rd., Wayne, N.J. 07470
D Cole-Flex Corp., Dept. EM, 91 Cabot St., W. Babylon, N.Y. 11704
Connecticut Hard Rubber Co., Dept. EM, 407 East St., New Haven, Conn. 06509
D General Elec. Co, Wiring Device Bus. Dept., Dept. EM, 95 Hathaway St., Providence, R.I. 02904
D ICO/Rally Corp., Dept. EM, Edward J. Bush, Palo Alto, Cal. 94303
Keene Corp, Dept. EM, 345 Park Ave, New York, N.Y. 10022
3M Co., Indl Elect Prods. Div., Dept. EM, 3M Center, St. Paul, Minn. 55101
Norelcom Electronics, Dept. EM, 200 Allen Blvd., Farmingdale, N.Y. 11735
Okonite Co., Dept. EM, Box 340, Ramsey, N.J. 07446
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Russell Inds., Inc., Dept. EM, 3069 Lawson Blvd., Oceanside, N.Y. 11572
Tensolite Co.,, Div. Carlisle Corp, Dept. EM, Old Post Rd., Rte. 9A, Buchanan, N.Y. 10511
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013
D Vidaire Electronics Mfg., Dept. EM, 150 Buffalo Ave., Freeport, N.Y. 11520

Tapes, Films & Foils, Pressure Sensitive

Ad-Vance Magnetics, Dept. EM, 226 E. 7th St., Rochester, Ind. 46975 ..... *
Applied Graphics, Dept. EM, 58 Shore Rd, Glenwood Landing, N.Y. 11547
Auburn Mfg., Dept. EM, Pease Ave. & Stack St., Middletown, Conn. 06457
Bishop Graphics, Dept. EM, 5388 Sterling Center, Westlake Village, Cal. 91361
M Brady Co., W. H., Industrial Prods. Div., Dept. EM, 2221 W. Camden Rd. Box 2131, Milwaukee, Wis. 53201
M Cadillac Plastic & Chemical, Dayco Co., Dept. EM, Box 810, Detroit, Mich. 48232
Chartpak, A Times Mirror Co., Dept. EM, 1 River Rd., Leeds, Mass. 01053
M Chemplast, Inc., Dept. EM, 31-150 Dey Rd., Wayne, N.J. 07470
DM Cole-Flex Corp., Dept. EM, 91 Cabot St., W. Babylon, N.Y. 11704
Connecticut Hard Rubber Co., Dept. EM, 407 East St., New Haven, Conn. 06509
M Holly Productions, Dept. EM, 1442 Tzena Way, Encinitas, Cal. 92024
D Labelon Corp., Dept. EM, 10 Chapin St., Canandaigua, N.Y. 14424
3M Co., Indl Elect Prods. Div., Dept. EM, 3M Center, St. Paul, Minn. 55101
M Markem Corp., Dept. EM, I000 Congress St., Keene, NH 03431
Schweitzer, Div., Kimberly Clark Corp., Dept. EM, Lee, Mass. 01238
Sheldahl, Inc., Electrical Prods. Div., Dept. EM, Box 170, Northfield, Minn. 55057
Tapecon, Inc., Dept. EM, 475 River St., Rochester, N.Y. 14612
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013
D Zippertubing Co., Dept. EM, 13000 S. Broadway, Los Angeles, Cal. 90061

Tapes, Heat Shrinkable—See Caps, Forms & Tapes, Heat Shrinkable

Tapes, Recording, Magnetic (All Types)

Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 ..... *
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... *
Mac Panel Co., Dept. EM, Box 5027, 216 Pine St., High Pt., N.C. 27262 ..... *
AGFA-Gevaert, Inc., Dept. EM, 275 North St., Teterboro, N.J. 07608
Amilon Corp., Dept. EM, 49-12 30th Ave., Woodside, N.Y. 11377
Ampex Corp., Dept. EM, 401 Broadway, Redwood City, Cal. 94063
D Chafitz Engineering, Dept. EM, P.O. Box 2188, Rockville, Md. 20852
D Duotone Co., Dept. EM, 6875 S.W. 81st St., S. Miami, Fla. 33143
E.I. DuPont de Nemours & Co., Dept. EM, 1007 Market St., Wilmington, Del. 19898
Information Terminals, Dept. EM, 323 Soquel Way, Sunnyvale, Cal. 94086
D Intern'l. Computer Prods., Inc., Dept. EM, 2925 Merrell Rd., Dallas, Tex. 75229
D Irish Magnetic Recording Tape, Dept. EM, 270-78 Newtown Rd., Plainview, N.Y. 11803
D Apollo Lasers, Apollo Lasers, Inc., Dept. EM, 6357 Arizonia Cir, Los Angeles, Cal. 90045
DM Memorex Corp., Dept. EM, San Thomas at Central Expwy., Santa Clara, Cal. 95052
MFE Corp., Dept. EM, Keewaydin Dr., Salem, N.H. 03079
Micro Communications Corp., Dept. EM, 80 Bacon St., Waltham, Mass. 02154
D Nuvox Elctrns. Corp., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
DM Qantex, div. North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803
M Robins Ind's. Corp., Consumer Products Div., Dept. EM, 75 Austin Blvd., Commack, N.Y. 11725

Technical Books

Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
Concord Elctrns., Dept. EM, 37 Great Jones St., Dept. JE, New York, N.Y. 10012 ..... *
Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ..... p. 2713
E & L Instruments, Inc., Dept. EM, 61 First St., Derby, Conn. 06418 ..... *
Electro-Craft Corp., Dept. EM, 1600 2nd St. South, Hopkins, Minn. 55343 .. *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *

Allied Electronics, Dept EM, 401 E. 8th St., Ft. Worth, Tex 76102
D American Radio Relay League, Dept. EM, 225 Main St., Newington, Conn. 06111
M Analog Devices, Inc., Dept EM, P O. Box 280, Norwood, MA 02062
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
Beckman Instrs., (AISSD), Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634
M D.A.T.A. Inc., A Cordura Co., Dept. EM, 45 U.S. Hwy 46, Pine Brook, NJ 07058
Gamma Elctrn Research Co., Tech. Pubs. Sect., Dept. EM, Box 482, Newark, CA 94560
M Information Handling Services, Dept. EM, 15 Inverness Way East, Englewood, Colo. 80150
D Martin Research, Dept. EM, 3336 Commercial Ave., Northbrook, Ill. 60062
M Matheson Gas Products, Dept. EM, Box 85, East Rutherford, N.J. 07073
Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
Omnicomp, Inc., Dept. EM, 5150 N 16th St, Ste 253, Phoenix, Ariz. 85016
PCS., Inc., Dept. EM, 750 N. Maple Rd., Saline, Mich. 48176
D Tab Books, Dept EM, Monterey & Pinola Aves., Blue Ridge Summit, Pa. 17214
Wiley & Sons Inc., J., Dept. EM, 605 3rd Ave., New York, N.Y. 10016

Tees, Coaxial

DM Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 *
M Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706 *
D Ava Elctrns., Dept. EM, 4000 Bridge St., Dreyel Hill, Pa 19026 *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 *
ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 *
DM Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725 *
M Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 *
D Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543 *
Alford Mfg. Co., Dept. EM, 120 Cross St., Winchester, Mass. 01890
DM Astrolab, Inc., Dept. EM, 345 Dalziel Rd., Linden, N.J. 07036
Cablewave Systems Inc., Dept. EM, 60 Dodge Ave., North Haven, Conn. 06473
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
D Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
M Norsal Industries, Inc., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
M RF Systems, Inc., Dept. EM, 3100 Communications Rd., St Cloud, Fla. 32769
D Sinclair Radio Labs., Dept EM, 122 Rayette Rd, Concord, Ontario, Can. L4K 1B6
Tektronix, Inc. Dept. EM, Box 500, Beaverton, Ore. 97077
Trompeter Electronics, Inc., Dept. EM, 8936 Comanche, Chatsworth, Cal. 91311
Winegard Co., Dept. EM, 3000 Kirkwood St., Burlington, Iowa 52601

Tees, Waveguide

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M Aircom, Inc., Dept. EM, Rte. 16B, Union, N.H. 03887
M Airtron, Div. Litton Inds., Dept. EM, 200 E. Hanover Ave., Morris Plains, N.J. 07950
M Dielectric Comms, Unit of Gen Signal, Dept. EM, Raymond, Maine 04071
M Eastern Microwave Corp., Dept. EM, 4 Gill St., Woburn, MA 01801
Innovative Electronics Inc., Dept. EM, 15200 NW 60th Ave., Miami Lakes, Fla. 33014
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D Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
Reeve Electronics, Inc., Dept. EM, 609 W. Lake St., Chicago, Ill 60606
M RF Systems, Inc., Dept. EM, 3100 Communications Rd., St Cloud, Fla. 32769
Sivers Lab, Dept. EM, Box 90339, Los Angeles, Cal. 90009
DM Systron-Donner Microwave Div., Dept EM, 14844 Oxnard St., Van Nuys, Cal. 91409
TRG,, Div of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006

Telecommunication Systems & Equipment—See Comm. Systems, Telephone

Telemetering Indicators—See Analyzers, Telemetric Data

Telemetering Systems, Electronic—See Comm. Systems, Telemetering

Telephone Handsets—See Handsets, etc.

Telephone Systems, Telephones Sound Powered—See Comm. Systems, Telephone

Teleprinters

Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 p. 1469
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
Centronics Data Computer Corp., Dept EM, Wall St., Hudson, N.H. 03051
D ComData Corp., Dept. EM, 8115 N. Monticello, Skokie, ILL. 60076
Computer Devices, Dept. EM, 25 North Avenue, Burlington, Mass. 01803
Computer Terminal Sys., Dept. EM, 52 Newtown Plaza, Plainview, N.Y. 11803
Computer Transceiver Systems, Dept. EM, 66 E. Midland Ave., Paramus, N.J. 07652
DM Data General Corp., Dept. EM, 15 Turnpike Rd Rte 9, Westboro, Mass 01581
Innovative Electronics Inc., Dept. EM, 15200 NW 60th Ave., Miami Lakes, Fla. 33014
Link Communications Inc., Dept. EM, 260 W. Broadway, New York, N.Y. 10013
Omnitec Corporation, Dept. EM, 2405 S. 20th St., Phoenix, Ariz. 85034
Perkin-Elmer Data Systems, Terminals Div., Dept. EM, Rt. 10 & Emery Ave., Randolph, N.J. 07801
Tally Corp., Dept. EM, 8301 S. 180th St., Kent, Wash. 98103
M Teletype Corp., Dept. EM, 5555 Touhy Ave., Skokie, Ill. 60076
TTS, Dept. EM, 2928 Nebraska Ave., Santa Monica, Cal. 90404

Teletypewriters & Equipment

Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 p. 1469
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 *
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D ComData Corp., Dept. EM, 8115 N. Monticello, Skokie, ILL. 60076
Electrocom Inds., Dept. EM, 1105 N. Ironwood Dr., S. Bend, Ind. 46615
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Omnitec Corporation, Dept. EM, 2405 S. 20th St., Phoenix, Ariz. 85034
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Television Systems & Equipment, Cable (CATV) & Master Antenna (MATV)—See CATV Systems & Equipment

Television Systems & Equipment Closed-Circuit

D Ava Elctrns., Dept. EM, 4000 Bridge St., Dreyel Hill, Pa 19026 *
M Colorado Video, Inc., Dept. EM, Box 928, Boulder, Colo. 80306 p. 1370-1377
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 p. 2782
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 *
D Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219 *
D Venus Scientific, Inc., Dept. EM, 399 Smith St., Farmingdale, N.Y. 11735 *
Ampex Corp., Dept. EM, 401 Broadway, Redwood City, Cal. 94063
M Atlantic Research Corp., Dept. EM, 5390 Cherokee Ave., Alexandria, Va 22314
Aviatech Intl. Inc., Dept. EM, 75 Carlough Rd, Bohemia, N.Y. 11716
D Blonder-Tongue Labs., Inc., Dept. EM, One Jake Brown Rd., Old Bridge, N.J. 08857
D CATV Communications, Div. of Amer. Elctrn. Labs. Inc., Dept. EM, Box 552, Lansdale, Pa. 19446
Circon Corp., Dept EM, 749 Ward Drive, Santa Barbara, Cal. 93111
M Cohu, Inc., Elctrns. Div., San Diego Div., Dept. EM, Box 623, San Diego, , Cal. 92112
Components Corp., Dept. EM, 6 Kinsey Pl., Denville, N.J. 07834
Conrac Div., Conrac Corp., Dept. EM, 600 N. Rimsdale Ave., Covina, Calif. 91722
Di-Tech Inc., Dept. EM, 315 Wyandanch Ave., North Babylon, N.Y. 11704
D Dynair Elctrns. Inc., Dept. EM, 5275 Market St., San Diego, Calif. 92114
Fairchild Camera & Instr., Federal Systems Group, Dept. EM, 300 Robbins La., Syosset, N.Y. 11791
D General Electric-MIDPS, Closed Circuit Television, Dept. EM, 316 East Ninth Street, Owensboro, Kentucky 42301
M Holly Productions, Dept. EM, 1442 Tzena Way, Encinitas, Cal. 92024
D Inter-Market, Inc., Dept. EM, 1946 Lehigh Ave., Glenview, Ill. 60025
D Apollo Lasers, Apollo Lasers, Inc., Dept. EM, 6357 Arizonia Cir, Los Angeles, Cal. 90045
D Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
Laser Inc., Dept. EM, Laser Lane, Box 537, Sturbridge, Mass. 01566
Leitz, Inc. E., Dept. EM, Link Crescent, Rockleigh, N.J. 07647
National Security Systems, Dept. EM, 20 Beechwood Ave., Port Washington, N.Y. 11050
D Peerless Sales Co., Dept. EM, 4200 W. Chicago Ave., Chicago, Ill 60651
Sierra Scientific Corp., Dept. EM, 2189 Leghorn St., Mountain View, Cal. 94043
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M Telectro Sys. Corp., Dept. EM, 96-18 43rd Ave., Corona, N.Y. 11368
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Trax Video Labs, Dept. EM, 2020 Milvia St., Berkeley, Cal. 94704
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
D Vicon Industries Inc., Dept. EM, 125 E Bethpage Rd., Plainview, N.Y. 11803
D Video Automation Systems Inc., Dept. EM, Rte 1—Box 21A, Pound Ridge, N.Y. 10576
Visual Information Institute Inc., Dept. EM, Box 33, Xenia, Ohio 45385
Westinghouse Electric Corp., Indl & Gov't Tube, Dept. EM, Westinghouse Circle, Horseheads, N.Y. 14845
Winegard Co., Dept. EM, 3000 Kirkwood St., Burlington, Iowa 52601

Temperature Indicators—See Meters, Temperature

Temperature Sensors—See Transducers, Temperature

Templates, Printed Circuit Design

Bishop Graphics, Dept. EM, 5388 Sterling Center, Westlake Village, Cal. 91361
HAPCO, Dept. EM, Box 1205, Boulder, Colo. 80302

Tensile Testers—See Testers, Material

Terminal Blocks (Including Barrier Types)

Alberox Corp., Dept. EM, New Bedford Ind'l. Pk., New Bedford, Mass. 02745 p. 2553
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Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
M **Appleton Electronic Div., Appleton Electric Co., Dept. EM, 2205 12th Ave., So. Milwaukee, Wisc. 53172 ..... p. 1715**
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Connector Corp., Dept. EM, 6025 N. Keystone Ave., Chicago, Ill. 60646 ..... *
D **Continental Connector Corp., Dept. EM, 34-63 56th St., Woodside, N.Y. 11377 ..... ***
D **Continental Specialties Corp., Dept. EM, Box 1942, 70 Fulton Terr, New Haven, Conn. 06509 ..... ***
D **Control Products Div., Amerace Corp., Dept. EM, 2330 Vauxhall Rd., Union, N.J. 07083 ..... p. 1748,1749**
D **Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... ***
Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
ITT Cannon Electric, Dept. EM, 666 E. Dyer Rd., Santa Ana, Cal. 92702 ..... *
Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 ..... *
Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012 p. 2052,2054
D **Methode Elctrns, Interconnect Prods Div, Dept. EM, 1700 Hicks Rd, Rolling Meadows, ILL 60008 ..... ***
Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032 p. 4121
D **National Tel-Tronics, Div. Electro Audio Dynamics, Inc., Dept. EM, State Road Hill, Meadville, Pa. 16335 ..... p. 2089**
D **RDI/Reed Devices, Inc., Dept. EM, 525 Randy Rd., Carol Stream, Ill. 60187 p. 2102,2103**
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D **Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2124**
D **Trimm, Inc., Dept. EM, 400 W. Lake, Box 489, Libertyville, Ill. 60048 .. p. 2247**
D **TRW/Cinch Connectors, Electronic Comp. Div. of TRW Inc., Dept. EM, 1501 Morse Ave., Elk Grove Village, Ill. 60007 ..... Inside Back Cover, Vol. 1**
D **Vernitron Elec. Comps., Beau Prods., Dept. EM, Box 10, Laconia, N.H. 03246 ***
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
DM ADC Prods, Dept. EM, 4900 W. 78th St., Minneapolis, Mn 55435
D AMP Special Industries, Dept. EM, Valley Forge, Pa. 19482
M Armel Electronics, Dept. EM, 1601 75th St., N. Bergen, N.J. 07047
Bishop Graphics, Dept. EM, 5388 Sterling Center, Westlake Village, Cal. 91361
D Burndy Corporation, Dept. EM, Richards Ave., Norwalk, , Conn. 06852
D Cambridge Thermionic Corp,, Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
D Curtis Industries Inc., Dept. EM, 8000 West Tower Ave., Milwaukee, Wisc. 53223
Doran Mfg. Co., Dept. EM, 1033 Bader St., Cincinnati, Ohio 45225
DM Electrovert, Dept. EM, 86 Hartford Ave., Mt. Vernon, N.Y. 10553
Federal Screw Products Inc., Dept. EM, 3917 N. Kedzie Ave., Chicago, Ill. 60618
D ITT Cannon/ETC Terminal Products, Dept. EM, 29000 Aurora Rd., Solon, Ohio 44139
DM Kulka Elec. Corp., Dept. EM, 520 S. Fulton Ave., Mt. Vernon, N.Y. 10551
DM Laminated Fabricators, Dept. EM, 1145 San Mateo Ave., San Bruno, Calif. 94066
D Marathon Special Prods. Corp., Dept. EM, 13300 Van Camp Rd., Bowling Green, Ohio 43402
Methode Elctrns., Inc., Dept. EM, 7447 W. Wilson Ave., Chicago, Ill. 60656
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
D T & B/Thomas & Betts, Dept. EM, 36 Butler St., Elizabeth, N.J. 07207
D Teledyne Penn-Union Elec., Dept. EM, Box 723, Edinboro, Pa. 16412
D Underwriters Safety Device, An Eltra Co., Dept. EM, 7300 W. Wilson Ave., Chicago, Ill. 60656
D Weidmuller Terminations, Inc., Dept. EM, 4326 Eubank Rd., Richmond, Va. 23231

Terminal Boards

Airflyte Elctrns. Co., Dept. EM, Box 207, 56 Hook Rd., Bayonne, N.J. 07002 *
Allied Systems Corp., Dept. EM, Box 11005, Greensboro, N.C. 27409 ..... *
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D **Continental Specialties Corp., Dept. EM, Box 1942, 70 Fulton Terr, New Haven, Conn. 06509 ..... ***
D **Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... ***
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DM **Excel Products Co., Inc., Dept. EM, 401 Joyce Kilmer Ave., New Brunswick, N.J. 08903 ..... ***
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ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ..... *
DM **Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012 p. 2052,2054**
National Tel-Tronics, Div. Electro Audio Dynamics, Inc., Dept. EM, State Road Hill, Meadville, Pa. 16335 ..... *
D **RDI/Reed Devices, Inc., Dept. EM, 525 Randy Rd., Carol Stream, Ill. 60187 ***
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D **Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 ***
D **TRW/Cinch Connectors, Electronic Comp. Div. of TRW Inc., Dept. EM, 1501 Morse Ave., Elk Grove Village, Ill. 60007 ..... Inside Back Cover, Vol. 1**
D **Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342 ..... p. 1312**
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D **W & M Mfg., Dept. EM, 187 Lafayette St., New York, N.Y. 10013 ..... p. 2255**
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
M Advanced Circuitry, Litton Systems Inc., Dept. EM, 4811 W. Kearney St., Springfield, Mo. 65803
Aerolite Elexs Corp., Dept. EM, 2207 Summit Ave., Union City, N.J. 07087
Ark-Les Switch Corp., Dept. EM, 51 Water St., Watertown, Mass. 02172
M Armel Electronics, Dept. EM, 1601 75th St., N. Bergen, N.J. 07047
M Avid Electronics Corp., Dept. EM, Box 426, Baldwin, Pl., N.Y. 10505
Bishop Graphics, Dept. EM, 5388 Sterling Center, Westlake Village, Cal. 91361
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
M Comco Plastics, Inc., Dept. EM, 98-36 C. Jamaica Ave., Richmond Hill, N.Y. 11418
Doran Mfg. Co., Dept. EM, 1033 Bader St., Cincinnati, Ohio 45225
Elgin Elctrns., Inc., Sub. Basic, Inc., Dept. EM, Walnut St., Waterford, PA. 16441
Federal Screw Products Inc., Dept. EM, 3917 N. Kedzie Ave., Chicago, Ill. 60618
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
ITT Cannon/ETC Terminal Products, Dept. EM, 29000 Aurora Rd., Solon, Ohio 44139
DM Kulka Elec. Corp., Dept. EM, 520 S. Fulton Ave., Mt. Vernon, N.Y. 10551
D Laminated Fabricators, Dept. EM, 1145 San Mateo Ave., San Bruno, Calif. 94066
L Mechanical Engraving Co., Inc., Dept. EM, 4500 Bullard Ave, Bronx, New York 10470
Nutronics, Inc., Dept. EM, 1515 N. Harlem Ave., Oak Park, Ill. 60302
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D SAMTEC, Dept. EM, 810 Progress Blvd., New Albany, Indiana 47150
M U.S. Terminals, Dept. EM, 7502 Camargo Rd., Cincinnati, Ohio 45243
D Weidmuller Terminations, Inc., Dept. EM, 4326 Eubank Rd., Richmond, Va. 23231
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Terminal Equipment, Digital

M **Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 ..... ***
Clary Corp., Precision Instrs. Div., Dept. EM, 320 W. Clary Ave., San Gabriel, Cal. 91776 ..... *
Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 ..... *
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... p. 1469
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Re-el Circuits, Inc., Dept. EM, 520 Victor Street, Saddle Brook, N.J. 07662 *
Refac Elctrns. Pinlite®, Wild Rover®, Dept. EM, Box 809, W. Hill Rd., Winsted, Conn 06098 ..... *
M **Trak Systems, Div. TRAK Microwave Corp., Dept. EM, 4722 Eisenhower Blvd., Dept. E8, Tampa, Fla. 33614 ..... ***
TRW/Cinch Connectors, Electronic Comp. Div. of TRW Inc., Dept. EM, 1501 Morse Ave., Elk Grove Village, Ill. 60007 ..... Inside Back Cover, Vol. 1
Ann Arbor Terminals, Inc., Dept. EM, 6107 Jackson Rd., Ann Arbor, Mich. 48103
D Autocon Inds., Sub. Control Data, Dept. EM, 2300 Berkshire La. N., Minneapolis, Minn. 55441
Centronics Data Computer Corp., Dept. EM, Wall St., Hudson, N.H. 03051
D ComData Corp., Dept. EM, 8115 N. Monticello, Skokie, ILL. 60076
DM Data General Corp., Dept. EM, 15 Turnpike Rd Rte 9, Westboro, Mass 01581
Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
Assocs. Inc., Dept. EM, 333 W. Commercial St., East Rochester, N.Y. 14445
Elcom Industries, Inc., Dept. EM, 10268 Bach Blvd., St. Louis, Mo. 53132
Electrocom Inds., Dept. EM, 1105 N. Ironwood Dr., S. Bend, Ind. 46615
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
DM Hughes Aircraft Co., Ind'l. Prods. Div., Prod. Equip. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
Information Displays, Inc., Dept. EM, 150 Clearbrook Rd., Elmsford, N.Y. 10523
Lexidata Corp, Dept. EM, 215 Middlesex Tpke., Burlington, MASS. 01803
Memodyne Corp., Dept. EM, 369 Elliot St., Newton Upper Falls, Mass 02164
M Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
D Omnitec Corporation, Dept. EM, 2405 S. 20th St., Phoenix, Ariz. 85034
D Perkin-Elmer Data Systems, Terminals Div., Dept. EM, Rt. 10 & Emery Ave., Randolph, N.J. 07801
Princeton Elctrn. Prods., Dept. EM, Box 101, New Brunswick, N.J. 08902
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
TTS, Dept. EM, 2928 Nebraska Ave., Santa Monica, Cal. 90404
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Westinghouse Canada Ltd., Dept. EM, Box 510, Hamilton, Ont., Can.

Terminal Strips (Including Barrier Types)

D **ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845 ..... ***
D **Continental Specialties Corp., Dept. EM, Box 1942, 70 Fulton Terr, New Haven, Conn. 06509 ..... ***
D **Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... ***
Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... p. 2422

M **Elctrn. Molding Corp., Dept. EM, 96 Mill St., Woonsocket, R.I. 02895** ..... *
Excel Products Co., Inc., Dept. EM, 401 Joyce Kilmer Ave., New Brunswick, N.J. 08903 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
ITT Cannon Electric, Dept. EM, 666 E. Dyer Rd., Santa Ana, Cal. 92702 ..... *
Jackson Bros., (London) Ltd., Dept. EM, 258 Bway., New York, N.Y. 10007 *
DM **Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012** p. 2052,2054
DM **National Tel-Tronics, Div. Electro Audio Dynamics, Inc., Dept. EM, State Road Hill, Meadville, Pa. 16335** ..... p. 2088
D **RDI/Reed Devices, Inc., Dept. EM, 525 Randy Rd., Carol Stream, Ill. 60187** p. 2102,2103
D **Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543** ..... *
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D **Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629** .... *
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
Acme Model Engrg. Co., Dept. EM, 654 Bergen Blvd., Ridgefield, N.J. 07657
Aerolite Elexs Corp., Dept. EM, 2207 Summit Ave., Union City, N.J. 07087
D A.P. Products, Dept. EM, 72 Corwin Dr. Box 110, Painesville, Ohio 44077
Apahouser Corp. of N.E., Apahouser-Elcom, Dept. EM, 101 Walnut St., Watertown, Mass. 02172
Ark-Les Switch Corp., Dept. EM, 51 Water St., Watertown, Mass. 02172
M Armel Electronics, Dept. EM, 1601 75th St., N. Bergen, N.J. 07047
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
M Avid Electronics Corp., Dept. EM, Box 426, Baldwin, Pl., N.Y. 10505
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
D Curtis Industries Inc., Dept. EM, 8000 West Tower Ave., Milwaukee, Wisc. 53223
D-Cemco, Inc., Dept. EM, 3200 N. San Fernando Blvd., Burbank, Calif. 91504
Doran Mfg. Co., Dept. EM, 1033 Bader St., Cincinnati, Ohio 45225
DM Electrovert, Dept. EM, 86 Hartford Ave., Mt. Vernon, N.Y. 10553
Essex Grp, Essex Terminals/Connectors, Dept. EM, 3405 Engle Rd., Box 9216, Ft. Wayne, Ind. 46809
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Industrial Electronic Hardware, Dept. EM, 109 Prince St., New York, N.Y. 10012
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DM Kulka Elec. Corp., Dept. EM, 520 S. Fulton Ave., Mt. Vernon, N.Y. 10551
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Multi-Tronix, Dept. EM, 3210 Terry Dr, Toledo, Ohio 43613
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D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Sjoberg, C. & Son, Inc., Dept. EM, 415 Station St., Cranston, R.I. 02910
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
D Weidmuller Terminations, Inc., Dept. EM, 4326 Eubank Rd., Richmond, Va. 23231
Zierick Mfg. Corp., Dept. EM, 44 Radio Circle, Mt. Kisco, N.Y. 10549

Terminals, Data Display (including Alphanumeric & Graphic)

Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... p. 1469
Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 ..... *
Industrial Elctrn. Engrs., Dept. EM, 7740 Lemona Ave., Van Nuys, Cal. 91405 *
M **Interstate Electronics, Dept. EM, Box 3117, Anaheim, Cal. 92803** ..... *
Itoh Electronics, Inc. (C.), Dept. EM, 280 Park Ave., New York, N.Y. 10017 *
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Ann Arbor Terminals, Inc., Dept. EM, 6107 Jackson Rd., Ann Arbor, Mich. 48103
Applied Systems Corp., Dept. EM, 26401 Harper Ave., St. Clair Shores, Mich. 48081
Burroughs Corp., Electronic Components Div., Dept. EM, Box 1226 - Mt. Bethel Rd., Plainfield, N.J. 07061
D ComData Corp., Dept. EM, 8115 N. Monticello, Skokie, ILL. 60076
Conrac Div., Conrac Corp., Dept. EM, 600 N. Rimsdale Ave., Covina, Calif. 91722
DM Data General Corp., Dept. EM, 15 Turnpike Rd Rte 9, Westboro, Mass 01581
Datamedia, Dept. EM, 7300 N. Crescent Blvd., Pennsauken, N.J. 08110
M Digitech Data Inds., Dept. EM, 66 Grove St., Box 547, Ridgefield, Conn. 06877
ECD Corp., Dept. EM, 196 Broadway, Cambridge, MA 02139
EECO, Dept. EM, 1441 E. Chestnut Ave, Box 659, Santa Ana, Cal. 92701
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
Honeywell Information Sys Inc, Dept. EM, 200 Smith St M5440, Waltham, Mass. 02154
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Hughes Aircraft Co., Image Devices Ind'l. Prods. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
Lehighton Electronics, Inc., Dept. EM, RD 1Box 374 Dept M, Lehighton, Pa 18235
Lexidata Corp, Dept. EM, 215 Middlesex Tpke., Burlington, MASS. 01803
LFE Control System Industries, Dept. EM, 2920 Sand Ysidro Way, Santa Clara, Cal. 95051
D Megatek Corp., Dept. EM, 3931 Sorrento Valley Blvd, San Diego, CA 92121
M Memorex Corp., Dept. EM, San Thomas at Central Expwy., Santa Clara, Cal. 95052
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D Princeton Elctrn. Prods., Dept. EM, Box 101, New Brunswick, N.J. 08902
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Ramtek Corp., Dept. EM, 585 N. Mary Ave. P.O. Box 60309, Sunnyvale, Cal. 94086
D SC Electronics, Dept. EM, 530 5th Ave. N.W., New Brighton, Minn. 55112
DM Systems Data Inc., Dept. EM, 1941 W. Market St., Akron, Ohio 44313
Tec, Inc., Dept. EM, 2727 N. Fairview, Tuscon, Ariz. 85705
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Teledyne/Geotech, Dept. EM, Box 28277, Dallas, Tex. 75228
Telesis Laboratory, Dept. EM, Box 387, Chillocothe, Ohio 45601
M Teletype Corp., Dept. EM, 5555 Touhy Ave., Skokie, Ill. 60076
Trivex, Dept. EM, 3180 Redhill Ave., Costa Mesa, Cal. 92626
M Westinghouse Canada Ltd., Dept. EM, Box 510, Hamilton, Ont., Can.

Terminals, Feedthru

M **Alberox Corp., Dept. EM, New Bedford Ind'l. Pk., New Bedford, Mass. 02745** p. 2553
Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
D **Augat Interconnection Prods. Div., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703** ..... *
D **Beman Mfg., Inc., Dept. EM, PO Box 370, New Cumberland, Pa. 17070** ..... *
Berg Electronics, Div. E.I. DuPont de Nemours & Co., Dept. EM, York Expwy., New Cumberland, Pa. 17070 ..... p. 1736
Compac, Dept. EM, 279-I Skidmore Rd., Deer Park, N.Y. 11729 ..... p. 1026
DM **Concord Elctrns., Dept. EM, 37 Great Jones St., Dept. JE, New York, N.Y. 10012** ..... *
D **Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458** ..... *
D **Elco Corp., Dept. EM, 2250 Park Pl., El Segundo, CAL 90245** ..... *
Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... *
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DM **Excel Products Co., Inc., Dept. EM, 401 Joyce Kilmer Ave., New Brunswick, N.J. 08903** ..... *
DM **Garry Mfg., Inc., Dept. EM, 1010 Jersey Ave., New Brunswick, N.J. 08902** .. *
D **Heyman Mfg. Co., Dept. EM, 147 N. Michigan Ave., Kenilworth, N.J. 07033** *
ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ..... *
D **Johnson Co., E.F., Dept. EM, 299 10th SW Ave., Waseca, Minn. 56093** ..... *
D **Jones Elctrns., Hiram, Dept. EM, 11607 Vanowen St., No. Hollywood, Cal. 91605** ..... p. 1773
DM **Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012** .. *
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M **Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612** ..... *
M **Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543** ..... *
D **Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207** p. 2148,2150-2154
M **Taurus Corp., Dept. EM, Academy Hill, Lambertville, N.J. 08530** ..... *
M **Torwico Elctrns., Inc., Dept. EM, Rte. 70, Lakewood, N.J. 08701** ..... *
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M Accessories for Electronics, Dept. EM, 800 Merrick Road, Baldwin, N.Y. 11510
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
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M Armel Electronics, Dept. EM, 1601 75th St., N. Bergen, N.J. 07047
M Art Wire/Doduco, Dept. EM, 9 Wing Dr., Cedar Knolls, N.J. 07927
Auto-Swage Products Inc., Dept. EM, 726 River Rd., Shelton, Conn. 06484
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
M Avid Electronics Corp., Dept. EM, Box 426, Baldwin, Pl., N.Y. 10505
Bead Elctrns., Div. Bead Chain Mfg. Co., Dept. EM, 110 Mountain Grove St., Bridgeport, Conn. 06605
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
Centerflex Ceramics, Dept. EM, 221 Seventh Ave., Hawthorne, N.J. 07507
DM D-Cemco, Inc., Dept. EM, 3200 N. San Fernando Blvd., Burbank, Calif. 91504
Doran Mfg. Co., Dept. EM, 1033 Bader St., Cincinnati, Ohio 45225
D Eaton Corp., Engineered Fasteners Oper., Dept. EM, Box 6688, Cleveland, Ohio 44101
DM Electrical Inds., Div. Philips Elctrns. Inc., Dept. EM, 691 Central Ave., Murray Hill, N.J. 07974
DM Electrovert, Dept. EM, 86 Hartford Ave., Mt. Vernon, N.Y. 10553
Emporium Specialties Co., Inc., Dept. EM, Box 65, Austin, Pa. 16720
Federal Screw Products Inc., Dept. EM, 3917 N. Kedzie Ave., Chicago, Ill. 60618
Fusite Div./Emerson Elec., Dept. EM, 6000 Fernview Ave., Cincinnati, Ohio 45212
M General Mfg. Co., Dept. EM, 724 Ruberta Ave., Glendale, Calif. 91201
Gulton Inds., SCD Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
ITT Cannon/ETC Terminal Products, Dept. EM, 29000 Aurora Rd., Solon, Ohio 44139
DM Kulka Elec. Corp., Dept. EM, 520 S. Fulton Ave., Mt. Vernon, N.Y. 10551
M Positronic Inds., Dept. EM, 208 W. Center St., Drawer H, Rogerville, Mo. 65742
Precision Metal Prods. Co., Dept. EM, 41 Elm St., Stoneham, Mass. 02180
Pylon Co., Inc., Dept. EM, 51 Newcomb St., Attleboro, Mass. 02703
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Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
D Weidmuller Terminations, Inc., Dept. EM, 4326 Eubank Rd., Richmond, Va. 23231
DM Whitso, Inc., Dept. EM, 9326 Byron St., Schiller Park, Ill. 60176
D Zierick Mfg. Corp., Dept. EM, 44 Radio Circle, Mt. Kisco, N.Y. 10549

Terminals, Ferrule, Cable-End

Alberox Corp., Dept. EM, New Bedford Ind'l. Pk., New Bedford, Mass. 02745 *
Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 *
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M Avid Electronics Corp., Dept. EM, Box 426, Baldwin, Pl., N.Y. 10505
Bead Elctrns., Div. Bead Chain Mfg. Co., Dept. EM, 110 Mountain Grove St., Bridgeport, Conn. 06605
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
Essex Grp, Essex Terminals/Connectors, Dept. EM, 3405 Engle Rd., Box 9216, Ft. Wayne, Ind. 46809
Sjoberg, C. & Son, Inc., Dept. EM, 415 Station St., Cranston, R.I. 02910
D Weidmuller Terminations, Inc., Dept. EM, 4326 Eubank Rd., Richmond, Va. 23231

Terminals, Lug (All Types)

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Allied Systems Corp., Dept. EM, Box 11005, Greensboro, N.C. 27409 *
Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 *
D Augat Interconnection Prods. Div., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703 *
D Beman Mfg., Inc., Dept. EM, PO Box 370, New Cumberland, Pa. 17070 *
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D Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 *
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D ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 p. 1974,1985
ITT Thermotech, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 1203 S. 5th St., Hopkins, Minn. 55343 *
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D AMP Special Industries, Dept. EM, Valley Forge, Pa. 19482
Ark-Les Switch Corp., Dept. EM, 51 Water St., Watertown, Mass. 02172
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
M Avid Electronics Corp., Dept. EM, Box 426, Baldwin, Pl., N.Y. 10505
D Burndy Corporation, Dept. EM, Richards Ave., Norwalk, , Conn. 06852
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D Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
D D-Cemco, Inc., Dept. EM, 3200 N. San Fernando Blvd., Burbank, Calif. 91504
DM Electrical Inds., Div. Philips Elctrns. Inc., Dept. EM, 691 Central Ave., Murray Hill, N.J. 07974
Emporium Specialties Co., Inc., Dept. EM, Box 65, Austin, Pa. 16720
Essex Grp, Essex Terminals/Connectors, Dept. EM, 3405 Engle Rd., Box 9216, Ft. Wayne, Ind. 46809
Federal Screw Products Inc., Dept. EM, 3917 N. Kedzie Ave., Chicago, Ill. 60618
General Mfg. Co., Dept. EM, 724 Ruberta Ave., Glendale, Calif. 91201
D Gould Inc., Electrical Comps. Div., Dept. EM, 123 Smith St., E. Farmingdale, N.Y. 11735
DM Hollingsworth Solderless Terminal Co., Dept. EM, 85 Benjamin Franklin Hwy, P.O. Box 499, Pottstown, Pa. 19464
D Holub Industries, Dept. EM, 413 DeKalb Ave., Sycamore, Ill. 60178
DM ICO/Rally Corp., Dept. EM, Edward J. Bush, Palo Alto, Cal. 94303
D Ideal Industries Inc., Dept. EM, 4450 Becker Pl., Sycamore, Ill. 60178
DM ITT Cannon/ETC Terminal Products, Dept. EM, 29000 Aurora Rd., Solon, Ohio 44139
Mark Eyelet & Stamping, Dept. EM, 185 Wakelee Rd., Wolcott, Conn. 06716
Micro Contacts Inc., Dept. EM, 62 Alpha Plaza, Hicksville, N.Y. 11801
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Seastrom Mfg. Co. Inc., Dept. EM, 701 Sonora Ave., Glendale, Cal. 91201
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D T & B/Thomas & Betts, Dept. EM, 36 Butler St., Elizabeth, N.J. 07207
D Teledyne Penn-Union Elec., Dept. EM, Box 723, Edinboro, Pa. 16412
M U.S. Terminals, Dept. EM, 7502 Camargo Rd., Cincinnati, Ohio 45243
M Waldman Corp., Dept. EM, 3 Eastmans Rd, Parsippany, NJ 07054
M Waterbury Pressed Metal Div., WPM, Inc., Dept. EM, 407 Brookside Rd., Waterbury, Conn. 06720
D Weidmuller Terminations, Inc., Dept. EM, 4326 Eubank Rd., Richmond, Va. 23231
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578
DM Zierick Mfg. Corp., Dept. EM, 44 Radio Circle, Mt. Kisco, N.Y. 10549

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Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 *
D Augat Interconnection Prods. Div., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703 *
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D Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 *
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DM Garry Mfg., Inc., Dept. EM, 1010 Jersey Ave., New Brunswick, N.J. 08902 *
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 *
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D Methode Elctrns, Interconnect Prods Div, Dept. EM, 1700 Hicks Rd, Rolling Meadows, ILL 60008 *
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Panduit Corp., Dept. EM, 17301 Ridgeland Ave., Tinley Park, Ill. 60477 *
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TRW/Cinch Connectors, Electronic Comp. Div. of TRW Inc., Dept. EM, 1501 Morse Ave., Elk Grove Village, Ill. 60007 *
D Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342 *
D Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 *
M Accessories for Electronics, Dept. EM, 800 Merrick Road, Baldwin, N.Y. 11510
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D Amatom Electronic Hardware, Div. MITE Corp., Dept. EM, 446 Blake St., New Haven, Conn. 06515
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Auto-Swage Products Inc., Dept. EM, 726 River Rd., Shelton, Conn. 06484
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
Bead Elctrns., Div. Bead Chain Mfg. Co., Dept. EM, 110 Mountain Grove St., Bridgeport, Conn. 06605
D Burndy Corporation, Dept. EM, Richards Ave., Norwalk, , Conn. 06852
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
DM D-Cemco, Inc., Dept. EM, 3200 N. San Fernando Blvd., Burbank, Calif. 91504
DM Electrical Inds., Div. Philips Elctrns. Inc., Dept. EM, 691 Central Ave., Murray Hill, N.J. 07974
Emporium Specialties Co., Inc., Dept. EM, Box 65, Austin, Pa. 16720
Federal Screw Products Inc., Dept. EM, 3917 N. Kedzie Ave., Chicago, Ill. 60618
M General Mfg. Co., Dept. EM, 724 Ruberta Ave., Glendale, Calif. 91201
DM Gould Inc., Electrical Comps. Div., Dept. EM, 123 Smith St., E. Farmingdale, N.Y. 11735
DM Kulka Elec. Corp., Dept. EM, 520 S. Fulton Ave., Mt. Vernon, N.Y. 10551
Mark Eyelet & Stamping, Dept. EM, 185 Wakelee Rd., Wolcott, Conn. 06716
Micro Contacts Inc., Dept. EM, 62 Alpha Plaza, Hicksville, N.Y. 11801
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966

Nutronics, Inc., Dept. EM, 1515 N. Harlem Ave., Oak Park, Ill. 60302
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Positronic Inds., Dept. EM, 208 W. Center St., Drawer H, Rogerville, Mo. 65742
DM Precision Metal Prods. Co., Dept. EM, 41 Elm St., Stoneham, Mass. 02180
Pylon Co., Inc., Dept. EM, 51 Newcomb St., Attleboro, Mass. 02703
D SAMTEC, Dept. EM, 810 Progress Blvd., New Albany, Indiana 47150
Sjoberg, C. & Son, Inc., Dept. EM, 415 Station St., Cranston, R.I. 02910
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
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D Weidmuller Terminations, Inc., Dept. EM, 4326 Eubank Rd., Richmond, Va. 23231
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D Zierick Mfg. Corp., Dept. EM, 44 Radio Circle, Mt. Kisco, N.Y. 10549

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D **Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521** ..... *
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DM **Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012** ..... *
D **Methode Elctrns, Interconnect Prods Div, Dept. EM, 1700 Hicks Rd, Rolling Meadows, ILL 60008** ..... p. 2080,2081
D **Molex Inc., Dept. EM, 2222 Wellington Ct., Lisle, Ill. 60532** ..... p. 2084
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D **TRW/Cinch Connectors, Electronic Comp. Div. of TRW Inc., Dept. EM, 1501 Morse Ave., Elk Grove Village, Ill. 60007** ..... *
Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342 ..... p. 1313,1314
D **Vero Electronics, Dept. EM, 171 Bridge Rd., Hauppauge, N.Y. 11787** .. p. 1320
D **Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629** p. 2254
M Accessories for Electronics, Dept. EM, 800 Merrick Road, Baldwin, N.Y. 11510
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
D AMP Special Industries, Dept. EM, Valley Forge, Pa. 19482
Ark-Les Switch Corp., Dept. EM, 51 Water St., Watertown, Mass. 02172
M Art Wire/Doduco, Dept. EM, 9 Wing Dr., Cedar Knolls, N.J. 07927
DM Associated Engrg. & Mfg. Corp., Dept. EM, 546 Valley Rd., Upper Montclair, N.J. 07043
Auto-Swage Products Inc., Dept. EM, 726 River Rd., Shelton, Conn. 06484
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
M Avid Electronics Corp., Dept. EM, Box 426, Baldwin, Pl., N.Y. 10505
Bead Elctrns., Div. Bead Chain Mfg. Co., Dept. EM, 110 Mountain Grove St., Bridgeport, Conn. 06605
Bishop Graphics, Dept. EM, 5388 Sterling Center, Westlake Village, Cal. 91361
D Burndy Corporation, Dept. EM, Richards Ave., Norwalk, , Conn. 06852
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
D Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
DM D-Cemco, Inc., Dept. EM, 3200 N. San Fernando Blvd., Burbank, Calif. 91504
Doran Mfg. Co., Dept. EM, 1033 Bader St., Cincinnati, Ohio 45225
Electro Space Fabricators, Inc., Dept. EM, Topton, Pa. 19562
Emporium Specialties Co., Inc., Dept. EM, Box 65, Austin, Pa. 16720
Essex Grp, Essex Terminals/Connectors, Dept. EM, 3405 Engle Rd., Box 9216, Ft. Wayne, Ind. 46809
General Mfg. Co., Dept. EM, 724 Ruberta Ave., Glendale, Calif. 91201
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
ITT Cannon/ETC Terminal Products, Dept. EM, 29000 Aurora Rd., Solon, Ohio 44139
DM Kulka Elec. Corp., Dept. EM, 520 S. Fulton Ave., Mt. Vernon, N.Y. 10551
Methode Elctrns., Inc., Dept. EM, 7447 W. Wilson Ave., Chicago, Ill. 60656
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
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Penn Engrg. & Mfg. Corp., Dept. EM, Doylestown, Pa. 18901
M Positronic Inds., Dept. EM, 208 W. Center St., Drawer H, Rogerville, Mo. 65742
DM Precision Metal Prods. Co., Dept. EM, 41 Elm St., Stoneham, Mass. 02180
Raychem Corp., Dept. EM, 300 Constitution Dr., Menlo Park, Cal. 94025
Sjoberg, C. & Son, Inc., Dept. EM, 415 Station St., Cranston, R.I. 02910
M U.S. Terminals, Dept. EM, 7502 Camargo Rd., Cincinnati, Ohio 45243
M Waterbury Pressed Metal Div., WPM, Inc., Dept. EM, 407 Brookside Rd., Waterbury, Conn. 06720
D Weidmuller Terminations, Inc., Dept. EM, 4326 Eubank Rd., Richmond, Va. 23231
D Zierick Mfg. Corp., Dept. EM, 44 Radio Circle, Mt. Kisco, N.Y. 10549

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D **Augat Interconnection Prods. Div., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703** ..... *
D **Beman Mfg., Inc., Dept. EM, PO Box 370, New Cumberland, Pa. 17070** ..... *
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D **Continental Specialties Corp., Dept. EM, Box 1942, 70 Fulton Terr, New Haven, Conn. 06509** ..... *
D **Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458** ..... *
E & L Instruments, Inc., Dept. EM, 61 First St., Derby, Conn. 06418 ..... *
D **Elco Corp., Dept. EM, 2250 Park Pl., El Segundo, CAL 90245** ..... p. 1754
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D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
ITT Cannon Electric, Dept. EM, 666 E. Dyer Rd., Santa Ana, Cal. 92702 ..... *
DM **Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012** .. *
D **Mallory Capacitor Co., Div. P.R. Mallory, Dept. EM, 3029 E. Washington, Box 372, Indianapolis, Ind. 46201** ..... *
D **Methode Elctrns, Interconnect Prods Div, Dept. EM, 1700 Hicks Rd, Rolling Meadows, ILL 60008** ..... *
DM **Panduit Corp., Dept. EM, 17301 Ridgeland Ave., Tinley Park, Ill. 60477** p. 4632
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D **Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342** ..... *
D **W & M Mfg., Dept. EM, 187 Lafayette St., New York, N.Y. 10013** ..... *
D **Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629** .... *
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
D A.P. Products, Dept. EM, 72 Corwin Dr. Box 110, Painesville, Ohio 44077
Ark-Les Switch Corp., Dept. EM, 51 Water St., Watertown, Mass. 02172
M Art Wire/Doduco, Dept. EM, 9 Wing Dr., Cedar Knolls, N.J. 07927
Auto-Swage Products Inc., Dept. EM, 726 River Rd., Shelton, Conn. 06484
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
Bead Elctrns., Div. Bead Chain Mfg. Co., Dept. EM, 110 Mountain Grove St., Bridgeport, Conn. 06605
Bishop Graphics, Dept. EM, 5388 Sterling Center, Westlake Village, Cal. 91361
D Burndy Corporation, Dept. EM, Richards Ave., Norwalk, , Conn. 06852
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
D Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
Doran Mfg. Co., Dept. EM, 1033 Bader St., Cincinnati, Ohio 45225
Emporium Specialties Co., Inc., Dept. EM, Box 65, Austin, Pa. 16720
Essex Grp, Essex Terminals/Connectors, Dept. EM, 3405 Engle Rd., Box 9216, Ft. Wayne, Ind. 46809
Federal Screw Products Inc., Dept. EM, 3917 N. Kedzie Ave., Chicago, Ill. 60618
D Gould Inc., Electrical Comps. Div., Dept. EM, 123 Smith St., E. Farmingdale, N.Y. 11735
DM Hollingsworth Solderless Terminal Co., Dept. EM, 85 Benjamin Franklin Hwy, P.O. Box 499, Pottstown, Pa. 19464
D Holub Industries, Dept. EM, 413 DeKalb Ave., Sycamore, Ill. 60178
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
D Ideal Industries Inc., Dept. EM, 4450 Becker Pl., Sycamore, Ill. 60178
DM ITT Cannon/ETC Terminal Products, Dept. EM, 29000 Aurora Rd., Solon, Ohio 44139
DM Kulka Elec. Corp., Dept. EM, 520 S. Fulton Ave., Mt. Vernon, N.Y. 10551
D Lance Inds., Dept. EM, P.O. Box 4156, Sylmar, Calif. 91342
Multi-Tronix, Dept. EM, 3210 Terry Dr, Toledo, Ohio 43613
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D Positronic Inds., Dept. EM, 208 W. Center St., Drawer H, Rogerville, Mo. 65742
D SAMTEC, Dept. EM, 810 Progress Blvd., New Albany, Indiana 47150
Sjoberg, C. & Son, Inc., Dept. EM, 415 Station St., Cranston, R.I. 02910
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
D T & B/Thomas & Betts, Dept. EM, 36 Butler St., Elizabeth, N.J. 07207
D Teledyne Penn-Union Elec., Dept. EM, Box 723, Edinboro, Pa. 16412
D Weidmuller Terminations, Inc., Dept. EM, 4326 Eubank Rd., Richmond, Va. 23231
DM Whitso, Inc., Dept. EM, 9326 Byron St., Schiller Park, Ill. 60176
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Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 *
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D **Grayhill Inc., Dept. EM, 569 Hillgrove Ave., LaGrange, Ill. 60525** *
Jackson Bros., (London) Ltd., Dept. EM, 258 Bway., New York, N.Y. 10007 *
Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 *
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M **Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612** *
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M **Taurus Corp., Dept. EM, Academy Hill, Lambertville, N.J. 08530** *
M **Torwico Elctrns., Inc., Dept. EM, Rte. 70, Lakewood, N.J. 08701** *
M Accessories for Electronics, Dept. EM, 800 Merrick Road, Baldwin, N.Y. 11510
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
D Amatom Electronic Hardware, Div. MITE Corp., Dept. EM, 446 Blake St., New Haven, Conn. 06515
M Armel Electronics, Dept. EM, 1601 75th St., N. Bergen, N.J. 07047
M Art Wire/Doduco, Dept. EM, 9 Wing Dr., Cedar Knolls, N.J. 07927
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M Avid Electronics Corp., Dept. EM, Box 426, Baldwin, Pl., N.Y. 10505
Bead Elctrns., Div. Bead Chain Mfg. Co., Dept. EM, 110 Mountain Grove St., Bridgeport, Conn. 06605
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
Centerflex Ceramics, Dept. EM, 221 Seventh Ave., Hawthorne, N.J. 07507
D Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
DM D-Cemco, Inc., Dept. EM, 3200 N. San Fernando Blvd., Burbank, Calif. 91504
DM Electrical Inds., Div. Philips Elctrns. Inc., Dept. EM, 691 Central Ave., Murray Hill, N.J. 07974
Emporium Specialties Co., Inc., Dept. EM, Box 65, Austin, Pa. 16720
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M General Mfg. Co., Dept. EM, 724 Ruberta Ave., Glendale, Calif. 91201
Gulton Inds., SCD Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
Micro Contacts Inc., Dept. EM, 62 Alpha Plaza, Hicksville, N.Y. 11801
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Penn Engrg. & Mfg. Corp., Dept. EM, Doylestown, Pa. 18901
D Positronic Inds., Dept. EM, 208 W. Center St., Drawer H, Rogerville, Mo. 65742
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D SAMTEC, Dept. EM, 810 Progress Blvd., New Albany, Indiana 47150
Sjoberg, C. & Son, Inc., Dept. EM, 415 Station St., Cranston, R.I. 02910
M U.S. Terminals, Dept. EM, 7502 Camargo Rd., Cincinnati, Ohio 45243
DM Whitso, Inc., Dept. EM, 9326 Byron St., Schiller Park, Ill. 60176
D Zierick Mfg. Corp., Dept. EM, 44 Radio Circle, Mt. Kisco, N.Y. 10549

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Jones Elctrns., Hiram, Dept. EM, 11607 Vanowen St., No. Hollywood, Cal. 91605 *
DM **Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012** .. *
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D **W & M Mfg., Dept. EM, 187 Lafayette St., New York, N.Y. 10013** *
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D Amatom Electronic Hardware, Div. MITE Corp., Dept. EM, 446 Blake St., New Haven, Conn. 06515
M Armel Electronics, Dept. EM, 1601 75th St., N. Bergen, N.J. 07047
M Art Wire/Doduco, Dept. EM, 9 Wing Dr., Cedar Knolls, N.J. 07927
M Avid Electronics Corp., Dept. EM, Box 426, Baldwin, Pl., N.Y. 10505
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
Centerflex Ceramics, Dept. EM, 221 Seventh Ave., Hawthorne, N.J. 07507
DM D-Cemco, Inc., Dept. EM, 3200 N. San Fernando Blvd., Burbank, Calif. 91504
D Eaton Corp., Engineered Fasteners Oper., Dept. EM, Box 6688, Cleveland, Ohio 44101
Federal Screw Products Inc., Dept. EM, 3917 N. Kedzie Ave., Chicago, Ill. 60618
M General Mfg. Co., Dept. EM, 724 Ruberta Ave., Glendale, Calif. 91201
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Penn Engrg. & Mfg. Corp., Dept. EM, Doylestown, Pa. 18901
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DM Precision Metal Prods. Co., Dept. EM, 41 Elm St., Stoneham, Mass. 02180
M U.S. Terminals, Dept. EM, 7502 Camargo Rd., Cincinnati, Ohio 45243
D Zierick Mfg. Corp., Dept. EM, 44 Radio Circle, Mt. Kisco, N.Y. 10549

Terminals, Turret

D **Augat Interconnection Prods. Div., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703** *
Concord Elctrns., Dept. EM, 37 Great Jones St., Dept. JE, New York, N.Y. 10012 *
D **Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458** *
Elctrn. Molding Corp., Dept. EM, 96 Mill St., Woonsocket, R.I. 02895 .. p. 1764
DM **Excel Products Co., Inc., Dept. EM, 401 Joyce Kilmer Ave., New Brunswick, N.J. 08903** *
DM **Garry Mfg., Inc., Dept. EM, 1010 Jersey Ave., New Brunswick, N.J. 08902** .. *
ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 p. 1980
D **Jones Elctrns., Hiram, Dept. EM, 11607 Vanowen St., No. Hollywood, Cal. 91605** *
DM **Keystone Elctrns. Corp., Dept. EM, 49 Bleeker St., New York, N.Y. 10012** .. *
D **RDI/Reed Devices, Inc., Dept. EM, 525 Randy Rd., Carol Stream, Ill. 60187** *
DM **Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543** *
D **Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207** p. 2132,2133
M Accessories for Electronics, Dept. EM, 800 Merrick Road, Baldwin, N.Y. 11510
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
D Amatom Electronic Hardware, Div. MITE Corp., Dept. EM, 446 Blake St., New Haven, Conn. 06515
M Armel Electronics, Dept. EM, 1601 75th St., N. Bergen, N.J. 07047
Auto-Swage Products Inc., Dept. EM, 726 River Rd., Shelton, Conn. 06484
M Avid Electronics Corp., Dept. EM, Box 426, Baldwin, Pl., N.Y. 10505
Bead Elctrns., Div. Bead Chain Mfg. Co., Dept. EM, 110 Mountain Grove St., Bridgeport, Conn. 06605
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
DM D-Cemco, Inc., Dept. EM, 3200 N. San Fernando Blvd., Burbank, Calif. 91504
DM Electrical Inds., Div. Philips Elctrns. Inc., Dept. EM, 691 Central Ave., Murray Hill, N.J. 07974
Federal Screw Products Inc., Dept. EM, 3917 N. Kedzie Ave., Chicago, Ill. 60618
M General Mfg. Co., Dept. EM, 724 Ruberta Ave., Glendale, Calif. 91201
DM Kulka Elec. Corp., Dept. EM, 520 S. Fulton Ave., Mt. Vernon, N.Y. 10551
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Positronic Inds., Dept. EM, 208 W. Center St., Drawer H, Rogerville, Mo. 65742
DM Precision Metal Prods. Co., Dept. EM, 41 Elm St., Stoneham, Mass. 02180
D SAMTEC, Dept. EM, 810 Progress Blvd., New Albany, Indiana 47150
M U.S. Terminals, Dept. EM, 7502 Camargo Rd., Cincinnati, Ohio 45243
M Waldman Corp., Dept. EM, 3 Eastmans Rd, Parsippany, NJ 07054
DM Whitso, Inc., Dept. EM, 9326 Byron St., Schiller Park, Ill. 60176

Terminals, Wirewrap

Allied Systems Corp., Dept. EM, Box 11005, Greensboro, N.C. 27409 *
Amp Inc., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105 *
D **Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521** *
D **Augat Interconnection Prods. Div., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703** *
Berg Electronics, Div. E.I. DuPont de Nemours & Co., Dept. EM, York Expwy., New Cumberland, Pa. 17070 p. 1734,1735
Concord Elctrns., Dept. EM, 37 Great Jones St., Dept. JE, New York, N.Y. 10012 *
Connector Corp., Dept. EM, 6025 N. Keystone Ave., Chicago, Ill. 60646 *
Elctrn. Molding Corp., Dept. EM, 96 Mill St., Woonsocket, R.I. 02895 *
Elfab Corp., Dept. EM, 4200 Wiley Post Rd., Addison, Tex. 75001 p. 1763
DM **Excel Products Co., Inc., Dept. EM, 401 Joyce Kilmer Ave., New Brunswick, N.J. 08903** *
DM **Garry Mfg., Inc., Dept. EM, 1010 Jersey Ave., New Brunswick, N.J. 08902** p. 1768
ITT Cannon Electric, Dept. EM, 666 E. Dyer Rd., Santa Ana, Cal. 92702 p. 1929-1932, Back Cover, Vol. 1
ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 p. 1986
D **Methode Elctrns, Interconnect Prods Div, Dept. EM, 1700 Hicks Rd, Rolling Meadows, ILL 60008** p. 2080,2081
D **National Tel-Tronics, Div. Electro Audio Dynamics, Inc., Dept. EM, State Road Hill, Meadville, Pa. 16335** *
D **RDI/Reed Devices, Inc., Dept. EM, 525 Randy Rd., Carol Stream, Ill. 60187** *
D **Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207** *
TRW/Cinch Connectors, Electronic Comp. Div. of TRW Inc., Dept. EM, 1501 Morse Ave., Elk Grove Village, Ill. 60007 *
Vector Electronic Co., Inc., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342 *
D **Vero Electronics, Dept. EM, 171 Bridge Rd., Hauppauge, N.Y. 11787** *
D **Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629** *
Accurate Electronics Corp., Dept. EM, 169 S. Abbe Rd., P.O. Box R, Elyria, Ohio 44035
D AMP Special Industries, Dept. EM, Valley Forge, Pa. 19482
M Art Wire/Doduco, Dept. EM, 9 Wing Dr., Cedar Knolls, N.J. 07927
M Auto-Swage Products Inc., Dept. EM, 726 River Rd., Shelton, Conn. 06484

Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
M Avid Electronics Corp., Dept. EM, Box 426, Baldwin, Pl., N.Y. 10505
Bead Elctrns., Div. Bead Chain Mfg. Co., Dept. EM, 110 Mountain Grove St., Bridgeport, Conn. 06605
Bishop Graphics, Dept. EM, 5388 Sterling Center, Westlake Village, Cal. 91361
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
Circuit Assembly Corp., Dept. EM, 3169 Red Hill Ave., Costa Mesa, Cal. 92626
Emporium Specialties Co., Inc., Dept. EM, Box 65, Austin, Pa. 16720
General Mfg. Co., Dept. EM, 724 Ruberta Ave., Glendale, Calif. 91201
M Hybricon Corp., Dept. EM, 410 Crest Rd., Litteton, Mass. 01460
Methode Elctrns., Inc., Dept. EM, 7447 W. Wilson Ave., Chicago, Ill. 60656
Micro Contacts Inc., Dept. EM, 62 Alpha Plaza, Hicksville, N.Y. 11801
M Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
Mupac Corp., Dept. EM, 646 Summer St., Brockton, Mass. 02402
D Positronic Inds., Dept. EM, 208 W. Center St., Drawer H, Rogerville, Mo. 65742
D SAMTEC, Dept. EM, 810 Progress Blvd., New Albany, Indiana 47150
M U.S. Terminals, Dept. EM, 7502 Camargo Rd., Cincinnati, Ohio 45243
Weidmuller Terminations, Inc., Dept. EM, 4326 Eubank Rd., Richmond, Va. 23231
DM Whitso, Inc., Dept. EM, 9326 Byron St., Schiller Park, Ill. 60176
Zierick Mfg. Corp., Dept. EM, 44 Radio Circle, Mt. Kisco, N.Y. 10549

Terminations, Antenna-Also See Dummy Loads

M Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706 ..... p. 2865
Ava Elctrns., Dept. EM, 4000 Bridge St., Dreyel Hill, Pa 19026 .... p. 1724,1725
M Bird Electronic Corp., Dept. EM, 30303 Aurora Rd., Solon, Ohio 44139 ..... *
Carborundum Co., Graphite Prods. Div., Dept. EM, Box 339, Niagara Falls, N.Y. 14302 ..... *
M Electro Impulse, Dept. EM, Box 870, Red Bank, N.J. 07701 ..... *
KDI Pyrofilm Corp, Dept. EM, 60 S. Jefferson Rd., Whippany, N.J. 07981 p. 3729
DM Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725 ..... *
M Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... *
D Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543 ..... *
D W & M Mfg., Dept. EM, 187 Lafayette St., New York, N.Y. 10013 ..... *
M Aircom, Inc., Dept. EM, Rte. 16B, Union, N.H. 03887
M Airtron, Div. Litton Inds., Dept. EM, 200 E. Hanover Ave., Morris Plains, N.J. 07950
Alan Industries Inc., Dept. EM, PO Box 1203, Columbus, Ind. 47201
D Astrolab, Inc., Dept. EM, 345 Dalziel Rd., Linden, N.J. 07036
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
D Barker & Williamson, Inc., Dept. EM, Canal St., Bristol, Pa. 19007
M Coleman Microwave Co., Dept. EM, Box 59, Rte. 22, Lebanon, N.J. 08833
M Connecticut Microwave Corp., Dept. EM, 106 Powder Mill Rd Box 389, Canton, Conn. 06019
M Dielectric Comms, Unit of Gen Signal, Dept. EM, Raymond, Maine 04071
Elcom Systems, Inc., Dept. EM, 127F Brook Ave., Deer Pk., N.Y. 11729
Engelmann Microwave, Dept. EM, Skyline Dr., Montville, N.J. 07045
Gabriel Elctrns. Inc., Dept. EM, Box 626, Scarborough Ind'l. Pk., Scarborough, Me. 04074
DM Kings Electronics, Dept. EM, 40 Mabledale Rd., Tuckahoe, N.Y. 10707
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
D R L C Elctrns., Inc., Dept. EM, 83 Radio Cir., Mt. Kisco, N.Y. 10549
Sjoberg, C. & Son, Inc., Dept. EM, 415 Station St., Cranston, R.I. 02910
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
M Technical Mat'l., Dept. EM, 700 Fenimore Rd., Mamaroneck, N.Y. 10543
M Transco Prods., Inc., Dept. EM, 4241 Glencoe Ave., Venice, Cal. 90291
TRG,, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006

Terminations, Microwave

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
M Applied Research Inc., Dept. EM, 76 S. Bayles Ave., Port Washington, N.Y. 11050 ..... p. 2866
M Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706 ..... *
Bird Electronic Corp., Dept. EM, 30303 Aurora Rd., Solon, Ohio 44139 ..... *
M Electro Impulse, Dept. EM, Box 870, Red Bank, N.J. 07701 ..... p. 2720
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 .... *
ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ..... *
D KDI Pyrofilm Corp, Dept. EM, 60 S. Jefferson Rd., Whippany, N.J. 07981 .... *
DM Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725 ..... p. 2881-2883
M Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... *
Telonic/Berkeley, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715 ..... *
D Texscan Corp., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219 p. 2830
Universal Voltronics Corp., Dept. EM, 27 Radio Circle Dr., Mt. Kisco, N.Y. 10549 ..... *
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
M Aircom, Inc., Dept. EM, Rte. 16B, Union, N.H. 03887
M Airtron, Div. Litton Inds., Dept. EM, 200 E. Hanover Ave., Morris Plains, N.J. 07950
Alford Mfg. Co., Dept. EM, 120 Cross St., Winchester, Mass. 01890
DM Astrolab, Inc., Dept. EM, 345 Dalziel Rd., Linden, N.J. 07036
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
Centerflex Ceramics, Dept. EM, 221 Seventh Ave., Hawthorne, N.J. 07507
M Coleman Microwave Co., Dept. EM, Box 59, Rte. 22, Lebanon, N.J. 08833
M Connecticut Microwave Corp., Dept. EM, 106 Powder Mill Rd Box 389, Canton, Conn. 06019
M Detoronics Corp., Dept. EM, 10660 E. Rush St., P.O. Box 3805, S. El Monte, Cal. 91733
M Dielectric Comms, Unit of Gen Signal, Dept. EM, Raymond, Maine 04071
M Eastern Microwave Corp., Dept. EM, 4 Gill St., Woburn, MA 01801
Elcom Systems, Inc., Dept. EM, 127F Brook Ave., Deer Pk., N.Y. 11729
Engelmann Microwave, Dept. EM, Skyline Dr., Montville, N.J. 07045
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
DM Kings Electronics, Dept. EM, 40 Mabledale Rd., Tuckahoe, N.Y. 10707
M Manger Elec. Co., Inc., Dept. EM, W. Henry St., Stamford, Conn. 06902
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Merrimac Inds., Inc., Dept. EM, 41 Fairfield Pl., West Caldwell, N.J. 07006
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
D Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
D Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
M RF Systems, Inc., Dept. EM, 3100 Communications Rd., St Cloud, Fla. 32769
D R L C Elctrns., Inc., Dept. EM, 83 Radio Cir., Mt. Kisco, N.Y. 10549
Sivers Lab, Dept. EM, Box 90339, Los Angeles, Cal. 90009
DM Solitron/Microwave, Dept. EM, Box 278, Port Salerno, Fla. 33492
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
M Transco Prods., Inc., Dept. EM, 4241 Glencoe Ave., Venice, Cal. 90291
TRG,, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006
M Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760

Terminations, VHF, Video, Pulse

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
M Applied Research Inc., Dept. EM, 76 S. Bayles Ave., Port Washington, N.Y. 11050 ..... p. 2866
M Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706 ..... *
D Ava Elctrns., Dept. EM, 4000 Bridge St., Dreyel Hill, Pa 19026 .... p. 1725,1727
Bird Electronic Corp., Dept. EM, 30303 Aurora Rd., Solon, Ohio 44139 ..... *
M Electro Impulse, Dept. EM, Box 870, Red Bank, N.J. 07701 ..... p. 2720
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Hope Elctrns., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470 .... *
ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ..... *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... *
DM Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725 ..... *
Universal Voltronics Corp., Dept. EM, 27 Radio Circle Dr., Mt. Kisco, N.Y. 10549 ..... *
D W & M Mfg., Dept. EM, 187 Lafayette St., New York, N.Y. 10013 ..... *
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
D Blonder-Tongue Labs., Inc., Dept. EM, One Jake Brown Rd., Old Bridge, N.J. 08857
M Dielectric Comms, Unit of Gen Signal, Dept. EM, Raymond, Maine 04071
Elcom Systems, Inc., Dept. EM, 127F Brook Ave., Deer Pk., N.Y. 11729
Engelmann Microwave, Dept. EM, Skyline Dr., Montville, N.J. 07045
D Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
DM Kings Electronics, Dept. EM, 40 Mabledale Rd., Tuckahoe, N.Y. 10707
Manger Elec. Co., Inc., Dept. EM, W. Henry St., Stamford, Conn. 06902
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Trompeter Electronics, Inc., Dept. EM, 8936 Comanche, Chatsworth, Cal. 91311
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006
Wide Band Engrg. Co. Inc., Dept. EM, Box 21652, Phoenix, Ariz. 85036

Test Equipment, Closed Circuit TV-Also See Television Systems & Equipment, Closed-Circuit

D B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 ..... *
M Colorado Video, Inc., Dept. EM, Box 928, Boulder, Colo. 80306 p. 1370-1377
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... p. 2782
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
Wavetek Indiana, Inc., Dept. EM, 66 N. First Ave., Beech Grove, Ind. 46107 *
Alessi Inds., Dept. EM, 3195-C Airport Loop Dr., Costa Mesa, Cal. 92626
D Blonder-Tongue Labs., Inc., Dept. EM, One Jake Brown Rd., Old Bridge, N.J. 08857
D Lectrotech, Inc., Dept. EM, 5810 N. Western Ave., Chicago, Ill. 60659
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Television Equip. Assocs., Dept. EM, Box 260, South Salem, N.Y. 10590
Visual Information Institute Inc., Dept. EM, Box 33, Xenia, Ohio 45385

Test Equipment, Color TV

D B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 ..... *
Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 ..... *
Colorado Video, Inc., Dept. EM, Box 928, Boulder, Colo. 80306 p. 1370-1377

Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... *
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... ***
D GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
D Lectrotech, Inc., Dept. EM, 5810 N. Western Ave., Chicago, Ill. 60659
Nuclear Resch. Corp., Dept. EM, 1105 Indl. Hwy., Southampton, Pa. 18966
D RCA Distr. & Special Prods. Div., Dept. EM, Deptford, N.J. 08096
D REI Sales Co., Dept. EM, 1 North Ave, Burlington, Mass. 01803
RIL Elctrns., Inc., Dept. EM, 1105 Ind'l. Hwy., Southampton, Pa. 18966
D Sencore, Dept. EM, 3200 Sencore Dr., Sioux Falls, S.D. 57107
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
D SYT Corporation, Dept. EM, 1220 Barranca, El Paso, Tex. 79935
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
M Telectro Sys. Corp., Dept. EM, 96-18 43rd Ave., Corona, N.Y. 11368
Television Equip. Assocs., Dept. EM, Box 260, South Salem, N.Y. 10590
Visual Information Institute Inc., Dept. EM, Box 33, Xenia, Ohio 45385

Test Equipment, Mechanical Impedance

Bafco, Inc., Dept. EM, 717 Mearns Rd., Warminster, Pa. 18974 ..... p. 2662
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
DM All American Tool & Mfg. Co., Dept. EM, 8027 Lawndale, Skokie, Ill. 60076
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
Endevco, Div. Becton, Dickinson & Co., Dept. EM, 30700 Rancho Viejo Rd., San Jaun Capistrano, Cal. 92675
Spectral Dynamics Corp., Dept. EM, Box 671, San Diego, Cal. 92112
Wilcoxon Research, Dept. EM, 12526 Parklawn Dr., Rockville, Md. 20852
Zonic Technical Labs., Dept. EM, 8927 Rossash Ave., Cincinnati, Ohio 45236

Test Equipment, Rental

Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 ..... *
Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 p. 2766,2767
D Atlas Energy Systems, Dept. EM, 9459 Rush St., S. El Monte, Cal. 91733
D Gamma Elctrn Research Co., RF & Microwave Lab., Dept. EM, 991 Commercial St. Ste. 4, Palo Alto, Cal 94303
D Gamma Elctrn Research Co., Tech. Pubs. Sect., Dept. EM, Box 482, Newark, CA 94560

Test Systems, Automatic D-C

Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 ..... *
D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 ***
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509 ..... *
Hughes Aircraft Co., Ind'l. Prods. Div. FACT Sys., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008 ..... p. 2758
Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 p. 2766,2767
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Slaughter Co., Dept. EM, Moore & Hailey Sts., P.O. Box 1805, Ardmore, Okla. 73401 ..... *
Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... p. 2837
Addison Div. Muirhead, Inc., Dept. EM, 1101 Bristol Rd., Mountainside, N.J. 07092
Aerotronic Assocs., Inc., Dept. EM, Riverside Dr., Contoocook, N.H. 03229
Analogic Corp., Dept. EM, Audubon Rd., Wakefield, Mass. 01880
Automatic Production Systems Inc., Dept. EM, #12 Springdale Rd. Cherry Hill Ind. Pk., Cherry Hill, N.J. 08003
D Davidson Electronic Development Co., Dept. EM, 2211 Peninsula Dr., Erie, Pa. 16506
DIT-MCO Int'l. Corp., Dept. EM, 5612 Brighton Terr., Kansas City, Mo. 64130
Electronic Sys & Programm, Dept. EM, 12901 Crenshaw Blvd., Hawthorne, Cal. 90250
Optimized Devices Inc., Dept. EM, 220 Marble Ave., Pleasantville, N.Y. 10570
DM Systron Donner, Data Products Div., Dept. EM, 735 Detroit Ave., Concord, Cal. 94518
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077

Test Systems, Computer Controlled (Automatic)

A. D. Data Sys., Inc., Dept. EM, POB 9209, Rochester, N.Y. 14625 ..... p. 2661
Applied Microwave, Div. Epsco Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 ..... *
Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 ..... *
M **Epsco, Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 ..... ***
D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 p. 2744,2745**
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Hughes Aircraft Co., Ind'l. Prods. Div. FACT Sys., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008 ..... p. 2758
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NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Slaughter Co., Dept. EM, Moore & Hailey Sts., P.O. Box 1805, Ardmore, Okla. 73401 ..... *
DM **Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518 ..... ***
Aerotronic Assocs., Inc., Dept. EM, Riverside Dr., Contoocook, N.H. 03229
DM Applied Data Commun., Dept. EM, 1509 E. McFadden Ave., Santa Ana, Cal. 92705
Applied Systems Corp., Dept. EM, 26401 Harper Ave., St. Clair Shores, Mich. 48081
M ATEC, Inc., Dept. EM, Box 19426, Houston, Tex. 77024
Automatic Production Systems Inc., Dept. EM, #12 Springdale Rd. Cherry Hill Ind. Pk., Cherry Hill, N.J. 08003
Benton Corp, Dept. EM, Race St Box 678, Manor, PA 15665
Com/Tech Systems Inc., Dept. EM, 44 Beaver St., New York, N.Y. 10004
M Computer Automation, Inc., Ind. Prods. Div., Dept. EM, 18651 Von Karman, Irvine, Cal. 92664
Cybersystems, Inc, Digital Broadcast Sys. Div, Dept. EM, 4306 Gov. Dr., Ste O, Huntsville, Ala. 35805
D Davidson Electronic Development Co., Dept. EM, 2211 Peninsula Dr., Erie, Pa. 16506
Digital Gen'l. Corp., Univ. Cir. Resch. Ctr., Dept. EM, 11000 Cedar Ave., Cleveland, Ohio 44106
DIT-MCO Int'l. Corp., Dept. EM, 5612 Brighton Terr., Kansas City, Mo. 64130
Assocs. Inc., Dept. EM, 333 W. Commercial St., East Rochester, N.Y. 14445
Electronic Sys & Programm, Dept. EM, 12901 Crenshaw Blvd., Hawthorne, Cal. 90250
GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Howell Inst. Inc., Dept. EM, 3479 W. Vickery Blvd., Ft. Worth, Tex. 76107
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
DM Hughes Aircraft Co., Ind'l. Prods. Div., Prod. Equip. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
MilerTronics, Dept. EM, 303 Airport Rd, Greenville, S.C. 29607
MTS Systems Corp., Dept. EM, Box 24012, Minneapolis, Minn 55424
Omnicomp, Inc., Dept. EM, 5150 N 16th St, Ste 253, Phoenix, Ariz. 85016
Optimized Devices Inc., Dept. EM, 220 Marble Ave., Pleasantville, N.Y. 10570
Siemens Corp., Dept. EM, 3 Computer Dr., P.O. Box 5006, Cherry Hill, N.J. 08034
M Singer Co., Librascope Div., Dept. EM, 833 Sonora Ave., Glendale, Cal. 91201
S.I.R. Atlanta, Inc., Dept. EM, 331 Luckie St., N.W., Atlanta, Ga. 30313
DM Systems Data Inc., Dept. EM, 1941 W. Market St., Akron, Ohio 44313
DM Systron Donner, Data Products Div., Dept. EM, 735 Detroit Ave., Concord, Cal. 94518
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
D Temptronic Corporation, Dept. EM, 40 Glen Ave., Newton, Mass. 02159
DM Trendar, Dept. EM, 630 Clyde Ave., Mountain View, Cal. 94040
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304
Zonic Technical Labs., Dept. EM, 8927 Rossash Ave., Cincinnati, Ohio 45236

Testers, Accelerometer—See Calibrators, Accelerometer

Testers, Battery

Abacus Controls Inc., Dept. EM, 89 Redington Rd., Somerville, N.J. 08876 *
Christie Elec., Dept. EM, 3404A W. 67th St., Los Angeles, Cal. 90043 p. 3220
Curtis Instrs., Inc., Dept. EM, 200 Kisco Ave., Mt. Kisco, N.Y. 10549 ..... *
Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
M **Marine Electric Railway Prods. Div., Inc., Dept. EM, 167 National Rd., Edison, N.J. 08817 ..... p. 3395**
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
VIZ Manufacturing Co., Dept. EM, 335 E. Price St., Phila, Pa. 19144 ..... *
D **Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... ***
Advanced Technology Sys., Dept. EM, 450 W. First Ave., Roselle, N.J. 07023
American Monarch Corp., Dept. EM, 2801-37th Ave., N.E., Minneapolis, Minn. 55421
M Anchor Specialty Mfg. Inc., Dept. EM, 300 Hollister Rd., Teterboro, N.J. 07608
D Bartlett-Emery Instrument Corp., Dept. EM, 14th & Ave. "M", Ft. Madison, Iowa 52627
Desco Mfg. Co., Dept. EM, 1530 Flower St., Glendale, Cal. 91201
Assocs. Inc., Dept. EM, 333 W. Commercial St., East Rochester, N.Y. 14445
Electronic Measurements Corp., Dept. EM, 625 Broadway, New York, N.Y. 10012
Optimized Devices Inc., Dept. EM, 220 Marble Ave., Pleasantville, N.Y. 10570
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Q.V.S., Inc., Dept. EM, 20 North 15th St., East Orange, N.J. 07017
Ratelco, Inc., Dept. EM, 610 Pontius Ave. N., Dept. EEM, Seattle, Wash. 98109
Schauer Mfg. Corp., Dept. EM, 4500 Alpine Ave., Cincinnati, Ohio 45242
Telco Products Co., Dept. EM, 44 Sea Cliff, Glen Cove, NY 11542

Testers, Burn-In, Aging

M **Cincinnati Sub-Zero Products, Dept. EM, 2612 Gilbert Ave., Cincinnati, Ohio 45206 ***
Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509 *
M **Jettron Prods., Dept. EM, P.O. Box 337, E. Hanover, N.J. 07936 ***
Megavolt, Corp., Dept. EM, 110 Hobart St, Hackensack, N.J. 07601 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
Slaughter Co., Dept. EM, Moore & Hailey Sts., P.O. Box 1805, Ardmore, Okla. 73401 *
Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 .... *
M Aerotronic Assocs., Inc., Dept. EM, Riverside Dr., Contoocook, N.H. 03229
Applied Control Co., Dept. EM, 1275 Bloomfield Ave., Fairfield, N.J. 07006
D Delta Design, Inc., Dept. EM, 5725 Kearny Villa Road, San Diego, Cal 92123
D Despatch Oven Co., Dept. EM, P.O. Box 1320, Minneapolis, Minn. 55440
Kantz Electronic Ind., Dept. EM, 229 W. 4th St., Clifton, N.J. 07011
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602
M Lehighton Electronics, Inc., Dept. EM, RD 1Box 374 Dept M, Lehighton, Pa 18235
Loranger Mfg. Corp., Dept. EM, Box 948, Warren, Pa. 16365

Micro Instrument Co., Marine & Power Instr. Div., Dept. EM, 2250 Micro Pl., Escondido, Cal. 92025
M Trio-Tech, Inc. of Calif., Trio-Tech Int., Dept. EM, 2435 N. Naomi St., Burbank, Calif. 91504
Webber Manufacturing Co., Dept. EM, P.O. Box 217, Indianapolis, Ind. 46206

Testers, Cable

A. D. Data Sys., Inc., Dept. EM, POB 9209, Rochester, N.Y. 14625 ..... *
D **Belden Corp., Electronic Div., Dept. EM, Box 1327, Richmond, Ind. 47374 .. ***
Chatsworth Data Corp, Cablemaster Div., Dept. EM, 20710 Lassen St., Chatsworth, Cal 91311 ..... p. 2680
Chatsworth Data Corp, Impact-o-Graph Div., Dept. EM, 20710 Lassen St., Chatsworth, Cal. 91311 ..... p. 2680
Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 .. *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 *
M **Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509 ..... ***
DM **Hughes Aircraft Co., Ind'l. Prods. Div. FACT Sys., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008 ..... p. 2758**
Megavolt, Corp., Dept. EM, 110 Hobart St, Hackensack, N.J. 07601 ..... *
Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 ..... *
Slaughter Co., Dept. EM, Moore & Hailey Sts., P.O. Box 1805, Ardmore, Okla. 73401 ..... p. 2823
Torotron, Dept. EM, 255 Washington St., Mt. Vernon, N.Y. 10553 ..... p. 2831
D **Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817 ..... ***
Universal Voltronics Corp., Dept. EM, 27 Radio Circle Dr., Mt. Kisco, N.Y. 10549 ..... *
Addison Div. Muirhead, Inc., Dept. EM, 1101 Bristol Rd., Mountainside, N.J. 07092
D American HV Voltage Test Sys., Inc., Dept. EM, Ctrl Garr Ind'l Pk, Accident, Md. 21520
D Amprobe Instrument, Div. SOS Consolidated Inc., Dept. EM, 630 Merrick Rd., Lynbrook, N.Y. 11563
M Anchor Specialty Mfg. Inc., Dept. EM, 300 Hollister Rd., Teterboro, N.J. 07608
Applied Systems Corp., Dept. EM, 26401 Harper Ave., St. Clair Shores, Mich. 48081
D Associated Research, Inc., Dept. EM, 6125 W. Howard St., Niles, Ill. 60648
Automatic Production Systems Inc., Dept. EM, #12 Springdale Rd. Cherry Hill Ind. Pk., Cherry Hill, N.J. 08003
M Automation Dynamics, Div. ABC Digital, Inc., Dept. EM, 25 Charles St., Westwood, N.J. 07675
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
Brown Electro-Measurements Co., Brown Electro-Meas., Dept. EM, P.O. Box 55169, Seattle, Wash. 98155
Computer Automation, Inc., Ind. Prods. Div., Dept. EM, 18651 Von Karman, Irvine, Cal. 92664
M Custom Scientific Instrs., Dept. EM, 13 Wing Dr., Box A, Whippany, N.J. 07981
Dantronics, Inc., Dept. EM, 3175 Hafner Ct., St. Paul, Minn 55112
Dillon, W.C. & Co., Dept. EM, 14620-EP Keswick St., Van Nuys 340, Cal. 91407
DIT-MCO Int'l. Corp., Dept. EM, 5612 Brighton Terr., Kansas City, Mo. 64130
Electronic Sys & Programm, Dept. EM, 12901 Crenshaw Blvd., Hawthorne, Cal. 90250
Everett/Charles, Inc., Dept. EM, 2806 Metropolitan Pl., Pomona, Cal. 91767
M Glenair, Inc., Dept. EM, 1211 Air Way, Glendale, Cal. 91201
GTE Lenkurt Inc., Dept. EM, 1105 County Rd., San Carlos, Cal. 94070
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
D Micro Electronic Systems, Inc., Dept. EM, 8 Kevin Drive, Danbury, Conn. 06810
M Peschel Instrs., Inc., Dept. EM, 1412 Viscaya Pkwy., Cape Coral, Fla. 33904
S.I.R. Atlanta, Inc., Dept. EM, 331 Luckie St., N.W., Atlanta, Ga. 30313
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
D Switchcraft, Inc., Dept. EM, 5555 N. Elston, Chicago, Ill. 60630
D T & B/Thomas & Betts, Dept. EM, 36 Butler St., Elizabeth, N.J. 07207
D Tau-Tron Inc., Dept. EM, 11 Esquire Rd., N. Billerica, Mass. 01862
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Telco Products Co., Dept. EM, 44 Sea Cliff, Glen Cove, NY 11542
D Viking Inds., Inc., Dept. EM, 9324 Topanga Cyn Blvd., Chatsworth, Cal. 91311

Testers, Capacitor

D **B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 ..... ***
Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 ..... *
Continental Specialties Corp., Dept. EM, Box 1942, 70 Fulton Terr, New Haven, Conn. 06509 ..... *
Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 .. *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509 ..... *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
London Co., Dept. EM, 811 Sharon Dr., Westlake, Ohio 44145 ..... *
Megavolt, Corp., Dept. EM, 110 Hobart St, Hackensack, N.J. 07601 ..... *
Slaughter Co., Dept. EM, Moore & Hailey Sts., P.O. Box 1805, Ardmore, Okla. 73401 ..... *
D **Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 ***
Torotron, Dept. EM, 255 Washington St., Mt. Vernon, N.Y. 10553 ..... p. 2831
Beckman Instrs., Cedar Grove Opers., Dept. EM, 89 Commerce Rd., Cedar Grove, N.J. 07009
Brown Electro-Measurements Co., Brown Electro-Meas., Dept. EM, P.O. Box 55169, Seattle, Wash. 98155
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
D Electronic Measurements Corp., Dept. EM, 625 Broadway, New York, N.Y. 10012
Freudenberg, Inc. B., Dept. EM, 50 Rockefeller Plaza, New York, N.Y. 10020
D Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
Kahle Engrg. Co., Dept. EM, 3344 Hudson Ave., Union City, N.J. 07087
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602
Metal Fabricators, Inc., Dept. EM, Box 1946, Greenville, S.C. 29602
Micro Instrument Co., Marine & Power Instr. Div., Dept. EM, 2250 Micro Pl., Escondido, Cal. 92025
Optimized Devices Inc., Dept. EM, 220 Marble Ave., Pleasantville, N.Y. 10570
M Peschel Instrs., Inc., Dept. EM, 1412 Viscaya Pkwy., Cape Coral, Fla. 33904
D Possis Corp., Dept. EM, 825 Rhode Island Ave., S., Minneapolis, Minn. 55426
D Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
D Wahl Clipper Corp., Dept. EM, 2902 Locust St., Sterling, Ill. 61081

Testers, Circuit—See Testers, Signal Tracing

Testers, Coil

B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 ..... *
Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 ..... *
Freed Transformer Co., Inc., Dept. EM, 1718 Weirfield St., Brooklyn, N.Y. 11227 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
M **International Electro-Magnetics, Dept. EM, 350 N. Eric Dr., Palatine, Ill. 60067 ***
D **Slaughter Co., Dept. EM, Moore & Hailey Sts., P.O. Box 1805, Ardmore, Okla. 73401 ..... p. 2823**
Torotron, Dept. EM, 255 Washington St., Mt. Vernon, N.Y. 10553 ..... p. 2831
Wabash Relay & Elctrns., Dept. EM, Box 708, Wabash, Ind. 46992 ..... *
M Anchor Specialty Mfg. Inc., Dept. EM, 300 Hollister Rd., Teterboro, N.J. 07608
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
Brown Electro-Measurements Co., Brown Electro-Meas., Dept. EM, P.O. Box 55169, Seattle, Wash. 98155
M Hacker Instrs., Inc., Dept. EM, Box 657, Fairfield, N.J. 07006
D Sencore, Dept. EM, 3200 Sencore Dr., Sioux Falls, S.D. 57107
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115

Testers, Communication Equipment (Automatic)

B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 ..... *
GRM Corp., Dept. EM, Box 337, Medford, N.J. 08055 ..... p. 1379
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... *
Com/Tech Systems Inc., Dept. EM, 44 Beaver St., New York, N.Y. 10004
Convex Corp., Dept. EM, 2810 Dorr Ave., Fairfax, Va. 22031
Data-Control Systems, Dept. EM, Commerce Dr., Box 860, Danbury, Conn. 06810
Dataprobe, Inc., Dept. EM, 254 Green St., So. Hackensack, N.J. 07606
D Digitech Data Inds., Dept. EM, 66 Grove St., Box 547, Ridgefield, Conn. 06877
Dynatech Data Sys, A Dynatech Co, Dept. EM, 900 Slaters La., Alexandria, Va. 22314
Epicom, Inc., Dept. EM, 592 N. Douglas Ave., Altamonte Springs, Fla. 32701
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
D International Data Sciences, Dept. EM, 100 Nashua St., Providence, R.I. 02904
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
M Singer Co., Librascope Div., Dept. EM, 833 Sonora Ave., Glendale, Cal. 91201

Testers, Component Linearity

Continental Specialties Corp., Dept. EM, Box 1942, 70 Fulton Terr, New Haven, Conn. 06509 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 p. 2766,2767
London Co., Dept. EM, 811 Sharon Dr., Westlake, Ohio 44145 ..... *
Slaughter Co., Dept. EM, Moore & Hailey Sts., P.O. Box 1805, Ardmore, Okla. 73401 ..... *
D Associated Research, Inc., Dept. EM, 6125 W. Howard St., Niles, Ill. 60648
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
Micro Technical Industries, Dept. EM, 1999 S. Coast Hwy., Laguna Beach, Cal. 92651
Optimized Devices Inc., Dept. EM, 220 Marble Ave., Pleasantville, N.Y. 10570
Solatron Enterprises, Dept. EM, 421 E. Beach Ave., Inglewood, Calif. 90302
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077

Testers, Corona

Bertan Assocs., Inc., Dept. EM, 3 Aerial Way, Syosset, N.Y. 11791 ..... *
M **Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509 ..... ***
Megavolt, Corp., Dept. EM, 110 Hobart St, Hackensack, N.J. 07601 ..... *
D American HV Voltage Test Sys., Inc., Dept. EM, Ctrl Garr Ind'l Pk, Accident, Md. 21520
D Associated Research, Inc., Dept. EM, 6125 W. Howard St., Niles, Ill. 60648
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602
M Peschel Instrs., Inc., Dept. EM, 1412 Viscaya Pkwy., Cape Coral, Fla. 33904
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
Techsonics, Dept. EM, Box 251, El Prado, N.M. 87529
Velonex, Instrument Div., Dept. EM, 560 Robert Ave., Santa Clara, Cal. 95050

Testers, Diode

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
D **B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635** ..... p. 2677
Continental Specialties Corp., Dept. EM, Box 1942, 70 Fulton Terr, New Haven, Conn. 06509 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
D **Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108** *
Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509 ..... *
Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 p. 2767
Aerotronic Assocs., Inc., Dept. EM, Riverside Dr., Contoocook, N.H. 03229
Automatic Production Systems Inc., Dept. EM, #12 Springdale Rd. Cherry Hill Ind. Pk., Cherry Hill, N.J. 08003
Beckman Instrs., Ectrn. Instrs. Div. Ectrn. Instrumentation, Dept. EM, 3900 N. River Rd., Schiller Park, Ill. 60176
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
Dantronics, Inc., Dept. EM, 3175 Hafner Ct., St. Paul, Minn 55112
E-H International, Inc., Dept. EM, 515 11th St Box 1289, Oakland, Cal 94604
E-H Resch. Labs., Inc., Dept. EM, Box 1289, Oakland, Cal. 94604
D Fairchild Sys. Technology, Dept. EM, 1725 Technology Dr., San Jose, Cal. 95110
Kikusui Elctrns. Corp., Dept. EM, 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
Larson Aero Dev., Dept. EM, Box 135, Concord, Cal. 94522
D Lectrotech, Inc., Dept. EM, 5810 N. Western Ave., Chicago, Ill. 60659
M Lehighton Electronics, Inc., Dept. EM, RD 1Box 374 Dept M, Lehighton, Pa 18235
Mastech, Inc., Dept. EM, 478 E. Brighton Ave., Syracuse, N.Y. 13210
Optimized Devices Inc., Dept. EM, 220 Marble Ave., Pleasantville, N.Y. 10570
M Peschel Instrs., Inc., Dept. EM, 1412 Viscaya Pkwy., Cape Coral, Fla. 33904
Quaker Elctrns., Dept. EM, Box 215, Hunlock Creek, Pa. 18621
Siemens Corp., Dept. EM, 3 Computer Dr., P.O. Box 5006, Cherry Hill, N.J. 08034
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Telco Products Co., Dept. EM, 44 Sea Cliff, Glen Cove, NY 11542
Telvac Instr. Co., Dept. EM, 7534 Atoll Ave. F, N. Hollywood, Cal. 91605
M Trio-Tech, Inc. of Calif., Trio-Tech Int., Dept. EM, 2435 N. Naomi St., Burbank, Calif. 91504
Velonex, Instrument Div., Dept. EM, 560 Robert Ave., Santa Clara, Cal. 95050

Testers, Electric Power—See Monitors, Power, A-C & D-C

Testers, Encoder

Datametrics/Trump Ross, Dept. EM, 340 Fordham Road, Wilmington, Mass. 01887 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
M Conrac Corp., Systems Sls Div., Dept. EM, Three Landmark Sq., Stamford, Conn. 06901
Kollsman Instr. Co., Dept. EM, Daniel Webster Hwy., Merrimack, N.H. 03054
Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
Telco Products Co., Dept. EM, 44 Sea Cliff, Glen Cove, NY 11542
Teledyne Gurley, Dept. EM, 514 Fulton St., Troy, N.Y. 12181
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006

Testers, Fiber Optic—See Fiber Optic Cables & Components

Testers, Ground Resistance—See Meters, Ohm

Testers, Hi-Pot—See Meters, Megohm

Testers, Insulation Breakdown—See Meters, Megohm

The Bendix Corp., Electrical Comp. Div., Dept. EM, Sidney, NY 13838 ..... *

Testers, Integrated Circuit (Automatic)

D **ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845** ..... *
B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Accuprobe, Inc., Dept. EM, 1 Harrison Ave, Box 1044, Salem, Mass 01970
Alessi Inds., Dept. EM, 3195-C Airport Loop Dr., Costa Mesa, Cal. 92626
D Alpha Data Incorporated, Dept. EM, 20750 Marilla St., Chatsworth, Cal 91311
Beckman Instrs., Ectrn. Instrs. Div. Ectrn. Instrumentation, Dept. EM, 3900 N. River Rd., Schiller Park, Ill. 60176
Berkeley Instruments, Inc., Dept. EM, 2700 Dupont Dr., Irvine, Cal. 92715
Biomation, Dept. EM, 10411 Bubb Rd., Cupertino, Cal. 95014
Bulova Systems & Instrument Corp., Dept. EM, Green Acres Rd., W., Valley Stream, N.Y. 11582
Computer Automation, Inc., Ind. Prods. Div., Dept. EM, 18651 Von Karman, Irvine, Cal. 92664
Digital Gen'l. Corp., Univ. Cir. Resch. Ctr., Dept. EM, 11000 Cedar Ave., Cleveland, Ohio 44106
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
E.S.I. Inc., Dept. EM, 13900 N.W. Science Park Dr., Portland, Oregon 97229
D Fairchild Sys. Technology, Dept. EM, 1725 Technology Dr., San Jose, Cal. 95110
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
DM Hughes Aircraft Co., Ind'l. Prods. Div., Prod. Equip. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
Optimized Devices Inc., Dept. EM, 220 Marble Ave., Pleasantville, N.Y. 10570
Pylon Co., Inc., Dept. EM, 51 Newcomb St., Attleboro, Mass. 02703
Siemens Corp., Dept. EM, 3 Computer Dr., P.O. Box 5006, Cherry Hill, N.J. 08034
Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
M Singer Co., Librascope Div., Dept. EM, 833 Sonora Ave., Glendale, Cal. 91201
Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
M Telectro Sys. Corp., Dept. EM, 96-18 43rd Ave., Corona, N.Y. 11368
D Testline, Dept. EM, 1625 White Drive, Titusville, Fla. 32780
M Trio-Tech, Inc. of Calif., Trio-Tech Int., Dept. EM, 2435 N. Naomi St., Burbank, Calif. 91504
Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304

Testers, Integrated Circuit (Manual)

D **Continental Specialties Corp., Dept. EM, Box 1942, 70 Fulton Terr, New Haven, Conn. 06509** ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Slaughter Co., Dept. EM, Moore & Hailey Sts., P.O. Box 1805, Ardmore, Okla. 73401 ..... p. 2823
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
Accuprobe, Inc., Dept. EM, 1 Harrison Ave, Box 1044, Salem, Mass 01970
D Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
Alessi Inds., Dept. EM, 3195-C Airport Loop Dr., Costa Mesa, Cal. 92626
D Alpha Data Incorporated, Dept. EM, 20750 Marilla St., Chatsworth, Cal 91311
Applied Control Co., Dept. EM, 1275 Bloomfield Ave., Fairfield, N.J. 07006
Automatic Production Systems Inc., Dept. EM, #12 Springdale Rd. Cherry Hill Ind. Pk., Cherry Hill, N.J. 08003
Beckman Instrs., Ectrn. Instrs. Div. Ectrn. Instrumentation, Dept. EM, 3900 N. River Rd., Schiller Park, Ill. 60176
Berkeley Instruments, Inc., Dept. EM, 2700 Dupont Dr., Irvine, Cal. 92715
D Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
Cybersonic Div., C. A. Briggs Co., Dept. EM, Box 151, Glenside, Pa. 19038
D E-Z-Hook, Div. Tektest, Dept. EM, Box 450 114 E. St. Joseph, Arcadia, Cal. 91006
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
E.S.I. Inc., Dept. EM, 13900 N.W. Science Park Dr., Portland, Oregon 97229
Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
D Fairchild Sys. Technology, Dept. EM, 1725 Technology Dr., San Jose, Cal. 95110
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Kurz-Kasch, Inc., Knob Div., Dept. EM, 711 Hunter Dr., Wilmington, Ohio 45177
Pylon Co., Inc., Dept. EM, 51 Newcomb St., Attleboro, Mass. 02703
Siemens Corp., Dept. EM, 3 Computer Dr., P.O. Box 5006, Cherry Hill, N.J. 08034
M Telectro Sys. Corp., Dept. EM, 96-18 43rd Ave., Corona, N.Y. 11368
D Testline, Dept. EM, 1625 White Drive, Titusville, Fla. 32780

Testers, Life, Component

M **Blue M Electric Co., Dept. EM, 138th & Chatham St., Blue Island, Ill. 60406** p. 2570
London Co., Dept. EM, 811 Sharon Dr., Westlake, Ohio 44145 ..... *
Megavolt, Corp., Dept. EM, 110 Hobart St, Hackensack, N.J. 07601 ..... *
Ohio Semitronics, Inc., Dept. EM, 1205 Chesapeake Ave., Columbus, Ohio 43212 ..... *
Slaughter Co., Dept. EM, Moore & Hailey Sts., P.O. Box 1805, Ardmore, Okla. 73401 ..... p. 2823
Advanced Technology Sys., Dept. EM, 450 W. First Ave., Roselle, N.J. 07023
M Aerotronic Assocs., Inc., Dept. EM, Riverside Dr., Contoocook, N.H. 03229
Custom Scientific Instrs., Dept. EM, 13 Wing Dr., Box A, Whippany, N.J. 07981
D Delta Design, Inc., Dept. EM, 5725 Kearny Villa Road, San Diego, Cal 92123
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602
Lehighton Electronics, Inc., Dept. EM, RD 1Box 374 Dept M, Lehighton, Pa 18235
Loranger Mfg. Corp., Dept. EM, Box 948, Warren, Pa. 16365
Micro Instrument Co., Marine & Power Instr. Div., Dept. EM, 2250 Micro Pl., Escondido, Cal. 92025
Solatron Enterprises, Dept. EM, 421 E. Beach Ave., Inglewood, Calif. 90302

Testers, Logic Card

DM **ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845** ..... *
B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 ..... *
Continental Specialties Corp., Dept. EM, Box 1942, 70 Fulton Terr, New Haven, Conn. 06509 ..... *
D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043** *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Advanced Technology Sys., Dept. EM, 450 W. First Ave., Roselle, N.J. 07023
Alessi Inds., Dept. EM, 3195-C Airport Loop Dr., Costa Mesa, Cal. 92626
Automatic Production Systems Inc., Dept. EM, #12 Springdale Rd. Cherry Hill Ind. Pk., Cherry Hill, N.J. 08003
M Automation Dynamics, Div. ABC Digital, Inc., Dept. EM, 25 Charles St., Westwood, N.J. 07675
M Computer Automation, Inc., Ind. Prods. Div., Dept. EM, 18651 Von Karman, Irvine, Cal. 92664
Digital Gen'l. Corp., Univ. Cir. Resch. Ctr., Dept. EM, 11000 Cedar Ave., Cleveland, Ohio 44106
Assocs. Inc., Dept. EM, 333 W. Commercial St., East Rochester, N.Y. 14445
D Fairchild Sys. Technology, Dept. EM, 1725 Technology Dr., San Jose, Cal. 95110
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791

Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
DM Hughes Aircraft Co., Ind'l. Prods. Div., Prod. Equip. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
Kurz-Kasch, Inc., Knob Div., Dept. EM, 711 Hunter Dr., Wilmington, Ohio 45177
Omnicomp, Inc., Dept. EM, 5150 N 16th St, Ste 253, Phoenix, Ariz. 85016
Optimized Devices Inc., Dept. EM, 220 Marbie Ave., Pleasantville, N.Y. 10570
S.I.R. Atlanta, Inc., Dept. EM, 331 Luckie St., N.W., Atlanta, Ga. 30313
DM Systron Donner, Data Products Div., Dept. EM, 735 Detroit Ave., Concord, Cal. 94518
DM Trendar, Dept. EM, 630 Clyde Ave., Mountain View, Cal. 94040

Testers, Magnetic Core

Inter-Tech. Grp., Inc., Dept. EM, Box 23, Irvington, N.Y. 10533 ..... p. 2557
Pioneer Magnetics, Dept. EM, 1745 Berkeley St., Santa Monica, Cal. 90404 *
RFL Inds., Thermocontrol Div., Dept. EM, Boonton, N.J. 07005 ..... *
Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... *
LDJ Electronics, Dept. EM, 1064 Naughton Ave., Troy, Mich. 48084
Magnetic Metals Co., Dept. EM, Hayes Ave. at 21st St., Camden, N.J. 08105
DM Magnos, Incorporated, Dept. EM, Old School House Rd., Harvard, Mass. 01451
Siemens Corp., Dept. EM, 3 Computer Dr., P.O. Box 5006, Cherry Hill, N.J. 08034
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
DM Systron Donner, Data Products Div., Dept. EM, 735 Detroit Ave., Concord, Cal. 94518
Walker Scientific, Inc., Dept. EM, Rockdale St., Worcester, Mass. 01606

Testers, Magnetron

Cober Elctrns., Inc., Dept. EM, 7 Gleason Ave., Stamford, Conn. 06902 ..... *
Megavolt, Corp., Dept. EM, 110 Hobart St, Hackensack, N.J. 07601 ..... *
RFL Inds., Thermocontrol Div., Dept. EM, Boonton, N.J. 07005 ..... *
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602

Testers, Material

Dynatech R/D Co., Microsystems Dept., Dept. EM, 99 Erie St., Cambridge, Mass. 02139 ..... *
Exact Electronics, Inc., Dept. EM, Box 160, 455 SE 2nd Ave., Hillsboro, Ore. 97123 ..... *
Megavolt, Corp., Dept. EM, 110 Hobart St, Hackensack, N.J. 07601 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
RFL Inds., Instr. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005 ..... *
D Associated Research, Inc., Dept. EM, 6125 W. Howard St., Niles, Ill. 60648
D Chatillon John & Sons, Dept. EM, 83-30 Kew Gardens Rd., Kew Gardens, N.Y. 11415
M Custom Scientific Instrs., Dept. EM, 13 Wing Dr., Box A, Whippany, N.J. 07981
Dillon, W.C. & Co., Dept. EM, 14620-EP Keswick St., Van Nuys 340, Cal. 91407
GCA/Precision Scientific, Dept. EM, 3737 W. Cortland St., Chicago, Ill. 60647
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602
LDJ Electronics, Dept. EM, 1064 Naughton Ave., Troy, Mich. 48084
Magnaflux Corp. , Dept. EM, 7328 W. Lawrence Ave., Chicago, Ill 60656
DM Magnos, Incorporated, Dept. EM, Old School House Rd., Harvard, Mass. 01451
MTS Systems Corp., Dept. EM, Box 24012, Minneapolis, Minn 55424
Schaevitz Engrg., Dept. EM, U.S. 130, Union Ave., Pennsauken, N.J. 08110
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
Thomas & Skinner, Inc., Dept. EM, Box 150-B,, Indianapolis, Ind. 46206
Thwing-Albert Instr. Co., Dept. EM, 10960 Dutton Rd., Philadelphia, Pa. 19154
Walker Scientific, Inc., Dept. EM, Rockdale St., Worcester, Mass. 01606

Testers, Meter

Electronic Dev. Corp., Dept. EM, 11 Hamlin St., Boston, Mass. 02127 ..... *
D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 ***
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 p. 2766,2767,2769
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
RFL Inds., Instr. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005 ..... *
D **United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403 ..... ***
Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... *
M Automation Dynamics, Div. ABC Digital, Inc., Dept. EM, 25 Charles St., Westwood, N.J. 07675
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
Jones & Laughlin Steel Corp, Dept. EM, 3 Gateway Ctr, Pittsburgh, PA 15263
D JPI, Inc., Dept. EM, 1507 San Vicente Blvd., Santa Monica, Cal. 90402
Kikusui Elctrns. Corp., Dept. EM, 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
Snap-On-Tools, Dept. EM, 8192-A 28th Ave., Kenosha, Wisc. 53140
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
Telco Products Co., Dept. EM, 44 Sea Cliff, Glen Cove, NY 11542
TransData Inc., Dept. EM, P.O. Box 518, Dublin, Ohio 43017

Testers, Microwave

B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 ..... *
Cober Elctrns., Inc., Dept. EM, 7 Gleason Ave., Stamford, Conn. 06902 p. 2862
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 p. 2870**
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Megavolt, Corp., Dept. EM, 110 Hobart St, Hackensack, N.J. 07601 ..... *
Vega Precision Labs., Dept. EM, 800 Follin La., Vienna, Va. 22180 ..... *
D Ailtech, Dept. EM, 2070 Fifth Ave, Ronkonkoma, NY 11779
Alford Mfg. Co., Dept. EM, 120 Cross St., Winchester, Mass. 01890
D Carco Elctrns., Dept. EM, 195 Constitution Dr., Menlo Park, Calif. 94025
Frequency Engrg. Labs., Dept. EM, Box 527, Farmingdale, N.J. 07727
D Gamma Elctrn Research Co., RF & Microwave Lab., Dept. EM, 991 Commercial St. Ste. 4, Palo Alto, Cal 94303
D Gamma Elctrn Research Co., Tech. Pubs. Sect., Dept. EM, Box 482, Newark, CA 94560
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Pacific Meas., Inc., Dept. EM, 470 San Antonio Rd, Palo Alto, Calif. 94306
D Rantec Div., Emerson Elec. Co., Dept. EM, 24003 Ventura Blvd., Calabasas, Calif. 91302
M Republic Elctrn. Inds. Corp., Dept. EM, 575 Broad Hollow Rd., Melville, N.Y. 11746
D Tau-Tron Inc., Dept. EM, 11 Esquire Rd., N. Billerica, Mass. 01862
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760
D Wiltron Co., Dept. EM, 825 E. Middlefield Rd., Mt. View, Cal 94043

Testers, Modem

Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 ..... *
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
Com/Tech Systems Inc., Dept. EM, 44 Beaver St., New York, N.Y. 10004
Data-Control Systems, Dept. EM, Commerce Dr., Box 860, Danbury, Conn. 06810
Dataprobe, Inc., Dept. EM, 254 Green St., So. Hackensack, N.J. 07606
Digitech Data Inds., Dept. EM, 66 Grove St., Box 547, Ridgefield, Conn. 06877
Dynatech Data Sys, A Dynatech Co, Dept. EM, 900 Slaters La., Alexandria, Va. 22314
D International Data Sciences, Dept. EM, 100 Nashua St., Providence, R.I. 02904
Moxon Inc., Dept. EM, 2222 Michelson Dr. Bldg. E, Irvine, Cal. 92715
D Racal-Milgo Corp., Racal-Milgo, Inc., Dept. EM, 8600 N.W. 41st St., Miami, Fla. 33166

Testers, Motor

B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 ..... *
Slaughter Co., Dept. EM, Moore & Hailey Sts., P.O. Box 1805, Ardmore, Okla. 73401 ..... *
D American HV Voltage Test Sys., Inc., Dept. EM, Ctrl Garr Ind'l Pk, Accident, Md. 21520
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
D Chatillon John & Sons, Dept. EM, 83-30 Kew Gardens Rd., Kew Gardens, N.Y. 11415
Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424

Testers, Potentiometer

Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 ..... *
Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 p. 2766-2768
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
Freudenberg, Inc. B., Dept. EM, 50 Rockefeller Plaza, New York, N.Y. 10020
M Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
Penn Airborne Prods., Dept. EM, Industrial Hwy., Southampton, Pa. 18966
Solatron Enterprises, Dept. EM, 421 E. Beach Ave., Inglewood, Calif. 90302
Teledyne Gurley, Dept. EM, 514 Fulton St., Troy, N.Y. 12181

Testers, Power Supply

ACDC Electronics, Dept. EM, 401 Jones Rd., Oceanside, Cal. 92054 ..... *
B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 ..... *
Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 .. *
Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ..... *
Electronic Dev. Corp., Dept. EM, 11 Hamlin St., Boston, Mass. 02127 ..... *
Elgar Corporation, Dept. EM, 8225 Mercury Ct., San Diego, Cal. 92111 ..... *
Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 p. 2766,2767
Megavolt, Corp., Dept. EM, 110 Hobart St, Hackensack, N.J. 07601 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Universal Voltronics Corp., Dept. EM, 27 Radio Circle Dr., Mt. Kisco, N.Y. 10549 ..... *
M **Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040 ***
M Automation Dynamics, Div. ABC Digital, Inc., Dept. EM, 25 Charles St., Westwood, N.J. 07675
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Micro Instrument Co., Marine & Power Instr. Div., Dept. EM, 2250 Micro Pl., Escondido, Cal. 92025
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
Optimized Devices Inc., Dept. EM, 220 Marble Ave., Pleasantville, N.Y. 10570
D Power Control Corp., Dept. EM, 122 Gamma Dr., Pittsburgh, Pa. 15238
M Transistor Devices, Dept. EM, 85 Horsehill Rd., Cedar Knolls, N.J. 07927

Testers, Pulse Jitter

EG&G, Inc., Electro-Optics Div., Dept. EM, 35 Congress St., Salem, Mass. 01970 ..... *

Slaughter Co., Dept. EM, Moore & Hailey Sts., P.O. Box 1805, Ardmore, Okla. 73401 ..... p. 2823

Testers, Relay

Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 ..... *
Continental Specialties Corp., Dept. EM, Box 1942, 70 Fulton Terr, New Haven, Conn. 06509 ..... *
Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
Slaughter Co., Dept. EM, Moore & Hailey Sts., P.O. Box 1805, Ardmore, Okla. 73401 ..... *
M Anchor Specialty Mfg. Inc., Dept. EM, 300 Hollister Rd., Teterboro, N.J. 07608
Digitech Data Inds., Dept. EM, 66 Grove St., Box 547, Ridgefield, Conn. 06877
D Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
Optimized Devices Inc., Dept. EM, 220 Marble Ave., Pleasantville, N.Y. 10570
Qualco, Dept. EM, One First St., Los Altos, Cal. 94022
Solatron Enterprises, Dept. EM, 421 E. Beach Ave., Inglewood, Calif. 90302
Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
Wilmar Elctrns. Inc., Dept. EM, 2430 Amsler St., Torrance, Cal. 90505

Testers, Resistivity

Chatsworth Data Corp, Cablemaster Div., Dept. EM, 20710 Lassen St., Chatsworth, Cal 91311 ..... *
D **Cutler-Hammer, Shallcross Resistor Prods., Dept. EM, US 70 East, Smithfield, N.C. 27577** ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509 ..... *
Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 p. 2768
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... *
Alessi Inds., Dept. EM, 3195-C Airport Loop Dr., Costa Mesa, Cal. 92626
D Associated Research, Inc., Dept. EM, 6125 W. Howard St., Niles, Ill. 60648
M Automation Dynamics, Div. ABC Digital, Inc., Dept. EM, 25 Charles St., Westwood, N.J. 07675
M Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
COSAR Corp., Dept. EM, 3121 Benton St., Garland, Tex. 75042
Custom Scientific Instrs., Dept. EM, 13 Wing Dr., Box A, Whippany, N.J. 07981
DM Hughes Aircraft Co., Ind'l. Prods. Div., Prod. Equip. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
DM Kenco Alloy & Chemical Co., Inc., Dept. EM, 418 W. Belden Ave., Addison, Ill. 60101
Lehighton Electronics, Inc., Dept. EM, RD 1Box 374 Dept M, Lehighton, Pa 18235
DM Matheson Gas Products, Dept. EM, Box 85, East Rutherford, N.J. 07073
Penn Airborne Prods., Dept. EM, Industrial Hwy., Southampton, Pa. 18966
M Space Electronics, Inc, Dept. EM, Box 2166, Meriden, Conn. 06450

Testers, Resistor

Continental Specialties Corp., Dept. EM, Box 1942, 70 Fulton Terr, New Haven, Conn. 06509 ..... *
D **Cutler-Hammer, Shallcross Resistor Prods., Dept. EM, US 70 East, Smithfield, N.C. 27577** ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 p. 2766-2768
London Co., Dept. EM, 811 Sharon Dr., Westlake, Ohio 44145 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
RFL Inds., Instr. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005 ..... *
Slaughter Co., Dept. EM, Moore & Hailey Sts., P.O. Box 1805, Ardmore, Okla. 73401 ..... *
D Alpha Components Corp., Dept. EM, 115 Eucalyptus Dr., El Segundo, Cal. 90245
M Anchor Specialty Mfg. Inc., Dept. EM, 300 Hollister Rd., Teterboro, N.J. 07608
M Associated Testing Laboratories, Div of Walter Kidde & Co., Dept. EM, Northwest Ind'l. Pk., Burlington, Mass. 01803
Automatic Production Systems Inc., Dept. EM, #12 Springdale Rd. Cherry Hill Ind. Pk., Cherry Hill, N.J. 08003
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
Brown Electro-Measurements Co., Brown Electro-Meas., Dept. EM, P.O. Box 55169, Seattle, Wash. 98155
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
Freudenberg, Inc. B., Dept. EM, 50 Rockefeller Plaza, New York, N.Y. 10020
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
Luft Instrs., Inc., Dept. EM, Hillside Rd, Lincoln, Mass. 01773
Optimized Devices Inc., Dept. EM, 220 Marble Ave., Pleasantville, N.Y. 10570
Penn Airborne Prods., Dept. EM, Industrial Hwy., Southampton, Pa. 18966
M Peschel Instrs., Inc., Dept. EM, 1412 Viscaya Pkwy., Cape Coral, Fla. 33904
M Space Electronics, Inc, Dept. EM, Box 2166, Meriden, Conn. 06450
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077

Testers, Servo—See Analyzers, Servo

Testers, Shock

M **Blue M Electric Co., Dept. EM, 138th & Chatham St., Blue Island, Ill. 60406** p. 2570
Chatsworth Data Corp, Cablemaster Div., Dept. EM, 20710 Lassen St., Chatsworth, Cal 91311 ..... p. 2680
Chatsworth Data Corp, Impact-o-Graph Div., Dept. EM, 20710 Lassen St., Chatsworth, Cal. 91311 ..... p. 2680
Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 ..... p. 2429
D CVC Products, Inc., Dept. EM, 525 Lee Rd., Box 1886, Rochester, N.Y. 14603
Endevco, Div. Becton, Dickinson & Co., Dept. EM, 30700 Rancho Viejo Rd., San Jaun Capistrano, Cal. 92675
Larson Aero Dev., Dept. EM, Box 135, Concord, Cal. 94522
Media Recovery Inc., Dept. EM, Box 867, Graham, Tex. 76046
Metrix Instrument Co., Metrix Instrument Co., Dept. EM, 1711 Townhurst, Houston, Tex. 77043
MTS Systems Corp., Dept. EM, Box 24012, Minneapolis, Minn 55424

Testers, Short-Turn—See Testers, Coil

Testers, Signal Tracing

D **B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635** ..... *
Chatsworth Data Corp, Cablemaster Div., Dept. EM, 20710 Lassen St., Chatsworth, Cal 91311 ..... p. 2680
Chatsworth Data Corp, Impact-o-Graph Div., Dept. EM, 20710 Lassen St., Chatsworth, Cal. 91311 ..... p. 2680
D **Continental Specialties Corp., Dept. EM, Box 1942, 70 Fulton Terr, New Haven, Conn. 06509** ..... *
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
United Wiring & Mfg. Co., Dept. EM, 2608 Electonic La. #404, Dallas, Tex. 75220 ..... p. 1302
M **Virginia Panel Corp., Dept. EM, Box 1106, 1400 New Hope Rd., Waynesboro, Va. 22980** ..... *
Applied Systems Corp., Dept. EM, 26401 Harper Ave., St. Clair Shores, Mich. 48081
M Automation Dynamics, Div. ABC Digital, Inc., Dept. EM, 25 Charles St., Westwood, N.J. 07675
M Barber Corp., Dept. EM, Box 635, Waynesville, Ohio 45068
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
Computer Automation, Inc., Ind. Prods. Div., Dept. EM, 18651 Von Karman, Irvine, Cal. 92664
Cybersonic Div., C. A. Briggs Co., Dept. EM, Box 151, Glenside, Pa. 19038
DIT-MCO Int'l. Corp., Dept. EM, 5612 Brighton Terr., Kansas City, Mo. 64130
Electro-Dynamics Dev. Co., Dept. EM, 475 Mt. Hood Dr. S.W., Issaquah, Wash 98027
D Electronic Measurements Corp., Dept. EM, 625 Broadway, New York, N.Y. 10012
Electronic Sys & Programm, Dept. EM, 12901 Crenshaw Blvd., Hawthorne, Cal. 90250
Everett/Charles, Inc., Dept. EM, 2806 Metropolitan Pl., Pomona, Cal. 91767
D Holub Industries, Dept. EM, 413 DeKalb Ave., Sycamore, Ill. 60178
DM Hughes Aircraft Co., Ind'l. Prods. Div., Prod. Equip. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
Jerrold Electronics Corp., Distr Sls, Dept. EM, 200 Witmer Rd., Horsham, Pa. 19044
Kurz-Kasch, Inc., Knob Div., Dept. EM, 711 Hunter Dr., Wilmington, Ohio 45177
National Camera inc., Dept. EM, 2000 W. Union Ave., Englewood, Colo. 80110
Optimized Devices Inc., Dept. EM, 220 Marble Ave., Pleasantville, N.Y. 10570
D Philips Audio Video Sys, Neutrik Prods, Dept. EM, 91 McKee Dr., Mahwah, N.J. 07430
DM Projects Unlimited, Inc., Dept. EM, 3680 Wyse Rd., Dayton, Ohio 45414
DM Systron Donner, Data Products Div., Dept. EM, 735 Detroit Ave., Concord, Cal. 94518
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Telco Products Co., Dept. EM, 44 Sea Cliff, Glen Cove, NY 11542
D Vidaire Electronics Mfg., Dept. EM, 150 Buffalo Ave., Freeport, N.Y. 11520
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Testers, Solderability

Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Chemical Etching Equip. & Supply, Dept. EM, 6905 Beulah St, Alexandria, Va. 22310
Hollis Engrg., Inc., Dept. EM, Charron Ave., Box 1189, Nashua, N.H. 03061
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204

Testers, Synchro/Resolver

M **Clifton Precision, Litton Systems, Inc., Dept. EM, Marple at Brdway., Clifton Hgts., Pa. 19018** ..... *
M **Computer Conversions Corp., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731** ..... *
M **Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101** ..... *
M **ILC Data Device Corp., Dept. EM, Airport Int'l. Plaza, Bohemia, N.Y. 11716** *
M **Industrial Control Co., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735** ..... p. 3976
M **North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803** ..... *
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
C & A Products, Inc., Dept. EM, 37-12 58th St., Woodside, N.Y. 11377
D NH Research, Inc., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705
Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
Singer Co., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424
Teledyne Gurley, Dept. EM, 514 Fulton St., Troy, N.Y. 12181
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006

Testers, Thickness (all types)

D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
Alessi Inds., Dept. EM, 3195-C Airport Loop Dr., Costa Mesa, Cal. 92626
Bicron Elctrns. Co., Dept. EM, Box 807, Barlow St., Canaan, Conn. 06018
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
M Custom Scientific Instrs., Dept. EM, 13 Wing Dr., Box A, Whippany, N.J. 07981
M Hacker Instrs., Inc., Dept. EM, Box 657, Fairfield, N.J. 07006

Leitz, Inc. E., Dept. EM, Link Crescent, Rockleigh, N.J. 07647
D Neuses, Inc. (P.K.), Dept. EM, 1401 Rohlwing Rd., Rolling Meadows, Ill. 60008
Nuclear Resch. Corp., Dept. EM, 1105 Indl. Hwy., Southampton, Pa. 18966
Panametrics Inc., Dept. EM, 221 Cresent St., Waltham, Mass. 02154
Rank Precision Inds., Dept. EM, 411 Jarvis Ave., Des Plaines, Ill. 60018
Sloan Technology Corp., Dept. EM, 535 E. Montecito St., Santa Barbara, Cal. 93103
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115

Testers, Tracking & Erosion Resistance (Insulation)

Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 *

Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509 *
Hioki New York Corp., Dept. EM, 42-16 235th St., Douglaston, N.Y. 11363

Testers, Transistor

American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 *
D **B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635** p. 2677
D **Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108** *

NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** *
D **Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817** *
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
Beckman Instrs., (AISSD), Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634
Berkeley Instruments, Inc., Dept. EM, 2700 Dupont Dr., Irvine, Cal. 92715
Bulova Systems & Instrument Corp., Dept. EM, Green Acres Rd., W., Valley Stream, N.Y. 11582
Dantronics, Inc., Dept. EM, 3175 Hafner Ct., St. Paul, Minn 55112
Desco Mfg. Co., Dept. EM, 1530 Flower St., Glendale, Cal. 91201
D Electronic Measurements Corp., Dept. EM, 625 Broadway, New York, N.Y. 10012
D Fairchild Sys. Technology, Dept. EM, 1725 Technology Dr., San Jose, Cal. 95110
D Lectrotech, Inc., Dept. EM, 5810 N. Western Ave., Chicago, Ill. 60659
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
Mastech, Inc., Dept. EM, 478 E. Brighton Ave., Syracuse, N.Y. 13210
Optimized Devices Inc., Dept. EM, 220 Marble Ave., Pleasantville, N.Y. 10570
D Sencore, Dept. EM, 3200 Sencore Dr., Sioux Falls, S.D. 57107
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Telco Products Co., Dept. EM, 44 Sea Cliff, Glen Cove, NY 11542
D Telvac Instr. Co., Dept. EM, 7534 Atoll Ave. F, N. Hollywood, Cal. 91605
D Testline, Dept. EM, 1625 White Drive, Titusville, Fla. 32780
M Trio-Tech, Inc. of Calif., Trio-Tech Int., Dept. EM, 2435 N. Naomi St., Burbank, Calif. 91504
Velonex, Instrument Div., Dept. EM, 560 Robert Ave., Santa Clara, Cal. 95050
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Testers, Transmission & Delay

B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 *
Comstron Seg., Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520 *
Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 *
Marconi Instrs., Div. Marconi Elctrns. Inc., Dept. EM, 100 Stonehurst Ct., Northvale, N.J. 07647 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
Slaughter Co., Dept. EM, Moore & Hailey Sts., P.O. Box 1805, Ardmore, Okla. 73401 p. 2822
Com/Tech Systems Inc., Dept. EM, 44 Beaver St., New York, N.Y. 10004
Convex Corp., Dept. EM, 2810 Dorr Ave., Fairfax, Va. 22031
Data-Control Systems, Dept. EM, Commerce Dr., Box 860, Danbury, Conn. 06810
Decom Systems, Inc., Dept. EM, 1404 Descanso Rd., San Marcos, Ca. 92069
Digitech Data Inds., Dept. EM, 66 Grove St., Box 547, Ridgefield, Conn. 06877
D International Data Sciences, Dept. EM, 100 Nashua St., Providence, R.I. 02904
Multimetrics Div. of Comstro, Comstron-Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11580
Racal-Milgo Corp., Racal-Milgo, Inc., Dept. EM, 8600 N.W. 41st St., Miami, Fla. 33166
Rantec Div., Emerson Elec. Co., Dept. EM, 24003 Ventura Blvd., Calabasas, Calif. 91302
Seg Subsidiary, Comstron Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
D Tau-Tron Inc., Dept. EM, 11 Esquire Rd., N. Billerica, Mass. 01862
Telecommunications Techniques Corp., Dept. EM, 112 Frederick Ave., Rockville, Md. 20850

Testers, Tube

D **B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635** *
Cober Elctrns., Inc., Dept. EM, 7 Gleason Ave., Stamford, Conn. 06902 *
D **Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108** *
D Electronic Measurements Corp., Dept. EM, 625 Broadway, New York, N.Y. 10012
D GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
RIL Elctrns., Inc., Dept. EM, 1105 Ind'l. Hwy., Southampton, Pa. 18966
D Sencore, Dept. EM, 3200 Sencore Dr., Sioux Falls, S.D. 57107

Testers, Vibration-Also See Services, Environmental Test

Chatsworth Data Corp, Cablemaster Div., Dept. EM, 20710 Lassen St., Chatsworth, Cal 91311 p. 2680
Chatsworth Data Corp, Impact-o-Graph Div., Dept. EM, 20710 Lassen St., Chatsworth, Cal. 91311 p. 2680
M **Dytronics Co., Inc., Dept. EM, 4800 Evanswood Dr., Columbus, Ohio 43229** *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 *
Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101 *
M **Tenney Engrg., Inc., Dept. EM, 109 Springfield Rd., Union, N.J. 07083** *
Unholtz-Dickie Corp., Dept. EM, 3000 Whitney Ave., Hamden, Conn. 06518 p. 2575
Acoustic Power Systems, Inc., Dept. EM, 3152-D E. La Palma, Anaheim, Cal. 92806
All American Tool & Mfg. Co., Dept. EM, 8027 Lawndale, Skokie, Ill. 60076
Alpha-M Corp, Dept. EM, 3009 Wildflower Drive, Dallas, Tx. 75229
Applied Systems Corp., Dept. EM, 26401 Harper Ave., St. Clair Shores, Mich. 48081
DM Associated Research, Inc., Dept. EM, 6125 W. Howard St., Niles, Ill. 60648
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
M Columbia Resch. Labs., Dept. EM, Macdade Blvd. & Bullens La., Woodlyn, Pa. 19094
Endevco, Div. Becton, Dickinson & Co., Dept. EM, 30700 Rancho Viejo Rd., San Jaun Capistrano, Cal. 92675
D Epic, Inc., Dept. EM, 150 Nassau St., New York, N.Y. 10038
IRD Mechanalysis, Inc., Dept. EM, 6150 Huntley Rd., Columbus, Ohio 43229
Metrix Instrument Co., Metrix Instrument Co., Dept. EM, 1711 Townhurst, Houston, Tex. 77043
MTS Systems Corp., Dept. EM, Box 24012, Minneapolis, Minn 55424
Spectral Dynamics Corp., Dept. EM, Box 671, San Diego, Cal. 92112
Sundstrand Data Control, Dept. EM, Overlake Ind'l. Pk., Redmond, Wash. 98052
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
M Thermotron Corp., Dept. EM, Kollen Park Dr., Holland, Mich 49423
D Vibra-Metrics, Inc., Dept. EM, 150 Bradley St., E. Haven, Conn. 06512
Wilcoxon Research, Dept. EM, 12526 Parklawn Dr., Rockville, Md. 20852
Zonic Technical Labs., Dept. EM, 8927 Rossash Ave., Cincinnati, Ohio 45236

Testers, Voltage

D **ALCO Electronic Prods., Inc., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845** *
Data Precision Corporation, Dept. EM, Audubon Rd., Wakefield, Mass 01880 p. 2706,2707
Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 *
D **Electro-Mechanical Instru. Div., Sheller-Globe Corp., Dept. EM, Box 368, Dublin, PA 18917** p. 2723
Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509 *
D **Industrial Devices, Dept. EM, Edgewater, N.J. 07020** *
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 p. 2762
Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 p. 2768
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
Ross Engineering Corp., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008 *
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** *
Slaughter Co., Dept. EM, Moore & Hailey Sts., P.O. Box 1805, Ardmore, Okla. 73401 p. 2822
Torotron, Dept. EM, 255 Washington St., Mt. Vernon, N.Y. 10553 p. 2831
D **Triplett Corp., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817** *
Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 *
D Amprobe Instrument, Div. SOS Consolidated Inc., Dept. EM, 630 Merrick Rd., Lynbrook, N.Y. 11563
Applied Systems Corp., Dept. EM, 26401 Harper Ave., St. Clair Shores, Mich. 48081
D Associated Research, Inc., Dept. EM, 6125 W. Howard St., Niles, Ill. 60648
D Holub Industries, Dept. EM, 413 DeKalb Ave., Sycamore, Ill. 60178
DM Hughes Aircraft Co., Ind'l. Prods. Div., Prod. Equip. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
D Ideal Industries Inc., Dept. EM, 4450 Becker Pl., Sycamore, Ill. 60178
D JPI, Inc., Dept. EM, 1507 San Vicente Blvd., Santa Monica, Cal. 90402
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602
Lark Electronics, Inc., Dept. EM, Box 390, New York, N.Y. 10040
Micro Instrument Co., Marine & Power Instr. Div., Dept. EM, 2250 Micro Pl., Escondido, Cal. 92025
M Peschel Instrs., Inc., Dept. EM, 1412 Viscaya Pkwy., Cape Coral, Fla. 33904
Sticht Co., Inc. Herman H., Dept. EM, 27 Park Pl., New York, N.Y. 10007

Testers, Voltage Breakdown

B & K Precision Prods. of Dynascan, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635 *
The Bendix Corp., Electrical Comp. Div., Dept. EM, Sidney, NY 13838 *
Bertan Assocs., Inc., Dept. EM, 3 Aerial Way, Syosset, N.Y. 11791 *
Chatsworth Data Corp, Cablemaster Div., Dept. EM, 20710 Lassen St., Chatsworth, Cal 91311 p. 2680
Chatsworth Data Corp, Impact-o-Graph Div., Dept. EM, 20710 Lassen St., Chatsworth, Cal. 91311 p. 2680
Clarke-Hess Comm., Resch. Corp., Dept. EM, 156-5th Ave., New York, N.Y. 10010 *
Cober Elctrns., Inc., Dept. EM, 7 Gleason Ave., Stamford, Conn. 06902 *
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 *
Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 *
Electrical Instr. Svc., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550 p. 2825
M **Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509** *
DM **Hughes Aircraft Co., Ind'l. Prods. Div. FACT Sys., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008** p. 2758

Industrial Test Equip., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050 ..... *
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122 ..... *
Megavolt, Corp., Dept. EM, 110 Hobart St, Hackensack, N.J. 07601 ..... *
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 p. 2825
D **Slaughter Co., Dept. EM, Moore & Hailey Sts., P.O. Box 1805, Ardmore, Okla. 73401** ..... p. 2822
Torotron, Dept. EM, 255 Washington St., Mt. Vernon, N.Y. 10553 ..... p. 2831
Advanced Kinetics, Dept. EM, 1231 Victoria St., Costa Mesa, Calif. 92627
Aerotronic Assocs., Inc., Dept. EM, Riverside Dr., Contoocook, N.H. 03229
D American HV Voltage Test Sys., Inc., Dept. EM, Ctrl Garr Ind'l Pk, Accident, Md. 21520
D Associated Research, Inc., Dept. EM, 6125 W. Howard St., Niles, Ill. 60648
Automatic Production Systems Inc., Dept. EM, #12 Springdale Rd. Cherry Hill Ind. Pk., Cherry Hill, N.J. 08003
Beckman Instrs., Cedar Grove Opers., Dept. EM, 89 Commerce Rd., Cedar Grove, N.J. 07009
D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462
Dantronics, Inc., Dept. EM, 3175 Hafner Ct., St. Paul, Minn 55112
Electronic Sys & Programm, Dept. EM, 12901 Crenshaw Blvd., Hawthorne, Cal. 90250
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
DM Hughes Aircraft Co., Ind'l. Prods. Div., Prod. Equip. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
Kahle Engrg. Co., Dept. EM, 3344 Hudson Ave., Union City, N.J. 07087
Kikusui Elctrns. Corp., Dept. EM, 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan
Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602
M Peschel Instrs., Inc., Dept. EM, 1412 Viscaya Pkwy., Cape Coral, Fla. 33904
Tobe Deutschmann Labs., Inc., Dept. EM, Box 74, Canton, Mass. 02021
Velonex, Instrument Div., Dept. EM, 560 Robert Ave., Santa Clara, Cal. 95050

Testing, Environmental—See Services, Environmental Testing

Thermistors

Carborundum Co., Graphite Prods. Div., Dept. EM, Box 339, Niagara Falls, N.Y. 14302 ..... p. 4270,4271
Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 ..... *
D **Fenwal Elctrns., Dept. EM, 63 Fountain St., Framingham, Mass. 01701** p. 4273
D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** ..... *
M **General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735** *
Harrel, Inc., Dept. EM, 16 Fitch St., E. Norwalk, Conn. 06855 ..... *
Interelectronics Corp., Dept. EM, Interelectronics Park, 550 U.S. Rte. 303, Congers, N.Y. 10920 ..... *
Keystone Carbon Co., Thermistor Div., Dept. EM, St. Marys, Pa. 15857 p. 4275-4277
D **Midwest Components, Dept. EM, 1981 Port City Blvd., Muskegon, Mich. 49400** ..... p. 4280-4282
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 ..... p. 4285
D **Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094** ..... *
RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102 ..... *
D **RFL Inds., Thermocontrol Div., Dept. EM, Boonton, N.J. 07005** ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
DM Ametek/Rodan Div., Dept. EM, 2905 Blue Star St., Anaheim, Cal. 92806
Baytron, Dept. EM, 344 Salem St., Medford, Mass. 02155
Cal-R, Inc., Dept. EM, P.O. Box 1397, Santa Monica, Cal. 90406
D Carbone Lorraine Industries Corp., Dept. EM, 400 Myrtle Ave., Boonton, N.J. 07005
Conax Corp., Dept. EM, 2300 Walden Ave., Buffalo, N.Y. 14225
Cox & Co., Inc., Dept. EM, 215 Park Ave. S., New York, N.Y. 10003
Electro Mats. Corp. Amer., Dept. EM, 605 Center Ave., Mamaroneck, N.Y. 10543
GTE Sylvania Inc., Dept. EM, Rte. 35, Standish, Maine 04084
Gulton Inds., Inc., Elctrn. Comps. Div., Dept. EM, Piezo Products Div., Metuchen, N.J. 08840
Hades Mfg Corp., Dept. EM, 151-A Verdi St., Farmingdale, N.Y. 11735
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
D Mepco/Electra, Inc., Dept. EM, Columbia Rd., Morristown, N.J. 07960
M Murata Corporation of America, Dept. EM, 1148 Franklin Rd., S.E., Marietta, Ga. 30067
D Murata Mfg. Co. Ltd., Dept. EM, 16, Kaiden Nishijin-cho, Nagaoka-Kyo-Shi, Kyoto, Japan
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Quality Thermistor, Dept. EM, 2096 S. Cole Rd. Ste 7, Boise, Idaho 83705
Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
M Thermometrics, Inc., Dept. EM, 808 US Hwy No. 1, Edison, N.J. 08817
D United Elec. Controls Co., Dept. EM, 85A School St., Watertown, Mass. 02172
D Victory Engrg. Corp., Dept. EM, Victory Rd., Springfield, N.J. 07081
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578
DM Yellow Springs Instrument Co., Dept. EM, Box 279, Yellow Springs, Ohio 45387

Thermocouple Devices & Materials—See Cooling/Heating Modules, Thermoelectric

Thermocouples, Elements & Accessories

Alberox Corp., Dept. EM, New Bedford Ind'l. Pk., New Bedford, Mass. 02745 *
D **Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521** ..... *
D **Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005** ..... *
Best Elecs. Div., Harry Levinson Co., Dept. EM, 1211 E. Denny Way, Seattle, Wash. 98122 ..... p. 4278
Doric Sci., Div. Emerson Elec. Co., Dept. EM, 3883 Ruffin Rd., San Diego, Cal. 92123 ..... *
Ectron Corp., Dept. EM, 8159 Engineer Rd., San Diego, Cal. 92111 .... p. 2719
D **Gulton Inds., Inc., Measurement & Control Systems Div., Dept. EM, Gulton Ind'l. Pk., E. Greenwich, R.I. 02818** ..... p. 2840
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
D **Modutec, Inc., Dept. EM, 18 Marshall St., Norwalk, Conn. 06854** ..... p. 2787
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 p. 4284,4285
PPM, Inc., Dept. EM, 7575 Bond St., Cleveland, Ohio 44139 ..... *
RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102 ..... p. 3739
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** ..... *
Acme Elec. Heating Corp., Dept. EM, 4685 E. 11th, Hialeah, Fla. 33013
M Acromag, Inc., Dept. EM, 30765 Wixom Rd., Wixom, Mich. 48096
D Alnor Instrument Co., Dept. EM, 7301 N. Caldwell Ave., Niles, Ill. 60648
D Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
M ARI Inds., Inc., Dept. EM, 9000 King St., Franklin Pk., Ill. 60131
M Bailey Instrs., Inc., Dept. EM, 515 Victor St., Saddle Brook, N.J. 07662
Bailey Meter Co., Sub. Babcock & Wilcox, Dept. EM, 29801 Euclid Ave., Wickliffe, Ohio 44092
M Barker Elec. Sls., Dept. EM, Box 405, Ship Bottom, NJ 08008
D Bartlett-Emery Instrument Corp., Dept. EM, 14th & Ave. "M", Ft. Madison, Iowa 52627
Beckman Instrs., (AISSD), Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634
BLH Elctrns., Dept. EM, 42 Fourth Ave., Waltham, Mass. 02154
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
Burns Engrg., inc., Dept. EM, 10201 Bren Rd. East, Minnetonka, Minn. 55343
Conax Corp., Dept. EM, 2300 Walden Ave., Buffalo, N.Y. 14225
Control Products Corp., Dept. EM, 4431 W. Division St., Chicago, Ill. 60651
Degussa Corporation, Metals Div., Dept. EM, Route 46 & Hollister Rd., Teterboro, NJ 07608
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
General Resistance, Inc., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553
Gulton Inds., Inc., Servonic/Instrumentation Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
Hades Mfg Corp., Dept. EM, 151-A Verdi St., Farmingdale, N.Y. 11735
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
Hy-Cal Engrg, Dept. EM, 12105 Los Nietos Rd., Santa Fe Springs, Cal 90670
Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704
Indl Timer An Esterline Co., Dept. EM, U.S. Hwy 287, Parsippany, N.J. 07054
D ITT General Controls, Dept. EM, 801 Allen Ave., Glendale, Cal. 91201
D LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Marlin Manufacturing Corp., Dept. EM, 12404 Triskett Rd., Cleveland, Ohio 44111
Materials for Elctrns., Dept. EM, 149-32 132nd St., Jamaica, N.Y. 11430
Micro, Emerson Electric Co. Devices Div, Dept. EM, Box 501 Wright Bros Br, Dayton, Ohio 45409
Minco Products Inc., Dept. EM, 7300 Commerce Lane, Minneapolis, Minn. 55432
NAN MAC, Dept. EM, 9 Mayhew St., Framingham, Mass. 01701
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
Pak-Tronic Inc., Dept. EM, 4044 N Rockwell St, Chicago, Ill 60618
D Revere Corp. of America, Neptune International Corp., Dept. EM, 845 N. Colony Rd., Wallingford, Conn. 06492
Simmonds Precision, Engine Systems Div., Dept. EM, Norwich, N.Y. 13815
M Syscon Int'l., Inc., Dept. EM, 1239 South Bend Ave., So. Bend, Ind. 46617
D Temptronic Corporation, Dept. EM, 40 Glen Ave., Newton, Mass. 02159
Thermo Elec. Co., Inc., Dept. EM, 109 Fifth St., Saddle Brook, N.J. 07662
Trans-Met Engrg., Dept. EM, 601 S. Palm St., La Habra, Cal. 90631
D United Elec. Controls Co., Dept. EM, 85A School St., Watertown, Mass. 02172
Vacuum Prods., Inc., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550
D Watlow Elec. Mfg. Co., Dept. EM, 12001 Lackland Rd., St. Louis, Mo. 63141
D West Instrs, Gulton Inds, M. C. S. Div., Dept. EM, Gulton Indl Pk, E. Greenwich, RI 02818

Thermoelectric, Modules—See Cooling/Heating Modules, Thermolectric

Thermometers, Electronic (All Types)—See Meters, Temperature

Thermometers, Resistance

D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043** p. 2739
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
M **Harrel, Inc., Dept. EM, 16 Fitch St., E. Norwalk, Conn. 06855** ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
M **KRL Electronics, Dept. EM, 28 Bridge St., Manchester, N.H. 03101** ..... *

Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
D **Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705** *
Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 p. 4285
M **Relco Prods., Dept. EM, 5594 E. Jefferson Ave., Denver, Colo. 80237** *
D **Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120** *
United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403 p. 2832
D **Weston Instrs., Div. of Sangamo Weston, Inc., Dept. EM, 614 Frelinghuysen Ave., Newark, N.J. 07114** *
Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 *
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
M Barnes Engrg. Co., Dept. EM, 30 Commerce Rd., Stamford, Conn. 06902
BLH Elctrns., Dept. EM, 42 Fourth Ave., Waltham, Mass. 02154
Burns Engrg., Inc., Dept. EM, 10201 Bren Rd. East, Minnetonka, Minn. 55343
Conax Corp., Dept. EM, 2300 Walden Ave., Buffalo, N.Y. 14225
D Degussa Corporation, Metals Div., Dept. EM, Route 46 & Hollister Rd., Teterboro, NJ 07608
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
D LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
M Minco Products Inc., Dept. EM, 7300 Commerce Lane, Minneapolis, Minn. 55432
Princo Instrs., Dept. EM, Industrial Pk., Southampton, Pa. 18966
Rosemount Inc., Dept. EM, Box 35129, Minneapolis, Minn. 55435
Stow Labs., Inc., Dept. EM, Kane Ind'l. Dr., Hudson, Mass. 01749
Tempkey Inc., Dept. EM, 2155 Park Blvd., Palo Alto, Cal. 94306
West Coast Resch. Corp., Dept. EM, Box 25061, Los Angeles, Cal. 90025
D West Instrs, Gulton Inds, M. C. S. Div., Dept. EM, Gulton Indl Pk, E. Greenwich, RI 02818
D Yellow Springs Instrument Co., Dept. EM, Box 279, Yellow Springs, Ohio 45387

Thermostats-Also See Switches, Thermally Actuated; Controls, Temperature

Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 *
Elmwood Sensors, Inc., Dept. EM, 1655 Elmwood Ave., Cranston, RI 02907 p. 4272
M **KRL Electronics, Dept. EM, 28 Bridge St., Manchester, N.H. 03101** *
D **Midwest Components, Dept. EM, 1981 Port City Blvd., Muskegon, Mich. 49400** *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
North American Philips Controls, Dept. EM, Husky Park, Frederick, Md. 21701 p. 4219
Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 *
Bryant Electric, Dept. EM, 1421 State St., Bridgeport, Conn. 06602
Burling Instr. Co., Dept. EM, 16 River Rd., Box 298, Chatham, N.J. 07928
M Cox & Co., Inc., Dept. EM, 215 Park Ave., S., New York, N.Y. 10003
H-B Instr. Co., Dept. EM, 4306 N. American St, Philadelphia, Pa. 19140
Honeywell Inc., Commerical Div., Dept. EM, Honeywell Plaza, Minneapolis, Minn. 55408
D ITT General Controls, Dept. EM, 801 Allen Ave., Glendale, Cal. 91201
Mack Elec. Devices, Dept. EM, 32 Glenside Ave., Wyncote, Pa. 19095
Micro, Emerson Electric Co. Devices Div, Dept. EM, Box 501 Wright Bros Br, Dayton, Ohio 45409
D On-Guard Corp. of America, Dept. EM, 350 Gotham Pkwy., Carlstadt, NJ 07072
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Princo Instrs., Dept. EM, Industrial Pk., Southampton, Pa. 18966
Therm-O-Disc, Inc., Dept. EM, South Main St., Mansfield, Ohio 44907
D United Elec. Controls Co., Dept. EM, 85A School St., Watertown, Mass. 02172
D Watlow Elec. Mfg. Co., Dept. EM, 12001 Lackland Rd., St. Louis, Mo. 63141

Thin-Film Memory Systems, Planar—See Memory Systems

Thyratrons—See Tubes, Thyratron

Thyristors (Includes Silicon Controlled Rectifiers)

D **A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876** p. 3920
Conditioning Semiconductor Devices, Dept. EM, Box 816, Wayne, N.J. 07470 p. 3921
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 *
D **International Rectifier Corp., Semiconductor Div., Dept. EM, 233 Kansas St., El Segundo, Cal. 90245** p. 3926
D **Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094** *
D **Westinghouse Elec. Corp., Semiconductor Div., Dept. EM, Armbrust Rd., Youngwood, Pa. 15697** p. 3973
American Microsemiconductor, Dept. EM, 145 Main St, Madison, NJ 07940
D Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
Electronic Transistors, Dept. EM, 112-15 Northern Blvd., Flushing, N.Y. 11368
D FMC Corp., Semiconductor Products Div., Dept. EM, 800 Hoyt St., Broomfield, Colo. 80020
General Elec., Semiconductor Prods., Dept. EM, Electronics Pk., Box 1122, Syracuse, NY 13201
Gentron Corp., Dept. EM, 6667 N. Sydney Pl., Milwaukee, Wisc. 53209
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
D ITT, Semiconductor Div., Dept. EM, 500 Broadway, Lawrence, MASS 01841
ITT Semiconductors Discrete Devices, Dept. EM, 500 Broadway, Lawrence, Mass 01841
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
Murata Corporation of America, Dept. EM, 1148 Franklin Rd., S.E., Marietta, Ga. 30067
National Electronics, Div. Varian Assoc. Inc., Dept. EM, Box 269, Geneva, Ill. 60134
D Power Control Corp., Dept. EM, 122 Gamma Dr., Pittsburgh, Pa. 15238
Raytheon/TAG Semiconductors Ltd., Dept. EM, 43 Third Ave., Burlington, MA. 01803
Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
D Solid State Inc., Dept. EM, 46 Farrand St., Bloomfield, N.J. 07003
DM St-Semicon Inc, Semiconductor Div., Dept. EM, 415 No. College Ave., Bloomington, Ind. 47401
D Teccor Electronics, Inc., Dept. EM, 1101 Pamela Dr., Box 669, Euless, Tex. 76039

Ties, Wire & Cable—See Wire & Cable Ties

Time Delays, Precision

Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470 *
M **North American Philips Controls Corp., Dept. EM, Cheshire Industrial Pk. Box E, Cheshire, Conn. 06410** *
M Argent Electronics, Inc., Dept. EM, 477 E. Wenger Rd., Englewood, Ohio 45322
Automatic Timing & Controls Co., Dept. EM, King of Prussia, Pa. 19406
D Bristol Saybrook Co., Dept. EM, 97 Coulter St., Old Saybrook, Conn. 06475
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
Instr. & Control Sys., Inc., Dept. EM, 520 Interstate Rd, Addison, Ill. 60101
IPAC Group, Inc., Dept. EM, POB 156 3047 Industrial Blvd., Bethel Park, PA 15102
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
Precision Timer Co., Dept. EM, 13 Westbrook Ind'l. Park, Westbrook, Conn. 06498
M Production Process, Div. Ind'l. Marine Elctrns. Inc., Dept. EM, Grenier Ind'l. Park, Londonderry, N.H. 03053
M Sara Sales Co., Dept. EM, P.O. Box 321, San Francisco, Calif. 94101
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
DM Syracuse Elctrns. Corp., Dept. EM, Box 566, Syracuse, N.Y. 13201

Timer Switches—See Switches, Time Delay

Timers, Counting

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
M **Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470** *
Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005 p. 2663
M **Bowmar/TIC, Inc., Dept. EM, 850 Lawrence Dr., Newbury Park, Calif. 91320** *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
M **Chrono-log Corp., Dept. EM, 2 W. Park Rd., Havertown, Pa. 19083** *
Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 *
DM **Electrodynamics, A Talley Inds. Co, Dept. EM, 1200 Hicks Rd, Rolling Meadows, Ill. 60008** *
D **ESE, Dept. EM, 505½ Centinela Ave., Inglewood, Cal. 90302** p. 2734
D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043** *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 *
D **IVO Industries, Dept. EM, 1109 Green Grove Rd., Neptune, N.J. 07753** p. 2269
D **Kessler-Ellis Prods., Dept. EM, 120 1st Ave., Atlantic Highlands, N.J. 07716** *
Ledex Inc., Dept. EM, 123 Webster St., Dayton, Ohio 45401 p. 4098
Matrix Corp., Dept. EM, 2260 Distributors Dr., Indianapolis, Ind. 46241 *
A Talley Ind's Co., , Dept. EM, 135 S. Main St., Thomaston, Conn. 06787 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
D **Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705** *
D **Non-Linear Sys., Inc., Dept. EM, 533 Stevens Ave., Solana Beach, Cal. 92075** *
D **Omron Electronics, Dept. EM, 233 S. Wacker Dr., Chicago, Ill. 60606** p. 3591
PPM, Inc., Dept. EM, 7575 Bond St., Cleveland, Ohio 44139 p. 2801
Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543 *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 *
M **Statek Corp., Dept. EM, 512 N. Main St., Orange, Cal. 92668** *
DM **Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518** *
Artisan Elctrns. Corp., Dept. EM, 5 Eastmans Rd., Parsippany, N.J. 07054
M ATEC, Inc., Dept. EM, Box 19426, Houston, Tex. 77024
Automatic Timing & Controls Co., Dept. EM, King of Prussia, Pa. 19406
Berkeley Instruments, Inc., Dept. EM, 2700 Dupont Dr., Irvine, Cal. 92715
D Bristol Saybrook Co., Dept. EM, 97 Coulter St., Old Saybrook, Conn. 06475
D Crouzet/Cridland, Dept. EM, 118 Barrington Commons Ct Ste 207, Barrington, Ill. 60010
D Eagle Signal, Mfg. Div. Gulf & Western Inds., Dept. EM, Box 3585, Davenport, Iowa 52808
Electronic Counters & Controls Inc., Dept. EM, 1500 McCormick Blvd., Mundelein, Ill. 60060
M Electronic Counters, Inc., Dept. EM, 240 Humphrey St., Englewood, N.J. 07631
DM ENM, Dept. EM, 5350 Northwest Hwy., Chicago, Ill. 60630
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854
Gotham Audio Corp., Dept. EM, 741 Washington St., New York, N.Y. 10014
DM Guardian California, Dept. EM, 4030 W. Spencer St., Torrance, Cal. 90503
M Harshaw Chemical Co., A Kenanee Industry, Dept. EM, 6801 Cochran Rd., Solon, Ohio 44139
Haydon Switch & Instr., Inc., Dept. EM, 1500 Meriden Rd., Waterbury, Conn. 06705
D Indl Timer An Esterline Co., Dept. EM, U.S. Hwy 287, Parsippany, N.J. 07054
Keltron Instrument Displays Div., Dept. EM, 223 Crescent St., Waltham, Mass. 02154
Lab-Line Instrs, Dept. EM, 15th & Bloomingdale, Melrose Park, Ill. 60160

D Master Elctrn. Controls, Dept. EM, 1651–19th St., Santa Monica, Cal. 90404
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
PCS., Inc., Dept. EM, 750 N. Maple Rd., Saline, Mich. 48176
D Precision Timer Co., Dept. EM, 13 Westbrook Ind'l. Park, Westbrook, Conn. 06498
M Production Process, Div. Ind'l. Marine Elctrns. Inc., Dept. EM, Grenier Ind'l. Park, Londonderry, N.H. 03053
M Regmo Data Corp., Dept. EM, 7275 Bush Lk Rd., Minneapolis, Minn. 55435
D Siliconix, Inc., Dept. EM, 2201 Laurelwood Rd., Santa Clara, Cal 95054
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Stoelting Co., Dept. EM, 1350 S. Kostner Ave., Chicago, Ill. 60623
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
Syracuse Elctrns. Corp., Dept. EM, Box 566, Syracuse, N.Y. 13201
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803
Tenor Co., Inc., Dept. EM, 17020 W. Rogers Dr., New Berlin, Wisc. 53151
D Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102
Wilmar Elctrns. Inc., Dept. EM, 2430 Amsler St., Torrance, Cal. 90505

Timers, Cycle & Reset

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Connor-Winfield Corp., Dept. EM, W. Chicago, Ill. 60185 ..... *
D **Control Products Div., Amerace Corp., Dept. EM, 2330 Vauxhall Rd., Union, N.J. 07083** ..... *
Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101 ..... *
D **Deltrol Controls, Dept. EM, 2745 S. 19th St., Milwaukee, Wisc. 53215** p. 3447
D **Diversified Electronics Inc., Dept. EM, 119 N. Morton Ave., Evansville, Ind. 47711** ..... p. 3449
D **ESE, Dept. EM, 505½ Centinela Ave., Inglewood, Cal. 90302** ..... p. 2734
D **Gould Inc. Circuit Protection & Controls Div,, Dept. EM, 100 Relay Rd., Plantsville, Conn. 06479** ..... *
DM **Hi-G Co., Inc., Dept. EM, 580 Spring St., Windsor Locks, Conn. 06096** ..... *
D **IVO Industries, Dept. EM, 1109 Green Grove Rd., Neptune, N.J. 07753** ..... *
D **Kessler-Ellis Prods., Dept. EM, 120 1st Ave., Atlantic Highlands, N.J. 07716** *
Matrix Corp., Dept. EM, 2260 Distributors Dr., Indianapolis, Ind. 46241 ..... *
D **Midtex, Inc., AEMCO Div., Dept. EM, 1650 Tower Blvd., No. Mankato, Minn. 56001** ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
M **North American Philips Controls Corp., Dept. EM, Cheshire Industrial Pk. Box E, Cheshire, Conn. 06410** ..... p. 2274
D **Omron Electronics, Dept. EM, 233 S. Wacker Dr., Chicago, Ill. 60606** ..... *
D **Potter & Brumfield, Div of AMF, Dept. EM, P.O. Box 322, Princeton, Ind. 47671** ..... *
D **Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543** ..... *
M **Statek Corp., Dept. EM, 512 N. Main St., Orange, Cal. 92668** ..... p. 2373
DM **Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518** ..... *
DM **Thordarson Meissner, Electronic Ctr., Dept. EM, Mt. Carmel, Ill. 62863** ..... *
Trak Systems, Div. TRAK Microwave Corp., Dept. EM, 4722 Eisenhower Blvd., Dept. E8, Tampa, Fla. 33614 ..... *
M Abrams Instr., Dept. EM, 606 E. Shiawassee, Lansing, Mich. 48901
Applied Electro Technology, Inc., Dept. EM, 2220 S. Anne St., Santa Ana, Cal. 92704
Automatic Timing & Controls Co., Dept. EM, King of Prussia, Pa. 19406
Autotrol Corp., Dept. EM, 6200 Three Oaks Rd., Crystal Lake, Ill. 60014
D Bristol Saybrook Co., Dept. EM, 97 Coulter St., Old Saybrook, Conn. 06475
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
Controls Plant, McGraw Edison Co., Dept. EM, 210 Redstone Hill Rd., Bristol, Conn. 06010
DM Cramer Division, Conrac Corporation, Dept. EM, Mill Rock Rd., Old Saybrook, Conn. 06475
D Crouzet/Cridland, Dept. EM, 118 Barrington Commons Ct Ste 207, Barrington, Ill. 60010
D Eagle Signal, Mfg. Div. Gulf & Western Inds., Dept. EM, Box 3585, Davenport, Iowa 52808
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854
Haydon Switch & Instr., Inc., Dept. EM, 1500 Meriden Rd., Waterbury, Conn. 06705
D Indl Timer An Esterline Co., Dept. EM, U.S. Hwy 287, Parsippany, N.J. 07054
Instr. & Control Sys., Inc., Dept. EM, 520 Interstate Rd, Addison, Ill. 60101
D Intermatic, Inc., Dept. EM, Intermatic Plaza, Spring Grove, Ill. 60081
Keltron Instrument Displays Div., Dept. EM, 223 Crescent St., Waltham, Mass. 02154
Lab-Line Instrs, Dept. EM, 15th & Bloomingdale, Melrose Park, Ill. 60160
D Master Elctrn. Controls, Dept. EM, 1651–19th St., Santa Monica, Cal. 90404
D Mitsumi Elec. Co., Ltd., Dept. EM, 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan
MKC Electronics, Dept. EM, 454 E. Donovan Rd., Kansas City, Kans. 66115
D Omnetics, Inc., Dept. EM, Box 113, Syracuse, N.Y. 13211
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Paragon Elect. Co., Inc., Sub. of AMF, Dept. EM, 606 Parkway Blvd. P.O. Box 28, Two Rivers, Wisc. 54241
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
D Precision Timer Co., Dept. EM, 13 Westbrook Ind'l. Park, Westbrook, Conn. 06498
M Raymond Engrg. Inc., Dept. EM, 217 Smith St., Middletown, Conn. 06457
D Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
D Ripley Co., Inc., Dept. EM, 46 Nooks Hill Road, Cromwell, Conn. 06416
D Siliconix, Inc., Dept. EM, 2201 Laurelwood Rd., Santa Clara, Cal 95054
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
S S A C Inc., Dept. EM, Box 395, Liverpool, N.Y. 13088
Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
DM Syracuse Elctrns. Corp., Dept. EM, Box 566, Syracuse, N.Y. 13201
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803
Tenor Co., Inc., Dept. EM, 17020 W. Rogers Dr., New Berlin, Wisc. 53151
Vanguard Relay Corp., Dept. EM, 225 Cortland St., Lindenhurst, N.Y. 11757
D Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102
Wilmar Elctrns. Inc., Dept. EM, 2430 Amsler St., Torrance, Cal. 90505
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Timers, Delay-Also See Delays, Time

Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
M **Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470** ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Connor-Winfield Corp., Dept. EM, W. Chicago, Ill. 60185 ..... *
D **Control Products Div., Amerace Corp., Dept. EM, 2330 Vauxhall Rd., Union, N.J. 07083** ..... *
D **Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101** ..... *
D **Diversified Electronics Inc., Dept. EM, 119 N. Morton Ave., Evansville, Ind. 47711** ..... p. 3449
D **ESE, Dept. EM, 505½ Centinela Ave., Inglewood, Cal. 90302** ..... *
D **Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043** *
D **Gould Inc. Circuit Protection & Controls Div., Dept. EM, 100 Relay Rd., Plantsville, Conn. 06479** ..... *
Guardian Electric Co., Dept. EM, 1550 W. Carroll Ave., Chicago, Ill. 60607 p. 3519,3520
DM **Hi-G Co., Inc., Dept. EM, 580 Spring St., Windsor Locks, Conn. 06096** p. 3543-3546
DM **Leach Corp., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003** ..... *
Matrix Corp., Dept. EM, 2260 Distributors Dr., Indianapolis, Ind. 46241 ..... *
D **Midtex, Inc., AEMCO Div., Dept. EM, 1650 Tower Blvd., No. Mankato, Minn. 56001** ..... *
D **Midwest Components, Dept. EM, 1981 Port City Blvd., Muskegon, Mich. 49400** ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
North American Philips Controls Corp., Dept. EM, Cheshire Industrial Pk. Box E, Cheshire, Conn. 06410 ..... *
D **Omron Electronics, Dept. EM, 233 S. Wacker Dr., Chicago, Ill. 60606** p. 3591
D **Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543** ..... *
M **Sigmapower, Inc., Dept. EM, 20790 Leapwood Ave., Carson, Cal. 90746** .... *
M **Technitrol, Inc., Dept. EM, 1952 E. Alleghany, Philadelphia, Pa. 19134** ..... *
DM **Thordarson Meissner, Electronic Ctr., Dept. EM, Mt. Carmel, Ill. 62863** ..... *
M Abrams Instr., Dept. EM, 606 E. Shiawassee, Lansing, Mich. 48901
Applied Electro Technology, Inc., Dept. EM, 2220 S. Anne St., Santa Ana, Cal. 92704
Artisan Elctrns. Corp., Dept. EM, 5 Eastmans Rd., Parsippany, N.J. 07054
D Bristol Saybrook Co., Dept. EM, 97 Coulter St., Old Saybrook, Conn. 06475
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
Cramer Division, Conrac Corporation, Dept. EM, Mill Rock Rd., Old Saybrook, Conn. 06475
D Crouzet/Cridland, Dept. EM, 118 Barrington Commons Ct Ste 207, Barrington, Ill. 60010
D Eagle Signal, Mfg. Div. Gulf & Western Inds., Dept. EM, Box 3585, Davenport, Iowa 52808
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
D Furnas Elec. Co., Dept. EM, 1197 McKee St., Batavia, Ill. 60510
GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854
GTE Sylvania Inc., Dept. EM, Rte. 35, Standish, Maine 04084
Hoagland Instr Co, Div Tech Dev, Dept. EM, Box 550, Dayton, N.J. 08810
D Indl Timer An Esterline Co., Dept. EM, U.S. Hwy 287, Parsippany, N.J. 07054
Instr. & Control Sys., Inc., Dept. EM, 520 Interstate Rd, Addison, Ill. 60101
D Master Elctrn. Controls, Dept. EM, 1651–19th St., Santa Monica, Cal. 90404
D Mitsumi Elec. Co., Ltd., Dept. EM, 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan
D Omnetics, Inc., Dept. EM, Box 113, Syracuse, N.Y. 13211
D Paragon Elect. Co., Inc., Sub. of AMF, Dept. EM, 606 Parkway Blvd. P.O. Box 28, Two Rivers, Wisc. 54241
D Precision Timer Co., Dept. EM, 13 Westbrook Ind'l. Park, Westbrook, Conn. 06498
Rantec Div., Emerson Elec. Co., Dept. EM, 24003 Ventura Blvd., Calabasas, Calif. 91302
M Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
Republic Elctrn. Inds. Corp., Dept. EM, 575 Broad Hollow Rd., Melville, N.Y. 11746
D Ripley Co., Inc., Dept. EM, 46 Nooks Hill Road, Cromwell, Conn. 06416
Sara Sales Co., Dept. EM, P.O. Box 321, San Francisco, Calif. 94101
D Siliconix, Inc., Dept. EM, 2201 Laurelwood Rd., Santa Clara, Cal 95054
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
S S A C Inc., Dept. EM, Box 395, Liverpool, N.Y. 13088
D Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
Syracuse Elctrns. Corp., Dept. EM, Box 566, Syracuse, N.Y. 13201
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
M Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803
Tenor Co., Inc., Dept. EM, 17020 W. Rogers Dr., New Berlin, Wisc. 53151
Vanguard Relay Corp., Dept. EM, 225 Cortland St., Lindenhurst, N.Y. 11757
Y-L Products Co., Inc., Dept. EM, Box 188, Yeadon, Pa. 19050

Timers, Electrolytic Cell

Curtis Instrs., Inc., Dept. EM, 200 Kisco Ave., Mt. Kisco, N.Y. 10549 ..... *

NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D Omron Electronics, Dept. EM, 233 S. Wacker Dr., Chicago, Ill. 60606 p. 3591
Plessey Electro-Products, Dept. EM, 3860 Centinela Ave., Los Angeles, Cal. 90066 ..... p. 2276
M Fredericks Co., Dept. EM, Philmont & Anne Sts., Huntingdon Valley, Pa. 19006
D Master Elctrn. Controls, Dept. EM, 1651–19th St., Santa Monica, Cal. 90404
DM Syracuse Elctrns. Corp., Dept. EM, Box 566, Syracuse, N.Y. 13201

Timers, Interval

Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 .. *
American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
M Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
M Chrono-log Corp., Dept. EM, 2 W. Park Rd., Havertown, Pa. 19083 ..... *
Connor-Winfield Corp., Dept. EM, W. Chicago, Ill. 60185 ..... *
D Control Products Div., Amerace Corp., Dept. EM, 2330 Vauxhall Rd., Union, N.J. 07083 ..... *
Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101 ..... *
Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216 ..... *
Data Precision Corporation, Dept. EM, Audubon Rd., Wakefield, Mass 01880 p. 2708
D Deltrol Controls, Dept. EM, 2745 S. 19th St., Milwaukee, Wisc. 53215 p. 3447
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M Electrodynamics, A Talley Inds. Co, Dept. EM, 1200 Hicks Rd, Rolling Meadows, Ill. 60008 ..... *
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D Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
DM Hi-G Co., Inc., Dept. EM, 580 Spring St., Windsor Locks, Conn. 06096 p. 3544-3546
M Janco Corp., Dept. EM, Box 3038-Glenoaks Sta., Burbank, Cal. 91504 ..... *
D Kessler-Ellis Prods., Dept. EM, 120 1st Ave., Atlantic Highlands, N.J. 07716 *
D Leach Corp., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003 ..... *
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A Talley Ind's Co., , Dept. EM, 135 S. Main St., Thomaston, Conn. 06787 .... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705 ..... *
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D Omron Electronics, Dept. EM, 233 S. Wacker Dr., Chicago, Ill. 60606 p. 3591
D Potter & Brumfield, Div of AMF, Dept. EM, P.O. Box 322, Princeton, Ind. 47671 ..... *
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M Sigmapower, Inc., Dept. EM, 20790 Leapwood Ave., Carson, Cal. 90746 .... *
D Simpson Electric Co., Dept. EM, 853 Dundee Ave., Elgin, Ill. 60120 ..... *
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M Abrams Instr., Dept. EM, 606 E. Shiawassee, Lansing, Mich. 48901
Amtron Div., Sippican Corp., Dept. EM, 14820 S. Kedzie Ave., Midlothian, Ill. 60445
Anadex Inc., Dept. EM, 9825 De Soto, Chatsworth, Cal. 91311
Applied Electro Technology, Inc., Dept. EM, 2220 S. Anne St., Santa Ana, Cal. 92704
Artisan Elctrns. Corp., Dept. EM, 5 Eastmans Rd., Parsippany, N.J. 07054
M ATEC, Inc., Dept. EM, Box 19426, Houston, Tex. 77024
Automatic Timing & Controls Co., Dept. EM, King of Prussia, Pa. 19406
D Bristol Saybrook Co., Dept. EM, 97 Coulter St., Old Saybrook, Conn. 06475
Bulova Systems & Instrument Corp., Dept. EM, Green Acres Rd., W., Valley Stream, N.Y. 11582
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
Controls Plant, McGraw Edison Co., Dept. EM, 210 Redstone Hill Rd., Bristol, Conn. 06010
DM Cramer Division, Conrac Corporation, Dept. EM, Mill Rock Rd., Old Saybrook, Conn. 06475
Crouzet/Cridland, Dept. EM, 118 Barrington Commons Ct Ste 207, Barrington, Ill. 60010
Dielectric Instr. Corp., Dept. EM, 761 Franklin Ave., Pittsburgh, Pa. 15221
D Dimco-Gray Company, Dept. EM, 8200 S. Suburban Rd., Dayton, Ohio 45459
D Dynapar Corp., Dept. EM, 1675 Delany Rd., Gurnee, Ill. 60031
D Eagle Signal, Mfg. Div. Gulf & Western Inds., Dept. EM, Box 3585, Davenport, Iowa 52808
M Electro-Module, Inc., Dept. EM, 2855 Metropolitan Place, Pomona, Cal. 91767
Electronic Counters & Controls Inc., Dept. EM, 1500 McCormick Blvd., Mundelein, Ill. 60060
DM ENM, Dept. EM, 5350 Northwest Hwy., Chicago, Ill. 60630
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
FSI/Fork Standards Inc., Dept. EM, 211 Main St., W. Chicago, Ill. 60185
D GCA/Precision Scientific, Dept. EM, 3737 W. Cortland St., Chicago, Ill. 60647
DM Guardian California, Dept. EM, 4030 W. Spencer St., Torrance, Cal. 90503
Haydon Switch & Instr., Inc., Dept. EM, 1500 Meriden Rd., Waterbury, Conn. 06705
Hoagland Instr Co, Div Tech Dev, Dept. EM, Box 550, Dayton, N.J. 08810
D Indl Timer An Esterline Co., Dept. EM, U.S. Hwy 287, Parsippany, N.J. 07054
Instr. & Control Sys., Inc., Dept. EM, 520 Interstate Rd, Addison, Ill. 60101
Keltron Instrument Displays Div., Dept. EM, 223 Crescent St., Waltham, Mass. 02154
Lab-Line Instrs, Dept. EM, 15th & Bloomingdale, Melrose Park, Ill. 60160
Lektra Labs., Inc., Dept. EM, 129-07 18th Ave., College Point, N.Y. 11356
D Master Elctrn. Controls, Dept. EM, 1651–19th St., Santa Monica, Cal. 90404
Meloy Labs Inc., Instrus. & Sys. Div., Dept. EM, 6715 Electronic Dr., Springfield, Va. 22151
Midland Standrad Inc., Dept. EM, 603 E. Chicago St. Box 38, Elgin, ILL 60120
D Mitsumi Elec. Co., Ltd., Dept. EM, 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan
D Omnetics, Inc., Dept. EM, Box 113, Syracuse, N.Y. 13211
Panametrics Inc., Dept. EM, 221 Cresent St., Waltham, Mass. 02154
D Paragon Elect. Co., Inc., Sub. of AMF, Dept. EM, 606 Parkway Blvd. P.O. Box 28, Two Rivers, Wisc. 54241
PCS., Inc., Dept. EM, 750 N. Maple Rd., Saline, Mich. 48176
Photobell Co., Inc., Dept. EM, 162 Fifth Ave, New York, N.Y. 10010
Precision Timer Co., Dept. EM, 13 Westbrook Ind'l. Park, Westbrook, Conn. 06498
M Production Process, Div. Ind'l. Marine Elctrns. Inc., Dept. EM, Grenier Ind'l. Park, Londonderry, N.H. 03053
M Raymond Engrg. Inc., Dept. EM, 217 Smith St., Middletown, Conn. 06457
M Regmo Data Corp., Dept. EM, 7275 Bush Lk Rd., Minneapolis, Minn. 55435
D Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
Republic Elctrn. Inds. Corp., Dept. EM, 575 Broad Hollow Rd., Melville, N.Y. 11746
D Ripley Co., Inc., Dept. EM, 46 Nooks Hill Road, Cromwell, Conn. 06416
D Siliconix, Inc., Dept. EM, 2201 Laurelwood Rd., Santa Clara, Cal 95054
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
S S A C Inc., Dept. EM, Box 395, Liverpool, N.Y. 13088
DM Stock Drive Prods., Div. Designatronics, Inc., Dept. EM, 55 S. Denton Ave., New Hyde Pk., N.Y. 11040
Struthers-Dunn, Inc., Dept. EM, Lamb's Rd., Pitman, N.J. 08071
Sunshine Sci. Instrs., Inc., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115
D Syracuse Elctrns. Corp., Dept. EM, Box 566, Syracuse, N.Y. 13201
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
Tech Serv., Inc., BRS/LVE Div, Dept. EM, 5301 Holland Dr., Beltsville, Md 20705
D Technic, Inc., Dept. EM, Box 965, Providence, R.I. 02901
Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803
Tenor Co., Inc., Dept. EM, 17020 W. Rogers Dr., New Berlin, Wisc. 53151
UFAD Corp., Dept. EM, 700 36th St. S.E., Grand Rapids, Mich. 49508
D Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102
D Zenith Controls Inc., Dept. EM, 830 West 40th St., Chicago, Ill. 60609

Timers, Programmed

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
M Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
M Chrono-log Corp., Dept. EM, 2 W. Park Rd., Havertown, Pa. 19083 ..... *
Connor-Winfield Corp., Dept. EM, W. Chicago, Ill. 60185 ..... *
Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101 ..... *
Deltrol Controls, Dept. EM, 2745 S. 19th St., Milwaukee, Wisc. 53215 ..... *
D ESE, Dept. EM, 505½ Centinela Ave., Inglewood, Cal. 90302 ..... *
D Fluke Mfg. Co., John, Dept. EM, Box 43210, Mountlake Terr., Wash 98043 p. 2741
D Hi-G Co., Inc., Dept. EM, 580 Spring St., Windsor Locks, Conn. 06096 ..... *
Ledex Inc., Dept. EM, 123 Webster St., Dayton, Ohio 45401 ..... p. 4098
LVC Inds. Inc., Co-Ord Switch Bloc-Lite Divs., Dept. EM, 135-25 37th Ave., Flushing, N.Y. 11354 ..... *
Matrix Corp., Dept. EM, 2260 Distributors Dr., Indianapolis, Ind. 46241 ..... *
D Midtex, Inc., AEMCO Div., Dept. EM, 1650 Tower Blvd., No. Mankato, Minn. 56001 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
North American Philips Controls Corp., Dept. EM, Cheshire Industrial Pk. Box E, Cheshire, Conn. 06410 ..... *
D Omron Electronics, Dept. EM, 233 S. Wacker Dr., Chicago, Ill. 60606 p. 3591
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D Sealectro Corp., Dept. EM, 225 Hoyt St., Mamaroneck, N.Y. 10543 ..... *
M Sigmapower, Inc., Dept. EM, 20790 Leapwood Ave., Carson, Cal. 90746 .... *
DM Thordarson Meissner, Electronic Ctr., Dept. EM, Mt. Carmel, Ill. 62863 ..... *
D United Systems, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403 ..... p. 2832
M Abrams Instr., Dept. EM, 606 E. Shiawassee, Lansing, Mich. 48901
Applied Systems Corp., Dept. EM, 26401 Harper Ave., St. Clair Shores, Mich. 48081
Artisan Elctrns. Corp., Dept. EM, 5 Eastmans Rd., Parsippany, N.J. 07054
Automatic Timing & Controls Co., Dept. EM, King of Prussia, Pa. 19406
Berkeley Instruments, Inc., Dept. EM, 2700 Dupont Dr., Irvine, Cal. 92715
D Bristol Saybrook Co., Dept. EM, 97 Coulter St., Old Saybrook, Conn. 06475
Bulova Systems & Instrument Corp., Dept. EM, Green Acres Rd., W., Valley Stream, N.Y. 11582
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
Controls Plant, McGraw Edison Co., Dept. EM, 210 Redstone Hill Rd., Bristol, Conn. 06010
Cramer Division, Conrac Corporation, Dept. EM, Mill Rock Rd., Old Saybrook, Conn. 06475
D Crouzet/Cridland, Dept. EM, 118 Barrington Commons Ct Ste 207, Barrington, Ill. 60010
Dantronics, Inc., Dept. EM, 3175 Hafner Ct., St. Paul, Minn 55112
Datum, Inc., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806
D Dynapar Corp., Dept. EM, 1675 Delany Rd., Gurnee, Ill. 60031
D Eagle Signal, Mfg. Div. Gulf & Western Inds., Dept. EM, Box 3585, Davenport, Iowa 52808
M Electro-Module, Inc., Dept. EM, 2855 Metropolitan Place, Pomona, Cal. 91767
Electronic Counters & Controls Inc., Dept. EM, 1500 McCormick Blvd., Mundelein, Ill. 60060
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854

DM Guardian California, Dept. EM, 4030 W. Spencer St., Torrance, Cal. 90503
D Indl Timer An Esterline Co., Dept. EM, U.S. Hwy 287, Parsippany, N.J. 07054
D Intermatic, Inc., Dept. EM, Intermatic Plaza, Spring Grove, Ill. 60081
Keltron Instrument Displays Div., Dept. EM, 223 Crescent St., Waltham, Mass. 02154
Lab-Line Instrs, Dept. EM, 15th & Bloomingdale, Melrose Park, Ill. 60160
Lehighton Electronics, Inc., Dept. EM, RD 1Box 374 Dept M, Lehighton, Pa 18235
D Master Elctrn. Controls, Dept. EM, 1651–19th St., Santa Monica, Cal. 90404
M Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
Midland Standrad Inc., Dept. EM, 603 E. Chicago St. Box 38, Elgin, ILL 60120
D Mitsumi Elec. Co., Ltd., Dept. EM, 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan
D Paragon Elect. Co., Inc., Sub. of AMF, Dept. EM, 606 Parkway Blvd. P.O. Box 28, Two Rivers, Wisc. 54241
D Precision Timer Co., Dept. EM, 13 Westbrook Ind'l. Park, Westbrook, Conn. 06498
M Raymond Engrg. Inc., Dept. EM, 217 Smith St., Middletown, Conn. 06457
D Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
D Ripley Co., Inc., Dept. EM, 46 Nooks Hill Road, Cromwell, Conn. 06416
D Siliconix, Inc., Dept. EM, 2201 Laurelwood Rd., Santa Clara, Cal 95054
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
DM Syracuse Elctrns. Corp., Dept. EM, Box 566, Syracuse, N.Y. 13201
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803
Tenor Co., Inc., Dept. EM, 17020 W. Rogers Dr., New Berlin, Wisc. 53151
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
Vanguard Relay Corp., Dept. EM, 225 Cortland St., Lindenhurst, N.Y. 11757
D Zenith Controls Inc., Dept. EM, 830 West 40th St., Chicago, Ill. 60609

Timers, Sequence

Airflyte Elctrns. Co., Dept. EM, Box 207, 56 Hook Rd., Bayonne, N.J. 07002 *
American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
M **Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470** *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
M **Chrono-log Corp., Dept. EM, 2 W. Park Rd., Havertown, Pa. 19083** *
Connor-Winfield Corp., Dept. EM, W. Chicago, Ill. 60185 *
D **Deltrol Controls, Dept. EM, 2745 S. 19th St., Milwaukee, Wisc. 53215** *
M **Electrodynamics, A Talley Inds. Co, Dept. EM, 1200 Hicks Rd, Rolling Meadows, Ill. 60008** *
D **ESE, Dept. EM, 505½ Centinela Ave., Inglewood, Cal. 90302** *
D **Hi-G Co., Inc., Dept. EM, 580 Spring St., Windsor Locks, Conn. 06096** *
Leach Corp., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003 *
M **Ledex Inc., Dept. EM, 123 Webster St., Dayton, Ohio 45401** *
Matrix Corp., Dept. EM, 2260 Distributors Dr., Indianapolis, Ind. 46241 *
A Talley Ind's Co., , Dept. EM, 135 S. Main St., Thomaston, Conn. 06787 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
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M **Sigmapower, Inc., Dept. EM, 20790 Leapwood Ave., Carson, Cal. 90746** *
DM **Thordarson Meissner, Electronic Ctr., Dept. EM, Mt. Carmel, Ill. 62863** *
M Abrams Instr., Dept. EM, 606 E. Shiawassee, Lansing, Mich. 48901
Amtron Div., Sippican Corp., Dept. EM, 14820 S. Kedzie Ave., Midlothian, Ill. 60445
Applied Systems Corp., Dept. EM, 26401 Harper Ave., St. Clair Shores, Mich. 48081
Artisan Elctrns. Corp., Dept. EM, 5 Eastmans Rd., Parsippany, N.J. 07054
Automatic Timing & Controls Co., Dept. EM, King of Prussia, Pa. 19406
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
D Bristol Saybrook Co., Dept. EM, 97 Coulter St., Old Saybrook, Conn. 06475
Bulova Systems & Instrument Corp., Dept. EM, Green Acres Rd., W., Valley Stream, N.Y. 11582
Candy Mfg. Co., Dept. EM, 626 Grove St., Evanston, Ill 60201
Cardinal Control Co., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037
Controls Plant, McGraw Edison Co., Dept. EM, 210 Redstone Hill Rd., Bristol, Conn. 06010
Cramer Division, Conrac Corporation, Dept. EM, Mill Rock Rd., Old Saybrook, Conn. 06475
Crouzet/Cridland, Dept. EM, 118 Barrington Commons Ct Ste 207, Barrington, Ill. 60010
Dynapar Corp., Dept. EM, 1675 Delany Rd., Gurnee, Ill. 60031
D Eagle Signal, Mfg. Div. Gulf & Western Inds., Dept. EM, Box 3585, Davenport, Iowa 52808
M Electro-Module, Inc., Dept. EM, 2855 Metropolitan Place, Pomona, Cal. 91767
Electronic Counters & Controls Inc., Dept. EM, 1500 McCormick Blvd., Mundelein, Ill. 60060
Environmental Communications, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627
D Furnas Elec. Co., Dept. EM, 1197 McKee St., Batavia, Ill. 60510
GECO, Inc., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854
DM Guardian California, Dept. EM, 4030 W. Spencer St., Torrance, Cal. 90503
Hoagland Instr Co, Div Tech Dev, Dept. EM, Box 550, Dayton, N.J. 08810
D Indl Timer An Esterline Co., Dept. EM, U.S. Hwy 287, Parsippany, N.J. 07054
Instr. & Control Sys., Inc., Dept. EM, 520 Interstate Rd, Addison, Ill. 60101
Keltron Instrument Displays Div., Dept. EM, 223 Crescent St., Waltham, Mass. 02154
D Master Elctrn. Controls, Dept. EM, 1651–19th St., Santa Monica, Cal. 90404
Midgard Electronics, Dept. EM, 175 California St., Newton, Mass. 02158
Midland Standrad Inc., Dept. EM, 603 E. Chicago St. Box 38, Elgin, ILL 60120
D Mitsumi Elec. Co., Ltd., Dept. EM, 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan
D Omnetics, Inc., Dept. EM, Box 113, Syracuse, N.Y. 13211
M Precision Mechanisms Corp., Dept. EM, 44 Brooklyn Ave., Westbury, N.Y. 11590
D Precision Timer Co., Dept. EM, 13 Westbrook Ind'l. Park, Westbrook, Conn. 06498
M Raymond Engrg. Inc., Dept. EM, 217 Smith St., Middletown, Conn. 06457
Relay Specialties Inc., Dept. EM, 1300 Plaza Rd., Fair Lawn, N.J. 07410
D Ripley Co., Inc., Dept. EM, 46 Nooks Hill Road, Cromwell, Conn. 06416
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
D Syracuse Elctrns. Corp., Dept. EM, Box 566, Syracuse, N.Y. 13201
Tempo Instrument, Inc., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803
Tenor Co., Inc., Dept. EM, 17020 W. Rogers Dr., New Berlin, Wisc. 53151
Therm-O-Disc, Inc., Dept. EM, South Main St., Mansfield, Ohio 44907
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
Vanguard Relay Corp., Dept. EM, 225 Cortland St., Lindenhurst, N.Y. 11757
D Zenith Controls Inc., Dept. EM, 830 West 40th St., Chicago, Ill. 60609

Timers, Solid State

Allen-Bradley Co., Dept. EM, 1201 S. Second St., Milwaukee, Wisc. 53204 *
American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 p. 2261
M **Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470** *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 p. 2261
Connor-Winfield Corp., Dept. EM, W. Chicago, Ill. 60185 *
D **Control Products Div., Amerace Corp., Dept. EM, 2330 Vauxhall Rd., Union, N.J. 07083** *
D **Crouse-Hinds Co., Arrow Hart Div., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101** *
D **Cutler-Hammer, Inc., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216** *
D **ESE, Dept. EM, 505½ Centinela Ave., Inglewood, Cal. 90302** p. 2734
D **Gould Inc. Circuit Protection & Controls Div., Dept. EM, 100 Relay Rd., Plantsville, Conn. 06479** *
Harrel, Inc., Dept. EM, 16 Fitch St., E. Norwalk, Conn. 06855 *
DM **Hi-G Co., Inc., Dept. EM, 580 Spring St., Windsor Locks, Conn. 06096** p. 3546
Kessler-Ellis Prods., Dept. EM, 120 1st Ave., Atlantic Highlands, N.J. 07716 p. 1650
DM **Leach Corp., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003** *
Litronix, Dept. EM, 19000 Homestead Rd., Cupertino, Cal. 95014 *
Matrix Corp., Dept. EM, 2260 Distributors Dr., Indianapolis, Ind. 46241 p. 1654
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D Omnetics, Inc., Dept. EM, Box 113, Syracuse, N.Y. 13211
D Paragon Elect. Co., Inc., Sub. of AMF, Dept. EM, 606 Parkway Blvd. P.O. Box 28, Two Rivers, Wisc. 54241
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M Regmo Data Corp., Dept. EM, 7275 Bush Lk Rd., Minneapolis, Minn. 55435
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M Glenair, Inc., Dept. EM, 1211 Air Way, Glendale, Cal. 91201
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E-Z-Hook, Div. Tektest, Dept. EM, Box 450 114 E. St. Joseph, Arcadia, Cal. 91006
Harwil Co., Dept. EM, 1548 17th St., Santa Monica, Calif. 90404
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Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
D Micro Electronic Systems, Inc., Dept. EM, 8 Kevin Drive, Danbury, Conn. 06810

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ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ..... p. 2001,2003-2006
D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... p. 4297
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D Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
E-Z-Hook, Div. Tektest, Dept. EM, Box 450 114 E. St. Joseph, Arcadia, Cal. 91006
D Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
D Matrix Engineering Corp., Dept. EM, 17000 S. Western Ave. 19, Gardena, Cal. 90247
D Orbit Inds., Div. Countis Inds., Dept. EM, Box 1444, San Luis Obispo, Calif. 93406

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D Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
M Air-Vac Engrg. Co., Dept. EM, 100 Gulf St., Milford, Conn. 06460
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Gardner-Denver Co., Pneutronics Div., Dept. EM, 1333 Fulton St., Grand Haven, Mich. 49417
Henes Products Corp., Dept. EM, 4301 E. Madison St., Phoenix, Ariz. 85034
D Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
National Camera Inc., Dept. EM, 2000 W. Union Ave., Englewood, Colo. 80110
Orbit Inds., Div. Countis Inds., Dept. EM, Box 1444, San Luis Obispo, Calif. 93406
Pace Inc., Dept. EM, 9329 Fraser Ave., Silver Spring, Md. 20910
D Telvac Instr. Co., Dept. EM, 7534 Atoll Ave. F, N. Hollywood, Cal. 91605

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D Adre Co., Dept. EM, Box 09415, Milwaukee, Wisc. 53209
D Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
D Klein Tools, Inc, Dept. EM, 7200 McCormick Rd., Chicago, Ill. 60645
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
D Neuses, Inc. (P.K.), Dept. EM, 1401 Rohlwing Rd., Rolling Meadows, Ill. 60008

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M Hybricon Corp., Dept. EM, 410 Crest Rd., Litteton, Mass. 01460
ITT Cannon/ETC Terminal Products, Dept. EM, 29000 Aurora Rd., Solon, Ohio 44139
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Standard Pneumatic Motor Co., Dept. EM, Box 10030, Reno, Nev. 89510
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Torches, Soldering, Welding & Access.

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DM Master Appliance Corp., Dept. EM, 2420 18th St., Box 545, Racine, Wisc. 53403
National Camera Inc., Dept. EM, 2000 W. Union Ave., Englewood, Colo. 80110
DM Tescom Instr. Div., Dept. EM, 2600 Niagara La. N., Minneapolis, Minn. 55441
Union Carbide Corp., Linde Div., Dept. EM, 270 Park Ave., New York, N.Y. 10017
Wall-Lenk Mfg. Co., Dept. EM, Box 3349, Dept. EEM-71, Kinston, N.C. 28501

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D **Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005** ..... *
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D **Newport Labs., Inc., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705** ..... *
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M ATEC, Inc., Dept. EM, Box 19426, Houston, Tex. 77024
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D Dynapar Corp., Dept. EM, 1675 Delany Rd., Gurnee, Ill. 60031
D Eagle Signal, Mfg. Div. Gulf & Western Inds., Dept. EM, Box 3585, Davenport, Iowa 52808
Electro-Numerics Inc., Dept. EM, 1811 Reynolds, Irvine, Cal. 92714
M Flow Technology, Inc., Dept. EM, Box 21346, Phoenix, Ariz. 85036
FSI/Fork Standards Inc., Dept. EM, 211 Main St., W. Chicago, Ill. 60185
Hecon Corp., Dept. EM, 31 Park Rd., Tinton Falls, N.J. 07724
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Richard-Lee Co., Dept. EM, Box 724, New Providence, N.J. 07974
DM Systems Data Inc., Dept. EM, 1941 W. Market St., Akron, Ohio 44313
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518
D Tau-Tron Inc., Dept. EM, 11 Esquire Rd., N. Billerica, Mass. 01862
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
DM Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102
West Coast Resch. Corp., Dept. EM, Box 25061, Los Angeles, Cal. 90025

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D Philips Audio Video Sys, Neutrik Prods, Dept. EM, 91 McKee Dr., Mahwah, N.J. 07430
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Measurement Sys., Inc., Dept. EM, 121 Water St., Norwalk, Conn. 06854 .... *
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M **Vega Precision Labs., Dept. EM, 800 Follin La., Vienna, Va. 22180** ..... *
M ABA Electromechanical Sys. Inc., Dept. EM, Box 500, Pinellas Pk., Fla. 33565
M Atlantic Research Corp., Dept. EM, 5390 Cherokee Ave., Alexandria, Va 22314
Beukers Labs., Inc., Dept. EM, 30 Orville Drive, Bohemia, N.Y. 11716
M Cubic Corp., Dept. EM, 9233 Balboa Ave., San Diego, Cal. 92123
Datron Systems, Dept. EM, 20700 Plummer St., Chatsworth, Cal. 91311
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Kollsman Instr. Co., Dept. EM, Daniel Webster Hwy., Merrimack, N.H. 03054
Parabam, Inc., Dept. EM, 3017 E. Las Hermanas St., Compton, Cal. 90221
D Rantec Div., Emerson Elec. Co., Dept. EM, 24003 Ventura Blvd., Calabasas, Calif. 91302
Resdel Engineering Corp., Dept. EM, 300 E. Live Oak Ave., Arcadia, Cal. 91006
M Tasker Systems, Dept. EM, 20131 Sunburst St., Chatsworth, Cal. 91311
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M Whittaker Corp., Dept. EM, 10880 Wilshire Blvd., Los Angeles, Cal. 90024

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M **Aeroflex Labs., Magnetic Prods. Div., Dept. EM, South Service Rd., Plainview, N.Y. 11803** ..... *
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M **Clifton Precision, Litton Systems, Inc., Dept. EM, Marple at Brdway., Clifton Hgts., Pa. 19018** ..... *
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Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 ..... *
M **Dytronics Co., Inc., Dept. EM, 4800 Evanswood Dr., Columbus, Ohio 43229** *
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Automatic Timing & Controls Co., Dept. EM, King of Prussia, Pa. 19406
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
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Bourns, Inc., Instr. Div., Dept. EM, 6135 Magnolia, Riverside, Calif. 92506
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
Brunswick Instr., Dept. EM, 6150 W. Mulford Street, Niles, Ill. 60648
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Columbia Resch. Labs., Dept. EM, Macdade Blvd. & Bullens La., Woodlyn, Pa. 19094
M Conrac Corp., Systems Sls Div., Dept. EM, Three Landmark Sq., Stamford, Conn. 06901
D Dynapar Corp., Dept. EM, 1675 Delany Rd., Gurnee, Ill. 60031
D Electro Corp., Dept. EM, Box 3049, Sarasota, Fla. 33578
Gould, Inc., Meas. Sys. Div., Dept. EM, 2230 Statham Blvd., Oxnard, Cal. 93030
Gulton Inds., Inc., Elctrn. Comps. Div., Dept. EM, Piezo Products Div., Metuchen, N.J. 08840
Gulton Inds., Inc., Servonic/Instrumentation Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
M Humphrey, Inc., Dept. EM, 9212 Balboa Ave., San Diego, Calif. 92123
IRD Mechanalysis, Inc., Dept. EM, 6150 Huntley Rd., Columbus, Ohio 43229
M Kaman Sciences Corp., Dept. EM, 1500 Garden of the Gods Rd. P.O. Box 7463, Colorado Springs, Colo. 80933
Kavlico Corp., Dept. EM, 20869 Plummer St., Chatworth, Cal. 91311
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Licon Div., Illinois Tool Works, Dept. EM, 6615 W. Irving Park Rd., Chicago, Ill. 60634
M Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
Magnetoelastic Devices, Dept. EM, 74 North St Box 625, Pittsfield, MA 01201
M Moxon Inc., Dept. EM, 2222 Michelson Dr. Bldg. E, Irvine, Cal. 92715
Northern Precision Labs., Inc., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006
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M Pickering & Co., Meas. & Controls Div., Dept. EM, 101 Sunnyside Blvd., Plainview, N.Y. 11803
D Research, Inc., Dept. EM, Box 24064, Minneapolis, Minn. 55424
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M Schaevitz Engrg., Dept. EM, U.S. 130, Union Ave., Pennsauken, N.J. 08110
D Scientific Technology, Dept. EM, 1201 San Antonio Rd., Mountain View, Cal. 94043
Siltran Digital, Dept. EM, 14831 Kitterman, Box 437, Silverado, Cal. 92676
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Spectral Dynamics Corp., Dept. EM, Box 671, San Diego, Cal. 92112
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Sundstrand Data Control, Dept. EM, Overlake Ind'l. Pk., Redmond, Wash. 98052

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Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006
Transmed Scientific, Dept. EM, 860-C Capitolio Way, San Luis Obispo, Cal. 93401
Trans-Tek, Inc., Dept. EM, Rte. 83, Ellington, Conn. 06029
D Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102
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D Fenwal Elctrns., Dept. EM, 63 Fountain St., Framingham, Mass. 01701 ..... *
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M Accurate Instrument Co., Dept. EM, Box No. 925, Westbury, N.Y. 11590
D Autocon Inds., Sub. Control Data, Dept. EM, 2300 Berkshire La. N., Minneapolis, Minn. 55441
Bailey Meter Co., Sub. Babcock & Wilcox, Dept. EM, 29801 Euclid Ave., Wickliffe, Ohio 44092
Bourns, Inc., Instr. Div., Dept. EM, 6135 Magnolia, Riverside, Calif. 92506
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M Columbia Resch. Labs., Dept. EM, Macdade Blvd. & Bullens La., Woodlyn, Pa. 19094
M Conrac Corp., Systems Sls Div., Dept. EM, Three Landmark Sq., Stamford, Conn. 06901
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M Flow Technology, Inc., Dept. EM, Box 21346, Phoenix, Ariz. 85036
Gould, Inc., Meas. Sys. Div., Dept. EM, 2230 Statham Blvd., Oxnard, Cal. 93030
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M Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
Ocean Research Equipment, Inc., Dept. EM, Box 709, Falmouth, Mass. 02541
DM Pres-Air-Trol Corp., Dept. EM, 895 Mamaroneck Av., Mamaroneck, N.Y. 10543
D Robertshaw Controls Co., Ind'l. Instr. Div., Dept. EM, 1910 Byrd Ave Ste 200, Richmond, Va. 23230
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Sundstrand Data Control, Dept. EM, Overlake Ind'l. Pk., Redmond, Wash. 98052
Telesis Laboratory, Dept. EM, Box 387, Chillocothe, Ohio 45601
D TSI Inc, Dept. EM, 500 Cardigan Rd., Box 3394, St. Paul, Minn. 55165
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D Dillon, W.C. & Co., Dept. EM, 14620-EP Keswick St., Van Nuys 340, Cal. 91407
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Wilcoxon Research, Dept. EM, 12526 Parklawn Dr., Rockville, Md. 20852
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D Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 *
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D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
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Coilcraft, Dept. EM, 1102 Siler Lake Rd., Cary, Ill. 60013
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LDJ Electronics, Dept. EM, 1064 Naughton Ave., Troy, Mich. 48084
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M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
D Telex Communications, Inc., Dept. EM, 9600 Aldrich Ave., So., Minneapolis, Minn. 55420
D Veeder-Root, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102

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Transducers, Pressure

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
BBN Instruments Co., Div. Bolt Beranek & Newman, Inc., Dept. EM, 50 Moulton St., Cambridge, Mass. 02138 ..... *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 ..... *
Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 ..... *
Doric Sci., Div. Emerson Elec. Co., Dept. EM, 3883 Ruffin Rd., San Diego, Cal. 92123 ..... p. 2716,2717
Gould, Inc., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114 ..... *
Harrel, Inc., Dept. EM, 16 Fitch St., E. Norwalk, Conn. 06855 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Kulite Semiconductor Prod., Dept. EM, 1030 Hoyt Ave., Ridgefield, N.J. 07657 ..... p. 4302
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032 *
Midwest Components, Dept. EM, 1981 Port City Blvd., Muskegon, Mich. 49400 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... p. 2278
M Accurate Instrument Co., Dept. EM, Box No. 925, Westbury, N.Y. 11590
D Ailtech, Dept. EM, 2070 Fifth Ave, Ronkonkoma, NY 11779
A.L. Design Inc., Dept. EM, 2070 Niagara Falls Blvd., Tonawanda, NY 14150
D Autocon Inds., Sub. Control Data, Dept. EM, 2300 Berkshire La. N., Minneapolis, Minn. 55441
Bailey Meter Co., Sub. Babcock & Wilcox, Dept. EM, 29801 Euclid Ave., Wickliffe, Ohio 44092
M Bell & Howell Co., Elctrns. & Instrs. Grp., Dept. EM, 360 Sierra Madre Villa, Pasadena, Cal. 91109
BLH Elctrns., Dept. EM, 42 Fourth Ave., Waltham, Mass. 02154
Bourns, Inc., Instr. Div., Dept. EM, 6135 Magnolia, Riverside, Calif. 92506
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
Channel Inds., Dept. EM, 839 Ward Dr., Santa Barbara, Cal. 93111
M Columbia Resch. Labs., Dept. EM, Macdade Blvd. & Bullens La., Woodlyn, Pa. 19094
M Conrac Corp., Systems Sls Div., Dept. EM, Three Landmark Sq., Stamford, Conn. 06901
M Consolidated Controls Corp., Dept. EM, 15 Durant Ave., Bethel, Conn. 06801
D Data Instruments Inc., Dept. EM, 4 Hartwell Pl., Lexington, Mass. 02173
Datametrics Inc, Dept. EM, 340 Fordham St., Wilmington, Mass. 01887
D Dynisco, Dept. EM, 20 S. West Pk., Westwood, Mass. 02090
D Electro-Voice, Sub. Gulton Inds., Dept. EM, 600 Cecil St., Buchanan, Mich. 49107
Endevco, Div. Becton, Dickinson & Co., Dept. EM, 30700 Rancho Viejo Rd., San Jaun Capistrano, Cal. 92675
Entran Devices, Inc., Dept. EM, 145 Paterson Ave., Little Falls, N.J. 07424
Essex Group, Dept. EM, 3501 W. Addison, Ft. Wayne, IN. 46809
M Giannini Institute, Dept. EM, 51555 Madison St., Indio, Ca. 92201
Gould, Inc., Meas. Sys. Div., Dept. EM, 2230 Statham Blvd., Oxnard, Cal. 93030

M Gulton Inds., Inc., Servonic/Instrumentation Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
Himmelstein & Co., S., Dept. EM, 2500 Estes Ave., Elk Grove Village, Ill. 60007
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704
M Kaman Sciences Corp., Dept. EM, 1500 Garden of the Gods Rd. P.O. Box 7463, Colorado Springs, Colo. 80933
Kavlico Corp., Dept. EM, 20869 Plummer St., Chatworth, Cal. 91311
Kollsman Instr. Co., Dept. EM, Daniel Webster Hwy., Merrimack, N.H. 03054
Linden Labs., Inc., Dept. EM, Box 920, State College, Pa. 16801
M Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
Magnaflux Corp. , Dept. EM, 7328 W. Lawrence Ave., Chicago, Ill 60656
Magnetoelastic Devices, Dept. EM, 74 North St Box 625, Pittsfield, MA 01201
MKS Instrs., Inc., Dept. EM, 22 Third Ave., Burlington, Mass. 01803
Paine Instruments, Inc., Dept. EM, 2401 S. Bayview St., Seattle, Wash. 98144
PCB Piezotronics, Inc., Dept. EM, 5800 Transit Rd., Depew, N.Y. 14043
Plessey Enviromental Sys., Dept. EM, 3939 Ruffin Rd., San Diego, Cal. 92123
DM Pres-Air-Trol Corp., Dept. EM, 895 Mamaroneck Av., Mamaroneck, N.Y. 10543
D Robertshaw Controls Co., Ind'l. Instr. Div., Dept. EM, 1910 Byrd Ave Ste 200, Richmond, Va. 23230
Robinson-Halpern Co., Dept. EM, One Apolio Rd., Plymouth Meeting, Pa. 19462
Rosemount Inc., Dept. EM, Box 35129, Minneapolis, Minn. 55435
M Schaevitz Engrg., Dept. EM, U.S. 130, Union Ave., Pennsauken, N.J. 08110
Siltran Digital, Dept. EM, 14831 Kitterman, Box 437, Silverado, Cal. 92676
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Stow Labs., Inc., Dept. EM, Kane Ind'l. Dr., Hudson, Mass. 01749
Sundstrand Data Control, Dept. EM, Overlake Ind'l. Pk., Redmond, Wash. 98052
M West Coast Resch. Corp., Dept. EM, Box 25061, Los Angeles, Cal. 90025
D Yellow Springs Instrument Co., Dept. EM, Box 279, Yellow Springs, Ohio 45387

Transducers, Proximity—See Transducers, Displacement

Transducers, Strain Gage

Doric Sci., Div. Emerson Elec. Co., Dept. EM, 3883 Ruffin Rd., San Diego, Cal. 92123 ..... p. 2716,2717
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Kulite Semiconductor Prod., Dept. EM, 1030 Hoyt Ave., Ridgefield, N.J. 07657 ..... *
Micro Switch, Div. Honeywell, Dept. EM, 11 W. Spring St., Freeport, Ill. 61032 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Advance Weight Systems, Inc., Dept. EM, 715 W. Smith Rd., Medina, Ohio 44256
D Ailtech, Dept. EM, 2070 Fifth Ave, Ronkonkoma, NY 11779
M Bell & Howell Co., Elctrns. & Instrs. Grp., Dept. EM, 360 Sierra Madre Villa, Pasadena, Cal. 91109
BLH Elctrns., Dept. EM, 42 Fourth Ave., Waltham, Mass. 02154
Bourns, Inc., Instr. Div., Dept. EM, 6135 Magnolia, Riverside, Calif. 92506
M Columbia Resch. Labs., Dept. EM, Macdade Blvd. & Builens La., Woodlyn, Pa. 19094
M Conrac Corp., Systems Sls Div., Dept. EM, Three Landmark Sq., Stamford, Conn. 06901
M Consolidated Controls Corp., Dept. EM, 15 Durant Ave., Bethel, Conn. 06801
D Data Instruments Inc., Dept. EM, 4 Hartwell Pl., Lexington, Mass. 02173
DM Dillon, W.C. & Co., Dept. EM, 14620-EP Keswick St., Van Nuys 340, Cal. 91407
D Dynisco, Dept. EM, 20 S. West Pk., Westwood, Mass. 02090
Entran Devices, Inc., Dept. EM, 145 Paterson Ave., Little Falls, N.J. 07424
Gould, Inc., Meas. Sys. Div., Dept. EM, 2230 Statham Blvd., Oxnard, Cal. 93030
Incor Instrumentation, Inc., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704
D Interface, Inc., Dept. EM, 7401 Butherus Dr., Scottsdale, Ariz. 85260
M Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
Magnaflux Corp. , Dept. EM, 7328 W. Lawrence Ave., Chicago, Ill 60656
D Revere Corp. of America, Neptune International Corp., Dept. EM, 845 N. Colony Rd., Wallingford, Conn. 06492
Sara Sales Co., Dept. EM, P.O. Box 321, San Francisco, Calif. 94101
Schaevitz Engrg., Dept. EM, U.S. 130, Union Ave., Pennsauken, N.J. 08110
Transmed Scientific, Dept. EM, 860-C Capitolio Way, San Luis Obispo, Cal. 93401
M West Coast Resch. Corp., Dept. EM, Box 25061, Los Angeles, Cal. 90025

Transducers, Temperature

Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470 ..... *
D **Fenwal Elctrns., Dept. EM, 63 Fountain St., Framingham, Mass. 01701 ..... ***
M **Harrel, Inc., Dept. EM, 16 Fitch St., E. Norwalk, Conn. 06855 ..... p. 2267**
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Kulite Semiconductor Prod., Dept. EM, 1030 Hoyt Ave., Ridgefield, N.J. 07657 ..... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
D **Midwest Components, Dept. EM, 1981 Port City Blvd., Muskegon, Mich. 49400 ..... ***
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Ohio Semitronics, Inc., Dept. EM, 1205 Chesapeake Ave., Columbus, Ohio 43212 ..... *
Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 ..... *
RCL Electronics Div., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102 ..... p. 3740
M **Relco Prods., Dept, EM, 5594 E. Jefferson Ave., Denver, Colo. 80237 p. 4323**
RFL Inds., Thermocontrol Div., Dept. EM, Boonton, N.J. 07005 ..... *
M Ametek/Rodan Div., Dept. EM, 2905 Blue Star St., Anaheim, Cal. 92806
D Amprobe Instrument, Div. SOS Consolidated Inc., Dept. EM, 630 Merrick Rd., Lynbrook, N.Y. 11563
Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
D API Instruments, LFE Corp., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154
M ARI Inds., Inc., Dept. EM, 9000 King St., Franklin Pk., Ill. 60131
Bailey Meter Co., Sub. Babcock & Wilcox, Dept. EM, 29801 Euclid Ave., Wickliffe, Ohio 44092
Beckman Instrs., Ectrn. Instrs. Div. Ectrn. Instrumentation, Dept. EM, 3900 N. River Rd., Schiller Park, Ill. 60176
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
Burns Engrg., Inc., Dept. EM, 10201 Bren Rd. East, Minnetonka, Minn. 55343
Conax Corp., Dept. EM, 2300 Walden Ave., Buffalo, N.Y. 14225
M Consolidated Controls Corp., Dept. EM, 15 Durant Ave., Bethel, Conn. 06801
M Cox & Co., Inc., Dept. EM, 215 Park Ave., S., New York, N.Y. 10003
Degussa Corporation, Metals Div., Dept. EM, Route 46 & Hollister Rd., Teterboro, NJ 07608
Gulton Inds., Inc., Elctrn. Comps. Div., Dept. EM, Piezo Products Div., Metuchen, N.J. 08840
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
Hy-Cal Engrg, Dept. EM, 12105 Los Nietos Rd., Santa Fe Springs, Cal 90670
James Electronics Inc., Dept. EM, 4050 N Rockwell St, Chicago, Ill. 60618
Larson Instr. Co., Inc., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962
D LFE Corp., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154
Licon Div., Illinois Tool Works, Dept. EM, 6615 W. Irving Park Rd., Chicago, Ill. 60634
Mack Elec. Devices, Dept. EM, 32 Glenside Ave., Wyncote, Pa. 19095
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
Micro-Measurements Div., Vishay Intertechnology, Inc., Dept. EM, Box 306, Romulus, Mich. 48174
M Murata Corporation of America, Dept. EM, 1148 Franklin Rd., S.E., Marietta, Ga. 30067
Plessey Enviromental Sys., Dept. EM, 3939 Ruffin Rd., San Diego, Cal. 92123
DM Precision Monolithics Inc., Dept. EM, 1500 Space Dr., Santa Clara, Cal. 95050
Princeton Applied Resch. Corp., Dept. EM, Box 2565, Princeton, N.J. 08540
Quality Thermistor, Dept. EM, 2096 S. Cole Rd. Ste 7, Boise, Idaho 83705
Raytek Div. Optical Coating Lab, Dept. EM, 325 E. Middlefield Rd., Mountain View, Cal. 94043
D Robertshaw Controls Co., Ind'l. Instr. Div., Dept. EM, 1910 Byrd Ave Ste 200, Richmond, Va. 23230
Rochester Instr System, Dept. EM, 255 N. Union St., Rochester, N.Y. 14605
Rosemount Inc., Dept. EM, Box 35129, Minneapolis, Minn. 55435
Schneider Instr. Co., Dept. EM, 8115 Camargo Rd., Cincinnati, Ohio 45243
Siltran Digital, Dept. EM, 14831 Kitterman, Box 437, Silverado, Cal. 92676
Stow Labs., Inc., Dept. EM, Kane Ind'l. Dr., Hudson, Mass. 01749
M Syscon Int'l., Inc., Dept. EM, 1239 South Bend Ave., So. Bend, Ind. 46617
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
Thermo Elec. Co., Inc., Dept. EM, 109 Fifth St., Saddle Brook, N.J. 07662
M Thermometrics, Inc., Dept. EM, 808 US Hwy No. 1, Edison, N.J. 08817
Transmed Scientific, Dept. EM, 860-C Capitolio Way, San Luis Obispo, Cal. 93401
Trans-Met Engrg., Dept. EM, 601 S. Palm St., La Habra, Cal. 90631
TransData Inc., Dept. EM, P.O. Box 518, Dublin, Ohio 43017
West Coast Resch. Corp., Dept. EM, Box 25061, Los Angeles, Cal. 90025
Westinghouse Elec. Corp., Relay-Instr. Div., Dept. EM, 95 Orange St., Newark, N.J. 07101
D Yellow Springs Instrument Co., Dept. EM, Box 279, Yellow Springs, Ohio 45387

Transducers, Thermoelectric—See Transducers, Temperature

Transducers, Torque

Doric Sci., Div. Emerson Elec. Co., Dept. EM, 3883 Ruffin Rd., San Diego, Cal. 92123 ..... p. 2716,2717
Jackson Bros., (London) Ltd., Dept. EM, 258 Bway., New York, N.Y. 10007 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
A.L. Design Inc., Dept. EM, 2070 Niagara Falls Blvd., Tonawanda, NY 14150
Beckman Instrs., Ectrn. Instrs. Div. Ectrn. Instrumentation, Dept. EM, 3900 N. River Rd., Schiller Park, Ill. 60176
BLH Elctrns., Dept. EM, 42 Fourth Ave., Waltham, Mass. 02154
Bourns, Inc., Instr. Div., Dept. EM, 6135 Magnolia, Riverside, Calif. 92506
Dillon, W.C. & Co., Dept. EM, 14620-EP Keswick St., Van Nuys 340, Cal. 91407
Himmelstein & Co., S., Dept. EM, 2500 Estes Ave., Elk Grove Village, Ill. 60007
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
D Interface, Inc., Dept. EM, 7401 Butherus Dr., Scottsdale, Ariz. 85260
Kavlico Corp., Dept. EM, 20869 Plummer St., Chatworth, Cal. 91311
Larson Aero Dev., Dept. EM, Box 135, Concord, Cal. 94522
M Litton Systems, Inc., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550
Magnetoelastic Devices, Dept. EM, 74 North St Box 625, Pittsfield, MA 01201
Moxon Inc., Dept. EM, 2222 Michelson Dr. Bldg. E, Irvine, Cal. 92715
Vibrac Corp., Dept. EM, 11 Alpha Rd., Chelmsford, Mass. 01824
M West Coast Resch. Corp., Dept. EM, Box 25061, Los Angeles, Cal. 90025
Zonic Technical Labs., Dept. EM, 8927 Rossash Ave., Cincinnati, Ohio 45236

Transducers, Ultrasonic

D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... ***
D **Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... ***
D AKG Acoustics, Philips Audio Video Sys. Corp., Dept. EM, 91 McKee Dr, Manwah, N.J. 07430
Andersen & Assoc., Walther M.A., Dept. EM, 4 Main St. Ext., Tariffville, Conn. 06081
Branson Cleaning Equip. Co., Dept. EM, Parrott Dr., Shelton, Conn. 06484
Carolina Medical Elctrns., Inc., Dept. EM, U.S. 52 Expwy., Box 307, King, N.C. 27021
Channel Inds., Dept. EM, 839 Ward Dr., Santa Barbara, Cal. 93111
Crystal Technology, Dept. EM, 2510 Old Middlefield Way, Mountain View, Cal 94043
Dunegan/Endevco, Dept. EM, Rancho Viejo Rd., San Juan Capistrano, Cal. 92675

Gulton Inds., Piezo Prods. Div., Dept. EM, Box 4300, Fullerton, Cal. 92634
Gulton Inds., Inc., Elctrn. Comps. Div., Dept. EM, Piezo Products Div., Metuchen, N.J. 08840
Gulton Inds., Inc., Servonic/Instrumentation Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
James Electronics Inc., Dept. EM, 4050 N Rockwell St, Chicago, Ill. 60618
Linden Labs., Inc., Dept. EM, Box 920, State College, Pa. 16801
Magnaflux Corp. , Dept. EM, 7328 W. Lawrence Ave., Chicago, Ill 60656
D Murata Mfg. Co. Ltd., Dept. EM, 16, Kaiden Nishijin-cho, Nagaoka-Kyo-Shi, Kyoto, Japan
D National Sonics, Div. Envirotech Corp., Dept. EM, 250 Marcus Blvd., Hauppauge, N.Y. 11787
Ocean Research Equipment, Inc., Dept. EM, Box 709, Falmouth, Mass. 02541
Panametrics Inc., Dept. EM, 221 Cresent St., Waltham, Mass. 02154
Phillips Mfg. Co., National Ultrasonic Div., Dept. EM, 7334 N. Clark St., Chicago, Ill. 60626
D Sonobond, Sub. Christiana Metals, Dept. EM, 200 E. Rosedale Ave., West Chester, Pa. 19380
D Ultrasonic Corp., Dept. EM, Box 672, Pipestone, Minn. 56164
Valtec Corp, Valpey-Fisher Div, Dept. EM, 75 South St, Hopkinton, Mass. 01748

Transducers, Velocity

Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 ..... *
D Fenwal Elctrns., Dept. EM, 63 Fountain St., Framingham, Mass. 01701 ..... *
Bell & Howell Co., Elctrns. & Instrs. Grp., Dept. EM, 360 Sierra Madre Villa, Pasadena, Cal. 91109
Carolina Medical Elctrns., Inc., Dept. EM, U.S. 52 Expwy., Box 307, King, N.C. 27021
D Electro Corp., Dept. EM, Box 3049, Sarasota, Fla. 33578
M Humphrey, Inc., Dept. EM, 9212 Balboa Ave., San Diego, Calif. 92123
IRD Mechanalysis, Inc., Dept. EM, 6150 Huntley Rd., Columbus, Ohio 43229
Kavlico Corp., Dept. EM, 20869 Plummer St., Chatworth, Cal. 91311
Licon Div., Illinois Tool Works, Dept. EM, 6615 W. Irving Park Rd., Chicago, Ill. 60634
Metrix Instrument Co., Metrix Instrument Co., Dept. EM, 1711 Townhurst, Houston, Tex. 77043
Plessey Enviromental Sys., Dept. EM, 3939 Ruffin Rd., San Diego, Cal. 92123
Robinson-Halpern Co., Dept. EM, One Apolio Rd., Plymouth Meeting, Pa. 19462
M Schaevitz Engrg., Dept. EM, U.S. 130, Union Ave., Pennsauken, N.J. 08110
Spectral Dynamics Corp., Dept. EM, Box 671, San Diego, Cal. 92112
Sprengnether Instr. Co., W.F., Dept. EM, 4567 Swan St., St. Louis, Mo. 63110
Teledyne/Geotech, Dept. EM, Box 28277, Dallas, Tex. 75228
Temposonics Inc., Dept. EM, 131 East Ames Ct, Plainview, N.Y. 11803
Trans-Tek, Inc., Dept. EM, Rte. 83, Ellington, Conn. 06029
M Transicoil, Inc., Dept. EM, Worcester, Pa. 19490
D TSI Inc, Dept. EM, 500 Cardigan Rd., Box 3394, St. Paul, Minn. 55165
D Vibra-Metrics, Inc., Dept. EM, 150 Bradley St., E. Haven, Conn. 06512

Transducers, Vibration

BBN Instruments Co., Div. Bolt Beranek & Newman, Inc., Dept. EM, 50 Moulton St., Cambridge, Mass. 02138 ..... *
M Dytronics Co., Inc., Dept. EM, 4800 Evanswood Dr., Columbus, Ohio 43229 *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Unholtz-Dickie Corp., Dept. EM, 3000 Whitney Ave., Hamden, Conn. 06518 p. 2575
Alpha-M Corp, Dept. EM, 3009 Wildflower Drive, Dallas, Tx. 75229
B & K Instruments, Inc., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142
Beckman Instrs., Ectrn. Instrs. Div. Ectrn. Instrumentation, Dept. EM, 3900 N. River Rd., Schiller Park, Ill. 60176
Bell & Howell Co., Elctrns. & Instrs. Grp., Dept. EM, 360 Sierra Madre Villa, Pasadena, Cal. 91109
Channel Inds., Dept. EM, 839 Ward Dr., Santa Barbara, Cal. 93111
M Columbia Resch. Labs., Dept. EM, Macdade Blvd. & Bullens La., Woodlyn, Pa. 19094
D Electro Corp., Dept. EM, Box 3049, Sarasota, Fla. 33578
Electro-Voice, Sub. Gulton Inds., Dept. EM, 600 Cecil St., Buchanan, Mich. 49107
Endevco, Div. Becton, Dickinson & Co., Dept. EM, 30700 Rancho Viejo Rd., San Jaun Capistrano, Cal. 92675
Entran Devices, Inc., Dept. EM, 145 Paterson Ave., Little Falls, N.J. 07424
M Gulton Inds., Inc., Servonic/Instrumentation Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
IRD Mechanalysis, Inc., Dept. EM, 6150 Huntley Rd., Columbus, Ohio 43229
M Kaman Sciences Corp., Dept. EM, 1500 Garden of the Gods Rd. P.O. Box 7463, Colorado Springs, Colo. 80933
Knowles Elctrns., Inc., Dept. EM, 3100 N. Mannheim Rd., Franklin Park, Ill. 60131
Larson Aero Dev., Dept. EM, Box 135, Concord, Cal. 94522
Linden Labs., Inc., Dept. EM, Box 920, State College, Pa. 16801
Metrix Instrument Co., Metrix Instrument Co., Dept. EM, 1711 Townhurst, Houston, Tex. 77043
PCB Piezotronics, Inc., Dept. EM, 5800 Transit Rd., Depew, N.Y. 14043
D Robertshaw Controls Co., Ind'l. Instr. Div., Dept. EM, 1910 Byrd Ave Ste 200, Richmond, Va. 23230
Spectral Dynamics Corp., Dept. EM, Box 671, San Diego, Cal. 92112
Sprengnether Instr. Co., W.F., Dept. EM, 4567 Swan St., St. Louis, Mo. 63110
Sundstrand Data Control, Dept. EM, Overlake Ind'l. Pk., Redmond, Wash. 98052
Teledyne/Geotech, Dept. EM, Box 28277, Dallas, Tex. 75228
Transmed Scientific, Dept. EM, 860-C Capitolio Way, San Luis Obispo, Cal. 93401
D Vibra-Metrics, Inc., Dept. EM, 150 Bradley St., E. Haven, Conn. 06512

Transducers, Volt, Watt, Current VAR, Power Factor, Frequency

Active Control Instrumentation, Dept. EM, PO Box 243-Wildwood Circle, Key Largo, Florida 33037 ..... p. 2256
M American Aerospace Controls, Dept. EM, 131 Verdi St., Farmingdale, N.Y. 11735 ..... p. 4298,4299
Autronics Corp., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470 p. 2259
Bell, Inc., F.W., Dept. EM, 4949 Freeway Dr. E., Columbus, Ohio 43229 p. 4300
EWC, Inc., Dept. EM, 725 Federal Ave., Kenilworth, N.J. 07033 ..... *
D Fenwal Elctrns., Dept. EM, 63 Fountain St., Framingham, Mass. 01701 ..... *
General Elec. Co., Elctrn. Comp. Sis., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Guardian Electric Co., Dept. EM, 1550 W. Carroll Ave., Chicago, Ill. 60607 p. 3519
Jackson Bros., (London) Ltd., Dept. EM, 258 Bway., New York, N.Y. 10007 *
Leach Corp., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003 .. p. 3577
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
M Ohio Semitronics, Inc., Dept. EM, 1205 Chesapeake Ave., Columbus, Ohio 43212 ..... p. 4303,4310-4319,4321,4322
D Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 ..... *
RFL Inds., Instr. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005 ..... *
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *
Star Micronics Inc., Dept. EM, Pan Am Building, Ste 2308, 200 Park Ave, New York, N.Y. 10017 ..... *
Yokogawa Corp. of America, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523 ..... *
Ampower Electronic Instr. Co., Dept. EM, 500 Union Blvd., Totowa, N. J. 07512
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
Cross Electronics Inc., Dept. EM, 100 Commonwealth Dr., Warrendale, Pa. 15086
D Greibach Instr. Div., Electrical Inst. Svc., Inc., Dept. EM, 25 Dock St., Mt Vernon, N.Y. 10550
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
IPAC Group, Inc., Dept. EM, POB 156 3047 Industrial Blvd., Bethel Park, PA 15102
RFL Inds., Comms. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005
Rochester Instr System, Dept. EM, 255 N. Union St., Rochester, N.Y. 14605
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077
TransData Inc., Dept. EM, P.O. Box 518, Dublin, Ohio 43017

Transformers, Audio

Bourns, Inc., Trimpot Prods. Div., Dept. EM, 1200 Columbia Ave., Riverside, Cal. 92507 ..... *
M Bourns Magnetic Prods., Trimpot Div., Dept. EM, Box 1398, Romoland, Cal. 92380 ..... p. 4333, Back Cover, Vol. 2
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Bug Electronics, Dept. EM, 151 Grove St, Westwood, Mass. 02090
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M Prototype Transformer Corp., Dept. EM, 545 N Arlington Ave, East Orange, N.J. 07017
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M Universal Elctrns. Corp., Dept. EM, 20747 Dearborn St., Chatsworth, Cal. 91311
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M North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803 ..... *
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E.S.I. Inc., Dept. EM, 13900 N.W. Science Park Dr., Portland, Oregon 97229
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Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
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M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
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Bicron Elctrns. Co., Dept. EM, Box 807, Barlow St., Canaan, Conn. 06018
Bourns, Inc., Instr. Div., Dept. EM, 6135 Magnolia, Riverside, Calif. 92506
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
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M Freed Transformer Co., Inc., Dept. EM, 1718 Weirfield St., Brooklyn, N.Y. 11227 ..... *
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Tranex Inc., Dept. EM, 1599 Stierlin Rd., Mountain View, Cal. 94043
Trans American Transformer, Dept. EM, 142 Peconic Ave., Medford, N.Y. 11763
M Transistor Devices, Dept. EM, 85 Horsehill Rd., Cedar Knolls, N.J. 07927
Wabash Transformer Corp., Dept. EM, 1375 Swan St., Huntington, Ind. 46750

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Magnetico, Inc., Dept. EM, 182 Morris Ave., Holtsville, N.Y. 11742 ..... *
D Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
M Sigmapower, Inc., Dept. EM, 20790 Leapwood Ave., Carson, Cal. 90746 .... *
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M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... *
D Triad-Utrad, Distr Svcs., Dept. EM, 305 N. Briant St., Huntington, Ind. 46750 *
Amperex Electronic Corp., Slatersville Div., Dept. EM, Providence Pike, Slatersville, R.I. 02876
Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
D Fuji Electrochemical Co., Dept. EM, Hamagomu Bld. 5 36-11 Shinbashi, Minato-ku, Tokyo, Japan
James Electronics Inc., Dept. EM, 4050 N Rockwell St, Chicago, Ill. 60618
D Murata Mfg. Co. Ltd., Dept. EM, 16, Kaiden Nishijin-cho, Nagaoka-Kyo-Shi, Kyoto, Japan
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016

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M Abbott Transistor Labs., Transformer Div., Dept. EM, 639 So. Glenwood Pl., Burbank, Cal. 91506 ..... p. 4326,4328,4329
M AMP Capitron Div./AMP Inc., Dept. EM, 1595 S. Mt. Joy St., Elizabethtown, Pa. 17022 ..... *
M Arnold Magnetics Corp., Dept. EM, 11520 Jefferson Blvd., Culver City, Cal. 90230 ..... *
M Axel Elctrns., Unit of General Signal, Dept. EM, 134-20 Jamaica Ave., Jamaica, N.Y. 11418 ..... *
Computer Power, Inc., Dept. EM, 124E West Main Street, High Bridge, New Jersey 08829 ..... *
M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 .. *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... *
EWC, Inc., Dept. EM, 725 Federal Ave., Kenilworth, N.J. 07033 ..... *
M Freed Transformer Co., Inc., Dept. EM, 1718 Weirfield St., Brooklyn, N.Y. 11227 ..... *
General Magnetics, Dept. EM, 211 Grove St., Bloomfield, N.J. 07003 ..... *
M Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 ..... *
M Inductive Components, Inc., Dept. EM, 181 Bridge Rd., Hauppauge, N.Y. 11787 ..... *
JM Transformer, Dept. EM, 262 Mott St., New York, N.Y. 10012 ..... *
KGS Electronics, Inc., Dept. EM, 2029 N. Lincoln Ave., Pasadena, Cal. 91103 *
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NWL Transformers, Dept. EM, Rising Sun Rd., Bordentown, N.J. 08505 ..... *
M OPT Inds. Inc., Data Products Div., Dept. EM, 300 Red School Lane, Phillipsburg, N.J. 08865 ..... *
M Perkin-Elmer Corp., Elctrn. Prods. Dept., Dept. EM, Main Ave., Norwalk, Conn. 06856 ..... *
Pico Elctrns. Inc., Dept. EM, 453 North MacQuesten Parkway, Mount Vernon, N.Y. 10552 ..... p. 4368,4386
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M Sigmapower, Inc., Dept. EM, 20790 Leapwood Ave., Carson, Cal. 90746 .... *
Signal Transformer Co., Dept. EM, 500 Bayview Ave., Inwood, N.Y. 11696 *
Sola Electric, Dept. EM, 1717 Busse Rd., Elk Grove Village, Ill. 60007 ..... *
DM Staco, Inc., Dept. EM, 301 Gaddis Blvd., Dayton, Ohio 45403 ..... *
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M Torwico Elctrns., Inc., Dept. EM, Rte. 70, Lakewood, N.J. 08701 p. 4440,4441
D Triad-Utrad, Distr Svcs., Dept. EM, 305 N. Briant St., Huntington, Ind. 46750 *
M TRW/UTC Transformers, Dept. EM, 150 Varick St., New York, N.Y. 10013 .. *
M Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040 *
American Monarch Corp., Dept. EM, 2801-37th Ave., N.E., Minneapolis, Minn. 55421
Basler Electric Co., Dept. EM, Box 269, Rte. 143, Highland, Ill. 62249
Bug Electronics, Dept. EM, 151 Grove St, Westwood, Mass. 02090
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
M Datatex Corp., Dept. EM, 10935 S. Wilcrest Dr., Houston, Tex. 77099
Electrocube Inc., Dept. EM, 1710 So. Del Mar Ave., San Gabriel, Cal. 91776
Field Electronics, Dept. EM, 1416 Commerce St, Chatham, N.J. 07928

G & G Tresco Corp., Dept. EM, 1952 E. Allegheny Ave., Phila., PA 19134
D Hammond Mfg. Co., Dept. EM, 385 Nagel Dr., Buffalo, NY 14225
James Electronics Inc., Dept. EM, 4050 N Rockwell St, Chicago, Ill. 60618
DM JB Elctrn, Transformers, Inc., Dept. EM, 2300 W. Armitage Ave., Chicago, Ill 60647
DM Jefferson Elec,, Div. Litton Inds., Dept. EM, 840 S. 25th Ave., Bellwood, Ill. 60104
Johnson Electric Coil Co., Dept. EM, Box 559, Elmhurst, Ill 60126
M Kenyon Magnetics Inc., Dept. EM, 1040 Grand St, Hoboken, N.J. 07030
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
Magnetic Products, Inc., Dept. EM, Box 1125, New London, N.H. 03257
Magnetran Corp., Dept. EM, 5701 Savoy Lane, Houston, Tex. 77036
Neshaminy Transformer, Div. Neshaminy Elctrn., Dept. EM, Edison-Furlong Rd., Furlong, Pa. 18925
M Northlake Engineering, Dept. EM, 999 Anita Ave., Antioch, Ill. 60002
M Osborne Transformer Corp., Dept. EM, 19636 Derby St., Detroit, Mich. 48203
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
PCA Elctrns., Inc., Dept. EM, 16799 Schoenborn St., Sepulveda, Cal. 91343
M Peschel Instrs., Inc., Dept. EM, 1412 Viscaya Pkwy., Cape Coral, Fla. 33904
M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
M Prototype Transformer Corp., Dept. EM, 545 N Arlington Ave, East Orange, N.J. 07017
M Schott Corp., Dept. EM, 3140 B Harbor Lane No., Minneapolis, Minn. 55441
Staco, Inc., Dept. EM, 625 S. "G" St., Richmond, Ind. 47374
D Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
Torelco Inc., Dept. EM, 14 Paine Ave., Irvington, N.J. 07111
Tranex Inc., Dept. EM, 1599 Stierlin Rd., Mountain View, Cal. 94043
Trans American Transformer, Dept. EM, 142 Peconic Ave., Medford, N.Y. 11763

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M AMP Capitron Div./AMP Inc., Dept. EM, 1595 S. Mt. Joy St., Elizabethtown, Pa. 17022 ..... *
M Axel Elctrns., Unit of General Signal, Dept. EM, 134-20 Jamaica Ave., Jamaica, N.Y. 11418 ..... *
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M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 p. 3243
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D Dormeyer Industries, Dept. EM, 3418 N. Milwaukee, Chicago, Ill. 60641 ..... *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... *
M Freed Transformer Co., Inc., Dept. EM, 1718 Weirfield St., Brooklyn, N.Y. 11227 ..... *
Glassman High Voltage, Dept. EM, 124 W. Main St., High Bridge, N.J. 08829 *
M Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509 ..... *
M Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 ..... *
M Inductive Components, Inc., Dept. EM, 181 Bridge Rd., Hauppauge, N.Y. 11787 ..... *
KGS Electronics, Inc., Dept. EM, 2029 N. Lincoln Ave., Pasadena, Cal. 91103 *
Magnetico, Inc., Dept. EM, 182 Morris Ave., Holtsville, N.Y. 11742 ..... *
Marine Electric Railway Prods. Div., Inc., Dept. EM, 167 National Rd., Edison, N.J. 08817 ..... *
Megavolt, Corp., Dept. EM, 110 Hobart St, Hackensack, N.J. 07601 ..... *
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M Sterling Transformer Corp., Dept. EM, 510 Driggs Ave., Brooklyn, N.Y. 11211 p. 4410
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M TRW/UTC Transformers, Dept. EM, 150 Varick St., New York, N.Y. 10013 .. *
Universal Voltronics Corp., Dept. EM, 27 Radio Circle Dr., Mt. Kisco, N.Y. 10549 ..... *
M Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040 *
D American HV Voltage Test Sys., Inc., Dept. EM, Ctrl Garr Ind'l Pk, Accident, Md. 21520
American Magnetics Corp., Dept. EM, P.O. Box 8, Carterville, Ill. 62918
Basler Electric Co., Dept. EM, Box 269, Rte. 143, Highland, Ill. 62249
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Elma Engineering, Dept. EM, 1066 E. Meadow Circle, Palo Alto, Cal. 94303
ENI Power Systems, Dept. EM, 3000 Winton Rd. S., Rochester, N.Y. 14623
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Kilovolt Corp., Dept. EM, 238 High St., Hackensack, N.J. 07602
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M Magnetic Circuit Elements, Dept. EM, 2455A Garden Rd., Monterey, Cal. 93940
Magnetic Products, Inc., Dept. EM, Box 1125, New London, N.H. 03257
Micron Industries Corp., Constant Voltage Div., Dept. EM, 1830 N. 32nd Ave., Stone Park, Ill. 60165
Neshaminy Transformer, Div. Neshaminy Elctrn., Dept. EM, Edison-Furlong Rd., Furlong, Pa. 18925
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M Northlake Engineering, Dept. EM, 999 Anita Ave., Antioch, Ill. 60002
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M Osborne Transformer Corp., Dept. EM, 19636 Derby St., Detroit, Mich. 48203
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
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D Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
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DM Cramer Coil, Div Digital Magnetics Inc, Dept. EM, Box 32, Grafton, Wisc. 53024 ..... *
Dale Electronics Inc., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601 ..... *
Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 ..... *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... *
Elctrn Instr & Specialty Corp., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890 ..... *
M Frequency Selective Networks, Inc, Dept. EM, 69-20 Garfield Ave., Woodside, N.Y. 11377 ..... *
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
M Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 ..... *
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Aladdin Elctrns., Dept. EM, 701 Murfreesboro Rd., Nashville, Tenn. 37210
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
Automatic Coil Corp., Sub. Designatronics Inc., Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010
M Caddell Coil Corp., Dept. EM, 35 Main St., Poultney, Vt. 05764
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Coilcraft, Dept. EM, 1102 Siler Lake Rd., Cary, Ill. 60013
Coil-Q Corp., Dept. EM, 340 Bronxville Rd., Bronxville, N.Y. 10708
Coil Specialty Co., Dept. EM, Box 978, 2730 Carolean Ind'l. Dr., State College, Pa. 16801
M Dietz Design, Inc., Dept. EM, 100 Electronics Pkwy., Belton, Mo. 64012
D Fuji Electrochemical Co., Dept. EM, Hamagomu Bld. 5 36-11 Shinbashi, Minato-ku, Tokyo, Japan
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Hytronics Corp., Dept. EM, 6231 72nd Ave. N., Pinellas Park, Fla. 33565
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Lambda Elctrns., Dept. EM, 515 Brd. Hollow Rd., Melville, N.Y. 11746
M Merrimac Inds., Inc., Dept. EM, 41 Fairfield Pl., West Caldwell, N.J. 07006
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
M Piconics Inc., Dept. EM, Cummings Rd., Tyngsboro, Mass. 01879
M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
M Syscon Int'l., Inc., Dept. EM, 1239 South Bend Ave., So. Bend, Ind. 46617
Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

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M Coil-Q Corp., Dept. EM, 340 Bronxville Rd., Bronxville, N.Y. 10708
M Component Specialties, Dept. EM, 9143 E. La Rosa Dr., Temple City, Cal. 91780
Custom Coil & Transformer Co., Dept. EM, Box 2369, Zanesville, Ohio 43701
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M Dietz Design, Inc., Dept. EM, 100 Electronics Pkwy., Belton, Mo. 64012
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D Gotham Audio Corp., Dept. EM, 741 Washington St., New York, N.Y. 10014
Grand Transformers, Dept. EM, Box 188, Grand Haven, Mich. 49417
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Hytronics Corp., Dept. EM, 6231 72nd Ave. N., Pinellas Park, Fla. 33565
InResCo, Dept. EM, 503 Adamston Rd., Bricktown, N. J. 08723
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M Kenyon Magnetics Inc., Dept. EM, 1040 Grand St, Hoboken, N.J. 07030
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M Magnetic Circuit Elements, Dept. EM, 2455A Garden Rd., Monterey, Cal. 93940
Magnetran Corp., Dept. EM, 5701 Savoy Lane, Houston, Tex. 77036
Modular Audio Products, Dept. EM, 50 Orville Dr., Bohemia, N.Y. 11716
Neshaminy Transformer, Div. Neshaminy Elctrn., Dept. EM, Edison-Furlong Rd., Furlong, Pa. 18925
North Electric Co., Power Sys Div., Dept. EM, Box 688, Galion, Ohio 44833
M Northlake Engineering, Dept. EM, 999 Anita Ave., Antioch, Ill. 60002
Nortran Co., Dept. EM, 96 Milton Rd, Rochester, New Hampshire 03867
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DM Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Philips Audio Video Sys, Neutrik Prods, Dept. EM, 91 McKee Dr., Mahwah, N.J. 07430
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M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
M Prototype Transformer Corp., Dept. EM, 545 N Arlington Ave, East Orange, N.J. 07017
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Schott Corp., Dept. EM, 3140 B Harbor Lane No., Minneapolis, Minn. 55441
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M **Frequency Selective Networks, Inc, Dept. EM, 69-20 Garfield Ave., Woodside, N.Y. 11377** ..... *
DM **Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582** *
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M **Pico Elctrns. Inc., Dept. EM, 453 North MacQuesten Parkway, Mount Vernon, N.Y. 10552** ..... *
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Torotron, Dept. EM, 255 Washington St., Mt. Vernon, N.Y. 10553 ..... *
M **Torwico Elctrns., Inc., Dept. EM, Rte. 70, Lakewood, N.J. 08701** ..... *
D **Triad-Utrad, Distr Svcs., Dept. EM, 305 N. Briant St., Huntington, Ind. 46750** *
M **TRW/UTC Transformers, Dept. EM, 150 Varick St., New York, N.Y. 10013** .. *
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M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
M Coil-Q Corp., Dept. EM, 340 Bronxville Rd., Bronxville, N.Y. 10708
M Dietz Design, Inc., Dept. EM, 100 Electronics Pkwy., Belton, Mo. 64012
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M Kenyon Magnetics Inc., Dept. EM, 1040 Grand St, Hoboken, N.J. 07030
M Magnetic Circuit Elements, Dept. EM, 2455A Garden Rd., Monterey, Cal. 93940
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
Phoenix Transformer Co., Dept. EM, 1818 E. Madison, Phoenix, Ariz. 85034
M Piconics Inc., Dept. EM, Cummings Rd., Tyngsboro, Mass. 01879
M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
Staco, Inc., Dept. EM, 625 S. "G" St., Richmond, Ind. 47374
DM Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618

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General Magnetics, Dept. EM, 211 Grove St., Bloomfield, N.J. 07003 ..... *
DM **Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582** *
NWL Transformers, Dept. EM, Rising Sun Rd., Bordentown, N.J. 08505 ..... *
M **OPT Inds. Inc., Data Products Div., Dept. EM, 300 Red School Lane, Phillipsburg, N.J. 08865** ..... *
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M Northlake Engineering, Dept. EM, 999 Anita Ave., Antioch, Ill. 60002
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Phoenix Transformer Co., Dept. EM, 1818 E. Madison, Phoenix, Ariz. 85034
M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
M Prototype Transformer Corp., Dept. EM, 545 N Arlington Ave, East Orange, N.J. 07017
Schott Corp., Dept. EM, 3140 B Harbor Lane No., Minneapolis, Minn. 55441
Staco, Inc., Dept. EM, 625 S. "G" St., Richmond, Ind. 47374
DM Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
M Syscon Int'l., Inc., Dept. EM, 1239 South Bend Ave., So. Bend, Ind. 46617
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

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Abacus Controls Inc., Dept. EM, 89 Redington Rd., Somerville, N.J. 08876 *
M **Abbott Transistor Labs., Transformer Div., Dept. EM, 639 So. Glenwood Pl., Burbank, Cal. 91506** ..... *
M **Axel Elctrns., Unit of General Signal, Dept. EM, 134-20 Jamaica Ave., Jamaica, N.Y. 11418** ..... *
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M **Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550** .. *
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Dynamic Instr. Corp., Dept. EM, 933 L.I. Motor Pkwy., Hauppauge, N.Y. 11787 *
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D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Coil-Q Corp., Dept. EM, 340 Bronxville Rd., Bronxville, N.Y. 10708
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D Hammond Mfg. Co., Dept. EM, 385 Nagel Dr., Buffalo, NY 14225
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DM JB Elctrn, Transformers, Inc., Dept. EM, 2300 W. Armitage Ave., Chicago, Ill 60647
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M Magnetic Circuit Elements, Dept. EM, 2455A Garden Rd., Monterey, Cal. 93940
Magnetran Corp., Dept. EM, 5701 Savoy Lane, Houston, Tex. 77036
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Neshaminy Transformer, Div. Neshaminy Elctrn., Dept. EM, Edison-Furlong Rd., Furlong, Pa. 18925
M Northlake Engineering, Dept. EM, 999 Anita Ave., Antioch, Ill. 60002
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M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
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M Northlake Engineering, Dept. EM, 999 Anita Ave., Antioch, Ill. 60002
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M Osborne Transformer Corp., Dept. EM, 19636 Derby St., Detroit, Mich. 48203
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
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Carson Mfg. Co., Dept. EM, 5453 N. Rural St., Indianapolis, Ind. 46220
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Coilcraft, Dept. EM, 1102 Siler Lake Rd., Cary, Ill. 60013
M Collins Elecs, Inc., Dept. EM, Old Love Pt. Rd., Stevensville, Md. 21666
M Component Specialties, Dept. EM, 9143 E. La Rosa Dr., Temple City, Cal. 91780
Custom Coil & Transformer Co., Dept. EM, Box 2369, Zanesville, Ohio 43701
Datatex Corp., Dept. EM, 10935 S. Wilcrest Dr., Houston, Tex. 77099
M Dietz Design, Inc., Dept. EM, 100 Electronics Pkwy., Belton, Mo. 64012
Dynage, Inc., Power Supply Corp., Dept. EM, 1331 Blue Hills Ave., Bloomfield, Conn. 06002
Elcor Prods. Neotec Elctrns. Inc., Dept. EM, 2431 Linden La., Silver Spring, Md. 20910
Electro-Pacific, Inc., Dept. EM, 5782 Thornwood Dr., Goleta, Calif. 93017
Electrocube Inc., Dept. EM, 1710 So. Del Mar Ave., San Gabriel, Cal. 91776
Elgin Elctrns., Inc., Sub. Basic, Inc., Dept. EM, Walnut St., Waterford, PA. 16441
Elma Engineering, Dept. EM, 1066 E. Meadow Circle, Palo Alto, Cal. 94303
ESSCO Industries, Dept. EM, PO Box 515, Sierra Madre, Cal. 91024
Field Electronics, Dept. EM, 1416 Commerce St, Chatham, N.J. 07928
Foster Transformer Co., Dept. EM, 3820 Colerain Ave., Cincinnati, Ohio 45223
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Gowanda Electronics Corp., Dept. EM, 179 Broadway Rd., Gowanda, N.Y. 14070
Grand Transformers, Dept. EM, Box 188, Grand Haven, Mich. 49417
Hammond Mfg. Co., Dept. EM, 385 Nagel Dr., Buffalo, NY 14225
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
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I Bendix, Electric & Fluid Power Div., Dept. EM, Hwy. 35, Eatontown, N.J. 07724
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Magnetic Products, Inc., Dept. EM, Box 1125, New London, N.H. 03257
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D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Phoenix Transformer Co., Dept. EM, 1818 E. Madison, Phoenix, Ariz. 85034
Polygon Inds (1977) Ltd, Dept. EM, 50 Northline Rd., Toronto, Ont., Can M4B 3E2
M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
M Prototype Transformer Corp., Dept. EM, 545 N Arlington Ave, East Orange, N.J. 07017
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Tranex Inc., Dept. EM, 1599 Stierlin Rd., Mountain View, Cal. 94043

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DM JB Elctrn, Transformers, Inc., Dept. EM, 2300 W. Armitage Ave., Chicago, Ill 60647
M Kenyon Magnetics Inc , Dept. EM, 1040 Grand St, Hoboken, N.J. 07030
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
M Magnetic Circuit Elements, Dept. EM, 2455A Garden Rd., Monterey, Cal. 93940
Magnetic Specialties, Dept. EM, 10 Albemarle Ave., Trenton, N.J. 08638
Magnetran Corp., Dept EM, 5701 Savoy Lane, Houston, Tex. 77036
North Electric Co., Power Sys Div., Dept. EM, Box 688, Galion, Ohio 44833
Nortran Co., Dept. EM, 96 Milton Rd, Rochester, New Hampshire 03867
Novatronics, Inc., Dept. EM, Box 878, Pompano Beach, Fla. 33061
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
M Osborne Transformer Corp , Dept. EM, 19636 Derby St., Detroit, Mich. 48203
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
PCA Elctrns., Inc., Dept. EM, 16799 Schoenborn St., Sepulveda, Cal. 91343
M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
Pulse Engrg., Inc., Dept. EM, Box 12235, San Diego, Cal 92112
M Sawyer Inds., Dept. EM, 5649 Peck Rd., Arcadia, Cal. 91006
M Schott Corp., Dept EM, 3140 B Harbor Lane No., Minneapolis, Minn. 55441
M Solid State Electronics Corp , Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
Torelco Inc., Dept. EM, 14 Paine Ave., Irvington, N.J. 07111
Trans American Transformer, Dept. EM, 142 Peconic Ave., Medford, N.Y. 11763
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

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D Bell Industries, J.W. Miller Div., Dept. EM, 19070 Reyes Ave., Compton, Cal. 90221 ..... *
M Bourns Magnetic Prods., Trimpot Div., Dept. EM, Box 1398, Romoland, Cal. 92380 ..... p. 4332, Back Cover, Vol. 2
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EWC, Inc., Dept. EM, 725 Federal Ave., Kenilworth, N.J. 07033 ..... *
M Freed Transformer Co., Inc., Dept. EM, 1718 Weirfield St., Brooklyn, N.Y. 11227 ..... p. 4346
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M Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 ..... *
M Inductive Components, Inc., Dept. EM, 181 Bridge Rd., Hauppauge, N.Y. 11787 ..... *
KGS Electronics, Inc., Dept. EM, 2029 N. Lincoln Ave., Pasadena, Cal. 91103 *
Magnetico, Inc., Dept. EM, 182 Morris Ave., Holtsville, N.Y. 11742 ..... *
M Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 p. 4362,4363
M Pico Elctrns. Inc., Dept. EM, 453 North MacQuesten Parkway, Mount Vernon, N.Y. 10552 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
M Sterling Transformer Corp., Dept. EM, 510 Driggs Ave., Brooklyn, N.Y. 11211 p. 4411
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M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 ..... *
D Triad-Utrad, Distr Svcs., Dept. EM, 305 N. Briant St., Huntington, Ind. 46750 p. 4445,4448
M TRW/UTC Transformers, Dept. EM, 150 Varick St., New York, N.Y. 10013 Inside Back Cover, Vol. 1
M Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040 *
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Coil-Q Corp., Dept. EM, 340 Bronxville Rd., Bronxville, N.Y. 10708
Computer Comps., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418
Custom Coil & Transformer Co., Dept. EM, Box 2369, Zanesville, Ohio 43701
Electrocom Inds., Dept. EM, 1105 N. Ironwood Dr., S. Bend, Ind. 46615
G & G Tresco Corp., Dept. EM, 1952 E. Allegheny Ave., Phila., PA 19134
D Hammond Mfg. Co., Dept. EM, 385 Nagel Dr., Buffalo, NY 14225
Hytronics Corp., Dept. EM, 6231 72nd Ave. N., Pinellas Park, Fla. 33565
James Electronics Inc., Dept. EM, 4050 N Rockwell St, Chicago, Ill. 60618
M JB Elctrn, Transformers, Inc., Dept. EM, 2300 W Armitage Ave., Chicago, Ill 60647
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
M Magnetic Circuit Elements, Dept. EM, 2455A Garden Rd., Monterey, Cal. 93940
Magnetran Corp., Dept. EM, 5701 Savoy Lane, Houston, Tex. 77036
M Northlake Engineering, Dept. EM, 999 Anita Ave., Antioch, Ill. 60002
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
PCA Elctrns., Inc., Dept. EM, 16799 Schoenborn St., Sepulveda, Cal. 91343
M Piconics Inc , Dept. EM, Cummings Rd., Tyngsboro, Mass 01879
M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
M Prototype Transformer Corp., Dept. EM, 545 N Arlington Ave, East Orange, N.J. 07017
Pulse Engrg., Inc., Dept. EM, Box 12235, San Diego, Cal 92112
Schott Corp., Dept. EM, 3140 B Harbor Lane No., Minneapolis, Minn. 55441
M Solid State Electronics Corp., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343
Staco, Inc., Dept. EM, 625 S. "G" St., Richmond, Ind. 47374
DM Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
Torelco Inc., Dept. EM, 14 Paine Ave., Irvington, N.J. 07111
Trans American Transformer, Dept. EM, 142 Peconic Ave., Medford, N.Y. 11763
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Wabash Transformer Corp., Dept. EM, 1375 Swan St., Huntington, Ind. 46750

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M Axel Elctrns., Unit of General Signal, Dept. EM, 134-20 Jamaica Ave., Jamaica, N.Y. 11418 ..... *
Caddel-Burns Mfg. Co., Inc., Dept. EM, 40 E. 2nd St., Mineola, N. Y. 11501 *
Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 ..... *
Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 ..... *
Electronic Navigation Inds., Dept. EM, 3000 Winton Rd. S., Rochester, N.Y. 14623 ..... *
EWC, Inc., Dept. EM, 725 Federal Ave., Kenilworth, N.J. 07033 ..... *
Magnetico, Inc., Dept. EM, 182 Morris Ave., Holtsville, N.Y. 11742 ..... *
DM Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 *
NWL Transformers, Dept. EM, Rising Sun Rd., Bordentown, N.J. 08505 ..... *
M Pico Elctrns. Inc., Dept. EM, 453 North MacQuesten Parkway, Mount Vernon, N.Y. 10552 ..... *
M Sterling Transformer Corp., Dept. EM, 510 Driggs Ave., Brooklyn, N.Y. 11211 *
M Technitrol, Inc., Dept. EM, 1952 E. Alleghany, Philadelphia, Pa. 19134 p. 4414
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M TRW/UTC Transformers, Dept. EM, 150 Varick St., New York, N.Y. 10013 .. *
Bicron Elctrns. Co., Dept. EM, Box 807, Barlow St., Canaan, Conn. 06018
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
M Dietz Design, Inc., Dept. EM, 100 Electronics Pkwy., Belton, Mo. 64012
ENI Power Systems, Dept. EM, 3000 Winton Rd. S., Rochester, N.Y. 14623
G & G Tresco Corp., Dept. EM, 1952 E. Allegheny Ave., Phila., PA 19134
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
M Northlake Engineering, Dept. EM, 999 Anita Ave., Antioch, Ill. 60002
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
Phoenix Transformer Co., Dept. EM, 1818 E. Madison, Phoenix, Ariz. 85034
M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
M Prototype Transformer Corp., Dept. EM, 545 N Arlington Ave, East Orange, N.J. 07017

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M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 .. *
D General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... p. 4350-4352
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D Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076 .... p. 4366
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Signal Transformer Co., Dept. EM, 500 Bayview Ave., Inwood, N.Y. 11696 p. 4401,4403
DM Staco, Inc., Dept. EM, 301 Gaddis Blvd., Dayton, Ohio 45403 ..... p. 4404,4405
Sterling Transformer Corp., Dept. EM, 510 Driggs Ave., Brooklyn, N.Y. 11211 *
D Superior Electric Co., Dept. EM, 1000 Middle St., Bristol, Conn. 06010 p. 3401,4412,4413
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DM Thordarson Meissner, Electronic Ctr., Dept. EM, Mt. Carmel, Ill. 62863 ..... *
M TRW/UTC Transformers, Dept. EM, 150 Varick St., New York, N.Y. 10013 .. *
M American Trans-Coil Corp., Dept. EM, 124-06 101st Ave, Richmond Hill, N.Y. 11419
M Caddell Coil Corp., Dept. EM, 35 Main St., Poultney, Vt. 05764
D Cambridge Thermionic Corp., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138
Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
M Columbia Resch. Labs., Dept. EM, Macdade Blvd. & Bullens La., Woodlyn, Pa. 19094
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Piconics Inc., Dept. EM, Cummings Rd., Tyngsboro, Mass. 01879

Transformers, Voltage-Dividing

Abacus Controls Inc., Dept. EM, 89 Redington Rd., Somerville, N.J. 08876 *
M Bourns Magnetic Prods., Trimpot Div., Dept. EM, Box 1398, Romoland, Cal. 92380 ..... *
Dale Elctrns., Inc., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078 ..... *
M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 .. *

Douglas Randall, Walter Kidde Div, Dept. EM, 6 Pawcatuck Ave., Pawcatuck, Conn. 02891 *
Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 *
Guildline Instrs., Inc., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538 *
M Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 *
Magnetico, Inc., Dept. EM, 182 Morris Ave., Holtsville, N.Y. 11742 *
DM Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 *
M North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803 *
NWL Transformers, Dept. EM, Rising Sun Rd., Bordentown, N.J. 08505 p. 4365
M Pico Elctrns. Inc., Dept. EM, 453 North MacQuesten Parkway, Mount Vernon, N.Y. 10552 *
Signal Transformer Co., Dept. EM, 500 Bayview Ave., Inwood, N.Y. 11696 *
M Sterling Transformer Corp., Dept. EM, 510 Driggs Ave., Brooklyn, N.Y. 11211 *
M Technitrol, Inc., Dept. EM, 1952 E. Alleghany, Philadelphia, Pa. 19134 p. 4414
DM Thordarson Meissner, Electronic Ctr., Dept. EM, Mt. Carmel, Ill. 62863 *
M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 *
M Torwico Elctrns., Inc., Dept. EM, Rte. 70, Lakewood, N.J. 08701 *
M TRW/UTC Transformers, Dept. EM, 150 Varick St., New York, N.Y. 10013 *
American Magnetics Corp., Dept. EM, P.O. Box 8, Carterville, Ill. 62918
Astrosystems, Inc., Dept. EM, 6 Nevada Dr., Lake Success, N.Y. 11040
Basler Electric Co., Dept. EM, Box 269, Rte. 143, Highland, Ill. 62249
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Electro Sci. Inds., Dept. EM, 13902 N.W. Science Pk. Dr., Portland, Ore. 97229
G & G Tresco Corp., Dept. EM, 1952 E. Allegheny Ave., Phila., PA 19134
Johnson Electric Coil Co., Dept. EM, Box 559, Elmhurst, Ill 60126
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
M Magnetic Circuit Elements, Dept. EM, 2455A Garden Rd., Monterey, Cal. 93940
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
M Prototype Transformer Corp., Dept. EM, 545 N Arlington Ave, East Orange, N.J. 07017
Schott Corp., Dept. EM, 3140 B Harbor Lane No., Minneapolis, Minn. 55441
Staco, Inc., Dept. EM, 625 S. "G" St., Richmond, Ind. 47374
D Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
Tranex Inc., Dept. EM, 1599 Stierlin Rd., Mountain View, Cal. 94043
Trans American Transformer, Dept. EM, 142 Peconic Ave., Medford, N.Y. 11763

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Abacus Controls Inc., Dept. EM, 89 Redington Rd., Somerville, N.J. 08876 *
Beckman Instrs., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634 *
D California Instrs., Dept. EM, 5150-Convoy St., San Diego, Cal. 92111 *
Computer Power, Inc., Dept. EM, 124E West Main Street, High Bridge, New Jersey 08829 *
Connor-Winfield Corp., Dept. EM, W. Chicago, Ill. 60185 *
M Del Electronics, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550 *
Deltec Corp., Dept. EM, 980 Buenos Ave., San Diego, Cal. 92110 *
D Dormeyer Industries, Dept. EM, 3418 N. Milwaukee, Chicago, Ill. 60641 *
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Elgar Corporation, Dept. EM, 8225 Mercury Ct., San Diego, Cal. 92111 *
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D General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 *
M Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 *
KGS Electronics, Inc., Dept. EM, 2029 N. Lincoln Ave., Pasadena, Cal. 91103 *
Magnetico, Inc., Dept. EM, 182 Morris Ave., Holtsville, N.Y. 11742 p. 4359
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D Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 *
NWL Transformers, Dept. EM, Rising Sun Rd., Bordentown, N.J. 08505 *
D Ohmite Mfg. Co., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076 *
M OPT Inds. Inc., Data Products Div., Dept. EM, 300 Red School Lane, Phillipsburg, N.J. 08865 *
Signal Transformer Co., Dept. EM, 500 Bayview Ave., Inwood, N.Y. 11696 *
D Sola Electric, Dept. EM, 1717 Busse Rd., Elk Grove Village, Ill. 60007 *
M Sterling Transformer Corp., Dept. EM, 510 Driggs Ave., Brooklyn, N.Y. 11211 *
D Superior Electric Co., Dept. EM, 1000 Middle St., Bristol, Conn. 06010 p. 3401
D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 *
M Technitrol, Inc., Dept. EM, 1952 E. Alleghany, Philadelphia, Pa. 19134 p. 4414
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M Torotel Inc., Dept. EM, 13402 S. 71 Hwy., Grandview, Mo. 64030 *
M Torwico Elctrns., Inc., Dept. EM, Rte. 70, Lakewood, N.J. 08701 *
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M TRW/UTC Transformers, Dept. EM, 150 Varick St., New York, N.Y. 10013 *
M Varo, Inc, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040 *
American Magnetics Corp., Dept. EM, P.O. Box 8, Carterville, Ill. 62918
American Monarch Corp., Dept. EM, 2801-37th Ave., N.E., Minneapolis, Minn. 55421
D Bug Electronics, Dept. EM, 151 Grove St, Westwood, Mass. 02090
Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Cyberex, Inc., Dept. EM, 7171 Industrial Park Blvd., Mentor, Ohio 44060
Datatex Corp., Dept. EM, 10935 S. Wilcrest Dr., Houston, Tex. 77099
Electro-Pacific, Inc., Dept. EM, 5782 Thornwood Dr., Goleta, Calif. 93017
Foster Transformer Co., Dept. EM, 3820 Colerain Ave., Cincinnati, Ohio 45223
G & G Tresco Corp., Dept. EM, 1952 E. Allegheny Ave., Phila., PA 19134
Johnson Electric Coil Co., Dept. EM, Box 559, Elmhurst, Ill 60126
M Kenyon Magnetics Inc., Dept. EM, 1040 Grand St, Hoboken, N.J. 07030
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
M Magnetic Circuit Elements, Dept. EM, 2455A Garden Rd., Monterey, Cal. 93940
Magnetic Products, Inc., Dept. EM, Box 1125, New London, N.H. 03257
Magnetran Corp., Dept. EM, 5701 Savoy Lane, Houston, Tex. 77036
Micron Industries Corp., Constant Voltage Div., Dept. EM, 1830 N. 32nd Ave., Stone Park, Ill. 60165
Neshaminy Transformer, Div. Neshaminy Elctrn., Dept. EM, Edison-Furlong Rd., Furlong, Pa. 18925
North Electric Co., Power Sys Div., Dept. EM, Box 688, Galion, Ohio 44833
M Northlake Engineering, Dept. EM, 999 Anita Ave., Antioch, Ill. 60002
Nortran Co., Dept. EM, 96 Milton Rd, Rochester, New Hampshire 03867
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
M Osborne Transformer Corp., Dept. EM, 19636 Derby St., Detroit, Mich. 48203
Phoenix Transformer Co., Dept. EM, 1818 E. Madison, Phoenix, Ariz. 85034
Power-Matic Inc., Dept. EM, 8076 Engineer Rd., San Diego, Cal. 92111
M Prototype Transformer Corp., Dept. EM, 545 N Arlington Ave, East Orange, N.J. 07017
Schott Corp., Dept. EM, 3140 B Harbor Lane No., Minneapolis, Minn. 55441
Solidstate Controls, Inc., Dept. EM, 600 Oakland Park Ave., Columbus, Ohio 43214
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
D Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
Tranex Inc., Dept. EM, 1599 Stierlin Rd., Mountain View, Cal. 94043

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M Bourns Magnetic Prods., Trimpot Div., Dept. EM, Box 1398, Romoland, Cal. 92380 p. 4333, Back Cover, Vol. 2
Caddel-Burns Mfg. Co., Inc., Dept. EM, 40 E. 2nd St., Mineola, N. Y. 11501 p. 1328
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Dranetz Engrg. Labs., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080 *
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M ESC Elctrns. Corp., Dept. EM, 534 Bergen Blvd., Palisades Pk., N.J. 07650 *
EWC, Inc., Dept. EM, 725 Federal Ave., Kenilworth, N.J. 07033 *
M Frequency Selective Networks, Inc, Dept. EM, 69-20 Garfield Ave., Woodside, N.Y. 11377 *
M Hisonic, Inc., Dept. EM, 249 N. Troost, Olathe, Kan. 66061 *
KGS Electronics, Inc., Dept. EM, 2029 N. Lincoln Ave., Pasadena, Cal. 91103 *
Magnetico, Inc., Dept. EM, 182 Morris Ave., Holtsville, N.Y. 11742 *
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DM Microtran Co., Inc., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y. 11582 *
Mini-Circuits Lab., Div. Scientific Comps. Corp., Dept. EM, 2625 E 14th St., Brooklyn, N.Y. 11235 p. 2890, Inside Front Cover, Vol. 1
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M Sterling Transformer Corp., Dept. EM, 510 Driggs Ave., Brooklyn, N.Y. 11211 *
M Stevens-Arnold, Inc., DC Input Pwr. Supply Div., Dept. EM, 7 Elkins St., So. Boston, Mass. 02127 *
M Technitrol, Inc., Dept. EM, 1952 E. Alleghany, Philadelphia, Pa. 19134 p. 4414
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Torotron, Dept. EM, 255 Washington St., Mt. Vernon, N.Y. 10553 *
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D Blonder-Tongue Labs., Inc., Dept. EM, One Jake Brown Rd., Old Bridge, N.J. 08857
M Caddell Coil Corp., Dept. EM, 35 Main St., Poultney, Vt. 05764
M Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
Coilcraft, Dept. EM, 1102 Siler Lake Rd., Cary, Ill. 60013
M Coil-Q Corp., Dept. EM, 340 Bronxville Rd., Bronxville, N.Y. 10708
Comdel, Inc., Dept. EM, Beverly Airport, Beverly, Mass. 01915
Dantel, Inc., Dept. EM, 1922 North Helm, Fresno, Cal. 93727
M Dietz Design, Inc., Dept. EM, 100 Electronics Pkwy., Belton, Mo. 64012
G & G Tresco Corp., Dept. EM, 1952 E. Allegheny Ave., Phila., PA 19134
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
James Electronics Inc., Dept. EM, 4050 N Rockwell St, Chicago, Ill. 60618
DM JB Elctrn, Transformers, Inc., Dept. EM, 2300 W. Armitage Ave., Chicago, Ill 60647
M Kenyon Magnetics Inc., Dept. EM, 1040 Grand St, Hoboken, N.J. 07030
Mag-Con, Inc., Dept. EM, 1626 Terrace Dr., St. Paul, Minn. 55113
M Magnetic Circuit Elements, Dept. EM, 2455A Garden Rd., Monterey, Cal. 93940
Oeco Corp., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214
M Polyphase Instr. Co., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405
M Prototype Transformer Corp., Dept. EM, 545 N Arlington Ave, East Orange, N.J. 07017

Pulse Engrg., Inc., Dept. EM, Box 12235, San Diego, Cal 92112
D Sinclair Radio Labs., Dept. EM, 122 Rayette Rd, Concord, Ontario, Can. L4K 1B6
Staco, Inc., Dept. EM, 625 S. "G" St., Richmond, Ind. 47374
Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
Summit Engineering Corp., Dept. EM, Box 938, Bozeman, Mont. 59715
Trans American Transformer, Dept. EM, 142 Peconic Ave., Medford, N.Y. 11763
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304
Wide Band Engrg. Co. Inc., Dept. EM, Box 21652, Phoenix, Ariz. 85036

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D A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 ..... *
Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... *
D Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 *
Dionics, Dept. EM, 65 Rushmore St., Westbury, N.Y. 11590
D Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
D General Transistor Corp., Dept. EM, 12591 Crenshaw Blvd., Hawthorne, Cal. 90250
D GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
DM Kertron, Inc., Dept. EM, 7516 Central Ind'l. Dr., Riviera Beach, Fla. 33404
D Semicoa, Inc., Dept. EM, 333 McCormick Ave., Costa Mesa, Cal. 92626
Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
DM Solitron Devices, Transistor Div., Dept. EM, 1177 Blue Heron Rd., Riviera Beach, Fla. 33404
Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247

Transistor, Diode, Thyristor Heat Dissipators

D AAVID Engrg, Inc., Dept. EM, 30 Cook Ct., Laconia, N.H. 03246 ..... *
D Augat Interconnection Prods. Div., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703 ..... *
Chomerics, Inc., Dept. EM, 77 Dragon Court, Woburn, Mass. 01801 ..... *
Delbert Blinn. Co., Dept. EM, Box 2007, Pomona, Calif. 91766 ..... p. 3923
D Delco Electronics Div., General Motors Corp., Dept. EM, 700 E. Firmin St., Kokomo, Ind. 46901 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 *
Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2122
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D Thermalloy, Inc., Dept. EM, 2021 W. Valley View, Dallas, Tex 75234 .. p. 3966
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D Westinghouse Elec. Corp., Semiconductor Div., Dept. EM, Armbrust Rd., Youngwood, Pa. 15697 ..... *
Accel Indl Heat Sink, Dept. EM, 5338 Alhambra, Los Angeles, Cal. 90032
M Astro Dynamics, Dept. EM, 2 Gill St., Woburn, Mass. 01801
Astrodyne, Inc., Sub. Roanwell Corp., Dept. EM, 353 Middlesex Ave., Wilmington, Mass. 01887
DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Cordover & Co., Carl, Dept. EM, 3914 North 29th Ave., Hollywood, Fla. 33020
Des Tek Ind., Dept. EM, Box 24163, Los Angeles, Cal. 90024
D General Elec., Semiconductor Prods., Dept. EM, Electronics Pk., Box 1122, Syracuse, NY 13201
D GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
D Hobson Bros., Inc., Dept. EM, 4940 W. Lawrence Ave., Chicago, Ill. 60630
D Int'l. Elctrn. Resch., Dept. EM, 135 W. Magnolia Blvd., Burbank, Cal. 91502
D ITT, Semiconductor Div., Dept. EM, 500 Broadway, Lawrence, MASS 01841
M Levit Electronics, C. M., Dept. EM, 200 Park Ave. S., New York, N.Y. 10003
Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
M Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Plessey Ceramic Div., Dept. EM, 8th & Harrison Sts., Frenchtown, N.J. 08825
Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
SWS Silicones Corp., Dept. EM, Box 428, Adrian, Mich. 49221
Texas Instruments Control Prods. Div., Dept. EM, 34 Forrest St., Attleboro, Mass. 02703
Tran-Tec Corporation, Dept. EM, Box 1022, Columbus, Neb. 68601
Waterbury Pressed Metal Div., WPM, Inc., Dept. EM, 407 Brookside Rd., Waterbury, Conn. 06720

Transistors, Chip, Unpackaged

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Clairex Elctrns. Inc., Dept. EM, 560 S. 3rd Ave., Mt. Vernon, N.Y. 10550 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... *
M Powertech, Inc., Dept. EM, 0-02 Fairlawn Ave., Fairlawn, N.J. 07410 ..... *
D TRW RF Semiconductors, Dept. EM, 14520 Aviation Blvd., Lawndale, Cal. 90260 ..... *
A Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Avantek, Inc., Dept. EM, 3175 Bowers Ave., Santa Clara, Cal. 95051
Cherry Semiconductor Corp, Dept. EM, 99 Bald Hill Rd., Cranston, RI 02920
Dionics, Dept. EM, 65 Rushmore St., Westbury, N.Y. 11590
D Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
Ferranti Elec., Dept. EM, East Bethpage Rd., Plainview, N.Y. 11803
General Elec., Semiconductor Prods., Dept. EM, Electronics Pk., Box 1122, Syracuse, NY 13201
General Instr. Corp., Microelectronics Div., Dept. EM, 600 W. John St., Hicksville, N.Y. 11802
DM General Semiconductor Industries, Inc., Dept. EM, 2001 W. 10 Pl., Box 3078, Tempe, Ariz. 85281
D General Transistor Corp., Dept. EM, 12591 Crenshaw Blvd., Hawthorne, Cal. 90250
M Intersil, Inc., Dept. EM, 10900 N. Tantau Ave., Cupertino, Cal. 95014
D ITT, Semiconductor Div., Dept. EM, 500 Broadway, Lawrence, MASS 01841
DM Kertron, Inc., Dept. EM, 7516 Central Ind'l. Dr., Riviera Beach, Fla. 33404
Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
Optron, Inc., Dept. EM, 1201 Tappon Cir., Carrollton, Tex. 75006
DM Raytheon Semiconductor, Dept. EM, 350 Ellis St., Mountain View, Cal. 94042
D RSM Sensitron Semiconductor, Div. RSM Electron Power, Inc., Dept. EM, 221 W. Industry Ct., Deer Park, N.Y. 11729
D Semicoa, Inc., Dept. EM, 333 McCormick Ave., Costa Mesa, Cal. 92626
Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
DM Semiconductor Technology, Inc., Dept. EM, 124-14 22nd Ave., College Point, N.Y. 11356
Silicon Transistor Corp., Dept. EM, Katrina Rd., Chelmsford, Mass. 01824
D Siliconix, Inc., Dept. EM, 2201 Laurelwood Rd., Santa Clara, Cal 95054
DM Solitron Devices, Transistor Div., Dept. EM, 1177 Blue Heron Rd., Riviera Beach, Fla. 33404
Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
DM Teledyne Semiconductor, Dept. EM, 1300 Terra Bella Ave., Mountain View, Cal. 94040
TRW Power Semiconductors, Dept. EM, 14520 Aviation Blvd., Lawndale, Cal. 90260

Transistors, Darlington

D A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 ..... p. 3920
Clairex Elctrns. Inc., Dept. EM, 560 S. 3rd Ave., Mt. Vernon, N.Y. 10550 p. 3133,3134
D Delco Electronics Div., General Motors Corp., Dept. EM, 700 E. Firmin St., Kokomo, Ind. 46901 ..... p. 3924,3925
D International Rectifier Corp., Semiconductor Div., Dept. EM, 233 Kansas St., El Segundo, Cal. 90245 ..... p. 3928
National Semiconductors, Ltd., Dept. EM, 331 Cornelia St., Plattsburgh, N.Y. 12901 ..... *
D Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
M Powertech, Inc., Dept. EM, 0-02 Fairlawn Ave., Fairlawn, N.J. 07410 ..... *
D Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 *
TRW RF Semiconductors, Dept. EM, 14520 Aviation Blvd., Lawndale, Cal. 90260 ..... *
Vactec, Inc., Dept. EM, 2423 Northline Blvd., Maryland Heights, Mo. 63043 p. 3148,3149
American Microsemiconductor, Dept. EM, 145 Main St, Madison, NJ 07940
Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
Ferranti Elec., Dept. EM, East Bethpage Rd., Plainview, N.Y. 11803
General Elec., Semiconductor Prods., Dept. EM, Electronics Pk., Box 1122, Syracuse, NY 13201
D General Transistor Corp., Dept. EM, 12591 Crenshaw Blvd., Hawthorne, Cal. 90250
D GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
HEI, Inc., Dept. EM, Jonathan Ind'l. Ctr., Chaska, Minn. 55318
DM Kertron, Inc., Dept. EM, 7516 Central Ind'l. Dr., Riviera Beach, Fla. 33404
Lambda Elctrns., Dept. EM, 515 Brd. Hollow Rd., Melville, N.Y. 11746
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
DM Plessey Semiconductors, Dept. EM, 1674 McGaw Ave., Irvine, Cal. 92714
DM Raytheon Semiconductor, Dept. EM, 350 Ellis St., Mountain View, Cal. 94042
D Semicoa, Inc., Dept. EM, 333 McCormick Ave., Costa Mesa, Cal. 92626
Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
DM Semiconductor Technology, Inc., Dept. EM, 124-14 22nd Ave., College Point, N.Y. 11356
SGS-ATES Semiconductor Corp., Dept. EM, 79 Massasoit St., Waltham, Mass. 02154
Silicon Transistor Corp., Dept. EM, Katrina Rd., Chelmsford, Mass. 01824
D Solid State Inc., Dept. EM, 46 Farrand St., Bloomfield, N.J. 07003
DM Solitron Devices, Transistor Div., Dept. EM, 1177 Blue Heron Rd., Riviera Beach, Fla. 33404
Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
TRW Power Semiconductors, Dept. EM, 14520 Aviation Blvd., Lawndale, Cal. 90260
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Transistors, Dual

M Inductive Components, Inc., Dept. EM, 181 Bridge Rd., Hauppauge, N.Y. 11787 ..... *
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
D Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 *
American Microsemiconductor, Dept. EM, 145 Main St, Madison, NJ 07940
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
CSR Industries Inc., Semiconductor Div., Dept. EM, 35 Central Ave., E. Farmingdale, N.Y. 11735
D Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
Ferranti Elec., Dept. EM, East Bethpage Rd., Plainview, N.Y. 11803

General Elec., Semiconductor Prods., Dept. EM, Electronics Pk., Box 1122, Syracuse, NY 13201
D General Transistor Corp., Dept. EM, 12591 Crenshaw Blvd., Hawthorne, Cal. 90250
D GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Hybrid Systems Corp., Dept. EM, Crosby Dr., Bedford, Mass. 01730
DM Intersil, Inc., Dept. EM, 10900 N. Tantau Ave., Cupertino, Cal. 95014
D ITT, Semiconductor Div., Dept. EM, 500 Broadway, Lawrence, MASS 01841
DM Kertron, Inc., Dept. EM, 7516 Central Ind'l. Dr., Riviera Beach, Fla. 33404
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
DM Plessey Semiconductors, Dept. EM, 1674 McGaw Ave., Irvine, Cal. 92714
DM Precision Monolithics Inc., Dept. EM, 1500 Space Dr., Santa Clara, Cal. 95050
DM Raytheon Semiconductor, Dept. EM, 350 Ellis St., Mountain View, Cal. 94042
D Semicoa, Inc., Dept. EM, 333 McCormick Ave., Costa Mesa, Cal. 92626
Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
DM Semiconductor Technology, Inc., Dept. EM, 124-14 22nd Ave., College Point, N.Y. 11356
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D Siliconix, Inc., Dept. EM, 2201 Laurelwood Rd., Santa Clara, Cal 95054
D Solid State Inc., Dept. EM, 46 Farrand St., Bloomfield, N.J. 07003
DM Solitron Devices, Transistor Div., Dept. EM, 1177 Blue Heron Rd., Riviera Beach, Fla. 33404
D Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
DM Teledyne-Crystalonics, Dept. EM, 147 Sherman St., Cambridge, Mass. 02140
DM Teledyne Semiconductor, Dept. EM, 1300 Terra Bella Ave., Mountain View, Cal. 94040
D Temtron Elctrns Ltd., Dept. EM, 138-69 Fran Lewis Blvd., Rosedale, N.Y. 12472

Transistors, Field-Effect

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Semtech Corp., Dept. EM, 652 Mitchell Rd., Newbury Park, Cal. 91320 p. 3965
D **Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247** *
American Microsemiconductor, Dept. EM, 145 Main St, Madison, NJ 07940
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
CSR Industries Inc., Semiconductor Div., Dept. EM, 35 Central Ave., E. Farmingdale, N.Y. 11735
Dionics, Dept. EM, 65 Rushmore St., Westbury, N.Y. 11590
Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
General Elec., Semiconductor Prods., Dept. EM, Electronics Pk., Box 1122, Syracuse, NY 13201
General Instr. Corp., Microelectronics Div., Dept. EM, 600 W. John St., Hicksville, N.Y. 11802
D General Transistor Corp., Dept. EM, 12591 Crenshaw Blvd., Hawthorne, Cal. 90250
D GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
DM Intersil, Inc., Dept. EM, 10900 N. Tantau Ave., Cupertino, Cal. 95014
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DM Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Plessey Semiconductors, Dept. EM, 1674 McGaw Ave., Irvine, Cal. 92714
Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
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D Solid State Inc., Dept. EM, 46 Farrand St., Bloomfield, N.J. 07003
DM Solitron Devices, Transistor Div., Dept. EM, 1177 Blue Heron Rd., Riviera Beach, Fla. 33404
D Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
DM Teledyne-Crystalonics, Dept. EM, 147 Sherman St., Cambridge, Mass. 02140
DM Teledyne Semiconductor, Dept. EM, 1300 Terra Bella Ave., Mountain View, Cal. 94040
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Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

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General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 *
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 *
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D General Transistor Corp., Dept. EM, 12591 Crenshaw Blvd., Hawthorne, Cal. 90250
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
D Lansdale Transistor & Elect., Dept. EM, 3600 W. Osborn Rd, Phoenix, Ariz. 85019
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

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D **Litronix, Dept. EM, 19000 Homestead Rd., Cupertino, Cal. 95014** ..... p. 2493
National Semiconductors, Ltd., Dept. EM, 331 Cornelia St., Plattsburgh, N.Y. 12901 ..... p. 3138
D **Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094** ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D **Vactec, Inc., Dept. EM, 2423 Northline Blvd., Maryland Heights, Mo. 63043** p. 3148,3149
Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
Ferranti Elec., Dept. EM, East Bethpage Rd., Plainview, N.Y. 11803
General Elec., Semiconductor Prods., Dept. EM, Electronics Pk., Box 1122, Syracuse, NY 13201
General Sensors, Inc., Dept. EM, P. O. Box 401347, Garland, Tex. 75040
HEI, Inc., Dept. EM, Jonathan Ind'l. Ctr., Chaska, Minn. 55318
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
Optron, Inc., Dept. EM, 1201 Tappon Cir., Carrollton, Tex. 75006
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
D Semiconductor Technology, Inc., Dept. EM, 124-14 22nd Ave., College Point, N.Y. 11356
Sensor Technology, Dept. EM, 21012 Lassen St., Chatsworth, Cal. 91311
D Temtron Elctrns Ltd., Dept. EM, 138-69 Fran Lewis Blvd., Rosedale, N.Y. 12472

Transistors, Power

D **A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876** ..... p. 3920
Clairex Elctrns. Inc., Dept. EM, 560 S. 3rd Ave., Mt. Vernon, N.Y. 10550 p. 3133
DM **Delco Electronics Div., General Motors Corp., Dept. EM, 700 E. Firmin St., Kokomo, Ind. 46901** ..... p. 3924,3925
D **General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345** ..... *
D **International Rectifier Corp., Semiconductor Div., Dept. EM, 233 Kansas St., El Segundo, Cal. 90245** ..... p. 3928
D **Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094** ..... *
M **Powertech, Inc., Dept. EM, 0-02 Fairlawn Ave., Fairlawn, N.J. 07410** p. 3932,3933
Semtech Corp., Dept. EM, 652 Mitchell Rd., Newbury Park, Cal. 91320 p. 3965
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TRW Capacitors, Dept. EM, 301 West 'O' Str., Ogallala, Neb. 69153 Inside Back Cover, Vol. 1
D **TRW RF Semiconductors, Dept. EM, 14520 Aviation Blvd., Lawndale, Cal. 90260** ..... Inside Back Cover, Vol. 1
D **Westinghouse Elec. Corp., Semiconductor Div., Dept. EM, Armbrust Rd., Youngwood, Pa. 15697** ..... p. 3975
American Microsemiconductor, Dept. EM, 145 Main St, Madison, NJ 07940
D Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
D Amperex Electronic Corp., Slatersville Div., Dept. EM, Providence Pike, Slatersville, R.I. 02876
DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Cordover & Co., Carl, Dept. EM, 3914 North 29th Ave., Hollywood, Fla. 33020
CSR Industries Inc., Semiconductor Div., Dept. EM, 35 Central Ave., E. Farmingdale, N.Y. 11735
D Electronic Transistors, Dept. EM, 112-15 Northern Blvd., Flushing, N.Y. 11368
D Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
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General Elec., Semiconductor Prods., Dept. EM, Electronics Pk., Box 1122, Syracuse, NY 13201
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D GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mas 02154
ITT, Semiconductor Div., Dept. EM, 500 Broadway, Lawrence, MASS 01841
DM Kertron, Inc., Dept. EM, 7516 Central Ind'l. Dr., Riviera Beach, Fla. 33404
Lambda Elctrns., Dept. EM, 515 Brd. Hollow Rd., Melville, N.Y. 11746
D Lansdale Transistor & Elect., Dept. EM, 3600 W. Osborn Rd, Phoenix, Ariz. 850
M Levit Electronics, C. M., Dept. EM, 200 Park Ave. S., New York, N.Y. 10003
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
D Nucleonic Prods., Dept. EM, Box 1454, 6660 Variel Ave., Canoga Pk., Cal. 913
DM Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N. 10016
DM RSM Sensitron Semiconductor, Div. RSM Electron Power, Inc., Dept. EM, 221 Industry Ct., Deer Park, N.Y. 11729
D Sanken Elec. Co., Dept. EM, 1-22-8 Nishi-Ikebukuro, Toshima-Ku, Tokyo, Japa
D Semicoa, Inc., Dept. EM, 333 McCormick Ave., Costa Mesa, Cal. 92626
Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, 60666

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D Solid State Inc., Dept. EM, 46 Farrand St., Bloomfield, N.J. 07003
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D Temtron Elctrns Ltd., Dept. EM, 138-69 Fran Lewis Blvd., Rosedale, N.Y. 12472
TRW Power Semiconductors, Dept. EM, 14520 Aviation Blvd., Lawndale, Cal. 90260
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Transistors, Pressure Sensitive

Stow Labs., Inc., Dept. EM, Kane Ind'l. Dr., Hudson, Mass. 01749

Transistors, R-F

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M Avantek, Inc., Dept. EM, 3175 Bowers Ave., Santa Clara, Cal. 95051
DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Electronic Transistors, Dept. EM, 112-15 Northern Blvd., Flushing, N.Y. 11368
Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
Ferranti Elec., Dept. EM, East Bethpage Rd., Plainview, N.Y. 11803
D General Transistor Corp., Dept. EM, 12591 Crenshaw Blvd., Hawthorne, Cal. 90250
D GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
DM Kertron, Inc., Dept. EM, 7516 Central Ind'l. Dr., Riviera Beach, Fla. 33404
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
D Nucleonic Prods., Dept. EM, Box 1454, 6660 Variel Ave., Canoga Pk., Cal. 91303
DM Plessey Semiconductors, Dept. EM, 1674 McGaw Ave., Irvine, Cal. 92714
D Semicoa, Inc., Dept. EM, 333 McCormick Ave., Costa Mesa, Cal. 92626
Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
D Semiconductor Technology, Inc., Dept. EM, 124-14 22nd Ave., College Point, N.Y. 11356
D SGS-ATES Semiconductor Corp., Dept. EM, 79 Massasoit St., Waltham, Mass. 02154
D Siliconix, Inc., Dept. EM, 2201 Laurelwood Rd., Santa Clara, Cal 95054
D Solid State Inc., Dept. EM, 46 Farrand St., Bloomfield, N.J. 07003
Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
DM Teledyne Semiconductor, Dept. EM, 1300 Terra Bella Ave., Mountain View, Cal. 94040
D Temtron Elctrns Ltd., Dept. EM, 138-69 Fran Lewis Blvd., Rosedale, N.Y. 12472
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Transistors, Silicon

A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 ..... p. 3920
General Elec. Co., Elctrn. Comp. Sis., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... *
International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 *
National Semiconductors, Ltd., Dept. EM, 331 Cornelia St., Plattsburgh, N.Y. 12901 ..... *
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
Powertech, Inc., Dept. EM, 0-02 Fairlawn Ave., Fairlawn, N.J. 07410 p. 3932,3933
R-OHM Corp, Dept. EM, 16931 Milliken Ave, POB 4455, Irvine, Cal. 92716 p. 3742
Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 *
TRW Capacitors, Dept. EM, 301 West 'O' Str., Ogallala, Neb. 69153 Inside Back Cover, Vol. 1
Westinghouse Elec. Corp., Semiconductor Div., Dept. EM, Armbrust Rd., Youngwood, Pa. 15697 ..... *
American Microsemiconductor, Dept. EM, 145 Main St, Madison, NJ 07940
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
Ferranti Elec., Dept. EM, East Bethpage Rd., Plainview, N.Y. 11803
M General Semiconductor Industries, Inc., Dept. EM, 2001 W. 10 Pl., Box 3078, Tempe, Ariz. 85281
D General Transistor Corp., Dept. EM, 12591 Crenshaw Blvd., Hawthorne, Cal. 90250
ITT Semiconductors Discrete Devices, Dept. EM, 500 Broadway, Lawrence, Mass 01841
M Kertron, Inc., Dept. EM, 7516 Central Ind'l. Dr., Riviera Beach, Fla. 33404
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Sanken Elec. Co., Dept. EM, 1-22-8 Nishi-Ikebukuro, Toshima-Ku, Tokyo, Japan
Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
SGS-ATES Semiconductor Corp., Dept. EM, 79 Massasoit St., Waltham, Mass. 02154
Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Transistors, Switching

D A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 ..... p. 3920
American Electronic Labs., Dept. EM, Box 552, Lansdale, Pa. 19446 ..... *
DM Delco Electronics Div., General Motors Corp., Dept. EM, 700 E. Firmin St., Kokomo, Ind. 46901 ..... *
D General Elec. Co., Elctrn. Comp. Sis., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... *
D International Rectifier Corp., Semiconductor Div., Dept. EM, 233 Kansas St., El Segundo, Cal. 90245 ..... p. 3928
D Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
M Powertech, Inc., Dept. EM, 0-02 Fairlawn Ave., Fairlawn, N.J. 07410 .. p. 3933
D Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 *
TRW Capacitors, Dept. EM, 301 West 'O' Str., Ogallala, Neb. 69153 ..... *
TRW RF Semiconductors, Dept. EM, 14520 Aviation Blvd., Lawndale, Cal. 90260 ..... *
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D Amperex Electronic Corp., Slatersville Div., Dept. EM, Providence Pike, Slatersville, R.I. 02876
M Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
Cherry Semiconductor Corp, Dept. EM, 99 Bald Hill Rd., Cranston, RI 02920
CSR Industries Inc., Semiconductor Div., Dept. EM, 35 Central Ave., E. Farmingdale, N.Y. 11735
D Electronic Transistors, Dept. EM, 112-15 Northern Blvd., Flushing, N.Y. 11368
Fairchild Camera & Instr., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042
Ferranti Elec., Dept. EM, East Bethpage Rd., Plainview, N.Y. 11803
General Elec., Semiconductor Prods., Dept. EM, Electronics Pk., Box 1122, Syracuse, NY 13201
General Instr. Corp., Microelectronics Div., Dept. EM, 600 W. John St., Hicksville, N.Y. 11802
DM General Semiconductor Industries, Inc., Dept. EM, 2001 W. 10 Pl., Box 3078, Tempe, Ariz. 85281
D General Transistor Corp., Dept. EM, 12591 Crenshaw Blvd., Hawthorne, Cal. 90250
D GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
DM Intersil, Inc., Dept. EM, 10900 N. Tantau Ave., Cupertino, Cal. 95014
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ITT Semiconductors Discrete Devices, Dept. EM, 500 Broadway, Lawrence, Mass 01841
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Lambda Elctrns., Dept. EM, 515 Brd. Hollow Rd., Melville, N.Y. 11746
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D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
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DM Raytheon Semiconductor, Dept. EM, 350 Ellis St., Mountain View, Cal. 94042
DM RSM Sensitron Semiconductor, Div. RSM Electron Power, Inc., Dept. EM, 221 W. Industry Ct., Deer Park, N.Y. 11729
D Semicoa, Inc., Dept. EM, 333 McCormick Ave., Costa Mesa, Cal. 92626
Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
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D SGS-ATES Semiconductor Corp., Dept. EM, 79 Massasoit St., Waltham, Mass. 02154
Silicon Transistor Corp., Dept. EM, Katrina Rd., Chelmsford, Mass. 01824
D Siliconix, Inc., Dept. EM, 2201 Laurelwood Rd., Santa Clara, Cal 95054
D Solid State Inc., Dept. EM, 46 Farrand St., Bloomfield, N.J. 07003
DM Solitron Devices, Transistor Div., Dept. EM, 1177 Blue Heron Rd., Riviera Beach, Fla. 33404
D Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
DM Teledyne-Crystalonics, Dept. EM, 147 Sherman St., Cambridge, Mass. 02140
DM Teledyne Semiconductor, Dept. EM, 1300 Terra Bella Ave., Mountain View, Cal. 94040
TRW Power Semiconductors, Dept. EM, 14520 Aviation Blvd., Lawndale, Cal. 90260
Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

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D Sprague Products Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247 *
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DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010

CSR Industries Inc., Semiconductor Div., Dept. EM, 35 Central Ave., E. Farmingdale, N.Y. 11735
General Elec., Semiconductor Prods., Dept. EM, Electronics Pk., Box 1122, Syracuse, NY 13201
D General Transistor Corp., Dept. EM, 12591 Crenshaw Blvd., Hawthorne, Cal. 90250
D GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
M Levit Electronics, C. M., Dept. EM, 200 Park Ave. S., New York, N.Y. 10003
D Motorola Semiconductor Prods., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036
Semiconductor Specialists, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666
D Solid State Inc., Dept. EM, 46 Farrand St., Bloomfield, N.J. 07003
Sprague Elec. Co., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Translators, Data

M Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 ..... *
Data Translation, Dept. EM, 4 Strathmore Rd., Natick, Mass. 01760 ..... *
Hickok Electrical Instr., Dept. EM, 10514 DuPont Ave., Cleveland, Ohio 44108 *
Interface Engineering Inc., Dept. EM, 386 Lindelof Ave., Stoughton, Mass. 02072 ..... p. 1648
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
D Superior Electric Co., Dept. EM, 1000 Middle St., Bristol, Conn. 06010 p. 3110,3111
M Trak Systems, Div. TRAK Microwave Corp., Dept. EM, 4722 Eisenhower Blvd., Dept. E8, Tampa, Fla. 33614 ..... p. 1668,1671
M Cubic Corp., Dept. EM, 9233 Balboa Ave., San Diego, Cal. 92123
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
M Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
Moxon Inc., Dept. EM, 2222 Michelson Dr. Bldg. E, Irvine, Cal. 92715
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006

Transmission Line, Wire & Cable—See Cable, Transmission Line

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Control Technology Co., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101 .. p. 3975
Hughes Aircraft Co., Microelectronic Prods Div., Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach, Cal. 92663 ..... *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 ..... *
Advanced Technology Sys., Dept. EM, 450 W. First Ave., Roselle, N.J. 07023
M Alden Elctrn. & Impulse Recording Equip. Co., Dept. EM, Washington St., Westboro, Mass. 01581
Applied Systems Corp., Dept. EM, 26401 Harper Ave., St. Clair Shores, Mich. 48081
D Autocon Inds., Sub. Control Data, Dept. EM, 2300 Berkshire La. N., Minneapolis, Minn. 55441
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
Computer Devices, Dept. EM, 25 North Avenue, Burlington, Mass. 01803
M Cubic Corp., Dept. EM, 9233 Balboa Ave., San Diego, Cal. 92123
Dantel, Inc., Dept. EM, 1922 North Helm, Fresno, Cal. 93727
Data-Control Systems, Dept. EM, Commerce Dr., Box 860, Danbury, Conn. 06810
Data Signal Corp, Dept. EM, 40-44 Hunt St, Watertown, MA 02172
M Dynatech Data Sys, A Dynatech Co, Dept. EM, 900 Slaters La., Alexandria, Va. 22314
Galileo Electro-Optics Corp., Dept. EM, Galileo Pk., Sturbridge, Mass. 01518
GTE Lenkurt Inc., Dept. EM, 1105 County Rd., San Carlos, Cal. 94070
GTE Sylvania Inc., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209
Hathaway Instruments, Inc., Dept. EM, 5250 E. Evans Ave., Denver, Colo. 80222
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
M Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Hy-Cal Engrg, Dept. EM, 12105 Los Nietos Rd., Santa Fe Springs, Cal 90670
IPAC Group, Inc., Dept. EM, POB 156 3047 Industrial Blvd., Bethel Park, PA 15102
M LNR Communications, Inc., Dept. EM, 180 Marcus Blvd., Hauppauge, N.Y. 11787
Metric Systems Corp., Dept. EM, 736 N. Beal St., Ft. Walton Beach, Fla. 32548
Potter Instr. Co. Inc., Dept. EM, 151 Sunnyside Blvd., Plainview, N.Y. 11803
Resdel Engineering Corp., Dept. EM, 300 E. Live Oak Ave., Arcadia, Cal. 91006
RFL Inds., Comms. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005
M RHG Elctrns. Lab., Dept. EM, 161 E. Industry Ct., Deer Park, N.Y. 11729
Schaevitz Engrg., Dept. EM, U.S. 130, Union Ave., Pennsauken, N.J. 08110
Schneider Instr. Co., Dept. EM, 8115 Camargo Rd., Cincinnati, Ohio 45243
Singer Co., American Meter Div., Dept. EM, 13500 Philmont Ave., Philadelphia, Pa. 19116
DM Systems Data Inc., Dept. EM, 1941 W. Market St., Akron, Ohio 44313
Telautograph Corp., Dept. EM, 8700 Bellanca Ave., Los Angeles, Cal. 90045
Telecommunications Techniques Corp., Dept. EM, 112 Frederick Ave., Rockville, Md. 20850
Theta Instr. Corp., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006

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M Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706 ..... *
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M A.R.F. Products, Dept. EM, Box 3226, Boulder, Colo. 80303
D Autocon Inds., Sub. Control Data, Dept. EM, 2300 Berkshire La. N., Minneapolis, Minn. 55441
Avcom International, Dept. EM, 784 N. W. 57th Ct., Fort Lauderdale, Fla. 33309
Beukers Labs., Inc., Dept. EM, 30 Orville Drive, Bohemia, N.Y. 11716
BF Elctrns., Dept. EM, 415 S. Nardo, Solana Beach, Calif. 92075
D Bogen Div., Lear Siegler, Inc., Dept. EM, Box 500, Paramus, N.J. 07652
D Brelonix, Inc., Dept. EM, 106 North 36th St., Seattle, Wash 98103
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
Communication Assocs., Inc., Dept. EM, 200 McKay Rd., Huntington Station, N.Y. 11746
Farinon Electric, Dept. EM, 1691 Bayport, San Carlos, Calif. 94070
GTE Lenkurt Inc., Dept. EM, 1105 County Rd., San Carlos, Cal. 94070
IEC Electronics Corp., Dept. EM, 105 Norton St., Newark, N.Y. 14513
M Microwave Power Devices, Dept. EM, Adams Ct., Plainview, N.Y. 11803
D Multi-Elmac Co., Dept. EM, 22700 Heslip Dr., Novi, Mich. 48050
Pacific Communications, Dept. EM, 2041 S. Grand Ave. #A, Santa Ana, Cal. 92705
D REPCO Inc., Dept. EM, Box 7065, Orlando, Fla. 32854
Resdel Engineering Corp., Dept. EM, 300 E. Live Oak Ave., Arcadia, Cal. 91006
M RHG Elctrns. Lab., Dept. EM, 161 E. Industry Ct., Deer Park, N.Y. 11729
D Seaboard Elctrns, Dept. EM, 70 Church St., New Rochelle, N.Y. 10805
M Technical Mat'l., Dept. EM, 700 Fenimore Rd., Mamaroneck, N.Y. 10543

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Kulite Semiconductor Prod., Dept. EM, 1030 Hoyt Ave., Ridgefield, N.J. 07657 ..... *
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NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Vernitech, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729 ..... p. 2271
M Accurate Instrument Co., Dept. EM, Box No. 925, Westbury, N.Y. 11590
Gould, Inc., Meas. Sys. Div., Dept. EM, 2230 Statham Blvd., Oxnard, Cal. 93030
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
Paine Instruments, Inc., Dept. EM, 2401 S. Bayview St., Seattle, Wash. 98144
D Robertshaw Controls Co., Ind'l. Instr. Div., Dept. EM, 1910 Byrd Ave Ste 200, Richmond, Va. 23230
Robinson-Halpern Co., Dept. EM, One Apolio Rd., Plymouth Meeting, Pa. 19462
Rosemount Inc., Dept. EM, Box 35129, Minneapolis, Minn. 55435
Schaevitz Engrg., Dept. EM, U.S. 130, Union Ave., Pennsauken, N.J. 08110
D Seaboard Elctrns, Dept. EM, 70 Church St., New Rochelle, N.Y. 10805
Singer Co., American Meter Div., Dept. EM, 13500 Philmont Ave., Philadelphia, Pa. 19116
Telmar, Inc., Dept. EM, 1150 W. Third Ave., Columbus, Ohio 43212
West Coast Resch. Corp., Dept. EM, Box 25061, Los Angeles, Cal. 90025
D Yellow Springs Instrument Co., Dept. EM, Box 279, Yellow Springs, Ohio 45387

Transmitters, Radar—See Radar Systems

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Re-el Circuits, Inc., Dept. EM, 520 Victor Street, Saddle Brook, N.J. 07662
M Vega Precision Labs., Dept. EM, 800 Follin La., Vienna, Va. 22180 .....
D Autocon Inds., Sub. Control Data, Dept. EM, 2300 Berkshire La. N., Minneapolis Minn. 55441
Avcom International, Dept. EM, 784 N. W. 57th Ct., Fort Lauderdale, Fla. 33309
M Aydin, Vector Div., Dept. EM, Box 328, Newtown, PA 18940
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BF Elctrns., Dept. EM, 415 S. Nardo, Solana Beach, Calif. 92075
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M Cubic Corp., Dept. EM, 9233 Balboa Ave., San Diego, Cal. 92123
Dantel, Inc., Dept. EM, 1922 North Helm, Fresno, Cal. 93727
Dataprobe, Inc., Dept. EM, 254 Green St., So. Hackensack, N.J. 07606
Assocs. Inc., Dept. EM, 333 W. Commercial St., East Rochester, N.Y. 14445
Epsilon-Lambda Elctrn. Corp., Dept. EM, 28 S. Water St., Batavia, Ill. 60510
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Microwave Power Devices, Dept. EM, Adams Ct., Plainview, N.Y. 11803
Midgard Electronics, Dept. EM, 175 California St., Newton, Mass. 02158
Pacific Communications, Dept. EM, 2041 S. Grand Ave. #A, Santa Ana, Cal. 92705
D REPCO Inc., Dept. EM, Box 7065, Orlando, Fla. 32854
Resdel Engineering Corp., Dept. EM, 300 E. Live Oak Ave., Arcadia, Cal. 9100
RFL Inds., Comms. Div., Dept. EM, Powerville Rd., Boonton, N.J. 07005
M RHG Elctrns. Lab., Dept. EM, 161 E. Industry Ct., Deer Park, N.Y. 11729
Schneider Instr. Co., Dept. EM, 8115 Camargo Rd., Cincinnati, Ohio 45243
D Seaboard Elctrns, Dept. EM, 70 Church St., New Rochelle, N.Y. 10805
D Singer Co., American Meter Div., Dept. EM, 13500 Philmont Ave., Philadelphia, Pa. 19116
Transmed Scientific, Dept. EM, 860-C Capitolio Way, San Luis Obispo, Cal. 93
M Zeta Laboratories, Inc., Dept. EM, 3265 Scott Blvd., Santa Clara, Cal. 95051

Transmitters, Tone

Re-el Circuits, Inc., Dept. EM, 520 Victor Street, Saddle Brook, N.J. 07662
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D Biddle, James G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, P 19462
Dantel, Inc., Dept. EM, 1922 North Helm, Fresno, Cal. 93727
IEC Electronics Corp., Dept. EM, 105 Norton St., Newark, N.Y. 14513
Microwave Power Devices, Dept. EM, Adams Ct., Plainview, N.Y. 11803
Mobil Electronics, Inc., Dept. EM, Box 1132, Anderson, Ind. 46015
D Regency Electronics, Inc., Dept. EM, 7707 Records St., Indianapolis, Ind. 4622
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D Singer Co., American Meter Div., Dept. EM, 13500 Philmont Ave., Philadelphia Pa. 19116
D Sonex, Dept. EM, 2337 Philmont Ave., Huntingdon Valley, Pa. 19006

ransponders

Columbia Components, Div. Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 ..... p. 2391
Computer Instrs., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550 p. 2391
Epsco, Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090 ..... *
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 ..... *
Vega Precision Labs., Dept. EM, 800 Follin La., Vienna, Va. 22180 ..... *
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A.R.F. Products, Dept. EM, Box 3226, Boulder, Colo. 80303
General Aviation Elctrns, Dept. EM, 4141 Kingman Dr., Indianapolis, Ind 46225
Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
King Radio Corp., Dept. EM, 400 N. Rogers Rd., Olathe, Kans. 66061
Seaboard Elctrns, Dept. EM, 70 Church St., New Rochelle, N.Y. 10805

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Redactron Corp., Dept. EM, 100 Parkway Dr. S., Hauppauge, N.Y. 11787

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Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 p. 2687
International Electro-Magnetics, Dept. EM, 350 N. Eric Dr., Palatine, Ill. 60067 p. 1011
Amilon Corp., Dept. EM, 49-12 30th Ave., Woodside, N.Y. 11377
Ampro Corp., Dept. EM, 850 Pennsylvania Blvd., Feasterville, PA. 19047
Digi-Data Corp., Dept. EM, 8580 Dorsey Rd., Jessup, Md. 20794
MFE Corp., Dept. EM, Keewaydin Dr., Salem, N.H. 03079
Micro Communications Corp., Dept. EM, 80 Bacon St., Waltham, Mass. 02154
Qantex, div. North Atlantic Inds., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803
Redactron Corp., Dept. EM, 100 Parkway Dr. S., Hauppauge, N.Y. 11787
Tape-Athon Corp., Dept. EM, 502 S. Isis Ave., Inglewood, Cal 90301

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riggers, SCR—See Controls, SCR

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Int'l. Elctrn. Resch., Dept. EM, 135 W. Magnolia Blvd., Burbank, Cal. 91502

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Dutrex Inds., Inc., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
Litton Inds., Electron Tube Div., Dept. EM, 960 Industrial Rd, San Carlos, Calif. 94070
OKI Electronics of America, Dept. EM, 4031 N.E. 12th Terr., Ft. Lauderdale, Fla. 33334
Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Raytheon Co., Microwave & Power Tube Div., Dept. EM, 190 Willow St., Waltham, Mass 02154
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304

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A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 ..... *
Clinton Elctrns. Corp., Dept. EM, 6701 Clinton Rd., Rockford, Ill. 61111 p. 4459-4461
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Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Amperex Electronic Corp., Slatersville Div., Dept. EM, Providence Pike, Slatersville, R.I. 02876
Ball Bros. Research Corp., Electronic Display Div., Dept. EM, Box 43376, St Paul, Minn. 55164
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
Channel Master Div. Avnet, Dept. EM, Rte. 209, Ellenville, N.Y. 12428
Dumont Electronics, Dept. EM, 750 Bloomfield Ave., Clifton, N.J. 07015
Dutrex Inds., Inc., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
Hughes Aircraft Co., Image Devices Ind'l. Prods. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
Litton Inds., Electron Tube Div., Dept. EM, 960 Industrial Rd, San Carlos, Calif. 94070
Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Rauland, Div. Zenith Radio Corp., Dept. EM, 2407 W. North Ave., Melrose Pk., Ill. 60160
Raytheon Co., Indl. Comps. Oper., Dept. EM, 465 Centre St., Quincy, Mass. 02169
RCA Distr. & Special Prods. Div., Dept. EM, Deptford, N.J. 08096
Thomas Elctrns., Inc., Dept. EM, 100 Riverview Dr., Wayne, N.J. 07470
Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304

ibes, Cathode-Ray, Instrument Use

A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 ..... *
Clinton Elctrns. Corp., Dept. EM, 6701 Clinton Rd., Rockford, Ill. 61111 p. 4459-4461
Inter-Tech. Grp., Inc., Dept. EM, Box 23, Irvington, N.Y. 10533 ..... p. 4463
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
Amperex Electronic Corp., Slatersville Div., Dept. EM, Providence Pike, Slatersville, R.I. 02876
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
Dumont Electronics, Dept. EM, 750 Bloomfield Ave., Clifton, N.J. 07015
Dutrex Inds., Inc., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
Ferranti Elec., Dept. EM, East Bethpage Rd., Plainview, N.Y. 11803
Hughes Aircraft Co., Image Devices Ind'l. Prods. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
Levit Electronics, C. M., Dept. EM, 200 Park Ave. S., New York, N.Y. 10003
Litton Inds., Electron Tube Div., Dept. EM, 960 Industrial Rd, San Carlos, Calif. 94070
Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Raytheon Co., Indl. Comps. Oper., Dept. EM, 465 Centre St., Quincy, Mass. 02169
T. C. Centronic, Dept. EM, King Henry's Dr, Addington, Croydon CR9 0BG, Great Britain
Temtron Elctrns Ltd., Dept. EM, 138-69 Fran Lewis Blvd., Rosedale, N.Y. 12472
Thomas Elctrns., Inc., Dept. EM, 100 Riverview Dr., Wayne, N.J. 07470
Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304

Tubes, Cathode-Ray, Multiple Gun

A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Inter-Tech. Grp., Inc., Dept. EM, Box 23, Irvington, N.Y. 10533 ..... *
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Amperex Electronic Corp., Slatersville Div., Dept. EM, Providence Pike, Slatersville, R.I. 02876
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
Dumont Electronics, Dept. EM, 750 Bloomfield Ave., Clifton, N.J. 07015
Dutrex Inds., Inc., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
Litton Inds., Electron Tube Div., Dept. EM, 960 Industrial Rd, San Carlos, Calif. 94070
Raytheon Co., Indl. Comps. Oper., Dept. EM, 465 Centre St., Quincy, Mass. 02169
T. C. Centronic, Dept. EM, King Henry's Dr, Addington, Croydon CR9 0BG, Great Britain
Thomas Elctrns., Inc., Dept. EM, 100 Riverview Dr., Wayne, N.J. 07470
Westinghouse Electric Corp., Indl & Gov't Tube, Dept. EM, Westinghouse Circle, Horseheads, N.Y. 14845

Tubes, Cathode-Ray, Projection

A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 ..... *
Clinton Elctrns. Corp., Dept. EM, 6701 Clinton Rd., Rockford, Ill. 61111 p. 4459-4461
Industrial Elctrn. Engrs., Dept. EM, 7740 Lemona Ave., Van Nuys, Cal. 91405 *
Amperex Electronic Corp., Slatersville Div., Dept. EM, Providence Pike, Slatersville, R.I. 02876
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
Dumont Electronics, Dept. EM, 750 Bloomfield Ave., Clifton, N.J. 07015
Dutrex Inds., Inc., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
Litton Inds., Electron Tube Div., Dept. EM, 960 Industrial Rd, San Carlos, Calif. 94070
Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Rank Precision Inds., Dept. EM, 411 Jarvis Ave., Des Plaines, Ill. 60018
Thomas Elctrns., Inc., Dept. EM, 100 Riverview Dr., Wayne, N.J. 07470
Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304

Tubes, Cathode-Ray, Scan Conversion

Clinton Elctrns. Corp., Dept. EM, 6701 Clinton Rd., Rockford, Ill. 61111 p. 4459-4461
Inter-Tech. Grp., Inc., Dept. EM, Box 23, Irvington, N.Y. 10533 ..... *
Dumont Electronics, Dept. EM, 750 Bloomfield Ave., Clifton, N.J. 07015
Hughes Aircraft Co., Image Devices Ind'l. Prods. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
Raytheon Co., Indl. Comps. Oper., Dept. EM, 465 Centre St., Quincy, Mass. 02169
Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304

Tubes, Cathode-Ray, Shaped-Beam

A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 ..... *
Clinton Elctrns. Corp., Dept. EM, 6701 Clinton Rd., Rockford, Ill. 61111 p. 4459-4461
Amperex Electronic Corp., Slatersville Div., Dept. EM, Providence Pike, Slatersville, R.I. 02876
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
Dutrex Inds., Inc., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
Litton Inds., Electron Tube Div., Dept. EM, 960 Industrial Rd, San Carlos, Calif. 94070
Raytheon Co., Indl. Comps. Oper., Dept. EM, 465 Centre St., Quincy, Mass. 02169
Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304

Tubes, Ceramic (Electron)

General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
DM **Raytheon Co., Distributor Prods. Oper., Dept. EM, Fourth Ave., Burlington, Mass. 01803** ..... *
DM Amperex Electronic Corp., Hicksville Div , Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Dutrex Inds., Inc., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
General Electric Co., Lamp Components Sls. Oper., Dept. EM, 21800 Tungsten Rd., Cleveland, Ohio 44117
D GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
ITT Electron Tube, Dept. EM, Box 100, Easton, Pa. 18042
M Levit Electronics, C. M., Dept. EM, 200 Park Ave. S., New York, N.Y. 10003
3M Company, Tech Ceramic Prods., Dept. EM, 3M Center 223-4S, St. Paul, MN. 55101
Plessey Ceramic Div., Dept. EM, 8th & Harrison Sts., Frenchtown, N.J. 08825
Rank Precision Inds., Dept. EM, 411 Jarvis Ave., Des Plaines, Ill. 60018
D Temtron Elctrns Ltd., Dept. EM, 138-69 Fran Lewis Blvd., Rosedale, N.Y. 12472
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Tubes, Counting

D **International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746** *
Refac Elctrns. Pinlite®, Wild Rover®, Dept. EM, Box 809, W. Hill Rd., Winsted, Conn 06098 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Dutrex Inds., Inc., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
D EMI Gencom Inc., Dept. EM, 80 Express St., Plainview, N.Y. 11803
T. C. Centronic, Dept. EM, King Henry's Dr, Addington, Croydon CR9 0BG, Great Britain
D Temtron Elctrns Ltd., Dept. EM, 138-69 Fran Lewis Blvd., Rosedale, N.Y. 12472

Tubes, Electrometer

D Dutrex Inds., Inc., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011

Tubes, Electron Multiplier

D **International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746** *
D Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
M Dumont Electronics, Dept. EM, 750 Bloomfield Ave., Clifton, N.J. 07015
D EMI Gencom Inc., Dept. EM, 80 Express St., Plainview, N.Y. 11803
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Westinghouse Electric Corp., Indl & Gov't Tube, Dept. EM, Westinghouse Circle, Horseheads, N.Y. 14845

Tubes, Flash

EG&G, Inc., Electro-Optics Div., Dept. EM, 35 Congress St., Salem, Mass. 01970 ..... *
Gen Rad, Dept. EM, 300 Baker Ave., Concord, Mass. 01742 ..... *
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Dutrex Inds., Inc., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016

Tubes, Forward Wave

DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Dutrex Inds., Inc., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
Hughes Aircraft Co., Electron Dynamics Div., Dept. EM, 3100 W. Lomita Blvd., Torrance, Cal. 90509
M Litton Inds., Electron Tube Div., Dept. EM, 960 Industrial Rd, San Carlos, Calif. 94070
Raytheon Co., Microwave & Power Tube Div., Dept. EM, 190 Willow St., Waltham, Mass 02154
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Tubes, Gas

DM **Raytheon Co., Distributor Prods. Oper., Dept. EM, Fourth Ave., Burlington, Mass. 01803** ..... *
M **Victoreen, Inc., Dept. EM, 10101 Woodland Ave., Cleveland, Ohio 44104** .... *
DM Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Dutrex Inds., Inc., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
ITT Electron Tube, Dept. EM, Box 100, Easton, Pa. 18042
Midcom Inc., Dept. EM, 1650 Tower Blvd., N. Mankato, Minn. 56001
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
DM Raytheon Co., Indl. Comps. Oper., Dept. EM, 465 Centre St., Quincy, Mass. 02169
D Ultra-Violet Prods., Inc., Dept. EM, 5100 Walnut Grove Ave., San Gabriel, Cal. 91778
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Tubes, Ignitron

D **Conditioning Semiconductor Devices, Dept. EM, Box 816, Wayne, N.J. 07470** *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
D **International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746** *
D **Raytheon Co., Distributor Prods. Oper., Dept. EM, Fourth Ave., Burlington, Mass. 01803** ..... *
D Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
D Dutrex Inds., Inc., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
M Levit Electronics, C. M., Dept. EM, 200 Park Ave. S., New York, N.Y. 10003
D National Electronics, Div. Varian Assoc. Inc., Dept. EM, Box 269, Geneva, Ill. 60134
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D Temtron Elctrns Ltd., Dept. EM, 138-69 Fran Lewis Blvd., Rosedale, N.Y. 12472
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Tubes, Image Converter

D **A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876** ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
Industrial Elctrn. Engrs., Dept. EM, 7740 Lemona Ave., Van Nuys, Cal. 91405 *
M Dumont Electronics, Dept. EM, 750 Bloomfield Ave., Clifton, N.J. 07015
D Dutrex Inds., Inc., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
D Princeton Elctrn. Prods., Dept. EM, Box 101, New Brunswick, N.J. 08902
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Varo Electron Devices, Inc., Dept. EM, 2203 W. Walnut St., Garland, Tex. 75040
Westinghouse Electric Corp., Indl & Gov't Tube, Dept. EM, Westinghouse Circle, Horseheads, N.Y. 14845

Tubes, Indicator—See Tubes, Readout

Tubes, Industrial Power

D **Conditioning Semiconductor Devices, Dept. EM, Box 816, Wayne, N.J. 07470** *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
D **International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746** *
DM **Raytheon Co., Distributor Prods. Oper., Dept. EM, Fourth Ave., Burlington, Mass. 01803** ..... *
M **Victoreen, Inc., Dept. EM, 10101 Woodland Ave., Cleveland, Ohio 44104** .... *
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
DM Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Dutrex Inds., Inc., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
ITT Electron Tube, Dept. EM, Box 100, Easton, Pa. 18042
M Levit Electronics, C. M., Dept. EM, 200 Park Ave. S., New York, N.Y. 10003
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
DM Raytheon Co., Indl. Comps. Oper., Dept. EM, 465 Centre St., Quincy, Mass. 02169
D RCA Distr. & Special Prods. Div., Dept. EM, Deptford, N.J. 08096
D Temtron Elctrns Ltd., Dept. EM, 138-69 Fran Lewis Blvd., Rosedale, N.Y. 12472
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Tubes, Klystron

D **A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876** .....
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 .....
International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 p. 115
DM **Raytheon Co., Distributor Prods. Oper., Dept. EM, Fourth Ave., Burlington, Mass. 01803** .....
DM Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Dutrex Inds., Inc., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
ITT Electron Tube, Dept. EM, Box 100, Easton, Pa. 18042
M Levit Electronics, C. M., Dept. EM, 200 Park Ave. S., New York, N.Y. 10003
M Litton Inds., Electron Tube Div., Dept. EM, 960 Industrial Rd, San Carlos, Calif. 94070
D OKI Electronics of America, Dept. EM, 4031 N.E. 12th Terr., Ft. Lauderdale, Fla. 33334
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Raytheon Co., Microwave & Power Tube Div., Dept. EM, 190 Willow St., Waltham, Mass 02154
D Temtron Elctrns Ltd., Dept. EM, 138-69 Fran Lewis Blvd., Rosedale, N.Y. 12472
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Tubes, Laser

DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Dutrex Inds., Inc., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
D Metrologic Instruments, Inc., Dept. EM, 143 Harding Ave., Bellmawr, N.J. 08030
Thermal Amer. Fused Quartz, Dept. EM, Change Bridge Rd., Montville, N.J. 07045

Tubes, Magnetron

General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 .....
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM Box 1503, Secaucus, N.J. 07094 .....
DM **Raytheon Co., Distributor Prods. Oper., Dept. EM, Fourth Ave., Burlington Mass. 01803** .....
DM Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
Centerflex Ceramics, Dept. EM, 221 Seventh Ave., Hawthorne, N.J. 07507
D Dutrex Inds., Inc., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
M Levit Electronics, C. M., Dept. EM, 200 Park Ave. S., New York, N.Y. 10003
M Litton Inds., Electron Tube Div., Dept. EM, 960 Industrial Rd, San Carlos, Calif. 94070
D Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 018(

D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Raytheon Co., Microwave & Power Tube Div., Dept. EM, 190 Willow St., Waltham, Mass 02154
D Temtron Elctrns Ltd., Dept. EM, 138-69 Fran Lewis Blvd., Rosedale, N.Y. 12472
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Tubes, Microwave

D A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
DM Raytheon Co., Distributor Prods. Oper., Dept. EM, Fourth Ave., Burlington, Mass. 01803 ..... *
DM Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
Centerflex Ceramics, Dept. EM, 221 Seventh Ave., Hawthorne, N.J. 07507
D Dutrex Inds., Inc., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
DM Hughes Aircraft Co., Electron Dynamics Div., Dept. EM, 3100 W. Lomita Blvd., Torrance, Cal. 90509
ITT Electron Tube, Dept. EM, Box 100, Easton, Pa. 18042
M Levit Electronics, C. M., Dept. EM, 200 Park Ave. S., New York, N.Y. 10003
M Litton Inds., Electron Tube Div., Dept. EM, 960 Industrial Rd, San Carlos, Calif. 94070
Raytheon Co., Microwave & Power Tube Div., Dept. EM, 190 Willow St., Waltham, Mass 02154
D Temtron Elctrns Ltd., Dept. EM, 138-69 Fran Lewis Blvd., Rosedale, N.Y. 12472
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Wall A. T. Co., Dept. EM, 55 Service Ave., Warwick, R.I. 02889
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304

Tubes, Noise Source

DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Dutrex Inds., Inc., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006
Westinghouse Electric Corp., Indl & Gov't Tube, Dept. EM, Westinghouse Circle, Horseheads, N.Y. 14845

Tubes, Photomultiplier

Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
M Bailey Instrs., Inc., Dept. EM, 515 Victor St., Saddle Brook, N.J. 07662
M Dumont Electronics, Dept. EM, 750 Bloomfield Ave., Clifton, N.J. 07015
D Dutrex Inds., Inc., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
DM EMI Gencom Inc., Dept. EM, 80 Express St., Plainview, N.Y. 11803
Gamma Scientific Inc., Dept. EM, 3777 Ruffin Rd., San Diego, Cal. 92123
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D RCA Distr. & Special Prods. Div., Dept. EM, Deptford, N.J. 08096
T. C. Centronic, Dept. EM, King Henry's Dr, Addington, Croydon CR9 0BG, Great Britain
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Tubes, Readout (CRT, Cold-Cathode, Vacuum Fluorescent, Incandescent, etc.)

D A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 ..... *
Clinton Elctrns. Corp., Dept. EM, 6701 Clinton Rd., Rockford, Ill. 61111 p. 4459-4461
General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 *
DM Industrial Elctrn. Engrs., Dept. EM, 7740 Lemona Ave., Van Nuys, Cal. 91405 *
Infodex, Inc., Dept. EM, 7 Cherry Ave., Waterbury, Conn. 06702 ..... p. 2487
Inter-Tech. Grp., Inc., Dept. EM, Box 23, Irvington, N.Y. 10533 ..... p. 4463
D Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
Refac Elctrns. Pinlite®, Wild Rover®, Dept. EM, Box 809, W. Hill Rd., Winsted, Conn 06098 ..... *
Amperex Electronic Corp., Slatersville Div., Dept. EM, Providence Pike, Slatersville, R.I. 02876
M Burroughs Corp., Electronic Components Div., Dept. EM, Box 1226 - Mt. Bethel Rd., Plainfield, N.J. 07061
M Day-light Display Corp., Dept. EM, 11 Fairfield Pl., Box 1231, W. Caldwell, N.J. 07006
GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
Litton Inds., Electron Tube Div., Dept. EM, 960 Industrial Rd, San Carlos, Calif. 94070
Major Data Concepts, Inc., Dept. EM, 1796 Monrovia Ave., Costa Mesa, Cal. 92627
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D RCA Distr. & Special Prods. Div., Dept. EM, Deptford, N.J. 08096
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304
Westinghouse Electric Corp., Indl & Gov't Tube, Dept. EM, Westinghouse Circle, Horseheads, N.Y. 14845

Tubes, Receiving

D A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 ..... *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
D International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 p. 1155
Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
D Raytheon Co., Distributor Prods. Oper., Dept. EM, Fourth Ave., Burlington, Mass. 01803 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
DM Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Dutrex Inds., Inc., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
D GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
M Levit Electronics, C. M., Dept. EM, 200 Park Ave. S., New York, N.Y. 10003
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D RCA Distr. & Special Prods. Div., Dept. EM, Deptford, N.J. 08096
Temtron Elctrns Ltd., Dept. EM, 138-69 Fran Lewis Blvd., Rosedale, N.Y. 12472
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304
Westinghouse Electric Corp., Indl & Gov't Tube, Dept. EM, Westinghouse Circle, Horseheads, N.Y. 14845

Tubes, Rectifying, Gas-Filled

D Conditioning Semiconductor Devices, Dept. EM, Box 816, Wayne, N.J. 07470 *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
D International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 *
DM Raytheon Co., Distributor Prods. Oper., Dept. EM, Fourth Ave., Burlington, Mass. 01803 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
DM Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Dutrex Inds., Inc., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
D GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
D National Electronics, Div. Varian Assoc. Inc., Dept. EM, Box 269, Geneva, Ill. 60134
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
DM Raytheon Co., Indl. Comps. Oper., Dept. EM, 465 Centre St., Quincy, Mass. 02169
D Temtron Elctrns Ltd., Dept. EM, 138-69 Fran Lewis Blvd., Rosedale, N.Y. 12472
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Westinghouse Electric Corp., Indl & Gov't Tube, Dept. EM, Westinghouse Circle, Horseheads, N.Y. 14845

Tubes, Rectifying, Vacuum

D Conditioning Semiconductor Devices, Dept. EM, Box 816, Wayne, N.J. 07470 *
DM Raytheon Co., Distributor Prods. Oper., Dept. EM, Fourth Ave., Burlington, Mass. 01803 ..... *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
D Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Dutrex Inds., Inc., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
D GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
M Levit Electronics, C. M., Dept. EM, 200 Park Ave. S., New York, N.Y. 10003
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Westinghouse Electric Corp., Indl & Gov't Tube, Dept. EM, Westinghouse Circle, Horseheads, N.Y. 14845

Tubes, Strobe—See Lights, Stroboscopic Source

Tubes, Switching

M EG&G, Inc., Electro-Optics Div., Dept. EM, 35 Congress St., Salem, Mass. 01970 ..... *
M Victoreen, Inc., Dept. EM, 10101 Woodland Ave., Cleveland, Ohio 44104 .... *
D Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Dutrex Inds., Inc., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Tubes, Tv Camera Pickup

General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 ..... *
D Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
D Amperex Electronic Corp., Slatersville Div., Dept. EM, Providence Pike, Slatersville, R.I. 02876
M Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
M Dumont Electronics, Dept. EM, 750 Bloomfield Ave., Clifton, N.J. 07015
D Dutrex Inds., Inc., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
D EMI Gencom Inc., Dept. EM, 80 Express St., Plainview, N.Y. 11803
D Apollo Lasers, Apollo Lasers, Inc., Dept. EM, 6357 Arizonia Cir, Los Angeles, Cal. 90045
M Levit Electronics, C. M., Dept. EM, 200 Park Ave. S., New York, N.Y. 10003
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D RCA Distr. & Special Prods. Div., Dept. EM, Deptford, N.J. 08096

D Temtron Elctrns Ltd., Dept. EM, 138-69 Fran Lewis Blvd., Rosedale, N.Y. 12472
Westinghouse Electric Corp., Indl & Gov't Tube, Dept. EM, Westinghouse Circle, Horseheads, N.Y. 14845

Tubes, Thyratron

D Conditioning Semiconductor Devices, Dept. EM, Box 816, Wayne, N.J. 07470 *
M EG&G, Inc., Electro-Optics Div., Dept. EM, 35 Congress St., Salem, Mass. 01970 *
General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 *
DM Raytheon Co., Distributor Prods. Oper., Dept. EM, Fourth Ave., Burlington, Mass. 01803 *
D Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Dutrex Inds., Inc., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
ITT Electron Tube, Dept. EM, Box 100, Easton, Pa. 18042
D National Electronics, Div. Varian Assoc. Inc., Dept. EM, Box 269, Geneva, Ill. 60134
D Temtron Elctrns Ltd., Dept. EM, 138-69 Fran Lewis Blvd., Rosedale, N.Y. 12472
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Westinghouse Electric Corp., Indl & Gov't Tube, Dept. EM, Westinghouse Circle, Horseheads, N.Y. 14845

Tubes, Transmit-Receive (TR)

DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Dutrex Inds., Inc., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
D Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
D Temtron Elctrns Ltd., Dept. EM, 138-69 Fran Lewis Blvd., Rosedale, N.Y. 12472
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Tubes, Transmitting

General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 *
D International Comps Corp., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746 *
DM Raytheon Co., Distributor Prods. Oper., Dept. EM, Fourth Ave., Burlington, Mass. 01803 *
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
DM Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Dutrex Inds., Inc., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
ITT Electron Tube, Dept. EM, Box 100, Easton, Pa. 18042
M Levit Electronics, C. M., Dept. EM, 200 Park Ave. S., New York, N.Y. 10003
Litton Inds., Electron Tube Div., Dept. EM, 960 Industrial Rd, San Carlos, Calif. 94070
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D RCA Distr. & Special Prods. Div., Dept. EM, Deptford, N.J. 08096
D Temtron Elctrns Ltd., Dept. EM, 138-69 Fran Lewis Blvd., Rosedale, N.Y. 12472
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Westinghouse Electric Corp., Indl & Gov't Tube, Dept. EM, Westinghouse Circle, Horseheads, N.Y. 14845

Tubes, Traveling-Wave

D A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 *
Inter-Tech. Grp., Inc., Dept. EM, Box 23, Irvington, N.Y. 10533 p. 4463
DM Raytheon Co., Distributor Prods. Oper., Dept. EM, Fourth Ave., Burlington, Mass. 01803 *
M Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
DM Hughes Aircraft Co., Electron Dynamics Div., Dept. EM, 3100 W. Lomita Blvd., Torrance, Cal. 90509
ITT Electron Tube, Dept. EM, Box 100, Easton, Pa. 18042
M Levit Electronics, C. M., Dept. EM, 200 Park Ave. S., New York, N.Y. 10003
M Litton Inds., Electron Tube Div., Dept. EM, 960 Industrial Rd, San Carlos, Calif. 94070
Raytheon Co., Microwave & Power Tube Div., Dept. EM, 190 Willow St., Waltham, Mass 02154
D Temtron Elctrns Ltd., Dept. EM, 138-69 Fran Lewis Blvd., Rosedale, N.Y. 12472
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304

Tubes, Vidicon—See Tubes, TV Camera Pickup

Tubes, Voltage Reference Or Regulating

General Elec. Co., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 *
DM Raytheon Co., Distributor Prods. Oper., Dept. EM, Fourth Ave., Burlington, Mass. 01803 *
M Victoreen, Inc., Dept. EM, 10101 Woodland Ave., Cleveland, Ohio 44104 *
DM Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
D Dutrex Inds., Inc., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011
M Levit Electronics, C. M., Dept. EM, 200 Park Ave. S., New York, N.Y. 10003
Simmonds Precision, Engine Systems Div., Dept. EM, Norwich, N.Y. 13815
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303
Westinghouse Electric Corp., Indl & Gov't Tube, Dept. EM, Westinghouse Circle, Horseheads, N.Y. 14845

Tubes, X-Ray

D A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876 *
D Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304

Tubing, Ceramic

Alberox Corp., Dept. EM, New Bedford Ind'l. Pk., New Bedford, Mass. 02745 *
Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 *
Varflex Corp., Dept. EM, 514 W. Court St., Rome, N.Y. 13440 p. 2848
Centerflex Ceramics, Dept. EM, 221 Seventh Ave., Hawthorne, N.J. 07507
Coors Porcelain Co., Dept. EM, 600 Ninth St., Golden, Colo. 80401
Diamonite Products Div., Dept. EM, Box 567, Shreve, Ohio 44676
General Electric Co., Lamp Components Sls. Oper., Dept. EM, 21800 Tungsten Rd., Cleveland, Ohio 44117
GTE Sylvania Inc., Western Gold & Platinum Sub., Dept. EM, 477 Harbor Blvd., Belmont, Cal. 94002
3M Company, Tech Ceramic Prods., Dept. EM, 3M Center 223-4S, St. Paul, MN. 55101
DM Nat'l Ceramic Co., Dept. EM, 500 Southard St., Trenton, N.J. 08602
Norton Co., Public Relations Dept., Dept. EM, One New Bond St., Worcester, Mass. 01606
D Plessey Ceramic Div., Dept. EM, 8th & Harrison Sts., Frenchtown, N.J. 08825
Quartzite Processing, Inc., Dept. EM, 6 Holyoke St., Malden, Mass. 02148
Santa Fe Textiles Inc., Dept. EM, 3151 W. Adams St., Santa Ana, Cal. 92704
Star Porcelain Co., Dept. EM, 71 Muirhead Ave., Box 1267, Trenton, N.J. 08638
Thermal Amer. Fused Quartz, Dept. EM, Change Bridge Rd., Montville, N.J. 07045
Tyco, Saphicon, Dept. EM, 16 Hickory Dr., Waltham, Mass. 02154

Tubing, Fiberglass

D Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 *
DM Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 *
D Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 *
DM Markel Corp., Dept. EM, P.O. Box 572, Norristown, Pa. 19404 p. 2847
National Wire & Cable Corp., Dept EEM, Svc Div., Dept. EM, 136 San Fernando Rd., Los Angeles, Cal. 90031 *
DM Varflex Corp., Dept. EM, 514 W. Court St., Rome, N.Y. 13440 p. 2848
DM Brand-Rex Co., Dept. EM, Box 498, Willimantic, Conn. 06226
M Cadillac Plastic & Chemical, Dayco Co., Dept. EM, Box 810, Detroit, Mich. 48232
DM Cole-Flex Corp., Dept. EM, 91 Cabot St., W. Babylon, N.Y. 11704
DM ICO/Rally Corp., Dept. EM, Edward J. Bush, Palo Alto, Cal. 94303
Precision Paper Tube Co., Dept. EM, 1049 S. Noel Ave., Wheeling, Ill. 60090
M , Shakespeare, Elctrns & Fiberglass Div., Dept. EM, Box 246, Columbia, S.C. 29202
M Stevens Prods., Inc., Dept. EM, 128 N. Park St., E. Orange, N.J. 07019

Tubing, Glass

Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 *
Varflex Corp., Dept. EM, 514 W. Court St., Rome, N.Y. 13440 p. 2848
Corning Glass Works, Dept. EM, Main Plant, Bldg. 21-3, Corning, NY 14830
Corning Science Products, Corning Glass Works, Dept. EM, Corning, N.Y. 14830
Esco Products, Dept. EM, Oak Ridge Rd., Oak Ridge, NJ 07438
Garner Glass Co., Dept. EM, 177 S. Indian Hill Blvd., Claremont, Calif. 91711
General Electric Co., Lamp Components Sls. Oper., Dept. EM, 21800 Tungsten Rd., Cleveland, Ohio 44117
M Heraeus-Amersil, Inc., Dept. EM, 650 Jemees Mill Rd., Sayreville, NJ 08872
M Wilmad Glass Co., Inc., Dept. EM, Buena, N.J. 08310

Tubing, Heat Shrinkable-Also See Caps, Forms & Tapes, Heat Shrinkable

D Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 p. 447
Chomerics, Inc., Dept. EM, 77 Dragon Court, Woburn, Mass. 01801
DM Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 p. 458
DM Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 p. 459
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101
DM Markel Corp., Dept. EM, P.O. Box 572, Norristown, Pa. 19404 p. 284
National Wire & Cable Corp., Dept EEM, Svc Div., Dept. EM, 136 San Fernando Rd., Los Angeles, Cal. 90031
Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 214
Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 9024
DM Zeus Ind'l. Prods., Dept. EM, Foot of Thompson St., Raritan, N.J. 08869 p. 28
D AMP Special Industries, Dept. EM, Valley Forge, Pa. 19482
DM Amrad Corp., Dept. EM, Box 876, Paris, Tex. 75460
Anchor Plastics, Dept. EM, 36-36 36th, Long Island City, N.Y. 11106
M Antex Div., M M Newman Corp., Dept. EM, Marblehead, Mass. 01945
M Automatic Die Cutting Mch, Dept. EM, 28 Warrel St., New York, N.Y. 10007
DM Birnbach Co., Inc., Dept. EM, 177 Hanse Ave., Freeport, N.Y. 11520
M Brady Co., W. H., Industrial Prods. Div., Dept. EM, 2221 W. Camden Rd. Box 2131, Milwaukee, Wis. 53201
Brand Dielectrics, Inc., Dept. EM, Route 203, N. Windham, Conn. 06256
M Cadillac Plastic & Chemical, Dayco Co., Dept. EM, Box 810, Detroit, Mich. 4823
Carborundum Co., Plastics Div., Dept. EM, Carborundum Center, Niagara Falls, New York 14302
M Chemplast, Inc., Dept. EM, 31-150 Dey Rd., Wayne, N.J. 07470
D Cimco Wire & Cable, Inc., Dept. EM, 250 W. Crescent Ave., Allendale, N.J. 074
DM Cole-Flex Corp., Dept. EM, 91 Cabot St., W. Babylon, N.Y. 11704
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
Emerson & Cuming, Inc., Dielectric Mat'ls. Div., Dept. EM, 869 Washington St., Canton, Mass. 02021
ENM, Dept. EM, 5350 Northwest Hwy., Chicago, Ill. 60630
M Geyer Systems, Inc., Dept. EM, 1917 Green Spring Dr., Timonium, Md. 21903
Gries Reproducer Co., Div. Coats & Clark Inc., Dept. EM, 162 Beechwood Ave New Rochelle, N.Y. 10801
High Voltage Engrg. Corp., Dept. EM, S. Bedford St., Burlington, Mass. 01803
M Hollingsworth Solderless Terminal Co., Dept. EM, 85 Benjamin Franklin Hwy, F Box 499, Pottstown, Pa. 19464

DM ICO/Rally Corp., Dept. EM, Edward J. Bush, Palo Alto, Cal. 94303
3M Co., Indl Elect Prods. Div., Dept. EM, 3M Center, St. Paul, Minn. 55101
D Norelcom Electronics, Dept. EM, 200 Allen Blvd., Farmingdale, N.Y. 11735
DM Penntube Plastics, Dept. EM, Madison Ave. & Holly St., Clifton Heights, Pa. 19018
Precision Paper Tube Co., Dept. EM, 1049 S. Noel Ave., Wheeling, Ill. 60090
Raychem Corp., Dept. EM, 300 Constitution Dr., Menlo Park, Cal. 94025
D Russell Inds., Inc., Dept. EM, 3069 Lawson Blvd., Oceanside, N.Y. 11572
DM Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
M Storm Products Co., Dept. EM, 112 S. Glasgow St., Inglewood, Cal. 90301
D T & B/Thomas & Betts, Dept. EM, 36 Butler St., Elizabeth, N.J. 07207
DM Zippertubing Co., Dept. EM, 13000 S. Broadway, Los Angeles, Cal. 90061

Tubing, Metal

DM Uniform Tubes Inc., MicroDelay Division, Dept. EM, Collegeville, Pa. 19426 *
Abex Corp, Dept. EM, 530 5th Ave, New York, NY 10036
Anaconda Company Brass Division, Dept. EM, 414 Meadow St., Waterbury, Conn. 06720
Armco Steel Corp., Dept. EM, Middletown, Ohio 45043
Carpenter Technology, Dept. EM, Box 662, Reading, Pa. 19603
Fansteel Inc., Dept. EM, One Tantalum Pl., N Chicago, Ill. 60064
M ITT-Higbie Mfg. Co., Dept. EM, Wagner Rd., Rochester, Mich. 48063
Jones & Laughlin Steel Corp, Dept. EM, 3 Gateway Ctr, Pittsburgh, PA 15263
DM K & S Engineering, Dept. EM, 6917 W. 59th St., Chicago, ILL. 60638
M Kawecki Berylco Inds., Inc., Dept. EM, PO Box 1462, Reading, PA 19603
NL Industries, Inc., Metal Div., Dept. EM, 1221 Ave. of Americas, New York, N.Y. 10020
Okonite Co., Dept. EM, Box 340, Ramsey, N.J. 07446
M Reynolds Metals Co., Dept. EM, Box 27003, Richmond, VA. 23261
D Unarco-Rohn, Div. Unarco Inds., Dept. EM, Box 2000, Peoria, Ill. 61656
Wall A. T. Co., Dept. EM, 55 Service Ave., Warwick, R.I. 02889
Whittaker Corp., Dept. EM, 10880 Wilshire Blvd., Los Angeles, Cal. 90024

Tubing, Plastic-Also See Tubing, Spaghetti

DM Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 p. 4478
D Bivar, Inc., Dept. EM, 1617 E. Edinger Ave., Santa Ana, Cal. 92705 *
DM Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 *
DM Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 *
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 *
DM Markel Corp., Dept. EM, P.O. Box 572, Norristown, Pa. 19404 p. 2847
National Wire & Cable Corp., Dept EEM, Svc Div., Dept. EM, 136 San Fernando Rd., Los Angeles, Cal. 90031 *
Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245 *
DM Varflex Corp., Dept. EM, 514 W. Court St., Rome, N.Y. 13440 p. 2848
DM Zeus Ind'l. Prods., Dept. EM, Foot of Thompson St., Raritan, N.J. 08869 p. 2849
Acme Model Engrg. Co., Dept. EM, 654 Bergen Blvd., Ridgefield, N.J. 07657
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
Anchor Plastics, Dept. EM, 36-36 36th, Long Island City, N.Y. 11106
M Antex Div., M M Newman Corp., Dept. EM, Marblehead, Mass. 01945
DM Birnbach Co., Inc., Dept. EM, 177 Hanse Ave., Freeport, N.Y. 11520
DM Blum, Julius & Co., Inc., Dept. EM, Box 292, Carlstadt, N.J. 07072
Brand Dielectrics, Inc., Dept. EM, Route 203, N. Windham, Conn. 06256
DM Brand-Rex Co., Dept. EM, Box 498, Willimantic, Conn. 06226
M Cadillac Plastic & Chemical, Dayco Co., Dept. EM, Box 810, Detroit, Mich. 48232
M Chemplast, Inc., Dept. EM, 31-150 Dey Rd., Wayne, N.J. 07470
DM Cimco Wire & Cable, Inc., Dept. EM, 250 W. Crescent Ave., Allendale, N.J. 07401
DM Cole-Flex Corp., Dept. EM, 91 Cabot St., W. Babylon, N.Y. 11704
Geyer Systems, Inc., Dept. EM, 1917 Green Spring Dr., Timonium, Md. 21903
Gibson/Egan Co., Dept. EM, 2666 East Huntington Dr., Duarte, CA. 91010
D ICO/Rally Corp., Dept. EM, Edward J. Bush, Palo Alto, Cal. 94303
3M Co., Indl Elect Prods. Div., Dept. EM, 3M Center, St. Paul, Minn. 55101
Norelcom Electronics, Dept. EM, 200 Allen Blvd., Farmingdale, N.Y. 11735
Norton Co., Public Relations Dept., Dept. EM, One New Bond St., Worcester, Mass. 01606
NVF Co., Dept. EM, Box 68, Yorklyn, Del. 19736
Okonite Co., Dept. EM, Box 340, Ramsey, N.J. 07446
D Penn Fibre & Specialty, Dept. EM, 2020 E. Westmoreland St., Phila., Pa. 19134
M Penntube Plastics, Dept. EM, Madison Ave. & Holly St., Clifton Heights, Pa. 19018
M Phoenix Wire, Inc., Dept. EM, 100 Teflon Ave., S. Hero, Vt. 05486
Precision Paper Tube Co., Dept. EM, 1049 S. Noel Ave., Wheeling, Ill. 60090
Resdel Corp., Dept. EM, Bldg. 22-County Airport, Rio Grande, N.J. 08242
SGL Homalite, Div. of SGL Inds., Inc., Dept. EM, 11 Brookside Dr., Wilmington, Del. 19804
M Stevens Prods., Inc., Dept. EM, 128 N. Park St., E. Orange, N.J. 07019
Synthane Taylor Corp., An Alco Standard Corporate Partner, Dept. EM, Box 835, Valley Forge, Pa. 19482
M Teledyne Aerospace Systems, Dept. EM, 1007 E. 10th St., Fairmont, Minn. 56031
Thermo Elec. Co., Inc., Dept. EM, 109 Fifth St., Saddle Brook, N.J. 07662
D Uniroyal, Inc., Dept. EM, 1230 Ave. of Americas, New York, N.Y. 10020
M Zippertubing Co., Dept. EM, 13000 S. Broadway, Los Angeles, Cal. 90061

ubing, Spaghetti

M Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 p. 4478
M Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 *
M Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 *
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 *
M Markel Corp., Dept. EM, P.O. Box 572, Norristown, Pa. 19404 *
National Wire & Cable Corp., Dept EEM, Svc Div., Dept. EM, 136 San Fernando Rd., Los Angeles, Cal. 90031 *
Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 *
D Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2143
Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245 *
DM Varflex Corp., Dept. EM, 514 W. Court St., Rome, N.Y. 13440 p. 2848
DM Zeus Ind'l. Prods., Dept. EM, Foot of Thompson St., Raritan, N.J. 08869 *
Allied Electronics, Dept. EM, 401 E. 8th St., Ft. Worth, Tex. 76102
DM Birnbach Co., Inc., Dept. EM, 177 Hanse Ave., Freeport, N.Y. 11520
Brand Dielectrics, Inc., Dept. EM, Route 203, N. Windham, Conn. 06256
DM Brand-Rex Co., Dept. EM, Box 498, Willimantic, Conn. 06226
M Cadillac Plastic & Chemical, Dayco Co., Dept. EM, Box 810, Detroit, Mich. 48232
M Chemplast, Inc., Dept. EM, 31-150 Dey Rd., Wayne, N.J. 07470
DM Cimco Wire & Cable, Inc., Dept. EM, 250 W. Crescent Ave., Allendale, N.J. 07401
DM Cole-Flex Corp., Dept. EM, 91 Cabot St., W. Babylon, N.Y. 11704
DM Electrovert, Dept. EM, 86 Hartford Ave., Mt. Vernon, N.Y. 10553
M Hollingsworth Solderless Terminal Co., Dept. EM, 85 Benjamin Franklin Hwy, P.O. Box 499, Pottstown, Pa. 19464
D ICO/Rally Corp., Dept. EM, Edward J. Bush, Palo Alto, Cal. 94303
NVF Co., Dept. EM, Box 68, Yorklyn, Del. 19736
DM Penntube Plastics, Dept. EM, Madison Ave. & Holly St., Clifton Heights, Pa. 19018
Precision Paper Tube Co., Dept. EM, 1049 S. Noel Ave., Wheeling, Ill. 60090
DM Zippertubing Co., Dept. EM, 13000 S. Broadway, Los Angeles, Cal. 90061

Tubing, Waveguide

Markel Corp., Dept. EM, P.O. Box 572, Norristown, Pa. 19404 *
M Uniform Tubes Inc., MicroDelay Division, Dept. EM, Collegeville, Pa. 19426 *
M Airtron, Div. Litton Inds., Dept. EM, 200 E. Hanover Ave., Morris Plains, N.J. 07950
Gabriel Elctrns. Inc., Dept. EM, Box 626, Scarborough Ind'l. Pk., Scarborough, Me. 04074
D Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
TRG,, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
Wall A. T. Co., Dept. EM, 55 Service Ave., Warwick, R.I. 02889
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006

Tubing, Zipper

D Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 p. 4479
D Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 *
DM Metex Corp., Dept. EM, 970 New Durham Rd., Edison, N.J. 08817 *
Brand Dielectrics, Inc., Dept. EM, Route 203, N. Windham, Conn. 06256
DM Zippertubing Co., Dept. EM, 13000 S. Broadway, Los Angeles, Cal. 90061

Tuners, A-M/F-M

Advance Conversion Devices Co., Dept. EM, 109 Eighth St., Passaic, N. J. 07055 *
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 *
D Bell PA Products, Dept. EM, 1200 N. Fifth St. Box 8177, Columbus, Ohio 43201
D Bogen Div., Lear Siegler, Inc., Dept. EM, Box 500, Paramus, N.J. 07652
Dynaco Inc., Div Tyco Corp., Dept. EM, Box 88 Coles Rd., Blackwood, N.J. 08012
D Mitsumi Elec. Co., Ltd., Dept. EM, 8-2, 8-Chome, Kokuryo, Chofu-City, Tokyo, Japan
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Precision Electronics, Inc., Dept. EM, 9101 King Ave., Franklin Park, Ill 60131
D Trutone Elctrns., Inc., Dept. EM, 7315 Fulton Ave., No. Hollywood, Cal. 91605
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304

Tuners, Microwave

M General Microwave Corp., Dept. EM, 155 Marine St., Farmingdale, NY 11735 *
Johanson Mfg. Corp., Dept. EM, Box 329, Boonton, N.J. 07005 *
M Aertech Industries, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086
M Aircom, Inc., Dept. EM, Rte. 16B, Union, N.H. 03887
M Airtron, Div. Litton Inds., Dept. EM, 200 E. Hanover Ave., Morris Plains, N.J. 07950
Alford Mfg. Co., Dept. EM, 120 Cross St., Winchester, Mass. 01890
M Eastern Microwave Corp., Dept. EM, 4 Gill St., Woburn, MA 01801

Engelmann Microwave, Dept. EM, Skyline Dr., Montville, N.J. 07045
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
M Microlab/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039
Microphase Corp., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
M RHG Elctrns. Lab., Dept. EM, 161 E. Industry Ct., Deer Park, N.Y. 11729
D R L C Elctrns., Inc., Dept. EM, 83 Radio Cir., Mt. Kisco, N.Y. 10549
Sivers Lab, Dept. EM, Box 90339, Los Angeles, Cal. 90009
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
D TRG, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
M Watkins-Johnson Co., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006
Weinschel Engrg. Co., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760

Tuning Forks

American Time Products, Bulova Watch, Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
Bulova Watch Co., Freq Controls Div., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377 *
M Philamon, Inc., Dept. EM, 33 Dubon Ct., Farmingdale, N.Y. 11735 *
FSI/Fork Standards Inc., Dept. EM, 211 Main St., W. Chicago, Ill. 60185
M Iwata Electric Co., Ltd., Dept. EM, 1-16, I-Chome Soto-Kanda, Chiyoda-ku Tokyo, Japan
Meloy Labs Inc., Instrus. & Sys. Div., Dept. EM, 6715 Electronic Dr., Springfield, Va. 22151
M Murata Corporation of America, Dept. EM, 1148 Franklin Rd., S.E., Marietta, Ga. 30067
D Murata Mfg. Co. Ltd., Dept. EM, 16, Kaiden Nishijin-cho, Nagaoka-Kyo-Shi, Kyoto, Japan
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
T-F Electronics Inc., Dept. EM, 9415 Neils Thompson Dr., Austin, Tex. 78759

Tweezers, Hand & Vacuum

D **GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101** *
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** *
D Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
M Air-Vac Engrg. Co., Dept. EM, 100 Gulf St., Milford, Conn. 06460
D Circon Corp., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111
Clauss Cutlery Co., Dept. EM, Box 667, Fremont, Ohio 43420
D Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
National Camera Inc., Dept. EM, 2000 W. Union Ave., Englewood, Colo. 80110
D Orbit Inds., Div. Countis Inds., Dept. EM, Box 1444, San Luis Obispo, Calif. 93406
D Telvac Instr. Co., Dept. EM, 7534 Atoll Ave. F, N. Hollywood, Cal. 91605

Typewriters, Input-Output (All Types)

Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 p. 1469
NES, Inc., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103 *
D Facit-Addo, Inc., Dept. EM, 66 Field Point Rd., Greenwich, Conn. 06830
Perkin-Elmer Data Systems, Terminals Div., Dept. EM, Rt. 10 & Emery Ave., Randolph, N.J. 07801

Ultraviolet Inspection Lighting-Also See Microscopes, Ultraviolet

D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** *
American Ultraviolet, Dept. EM, 320 Commerce St., Chatham, N.J. 07928
D Clean Room Prods., Dept. EM, 56 W. Penataquit Ave., Bay Shore, N.Y. 11706
Gates & Co., Inc., Geo. W., Dept. EM, Hempstead Tpke. & Lucille Ave., Franklin Sq., N.Y. 11010
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
DM Shannon Luminous Mat'ls., Div. Shannon-Glow Inc., Dept. EM, 7356 Santa Monica Blvd., Hollywood, Cal. 90046
DM Ultra-Violet Prods., Inc., Dept. EM, 5100 Walnut Grove Ave., San Gabriel, Cal. 91778
Westinghouse Elec., Lamp Div., Dept. EM, Parts Sls., 1 Westghse Plaza, Bloomfield, N. J. 07003

Urea Formaldehyde—See Plastic Raw Materials

Valves, Solenoid

Magnetec Corp., Sub of Hi-G Inc, Dept. EM, 96 Granby St., Bloomfield, Conn. 06002 *
D Atkomatic Valve Co., Inc., Dept. EM, Box 11258, 141 South Sherman Dr., Indianapolis, Ind. 46201
Bailey Meter Co., Sub. Babcock & Wilcox, Dept. EM, 29801 Euclid Ave., Wickliffe, Ohio 44092
M Bendix Corp., Electrodynamics Div., Dept. EM, 11600 Sherman Way, N. Hollywood, Calif. 91605
Bicron Elctrns. Co., Dept. EM, Box 807, Barlow St., Canaan, Conn. 06018
Everett/Charles, Inc., Dept. EM, 2806 Metropolitan Pl., Pomona, Cal. 91767
General Valve Corp., Dept. EM, 110 Rte. 10 Box 342, E. Hanover, N.J. 07936
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
IMC Magnetics Corp., Arizona Div., Dept. EM, 1900 East Fifth St., Tempe, Ariz. 85281
M ITT General Controls, Dept. EM, 801 Allen Ave., Glendale, Cal. 91201
Jamesbury Corp., Dept. EM, 640 Lincoln St., Worcester, Mass. 01605
M Marotta Sci. Controls, Inc., Dept. EM, Boonton Ave., Boonton, N.J. 07005
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Square D Co., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201
Vactronic Lab. Equip., Inc., Dept. EM, 65 Brightside Ave., E. Northport, N.Y. 11731
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Valves, Vacuum

D **A E G Telefunken, Dept. EM, Rte 22, Sommerville, N.J. 08876** *
M Bemco, Inc., Dept. EM, 9908 San Fernando Rd., Pacoima, Cal. 91331
D CVC Products, Inc., Dept. EM, 525 Lee Rd., Box 1886, Rochester, N.Y. 14603
Everett/Charles, Inc., Dept. EM, 2806 Metropolitan Pl., Pomona, Cal. 91767
FTS Systems Inc., Dept. EM, POB 158, Stone Ridge, N.Y. 12484
General Valve Corp., Dept. EM, 110 Rte. 10 Box 342, E. Hanover, N.J. 07936
High Voltage Engrg. Corp., Dept. EM, S. Bedford St., Burlington, Mass. 01803
Hills-McCanna Co., Dept. EM, 400 Maple Ave., Carpentersville, Ill. 60110
IMC Magnetics Corp., Arizona Div., Dept. EM, 1900 East Fifth St., Tempe, Ariz. 85281
Jamesbury Corp., Dept. EM, 640 Lincoln St., Worcester, Mass. 01605
Materials Resch. Corp., Dept. EM, Route 303, Orangeburg, N.Y. 10962
D Matheson Gas Products, Dept. EM, Box 85, East Rutherford, N.J. 07073
Perkin-Elmer Ultek Inc., Dept. EM, Box 10920, Palo Alto, Cal. 94303
T-M Vacuum Prods., Dept. EM, Warrington & Rowland, Riverton, N.J. 08077
DM Ulvac North America, Dept. EM, Colchester Plaza, Colchester, VT 05446
Vactronic Lab. Equip., Inc., Dept. EM, 65 Brightside Ave., E. Northport, N.Y. 11731
Vacuum Resch. Mfg., Dept. EM, 3100 Crow Canyon Rd., San Ramon, Cal. 94583
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

Varactors—See Diodes, Varactor

Varistors—See Resistors, Voltage Sensitive

VHF Equipment—See Generators; Receivers; etc.

Vibration Test Systems—See Testers, Vibration

Vibrators

D **ATR Electronics, Inc., Dept. EM, 300 E. 4th St., St. Paul, Minn. 55101** p. 3357
Endicott Coil Co., Dept. EM, 24 Charlotte St., Binghamton, N.Y. 13905 p. 1342
Unholtz-Dickie Corp., Dept. EM, 3000 Whitney Ave., Hamden, Conn. 06518 p. 2575
DM All American Tool & Mfg. Co., Dept. EM, 8027 Lawndale, Skokie, Ill. 60076
Alpha-M Corp, Dept. EM, 3009 Wildflower Drive, Dallas, Tx. 75229
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
Coil Co. of Amer., Dept. EM, 221 Washington St., Northvale, N.J. 07647
D GCA/Precision Scientific, Dept. EM, 3737 W. Cortland St., Chicago, Ill. 60647
DM Terado Corp., Dept. EM, 1068 Raymond Ave., St. Paul, Minn. 55108
Wilcoxon Research, Dept. EM, 12526 Parklawn Dr., Rockville, Md. 20852
D Wilson Co., H. M., Dept. EM, 11501 Chimney Rock Rd., Houston, Tex. 77035

Vidicon Tubes—See Tubes, TV Camera Pickup

Viewing Hoods, Cathode Ray Tube

Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 *
D **Jan Hardware Mfg. Co., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101** p. 2434
Tektronix, Inc., Dept. EM, Box 500, Beaverton, Ore. 97077

Vinyl Compounds—See Plastic Raw Materials

VLF Equipment—See Receivers; Transmitters; etc.

Voltage Sources

Abacus Controls Inc., Dept. EM, 89 Redington Rd., Somerville, N.J. 08876 *
D **Ballantine Laboratories, Inc., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005** *
Burr-Brown, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734 *
D **California Instrs., Dept. EM, 5150-Convoy St., San Diego, Cal. 92111** p. 3370,3371
Continental Resources, Inc., Dept. EM, 175 Middlesex Tpke., Bedford, Mass. 01730 *
Datel Systems Inc., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021 p. 2687
Deltec Corp., Dept. EM, 980 Buenos Ave., San Diego, Cal. 92110 *
Electronic Dev. Corp., Dept. EM, 11 Hamlin St., Boston, Mass. 02127 p. 2724
Freed Transformer Co., Inc., Dept. EM, 1718 Weirfield St., Brooklyn, N.Y. 11227 *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 p. 3267
Hipotronics, Inc., Dept. EM, Brewster, N.Y. 10509 *
Interstate Electronics, Dept. EM, Box 3117, Anaheim, Cal. 92803 p. 2767
Julie Research Lab., Dept. EM, 211 West 61st St., New York, N.Y. 10023 p. 2767,2768
Keithley Instruments Inc., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139 *
Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
North Hills Elctrns., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542 *
Power Designs, Inc., Dept. EM, 1700 Shames Dr., Westbury, N.Y. 11590 *
Sensitive Research Instrs., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550 *
D **Sigmapower, Inc., Dept. EM, 20790 Leapwood Ave., Carson, Cal. 90746** *
DM **Systron-Donner Corp., Dept. EM, 10 Systron Dr., Concord, Cal. 94518** *
Analog Devices, Inc., Dept. EM, P.O. Box 280, Norwood, MA 02062
Analogic Corp., Dept. EM, Audubon Rd., Wakefield, Mass. 01880
Argus International, Dept. EM, Box 38, Hopewell, N.J. 08525
Ferranti Elec., Dept. EM, East Bethpage Rd., Plainview, N.Y. 11803
Precision Monolithics Inc., Dept. EM, 1500 Space Dr., Santa Clara, Cal. 95050
DM Systron-Donner Instr. Div., Dept. EM, 10 Systron Dr., Concord, Cal. 94518

D – Product sold through distributors M – Product meets MIL specs
* – Company has information in this edition but not on this product.

M Todd Products Corp., Dept. EM, 123 Milbar Blvd., Farmingdale, N.Y. 11735
Zi-Tech Div., Aikenwood Corp., Dept. EM, Box 26, 2151 Park Blvd., Palo Alto, Cal. 94302

Wafer Fabrication, Semiconductor—See Semiconductor Wafer Fabrication

Wall Plates—See Boxes, Junction, Outlet & Wall Plates

Washers—See Fasteners

Wave Soldering Equipment—See Soldering Equip, Printed Circuit

Waveguide-Coax Adapters

Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
M Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706 ..... *
Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 .. *
DM Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725 ..... **p. 2886**
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
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M Airtron, Div. Litton Inds., Dept. EM, 200 E. Hanover Ave., Morris Plains, N.J. 07950
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DM Astrolab, Inc., Dept. EM, 345 Dalziel Rd., Linden, N.J. 07036
Cablewave Systems Inc., Dept. EM, 60 Dodge Ave., North Haven, Conn. 06473
M Dielectric Comms, Unit of Gen Signal, Dept. EM, Raymond, Maine 04071
M Eastern Microwave Corp., Dept. EM, 4 Gill St., Woburn, MA 01801
DM Harris Corp., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
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D Microwave Assocs., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803
D Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
Nurad, Inc., Dept. EM, 2165 Druid Pk. Dr., Baltimore, Md. 21211
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
Reeve Electronics, Inc., Dept. EM, 609 W. Lake St., Chicago, Ill 60606
M RF Systems, Inc., Dept. EM, 3100 Communications Rd., St Cloud, Fla. 32769
Sivers Lab, Dept. EM, Box 90339, Los Angeles, Cal. 90009
DM Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
M UTE Microwave, Dept. EM, 3500 Sunset Ave., Asbury Park, N.J. 07712
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006

Waveguides

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M Arra Inc., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706 ..... **p. 2865**
The Bendix Corp., Electrical Comp. Div., Dept. EM, Sidney, NY 13838 ..... *
M Electro Impulse, Dept. EM, Box 870, Red Bank, N.J. 07701 ..... *
Midisco, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725 ..... **p. 2886**
M Uniform Tubes Inc., MicroDelay Division, Dept. EM, Collegeville, Pa. 19426 *
Wavetek, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123 ..... *
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M Cir-Q-Tel, Inc., Dept. EM, 10504 Wheatley St., Kensington, Md. 20795
M Dielectric Comms, Unit of Gen Signal, Dept. EM, Raymond, Maine 04071
M Eastern Microwave Corp., Dept. EM, 4 Gill St., Woburn, MA 01801
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Hughes Aircraft Co, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230
Maury Microwave Corp., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730
D Microwave Development Labs., Inc., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194
Narda Microwave Corp., Dept. EM, Plainview, N.Y. 11803
M Premier Microwave, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573
Reeve Electronics, Inc., Dept. EM, 609 W. Lake St., Chicago, Ill 60606
M RF Systems, Inc., Dept. EM, 3100 Communications Rd., St Cloud, Fla. 32769
M Servometer Corp., Dept. EM, 501 Little Falls Rd., Cedar Grove, N.J. 07009
M Systron-Donner Microwave Div., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409
TRG, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801
Waveline, Inc., Dept. EM, Box 718, W. Caldwell, N.J. 07006

Wave Traps—See Filters, Antenna; Filters, Microwave; etc.

Welding Equipment & Access. (Excluding Equip. for Semiconductor Devices)

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D Union Carbide Corp., Battery Products Div., Dept. EM, 270 Park Ave., New York, N.Y. 10017 ..... *
D Apollo Lasers Inc., Dept. EM, 6357 Arizona Cir., Los Angeles, Cal. 90045
Associate General Labs., Dept. EM, 8934 W. Ogden Ave., Brookfield, Ill. 60513
Dillon, W.C. & Co., Dept. EM, 14620-EP Keswick St., Van Nuys 340, Cal. 91407
Ewald Instrs. Corp., Dept. EM, Rte. 7R, Kent, Conn. 06757
Freudenberg, Inc. B., Dept. EM, 50 Rockefeller Plaza, New York, N.Y. 10020
Henes Products Corp., Dept. EM, 4301 E. Madison St., Phoenix, Ariz. 85034
DM Hughes Aircraft Co., Ind'l. Prods. Div., Prod. Equip. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008
Laser Inc., Dept. EM, Laser Lane, Box 537, Sturbridge, Mass. 01566
D Master Appliance Corp., Dept. EM, 2420 18th St., Box 545, Racine, Wisc. 53403
Microflame Inc., Dept. EM, 3724 Oregon Ave. S., Minneapolis, Minn 55426
Nelson Stud Welding TRW Inc., Dept. EM, 28th & Toledo Ave., Lorain, Ohio 44035
Quantronix Corp., Dept. EM, 225 Engineers Rd., Smithtown, N.Y. 11787
D Raytheon Co., Spec. Microwave & Device Oper., Dept. EM, Fourth Ave., Burlington, Mass. 01803
Snap-On-Tools, Dept. EM, 8192-A 28th Ave., Kenosha, Wisc. 53140
Taylor-Winfield Corp., Dept. EM, 1052 Mahoning Ave. NW, Warren, Ohio 44482
DM Tescom Instr. Div., Dept. EM, 2600 Niagara La. N., Minneapolis, Minn. 55441
Tro Dyne Corp., Dept. EM, 900 Corporate Dr., Mahwah, N.J. 07430
Union Carbide Corp., Linde Div., Dept. EM, 270 Park Ave., New York, N.Y. 10017
M Wells Electronics, Inc., Weltek Div., Dept. EM, 1801 S. Main St., South Bend, Ind. 46613
Westinghouse Elec., Process Equip./Consumables Dept, Dept. EM, Box 300, Sykesville, Md. 21784

Wire & Cable Ties

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D Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
DM Grayhill Inc., Dept. EM, 569 Hillgrove Ave., LaGrange, Ill. 60525 ..... **p. 4609**
D Heyman Mfg. Co., Dept. EM, 147 N. Michigan Ave., Kenilworth, N.J. 07033 **p. 4610**
ITT Cannon Electric, Dept. EM, 666 E. Dyer Rd., Santa Ana, Cal. 92702 ..... *
DM Panduit Corp., Dept. EM, 17301 Ridgeland Ave., Tinley Park, Ill. 60477 **p. 4628-4630**
M Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... *
D Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 **p. 2123,2144**
D Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ..... *
D Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 .... *
D AMP Special Industries, Dept. EM, Valley Forge, Pa. 19482
DM Amrad Corp., Dept. EM, Box 876, Paris, Tex. 75460
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
D Burndy Corporation, Dept. EM, Richards Ave., Norwalk, , Conn. 06852
Copperweld Bimetallics, Div. Copperweld Corp., Dept. EM, Glassport, PA 15045
Dek, Inc., Dept. EM, 1555-A Hawthorne La., W. Chicago, Ill. 60185
M Dennison Mfg. Co., Fastener Division, Dept. EM, Framingham, Mass. 01701
D Eaton Corp., Engineered Fasteners Oper., Dept. EM, Box 6688, Cleveland, Ohio 44101
DM Electrovert, Dept. EM, 86 Hartford Ave., Mt. Vernon, N.Y. 10553
DM Gould Inc., Electrical Comps. Div., Dept. EM, 123 Smith St., E. Farmingdale, N.Y. 11735
D Gries Reproducer Co., Div. Coats & Clark Inc., Dept. EM, 162 Beechwood Ave., New Rochelle, N.Y. 10801
Hanscom, H.F. Co., Inc., Dept. EM, 225 Chapman St., Providence, R.I. 02905
M Hollingsworth Solderless Terminal Co., Dept. EM, 85 Benjamin Franklin Hwy, P.O. Box 499, Pottstown, Pa. 19464
Holub Industries, Dept. EM, 413 DeKalb Ave., Sycamore, Ill. 60178
DM ICO/Rally Corp., Dept. EM, Edward J. Bush, Palo Alto, Cal. 94303
D Ideal Industries Inc., Dept. EM, 4450 Becker Pl., Sycamore, Ill. 60178
DM ITT Cannon/ETC Terminal Products, Dept. EM, 29000 Aurora Rd., Solon, Ohio 44139
M Manger Elec. Co., Inc., Dept. EM, W. Henry St., Stamford, Conn. 06902
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
Milton Ross Co., Dept. EM, 210 Second St. Pike, Southampton, Pa. 18966
Nat'l. Band & Tag, Dept. EM, 721 York St., Newport, Ky. 41072
Norelcom Electronics, Dept. EM, 200 Allen Blvd., Farmingdale, N.Y. 11735
D Oneida Electronics Mfg., Dept. EM, POB 678, R.D. #3 Baldwin Ext., Meadville, Pa. 16335
D Preformed Line Products Co., Dept. EM, Box 91129, Cleveland, Ohio 44101
M Santa Fe Textiles Inc., Dept. EM, 3151 W. Adams St., Santa Ana, Cal. 92704
M Squires Electronics Inc., Dept. EM, 8900 S.W. Burnham Rd. F-13, Tigard, Ore. 97223
Whitso, Inc., Dept. EM, 9326 Byron St., Schiller Park, Ill. 60176
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Wire, Airframe

DM Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 ..... *
Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
DM Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 ..... **p. 4592,4601**
Philadelphia Insulated Wire Co. Inc., Dept. EM, 333 New Albany Rd., Moorestown, N.J. 08057 ..... **p. 4634,4640,4641**
M Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245 **p. 4656**
TRW/Holyoke Wire & Cable, Dept. EM, 775 New Ludlow Rd., South Hadley, Mass. 01075 ..... *
M Brand-Rex Co., Dept. EM, Box 498, Willimantic, Conn. 06226
Chester Cable, Dept. EM, Oakland Ave., Chester, N.Y. 10918
DM Cimco Wire & Cable, Inc., Dept. EM, 250 W. Crescent Ave., Allendale, N.J. 07401
D Custom Cable Co., Dept. EM, 242 Butler, Westbury, N.Y. 11590
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
ENM, Dept. EM, 5350 Northwest Hwy., Chicago, Ill. 60630
M Galileo Electro-Optics Corp., Dept. EM, Galileo Pk., Sturbridge, Mass. 01518
D Manhattan Elec. Cable Corp., Dept. EM, 1 Station Plaza, Rye, N.Y. 10580
M Storm Products Co., Dept. EM, 112 S. Glasgow St., Inglewood, Cal. 90301

DM Tensolite Co., Div. Carlisle Corp, Dept. EM, Old Post Rd., Rte. 9A, Buchanan, N.Y. 10511
M Thermax Wire Corp., Dept. EM, 32-02 Linden Pl., Flushing, N.Y. 11354

Wire, Antenna (All Types)

D Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
D Belden Corp., Electronic Div., Dept. EM, Box 1327, Richmond, Ind. 47374 .. *
D Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 ..... p. 4563,4573,4584
D Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
D Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 ..... p. 4592
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245 p. 4656
TRW/Holyoke Wire & Cable, Dept. EM, 775 New Ludlow Rd., South Hadley, Mass. 01075 ..... *
American Electric Cable Co., Dept. EM, 181 Appleton St., Holyoke, Mass. 01040
D Birnbach Co., Inc., Dept. EM, 177 Hanse Ave., Freeport, N.Y. 11520
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
DM Carolina Steel & Wire Corp., Dept. EM, I-20 and S.C. 6, Lexington, S.C. 29072
Chester Cable, Dept. EM, Oakland Ave., Chester, N.Y. 10918
Copperweld Bimetallics, Div. Copperweld Corp., Dept. EM, Glassport, PA 15045
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
ENM, Dept. EM, 5350 Northwest Hwy., Chicago, Ill. 60630
D Jersey Specialty Co., Dept. EM, Box 248, Burgess Pl., Wayne, N.J. 07470
Leviton Mfg. Co., Inc., Dept. EM, 59-25 Little Neck Pkwy., Little Neck, N.Y. 11362
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D South River Metal Prods. Co., Dept. EM, P.O. Box 394, Matawan, N.J. 07747
M Times Fiber Comm. Inc., Sub. Insilco Corp. Times Wire & Cable Div., Dept. EM, 358 Hall Ave., Wallingford, Conn. 06492
D Unarco-Rohn, Div. Unarco Inds., Dept. EM, Box 2000, Peoria, Ill. 61656
Victor Electric Wire & Cable, Dept. EM, 618 Main St., Coventry, R.I. 02816
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Wire, Bare, Copper

D Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
D Belden Corp., Electronic Div., Dept. EM, Box 1327, Richmond, Ind. 47374 .. *
D Columbia Elctrn. Cables, Dept. EM, 11 Cove St., New Bedford, Mass. 02744 *
D Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 ..... p. 4583,4584
DM Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
D Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 ..... p. 4592,4600
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... p. 1469
National Wire & Cable Corp., Dept EEM, Svc Div., Dept. EM, 136 San Fernando Rd., Los Angeles, Cal. 90031 ..... *
Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 ..... *
Philadelphia Insulated Wire Co. Inc., Dept. EM, 333 New Albany Rd., Moorestown, N.J. 08057 ..... p. 4650
Shigoto Far East Ltd., Dept. EM, 1500 Broadway, New York, N.Y. 10036 .... *
Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245 p. 4656
TRW/Holyoke Wire & Cable, Dept. EM, 775 New Ludlow Rd., South Hadley, Mass. 01075 ..... *
Anaconda Company Brass Division, Dept. EM, 414 Meadow St., Waterbury, Conn. 06720
DM Birnbach Co., Inc., Dept. EM, 177 Hanse Ave., Freeport, N.Y. 11520
Chester Cable, Dept. EM, Oakland Ave., Chester, N.Y. 10918
Cohn Corp., Sigmund, Dept. EM, 121 S. Columbus Ave., Mt. Vernon, N.Y. 10553
D Custom Cable Co., Dept. EM, 242 Butler, Westbury, N.Y. 11590
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
Essex Grp, Power Conductor Div., Dept. EM, 2601 S. Adams, Marion, Ind. 46953
General Electric Co., Wire & Cable, Dept. EM, 1285 Boston Ave., Bridgeport, Conn. 06602
GTE Sylvania Inc., Western Gold & Platinum Sub., Dept. EM, 477 Harbor Blvd., Belmont, Cal. 94002
International Wire Products Co., Dept. EM, 500 W. Main St., Wyckoff, N.J. 07481
Kentucky Electronics, Dept. EM, 1204 Ind'l Dr., Box 507, Owensboro, Ky. 42301
Laser Technology, Inc., Dept. EM, 10624 Ventura Blvd., N. Hollywood, Calif. 91604
D Manhattan Elec. Cable Corp., Dept. EM, 1 Station Plaza, Rye, N.Y. 10580
Materials Resch. Corp., Dept. EM, Route 303, Orangeburg, N.Y. 10962
Nesor Alloy Corp., Dept. EM, 666 Passaic Ave., W. Caldwell, N.J. 07006
D Pace Wire & Cable Corp., Dept. EM, 3590 Oceanside Rd., Oceanside, N.Y. 11572
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
DM Phelps Dodge Cable & Wire Co., Dept. EM, Box 391 Point St., Yonkers, N.Y. 10702
D Triangle PWC, Dept. EM, Box 711, New Brunswick, N.J. 08903
D United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013
Wireflex Incorporated, Dept. EM, 502 Old Route 30 East, Bourbon, Ind. 46504

Wire, Bare, Nickel

Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 ..... *
D Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 ..... p. 4592
Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245 p. 4656
Atomergic Chemetals Corp Co., Dept. EM, 100 Fairchild Ave., Plainview, N.Y. 11803
Cohn Corp., Sigmund, Dept. EM, 121 S. Columbus Ave., Mt. Vernon, N.Y. 10553
M Consolidated Refining Co. Inc., Dept. EM, 116 Hoyt Ave., Mamaroneck, N.Y. 10543
Control Products Corp., Dept. EM, 4431 W. Division St., Chicago, Ill. 60651
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
GTE Sylvania, Wilbur B. Driver Co Sub., Dept. EM, 1875 McCarter Hwy., Newark, N.J. 07104
International Wire Products Co., Dept. EM, 500 W. Main St., Wyckoff, N.J. 07481
Kentucky Electronics, Dept. EM, 1204 Ind'l Dr., Box 507, Owensboro, Ky. 42301
M Magnetics, Div/Spang Industries, Inc., Dept. EM, Box 391, Butler, Pa. 16001
Materials Resch. Corp., Dept. EM, Route 303, Orangeburg, N.Y. 10962
D Triangle PWC, Dept. EM, Box 711, New Brunswick, N.J. 08903
United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013

Wire, Bare, Nickel-Chrome

Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
D Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 ..... *
D Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 ..... p. 4592
Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 ..... *
Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245 p. 4656
Atomergic Chemetals Corp Co., Dept. EM, 100 Fairchild Ave., Plainview, N.Y. 11803
Cohn Corp., Sigmund, Dept. EM, 121 S. Columbus Ave., Mt. Vernon, N.Y. 10553
M Consolidated Refining Co. Inc., Dept. EM, 116 Hoyt Ave., Mamaroneck, N.Y. 10543
Control Products Corp., Dept. EM, 4431 W. Division St., Chicago, Ill. 60651
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
D Eaton Corp., Engineered Fasteners Oper., Dept. EM, Box 6688, Cleveland, Ohio 44101
GTE Sylvania, Wilbur B. Driver Co Sub., Dept. EM, 1875 McCarter Hwy., Newark, N.J. 07104
Hoskins Mfg. Co., Dept. EM, 4445 Lawton Ave., Detroit, Mich. 48208
Materials Resch. Corp., Dept. EM, Route 303, Orangeburg, N.Y. 10962
Nesor Alloy Corp., Dept. EM, 666 Passaic Ave., W. Caldwell, N.J. 07006

Wire, Braid (Excluding Shielding)

Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
M Amphenol North America Div., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521 ..... *
D Belden Corp., Electronic Div., Dept. EM, Box 1327, Richmond, Ind. 47374 .. *
D Columbia Elctrn. Cables, Dept. EM, 11 Cove St., New Bedford, Mass. 02744 *
D Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 ..... *
DM Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
D Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 ..... p. 459
DM Metex Corp., Dept. EM, 970 New Durham Rd., Edison, N.J. 08817 ..... *
Philadelphia Insulated Wire Co. Inc., Dept. EM, 333 New Albany Rd., Moorestown, N.J. 08057 ..... p. 464
Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245 p. 465
TRW/Holyoke Wire & Cable, Dept. EM, 775 New Ludlow Rd., South Hadley, Mass. 01075 ..... *
DM Whitmor Wire & Cable, Dept. EM, 13161 Sherman Way Bldg. B, No. Hollywood, Cal. 91605 ..... *
Atomergic Chemetals Corp Co., Dept. EM, 100 Fairchild Ave., Plainview, N.Y. 11803
DM Birnbach Co., Inc., Dept. EM, 177 Hanse Ave., Freeport, N.Y. 11520
Chester Cable, Dept. EM, Oakland Ave., Chester, N.Y. 10918
Cohn Corp., Sigmund, Dept. EM, 121 S. Columbus Ave., Mt. Vernon, N.Y. 10553
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
International Wire Products Co., Dept. EM, 500 W. Main St., Wyckoff, N.J. 07481
D Manhattan Elec. Cable Corp., Dept. EM, 1 Station Plaza, Rye, N.Y. 10580
Nat'l-Standard Co., Dept. EM, Niles, Mich. 49120
Nesor Alloy Corp., Dept. EM, 666 Passaic Ave., W. Caldwell, N.J. 07006
D Oneida Electronics Mfg., Dept. EM, POB 678, R.D. #3 Baldwin Ext., Meadville, Pa. 16335
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Santa Fe Textiles Inc., Dept. EM, 3151 W. Adams St., Santa Ana, Cal. 92704
Wireflex Incorporated, Dept. EM, 502 Old Route 30 East, Bourbon, Ind. 46504
D Zippertubing Co., Dept. EM, 13000 S. Broadway, Los Angeles, Cal. 90061

Wire, Braid (Shielding)—See Braid, Cable

Wire, Ceramic Insulated

Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 ...
Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago Ill. 60616 .....
DM Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 .....
Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 ..... p. 4
Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 .....
Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 902 p. 4

D Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
M ARI Inds., Inc., Dept. EM, 9000 King St., Franklin Pk., Ill. 60131
Conax Corp., Dept. EM, 2300 Walden Ave., Buffalo, N.Y. 14225
Control Products Corp., Dept. EM, 4431 W. Division St., Chicago, Ill. 60651
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
Hy-Temp Transducers, Dept. EM, Box 11522, Philadelphia, Pa. 19116
Permaluster, Inc., Dept. EM, 1844 N. Keystone St., Burbank, Calif. 91504
M Santa Fe Textiles Inc., Dept. EM, 3151 W. Adams St., Santa Ana, Cal. 92704
Tensolite Co.,, Div. Carlisle Corp, Dept. EM, Old Post Rd., Rte. 9A, Buchanan, N.Y. 10511
Wireflex Incorporated, Dept. EM, 502 Old Route 30 East, Bourbon, Ind. 46504

Wire, Clad (All Types)

Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
D Belden Corp., Electronic Div., Dept. EM, Box 1327, Richmond, Ind. 47374 .. *
Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 ..... *
DM Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 ..... p. 4592,4600
Digital Equipment Corp., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060 ..... p. 1469
Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... *
Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245 p. 4656
M Advanced Materials Systems, Dept. EM, 72 Elm St. N., Atteboro, Mass. 02703
Copperweld Bimetallics, Div. Copperweld Corp., Dept. EM, Glassport, PA 15045
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
GTE Sylvania, Tech Prods Div, Dept. EM, 816 Lexington Ave., Warren, Pa 16365
Handy & Harman, Dept. EM, 850 Third Ave., New York, N.Y. 10022
Kentucky Electronics, Dept. EM, 1204 Ind'l Dr., Box 507, Owensboro, Ky. 42301
Leviton Mfg. Co., Inc., Dept. EM, 59-25 Little Neck Pkwy., Little Neck, N.Y. 11362
Nat'l-Standard Co., Dept. EM, Niles, Mich. 49120
D Oneida Electronics Mfg., Dept. EM, POB 678, R.D. #3 Baldwin Ext., Meadville, Pa. 16335
DM Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
Texas Instruments Control Prods. Div., Dept. EM, 34 Forrest St., Attleboro, Mass. 02703

Wire, Enamel Insulated—See Wire, Hookup (All-Types)

Wire, Fiberglass Insulated—See Wire, Glass Insulated

Wire, Flame Retardant

D Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
D Belden Corp., Electronic Div., Dept. EM, Box 1327, Richmond, Ind. 47374 .. *
D Berk Tek, Inc., Dept. EM, Box 60, RD 1, Reading, Pa. 19607 ..... p. 4540,4541
D Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 ..... p. 4577
DM Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
DM Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 ..... p. 4592,4604
National Wire & Cable Corp., Dept EEM, Svc Div., Dept. EM, 136 San Fernando Rd., Los Angeles, Cal. 90031 ..... *
Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 p. 4653
Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245 p. 4656
American Electric Cable Co., Dept. EM, 181 Appleton St., Holyoke, Mass. 01040
Boston Insulated Wire & Cable Co., Dept. EM, 65 Bay St., Dorchester, Mass. 02125
D Brand-Rex Co., Dept. EM, Box 498, Willimantic, Conn. 06226
Chester Cable, Dept. EM, Oakland Ave., Chester, N.Y. 10918
D Custom Cable Co., Dept. EM, 242 Butler, Westbury, N.Y. 11590
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
ENM, Dept. EM, 5350 Northwest Hwy., Chicago, Ill. 60630
M Galileo Electro-Optics Corp., Dept. EM, Galileo Pk., Sturbridge, Mass. 01518
DM General Electric Co., Wire & Cable, Dept. EM, 1285 Boston Ave., Bridgeport, Conn. 06602
M Gore, W.L. & Assocs., Dept. EM, 555 Paper Mill Rd., Box 9734, Newark, Del. 19711
Gulton Inds., SCD Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
D Jersey Specialty Co., Dept. EM, Box 248, Burgess Pl., Wayne, N.J. 07470
Lynn Elctrns. Corp., Dept. EM, 915 Pennsylvania Blvd., Feasterville, Pa. 19047
D Manhattan Elec. Cable Corp., Dept. EM, 1 Station Plaza, Rye, N.Y. 10580
Okonite Co., Dept. EM, Box 340, Ramsey, N.J. 07446
D Oneida Electronics Mfg., Dept. EM, POB 678, R.D. #3 Baldwin Ext., Meadville, Pa. 16335
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
DM Phelps Dodge Cable & Wire Co., Dept. EM, Box 391 Point St., Yonkers, N.Y. 10702
Santa Fe Textiles Inc., Dept. EM, 3151 W. Adams St., Santa Ana, Cal. 92704
DM Tensolite Co.,, Div. Carlisle Corp, Dept. EM, Old Post Rd., Rte. 9A, Buchanan, N.Y. 10511
M Thermax Wire Corp., Dept. EM, 32-02 Linden Pl., Flushing, N.Y. 11354
D Triangle PWC, Dept. EM, Box 711, New Brunswick, N.J. 08903
Wireflex Incorporated, Dept. EM, 502 Old Route 30 East, Bourbon, Ind. 46504

Wire, Flat Strip—See Cable, Flat

Wire, Glass Insulated

Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
D Belden Corp., Electronic Div., Dept. EM, Box 1327, Richmond, Ind. 47374 .. *
Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 ..... *
DM Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
DM Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 ..... p. 4592,4606
Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 ..... *
Philadelphia Insulated Wire Co. Inc., Dept. EM, 333 New Albany Rd., Moorestown, N.J. 08057 ..... p. 4633,4644,4649
Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245 p. 4656
TRW/Holyoke Wire & Cable, Dept. EM, 775 New Ludlow Rd., South Hadley, Mass. 01075 ..... *
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
D Birnbach Co., Inc., Dept. EM, 177 Hanse Ave., Freeport, N.Y. 11520
Boston Insulated Wire & Cable Co., Dept. EM, 65 Bay St., Dorchester, Mass. 02125
M Brand-Rex Co., Dept. EM, Box 498, Willimantic, Conn. 06226
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
M Galileo Electro-Optics Corp., Dept. EM, Galileo Pk., Sturbridge, Mass. 01518
M General Electric Co., Wire & Cable, Dept. EM, 1285 Boston Ave., Bridgeport, Conn. 06602
GTE Sylvania, Wilbur B. Driver Co Sub., Dept. EM, 1875 McCarter Hwy., Newark, N.J. 07104
D Manhattan Elec. Cable Corp., Dept. EM, 1 Station Plaza, Rye, N.Y. 10580
Tensolite Co.,, Div. Carlisle Corp, Dept. EM, Old Post Rd., Rte. 9A, Buchanan, N.Y. 10511
Wireflex Incorporated, Dept. EM, 502 Old Route 30 East, Bourbon, Ind. 46504

Wire, Guy

Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
D Columbia Elctrn. Cables, Dept. EM, 11 Cove St., New Bedford, Mass. 02744 *
Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 ..... *
D Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 ..... p. 4592
D Birnbach Co., Inc., Dept. EM, 177 Hanse Ave., Freeport, N.Y. 11520
D Carolina Steel & Wire Corp., Dept. EM, I-20 and S.C. 6, Lexington, S.C. 29072
D Channel Master Div. Avnet, Dept. EM, Rte. 209, Ellenville, N.Y. 12428
Copperweld Bimetallics, Div. Copperweld Corp., Dept. EM, Glassport, PA 15045
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
Jones & Laughlin Steel Corp, Dept. EM, 3 Gateway Ctr, Pittsburgh, PA 15263
Lance Inds., Dept. EM, P.O. Box 4156, Sylmar, Calif. 91342
Nat'l-Standard Co., Dept. EM, Niles, Mich. 49120
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D South River Metal Prods. Co., Dept. EM, P.O. Box 394, Matawan, N.J. 07747
D Unarco-Rohn, Div. Unarco Inds., Dept. EM, Box 2000, Peoria, Ill. 61656

Wire, Heater—See Cable, Heater

Wire, High-Temperature (Over 125 C)

DM Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
DM Belden Corp., Electronic Div., Dept. EM, Box 1327, Richmond, Ind. 47374 .. *
D Berk Tek, Inc., Dept. EM, Box 60, RD 1, Reading, Pa. 19607 ..... p. 4541
D Columbia Elctrn. Cables, Dept. EM, 11 Cove St., New Bedford, Mass. 02744 *
DM Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 ..... p. 4579,4581
DM Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
D Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 ..... p. 4592,4605,4606
M Electroweave, Inc., Dept. EM, 27 E. Foundry St., Central Falls, R.I. 02863 .. *
DM Markel Corp., Dept. EM, P.O. Box 572, Norristown, Pa. 19404 ..... p. 4611
National Wire & Cable Corp., Dept EEM, Svc Div., Dept. EM, 136 San Fernando Rd., Los Angeles, Cal. 90031 ..... *
Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 ..... *
Philadelphia Insulated Wire Co. Inc., Dept. EM, 333 New Albany Rd., Moorestown, N.J. 08057 ..... p. 4635-4637,4640,4641,4643-4645,4649
M Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 p. 4653
M Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245 p. 4656
TRW/Holyoke Wire & Cable, Dept. EM, 775 New Ludlow Rd., South Hadley, Mass. 01075 ..... *
M Woven Elctrns., Southern Weaving Co., Dept. EM, Box 189, Mauldin, S. C. 29662 ..... *
M ARI Inds., Inc., Dept. EM, 9000 King St., Franklin Pk., Ill. 60131
M Assembled Products Co., Dept. EM, Box 750, St. Albans, Vt. 05478
Atomergic Chemetals Corp Co., Dept. EM, 100 Fairchild Ave., Plainview, N.Y. 11803
D Baron Wire & Cable Corp., Dept. EM, 6019 W. Howard St., Chicago, Ill. 60648
DM Birnbach Co., Inc., Dept. EM, 177 Hanse Ave., Freeport, N.Y. 11520
Boston Insulated Wire & Cable Co., Dept. EM, 65 Bay St., Dorchester, Mass. 02125
DM Brand-Rex Co., Dept. EM, Box 498, Willimantic, Conn. 06226
DM Cimco Wire & Cable, Inc., Dept. EM, 250 W. Crescent Ave., Allendale, N.J. 07401
Cohn Corp., Sigmund, Dept. EM, 121 S. Columbus Ave., Mt. Vernon, N.Y. 10553
D Custom Cable Co., Dept. EM, 242 Butler, Westbury, N.Y. 11590
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
Essex Grp - Indl Wire Prods Div., Sub. United Tech, Dept. EM, 6235 S. Harlem Ave., Chicago, Ill 60638
M Galileo Electro-Optics Corp., Dept. EM, Galileo Pk., Sturbridge, Mass. 01518

M General Electric Co., Wire & Cable, Dept. EM, 1285 Boston Ave., Bridgeport, Conn. 06602
M Gore, W.L. & Assocs., Dept. EM, 555 Paper Mill Rd., Box 8734, Newark, Del. 19711
GTE Sylvania, Inc., Chem. & Metallurgical Div., Dept. EM, Hawes St., Towanda, Pa. 18848
GTE Sylvania, Wilbur B. Driver Co Sub., Dept. EM, 1875 McCarter Hwy., Newark, N.J. 07104
Gulton Inds., SCD Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
Hoskins Mfg. Co., Dept. EM, 4445 Lawton Ave., Detroit, Mich. 48208
International Wire Products Co., Dept. EM, 500 W. Main St., Wyckoff, N.J. 07481
Kentucky Electronics, Dept. EM, 1204 Ind'l Dr., Box 507, Owensboro, Ky. 42301
Leviton Mfg. Co., Inc., Dept. EM, 59-25 Little Neck Pkwy., Little Neck, N.Y. 11362
D Manhattan Elec. Cable Corp., Dept. EM, 1 Station Plaza, Rye, N.Y. 10580
D Pace Wire & Cable Corp., Dept. EM, 3590 Oceanside Rd., Oceanside, N.Y. 11572
Permaluster, Inc., Dept. EM, 1844 N. Keystone St., Burbank, Calif. 91504
M Phoenix Wire, Inc., Dept. EM, 100 Teflon Ave., S. Hero, Vt. 05486
Raychem Corp., Dept. EM, 300 Constitution Dr., Menlo Park, Cal. 94025
SermeTel Inc., Sub. Teleflex Inc., Dept. EM, 155 Limerick Rd., Limerick, Pa 19468
D Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
M Storm Products Co., Dept. EM, 112 S. Glasgow St., Inglewood, Cal. 90301
DM Tensolite Co.,, Div. Carlisle Corp, Dept. EM, Old Post Rd., Rte. 9A, Buchanan, N.Y. 10511
DM Thermax Wire Corp., Dept. EM, 32-02 Linden Pl., Flushing, N.Y. 11354
M Times Fiber Comm. Inc., Sub. Insilco Corp. Times Wire & Cable Div., Dept. EM, 358 Hall Ave., Wallingford, Conn. 06492
D Triangle PWC, Dept. EM, Box 711, New Brunswick, N.J. 08903
Wireflex Incorporated, Dept. EM, 502 Old Route 30 East, Bourbon, Ind. 46504

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M Alden Products Co, Dept. EM, 117 N Main St, Brockton, Mass. 02403 ..... *
Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
D Belden Corp., Electronic Div., Dept. EM, Box 1327, Richmond, Ind. 47374 .. *
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D Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
DM Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 ..... p. 4592,4595
M Electroweave, Inc., Dept. EM, 27 E. Foundry St., Central Falls, R.I. 02863 .. *
DM Markel Corp., Dept. EM, P.O. Box 572, Norristown, Pa. 19404 ..... *
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M Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 p. 4653
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DM Whitmor Wire & Cable, Dept. EM, 13161 Sherman Way Bldg. B, No. Hollywood, Cal. 91605 ..... *
DM Baron Wire & Cable Corp., Dept. EM, 6019 W. Howard St., Chicago, Ill. 60648
D Birnbach Co., Inc., Dept. EM, 177 Hanse Ave., Freeport, N.Y. 11520
Boston Insulated Wire & Cable Co., Dept. EM, 65 Bay St., Dorchester, Mass. 02125
M Brand-Rex Co., Dept. EM, Box 498, Willimantic, Conn. 06226
Chester Cable, Dept. EM, Oakland Ave., Chester, N.Y. 10918
DM Cimco Wire & Cable, Inc., Dept. EM, 250 W. Crescent Ave., Allendale, N.J. 07401
D Custom Cable Co., Dept. EM, 242 Butler, Westbury, N.Y. 11590
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
ENM, Dept. EM, 5350 Northwest Hwy., Chicago, Ill. 60630
M Galileo Electro-Optics Corp., Dept. EM, Galileo Pk., Sturbridge, Mass. 01518
D General Electric Co., Wire & Cable, Dept. EM, 1285 Boston Ave., Bridgeport, Conn. 06602
M Gore, W.L. & Assocs., Dept. EM, 555 Paper Mill Rd., Box 8734, Newark, Del. 19711
Gulton Inds., SCD Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
Leviton Mfg. Co., Inc., Dept. EM, 59-25 Little Neck Pkwy., Little Neck, N.Y. 11362
D Manhattan Elec. Cable Corp., Dept. EM, 1 Station Plaza, Rye, N.Y. 10580
Okonite Co., Dept. EM, Box 340, Ramsey, N.J. 07446
D Oneida Electronics Mfg., Dept. EM, POB 678, R.D. #3 Baldwin Ext., Meadville, Pa. 16335
DM Phelps Dodge Cable & Wire Co., Dept. EM, Box 391 Point St., Yonkers, N.Y. 10702
Raychem Corp., Dept. EM, 300 Constitution Dr., Menlo Park, Cal. 94025
M Reynolds Metals Co., Dept. EM, Box 27003, Richmond, VA. 23261
M Storm Products Co., Dept. EM, 112 S. Glasgow St., Inglewood, Cal. 90301
DM Tensolite Co.,, Div. Carlisle Corp, Dept. EM, Old Post Rd., Rte. 9A, Buchanan, N.Y. 10511
Times Fiber Comm. Inc., Sub. Insilco Corp. Times Wire & Cable Div., Dept. EM, 358 Hall Ave., Wallingford, Conn. 06492
Wireflex Incorporated, Dept. EM, 502 Old Route 30 East, Bourbon, Ind. 46504

Wire, Hookup (All Types)

D Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
DM Belden Corp., Electronic Div., Dept. EM, Box 1327, Richmond, Ind. 47374 .. *
DM Berk Tek, Inc., Dept. EM, Box 60, RD 1, Reading, Pa. 19607 ..... p. 4540
D Columbia Elctrn. Cables, Dept. EM, 11 Cove St., New Bedford, Mass. 02744 p. 4550
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DM Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 ..... p. 4592,4594-4596,4601,4604-4607
D GC Electronics, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101 ..... *
ITT Pomona Electronics, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766 ..... p. 2022
DM Markel Corp., Dept. EM, P.O. Box 572, Norristown, Pa. 19404 ..... *
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DM Spectra-Strip Corp., Dept. EM, 7100 Lampson Ave., Box 415, Garden Grove, Cal. 92642 ..... p. 4655
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DM Whitmor Wire & Cable, Dept. EM, 13161 Sherman Way Bldg. B, No. Hollywood, Cal. 91605 ..... *
M Woven Elctrns., Southern Weaving Co., Dept. EM, Box 189, Mauldin, S. C. 29662 ..... *
M American Electric Cable Co., Dept. EM, 181 Appleton St., Holyoke, Mass. 01040
DM Baron Wire & Cable Corp., Dept. EM, 6019 W. Howard St., Chicago, Ill. 60648
DM Birnbach Co., Inc., Dept. EM, 177 Hanse Ave., Freeport, N.Y. 11520
Boston Insulated Wire & Cable Co., Dept. EM, 65 Bay St., Dorchester, Mass. 02125
DM Brand-Rex Co., Dept. EM, Box 498, Willimantic, Conn. 06226
Calvert Elctrns., Inc., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010
Chester Cable, Dept. EM, Oakland Ave., Chester, N.Y. 10918
DM Cimco Wire & Cable, Inc., Dept. EM, 250 W. Crescent Ave., Allendale, N.J. 07401
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
ENM, Dept. EM, 5350 Northwest Hwy., Chicago, Ill. 60630
D Essex Grp - Indl Wire Prods Div., Sub. United Tech, Dept. EM, 6235 S. Harlem Ave., Chicago, Ill 60638
Essex Grp, Power Conductor Div., Dept. EM, 2601 S. Adams, Marion, Ind. 46953
M Galileo Electro-Optics Corp., Dept. EM, Galileo Pk., Sturbridge, Mass. 01518
M General Electric Co., Wire & Cable, Dept. EM, 1285 Boston Ave., Bridgeport, Conn. 06602
M Gore, W.L. & Assocs., Dept. EM, 555 Paper Mill Rd., Box 8734, Newark, Del. 19711
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
M Lynn Elctrns. Corp., Dept. EM, 915 Pennsylvania Blvd., Feasterville, Pa. 19047
D Norelcom Electronics, Dept. EM, 200 Allen Blvd., Farmingdale, N.Y. 11735
D On-Guard Corp. of America, Dept. EM, 350 Gotham Pkwy., Carlstadt, NJ 07072
D Oneida Electronics Mfg., Dept. EM, POB 678, R.D. #3 Baldwin Ext., Meadville, Pa. 16335
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
M Phoenix Wire, Inc., Dept. EM, 100 Teflon Ave., S. Hero, Vt. 05486
Raychem Corp., Dept. EM, 300 Constitution Dr., Menlo Park, Cal. 94025
M Rockland Insulated Wire & Cable, Dept. EM, 87 Broadway, Haverstraw, N.Y. 10927
M Sag Harbor Inds., Inc., Dept. EM, Bayview St., Sag Harbor, N.Y. 11963
DM Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
M Storm Products Co., Dept. EM, 112 S. Glasgow St., Inglewood, Cal. 90301
D , Superior Cable Corp, Dept. EM, Box 489, Hickory, N.C. 28601
DM Tensolite Co.,, Div. Carlisle Corp, Dept. EM, Old Post Rd., Rte. 9A, Buchanan, N.Y. 10511
DM Thermax Wire Corp., Dept. EM, 32-02 Linden Pl., Flushing, N.Y. 11354
Thermo Elec. Co., Inc., Dept. EM, 109 Fifth St., Saddle Brook, N.J. 07662
D Triangle PWC, Dept. EM, Box 711, New Brunswick, N.J. 08903
Victor Electric Wire & Cable, Dept. EM, 618 Main St., Coventry, R.I. 02816
Wireflex Incorporated, Dept. EM, 502 Old Route 30 East, Bourbon, Ind. 46504
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Wire, Irradiated

DM Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
D Belden Corp., Electronic Div., Dept. EM, Box 1327, Richmond, Ind. 47374 .. *
Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 ..... p. 4577,4579
DM Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ..... *
DM Dearborn Wire & Cable Co., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018 ..... p. 4592,4595
M Electroweave, Inc., Dept. EM, 27 E. Foundry St., Central Falls, R.I. 02863 ..
D Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 .....
Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245
M Woven Elctrns., Southern Weaving Co., Dept. EM, Box 189, Mauldin, S. C. 29662 .....
M American Electric Cable Co., Dept. EM, 181 Appleton St., Holyoke, Mass. 01040
Boston Insulated Wire & Cable Co., Dept. EM, 65 Bay St., Dorchester, Mass. 02125
D Brand-Rex Co., Dept. EM, Box 498, Willimantic, Conn. 06226
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
Essex Grp - Indl Wire Prods Div., Sub. United Tech, Dept. EM, 6235 S. Harlem Ave., Chicago, Ill 60638
Lynn Elctrns. Corp., Dept. EM, 915 Pennsylvania Blvd., Feasterville, Pa. 19047
D Manhattan Elec. Cable Corp., Dept. EM, 1 Station Plaza, Rye, N.Y. 10580
Permaluster, Inc., Dept. EM, 1844 N. Keystone St., Burbank, Calif. 91504
Raychem Corp., Dept. EM, 300 Constitution Dr., Menlo Park, Cal. 94025
M Storm Products Co., Dept. EM, 112 S. Glasgow St., Inglewood, Cal. 90301

Wire, Lead-In & Ground

D Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 ...

D **Belden Corp., Electronic Div., Dept. EM, Box 1327, Richmond, Ind. 47374 .. ***
D **Columbia Elctrn. Cables, Dept. EM, 11 Cove St., New Bedford, Mass. 02744 ***
D **Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 ***
D **Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ***
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M **Electroweave, Inc., Dept. EM, 27 E. Foundry St., Central Falls, R.I. 02863 .. ***
Markel Corp., Dept. EM, P.O. Box 572, Norristown, Pa. 19404 *
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D **Rowe Industries, Inc., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612 ..... ***
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M **Woven Elctrns., Southern Weaving Co., Dept. EM, Box 189, Mauldin, S. C. 29662 ***
M American Electric Cable Co., Dept. EM, 181 Appleton St., Holyoke, Mass. 01040
D Baron Wire & Cable Corp., Dept. EM, 6019 W. Howard St., Chicago, Ill. 60648
D Birnbach Co., Inc., Dept. EM, 177 Hanse Ave., Freeport, N.Y. 11520
Boston Insulated Wire & Cable Co., Dept. EM, 65 Bay St., Dorchester, Mass. 02125
DM Brand-Rex Co., Dept. EM, Box 498, Willimantic, Conn. 06226
D Channel Master Div. Avnet, Dept. EM, Rte. 209, Ellenville, N.Y. 12428
Chester Cable, Dept. EM, Oakland Ave., Chester, N.Y. 10918
Copperweld Bimetallics, Div. Copperweld Corp., Dept. EM, Glassport, PA 15045
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
ENM, Dept. EM, 5350 Northwest Hwy., Chicago, Ill. 60630
Essex Grp - Indl Wire Prods Div., Sub. United Tech, Dept. EM, 6235 S. Harlem Ave., Chicago, Ill 60638
Essex Grp, Power Conductor Div., Dept. EM, 2601 S. Adams, Marion, Ind. 46953
General Electric Co., Lamp Components Sls. Oper., Dept. EM, 21800 Tungsten Rd., Cleveland, Ohio 44117
D General Electric Co., Wire & Cable, Dept. EM, 1285 Boston Ave., Bridgeport, Conn. 06602
Lance Inds., Dept. EM, P.O. Box 4156, Sylmar, Calif. 91342
Lynn Elctrns. Corp., Dept. EM, 915 Pennsylvania Blvd., Feasterville, Pa. 19047
D Manhattan Elec. Cable Corp., Dept. EM, 1 Station Plaza, Rye, N.Y. 10580
D Pace Wire & Cable Corp., Dept. EM, 3590 Oceanside Rd., Oceanside, N.Y. 11572
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
D , Superior Cable Corp, Dept. EM, Box 489, Hickory, N.C. 28601
Tensolite Co.,, Div. Carlisle Corp, Dept. EM, Old Post Rd., Rte. 9A, Buchanan, N.Y. 10511
D Unarco-Rohn, Div. Unarco Inds., Dept. EM, Box 2000, Peoria, Ill. 61656
Victor Electric Wire & Cable, Dept. EM, 618 Main St., Coventry, R.I. 02816
Wireflex Incorporated, Dept. EM, 502 Old Route 30 East, Bourbon, Ind. 46504

Wire, Litz

Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
D **Belden Corp., Electronic Div., Dept. EM, Box 1327, Richmond, Ind. 47374 .. ***
Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 *
Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 *
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Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245 p. 4656
ENM, Dept. EM, 5350 Northwest Hwy., Chicago, Ill. 60630
Tensolite Co.,, Div. Carlisle Corp, Dept. EM, Old Post Rd., Rte. 9A, Buchanan, N.Y. 10511

Wire, Magnet

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Caddel-Burns Mfg. Co., Inc., Dept. EM, 40 E. 2nd St., Mineola, N. Y. 11501 *
D **Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 ..... p. 4582,4583**
M **Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ***
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United Wiring & Mfg. Co., Dept. EM, 2608 Electonic La. #404, Dallas, Tex. 75220 *
M Birnbach Co., Inc., Dept. EM, 177 Hanse Ave., Freeport, N.Y. 11520
General Electric Co., Wire & Cable, Dept. EM, 1285 Boston Ave., Bridgeport, Conn. 06602
New Haven Wire & Cable, Dept. EM, Hwy. 14E, New Haven, IN 46774
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
Permaluster, Inc., Dept. EM, 1844 N. Keystone St., Burbank, Calif. 91504
Phelps Dodge Magnet Wire Co., Dept. EM, 1302 E. Creighton Ave., Ft. Wayne, Ind. 46803
M Phoenix Wire, Inc., Dept. EM, 100 Teflon Ave., S. Hero, Vt. 05486
D Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
Texas Instruments Control Prods. Div., Dept. EM, 34 Forrest St., Attleboro, Mass. 02703
United Mineral & Chem. Corp., Dept. EM, 129 Hudson St., New York, N.Y. 10013

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Datak Corp., Dept. EM, 65 Seventy-First St., Guttenberg, N.J. 07093 *
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D **Panduit Corp., Dept. EM, 17301 Ridgeland Ave., Tinley Park, Ill. 60477 p. 4629,4631**
Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 p. 2123
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ***
Antex Div., M M Newman Corp., Dept. EM, Marblehead, Mass. 01945
Bishop Graphics, Dept. EM, 5388 Sterling Center, Westlake Village, Cal. 91361
M Brady Co., W. H., Industrial Prods. Div., Dept. EM, 2221 W. Camden Rd. Box 2131, Milwaukee, Wis. 53201
DM Cole-Flex Corp., Dept. EM, 91 Cabot St., W. Babylon, N.Y. 11704
Conrac Corp., Machine Tool Div., Dept. EM, 9200 Bolsa Ave., Westminister, Cal. 92683
DM Electrovert, Dept. EM, 86 Hartford Ave., Mt. Vernon, N.Y. 10553
ENM, Dept. EM, 5350 Northwest Hwy., Chicago, Ill. 60630
M Geyer Systems, Inc., Dept. EM, 1917 Green Spring Dr., Timonium, Md. 21903
D Ideal Industries Inc., Dept. EM, 4450 Becker Pl., Sycamore, Ill. 60178
M Manger Elec. Co., Inc., Dept. EM, W. Henry St., Stamford, Conn. 06902
M Markem Corp., Dept. EM, 1000 Congress St., Keene, NH 03431
Matthews Intl Corp., Marking Systems Div., Dept. EM, 6515 Penn. Ave., Pittsburgh, Pa. 15206
Nat'l. Band & Tag, Dept. EM, 721 York St., Newport, Ky. 41072
D Penn Fibre & Specialty, Dept. EM, 2020 E. Westmoreland St., Phila., Pa. 19134
Raychem Corp., Dept. EM, 300 Constitution Dr., Menlo Park, Cal. 94025
M Storm Products Co., Dept. EM, 112 S. Glasgow St., Inglewood, Cal. 90301
D Weidmuller Terminations, Inc., Dept. EM, 4326 Eubank Rd., Richmond, Va. 23231
D Zippertubing Co., Dept. EM, 13000 S. Broadway, Los Angeles, Cal. 90061

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Alpha Wire Corp., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207 .... *
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D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462 ***
D **Waldom Electronics, Inc., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629 .... ***
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
D Gould Inc., Electrical Comps. Div., Dept. EM, 123 Smith St., E. Farmingdale, N.Y. 11735
Holub Industries, Dept. EM, 413 DeKalb Ave., Sycamore, Ill. 60178
D Ideal Industries Inc., Dept. EM, 4450 Becker Pl., Sycamore, Ill. 60178
3M Co., Indl Elect Prods. Div., Dept. EM, 3M Center, St. Paul, Minn. 55101
D Oneida Electronics Mfg., Dept. EM, POB 678, R.D. #3 Baldwin Ext., Meadville, Pa. 16335
D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016

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Wire, Plated (All Types)

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Consolidated Wire & Assoc. Corps., Dept. EM, 1635 S. Clinton St., Chicago, Ill. 60616 .....p. 4579,4581,4583,4584
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M Advanced Materials Systems, Dept. EM, 72 Elm St. N., Atteboro, Mass. 02703
M Consolidated Refining Co. Inc., Dept. EM, 116 Hoyt Ave., Mamaroneck, N.Y. 10543
GTE Sylvania, Tech Prods Div, Dept. EM, 816 Lexington Ave., Warren, Pa 16365
International Wire Products Co., Dept. EM, 500 W. Main St., Wyckoff, N.J. 07481
Kentucky Electronics, Dept. EM, 1204 Indl Dr., Box 507, Owensboro, Ky. 42301
Nesor Alloy Corp., Dept. EM, 666 Passaic Ave., W. Caldwell, N.J. 07006
Philips Elmet Corp., Dept. EM, 1560 Lisbon Rd., Lewiston, Me. 04240

Wire, Radiation-Resistant

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D **Daburn Electronics & Cable Corp., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458 ***
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DM **Markel Corp., Dept. EM, P.O. Box 572, Norristown, Pa. 19404 ***
DM **Metex Corp., Dept. EM, 970 New Durham Rd., Edison, N.J. 08817 ***
Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245 p. 4656
TRW/Holyoke Wire & Cable, Dept. EM, 775 New Ludlow Rd., South Hadley, Mass. 01075 *
M ARI Inds., Inc., Dept. EM, 9000 King St., Franklin Pk., Ill. 60131
Boston Insulated Wire & Cable Co., Dept. EM, 65 Bay St., Dorchester, Mass. 02125
ENM, Dept. EM, 5350 Northwest Hwy., Chicago, Ill. 60630

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M Galileo Electro-Optics Corp., Dept. EM, Galileo Pk., Sturbridge, Mass. 01518
D General Electric Co., Wire & Cable, Dept. EM, 1285 Boston Ave., Bridgeport, Conn. 06602
M Gore, W.L. & Assocs., Dept. EM, 555 Paper Mill Rd., Box 8734, Newark, Del. 19711
Gulton Inds., SCD Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
D Manhattan Elec. Cable Corp., Dept. EM, 1 Station Plaza, Rye, N.Y. 10580
Okonite Co., Dept. EM, Box 340, Ramsey, N.J. 07446
Permaluster, Inc., Dept. EM, 1844 N. Keystone St., Burbank, Calif. 91504
Raychem Corp., Dept. EM, 300 Constitution Dr., Menlo Park, Cal. 94025
Tensolite Co.,, Div. Carlisle Corp, Dept. EM, Old Post Rd., Rte. 9A, Buchanan, N.Y. 10511
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Times Fiber Comm. Inc,, Sub. Insilco Corp. Times Wire & Cable Div., Dept. EM, 358 Hall Ave., Wallingford, Conn. 06492

Wire, Resistance

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Cox & Co., Inc., Dept. EM, 215 Park Ave., S., New York, N.Y. 10003
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D Manhattan Elec. Cable Corp., Dept. EM, 1 Station Plaza, Rye, N.Y. 10580
Okonite Co., Dept. EM, Box 340, Ramsey, N.J. 07446
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Wireflex Incorporated, Dept. EM, 502 Old Route 30 East, Bourbon, Ind. 46504

Wire, Resistance Thermometer

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Wire, Ribbon

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D 3M Co., Electronic Prods Div., Dept. EM, 3M Center, St. Paul, Minn. 55101 *
DM Spectra-Strip Corp., Dept. EM, 7100 Lampson Ave., Box 415, Garden Grove, Cal. 92642 ..... *
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American Electric Cable Co., Dept. EM, 181 Appleton St., Holyoke, Mass. 01040
DM Associated Engrg. & Mfg. Corp., Dept. EM, 546 Valley Rd., Upper Montclair, N.J. 07043
Autosplice/Dv Gen Staple, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010
Bishop Graphics, Dept. EM, 5388 Sterling Center, Westlake Village, Cal. 91361
Chester Cable, Dept. EM, Oakland Ave., Chester, N.Y. 10918
Circuit Assembly Corp., Dept. EM, 3169 Red Hill Ave., Costa Mesa, Cal. 92626
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M Consolidated Refining Co. Inc., Dept. EM, 116 Hoyt Ave., Mamaroneck, N.Y. 10543
D Custom Cable Co., Dept. EM, 242 Butler, Westbury, N.Y. 11590
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D Stanford Applied Engrg, Dept. EM, 340 Martin Ave., Santa Clara, Cal. 95050
D Workman Electronic Prods., Inc., Dept. EM, Box 3828, Sarasota, Fla. 33578

Wire, Semiconductor Lead

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M Art Wire/Doduco, Dept. EM, 9 Wing Dr., Cedar Knolls, N.J. 07927
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General Electric Co., Lamp Components Sls. Oper., Dept. EM, 21800 Tungsten Rd., Cleveland, Ohio 44117
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International Wire Products Co., Dept. EM, 500 W. Main St., Wyckoff, N.J. 07481
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Nesor Alloy Corp., Dept. EM, 666 Passaic Ave., W. Caldwell, N.J. 07006
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Wire, Shielded

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M Galileo Electro-Optics Corp., Dept. EM, Galileo Pk., Sturbridge, Mass. 01518
M General Electric Co., Wire & Cable, Dept. EM, 1285 Boston Ave., Bridgeport, Conn. 06602
M Gore, W.L. & Assocs., Dept. EM, 555 Paper Mill Rd., Box 8734, Newark, Del. 19711
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High Speed Hammer Co., Inc., Dept. EM, 313 Norton St., Rochester, N.Y. 14621
Ideal Industries Inc., Dept. EM, 4450 Becker Pl., Sycamore, Ill. 60178
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
Ripley Co., Inc., Dept. EM, 46 Nooks Hill Road, Cromwell, Conn. 06416
Tech. Devices Co., Dept. EM, 11250 Playa Ct., Culver City, Calif. 90230

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M AMP Special Industries, Dept. EM, Valley Forge, Pa. 19482
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ITT Cannon/ETC Terminal Products, Dept. EM, 29000 Aurora Rd., Solon, Ohio 44139
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D Klein Tools, Inc, Dept. EM, 7200 McCormick Rd., Chicago, Ill. 60645
D Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
D Micro Electronic Systems, Inc., Dept. EM, 8 Kevin Drive, Danbury, Conn. 06810
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Winegard Co., Dept. EM, 3000 Kirkwood St., Burlington, Iowa 52601
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Wire Strippers, Thermal

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Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
Meisei Corp., Dept. EM, 2226 Stoner Ave., Los Angeles, Cal. 90064
Pace Inc., Dept. EM, 9329 Fraser Ave., Silver Spring, Md. 20910
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D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016
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M Galileo Electro-Optics Corp., Dept. EM, Galileo Pk., Sturbridge, Mass. 01518
M Gore, W.L. & Assocs., Dept. EM, 555 Paper Mill Rd., Box 8734, Newark, Del. 19711
D Manhattan Elec. Cable Corp., Dept. EM, 1 Station Plaza, Rye, N.Y. 10580
M Phoenix Wire, Inc., Dept. EM, 100 Teflon Ave., S. Hero, Vt. 05486
DM Stancor/Essex Grp, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618
M Storm Products Co., Dept. EM, 112 S. Glasgow St., Inglewood, Cal. 90301
DM Tensolite Co.,, Div. Carlisle Corp, Dept. EM, Old Post Rd., Rte. 9A, Buchanan, N.Y. 10511
DM Thermax Wire Corp., Dept. EM, 32-02 Linden Pl., Flushing, N.Y. 11354
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Leeds & Northrup Co., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454 *
DM **Markel Corp., Dept. EM, P.O. Box 572, Norristown, Pa. 19404** ..... *
Omega Engrg., Inc., Dept. EM, Box 4047, Stamford, Conn. 06907 ..... p. 4284
M **Standard Wire & Cable, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245** p. 4656
TRW/Holyoke Wire & Cable, Dept. EM, 775 New Ludlow Rd., South Hadley, Mass. 01075 ..... *
D Alnor Instrument Co., Dept. EM, 7301 N. Caldwell Ave., Niles, Ill. 60648
D Amperex Electronic Corp., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802
M ARI Inds., Inc., Dept. EM, 9000 King St., Franklin Pk., Ill. 60131
Bailey Instrs., Inc., Dept. EM, 515 Victor St., Saddle Brook, N.J. 07662
D Baron Wire & Cable Corp., Dept. EM, 6019 W. Howard St., Chicago, Ill. 60648
Boston Insulated Wire & Cable Co., Dept. EM, 65 Bay St., Dorchester, Mass. 02125
Bristol Div. Acco, Dept. EM, 40 Bristol St., Waterbury, Conn. 06720
Chester Cable, Dept. EM, Oakland Ave., Chester, N.Y. 10918
Cimco Wire & Cable, Inc., Dept. EM, 250 W. Crescent Ave., Allendale, N.J. 07401
Cohn Corp., Sigmund, Dept. EM, 121 S. Columbus Ave., Mt. Vernon, N.Y. 10553
M Consolidated Refining Co. Inc., Dept. EM, 116 Hoyt Ave., Mamaroneck, N.Y. 10543
D Custom Cable Co., Dept. EM, 242 Butler, Westbury, N.Y. 11590
D Degussa Corporation, Metals Div., Dept. EM, Route 46 & Hollister Rd., Teterboro, NJ 07608
Delco Wire & Cable, Inc., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007
Engelhard Minerals & Chem., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830
M Galileo Electro-Optics Corp., Dept. EM, Galileo Pk., Sturbridge, Mass. 01518
General Electric Co., Wire & Cable, Dept. EM, 1285 Boston Ave., Bridgeport, Conn. 06602
M Gore, W.L. & Assocs., Dept. EM, 555 Paper Mill Rd., Box 8734, Newark, Del. 19711
GTE Sylvania, Wilbur B. Driver Co Sub., Dept. EM, 1875 McCarter Hwy., Newark, N.J. 07104
Gulton Inds., SCD Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627
Honeywell, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034
Hoskins Mfg. Co., Dept. EM, 4445 Lawton Ave., Detroit, Mich. 48208
International Wire Products Co., Dept. EM, 500 W. Main St., Wyckoff, N.J. 07481
Lynn Elctrns. Corp., Dept. EM, 915 Pennsylvania Blvd., Feasterville, Pa. 19047
Marlin Manufacturing Corp., Dept. EM, 12404 Triskett Rd., Cleveland, Ohio 44111
NAN MAC, Dept. EM, 9 Mayhew St., Framingham, Mass. 01701
Okonite Co., Dept. EM, Box 340, Ramsey, N.J. 07446
M Santa Fe Textiles Inc., Dept. EM, 3151 W. Adams St., Santa Ana, Cal. 92704
Tensolite Co.,, Div. Carlisle Corp, Dept. EM, Old Post Rd., Rte. 9A, Buchanan, N.Y. 10511
D Thermax Wire Corp., Dept. EM, 32-02 Linden Pl., Flushing, N.Y. 11354
Thermo Elec. Co., Inc., Dept. EM, 109 Fifth St., Saddle Brook, N.J. 07662
Victor Electric Wire & Cable, Dept. EM, 618 Main St., Coventry, R.I. 02816
D West Instrs, Gulton Inds, M. C. S. Div., Dept. EM, Gulton Indl Pk, E. Greenwich, RI 02818

Wire, Transmission—See Cable, Transmission Line

Wire, Twisted Pair—See Cable, Twisted Pair

Wire Twisters, Automatic

D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
United Wiring & Mfg. Co., Dept. EM, 2608 Electonic La. #404, Dallas, Tex. 75220 ..... *
D Eraser Co., Dept. EM, Box 1342, Syracuse, N.Y. 13201
Gardner-Denver Co., Pneutronics Div., Dept. EM, 1333 Fulton St., Grand Haven, Mich. 49417
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006

Wire Twisters, Hand Operated

D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
United Wiring & Mfg. Co., Dept. EM, 2608 Electonic La. #404, Dallas, Tex. 75220 ..... *
Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
D Klein Tools, Inc, Dept. EM, 7200 McCormick Rd., Chicago, Ill. 60645
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
National Camera Inc., Dept. EM, 2000 W. Union Ave., Englewood, Colo. 80110
Snap-On-Tools, Dept. EM, 8192-A 28th Ave., Kenosha, Wisc. 53140
D Storm Products Co., Dept. EM, 112 S. Glasgow St., Inglewood, Cal. 90301

Wire Ways

D **Panduit Corp., Dept. EM, 17301 Ridgeland Ave., Tinley Park, Ill. 60477** ..... *
M Hybricon Corp., Dept. EM, 410 Crest Rd., Litteton, Mass. 01460
ITT Cannon/ETC Terminal Products, Dept. EM, 29000 Aurora Rd., Solon, Ohio 44139

Wiring Panels & Boards, Computer—See Boards, Programming

Work Positioners, Circuit Board & Chassis—See Holders, Circuit Board; Jigs

Wrenches

D **Channellock, Inc., Dept. EM, 1306 S. Main St., Meadville, Pa. 16335** ..... p. 4287
D **Clare & Co., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645** ..... *
Smith Inc., Herman H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207 *
D **Techni-Tool, Inc., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462** ..... *
D Adtool Corp., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8
DM Allen Mfg. Co., Dept. EM, 22 E. Dudley Town Rd., Bloomfield, Conn. 06002
DM Bondhus Corporation, Dept. EM, Monticello, Minn 55362
Desco Mfg. Co., Dept. EM, 1530 Flower St., Glendale, Cal. 91201
Dresser Industries, Dept. EM, 1505 Elm St., Dallas, Tex. 75201
Emporium Specialties Co., Inc., Dept. EM, Box 65, Austin, Pa. 16720
D Erikson Specialized Tool Co., Dept. EM, Box 424, Pico-Rivera, Cal. 90660
Gardner-Denver Co., Pneutronics Div., Dept. EM, 1333 Fulton St., Grand Haven, Mich. 49417
D Jonard Industries Corp., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707
M Kawecki Berylco Inds., Inc., Dept. EM, PO Box 1462, Reading, PA 19603
D Klein Tools, Inc, Dept. EM, 7200 McCormick Rd., Chicago, Ill. 60645
M MacDonald & Co., Dept. EM, 213 S. Brand Blvd., Glendale, Calif. 91204
Mann, Henry Inc., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006
D Marshall Industries, Hunter Tools, Dept. EM, 9674 Telstar Ave., El Monte, Cal. 91731
D Moody Tools, Inc., Dept. EM, 1 Culver St., Providence, R.I. 02905
D Neuses, Inc. (P.K.), Dept. EM, 1401 Rohlwing Rd., Rolling Meadows, Ill. 60008
OTC Div Owatonna Tool Co, Dept. EM, 395 Eisenhower Dr., Owatonna, Minn. 55060
D Raymond Engrg. Inc., Dept. EM, 217 Smith St., Middletown, Conn. 06457
Snap-On-Tools, Dept. EM, 8192-A 28th Ave., Kenosha, Wisc. 53140
D T & B/Thomas & Betts, Dept. EM, 36 Butler St., Elizabeth, N.J. 07207

X-Ray Inspection Equipment

Hewlett-Packard Co., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304 ..... *
Victoreen, Inc., Dept. EM, 10101 Woodland Ave., Cleveland, Ohio 44104 ..... *
DM Addelco Corp., Advanced Dev. Elctrns. Div., Dept. EM, 56 Pickering St., Needham, Mass. 02192
D Bendix Corp., Aerospace Sys. Div., Dept. EM, 3621 S. State Rd., Ann Arbor, Mich. 48107
Eastern Delta Corp., Dept. EM, 29-09 S. Broadway, Fair Lawn, N.J. 07410
D Gagne Assocs., Inc., Dept. EM, 1080 Chenango St., Dept. 3EE-27, Binghamton, N.Y. 13901
M Harshaw Chemical Co., A Kenanee Industry, Dept. EM, 6801 Cochran Rd., Solon Ohio 44139
High Voltage Engrg. Corp., Dept. EM, S. Bedford St., Burlington, Mass. 01803
Magnaflux Corp. , Dept. EM, 7328 W. Lawrence Ave., Chicago, Ill 60656
Nuclear Resch. Corp., Dept. EM, 1105 Indl. Hwy., Southampton, Pa. 18966
Panametrics Inc., Dept. EM, 221 Cresent St., Waltham, Mass. 02154
Radiation Dynamics, Inc., Dept. EM, 316 S. Service Rd., Melville, N.Y. 11746
D Spatial Data Systems, Inc., Dept. EM, P.O. Box 249 508 S. Fairview, Goleta, Ca 93017
Varian Assocs., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303

X-Y Axis Tables—See Simulators, Motion

Yokes, Deflection, Oscilloscope

Inter-Tech. Grp., Inc., Dept. EM, Box 23, Irvington, N.Y. 10533 .....
Stackpole Carbon Co., Electronic Comps. Div./Soft Ferrites/Special Purpose Resistors, Dept. EM, St. Mary's, Pa. 15857 .....
Syntronic Instruments Inc., Dept. EM, 100 Industrial Rd., Addison, Ill. 6010

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DM **Thordarson Meissner, Electronic Ctr., Dept. EM, Mt. Carmel, Ill. 62863** ..... *
D **Triad-Utrad, Distr Svcs., Dept. EM, 305 N. Briant St., Huntington, Ind. 46750** *
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D Pan American Trade Development Corp., Dept. EM, 2 Park Ave., New York, N.Y. 10016

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Stackpole Carbon Co., Electronic Comps. Div./Soft Ferrites/Special Purpose Resistors, Dept. EM, St. Mary's, Pa. 15857 ..... *
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Ferranti Elec., Dept. EM, East Bethpage Rd., Plainview, N.Y. 11803
GTE Sylvania Inc., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154
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Yokes, Deflection, TV Camera

Panasonic, Ind'l. Elctrn. Comps., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094 ..... *
Stackpole Carbon Co., Electronic Comps. Div./Soft Ferrites/Special Purpose Resistors, Dept. EM, St. Mary's, Pa. 15857 ..... *
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M Display Components Inc., Dept. EM, 550 Newton Rd, Box 488, Littleton, Mass. 01460
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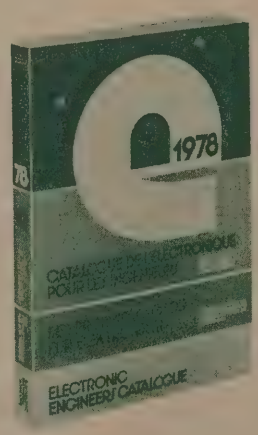

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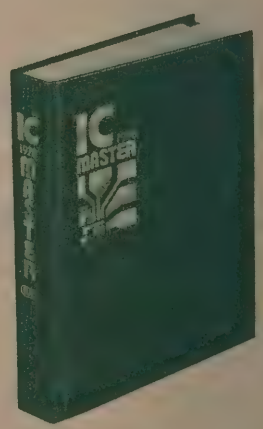

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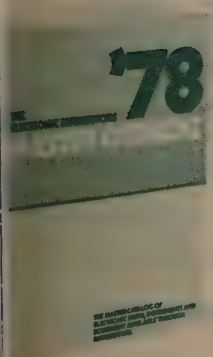

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All manufacturers are listed alphabetically. Each listing contains complete address and phone numbers of main offices and key personnel, branch offices, local representatives and local distributors.

Bold face listings indicate manufacturers who have information in this edition. Their catalog page numbers are included.

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CORP, Dept. EM, POB 1; Methuen, Mass 01844; : 617-373-3769; FSC No.: 04 26 3109-1

les Manager: A. L. Clay

cal Sales Offices & Reps.
Pasadena, Advanced Techniques 213-681-1093
Merrimack, Mech-Tron Co. 603-424-5300
Long Branch, Mer-Mon Elctrn. Instrumentation 201-229-3172

D ENGRG, INC., Dept. EM, 30 Cook Ct., Laconia, 1. 03246, Tel: 603-524-4443; FSC No.: 30161; Empl.:) ..... p. 3919

les Manager: P. Johnson

cal Sales Offices & Reps.
Huntsville, BJR Research & Mfg. Reps. 205-881-3569
Mountain View, Shaw-Tech 415-961-4775
Hallandale, Bairstow Assocs..... 305-927-2421
ss Melrose, P. Johnson 617-665-0666
:h Jackson, W. Scroggs 517-750-1170
n Brainerd, M. Johnson 218-963-7875
Moorestown, L. E. Brown Assocs. 609-234-0382
Baldwin, W. Jay Assocs. 212-229-0150
Rochester, Lloyd Hart Assocs.... 716-244-3253
o Cincinnati, F. E. Kahsar Sls..... 513-471-9011
o Hudson, F. E. Kahsar Sls. 216-653-6808
: Plano, K&H Sls. Co. 214-423-6520

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ABACUS CONTROLS INC., Dept. EM, 89 Redington Rd., Somerville, N.J. 08876, Tel: 201-526-6010; FSC No.: 54241; Empl.: 25 ..... p. 3163

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Ariz Scottsdale, RMH Assoc 602-947-4647
Cal Mountain View, Energy Devices 415-969-0330
Cal Santa Ana, J. Franek Co..... 714-832-0290
Tex Dallas, True Technology..... 214-691-7870
Exp: Rahway, REA Intl. Ltd. 201-382-7100

ABBOTT SCREW & MFG. CO., Dept. EM, 6525 N. Clark St., Chicago, Ill. 60626, Tel: 312-761-8400; Empl.: 161

ABBOTT TRANSISTOR LABS., Industrial Div., Dept. EM, 5200 W. Jefferson Blvd., Los Angeles, Cal. 90016, Tel: 213-930-1040, Telex: 69-1398; Empl.: 14 p. 3150-3154

Sales Manager: A. Hilbert Dir. Mktg.

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Mass Burlington, Dynamic Sls. of New England 617-273-1199
NJ Fort Lee, Abbott Transistors 201-224-6900
Tex Dallas, Data Aids Assocs. 214-620-1551
Tex Houston, Data Aids Assocs. 713-862-6685

ABBOTT TRANSISTOR LABS, Power Supply Div., Dept. EM, 5200 W. Jefferson Blvd., Los Angeles, Cal. 90016, Tel: 213-936-8185, Telex: 69-1398; FSC No.: 15755; Empl.: 210 ..... p. 3150,3155-3162

Sales Manager: Jim Bell

Refer to Abbott Transistor Labs. Industrial Div. for sales office information.

ABBOTT TRANSISTOR LABS., Transformer Div., Dept. EM, 639 So. Glenwood Pl., Burbank, Cal. 91506, Tel: 213-841-3630, Telex: 69-6282; Empl.: 30 p. 4325-4329

Sales Manager: W. Lovett

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ACCO, BRISTOL DIV, See Bristol Div, Acco

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Sales Manager: J.B. Snook

ACCUPROBE, INC., Dept. EM, 1 Harrison Ave, Box 1044, Salem, Mass 01970, Tel: 617-745-7878

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ACCURATE INSTRUMENT CO., Dept. EM, Box No. 925, Westbury, N.Y. 11590, Tel: 516-938-9262; Empl.: 12

Sales Manager: M. Scott

ACCURIDE, Div. Standard Precision, Dept. EM, 12311 S. Shoemaker, Santa Fe Springs, Cal. 90670, Tel: 213-944-6236, TWX: 910-586-1632

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Cal	Santa Clara, Nova-Tronix	
Cal	Santa Fe Springs, Accuride Div., Standard Prec.	213-944-6236
Cal	Tustin, Spaulding Sls. Co.	714-832-1384
Colo	Golden, B. Callister & Assocs.	303-761-0992
Fla	Margate, Davidson Co.	305-971-1865
Ga	Atlanta, Davidson Co.	404-449-6123
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Kans	Olathe, Rush & West	913-764-2700
Mass	Holliston, Accuride	617-429-2474
Mich	Grand Rapids, J.E. Mackay Co.	616-451-4990
Minn	Minneapolis, C.R. Gibb Co.	612-377-1200
Mo	Ballwin, Rush & West	314-394-7271
NJ	Mountain Lakes, Components for Elctrns.	201-334-2921
NY	Syracuse, Components for Industry	315-472-6832
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Tenn	Cookeville, Davidson Co.	901-526-9292
Tex	Houston, Zonk Engrg. Co.	713-697-9302
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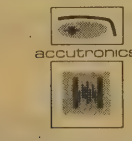

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Fla	Maitland, Beacon Elctrn. Assocs.	305-647-3498
Ga	Atlanta, Beacon Elctrn. Assocs.	404-351-3654
Ill	Arlington Heights, Dytec/Central	312-394-3380
Md	Rockville, Elctrn. Mktg. Assoc.	301-744-7700
Mass	Waban, Instr. Consultants	617-969-9881
Mich	Madison Heights, WKM Assocs.	313-588-2300
Minn	St. Paul, Dytec/North, Inc.	612-645-5816
Mo	Hazelwood, Dytec/South, Inc.	314-731-5400
Nev	Las Vegas, Harvey King	702-458-5342
NJ	Fort Lee, Tech. Mktg. Assocs.	201-224-6911
NM	Sandia Park, PAR Assocs.	505-881-5000
NY	East Syracuse, Ossmann Instrs., Inc.	315-437-6666
NY	Fort Lee, Tech. Mkt. Assocs.	201-224-6911
NY	Rochester, Ossmann Instrs., Inc.	716-328-2230
NY	Vestal, Ossmann Instrs., Inc.	607-785-9947
NC	Charlotte, Beacon Elect. Assoc.	704-525-7412
Ohio	Cleveland, WKM Assocs.	216-267-0445
Ohio	Dayton, WKM Assocs.	513-434-7500
Okla	Oklahoma City, Data Mktg. Assocs.	405-528-6071
Ore	Portland, Pacific Northwest Elctrns	503-292-3505
Pa	King of Prussia, Elctrn. Mktg. Assocs.	215-248-5050
Pa	Pittsburgh, WKM Assocs.	412-892-2953
Tenn	Oak Ridge, Beacon Elect. Assoc.	615-482-2409
Tex	Dallas, Data Mktg. Assocs.	214-661-0300
Tex	Houston, Data Mktg. Assocs.	713-780-2511
Tex	San Antonio, Data Mktg. Assocs.	512-828-2251
Utah	Salt Lake City, R²M Manf. Rep.	801-972-5646
Wash	Bellevue, Pacific Northwest Elctrns	206-641-6444

ACHESON COLLOIDS CO., Div. Acheson Inds., Dept. EM, P.O. Box 288, Port Huron, Mich. 48060, Tel: 313-984-5581, TWX: 810-231-5265; Empl.: 150

Local Sales Offices & Reps.

Cal	LaMirada	714-523-8812
Ga	Atlanta	404-451-7452
Ill	Chicago	312-664-2032
Mass	Boston	617-662-6787
Mich	Grosse Pointe Woods	313-885-3043
NJ	Elizabeth	201-353-0414
NY	Rochester	716-381-7610
Ohio	Cincinnati	513-272-1203
Ohio	Cleveland	216-521-1900
Ohio	Hudson, Rep/Douglas Sawyer	216-653-5811
Pa	Exton	215-363-6646
Tex	Dallas	817-292-4264

ACME BATTERY CORP, See Wonder Corp of America

ACME CHEMICAL & INSULATION CO., Dept. EM, 166 Chapel St., New Haven, Conn. 06513, Tel: 203-562-2171; Empl.: 75

Local Sales Offices & Reps.

Ariz	Phoenix, E.J. Foley Assoc.	602-945-2665
Cal	Los Angeles, Electrical Specialty	213-724-9600
SC	West Columbia, Wilkie Assoc.	803-359-4531
Tex	Dallas, Kentron Eng.	214-352-7535

ACME ELECTRIC, Dept. EM, 614 Water St., Cuba, N.Y. 14727, Tel: 716-968-2400, Telex: 91-6451; Empl.: 1200 ..... p. 3196,3197

Sales Manager: Dick Swift, S/M

Local Sales Offices & Reps.

Ala	Huntsville, Currie Peak & Frazier	205-536-5650
Ariz	Phoenix, J.W. Martin	602-996-4100
Ariz	Scottsdale, Arcom Sls	602-947-5745
Cal	Carlsbad, Luscombe Engrg	714-436-2200
Cal	Los Gatos, Luscombe Engrg	408-354-6496
Cal	Pasadena, Luscombe Engrg	213-684-2000
Cal	Sunnyvale, R. Hesse	408-739-1067
Conn	Meriden, Kanan Assocs	203-238-4484
Fla	Orlando, Currie Peak & Frazier	305-855-0843
Md	Linthicum Heights, KD Assocs.	301-636-1151
Mass	Reading, Kanan Assocs	617-944-8484
NH	Nashua, R.P. Reese	603-883-2407
NJ	Cherry Hill, J.N. Barrett Assocs.	609-429-1551
NM	Albuquerque, Arcom Sls	505-296-0606
NY	Rochester, Acme Elec.	716-889-1807
NY	Vestal, Acme Elec. Corp.	607-748-8053
NC	Greensboro, Currie Peak & Frazier	919-273-3040
Ohio	Galion, J.R. Bright Agency	419-468-3787
Tex	Dallas, W. Weaver	214-296-5081
Tex	Houston, Scientific Sls	713-666-5318
Tex	Richardson, Scientific Sls	214-231-6541
Va	Lynchburg, J.A. Griffin Co.	804-384-5236

ACME ELEC. HEATING CORP., Dept. EM, 4685 11th, Hialeah, Fla. 33013, Tel: 305-685-8326; Empl.:

ACME MODEL ENGRG. CO., Dept. EM, 654 Berg Blvd., Ridgefield, N.J. 07657, Tel: 201-943-7650; Em 16

ACME PLASTIC PRODUCTS CO., INC., Dept. E 9629 N. 22nd Ave., Phoenix, Ariz. 85021, T 602-997-9944; Empl.: 6

ACOPIAN CORP., Dept. EM, Box 585, Easton, 18042, Tel: 215-258-5441, TWX: 510-651-49 847-493; FSC No.: 14749 p. 3165-31 Inside Front Cover, Vo

Sales Manager: T. Skopal

Local Sales Offices & Reps.

Ariz	Scottsdale, Williams Assoc.	602-947-4
Cal	Inglewood, Basic Sys. Co.	213-673-4
Cal	San Diego, Basic Sys. Co.	714-279-9
Colo	Denver, Williams Assoc.	303-373-4
Conn	Enfield, Meas. Equip. Co.	800-225-3
Fla	Melborne, Acopian Corp.	305-727-1
Ill	Wheeling, Potter-Mac Co.	312-541-4
Kans	Olathe, Rush & West Assoc.	913-764-2
Md	Ellicott City, Doss Elctrns.	301-465-1
Mass	Reading, Meas. Equip. Co.	617-944-6
Mich	Birmingham, J.C. Hofstetter Co.	313-646-3
Mo	Ballwin, Rush & West Assoc.	314-394-7
NJ	Parlin, J.N. Sweeney & Co.	201-721-4
NM	Albuquerque, Williams Assoc.	505-255-1
Ohio	Dayton, J.C. Hofstetter Co.	513-296-1
Ohio	Medina, J.C. Hofstetter Co.	216-725-4
Okla	Tulsa, Norvell Assoc.	918-663-1
Pa	Ardmore, Martin Assoc.	215-649-6
Tex	Dallas, Norvell Assocs.	214-233-0
Tex	Houston, Norvell Assocs.	713-988-0

ACOUSTIC POWER SYSTEMS, INC., Dept. 3152-D E. La Palma, Anaheim, Cal. 92806, 714-535-5490, Telex: 67-8401; Empl.: 5

Local Sales Offices & Reps.

Cal	Montebello, Tucul Engrg. Co.	213-728-7
Fla	Fern Park, Bilred Assocs.	305-831-1
Md	Crofton, Technical Sys.	301-261-6
Mich	Ferndale, Tiby Co.	313-547-2
NJ	Teaneck, I. Rudnick	201-836-5
Ohio	Cleveland, Tiby Co.	216-371-5
Ohio	Dayton, Tiby Co.	513-277-5
Tex	Dallas, Merit Co.	214-620-4

ACOUSTONE CORP., Dept. EM, 80 Wythe Brooklyn, NY 11211; Empl.: 50

Local Sales Offices & Reps.

Cal	San Francisco, Meyer & Ross	415-864-
Cal	Van Nuys, Oberman-Renner Sales co.	213-997-
Colo	Aurora, A-E-S	303-366-
Fla	Hollywood, Intracoastal Electronic Sales C	305-921-
Ill	Chicago, Lassers & Co.	312-539-
Ind	Indianapolis, J. S. Sls.	317-547-
Mass	Walpole, McCabe Assocs.	617-668-
Mich	Troy, Champagne Sls Co.	313-649-
Minn	Minneapolis, Ripley & Assoc.	612-881-
Miss	Greenwood, Le Roy Massey Co.	601-GL3-
Mo	Jefferson City, C. A. Vignola Assoc.	314-893-
NY	Brooklyn, S. Verter Sls. Co.	212-444-
Ohio	Columbus, Mandabach-Lehner Co.	614-235-
Ore	Portland, R. Minthorne Co.	503-246-
Pa	Pittsburg, Mandabach Lehner Co.	412-279-
Pa	Willow Grove, R. Lewis Sls.	215-659-
SC	Rock Hill, Rohr-Wanger Sales	803-366-
Tenn	Memphis, Lewis Jones	901-683-
Tex	Houston, Ranger Elctrns. Co.	713-626-

ACROMARK CO., Dept. EM, 60 Locust/Dept Berkeley Hts., N.J. 07922, Tel: 201-464-6474; Em

Local Sales Offices & Reps.

Cal	Lafayette, Diablo Pacific	415-283-
Cal	Pasadena, J. Dan Culp Sales Co	213-578-
Colo	Denver, Plateau Machinery Co.	303-534-
Conn	E. Hartford, Breen Asso.	203-528-
Ga	Atlanta, EME Assocs.	404-253-
Ill	Downers Grove, Midwest Tech. Ser.	312-964-
Mass	Duxbury, T. M. Walsh	617-934-
Mich	Adrian, E. Loncki	517-263-
NY	Skaneateles, Tech-Sonic Assocs.	315-685-
Tex	Houston, Mercer Engrs.	713-526-
Wash	Hoodsport, G.M. Earsley Co.	206-877-

ROMAG, INC., Dept. EM, 30765 Wixom Rd., Wixom, lich. 48096, Tel: 313-624-1541, Telex: 230-505; Empl.: 2

ocal Sales Offices & Reps.

al Buena Park, D.A. Matthews/Assoc. 714-994-4321
al Palo Alto, Priz Co. 415-326-9333
olo Denver, C.E.C., Inc. 303-399-6931
la Ruskin, L.E. Rogers Co. 813-645-1453
a Atlanta, R. Freeman Assocs. 404-938-1227
Schaumburg, Carvel Engrg. Co. 312-885-8800
ans Shawnee Mission, D. Allert Co. 913-831-4244
a Baton Rogue, Aztec Entprs 504-927-5644
lass Norwell, Bordewieck Engrg. & Sls. 617-659-4915
lich Ann Arbor, H.C. Heym Assocs. 313-971-6552
lich Marquette, NWR Elctrns. Corp. 906-226-7578
lich Saginaw, H.C. Heym Assocs. 517-799-0873
linn Edina, NWR Elctrns. Corp. 612-831-6240
linn Virginia, NWR Elctrns. Corp. 218-741-5080
lo St. Louis, Scherrer Instr. Co. 314-644-5362
J Bogota, Neville & Vespo Corp. 201-487-1505
Y Albany, O.R. Lawrence Co. 518-456-4444
Y Buffalo, O.R. Lawrence Co. 716-839-4422
Y New York, Neville & Vespo Corp. 212-539-1515
Y Syracuse, O.R. Lawrence Co. 315-455-5587
C Matthews, W.K. Hile Co. 704-847-9125
hio Cincinnati, G.H. Drysdale & Assoc. 513-752-2069
hio Cleveland, Jay Industrial Sls 216-831-9393
kla Tulsa, D. Allert Co. 918-743-7705
re Portland, McLaren, Inc. 503-297-2248
a Bridgeville, Instr. Svcs., Inc. 412-221-3601
a Devon, B & A Assocs. 215-688-5173
enn Knoxville, W.K. Hile, Co. 615-690-1061
enn Memphis, M. Watson Co. 901-272-7495
ex Houston, Gay Engrg. & Sls. 713-869-3306
ex Midland, Gebhart & Boyd Assoc. 915-697-2263
tah Salt Lake City, Specialty Sls. Co. 801-262-2979
a Richmond, W.K. Hile, Co. 804-275-0799
'ash Bellevue, McLaren, Inc. 206-454-3400
'Va St. Albans, Instr. Svcs., Inc. 304-722-2953
'isc Glendale, Carvel Engrg. 414-352-6630
'yo Casper, Crum Electric Co. 307-266-1278
cp: Mass., Boston, Extech Int'l. 617-227-7090

ROSYS, Dept. EM, Box 687, Philomath, Ore. 97370, el: 503-929-5880; Empl.: 4

ales Manager: B.A. Miklashek

ION LABS INC., Dept. EM, 3238 Washington Ave. , Minneapolis, Minn. 55412, Tel: 612-522-4391; Empl.:

IVE CONTROL INSTRUMENTATION, Dept. M, PO Box 243-Wildwood Circle, Key Largo, Florida 1037, Tel: 305-451-1000; FSC No.: 55116; Empl.: 6 p. 2256

TRANSFORMER CORP., Dept. EM, 89 Madison ., Newark, N.J. 07105, Tel: 201-589-8574; Empl.: 13

IREX-AUTODATA, Dept. EM, 485 Clyde, Mountain ew, Cal. 94042, Tel: 415-964-3200, TWX: 0-379-6593; Empl.: 807

ales Manager: D. Beason

ocal Sales Offices & Reps.

iz Tempe, Trembly Assocs. 602-966-4428
il Inglewood, Basic Systems 213-673-4300
il Los Altos, J. Stone & Assocs. 415-948-4563
il San Diego, Basic Systems 714-991-5390
lo Arvada, Figaro-Klebba Assocs. 303-424-0108
nn Canton Center, Tekdata, Inc. 203-693-0719
a Clearwater, Teqspec 813-725-2201
i Miami, Teqspec, Inc. 305-274-4899
t Atlanta, Teqspec II 404-455-7222
Arlington Heights, Dytec Central 312-394-3380
t Ft. Wayne, Dytec Central 219-485-0845
ns Overland Park, Dytec South 913-384-2710
ss Wakefield, Tekdata, Inc. 617-245-5940
ch Southfield, Stress Analysis Srvcs. 313-356-6686
n St. Paul, Dytec North 612-645-5816
St. Louis, Dytec South 314-423-9595
Paramus, SDM Representatives 201-368-0123
Albuquerque, Trembly Assocs. 505-266-8616
Rochester, SDM Representatives 716-381-9962
io Medina, Stress Analysis Srvcs. 216-725-7733
la Oklahoma City, Data Marketing Assocs 405-528-6071
Jenkintown, PDC Corp. 215-887-9610
Greenville, Teqspec II 803-233-1469
Austin, Data Marketing Assocs. 512-451-5174

Tex Dallas, Data Marketing Assocs. 214-661-0300
Tex Houston, Data Marketing Assocs. 713-780-2511
Tex San Antonio, Data Marketing Assocs. 512-828-0937
Wash Lynwood, Indl. Elctr. Instrs. Co. 206-775-3516

A. D. DATA SYS., INC., Dept. EM, POB 9209, Rochester, N.Y. 14625, Tel: 716-334-9649; Empl.: 35 p. 2661

Sales Manager: H. Turner

Local Sales Offices & Reps.

Ala Huntsville, RJC Assocs. 205-883-6310
Ariz Tempe, J. Smith & Assocs. 602-968-7025
Cal Glendale, GRU Assocs. 213-845-8771
Colo Lakewood, J. Smith & Assocs. 303-442-7100
Md Linthicum Hghts, KD Assocs 301-636-1151
Mass Burlington, Tripek, Inc 617-272-4550
Mich Ferndale, Tiby Co. 313-547-3550
NJ Westfield, E.P. Mertz 201-232-4643
NM Albuquerque, J. Smith & Assocs 505-265-3406
Ohio Cleveland, Tiby Co. 216-371-5335
Pa Southampton, Bert Dempster 215-357-6644
Tex Dallas, Bouco 214-247-6708

ADALET-PLM DIV, Div. Scott & Fetzer Co., Dept. EM, 4801 W. 150th St., Cleveland, Ohio 44135, Tel: 216-267-9000, Telex: 98-5349; FSC No.: 73389; Empl.: 177

Sales Manager: J. L. Smelko

Local Sales Offices & Reps.

Ala Birmingham, C.W. Ashby Co. 205-879-1651
Ariz Phoenix, Stevens & Watkins 602-264-2201
Cal Emeryville, G.E. Honn Co. 415-653-0737
Cal Los Angeles, Adalet-West 213-263-7451
Colo Wheat Ridge, Barry Cable & Equip. 303-422-8075
Fla Jacksonville, Swanson & Co. 904-786-5656
Fla Tampa, Swanson & Co. 813-621-0808
Ga Atlanta, Roy E. Wilson Co. 404-876-8833
Haw Ewa Beach, R. A. Kemp Co 808-682-4220
Ill Rosemont, L. Butter & Assocs., Inc. 312-671-5040
Ind Indianapolis, Engrg Products 317-545-5208
Ky Louisville, L. P. Chick Co. 502-964-8181
La Jefferson, General Power & Control Corp. 504-733-7340
Md Baltimore, Wilson Assocs., Inc. 301-485-5100
Mass Boston, C.C. Pierce Co., Inc. 617-268-8816
Mich Southfield, Engel-Klaes Co. 313-355-1610
Minn Minneapolis, Pinkney & Assocs., Inc. 612-566-0720
Mo Hazelwood, Lawrence E. Brunson Co. 314-731-3104
Neb Omaha, Electric Equip Sls. 402-339-4140
NM Albuquerque, Ralph B. Black Co. 505-344-3288
NY Bronx, Schofield/Coe Assocs. 212-933-2900
NY Rochester, Canavan-Scanlon Assocs., Inc. 716-424-1830
NY Syracuse, Canavan-Scanlon Assocs., Inc. 315-437-1271
NC Charlotte, Glenn & Larson of Carolina 704-377-1314
Ohio Cincinnati, Phillips Sales 513-791-3926
Ohio Columbus, Jerry C. Leesman Co. 614-457-4700
Okla Tulsa, C. Mullen & Assocs. 918-749-4991
Pa Jenkintown, Jacobson-Rodger Assocs. 215-884-5524
Pa Pittsburgh, Gormley Electric. 412-371-4111
Tenn Memphis, LDA Sls 901-743-3111
Tex Dallas, Titan Reps 214-661-5350
Tex Houston, Ampsco 713-869-6181
Utah Salt Lake City, B. Cable & Equip. Co. 801-364-3452
Va Richmond, Atlantic Southern Assoc. 804-353-4466
Wash Vancouver, Horning & Assocs. 206-693-1416
WVa Charleston, Skaff Engrg. Co. 304-925-1143
Wisc Milwaukee, A.W. Schwind Co. 414-228-7330

ADAMS-RUSSELL CO., INC., Dept. EM, 280 Bear Hill Rd., Waltham, Mass. 02154, Tel: 617-899-3211, TWX: 710-324-6484; FSC No.: 27965; Empl.: 450

Sales Manager: J. M. Caputo

ADAMS-SMITH INC., Dept. EM, Summer Rd., Boxboro, Mass. 01719, Tel: 617-263-1400; Empl.: 20

ADAMS & WESTLAKE CO., Dept. EM, 1025 W. Michigan St., Elkhart, Ind. 46514, Tel: 219-264-1141, Telex: 25-8458; Empl.: 380 p. 3411

Sales Manager: C. E. Goshorn

Local Sales Offices & Reps.

Ala Birmingham, E.J. Ruth Assoc. 205-979-0511
Cal Tustin, Sierra-Pacific Engrg. 714-731-3411
Cal Walnut Creek, P.W. Jasin Co. 415-935-6339
Colo Englewood, Electronic Sls. Inc. 303-771-6300
Fla Orlando, W.B. Wimberly Co. 305-423-2514
Ill Chicago, D. Dolin Sls. 312-286-6200
Ind Greenwood, Valentine & Assoc. 317-888-2260
Mass Needham, White Sls. Co. 617-444-3677
Minn Minneapolis, Wendell E. Lee & Assocs. 612-926-1523
NM Albuquerque, Cleveland Enterprises Inc. 505-345-2481
NY East Northport, Jarms Assoc. 516-822-7085
NY Fayetteville, M.P. Andrews, Inc. 315-637-5291
Ohio Beachwood, Electronic Salesmasters Inc. 216-831-9555
Ore Portland, Syscom 503-644-2505
Pa Pittsburgh, R.F. Clark Co. 412-242-9500
Pa Radnor, W. Henry Cordray Sls. Co. 215-687-1366
Tex Dallas, Advance Tech. Sls. 214-361-8584
Tex Houston, Advance Tech. Sls. 713-469-6668
Wisc Milwaukee, D. Dolin Sls. Co. 414-482-1111

Local Distributors

Ala Birmingham, MG Elctrns. & Equip. Co. 205-328-4525
Cal Los Angeles, Master Distributors 213-829-4656
Fla Lakeland, AA Electric 813-682-6181
Ga Norcross, AA Electric 404-449-8670
Ill Chicago, Electro-Kinetics 312-286-4200
Mich Bellevue, Dingman Electric Supply 313-697-9151
NJ Fair Lawn, Relay Specialties 201-797-3313
NC Greensboro, Energy Conversion 919-378-1221
Ohio Akron, Akron Elctrn Supply 216-762-8816
Okla Tulsa, Radio, Inc. 918-587-9123
Ore Portland, Platt Electric Supply 503-228-6121
Pa Huntingdon Valley, Shap Electronics 215-698-9550
Pa McKeesport, Barno Radio Co. 412-664-9394
Wash Seattle, Platt Electric Supply 206-624-4083
Wisc Cedarburg, AA Electric 414-377-7500
Wisc Greenbay, AA Electric 414-499-0258

ADAPTER/CHARGER PRDTS., Dept. EM, Box 3218, Peoria, Ill. 61614, Tel: 309-691-0810; Empl.: 50

Local Sales Offices & Reps.

Minn Minneapolis, Jos. Co. Sls. Engrg. 612-835-5858

ADC PRODS, Dept. EM, 4900 W. 78th St., Minneapolis, Mn 55435, Tel: 612-835-6800, TWX: 910-576-2832

Sales Manager: G. E. Rue; *Distributor Manager:* P. Tinsley

Local Sales Offices & Reps.

Cal Mountain View, CSS Telecomm Specialists 415-964-4335
Cal Santa Ana, CSS Telecomm Specialists 714-546-8430
Colo Englewood 303-761-4061
Conn Fairfield 203-255-0644
Fla Melbourne 305-724-8874
Ga Atlanta 404-766-9595
Ind Lafayette 317-474-0814
Md Reistertown 202-452-1043
Minn Bloomington 612-835-6800
NY Manhasset, Win-Cor Elctrns Sls 516-627-9474
Pa Norristown 202-452-1043
Tex Dallas 214-241-6783
Wash Seattle, CSS Telecomm Specialists 206-367-1440

Local Distributors

Alas Anchorage, Anixter-Pruzan 907-274-8525
Cal Santa Ana, Anixter-Pruzan 714-556-4600
Ga Atlanta, ACK Radio Supply 404-351-6340
Ga Atlanta, Power & Telephone Supply 404-691-6813
Ga Jacksonville, Southeast Elctrn. 904-356-3007
Ga Norcross, Southern Telephone Supply 404-447-8410
Ill Chicago, Newark Elctrns 312-638-4411
Ind Indianapolis, RA-DIS-CO 317-637-5571
Kans Kansas City, Alexander Elctrns. 816-474-6656
Kans Lenexa, No Electric Supply 913-888-9800
Md Baltimore, Radio Elec Svc Co. 301-823-0070
Mo St. Louis, Anixter-Pruzan 314-423-6161
Neb Lincoln, Centel Svc Co. 402-475-5941
NY Long Island, Harvey Radio Co. 516-921-8700
NY New York, Harvey Radio Co 212-575-5211
NY New York, Martin Audio-Video 212-541-5900
NY New York, Graybar Elec Co. 212-532-4000
NC Lexington, Power & Telephone Supply 704-249-0256
ND Fargo, Dakota Elec Supply 701-237-9440
Ohio Columbus, Buckeye Telephone 614-488-0655
Ohio Dayton, Esco, Inc. 513-226-1133
Pa Philadelphia, Philadelphia Elctrns 215-568-7400
Tenn Memphis, Power & Telephone Supply 901-324-8811
Tenn Nashville, Electra Distributing 615-329-3971

Tex Dallas, Southern Telephone Supply 214-631-5340
Tex Dallas, Whalins Pro Audio Sls 817-640-0261
Tex Ft. Worth, Allied Elctrns 817-336-5401
Tex Houston, Power & Telephone Supply 713-461-8444
Wash Seattle, Anixter-Pruzan 206-251-5287

ADDELCO CORP., Advanced Dev. Elctrns. Div., Dept. EM, 56 Pickering St., Needham, Mass. 02192, Tel: 617-444-4754, TWX: 710-325-0370; Empl.: 23

ADDINGTON LABS., INC., Solid State Prods. Div., Dept. EM, 783 Palomar Ave., Sunnyvale, Cal. 94086, Tel: 408-245-6810, TWX: 910-339-9230; Empl.: 120

Sales Manager: J.R. Campbell

Local Sales Offices & Reps.
Ariz Scottsdale, Elctrns. Entprs. 602-266-9841
Cal Fullerton, Midwin & Olifson, Inc. 213-475-8568
Cal Los Altos, Stout-Loeswick 415-948-3265
Fla Clearwater, Reynolds & Assocs. 305-773-4700
Fla Satellite Beach, Reynolds & Assocs., Inc. 305-773-4700
Kans Wichita, Eugene Carbiener Assoc. 316-682-5782
Me Oqunquit, Micronic Assocs. 617-933-2121
Md Kensington, Elctrn. Mktg. Assoc. 301-881-5300
NM Las Cruces, Electronic Enterprises 505-524-0126
NY Huntington Station, Gray & Reed Assoc. 516-271-6677
Ohio Dayton, Ashby Associates 513-252-5627
Pa King of Prussia, Elctrn. Mktg. Assoc. 215-248-5050
Tex Garland, Vector Sls. 214-276-4518
Tex Richardson, Vector Sls 214-234-4291
Wash Renton, Baxley Assocs. 206-226-0650

ADDISON DIV. MUIRHEAD, INC., Dept. EM, 1101 Bristol Rd., Mountainside, N.J. 07092, Tel: 201-233-0610, Telex: 13-8275; Empl.: 10

Local Sales Offices & Reps.
Ala Dunwoody, Saber Assocs 800-327-1181
Ala Madison, Saber Assocs. 205-534-3385
Cal Altedena, Measurement Assocs. 213-671-7651
Cal Costa Mesa, Measurement Assocs. 714-540-7160
Cal Oakland, Advanced Technology 415-452-1401
Conn Hamden, Instr Consits 203-288-5246
Fla Lighthouse Point, Saber Assocs. 305-943-3076
Ill Downers Grove, Engrg Prods Assocs 312-963-0420
Iowa Cedar Rapids, Tech. Reps. Inc. 319-396-5662
Kans Olathe, Technical Reps. 913-782-1177
Mass Waban, Instr Consts 617-969-9881
Mich Detroit, Electro Entprs. 313-521-1500
Minn Minneapolis, Engrg. Prods. Assoc. 612-925-1883
Mo Hazelwood, Tech. Reps. Inc. 314-731-5200
Mo Independence, Tech. Reps., Inc. 816-737-1414
NC Raleigh, Saber Assocs. 919-834-3961
Ohio Cleveland, Electro Entprs. 216-261-7670
Ohio Dayton, Electro Entprs. 513-426-6071
Ore Beaverton, Showalter Instrs 503-646-5196
Pa Pittsburgh, Electro Entprs. 412-371-8497
Tex San Antonio, Ashcraft Assocs. 512-824-7267
Wash Bellevue, Showalter Instrs 206-455-4922

ADDMASTER CORP., Dept. EM, 416 Junipero Serra Dr., San Gabriel, Cal. 91776, Tel: 213-285-1121, Telex: 67-4770; Empl.: 400

Local Sales Offices & Reps.
Ala Huntsville, Scientific Devices 205-536-1969
Cal Los Altos, Sys. Mktg. Consits 415-941-7122
Colo Denver, Grifco 303-795-1989
Fla Palm Bay, Scientific Devices 305-723-1800
Ill Chicago, Scientific Sls. 312-775-7595
Ind Indianapolis, Scientific Sls. 317-253-4606
Md Bethesda, S & S Assocs. 301-654-1434
Mass Wellesley Hills, Datamart 617-235-5520
Minn Bloomington, Scientific Sls. 612-881-3300
NJ Ridgewood, Instrumentation Sls. 201-445-5210
NM Albuquerque, Fry-Gates Co. 505-298-1875
NY Schenectady, N.W. Alexander & Assoc. 518-377-0581
NC Raleigh, Scientific Devices 919-872-7066
Ohio Cleveland, Shamrock Elctrn. Sls. 216-883-3995
Ohio Dayton, Shamrock Elctrn. Sls. 513-258-1227
Pa King of Prussia, S & S Assoc. 215-265-3450
Tex Austin, Palatine Sls. 512-451-7463
Tex Houston, Palatine Sls. 713-783-1492
Tex Richardson, Palatine Sls. 214-231-9489
Wash Seattle, Delcom Sls. Co. 206-248-0090

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Sales Manager: D.L. Wiesen

ADHESIVE MACHINERY CORP., Dept. EM, Folly Hill Rd., Seabrook, NH 03874, Tel: 603-474-5541, Telex: 943470; Empl.: 98

Sales Manager: R. Ornsteen; *Distributor Manager:* R. Ornsteen

ADRE CO., Dept. EM, Box 09415, Milwaukee, Wisc. 53209, Tel: 414-352-3531; Empl.: 50

ADRET/COMSTRON, Dept. EM, 200 E. Sunrise Hwy, Freeport, NY 11520, Tel: 516-546-9700, TWX: 510-225-3699 p. 2682,2683

Local Sales Offices & Reps.
Ariz Scottsdale, Measurement Consits 602-994-9519
Cal Anaheim, Blair Assocs. 714-635-1350
Cal San Jose, PBC Assocs. 408-377-7001
Colo Boulder, Measurement Consits 303-499-5294
Conn Hamden, J & J Assocs 203-624-7800
Fla Dunwoody, Saber Assocs 800-432-3007
Fla Longwood, Saber Assocs. 800-432-3007
Fla Pompano Beach, Saber Assocs 800-432-3007
Mass Winchester, J & J Assocs 617-729-5770
NJ Cherry Hill, Scientific Reps. 609-482-0059
NJ Woodcliff Lake, F & F Assocs. 201-778-6767
NM Las Cruces, Measurement Consits 505-265-6471
NY Hicksville, F & F Assocs. 516-935-1100
NC Raleigh, Saber Assocs. 800-327-1181
Tex Pasadena, Sci. Devices 713-475-0328
Tex San Antonio, Sci. Devices 512-736-3164
Utah Salt Lake City, Measurement Consits 801-364-3174
Va Falls Church, Sci. Assocs. 703-573-8787
Wash Bellevue, Kevin Hall Assocs 206-455-5526

ADTOOL CORP., Dept. EM, 10 Ronald Dr., Montreal W P Q, Can. H4X 1M8, Tel: 514-482-2548, Telex: 05-24462; Empl.: 15

ADVANCE CONVERSION DEVICES CO., Dept. EM, 109 Eighth St., Passaic, N. J. 07055, Tel: 201-778-0707; Empl.: 24 p. 3354,3355

Sales Manager: F.C. Lambert

Local Sales Offices & Reps.
Cal Woodside, N.S. Assocs. 415-854-4870
Fla Orlando, Gra-Mar Inc. 305-894-3351
Ill Chicago, Electro-Tech Mktg. Assocs. 312-588-4535
Kans Leawood, Leemark Engrs. 913-648-0124
Md Annapolis, Hayden Assocs. 202-296-6059
Mass Randolph, Abbott-Allison Co. 617-245-0250
NM Albuquerque, Grady Moore Assocs. 505-262-1416
Tex Houston, Roger Martin Assocs. 713-444-2944
Wash Seattle, Datacom Assocs. 206-285-2525

ADVANCE ELECTRICAL MFG, Dept. EM, 1661 Industrial Way, Box 500, Belmont, CA 94002, Tel: 415-592-4550, Telex: 334475

Sales Manager: Ed Mittelbusher; *Distributor Manager:* Ed Mittelbusher

Local Sales Offices & Reps.
Ariz Phoenix, Advance Electrical Sls 602-271-0920
Cal Anaheim, Advance Electrical Sls 714-870-0300
Cal San Diego, Advance Electrical Sales 714-565-4195
Colo Denver, Advance Electrical Sls. 303-388-0923
Fla Sarasota, R.F. Carlson Co. 813-365-2992
Ill Lisle, Trend-Tronics 312-963-2210
Md Silver Spring, Carwithen Assocs 301-589-9040
Mass Needham, A & M Electronic 617-44
Minn Minneapolis, Paul Ericson & Assocs 612-88
Mo St. Louis, R.F. Carlson Co 314-96
NJ Haddonfield, Mills-Brown Assocs 609-42
NY Melville, Astrorep Inc. 516-42
NY Rochester, B. H. Tollefson Assocs. 716-27
Ohio Columbus, McFadden Sls 614-45
Tex Dallas, R. D. Spooner Co. 214-35
Tex Houston, Ev Emith Sls 713-64
Wash Seattle, Advance Electrical Sls 206-76

AD-VANCE MAGNETICS, Dept. EM, 226 E. Rochester, Ind. 46975, Tel: 219-223-3158, 810-290-0294; Empl.: 17

Sales Manager: R. Vance

Local Sales Offices & Reps.
Cal Los Altos, Frauman Assoc. 415-94
Cal Pasadena, A-F Sls. 213-68
Conn Meriden, A. Allison 203-23
Fla Hollywood, A.P. Assocs. 305-98
Ill Westchester, Brouillette 312-34
Md Baltimore, D.K. Jones Assoc. 301-75
NJ Fairlawn, Harris Assoc. 201-79
Ohio Dayton, D. Grupe Co. 513-29
Pa Flourtown, Eastern Comps. 215-83
Tex Dallas, Techno Assoc. 214-35

Local Distributors
Cal Los Angeles, Mil-Comm Distributors 213-47

ADVANCE ROSS ELCTRNS. CORP., see M Electronics, Inc.

ADVANCE WEIGHT SYSTEMS, INC., De 715 W. Smith Rd., Medina, Ohio 4425 216-725-6409; Empl.: 12

Sales Manager: A.R. Oxley

Local Sales Offices & Reps.
Ala Birmingham, Bessemer Scale Co. 205-42
Ariz Phoenix, Southwestern Scale Co. 602-27
Cal Anaheim, California Scale Co. 714-95
Cal Burlingame, Accurate Weighing Sys. 415-34
Colo Denver, Murphy Scale & Equip. Co. 303-22
Fla Miami, Weigh & Test Sys. 305-6
Fla Mulberry, O'Neill Scale Co. 813-42
Fla Winter Park, Tinsley Scales 305-6
Ill Alsip, Central Scale & Supply Co. 312-3
Ill Alsip, Electromech Scale Co. 312-3
Ill Arlington Heights, Concord Engrg. 312-6
Ill Chicago, Aaction Scale Co. 312-2
Ill E. Moline, Midwest Scale Co. 309-7
Ill Rockford, Northern Illinois Scale Co. 815-2
Ill Wheeling, Data Weighing Sys 312-3
Iowa Cedar Rapids, Midwest Scale Co. 319-3
Iowa Newton, Electronic Sys. 515-7
Iowa Pleasant Valley, Rogan Scale Svc. 319-3
Kans Cedar Rapids, M & G Scale Co. 319-8
Ky Louisville, Richards Scale Co. 502-5
Md Columbia, Columbia Balance Svc. 301-5
Mass Dorchester, Boston Scale Co. 617-2
Mass Worcester, Worcester Scale Co. 617-8
Mich Grand Rapids, Grand Rapids Scale Co 616-5
Mich Orchard Lake, Lampe-Marsh 313-6
Mich Sterling Heights, Richmond Scale Co
Minn Minneapolis, Kennedy's 612-5
Mo Lees Summit, R. T. Cox Co. 816-5
NJ Trenton, Quality Balance Svc. 609-8
NY New York, Resnick Scale Co. 212-9
NY Syracuse, Syracuse Scale Co. 315-4
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Ohio Cleveland, Parma Scale Co. 216-6
Ohio Cleveland, Kaspar Scale Co. 216-6
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Ohio Dublin, Grant & Marshall 614-5
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Ohio Macedonia, Filing Scale Co. 216-4
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Pa Pittsburgh, Acme Scale & Supply Co. 412-782-1808
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Wisc Glendale, Cream City Scales 414-228-9090
Wisc Milwaukee, Battery Shop 414-384-5410
Wisc Milwaukee, Midwest Scale Co. 414-643-4500
Wisc Milwaukee, S. A. Meier 414-463-1700
Wyo Menomonee Falls, Industrial Scale Svc. 414-781-9292

)VANCED CIRCUITRY, Litton Systems Inc., Dept. EM, 4811 W. Kearney St., Springfield, Mo. 65803, Tel: 417-862-0751, TWX: 910-775-4705; Empl.: 962

Sales Manager: J. Turnbull

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Cal Newport Beach, Babco Assocs. 714-751-8375
Cal San Jose, A.C.D. of Litton 408-268-2927
Colo Littleton, A.C.D. of Litton 303-771-8000
Fla Tampa, A.C.D. of Litton 813-259-1323
Ill Chicago, ACD Litton 312-498-6228
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Minn Minneapolis, Giefer Sls. Co. 612-884-2395
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NJ Long Valley, A.C.D. of Litton 201-850-0879
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Tex Plano, A.C.D. of Litton 214-423-4880
Va Richmond, A.C.D. of Litton 804-794-6268

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)VANCED HIGH VOLTAGE INC., Dept. EM, 14532 Arminta St., Van Nuys, Cal. 91402, Tel: 213-997-7222 p. 3199; p. 3.199

Sales Manager: J. Richardson

Local Sales Offices & Reps.
Ariz Tempe, Trembly Assoc. 602-967-2058
Cal Mountain View, Energy Devices 415-969-0330
Cal Van Nuys, Advanced High Voltage 213-997-7222
Colo Denver, Trembly Assoc 303-759-1195
Conn Newington, Daner-Hayes Inc 203-693-6010
Ill Chicago, Electro-Tech Mktg 312-588-4535
Mass Newton Center, Daner-Hayes Inc 617-969-4650
Nev Las Vegas, Trembley Assoc 702-739-6816
NJ East Brunswick, Daner-Hayes Inc 201-246-2727
NM Albuquerque, Trembly Assoc 505-266-8616
NY Rochester, Daner-Hayes Inc 716-467-5100
NY Saint James, Daner-Hayes Inc 516-883-4576
Va Fairfax, Schibley Assoc 703-591-3008

VANCED KINETICS, Dept. EM, 1231 Victoria St., Costa Mesa, Calif. 92627, Tel: 714-646-7165; Empl.: 32

VANCED MATERIALS SYSTEMS, Dept. EM, 72 Elm St. N., Atteboro, Mass. 02703, Tel: 617-695-1401; Empl.: 100

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la Winter Park, Lancaster Indl Sls. 305-671-7775
a Atlanta, Lancaster Indl Sls 404-394-6604
J Middlebush, Lancaster Indl. Sls. 201-828-2499
a Doylestown, Lisi 215-348-1161
a Lancaster, Lancaster Industrial Sls. 717-397-2942
a Lewiston, Lisi 717-242-1668
a Sewickley, Lisi 412-741-7929
a York, Lisi 717-843-9344
xp: Penfield N.Y., J. Lazor Assocs 716-385-3300

VANCED MICRO DEVICES, Dept. EM, 901 hompson Pl., Sunnyvale, Cal. 94086, Tel: 08-732-2400, TWX: 910-339-9280, 34-6306; Empl.: 500

ales Manager: T. Jones, VP Mktg.; *Distributor lanager:* S. Zelencik

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riz Phoenix, Advanced Micro Devices 602-258-6515
al Beverly Hills, Advanced Micro Devices 213-278-9700
al Los Angeles, Black, Ekizian, Strong 213-870-9191
al San Diego, Bestronics 714-278-2150
al Santa Clara, I² Inc. 408-985-0400
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a Oviedo, Conley & Assocs. 305-365-3283
Fla Tampa, Conley & Assocs. 813-933-1759
Ill Elk Grove Village, Oasis Sls. 312-640-1850
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Iowa Cedar Rapids, Lorenz Sls. 319-393-6912
Kans Derby, Palatine Engrg. Sls. 316-426-7055
Kans Lenexa, Palatine Sls. 913-492-7020
Md Baltimore, Burgin-Kreh Assocs. 301-788-5200
Md Baltimore, Advanced Micro Devices 301-744-8233
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Mich Milford, T. Mulligan & Associates 313-363-5575
Minn Bloomington, Advanced Micro Devices 612-854-6500
Mo St. Louis, Palatine Engrg. Sls. 314-426-7055
NM Albuquerque, Thorson Co. 505-265-5655
NY Buffalo, Ossmann Comp. Sls. 716-832-4271
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NY Plainview, ERA 516-822-9890
NY Rochester, Ossmann Comp. Sls. 716-442-3290
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NY Syracuse, Ossmann Comp. Sls. 315-454-4477
NY Vestal, Ossmann Comp. Sls. 607-785-9949
NC Winston-Salem, Burgin-Kreh Assocs. 919-768-4174
Ohio Centerville, Dolfuss-Root 513-433-6776
Ohio Rocky River, Dolfuss-Root 216-333-7504
Pa Ft. Washington, GCM 215-646-7535
Pa Waterford, Bacon Elctrn. Sls. 814-796-6556
Tex Dallas, Bosner-Philhower Sls. 214-234-8438
Tex Dallas, Advanced Micro Devices 214-234-5886
Tex Houston, Bosner-Philhower Sls. 713-467-4373
Utah Salt Lake City, R2M 801-972-5646
Va Lynchburg, Burgin-Kreh Assocs. 804-845-5600
Wash Bellevue, R. Over Sls. 206-454-4551
Wash Vancouver, R. Over Sls. 206-695-4637

ADVANCED TECHNOLOGY SYS., Dept. EM, 450 W. First Ave., Roselle, N.J. 07023, Tel: 201-241-3300, TWX: 710-996-5981; Empl.: 100

Sales Manager: R. R. Draudin

Local Sales Offices & Reps.
Vt Burlington, Polhemus Navigation Sciences 802-879-6547

AEC - ABLE ENGRG CO., Dept. EM, P.O. Box C, 350 S So. Kellogg, Goleta, Cal 93017

A E G TELEFUNKEN, Dept. EM, Rte 22, Sommerville, N.J. 08876, Tel: 201-568-8570, Telex: 13-5497 p. 3920

Sales Manager: Semis J. Szafranski

AEL, INC, See American Electronic Labs

AEL COMMUNICATIONS CORP., see CATV Communications Corp.

AEMCO DIV., MIDTEX, INC., See Midtex, Inc., Aemco Div.

AERCOM, Dept. EM, 405 Tasman Dr., Sunnyvale, Cal. 94086, Tel: 408-744-1320, TWX: 910-339-9308

Sales Manager: J. Zechmeister

Local Sales Offices & Reps.
Ariz Scottsdale, Territorial Mktg 602-994-8665
Cal Cupertino, E. Reid Miller 408-257-6927
Cal Inglewood, L & M Engrg 213-674-6850
Colo Parker, Technology Mktg 303-841-3435
Fla Orlando, Truex Assocs 305-859-2160
Md Davidsonville, R. L. Engrg 301-760-5533
Mass Wakefield, NEREM 617-245-4426
NM Albuquerque, Technology Mktg. 505-293-2776
NY Fayetteville, Martin P. Andrews 315-637-9734
NY Huntington, CDB Enterprises 516-692-5200

AERO-MOTIVE MFG CO., Dept. EM, 1-94 At Miller Rd., Kalamazoo, Mich. 49001, Tel: 616-381-1242; Empl.: 150

AEROCOM, Dept. EM, 3090 S.W. 37th Ave., Miami, Fla. 33133, Tel: 305-448-6503, Telex: 51-9209; Empl.: 100

Local Sales Offices & Reps.
Cal Los Angeles, Aeronautical Elctrn. Sls. Corp. 213-670-5166
Va Vienna, Aerocom 703-273-3706

AEROFLEX LABS, INTEGRATED MICROSYSTEMS DIV., Eastern Opers., Dept. EM, 35 S. Service Rd., Painview, N. Y. 11803, Tel: 516-694-6700, TWX: 510-224-6417 p. 2851

Sales Manager: A. Goldstein

Local Sales Offices & Reps.
Cal Los Angeles, Knight Co. 213-670-2833
Cal Mountain View, Thrisum Assoc. 415-965-9180
Cal San Diego, Littlefield & Smith Assoc. 714-455-0055
Conn Ridgefield, Phoenix Sls. 203-438-9644
Fla Clearwater, Perrott Assoc. 813-585-3327
Fla Ft. Lauderdale, Perrott Assoc. 305-792-2211
Fla Orlando, Perrott Assoc. 305-257-1132
Ill Wauconda, Cudahy Sls. 312-526-2484
Ind Indianapolis, Ihrig Assocs 317-783-7630
Kans Overland Park, Advanced Tech. Sls. 913-492-4333
Md Glen Burnie, Micro-Comp 301-247-0400
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NH Londonderry, Com-Sale 603-668-1440
NY Jericho, Electro Rep. 516-938-0540
NY No. Syracuse, Advanced Comps. 315-699-2671
NC Cary, Montgomery Mktg. 919-467-9319
Ohio Cleveland, KRW Sls. 216-741-4711
Ohio Dayton, KRW Sls. 513-885-3330
Pa Pittsburgh, KRW Sls. 412-243-2284

AEROFLEX LABS, INTEGRATED MICROSYSTEMS DIV., Western Opers., Dept. EM, 1215 Terra Bella Ave, Mountain View, Cal. 94043, Tel: 415-965-3900, TWX: 910-379-6585 p. 2851

Refer to Aeroflex Labs, Integrated Microsys. Eastern Opers. for sales office information.

AEROFLEX LABS., Magnetic Prods. Div., Dept. EM, South Service Rd., Plainview, N.Y. 11803, Tel: 516-694-6700, TWX: 510-224-6417; Empl.: 150 p. 2257,3069-3071

Sales Manager: H.W. Cashman

Local Sales Offices & Reps.
Cal Mountain View, Leddy Assocs. 415-969-6313
Cal Yorba Linda, D & G Assocs. 714-772-0587
Ill Lombard, Quadtron Assocs. 312-627-6800
Iowa Cedar Rapids, ARD Sls. 319-393-6392
Kans Wichita, D & O Engrg. Co. 316-264-7358
Mich Farmington Hills, H. Lowell Co. 313-851-7474
Minn St. Paul, Vikeland Sls. 612-645-4647
NM Albuquerque, A-Tek Co. 505-265-8325
NY Vestal, SHR Inc. 607-729-6339
Ohio Fairborne, Tech. Assocs. 513-878-2484
Tex Houston, Aid Elctrns. 713-777-3882
Tex Irving, Aid Elctrns. 214-259-4761
Wash Seattle, G.M. Gillet & Assoc. 206-284-3344
Exp: New York City, N.Y., Frathom Co. 212-687-9390

AEROLITE ELEXS CORP., Dept. EM, 2207 Summit Ave., Union City, N.J. 07087, Tel: 201-863-2956; Empl.: 60

AEROLIX CORPORATION, Dept. EM, 720 So. Columbus Street, Mt. Vernon, NY 10550, Tel: 914-699-1054

Sales Manager: Dan Saslow

AEROSPACE AVIONICS, INC., Dept. EM, Airport International Plaza, 110 Wilbur Pl., Bohemia, N.Y. 11716, Tel: 516-589-9200, TWX: 510-228-7889; Empl.: 250

Sales Manager: S. F. Scilingo

Local Sales Offices & Reps.
Cal Torrance, Aerospace Avionics 213-540-8562
Ga Atlanta, Craft Assocs. 404-256-0420
Kans Wichita, Thunderbird Technical Sls. & Svs. 316-684-3941
Mo St. Louis, Thunderbird Tech. Sls. & Svcs. 314-567-6488
Tex Ft. Worth, Aerospace Avionics 817-738-1411

AEROSPACE OPTICS INC., Dept. EM, 7112 Burns St., Fort Worth, Tex. 76118, Tel: 817-284-2293, Telex: 75-8461; Empl.: 75

AEROTECH, INC., Dept. EM, 101 Zeta Dr., Pittsburgh, Pa. 15238, Tel: 412-963-7470, TWX: 710-795-3125; Empl.: 50

Local Sales Offices & Reps.
Ariz Tucson, G. Moore Assocs. 602-839-3458
Cal Hermosa Beach, Aerotech West 213-376-9698
Colo Lafayette, G. Moore Assocs. 303-494-3351
Conn Farmington, Aerotech Northeast 203-673-3330
Fla Winter Park, McMahan Assocs. 305-645-0463
Md Silver Spring, Spectro System 301-949-8261
NM Albuquerque, G. Moore Assocs. 505-262-1416
Tex Richardson, John Moore Assocs 214-231-5039

AEROTRONIC ASSOCS., INC., Dept. EM, Riverside Dr., Contoocook, N.H. 03229, Tel: 603-746-4631; FSC No.: 67272; Empl.: 95

Local Sales Offices & Reps.

Ala	Huntsville, Saber Assocs	205-534-3386
Ariz	Phoenix, R.A. Mayes Co	602-279-5243
Colo	Boulder, R.A. Mayes Co	303-444-0782
Fla	Longwood, Saber Assocs.	305-422-3686
Ga	Dunwoody, Saber Assocs	800-327-1193
Ind	Greenwood, Aerotronic Assocs.	317-881-2894
NM	Albuquerque, R.A. Mayes Co	505-292-2330
NC	Raleigh, Saber Assocs.	919-834-3961

AEROVOX INDS., INC., Dept. EM, 740 Belleville Ave., New Bedford, Mass. 02741, Tel: 617-994-9661, TWX: 710-344-6985

Sales Manager: O.J. Wood, VP Mktg.

Local Sales Offices & Reps.

Ala	Huntsville, 20th Century Mktg.	205-772-9237
Cal	San Jose, Verwer Assocs	408-966-9616
Cal	Woodland Hills, Interstate Mktg. Assocs.	213-883-7606
Conn	Munroe, J. E. Boeing Co.	203-261-9512
Del	Greenville, H. Anderson	302-655-2917
Fla	Oviedo, Conley & Assocs.	305-365-3283
Ill	Chicago, T. B. Hunter Assocs.	312-777-2500
Ill	Wauconda, Miller Sls	312-526-9200
Ill	Wheaton, J-C OEM Sls.	312-668-7621
Ind	Ft. Wayne, F. J. Campisano Co.	219-747-2633
Mass	Lexington, J. E. Boeing Co.	617-862-2500
Mich	Southfield, Carrier & Gable	313-275-5230
Minn	Minneapolis, Comstrand	612-571-0000
Miss	Corinth, 20th Century Mktg	601-287-2493
Mo	Grandview, Beneke & McCaul	816-765-2998
NY	Ithaca, B. Dean	607-272-2187
NY	Melville, Comtronic Assocs.	516-249-0505
Ohio	Cincinnati, F. J. Campisano Co.	513-574-7111
Okla	Oklahoma City, Ammon & Rizos Co.	405-373-2748
Ore	Portland, Western Tech Sls	530-297-1711
Pa	Coraopolis, F.J. Campisano Co.	412-264-5151
Tenn	Greenville, 20th Century Mktg	615-638-4021
Tex	Dallas, Hale & Assocs.	214-350-8791
Tex	Houston, Ammon & Rizos Co.	713-781-6240
Wash	Bellevue, Western Tech. Sls.	206-641-3900

AERTECH INDUSTRIES, Dept. EM, 825 Stewart Dr., Sunnyvale, Cal. 94086, Tel: 408-732-0880, TWX: 910-339-9207; FSC No.: 21847; Empl.: 400

Sales Manager: J. Moore

Local Sales Offices & Reps.

Ariz	Tempe, Trembly Assocs.	602-967-2058
Cal	Los Alamitos, Scientific Devices	213-598-7678
Cal	Los Altos, J. Stone & Assocs.	415-948-4563
Cal	San Diego, Scientific Devices	714-279-6642
Colo	Boulder, H. Bass & Assocs.	303-499-7509
Fla	Pompano Beach, Saber Assocs.	800-327-1193
Ga	Atlanta, Saber Assocs	800-327-1193
Ill	Northfield, Feller Assocs.	312-446-8065
Kans	Shawnee Mission, Tech. Sls. Assocs.	913-888-3330
Md	Ellicott City, Doss Elctrns., Inc.	301-465-1336
Mass	Chelmsford, BBC	617-256-6593
Minn	Bloomington, Elctrn Sls Agcy	612-884-8291
Mo	St. Louis, Technical Sls. Assocs.	314-725-5361
Nev	Las Vegas, Trembly Assocs	702-739-6816
NM	Albuquerque, Trembly Assocs.	505-266-8616
NY	Commack, Dal-tech Devices	516-543-4776
NC	Raleigh, Saber Assocs	800-327-1193
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Tex	Richardson, Lear Assocs.	214-231-5388
Tex	Universal City, Lear Assocs.	512-658-6672
Wash	Seattle, Delcom Sls. Co.	206-248-0090

AETNA ENGRG., Dept. EM, P.O. Box 7749, Van Nuys, Cal. 91409, Tel: 213-341-9409; Empl.: 10

Sales Manager: T. W. Collins

AGFA-GEVAERT, INC., Dept. EM, 275 North St., Teterboro, N.J. 07608, Tel: 201-288-4100, TWX: 710-990-6137; Empl.: 750

Local Sales Offices & Reps.

Cal	Brisbane	415-467-2330
Cal	Burlingame	415-692-2432
Cal	Glendale	213-246-8141
Colo	Denver	303-756-3442
Ga	Atlanta	404-355-7450
Ill	Chicago	312-267-9100
Mass	Waltham	617-890-5430
NJ	Waldwick	201-444-8500
NY	New York	212-279-2560
Tex	Dallas	214-243-7315
Wash	Seattle	206-454-1066

AIKEN INDS, See Norlin Communications, Inc

AIKEN INDS., MECHANICAL PRODS DIV, See Mechanical Products, Inc, A Norlin Tech. Co.

AIL, DIV. CUTLER-HAMMER, Dept. EM, Comac Road, Deer Park, N.Y. 11729, Tel: 516-595-3094, TWX: 510-227-6073; Empl.: 3100

Local Sales Offices & Reps.

Cal	Marina Del Rey, D.O. Ness	213-822-1324
Mass	Bedford, J. C. Graham	617-274-0770
Ohio	Dayton, A.P. Vogel	513-254-3511
Va	Arlington, S. Collin	703-521-3300

AILTECH, Dept. EM, 2070 Fifth Ave, Ronkonkoma, NY 11779, Tel: 516-588-3600, TWX: 510-224-6558; Empl.: 200

Local Sales Offices & Reps.

Ala	Huntsville, Beacon Electronics	205-881-5031
Cal	La Jolla, Ward/Davis Assoc.	714-459-3351
Cal	Lawndale, Ward/Davis Assoc.	213-542-7740
Cal	Los Angeles, Ailtech, West Coast Oper.	213-965-4911
Cal	Menlo Park, AILTECH	415-854-7200
Colo	Boulder, Herb Bass Assoc.	303-499-7509
Fla	Ft. Lauderdale, Beacon Elctrns.	305-971-7320
Fla	Maitland, Beacon Elctrns.	305-647-3498
Ga	Atlanta, Ailtech	404-939-2016
Ga	Atlanta, Beacon Elctrns.	404-351-3654
Ill	Chicago, K. Meyers Co.	312-774-6440
Ind	Indianapolis, K. Meyers Co.	317-243-6681
Kans	Shawnee Mission, EIR Co.	913-362-0919
Mass	Burlington, R.J. Sickles Assocs.	617-272-7285
Mich	Detroit, Micro Sls. Corp.	313-482-1229
Minn	Minneapolis, K. Meyers Co.	612-920-7080
Mo	Hazelwood, EIR Co.	314-895-4100
NM	Albuquerque, IMEC	505-883-9010
NY	East Syracuse, Ossmann Instrs.	315-437-6666
NC	Charlotte, Beacon Electronics	704-525-7412
Ohio	Cleveland, Micro Sls. Corp.	216-331-0900
Ohio	Dayton, Micro Sls. Corp.	513-433-8171
Okla	Norman, Data Mktg. Assocs.	405-364-8320
Pa	Ambler, W & M Assocs.	215-643-4119
Tenn	Oak Ridge, Beacon Elctrns.	615-482-2409
Tex	Austin, Data Mktg. Assocs.	512-451-5174
Tex	Dallas, Data Marketing Associates	214-661-0300
Tex	Houston, Data Marketing Associates	713-780-2511
Tex	San Antonio, Data Mktg. Assocs.	512-828-0937
Va	McLean, Creative Mktg. Assoc.	703-893-6612

AIMSCO INC., Dept. EM, 4000-4024 22nd Ave. W., Seattle, Wash. 98199, Tel: 206-284-5563, TWX: 910-444-1333; Empl.: 30

Sales Manager: C. Ernst; *Distributor Manager:* E. Chadwick

Local Sales Offices & Reps.

Cal	Hollywood	213-934-2122
Cal	Oakland	415-836-2405
Colo	Denver	800-426-0245
Ore	Portland	503-223-4377
Utah	Salt Lake City	800-426-0245

AIR ELECTRO COMM. CORP., Dept. EM, 17 Meadow Ridge Lane, Glen Head, N.Y. 11545

AIR-O-TRONICS PRODS., Dept. EM, Box K, Morrisville, N.Y. 13408, Tel: 315-684-3705; FSC No.: 16663; Empl.: 10

Sales Manager: G. M. Trush

Local Sales Offices & Reps.

Cal	Long Beach, W. S. Harmon Co.	213-426-0551
Colo	Englewood, Inverness Mktg	303-770-2300
Ill	Chicago, Electro-Kinetics	312-286-4200
Kans	Shawnee Mission, Midtec Assocs	913-441-6565
Mass	Waltham, Del Tech Sls	617-890-1020
Mo	Florissant, Midtec Assocs.	314-837-5200
Tex	Lewisville, Jim Hughes Co.	817-430-1683
Tex	Stafford, Jim Hughes Co.	713-491-2498
Wash	Kirkland, Manon Engrg	206-827-7449

AIR PRODUCTS & CHEMICALS, Dept. EM, Box 538, Allentown, PA 18105, Tel: 215-398-4911

AIR-VAC ENGRG. CO., Dept. EM, 100 Gulf St., Milford, Conn. 06460, Tel: 203-874-2541; Empl.: 30

Local Sales Offices & Reps.

Ariz	Phoenix, Scottsdale Tool & Supp	602-273-7376
Cal	San Jose, ARN-MAC, Inc.	408-262-8325
Cal	Santa Ana, TMD Assoc	714-541-8164
Colo	Arvada, Arrowhead Sls Co	303-423-
Conn	Guilford, The Ober Co.	203-453-
DC	Washington, H. Wise & Co.	202-363-
Fla	Miami, Ludlum Assocs.	305-592-
Ill	Downers Grove, The Tipler Corp.	312-969-
Ill	Libertyville, R. Klipp Assocs.	312-362-
Mich	Detroit, E & E Engrg., Inc.	313-371-
Minn	Minneapolis, Air Engrg. & Supply	612-335-
Mo	St. Louis, Harris-Hanson Co.	314-432-
NH	Spofford, Bahr Sls. Co.	603-352-
NJ	Bloomfield, Sweeney Assocs.	201-743-
NY	Brentwood, Cir-Tech Assocs.	516-231-
NY	Syracuse, Mr. J. V. Costello	315-472-
NC	Charlotte, Electro Rep Assocs.	704-527-
Ohio	Medina, McShane	216-725-
Pa	Norristown, Glove Engrg Co.	215-275-
Tex	Dallas, PESO	214-358-
Wash	Seattle, Andrew Sproul Assoc.	206-789-
Exp:	Fla., Hollandale, EMEC, Inc.	305-925-

AIRBORN, INC., Dept. EM, 4321 Airborn Dr., Ad Tex. 75001, Tel: 214-233-2000, TWX: 910-860- FSC No.: 10400; Empl.: 200 p. 1676

Sales Manager: W.A. Clark

Local Sales Offices & Reps.

Cal	Los Angeles, Air Born	213-670
Fla	Satellite Beach, Reynolds & Assoc.	305-773
Md	Columbia, Airborn	301-997
NY	E. Northport, Airborn	516-757
NY	Red Hook, R.P. Kennedy Co.	914-876
NY	Rochester, R.P. Kennedy Co.	716-271

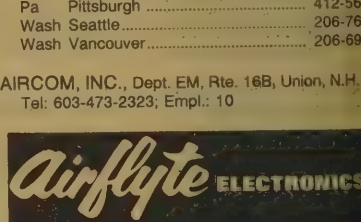
AIRCO INDUSTRIAL GASES, Dept. EM Mountain Ave., Murray Hill, N.J. 07974, 201-464-8100, TWX: 710-984-7992

Sales Manager: W. Kroll

Local Sales Offices & Reps.

Ariz	Phoenix	602-27
Cal	City of Industry	213-96
Cal	San Leandro	415-48
Ga	Atlanta	404-35
Ill	Broadview	312-86
Kans	Lawrence	913-84
La	Metairie	504-88
Mass	South Acton	617-26
Mich	Southfield	313-56
Minn	St. Paul	612-64
Mo	Bridgeton	314-73
NY	Albany	518-48
NY	Buffalo	716-85
Pa	King of Prussia	215-26
Pa	Pittsburgh	412-56
Wash	Seattle	206-76
Wash	Vancouver	206-69

AIRCOM, INC., Dept. EM, Rte. 16B, Union, N.H. Tel: 603-473-2323; Empl.: 10



AIRFLYTE ELCTRNS. CO., Dept. EM, Box Hook Rd., Bayonne, N.J. 07002, Tel: 201-43 TWX: 710-729-4489; Empl.: 60 p. 307

Local Sales Offices & Reps.

Cal	Los Altos, Poltronics	415-94
Cal	Marina Del Ray, Westaironics	213-82
Conn	No. Haven, Kitchen & Kutchin	203-23
Fla	Miami Bch., OEM Mktg. Corp.	305-86
Fla	Orlando, OEM Mktg. Corp.	305-29
Ill	Park Ridge, RF Specialists	312-69
Ind	Ft. Wayne, R. F. Specialists	219-4
Kans	Lenexa, T.R.I.	913-7
Md	Baltimore, R.P. Luce & Co.	301-7
Mass	Lexington, Kitchen & Kutchin	617-8
Mo	Hazelwood, T.R.I.	314-7
NJ	Clifton, Avionics Equip., Inc.	201-7
NY	Rochester, R.P. Kennedy Co.	716-2
Pa	Philadelphia, R.P. Luce & Co.	215-8
Tex	Dallas, Jacobson Co.	214-3

AIRPAX ELCTRNS., INC., Cambridge Div., D Woods Rd., Cambridge, Md. 21613, Tel: 301-22 TWX: 8-7715, 710-865-9655; FSC No.: 8154 550 p. 1022,39

Sales Manager: D. Marshall

Local Sales Offices & Reps.

Ala	Huntsville, Electronic Mfrs. Agents	205-5
Ariz	Phoenix, Gramer & Company	602-2

Cal Mt. View, Wagner Assoc. 415-964-8300
Cal Pico Rivera, Westrep 213-949-2551
Cal San Diego, Westrep 714-276-0751
Colo Littleton, Lange Sls. 303-795-3600
Ill Glen Ellyn, Rockford Controls 312-469-6016
Ind Indianapolis, Rockford Controls .. 317-248-2518
Iowa Cedar Rapids, Reid Assocs., Inc. 319-362-6302
La Bossier City, Deeco Controls 318-742-0856
Md Columbia, Rep-Tron 301-465-6433
Mass Millis, Selmark Assocs. 617-376-2914
Mich Troy, Pine Sls. Inc. 313-524-1860
Minn Hopkins, Fred Peterson Co. 612-941-5400
Mo Ballwin, Weisler & Assoc. 314-394-4543
Mo North Kansas City, Weisler & Assoc. 816-421-1679
NY Great Neck, Pacent-DiBlasi 516-482-4040
NY Poughkeepsie, C. W. Floring & Assoc. 914-471-2973
NY Rochester, J. G. Welch Assoc. .. 716-244-1100
NC Winston-Salem, L.G. White 919-725-3612
Ohio Cincinnatti, Baehr, Greenleaf & Assoc. 513-891-3826
Ohio Cleveland, Baehr, Greenleaf & Assoc. 216-221-9030
Ohio Columbus, Baehr, Greenleaf & Assoc. 614-486-4046
Ohio Dayton, C.P Haskell 513-298-3331
Okla Tulsa, T.J Ray Co. 918-627-1515
Pa Harleysville, T. Jackson Assoc. .. 215-643-5560
Pa Pittsburgh, Russell F. Clark Co. 412-242-9500
Tex Dallas, Stevens Sls. 214-350-2476
Tex Odessa, Barnco Co. 915-332-0294
Wash Seattle, Don Smith Sls. 206-633-3160
Wisc Wauwatosa, Larsen Assocs. 414-258-0529

RPAX ELCTRNS., Controls Div., Dept. EM, 6801 W. Sunrise Blvd., Ft. Lauderdale, Fla. 33313, Tel: 305-587-1100, TWX: 510-955-9866, Empl.: 200 p. 2258

Local Sales Offices & Reps.
Ark. Scottsdale, Electro-Marketing Assoc. 602-991-0110
Cal Buena Park, Sales Engrs. Ltd. .. 213-921-4337
Cal Mountain View, Manco 415-964-7281
Colo Lafayette, Spectrum Sls. 303-449-7677
Conn Trumbull, S.I.R. Assoc. 203-268-2560
Fla Ft. Lauderdale, Bredesen Assoc. 305-566-3289
Ill Chicago, Carvel Engr 312-885-8800
Ind Indianapolis, Electro Engrg. & Sls. 317-547-5273
Iowa Cedar Rapids, Reid Assoc. 319-362-6302
La Baton Rouge, Process Specialty Co. 504-937-0644
La Bossier City, Deeco Co. 318-742-0856
Md Phoenix, Rebco Sls 301-592-8907
Mass Lexington, S.I.R. Assoc. 617-862-1812
Mich Southfield, Automatic Controls Co. 313-354-1190
Minn St. Paul, Kenco Co. 612-645-7717
Mo Kansas City, Harris-Hanson Co. 816-444-9494
Mo St. Louis, Harris-Hanson Co. 314-432-3611
NJ Bogota, Neville & Vespo 201-487-1505
NY Buffalo, R.M. Newell Co. 716-632-0662
NY Syracuse, C.W. Floring & Assoc. 315-478-2149
NC Charlotte, MacGuire & Crawford Instr. Co. 704-366-3454
Ohio Cincinnati, J.W. Murray & Assoc. 513-662-1616
Ohio Medina, Automatic Controls Corp. 216-725-7989
Okla Tulsa, Lucas Controls 918-749-6491
Ore Portland, Fry Controls. 503-226-2620
Pa Harleysville, T. Jackson & Assocs. 215-643-5560
Pa Pittsburgh, Friday Engrg. Sls. 412-341-1444
Tex Dallas, Stevens Sls. 214-350-2476
Tex Houston, Haltom Co. 713-782-5625
Tex Odessa, Barnco, Inc. 915-332-0293
Va Roanoke, Process Specialties 703-345-5683
Va Rockville, Virginia Meter & Controls Co. 804-285-4228
Wisc Wauwatosa, Larsen Assocs. 414-258-0529

RTROL CORP., Dept. EM, 203 W. Hawick St., Rockton, Ill. 61072, Tel: 815-624-8051; Empl.: 28

Sales Manager: N.K. Anderson

Local Sales Offices & Reps.
Ariz , Gassner & Clark Co. 602-968-9037
Cal Pasadena, RDX Corp. 213-681-3451
Cal San Diego, J. C. Henberger Co. 714-292-5772
Cal San Francisco, RDX Corp. 408-734-4500
Colo Denver, D/Z Assocs 303-534-3649
Fla Boca Raton, E. Kershaw 305-392-9263
Iowa Cedar Rapids, Gassner & Clark 319-393-5763
Kans Kansas City, Burton-Medley Assocs. 816-436-0491
Mass Boston, Sullivan Tech. Sls. 617-620-0195
Minn Minneapolis, Conway Assocs. 612-721-5229
NJ Camden, Naudain Assocs. 609-235-1801
NY Buffalo, Robert F. Lamb Co. 716-874-4900
NY New York, SGS Sls. & Mktg. Ltd. 516-921-5335
NY Rochester, Robert F. Lamb Co. 716-544-5580
NY Schenectady, Robert F. Lamb Co. 518-393-4844
NY Syracuse, Robert F. Lamb Co. .. 315-455-2469
Ohio Dayton, Dynel Co. 513-434-6467
Pa Philadelphia, Naudain Assocs. 609-235-1801
Tex Dallas, J. B. Guenther 214-691-8500
Tex Houston, J. B. Guenther 713-468-0232
Wisc Beloit, Dale & Assocs. 608-362-1495

AIRTRON, Div. Litton Inds., Dept. EM, 200 E. Hanover Ave., Morris Plains, N.J. 07950, Tel: 201-539-5500, TWX: 710-986-7473; FSC No.: 80006; Empl.: 350

Local Sales Offices & Reps.
Ariz Tempe, Trembly Assocs. 602-967-2058
Cal San Jose, MCH Assocs 408-246-7330
Cal Van Nuys, G.M.A. 213-989-5111
DC Wash D.C., T. Britt Assoc. 202-296-7029
Fla Coral Springs, Precision Mktg. .. 305-752-1700
Ga Warner Robins, A. J. Erickson 912-743-1950
Ill Elk Grove, R-TEK 312-439-9090
Md Baltimore, Dickison Sls. Co. 301-823-0923
Mass Lexington, Eugene F. Delfino Co. 617-862-1118
Mo Maryland Hts., Midwest Meridian 314-878-4441
NJ Merchantville, L. Adezio Sls Co. 609-235-1606
NM Albuquerque, Trembly Assocs. 505-266-8616
NY E. Syracuse, Ossmann Instrs 315-437-6666
NY Huntington Station, E-F Tech Sls 516-549-1818
Ohio Dayton, A. Grimm 513-299-8461
Pa York, Gerald R. Walter 717-843-9501
Tex Richardson, Vector Sls 214-234-4291

AITKEN COMMUNICATIONS INC., Dept. EM, 214 Harrison St, Taft, Cal 93268, Tel: 805-765-5403; Empl.: 6

AJAX MAGNETHERMIC CORP., Dept. EM, 1745 Overland Ave., N.E., Warren, Ohio 44482, Tel: 216-372-8511, Telex: 098-2482; Empl.: 450

Local Sales Offices & Reps.
Ala Birmingham, Ajax Magnethermic Corp. 205-870-9747
Cal Fullerton, Ajax Magnethermic Corp. 714-525-8914
Conn East Lyme, Ajax Magnethermic Corp. 203-739-9122
Ill Chicago, Ajax Magnethermic Corp. 312-992-2116
Ind Indianapolis, Ajax Magnethermic Corp. 317-842-1804
Mich Grand Rapids, Ajax Magnethermic 616-364-7904
Mich Southfield, Ajax Magnethermic Corp 313-559-1360
Mo Kansas City, Boschert Equip Co. 816-561-4050
NY Rochester, Ajax Magnethermic Corp 716-235-1488
Ohio Cincinnati, Ajax Magnethermic Corp 513-791-0628
Ohio Cleveland, Ajax Magnethermic Corp. 216-641-3655
Ohio Port Clinton, Ajax Magnethermic Corp. 419-797-2927
Okla Tulsa, Boschert & North Cult. 816-561-4050
Pa Langhorne, Ajax Magnethermic .. 215-757-1060
Pa Pittsburgh, Ajax Magnethermic Corp 412-931-3737
Tex Conroe, Ajax Magnethermic Corp 713-444-7474
Wash Mercer Island, C.R. Monlux Co. 206-232-3100
Wisc Milwaukee, Ajax Magnethermic .. 414-453-0811

AKG ACOUSTICS, Philips Audio Video Sys. Corp., Dept. EM, 91 McKee Dr, Manwah, N.J. 07430, Tel: 201-529-3800, TWX: 138023, 710-988-3151; Empl.: 40

Sales Manager: S.R. Ravich

Local Sales Offices & Reps.
Cal Culver City, Marshank Sls. Co. .. 213-559-2591
Cal Walnut Creek, MacPherson Sls. Co. 415-937-1482
Colo Denver, B & B Elctrn. Prods. 303-773-6700
Conn Stamford, J. B. Anthony Co. 203-322-9202
Fla Miami, World Wide Prods. 305-754-5475
Ga Tucker, Elrep Sls. Co. 404-938-7108
Ill Chicago, T. Pappas & Assocs. .. 312-685-2338
Iowa Des Moines, Beams Co. 515-255-1148
Md Silver Spring, Taub Sls. Inc. 301-622-0300
Mass Natick, VF Sls. Inc. 617-237-6544
Mich Canton, VF Sls. Inc. 313-453-8720
Minn Minneapolis, Kodo Assoc. Inc. 612-881-1255
Mo St. Louis, Beams Co. 314-569-1060
NY Baldwinsville, B. Darmstedter Assoc. 315-638-1261
Ohio Medina, J. B. Parent Co. 216-725-8871
Ore Portland, Earl & Brown Co. 503-245-2283
Tex Dallas, Wyborny Sls. Co. 214-348-9657
Tex Houston, Wyborny Sls. Co. 713-772-0961
Utah Salt Lake City, B & B Elctrn. Prods. 801-486-3943
Wash Seattle, Earl & Brown Co. 206-284-1121

AKRO-MILS, INC., Dept. EM, 1293 S. Main St., Akron, Ohio 44301, Tel: 216-253-5593, Telex: 98-6321; Empl.: 200

Distributor Manager: D. Martin

ALADDIN ELCTRNS., Dept. EM, 701 Murfreesboro Rd., Nashville, Tenn. 37210, Tel: 615-748-3335, Telex: 554466; FSC No.: 06978; Empl.: 300

Sales Manager: J. Holeman

Local Sales Offices & Reps.
Ariz Phoenix, Eltron Inc. 602-997-1042
Cal Culver City, De Angelo, Rothman & Co. 213-398-6239
Cal San Diego, DeAngelo, Rothman & Co. 714-560-5707
Cal Sunnyvale, Trident Assoc. 408-734-5900
Colo Denver, E. W. Johnson Co. 303-985-4810
Fla Winter Park, Young & Lawrence Assoc. 305-647-6929
Ind Indianapolis, Loomis Assocs. 317-299-5644
Iowa Cedar Rapids, Seltec Sales Corp. 319-393-1114
Md Timonium, Glen White & Assoc. 301-252-6360
Mass Waltham, Deveer Sls. Engrg. 617-899-5900
Mich Warren, Luebbe Sls. Co. 313-574-2230
Minn Minneapolis, Bohlig & Assocs 612-922-7011
Mo Kansas City, Automatic General Sls. 816-333-8206
NJ N. Caldwell, Masin-Esco. 201-226-2550
NY Syosset, Masin-Esco 516-364-0310
NC Raleigh, Glen White Assoc. 919-787-7016
Ohio Cincinnati, Luebbe Sls. Co. 513-871-4211
Ohio Cleveland, Luebbe Sls. Co. 216-333-0425
Ohio Columbus, Luebbe Sls 614-425-5504
Ohio Dayton, Luebbe Sls. Co. 513-294-0426
Okla Bixby, Elgin B. Robertson 918-369-5186
Pa Philadelphia, A & M Assocs. 215-836-5122
Tenn Jonesboro, Glen White Assocs. 615-477-8850
Tex Dallas, EBR, Inc. 214-942-2716
Va Lynchburg, Glen White Assoc. 804-846-4624
Wash Mercer Island, Tri-Tronix N.W. 206-232-4993

ALAN INDUSTRIES INC., Dept. EM, PO Box 1203, Columbus, Ind. 47201, Tel: 812-372-8869; FSC No.: 52750; Empl.: 25

Local Sales Offices & Reps.
Cal Canoga Park, California Electronic Mktg. 213-884-7867
Cal Los Altos, Stout-Loeswick, Inc. .. 415-948-3265
Cal Santa Ana, California Electronic Mktg. 714-835-2702
Fla Lighthouse Point, Saber Assocs. 305-943-3076
Fla Longwood, Saber Assocs. 305-422-3686
Fla Sarasota, Saber Assocs. 813-441-1301
Ga Dunwoody, Saber Assocs 205-534-3386
Ind Indianapolis, Loren Green Assocs 317-293-9827
Iowa Davenport, Ensco-Rep 319-386-6600
Kans Overland Park, Ensco-Rep. 913-381-7557
Md Bethesda, S & S Assocs. 301-654-1434
Mass Needham, Addelco Corp 617-644-4754
Mo St. Louis, Ensco-Rep. 314-567-3935
NM Albuquerque, A.L. S. Elctrns. 505-298-2575
NY Liverpool, R. & D. Assocs 315-457-0100
NY Tuckahoe, Asco Elctrns. 914-779-8110
NC Raleigh, Saber Assocs. 919-834-3961
Pa King of Prussia, S & S Assocs. .. 215-265-3450
Tex Dallas, Southern Engrg. 214-231-3065
Exp: CT, Stamford, Dage Corp. 203-234-3123

ALBEROX CORP., Dept. EM, New Bedford Ind'l. Pk., New Bedford, Mass. 02745, Tel: 617-995-1725; Empl.: 80 ..... p. 2553

Sales Manager: Perry Pollins S/M

Local Sales Offices & Reps.
Cal Los Angeles, Alberox Corp. 213-383-3630
Cal Santa Cruz, Alberox Corp. 408-426-3424
Fla Orlando, Buchanan & Abrams Assoc. 305-898-7444
Ill Chicago, Weldin Sls. Co. 312-267-4944
Ind Indianapolis, J. C. Butler 317-253-5143
Kans Kansas City, Kebco 913-649-2168
Mass Weston, J. Goode Assocs. 617-235-3900
Mo Maryland Heights, KEBCO 314-576-4111
NY Pompey, S. F. Foster Co. 315-677-3333
NY Valley Stream, Levison Sls. Co. 516-561-9696
Pa Philadelphia, Stanton J. Shelton 215-248-0131
Tex Dallas, United Comps. 214-324-1448

ALCO ELECTRONIC PRODS., INC., Sub. of Augat, Inc., Dept. EM, 1551 Osgood St., North Andover, Mass. 01845, Tel: 617-685-4371, TWX: 710-342-0552; Empl.: 60 ..... p. 2418,2457,3980-3983

Distributor Manager: L. Murphy

Local Sales Offices & Reps.

Ala Huntsville, Interep Assoc. 205-881-3677
Cal Daly City, R. Del. Bucchia & Assocs. 415-756-1664
Cal Los Angeles, Knight Co 213-670-2822
Cal San Diego, Knight Co 714-271-7817
Colo Denver, Simpson & Assocs. 303-794-8381
Conn Middletown, Gerber Sls Corp. 203-347-3000
Conn Newton, Gerber Sls. Corp. 203-426-3440
Fla Orlando, Irby & Connolly, Inc. 305-894-8471
Fla Plantation, Irby & Connolly..... 305-949-5197
Ga Atlanta, Interep Assoc. 404-394-7756
Ill Glen Ellyn, Rockford Controls Co. 312-469-6016
Ind Indianapolis, Rockford Controls Co. 317-248-2518
Iowa Marion, Thomas & Modrcin Assoc. 319-377-6261
Kans Shawnee Mission, Thomas & Modrcin Assoc. 913-432-2131
Md Towson, Habco Elctrns. 301-825-9637
Mass E. Longmeadow, Gerber Sls. Corp. 413-525-3059
Mass Waltham, Gerber Sls. Corp..... 617-890-8040
Mich Detroit, R.P. Urban & Assocs 313-535-2355
Mich Grand Rapids, R.P. Urban & Assocs 616-245-0511
Minn St. Paul, Countryman Assocs..... 612-645-9151
Mo Hazelwood, Thomas & Modrcin Assoc. 314-895-4700
NJ Keasbey, Addem II 516-549-8400
NJ West Caldwell, Addem III 516-549-8400
NM Albuquerque, C.T. Carlberg & Assoc 505-265-1579
NY Endwell, Tri-Tech Elctrns..... 607-754-1094
NY Fairport, Tri-Tech Elctrns..... 716-223-5720
NY Fayetteville, Tri-Tech Elctrns 315-446-2881
NY Melville, Addem I 516-549-8400
NY Poughkeepsie, Tri-Tech Elctrns.. 914-473-3880
NC Charlotte, Over & Over, Inc. 704-527-3070
Ohio Cincinnati, Luebbe Sales Co..... 513-871-4211
Ohio Cleveland, Luebbe Sales Co. 216-333-0425

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Va Lynchburg, Habco Elctrns. 804-384-5236
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Ore Portland, Pacific Scientific Co. 503-256-1770
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Tex Houston, Pacific Scientific Co. 713-621-2720
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Minn Anoka, K. Haugen & Assocs. 612-421-3395
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Md Landover, Allied Elctrns 301-773-5050
Mass Wilmington 617-942-0150
NC Raleigh, Allied Elctrns 919-821-0415
Tex Houston, Allied Elctrns 713-932-7321

ALLIED SYSTEMS CORP., Dept. EM, Box 11005, Greensboro, N.C. 27409, Tel: 919-299-2294; Empl.: 25 ..... p. 1683

Sales Manager: E.V. Saude

Local Sales Offices & Reps.

Ala Huntsville, Reynolds & Assocs... 205-536-1941
Cal Seal Beach, Cairns Engrg. Sls. Corp. 213-430-9084
Fla Satellite Beach, Reynolds & Assocs. 305-773-4700
Ga Atlanta, Reynolds & Assocs. 404-252-5360
Mass Waltham, ICM Co. 617-891-8059
NY New Hook, R. P. Kennedy Co. .. 914-876-2700
NY Rochester, R. P. Kennedy Co..... 716-271-6322
NC Winston-Salem, Reynolds & Assocs. 919-725-6196
Va Arlington, H. J. Heffernan Co. 703-522-6666

ALLIS-CHALMERS, See Siemens-Allis, Inc

ALLMETAL SCREW PRODUCTS CO., INC., Dept. EM, 821 Stewart Ave., Garden City, N.Y. 11530, Tel: 516-222-1200, TWX: 510-222-8132; Empl.: 200

Sales Manager: W. Griffin

Local Sales Offices & Reps.

Cal El Segundo 213-772-3131
Cal Santa Clara 408-246-7444
Ga Atlanta 404-455-6840
Ill Elmhurst 312-279-3980
Md Columbia 301-730-7550
Mass Waltham 617-899-2500
Mich Ferndale 313-548-0730
NJ Middlesex 210-469
NY Pittsford 716-385
NC Charlotte 704-597
Ohio Cincinnati 513-851
Ohio Cleveland 216-461
Tex Dallas 214-350

ALMO DIV DEVELCO INC, See Develco Inc

ALMOND INSTRS. CO., Dept. EM, 1223 Eas Pl., Covina, Cal. 91724, Tel: 213-967-4151, 910-584-1320; Empl.: 55 ..... p. 320

Sales Manager: R. J. Walsh

Local Sales Offices & Reps.

Ariz Phoenix, Cleveland Entprs 602-94
Cal Los Angeles, Midwin & Olifson .. 213-47
Cal San Diego, Power Assocs 714-27
Cal Sunnyvale, Mission Mktg 408-73
Colo Denver, Cleveland Entprs of Colo 303-75
Fla Orlando, Truex Assocs 305-85
Iowa Cedar Rapids, Dytronix, Inc. 319-37
Md Rockville, Elctrn Mktg Assoc. 301-88
Minn Wayzata, Dorwart Peripherals.... 612-47
Mo Hazelwood, Dy-Tronix, Inc. 314-73
Mo Independence, Dy-Tronix, Inc. 816-37
NM Albuquerque, Cleveland Entprs.. 505-26
NY Melville, Astrorep, Inc. 516-42
NY Northport, Data Logic Sls. 516-75
NY Williston Park, ABC Elctrn. Sls. Co. 516-74
Ohio Dayton, Ashby Assocs 513-25
Pa Gwynedd, Elctrn Mktg Assoc. 215-64
Pa King of Prussia, Elctrn Mktg Assoc. 215-26
Wash Bellevue, DPM Assocs 206-45

ALNOR INSTRUMENT CO., Dept. EM, 7 Caldwell Ave., Niles, Ill. 60648, Tel: 312-64 Telex: 72-4458; Empl.: 160

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Ariz Phoenix, Portis & Assocs. 602-94
Cal Costa Mesa, Tech. Prods. & Controls 714-64
Cal San Francisco, Elctrn. Engrg. Ltd. 415-59
Colo Denver, R.A. Mayes Co. 303-44
Fla Miami, Florida Precision Inst. Co. 305-32
Ga Decatur, Spader & Assoc. 404-29
Haw Honolulu, Controls, Inc. 808-84
Ind Indianapolis, Electro Engrg. Sls. 317-54
Iowa Cedar Rapids, Mueller Sls. Corp. 319-36
Iowa Davenport, Mueller Sls. Corp. 319-32
La New Orleans, M. Erichson Co. .. 504-83
Md Baltimore, Jobe & Co. 301-23
Mass Boston, Osgood Engrg. Co. 617-93
Mich Detroit, B. Turpin Co. 313-27
Minn Minneapolis, Mueller Sls. Corp... 612-54
Mo St. Louis, Ind'l. Svc. Labs. 314-53
NJ Saddlebrook, Ribble Engrs. 201-79
NY Buffalo, Thermal Systems, Inc. .. 716-66
NY Rochester, Thermal Systems, Inc. 716-32
NY Syracuse, Thermal Systems, Inc. 315-4
NC Charlotte, A.D. Penn Co. 704-8
Ohio Cincinnati, Beedle Equip. Co..... 513-7
Ohio Cleveland, A.F. Brock & Co. 216-9
Okla Tulsa, J. Schoeffler Co. 918-7
Ore Portland, Fairman B. Lee Co. 503-2
Pa Philadelphia, W. Clear 215-6
Pa Pittsburgh, L.H. Boleky Co. 412-7
Tex Dallas, Gettys-Eads-Adair 214-2
Tex Houston, Gettys-Eads-Adair..... 713-7
Utah Salt Lake City, R.A. Mayes Co. 801-2
Va Richmond, Virginia Tech. Assoc. 703-2
Wash Seattle, Fairman B. Lee Co. 206-2
Exp: Chicago, Ill, A. Torres Export..... 312-5

ALPHA COMPONENTS, INC., Dept. EM, Simpson Rd., Mechanicsburg, Pa. 1705 717-697-8595, TWX: 510-650-4930; FSC No.

Local Sales Offices & Reps.

Iowa Des Moines, Beams Co. 515-2
Kans Shawnee Mission, Beams Co..... 913-6
Md Towson, Dickison Sls. Co. 301-8
Mo St. Louis, Beams Co 314-5
Ohio Dayton, Robert Mayne & Co 513-2

ALPHA COMPONENTS CORP., Dept. Eucalyptus Dr., El Segundo, Cal. 902 213-322-7780; Empl.: 12

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Ariz Tempe, Gassner & Clark Co 602-9
Cal Long Beach, Ross Sls. 213-9
Cal Sunnyvale, RDX Corp 408-7

olo Denver, D/Z Assocs 303-534-3649
onn Manchester, Sullivan Technical Sls 302-643-6008
la Boca Raton, Ernie Kershaw 305-392-9263
wa , Hiawatha ..... Gassner & Clark Co.
lass Framingham, Sullivan Tech Sls .. 617-620-0195
inn Minneapolis, Jim Conway 612-721-5229
J Mount Laurel, Naudain Assocs .. 609-235-1801
Y Brooklyn, I. Brown Co. 212-493-1379
Y Buffalo, The Robert F. Lamb Co. 716-874-4900
Y Syosset, SGS Sls & Mktg 516-921-5335
ex Austin, John B. Guenther 512-472-3825
ex Dallas, John B. Guenther 214-691-8500
ex Houston, John B. Guenther 713-468-0382
Visc Beloit, Dale & Assocs 608-362-1495
xp: Calif. Beverly Hills, Itonra International 213-990-6222

HA DATA INCORPORATED, Dept. EM, 20750 Marilla St., Chatsworth, Cal 91311, Tel: 213-882-6500, WX: 910-494-4914; Empl.: 55

ales Manager: L.T. Lincoln, Dir. of Mktg.

ocal Sales Offices & Reps.
riz Phoenix, Industrial Prod. Corp. .. 602-246-8487
al Cupertino, MAC-i 408-257-9880
al San Diego, Mesa Elctrns. 714-278-8021
olo Denver, Data Sys. Mktg. 303-426-4240
onn Southbury, J.J. Wild, Inc. of New Englnad 203-264-9494
a Chamblee, Technical Assoc. 404-457-1645
aw Honolulu, Aloha Assocs. 808-941-1574
Chicago, Scientific Sls. 312-775-7594
d Indianapolis, Scientific Sls. 317-253-4606
d Rockville, L. G. White & Assocs. 301-770-6556
ass Needham, J.J. Wild, Inc. of New England 617-444-2366
ich Ann Arbor, Electro Sales Assocs. 313-665-5397
inn Bloomington, Scientific Sls. 612-881-3300
M Albuquerque, Industrial Prods. 505-256-3561
Y Jericho, J.J. Wild, Inc. 516-935-6600
Y Rexford, N. W. Alexander & Assocs. 518-377-0581
hio Cleveland, Electro Sls. Assocs... 216-261-5440
hio Dayton, Electro Sls. Assocs. 513-426-5551
re Portland, McLaren Inc. 503-297-2248
a Audubon, Holmes Assocs. 215-666-0636
ex Houston, Data Applications Corp. 713-782-0830
ex Richardson, Data Applications Corp. 214-231-4846
tah Salt Lake City, Data Sys. Mktg. 801-487-8281
ash Bellevue, McLaren Inc. 206-454-3400

HA ELECTRONIC SERVICES, See American icrosignal Corp

HA-M CORP, Dept. EM, 3009 Wildflower Drive, allas, Tx. 75229; Empl.: 5

ales Manager: W. L. Cowley

ocal Sales Offices & Reps.
al Montebello, TUCUL Engrg. Co... 213-728-7397
aw Honolulu,, Aloha Assocs. 808-914-1514
Des Plaines, Maher Engrg. Co... 312-824-2124
ex Dallas, Merit Co. 214-620-0021

HA METALS, INC., Dept. EM, 600 Rte 440, Jersey ty, N.J. 07304, Tel: 201-434-6778, Telex: 12-5798; npl.: 400

ales Manager: S. Colton

ocal Sales Offices & Reps.
a Huntsville, BJR Manufacturers' Reps 205-881-3569
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al Norco, Alpha Metals 714-734-5488
al San Jose, Alpha Metals 408-257-7833
al Santa Ana, Alpha Metals 714-547-7315
al Santa Clara, John F. Smith 408-247-9691
olo Denver, Westmark Denver 303-922-8248
a Kissimmee, E. L. Moyson 305-846-6342
Chicago, Alpha Metals 312-642-1785
Des Plaines, Alpha Metals 312-297-0730
Palatine, Alpha Metals 312-991-1547
d Indianapolis, Alpha Metals 317-545-7308
ins Kansas City, Louis Bruns 913-287-5242
ass Brantree, Minot Sales Assoc. 617-843-4999
ch Troy, Alpha Metals 313-879-8189
nn St. Paul, R. G. Ragon 612-488-0201
l Haddonfield, Alpha Metals 609-547-9439
l Sea Girt, Alpha Metals 201-449-1695
M Albuquerque, Power Enterprises 505-881-8537
Ithaca, Bob Dean 607-272-2187
C Charlotte, Alpha Metals 704-554-0581
io Kent, Alpha Metals 216-678-5852
x Dallas, Alpha Metals 214-691-5387
x Garland, Alpha Metals 214-278-7623

ALPHA POWER, INC., Dept. EM, 20536 Plummer St, Chatsworth, Cal. 91311, Tel: 213-998-9873; Empl.: 60 ..... p. 3202,3203

Local Sales Offices & Reps.
Ariz Tempe, J. Smith & Assocs. 602-968-7025
Cal Los Altos, Westec Electronics 415-948-8880
Cal Woodland Hills, Burtis Instrumentation Sls. 213-887-1360
Colo Denver, J. Smith & Assocs. 303-442-7100
Conn Danbury, ABC Elctrn Sls 203-743-9441
Ill Lisle, John Topel Co 312-963-6465
Kans Overland Park, Advanced Techn Sls 913-492-4333
Md Ellicott City, A/O Electronics 301-942-8883
Mass Newton Centre, Daner-Hayes 617-969-4650
Mo St. Louis, Advanced Techn Sls .. 314-567-6272
NJ Tenafly, ABC Elctrn Sls 201-568-2354
NM Albuquerque, J. Smith & Assocs. 505-265-3406
NY Rochester, Daner-Hayes 716-467-5100
NY Williston Park, ABC Elctrn Sls 516-747-6610
Pa Audubon, Daner Hayes 215-666-5005
Tex Dallas, Vista Assocs 214-235-4547
Tex Houston, Vista Assocs. 713-661-0119

ALPHA WIRE CORP., Dept. EM, 711 Lidgerwood Ave., Elizabeth, N.J. 07207, Tel: 201-925-8000, TWX: 710-996-5895 13-9180; Empl.: 250 ..... p. 4464-4479

Local Sales Offices & Reps.
Ariz Phoenix, Shefler-Kahn Co., Inc... 602-257-9015
Cal Inglewood, J. Berman Co. 213-649-6111
Cal Pleasanton, Moulthrop Sls., Inc. 415-846-0550
Fla Maitland, Hutto-Hawkins-Peregory, Inc. 305-831-2474
Ga Atlanta, Millar Elctrns., Inc..... 404-261-6160
Ill Chicago, I.R.I. Inc. 312-647-7755
Ind Indianapolis, Mktg. Engrs., Inc. .. 317-546-1523
Md Pikesville, L & M Assocs. 301-484-7970
Mass Needham, Mullin Techn. Sls. 617-444-4780
Mich Detroit, R.C. Merchant 313-535-6000
Minn Minnepolis, Clark R. Gibb Co. 612-377-1200
Mo Kansas City, Forristal-Young Sls. Co. 816-358-6771
NJ East Brunswick, Happco Assocs. 201-238-2008
NY Rochester, Marchese, Marsey, Barden Assocs. 716-442-9702
Ohio Cleveland, Marlow Assocs., Inc. 216-991-6500
Tex Dallas, J.Y. Schoonmaker Co., Inc. 214-349-1650
Wash Seattle, Earl & Brown Co., Inc. .. 206-284-1121

A.L.S. ELECTRONICS CORP., Dept. EM, 1400 N. Baxter St., Anaheim, Cal. 92806, Tel: 714-956-9200, TWX: 910-591-2711; FSC No.: 04801; Empl.: 44 p. 3204,3205

ALTEK CORP., Dept. EM, 2150 Industrial Pkwy, Silver Spring, MD 20904, Tel: 301-622-3906, TWX: 710-825-0422; Empl.: 25

Sales Manager: E. A. Cameron

ALUMINUM FILTER CO., Dept. EM, PO Box 1311, Santa Barbara, Cal. 93102, Tel: 805-684-7651; FSC No.: 17504; Empl.: 40

Sales Manager: B.L. Baker

Local Sales Offices & Reps.
Cal Los Angeles, Aluminum Filter Co. 805-684-7651
Cal San Diego, Aluminum Filter Co. 805-684-7651
Cal San Francisco, Air Filter/Control 415-871-6808
Colo Estes Park, Windcliff Service Co. 303-586-5805
Tex Dallas, W.P. Schoenfield Co. 214-352-2233

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Sales Manager: T. Whigham

Local Sales Offices & Reps.
Ariz Tempe, Jarko Assocs. 602-966-3020
Cal El Monte, MITE/Western 213-686-1354
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Cal Pasadena, T.W. Yeakle 213-684-2275
Cal Santa Clara, Novatronix 408-243-9530
Colo Englewood, Dynatech, Inc..... 303-773-2830
Conn Bethany, Reps. Corp. 203-393-0024
Fla Miami, S.K. Wallace Assocs. 305-961-6640
Fla Tampa, S.K. Wallace Assocs. 813-935-5817
Ill Elk Grove Village, Control Sls.... 312-595-2110
Ind Indianapolis, Carter, McCormic & Peirce 317-844-4175
Iowa Marion, Thomas & Modrcin 319-377-6261
Kans Shawnee Mission, Thomas & Modrcin 913-432-2131
Mass Topsfield, Reps. Corp. 617-426-0541
Mich Farmington Hills, Carter, McCormic & Peirce 313-477-7700
Minn Minneapolis, C.E. Bohlig Co. 612-922-7011
Mo Hazelwood, Thomas & Modrcin 314-895-4700
NY New Rochelle, A & M Assocs. .. 914-235-4672
NY Syracuse, Lenard Co. 315-479-9191
NC Garner, Candor Co 919-779-1855
Ohio Cincinnati, J.O. Olsen Co. 513-922-2176
Ohio Cleveland, J.O. Olsen Co. 216-752-5444
Pa Birchrunville, Jadelectronics Assocs. 215-647-5151
Pa Pittsburgh, J.O. Olsen Co. 412-279-2550
SC Myrtle Beach, Candor Co..... 803-448-8361
Tenn Chattanooga, Candor Co 615-894-9686
Tex Dallas, McCoy Assocs. Co. 214-350-9931
Tex Houston, McCoy Assocs. Co. 713-649-5756
Utah Sandy, Dynatech 801-942-4387
Wash Seattle, Blum & Assocs. 206-284-4082
Wisc Thiensville, Control Sls 414-242-4580

Local Distributors
Cal Irvine, Ratel Terminal Elctrn. 714-549-8611
Cal Sunnyvale, Ratel Elctrn. 408-739-9220

AMBI-TECH INDS. INC., Dept. EM, 319 Knickerbocker Ave, Hillsdale, NJ 07642, Tel: 201-666-0504; Empl.: 12

Sales Manager: Al Nagler

Local Sales Offices & Reps.
Cal Montebello, Tucul Engng. 213-723-4072
Fla Indian Rocks Beach, Kirk Sales 813-595-7353
Ga Dunwoody, Power Sys Engrg 404-394-6775
Ill Northbrook, McFarland Engrg 312-272-6246
Ind Indianapolis, Bryant Control, Inc. 317-784-0261
Mass Reading, V. Banester Co. 617-944-3776
Mich Farmington Hills, Electromatic, Inc. 313-478-1182
Nev Sparks, Carroll A. Brant Entprs.. 702-358-0829
NY Baldwinsville, Oshex Assocs 315-635-6027
NY Buffalo, D.C. Rudell Assocs..... 716-634-4300
NC Charlotte, B. J. Shepard & Co... 704-588-0693
Ohio Canton, Electromatic of Ohio..... 216-456-6239
Ohio Cincinnati, Loesch Assocs 606-331-4332

AMBROID CO., Dept. EM, P.O. Box 1089, Taunton, MA 02780, Tel: 617-823-1726; Empl.: 10

AMCO ENGINEERING CO., Dept. EM, 7333 W. Ainslie St., Chicago, Ill. 60656, Tel: 312-867-8500, TWX: 910-221-5192; Empl.: 225 ..... p. 1023

Sales Manager: F.A. Johnson

Local Sales Offices & Reps.
Ala Huntsville, Ridge Instr. Co..... 205-837-3211
Ariz Phoenix, Gramer & Co..... 602-279-1231
Cal Burlingame, Polach & Bensinger, Inc. 415-697-2525
Cal Los Angeles, The Knight Co, ... 213-670-2833
Cal Orange County, The Knight Co.. 714-833-8250
Cal San Diego, The Knight Co..... 714-271-7817
Colo Boulder, R.G. Enterprise..... 303-447-9211
Conn Stratford, Instr. Dynamics, Inc. .. 203-378-6019
Fla Clearwater, WMM Assocs..... 813-442-3913
Fla Ft. Lauderdale, WMM Assocs..... 305-772-9850
Fla Maitland, WMM Assocs. 305-831-4530
Ga Norcross, C. Harrison Assocs 404-449-7696
Ill Chicago, R.L. Lang & Assocs..... 312-867-4241
Ind Ft. Wayne, McDonald Sls. Co. .. 219-747-3650

Iowa Davenport, Ensco-Rep 319-386-6600
Kans Overland Park, Ensco-Rep..... 913-381-7557
Md Rockville, L.G. White & Co. 301-770-6556
Mass Wakefield, Instr. Dynamics, Inc... 617-245-5100
Mich Madison Heights, WKM Assocs. 313-588-2300
Minn St. Paul, Bonament Heyda Co. .. 612-484-8531
Mo St. Louis, Ensco-Rep..... 314-567-3935
NJ Woodcliff Lake, F&F Assocs..... 201-778-6767
NM Albuquerque, C.T. Carlberg Assocs. 505-265-1579
NY Coram, F&F Assocs..... 516-935-1100
NY Syracuse, NACO Elctrns..... 315-699-2651
NC Winston Salem, L.G. White & Co. 919-725-3612
Ohio Cleveland, WKM Assocs..... 216-267-0445
Ohio Dayton, WKM Assocs. 513-434-7500
Okla Tulsa, Don Shuhart Co. 918-747-4136
Ore Beaverton, Showalter Instrs., Inc. 503-644-9164
Pa Broomall, White-Whiddett..... 215-353-6347
Pa Pittsburgh, WKM Assocs. 412-892-2953
Tex Dallas, Don Shuhart Co..... 214-239-0185
Tex Houston, Pan/Tech Engrg 713-623-0640
Wash Bellevue, Showalter Instruments, Inc. 206-455-4922
Wash Richland, Showalter Instrs., Inc. 509-943-5288
Exp: Mahwah, N.J., International Sls Div 201-825-0473

AMCOMP, INC., Dept. EM, 686 W. Maude Ave., Sunnyvale, Cal. 94086, Tel: 408-732-7330, TWX: 910-339-9244; Empl.: 380

Local Sales Offices & Reps.
Ariz Phoenix, Thorson Co. 602-956-5300
Cal Laguna Hills, Richard Oldmiton.. 714-770-2611
Cal Sunnyvale, James F. Brady..... 408-732-7330
Colo Boulder, P.A.R. Assocs. 303-499-4736
Md Bethesda, Bartlett Assocs. 301-656-3061
Mass Framingham, Bartlett Assocs. 617-879-7530
NY White Plains, Bartlett Assocs. 914-949-6476
Pa Wayne, Bartlett Assocs. 215-688-7325
Tex Dallas, Thorson Co..... 214-233-5744
Tex Houston, Thorson Co..... 713-771-3504

AMERICAN AEROSPACE CONTROLS, Dept. EM, 131 Verdi St., Farmingdale, N.Y. 11735, Tel: 516-694-5100; Empl.: 30 ..... p. 4298,4299

Sales Manager: G. D'Abramo

Local Sales Offices & Reps.
Cal Los Angeles, Dyna Sls. Co..... 213-268-1175

AMERICAN CAN CO, Packaging Oper, Dept. EM, Box 1126-Wall St. Sta, NY, NY 10005, Tel: 800-221-3333

AMERICAN COMPONENTS, INC., Dept. EM, 8th Avenue at Harry St., Conshohocken, Pa. 19428, Tel: 215-825-6200, TWX: 510-660-9268; Empl.: 417 p. 1058,1059,3634-3637

Sales Manager: Joseph Carroll

Local Sales Offices & Reps.
Ala Huntsville, B.J.R. Research & Mftg. 205-881-3569
Ariz Scottsdale, Carter Assocs. 602-947-4355
Cal Palo Alto, Heid & Mollard 415-965-9321
Cal Van Nuys, Wes-K Assocs. 213-989-3070
Colo Wheatridge, Waugaman Assocs. 303-423-1020
Fla Ft. Lauderdale, Beacon Elctrns. Assocs. 305-491-4211
Fla Maitland, Beacon Elctrns. Assocs. 305-647-3498
Ga Atlanta, G. S. O'Hara 404-237-0600
Ill Westchester, Gassner & Clark .. 312-345-4245
Kans Shawnee Mission, Midtek Assoc 913-441-6565
Mass Canton, New England Elctrn. Sls. 617-828-4835
Mich Livonia, Giesting & Assocs. 313-477-6060
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NJ Cherry Hill, Danco Corp. 609-424-5590
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NY Pompey, S.F. Foster Co. Inc..... 315-677-3333
Ohio Cincinnati, Giesting & Assocs. 513-851-7800
Ohio Dayton, Geisting & Assocs. 513-293-4044
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Wash Seattle, Northmar Inc..... 206-524-5170

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Ariz Phoenix, Mirco Elctrn Distributor 602-997-6194
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Ohio Solon, Radio Elc. Parts..... 216-248-8900
Pa Huntington Valley, Henwarr 215-675-4104
Pa Philadelphia, Almo Elctrns 215-698-4024
Tex Fort Worth, T. T. I..... 817-336-8111
Wash Seattle, Zepher Elctrns..... 206-242-2517
For: Can., Montreal, Prelco Elctrns.... 514-389-8051

AMERICAN ELECTRIC CABLE CO., Dept. EM, 181 Appleton St., Holyoke, Mass. 01040, Tel: 413-539-9893; Empl.: 100

Sales Manager: P. Tutschek

Local Sales Offices & Reps.
Cal Palo Alto, B. Budge Assocs. 415-961-0940
Fla Treasure Island, Buening Assocs 813-360-4973
Ind Indianapolis, Hoster & Sieloff Assocs 317-842-3701
Mass Holyoke, American Electric Cable Co. 413-539-9893
Minn Minneapolis, International Sales Co. 612-831-8423
Mo Kirkwood, Limmit Manufacturers' Repr. 314-822-3015
NJ Cherry Hill, Metz & Benham 609-424-9442
NJ Morristown, Andrews & Andrews 201-569-8800
NY Huntington, Andrews & Andrews 516-692-8686
NC Raleigh, Wolff's Sls. Svc. Co. 919-851-2800
Ohio Cleveland, Milber Co. 216-752-7528
Pa Ardmore, W.K Metz 215-649-3966

AMERICAN ELECTRONIC LABS., Dept. EM, Box 552, Lansdale, Pa. 19446, Tel: 215-822-2929, TWX: 510-661-4976; Empl.: 1100 ..... p. 1381

Local Sales Offices & Reps.
Ariz Phoenix, Shefler-Kahn Co. 602-257-9015
Cal Los Angeles, RF Assocs. 213-478-1586
Cal San Jose, L & M Engrg..... 408-292-3220
Colo Englewood, Shefler-Kahn Co. 303-761-2590
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Md Timonium, Deshawn Assocs. 301-252-4878
Mass Reading, R. H. Kelly 617-942-0055
NM Albuquerque, Shefler-Kahn Co... 505-296-0749
NY Melville, ASTROREP Inc. 516-423-2266
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SD Oak Ridge, Pulcir..... 615-483-6358
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Utah Salt Lake City, Shefler-Kaha Co. 801-484-4222
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Exp: N.Y., Westbury, CPS Intl. 516-334-

AMF INC., AMF Cuno Div., Dept. EM, 400 Res Pkwy., Meriden, Conn. 06450, Tel: 203-237- Telex: 962457

Local Sales Offices & Reps.
Ala Mobile, George S. Edwards Co. 205-476-
Ala Pelham, G.S. Edwards Co. 205-663-
Ariz Phoenix, Fluid Conditioning Co... 602-243-
Cal Hayward, Filtrex..... 415-783-
Cal Westminster, G. Yardley, Inc. 213-598-
Colo Arvada, W.M. Murphy & Co. 303-423-
Conn Branford, Eastern Filters Sls..... 203-488-
Fla Tampa, Gulf Controls Corp..... 813-884-
Ga Atlanta, Process & Control Equip. Co. 404-458-
Ill Franklin Park, Semier Ind. 312-671-
Ind Evansville, Vonnegut Indl Prods 812-425-
Ind Indianapolis, Vonnegut Ind. Prod. 317-632-
La Metairie, Eggelhof Inc. 504-888-
La Shreveport, Eggelhof Inc. 318-222-
Mass Quincy, MWM Co 617-328-
Mich Burton, J.N. Fauver Co. 313-742-
Mich Grand Rapids, J. N. Fauver Co. 616-247-
Mich Jackson, J. N. Fauver Co. 517-787-
Mich Kalamazoo, J. N. Fauver Co..... 616-382-
Mich Madison Heights, J.N. Fauver Co., Inc. 313-585-
Minn St. Paul, H.R. Peterson Co. 612-646-
Mo Kansas City, Fitzwater & Assoc. 816-353-
Mont Brentwood, Hagedorn & Gannon 314-962-
NJ Union City, Process Equip. & Sup. Co. 201-867-
NY E. Aurora, Fluid Cond. Equip. 716-652-
NC Charlotte, Process Pneumatics Corp. 704-588-
NC Wake Forest, Process Pneumatics 919-556-
Ohio Cincinnati, J.N. Fauver Co..... 513-891-
Ohio Cleveland, Control Comps. Co... 216-691-
Ohio Dayton, J. N. Fauver Co. 513-233-
Okla Tulsa, Eggelhof Inc..... 918-663-
Ore Portland, J.H. Marvin Co. 503-292-
Pa Bridgeville, G.P. Dempler Co. 412-561-
Pa Layfayette Hill, Waco Assocs..... 215-828-
SC Greenville, Process-Pneumatics Corp. 803-277-
Tex Beaumont, Eggelhof Incorporated713-833-
Tex Dallas, Eggelhof Incorporated 214-324-
Tex El Paso, Eggelhof Incorporated.. 915-778-
Tex Houston, Eggelhof Incorporated 713-923-
Tex Lubbock, Eggelhof Incorporated 806-795-
Tex San Antonio, Eggelhof Incorporated 512-349-
Utah Salt Lake City, C.H. Spencer & Co. 801-486-
Va Richmond, Process Pneumatics Corp. 804-794-
Wash Seattle, J.H. Marvin Co. 206-282-

MF POTTER & BRUMFIELD, see Potter & Brumfield Div. of AMF

MILON CORP., Dept. EM, 49-12 30th Ave., Woodside, N.Y. 11377, Tel: 212-274-1794; Empl.: 50

Sales Manager: L. Rosenblatt

Local Sales Offices & Reps.

Ala	Huntsville, Murcota Corp.	205-539-8476
Cal	Los Angeles, Halbar Assocs.	213-387-8283
Cal	San Mateo, Halbar Assocs.	415-349-4700
Fla	Maitland, Lawrence Assocs.	305-647-1188
Ill	Chicago, J. C. Angel & Co.	312-593-7600
Ind	Indianapolis, Scott Elctrns.	317-897-9976
Ky	Louisville, Scott Elctrns.	502-583-3220
Md	Baltimore, R. L. Wilkinson Inc.	301-377-7800
Mass	Lexington, Hathaway Elctrns. Inc.	617-861-7010
Mich	Plymouth, Scott Elctrns.	313-455-2440
Minn	St. Paul, B. Heyda Co.	612-484-8531
NY	Floral Park, MOS Assocs.	516-487-3966
NC	Winston-Salem, Murcota Corp.	919-722-9445
Ohio	Cleveland, Scott Elctrns.	216-291-2600
Pa	Glenside, R. L. Wilkinson Inc.	215-887-5300
Wash	Buckley, Halbar Assocs.	206-939-2080

MP CAPITRON DIV./AMP INC., Dept. EM, 1595 S. Mt. Joy St., Elizabethtown, Pa. 17022, Tel: 717-367-1105, TWX: 510-657-4561 p. 1382, 1383, 1684, 1685, 2616, 2617, 3206

Sales Manager: W.L. Pharmer

Local Sales Offices & Reps.

Cal	Compton	213-537-4490
Cal	Cupertino	408-255-3830
DC	Wash	202-659-9112
Fla	Orlando	305-841-7771
Ill	Hanover Park	312-593-1386
Mass	Needham	617-444-4839
Minn	Eden Prairie	612-941-2203
Mo	St. Charles	314-441-3240
NJ	North Plainfield	201-753-5964
NY	Canadaiga	315-394-0930
Ohio	North Olmsted	216-779-5206
Tex	Dallas	214-231-2118

MP INC., Ind'l. Div., Dept. EM, Box 3608, Harrisburg, Pa. 17105, Tel: 717-564-0100, TWX: 510-657-4110; Empl.: 15,000 ..... p. 3985-3996

Local Sales Offices & Reps.

Cal	Compton	213-537-4490
Cal	Cupertino	408-255-3830
Colo	Englewood	303-773-0422
Ga	Atlanta	404-934-6363
Ill	Elk Grove Village	312-439-5800
Kans	Overland Park	913-642-9850
Mass	Weston	617-891-7500
Mich	Southfield	313-645-5590
Minn	Minneapolis	612-831-8242
NJ	Parsippany	201-334-6664
NY	Pittsford	716-385-2860
Ohio	Columbus	614-486-0276
Pa	Berwyn	215-647-6060
Tex	Dallas	214-357-9151
Va	Alexandria, AMP Inc.	703-683-5955

MP SPECIAL INDUSTRIES, Dept. EM, Valley Forge, Pa. 19482, Tel: 215-647-1000, Telex: 846-405; Empl.: 550

Distributor Manager: S. J. Matt

Local Sales Offices & Reps.

Alas	Anchorage, Yukon Radio Supp.	
Cal	Compton, AMP Special Industries	213-639-1691
Cal	San Mateo, AMP Special Industries	415-573-7722
Colo	Englewood, AMP Special Inds.	303-773-1885
Ga	Atlanta, AMP Special Industries	404-939-7604
Haw	Honolulu, AMP Special Industries	538-3774
Ill	Elk Grove Village, AMP Special Industries	312-439-7800
Mass	Weston, AMP Special Industries	617-899-6700
Mich	Southfield, AMP Special Industries	313-646-0090
Mo	Overland Park, AMP Special Industries	913-642-9800
Mo	St Louis, AMP Special Inds.	314-878-9111
NJ	Cranford, AMP Special Industries	201-276-8300
Ohio	Cincinnati, AMP Special Industries	513-821-6650
Pa	Paoli, AMP Special Industries	215-647-1000
Pa	Philadelphia, AMP Special Industries	215-647-3250
Pa	Pittsburgh, AMP Special Industries	412-344-7900
Tex	Dallas, AMP Special Industries	214-631-0850

AMPEREX-ELECTRO-OPTICAL DEVICES DIV., see Amperex Electronic Corp., Slatersville Div.

AMPEREX ELECTRONIC CORP., Hicksville Div., Dept. EM, Box 418 - 230 Duffy Ave., Hicksville, N.Y. 11802, Tel: 516-931-6200, TWX: 510-221-1839; Empl.: 250

Local Sales Offices & Reps.

Ala	Huntsville, 20th Century Mktg	205-772-9237
Ariz	Tempe, Amperex Sls Corp.	602-968-7917
Cal	Los Gatos, Wedemeyer Sls Co.	408-378-3833
Cal	No. Hollywood, Amperex Sls Corp.	213-980-4212
Cal	San Diego, The Rep Co	714-292-9001
Cal	Santa Clara, Ameprex Sls Corp.	408-249-1134
Colo	Lakewood, Amperex Sls Corp.	303-922-8434
Conn	Orange, Amperex Sls Corp.	203-795-4748
Conn	Orange, Macpherson Conner Assocs	203-795-4748
Fla	Orlando, Technology Mktg Assoc.	305-857-3750
Fla	Pompano Beach, Technology Mktg Assoc.	305-942-0774
Ill	Elk Grove Village, Amperex Sls Corp.	312-640-2525
Ind	Crawfordsville, Dale A. Miller & Assoc.	317-362-6348
Iowa	Cedar Rapids, Lorenz Sls Inc.	319-393-6912
Kans	Overland Park, Advanced Technical Sls	913-492-4333
Mass	Waltham, Amperex Sls Corp.	617-968-7917
Mich	Farmington, Amperex Sls Corp.	313-478-7666
Minn	Minneapolis, Siedare Assocs	612-545-5563
Mo	St. Louis, Advanced Technical Sls	314-567-6272
NY	Clay, Tech-Mark, Inc.	315-699-2261
NY	Endicott, Tech-Mark, Inc.	607-748-7473
NY	Hicksville, Amperex Sls Corp.	516-931-6200
NY	Liverpool, Tech-Mark, Inc.	315-652-6229
Ohio	Dayton, Amperex Sls Corp.	513-278-7351
Ore	Portland, Amperex Sls Corp.	503-645-7722
Ore	Portland, Western Technical Sls	503-297-1711
Pa	King of Prussia, Amperex Sls Corp.	215-265-4240
SC	Myrtle Beach, Candor Co.	803-448-8361
Tex	Dallas, Amperex Sls Corp.	214-231-3481
Wash	Bellevue, Western Technical Sls	206-641-3900

AMPEREX-SOLID STATE & ACTIVE DEVICES, see Amperex Electronic Corp., Slatersville Div.

AMPEREX ELECTRONIC CORP., Slatersville Div., Dept. EM, Providence Pike, Slatersville, R.I. 02876, Tel: 401-762-3800, TWX: 710-382-6332, 927584; FSC No.: 73445; Empl.: 565

Local Sales Offices & Reps.

Ariz	Tempe	602-968-7917
Cal	North Hollywood	213-980-4212
Cal	Santa Clara	408-249-1134
Colo	Lakewood	303-922-8434
Conn	Orange	203-795-4748
Ill	Elk Grove Village	312-640-2525
Mass	Waltham	617-899-7100
Mich	Farmington	313-478-7666
NY	Hicksville	516-931-6200
Ohio	Dayton	513-278-7351
Ore	Portland	503-645-7722
Pa	King of Prussia	215-265-4240
Tex	Dallas	214-231-3481

AMPEX CORP., Dept. EM, 401 Broadway, Redwood City, Cal. 94063, Tel: 415-367-2011, TWX: 415-364-9034; Empl.: 11,000

AMPHENOL NORTH AMERICA DIV., Bunker Ramo Corp., Dept. EM, 900 Commerce Dr., Oak Brook, Ill. 60521, Tel: 312-986-2700, TWX: 910-651-0191; Empl.: 3600 ..... p. 1686-1704,3998,3999

Sales Manager: R. Ploudre, V.P. Dir Sls; *Distributor Manager:* R. Parlissidi, V.P. Distr Mktg

RF CONNECTOR OPERATION, Dept. EM, 33 E. Franklin St., Danbury, Conn. 06810, Tel: 203-743-9272, TWX: 710-456-0281

CANADA LTD. OPERATION, Amphenol Bunker Ramo Corp. North America Div., Dept. EM, 44 Metropolitan Rd., Scarborough, (Ont.), Can., Tel: 416-291-4401, TWX: 610-492-4379

Amphenol *Local Sales Offices & Reps.*

Cal	Los Angeles	213-649-5015
Cal	San Francisco	408-732-8990
Colo	Denver	303-758-8033
DC	Washington	703-524-8700
Fla	Orlando	305-647-5504
Ga	Atlanta	404-394-6298
Ill	Chicago	312-449-1880
Ind	Indianapolis, L.M. Devoe Co.	317-842-3245
Kans	Kansas City	913-764-1541
Mass	Boston, R. Purinton	617-475-7055
Minn	Minneapolis	612-835-4595
Mo	St. Louis	314-569-2279
NY	New York	516-364-2270
NY	Syracuse	315-455-5786
NC	Greensboro	919-275-8644
Ohio	Dayton	513-294-0461
Pa	Philadelphia	215-657-5170
Tex	Dallas	214-235-8319
Wash	Seattle	206-455-2525

Local Distributors

Ariz	Phoenix, Liberty Electronics/Ariz.	602-249-2232
Ariz	Phoenix, Moltronics of Ariz.	602-272-7951
Cal	El Segundo, Liberty Elctrns.	213-322-8100
Cal	Irvine, Cramer Elctrns.	714-979-3000
Cal	Los Angeles, Kierulff Elctrns.	213-725-0325
Cal	Mountain View, Elmar Elctrns.	415-961-3611
Cal	San Carlos, Sterling Elctrns.	415-592-2353
Cal	San Diego, Kierulff Elctrns.	714-278-2112
Cal	San Diego, Liberty Elctrns.	714-565-9171
Cal	San Diego, Moltronics	714-278-5020
Cal	South Gate, Moltronics	213-773-6521
Cal	Sunnyvale, Bell Industries	408-734-8570
Colo	Commerce City, Elmar Elctrns.	303-287-9611
Colo	Denver, Newark Elctrns.	303-757-3351
Conn	Hamden, Wilshire Elctrns.	203-281-1166
Conn	New Haven, Connector Co.	203-624-0127
Fla	Hollywood, Schweber Elctrns.	305-927-0511
Fla	Hollywood, Cramer Elctrns.	305-921-7878
Fla	Orlando, Cramer Elctrns.	305-894-1511
Ga	Atlanta, Arrow Elctrns.	404-455-4054
Ga	Norcross, Cramer Elctrns.	404-448-9050
Ill	Chicago, Bell Inds.	312-982-9210
Ill	Chicago, Newark Elctrns.	312-638-4411
Ill	Elk Grove, Schweber Elctrns.	312-593-2740
Ill	Palatine, Ohm Elctrns.	312-359-5500
Ill	Peoria, Klaus Radio, Inc.	309-691-4840
Ind	Indianapolis, Graham Elctrns. Supply	317-634-8202
Ind	South Bend, Genesis Elctrns	
Kans	Wichita, Interstate Elctrn. Supply	316-264-6317

INDUSTRIAL DISTRIBUTORS
AMPEREX • EIMAC • RCA
RAYTHEON • VARIAN
VACUUM TUBES
ZACK
ELECTRONICS
PALO ALTO, CA
415/326-5432 654 High St. 94301
SAN FRANCISCO, CA
415/626-1444 1444 Market St. 94102

Md Baltimore, Arrow Elctrns. 301-247-5200
Md Gaithersburg, Cramer Elctrns. 301-948-0110
Md Gaithersburg, Pioneer Elctrns. 301-948-0710
Mass Burlington, Wilshire Elctrns. 617-272-8200
Mass Newton, Cramer Elctrns. 617-969-7700
Mass North Wilbraham, Industrial Comps. Corp. 413-596-3854
Mass Waltham, Schweber Elctrns.
Mich Ann Arbor, Wedemeyer Elctrn. Supply Co. 313-665-8611
Mich Livonia, RS Elctrns. 313-525-1155
Minn Edina, Cramer/Bonn Co. 612-835-7811
Minn Minneapolis, Arrow Elctrns. 612-887-6400
Minn Minneapolis, Newark Elctrns. 612-331-6350
Mo Kansas City, Lcomp Elctrns. 816-221-2400
Mo Maryland Hgts., Lcomp Elctrns. 314-291-6200
Mo University City, Olive Indl. Elctrns. 314-863-7800
NJ Clifton, Wilshire Elctrns. 201-340-1900
NJ Pennsauken, Radio Electric Svc. 215-925-6900
NJ Somerset, Schweber Elctrns. 201-469-6008
NY Binghamton, Harvey Elctrns. 607-748-8211
NY Buffalo, Summit Distrs. 716-884-3450
NY Buffalo, Genessee Radio Parts Co. 716-873-9661
NY Farmingdale, DRW Elctrns. 516-249-2660
NY Plainview, Progress Elctrns. 516-433-1700
NY Rochester, Simcona Elctrns. 716-328-3230
NY Westbury, Schweber Elctrns. 516-334-7474
NC Winston-Salem, Cramer Elctrns. 919-725-8711
Ohio Beachwood, Schweber Elctrns. ... 216-464-2970
Ohio Cincinnati, Schuster Electric Co. 513-984-1600
Ohio Cleveland, Pioneer/Cleveland Div. Pioneer Std. Elctrns. 216-587-3600
Ohio Dayton, Pioneer/Dayton Div. Pioneer Std. Elctrns. 513-236-9900
Okla Oklahoma City, Electro Entprs. ... 405-478-1752
Pa Montgomeryville, Pyttronic Ind. .. 215-643-2850
Pa Philadelphia, Almo Elctrns. 215-698-4000
Pa Pittsburgh, CAM/RPC Indl. Elctrns. 412-782-3770
Tenn Nashville, Electra Distributing Co. 615-329-3971
Tex Dallas, Hamilton/Avnet 214-661-8661
Tex Dallas, Sterling Elctrns. 214-357-9131
Tex Dallas, Texas Instr. Supply Co. .. 214-238-6821
Tex Ft. Worth, Allied Elctrns. 817-336-5401
Tex Houston, Sterling Elctrns. 713-627-9800
Utah Salt Lake City, Standard Supply Co. 801-486-3371
Utah Salt Lake City, Diplomat/Alta 801-486-4134
Wash Bellevue, Bell Industries 206-747-1515
Wash Seattle, Liberty Elctrns. 206-453-8300
Wisc Milwaukee, Electronic Expeditors 414-228-8100

AMPLIFIER CORP. OF AMERICA, Dept. EM, 75 Frost St., Westbury, N.Y. 11590, Tel: 516-333-9100 TWX: 510-222-9774; FSC No.: 73446; Empl.: 40
Sales Manager: A.J. Gillette

AMPLIFIER RESEARCH CORP., Dept. EM, 160 School House Rd., Souderton, Pa 18964, Tel: 215-723-8181; FSC No.: 30639; Empl.: 15 .... p. 1001
Sales Manager: D.W. Roth
Local Sales Offices & Reps.
Cal N. Nollywood, O'Halloran Assoc 213-877-0173
Cal Palo Alto, O'Holloran Assoc. 415-326-1493
Colo Boulder, H. Bass. Assoc. 303-499-7509
Conn Hamden, J.B.L. Assoc. 203-281-3161
Fla Bradenton, Saber Assoc. 800-432-3007
Fla Indialantic, Saber Assocs 800-432-3007
Fla Longwood, Saber Assoc. 800-432-3007
Fla Pompano Beach, Saber Assoc... 305-943-3076
Ga Atlanta, Saber Assocs 800-327-1193
Ill Chicago, Elctrn. Instr. Assocs.... 312-271-3774
Ind Indianapolis, Elctrn. Instr. Assocs. 317-257-7231
Mass Burlington, R.J. Sickles 617-272-7285
Mich Northville, Micro Sls. 313-459-1670
NJ Westfield, Gray & Reed Assocs. 201-233-6116
NY Huntington Station, Gray & Reed Assocs. 516-433-3333
NC Raleigh, Saber Assoc. 800-327-1193
Ohio Centerville, Micro Sls. 513-433-8171
Ohio Cleveland, Micro Sls. 216-331-0900
Okla Oklahoma City, Airep Elctrns. 405-721-3026
Pa Melrose Park, R. Meyers Assoc. 215-224-1663
Tex Austin, Airep Elctrns. 512-444-1273
Tex Dallas, Airep Elctrns. Inc. 214-827-2120
Tex Houston, Airep Elctrns. 713-944-2055
Va Bailey's Crossroads, Q.T. Elctrn Sls 703-671-4357
Wash Seattle, J. B. Jolly 206-938-4166
Exp: Ind., Indianapolis, Texscan Tech. Prods. 317-357-8781

AMPOWER ELECTRONIC INSTR. CO., Dept. EM, 500 Union Blvd., Totowa, N. J. 07512, Tel: 201-790-6750, TWX: 710-988-5949
Sales Manager: H. L. Hirschfeld; *Distributor Manager:* H. L. Hirschfeld
Local Sales Offices & Reps.
NY Farmingdale 516-752-1078
NY Rochester 716-424-1220

AMPRO CORP., Dept. EM, 850 Pennsylvania Blvd., Feasterville, PA. 19047, Tel: 215-322-5100; Empl.: 66

AMPROBE INSTRUMENT, Div. SOS Consolidated Inc., Dept. EM, 630 Merrick Rd., Lynbrook, N.Y. 11563, Tel: 516-LY 3-5600
Sales Manager: W. Eagle
Local Sales Offices & Reps.
Ariz Phoenix, Maddox Sls. 602-274-3807
Cal Los Angeles, Maddox Sls. Co. .. 213-949-5433
Cal San Diego, Maddox Sls. Co. 714-583-3389
Cal San Francisco, Maddox Sls. Co. 415-647-5560
Colo Englewood, J.R. Schmidt & Assocs. 303-751-1655
Conn Meriden, MacRae-Patton 203-238-1965
Fla Maitland, Hutto-Hawkins-Peregoy 305-831-2474
Ga Atlanta, Millar Elctrns. 404-261-6160
Ill Downers Grove, Mika Sls. 312-968-8403
Ind Indianapolis, A. Lee Clifford Co. 317-639-5248
Iowa Cedar Rapids, J. Bertsch Elec. Sls. 319-366-7719
Mass Avon, Jack Fay, Inc. 617-963-7100
Mich Detroit, Young & Champagne 313-491-6500
Minn Hamel, Elstad Sls. Co. 612-559-4000
Mo Kirkwood, M. Elec. Sls. 314-966-8659
Mo Raytown, Arehart Barnels Sls. .. 816-356-3488
NH North Hampton, Beaman Assoc. 603-964-8876
NJ Chatham, Electrical Sales 201-759-7161
NM Albuquerque, Maddox Sls. 505-298-2422
NY Albany, Les Osterman Assoc. 518-869-6346
NY Cazenovia, Les Osterman Assoc. 315-463-4312
NY Long Island City, Plunkett & Lynch Assoc 212-937-0379
NY Rochester, Les Osterman Assoc. 716-546-5780
Ohio Cleveland, Gordon F. Stoter & Bro. 216-333-0733
Okla Jenks, Wyane Parker Co. 918-299-5449
Ore Portland, Northwest Agencies 503-227-5004
Pa Glenside, R.A. Johnson Co. 215-884-1389
Tenn Memphis, Hicks Sls 901-396-5
Tex Dallas, Glidden Electro Equipt. .. 214-341-0
Utah Salt Lake City, Darger Co. 801-355-2
Va Richmond, A. Hoey Co. 804-272-3
Wash Seattle, Northwest Agencies 206-623-8
Wash Spokane, Northwest Agencies.... 509-747-0

AMPSCO POWER SYSTEMS INC, Dept. EM Grand St, Worcester, Mass. 01608, Tel: 617-753-8 Empl.: 51
Local Sales Offices & Reps.
Mass Worcester, Ampsco Mktg. Corp. 617-753-8

Amrad CORPORATION
AMRAD CORP., Dept. EM, Box 876, Paris, Tex. 75 Tel: 214-785-4544; Empl.: 17
Sales Manager: J. Clifford; *Distributor Manage* Clifford
Local Sales Offices & Reps.
Ill Chicago, Ropek-Cahill, Inc. 312-631-
Mich Stevensville, Ken-Mor Assocs. .. 616-429-
NJ Berkeley Heights, Cambridge-Allen Assoc. 212-682-
Ohio Rocky River, Loesch Assocs. 216-333-
Tex Dallas, Packard Assocs 214-357-

AMTRON DIV., Sippican Corp., Dept. EM, 1482 Kedzie Ave., Midlothian, Ill. 60445, Tel: 312-389-3 TWX: 910-689-4494; Empl.: 175
Sales Manager: E. Rozylowicz

AMUNEAL MFG. CORP., Dept. EM, 4737 Darra Philadelphia, Pa. 19124, Tel: 215-535-3000; FSC 23740; Empl.: 72 ..... p.
Local Sales Offices & Reps.
Ala Huntsville, REMCO 205-883-
Ariz Phoenix, Shefler Kahn Co 602-275-
Cal Canoga Park, C.E.M., Inc. 213-884-
Cal Redwood City, Parks & Pruitt Assocs. 415-364-
Cal Santa Ana, C.E.M., Inc. 714-835-
Colo Wheatridge, Waugaman Assocs. 303-423-
Conn New Canaan, S. Pierce, Inc. 203-966-
Fla Pompano Beach, Cole Tek Assocs. 305-781-
Ill Chicago, G.Mc L. Cole Co. 312-774-
Ind Indianapolis, McClain & Assocs.. 317-842-
Kans Overland Park, Advanced Technical Sales 913-492-
Md Baltimore, Muncy Sls. 301-484-
Mass Norwood, S. Pierce, Inc. 617-762-
Mich Jackson, Norwood Scroggs Co. 517-750-
Minn Minneapolis, B. Deming & Assocs. 612-888-
NJ Oaklyn, A. Wetterhahn Co. 609-858-
NM Albuquerque, Shefler Kahn Co .. 505-296-
NY Fayetteville, M.P. Andrews 315-637-
NY Queens Village, Buscaglia Assocs. 212-468-
NC Raleigh, REMCO - Raleigh 919-787-
Ohio Cincinnati, R. Makin Assocs. 513-232-
Tex Richardson, P.J. Scanlon Co. 214-231-
Utah Salt Lake City, Waugaman Assocs. 801-277-
Exp: Teaneck, S. Ginsbury Ltd. 201-837-

ANACONDA COMPANY BRASS DIVISION, EM, 414 Meadow St., Waterbury, Conn. 0672 203-574-8500, Telex: 962498; Empl.: 5000
Sales Manager: B. H. Eisner; *Distributor Manage* Tobin
Local Sales Offices & Reps.
Cal Oakland 415-562-
Cal Paramount 213-636-
Colo Denver 303-534-
Conn Waterbury 203-574-
Fla Tampa 813-839-
Ga Atlanta 404-255-
Ill Hinsdale 312-242-
Ind Indianapolis 317-844-
Iowa Cedar Rapids 319-364-
Mass Braintree 617-848-
Mich Detroit 313-554-
Mo Kansas City 816-753-
Mo St. Louis 314-966-
NY Buffalo 716-874-
NY New York 212-697-
NY Syracuse 315-422-
NC Charlotte 704-568-
Ohio Berea 216-243-
Ohio Cincinnati 513-421-
Pa Pittsburgh 412-34-
Pa Wayne 215-293-

INDUSTRIAL DISTRIBUTORS
AMPEREX • EIMAC • RCA
RAYTHEON • VARIAN
VACUUM TUBES
ZACK
ELECTRONICS
PALO ALTO, CA
415/326-5432 654 High St. 94301
SAN FRANCISCO, CA
415/626-1444 1444 Market St. 94102

Tex Dallas 214-233-7771
Tex Houston 713-960-1462
Misc Milwaukee 414-258-7600

ADEX INC., Dept. EM, 9825 De Soto, Chatsworth, Cal. 91311, Tel: 213-998-8010, TWX: 910-494-2761; Empl.: 75

Local Sales Offices & Reps.
Ala Huntsville, Currie, Peak & Frazier, Inc. 205-536-5650
Ariz Scottsdale, Barnhill Three 602-947-7841
Cal Inglewood, Basic Sys. 213-673-4300
Cal Los Altos, J. Stone & Assocs. 415-948-4563
Cal San Diego, Basic Sys. 714-279-9641
Colo Denver, Barnhill Three 303-750-1222
Conn Hamden, P. Jenks Assoc. 203-281-0810
Fla Orlando, Currie, Peak & Frazier, Inc. 305-855-0843
Haw Honolulu, EMC Corp. 808-847-1138
Ill Chicago, Pivan Engrg. Co. 312-539-4838
Ind Indianapolis, Pivan Engrg. Co. 317-253-1681
Kans Mission, Pivan Engrg. Co. 913-722-1030
Md Burtonsville, Eastern Instrumentation 301-384-8500
Mass Wakefield, P. Jenks Assoc. 617-246-1590
Mich Farmington, Carter, McCormic & Peirce, Inc. 313-477-7700
Minn Minneapolis, Pivan Engrg. Co. 612-835-3060
Mo St. Louis, Pivan Engrg. Co. 314-567-3636
NJ Fort Lee, Tech. Mktg. Assocs. 201-224-6911
NM Albuquerque, Barnhill Three 505-299-7658
NY E. Syracuse, Ossmann Instrs., Inc. 315-437-6666
NY Rochester, Ossmann Instrs., Inc. 716-328-2230
NY Vestal, Ossmann Instrs., Inc. 607-785-9947
NC Greensboro, Currie, Peak & Frazier, Inc. 919-273-3040
Ohio Cleveland, Carter, McCormic & Peirce, Inc. 216-779-5100
Ohio Dayton, Carter, McCormic & Peirce, Inc. 513-222-7700
Pa Monroeville, Carter, McCormic & Peirce, Inc. 412-372-4415
Pa Philadelphia, Eastern Instrumentation 215-927-7777
Tex Houston, Barnhill Two 713-688-9971
Tex Richardson, Barnhill Two 214-231-2573
Wash Seattle, R.S. Drake Assocs., Inc. 206-763-2755
Misc Brookfield, Pivan Engrg. Co. 414-786-1940

ADYNE, Dept. EM, 14830 Valley View Ave., aMirada, Cal. 90638, Tel: 714-522-8924, TWX: 10-583-4807; Empl.: 100

AHEIM AUTOMATION, Dept. EM, 922 Orangefair a., Anaheim, Cal. 92801, Tel: 714-992-6990; Empl.: 15

Sales Manager: J. Patnode

Local Sales Offices & Reps.
Cal Palo Alto, Harris Engrg. Assocs. 415-328-3370

ALOG DEVICES, INC., Dept. EM, P.O. Box 280, Norwood, MA 02062, Tel: 617-329-4700, TWX: 10-394-6577; Empl.: 1,200

Sales Manager: M. Gross

Local Sales Offices & Reps.
Ala Huntsville, Currie, Peak & Frazier 205-536-5650
Ariz Mesa, Grady Moore Associates 602-839-3458
Cal Long Beach, Analog Devices Inc. 213-595-1783
Cal Mountain View, Analog Devices, Inc. 415-969-8525
Colo Boulder, Grady Moore Assoc. 303-494-3351
Fla Orlando, Currie, Peak & Frazier 305-855-0843
Bloomingdale, Analog Devices, Inc. 312-894-3300
Northfield, Torkelson Assoc. 312-446-9085
Ind Indianapolis, Torkelson Assoc. 317-244-7867
Kans Shawnee Mission, Tech. Sales, Assoc. 913-888-3330
Md Columbia, Rep-Tron, Inc. 301-953-7580
Mich Petosky, A.P.J. Assocs. 616-526-6974
Mich Plymouth, A.P.J. Assocs. 313-459-1200
Minn Minneapolis, Torkelson Assoc. 612-835-2414
Mo St. Louis, Tech. Sales Assoc. 314-725-5361
NJ Irvington, Harwood-Sandler Assoc 201-399-3748
NM Albuquerque, Grady Moore Assoc. 505-262-1416
NY N. Tonawanda, Labtronics, Inc. 716-695-4111
NY Rochester, Labtronics, Inc. 716-685-4111
NY Syracuse, Labtronics, Inc. 315-454-9314
NY Ulster Park, Labtronics, Inc. 914-471-2806
NY Woodbury, Harwood-Sandler Assoc. 516-692-6100
NC Greensboro, Currie, Peak & Frazier 919-273-3040
Ohio Cleveland, Electro Sales Assoc. 216-261-5440
Ohio Dayton, Electro Sales Assoc. 513-426-5551
Pa Glenside, Wyncote Instru. Co. 215-887-4661
Pa Pittsburgh, Electro Sales Assoc. 412-371-9449
Tex Houston, Analog Devices, Inc. 713-664-6704
Tex Richardson, Analog Devices, Inc. 214-231-5094
Wash Seattle, Avionics Liaison, Inc. 206-767-3870

ANALOG DEVICES, Semiconductor Div., Dept. EM, 829 Woburn St., Wilmington, Mass 01887

ANALOG DIGITAL DATA SYSTEMS, See A.D. Data Systems

ANALOGIC CORP., Dept. EM, Audubon Rd., Wakefield, Mass. 01880, Tel: 617-246-0300, TWX: 94-9307, 710-348-0425; Empl.: 480

Sales Manager: M.E. Culverhouse; *Distributor Manager:* M. E. Culverhouse

Local Sales Offices & Reps.
Cal San Jose, Analogic 408-247-6401
Cal Tustin, Analogic 714-838-7243
Colo Parker, West. Mktg. Assoc. 303-841-2788
Conn Guilford, R.H. Sturdy Co. 203-453-5424
Fla Orlando, Datarep, Inc. 305-843-5224
Fla Seminole, Datarep, Inc. 813-393-1741
Ga Atlanta, Technical Equip. Sls 404-938-6940
Ill Chicago, First Rep Inc. 312-992-0830
Iowa Cedar Rapids, Palatine Sls. 319-365-8071
Kans Derby, Palatine Sls. 316-788-0621
Kans Lenexa, Palatine 913-492-7020
Mass Wellesley Hills, R.H. Sturdy Co. 617-235-2330
Mich Farmington Hills, Lowell-Wendt Mktg. Co. 313-553-9800
Minn Eden Prairie, First Rep Co. 612-944-2096
Mo Hazelwood, Palatine Sls. 314-895-4577
NJ Berkeley Hghts, N.B.S. Assoc. 201-464-8500
NM Albuquerque, Mountaintek Inc. 505-265-8521
NY Fayetteville, Tri-Tech Elctrns. 315-446-2881
NC Winston Salem, Radco Co. 919-722-9671
Ohio Cleveland, Geotronix, Inc. 216-526-2535
Ohio Columbus, Geotronix, Inc. 614-457-8472
Pa Ambler, Data Engrg. Co. 215-542-9876
Tenn Oak Ridge, Tech. Equip. Supply Co. 615-483-4285
Tex Austin, Palatine Sls. 512-451-7463
Tex Houston, Palatine Sls. 713-783-1492
Tex Richardson, Palatine Sls. 214-231-9489
Utah Logan, Western Mktg. Assoc. 801-753-0073
Va Arlington, H.J. Heffernan Co. 703-522-6666
Wash Seattle, R & R Assoc. 206-762-7664

Local Distributors
Ala Mobile, Brownell Electro 205-479-8581
Ariz Phoenix, Kierulff Elctrns 602-243-4101
Ariz Phoenix, Cramer Elctrns 602-276-7321
Ariz Phoenix, Metermaster 602-243-4111
Cal Irvine, Cramer Elctrns 714-979-3000
Cal Los Angeles, Kierulff Elctrns 213-685-5511
Cal Los Angeles, E.I.L. Instrs. 213-685-7020
Cal Los Angeles, Metermaster 213-685-4340
Cal Los Angeles, Kierulff Elctrns 213-725-0325
Cal Palo Alto, Metermaster 415-968-0313
Cal Palo Alto, Kierulff Elctrns 415-968-6292
Cal San Diego, Kierulff (KSD) 714-278-2112
Cal San Diego, Cramer Elctrns 714-565-1881
Cal San Diego, Metermaster 714-560-4841
Cal Sunnyvale, Cramer Elctrns 408-739-3011
Cal Tustin, Kierulff Elctrns 714-731-5711
Colo Denver, Keirulff Elctrns 303-371-6500
Colo Denver, Cramer Elctrns 303-758-2100
Conn Middletown, The Mancib 203-346-6646
Conn North Haven, Cramer Elctrns 203-239-5641
Fla Hollywood, Cramer Elctrns 305-923-8181
Fla Orlando, Cramer Elctrns 305-894-1511
Fla Orlando, Brownell Electro 305-843-6775
Ga Atlanta, Brownell Electro 404-762-5181
Ga Norcross, Cramer Elctrns 404-448-9050
Ill Bridgeview, E.I.L. Instrs. 312-430-2292
Ill Elk Grove Village, Metermaster 312-593-8650
Ill Elk Grove Village, Kierulff Elctrns 312-640-0200
Ill Mt. Prospect, Cramer Elctrns 312-593-8230
Ind Carmel, Star-Tronic Dist. 317-844-0102
Ind Indianapolis, E.I.L. Instrs. 317-545-1373
Md Gaithersburg, Cramer Elctrns 301-948-0110
Md Timonium, E.I.L. Instrs. 301-252-1260
Mass Billerica, Kierulff Elctrns 617-667-8331
Mass Burlington, Mancib Co. 617-272-9450
Mass Newton, Cramer Elctrns 617-969-7700
Mich Farmington, Star-Tronic Dist Co. 313-477-7700
Minn Edina, Cramer Elctrns 612-835-7811
NJ Cherry Hill, Cramer Elctrns 609-424-5993
NJ Fairfield, Kierulff Elctrns 201-575-6750
NJ Little Falls, Cramer Elctrns 201-785-4300
NJ Totowa, Ampower Elctrn. Instr. Co. 201-742-3215
NM Albuquerque, Cramer Elctrns 505-265-5767
NY Clarence, Trott Elctrns. 716-634-8500
NY East Syracuse, Cramer Elctrns 315-437-6671
NY Farmingdale, Ampower Elctrn. Instr. Co. 516-752-1078
NY Hauppauge, Cramer Elctrns 516-231-5600
NY Hicksville, Kierulff Elctrns 516-433-5530
NY Pittsford, Trott Elctrns. 716-586-8251
NY Rochester, Cramer Elctrns 716-275-0300
NC Winston-Salem, Cramer Elctrns 919-725-8711
Ohio Cleveland, Cramer Elctrns 216-248-8400
Ohio Cleveland, Star-Tronic Dist. Co. 216-779-9660
Ohio Dayton, E.I.L. Instrs. 513-435-2134
Ohio Dayton, Star-Tronic Dist. 513-222-5804
Ore Portland, E.I.L. Instruments 503-234-6683
Pa Pittsburgh, E.I.L. Instrs. 412-731-5230
Tenn Memphis, Brownell Electro 901-332-9258
Tenn Nashville, Brownell Electro 615-889-8230
Tex Dallas, Cramer Elctrns 214-661-9300
Tex Garland, Metermaster 214-271-5671
Tex Richardson, Prime Distrib Co. 214-231-0170
Utah Salt Lake City, Kierulff Elctrns. 801-973-6913
Va Alexandria, E.I.L. Instrs. 703-354-4330
Va Norfolk, E.I.L. Instrs. 804-855-4241
Wash Bellevue, E.I.L. Instruments 206-747-9410
Wash Seattle, Eicher-Richards Co. 206-523-7888
Wash Tukwila, Kierulff Elctrns 206-575-4420
Wash Tukwila, Cramer Elctrns 206-575-0907
For: Canada, Brampton, Ont., Thermo Electric Ltd. 416-451-0813

ANALYTICAL MEASUREMENTS, Dept. EM, 31 Willow St., Chatham, N.J. 07928, Tel: 201-273-7500; Empl.: 35

ANAREN MICROWAVE, INC., Dept. EM, 1010 James St., Syracuse, N.Y. 13203, Tel: 315-476-7901, TWX: 710-541-1507; FSC No.: 31597; Empl.: 165

Sales Manager: R.A. Worden, Mktg. Mgr.

Local Sales Offices & Reps.
Ariz Phoenix, The Thorson Co. 602-956-5300
Cal Los Angeles, Cain Technology 213-476-2251
Cal Palo Alto, Waldman Assocs. 415-961-4100
Colo Denver, The Thorson Co. 303-355-3521
Fla Clearwater, Southeastern Comp. Sls. 813-447-1911
Ind Fort Wayne, J.B. Engrg. Sls. Co. 219-483-2813
Md Davidsonville, R.L. Engrg. 301-760-5533
Mass Reading, Geder Assocs. 617-944-3105
Mich Detroit, Comtel-Sterling Co. 313-255-1970
Minn Minneapolis, Deerland Distrs. 612-331-6433
NM Albuquerque, The Thorson Co. 505-265-5655
NY Huntington Station, E-F Tech. Sls 516-549-1818
NY Skaneateles, Robtron 315-685-5731
Ohio Cleveland, Comtel-Sterling Co. 216-442-8080
Ohio Dayton, Comtel-Sterling Co. 513-298-7573
Pa Ambler, WM Assocs. 215-643-4119
Pa Pittsburgh, Comtel-Sterling Co. 412-922-5720
Tex Irving, Kemco, Inc. 214-255-0537
Wash Seattle, Rush S. Drake Assocs., Inc. 206-763-2755

ANCHOR PLASTICS, Dept. EM, 36-36 36th, Long Island City, N.Y. 11106, Tel: 212-729-1494, Telex: 12-362; Empl.: 200

ANCHOR SPECIALTY MFG. INC., Dept. EM, 300 Hollister Rd., Teterboro, N.J. 07608, Tel: 201-288-1939; Empl.: 10

AND, Dept. EM, 770 Airport Blvd. Bx 4188, Burlingame, Cal. 94010, Tel: 415-347-9916, TWX: 910-374-2353 p. 2458,2459

Local Sales Offices & Reps.
Ariz Tempe, E.J. Foley & Assocs 602-698-3841
Cal Burlingame, William J. Purdy Co 415-347-7701
Colo Denver, William J. Purdy Co 303-777-1411
Fla Orlando, Currie, Peak, Frazier. 305-855-0843
Ill Elmhurst, Hill-Gray Assocs 312-832-4101
Mass Lynnfield, Genex Assocs 617-334-3442
NM Albuquerque, William J. Purdy Co 505-266-7959
NY Larchmont, Hingston Walsh Assocs 914-834-5781
Ohio Columbus, McFadden Sales 614-221-3363
Pa Philadelphia, Samuel K. MacDonald 215-545-1205
Tex Dallas, J.Y. Schoonmaker Co 214-349-1650
Wash Kirkland, Freed Assocs. 206-822-8223

ANDERSEN & ASSOC., WALTHER M.A., Dept. EM, 4 Main St. Ext., Tariffville, Conn. 06081, Tel: 203-658-7666; FSC No.: 52045; Empl.: 18

Sales Manager: R. A. Grover

ANDERSEN LABORATORIES INC., Dept. EM, 1280 Blue Hills Ave., Bloomfield, Conn. 06002, Tel: 203-242-0761, TWX: 710-425-2390; Empl.: 300 ..... p. 2618,2619

Sales Manager: W.A. Crofut, Dir. Mktg.

Local Sales Offices & Reps.

Ala	Huntsville, Beacon	205-881-5031
Ariz	Phoenix, Chaparral-Dorton Ent.	602-263-0414
Cal	Inglewood, C & M Engrg	213-674-6850
Cal	Mountain View, Weil & Disman Assoc.	415-965-4300
Fla	Ft. Lauderdale, Beacon	305-971-7320
Fla	Maitland, Beacon	305-647-3498
Ga	Atlanta, Beacon	404-351-3654
Md	Elliott City, Applied Engrg Consits	301-465-1272
Mass	Chelmsford, Independant Mktg Reps	617-256-8251
Minn	Minneapolis, Nortec Sls	612-835-7414
NC	Charlotte, Beacon	704-525-7412
Pa	Berwyn, Tucker Assoc.	215-644-0142
Tenn	Oak Ridge, Beacon	615-482-2409

ANDREW CORP., Dept. EM, 10500 W. 153rd St., Orland Park, Ill. 60462, Tel: 312-349-3300, TWX: 25-3897, 910-651-3340

Sales Manager: H. Woodbury

Local Sales Offices & Reps.

Cal	Claremont	714-626-3505
Cal	Palo Alto	415-323-3139
Colo	Denver	303-534-1788
Md	Gaithersbury	301-840-0540
Mass	Lexington	617-862-0888
NJ	Ridgewood	201-652-1310
Tex	Richardson	214-235-1279

ANEMCO, INC., Dept. EM, 157 Freedom Ave, Anaheim, Cal. 92801, Tel: 714-879-6092

Sales Manager: George R. Ufen

Local Sales Offices & Reps.

Cal	Glendale, GRU Associates	213-845-8771

ANGSTROHM PRECISION, INC., Dept. EM, 1 Precision Pl., Hagerstown, Md. 21740, Tel: 301-739-8722, TWX: 710-853-6834; FSC No.: 17745; Empl.: 250 ..... p. 3638

Sales Manager: G.S. Ollen

Local Sales Offices & Reps.

Ala	Huntsville, Twentieth Century Mktg., Inc.	205-772-9237
Ariz	Tempe, Argus Sls	602-967-8709
Cal	Los Altos, Recht Assocs.	415-941-0338
Cal	Los Angeles, W. Bert Knight	213-670-2833
Colo	Denver, Camel Elctrns	303-757-6191
Ill	Downers Grove, Momak Sls.	312-963-6400
Ind	Southbend, C-S Elctrn Sls	219-291-6258
Md	Baltimore, Bernard White	301-484-5400
Md	Hagerstown, Angstrohm Precision, Inc.	
Mass	Framingham, KSA of New England	617-875-5464
Minn	St. Louis Park, Beta Engrg.	612-546-2215
Mo	Blue Springs, CHESCO	816-229-1404
Mo	St. Charles, CHESCO	314-946-6677
NJ	East Hanover, HLM Assoc.	201-386-0794
NY	Utica, Micro Comp	315-733-2460
Ohio	Cincinnati, Luebbe Sls.	513-871-4211
Ohio	Cleveland, Luebbe Sls.	216-333-0425
Ohio	Dayton, Luebbe Sls.	513-294-0426
Pa	Philadelphia, S. K. Macdonald, Inc.	215-545-1205
Pa	Pittsburgh, S. K. Macdonald Inc.	412-366-2643
Tex	Houston, Bill Hamilton Co.	713-445-7086
Wash	Seattle, H. Levinson Co.	206-323-5100
Wisc	Milwaukee, Star Engrg. Sls.	414-645-3680

ANN ARBOR TERMINALS, INC., Dept. EM, 6107 Jackson Rd., Ann Arbor, Mich. 48103, Tel: 313-769-0926, TWX: 810-223-6033; Empl.: 55

Sales Manager: K.M. Straith

Local Sales Offices & Reps.

Ala	Huntsville, FM Assocs	205-536-9990
Ariz	Scottsdale, BFA Corp.	602-994-5400
Cal	Canoga Park, Chandler Assocs.	213-340-6103
Cal	Los Altos, Chandler Assoc.	415-941-1887
Colo	Denver, BFA Corp.	303-837-1247
Conn	Litchfield, Digital Sls. Assoc.	203-567-9776
Fla	Jupiter, FM Assocs	305-746-2996
Fla	Orlando, FM Assocs	305-851-5710
Ga	Atlanta, FM Assocs	404-634-7830
Ill	Rolling Meadows, SEA, Inc.	312-255-4820
Ind	Carmel, SEA, Inc.	317-846-2591
Md	Rockville, Electronic Mktg Assoc	301-744-7700
Mass	Waltham, Digital Sls. Assocs.	617-899-4300
Minn	Minneapolis, SEA, Inc.	612-425-4455
Mo	Grandview, Digital Sys. Sls.	816-765-3337
NM	Albuquerque, BFA Corp.	505-296-8303
NM	Las Cruces, BFA Corp.	505-523-0601
NC	Ramseur, FM Assocs	919-824-2196
Ohio	Cleveland, Dietrich & Assocs	216-781-1855
Ohio	Dayton, Dietrich & Assocs	513-223-6042
Ore	Portland, Rush S. Drake Assocs	503-224-3145
Pa	King of Prussia, Electronic Mktg Assoc.	215-265-1600
Pa	Pittsburgh, Dietrich & Assocs	412-892-2992
Tex	Dallas, Remtek, Inc.	214-387-2855
Tex	Houston, Remtek, Inc.	713-227-2195
Utah	Salt Lake City, BFA Corp.	801-466-6522
Wash	Seattle, Rush Drake Assocs.	206-763-2755
Wisc	Waukesha, SEA, Inc.	414-547-6637

ANNIS R B CO., Dept. EM, 1101 N. Delaware, Indianapolis, Ind. 46202, Tel: 317-637-9282; Empl.: 10

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ANTENNA INCORPORATED, Dept. EM, 26301 Richmond Road, Cleveland, Ohio 44126, Tel: 216-464-7075

Local Sales Offices & Reps.

Ala	Huntsville, Cartwright & Bean	205-533-3509
Ariz	Scottsdale, Marshank Sls. Co.	602-949-9443
Cal	Culver City, Marshank Sls. Co.	213-559-2591
Cal	Pleasanton, Moulthrop Sls.	415-846-0550
Colo	Denver, McLoud & Raymond Co.	303-756-1589
Conn	Meriden, Paul Sturgeon Co.	203-237-1112
Fla	Maitland, Hutto, Hawkins, Peregoy	305-831-2474
Ga	Atlanta, Cartwright & Bean	404-255-5262
Haw	Honolulu, H & R Assocs.	808-946-7944
Ill	Arlington Hts., Brainard-Wilson Mktg.	312-437-2700
Ind	Indianapolis, McFadden Sls.	317-257-8689
La	Metairie, Cartwright & Bean	504-835-6220
Mass	Needham Hts., Paul Sturgeon Co.	617-444-6603
Mich	Southfield, Robert Milsk Co.	313-354-3310
Minn	Minneapolis, Borretti & Lee	612-929-0028
Miss	Jackson, Cartwright & Bean	601-981-1368
NY	Elmont, F. Edwin Schmitt Co.	516-437-8150
NY	Rockville Centre, Antenna Inc. Intl. Div.	516-536-2211
NY	Syracuse, Paston-Hunter	315-437-2992
NC	Charlotte, Cartwright & Bean	704-377-5673
Ohio	Columbus, McFadden Sls.	614-459-1280
Pa	Pittsburgh, Covert & Newman	412-531-2002
Pa	Willow Grove, Esterson Assoc.	215-657-1414
Tenn	Knoxville, Cartwright & Bean	615-693-7450
Tenn	Memphis, Cartwright & Bean	901-276-4442
Tex	Dallas, Robert Nesbitt Co.	214-357-4601
Wash	Seattle, DMS/Vantage	206-525-2050
Wisc	Milwaukee, Brainard-Wilson Mktg.	414-463-5776

ANTEX DIV., M M Newman Corp., Dept. EM, Marblehead, Mass. 01945, Tel: 617-631-7100

Sales Manager: C. Loutrel; *Distributor Manager:* C. Loutrel

ANZAC ELECTRONICS, Dept. EM, 39 Green St., Waltham, Mass. 02154, Tel: 617-899-1900, TWX: 710-324-6484

Local Sales Offices & Reps.

Ariz	Phoenix, Thorson Co.	602-956-5300
Cal	Los Altos, Wright Engrg.	415-941-4405
Cal	Los Angeles, Midwin & Olifson	213-475-8568
Colo	Parker, Mikra Sls	303-841-4131
Fla	Clearwater, Southeastern Comp Sls	813-447-1911
Ga	Smyrna, Spar-Tech Assoc.	404-432-3644
Ill	Northfield, Feller Assocs.	312-446-8
Kans	Wichita, Eugene Carbiener Assoc.	316-682-5
Md	Davidsonville, R.L. Engrg.	301-760-5
Mass	Lowell, Russell Engrg. Svcs.	617-458-7
NM	Albuquerque, Thorson Co.	505-265-5
NY	Bayside, Robert Diamond	212-423-7
NY	Bridgeport, Lightstone Corp.	315-699-5
Ohio	Dayton, Ashby Assocs.	513-252-5
Pa	Ambler, WM Assocs.	215-643-4
Tex	Dallas, Stevens Sls.	214-350-2
Wash	Seattle, Datacom Assoc.	206-285-2

A. P. CIRCUIT CORP., Dept. EM, 865 West End A New York, N.Y. 10025, Tel: 212-222-0876 .... p. 2

Local Sales Offices & Reps.

Haw	Honolulu, Aloha Assocs	808-941-
Mich	Detroit, Comtel Instruments	313-255-
Ohio	Cleveland, Comtel Instruments	216-442-
Ohio	Dayton, Comtel Instruments	513-298-

A.P. PRODUCTS, Dept. EM, 72 Corwin Dr. Box Painesville, Ohio 44077, Tel: 216-354-2101, T 810-425-2250; Empl.: 150

Local Sales Offices & Reps.

Ala	Huntsville, Macro Marketing Assoc.	205-883-
Ariz	Scottsdale, Piper-Sales Co.	602-946-
Cal	Glendale, Mission Mktg. Gp.	213-246-
Cal	Palo Alto, Brooks Tech. Gp.	415-328-
Cal	San Diego, Daniels & Doty Sales	714-560-
Colo	Arvada, Piper-Sales Co.	303-420-
Conn	Washington, Tri-Com Assoc.	203-868-
Fla	Ft. Lauderdale, Interface Dynamics	305-772-
Ill	Arlington Heights, Brainard-Wilson Mktg.	312-437-
Ind	Indianapolis, Brainard-Wilson Mktg.	317-844-
Md	Baltimore, Compar Chesapeake	301-484-
Mass	Burlington, Tri-Com Assoc.	617-272-
Mich	Bloomfield Hills, Enco Mktg. Inc.	313-642-
NJ	Berkley Heights, Cambridge Allen Assoc.	201-464-
NJ	Haddonfield, Sunday-O'Brien Inc.	609-429-
NY	Buffalo, R.W. Mitscher Co	716-633-
NC	Winston Salem, Macro-Marketing Assoc.	919-788-
Ohio	Centerville, Norm Case Assocs.	513-433-
Ohio	Fairview Pk., Norm Case Assocs.	216-333-
Tex	Austin, Allied Components	512-459-
Tex	Dallas, Allied Comps.	214-238-
Tex	Houston, Allied Comps.	713-960-
Wash	Kirkland, Freed Assoc.	206-822-
Wisc	Milwaukee, Brainard Wilson Mktg.	414-527-

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APM-HEXSEAL, Dept. EM, 44 Honeck St., Engle N.J. 07631, Tel: 201-569-5700, Telex: 13-3403; 80 ..... p

Sales Manager: J.G. Long Mktg. Mgr.

Local Sales Offices & Reps.

Ariz	Phoenix, Zeus	602-258
Cal	Encino, Porter Co.	213-999
Colo	Englewood, Elcom, Inc.	303-770
Conn	Newton, Gerber Sls. Corp.	203-426
Fla	Orlando, Buchanan & Abrams Assoc.	305-898
Ill	Hinsdale, Hill-Gray Assoc.	312-325
Iowa	Cedar Rapids, Penzner-Mankus Assoc.	319-362
Kans	Overland Park, Penzner-Mankus Assoc.	913-381
Kans	Wichita, Penzner-Mankus Assoc.	316-264
Mass	E. Longmeadow, Gerber Sls. Corp.	413-525
Mass	Waltham, Gerber Sls. Corp.	617-890

Mich Troy, C.B. Jensen & Assoc. 313-643-0506
Mo Maryland Heights, Penzner-Mankus Assoc. 314-569-1220
NM Albuquerque, Zeus, Inc. 505-256-9831
NY Great Neck, F. Tylinski Co. 516-466-9070
NY Syracuse, Rep-Tech, Inc. 315-437-2845
Ohio Cleveland, Val-Skol Sls., Inc. 216-526-2156
Pa Paoli, T. Griffin Co. 215-647-1550
Pa Pittsburgh, Dolfuss-Root & Co. 412-561-4125
Tex Dallas, R.P. Votteler 214-823-2320
Utah Salt Lake City, Elcom Inc. 801-532-7940
Wash Seattle, Blum & Assocs. 206-285-2590

I INSTRUMENTS, LFE CORP., Dept. EM, 1601 Trapelo Rd., Waltham, Mass 02154, Tel: 617-890-2000, TWX: 92-3445, 710-324-0681; FSC No.: 20905

Sales Manager: R. Arslanian; *Distributor Manager:* C. Davis

Local Sales Offices & Reps.
Ariz Tempe, Trembly Assocs. 602-967-2058
Cal Santa Ana, Westlab Inc. 714-979-8472
Cal Sunnyvale, Mission Mktg 408-732-9611
Colo Denver, Trembly Assocs 303-756-1234
Ga Atlanta, PAR Assocs 404-393-0018
Ill Mount Prospect, G&E Instrs. 312-593-5551
Kans Overland Park, G&E Instrs. 913-649-0121
Mass Needham, Eastronix, Inc. 617-449-1550
Mass Waltham, LFE-Export Department 617-890-2000
Mich Royal Oak, George Instrs 313-576-4700
Minn Minneapolis, CMI Corp 612-566-6930
Nev Las Vegas, Trembly Assocs 702-739-6816
NJ Oakland, Applied Process Instrs 201-337-6163
NM Alburquerque, Trembly Assocs 505-266-8616
NY Clark Mills, KLM Assocs. 315-853-6126
NY N Syracuse, KLM Assocs. 315-458-6214
NY Pittsford, KLM Assocs. 716-381-8350
NC Charlotte, PAR Assocs 704-597-1804
Ohio Chagrin Falls, RPM Indl Sls 216-247-3295
Ohio Dayton, Mohawk Intronics 513-434-8873
Pa Ingomar, Greye Glass Assocs. 412-366-6664
Pa Newtown Square, DCI Systems 215-353-0772
Tex Fort Worth, Carey-Wolf & Assocs 817-461-7333
Tex Houston, Carey-Wolf & Assocs. 713-721-2442
Wash Seattle, Comptronics 206-284-4842

OLLO LASERS INC., Dept. EM, 6357 Arizona Cir., Los Angeles, Cal. 90045, Tel: 213-776-3343, Telex: 69-8204; Empl.: 70

Sales Manager: S. J. Parnas

APPLETON®

PLETON ELECTRONIC DIV., Appleton Electric Co., Dept. EM, 2205 12th Ave., So. Milwaukee, Wisc. 53172, Tel: 414-764-7200, Telex: 25-3256; Empl.: 1500 p. 1708-1715

Sales Manager: J. Rutkowski

Local Sales Offices & Reps.
Ariz Phoenix, Elctrn. Specialists 602-996-3889
Cal Del Mar, Interconnect Specialties 714-453-2133
Cal San Jose, Norwest Elctrns. 408-287-9378
Cal Thousand Oaks, Appleton Elctrns. 805-529-0276
Fla No. Miami, Publicover Assocs. 305-947-5080
Fla Orlando, Publicover Assocs. 305-898-9361
Ill Chicago, W.T. Adams Sls. 312-956-7685
Kans Kansas City, Harris-Hanson Co. 816-444-9494
Mass Needham, Maguire Assoc 617-440-5128
Mo St. Louis, Harris-Hanson Co. 314-432-3611
NJ Parlin, Martech Eng. Sls. Representatives 201-721-2200
NY Manhasset, Martech Eng. Sls. Representatives 516-627-1151
Ohio Dayton, INH Comp. Sls. 513-434-8808
Tex Houston, Aid Elctrns. 713-777-3882
Tex Irving, Aid Elctrns. 214-259-4761
Wash Bellevue, Comtec Sls 206-453-1188
Exp N.Y., Hartsdale, H. Stern & Co. 914-761-4800

PLIED CIRCUITS, INC., Dept. EM, 36-06 43rd Ave., Long Island City, N.Y. 11101, Tel: 212-786-7200; Empl.: 20 p. 1295

PLIED CONTROL CO., Dept. EM, 1275 Bloomfield Ave., Fairfield, N.J. 07006, Tel: 201-227-5454; FSC No.: 4725; Empl.: 23

Local Sales Offices & Reps.
NJ Pine Beach, R. Cinalli 201-244-1348

APPLIED DATA COMMUN., Dept. EM, 1509 E. McFadden Ave., Santa Ana, Cal. 92705, Tel: 714-547-6954; Empl.: 12

Local Sales Offices & Reps.
Cal Los Altos, Bergis Assoc. 415-941-4133
Cal Santa Ana, Applied Data Comms. 714-547-6954
Cal Tarzana, Advanced Mktg Trends 213-344-0688
Cal Tustin, Computer Country 714-838-4770
Idaho Idaho Falls, Idaho Computers 208-526-9850
Ill Chicago, Turn Key Sys. 312-465-7233
Md Pikesville, PAL Computer Svcs 301-484-2156
NH Derry, Applied Data Comm 603-434-0909
NY Patchogue, Efficient Svcs For Business 516-654-1522
Va Gaithersburg, Mach/8 301-977-5050

APPLIED DESIGN CO., Dept. EM, 2465 Sheridan Dr., Tonawanda, N.Y. 14150, Tel: 716-837-4400; Empl.: 150

Sales Manager: T.Y. Smith

APPLIED ELECTRO TECHNOLOGY, INC., Dept. EM, 2220 S. Anne St., Santa Ana, Cal. 92704, Tel: 714-556-6570, TWX: 910-595-1797; FSC No.: 52797; Empl.: 20

Local Sales Offices & Reps.
Cal Los Angeles, E. Landa Co. 213-879-0770
Cal Sunnyvale, Mission Mktg. 408-732-9611
DC Washington, H. Wise Co. 202-363-9417
NJ Bergenfield, H. Gray Assocs. 201-384-3643
Tex Irving, Space Elctrns Corp. 214-251-3636

APPLIED GRAPHICS, Dept. EM, 58 Shore Rd, Glenwood Landing, N.Y. 11547, Tel: 516-676-1211; Empl.: 29

APPLIED MAGNETICS CORP., Magnetic Head Div., Dept. EM, 75 Robin Hill Rd., Goleta, Calif. 93017, Tel: 805-964-4881, TWX: 910-334-1195; FSC No.: 11935; Empl.: 3000

Sales Manager: O. M. Fundingsland

Local Sales Offices & Reps.
Ariz Scottsdale, Arcom Sls. 602-947-5745
Cal Santa Clara, King Assoc. 408-249-1022
Colo Denver, B5 Inc. 303-426-0222
Fla Ft. Lauderdale, Banner Elctrn. Sls 305-721-3240
Mass Wakefield, Data Engrg. Svc. 617-245-6666
NJ Millburn, Graydon-Sherman, Inc. 201-467-1400
NM Albuquerque, Arcom Sls. 502-296-0606
NY Fayetteville, R.D. Sherman 315-637-9861
Ohio Dayton, Ashby Assocs., Inc. 513-252-5627
Tex Richardson, Oeler & Menelaides 214-234-6334
Utah West Bountiful, B5 Inc. 801-292-8991
Wash Edmonds, Cunningham Sales, Inc. 206-743-6300

APPLIED MICROWAVE, Div. Epsco Inc., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090, Tel: 617-329-1500, TWX: 710-348-0484; FSC No.: 15894; Empl.: 127 p. 2861

Local Sales Offices & Reps.
Ala Huntsville, Gentry Assocs
Cal Anaheim, Blair Assoc. 714-635-1350
Cal Palo Alto; R-V Assocs 415-967-5994
Colo Boulder, Herb Bass Assocs 303-499-7509
Fla Hallandale, Emec, Inc. 305-457-9400
Fla Orlando, Gentry Assocs. 305-894-4401
Ga Atlanta, Gentry Assocs 404-455-1206
Ill Northfield, Feller Assoc. 312-446-8065
NJ Dover, PRW Corp 201-366-9421
NJ Haworth, Central Assoc. 201-568-0808
NY Old Bethpage, Central Assocs 516-433-0808
NC Burlington, Gentry Assocs 919-227-3639
Tex Fort Worth, Carey Wolf & Assoc. 817-738-1996
Tex Houston, Carey Wolf & Assoc. 714-721-2442
Va Annandale, Q. T. Elctrns Sls 703-941-4242
Wash Seattle, Datacom Assoc. 206-285-2525

APPLIED RESEARCH INC., Dept. EM, 76 S. Bayles Ave., Port Washington, N.Y. 11050, Tel: 516-883-5700; Empl.: 50 p. 2866,2867

Sales Manager: G. Costas

Local Sales Offices & Reps.
Cal Orange, E. Bell Assocs. 714-637-6471
Cal Palo Alto, RV Assocs. 415-967-5994
Mass Waban, Bawer Assocs. 617-244-6572
NY Bridgeport, Lightstone Corp. 315-699-5747
Pa Elkins Park, Snow Assocs. 215-379-4700
Tex Dallas, Texas Avionics 214-368-3566

APPLIED SYSTEMS CORP., Dept. EM, 26401 Harper Ave., St. Clair Shores, Mich. 48081, Tel: 313-779-8700; Empl.: 12

A. P. W. CO., INC., Dept. EM, 72 W. Main, Rockaway, N. J. 07866, Tel: 201-627-0643; Empl.: 18

Local Sales Offices & Reps.
NY Seaford, H. Abbott 516-781-5256

ARCO ELECTRONICS INC., Dept. EM, 400 Moreland Rd., Commack, N.Y. 11725, Tel: 516-864-7000, TWX: 510-226-0241; FSC No.: 84171; Empl.: 90 p. 1057

Sales Manager: Irwin Wolberg; *Distributor Manager:* Irwin Wolberg

Local Sales Offices & Reps.
Ariz Phoenix, J. Smith & Assoc. 602-968-7525
Cal Chatsworth, Arco Pacific 213-882-8707
Cal Chatsworth, Arco Pacific 213-882-8707
Cal Santa Clara, Fischer Assocs. 408-733-7350
Cal Van Nuys, Oberman Renner 213-985-7080
Colo Boulder, Component Prod. Sls. Co. 303-494-5100
Fla Ft. Lauderdale, Electrocomp Assocs 305-491-4141
Fla No. Miami, L. Haas Co. Inc. 305-945-6545
Ga Atlanta, J.E. Joyner & Assoc. 404-691-1776
Ill Downers Grove, Momak Sales 312-963-6400
Ind Indianapolis, Advanced Comp. Sls. 317-545-6441
Iowa Cedar Rapids 319-365-8071
Kans Derby, Palatine Sls. Inc. 316-788-0621
Mass Norwood, Rudolph & Mac Innis Assocs 617-769-5450
Mass Waltham, Datcom 617-891-4600
Mich Southfield, Reps. Elctrn. Prods. 313-354-9066
Minn Minneapolis, Beta Engrg. Corp. 612-546-2215
Mo Hazelwood, Palatine Sls. 314-895-4577
NJ Clifton, Legtronics Assoc. Inc. 201-778-1978
NJ Clifton, Legtronics Inc. 201-778-1978
NY Rochester, L-Mar Assoc. 716-328-5240
Ohio Cleveland, Marlow Assoc. Inc. 216-932-0900
Ohio Dayton, Marlow Assoc. Inc. 513-866-4991
Tex Dallas, EBR, Inc. 214-942-2716
Tex Dallas, EBR, Inc. 214-942-2716
Exp Commack, Arco Elctrns 516-864-7000

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415/626-1444 1444 Market St. 94102

ARCOLECTRIC CORP., Dept. EM, Box 348, 11120 Chandler Blvd., No. Hollywood, Cal. 91603, Tel: 213-985-3130, Telex: 65-1349 ..... p. 4001

Sales Manager: L. Lewis; *Distributor Manager:* G. Miller

ARENBERG ULTRASONIC INC., Dept. EM, 94 Green, Jamaica Plain, Mass. 02130, Tel: 617-522-8640; FSC No.: 04-2593524; Empl.: 14

Sales Manager: R.J. Toronto

Local Sales Offices & Reps.

Ohio Cleveland, Tiby Co. 216-371-5335

A.R.F. PRODUCTS, Dept. EM, Box 3226, Boulder, Colo. 80303, Tel: 303-443-4844, TWX: 910-940-3446; FSC No.: 15196; Empl.: 24

Local Sales Offices & Reps.

Ohio Dayton, L.D. Bruno Co. 513-434-1847

ARGENT ELECTRONICS, INC., Dept. EM, 477 E. Wenger Rd., Englewood, Ohio 45322, Tel: 513-836-8633; Empl.: 10

Sales Manager: J. Kendall

ARGOS PRODUCTS CO., INC., Dept. EM, 600 S. Sycamore St., Genoa, Ill. 60135, Tel: 815-784-5118; Empl.: 85

Local Sales Offices & Reps.

Ark Little Rock, J.Y. Schoonmaker .. 501-375-2168
Cal Culver City, W. Alderson Co. 213-870-1030
Cal San Francisco, Meyer, Ross & Fleming, Inc. 415-864-8880
Colo Denver, K-C Marketers, Inc. 303-733-5561
Fla Ocala, Bencsik Assoc. 904-732-9775
Ga Atlanta, Murphy & Cota 404-875-2525
Haw Honolulu, G. Piety Factors, Inc... 808-839-9059
Ill Chicago, G. Mcl. Cole Co. 312-774-3535
Ind Indianapolis, C. Scheffler Co. 317-253-6337
Mass North Scituate, W.A. Hendrickson Co. 617-545-0652
Mich Plymouth, J. Malcolm Flora, Inc. 313-453-4296
Minn Edina, Foster Tech. Sls. 612-835-2252
Mo Kansas City, Nevco, Inc. 816-421-1751
NJ Fort Lee, TMC Sls. Corp. 201-944-5665
NY Camillus, Callahan-Ferguson 315-487-3870
NC Burlington, Murphy & Cota 919-584-6450
Ohio Columbiana, Nebco Assocs 216-457-2333
Ohio Dayton, Shamrock Elctrn Sls..... 513-258-1227
Okla Tulsa, J.Y. Schoonmaker Co. 918-936-1423
Ore Salem, Pacnor Mktg 503-363-6445
Pa Wynnewood, Stinson Assocs 215-896-7378
Tex Dallas, J.Y. Schoonmaker Co..... 214-349-1650
Wash Seattle, Pacnor Mktg. 206-284-8020
Wisc Menomonee Falls, G.M.C.L. Cole Co. 414-251-2011
Exp: N.Y., New York, Roburn Agencies, Inc. 212-989-5939

ARGUS INTERNATIONAL, Dept. EM, Box 38, Hopewell, N.J. 08525, Tel: 609-466-9075/1677, Telex: 843-349; Empl.: 80

Sales Manager: M. Sleppin

Local Sales Offices & Reps.

Ariz Phoenix, Tooltronics 602-257-0768
Cal Corona, J. Wittman Co 714-735-0247
Cal Glendale, Tooltronics 213-240-4000
Cal Santa Ana, Dyeco 714-541-3974
Fla Casselberry, Photo Chem Sys .. 305-830-6313
Ga Roswell, Photo Chemical Sys..... 404-993-1738
Ill Naperville, B. Johnson Co. 312-355-1738
Ind Indianapolis, Couchman-Conant, Inc. 317-849-9890
Kans Kansas City, L. E. Bruns Co. 913-287-5242
Md Timonium, B. Alzua & Assocs..... 301-252-9020
NH Amherst, Nationwide Circuit Prods. 603-889-2122
NJ Cedar Grove, Nationwide Circuit Prods. 201-857-1333
NY Lewiston, Watmet, Inc. 716-285-3595
NY Rochester, Nationwide Circuit Prods. 716-247-2730
Tex Dallas, S. Daniels, Inc. 214-350-3555
Wisc Hales Corner, Process Technology 414-425-2940
Exp: Wash., Seattle (British Columbia), Chemithon Corp. 206-937-9958

ARI INDS., INC., Dept. EM, 9000 King St., Franklin Pk., Ill. 60131, Tel: 312-671-0511; TWX: 910-227-0052; Empl.: 100

Local Sales Offices & Reps.

Ala Birmingham, Indl Systematics 205-979-2070
Cal Northridge, I.N.S.S. 213-349-2525
Cal Redwood City, Marchi Assocs. .. 415-364-3411
Cal Santa Ana, I.N.S.S. 714-499-4898
Conn North Haven, Forsberg Sls. 203-239-5111
Fla Eustis, Indl Systematics 904-357-5100
Ga Riverdale, Indl Systematics 404-471-3718
Ill Northfield, Instronics 312-446-3231
Mass Acton, Applied Measurements.... 617-646-7250
Mich Clawson, Instr. Specialties 313-435-3311
Mo St. Louis, Scherrer Instrs 314-644-5362
NJ So. Hackensack, Prime Indl Comps 201-489-4101
NM Albuquerque, Rustco Entprs. 505-292-2741
NM Albuquerque, Rustco Enterprises 505-292-2741
NY Rochester, Nickles Engrg. 716-586-4988
NC Matthews, Datatech, Inc. 704-847-4464
Ohio Chagrin Fall, Jerry Kilroy Corp... 216-247-8997
Ohio Cincinnati, Schlemmer Assocs. .. 513-522-8340
Okla Tulsa, Telstar Instr Corp..... 918-628-1011
Ore Portland, Brett-Ross 503-232-4184
Pa Blue Bell, W.A. Gregory & Co. .. 215-643-4702
Pa Devon, B & A Assoc. 215-688-5173
Tex Houston, Instrumatics 713-225-6626
Wash Seattle, Brett-Ross 206-935-8054

ARIES ELECTRONICS, Dept. EM, Box 231, Frenchtown, N.J. 08825, Tel: 201-996-4096, TWX: 510-235-3391; FSC No.: 51167 ..... p. 1716-1718

Sales Manager: A. F. Lehnhardt; *Distributor Manager:* A. F. Lehnhardt

Local Sales Offices & Reps.

Ariz Scottsdale, Sales Engrg. 602-945-5781
Cal Mountain View, Caltron Comp. .. 415-964-3244
Cal Pasadena, P. Nurches Co. 213-681-8957
Colo Englewood, Inverness Mktg. 303-770-2300
Conn Norwalk, Betronic Assocs. 203-853-7630
Fla Pompano Beach, Saber Assoc... 305-943-3076
Ga Dunwoody, Saber Assocs. 205-534-3386
Ill Des Plaines, Coombs Assoc..... 312-298-4830
Md Baltimore, J. A. Maguire & Co. .. 301-377-0223
Mass Waltham, Betronic Assoc. 617-894-8400
Mich Lathrup Village, R. C. Nordstrom & Co. 313-559-7373
Minn Minneapolis, C.E. Bohlig 612-992-7011
Mo Kansas City, Forristal-Young Sls. Co. 816-561-7222
NJ Ho-Ho-Kus, D. J. Fisher Co. 201-652-0090
NJ Pennsauken, J. A. Maguire & Co. 609-665-5136
NM Albuquerque, Tru-Tronix 505-265-0172
NY Elbridge, L-Tron Corp. 315-689-3787
NY Newark Valley, L-Tron Corp. 607-724-7442
Ohio Cleveland, Midwest Mktg. Assoc. 215-247-6655
Ohio Dayton, Midwest Mktg. Assoc. .. 513-433-2511
Ore Portland, SPS Elctrns. 503-645-3769
SC Greenville, J.A. Maguire & Co. .. 803-244-2400
Tex Arlington, Wheelex, Inc. 817-461-8039
Wisc Milwaukee, Coombs Assocs. 414-671-1945

Local Distributors

Ala Huntsville, Controlled Dist. 205-883-7501
Cal Sunnyvale, Ratel Elctrns. 408-739-9220
Cal Van Nuys, Tim-Co Sls. 213-873-4940
Colo Denver, Ratel Elctrns. 303-934-5813
Fla Margate, Controlled Dist. 305-971-4950
Ill Mundelein, J & R Enprs. 312-566-2030
La Lafayette, Ralph's 318-234-4507
Md Baltimore, A S I Elctrns. 301-265-5100
Mass Waltham, QPL Elctrn Dist 617-891-0460
NM Albuquerque, International Elctrns. 505-265-6453
Ohio Centerville, IPD 513-435-2086
Tex Fort Worth, Ind. Elctrns. 817-531-2961
Tex Richardson, Air Quip Sls. Co. 214-234-3285
Utah Salt Lake City, Alta-Land Elctrns. 801-486-4134
Wash Seattle, Carlyle Wire & Cable.... 206-767-4511
Wisc Mequon, Taylor Elect. 414-241-4321

ARK-LES SWITCH CORP., Dept. EM, 51 Water St., Watertown, Mass. 02172, Tel: 617-924-2330, Telex: 92-2441

Sales Manager: D.M. Grimshaw

Local Sales Offices & Reps.

Ark Little Rock, Industrial Sls. Co. 501-562-5852
Cal Los Angeles, Hartfield, Kennan & Freytag 213-225-1318
Conn Bethany, The Representatives Corp. 203-393-0024
Fla Clearwater, J.J. Galleher Co. 813-446-7706
Ill Crestwood, C.B. Fall, Inc. 314-968-3850
Ill Northbrook, Raines-Brin Assoc.. 312-498-0890
Ind Indianapolis, Neal Engrg. Co..... 317-849-4201
Ky Indianapolis, R & D Sls., Inc. 317-842-0909
Mich Detroit, R. C. Dakin Co. 313-647-2262
Minn Hopkins, J.B. Wright & Assoc..... 612-335-7833
Mo St. Louis, C. B. Fall Co. 314-968-3850
NY Rye, C. Avery Assoc. Ltd. 914-967-7610
NC Charlotte, B.M. Triggs & Assocs. 704-525-7782
Ohio Kent, Norco Sls. Co. 216-678-8462
Pa Glenside, Shelmar Elctrns. Co. .. 215-885-0800
Tenn Chattanooga, Neal Engrg. Co..... 615-894-4697
Tex Houston, John J. Swinford Co. .. 713-376-3260
Tex Plano, Herrin & Co. 214-424-
Wisc Waukesha, Schram Assocs. 414-547-

ARMCO STEEL CORP., Dept. EM, Middletown, 45043, Tel: 513-425-2535; Empl.: 45,000

Local Sales Offices & Reps.

Cal Los Angeles 213-776-
Colo Denver 303-761-
Ga Atlanta 404-325-
Ill Chicago 312-920-
Kans Wichita 316-685-
Md Baltimore 301-563-
Mo Joplin 417-624-
Mo Kansas City 816-483-
NY Buffalo 716-839-
NY New York City 212-695-
NC Charlotte 704-588-
Ohio Cleveland 216-831-
Pa Philadelphia 215-839-
Pa Pittsburgh 412-391-
Tex Dallas 214-526-
Tex Houston 713-458-
Wisc Milwaukee 414-271-

ARMEL ELECTRONICS, Dept. EM, 1601 75th S Bergen, N.J. 07047, Tel: 201-869-4300, 710-992-8842; FSC No.: 91663; Empl.: 55

Local Sales Offices & Reps.

Md Baltimore, R. A. Wafer Assocs... 301-744-

ARMSTRONG CORK CO., Dept. EM, W. Libert Lancaster, Pa. 17604, Tel: 717-397-0611, 717-560-4405; Empl.: 24,000

Local Sales Offices & Reps.

Cal San Francisco, Armstrong Cork Co., Ind Prods. Div. 415-574-
Ill Park Ridge, Armstrong Cork Co., Ind. Prod Div. 312-696-
Mich West Bloomfield, Armstrong Cork Co., Ind Products Div. 313-851-
Mo St. Louis, Armstrong Cork Co., Ind. Produ Div. 314-863-
NY Saddle Brook, Armstrong Cork Co., Ind. Products Div. 201-843-
NC Charlotte, Armstrong Cork Co., Ind. Produ Div. 704-588-
Ohio Cincinnati, Armstrong Cork Co., Ind. Prods Div. 513-563-
SC Greenville, Armstrong Cork Co., Ind. Prod Div. 803-288-

ARNOLD ENGINEERING CO., Dept. EM, Box Marengo, Ill. 60152, Tel: 815-568-2000, TWX: 25 910-642-2790; Empl.: 1500

Sales Manager: F. L. Spalla

Local Sales Offices & Reps.

Ariz Scottsdale, C.T. Fink & Assocs. 602-992
Cal Costa Masa, R.E. Davidson Co. 714-546
Cal Fullerton, Arnold Engrg. Co. 714-871
Cal Menlo Park, Straube Assocs. 415-321
Cal Palo Alto, Arnold Engrg. Co. 415-326
Mass Lexington, Arnold Engrg. Co..... 617-862
Mich Jackson, Arnold Engrg. Co. 517-784
Minn Bloomington, F.W. Ladky Assocs. 612-884
Neb Ogallala, Ogallala Elctrns. 308-284
NJ Leonia, Ontec 201-461
NJ Leonia, Arnold Engrg. Co. 201-461
NY Rochester, Ontec 716-464
NC Raleigh, Arnold Engrg. Co. 919-828
Ohio Shaker Heights, Arnold Engrg. Co. 216-283
Pa King of Prussia, Arnold Eng. 219-269
Tex Dallas, Arnold Engrg. Co. 214-821
Wisc Madison, F.W. Ladky Assocs. 608-222
Wisc Milwaukee, F.W. Ladky Assocs. 414-964

ARNOLD MAGNETIC

ARNOLD MAGNETICS CORP., Dept. EM, Jefferson Blvd., Culver City, Cal. 90230, 213-390-3537, TWX: 910-343-6468; Empl.: p. 3207

Distributor Manager: L. Arnold

Local Sales Offices & Reps.

Cal Los Altos, Tauber-Dreyer-Kolm.. 415-948
Cal San Diego, Col-Rolo Elctrns. 714-565
Cal Torrance, L.L. Stokes Inc. 213-370
Fla Orlando, Truex Assocs. 305-859
Md Silver Springs, Youth Assocs..... 301-59
NY Skaneateles, Robton, Inc. 315-685

hio Cleveland, Bock Assoc. 216-331-5212
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a Media, WRA Assocs 215-566-6709
ex Dallas, Tesco 214-328-5484
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OMAT CORP., Dept. EM, 250 Sheffield Ave., Mountainside, N.J. 07092, Tel: 201-232-4260 ..... p. 3414-3425

ales Manager: T. Gottlick

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la Huntsville, Powertronics 205-852-6347
riz Phoenix, Stitzer-Dodd 602-944-2237
al Long Beach, App-Rep 213-636-6124
al Santa Clara, Westrep 408-984-0350
olo Denver, Omega Ltd 303-758-1508
onn Madison, United Comps 203-562-4002
la Casselberry, EIR, Inc. 305-830-9600
la Clearwater, EIR, Inc. 813-447-5192
la Coral Springs, EIR, Inc. 305-752-9227
la Plantation, EIR, Inc. 305-791-8243
Elk Grove Village, Carlson Elctrn Sls 312-956-8240
d Indianapolis, Giesting Assocs 317-787-0276
d Indianapolis, Carlson Elctrn Sls 317-842-3740
wa Blairstown, Engrg Svcs 319-454-6970
ans Prairie Village, Engrg Srvcs 913-649-4000
d Pikesville, Imagitron Sls 301-484-1411
ich Dearborn, Pitcher-Poulin 313-582-5450
inn St. Paul, SKOR 612-645-6461
o St. Louis, Engrg Svcs 314-997-1515
J Plainfield, Meg Elctrn Sls 201-757-6640
Y Buffalo, Quality Comps 716-839-4170
Y Manlius, Quality Comps 315-682-8885
C Winston-Salem, Powertronics 919-765-6539
hio Cincinnati, Giesting Assocs 513-851-7800
hio Dayton, Giesting Assocs 513-293-4044
hio Galion, Giesting Assocs 419-468-3737
a Louisville, Imagitron Sls 717-893-7633
a Pittsburgh, Trymax Co 412-823-8400
Saunderstown, United Comps 617-226-0556
C Greenville, Powertronics 803-288-0270
ex Dallas, P.J. Scanlon Co 214-231-4661
ex Houston, P.J. Scanlon Co 713-496-1170
ash Mercer Island, Sls & Engrg 206-232-6550
ash Vancouver, Sls & Engrg 206-573-5161
isc Milwaukee, Carlson Elctrn Sls 414-476-2790

ocal Distributors
iz Phoenix, Moltronics 602-272-7951
iz Phoenix, Kachina Elect. Dist. 602-269-6201
al Chatsworth, Jaco Elctrns 213-998-2200
al Gardena, Bell Inds 213-321-5802
al Sacremento, Cal State Enterprises 916-482-0400
al San Diego, Moltronics 714-278-5020
al Santa Clara, Moltronics 408-244-7600
al South Gate, Moltronics 213-773-6521
al Sunnyvale, Bell Inds 408-734-8570
al Van Nuys, Patane Avionics 213-988-4455
olo Denver, Integrated Elctrns 303-924-5813
olo Denver, Ratel Elctrns 303-934-5813
onn Fairfield, U-Tronics 203-255-4521
onn Naugatuck, SCR Electric 203-729-8274
a Casselberry, Pace Elctrns 305-834-7777
a West Palm Beach, Nurmi Elctrns Supply 305-686-8553
Northbrook, Classic Comp Supply 312-272-9650
Westmont, RM Elctrns 312-323-9670
t Columbia, Technico 301-461-2200
ass Newton, Impact Sls 617-964-7740
ch Grand Rapids, RM Elctrns 616-531-9300
nn Minneapolis, Joel Co 612-545-5669
nn Minneapolis, Bergquist Co 612-835-2322
nn St. Paul, Kim Controls 612-636-9594
ont Belgrade, Flammand Elctrn Supply 406-388-6606
Fair Lawn, Relay Specialities 201-797-3313
Plainfield, Mars Elctrns 201-757-4332
Buffalo, Summit Distributor 716-884-3450
Hempstead, Elctrn Equip 516-538-5512
Lynbrook, Peerless Radio 516-593-2121
Rockville Centre, Midway Indl Elctrns 516-764-2400
io Blue Ash, Cincinnati, Midwest Equip 513-793-4060
g Portland, P & R Inds 503-292-4436
Erie, Advacom 814-455-8110
Horsham, Pioneer/Delaware Valley 215-674-4000
Warwick, W. H. Edwards 401-781-8000
Columbia, Dixie Elctrns 803-779-5333
Addison, Computer Comps 214-239-0271
Dallas, Wholesale Elctrn 214-824-3001
Houston, Components Sls & Svc 713-442-8127
sh Bellevue, Liberty Elctrns 206-453-8300
sc Mequon, Taylor Electric 414-241-4321

For: Can., Montreal, Que, Future Elctrns 514-735-5775
For: Can., Montreal, Que, Specialty Elctrns 514-336-4500
For: Can., Vancouver, B.C., Deskin Sls 604-324-6331

ARRA INC., Antenna & Radome Resch. Assocs., Dept. EM, 15 Harold Ct., Bay Shore, N.Y. 11706, Tel: 516-231-8400, TWX: 510-227-6231; Empl.: 45 p. 2865

Sales Manager: M. V. Geraci

Local Sales Offices & Reps.
Ariz Phoenix, R.A. Mayes Co. 602-279-5243
Cal Los Angeles, R F Assocs. Inc. .. 213-478-1586
Cal Palo Alto, R F Assocs. Inc. 415-494-3331
Colo Boulder, R.A. Mayes Co. 303-444-0782
Fla Bradentown, Saber Assoc. 813-756-5457
Fla Longwood, Saber Assoc. 305-943-3076
Fla Pompano Beach, Saber Assoc. .. 305-943-3076
Ga Dunwoody, Saber Assoc. 305-943-3076
Ill Mt Prospect, Cain & Co. 312-253-3578
Iowa Cedar Rapids, Palatine Sls. 319-365-8071
Kans Derby, Palatine Sls. 316-788-0621
Kans Lenexa, Palatine Sls. 913-492-7020
Md Ellicott City, Doss Elctrns. 301-465-1336
Mo Hazelwood, Palatine Sls. 314-895-4577
NJ Newtown Sq., SWR Assoc. 215-356-8550
NM Albuquerque, R. A. Mayes 505-292-2330
NY Great Neck, EAC 516-466-9798
NY Utica, B D Hummel Co 315-736-7821
NC Raleigh, Saber Assoc. 919-834-3961
Ohio Dayton, Haacke Co. 513-254-1951
Ohio Lancaster, Cain & Co. 614-654-4800
Pa Newtown, SWR Assocs. Corp. .. 215-356-8550
Tex Houston, R.A. Mayes 713-410-9288
Tex Richardson, R.A. Mayes 214-235-3043
Utah Centerville, R.A. Mayes Co. 801-292-6781
Exp: Fla., Hallandale, Emec Inc. 305-925-6366

ARROW HART DIV., See Crouse Hinds Co., Arrow Hart Div.

ARROW-M, See Aromat Corp

ART WIRE/DODUCO, Dept. EM, 9 Wing Dr., Cedar Knolls, N.J. 07927, Tel: 201-267-2000, Telex: 136-455; Empl.: 100

Local Sales Offices & Reps.
Ariz Scottsdale, J. Hagestad 602-945-8415
Cal San Francisco, D.R. Cox 415-441-8666
Colo Estes Park, Amidon Co. 303-586-2121
Ill Zion, A.O. Capp Co. 312-872-8311
Ind Indpls, Hoster & Sieloff 317-844-9921
Mich Detroit, W. Crawford Assoc. 313-836-8121

ARTISAN ELCTRNS. CORP., Dept. EM, 5 Eastmans Rd., Parsippany, N.J. 07054, Tel: 201-887-7100; Empl.: 150

Sales Manager: A. Seman

Local Sales Offices & Reps.
Cal Laguns Hills, English Sales Assocs 714-770-2727
Cal Lawndale, English Sls. Assoc. 213-772-7272
Cal Sunnyvale, English Sls. Assoc. .. 408-733-5885
Conn Bloomfield, Zaslow Sls. 203-242-7781
Conn Bloomfield, Zaslow Sls Co 203-242-7781
Conn Milford, Zaslow Sls. 203-878-1094
Ind Zionsville, Control Sls, Inc. 317-873-5158
Mass Lowell, Zaslow Sls. 617-458-8452
Mass Northboro, Zaslow Sls. 617-393-8150
Minn Minneapolis, A.J. Warner Co. 612-729-7371
NJ South Orange, Sonny Simberkoff Asso., Inc. 201-763-7900
Ohio Strongsville, Jim Finnegan & Co. 216-238-5905
Ohio W. Carrollton, J. Finnegan & Co. 513-435-0956
Pa King of Prussia, Monteiro Assocs 215-265-0634
Tex Addison, Southland Comps 214-783-8348

ARTOS ENGRG. CO., Dept. EM, 15600 W. Lincoln Ave., New Berlin, Wisc. 53151, Tel: 414-782-3300, Telex: 26-9549; Empl.: 300

Local Sales Offices & Reps.
Cal Fullerton
Conn Stamford
Ga Atlanta
Ill Morton Grove

ARTRONIC INSTR. CO., Dept. EM, 11232 Triangle La., Silver Spring, Md. 20902, Tel: 301-949-1131; FSC No.: 09446 ..... p. 2379

ASHLEY-BUTLER, INC., ASHA, Dept. EM, 208 Route 206 South, Somerville, N.J. 08876, Tel: 201-359-5911

Sales Manager: R. Klein

Local Sales Offices & Reps.
Ariz Scottsdale, Spectre Sls. 602-948-8888
Cal Newport Beach, Weatherman Assoc. 714-642-0074
Colo Boulder, PAR Assocs. 303-499-4736
Fla Orlando, Gra-Mar. Inc. 305-894-3351
Ill Schaumburg, Kingston Comps. .. 312-529-8055
Mass Newton, Daner-Hayes, Inc. 617-969-4650
Mich Pleasant Ridge, Shaico, Inc. 313-547-4771
Minn New Brighton, TWC Sls. 612-636-1770
NJ Westwood, Lubell Assoc. 201-664-2262
NY New Hyde Park, Comptech Sls. 201-935-5454
NY Syracuse, Lenard Sls. 315-479-9191
Ohio Highland Heights, Micro-Tec, Inc. 216-442-1555
Pa Jenkintown, Stein Instrumentation, Inc. 215-885-2370
Tex Houston, Cunningham Co. 713-461-4197
Wash Seattle, Del Com Sls. 206-248-0090

ASHLAND ELEC. PRODS., Dept. EM, 32-02 Queens Blvd., L.I.C., N.Y. 11101, Tel: 212-EX 2-4010; Empl.: 150

Local Sales Offices & Reps.
Cal Burlingame, W.J. Purdy 415-347-7701
Cal Los Angeles, C. Repp 213-820-1715
Cal Sacramento, Wm. J. Purdy Co. .. 916-481-0971
Colo Denver, Wm. J. Purdy Co. 303-777-1411
Mass Brookline, Harman 617-232-6687
NJ Cherry Hill, Danco Sls Corp. 609-424-5590
NJ West Long Branch, Eastern Elctrn. Sls. 201-222-6836
NY Fairport, TAC Assocs. 716-377-1742
Ohio Akron, Augnat Assocs. 216-239-1621

ASM CORP, Dept. EM, Box 860, 525 Truck Lane, Smithfield, N.C. 27577, Tel: 919-934-3104; FSC No.: 31336; Empl.: 12

Sales Manager: L.L. Armstrong

Local Sales Offices & Reps.
Cal Los Altos, Westec North 415-948-8880
Conn East Haven, Eagle Assocs. 203-467-6542
Ga Alpharetta, Kark Ekmark 404-475-4872
Ind Ft. Wayne, Scott Elctrns 219-743-1586
Ind Indianapolis, Scott Elctrns 317-897-9976
Ky Louisville, Scott Elctrns 502-583-3220
Mich Plymouth, Scott Elctrns 313-455-2440
NJ Cherry Hill, Danc. Elctrn Sls 215-627-2218
NY Plainville, Robert H. Smith Assocs 516-681-3155

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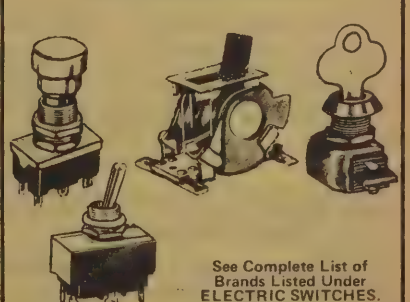
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Ohio Dayton, Scott Elctrns. 513-223-2652
Pa Pittsburgh, Scott Elctrns 412-781-3112
Exp: NY, Schenectady, EMB Techn Corp 518-372-5841

Local Distributors
Cal Los Altos, Westec Dist Co. 415-948-8880
Cal Sun Valley, Q C Comps, Inc 213-768-6111
Conn Norwalk, Park Dists 212-931-1680
NJ Bergenfield, Technical Elctrn Dists 201-384-3643
Tex Houston, Lenert Co 713-225-1465
For: Can., Vancouver, BC, L.A. Varah 604-873-3211

ASSEMBLED PRODUCTS CO., Dept. EM, Box 750, St. Albans, Vt. 05478, Tel: 802-879-6000; Empl.: 22
Sales Manager: A. Sherry

ASSOCIATE GENERAL LABS., Dept. EM, 8934 W. Ogden Ave., Brookfield, Ill. 60513, Tel: 312-485-1135; Empl.: 11

ASSOCIATED ENGRG. & MFG. CORP., Dept. EM, 546 Valley Rd., Upper Montclair, N.J. 07043, Tel: 201-783-7800, Telex: 138866; Empl.: 69

ASSOCIATED ENVIRONMENTAL SYSTEMS, Dept. EM, 360 Merrimack St., Lawrence, Mass. 01842, Tel: 617-683-9501, TWX: 710-342-0765; Empl.: 300
Sales Manager: K. D. Crowell
Local Sales Offices & Reps.
Ala Huntsville, W. A. Brown Comps. 205-539-4411
Ariz Scottsdale, Martech Assocs 602-994-1285
Cal Mountain View, IFM, Inc. 415-961-2828
Cal Van Nuys, Gordon-Elliot, Inc. 213-873-6862
Colo Denver, Fry-Gates 415-961-2828
Conn Glastonbury, Edcom, inc. 203-633-1380
Fla Orlando, W. A. Brown Comps. 305-425-5505
Ga Chamblee, W. A. Brown Comps. 404-455-0405
Ill Chicago, Midwest Elctrn. Sls. 312-777-9700
Ind Indianapolis, Midwest Elctrn. Sls. 317-253-0590
Iowa Cedar Rapids, Midwest Elctrn. Sls. 319-362-4410
Kans Wichita, Aero-Hill Sls. 316-682-2052
Md Silver Spring, ARA Elctrns., Inc. 301-565-2584
Mass Newtonville, Edcom 617-969-9710
Mich Detroit, Electro Entprs., Inc. 313-521-1500
NM Albuquerque, Fry-Gates 505-298-1875
NY Great Neck, Trionic Assocs., Inc. 516-466-2300
NY Rochester, Scientific Devices of N.Y. 716-334-2445
NC Raleigh, W. A. Brown Comps. 919-781-9426
Ohio Cleveland, Electro Entprs., Inc. 216-261-7670
Ohio Dayton, Electro Entprs., Inc. 513-426-6071
Pa Glenside, ARA Elctrns., Inc. 215-887-5250
Tex Dallas, Textec 214-233-1928
Tex Longview, Textec 214-753-3412
Utah Salt Lake City, Fry Gates 801-285-9309
Va Richmond, ARA Electronics, Inc. 804-285-9309
Wisc Waukesha, Midwest Elctrn. Sls. 414-542-5129

ASSOCIATED RESEARCH, INC., Dept. EM, 6125 W. Howard St., Niles, Ill. 60648, Tel: 312-647-7850; FSC No.: 04237; Empl.: 105
Sales Manager: Carl Riggio
Local Sales Offices & Reps.
Ariz Scottsdale, Sls. Engrg. 602-945-5781
Ark Littlerock, J. Y. ScHoonmaker Co. 501-375-2168
Cal Paramount, Brenner-Fiedler Assoc. 213-531-7222
Cal San Francisco, California Instr. Co. 415-647-5959
Conn Weston, Northeast Reps 203-239-2507
Fla Miami, Ludlum Assocs. Co. 305-592-6523
Fla Orlando, Ludlum Assocs. Co. 305-894-7761
Ga Atlanta, Holman-Lobsinger Co. 404-256-9120
Ill Chicago, Factory Office 312-647-7850
Ind Indianapolis, C.M. Buck & Assocs. 317-293-5704
Iowa Cedar Rapids, F. C. Clatterbaugh 319-364-5557
Iowa Des Moines, F. C. Clatterbaugh 515-282-3213
Mass Needham, Northeast Reps. 617-449-3034
Mich Birmingham, Electro-Mation Assocs. 313-564-6517
Minn Edina, Ainslie Co. 612-920-2996
Mo Kansas City, Cleaves-Bessmer-Marietti 816-353-6011
Mo St. Louis, Fitzgerald Sls. Co. 314-862-1660
Neb Lincoln, F. C. Clatterbaugh 402-489-5912
Neb Omaha, F.C. Clatterbaugh Co. 402-333-1600
NC Charlotte, J. Rudisill Assocs. 704-377-6901
Ohio Brecksville, D & B Engrg. Sls. 216-526-6320
Okla Tulsa, J. Y. Schoonmaker Co. 918-936-1423
Tex Dallas, J.Y. Schoonmaker Co. 214-349-1650
Tex Houston, J. Y. Schoonmaker Co. 713-926-9510
Wash Seattle, D.A. Olson 206-522-6594

ASSOCIATED SPRING-BARNES GROUP INC., Dept. EM, 18 Main St., Bristol, Conn. 06010, Tel: 203-582-9581, TWX: 962449 710-454-0592; Empl.: 6,105
Sales Manager: R. Hufsmith
Local Sales Offices & Reps.
Cal Gardena 213-323-4833
Conn Bristol 203-582-9581
Ga Atlanta 404-256-2610
Ill Lombard 312-495-4760
Ill Mattoon 217-235-5601
Mich Ann Arbor 313-665-8686
Mich Plymouth 313-453-6100
NY Syracuse 315-457-9200
NC Arden 704-684-7836
Ohio Dayton 513-253-4131
Pa Corry 814-665-8241
Tenn Memphis 901-332-4832
Tex Dallas 214-330-8661
Wisc Milwaukee 414-482-1600

ASSOCIATED TESTING LABORATORIES, Div of Walter Kidde & Co., Dept. EM, Northwest Ind'l. Pk., Burlington, Mass. 01803, Tel: 617-272-9050; Empl.: 80
Sales Manager: V. Twomey
Local Sales Offices & Reps.
Conn Stratford, G. Rosen Co. 203-375-5456
Del Newark, Wedge Associates 302-738-0176
Mass Framingham, G. Rosen Co. 617-879-5505
NH Hollis, G. Rosen Co. 603-465-7902

ASSOCIATED TESTING LABORATORIES, Div. of Walter Kidde & Co., Dept. EM, 23 Vincent St., Wayne, N.J. 07470, Tel: 201-473-6455; Empl.: 8
Sales Manager: G. J. Murphy
Local Sales Offices & Reps.
Conn Stratford, G. Rosen Co. 203-373-5456
Del Newark, Wedge Associates 302-738-0176
Mass Framingham, G. Rosen Co. 617-879-5505
NH Hollis, G. Rosen Co. 603-456-7902

ASTROCOM CORP., Dept. EM, 15012 Minnetonka Rd., Minnetonka, Minn 55343, Tel: 612-933-2208; Empl.: 80
Local Sales Offices & Reps.
Ariz Scottsdale, Fryco. 602-945-3281
Cal Canoga Park, Chandler Assocs. 213-340-6103
Colo Golden, J. F. Hurlbut Co. 303-279-7796
Haw Honolulu, Western Union of Hawaii 808-523-1326
Ill Chicago, Scientific Sls Corp 312-775-7594
Ind Indianapolis, Scientific Sls Corp 317-253-4606
Md New Carrolton, W. A. Brown Equip. 301-577-6105
Mass Lowell, S & S Elctrns. 617-459-2578
Mich Southfield, Mecom 313-557-7888
Minn Minnetonka, Astrocom Corp. 612-933-2208
NJ Wayne, G & A Sls 201-256-8500
NM Sandia Park, PAR Assocs-SO 505-881-5000
NY Saratoga Springs, S & S Electronics 518-587-2313
Ohio Rising Sun, Mecom 419-457-3231
Pa King of Prussia, J. E. Cuesta & Co 215-265-5800
Tex Dallas, Data Aids Assocs. 214-620-1551
Tex Houston, Data Aids Assocs 713-862-6685
Tex Houston, Data Aids Assocs. 713-862-6685
Utah Salt Lake City, J. F. Hurlbut Co 801-969-4034
Va Alexandria, W. A. Brown Equip. 703-836-1800
WVa Charleston, W. A. Brown Equip. 304-342-2700

ASTRO DYNAMICS, Dept. EM, 2 Gill St., Woburn, Mass. 01801, Tel: 617-935-4944; Empl.: 50
Local Sales Offices & Reps.
Cal Pasadena, Components Corp. 213-681-7448
Fla Jupiter, Cherry Assocs. 305-746-4591
Ind Ft. Wayne, TX Sales 219-637-5410
Md Baltimore, V.P.I., Inc. 301-685-4206
NH Agora, Eng. Comp. 603-432-8076
Pa North Wales, V.P.I. 215-474-3200
Exp: Conn., Stanford, Deltron Co. 203-322-7424

ASTRODYNE, INC., Sub. Roanwell Corp., Dept. EM, 353 Middlesex Ave., Wilmington, Mass. 01887, Tel: 617-272-3850, TWX: 710-347-0704; Empl.: 75
Sales Manager: Z.B. Laycock; *Distributor Manag* Levesque
Local Sales Offices & Reps.
Ariz Tempe, Gassner & Clark 602-968
Cal Lynwood, Application Reps 213-638
Cal Redwood City, Parks & Pruitt Assoc. 415-364
Cal San Diego, Earle Assoc. 714-278
Colo Vail, Mile High Elctrns. 303-476
Fla Hollywood, A. P. Assocs 305-987
Ill Skokie, Saffro & Assocs. 312-588
Md Silver Spring, Carwithen Assoc. 301-589
Mass Brookline, Harman Assoc. 617-232
Mich Birmingham, Forand Sls. Co. 313-644
Mo St. Louis, Ensco Rep Inc 314-567
NJ Haddonfield, Sunday-O'Brien 609-429
NJ Harrington Park, Metro Tech. Sls. 201-768
NY Jericho, Metro Tech. Sls. 516-935
NY Liverpool, Jones-Sudders Inc. 315-457
NC Charlotte, J.W.L. Assocs 704-364
Pa Pittsburgh, J.W. Kight Co. 412-781
Tex Dallas, Ralph Matthews Elctrns. 214-783
Wash Bellevue, COMTEC 206-453
Exp: New York, Westbury, Minthorne Internati Co 516-334

ASTRO-GEO-MARINE INC., Dept. EM, 2005 Dr., Ventura, Cal. 93003, Tel: 805-485-3128; FS 51473; Empl.: 10

ASTROLAB, INC., Dept. EM, 345 Dalziel Rd., N.J. 07036, Tel: 201-862-0022, TWX: 710-996 FSC No.: 16301; Empl.: 36
Local Sales Offices & Reps.
Cal Redwood City, Parks & Pruitt Assocs 415-364
Ill Chicago, Technical Sls 312-237
Tex Fort Worth, McDonald Engrg Co. 817-429
Wash Renton, Sherman Wilson Assoc. 206-226

ASTRO-MED, Div Atlan-Tol Inds. Inc., Dept. EM, Greenwich Ave., West Warwick, R.I. 02893 401-828-4000, TWX: 710-382-6409; Empl.: 100
Sales Manager: D. Colinan
Local Sales Offices & Reps.
Fla Orlando, Nine Assocs. 305-35
Va Fairfax, Nine Assocs. 703-27
Wash Seattle, R.S. Drake Assoc. 206-76

ASTRO RESEARCH CORP., Astro Spar Corp EM, Box 4128, Santa Barbara, Cal. 9310 805-684-6641, TWX: 910-336-1144; FSC No.: Empl.: 35
Sales Manager: K. Knapp
Local Sales Offices & Reps.
Ala Huntsville, Repcom, Inc. 205-53
Ariz Tempe, J.F. Hurlbut Co. 602-96
Cal San Diego, Windsor Dynamics 714-45
Cal Sherman Oaks, Windsor Dynamics 213-99
Cal Sunnyvale, Advent Assocs. 408-77
Colo Denver, J.F. Hurlbut Co. 303-27
Fla Melbourne, Repcom, Inc. 305-25
Md Bethesda, C. G. Kretschmer 301-53
NJ Tenafly, Budd-tronics, Inc. 201-56
Tex Dallas, Tesco 214-32

ASTROSYSTEMS, INC., Dept. EM, 6 Neva Lake Success, N.Y. 11040, Tel: 516-328-1600 510-223-0411; Empl.: 150
Local Sales Offices & Reps.
Ala Huntsville, Kemp Engrg. 205-83
Cal Los Altos, Tauber-Dreyer Assoc. 415-94
Cal Northridge, Tauber & Dreyer Corp. 213-36
Cal San Diego, Tauber Assocs. 714-27
Colo Englewood, Dynatech Inc 303-77
Fla Atlanta, Fancher & Assoc. 404-44
Fla Pompano Beach, Cole-Tek Assoc. 305-78
Ill Hinsdale, Patton Sls 312-32
Ind Indianapolis, Tri-State Tech Sls. 317-92
Mass Sturbridge, Branford Controls 617-34
Mich Southfield, Static Controls Corp. 313-35
Mo Independence, Gribbie Sls Engrg 816-79
NY Cazenovia, P. DeCew, Inc. 315-65
NY Melville, Astrorep 516-42
NC Charlotte, W. Fancher & Assoc. 704-37
Ohio Dayton, Instrumentation Sys 513-29
Okla Tulsa, Kemp Eng. Co. 918-25
Ore Portland, G. E. Fields & Assoc 503-23
Pa Pittsburgh, Instrumentation Sys. 412-26
Tex Addison, Kemp Engrg. 214-66
Tex Houston, Kemp Engrg. Co. 713-68

a Alexandria, T D I 703-971-8982
/ash Bellevue, G. E. Fields & Assoc .. 206-747-2191
/isc Elm Grove, Industrial Mktg Assoc. 414-786-0135

:C, INC., Dept. EM, Box 19426, Houston, Tex. 77024, el: 713-468-7971; Empl.: 80

ales Manager: F. Sawberger

ocal Sales Offices & Reps.
hio Dayton, Instr. Sys. 513-294-2838
ex Dallas, SESCO 214-231-9364

:OMATIC VALVE CO., INC., Dept. EM, Box 1258, 141 South Sherman Dr., Indianapolis, Ind. 3201, Tel: 317-357-8421, Telex: 027-345; FSC No.: 0642; Empl.: 45

ales Manager: A.E. Richardson

ocal Sales Offices & Reps.
la Birmingham, Control Specialists 205-871-9679
la Spanish Fort, Control Specialists 205-433-1453
riz Phoenix, Bews & Wallace Co. 602-267-1171
riz Tucson, Bews & Wallace Co. 602-327-6061
rk Little Rock, Murrel Haase & Co. 501-376-7227
al Albany, Denco Controls 415-527-8000
al Paramount, Brenner-Fiedler & Assoc. 213-531-7222
olo Denver, Hank Thurstin Co. 303-758-2232
onn Hamden, Pond Tech. Sls. 203-281-0005
la Orlando, Control Center 305-896-6831
a Atlanta, Rittelmeyer & Co. 404-874-3355
Chicago, Miller Engrg. Specialties 312-965-6161
wa Cedar Rapids, Skarda Equip. Co. 319-393-3003
ans Overland Park, Parker & Foster 913-381-9330
y Louisville, Richard Equip. Co. 502-895-8060
a Baton Rouge, Del Rio 504-927-9167
ass Somerville, Peeco 617-666-4444
ich Madison Heights, L.W. Jeffries Co. 313-585-4182
inn St. Paul, A-tu-Zee 612-646-6383
o St. Louis, Tepco Ind. Sls. 314-741-1800
eb Omaha, Skarda Equip. Co. 402-422-0430
J Rochelle Park, Gale Equip. Co... 201-843-1144
Y Syracuse, J.R. Manier 315-446-9533
C Charlotte, Mec-Tric Control Co. 704-376-8551
hio Cincinnati, Richard Equip. Co. 513-271-8666
hio Cleveland, Commercial Elec. Prods. Corp. 216-241-2886
hio Toledo, Fred H Hall Co. 419-531-4878
hio Worthington, Roc Assocs. 614-885-1057
kla Tulsa, Southwestern Controls 918-663-6777
a Broomall, John C. Whiddett Co. 215-353-6343
a Pittsburgh, Controlamatic Co. 412-563-4611
enn Memphis, Murrel Hasse & Co. .. 901-743-4304
ex Dallas, Southwestern Controls .. 214-742-6266
ex Houston, Southwestern Controls 713-666-2801
a Richmond, Virginia Carolina Controls Co. 804-288-1623
ash Seattle, Greaves Co. 206-284-0660
isc New Berlin, D.E. Riley Corp. 414-786-1230

ANTIC LAMINATES, Dept. EM, 174 N. Main St., anklin, N.H. 03235, Tel: 603-934-5736, TWX: 0-298-1170; FSC No.: 53240

ocal Sales Offices & Reps.
al Santa Clara, Butler Chemical 408-244-4177
olo Boulder, R-G Enterprises 303-447-9211
onn Southport, JCL Assocs. 203-255-2456
Bensenville, Triple S Etchants 312-595-7570
inn Minneapolis, Hamlet & Smith..... 612-545-3666
J Rocky Hills, Krone & Rubin Assocs. 609-924-0200
C Greensboro, L & D Inc. 919-292-3201
nio Cleveland, Insulation & Components 216-331-4434
ex Addison, Metal Clad Corp. 214-661-3900
isc Milwaukee, Hamlet & Smith..... 414-272-2787

ANTIC OPTICAL MOULDING CO., Dept. EM, lis St., Dudley, Mass. 01570, Tel: 617-943-1746; npl.: 6

ANTIC RESEARCH CORP., Dept. EM, 5390 herokee Ave., Alexandria, Va 22314, Tel: 3-354-3400, TWX: 710-832-9828; FSC No.: 95335; npl.: 950

ocal Sales Offices & Reps.
a Huntsville, BCS Assocs 205-881-6220
iz Phoenix, Mountaintek 602-991-0553
al Los Angeles, O'Holloran Assocs 213-877-0173
al San Francisco, O,Holloran Assocs 415-326-1493
olo Denver, Mountaintek 303-674-5255
a Orlando, BCS Assocs 305-896-4881
Chicago, Reshal Assocs 312-398-7660

Iowa Cedar Rapids, Engrg Svcs 319-362-0503
Kans Kansas City, Engrg Svcs 913-649-4000
Mass Boston, Ken Corp 617-438-5464
Minn Minneapolis, Reshal Assocs..... 612-941-8697
Mo St. Louis, Engrg Svcs 314-997-1515
NJ Newark, L&M Assocs 201-843-8700
NM Albuquerque, Mountaintek 505-294-1491
NY New York City, L&M Assocs 212-243-6155
NY Rochester, RG Engineering 716-385-3021
NC Greensboro, BCS Assocs 919-273-1918
Ohio Cleveland, Reshal Assocs 216-248-5459
Pa Philadelphia, L&M Assocs 215-639-3100
Tex Dallas, Data Applications 214-231-4846
Tex Houston, Data Applications 713-782-0830
Tex San Antonio, Data Applications .. 512-732-7176
Utah Salt Lake City, Mountaintek..... 801-278-6920
Wash Seattle, Arva-Hudson 206-455-0773

ATLAS ELECTRIC DEVICES, Dept. EM, 4114 N. Ravenswood Ave., Chicago, Ill. 60613, Tel: 312-327-4520, Telex: 25-4328; Empl.: 95

Sales Manager: R.R. Metzinger

ATLAS ENERGY SYSTEMS, Dept. EM, 9459 Rush St., S. El Monte, Cal. 91733, Tel: 213-575-0755; Empl.: 25

Sales Manager: R. Bowyer

Local Sales Offices & Reps.
Cal Santa Ana 714-558-1290
Ill Chicago 312-372-2237
Mass Boston 617-492-2525

ATLAS ENGRG. CORP., Dept. EM, 26 Custer St., W. Hartford, Conn. 06110, Tel: 203-247-4100; FSC No.: 07001; Empl.: 10

ATLAS FIBRE CO., Dept. EM, 6970 N. Central Park Ave., Chicago, Ill. 60645, Tel: 312-465-1234; Empl.: 11

Sales Manager: R. Welch

Local Sales Offices & Reps.
Cal San Gabriel, Allen Plastics..... 213-280-5660
Colo Boulder, Colorado Plastics..... 303-443-9271
Conn Hartford, Indl Safety Supply 203-233-9881
Ky Knoxville, Plastic Trading 800-251-9502
Mass Boston, AAA Plastic Supply..... 617-269-8550
Minn Minneapolis, Precision Punch & Plastics 612-544-9351
NY Lake Success, Franklin Fibre Lamitex 616-437-7791
Tex Dallas, C. P. Waggoner Sls. 214-264-1601
Tex Houston, A-1 Plastics 713-785-3040

ATLAS SOUND DIV., American Trading & Prod., Dept. EM, 10 Pomeroy Rd., Parsippany, N.J. 07054, Tel: 201-887-7800; Empl.: 350

Sales Manager: H. M. Jaffe; *Distributor Manager:* Cy Berger

ATLEE CORP., Dept. EM, 8 Gill St., Woburn, Mass. 01801, Tel: 617-933-3510; FSC No.: 99378; Empl.: 40

Sales Manager: Walter Scott

Local Sales Offices & Reps.
Cal Los Angeles, El-Com Inc. 213-223-1351
Fla Melbourne, Repcom, Inc. 305-254-1877
Ill Chicago, Ellinger Sls. 312-763-1570
Mass Woburn, Atlee Corp. 617-933-3510
Minn Minneapolis, J. Melius Assocs. .. 612-854-4270
NJ Madison, Livera-Polk Assocs. 201-377-3220
NY Huntington, C. R. Mayer Co. 516-921-7876
NY Rochester, Net Sales 716-467-4538

ATMOSPHERE CONTROLS PRDTS., Dept. EM, 295 Polaris, Mt. View, Cal. 94043, Tel: 415-969-2690; Empl.: 16

Local Sales Offices & Reps.
NY Lewiston, Watmet, Inc. 716-285-3595

ATOMERGIC CHEMETALS CORP CO., Dept. EM, 100 Fairchild Ave., Plainview, N.Y. 11803, Tel: 516-822-8800, Telex: 14-4612; Empl.: 30

Sales Manager: H. Gary

Local Sales Offices & Reps.
Cal Los Angeles 213-559-1111

ATR ELECTRONICS, INC., Dept. EM, 300 E. 4th St., St. Paul, Minn. 55101, Tel: 612-222-3791 ..... p. 3357

Distributor Manager: A.A. Goffstein

AUBURN MFG., Dept. EM, Pease Ave. & Stack St., Middletown, Conn. 06457, Tel: 203-346-6677

Sales Manager: L. N. Schwartz

AUDIO-TECHNICA U.S., INC., Dept. EM, 33 Shiawassee Ave., Fairlawn, Ohio 44313, Tel: 216-836-0246

Sales Manager: R. Payton

Local Sales Offices & Reps.
Alas Anchorage, Bazar, Inc. Sales Company 907-276-2875
Cal Los Angeles, Twentieth Century Mktg 213-532-3040
Cal San Leandro, Paul Seaman Co. 415-352-7860
Colo Littleton, H.P. Mktg 303-794-8367
Fla Hollywood, Marketing 305-921-1319
Ga Lawrenceville, Audiorep Assoc... 404-963-6575
Ill Morton Grove, Paul Stone Sls.... 312-967-7471
Ind Indianapolis, P. Stone Sls. Co. .. 317-257-4277
Md Baltimore, D. Brothers Co. 301-764-7189
Mass Westwood, Northeast Stereo Mktg 617-326-2260
Mich Buchanan, Riley & Petchell Sls. 616-695-6356
Mich Detroit, Riley & Petchell Sls. 313-937-3000
Minn Edina, Marketing Plus 612-831-4104
Mo Raytown, Pacer Corp. 816-358-6638
NJ Ridgefield, Bi-State Mkts. 201-943-5888
NY Syracuse, Paston Hunter 315-437-2992
Tex Houston, L.J. Paul Assocs. 713-772-1097
Va Richmond, D. Brothers Co. 804-264-8058
Wash Seattle, W.K. Wood Co. 206-623-9950

AUDIO-VIDIO ENGRG. CO., Dept. EM, 65 Nancy Blvd., Merrick, N.Y. 11566, Tel: 516-546-4239

Local Sales Offices & Reps.
Cal Anaheim, BCD, Inc. 714-528-9505

AUDIO EQUIP., Div. W. Kidde & Co., Inc., Dept. EM, 706 Forrest St., Charlottesville, Va. 22901, Tel: 804-977-8050, TWX: 510-587-5461; Empl.: 50

AUDIOSEARS CORP., Dept. EM, South St., Stamford, N.Y. 12167, Tel: 607-652-7305; FSC No.: 97101; Empl.: 130

Sales Manager: D. Hartwell

Local Sales Offices & Reps.
Cal Huntington Beach, H. Brunning .. 714-968-7724
NJ Medford, Mech. Elec. Sls. 609-654-8209
NY Geneva, J. Sumers Assocs..... 315-789-2238

AUDIOTRONICS CORP., Dept. EM, 7428 Bellaire Ave., N. Hollywood, Cal. 91605, Tel: 213-765-2645, Telex: 69-1241; Empl.: 400

Sales Manager: Roy Schaub

AUGAT®

AUGAT INTERCONNECTION PRODS. DIV., Dept. E, Dept. EM, 33 Perry Ave., Box 779, Attleboro, Mass 02703, Tel: 617-222-2202, TWX: 710-391-0644; FSC No.: 91506; Empl.: 450 ..... p. 1720-1723

Local Sales Offices & Reps.
Ala Huntsville, Cartwright & Bean, Inc. 205-533-3509
Ariz Phoenix, Howe & Howe Sls., Inc. 602-264-7971
Cal Los Angeles, P. F. Wiley Co..... 213-663-8028
Cal San Carlos, D. H. Ross Co..... 415-591-4411
Cal San Diego, Wiley Co. 714-571-2881
Colo Littleton, Simpson Assocs., Inc... 303-794-8381
Conn New Canaan, Stan Pierce, Inc. .. 203-335-9848
Fla Altamonte Springs, Semtronic Assocs. 305-831-8233
Fla Clearwater, Semtronic Assocs. .. 813-461-4675
Ga Atlanta, Cartwright & Bean, Inc. 404-255-5262
Ill Rolling Meadows, Sumer 312-991-8500
Kans Shawnee Mission, Lowell-Kangas & Assocs. 913-631-3515
Md Silver Spring, NKA Inc., (Gov't) .. 301-585-6141
Mass Norwood, S. Pierce, Inc. 617-762-3164
Mich Ferndale, Hilltronics, Inc. 313-398-5556
Minn Edina, M. Foster Co. 612-835-2252
Miss Jackson, Cartwright & Bean, Inc. 601-981-1368
Mo St. Louis, Lowell-Kangas & Assocs. 314-821-4050
NJ Cherry Hill, NKA Inc., (Gov't)..... 609-662-2958
NJ Cherry Hill, Trinkle Sls., Inc. 609-795-4200
NM Albuquerque, C.T. Carlberg Assoc. 505-265-1579
NY Mt. Vernon, D. Sonkin Assocs. .. 914-668-9809
NY N. Syracuse, L.D. Allen, Inc. 315-458-7470
NC Charlotte, Cartwright & Bean, Inc. 704-377-5673
NC Raleigh, Cartwright & Bean, Inc. 919-781-6560

Ohio Brecksville, A. Nace Co. 216-526-4323
Ohio Englewood, A. Nace Co. 513-836-0931
Ore Portland, Earl & Brown Co. 503-245-2283
Pa Pittsburgh, A. Nace Co. 615-922-7225
Tenn Knoxville, Cartwright & Bean 515-693-7450
Tenn Memphis, Cartwright & Bean, Inc. 901-276-4442
Tex Houston, Datatex Corp. 713-495-3100
Tex Richardson, Datatex Corp. 214-235-7166
Utah Salt Lake City, Simpson Assocs., Inc. 801-486-3731
Wash Seattle, Earl & Brown Co. 206-284-1121
Wisc Milwaukee, Sumer Inc. 414-259-9060

Local Distributors

Ala Birmingham, ACK Radio Supply Co. 205-322-0588
Ala Huntsville, Hamilton/Avnet Elctrns. 205-533-1170
Ariz Phoenix, Kierulff Elctrns, Inc. 602-243-1401
Ariz Phoenix, Liberty Electrns/Ariz. .. 602-257-1272
Ariz Phoenix, Sterling Elctrns..... 602-258-4531
Ariz Phoenix, Hamilton/Avnet Elctrn. 602-275-7851
Ariz Phoenix, Cramer/Ariz. 602-267-7321
Cal Costa Mesa, Avnet Elctrns. 714-754-6111
Cal Culver City, Hamilton Electro Sls. 213-558-2020
Cal El Segundo, Liberty Elctrns/El Segundo 213-322-8100
Cal Los Angeles, Kierulff Elctrns 213-685-5511
Cal Mountain View, Hamilton/Avnet Elctrn. 415-961-7000
Cal Mountain View, Elmar Elctrns 415-961-3611
Cal San Carlos, Sterling Elctrns..... 415-592-2353
Cal San Diego, Liberty Elctrns/San Diego 714-565-9171
Cal San Diego, Kierulff Elctrns 714-278-2112
Cal San Diego, Hamilton/Avnet Elctrns. 714-279-2421
Cal Sunnyvale, Cramer/San Francisco 408-739-3011
Cal Sun Valley, Richey Elctrns, Inc... 213-875-2862
Colo Commerce City, Elmar Elctrns, Inc. 303-287-9611
Colo Denver, Kierulff Elctrns, Inc..... 303-371-6500
Colo Denver, Cramer/Denver 303-758-2100
Conn Georgetown, Hamilton/Avnet Elctrns 203-762-0361
Conn Hamden, Arrow Elctrns..... 203-248-3801
Conn North Haven, Cramer/Conn. 203-239-5641
Fla Hollywood, Cramer/Hollywood .. 305-921-7878
Fla Orlando, Cramer/Orlando 305-894-1511
Ga Atlanta, Ack Radio Supply Co. .. 404-351-6340
Ga Norcross, Cramer/Atlanta 404-448-9050
Ga Norcross, Hamilton/Avnet Elctrns. 404-448-0800
Ill Elk Grove, Kierulff Elctrns, Inc. .. 312-640-0200
Ill Elmhurst, Semiconductor Specialists, Inc. 312-279-1000
Ill Mt. Prospect, Cramer/Chicago .. 312-593-8230
Ill Schiller Park, Hamilton/Avnet Elctrns. 312-678-6310
Ind Fort Wayne, Fort Wayne Elctrn. Supply 219-423-3422
Ind Indianapolis, Ra-Dis Company, Inc. 317-637-5571
Ind Indianapolis, Graham Elctrns Supply, Inc. 317-634-8202
Iowa Cedar Rapids, Deeco, Inc. 319-365-7551
Kans Lenexa, Hamilton/Avnet Elctrns. 913-888-8900
Kans Wichita, Radio Supply Co. 316-267-5213
Md Baltimore, Arrow Elctrns..... 301-247-5200
Md Baltimore, Hamilton/Avnet Elctrns. 301-796-5000
Md Bethesda, Empire Elctrn Supply 301-656-3300
Md Gaithersburg, Pioneer/Wash..... 301-948-0710
Md Lanham, Milgray/Wash. 301-459-2222
Mass Billerica, Kierulff Elctrns 617-667-8331
Mass Newton, Cramer Elctrns 617-967-7700
Mass Waltham, Sterling Elctrns..... 617-894-6200
Mass Woburn, Hamilton/Avnet Elctrns 617-933-8020
Mich Ann Arbor, Wedemeyer Elctrns Supply Co. 313-665-8611
Mich Livonia, Pioneer/Mich..... 313-525-1800
Minn Bloomington, Arrow Elctrns..... 612-888-5522
Minn Edina, Cramer/Minnesota 612-835-7811
Minn Edina, Hamilton/Avnet Elctrns. .. 612-941-3801
Minn St. Paul, Gopher Elctrns 612-645-0241
Mo Hazelwood, Hamilton/Avnet Elctrns. 314-731-1144
Mo Kansas City, Walters Radio Supply, Inc. 816-531-7015
Mo St. Charles, Lectronix, Inc. 314-723-1122
NJ Cedar Grove, Hamilton/Avnet Elctrns. 201-239-0800
NJ Cherry Hill, Cramer/Pa. 609-424-5993
NJ Fairfield, Kierulff Elctrns..... 201-575-6750
NJ Little Falls, Cramer/NJ 201-785-4300
NJ Moorestown, Arrow Elctrns..... 609-235-1900
NJ Mt. Laurel, Hamilton/Avnet Elctrns 609-234-2133
NJ Saddlebrook, Arrow Elctrns..... 201-797-5800
NM Albuquerque, Cramer/NM 505-243-4566
NM Albuquerque, Hamilton/Avnet Elctrns 505-765-1500
NY Bohemia, Car-Lac Elctrn Ind'l Sls 516-567-4200
NY Buffalo, Summit Distrs. 716-884-3450
NY East Syracuse, Hamilton/Avnet Elctrns. 315-437-2642
NY East Syracuse, Cramer/Syracuse 315-437-6671
NY Farmingdale, Arrow Elctrns 516-694-6800
NY Freeport, Milgray Elctrns 516-546-6000
NY Hauppauge, Cramer/L.I. 516-231-5600
NY Rochester, Summit Distrs. 716-334-8110
NY Rochester, Cramer/Rochester .. 716-275-0300
NY Rochester, Hamilton/Avnet Elctrns 716-442-7820
NC Greensboro, Pioneer/Carolina.... 919-273-4441
NC Winston-Salem, Cramer/Winston-Salem 919-725-8711
NC Winston-Salem, Kirkman Elctrns, Inc. 919-722-9131
Ohio Cleveland, Milgray/Cleveland 216-881-8800
Ohio Cleveland, Pattison Supply Co... 216-441-3000
Ohio Cleveland, Pioneer/Cleveland 216-587-3600
Ohio Cleveland, Cramer/Cleveland 216-248-8400
Ohio Columbus, Thompson Elctrns Supplies, Inc. 614-228-6191
Ohio Dayton, Pioneer/Dayton 513-236-9900
Pa Horsham, Pioneer/Delaware Valley 215-674-4000
Pa Pittsburgh, Pioneer/Pittsburgh 412-782-2300
Tex Dallas, Sterling Elctrns 214-357-9131
Tex Dallas, Cramer/Tex. 214-661-9300
Tex Dallas, Hamilton/Avnet Elctrns .. 214-661-8661
Tex Houston, Sterling Elctrns 713-627-9800
Utah Salt Lake City, Hamilton/Avnet Elctrns. 801-972-2800
Utah Salt Lake City, Standard Supply Co. 801-486-3371
Utah Salt Lake City, Cramer/Utah..... 801-487-4131
Wash Tukwila, Kierulff Elctrns, Inc. 206-575-4420
Cal N. Hollywood, Electronic Hardware 213-982-6100
Cal Santa Clara, Electronic Hardware 408-988-1000
Colo Denver, Hamilton/Avnet Elctrn... 303-534-1212
Fla Fort Lauderdale, Arrow Elctrn. .. 305-776-7790
Fla Fort Lauderdale, Hamilton/Avnet Elctrn. 305-971-2900
Haw Honolulu, Industrial Elctrns..... 808-533-6095
Ind Indianapolis, Pioneer/Indiana 317-849-7300
La Metairie, Sterling Elctrn. 504-887-7610
Mass Woburn, Arrow Elctrn..... 617-933-8000
Mich Livonia, Hamilton/Avnet Elctrn. .. 313-522-4700
NJ Cherry Hill, Milgray Elctrns 609-424-1300
NY Binghamton, A.S.I. Elctrn..... 607-723-6326
NY Westbury, Hamilton/Avnet Elctrn.516-333-5800
NC Raleigh, Hamilton/Avnet Electr .. 919-829-8030
Ohio Cleveland, Hamilton/Avnet Elctrn. 216-461-1400
Ohio Dayton, Hamilton/Avnet Elctrn.... 513-433-0610
Tex Austin, Sterling Elctrn..... 512-836-1341
Tex Houston, Hamilton/Avnet Elctrn. 713-780-1771
Wash Bellevue, Hamilton/Avnet Elctrn. 206-746-8750
Wash Seattle, Liberty Elctrns./Northwest 206-453-8300
Wash Tukwila, Cramer/Seattle 206-575-0907
Wash Tukwila, Kierulff Elctrns 206-575-4420
Wisc New Berlin, Hamilton/Avnet Electr 414-784-4510
Wisc Oak Creek, Arrow Elctrn..... 414-764-6600
For: Argentina, Belgrano, Rayo Electronica S.C.A. 38-1779
For: Argentina, Buenos Aires, Ray Elctrna SCA 38-1779
For: Australia, N. Brighton, Victoria, Namco Elctrns. 96-2891
For: Austria, Rotenmuhlgasse,26, Bacher Elektronische Geraete, Ges. 837152
For: Belgium, Brussels, Nijkerk N.V. 02/7360096
For: Belgium, Brussels, Augat NV 02/7369399
For: Brazil, Rio de Janeiro, RJ, Sociedade Consignataria Hobeco Ltda..... 223-4720
For: Brazil, Sao Paulo, SP, Eletronica Vetenova Ltda..... 221-4180
For: Calif, Palo Alto, Fegu, Inc. 415-493-1788
For: Can., Don Mills, Ont., Saynor Elctrns. Ltd. 416-445-0723
For: Can., Edmonton, Alberta, Cardinal Ind'l Elctrns, Ltd..... 403-455-4122
For: Can., Mississauga (Toronto), Ont., Hamilton-Avnet Int'l (Can.) Ltd. .. 416-677-7432
For: Can., Montreal, Que., Hamilton-Avnet Int'l (Canada) Ltd. 514-331-6443
For: Can., Montreal, Que., Future Elctrns 514-735
For: Can., Ottawa, Ont., Hamilton-Avnet Int'l Ltd..... 613-725
For: Can., Ottawa, Ont., Wackid Radio & TV Laboratories 613-728
For: Can., Quebec, Que., Crobel Ltd. 418-524
For: Can., Rexdale, Ont., Future Elctrns 416-675
For: Can., Vancouver, B.C., R-A-E Ind'l Elctrns 604-687
For: Can., Winnipeg, Man., Cam Gard Supply 204-786
For: Denmark, Copenhagen, Mer-el A/S 01/2
For: England, Bolton, Lancs., Hird Brown Elctr Ltd..... 0204/
For: England, Croydon, Surrey, Hird Brown El 01/681
For: England, East Kilbride, Glasgow, S.D.S. Components 63552/
For: England, Hammersmith, London, Rastra Elctrns., Ltd. 01/748
For: England, Kempston, Bedfordshire, Elvers Elctrns 0234-
For: England, Portsmouth, S.D.S. Comps. Ltd. 705-
For: England, Rugby, Warwichkshire, Augat, L (0788)
For: England, Yiewsley W. Drayton, Middlesex Semiconductor Specialists, Ltd..... 4
For: Finland, Helsinki, Oy-Sufra AB 4
For: Finland, Helsinki, Medivalmet Oy 07
For: France, Jouy-en-Josas, Copel..... 977
For: France, Paris, Societe Megex 577
For: France, Rueil Malmaison, Dixel 97
For: Holland, Amsterdam-Buitenveldert, Nijker Electronika B.V. 020/4
For: Ireland, Dublin, Neltronics, Ltd. 01/5
For: Israel, Ramat-Gan, Elina, Ltd. 03/7
For: Italy, Milan, Eledra 3S SPA 02/34-
For: Italy, Rome, Eledra 3S SPA..... 06/81-
For: Italy, Trieste, Eltrade s.a.r.l. .....
For: Japan, Otemachi/Chiyoda-Ku, Tokyo, Ky Boeki Kaisha, Ltd. ..... (03)24
For: Mexico, Mexico 20, D.F., Nucleoelectroni S.A. 59
For: New Zealand, Palmerston, E.C.S. (Div./ Airspares New Zealand, Ltd.) ..... N
For: Norway, Manglerud/6 Oslo, Norsk Marc 02/67
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For: Singapore, General Engrs. Corp. Pte. Lt
For: Spain, Madrid, Hispano Electronica S.A. 2-33-31-00
For: Sweden, Solna, AB Elfa 08/7
For: Sweden, Spanga, Augat AB 7
For: Switzerland, Zurich, Dewald AG Zurich 4
For: Taipei, Taiwan, Treasure Island Trading Ltd..... 5

AURIC CORP., Dept. EM, 470 Frelinghuyse Newark, N.J. 07114, Tel: 201-242-4100; Empl.:

AURICH F W & CO, Dept. EM, 4000 22nd Seattle, Wash. 98199, Tel: 206-284-5561, 910-444-1333; Empl.: 25

Sales Manager: C. Ernst

Local Sales Offices & Reps.

Cal Oakland..... 415-83

AUSTIN ELCTRNS, See Advanced Technolog

AUSTRON, INC., Dept. EM, 1915 Kramer La. Tex. 78758, Tel: 512-836-3523, TWX: 910-87 FSC No.: 24672; Empl.: 79

Sales Manager: R. Ellis

Local Sales Offices & Reps.

Ala Huntsville, Sci Devices - SE 205-5
Cal Calabasas, M. Shovlowsky 805-4
Cal Pasadena, Advanced Techniques 213-6
Cal San Carlos, Westronics Assocs 415-5
Conn Milford, Wayland Engrg Sls 203-8
Fla Orlando, Sci Devices - SE 305-8
Fla Palm Bay, Sci Devices - SE 305-7
Md Rockville, T.E. Corp. 301-3
Mass Natick, Wayland Engrg Sls 617-6
NY Great Neck, Industron Assocs.... 516-4
NC Raleigh, Sci Devices - SE 919-8
Ohio Cincinnati, Measurement Instr 513-5
Ohio Columbus, Measurement Instrs. 614-2
Pa Plymouth Meeting, Sci Devices - Phila. 215-8

JTO-TROL CORP., Dept. EM, 5650 N. Pecos St., Denver, Colo. 80221, Tel: 303-458-5900, TWX: 910-931-0563; Empl.: 200

Sales Manager: R. McFarland

Local Sales Offices & Reps.

Ill Chicago 312-654-0549
Md Rockville 301-424-4650
Tex Dallas 214-661-8027

JTOCON INDS., Sub. Control Data, Dept. EM, 2300 Berkshire La. N., Minneapolis, Minn. 55441, Tel: 612-553-4100; Empl.: 300

Local Sales Offices & Reps.

Ala Odenville, Lewis M. Crowe Co. .. 205-640-5254
Ark Little Rock, McCallister Equip. Co. 501-375-4474
Cal Man. Beach, James O. Gierlich Co. 213-772-4434
Cal San Mateo, Ambrosini & Chalmers 415-349-8222
Colo Denver, Colorado Environmental Equip. Co. 303-758-4338
Fla Orlando, V. K. Assocs. 305-898-8811
Ga Atlanta, J.K. Duren Co. 404-992-5405
Haw Honolulu, Process Equip. Pacific 808-845-0898
Ill W. Chicago, Enviromod Control Sys. 312-231-9180
Iowa Ames, Automatic Sys. Co. 515-232-4770
Kans Shawnee Mission, R.E. Pedrotti Co. 913-677-3366
La Metairie, Parson & Sanderson Co. 504-733-1330
Md Baltimore, Durling Elec. Co. 301-467-5560
Mich Detroit, H. V. Burton Co. 313-261-4220
Minn St. Paul, Prest Co. 612-690-1537
Miss Jackson, Hartco Services. 601-856-2131
Mo Ballwin, Manes Sales Engrg 314-394-4659
Mont Billings, Industrial Sys 406-252-6671
NH Salem, Marbros Assoc. 603-893-1931
NJ Plainfield, J.S. Gardner Co. 201-754-6500
NM Albuquerque, Applied Products .. 505-898-6603
NY Derby, R. H. Perry Co. 716-947-4311
NC Charlotte, Interstate Utility Sls. .. 704-377-2636
Ohio Cincinnati, H. P. Thompson 513-891-4414
Ohio Cleveland, J. P. Bergren Co. 216-932-9445
Okla Okla. City, Pumpco 405-737-7841
Ore Portland, Fry Controls, Inc. 503-226-2620
Pa King of Prussia, Reinbrecht Assocs. 215-265-6180
Pa Pittsburgh, Electrical Engineered Products 412-892-2129
Tenn Knoxville, Dickey Engrg Co. 615-524-8641
Tex Dallas, J. F. Rasco Co. 214-747-0108
Tex Houston, Hydrodyne, Inc. 713-468-0565
Utah Salt Lake City, Folsom Assoc. .. 801-972-4600
Wash Seattle, Clair Stebbins Co. 206-246-1170
Wisc Milwaukee, Allan Engrg Co. 414-353-5070

JTOMATIC COIL CORP., Sub. Designatronics Inc., Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010, Tel: 305-883-5311, TWX: 810-848-8097; Empl.: 125

Local Sales Offices & Reps.

Cal San Mateo, Melvin Sls. Co. 415-349-7444

JTOMATED MEAS. DIV., see E.H. Research Labs., Inc.

JTOMATIC DIE CUTTING MCH, Dept. EM, 28 Warrel St., New York, N.Y. 10007, Tel: 212-962-7658; Empl.: 31

JTOMATIC PRODUCTION SYSTEMS INC., Dept. EM, #12 Springdale Rd. Cherry Hill Ind. Pk., Cherry Hill, N.J. 08003, Tel: 609-424-4028, Telex: 831-373; Empl.: 25

Sales Manager: B. Smith

Local Sales Offices & Reps.

Cal N. Hollywood, Crown Elct. 213-877-3550
Fla West Palm Beach, PSA, Inc 305-689-0575
Ohio Cleveland, WRR Assocs. 216-526-2023
Tex Dallas, Data Marketing Assoc. .. 214-358-4643

JTOMATIC TIMING & CONTROLS CO., Dept. EM, King of Prussia, Pa. 19406, Tel: 215-265-0200; Empl.: 300

Sales Manager: V.C. McMahon

Local Sales Offices & Reps.

Ariz Phoenix, Portis & Assocs. 602-947-4379
Cal Glendale, Hundley Co. 213-240-3600
Cal San Francisco, Automated Process Controls Co. 415-467-6162
Fla Lakeland, A.A. Elec. Div. 813-682-6181
Ga Norcross, A.A.Electric Div. of AEC 404-449-8670
Ill Glen Ellyn, Rockford Controls Co. 312-469-6016
Ind Indianapolis, Rockford Controls Co. 317-297-2956
Ky Louisville, Air-Hydro Power Co... 502-451-1000
La New Orleans, Mid South Sls. Co. 504-822-3030
Md Baltimore, Jobe & Co. 301-235-3502
Mass Sturbridge, Branford Corpntrol Co 617-347-7367
Mich Brighton, H. H. Barnum Co. 313-229-2961
Mich Lowell, H. H. Barnum Co. 616-451-0980
Minn Minneapolis, Automated Controls, Inc. 612-377-7727
Mo Kansas City, Duncan Sales & Engrg., Inc. 816-523-2908
Mo University City, E. Mooney Co. .. 314-725-8875
NJ Newark, Norman Bragar Co. 201-344-1100
NY Buffalo, Niagara Electric Sls. Co. 716-886-4000
NY Rochester, Niagara Electric Sls. Co. 716-271-1223
NY Syracuse, Niagara Elec. Sls. Co. 315-422-9177
NY Yonkers, Ross Co. 212-TA4-5424
NC Charlotte, Brown & Morrison 704-333-0774
Ohio Cincinnati, Anderson-Bolds, Inc. 513-272-3351
Ohio Cleveland, Anderson-Bolds, Inc. 216-229-4700
Ohio Worthington, Anderson-Bolds, Inc. 614-885-3933
Okla Tulsa, Driscoll Automatic Control Co. 918-747-6625
Ore Eugene, J. A. Tudor & Assoc. 503-344-9212
Ore Portland, J. A. Tudor & Assoc., Inc. 503-288-5154
Pa King of Prussia, Applied Controls, Inc. 215-265-3832
Pa Pittsburgh, Gilson Engrg. Sls. Inc. 412-931-6114
Tenn Memphis, Engineered Instrs. 901-743-3402
Tex Houston, Gettys-Eads-Adair 713-781-3005
Utah Salt Lake City, Control Equip. Co. of Salt Lake 801-487-7741
Va Richmond, Jobe & Co. 804-282-6508
Wash Seattle, J. A. Tudor & Assoc. .. 206-MU 2-7444
Wash Spokane, J. A. Tudor & Assoc. 509-FA 7-3328
Wisc Cedarburg, Automation Engrg. Co. 414-377-7500

AUTOMATION DISPLAYS INC., Dept. EM, 3833 N. White Ave., Eau Claire, Wisc. 54701, Tel: 715-834-9595; Empl.: 13

Local Sales Offices & Reps.

Ariz Phoenix, Spectrum Co. 602-997-6324
Cal San Francisco, Technical Sls. Dev. 415-788-7788
Cal Santa Ana, Spectrum Assocs. Inc. 714-835-4114
Colo Arvada, J.H. Dorough Co. 303-892-0047
Ga Atlanta, Secom Sys. 404-434-8101
Ill Chicago, Bex Data Ltd. 312-221-1411
Mass Lowell, S&S Elctrns. 617-459-2578
Minn Minneapolis, Bex Data Ltd. 612-835-5220
Mo St. Louis, Engrg Svcs Co. 314-997-1515
Mo St. Louis, Bex Data Ltd. 314-872-3357
NJ Cherry Hill, L.H. Walke Co. 609-424-3766
NM Albuquerque, Western Consultants
Tex Dallas, T-Square Assocs. 214-369-3173
Wash Bellevue, Hudson Co. 206-455-0773

AUTOMATION DYNAMICS, Div. ABC Digital, Inc., Dept. EM, 25 Charles St., Westwood, N.J. 07675, Tel: 201-666-2458; FSC No.: 53089; Empl.: 30

AUTOMATION PRDTS., Dept. EM, 3030 Max Roy, Houston, Tex. 77008, Tel: 713-869-0361

AUTO-SWAGE PRODUCTS INC., Dept. EM, 726 River Rd., Shelton, Conn. 06484, Tel: 203-929-1401, Telex: 963-542; Empl.: 170

Sales Manager: R. Mikulsky

Local Sales Offices & Reps.

Ariz Scottsdale, E.E. Black. 602-947-2007
Cal Campbell, Bates Assocs. 408-734-0117
Cal Glendale, Haldeman & Frazier .. 213-247-3330
Colo Denver, Regional Sls. Co. 303-433-7397
Conn Newtown, Yankee Engrg. 203-426-5679
Fla Boca Raton, F/G Assocs 305-395-3907
Ill Barrington, Perhats Assocs 312-381-6360
Ind Greensburg, H.K. Feaster Assocs 812-663-5689
Minn Minneapolis, W.R. Maleckar Co. 612-926-7601
Miss Jackson, Lawrence & Co. 601-982-9513
NY Rochester, Gislason Sls. 716-454-4741
Ohio Chagrin Falls, Bray Assocs. 216-247-4474
Pa Broomal, AM Tech. Sls. Co. 215-356-0574
Tex Richardson, R.S. Marston Co. 214-235-3577
Exp New York, N.Y., Lang & Zysk 212-227-1743

AUTOSPLICE/DV GEN STAPLE, Dept. EM, 220 E. 23rd St., New York City, N.Y. 10010, Tel: 212-674-4369, Telex: 420902; Empl.: 55

Sales Manager: O. Nedelkovich

Local Sales Offices & Reps.

Cal No. Hollywood, Autosplice West 213-769-5844

AUTOTROL CORP., Dept. EM, 6200 Three Oaks Rd., Crystal Lake, Ill. 60014, Tel: 815-459-3080, Telex: 72-2417

Sales Manager: S. E. Farrow

Local Sales Offices & Reps.

Ala Madison, B-C Elctrn Sls 205-837-5778
Cal Los Angeles, Halbar Assocs 213-387-8283
Cal San Mateo, Halbar Assocs 415-922-2976
Colo Denver, William J. Purdy Co 303-777-1411
Conn Bloomfield, Zaslow Sls Co. 203-242-7781
Conn Milford, Zaslow Sls Co. 203-878-1094
Fla Indian Rocks Beach, Tech-Rep Assocs 813-595-2834
Ga Smyrna, B-C Elctrn Sls 404-436-5169
Ill Westchester, Wasson-Gallagher 312-261-7517
Ind Ft. Wayne, O.H. Bromberg & Assocs 219-447-5783
Ky Louisville, OH Bromberg & Assocs 502-245-8916
Mass Littleton Common, Zaslow Sls.... 617-486-8915
Mass Northboro, Zaslow Sls Co. 617-393-8150
Mich Ann Arbor, Robert Reed. 313-769-5181
Mich Marshall, Robert Reed 616-781-7287
Minn St. Paul, Cahill Assocs 612-646-7217
Mo Kansas City, Harris-Hanson Co.. 314-432-3611
Mo St. Louis, Harris-Hanson Co 314-432-3611
NJ Red Bank, Motoreps 201-741-3356
NM Albuquerque, William Purdy 505-266-7959
Ohio Cincinnati, O.H. Bromberg & Assocs 513-771-9333
Ohio Westlake, James H. Beal Sls 216-871-1516
Okla Tulsa, J.Y. Schoonmaker 918-936-1423
Pa Furlong, Avenir 215-348-8290
Tex Dallas, J.Y. Schoonmaker 214-349-1650
Va Vinton, B-C Elctrn Sls 703-890-1128
Wash Buckley, Halbar Assocs 206-829-1750

AUTOTRON, INC., Dept. EM, 3269 N. Vermilion St., Box 595, Danville, Ill. 61832, Tel: 217-446-0650; Empl.: 30

Local Sales Offices & Reps.

Ariz Mesa, L.C. Brandt Co. 602-832-0710
Ark Ft. Smith, Electro-Related Prods. 501-783-7323
Cal Los Angeles, Electro Comps. 213-264-7100
Cal San Francisco, J.M. Krotozyner 415-777-4636
Fla Ft. Lauderdale, R.D. Jacobs 305-462-1932
Ill Addison, Lectron Controls Co.... 312-543-8460
Ill Rock Island, Carlin Automation Sls. 309-788-1275
Kans Shawnee Mission, Automation Specialties 913-362-4422
Mass Needham, White Sls. Co. 617-444-3676
Mich Detroit, Basic Service Corp..... 313-837-8820
Minn Minneapolis, Bican Co. 612-827-4734
Mo St. Louis, Kathrinus, Kelly & Co. 314-968-3800
NY Elmont, Crane & Egert Corp..... 516-488-2100
NY Rochester, Sweetco Assoc. 716-225-2383
NC Charlotte, Electro-Rep Assocs.. 704-527-2530
Ohio Cincinnati, J.W. Murray & Assoc. 513-574-7111
Ohio Cleveland, C.A. Robinson Co. 216-381-9049
Pa Paoli, Tyler Griffin Co. 215-644-7710
Tex Dallas, Advance Tech. Sls. 214-361-8584
Utah Salt Lake City, Control Agency.. 801-466-8601
Wash Seattle, C.B. Parsons & Co. 206-762-7373
Wisc Wauwatosa, Larsen Assocs. 414-258-0529

AUTRONICS CORP., Dept. EM, 314 E. Live Oak, Arcadia, Cal. 213-445-5470, Tel: 213-445-5470, TWX: 910-582-3216; FSC No.: 03972; Empl.: 50 ... p. 2259

Sales Manager: Lee Robinson

Local Sales Offices & Reps.

Ariz Phoenix, Thorson Co. 602-956-5300
Md Baltimore, R. P. Luce & Co. 301-752-8200
NJ Berkeley Hgts., R.P. Luce & Co. 201-464-6440
NY New Hyde Pk., R. P. Luce & Co 516-437-4550
Wash Bellevue, Thorson Co. 206-455-9180

AVA ELCTRNS., Dept. EM, 4000 Bridge St., Dreyel Hill, Pa 19026, Tel: 215-284-2500; Empl.: 80 p. 1724-1727

Local Sales Offices & Reps.

Cal Foster City, Steve Olson Assoc 415-574-8452
Cal Van Nuys, Roth Sls 213-989-3738
Colo Westminster, Electro Tek Sls 303-623-3370
Fla Ft. Lauderdale, Sprock Sls 305-587-3792
Ill Chicago, M. Gottlieb Assoc. 312-775-1151
Ind Indianapolis, Charles Scheffler Co 317-253-5836

Md Kensington, Forti Assoc. 301-949-1706
NJ Fort Lee, TMC Sls. Corp. 201-944-8340
NJ Willingboro, Joe Austin Co. 609-871-3720
NY Syracuse, W. Tauber Co. 315-446-7094
NC Charlotte, Maitland-Smith 704-372-1026
Ohio Beechwood, Electronic-Salesmasters 216-831-9555
Tenn Memphis, A.F. Howard 901-682-2281
Tex Ft Worth, Chet Wells 817-579-0824
Wash Seattle, W. Lanphear Dist. 206-285-2012

AVANTEK, INC., Dept. EM, 3175 Bowers Ave., Santa Clara, Cal. 95051, Tel: 408-249-0700, TWX: 346-337, 910-339-9274; Empl.: 380

Local Sales Offices & Reps.
Ala Huntsville, Beacon 205-881-5031
Ariz Phoenix, Thorson Co. 602-956-5300
Cal Los Altos, Cain-White & Co. 415-948-6533
Cal Los Angeles, Cain Technology 213-476-2251
Colo Denver, Thorson Co. 303-759-0809
DC Washington, Applied Engrg. Consits. 301-953-2808
Fla Ft. Lauderdale, Beacon 305-971-7320
Fla Maitland, Beacon 305-647-3498
Ga Atlanta, Beacon 404-351-3654
Ill Arlington Heights, Dytec/Central 312-394-3380
Kans Overland Park, Dytec/South 913-432-5596
Md Ellicott City, Applied Engrg. Consits. 301-465-1272
Mass Burlington, R.J. Sickles 617-272-7285
Mich Detroit, Comtel Instr. 313-255-1970
Mo St. Louis, Dytec/South 312-423-1234
NJ Fort Lee, Tech. Mktg. Assocs. 201-224-6911
NM Albuquerque, Thorson Co. 505-265-5655
NY Skaneateles, Robtron 315-685-5731
NC Greensboro, Beacon Elctrn Assocs 919-674-0348
Ohio Cleveland, Comtel Instr. 216-442-8080
Ohio Dayton, Comtel Instr. 513-298-7573
Pa Philadelphia, Eastern Instrumentation 215-927-7777
Pa Pittsburgh, Comtel Instr. 412-922-5720
Tenn Oak Ridge, Beacon 615-482-2409
Tex Dallas, Thorson Co. 214-233-5744
Tex Houston, Thorson Co. 713-771-3504
Wash Bellvue, Thorson Co. 206-455-9180

AVCOM INTERNATIONAL, Dept. EM, 784 N. W. 57th Ct., Fort Lauderdale, Fla. 33309, Tel: 305-491-0141, Telex: 51-4304; FSC No.: 3662

Sales Manager: R. L. Kotnik; *Distributor Manager:* R. L. Kotnik

AVEL LINDBERG LTD., Dept. EM, Arisdale Ave, S. Ockendon, Essex RM 155 TD ENGLAND, Tel: 04-025-3444, Telex: 897106

Sales Manager: R. H. Barness

Local Sales Offices & Reps.
Conn Danbury, Conn Research Assocs 203-744-3020

Local Distributors
Mass Hingham, Sager Electrical Supply 617-749-6700
Mass Newton, Greene-Shaw Co 617-969-8900
NY New York, Martin Audio Video 212-541-5900
Pa Glenside, Wyncote Instrumentation 215-643-2440
For: England, Harrow, ITT Electronic Svcs. 0279-26777

AVIATECH INTL. INC., Dept. EM, 75 Carlough Rd, Bohemia, N.Y. 11716, Tel: 516-567-4900, Telex: 967892; FSC No.: 54520; Empl.: 12

Sales Manager: D. P. Antioco

AVIBANK MFG. INC., Dept. EM, 210 S. Victory Blvd., Burbank, Calif. 91503, Tel: 213-843-4330, TWX: 910-498-2215; FSC No.: 84256; Empl.: 225

Sales Manager: D. Ladin

Local Sales Offices & Reps.
NY Smithtown, Avibank Mfg. Inc. 516-979-8045

AVID ELECTRONICS CORP., Dept. EM, Box 426, Baldwin, Pl., N.Y. 10505, Tel: 914-628-6952; FSC No.: 08842; Empl.: 10

Sales Manager: D. McVey

AVIONIC INSTRS. INC., Dept. EM, 943 E. Hazelwood Ave., Rahway, N.J. 07065, Tel: 201-382-7100, Telex: 844413; Empl.: 32 p. 3358-3361

Sales Manager: R. Risley; *Distributor Manager:* G. Wood

Local Sales Offices & Reps.
Exp: New Jersey, Rahway, REA Int'l. Ltd. 201-382-7100

Local Distributors
Cal Burbank, Edmo, Inc. 213-843-2129
Cal Burlingame, Cooper Airmotive 415-697-0695
Cal Irvine, Mid-America Avionics 714-754-6624
Cal Napa, Avionic Assocs 707-252-2121
Cal San Carlos, Moavco 415-591-7301
Cal Van Nuys, Cooper Airmotive 213-997-0242
Fla Ft. Lauderdale, Cooper Airmotive 305-871-5280
Fla Pine Castle, Avionic Assocs. 305-855-4920
Ga College Park, Cooper Airmotive 404-766-5241
Ill Joliet, Avionic Assocs 815-729-0820
Ill Wheeling, Cooper Airmotive 312-541-7040
Kans Kansas City, Cooper Airmotive 913-321-8200
La Lafayette, Cooper Airmotive 318-233-8930
Mass Norwood, Mid-America Avionics 617-762-1006
Mich Romulus, Cooper Airmotive 313-946-9110
Mo Chesterfield, Cooper Airmotive 314-532-3458
NY Garden City, Cooper Airmotive 516-747-8787
Pa Philadelphia, Cooper Airmotive 215-677-9700
Pa Spring House, Avionic Assocs. 215-643-6555
Tenn Memphis, Mid-America Avionic Dist. 901-362-9300
Tex Dallas, Cooper Airmotive 214-357-1811
Tex Dallas, Mid-America Avionic Dist. 214-243-0541
Tex Fort Worth, Cooper Airmotive 817-626-3795
Tex Houston, Cooper Airmotive 713-645-3376
For: Can., Mississauga, Ont., Airborne Elctrn 416-671-4103

AVIONICS LTD., Dept. EM, Box 200, Niagara-On-Lake, Ont., Can., Tel: 416-468-3632; Empl.: 25

AVTEL DIV, UNITRON CORP., Dept. EM, 2826 W. Kingsley Rd, Box 1331, Garland, Tex. 75040, Tel: 214-271-4531, Telex: 73-0644; FSC No.: 6130; Empl.: 75 p. 3362-3364

Sales Manager: R. L. Beutel

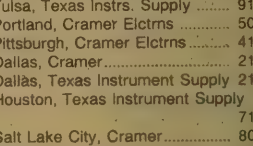
Local Sales Offices & Reps.
Ariz Tempe, Trembly Assoc. 602-966-4428
Mass Holbrook, McLellan Assoc 617-767-4771
NM Albuquerque, Trembly Assoc. 505-266-8616

AVX CERAMICS, Dept. EM, Box 867, Myrtle Beach, S.C. 29577, Tel: 803-448-9411, TWX: 810-661-2252; FSC No.: 9K916; Empl.: 2387 p. 1063-1071

Sales Manager: R. Baughrum; *Distributor Manager:* Denver Lough

Local Sales Offices & Reps.
Ala Huntsville, Beacon Elctrns 205-881-5031
Ariz Tempe, Interstate Mktg. 602-957-1220
Cal Sunnyvale, Quadrep Inc. 408-733-7300
Cal Woodland Hills, Interstate Mktg. Assocs. 213-883-7606
Colo Denver, Elcom 303-770-4400
Fla Boca Raton, Conley and Assoc. 305-395-6108
Fla Oviedo, Conley & Assocs., Inc. 305-365-3283
Fla Tampa, Conley & Assoc. 813-933-3183
Ga Atlanta, Beacon Elctrns 404-351-3654
Ill Chicago, T.B. Hunter Assocs. 312-777-2500
Ind Ft. Wayne, F.J. Campisano Co. 219-747-2633
Iowa Cedar Rapids, Comstrand 319-377-1571
Md Baltimore, Burgin-Kreh Assocs. 301-788-5200
Mass Lexington, J.E. Boeing Co. 617-862-2500
Mich Grand Rapids, J.L. Montgomery 616-774-9308
Mich Southfield, J.L. Montgomery 313-358-2616
Minn Minneapolis, Comstrand Inc. 612-571-0000
Mo Grandview, Beneke & McCaul 816-765-2998
Mo St. Louis, Beneke & McCaul 314-569-2660
NJ Haddonfield, Thomas Assoc. 609-546-7592
NM Albuquerque, A.Q. Electronics 505-883-1003
NM Albuquerque, Thorson Co. 505-265-5655
NY Ithaca, B. Dean, Inc. 607-272-2187
NY Melville, Comtronic Assocs. 516-249-0505
NC Winston-Salem, Burgin-Kreh 919-768-4174
Ohio Cincinnati, F.J. Campisano Co. 513-574-7111
Ohio Dayton, Schmidt & Assoc. 513-293-6652
Ohio Northfield, F.J. Campisano Co. 216-468-1515
Okla Oklahoma City, Ammon & Rizos 405-373-2748
Ore Portland, Western Tech. Sls. 503-297-1711
Pa Coraopolis, F.J. Campisano Co. 412-264-5151
Tenn Kingston, Burgin-Kreh 614-690-6100
Tenn Oak Ridge, Beacon Elctrns 615-482-2409
Tex Austin, Ammon & Rizos Co. 512-454-5131
Tex Dallas, Ammon & Rizos Co. 214-233-5591
Tex Houston, Ammon & Rizos Co. 713-781-6240
Utah Salt Lake City, Elcom, Inc. 801-532-7940
Va Lynchburg, Burgin-Kreh Assoc. 804-845-5600
Wash Bellevue, Western Tech. Sls. 206-641-3900

Local Distributors
Ariz Phoenix, Liberty Electrns. 602-249-2
Ariz Phoenix, Cramer Elctrns. 602-267-7
Ariz Tucson, Liberty Elctrns 602-884-7
Cal El Segundo, Texas Instrs. Supply 213-973-2
Cal El Segundo, Liberty Elctrns 213-322-8
Cal Irvine, Cramer 714-979-3
Cal Los Angeles, Texas Instrs. Supply 213-776-4
Cal Mountain View, Elmar Elctrns 415-961-3
Cal San Diego, Cramer 714-565-1
Cal San Diego, Liberty Electrns 714-565-9
Cal Sunnyvale, Texas Instrs. Supply
Cal Sunnyvale, Cramer Elctrns. 408-739-3
Cal Woodland Hills, Jaco Elctrns. 213-887-6
Colo Commerce City, Elmar Elctrns 303-287-9
Colo Denver, Cramer Elctrns. 303-758-2
Colo Denver, Texas Insts. Supply 303-751-1
Conn Greenwich, Arrow Elctrns 203-622-9
Conn Hamden, Arrow Elctrns. 203-248-3
Conn N. Haven, Cramer Elctrns. 203-239-5
Fla Ft. Lauderdale, Arrow Elctrns 305-776-7
Fla Hollywood, Cramer Elec. 305-921-7
Fla Melbourne, Arrow Elctrns
Fla Orlando, Cramer 305-894-1
Ga Dorville, Arrow Elctrns 404-934-2
Ga Norcross, Cramer Elctrns. 404-448-9
Ill Arlington Heights, Texas Instrs. Supply 312-593-7
Ill Chicago, Arrow Elctrns 312-893-9
Ill Mt. Prospect, Cramer Elec. 312-593-8
Md Baltimore, Arrow Elctrns. 301-247-5
Md Gaithersburg, Cramer Elec. 301-948-0
Md Hanover, Cramer Elec. 301-796-5
Mass Newton, Cramer Elec. 617-964-4
Mass Waltham, Texas Instrs. Supply 617-890-0
Mass Woburn, Arrow Elctrns 617-933-8
Mich Ann Arbor, Arrow Elctrns 313-971-0
Mich Livonia, Cramer 313-425-7
Minn Bloomington, Arrow Elctrns 617-887-6
Minn Edina, Cramer 612-835-7
NH Manchester, Arrow Elctrns 603-668-6
NJ Cherry Hill, Cramer Elctrns. 609-424-5
NJ Clark, Texas Instrument Supply 201-382-6
NJ Little Falls, Cramer Elctrns 201-785-4
NJ Moorestown, Arrow Elctrns 609-235-1
NJ Saddle Brook, Arrow Elctrns 201-797-5
NM Albuquerque, Cramer Elec. 505-243-4
NY Farmingdale, Arrow Elctrns 516-694-6
NY Fishkill, Arrow Elctrns 914-896-7
NY Hauppauge, Jaco Elctrns. 516-273-5
NY Hauppauge, Cramer 516-231-5
NY Rochester, Cramer Elec. 716-275-0
NY Syracuse, Cramer 315-437-6
NY West Babylon, Arrow Elctrns 516-643-4
NC Winston Salem, Arrow Elctrns 919-725-1
NC Winston-Salem, Cramer 919-725-8
Ohio Cleveland, Cramer 216-248-6
Ohio Cleveland, Arrow Elctrns 216-464-2
Ohio Kettering, Arrow Elctrns 513-253-9
Okla Tulsa, Texas Instrs. Supply 918-437-4
Ore Portland, Cramer Elctrns 503-223-0
Pa Pittsburgh, Cramer Elctrns 413-242-7
Tex Dallas, Cramer 214-661-9
Tex Dallas, Texas Instrument Supply 214-238-4
Tex Houston, Texas Instrument Supply 713-785-
Utah Salt Lake City, Cramer 801-487-
Wash Seattle, Liberty 206-453-
Wash Tulwila, Cramer 206-575-
Wisc Oak Creek, Cramer 414-764-
Wisc Oak Creek, Arrow Elctrns 414-764-
For: Can., Montreal, Que., Future Elctrns 514-735-
For: Can., Toronto, Ont., Future Elctrns. 416-677-
For: Toronto, Ont., Cramer Elctrns 416-661-



AXEL ELCTRNS., Unit of General Signal, Dept 134-20 Jamaica Ave., Jamaica, N.Y. 11418, 212-291-3900, TWX: 710-582-2618; FSC No. 1 Empl.: 180 p. 1073-1077

Sales Manager: J. Alaimo

Local Sales Offices & Reps.
Ariz Los Angeles, High Voltage Sales 213-641-
Cal Fremont, Spence Assocs. 415-656-
Cal Los Angeles, High Voltage Sls. 213-641-
Colo Denver, Component Sls. 303-841-
Fla Miami, Reptronics 303-251-
Iowa Hiawatha, Gassner & Clark Co. 319-393-

Md Baltimore, Burgin-Kreh Assocs... 301-788-5200
Mass Medway, J. Gallagher 617-533-7292
NC Cary, Montgomery Mktg. 919-467-6319
Ohio Cleveland, E.E. Bock & Assocs. 216-331-5212
Ohio Dayton, L.D. Bruno Co..... 513-434-1847
Ore Bellevue, S.P. Inc..... 206-454-0660
Pa Pittsburgh, Automated Equip. & Engrg. 412-931-7616
Wash Bellevue, S.P. Inc. 206-454-0060

DIN, VECTOR DIV., Dept. EM, Box 328, Newtown, PA 18940, Tel: 215-968-4271, TWX: 510-667-2320; FSC No.: 13923

Sales Manager: J. W. Thomason, V-P, Sls

Local Sales Offices & Reps.

Ariz Tucson, William Craven 602-298-0823
Cal Los Altos Hills, Hoeke/Reeser Assocs 415-941-3080
Cal Thousand Oaks, Aydin Vector Div 215-889-2911
DC Washington, Aydin Corp..... 202-488-4138
Md Greenbelt, Riffe Assocs 301-474-8600
NJ Blairstown, Robert I. Keiper 201-362-8602
Pa Richboro, Robert LaCava..... 215-322-7197
Tex Arlington, John Houston Assocs 817-265-2931
Wash Bellevue, Tasco, Inc. 206-453-1414

B MOTOR & CONTROL, Dept. EM, 96 Spring St., New York, N.Y. 10012, Tel: 212-966-5777, Telex: 4-1484; Empl.: 40

Local Sales Offices & Reps.

Conn Wallingford 203-869-8494
Ind Indianapolis..... 317-248-0396
NJ Edison 201-420-1466
NY Rochester 716-473-6640
Tex Houston, B & B Motor & Control Corp. 713-664-6961

& K PRECISION PRODS. OF DYNASCAN, Dept. EM, 6460 W. Cortland, Chicago, Ill. 60635, Tel: 312-889-8870; Empl.: 250 ..... p. 2670-2679

Local Sales Offices & Reps.

Ala. Birmingham, Maitland K. Smith, Inc. 205-967-3080
Cal Redwood City, Sinai-Johnson, Inc. 415-365-6263
Cal Van Nuys, Mike Roth Sls. of Cal. 213-989-3738
Colo Denver, K-C Mkts., Inc..... 303-733-5561
Fla Ft. Lauderdale, Sproch Sls., Inc. 305-587-3792
Ga Tampa, Sproch Sls., Inc. 813-849-6067
Ga Tucker, Maitland K. Smith, Inc. .. 404-938-7161
Ill Arlington Heights, Brainard-Wilson Mktg. 312-437-2700
Ill Centralia, R. Dunn..... 618-533-1775
Ind Indianapolis, Robert Dunn Sls..... 317-247-7857
La New Orleans, Texport Co. 504-486-6073
Mich Detroit, Burcaw Co. & Assoc. 313-533-7700
Minn Minneapolis, HMR, Inc. 612-831-7400
Mo Crestwood, Nevco, Inc..... 314-843-7406
Mo Kansas City, Nevco, Inc..... 816-421-1751
NH North Hampton, R. Thompson.... 401-521-1555
NY Endwell, Tri-Tech Elctrns..... 607-754-1094
NY Fairport, Tri-Tech Elctrns..... 716-223-5720
NY Fayetteville, Tri-Tech Elctrns. 315-446-2881
NY Lindenhurst, L.W. Keller Assoc... 516-888-7790
NY Poughkeepsie, Tri-Tech Elctrns. 914-473-3880
NC Charlotte, Maitland K. Smith, Inc. 704-372-1026
Okla Tulsa, Texport Co..... 918-939-1727
Ore Portland, Fleehart & Sullivan..... 503-297-1033
Pa Pittsburgh, E. Hall Jr. 412-261-0950
Pa Temple, J. Browne 215-929-2886
Penn Memphis, Texport Co..... 901-683-0880
Tex Houston, Texport Co. 713-464-2828
Tex Richardson, Texport Co..... 214-238-7117
Wash Seattle, Fleeheart & Sullivan..... 206-522-1533
Wisc Milwaukee, Brainard-Wilson Mktg. 414-527-1500
Exp: Plainview, N.Y., Empire Exporters516-293-5582
Exp: Toronto, Canada, Atlas Elctrns., Inc. 416-781-6174

K INSTRUMENTS, INC., Dept. EM, 5111 W. 164th St., Cleveland, Ohio 44142, Tel: 216-267-4800, TWX: 810-421-8266; FSC No.: 27591; Empl.: 65

Sales Manager: R.P. Farrell

Local Sales Offices & Reps.

Ala Huntsville, Lee Mid-South, Inc. .. 205-533-5896
Cal Anaheim, B & K Instrs., Inc..... 714-778-2450
Cal San Mateo, B & K Instrs., Inc..... 415-574-8100
Colo Arvada, Figaro-Klebba, Inc. 303-424-0108
Fla Coral Springs, Col-Ins-Co 305-753-1338
Fla Largo, Col-Ins-Co 813-581-8233
Ga Buford, Lee Mid-South 404-945-4222
Haw Honolulu, J.C. Elctrns. 808-537-6787
Ill Bensenville, B & K Instrs. 312-595-7470
Md Rockville, Farrell Assocs..... 301-424-9460
Mich Livonia, B & K Instrs..... 313-522-8600
Minn Cottage Grove, B&K Instrs..... 612-439-1973
NJ W. Caldwell, B & K Instrs. 201-227-6100
NM Albuquerque, Trembly Assoc. 505-266-8616
NY Liverpool, B & K Instrs..... 315-451-1310
NC Raleigh, Lee of the Carolina's.... 919-787-5818
Ohio Cincinnati, B & K Instrs. 513-874-5379
Pa Penn Hills, B&K Instrs..... 412-793-8566
Tex Houston, B & K Instrs. 713-333-2851
Wash Seattle, H. Levinson Co..... 206-323-5100
Wisc Milwaukee, B & K Instrs. 414-453-6440

BACHARACH INSTRUMENT CO., Dept. EM, 2300 Leghorn St., Mountain View, Cal. 94043, Tel: 412-782-3500, TWX: 710-664-2085; Empl.: 500

Local Sales Offices & Reps.

Cal Mountain View 415-967-7221
Ill Wheeling 312-541-3293
NJ Piscataway 201-968-4523
Ohio Pleasant Plain 513-877-2543
Pa Philadelphia 215-492-9188
Tex Houston..... 713-683-8141

BAFCO, INC., Dept. EM, 717 Mearns Rd., Warminster, Pa. 18974, Tel: 215-674-1700, TWX: 510-665-6860; Empl.: 21 ..... p. 2662

Local Sales Offices & Reps.

Cal Carson, ABCO Co. 213-537-5152
Conn Newton, Daner-Hayes Inc. 203-426-9094
DC Falls Church, Sci-Rep..... 703-573-8787
Fla Orlando, Truex Assocs. 305-859-2160
Md Baltimore, Sci-Rep..... 301-321-1411
Mass Newton Centre, Daner-Hayes inc. 617-969-4650
NJ Cherry Hill, Sci-Rep 609-482-0059
NY Canadaigua, Daner-Hayes 716-467-5100
NY Port Washington, Daner-Hayes.. 516-883-4576
NY Rochester, Daner-Hayes Inc..... 716-467-5100
Ohio Dayton, P. Glavinos..... 513-433-2347
Va Falls Church, Sci-Rep..... 703-573-8787

BAILEY INSTRS., INC., Dept. EM, 515 Victor St., Saddle Brook, N.J. 07662, Tel: 201-845-7252; Empl.: 15

BAILEY METER CO., Sub. Babcock & Wilcox, Dept. EM, 29801 Euclid Ave., Wickliffe, Ohio 44092, Tel: 216-943-5500, TWX: 216-944-4160; Empl.: 2300

Local Sales Offices & Reps.

Cal El Monte 213-283-1187
Cal Oakland..... 415-569-1716
Colo Denver..... 303-757-5408
Conn N Haven 203-239-1676
Ga Tucker..... 404-934-0212
Ill Chicago..... 312-427-4892
Kans Prarie Village 913-362-6093
La Metairie 504-888-0761
Mass Framingham 617-879-8456
Mich Southfield 313-356-1500
Minn St Paul 612-739-0450
Mo St Louis..... 314-962-5532
NJ Fairfield 201-575-7640
NY Buffalo..... 716-839-3662
NC Charlotte..... 704-364-8722
Ohio Cincinnati..... 513-281-0132
Ohio Cleveland 216-531-7914
Ore Bala-Cynwyd 215-664-3282
Pa Pittsburgh 412-921-6356
Tex Dallas 214-233-9900
Tex Houston..... 713-774-9605
Wash Seattle..... 206-575-0260

BAKER CO., INC., Dept. EM, Drawer E - Sanford Airport, Sanford, Me. 04073, Tel: 207-324-8773; Empl.: 80

Local Sales Offices & Reps.

Ala Huntsville, Newcomb Assocs..... 205-852-0304
Ariz Chandler, Southwest Tech. Prods. Co. 602-963-5135
Cal Anaheim, Applied Instrs. Corp. .. 714-535-6551
Cal Richmond, Tegal Corp. 415-229-4700
Colo Boulder, Sunshine Scientific..... 303-447-2385
Fla Ocala, T. Dawson 904-236-4149
Ill Villa Park, Motordor 312-833-2700
Mass Cambridge, Rush Assocs. 617-661-1200
Minn Minneapolis, Gibbco Scientific 612-781-3488
Mo Clayton, Gateway Scientific..... 314-725-3464
NJ Newark, Zacon..... 201-624-0240
NY N. Tonawanda, Harvey Instrs. 716-694-9500
NC Cary, R. Petty 919-467-9663
Ohio Cincinnati, Witt Sls..... 513-761-5602
Okla Oklahoma City, Frank C. Stewart & Assocs 405-946-6755
Tex Dallas, CYRAC 214-681-1351
Tex Houston, Contamination Control 713-943-1883
Wash Lake Stevens, Northwest Scientific Instrs. 206-259-0123

BAKER CHEMICAL CO., J.T., Dept. EM, Phillipsburg, N.J. 08865, Tel: 201-859-2151, TWX: 510-235-2924; Empl.: 750

Sales Manager: D. J. Silverblatt

Local Sales Offices & Reps.

Cal Hayward 415-471-6225
Ill Glen Ellyn 312-469-4224
NJ Phillipsburg 201-859-2151
Ohio Columbus 614-885-9287
Va Alexandria..... 703-823-2313

BALDPATE ELECTRONICS, INC., Dept. EM, 225 E. Main St., Georgetown, Mass. 01833, Tel: 617-352-8074; Empl.: 3

Local Sales Offices & Reps.

Cal Torrance, Pacific Aero Sls. 213-540-5177
Va Annandale, J. Hopkins Assocs.. 703-323-1641

BALDWIN ELECTRONICS, see BEI Electronics, Inc.

BALL BROS. RESEARCH CORP., Electronic Display Div., Dept. EM, Box 43376, St Paul, Minn. 55164, Tel: 612-786-8900, TWX: 910-563-3552; Empl.: 350

Sales Manager: L. R. Lemke

Local Sales Offices & Reps.

Cal Santa Clara 408-244-1474
Cal Upland..... 714-985-7110
Ill Addison 312-279-7400
NJ Ocean 201-922-2800
Tex Lewisville..... 214-436-2383

BALLANTINE LABORATORIES, INC., Dept. EM, 90 Fanny Rd., Box 97, Boonton, N.J. 07005, Tel: 201-335-0900, TWX: 710-987-8380; FSC No.: 50423; Empl.: 110 ..... p. 2663

Sales Manager: R. Stagnol, Mktg. Svc Mgr.

Local Sales Offices & Reps.

Ala Huntsville, Gentry Assoc. Inc. 205-534-9771
Ariz Scottsdale, Measurement Consultants 602-994-9519
Cal Anaheim, Moxon Elctrns. 714-635-7600
Cal San Diego, Moxon Elctrns..... 714-292-4820
Cal Santa Clara, Moxon Elctrns. 408-249-2491
Colo Denver, Par Assocs. 303-355-2363
Conn Hamden, J & J Assocs. 203-624-7800
Fla Melbourne Beach, Gentry Assocs. 305-724-0812
Fla Orlando, Gentry Assocs. 305-894-4401
Fla St. Petersburg, Gentry Assocs... 813-867-7820
Ga Atlanta, Gentry Assocs, Inc..... 404-237-7272
Kans Shawnee Mission, EIR Co..... 913-362-0919
Mass Winchester, J & J Assocs. 617-729-5770
Mich Ann Arbor, Electro Sls Assoc.... 313-665-5397
Minn St. Paul, Dytec/North, Inc. 612-645-5816
Mo Leasburg, EIR Co. 314-895-4100
NJ Saddle Brook, L & M Assocs..... 201-843-8700
NY East Syracuse, Ossmann Instrus 315-437-6666
NC Burlington, Gentry Assocs. 919-227-3639
Ohio Cleveland, Electro Sls. Assoc. .. 216-261-5440
Ohio Dayton, Electro Sls. Assoc. 513-426-5551
Okla Oklahoma City, Data Mktg. Assoc. Inc. 405-528-6071
Pa Andalusia, L & M Assocs 215-639-3100
Pa Pittsburg, electro Sales Assoc. .. 412-371-9449
Tex Austin, Data Mktg Assoc. Inc. 512-451-5174
Tex Dallas, Data Mktg. Assocs. 214-661-0300
Tex Houston, Data Mktg. Assocs. 713-780-2511
Tex San Antonio, Data Mktg. Assoc. Inc. 512-828-0937
Va Alexandria, Dyna Rep Co. 703-354-1222
Exp: Miami (Caribbean Islands), West Indies Sls. Co. Ltd. 305-592-8188
Exp: Palo Alto, Dimes Group 415-493-1885

Local Distributors

Cal Huntington Beach, Tekom Inc..... 714-968-1240
Cal San Leandro, Pasco Scientific.... 415-351-1501
Md Rockville, Metric Resources..... 301-881-6700
NJ Freehold, Raycomm Industries .. 201-431-2500
NJ Parlin, JMR Sales 201-727-5335
NJ Totowa, Ampower, Inc. 201-742-3215
NM Taos, Dyma Engrg..... 505-758-2686
NY Great Neck, Instrument Mart..... 516-487-7800
NY Yonkers, Jack Mesnick Sls. 914-961-6619
Ohio Centerville, NIDI 513-435-4503
Ohio Cleveland, Broadhouse-Garrett.. 216-341-0248

Ohio Toledo, Freeman Educational Div 419-691-4624
Pa Philadelphia, Sunshine Scientific Instrs. 215-673-5600
Pa Philadelphia, Herbach & Rademan, Inc. 215-426-1700
Pa Philadelphia, Baynton Electronics Corp. 215-229-9800
Tenn Bellevue, McLemore Assocs. 615-646-0062
Tex Garland, Tucker Elctrns 214-348-8800
Va Vienna, Electronic Equip. Bank 703-938-3350

BALSTON, INC., Dept. EM, Box C, 703 Massachusetts Ave., Lexington, Mass 02173, Tel: 617-861-7240, Telex: 92-3481

Local Distributors
Ala Mobile, Alabama Controls Co. 205-479-2345
Cal Palo Alto, Priz-Co. 415-326-9333
Cal Paramount, Brenner-Fiedler & Assoc. 213-636-3206
Colo Denver, Mundix Ind'l Controls 303-893-2390
Fla Orlando, Control Center 305-896-6831
Ill Chicago, A. Stanley & Co. 312-973-7376
Md Baltimore, Jobe & Co. 301-235-3502
Mich Detroit, Michigan Value & Fitting Co. 313-884-9415
Minn Eden Prairie, G. Speaker Co. 612-941-5730
Mo Hazelwood, E. M. Thompson Co. 314-731-2688
Mo Kansas City, E. M. Thompson Co. 816-471-8248
Neb Omaha, E. M. Thompson Co. 402-341-4635
NJ Moorestown, Salem Scientific 609-235-4565
NJ Springfield, RJM Sls. 201-467-1210
NY Buffalo, R.L. Stone Co. 716-873-1873
NY Rochester, R.L. Stone Co. 716-381-1155
NY Syracuse, R.L. Stone Co. 315-468-2700
NC Charlotte, Salem Sls. Assocs. 704-375-3328
Ohio Cincinnati, J.R. Douglass Co. 513-931-4986
Ohio Cleveland, F. W. Kirk Co. 216-226-1970
Pa Pittsburgh, J.F. Kraus & Co. 412-531-1200
Tenn Memphis, Centro, Inc. 901-526-0518
Tex Dallas, H & D Distributors 214-351-6478
Tex Pasadena, Tech-Quip, Inc. 713-473-2891
Utah Provo, Priz-Co, 801-377-5858
Va Richmond, Jobe & Co. 804-282-6508
WVa So. Charleston, Appalachian Controls Co. 304-744-5324
Wisc Appleton, Guy Speaker Co. 414-739-6066
Wisc Milwaukee, Guy Speaker Co. 414-258-2325
For: Can., Mississauga, Ont., Can-Am Instrs. Ltd. 416-277-4541
For: Can., Montreal, Que., Can-Am Instrs. Ltd. 514-931-2588

BARBER-COLMAN CO., MOTOR DIV., Dept. EM, Dept. F, 14116 Rock St., Rockford, Ill. 61101, Tel: 815-877-0241, TWX: 910-631-3425; Empl.: 3500 p. 3074,3075

Sales Manager: R. B. Nelson

Local Sales Offices & Reps.
Cal Los Angeles, Sierra Indl Engrg. 213-624-3123
Cal Menlo Park, Long & Assoc. 415-327-1300
Colo Englewood, Todd Assoc. 303-761-7801
Conn Berlin, White Sls. Co. 203-224-0423
Fla Boca Raton, E. A. Kershaw & Co. 305-392-9263
Ill Chicago, Barber-Colman Co. 815-459-7204
Ind Ft. Wayne, Menze Sls. 219-747-5616
Iowa Cedar Rapids, PMA Corp. 319-362-9177
Kans Overland Park, PMA Corp. 913-381-0004
Kans Wichita, PMA Corp. 316-264-2662
Md Woodbine, Naudain Assocs - So. 301-442-2270
Mass Needham, White Sls. Co. 617-444-3676
Minn St. Paul, Northport Engrg. 612-698-3841
Mo Maryland Heights, PMA Corp. 314-569-1220
NJ Mt. Laurel, Naudain & Assoc. 609-235-1801
NJ Springfield, P. H. Werner, Inc. 201-376-9440
NY Albany, Robert F. Lamb Co. 518-869-3355
NY Buffalo, Robert F. Lamb Co. 716-874-4900
NY Rochester, Robert F. Lamb Co. 716-544-5580
NY Syracuse, Robert F. Lamb Co. 315-455-2469
NY Webster, Maher Talty Assocs 716-872-1761
NC Garner, Candor Co. 919-779-1855
Ore Sandy, Cummings & Assocs 503-287-6050
SC Myrtle Beach, Candor Co. 803-448-8361
Tenn Chattanooga, Candor Co. 615-894-9686
Tex Austin, John B. Guenther 512-472-3825
Tex Dallas, J. B. Guenther, Inc. 214-691-8500
Tex Houston, J. B. Guenther, Inc. 713-468-0232
Va Richmond, Candor Co. 804-320-7375
Wisc Milwaukee, Barber-Colman Co. 414-464-5900
Exp: Wisc., Milwaukee, Dummann World Trade Co. 414-464-0100

BARBER CORP., Dept. EM, Box 635, Waynesville, Ohio 45068, Tel: 513-897-2926; Empl.: 25

BARCO CHEM. PRODS. INC., Dept. EM, 525 So. Dearborn St., Chicago, Ill. 60605, Tel: 312-427-2957; Empl.: 10

BARIOD DIV., N L Inds., Inc., Dept. EM, Box 1675, Houston, Tex. 77001, Tel: 713-527-1182

BARKER ELEC. SLS., Dept. EM, Box 405, Ship Bottom, NJ 08008, Tel: 609-494-8209; FSC No.: 31142; Empl.: 17

Sales Manager: T. Robinson-Cox

BARKER & WILLIAMSON, INC., Dept. EM, Canal St., Bristol, Pa. 19007, Tel: 215-788-5581; Empl.: 51

Sales Manager: M. Zegel

BARNES ENGRG. CO., Dept. EM, 1645 So. Claudina Way, Anaheim, Calif. 92805, Tel: 714-533-7530; Empl.: 32

Sales Manager: G.W. Barnes

Local Sales Offices & Reps.
Cal Palo Alto, R.W. Thompson Assocs 415-494-7516
Cal San Diego, Earle Assocs. 714-278-5441
Conn Norwalk, Betronic Assocs. 203-853-7630
Fla Hollywood, A.P. Assocs 305-987-6720
Ill Downer's Grove, Reisch & Assocs. 312-968-0731
Mass Waltham, Betronic Assocs. 617-894-8400
Mo St. Louis, Ensco-Rep. 314-567-3935
NJ Tenafly, Johnson Assocs 201-569-7111
NJ Woodcliff Lake, F & F Assocs. 201-778-6767
NY Coram, F & F Assocs. 516-928-9666
NY Fairport, Naco Elctrns. 716-223-4490
NY Syracuse, Naco Elctrns. 315-699-2651
NY Utica, Naco Elctrns. 315-732-1801
Ohio Cleveland, CSA Elctrn Sls Agency 216-333-2088
Ore Portland, Tasco 503-292-1473
Pa King Of Prussia, Monteiro Assocs. 215-265-0634
Tex Houston, Unidyne 713-772-3170
Tex Richardson, Unidyne 214-234-3050
Wash Bellevue, Tasco 206-453-1414

BARNES ENGRG. CO., Dept. EM, 30 Commerce Rd., Stamford, Conn. 06902, Tel: 203-348-5381, Telex: 965921; Empl.: 250

Sales Manager: H. Kaplan

Local Sales Offices & Reps.
Ariz Tempe, Trembly Assocs. 602-966-4428
Cal Los Altos, J. Stone Assocs. 415-948-4563
Cal Los Angeles, Basic Systems Co. 213-938-2833
Colo Arvada, Figaro-Klebba Assocs. 303-424-0108
Fla Orlando, E. G. Holmes & Assocs. 305-894-8901
Ga Chamblee, E. G. Holmes & Assocs. 404-451-6161
Ill South Holland, Raeco, Inc. 312-331-6001
Md Silver Spring, Spectro Systems. 301-949-8261
Mass Marblehead, Northeast Assocs. 617-631-9500
Mich Madison Heights, WKM Assocs. 313-588-2300
Minn Minneapolis, CT Sls 612-374-1241
Nev Las Vegas, Trembly Assocs 702-739-6816
NJ East Orange, Friedman Assocs. 201-673-2500
NM Albuquerque, Trembly Assocs. 505-266-8616
NY Fayetteville, M. P. Andrews 315-637-3144
Ohio Cleveland, WKM Assocs. 216-267-0445
Ohio Dayton, WKM Assocs. 513-434-7500
Pa Elkins Park, Snow Assocs. 215-379-4700
Pa Pittsburgh, WKM Assocs. 412-892-2953
Tex Richardson, Optics & Electrns. 214-690-9799
Wash Walla Walla, Northwest Techn Co 509-529-2051

BARNES & REINECKE, INC., Dept. EM, 2375 Estes Ave., Elk Grove Village, Ill. 60007, Tel: 312-640-7200; Empl.: 250

BARON-BLAKESLEE, Dept. EM, 1620 S. Laramie Ave., Chicago, Ill. 60650, Tel: 312-656-7300

Sales Manager: (Natl) P. Johnson

Local Sales Offices & Reps.
Cal Gardena 213-532-0730
Cal Newark 415-794-6511
Cal San Diego 714-295-0041
Cal Santa Fe Springs 213-723-0971
NJ South Kearny 201-589-5933
NJ Thorofare 609-853-0355
NY Bayshore 516-242-5588
Ore Portland 503-252-3468
Wisc Oak Creek 414-762-6850

BARON WIRE & CABLE CORP., Dept. EM, 601 Howard St., Chicago, Ill. 60648, Tel: 312-647-8 Telex: 72-4322; Empl.: 25

Sales Manager: M. Turim

Local Sales Offices & Reps.
Ga Atlanta, Electro Mech Reps 404-449-6
Ill Durand, Specialty Wire & Cable 815-248-2
Ind Indianapolis, Wilder & Assocs 317-632-9
Iowa Marion, Arnie Sell & Assocs 319-393-4
Ky Ft. Mitchell, McGinnis & Assoc 513-271-4
Ky Louisville, Mayhall & Assoc 502-636-1
Md Silver Springs, Mitchell Electrical Sls 301-587-1
Mich Detroit, R.M. Gardner Co. 313-531-1
Minn Burnsville, Strong & Assoc. 612-890-3
Mo Blue Springs, Jon Jacobson Co. 816-229-4
Mo St. Louis, The Mfr. Rep 314-961-2
NJ Paramus, Topinka & Assoc. 201-265-7
NC Charlotte, L. P. Spoon Co. 704-372-3
Ohio Cleveland, R.C. Childs Co. 216-333-0
Okla Jenks, Wayne Parker 918-299-5
Tenn Nashville, John Dabbs & Assoc 615-385-1
Wash Seattle, Rainer Electrical Agts. 206-624-2
Wisc Mequon, Norberg Electrical Sls. 414-242-2

BARTLETT-EMERY INSTRUMENT CORP., D EM, 14th & Ave. "M", Ft. Madison, Iowa 52627, 319-372-8366; Empl.: 25

Local Sales Offices & Reps.
Cal San Gabriel, R.G. Moye Co. 213-283-
Pa Glenside, W.E. Girard Co. 215-887-

BASLER ELECTRIC CO., Dept. EM, Box 269, 143, Highland, Ill. 62249, Tel: 618-654-2341, 910-996-2522; Empl.: 850

Local Sales Offices & Reps.
Ala Birmingham, E.J. Ruth Assocs. 205-979-
Ala Huntsville, Electro-Mech Sls Engrg Co. 205-883-
Ariz Phoenix, F.W. Gorman 602-956-
Cal Buena Park, Sls. Engrs. Ltd. 714-521-
Cal LaHabra, Nolan Assocs. 213-694-
Cal Palo Alto, Abbott Engrg. Co. 415-968-
Cal San Diego, Sls Engrs Ltd. 714-277-
Colo Boulder, Front Range Mktg 303-443-
Conn New Preston, Nelson, Bennett, Skilton Ass 203-868-
Fla Ft. Lauderdale, Electrocomp Assoc. 305-491-
Fla Jacksonville, Belcher & Assocs. 904-724-
Fla Miami, Belcher & Assoc 305-661-
Fla St. Petersburg, Electrocomp Assoc. Inc. 813-822-
Ga Atlanta, Belcher & Assoc. 404-255-
Ga Atlanta, Electro Mech Sls. Engrg. Co. 404-449-
Haw Honolulu, Kems Inc. 808-847-
Ill Chicago, H. Sam Tollaksen 312-441-
Md Glen Burnie, Faion Lott Co. 301-744-
Mass Braintree, R.F. Duffy Assocs. 617-848-
Mass Sturbridge, Branford Controls 617-347-
Mich Farmington, Miltimore Sls. Inc. 313-476-
Mich Grand Rapids, Miltimore Sls 616-942-
Minn Minneapolis, White Sls. Co. 612-566-
Mo Ballwin, H.J. Weisler & Assocs. 314-394-
Mo North Kansas City, H.J. Weisler & Assocs 816-421-
NJ Cherry Hill, L.H. Walke Co. 609-424-
NM Albuquerque, F.W. Gorman 513-393-
NY Memphis, Aero Sls. Co. 315-689-
NY Roslyn, Seidel Assocs. 516-621-
NC Charlotte, J. Rudisill Assocs. 704-377-
NC Raleigh, Electro Mech Sales Engrg. Co. 919-782-
Ohio Cleveland, A.H. Baier Co., & Assocs. 216-461-
Ohio Dayton, A.H. Baier Co. & Assoc. 513-276-
Ohio Dayton, Rockford Controls OH 513-898-
Ohio Montgomery, Seawood Sls. 513-793-
Okla Tulsa, L. Elliott Co. 918-743-
Ore Portland, McLaren Inc. 503-297-
Pa Pittsburgh, Gormley Elec. Co. 412-371-
Tenn Nashville, Electro Mech. Sls. Engrg. Co. 615-256-
Tex Dallas, Wm. Reese Assocs. 214-638-
Tex El Paso, Frank Gorman 915-532-
Tex Houston, Weisler & Assoc. 713-467-
Wash Bellevue, McLaren, Inc. 206-454-
Exp: St. Louis, Mo., Brauner Export Co. 314-426-

BAUMKER MFG. CO., Dept. EM, 5144 Ente Toledo, Ohio 43612; Empl.: 8

SCH & LOMB, A.S. DIV., Dept. EM, 820 Linden ve., Box 9189, Rochester, N.Y. 14625, Tel: 6-385-1000; Empl.: 300

SCH & LOMB, S.O.P.D. DIV, Dept. EM, 1400 N. oodman St., Rochester, N.Y. 14602, Tel: 6-338-6000, TWX: 97-8231, 510-253-6189; Empl.: 00

ales Manager: L. Rowell

ocal Sales Offices & Reps.

al	San Leandro	415-895-8711
a	Atlanta	404-873-2023
	Deerfield	312-948-9290
d	Sparks	301-666-2109
l	Fairfield	201-575-1646

LABORATORIES, INC., Dept. EM, 20160 Center dge Rd., Cleveland, Ohio 44116, Tel: 216-333-3898; npl.: 20

TRON, Dept. EM, 344 Salem St., Medford, Mass. 155, Tel: 617-391-1550; FSC No.: 52683; Empl.: 17

ales Manager: T. Kozul

ocal Sales Offices & Reps.

al	Los Angeles, McDougall/McLaughlin Co.	213-477-8556
al	Woodside, N-S Assocs.	415-854-4870
olo	Boulder, Herb Bass Assocs.	303-499-7509
ass	Lexington, Zieco, Inc.	617-861-8300
r	Greenvale, B. Aaron & Co.	516-621-0630
t	Lafayette Hill, M. Lader Co.	215-825-3177
t	Woodbridge, M. Lader Co.	202-296-2497
p:	New Jersey, Cresskill, Lars Microwave	201-871-0024

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INSTRUMENTS CO., Div. Bolt Beranek & wman, Inc., Dept. EM, 50 Moulton St., Cambridge, ass. 02138, Tel: 617-491-0092, Telex: 921-470; npl.: 35 ..... p. 4301

ales Manager: T. J. Glynn

cal Sales Offices & Reps.

a	Huntsville, Currie Peak & Frazier	205-536-5650
as	Anchorage, Harry J. Lang & Assocs.	907-279-5751
iz	Scottsdale, Williams Assocs.	602-947-4297
l	Costa Mesa, FLW Inc	213-860-4695
l	Palo Alto, E.V. Roberts Assocs.	415-494-1671
l	San Diego, FLW Inc	714-277-0993
lo	Denver, Williams Assoc.	303-373-4730
nn	Canton Center, Tekdata	203-693-9219
a	Orlando, Currie Peak & Frazier	305-855-0843
	Northfield, Instronics Assocs.	312-446-3231
l	Indianapolis, Loren Green Assocs.	317-293-9827
	Lafayette, Kemp Engrg	318-984-3516
l	New Carrollton, W. A. Brown Equip.-Comp, Inc.	301-577-6105
ss	Wakefield, Tekdata	614-245-5940
ch	Mt. Clemens, R.J. O'Hara Assocs.	313-791-7140
nn	Minneapolis, Loren Green Assocs.	612-781-1611
	St. Louis, Deltron Co.	314-869-4779
	Fairlawn, Willrich Precision Instr.	201-791-6692
	North Plainfield, Brady Co.	201-753-7988
M	Albuquerque, Williams Assoc.	505-255-1638
r	Dewitt, D. B. Assocs.	315-446-0220
C	Greensboro, Currie Peak & Frazier	919-273-3040
io	Columbus, R.D. Cloon Assocs.	614-459-2890
	Philadelphia, Victor Halta Co	215-836-5122
x	Dallas, Synthenetics, Inc.	214-631-1740
x	Houston, Kemp Engrg	713-688-5532
	Alexandria, W. A. Brown Equip.-Comp., Inc.	703-836-1800
ash	Seattle, Rush S. Drake Assocs.	206-763-2755
sc	Wauwatosa, T.R. Bickler Assocs.	414-453-3772

BEAD ELCTRNS., Div. Bead Chain Mfg. Co., Dept. EM, 110 Mountain Grove St., Bridgeport, Conn. 06605, Tel: 203-334-4124; Empl.: 150

Local Sales Offices & Reps.

Cal	Los Angeles, Yarbrough Sls. Co.	213-254-5101
Ill	Chicago, Electro-Mech Sls. Co.	312-777-0554
Ind	Indianapolis, Hoster & Sieloff Assocs., Inc.	317-842-3700
Mass	Needham, A. G. Anderson	617-449-1418
Mich	Union Lake, Fox Industries, Inc.	313-363-7183
Minn	Minneapolis, Nygaard Sls. Co.	612-881-3727
Mo	Independence, Gribble Sls Engrg	816-796-4333
Va	Williamsburg, Dyneers, Inc.	804-229-3612
Wash	Seattle, F.W. Aurich & Co.	206-284-5561
Exp:	N.J., Teterboro, GTE Sylvania Precision Materials, Inc.	201-288-9484

BEARING INSPECTION, Dept. EM, 10041 Shoemaker Ave., Santa Fe Springs, Cal. 90670, Tel: 213-944-6251; Empl.: 32

BEAU PRODS., See Vernitron Elec. Comps.

BEAU TECH, INC., Dept. EM, P.O. Box 523, Portland, Me. 04122, Tel: 207-775-6139; Empl.: 5

BECKMAN INSTRS., (AISSD), Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634, Tel: 714-871-4848, TWX: 910-592-1260; Empl.: 3500

Local Sales Offices & Reps.

Cal	Mountain View	415-326-1970
Colo	Denver	303-371-0950
Ga	Atlanta	404-934-3830
Ill	Lincolnwood	312-583-1020
La	Baton Rouge	504-926-5085
Md	Silver Springs	301-622-2500
Mass	Wakefield	617-245-6800
Mich	Southfield	313-424-8800
Minn	Minneapolis	612-835-2202
Mo	Creve Coeur	314-432-5610
NJ	Mountainside	201-232-7600
Ohio	Cleveland	216-886-3020
Ohio	Reading	513-761-9560
Pa	Broomall	215-544-2695
Pa	Pittsburgh	412-921-1530
Tex	Dallas, 214-637-1640	
Tex	Houston	713-781-0810
Wash	Bellevue	206-454-9528

BECKMAN INSTRS., Cedar Grove Opers., Dept. EM, 89 Commerce Rd., Cedar Grove, N.J. 07009, Tel: 201-239-6200, TWX: 710-994-5781; Empl.: 3500

Local Sales Offices & Reps.

Cal	Fullerton	714-521-3700
Ga	Atlanta	404-934-3830
Ill	Lincolnwood	312-583-1020
NJ	Cedar Grove	201-239-6200
Pa	Pittsburgh	412-921-1530
Tex	Houston	713-781-0810
Va	Richmond	804-282-0555

BECKMAN INSTRS., Ectrn. Instrs. Div. Ectrn. Instrumentation, Dept. EM, 3900 N. River Rd., Schiller Park, Ill. 60176, Tel: 312-671-3300, TWX: 910-253-1820; Empl.: 3500

Refer to Beckman Instrs. (AISSD) for sales office information.

BECKMAN INSTRS., Helipot Div., Dept. EM, 2500 Harbor Blvd., Fullerton, Cal. 92634, Tel: 714-871-4848, TWX: 06-78413, 910-592-1260; FSC No.: 73138; Empl.: 3700 ..... p. 2461,2852-2854,3646,3647,3786-3790

Sales Manager: M. P. Crugnale; *Distributor Manager:* R. Alexander

Local Sales Offices & Reps.

Ala	Huntsville, Murcota Corp.	205-539-8476
Ariz	Scottsdale, Arcom Sls.	602-947-5745
Cal	Mountain View, Beckman Instrs.	415-961-6817
Cal	Orange, Beckman Instrs	714-538-0086
Cal	San Diego, Beckman	714-565-6244
Colo	Denver, B-5	303-426-0222
Fla	Boca Raton, Conley & Assocs.	305-395-6108
Fla	Oviedo, Conley & Assocs.	305-365-3283
Fla	Tampa, Conley & Assocs.	813-933-1759
Ill	Chicago, Carlson Elctrn. Sls. Co.	312-956-8240
Ind	Carmel, SAI Mktg. Corp.	317-844-7196
Ind	Indianapolis, Carlson Elctrn. Sls. Co.	317-253-5610
Iowa	Cedar Rapids, Comstrand	319-377-1575
Md	Silver Spring, Beckman	301-622-2500
Mass	Needham Hgts., Beckman	617-444-9010
Mich	Brighton, SAI Mktg. Corp.	313-227-1786
Mich	Grand Rapids, SAI Mktg. Corp.	616-942-2504
Minn	Minneapolis, Comstrand	612-571-0000
Mo	Florissant, SAI Mktg. Corp.	314-837-5200
NJ	Clifton, Ossmann Comp. Sls. Corp.	201-778-8888
NJ	Mt. Laurel, Beckman	609-235-3314
NM	Albuquerque, Arcom Sls Co.	505-296-0606
NY	Bowmansville, Ossmann Comp. Sls.	716-681-9700
NY	Kingston, Ossmann Comp. Sls.	914-338-5505
NY	Rochester, Ossmann Comp. Sls. Corp.	716-424-4460
NY	Syracuse, Ossmann Comp. Sls.	315-454-4477
NY	Vestal, Ossmann Comp. Sls.	607-785-9949
NC	Winston-Salem, Murcota Corp.	919-722-9445
Ohio	Beachwood, SAI Mktg. Corp.	216-292-2982
Ohio	Dayton, SAI Mktg. Corp.	513-435-3181
Ohio	Reading, SAI Mktg. Corp.	513-761-5432
Okla	Tulsa, Norvell Assocs.	918-663-1247
Ore	Portland, Beckman Inst.	503-292-0701
Pa	Pittsburgh, SAI Mktg. Corp.	412-782-5120
Tex	Austin, Norvell Assocs.	512-458-8106
Tex	Dallas, Norvell Elctrns., Inc.	214-233-0020
Tex	Houston, Norvell Assocs.	713-774-2568
Utah	Bountiful, B-5	801-292-8991
Wash	Bellevue, Electronic Sources, Inc.	206-453-0800
Wisc	Milwaukee, Carlson Elctn. Sls. Co.	414-476-2790

Local Distributors

Ala	Huntsville, M & C Sls.	205-539-8476
Ala	Huntsville, Powell Elctrns.	205-539-2731
Ariz	Phoenix, Kierulff Elctrns.	602-243-4101
Ariz	Phoenix, Liberty Elctrns.	602-257-1272
Ariz	Tempe, Marshall Inds.	602-968-6181
Cal	Canoga Park, Marshall Inds.	213-999-5001
Cal	El Monte, Marshall Inds.	213-686-0141
Cal	El Segundo, Liberty Elctrns.	213-322-8100
Cal	Irvine, Marshall Inds.	714-556-6400
Cal	Mountain View, Elmar Elctrns.	415-961-3611
Cal	San Diego, Liberty Elctrns.	714-565-9171
Cal	San Diego, Marshall Inds.	714-278-6350
Cal	Sunnyvale, Marshall Inds.	408-732-1100
Colo	Arvada, Marshall Inds.	303-423-9670
Colo	Commerce City, Elmar Elctrns.	303-287-9611
Colo	Denver, Kierulff Elctrns.	303-371-6500
Conn	Hamden, Arrow Elctrns.	203-248-3801
Conn	North Branford, Marshall Inds.	203-484-0488
Fla	Clearwater, Lynch-Gentry Assocs.	813-443-2697
Fla	Fort Lauderdale, Arrow Elctrns.	305-776-7790
Fla	Miami Springs, Powell Elctrns.	305-592-3260
Ga	Doraville, Arrow Elctrns	404-455-4054
Ill	Elk Grove Village, Kierulff Elctrns.	312-640-0200
Ill	Mount Prospect, Magnuson Elctrns.	312-956-0700
Ill	Rosemont, Advent Elctrns.	312-298-4210
Ind	Indianapolis, Advent Elctrns	317-297-4910
Iowa	Cedar Rapids, Advent Elctrns	319-393-8811
Md	Baltimore, Arrow Elctrns.	301-247-5200, 202-737-1700
Md	Beltsville, Powell Elctrns.	301-937-4030
Md	Gaitherburg, Kierulff Elctrns.	301-948-0250
Mass	Billerica, Kierulff Elctrns.	617-667-8331
Mass	Newton, Marshall Inds.	617-965-5115
Mass	Woburn, Arrow Elctrns.	617-933-8130
Mich	Ann Arbor, Arrow Elctrns	313-971-8220
Mich	Farmington, Advent Elctrns	313-477-1650
Mich	Farmington, Sheridan Sls. Co.	313-477-3800
Minn	Bloomington, Arrow Elctrns.	612-887-6400
Minn	Plymouth, Marshall Inds.	612-559-2211
Minn	St. Paul, Magnuson Elctrns.	612-227-8495
NH	Manchester, Arrow Elctrns.	603-668-6968
NJ	Moorestown, Arrow/Electronics	609-235-1900, 215-928-1800
NJ	Rutherford, Kierulff Elctrns.	201-935-2120
NJ	Saddle Brook, Arrow Elctrns.	201-797-5800
NY	Bomansville, Ossmann Comp Sls Corp.	716-681-9700
NY	Farmingdale, Marshall Inds.	516-293-4141
NY	Farmingdale, Arrow Elctrns.	516-694-6800
NY	Kingston, Ossmann Component Sls. Corp.	914-338-5505
NY	Mount Vernon, QAR Indl Elctrnc Sls	914-699-2224
NY	Rochester, Ossmann Component Sls. Corp.	716-424-4460
NY	Syracuse, Ossmann Component Sls. Corp.	315-454-4477
NY	Vestal, Ossmann Component Sls. Corp.	607-785-9949
NC	Winston-Salem, Arrow Elctrns.	919-725-1971
NC	Winston-Salem, M & C Sls.	919-722-9445
Ohio	Cincinnati, Sheridan Sls. Co.	513-761-5432
Ohio	Cleveland, Sheridan Sls. Co.	216-831-0130
Ohio	Cleveland, Arrow Elctrns.	216-464-2000
Ohio	Dayton, Sheridan Sls. Co.	513-223-3332
Ohio	Kettering, Arrow Elctrns.	513-253-9176
Okla	Tulsa, Norvell Elctrns.	918-663-1247

Ore Portland, Almac/Stroum Elctrns. 503-292-3534
Pa Philadelphia, Powell Elctrns. 215-365-1900
Pa Pittsburgh, Sheridan Sls. Co..... 412-244-1640
Tex Dallas, Marshall Inds..... 214-233-5200
Tex Dallas, Norvell Elctrns. 214-233-0020
Tex Houston, Marshall Inds 713-777-0358
Tex Houston, Norvell Elctrns. 713-777-1666
Wash Bellevue, Liberty Elctrns..... 206-453-8300
Wash Seattle, Almac/Stroum Elctrns... 206-763-2300
Wisc Oak Creek, Arrow Elctrns 414-764-6600
For: Can., Montreal, Que., Semad Elctrns. 514-636-4614
For: Can., Montreal, Que., Specialty Elctrns. 514-336-4500
For: Can., Toronto, Ont., Semad Elctrns. 416-635-9880
For: Can., Toronto, Ont., Specialty Elctrns. 416-678-2104
For: Can., Vancouver, BC, Bowtek Elctrns. 604-736-7677
For: Can., Vancouver, B. C., Intek Elctrns, Ltd. 604-324-6831

BECKMAN INSTRS., Information Displays Oper., Dept. EM, Box 3579, Scottsdale, Ariz. 85257, Tel: 602-947-8371, TWX: 910-950-1293; Empl.: 150 p. 2462-2466

Refer to Beckman Instrs. Helipot Div. for distributor and sales office information

BEEDE ELECTRICAL INSTR. CO., Dept. EM, S. Main St., Penacook, N.H. 03301, Tel: 603-753-6362, TWX: 710-364-6977; Empl.: 500 ..... p. 2664

Sales Manager: J. Veldhuizen; *Distributor Manager:* J. Veldhuizen

Local Sales Offices & Reps.
Ariz Phoenix, MR Engineering 602-956-4670
Cal Los Angeles, Universal Comp. Co. 213-641-4255
Cal San Carlos, Elctrn. Engrg. Assoc. 415-593-2189
Colo Denver, Elctrn. Sls, Inc. 303-771-6300
Conn Farmington, R. Perron & Co. 203-673-4825
Conn Trumbull, R. Perron & Co. 203-268-9631
Fla Winter Park, Floritronics 305-886-4818
Ga Atlanta, Electrical Concepts..... 404-491-3154
Haw Honolulu, Aloha Assoc..... 808-941-1574
Ill Skokie, Saffro & Assocs. 312-328-0140
Kans Leawood, Thunderbird Tech. Sls. & Svc. 913-642-7220
Kans Wichita, Thunderbird Tech. Sls. & Svc. 316-684-3941
Mass Norwood, R. Perron & Co..... 617-762-8114
Mich Ann Arbor, O-M Sls. Co. 313-973-9450
Minn Minneapolis, PSI 612-835-1777
Mo St. Louis, Thunderbird Tech. Sls. & Svc. 314-567-6488
NH Dover, R. Perron & Co. 603-742-2321
NJ Clifton, Ossman Comp..... 201-778-8888
NY Buffalo, Ossman Comp. Sls. Corp. 716-832-4271
NY Huntington, Ossman Comp 516-673-9300
NY Kingston, Ossman Comp. Sls. Corp. 914-338-5505
NY Rochester, Ossman Comp. Sls. Corp. 716-442-3290
NY Syracuse, Ossman Comp. Sls. Corp. 315-454-4477
NY Vestal, Ossman Comp. Sls. Corp. 607-785-9949
Pa Devon, B & A Assocs. 215-688-5173
Tex Dallas, Southwest Elctrn. Ind. 214-690-9881
Tex Houston, Southwest Elctrn. Ind. 713-729-1670
Wash Mercer Island, J. H. Andersen Assocs. 206-232-0484
Wisc Lake Mills, Saffro & Assocs..... 414-648-2605

Local Distributors
Cal Los Angeles, Metermaster Inc. .. 213-685-4340
Cal Los Angeles, EIL Instruments 213-685-7020
Cal Santa Clara, Dynametron..... 408-246-6535
Colo Denver, Metermaster Inst. Corp. 303-722-5766
Conn Middletown, Mancib Co. 203-346-6646
Fla Tampa, Tampa Instrumentation CTR 813-870-0183
Ill Chicago, EIL Instrs. 312-430-2292
Ill Oak Park, Pacific Indicator..... 312-261-1330
Ind Indianapolis, EIL Instrs. 317-545-1373
Kans Overland Pk., Brooks Elctrn. Svc Co. 913-648-3131
Md Timonium, EIL Instrs..... 301-252-1260
Mass Burlington, Mancib Co. 617-272-9450
Mich Clawson, Instr. Specialties 313-435-3311
Minn Minneapolis, Environ Labs 612-888-7795
Mo St. Louis, Scherrer Instrs..... 314-644-5362
NJ Pompton Lakes, Ree Instrs. Co. 201-839-7676
NY Clarence, Trott Elctrns..... 716-634-8500
Ohio Cleveland, Weschler Elec. Corp. 216-251-4609
Ohio Dayton, EIL Instruments 513-435-2134
Pa Pittsburgh, EIL Instrs. 412-731-5230
RI No. Kingston, EIL Instruments 401-885-1773
Tex Dallas, Dallas Instruments 214-341-2990 o1
Tex Houston, Electrical Inst. & Meter Co. 713-526-6871
Va Alexandria, EIL Instrs. 703-354-4330
Wash Seattle, Eicher-Richards Co. 206-523-7888
For: Can., Brampton, Ont., Mod Tronics Instrs. 416-457-6322
For: Can., Sherbrooke, Que., Brunelle Instrs. 819-569-1408
For: Can., Vancouver, BC, Miller Mktg. Ltd. 604-876-7544

BEHLMAN ENGINEERING CORP., Dept. EM, Box 4518, 427 N. Nopal St., Santa Barbara, Cal. 93103, Tel: 805-963-8691 ..... p. 3366-3369

Sales Manager: E.C. Bertolet

Local Sales Offices & Reps.
Ala Huntsville, Reynolds & Assocs... 205-536-1941
Ariz Phoenix, R.L. Davis Co. 602-955-2266
Cal Cupertino, T. Louis Snitzer Co. .. 408-257-8333
Cal Del Mar, T. Louis Snitzer Co. 714-226-0305
Cal Los Angeles, T. Louis Snitzer Co. 213-836-6170
Fla Satellite, Reynolds & Assocs. 305-773-4700
Ga Atlanta, Reynolds & Assocs. 404-252-5360
Md Rockville, Farrell Assocs., Inc..... 301-424-9460
Mass Needham, Addleco Corp. 617-444-4754
Minn St. Paul, Dytec North 612-645-5816
NJ Ridgefield, Ricial Assocs. 201-945-5250
NM Albuquerque, Scientific Devices 505-293-3494
Pa King of Prussia, Letronix..... 215-265-1020
Exp: Los Angeles, Hanex Inc..... 213-556-3807

BEI ELCTRNS., INC., Dept. EM, 1101 McAlmont St., Little Rock, Ark. 72203, Tel: 501-372-7351, TWX: 910-722-7384; Empl.: 419 ..... p. 1384-1387

Sales Manager: N. Hinkle

Local Sales Offices & Reps.
Ariz Phoenix, R.A. Mayes Co. 602-279-5243
Cal Tustin..... 714-731-6151
Conn North Haven, Northeast Reps., Inc. 203-239-2507
Mass Needham Heights, Northeast Reps. 617-449-3034
Mo St. Louis, Cadon Tech. Sls. 314-991-0262
NJ Engelwood 201-871-4557
NM Albuquerque, R.A. Mayes Co. 505-292-2330
NY East Amherst 716-688-4531
NY Rochester, H.C. Johnson Agencies 716-482-3000
Ohio Cincinnati, BEI Elctrns. 513-321-1121
Tex Euless, BEI Elctrns. 817-267-9351
Utah Salt Lake City, R.A. Mayes Co. 801-292-6781

BEL FUSE, Dept. EM, 203 Van Vorst, Jersey City, N.J. 07302, Tel: 201-432-0463, TWX: 710-730-5301; Empl.: 125 ..... p. 2384-2390

Sales Manager: A. Sutta

Local Sales Offices & Reps.
Cal Escondido, Cirolia Elec. Sls. 714-743-3015
Cal Mt. View, Leddy Assoc. 415-969-6313
Cal San Gabriel, Van Gott Assoc. 213-285-2148
Fla Clearwater, Southeastern Comp. Sls. 813-447-1911
Ill Chicago, Memac Sls. 312-545-1033
Md Reisterstown, FBD Sls..... 301-833-9444
Mass Waban, QRC Corp..... 617-332-9600
Minn Minn., Beta Engrg..... 612-546-2215
NY Hempstead, Kahgan Sls. 516-538-2300
NC Cary, FBD Sls..... 919-467-7595
Ohio Cleveland, Jim Finnegan & Co .. 216-238-5905
Pa Bala Cynwyd, M. Friedman & Assoc. 215-839-3450
Tex Addison, Parvin Sls. 214-664-2401
Va Portsmouth, FBD Sls. 804-484-3162

BELDEN

BELDEN CORP., Electronic Div., Dept. EM, Box Richmond, Ind. 47374, Tel: 317-966-6661; Empl. ..... p. 4480-

Local Sales Offices & Reps.
Cal Irvine, Beyden Corp.-Elctrn Div. 714-833-
Colo Golden..... 303-238-
Fla Boca Raton..... 305-395-
Fla Winter Park..... 305-678-
Ga Lilburn 404-921-
Ill Elk Grove 312-593-
Ill Hinsdale 312-654-
Ill West Chicago..... 312-231-
Ind Indianapolis..... 317-849-
Iowa Ankeny 515-964-
La River Ridge..... 504-737-
Md Laurel 301-776-
Mass Framingham Center..... 617-877-
Mass Millbury 617-865-
Mich Farmington 313-477-
Mo St. Louis 314-869-
NH Hudson 603-822-
NJ Lake Hiawatha 201-334-
NY Rochester 716-461-
NC Charlotte..... 704-536-
Ohio Englewood 513-836-
Ohio Medina..... 216-725-
Okla Tulsa 918-252-
Pa Pittsburgh 412-367-
Pa West Chester 215-696-
Tenn Memphis 901-365-
Tex Burleson 817-295-
Tex Houston..... 713-444-
Wash Bellevue 206-885-
Wisc Waukesha..... 414-968-

BELL, INC., F.W., Dept. EM, 4949 Freeway D Columbus, Ohio 43229, Tel: 614-888-7501, 810-337-2851; Empl.: 90 .....p. 2666,2667

Local Sales Offices & Reps.
Ala Huntsville, Scientific Devices, Southeast, 205-356
Cal Palo Alto, Alpha-Tech Assocs. .. 415-494
Cal Pasadena, P. Nurches Co..... 213-796
Colo Denver, G. Moss Elctrns. 303-455
Fla Orlando, Scientific Devices-Southeast, Inc 305-841
Ill Chicago, Carter Elctrns. 312-585
Ind Indianapolis, Carter Elctrns. 317-293
Kans Overland Park, Carter Elctrns. .. 913-649
Mass Waltham, McBar Assoc., Inc..... 617-890
Mich Madison Heights, WKM Assocs. 313-588
Minn Minneapolis, Carter Elctrns..... 612-559
Mo St. Louis, Carter Elctrns. 314-569
NM Albuquerque, G. Moss Elctrns. .. 505-256
NY Mamaroneck, Cane Tech. Sls. .. 914-698
NY North Tonawanda, Labtronics, Inc. 716-685
NY Syracuse, Labtronics, Inc. 315-454
NY Ulster Park, Labtronics, Inc..... 914-471
NC Raleigh, Scientific Devices-Southeast, Inc 919-872
Ohio Cleveland, WKM Assocs. 216-267
Ohio Dayton, WKM Assocs. 513-434
Ore Beaverton, Showalter Instrs. 503-644
Pa Paoli, T. Griffin Co. 215-644
Pa Pittsburgh, WKM Assocs. 412-892
Tex Dallas, Carey-Wolf & Assocs. 214-823
Tex Ft. Worth, Carey-Wolf & Assocs. 817-738
Tex Houston, Cary-Wolf & Assocs. .. 713-72
Wash Bellevue, Showalter Instrs..... 206-455
Wash Richland, Showalter Instrs..... 509-943
Wisc Milwaukee, Carter Electronics, Inc. 414-464
Exp: New York, N.Y., J. Plasencia, Inc. 212-683

Local Distributors
Ala Huntsville, Scientific Devices, Southeast 205-350
Cal Palo Alto, Alpha-Tech Assocs 415-49
Cal Pasadena, Paul Nurches Co..... 213-79
Colo Denver, Gordon Moss Elctrns 303-45
Fla Orlando, Scientific Devices, Southeast 305-84
Ill Chicago, Carter Elctrns 312-58
Ind Indianapolis, Carter Elctrns 317-29
Kans Overland Park, Carter Elctrns.... 913-64
Mass Waltham, McBar Assocs 617-89
Mich Madison Heights, NIDI..... 313-58
Minn Minneapolis, Carter Elctrns 612-55

to St. Louis, Carter Elctrns 314-569-1406
IM Albuquerque, Gordon Moss Elctrns 505-256-3622
IY Mamaroneck, Cane Technical Sls 914-698-4411
IY North Tonawanda, Labtronics ... 716-685-4111
IY Syracuse, Labtronics 315-454-9314
IY Ulster Park, Labtronics 914-471-2806
IC Raleigh, Sci Devices, Southeast 919-872-7066
)hio Cleveland, NIDI 216-267-0445
)hio Dayton, NIDI 513-434-7500
)re Beaverton, Showalter Instrs 503-644-9164
'a Paoli, Tyler Griffin Co. 215-644-7710
'a Pittsburgh, NIDI 412-892-2953
Vash Bellevue, Showalter Instrs 206-455-4922
Vash Richland, Showalter Instrs 509-943-5288
Visc Milwaukee, Carter Elctrns 414-464-5555
.xp: New York, NY, Joseph Plasencia, Inc. 212-683-1416
'or: Can., Burnaby, B.C., Megatronix Ltd 604-526-3312
'or: Can., Montreal, Que., Megatronix Ltd. 514-488-0404
or: Can., Ottawa, Ont., Megatronix Ltd. 613-729-4004
'or: Can., Weston, Ont., Megatronix Ltd 416-742-8015

.L & HOWELL CO., Elctrns. & Instrs. Grp., Dept. :M, 360 Sierra Madre Villa, Pasadena, Cal. 91109, Tel: 13-796-9381, TWX: 910-587-3440; Empl.: 1400

ocal Sales Offices & Reps.
Ala Huntsville 205-881-2231
Cal Palo Alto 415-965-2500
Cal Pasadena 213-796-9381
Cal Van Nuys 213-872-2763
DC McLean 703-790-8930
Fla Winter Park 305-647-0101
I Des Plaines 312-298-2450
Mass Needham Hgts 617-444-8010
Mich Troy 313-689-8526
NJ Cherry Hill 215-922-0564
NM Albuquerque 505-255-8671
Ohio Dayton 513-278-0626
Tex Dallas 214-631-3700
Tex Houston 713-442-6418
Utah Brigham City 801-734-9101
Wash Seattle 206-284-5370

.L INDUSTRIES, J.W. Miller Div., Dept. EM, 19070 Reyes Ave., Compton, Cal. 90221, Tel: 213-537-5200, TWX: 910-346-6740; FSC No.: 76493; Empl.: 55 p. 1322,1323

ocal Sales Offices & Reps.
Ariz Phoenix, H.A. Moore Sls. Assoc. 602-274-4558
Ark El Dorado, D. Bellew Sls., Inc. .. 501-863-8325
Cal Gardena, Bidwell Sls. Assocs..... 213-770-0300
Cal Redwood City, Logan Sls. Co. .. 415-369-6726
Colo Englewood, R.G. Bowen Co., Inc. 303-789-1884
Fla Maitland, Hutto-Hawkins-Peregoy, Inc. 305-831-2474
Fla Pompano Beach, Hutto-Hawkins-Peregoy, Inc. 305-943-9593
Ga Atlanta, Millar Electronics, Inc. . 404-261-6160
I Chicago, Markal Sls. Corp. 312-282-5800
I Peru, Markal Sls. Corp. 815-223-8006
Ind Indianapolis, Elctrn. Reps., Inc. .. 317-894-1414
Ky Louisville, Electronic Reps..... 502-368-4911
La New Orleans, D. Bellew Sls., Inc. 504-443-3237
Md Columbia, Par-Nell Sls. Co. 301-992-5454
Mass North Scituate, W.A. Hendrickson Co. 617-545-0652
Mich Grand Rapids, Markal Sls Corp. 616-942-2670
Mich Southfield, Markal Sls. Corp..... 313-355-5700
Minn Minneapolis, C.R. Gibb Co. 612-377-1200
Miss Jackson, Dick Bellew Sls. 601-366-6728
Mo Raytown, Marty Taraski Sls Co. 816-358-1442
NJ Englewood, Bressler & Baum Assoc. 201-569-7600
NM Albuquerque, C.T. Carlberg & Assocs. 505-265-1579
NY E. Aurora, LSM Assocs. 716-652-2878
NY Ltham, LSM Assocs. 518-783-5606
NY Phelps, LSM Assocs. 315-548-4891
NC Raleigh, Millar Elctrns., Inc. 919-787-9564
Ohio St. Marys, T. Shelby & Co. 419-394-3377
Ore Portland, Earl & Brown, Co..... 503-245-2283
Pa Holland, Par-Nell Sls. Co. 215-355-9330
Penn Memphis, D. Bellew Sls., Inc. 901-365-9437
Tex Fort Worth, Chet Wells & Co. 871-284-0261
Wash Seattle, Earl & Brown Co. 206-284-1121
Exp: New York City, N.Y., Roburn Agencies, Inc. 212-989-5939

.L PA PRODUCTS, Dept. EM, 1200 N. Fifth St. Box 177, Columbus, Ohio 43201; Empl.: 20

Local Sales Offices & Reps.
Ariz Phoenix, A.C. Smith..... 602-257-1875
Ark Magnolia, Custom Prods 501-234-7399
Ga Atlanta, O. Cavendish..... 404-394-6570
Ill Chicago, P. Bunket 815-838-1026

BEMAN MFG., INC., Dept. EM, PO Box 370, New Cumberland, Pa. 17070, Tel: 717-938-1451, TWX: 510-650-3539; Empl.: 300 ..... p. 3648,3649

Sales Manager: Ray Brown, Dir. Mktg.; *Distributor Manager:* D. Fortenbaugh

Local Sales Offices & Reps.
Cal Westminster, A.A. Dowers Co. .. 213-596-4485
Colo Denver, G. Moss Elctrns..... 303-985-8815
Mich Lathrup Village, R.C. Nordstrim Co. 313-559-7373
Minn Minneapolis, Furber Sls..... 612-881-3620
Ohio Cleveland, J. O. Olsen Co. 216-752-5444
Pa Philadelphia, K. Erdman Co. 215-224-1833
Pa Pittsburg, J. O. Olsen Co. 412-279-2550
Exp: N.Y., Westbury, Minthorne Int'l. Co. 516-334-3303

BEMCO, INC., Dept. EM, 9908 San Fernando Rd., Pacoima, Cal. 91331, Tel: 213-899-5296, TWX: 910-496-1520; Empl.: 35

Local Sales Offices & Reps.
Exp: Los Angeles, Bemco Int'l Mktg. Grp. 213-391-6777

BENDIX CORP., Aerospace Sys. Div., Dept. EM, 3621 S. State Rd., Ann Arbor, Mich. 48107, Tel: 313-665-7766, TWX: 810-223-6041; FSC No.: 07038; Empl.: 450

Sales Manager: M.B. Osmun

Local Sales Offices & Reps.
Cal Santa Ana, Bendix..... 714-541-8261
Colo Evergreen, Mountaintek 303-674-5255
Fla Maitland, Bendix..... 305-644-9565
Va Arlington, Bendix Corp 703-841-1200

BENDIX CORP., Avionics Div, Dept. EM, Box 9414, Ft. Lauderdale, Fla. 33310, Tel: 305-776-4100, TWX: 514417, 510-955-9884; Empl.: 1300

Sales Manager: Al White

Local Sales Offices & Reps.
Cal Burbank..... 213-843-4600
Fla Fort Lauderdale 305-776-4100
Ga Atlanta..... 404-691-3875
Kans Wichita..... 316-684-0177
Md Cockeysville 301-239-3606
Ohio Dayton..... 513-224-9214
Tex Euless 817-268-1190

BENDIX, Electric & Fluid Power Div., Dept. EM, Hwy. 35, Eatontown, N.J. 07724, Tel: 201-542-2000, TWX: 132-444, 710-722-6686; FSC No.: 83298; Empl.: 500

Sales Manager: H. I. Nadler

Local Sales Offices & Reps.
Ala Huntsville, Bendix Corp. 714-896-4166
Cal Los Angeles, Bendix Corp.
DC Washington, Bendix Corp. 703-841-1200
Ohio Dayton, Bendix Corp. 513-222-8002
Wash Renton, Bendix Corp. 206-226-3565

THE BENDIX CORP., Electrical Comp. Div., Dept. EM, Sidney, NY 13838, Tel: 607-563-5325, TWX: 932-456, 510-261-7550; FSC No.: 77820 ..... p. 1756-1762

Sales Manager: F. N. Bulken; *Distributor Manager:* T. Weisensee

Local Sales Offices & Reps.
Cal Lakewood 213-920-1711
Cal Palo Alto 415-494-1224
Fla Maitland..... 305-645-2005
Ill Sleepy Hollow 312-296-7791
Mass Lexington..... 617-861-8900
Mo Florissant 314-647-1111
NJ Teterboro 201-288-1710
Ohio Dayton..... 513-222-8002
Tex Dallas 214-243-4394
Va Arlington 703-841-1200
Wash Tukwila 206-575-4100
Exp: N.Y., New York, Bendix Corp., Int'l. Mktg Oper 212-262-8000

BENDIX CORP., Electrodynamics Div., Dept. EM, 11600 Sherman Way, N. Hollywood, Calif. 91605, Tel: 213-765-1010, TWX: 910-499-2151; Empl.: 1200

Local Sales Offices & Reps.
Va Arlington, Bendix Corp., Electrodynamics Div. 703-841-1200

BENDIX CORP., MOTOR COMPS. DIV., See Facet Enterprises, Inc.

BENTHOS, INC., Dept. EM, Edgerton Dr., N. Falmouth, Mass. 02556, Tel: 617-563-5917, Telex: 94-0884; Empl.: 55

Sales Manager: P.F. Smith

Local Sales Offices & Reps.
Cal Poway, CCM Entprs 714-487-2871
Tex Houston, C.A. Richards & Assoc. 713-692-3368
Va Arlington, Gans-Fryling, Inc. 703-527-3262
Wash Seattle, J.B. Jolly, Inc. 206-932-8937

BENTON CORP, Dept. EM, Race St Box 678, Manor, PA 15665, Tel: 412-863-1152, TWX: 510-468-8615

Sales Manager: A. Bouvier

BERG ELECTRONICS, Div. E.I. DuPont de Nemours & Co., Dept. EM, York Expwy., New Cumberland, Pa. 17070, Tel: 717-938-6711, TWX: 510-650-3538; Empl.: 1000 ..... p. 1729-1736

Sales Manager: F. Wigfield III; *Distributor Manager:* H. J. Negler

Local Sales Offices & Reps.
Cal Woodland Hills..... 213-347-8830
Ill Lincolnwood 312-982-4280
Mass East Longmeadow..... 413-525-4228
Minn Minneapolis..... 612-835-4820
Pa Ft. Washington 215-628-3066
Tex Dallas 214-233-3920

BERG INC., WINFRED M., Dept. EM, 499 Ocean Ave., East Rockaway, N.Y. 11518, Tel: 516-599-5010; Empl.: 80

Sales Manager: C. Keenan

BERGER-LAHR CORP, Dept. EM, Peterborough Rd, Jaffrey, N.H. 03452, Tel: 603-532-7701, Telex: 92-8445 ..... p. 3076

Sales Manager: W. D. Jacobson

Local Sales Offices & Reps.
Ariz Phoenix, Thorson Co. 602-956-5300
Cal Irvine, Thorson Co. 714-557-4460
Cal Los Angeles, Thorson Co. 213-476-1241
Cal Mountain View, Thorson Co. 415-964-9300
Cal San Diego, Thorson Co. 714-292-8525
Conn Guilford, Whitehead Assocs..... 203-453-3762
Ill Elk Grove Village, Carlson Elctrn Sls 312-956-8240
Ind Indianapolis, Carlson Elctrn Sls.. 317-253-5610
Mass Boston, Whitehead Assocs..... 617-542-7676
Minn Minneapolis, John J. Exon Co. .. 612-571-5340
NJ Wayne, SHL Assocs..... 201-790-1714
NY Penfield, R. Barthel Entprs..... 716-377-3018
Ore Portland, Thorson Co..... 503-620-5800
Pa Devon, Kershner Assocs 215-356-5000
Tex Dallas, Thorson Co..... 214-233-5744
Tex Houston, Thorson Co..... 713-771-3504
Wash Bellevue, Thorson Co..... 206-455-9180
Wisc Milwaukee, Carlson Elctrn Sls.... 317-253-5610

BERK TEK, INC., Dept. EM, Box 60, RD 1, Reading, Pa. 19607, Tel: 215-376-8071, TWX: 510-651-0511; Empl.: 150 ..... p. 4540,4541

Sales Manager: G. Merkwaz, (V.P. Mktg. & Sales); *Distributor Manager:* G. Merkwaz

Local Sales Offices & Reps.
Ala Huntsville, Elctrn Mktg. Assoc. .. 205-533-3690
Ariz Phoenix, MR Engineering Sls. 602-956-4670
Cal Orange, RJM Assoc..... 714-532-3328
Cal Sunnyvale, Mission Mktg..... 408-732-9611
Colo D/Z Assoc., Duffy Assoc..... 303-534-3649
Conn Lakeville, Conti-Younger Assoc. 203-824-5982
Fla Ft. Lauderdale, R.I. Smith Assoc. 305-772-5100
Fla Melbourne, R.I. Smith Assoc..... 305-727-3163
Ill Downers Grove, Richmar Elctrns.312-968-0118
Ind Carmel, Richmar Elctrns 317-846-6383
Kans Lenexa, Palatine Sls..... 913-492-7020
Md Lutherville, Gibson Elctrn Sls..... 301-825-0989
Mass N. Billerica, Pacer Elctrns
Mass Waltham, Conti-Younger Assocs. 617-890-4582
Mich Broomfield Hills, Enco Mktg. 313-642-0203
Minn Minneapolis, Siedare Assoc..... 612-545-5663
Mo St. Charles, Buckman and Assoc. 314-724-6690
NJ Ridgefield, Rical Assocs. 201-945-5250
NC Winston-Salem, Elctrn Mktg. Assoc. 919-722-5151
Ohio Cleveland, Im Tech 216-826-3400
Ohio Dayton, Im Tech 513-278-6507
Pa Huntingdon Valley, Inacker Sls... 215-947-5660
SC Greenville, Elctrn Mktg. Assoc.... 803-233-4637
Tex Addison, Parvin Sls 214-661-5374

Tex Houston, Parvin Sls 713-981-0852
Wash Redmond, Quadra Sls 206-883-3550
Wisc Butler, Richmar Elctrns. 414-781-1730
Exp: Pa., Philadelphia, Ballagh & Thrall 215-564-4020

Local Distributors
Ala Madison, Southeastern Assocs .. 205-772-9616
Ariz Phoenix, Storm Products Co..... 602-269-3485
Cal Inglewood, Storm Prods 213-776-8141
Cal Montebello, Atlas Wire & Cable 714-994-1601
Cal Mt. View, Jarome Wire 415-968-3195
Cal Palo Alto, Storm Prods..... 415-494-6621
Cal San Diego, Intercon Sls 714-292-5901
Cal Santa Ana, Pacific Wire & Cable 714-547-4179
Colo Broomfield, Storm Prods 303-466-1991
Mass Lexington, Harvey/R&D 617-861-9200
Mass N. Billerica, Pacer Elctrns..... 617-862-3300
Mo St. Charles, Finnigan Wire & Cable 314-964-6201
NY Farmingdale, Welco, Inc. 516-293-0050
NY Farmingdale, Vertex Elctrns..... 516-293-9880
NY Rochester, Summit Distrib 716-334-8110
NY Syracuse, G.E. Supply 607-729-9177
NY Vestal, G.E. Supply 607-729-9176
Ohio Dayton, Astro Industries 513-253-5118
Ohio Solon, Repco 216-248-8900
Pa Folcroft, Delphi Elctrns 215-534-3900
Tex Dallas, Southern Radio Supp..... 214-824-6393
Tex Dallas, Storm Products..... 214-330-1381
Wash Seattle, Radar Electric 206-282-2511
Wisc New Berlin, Industrial Elec. Wire 414-782-2323
For: Can.; Montreal, Que., Prelco Elctrns 514-389-8051

BERKELEY NUCLEONICS, Dept. EM, 1198 Tenth St., Berkeley, Cal. 94710, Tel: 415-527-1121; Empl.: 15

BERKELEY INSTRUMENTS, INC., Dept. EM, 2700 Dupont Dr., Irvine, Cal. 92715, Tel: 714-833-3300, TWX: 910-595-2552; Empl.: 25

Sales Manager: H. Mengel

Local Sales Offices & Reps.
DC Washington, Wright Co. 301-840-1928
Ill La Grange, P V A Co..... 312-352-1037
Mass Boston, ICI 617-969-9881
NY New York City, Eastern Metro Inc. 516-931-1414

BERTAN ASSOCS., INC., Dept. EM, 3 Aerial Way, Syosset, N.Y. 11791, Tel: 516-433-3110; FSC No.: 6130; Empl.: 65 ..... p. 3212

Local Sales Offices & Reps.
Cal Cain, White Assocs. 415-948-6533
Cal Encino, King-Way Assoc. 213-788-4124
Colo Boulder, H. Bass Assocs..... 303-499-7509
Conn Washington, Tri-Com Assocs. 203-868-7748
Ill Aurora, D. Smith & Assoc. 312-323-8900
Ind Carmel, Carter, McCormic & Peirce 317-844-4175
Md Silver Springs, Spectro Systems 301-949-8261
Mass Burlington, Tri-Com Assocs..... 617-272-8163
Mich Farmington, Carter, McCormic & Peirce 313-477-7700
NJ Woodcliff Lake, F & F Assocs.... 201-778-6767
NM Albuquerque, Thorson Co. 505-265-5655
NY Hicksville, F & F Assocs..... 516-935-1100
NY Pittsford, RJC Assocs..... 716-385-2770
Ohio Dayton, Carter, McCormic & Peirce 513-278-5873
Ohio Fairview Park, Carter, McCormic & Peirce 216-779-5100
Pa Audubon, Holmes Assocs. 215-666-0636
Pa Monroeville, Carter, McCormic & Peirce 412-372-4415
Tex Dallas, Dwayne Clement & Assocs. 214-341-5860
Wash Bellevue, Topp Engrg 206-747-5400
Exp: N.Y., New York, Singer Prods. Co. 212-432-1400

BEST ELECS. DIV., Harry Levinson Co., Dept. EM, 1211 E. Denny Way, Seattle, Wash. 98122, Tel: 206-323-5100, TWX: 910-444-2154; Empl.: 4 p. 4278

Local Sales Offices & Reps.
Cal Menlo Park, Straube Assocs., Inc. 415-321-9050
Colo Westminster, Straube Assocs., Inc. 303-426-0890

BETATRONIX, INC., Dept. EM, 110 Nicon Ct, Hauppauge, N.Y. 11787, Tel: 516-582-6740, TWX: 510-226-3748; Empl.: 35

Sales Manager: H. Marschausen

BEUKERS LABS., INC., Dept. EM, 30 Orville Drive, Bohemia, N.Y. 11716, Tel: 516-567-5100, TWX: 510-228-7888; Empl.: 60

Sales Manager: D.C. Johnson

BF ELCTRNS., Dept. EM, 415 S. Nardo, Solana Beach, Calif. 92075, Tel: 714-755-1881; Empl.: 7

BFGOODRICH CHEMICAL DIV, Dept. EM, 6100 Oak Tree Blvd., Cleveland, Ohio 44131, Tel: 216-524-0200, TWX: 980-427, 810-427

Sales Manager: P.J. Weaver

Local Sales Offices & Reps.
Cal Los Angeles 213-386-7436
Ga Atlanta 404-434-7761
Ill Oak Brook 312-654-4700
Mass Wellesley Hills 617-235-8700
Mich Southfield 313-357-3939
Mo Kansas City 816-353-6440
NJ Saddle Brook 201-368-9400
Pa Fort Washington..... 215-643-6805

BG ELECTRONICS, INC., Dept. EM, 9 Elm Ave., Mount Vernon, N.Y. 10550, Tel: 914-664-5591; FSC No.: 33791; Empl.: 32

Local Sales Offices & Reps.
Cal San Carlos, Westronics Assocs. 415-592-1417
Ill Wauconda, Cudahy Sls 312-526-2480
NY Huntington, Andrews & Andrews Inc. 516-692-8686
Tex Dallas, J. A. Green Co..... 214-631-7450
Tex Houston, J. A. Green Co..... 713-526-2959
Exp: PA, Lemoyne, Elctrns. Int'l. 717-737-8858

B. H. INDUSTRIES, Dept. EM, 5784 Venice Blvd., Los Angeles, Cal 90019, Tel: 213-937-4763; Empl.: 6

Local Sales Offices & Reps.
Haw Honolulu, Aloha Assocs..... 808-941-1574
Exp: Calif., Los Angeles, Energy Elctrn. Prod. Corp. 213-670-7880

BICRON ELCTRNS. CO., Dept. EM, Box 807, Barlow St., Canaan, Conn. 06018, Tel: 203-824-5125, TWX: 710-420-0411; Empl.: 70

Sales Manager: Peter B. Kent

Local Sales Offices & Reps.
Ohio Hubbard, Richard S. Rosine 216-534-3484
Va Vinton, Cliff Schmitt..... 703-890-3859

BIDDLE, JAMES G., Dept. EM, Township Line & Jolly Rds., Plymouth Meeting, Pa. 19462, Tel: 215-646-9200, Telex: 83-4423; Empl.: 197

Local Sales Offices & Reps.
Ala Huntsville, Col-Ins-Co., Inc. 800-327-6600
Cal Mountainview, Tech-Ser., Inc. 415-969-9020
Cal San Diego, Tech-Ser., Inc. 714-222-1121
Cal Torrance, Tech-Ser, Inc..... 213-538-2267
Colo Denver, Tessco, Inc. 303-744-1119
Conn Middletown, The Mancib Co. 203-346-6646
Fla Largo, Col-Ins-Co. 305-423-7615
Fla Orlando, Col-Ins-Co., Inc..... 305-423-7615
Ga Atlanta, T.S. Williams & Assocs. Inc. 404-261-3434
Ill Chicago, K.W. Meyers Co..... 312-774-6440
Ind Indianapolis, K.W. Meyers Co.... 317-243-6681
La New Orleans, Butler & Land, Inc. 504-722-6363
Md Silver Spring, Sel-Tronics, Inc.... 301-589-3391
Mass Burlington, The Mancib Co. 617-272-9450
Mich Royal Oak, Satullo Co..... 313-549-3910
Minn Minneapolis, K.W. Meyers Co.... 612-920-7080
Mo Kansas City, Carlton Co. 816-363-5300
Mo St. Louis, Carlton Co. 314-961-0700
NJ Saddlebrook, L & M Assoc..... 201-843-8700
NY Fayetteville, Savage Sales Co. .. 315-682-2131
NY New York, L & M Asso. 212-243-6155
NC Charlotte, Baesel & Assoc. 704-334-4244
Ohio Cincinnati, Lax Assocs. 513-771-4411
Ohio Cleveland, Lax Assocs. 216-226-8815
Okla Tulsa, Butler & Land 918-664-8633
Ore Portland, ILI Corp. 503-234-6683
Pa Andalusia, L & M Assoc. 215-639-3100
Pa Pittsburgh, Lax Assocs. 412-833-5477
Tex Dallas, Butler & Land, Inc. 214-363-8900
Tex El Paso, Butler & Land, Inc..... 915-566-2923
Tex Houston, Butler & Land, Inc. 713-464-4662
Va Richmond, Virginia Tech. Assoc. 804-266-9654
Wash Bellevue, ILI Corp. 206-747-9410

BIKOR CORPORATION, Dept. EM, 23970 Madison St., Torrance, Cal. 90505, Tel: 213-378-8284; Empl.: 15 ..... p. 3210,3211

Sales Manager: Ron Pizer

Local Sales Offices & Reps.
Cal Mountain View, Nor-Cal Assocs. 415-961-
Ill Lisle, John Topel Co. 312-963-
NJ Carlstadt, Comp. Tech. Sls..... 201-935-
NY Syracuse, Advanced Comps..... 315-699-
Ohio Cleveland, Ed Bock & Assoc. 216-331-
Va Annandale, QT Elctrn. Sls 703-941-

BIOCOM, INC, See Transmed Scientific

BIOMATION, Dept. EM, 10411 Bubb Rd., Cupertino 95014, Tel: 408-255-9500, TWX: 910-338-0226; E 180

Local Sales Offices & Reps.
Biomation
Ariz Scottsdale, B.F.A. Corp. 602-994-
Cal La Jolla, Ward/Davis Assoc. ... 714-459-
Cal Lawndale, Ward/Davis Assoc. .. 213-542-
Cal Sunnyvale, Ward/Davis Assoc... 408-245-
Colo Parker, C.W. Fowler Co. 303-744-
Conn Hamden, P. Jenks Assoc. 203-281-
Fla Orlando, E.G. Holmes & Assoc. 305-894-
Ga Chamblee, E.G. Holmes & Assoc. 404-451-
Ill Chicago, Pivan Engrg..... 312-539-
Ind Indianapolis, Pivan Engrg..... 317-253-
Kans Mission, Pivan Engrg. 913-722-
Mass Wakefield, P. Jenks Assoc. 617-246-
Mich Madison Heights, WKM Assoc. .. 313-588-
Minn Minneapolis, Pivan Engrg. 612-537-
Mo St. Louis, Pivan Engrg. 314-567-
NM Albuquerque, C.W. Fowler Co. .. 505-299-
NY Dewitt, D.B. Assoc. 315-446-
NY Port Chester, Radiation Elctrns. 914-937-
Ohio Cleveland, WKM Assoc. 216-267-
Ohio Dayton, WKM Assoc. 513-434-
Ore Beaverton, Showalter Instrs. 503-646-
Pa Ambler, Data Engrg. 215-542-
Pa Pittsburgh, WKM Assoc. 412-892-
Tex Austin, Crockett Southwest Co. 512-451-
Tex Dallas, Crockett Southwest Co. 214-215-
Tex Needville, Crockett Southwest Co. 713-342-
Va McLean, Creative Mktg. Assoc... 703-893-
Va Virginia Beach, E.G. Holmes Assoc. 804-481-
Wash Seattle, Showalter Instrs. 206-455-
Wisc Brookfield, Pivan Engrg. 414-786-

BIOMETRICS INSTRUMENT CORP SUBV/ INC., See Varo, Inc. Power Systems Div.

BIRD ELECTRONIC CORP., Dept. EM, 30303 A Rd., Solon, Ohio 44139, Tel: 216-248-1200, 810-427-2687; FSC No.: 70998; Empl.: p. 2668

Sales Manager: W.L. Yochum

Local Sales Offices & Reps.
Cal Ojai, Bird Electrn Corp 805-646-
Pa Lancaster, Bird Electrn Corp 717-569-

Local Distributors
Cal Burlingame, Ham Radio Outlet .. 415-342-
Cal Carson, C & A Elctrn Entprs 213-834-
Cal Huntington Beach, Tekcom, Inc. 714-968-
Cal Los Angeles, Henry Radio 213-477-
Ill Oak Park, Spectronics 312-848-
Mass Meford, Tufts Radio & Elctrn..... 617-395-
Mich Rochester, Webster Communications 313-375-
NJ Somerset, Radios Unltd 201-469-
Ohio Cincinnati, Cartwright Communications 513-984-
Pa Trevose, Trevose Elctrn (Hamtronics) 215-357-
Tex Houston, Madison Elctrn Supply 713-658-
Va Vienna, Elctrn Equipment Bank .. 703-938-
Wash Seattle, Amateur Radio Supply .. 206-767-

BIRD, RICHARD H. & CO., INC., Dept. EM, 1 St., Waltham, Mass. 02154, Tel: 617-894-0160, 923-441; FSC No.: 17706; Empl.: 50

Sales Manager: R.J. Cameron

BIRNBACH CO., INC., Dept. EM, 177 Hanse Freeport, N.Y. 11520, Tel: 516-223-8400; Empl.

BISHOP GRAPHICS, Dept. EM, 5388 Sterling C Westlake Village, Cal. 91361, Tel: 213-991-2600, 66-2400; Empl.: 120

Sales Manager: J. Asher

Local Sales Offices & Reps.
Cal Irvine, Bishop Graphics Drafting Supply C 714-97

Cal N. Hollywood, Bishop Graphics Drafting Supply 213-984-0300
Cal Sunnyvale, Bishop Graphics Drafting Supply Center 408-732-9010
Cal Ventura, C & R Blueprint Supply 805-648-3288

IVAR, INC., Dept. EM, 1617 E. Edinger Ave., Santa Ana, Cal. 92705, Tel: 714-547-5832; FSC No.: 32559; Empl.: 7 p. 1024

Local Sales Offices & Reps.
Ariz Scottsdale, Jack Osborn 602-838-9358
Cal Burlingame, W. J. Purdy 415-347-7701
Cal San Diego, Qualtronics Co. 714-560-8955
Colo Denver, W.J. Purdy Co. 303-777-1411
Fla Winter Park, Young & Lawrence 305-647-6929
Ill Chicago, Kennedy Engrg. 312-631-8283
Iowa Marion, Thomas & Modrcin 319-377-6261
Kans Shawnee Mission, Thomas & Modrcin 913-432-2131
Mich Detroit, Heick & Ralph Assocs. 313-557-8460
Minn Minneapolis, Thurston Assocs. 612-929-7801
Mo Hazelwood, Thomas & Modrcin 314-895-4700
Ohio Cincinnati, Tri-State Mktg. 513-761-7993
Pa Elkins Park, K.B. Erdman Co. 215-224-1833
Tex Dallas, Elcom Co. 214-352-5006
Wash Seattle, Blum & Assocs. 206-285-2590
Exp: Resea, Cal., Dynatronics International 213-881-8700

Local Distributors
Cal El Segundo, Wassco 213-772-8171
Ill Glen Ellyn, H.F. Wilson Engr. 312-469-8473
NH Londonderry, Elctrn Production Equip. 603-669-9181

ACK & WEBSTER, INC., Dept. EM, 281 Winter St., Waltham, Mass. 02154, Tel: 617-890-9100; Empl.: 70

Local Sales Offices & Reps.
Ariz Phoenix, DiEugenio Tool Center, Inc. 602-258-8364
Cal Hayward, D. Lewis Assocs 415-785-9650
Cal Los Angeles, Zonne Industrial Tool Co. 213-747-0561
Cal Valley Center, Heptell Corp. 714-749-1939
Colo Denver, Duboc-Lane & Monckton, Inc. 303-623-1261
Conn Hartford, Breen Assocs. 203-247-8604
Fla Coral Gables, R.F. Jackson Assoc. 305-752-6878
Fla Hallendale, Sanders Tool & Mach. 305-925-3200
Haw Honolulu, H.S. Gray Co, Ltd. 808-839-2747
Ill Westchester, W.H. Brooke Machine Tools, Inc. 312-865-0950
Ind Buck Creek, Blettner Engrg Co. 317-589-3334
Ind South Bend, Powell Tool Supply 219-289-4811
Iowa Cedar Rapids, C.R. Service Corp. 319-377-9821
Mass Duxbury, T.M. Walsh Assocs 617-934-6210
Mich Grand Rapids, P.E. Watson Machinery Sls, Inc. 616-453-6386
Mich Southfield, C.N. Simpson Co. 313-557-8850
Minn Minneapolis, Giefer Sls Co. 612-884-2395
Mo St. Louis, J.E. Rush Machinery Co. 314-726-0332
NJ Edison, Affiliated Sls, Inc. 201-572-0777
NY Rochester, BMH Equipment 716-381-8550
NY White Plains, D. Campbell 914-946-4708
NY Yonkers, Gene Ross Corp. 212-824-5424
NC Charlotte, Apex Machine Tool Supply, Inc. 704-399-0454
Ohio Cleveland, Production Tool Co 216-932-1880
Ohio Trotwood, Jeffers Machinery 513-461-3968
Ohio Worthington, Industrial Supply of Col. 614-888-4461
Pa Jenkintown, Riley & Aleshire, Inc. 215-884-1708
Tex Dallas, Tech Sls Co 214-631-8820
Wash Seattle, National Co 206-623-7060
Wisc Oak Creek, TFL-Endman 414-761-2120

ACKHAWK NETWORKS CORP., Dept. EM, 14 N. Parker Dr., Janesville, Wisc. 53545, Tel: 608-752-8701; FSC No.: 12724; Empl.: 10

H ELCTRNS., Dept. EM, 42 Fourth Ave., Waltham, Mass. 02154, Tel: 617-890-6700, TWX: 92-3413, 710-324-0683; FSC No.: 03089; Empl.: 500

Sales Manager: A. Beecoff

Local Sales Offices & Reps.
Ala Huntsville, BCS Assoc. 205-881-6220
Ariz Scottsdale, Barnhill Three 602-947-7841
Cal Cupertino, T. Louis Snitzer 408-257-8333
Cal Del Mar, T. Louis Snitzer 714-454-2191
Cal Los Angeles, T. Louis Snitzer 213-836-6170
Colo Denver, Barnhill Three 303-750-1222
Conn Hamden, Applied Measurements 203-288-5288
Fla Orlando, BCS Assoc 305-896-4881
Ill Chicago, Pivan Engrg. 312-539-4838
Ind Indianapolis, Pivan Engrg. 317-253-1681
Iowa Cedar Rapids, Pivan Engrg. 319-377-9434
Kans Shawnee Mission, Pivan Engrg. 913-722-1030
Md Baltimore, Sci-Rep 301-256-8144
Mich Detroit, Comtel Instrs. 313-255-1970
Minn Minneapolis, Pivan Engrg. 612-537-4501
Mo St. Louis, Pivan Engrg. 314-567-3636
NJ Saddle Brook, Tri Inc. 201-791-5225
NM Albuquerque, Barnhill Three 506-299-7658
NY E. Syracuse, Ossmann Instrs. 315-437-6666
NY Rochester, Ossmann Instrs. 716-328-2230
NY Vestal, Ossmann Instrs. 607-785-9947
NC Greensboro, BCS Assocs. 919-273-1918
Ohio Cleveland, Comtel Instrs. 216-442-8080
Ohio Dayton, Comtel Instrs. 513-298-7573
Ore Portland, SJI Corp. 503-224-0344
Pa Chester Springs, Letronix 215-458-8977
Tex Houston, Barnhill Two 713-688-9971
Tex Richardson, Barnhill Two 214-231-2573
Va Falls Church, Sci-Rep 703-573-8787
Wash Seattle, SJI Corp. 206-624-9020
Wisc Brookfield, Pivan Engrg. 414-786-1940

BLILEY ELECTRIC CO., Dept. EM, 2545 W. Grandview Blvd., Box 3428, Erie, Pa. 16508, Tel: 814-838-3571, TWX: 510-696-6886; FSC No.: 71034; Empl.: 170 p. 2284-2289

Sales Manager: H.A. Yocum

Local Sales Offices & Reps.
Cal Los Angeles, Elsner-Rambo Co. 213-664-2928
Conn Meriden, Sturgeon Co 203-237-1112
Ky Fern Creek, R.W. Mitscher Co. 502-239-8927
Mass Needham Hts., P.R. Sturgeon Co. 617-444-6603
NY Buffalo, R.W. Mitscher Co. 716-633-7970
NY Elmont, F. Edwin Schmitt Co. 516-437-8150
NY Manlius, R.W. Mitscher Co. 315-682-2855
NY Pittsford, R.W. Mitscher Co. 716-586-4012
NY West Hurley, R.W. Mitscher Co. 914-679-6151
NC Raleigh, R.W. Mitscher Co. 919-828-0575
Ore Portland, C.K. Shanks & Assocs. 503-292-5656
Tenn Johnson City, R.W. Mitscher Co. 615-929-1141
Tex Grand Prairie, Howell Sls., Inc. 214-262-5153
Va Virginia Beach, R.W. Mitscher Co. 804-481-7200
Wash Seattle, C.K. Shanks & Assocs. 206-632-4290
Exp: Conn., Stamford, Dage Corp. 203-324-3123
Exp: N.Y., Plainview, Telesco Int'l. Corp. 516-433-6210

BLONDER-TONGUE LABS., INC., Dept. EM, One Jake Brown Rd., Old Bridge, N.J. 08857, Tel: 201-679-4010; Empl.: 450

Local Sales Offices & Reps.
Alas Anchorage, H. J. Lang & Assocs 907-279-5741
Ariz Phoenix, Toward Engrg Assoc. 602-955-3193
Cal Los Angeles, Southern: E. N. Strassner Co. 213-666-1511
Cal Pleasanton, Moulthrop Sls 415-846-0550
Colo Thornton, Mile High Mkt. 303-451-5903
Fla Sarasota, Enjay Assoc. 813-958-9533
Haw Honolulu, Lee Gaber Co. HI9-6815
Ill Oak Park, G. Petitt Co. 312-261-0342
Ind Fort Wayne, N. Hoemig Sls Co. 219-747-0826
La New Orleans, Texport Co. 504-486-6073
Mass North Scituate, W. A. Hendrickson Co. 617-545-0652
Mich Brighten, Lectro Sls Co. 313-632-7941
Minn Edina, M. Foster Co. 612-835-2252
Mo Kansas City, Forristal-Young Sls Co. 816-358-6771
Mo St. Louis, Forristal-Young Sls Co. 314-645-2360
NM Albuquerque, C. T. Carlberg & Assocs 505-265-1579
NY Phelps, LSM Assocs Orchard Park 315-548-4891
NY Tuckahoe, L-C-A Sls 914-961-4700
NC Greensboro, Adams & Assocs. 919-272-6838
Ohio Columbus, Weller Elctrn Sls 614-885-7819
Tenn Memphis, Texport Co. 901-683-0880
Tex Dallas, Texport Co. 214-358-3435
Tex Houston, Spivey-LeBoeuf Assocs. 713-649-1221
Tex Richardson, Spivey-LeBoeuf Assocs. 214-231-3190
Wash Seattle, Pacnor Mktg 206-284-8020
Exp: N.Y., Plainview, Morhan Exporting Corp. 516-293-5582

BLUE M

BLUE M ELECTRIC CO., Dept. EM, 138th & Chatham St., Blue Island, Ill. 60406, Tel: 312-385-9000, TWX: 910-689-3398; Empl.: 250 p. 2570

Sales Manager: H.G. Mathews

Local Sales Offices & Reps.
Ariz Tempe 602-894-2305
Cal El Monte 213-442-6672
Cal Sunnyvale 408-734-8734
Fla Orlando 305-671-6655
Ga Atlanta 404-455-3452
Mass Framingham 617-235-8320
Mich Allen Park 313-381-2123
NY Elmsford 914-592-3883
NY Syracuse 315-437-0192
NC Charlotte 704-527-2492
Ohio Cincinnati 513-821-6278
Pa Ardmore 215-649-1448
Pa Pittsburgh 412-823-2180
Tex Garland 214-272-2509
Wash Seattle 206-763-1030

BLUM, JULIUS & CO., INC., Dept. EM, Box 292, Carlstadt, N.J. 07072, Tel: 201-438-4600, Telex: 13-3491; Empl.: 40

BODINE ELECTRIC CO., Dept. EM, 2500 W. Bradley Pl., Chicago, Ill. 60618, Tel: 312-IR8-3515, Telex: 25-3646; Empl.: 735 p. 3077

Sales Manager: R.E. Ford

Local Sales Offices & Reps.
Cal Los Angeles, C.E. Mello 213-626-9159
Cal San Jose, E.W. Duemmlein 408-243-4800
Kans Shawnee Mission, Automation Specialties 913-362-4422
Mass Andover, L.R. Cascino 617-470-0050
Mich Grosse Ile, P.S. Miller 313-386-0900
Minn Minneapolis, E.R. Kaye 612-588-2821
NY East Syracuse, R.H. Nichols 315-437-2813
NY Massapequa, D.V. Mayorga 516-541-1611
NY Rochester, Serr, Anderson & Martin 716-586-6226
Ohio Mantua, D.E. DeWolf 216-543-1591
Ore Portland, D.E. Johnson 503-246-3131
Tex Dallas, General Power Equip. 214-368-4655
Tex Houston, General Power Equip. 713-524-1895
Exp: Ill., Export Dept., Bodine Elec. 312-478-3515

Local Distributors
Ala Mobile, Brownell Electro, Inc. 205-479-5405
Cal Antioch, King Bearing, Inc. 415-757-4680
Cal Fremont, King Bearing, Inc. 415-797-8552
Cal Fresno, King Bearing, Inc. 209-485-7660
Cal Los Angeles, Minarik Electric Co. 213-MA4-3161
Cal Los Angeles, Andrews Hardware 213-HU3-8110
Cal Merced, King Bearing, Inc. 209-722-6218
Cal Modesto, King Bearing, Inc. 209-529-2880
Cal Mountain View, King Bearing, Inc. 415-968-8316
Cal Oakland, King Bearing, Inc. 415-568-6690
Cal Sacramento, King Bearing, Inc. 916-372-0790
Cal San Jose, King Bearing, Inc. 408-294-3363
Cal San Leandro, Republic Supply Co. 415-357-5985
Cal So San Francisco, King Bearing Inc. 408-294-3363
Cal Stockton, King Bearing, Inc. 209-464-7661
Cal Tulare, King Bearing, Inc. 209-686-4738
Colo Denver, Wazee Electric Co. 303-892-7003
Fla Orlando, Brownell Electro, Inc. 305-843-6770
Ga Hapeville, Brownell Electro, Inc. 404-762-5181
Ill Chicago, Excel Electric Service Co. 312-VI7-7220
Ill Chicago, Samuel Harris & Co. 312-FR2-7272
Ill Rockford, Samuel Harris & Co. 815-398-0606
Ill St. Charles, Samuel Harris & Co. 312-584-5000
Ill Waukegan, Samuel Harris & Co. 312-ON2-0372
Ind Indianapolis, B & B Motor & Control 612-544-9131
Kans Kansas City, Kornfeld-Thorp Electric 913-321-7070
Mass Medford, Empire Electrical Co. 617-395-5000
Mass Somerville, Electro Sls Co. 617-666-0500
Mich Detroit, Howard Electric Co. 313-WA3-0430
Minn Minneapolis, Boustead Electric & Mfg. 612-544-9131
Mo St. Louis, Zeller Electric, Inc. 314-638-9641

NJ Cherry Hill, Motor & Control Sys. Div. of Jos. T. Fewkes & Co. 609-424-5810
NJ Edison, B & B Motor & Control .. 201-420-1466
NY Bingamton, Diehl Binghamton, Inc. 607-772-1760
NY East Syracuse, Diehl Syracuse, Inc. 315-437-2826
NY N. Y., B & B Motor & Control .. 212-WO6-5777
NY Rochester, B & B Motor & Control Corp. of Rochester 716-473-6640
NC Charlotte, Mize Company, Inc. .. 704-375-5761
Ohio Cleveland, Reserve Electric Co. 216-PR1-5764
Ohio Dayton, Thal Mor Assocs. Inc..... 513-298-9939
Okla Oklahoma City, Dagwell Dixie Co. 405-232-7671
Okla Tulsa, Dagwell Dixie Co. 918-932-4231
Ore Portland, Star Machinery Co. 503-226-3011
Pa Pittsburgh, Braunlich-Roessle Co.412-471-6995
Tenn Memphis, Brownell Electro Inc.. 901-332-9254
Tenn Nashville, Tennessee Machinery Co. 615-242-1742
Tex Dallas, Bearing Chain & Supply 214-ME1-8310
Tex Fort Worth, Bearing Chain & Supply 817-335-8131
Tex Houston, B & B Motor & Control 713-664-6961
Tex Houston, Bearing Chain & Supply 713-676-2641
Tex Tyler, Bearing Chain & Supply .. 214-LY2-0873
Va Richmond, Industrial Supply Corp. 804-EL5-8041
Wash Seattle, Industrial Electric..... 206-EA9-3900
Wisc Milwaukee, Trester Service Elec. 414-264-8170
Wisc New Berlin, Electric Sls. & Engrg. 414-782-2400

BODINE CO., Dept. EM, 236 Mt. Pleasant Rd., Collierville, Tenn. 38017, Tel: 901-853-7211; Empl.: 30

Local Sales Offices & Reps.
Ala Birmingham, G.E. Baucom Co. .. 205-871-4444
Cal Brisbane, Drath-Jacobs 415-467-5642
Cal San Diego, Lighting Sls of San Diego 714-440-4550
Cal San Francisco, Drath-Jacobs..... 415-467-5642
Cal Westminster, Lectric Sls. Calif. .. 714-893-2443
Conn Bloomfield, Nema II 203-243-2571
Fla Maitland, Hartman & Assocs 305-645-2600
Fla Miami, James A. Foerster & Associates 305-274-3989
Ga Atlanta, J. J. Perry, Jr. 404-237-8239
Haw Honolulu, Joe Liu & Assocs. 808-531-8155
Idaho Boise, Ralph Zundel 208-375-2068
Ill Chicago, Electri-Agency 312-439-5030
Ind Indianapolis, C. M. Buck & Associates 317-293-5704
Kans Kansas City, Bill Andrews Company 816-931-7195
Md Baltimore, A. Daniels..... 301-752-0982
Mich Detroit, KVA Assocs..... 313-892-6000
Minn St. Louis Park, Fruen & Vedders Sls 612-922-1642
Miss Jackson, A. Spencer..... 601-373-5552
Mo St. Louis, Consolidated Agencies, Inc. 314-721-1213
NH Merrimack, Barnard Assocs..... 603-424-3125
NJ Somerville, D. Caughlan & Assocs. 201-725-5623
NM Albuquerque, McGillan Sls. Co... 505-298-1273
NY New York, Mark Sls. Agency..... 516-221-2995
NC Charlotte, C. Alley Assocs. 704-523-1532
Ohio Cleveland, Verne LaSalle..... 216-241-3788
Okla Oklahaoma City, Easlon & Assocs. 405-235-7177
Ore Portland, George M. Roth Co.... 503-233-5561
Pa Philadelphia, Penn Lighting Assocs. 215-765-6300
Tenn Knoxville, Factory Sales Agency 615-546-1434
Tenn Memphis, Salomon Lighting Co.. 901-682-1222
Tenn Nashville, Factory Sls. Agency .. 615-327-9051
Tex Dallas, Easlon & Assocs. 214-241-9441
Tex Houston, Lighting & Electrical Sls. 713-923-7781
Tex San Antonio, Hyltin-Ayres 512-828-0624
Utah Salt Lake City, Electrical Sls Co. 801-486-1367
Va Roanoke, Westbury Assocs. 703-342-2247
Wash Spokane, Bragmen Sls Agency.. 509-624-1215
Wisc Wauwatosa, Llewellyn Lighting Sls Co. 414-475-5599

BOGEN DIV., Lear Siegler, Inc., Dept. EM, Box 500, Paramus, N.J. 07652, Tel: 201-343-5700, TWX: 710-990-5047; Empl.: 332

Sales Manager: J. A. Palmieri, Dir Sls; *Distributor Manager:* A. Callahan

Local Sales Offices & Reps.
Ariz Scottsdale, Marshank Sls. Co. ... 602-949-9443
Cal Culver City, Marshank Sls. Co... 213-559-2591
Cal Redwood City, Warren Assocs .. 415-368-9483
Colo Denver, B.Newman & Co. 303-744-2501
Ga Atlanta, Hollingsworth & Still Inc. 404-394-3270
Haw Honolulu, Nylen Brothers 808-538-1171
Ill Northbrook, M. Linz Assocs. 312-498-9600
Ind Indianapolis, Kingston Sales..... 317-353-9406
Iowa Des Moines, Forristal-Young Sls 515-333-2350
La New Orleans, The Texport Co. .. 504-486-6073
Md Baltimore, D. H. Brothers Co. 301-764-7189
Md Severna Park, David H. Brothers Co. 301-647-4225
Mass Wellesley Hills, M. Scott Co. 617-235-0102
Mich Buchanan, Riley & Petchell, Inc. 616-695-6356
Mich Detroit, Riley & Petchell, Inc. 313-937-3000
Mich Kalamazoo, Riley & Petchell Sls 616-375-2155
Minn St. Paul, Skor..... 612-645-6461
Mo Kansas City, Forristal-Young Sls. Co. 816-358-6771
Mo St. Louis, Rancilio Assocs 314-842-6443
Mo St. Louis, Forristal-Young Sls. Co. 314-645-2360
Neb Omaha, Forristal-Young Sls. Co. 402-333-0800
NJ Ridgefield, Bi-State Marketers Inc. 201-943-5888
NM Albuquerque, C.T. Carlberg & Assocs. 505-265-1579
NY Buffalo, Waxman-Currant Sls. Co. 716-873-0442
NY Centereach, Bi-State Mktrs 516-732-7738
Ohio Columbus, Weller Elctrn. Sls. 614-885-7819
Okla Tulsa, The Texport Co..... 918-939-1727
Ore Salem, Pacnor Mktg..... 503-363-6445
Pa Glenside, M. Weinberg Assoc..... 215-885-7819
Pa Pittsburgh, F. P. Yarussi Co. 412-221-4676
Tenn Memphis, The Texport Co..... 901-683-0880
Tex Houston, The Texport Co. 713-464-2828
Tex Richardson, Texport Co..... 214-238-7117
Utah Salt Lake City, Bill Newman & Co. 801-363-8801
Va Richmond, David H. Brothers 804-264-8058
Wash Seattle, Pacnor Mktg. 206-284-8020
Exp: New York, N.Y., Genex Corp. 212-563-1755

BOLT BERANEK & NEWMAN INC., see BBN Instruments Co.

BONDHUS CORPORATION, Dept. EM, Monticello, Minn 55362, Tel: 612-295-2162; Empl.: 32

Local Sales Offices & Reps.
Cal Orange, Kenbil Engrg. Co. 213-893-6315
Colo Denver, G. Metcalf 303-222-2062
Ga Carrollton, C.F. Lawrence Co..... 404-832-8571
Ill Chicago, D. Beers..... 312-782-7064
Md Kensington, R.F. Johnson Assocs. 301-942-3141
Mich Birmingham, Marshall Durston Co. 313-646-6144
Mo Hawk Point, Manufacturers' Svcs. 314-338-4373
Mo Kansas City, D. White..... 816-753-1991
NY New Hartford, V. Clair Assocs. .. 315-735-8122
NY New York, F. Loewenthal..... 212-569-7400
Pa Southampton, Wendig Assoc. 215-357-4252
RI Cranston, W.K. Coleman Co..... 401-781-7512
Wash Seattle, D. D. Harader 206-322-5790

BOONTON

BOONTON ELECTRONICS CORP., Dept. EM, Route #287, Parsippany, N.J. 07054, Tel: 201-887-5110, TWX: 710-986-8241; Empl.: 180 p. 2665

Sales Manager: J. Garthwaite

Local Sales Offices & Reps.
Ala Huntsville, J.L. Highsmith, Inc.... 205-881-3294
Ariz Phoenix, Zeus, Inc. 602-253-6104
Cal North Hollywood, O'Halloran Assoc. 213-877-0173
Cal Orange County, O'Halloran Assoc. 714-750-7098
Cal Palo Alto, O'Halloran Assocs 415-326-1493
Colo Denver, Zeus, Inc. 800-538-4512
Conn Mt. Carmel, Scientific Devices, Conn. 203-248-9361
Fla Boca Raton, J. L. Highsmith & Co. 305-368-9194
Fla Orlando, J.L. Highsmith, Inc. 305-293-5202
Ga Acworth, J.L. Highsmith & Co..... 404-926-7298
Ill Chicago, K.W. Meyers Co..... 312-774-6440
Ind Indianapolis, K.W. Meyers Co..... 317-243-6681
Kans Lenexa, Technical Representatives, Inc. 913-888-0212
Md Silver Spring, Sol-Tronics, Inc..... 301-589-3391
Mass Burlington, R. J. Sickles Assoc... 617-272-7
Mich Plymouth, Micro Sls. Corp. 313-459-9
Minn Minneapolis, K.W. Meyers Co..... 612-920-7
Mo Hazelwood, Technical Reps, Inc. 314-731-5
NJ Englewood, Scientific Devices East 201-871-3
NM Albuquerque, Zeus Inc. 505-268-3
NY Rochester, Scientific Devices..... 716-334-2
NC Charlotte, J.L. Highsmith 704-333-7
Ohio Centerville, Micro Sales Corporation 513-433-8
Ohio Cleveland, Micro Sls. Corp. 216-331-0
Ore Portland, Scientific Devices-Northwest 503-292-6
Pa Melrose Park, R. Meyers Assoc. 215-224-1
Tex Dallas, Airep Elctrns. Inc. 214-827-2
Utah Zeus, Inc. 801-534-0
Va Norfolk, Sel-Tronics, Inc. 804-461-8
Wash Bellevue, Scientific Devices Northwest 206-454-0

Local Distributors
SC Columbia, Dixie Radio Supply Co. 803-AL3-5

BORG WARNER®

BORG-WARNER THERMOELECTRICS, D
Borg-Warner, Dept. EM, Wolf & Algonquin Rds., Plaines, Ill. 60018, Tel: 312-827-3131; Empl.: p. 2576,2

Local Sales Offices & Reps.
Exp: Franklin Park, Ill., Borg-Warner Aerospace Prods. International 312-455-3

BOSTITCH, Div. of Textron, Inc., Dept. EM, Briggs Dr Greenwich, R.I. 02818, Tel: 401-TU 4-2500, Te 92-7681; Empl.: 2,300

Sales Manager: H. W. Miller

Local Sales Offices & Reps.
Cal Los Angeles 213-724-0
Cal San Francisco 408-249-7
Ga Atlanta 404-458-2
Ill Northbrook 312-498-6
Ind Indianapolis 317-353-2
Mass Winchester 617-729-6
Mich Farmington 313-477-1
Mo Maryland Hts. 314-567-6
NJ South Hackensack 201-488-1
NY Mattydale, Bostitch Div of Textron 315-422-8
NC Charlotte 704-376-4
Ohio Middleburg Heights 216-433-1
Pa Montgomeryville 215-643-6
Tenn Memphis 901-365-7
Tex Dallas 214-631-7
Va Richmond, Bostitch Div of Textron 804-222-3
Wash Tukwila 206-575-0

BOSTON INSULATED WIRE & CABLE CO., D EM, 65 Bay St., Dorchester, Mass. 02125, 617-265-2102, Telex: 94-0604; FSC No.: 71102; E 400

Sales Manager: R. Henry

Local Sales Offices & Reps.
Ariz Phoenix, Reps, Inc 602-258-8
Cal Los Angeles, N. Friedman 213-532-9
Cal Los Angeles, Agencies Co. 213-263-9
Cal Los Angeles, Bos. Ins. W & C Connector S Div. 213-532-9
Cal Sonoma, H.B. Burley III 707-996-3
Colo Denver, Colorado Sun Sls. 303-750-5
Conn Southbury, A. Coscina 203-756-2
Ga Roswell, Rushin Hamilton..... 404-993-6
Ga Tallapoosa, W. Bridges..... 404-574-2
Ill Crestwood, Brisky Assocs..... 312-597-7
Ill Hinsdale, K. Olson..... 312-325-6
La Metairie, Aneson Assocs 504-835-6
Mass Bolton, K. Lachner..... 617-779-6
Mich Royal Oak, M. McAuliffe Sls..... 313-545-7
Minn Minneapolis, Mitchell Sls 612-831-7
Mo St. Louis, Consolidated Agencies 314-721-1
NJ Bogota, Neville & Vespo..... 201-487-
NJ Cherry Hill, J. Schindell Assocs. 609-424-7
NM Albuquerque, Sealect Technology, Inc. 505-299-
NY Jamestown, W. Arnold 716-664-5
NY Pittsford, Noeth-Honsinger 716-461-
NC Charlotte, Watson Sls. 204-364-
Ohio Chagrin Falls, F. Gunther 216-247-
Pa Ambridge, R. R. Meinert Co. 412-931-

Tex Houston, J. R. Woodruff Co. 713-467-8463
Tex The Woodlands, J. Zackrison 713-367-4030

OURNS, INC., Instr. Div., Dept. EM, 6135 Magnolia, Riverside, Calif. 92506, Tel: 714-684-1700, TWX: 910-332-6103; Empl.: 250

Local Sales Offices & Reps.

Aerospace
Ala Huntsville, Kemp Instrs., Inc. 205-837-4304
Cal Hayward, Avionics Liaison, Inc. .. 415-783-1131
Cal San Diego, L.L. Stoakes Inc. 714-274-6281
Colo Arvada, Cleveland Entprs. 303-423-3707
Fla Orlando, Truex Assocs., Inc. 305-859-2160
Iowa Cedar Rapids, Tech. Reps., Inc. 319-363-2489
Mass Natick, Andruss-Peskin Corp. 617-653-3919
Mich Farmington, Carter, McCormic & Peirce 313-477-7700
Mich Kalamazoo, Carter, McCormic & Peirce Inc. 616-349-9666
Minn Minneapolis, Furber Sls. Co. 612-861-1518
Mo Hazelwood, Tech. Reps., Inc. 314-731-5200
Mo Independence, Technical Representatives 816-737-1414
NM Albuquerque, Cleveland Entprs. 505-345-2481
NY Fayetteville, H. C. Johnson Agency, Inc. 315-637-9383
NY Guilderland, H.C. Johnson Agency, Inc. 518-456-9681
NY Melville, Astrorep, Inc..... 516-423-2266
NY Rochester, H. C. Johnson Agency, Inc. 716-482-3000
NY Williamsville, H. C. Johnson Agency, Inc. 716-632-7880
Ohio Cleveland, Carter McCormic & Peirce 216-333-5650
Ohio Dayton, Carter McCormic & Peirce 513-278-5873
Ohio Worthington, Carter McCormic & Peirce 614-888-4466
Okla Tulsa, Kemp Engrg. Co. 918-299-2636
Pa Glenshaw, H. C. Johnson Agency, Inc. 412-961-0414
Pa Jenkintown, PDC Corp..... 215-887-9610
Tex Addison, Kemp Engrg. Co..... 214-661-0400
Tex Houston, Kemp Engrg. Co. 713-688-1431

Industrial
Ala Huntsville, Kemp Instrs., Inc. 205-837-4304
Cal Foster City, Featherstone Assocs. 415-341-1617
Cal San Diego, L.L. Stoakes Inc. 714-274-6281
Colo Arvada, Cleveland Entprs. 303-423-3707
Fla Orlando, Milne Assocs..... 305-855-1533
Ill Schaumburg, Carvel Engrg..... 312-882-6088
La Harvey, Bourns, Inc. 504-362-2043
Mass Natick, Andruss-Peskin Corp. 617-653-3919
Mich Farmington, Carter, McCormic & Peirce 313-477-7700
Mich Kalamazoo, Carter, McCormic & Peirce Inc. 616-349-9666
Mo Hazelwood, Tech. Reps., Inc. 314-731-5200
Mo Independence, Technical Representatives 816-737-1414
NJ Stirling, NBS Assocs. 201-464-8500
NM Albuquerque, Cleveland Entprs. 505-298-7671
NY Fayetteville, H. C. Johnson Agency, Inc. 315-637-9383
NY Guilderland, H.C. Johnson Agency, Inc. 518-456-9681
NY Rochester, H. C. Johnson Agency, Inc. 716-482-3000
NY Williamsville, H. C. Johnson Agency, Inc. 716-632-7880
Ohio Cleveland, Carter McCormic & Peirce 216-333-5650
Ohio Dayton, Carter McCormic & Peirce 513-278-5873
Ohio Worthington, Carter McCormic & Peirce 614-888-4466
Okla Tulsa, Kemp Engrg. Co. 918-299-2636
Ore Portland, Brett Assocs., Inc..... 503-232-4184
Pa Glenshaw, H. C. Johnson Agency, Inc. 412-961-0414
Pa Glenside, Elcom, Inc..... 215-885-1325
Tex Addison, Kemp Engrg. Co..... 214-661-0400
Tex Houston, Kemp Engrg. Co. 713-688-1431
Wash Seattle, Brett Assocs., Inc..... 206-935-8054

OURNS, INC., Trimpot Prods. Div., Dept. EM, 1200 Columbia Ave., Riverside, Cal. 92507, Tel: 714-781-5311, TWX: 910-332-1252; Empl.: 4000 p. 3639-3645,3791-3871, Back Cover, Vol. 2

Sales Manager: C. Nehlsen; *Distributor Manager:* R. Goodman

Local Sales Offices & Reps.
Ala Huntsville, Beacon Elctrns..... 205-881-5031
Ariz Phoenix, Shefler-Kahn Co. 602-257-9015
Cal San Jose, Quad Rep. Inc. 408-377-5740
Cal Santa Ana, Bourns, Inc. 213-582-6391
Colo Denver, Parker Webster 303-770-1972
Fla Clearwater, Dyne-A-Mark..... 813-441-4702
Fla Ft. Lauderdale, Beacon Elctrns. 305-971-7320
Fla Ft. Lauderdale, Dyne-A-Mark..... 305-771-6501
Ga Atlanta, Beacon Elctrns. Assoc. 404-351-3654
Ill Chicago, Bourns, Inc. 312-255-1903
Ind Carmel, Rich Elect. Mktg..... 317-844-8462
Md Baltimore, Micro-Comp., Inc. 301-247-0400
Mass Wellesley, Bourns, Inc. 617-237-6730
Mich Detroit, Rathsburg Assoc. 313-882-1717
Minn Edina, Mel Foster Co., Inc..... 612-835-2252
Mo Earth City, Centech 314-291-4320
Mo Raytown, Centech 816-358-8100
NJ Haddonfield, Thomas Assoc. 609-854-3011
NY Ithaca, B. Dean, Inc. 607-272-2187
NY Melville, Bourns, Inc. 516-271-3500
NC Charlotte, Beacon Elctrns. 704-525-7412
Ohio Richfield, Bear Mktg 216-659-3131
Ore Portland, J.J. Backer Co. 503-297-3776
Ore Salem, J.J. Backer Co..... 503-362-0717
Tenn Oak Ridge, Beacon Elctrns..... 615-482-2409
Utah Salt Lake City, Parker Webster Co. 801-487-5911
Wash Seattle, J. J. Backer Co. 206-285-1300

Local Distributors
Ala Huntsville, Hamilton/Avnet Elctrns. 205-533-1170
Ariz Phoenix, Hamilton/Avnet 602-275-7851
Cal Chatsworth, Westates Elctrns. Corp. 213-341-4411
Cal Costa Mesa, Avnet Electronics .. 714-754-6111
Cal Costa Mesa, Westates Elect. 714-549-8401
Cal Culver City, Hamilton Electro Sls. 213-558-2121
Cal Irvine, Cramer/Los Angeles..... 714-979-3000
Cal Mountain View, Hamilton/Avnet 415-961-8600
Cal Riverside, Elctrn. Supp. Corp. 714-683-7300
Cal San Diego, Hamilton/Avnet 714-279-2421
Cal San Diego, Cramer/San Diego .. 714-565-1881
Cal Sunnyvale, Bell Inds..... 408-734-8570
Cal Sunnyvale, Cramer/San Francisco 408-739-3011
Colo Denver, Cramer/Denver..... 303-758-2100
Colo Denver, Hamilton/Avnet 303-534-1212
Conn Georgetown, Hamilton/Avnet..... 203-762-0361
Conn Hamden, Wilshire Elctrns. 203-281-1166
Conn North Haven, Cramer/Conn. 203-239-5641
Conn Norwalk, Harvey Elctrns. 203-853-1515
Fla Ft. Lauderdale, Hamilton/Avnet 305-971-2900
Fla Hollywood, Cramer/E.W. 305-921-7878
Fla Orlando, Cramer/Orlando 305-894-1511
Fla Orlando, Hammond Elctrns..... 305-849-6060
Ga Norcross, Cramer/Atlanta 404-448-9050
Ga Norcross, Hamilton/Avnet 404-448-0800
Ill Chicago, Newark Elctrns. Corp. 312-638-4411
Ill Mt. Prospect, Cramer/Chicago .. 312-593-8230
Ill Schiller Park, Hamilton/Avnet 312-678-6310
Ind Fort Wayne, Fort Wayne Elctrns. Supply 219-742-4346
Ind Indianapolis, Pioneer/Indiana 317-849-7300
Ind Indianapolis, Graham Elctrns. Supp. 317-634-8486
Kans Lenexa, Hamilton/Avnet..... 913-888-8900
La Lafayette, Ralph's of Lafayette .. 318-234-4507
Md Gaithersburg, Pioneer Std. Elctrns. 301-948-0710
Md Gaithersburg, Cramer/Wash..... 301-948-0110
Md Hanover, Hamilton/Avnet..... 301-796-5000
Mass Burlington, Wilshire Elctrns./New England 617-272-8200
Mass Newton, Cramer Elctrns. 617-964-4000
Mass Woburn, Hamilton/Avnet 617-933-8000
Mich Livonia, Hamilton/Avnet 313-522-4700
Mich Livonia, Pioneer/Michigan..... 313-525-1800
Minn Edina, Cramer/Minnesota 612-835-7811
Minn Edina, Hamilton/Avnet 612-941-3801
Minn Minneapolis, Newark Elctrns..... 612-331-6350
Mo Hazelwood, Hamilton/Avnet 314-731-1144
NJ Cedar Grove, Hamilton/Avnet.... 201-239-0800
NJ Clifton, Wilshire Elctrns. 201-340-1900
NJ Little Falls, Cramer/N.J. 201-785-4300
NJ Mount Laurel, Hamilton/Avnet.... 609-234-2133
NJ Mt. Laurel, Wilshire Elctrns. 609-234-9100
NJ Somerset, Schweber Elctrns. 201-469-6008
NM Albuquerque, Hamilton/Avnet Elctrns. 505-765-1500
NM Albuquerque, Elctrn. Parts Co.. 505-293-6161
NY E. Syracuse, Cramer/Syracuse 315-437-6671
NY E. Syracuse, Hamilton/Avnet..... 315-437-2641
NY Hauppauge, Cramer/L.I. 516-231-5600
NY Rochester, Cramer/Rochester .. 716-275-0300
NY Rochester, Hamilton/Avnet Elctrns. 716-442-7820
NY Westbury, Hamilton/Avnet 516-333-5413
NY Westbury, Schweber Elctrns..... 516-334-7474
NY Woodbury, Harvey Elctrns. 516-921-8700
NC Winston-Salem, Cramer/Winston-Salem 919-725-8711
Ohio Cincinnati, Hughes-Peters 513-351-2000
Ohio Cleveland, Pioneer Standard Elctrns. 216-587-3600
Ohio Cleveland, Hamilton/Avnet Elctrns. 216-461-1400
Ohio Columbus, Hughes-Peters 614-294-5351
Ohio Dayton, Pioneer-Dayton 513-236-9900
Ohio Dayton, Hamilton/Avnet Elctrns. 513-433-0610
Pa Philadelphia, ALMO Elctrns..... 215-698-4000
Pa Pittsburgh, Cam-RPC 412-782-3770
Pa Pittsburgh, Pioneer/Pittsburgh 412-782-2300
RI Warwick, W. H. Edwards 401-781-8000
Tex Dallas, Cramer/Dallas 214-661-9300
Tex Dallas, Hamilton/Avnet..... 214-661-8661
Tex Houston, Hamilton/Avnet..... 713-780-1771
Tex Houston, Harrison Equip. Co. 713-652-4700
Utah Salt Lake City, Hamilton/Avnet.. 801-972-2800
Utah Salt Lake City, Cairon Elctrns. .. 801-487-7451
Wash Bellevue, Hamilton/Avnet..... 206-746-8750
Wash Tukwilla, Cramer/Seattle 206-575-0907
Wisc Mequon, Taylor Elec. Co..... 414-241-4321
Wisc Milwaukee, Electronic Expeditors 414-228-8100
Exp: Can., Montreal, Quebec, Zentronics, Ltd. 514-735-5361
For: Can., Calgary, Alberta, L.A. Varah 403-276-8818
For: Can., Mississauga, Ont., Hamilton/Avnet 416-677-7432
For: Can., Montreal, Que., Prelco Elctrns. 514-389-8051
For: Can., Ottawa, Ont., Hamilton/Avnet 613-226-1700
For: Can., St. Laurent, Que., Hamilton/Avnet 514-331-6443
For: Can., Vancouver 10, B.C., L.A. Varah Ltd. 604-873-3211

BOURNS MAGNETIC PRODS., Trimpot Div., Dept. EM, Box 1398, Romoland, Cal. 92380, Tel: 714-657-5195, TWX: 910-332-1304; Empl.: 120 p. 1324-1327,2383,4331-4336, Back Cover, Vol. 2

Sales Manager: R.F. Miller

Local Sales Offices & Reps.
Ariz Phoenix, Shefler-Kahn Co 602-257-9015
Cal San Jose, Bourns, Inc. 408-377-5740
Cal Santa Ana, Bourns, Inc. 213-582-6391
Colo Denver, Parker Webster Co..... 303-751-2600
Fla Ft. Lauderdale, Dyne-A-Mark..... 305-771-6501
Ga Atlanta, Beacon Elctrn Assocs .. 404-351-3654
Ill Rolling Meadows, Bourns..... 312-255-1903
Ind Carmel, Rich Elctrn Mktg..... 317-844-8462
Md Baltimore, Micro-Comp, Inc..... 301-247-0400
Mass Wellesley, Bourns, Inc..... 617-237-6730
Mich Detroit, Rathsburg Assocs 313-882-1717
Minn Edina, Mel Foster Techn Sls 612-835-2252
Mo Raytown, Centech Inc. 816-358-8100
NJ Haddonfield, Thomas Assocs 609-854-3011
NY Ithaca, Bob Dean..... 607-272-2187
NY Melville, Bourns Inc. 516-271-3500
Ohio Richfield, Bear Mktg 216-659-3131
Tex Dallas, Ammon & Rizos Co 214-233-5591
Wash Seattle, Jas. J. Backer, Co. 206-285-1300

BOW SOLDER PRODUCTS, Dept. EM, P.O. Box 488, 900 Hobson St., Union, N.J. 07083, Tel: 201-686-6040; Empl.: 25

BOWMAR/TIC, INC., Dept. EM, 850 Lawrence Dr., Newbury Park, Calif. 91320, Tel: 805-498-2161, TWX: 910-336-1265; FSC No.: 99957; Empl.: 80 .... p. 3872

Sales Manager: K.J. Cox

Local Sales Offices & Reps.
Cal Downey, Trimarco, Inc. 213-861-8244
Cal San Carlos, Kottmeier Assocs. .. 415-592-8333
Colo Denver, Shefler-Kahn 303-761-2590
Conn Suffield, Terrance Dunn & Assoc. 203-668-0446
Fla Lighthouse Point, Saber & Assoc. 305-943-3076
Ga Smyrna, Spartech Assoc..... 404-432-3644
Ill Chicago, Engineered Sls. Co. 312-867-8434
Mass Woburn, R. W. Hatfield Co. 617-933-2324
Mo St. Louis, Gordon Fixman Engrg. 314-725-5219
NY Buffalo, Net Sls..... 716-467-4538
NY Jericho, Metro Tech. Sls. 516-935-3330
Ohio Columbus, T. Mulligan & Assoc. 614-457-2242
Tex Arlington, CTR, Inc 817-277-6001
Wash Bellevue, SD-R2 Prods. & Sls. .. 206-747-9424

BP INSTRUMENTS INC, Dept. EM, 10601 De Anza Blvd., Cupertino, Cal. 95014, Tel: 408-446-4322; Empl.: 12

Sales Manager: K. Pine

BRADY CO., W. H., Industrial Prods. Div., Dept. EM, 2221 W. Camden Rd. Box 2131, Milwaukee, Wis. 53201, Tel: 414-332-8100, TWX: 26-677 910-262-3151

Sales Manager: N.R. Barger, Jr., Mktg. Mgr.; *Distributor Manager:* D. L. Hazelwood

Local Sales Offices & Reps.

Ala	Birmingham	205-324-9196
Cal	Redondo Beach	213-373-6869
Cal	San Mateo	415-574-5822
Colo	Denver	303-455-6232
Conn	Hartford	203-247-1283
Fla	Goldenrod	305-644-0673
Ga	Atlanta	404-636-5581
Ill	Chicago	312-827-6108
Ind	Indianapolis	317-542-8380
Iowa	Bettendorf	319-324-8516
Kans	Kansas City	816-363-4133
Md	Baltimore	704-524-4868
Mass	Waltham	617-893-8390
Mich	Birmingham	313-642-6643
Minn	Minneapolis	612-926-4666
Mo	St. Louis	314-535-3406
NJ	So. Orange	201-763-7274
NY	Huntington	516-433-6088
NY	Rochester	716-424-3153
NC	Kernersville	704-333-0928
Ohio	Chagrin Falls	216-382-5090
Ohio	Cincinnati	513-731-3797
Pa	Morristown	215-337-1275
Pa	Pittsburgh	412-766-0555
Tenn	Memphis	901-452-2640
Tex	Dallas	214-363-3710
Tex	Houston	713-622-2992
Vt	Arlington	703-534-4868
Va	Richmond	704-333-0928
Wash	Medina	206-455-1177
Wisc	Milwaukee	414-332-8100

BRAEMAR COMPUTER DEVICES, Dept. EM, 11950 Twelfth Ave. S., Burnsville, Minn. 55337, Tel: 612-890-5135; Empl.: 50

Sales Manager: R. Morris

Local Sales Offices & Reps.

Ala	Huntsville, Alpha Mktg	205-533-0766
Ariz	Scottsdale, Al Williams Assoc.	602-947-4297
Cal	Burbank, Roland Olander & Assoc.	213-843-5200
Cal	Corona Del Mar, Roland Olander & Assoc.	714-644-9894
Cal	Los Altos, McClenning Assoc.	415-941-2113
Colo	Denver, Al Williams Assoc.	303-373-4930
Conn	Litchfield, Media Sys	203-567-0689
Fla	Ft. Lauderdale, Interface Dynamics	305-772-7998
Ill	Des Plaines, Coombs Assoc., Inc	312-298-4830
Mass	Cambridge, Media Sys Inc	617-876-0164
Mich	Farmington, Carter-McCormick-Pierce	313-477-7700
Minn	Burnsville, Braemar Computer Devices, Inc	612-890-5135
Mo	Kansas City, Nevco Inc	816-421-1751
Mo	St. Louis, Nevco	314-843-7406
NJ	Fort Lee, Tecnimat	201-461-8686
NM	Albuquerque, Al Williams Assoc	505-255-1638
NY	Syracuse, Naylor Elect Co, Inc	315-656-2251
NC	Kernersville, Naylor Assoc.	919-996-4162
Ohio	Cleveland, Carter-McCormick-Pierce	216-779-5100
Ohio	Dayton, Carter-McCormick-Peirce	513-222-7700
Ore	Portland, Tasco	503-292-1473
Pa	Paoli, Action Planning Inc	215-647-4080
Pa	Pittsburgh, Carter-McCormick-Peirce	412-372-4415
Tex	Houston, Boullion Elctrns Sls Co	713-682-3775
Tex	Houston, Boullion Elctrns Sls Co	713-682-3775
Tex	Plano, Boullion Elctrns Sls Co	214-423-8923
Wash	Bellevue, Tasco	206-453-1414
Wisc	Milwaukee, Coombs Assoc.	414-671-1945
Exp:	Cambridge, Techexpert	617-661-9424

BRAILSFORD & CO., Dept. EM, 670 Milton Rd., Rye, N.Y. 10580, Tel: 914-967-1820; Empl.: 20

BRAND DIELECTRICS, INC., Dept. EM, Route 203, N. Windham, Conn. 06256, Tel: 203-423-6321; Empl.: 5

BRAND-REX CO., Dept. EM, Box 498, Willimantic, Conn. 06226, Tel: 203-423-7771; TWX: 710-440-2247; FSC No.: 71124; Empl.: 1000

Sales Manager: J. F. Cichy

Local Sales Offices & Reps.

Ala	Huntsville, Interep Assocs.	205-881-3677
Cal	San Mateo, Brand-Rex	415-574-0750
Cal	Santa Ana, Brand-Rex Co.	714-835-0802
Conn	Manchester, Brand-Rex	203-649-2102
Conn	West Haven, Brand-Rex	203-384-2318
Fla	Casselberry, E.I.R., Inc.	305-830-9600
Ga	Atlanta, Interep Assocs	404-757-0182
Ill	Rolling Meadows, Brand-Rex Co.	312-392-7362
Ind	Ft. Wayne, Insulation Reps, Inc.	219-482-1596
Iowa	Cedar Rapids, Tech Reps	319-393-5510
Kans	Lenexa, Tech Reps	314-888-0212
Md	Baltimore, J.A. Maguire & Co.	301-377-0223
Mass	Clinton, Brand-Rex Co.	617-368-8234
Mass	Shrewsbury, B & N Assocs.	617-845-1613
Mich	Troy, Plas-Tronics	313-649-2350
Minn	Hopkins, Grayden & Flemmer	612-941-1120
Mo	Hazelwood, Tech Reps	314-731-5200
NJ	Dunellen, J.A. Maguire & Co.	201-752-8480
NJ	Pennsauken, J.A. Maguire & Co.	609-665-5136
NM	Albuquerque, Tri-Tronix	505-265-8409
Ohio	Aurora, Clark Sls. Co.	216-543-5656
Ore	Beaverton, Barrett, Squibb & Assocs.	503-644-2550
SC	Greenwood, Bamco, Inc.	803-229-6801
Tex	Austin, C. J. Tellier Co.	512-836-3720
Tex	Richardson, C.J. Tellier Co.	214-231-6348
Wash	Redmond, Barrett, Squibb & Assocs.	206-885-6991

BRANSON CORP., Dept. EM, Box 147, Newton, N.J. 07860, Tel: 201-383-3132, TWX: 710-988-2298; FSC No.: 99928; Empl.: 40

Local Sales Offices & Reps.

Fla	Orlando, Perrott Assoc. Inc.	305-275-1132
Ohio	Columbus, T. Mulligan & Assoc.	614-457-2242

BRANSON CLEANING EQUIP. CO., Dept. EM, Parrott Dr., Shelton, Conn. 06484, Tel: 203-929-7301, TWX: 710-450-3543; Empl.: 300

Sales Manager: R.N. Harvey

Local Sales Offices & Reps.

Ariz	Phoenix, H. C. Torrey Assocs.	602-944-0352
Cal	Fullerton, Branson Cleaning Equip.	714-870-6360
Cal	San Francisco, Branson Cleaning Equip.	408-249-2616
Cal	Santa Clara, Branson Cleaning Equip.	408-249-2616
Colo	Denver, Crump Co.	303-426-1443
Fla	Clearwater, MacGregor Assocs.	813-446-7310
Fla	Coral Springs, MacGregor Assocs.	305-752-1924
Ga	Lilburn, MacGregor Assocs.	404-921-1300
Haw	Honolulu, Thorn Equip. Co.	808-847-2027
Ill	Rolling Meadows, Furnace Finders	312-259-7060
Ill	Streamwood, Branson Cleaning Equip.	312-885-2131
La	Kenner, Automation Supplies	504-722-2217
Mass	Woburn, Branson Cleaning Equip.	617-935-8060
Mich	Bloomfield, Indl Sys	313-338-7230
Mo	Kansas City, Process & Control Products	816-444-4344
NJ	Stratford, Branson Cleaning Equip.	609-627-2888
NY	Rochester, Branson Cleaning Equip.	716-288-0100
Ohio	Dayton, Hawkins & Hawkins	513-293-2628
Ohio	Toledo, R.F.D. Assocs	419-535-6881
Ore	Portland, Pacific Scientific Co.	503-256-1770
SC	Fort Mill, Branson Cleaning Equip.	803-548-4334
Tex	Richardson, Branson Cleaning Equip.	214-234-2477
Wash	Seattle, Pacific Scientific Co.	206-762-4260

BRAUN-BRUSH CO., Dept. EM, 43 Albertson Ave., Albertson, N.Y. 11507, Tel: 516-741-6000; Empl.: 26

Sales Manager: M. Braun; *Distributor Manager:* B. McVeigh

BRAXTON MFG. CO., Dept. EM, Echo Lake Rd. N., Watertown, Conn. 06795, Tel: 203-274-6781; Empl.: 42

Local Sales Offices & Reps.

Cal	Costa Mesa, Braxton Mfg. Cal.	714-645-7363

BREEZE ILLINOIS

BREEZE-ILLINOIS, INC., Dept. EM, Main & Agard Sts., Wyoming, Ill. 61491, Tel: 309-695-2511, TWX: 510-390-3691; Empl.: 85 p. 4542

Local Sales Offices & Reps.

Cal	Redwood City, Ault Assocs.	415-367-1
Cal	Woodland Hills, Cal Ward Sls. Co.	213-883-2
Colo	Englewood, Todd Assocs.	303-761-7
Conn	Milford, Charles Hand	203-874-8
Fla	Tampa, Reptronics, Inc.	
Ga	Chamblee, E. G. Holmes & Assocs.	404-451-6
Ill	La Grange Park, Bierhaus Sls.	312-354-5
Mass	Milton, Naton Assocs.	617-698-0
Minn	Minneapolis, Merrill Franklin Co.	612-927-4
Mo	St. Louis, Fitzgerald Sls.	314-862-1
NY	Fairport, Tom Caiola	716-377-9
NY	Fayetteville, R.D. Sherman, Inc.	315-637-9
NY	Great Neck, Trionic Assocs.	516-466-2
Pa	Media, Snyder & Stefkovic Assocs.	215-566-5
Tex	Dallas, DK Sls.	214-247-0
Va	Fairfax, Snyder & Stefkovic Assoc.	703-273-1
Wash	Bellevue, Martin Poggi Co.	206-454-2

BRELONIX, INC., Dept. EM, 106 North 36th St., Sea Wash 98103, Tel: 206-633-1964; Empl.: 10

Sales Manager: H.W. Blake

BRISTOL DIV. ACCO, Dept. EM, 40 Bristol Waterbury, Conn. 06720, Tel: 203-756-4451, T 96-2417, 203-754-1477; Empl.: 1200

Sales Manager: J. A. Schemenaur

Local Sales Offices & Reps.

Ala	Birmingham	205-956-4
Cal	Los Angeles	213-723-9
Cal	South San Francisco	415-873-2
Colo	Denver	303-371-5
Conn	Waterbury	203-753-2
Del	Wilmington	302-652-3
Ga	Stone Mountain	404-939-2
Ill	Melrose Park	312-345-6
La	Baton Rouge	1-800-231-6
Mass	Newton	617-244-6
Mich	Warren	313-755-3
Mo	St. Louis	314-961-1
NJ	Clark	201-381-4
NY	Buffalo	716-839-1
NC	Charlotte	704-375-7
Ohio	Cincinnati	513-351-0
Ohio	Cleveland	216-333-3
Okla	Tulsa	918-627-5
Pa	Haverford	215-527-0
Pa	Pittsburgh	412-923-2
Tenn	Knoxville	615-588-3
Tex	Houston	713-741-3
Tex	Richardson	214-238-8
Wash	Seattle	206-623-3
Wisc	Milwaukee	414-251-4

BRISTOL SAYBROOK CO., Dept. EM, 97 Coulter Old Saybrook, Conn. 06475, Tel: 203-388-3414, Te 966-435; Empl.: 125

Local Sales Offices & Reps.

Cal	Los Angeles, C.E. Mello Co.	213-626-9
Conn	Old Saybrook, M.L. Assoc.	203-388-9
Mo	Independence, Gribble Sls. Engr. Co.	816-796-4
Ore	Beaverton, David Fry Co.	503-643-5

Local Distributors

Cal	Los Angeles, Minarik Electic Co.	213-624-3
Mass	Somerville, Electro Sls. Co.	617-666-0
NY	Sodus, AED Distributors	315-483-6

BROMBERG ENGINEERING, Dept. EM, 461 Co Rd., Weston, Mass. 02193, Tel: 617-653-4285; Emp

BROOKS MFG. CO., Dept. EM, Box 17 Philadelphia, Pa 19135, Tel: 215-425-3395; Empl.:

Sales Manager: G. Brooks

Local Sales Offices & Reps.

Cal	San Francisco, Irving Ballard Co	415-781-1
NC	Charlotte, Dewitt Austin Inc	704-334-0

BROWN ELECTRO-MEASUREMENTS C Brown Electro-Meas., Dept. EM, P.O. Box 55 Seattle, Wash. 98155, Tel: 206-363-8252; Empl.:

Local Sales Offices & Reps.

Cal	Burlingame, William J. Purdy Co.	415-347-7
Colo	Boulder, Scientific Devices	303-449-9
Haw	Honolulu, Aloha Assocs.	808-941-1
Ill	Bloomingdale, Scientific Devices	312-894-9
Kans	Overland Park, Scientific Devices	913-362-8
Mich	Milford, Scientific Devices	313-685-8
Minn	Eden Prairie, Scientific Devices	612-944-3
NJ	Fort Lee, Bob Cameron Assocs.	201-461-2
NM	Albuquerque, Scientific Devices	505-293-3

NY New York, Ad Auriema Inc. 212-466-2500
NY Rochester, Scientific Devices..... 716-334-2445
Ohio Dayton, Scientific Devices 513-298-9904
Pa Plymouth Meeting, Scientific Devices 215-825-9515
Tex Richardson, Scientific Devices.... 214-231-8106
Tex San Antonio, Scientific Devices.. 512-736-3164
Vt Virginia-Springfield, Scientific Devices 703-451-6500
Wash Bellevue, Scientific Devices 206-454-0900

UNSWICK INSTR., Dept. EM, 6150 W. Mulford Street, Niles, Ill. 60648, Tel: 312-775-6224; Empl.: 12

Sales Manager: Marty McDonnell

Local Sales Offices & Reps.
Ariz Phoenix, Cooke Sls. Co..... 602-956-3515
Cal San Carlos, Dimensional Control Corp. 415-591-0365
Colo Denver, I. J. Esbenson Co. 303-571-1606
Fla Tampa, Tool & Die Supply Co.. 813-876-1346
Il Niles, Brunswick Instr..... 312-775-6224
Ind Indianapolis, R.L. Guimont Co.... 317-251-9261
Iowa Cedar Rapids, T. Froeberg Co... 319-362-6547
Mass Shrewsbury, Sterling Sls..... 617-757-0800
Mich Grand Rapids, Burton Precision Co. 616-454-3321
Minn Minneapolis, L.O. Hallonquist Co. 612-944-2104
NJ Bound Brook, Clarkson & Foreman Inc. 201-469-2884
NY Rochester, Brook-Anco Corp. 716-271-4100
NC Charlotte, F.D. Hurka Co..... 704-366-0209
Ohio Cleveland, Production Svc. Co... 216-671-2550
Ohio Dayton, Walter R. Olt Co. 513-298-4051
Pa Bridgeville, Roger M. Brown Co. 412-344-5611
Pa Edgemont, George S. Maier Co. 215-353-6821
Tenn Chattanooga, Tool Crib..... 615-266-5686
Tenn Knoxville, Tool Crib 615-525-6195
Utah Salt Lake City, TimeSaver Industrial 801-363-3821
Wash Seattle, Dimensional Control Corp. 206-362-3803
Wisc Brookfield, L. Hammond Co. 414-786-9340

YANT ELECTRIC, Dept. EM, 1421 State St., Bridgeport, Conn. 06602, Tel: 203-334-5561, TWX: 710-453-2036; Empl.: 1000+

Sales Manager: G. V. Curtin; *Distributor Manager:* W.B. Rankin

Local Sales Offices & Reps.
Cal Los Angeles 213-588-3243
Cal San Francisco 415-285-4100
Conn Bridgeport 203-334-5561
Ga Atlanta 404-885-5115
Il Chicago 312-281-8778
Pa Philadelphia 215-667-7600
Pa Pittsburgh 412-255-4541
Tex Dallas 214-688-7031

YNLAW PRODS., INC., Dept EM, 1707 U.S Hwy. 30 S., Burlington, N.J. 08016, Tel. 609-386-7733; Empl 7

Local Sales Offices & Reps.
Cal Redwood City, Product Assocs.. 415-368-0640
Pa Jenkintown, Stein Instrumentation Corp. 215-885-2370

CHANAN CRIMP TOOL PRODS., Amerace, Control Prods., Dept. EM, 1065 Floral Ave., Union, N.J. 07083, Tel: 201-289-2225, Telex: 138-214; Empl.: 65 p. 1748,1749

Sales Manager: J. Nosti

Local Sales Offices & Reps.
Cal Van Nuys 213-997-7243
NJ Union 201-289-2225

CKBEE MEARS CO., Dept. EM, 245 E. 6th St., St. Paul, Minn. 55101, Tel: 612-228-6371; Empl.: 1600

Sales Manager: J. Jorgenson

Local Sales Offices & Reps.
Cal Los Angeles 805-523-7589
Cal San Jose 408-248-2750
Il Elk Grove Village 312-439-6433
Minn St Paul 612-228-6371
NH Nashua 603-883-0316
NJ E Windsor 609-443-3340
Ohio Sylvania 419-882-6918

CKEYE STAMPING CO., Dept. EM, 555 Marion Rd., Columbus, Ohio 43207, Tel: 614-445-8433; Empl.: 5 ..... p. 1025,2419

Sales Manager: R.E. Osborne VP Mktg.

Local Sales Offices & Reps.
Cal Palo Alto, Engrg. Assocs..... 415-494-7842
Cal Pasadena, P. Nurches Co.....213-MU1-8957
Colo Denver, G. Moss Elctrns., Inc.... 303-455-7205
Ga Atlanta, Par Assoc. 404-393-0018
Ill Chicago, W.J. Doyle Co. 312-BR4-6685
Kans Shawnee Mission, Midtec Assoc. 913-441-6565
Mass Belmont, Elctrn. Comps. & Svc. 617-484-8680
Minn Minneapolis, A.J. Warner Co. 612-729-7371
NY Lynbrook, P. Saftler Assoc. 516-593-7880
Ohio Cleveland, H. N. Heasley Co. 216-486-2800
Ohio Columbus, McFadden Sls. 614-221-3363
Ore Portland, Elctrns. Comp. Sls..... 503-243-2342
Pa Paoli, T. Griffin Co. 215-647-1550
Tex Dallas, Advance Technical Sales 214-361-8584

Local Distributors
Cal Los Angeles, Elect. Switches..... 213-660-1310
Mich Ann Arbor, Wedemeyer Elctrns. 313-665-8611

BUD RADIO, INC., Dept. EM, 4605 E. 355th St., Willoughby, Ohio 44094, Tel: 216-946-3200, TWX: 810-427-2604; Empl.: 200

Sales Manager: A.N. Haas

Local Sales Offices & Reps.
Ala Huntsville, Cartwright & Bean 202-533-3509
Cal Inglewood, J. Berman Co. 213-649-6111
Cal San Carlos, D.H. Ross Co. 415-591-4411
Colo Denver, Lindberg Co. 303-758-9033
Fla Ft. Lauderdale, Cartwright & Beam Co. 305-791-3938
Fla Orlando, Cartwright & Bean Co. 305-422-4531
Ga Atlanta, Cartwright & Bean Co... 404-255-5262
Ill Chicago, I.R.I. Inc. 312-647-7755
Ind Indianapolis, Southern Sls. Corp. 317-299-2992
Iowa Cedar Rapids, P.M.A. Corp..... 319-362-9177
Kans Overland Park, P.M.A. Corp. 910-381-0004
Kans Wichita, P.M.A. Corp. 316-264-2662
La Gretna, Cartwright & Bean Co... 504-362-4649
Mass Needham, Mullin Tech. Sls. 617-444-4780
Mich St. Clair Shores, J.M. Thorpe 313-779-6363
Minn Minneapolis, C. Gibb Co. 612-377-1200
Miss Jackson, Cartwright & Beam Co. 601-981-1368
Mo Maryland Heights, P.M.A. Corp. 314-569-1220
NJ Cherry Hill, Trinkle Sls..... 609-795-4200
NM Albuquerque, Lindberg Co..... 505-881-1006
NY Rochester, Marchese & Marsex Assoc. 716-442-9700
NY Rockville Centre, Willgold 516-764-4022
NC Charlotte, Cartwright & Bean Co. 704-333-6457
NC Raleigh, Cartwright & Bean Co. 919-781-6560
Ohio Cleveland, Marlow Assocs. 216-932-0900
Ohio W. Carrollton, Marlow Assocs. .. 513-866-4991
Ore Portland, Earl & Brown Co. 503-245-2283
Pa Pittsburgh, Marlow Assoc. 412-831-6113
Tenn Knoxville, Cartwright & Bean Co. 615-693-7450
Tenn Memphis, Cartwright & Bean Co. 901-276-4442
Tex Dallas, Lund & Co. 214-387-4634
Utah Salt Lake City, Lindberg Co. 801-534-1500
Wash Seattle, Earl & Brown Co. 206-284-1121

BUG ELECTRONICS, Dept. EM, 151 Grove St, Westwood, Mass. 02090, Tel: 617-329-4068, TWX: 710-325-6589

Sales Manager: G. Urban

Local Sales Offices & Reps.
Ala Birmingham, Nickerson Corp. ... 704-938-4647
Ariz Phoenix, P. A. R. Assoc..... 602-993-5237
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Colo Denver, R. G. Bowen Co..... 303-789-1884
Fla Clearwater, Perrott Assoc..... 813-585-3327
Fla Ft. Lauderdale, Perrott Assoc..... 305-792-2211
Fla Orlando, Perrott Assoc 305-275-1132
Ill Glenview, Reigel Assocs 312-729-3824
La Chalmette, Ohmtronics..... 504-271-1976
Mich Benton Harbor, R. C. Nordstrom & Co. 616-429-8560
Mich Lathrup Village, R. C. Nordstrom & Co. 313-559-7373
Minn Minneapolis, The Heimann Co. .. 612-861-6051
Miss Jackson, Ohmtronics, Inc. 601-939-1978
Mo Kansas City, Nevco, Inc..... 816-421-1751
Mo St. Louis, Nevco, Inc. 314-843-7406
NJ Haddonfield, Gray Assocs 609-429-5300
NJ Nutley, Solid Sls 201-667-0653
NM Sandia Park, P. A. R. Assoc..... 505-881-5000
NY DeRuyter, R.P. Kennedy Co 315-662-7996
NY Ravena, R.P. Kennedy Co..... 518-731-6022
NY Rochester, R.P. Kennedy Co..... 716-271-6322
NC Franklin, Nickerson Corp. 704-524-6790
NC Kannapolis, Nickerson Corp. 704-932-6772
Ohio Cleveland, John O. Olson Co..... 216-752-5444
Ohio Dayton, Dynel Co 513-434-6467
Pa Pittsburgh, John O. Olson Co 412-279-2550
Pa Pittsburgh, John O. Olson Co..... 412-341-8391
Tex Dallas, George Weinreich..... 214-321-2800
Va Springfield, TEMSCO 703-569-2700
Wash Seattle, Northmar, Inc. 206-524-5170

BULOVA WATCH CO., FREQ CONTROLS DIV., Elctrns. Div., Dept. EM, 61-20 Woodside Ave., Woodside, N.Y. 11377, Tel: 212-335-6000, TWX: 710-852-2637 ..... p. 2261,2290,2291,3365

Local Sales Offices & Reps.
Cal Menlo Park, Straube Assocs. 415-321-9050
Cal San Luisobispo, Johnson Assocs. 805-544-7770
Colo Westminister, Straube Assocs.... 303-426-0890
Conn Wethersfield, Underwood Sls..... 203-563-3046
Fla Fort Lauderdale, Dyne-A-Mark .. 305-771-6501
Iowa Cedar Rapids, J.R. Sls. Engrg. Inc. 319-393-2232
Kans Wichita, Thunderbird Tech Sls.... 316-684-3941
Mass Chelmsford, Underwood Sls. 617-256-8191
Mich Grand Rapids, Cecil A. Geer..... 616-247-1656
Mo St Louis, Thunderbird Tech Sls.. 314-567-6488
NM Albuquerque, Straube Assocs 505-265-7759
NY Albany, H.C. Johnson Agencies 518-456-6667
NY Fayetteville, H.C. Johnson Agencies 315-637-9383
NY Rochester, H.C. Johnson Agencies 716-482-3000
NY Williamsville, H.C. Johnson Agencies 716-632-7880
Ore Portland, J. J. Backer 503-297-3776
Ore Salem, James J. Backer 503-362-0717
Pa Glenshaw, H.C. Johnson Agencies 412-961-0414
Pa Philadelphia, Eastern Comps. 215-927-6262
Tex Richardson, Carl Tinch Sls..... 214-231-1322
Utah Salt Lake City, Straube Assocs. 801-943-5650
Wash Seattle, J.J. Backer..... 206-285-1300
Exp: N.Y., New York, C. Tennant & Sons 212-679-1300

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Local Sales Offices & Reps.
Cal Palo Alto, A. Barauck Co. 415-327-7711
Cal San Luis Obispo, Johnson Assocs 805-544-7770
Colo Westminster, Straube Assocs 303-426-0890
Conn Wethersfield, Underwood 203-563-3046
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Mo St. Louis, Thunderbird..... 314-567-6488
NM Albuquerque, Straube Assocs.... 505-265-7759
NY Albany, H.C. Johnson Agencies 518-456-6667
NY Buffalo, H.C. Johnson Agencies 716-632-2880
NY Fayetteville, H. C. Johnson Agenices 315-637-9383
NY Mamaroneck, Cane Technical Sales 914-698-4411
NY Rochester, H. C. Johnson Agencies 716-482-3000
NC Greensboro, Bud Browur 919-852-0080
Ore Portland, Jasmes J. Backer Co.. 503-297-3776
Pa King of Prussia, Monterio Associates Inc 215-265-0634
Tex Richardson, Carl Tinch Sales 214-231-1322
Utah Salt Lake City, Straube Associates 801-943-5650
Exp: New York, C. Tennant 212-679-1300

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Local Sales Offices & Reps.
Exp: Mass., Mattapoisett, C. Boyd..... 617-758-3319

BUNKER RAMO, see Amphenol

BUNTING BRASS & BRONZE CO., See N.L. Inds., Bearings Div.

BUREAU ENGRAVING, INC., Ind'l. Div., Dept. EM, 219 N. Second St., Minneapolis, Minn. 55401, Tel: 612-339-8001, TWX: 910-576-2733; Empl.: 650

BURLING INSTR. CO., Dept. EM, 16 River Rd., Box 298, Chatham, N.J. 07928, Tel: 201-635-9481; Empl.: 27

Sales Manager: E. C. Mick

Local Sales Offices & Reps.
Cal Irvine, Prime Controls Co. 714-754-6300
Cal Mountain View, Claypool Controls Co. 415-968-7488
Colo Denver, Toncray Equip. Co..... 303-629-1102
Conn Bridgeport, M.A. Selmon Co..... 203-377-3525
Fla Cantonment, C.B. Metcalf Co..... 904-968-5500
Fla Jacksonville, Olen Sls. Corp..... 904-744-3988
Fla Miami, Henning Co. 305-624-5832
Ga Smyrna, Specialty Equipment & Controls 404-433-8004
Haw Honolulu, Berkley Engrg. & Equip. Co. 808-538-1921
Ill Chicago, Kelburn Engrg. Co. 312-775-8383
La New Orleans, Gilbert & Assocs. 504-866-7444
Md Baltimore, G. Goodman Ind..... 301-837-3210
Mich St. Clair Shores, H.C. Engelman Co. 313-777-0750
Minn Minneapolis, Industra Co. 612-929-6224
Mo Florissant, H & R Sls. & Engrg. Co. 314-921-6242
Mo Kansas City, Edward M. Thompson Co. 816-471-8248
Neb Omaha, H.G. Klug Co. 402-397-8910
NJ Springfield, RJM Sls..... 201-467-1210
NY Rochester, H.C. Johnson Agencies 716-482-3000
NC Charlotte, Brown & Morrison..... 704-333-0774
Ohio Cincinnati, BC Engrg. Co..... 513-891-6122
Ohio Cleveland, Franklyn W. Kirk Co. 216-226-1970
Okla Tulsa, Gallop Instrument Co 918-747-2494
Pa Broomall, White/Whiddett Co..... 215-353-6343
Pa Glenshaw, H.C. Johnson Agencies 412-961-0414
Tex Arlington, Pan-Tech Controls Co. 817-640-3232
Tex Houston, Pan-Tech Engrg. Co. .. 713-623-0640
Tex Odessa, Barnco, Inc..... 915-332-0293
Wash Kirkland, Unit Process Co. 206-827-0433
Exp: Conn., New Haven, Masten-Wright Corp. 203-288-1638

BURNDY CORPORATION, Dept. EM, Richards Ave., Norwalk, , Conn. 06852, Tel: 203-838-4444, TWX: 710-468-2546; Empl.: 3500

Sales Manager: R. Bergstrom

Local Sales Offices & Reps.
Ala Huntsville, Interep Assocs.
Ariz Phoenix, Burndy Corp. 602-244-9719
Cal El Segundo, Burndy Corp. 213-772-5401
Cal Santa Clara, Burndy Corp..... 408-249-5353
Colo Wheatridge, Waugaman Assocs.
Conn Norwalk, Burndy Corp. 203-838-4444
Fla Cocoa, Electro Comp Assocs.
Fla Ft. Lauderdale, Electro Comp Assocs. 305-491-4141
Fla Orlando, Burndy Corp. 305-896-3067
Ga Atlanta, Interep Assocs. 404-394-7756
Ill Schiller Park, Burndy Corp. 312-678-5211
Ind Carmel, Rich Elctrn. Mktg. 317-844-8462
Kans Olathe, BC Elctrn. Sls. 913-888-6680
Md Hunt Valley, Burndy Corp. 301-628-2520
Md Silver Spring, Carwithen Assocs. 301-589-9040
Mass Dedham, Burndy Corp. 617-326-6386
Mich Canton, Burndy Corp.
Mich Detroit, Rathsburg Assocs..... 313-882-1717
Minn Bloomington, Burndy Corp. 612-854-2100
Minn Minneapolis, Comstrand, Inc..... 612-571-0000
Mo Hazelwood, Burndy Corp.
NM Albuquerque, Waugaman Assocs. 505-294-1436
NY Camillus, Noeth-Honsinger Assocs. 315-672-3988
NY Ilion, Noeth-Honsinger Assocs. .. 315-894-9943
NY New Rochelle, Burndy Corp.
NY Pittsford, Noeth-Honsinger Assocs. 716-461-4750
NC Charlotte, Burndy Corp.
Ohio Cleveland, A.H. Baier Co. 216-461-6161
Ohio Dayton, A.H. Baier Co. 513-276-4128
Tex Garland, Burndy Corp. 214-271-4431
Tex Houston, Cunningham Co.
Utah Salt Lake City, Waugaman Assocs. 801-363-0275
Wash Bellevue, Comtec Mktg. & Sls. Engrgs. 206-453-1188
Wash Mercer Island, Burndy Corp. 206-624-5442

Local Distributors
Ala Phoenix, Kierulff Elctrns.
Cal Irvine, Cramer Elctrns.
Cal Los Angeles, Kierulff Elctns.
Cal Los Angeles, Kierulff Airline Supply Co.
Cal Palo Alto, Kierulff Elctrns.
Cal San Carlos, Sterling Elctns.
Cal San Diego, Cramer Elctns.
Cal San Diego, Kierulff Elctns.
Cal Van Nuys, Coast Air Supply
Colo Denver, Kierulff Elctrns.
Conn Hamden, Arrow Elctrns.
Conn New Haven, Cramer Elctns.
Fla Clearwater, Diplomat/Southland
Fla Ft. Lauderdale, Arrow Electns.
Fla Hollywood, Cramer Elctrns.
Fla Orlando, Cramer Elctrns.
Ga Atlanta, Cramer Elctrns.
Ga Atlanta, Lykes Elctrns.
Ill Arlington Hgts., Texas Instr. Supply Co.
Ill Elk Grove Vil., Kierulff Elctrns.
Ill Mt. Prospect, Cramer Elctrns.
Kans Wichita, Wichita Aircraft
Md Baltimore, Arrow Elctrns.
Md Gaitherburg, Cramer Elctrns.
Md Hanover, Cramer Elctrns.
Mass Lexington, Harvey Elctrns.
Mass Newton, Cramer Elctrns.
Minn Bloomington, Arrow Elctrns.
Mo St. Charles, Lectronix
NJ Moorestown, Arrow Elctrns.
NJ Rutherford, Kierulff Elctrns.
NJ Saddlebrook, Arrow Elctrns.
NY Binghamton, Harvey Elctrns.
NY Farmingdale, Iris Elctrns.
NY Farmingdale, Arrow Elctrns.
NY Plainview, Progress Elctrns.
NY Rochester, Cramer Elctrns.
NY Syracuse, Cramer Elctrns.
NC Winston Salem, Cramer Elctrns.
Ohio Cleveland, Cramer Elctrns.
Ohio Dayton, Arrow Elctrns.
Okla Tulsa, Texas Instr. Supply
Pa Montgomeryville, Pyttronic Inds.
Tex Dallas, Cramer Elctrns.
Tex Dallas, Texas Instr. Supply
Tex Houston, Texas Instr. Supply
Wash Seattle, Kierulff Elctrns.

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Sales Manager: John Lacey

BURR-BROWN, Dept. EM, 6730 S. Tucson Blvd., Tucson, Ariz. 85734, Tel: 602-746-1111, TWX: 66-6491, 910-952-1111; Empl.: 700 ....p. 1388-1390,2856,2857

Sales Manager: T.W. Fern

Local Sales Offices & Reps.
Ala Huntsville, BCS Assocs. 205-881-6220
Ariz Tucson, Burr-Brown Research Corp. 602-746-1
Cal San Jose, Burr-Brown Research Corp. 408-984-7
Cal Santa Ana, Burr-Brown Research Corp. 714-835-0
Conn Southbury, Burr-Brown Resch. Corp. 800-645-8
Fla Orlando, BCS Assocs. 305-896-6
Ill Addison, Burr-Brown Research Corp. 312-832-6
Md Betheseda, Powell-Pendergraph 301-656-4
Mass Needham, Burr-Brown Research 617-444-9
Mass Reading, MECO..... 617-944-6
Mich Brighton, SAI Mktg. Corp..... 313-227-1
Mich Grand Rapids, SAI Mktg. Corp... 616-942-2
Minn Bloomington, Electronic Sls Agency 612-884-5
Mo Florissant, SAI Mktg. Corp. 314-837-5
NJ W. Berlin, QED Electronics 609-346-9
NY Clinton, Advanced Comps. Corp. 315-853-6
NY Endicott, Advanced Comps. Corp. 607-785-3
NY Great Neck, Burr-Brown Research Corp. 516-466-2
NY Scottsville, Advanced Comps. Corp. 716-889-1
NY Syracuse, Advanced Comps. Corp. 315-699-2
NC Greensboro, BCS Assocs. 919-273-1
Ohio Cleveland, SAI Mktg. Corp. 216-292-2
Ohio Dayton, SAI Mktg. Corp..... 513-435-3
Okla Tulsa, Norvell Assocs. 918-663-1
Pa Hatboro, QED Elctrns. 215-674-5
Pa Pittsburgh, SAI Mktg. Corp. 412-782-5
Tex Austin, Norvell Assocs. 512-458-1
Tex Dallas, Norvell Assocs. 214-233-1
Tex Houston, Norvell Assocs. 713-988-4
Va Richmond, Powell-Pendergraph.. 804-264-3
Wash Lynnwood, Industrial Elctrns. Instrs. 206-775-1

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Sales Manager: B. Ganz, U.S; A. Rifkin, Int'l

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Cal Palo Alto 415-321-
Cal Santa Ana..... 714-835-
Ill Schiller Park..... 312-671-
Mass Brockton 617-583-
Ohio Dayton, Burroughs Corp Ecd..... 513-435-
Tex Dallas 214-387-

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Ala Huntsville, Hamilton/Avnet Elctrn 205-533-
Ariz Phoenix, Hamilton/Avnet Elctrns 602-275-
Cal Culver City, Hamilton/Avnet Elctrns 213-558-
Cal San Diego, Hamilton/Avnet Elctrns 714-279-
Cal San Francisco, Hamilton/Avnet Elctrns
Colo Denver, Hamilton/Avnet Elctrns 303-534-
Conn Georgetown, Hamilton/Avnet Elctrns 203-762-
Fla Ft. Lauderdale, Hamilton/Avnet Elctrns 305-971-
Ga Norcross, Hamilton/Avnet Elctrns404-448-
Ill Schiller Park, Hamilton/Avnet Elctrns 312-678-
Kans Lenexa, Hamilton/Avnet Elctrns 913-888-
Md Hanover, Hamilton/Avnet Elctrns 301-796-
Mass Woburn, Hamilton/Avnet Elctrns 617-933-
Mich Livonia, Hamilton/Avnet Elctrns 313-522-
Minn Edina, Hamilton/Avnet Elctrns.... 612-941-
Mo Hazelwood, Hamilton/Avnet Elctrns 314-731-
NJ Cedar Grove, Hamilton/Avnet Elctrns 201-239-
NJ Mt. Laurel, Hamilton/Avnet Elctrns 609-234-
NM Albuquereque, Hamilton/Avnet Elctrns 505-765-
NY E Syracuse, Hamilton/Avnet Elctrns 315-437-
NY Rochester, Hamilton/Avnet Elctrns 716-442-
NY Westbury, Hamilton/Avnet Elctrns 516-333-
Ohio Cleveland, Hamilton/Avnet Elctrns 216-461-
Ohio Dayton, Hamilton/Avnet Elctrns 513-433-
Tex Dallas, Hamilton/Avnet Elctrns .. 214-661-
Tex Houston, Hamilton/Avnet Elctrns 713-780-
Tex Richardson, Arnold Barnes Assocs 214-235-

tah Salt Lake City, Hamilton/Avnet Elctrns 801-972-2800
ash Bellevue, Hamilton/Avnet Elctrns 206-746-8750

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riz	Tempe, W. Louis	602-839-5339
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al	San Francisco, C.R. Wideman	415-282-8220
olo	Denver, L. Hall	303-322-2189
onn	Cheshire, J. Miller	203-624-2440
a	Clearwater, W. Penhallegon	813-531-5112
a	Chamblee, L. Acker	404-457-1356
	Lincoln, V. Saporita	217-735-4181
	Northlake, J. Waters	312-562-3370
d	Carmel, J. Adams	317-637-9606
wa	Davenport, T. Bates	319-355-5400
ans	Overland Park, D. Bailey	816-EM3-3700
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a	Metairie, A. Richard	504-488-5333
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ass	Plymouth, P. Walsh	617-586-7069
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inn	Maple Grove, G. Gossling	612-544-1982
o	St. Louis, P. Friemel	314-739-9600
eb	Bellevue, B. Shriver	402-341-9224
J	Newark, E. Gimbut	201-484-3500
Y	Fairport, G. Goyette	716-271-2112
Y	New York, T. Lawless	212-267-1466
Y	N Syracuse, R. Lachut	315-422-1929
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hio	Grand Rapids, W. Bates	419-255-6498
hio	Johnstown, J. Bosko	614-237-9810
hio	Willowick, J. Bene	216-561-4875
kla	Oklahoma City, H. Gossage	405-751-4996
kla	Tulsa, L. Vantine	918-742-5914
re	Lake Oswego, S. Dyrnes	503-234-0281
a	Beaver, D. Nichols	412-728-5366
a	St. Davids, H. Thompson	215-KI6-0644
C	Lexington, S. Robinson	803-781-6410
enn	Jefferson City, D. Aldredge	615-588-2476
enn	Memphis, R. Spencer	901-324-3633
ex	Cypress, E. Bollman	713-444-2716
ex	Richardson, J. Tubbesing	214-263-0352
tah	Salt Lake City, O. Christiansen	801-363-4596
a	Hayes, W. Kirkland	804-642-5550
ash	Seattle, R. Shipek	206-RO3-1350
isc	Milwaukee, W. Burbach	414-964-3185

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ales Manager: S. Lindsay

ocal Sales Offices & Reps.

Rp.	NY, N.Y., S. Ginsbury	212-689-5212

ELECTRONICS, INC., Dept. EM, 14709 Keswick , Van Nuys, Cal. 91405, Tel 213-781-3849, FSC No 905, Empl. 50

ales Manager B. Barton

ocal Sales Offices & Reps.

a	Huntsville, Twentieth Century Mktg.	205-772-9237
riz	Tempe, Argus Sls	602-967-8709
al	Van Nuys, C.F. Elctrns	213-781-3982
a	Orlando, Perrott Assocs	305-275-1132
e	Ellicott City, Doss Elctrns.	301-465-1336
e	Hagerstown, Angstrohm Precision	301-739-8722
ass	Framingham, Murata/Angstrohm Sls. Off.	617-872-4843
o	St. Charles, Chesco	314-946-6677
J	E. Hanover, HLM Assocs	201-386-0794
NY	New Hartford, Murata/Angstrohm Sls. Off.	315-732-3507
NY	Northport, HLM Assocs.	516-423-1818
Ore	Portland, C.K. Shanks & Assocs.	503-292-5656
Tex	Houston, B. Hamilton	713-445-7086
Tex	Hurst, Wheelex	817-268-1812
Wash	Seattle, C. K. Shanks & Assocs.	206-632-4290
Wisc	Milwaukee, Star Engrg. Sls.	414-645-3680

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Sales Manager: J. Martinec; *Distributor Manager:* N. Amato

Local Sales Offices & Reps.

Ala	Huntsville, Beacon	205-881-5031
Ariz	Scottsdale, Sls. Engrg.	602-994-3230
Cal	Los Altos, Ewing-Foley	415-941-4525
Cal	Los Angeles, Universal Comps	213-641-4255
Colo	Boulder, Front Range Mktg	303-443-4780
Conn	Glastonbury, Barton-Caron Assoc.	203-633-9417
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Fla	Maitland, Beacon	305-647-3488
Ga	Atlanta, Beacon	404-351-3654
Ill	Elk Grove Village, Control Sls	312-595-2110
Ind	Grabill, Frank E. Kahsar Sls	219-489-6717
Md	Randallstown, Beacon	301-922-1248
Mass	Auburndale, Barton-Caron Assoc.	617-332-2021
Mass	Watertown, C&K Comps.	617-926-0800
Mich	Plymouth, A.P.J. Assoc.	313-459-1200
Minn	Minneapolis, Beta Engrg.	612-546-2215
Mo	Hazelwood, Dy-Tronix	314-731-5799
Mo	Independence, Dy-Tronix	816-373-6600
NJ	Cherry Hill, Quality Comps	609-428-6266
NM	Albuquerque, The Staley Co.	505-292-0060
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Cal	San Diego, Kierulff Elctrns	714-278-2112
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Cal	Sunnyvale, Bell Inds	408-734-8570
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Colo	Denver, Keirulff Elctrns	303-371-6500
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Conn	Fairfield, Utronics	203-255-4521
Conn	Hamden, Arrow Elctrns	203-248-3801
Conn	Hamden, Wilshire Elctrns	203-281-1166
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Conn	Wallingford, Midan Elctrns	203-265-2077
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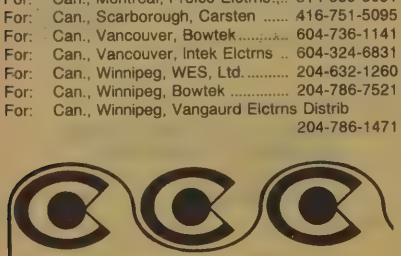

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Sales Manager: H. Lorber

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NH Nashua, Bell Controls..... 603-882-6984
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Ohio Cincinnati, Tri-State Mktg. 513-761-7993
Pa King of Prussia, Monteiro Assoc. 215-265-0545
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Utah Salt Lake City, Comp. Prods. Sls. 801-262-0000
Wisc Butler, Richmar Elctrns..... 414-781-1730

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Sales Manager: A. Armelin Jr.

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NY Syracuse, T2 Elctrns. 315-463-8592
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Pa Fort Washington, Kirk-Sandell, Inc. 215-643-2100
Tex Dallas, Hillman Entprs. 214-827-4790
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NY Bay Shore, Brunetta Sls. Co. 516-586-1800
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CALLINS INDUSTRIES, Dept. EM, Box C, Greenfield, Tenn. 38230, Tel: 901-235-2234, TWX: 810-590-3779; Empl.: 250

Local Sales Offices & Reps.
Cal Redwood City, Parks & Pruitt Assocs. 415-364-1640
Cal Tustin, Orion Sales Co 714-832-9687
Colo Englewood, Dynatech, Inc..... 303-773-2830
DC Washington, Harry Wise & Co. .. 202-363-9417
Fla West Palm Beach, Graham Assoc 305-622-4049
Ill Chicago, Industrial Reps. 312-647-7755
Ind Columbus, Alan Bolenbaugh 812-372-8666
Kans Shawnee Mission, Delltron Co. .. 913-362-5512
Ky Fern Creek, R. W. Mitscher Co.
Mass Millis, Selmark Assocs. 617-376-2914
Mich Livonia, Giesting & Assocs. 313-477-6060
Minn Minneapolis, White Sls. Co. 612-566-6320
Mo St. Louis, Delltron Co..... 314-869-4779
NY Rye, Charles L. Avery Assocs. .. 914-967-7610
NC Raleigh, R. W. Mitscher Co..... 919-828-0575
Ohio Cincinnati, Giesting & Assocs. 513-851-7800
Ohio Dayton, Giesting & Assocs. 513-293-4044
Pa Paoli, Stitzer Assocs. 215-644-5500
Tenn Johnson City, R. W. Mitscher Co. 615-929-1141
Tenn Shelbyville, R. W. Mitscher Co... 615-684-4544
Tex Addison, Parvin Assoc 214-661-5374
Wash Redmond, Quadra Sls. Corp. 206-883-3550
Exp: New York, Singer World Products 212-432-1400

CALMARK CORP., Dept. EM, 4947 Walnut Grove, 4947 Walnut Grove, Cal. 91776, Tel: 213-287-0451; FSC No.: 52094; Empl.: 31

Sales Manager: R.L. Rosenthal; *Distributor Manager:* R.L. Rosenthal

Local Sales Offices & Reps.
Ala Huntsville, Remco 205-883-9260
Ariz Carefree, Vinson Inds 602-488-2700
Cal Foraker Sales Corp. 415-657-2213
Cal San Gabriel, Calmark Corp..... 213-287-0451
Colo West/Mark Denver 303-922-8248
Fla Orlando, OEM Mktg Corp 305-299-1000
Ill Arlington Hgts., Martec Assocs. 312-956-8090
Kans Lenexa, Tech Reps 314-888-0212
Mass Westboro, Technical Mktg. Svcs. Co. 617-366-8462
Mich Ann Arbor, Kirk-Sandell 313-962-7486
Minn Minneapolis, Components Group 612-824-4222
Mo Hazelwood, Tech Reps..... 314-731-5200
NY Cooperstown, Fitzelle Assocs..... 607-547-9333
NY Hartsdale, Com-Tec Sls. Co..... 914-761-6644
NC Raleigh, Remco 919-787-1461
Ohio Cleveland, Comps 216-243-9200
Ohio West Carrollton, Comps 513-866-0661
Pa Ft Washington, Kirk-Sandell..... 215-643-2100
Tex Houston, Zonk Engrg 713-697-9302
Tex Richardson, Zonk Engrg..... 214-238-7651
Wash Tukwila, General Elctrns..... 206-575-4030
Exp: Cal., Los Angeles, Product Supply Co. 213-659-1858

Local Distributors
Cal Fremont, Terminal Sls Corp..... 415-656-7722
Cal Placentia, Cur-Mel Entrprs..... 714-528-4601
Cal Temple City, Modern Fasteners 213-579-4600
Ill Arlington Heights, Martec Assoc 312-956-8090
Mass Westboro, TMSC Elctrn Supply 617-366-8462
NJ Clifton, J-Mar Elctrns 201-772-6400
NJ Totowa, Diplomat/I.P.C. Corp..... 201-785-1830
NY Hartsdale, Multimetrics Co. 914-761-6645
Tex Richardson, Zec Sls 214-238-7651
Exp: Los Angeles, CA; Products Supp Co. 213-659-1858

CAL-TEK ENGRG, Dept. EM, 29 Pemberton Rd., Wayland, Mass. 01778, Tel: 617-653-0355; Empl.: 5

Local Sales Offices & Reps.
Md Ellicott City, A-O Elctrns..... 301-531-6700
Wash Seattle, Data Com Assocs. 206-285-2525
Exp: Los Angeles, Consolidated Trading Co. 213-397-6231

CALVERT ELCTRNS., INC., Dept. EM, 220 E. 23rd St., New York, N.Y. 10010, Tel: 212-481-5300, TWX: 666273, 710-581-4088; Empl.: 50

Sales Manager: F. M. Samuel; *Distributor Manager:* Joy Soodick

Local Sales Offices & Reps.
Cal San Jose, Calvert Elctrns. 408-265-0521

CAMBRIDGE PRODUCTS CORP., Cambridge Products Corp., Dept. EM, 244 Woodland Ave., Bloomfield, Conn. 06002; Empl.: 28 ..... p. 1738

Sales Manager: E. Selig; *Distributor Manager:* R. Wolpoe

CAMBRIDGE THERMIONIC CORP., Dept. EM, 455 Concord Ave., Cambridge, Mass. 02138, Tel: 617-491-5400, TWX: 92-1480 710-320-6399; FSC No.: 71279; Empl.: 550

Sales Manager: W.G. Nowlin; *Distributor Manager:* C.A. Peterson

Local Sales Offices & Reps.
Ariz Nogales, Arizona Cambion Corp. 602-287-6617
Ariz Phoenix, Zeus..... 602-258-7519
Cal Belmont, Cambridge Thermionic 415-592-4524
Cal Torrance, Cambridge Thermionic 213-326-7822
Colo Denver, Elcom, Inc. 303-770-4400
Fla Orlando, Publicover Assocs. 305-898-9361
Ill Chicago, Berndt Assocs., Inc. 312-283-0713
Ind Carmel, Berndt Assocs., Inc. 317-844-0114
Iowa Cedar Rapids, BC Elctrns. 319-393-5818
Kans Olathe, B.C. Elctrn. 913-888-6680
Mass Cambridge, Cambridge Thermionic 617-491-5400
Mich Dearborn, Pitcher-Poulin, Inc. 313-582-5450
Minn Edina, Merrill Franklin Co..... 612-927-4361
Minn St. Paul, Cahill Assocs. 612-646-7217
Mo Hazelwood, B.C. Elctrn. 314-731-1255
NM Albuquerque, Zeus 505-255-9831
NC Charlotte, Robert W. Chapman & Co. 704-525-2421
NC Greensboro, RW Chapman Co .. 919-282-0740
NC Raleigh, Robert W. Chapman & Co. 919-787-8731
Ohio Benchwood, K.W. Elctrn. Sls. 216-831-8292
Ohio Dayton, K.W. Elctrn. Sls. 513-890-2150
Ohio Worthington, KW Electronic Sls.. 614-888-0483
Ore Portland, J.J. Backer Co: 503-297-3776
Ore Salem, J.J. Backer Co..... 503-362-0717
Pa Allison Park, K W Electronic Sls. 412-487-4300
Pa Philadelphia, K.B. Erdman Co..... 215-224-1833
Tenn Knoxville, RW Chapman Co..... 615-966-6120
Tex Houston, RF Kimball 713-666-6763
Tex Houston, R.F. Kimball 713-666-6763
Tex Richardson, R.F. Kimball 214-231-3447
Utah Salt Lake City, Elcom, Inc..... 801-532-7940
Wash Seattle, J.J. Backer Co. 206-285-1300
Wisc Milwaukee, Berndt Assocs. 414-545-8400

Local Distributors
Cal Gardena, Bell Inds. 213-321-5802
Cal Gardena, Bell Elex 213-321-5802
Cal Inglewood, Force Elex 213-776-1324
Cal San Carlos, Sterling Elex..... 415-592-2353
Cal Sun Valley, Richey Elex 213-875-2862
Colo Denver, Integrated Elex 303-534-6121
Conn Hamden, Wilshire Elctrns. 203-281-1166
Fla Casselberry, American Fasteners 305-831-6630
Haw Windsor Locks, Adams Industries 203-623-4454
Ill Chicago, Newark Elctrns..... 312-638-4411
Ind Ft. Wayne, Fort Wayne Elec. Sup. 219-423-3422
Ind Indianapolis, Graham Elex 317-634-8202
Iowa Davenport, Klaus Radio 319-323-9761
La New Orleans, Southern Radio Sup. 504-524-2345
Mass Burlington, Heilind Elex..... 617-272-5610
Mass Lexington, Harvey Elex..... 617-861-9200
Mass Newton, Cramer Elex 617-969-7700
Mass Woburn, Pacer Elex 617-935-8330
Mass Woburn, Time Elex 617-935-8080
Mich Farmington Hills, Advent Elex 313-477-1650
Minn Minneapolis, Stark Elex 612-332-1325

Mo Univ. City, Olive Ind. Elect..... 314-426-4500
Neb Lincoln, Scott Elctrn. Sup. 402-464-8308
NJ Camden, General Radio Supply 609-964-8560
NY Binghamton, Stack Indust. Elect. 607-723-6326
NY Bohemia, Car-Lac Elex..... 516-567-4200
NY Buffalo, Summit Distributors..... 716-884-3450
NY Cheektowaga, Standard Elex 716-685-4220
NY Mount Vernon, Qar Elex..... 914-699-2224
Ohio Cleveland, Pioneer Standard Elex 216-587-3600
Ohio Columbus, Hughes Peters, Inc... 614-294-5351
Pa Philadelphia, Philadelphia Elect. 215-568-7400
Pa Philadelphia, Powell Elex 215-365-1900
Pa Pittsburgh, Cam/RPC Elex 412-782-3770
Tex Dallas, Hall-Mark Elex 214-231-5101
Tex El Paso, McNicol Elex..... 915-566-2936
Tex Houston, The Altair Co. 713-462-3029
Utah Provo, Omega Elex..... 801-375-4664
For: Can., Montreal, Que, Cesco Elex 514-735-5511
For: Can., Montreal, Que, Hooker Elex 514-487-5151
For: Can., Newburgh, Ont., Electrocraft Ind. Sls. 613-378-2603
For: Can., Ottawa, Ont., Wackid Radio 613-728-1821
For: Can., Scarborough, Ont., Carsten Elex 416-751-2371
For: Can., Willowdale, Ont., Electrosonic Ind. 416-494-1666

CAMUSAT GUEGUEN TELECOM INT'L., see CGTI

CANDY MFG. CO., Dept. EM, 626 Grove St., Evanston, Ill 60201, Tel: 312-869-6070; Empl.: 8

CANNON ELECTRIC, See ITT Cannon Electric

CANON U.S.A., INC., Dept. EM, 10 Nevada Dr., Lake Success, N.Y. 11040, Tel: 516-488-6700, Telex: 96-1333; Empl.: 430 ..... p. 3078

Sales Manager: M. Yoshikawa

Local Sales Offices & Reps.

Ariz Phoenix, Toward Engrg Assocs. 602-955-2193
Cal San Jose, J.T. McFarland Assoc. 408-286-9333
Cal Thousand Oaks, J.T. McFarland Assoc. 805-492-5678
Colo Denver, W.J. Purdy Co. 303-777-1411
Conn Guilford, R. Whitehead, Jr. Assoc. 203-453-3762
Ga Lilburn, Motion Technology 404-233-4368
Ill Dundee, J. Huegel Sls..... 312-426-6370
Ind Ft. Wayne, J&B Engrg..... 219-483-2813
Md Lutherville, Greenwood Elctns. .. 301-252-9296
Mass Boston, R.H. Whitehead Jr. Assocs. 617-542-7676
Mich Mt. Clemens, L P Assoc. 313-731-1171
Minn Minneapolis, Components Grp. .. 612-824-4222
NY Penfield, A & D Devices..... 716-586-8033
NC Charlotte, Motion Technology 704-525-9855
Ohio Fairborn, L P Assoc. 513-223-9975
Pa Phila., Stan Cohen Assoc. 215-698-9660
Tex Dallas, Blackburn Assoc. 214-692-8885
Wisc Oconomowoc, J. Huegel Sls. 414-271-6105

CANRAD-HANOVIA, INC., Dept. EM, 100 Chestnut St., Newark, N.J. 07105, Tel: 201-589-4300, Telex: 13-8531; Empl.: 250

Local Sales Offices & Reps.

Cal Anaheim, R. Martin 714-772-7863
Conn Fairfield, Magna Engrg. Sls..... 203-334-5538
Fla Winter Park, R. Evans..... 305-671-8716
Ga Atlanta, R. H. Smith 404-394-1747
Ill Glenview, Vico Assocs..... 312-729-9240
Kans Wichita, J. O'Reilly 316-744-0851
Mo Ballwin, H.J. Lawson..... 314-394-5688
NJ Newark, Canrad-Hanovia 201-589-4300
NJ Newark, Barry DuRon..... 201-589-4300
NY Huntington, N. Bannerton 516-421-3342
NY Liverpool, R. Ricketson..... 315-652-6270
NC Elm City, H. R. Patton..... 919-291-3284
Ohio Cincinnati, G. Nichols 513-891-5104
Pa Doylestown, W. Brem 215-348-5152
Tex Denton, C. Schleeweis 817-387-7219
Wash Everett, W. Kohlins 206-353-3700

CAPACITOR SPECIALISTS, Dept. EM, P.O. Box 2052, Escondido, Cal. 92025, Tel: 714-747-4000; Empl.: 40

Sales Manager: B. R. Hayworth

Local Sales Offices & Reps.

Cal Fremont, Spence Assoc 415-656-9506
Cal Pasadena, AF Sls Eng..... 213-681-5631
Conn Newton, Gerber Sls..... 203-426-3440
DC , TY Griffon Co..... 301-951-0112
Fla St Petersburg, David King Assoc 813-381-5344
Ill Skokie, Heth, Inc 312-282-8737
Mass Waltham, Gerber Sls..... 617-890-8040
Minn Burnsville, Heth Inc 612-333-8494
NJ Wayne, G & A Sls..... 201-256-8500
NM Albuquerque, Data Handling Co 505-268-4364
NY Cazenduia, Woolard, Inc..... 315-655-8145
NY New York City, Singer Prods. Co 212-432-1700
Ohio Cleveland, Components, Inc. 216-243-9200
Ohio West Carrolton, Components Inc. 513-866-0661
Ore Portland, Components West 503-643-5588
Pa Paoli, TY Griffon Co 215-647-1550
Tex Dallas, Cunningham Co 214-233-4303
Tex Houston, Cunningham Co..... 713-461-4197
Wash Seattle, Comps West 206-243-2133

CAPAR, Dept. EM, 303 Crossways Park Dr., Woodbury, N.Y. 11797, Tel: 516-364-2610, Telex: 144678; Empl.: 7 ..... p. 1079-1085,3666-3668

Sales Manager: P. Tumolo

Local Sales Offices & Reps.

Ala Huntsville, Remco Assoc..... 205-883-9260
Ariz Phoenix, Cleveland Entprs. 602-944-4679
Cal Downey, Trimarco 213-861-8244
Cal Sunnyvale, Winston Assoc. 415-968-5374
Colo Aurora, Cleveland Entprs. 303-751-3252
Conn Milford, Conti-Younger 203-929-3294
Fla Hollywood, Wallace Elect. Sls. ... 305-961-6640
Ill Streamwood, A. Holte & Assoc. 312-837-4066
Mass Waltham, Conti-Younger..... 617-890-4582
Minn Minneapolis, W. Lee Assoc. 612-926-1523
Mo Ballwin, Rush & West Assoc. 314-394-7271
NJ Cherry Hill, J.N. Barrett Assoc. .. 609-429-1551
NJ Fort Lee, Necco Assoc. 201-461-2789
NM Albuquerque, Cleveland Entprs. 505-266-5594
NY E. Syracuse, Naylor Assoc. 315-656-2251
NY Woodbury, Capar Comps. Corp. 516-364-2610
NC Raleigh, Remco Assoc..... 919-834-5820
Ohio Cleveland, Buckeye Comps. Corp. 216-461-2080
Ohio Dayton, Buckeye Comps. Corp. 513-278-4279
Pa Erie, JDS..... 814-455-8872
Wash Bellevue, Comtec 206-285-1698

Local Distributors

NY Mt. Vernon, QAR Elctrns..... 914-699-2244
NY Valley Stream, L & S Elctrns. 516-561-2474

CAPCON, INC., Dept. EM, 147 W. 25th St., New York, N.Y. 10001, Tel: 212-243-6275; FSC No.: 54841; Empl.: 64

Sales Manager: L. Reeves; *Distributor Manager:* L. Reeves

Local Sales Offices & Reps.

Exp: Conn., Stamford, Microwave International Corp. 203-322-6911

CAPINTEC INSTRUMENTS, INC., Dept. EM, 136 Summit Ave., Montvale, N.J. 07645, Tel: 201-391-3930, Telex: 138630; Empl.: 85

Sales Manager: E. Weis

Local Sales Offices & Reps.

Ala Birmingham, Systematx 205-979-2070
Cal Berkeley, P. Rosen Co. 415-526-8286
Cal Marina Del Ray, H.L.C. Assocs. 213-823-8424
Cal Palo Alto, Digital Pathways 415-493-5011
Fla Eustis, Industrial Systematics Corp. 904-357-5100
Ga Riverdale, Systematx 404-471-3718
Ill South Holland, Raeco, Inc..... 312-331-6001
Kans Shawnee Mission, Wehco Tech. Sls. 913-362-8066
Mass Marblehead, Northeast Assocs .. 617-631-9500
Mich Ann Arbor, Hal Heym Assocs..... 313-971-6552
Minn St. Paul, Sabco, Inc. 612-483-1102
Mo St. Louis, W. Hickman & Co..... 314-997-4220
Neb Omaha, Wehco Tech. Sls. 402-895-0262
NJ Bogota, Neville & Vespo..... 201-487-1505
NM Albuquerque, S.W.E.E. Co. 505-265-6775
NY Rochester, Unbehaun Sls. Assocs. 716-467-6304
NC Charlotte, Electro-Rep Assocs. .. 704-527-2530
Ohio Cleveland, M.A. Blankenburg & Co. 216-251-7010
Ore Portland, Topp Engrg. Sls. Corp. 503-244-7265
Pa Pittsburgh, Capintec Instrs. 412-781-5300
Tex Dallas, S.W.E.E. Co. 214-827-2621
Tex Missouri City, S.W.E.E. Co. 713-437-1171
Va Lynchburg, H.T. Vaders Co..... 804-237-4637
Wash Bellevue, Topp Engrg. Sls. Corp. 206-747-5400
Wisc New Berlin, Nover Assocs..... 414-784-1737

CAPITOL MACHINE & SWITCH CO., Dept. EM, Box 890, Danbury, Conn. 06810, Tel: 203-744-3300; Empl.: 125

Local Sales Offices & Reps.

Ala Madison, A.P. Spears 205-837-5
Ariz Phoenix, Tauber & Assocs. 602-955-2
Cal Los Altos, Frauman Assocs. 415-941-0
Cal San Diego, Tauber & Assocs. Inc. 714-274-7
Cal San Gabriel, Van Gott & Assoc. 213-285-2
Colo Littleton, Franklin Sls. Co. 303-794-3
Conn Litchfield, Norcon, Div. of Intrade 203-567-5
Conn N. Haven, Comp. Rep. 203-239-9
Fla Pompano Beach, B-C Electronics 305-785-2
Ga Smyrna, B-C Elctrns. 404-436-5
Ill Oak Pk., G. Petitt..... 312-261-0
Kans Shawnee Mission, Lowell, Kangas & Assoc Inc. 913-631-3
Mass Needham Heights, Comp. Rep... 617-444-2
Mich Southfield, Heick & Ralph Assoc. Intern'l., 313-557-8
Minn So. Minneapolis, Bitronics Sls. Co. 612-835-7
Mo St. Louis, Lowell, Kangas & Assocs., Inc. 314-821-4
NJ Livingston, Varrelman-Gorman Co. 201-992-2
Ohio Centerville, E. Frost..... 513-434-5
Pa Philadelphia, J. Biernbaum 215-635-1
Tex Dallas, Blackburn Assoc. 214-692-8
Tex Houston, Blackburn Assocs 713-784-1
Va Vinton, B-C Electronics 703-890-1
Wash Bellevue, Hensley Assoc..... 206-641-1
Wash Edmonds, McLaughlin Mktg 206-743-1

CAPLUGS DIV., Protective Closures Co., Dept. 2150 Elmwood Ave., Buffalo, N.Y. 14207, 716-876-9855; Empl.: 125

Local Sales Offices & Reps.

Cal Inglewood, E. Dudley Co. 213-678-1
Colo Denver, The Crump Co 303-426-
Conn West Simsbury, Anchor Engrg. Corp. 203-658-
Fla Vero Beach, Keeneth Corp. 305-567-
Ga Atlanta, Keeneth Corp. 404-952-
Ill Chicago, A. J. Ellis Co. 312-262-
Iowa Des Moines, F. R. Johnston Co. 515-255-
Mass Newton Upper Falls, Anchor Engrg. Corp. 617-964-
Mich Grand Rapids, Gillespie Sls. Engrg. Co. 616-949-
Mich St. Clair Shores, V. Goethem Co. 313-778-
Minn Minneapolis, Krez-Co. 612-561-
Mo St. Louis, Tanler & Co. 314-645-
NJ Englewood Cliffs, Unisco 201-567-
NJ Spotswood, Banico 201-251-
NY Buffalo, R. Schaefer Co. 716-632-
Ohio Cincinnati, Gallagher Co. 513-761-
Ohio N. Olmsted, Plus Sls. 216-734-
Okla Tulsa, Koons & Assocs. 918-627-
Pa Pittsburgh, Buchanan Sls. Co. 412-366-
Tenn Hendersonville, B. Lucas Assocs. 615-824-
Tex Hutchins, Prior Gaskets 214-225-
Wash Seattle, R. J. Matzke Co. 206-682-

CARBONE LORRAINE INDUSTRIES CO Dept. EM, 400 Myrtle Ave., Boonton, N.J. 07005 201-DE 4-0700; Telex: 136407; Empl.: 50

Local Sales Offices & Reps.

Battery Prods. Representation
La Westwego, Automatic Power..... 504-347-
Tex Houston, Automatic Power..... 713-228-
Tex Houston, Tideland Signal Corp... 713-681-
Brush Prods.
Cal San Francisco, Advance Carbon Prod. 415-431-
Colo Arvada, R F S 303-423-
Conn Newington, Interep Co. 203-666-
Fla Delray Beach, J.W. Beaver 305-276-
Ill Park Forest, Carbone 312-798-
Ind Highland, H A Smolen Co. 219-838-
Mich Detroit, Winton Crawford Assocs.
Mich Owosso, Cortem Int. Div., Toledo Commu Co. 517-725-
Minn Minneapolis, W.B. Odegard
NJ Morristown, David A. Rugg Co... 201-538-
NY Syracuse, B. Fleckenstein 315-488-
Ohio Copley, Norco 216-666-
Pa Greentown, Beaver Co. 717-676-
Pa Pittsburgh, Bowman & Co. 412-781-
Wisc Milwaukee, F C du Bois & Assocs.
Carbolube
Cal San Francisco, Advance Carbon Prods. 415-431-
Conn Newington, Interep Co. 203-666-
Fla Delray Beach, J.W. Beaver 305-276-
Ill Park Forest, Carbone 312-SY8-
Ind Highland, H.A. Smolen Co. 219-838-
Ky Clarksville, Waite Sls. 812-948-

Mich Franklin, Schlee Sls. & Engrg. Co. 313-499-3430
Minn Minneapolis, William Be Odegard 612-929-2226
Mo St. Louis, Unterberger 314-863-3136
NJ East Paterson, Bergen Ind. Supp. 201-796-2600
NJ Paramus, Tower Sls. Engr. Co. 201-265-2878
NY Plainview, Atomergic Chemetals Co. (516) 822-8800
NY Syracuse, B. Fleckenstein 315-488-7883
Ohio Copley, Norco 216-666-3774
Pa PA, Greentown Beaver Co. 717-676-4895
Tex Dallas, Dynamic Component Sls. 214-363-6191
Wisc Oconomowoc, McNellis Representatives 414-567-9731

Chemical Equip. Reprs.
Cal Glendale, Horrell Co. 213-245-6452
Cal Pinole, Cutino Co. 415-223-5555
Fla Hastings, Paul Sleeper Assoc. 904-328-5177
Ga Atlanta, G.H. Crossley & Assocs. 404-261-4278
Il Park Forest, J.J. Carey 312-798-7400
La Gonzales, Wallace Co. 504-644-2861
Md Millersville, PSI 301-987-1343
Mass Cambridge, Mooney New England 617-864-5630
Mich Galesburg, Hagadone Co. 616-665-4982
Mo St. Louis, Technical Serv. Corp. 314-647-4252
NJ Boonton, Carbone 201-334-0700
NJ Little Falls, Mooney Bros. Co. 201-256-6200
NY Batavia, F.J. Guppenberger 716-343-0115
NC Charlotte, Carotek 704-847-4406
Ohio Cincinnati, R.A. Mueller & Assocs. 513-242-2535
Okla Tulsa, Laster/Castor Corp. 918-663-7365
Pa McMurray, Kenneth R. Sears 412-941-8574
Pa Philadelphia, M & S Seitz Co. 215-563-6136
Tenn Chattanooga, David F. Moore & Assocs. 615-622-2123
Tex Houston, Mercer Engineers 713-529-6121
Wisc Milwaukee, A.E. Rasmussen Co. 414-342-2065

ARBORUNDUM

RBORUNDUM CO., Graphite Prods. Div., Dept. EM, Box 339, Niagara Falls, N.Y. 14302, Tel: 16-278-2553, Telex: 91 555; Empl.: 250 p. 3670-3673,4270,4271

ocal Sales Offices & Reps.
Cal Campbell, Carborundum 408-377-0167
Cal El Segundo, Varigon Assocs. 213-322-1120
Cal Palo Alto, O'Donnell Assocs. North 415-327-9260
Cal San Diego, Varigon Assocs. 714-299-5413
Conn Greenwich, Crane & Egert 203-622-9191
I Berkeley, Carborundum 312-547-3767
Mass West Springfield, Carborundum 413-739-7361
NY Elmont, Crane & Egert Corp. 516-488-2100
Ohio Dayton, R.R.M. Assoc. 513-433-7761

RBORUNDUM CO., Plastics Div., Dept. EM, Carborundum Center, Niagara Falls, New York 14302, el: 716-278-2105; Empl.: 600

ocal Sales Offices & Reps.
al Danville, Webco Sls 415-837-6048
olo Denver, Ross Equip Co. 303-759-4215
onn West Hartford, O'Connor Assocs Engrd Prods 201-236-6015
Downers Grove, Corrosioneering 312-969-4455
y Louisville, Stemmerich 502-425-1983
lass Southborough, O'Connor Assocs Engrd Prods 617-481-7755
lo St. Louis, Stemmerich 314-832-7726
J Little Falls, Muller Process Equip 201-256-2052
Y Niagara Falls, High Performance Plastics Dept. 716-278-2105
Y Rochester, Corrosion Resistants 716-546-8576
C Charlotte, Process & Control Equip 704-344-0881
hio Cincinnati, Brumleve Assocs 513-891-6161
a Avondale, Protective Plastics Dept. 215-268-3101
enn Chattanooga, David F. Moore & Assocs 615-622-2123
t Bethel, G-W Plastics Dept. 802-234-9941
ash Everett, Engrg Service 206-353-3700

RCO ELCTRNS., Dept. EM, 195 Constitution Dr., enlo Park, Calif. 94025, Tel: 415-321-8174, Telex: 18482; Empl.: 59

CARDINAL CONTROL CO., Dept. EM, 110 Kensington Rd., Kensington, Conn. 06037, Tel: 203-828-6379

Sales Manager: L.E.P. Beatman; *Distributor Manager:* L.E.P. Beatman

CAREY ELCTRN. ENGRG. CO., Dept. EM, 1880 Clifton Ave., Springfield, Ohio 45505, Tel: 513-323-6300; Empl.: 10-25

Local Sales Offices & Reps.
Cal Glendale, Yates Prods. Co. 213-245-6951
Cal Oakland, Sanford Mech. Equip. Co. 415-451-6691
Mich Lathrup Village, C.J. Brush Co. 313-EL 6-8233
NY Brooklyn, Bailey Distributors Inc. 212-855-3958
Ohio Dayton, Related Comps. 513-253-6116

CARLINGSWITCH INC., Dept. EM, 505 New Park Ave., W. Hartford, Conn. 06110, Tel: 203-233-5551, TWX: 710-425-0034; Empl.: 1000 p. 4009-4013

Local Sales Offices & Reps.
Cal Los Altos, Serra Assocs 408-738-1117
Cal Van Nuys, Pacific Switch 213-873-4802
Colo Denver, Alan Williams 303-373-4730
Conn W. Hartford, Atlantic Switch 203-523-5259
Fla Miami, Switch Controls 305-885-6727
Ill Wheaton, Conectrix 312-653-1130
Mass Quincy, F. Rybak 617-471-0902
Mich Wheaton, M. Hass 312-653-1130
Minn Stillwater, L. Hartmann 612-888-0665
Mo Clayton, Mertens Electric 314-721-0058
NJ Burlington, R. Circus 609-387-9331
NY Pompey, S. Foster 315-677-3333
Ohio Columbus, R. Johnson 614-294-7103
Ore Portland, Elctrn. Comp. Sls. 503-245-2342
Pa Harrisburg, Larry Young 717-564-7234
SC Spartanburg, Rick Hadley 803-573-5176
Tex Dallas, Texaswitch 214-357-1768

Local Distributors
Cal Van Nuys, Pacific Switch Controls 213-873-4802
Conn West Hartford, Atlantic Switch Controls 203-523-5259
Fla Miami, Switch Controls 305-885-6727
Ill Wheaton, Conectrix, Inc. 312-653-1130
Tex Dallas, Texaswitch, Inc. 214-357-1768

CAROLINA MEDICAL ELCTRNS., INC., Dept. EM, U.S. 52 Expwy., Box 307, King, N.C. 27021, Tel: 919-983-5132, Telex: 80-6442; Empl.: 34

Sales Manager: C. Roger Jones

CAROLINA STEEL & WIRE CORP., Dept. EM, I-20 and S.C. 6, Lexington, S.C. 29072, Tel: 803-359-5501, Telex: 573355; FSC No.: 72954; Empl.: 115

Sales Manager: R. H. Wilson, VP

Local Sales Offices & Reps.
Fla Miami, J.M. Keely Sls. 305-634-8526
Ill Elk Grove Village, Carolina Steel & Wire Corp. 312-640-0708
NJ South Hackensack, Carolina Steel & Wire Corp. 201-487-1036
Tex Houston, R.D. Chapman 713-681-6221

CARPENTER TECHNOLOGY, Dept. EM, Box 662, Reading, Pa. 19603, Tel: 215-372-4511; Empl.: 4500

Sales Manager: R. W. Cardy

Local Sales Offices & Reps.
Cal Los Angeles 213-587-9131
Cal San Francisco 415-593-8461
Conn Hartford 203-233-7581
Ga Atlanta 404-768-5883
Ill Chicago 312-681-3500
Ind Indianapolis 317-632-4351
Iowa South Bend 219-234-0093
Mass Boston 617-339-5161
Mich Detroit 313-588-5300
Minn Minneapolis 612-331-8440
Mo St. Louis 314-652-6700
NJ West Caldwell 201-227-5400
NY Buffalo 716-684-3000
NY Syracuse 315-437-9921
NC Charlotte 704-596-7555
Ohio Cincinnati 513-771-0250
Ohio Cleveland 216-267-6700
Pa Philadelphia 215-248-2500
Pa Pittsburgh 412-343-4711
Tenn Memphis 901-332-8332
Tex Dallas 214-352-1771
Tex Houston 713-466-5544
Wisc Milwaukee 414-353-4900

CARROLL MFG. CO., Dept. EM, 1212 Hagan, Champaign, Ill. 61820, Tel: 217-352-5438; Empl.: 10

CARSON MFG. CO., Dept. EM, 5453 N. Rural St., Indianapolis, Ind. 46220, Tel: 317-257-3191; Empl.: 125-150

CARTER MFG. CORP., Dept. EM, Sugar Rd., Bolton, Mass. 01740, Tel: 617-779-5501; FSC No.: 03929; Empl.: 25 p. 3873

Sales Manager: L.W. Tedstone

Local Sales Offices & Reps.
Cal Burlingame, Polach & Bensinger Inc. 415-697-2525
Conn Washington, Tri-Com Assocs. 203-868-7748
Ill Chicago, Comms. Engrs. 312-761-0548
Mass Burlington, Tri-Com Assocs. 617-272-8163
NJ Kinnelon, Ind'l. Science Supply Corp. 201-838-8746
NY Bayside, Ind'l. Science Supply Corp. 212-224-3147
Ohio Dayton, Bek Assocs. 513-278-1343
Pa Pittsburgh, J.O. Olsen Co. 412-279-2550
Tex Arlington, Southern Engrg. & Sls. Co. 214-748-5760
Exp: Vermont, North Bennington, O'Neil Mktg. Assocs. 802-447-7890

CARTER MOTOR CO., Dept. EM, 2707 W. George St., Chicago, Ill. 60618, Tel: 312-588-7700

Local Sales Offices & Reps.
Cal San Jose, J.T. McFarland Assocs. 408-286-9333
Cal Sherman Oaks, Gee Assocs 213-788-5961
Colo Englewood, H. Kaub & Co. 303-761-5881
Conn Old Lyme, Aid Engrg. Sls. 203-434-1673
Fla Seminole, Spartak, Inc. 813-393-6533
Ga Smyrna, B-C Elctrn. Sls. 404-436-5169
Ill Oak Brook, A.G. Erickson & Assocs. 312-323-1367
Kans Shawnee Mission, McCrary Ind'l Sls. 913-341-5401
Ky Louisville, Walter Nussbaume, Jr. 502-895-5037
Md Baltimore, Robt. Gable 301-797-8530
Mich Ann Arbor, V. Miklas 313-769-5181
Mich Marshall, R. Reed Inc. 616-781-7287
Minn Minneapolis, A.J. Warner Co. 612-729-7371
Neb Omaha, S. Adams 402-339-1216

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Pa Philadelphia, Clisby & Assocs. 215-425-7724
Tex Houston, Carey & Assoc 713-460-1111
Tex Richardson, Carey & Assoc 214-234-2202
Utah Salt Lake City, Brandon Co. 801-487-2231
Va Virginia Beach, C. Bludau 804-481-7200
Wash Seattle, Northmar, Inc. 206-524-5170
Exp: Ill., Wheaton, CHS Int'l 312-665-3402

CASSO-SOLAR CORP., Dept. EM, 125-10 Queens Blvd., Kew Gardens, N.Y. 11415, Tel: 212-544-2424; Empl.: 30

Sales Manager: Ed Jansen, Dir. Mktg.

Local Sales Offices & Reps.
Ala Birmingham, Thomas Lane & Assocs. 205-870-0478
Cal Milbrae, Call Assocs 415-692-1555
Colo Littleton, Techna-Flo Corp. 303-773-6528
Ill Elmwood Park, Malovac Sls. Co. 312-637-9090
Mass Petersham, Kuniholm Assocs. 617-724-3433
Mich St. Clair Shores, Xanthus, Inc. 313-771-3020
Mich Troy, Xanthus, Inc. 313-391-3235
Minn Minneapolis, Applied Technology 612-825-6111
NJ Wyckoff, Frank A. Sterne Co. 201-891-8780
NY Nanuet, Shorteck, Inc. 914-623-5838
NY Orchard Park, Shorteck, Inc. 716-662-7290
NY Schenectady, Shorteck, Inc. 518-355-4096
Ohio Dayton, Techmark, Inc. 513-890-0177
Ohio Toledo, Cubbedge Controls 419-535-5530
SC Greenville, Cotton-McCauley Co. 803-244-1598
Tenn Chattanooga, Kaylor Prods. 615-892-5705
Tex Houston, Clay Sheets Assocs. 713-488-4404
Wash Seattle, Thomas E. Sill Co. 206-622-1792

CASTALL, INC., Dept. EM, Weymouth Ind. Park, E. Weymouth, Mass. 02188, Tel: 617-337-6075; Empl.: 30

Local Sales Offices & Reps.
Ala Huntsville, Murcota Corp. 205-539-8476
Cal Huntington Beach, Polymer-West 213-430-8952
Ill Chicago, Electro-Mech Sls. Co. 312-777-0554
Pa Ardmore, R. D. Freedman Assocs. 215-649-3679

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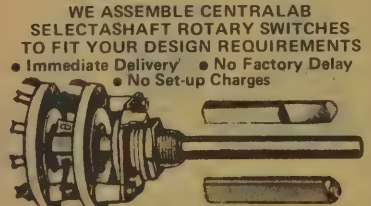
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CATON CONNECTOR CORP., Dept. EM, Cordage Pk, Plymouth, Mass 02360, Tel: 617-746-6817, TWX: 510-223-0820; FSC No.: 52196; Empl.: 14 .... p. 1739

Sales Manager: L. Galambos

Local Sales Offices & Reps.
Cal Van Nuys, Interconnect Specialties 213-988-7620

CATV COMMUNICATIONS, Div. of Amer. Elctrn. Labs. Inc., Dept. EM, Box 552, Lansdale, Pa. 19446, Tel 215-822-2929, TWX: 510-661-4976; Empl.: 60

Sales Manager: I.A. Faye, V.P.

Local Sales Offices & Reps.
Mo Ballwin, R. Hood 314-227-3212
NY Manlius, CATV Communications Div. 315-682-5853
Pa Lansdale, W. Stone 215-822-2929

CEA a division of Berkleonics, Inc.

CEA, Div. Berkleonics, Inc., Dept. EM, 1 Aerovista Pk. San Luis Obispo, Cal. 93401, Tel: 800-544-5454; Empl.: 30 ..... p. 3213-3218

Local Sales Offices & Reps.
Cal Anaheim, Tri-Tek 714-533-1454
Cal Mountain View, Thresum Assocs. 415-965-9180
Fla Orlando, Perrott Assocs 305-275-1132
Md Betheseda, S & S Assocs. 301-654-1434
Mass Burlington, Tritek 617-272-4550
NJ S. Orange, S. Simberkoff Assoc. 201-763-7900
NM Albuquerque, F. Hawker 505-292-2196
Pa King of Prussia, S & S Div of Klinetics 215-265-3450
Pa Pittsburgh, R. F. Clark Co. 412-242-9500
Tex Houston, Jackson Arnold Co. 713-981-5789
Wash Bellevue, Olson Ferree & Assocs. 206-454-1210
Exp: Cal.; Los Angeles, Trans-World Tr. 213-472-0444

CENTERFLEX CERAMICS, Dept. EM, 221 Seventh Ave., Hawthorne, N.J. 07507, Tel: 201-423-0505, Telex: 130347; Empl.: 30

CENTRALAB DISTRIBUTOR PRODS., Dept. EM N. 93 W 16112 Megal Dr., Box 38, Menomonee Falls Wisc. 53051, Tel: 414-228-2911, TWX: 910-260-3620; Empl.: 30

Sales Manager: R. Michaels; *Distributor Manager:* D. Neubauer

Refer to Centralab Elctrns. Div. for Product and Sales Office Information.

CENTRALAB, Electrns. Div. - Globe Union Inc., Dept. EM, 5757 N. Green Bay Ave., Milwaukee, Wisc. 53201, Tel: 414-228-1200, TWX: 026-650, 910-262-3084; Empl.: 5000

Sales Manager: K. Stephan; *Distributor Manager:* R. Michaels

Local Sales Offices & Reps.
Ala Huntsville, Cartwright & Bean 205-533-3509
Ariz Phoenix, Clemick-Neenan & Assoc. 602-279-7649
Cal Palo Alto, Brooks Technical Group 415-328-3232
Cal San Diego, Clemick-Neenan & Assoc. 714-464-0666
Cal Sherman Oaks, Clemick-Neenan & Assoc. 213-990-3150
Cal Tustin, Clemick-Neenan & Assoc. 714-547-0966
Colo Denver, Electro-Rep Inc. 303-744-2821
Fla Ft. Lauderdale, Cartwright & Bean 305-791-3989
Fla Orlando, Cartwright & Bean, Inc. 305-422-4531
Ga Atlanta, Cartwright & Bean, Inc. 404-255-5262
Haw Honolulu, Dougherty Enterprises 808-847-4144
Ill Des Plaines, Centralab 312-694-4870
Ind Indianapolis, L.M. De Voe Co. 317-842-3245
Iowa Cedar Rapids, J. Vrbik Co. 319-366-8733
Kans Shawnee Mission, Lowell-Kangas & Assoc. 913-631-3515
La Metairie, Cartwight & Bean 504-834-2350
Md Damascus, J. Bresson Assoc. 215-664-6460
Md Towson, Jerry Bresson Assocs. 215-664-6460
Mass Needham, Centralab 617-444-4847
Mich Lathrop Village, Centralab 313-559-9095
Minn Minneapolis, Centralab 612-831-5212
Miss Jackson, Cartwright & Bean, Inc. 601-981-1368
Mo St. Louis, Lowell-Kangas & Assoc. 314-821-4050
NJ Paramus, Centralab 201-262-67
NY Albany, Reagan/Compar Albany 518-489-74
NY Endwell, Reagan/Compar Albany 607-723-8
NY Fairport, Reagan/Compar Albany 716-271-22
NY New Hartford, Reagan/Compar Albany 315-732-37
NC Charlotte, Cartwright & Bean, Inc. 704-377-56
NC Raleigh, Cartwright & Bean, Inc. 919-781-65
Ohio Columbus, Centralab 614-888-21
Ore Portland, Centralab 503-620-16
Pa Narberth, J. Bresson Assoc. 215-664-64
Tenn Knoxville, Cartwright & Bean, Inc. 615-693-74
Tenn Memphis, Cartwright & Bean, Inc. 901-276-44
Tex Farmers Branch, Centralab 214-243-81
Va Lynchburg, J. Bresson Assoc. 215-664-64
Wisc Milwaukee, Centralab 414-228-21

CENTRALAB ELCTRNS. DIV., Globe-Union I Dept. EM, Box 858, Hwy. 20 W., Fort Dodge, Io 50501, Tel: 515-955-8534, TWX: 910-520-2493

Refer to Centralab Elctrns. Div. Milwaukee, Wisc. sales office information.

CENTRALAB/USCC, Div. of Globe-Union Inc., D EM, 4561 Colorado Blvd., Los Angeles, Cal. 90039, 213-240-4880, TWX: 910-497-2282; Empl.: 550

Sales Manager: D. Hosmer

Local Sales Offices & Reps.
Ala Huntsville, Rep. Inc. 205-881-9
Ariz Phoenix, Clemick-Neenan & Assoc. 602-279-7
Cal Mt. View, Caltron Components 415-964-3
Cal Sherman Oaks, Clemick-Neenan 213-990-3
Colo Denver, Electro-Rep., Inc. 303-744-2
Fla Ft. Lauderdale, Dyne-A-Mark Corp. 305-771-6
Ga Tucker, Rep. Inc. 404-938-4
Ill Des Plaines, Centralab 312-827-4
Kans Shawnee Mission, Thomas Modrcin Assoc. 913-432-2
Md Towson, Jerry Bresson Assoc. 215-664-6
Mass Needham, Hatch Assoc. 617-444-3
Mich Lathrup Village, Centralab 313-559-9
Minn Minneapolis, Centralab 612-831-5
Mo Hazelwood, Thomas-Modrcin Assoc. 314-895-4
NJ Clifton, Centralab 201-778-5
NY Albany, Reagan/Compar Albany, Inc. 518-489-7
NY Plainview, E.R.A. 516-822-9
NC Raleigh, Carlwright & Bean, Inc. 704-337-5
Ohio Columbus, Centralab 614-888-2
Ohio Columbus, McFadden Sls., Inc. 614-221-3
Pa Narberth, Jerry Bresson Assoc. 215-664-6
Tenn Jefferson City, REP, Inc. 615-475-4
Tex El Paso, Centralab 915-779-3
Tex Houston, Aid Elctrns., Inc. 713-777-3
Tex Irving, Aid Elctrns., Inc. 214-259-4
Va Lynchburg, J. Bresson, Assoc. 215-664-6
Wash Seattle, H.S. Thorpe Comp. 206-784-3
Wisc Milwaukee, Centralab 414-228-2

CENTRE ENGRG., Dept. EM, 2820 E. College A State College, Pa. 16801, Tel: 814-237-0321, T 510-691-2634; Empl.: 475 ..... p. 1088-

Sales Manager: H.D. Shirey

Local Sales Offices & Reps.
Cal Redondo Beach, J. J. Riley Assocs. 213-374-
Fla Ft. Lauderdale, Hutto-Hawkins-Peregoy 305-971-
Fla Maitland, Hutto-Hawkins-Peregoy 305-831-
Ga Atlanta, Millar Elctrns. 404-261-
Ill West Chester, Wasson-Gallagher 312-261-
Ind Chicago, Croydon Elctrns. 312-237-
Mass Walpole, KCA Comps. 617-861-
Minn Chanhassen, Barnes Assocs. 612-474-
NY Baldwin, Milano Bros. International 516-223-
NY Elmhurst, S. Levinson 212-271-
NY Lewiston, Watmet, Inc. 716-285-
NC Raleigh, Millar Elctrns. 919-787-
Ohio Beachwood, K W Elctrn. Sls. 216-831-
Ohio Dayton, K W Elctrn. Sls. 513-890-
Ohio Worthington, KW Elctrn Sales 614-888-
Ore Portland, Components West 503-643-
Pa Allison Park, K W Elctrn. Sls. 412-487-
Pa King of Prussia, Colburn Assocs. 215-265-
Tex Austin, Allied Components 512-837-
Tex Dallas, Allied Comps. 214-238-
Tex Houston, Allied Comps. 713-691-
Wash Seattle, Components West 206-243-

Local Distributors
Cal Redondo Beach, Jesse James Elctrns 213-374-3468
Cal San Jose, Green Ray Distr 408-379-0800
Fla Orlando, Hammond Elect. 305-849-6060
Ind Ft. Wayne, Phoenix Co. 219-422-2311
Minn Chanhassen, G & F Distr 612-474-2907
NY Commack, ARCO Elctrns 516-864-7000
Ohio Englewood, Argent Ind. 513-836-8633
Pa Pittsburgh, CAM Radio 412-782-3770

:NTRONICS DATA COMPUTER CORP., Dept. EM, Wall St., Hudson, N.H. 03051, Tel: 603-883-0111, TWX: 710-228-6505; Empl.: 1,500

Local Sales Offices & Reps.
Ariz Tempe, CDCC 602-968-7285
Cal Costa Mesa 714-979-6650
Cal Sunnyvale 408-744-1244
Fla Orlando, CDCC 305-857-0216
Ga Atlanta 404-455-8740
Ill Arlington Heights 312-956-0095
Mass Woburn 617-935-6150
NH Hudson 603-883-0111
NH Londonderry, Centronics of Puerto Rico 603-434-4912
NJ Mt. Laurel 609-268-1331
NY Calendonia, CDCC 716-538-4754
NY New York City, CDCC 212-697-7655
NY Plainview 516-433-1963
Ohio Kettering 513-294-0070
Tex Arlington 817-461-5711
Tex Houston, CDCC 713-988-0532
Va Falls Church 703-671-2900

Local Distributors
Ala Huntsville, W.A. Brown Instr 205-883-8660
Ariz Phoenix, The Thorson Co. 602-956-5300
Cal Goleta, The Thorson Co 805-964-8751
Cal LA, The Thorson Co 213-476-1241
Cal LA, The Thorson Co 213-937-5450
Cal San Diego, The Thorson Co 714-298-8385
Colo Denver, The Thorson Co 303-759-0809
Fla Ft. Lauderdale, W.A. Brown Instr 305-776-4800
Ga Atlanta, W.A. Brown Instr 404-939-1674
Kans Shawnee Mission, Inland Assoc. 913-362-2366
La Mandeville, W.A. Brown Instru. 504-626-9701
Md Bethesda, Bartlett Assoc. 301-656-3061
Mass Framingham, Bartlett Assoc. 617-879-7530
Mich Madison Hgts, WKM Assoc. 313-588-2300
Mo St. Louis, Inland Assoc. 314-821-3742
NM Albuquerque, The Thorson Co. 505-265-5655
NY New York, Terminal Mart Assoc. 212-685-2679
NY White Plains, Bartlett Assoc. 914-949-6476
NC Durham, W.A. Brown Instru. 919-682-2383
Ohio Cleveland, WKM Assoc. 216-267-0445
Ohio Dayton, WKM Assoc. 513-434-7500
Pa Wayne, Bartlett Assoc. 215-688-7325
SC Columbia, W.A. Brown Instru. 803-798-3297
Tenn Oak Ridge, W.A. Brown Instru. 615-482-5761
Wash Belleview, The Thorson Co 206-455-9180
Wisc Hartford, General Robotics Corp 414-673-6800

RAMIC MAGNETICS, INC., Dept. EM, 87 Fairfield Rd., Fairfield, N.J. 07006, Tel: 201-227-4222, Telex: 138 30; Empl.: 40

Local Sales Offices & Reps.
Ala Huntsville, Macro Marketing Assoc. 205-883-9630
Cal Irvine, A. C. Allen 714-552-9428
Cal Palo Alto, Testco, Inc. 415-324-1900
Il Elk Grove Village, J.G. Twist Co. 312-593-0200
Ind Ft. Wayne, R.O. Whitesell 219-432-5591
Ind Indianapolis, R.O. Whitesell 317-359-9283
Ind Kokomo, R.O. Whitesell 317-453-3592
Iowa Cedar Rapids, J. G. Twist 319-393-8703
Kans Prairie Village, J.G. Twist 913-236-4646
Kans Wichita, J. G. Twist 316-686-6685
Ky Louisville, R.O. Whitesell 502-897-1569
Md Churchville, Dean Inc. 301-948-5444
Mass Needham Heights, Northeast Reprs. 617-449-3034
Mich Grand Rapids, R.O. Whitesell 616-942-5420
Mich Southfield, R.O. Whitesell 313-559-5454
Minn St. Joseph, R.O. Whitesell 616-983-7337
Minn Minneapolis, J.G. Twist Co. 612-854-4600
Mo St. Louis, J. G. Twist 314-432-2830
Neb Lincoln, John G. Twist Co. 402-474-5151
NJ West Orange, E-F Technical Sls 201-731-7203
NY Albany, H.C. Johnson Agencies 518-456-6667
NY Buffalo, H. C. Johnson Agencies 716-632-7880
NY Dix Hills, K & J Engrg. 516-242-0888
NY Fayetteville, H. C. Johnson Agencies 315-637-9383
NY Huntington Station, E-F Technical Sls 516-549-1818
NY Rochester, H. C. Johnson Agencies 716-482-3000
NC Winston-Salem, Macro-Mktg. Assoc. 919-788-8146
Ohio Cincinnati, R.O. Whitesell 513-521-2290
Ohio Columbus, R.O. Whitesell 614-888-9396
Ohio Dayton, R.O. Whitesell 513-298-9546
Ohio Middle-Burg Hts., R.O. Whitesell 216-826-4424
Pa Pittsburgh, R.O. Whitesell 412-344-7277
Tenn Greeneville, R. O. Whitesell 615-639-6154
Tex Dallas, J & R Assocs. 214-348-5752
Wash Seattle, J. B. Jolly 206-938-4166
Wisc Wauwatosa, J. G. Twist 414-475-7755

CERMETEK, INC., Dept. EM, 660 National Ave., Mountain View, Cal. 94040, Tel: 415-969-9433, TWX: 910-379-6931; Empl.: 110

Sales Manager: G. Meadows

Local Sales Offices & Reps.
Ariz Glendale, Nakoma 602-931-9103
Cal Costa Mesa, Relcom 714-549-3674
Cal Marina Del Rey, Relcom 213-822-1187
Conn North Haven, Kitchen & Kutchin, Inc. 203-239-0212
Fla Clearwater, Brennan Assocs. 813-446-5006
Ill Chicago, I.R.I. 312-647-7755
La Kenner, Cunningham Co. 504-722-2217
Mass Lexington, Kitchen & Kutchin Inc. 617-862-8230
Mich Southfield, R. C. Nordstrom, & Co. 313-559-7373
Mich St. Joseph, R. C. Nordstrom & Co. 616-429-8560
Minn Minneapolis, Jos Co/Melius, Inc. 612-854-4270
NJ Clifton, Compar New York 201-546-3660
NM Albuquerque, Tritronix/Albuquerque 505-265-8400
Ohio Cleveland, Marlow Assocs 216-991-6500
Ohio West Carrollton, Marlow Assocs 513-866-4991
Pa King of Prussia, Rivco, Inc. 215-265-5211
Pa Pittsburgh, Marlow Assocs 412-831-6113
Tex Dallas, Cunningham Co. 214-233-4303
Tex Houston, Cunningham Co. 713-461-4197
Va Arlington, H. J. Heffernan Co. 703-522-6666
Wisc Milwaukee, I.R.I. 414-259-0966
Exp: Palo Alto, Ca. (Headquarters), Western Int. Trade Corp. 415-321-1240

CGTI, Dept. EM, 2 Windward Ave., White Plains, N.Y. 10605, Tel: 914-949-3719, TWX: 710-568-1305; Empl.: 270

Sales Manager: G.N. Snider

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CHAFITZ ENGINEERING, Dept. EM, P.O. Box 2188, Rockville, Md. 20852; Empl.: 60

Local Sales Offices & Reps.
Md Rockville, Chafitz, Inc. 301-340-0200

CHANNEL INDS., Dept. EM, 839 Ward Dr., Santa Barbara, Cal. 93111, Tel: 805-967-0171, Telex: 658-427; Empl.: 75

Local Sales Offices & Reps.
Ohio Chagrin Falls, Channel Prods. 216-543-8137

CHANNEL MASTER DIV. AVNET, Dept. EM, Rte. 209, Ellenville, N.Y. 12428, Tel: 914-647-5000; Empl.: 1000

CHANNELLOCK

CHANNELLOCK, INC., Dept. EM, 1306 S. Main St., Meadville, Pa. 16335, Tel: 814-724-8700; Empl.: 565 p. 4287

Sales Manager: B. DeArment Jr.

Local Sales Offices & Reps.
Cal Alhambra, J.J. Brown Co. 213-283-1322
Cal S. San Francisco, J.J. Brown Co. 415-589-5775
Colo Parker, Western Ind'l. Sls. & Svcs. Co. 303-841-4310
Fla Ft. Lauderdale, G.A. Palmer 305-764-3487
Ga Decatur, J.C. Lyle & Assocs. 404-378-5691
Ill Elmhurst, Muzzy & Peters 312-833-0166
Ind Jeffersonville, Charles Clinard Co. 812-283-0955
Mass Wellesley, T. Sawyer Sls. Co. 617-235-2667
Mich Detroit, Wixson-Nehls Co. 313-871-8815
Minn Minneapolis, Witta Sls. Co. 612-835-5818
Mo Kansas City, Pedersen Brothers & Assocs 816-444-5330
NJ Summit, A.P. Henricks Co., Inc. 201-273-0555
Ohio Cleveland, H.W. Murray Co., Inc. 216-333-2977
Pa Broomall, A.P. Henricks Co., Inc. 215-583-3921
Pa Pittsburgh, E.D. McGinley 412-561-7979
Tex Dallas, Lynn & Hemphill, Inc. 214-747-4745
Va Richmond, D. Miller & Assocs. 804-262-1000
Wash Graham (Tacoma), Geo. R. Sullivan Co. 206-847-1734
Exp: Ind., South Bend, United Export Corp. 219-232-8286

CHARTPAK, A Times Mirror Co., Dept. EM, 1 River Rd., Leeds, Mass. 01053, Tel: 413-584-5446; Empl.: 165

CHASSIS-TRAK, DIV., General Devices Co., Inc., Dept. EM, 525 S. Webster Ave., Indianapolis, Ind. 46219, Tel: 317-897-7000, Telex: 27-2169; Empl.: 125 p. 1032,1033

Sales Manager: H. L. Crouch

Local Sales Offices & Reps.
Ala Huntsville, International Sci. Instr. 205-533-6880
Ariz Scottsdale, Schoeffler Assoc. 602-959-3011
Cal Downey, Groh Assocs 213-923-0963
Cal Mtn. View, G. Woempner Co. 415-964-5454
Cal Van Nuys, J. Thomas 213-782-3820
Colo Sedalia, Jensen Reps. 303-688-4154
Conn West Haven, Coakley, Boyd & Abbett 617-444-5470
Fla North Miami, J. Krutek & Assoc. 305-941-6544
Fla Tampa, J. Krutek & Assoc. 305-941-6544
Ind Indianapolis, Techn Rep. 317-849-6454
Kans Shawnee Mission, Lowell, Kangas & Assoc. 913-631-3515
Md Bethesda, G. Rosen Assocs., Inc. 301-530-8448
Mass Needham, Coakley, Boyd & Abbett, Inc. 617-444-5470
Mich Dearborn, Pitcher Poulin 313-582-5450
Minn St. Paul, Northport Engineering 612-698-3841
Mo St. Louis, Lowell, Kangas & Assocs. 314-821-4050
NJ Mountainside, Henry G. Richter 201-233-4615
NM Albuquerque, Hawk Enterprises 505-265-0200
NY Fayetteville, H.G. Richter Inc. 315-637-6713
Ohio Cincinnati, Components, Inc. 513-721-2997
Ohio Cleveland, Components, Inc. 216-842-2737
Tex Dallas, Advance Techn Sls 214-361-8584
Tex Houston, Advance Techn Sls. 713-569-6668
Utah Taylorville, Jensen Reps 301-487-2611
Wash Olympia, Bergford Assoc. 206-866-2001
Exp: Ind., Indianapolis, General Devices Co. 317-359-5407

CHATILLON JOHN & SONS, Dept. EM, 83-30 Kew Gardens Rd., Kew Gardens, N.Y. 11415, Tel: 212-847-5000; Empl.: 135

CHATSWORTH DATA CORP, Cablemaster Div., Dept. EM, 20710 Lassen St., Chatsworth, Cal 91311, Tel: 213-341-9200 p. 2680

Sales Manager: Hank Boehm

Local Sales Offices & Reps.
Md Silver Spring, A.R.A. Electronics 301-565-2585
Mass Waltham, W. M. Hague Co 617-899-5600
Mich Detroit, Triad Assoc. 313-779-3491
Ohio Cleveland, Triad Assoc. 216-248-3350
Pa Glenside, A.R.A. Electronics 215-887-5250
Tex Richardson, O & O Sales Co. 214-231-9585
Va Richmond, A.R.A. Electronics 804-285-9309
Wash Lynnwood, System Specialists 206-775-6603

CHATSWORTH DATA CORP, Impact-o-Graph Div., Dept. EM, 20710 Lassen St., Chatsworth, Cal. 91311, Tel: 213-341-3000 p. 2680

CHEMCUT CORP., Dept. EM, 500 Science Pk., State College, Pa. 16801, Tel: 814-238-0514, Telex: 842-555; Empl.: 186

Sales Manager: K. Lutz

Local Sales Offices & Reps.
Cal Anaheim, Chemcut Corp., Western Dist. Office 714-630-1700
Cal San Francisco, Chemcut Corp. 408-244-8826
Ill Elk Grove Village, Chemcut Corp. 312-593-2833

CHEMICAL ETCHING EQUIP. & SUPPLY, Dept. EM, 6905 Beulah St, Alexandria, Va. 22310, Tel: 703-971-2646; Empl.: 5

CHEMPLAST, INC., Dept. EM, 31-150 Dey Rd., Wayne, N.J. 07470, Tel: 201-696-4700, TWX: 710-988-5834; Empl.: 285

Sales Manager: Miles Powell, Jr. - Exec. VP

Local Sales Offices & Reps.

Ariz Phoenix, Chemplast-West, S. Margoles 213-786-8866
Cal Northridge, M.V. Woldanski 213-360-7798
Cal Van Nuys, Chemplast-West 213-786-8866
Colo Denver, Chemplast-West, S. Margoles 213-786-8866
Conn Killingworth, W.C. Thompson 203-663-1827
Fla Vero Beach, J.D. Rule 305-589-5357
Ga Stone Mountain, R.J. Parker Co. 404-939-5030
Ill Franklin Pk., W. Cogger 312-671-0099
Kans Wichita, Regal Plastic & Sup. 316-263-1211
Md Pasadena, P.J. Simard 301-437-0855
Mass Acton, P. Moles 617-897-9311
Minn Minneapolis, Richard Hillblom..... 312-671-0099
Mo Kansas City, Regal Plastic & Sup. Co. 816-471-6390
Mo St. Louis, J.A. Crowe 314-842-1353
Neb Omaha, Regal Plastic & Sup. Co. 402-344-4446
NJ Mount Holly, J.T. Anderson 609-267-6902
NJ Waldwick, O.R. Strauch 201-447-5762
NY New Hyde Park, J.J. Hagmaier.. 516-742-0524
Ohio Geneva 216-466-1567
Tenn Oak Ridge, I & I Inc. 615-483-8581
Tex Dallas, Kolster 214-233-4158
Utah Salt Lake City, Chemplast-West, S. Margoles 213-786-8866
Wash Seattle, Chemplast-West, S. Margoles 213-786-8866
Exp: Wayne, N.J., H. Hamilton 201-696-4700

CHEMTRONICS, INC., Dept. EM, 45 Hoffman Ave., Hauppauge, N.Y. 11787, Tel: 516-582-3322; Empl.: 23

Sales Manager: L. Friedman

Local Sales Offices & Reps.

Ala Alabaster, Rohr-Wanger Sls 205-663-2784
Cal Burlingame, Wm. J. Purdy Co. .. 415-347-7701
Cal Los Angeles, Erlanger Sls. Co. 213-RE 1-2238
Colo Denver, W. J. Purdy Co..... 303-777-1411
Ill Chicago, Markal Sls. Corp. 312-282-5800
Ind Mulberry, Maish Sls..... 317-296-2322
Mass N. Scituate, W.A. Hendrickson .. 617-545-0652
Minn Minneapolis, Nor-Centronix 612-845-8494
Mo Raytown, Taraski Sls. Corp. 816-358-4590
NM Albuquerque, W. J. Purdy Co. 505-266-7959
NY Grand Island, L.J. McTaggart Assoc. 716-773-9222
Ohio St. Mary's, Repptronics 419-394-4724
Pa Pittsburgh, Repptronics..... 412-561-4687
SC Rock Hill, Rohr-Wanger Sls..... 803-366-9353
Tex Richardson, Willoughby-Fowler Co. 214-235-3664
Wash Seattle, Fleehart & Sullivan 206-LA 2-1533
Exp: Westbury, Minthorne Intl..... 516-334-3303

CHERRY ELECTRICAL PRODS. CORP., Dept. EM, 3623 Sunset Ave., Waukegan, Ill. 60085, Tel: 312-689-7700, TWX: 910-235-1572; Empl.: 1250 p. 4014,4015

Sales Manager: Peter Barthell; *Distributor Manager:* Donald Galbo

Local Sales Offices & Reps.

Ala Huntsville, Powertronics, Inc. 205-852-6347
Ariz Glendale, O'Donnell Assoc. SW 602-938-3120
Cal Palo Alto, Abbott Engrg 415-968-2265
Cal Torrance, O'Donnell Assoc..... 213-328-9710
Colo Boulder, Front Range Mktg 303-433-4780
Conn Meridan, Electro Prod. Sls 203-235-4040
Fla Ft. Lauderdale, CBC Electronics Inc. 305-484-7330
Fla Longwood, CBC Elctrns 305-831-5380
Ill Glen Ellyn, Rockford Controls Co. 312-469-6016
Ind Ft. Wayne, Menze Sls, Inc. 219-747-5616
Iowa Cedar Rapids, Dy-Tronix 319-377-8275
Me Waltham, Electro Products..... 617-899-1570
Mich Farmington, Miltimore Sls, Inc. .. 313-476-2446
Mich Grand Rapids, Multimore Sls. 616-942-9721
Mich Troy, McPhail Corp. 313-689-6444
Minn St. Paul, Cahill Assoc., inc. 612-646-7217
Mo Hazelwood, Dy-Tronix, Inc. 314-731-5799
Mo Independence, Dy-Tronix 816-373-6600
NJ Ft. Lee, Sydney-Justin Assoc. 201-947-4371
NJ Pitman, Colrud Corp..... 609-589-5866
NM Albuquerque, IMEC 505-883-9010
NY Rochester, Elcom Sales, Inc..... 716-385-1400
NY Syracuse, Elcom Sls. 315-463-4638
NC Winston Salem, Powertronics Inc. 919-765-6539
Ore Portland, Jas. J. Bacher Co. 503-297-3776
Ore Salem, Jas. J. Bacher..... 503-362-0717
SC Greenville, Powertronics, Inc..... 803-288-0270
Tex Dallas, Ion Assoc., Inc. 214-357-9441
Tex Houston, ION Assocs 713-461-5311
Wash Seattle, Jas. J. Bacher 206-285-1300
Wisc Wauwatosa, Larsen Assoc.,..... 414-258-0529

Local Distributors

Ala Birmingham, Ack Radio 205-322-0588
Cal Chatsworth, Westates Elctrns. Corp. 213-341-4411
Cal Costa Mesa, Westates Electronics Corp. 714-549-8401
Cal San Diego, Westates Elec. Corp. 714-292-5693
Cal Sunnyvale, Westates Elec. Co. .. 408-744-1555
Colo Denver, Denver Wintronics..... 303-934-2406
Colo Denver, Integrated Elec. Co. 303-534-6121
Fla Ft. Lauderdale, K.S.M. 305-739-5888
Fla Miami, K.S.M. 305-949-7060
Fla Miami, ESL Elctrn. Distrs..... 305-633-6973
Ga Atlanta, Ack Radio Supply 404-351-6340
Ill Champaign, Klaus Radio 217-356-1896
Ill Elk Grove Village, Diplomat/Lakeland 312-595-1000
Ill Palatine, OHM Elctrns. 312-359-5500
Ind Indianapolis, Ra-Dis-Co..... 317-637-5571
Ind South Bend, Genesis Elctrns. 219-287-2911
Iowa Cedar Rapids, Advent Elctrn 319-363-0221
Kans Kansas City, C. Tennant Sons & Co., 913-287-2100
Ky Louisville, P.I. Burks Co..... 502-589-3960
Md Savage, Pyttronic Ind. 301-792-7000
Mass W. Newton, A. W. Mayer 617-965-1111
Mich Livonia, Rep-Tron Elctrns. 313-525-2700
Mo St. Charles, Lectronix Inc. 314-946-6424
NY Mt. Vernon, QAR Ind'l. Elctrn. Sls. 914-699-2224
NY Rochester, Rochester Radio Supply Co. 716-454-7800
NY Woodbury, C. Tennant Sons & Co. 516-364-9070
Ohio Cleveland, Selectronics 216-621-5080
Ohio Dayton, Esco Inc..... 513-226-1133
Okla Tulsa, Radio Inc. 918-587-9123
Ore Portland, Tekelectric Control Co. 503-246-5451
Pa Philadelphia, Herbach & Rademan 215-426-1700
Tex Dallas, Solid State Elctrns. So... 214-352-2601
Tex Dallas, Component Spec..... 214-357-6511
Tex Denison, Denison Radio Supply 214-465-2336
Tex San Antonio, Sherman Elctrns. Supply 512-224-1004
Tex Stafford, Southwest Elctrns. 713-491-4900
Utah Salt Lake City, Standard Supply Co. 801-486-3371
Wash Seattle, Interface Elctrns. 206-575-3630
Wash Seattle, Radar Elec. Co..... 206-282-2511
Wisc New Berlin, B.W. Elec. 414-784-4420
Wyo Cheyenne, Houge Radio & Supply 307-632-6474
For: Can., Edmonton, Alb., Bowtek Elec Co., Ltd. 403-426-1072
For: Can, London, Ont, C.M. Peterson 519-434-3204
For: Can, Vancouver, B.C., Bowtek Elec. Co., Ltd. 604-736-1141
For: Can., Winnipeg, Man., Bowtek Elec Co., Ltd. 204-786-7521

CHERRY FASTENERS, Townsend Div. Textron Inc., Dept. EM, Box 2157, Santa Ana, Cal. 92707, Tel: 714-545-5511, TWX: 678431, 910-595-1500; FSC No.: 11815; Empl.: 850

CHERRY SEMICONDUCTOR CORP, Dept. EM, 99 Bald Hill Rd., Cranston, RI 02920, Tel: 401-463-6000, TWX: 710-381-1757; Empl.: 175

Local Sales Offices & Reps.

Ala Huntsville, 20th Century Mktg 205-772-2194
Ariz Glendale, O'Donnell Assocs SW 602-938-3120
Cal Palo Alto, Abbott Engrg 415-968-2265
Cal San Diego, The Rep Co. 714-292-9001
Cal Torrance, O'Donnell Assocs 213-328-9710
Colo Littleton, Component Sales 303-773-8643
Fla Ft. Lauderdale, CBC Elctrns 305-484-7330
Ill Chicago, M & S Sls. Co. 312-992-1053
Ind Ft. Wayne, Menze Sls..... 219-747-5616
Kans Shawnee Mission, Florence & Meyer 913-722-5210
Mass Westboro, Technical Mktg. Svcs. Co. 617-366-8462
Mich Ann Arbor, O-M Sls. Inc. 313-973-9450
Minn St. Paul, Cahill Assocs 612-646-7217
Mo Kirkwood, Florence & Meyer 314-822-2629
NJ Pitman, Colrud Corp 609-589-5866
NY Hempstead, Kahgan Sls. Corp... 516-538-2
NY Rochester, Elcom Sls 716-385-1
NC Winston-Salem, Powertronics 919-765-6
Tex Dallas, ION Assocs 214-357-9
Tex Houston, ION Assocs 713-461-5
Wash Seattle, Jas. J. Backer Co..... 206-285-1

CHESTER CABLE, Dept. EM, Oakland Ave., Che N.Y. 10918, Tel: 914-469-2141; Empl.: 450

Local Sales Offices & Reps.

Cal Hunting Beach, Damco 714-894-
Colo Denver, E O Sls..... 303-778-
Conn New Haven, Phil Orzell 203-453-
Ga Atlanta, Measurement & Control 404-321-
Ill Schaumburg, Doris Arnesen 312-843-
Ky Ft Mitchell, G.W. Thelen..... 606-341-
Me Yarmouth, Raymond M Alden 207-774-
Md Baltimore, R A Wafer Assocs 301-744-
Mass Brockton, Forsberg Sls..... 617-522-
Mich Sherwood, Ken Wyant 517-741-
Minn Minneapolis, Kurschner Industrial Sls 612-374-
Mo Maryland Hghts, DF Adams..... 314-567-
NY Brooklyn, Joseph Coury 212-687-
NY Great Neck, Cooper Simon & Co 516-487-
NY Syracuse, Sutton Agency..... 315-471-
Ohio Ashland, Joe Lewis Sales Co 419-322-
Ohio Medina, GW Thelen..... 216-723-
Ore Portland, Elec Cable Consit & Design 503-620-
Pa Emmaus, Robert W Stevens 215-434-
SC Columbia, G E Younginer & Assoc 803-772-
Tex Houston, Barry Sls 713-784-
Tex Richardson, Barry Sls..... 214-234-

CHESTERFIELD PRODS. INC., Dept. EM, Victor St., Saddle Brook, N.J. 07662, 201-845-6886; Empl.: 27 ..... p.

Sales Manager: M. Perry

Local Sales Offices & Reps.

Cal Mission Viejo, E.B. Hoin Assoc .. 714-586-
Cal Palo Alto, J M Assocs. 415-327-
Fla Coral Springs, H.A., Inc..... 305-752-
Ill Chicago, K. W. Meyers Co. 312-774-
Ind Indianapolis, K. W. Meyers Co... 317-243-
Md Edgewater, Commart, Inc. 301-261-
Mass Stoneham, Ken Corp. 617-438-
Minn Minneapolis, K. W. Meyers Co... 612-920-
NJ Saddle Brook, L&M Assocs. 201-843-
NY New York City, L & M Assocs.. 212-243-
Pa Andalusia, L & M Assocs. 215-639-
Tex Dallas, Bradenco 214-243-
Tex Houston, Bradenco 713-529-
Exp: Teaneck, NJ, Sylvan Ginsbury Ltd. 201-837-

CHICAGO LOCK CO., Dept. EM, 4311 W. Be Ave., Chicago, Ill. 60641, Tel: 312-282-7177, 25-4055; Empl.: 408 ..... p.

CHICAGO MINIATURE/DRA

GENERAL INSTRUMENT COMPANIES

CHICAGO MINIATURE/DRAKE, Dept. EM, 4 Ravenswood Ave., Chicago, Ill. 60640, 312-784-1020, TWX: 910-221-5445; FSC No.: 7 Empl.: 590 ..... p. 2467

Sales Manager: J.F. Flanagan

Local Sales Offices & Reps.

Ala Huntsville, Electro Mech. 205-883-
Ariz Phoenix, Howe & Howe Sls., Inc. 602-264-
Cal N. Hollywood, Chicago Miniature 213-877-
Cal Sunnyvale, CMLW..... 408-733-
Colo Denver, Lindberg Co. 303-758-
Conn Middletown, Gerber Sls 203-347-
Conn Newtown, Gerber Sls. Corp. 203-426-
Conn Old Saybrook, Gerber Sls..... 203-388-
Fla Altamonte Springs, "C" Assocs 305-831-
Fla Hollywood, "C" Associates 305-922-
Ga Atlanta, Electro-Mech Sls. Engrg. Co. 404-449-
Ind Ft. Wayne, Tech Representatives 219-484-
Ind Indianapolis, Tech. Reprs. 317-845-
Iowa Cedar Rapids, Dy-Tronix Inc..... 319-377-
Ky Louisville, Tech. Reps. 502-451-
Mass East Longmeadow, Gerber Sls. Corp. 413-525-
Mass Waltham, Gerber Sls. Corp..... 617-899-
Mich Detroit, Rathsburg Assoc. 313-881-
Minn Minneapolis, Nortec Sls..... 612-831-
Mo Hazelwood, Dy-Tronix Inc. 314-731-

Io Independence, Dy-Tronix Inc..... 816-373-6600
J Boonton, TMA 201-263-2946
J Cherry Hill, Trinkle Sls., Inc. 609-795-4200
M Albuquerque, Lindberg Co..... 505-881-1006
Y Buffalo, L.D. Allen, Inc. 716-837-1955
Y Fairport, L.D. Allen Inc..... 716-377-3530
Y N. Syracuse, L.D. Allen, Inc. 315-458-7470
Y Pleasant Valley, L.D. Allen Inc.. 914-635-3363
Y Port Washington, T.M.A. 516-883-2432
C Raleigh, Electro-Mech Sls. Engrg. Co. 919-782-7586
hio St. Marys, T. Shelby & Co. 419-394-3377
re Portland, J.J. Backer Co. 503-297-3776
re Salem, J.J. Backer Co. 503-362-0717
enn Nashville, Electro-Mech. Sls. Engrg. Co. 615-256-2516
ex Dallas, Electra Reps. Inc. 214-387-3594
tah Salt Lake City, Lindberg Co. 801-534-1500
Vash Seattle, J.J. Backer Co. 206-285-1300
xp: Chicago, Ill., Chicago Miniature .. 312-784-1020

CAGO SWITCH, INC., Dept. EM, 1714 N. Damen, hicago, Ill. 60647, Tel: 312-489-5500, TWX: '0-221-5252; Empl.: 200 ..... p. 4016,4017

ales Manager: E. Petersen; *Distributor Manager:* P. ardanier

ocal Sales Offices & Reps.

a Huntsville, JHU Assocs. 205-536-7455
iz Phoenix, Cleveland Entr. 602-944-4679
al Palo Alto, O'Donnell Assoc..... 415-327-9260
al San Diego, Van Gott & Assoc. .. 714-272-8452
al San Gabriel, V. Gott & Assoc..... 213-285-2148
olo Englewood, Elcom Inc. 303-770-4400
onn Bethany, Reps. Corp. 203-393-0024
a Ft. Lauderdale, Electrocomp Assocs. 305-491-4141
a Atlanta, Jhu Assoc. 404-394-9711
Wooddale, Utronix Sls 312-766-1700
d Ft. Wayne, Technical Reps 219-484-1432
d Indianapolis, Tech. Reps. 317-849-6454
wa Cedar Rapids, BC Elctrn Sls 319-393-5818
ms Olathe, BC Elctrn Sls 913-888-6680
Louisville, Technical Reps 502-451-9818
ass Wellesley, Reps. Corp. 617-237-6476
ch Farmington, Carter, McCormic & Peirce 313-477-7700
ch Southfield, Kingsley Assoc. 313-424-8181
nn Minneapolis, Siedare Assoc. 612-545-5663
) Hazelwood, BC Elctrn Sls 314-731-1255
Mountain Lakes, Comps. Elctrns. 201-334-2921
S. Orange, S. Simberkoff Assoc. 201-763-7900
M Albuquerque, Cleveland Entr. 505-266-5594
' Rochester, L-Mar Assoc. 716-328-5240
: Candler, Jhu Assoc. 704-255-0157
lio Cleveland, IM Tech. 216-826-3400
e Portland, Components West 503-643-5588
Ardmore, Manreps..... 215-649-6300
x Dallas, Erickson Sls 214-243-6611
k Sugarland, Erickson Sls 713-494-9680
ah Salt Lake City, Elcom Inc. 801-532-7940
ash Seattle, Components West 206-243-2133

cal Distributors

Huntsville, Powell Elctrns 205-539-2731
l Burlingame, Rose Elctrns. 415-348-2740
l Los Angeles, Mil-Comm 213-478-0525
l Mountain View, Powell Elctrns.... 415-964-0820
lo Englewood, Industrial Elctrns. 303-771-2636
Ft Lauderdale, Peerless Radio.. 305-566-5966
Miami Springs, Powell Elctrns 305-592-3260
w Honolulu, Industrial Elctrns. 808-533-6096
Chicago, Bell Industries 312-982-9210
Ft. Wayne, Ft. Wayne Elctrns 219-423-3422
Beltsville, Powell Elctrns..... 301-937-4030
h Farmington, CMP Distrs..... 313-477-7700
n Minneapolis, Joel Co. 612-545-5669
Hudson, C & H Elctrns. 603-882-1133
Albuquerque, Intl Elec. 505-265-6453
Mt. Vernon, Qar Indl. Elect. 914-699-2224
Port Washington, Connector Concepts Corp. 516-883-3800
Utica, Mohawk Scientific..... 315-732-6042
lo Cleveland, CMP Distrs..... 216-779-5100
lo Dayton, Esco Elctrns..... 513-226-1133
lo Dayton, CMP Distrs. 513-278-5873
Monroeville, CMP Distrs. 412-372-4415
Philadelphia, Powell Elctrns 215-365-1900
Austin, Galtronics, Inc. 512-452-5773
Dallas, Powell Elctrns..... 214-350-4186
El Paso, Intl Elec. 915-778-9761
c Elm Grove, Bell Industries 414-784-0235

CHOMERICS, INC., Dept. EM, 77 Dragon Court, Woburn, Mass. 01801, Tel: 617-935-4850, TWX: 710-393-0173; Empl.: 90 ..... p. 4019

Sales Manager: K. Dunn

Local Sales Offices & Reps.

COMPONENT

Cal Burlingame, J. Logan 415-697-6100
Cal Culver City, Bestronics Inc. 213-870-9191
Cal San Mateo, Chromerics 415-349-7743
Colo Westminster, Straube Assocs..... 303-426-0890
Fla Orlando, Perrott Assocs. 305-275-1132
Ind Greenwood, Valentine & Assocs. 317-888-2260
Mass Andover, R. Purinton Inc. 617-475-7055
Mich Brighton, SAI Mktg Corp. 313-227-1786
Minn Minneapolis, Comstrand Inc..... 612-571-0000
NM Albuquerque, Straube Assocs. .. 505-265-7759
NY Manhasset, Win-Cor Elctrn. Sls.. 516-627-9474
Ohio Dayton, SAI Mktg Corp. 513-435-3180
Pa Philadelphia, P.S.A. Inc. 215-355-6244
Tex Dallas, J. Clay Co. 214-350-1281
Tex Dallas, J. Clay Co. 214-350-1281
Tex Houston, J. Clay Co..... 713-367-2292
Utah Salt Lake City, Straube Assocs. 801-322-1828

RFI Shielding

Ariz Tempe, Gassner & Clark Co. 6-2-968-9037
Cal Belmont, Lo-Dan, Inc. 415-592-4600
Cal Los Angeles, El-Com, Inc. 213-223-1351
Cal San Mateo, Chromerics 415-349-7743
Fla Fern Park, Blair Engrg. 305-834-1244
Ill Skokie, Mar-Con Assoc. 312-675-6450
Ind Greenwood, Valentine & Assocs. 317-888-2260
Md Rockville, Mechtronics Sls., Inc. 301-340-2130
Mass Andover, R. Purinton Inc. 617-475-7055
Minn Minneapolis, Comstrand Inc..... 612-571-0000
NY Manhasset, Win-Cor Elctrn. Sls. 516-627-9474
Ohio Akron, Augnat Assocs. 216-239-1621
Okla Tulsa, Blair Engrg. 918-633-9850
Ore Portland, Houston Co..... 503-235-4174
Pa Philadelphia, P.S.A. Inc. 215-355-6244
Tex Dallas, Blair Engrg. 214-352-8411
Tex Houston, Blair Engrg. 713-772-0677
Wash Seattle, Houston 206-622-0750

Local Distributors

Cal Los Angeles, El-Com 213-223-1351

CHRISTIE ELEC., Dept. EM, 3404A W. 67th St., Los Angeles, Cal. 90043, Tel: 213-750-1151, TWX: 910-321-3867; FSC No.: 02294; Empl.: 120 p. 3220-3223

Local Sales Offices & Reps.

Cal Santa Clara, Thomas-Hartman Assoc. 408-988-4484
Fla Orlando, Newco & Assocs. 305-422-7700
Md Rockville, L. White..... 301-770-6556
NJ Englewood Cliffs, Power Conversion & Control 201-569-0015
Tex Richardson, C. Tinch..... 214-231-1322
Exp: Cal., L.A., Trans-World Trade 213-472-0444

CHRONO-LOG CORP., Dept. EM, 2 W. Park Rd., Havertown, Pa. 19083, Tel: 215-853-1130; Empl.: 16 p. 1391

Local Sales Offices & Reps.

Exp: Mass., Medway, Surel, Int'l..... 617-533-2041

CIMCO WIRE & CABLE, INC., Dept. EM, 250 W. Crescent Ave., Allendale, N.J. 07401, Tel: 201-327-2522, Telex: 13-3443; Empl.: 87

Local Sales Offices & Reps.

Cal Chatsworth, Cal-Ward Sls. Co.. 213-885-1771
Cal San Francisco, Pacific Signal 415-397-5995
Fla Orlando, Royce Elctrn. Sls., Inc. 305-843-6030
Ill Chicago, Kennedy Engrg. 312-631-8283
Mass Weston, F.C. Talbot Co..... 617-893-6877
Mich Birmingham, Forand Sls. Co..... 313-644-0087
Minn Minneapolis, Luse & Assocs 612-884-8698
Mo Kansas City, F.P. Williams & Assocs 816-471-8656
NJ Ho-Ho-Kus, J.F. Ryan Sls 201-652-1178
NY East Syracuse, Mac-Tron Sls. & Engrg. Co. 315-422-2425
NC Winston-Salem, Mars Elctrn Comps & Material 919-768-0671
Ohio Cincinnati, F.J. Campisano Co.... 513-662-1616
Pa Radnor, Cordray Sales Co. 215-687-1366
Tex Richardson, Campion Sls. Co..... 214-238-8145
Wash Bellevue, J. Findlay Co. 206-454-5200

CINCH, See TRW Cinch

CINCINNATI MILACRON, Molded Plastics Division, Dept. EM, P.O. Box 246, Blanchester, Ohio 45107, Tel: 513-783-2464, Telex: 21-4472; Empl.: 10000

Sales Manager: C. Shilling

Local Sales Offices & Reps.

Cal San Francisco, R.L. Voyles 213-582-8361
Colo Denver, Omega Ltd. 303-758-1508
Conn Bloomfield, E. Ferrara..... 203-243-1741
Ga Lilburn, C. Little 404-923-9500
Ill Chicago, Electro-Comp. Sls., Inc. 312-297-1455
Ind Ft. Wayne, P. Kilfoil..... 219-424-7719
Minn Minneapolis, M. Franklin..... 612-927-4361
Ohio Cincinnati, J.F. Kilfoil Co. 513-791-6150
Ohio No. Canton, J. Kirkendall 216-821-7420
Pa Devon, R. Myers 215-688-5700
Tex Hurst, G.V. Peck Co..... 214-351-4210

CINCINNATI SUB-ZERO PRODUCTS, Dept. EM, 2612 Gilbert Ave., Cincinnati, Ohio 45206, Tel: 513-751-8810; Empl.: 50 ..... p. 2571

Sales Manager: G. E. Eshliman

CIRQTEL INCORPORATED

CIR-Q-TEL, INC., Dept. EM, 10504 Wheatley St., Kensington, Md. 20795, Tel: 301-946-1800; Empl.: 27

CIRCON CORP., Dept. EM, 749 Ward Drive, Santa Barbara, Cal. 93111, Tel: 805-967-0404, Telex: 674-666; Empl.: 45

Sales Manager: W. J. Colahan

Local Sales Offices & Reps.

Ariz Phoenix, Jensen Tools & Alloys 602-959-2210
Cal Marina Del Ray, H.L.C. Assocs.. 213-823-8424
Fla Altamonte Springs, SPD Assocs 305-831-8667
Fla Miami, Elctrn. Equip. 305-871-3500
Iowa Des Moines, Midwest Surgical.... 515-287-4653
Md Rockville, Research Technology Corp. 301-881-5780
Mass Framingham, DLG Assocs.
Mass Sudbury, DLG Assocs. 617-877-7880
Minn Minneapolis, North Central Instrs 612-545-8111
NM Albuquerque, Southwestern Engrg. & Equip. Co. 505-265-6775
NY Binghamton, Stack Ind'l. Elctrns. 607-723-6326
NY Hempstead, Davis Elctrns..... 516-483-9200
NY Huntington Station, Sigma Comms. Assocs. 516-293-3737
Ohio Cleveland, Harvey Teplitz & Co. 216-486-2800
Ohio Dayton, Harvey Teplitz & Co. 513-277-6531
Pa Feasterville, H. Mann 215-355-7200
Pa Plymouth Meeting, Techni-Tool .. 215-825-4990
Tenn Nashville, Specialty Surgical Instrumentation 615-259-2233
Tex Dallas, Southwestern Engrg. & Equip. Co. 214-692-8097
Tex Houston, Southwestern Engrg. & Equip. Co. 713-461-5669

CIRCUIT ASSEMBLY CORP., Dept. EM, 3169 Red Hill Ave., Costa Mesa, Cal. 92626, Tel: 714-540-5490, TWX: 910-595-1971; FSC No.: 52072; Empl.: 275

Local Sales Offices & Reps.

Ala Birmingham, Nickerson Corp 205-854-6330
Ariz Scottsdale, Arcom Sls. 602-947-5745
Cal San Diego, L & S Assocs. 714-455-0055
Cal Santa Barbara, Scarab..... 805-965-1487
Cal Santa Clara, Mann Elctrns. 408-988-6061
Colo Parker, Technology Mktg. 303-841-3435
Conn Wallingford, Con Sales..... 203-269-7964
Fla Fort Lauderdale, Tech-Rep Assocs. 305-792-0962
Fla Indian Rocks Beach, Tech-Rep Assocs. 813-595-2834
Fla Largo, Tech Rep. Assocs. 813-595-2834
Ill Arlington Heights, Delta Tech. Sls. 312-253-9440
Iowa Cedar Rapids, Lorenz Sls. 319-393-6912
Mass Waltham, Con Sales..... 617-890-0011
Mich Birmingham, Favco Technical Sls 313-664-0173
Minn Osseo, Denny Gaffney Co. 612-425-5484
Mo St. Louis, Harris-Hanson Co. 314-432-3611
NJ Haddonfield, TAI Corp 609-854-3011
NJ Westwood, R. C. Assocs..... 201-664-1241
NM Albuquerque, Technology Mktg. 505-298-2415
NC Kannapolis, Nickerson Corp. 704-932-6772
Pa Birchrunville, Jade Elctrns 215-647-5151
Tex Dallas, P. J. Scanlon Co 214-231-4661
Utah Salt Lake City, Technology Mktg. 801-485-9381
Wash Bellevue, Mann Northwest 206-747-9405
Exp: Los Angeles, Product Supply..... 213-659-1858

Local Distributors

Ala Huntsville, Chase Elctrns
Ariz Phoenix, Tri-Tek..... 601-995-5352
Ariz Tempe, Circuit Specialist 602-966-0764

Cal Burlingame, Rose Elctrns. 415-348-2740
Cal San Diego, Intercon..... 714-292-5901
Cal Santa Ana, Mann Sw 714-558-3202
Cal Santa Clara, Mann Elctrns. 408-246-9393
Colo Parker, Technology Mktg. 303-841-3435
Fla Miami, Electronic Equip. 305-891-3500
Ill Champaign, Klaus Radio 217-356-1896
Ill Des Plaines, Edmar Elctrns. 312-298-8580
Ill Elk Grove Village, Hallmark Elctrns 312-437-8800
Kans Shawnee Mission, Hallmark Elctrns 913-888-4747
Md Columbia, Technico..... 301-461-2200
Mass Dedham, Gerber Elctrns. 617-329-2400
Mass West Newton, Technico 301-461-2200
Mich Livonia, Camelot Elctrns. 313-427-8660
Minn Minneapolis, Cassidy Elctrns 612-835-7746
Mo St. Louis, Gateway Elctrns. 314-427-6116
NH Londerry, Yankee Elctrns. 603-625-9746
NJ Bellmawr, Mid-Atlantic 609-931-5303
NM Albuquerque, Technology Mktg. 505-293-2776
NY Bohemia, Car Lac Ind'l. 516-567-4200
NY Mt. Vernon, QAR..... 914-699-2224
NC Raleigh, Southeastern Radio Supply 919-828-2311
Ohio Worthington, Hallmark Elctrns 614-846-1882
Okla Tulsa, Hallmark Elctrns..... 918-835-8458
Pa Huntington Valley, Hallmark Elctrns 215-355-7300
SC Columbia, Dixie Elctrns..... 803-779-5332
SC Columbia, Dixie Radio..... 803-253-5333
Tex Dallas, K A Elctrns. 214-634-7870
Tex Dallas, Hallmark Elctrns..... 214-231-6111
Tex Garland, K A Elctrns. 214-494-2588
Utah Salt Lake City, Standard Supply Co. 801-486-3371
Wash Bellevue, Mann Northwest 206-747-9405
Wash Seattle, Interface Elctrns. 206-285-3500
Exp: Los Angeles, Product Supply Co. 213-659-1858
For: Can., Edmonton, Alb., Cardinal Indl. 403-455-4122
For: Can., Edmonton, Alb., Glad Elctrn. Dist. Inc. 403-454-1511

CIRCUIT STRUCTURES LAB., Div. D-Cemco Inc Inc., Dept. EM, 3200 N. San Fernando Blvd., Burbank, Calif. 91504, Tel: 213-849-6341; Empl.: 4

CIRCUIT TECHNOLOGY, Dept. EM, 160 Smith St., Farmingdale, N.Y. 11735, Tel: 516-293-8686, TWX: 510-224-6555; Empl.: 385

Local Sales Offices & Reps.
Cal Manhattan Beach..... 213-374-7446

CIRCUITS, INC., Dept. EM, 59 Deming Rd., Berlin, Conn. 06037, Tel: 203-828-3526; Empl.: 90

Local Sales Offices & Reps.
Minn Mendota Hgts, G-II Sls 612-454-3086
Mo Kansas City, Automatic General Elctrn Sls 816-333-8206
NJ Fort Lee, NECCO 201-461-2789
NY Buffalo, J. McDonough Assoc..... 716-839-2044

CIRTECH CORP, Dept. EM, 15237 Cherry St, Stanley, Kan. 66223, Tel: 913-681-2801, TWX: 910-749-6806; FSC No.: 5915

Sales Manager: L. Berberich

Local Sales Offices & Reps.
Ariz Tempe, Toribre Assocs..... 602-894-2263
Colo Lafayette, Spectrum Sls Co..... 303-449-7677
Ind Ft. Wayne, Berberich Assocs 219-424-0600
Iowa Cedar Rapids, ARD Sls Co 319-393-6392
Kans Stanley, Cirtech Corp 913-681-2801
Md Elliott City, Doss Elctrns..... 301-465-1336
Mass Burlington, R.J. Sickles Assocs.. 617-272-7285
NY Rochester, Kennard Tech Sls 716-223-4500
Ohio Cleveland, Berberich Assocs..... 216-289-5094
Ohio Dayton, Berberich Assocs 513-433-0342

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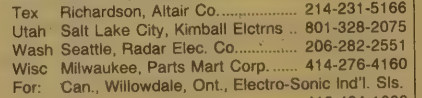
Local Sales Offices & Reps.
Ala Huntsville, K&E Assoc. 205-883-9720
Cal Culver City, E.V. Roberts & Assoc. 213-870-9561
Cal El Toro, Clairex Elctrns..... 714-768-4561
Cal Palo Alto, Shaw-Tech Inc..... 415-961-4775
Colo Eastlake, Jenson Reps. 303-688-4151
Fla Orlando, Irby & Connolly Inc. 305-894-8471
Fla Plantation, Irby & Connolly Inc. .. 305-949-5197
Ga Hartwell, K&E Assoc. 404-376-5438
Ill Chicago, L-Tec Inc. 312-286-1500
Ill Richmond, Clairex Elctrns 815-675-2880
Kans Overland Park, Advanced Technical Sls 913-492-4333
Md Baltimore, Cunningham & Assoc. 301-661-4306
Mass Hingham, Clairex Elctrns 617-749-5203
Mich Ferndale, Hilltronics Inc. 313-398-5556
Minn Minneapolis, H.M.R. Inc. 612-920-8200
Miss Corinth, K&E Assoc. 601-287-5369
Mo Earth City, Advenced Tech Sls .. 314-739-4048
NJ Fort Lee, Tecnimat 201-461-8686
NY Mt. Vernon, Clairex Elctrns. 914-664-6602
NY Seaford, Abbott Assoc. 516-781-5256
NC Garner, K & E Assoc 919-772-8454
Pa Media, W. Reeves Assoc. 215-566-6709
Tex Austin, J. B. Guenther Inc..... 512-472-3825
Tex Dallas, J.B. Guenther Inc..... 214-691-8500
Tex Houston, J.B. Guenther Inc. 713-468-0232
Utah Salt Lake City, Jensen Reps. 801-484-1066
Wash Seattle, H. Levinson Co..... 206-323-5100
Wisc Wanwatosa, L-TEC Inc. 414-774-1000
Exp: Teaneck, Sylvan Ginsbury Ltd.... 201-837-1100

Local Distributors
Ala Birmingham, M-G Elctrns & Equip., Inc. 205-328-4525
Cal Culver City, E.V. Roberts & Assocs., Inc. 213-870-9561
Cal Palo Alto, E.V. Roberts & Assocs., Inc. 415-494-1671
Fla Orlando, Hammond Elctrns., Inc. 305-241-6601
Fla Tampa, Lykes Elctrns. Corp..... 813-886-6621
Idaho Boise, Kimball Elctrns 208-342-3559
Ill Skokie, Bell Inds 312-965-7500
Ind Indianapolis, Graham Elctrns. Supp., Inc. 317-634-8486
Kans Topeka, Acme Radio Supply..... 913-235-1363
Ky Louisville, P.I. Burks Co..... 502-589-3960
La New Orleans, Southern Radio Supply Co. 504-524-2343
Mass Norwell, Bordewieck Sls. Co. 617-659-4915
Mich Detroit, R.S. Elctrns. 313-491-1000
Mich Detroit, Michigan Lectrols Corp. 313-255-4250
Minn Minneapolis, Stark Elctrns..... 612-294-1325
Mo St. Louis, Van Sickle Radio Elctrns. 314-621-5000
NJ Cherry Hill, D.F. Assocs. 609-428-3455
NY Buffalo, Summit Dists..... 716-884-3450
NY New York, Blan Elctrns. Corp..... 212-233-6288
NY Rochester, Summit Elctrns. Rochester 716-334-8110
NC Greensboro, Hammond Elctrns., Inc. 919-275-6391
NC Raleigh, Southeastern Radio Supply Co. 919-828-2311
NC Winston-Salem, Kirkman Elctrns., Inc. 919-724-0541
Ohio Cincinnati, Hughes-Peters, Inc. .. 513-351-2000
Ohio Columbus, Hughes-Peters, Inc. .. 614-294-5351
SC Columbia, Dixie Radio Supply Co. 803-253-5333
SC Greenville, Hammond Elctrns., Inc. 803-233-4121
Tenn Memphis, Bluff City Dist. Co..... 901-276-4501
Tenn Nashville, Electra Distr. Co. 615-329-3971
Tex Ft. Worth, Allied Elctrns..... 817-336-5401
Tex Richardson, Altair Co..... 214-231-5166
Utah Salt Lake City, Kimball Elctrns .. 801-328-2075
Wash Seattle, Radar Elec. Co..... 206-282-2551
Wisc Milwaukee, Parts Mart Corp..... 414-276-4160
For: Can., Willowdale, Ont., Electro-Sonic Ind'l. Sls. Ltd..... 416-494-1666



CLARE & CO., C.P., General Instrument, Dept. EM, 3101 Pratt Blvd., Chicago, Ill. 60645, Tel: 312-262-7700, Telex: 25-3775; Empl.: 1500 p. 3426-3432,4022-4024

Sales Manager: J. Deith; *Distributor Manage* Hanisko

Local Sales Offices & Reps.
Ala Huntsville, Electronic Mfrs Agts.. 205-533-
Ala Huntsville, C.P. Clare & Co. 205-883-
Ariz Phoenix, Spectrum Assocs. 602-997-
Ark Fort Smith, Electro-Related Prods. 501-783-
Cal San Jose, C.P. Clare & Co..... 408-371-
Cal Santa Ana, Spectrum Assocs..... 714-835-
Colo Denver, Electrodyne, Inc. 303-759-
Conn Stamford, C.P. Clare & Co 203-348-
Fla Ft. Lauderdale, R.I. Smith Assocs. 305-772-
Fla Melbourne, R.I. Smith Assocs 305-727-
Ill Chicago, C.P. Clare & Co..... 312-262-
Ill Elk Grove Village,, G. Twist Co. 312-593-
Ind Fort Wayne, Baehr, Greenleaf & Assoc. 219-447-
Iowa Cedar Rapids, G. Twist Co..... 319-393-
Kans Prairie Village, G. Twist Co..... 913-236-
Kans Wichita, G. Twist Co..... 316-686-
Md Ellicott City, Doss Elctrns., Inc. .. 301-465-
Mass Needham, C.P. Clare & Co..... 617-449-
Mich Detroit, A. Blumenberg Assoc. .. 313-557-
Mich Farmington Hills, C.P. Clare & Co. 313-553-
Mich St. Joseph, A. Blumenberg Assoc. 616-983-
Minn Minneapolis, G. Twist Co..... 612-854-
Mo St. Louis, G. Twist Co. 314-432-
Neb Lincoln, John G. Twist Co 402-474-
NJ Clark, C.P. Clare & Co. 201-381-
NY Syracuse, Nycom 315-437-
NC Charlotte, R.W. Chapman & Co. 704-525-
NC Greensboro, Robert Chapman & Co. 919-282-
NC Raleigh, R.W. Chapman & Co. .. 919-782-
Ohio Cincinnati, Baehr, Greenleaf & Assoc. 513-891-
Ohio Columbus, Baehr, Greenleaf & Assoc. 614-486-
Ohio Dayton, Baehr, Greenleaf & Assoc. 513-293-
Ohio Lakewood, Baehr, Greenleaf & Assoc. 216-221-
Pa Maple Glen, C.P. Clare & Co..... 215-643-
Tex Dallas, C.P. Clare & Co. 214-66-
Tex Dallas, Electra Reps 214-38-
Utah Salt Lake City, Electrodyne, Inc. 801-48-
Wash Bellevue, C.P. Clare & Co. 206-74-
Wisc Wauwatosa, John G. Twist..... 414-47-

Local Distributors
Ala Birmingham, M. G. Elctrns. & Equip. 205-32-
Ala Huntsville, Powell Elctrns. 205-53-
Ala Huntsville, Hall-Mark Elctrns 205-83-
Ariz Phoenix, Kierulff Elctrns..... 602-24-
Ark Fort Smith, Wise Wholesale Elctrns. 501-78-
Ark Little Rock, Carlton-Bates Co..... 501-56-
Cal El Segundo, Texas Instrs. Supply Co. 213-97-
Cal Los Angeles, Kierulff Elctrns. Corp. 213-68-
Cal Mountain View, Powell Elctn..... 415-96-
Cal Palo Alto, Kierulff Elctrns. 415-96-
Cal San Diego, Kierulff Elctrns. 714-27-
Cal San Diego, Richey Elctrns 213-76-
Cal Sunnyvale, Texas Instrs Supply 408-73-
Cal Sunnyvale, Bell Ind. Elctrn. Distr. Div. 408-73-
Cal Tustin, Kierulff Elctrns..... 714-73-
Colo Denver, Kierulff Elctrns. Corp.... 303-37-
Conn Hamden, Texas Instrs Supply 203-28-
Conn North Haven, Cramer/Conn..... 203-23-
Fla Hollywood, Cramer/EW Miami .. 305-92-
Fla Miami Springs, Powell Elctrns. .. 305-59-
Fla Orlando, Cramer/EW Orlando .. 305-89-
Ga Atlanta, Specialty Distributing 404-87-
Ga Atlanta, Cramer/EW Atlanta 404-44-
Ga Augusta, Dixie Elctrns..... 404-72-
Haw Honolulu, Industrial Elctrns..... 808-53-
Ill Arlington Heights, Texas Instrs Supply 312-64-
Ill Elk Grove Village, Kierulff Elctrns 312-64-
Ill Mount Prospect, Cramer/Chicago 312-59-
Ill Palatine, Ohm/Elctrns. 312-35-
Ill Peoria, Klaus Radio..... 309-68-
Ind Ft. Wayne, Ft. Wayne Elctrns. Supply 219-42-
Ind Indianapolis, Graham Elctrns. Supply 317-63-
Kans Wichita, Radio Supply Co., Inc.... 316-26-
La LaFayette, Ralph's of LaFayette 318-2

a Shreveport, Industrial Elctrn. Supply 318-222-9459
d Beltsville, Powell Elctrns. 301-937-4030
d Beltsville, Treeko Sls. 301-937-8260
d Gaithersburg, Pioneer/Washington Elctrn. 301-948-0710
d Gaithersburg, Cramer/EW Washington 301-948-0110
ass Burlington, Wilshire Elctr. 617-272-8200
ass Newton, Cramer Elctrns. 617-969-7700
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ich Livonia, RS Elctrns. 313-525-1155
nn Edina, Cramer/Bonn 612-835-7811
nn Minneapolis, Control Design 612-721-1628
o Kansas City, Walters Radio Supply 816-531-7015
o St. Louis, Olive Elctrns. 314-426-4500
eb Lincoln, Scott Electrn. Supply Corp. 402-464-8308
J Cherry Hill, Cramer/Pennsylvania 609-424-5993
J Clark, Texas Instrs Supply 201-382-6400
J Clifton, Wilshire Elctrns./N.J. 201-340-1900
J Fairfield, Kierulff Elctrns 201-575-6750
J Little Falls, Cramer/New Jersey 201-785-4300
r East Syracuse, Cramer/Syracuse 315-437-6671
r Endwell, Wilshire Elctrns. 607-754-1570
r Farmingdale, Wilshire Elctrns./L.I. 516-293-5775
r Hauppauge, Cramer/Long Island 516-231-5600
r Hicksville, Kierulff Elctrns 516-433-5530
r Rochester, Cramer/Rochester 716-275-0300
r Rochester, Simcona Elctrns. 716-328-3230
S Greensboro, Pioneer/Carolina 919-273-4441
S Winston-Salem, Cramer/Winston-Salem 919-725-8711
io Cleveland, Pioneer/Cleveland Elctrns. 216-587-3600
io Cleveland, Cramer/Cleveland 216-248-8400
io Dayton, Pioneer/Dayton Elctrns. 513-236-9900
da Tulsa, Texas Instrs. Supply 918-437-7904
Allentown, Federated Elctrns., Div. Federated Purchaser 215-437-4481
Braddock, M. Leff Radio Parts Co. 412-351-5000
Philadelphia, Powell Elctrns. 215-365-1900
: Columbia, Dixie Radio Supply 803-779-5332
on Nashville, Electra Distributing Co. 615-329-3971
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ish Washington, Kierulff Elctrns 800-645-7100
sc Milwaukee, Marsh Elctrns., Inc. 414-475-6000

RKE-HESS COMM., Resch. Corp., Dept. EM, 5-5th Ave., New York, N.Y. 10010, Tel: 2-255-2940; FSC No.: 34423 p. 2681

al Sales Offices & Reps.
Chicago, P. Lind Elctrns. Co. 312-774-1246
Indianapolis, P. Lind Elctrns. Co. 317-547-9178
ss Needham, Addelco, Corp. 617-444-4754
n Circle Pines, P. Lind Elctrns. Co. 612-786-5770
Crossroads, Q.T. Elctrns. Sls. Co. 703-671-4357

IOSTAT MFG. CO., INC., Dept. EM, Washington Dover, N.H. 03820, Tel: 603-742-1120, TWX: -297-4455; Empl.: 600

ributor Manager: H.E. Taylor

al Sales Offices & Reps.
Little Rock, J.Y. Schoonmaker Co. 501-375-2168
Inglewood, J. Berman Co. 213-649-6111
Menlo Park, Straube Assoc. 415-321-9050
o Westminster, Straube Assoc./Mtn. States 303-426-0890
Bradenton, Hutto-Hawkins-Peregoy Inc. 813-755-4015
Maitland, Hutto-Hawkins-Peregoy Inc. 305-831-2474
Pompano Beach, Hutto-Hawkins-Peregoy Inc. 305-943-9593
Atlanta, Millar Elctrs. Inc. 404-261-6160
Chicago, Clarostat Mfg. Co. Inc. 312-792-3898
Fort Wayne, Needler Sls. Co. 219-447-2123
Indianapolis, Needler Sls. 317-255-8056
a Cedar Rapids, Palatine Eng. Sls. Inc. 319-365-8071
s Derby, Palatine Eng. Sls. Inc. 316-788-0621
s Lenexa, Palatine Eng. Sls. Inc. 913-492-7020
Lanham, L.D. Lowery Inc 301-459-1556
s Concord, Clarostat Mfg. Co. Inc. 617-369-7933

Mich Detroit, R.C. Merchant & Co. Inc. 313-535-6000
Mich St. Joseph, R.C. Merchant & Co. Inc. 616-983-7378
Minn Minneapolis, A.J. Warner Co. 612-729-7371
Mo St. Louis, Palatine Eng. Sls. Inc. 314-426-7055
NM Albuquerque, Straube Assoc./Mt. States 505-265-7759
NY Buffalo, Leonard D. Allen Co. Inc. 716-837-1955
NY Fairport, Leonard D. Allen Co. Inc. 716-377-3530
NY Manhasset, Win-Cor Elctr. Sls. Corp. 516-627-9474
NY N. Syracuse, L.D. Allen Inc. 315-458-7470
NC Raleigh, Millar Elctrs. Inc. 919-787-9564
Ohio Beachwood, K.W. Elctrs. Sls. Inc. 216-831-8292
Ohio Dayton, K.W. Elctrs. Sls. Inc. 513-890-2150
Okla Tulsa, J.Y. Schoonmaker Co. 918-936-1423
Ore Portland, Electronic Sources 503-292-0701
Pa Allison Park, K.W. Elctrs. Sls. Inc. 412-487-4300
Pa Broomall, L.D. Lowery Inc. 215-356-5300
Pa Camp Hill, Beil & Whitaker Inc.
Pa Harrisburg, Beil & Whitaker Inc. 717-652-0184
Pa Reading, Beil & Whitaker Inc. 215-779-2610
Tex Dallas, J.Y. Schoonmaker Co. Inc. 214-349-1650
Tex Houston, J.Y. Schoonmaker Co. Inc. 713-926-9510
Va Charlottesville, L.D. Lowery Inc. 804-973-6672
Wash Bellevue, Electronic Sources 206-453-0800
Exp: New York, N.Y., M. Simons & Sons Co. Inc. 212-227-5513

Local Distributors
Ariz Phoenix, Sterling Elctrns. 602-258-4531
Cal Irvine, Cramer/Los Angeles 714-979-3000
Cal Irvine, Terminal Elctrn. 714-549-8611
Cal Los Angeles, Western Electronmotive/ Shephard 213-820-3777
Cal Los Angeles, Kierulff Electr. 213-685-5511
Cal Mt. View, Terminal Elctrn. 415-969-9240
Cal Oakland, Brill Elctrns. 415-834-5888
Cal Riverside, Elctrn. Supp. 714-683-7300
Cal San Carlos, Sterling Elctrns. 415-592-2353
Cal Sunnyvale, Diplomat/Westland 408-734-1900
Cal Sun Valley, Richey Elctrns. 213-875-2862
Cal Woodland Hills, Rampart Comp. 213-887-7260
Colo Denver, Acacia Sls. 303-232-2882
Colo Denver, Elctrn. Parts Co. 303-266-3755
Colo Denver, Integrated Elctrn. 303-534-6121
Conn Fairfield, U-Tronics 203-255-4521
Conn North Haven, Cramer Elctrns. 203-239-5641
Conn Waterbury, Bond Radio 203-753-1184
Del Stratford, State Elctrn. Parts Corp. 203-375-5961
Fla Miami, Elctrn. Equip. 305-635-0421
Fla Norcross, Lykes Electr. 404-355-2223
Fla Oakland Park, Peerless Radio of Fla. 305-566-5966
Fla Orlando, Hammond Elctrn. 305-849-6060
Fla Tampa, Lykes Electr. Corp. 813-886-6621
Ill Chicago, Newark Elctrns. Corp. 312-638-4411
Ill Elgin, Allied Radio Corp. 312-697-8200
Ill Palatine, Ohm Elctrns. 312-359-5500
Ind Indianapolis, Graham Electr. 317-634-8202
Ind Indianapolis, Radisco. 317-637-5571
Iowa Cedar Rapids, Deeco 319-365-7551
Iowa Ft. Wayne, Ft. Wayne Elctr. 219-423-3422
Kans Wichita, Radio Supply Co. 316-267-5213
Ky Louisville, P.I. Burks 502-583-2871
La Lafayette, Ralph's of Lafayette 318-369-9816
Md Baltimore, Radio Elec. Serv. Co. 301-823-0070
Md Gaithersburg, Pioneer/Washington 301-948-0710
Mass Boston, Sager Electrical Supply 617-542-2281
Mass Dedham, Gerber Radio 617-329-2400
Mass Newton, Greene-Shaw Co., Inc. 617-969-8900
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Sales Manager: John Machina S/M

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Sales Manager: B. Claude

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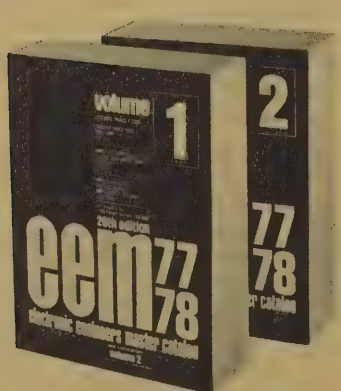

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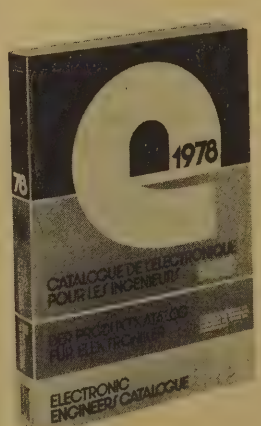

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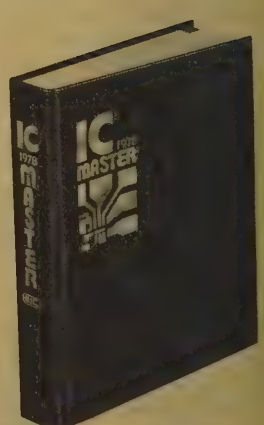

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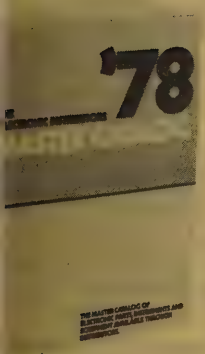

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Ohio Cincinnati, Tri-State Mktg. 513-761-

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Cal North Hollywood, Crown Elctrns 213-877-
Ind Audburn, D.C. Flanagan 219-925-
Mass Topsfield, Aries Assoc. 617-887-
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NJ Moorestown, Stern Assocs 609-234-
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NY Syracuse, Howard C. Murray & Assocs 315-48

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Sales Manager: H. W. Sussman

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RI	E. Providence, Commercial Plastics & Supply Corp.	401-941-5200
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Tex	Dallas, Commercial Plastics & Supply Corp.	214-631-8170
Utah	Salt Lake City, Comm Plastics & Sply Corp	801-486-9275
Va	Richmond, Comm Plastics & Sply Corp.	804-264-2976

COMDATA CORP., Dept. EM, 8115 N. Monticello, Skokie, ILL. 60076, Tel: 312-677-3900, TWX: 910-223-3617; Empl.: 65

COMDEL, INC., Dept. EM, Beverly Airport, Beverly, Mass. 01915, Tel: 617-927-3144; Empl.: 12

COMMERCIAL ELEC. HEATING DEVICES & MFG., INC., Dept. EM, 1008 E. Garvey Blvd., Monterey Park, Cal. 91754, Tel: 213-288-9445; Empl.: 12

COMMUNICATION ASSOCS., INC., Dept. EM, 200 McKay Rd., Huntington Station, N.Y. 11746, Tel: 516-271-0800, TWX: 510-226-6998; Empl.: 150

Local Sales Offices & Reps.

Va	Alevanderia, Carl Gray	703-360-4625

COMMUNICATIONS EQUIP CO., Dept. EM, Box 700, Glen Arbor, Mich. 49636, Tel: 616-334-3081, TWX: 810-291-1940; Empl.: 23

Sales Manager: T.A. Garmhausen; *Distributor Manager:* J. P. Jensen

Local Sales Offices & Reps.

Fla	Orlando, Cartwright & Bean of Fla	305-422-4531
Ga	Marietta, Guyer & Assocs	404-971-2831
Ind	Indianapolis, Communications Equip. Co. Inc.	317-634-3161
Mass	North Scituate, W.A. Hendrickson Co.	617-545-0652
Mo	St. Louis, Kathrinus-Kelly-Baumhaur & Co.	314-968-3800
NY	Long Island City, Metrocom System Sls	212-786-3890
Ohio	Beachwood, Electronic Salesmasters	216-831-9555
Pa	Philadelphia, R. S. Pass Assocs.	215-464-9444
Tex	Carrollton, El Wilco	214-242-5321

COMMUNITRON CORP., Dept. EM, 1429 N. Halstead, Hutchinson, Kans 67501, Tel: 800-835-2256; Empl.: 14

COMPAC, Dept. EM, 279-I Skidmore Rd., Deer Park, N.Y. 11729, Tel: 516-667-3933; Empl.: 20 p. 1026,1027

Local Sales Offices & Reps.

Ala	Huntsville, Repcom, Inc	205-852-0394
Ariz	Scottsdale, Territorial Mktg	602-994-8665
Cal	N. Hollywood, Crown Elctrns.	213-877-3550
Cal	Redwood City, Woodworth Co	415-365-0252
Fla	Milbourne, Repcom, Inc.	305-254-1877
Mass	Lexington, Zieco, Inc.	617-861-8300
Minn	Lakeville, Dan'l Engrg Corp.	612-435-6000
NY	Tuckahoe, Spectrum Sls, Inc.	914-793-1660
Ohio	Dayton, Ashby Assocs.	513-252-5627
Pa	King of Prussia, Schibley Assocs.	215-688-7207
Tex	Fort Worth, Carey, Wolf & Assocs	817-461-7333
Va	Fairfax, Schibley Assocs.	703-591-3008

Local Distributors

For:	Cresskill, N.J., Lars Microwave	201-871-0555

COMPEX CORP., Dept. EM, 383 Kings Highway, Cherry Hill, N.J. 08034, Tel: 609-667-6795

Local Sales Offices & Reps.

Ariz	Phoenix, R E B Elctrn Sls	602-931-5361
Cal	Los Angeles, R F Assocs	213-478-1586
Cal	Palo Alto, R F Assocs	415-494-3331
Ill	Park Ridge, R.F. Specialists	312-698-2044
Md	Baltimore, Bernard White & Co.	301-484-5400
Pa	Elkins Park, Snow Assocs	215-379-4700

COMPONENT RESCH., Dept. EM, 1655-26 St., Santa Monica, Cal. 90404, Tel: 213-829-3615, TWX: 910-343-6864; FSC No.: 12517; Empl.: 175 p. 1100-1143

Sales Manager: S. Kellerman

COMPONENT SPECIALTIES, Dept. EM, 9143 E. La Rosa Dr., Temple City, Cal. 91780, Tel: 213-283-0015; FSC No.: 28984; Empl.: 45

Sales Manager: D.R. Heins

COMPONENTS CORP., Dept. EM, 6 Kinsey Pl., Denville, N.J. 07834, Tel: 201-627-0290; Empl.: 11

Sales Manager: W. H. Gordon

Local Sales Offices & Reps.

Cal	Los Angeles, E. E. Strassner Co.	213-666-1511
Fla	Orlando, Buchanan & Abrams Assoc.	305-898-7444
Ill	Des Plaines, Coombs Assocs.	312-298-4830
Ind	Indianapolis, Coombs Assocs.	317-251-2757
Mass	Northboro, Henik Assoc.	617-891-5660
Tex	Plano, Zeus Engrg.	214-423-2027
Wisc	Greendale, Coombs Assocs.	414-421-2300

COMPONENTS SPECIALTIES, INC, See SPECO Div., Components Specialties, Inc

COMPUTER AUTOMATION, INC., Ind. Prods. Div., Dept. EM, 18651 Von Karman, Irvine, Cal. 92664, Tel: 714-833-8830, TWX: 910-595-2543; Empl.: 1200

Local Sales Offices & Reps.

Cal	Irvine	714-833-8830
Fla	Orlando	305-857-0100
Ill	Chicago	312-956-6400
Mass	Waltham	617-890-7190
NJ	Bloomfield	201-338-8300
Tex	Dallas	214-358-0278

COMPUTER COMPS., Dept. EM, 88-06 Van Wyck Expwy., Jamaica, N.Y. 11418, Tel: 212-AX 1-3500; Empl.: 45

Sales Manager: H. Weinberg

Local Sales Offices & Reps.

Cal	Costa Mesa, Murray-Baskett Assoc	714-642-3282
Cal	San Jose, Frequency Cont Assoc.	408-253-4677
Fla	Clearwater, Brennan Assoc.	813-446-5006
Mass	Randolph, Bengal Assoc.	617-877-2639
NJ	Springfield, Svc. & Tech. Inc.	201-232-2666
NY	Commack, Svc. & Tech. Inc.	516-543-1061
Ohio	Wickliffe, Walter J. Brauer Assoc.	216-943-0601

Exp: N.Y., Baldwin, Milano Brothers .. 516-223-9000

COMPUTER CONVERSIONS CORP., Dept. EM, 6 Dunton Ct., East Northport, N.Y. 11731, Tel: 516-261-3300, TWX: TWX 510-226-0448; FSC No.: 51086; Empl.: 100 ..... p. 1392,1393

Sales Manager: S.J. Renard

Local Sales Offices & Reps.

Ariz	Phoenix, Betco	602-934-9657
Cal	Costa Mesa, Xebex	714-540-3245
Cal	Mountain View, Leddy Assocs.	415-969-6313
Colo	Denver, Fry-Gates Co.	303-756-9886
DC	Washington, Powell-Pendergraph	301-656-4535
Fla	Clearwater, Brennan Assocs.	813-446-5006
Haw	Honolulu, Aloha Assocs.	941-1574
Mass	Brookline, Technology Prods. Grp.	617-731-0858
Mich	Birmingham, Favco Inc	313-644-0173
NM	Albuquerque, F.Y. Gates Co.	505-298-1875
NY	Liverpool, R & D Assocs.	315-457-0100
Ohio	Aurora, EMA Inc.	216-562-6104
Ohio	Centerville, EMA Inc.	513-433-2800
Ore	Beaverton, R&R Assoc., Inc.	503-643-5754
Pa	Willow Grove, Powell-Pendergraph, Inc.	215-657-0330
Tex	Dallas, Jacobson Co.	214-363-7584
Wash	Seattle, R&R Assoc., Inc.	206-762-7664
Wisc	Hales Corners, Automation Prods Co.	414-425-2250

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Ala	Huntsville, Gentry Assocs	205-534-9771
Ariz	Scottsdale, PLS Assocs	602-994-5461
Cal	Campbell, Sedillo Co.	408-374-5220
Cal	Foster City, Computer Devices	415-574-5561
Cal	Santa Fe Springs, Computer Devices	213-921-8451
Cal	Van Nuys, Gordon Elliot Inc.	213-781-8454
Colo	Denver, PLS Assocs	303-773-1218
Conn	Rocky Hill, Computer Devices	203-529-7721
Fla	Orlando, Gentry Assocs	305-894-4401
Ga	Atlanta, Gentry Assocs	404-455-1206
Haw	Honolulu, Gray Assocs	808-395-8669
Ill	Des Plaines, Computer Devices	312-298-6320
Mass	Burlington, Computer Devices	167-273-1550
Mass	Wayland, Centennial Sls.	617-358-5161
NJ	Nutley, Computer Devices	201-661-1181
NM	Albuquerque, PLS Assocs	505-255-2330
NY	Clark Mills, KLM Assocs.	315-853-6126
NY	New York, Computer Devices	212-695-3055
NY	North Syracuse, KLM Assoc	315-458-6214
NY	Pittsford, KLM Assoc.	716-381-8350
NY	Rochester, RG Engrg	716-385-3021
NC	Burlington, Gentry Assocs	919-227-3639
Ohio	Aurora, Engineering Mktg Assoc.	216-562-6104
Ohio	Centerville, Engineering Mktg Assoc.	513-433-2800
Pa	Hatboro, QED Elctrns	215-674-9600
Pa	Plylouth Meeting, Computer Devices	215-828-1650
Tex	Dallas, Computer Devices	214-387-2301
Utah	Sandy, PLS Assocs.	801-942-2081
Va	Arlington, Computer Devices	703-532-0321
Wash	Seattle, Datec	206-242-8883

COMPUTER DEVICES CORP., Dept. EM, 63 Austin Blvd., Commack, N.Y. 11725, Tel: 516-543-4220; Empl.: 50 ..... p. 2392

Local Sales Offices & Reps.

Cal	Arcadia, Mar-Land Entprs.	213-681-9440
Md	Baltimore, R.A. Wafer Assocs.	301-744-1133
Minn	Minneapolis, R.C. Johnson Assocs.	612-835-1728
Tex	Dallas, Bouco Sls. Assocs.	214-247-1749
Exp:	New Rochelle, N.Y., Montclair Elctrns.	914-576-1400

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COMPUTER INSTRS., Dept. EM, 100 Madison Ave., Hempstead, N.Y. 11550, Tel: 516-483-8200, TWX: 510-222-4189; Empl.: 50 ..... p. 2391

Sales Manager: V. McCormack

Local Sales Offices & Reps.

Cal	Los Altos, Servo Data	415-964-1325
Del	Wilmington, Briggs-Copper Control	302-478-3548
Fla	Largo, Technical Comps. & Instr.	813-584-1122
Ill	Lansing, Van Meter Instr.	312-474-3580
La	Baton Rouge, Tech-Quip Inc	504-927-4284
Mass	Norwell, Bordewieck Engrg. Sls. Co.	617-659-4915
Minn	Minneapolis, R.J. Sls.	612-922-1425
NY	Orchard Park, Shorteck Inc	716-662-6100
NY	Schenectady, Shorteck Inc	518-355-4096
NY	Westbury, Tech-Rep Engrg. Sls.	516-997-7946
NC	Charlotte, Beck Sls and Engrg	704-366-5366
Tex	Arlington, Pan Tech Engrg.	817-640-3232
Tex	Pasadena, Tech-Quip Inc	504-927-4284
Wash	Seattle, G.M. Gillette Assoc.	206-284-3344
Wash	Spokane, Calvert Controls Inc.	509-244-3601

Local Distributors

Cal	Los Altos, Servo Data	415-964-1325
Del	Wilmington, Briggs-Cooper Control	302-478-3548
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La	Baton Rouge, Tech-Quip	504-927-4284
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NY	Schenectady, Shorteck	518-355-4096
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NC	Charlotte, Beck Sls & Engrg	704-366-5366
Tex	Arlington, Pan-Tech Controls	817-640-3232
Tex	Pasadena, Tech-Quip	713-473-2891
Wash	Seattle, G. M. Gillette & Assoc.	206-284-3344
Wash	Spokane, Calvert Controls	509-244-3601

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Sales Manager: R. Love

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Local Sales Offices & Reps.

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Cal	Los Altos, Tauber/Dreyer/Kolm	415-948-2635
Colo	Denver, R.A. Mayes Co	303-444-0782
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NM	Albuquerque, R.A. Mayes Co	505-292-2330
NC	Asheboro, Imagitron Sls Co	919-629-9630
Pa	Landisville, Imagitron Sls Co	717-898-7633
Tex	Dallas, R.A. Mayes Co	214-235-3043
Tex	Houston, R. A. Mayes Co	713-440-9288
Utah	Salt Lake City, R. A. Mayes Co	801-292-6781

COMPUTER TALK INC., Dept. EM, Box 145, Idledale, Colo. 80453, Tel: 303-697-4315; Empl.: 20

COMPUTER TERMINAL SYS., Dept. EM, 52 Newtown Plaza, Plainview, N.Y. 11803, Tel: 516-293-6611; FSC No.: 33948; Empl.: 35

Sales Manager: J. Gross

COMPUTER TRANSCEIVER SYSTEMS, D EM, 66 E. Midland Ave., Paramus, N.J. 07652, 201-261-6800, TWX: 201-138-707; Empl.: 80

Sales Manager: C. Kaplan; *Distributor Manager* Kaplan

Local Sales Offices & Reps.

Ala	Huntsville, So Central Mktg	205-883-5
Alas	Anchorage, H & M Elctrns	907-272-7
Ariz	Phoenix, Southwest Peripherals	602-267-7
Cal	San Jose, Digicom Data Prods	408-279-5
Cal	Torrance, Edwards Assocs	213-328-9
Colo	Denver, Data Sys Mktg	303-426-4
Conn	Wallingford, IMF Sls Assocs	203-265-6
Ga	Atlanta, Flex-Comm Intl	404-237-9
Haw	Honolulu, Response of Hawaii	808-947-
Ill	Addison, R. Edward Stemm	312-279-2
Md	Silver Springs, Computer Complements	301-589-2
Mass	Wakefield, IMF Sls Assosc.	617-245-8
Mich	Madison Heights, WKM Assocs.	313-588-2
Minn	St. Paul, Dytec North	612-645-4
Mo	St. Johns, Mid-West Mktg M.R.	314-426-6
NY	New York, H. Knaepen	212-986-
NY	New York, J. Carlucci	212-986-
NY	Rochester, J. Cameron Assocs.	716-385-
Ohio	Cleveland, WKM Assocs	216-267-
Ohio	Dayton, WKM Assocs	513-434-
Okla	Oklahoma City, Data Mktg Assocs	405-528-
Ore	Portland, Brennan Assocs	503-223-
Pa	Pittsburgh, WKM Assocs	412-892-
Tex	Austin, Data Mktg Assocs	512-451-
Tex	Houston, Data Mktg Assocs	713-780-
Utah	Salt Lake City, Data Sys Mktg	801-487-
Wash	Bellevue, Brennan Assocs	206-454-

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COMSTRON CORP., Dept. EM, 200 E. Sunrise Freeport, N.Y. 11520, Tel: 516-546-9700, 510-225-3699 ..... p. 2294,2621,2682

COMSTRON SEG., Dept. EM, 200 E. Sunrise Freeport, N.Y. 11520, Tel: 516-546-9700, 510-225-3699; Empl.: 50 ..... p. 2294,2621

Sales Manager: L. J. Borow, V.P. Sls

Local Sales Offices & Reps.

Ariz	Scottsdale, Measurement Consits.	602-994
Cal	Inglewood, L & M Engrg.	213-674
Cal	Mountain View, CSS Telecoms. Spec.	415-964
Cal	San Jose, L & M Engrg.	408-292
Colo	Boulder, Measurement Consits.	303-499
Conn	Hamden, Instr. Consits.	203-288
Fla	Bradenton, Saber Assocs.	800-432
Fla	Longwood, Saber Assocs.	800-432
Fla	Pompano Beach, Saber Assocs.	800-432
Ga	Dunwoody, Saber Assocs.	800-327
Kans	Shawnee Mission, EIR Co.	913-362
Mass	Waban, Instr. Consits.	617-969
Mass	Winchester, J & J Assocs.	617-729
Mo	Hazelwood, EIR Co.	314-895
NJ	Cherry Hill, Scientific Reps	609-482
NJ	Woodcliff Lake, F & F Assocs.	201-778
NM	Las Cruces, Measurement Consits.	505-265
NY	Hicksville, F & F Assocs.	516-935
NY	Skaneateles, Robtron, Inc.	315-685
NC	Raleigh, Saber Assocs.	800-327
Tex	Pasadena, Scientific Devices Gulf Coast	713-475
Tex	Richardson, Scientific Devices S.W.	214-231
Tex	San Antonio, Scientific Drvices S.W.	512-736
Utah	Salt Lake City, Measurement Consits.	801-364
Va	Falls Church, Scientific Assocs.	703-573
Wash	Bellevue, Kevin Hall Assocs.	206-455

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Sales Manager: D.A. Williamson

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Ariz	Phoenix, Advance Electrical Sls.	602-95
Cal	Anaheim, Advance Electrical Sls.	714-87
Cal	Belmont, Advance Electrical Sls.	415-59
Cal	San Diego, Advance Electrical Sls.	714-23

Colo Denver, Advance Electrical Sls. 303-388-0923
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Ga Macon, Stoneco Assocs. 912-745-4652
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Kans Overland Park, Ensco-Rep 913-381-7557
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Mo St. Louis, Ensco-Rep Inc. 314-542-3935
NJ Helmetta, Conap, Inc. 201-521-3460
NY Southampton, Polyester Corp 516-283-4400
Ore Wilsonville, Advance Electrical Sls. 503-638-4917
Pa Meadville, Conap, Inc. 814-332-6541
Tex Garland, Cogburn & Assocs. 214-271-2029
Wash Seattle, Advance Electrical Sls. 206-762-2262
Wisc Brookfield, Techno-Ind'l. Sls. Co. 414-783-4385

NAX CORP., Dept. EM, 2300 Walden Ave., Buffalo, N.Y. 14225, Tel: 716-684-4500, Telex: 91-275; Empl.: 25

Sales Manager: W. L. Jones

Local Sales Offices & Reps.
Ala Huntsville, Control Equip. Co. 205-883-1330
Cal Gardena, Instrument Lab. 213-770-0650
Cal Palo Alto, Instrument Lab. 415-328-1040
Colo Denver, D.E. Bond Assocs. 303-756-1234
Fla Winter Park, Control Equip. Co. 305-647-4496
Ga Atlanta, Control Equip. Co. 404-237-1688
I Mt. Prospect, Automation Equip. Co. 312-398-7550
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Mo St. Louis, Barry Sls. Engrg. Co. 314-821-2525
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NY East Syracuse, Niagara Electric Sls. Co. 315-437-1656
NY Rochester, Niagara Elcctric Sls. Co. 716-271-1223
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Va Richmond, United Control Co. 804-285-9927
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ICORD ELCTRNS., Dept. EM, 37 Great Jones St., ept. JE, New York, N.Y. 10012, Tel: 212-777-6571, NX: 710-581-4930; Empl.: 150 p. 1741

ales Manager: Josie Wheaton

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hio Centerville, E.M.A., Inc. 513-433-2800

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nn Litchfield, Intrade, Inc. 203-567-5901
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Litchfield, Conn. 06759, Intrade, Inc. 800-243-5252

cal Distributors
Colonia, Lectron Inds 201-574-1313

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cal Sales Offices & Reps.
Orange, Omega Ind'l. Sls. Co. 714-997-5700
Newark, Grapek Co. 201-485-7605
Cincinnati, Lohrer Ind. Equip. 513-922-5000

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Local Sales Offices & Reps.
Ala Birmingham, Commerical Plastics & Supply Corp. 205-591-8900
Ala Decatur, Valley Products 205-353-0144
Ala Mobile, Gulf Rubber & Gasket 205-666-7400
Ariz Phoenix, Boyd Indl Rubber, Div. A. B. Boyd 602-269-3456
Ariz Scottsdale, Insulectro 602-991-2370
Cal Berkeley, C. D. LaMoree Co. 415-841-0601
Cal City of Industry, Boyd Indl Rubber, Div. A. B. Boyd 213-962-7111
Cal El Segundo, Insulectro Corp. 213-640-1470
Cal Fresno, Boyd Indl Rubber 209-486-6880
Cal Gardena, Commercial Plastics & Supply 213-532-9151
Cal Los Angeles, C.D. LaMoree 213-225-5631
Cal Mt View, Insulectro 415-969-7010
Cal San Diego, Insulectro 714-276-6604
Cal San Leandro, Boyd Indl Rubber 415-278-8000
Colo Aurora, Insulectro 303-344-4451
Colo Denver, Plasticrafts 303-433-8801
Conn E. Hartford, Comm Plastics & Supp 203-528-4457
Conn Greenwich, R.H. Carlson Co. 203-661-9288
Conn Middletown, Auburn Mfg. Co. 203-346-6631
Fla Jacksonville, SE Indl Tape 904-733-2351
Fla St. Petersburg, Tri-Tech of Fla. 813-544-8836
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Ill Elk Grove Village, Quality Rubber 312-593-4200
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Ill Skokie, Rhopac 312-673-8020
Ind Indianapolis, Marian Rubber Products Co. 317-635-8273
Iowa Des Moines, Nott Co. 515-276-8559
Kans Wichita, Rubber Supply 316-AM5-3257
Ky Louisville, General Rubber & Supply 502-635-2605
Ky Louisville, B & R Rubber & Supply Co. 502-585-5171
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Md Baltimore, Comm Plastics & Supp 301-889-6640
Md Baltimore, Robins Rubber 301-727-6275
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Mass Wellesley Hills, John G. Shelley 617-237-0900
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Mich Muskegon Hgts, W Michigan Rubber 616-759-8502
Minn Minneapolis, Nott Co. 612-781-9561
Miss Jackson, Dixie Rubber & Belting Co. 601-355-6406
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NY Endicott, Chamberlin Rubber Co 607-748-7324
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Pa Erie, Sheilds Rubber 814-838-6561
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Pa Pittsburgh, Comm Plastics & Supp 412-231-2212
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RI Providence, Comm Plastics & Supp 401-438-0130
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Va Richmond, Sutton-Clark Supply 804-643-8311
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Wisc Milwaukee, N. L. Kuehn Co. 414-964-3300
Exp: Pa., Reading, Polypenco, Inc. 215-929-5858
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Utah Salt Lake City, Plastic Prod Co of Utah 801-486-9275
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Ohio Cleveland, Component/Insulation Corp. 216-521-3570

CONNOR-WINFIELD CORP., Dept. EM, W. Chicago, Ill. 60185, Tel: 312-231-5270, TWX: 910-230-3231; FSC No.: 21022; Empl.: 25 ..... p. 2296,2297

Local Sales Offices & Reps.

Cal Encino, C.D.H. Assocs. 213-345-3111
Cal Los Altos, Frauman Assocs. 415-941-0660

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Pa King of Prussia, Mach. & Tool Sys. 215-265-7784
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Wisc Milwaukee, Stoffregen Machinery Crop. 414-352-8181

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Ill La Grange, Olson Engrg. & Sls. Co. 312-482-3300
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Cal Woodland Hills, California Tech Svs 213-346-6401
Conn Southington, Libby Assocs. 203-747-5601
Fla Maitland, V. L. Dorr..... 305-423-7562
Ind Carmel, E. McWilliams 317-846-5991
NY Lewiston, Watmet, Inc. 716-285-3595
Pa Franconia, Scharas Assoc. 215-368-2017
Tex Richardson, C. Price 214-AD 1-4321
Wash Seattle, Demarest & Assocs..... 206-523-0600
Wisc Milwaukee, M-W Entprs 414-352-9150

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Fla Tampa, S.K. Wallace Assoc. 813-961-1037
Ga Jonesboro, S.K. Wallace Assoc. 404-471-6297
Ill Chicago, Hutmacher Assoc..... 312-631-3248
Ind Indianapolis, New/ERA Sls. 317-476-6297
Md Kensington, Forti-Austin Assoc.. 301-949-1706
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NC Kernersville, S.K. Wallace Assoc. 919-993-3993
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Tenn Memphis, Elctrns. Sls..... 901-682-2281
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Cal Los Altos..... 415-948-0
Fla Ft. Lauderdale 305-485-5
Mass Sudbury..... 617-443-3
Minn Minneapolis..... 612-546-0
NY Woodside 212-899-4
Ohio Dayton..... 513-223-0
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Cal Chatsworth, Westates Elctrns..... 213-341-
Cal Sunnyvale, Westates Elctrs. 408-733-
Fla Miami, All Amer Transistor..... 305-754-
Mass Waltham, March Elctrns. 617-899-
Mich Livonia, Camelot Electronics 313-427-
NY W. Hempstead, March Elctrns. .. 516-486-
Tex Dallas, Trevino Electronics..... 214-358-
Tex Dallas, Solid State Elctrns. 214-352-
Tex Houston, Lenert Co. 713-225-

CONTINENTAL RESOURCES, INC., Dept. EM Middlesex Tpke., Bedford, Mass. 01730, 617-275-0850, TWX: 710-326-0833; Empl.: 150 p.

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Ariz Scottsdale, PLS Assocs. 602-994-
Cal Costa Mesa, Continental Resources 714-540-
Cal Los Angeles, Continental Resources 213-638-
Cal Santa Clara, Continental Resources 408-735-
Colo Denver, PLS Assocs. 303-773-
Fla Ft. Lauderdale, Lee Assocs 305-491-
Ga Buford, Lee Assocs..... 404-945-
Ill Elk Grove Village, Continental Resources 312-439-
Md Gaithersburg, Continental Resources 301-948-
Mass Bedford, Continental Resources 617-275-
Mich South Lyon, Infinity 313-437-
Minn Minneapolis, Bendt Assocs 612-835-
Mo Kansas City, Dytech/South 913-888-
Mo St. Louis, Dytech/South 314-731-
NJ Moorestown, Continental Resources 609-234-
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NM Albuquerque, PLS Assocs..... 505-255-
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Cal San Francisco, Continental Specialties 415-421
Cal San Francisco, J. Pascoe..... 415-421
Ill Chicago, Bob Burns Assocs. 312-775
Ind Indianapolis, Green, Wissler Sls. Co. 317-846
Mich St. Clair Shores, Jack M. Thorpe Co. 313-779
Mo Kansas City, Forristal-Young Sls. Co. 816-358
Mo St. Louis, Forristal-Young Sls. Co. 314-645

CONTROL CONCEPTS CORP., Dept. EM Front St., Binghamton, N.Y. 13905, Tel: 607-724 Empl.: 25

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NY Binghamton, Control Concepts .. 607-724

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sc Milwaukee, E.C. Stiedemann Co. 414-332-1250

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TROL SCIENCES, INC., Dept. EM, 8399 anga Canyon Blvd., Canoga Park, Cal. 91304, Tel: 1-887-7344; FSC No.: 53317; Empl.: 10 .... p. 1395

es Manager: H.C. Ericsson

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North Hollywood, Crown Elctrns. 213-887-3550
Paramus, Carnes Diamond 201-967-1309
Centerport, Carnes Diamond..... 516-261-8100
Dallas, Mycrosystems Mktg..... 214-238-7157
Houston, Mycrosystems Mktg 713-783-2900

TROL SWITCH, A Cutler Hammer Co., Dept. EM, 0 Delmar Dr., Folcroft, Pa. 19032, Tel: -586-7500, Telex: 83-4216; FSC No.: 81640; Empl.:

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al Sales Offices & Reps.
Huntsville, Rakes Engrg. & Mktg. 205-883-9260
Anaheim, Control Switch/Cutler-Hammer 714-776-1910
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Menlo Park, Control Switch Inc. 415-854-1005
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Broadview, Control Switch/Cutler-Hammer 312-547-7980
Elk Grove, Carlson Elctrn. Sls. Co. 312-956-8240
Indianapolis, Carlson Elctrns 317-253-5610
Mission, Cutler-Hammer..... 913-236-6313
Shawnee Mission, Control Switch/ Cutler-Hammer 913-236-6313
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Southfield, F. H. Gehrke & Assocs. 313-559-5363
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Wisc Milwaukee, Carlson Elctrn. Sls. Co. 414-476-2790

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Fla Ft. Lauderdale, Peerless Radio Corp. of Fla. Inc. 305-566-5966
Fla Miami, Electronic Equip. Co. 305-871-3500
Md Kensington, Marine Air Supply.... 301-949-1353
Mass Boston, Sager Elec. Supply Co. 617-542-2281
NY Lynbrook, Peerless Radio Corp. 516-593-2121
Ohio Dayton, Related Components Inc. 513-253-6116
Tex Dallas, Associated Aircraft Supply Co. Inc. 214-331-4381

CONTROL SYSTEMS RESEARCH, INC., Dept. EM, CSR Bldg., 632 Fort Duquesne Blvd., Pittsburgh, Pa. 15222, Tel: 412-566-1200,, TWX: 710-664-4203; Empl.: 150

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Cal Los Angeles, Halbar Assocs..... 213-387-8283
Cal Northridge, Motion Tech 213-876-1934
Ill Mc Henry, CSR 815-385-8140
Ind Elkhart, Shaum Industrial 219-341-5860
Ky Covington, CSR 606-371-2515
Mass Natick, CSR 617-653-6869
Mich W. Bloomfield, CSR 313-682-2717
NY Irvington, Charmarl Co..... 914-591-8814
NY Rochester, Ross Equip Co. 716-271-5660
NC Charlotte, J. Rudisill Assocs. 704-377-6901
Ohio Chardon, CSR 216-951-6916
Pa Malvern, Miller & Dietz Co. 215-647-7373
Tex Dallas, Dwayne Clement Assocs. 214-341-5860

CONTROL TECHNOLOGY CO., Dept. EM, 41-16 29th St., L.I.C., N.Y. 11101, Tel: 212-EM 1-2133; FSC No.: 14545; Empl.: 35 ..... p. 3975

Sales Manager: H. Cooper

Local Sales Offices & Reps.
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CONTROLCRAFT CORP., See FSI/Fork Standard Inc., Controlcraft Prod. Line

CONTROL PRODUCTS DIV., Amerace Corp., Dept. EM, 2330 Vauxhall Rd., Union, N.J. 07083, Tel: 201-964-4400, TWX: 710-985-4687; FSC No.: 3L154; Empl.: 275 ..... p. 1748,1749

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Cal Buena Park, Sls. Engrs. Ltd. 714-521-8673
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Fla Orlando, B. Stevens Co..... 305-425-3202
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Neb Omaha, B. Gurney & Assoc. 402-342-8445
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Ohio Chagrin Falls, Control Prods..... 216-543-4233
Ore Portland, Syscom 503-644-2505
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Ky Edgewood, Control Prods. Div. .. 606-341-0330
Md Silver Spring, Control Prod Div. 301-652-0111
Mass Norwell, Control Prod Div. 617-659-4474
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Ohio West Chester, Control Prod. Div. 513-777-2472
Ore Portland, Syscom 503-644-2505
Pa Willow Grove, Cusick Elec. Sls. Co. 215-659-6666
SC Inman, Control Prods. Div. 803-578-6080
Tex Houston, Control Prods. Div. 713-666-8421
Tex Plano, Control Prods. Div. 214-423-4431
WVa Charleston, Process Instrs. & Equip. Co. 304-344-2337
Wisc Hudson, Control Prod. Div..... 715-571-5640
Wisc Milwaukee, Control Prod. Div. 414-377-0800

CONTROLS PLANT, McGraw Edison Co., Dept. EM, 210 Redstone Hill Rd., Bristol, Conn. 06010, Tel: 203-582-6321; Empl.: 550

CONVEX CORP., Dept. EM, 2810 Dorr Ave., Fairfax, Va. 22031, Tel: 22030, TWX: 703-698-8010; Empl.: 24

Local Sales Offices & Reps.
Md Edgewater, Commart 301-261-4344
NJ Ridgewood, Instrumentation Sls. Co. 201-445-5210

COORS PORCELAIN CO., Dept. EM, 600 Ninth St., Golden, Colo. 80401, Tel: 303-278-4000, Telex: 45593; Empl.: 1200

Sales Manager: J. Wade

Local Sales Offices & Reps.
Ariz Phoenix, Hecht, Henschen & Assoc. 602-275-4411
Cal San Jose, J. J. Graham 408-292-1272
Colo Golden, R. White 303-278-4000
Ill Chicago, A.S. Deter, Jr. 312-541-8010
Ill Chicago, A. S. Deter..... 312-541-8010
Mass Prides Crossing, R. S. Trayes.... 617-887-8144
Mass Prides Crossing, R. S. Trayes.... 617-887-8144
NJ Flanders, G. P. Rush..... 201-526-9050
NJ Tranquility, G. P. Rush 201-526-9050
SC Cross Hill, F. W. Meyers 803-998-3117
Tex Plano, M. Savage 214-495-5105
Wisc Milwaukee, J. C. Thompson..... 414-352-1123

COPPERWELD BIMETALLICS, Div. Copperweld Corp., Dept. EM, Glassport, PA 15045, Tel: 412-664-3500, TWX: 866468 710-794-4806

CORCOM, INC., Dept. EM, 2635 No. Kildare Ave., Chicago, Ill. 60639, Tel: 312-384-7400, TWX: 910-221-5308; FSC No.: 05245; Empl.: 275 p. 2622,2623

Local Sales Offices & Reps.
Ariz Scottsdale, Q.T. Wiles & Assoc. 602-948-5590
Cal Los Angeles, Q.T. Wiles & Assoc. 213-478-0183
Cal Menlo Park, Straube Assocs. 415-321-9050
Cal Tustin, Q.T. Wiles & Assoc. 714-832-4952
Colo Denver, Straube Assocs. 303-426-0890
Conn Milford, Conti-Younger 203-929-3294
Fla Casselberry, EIR Inc. 305-830-9600
Fla Coral Springs, E.I.R. Inc. 305-585-6689
Fla Ft. Lauderdale, E.I.R. Inc..... 305-583-2351
Fla Plantation, EIR Inc. 305-791-3690
Ga Atlanta, G.S. O'Hara..... 404-237-0600
Ill Downers Grove, Richmar Elctrns. Corp. 312-968-0118
Ind Fort Wayne, Robert O. Whitesell & Assocs. 219-432-5591
Ind Indianapolis, Robert O. Whitesell & Assocs. 317-359-9283
Ind Kokomo, Robert O. Whitesell & Assocs. 317-453-3592
Iowa Cedar Rapids, Palatine Sls. 319-365-8071
Kans Derby, Palatine Sls..... 316-788-0621
Kans Lenexa, Palatine Sls..... 913-492-7020
Ky Louisville, Robert O. Whitesell & Assocs. 502-897-1569

Md Columbia, Rep-Tron Inc. 301-465-6433
Md Ellicott City, Mktg Technologies Assoc. 301-465-5944
Md Hillside, Rep-Tron, Inc. 301-420-1133
Mass Waltham, Conti-Younger Assocs. 617-890-4582
Mich Grand Rapids, Robert O. Whitesell & Assocs. 616-942-5420
Mich Southfield, Robert O. Whitesell & Assocs. 313-559-5454
Mich St. Joseph, Robert O. Whitesell & Assocs. 616-983-7337
Minn Edina, M. Foster Co. 612-835-2252
Mo St. Louis, Palatine Sls. 314-426-7055
NM Albuquerque, Straube Assocs. 505-265-7759
NY Clinton, Advanced Comp. Corp. 315-853-6438
NY Endicott, Advanced Comp. Corp. 607-785-3191
NY Manhasset, Win-Cor Elctrn. Sls. 516-627-9474
NY No. Syracuse, Advanced Comp. Corp. 315-699-2671
NY Scottsville, Advanced Comp. Corp. 716-889-1429
Ohio Cincinnati, Robert O. Whitesell & Assocs. 513-521-2290
Ohio Columbus, Robert O. Whitesell & Assocs. 614-888-9396
Ohio Dayton, Robert O. whitesell & Assocs. 513-298-9546
Ohio Middleburg Hts., R.O. Whitesell Assoc. 216-826-4424
Ore Portland, Earl & Brown Co. 503-245-2283
Pa Feasterville, Professional Service Assoc. 215-355-6244
Pa Pittsburgh, Robert O. Whitesell & Assocs. 412-344-7277
Tenn Greenville, R.O. Whitesell Assocs. 615-639-6154
Tex Plano, K & H Sls. 214-423-6520
Utah Salt Lake City, Straube Assocs. 801-943-5650
Wash Seattle, Earl & Brown Co. 206-284-1121
Wisc Butler, Richmar Elctrns Corp. 414-781-1730

Local Distributors

Ariz Phoenix, CEC Moltronics 602-272-7951
Cal Garden Grove, Allied Elctrns. 213-598-8671
Cal Irvine, Terminal Elctrn. 714-549-8611
Cal Mt. View, Terminal Elctrns. 415-969-9240
Cal San Diego, CEC Moltronics 714-278-5020
Cal Santa Clara, CEC/Moltronics 408-244-7600
Cal South Gate, CEC/Moltronics 213-773-6521
Cal Sunnyvale, Diplomat/Westland 408-734-1900
Colo Denver, Ratel Terminal Elctrns 303-934-5813
Colo Denver, Elctrn. Parts 303-744-1992
Colo Denver, Newark Elctrn. 303-757-3351
Conn E. Haven, J.V. Elctrns. 203-469-2321
Fla Clearwater, Diplomat/Southland Elctrns 813-443-4514
Fla Orlando, Hammond Elctrns. 305-849-6060
Ill Chicago, Newark Elctrns. 312-638-4411
Ill Elgin, Allied Elctrns. 312-697-8200
Ill Elk Grove Village, Pioneer/Chicago 312-437-9680
Ill Palatine, Ohm Elctrns. 312-359-5500
Md Baltimore, RESCO/Baltimore 301-823-0070
Md Beltsville, Resco/Washington 301-937-5890
Md Savage, Pyttronics Ind. 301-792-7000
Mass Dedham, Gerber Elctrns. 617-329-2400
Mass Newton, Green Shaw 617-969-8900
Mich Livonia, Pioneer/Mich. 313-525-1800
Minn Minneapolis, Newark Elctrns. 612-331-6350
Mo Grandview, Advanced Elctrn. 816-763-3740
Mo St. Louis, Olive Elctrns. 314-863-7800
NJ Bellmawr, Mid Atlantic Elctrn. 609-931-5303
NY Buffalo, Summit Distributing 716-884-3450
NY Mt. Vernon, QAR Ind. Elctrn. 914-699-2224
NY Rochester, Summit Distributing 716-334-8110
NY Vestal, Harvey Elctrns 607-748-8211
Ohio Dayton, Pioneer Standard 513-236-9900
Ore Portland, Radar Elec. Co. 503-233-3691
Pa Montgomeryville, Pyttronics Inds. 215-242-6700
SC Columbia, Dixie Radio Supply 803-253-5332
Tex Dallas, Component Specialties, Inc. 214-357-6511
Tex Ft. Worth, Allied Elctrns. 817-336-5401
Tex Houston, Component Specialties, Inc. 713-771-7237
Tex Richardson, Prime Distr. 214-231-0170
Utah Salt Lake City, Diplomat/Alta Land 801-486-4134
Wash Seattle, Radar Elctrns. 206-282-2511
Wisc Milwaukee, Marsh Elctrn. 414-475-6000

CORDOVER & CO., CARL, Dept. EM, 3914 North 29th Ave., Hollywood, Fla. 33020, Tel: 305-921-6300; Empl.: 25

CORNELL-DUBILIER ELCTRNS., Dept. EM, 2070 Maple, Des Plaines, Ill 60018

CORNELL-DUBILIER ELECTRONICS, Dept. EM, 150 Avenue "L", Newark, N.J. 07105, Tel: 201-589-7500, Telex: 03-8366; FSC No.: 14655; Empl.: 3000 ..... p. 1091-1099,2624,2625,3433

Sales Manager: A. Cavuto; *Distributor Manager:* E. Larabee

Local Sales Offices & Reps.

Ariz Scottsdale 602-946-4437
Cal Los Altos 415-941-3399
Cal San Diego 714-566-5252
Cal Santa Monica 213-829-6731
Colo Wheatridge 303-423-1020
Fla Maitland 305-831-1242
Ga Atlanta 404-261-6160
Ill Des Plaines 312-299-8171
Ind Indianapolis 317-849-7154
Mass Norwood 617-762-5333
Mich Detroit 313-882-1717
Minn Minneapolis 612-559-5361
Mo St. Louis 314-534-4611
NJ Newark 201-589-7500
NM Albuquerque 505-294-1436
NY Rochester 716-544-9580
NC Raleigh 919-787-9564
Ohio Cleveland 216-271-5429
Ohio Dayton 513-298-7224
Ore Portland 503-297-2581
Pa Norristown 215-272-0118
Tex Dallas 214-357-4024
Utah Salt Lake City 801-363-0275
Wash Bellevue 206-455-5846
Exp: Ill., Des Plaines 312-299-8171

Local Distributors

Ariz Phoenix, Moltronics of Arizona 602-272-7951
Cal Chatsworth, Jaco Elctrns
Cal Los Angeles, Kierulff Elctrns. 213-685-5511
Cal Mountain View, Capacitor Sls. Co. 415-964-8880
Cal Mountain View, Abacus Elctrns. 415-961-1500
Cal San Diego, Moltronics 714-278-5020
Cal San Diego, Shelley-Neuman 714-453-7133
Cal San Diego, Kierluff Elctrns. 714-278-2112
Cal San Francisco, Zack Elctrns. Co. 415-626-1444
Cal Southgate, Moltronics 213-773-6521
Cal Sun Valley, Q.C. Comps. 213-768-6111
Colo Lakewood, Acacia Sls.
Conn Hamden, Wilshire Elctrns. 203-281-1166
Conn North Haven, Cramer Elctrns. 203-239-5641
Conn Stratford, State Elctrns. 203-375-5961
Conn Waterbury, Bond Radio Supply 203-753-1184
Fla Ft. Lauderdale, Newark Electric 305-587-2372
Fla Ft. Lauderdale, Hall-Mark Elect. 305-971-9280
Fla Miami, Lykes Elctrns. 305-635-0849
Fla Orlando, Hammond Elctrns. 305-849-6060
Fla Orlando, Hall-Mark Elect. 305-855-4020
Fla Tampa, Lykes Elec. Corp. 813-886-6651
Ga Norcross, Lykes Elctrns. 404-449-9400
Ill Chicago, Newark Elect. Co. 312-638-4411
Ill Elk Grove Village, G.B.L. 312-593-3220
Ind Ft. Wayne, Ft. Wayne Elec. Sy. 219-423-3422
Ind Indianapolis, Graham Elctrns. 317-634-8486
Iowa Cedar Rapids, DEECo. 319-365-7551
Kans Shawnee Mission, Hall-Mark Elec. 913-888-4747
Kans Wichita, Radio Supply 316-267-5214
Md Gaithersburg, Pioneer/Washington 301-948-0710
Md Rockville, Capital Radio 301-881-2270
Mass Burlington, Wilshire Electric/New England 617-272-8200
Mass Dedham, Gerber Elctrns. 617-329-2400
Mass Lynn, Land Elctrn. Supply 617-592-2221
Mass Newton, Green Shaw 617-969-8900
Mass Newton Centre, Cramer Elctrns. 617-969-4000
Mass Watertown, Sterling Elect. 617-926-9720
Mass West Newton, A.W. Mayer Co. 617-965-1111
Mich Livonia, Pioneer/Michigan 313-525-1800
Minn Bloomington, Arrow Elec. 612-888-5522
Minn Minneapolis, Hall Mark Elctrns. 612-884-9056
Minn St. Paul, Gopher Elect. Co. 612-645-0241
Mo Earth City, Hall-Mark Elect. 314-291-5350
Mo Kansas City, Walter's Radio Sy. 816-531-7015
Mo St. Louis, Olive Elctrns. 314-863-7800
Neb Omaha, Radio Equip. Co. 402-341-7700
NH Concord, Evans Radio 603-224-9961
NJ Cinnaminson, Wilshire Elect./Philadelphia 215-627-1920
NJ Clifton, Wilshire Elect. 201-340-1900
NJ Hanover, State Elctrns. 201-887-2550
NY Buffalo, Summit Distrs. 716-884-3450
NY Farmingdale, Arrow Elctrns. 516-694-6800
NY Hauppauge, Jaco Elctrns. 516-273-5500
NY Rochester, Simcona Elctrns. 716-328-3230
NY Rochester, Summit Dist. 716-334-8110
NY Rochester, Rochester Radio Supply 716-454-7800
NC Greensboro, Hammond Elec. 919-27
NC Winston-Salem, Kirkman Elctrns. 919-72
Ohio Cincinnati, Hughes Peters 513-35
Ohio Cleveland, Pioneer Standard 216-58
Ohio Columbus, H. Peters 614-29
Ohio Dayton, Arrow Elec. 513-25
Ohio Dayton, Pioneer/Dayton 513-23
Ohio Dayton, Stotts Friedman 513-29
Okla Tulsa, Radio, Inc. 918-58
Pa Huntingdon Valley, Hall-Mark Elctrns. 215-35
Pa Pittsburgh, Cam/RPC 412-78
Pa Pittsburgh, Pioneer Pittsburgh 412-78
RI Providence, W. Dandreta 401-86
RI Warwick, W.H. Edwards 401-48
Tenn Memphis, Bluff City Dist. Co. 901-72
Tex Dallas, Hall-Mark Elec. 214-23
Tex Hall-Mark 713-78
Tex Houston, Harrison Equip. Co. 713-65
Tex Houston, Altair Co. 713-46
Tex Richardson, Altair Co. 214-23
Utah Salt Lake City, Calron Elec. Sy. 801-48
Wash Seattle, Almac/Stroum Elect. 206-76
Wisc Milwaukee, Electronic Expeditors 414-22
Exp: Can., Montreal, Que., Payette Radio Ltd 514-87
For: Canada, Calgary, Alberta, Varah's 403-27
For: Canada, Dartmouth, N.S., Hermes Elctr 902-46
For: Canada, Scarborough, Ont., Carsten El 416-75
For: Canada, St. Laurent, Que., Specialty El Ltd. 514-33
For: Can., Don Mills, Ont., Saynor Elctrns. 416-4
For: Can., Vancouver, BC, L.A. Varah Ltd. 604-8

CORNING GLASS WORKS, Dept. EM, Mai Bldg. 21-3, Corning, NY 14830, Tel: 607-97 Telex: 932-499

Sales Manager: P. Radding

CORNING GLASS WORKS, Corning Elec Dept. EM, Houghton Pk., Bldg. A-2, Cornin 14830, Tel: 607-974-9000, Telex: 932481 p. 10

Sales Manager: R. E. Rahill; *Distributor Manag* Hall

Local Sales Offices & Reps.

Cal Orange, Corning Glass Works 714-7
Cal San Diego, Harvey King Assoc. 714-5
Cal Sunnyvale, Corning Glass Works 408-7
Ill Chicago, Corning Glass Works 312-6
Kans Leawood, H.C. Heyde Co. 913-6
Me Biddeford, Components, Inc. 207-2
Md Lanham, L. D. Lowery 301-4
Mass Littleton, Corning Glass Works 617-4
Mich Detroit, Rathsburg Assocs. 313-8
NC Raleigh, Corning Glass Works 919-8
NC Wilmington, Corning Glass Works 919-7
Ore Portland, Jas. J. Backer Co. 503-2
Ore Salem, Jas. J. Backer 503-3
Pa Bradford, Corning Glass Works 814-3
Pa Broomall, L.D. Lowery Assocs. 215-3
Pa Pittsburgh, Covert & Newman Co. 412-5
Wash Seattle, J. J. Backer Co. 206-2

Local Distributors

Ariz Phoenix, Liberty Elctrns. 602-2
Cal El Segundo, Liberty Elctrns. Inc. 213-3
Cal Gardena, Bell Industries 213-3
Cal Mountain View, Elmar Elctrns. 415-9
Cal San Diego, Liberty Elctrns. 714-5
Cal Sunnyvale, Bell Industries 408-7
Colo Commerce City, Elmar Elctrns. 303-2
Colo Denver, Cramer Elctrns. 303-7
Conn North Haven, Cramer/Conn. 203-2
Fla Ft. Lauderdale, Cramer/Ft. Lauderdale 305-9
Fla Hollywood, Cramer/Hollywood 305-9
Fla Orlando, Cramer/Orlando 305-8
Ga Norcross, Cramer/Atlanta 404-4
Ill Chicago, Bell Ind. 312-9
Ind Indianapolis, Pioneer Ind. 317-8
Kans Lenexa, Hamilton Avnet Elctrns. 317-8
Md Baltimore, RESCO/Baltimore 301-8
Md Gaithersburg, Cramer/Washington, Inc 301-9
Md Lanham, Milgray 301-4
Mass Billerica, Kierulff Elect. 617-4
Mass Newton Centre, Cramer Elctrns. 617-7
Mass Waltham, Sterling Elctrns. 617-8
Mich Livonia, Pioneer/Mich 313-5
Minn St. Paul, Ragon Elctrns. 612-8
NJ Cherry Hill, Cramer/Penn 609-4

J Somerset, Schweber Elctrns. 201-469-6008
M Albuquerque, Cramer/N.M. 505-243-4566
Y E. Syracuse, Cramer/Syracuse, 315-437-6671
Y Farmingdale, Arrow Elctrns..... 516-694-6800
Y Freeport, Milgray Elctrns..... 516-546-6000
Y Hauppauge, Cramer/Long Island 516-231-5600
Y Rochester, Cramer/Rochester, Inc. 716-275-0300
Y Westbury, Schweber Elctrns..... 516-334-7474
C Raleigh, Resco/Raleigh 919-781-5700
C Winston-Salem, Cramer/Winston-Salem 919-725-8711
hio Cincinnati, Sheridan Sls..... 513-761-5432
hio Cleveland, Pioneer/Cleveland 216-587-3600
hio Columbus, Hughes-Peters, Inc. .. 614-294-5351
hio Dayton, Pioneer/Dayton..... 513-236-9900
hio Dayton, Sheridan Sls Co..... 513-223-3332
a Philadelphia, Almo Elctrns..... 215-698-4000
a Pittsburgh, Pioneer/Pittsburgh 412-782-2300
ex Dallas, Hamilton/Avnet Elctrns .. 214-661-8661
ex Dallas, Solid State Elctrns. 214-352-2601
ex Houston, Hamilton/Avnet Elctrns. 713-780-1771
ash Bellvue, Liberty Elctrns./NW 206-453-8300
or: Can., Montreal, Quebec, Cesco Elctrns. 514-735-5511
or: Can., Toronto, Ont., Cesco Elctrns. 416-661-0220

NING GLASS WORKS, Memory Prods Dept., ept. EM, 3900 Electronic Dr., Raleigh, N.C. 27602, Tel: 9-876-1100, TWX: 510-928-1840; Empl.: 25
les Manager: H. S. Craumer

NING GLASS WORKS, Telecomm Prods Dept., ept. EM, Corning, NY 14830, Tel: 607-974-8812, lex: 932498
les Manager: W. L. Babcock

NING SCIENCE PRODUCTS, Corning Glass orks, Dept. EM, Corning, N.Y. 14830, Tel: 7-974-9000, Telex: 9324-81/99; Empl.: 8000
les Manager: R.T. Cahill

TEC, INC., Dept. EM, 15811 Chemical La., ntington Bch, Cal. 92649, Tel: 714-897-2529; Empl.:
cal Sales Offices & Reps.
l Orange, Sls & Mktg. Assoc. 714-997-5720
Chicago, Kennedy Engirg..... 312-631-8283
Old Bridge, S.E.A. Co. 201-679-8800
Charlotte, McLean Sls. 704-366-2675

TRON DIV., Illinois Tool, Dept. EM, 6601 W. Irving k Rd., Chicago, Ill. 60634, Tel: 312-282-4040, TWX: 0-221-0275
cal Sales Offices & Reps.
Huntsville, Electro-Mech. Sls. Engrg. Co. 205-883-9624
s Los Angeles, Cortron Div., I.T.W. 213-723-1181
Menlo Park, McKnight Co. 415-325-2844
Orlando, Perrott Assocs. 305-275-1132
Atlanta, Electro-Mech. Sls. Engrg. 404-449-6337
Chicago, Cortron Div., I.T.W. 312-282-4040
ns Leawood, Thunderbird Tech. Sls. & Svcs. 913-642-7220
Randallstown, Beacon 301-922-1248
ss Burlington, Cortron Div., I.T.W. .. 617-272-5646
n Minneapolis, Comstrand, Inc..... 612-571-0000
St. Louis, Thunderbird Tech. Sls. & Svcs. 314-567-6488
Lincoln, Mktg. Assocs. 402-464-5244
Bridgewater, J. F. Coughlin 201-725-1327
Haddonfield, TAI Corp. 609-854-3011
East Syracuse, Fountain, Young & Co. 315-437-7733
Massapequa, J. F. Coughlin Assocs. 516-799-7743
Raleigh, Electro-Mech Sls. Engrg. 919-782-7586
Dayton, Rockford Controls..... 513-898-5452
n Nashville, Elctro-Mech Sls. Engrg. 615-256-2516
Dallas, Microsystems Mktg. Inc. 214-238-7157
Falls Church, Beacon 703-534-7200
h Redmond, Barrett Sls. Northwest Ltd. 206-885-6991

R CORP., Dept. EM, 3121 Benton St., Garland, 75042, Tel: 214-276-9487, Telex: 730-764; FSC 20891; Empl.: 50
s Manager: D.N. Dukes
l Sales Offices & Reps.
Fullerton 714-992-4690
n Greenwich..... 203-661-2325
Ill Chicago..... 312-539-6181
Tex Dallas 214-276-9487
Tex Houston..... 713-649-4441

COSMO PLASTICS CO., Dept. EM, 3239 W. 14th St., Cleveland, Ohio 44109, Tel: 216-861-5594, TWX: 810-421-8444; Empl.: 500
Local Sales Offices & Reps.
Ariz Phoenix, Electrical Specialty Co. 602-275-5736
Cal Los Angeles, Electrical Specialty Co. 213-724-9600
Cal San Diego, Electrical Specialty Co. 714-239-1345
Cal So. San Francisco, Electrical Specialty Co. 415-589-9611
Colo Denver, Electrical Specialty Co. 303-321-0226
Conn Guilford, R.H. Whitehead Jr. & Assocs. 203-453-3762
Ill Chicago, A.J. Ellis Co. 312-262-2708
Ind Indianapolis, Blind & Assocs. 317-251-1249
Mass Boston, Whitehead Assocs. 617-542-7676
Minn Minneapolis, Ladky Assocs. of Minn. 612-884-2125
Mo Webster Grove, Hippler Sls. Co. 314-961-8499
NJ Morristown, Andrews & Andrews, Inc. 201-569-8800
NY Huntington, Andrews & Andrews, Inc. 516-692-8686
NY Rochester, P.J. Andres..... 716-381-1043
Ohio North Olmsted, Plus Sls., Inc. 216-734-8989
Ore Portland, Electrical Specialty Co. 503-227-3601
Pa Bridgeport, R.D. Freedman Assocs. 215-279-5767
Tenn Knoxville, T.S. Stone Co. 615-588-7721
Utah Salt Lake City, Electrical Specialty Co. 801-487-9805
Va Roanoke, A.B. Kreger Co. 703-989-4738
Wash Seattle, Electrical Specialty Co. 206-682-3434

COTO-COIL CO., Dept. EM, 65 Pavilion Ave., Providence, R.I. 02905, Tel: 401-467-4777; Empl.: 140 ..... p. 3434-3440
Sales Manager: W. Poisson
Local Sales Offices & Reps.
Cal Palo Alto, Testco Inc. 415-324-1900
Cal Santa Monica, Rep Assocs..... 213-829-5401
Conn Plantsville, Parnetics Co. 203-628-9343
Fla Ft. Lauderdale, Perrott Assoc. Inc. 305-792-2211
Fla Orlando, Perrott Assoc. Inc..... 305-275-1132
Mass Needham, White Sls. Co..... 617-444-3677
NY E. Northport, Jarms Assoc. 516-822-7085
Ore Portland, C.K. Shanks Assoc. 503-292-5656
Wash Seattle, C.K. Shanks Assoc. 206-632-4290

COUNTIS INDS., Dept. EM, Box 1444, San Luis Obispo, Cal. 93406, Tel: 805-544-1770; Empl.: 9

COX & CO., INC., Dept. EM, 215 Park Ave., S., New York, N.Y. 10003, Tel: 212-OR 4-4727, TWX: 710-581-2839; FSC No.: 98085; Empl.: 92
Sales Manager: W. Achenbaum, V.P. Mktg.
Local Sales Offices & Reps.
Cal Palos Verdes Penninsula, J. E. Scott 213-377-9761
NJ Westfield, E. Mertz 201-232-4643
Wash Mukilteo, J. Ransom 206-775-5431

CRAIG SYS. CORP., Dept. EM, 360 Merrimack St., Lawrence, Mass. 01842, Tel: 617-688-6961, TWX: 710-342-0765; Empl.: 200
Sales Manager: A. E. Koptuck
Local Sales Offices & Reps.
Cal Fullerton, Craig Sys. Corp..... 714-879-3180
Md Rockville, W. F. Frank Assoc. 301-340-7717
Minn St. Paul, Debeck Assoc 612-690-1557

CRAMER COIL, Div Digital Magnetics Inc, Dept. EM, Box 32, Grafton, Wisc. 53024, Tel: 414-377-7040; Empl.: 50 ..... p. 1335
Sales Manager: R. Rubinstein
Local Sales Offices & Reps.
Cal Sunnyvale, Winston Assoc..... 415-968-5374
Cal Van Nuys, Edmar Elctrns., West Co. 213-782-9020
Colo Lakewood, Precision Sls. 303-238-6634
Fla Miami, R.K. Welter Assoc..... 305-644-9345
Fla Orlando, R.K. Welter Assoc..... 305-644-9345
Fla Orlando, R.K. Welter Assoc..... 305-644-9345
Ill Downers Grove, Momak Sls 312-963-6400
Ind South Bend, C-S Elctrn Sls 219-291-6258
Kans Prairie Village, Engrg Svc Co. 913-649-4000
Mass Brookline, Technology Prods. Group 617-731-0858
Mich Southfield, Valentine & Assoc 313-559-3680
Minn Minneapolis, Sidaire Assoc 612-545-5669
Mo St. Louis, Engrg Svc Co. 314-997-1515
NY Syosset, SGS Sls..... 516-921-5335
SC Greenville, Elctrn Mktg Assoc..... 803-268-1125
Tex Dallas, Precision Sls 214-272-0616

CRAMER DIVISION, Conrac Corporation, Dept. EM, Mill Rock Rd., Old Saybrook, Conn. 06475, Tel: 203-388-3574, Telex: 966-453; Empl.: 350
Sales Manager: Mktg. Mgr. J. H. Moor; *Distributor Manager:* E. Latourette
Local Sales Offices & Reps.
Ala Huntsville, Col-Ins-Co..... 205-539-1771
Ariz Phoenix, Spectrum Assocs. 602-997-6324
Cal Palo Alto, Held & Mollard 415-965-9321
Cal Santa Ana, Spectrum Assocs..... 714-835-4114
Colo Denver, I.W. Strong & Assoc. 303-292-6900
Conn Rocky Hill, Aid Engrg. Sls. Co. .. 203-673-3692
Fla Orlando, Col-Ins-Co..... 305-423-7615
Ga Clarkston, Col-Ins-Co..... 404-934-7280
Ill Arlington Heights, Martec Assocs. 312-956-8090
Ind Indianapolis, Sukup & Cox..... 317-253-1215
Mass Westboro, Aid Engrg. Sls. Co..... 617-890-8181
Mich Birmingham, J.C. Hofstetter Co. 313-643-7203
Minn Minneapolis, Melius Co. 612-861-3343
Mo St. Louis, Lowell-Kangas & Assocs 314-821-4050
NY Hartsdale, Com-Tec Sls..... 914-761-6644
NC Winston-Salem, Col-Ins-Co..... 800-237-2600
Ohio Medina, J.C. Hofstetter Co. 216-241-4880
Pa Broomall, White/Whiddett Co..... 215-353-6343
Tex Dallas, Glidden Electro Equip. Co. 214-363-6539
Va Alexandria, TDI..... 703-971-8979
Wash Mercer Island, J.H. Andersen Assocs. 206-232-0484

CRESTRON ELEC., Dept. EM, 40 John Strt, Closter, NJ 07624

CRESTRONICS INC, Dept. EM, 1470 Hammer Rd RR#1 Mohave Mesa, Bullhead City, Ariz. 86430, Tel: 602-768-4501; Empl.: 11 ..... p. 3219

CRM DIV., See Consolidated Refining Co.

CROSS ELECTRONICS INC., Dept. EM, 100 Commonwealth Dr., Warrendale, Pa. 15086, Tel: 412-776-1591; Empl.: 35
Local Sales Offices & Reps.
Conn Meriden, Abbott-Allison Co. 203-237-8671
Mass E. Bridgewater, Abbott-Allison 617-245-0250
NY Roslyn Heights, Travco Assocs. 516-621-3223
Tex Richardson, Concept Sls..... 214-690-4521

CROUSE-HINDS CO., ARROW HART DIV., Dept. EM, 103 Hawthorne St, Hartford, Conn 06101, Tel: 203-249-8471, Telex: 99328 ..... p. 4026
Local Sales Offices & Reps.
Ariz Phoenix, Arrow Hart 602-957-2860
Ark El Dorado, Dick Bellew Sls 501-863-8325
Cal Los Angeles, Arrow Hart 213-926-0487
Cal San Francisco, Arrow Hart..... 415-397-8343
Cal San Rafael, L. Wright & Assoc .. 415-457-9940
Colo Denver, I.W. Strong Inc. 303-292-6900
Conn Manchester, Arrow Hart 203-289-6821
Ga Atlanta, Arrow Hart 404-394-4698
Ga Atlanta, Hollingsworth & Still 404-394-3270
Ill Wood Dale, Arrow Hart 312-595-7750
Ind Fort Wayne, R.O. Whitesell & Assocs. 219-432-5591
Ind Indianapolis, R.O. Whitesell & Assocs. 317-359-9283
Ind Kokomo, R.O. Whitesell & Assocs. 317-452-6065
Ky Louisville, R.O. Whitesell & Assocs. 502-897-1569
Me Falmouth, Arrow Hart 207-781-3569
Mich Detroit, R.O. Whitesell & Assocs. 313-559-5454
Minn Minneapolis, Arrow Hart 612-546-2285
Mo St. Louis, Arrow Hart 314-351-0770

NJ Cinnaminson, Arrow Hart 609-829-4777
NY Endicott, Arrow Hart 607-785-0785
NY Homer, Arrow Hart 315-458-3955
NY Rochester, Arrow Hart 716-227-2630
NY Yorktown Heights, Arrow Hart.... 212-684-0767
Ohio Cincinnati, R.O. Whitesell & Assocs. 514-521-2290
Ohio Columbus, R.O. Whitesell & Assocs. 614-888-9396
Ohio Dayton, R.O. Whitesell & Assocs. 513-298-9546
Ohio Middleburg Hgts., R.O. Whitesell & Assocs. 216-826-4424
Pa Pittsburgh, R.O. Whitesell & Assocs. 412-344-7277
Tex Arlington, W. Pat Fralia Co 817-640-9101
Utah Sandy, P.S. Farley 801-533-9303
Wisc Milwaukee, Arrow Hart 414-351-0840

Local Distributors

Ark Little Rock, Carlton-Bates 501-562-9100
Cal Los Angeles, Eurton Elect..... 213-747-9457
Cal Los Angeles, Fisher/Brownell 213-532-2170
Cal Los Angeles, Electro Comps. 213-264-7100
Cal Los Angeles, Electric Switches .. 213-664-1141
Cal Riverside, Electronic Supply 714-683-7300
Cal San Francisco, Zack Elctrns..... 415-626-1444
Cal San Jose, Consolidated Parts, Inc. 408-294-2303
Cal San Leandro, Electro Comps. ... 415-352-5210
Cal Santa Clara, Fisher/Brownell 408-244-6182
Colo Denver, Electronic Parts Co. 303-744-1992
Colo Denver, Integrated Electrns. 303-534-6121
Colo Lakewood, Acacia Sls. 303-232-2882
Conn Hartford, GAL Elect. Co. 203-232-9880
Conn Waterbury, Suburban Supply Co. 203-757-1251
Fla Miami, Electronic Equip. Co. 305-871-3500
Ga Atlanta, Ack Radio Supply Co. .. 404-351-6304
Ill Broadview, LCOMP Chicago, Inc. 312-865-7600
Ill Chicago, Electro/Kinetics..... 312-286-4200
Ill Chicago, Newark Elctrns..... 312-638-4411
Ill Rockford, J&M Elctrns..... 815-963-6445
Ill Rockford, G.C. Elctrns..... 815-963-6445
Ind Indianapolis, Graham Elctrns. Supply 317-634-8486
La Shreveport, Industrial Electric Supply 318-222-9459
Me Lewiston, Lewiston Supply Co. .. 207-784-4083
Md Bethesda, Empire Elctrns. 301-656-3300
Md Rockville, Capitol Radio Wholesalers 301-881-2270
Mass Boston, Sager Electric Supply Co. 617-749-6700
Mass Cambridge, Hilco Electric Supply Co. 617-876-0610
Mass West Newton, A.W. Mayer Co. .. 617-965-1111
Mich Detroit, R.S. Elctrns. 313-491-1000
Mich St. Clair Shores, SPEMCO 313-771-2700
Minn Minneapolis, H.A. Holden Co. 612-336-5353
Minn St. Paul, Gopher Elctrn. Co. 612-645-0241
Miss Jackson, Ellington Elctrns..... 601-355-0561
Mo St. Louis, LCOMP St. Louis, Inc. 314-291-6200
NJ Camden, General Radio Supply Co. 609-964-8560
NJ East Rutherford, Kappe Elect. Distr. 201-939-5751
NJ Hanover, State Electrn. Parts 201-887-2550
NY Binghampton, Florance Elec. Supply 607-724-2455
NY Brooklyn, Herman H. Smith, Inc. 212-272-9400
NY Buffalo, Summit Dist. Inc. 716-884-3450
NY Buffalo, Genesee Radio & Parts, Inc. 716-873-9661
NY Farmingdale, Arrow Elctrn..... 516-694-6800
NY Hempstead, Electronic Equip. Co. 516-538-5510
NY Lynbrook, Peerless Radio Corp. 516-593-2121
NY New York, City Electrical Distr... 212-564-5454
NY New York, Brownell, Inc. 212-924-6000
NY Rochester, Rochester Radio Supply 716-454-7800
NC Winston Salem, Kirkman Electronics 919-722-9131
Ohio Cincinnati, Hughes-Peters, Inc. .. 513-351-2000
Ohio Cleveland, Pioneer/Cleveland 216-587-3600
Ohio Cleveland, Midland Elect. 216-861-3200
Ohio Columbus, Hughes-Peters, Inc. ... 614-294-5351
Ohio Dayton, ESCO, Inc. 513-226-1133
Ohio Dayton, Pioneer/Dayton 513-236-9900
Ohio Solon, REPCO 216-248-8900
Okla Oklahoma City, Trice Wholesale Elctrns. 405-524-4411
Ore Portland, Tek Electric Controls Co. 503-246-5451
Pa Philadelphia, Almo Elctrns..... 215-698-4000
Pa Philadelphia, Philadelphia Elctrns. 215-568-7400
Pa Pittsburgh, CAM/RPC Elctrns..... 412-782-3770
RI Providence, Dandreta & Co. 401-861-2800
Tex Dallas, Assoc. Aircraft 214-331-4381
Tex Fort Worth, Allied Elctrns. 817-336-5401
Tex Houston, Harrison Equip. Co. 713-224-9131
Va Charlottesville, Virginia Radio Supp 804-296-4184
Va Richmond, Meridian Elctrns..... 804-359-0221
Wash Bellevue, Bell Inds. 206-747-1515
Wash Seattle, Radar Elctrns. Co. 206-282-2511
Wisc Mequon, Taylor Elect. Co. 414-241-4321

CROUZET/CRIDLAND, Dept. EM, 118 Barrington Commons Ct Ste 207, Barrington, Ill. 60010, Tel: 312-381-7044, Telex: 722-403

Sales Manager: G.A. Cridland

Local Sales Offices & Reps.

Cal Aptos, Tri-tek 408-688-8277
Cal Manhattan Beach, Tri-Tek 714-533-1454
Fla Winter Park, Young & Lawrence 305-647-6929
Ga Pine Lake, Hilco..... 404-294-7157
Ill Schaumburg, Kingston Comps. .. 312-529-8055
Ind Carmel, Carter, McCormick & Peirce 317-844-4175
Mass Lowell, Moisan Assocs 617-459-6800
Mich Farmington, Carter, McCormick & Peirce 313-477-7700
Minn Wayzata, Joe Little Assocs,..... 612-473-1107
NY Cazenovia, Peter M. DeCew 315-655-8602
NY Syosset, Motion Control Sls. 516-921-5656
Ohio Dayton, Carter, McCormick & Peirce 513-222-7700
Ohio Westlake, Harry Applegate 216-331-2960
Pa Cornwells Heights, William D. Staats Co. 215-639-5231
Pa Monroeville, Carter, McCormick & Peirce 412-372-4415
Tex Dallas, B.P. Sls. 214-234-8438
Wash Issaquah, Jack Dermody 206-392-2053

CROVEN LIMITED, Dept. EM, 500 Beech St., Whitby, Ont., Can., Tel: 416-668-3324, TWX: 610-384-2750; FSC No.: 00809; Empl.: 250 ..... p. 2295

Sales Manager: R. McCormick

Local Sales Offices & Reps.

Ala Huntsville, J.H.U. Assocs 205-536-7455
Ariz Tempe, Sedco Sls..... 602-968-7791
Cal San Mateo, Melvin Sls. Co. 415-349-7444
Cal Van Nuys, R.L. Assocs. 213-782-7826
Fla Tampa, Reptronics Inc..... 813-879-8730
Mass Randolph, Naton Assoc..... 617-986-6417
Ohio Dayton, F.L. Ohmer & Assocs. .. 513-434-1454
Tex Fort Worth, W. Pat Fralia Co. 817-738-2394

CROWN INTERNATIONAL, Dept. EM, Box 1000, Elkhart, Ind. 46514, Tel: 219-294-5571, TWX: 810-294-2160; Empl.: 175 ..... p. 1010

Sales Manager: M. Stoll

Local Sales Offices & Reps.

Ala Huntsville, RJC Assoc 205-883-6310
Cal Cupertino, Ashby Assocs.-West 408-996-0411
Cal Encino, CDH Assocs. 213-345-3111
Conn Woodbridge, Elctrn. Mktg. 203-397-1461
Ill Chicago, P. Berndt Assocs. 312-283-0713
Md Gaithersburg, Wright Co. 301-840-1928
Mich Ferndale, Shalco 313-547-4771
Minn St. Paul, Skor..... 612-645-6461
NJ Parlin, JMR Sls., Inc..... 201-727-5335
NY E. Rochester, RJC Assoc. 716-385-2770
Ohio Dayton, Ashby Assocs..... 513-252-5627

CROWN MICROWAVE, INC., Sub. Microwave Semiconductor Corp., Dept. EM, 6 Executive Park Dr., N. Billerica, Mass. 01862, Tel: 617-667-4165, TWX: 710-347-1576; Empl.: 40

Local Sales Offices & Reps.

Ala Huntsville, Beacon Elctrns. Assocs. 205-881-5031
Ariz Scottsdale, Territorial Mktg..... 602-994-8665
Cal Los Altos, Cain, White & Co..... 415-948-6533
Cal Van Nuys, C. W. Swift Assocs.. 213-989-1133
Colo Wheatridge, Eggeman Assocs. .. 303-423-3707
Fla Ft. Lauderdale, Beacon Elctrns. Assocs. 305-971-7320
Ga Atlanta, Beacon Elctrns. Assocs. 404-351-3654
Ill Northfield, Feller Assocs. 312-446-8065
Ind Ft. Wayne, Given Corp. 219-432-5585
Md Columbia, Neal Deoul Assocs. .. 301-997-4353
Mass South Chelmsford, Independent Mktg. Reps. 617-256-8251
NJ Ft. Lee, Technical Mktg. Assocs. 201-224-6911
NJ Moorestown, Stern Assocs 609-234-0661
NM Albuquerque, Trembly Assocs. .. 505-266-8616
NY Skaneateles, Robtron 315-685-5731
NC Charlotte, Beacon Elctrns. Assocs. 704-525-7412
Ohio Dayton, Micro Sls. Corp. 513-433-8171
Ohio Dayton, M. Ohmer Assocs. 513-29
Tenn Oak Ridge, Beacon Elctrns. Assocs.
Tex Dallas, Texas Avionics Co..... 214-36
Wash Seattle, Datacom Assocs. 206-28

CRYDOM CONTROLS, Int'l. Rectifier, Dept. EM, Grand Ave., El Segundo, Cal. 90245, 213-322-3331, TWX: 910-348-6283, 67-4660; 100 ..... p. 355

Sales Manager: Karl Bissell

Local Sales Offices & Reps.

Ala Birmingham, Com-Trol Corp. 205-82
Cal Santa Clara, T. Hartman Assoc. 408-24
Cal Tustin, Morgan Johnson Co. 714-83
Colo Denver, Parker-Webster Co. 303-75
Conn Ridgefield, W. Johnson Co. 203-43
Ill Elk Grove Village, Carlson Elctrns. 321-95
Ind Indianapolis, Carlson Elctrns..... 317-25
Md Riderwood, Manreps Inc. 301-29
Mass Burlington, Contact Sls..... 617-27
Mich Bloomfield Hills, Roth Ind'l Sls. .. 313-62
Minn Minneapolis, Electronic Innovators 612-88
NM Albuquerque, Shefler-Kahn 505-29
NY Buffalo, R. W. Mitscher Co. 716-63
NY Melville, Astrorep Inc. 516-42
NC Raleigh, R. W. Mitscher Co..... 615-68
Ohio Cleveland, D. Steffen & Assoc... 216-46
Ohio Dayton, D. Steffen & Assoc. 513-29
Ore Portland, Electronic Comp. Sls... 503-24
Pa Ardmore, Manreps, Inc. 215-64
Tenn Johnson City, R. W. Mitscher Co. 615-68
Tex Ft. Worth, W. Pat Fralia Co. 817-64
Tex Houston, W. Pat Fralia Co. 713-77
Utah Salt Lake City, Parker-Webster Co. 801-48
Wisc Milwaukee, Carlson Elctrns..... 414-47

CRYSTAL TECHNOLOGY, Dept. EM, 25 Middlefield Way, Mountain View, Cal 9404 415-961-9311, TWX: 910-379-6625; Empl.: 75

Sales Manager: L. Castelli

Local Sales Offices & Reps.

Mass Billerica, Drew Associates 617-66
NJ E Windsor, Cook & Weil, Inc. 609-44
NY New York, Cook & Weil 212-74

CRYSTEK CRYSTALS CORP., Dept. EM Crystal Dr., Ft. Myers, Fla. 33901, Tel: 813-93 TWX: 510-951-7448; FSC No.: 13454; Empl.:

Local Sales Offices & Reps.

Ariz Phoenix, J. R. Morgan Agcy. 602-25
Cal Carlsbad, Kaplan Assocs 714-72
Cal Los Angeles, Crystek Crystals Sls. Offic 714-93
Cal San Francisco, J.E. Stricker Co. 415-34
Colo Denver, Omega Ltd..... 303-75
Conn Norwalk, Johnson Assoc. 203-76
Conn Norwalk, Betronic Assoc. 203-85
DC Washington, Sonny Simberkoff Assocs.. 703-52
Fla Altamonte Springs, Semtronic Assocs 305-83
Fla Brandon, J&L Sls Co 813-68
Fla Clearwater, Semtronic Assocs .. 813-46
Fla Plantation, Semtronic Assocs 305-83
Ga Tucker, Bill Brown Co..... 404-93
Ill Chicago, Lassers & Co. 312-53
Ill Palatine, Technology Sls 312-95
Kans Shawnee Mission, SAI Mktg 913-4
Mo St. Louis, SAI Mktg 314-83
NJ South Orange, Sonny Simberkoff Assoc 201-76
NY Buffalo, Sonny Simberkoff Assocs., Inc. 716-83
NY New York City, Sonny Simberkoff Asso 212-9
NC Burlington, Sonny Simberkoff Assocs., I 919-5
Ohio Cleveland, SAI Mktg 216-2
Ohio Dayton, SAI Mktg 513-4
Ore Portland, Earl & Brown Co..... 503-2
Pa Philadelphia, Sonny Simberkoff Assocs. 215-4
Pa Pittsburgh, SAI Mktg 412-7
Tex Arlington, Wheelex Inc 817-4
Tex Spring, Wheelex Inc. 713-3
Wash Seattle, Earl & Brown Co. 206-2

CRYSTONIC LABS, Dept. EM, 10418 La Blvd., Inglewood, Calif. 90304, Tel: 213-645-8

Sales Manager: Bob Perkins

Local Sales Offices & Reps.
Cal Marina Del Rey, Intervend Inds.. 213-821-7936

R INDUSTRIES INC., Semiconductor Div., Dept. EM, 35 Central Ave., E. Farmingdale, N.Y. 11735, Tel: 516-694-3404, TWX: 510-224-6444; Empl.: 25

Sales Manager: R. Roskowski

S CORP., Dept. EM, 905 N. West Blvd., Elkart, Ind. 46514, Tel: 219-293-7511, TWX: 810-294-2167; Empl.: ',000

Sales Manager: R. A. Stackhouse; *Distributor Manager:* I. C. Wells

Local Sales Offices & Reps.
la Huntsville, Interep Assocs. 205-881-3677
riz Phoenix, Hecht, Henschen & Assocs. 602-275-4411
al Burlingame, Logan & Assocs. 415-697-6100
al South Pasadena, CTS Corp. 213-682-1137
olo Denver, Elcom, Inc. 303-770-4400
onn North Haven, Comp Rep Assocs. 203-239-9762
la Cocoa, Electrocomp Assocs. 305-452-9568
la Ft. Lauderdale, Electrocomp Assocs. 305-491-4141
la St. Petersburg, Electrocomp Assocs. 813-822-9677
a Atlanta, Interep Assocs. 404-394-7756
wa Marion, Thomas & Modrcin Assocs. 319-377-6261
ans Shawnee Mission, Thomas & Modrcin Assocs. 913-432-2131
d Baltimore, Coulbourn DeGreif, Inc. 301-247-4646
ass Needham, Comp Rep Assocs. .. 617-444-2484
ich Grand Rapids, J.L. Montgomery, Assoc. 616-774-9308
lich Southfield, J.L. Montgomery, Assoc. 313-358-2616
linn Minneapolis, R.W. Marshall Co... 612-929-0457
lo Hazelwood, Thomas & Modrcin Assocs. 314-895-4700
Y Jamaica, S-J Sales Assocs. 212-291-3232
Y Syracuse, Nycom, Inc. 315-437-8343
C Raleigh, Component Sls. 919-782-8433
hio Cincinnati, Baehr, Greenleaf & Assocs. 513-891-3827
hio Cleveland, Baehr, Greenleaf & Assocs. 216-221-9030
hio Columbus, Baehr, Greenleaf & Assocs. 614-486-4046
hio Dayton, Baehr, Greenleaf & Assocs. 513-293-1102
a Fort Washington, G.C.M. Associated 215-646-7535
a Pittsburgh, Covert & Newman Co. 412-531-2002
ex Addison, Parvin Sls. Co. 214-661-5374
ex Houston, Parvin Sls. Co. 713-981-0852
ah Salt Lake City, Elcom, Inc. 801-532-7940
ash Bellevue, SD-R2 Prods. & Sls. .. 206-747-9424

Local Distributors
a Huntsville, Hall-Mark Elctrns. Corp.
iz Phoenix, R. V. Weatherford Co. 602-272-7144
al Burlingame, Rose Elctrns.
al Gardena, Bell Inds.
al Irvine, Cramer/Los Angeles
al Irvine, Terminal Elctrns. Corp.
al Los Angeles, Western Electromotive Shephard, Inc. 213-820-3777
al Mountain View, Terminal Elctrns.
al San Diego, Cramer/San Diego
al Sunnyvale, Bell Inds.
lo Denver, Indl Elctrns. 303-771-2636
nn N. Haven, Cramer Elctrns.
Clearwater, Diplomat/Southland
Ft. Lauderdale, Hall-Mark Miami 305-971-9280
Orlando, Hall-Mark/Orlando 305-855-4020
Norcross, Cramer/Atlanta
Elk Grove Village, Hall-Mark/Chicago 312-437-8800
Mount Prospect, Cramer/Chicago
Skokie, Bell Inds.
Westmont, Bodelle Co.
Baltimore, Hall-Mark/Baltimore .. 301-796-9300
Gaithersburg, Cramer/EW Wash.
ss Newton, Greene-Shaw Co.
ss Newton Center, Cramer Elctrns.
h Farmington, Diplomat/Northland
h Kentwood, R. M. Elctrns. 616-531-9300
h Livonia, R. S. Elctrns. 313-525-1155
n Minneapolis, Indl. Comp. 612-831-2666
n Minneapolis, Diplomat Electro-Com
n Minneapolis, Cramer/Bonn
St. Louis, Olive Ind.'l Elctrns.
Little Falls, Cramer/New Jersey 201-785-4300
NM Albuquerque, Cramer/New Mexico 505-243-4566
NY Buffalo, Summit Distrs.
NY East Syracuse, Cramer/Syracuse
NY Hauppauge, Cramer/Long Island
NY Jamaica, Archer Indl. Distributors 212-291-3232
NY Plainview, Fairmont Elctrn. Sls. .. 516-694-8200
NY Rochester, Cramer/Rochester
NC Winston-Salem, Cramer/EW Winston-Salem
Ohio Cleveland, Cramer/Cleveland
Ohio Worthington, Hall-Mark/Columbus 614-846-1882
Pa Hungtington Valley, Hall-Mark/Philadelphia 215-355-7300
Pa Philadelphia, Philadelphia Elctrns.
Tex Dallas, Component Specialties, Inc. 214-357-6511
Tex Dallas, R. V. Weatherford 214-243-1571
Tex Stafford, Southwest Elctrns.
Utah Salt Lake City, Standard Supply Co. 801-486-3371
Wash Seattle, R. V. Weatherford..... 206-243-6340
Wash Tukwila, Cramer/Seattle, Inc. 206-575-0907

CTS OF BERNE, Dept. EM, 406 Parr Rd., Berne, Ind. 46711, Tel: 219-589-3111, TWX: 810-323-1580; Empl.: 1400 ..... p. 3675-3679,3875

Sales Manager: M. D. Weaver

Refer to CTS Corp. for distributor & sales office information

CTS KNIGHTS, INC., Dept. EM, 400 Reimann Ave., Sandwich, Ill. 60548, Tel: 815-786-8411, TWX: 910-642-0860; Empl.: 600 p. 2203,2300-2302,2304-2313

Sales Manager: Dave Nelson; *Distributor Manager:* Ray Kepka

Refer to CTS Corp. for distributor & sales office information

CTS MICROELECTRONICS, INC., Dept. EM, 1201 Cumberland Ave., W. Lafayette, Ind. 47906, Tel: 317-463-2565, TWX: 810-342-1882; Empl.: 275

Refer to CTS Corp. for distributor & sales office information

CUBIC CORP., Dept. EM, 9233 Balboa Ave., San Diego, Cal. 92123, Tel: 714-277-6780, TWX: 910-335-2010; Empl.: 2750

Local Sales Offices & Reps.
Cal Oceanside, Siltronix Div, Cubic Corp 714-757-8860
Cal San Marino, Cubic Corp 213-281-6222
Fla Altamonte Springs, Cubic Corp.. 305-830-1901
Fla Ft. Walton Beach, Cubic Corp.... 904-243-9505
NY New Hartford, Cubic Corp 315-724-9171
Ohio Dayton, Cubic Corp..... 513-233-1755
Ohio Fairborn, Cubic Corp..... 513-864-2592
Va Arlington 703-521-4525

CURTIS INDUSTRIES INC., Dept. EM, 8000 West Tower Ave., Milwaukee, Wisc. 53223, Tel: 414-354-1500; Empl.: 160

Sales Manager: R. VanDer Elsen

Local Sales Offices & Reps.
Ariz Tucson, Morrow & Assoc. 602-296-4719
Ark El Dorado, Indl Controls Assoc. 501-862-2051
Cal Los Altos, Ewing-Foley 415-941-4525
Cal Santa Monica, Master Representatives 213-395-2637
Colo Denver, Denver Electrical Sls 303-777-3010
Fla Lakeland, AA Electric Div. of AEC 813-682-6181
Ga Norcross, Southern Comps 404-921-6929
Haw Honolulu, Dougherty Entprs.
Ill Downers Grove, Richmar Elctrns. Corp. 312-968-0118
Md Woodbine, Naudain Assoc. Southern 301-442-2270
Mich Farmington Hills, Electro-Matic .. 313-478-1182
Minn St. Paul, Kenco Co..... 612-645-7717
Mo Hazelwood, Dy-Tronix..... 314-731-5799
Mo Kansas City, Dy-Tronix 816-737-1100
NH Nashua, Bell Controls 603-882-6984
NJ Clifton, Ossmann Comp. Inc. 201-778-8888
NJ Mount Laurel, Naudain Assocs... 609-235-1801
NY Bowmensville, Ossmann Comp Sls 716-681-9700
NY Huntington, Ossmann Comp. Inc. 516-673-9300
NY Kingston, Ossmann Comp. Sls... 914-338-5505
NY Rochester, Ossmann Comp. Sls. 716-424-4460
NC Winston-Salem, L.G. White & Co. 919-725-3612
Ohio Cleveland, Nationwide Comps. Reps. 216-562-9666
Pa Carnegi, Myles F. Smith & Assoc. 412-276-5363
Pa Philadelphia, Naudain Assocs..... 609-235-1801
Tex Irving, Aid Elctrns. 214-259-4761
Wash Seattle, C.B. Parsons & Co. 206-762-7373
Wisc Milwaukee, Richmar Elctrns. 414-781-1730

Local Distributors
Ala Birmingham, M.G. Electronics 205-328-4525
Ariz Phoenix, Vinson-Carter Elect. 602-275-4731
Ark Eldorado, Electra 501-862-4901
Cal Burlingame, Rose Elctrnes 415-348-2740
Cal Los Angeles, Master Distr 213-829-4656
Colo Denver, Integrated Elctrns 303-534-6121
Conn Bridgeport, Tower-Olschan 203-367-7401
Fla Lakeland, A.A. Electric 813-682-6181
Ga Atlanta, A.C. Equip 404-451-2747
Ill Chicago, Control Design..... 312-882-7232
Ill Chicago, Electro-Kinetics 312-286-4200
Ind Indianapolis, Control Design..... 317-788-4559
Iowa West Des Moines, Ramco Co 515-225-6933
Kans Kansas City, Korn-Feld Thorp Elect 913-321-7070
La Harahan, M. G. Elctrns 504-733-0070
Md Gaithersburg, Deanco 301-948-5444
Mass Allston, Apparatus Serv..... 617-787-1300
Mass Springfield, T.F. Cushing..... 413-788-7341
Mich Grand Rapids, Stotts-Friedman .. 616-459-0216
Mich Madison Hgts, McNaughton-McKay Elect. 313-399-7500
Minn Minneapolis, Stark Electric Supp 612-332-1325
Mo St. Louis, Control Design 314-426-3150
NJ Bergenfield, Technl Electronic Dist 201-384-3643
NJ Fairlawn, Relay Specialties 201-797-3313
NY Buffalo, Summit Distr 716-884-3450
NY Mt. Vernon, QAR Ind. Elctrns 914-669-2224
NY Rochester, Masline Elctrns..... 716-546-5373
NY Scarsdale, Logicomp Elctrns., Inc. 914-723-3334
NC Raleigh, Southeastern Radio Supp 919-828-2311
Ohio Cincinnati, Hughes-Peters 513-351-2000
Ohio Cleveland, Gateway Megatech .. 216-944-8565
Okla Tulsa, T.J. Ray..... 918-627-1515
Pa Pittsburgh, CAM/RPC..... 412-782-3770
SC Columbia, Dixie Elctrns..... 803-779-5332
Tex Dallas, Altair..... 214-231-5166
Va Richmond, Sterling Elctrns..... 804-359-0221
Wash Seattle, C.B. Parsons 206-762-7373
Wisc Milwaukee, Marsh Elctrns 414-475-6000
For: Can., Pickering, Ont, A.C. Simmonds & Sons

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IMMEDIATE DELIVERY!
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Telephone: 914 698-9332
Off the shelf delivery of CURTIS
Terminal Blocks, Relay Sockets,
Track and Controls.

CURTIS INSTRS., INC., Dept. EM, 200 Kisco Ave., Mt. Kisco, N.Y. 10549, Tel: 914-666-2971, TWX: 710-571-2163; Empl.: 70 ..... p. 2686

Sales Manager: Rhoda McDonald

Local Sales Offices & Reps.
Ariz Glendale, O'Donnel Assoc. 602-938-3120
Cal Burlingame, Polach & Bensinger, Inc. 415-697-2525
Cal Seal Beach, Texel Engrg..... 213-596-9411
Colo Littleton, Grifco..... 303-795-1989
Ill La Grange Park, Bierhaus Sls. .. 312-354-5100
Ind Ft. Wayne, McDonald Sls. Co. .. 219-747-3650
Mass Brookline, Harman Assocs. 617-232-6687
Minn St. Paul, Kenco Co..... 612-645-7717
Mo St. Louis, Fixman Engrg..... 314-725-5219
NY Manhasset, WinCor Elctrn. Sls. Corp. 516-627-9474
NY Syracuse, Rep. Tech., Inc. 315-437-2845
NC Winston-Salem, Radco Engrg..... 919-722-9671
Pa Media, W. Reeves Assocs., Inc. 215-LO 6-6709
Tex Dallas, Etron Corp. 214-245-6633
Va Arlington, Gans Pugh Inc..... 703-527-3262
Wash Seattle, Blum & Assocs..... 206-285-2590
Wisc Milwaukee, Bierhaus Sls. 414-332-0900

CUSHMAN ELECTRONICS, Dept. EM, 2400 N. 1st St., San Jose, Cal. 95112, Tel: 408-263-8100, TWX: 910-338-0556; Empl.: 190

Sales Manager: H. D. Farnsworth

CUSTOM CABLE CO., Dept. EM, 242 Butler, Westbury, N.Y. 11590, Tel: 516-334-3600; Empl.: 8

Sales Manager: J. Michelman; *Distributor Manager:* D. Pollack

CUSTOM COIL & TRANSFORMER CO., Dept. EM, Box 2369, Zanesville, Ohio 43701, Tel: 614-452-6973; Empl.: 60

Sales Manager: Murray Kraus

Local Sales Offices & Reps.

Ark	Little Rock, Crockett Sls.	501-224-3573
NC	China Grove, Nickerson Corp.	704-932-6772
Va	Falls Church, Beacon North	703-534-7200
Wash	Seattle, G.M. Gillette Assoc	206-284-3344
		*6;R.;R.

Local Distributors

Mo	St. Louis, L-Comp	314-647-5505

CUSTOM CONNECTOR CORP., Dept. EM, 1738 E. 30th St., Cleveland, Ohio 44114, Tel: 216-241-1679; Empl.: 36

Local Sales Offices & Reps.

Colo	Aurora, Comp. Specialties	303-341-0160
Conn	Glastonbury, Barton-Caron Assoc.	203-633-9417
Ill	Schaumberg, Control Design	312-882-7232
Ind	Indianapolis, Control Design	317-788-4559
Mass	Auburndale, Barton-Caron Assoc.	617-322-2021
Mo	St. Louis, Control Design	314-426-3150
Tex	Garland, Ray-May Assoc.	214-276-5214

CUSTOM ELCTRNS., Dept. EM, Browne St., Oneonta, N.Y. 13820, Tel: 607-432-3880, TWX: 510-241-8292; Empl.: 60 ..... p. 1146

Local Sales Offices & Reps.

Cal	Los Angeles, M.A. Stolaroff Co.	213-295-7781
Cal	Santa Clara, Richards Ass.	408-246-5860
Ill	Chicago, Rozner Sales	312-283-0022
Md	Silver Spring, Youth Assocs.	301-598-5740
Mass	Stow, Musello Assocs.	617-369-5900
Mich	Southfield, C.H. Schmidt Co.	313-353-6000
NY	Dix Hills, Mc Culloch Sls. Co.	516-864-8831
Tex	Dallas, Hillman Entprs.	214-827-4790
Wash	Seattle, Components West Inc.	206-243-2133
Exp:	Baldwin, N.Y., Milano Bros. Intl	516-223-9000

CUSTOM SCIENTIFIC INSTRS., Dept. EM, 13 Wing Dr., Box A, Whippany, N.J. 07981, Tel: 201-538-8500; Empl.: 20

Local Sales Offices & Reps.

SC	Lancaster, Slaughter Machinery Co.	803-283-2038

CUTLER-HAMMER, INC., Specialty Prods Grp., Dept. EM, 4201 N. 27th St., Milwaukee, Wisc. 53216, Tel: 414-442-7800, TWX: 910-262-3089 ..... p. 4041-4043

Sales Manager: J.A. Anderson; *Distributor Manager:* M.F. Higbie

Local Sales Offices & Reps.

Cal	Los Angeles	714-776-1910
Cal	San Francisco	415-854-3757
Fla	Tampa	813-839-5493
Ga	Atlanta	404-939-3023
Ill	Chicago	312-547-7980
Md	Baltimore	301-825-6041
Mass	Boston	617-244-7514
Mich	Detroit	313-353-3834
Mich	Grand Rapids	616-949-7708
Minn	Minneapolis	612-831-3560
Mo	Kansas City	913-236-6313
Mo	St. Louis	314-567-3311
NY	Melville	516-595-4424
NY	Rochester	716-271-5460
Ohio	Dayton	513-294-1877
Pa	Philadelphia	215-878-0820
Pa	Pittsburgh	412-221-4420
Tex	Dallas	214-386-4121
Wash	Seattle	206-747-5560

Local Distributors

Ala	Birmingham, MG Elctrns	205-328-4525
Ariz	Phoenix, Hamilton/Avnet	602-275-7851
Cal	Los Angeles, Richey	213-875-2862
Cal	Los Angeles, Ed Warburg Co.	213-627-1126
Cal	Los Angeles, Avnet	213-558-2345
Cal	Los Angeles, Kierulff	213-685-5511
Cal	Los Angeles, Western Electromotive/Shephard	213-820-3777
Cal	Los Angeles, Fisher/Brownell	213-532-2170
Cal	San Carlos, Sterling	415-592-2353
Cal	San Diego, Hamilton/Avnet	714-279-2421
Cal	San Jose, Consolidated Parts	408-263-9521
Cal	Santa Clara, Fisher/Brownell	408-244-6182
Colo	Denver, Hamilton/Avnet	303-534-2121
Colo	Denver, Consolidated Parts	303-623-5313
Colo	Denver, Newark	303-757-3351
Conn	Hartford, GAL Electric	203-232-9880
Fla	Fort Lauderdale, Peerless	303-566-5966
Fla	Miami, Elctrn Equip	305-871-3500
Fla	Orlando, Hammond	305-849-6060
Ga	Atlanta, Brownell Electro	404-762-5181
Ga	Atlanta, Electro Air	404-351-3545
Ill	Chicago, Complete-Reading	312-454-1234
Ill	Chicago, Hamilton/Avnet	312-678-6310
Iowa	Davenport, Crescent	319-326-3591
Ill	Chicago, Newark	312-638-4411
Ill	Chicago, Steiner	312-685-7000
Ill	Chicago, Ohm	312-359-5500
Ill	Chicago, LCOMP	312-865-7600
Ill	Rockford, Jack H. Muntz Elec	815-968-8866
Ind	Fort Wayne, Fort Wayne Elctrns	219-423-3422
Ind	Indianapolis, Graham	317-634-8202
Kans	Kansas City, Hamilton/Avnet	913-888-8900
Kans	Wichita, Airtechnics	316-267-2849
La	Lafayette, Ralph's of Lafayette	318-234-4507
Md	Gaithersburg, Pioneer-Wash	301-948-0710
Md	Kensington, Marine Air	301-949-1353
Mass	Boston, Sager	617-749-6700
Mass	Boston, Controller Service	617-269-1300
Mich	Detroit, Don Blackburn & Co.	313-261-9100
Mich	Detroit, Spemco	313-771-2700
Mich	Detroit, R S Elctrns	313-525-1155
Mich	Grand Rapids, Stotts Friedman	616-459-0216
Minn	Minneapolis, Newark	612-331-6350
Minn	Minneapolis, H. A. Holden, Inc.	612-749-6700
Minn	Minneapolis, Boustead	612-544-9131
Minn	Minneapolis, Hamilton/Avnet	612-941-3801
Mo	Kansas City, LCOMP	816-221-2400
Mo	St. Louis, LCOMP	314-291-6200
NJ	Hanover, State Elctrn	201-887-2550
NJ	Pennsauken, Resco	609-662-4000
NM	Albuquerque, Hamilton/Avnet	505-765-1500
NY	Birmingham, Harvey Federal	607-748-8211
NY	Buffalo, Summit	716-884-3450
NY	New York, Brownell Electro	212-924-6000
NY	New York, Dever & Edds	212-989-1100
NY	New York, Peerless	516-593-2121
NY	New York, Elctrn Equip	516-538-5510
NY	New York, Herman H. Smith Co.	212-272-9400
NY	Rochester, Simcona	716-328-3230
NC	Charlotte, Brownell Electro	704-394-4341
NC	Raleigh, Hamilton/Avnet	918-829-8030
Ohio	Cincinnati, Schuster	513-984-1600
Ohio	Cleveland, Complete-Reading	216-267-1000
Ohio	Cleveland, Roland	216-351-2050
Ohio	Cleveland, Wood-Compton	216-587-5200
Ohio	Dayton, Hamilton/Avnet	513-433-0610
Okla	Oklahoma City, John H. Cole Co.	405-235-1761
Ore	Portland, C. E. Riggs, Inc.	503-226-3286
Pa	Erie, Erie Indl	814-455-8051
Pa	Philadelphia, Resco	609-662-4000
Pa	Philadelphia, Pyttronic	215-643-2850
Pa	Philadelphia, Herback & Rademan	215-426-1700
Pa	Philadelphia, Powell Electronics	215-365-1900
Pa	Philadelphia, Peak	215-293-9000
Pa	Pittsburgh, Cam/R.P.C.	412-782-3770
Pa	Reading, Barbey	215-376-7451
SC	Columbia, Dixie	802-779-5332
Tenn	Memphis, Brownell Electro	901-332-9254
Tenn	Nashville, Electra	615-329-3971
Tex	Dallas, Associated Aircraft	214-331-4381
Tex	Dallas, Hamilton/Avnet	214-661-8661
Tex	Dallas, Hall-Mark	214-234-7400
Tex	Dallas, Complete-Reading	214-827-8891
Tex	Fort Worth, Allied	817-336-5401
Tex	Houston, Southwest	713-491-4900
Tex	Houston, Hamilton/Avnet	713-780-1771
Utah	Salt Lake City, Stuart	801-466-8605
Utah	Salt Lake City, Hamilton/Avnet	801-972-2800
Va	Richmond, Sterling/Meridian	804-359-0221
Wash	Seattle, Almac/Stroum	206-763-2300
Wash	Seattle, Bell	206-747-1515
Wisc	Milwaukee, Standard Elec	414-272-8100
Wisc	Milwaukee, Elctrn Expeditors	414-228-8100
Wisc	Wausau, Morley-Murphy	715-842-2061

CUTLER-HAMMER, Shallcross Resistor Prods., Dept. EM, US 70 East, Smithfield, N.C. 27577, Tel: 919-934-5181, TWX: 510-939-1463; FSC No.: 54294; Empl.: 130 ..... p. 3674

Sales Manager: F. Giasone; *Distributor Manager:* Giasone

Local Sales Offices & Reps.

Ala	Huntsville, Remco Corp.	205-883-92
Cal	Anaheim, Cutler Hammer	714-776-19
Cal	Irvine, Celtec Co	714-557-50
Cal	San Diego, Celtec Co	714-279-79
Cal	Sherman Oaks, Celtec Co	213-990-34
Colo	Denver, R.W. Masterson Co.	303-771-14
Fla	Oviedo, Conley Assocs.	305-365-32
Kans	Lenexa, T.R.I.	314-888-02
Md	Bethesda, Warren Mount Co.	301-657-93
Mass	Allston, Vector Sls., Inc.	617-787-27
Mich	Farmington Hills, Lowell Wendt Co.	313-553-98
Minn	Minneapolis, Components Group	612-824-42
NY	Plainview, ERA, Inc.	516-822-98
NC	Smithfield, ADI	919-934-81
Ohio	Cincinnati, A.C. Wahl & Assocs.	513-761-55
Pa	Pittsburgh, Dolfuss/Root & Co.	412-221-44
Tex	Dallas, Cutler-Hammer	214-631-37
Wash	Bellevue, Cutler-Hammer	206-747-55
Exp:	Wisc., Milwaukee, Cutler-Hammer Internation	
	C.A.	414-442-78

Local Distributors

Cal	Mountain View, Shelley-Rodabaugh	415-969-18
Cal	San Diego, Shelley-Neumann	714-453-71
Cal	Santa Monica, Shelley Eltrns.	213-392-39
Conn	Stratford, Electro-Comp	203-375-58
Fla	Clearwater, Diplomat/Southland	813-443-45
Md	Bethesda, Wire Supply	301-657-93
Mich	Grand Rapids, Stotts-Friedman Elctrns. Supp	616-459-02
Mo	St. Louis, Diplomat/St. Louis	314-645-85
NJ	Bellmawr, Mid-Atlantic	609-931-53
NY	Farmingdale, Command Elctrns.	516-293-12
NY	Plainview, ACI	516-293-66
NY	Vestal, Harvey Federal	607-748-82

CVC PRODUCTS, INC., Dept. EM, 525 Lee Rd., B 1886, Rochester, N.Y. 14603, Tel: 716-458-2550, Tel 97-8269; Empl.: 160

Local Sales Offices & Reps.

Ariz	Tempe, J. Smith & Assoc.	602-968-70
Cal	Glendale, Gene Purite	213-240-55
Cal	Lafayette, Archer & Assoc.	415-538-88
Cal	Los Altos, MacNeil Assoc.	415-961-64
Cal	Mt. Carmel, Sci Devices Ct.	203-248-93
Cal	Newport Beach, Dick Briggs Assoc.	714-675-19
Cal	Panorama City, Core-Rosion Prods	213-787-59
Cal	Sunnyvale, CVC Prods.	408-739-85
Colo	Boulder, J. Smith & Assoc.	303-442-7
Fla	St. Petersburg, Indep Medical Assoc.	813-894-4
Ga	Atlanta, CVC	404-235-7
Ill	Downers Grove, Danielson Assoc.	312-960-0
Ill	Roselle, CVC	312-529-9
Mass	Amesbury, CVC	617-388-4
Minn	Minneapolis, Special Sys Co.	612-929-7
Mo	Kansas City, Process & Control Prods	816-444-4
NJ	Monmouth Beach	201-229-7
NM	Albuquerque, J. Smith & Assoc.	505-265-3
NY	Buffalo, K & W Indl Sls.	716-875-9
Ohio	Cincinnati, Batsner Bros.	513-871-2
Ohio	Cleveland, Process Sys Indl Sls	216-526-5
Pa	Kennett Square, Schlegel Assoc	215-388-6
Pa	Paoli, Engelman Engrg	215-644-8
Tex	Richardson, Moore Assoc.	214-690-4
Tex	Spring, Instrumentation Techn & Sls	713-353-9
Wash	Kennewick, Ben-Tronics	509-783-3

CW INDUSTRIES, Dept. EM, 550 Davisville Warminster, Pa. 18974, Tel: 215-355-7080, T 510-667-1875; Empl.: 500 ..... p. 1740,4

Local Sales Offices & Reps.

Ariz	Phoenix, MR Engrg. Sls.	602-956-4
Cal	Los Angeles, Western Electromotive/Shephr	213-820-3
Cal	Redwood City, W. Hickey Sls.	415-368-6
Colo	Boulder, RG Enterprises	303-447-9
Fla	Pompano Beach, Cole Tek Assoc.	305-781-8
Ill	Chicago, G. Mcl Cole	312-774-3
Ind	Indpls., Southern Sls.	317-299-2
Iowa	Cedar Rapids, H.R. Brown Sls.	319-366-0
Md	Pikesville, Muncy Sls. Assoc.	301-484-6
Mass	Needham, A & M Elctrn. Reps.	617-444-5
Mich	Plymouth, A.P.J. Assocs.	313-459-1
Minn	Eden Prairie, Fred Peterson Co.	612-941-5
Mo	St. Louis, E. Hill	314-621-1

NJ Oaklyn, A. Wetterhahn 609-858-3003
NM Albuquerque, Staley Co..... 505-821-4310
NY Fairport, Frank Hall 716-223-5102
NY Hempstead, Kahgan Sls. Corp... 516-538-2300
NY N. Hartford, H. Lessman 315-737-5038
NY Syracuse, W.A. Franklin Sls. Corp. 315-472-5273
NC Carey, T. Santel..... 919-467-7595
Ohio Cincinnati, Makin & Assoc..... 513-871-2424
Ore Beaverton, LD Elctrns. 503-649-8556
SC Mauldin, Carl Hart 803-288-2323
Tenn Greeneville, Lamons Sls. Co: 615-639-8711
Tex Dallas, Vista Assocs..... 214-235-4547
Va Portsmouth, F.B.D. Sls..... 804-484-3162
Wash Woodinville, Marvin Klinect..... 206-485-7312
Exp: N.Y., N.Y., Robum Agencies 212-989-5939

CYBEREX, INC., Dept. EM, 7171 Industrial Park Blvd., Mentor, Ohio 44060, Tel: 216-946-1783, Telex: 980-644; Empl.: 65

Local Sales Offices & Reps.
Ala Birmingham, Crim Sls. & Engrg. Co. 205-871-4084
Cal Anaheim, Engineering Reps. Co. 714-535-4831
Cal Long Beach, Matzinger-Wells 213-433-1111
Cal San Diego, Engineering Reps. Co. 714-535-9831
Cal San Francisco, Artwel Elec., Inc. 415-467-1880
Colo Denver, Electrical Agencies Co. 303-623-8246
Fla Brandon, J. Meeks & Assocs. 813-689-6137
Fla Miami, A.C. Chaney & Assocs. .. 305-754-8857
Ga Atlanta, Whitehead Assocs. 404-393-0695
Haw Honolulu, Atlas Elec. Co. 808-571-1906
Ill Chicago, W. Lamont Assocs..... 312-777-8575
Ill Chicago, Gannon Elec. 312-774-2884
La Jefferson, General Power & Control 504-733-7340
Md Silver Spring, Bradley Electro Sls. 301-587-1866
Mich Southfield, Engel-Klaes Co. 313-355-1610
Minn Minneapolis, A.M. Johnson Co.. .. 612-927-8741
Mo St. Louis, Karraker Co. 314-231-3666
Neb Omaha, Electric Equip. Sls. Co. 402-556-4198
NY Buffalo, Robinson Assocs. 716-886-7350
NY Latham, Robinson Assocs. 518-785-5844
NY New York City, NEPA, Inc..... 212-867-0340
NY Rochester, Robinson Assocs. 716-342-3130
NY Syracuse, Robinson Assocs. 315-478-0241
NC Charlotte, Ray Waggoner..... 704-523-5476
NC Charlotte, R W Chapman..... 704-525-2421
NC Greensboro, R.W. Chapman & Co. 919-273-1809
NC Raleigh, R.W. Chapman & Co. .. 919-782-2624
Ohio Cincinnati, Alexander Equip. Co. 513-221-7520
Ohio Cleveland, Collart Co..... 216-333-5550
Okla Tulsa, H. Furtney Co. 918-747-6490
Ore Lake Oswego, United Sls. Assocs.
Pa Concordville, Charlie Harris 215-459-5532
Pa Pittsburgh, Waggoner-Ver Hill Assocs. 412-241-5202
SC Greenville, R.W. Chapman & Co. 803-232-5391
SC W. Columbia, R.W. Chapman & Co. 803-796-9796
Tenn Concord, R.W. Chapman & Co. 615-966-6120
Tex Dallas, United Technical Mktg. .. 214-231-5611
Wisc Cedarburg, Osbon Assocs. 414-377-2400

YBERNETICS MEDICAL, INC., Dept. EM, 206 5th St., Lynchburg, Va. 24504, Tel: 804-528-3888; FSC No.: 56531; Empl.: 15

Sales Manager: Bill Scudder

YBERSONIC DIV., C. A. Briggs Co., Dept. EM, Box 151, Glenside, Pa. 19038, Tel: 215-885-2244, Telex: 83-4753

Sales Manager: C. A. Briggs, Jr.

Local Sales Offices & Reps.
Md Sykesville, C.A. Briggs Co. 301-781-4894

YBERSYSTEMS, INC, Digital Broadcast Sys. Div, Dept. EM, 4306 Gov. Dr., Ste O, Huntsville, Ala. 35805, Tel: 205-837-2080; FSC No.: 66; Empl.: 25

Sales Manager: W. Churchill

YCLE-DYNE, INC., Sub. Axel Elctrns., Inc., Dept. EM, 134-20 Jamaica Ave., Jamaica, N.Y. 11418, Tel: 212-AX 1-3907, TWX: 710-582-2618; Empl.: 50

Local Sales Offices & Reps.
Ariz Scottsdale, Mercury Engrg. Sls. 602-949-5054
Cal Los Altos, Wank Tech..... 415-941-3339
Conn Greenwich, Inman Assoc..... 203-869-2144
Fla Clearwater, H.R. Gross & Co..... 813-446-6649
Ill Berwyn, Technical Specialties.... 312-656-0120
Ind Indianapolis, Emmtronics Supply & Engrg 317-356-3658
Md Baltimore, Precision Sls. Co. 301-828-4897
Mass Salisbury, Glenn Colburn Co 617-462-7812
Mich Birmingham, Thibodeau Engrg. .. 313-642-6620
Minn White Bear Lake, Tempco Corp. 612-429-4251
Mo St. Louis, Woodsons Machinery Co. 314-822-8836
NY New York, Peterson Equip Co.... 212-244-3100
NY Rochester, Ferrotherm 716-461-5270
NC Matthew, Carolina Tech. Reps. Inc. 704-847-4494
Ohio Cleveland, Jay Industrial Sls 216-831-9393
Ohio Dayton, Jay Industrial Sls..... 513-236-7400
Pa Bridgeville, Jacobs Assocs. 412-341-8320
Pa Paoli, The Hubbert Co. 215-647-7880
Tenn Nashville, System Engrg. Co. 615-227-2803
Tex Dallas, Production Engrg. Sale Organ. 214-369-3181
Wash Seattle, Hartley Corp. 206-772-2000
Wisc Butler, AKO Engrg., Sale & Service 414-781-8360
Exp: Rochester, Ferrotherm 716-461-5270

CYCLO-TRONICS, INC., Dept. EM, 3858 N. Cicero Ave., Chicago, Ill. 60641, Tel: 312-282-6141; Empl.: 10

Local Sales Offices & Reps.
Ala Huntsville, Saber Assocs. Inc. 205-534-3387
Cal Inglewood, Tracker, Inc. 213-645-6060
Fla Light House Point, Saber Assocs. 305-943-3076
Fla Longwood, Saber Assocs. 305-422-3686
Ill Bensenville, Process Specialties 312-897-6463
Mich Detroit, Micro Sls. Corp. 313-482-1229
Minn Minneapolis, Loren Green Assocs. 612-781-1161
NC Raleigh, Saber Assocs. 919-834-3961
Ohio Centerville, Micro Sls. Corp. 513-433-8171
Ohio Medina, Micro Sls. Corp. 216-331-0900

D-B DEVELOPMENTS, Dept. EM, 7709 Kilbourne Rd., Rome, NY 13440, Tel: 315-339-1265; Empl.: 5 p. 1399

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D-CEMCO, INC., Dept. EM, 3200 N. San Fernando Blvd., Burbank, Calif. 91504, Tel: 213-849-6341; Empl.: 16

Local Sales Offices & Reps.
Ariz Scottsdale, Gleason Sls Co..... 602-946-3992
Cal Cupertino, John E. Striker Co 408-252-4220
Cal Orange, A/T Assocs..... 714-633-7414
Colo Denver, D/Z Assocs 303-534-3649
Fla Maitland, Delmac Sls 305-423-7562
Ind Fort Wayne, M/S Sls 219-484-1904
Mass Marlboro, O.K. Engrg Co 617-481-6400
Minn Minneapolis, Bitronics Sls..... 612-835-7744
Ore Milwaukie, Desco, N.W. 503-653-1750
Tex Dallas, Stevens Sls 214-350-2476
Va Reston, Boyle Assocs..... 703-620-9558
Wash Redmond, Desco, N.W. 206-883-6336

D & L SALES CO. INC., Dept. EM, 296 Preakness Ave., Paterson, N.J. 07502, Tel: 201-684-8223, 684-8224; Empl.: 10

DABURN ELECTRONICS & CABLE CORP., Dept. EM, 2360 Hoffman, Bronx, N.Y. 10458, Tel: 212-295-0050, TWX: 710-593-4145; FSC No.: 25706 p. 4587-4591

Local Sales Offices & Reps.
Ala Birmingham, Nickerson Corp. 205-854-6330
Cal San Mateo, Carelli-EMA..... 415-697-6286
Fla Clearwater, Chaco Sls 813-536-9503
Haw Honolulu, Hawaii Elctrn. Ser..... 808-845-8207
Ind Indian, Midstates Mktg. 317-247-7857
Mass Boston, Anderson Sls. Co..... 617-227-2980
Minn Minn., Kodo Associates, Inc. 612-881-1255
NY Plainview, R. Smith Assoc..... 516-681-3155
NY Spring Valley, R. Smith Assoc. .. 914-354-6067
NY Syracuse, Lewis-Dunnigan Co. .. 315-446-5522
NC Charlotte, Nickerson Corp 704-394-5544
NC China Grove, Nickerson Corp 704-932-6772
NC Franklin, Nickerson Corp..... 704-524-6790
NC Kannapolis, F.C. Nickerson Co... 704-932-6772
Ohio Cleveland, Ind'l. Sls. Assoc..... 216-721-7500
Tex Dallas, G.V. Peck Co. 214-783-1011
Tex Houston, G.V. Peck Co. 713-780-2220

DACO INSTR. CO., Dept. EM, 30 Stran Rd., Milford, Conn. 06460, Tel: 203-874-2515, TWX: 710-462-1049; Empl.: 40

DADEN ASSOCS, INC., Dept. EM, 23011 Moulton Pky, Ste A12, Laguna Hills, CA 92653, Tel: 714-770-1522

Sales Manager: Dennis Hook

DAICO INDUSTRIES INC., Dept. EM, Box 5225, Compton, Cal. 90220, Tel: 213-631-1143, TWX: 910-346-6741; Empl.: 60 ..... p. 2869

Local Sales Offices & Reps.
Ariz Phoenix, Thorson Co. 602-956-5300
Cal Los Altos, Cain-White & Co. 415-948-6533
Cal Los Angeles, Midwin & Olifson .. 213-475-8568
Fla Palm Bay, Spartech Assocs. 305-727-8045
Ga Smyrna, Spartech Assocs..... 404-432-3644
Ind Fort Wayne, Berberich Assocs, Inc. 219-749-0600
Mass Cochituate, Micronic Assocs. 617-872-6561
NY Tuckahoe, Spectrum Sls 914-793-1660
Ohio Centerville, Berberich Assocs, Inc. 513-433-0342
Ohio Cleveland, Berberich Assocs, Inc. 216-289-5094
Pa Newtown Square, SWR Assocs. 215-EL6-8550
Tex Ft. Worth, McDonald Engrg 817-244-2480
Va Fairfax, Schibley Assocs. 703-591-3008

DALE ELECTRONICS INC., Sub. Lionel Corp., Dept. EM, Box 609, Columbus, Neb. 68601, Tel: 402-564-3131, TWX: 910-626-8314; Empl.: 2000 p. 3680-3687,3878,3879

Local Sales Offices & Reps.
Ala Huntsville, Powertronics, Inc. 205-852-6347
Ariz Scottsdale, Williams Assocs. 602-947-4297
Cal Del Mar, Reed Elctrn. Mktg. 714-452-1456
Cal Los Alamitos, Reed Electronic Mktg. 213-598-6676
Cal Redwood City, J.S. Heaton Co. 415-367-9000
Colo Denver, Williams Assocs. 303-373-4730
Fla Palm Beach Gardens, Graham Assocs. 305-622-4049
Fla Sitra, Graham Assocs. 904-629-6712
Ill Chicago, Industrial Representatives Inc. 312-647-7755
Ind Fort Wayne, Scott Elctrns., Inc... 219-743-1586
Ind Indianapolis, Scott Elctrns., Inc... 317-897-9976
Kans Mission, Dale Sls. Office 913-432-9175
Ky Louisville, Scott Elctrns., Inc. 502-583-3220
Md Towson, R.L. Wilkinson, Inc. 301-377-7800
Mass Wakefield, Kaelber & Mack, Inc. 617-245-9359
Mich Plymouth, A.P.J. Assoc. 313-459-1200
Minn Edina, Merrill Franklin Co. 612-927-4361
NJ Fairlawn, Kaelber & Mack, Inc. .. 201-797-7782
NM Albuquerque, Williams Assocs. .. 505-255-1638
NY Commack, Kaelber & Mack, Inc. 516-543-2924
NY Ithaca, Dale Electrs. 607-272-6212
NC Winston-Salem, Powertronics, Inc. 919-765-6539
Ohio Cincinnati, Scott Elctns. Inc..... 513-791-2513
Ohio Cleveland, Scott Elctrns., Inc. 216-291-2600
Ohio Columbus, Scott Elctrns., Inc. 614-236-8619
Ohio Dayton, Scott Elctrns., Inc..... 513-294-0539
Ore Beaverton, L/D Elctrns. 503-649-6177
Pa Glenside, R. Wilkinson, Inc. 215-887-5300
Pa Pittsburgh, Scott Elctrns., Inc. 412-828-1073
SC Greenville, Powertronics, Inc..... 803-288-0270
Tex Dallas, E.F. Aymond Co. 214-826-7620
Tex Houston, E. F. Aymond Co. 713-442-5791
Wash Woodinville, L/D Elctrns. 206-485-7312
Wisc Milwaukee, Industrial Reps. Inc. 414-259-0965

Local Distributors
Ala Huntsville, Hamilton/Avnet..... 205-533-1170
Ariz Phoenix, Hamilton/Avnet 602-267-9512
Cal Costa Mesa, Avnet Elctrns. 714-754-6040
Cal Mountain View, Shelley-Rodabaugh 415-969-1820

Cal Mountain View, Hamilton/Avnet Corp. 415-961-7000
Cal San Diego, Shelley-Neumann, Inc. 714-453-7133
Cal San Diego, Hamilton/Avnet 714-279-2421
Cal Santa Monica, F. Shelley Elctrns. 213-392-3913
Cal Sunnyvale, Acacia Sls., ... 408-745-7200
Colo Denver, Hamilton/Avnet Elctrns. 303-534-1212
Colo Denver, Waco Elctrns. 303-371-4370
Colo Denver, Newark-Denver Elctrns. 303-757-3351
Conn Georgetown, Hamilton/Avnet..... 203-762-0361
Conn Stratford, Electro/Comp..... 203-375-5811
Fla Fort Lauderdale, Newark Elctrns. 305-587-2372
Fla Ft. Lauderdale, Hamilton/Avnet 305-971-2900
Fla Orlando, T.T.I-11 305-859-1000
Fla Palm Beach Gardens, Legri S. Resistor 305-626-5400
Ga Atlanta, Hamilton/Avnet 404-448-0800
Ill Chicago, Newark Elctrns. 312-638-4411
Ill Chicago, Bell Ind 312-982-9210
Ill Palatine, Ohm Elctrns. 312-359-5500
Ill Schiller, Hamilton/Avnet Elctrns. 312-678-6310
Ill Shiller Park, Hamilton/Avnet 312-678-6310
Ind Ft. Wayne, Ft. Wayne Elctrns..... 219-423-3422
Ind Indianapolis, Graham Elec. Supply 317-634-8202
Ind South Bend, Radio Distributing Co. 219-287-2911
Iowa Cedar Rapids, Deeco, Inc. 319-365-7551
Kans Overland Pk., Hamilton/Avnet.... 913-888-8900
Kans Wichita, Radio Supply Co. 316-267-5216
Md Baltimore, Radio Elec. Svc. Co. 301-823-0070
Md Baltimore, Hamilton/Avnet 301-796-5000
Mass Waltham, Sterling Elctrns. 617-894-6200
Mass West Newton, A.W. Mayer Co. .. 617-965-1111
Mass Woburn, Hamilton/Avnet
Mich Ann Arbor, Wedemeyer Elctrn. Supply 313-665-8611
Mich Grand Rapids, Stotts-Friedman .. 616-459-0216
Mich Livonia, Hamilton/Avnet 313-522-4700
Mich Livonia, R S Elctrns. 313-525-1155
Mich Oak Park, Newark-Detroit Elctrns. 313-548-0250
Mich Wyoming, Newark Industrial Elec. 616-241-6681
Minn Edina, Hamilton/Avnet 612-941-3801
Minn Minneapolis, Stark Elctrns..... 612-332-1325
Minn St. Paul, Gopher Elctrns. Co..... 612-645-0241
Mo Kansas City, Burstein-Applebee Co. 816-531-5614
Mo St. Charles, Lectronix, Inc. 314-946-6424
Mo St. Louis, Hamilton/Avnet 314-731-1144
NJ Cedar Grove, Hamilton/Avnet Elctrns. 201-239-0800
NJ Clifton, Wilshire Elctrns. 201-340-1900
NJ Kenilworth, Newark Elctrns. Ctr. 201-272-8410
NJ Mount Laurel, Hamilton/Avnet Elctrns. 609-234-2133
NJ Roselle, Garden State Ind'l. Elctrns. 201-241-9000
NJ Springfield, Federated Purchaser 201-376-8900
NM Albuquerque, Hamilton/Avnet 505-765-1500
NY Binghamton, ASI Elctrn. 607-723-6326
NY Buffalo, Summit Dist..... 716-884-3450
NY E. Farmingdale, Harrison Radio Corp. 516-293-7990
NY Endwell, Wilshire Elctrns. 607-754-1570
NY E. Syracuse, Hamilton/Avnet..... 315-437-2641
NY Farmingdale, Arrow Elctrns..... 516-694-6800
NY Plainview, Fairmont Elctrns. 516-694-8200
NY Rochester, Simcona Elctrns. 716-328-3230
NY Rochester, Hamilton/Avnet 716-442-7820
NY Rockville Centre, Midway Ind'l. Elctrns. 516-764-2400
NY Rome, Rome Elctrns. 315-337-5400
NY Westbury, Hamilton/Avnet 516-333-5800
NC Charlotte, Brownell-Electro 704-394-4341
NC Winston-Salem, Kirkman Elctrns. 919-722-9131
Ohio Cincinnati, Hughes-Peters, Inc. .. 513-351-2000
Ohio Cleveland, Pioneer Standard Elctrns. 216-587-3600
Ohio Cleveland, Hamilton/Avnet 216-461-1400
Ohio Cleveland, W.M. Pattison Supply Co. 216-441-3000
Ohio Columbus, Hughes-Peters, Inc. .. 614-294-5351
Ohio Dayton, Hamilton/Avnet 513-433-0610
Ohio Dayton, Pioneer/Dayton 513-236-9900
Ohio Lima, Lima Radio..... 419-228-1220
Okla Tulsa, Radio, Inc..... 918-587-9123
Okla Tulsa, Oil Capitol Elctrns..... 918-622-8520
Pa Erie, Advacom 814-455-8110
Pa Philadelphia, Herbach & Rademan 215-426-1700
Pa Pittsburgh, CAM/RPC..... 412-782-3770
RI Providence, W. Dandreta & Co. 401-861-2800
Tenn Nashville, Electra Distributing Co. 615-329-3971
Tex Dallas, Sterling Elctrns. 214-357-9131
Tex Dallas, Hamilton/Avnet..... 214-661-8661
Tex Fort Worth, T.T.I., Inc. 817-335-8111
Tex Houston, Hamilton/Avnet 713-780-1771
Tex Houston, Lenert Co. 713-225-1465
Tex Houston, Sterling Elctrns..... 713-627-9800
Utah Salt Lake City, Hamilton/Avnet.. 801-972-2800
Va Richmond, I.T.R..... 804-275-1431
Wash Bellevue, Hamilton/Avnet Corp. 206-746-8750
Wash Seattle, Radar Elec. Co..... 206-282-2511
WVa Charleston, McJunkin Corp..... 304-348-5211
Wisc New Berlin, Hamilton/Avnet..... 414-784-4510

DALE ELECTRONICS, INC., Dept. EM, Box 74, Norfolk, Nebr. 68701, Tel: 402-371-0080, TWX: 910-623-0163 ..... p. 3688-3695

Refer to Dale Electronics Columbus, Neb. for sales office and distributor information.

DALE ELECTRONICS, INC., Dept. EM, 930 West 23rd St., Tempe, Ariz. 85282, Tel: 602-967-7874, TWX: 910-950-1943; FSC No.: 22929; Empl.: 65

Sales Manager: D. Robinson

Local Sales Offices & Reps.
Ariz Scottsdale, Mercury Engn. Sls. .. 602-275-8579
Tex Dallas, Blackburn Assoc. 214-692-8885

DALE ELECTRONICS, INC., Frequency Control Group, Dept. EM, 930 West 23rd St., Tempe, Ariz. 85282, Tel: 602-967-7874, TWX: 910-950-1943 p. 2314-2317

Local Sales Offices & Reps.
Cal Los Alamitos, Reed Elctrns. Mktg. 213-598-6676
Cal Redwood City, J. S. Heaton Co. 415-369-9000
DC Washington, H. Wise & Co. 202-363-9417
Ill Chicago, I.R.I., Inc. 312-647-7755
Mich Plymouth, A.P.J. Assoc..... 313-459-1200
Minn Minneapolis, Merrill Franklin Co. 612-927-4361
NY Commack, Kaelber & Mack, Inc. 516-543-2924
Ohio Cleveland, Scott Elctrns. 216-291-2600
Ore Beaverton, L/D Elctrns. 503-649-6177
Tex Dallas, Blackburn Assocs. 214-692-8885

DALE ELCTRNS., INC., Yankton Div., Dept. EM, E. Hwy. 50, Box 180, Yankton, S.D. 57078, Tel: 605-665-9301, TWX: 910-668-3605; Empl.: 250 p. 1336-1338,1750,4338,4339

Refer to Dale Elctrns., Columbus, Neb. for sales office and distributor information.

DAMON CORP., Elctrns. Div., Dept. EM, 80 Wilson Way, Westwood, Mass. 02090, Tel: 617-449-0800, TWX: 710-348-6722; Empl.: 75 ..... p. 2319

Local Sales Offices & Reps.
Cal No. Hollywood, Jewett Assocs.. 213-789-8103
Cal Palo Alto, Waldman Assocs. 415-961-4100
DC Washington, Stemler Assoc. 301 944-8262
Fla Melbourne, Repcom, Inc. 305-254-1877
Ill Northfield, Feller Assoc. 312-446-8065
Md Baltimore, Stemler Assoc. 301-944-8262
Mass Waltham, Del Tech Sls. 617-890-1020
NJ Cherry Hill, Stemler Assocs. 609-966-4070
NM Albuquerque, ALS Elctrns. 505-298-2575
NY Cazenovia, S T Wollard Co 315-655-8145
Tex Addison, Southland Comp..... 214-233-0603

DAN-L INC., Dept. EM, 229 Laurel Rd., E. Northport, N.Y. 11731, Tel: 516-757-8000; FSC No.: 28327; Empl.: 22

Local Sales Offices & Reps.
NC Charlotte, Jake Rudisill Assocs.. 704-377-6901

DANA EXACT ELECTRONICS, INC., See Exact Electronics, Inc.

DANA LABS. INC, See Racal Dana Instrs., Inc

DANIELS MFG. CORP., Dept. EM, 2266 Franklin Rd., Bloomfield Hills, Mich. 48013, Tel: 313-338-9611; FSC No.: 5120; Empl.: 50

Local Sales Offices & Reps.
Cal Bellflower, Daniels Mfg. Corp..... 714-774-6872
Fla Orlando, Balmar Ents. 305-851-4041

DANTEL, INC., Dept. EM, 1922 North Helm, Fresno, Cal. 93727, Tel: 209-252-1651; Empl.: 50

Local Sales Offices & Reps.
Cal Sunnyvale, Rea Assocs..... 408-736-6024
Ill Arlington Heights, James R. McLaughlin 312-394-9475
Mass Framingham, Harris W. Fuller 617-620-0333
Tex El Paso, H. Markowitz..... 915-584-1795

DANTRONICS, INC., Dept. EM, 3175 Hafner Ct., St. Paul, Minn 55112, Tel: 612-484-2108; Empl.: 22

DATA ACQUISITION PRODS. LAB., AEL, Inc., D
EM, Box 552, Lansdale, Pa. 19446, Tel: 215-822-29
TWX: 510-661-4976; Empl.: 1100

Local Sales Offices & Reps.
Ariz Phoenix, Shefler-Kahn Co. 602-257-9
Cal Los Angeles, RF Assocs. 213-478-1
Cal San Jose, L & M 408-292-3
Colo Denver, Shefler-Kahn Co. 303-761-2
DC Washington, Scientific Sys. Sls. Corp. 202-726-4
Ill Mt. Prospect, Contemporary Sciences 312-255-3
Me Burlington, Sci Systems Sls..... 617-273-1
Mass Burlington, Scientific Sys. Sls. Corp. 617-273-1
Mo St. Louis, Kemco, Inc. 314-524-0
NM Albuquerque, Shefler-Kahn Co... 505-296-0
NY New York, Multiparts Corp. 212-944-4
NY Syosett, Scientific Sys. Sls. Corp. 516-921-3
Ohio Westerville, Contemporary Sciences 614-822-6
Tex Irving, Kemco Inc, ... 214-255-0
Utah Salt Lake City, Shefler-Kahn Co. 801-484-4
Wash Seattle, Rush S. Drake Assocs. 206-763-2

D.A.T.A. INC., A Cordura Co., Dept. EM, 45 U.S. Hwy Pine Brook, NJ 07058, Tel: 201-227-3740, T 710-734-4339; Empl.: 39

DATA, INC., Dept. EM, 210 S. Mason, Box 2071, Collins, Colo. 80521, Tel: 303-493-1222; Empl.: 3

Sales Manager: B. Shilling

DATA CHECK CORP., Dept. EM, 10070 Willow Cr Rd., San Diego, Cal 92131, Tel: 714-578-0101, T 910-335-1596; FSC No.: 55792

Sales Manager: Al Agent

Local Sales Offices & Reps.
Ala Huntsville, W. A. Brown Instruments, Inc. 205-883-8
Ariz Phoenix, Zeus, Inc. 602-253-6
Cal Los Alamitos, Scientific Devices-California 213-598-7
Cal Mountain View, Scientific Devices-California 415-964-4
Cal San Diego, Scientific Devices-California 714-279-6
Conn Hamden, Pat Jenks Associates.. 203-281-0
Fla Orlando, W. A. Brown Instruments, Inc. 305-425-5
Ga Atlanta, W. A. Brown Instruments, Inc. 404-455-1
Haw Honolulu, Atechs Corportation.... 808-845-2
Ill Arlington Hts., Dytec Central, Inc. 312-394-3
Ind Ft. Wayne, Dytec Central, Inc. .. 219-485-0
Kans Lenexa, Dytec South, Inc. 913-888-0
La Mandeville, W. A. Brown Instruments, Inc. 504-626-9
Md Silver Spring, Sel-Tronics, Inc.... 301-589-3
Mass Wakefield, Pat Jenkins Associates 617-246-1
Mich Madison Hts., WKM Associates.. 313-588-2
Minn St. Paul, Dytec North, Inc. 612-645-5
Mo Hazlewood, Dytec South, Inc. 314-731-5
NM Albuquerque, Zeus, Inc. 505-286-3
NY Liverpool, Rayelco Electronics.... 315-652-5
NY Northport, Milt Lindgren Associates 516-261-7
NC Durham, W. A. Brown Instruments, Inc. 919-682-2
Ohio Cleveland, WKM Associates, Inc. 216-267-0
Pa Philadelphia, Robert Meyers Associates, In 215-224-1
Pa Pittsburgh, WKM Associates, Inc. 412-892-2
SC Columbia, W. A. Brown Associates, Inc. 803-798-3
Tenn Oak Ridge, W. A. Brown Associates, Inc. 615-482-5
Tex Lewisville, BOB Associates 214-434-2
Va Norfolk, Sel-Tronics, Inc. 804-461-6

DATA CHECK CORP. cont'd

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MONITOR SCOPES, METERS, AND TAPE RECORDER ANALYZERS - Multi-channel scopes and meter monitor data in a variety of applications incl. IRIG tape recording, data communications, turbine testing, and bio-medical engineering.
Model 101C Tape Recorder Analyzer simplifies tape recorder calibration by combining 3-instruments-in-1.

DATA-CONTROL SYSTEMS, Dept. EM, Commerce Dr., Box 860, Danbury, Conn. 06810, Tel: 203-743-9241, TWX: 710-456-0376; FSC No.: 08539; Empl.: 87

Local Sales Offices & Reps.

Ala	Huntsville, Data-Control Sys.	205-536-0784
Ala	Huntsville, Gentry Assoc.	205-534-9771
Ala	Huntsville, Gentry Assocs	205-534-9771
Ariz	Phoenix, Data Sys Mktg	602-265-5216
Ariz	Scottsdale, BFA Corp.	602-944-5400
Cal	Irvine, Data Systems Mktg	714-540-2312
Cal	Los Altos, Data Systems Mktg	415-941-0240
Cal	Mt. View, Data Sys. Mktg.	415-941-0240
Cal	San Diego, Data Systems Mktg	714-560-9222
Cal	San Francisco, Data Systems Mktg	415-391-1111
Cal	Westminister, Data-Control Sys.	714-894-4471
Colo	Denver, BFA Corp.	303-837-1247
Colo	Denver, Data Systems Mktg	303-426-4240
Conn	Bethel, O'Neill Assocs.	203-748-3801
Conn	Danbury, C. Pappas Assoc.	203-792-3444
Fla	Orlando, Gentry Assoc.	305-894-4401
Ga	Atlanta, Gentry Assoc.	404-455-1206
Ill	Des Plaines, Lincoln, Hodges & Assoc.	312-297-3810
Kans	Prairie Village, Engineering Svcs.	913-649-4000
Md	Framingham, C. Pappas Assoc.	617-877-2984
Md	Laytonsville, G. T. Assoc.	301-949-8060
Md	Laytonsville, G T Assocs.	301-949-8060
Mich	Royal Oak, Teleproducts	313-576-4424
Minn	Bloomington, Jaynus Assoc.	612-884-1700
Mo	St. Louis, Engineering Svcs	314-997-1515
NM	Albuquerque, Data-Systems Mktg	505-294-5790
NM	Albuquerque, BFA Corp.	505-292-1212
NM	Las Cruces, BFA Corp.	505-523-0601
NY	Rochester, Cameron Assoc	716-385-1681
NC	Burlington, Gentry Assoc	919-227-3639
Okla	Oklahoma City, Data-Mktg. Assoc	405-528-6071
Pa	Huntingdon Valley, Rabal Assoc.	215-947-4825
Tex	Dallas, Data Mktg. Assoc.	214-661-0300
Tex	Dallas, Martin, Zienkosky, Browne & Assoc	214-233-5535
Tex	Houston, Martin, Zienkosky, Browne & Assoc	713-523-7333
Tex	Houston, Data-Mktg. Assocs.	713-780-2511
Tex	San Antonio, Data Mktg. Assocs.	512-828-0937
Utah	Salt Lake cCity, Data-Sys Mktg	801-487-8281
Utah	Salt Lake City, BFA Corp.	801-466-6522
Wash	Bellevue, Data Sys Mktg	206-454-1676
Wisc	Waukesha, Lincoln, Hodges & Assoc.	414-542-3087

DATA DELAY DEVICES, Dept. EM, 253 Crooks Ave., Clifton, N.J. 07011, Tel: 201-772-1106; Empl.: 18

p. 2395-2400,2626

Local Sales Offices & Reps.

Cal	Mountain View, Weseloh & Assocs.	415-961-0565
Cal	Santa Ana, California Elctrn Mktg	714-835-2702
Mass	Brookline, Harman Assoc.	617-232-6687
NY	Rochester, Net Sales	716-467-4538

DATA DELAY DEVICES cont'd

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We manufacture, Design, Develop:
- Electromagnetic Delay lines fixed; variable, lumped, distributed, electrically variable digital delay units.
- Filters Passive & Active of all response types
- Oscillators, Low-Freq. modular

DATA DISC INC., see Amcomp Inc.

DATA DISPLAY PRODUCTS, Dept. EM, Box 91072, Los Angeles, Cal. 90009, Tel: 213-641-1232, 213-677-6166, TWX: 910-328-7205; FSC No.: 15513; Empl.: 17

Sales Manager: G. Taniguchi; *Distributor Manager:* Q. Lodhie

Local Sales Offices & Reps.

Ala	Huntsville, Repcom, Inc.	205-534-2235
Ariz	Phoenix, Thorson	602-956-5300
Cal	Burlingame, Rose Electrns	415-348-2740
Cal	Inglewood, HMC	213-645-6953
Cal	Menlo Park, G. R. McKnight Co.	415-325-2844
Fla	Melbourne, Repcom, Inc.	305-254-1877
Ill	Lisle, Trend-Tronics	312-963-2210
Mass	Sturbridge, Branford Controls	617-347-7367
Minn	Minneapolis, R. W. Marshall Co.	612-929-0457
NJ	Flanders, K. & R. Enginrg.	201-584-5235
NY	Flanders, K & R Eng	212-767-6293
NC	Charlotte, Repcom, Inc.	704-597-7491
Ohio	Brecksville, WRR Assoc	216-526-2023
Pa	Jenkintown, Arnold Assocs.	215-742-0600

Local Distributors

Cal	Inglewood, PARCO	213-645-3520
Cal	Menlo Park, McKnight/ElectroQuip	415-325-2848
Ill	Lisle, Trend-Tronics	312-963-2210
NJ	Whippany, Tonar Ind	201-884-1400
Okla	Tulsa, Comp Specialties	918-664-2820
Pa	Huntingdon Valley, Shap Elect	215-698-9550
Tex	Houston, Comp Specialties	713-771-7237

DATA GENERAL CORP., Dept. EM, 15 Turnpike Rd Rte 9, Westboro, Mass 01581, Tel: 617-366-8911, TWX: 920-329, 710-390-1217; Empl.: 11,000

Sales Manager: B. Jobe

Local Sales Offices & Reps.

Ariz	Phoenix	602-254-6412
Cal	El Segundo	213-973-0401
Cal	Palo Alto	415-321-8010
Cal	Sacramento	916-920-3434
Cal	San Diego	714-276-8450
Cal	San Francisco	415-543-6730
Cal	Santa Ana	714-558-9421
Cal	Santa Barbara	805-967-5544
Cal	Van Nuys	213-787-8870
Colo	Englewood	303-773-2620
Conn	North Branford	203-484-2771
Fla	Ft. Lauderdale	305-771-0784
Fla	Orlando	305-851-8230
Fla	Tampa	813-879-2515
Ga	Atlanta	404-325-3181
Ill	Peoria	309-688-2224
Ill	Schaumburg	312-885-0505
Ind	Indianapolis	317-248-8306
Ky	Louisville	502-491-6595
La	Baton Rogue	504-923-0660
Md	Baltimore	301-247-8900
Mass	Wellesley	617-235-8171
Mich	Southfield	313-569-0200
Minn	Richfield	612-866-3005
Mo	Kansas City	816-531-1326
NH	Nashua	603-889-8524
NJ	Wayne	201-785-3910
NM	Albuquerque	505-294-1416
NY	Latham	518-783-3101
NY	Melville	516-427-0311
NY	Newfield	607-272-9440
NY	New York City	212-557-1122
NY	Rochester	716-385-2000
NY	Syracuse	315-455-1525
NC	Greensboro	919-378-9401
Ohio	Brooklyn Heights	216-459-2300
Ohio	Dayton	513-435-1932
Okla	Tulsa	918-664-8530
Ore	Portland	503-223-7150
Pa	Blue Bell	215-643-5515
Pa	Carnegie	412-279-3500
Tex	Austin	512-458-4201
Tex	Dallas	214-233-4496
Tex	Houston	713-688-8641
Utah	Salt Lake City	801-972-1338
Va	McLean	703-893-0910
Va	Norfolk	804-461-0933
Va	Richmond	804-288-1675
Wash	Kirkland	206-827-0503
Wisc	West Allis	414-327-6811
Ala	Birmingham	205-942-3730
Ariz	Tucson	602-327-6811
Ark	Little Rock	501-664-7075
Cal	Fresno	209-251-5027
Cal	San Francisco, M-C Intl (Korea) Ltd.	415-543-1455
Cal	Woodland Hills, Codevintec Pacific Inc.	213-348-1719
Idaho	Boise	208-375-6510
Mass	Cambridge, Data Conversion, Inc.	617-491-6827
Mass	Worcester	617-754-3096
Mo	St. Louis	314-567-4820
Nev	Las Vegas	702-876-0663
NY	Buffalo	716-835-3710
NY	White Plains	914-694-1410
NC	Charlotte	704-554-8600
Ohio	Columbus	614-436-0951
Okla	Oklahoma City	405-840-3891
RI	Rumford	401-438-0001
SC	Columbia	803-798-6510
Tenn	Knoxville	615-524-1841
Tenn	Memphis	909-761-3366
Tex	El Paso	915-778-6601
Tex	Ft. Worth	817-732-6441
Va	Salem	703-389-8155
WVa	Charleston	304-345-2981

DATA INSTRUMENTS INC., Dept. EM, 4 Hartwell Pl., Lexington, Mass. 02173, Tel: 617-861-7450, TWX: 710-326-0672; Empl.: 84

Local Sales Offices & Reps.

Cal	San Carlos, Elctrn. Engrg. Assocs.	415-593-2189
Cal	South Pasadena, Deniston & JDA	213-254-7755
Colo	Boulder, H. Bass Assocs.	303-499-7509
Fla	Hollywood, AP Assocs	305-987-6720
Fla	Orlando, AP Assocs	305-298-2816
Fla	Tampa, AP Assocs	813-886-2457
Ga	Atlanta, Scientific Sls	404-252-6808
Ill	Lancing, Van Meter Instrs	312-474-3580
Ind	Cedar Rapids, BC Elctrn Sls	319-393-5818
Kans	Olathe, BC Elctron Sls Inc.	913-888-6680
Mass	Natick, A. Peskin Corp.	617-653-3919
Mich	Southfield, Stress Analysis Svcs.	313-356-6686
Minn	Minneapolis, Volco Company	612-933-6631
Mo	Hazelwood, BC Elctrn Sls, Inc.	314-731-1255
NC	Charlotte, Control Specialists Inc.	704-377-6271
Ohio	Medina, Stress Analysis Svcs.	216-225-7535
Pa	Frazer, Measurements Inc.	215-644-7142
Tex	Dallas, Griffin Sls. Co.	214-234-5013
Va	Fairfax, Nine Assocs., Inc.	703-273-1830
Wash	S.E. Mercer Island, S.E.A. Sls and Engrg Ass.	216-232-6550
Wash	Vancouver, S.E.A. Sls and Engrg Ass.	206-573-5161

DATA PANEL, INC, Dept. EM, 7313 S. Washington, Edina, Minn. 55435, Tel: 612-941-3511; Empl.: 8

Local Sales Offices & Reps.

Cal	Mountain View, Cindel, Inc.	415-965-2630
Ga	Atlanta, Elmar Assocs.	404-938-2821
Ill	Des Plaines, Lincoln, Hodges & Assocs	312-297-3810
Mass	Norwell, Bordewieck Engrg & Sls Co.	617-659-4915
Minn	Minneapolis, Grayden & Flemmer, Inc.	612-941-1120
Mo	Hazelwood, Technical Reps, Inc	314-731-5200
NY	Binghamton, Reagon/Compar Albany	607-723-8743
NY	Mount Vernon, Friedman-Smith Electronic	914-664-4866
NY	Rochester, Reagon/Compar Albany	518-489-7408
NY	Utica, Reagon/Compar Albany	315-735-9831
Ohio	Breaksville, Allen Nace Co, Inc.	216-526-4323
Pa	Pittsburgh, Allen-Nace Co, Inc.	412-922-7225
Tex	Dallas, Jacobson Co	214-363-7584
Utah	Salt Lake City, Jensen Rep Co.	303-688-4154
Wisc	Waukesha, Lincoln Hodges & Assoc	414-542-3087

DATA PRECISION CORPORATION, Dept. EM, Audubon Rd., Wakefield, Mass 01880, Tel: 617-246-1600, Telex: 94-9341; FSC No.: 51692; Empl.: 160 ..... p. 2706-2708

Local Sales Offices & Reps.

Ala	Huntsville, Lee Assocs.	205-533-5896
Ariz	Phoenix, Zeus, Inc.	602-253-6104
Cal	Costa Mesa, Meas. Assocs.	714-540-7160
Cal	Los Angeles, Measurement Assoc.	213-924-6227
Cal	Sunnyvale, Amasco	408-733-8690
Colo	Denver, Zeus, Inc.	800-528-4512
Conn	Canton Center, Tekdata, Inc.	203-693-0710
Fla	Ft. Lauderdale, Lee Assocs.	305-491-7220
Fla	Winterhaven, Lee Assocs.	813-294-5815
Ga	Buford, Lee Assocs.	404-945-4222
Ill	Elk Grove Village, L. F. Green Assoc.	312-593-0282
Ind	Indianapolis, L. F. Green Assoc.	317-293-9827
Md	Burtonsville, Eastern Instr.	301-384-8500
Mass	Wakefield, Tekdata, Inc.	617-245-5940
Mich	Detroit, Micro Sls. Corp.	313-459-1670
Minn	Minneapolis, L. F. Green Assoc.	612-781-1611
Mo	Kansas City, Paloma Sls.	816-358-7272
NJ	Great Neck, MTI Sales Inc.	800-645-8016
NM	Albuquerque, Zeus, Inc.	800-528-4512
NY	DeWitt, DB Assocs.	315-446-0220
NY	Great Neck, Measurement Tech. Inc.	516-482-3500
NC	Raleigh, Lee Assocs.	919-787-5818
Ohio	Cleveland, Micro Sls. Corp.	216-331-0900
Ohio	Dayton, Micro Sls. Corp.	513-433-8171
Okla	Tulsa, Comspec, Inc.	918-743-6892
Ore	Milwaukie, Cascade Inst.	503-653-1750
Pa	Hatboro, QED Elctrns. Inc. of PA	215-674-9600
Tex	Dallas, Comspec. Inc.	214-234-4137
Tex	Houston, Comspec. Inc.	713-461-4487
Utah	Salt Lake City, Zeus	800-528-4512
Wash	Bellvue, Cascade Inst	206-883-6336
Wyo	, Zeus, Inc.	800-528-4512

Local Distributors

Ala	Huntsville, Lee Assoc./Leeco	205-533-5896
Ariz	Phoenix, Zeus, Inc.	602-253-6104
Ark	Raleigh, Lee Assoc./Leeco	919-787-5818
Cal	Sunnyvale, Amasco	408-733-8690
Colo	Denver, Zeus, Inc.	800-528-4512
Conn	Canton Center, Tekdata	203-693-0710
Fla	Ft. Lauderdale, Lee Assoc./Leeco	305-491-7220
Fla	Winter Haven, Lee Assoc./Leeco	813-294-5815
Ga	Buford, Lee Assoc./Leeco	404-945-4222
Ill	Elk Grove Village, Loren Green Assocs.	312-593-0282
Ind	Indianapolis, Loren Green Assoc.	317-293-9827
Md	Burtonsville, Eastern Instrumentation	301-384-8500
Mass	Wakefield, Tekdata Sls.	617-245-5940
Mich	Northville, Micro Sales Corp.	313-459-1670
Minn	Minneapolis, Loren Green Assoc.	612-781-1611
Mo	Kansas City, Paloma Sls. Co.	816-358-7272
NM	Albuquerque, Zeus, Inc.	800-528-4512
NY	DeWitt, DB Assocs.	315-446-0220
NY	Great Neck, MTI Sls. Corp.	516-482-3500
Ohio	Cleveland, Micro Sls. Corp.	216-331-0900
Ohio	Dayton, Micro Sls. Corp.	513-433-8171
Okla	Tulsa, Comspec, Inc.	918-743-6892
Ore	Milwaukie, Cascade Instrs	503-653-1750
Pa	Hatboro, QED Elctrns.	215-674-9600
Tex	Houston, Comspec, Inc.	713-461-4487
Tex	Richardson, Comspec, Inc.	214-234-4137
Utah	Salt Lake City, Zeus, Inc.	800-528-4512
Wash	Bellvue, Cascade Instrs	206-883-6336
For:	Can., Mississauga, Ont., Webster Inst. Ltd.	416-275-2270
For:	Can., N. Vancouver, B. C., National Electrolab Ltd.	604-985-0511

DATAPRODUCTS CORP., Dept. EM, 6219 DeSoto Ave., Woodland Hills, Cal. 91365, Tel: 213-887-8000, Telex: 69-8487; Empl.: 3500

Local Sales Offices & Reps.

Cal	Newport Beach	714-752-7411
Cal	Santa Clara	408-249-9900
Fla	Coral Springs	305-753-1040
Mass	Framingham	617-620-1950
Mich	Rochester	313-652-1134
Minn	Minneapolis	612-835-2066
Pa	Wayne	215-293-1810
Tex	Dallas	214-231-2240

DATA SIGNAL CORP, Dept. EM, 40-44 Hunt St, Watertown, MA 02172, Tel: 617-926-5080

Local Sales Offices & Reps.

Mass	Cohasset, E/M Assocs	617-383-6260
Ohio	Cleveland, Morlan & Assocs	216-235-1689
Tex	Houston, ANHO Controls	713-931-3240

DATA SPECIALTIES, Dept. EM, 3455 Commercial Ave., Northbrook, Ill. 60062, Tel: 312-564-1800; Empl.: 85 ..... p. 1397

Local Sales Offices & Reps.

Ala	Huntsville, J. L. Highsmith & Co.	205-881-3294
Cal	Cupertino, Inter-Linek Sys.	408-257-7165
Cal	Sunnyvale, Inter-Link Systems	408-744-1930
Conn	Wallingford, IMF Sls Assocs	203-265-0215
Fla	Boca Raton, J. L. Highsmith & Co.	305-368-9194
Fla	Orlando, J. L. Highsmith & Co.	305-293-5202
Ga	Acworth, J. L. Highsmith & Co.	404-926-7298
Ill	Chicago, Pivan Engrg.	312-539-4838
Ind	Indianapolis, Pivan Engrg.	317-253-1681
Iowa	Cedar Rapids, Pivan Engrg.	319-377-9434
Kans	Shawnee Mission, Pivan Engrg.	913-722-1030
Mass	Wakefield, IMF Sls Assocs.	617-245-8900
Mich	Madison Hts., WKM Assocs.	313-588-2300
Minn	Minneapolis, Pivan Engrg	612-537-4501
Mo	St. Louis, Pivan Engrg.	314-567-3636
NY	Rochester, RG Engineering	716-385-3021
NY	Roslyn Heights, Travco Assocs.	516-621-3223
NC	Charlotte, J. L. Highsmith & Co.	704-333-7743
Ohio	Cleveland, WKM Assocs	216-267-0445
Ohio	Dayton, WKM Assocs	513-434-7500
Ore	Portland, McLaren Inc.	503-297-2248
Pa	Pittsburgh, WKM Assocs	412-892-2953
Tex	Dallas, Salcor, Inc.	214-234-8072
Va	Richmond, J. L. Highsmith & Co.	804-272-5888
Wash	Bellevue, McLaren Inc.	206-454-3400
Wisc	Brookfield, Pivan Engrg	414-786-1940

DATA TECH, DIV. OF PENRIL CORP., Dept. EM, 2700 S. Fairview, Santa Ana, Cal. 92704, Tel: 714-546-7160, TWX: 910-595-1570; Empl.: 150

Sales Manager: Pres Weber

Local Sales Offices & Reps.

Ariz	Phoenix, Trembly Assocs.	602-967-2058
Cal	Los Angeles, Luscombe Engrg	213-684-2000
Cal	Los Gatos, Luscombe Engrg	408-354-6496
Cal	San Diego, Luscombe Engrg Co.	714-436-2200
Colo	Boulder, Herb Bass Assocs.	303-499-7509
Fla	Orlando, E.G. Holmes	305-894-8901
Ga	Chamblee, E.G. Holmes	404-451-6161
Ill	Chicago, Sea Inc.	312-282-6694
Ind	Carmel, Sea Inc.	317-846-2593
Kans	Mission, Vertec Assocs.	913-677-3200
Md	Bethesda, Powell-Pendergraph	301-656-4535
Mass	Waltham, McBar Assoc.	617-890-0233
Mich	Royal Oak, Dave Ray & Assocs.	313-576-4705
Minn	Minneapolis, Sea Inc.	612-425-4455
Mo	Manchester, Vertec Assocs.	314-394-6242
NY	New Hartford, KLM Assocs.	315-735-8525
NY	No. Syracuse, KLM Assocs.	315-458-6214
NY	Portchester, Radiation Elect.	212-539-1515
NY	Rochester, KLM Assocs.	716-442-0820
Ohio	Richmond Heights, Bradcor Elctrns	216-692-0881
Va	Richmond, Powell-Pendergraph	804-264-2341
Wisc	Waukesha, Sea Inc.	414-547-6637

DATA TECHNOLOGY, INC., Dept. EM, 4 Gill St., Woburn, Mass. 01801, Tel: 617-935-8820, Telex: 94-9476; Empl.: 70

Sales Manager: D.E. Skenderian

Local Sales Offices & Reps.

Cal	San Marino, Dale-Dahl	213-682-3417
Cal	Walnut Creek, Dale-Dahl	415-933-9595
Conn	Guilford, Whitehead Assocs.	203-453-3762
Ill	Northbrook, Traco Eng.	312-564-2288
Md	Columbia, Rep-Tron	301-465-6433
Mass	Boston, Whitehead	617-542-7676
Mich	Troy, Xanthus	313-771-3020
Minn	Minneapolis, Bican Co.	612-827-4734
NY	Penfield, A & D Devices	716-586-8033
Ohio	Cleveland, Geotronix	216-526-2535
Ohio	Columbus, Geotronix	614-457-8472
Pa	Pittsburgh, Geotronix	412-266-4819

DATA TECHNOLOGY, INC. cont'd

Advertisement

DATA TECH offers a complete line of optical incremental encoders ranging from the K15 and K22 modular kit encoders, the RS23 lowest price complete encoders through the OPTECON series industrial encoders to the OP35 high accuracy, high resolution encoders. All encoders have proven to be cost effective and reliable mean of translating position into digital form.

DATA TRANSLATION, Dept. EM, 4 Strathmore R Natick, Mass. 01760, Tel: 617-655-5300, Te 948-474; Empl.: 25 ..... p. 1

Local Sales Offices & Reps.

Ariz	Scottsdale, BFA Corp.	602-994-5
Cal	Costa Mesa, Xebex	714-540-3
Cal	Santa Clara, Telemark	408-248-9
Colo	Denver, BFA Corp.	303-837-1
DC	Washington, Gans, Fryling, Pugh	703-527-3
Md	Scaggsville, Gans, Fryling, Pugh	703-527-3
Mass	Natick, Data Translation	617-655-5
Minn	St. Paul, Applied Technology Sls.	612-488-1
NM	Albuquerque, BFA Corp.	505-292-1
NM	Las Cruces, BFA Corp.	505-523-0
NY	Elmont, Crane & Egert Corp.	516-488-2
Okla	Oklahoma City, DMA, Inc.	405-364-8
Tex	Austin, DMA, Inc.	512-451-5
Tex	Dallas, DMA, Inc.	214-661-0
Tex	El Paso, B F A	505-523-0
Tex	Houston, DMA, Inc.	713-780-2
Tex	San Antonio, DMA, Inc.	512-828-2
Utah	Salt Lake City, BFA Corp.	801-466-6
Va	Arlington, Gans-Fryling & Pugh	703-527-3
Wisc	Osceola, Applied Technology Sls.	715-294-3

DATACOM, INC., Dept. EM, Box 278, Ft. Walton Bea Fla. 32548, Tel: 904-244-6121, TWX: 510-730-76 Empl.: 50

Local Sales Offices & Reps.

Ala	Huntsville, Currie, Peak, & Frazier, Inc.	205-536-5
Fla	Orlando, Currie, Peak & Frazier, Inc.	305-855-0
Md	Greenbelt, J.E. Cuesta & Co.	301-552-1
Mich	Detroit, Electro Sls. Assocs.	313-526-8
Mo	Hazelwood, Technical Reps.	314-731-5
NC	Greensboro, Currie, Peak, & Frazier, Inc.	919-273-3
Ohio	Dayton, Electro Sls. Assocs.	513-426-5
Pa	Valley Forge, J.E. Cuesta & Co., Inc.	215-265-5

DATADYNE CORP., Dept. EM, Box 247, King Prussia, Pa. 19406, Tel: 215-265-1793; FSC 53032; Empl.: 23

Sales Manager: R.F. Rainer

DATAK CORP., Dept. EM, 65 Seventy-First Guttenberg, N.J. 07093, Tel: 201-869-220 p. 1298,2

Local Sales Offices & Reps.

Ala	Birmingham, H.W. Phillips	205-967-5
Cal	Burlingame, Polach & Bensinger	415-697-2
Cal	West Covina, Don Forth Assocs.	213-962-1
Colo	Littleton, Electro-Tek Sls.	303-623-3
Fla	Ft. Lauderdale, Unirep, Inc.	305-527-1
Ga	Boswell, H.W. Phillips Co.	404-992-3
Ill	O'Hare, W.T. Adams Sls.	312-956-7
Ind	Indianapolis, Mid-States Mktg.	317-247-7
Iowa	Atlantic, Kimian Sls.	712-243-1
Md	Kensington, Forti-Assocs	301-949-1
Mich	Pleasant Ridge, Shalco, Inc.	373-547-4
Minn	Minneapolis, Kodo Assoc.	612-881-1
Mo	Independence, Kimian SLs.	816-796-4
NJ	Teaneck, Steve Fisher Sls.	201-837-1
NJ	Willingboro, Austin Assocs.	609-871-9
NY	Skaneateles, Leahy & Thomson	315-685-8
Ohio	Cleveland, John Olsen Co.	216-752-5
Ore	Lake Oswego, McMillan Elctrns.	503-636-7
Pa	Pittsburgh, John Olsen Co.	412-341-8
RI	Lincoln, Adams-McGregor	401-726-1
Tex	Irving, Antle-Smith Sls.	214-438-1

Local Distributors
Ala Huntsville, Mock Elect. Inc.
Alas Juneau, Juneau Elctrn.
Ariz Tempe, Circuit Special
Cal El Cerrito, Trumbull Co
Cal Hawthorne, Graphic Media
Cal Palo Alto, Zack Elctrns.
Cal San Francisco, Zack Elctrns.
Colo Boulder, Rocky Mtn Elect Sply .. 303-444-5611
Colo Colorado Springs, Walker Elect.
Conn Waterbury, Bond Radio Elect.
Del Wilmington, RESCO
Fla W. Palm Bch., Nurmi Elect.
Ga Atlanta, Lykes Elect. Sply.
Haw Honolulu, Precision Radio Ltd.
Ill Geneva, Melvin Elctrns 312-232-8050
Ill Mt. Prospect, Tri-State Elctrn 312-255-0600
Ill Peoria, Klaus Radio & Elect.
Ind Indianapolis, Graham Elect.
Ky Louisville, P.I. Burks Co.
La N. Orleans, Radio Parts Inc.
Md Baltimore, A S I Elect.
Mass Boston, Sager Elctrical Sply.
Mass Dedham, Gerber Elect.
Minn Minneapolis, Electronic Ctr.
Mo Kansas City, Burstein Applebee
Mo St. Louis, Gateway Elect.
Neb Lincoln, Scott Elect. Sply.
Nev Reno, Elect. Dist. Co.
NH Dover, American Radio Corp..... 603-742-6800
NJ Spfld., Route Elect.
NM Albuquerque, Elect. Parts
NY Buffalo, Summit Distributor
NY Farmingdale, Broadline Elctrns .. 516-420-8320
NY Rochester, Rochester Radio Sply.
NY Syosset, Lafayette Radio
NC Raleigh, Southeastern Radio
Ohio Columbus, Hughes-Peters
Okla Tulsa, Radio Inc.
Ore Portland, Portland Radio Sply.
Pa Pittsburgh, Cam/RPC 412-782-3770
Pa Reading, G. D. Barbey
RI Providence, W. Dandreta & Co.
SC Columbia, Dixie Radio Sply.
Tenn Memphis, W & W Distributing
Tex El Paso, Midland Specialty Co.
Utah Salt Lake City, Kimball Elect.
Va Alexandria, Sasco Elctrns.
Va Arlington, Arlington Elect. Who.
Wash Seattle, Radar Elect. Co.
Wisc Milwaukee, Parts Mart Corp. 414-276-4160

ATAMEDIA, Dept. EM, 7300 N. Crescent Blvd., Pennsauken, N.J. 08110, Tel: 609-665-2382, TWX: 710-892-1693; FSC No.: 00750; Empl.: 108

Sales Manager: R. L. Sullivan

Local Sales Offices & Reps.
Cal Los Angeles 213-397-3556
Colo Denver, American Teledata
Md Gaithersburg 301-948-1670

Local Distributors
Cal Irvine, Computer Datacom 714-540-6327
Cal N. Hollywood, Terminal Sys..... 213-769-6772
Cal Redwood City, Product Assocs.. 415-368-0640
Cal San Diego, Sierra Nat'l. Corp..... 714-277-4810
Cal San Jose, Digicom Data Prod 408-279-8711
Mass Wellesley, Marketechs, Inc. 617-237-4343
NM Albuquerque, BFA Corp 505-292-1212
Pa Cornwell Hgts, Eastern Terminals & Comm 215-757-5136
Tex Irving, Noakes Data Comm 214-255-1151
Wash Seattle, Datec, Inc. 206-242-8883

ATAMETRICS INC, Dept. EM, 340 Fordham St., Wilmington, Mass. 01887, Tel: 617-658-5410, TWX: 710-347-7672; Empl.: 150

Sales Manager: R. Kieser

ATAMETRICS/TRUMP ROSS, Dept. EM, 340 Fordham Road, Wilmington, Mass. 01887, Tel: 617-658-5410, TWX: 710-347-7672; Empl.: 55 p. 1396

Sales Manager: A. W. Siff

Local Sales Offices & Reps.
Cal Benicia, Drive Sys. Tech., Inc. 707-745-5117
Cal Buena Park, Sls Engrs Ltd. 213-921-0681
Cal San Diego, Sls Engrs Ltd. 714-277-5723
Fla Orlando, Mackay, Smith & Assocs 305-277-1513
Ga Atlanta, Mackay, Smith & Assocs 404-449-7444
Ill Chicago, United Energy Sys. Inc. 312-631-0255
Mass Waltham, J. W. Simpson Co..... 617-899-7700
Mich Royal Oak, Dave Ray & Associates 313-576-4705
Minn Minneapolis, John J. Exon Co. .. 612-571-5340
NY Clark Mills, KLM Assocs. 315-853-6126
NY Rochester, KLM Assocs. 716-442-0820
NY Syracuse, KLM Assocs. 315-458-6214
NC Charlotte, Mackay, Smith & Assocs 704-527-0240
Ohio Chagrin Falls, J. Kilroy Corp..... 216-247-8997
Ohio Dayton, J. Kilroy Corp. 513-435-4100
Tex Dallas, Concept Sls. 214-241-5202
Tex Houston, Concept Sls 713-456-2597
Wash Bellevue, Al Smith Co. 206-746-6770

DATAPROBE, INC., Dept. EM, 254 Green St., So. Hackensack, N.J. 07606, Tel: 201-489-5588; Empl.: 10

DATATEX CORP., Dept. EM, 10935 S. Wilcrest Dr., Houston, Tex. 77099, Tel: 713-495-3100; Empl.: 175

Sales Manager: R. A. McKee; *Distributor Manager:* K. Pelletier

Local Sales Offices & Reps.
Ala Huntsville, Cartwright & Bean 205-533-3509
Ariz Phoenix, Howe & Howe Sls..... 602-264-7971
Cal Los Angeles, Wiley Co 213-663-8028
Cal San Carlos, David H. Ross Co .. 415-591-4411
Cal San Diego, Wily Co..... 714-571-2881
Colo Littleton, Simpson Assoc 303-794-8381
Conn New Canaan, Stan Pierce 203-966-4630
Fla Altamonte Springs, Semtronic Assoc 305-831-8233
Ga Atlanta, Cartwright & Bean 404-255-5262
Ill Rolling Meadows, Sumer, Inc 312-991-8500
Kans Shawnee Mission, Lowell-Kangas & Assoc 913-631-3515
Mass Norwood, Stan Pierce..... 617-762-3164
Mich Ferndale, Hilltronics..... 313-398-5556
Minn Edina, Mel Foster Tech Sls 612-835-2252
Miss Jackson, Cartwright & Bean 601-981-1368
Mo St. Louis, Lowell-Kangas & Assoc 314-821-4050
NJ Cherry Hill, Trinkle Sls 609-662-2958
NM Albuquerque, C.T. Carlberg Assoc 505-265-1579
NY Buffalo, Leonard D. Allen..... 716-837-1955
NY Mount Vernon, David Sonkin Assoc 914-668-9809
NY Syracuse, Leonard D. Allen..... 315-458-7470
NC Charlotte, Cartwright & Bean..... 704-333-6457
Ohio Brecksville, Allen Nace Co..... 216-526-4323
Ohio Englewood, Allen Nace Co 513-836-0931
Pa Pittsburgh, Allen Nace Co 412-922-7225
Tenn Memphis, Cartwright & Bean..... 901-276-4442
Tex Dallas, Datatex Corp..... 214-235-7166
Utah Salt Lake City, Simpson Assoc.. 801-486-3731
Wash Seattle, Earl & Brown Co. 206-284-1121

DATAWEST CORP., Dept. EM, 7333 E. Helm Dr., Scottsdale, Ariz. 85260, Tel: 602-948-3280, TWX: 910-950-1289; Empl.: 19

Sales Manager: (Dir.) D. J. Long

Local Sales Offices & Reps.
Ariz Tempe, Grady Moore Assoc..... 602-839-3458
Colo Littleton, Davis Assocs 303-795-1400
Haw Honolulu, Aloha Assocs..... 808-941-1574
Md Annapolis, A/O Elctrns..... 301-942-8883
NM Albuquerque, Grady Moore Assoc. 505-262-1416
Tex Houston, System Tech Assocs .. 713-440-8340

DATEC, INC., Dept. EM, Box 839, Chapel Hill, N.C. 27514, Tel: 919-967-5605

Sales Manager: M. E. Riley

DATEL SYSTEMS, INC.

DATEL SYSTEMS INC., Dept. EM, 1020 Turnpike St., Canton, Mass. 02021; Tel: 617-828-8000, TWX: 924461, 710-348-0135; Empl.: 450 p. 1401,2687,3225

Sales Manager: J. Zaros

Local Sales Offices & Reps.
Ala Huntsville, Int'l. Scientific Instrs. 205-533-6880
Ariz Phoenix, Cleveland Ent. 602-944-4670
Cal Santa Ana, Datel Sys., Inc. 213-933-7256
Cal Sunnyvale, Datel Sys..... 408-733-2424
Colo Denver, Cleveland Enterpirses .. 303-751-3252
Conn Hamden, JBL Assocs 203-281-3161
Fla Pompano Beach, Saber Assocs., Inc. 305-943-3076
Haw Honolulu, Hawaii Data Sys. 808-946-1533
Ill Chicago, Carter Elctrns., Inc..... 312-585-5485
Ind Indianapolis, Carter Elctrns., Inc. 317-293-0696
Iowa Cedar Rapids, Tech Reps 319-393-5510
Kans Lexena, Technical Reps. 913-888-0212
Md Gaithersburg, Datel Systems..... 301-840-9490
Mass Canton, Datel Sys., Inc. 617-828-8000
Mich Troy, G.R. Peters Assocs. 313-362-1220
Minn Minneapolis, Carter Elctrns., Inc. 612-559-1976
Mo Hazelwood, Technical Reps. 314-731-5200
NJ Englewood, Eastern Instrumentation 201-567-9505
NM Albuquerque, Cleveland Ent. 505-266-5594
NY Liverpool, R & D Assocs. 315-457-0100
NC Raleigh, Saber Assoc. 919-834-3961
Ohio Cleveland, Instrumentation Sys. 216-561-6100
Ohio Dayton, Instrumentation Sys. 513-294-2838
Pa Jenkintown, Stein Instrumentation 215-885-2370
Pa Pittsburgh, Instrumentation Sys. 412-243-1282
Tex Houston, Datel Systems..... 713-932-1130
Tex Irving, Datel Systems 214-256-4444
Wash Bellevue, Tasco, Inc. 206-453-1414
Wisc Milwaukee, Carter Elctrns. 414-464-5555

Local Distributors
Tex Austin, Component Specialties, Inc. 512-459-3307
Tex Houston, Component Specialties, Inc. 713-771-7237
For: Canada, Missisauga, Ont., Prelco Elctrns. Ltd. 416-678-0401
For: Canada, Montreal, Que., Prelco Elctrns. Ltd. 514-389-8051
For: Canada, Ottawa, Ont., Prelco Elctrns. Ltd. 613-226-3491

DATOTEK, INC., Dept. EM, 13740 Midway Rd., Dallas, Tex. 75240, Tel: 214-233-1030, Telex: 73-0558; Empl.: 50

Sales Manager: B. Spencer

DATRON SYSTEMS, Dept. EM, 20700 Plummer St., Chatsworth, Cal. 91311, Tel: 213-882-9616, Telex: N/A; FSC No.: 32255; Empl.: 150

Sales Manager: R. A. Potter, (Dir. of Mktg.); *Distributor Manager:* R. A. Potter

Local Sales Offices & Reps.
Cal Santa Barbara, Kannard Engrg., Inc. 805-682-1928
Fla Ft. Lauderdale, Snow Co. 305-563-2449
Tex Fort Worth, C. Wolf & Assocs. .. 817-738-1996

DATTILO ENTERPRISES, INC., Dept. EM, 2302 Taylorsville Rd., Louisville, Ky. 40205, Tel: 502-456-4310; Empl.: 56

DATUM, INC., Dept. EM, 1363 State College Blvd., Anaheim, Calif. 92806, Tel: 714-533-6333, TWX: 910-592-1289; Empl.: 350

Local Sales Offices & Reps.
Ala Huntsville, Datum..... 205-881-7629
Ala Huntsville, Lee Assocs..... 205-533-5896
Ariz Scottsdale, BFA of Arizona, Inc. 602-946-4215
Cal Lawndale, Ward/Davis Assoc. .. 213-542-7740
Cal San Diego, Datum, Inc..... 714-453-1633
Cal Sunnyvale, Ward/Davis Assoc.. 408-245-3700
Colo Denver, BFA of Arizona, Inc. 303-744-3301
Conn Hamden, P. Jenks Assoc. 203-281-0810
Fla Ft. Lauderdale, Lee Assocs. 305-525-9767
Fla Longwood, Southern Data Assocs. 305-831-3311
Fla Winterhaven, Lee Assocs. 813-294-5815
Ill Hoffman Estates, Datum, Inc. 312-298-1244
Kans Wichita, Winco, Inc. 316-684-8224
Md Silver Spring, K-G Elctrns. 301-588-3000
Mass Wakefield, P. Jenks Assoc. 617-246-1590
Mass Waltham, Datum, Inc. 617-899-7474
Mich Detroit, Electro Sls. Assoc. 313-526-8800
NM Albuquerque, BFA of Arizona, Inc. 505-292-1212
NM Las Cruces, BFA of Ariz., Inc. 505-523-0601
NY Great Neck, Krasner Assocs. 516-487-0690
NY Melville, Astrorep..... 516-423-2266
NC Raleigh, Lee Assocs. 919-787-5818
Ohio Aurora, EMA, Engrg. Mktg. Assoc. 216-562-6104
Ohio Centerville, EMA, Inc. 513-433-2800
Ohio Cleveland, Electro Sls. Assoc. .. 216-261-5440
Ohio Dayton, Electro Sls. Assoc. 513-426-5551
Pa Norristown, Denco, Data Engrg. Co. 215-279-8146
Pa Pittsburgh, Electro Sls. Assoc. .. 412-371-9449
Tex Arlington, J. T. Houston Assoc.. 817-265-2931
Tex Dallas, Data Aids Assoc. 214-620-1551
Tex Dallas, Datum, Inc. 214-352-7411
Tex Houston, Data Aids Assoc. 713-862-6685
Utah Salt Lake City, BFA of Ariz..... 801-466-6522
Wash Seattle, Comptronics, Inc. 206-284-4842

DAVIDSON ELECTRONIC DEVELOPMENT CO., Dept. EM, 2211 Peninsula Dr., Erie, Pa. 16506, Tel: 814-833-9818; Empl.: 10

DAVIES MOLDING CO., HARRY, Dept. EM, 4920 Bloomingdale Ave., , Chicago, Ill. 60639, Tel: 312-622-8966; FSC No.: 72512; Empl.: 170

Local Sales Offices & Reps.

Cal	Belmont, Littrell Western Sls., Inc.	415-592-3346
Cal	Los Angeles, Littrell Western Sls., Inc.	213-261-0164
Colo	Arvada, Challenge Sls	303-420-4316
Conn	Meriden, P.R. Sturgeon Co.	203-237-1112
Fla	Fort Lauderdale, W. Chester Smith	305-564-1477
Ill	Chicago, R. W. Kruse Co.	312-736-9546
Ind	Noblesville, McCaw Sales Co.	317-896-5300
Iowa	Cedar Rapids, Clancey Co.	319-365-7141
Iowa	Des Moines, Clancey Co.	515-278-1331
Kans	Shawnee Mission, Clancy Co.	913-432-4550
Mass	Needham Heights, P.R. Sturgeon Co.	617-444-6603
Mich	Bloomfield Hills, Gitre Co.	313-645-1777
Mo	St. Louis, Clancey Co.	314-432-3633
NY	Syosset, Rywel Sls.	516-364-0888
NC	Charlotte, Anthom, Inc.	704-527-1515
Ohio	Westlake, Foley & Beilstein Co.	216-871-8830
Pa	Erie, M.L. Crowell Co.	814-454-0250
Pa	Paoli, W.G. Walker	215-627-8146
Tenn	Memphis, L.E. Offutt Co.	901-789-1210
Tex	Dallas, L.T. Greenwood	214-522-8718
Utah	Salt Lake City, Challenge Sls	801-364-2999
Wash	Renton, Northwest Plastics Inds.	206-226-8340
Wisc	Milwaukee, Clague Sls. Corp.	414-272-1951

DAVIS ELEC. CO., Dept. EM, Box 38, Cape Girardeau, Mo. 63701, Tel: 314-335-5547; Empl.: 53

Local Sales Offices & Reps.

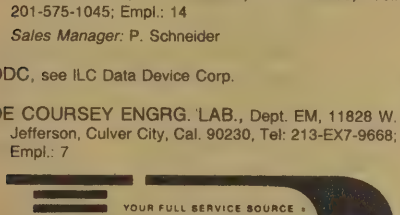
Cal	Los Altos, Schwerin Assocs.	415-941-3737
Cal	Santa Ana, J. Franek Co.	714-832-0290
Cal	Santa Barbara, Schwerin Assocs.	805-967-7317
Ill	Norridge, Gianaras Sls. Co.	312-774-4600
Mass	Scituate, Near, Inc.	617-545-6327
Mo	Kansas City, Automatic Gen. Elctrn. Sls., Co.	816-333-8206
Ohio	Cleveland, Components Inc.	216-243-9200
Ohio	W. Carrollton, Components, Inc.	513-866-0061
Pa	Pittsburgh, omponents, Inc.	412-833-9380
Pa	Radnor, W. Henry Cordray Sls. Co.	215-878-3737
Tex	Dallas, Stevens Sls. Co.	214-350-2476

DAY-LIGHT DISPLAY CORP., Dept. EM, 11 Fairfield Pl., Box 1231, W. Caldwell, N.J. 07006, Tel: 201-575-1045; Empl.: 14

Sales Manager: P. Schneider

DDC, see ILC Data Device Corp.

DE COURSEY ENGRG. LAB., Dept. EM, 11828 W. Jefferson, Culver City, Cal. 90230, Tel: 213-EX7-9668; Empl.: 7



DEARBORN WIRE & CABLE CO., Dept. EM, 8299 Evenhouse Dr., Rosemont, Ill. 60018, Tel: 312-696-1000, TWX: 910-253-0343; Empl.: 58 p. 4592-4607

Local Sales Offices & Reps.

Cal	Palos Verdes Estates, Clay Kucenas Assoc.	213-378-3685
Colo	Denver, Parker-Webster	303-770-1972
Fla	St. Petersburg, John F. Thompson	
Ill	Chicago, R.J. Drews & Sons	312-827-5882
Ill	Wilmette, Joel Wasserman Assocs.	312-256-3566
Mass	Framingham, Gordon Travis Co	617-877-8816
Mich	Dearborn, Pitcher & Poulin	313-582-5450
NY	North Syracuse, Leonard Allen	315-458-7470
Tex	Dallas, Electra Reps	214-387-3594
Utah	Salt Lake City, Parker Webster	801-487-5911
Va	Richmond, D. Miller Assocs.	804-353-5324
Wisc	Milwaukee, Key Entrprs	414-784-3390

Local Distributors

Cal	Garden Grove, Allied Elctrns.	213-598-6605
Cal	Gardenia, California Switch & Signal	213-770-2330
Cal	Sunnyvale, Diplomat/Westland	408-734-1900
Fla	Clearwater, Diplomat/Southland	813-443-4514
Fla	Fort Lauderdale, Simcona Elctrns.	305-485-4455
Fla	Miami, Electro-Standard Labs	305-633-6973
Fla	Orlando, Royce Elctrns	305-843-6030
Ill	Arlington Heights, S & R Corp.	312-593-2545
Ill	Broadview, L Comp	312-865-7600
Ill	Chicago, Newark Elctrns.	312-638-4411
Ill	Elgin, Allied Elctrns.	312-697-8200
Ill	Elk Grove, Diplomat/Lakeland	312-595-1000
Ill	Elk Grove, GBL Elctrns.	312-593-3222
Ill	Elk Grove Village, Hallmark Elctrns	312-437-8800
Ill	Palatine, OHM Elctrns.	312-359-5500
Ill	Skokie, Bell Inds.	312-965-7500
Ind	Evansville, Hutch & Sons	812-425-7201
Ind	Fort Wayne, Ft. Wayne Elctrns.	219-423-3422
Ind	Indianapolis, Graham Elctrns.	317-634-8486
Ind	Indianapolis, Ra-Dis-Co.	317-637-5571
Iowa	Cedar Rapids, Deeco	319-365-7551
Mich	Grand Rapids, Stotts-Friedman	616-459-0216
Minn	Minneapolis, Diplomat/Electro Co.	612-788-8601
Miss	Jackson, Ellington Elctrns.	601-948-5741
Miss	St Charles, Lectronixs	314-946-6424
Mo	St. Louis, Diplomat/St. Louis	314-645-8550
Mo	St. Louis, L Comp	314-647-5505
NY	Albany, E.E. Taylor	518-438-4461
NY	Rochester, Simcona Elctrns.	716-328-3230
NC	Winston-Salem, Kirkman Elctrn	919-722-9131
Ohio	Mansfield, National Elect. Supply	419-524-1042
Tex	Fort Worth, Allied Elctrns.	817-336-5401
Tex	Garland, Hisco	214-272-5411
Tex	Houston, Altair Co.	713-462-3029
Tex	Midland, ESI Supply	915-694-6635
Tex	Richardson, Altair Co.	214-231-5166
Utah	Salt Lake City, Diplomat/Alta	801-486-7227
Utah	Salt Lake City, Calron Elect. Supply	801-487-7451
Va	Arlington, Arlington Elctrns.	703-524-2412
Va	Richmond, Avec Elctrns.	703-359-6071
Wisc	Mequon, Taylor Elctrns.	414-241-4321
Wisc	Milwaukee, Marsh Elctrns.	414-545-6500

DECALCRAFT CORP., Dept. EM, Rte. 309, Hatfield, Pa. 19440, Tel: 215-822-0517; Empl.: 12

DECOM SYSTEMS, INC., Dept. EM, 1404 Descanso Rd., San Marcos, Ca. 92069, Tel: 714-744-1002; FSC No.: 55744; Empl.: 25

Sales Manager: G.F. Tremain

Local Sales Offices & Reps.

Ala	Huntsville, Tom Luckett	205-536-1969
Cal	Palo Alto, J. Egbert	415-326-1387
Cal	San Diego, L.L. Stoakes	714-274-6281
Cal	San Marcos, G. F. Tremain	714-744-1002
Cal	Torrance, D. Preston	213-370-8251
Fla	Orlando, J. Jones	305-841-8180
Kans	Shawnee Mission, B. Frantz	913-888-3330
Md	Timonium, R. Bishop	301-252-8851
Mo	St. Louis, D. Mazzacavello	314-725-5361
NM	Albuquerque, G. Moore	505-262-1416
NY	E. Syracuse, C. Gossier	315-437-6666
Ohio	Cleveland, Bud Wolf	513-434-7500
Ohio	Dayton, Don McNamee	513-434-7500
Tex	Dallas, D. Liljestrand	214-631-1740
Va	Springfield, J. Strock	703-451-6500
Wash	Bellevue, K. Olson	206-454-0900
Exp:	Cal., San Marcos, G. F. Tremain	714-744-1002

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DSI PRODUCTS:
•PCM Telemetry Ground Equipment, PCM Bit Synchronizers, PCM Frame Synchronizers, PCM Word Selectors, PCM Data Compressors, PSK Modems, PCM Bit Error Rate Testers, PCM Minicomputer Systems, Telemetry software, PCM Microprocessor Decoms.

APPLICATIONS:
Vehicle Flight Test Checkout, Satellite Instrumentation Testing, PCM Data Reformatting, Processing & Computer Tape Generation, PCM Data Transmission Testing, High Density PCM Data Recording.

DECITEK, Div. Jamesbury Corp., Dept. EM, 250 Chandler St., Worcester, Mass. 01602, Tel: 617-798-8731, TWX: 920-448, 710 340-1268; Empl.: 1000

Local Sales Offices & Reps.

Cal	Los Altos, Casey/Johnson	415-941-6892
Cal	Tustin, MQI Associates	714-751-2005
Colo	Denver, J.F. Hurlbut Co	303-279
Conn	Bridgeport, Reptron Sls	203-268
Kans	Shawnee Mission, Inland Assocs.	913-362
Md	Linthicum Heights, KD Assocs	301-636
Mich	Brighton, Lowry Assocs.	313-227
Mo	St. Louis, Inland Assocs	314-821
NJ	Bogota, Neville & Vespo	212-539
NY	Rochester, A.D. Devices	716-586
Ohio	Cleveland, Geotronix	216-526
Ohio	Columbus, Geotronix Inc.	614-457
Pa	Berwyn, E.C. Brown Assocs.	215-647
Tex	Dallas, Sci Devices	214-231
Tex	Houston, Sci Devices	713-479
Tex	San Antonio, Sci Devices	512-736

DEFIANCE CIRCUIT CORP., Sub. of Hi-G Inc. EM, 12 Shepherd St., Lawrence, Mass. 0184 617-688-1856; Empl.: 175

Sales Manager: W. McKay

Local Sales Offices & Reps.

Conn	Easton, John E. Boeing	203-26
Ill	Mt. Prospect, Magnuson Assocs.	312-956
Md	Timonium, Heller Sls.	301-252
Mass	Lexington, John E. Boeing Co.	617-862
Minn	St. Paul, Maguson Assocs.	612-227
NH	Manchester, Northeast Comps.	603-627
NY	Endicott, Tech-Mark, Inc.	607-748
NY	Jericho, HRC Comp-Tech	516-822
NY	Rochester, Tech-Mark	716-223
Pa	Glenside, Elcom, Inc.	215-885
Exp:	N.Y., New York, Eurotronix	212-765

DEGUSSA CORPORATION, Metals Div., Dep Route 46 & Hollister Rd., Teterboro, NJ 0760 201-288-6500, TWX: 134610, 710-990-; Empl.:

DEK, INC., Dept. EM, 1555-A Hawthorne L Chicago, Ill. 60185, Tel: 312-231-4245; Empl.: 5

Sales Manager: R. Glende V.P.

Local Sales Offices & Reps.

Wash	Kirkland, Freed Assoc.	206-822

Local Distributors

Cal	Riverside, Elctrn Supply	714-683
Ill	Broadview, L-Comp	312-865
Md	Beltsville, Vertex-Mid Atlantic	301-937
Mass	No. Wilbraham, Indl Comps Corp.	413-596
Mich	Lavonia, Camelot Elctrns	313-427
Minn	St. Paul, Arden Industrial Prods	612-483
Mo	Kansas City, L-Comp	816-221
Mo	St. Louis, L-Comp	314-647
NJ	Springfield, Federated	201-376
NY	Farmingdale, Vertex Elctrns.	516-293
Ohio	Columbus, Elctronic Mktg.	614-299
Pa	Philadelphia, Philadelphpa Elctrns	215-568
Tex	Dallas, Wholesale Elctrn.	214-824
For:	Can., Burlington, Ont., White Radio Div. Martin Indl Sls	416-632
For:	Japan, Naka-Ku, Nagoya, Kitagawa Inds.	261-5
For:	W. Germany, Frankfurt, Zippertechnik Gm	6102-

DELAVAL TURBINE INC., Gems Sensors Div., EM, Spring La., Farmington, Conn. 06032 203-677-1311, Telex: 99-306; Empl.: 160

Local Sales Offices & Reps.

Alas	Anchorage, C. V. Reser Co.	907-279
Ariz	Phoenix, Bews & Wallace	602-267
Ariz	Tucson, Bews & Wallace	602-327
Cal	Burlingame, Delaval	415-342
Cal	Downey, Delaval	213-923
Conn	Wethersfield, Delaval	203-563
Fla	Tampa, State Instrs.	813-251
Ga	Atlanta, Delaval	404-261
Haw	Honolulu, Berkley Eng. & Equip. Co.	808-536
Ill	Moline, R. R. Floody Co.	309-755
Ill	Rockford, R. R. Floody Co.	815-399
Ill	Westchester, Delaval	312-681
Kans	Kansas City, E. A. Akin Engrg. Co.	913-831
La	Metairie, Aries Marine & Ind. Sls.	504-835
Md	Lanham, Delaval Turbine	301-459
Mich	Madison Hts., Delaval	313-585
Minn	Minneapolis, W. F. Hartfiel Co.	612-929
Mo	St. Louis, Neff Power	314-727
NJ	Hackensack, Delaval	201-488
NM	Albuquerque, Lietz Equip. Co.	505-266
NC	Charlotte, R. W. Chapman & Co.	704-525
Ohio	Cleveland, Delaval	216-333
Okla	Tulsa, Tulsa Gauge & Instr.	918-622
Pa	Horsham, Delaval	215-674
Pa	Pittsburgh, Delaval	412-343

Tex Dallas, Delaval 214-638-1712
Tex Houston, Delaval 713-697-2897
Utah Salt Lake City, Specialty Sls. Co. 801-262-2979
Wash Bellevue, Delaval 206-885-9777
Wisc Milwaukee, Delaval 414-342-1500

DELAVAN ELECTRONICS, INC., Dept. EM, 14605 No. 73rd St., Scottsdale, Ariz. 85260, Tel: 602-948-6350; Empl.: 500

Local Sales Offices & Reps.
Ala Birmingham, Dixie Industrial Equip. Co. 205-780-1346
Ariz Phoenix, Fluid Conditioning Co... 602-273-1308
Cal Buena Park, Sales Engineers Ltd. 213-921-0681
Colo Denver, B F Sales Engrg. Co.... 303-893-1124
Fla Lakeland, A-A Electric Inc. 813-682-6181
Ga Norcross, A-A Electric Co. 404-449-8670
Ill Chicago, L. Fitz Co. 312-631-5488
Iowa Bettendorf, J. H. Laas Co. 319-355-6133
Kans Shawnee Mission, Automation Specialties 913-362-4422
Ky Louisville, Primary Devices 502-895-6500
Md Baltimore, H. M. Wood Electric Co. 301-789-4457
Mass Waltham, Johnston industrial Equip. Co. 617-890-0800
Mich Detroit, R. D. Ernest Assocs. 313-861-7311
Mich Marquett, NWR Elctrns. 616-228-9660
Minn Minneapolis, Engineered Sls. Co. 612-823-8238
Miss Birmingham, Dixie Ind'l. Equip. Co. 205-780-1346
Mo St. Louis, Gateway Controls 314-771-1139
NJ North Bergen, Critides Assoc. 201-868-4300
NY Buffalo, K.O.M. Lamb Co. 716-874-3530
NC Charlotte, MacGuire Crawford & Barnes 704-366-3454
Ohio Cleveland, Control Comps. Co... 216-692-3710
Ohio Xenia, B. L. Michaelson Co. 513-372-5496
Okla Tulsa, Pan Tech Engrg. Co. 918-747-2494
Pa Philadelphia, Y.W. Miller Co. 215-247-9600
Pa Pittsburgh, H. Woolman Co. 412-922-2420
Tex Houston, Pan Tech Engrg. Co. .. 713-263-0640
Utah Salt Lake City, Control Sys. 801-364-6425
Wash Spokane, Electro Power Corp. .. 509-535-2931
Wash Vancouver, SEA Sls. & Engrg. .. 206-696-0141
Wisc Cedarburg, Herb Smith Sls. 414-377-7028

DEL ELECTRONICS, Dept. EM, 250 E. Sandford Blvd., Mt. Vernon, N.Y. 10550, Tel: 914-699-2000, TWX: 710-562-0130; FSC No.: 01378; Empl.: 160 p. 3242,3243

Local Sales Offices & Reps.
Ala Huntsville, Lee Assocs. 205-533-5896
Cal Palo Alto, Brooks Techn. Group 415-328-3232
Cal San Carlos, Winco Sls. 415-365-6082
Cal Santa Monica, Rep Assoc. 213-829-5401
Colo Littleton, Radco Elctrns. 303-794-4279
Fla Winter Haven, Lee Assocs. 813-294-5815
Fla Winter Park, Young & Lawrence Assoc. 305-647-6929
Haw Honolulu, Aloha Assocs. 808-941-1574
Ill Elmhurst, Scott Assocs. 312-279-5681
Mass Burlington, TriTek Inc. 617-272-4550
Mich Dearborn, Pitcher-Poulin 313-582-5450
Minn Mpls., Josco-Melius 612-861-3343
Mo Springfield, Del-Tech Assocs. 417-881-3667
NJ Nutley, I. Brill 201-667-0653
NM Albuquerque, Trembly Assocs. .. 505-266-8616
NY Huntington, Sweeney & Co. 516-692-4222
NC Raleigh, Lee Assocs. 919-787-5818
Ohio Cincinnati, F.J. Campisano 513-574-7111
Ohio Fairborn, Tech. Assocs. 513-878-2484
Ore Portland, J.E. Edstrom 503-775-8527
Pa Ardmore, Martin Assoc. 215-649-6332
Tex Lewisville, J. Hughes Co. 817-430-1683
Tex Richardson, Athans Sls. Co. 214-235-7859

DELBERT BLINN. CO., Dept. EM, Box 2007, Pomona, Calif. 91766, Tel: 714-629-3900; Empl.: 10 .... p. 3923

Local Sales Offices & Reps.
Cal San Carlos, Baytronic's 415-588-0958
Md Baltimore, Callas Elctrns. 301-744-7711
NY Manhasset, Kaelber & Mack 516-627-6620
Wash Kirkland, W. J. Stulgis Co. 206-822-3867

Local Distributors
Minn Minneapolis, Stark Elctrns. 612-332-1325

DELCO ELECTRONICS DIV., General Motors Corp., Dept. EM, 700 E. Firmin St., Kokomo, Ind. 46901, Tel: 317-457-8461, TWX: 810-269-1921; FSC No.: W.C. Caldwell, (Coor) Dist. Sls.; Empl.: 11,000 p. 3924,3925

Sales Manager: J.C. Crawford, (Gen. Sls. Mgr.)

Local Sales Offices & Reps.
Cal Hawthorne, Delco Elctrns Div. GMC 213-675-4401
Ind Kokomo 317-459-1271
Exp: NY New York, Gen. Motors Overseas Opers, Power & Ind'l. Prods. Dept. 212-486-4412

Local Distributors
Ala Huntsville, Powell Elctrns 205-539-2731
Ariz Phoenix, Sterling Elctrns 602-258-4531
Cal Gardena, Bell Inds 213-321-5802
Cal Goleta, R.P.S. Elctrns 805-964-6823
Cal Los Angeles, R.P.S. Elctrns 213-748-1271
Cal Los Angeles, Kierulff Elctrns 213-725-0325
Cal Palo Alto, Kierulff Elctrns 415-968-6292
Cal San Diego, R.P.S. Elctrns 714-292-5611
Cal San Diego, Kierulff Elctrns 714-278-2112
Cal Sunnyvale, Bell Inds 408-734-8570
Colo Denver, Kierulff Elctrns 303-371-6500
Conn Norwalk, Harvey Elctrns 203-853-1515
Fla Clearwater, Diplomat/Southland 813-443-4514
Fla Miami Springs, Powell Electronics/Florida 305-592-3260
Ill Chicago, Bell Inds, Elctrns Distrib Div. 312-982-9210
Ill Elk Grove Village, Kierulff Elctrns 312-640-0200
Ind Indianapolis, Graham Elctrns Supply 317-634-8202
Md Baltimore, RESCO/Baltimore 301-823-0070
Mass Billerica, Kierulff Elctrns 617-935-5134 617-667-8331
Mass Newton, The Greene-Shaw Co... 617-969-8900
Mich Livonia, Pioneer/Michigan 313-525-1800
Minn Minneapolis, Stark Elctrns Supply 612-332-1325
Mo Kansas City, Walters Radio Supply 816-531-7015
Mo Maryland Heights, LCOMP - St. Louis 314-291-6200
NJ Cinnaminson, Wilshire Elctrns/Philadelphia 609-786-8990 215-627-1920
NJ Clifton, Wilshire Elctrns 201-340-1900 212-244-8930
NM Albuquerque, Sterling Elctrns 505-345-6601
NY Binghamton, Harvey Elctrns 607-748-8211
NY Buffalo, Summit Distributors 716-884-3450
NY Farmingdale, Wilshire Elctrns 516-293-5775
NY Freeport, Milgray/New York 516-546-6000
NY Woodbury, Harvey Elctrns 516-921-8700 212-895-9260
Ohio Cincinnati, United Radio 513-761-4030
Ohio Cleveland, Pattison Supply, Inds Elctrns Division 216-441-3000
Ohio Dayton, Pioneer/Dayton 513-236-9900
Pa Philadelphia, Almo Elctrns 215-698-4000
Pa Pittsburgh, CAM/RPC Elctrns 412-782-3770
SC Columbia, Dixie Elctrns 803-779-5333
Tex Dallas, Sterling Elctrns 214-357-9131
Tex Houston, Sterling Elctrns 713-627-9800
Tex Houston, Harrison Equip. 713-652-4700
Wash Seattle, Kierulff Elctrns 206-575-4420
For: Can., Downsview, Ont., Zentronics Ltd. 416-635-2822
For: Can., Montreal, Que., Zentronics Ltd. 514-735-5361
For: Can., Ottawa, Ont., Zentronics Ltd. 613-238-6411

DELCO WIRE & CABLE, INC., Dept. EM, 257 Rittenhouse Cir., Bristol, Pa. 19007, Tel: 215-785-0511, TWX: 06-964523 510-667-0968

Sales Manager: T. Blick

Local Sales Offices & Reps.
Ore Philadelphia 215-785-0511
Pa Pittsburg 412-344-4030
Tex Houston 713-682-1545
Exp: Bristol 215-637-9100

DELEVAN DIV., AMERICAN PREC. INDS., Clutch & Brake Prods., Dept. EM, 270 Quaker Road, E. Aurora, N.Y. 14052, Tel: 716-652-3600, Telex: 91-293; Empl.: 350 ..... p. 3080

Local Sales Offices & Reps.
Ariz Phoenix, Southwest e/m Engrg., Inc. 602-993-0250
Cal Culver City, Bestronics Inc. 213-870-9191
Cal Los Altos, Servo-Data 415-964-1325
Cal San Diego, Bestronics, Inc. 714-278-2150
Colo Denver, Walter Engrg. Assocs. .. 303-777-5585
Fla Boca Raton, Conley & Assocs., Inc. 305-395-6108
Fla Oviedo, Conley & Assocs., Inc... 305-365-3283
Fla Tampa, Conley & Assocs., Inc. .. 813-933-1759
Kans Leawood, H.C. Heyde Co. 913-649-8628
Md Lutherville, J.A. Dougherty Sls. Co. 301-321-7890
Mass Brookline, Harman Assocs. 617-232-6687
Mich Southfield, L.H. Dickelman Co. .. 313-353-8210
Minn Mendota Hgts, G-II Sls 612-454-3086
NJ Parlin, Martech Assocs. 201-721-2200
NJ Woodstown, Loman Co. 609-769-0055
NY Manhassett, Martech Assocs. 516-627-1151
NY Syracuse, M. C. Antil 315-468-2370
Ohio Cleveland, L.H. Dickelman Co. .. 216-292-5643
Tex Dallas, Scott Tech. Sls. Co. 214-352-7698

DELEVAN DIV., COIL PRODS., American Precision Inds., Dept. EM, 270 Quaker Rd., E. Aurora, N.Y. 14052, Tel: 716-652-3600, Telex: 91-293; FSC No.: 99800; Empl.: 300 ..... p. 1340,1341

Local Sales Offices & Reps.
Ariz Phoenix, Toward Engrg. 602-955-3193
Cal Los Angeles, Bestronics, Inc. 213-870-9191
Cal Menlo Park, Long & Assoc. 415-327-1300
Cal San Diego, Bestronics Inc. of San Diego 714-278-2150
Colo Denver, Walter-Engrg. 303-777-5585
Fla Boca Raton, Conley & Assc. 305-395-6108
Fla Oviedo, Conley & Assoc. 305-365-3283
Fla Tampa, Conley & Assoc. 813-933-1759
Ill Downers Grove, MO-MAK Sls. .. 312-963-6400
Ind Ft. Wayne, W.W. Bieberich 219-432-2537
Ind New Albany, Walter W. Bieberich 812-948-8224
Iowa Cedar Rapids, Lorenz Sls. 319-393-6912
Kans Leawood, H.C. Heyde Co. 913-649-8628
Md Lutherville, J. Dougherty Sls. 301-321-7890
Mass Boston, P.J. Engrg. 617-924-5950
Minn Mendota Heights, G-II Sales Inc. 612-454-3086
NJ Haddonfield, Thomas Assocs. 609-854-3011
NJ Parlin, Martech Assc. 201-721-2200
NY Clarence Center, Tech Mark, Inc. 716-741-9106
NY Endicott, Tech-Mark 607-748-7473
NY Liverpool, Tech-Mark, Inc. 315-652-6229
NY Manhasset, Martech Assc. 516-627-1151
Ohio Cleveland, C. Robinson 216-381-9049
Ohio Dayton, C. Robinson 513-275-2412
Ore Portland, D.G. Weber Co. 503-234-0686
Tex Austin, Allied Comps Inc. 512-459-0761
Tex Dallas, Allied Components Inc. .. 214-238-0408
Tex Houston, Allied Components Inc. 713-960-1962
Wash Seattle, D. G. Weber Co. 206-623-5990
Exp: New York, N.Y., European Elctrns Co Div of Joseph Plasencia 212-683-1420
Exp: N.Y., Westbury, CPS International Ltd. 516-334-8500

Local Distributors
Ariz Phoenix, R.V. Weatherford Co. .. 602-272-7144
Cal Glendale, R. V. Weatherford 213-849-3451
Cal Mountain View, Elmar Elctrns. 415-961-3611
Cal San Diego, R.V. Weatherford Co. 714-278-7400
Cal Woodland Hill, JACO Electronics, Inc. 213-887-7260
Colo Denver, Elmar Elctrns. 303-287-9611
Conn Orange, Milgray Elctrns. 203-795-0711
Fla Dania, Summit Distr. 305-920-6253
Fla Orlando, Milgrapy Elctrns. 305-647-5747
Ill Chicago, Genesis Elctrn. 312-530-2272
Ind Indianapolis, Genesis Elctrns 317-257-2231
Ind South Bend, Genesis Elctrns. 219-287-2911
Kans Overland Park, Milgray Elctrns... 913-236-8800
Md Lanham, Milgray Elctrns 301-459-2222
Mass Boston, P. J. Engrg. Supply 617-783-0510
Mass Burlington, Milgray Elctrns. 617-272-6800
NJ Cherry Hill, Milgray Elctrns. 609-424-1300
NJ Pennsauken, Radio Elec. Svc. Co. 609-662-4000
NJ Springfield, Route Elctrns. 201-379-7710
NY Buffalo, Summit Distributors 716-884-3450
NY Freeport, Milgray/New York 516-546-6000
NY Hauppauge, JACO Electronics, Inc. 516-273-5500
NY Rochester, Summit Distrs. 716-334-8110
Ohio Cleveland, Genesis Elctrns. 216-447-0012
Ohio Dayton, Genesis Elctrns. 513-252-5609
Pa Ivyland, Century Elctrn. Comp. .. 215-824-1897
Pa Montgomeryville, Pyttronics Inc. 215-643-2850
Tex Dallas, R.V. Weatherford Co. 214-243-1571
Tex Houston, R.V. Weatherford Co... 713-688-7406
Wash Seattle, R.V. Weatherford Co. 206-243-6340
For: Can., Don Mills, Ontario, Saynor Elctrns. Ltd. 416-445-2347
For: Can., Montreal, Quebec, Prelco Elctrns. Ltd. 514-389-8051
For: Can., Vancouver, British Columbia, R-A-E Industrial Elctrns. Ltd. 604-687-2621

DELTA DESIGN, INC., Dept. EM, 5725 Kearny Villa Road, San Diego, Cal 92123, Tel: 714-292-5000, TWX: 910-335-1215; Empl.: 55

Sales Manager: G. Whitlock

Local Sales Offices & Reps.
Ariz Tempe, Q. P. L. 602-949-9477
Cal Belmont, Delta Design 415-591-2696

Cal San Diego, Delta Design 714-292-5000
Cal S. El Monte, Q. P. L. Assoc. 213-575-8022
Colo Vail, Mile High Elect. 303-476-1149
Fla Ft. Lauderdale, Lenz Engrg Co. 305-739-2546
Fla Longwood, Lenz Engrg. 305-831-9797
Ill Northfield, Torkelson Assocs. 312-446-9085
Ind Indianapolis, Torkelson Assocs... 317-244-7867
Kans Derby, Production Automation Corp. 316-788-3352
Md Randallstown, Beacon North 301-922-1248
Mass Lynnfield, Newmar Assocs. 617-245-7960
Minn Minneapolis, Torkelson Assocs. 612-835-2414
Mo Grandview, Production Automation Corp. 816-763-4155
Mo Hazelwood, Production Automation Corp. 314-731-2331
NJ Cedar Grove, KLS Assocs. 201-785-4450
NY D./FW., Delta Design 214-256-2794
NY Kings Park, KLS Assocs. 201-785-4450
NY New Paltz, Stone Assocs. 914-255-0022
NY Syracuse, Tesco Assocs. 315-463-4566
NC Greensboro, Lenz Engrg. Co. 919-299-7879
Pa Bala Cynwyd, Electech, Inc. 215-687-5305
Va Falls Church, Beacon North..... 703-534-7200
Va Lynchburg, Beacon North..... 804-237-4740
Wash Edmonds, Cunningham Sls. 206-743-6300

DELTA PRODUCTS, Dept. EM, Box 1147, Grand Junction, Colo. 81501, Tel: 303-242-9000; Empl.: 120

Sales Manager: K. D. Braa

Local Sales Offices & Reps.
Ariz Phoenix, McSherry & Assocs. 602-265-2803
Cal Van Nuys, A. Szerlip Sls. 213-782-1765
Colo Denver, McSherry & Assoc. 303-238-8361
Colo Grand Junction, Delta Prods., Inc. 303-242-9000
Fla Miami, Sochin Sls. 305-235-6048
Haw Honolulu, A. Mosher 808-732-3636
Ind Indianapolis, Shamrock Elctrn..... 317-251-5527
Md Severna Park, Hochrein & Assoc. 301-987-4003
Mass Northboro, W.B. Pray Sls. 617-393-3434
Mich Brighton, Lectro Sls. 313-532-5725
Minn Minneapolis, Heimann Co. 612-861-6051
Mo Independence, C.W. Dreese & Assoc. 816-461-7294
Ohio Dayton, Shamrock Elctrn Sls..... 513-258-1227
Exp: South Bend, Ind., Schwanke & Marshall Int., Inc. 219-232-5948

DELTEC CORP., Dept. EM, 980 Buenos Ave., San Diego, Cal. 92110, Tel: 714-297-4466, TWX: 910-335-1241; FSC No.: 52297; Empl.: 70 p. 3376,3377

Local Sales Offices & Reps.
Ala Huntsville, F-M Assocs. 205-536-9990
Ariz Scottsdale, Barnhill Three 602-947-7841
Cal Pasadena, A-F Sales Engg. 213-681-5631
Cal Santa Clara, Thomas & Hartman Assocs. 408-247-1252
Colo Denver, Barnhill Three 303-750-1222
Fla Jupiter, F-M Assocs. 305-746-2996
Fla Orlando, F-M Assocs. 305-851-5710
Ga Atlanta, F. Massocs. 404-634-7830
Iowa Cedar Rapids, Palatine Sls. 319-365-8071
Kans Andover, Palatine Sls. 316-683-7512
Kans Lenexa, Palatine Sls. 913-492-7020
Md Silver Springs, Sel-Tronics 301-589-3391
Mass Waltham, McBar Assocs. 617-890-0233
Mich Southfield, Data-tron 313-354-6421
Minn Minneapolis, Electro-Service Co. 612-827-2907
Mo St. Louis, Palatine Sls. 314-426-7055
NJ Pennsauken, Megargel/Himmelstein Assoc. 609-662-3081
NM Albuquerque, Barnhill Three..... 505-299-7658
NC Greensboro, F-M Assocs. 919-294-2754
Ohio Dayton, Data-tron 513-223-8421
Ohio Wickliffe, Data-tron 216-585-8421
Ore Lake Oswego, Wilson Applied Instr. 503-636-0965
Pa Monroeville, Data-tron..... 412-243-8421
Tex Austin, Barnhill Two, Inc. 512-444-2377
Tex Houston, Barnhill Two, Inc..... 713-688-9971
Tex Richardson, Barnhill Two, Inc. 214-231-2573
Wash Bellevue, Wilson Intl. Instr. 206-641-6444

DELTROL controls
Division Of Deltrol Corp.

DELTROL CONTROLS, Dept. EM, 2745 S. 19th St., Milwaukee, Wisc. 53215, Tel: 414-671-6800; Empl.: 300 ..... p. 3442-3447

Local Sales Offices & Reps.
Cal Canoga Park, Cummings & Assocs. 204-340-6035
Cal Santa Clara, Cummings & Assocs. 408-247-8656
Colo Denver, Cummings & Assocs. 303-455-6860
Conn Marion, Sands Co. 203-628-4363
Fla Lighthouse Point, J. Krutek & Assocs. 305-941-6544
Ga Norcross, Southern Components 404-921-9029
Haw Honolulu, Aloha Assocs. 808-941-1574
Ind Ft. Wayne, W. Bieberich Co. 219-432-2537
Ind New Albany, W. W. Bieberich 812-945-3187
Md Woodbine, Naudain Associates .. 301-252-5378
Minn St. Paul, Kenco Co. 612-645-7717
Mo Ballwin, Weisler & Assocs. 314-394-4543
Mo Kansas City, Weisler & Assocs. 816-421-1679
NJ Mount Laurel, Naudain Assocs... 609-235-1801
NY Massapequa, Coughlin Assocs... 516-799-7743
NY Rochester, Deltrol Controls 716-473-3340
NC Charlotte, JWL Assocs 704-364-3177
Ohio Aurora, Nationwide Comp. Reps. 216-562-9666
Ohio Dayton, Nationwide Comps..... 513-294-2303
Ore Sandy, Cummings & Assocs 503-287-6050
Pa Philadelphia, Naudain & Assoc... 609-235-1801
Tex Garland, R. May Assocs. 214-276-5214
Wisc Wauwatosa, F.C. DuBois & Assoc. 414-774-3100
Exp: Can., Ontario, Islington, Power Service Products 416-239-2977

Local Distributors
Ala Montgomery, Southern Controls 205-277-5030
Ariz Pasadena, Dow Radio Co. 213-793-1195
Ariz Phoenix, Electronics Parts Co. .. 602-257-1040
Ariz Sunnyvale, Diplomat-Westland .. 408-734-1900
Ark Little Rock, Carlton-Bates Co..... 501-562-9100
Cal Canoga Park, C & A Elctrns..... 213-340-6022
Cal Los Angeles, Electro Components Distrs. 213-264-7100
Cal Los Angeles, Electric Switches .. 213-664-2125
Cal San Jose, Consolidated Parts 408-294-3202
Colo Aurora, Component Specialties Corp. 303-341-0160
Colo Denver, Fistell's Elctrn. Supply Co. 303-629-1312
Colo Grand Junction; Radio & Elctrns. Supply Co. 303-243-3346
Conn Waterbury, Suburban Supply Co. 203-757-1251
Fla Bradenton, Orange Elctrns..... 305-748-6464
Fla Deerfield, American Elctrns..... 305-428-0262
Fla Fort Lauderdale, Peerless Radio Corp. 305-566-5966
Fla Tampa, Leader Elctrns. Distrs. .. 813-835-1891
Idaho Boise, Kimball Elctrns. 208-342-3559
Idaho Pocatello, Kimball Elctrns. 208-232-2201
Ill Chicago, Otto Frankenbush 212-647-0755
Ill Rockford, J & M Elctrns., Inc. 815-963-6445
Ill Schaumburg, Control Design..... 312-882-7232
Ind Control Design..... 317-788-4559
Ind Advent Elctrns. 317-297-4910
Ind Fort Wayne, Warren Radio Co... 219-743-5344
Ind Fort Wayne, Fort Wayne Elctrns. Supply 219-742-4346
Ind Indianapolis, Warren Radio Co.. 317-634-5566
Iowa Davenport, Warren Radio..... 319-323-8051
Iowa Waterloo, Farnsworth Elctrns. 391-234-6681
Iowa West Des Moines, Ramco Co. .. 515-225-6933
Kans Topeka, Carroll Radio..... 912-234-6677
Ky Ashland, Ashland Electric Co. 606-324-4107
Ky Louisville, Peerless Elctrn. Equip. Co. 502-637-7677
Ky Paducah, Warren Radio Co. 502-442-4367
La Amelia, Bayou Bouef Elec..... 504-631-2853
La Baton Rouge, Menard Elctrns..... 504-355-0323
La Shreveport, Industrial Electric Supp 318-222-9459
Mass Cambridge, Interstate Elctrns. Equip. 617-868-7440
Mass Fitchburg, Gettens Elec. Supply Co. 617-343-3711
Mich Flint, Roth Elec. Supply Co..... 313-234-8661
Mich Grand Rapids, Stotts Friedman Eltrns. Co. 616-459-0216
Mich Kentwood, R-M Elctrns. 616-531-9300
Minn Minneapolis, Control Design, Inc. 612-721-1629
Mo Kansas City, Kornfeld Thorp Elec. 816-221-4000
Mo St. Louis, Van Sickle Radio Elctrns. 314-621-5000
Mo St. Louis, Control Design 314-426-3150
NH Hudson, C & H Electronics 603-882-1133
NJ Belleville, Beltronics Corp. 201-751-2250
NJ Edison, William Elctrns. Supply .. 201-985-3700
NJ Totowa, Diplomat/I.P.C. 201-785-1830
NJ Union City, Nidisco, Inc. 201-863-2111
NY Brooklyn, Brooklyn Elctrns. 212-748-1300
NY Hempstead, Electronic Equip. Co. 516-895-
NY Hempstead, Davis Elctrns. 516-483-
NY Hicksville, Motors & Armatures.. 516-935-
NY Jamestown, B&E Elec. 716-483-
NY Lynbrook, Peerless Radio Corp. 516-593-
NY Schenectady, Adirondack Elctrns. 518-346-
NC Durham, Vickers Elctrns. Supply Co. 919-688-
NC Raleigh, Southeastern Elctrns. .. 919-828-
Ohio Cincinnati, Schuster Elec. Co. 513-984-
Ohio Columbus, McJunkin Corp. 614-294-
Ohio Toledo, Warren Radio Co. 419-248-
Ohio Wickliffe, Gateway Megatech 216-944-
Okla Ardmore, Ardmore Elec. Supply 405-223-
Ore Eugene, No Coast Electric Co.... 503-343-
Ore Eugene, Portland Electric & Plumbing 503-342-
Ore Portland, Portland Electric & Plumbing Co. 503-243-
Pa Erie, Mace Electronics 814-838-
Pa McKeesport, Barno Radio Co..... 412-751-
Pa Philadelphia, Jan Industrial Elctrns 215-921-
Pa Philadelphia, Lindley Elec. Supply 215-329-
SC Columbia, Dixie Radio Supply 803-253-
Tenn Chattanooga, Curle Electronics.. 615-266-
Tenn Memphis, Warren Radio Co. 901-274-
Tex Dallas, Hall-Mark Elctrns..... 214-231-
Tex Dallas, Dallas Instruments 214-341-
Tex El Paso, Midland Specialty..... 915-533-
Tex Houston, Buffalo Elec. Co. 713-228-
Tex Houston, Kent Elctrns. 713-783-
Tex Lubbock, R & R Elec. Co. 806-765-
Tex Midland, ESI Supply Co..... 915-694-
Tex Odessa, Midland Specialty Co... 915-337-
Tex San Antonio, Blackburn Drives Controls 512-349-
Utah Salt Lake City, Kimball Elctrns... 801-328-
Va Staunton, Southern Electric Corp. 703-886-
Wash Seattle, Almac Stroum Elctrns.. 206-763-
Wisc Mequon, Taylor Electric Co. 414-241-
For: Can., Ont., Islington, Power Service Prods. 416-239-

DELTRON, INC., Dept. EM, Wissahickon Ave Wales, Pa. 19454, Tel: 215-699-9261, 510-661-8061; Empl.: 75

Sales Manager: Murray Kraus

Local Sales Offices & Reps.
Cal Costa Mesa, Measurement Assocs 714-540-
Cal Mountain View, Caltron Comp.... 415-964-
Colo Arvada, Sage Sls. 303-841-
Fla Clearwater, Chaco Sls 813-536-
Ill Elk Grove Village, Micro Sls 312-956-
Ind Indianapolis, Maketing Engrs..... 317-546-
Kans Shawnee Mission, K & M Sls. Co. 913-262-
Md Silver Spring, Spectro Sys..... 301-949-
Mich Detroit, R. P. Urban & Assocs. .. 313-535-
Mich Grand Rapids, R. P. Urban & Assocs. 616-245-
Minn Minneapolis, Bill Deming & Assocs. 612-888-
Mo St. Louis, K & M Sales Co. 314-423-
NH Nashua, Bell Controls 603-882-
NY Pittsford, T-Squared Eletrns. Co. 716-381-
NY Syracuse, T-Squared Elctrns. Co. 315-463-
NY Tuckahoe, Spectrum Sls. 914-793-
NC Fayetteville, Zim-Tek Sls 919-485-
Ohio Centerville, Micro Sales Corp.... 513-885-
Ohio Cleveland, Micro Sls. Corp. 216-331-
Pa Newtown Square, Holdsworth & Co. 215-EL6-
Tex Austin, Microsystems Mktg. 512-472-
Tex Dallas, Microsystems Mktg. 214-238-
Tex Houston, Microsystems Mktg. 713-783-
Utah Salt Lake City, Sage Sls 801-290-
Wash Seattle, Walt Spaulding Co..... 206-282-

DELTRONIC CRYSTAL INDS., INC., Dept. EM, 323, Denville, N.J. 07834, Tel: 201-361-2222; Emp

DENNISON MFG. CO., Fastener Division, Dept. Framingham, Mass. 01701, Tel: 617-879-0511, Te 948-478; FSC No.: 5975; Empl.: 6000

Sales Manager: C.W. Nelson; *Distributor Manager:* Wright

Local Sales Offices & Reps.
Cal Burlingame, Dennison Mf. Co., Fastener Di 415-347-

Cal Irvine, Dennison Mfg., Fastener Div. 714-955-2311
Colo Denver, Thorson Co. 303-939-5450
Ga Atlanta, Dennison Mfg. Co, Fastener Div. 404-355-7665
Ill Des Plaines, Dennison Mfg. Co., Fastener Div. 312-298-8870
Mass Waltham, Dennison Mfg. Co, Fastner Div. 617-890-0035
Mich Southfield, Dennison Mfg. Co, Fastener Div. 313-354-7440
NJ Bogota, Neville & Vespo Corp. 201-487-1505
NY Buffalo, R.W. Mitscher Co. 716-633-7970
NC Gastonia, Dennison Mfg. Co., Fastener Div. 704-867-8315
Pa Wayne, Dennison Mfg. Co. Fastener Div. 215-687-9110
Tex Dallas, Dennison Mfg. Co., Fastener Div. 214-826-3150
Wash Seattle, Earl & Brown Co. 206-284-1121

DERINGER MFG. CO., Dept. EM, 1250 Town Line Rd., Mundelein, Ill. 60060, Tel: 312-566-4100, TWX: 910-685-4321; Empl.: 220

DES TEK IND., Dept. EM, Box 24163, Los Angeles, Cal. 90024, Tel: 213-474-5093; Empl.: 3

DESCO MFG. CO., Dept. EM, 1530 Flower St., Glendale, Cal. 91201, Tel: 213-241-9560; Empl.: 6

DESIGN AUTOMATION, Dept. EM, 809 Massachusetts Ave., Lexington, Mass. 02173, Tel: 617-862-8998; Empl.: 5

DESPATCH OVEN CO., Dept. EM, P.O. Box 1320, Minneapolis, Minn. 55440, Tel: 612-331-1873, Telex: 29-0704; Empl.: 350

Local Sales Offices & Reps.
Ala Birmingham, Dilcher Engrg. 205-252-3300
Ark Little Rock, Jordan/Marlar/Hale, Inc. 501-378-0421
Cal Los Angeles, Lyle Smith Co. 213-747-9228
Cal South San Francisco, Matheson-Doherty Co. 415-583-6161
Colo Denver, T.C. Jarrett Co. 303-233-2333
Conn Hamden, Etter Engrg. Co. 203-288-3575
Fla St. Petersburg, Dilcher 813-343-1041
Ga Atlanta, Dilcher Engrg. Co. 404-873-1338
Ill Berkley, Hoge & Assocs. 312-544-9890
Ind Indianapolis, W.R. Frew Co. 317-253-3271
Ky Louisville, W.R. Frew Co. 502-451-4616
Mass Waltham, Etter Engrg. Co. 617-893-8658
Mich Grosse Pointe, Hartmann-Schaffer Engrg. Co. 313-886-1345
Mich Southfield, Schaffer Engrg. Co. 313-354-5337
Minn Minneapolis, Design-Tec, Inc. 612-835-5811
Mo Kansas City, Boschert & Northcott Inc 816-561-4050
Mo St. Louis, Beaco Equip. Co. 314-965-8600
NJ Belford, Hasco Sls. 201-787-5504
NY Grand Island, Nickles Assocs. 716-773-5399
NY Rochester, Nickles Assocs. 716-586-4988
NC Charlotte, Sloan Assocs. 704-523-2122
Ohio Cleveland, Wagner-Green Co. 216-464-8350
Ohio Dayton, Pier, Inc. 513-228-5815
Okla Tulsa, R. J. Ely Co. 918-743-9828
Pa Audubon, Day Engrg. Co. 215-666-7700
Pa Pittsburgh, L. R. Nourie, Inc. 412-561-1628
Tenn Memphis, Jordan/Marlar/Hale, Inc. 901-452-7441
Tenn Nashville, Jordan/Marlar/Hale, Inc. 615-361-3006
Tex Houston, Selle Alloys & Equip. Co. 713-524-3013
Va Richmond, Sloan Assocs. 804-359-6051
Wash Seattle, Hartley Corp. 206-772-2000
Wisc Butler, W. E. Swanson & Assocs. 414-781-3970

DEST DATA CORP., Dept. EM, 1285 Forgewood Ave., Sunnyvale, Cal. 94085, Tel: 408-734-1234; Empl.: 33

Sales Manager: T.R. Goldsmith

DETORONICS CORP., Dept. EM, 10660 E. Rush St., P.O. Box 3805, S. El Monte, Cal. 91733, Tel: 213-579-7130, TWX: 587-3436, 910-587-3436; FSC No.: 29867; Empl.: 45

DEUTSCH FASTENER CORP., Dept. EM, 7001 W. Imperial Hwy., Los Angeles, Cal. 90045, Tel: 213-649-1400, TWX: 213-673-1000; Empl.: 300

DEVCO ENGRG., Control Sys. Div., Dept. EM, Pier La., W. Caldwell, N.J. 07006, Tel: 201-CA8-0321, Telex: 139-340; Empl.: 36

Develco Inc., Dept. EM, 404 Tasman Dr., Sunnyvale, Cal. 94086, Tel: 408-734-5700, TWX: 910-339-9295; Empl.: 28

Sales Manager: J. L. Marsh

Local Sales Offices & Reps.
Va Reston, Sphere Assocs 703-471-7887

DEXTER RESEARCH CTR, INC., Dept. EM, 7300 Huron River Dr, Dexter, Mich 48130, Tel: 313-426-3921

Sales Manager: D. M. Szeles

Local Sales Offices & Reps.
Cal Los Angeles, C.H. Scientific 213-476-7341
Minn Minneapolis, C.T. Sales 612-374-1241
Va Falls Church, Beacon Elctrns 703-534-7200

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DF GOLDSMITH CHEM & METAL CORP., Dept. EM, 909 Pitner Ave, Evanston, Ill. 60602

DI-ACRO, Div. Houdaille Inds., Inc., Dept. EM, 316 8th Ave., Lake City, Minn. 55041, Tel: 612-345-4571, Telex: 290-397; Empl.: 400

Sales Manager: E. Roessle

DIALIGHT, Dept. EM, 203 Harrison Pl., Brooklyn, N.Y. 11237, Tel: 212-497-7600, TWX: 710-584-5487; Empl.: 400 p. 2474,2475

Sales Manager: P. Malecka

Local Sales Offices & Reps.
Ala Huntsville, Cartwright & Bean Inc. 205-533-3509
Ariz Phoenix, Stitzer-Dodd Inc. 602-944-2237
Cal Oakland, Moulthrop Sls. 415-846-0550
Cal Pico Rivera, Westrep 213-949-2551
Cal San Diego, Westrep 714-276-0751
Colo Englewood, R.G. Bowen Co. 303-789-1884
Fla Ft. Lauderdale, Cartwright & Bean, Inc. 305-791-3989
Fla Orlando, Cartwright & Bean, Inc. 305-422-4531
Ga Atlanta, Cartwright & Bean, Inc. 404-255-5262
Ill Chicago, D. Dolin Sales 312-286-6200
Ind Indianapolis, Southern Sls. Corp. 317-257-7575
Kans Shawnee Mission, K & M Sls. Co. 913-262-1444
La Metairie, Cartwright & Bean, Inc. 504-362-4649
Md Lanham, L.D. Lowery, Inc. 301-459-1556
Mass Needham, Mullin Tech. Sls. 617-444-4780
Mich Ferndale, Hilltronics Inc. 313-398-5556
Minn St. Paul, R.G. Ragon, Inc. 612-488-0201
Mo St. Louis, K & M Sls. Co. 314-423-2420
NY No. Syracuse, Precision Sls. 315-458-2223
NC Charlotte, Cartwright & Bean, Inc. 704-337-6457
NC Raleigh, Cartwright & Bean, Inc. 919-781-6560
Ohio Cleveland, K.W. Elctrn. Sls. 216-831-8292
Ohio Dayton, K.W. Elctrn. Sls. 513-890-2150
Ohio Worthington, KW Elctrn Sls 614-888-0483
Ore Portland, Electronic Sources, Inc. 503-292-0701
Pa Allison Park, K.W. Elctrn. Sls. 412-487-4300
Pa Broomall, L.D. Lowery, Inc. 215-528-5170
Tenn Memphis, Cartwright & Bean, Inc. 901-276-4442
Tex Dallas, Tesco 214-328-5484
Utah Salt Lake City, R.G. Bowen Co. 801-363-8801
Wash Bellevue, Almac/Stroum Elctrns. 206-453-0800
Wisc Milwaukee, D. Dolin Sls 414-482-1111
Exp: Brooklyn, N.Y., Dialight 212-497-7600

Local Distributors
Ariz Phoenix, Moltronics of Ariz 602-272-7951
Cal Chatsworth, Westates Elctrns. 213-341-4411
Cal Inglewood, Newark Elctrns. 213-678-0441
Cal Los Angeles, Western Electromotive/Shephard Inc. 213-820-3777
Cal Sacramento, Sacramento Elctrns. 916-441-4821
Cal Santa Clara, Fisher/Brownell 408-244-6182
Cal Sunnyvale, Bell Industries 408-734-8570
Cal Sun Valley, Richey Elctrns., Inc. 213-875-2862
Colo Denver, Newark-Denver Elctrns. 303-757-3351
Colo Denver, Meter Master Instr. 303-722-5766
Conn Waterbury, Surburban Supply 203-757-1251
Fla Ft. Lauderdale, Peerless Radio Corp. of Fla. 305-566-5966
Fla Orlando, Hammond Elctrns. 305-849-6060
Ga Atlanta, Specialty Dist. 404-873-2521
Ga Norcross, Lykes Elctrns. Corp. 404-449-9400
Ill Chicago, Newark Elctrns. 312-638-4411
Ill Peoria, Klaus Radio & Elect. 309-691-4840
Ind Ft. Wayne, Fort Wayne Elctrn. Supply 219-423-3422
Ind Indianapolis, Graham Elctrn. Supply 317-634-8202
Ind South Bend, Radio Dist. 219-287-2911
Ky Louisville, P.I. Burks Co. 502-589-3960
La Lafayette, Ralph's of Lafayette 318-234-4507
La New Orleans, Southern Radio Supply Co. 504-524-2343
Md Baltimore, Resco/Baltimore 301-823-0070
Md Gaithersburg, Cramer/EW Wash. 301-948-0110
Md Gaithersburg, Pioneer Washington Elect. 301-948-0710
Md Rockville, Capitol Radio Wholesalers 301-881-2270
Mass Dedham, Gerber Elctrns. 617-329-2400
Mass Hingham, Sager Electrical Supply 617-749-6700
Mass Newton, Cramer Elctrns. 617-969-7700
Mass Springfield, T.F. Cushing, Inc. 413-788-7341
Mass Wilbraham, Ind'l. Components 413-596-3854
Mich Ann Arbor, Wedemeyer Elctrn. Supply 313-665-8611
Mich Livonia, RS Elctrns. 313-525-1155
Mich Oak Park, Newark Elctrn. Supply 313-548-0250
Mich Wyoming, Newark Elctrn. 616-241-6681
Minn St. Paul, Gopher Elctrns. 612-645-0241
Mo Kansas City, LCOMP-Kansas City 816-221-2400
Mo Kansas City, Walters Radio Supply 816-531-7015
Mo Maryland Hgts., LCOMP-St. Louis 314-291-6200
Neb Lincoln, Scott Elctrn. Supply 402-466-8221
NJ Hanover, State Elctrns. 201-887-2550
NJ Kenilworth, Newark Elctrns. 201-272-8410
NJ Oakland, Gordon/Horne Inc. 201-337-5200
NJ Pennsauken, Resco Elctrns. 609-662-4000
NJ Springfield, Federated Elctrns. 201-376-8900
NY Binghamton, ASI Elect. Inc. 800-252-8711
NY Buffalo, Summit Distributors 716-884-3450
NY Elmsford, Ancar Electronics Supply 914-592-7100
NY Farmingdale, Arrow Elctrns. 516-694-6800
NY Farmingdale, Harrison Radio 516-293-7990
NY Long Island City, Dalis Industrial Elect. 212-361-1100
NY Lynbrook, Peerless Radio 516-593-2121
NY Rochester, Summit Elctrns. of Rochester 716-334-8110
NY Rome, Rome Elctrns. 315-337-5400
NY Woodbury, Harvey Radio 516-921-8700
NC Greensboro, Hammond Elctrns. of Carolina 919-275-6391
NC Raleigh, Southeastern Radio Supply 919-828-2311
NC Winston-Salem, Cramer/EW 919-725-8711
Ohio Akron, Sun Radio 216-434-2171
Ohio Akron, Akron Elctrn. Supply 216-762-8816
Ohio Cincinnati, Hughes-Peters 513-351-2000
Ohio Cincinnati, Newark Elctrns 513-874-5115
Ohio Cincinnati, United Radio 513-761-4030
Ohio Cleveland, Pioneer-Cleveland 216-587-3600
Ohio Columbus, Hughes-Peters 614-294-5351
Ohio Dayton, Pioneer/Dayton 513-236-9900
Ohio Dayton, Stotts-Friedman 513-298-5555
Ohio Lima, Lima Radio Parts 419-228-1220
Ohio Solon, Radio & Elctrn. Parts (Repco) 216-248-8906
Okla Tulsa, Radio, Inc. 918-587-9123
Ore Portland, Almac/Stroum Elctrns. 503-292-3534
Pa Erie, Seaway Elec. Supply 814-455-1304
Pa Montgomeryville, Pyttronic Industries 215-643-2850
Pa Philadelphia, Almo Elctrns. 215-698-4000
Pa Philadelphia, Philadelphia Elctrns. 215-568-7400
Pa Pittsburgh, Cam RPC Industrial Elect. 412-782-3770
Pa Reading, Barbey Elctrns 215-376-7451
RI Providence, Wm. Dandreta & Co. 401-861-2800
SC Greenville, Hammond Elctrns. of Carolina 803-233-4121
Tenn Kingsport, Radio Elec. Supply 615-247-8111
Tenn Nashville, Electra Distributing 615-329-3971
Tex Dallas, Texas Instr. Supply 214-238-6821

Tex Dallas, Norvell Elctrns 214-233-0020
Tex Garland, Newark Elctrns. 214-271-2511
Tex Houston, Newark-Houston Elctrns. Corp. 713-782-4800
Tex Houston, Lenert Co. 713-225-1465
Tex Houston, Harrison Equip. Co. 713-652-4700
Utah Salt Lake City, Standard Supply Co. 801-486-3371
Va Norfolk, Priest Elctrns. 804-855-0141
Va Richmond, Sterling Electronics .. 804-226-2190
Wash Seattle, Almac/Stroum Elctrns... 206-763-2300
Wisc Milwaukee, Parts Mart 414-276-1212
Wisc Milwaukee, Elctrn. Expaditors 414-228-8100
For: Can., Don Mills, Ont., Saynor Elctrns. Ltd. 416-445-2340
For: Can., Downsview, Ont., Cesco Elctrns. Ltd. 416-661-0220
For: Can., Downsview, Ont., Zentronics, Ltd. 416-635-2822
For. Can., Montreal, Que., Cesco Elctrns., Ltd. 514-735-5511
For: Can., Montreal, Que., Payette Radio Ltd. 514-878-4771
Cal Costa Mesa, Westates 714-549-8401
Cal Gardena, Bell Industries 213-321-5802
Cal Los Angeles, Fisher/Brownell 213-532-2170
Conn Milford, Stepco Elctrn 203-877-4501
Ill Northbrook, Classic Components Supply 312-272-9650
Tex Austin, Norvell Austin 512-458-8106
For: Can, Calgary, Alb., L.A. Varah (Alb) Ltd. 403-276-8818
For: Can., Ottawa, Ont., Wackid Radio TV Labs, Ltd..... 613-728-1821
For: Can., Vancouver, B.C., L.A. Varah Ltd. 604-873-3211
For: Can., Willowdale, Ont., Electro Sonic Supply Co., Ltd. 416-494-1666
For: Can., Winnipeg, Man., Cam Gard Supply, Ltd. 204-786-8481

DIAMOND SHAMROCK CORP, Dept. EM, 1100 Superior Ave, Cleveland, Ohio 44114, Tel: 216-694-5222

DIAMONITE PRODUCTS DIV., Dept. EM, Box 567, Shreve, Ohio 44676, Tel: 216-567-2145, Telex: 98-6342; Empl.: 250
Sales Manager: G. E. Carlisle

DIA-NETICS INC., Dept. EM, 18823 Napa St., Northridge, Cal. 91324, Tel: 213-886-2616; Empl.: 35

DICKSON ELECTRONICS, See Siemens Corp, Comps Div.

DIELECTRIC COMMS, Unit of Gen Signal, Dept. EM, Raymond, Maine 04071, Tel: 207-655-4555, TWX: 710-229-6890; FSC No.: 08441; Empl.: 165
Sales Manager: S.O. Thomas

DIELECTRIC INSTR. CORP., Dept. EM, 761 Franklin Ave., Pittsburgh, Pa. 15221, Tel: 412-731-6566; Empl.: 7
Local Sales Offices & Reps.
Ark Pine Bluff,, Utilities Svs..... 501-879-0051
Ga Atlanta, James M. Young III, Rep 404-255-5445

DIELECTRIC LABORATORIES, INC., Dept. EM, 64 Clinton Rd, Fairfield, NJ 07006, Tel: 201-575-8922, TWX: 710-541-1530; Empl.: 15
Sales Manager: J. M. Danich
Local Sales Offices & Reps.
Ala Huntsville, A. B. Andrews..... 205-539-6817
Ariz Phoenix, Bob Anderson Co 602-266-2070
Cal Portola Valley, Kipp Assocs. 415-851-0123
Cal Santa Fe Springs, Comp Svcs .. 213-921-8445
Colo Arvada, Sage Sls..... 303-841-2487
Conn North Haven, Kitchen & Kutchin 203-239-0212
Fla Deerfield Beach, S.T.C., Inc. 305-428-0818
Ill Rosemont, S.T.C., Inc. 312-671-4208
Minn Eden Prairie, Technical Assoc. .. 612-944-3034
NJ West Orange, E-F Technical Sls. 201-731-7203
NY Cazenovia, S-T Woolard Co 315-655-8141
NY Huntington Station, E-F Technical Sls. 516-549-1818
NC Research Triangle Park, A. B. Andrews 919-549-0563
Ohio Dayton, Elcomp Mktg 513-434-8021
Tex Dallas, Stevens Sls. Co..... 214-350-2476
Tex Lexington, Kitchen & Kutchin 617-862-8230
Utah Salt Lake City, Sage Sls 801-531-0531
Wash Kirkland, Manon Engrg 206-827-7449

DIETZ DESIGN, INC., Dept. EM, 100 Electronics Pkwy., Belton, Mo. 64012, Tel: 816-331-4911; Empl.: 9
Local Sales Offices & Reps.
Cal Palo Alto, Ellis Entprs 415-494-1441
Ind Fort Wayne, Berberich Assocs... 219-424-0600
Kans Shawnee, Zinsmaster & Assocs 913-362-5512
Ohio Cleveland, Berberich Assocs..... 216-289-5094
Ohio Dayton, Berberich Assocs 513-433-0342

DIETZ, HENRY G. CO., INC., Dept. EM, 14-26 28th Ave., Long Island City, N.Y. 11102, Tel: 212-RA 6-3347; Empl.: 20

DIETZGEN CORP., Dept. EM, 250 Wille Rd., Des Plaines, Ill 60018, Tel: 312-635-5200; Empl.: 200
Local Sales Offices & Reps.
Cal Los Angeles 213-772-8481
Cal San Francisco 408-984-2460
Conn East Brunswick..... 201-257-9400
Ga Atlanta..... 404-934-5240
La New Orleans 504-831-9400
Md Silver Springs..... 301-587-2820
Mo Kansas City 816-471-3340
NJ East Brunswick..... 201-257-9400
Ohio Cincinnati..... 513-761-2724
Ohio Cleveland 216-631-2660
Ohio Columbus..... 614-497-2030
Pa Philadelphia 215-688-6400
Pa Pittsburgh..... 412-563-6880
Tex Arlington 214-647-1711
Wash Seattle..... 206-244-5440

DIGIAC CORP., Dept. EM, 175 Engineers Rd., Smithtown, N.Y. 11787, Tel: 516-273-8600; Empl.: 40
Sales Manager: J. Middleton; *Distributor Manager:* C. Pastore
Local Sales Offices & Reps.
Ala Birmingham, Technical Training Aids 205-822-1326
Ariz Scottsdale, Peterson Assocs. 602-945-6605
Cal Fremont, G.L. Oliver Co. 415-794-6720
Colo Wheatridge, Intermountain Education Sys. 303-422-7869
Fla Winter Pk., Tech. Training Aids .. 305-647-5373
Ga Calhoun, Learning Labs. Inc. 404-629-4624
Ill Downers Grove, Aidex Corp..... 312-963-4270
Iowa Marion, Gib Klein Co. 319-393-4048
Kans Marion, G. Klein Co. 319-393-4048
Mich Plymouth, J. Close 313-453-7531
Minn Eden Prairie, Lab Corp. 612-944-1807
NH Windham, Helmar Assocs. 603-893-4586
NY East Norwich, Tequipment 516-922-6590
NY Smithtown, Digiac Corp. 516-273-8600
NC Sanford, A.B. Williams Jr. Assoc. 919-775-4164
Ohio Toledo, Freeman Supply Co..... 419-691-4624
Pa Philadelphia, Delta Equip. Co. 215-236-6350
SD Watertown, J.L.H. Assocs. 605-886-4667
Tex Dallas, Tol-Mark Co. 214-341-6917
Va Richmond, A.B. Williams, Jr. Assoc. 804-276-9291
Wash Seattle, Wear Corp. 206-763-2270
Wisc Milwaukee, Lab Corp. 414-771-2946

DIGI-DATA CORP., Dept. EM, 8580 Dorsey Rd., Jessup, Md. 20794, Tel: 301-498-0200, TWX: 710-867-9254; Empl.: 80
Sales Manager: E. Channell
Local Sales Offices & Reps.
Ala Huntsville, Gentry Assocs 205-534-9771
Cal Cupertino, Eakins Assocs..... 408-255-6494
Cal El Segundo, Diga-Data Corp 213-640-2026
Conn New Haven, Computer Mktg 203-789-1013
Fla Orlando, Gentry Assocs..... 305-894-4401
Ga Atlanta, Gentry Assocs..... 404-455-1206
Md Jessup, Diga-Data Corp 301-498-0200
Mass Waltham, Computer Mktg 617-894-7000
Mich Plymouth, Diga-Data Corp 313-459-5580
NY Elmont, Crane & Egert Corp 516-488-2100
NY Rochester, R G Engrg 716-385-3021
NC Burlington, Gentry Assocs 919-227-3639
Okla Oklahoma City, Data Mktg Assocs 405-528-6071
Tex Dallas, Data Mktg Assocs 214-661-0300
Tex Houston, Data Mktg Assocs 713-780-2511
Wisc Osceloa, Applied Technology Sls, Assoc. 715-294-3579
Wisc Waukesha, Michels Digital Sys .. 414-544-9346

DIGITAL BROADCAST SYSTEMS, See Cybersystems, Inc Digital Broadcast Sys. Div.

DIGITAL COMMUNICATIONS ASSOC., INC., Dept. EM, 135 Technology Park/Atlanta, Norcross, Ga 30071, Tel: 404-448-1400; Empl.: 28
Sales Manager: J. M. Snuggs

DIGITAL DATA SYSTEMS, Dept. EM, 6501 N.W. 14th St., Plantation, Fla. 33313, Tel: 305-792-3290
Sales Manager: A. Gomez
Local Sales Offices & Reps.
Cal Los Altos Hills, Bergis Assocs.... 415-941-4133
Cal Pasadena, Advanced Techniques 213-796-6187
Fla Plantation, J. Fitzmaurice & Co. 305-583-1010
Mass Lynnfield, Newmar Assocs..... 617-245-7960
Ohio Dayton, Ashby Assocs 513-252-5627
Pa Valley Forge, J.E. Cuesta & Co 215-242-0150

DIGITAL ENGRG CO., Dept. EM, 12427 E. Penn St., Whittier, Cal 90605, Tel: 213-698-3242
Sales Manager: J. P. Elliott

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DIGITAL EQUIPMENT CORP., Direct Sales Catalog, Dept. EM, 5 Cotton Rd, Nashua, N.H. 03060, Tel: 800-258-1710, TWX: 710-228-0538 ..... p. 1469

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Catalog Sales Desk
Hot Line Phone Number
800-258-1710
(N.H. residents 603-884-6660

Desk Open 8:30AM to 5PM EST

DIGITAL GEN'L. CORP., Univ. Cir. Resch. Ctr., Dept. EM, 11000 Cedar Ave., Cleveland, Ohio 44106, Tel: 216-721-0440; Empl.: 12
Sales Manager: S. F. Daniels
Local Sales Offices & Reps.
Minn Minneapolis, Engrg Prods Assocs 612-925-1883
Ohio Cleveland, WRR Assocs 216-526-2023

DIGITAL SCIENTIFIC, Dept. EM, 11425 Sorrento Valley Rd, San Diego, Cal. 92121, Tel: 714-453-6050, TWX: 910-322-1136; Empl.: 127
Local Sales Offices & Reps.
Cal Los Angeles 213-640-1360
Cal San Diego..... 714-453-6050
Conn Simsbury..... 203-651-3537
Ill Chicago..... 312-449-5155
Mich Detroit 314-744-4280
Tex Dallas 214-233-9323
Tex Houston..... 713-468-8324

DIGITECH DATA INDS., Dept. EM, 66 Grove St., Box 547, Ridgefield, Conn. 06877, Tel: 203-438-3731, Telex: 969-623; Empl.: 80
Sales Manager: K. Damanda
Local Sales Offices & Reps.
Cal Newport Beach, Helfrich Co..... 714-631-2300
Cal Union City, Helfrich Co. 415-487-0455
Fla Satellite Beach, General Techn.. 305-777-1133
Mass Danvers, John R. Melanson Co. 617-774-1220
Tex Dallas, Computer Assoc..... 214-634-1320

DIGITRAN CO., Dept. EM, 855 So. Arroyo Pkwy., Pasadena, Cal. 91105, Tel: 213-449-3110, TWX: 910-588-3794; Empl.: 350 ..... p. 4044-4049
Local Sales Offices & Reps.
Ala Huntsville, Beacon Elctrns. Assoc. 205-881-5031
Ariz Phoenix, Howe & Howe Sls., Inc. 602-264-7971
Ark Little Rock, Beacon Elctrn. Assoc. 501-224-5449
Cal El Segundo, Celtec Co. 213-644-9712
Cal Irvine, Celtec Co 714-557-5021
Cal San Diego, Celtec Co. Inc..... 714-279-7961
Colo Englewood, Todd Assoc. 303-761-7801
Conn North Haven, Kitchen & Kutchin Inc 203-239-0212
Fla Fort Lauderdale, Beacon Elctrns. Assoc. 305-971-7320
Fla Fort Walton Beach, Beacon Electric Assoc. 904-244-1550
Fla Maitland, Beacon Elctrns. Assoc. 305-647-3498
Ga Atlanta, Beacon Elctrns. Assoc. 404-351-3654
Ill Chicago, Scientific Sls. Corp. 312-775-7594
Ind Ft. Wayne, R.O. Whitesell & Assoc. 219-432-5591

Ind Indianapolis, R.O. Whitesell & Assoc. 317-359-9283
Ind Kokomo, R.O. Whitesell & Assocs. 317-453-3592
Iowa Des Moines, Beams 515-255-1148
Kans Shawnee Mission, Beams..... 913-631-0300
Ky Louisville, R.O. Whitesell & Assoc. 502-897-1569
Md Silver Springs, Marktron, Inc..... 301-460-6100
Md Timonium, Marktron, Inc. 301-252-7111
Mass Lexington, Kitchen & Kutchin Inc 617-862-8230
Mich Grand Rapids, R. O. Whitesell & Assoc. 616-942-5420
Mich South Field, R. O. Whitesell & Assoc. 313-559-5454
Mich St. Joseph, R. O. Whitesell & Assoc. 616-983-7337
Minn Bloomington, Scientific Sls. Corp. 612-881-3300
Mo St. Louis, Beams 314-569-1060
NJ Haddonfield, Sunday-O'Brien..... 609-429-4013
NJ Westwood, Digitran 201-666-2825
NM Albuquerque, Data Handling Co. 505-268-4364
NY Bowmansville, Ossmann Comp Sls 716-681-9700
NY Kingston, Ossman Comp Sls..... 914-338-5505
NY Rochester, Ossmann Comp Sls 716-424-4460
NY Syracuse, Ossmann Comp Sls.. 315-455-6611
NY Vestal, Ossmann Comp Sls..... 607-785-9949
NC Greensboro, Beacon Elctrns. Assoc. 919-275-9997
Ohio Cincinnati, R.O. Whitesell & Assoc. 513-521-2290
Ohio Columbus, R.O. Whitesell & Assoc. 614-888-9396
Ohio Dayton, R. O. Whitesell & Assoc. 513-298-9546
Ohio Middleburg Heights, R.O. Whitesell & Assoc. 216-826-4424
Okla Tulsa, Allied Comps. Inc. 918-665-1494
Ore Beaverton, R & R Elctrns. Assoc. 503-643-5754
Pa Pittsburgh, Robert O. Whitesell & Assoc. 412-344-7277
Tenn Oak Ridge, Beacon Elctrns. Assoc. 615-482-2409
Tex Austin, Allied Comps. Inc..... 512-837-0037
Tex Dallas, Allied Comps., Inc. 214-238-0408
Tex Houston, Allied Comps., Inc. 713-960-1962
Va Charlottesville, Marktron, Inc. 301-460-6100
Wash Seattle, R & R Elctrns. Assocs. 206-762-7664

Local Distributors

Ala Huntsville, Controlled Distrs. 205-883-7501
Ala Huntsville, Powell Electrs./Huntsville 205-539-2731
Cal Los Angeles, El-Com, Inc. 213-223-1351
Cal Mountain View, Time Elctns..... 415-965-8000
Cal San Diego, El-Com Inc..... 714-578-0900
Cal Sunnyvale, Powell Electrns., Inc. 408-739-4321
Conn Hamden, Impact Sls. Inc. 203-281-1331
Fla Margate, Controlled Distrs. 305-971-4950
Fla Miami Springs, Powell Electr./Fla. 305-592-3260
Ill Mt. Prospect, Magnuson Elctrns. 312-956-0700
Ind Indianapolis, Pioneer Standard .. 317-849-7300
Ind Indianapolis, Magnuson Elctrns. Inc. 317-243-8885
Md Beltsville, Powell Electr./Wash.... 301-937-4030
Mass Newton, Impact Sls. Co..... 617-964-7740
Mich Livonia, Pioneer/Michigan..... 313-525-1800
Minn St. Paul, Magnuson Elec., Inc.... 612-227-8495
NJ Clifton, Ossmann Comps..... 201-778-8888
NY Bowmansville, Ossmann Comp. Sls. Corp. 716-681-9700
NY Hauppauge, Time Elctrn Sls 516-273-0100
NY Huntington, Ossman Comps..... 516-673-9300
NY Kingston, Ossmann Comp. Sls. Corp. 914-338-5505
NY Rochester, Ossmann Comp. Sls. 716-424-4460
NY Syracuse, Ossmann Comp. Sls. Corp. 315-455-6611
NY Vestal, Ossmann Comp. Sls. Corp. 607-785-9949
Ohio Cleveland, Pioneer Standard..... 216-587-3600
Ohio Columbus, Electronics Mktg. Corp. 614-299-4161
Ohio Dayton, Pioneer Standard 513-236-9900
Okla Tulsa, Norvell Elctrns..... 918-663-1247
Pa Clifton Heights, Time Elctrns 215-622-2500
Pa Philadelphia, Powell Electr./Philadelphia 215-365-1900
Pa Pittsburgh, Pioneer Standard..... 412-782-2300
Tex Austin, Norvell Elctrns. 512-458-8106
Tex Dallas, Powell Elctrns./Dallas 214-350-4186
Tex Dallas, Norvell Elctrns. 214-233-0020
Tex Houston, Norvell Elctrns. 713-777-1666
Va Falls Church, Controlled Distrib.. 703-533-3500
Wash Seattle, Shannon, Ltd. 206-763-0545
For: Belgium, Erembodegem, Digitran European Office..... 053-66.53-90
For: England, Royston, Herts, Digitran Endevco 0763-61311
For: Japan, Tokyo, Digitran Japan Office 03-449-4741

DILLON, W.C. & CO., Dept. EM, 14620-EP Keswick St., Van Nuys 340, Cal. 91407, Tel: 213-786-8812, Telex: 65-1449; Empl.: 80

Sales Manager: R. Magid

Local Sales Offices & Reps.

Alas Anchorage, Alaska Scale Co.
Ariz Phoenix, Southwest Scale Co.
Ark Boonville, Kirkpatrick Scales 501-675-3302
Cal Escondido, OAL Associates..... 714-743-7143
Cal Redwood City, Scale-Co United 415-365-5985
Cal San Francisco, California Instr. Co. 415-647-5959
Colo Denver, J. H. Dorough Co..... 303-892-0047
Fla Ft. Lauderdale, R. Jacobs 305-462-1932
Ga Decatur, Fredrick Process Equip. 404-299-1245
Haw Honolulu, Automation Hawaii..... 808-848-1091
Idaho Boise, Adco Equip. Co..... 208-344-8451
Ill Alsip, Central Scale & Supply.... 312-371-4330
Ill Chicago, Service Associated..... 312-568-4545
Iowa Des Moines, Anderson Scale Co. 515-255-0077
Ky Louisville, H & H Scale Co. 502-634-0958
La Metairie, G. T. Michelli Co..... 504-885-9710
Md Baltimore, Jobe & Co. 301-235-3503
Mass Hathorne, Danvers, Osgood Engrg. 617-933-4744
Mich Detroit, Basic Serv. Corp..... 313-837-8820
Minn Minneapolis, W. K. Nelson Co. .. 612-374-1970
Mo Kansas City, Acme Scale & Svc. 816-842-2731
Mont Great Falls, Carl Weissman & Sons 406-453-0301
Neb Omaha, Fuchs Machinery & Supply 402-341-7050
Nev Reno, Wedco, Inc. 702-329-1131
NJ Irvington, Fox Scale Co. 201-371-1202
NY Amityville, Testing Machines 516-842-5400
NY Amityville, Long Island, Testing Machines Inc. 516-598-1400
NC Asheville, Braswell Scale & Equip. 704-274-3771
ND Grand Forks, Border States Supply 701-772-3477
Ohio Cleveland, Northern Ohio Scale Co. 216-861-3840
Ohio Cleveland, M. A. Blankenburg & Co. 216-251-7010
Okla Tulsa, Lambert-Brown Sls..... 918-584-2491
Ore Portland, Instrument Laboratory Co. 503-234-6683
Pa Newtown Square, C.W. Middlestead Co. 215-528-5092
SC Taylors, Greenville Scale & Fixture 803-244-4723
Tenn Nashville, Holt Scale Svc. 615-292-1616
Tex Dallas, Dillon Equip. Co..... 214-824-2511
Utah Salt Lake City, Mine & Smelter Supply Co. 801-486-7641
Va Richmond, Jobe & Co. 804-282-6508
Wash Renton, O. J. Harper Sls. Co.... 206-255-0414
WVa Charleston, Capitol City Supply Co. 304-342-2161
Wisc Milwaukee, Charles V. Kray Co. 414-352-5194
Wyo Mills, Rocky Mountain Meter & Scale 307-237-3593

DIMCO-GRAY COMPANY, Dept. EM, 8200 S. Suburban Rd., Dayton, Ohio 45459, Tel: 513-433-7600; Empl.: 150

Sales Manager: R. Cramer

Local Sales Offices & Reps.

Cal Downey, Corbett-Smith..... 213-923-9872
Conn Westport, Fastech 203-227-6585
Ga Atlanta, Electro-Mech Sls. Engr. Co. 404-449-6337
Ill Des Plaines, L. Hodges & Assocs. 312-297-3810
Mich Birmingham, Barribeau-Simmons Co. 313-646-7800
Minn Minneapolis, Crum Co. 612-824-5394
Mo Kansas City, Automatic General Elctrn. Sls. 816-333-8206
NJ Cranbury, Feralite Metals Corp. 609-655-2930
NY Penfield, C. L. Kerr & Assocs..... 716-586-2920
NC Raleigh, Electro-Mech Sls. Engr. Co. 919-782-7586
Ohio Cleveland, C.L. Kerr & Assocs... 216-261-1840
Pa Feasterville, Par Assocs..... 215-322-0260
Wash Seattle, National Co..... 206-623-7060
Wisc Waukesha, Lincoln Hodges & Assocs. 414-542-3087

DIONICS, Dept. EM, 65 Rushmore St., Westbury, N.Y. 11590, Tel: 516-997-7474, TWX: 510-222-0974; Empl.: 60

Sales Manager: E.B. Sussman

Local Sales Offices & Reps.

Ala Huntsville, Murcota 205-539-8476
Ariz Scottsdale, Verein Corp 602-948-3571
Cal San Jose, Advantage 408-253-7559
Cal Santa Ana, Rical 714-557-6543
Conn Hamden, Impact Sls 203-281-1331
Fla Ft. Lauderdale, CBC Elctrns 305-484-7330
Ill Des Plaines, Coombs Assoc 313-298-4830
Mass Newtown, Impact Sls 617-964-7740
Mich Farmington Hills, Lowell Wendt Mktg. 313-553-9800
Minn Minneapolis, Elctrn Innovators.... 612-884-7471
Mo Maryland Hts, Kebco 314-576-4111
NC Winston-Salem, Murcota..... 919-722-9445
Ohio Brecksville, WRR Assoc..... 216-526-2023
Tex Richardson, Hytech Inc. 214-234-3375
Wisc Milwaukee, Coombs Assoc 414-671-1945

DIPLOHMATIC DIV., Harry Levinson Co., Dept. EM, 1211 E. Denny Way, Seattle, Wash. 98122, Tel: 206-323-5100, TWX: 910-444-2154; Empl.: 4

Local Sales Offices & Reps.

NY Farmingdale, Service & Technology 516-543-1061

DISPLAY COMPONENTS INC., Dept. EM, 550 Newton Rd, Box 488, Littleton, Mass. 01460, Tel: 617-486-3594; Empl.: 60

Local Sales Offices & Reps.

Cal Encino, King-Way Assocs. 213-788-4124
Cal Los Altos, Cain-White & Co. 415-948-6533
Colo Denver, Fry-Gates Co. 303-756-9886
Fla Pompano Beach, Cole Tek Assocs 305-781-9110
Mass Concord, Nortech Engrg. Sls. 617-259-0032
Minn St. Paul, Knox Assocs. 612-488-5402
NJ Flanders, K & R Engrg. Sls..... 201-584-5235
NM Albuquerque, Fry-Gates Co. 505-298-1875
Pa Glenside, Koebert & Assoc..... 215-887-2310
Utah Salt Lake City, Fry-Gates Co. 801-272-3641

DISPLAY DEVICES, Dept. EM, Box 667, Encinitas, Cal. 92024, Tel: 714-753-0113; FSC No.: 26107 p. 2476,2477

Local Sales Offices & Reps.

Ariz Phoenix, Thorson Co. 602-956-5300
Cal Santa Clara, Nova-Tronix..... 408-243-9530
Cal Torrance, James W. Johnson 213-371-8580
Conn Middletown, Bell Controls..... 203-346-0670
Fla Miami, Ludlum Assocs. Co. 305-592-6523
Fla Orlando, Ludlum Assocs. Co. 305-894-7761
Ill Bellwood, Fiat Engrg. Assocs..... 312-547-6200
Ind Ft. Wayne, Advanced Comp. Sls. 219-432-2546
Ind Indianapolis, Advanced Comp. Sls. 317-545-6441
Md Towson, Kraft Elctrn. Sls., Inc. .. 301-828-5838
Mich Plymouth, Romarc..... 313-455-0300
NH Nashua, Bell Controls..... 603-882-6984
NJ Wayne, G T Assoc:..... 201-694-6040
NC Winston-Salem, Dula Assocs. 919-768-7166
Ohio Chagrin Falls, Crest Comp. Sls. 216-543-9808
Pa Newton Square, Holdsworth & Co., Inc. 215-356-8550
Tex Dallas, Thorson Co..... 214-233-5744
Tex Houston, Thorson Co..... 713-771-3504

DI-TECH INC., Dept. EM, 315 Wyandanch Ave., North Babylon, N.Y. 11704, Tel: 516-643-4040; Empl.: 8

Sales Manager: T. Bolletino

DIT-MCO INT'L. CORP., Dept. EM, 5612 Brighton Terr., Kansas City, Mo. 64130, Tel: 816-444-9700, Telex: 42-6149; Empl.: 170

Sales Manager: E. P. Tobin

Local Sales Offices & Reps.

Cal Corona, G. Coulter 213-772-4386
Cal Los Angeles, A. Holtz..... 213-772-4386
Mass Beverly, J. Coogan 617-734-5400
NY N.Y., J. Fitzsimmons 212-682-5844

DIVERSIFIED ELECTRONICS CO., Dept. EM, 260 Wolfe Rd., Sunnyvale, Cal. 94086, Tel: 408-738-3911; Empl.: 22

DIVERSIFIED ELECTRONICS INC., Dept. EM, 119 N. Morton Ave., Evansville, Ind. 47711, Tel: 812-426-2806; Empl.: 30 ..... p. 3448,3449

Sales Manager: K. Qualls

Local Sales Offices & Reps.

Cal Danville, Automation Tech..... 415-837-8197
Cal L.A., Cutlass Elctrns..... 213-324-7360
Cal San Francisco, Automation Tech. Co. 415-837-8197
Cal Torrance, Cutlass Elctrns. 213-324-7360
Fla Leesburg, Diversified Elctrns. 904-787-7259
Ill Des Plaines, Lincoln Hodges Assoc. 312-297-3810
Ind Ft. Wayne, McDonald Sls. Co. .. 219-747-3650
Md Fulton, S. Jefferies 301-792-7452
Mo Kansas City, Weisler & Assocs. 816-421-1679
Mo St. Louis, Weisler & Assocs. 314-428-3934
Ore Forest Grove, Doran Sls. Assoc. 503-357-3333
Pa Narberth, S. A. Jefferies..... 215-664-8500
Tex Houston, Weisler & Assocs..... 713-467-1847
Wash Redmond, Doran Sls.'..... 206-855-1885
Wisc Hales Corners, Automation Prods. Co. 414-425-2250

Local Distributors

Cal Cathedral City, Consolidated Electl. Distr. 714-328-1131
Cal Fresno, Electric Motor & Supply Co. 209-233-1155
Ind Indianapolis, Ra-Dis-Co..... 317-637-5571
Ky Louisville, E & H Elect. Supply Co. 502-587-0991
Ky Louisville, Peerless Elctrn. Equip. 502-637-7677
Mo St. Louis, Repp the Rep, Inc..... 314-843-0730
NJ Fairlawn, Relay Specialties 201-797-3313
Ore Portland, Portland Elect. & Plumbing Co. 503-243-6800
Tex Waco, Smith Pump Co. 817-776-0377
Va Roanoke, Wesco 703-344-3271
Wash Kennewick, Pepco, Inc..... 509-586-3168
Wash Seattle, Pepco, Inc. 206-623-0982
Exp: New York, N.Y., Fredro Corp. 212-233-6190
For: Can. Toronto, Ont., Nedco Ltd.. 416-363-8651
For: Central America, Hondura, Industrial Y Comercio Panaire 52-1054
For: Puerto Rico, Santurce, Refrigeration Parts & Equip..... 809-723-5990
For: U.S. Virgin Islands, St. Thomas, Universal Supply Corp. 809-774-4671

DIXSON, INC., Dept. EM, Box 1449, Grand Junction, Colo. 81501, Tel: 303-242-8863, TWX: 910-929-6991; Empl.: 505

Local Sales Offices & Reps.

Ariz Phoenix, Kay Entprs..... 602-242-6787
Ark Ft. Smith, Electro-Related Products 501-783-7323
Cal Long Beach, Emerson Kirk Engrg. 213-439-9559
Cal San Carlos, D. H. Ross Co..... 415-591-4411
Colo Littleton, Simpson Assocs., Inc... 303-794-8381
Fla Lighthouse Point, J. Krutek & Assocs. 305-941-6544
Ill Des Plaines, E. Flaxman Co..... 312-298-8580
Md Pikesville, Imagitron Sls. Co. 301-484-1411
Minn Minneapolis, Thomas Mktg. 612-823-4880
NY Mount Vernon, D. Sonkin Assocs. 914-668-9809
NY Syracuse, Nycom, Inc. 315-437-8343
Ohio Wickliffe, Walter J. Brauer Assocs 216-943-0601
Pa Landisville, Imagitron Sls. Co. 717-898-7633
Tex Dallas, United Comps. 214-324-1448
Utah Salt Lake City, Simpson Assocs., Inc. 801-486-3731
Wash Bellevue, SD-R2 206-747-9424

DOLAN-JENNER INDS., INC., Dept. EM, Box 1020, Woburn, Mass. 01801, Tel: 617-935-7444; Empl.: 80

DOLPH, JOHN C. CO., Dept. EM, New Rd., Monmouth Junction, N.J. 08852, Tel: 201-DA 9-2333

Sales Manager: W. H. Deinzer

DORAN MFG. CO., Dept. EM, 1033 Bader St., Cincinnati, Ohio 45225, Tel: 513-681-5424; Empl.: 30

DORIC SCI., DIV. EMERSON ELEC. CO., Dept. EM, 3883 Ruffin Rd., San Diego, Cal. 92123, Tel: 714-565-4415, Telex: 69-5001; Empl.: 50,000 p. 2714-2717

Sales Manager: B. Hoyt

Local Sales Offices & Reps.

Ala Huntsville, Gentry Assocs. 205-534-9771
Cal La Jolla,. Ward/Davis Assocs 714-459-3351
Cal Lawndale, Ward/Davis Assocs .. 213-542-7740
Cal Sunnyvale, Ward/Davis Assocs 408-245-3700
Colo Littleton, Radco Elctrns. 303-794-4279
Conn Hamden, Pat Jenks Assocs..... 203-281-0810
Fla Orlando, Gentry Assocs 305-894-4401
Ga Atlanta, Gentry Assocs..... 404-455-1206
Ill Schaumburg, Carvel Engrg & Sls 312-885-8800
Ind Indianapolis, Tech Sls & Mktg 317-356-3658
Kans Mission, Vertec Assoc. 913-677-3200
Md Rockville, Elctrn Mktg Assoc. 301-744-7700
Mass Wakefield, Pat Jenks Assoc 617-246-1590
Mich Farmington, Anderson Elctrns..... 313-476-9161
Minn Minneapolis, Arjay Sls, Inc. 612-854-4972
Mo St. Louis, Vertec Assoc. 314-394-6242
NJ Cedar Grove, KLS Assocs., Inc. 201-785-4451
NM Albuquerque, Rustco Entprs. 505-296-6474
NY Fairport, Naco Elctrns. Corp. 716-223-4490
NY N. Syracuse, Naco Elctrns. Corp. 315-699-2651
NY Utica, Naco Elctrns. Corp. 315-732-1801
NC Charlotte, Mec-Tric Control 704-376-8551
Ohio Cleveland, Instrumentation Sys., Inc. 216-486-0782
Ohio Dayton, Instrumentation Sys., Inc. 513-294-2838
Okla Tulsa, Sesco..... 918-622-2868
Ore Beaverton, SJI Corp..... 503-224-0344
Pa King of Prussia, Elctrn Mktg Assoc 215-265-1600
Pa Pittsburgh, Instrumentation Sys., Inc. 412-243-1111
Tex Houston, Sesco 713-688-9656
Tex Richardson, Sesco..... 214-231-9364
Tex Spring, Doric-Houston..... 713-351-0053
Wash Seattle, SJI Corp. 206-624-9020
Wisc Glendale, Carvel Engrg & Sls 414-352-6630

Local Distributors

Ala Huntsville, Gentry Assocs 205-534-9771
Ala Huntsville, Leeco, Inc..... 205-533-5896
Ariz Scottsdale, Barnhill Three 602-947-7841
Cal Costa Mesa, Measurement Assocs 714-540-7160
Cal Inglewood, Basic Elctrns Div..... 213-673-4300
Cal La Jolla, Ward Davis Assoc..... 714-459-3351
Cal Lawndale, Ward Davis Assoc 213-542-7740
Cal Mt. View, Manco 415-964-7281
Cal Sunnydale, Ward Davis Assoc. .. 408-245-3700
Cal Sunnydale, Amasco..... 408-733-8690
Colo Denver, Barnhill Two & Barnhill Three Assoc 303-750-1222
Colo Littleton, Radco Elctrns..... 303-794-4279
Conn Hamden, Pat Jenks Assoc..... 203-281-0810
Conn Hamden, Applied Meas, Inc. 203-288-5288
Fla Orlando, Gentry Assoc. 305-894-4401
Fla Winter Haven, Kiplo, Inc. 813-294-5815
Ga Atlanta, Gentry Assoc. 404-455-1206
Ill Elk Grove Village, Loren Green Assoc. 312-593-0282
Ill Schaumburg, Carvel Engrg & Sls 312-885-8800
Ind Indianapolis, Loren Green Assocs 317-293-9827
Ind Indianapolis, Tech Sls & Mktg 317-356-3658
Kans Mission, Vertec Assocs..... 913-677-3200
La Baton Rouge, Sesco 504-924-5102
Md Burtonsville, Eastern Instrumentation 301-384-8500
Md Rockville, Electronic Mktg Assoc. 301-881-5300
Mass Wakefield, Tekdata 617-245-5940
Mass West Acton, Applied Meas..... 617-263-2766
Mich Farmington, Anderson Elctrns 313-476-9161
Mich Northville, Micro Sls Corp. 313-482-1229
Minn Minneapolis, Loren Green of Minnesota 612-781-1611
Minn Minneapolis, Arjay Sls, Inc. 612-854-4972
Mo Kansas City, Paloma Sls Co..... 816-358-7272
NJ Cedar Grove, KLS Assocs..... 201-785-4450
NM Albuquerque, Rustco Elctrns 505-292-2741
NM Albuquerque, Barnhill Three..... 505-299-7658
NY Fairport, Naco Elctrns Corp. 716-223-4490
NY Great Neck, Meas Tech 516-482-3500
NY N. Syracuse, Naco Elctrns Corp. 315-699-2651
NY Utica, Naco Elctrns Corp..... 315-732-1801
NC Charlotte, Mec-Tric Control 704-376-8551
NC Raleigh, Lee Assocs of the Carolinas 919-787-5818
Ohio Centerville, Micro Sls Corp..... 513-433-8171
Ohio Cleveland, Instrumentation Sys .. 216-561-6100
Ohio Cleveland, Micro Sls Corp. 216-331-0900
Ohio Dayton, Instumentation Sys 513-294-2838
Okla Tulsa, Sesco..... 918-622-3868
Pa King of Prussia, Elctrn Mktg Assoc. 215-265-1600
Pa Matboro, Q.E.D. Elctrns Inc. 215-674-9600
Pa Warminster, Multi Meas 215-675-3082
Tex Austin, Barnhill Two..... 512-451-0217
Tex Dallas, Sesco-Dallas..... 214-231-9364
Tex Houston, Barnhill Two..... 713-688-9971
Tex Houston, Sesco-Houston 713-688-9656
Tex Richardson, Barnhill Two 214-231-2573
Utah Salt Lake City, Barnhill Three 801-485-8121
Wash Bellevue, Showalter Distributing 206-455-4922
Wash Seattle, SJI Corp. 206-624-9020
Wisc Glendale, Carvel Engrg & Sls 414-352-6630

DORMEYER INDUSTRIES, Dept. EM, 3418 N. Milwaukee, Chicago, Ill. 60641, Tel: 312-283-4000; Empl.: 650 ..... p. 3244,3245,3450-3457,4340-4342

Sales Manager: J. F. Milota

Local Sales Offices & Reps.

Ala Huntsville, Interep Assocs 205-881-3677
Cal El Segundo, Don Weaver & Assocs 213-322-4742
Cal Santa Clara, Nova-Tronix..... 408-243-9530
Colo Denver, Gordon Moss Elctrns 303-455-7205
Conn Farmington, Ray Perron & Co.... 203-673-4825
Conn Trumbull, Ray Perron & Co 203-268-9631
Fla Altamonte Springs, V.G. Sls 305-831-8688
Fla Pompano Beach, V.G. Sls 305-971-0900
Ga Atlanta, Interep Assocs..... 404-394-7756
Ill Lincolnwood, James Inds 312-679-1070
Ind Fort Wayne, Technical Reps 219-484-1432
Ind Indianapolis, Technical Reps 317-849-6454
Iowa Des Moines, The Beams Co 515-255-1148
Kans Shawnee Mission, The Beams Co 913-631-0300
Ky Louisville, Technical Reps 502-451-9818
Mass Norwood, Ray Perron & Co..... 617-762-8114
Mich Bloomfield, Enco Mktg 313-642-0203
Minn St. Paul, Cahill Assocs 612-646-7217
Mo St. Louis, The Beams Co 314-569-1060
NH Dover, Ray Perron & Co 603-742-2321
NJ Livingston, Varrelman-Gorman Co 201-992-2505
NJ Pitman, Colrud Co..... 609-589-5866
NM Albuquerque, Gordon Moss Elctrns 505-256-3622
NY Albany, H.C. Johnson Agencies 518-456-6667
NY Fayetteville, H.C. Johnson Agencies 315-637-9383
NY Rochester, H.C. Johnson Agencies 716-482-3000
NY Williamsville, H.C. Johnson Agencies 716-632-7880
Ohio Pepper Pike, Kaercher Sales Assocs 216-831-8098
Pa Glenshaw, H.C. Johnson Agencies 412-961-0414
Tex Dallas, Erickson Sls 214-243-6611
Tex Sugarland, Erickson Sls 713-494-9680
Wash Seattle, Walt Spaulding Co 206-283-9173
Exp: Utica, Peter A. Karl 315-733-7559

Local Distributors

Ariz Tempe, Service Specialists 602-966-6990
Cal Los Angeles, Minarik Electric..... 213-485-1291
Cal San Jose, Consolidated Parts 408-263-9521
Cal Santa Monica, Master Distributors 213-395-2637
Fla Ft. Lauderdale, Peerless Radio Corp. 305-566-5966
Ill Chicago, United Value 312-539-0839
Ill Niles, W.W. Grainger..... 312-647-8900
Ind Indianapolis, Graham Elctrns 317-634-8466
Kans Witchita, Radio Supply 316-267-5213
Mass Norwood, Value Added Elctrns .. 617-762-1490
Mass Springfield, T.F. Cushing..... 413-788-7341
Mich Ferndale, P-G Assco Corp..... 313-547-7223
Mich Troy, The Westward Co 313-643-0700
NY Buffalo, Summit Distributors..... 716-884-3450
NY New York, Component Prods 212-242-1610
Wisc Milwaukee, Elctrn Expeditors..... 800-558-8547

DOUGLAS RANDALL, Walter Kidde Div, Dept. EM, Pawcatuck Ave., Pawcatuck, Conn. 02891, Tel: 203-599-1750, Telex: 996427; Empl.: 125 p. 2627,3458-3464

Local Sales Offices & Reps.

Ala Union Grove, Leigh Sls., Inc.
Cal Los Angeles, Sodaro Assocs. 213-478-7733
Cal San Diego, Qualtronix..... 714-560-8955
Cal San Jose, Parsons & Horne 415-327-2625
Colo Broomfield, Sage Sls. 303-841-2481
Fla Maitland, D.J. Ellis & Assoc. 305-645-1100
Ill Chicago, R. Cahill, Inc. 312-631-0075
Mass Norwood, JMG, Inc..... 617-762-5330
Mich Anchorville, I.B.N. Research & Devel. Co. 313-725-9000
Mich Bloomfield Hills, ENCO Mktg. 313-642-0200
Minn St. Paul, Cahill 612-646-7217
Mo Lake Lotawana, Lotronics 816-578-4490
Mo St. Louis, Delitron Co..... 314-869-4770
NJ Morristown, Andrews & Andrews 201-569-8800
NY Huntington, Andrews & Andrews 516-692-8680

NY Rochester, J.G. Welch Assoc. 716-244-1100
NC Knightdale, Leigh Sales 919-266-0105
Ohio Cleveland, Geotronix Mktg. Assoc. 216-526-2535
Ohio Columbus, Geotronix Mktg. Assoc. 614-457-8472
Pa Glenside, Elcom, Inc. 215-885-1715
Tex Dallas, Wm. Reese Assoc. 214-638-6575
Utah Salt Lake City, Sage Sls. 801-290-1234
Wash Seattle, Carlyle Tech. Sls. 216-767-4511

Local Distributors
Cal San Francisco, Steven Engrg 415-583-5868
Mass W. Newton, A.W. Mayer
Mich Madison Hghts., McNaughton & McKay Elec. 313-399-7500

DRANETZ ENGRG. LABS., Dept. EM, 2385 S Clinton Ave., So. Plainfield, N.J. 07080, Tel: 201-755-7080, TWX: 710-997-9553; FSC No.: 23207; Empl.: 160 p. 2709-2713

Sales Manager: A. Ackerman

Local Sales Offices & Reps.
Ala Huntsville, Kemp Instrs. 205-837-4304
Ariz Scottsdale, Barnhill III 602-947-7841
Cal Los Angeles, E. Mintz 213-670-5410
Cal Palo Alto, Coherent Mktg. Assoc. 415-327-2217
Cal San Diego, E. Mintz 213-645-2066
Colo Denver, Barnhill III 303-750-1222
Conn Mount Carmel, Scientific Devices-Conn. 203-248-9361
Fla Orlando, Datarep, Inc. 305-843-5224
Ill Elk Grove Village, L. F. Green & Assocs. 312-593-0282
Ind Indianapolis, L. F. Green & Assocs. 317-293-9827
Mass Waltham, Scientific Devices-New England 617-890-2252
Mich Farmington, Carter McCormic & Peirce Inc. 313-477-7700
Minn Minneapolis, L. F. Green & Assoc. 612-781-1611
NJ Paramus, SDM Rep. 201-368-0123
NM Albuquerque, Barnhill III 505-299-1650
NY Rochester, SDM Rep 716-381-9962
NC Charlotte, Ranson, Wallace & Baesel, Inc. 704-334-4244
Ohio Cleveland, Carter McCormic & Peirce Inc. 216-779-5100
Ohio Dayton, Carter McCormic & Peirce Inc. 513-278-5873
Ore Portland, Topp Eng. Sls. 503-244-7265
Pa King of Prussia, Electronic Mktg. Assoc. 215-265-1600
Pa Monroeville, Carter, McCormic & Peirce 412-372-4415
Tex Austin, Barnhill Two 512-451-0217
Tex Houston, Barnhill II 713-688-9971
Tex Richardson, Barnhill II 214-231-2573
Utah Salt-Lake City, Barnhill III 801-485-8121
Wash Bellevue, Topp Engrg. Sls. 206-747-5400

DRESSEN-BARNES ELECTRONICS, Div. American Elctrns., Dept. EM, 1600 E. Valencia Dr., Fullerton, Cal. 92631, Tel: 714-871-3020, TWX: 910-592-1256; FSC No.: 94412; Empl.: 200

Sales Manager: B. Guy

DRESSER INDUSTRIES, Dept. EM, 1505 Elm St., Dallas, Tex. 75201, Tel: 214-745-8000

DUMONT ELECTRONICS, Dept. EM, 750 Bloomfield Ave., Clifton, N.J. 07015, Tel: 201-773-2000; FSC No.: 18778; Empl.: 250

Local Sales Offices & Reps.
Colo Denver, B. Millspaugh 303-756-9886
NJ Marlboro, Cook & Weil 201-536-3964
NM Albuquerque, Fry-Gates 505-298-1875
Pa Glenside, R. F. Koebert & Assoc. 215-887-2310
Tex Richardson, M. Hemmes, Optics & Elctrns. 214-690-9799

DUMONT OSCILLOSCOPE LABS., Dept. EM, 40 Fairfield Pl., W. Caldwell, N.J. 07006, Tel: 201-575-8666, TWX: 710-734-4308; Empl.: 125

Sales Manager: P. Zagaria

Local Sales Offices & Reps.
Ariz Scottsdale, Williams Assocs 602-947-4297
Cal Tarzana, Domino Ultd 213-881-1090
Colo Denver, Williams Assocs 303-373-4730
Conn New Canaan, Measurement Consits Corp 203-966-4630
Ind Fort Wayne, Domino Ultd 219-747-5621
La New Orleans, Anderson Assocs 504-943-5237
Md Rockville, T.E. Sls 301-340-0303
Mass Waltham, Measurement Consits 617-890-4400
Minn Excelsior, Domino Ultd 612-472-1294
Mo Parkville, Anderson Assocs 816-741-6158
NM Albuquerque, Williams Assocs. 505-255-1638
NC Burlington, P.J. Nahser Co. 919-226-8053
Tenn Hurst, Anderson Assocs 817-268-0811

DUNCAN ELECTRONICS, INC., Dept. EM, 2865 Fairview Rd., Costa Mesa, Cal. 92626, Tel: 714-545-8261, TWX: 910-595-1128; FSC No.: 5905; Empl.: 130 p. 3880-3882

Sales Manager: R.L. Rissler; *Distributor Manager:* R. L. Rissler

Local Sales Offices & Reps.
Ala Meridianville, L. & D., Inc. 205-828-3522
Ariz Phoenix, Southwest e/m Engrg., Inc. 602-993-0250
Cal Costa Mesa, Duncan Elctrns., Inc. 714-545-8261
Cal Irvine, Comar Co. 714-540-1219
Cal Mountain View, Caltron Comps. Corp. 415-964-3244
Colo Denver, Elcom, Inc. 303-770-4400
Conn Madison, A & M Elctrn 203-421-4242
Ill Arlington Heights, Delta Tech. Sls. 312-253-9440
Ind Greenwood, Valentine & Schillinger 317-888-2260
Ind South Bend, Valentine & Schillinger 219-291-6258
Kans Shawnee Mission, Florence & Meyer 913-722-5210
Kans Wichita, Florence & Meyer 316-838-7226
La Lafayette, Kemp Engrg Co., Inc 318-984-3516
Md Silver Spring, Marktron, Inc. 301-460-6100
Md Timonium, Markton, Inc. 301-252-7111
Mass Needham, A & M Elctrn, Inc. 617-444-8170
Mich Grosse Pointe Park, Greiner Assoc. 313-499-0188
Minn Minneapolis, J.J. Exon Co. 612-571-5340
Mo Kirkwood, Florence & Meyer 314-822-2629
NY Copiague, Sencor, Inc. 516-842-7676
NY De Ruyter, R.P. Kennedy Co. 315-682-2299
NY Red Hook, R.P. Kennedy Co. 914-876-2700
NY Rochester, R.P. Kennedy Co. 716-271-6322
NC Greensboro, L. & D., Inc. 919-292-3201
Ohio Columbus, Rockford Controls Ohio 614-231-5890
Ohio Dayton, Rockford Controls Ohio, Inc. 513-898-5452
Ohio Euclid, Rockford Controls Ohio, Inc. 216-731-5250
Okla Tulsa, Kemp Engrg. Co. 918-299-2636
Ore Portland, C. K. Shanks & Assoc. 503-292-5656
Pa Philadelphia, Sencor, Inc. 215-698-9660
Tex Addison, Kemp Engrg. Co. 214-661-0400
Tex Houston, Unidyne, Inc. (SLIDELINE ONLY) 713-772-3170
Tex Houston, Kemp Engrg. Co. 713-688-1431
Utah Salt Lake City, Elcom, Inc. 801-532-7940
Va Charlottesville, Marktron, Inc. 804-973-5874
Wash Seattle, C. K. Shanks & Assoc. 206-632-4290

Local Distributors
Cal Hollywood, Yale Radio Elect. Co. 213-465-3186
Cal San Carlos, Sterling Elctrns. 415-592-2353
Cal Sun Valley, Richey Elctrns. 213-875-2862
Colo Denver, Ind. Elctrns. 303-771-2636
Fla Miami, Lykes Elctrns. 305-633-8535
Fla Tampa, Lykes Elctrns. 813-886-6621
Ill Elk Grove Village, GBL Elctrns 312-593-3220
Ill Westmont, RM Company 312-323-9670
La Shreveport, Indl Elctrn Supply 318-222-9459
Mass Waltham, Sterling Elctrns 617-894-6200
Mich Farmington, Advent Elctrns. 313-477-1650
NJ Wayne, Parts Masters 201-694-5885
NY NYC, Martin Audio 212-541-5900
Ohio Akron, Sun Radio Co. 216-434-2172
Ohio Akron, Akron Elctrns. 216-762-8818
Ohio Dayton, KM Co. 513-890-6734
Ohio Warren, REM Elctrn. Supply Co. 216-399-2777
Pa Allentown, AA Peters 215-434-5237
Pa Braddock, M. Leff Radio Parts 412-271-2800
Pa Erie, Mace Elctrns. 814-838-3517
Tex Richardson, Southwest Elctrns. 214-234-3050
Tex Stafford, Southwest Elctrns 713-491-4900
Wash Seattle, Radar Electric 206-282-2511
For: Can., Ottawa, Ont., Wackid Radio TV Labs 613-728-1821

DUNEGAN/ENDEVCO, Dept. EM, Rancho Viejo Rd., San Juan Capistrano, Cal. 92675, Tel: 714-831-9131, TWX: 68-5608, 910-596-1415; Empl.: 50

Sales Manager: B. Toffelmier

Local Sales Offices & Reps.
Cal Anaheim, Dunegan/Endevco 714-493-8181
Cal Palo Alto, Dunegan/Endevco 415-969-3212
Cal San Juan Capistrano, Dunegan/Endevco 714-831-9131
Ga Atlanta, Dunegan/Endevco 404-478-1501
Ill Chicago, Dunegan/Endevco 312-867-4505
Md Towson, Dunegan/Endevco 301-752-0688
NH Nashua, Dunegan/Endevco 617-969-8063
NJ E. Brunswick, Dunegan/Endevco 201-254-9600
Ohio Brecksville, RDP Assocs. 216-659-3138
Ohio Dayton, RDP Assocs. 513-253-6175
Tex Houston, Dunegan/Endevco 713-931-8948

DUOTONE CO., Dept. EM, 6875 S.W. 81st St., S. Miami, Fla. 33143, Tel: 305-665-1121; Empl.: 35

Sales Manager: S. Nester; *Distributor Manager:* S. G. Nester

Local Sales Offices & Reps.
Cal Canoga Park, Marketronics - A & M Mktg 213-998-6031
Cal Pacifica, Tony Mannino & Assoc 415-993-6425
Colo Denver, Nelson Co. 303-573-1516
DC Washington, Forti Assoc. 301-949-1706
Ga East Point, Paul Hayden Assoc. 404-766-0261
Ill Chicago, Michael Zindell 312-274-7175
Ind Indianapolis, Charles Schiffler Co 317-253-6337
Kans Overland Park, Robert C. Howard & Assoc. 913-492-7182
Md Kensington, Forti Associates 301-949-1706
Mich Southfield, Charles Bassin & Assoc. 313-357-2172
NJ Willingboro, Austin Assocs 609-871-9290
NY Brooklyn, N. Maltz 212-252-1139
Tex Dallas, The Collins Co 214-341-7866
Wash Seattle, Northmar, Inc. 206-524-5170

DUPREE, INC., Dept. EM, 9835 Dupree St., So. El Monte, Cal. 91733, Tel: 213-442-4700; Empl.: 40

Sales Manager: Beverly Bowdry

Local Sales Offices & Reps.
Cal San Diego, The Rep Co. 714-292-9001
Fla Merritt Island, L. Meldeau 305-452-5975
Kans Wichita, R. Elston 316-942-4904
Mass Woburn, Gilway Sls. Co. 617-935-4442
NY Lynbrook, H.B. Heft Co. 516-599-3351
NY Rochester, Gislason Sls. Co. 716-454-4741
Pa King of Prussia, White-Whiddett Co. 215-265-1817
Tex Arlington, Lamco 817-461-1166
Wash Seattle, Norwest Co. 206-282-3707

DURAKOOL, Dept. EM, 1010 N. Main St., Elkhart, Ind. 46514, Tel: 219-264-1116, Telex: 25-8482; Empl.: 200 p. 3465-3473,4050-4052

Sales Manager: P. Phillips; *Distributor Manager:* F. Aitchison

Local Sales Offices & Reps.
Ala Alabaster, A. Brown & Assoc. 205-870-3141
Cal Burlingame, Campbell & George 415-697-2965
Cal Glendale, Hundley Co. 213-240-3600
Colo Englewood, E & M Sls. 303-761-6202
Ga Atlanta, A. Brown Assocs. 404-455-1216
Ill Chicago, Kelburn Engrg Co. 312-775-8383
Ind Indianapolis, Kelburn Engrg Co. 317-257-9874
Iowa Davenport, Volco Co. 319-326-5233
Iowa Des Moines, Volco Co. 515-283-1650
La Chalmette, L. Elliott Co. 504-737-1895
Md Glen Burnie, E.J. Varholy & Son 301-760-3344
Mass Needham, Northeast Reps. 617-449-3034
Mich Farmington, CMP Engrg. Sls. 313-477-7700
Minn Minneapolis, Volco Co. 612-933-4671
Mo Overland Park, R. Greene Co. 913-492-6886
Mo St. Louis, R. Greene Co. 314-994-0222
Neb Omaha, Volco Co. 402-346-2203
NY Wantagh, DONY Tech. Sls. 516-826-5550
NC Charlotte, Mel Sls 704-364-3177
Ohio Cleveland, CMP Engrg. Sls. 216-779-5100
Ohio Dayton, CMP Engrg. Sls. 513-222-7700
Okla Oklahoma City, L. Elliott Co. 405-842-7885
Okla Tulsa, L. Elliott Co. 918-743-7794
Ore Portland, Branom Instr. Co. 503-283-2555
Pa Monroeville, CMP Engrg. Sls. 412-372-4415
Pa Narberth, Power Modules Inc. 215-839-1331
Tenn Brentwood, A. Brown Assocs 615-373-2068
Tenn Memphis, R. M. Jordan & Assoc. 901-452-4516
Tex Addison, L. Elliott Co. 214-239-8533
Tex Missouri City, L. Elliott Co. 713-499-1571
Utah Salt Lake City, Thermalink Intermountain 801-466-8601
Wash Seattle, Branom Instr. Co. 206-762-6050
Wisc Milwaukee, Kelburn Engrg Co. 414-545-2122
Exp: Ill., Hinsdale, Worldwide Exports 312-654-1315

Local Distributors
Pa Narberth, Power Modules 215-839-1331

DURANT DIGITAL INSTRUMENTS, Cutler Hammer Co., Dept. EM, 901 S. 12th St., Watertown, Wisc. 53094, Tel: 414-261-4070, TWX: 910-260-3713; Empl.: 500

Local Sales Offices & Reps.

Ala	Birmingham, Spader & Assocs...	205-879-1366
Cal	Cupertino, Durant Digital Instrs.-Cutler-Hammer Co.	408-255-3232
Cal	Los Angeles, Durant Digital Instrs.-Cutler Hammer Co.	213-876-4000
Colo	Lakewood, Durant Digital Instrs.-Cutler Hammer	303-922-3949
Conn	New Canaan, Durant Digital Instrs.-Cutler Hammer Co.	203-972-1868
Fla	Clearwater, H.R. Gross & Co.	813-446-6649
Ill	Elmhurst, Durant Digital Instrs.-Cutler-Hammer Co.	312-279-8220
Kans	Mission, Durant Digital Instrs.-Cutler-Hammer Co.	913-262-2199
Mass	Wakefield, Durant Digital Instrs.-Cutler Hammer Co.	617-246-0024
Mich	Detroit, Durant Digital Instrs.-Cutler Hammer Co.	313-535-3630
Minn	Minneapolis, Durant Digital Instrs.-Cutler Hammer	612-835-5534
Mo	St. Louis, Durant Digital Instrs.-Cutler Hammer	314-567-3377
NJ	Laurel Springs, Durant Digital Instrs	609-784-2334
NY	Rochester, Durant Digital Instrs.-Cutler Hammer	716-442-3440
NC	Charlotte, Durant Digital Instrs.-Cutler Hammer	704-525-3149
Ohio	Cincinnati, Durant Digital Instrs.-Cutler Hammer	513-531-5073
Ohio	Cleveland, Durant Digital Instrs.-Cutler Hammer	216-464-8787
Ore	Portland, Durant Digital Instrs.-Cutler Hammer	503-226-4317
Pa	Plymouth Meeting, Durant Digital Instrs.-Cutler Hammer	215-825-5450
Tex	Houston, Durant Digital Instrs.-Cutler Hammer	713-868-2363
Wash	Bellevue, Durant Digital Instrs.-Cutler Hammer	206-747-2001

DUTREX INDS., INC., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011, Tel: 212-989-5000, TWX: 710-581-6234; Empl.: 20

DYNACO INC., Div Tyco Corp., Dept. EM, Box 88 Coles Rd., Blackwood, N.J. 08012, Tel: 609-228-3200, Telex: 831-493; Empl.: 100

Local Sales Offices & Reps.

Cal	Redwood City, Sinai-Johnson Co.	415-365-6263
Cal	Van Nuys, Markman Co.	213-787-6151
Colo	Denver, McLoud & Raymond Co.	303-756-1589
Fla	Ft. Lauderdale, Alan Assocs	305-741-0712
Ga	Atlanta, Elmar Assocs.	404-938-2821
Haw	Honolulu, S&A Ltd.	808-941-2400
Ill	Warrenville, Lintern Assoc.	312-357-4896
Kans	Shawnee Mission, Audio Marketing	913-492-5869
Md	Grasonville, AB&T Sls Co.	301-827-8046
Mass	Brookline, Berlin Sls Co.	617-566-6064
Mich	Buchanan, Riley & Petchell Sls.	616-695-6356
Mich	Detroit, Riley & Petchell Sls.	313-937-3000
Minn	Minneapolis, Gibb Co.	612-377-1200
NY	Jackson Hgts., Jim Altman Co.	212-779-2665
Ohio	N. Olmsted, Morrow Co.	216-777-5001
Ohio	Vandalia, Morrow Co.	513-898-3807
Pa	King of Prussia, AB&T Sls Co.	215-265-2028
Pa	Pittsburgh, Morris Taylor Co.	301-589-4002
Tex	Houston, Tobias Co.	713-462-6864
Wash	Edmonds, Champlin Co.	206-776-0341
Exp:	Blackwood, Dynaco Inc./Dan Konyak	609-228-3200

DYNAGE, INC. CONTROL PRODS GRP., Dept. EM, 1331 Blue Hills Ave., Bloomfield, Conn. 06002, Tel: 203-243-0315, TWX: 710-425-6063; Empl.: 52

Sales Manager: D. K. Kreidler VP-Mktg

Local Sales Offices & Reps.

Cal	Buena Park, Sales Engineers Ltd.	213-921-0681
Conn	W. Hartford, Indl Sys Assocs.	203-521-7986
Ga	Atlanta, Par Assocs.	404-393-0018
Ill	Lombard, Quadtron Assocs.	312-627-6800
Kans	Lenexa, Technical Sls Assocs.	913-888-3330
Ky	Louisville, Richard Equip. Corp.	502-895-8060
La	Baton Rouge, Rise, Inc.	504-766-4645
La	Harvey, Rise, Inc.	504-362-4405
La	Lafayette, Rise, Inc.	318-234-0178
Mich	Birmingham, Electromation Assocs.	313-564-6517
Miss	Jackson, Rise, Inc.	601-354-2163
Mo	St. Louis, Technical Sls Assocs	314-725-5361
NJ	Short Hills, W.J. Fraind Assocs.	201-376-6315
NY	Elmira, Courser, Inc.	607-733-8496
Ohio	Cincinnati, Richard Equip. Corp.	513-271-8666
Ohio	Cleveland, Adcon Engrg. Co.	216-238-3915
Okla	Tulsa, Olson Engrig Co.	918-742-3720
Pa	Ingomar, Greye Glass Assocs.	412-366-6664
Tex	Houston, Electro-Flow Controls.	713-780-7161

Local Distributors

La	Baton Rouge, Rise, Inc.	504-766-4645
Mo	Maryland Hgts, Custom Control Panels	314-291-0330
NY	Buffalo, Amherst Prods.	716-896-0429
NY	Elmira Hgts, Courser, Inc	607-733-2150
Ohio	Defiance, Koester & Assocs	419-782-2247
Pa	York, Frank Elec	717-764-5959

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Local Sales Offices & Reps.

Ala	Huntsville, Reynolds & Assocs.	205-536-1941
Ariz	Phoenix, Bob Anderson Co.	602-266-2070
Cal	Palo Alto, Engrg. Assocs.	415-494-7842
Cal	San Gabriel, Van Gott & Assoc.	213-285-2148
Conn	Orange, C P S Corp.	203-795-3515
Fla	Satellite Beach, Reynolds & Assocs.	305-773-4700
Ga	Atlanta, Reynolds & Assocs.	404-252-5360
Ill	Northfield, H. Sam Tollaksen Co.	312-441-6644
Kans	Lenexa, Technical Sls. Assocs.	913-888-3330
Md	Ellicott City, A/O Electronics	301-942-8883
Mass	Wakefield, Data Engrg. Svcs.	617-245-6666
Mich	Birmingham, Electro-Mation Assocs.	313-564-6517
Mo	St. Louis, Technical Sls. Assocs.	314-725-5361
NJ	Englishtown, Triple E.	201-446-4222
NY	Fayetteville, Martin P. Andrews.	315-637-5291
NC	Winston-Salem, Reynolds & Assocs.	919-725-6196
Ohio	Chagrin Falls, Midwest Mktg. Assocs.	216-247-6655
Ohio	Dayton, Midwest Mktg. Assoc.	513-433-2511
Pa	Paoli, Stitzer Assocs.	216-644-5500
Tex	Austin, Jackson Arnold Co.	512-447-1068
Tex	Houston, Jackson Arnold Co.	713-783-7297

Local Distributors

Conn	Milford, Stepco	203-877-4501
NJ	East Hanover, State Elctrns.	201-887-2550
NY	Rochester, Masline Elctrns.	716-546-5373

DYNAIR ELCTRNS. INC., Dept. EM, 5275 Market St., San Diego, Calif. 92114, Tel: 714-263-7711, TWX: 910-335-2040; FSC No.: 11650; Empl.: 150

Sales Manager: R.A. Jacobs

DYNALOY, INC., Dept. EM, 7 Great Meadow La., Hanover, N.J. 07936, Tel: 201-887-9270; FSC No.: 27908; Empl.: 19

Local Sales Offices & Reps.

Ariz	Scottsdale, E. J. Foley & Assocs.	602-945-2665
Cal	Westminster, Contronic Devices	714-897-2266
Fla	Ft. Lauderdale, Etchomatic, Inc.	305-563-5060
Ind	Noblesville, G. Cardoza	317-255-6685
Mass	Waltham, Etchomatic	617-893-2020
Minn	Minneapolis, International Sales	612-831-8423
Tex	Dallas, M. Daggett, Jr. & Assoc.	214-368-0135

DYNAMIC AIR ENGRG, INC., EMC Filter Div., Dept. EM, 620 E. Dyer Rd., Santa Ana, Cal. 92705, Tel: 714-540-2081, TWX: 910-595-2588; FSC No.: 18965; Empl.: 60

Local Sales Offices & Reps.

Kans	Wichita, D & O Engrg.	316-264-7358
NJ	Cherry Hill, Dynamic Air Engrg.	609-428-9772
Wash	Bellevue, S.P. Inc.	206-454-0660
Exp:	North Hollywood, Donalico Sls.	213-875-0550

DYNAMIC INSTR. CORP., Dept. EM, 933 L.I. Motor Pkwy., Hauppauge, N.Y. 11787, Tel: 516-234-2900, TWX: 510-227-9884; Empl.: 720 p. 3246

Local Sales Offices & Reps.

Ala	Huntsville, 20th Century Mktg.	205-772-9237
Ariz	Phoenix, Arrowhead Sls. Corp.	602-277-7148
Cal	Burlingame, J. Logan & Assoc.	415-697-6100
Cal	Pasadena, Electro-Mechanical Instrs.	213-795-7193
Colo	Arvada, Arrowhead Sls. Corp.	303-423-5556
Conn	Ansonia, Zaslow Sls.	203-735-9581
Conn	Bloomfield, Zaslow Sls. Co.	203-242-7781
Ga	Atlanta, Hollingsworth & Still Inc.	404-394-3270
Ill	Rolling Meadows, Sumer Inc.	312-991-8500
Mass	Littleton Common, Zaslow Sls.	617-486-8915
Mass	Northboro, Zaslow Sls.	617-393-8150
Mich	Ferndale, Hilltronics, Inc.	313-398-5556
Minn	St. paul, H.A. Cullen Assoc.	612-646-7371
Miss	Corinth, 20th Century Mktg.	601-287-2493
NJ	Cherry Hill, Trinkle Sls.	215-922-2080
NY	Plainview, Preisick Assoc.	516-681-8444
NY	Syracuse, Mar-Com Assocs.	315-437-2843
NC	Kernersville, Naylor Assocs.	919-996-4162
Ohio	Richfield, Bear Mktg.	216-659-3131
Tenn	Greeneville, 20th Century Mktg.	615-638-4021
Tex	Dallas, E.B. Robertson Inc.	214-942-2719
Tex	Houston, E.B. Robertson Inc.	713-785-6800
Utah	Salt Lake City, Arrowhead Sls. Corp.	801-268-8852
Wash	Bellevue, Panoco	206-454-2503
Wisc	Milwaukee, Sumer, Inc.	415-259-9060

Local Distributors

Cal	Burlingame, J. Logan & Assocs	415-697-6100
Cal	Pasadena, Electro-Mechanical Instrs.	213-795-7193
Colo	Arvada, Arrowhead Sls. Corp.	303-423-5556
Conn	Bloomfield, Zaslow Sls. Co.	203-242-7781
Ill	Rolling Meadows, Sumer, Inc.	
Mich	Ferndale, Hilltronics	313-398-5556
Minn	St. Paul, H.A. Cullen Assoc.	612-646-7371
NY	Bayshore, D & B Power	516-586-5955
NY	Plainview, Preisick Assocs.	516-681-8444
Ohio	Richfield, Bear Mktg.	216-659-3131
Tex	Dallas, Elgin B. Robertson	241-942-2719
For:	Switzerland, Lausanne, Marketing & Liaison	(021) 23 58 15

DYNAMIC MEASUREMENTS CORP., Dept. EM, Lowell Ave., Winchester, Mass. 01890, Tel: 617-729-7870, TWX: 710-348-6596; Empl.: 30

Local Sales Offices & Reps.

Ariz	Tempe, Sedco Sls.	602-968-7791
Cal	Santa Ana, CEM	714-835-2701
Cal	Sunnyvale, Mission Mktg	408-732-9611
Colo	Parker, Technology Mktg Assocs	303-841-3431
Ill	Chicago, EIA, Inc.	312-271-3771
Ind	Indianapolis, EIA, Inc.	317-257-7231
Md	Linthicum Heights, KD Assocs.	301-636-1151
Mass	Littleton, Hybricon	617-486-3171
Mo	St. Louis, Ozark Elec. Mktg.	314-423-7201
NJ	Englishtown, Triple E.	201-446-4222
NM	Albuquerque, Tech Mktg Assocs	505-293-2771
NY	Locust Valley, Triple E	516-676-1611
Ohio	Chesterland, EQS Systems	216-729-2221
Pa	King of Prussia, Rivco January Inc	215-265-5211
Tex	Richardson, Scientific Sales.	214-231-6541

Local Distributors

Ill	Elmhurst, Semiconductor Specialists	

DYNAMICS ELCTRN. PRODS., WAUGH CONTROLS, Dept. EM, 9001 Fullbright Ave Chatsworth, Cal. 91311, Tel: 213-998-8281, Tele: 69-6171; Empl.: 130 p. 100

Local Sales Offices & Reps.

Ala	Huntsville, Burnette Techno-Metrics	205-837-5861
Cal	Chatsworth, Dynamics Elctrn. Prods.	213-998-0121
Cal	Palo Alto, Egbert Engrg. Assocs.	415-326-1381
Cal	San Diego, L. L. Stoakes	714-274-6281
Colo	Lakewood, J. Smith & Assocs.	303-442-7101
Fla	Ft. Lauderdale, Lee Assocs.	305-491-7221
Fla	Winter Haven, Lee Assocs.	813-294-5811
Ill	Chicago, Pivan Engrg. Co.	312-539-4831
Ind	Indianapolis, Pivan Engrg. Co.	317-253-1681
Iowa	Cedar Rapids, Pivan Engrg. Co.	319-377-9431
Kans	Shawnee Mission, Pivan Engrg. Co.	913-722-1031
Md	Fulton, Gans-Fryling & Pugh	301-953-3721
Mich	Detroit, Comtel Inst. Co.	313-255-1971
Minn	Minneapolis, Pivan Engrg. Co.	612-835-3061
Mo	St. Louis, Pivan Engrg. Co.	314-567-3631
NJ	Haddonfield, G. L. Williams Assoc.	609-428-6061

NM Albuquerque, J. Smith & Assocs. 505-265-3406
NY Syosset, Scientific Sys Sls 516-921-3737
NC Raleigh, Lee Assocs. 919-787-5818
Ohio Cleveland, Comtel Inst. Co. 216-442-8080
Ohio Dayton, Comtel Inst. Co. 513-298-7573
Pa Pittsburgh, Comtel Inst. Co. 412-922-5720
Tex Dallas, Tech Prods 214-357-9603
Tex Houston, Tech Prods 713-777-7360
Va Arlington, Gans-Fryling & Pugh 703-527-3262
Wash Seattle, Comptronics 206-284-4842
Wisc Brookfield, Pivan Engrg. Co. 414-786-1940

YNAPAR CORP., Dept. EM, 1675 Delany Rd., Gurnee, Ill. 60031, Tel: 312-662-2666, TWX: 910-235-1865; Empl.: 120

Local Sales Offices & Reps.
Ala Birmingham, Systematx 205-979-2070
Ala Gadsden, Dynapar Corp. 205-546-4213
Ariz Phoenix, Western Automation 602-277-2166
Cal Fullerton, Western Automation 213-694-1043
Cal San Jose, J. T. McFarland Assocs 408-286-9333
Cal San Mateo, Dynapar Corp. 415-347-7774
Colo Denver, Peterson Co. 303-388-6322
Colo Grand Junction, Peterson Co. 303-245-4908
Fla Eustis, Indl Systematics 904-357-5100
Ga Lilburn, Motion Technology 404-972-5050
Haw Honolulu, Aloha Assocs 808-941-1574
Ill Northbrook, McLeod Engrg 312-935-5996
Ind Indianapolis, Robert M. Price Co 317-255-0665
Iowa Bettendorf, White Equip Co 319-355-5623
Mich Farmington Hills, W. R. Hummon & Assocs 313-474-0661
Mo St. Louis, Power Ponents 314-822-0736
NJ Bound Brook, Dynapar 201-356-3800
NC Charlotte, Motion Technology 704-525-9855
Ohio Cincinnati, Dorsey-Alexander 513-221-7518
Ohio Cleveland, Jay Industrial Sls Co 216-831-9393
Ohio Willowick, Dynapar Corp 216-944-9616
Ore Portland, McLaren, Inc. 503-297-2248
Pa Pittsburgh, Russell F. Clark Co. 412-242-9500
Pa Pittsburgh, Bollinger & Richards 412-561-2340
SC Greenville, Motion Technology 803-271-1608
Tex Richardson, Donald E. Harman Co. 214-234-2021
Utah Salt Lake City, Peterson Co 801-972-3328
Va Richmond, Commonwealth Controls 804-358-5700
Wash Bellevue, McLaren, Inc. 206-454-3400
Wisc Rhinelander, Lakeland Equip Co 715-369-4860

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Cal Santa Clara, S and C Supp 408-243-1321
Ga Columbus, Southern Belting & Transmission 404-324-4307
Ga Rome, Southern Belting & Transmission 404-875-1651
Ind Indianapolis, Trojan Industrial Supply 317-247-4473
Mass Mansfield, R. T. Engineering 617-329-0750
Mich Farmington Hills, Motion Control Corp 313-478-1640
Minn Minneapolis, Boustead Elec & Mfg 612-544-9131
NY Buffalo, Ross Equip Co 716-634-0990
NY Elmira, Ross Equip Co 607-734-1324
NY Rochester, Ross Equip Co 716-271-5660
NY Syracuse, Ross Equip Co 315-463-6691
NC Charlotte, Power Drives 704-568-7480
Ohio Dayton, Transmission, Inc. 513-298-9836
Pa Lancaster, Marino Grp 717-569-7047
Pa Philadelphia, Marino Grp 215-546-8200

YNATECH CORP., Dept. EM, 1225 E. Wakeham Ave., Santa Ana, Cal. 92702, Tel: 714-558-8755, TWX: 910-595-1951; Empl.: 175 p. 1751

Sales Manager: L. Pearson

Local Sales Offices & Reps.
Ala Huntsville, Technology Mktg. Assoc. 205-883-7893
Ariz Carefree, Vinson Industries 602-488-2700
Cal Beverly Hills, Balzer/Wolf Assoc. 213-888-7432
Cal Fountain Valley, Balzer/Wolf Assocs. 714-962-8169
Cal Los Altos, Frauman Assoc. 415-941-0660
Cal Ont, Balzer/Wolf Assocs 714-988-6955
Cal San Diego, Balzer/Wolf Assocs. 714-272-2200
Cal Santa Ana, Dynatech Corp. 714-558-8755
Colo Denver, Rope & Williamson 303-758-8507
Fla Orlando, Technology Mktg. Assocs. 305-857-3760
Fla Pompano Beach, Technology Mktg Assocs 305-942-0774
Ga Atlanta, Technical Comps., Inc. 404-394-9401
Ill Rolling Meadows, Sumer, Inc. 312-991-8500
Kans Shawnee Mission, Martec Assocs 913-441-6565
Mass Westboro, Technical Mktg. Svc. 617-366-8462
Mass Woburn, Technical Mktg Svcs 617-935-8427
Minn Minneapolis, Components Group 612-824-4222
NJ Wayne, G. T. Assocs 201-694-6040
NY Syracuse, D. Dwyre 315-472-8282
NC Raleigh, Burgin-Kreh Assocs 919-781-1100
Ohio Cleveland, CSA Elctrn. Sls. Agcy. 216-333-2088
Ohio Galion, J.R. Bright Agcy. 419-468-3787
Pa Ft. Washington, Kirk-Sandell 215-643-2100
Tenn Kingston, Burgin-Kreh Assocs 615-690-6100
Tex Houston, Zonk Engrg. Co. 731-697-9302
Tex Richardson, Zonk Engrg. Co. 214-238-7651
Wash Vashon, R.T.S., Inc. 206-455-2778
Wisc Milwaukee, Sumer, Inc. 414-259-9060

Local Distributors
Cal Mountain View, Abacus Elctrns. 415-961-1500
NY Brooklyn, H.H. Smith 212-272-9400
NY Farmingdale, Broadline Elec. Dist. 516-420-8320
NY New York, Hofortech Corp. 212-682-3092
Tex Addison, Computer Comp Corp. 214-239-0271
For: Can., Vancouver, B.C., Intek Elctrns. 604-324-6831
For: Japan, Chiyoda-Ku, Tokyo, Sankyo International Corp.

DYNATECH DATA SYS, A Dynatech Co, Dept. EM, 900 Slaters La., Alexandria, Va. 22314, Tel: 703-548-3889, Telex: 89-9119; Empl.: 150

Sales Manager: Edward Siira

DYNATECH R/D CO., Microsystems Dept., Dept. EM, 99 Erie St., Cambridge, Mass. 02139, Tel: 617-868-8050 p. 1641

Local Sales Offices & Reps.
Ariz Scottsdale, Williams Assocs 602-947-4297
Cal Santa Clara, Telemark 408-248-9616
Cal Seal Beach, CESCO 213-430-9084
Colo Denver, Williams Assocs 303-373-4730
Conn Hamden, J & J Assocs 203-624-7800
Fla Orlando, E. G. Holmes & Assocs 305-894-8901
Ga Chamblee, E. G. Holmes & Assocs 404-451-6161
Haw Honolulu, Aloha Assocs 808-941-1574
Ill Chicago, Carter Elctrns 312-585-5485
Ind Indianapolis, Carter Elctrns 317-293-0696
Kans Overland Park, Carter Elctrns 913-649-6996
Md Annapolis, Bartek Assocs 301-261-2987
Mass Winchester, J & J Assocs 617-729-5770
Minn Minneapolis, Carter Elctrns 612-559-1976
Mo St. Louis, Carter Elctrns 314-569-1406
NM Albuquerque, Williams Assocs 505-255-1638
NY DeWitt, DB Assocs 315-446-0220
NY Great Neck, Industron Assocs 516-487-2620
Ohio Euclid, Bradcor Elctrns 216-261-0888
Tex Dallas, Crockett Southwest 214-251-1776
Va Virginia Beach, E. G. Holmes & Assocs 804-481-6556
Wisc Milwaukee, Carter Elctrn 414-464-5555

DYNATRON CO., Dept. EM, Box 48822, Los Angeles, Cal. 90048, Tel: 213-933-9638; Empl.: 3

Local Sales Offices & Reps.
Cal Northridge, Tauber-Dreyer 213-993-0048
Ga Chamblee, Secom Systems 404-455-0672
Mass Woburn, Essco Standards Lab 617-933-8150

DYNETIC SYSTEMS, Dept. EM, 19128 Indl Blvd., Elk River, Minn 55330, Tel: 612-441-4300

Sales Manager: W. S. Sadler, VP

Local Sales Offices & Reps.
Cal Anaheim, Tri-Tek 714-533-1454
Cal Palo Alto, Alfred Barauck Co. 415-327-7711

DYNISCO, Dept. EM, 20 S. West Pk., Westwood, Mass. 02090, Tel: 617-326-8210, Telex: 092-4347; Empl.: 78

Local Sales Offices & Reps.
Cal San Francisco, Automated Process Controls 415-467-6162
Cal Santa Ana, Hughes Processing 714-547-8439
Conn Canton, Daner-Hayes, Inc. 203-693-6010
Fla Ft. Lauderdale, Beacon Elctrn. Assocs. Inc. 305-491-4211
Ga Atlanta, Beacon Elctrn. Assocs. Inc. 404-351-3654
Ill Chicago, Thermo/Cense Inc. 312-792-2760
Mass Newton Centre, D. Hayes Inc. 617-969-4650
Mich Farmington, Anderson Elctrs. 313-476-9161
Minn Minneapolis, C.T. Sls. 612-374-1241
Mo St. Louis, Ozark Elctrn. Mktg. 314-423-7200
NJ Englewood, Tridon Sls. 201-569-8011
NY Rochester, D. Hayes Inc. 716-394-5560
NC Greensboro, Beacon Elctrn. Assoc. 919-275-9997
Ohio Cincinnati, Schlemmer Assocs. 513-522-8340
Ohio Cleveland, Orr Assocs. 216-885-1324
Pa Jenkintown, PDC Corp. 215-887-9610
Tex Dallas, K. Dawson Co. 214-241-3843
Utah Salt Lake City, Applied Engrg. Prods. Co. 801-582-4942
Wash Bellevue, Topp Engrg. Sls. 206-747-5400

DYTRONICS CO., INC., Dept. EM, 4800 Evanswood Dr., Columbus, Ohio 43229, Tel: 614-885-3303; Empl.: 31 p. 2718

Local Sales Offices & Reps.
Cal Alamo, Indl Measurement & Control 415-837-2000
Cal Buena Park, Cost Reduction Equip. Co. 714-523-7330
Conn Hamden, Applied Measurements 203-288-5288
Ill Des Plaines, Marsland Assocs. 312-775-1309
La Baton Rouge, Cecil Doyle Co. 504-925-5386
Mass Acton, Applied Meas. 617-263-2766
Mich Marquette, NWR Elctrns. Corp. 906-228-9660
Minn Edina, NWR Elctrns. Corp. 612-831-6240
Minn Minneapolis, Marsland Assoc. 612-545-4481
Minn Virginia, NWR Elctrns. Corp. 218-741-5080
NY Buffalo, Angus Instrs. 716-634-0640
NY Marietta, REB Controls 315-636-7765
NC Charlotte, Sam Shannon 704-332-9934
Ohio Cleveland Hts., Murray Ltd 216-371-1578
Pa Spring House, OR Instrumentation 215-646-3399
Tex Dallas, Airep Elctrns. 214-827-2120
Tex Houston, Cecil Doyle Co. 713-771-3490
Exp: New York, N.Y., Joseph Plasencia, Inc. 212-867-8084

DZUS FASTENER CO., INC., Dept. EM, 425 Union Blvd., West Islip, N.Y. 11795, Tel: 516-669-0494; Empl.: 100

Local Sales Offices & Reps.
Cal Anaheim, Dzus Fastener Co. 714-635-0830
Mass East Pepperell, Dzus Fastener Co. 617-889-2545

Local Distributors
Ill Downers Grove, S.W. Anderson Co. 312-964-2600
Kans Wichita, Standard Parts & Equip. Corp. 316-522-1516
Tex Fort Worth, Standard Parts & Equip. Corp. 817-336-2521
For: Can., Weston, Ontario, International Fasteners, Ltd. 416-749-0070

E-H INTERNATIONAL, INC., Dept. EM, 515 11th St Box 1289, Oakland, Cal 94604, Tel: 415-834-3030, TWX: 910-366-7258

Sales Manager: P. Marra; *Distributor Manager:* P. Marra

Local Sales Offices & Reps.
Ala Huntsville, Pen Tech 205-533-0090
Ariz Phoenix, Zeus, Inc. 620-253-6104
Cal Inglewood, Basic Systems 213-673-4300
Cal La Jolla, Ward/Davis Assoc. 714-459-3351
Cal Lawndale, Ward/Davis Assoc. 213-542-7740
Cal Oakland, E-H International 415-834-3030
Cal San Diego, Basic Systems 714-279-9641
Cal Sunnyvale, Ward/Davis Assoc. 408-245-3700
Cal Tiburon, BHL Associates 415-388-6871
Conn Avon, Instrument Dynamics 203-678-1088
Fla Deerfield Beach, Pen Tech 305-421-4989
Fla Maitland, Pen Tech 305-645-3444
Ga Atlanta, Pen Tech 404-955-0293
Ill Arlington Heights, Dytec/Central 312-393-3380
Kans Overland Park, Dytec/South 913-384-2710
Md Towson, Sci Rep 301-321-1411
Mass Wakefield, Instrument Dynamics 617-245-5100
Minn Minneapolis, E-H International 612-941-6580
Minn St. Paul, Dytec/North 612-645-5816
Mo Hazelwood, Dytec/South 314-731-5400
NJ Cherry Hill, Sci Rep 609-482-0059
NJ Paramus, SDM Reps 201-368-0123
NM Albuquerque, Zeus 505-268-3941
NY Rochester, SDM Reps 716-544-8080
NC High Point, Pen Tech 919-883-9125
Ohio Chesterland, EQS Systems 216-729-2222
Ohio Dayton, EQS Systems 513-434-8993
Okla Oklahoma City, Data Mktg Assoc. 405-528-6071
Ore Portland, Pacific Northwest Elctrns 503-228-0008
Pa Glen Rock, E-H International 717-235-6035
Tex Austin, Data Mktg Assoc. 512-451-5174
Tex Dallas, Data Mktg Assoc. 214-661-0300
Tex Houston, Data Mktg Assoc. 713-780-2511
Tex San Antonio, Data Mktg Assoc. 512-838-0937
Va Falls Church, Sci Rep 703-573-8787
Wash Bellevue, Pacific Northwest Elctrns 206-641-6444

E-H RESCH. LABS., INC., Dept. EM, Box 1289, Oakland, Cal. 94604, Tel: 415-834-3030, TWX: 910-366-7258; Empl.: 85

Sales Manager: J.B. Long

Local Sales Offices & Reps.

Ala	Huntsville, Pen Tech	205-533-0090
Ariz	Phoenix, Zeus, Inc.	602-253-6104
Cal	La Jolla, Ward/Davis Assocs.	714-459-3351
Cal	Lawndale, Ward/Davis Assocs.	213-542-7740
Cal	Mtn. View, Cartesian Corp	415-969-2053
Cal	San Francisco, BHL Assocs	415-681-9131
Cal	Sunnyvale, Ward/Davis Assocs.	408-245-3700
Fla	Deerfield Beach, Pen Tech Assocs	305-421-4989
Ga	Atlanta, Pen Tech Assocs	404-955-0293
Ill	Arlington Heights, Dytec/Central	312-394-3380
Kans	Overland Park, Dytec/South	913-432-5596
Md	Baltimore, E-H Research Labs.	717-235-6035
Md	Towson, Scientific Representatives, Inc.	301-321-1411
Mass	Wakefield, Instr. Dynamics	617-245-5100
Minn	St. Paul, Dytec/North, Inc.	612-645-5816
Mo	Hazelwood, Dytec/South, Inc.	314-731-5400
NJ	Cherry Hill, Scientific Representatives, Inc.	609-482-0059
NJ	Raramus, SDM Reps.	201-368-0123
NM	Albuquerque, Zeus, Inc.	505-268-3941
NY	Rochester, SDM Reps.	716-381-9962
NC	High Point, Pen Tech Assocs	919-883-9125
Ohio	Chesterland, EQS Systems	216-729-2222
Ohio	Dayton, EQS Systems	513-434-8993
Okla	Oklahoma City, Data Mktg.	405-528-6071
Ore	Portland, Pacific Northwest Elctrns	503-228-0008
Tex	Austin, Data Mktg.	512-451-5174
Tex	Dallas, Data Mktg.	214-661-0300
Tex	Houston, Data Mktg.	713-780-2511
Tex	San Antonio, Data Mktg.	512-828-0937
Va	Falls Church, Sci Reps, Inc.	703-573-8787
Wash	Bellevue, Pacific Northwest Elctrns	206-641-6444

E & L INSTRUMENTS, INC., Dept. EM, 61 First St., Derby, Conn. 06418, Tel: 203-735-8774, Telex: 963536; Empl.: 46 ..... p. 1299

Sales Manager: K. J. Kruk

Local Sales Offices & Reps.

Cal	Mountain View, Inform Distrib	415-961-5500
Cal	Torrance, Edwards Assocs	213-328-9770
Colo	Denver, Bill Newman & Co.	303-534-1356
Conn	Woodbridge, Electronic Mktg. Co.	203-397-1461
Fla	Orlando, Nine Assocs.	305-351-1841
Ill	Arlington Heights, Martec Assocs.	312-956-8090
Kans	Overland Park, Sir John Co.	913-649-8952
Minn	Minneapolis, Depot Distrib.	612-927-5601
NJ	Springfield, Shortess-Rawson & Assocs.	201-467-8585
NY	N. Syracuse, Naco Elctrns.	315-699-2651
Ohio	Dayton, Rixan Assocs.	513-222-0011
Pa	Souderton, Shortess-Rawson & Assoc.	215-723-8733
Va	Fairfax, Nine Assocs.	703-273-1803
Wash	Seattle, J. Jolly, Inc.	206-938-4166

Local Distributors

Cal	Mountain View, I.F.M. Inc.	415-961-2828
Cal	Palos Verdes Peninsula, Edwards Assocs.	213-377-0975
Colo	Denver, Bill Newman & Co.	303-744-2501
Conn	Woodbridge, Electronic Mktg. Co.	203-397-1461
Fla	Orlando, Nine Assocs.	305-351-1841
Ill	Arlington Heights, Martec Assocs.	312-956-8090
Kans	Overland Park, Sir John, Inc.	913-649-8952
NJ	Springfield, Shortess-Rawson & Assocs.	201-467-8585
NY	North Syracuse, Naco Elctrns. Corp.	315-699-2651
Ohio	Dayton, Rixan Assocs.	513-222-0011
Pa	Sauderton, Shortess-Rawson & Assocs.	215-723-8733
Tex	Dallas, Tesco, Inc.	214-328-5484
Va	Fairfax, Nine Assocs.	703-273-1803
Wash	Seattle, Jon Jolly, Inc.	206-938-4166

E & M LABORATORIES, INC., see TRAK Microwave Corp.

ESNA DIVISION, Amerace Corp., Dept. EM, 2330 Vauxhall Rd., Union, N.J. 07083, Tel: 201-686-6000, TWX: 1-38243, 710-985-4677; Empl.: 700

Sales Manager: W.H. Riley; *Distributor Manager:* A. Wighton

Local Sales Offices & Reps.

Cal	Van Nuys	213-873-7420
Ga	Marietta	404-427-5744
Ill	Chicago	312-777-2929
Ind	Indianapolis	317-253-6526
Mass	Boston	617-545-3424
Mich	Southfield	313-646-6700
Mo	Kansas City	816-333-8394
Mo	St. Louis	314-968-1336
NJ	Union	201-686-6000
Ohio	Strongsville	216-238-3351
Pa	Ardmore	215-642-8667
Tex	Dallas	214-231-2391
Wisc	Milwaukee	414-786-4456

E-SYSTEMS INC., Garland Div., Dept. EM, Box 6118, Dallas, Tex. 75222, Tel: 214-272-0515, TWX: 910-860-5187; Empl.: 1700

Local Sales Offices & Reps.

Fla	Fort Walton Beach	904-243-0127
Mass	Lexington	617-861-9050
NJ	Monmouth	201-747-3101
NY	Rome	315-336-1911
Ohio	Dayton	513-254-8464
Va	Arlington	703-524-2310
Va	Hampton	703-838-2010

E-SYSTEMS, INC., Memcor Div., Dept. EM, 1320 Flaxmill Rd., Huntington, Ind. 46750, Tel: 219-356-4300, TWX: 810-333-1530; Empl.: 1100 ..... p. 3697,3883

Sales Manager: Ray Vanderspool

Local Sales Offices & Reps.

Ala	Huntsville,, Murcota Inc.	205-539-8476
Cal	Culver City, De Angelo, Rothman & Co.	213-398-6239
Cal	San Carlos, D.H. Ross Co.	415-591-4411
Colo	Denver, Gossard & Assoc.	303-985-0602
Fla	Boca Raton, R.K. Welter Co.	305-391-9067
Ga	Atlanta, Murcota Corp.	404-875-2525
Ill	Chicago, D. Dolin Sls. Co.	312-286-6200
Ind	Ft. Wayne, M & N Prods. Co.	219-747-2461
Iowa	Marion, Thomas & Modrcin Assocs.	319-377-6261
Kans	Shawnee Mission, Thomas & Modrcin Assocs.	913-432-2131
Mass	Boston, Anderson Sales Assoc.	617-227-2980
Mich	St. Clair Shores, J.M. Thorpe Co.	313-779-6363
Minn	St. Paul, H.A. Cullen, Assoc.	612-646-7371
Mo	Hazelwood, Thomas & Modrcin Assocs.	314-895-4700
NJ	East Orange, Masin Esco Inc.	201-674-6505
NY	E. Syracuse, Honsinger Mktg. Assocs.	315-463-5718
NY	Syosset, Masin Esco Inc.	516-364-0310
NC	Burlington, Murcota Corp.	919-585-1577
NC	Winston Salem, Murcota Corp.	919-723-1001
Ohio	Cleveland, Glover Sls. Co.	216-842-4520
Pa	Newtown Square, G.M. Conneen	215-353-2241
Tex	Dallas, Southwest Electronic Ind.	214-233-9816
Tex	Houston, Southwest Electronic Ind.	713-729-1670
Wash	Seattle, R.K. Squibb Inc.	206-632-2450

E-T-A CIRCUIT BREAKERS, Dept. EM, 7400 N. Croname Rd., Chicago, Ill. 60648, Tel: 312-647-8303, Telex: 253780; Empl.: 13

Local Sales Offices & Reps.

Cal	Pleasanton, Moulthrop Sls., Inc.	415-846-0550
Cal	Tustin, Sierra-Pacific Eng.	714-731-3411
Conn	East Haven, Eagle Assocs., Inc.	203-467-6542
Fla	Orlando, Buchanan & Abrams Assoc., Inc.	305-898-7444
Ill	Chicago, Midwest Elctrn. Sls.	312-777-9700
Ind	Fort Wayne, Needler Sls Co.	219-447-2123
Ind	Indianapolis, Needler Sls Co.	317-255-8056
Iowa	Cedar Rapids, Midwest Elctrn. Sls.	319-362-4410
Md	Baltimore, D.K. Jones & Assoc.	301-752-0577
Mass	Boston, Eagle Assocs., Inc.	617-444-3446
Minn	Minneapolis, Wenco Sls., Inc.	612-866-3639
Mo	Hazelwood, Dy-Tronix Inc.	314-731-5799
Mo	Independence, Dy-Tronix, Inc.	816-373-6600
NJ	Fort Lee, S. Justin Assoc.	201-947-4371
NY	Albany, Robert F. Lamb Co.	518-869-3355
NY	Buffalo, Robert F. Lamb Co.	716-874-4900
NY	Rochester, Robert F. Lamb Co.	716-544-5580
NY	Syracuse, Robert F. Lamb Co.	315-455-2469
Ohio	Cincinnati, J.O. Olsen Co.	513-922-2176
Ohio	Cleveland, J.O. Olsen Co.	216-752-5444
Pa	Pittsburgh, J.O. Olsen Co.	412-279-2550
Pa	Willow Grove, Techparts	215-659-6900
Tenn	Hendersonville, Stark & Assoc., Inc.	615-822-1667
Utah	Salt Lake City, Frank Merchant	801-277-3775
Wash	Woodinville, W.J. Stulgis Co.	206-486-8539
Wisc	Milwaukee, Star Engineering	414-645-3680

E-Z-HOOK, Div. Tektest, Dept. EM, Box 450 114 E. St. Joseph, Arcadia, Cal. 91006, Tel: 213-446-6175, TWX: 910-582-1614; FSC No.: 08505; Empl.: 17

Sales Manager: C. Haskin

Local Sales Offices & Reps.

Cal	Arcadia, Ash M. Wood Co.	213-447-3511
Cal	Santa Clara, David H. Ross Co.	415-591-4411

EAC/ELECTRONIC APPLICATIONS CO., see Electronic Applications Co.

EAGLE MAGNETIC CO., Dept. EM, Box 24282, 7421 Crawfordsville Rd., Indianapolis, Ind. 46224, Tel: 317-297-1030; Empl.: 18 ..... p. 2555

Sales Manager: D. Love

EAGLE-PICHER INDS., Commercial Prods, Dept. Dept. EM, Box 130, Seneca, Mo. 64865, Tel: 417-776-2258; Empl.: 100 ..... p. 3247

Sales Manager: J.H. Howell

Local Sales Offices & Reps.

Ariz	Phoenix, Spectrum Assocs.	602-997-6324
Cal	Palo Alto, Abbott Engrg. Co.	415-327-0830
Cal	Santa Ana, Spectrum Assocs.	714-835-4114
Conn	Bloomfield, Zaslow Sls. Co.	203-242-7781
Conn	Milford, Zaslow Sls. Co.	203-878-1094
Ill	Park Ridge, Metcom Assocs. Corp.	312-696-1490
Ind	Frankfort, C&S Electronic Sls	317-659-1874
Ind	South Bend, C&S Electronic Sls	219-291-6258
Kans	Wichita, Baka	316-264-2662
Md	Devon, Kile Elect Co.	215-687-9340
Mass	Northboro, Zaslow Sls. Co.	617-393-8150
Minn	Minneapolis, Ohlin Sls. Co.	612-929-6924
Mo	Kansas City, F.P. Williams & Assoc	816-471-1617
NY	Massapequa, H.C. Assocs.	516-541-0262
NY	Syracuse, Naylor Elec. Co.	315-656-2251
NC	Greensboro, L & D	919-292-3201
Ohio	Dayton, Ad-El-Tek/El Compo	513-836-2741
Okla	Bixby, E.B. Robertson	918-369-5686
Pa	, Kile Elect Co.	215-687-9340
Tex	Dallas, E. B. Robertson	214-942-2716
Va	Richmond, L & D Inc.	804-359-0125
Wash	Bellevue, Pacific Consltnts.	206-454-2503

Local Distributors

Cal	Los Angeles, Mil-Comm	213-478-0525
Cal	Palo Alto, Power Source	415-327-0830
Colo	Englewood, J & B Sls.	303-761-9181
Ga	Smyrna, Mark C. Pope Assocs.	404-435-2471
Kans	Wichita, Radio Supply Co.	316-267-5214
Md	Baltimore, Professional Elctrns	301-661-2123
Mass	Sharon, Adcour	617-784-8123
Neb	Omaha, Scott Elctrns	402-734-6750
NJ	Moorestown, Aristo Elctrns	609-234-4471
NY	Farmingdale, Battery Power	516-694-3911
NC	Greensboro, Industrial Electric.	919-274-3251
Ohio	Worthington, Applied Elctrns	
Okla	Oklahoma City, Electro Entprs.	405-478-1752
SC	Greenville, Hammond Elctrns	803-233-4121
Tex	Richardson, Southwest Elctrns.	214-234-3056
Tex	Stafford, Southwest Elctrns.	713-494-6021
For:	Can., Montreal, Que., ABC Security Prod.	514-389-7815

EAGLE SIGNAL, Mfg. Div. Gulf & Western Inds., Dept EM, Box 3585, Davenport, Iowa 52808, Tel 319-326-8111; Empl.: 600

Sales Manager: F.P. Newburn

Local Sales Offices & Reps.

Ala	Birmingham, McConnell Sls. & Engrg. Corp.	205-942-350
Ariz	Phoenix, Bews & Wallace Co., Inc.	602-267-117
Ariz	Tucson, Bews & Wallace Co., Inc.	602-327-606
Ark	Little Rock, J. Tyler Engrg. Co.	501-562-229
Cal	Burlingame, Campbell & George Co.	415-697-296
Colo	Denver, Eagle Signal (Mountain States)	303-773-602
Fla	Jacksonville, Ward Engrg. Co.	904-388-765
Fla	Orlando, Ward Engrg. Co.	305-851-072
Ga	Atlanta, B. Fancher & Assocs.	404-448-707
Ill	Chicago, Kelburn Engrg. Co.	312-775-838
Ill	Moline, J. Otis & Assocs.	309-762-931
Ind	Indianapolis, Kelburn Engrg. Co.	317-257-987
Kans	Overland Park, R. Greene Co.	913-492-688
La	Baton Rouge, Thompson Equip. Co.	504-355-666
La	New Orleans, Thompson Equip. Co.	504-833-638

Md Glen Burnie, E.J. Varholy & Sons Inc. 301-760-3344
Mass Norwood, Gibson Engrg. Co. 617-769-3600
Mich Detroit, R.D. Ernest Assocs. 313-861-7311
Minn Minneapolis, W. Hallock Co. 612-920-6100
Mo St. Louis, R. Greene Co. 314-994-0222
NJ Saddle Brook, C.H. Ribble Co. 201-791-0233
NY Buffalo, Munhall Co. 716-856-1212
NC Charlotte, B. Fancher & Assocs. 704-597-7753
Ohio Cleveland, J.L. Finnicum & Assocs. 216-226-7076
Ohio Dayton, Thal-Mor Assocs. 513-298-9939
Okla Tulsa, L. Elliott Co. 918-743-7794
Ore Portland, Branom Instr. Co. 503-285-9861
Pa Havertown, W. F. Keegan & Co. 215-528-6640
Pa Monroeville, H. A. Deevers & Co. 412-372-4000
Tenn Knoxville, J. R. Stephenson Agency 615-588-7474
Tex Addison, L. Elliott Co. 214-239-8533
Tex Missouri City, L. Elliott Co. 713-499-1571
Wash Seattle, Branom Instr. Co. 206-762-6050
WVa Charleston, Skaff Engrg. Co. 304-342-0131
Wisc Milwaukee, Kelburn Engrg. Co. 414-545-2122
Exp: Iowa, Davenport, (Eagle Signal - J. Duda) 319-326-8146

ANCO, INC., Mid-Eastern Prods., Dept. EM, 539 Jacksonville Rd., Warminster, Pa. 18974, Tel: 215-672-4800, TWX: 510-665-6752; FSC No.: 061790; Empl.: 30 ... p. 3287

Sales Manager: D. Ellenback, Prod. Mgr.

Local Sales Offices & Reps.
Cal Los Angeles, Dyna Sls. 213-268-1175
Fla Alamonte Spg., WMM Assocs. 305-862-4700
Fla Clearwater, WMM Assocs., Inc. 813-446-0075
Fla Pompano Bch., WMM Assocs., Inc. 305-943-3091
Mass Wellesley Hls., R. Sturdy 617-235-2330
Mich Centerline, Dietrich & Assoc. 313-754-6450
NJ Cinnaminson, Scott Sls. Co. 609-829-2991
NY Huntington, C.R. Mayer Co. 516-WA 1-7876
Ohio Cleveland, Dietrich & Assoc. 216-781-1855
Ohio Dayton, Dietrich & Assoc. 513-223-6042
Pa Pittsburgh, Dietrich & Assoc. 412-892-2992
Wash Seattle, Eicher-Richards Co. 206-LA 3-7888

EASTERN AIR DEVICES MOTOR DIV., Electro Audio Dynamics, Inc., Dept. EM, 1 Progress Dr., Dover, N.H. 03820, Tel: 603-742-3330, TWX: 510-297-4454; Empl.: 300 ... p. 3081

Local Sales Offices & Reps.
Ala Decatur, Tenn Tech. Sls. 205-350-0630
Cal Los Altos, Servo Data 415-964-1325
Cal Pico Rivera, Westrep 213-949-2551
Colo Boulder, R.G. Enterprises 303-447-9211
Fla Orlando, Perrott Assoc. 305-275-1132
Ill Arlington Hgts, Martec Assocs. 312-956-8090
Mass Millis, Selmark Assocs. 617-376-2914
Mich Detroit, A. Blumenberg Assoc. 313-557-1934
Minn St. Paul, R. G. Ragon 612-488-0201
Mo Ballwin, Weisler Assocs. 314-394-4543
NJ Ridgefield, Rical Assocs 201-945-5250
NY E. Syracuse, Noeth-Honsinger Assoc. 315-463-5718
Ohio Cleveland, C.A. Robinson 216-381-9049
Pa Newtown Square, Hagy Assoc. 215-459-0504
Tex Houston, Weisler Assocs. 713-467-1847
Wash Seattle, Seatronics, Inc. 206-767-4330

EASTERN DELTA CORP., Dept. EM, 29-09 S. Broadway, Fair Lawn, N.J. 07410, Tel: 201-797-4200; FSC No.: 18105; Empl.: 35

Local Sales Offices & Reps.
NJ Fair Lawn, Eastern Delta Corp. 201-797-4200
Exp: NY, W. Babylon, Delmar Elctrns. 516-420-1234

EASTERN ELECTRONICS MFG. CORP, Dept. EM, 180 Roberts St., East Hartford, Conn. 06108, Tel: 528-9821; Empl.: 50

Sales Manager: T.P. Dunn

EASTERN MARKING MACHINE CORP., Dept. EM, 30 Alabama Ave., Island Park, N.Y. 11558, Tel: 516-889-9090; Empl.: 8

Sales Manager: H. Leighton; *Distributor Manager:* L. Sherman

Local Sales Offices & Reps.
Cal Santa Ana, Weatherman Assocs 714-544-1305
Mass Duxbury, T.M. Walsh Sales 617-934-6210
Mass Framingham, Breen Assocs 203-528-5627
SC Lexington, Wilkie Assocs 803-359-4531
Tex Dallas, Teamwork, Inc. 214-243-5881

EASTERN MICROWAVE CORP., Dept. EM, 4 Gill St., Woburn, MA 01801, Tel: 617-935-8600; FSC No.: 30616; Empl.: 45

Sales Manager: J. R. Alo

Local Sales Offices & Reps.
Cal North Hollywood, Crown Elctrns 213-877-3550
Ga Warner Robins, L.J. Avery 912-923-8314
Kans Wichita, D & O Engrg Co. 316-264-7358
Md Ellicott City, Applied Engrg Consits 301-465-1272
Mass Lexington, E. F. Delfino Co. 617-862-1118
NJ Ocean, Rod Davis 201-922-1299
NY Tuckahoe, Spectrum Sls 914-793-1660
Tex Irving, D & O Engrg Co. 214-251-2021
Tex San Antonio, John W. Casey III. 512-494-5288
Va Woodbridge, Applied Engrg Consits 301-953-2808
Wash Renton, Sherm Wilson Co. 206-226-0650

EASTMAN CHEM. PRODS., Sub. Eastman Kodak Co., Dept. EM, Kingsport, Tenn. 37662, Tel: 800-251-0351, TWX: 810-574-5174; Empl.: 1000

EASY-UP INC., Dept. EM, Racine, Wisc. 53401, Tel: 414-633-6389; Empl.: 12

Local Sales Offices & Reps.
Ill Skokie, M. Bermann Sls. Co. 312-675-3740
Ind Fort Wayne, N. Hoemig Sls. Co. 219-747-0826
Mich Detroit, R. Milsk Co. 313-342-6660
Minn Minneapolis, R. Ripley & Assocs. 612-881-8282
Mo Ballwin, R.J. Throckmorton Sls. Co. 314-227-7222
NY Yonkers, J. Mesnick Elctrn. Sls. 914-961-6619
Ohio Dayton, Shamrock Elctrn Sls. 513-258-1227

EATON CORP., Ind'l. Drives Div., Dept. EM, 9919 Clinton Rd., Cleveland, Ohio 44111; Empl.: 1640

Local Sales Offices & Reps.
Cal Los Angeles 213-724-4320
Cal San Leandro 415-635-5027
Colo Denver 303-623-7011
Conn Meriden 203-375-5207
Fla Jacksonville 904-786-3254
Ga Atlanta 404-448-6600
Ga Norcross 404-449-9089
Ill Elk Grove Village 312-364-2681
Iowa Des Moines 515-278-4540
La Metairie 504-888-9811
Md Timonium 301-252-1777
Mass Westboro 617-366-9636
Mich Southfield 313-354-2700
Minn Minneapolis 612-831-0473
Mo Maplewood 314-645-4732
NJ Cherry Hill 215-563-1446
NJ Fairfield 212-962-4240
NY Buffalo 716-836-0850
NY Syracuse 315-463-8202
NC Charlotte 704-377-2505
Ohio Cincinnati 513-772-2500
Ohio Cleveland 216-621-2186
Okla Tulsa 918-587-7917
Ore Portland 503-222-4281
Pa Pittsburgh 412-261-5360
Tenn Memphis 901-272-1374
Tex Dallas 214-522-6191
Tex Fort Worth 817-332-5351
Tex Houston 713-224-5236
Tex Odessa 915-332-2617
Wash Seattle 206-243-9951
Wisc Appleton 414-733-8535
Wisc Milwaukee 414-462-3800

EATON CORP., Engineered Fasteners Oper., Dept. EM, Box 6688, Cleveland, Ohio 44101; Tel: 216-523-5363, TWX: 810-421-8678, 98-5255; Empl.: 1000

Sales Manager: V.E. Allen

Local Sales Offices & Reps.
Cal Santa Ana 714-542-7295
Ga Chamblee 404-457-3106
Ill Oak Park 312-589-0300
Mich Southfield 313-354-2810
Minn Minneapolis 612-884-9090
NJ Kenilworth 201-272-8780
Ohio Cincinnati 513-771-9303

Local Distributors
Cal Cerritos, Acacia American Co. 213-926-5543
Cal Monterey Park, Bolt Prods. 213-268-6753
Cal Mountain View, E. Wachtel Co. 415-968-2513
Fla Miami, Florida Ind'l. Fasteners 305-633-7446
Ga Norcross, Atlanta Fasteners 404-448-6375
Ill Melrose Park, Anchor Bolt & Screw Co. 312-681-2100
Ind Indianapolis, Service Supply Co. 317-638-2411
Md Baltimore, The L. A. Benson Co. 301-342-9225
Mass Waltham, Electronic Fasteners 617-890-7780
Mich Farmington, Bamal Corp. 313-477-8100
Minn St. Paul, Arden Indl. Prods. 612-483-6681
Mo Maryland Heights, Anchor Bolt & Screw Co. 314-567-1785
NY New York, Industrial Fasteners Corp. 212-244-0991
NY Rochester, Fastener House 716-381-9503
NC Greensboro, L. A. Benson Co. 919-294-4560
Ohio Cleveland, Fastener House 216-861-8250
Tex Dallas, Advance Comp. 214-661-2410

EBY COMPANY, Dept. EM, 4701 Germantown, Philadelphia, Pa. 19144, Tel: 215-842-3000, TWX: 710-670-0452; FSC No.: 72825; Empl.: 150 p. 1752,1753

Local Sales Offices & Reps.
Cal Norwalk, Zoolialian Inc. 213-921-9791
Cal Sunnyvale, Winston Assocs 415-968-5374
Fla Fort Lauderdale, Interface Dynamics 305-772-7998
Ill Northbrook, Rendell Sls Co. 312-498-9860
Ind Fort Wayne, Given Corp. 219-432-5585
Mass Brookline, Harmon Assocs 617-232-6687
Minn Edina, Grayden & Flemmer 612-941-1120
NY Melville, Astrorep 516-423-2266
NY New York, Eltron Export Corp. 212-966-4710
NY Vestal, S.H.R. Inc 607-729-6339
Ohio Cincinnati, Giesting & Assocs. 513-851-7800
Ore Portland, R. M. Minthorne Co. 503-246-4556
Tex Dallas, Stevens Sls. Co. 214-350-2476

Local Distributors
Cal Los Angeles, Dyna Service Co. 213-268-8531
Cal Sunnyvale, Diplomat 408-734-1900
Conn Wilton, Connecticut Comps For Ind 203-762-8691
Ill Northbrook, Rendell Elctrns 312-498-9860
Mass Newton Upper Falls, In-Stock Prods 617-964-6200
NY Buffalo, Summit Dists. 716-884-3450
NY Jamaica, Eby Sls. Co. 212-291-3232

ECC CORP., see Teccor Electronics, Inc.

ECD CORP., Dept. EM, 196 Broadway, Cambridge, MA 02139, Tel: 617-661-4400, TWX: 710-320-6965; Empl.: 40

ECTRON CORP., Dept. EM, 8159 Engineer Rd., San Diego, Cal. 92111, Tel: 714-278-0600, TWX: 910-335-1259; FSC No.: 24856; Empl.: 40 .... p. 2719

Sales Manager: W. W. Hanford

Local Sales Offices & Reps.
Ariz Phoenix, Aztec Enter. 602-944-9185
Cal Costa Mesa, FLW Inc. 714-751-7512
Cal Mt. View, IFM Inc. 408-961-2828
Cal San Diego, FLW Inc. 714-277-0993
Colo Littleton, Aztec Enter. 303-795-0250
Fla Orlando, RJC Assocs. 305-894-7371
Ill Chicago, Carter Elctrns. 312-585-5485
Ind Indianapolis, Carter Elctrns. 317-293-0696
Kans Kansas City, Carter Elctrns. 913-649-6996
La Baton Rouge, Sesco Inc. 504-924-5102
Md Kensington, Electronic Mktg. Assoc. 301-744-7700
Mass Meedham, Addelco Corp. 617-444-4754
Mich Royal Oak, Satullo 313-549-3910
Minn Minneapolis, Carter Elctrns. 612-559-1976
Mo St. Louis, Carter Elctrns. 314-569-1406
NM Albuquerque, Aztec Entprs. 505-255-2440
NY East Syracuse, Ossmann Instrs. 315-437-6666
NY Planview, Eastern-Metro Assoc. 516-931-1414
NY Rochester, Ossmann Instrs. 716-328-2230
NY Vestal, Ossmann Instrs. 607-785-9947
NC Winston-Salem, Radco Co. 919-722-9671
Ohio Cleveland, Instrumentation Sys. Inc. 216-486-0782
Ohio Dayton, Instrumentation Sys. Inc. 513-294-2838
Pa King of Prussia, Electronic Mktg. Assoc. 215-248-5050
Pa Pittsburgh, Instrumentation Sys. 412-243-1111
Tex Houston, Sesco, Inc. 713-688-9656
Tex Richardson, Sesco, Inc. 214-231-9364
Wash Seattle, S.J.I. Corp. 206-624-9020
Wisc Milwaukee, Carter Elctrns. 414-464-5555

EDAL INDS., INC., Dept. EM, 4 Short Beach Rd., E. Haven, Conn. 06512, Tel: 203-467-2591; Empl.: 200

Local Sales Offices & Reps.
Cal Orange, A.T. Assocs. 714-633-7414
Cal San Jose, Mission Mktg. 408-732-9611
Fla Terra Ceia, Component Sls. 813-894-4366
Ill Chicago, L-Tec 312-286-1500
Mass Lexington, Hathaway Elctrns. 617-861-7010
Minn Minneapolis, Furber Sls. 612-881-3620

Mo Blue Springs, Chesco 816-229-1404
Mo St. Charles, Chesco 314-946-6677
NJ Nutley, I. Brill 201-667-0653
NY Binghamton, Net Sls 607-754-3535
NY Brooklyn, Eastern Eletrn. Sls. 212-634-8359
NY Rochester, Net Sls 716-467-4538
NC Charlotte, JWL Assocs 704-364-3177
Ohio Dayton, Elcomp Mktg 513-434-8021
Pa Radnor, Cordray Sls. 215-687-1366

E.D.I. INC., Dept. EM, Box 66, Cairo, Ill. 62914, Tel: 618-734-1694; Empl.: 3

EDISON ELECTRONICS DIV., See McGraw-Edison Co.

ASSOCS. INC., Dept. EM, 333 W. Commercial St., East Rochester, N.Y. 14445, Tel: 716-385-1440, TWX: 510-254-2896; Empl.: 115

Local Sales Offices & Reps.
Cal Pasadena, Quigley Enterprises .. 213-798-0432
Cal Woodland Hills, Robert Bennett 213-986-6622
Conn Meriden, Abbott-Allison 203-237-9232
Ga Atlanta, So Peripherals & Instr... 404-455-3518
Haw Honolulu, Aloha Assocs 808-941-1574
Ill Northfield, Torkelson Assoc. 312-446-9085
Ind Indianapolis, Torkelson Assoc..... 317-244-7867
Md Gaithersburg, Wright Co. 301-840-1928
Mich Royal Oaks, Satullo Co 313-549-3910
Minn Minneapolis, Torkelson Assoc. .. 612-835-2414
Ohio Bedford Heights, Harvey Teplitz & Co 216-439-3265
Ohio Dayton, Harvey Teplitz & Co..... 513-277-6531
Ore Portland, Rush S. Drake Assoc. 503-224-3145
Va Arlington, EDMAC Assocs..... 202-521-7370
Wash Seattle, Rush S. Drake Assoc. .. 206-763-2755

EDMUND SCIENTIFIC CO., Dept. EM, 101 E. Gloucester Pk., Barrington, N.J. 08007, Tel: 609-547-3488, Telex: 83-1564; Empl.: 175

EDSYN, INC., Dept. EM, 15958 Arminta St., Van Nuys, Cal. 91406, Tel: 213-873-5115, Telex: 65-1469; Empl.: 25 ..... p. 4288,4289

Local Distributors
Ariz Phoenix, Jensen Tools & Alloys
Cal El Monte, Marshall Inds.
Cal El Segundo, Wassco
Cal San Jose, J. Elctrn. Tool Co.
Cal Santa Clara, Com Kyl
Conn New London, Jabbour Elctrn. 203-442-4386
DC Wash., Collins Brothers Elctrn. .. 301-420-4400
Fla Orlando, Marshall Inds..... 305-859-1620
Ga Macon, Specialty Distributing Co. 912-743-5421
Ill Chicago, EMF Co.
Md Rockville, Capitol Radio Wholesalers 301-881-2270
Mass Leominster, Fitchburg Hardware Co. 617-343-4806
Mich Detroit, R S Elctrns. Inc..... 313-491-1000
Minn St. Paul, Ragon Elctrns. 612-488-0201
NJ Saddlebrook, Tool-Tronics
NY Mt. Vernon, Electonic Tool Co. .. 914-664-0088
NC Winston-Salem, Kirkman Elctrns. 919-722-9131
Ohio Dayton, Claude Michael 513-898-1105
Okla Oklahoma City, Trice Wholesale Elctrns. 405-524-4415
Ore Portland, Murphy Ind'l Supply ... 503-226-6081
Pa Huntingdon Valley, H. Mann Inc.
Pa Plymouth Meeting, Techni-Tool .. 215-825-4990
Tenn Memphis, Bluff City Distributing Co. 901-725-9500
Tex Dallas, Specialized Prods. Co. .. 214-358-4663
Utah Salt Lake City, Kimball Elctrns... 801-328-2075
Va Norfolk, Aveck Elctrns. Corp. ... 703-627-3502
Wash Seattle, Seattle Tool Supply

EECO, Dept. EM, 1441 E. Chestnut Ave, Box 659, Santa Ana, Cal. 92701, Tel: 714-835-6000, TWX: 67-8420 910-595-1550; Empl.: 6

Sales Manager: J. Fahy

Local Sales Offices & Reps.
Ala Huntsville, Col-Ins-Co 800-327-6600
Ariz Tempe, Gassner & Clark 602-968-9037
Cal Los Altos, Recht Assocs. 415-941-0336
Cal San Diego, Mesa Engr. & Sls. Assoc. 714-278-8021
Colo Littleton, Lange Sales 303-795-3600
Conn Farmington, R. Perron & Co..... 203-673-4825
Conn Trumbull, R. Perron & Co. 203-268-9631
Fla Largo, Col-Ins-Co 800-432-4480
Fla Orlando, Col-Ins-Co 305-423-7615
Ga Clarkston, Col-Ins-Co 800-327-6600
Ill Elk Grove Village, Oasis Sls..... 312-640-1850
Ind Carmel, REM 317-844-8462
Iowa Cedar Rapids, Palatine Sls. 319-365-8071
Kans Derby, Palatine Sls., Inc. 316-788-0621
Kans Lenexa, Palatine Sls. Inc. 913-492-7020
Md Rockville, EMA (Elctrn. Mktg. Assts.) 301-881-5300
Mass Norwood, R. Perron & Co. 617-762-8114
Mich Farmington Hills, Lowell Wendt Mktg 313-553-9800
Minn Bloomington, Elctrn. Sls. Agecy. 612-884-8291
Mo St. Louis, Palatine Sls., Inc. 314-426-7055
NH Dover, R. Perron Co., Inc. 603-742-2321
NJ Ft. Lee, Tecnimat..... 201-461-8686
NM Albuguerque, Cleveland Entrprs 505-266-5594
NY Endicott, Tech-Mark, Inc. 607-748-7473
NY Rochester, EECO 716-325-2160
NC Winston-Salem, Col-Ins-Co 800-327-6600
Ohio Aurora, EMA, Inc. 216-562-6104
Ohio Centerville, EMA, Inc. (Engr. Mktg. Assts.) 513-433-2800
Pa King of Prussia, EMA (Elctrn. Mktg. Assts.) 215-265-1600
Tex Houston, Semiconductor Sls, Assoc. 713-661-0681
Tex Richardson, Semiconductor Sls. Assoc. 214-231-6181
Wash Seattle, B. Hirsh Co. 206-783-3423

EFRATOM CALIFORNIA, INC., Dept. EM, 18851 Bardeen Ave, Irvine, CAL. 92715, Telex: 68-5635; Empl : 35

Local Sales Offices & Reps.
Md Towson, Scientific Assoc. 301-321-1411
Mass Reading, Geder & Assoc..... 617-944-3105
NJ Cherry Hills, Scientific Assoc. 609-482-0059
Va Falls Church, Scientific Assoc. .. 704-573-8787

EG&G, INC., Electro-Optics Div., Dept. EM, 35 Congress St., Salem, Mass. 01970, Tel: 617-745-3200, TWX: 710-347-6741; FSC No.: 25506; Empl.: 400 p. 3135-3137

Sales Manager: J. Murachver

Local Sales Offices & Reps.
Cal Los Angeles, EG&G, Inc. 213-484-8780
Fla Longwood, Lenz Engrg. Co..... 305-831-9797
Md Silver Spring, Spectro Systems Corp. 301-622-4200
Mass Salem, E G & G Inc., Electro-Optics Div. 617-745-3200
NJ Marlboro, Cook & Weil 201-536-3964
NY Rochester, R. F. Lamb Co. 716-544-5580
Tex Richardson, Optics & Elctrns. Co. 214-690-9799

E.I. DUPONT DE NEMOURS & CO., Dept. EM, 1007 Market St., Wilmington, Del. 19898, Tel: 302-774-2421; Empl.: 130,000

Local Sales Offices & Reps.
Cal Los Angeles 213-843-1038
Del Wilmington 302-774-2421
DC Washington 202-DU7-0416
Ill Chicago 312-982-4050
Md Baltimore 301-PL2-2506
NY New York 212-971-4771
Pa Philadelphia, 215-WA3-2493
Tex Houston 713-467-4449

EIP, INCORPORATED, Dept. EM, 3230 Scott Blvd., Santa Clara, Cal. 95051, Tel: 408-244-7975, TWX: 910-338-0155; Empl.: 110

Local Sales Offices & Reps.
Ariz Phoenix, Zeus, Inc. 602-253-6104
Cal La Jolla, Ward/Davis Assocs. 714-459-3351
Cal Lawndale, Ward/Davis Assocs... 213-542-7740
Cal Sunnyvale, Ward/Davis Assocs. 408-245-3700
Colo Denver, Zeus, Inc. 303-770-4400
Conn Hamden, Pat Jenks Assocs..... 203-281-0810
Fla Pompano Beach, Saber Assocs 305-043-3076
Ga Georgia, Saber Assocs..... 305-943-3076
Ill Chicago, Berndt Assocs 312-283-0713
Kans Shawnee Mission, EIR Co. 913-362-0919
Mass Wakefield, Pat Jenks Assocs..... 617-246-1590
Mo Hazelwood, EIR Co. 314-895-4100
NJ Fort Lee, Tech. Mktg. Assocs:.... 201-224-6911
NM Albuquerque, Zeus, Inc. 505-268-3941
NY East Syracuse, Ossmann Instrs., Inc. 315-437-6666
NY Rochester, Ossmann Instrs., Inc. 716-328-2230
NY Vestal, Ossmann Instrs., Inc. 607-785-9947
NC Raleigh, Saber Assocs 305-943-3076
Ohio Cleveland, Comtel Insts..... 216-442-8080
Ohio Dayton, Comtel Insts. 513-298-7573
Okla Norman, Data Mktg. Assocs., inc. 405-364-8320
Pa Philadelphia, Eastern Instrumentation 215-927-7777
Tex Dallas, Data Mktg. Assocs., Inc. 214-661-0300
Tex Houston, Data Mktg. Assocs. 713-686-9627
Tex San Antonio, Data Mktg. Assocs. 512-828-0937
Utah Salt Lake City, Zeus, Inc. 801-534-0500
Va McLean, Creative Mktg. 703-893-6612
Wash Seattle, Arva-Hudson 206-455-0773
Exp: Can., Montreal, Radionics Ltd 514-735-4565

ELCO CORP., Dept. EM, 2250 Park Pl., El Segundo CAL 90245, Tel: 213-675-3311, TWX: 910-325-6602 Empl.: 825 ..... p. 1754,1755

Sales Manager: J.J. Smith

Local Sales Offices & Reps.
Ala Huntsville, EMA 205-533-6640
Ariz Phoenix, Stitzer-Dodd, Inc. 602-944-2237
Cal Anaheim, LoCal Sls. 714-956-1560
Cal El Segundo, Elco Interconnect Sys Div 213-675-3311
Cal Pleasanton, Moulthrop Sls. 415-846-0550
Cal San Diego, LoCal Sls 714-298-8630
Colo Denver, Parker, Webster Co..... 303-751-2600
Fla Ft. Lauderdale, R. I. Smith Assocs. 305-772-5100
Ill Elk Grove Village, Carlson Elctrn. Sls. Co. 312-956-8240
Ind Ft. Wayne, Baehr, Greenleaf & Assocs. 219-221-9030
Md Silver Springs, Marktron Inc. 301-460-6100
Md Timonium, Marktron Inc. 301-252-7111
Mass Woburn, Belmac Corp. 617-935-6810
Mich Farmington, Miltimore Sls. 313-476-2446
Mo Crestwood, Nevco Inc. 314-843-7406
Mo Kansas City, Nevco Inc. 816-421-1751
NY Jericho, Electro Rep..... 516-938-0540
NY Rochester, Canavan-Scanlon Assocs. 716-442-0720
NY Syracuse, Canavan-Scanlon Assocs. 315-437-1271
NC Winston-Salem, EMA 919-722-5151
Ohio Columbus, Baehr, Greenleaf & Assocs. 614-486-4046
Ohio Lakewood, Baehr-Greenleaf 216-221-9030
Okla Tulsa, H.J. Daly 918-627-4159
Ore Beaverton, Vantage Corp. 503-646-3466
Pa Huntingdon, Elco Connector Div 814-643-0700
Pa Huntingdon Valley, Inacker Sls .. 215-947-5660
Pa Pittsburgh, Covert & Newman Co. 412-531-2002
Pa Willow Grove, Elco Corp. Natl Sls Off 215-659-7000
SC Greenville, EMA 803-268-1125
Tex Houston, Aid Elctrns..... 713-777-3882
Tex Irving, Aid Elctrns. 214-259-4761
Utah Salt Lake City, Parker Webster Co. 801-261-1058
Va Charlottesville, Marktron Inc. 804-973-5874
Wash Seattle, Vantage Corp. 206-455-3460
Wisc Milwaukee, Carlson Elctrn. Sls... 414-476-2790

ELCOM INDUSTRIES, INC., Dept. EM, 10268 Bach Blvd., St. Louis, Mo. 63132, Tel: 314-429-3100; Empl. 20

Local Sales Offices & Reps.
Cal Cupertino, Eakins Assocs. 408-255-6494

ELCOM SYSTEMS, INC., Dept. EM, 127F Brook Ave. Deer Pk., N.Y. 11729, Tel: 516-667-5800; Empl.: 6

Sales Manager: D. Pollachek

ELCOR PRODS. NEOTEC ELCTRNS. INC., Dept EM, 2431 Linden La., Silver Spring, Md. 20910, Tel 301-589-5211

Local Sales Offices & Reps.
Cal San Mateo, J.E. Lape Co. 415-345-3021

ELDEC CORP., Dept. EM, Box 100, 16700 13th Ave. W. Lynnwood, Wash. 98036, Tel: 206-743-1313, TWX 910-449-2855; Empl.: 700

ELDEN MFG. CO., Dept. EM, 2712 N. Elston Ave. Chicago, Ill. 60647; Empl.: 12

ELEC-TROL, INC., Dept. EM, 26477 N. Golden Valley Rd., Saugus, Cal. 91350, Tel: 805-252-8330, TWX 910-336-1556; FSC No.: 15636; Empl.: 400 p. 3474-3477

Local Sales Offices & Reps.
Ala Huntsville, Beacon Elctrn. Assocs. 205-881-5031
Ariz Phoenix, Southwest Engrg, Inc.. 602-993-0250
Cal Granada Hills, C & W Component Sls 213-368-4032
Cal Mt. View, Gene C. Woempner Co. 415-964-5454
Colo Englewood, Elcom, Inc..... 303-770-4400
Conn Orange, NPM Assocs. 203-878-4066

Fla Fort Walton Beach, Beacon Elctrn Assocs 904-244-1550
Fla Ft. Lauderdale, Beacon Elctrn. Assocs. 305-971-7320
Fla Maitland, Beacon Elctrn. Assocs. 305-647-3498
Ga Atlanta, Beacon Elctrn. Assocs. 404-351-3654
Ill Des Plaines, Lincoln, Hodges & Assocs. 312-297-3810
Mass Franklin, NPM Assocs. 617-528-5013
Mich Detroit, Nicon Assocs. 313-341-7688
Minn Minneapolis, R-J, Inc. 612-922-1425
Mo Blue Springs, Chesco 816-229-1404
Mo St. Charles, Chesco 314-946-6677
NY Clark Mills, KLM Assocs. 315-853-6126
NY Mt. Vernon, Sonkin Assocs. 914-668-9809
NY North Syracuse, KLM Assocs. 315-458-6214
NY Pittsford, KLM Assocs. 716-381-8350
NC Charlotte, Beacon Elctrn. Assocs. 704-525-7412
Ohio Cincinnati, G & H Sls. Co. 513-771-8231
Ohio Grove City, G & H Sls. Co. 614-878-1128
Ore Beaverton, N.R. Schultz Co. 503-643-1644
Pa Birchrunville, Jadelectronic Associates, Inc. 215-647-5151
Tenn Oak Ridge, Beacon Elctrn. Assocs. 615-482-2409
Tex Houston, Aid Elctrns. 713-777-3882
Tex Irving, Aid Elctrns. 214-259-4761
Utah Salt Lake City, Elcom, Inc. 801-532-7940
Wash Bellevue, N.R. Schultz Co. 206-454-0300
Wisc Waukesha, Lincoln, Hodges & Assocs. 414-542-3087

Local Distributors
Ala Huntsville, C.D.I. 205-883-7501
Cal Irvine, Acacia Sls, Inc. 714-549-0954
Cal San Diego, Acacia Sls, Inc. 714-565-4365
Cal Sunnyvale, Acacia Sls. 408-745-7200
Cal Van Nuys, Patane Avionics 213-988-4455
Colo Lakewood, Acacia Sls. 303-232-2882
Fla Clearwater, Diplomat/Southland 813-443-4514
Fla Margate, C.D.I. 305-971-4950
Ill Elk Grove Village, Diplomat/Lakeland 312-595-1000
Mass Holliston, Diplomat/New England 617-429-4121
Mich Farmington, Diplomat/Northland 313-477-3200
Minn Minneapolis, Diplomat/Electro-Com. 612-788-8601
Mo St. Louis, Diplomat/St. Louis 314-645-8550
NJ Edison, Brothers Elctrns. 201-985-3000
NY Mount Vernon, Sonkin Elctrn Dist 914-668-9809
Ohio Solon, Repco 216-248-8900
Ore Beaverton, Parrott Elctrns 503-641-3355
Pa Huntingdon Valley, Shap Elctrns. 215-698-9550
Tex Dallas, Solid State Elctrns. Co. of Tex 214-352-2601
Tex Houston, Harrison Equip. Co. 713-652-4750
Tex Houston, Solid State Elctrns. Co. of Tex 713-785-5436
Utah Salt Lake City, Diplomat/Alta-Land 801-486-4134

ELECTRIC INDICATOR CO., INC., Dept. EM, 272 Main Avenue, Norwalk, Conn. 06851, Tel: 203-847-5861, Telex: 96-5945; Empl.: 102

Local Sales Offices & Reps.
Ala Huntsville, Technology Mktg Assocs 205-883-7893
Cal Burlingame, Artwel Elect 415-347-9804
Cal West Covina, Valectron Engrg Co 213-330-1515
Colo Denver, Camel Elctrns 303-757-6191
Fla Pompano Beach, Technology Mktg Assocs 305-942-0774
Ill Rosemont, P.D.S. Sls. 312-299-2284
Ky St. Louis, Walter Nussbaum, Jr. Co. 502-895-5037
Mass Lexington, John E. Boeing Co. 617-862-2500
Mo St. Louis, Walter Nussbaum, Jr. Co. 314-878-5136
NY Liverpool, Jones/Sudders 315-457-1180
NC Charlotte, Robert W. Chapman & Co 704-525-2421
Ohio Chagrin Falls, K. F. Nauerz Co. 216-338-8450
Okla Tulsa, T. J. Ray Co 918-627-1515
Pa Birchrunville, Jadelectronic Assocs 215-647-5151
Tex Lewisville, Jim Hughes Co 817-430-1683
Tex Stafford, Jim Hughes Co 713-491-2498

ELECTRIC MACHINERY MFG. CO., Dept. EM, 800 Central Ave., Minneapolis, Minn. 55413, Tel: 612-378-8000, Telex: 290638; Empl.: 1100

Sales Manager: P. Springer

Local Sales Offices & Reps.
Ala Birmingham 205-822-4474
Ariz Phoenix 602-244-0331
Cal Los Angeles 213-921-8411
Cal San Francisco 415-569-5904
Colo Denver 303-388-6322
Fla Tampa 813-872-7859
Ga Atlanta 404-458-7971
Ill Oak Brook 312-325-9620
Ind Indianapolis 317-546-4053
Kans Prairie Village 913-362-8540
La New Orleans 504-341-8586
Me Auburn 207-784-7341
Mass Allston 617-782-7447
Mass Boston 617-482-9238
Minn St. Paul 612-483-5438
Mo St. Louis 314-872-7300
Mont Butte 406-792-5447
NJ Hoboken 201-420-1600
NM Albuquerque 505-344-3288
NY Blauvelt 914-359-5221
NY Buffalo 716-839-0851
NY New York 212-697-0955
NC Charlotte 704-372-4161
Ohio Cincinnati 513-561-5111
Ohio Cleveland 216-723-3772
Okla Tulsa 918-743-9851
Ore Portland 503-234-7437
Pa Broomall 215-353-5040
Pa Pittsburgh 412-563-7603
Pa West Chester 215-436-6275
Tenn Memphis 901-767-3555
Tex Houston 713-461-8168
Utah Salt Lake City 801-972-3328
Va Richmond 703-784-5293
Va Vienna 703-938-4242
Wash Seattle 206-523-0664
Wash Spokane 509-624-1339
Wisc Milwaukee 414-351-4333

ELECTRIC TACHOMETER CORP., Dept. EM, 68th & Upland Sts., Philadelphia, Pa. 19142, Tel: 215-SA6-7723, Telex: 83-1475; FSC No.: 20049; Empl.: 50

Local Sales Offices & Reps.
Ala Huntsville, VESCO 205-539-8716
Cal Berkeley, P. Rosen Co. 415-526-8286
Cal Reseda, T.R. Slocum, Jr. 213-789-3355
Fla Cocoa Beach, VESCO 305-784-0784
Haw Honolulu, Berkley Engrg. & Equip. Co. 808-538-1921
Ill Hinsdale, Johnson Engrg. & Sls. Co. 312-325-2272
Ind Chesterton, J.M. Fallis 219-926-3076
Mass Lexington, W.R. Hatfield Assoc. 617-861-0201
Mich Lake Orion, Service Instr. Sls. 313-391-2266
Minn St. Paul, Nelson Engineered Sls. 612-631-0646
Mo St. Louis, C.O. Leaver Co. 314-968-1500
NJ Fair Lawn, Bixon Assocs. 201-797-5356
NJ Haddonfield, C.G. Thomson 609-429-5233
NY Rochester, Holter Assocs. 716-381-7988
NY Valley Stream, Idalee Elctrns. Corp. 516-825-8955
NC Greensboro, Associated Agents 919-292-6508
Ohio Cincinnati, Kammerer Sls. Co. 513-321-1916
Ohio Cleveland, Fred R. Sharp Co. 216-464-3820
Pa Ligonier, J.K. Woodwell, Jr. 412-238-2748
Tenn Memphis, Engineered Instrs. 901-743-3402
Tex Stafford, Jordan Equip. Co. 713-GY8-6212

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NC Thomasville, Powertronics, Inc. .. 919-476-6727
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Pa Waterford, K.W. Elctrn. Sls. 814-796-6714
SC Greenville, Powertronics..... 803-288-0270
Tex Dallas, W. Reese Assocs. 214-638-6575
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Sales Manager: R.A. Luce

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Sales Manager: A.L. Harmon

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Vt Springfield, Six States Engrg. 802-885-5253
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WVa S. Charleston, Appalachian Controls Co. 303-744-5324

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Fla Winterhaven, Lee Assocs. 813-294-5815
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NC Kernersville, Imagitron Sls..... 919-993-8369
Ohio Cincinnati, F.E. Kahsar Sls. 513-471-9011
Ohio Hudson, F.E. Kahsar Sls. 216-653-6808
Tex Fort Worth, W. P. Fralia Co. 817-640-9101
Tex Houston, W. P. Fralia Co..... 713-772-1572
Wash Mercer Island, J.H. Andersen Assoc. 206-232-0484

ELCTRN. INSTR. & SPECIALTY, Dept. EM, 42 Pleasant St., Stoneham, Mass. 02180, Tel: 617-438-5300; FSC No.: 14908; Empl.: 125 p. 3480-3483

Sales Manager: W.K. Crawford

Local Sales Offices & Reps.
Cal Menlo Park, G. R. McKnight Co. 415-325-2844
Cal San Diego, Cirolia Elctrn Sls 714-743-3015
Md Woodbine, Naudain Assocs..... 301-442-2270
Mass Stoneham, Electronic Instr. & Specialty Corp. 617-438-5300
NJ Nutley, I. Brill 201-667-0653
Pa King of Prussia, Rivco January .. 215-265-5211
Tex Houston, Texas Special Elctrn. Comps. 713-666-5871

Local Distributors
NJ Wayne, Parts Masters 201-694-5885

ELCTRN INSTR & SPECIALTY CORP., MC Div, Dept. EM, 5 Lowell Ave., Winchester, Mass. 01890, Tel: 438-5720 ..... p. 2422

Local Sales Offices & Reps.
Cal Burlingame, Polach & Bensinger 415-697-2525
Cal Sunnyvale, Polach & Bensinger 408-739-8920
Ill Streamwood, Al Holte & Assocs 312-837-4066
Mass Winchester, Elctrn Instr MC Div 627-739-5774
NJ Union, Pacent/DiBlasi 201-687-6914
NY Great Neck, Pacent/DiBlasi..... 516-482-4678
NY Liverpool, Dan Hurley Sls 315-457-1180
NY Pittsford, Dan Hurley Sls 716-586-6159
Tex Richardson, Air Quip Sls 214-234-3285

ELECTRONIC MEASUREMENTS CORP., Dept. EM, 625 Broadway, New York, N.Y. 10012

ELECTRONIC MEASUREMENTS, Dept. EM, 405 Essex Rd., Neptune, N.J. 07753, Tel: 201-922-9300, Telex: 132-424; Empl.: 70 ..... p. 3249-3252

Sales Manager: C. Applegate S/M

ELECTRONIC MEMORIES & MAGNETICS CORP., Dept. EM, 12621 Chadron Ave., Hawthorne, Cal. 90250, Tel: 213-644-9881, TWX: 910-325-6213; Empl.: 5000

Sales Manager: W.L. Knaack

Local Sales Offices & Reps.
Ala Huntsville, Gentry Assocs. 205-534-9771
Ariz Phoenix, Emm/Semi 602-263-0202
Cal Burlingame, EMM Corp. 415-692-4250
Cal Encino, EMM Corp. 213-995-1755
Fla Orlando, Gentry Assocs. 305-894-4401
Ga Atlanta, Gentry Assocs. 404-448-2365
Ill Des Plaines, EMM Corp. 312-297-3110
Mass Lexington, EMM Corp. 617-861-9650
NY Melville, EMM..... 516-423-5800
NC Burlington, Gentry Assoc..... 919-227-3639
Tex Dallas, EMM Corp. 214-361-7121

ELCTRN. MOLDING CORP., Dept. EM, 96 Mill St., Woonsocket, R.I. 02895, Tel: 401-769-3800, TWX: 710-387-1350; FSC No.: 17117; Empl.: 200 p. 1764,1765

Sales Manager: Irene Dulude

Local Sales Offices & Reps.
Cal Mountain View, G. C. Woempner Co. 415-964-5454
Cal Newport Beach, W. B. Knight Co. 714-833-8250
Colo Aurora, Cleveland Entprs of Colo. 303-751-3252
Fla Altamonte Springs, V.G. Sales Co. 305-831-8688
Fla Pompano Beach, V.G. Sales Co. 305-971-0900
Md Columbia, Technical Sls. Assocs. 301-992-9194
Mass Danvers, C.H. Burnham Assocs 617-774-0111
Mich Farmington, Davis & Martensen Co 313-474-8300
Mo Clayton, Mertens Co..... 314-721-0058
NH Durham, C.H. Burnham Assocs.. 603-868-2282

NJ Haddenfield, Mills-Brown Assocs. 609-429-1005
Tex Dallas, P. J. Scanlon Co. 214-231-4661
Tex Houston, P. J. Scanlon Co. 713-781-9036
Wash Seattle, Seawell Mktg. 206-783-2043

ELECTRONIC NAVIGATION INDS., Dept. EM, 3000 Winton Rd. S., Rochester, N.Y. 14623, Tel: 716-473-6900, Telex: 97-8283; Empl.: 50 p. 1003-1005

Sales Manager: L. M. Salmen

Local Sales Offices & Reps.
Ala Huntsville, Scientific Devices 205-536-1969
Cal Los Angeles, McDougall/McLaughlin Co. 213-477-8556
Cal Portola Valley, Kipp Assocs. 415-851-0123
Colo Boulder, Scientific Devices 303-449-9466
Fla Orlando, Scientific Devices 305-841-8180
Fla Palm Bay, Scientific Devices 305-723-1800
Ill Chicago, Carter Elctrns. 312-585-5485
Ind Indianapolis, Carter Elctrns. 317-293-0696
Kans Overland Park, Carter Elctrns. 913-649-6996
Md Silver Springs, Gawler Knoop Co. 301-589-4406
Mass South Chelmsford, Independent Mktg. Reps. 617-256-8251
Mich Ferndale, Tiby Co. 313-547-3550
Minn Minneapolis, Carter Elctrns. 612-559-1976
Mo St. Louis, Carter Elctrns. 314-569-1406
NM Albuquerque, B. Dieruf Assoc. 505-299-0989
NY Greenvale, B.D. Aaron & Co. 516-621-0630
NY Rochester, Elctrn. Navigation Ind's. 716-473-6900
NC Raleigh, Scientific Devices 919-872-7066
Ohio Cleveland, Tiby Co. 216-371-5335
Ohio Dayton, Tiby Co. 513-277-3822
Pa Newtown Square, SWR Assocs. 215-353-6711
Tex Pasadena, Scientific Devices 713-475-0328
Tex Richardson, Scientific Devices 214-231-8106
Tex San Antonio, Scientific Devices 512-736-3164
Wash Bellevue, Marra & Assocs. 206-641-3535
Wisc Milwaukee, Carter Elctrns. 414-464-5555

ELECTRONIC RELAYS, INC., Dept. EM, 7106-08 W. Touhy Ave., Niles, Ill. 60648, Tel: 312-647-7727, TWX: 910-221-2803; FSC No.: 53087; Empl.: 83

Sales Manager: R. Savini; *Distributor Manager:* R. Kedzior

Local Sales Offices & Reps.
Ala Huntsville, A.B. Andrews & Co. 205-539-6817
Ariz Tempe, Gassner & Clark 602-968-9037
Cal Belmont, LoDan Inc. 415-592-4600
Cal Carlsbad, Luscombe Eng. 714-436-2200
Cal Pasadena, Luscombe Eng. 213-684-2000
Colo Englewood, Parker Co 303-841-4131
Fla Clearwater, WMM Assocs. 813-442-3913
Fla Fort Lauderdale, WMM Assocs. 305-772-9850
Fla Maitland, WMM Assocs. 305-831-4530
Ill Arlington Heights, LoDan Elctrns. 312-956-6700
Ill Wheaton, Charles D. Atwater Assc. 312-665-0275
Ind Indianapolis, Marketing Engrs. 317-546-1523
Mass Canton, D. Taggart Assc. 617-828-6064
Mich Troy, Pine Sls. & Engrg. 313-524-1860
Mo St. Louis, Ozark Electronic Mktg. 314-423-7200
NY Jericho, HRC Comp-tech 516-822-5550
NY Manlius, Jerome Fine 315-682-7272
NY Northport, Pro Components 516-261-0662
NC Research Triangle Park, A.B. Andrews 919-549-0563
Ohio Chagrin Falls, Pine Sls. & Engrg. 216-247-6198
Okla Bixby, Elgin B. Robertson 918-369-5688
Pa Feasterville, Vista Sls 215-322-7420
Tex Dallas, Elgin B. Robertson 214-942-2716
Tex Houston, Elgin B. Robertson 713-785-6800
Utah Salt Lake City, Mikro Sls. 801-277-3775
Va Vinton, Bob Jones 703-890-1128
Wash Vashon, R.T.S. Inc. 206-455-2778

Local Distributors
Ark Little Rock, Electro Entprs 501-664-9207
Cal Sunnyvale, Western Microtechnology Sls 408-737-1660
Cal Sunnyvale, Pryamid Elctrns 910-339-9339
Cal Woodland Hill, Jaco 213-887-6400
Ill Arlington Htgs., LoDan Elctrns. 312-956-6700
Ill Oak Brook, Sadeto 312-887-9522
NY Farmingdale, Braodline Elect. Dist. 516-420-8320
Ohio Chagrin Falls, Neptune 216-247-7030
Okla Okla. City, Electro Entprs. 405-478-1752
Okla Tulsa, Electro Entprs. 918-835-9448
Tex San Antonio, Sherman Elect. 512-224-1001
Utah Salt Lake City, Standard Supp 801-486-3371
Wash Seattle, Zepher Elctrns Sls 206-575-0922

ELECTRONIC RESEARCH CO., Dept. EM, Box 913, Shawnee Mission, Kans. 66201, Tel: 913-631-6700, TWX: 910-749-6477; Empl.: 220

Sales Manager: G. Dehnert

Local Sales Offices & Reps.
Frequency product
Cal San Jose, Frequency Control Assocs 408-243-4412
Conn New Canaan, S. Pierce Inc. 203-966-4630
Ill Oak Brook, Whitmore Assocs. 312-325-4727
Ky Ft. Mitchell, G. W. Thelen Co. 606-341-8181
Md Annapolis, Spectro Sys. 301-261-1984
Mass Norwood, S. Pierce, Inc. 617-762-3164
Minn Minneapolis, Nortec Sls. Inc. 612-835-7414
Mo Springfield, Osbern Sls. Co. 417-887-1773
NJ Riverdale, Comp Tech Sls. 201-935-5454
NJ Union, Comp-Tech Sls. 201-687-2484
NY New Hyde Park, Comp-Tech Sls. 516-593-2628
Pa Wyndmoor, Spectro Sys. Corp. 215-836-1545
Wash Seattle, Blum & Assocs. 206-285-2590

ELCTRN. SEALS, Dept. EM, 13766 Saticoy St., Van Nuys, Cal. 91402, Tel: 213-873-4982; FSC No.: 12349; Empl.: 25

ELECTRONIC SPECIALTY DIV., Datron Systems Inc., Dept. EM, 18900 N.E. Sandy Blvd., Portland, Ore. 97220, Tel: 503-665-0121, TWX: 360-453 910-469-8782; FSC No.: 98927 p. 3484-3487

Sales Manager: R. Lisdero

Local Sales Offices & Reps.
Ariz Scottsdale, Summit Sls. 602-994-4587
Cal Costa Mesa, Gabriel Damon Assocs. 714-957-1981
Cal San Jose, Silicon Valley Sls. 408-984-6354
Colo Denver, R.G. Bowen Co. 303-722-4641
Conn Glastenbury, Barton Caron Assoc. 203-633-9417
Fla Winter Springs, Spartak Inc. 813-393-6533
Haw Honolulu, Aloha Assoc. 808-941-1574
Ill Chicago, L.G.S. Elctrn. 312-456-9616
Iowa Cedar Rapids, Engrg. Svcs. 319-362-0503
Kans Prairie Village, Engrg. Svc. Co. 913-649-4000
Mass Auburndale, Barton Caron Assoc. 617-332-2021
Mich Plymouth, A.P. Assoc. 313-476-2300
Minn St. Paul, Countryman Assoc. Co. 612-645-9151
Mo St. Louis, Engrg. Svcs. Co. 314-997-1515
NY Melville, Astrorep 516-423-2266
NY Poughkeepsie, C.W. Floring 914-471-2973
NY Syracuse, C.W. Floring & Assoc. 315-478-2149
Pa Glenside, Wyncote Instr. Co. 215-643-2440
Tex Dallas, Blackburn Assoc. 214-792-8885

Local Distributors
NY Hauppuage, Jaco Elctrns. 516-273-5500

ELECTRONIC SYS & PROGRAMM, Dept. EM, 12901 Crenshaw Blvd., Hawthorne, Cal. 90250, Tel: 213-973-0262, Telex: 66-4467; Empl.: 30

Local Sales Offices & Reps.
Ill Arlington Hgts, Eugene A. Sequeira 312-255-3800
NC Matthews, John B. MacKenzie 704-542-1344

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ELECTRONIC TRANSISTORS, Dept. EM, 112-15 Northern Blvd., Flushing, N.Y. 11368, Tel: 212-651-7200, Telex: 96-0173; FSC No.: 12045; Empl.: 45

Sales Manager: L. Braunstein; *Distributor Manager:* L. Braunstein

Local Sales Offices & Reps.
Ohio Dayton, L.S. Fedotin 513-275-9345
Exp: N.Y., Westbury, Minthorne Int. Co. 516-334-3303

ELECTROSTATICS INC., Dept. EM, 7718 Clairemont Mesa Blvd., San Diego, Cal. 92111, Tel: 714-279-1414; FSC No.: 34538; Empl.: 20 p. 3248

ELECTROVERT, Dept. EM, 86 Hartford Ave., M Vernon, N.Y. 10553, Tel: 914-664-6090, Telex 1-37483; Empl.: 66

Local Sales Offices & Reps.
Ala Huntsville, BJR Research Reps 205-881-356
Ariz Phoenix, Kay Ent. 602-242-678
Ariz Phoenix, N.G. Ganem Co. 602-945-083
Cal Monterey Park, Aero K.A.P. 213-573-531
Cal San Francisco, Westech. 415-433-077
Cal Santa Ana, Electrovert, Inc. 714-835-203
Cal Santa Ana, Production Technology West 714-558-183
Cal Santa Clara, Production Technology West 408-739-447
Colo Denver, Gossard & Assoc 303-770-203
Colo Vail, Mile High Elctrns. 303-476-114
Conn West Hartford, Charles Segel Co 203-236-202
Fla Lake Park, Ron Goforth Co 305-844-671
Ga Atlanta, Electrovert 404-451-936
Ga Atlanta, Deep South Electrical Sls 404-255-826
Ga Chamblee, W. A. Brown Comps 404-455-040
Ill Chicago, EMF Co. 312-889-832
Ill Chicago, Berndt Assoc. 312-283-071
Ill Rosemont, Electrovert, Inc. 312-678-5557-8
Ill Westchester, Electrical Mktg. Corp. 312-681-118
Ind Indianapolis, Marketing Engrgs. 317-546-152
Ind Noblesville, King Sls Co 317-842-103
Iowa Des Moines, K S W Inc 515-279-923
Kans Overland Park, Electri-Rep 913-649-216
Md Silver Springs, ARA Elctrns. 301-565-258
Mass Newtonville, C. Segel Assoc. 617-969-690
Mass Newtonville, Edcom, Inc. 617-969-971
Mich Farmington, Carter, Mc Cormic & Peirce Inc 313-477-770
Mich Royal Oak, M. A. Percival Co. 313-548-197
Minn Minnetonka, Tonka Electronic Supply 612-933-378
Minn St. Paul, Countryman Assoc. Co. 612-645-915
Mo Kansas City, K S W Inc. 816-358-524
Mo St. Louis, Electri-Rep 314-569-266
Neb Omaha, K S W Inc. 402-333-294
NH Manchester, Electrovert Inc 603-625-587
NJ Livingston, Argo Engineering Co 201-992-436
NY Guilderland, The Solder Pot 518-355-182
NY Plainview, Robert Smith Assoc. 516-681-315
NY Rochester, L-Mar Assoc 716-328-524
NY Spring Valley, R. Smith Assoc. 914-354-606
Ohio Cleveland, J. B. Clough Co. 216-431-270
Ohio Cleveland, Marlow Assoc. 216-932-090
Ohio Engelwood, Argent Industries 513-836-098
Ore Portland, Van Voorhees Assoc 503-292-931
Ore Portland, Joseph V. Belusko Co 503-222-427
Pa Glenside, ARA Elctrns. Inc. 215-887-525
Pa Narberth, S. A. Jeffries, Inc. 215-664-850
Pa Pittsburgh, Marlow Assoc. 412-831-611
Pa Reading, Beil & Whitaker 215-779-261
Pa W. Kittanning, Solder Pot 412-543-575
SC Greenville, Elctrn Mktg Assoc 803-233-463
Tenn Memphis, Al Engelman Co. 901-458-626
Tex Dallas, P. J. Scanlon Co. 214-231-466
Tex Dallas, Electrovert Inc. 214-241-569
Tex Dallas, J. Tuite Co. 214-381-210
Wisc Milwaukee, Berndt Assoc 414-545-840

Electroweave, Inc.

ELECTROWEAVE, INC., Dept. EM, 27 E. Foundry St Central Falls, R.I. 02863, Tel: 401-724-3000; FSC No 54207 p. 460

Sales Manager: R. Planchet

Local Sales Offices & Reps.
Cal Glendale, Mission Mktg. Group 213-246-711
Cal Sunnyvale, Reptronics 408-739-035
Fla Lighthouse Point, R.C. Simon 305-941-275
Kans Leawood, Thunderbird Tech. Sls. & Svcs. 913-642-722
Kans Wichita, Thunderbird Tech. Sls. & Svcs. 316-684-394
Md Ellicott City, Mktg Tech Assoc. 301-465-594
Mass Clinton, F.J. Coleman & Co. 617-368-011
Minn Minneapolis, Jos Co-Melius, Inc. 612-861-334
Mo St. Louis, Thunderbird Tech. Sls. & Svcs 314-567-648
NJ Springfield, F.F. Sylvester Assocs. 201-376-332
NM Albuquerque, Sealect Technology, Inc. 505-299-113
Tex Dallas, Southern Engrg. 214-357-066

ELFAB CORP., Dept. EM, 4200 Wiley Post Rd., Addison, Tex. 75001, Tel: 214-233-3033, TWX: 910-860-5460; Empl.: 400 ..... p. 1763

Local Sales Offices & Reps.

Ala	Huntsville, Remco	205-883-9260
Ariz	Tempe, Delta Elctrns.	602-966-9903
Cal	Fremont, Foraker Sls. Corp.	415-657-2213
Cal	Long Beach, Elfab Corp.	213-426-4534
Cal	Westlake Village, Elfab C3rp.	213-889-3535
Colo	Boulder, Elfab Corp.	303-499-1560
Conn	Vernon, G/M Assocs	203-646-4443
Fla	Indialantic, Raycom	305-727-8860
Fla	Winterpark, Young & Lawrence Assoc.	305-647-6929
Ill	Lisle, Trend-Tronics	312-963-2210
Md	Rockville, Mechtronics Sls.	301-340-2130
Mass	Framingham, G/M Assocs	617-872-4871
NH	Dover, G/M Assocs	603-742-6800
NH	Seabrook, Elfab Corp.	617-893-3092
NJ	Cherry Hill, Benco Sls.	609-779-9282
NY	Manhasset, Win-Cor Elctrn. Sls.	516-627-9474
NY	Syosset, Masin-Esco	516-369-0370
Ohio	Chagrin Falls, Midwest Mktg.	216-247-6655
Ohio	Dayton, Midwest Mktg.	513-433-2511
Okla	Oklahoma City, Ammon & Rizos Co.	405-373-2748
Pa	Huntingdon Valley, Omega Elctrn. Sls.	215-947-4135
RI	Narrangansett, G/M Assocs	401-789-1356
Tenn	Jackson, Remco	901-424-0142
Tex	Dallas, Ammon & Rizos Co.	214-233-5591
Tex	Houston, Ammon & Rizos Co.	713-781-6240
Wash	Tukwila, General Elctrns, Inc.	206-575-4030

Local Distributors

Cal	Irvine, Ratel Elctrns	213-924-8387
Cal	Sunnyvale, Ratel Elctrns	408-739-9220
Colo	Denver, Ratel Elctrns	303-934-5813
DC	Washington, Treeko Sls	202-937-8260
Md	Beltsville, Treeko Sls	301-972-0112
Mass	Waltham, QPL Elctrns	617-891-0460
Tex	Houston, Altair Co.	713-462-3029
Tex	Richardson, Altair Co.	214-231-5166

ELGAR CORPORATION

ELGAR CORPORATION, Dept. EM, 8225 Mercury Ct., San Diego, Cal. 92111, Tel: 714-565-1155, TWX: 910-335-1246; FSC No.: 25965; Empl.: 150 ..... p. 3378-3383

Local Sales Offices & Reps.

Ala	Huntsville, BCS Assocs.	205-881-6220
Ariz	Tempe, Trembly Assoc.	602-967-2058
Cal	La Jolla, Ward/Davis Assocs.	714-459-3351
Cal	Lawndale, Ward/Davis Assocs.	213-542-7740
Cal	Sunnyvale, Ward/Davis Assocs.	408-245-3700
Colo	Arvada, Figaro-Klebba Assoc.	303-424-0108
Conn	Hamden, P. Jenks Assocs.	203-281-0810
Fla	Orlando, BCS Assocs.	305-896-4881
Haw	Honolulu, Intelect, Inc.	808-845-9016
Ill	Arlington Heights, Dytec/Central, Inc.	312-394-3380
Ind	Ft. Wayne, Dytec/Central	219-485-0845
Kans	Lenexa, Dytec/South, Inc.	913-888-0215
Md	Rockville, Electronic Mktg. Assocs.	301-881-5300
Mass	Holbrook, McLellan Assocs.	617-767-4771
Mass	Wakefield, P. Jenks Assocs.	617-246-1590
Mich	Madison Heights, WKM Assoc.	313-588-2300
Minn	Minneapolis, Berndt Assocs., Inc.	612-835-4818
Mo	Hazelwood, Dytec/South, Inc.	314-731-5400
NM	Albuquerque, Trembly Assoc.	505-266-8616
NY	Fairport, NACO Elctrns. Corp.	716-223-4490
NY	Great Neck, Measurement Tech. Inc.	516-482-3500
NY	North Syracuse, NACO Elctrns. Corp.	315-699-2651
NY	Utica, NACO Elctrns. Corp.	315-732-1801
NC	Greensboro, BCS Assocs.	919-273-1918
Ohio	Cleveland, WKM Assocs.	216-267-0445
Ohio	Dayton, WKM Assocs.	513-434-7500
Pa	King of Prussia, Electronic Mktg. Assocs.	215-265-1600
Pa	Pittsburgh, WKM Assocs.	412-892-2953
Tex	Dallas, Data Aids Assoc.	214-620-1551
Tex	Houston, Data Aids Assoc.	713-862-6685
Utah	West Jordan, Figaro-Klebba	801-561-0214
Wash	Bellevue, Data Power Sls. Co.	206-453-8200
Exp:	San Diego, Cal., Elgar Intern'l. Corp.	714-565-1155

ELGENCO, INC., Dept. EM, Box 460, Huricane, Utah 84737, Tel: 801-635-4954; FSC No.: 15455 ..... p. 2726-2731

Local Sales Offices & Reps.

Cal	Sherman Oaks, Windsor Dynamics, Inc.	213-990-4173
Cal	Woodside, N-S Assocs.	415-854-4870
Conn	Hamden, Instrument Consits	203-288-5246
Mass	Waban, Instrument Consits	617-969-9881
NJ	Marmore, Holdsworth & Co.	609-398-4340
NM	Albuquerque, Technology Mktg. Assoc.	505-298-4321
NY	Great Neck, Harvey J. Krasner Assoc.	516-487-0690
Pa	Newtown Square, Holdsworth & Co.	215-EL6-8550

ELGIN ELCTRNS., INC., Sub. Basic, Inc., Dept. EM, Walnut St., Waterford, PA. 16441, Tel: 814-796-2601, TWX: 510-699-6659; Empl.: 400

Local Sales Offices & Reps.

Cal	Mountain View, Microwave Mktg. Assoc.	415-969-3355
Conn	Wilton, Elgin Electronics	203-762-7012
Ill	Woodridge, Elgin Electronics	312-964-4474
Tex	Houston, Bill Sneed	713-667-6561
Exp:	Can., Scarborough, Ont., R.O.R. Assoc. Ltd.	416-291-7121

ELMA ENGINEERING, Dept. EM, 1066 E. Meadow Circle, Palo Alto, Cal. 94303, Tel: 415-494-7303, Telex: 345-560; Empl.: 50

Sales Manager: J. Frederick

Local Sales Offices & Reps.

Ariz	Phoenix, Montgomery Bros.	602-253-3431
Cal	Laguna Beach, Marchi-Barus Assocs.	714-497-1815
Cal	Northridge, J.J. Ghiglia	213-349-2525
Cal	Redwood City, Marchi Assocs.	415-364-3411
Conn	Hamden, Godfrey & Assoc.	203-288-1795
Conn	Woodstock, Godfrey & Assocs.	203-928-0332
Del	Newark, J. Harzman	
Fla	Coral Gables, H.G. Wilson & Assoc.	305-446-0014
Ga	Atlanta, Stoughton & Assoc.	404-255-9279
Ill	Arlington, R.K. Orman Co.	312-829-9129
Md	Queenstown, Langmack Sls.	301-827-7007
Mich	Southfield, Engel-Klaes	313-355-1610
Miss	Jackson, Kossen Equip.	601-922-6310
NY	Rochester, H.C. Johnson Agencies	716-482-3000
NC	Charlotte, R.C. Chapman Co.	704-525-2421
Ohio	Cleveland, R.J. Gibbs & Assoc.	216-871-7997
Pa	Pittsburgh, Lax Assoc.	
Tex	Houston, Beeco	713-661-3192

ELMWOOD SENSORS, INC., Dept. EM, 1655 Elmwood Ave., Cranston, RI 02907, Tel: 401-781-6500, TWX: 710-381-6413; Empl.: 400 ..... p. 4272

Local Sales Offices & Reps.

Ala	Decatur, Tenn. Tech. Sls.	205-350-0630
Ariz	Glendale, O'Donnell SW	602-931-8740
Ark	Hot Springs, M. Young Assocs.	501-262-1365
Cal	Palo Alto, O'Donnell	415-327-9061
Cal	Torrance, O'Donnell	213-328-9710
Colo	Boulder, Front Range Mktg.	303-443-4780
Fla	Maitland, D & E Assocs.	305-644-3039
Ill	Deerfield, Thermec Inc.	312-945-5300
Ind	Fort Wayne, O. Bromberg	219-447-5783
Ky	Louisville, O. Bromberg	502-245-8916
Md	Riderwood, Manreps	301-296-2778
Mich	Brooklyn, William C. Moburg & Assoc.	517-592-6801
Minn	Mpls., C. Listug Sls.	612-537-6740
Mo	St. Louis, E.J. Hill Co.	314-621-1818
NH	Durham, G. Forman	603-868-2282
NY	Larchmont, G.M. Moch Co.	914-834-3530
NY	Latham, L-Tron Corp.	518-785-5032
NY	Rochester, Canavan-Scanlon	716-442-0720
NY	Syracuse, Canavan-Scanlon	315-437-1271
NC	Charlotte, Peter D. Edquist & Co.	704-525-6295
Ohio	Cincinnati, O. Bromberg	513-771-9333
Ohio	Cleveland, Allied Entprs.	216-826-3350
Pa	Ardmore, Manreps	215-649-6300
Pa	Murrysville, Allied Enterprises	412-325-3200
Tenn	Knoxville, Tenn Tech Sls	615-966-6409
Tex	Dallas, Ion Assocs.	214-357-9441
Tex	Houston, Ion Assocs	713-461-5311
Wash	Seattle, Temco Northwest	206-935-4845
Wisc	Milwaukee, R. Zingler	414-351-5005

ELPAC COMPONENTS, Div. Elpac Elctrns., Dept. EM, 3131 So. Standard Ave., Santa Ana, Cal. 92705, Tel: 714-979-4440, TWX: 910-595-1513; Empl.: 130 ..... p. 1147,3253

Sales Manager: D. Allen

Local Sales Offices & Reps.

Ariz	Tempe, Sedco Sls.	602-968-7791
Cal	San Diego, Wes-K Assocs	714-274-4611
Cal	Santa Clara, I-Square, Inc.	408-985-0400
Cal	Van Nuys, Wes-K Assocs.	213-989-3070
Colo	Denver, R. W. Masterson Co.	303-771-1482
Fla	Ft. Lauderdale, CBC Elctrns.	305-484-7330
Fla	Longwood, CBC Elctrns	305-831-5380
Ill	Chicago, Brock & Cushman	312-622-4110
Md	Woodbine, Naudain Assocs Southern	301-442-2270
Mass	Needham Heights, Todino Eng. Sls.	617-444-7925
Mich	Birmingham, J. C. Hofstetter Co.	313-646-3536
Minn	Bloomington, Thomas Mktg.	612-888-5551
NY	Lynbrook, P. Saftler Assocs	516-593-7880
Ohio	Dayton, J. C. Hofstetter Co.	513-296-1010
Ohio	Medina, J.C. Hofstetter Co.	216-241-4880
Okla	Tulsa, H. J. Daly Co.	918-627-4159
Pa	Doylestown, T.O.E. Sls.	215-348-2212
Tex	Dallas, Hillman Entprs.	214-827-4790
Wash	Bellevue, Testco	206-454-7422

Local Distributors

Cal	Carson, Hi-Rel Distribr Sls	714-638-4541
Cal	Los Angeles, MIL-COMM	213-478-6525
Ill	Des Plaines, Edmar Electronics	312-298-8580
NJ	Bergenfield, Tech Elctrns Distribrs	201-384-3643
Tex	Ft. Worth, T.T.I.	817-335-8111
Tex	Houston, Newark Electronics	713-782-4800

ELPOWER CORP., Dept. EM, 2117 S. Anne St., Santa Ana, Cal. 92704, Tel: 714-540-6155; Empl.: 200

Sales Manager: R. Flickinger; *Distributor Manager:* P. Basconcillo

Local Sales Offices & Reps.

Ala	Huntsville, Beacon Elctrns.	205-881-5031
Colo	Englewood, R.G. Bowen	303-780-1884
Fla	Ft. Lauderdale, Beacon Elctrns.	305-971-7320
Ga	Atlanta, Beacon Elctrns.	404-351-3654
Ill	Chicago, G. McL. Cole Co.	312-774-3535
Kans	Prairie Village, Engineering Svcs. Co.	913-649-4000
Mo	St. Louis, Engineering Svcs. Co.	314-997-1515
NJ	Cherry Hill, Trinkle Sls., Inc.	609-795-4200
NJ	N. Caldwell, Masin Esco	201-226-2550
NM	Albuquerque, A.L.S. Elctrns.	505-298-2575
NY	Syosset, Masin-Esco, Inc.	516-364-0310
Ore	Portland, Components West	503-643-5588
Tenn	Oak Ridge, Beacon Elctrns.	615-482-2409
Tex	Dallas, Advance Tech Sls	214-361-8584
Tex	Houston, Advance Tech Sls.	713-469-6668
Wash	Seattle, Components West	206-243-2133

ELTEC INSTRUMENTS INC., Dept. EM, P.O. Box 9610, Daytona Beach, Fla. 32020, Tel: 904-252-0411, TWX: 810-832-6294; Empl.: 25

EMCO HIGH VOLTAGE, Dept. EM, 2444 Old Middlefield Way, Mt. View, Cal. 94043, Tel: 415-969-3056; Empl.: 10

EMCOR PRODUCTS, Dept. EM, 1600 Fourth Ave. NW, Rochester, Minn. 55901, Tel: 507-289-3371, TWX: 910-565-2374

Sales Manager: Gary Ellis

Local Sales Offices & Reps.

Ala	Huntsville, W. A. Brown Instrs.	205-883-8660
Ariz	Scottsdale, PLS Assocs.	602-994-5461
Cal	Cupertino, T. Louis Snitzer Co.	408-257-8333
Cal	Del Mar, T. Louis Snitzer Co.	714-454-2191
Cal	Los Angeles, T. Louis Snitzer Co.	213-836-6170
Colo	Denver, PLS Assocs.	303-773-1218
Conn	Bridgeport, Technical Instrs.	203-368-4582
Fla	Ft. Lauderdale, W. A. Brown Instrs.	305-776-4800
Fla	Melbourne, W. A. Brown Instrs.	305-723-0766
Fla	Orlando, W. A. Brown Instrs.	305-425-5505
Fla	Valparaiso, W. A. Brown Instrs.	904-678-7932
Ga	Atlanta, W. A. Brown Instrs.	404-939-1674
Ill	Des Plaines, Marsland Assocs.	312-694-2262
Ind	Indianapolis, Marsland Assocs.	317-924-3568
La	Mandeville, W.A. Brown Instrs.	504-626-9701
Mass	Wilmington, Technical Instrs.	617-944-3930
Mich	Detroit, Comtel-Sterling Co.	313-255-1970
Minn	Minneapolis, Marsland Assocs.	612-545-4481
Mo	Kansas City, Harris-Hanson Co.	816-444-9494
Mo	St. Louis, Harris-Hanson Co.	314-432-3611
NJ	Ft. Lee, K. E. Hughes Co.	201-944-1600
NM	Albuquerque, PLS Assocs.	505-298-6284
NY	Albany, Reagan/Compar Albany	518-489-4777
NY	Endwell, Reagan/Compar Albany	607-723-9661

NY Fairport, Reagan/Compar Albany 716-271-2230
NY New Hartford, Reagan/Compar Albany 315-732-3775
NY New York City, K. E. Hughes Co. 212-674-6993
NY Plainview, K. E. Hughes Co. 516-938-7664
NC Durham 919-682-2383
Ohio Cleveland, Comtel-Sterling Co. 216-442-8080
Ohio Dayton, Comtel-Sterling Co. 513-298-7573
Ore Beaverton, N. R. Schultz Co. 503-643-1644
Pa Huntingdon Valley, Inacker Sls., Inc. 215-947-5660
Pa Pittsburgh, Comtel-Sterling Co. 412-922-5720
Tenn Oak Ridge, W. A. Brown Instrs. 615-482-5761
Tex Dallas, J. A. Green Co. 214-631-7450
Tex Houston, J. A. Green Co. 713-526-2959
Utah Salt Lake City, PLS Assocs.
Va Alexandria, Dyna Rep Co. 703-354-1222
Wash Bellevue, N. R. Schultz Co. 206-454-0300

EMERSON & CUMING, INC., Dielectric Mat'ls. Div., Dept. EM, 869 Washington St., Canton, Mass. 02021, Tel: 617-828-3300, TWX: 710-348-1324; Empl.: 325

Sales Manager: J.R. Copley

Local Sales Offices & Reps.
Cal Gardena, Emerson & Cuming, Inc. 213-321-6650
Fla Winter Park, Emerson & Cuming, Inc. 305-647-2602
Ill Northbrook, Emerson & Cuming, Inc. 312-272-6700
Md Silver Spring, Emerson & Cuming, Inc. 301-949-2777
Pa Philadelphia, Emerson & Cuming, Inc. 215-848-2040
Tex Richardson, Emerson & Cuming, Inc. 214-235-7394
Wash Seattle, Minor B. Brown & Assoc. 206-932-5855

EMERSON, INDUSTRIAL CONTROLS DIV., Dept. EM, 3300 Standard St., Santa Ana, Cal. 92702, Tel: 714-545-5581, Telex: 67-8460; Empl.: 400

Sales Manager: W. T. Brummett

EMI GENCOM INC., Dept. EM, 80 Express St., Plainview, N.Y. 11803, Tel: 516-433-5900, TWX: 510-221-1889; Empl.: 21

Sales Manager: L. Lieberman

Local Sales Offices & Reps.
Ariz Scottsdale, PLS Assocs. 602-994-5461
Cal N. Hollywood, O'Halloran Assocs. 213-877-0173
Cal Palo Alto, O'Halloran Assocs. 415-326-1493
Colo Denver, PLS Assocs. 303-773-1218
Fla Orange Park, Pulcir 904-264-7615
Ill Chicago, Pivan Engrg. 312-539-4838
Kans Shawnee, Pivan Engrg. 913-722-1030
Mo St. Louis, Pivan Engrg. 314-567-3636
NJ East Orange, Friedman Assocs. 201-673-2500
NM Albuquerque, PLS Assocs. 505-255-2330
Ore Beaverton, Underwood Assocs. 206-575-0123
Pa Elkins Park, Snow Assocs. 215-379-4700
Tenn Oak Ridge, Pulcir 615-483-6358
Tex Dallas, Southwestern Eng. & Equip. Co. 214-827-2621
Tex Houston, Southwestern Eng. & Equip. Co. 713-437-1171
Wash Bellevue, Underwood Assocs. 206-575-0123
Wash Seattle, Underwood Assocs. 206-575-0123

EMI TECHNOLOGY, Dept. EM, 55, Kenosia Ave., Danbury, Conn 06810, Tel: 203-744-3500, TWX: 710-456-3068

Local Sales Offices & Reps.
Ala Huntsville, Lee Assocs. 205-533-5896
Cal Los Alamitos, Scientific Devices 213-598-7678
Cal Mt. View, Scientific Devices 415-964-4230
Haw Honolulu, Aloha Assocs 808-941-1574
Ill Chicago, Carter Elctrns 312-585-5485
Mass Waltham, Scientific Devices 617-890-2252
NJ Englewood, Scientific Devices 201-871-3916
NM Albuquerque, Southwestern Engrg. & Equip. 505-265-6775
Ohio Cleveland, Electro Sls. Assocs. 216-261-5440
Tex Dallas, Southwestern Engrg. & Equip. 214-827-2621
Va Springfield, Scientific Devices 703-451-6500
Wash Bellevue, Scientific Devices 206-454-0900

EMPORIUM SPECIALTIES CO., INC., Dept. EM, Box 65, Austin, Pa. 16720, Tel: 814-647-8661; Empl.: 150

Local Sales Offices & Reps.
Ariz Scottsdale, C.T. Fink & Assocs. 602-947-7981
Cal Lynwood, D. West & Assocs. 213-636-6124
Conn Woodbury, Hart, Nininger & Campbell 203-263-4321
Fla Lighthouse Point, E. Whalen 305-781-6996
Ill Chicago, K.D. Engle Co. 312-539-1820
Mass Gloucester, P. Hart 617-281-0679
Mich St. Claire Shores, L. Donlon 313-775-6496
Minn Anoka, Magner & Assocs. 612-483-0656
NJ Montvale, H. Herzing 201-573-0967
NY Roslyn Heights, R. Binder 516-621-8279
NC Charlotte, B. T. Walker 704-364-8562
Ohio Cleveland, G.F. Sindelar Co. 216-333-9945
Tex Richardson, C.J. Garvey Co. 214-234-3371
Wisc Wauwatosa, C. Garny 414-475-9290

EMPRO MFG. CO., INC., Dept. EM, Box 26064, 10920 E. 59th St., Indianapolis, Ind. 46226, Tel: 317-823-4478; Empl.: 25 p. 2732

Local Sales Offices & Reps.
Cal LaCanada, Lew Brooks Co. 213-790-8358
Cal Santa Ana, Lew Brooks Co. 714-544-8900
Ga Atlanta, Brownell Electro Inc. 404-762-5181
Ill LaGrange, PVA Co 312-352-1037
Mass Burlington, Mancib Co. 617-272-9450
NJ Cedar Grove, D.F. Tobias & Co. 201-239-8585
Ohio Cleveland, Weschler Elec. Corp. 216-251-4609
Pa Philadelphia, Sunshine Scientific Inst. 215-673-5600

EMR TELEMETRY, DIV. SANGAMO-WESTON, Dept. EM, Box 3041, Sarasota, Fla. 33578, Tel: 813-371-0811, TWX: 052-890 810-864-0406; Empl.: 800

Sales Manager: G. E. Ramsey

Local Sales Offices & Reps.
Ala Huntsville, EMR-Telemetry 205-883-2582
Cal Carson, EMR-Telemetry 213-515-0449
Cal Cupertino, EMR-Telemetry 408-257-1813
Cal El Segundo, Sangamo Recorders 213-640-0847
Cal Lancaster, EMR-Telemetry 805-948-7614
Cal San Mateo, Sangamo Recorders 415-574-4646
Cal Woodland Hills, EMR-Telemetry 213-348-6872
Fla Orange Park, Sangamo Recorders 904-264-3826
Fla Sarasota, EMR-Telemetry 813-371-0811
Ill Arlington Hgts, Sangamo Recorders 312-255-8823
Md Silver Spring, EMR-Telemetry 301-588-8200
Mass Bedford, Claflin Assocs. 617-275-7428
Mass Burlington, Sangamo Recorders 617-272-2729
Mich Southfield, EMR-Telemetry 313-559-2580
Mo Ballwin, Sangamo Recorders 314-391-7288
NM Albuquerque, EMR-Telemetry 505-293-6435
NM Albuquerque, Sangamo Recorders 505-268-3964
NY Port Jefferson Sta, Sangamo Recorders 516-331-2053
Pa Devon, Sangamo Recorders 215-687-3220
Tex Houston, Sangamo Recorders 713-856-4432
Va McLean, Sangamo Recorders 703-893-7343
Wash Seattle, EMR-Telemetry 206-575-4550
Exp Fla., Sarasota, EMR-Telemetry 813-371-0811

ENCODER DIVISION, Litton Sys. Inc., Dept. EM, 20745 Nordhoff St., Chatsworth, Cal. 91311, Tel: 213-341-6161, TWX: 910-494-1229; Empl.: 205 p. 1653

Local Sales Offices & Reps.
Ariz Phoenix, Clifton Precision Prod. 602-242-0910
Cal Van Nuys, G. Mitchell Assoc. 213-989-5111
Ill Elk Grove Village, Midwest Meridian Corp. 312-437-6531
Iowa Cedar Rapids, Midwest Meridian Corp. 319-365-6561
Mo Maryland Heights, Midwest Meridian Corp. 314-878-4441
NY Chappaqua, R. M. Glueck Assoc. 914-238-3233
Ohio Dayton, Midwest Meridian Corp. 513-256-6960
Tex Hurst, Midwest Meridian Corp. 817-589-1711

ENCOM PRODS. CO., INC., Dept. EM, Lower Hopewell Rd., Box 300, Oxford, Pa. 19363, Tel: 215-932-9265

Local Sales Offices & Reps.
Pa Pittsburgh, Control Assembly Co.

ENDEVCO, Div. Becton, Dickinson & Co., Dept. EM, 30700 Rancho Viejo Rd., San Jaun Capistrano, Cal. 92675, Tel: 714-493-8181, TWX: 68-5608, 910-596-1415; FSC No.: 95411; Empl.: 400

Sales Manager: B. Toffelmier

Local Sales Offices & Reps.
Cal Anaheim, Endevco 714-493-8181
Cal Palo Alto 415-969-3212
Ga Atlanta 404-761-4996
Ill Chicago 312-867-4505
Md Towson 301-752-0688
NH Nashua 603-889-6806
NJ E. Brunswick 201-254-9600
Ohio Cleveland 216-659-3138
Tex Houston 713-931-8948

ENDICOTT COIL CO., Dept. EM, 24 Charlotte St., Binghamton, N.Y. 13905, Tel: 607-797-1263, TWX: 510-252-0155; Empl.: 150 p. 1342,2478

Sales Manager: R.S. Rakowski

Local Sales Offices & Reps.
Cal Palo Alto, Testco Inc. 415-324-1900
Cal Panorama City, Sentenac Assoc. 213-988-2671
Colo Parker, Tech Mktg Assoc. 303-841-3435
Conn Trumbull, Sir Assocs 203-268-2560
Fla Pompano Beach, Cole-Tek Assocs 305-781-8110
Ill Elk Grove Village, Carlson Elctrn Sls 312-956-8420
Kans Prairie Village, Engrg Svcs Co. 913-649-4000
Md Timonium, Heller Assoc. 301-252-4780
Mass Lexington, Sir Assoc. 617-862-1812
Mich Detroit, Blumenberg Assoc. 313-557-1934
Mo St. Louis, Engineering Svcs. Co. 314-997-1515
NM Albuquerque, Technology Mktg. 505-298-2415
NY Rochester, H.C. Johnson 716-482-3000
NY Valley Stream, Hyrel-Idalee 516-825-8955
NC Raleigh, Candor Co. 919-876-4999
Ohio Dayton, Dynel Co. 513-434-6467
Okla Tulsa, Palatine Sls. 918-622-0321
Pa Bridgeport, Freedman Assoc. 215-279-5767
SC Myrtle Beach, Candor Co. 803-448-8361
Tenn Chattanooga, Candor Co. 615-894-9686
Tex Richardson, Palatine Inc. 214-231-9489
Wash Bellevue, Testco 206-454-7422
WVa Glenshaw, H.C. Johnson 412-961-0414

ENGDAHL ENTERPRISES, Dept. EM, 2850 Monterey Ave., Costa Mesa, Cal. 92626, Tel: 714-540-0398

ENGELHARD MINERALS & CHEM., Engelhard Inds. Div., Dept. EM, 70 Wood Ave So, Iselin, NJ 08830, Tel: 201-321-5900, Telex: 83-3147; Empl.: 3,500

Local Sales Offices & Reps.
Ala Birmingham 205-822-5592
Cal Hayward 415-782-9982
Cal Los Angeles 213-724-1800
DC Washington, D.C. 202-296-7077
Ill Skokie 312-673-1900
Mich Southfield 313-358-1920
Tex Houston 713-627-2160

ENGELMANN MICROWAVE, Dept. EM, Skyline Dr., Montville, N.J. 07045, Tel: 201-334-5700, TWX: 710 987-8344; Empl.: 100

Sales Manager: C. Schraufnagl

Local Sales Offices & Reps.
Cal Inglewood, L & M Engrg., Inc. 213-674-6850
Cal Santa Clara, L & M Engrg. Inc. 408-243-2891
Fla Fort Lauderdale, Snow Co. 305-563-2448
Ga Smyrna, SparTech Assocs. 404-432-3644
Ill Highland Park, Feller Assocs. 312-433-3651
Ind Rochester, Feller Assocs. 219-223-2377
Md Columbia, Neal Deoul Assocs. 301-997-4353
Mass Waltham, Measurement Consultants Corp. 617-890-4400
NJ Cresskill, Lars Microwave 201-871-0024
NY Bridgeport, Lightstone Corp. 315-699-5747
NY Huntington, CDB Enterprises, Inc. 516-692-5200
Tex Garland, Vector Sls. Co. 214-276-4518
Wash Bellevue, Ray Over Sls. 206-454-4551

ENGINEERED COMPONENTS CO., Dept. EM, 3580 Sacramento Dr., San Luis Obispo, Cal. 93401, Tel: 805-544-3800; FSC No.: 32440; Empl.: 90

ENI, INC., See Electronic Navigation Inds., Inc.

ENI POWER SYSTEMS, Dept. EM, 3000 Winton Rd. S., Rochester, N.Y. 14623, Tel: 716-473-7330, Telex: 97-8283; Empl.: 20

Sales Manager: L. M. Salmen

ENM, Dept. EM, 5350 Northwest Hwy., Chicago, Ill. 60630, Tel: 312-775-8400, Telex: 25-4068; Empl.: 140

Sales Manager: G. Glynn; *Distributor Manager:* J. Sutter

Local Sales Offices & Reps.
Cal San Francisco, USI Int'l. 415-647-3400
Colo Englewood, Mikro Sls. Co., Inc. 303-770-2623
Fla Orlando, B & M Sls. 305-855-1002
Ill Chicago, Stevens Engrg. 312-545-4744
Mass Newton Upper Falls, Anchor Engrg. Corp. 617-964-6205
Minn Minneapolis, Jos. Co./Melius Inc. 612-854-4270

Mo Independence, Gribble Sls. Engrg. 816-796-4333
NJ Barrington, Milton E. Carter 609-547-4691
NY Manhasset, Ray Fara & Assocs. 516-627-1151
NY Rochester, F.H. Dasson 716-338-1699
Ohio Perrysburg, ENM Co. - Toledo .. 419-874-8694
Tex Richardson, Campion Sls. 214-238-8145

ENTERPRISE DEVELOPMENT CORP., Dept. EM, 5127 E. 65th St., Indianapolis, Ind. 46220, Tel: 317-251-1231; Empl.: 10

Local Sales Offices & Reps.
Cal Redondo Beach, Oberman-Renner Sls. 213-772-1113
Fla St. Petersburg, J.F. Thompson Co. 813-866-0045
Ga Tucker, Elrep Sls. Co. 404-938-7108
Ill Skokie, M. Berman Sls. 312-679-2293
Ind Indianapolis, Elctrn. Rep., Inc. 317-894-1414
Mich Livonia, F. Peters & Assocs. 313-425-0086
Minn Minneapolis, Borrett & Lee Corp. 612-929-0028
Mo Ballwin, R.J. Throckmorton Sls. Co. 314-227-7222
NY Camillus, Callahan-Ferguson Co. 315-487-3870
Ohio St. Mary's, T. Shelby & Co. 419-394-3377
Pa Philadelphia, S.K. Macdonald, Inc. 315-545-1205

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ENTRAN DEVICES, INC., Dept. EM, 145 Paterson Ave., Little Falls, N.J. 07424, Tel: 201-785-4060, Telex: 130-361

Sales Manager: D. Slavik

Local Sales Offices & Reps.
Ala Huntsville, Lee Assocs. 205-533-5896
Ariz Tempe, J. Smith & Assocs. 602-968-7025
Cal Cupertino, Applied Measurements 408-446-4792
Cal Long Beach, Saber Entprs. 213-595-5646
Colo Lakewood, J. Smith & Assocs. .. 303-442-7100
Conn Canton, Daner-Hayes 203-426-9094
Fla Winter Haven, Lee Assocs. 813-294-5815
Ga Buford, Lee Assocs. 404-945-4222
Ill Glen Ellyn, G.B. Hall Co. 312-858-1700
Mass Newton Centre, Daner-Hayes 617-969-4650
Mich Southfield, Stress Analysis Svcs. 313-356-6686
NM Albuquerque, J. Smith & Assocs. 505-265-3406
NY Port Washington, Daner-Hayes .. 516-883-4576
NY Rochester, Daner-Hayes 716-467-5100
Ohio Medina, Stress Analysis Svc. 216-725-7733
Pa Frazer, Measurements, Inc. 215-644-7142
Tex Dallas, Technical Prods. 214-357-9603
Va Fredericksburg, Measurements, Inc. 703-373-5520
Wash Bellevue, Topp Engineering Sls. Corp. 206-747-5401

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ENVIRONMENTAL COMMUNICATIONS, Dept. EM, 3150 Pullman St., Costa Mesa, Cal. 92627, Tel: 714-557-7800, TWX: 910-595-1781; Empl.: 76

ENVIRONMENTAL CONTAINER SYS., INC., Dept. EM, 3560 Rogue River Hwy., Box 188, Grants Pass, Ore. 97526, Tel: 503-476-8871; FSC No.: 24995; Empl.: 100 ..... p. 1028,1029

Local Sales Offices & Reps.
Ariz Phoenix, R. A. Mayes Co. 602-279-5243
Colo Boulder, R. A. Mayes Co. 303-444-0782
Fla Clearwater, Brennan Assocs 813-446-5006
Md Silver Spring, Spectro Sys 301-949-8261
NH Nashua, Environmental Container Systems 603-883-3411
NM Albuquerque, R.A. Mayes Co. 505-293-8010
Okla Bixby, E. B. Robertson, Inc. 918-369-5688
Tex Dallas, E.B. Robertson, Inc. 214-942-2716
Tex Houston, E. B. Robertson, Inc. ... 713-785-6800
Utah Centerville, R. A. Mayes Co. 801-292-6781

ENVIRONMENTAL RESEARCH GRP., Dept. EM, 117 N. First St., Ann Arbor, Mich. 48103, Tel: 313-662-3104; Empl.: 40

Local Sales Offices & Reps.
Ill Chicago 312-430-1112
Mich Ann Arbor 313-662-3104
Ohio Cleveland 216-447-0790

EPIC, INC., Dept. EM, 150 Nassau St., New York, N.Y. 10038, Tel: 212-349-2470; Empl.: 8

Sales Manager: Peter Letica

EPICOM, INC., Dept. EM, 592 N. Douglas Ave., Altamonte Springs, Fla. 32701, Tel: 305-869-5000; Empl.: 26

Sales Manager: R. Ostrander

Local Sales Offices & Reps.
Ala Huntsville, W. A. Brown Instrs 205-883-8660
Ariz Phoenix, Comm Diversified 602-268-1414
Cal Las Gatos, Hefte Inds 408-264-8319
Cal Mountain View, CSS Telecommunications 415-964-4335
Cal Santa Ana, CSS Telecommunications 714-546-8430
Cal Torrance, Edwards Assocs 213-328-9770
Colo Denver, Thorson Co 303-759-0809
Fla Orlando, W. A. Brown Instrs 305-425-5505
Ga Atlanta, W. A. Brown Instrs 404-455-1035
Ill Arlington Hgts, Dytec Central 312-394-3380
Ind Ft. Wayne, Dytec North 612-645-5816
Kans Lenexa, Dytec South 913-888-0215
La Mandeville, W. A. Brown Instrs .. 504-626-9701
Md Cockeysville, Advanced Tech Sls 301-666-9027
Mass Newtonville, Eastmark 617-449-0050
Minn St. Paul, Dytec North 612-645-5816
Mo Hazelwood, Dytec South 314-731-5400
NJ Albuquerque, Data Handling Co 505-268-4364
NJ Ft. Lee, Tecnimat 201-461-8686
NY Syracuse, NACO Elctrns Corp .. 315-699-2651
NC Durham, W. A. Brown Instrs 919-682-2383
Ohio Chagrin Falls, E. C. Koepf Assocs 216-247-3856
Pa Jenkintown, Stein Instrumentation 215-885-2370
Tenn Oak Ridge, W. A. Brown Instrs .. 615-482-5761
Tex Irving, Noakes Data Comm 214-255-1151
Utah Salt Lake City, Thorson Co 219-485-0845
Wash Seattle, CSS Telecommunications 206-367-1440

EPOXYCAST ELECTRONIC CASE CO., Dept. EM, 222 Lake Ave., Yonkers, N.Y. 10701, Tel: 914-YO3-5900; Empl.: 20

Local Sales Offices & Reps.
Mass Lynnfield, Grady & Assocs. 617-334-6633

EPSCO, INC., Dept. EM, 920 Westwood Dr., Addison, Ill. 60101, Tel: 312-543-0410; FSC No.: 53003; Empl.: 6 p. 3260

Local Distributors
Ala Opelika, Southern Elec. 205-745-5298
Alas Anchorage, Yukon Radio Supply Corp. 907-277-7117
Ariz Phoenix, Dalis Elctrn Supply 602-258-8151
Ark Little Rock, Carlton-Bates Co. 501-562-9100
Cal Garden Grove, Allied Elctrns. 213-598-6605
Cal Oakland, Brill Elctrns 415-834-5888
Colo Denver, Newark Elctrns 303-757-3351
Conn New London, Aikins Elctrn. Supply 203-442-4406
Del Wilmington, Almo Elctrn. Corp. .. 302-656-9467
DC Washington, Graybar Electric 202-723-9500
Fla Tampa, Leader Elctrns 813-835-1891
Fla Tampa, Lykes Elctrns. 813-886-6621
Ga Atlanta, Spec. Distr. Co. 404-873-2521
Haw Honolulu, Honolulu Elctrn. 949-5564
Idaho Twin Fall, Central Elctrn.
Ill Chicago, Newark Elctrns. 312-638-4411
Ill Chicago, Allied Elctrn. 312-421-2400
Ind Ft Wayne, Ft Wayne Elctrns Supply 219-423-3422
Ind Indianapolis, Graham Elctrns. Supply 317-634-8202
Iowa Cedar Rapids, Deeco, Inc. 319-365-7551
Kans Wichita, Interstate Elctrns Supply 316-264-6316
Ky Lexington, Radio-Elctrn. Equip. .. 606-255-6661
La New Orleans, Radio Parts 504-581-5919
Me Portland, Holmes Distr. 207-774-5901
Md Rockville, Capitol Radio Wholesalers 301-881-2270
Mass Deedham, Gerber Elctrns. 617-329-2400
Mich Lansing, Fulton Radio 517-394-5020
Mich Livonia, R.S. Elctrns 313-525-1155
Minn Duluth, Northwest Radio of Duluth 218-727-1565
Miss Jackson, Ellington Elctrn. Supply 601-355-0561
Mo Kansas City, Walters Radio Sup. 816-531-7015
Mo St. Louis, Olive Elctrn 314-426-4500
Mont Billings, Elctrn. Supply Co. 406-252-2197
Neb Omaha, Radio Equip 402-341-7700
Nev Las Vegas, Indl. Elctrns. 702-384-2151
NH Concord, Evans Radio & Elctrns. 603-224-9961
NJ Bridgeport, VWR Scientific Corp 609-467-2600
NJ East Hanover, State Elctrns. 201-887-2550
NJ Rahway, Quad Parts Distr. 201-381-5400
NM Albuquerque, Walker Radio 505-247-2288
NY Brooklyn, National Euphonics 212-778-0800
NY Buffalo, Standard Elctrns 716-685-4330
NY Rochester, Rochester Radio Supply 716-454-7800
NC Raleigh, Southeastern Supply 919-828-2313
ND Minot, J-I Co., Inc. 701-838-5466
Ohio Columbus, Hughs Peters 614-294-5351
Ohio Lima, Lima Radio 419-228-1220
Okla Oklahoma City, Trice Wholesale Elctrns. 405-232-2291
Ore Pittsburg, CAM/RPC Industrial Elctrns 412-782-3770
Ore Portland, United Radio Supply.... 503-233-5346
RI Providence, W. Dandretta & Co. 401-861-2100
SC Columbia, Dixie Radio Supply 803-253-5333
SD Mitchell, Elctrn. Supply Co. 605-996-4300
Tenn Kingsport, Radio Electric Supply 615-247-8111
Tex Dallas, Wholesale Electronics Supply 214-824-3001
Tex Ft. Worth, Allied Elctrns. 817-336-5401
Utah Salt LaKe City, Newark Elctrns.. 801-486-1048
Vt White River Jct., Elctrn. Supply.. 802-295-3536
Va Norfolk, Avec Elctrns 804-627-3502
Wash Seattle, Western Elctrns. Co. 206-284-0200
WVa Charleston, McJunkin Corp. 304-348-4919
Wisc Milwaukee, Marsh Elctrns 414-475-6000
Wyo Casper, Fleming Supply Co.
Exp: Can., Toronto 19, Ont., Atlas Elctrns. Ltd. 416-781-6174

EPSCO, INC., Dept. EM, 411 Providence Hwy., Westwood, Mass. 02090, Tel: 617-329-1500, TWX: 710-348-0484; FSC No.: 99380; Empl.: 150 .. p. 2861

Local Sales Offices & Reps.
Cal Anaheim, Blair Assocs. 714-635-1350
Cal Palo Alto, R-V Assocs 415-967-5994
Cal Palos Verdes, EPSCO/Brocks .. 213-831-3677
Ga Kingsland, EPSCO/Brocks 912-729-3295
Ill Northfield, Feller Assocs. 312-446-8065
Mass Westwood, EPSCO, Inc 617-329-1500
NJ Dover, PRW Corp. 201-366-9421
NJ Hayworth, Central Assocs. 201-568-0808
NY Old Bethpage, Central Assocs... 516-433-0808
Tex Fort Worth, C. Wolf & Assocs. .. 817-461-7333
Tex Garland, Carey Wolf & Assocs.. 214-494-1212
Tex Houston, C. Wolf & Assocs. 714-721-2442
Tex San Antonio, Data Applications.. 512-732-7176
Va Bailey's Crossroads, Q.T. Elctrns Sls 703-671-4357
Wash Seattle, EPSCO/Brocks 206-575-3853
Wash Seattle, Datacom Assocs. 206-285-2525
Exp: Hallandale, Emec, Inc. 305-925-6366

Local Distributors
Cal Irvine, Seagull Marine 714-979-6161
Cal San Rafael, Mercury Marine 415-457-7070
Fla Marathon Shores, Maritronics South 305-743-3705
Fla No. Miami Beach, Fleet Marine Supply 305-945-4253
Fla Sanford, BFJ Communications .. 800-327-2200
Ill Chicago, Skipper Marine Elctrns 312-726-1721
Md Glen Burnie, Able Marine Elctrns 301-761-7829
Mass Medford, Imtra Corp. 617-391-5660
NJ Spring Lake Hgts, Win-Tron Elctrns 201-449-4211
NY New Rochelle, Griffith Marine Navigations 212-828-5554
Tex Seabrook, Seabrook Marine 713-334-1414
Wash Seattle, Marland Entprs 206-284-3906
Wash Tukwila, Sky-Mar, Inc. 206-575-3860

EPSILON-LAMBDA ELCTRN. CORP., Dept. EM, 28 S. Water St., Batavia, Ill. 60510, Tel: 312-879-6006; Empl.: 15

Local Sales Offices & Reps.
Exp: N.J., Tenafly, Lars Microwave 201-871-0024

EQUIPTO, Aurora Equipment Co., Dept. EM, 225 So. Highland Ave., Aurora, Ill. 60507, Tel: 312-859-1000; Empl.: 300

EQUIPTO ENCLOSURE SYSTEMS, Div/Equipto Elec. Corp., Dept. EM, 435 Woodlawn Ave., Aurora, Ill. 60507, Tel: 312-897-4691; FSC No.: Multiple; Empl.: 40 ..... p. 1030

Local Sales Offices & Reps.

Ala	Huntsville, J.L. Highsmith & Co.	205-881-3294
Ariz	Tempe, E.J. Foley & Assocs.	602-894-2345
Cal	Menlo Park, Long & Assocs.	415-327-1300
Cal	San Gabriel, Van Gott & Assocs.	213-285-2148
Colo	Littleton, Grifco Inc.	303-795-1989
Conn	Glastonbury, Edcom, Inc.	203-633-1380
Fla	Orlando, J.L. Highsmith Co.	305-293-5202
Haw	Honolulu, Aloha Assoc	808-941-1574
Ill	Palatine, J. Clark Co.	312-358-5095
Ind	Indianapolis, Scott Elctrns.	317-897-9976
Ky	Louisville, Scott Elctrns.	502-583-3220
Md	Silver Spring, Sel-Tronics	301-589-3391
Mass	Newtonville, Edcom, Inc.	617-969-9710
Mich	Plymouth, Scott Elctrns.	313-455-2440
Minn	Minneapolis, Elctrn. Innovators Inc	612-884-7471
Mo	Blue Springs, Cairns & Hayes Elctrn. Sls. Co.	816-229-1404
Mo	St. Charles, Cairns & Hayes Elctrn. Sls. Co.	314-946-6677
NY	Port Chester, Radiation Elctrns., Inc.	914-937-2300
NY	Syracuse, Labtronics, Inc.	315-454-9314
NC	Charlotte, J.L. Highsmith & Co.	704-333-7743
Ohio	Cleveland, Scott Elctrns.	216-291-2600
Ohio	Dayton, Scott Elctrns.	513-294-0539
Pa	Pittsburgh, Scott Elctrns.	412-828-1073
Pa	Valley Forge, J.E. Cuesta & Co.	215-265-5800
Tex	Dallas, Kruvand Assocs.	214-691-4592
Tex	Houston, Kruvand Assocs.	713-780-9710
Va	Richmond, J.L. Highsmith & Co.	804-272-5888
Wash	Bellevue, Olson, Ferree & Assocs.	206-454-1210
Exp:	Can., Hamilton, Ont., Cartwright Southall Assocs.	416-528-0294

ERA TRANSPAC CORPORATION

ERA TRANSPAC CORP., Sub. Elctrn. Research Assocs., Dept. EM, 311 B East Park St. Dept. 1202, Moonachie, N.J. 07074, Tel: 201-641-3650, TWX: 710-990-5064; FSC No.: 96762; Empl.: 100 p. 3254-3259

Sales Manager: T. Gordon

Local Sales Offices & Reps.

Ala	Huntsville, Repcom Inc.	205-534-2235
Cal	San Jose, L & M Engrg.	408-292-3220
Cal	Santa Monica, Rep Assocs.	213-829-5401
Conn	Stonington, Electronic Sls. of New England	203-443-2646
Fla	Melbourne, Repcom	305-254-1877
Ill	Rolling Meadows, Lightner Assoc.	312-398-3000
Md	Fulton, Gans, Fryling & Pugh	301-837-6311
Mass	Attleboro, ESNE	617-222-4078
Mo	St. Louis, Al Prel & Assocs.	314-991-4833
NY	Fayetteville, M.P. Andrews Co.	315-637-3144
NY	Plainview, R.H. Smith Assocs.	516-681-3155
NY	Spring Valley, R. Smith Assocs.	914-354-6067
NC	Charlotte, Repcom Inc.	704-525-4666
Pa	Conchohocken, Scientific Devices	215-825-9515
Tex	Houston, Spectra Sls. Corp.	713-524-7800
Tex	Richardson, Spectra Sls. Corp.	214-234-3600
Va	Arlington, Gans, Fryling & Pugh	703-527-3262
Wash	Bellevue, Olson, Ferree & Assoc.	206-454-1210

ERASER CO., Dept. EM, Box 1342, Syracuse, N.Y. 13201, Tel: 315-454-3237, Telex: 93-7442; Empl.: 38

Sales Manager: L. Broadbent

Local Sales Offices & Reps.

Ark	Hot Springs, Meredith Young Assoc.	501-262-1365
Cal	Santa Anna, Kendall Mktg Corp.	714-835-5302
Fla	Ft. Lauderdale, Bob Melvin Production Equip	800-327-5553
Ill	Hillside, Miltex Sls	312-449-0420
Md	Annapolis, Kirk-Sandell Inc.	301-268-2468
Mass	Stoneham, Production Devices	617-438-2772
Minn	Minnetonka, Baillie Sls & Engrg Co.	612-933-7989
NY	Fayetteville, Tri-Tech Elctrns	315-446-2881
NY	Great Neck, F. Tylinski Co.	516-466-9070
Ohio	Strongsville, Jim Finnegan & Co.	216-826-1033
Pa	Ft. Washington, Kirk-Sandell Inc.	215-643-2100
Tex	Dallas, Production Automation Corp.	214-620-0227
Wash	Bellevue, Rowel Northwest	206-455-2686

ERC, See Electronic Research Co.

ERIE FREQUENCY CONTROL, Div. Erie Technological Prods., Dept. EM, 453 Lincoln St., Carlisle, Pa. 17013, Tel: 717-249-2232, Telex: 84-2328; Empl.: 250 ..... p. 2320-2323

Local Sales Offices & Reps.

Cal	Palo Alto	415-327-1520
Cal	Santa Ana	714-835-4822
Fla	Maitland	305-644-0954
Ill	Des Plaines	312-297-5560
Ind	Fort Wayne	219-484-1528
Mass	Wakefield	617-245-7880
NJ	Pennsauken	609-655-4787
NC	Greensboro	919-299-1905
Tex	Richardson	214-238-8211
Exp:	Pa.	814-453-5611

ERIE TECHNOLOGICAL PRODUCTS, Dept. EM, PO Box 961, Erie, Pa. 16512, Tel: 814-453-5611, Telex: 91-4436; FSC No.: Multiple; Empl.: 2300

Distributor Manager: J.H. Ohlrich

Local Sales Offices & Reps.

Cal	Palo Alto, Erie Technological Prods., Inc.	415-327-1520
Cal	Santa Ana, Erie Technological Prods., Inc.	714-835-4822
Fla	Maitland, Erie Technological Prods., Inc.	305-644-0954
Ill	Des Plaines, Erie Technological Prods., Inc.	312-297-5560
Ind	Fort Wayne, Erie Technological Prods., Inc.	219-484-1528
Mass	Wakefield, Erie Technological Prods., Inc.	617-245-7880
Mo	North Kansas City, LCOMP, Inc./Kansas City	816-221-2400
NJ	Pennsauken, Erie Technological Prods., Inc.	609-665-4787
NC	Greensboro, Erie Technological Prods., Inc.	919-299-1905
Pa	Erie, Erie Technological Prods., Inc.	814-453-5611
Tex	Richardson, Erie Tech. Prod. Inc.	214-238-8211
Exp:	Erie, Pa., Erie Technological Prods. Export Sls.	814-453-5611

Local Distributors

Cal	El Segundo, Liberty Elctrns.	213-322-8100
Cal	Glendale, R. V. Weatherford Co.	213-849-3451
Cal	Mt. View, Elmar Elctrns.	415-961-3611
Ill	Chicago, L Comp Inc.	312-865-7600
Ill	Chicago, Newark Elctrns. Corp.	312-638-4411
Md	Baltimore, Radio Electric Svc. Co.	301-823-0070
Mass	Newton Centre, Cramer Elctrns.	617-969-7700
NY	Buffalo, Summit Distrs. Inc.	716-884-3450
NY	Farmingdale, Arrow Elctrns.	516-694-6800
NY	Freeport, Milgray Elctrns.	516-546-6000
Pa	Philadelphia, Powell Elctrns.	215-365-1900
Tex	Richardson, Altair Co.	214-231-5176

ERIKSON SPECIALIZED TOOL CO., Dept. EM, Box 424, Pico-Rivera, Cal. 90660, Tel: 213-699-3719; Empl.: 4

ESB WISCO INC., Dept. EM, 1222 18th St., Racine, Wisc. 53403, Tel: 414-637-9131, TWX: 910-271-2382; Empl.: 150

ESC ELECTRONICS CORPORATION

ESC ELCTRNS. CORP., Dept. EM, 534 Bergen Blvd., Palisades Pk., N.J. 07650, Tel: 201-947-0400, TWX: 710-991-9780; Empl.: 120 ....p. 2402,2403,2628,2629

Local Sales Offices & Reps.

Ariz	Tempe, Sedco Sls.	602-968-7791
Cal	Los Alamitos, Westaironics Inc.	213-431-1101
Cal	Marina Del Ray, Westaironics Inc.	213-821-7958
Cal	San Diego, Hadden Assocs.	714-565-9444
Cal	Santa Clara, Rodgers Assoc.	408-984-8110
Colo	Denver, D/Z Assocs	303-534-3649
Conn	Norwalk, Betronic Assocs.	203-853-7630
Fla	Altamonte Springs, QXI, Inc.	305-331-1001
Fla	St. Petersburg, QXI, Inc.	813-821-2281
Fla	Tamarac, QXI, Inc.	305-485-6030
Ill	Elk Grove, Carlson Elctrns. Sls. Co.	312-956-8240
Ind	Indianapolis, Carlson Elctrn. Sls. Co.	317-253-5610
Md	Glen Burnie, New Era Sls.	301-768-6666
Mass	Waltham, Betronic Assocs.	617-894-8400
Minn	New Brighton, TWC Sales	612-636-1770
Mo	St. Louis, Kebco	314-569-2660
NJ	Cherry Hill, S. Auerbach	609-983-7862
NJ	Clifton, A. Clarfield Assocs.	212-757-6454
Tex	Austin, Allied Comps	512-837-0037
Tex	Dallas, Allied Comps	214-238-0408
Tex	Houston, Allied Comps	713-960-1962
Wisc	Milwaukee, Carlson Elctrn. Sls. Co.	414-476-2790
Exp:	N.J., Palisades Park, ESC Elctrn. Corp.	201-947-0400

ESCO PRODUCTS, Dept. EM, Oak Ridge Rd., Oak Ridge, NJ 07438, Tel: 201-697-3700; Empl.: 35

ESE, Dept. EM, 505½ Centinela Ave., Inglewood, Cal. 90302, Tel: 213-674-3021 ..... p. 2734,2735

Sales Manager: R. Mayers; *Distributor Manager:* R. Mayers

Local Distributors

Fla	Ft. Lauderdale, Lauderdale Elctrn Labs	305-764-7755
Ga	Atlanta, Roscom, Inc	404-577-4689
Ind	Richmond, Allied Broadcast Equip	317-962-8596
Ky	Louisville, Cisler Sight & Sound	502-584-5535
Mich	Farmington Hills, H. M. Dyer Elctrns	313-478-2157
Mich	Grand Rapids, Audio Distributors	616-452-1596
NJ	Bridgeport, Tele-Quip	609-467-3535
NM	Taos, Dyma Engrg.	505-758-2686
NY	New York, Martin Audio	212-541-5900
NY	Port Washington, David Bain	516-883-4818
Pa	Pittsburgh, Ro-Cel Elctrns	412-781-2326
Tex	Richardson, Savco	214-234-1841
Va	Leesburgh, David Green	703-777-8660
Wash	Federal Way, Track Audio	206-941-2233
For:	Australia, Chatswood, NSW, Syntec Pty. Ltd.	406-4627
For:	Can., Rexdale, Ont, Comad	416-745-6494
For:	Can., Vancouver, B.C., Nortec West Ltd	604-872-8525

E.S.I. INC., Dept. EM, 13900 N.W. Science Park Dr., Portland, Oregon 97229, Tel: 503-641-4141, Telex: 360-273; Empl.: 220

Sales Manager: S. Gressel

Local Sales Offices & Reps.

Ala	Huntsville, Gentry Assocs.	205-534-9771
Cal	Orange, Electro Scientific Inds.	714-633-0643
Cal	Palo Alto, Electro Scientific Inds.	415-494-7458
Fla	Orlando, Gentry Assocs.	305-894-4401
Ill	Rosemont, Electro Scientific Inds.	312-696-4322
Mass	Waltham, Electro Scientific Inds.	617-899-6633
NJ	Bergenfield, Electro Scientific Inds.	201-385-9493
NY	Camillus, Electro Scientific Inds.	315-487-3155
NC	Burlington, Gentry Assocs.	919-227-3639
Tex	Austin, Crockett Southwest Co.	512-451-8269
Tex	Dallas, Crockett Southwest Co.	214-251-1776
Tex	Needville, Crockett Southwest Co.	713-342-2176

ESICO, INC., Dept. EM, Box 247, Deep River, Conn. 06417, Tel: 203-526-5361; Empl.: 40

Local Sales Offices & Reps.

Ga	Atlanta, Electr-Mech Sls. Engrg. Co.	404-449-6337
Ill	Hillside, Miltex Sls Corp.	312-449-0420
Ohio	Dayton, AMES Corp.	513-435-9730
Tex	Dallas, Tooltronics, Inc.	214-661-0700

ESSCO INDUSTRIES, Dept. EM, PO Box 515, Sierra Madre, Cal. 91024, Tel: 213-355-8825; Empl.: 32

Local Sales Offices & Reps.

Ala	Huntsville, Reynolds & Assocs.	
Cal	Los Angeles, R. F. Specialists	213-785-0503
Fla	Satellite Beach, Reynolds & Assocs.	305-773-4700
Ga	Atlanta, Reynolds & Assocs.	
Ill	Chicago, Midwest Elctrn. Ind.	312-777-9700
Mich	Ferndale, TIBY Co.	313-547-3550
NC	Winston Salem, Reynolds & Assocs.	
Ohio	Cleveland, TIBY Co.	216-371-5335

ESSEX GROUP, Dept. EM, 3501 W. Addison, Ft. Wayne, IN. 46809, Tel: 219-478-1521

Sales Manager: L. Long

ESSEX INT'L., INC., Telecommunications Prods. Div., Dept. EM, 800 E. Garfield Ave., Decatur, Ill. 62526, Tel: 217-429-2531, TWX: 910-243-4300

ESSEX GRP - INDL WIRE PRODS DIV., Sub. United Tech, Dept. EM, 6235 S. Harlem Ave., Chicago, Ill 60638, Tel: 312-586-3000, TWX: 910-221-3106; Empl.: 1632

Sales Manager: J. Holland

Local Sales Offices & Reps.

Cal	Anaheim, Essex Int'l., Inc.	213-625-7516
Colo	Denver, Essex Int'l., Inc.	303-399-0521
Ky	Georgetown, Essex Int'l., Inc.	502-863-3321
Mich	Berrien Springs, Essex Int'l., Inc.	616-473-4811
Minn	Minneapolis, Essex Int'l., Inc.	612-331-6370
Mo	St. Louis, Essex Int'l., Inc.	314-382-9000
Ohio	Dayton, Essex Int'l., Inc.	513-277-8964
Pa	Philadelphia, Essex Int'l., Inc.	215-236-7100
SC	Bennettsville, Essex Int'l., Inc.	803-479-6211
Tenn	Nashville, Essex Intl.	615-794-8451
Tex	Dallas, Essex Intl.	214-369-6541

ESSEX GRP, Power Conductor Div., Dept. EM, 2601 S. Adams, Marion, Ind. 46953, Tel: 317-664-6211, TWX: 317-667-6972; Empl.: 700

Sales Manager: J. Boosey

ESSEX CONTROLS DIV., Essex Grp, Dept. EM, 131 Godfrey St., Logansport, Ind. 46947, Tel: 219-753-7521, TWX: 810-295-0699

Sales Manager: C. Michalski; *Distributor Manager:* R. Todd

Local Sales Offices & Reps.

Cal	Anaheim, Essex Controls Div.	714-772-9300
Colo	Denver, R.G. Bowen Co.	303-722-4641
Conn	Madison, A & M Elctrn. Reps., Inc.	203-421-4242
Fla	Hollywood, A.P. Assocs.	305-987-6720
Fla	Orlando, A.P. Assocs.	305-298-2816
Fla	St. Petersburg, Reynolds & Assocs.	813-360-1484
Ill	Chicago, Essex Controls Div.	312-463-7358
Ill	Sycamore, Essex Controls Div.	815-895-4501
Ind	Logansport, Essex Controls Div.	219-753-7521
Iowa	Des Moines, Essex Controls Div.	515-243-8032
Ky	Crestwood, Essex Controls Div.	502-241-9667
Mass	Needham, A & M Elctrn. Reps.	617-444-8170
Mich	Berrien Springs, Essex Controls Div.	616-471-2807
Minn	Minneapolis, Essex Controls Div.	612-331-6370
Mo	St. Louis, Essex Controls Div.	314-371-2616
NJ	South Hackensack, Essex Controls Div.	201-641-4408
NY	Dewitt, Essex Controls Div.	315-446-0800
NY	New York, Roburn Agencies	212-989-5939
Ohio	Cleveland, Essex Controls Div.	216-781-2317
Ohio	Dayton, Essex Controls Div.	513-277-8963
Pa	Frazer, Essex Controls Div.	215-236-7100
SC	Bennettsville, Essex Controls Div.	803-479-6211
Tenn	Franklin, Essex Controls Div.	615-794-8451
Tenn	Hixson, Essex Controls Div.	615-875-5473
Tex	Dallas, Essex Controls Div.	214-369-6541

ESSEX GRP, Essex Terminals/Connectors, Dept. EM, 3405 Engle Rd., Box 9216, Ft. Wayne, Ind. 46809, Tel: 219-747-1656, TWX: 23-2461, 810-332-1519; Empl.: 465

Sales Manager: E. Marrotte

Local Sales Offices & Reps.

Ariz	Tucson, Morrow & Assoc	602-296-4719
Cal	Glendale, JBR Inds	213-242-7324
Cal	Palo Alto, Bart Budge Assocs	415-961-0940
Colo	Boulder, Component Prod Sls	303-494-5100
Conn	North Haven, Forsberg Sls	203-239-5111
Fla	Ft. Lauderdale, Bolton Assocs.	305-491-5161
Fla	St Petersburg, Bolton Assoc	813-864-2294
Ill	Des Plaines, Essex Mach & Termials Div	312-298-7390
Ind	Ft Wayne, Essex Mach & Terminals Div	219-747-1656
Kans	Overland Park, Essex Mach & Terminals Div	913-648-5900
Ky	Louisville, Essex Mach & Terminal Div	502-456-5962
Mass	Brockton, Forsberg Sls	617-522-6300
Mich	Ann Arbor, Kirk-Sandell	313-962-7486
Minn	Minneapolis, Nortec Sls	612-835-7414
NJ	Morristown, Andrews & Andrews	201-539-0651
NY	Buffalo, Telesco Assocs	716-834-1026
NY	Huntington, Andrews & Andrews	516-692-8686
NY	Manlius, Telesco Assocs	315-682-7272
NC	Smithfield, ADI	919-934-8136
Ohio	Columbus, Essex Mach & Terminals Div	614-459-1971
Pa	Ft. Washington, Kirk-Sandell	215-643-2100
Tenn	Morristown, Gillam Sls	615-587-2770
Tex	Houston, AID Elctrns	713-777-3882
Tex	Irving, AID Elctrns	214-259-4761

ESTERLINE ANGUS, Dept. EM, Box 24000, Indianapolis, Ind. 46224, Tel: 317-244-7611, Telex: 027-419; FSC No.: 72264; Empl.: 300 .. p. 2838,2839

Sales Manager: R.K. Mengel; *Distributor Manager:* H. Knapp

Local Sales Offices & Reps.

Ala	Birmingham, Spader & Assocs.	205-879-1366
Ariz	Tempe, Grady Moore Assocs.	602-839-3458
Ark	Benton, Gilbert & Assoc.	501-372-5916
Cal	City of Industry, Esterline Angus Branch Off.	213-330-1621
Cal	Hayward, Esterline Angus Branch Off.	415-785-8232
Colo	Denver, Cliff Beabout Co.	303-831-7259
Colo	Engelwood, Tech Sls.	303-761-9710
Fla	Orlando, Datarep, Inc.	305-843-5224
Ga	Decatur, Spader & Assocs.	404-296-3024
Haw	Honolulu, Berkley Engrg. & Equip. Co.	808-538-1921
Ill	Elmhurst, Esterline Angus Branch Off.	312-833-4410
Ind	Indianapolis, C.D. Arnold Co.	317-259-4171
Iowa	Bettendorf, Deco Engrg. Prods.	319-355-2679
Iowa	Des Moines, Deco Engrg Prods	515-223-6091
Kans	Mission, J-G Industries	913-831-2380
La	New Orleans, Mid-South Sls. Co.	504-822-3030
Mass	Holliston, Esterline Angus Branch Off.	617-235-5343
Mich	Marquette, NWR Elctrns. Corp.	906-228-9660
Mich	Troy, G. R. Peters Assocs.	313-362-1220
Minn	Minneapolis, Electrical Jobbers Equip. Inc.	612-721-4815
Minn	Virginia, NWR Elctrns. Corp.	218-741-5080
Mo	Crestwood, Carlton Co.	314-961-0700
Mo	Kansas City, Carlton Co.	816-363-5300
Neb	Omaha, Deco Engrg. Prods	402-341-4386
NJ	Lodi, Esterline Angus Branch Off.	201-471-0084
NM	Albuquerque, Grady Moore Assocs	505-262-1416
NY	Albany, R. F. Lamb Co.	518-869-3355
NY	Buffalo, R. F. Lamb Co.	716-874-4900
NY	Rochester, R. F. Lamb Co.	716-544-5580
NY	Syracuse, R. F. Lamb Co.	315-454-2469
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Sales Manager: G. Wolf

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Ala	Huntsville, Young & Lawrence Assocs.	205-539-6575
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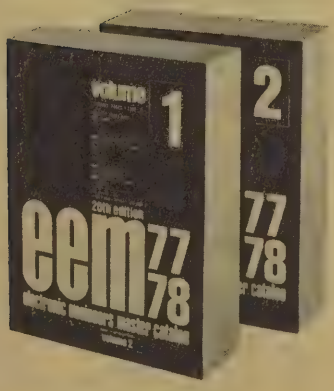

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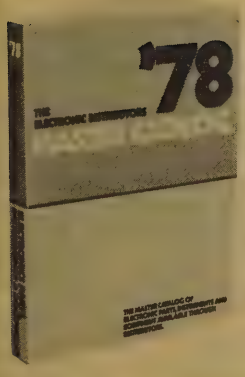

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Ore Portland, N. Rupp Co. 503-228-4311
Pa Bridgeville, Foster-McClinton Inc. 412-941-4800
Pa Erie, F. McClinton 814-455-9111
Pa Paoli, Joos Equip. Co. 215-644-5875
Tex Richardson, D. E. Harman Co. 214-234-2021
Wash Bellevue, N. Rupp Co. 206-455-2130
WVa Huntington, Foster-McClinton 304-776-5910
Wisc Wauwatosa, Gille Engrg. Sls. 414-258-4100
Exp: Stamford, Ct., Facet Intl Sls Off 203-325-2615

FACIT-ADDO, INC., Dept. EM, 66 Field Point Rd., Greenwich, Conn. 06830, Tel: 203-622-9150, TWX: 965998 710-579-2947; Empl.: 125

Sales Manager: O. Bjerkmann

Local Sales Offices & Reps.

Cal Foster City, Facit-Addo, Inc. 415-574-8255
Cal Los Altos, Cain-White, Co.
Cal Los Angeles, Facit-Addo, Inc. 213-385-4161
Cal Sherman Oaks, Elctrn. Mktg. Specialists 213-990-4244
Colo Evergreen, Fahnestock, Inc. 303-674-5255
Fla Ft. Lauderdale, Interface Dynamics 305-772-7998
Fla Orlando, Gra-Mar, Inc. 305-894-3351
Md Wheaton, K-G Elctrns. 301-946-4055
Mass Wakefield, Instr. Dynamics 617-245-5100
Mo Florissant, Midwest Mktg. Assocs. 314-831-0342
NJ Secaucus, Facit-Addo, Inc.
NY Elmont, Crane & Egert 516-448-2100
Ohio Wickliffe, Data-tron 216-585-8421
Pa King of Prussia, Riv-Co. 215-265-5211
Tex Fort Worth, Carey Wolf & Assocs. 817-738-1996
Wash Seattle, SJI Corp. 206-624-9020

FAIR-RITE PRODS. CORP., Dept. EM, Wallkill, N.Y. 12589, Tel: 914-895-2055, TWX: 510-249-4819; Empl.: 210 p. 2556

Sales Manager: B.G. Tolen

Local Sales Offices & Reps.

Cal Anaheim, Micrometals 714-630-7420
Cal Los Altos, Schwerin Assocs. 415-941-3737
Colo Englewood, A-G Elctrns. 303-771-8088
Conn W Hartford, R. S. Pettigrew & Assoc. 203-233-8533
Fla Maitland, Barrett Assocs. 305-678-0172
Ill Palestine, Fair-Rite Prod. 618-586-2556
Md Silver Spring, Carwithen Assocs. 301-589-9040
Mass W. Newton, R.S. Pettigrew & Co. 617-969-5770
Ohio Cincinnati, F. J. Campisano & Assoc. 513-574-7111
Pa Easton, Kendon Co. 215-253-3100
Va Roanoke, A. B. Kreger & Co. 703-989-4738

FAIRCHILD CAMERA & INSTR., Federal Systems Group, Dept. EM, 300 Robbins La., Syosset, N.Y. 11791, Tel: 516-931-4500, TWX: 510-221-1836; Empl.: 800

Sales Manager: R. Bashe, C. Schleicher

Local Sales Offices & Reps.

Va Arlington, Fairchild Camera & Inst. Corp 703-521-0448

FAIRCHILD INDUSTRIAL PRODS. DIV., Dept. EM, 75 Mall Dr., Commack, N.Y. 11725, Tel: 516-864-8500, TWX: 510-226-3739; Empl.: 15,000

Sales Manager: H. Poschmann

Local Sales Offices & Reps.

Cal Burlingame, Polach & Bensinger 415-697-2525
Cal Sherman Oaks, Gee Assocs. 213-788-5961
Colo Golden, J. F. Hurlbut 303-279-7796
Fla Fort Lauderdale, Electronic Devices & Controls 305-974-2500
Ill Wheaton, D. Hausten Co. 312-MO-8-7312
Md Baltimore, Stemler Assocs. 301-944-8262
Mass Lexington, G. Hathaway Elctrns. 617-861-7010
Minn St. Paul, H. Cullen & Assoc. 612-646-7371
NJ Glendora, Electronic Controls & Devices 609-939-2200
NY Buffalo, R. F. Lamb Co. 716-874-4900
NY Manhasset, Everett Mktg. Inc. 516-627-7750
NC Charlotte, Electro Rep. Assoc. 704-527-2530
Ohio Cincinnati, J. W. Murray 513-662-1616
Ohio N. Olmstead, D. Spicer 216-777-1855
Okla Tulsa, H. Daly Co. 918-627-4159
Ore Portland, Fry Controls 503-226-2620
Tex Dallas, United Comps. 214-324-1448

FAIRCHILD CAMERA & INSTR., Dept. EM, 401 Ellis St. MS14-1030, Mountain View, Cal. 94042, Tel: 415-962-2521, TWX: 910-379-6435; Empl.: 17 405

Sales Manager: B. O'Meara

Local Sales Offices & Reps.

Ala Huntsville, Fairchild Semiconductor 205-883-7020
Ala Huntsville, Cartwright & Bean 205-533-3509
Ariz Phoenix, Fairchild Semiconductor 602-264-4948
Cal Irvine, Celtec Co. 714-752-6111
Cal Los Angeles, Celtec Co. 213-874-6002
Cal Los Angeles, Fairchild Semiconductor 213-466-8393
Cal San Diego, Celtec Co. 714-279-7961
Cal Santa Ana, Fairchild Semiconductor 714-558-1881
Cal Santa Clara, Fairchild Semiconductor 408-244-1400
Cal Santa Clara, Magna Sls. 408-985-1750
Colo Littleton, Simpson Assocs. 303-794-8381
Conn Ridgefield, Phoenix Sls. 203-438-9644
Fla Altamonte Springs, Lectromech 305-831-1577
Fla Altamonte Springs, Fairchild Semiconductor 305-834-7000
Fla Hollywood, Lectromech 305-920-2291
Fla Indialantic, Lectromech 305-727-1250
Fla St. Petersburg, Lectromech 813-527-2406
Ga Atlanta, Cartwright & Bean 404-255-5262
Ga Dunwoody, Fairchild Semiconductor 404-394-5298
Ill Elk Grove Village, Micro Sls. 312-956-1000
Ill Rolling Meadows, Fairchild Semiconductor 312-640-1000
Ind Fort Wayne, Fairchild Semiconductor 219-483-6453
Ind Indianapolis, L. M. Devoe Co. 317-257-1227
Ind Indianapolis, Fairchild Semiconductor 317-849-5412
Iowa Cedar Rapids, B. C. Elctrns. 313-364-7253
Kans Olathe, B.C. Elctrn. Sls. 913-888-6680
Kans Overland Park, Fairchild Semiconductor 913-649-3974
Md Bladensburg, Fairchild Semiconductor 301-779-0954
Md Bladensburg, Delta III Assocs. 301-779-0977
Mass Wellesley, Spectrum Assocs. 617-237-2796
Mass Wellesley Hills, Fairchild Semiconductor 617-237-3400
Mich Detroit, Rathsburg Assocs. 313-882-1717
Mich Farmington Hills, Fairchild Semiconductor 313-478-7400
Minn Edina, Fairchild Semiconductor 612-835-3322
Minn Minneapolis, PSI Co. 612-835-1777
Miss Jackson, Cartwright & Bean 601-981-1368
Mo Hazelwood, B.C. Electronic Sls. 314-731-1255
NJ Wayne, Lorac Sls. 201-696-8875
NJ Wayne, Fairchild Semiconductor 201-696-7070
NM Albuquerque, Fairchild Semiconductor 505-265-5601
NY Endwell, Tri-Tech Elect. Inc. 607-754-1094
NY Fair Port, Tri-Tech Elect. 716-223-5720
NY Fayetteville, Tri-Tech Elect. 315-446-2881
NY Melville, Lorac Sls. 516-293-2970
NY Melville, Fairchild Semiconductor 516-293-2900
NY Poughkeepsie, Fairchild Semiconductor 914-452-4200
NY Rochester, Fairchild Semiconductor 716-223-7700
NC Charlotte, Cartwright & Bean 704-333-6457
NC Raleigh, Cartwright & Bean 919-781-6560
Ohio Cleveland, Components 216-243-9200
Ohio Dayton, Fairchild Semiconductor 513-278-8278
Ohio Dayton, Lyons Corp. 513-278-0714
Ohio Highland Hgts., Lyons Corp. 216-461-8288
Okla Tulsa, Technical Mktg. 918-622-5984
Okla Tulsa, Fairchild Semiconductor 918-663-7131
Ore Hillsboro, Quadra Corp. 503-225-0350
Pa Willow Grove, Fairchild Semiconductor 215-657-2711
Pa Willow Grove, BGR Assocs. 215-657-3301
Tenn Knoxville, Cartwright & Bean 615-693-7450
Tenn Memphis, Cartwright & Bean 901-276-4442
Tex Dallas, Technical Mktg. 214-387-3601
Tex Dallas, Fairchild Semiconductor 214-234-3391
Tex Houston, Fairchild Semiconductor 713-771-3547
Tex Houston, Technical Mktg. 713-777-9228
Utah Salt Lake City, Simpson Assocs. 801-486-3731
Wash Redmond, Quadra Corp. 206-883-3550
Wisc Wauwatosa, Larsen Assocs. 414-258-0529
Wisc Wauwatosa, Larsen Assocs. 414-258-0529

FAIRCHILD SOUND EQUIPMENT, see Robins Broadcast & Sound Equipment Corp.

FAIRCHILD SYS. TECHNOLOGY, Dept. EM, 1725 Technology Dr., San Jose, Cal. 95110, Tel: 408-998-0123, TWX: 910-338-0558; Empl.: 650

Local Sales Offices & Reps.

Ariz Tempe, FST 602-966-7297
Cal Los Angeles, Fairchild Sys. Tech. 213-640-2010
Cal Santa Clara, Fairchild Sys. Tech. 408-998-0123
Fla Altamonte Springs, Fairchild Sys. Tech. 305-834-7070
Ill Chicago, Fairchild Sys. Tech. 312-671-4480
Mass Wellesley, FST 617-237-4787
Minn Minneapolis, Fairchild Sys. Tech. 612-835-3322
NJ Marlton, FST 609-983-3100
NY Great Neck, FST 516-466-6393
Tex Dallas, FST 214-233-1855

FANON/COURIER CORP., SUBS., Resdel Engrg, Dept. EM, 990 S. Fair Oaks, Pasadena, Cal. 91105, Tel: 213-799-9161, Telex: 67-5448; Empl.: 110

Sales Manager: M. Trotiner; *Distributor Manager:* D. Lask

Local Sales Offices & Reps.

Courier
Cal North Hollywood, C.H. Mitchell Co 714-546-0184
Cal Van Nuys, C.H. Mitchell Co. 213-875-1552
Conn Stamford, R.D.A., Inc. 203-357-8835
Fla Holiday, Ron Schneid Assoc. 813-938-3834

Ill Chicago, Marketing Specialists .. 312-775-1233
Ill Chicago, Mktg Specialists (B&R Assoc.) 312-545-6882
Md Silver Spring, Richard Lewis Sls 301-434-5868
Minn Minneapolis, Norcentronix 612-854-8494
Mo Kansas City, Fisher & Assoc. 816-931-4113-14
Neb Omaha, Fisher & Assocs. 402-333-2943
NH Pelham, R.D.A., Inc. 603-635-7587
NJ Fair Lawn, Moses & Kline 201-791-8538
NY Merrick, Moses & Kline..... 516-378-1804
NY New York, Roburn Agencies 212-989-5939
Pa Willowgrove, R. Lewis Sls..... 215-659-0704
Fannon
Ariz Phoenix, Western Mktg. Corp..... 602-955-3210
Ark Little Rock, Crockett Sls..... 501-224-3573
Cal Newport Beach, Roman Mktg 714-540-2270
Cal No. Hollywood, M. Stobin Co. 213-983-1555
Cal San Francisco, The Hanna Co... 415-863-7627
Cal Van Nuys, Roman Mktg 213-989-2561
Colo Denver, Brake & Assocs., Inc..... 303-433-8531
Conn Stamford, R.D.A., Inc 203-357-8835
Fla Holiday, Ron Schneid Assoc..... 813-938-3834
Fla Homestead, Haas/Winfield 305-245-2500
Fla Longwood, Haas/Winfield 305-831-1276
Fla North Miami, Haas Winfield 305-945-6544
Fla Ocala, Haas/Winfield 904-239-8125
Ill Chicago, Mktg Specialist B&R Assoc. 312-545-6882
Ill Chicago, Mktg Specialist Bob Burns Assoc. 312-775-1233
Ill Chicago, Markal Sls. Co. 312-282-5800
Ind Indianapolis, Green-Wissler Sls.. 317-291-2232
Mich Bloomfield Hills, Markal Sls 313-646-7079
Mich Grand Rapids, Markal Sls 616-453-0660
Mich Troy, Markal Sls 313-689-6936
Minn Minneapolis, Norcentronix 612-854-8494
Minn Minneapolis, G & C Assocs. 612-835-6616
Mo Kansas City, Fisher & Assoc. 816-931-4114-13
Neb Omaha, Fisher & Assocs. 402-333-2943
NH Pelham, R.D.A., Inc. 603-635-7587
NJ Fair Lawn, Moses & Kline 201-791-8538
NJ Marlton, De Pillis Assoc..... 609-983-8063
NY Merrick, Moses & Kline..... 516-378-1804
NY Tonowanda, Jim Quinn, Inc.
Ohio Cleveland, M S Sls 216-382-2060
Pa Philadelphia, Mike Oberst Assocs. 215-743-2512
SC Rock Hill, Rohr-Wanger Sls..... 803-366-9353
Tex Dallas, Crockett Sls 214-748-8209
Tex Dallas, T R Sls..... 214-233-8050
Tex Houston, Crockett Sls..... 713-488-7860
Tex Plugerville, Crockett Sls 512-251-4056
Utah Salt Lake City, Brake & Assocs. 801-250-0557
Va Arlington, Howard Golenpaul & Assocs. 703-525-5898
Wash Seattle, W.R. Lanphear & Co..... 206-285-2012
Wisc Hubertus, markal Sls 414-628-2801
Wisc Sheboygan, Markal Sls. Co. 414-452-1848
Exp: N.Y., New York, Roburn Agencies 212-989-5939

FANSTEEL INC., Dept. EM, One Tantalum Pl., N Chicago, Ill. 60064, Tel: 312-689-4900, TWX: 910-235-1577; Empl.: 2800

FARATRON CORP., Dept. EM, 280 Green St., S. Hackensack, N.J. 07606, Tel: 201-488-1440; Empl.: 60
Sales Manager: V. Plessner V.P. Mktg.
Local Sales Offices & Reps.
Cal Fountain Valley, Cen-Tec..... 714-963-9721
Cal Menlo Park, G.R. McKnight Co. 415-325-2844
Ill Schaumburg, Kingston Comps... 312-529-8055
La Kenner, Automation Supplies..... 504-721-3497
Mass Southboro, Victor Assocs..... 617-481-4010
NJ Parsipany, HLM Assocs 201-263-1535
NY Northport, H.L.M. Assocs. 516-757-1606
NY Syracuse, Nycom Corp. 315-437-8343
NC Charlotte, JWL Assocs..... 704-364-3177
Ohio Brecksville, W R R Assoc. 216-526-2023

FARIA METER CORP., Dept. EM, 19 Faria Lane, Uncasville, Conn. 06382, Tel: 203-848-9271; Empl.: 150 ..... p. 2747
Sales Manager: J. A. Abbiati

FARINON ELECTRIC, Dept. EM, 1691 Bayport, San Carlos, Calif. 94070, Tel: 415-592-4120, Telex: 34-8491; Empl.: 1000
Local Sales Offices & Reps.
Kans Overland Park 913-492-6776
NJ Bridgewater 201-469-6740
SC Fair Play 803-882-6391
Tex Houston..... 713-688-5569

FARRAND CONTROLS DIV., Dept. EM, 99 Wall St., Valhalla, N.Y. 10595, Tel: 914-RO 1-2600; Empl.: 75
Local Sales Offices & Reps.
Cal Los Angeles, Applied Machinery Co. 213-726-1910
Conn Torrington, G. Sharpe Co. 203-482-2461
Ga Atlanta, Scott Mach. Tool Co. 404-522-8311
Haw Honolulu, H. S. Gray Co., Ltd..... 808-839-2747
Ill Elmhurst, Federal-Bryant Mach. 312-833-4800
La Shreveport, Richards Mach. & Sup. 314-567-3131
Mass E. Boston, Wigglesworth Mach... 617-567-7210
Mich Bay City, Machine Tool Engrg.... 517-684-8888
Mo Springfield, Crossland Mach. Co.
Neb Omaha, Crossland Mach. Co. 402-571-2288
NJ Hasbrouck Hts., G. Sharpe Co... 201-288-2288
NY Pittsford, R/F Allen Mach. 716-385-2730
Ohio Cincinnati, Technical Equip. Sls. 513-771-3630
Ohio Cincinnati, Tech. Equip. S. 513-771-3630
Ore Portland, Star Machinery 503-226-3011
Tex Dallas, Southwestern Gage & Sls 214-358-5151

FASCO INDUSTRIES, INC., Dept. EM, 601 N. Federal Ave., Boca Raton, Fla. 33432, Tel: 305-368-0600, Telex: 51-5612; Empl.: 3500
Sales Manager: C. Button; *Distributor Manager:* P. Reid
Local Sales Offices & Reps.
Ala Huntsville 205-852-1241
Cal Orange 714-639-3951
Conn Hamden..... 203-281-4008
Ill Oak Brook 312-325-6030
Mich Jackson..... 517-783-2831
Minn Bloomington 612-884-5830
Mo St. Louis 314-569-1720
NY Rochester 716-546-7500
Ohio Centerville..... 513-433-4739
SC Rock Hill 803-328-5656
Tex Richardson 214-231-1381

FEDERAL PACKAGE CORP, See Lydall Package Div.

FEDERAL SCIENTIFIC CORP., See Nicolet Scientific Corp.

FEDERAL SCREW PRODUCTS INC., Dept. EM, 3917 N. Kedzie Ave., Chicago, Ill. 60618, Tel: 312-478-5744, Telex: 25-3677; Empl.: 25
Local Sales Offices & Reps.
Cal Pleaston, Moulthrop Sls..... 415-846-0550
Cal San Gabriel, R.G. Moye Co. 213-283-1669

FEDERATED METALS CORP., Dept. EM, 120 Broadway, New York, N.Y. 10005, Tel: 212-732-9500
Local Sales Offices & Reps.
Cal Long Beach 213-638-9333
Cal San Francisco 415-282-3340
Ind Whiting..... 219-659-0826
Mass Medway..... 617-533-6768
Mich Detroit 313-871-5040
Mo St. Louis, Federated Metals Corp. 314-842-2809
NJ Cherry Hill..... 609-424-4501
NJ Newark 201-589-0500
Ohio Cincinnati..... 513-241-1678
Ore Portland..... 503-227-1403
Pa Pittsburgh 412-682-2410
Tex Houston..... 713-674-7611

Fenwal® Electronics

FENWAL ELCTRNS., Dept. EM, 63 Fountain St., Framingham, Mass. 01701, Tel: 617-872-8841, TWX: 710-346-0678; Empl.: 300 ..... p. 4273
Local Sales Offices & Reps.
Ala Huntsville, Col Ins Co. 800-327-6600
Ariz Phoenix, Dorton Enterprises, Inc. 602-263-0414
Cal Los Angeles, E. Landa Co. 213-879-0770
Cal Menlo Park, G.R. McKnight Co. 415-325-2844
Colo Denver, Elcom, Inc. 303-770-4400
Conn Suffield, Andrews Airtronics, Inc. 203-668-0446
Fla Orlando, Col Ins Co. 800-327-6600
Ill Chicago, Midwest Elctrn. Sls..... 312-777-9700
Ind Monrovia, Midwest Elctrn. Sls..... 317-996-2725
Iowa Marion, Thomas & Modrcin Assocs. 319-377-6261
Kans Shawnee Mission, Thomas & Modrcin Assocs. 913-432-2131
Md Baltimore, B. White & Co. 301-484-5400
Mass Lynfield, Andrews Airtronics, Inc. 617-245-5220
Mich Ferndale, Hilltronics, Inc. 313-398-5556
Minn St. Paul, Northport Engr., Inc. 612-698-3841
Mo Hazelwood, Thomas & Modrcin Assocs. 314-895-4700
NM Alburquerque, Zeus, Inc..... 505-256-9831
NY De Ruyter, R.P. Kennedy Co. 315-682-2299
NY Huntington, CDB Enterprises, Inc. 516-692-5200
NY Red Hook, R.P. Kennedy Co. 914-876-2700
NY Rochester, R.P. Kennedy Co. 716-271-6322
NC Winston-Salem, Col Ins Co..... 800-327-6600
Ohio Cleveland, A.H. Baier Co. & Assocs. 216-461-6161
Ohio Dayton, A.H. Baier Co. & Assocs. 513-276-4128
Ore Beaverton, R & R Assocs. 503-643-5754
Pa Ardmore, W.K. Metz, Inc. 215-649-3966
Pa Pittsburgh, Covert & Newman Co. 412-531-2002
Tex Fort Worth, W.P. Fralia Co. 817-640-9101
Tex Houston, W.P. Fralia Co. 713-772-1572
Utah Salt Lake City, Elcom, Inc..... 810-532-7940
Wash Seattle, R & R Assocs..... 206-762-7664
Wisc Milwaukee, Midwest Elctrn. Sls. 414-645-3680
Exp: Mass., Framingham, Fenwal Electronics 617-872-8841
Local Distributors
Ala Huntsville, Thermal Corp..... 205-837-1122
Ala Huntsville, Thermal Corp 205-837-1122
Cal Burlingame, Rose Elctrns. 415-348-2740
Cal Burlingame, Rose Elctrn Distr 415-348-2740
Cal Los Angeles, Mil-Comm Distrs.. 213-478-0525
Cal Los Angeles, Mil-Comm Distr 213-478-0525
Colo Aurora, Jet Elctrns. Supply Co... 303-364-7000
Colo Aurora, Jet Elctrn Supply..... 303-364-7000
Colo Denver, Indl. Elctrns. Corp. 303-771-2636
Colo Denver, Indl Elctrns Corp..... 303-771-2636
Colo Denver, Newark-Denver Elctrn Supply 303-757-3351
Colo Denver, Newark-Denver Elctrn. Supply 303-757-3351
Fla Ft. Lauderdale, Newark Elctrns.. 305-587-2372
Ga Atlanta, Newark Elctrns 404-321-0413
Ill Chicago, Newark Elctrns. Corp. 312-638-4411
Ill Chicago, Newark Elctrns 312-638-4411
Ill Elgin, Allied Elctrns 312-697-8200
Ill Elgin, Allied Elctrns..... 312-697-8200
Ind Indianapolis, Graham Elctrn Supply 317-634-8202
Ind Indianapolis, Graham Elctrns Supply 317-634-8202
Md Beltsville, Newark Elctrns..... 301-937-5085
Mass Holliston, Diplomat / New England 617-429-4120
Mass Holliston, Diplomat New England, Inc. 617-429-4120
Mass Newton, A. W. Mayer Co 617-965-1111
Mass Newton, A. W. Mayer Co. 617-965-1111
Mich Oak Park, Newark Elctrns 313-548-0250
Mich Wyoming, Newark Elctrns 616-241-6681
Minn Minneapolis, Harry Stark, Inc. 612-332-1325
Minn Minneapolis, Stark Elctrns 612-332-1325
Mo Kansas City, Burstein-Applebee Co 816-531-5614
Mo Kansas City, Burstein-Applebee Co. 816-531-5614
Mo St. Louis, Olive Indl Elc 314-426-4500
Mo St. Louis, Olive Indl. Elec. 314-426-4500
NJ Huntington, CDB Development Corp. 516-692-5200
NJ Kenilworth, Newark Elctrns 201-272-8411
NM Albuquerque, Industrial Elctrns... 505-256-9831
NM Albuquerque, Indl Elctrns 505-256-9831
NY Buffalo, Summit Distributors..... 716-884-3450
NY Buffalo, Summit Dists 716-884-3450
NY Huntington, L. I., CDB Development Corp. 516-692-5200
NY Rochester, Summit Elctrns. of Rochester 716-334-8110
NY Rochester, Summit Elctrns of Rochester 716-334-8110
NC Winston-Salem, Kirkman Elctrns 919-722-9131
NC Winston-Salem, Kirkman Elctrns., Inc. 919-722-9131
Ohio Cincinnati, United Radio 513-761-4030
Ohio Cincinnati, United Radio 513-761-4030
Okla Tulsa, Radio, Inc..... 918-587-9123
Okla Tulsa, Radio, Inc 918-587-9123
Pa Ardmore, W.K. Metz, Inc. 215-649-3966
Pa Ardmore, W. K. Metz 215-649-3966
RI Providence, Wm. Dandreta & Co. 401-861-2800
RI Providence, Wm. Dandreta and Co 401-861-2800
Tex Arlington, Patco Supply 817-336-5401
Tex Fort Worth, Patco Supply..... 817-640-9101
Utah Salt Lake City, Standard Supply 801-486-1048
Utah Salt Lake City, Standard Supply Co. 801-486-3371

Wyo Can., Montreal, Que., John G. Weiss 514-489-6887
Exp: Can., Vancouver, B.C., Rae Indul Elctrns Ltd 604-687-2621
For: Can., Edmonton, Alb., Cardinal Indl. Elctrns. Ltd. 403-455-4122
For: Can., Edmonton, Alb., Cardinal Indul Elctrns, Ltd 403-455-4122
For: Can., Montreal, Que., J.G. Weiss Co. Ltd. 514-489-6887
For: Can., Montreal West, Que., S. C. Hooker (Cda) Ltd. 514-487-5151
For: Can., Montreal West, Que., Samuel C. Hooker (Cda.) Ltd 514-487-5151
For: Can., Vancouver 2, BC, RAE Indl. Elctrns. Ltd. 604-687-2621
For: Can., Willowdale, Ont., Elctro Sonic Indl Sls 416-494-1555

FERRANTI ELEC., Dept. EM, East Bethpage Rd., Plainview, N.Y. 11803, Tel: 516-293-8383, TWX: 510-224-6483; Empl.: 20

FERRANTI-PACKARD, LTD. ELEC. DIV., Dept. EM, 6030 Ambler Dr, Mississauga, Ont. Can. L4W 2P1, Tel: 416-624-3020, Telex: 06-961437; Empl.: 140

Sales Manager: D. W. Smart

Local Sales Offices & Reps.

Ala Huntsville, Beacon Elctrn Assocs 205-881-5031
Cal Los Gatos, Luscombe Engrg Co. of San Fran. 408-354-6496
Cal Pasadena, Luscombe Engrg. Co. 213-684-2000
Fla Ft. Lauderdale, Beacon Elctrn Assocs 305-971-7320
Ga Atlanta, Beacon Elctrn Assocs .. 404-351-3654
Ill Arlington Heights, Brainard-wilson Mktg 312-437-2700
Ind Indianapolis, Brainard-Wilson Mktg 317-844-2800
Minn Bloomington, Scientific Sls. Corp. 612-881-3300
NH Nashua, Bell Controls 603-882-6984
NY Mount Vernon, Sonkin Assocs. .. 914-668-9809
NC Charlotte, Beacon Elctrn Assocs 704-525-7412
Ohio Cleveland, Berberich Assocs 216-289-5094
Ohio Dayton, Berberich Assocs. 513-433-0342
Pa Paoli, T. Griffin Co. 215-647-1550
Tenn Oak Ridge, Beacon Elctrn Assocs 615-482-2409
Tex Richardson, Campion Sls. Co. 214-238-8145
Wash Seattle, Delcom Sls. Co. 206-248-0090
Wisc Milwaukee, Brainard-Wilson Mktg 414-527-1500

FERRONICS, INC., Dept. EM, 60 N. Lincoln Rd., East Rochester, N.Y. 14445, Tel: 716-377-6820, TWX: 510-254-2893; Empl.: 85

Sales Manager: M Northrup

Local Sales Offices & Reps.

Ala Huntsville, Comp. Sls. 205-881-4753
Ariz Tempe, Gassner & Clark 602-968-9037
Cal Seal Beach, Texel, 213-596-9411
Colo Boulder, P.A.R. Assoc. 303-499-4736
Fla Tera Ceia, Comp. Sls. 813-894-4366
Ill Chicago, Kennedy Engrg. 312-631-8283
Ind Fort Wayne, Scott Elctrn. 219-743-1586
Ind Indianapolis, Scott Elc. 317-897-9976
Md Baltimore, Bernard White 301-484-5400
Mass Canton, New England Elctrn. Sls. 617-828-4835
Mich Birmingham, Forand Sls. 313-644-0087
Minn St. Paul, Countryman Assoc. 612-645-9151
Mo Blue Springs, Cairns & Hayes Co. 816-229-1404
NJ Ft. Lee, B. Cameron 201-461-2595
NY Syracuse, J Rudy Co. 315-488-3251
NC Raleigh, Comp. Sls. 919-832-1897
Ohio Cleveland, Scott Elctrns. 216-291-2600
Pa Ardmore, Wm. K. Metz, Inc. 215-649-3966
Pa Pittsburg, Scott Elec. 412-828-1073
Tex Dallas, Campion Sls: 214-238-8145
Wash Tukwila, General Elctrns. 206-575-4030
Exp: Connecticut, Intrane 203-567-5865

FERROTRAN ELCTRN., Dept. EM, 683 Broadway, New York, N.Y. 10012, Tel: 212-691-3610 .... p. 3261

Sales Manager: H. King

FERROXCUBE CORP., Dept. EM, 5083 Kings Hwy., Saugerties, N.Y. 12477, Tel: 914-246-2811, TWX: 510-247-5410; Empl.: 300

Sales Manager: J. Turnbull; *Distributor Manager:* R. Denison

Local Sales Offices & Reps.

Ala Huntsville, 20th Century Mktg. 205-772-9237
Ariz Tempe, Ampres/Ferroxcube 602-968-7917
Cal North Hollywood, Amperex/Ferroxcube 213-980-4212
Cal San Diego, Repco 714-292-9001
Cal Santa Clara, Amperex/Ferroxcube 408-249-1134
Colo Lakewood, NAPECC 303-922-8434
Conn , MacPherson Conner 914-638-1775
Fla Orlando, Tech. Mktg. Assoc. 305-857-3760
Fla Pompano Beach, Technology Mktg. Assoc. 305-942-0774
Ill Elk Grove Village, Amperex/Ferroxcube 312-640-2525
Ind Crawfordsville, Dale A. Miller & Assoc. 317-362-6348
Ind Fort Wayne, Amperex/Ferroxcube 219-432-8567
Iowa Cedar Rapids, Lorenz Sls. Co. .. 319-393-6912
Kans Overland Park, Advanced Technical Sls 913-492-4333
Mass Waltham, Amperex/Ferroxcube 617-899-7100
Mich Farmington, Amperex/Ferroxcube 313-478-7666
Minn Minneapolis, Siedare Assoc. 612-545-5663
Mo St. Louis, Advanced Techincal Sls 314-567-6272
NY Clay, Tech-Mark, Inc. 315-699-2261
NY Endicott, Tech-Mark Inc. 607-748-7473
NY Hempstead, Kahgan Sls. Co. 516-538-2300
NY Liverpool, Tech-Mark Inc. 315-652-6229
Ohio Dayton, Amperex/Ferroxcube 513-278-7351
Ore Portland, Westek 503-297-1711
SC Myrtle Beach, Candor Co. 803-448-5213
Tenn Chattanooga, Candor Co. 615-894-9686
Tex Dallas, Amperex/Ferroxcube 214-231-3481
Wash Bellevue, Westek 206-641-3900

Local Distributors

Cal Canoga Park, Ferroxcube Div. .. 213-998-7311
Ill Elk Grove Village, Ferroxcube Div. 312-593-8220
Mass Waltham, Ferroxcube Div. 617-899-7103
NY Hempstead, Kahgan Sales 516-538-2300
NY Woodstock, Elna Ferrite 914-246-5861
Pa Flourtown, Eastern Comps. 215-836-1616

FG ENGINEERING CO., Dept. EM, Box 39, Black Canyon Stage, Mayer, Ariz. 86333, Tel: 602-632-7363; Empl.: 6

Sales Manager: F. Griswold

Local Sales Offices & Reps.

Colo Arvada, Eggeman Assoc. 303-423-3707
NJ West Orange, H. Berkowitz 201-736-2807

FIBERFIL DIV. DART IND., Dept. EM, P.O. Box 3333, Evansville, Ind. 47732, Tel: 812-424-3831, TWX: 810-353-0506

Local Sales Offices & Reps.

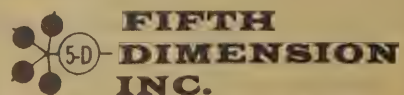
Cal Encino 213-783-3235
Ga Atlanta 404-525-7184
Ill Chicago 312-332-6242
Mass Boston 617-742-1049
Mich Detroit 313-961-9696
Minn Minneapolis 612-335-0186
NY New York 212-765-3690
Ohio Cincinnati 513-721-3810
Okla Oklahoma City 405-235-2001
Pa Philadelphia 215-567-2450

FIBRE MATERIALS CORP., Dept. EM, 34 Dupont St., Plainview, N.Y. 11803, Tel: 516-433-3660; Empl.: over 100

Sales Manager: Stu Rich

FIDELITY CHEM. PRODS. CORP., Dept. EM, 472 Frelinghuysen Ave., Newark, N.J. 07114, Tel: 201-242-4110; Empl.: 35

FIELD ELECTRONICS, Dept. EM, 1416 Commerce St, Chatham, N.J. 07928, Tel: 201-635-6566



FIFTH DIMENSION, Dept. EM, 707 Alexander Rd., Princeton, N.J. 08540, Tel: 609-452-1200, TWX: 510-685-2387; Empl.: 100 ..... p. 3489,4056

Local Sales Offices & Reps.

Ariz Phoenix, Portis & Assocs. 602-947-4379
Cal Encino, Porter Co. 213-999-0171
Cal Menlo Pk., G.R. McKnight Co. 415-325-2844
Colo Englewood, A-G Elctrns. 303-771-8088
Fla Orlando, Gra-Mar 305-894-3351
Ill Northfield, Such & Assocs. 312-446-8934
Mass Burlington, Tritek Inc. 617-272-4550
Mich Detroit, Nicon Assocs. 313-341-7688
Minn Minneapolis, G.E. Arneson & Co. 612-835-2177
Mo Kansas City, Harris Hanson Co. 816-444-9494
Mo St. Louis, Harris-Hanson Co. 314-432-3611
NY Jerico, HRC Comp. Tech. 516-822-5550
Ohio Aurora, EMA Inc. 216-562-6104
Ohio Centerville, EMA Inc. 513-433-2800
Pa Harleysville, T. Jackson Assocs. 215-643-5560
Va Alexandria, Vanguard Engrg. Sls. 703-768-1660
Wash Seattle, H. Levinson Co. 206-323-5100

FIGARO ENGRG. INC., Dept. EM, 3-7-3 Higashitoyonaka, Toyonaka City, Osaka, Japan, Tel: 06-848-6171, Telex: 05286155; Empl.: 100

Sales Manager: Kunio Tsukada

FILM CAPACITORS, INC., Dept. EM, 100 8th St., Passaic, N.J. 07055, Tel: 201-779-2240; Empl.: 55

Local Sales Offices & Reps.

Ill Chicago, Berndt Assocs. 312-283-0713
Mass Randolph, Bengal Assocs. 617-961-4120
NJ Leonia, Kohl 201-944-6488
NY Pittsford, D Hurley Sls. 716-586-6159
Tex Dallas, G. Weinreich & Assocs. 214-DA 1-2800

FILM MICROELECTRONICS, INC., Dept. EM, 17 A St., Burlington, Mass 01803, Tel: 617-272-5650; Empl.: 75

FILTER TECHNOLOGY, Dept. EM, 6241 Yarrow Dr, Ste D, Carlsbad, Cal 92008, Tel: 714-438-2074; FSC No.: 56620 ..... p. 2327

Sales Manager: D. A. Heydon

FINNEY CO., Dept. EM, 34 W. Interstate St., Bedford, Ohio 44014, Tel: 216-232-6161; Empl.: 135

Local Sales Offices & Reps.

Cal Los Alamitos, Broom's Elctrns. .. 213-598-3314
Colo Denver, Brake & Assocs 303-433-8531
Fla Maitland, Hutto-Hawkins-Peregoy 305-831-2474
Fla Pompano Beach, Hutto-Hawkins-Peregoy 305-943-9593
Ga Atlanta, Cavendish Sls. Co. 404-394-2642
Ill Chicago, Markal Sls. 312-282-5800
Ind Indianapolis, Elctrn. Representatives, Inc. 317-894-1414
Kans Shawnee Mission, Lowell, Kangas & Assocs. 913-631-3515
Mass Natick, Jonel Sls Assocs 617-653-3736
Mass W. Springfield, Jonel Sls Assocs 617-781-3040
Mich Buchanan, Riley & Petchell Sls. 616-695-6356
Mich Detroit, Riley & Petchell Sls. 313-937-3000
Minn Osseo, R.C. Sls. 612-425-5543
Mo St. Louis, Lowell, Kangas & Assocs. 314-821-4050
NY Ellenville, C & W Mktg. Assocs. 914-647-7008
NY Lindenhurst, L.W. Keller & Assocs. 516-888-7790
NY Liverpool, C & W Mktg. Assocs. 315-652-6651
Ohio Bedford, Dennis Dorsey 216-232-6161
Ohio Westlake, T.G. Corpus 216-871-8832
Okla Tulsa, McKinney Sls Co 918-622-5511
Ore Beaverton, DMS/Vantage 503-644-6111
Pa Easton, Kaiser Assoc. 215-258-6477
Tex Dallas, McKinney Sls. Co. 214-631-9450
Tex Ft. Worth, L. Smith 817-589-2040
Wash Seattle, D. Miller Sls. 206-525-2050
Wisc Hubertus, Markal Sls. 414-628-2801

FIRING CIRCUITS INC., Dept. EM, Muller Ave., Box 2007, Norwalk, Conn. 06852, Tel: 203-846-1633, TWX: 710-468-3334; Empl.: 160

Sales Manager: W.P. Walden

FISCHER SPECIAL MFG. CO., Dept. EM, 446 Morgan St., Cincinnati, Ohio 45206, Tel: 513-961-1280; Empl.: 78

FISHER SCIENTIFIC CO., Dept. EM, 711 Forbes Ave., Pittsburgh, Pa. 15219, Tel: 412-562-8300; Empl.: 2500

Sales Manager: T. P. Lawton

Local Sales Offices & Reps.

Cal Santa Clara 408-249-0660
Fla Orlando 305-857-3600
Ga Atlanta 404-449-5050
Ill Itasca 312-773-3050
Md Silver Spring 301-587-7000
Mass Medford 617-391-6110
Mich Livonia 313-261-3320
Mo St. Louis 314-991-2400
NJ Springfield 201-379-1400
NY Rochester 716-464-8900
NC Raleigh 919-876-2351
Ohio Cincinnati 513-793-5100
Ohio Cleveland 216-292-7900

Pa King of Prussia ... 215-265-0300
Pa Pittsburgh ... 412-781-3400
Tex Houston ... 713-495-6060

FJW INDUSTRIES, Dept. EM, 215 E. Prospect Ave., Mt. Prospect, Ill. 60056, Tel: 312-259-8100, Telex: 910-687-22; FSC No.: 34870; Empl.: 125

Sales Manager: E.A. Wood

FLEX KEY CORP., Dept. EM, 18 Sargent St., Gloucester, Mass. 01930, Tel: 617-281-2040, Telex: 94-0333; FSC No.: 51163; Empl.: 25

Local Sales Offices & Reps.

Ariz Phoenix, Stitzer-Dodd ... 602-994-2237
Cal Downey, Groh Assoc. ... 213-923-0963
Cal Los Gatos, Clark/Groh Assoc. ... 408-358-3466
Ill Des Plaines, Coombs Assocs. ... 312-298-4830
Ind Ft. Wayne, Coombs Assocs.
Minn Minneapolis, Elctrn. Innovators, Inc. 612-884-7471
Mo St. Louis, Coombs Assocs. ... 314-567-3657
NJ Livingston, G & A Sls. ... 201-992-3087
NY Syracuse, Nycom Inc. ... 315-437-8343
NC Charlotte, Over & Over ... 704-527-3070
Pa Newtown Square, Kershner Assoc. 215-356-5000
Tex Hurst, Wheelex ... 817-268-1812
Wash Bellevue, Comtec ... 206-285-1698
Wisc Milwaukee, Coombs Assocs. ... 414-671-1945

FLITE-TRONICS CO., INC., Dept. EM, 2525 No. Naomi St., Burbank, Cal. 91504, Tel: 213-841-3210, Telex: 69-1487; Empl.: 50 ... p. 3384,3385

Sales Manager: John Mollena, V.P.

FLOW TECHNOLOGY, INC., Dept. EM, Box 21346, Phoenix, Ariz. 85036, Tel: 602-268-8776, Telex: 668-344; Empl.: 90

Sales Manager: A. Marshall

Local Sales Offices & Reps.

Ala Huntsville, Kemp Instrs., Inc. ... 205-837-4305
Ariz Phoenix, Wisco Equip. ... 602-968-9063
Ariz Phoenix, R.D. Playman Co. ... 602-278-9405
Cal Calabasas, D.W. Harmon Co. ... 213-346-7559
Cal Walnut Creek, Dale-Dahl Assoc. 415-933-9595
Cal Woodland Hills, D.W. Harmon Co 213-346-7559
Conn Hamden, Applied Meas. ... 203-288-5288
Fla Tampa, Paul A. Quinn Assoc. ... 813-254-5211
Ga Doraville, Kemp Engrg Co ... 404-938-5973
Idaho Idaho Falls, Measurements ... 208-524-2520
Ill La Grange, Olson Engrg. & Sls. Corp. 312-482-3300
Md Kensington, Elctrn. Mktg. Assocs. 301-881-5300
Md Rockville, Electronic Mrktg Assocs 301-881-5300
Mass W. Acton, Applied Measurements 617-263-2766
Mich Detroit, WKM Assocs. ... 313-892-2500
Minn Minneapolis, Waytec ... 612-933-2133
Mo Hazelwood, Dy-Tronix, Inc. ... 314-731-1445
NJ Springfield, RJM Sls. ... 201-467-1210
NY Buffalo, Terryberry Engrg. Sls. Co. 716-632-7404
Ohio Cleveland, WKM Assocs. ... 216-267-0445
Ohio Dayton, WKM Assocs. ... 513-434-7500
Pa King of Prussia, Elctrn. Mktg. Assocs. 215-265-1600
Pa Pittsburgh, WKM Assocs. ... 412-892-2953
SC Greenville, E.C. Capell & assocs. 803-288-4159
Tex Arlington, P. Vickery Co. ... 817-261-9544
Tex Houston, Pro-Quip (Letlow-Collins Assoc.) 713-464-6832
Tex Midland, Tex-Mex Inds. ... 915-684-5841
Wash Seattle, Brett Assocs. ... 206-935-8054

FLUKE MFG. CO., JOHN, Dept. EM, Box 43210, Mountlake Terr., Wash 98043, Tel: 206-774-2211, Telex: 32-0013; Empl.: 1428 ... p. 2736-2746

Sales Manager: G. Kestner; *Distributor Manager:* G. Swinney

Local Sales Offices & Reps.

Ala Huntsville, BCS Assocs. ... 205-881-6220
Alas Anchorage, Harry Lang Assocs. 907-279-5741
Ariz Scottsdale, Barnhill Three, Inc. ... 602-947-7841
Cal Burbank, Instrument Specialists Sls. Grp. 213-849-7181
Cal San Diego, Instrument Specialists Sls. Grp. 714-278-7752
Cal Santa Clara, Instrument Specialists Sls. Grp. 408-244-1505
Colo Denver, Barnhill Three, Inc. ... 303-750-1222
Conn Glastonbury, Instrument Reps. Sls. Grp. 203-633-0777
Fla Orlando, BCS Assoc. Inc. ... 305-896-4481
Haw Hololulu, EMC Corp ... 808-847-1138
Ill Rolling Meadows, CCI Sls Grp ... 312-398-0850
Ind Indianapolis, Cozzens & Cudahy Sls. Grp. 317-244-2456
Md Kensington, Mid-Atlantic Sls. Grp. 301-881-3370
Mass Waltham, IRI Sls Grp ... 617-890-1600
Mich Detroit, WKM Assoc. ... 313-588-2300
Minn Minneapolis, Cozzens & Cudahy Sls. Grp. 612-884-4336
Mo Kansas City, Cozzens & Cudahy Sls. Grp. 816-454-5836
Mo St. Louis, Cozzens & Cudahy Sls. Grp. 314-731-3388
NJ Clifton, SBM Reps. Sls. Grp. ... 201-778-4040
NM Albuquerque, Barnhill Three, Inc. 505-299-7658
NY Rochester, SBM Reps. Sls. Grp. 716-266-1400
NC Greensboro, BCS Assoc. ... 919-273-1918
Ohio Cleveland, WKM Assoc. ... 216-267-0445
Ohio Dayton, WKM Assoc. ... 513-434-7500
Pa King of Prussia, Mid-Atlantic Sls Grp 215-265-4040
Pa Pittsburgh, WKM Assoc. ... 412-892-2953
Tex Austin, Barnhill Two, Inc. ... 512-451-0217
Tex Houston, Barnhill Two, Inc. ... 713-688-9971
Tex Richardson, Barnhill Two, Inc. ... 214-231-2573
Utah Salt Lake City, Barnhill Assocs ... 801-485-8121

Local Distributors

Ala Mobile, Brownell Electro ... 205-479-5405
Ariz Phoenix, Liberty Elctrns. ... 602-257-1272
Ariz Phoenix, Metermaster ... 602-243-4111
Ariz Tempe, Jensen Tool & Alloys ... 602-968-6231
Ariz Tucson, Ancrona ... 602-881-2348
Cal Culver City, Ancrona ... 213-390-3595
Cal El Segundo, Liberty Elctrns. ... 213-322-8100
Cal Los Angeles, Ancrona ... 213-670-7880
Cal Los Angeles, Metermaster ... 213-685-4340
Cal Mountain View, Elmar Elctrns. ... 415-961-3611
Cal N. Hollywood, G. Wolfe & Assoc. 213-877-5518
Cal San Deigo, Liberty Elctrns. ... 714-565-9171
Cal Santa Anna, Ancrona ... 714-547-8424
Cal South Gate, Automatic Inst. Svc 213-564-7841
Colo Commerce City, Elmar Elctrns. ... 303-287-9611
Conn Middleton, Mancib Co. ... 203-346-6646
Fla Orlando, Brownell Electro ... 305-843-6770
Ga Atlanta, Ancrona ... 503-881-2348
Ga Atlanta, Brownell Electro ... 404-762-5181
Ind Indianapolis, Pioneer/Indiana ... 317-849-7300
Md Rockville, Leasametric ... 301-881-6700
Mass Burlington, Mancib Co. ... 617-272-9450
Mass Farmingham, Calcotron, Inc. ... 617-879-7650
Mich Livonia, Pioneer/Michigan ... 313-525-1800
NJ Totowa, Ampower ... 213-670-7880
NM Albuquerque, Liberty Elctrns. ... 505-299-8293
NY New York, Advance Elctrns ... 212-687-2224
NC Charlotte, Brownell Electro ... 704-394-4341
Ohio Cleveland, Pioneer/Cleveland ... 216-587-3600
Ohio Dayton, Pioneer/Dayton ... 513-236-9900
Ore Beaverton, Showalter Inst. ... 503-644-9164
Ore Portland, Ancrona ... 503-254-5541
Ore Portland, Liberty Elctrns ... 503-292-9234
Pa Philadelphia, Sunshine Sci ... 215-673-5600
Pa Pittsburgh, Pioneer/Pittsburgh ... 412-782-2300
Pa Plymouth Meeting, Technitool ... 215-825-4990
Tenn Memphis, Brownell Electro ... 901-323-8554
Tenn Nashville, Brownell Electro ... 615-889-8230
Wash Bellevue, Showalter Inst. ... 206-455-4922
Wash Richland, Showalter Inst. ... 509-943-5288

FMC CORP., Ind'l. Chemical Grp, Dept. EM, 2000 Market St., Philadelphia, Pa 19103, Tel: 215-299-6000; Empl.: 800

Local Sales Offices & Reps.

Cal City of Industry ... 213-330-0680
Cal Newark ... 415-793-1230
Ill Oak Brook ... 312-654-8040
Mass Framingham ... 617-875-6141
NY Tarrytown ... 914-631-7900
NC Charlotte ... 704-554-1551
Ohio Cincinnati ... 513-563-2100
Pa Bala Cynwyd ... 215-667-6550
Tex Houston ... 713-528-0564

FMC CORP., Semiconductor Products Div., Dept. EM, 800 Hoyt St., Broomfield, Colo. 80020, Tel: 303-469-2161, Telex: 45-4357; Empl.: 373

Local Sales Offices & Reps.

Ala Mobile, Hollingsworth & Still ... 205-344-1641
Ariz Phoenix, Hecht Henschen & Assoc. 602-275-4411
Cal Palo Alto, Engrg. Assocs. ... 415-494-7842
Cal San Diego, Van Gott & Assocs. ... 714-272-8452
Cal San Gabriel, Van Gott & Assocs. 213-285-2148
Colo Englewood, Elcom, Inc. ... 303-770-4400
Conn Branford, David H. Minshall ... 203-481-2125
Fla Miami, A. Frank Assocs. ... 305-947-5080
Ga Atlanta, Hollingsworth & Still ... 404-394-3270
Ill Des Plaines, Janus, Inc. ... 312-298-9330
Ind Fort Wayne, Mc Donald Sls. ... 219-747-3650
Md Baltimore, Callas Elctrns. ... 301-744-7711
Mich Farmington Hills, Lowell-Wendt Mktg 313-553-980
Minn St. Paul, Northport Engrg. ... 612-698-384
Mo Ballwin, Weisler & Assocs ... 314-394-454
Mo North Kansas City, Weisler & Assocs 816-421-167
NJ Summit, B. Ringalda ... 201-273-250
NY Endwell, Tri-Tech Elctrns ... 607-754-109
NY Fairport, Tri-Tech Elctrns ... 716-223-572
NY Fayetteville, Tri-Tech Elctrns ... 315-446-288
NY Poughkeepsie, Tri-Tech Elctrns ... 914-473-388
NC Charlotte, JWL Assocs ... 704-364-317
Ohio Brecksville, A. Nace Co. ... 216-526-432
Ohio Englewood, Allen Nace Co. ... 513-836-093
Pa Easton, Kendon Co. ... 215-253-310
Pa Pittsburgh, Allen Nace Co. ... 412-922-722
Tenn Nashville, Hollingsworth & Still ... 615-361-825
Tex Houston, Barry Sls ... 713-784-586
Tex Richardson, Barry Sls ... 214-234-025
Utah Salt Lake City, Elcom, Inc. ... 801-532-794
Wash Olympia, Bergford & Assocs. ... 206-866-200
Wisc Mequon, T.V. Stumm ... 414-241-805
Exp: NY, New York, Singer Prods. ... 212-432-140

FOGG SYSTEM CO., Dept. EM, 15592 E. Batavia Dr Aurora, Colo. 80011, Tel: 303-344-1883; Empl.: 7

FORMA SCIENTIFIC, INC., Dept. EM, Box 64 Marietta, Ohio 45750, Tel: 614-373-4763, Tele 24-5394; Empl.: 270

FORMICA METAL PRODS. CO., Dept. EM Corporation Way, Dept. M, Medford, Mass. 02155, Te 617-395-5656; Empl.: 35 ... p. 103

FORMULATED RESINS INC., Dept. EM, Box 50 Greenville, R.I. 02828, Tel: 401-949-2060; Empl.: 15

Sales Manager: H.R. Oldham

Local Sales Offices & Reps.

Ill Arlington Heights, R. Diethert Co. 312-593-760
Mich Southfield, Associated Electric Sls. Co. 313-354-117
NJ Bayonne, Seletar Prods. ... 201-437-122
Ohio Cleveland, E. Bock & Assoc. ... 216-331-521
Ore Portland, J.E. Edstrom Co. ... 503-775-852

FOSTER TRANSFORMER CO., Dept. EM, 382 Colerain Ave., Cincinnati, Ohio 45223, Te 513-681-2420, TWX: 810-461-2584; Empl.: 250

Sales Manager: A.W. Reynolds

Local Sales Offices & Reps.

Cal San Gabriel, Van Gott & Assocs 213-285-214
Ill Evanston, W.F. Swinke & Assocs. 312-869-357
Minn Minneapolis, R.W. Marshall Co. ... 612-929-045
NJ Ho-Ho-Kus, Alto Assoc. ... 201-447-177
NJ Medford, Jack McCoy, Inc. ... 609-428-344
NY Pittsford, D. Hurley Sls. ... 716-586-615

FOURJAY INDUSTRIES, Dept. EM, Box 146 Northridge Br., Dayton, Ohio 45414, Tel: 513-278-941 Empl.: 20

Sales Manager: M. W. Frawley

FRAMAR METAL PRODS CO., Dept. EM, 124 Main St Dept 1201, High Bridge, N.J. 08829, Te 201-638-6688

Sales Manager: J. W. Moore

FRAZIER, INC., Dept. EM, 1930 Valley View La., Dallas Tex. 75234, Tel: 214-241-3441; Empl.: 30

Local Sales Offices & Reps.

Cal Los Angeles, J.G. Humble & Assocs. 714-750-224
Ga Atlanta, Murphy & Cota ... 404-875-252
Haw Honolulu, J.C. Elctrns. ... 808-537-678
Ill Rolling Meadows, Sumer Inc. ... 312-991-850
Mass Needham, Piper Assocs ... 617-449-114
Mich Ferndale, Shalco Inc. ... 313-547-477
Minn Moorhead, Northland Assocs. ... 218-233-461
NJ Greenbrook, Eldiserco Co. ... 201-968-034
Ohio Dayton, N. Browning Co. Ltd. ... 513-298-597
Tex Dallas, B. Amos & Assocs. ... 214-741-367

FREDERICKS CO., Dept. EM, Philmont & Anne Sts Huntingdon Valley, Pa. 19006, Tel: 215-947-250 Empl.: 110

FREED TRANSFORMER CO., INC., Dept. EM, 171 Weirfield St., Brooklyn, N.Y. 11227, Tel: 212-386-130 Empl.: 200 ... p. 2748,2749,4346-434

Sales Manager: M. Salzberg

Local Sales Offices & Reps.

Cal San Gabriel, R. G. Moye Co. ... 213-283-166

Colo Denver, Nelson Co. 303-573-1516
Ga Smyrna, B-C. Elctrn. Sls. 404-436-5169
Md Baltimore, B. White & Co. 301-484-5400
Mass Allston, Vector Sls. 617-787-2790
Ohio Cleveland, Scott Elctrns. 216-291-2600
Ohio Trotwood, I. Atkind & Assoc. 513-837-4750
Pa King of Prussia, Montiero Assocs. 215-265-0634
Exp: N.Y., Plainview, Morhan Exporting Corp. 516-293-5582

Frequency Electronics

FREQUENCY ELCTRNS., Dept. EM, 3 Delaware Dr., New Hyde Pk., N.Y. 11040, Tel: 516-328-0100, TWX: 510-223-0418; Empl.: 160 ..... p. 2324,2325

Sales Manager: A. Vulcan

Local Sales Offices & Reps.
Ariz Scottsdale, Semper Fl Sls. Co... 602-991-9197
Cal Mountain View, Weil & Bisman Assoc. 415-965-4300
Fla Orlando, Truex Assoc. 305-859-2160
Ill Chicago, Pivan Engrg. 312-539-4838
Md Rockville, Marktron Inc. 301-762-6210
Mass Reading, Kanan Assocs. 617-944-8484
Mo St. Louis, Pivan Engrg. 314-567-3636
NY Plainview, ERA Inc. 516-822-9890
Ohio Cleveland, Tiby Co. 216-371-5335
Pa Glenside, Elcom Inc. 215-885-1325
Tex Houston, R. Martin Assocs. 713-444-2944
Va Charlottesville, Marktron, Inc. 804-973-5874
Wash Renton, S. Wilson Co. 206-226-0650
Exp: New York, N.Y., Henley Elctrns. 212-986-5544

FREQUENCY ENGRG. LABS., Dept. EM, Box 527, Farmingdale, N.J. 07727, Tel: 201-938-9000, TWX: 710-723-6941; Empl.: 400

Sales Manager: J.M. Ruskin

Local Sales Offices & Reps.
Ala Huntsville, Beacon Elctrn Assoc 205-881-5031
Cal Los Angeles, Fetty/Schoenduve 213-651-4050
Cal Palo Alto, Fetty/Schoenduve..... 415-321-7041
Cal San Diego, Fetty/Schoenduve.... 714-292-5136
Fla Ft. Lauderdale, Beacon Elctrn Assoc 305-971-7320
Ga Atlanta, Beacon Elctrn Assoc 404-351-3654
Mass Reading, MECO 617-944-6660
Mo St. Louis, Engrg Svs 314-997-1515
NJ Haddonfield, M & S Assoc..... 609-429-7055
NY Fayetteville, Martin P. Andrews.. 315-637-5291
NY Tuckahoe, ASCOR Elctrns. 914-779-8110
Tenn Oak Ridge, Beacon Elctrns Assoc 615-482-2409
Tex Ft. Worth, Carey-Wolf Assocs. .. 817-461-7333
Tex Garland, Carey-Wolf Assocs. 817-461-7333
Exp: N.J., Cresskill, Lars Microwave .. 201-871-0024

FREQUENCY SELECTIVE NETWORKS, INC, Dept. EM, 69-20 Garfield Ave., Woodside, N.Y. 11377, Tel: 212-424-7500; FSC No.: 56662 ..... p. 2326

Sales Manager: Sidney Lande

Local Sales Offices & Reps.
Cal San Luis Obispo, Johnson Assocs 805-544-7700
Md Baltimore, Callas Elctrns 301-744-7711
Mass Andover, B. E. E. Assocs 617-475-2124
NJ Paramus, Carnes Diamond Assocs 201-967-1309
NY Centerport, Carnes Diamond Assocs 516-261-8100
NY Rochester, H.C. Johnson Agencies 716-482-3000
Ohio Akron, Augnat Assocs 216-725-6087
Tex Richardson, Carl Tinch, Sls 214-231-1322
WVa Glenshaw, H. C. Johnson Assocs 412-961-0444

FREQUENCY WEST, INC., Dept. EM, 3140 Alfred St., Santa Clara, Cal. 95050, Tel: 408-249-2850, TWX: 910-338-0163; FSC No.: 8F150; Empl.: 90

Local Sales Offices & Reps.
Ariz Phoenix, Thorson Co. 602-956-5300
Cal Goleta, Thorson Co. 805-964-8751
Cal Los Altos, Cain-White & Co. 415-948-6533
Cal Los Angeles, Thorson Co. 213-476-1241
Cal San Diego, Thorson Co. 714-292-8525
Fla Clearwater, Southeastern Comps. Sls. 813-447-1911
Ill Chicago, Tech. Sls. 312-237-7210
Kans Overland Park, J. F. Guernsey Co. 913-381-2225
Md Ellicott City, Applied Engrg. Consultants 301-465-1272
Mass Needham Hts., O'Sullivan & Murphy 617-449-4141
Mo Maryland Heights, Hitt Assocs. .. 314-878-5404
NM Albuquerque, Thorson Co. 505-265-5655
NY N. Syracuse, NACO ELCTRNS. 315-699-2651
NY Tuckahoe, Spectrum Sls. 914-793-1660
Ohio Cleveland, Contel-Sterling Co. .. 216-442-8080
Ohio Dayton, Contel-Sterling Co. 513-298-7573
Tex Addison, Dunbar Assocs. 214-239-7151
Tex Dallas, Thorson Co. 214-233-5744
Tex Houston, Thorson Co. 713-771-3504

FREUDENBERG, INC. B., Dept. EM, 50 Rockefeller Plaza, New York, N.Y. 10020, Tel: 212-757-9130, Telex: 421113; Empl.: 13

Sales Manager: L. Zimmerman

FRIEND'S MFG., Dept. EM, Rd. 5, Box 74, Williamstown, N.J. 08094, Tel: 609-629-7919; Empl.: 2

FSI/FORK STANDARDS INC., Dept. EM, 211 Main St., W. Chicago, Ill. 60185, Tel: 312-231-3511; Empl.: 20

Sales Manager: R. W. Buras

FTS SYSTEMS INC., Dept. EM, POB 158, Stone Ridge, N.Y. 12484, Tel: 914-687-7664

Sales Manager: T. N. Thompson

FUJITSU LTD., Dept. EM, 2-chone 6-1, Marunochi, Chiyoda-ku, Japan 100, Tel: 03-216-3211; Empl.: 32380

FUJITSU

FUJITSU AMERICA, INC., Component Sales Div., Dept. EM, 910 Sherwood Dr., Lake Bluff, Ill. 60044, Tel: 312-295-2610, TWX: 910-651-2259 p. 1149,1766,3490,3491

Sales Manager: H. Iida; *Distributor Manager:* H. Iida

Local Sales Offices & Reps.
Ala Huntsville, Hughes Assocs 205-533-9108
Cal Del Mar, Reed Elctrn Mktg 714-452-1456
Cal Los Alamitos, Reed Elctrn Mktg 213-598-6676
Cal San Francisco, Shonin, Inc. 415-467-8700
Colo Colorado Springs, Spectrum Sls Co. 303-473-1199
Colo Lafayette, Spectrum Sls Co. 303-449-7677
Fla Altamonte Springs, "C" Assocs 305-831-1717
Fla Hollywood, "C" Assocs 305-922-5230
Ill Highland Park, Bransky Sls 312-433-2375
Ind Noblesville, McFadden Sls 317-896-5070
Mass East Orleans, Electrical Comps 617-255-5861
Mass Longmeadow, Electrical Comps 413-567-0153
Mass Natick, Electrical Comps 617-655-2225
Mich West Bloomfield, McFadden Sls 313-681-7540
Minn Minneapolis, Impact/JQS-Co Melius 612-861-3343
NJ Parlin, Impact/JMR Sls. 201-727-5335
NY E. Syracuse, Application Specialists 315-437-2813
NY Pleasantville, Impact Electrical Prods 914-769-2314
NY Rochester, Application Specialists 716-586-6226
Ohio Columbus, McFadden Sls 614-459-1280
Ore Portland, Impact Electrical Prods 503-644-3714
Tenn Morristown, Gillum Sls 615-587-2770
Tex Dallas, United Comps 214-324-1448

FUJI ELECTROCHEMICAL CO., Dept. EM, Hamagomu Bld. 5 36-11 Shinbashi, Minato-ku, Tokyo, Japan, Tel: 03-434-1271, TWX: 2422174 (FNOVEL J); Empl.: 2500

Sales Manager: Tsutomu Hashimoto

Local Sales Offices & Reps.
Cal Gardena 213-323-1134

FURNAS ELEC. CO., Dept. EM, 1197 McKee St., Batavia, Ill. 60510, Tel: 312-879-3410, Telex: 72-0458; Empl.: 1100

Sales Manager: J.V. Shannon; *Distributor Manager:* R. Lanser

Local Sales Offices & Reps.
Ariz Phoenix, Hart & Assoc. 602-278-5816
Ark Little Rock, Ransom Sls. Co..... 501-225-7332
Cal Burlingame, Furnas Elec. Co. 415-692-5656
Cal Los Angeles, Calhoun & Poxon Co. 213-225-2328
Cal Sacramento, R.G. Mitchell Co. .. 916-444-3789
Conn North Haven, Furnas Elec. Co. .. 203-239-5605
Fla Miami, J.C. Turner Assoc. 305-625-6556
Fla Orlando, J.C. Turner Assoc. 305-859-4705
Ga Atlanta, A. Brown Assoc. 404-457-6381
Ill Chicago, Furnas Elec. Co. 312-521-7450
Ind Fort Wayne, Neal Eng. Co. 219-484-5090
Ind Indianapolis, Neal Eng. Co. 317-849-4201
Iowa Bettendorf, Furnas Elec. Co. 319-359-4418
Kans Kansas City, R.E. Gooley..... 913-831-0200
Ky Louisville, Neal Engr. Co. 502-267-8337
La Harahan, MacKenroth-Robbins & Assocs. 504-733-7524
Md Bel Air, "L" Inc. 301-879-6644
Mass Boston, Electrical Comp. 617-655-2225
Mass Longmeadow, Electrical Comp... 617-655-2225
Mich Detroit, C.H. Armstrong Co..... 313-524-1414
Mich Grand Rapids, J.M. Perry Co.... 616-949-0271
Minn Minneapolis, H. Mercer Co. 612-933-7111
Miss Jackson, MacKenroth-Robbins & Assoc. 601-355-3946
Mo St. Louis, Kattelmann & Co..... 314-434-6875
Neb Omaha, William E. Gosley 402-334-8480
NJ Fairfield, Furnas Elec. Co. 201-227-5122
NM Albuquerque, Elec. Locator & Sls. Co. 505-867-5340
NY Buffalo, John Anderson 716-834-3377
NY New York City, Furnas Elec. Co. 212-285-9732
NY Rochester, F. Serr..... 716-586-6226
NY Syracuse, R.H. Nichols..... 315-437-2813
NC Charlotte, R.W. Chapman & Co. 704-525-2421
NC Greensboro, R.W. Chapman & Co. 919-282-0740
NC Raleigh, R.W. Chapman & Co. .. 919-782-2624
Ohio Akron, R.R. Smith 216-334-2518
Ohio Cincinnati, H. Sterling & Assoc... 513-232-2600
Ohio Dayton, W. Hammer & Assoc. .. 513-435-5432
Okla Tulsa, Industrial Sls. & Engr. Co. 918-743-3610
Ore Portland, Donal Co. 503-246-3131
Pa Bridgeville, Foster-McClinton Inc. 412-941-4800
Pa Erie, Foster-McClinton Inc. 814-455-9111
Pa Philadelphia, H.B. Stallings & Assoc. 215-566-4100
SC Greenville, R.W. Chapman & Co. 803-288-8821
SC W. Columbia, R.W. Chapman & Co. 803-796-9796
Tenn Brentwood, A. Brown Assoc. 615-373-2068
Tenn Memphis, Ransom Sls. Co. 901-332-0036
Tex Dallas, Titan Reps Inc. 214-661-5350
Tex Houston, Beeco Corp..... 713-661-3192
Tex San Antonio, Markmann Sls Co 512-826-4671
Utah Salt Lake City, Electrical Sls. Co. 801-486-1367
Va Richmond, Marchant Electrical Sls. Co. 804-262-7333
Wash Spokane, Bruce-Emmett Co 509-326-9304
WVa Huntington, Foster-McClinton Inc. 304-776-5910
Wisc Appelton, H. Mercer Co..... 414-739-6223
Wisc Milwaukee, H. Mercer Co. 414-786-6431

FUSION SYSTEMS CORP., Dept. EM, 11810 Parklawn Dr., Rockville, Md. 20852, Tel: 301-881-5934, TWX: 710-828-0244; Empl.: 35

Sales Manager: E. DeSaussure

Local Sales Offices & Reps.
Ill Chicago, J. Spero & Co 312-774-0020
NJ Ridgewood, Diadem Inds..... 201-652-6371
NJ Wayne, A.J. Soltis Assos. 201-696-7777
NJ Wyckoff, Frank A. Stern Co..... 201-891-8780

FUSITE DIV./EMERSON ELEC., Dept. EM, 6000 Fernview Ave., Cincinnati, Ohio 45212, Tel: 513-731-2020, TWX: 810-461-2810; Empl.: 200

Sales Manager: W. Westphale

FUTABA CORP., Dept. EM, Daido Keori Bldg., 3-1-16 Sotokanda,, Chiyoda-ku, Tokyo, Japan, Tel: 03-255-5881, Telex: J26532; Empl.: 1400

Sales Manager: M. Yamamoto

Local Sales Offices & Reps.
Cal Compton, Futaba Industries, U.S.A. 213-537-9610

FUTRONIX, INC., Dept. EM, Box 2269, Sunnyvale, Cal. 94087, Tel: 415-329-1626

GABRIEL ELCTRNS. INC., Dept. EM, Box 626, Scarborough Ind'l. Pk., Scarborough, Me. 04074, Tel: 207-883-5161; Empl.: 120

Sales Manager: D.B. Crisman

GAGNE ASSOCS., INC., Dept. EM, 1080 Chenango St., Dept. 3EE-27, Binghamton, N.Y. 13901, Tel: 607-723-9556; Empl.: 45

Sales Manager: S. Morrisey

GALILEO ELECTRO-OPTICS CORP., Dept. EM, Galileo Pk., Sturbridge, Mass. 01518, Tel: 617-347-9191, TWX: 710-347-1190; FSC No.: 28719; Empl.: 600

Sales Manager: L. P. Thompson

Local Sales Offices & Reps.

Ala	Huntsville, Beacon Elctrn Assocs	205-881-5031
Ariz	Phoenix, Griot Assocs.	602-275-4991
Cal	Corona Del Mar, Griot Assocs.	714-675-5090
Cal	El Segundo, Griot Assocs.	213-322-8383
Cal	Los Altos, Griot Assocs.	415-941-2533
Cal	Oakland, Indl Measurement & Control	415-568-2000
Colo	Denver, Cleveland Entprs.	303-751-3252
Conn	Meriden, Sturgeon Co.	203-237-1112
Fla	Fort Lauderdale, Beacon Elctrn Assocs	305-971-7320
Ill	Chicago, LGS Elctrns. Corp.	312-456-9616
Iowa	Davenport, Ensco-Rep Inc	319-386-6600
Md	Randallstown, Beacon North	301-922-1248
Mass	Needham Hgts, Sturgeon Co.	617-444-6603
Mich	Brighton, S.A.I. Mktg. Corp.	313-227-1786
Mich	Grand Rapids, S.A.I. Mktg. Corp.	616-942-2504
Mo	St. Louis, Ensco-Rep Inc	314-567-3935
NJ	Tenafly, Budd-Tronics	201-569-2230
NM	Albuquerque, Cleveland Entprs.	505-266-5594
NY	E Syracuse, Fountain, Young & Co.	315-437-7733
NY	Henrietta, Fountain, Young & Co.	716-334-8579
NC	Charlotte, Beacon Elctrn Assocs	704-525-7412
Ohio	Beachwood, S.A.I. Mktg. Corp.	513-292-2986
Ohio	Dayton, S.A.I. Mktg. Corp.	513-435-3181
Ore	Portland, ES/Chase Co.	503-620-9616
Pa	Elkins Park, Snow Assocs.	215-379-4700
Tenn	Oak Ridge, Beacon Elctrn Assocs	615-482-2409
Tex	Richardson, R.S. Marston Co.	214-235-3577
Tex	Richardson, Palatine Sls.	214-231-9489
Va	Falls Church, Beacon North	703-534-7200
Wash	Seattle, ES/Chase Co.	206-762-4824
Exp:	Mass., Plainville, Teknis	617-695-3591

GAMBLE, CHARLES T. INDS., Dept. EM, 605 Perkins La., Delanco, N.J. 08075, Tel: 609-461-1900; Empl.: 150 ..... p. 3698,3699

Sales Manager: W. Snyder

Local Sales Offices & Reps.

Cal	Carson, Associated Reps. Corp.	213-639-2211
Cal	Menlo Park, G.R. McKnight Co.	415-325-2844
Ill	Glenview, Crimson Eng.	312-724-1780
Mass	Millis, Selmark Assocs.	617-376-2914
NY	Hempstead, Kahgan Sls. Corp.	516-538-2300
Pa	Erie, ECCO Elctrn. Sls.	814-452-3762
Tex	Houston, J. Arnold Co.	713-783-7297

Local Distributors

NY	Hempstead, Kahgan Sls	516-538-2300
Pa	Erie, Advacom Inc	814-455-8110

GAMMA ELCTRN RESEARCH CO., RF & Microwave Lab., Dept. EM, 991 Commercial St. Ste. 4, Palo Alto, Cal 94303, Tel: 415-494-8150

Sales Manager: Anne Trosper

Local Sales Offices & Reps.

Cal	San Diego, Robert L. Kahn & Assocs	714-452-1005

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GAMMA ELCTRN RESEARCH CO., Tech. Pubs. Sect., Dept. EM, Box 482, Newark, CA 94560, Tel: 415-797-2595

Sales Manager: A. T. Kahn, Mktg Dir

Local Sales Offices & Reps.

Cal	San Diego, Robert L. Kahn & Assocs	714-452-1005

GAMMA SCIENTIFIC INC., Dept. EM, 3777 Ruffin Rd., San Diego, Cal. 92123, Tel: 714-279-8034, Telex: 69-7938, Empl.: 45

Sales Manager: G.C. Unangst

Local Sales Offices & Reps.

Ariz	Phoenix, Griot Assocs.	602-275-4991
Cal	Corona Del Mar, Griot Assocs.	714-675-5090
Cal	El Segundo, Griot Assocs.	213-322-8383
Cal	Los Altos, Griot Assocs.	415-941-2533
Fla	Winter Park, McMahan Assocs.	305-645-0463
Ill	Chicago, Brooks Engrg.	312-944-1227
Md	Annapolis, C.W. Hench Assocs.	301-946-7822
Mass	Sudbury, DLG Assocs.	617-877-7880
NY	Plainview, Eastern Metro Assocs.	516-931-1414
Pa	Elkins Park, Snow Assocs.	215-379-4700
Tex	Lucas, Optical Svcs. Co.	214-442-2011
Wash	Bellevue, Griot Assocs.	206-454-8592

GAP INSTR. CORP., Dept. EM, 110 Marcus Blvd., Hauppauge, N.Y. 11787, Tel: 516-273-0909, TWX: 510-227-6237; FSC No.: 00607; Empl.: 50

Local Sales Offices & Reps.

Cal	Irvine, Aero Components Co.	
Exp:	N.Y.C., N.Y., Frathom Co., Div. of Henley Overseas Sls	212-687-9390

GAR ENTERPRISES, Dept. EM, 2031 N. Lincoln Ave., Pasadena, Cal. 91103, Tel: 213-798-0785; Empl.: 25

GARDINER SOLDER CO., Div. of Gardiner Metal Co., Dept. EM, 4820 S. Campbell Ave., Chicago, Ill 60632, Tel: 312-847-0100, TWX: 910-221-2510; Empl.: 100 ..... p. 4290,4291

Local Sales Offices & Reps.

Ala	Huntsville, Alps Distributing Co.	205-837-6060
Ariz	Scottsdale, F. Board Assocs.	602-994-9388
Cal	La Mirada, Gardner Solder	714-994-6350
Cal	San Jose, RGB Electro. Indl. Tool & Supply	408-998-4491
DC	Washington, H. Wise & Co.	202-363-9417
Fla	Merritt Island, James A. Kennedy Co.	305-452-9821
Ill	Chicago, G. Solder Co.	312-847-0100
Ind	Indianapolis, Electrn. Sls. & Engrg	317-849-4260
Ky	Louisville, Lamb, Zwischenberger & Assoc.	502-425-1828
Mich	Hillsdale, Zaiser Assocs.	517-437-4589
NY	Medford, Pace Center of Long Island	516-654-1197
NC	Charlotte, Electro-Rep. Assocs	704-527-2530
RI	Manville, Nemco Metals	401-722-4355
Wash	Bellevue, W. M. Buehler	206-455-5512
Wisc	Milwaukee, Hamlet & Smith	414-272-2787

GARDNER-DENVER CO., Pneutronics Div., Dept. EM, 1333 Fulton St., Grand Haven, Mich. 49417, Tel: 616-842-0200, Telex: 22-8457; Empl.: 5000

Local Sales Offices & Reps.

Cal	San Francisco	415-589-3305
Cal	Whittier	213-692-1258
Ga	Stone Mountain	404-938-6633
Ill	Broadview	312-681-2210
Kans	Shawnee Mission	913-888-1040
Mass	Hopkinton	617-435-6311
Mich	Livonia	313-525-9110
Minn	Mendota Heights	612-452-5850
Minn	Mendota Hgts.	612-452-5850
Pa	Horsham	215-672-3003
Tex	Dallas	214-233-0100

Local Distributors

Ala	Birmingham, Mill & Textile Supply	205-328-3440
Alas	Anchorage, Anixter/Alasks	907-274-8525
Alas	Scottsdale, Scottsdale Tool & Supply	602-273-0902
Ariz	Phoenix, Pines Tool & Supply	602-243-1235
Ark	Little Rock, M. Haase & Co.	501-376-7227
Cal	Burlingame, Teglen-Airdraulics, Div. Bearing Specialty	415-692-2011
Cal	City of Commerce, Teglen-Airdraulics, Div. Bearing Specialty	213-685-8505
Cal	San Diego, Barbee Valve & Supply	714-297-4213
Colo	Denver, Wild Co.	303-373-4840
Conn	Bloomfield, Pearse-Pearson Co.	203-242-7777
Fla	Fort Lauderdale, Mid Florida Indl Tools	305-973-1122
Fla	Jacksonville, J. D. Christopher & Co.	904-783-0260
Fla	Orlando, Moore Indl Tooling	305-849-0470
Ga	Augusta, Augusta Tool & Specialty Co.	404-790-6180
Ill	Bensenville, Schutt-Huelsman	312-595-7800
Ind	Ft. Wayne, K.C. Mosier Co.	219-747-7568
Ind	Indianapolis, K.C. Mosier Co.	317-897-1496
Iowa	Cedar Rapids, Mid-Iowa Tools	319-366-8363
Kans	Kansas City, Nichols Equip	913-281-0135
Kans	Wichita, William F. Hurst Co	316-942-7474
Kans	Wichita, Cullum & Brown	316-265-0891
Ky	Lexington, Air Hydro Power, Inc.	606-252-8444
Ky	Louisville, Air Hydro Power, Inc.	502-451-1000
Ky	Millis, Pearse-Pearson Co	617-376-2947
La	Monroe, Tool House, Inc.	318-322-6167
La	New Orleans, Woodward Wight & Co.	504-586-1223
Mich	Flint, Mahar Tool Supply Co	313-767-6820
Mich	Kalamazoo, Wilson Air Equip Co	616-342-0138
Mich	Saginaw, Mahar Tool Supply Co	517-799-5530
Mich	Spring Lake, Kelly Sales & Engrg. Co.	616-846-3260
Minn	Minneapolis, Minnesota Industrial Tools	612-333-8281
Miss	Tupelo, Utility & Indl Supply	601-566-2235
Mo	Columbia, Solid State Sys	800-325-2981
Mo	St. Louis, Nichols Equip.	314-569-0222
Neb	Omaha, Midwest Indl Tools	402-334-2011
NM	Albuquerque, Crist Machinery & Supply	505-345-4511
NY	Buffalo, Madac Corp	716-633-7200
NY	North Tarrytown, North Atlantic Tool Co	914-332-0170
NY	Rochester, Madac Corp	716-247-5383
NC	Winston-Salem, Carolina Indl Sls	919-722-0378
Ohio	Cleveland, Quiet Airtronics, Inc.	216-941-3131
Ohio	Dayton, K.C. Mosier Co	513-298-9846
Ohio	Toledo, Toledo Abrasive & Supply	419-241-2237
Ore	Portland, Mitchell, Lewis & Staver Co	503-233-4921
Pa	Franklin, Jolley Industrial Supply Co.	814-437-3085
Pa	Pittsburgh, Ralph A. Hiller Co	412-882-5300
Pa	Sharon, Jolley Industrial Supply Co.	412-981-5400
Pa	York, Ramclif Supply Co.	717-854-5534
SC	Greenville, Greenville Textile Supply	803-288-4400
SC	Summerville, Federal Tool Co.	803-871-1989
Tenn	Memphis, Murrel Haase & Co.	901-743-4304
Tenn	Nashville, Southeastern Fluid Power	615-256-3229
Tex	Addison, Wilson Co	214-233-1081
Tex	Austin, Texas Tool & Fastener	512-836-1340
Tex	El Paso, Wisco, Inc.	915-544-8294
Tex	Harlingen, Texas Tool & Fastener	512-428-4065
Tex	Houston, PME Equip Co.	713-691-3081
Tex	Lubbock, Brandon & Clark Electric Co.	806-747-3866
Utah	Salt Lake City, Wild Co	801-487-3601
Va	Roanoke, J. W. Burress	703-343-1507
Wash	Seattle, E.F. Bailey Co.	206-762-4840
WVa	Huntington, J & L Equip	304-525-8167
WVa	South Charleston, K.C. Mosier Co.	304-744-5356
Wisc	Milwaukee, Milwaukee Indl Tools	414-462-8550

GARNER GLASS CO., Dept. EM, 177 S. Indian Hill Blvd., Claremont, Calif. 91711, Tel: 714-NA 4-5071; Empl.: 61

GARRY MFG., INC., Dept. EM, 1010 Jersey Ave., New Brunswick, N.J. 08902, Tel: 201-545-2424, Telex: 844-434; Empl.: 250 ..... p. 1768

Sales Manager: W. Althoff; *Distributor Manager:* W. B. Schwartz

Local Sales Offices & Reps.

Ariz	Phoenix, Chaparral-Dorton	602-263-0414
Cal	El Segundo, Varigon Assocs.	213-322-1120
Cal	Mountainview, Westmark Assocs.	415-969-1700
Colo	Denver, Westmark Assocs.	303-433-7181
Fla	Pompano Beach, Hutto, Hawkins & Peregoy	305-943-9593
Ga	Norcross, Macro Mktg.	404-449-7440
Ill	Downers Grove, Richmar Elctrns.	312-968-0118
Ind	Ft. Wayne, TX Sls.	219-489-4447
Kans	Lenexa, Ensco-Rep. Inc.	314-567-3935
Md	Glen Burnie, New Era Sls.	301-768-6666
Mass	Needham, Northeast Reps.	617-449-3034
Mich	Farmington Hills, W.R. Hommon & Assoc.	313-474-0661
Minn	Edina, Grayden & Flemmer	612-941-1120
Mo	St. Louis, Ensco-Rep. Inc.	314-567-3935
NJ	Haddonfield, Thomas Assocs.	609-854-3011
NY	Mount Vernon, Friedman Smith Elec. Sls.	914-664-4866
NY	Syracuse, I. A. Hotze	315-479-6641
NC	Greensboro, Macro Mktg.	404-449-7440
Ohio	Cinncinati, Giesting & Assoc.	513-851-7800

Tex Dallas, Kruvand Assoc. 214-691-4592
Wash Kirkland, Freed Assocs. 206-822-8100

Local Distributors
Ariz Phoenix, R.V. Weatherford Co. 602-272-7144
Cal Anaheim, R.V. Weatherford Co. 714-547-0891
Cal Glendale, R.V. Weatherford Co. 213-849-3451
Cal Palo Alto, R.V. Weatherford Co. 415-493-5373
Colo Englewood, R.V. Weatherford Co. 303-761-5432
Ill Palatine, Ohm Elctrns. 312-359-5500
Md Columbia, Technico 301-828-6416
Mass Woburn, Time Elctrns. 617-935-8080
NJ Perth Amboy, Sterling 201-442-8000
NY West Hempstead, March 516-486-6511
Pa Horsham, Pioneer 215-674-5710
Tex Dallas, R.V. Weatherford Co. 214-243-1571
Tex Houston, R.V. Weatherford 713-688-7406
Wash Seattle, R.V. Weatherford Co. 206-243-6340
Wisc Mequon, Taylor Elctrns.
For: Australia, Crows Nest, General Elctrn Svcs 439 2488
For: Australia, Strathfield, Ampec Engineering Co. (02) 747 2731
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For: Belgium, Brussels, J. P. Lemaire s.p.r.l. 02 478 4847
For: Denmark, Copenhagen, Obel-P-Products (02) 98 3833
For: Finland, Helsinki, Oy. Flinkenberg & Co. 630686
For: France, Montreuil, Euromega 858 9009
For: Germany, Munich, Componenta 89 601-3008
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For: Japan, Tokyo, Yasaka Industries, Inc. (03) 294-2541
For: Norway, Oslo, Henaco A/S 1575550
For: South Africa, Dunswart, Elctrns 2000, Pty. Ltd. 8 2865SA
For: Spain, Barcelona, Cresa 230 5507
For: Sweden, Sundyberg 3, Ultra Elctrns AB 8290255
For: Switzerland, Zurich, Kurt Hirt AG 1-512121

GATES ELCTRN. CO., Dept. EM, 526 Van Nest Ave., Bronx, N.Y. 10460, Tel: 212-TU1-5900

GATES ENERGY PRODS., INC., Dept. EM, 1050 S. Broadway, Denver, Colo. 80217, Tel: 303-744-4806, TWX: 910-931-2658, 045-511; Empl.: 225

Sales Manager: T. G. Moore; *Distributor Manager:* T. Lockwood

Local Sales Offices & Reps.
Ariz Phoenix, DAR-C, Inc. 602-948-2240
Cal San Diego, Tauber & Assocs. 714-274-7242
Ga Lake Park, Charles E. Hopper 912-559-7863
Ill Glen Ellyn, W. J. Barcus 312-858-9590
Ind Indianapolis, France Entprs. 317-894-0593
Md Towson, William B. MacLEA 301-321-0852
Mass Maynard, Robert W. Ojalehto 617-897-6991
Minn Minneapolis, HMR, Inc. 612-831-7400
Mo Kansas City, H. Hanson Co. 816-444-9494
Mo St. Louis, H. Hanson Co. 314-432-3611
NJ Somerville, D.H. Pantiel 201-359-2019
Ore Portland, C.K. Shanks & Assoc. 503-292-5656
Wash Seattle, C.K. Shanks & Assoc. 206-632-4290

Local Distributors
Ariz Scottsdale, Electro Mktg 602-991-0110
Cal Burlingame, Rose Elctrns. 415-348-2740
Cal Culver City, National Electro-Sls. Corp. 213-391-6294
Cal San Diego, Tauber Elctrns. Dist. 714-274-7242
Colo Denver, Electronic Parts 303-744-1992
Fla Miami, Electronic Equip. Co. 305-871-3500
Ga Valdosta, Taylor Assoc. Elect. Sls 912-247-4380
Ill Broadview, LCOMP Chicago, Inc. 312-865-7600
Ill Niles, Joseph Elctrns. 312-297-4200
Kans Wichita, Radio Supply Co. 316-267-5213
Md Rockville, Capitol Radio Wholesalers 301-881-2270
Md Timonium, M x 4 Elctrns. 301-252-1192
Mass Sharon, Adcour 617-784-8123
Mass Winchester, Keystone Battery Corp. 617-729-8333
Minn Minneapolis, Stark Elctrns. 612-332-1325
Mo Kansas City, Lcomp Kansas City 910-771-3148
Mo St. Louis, Olive Ind'l. Elctrns. 314-426-4500
NJ Bergenfield, Technical Elect. Dist. 201-384-3643
NY Buffalo, Summit Distrib 716-884-3450
NY Farmingdale, Battery Specialists of NY 516-752-0011
Ohio Cincinnati, Sheridan Sls. Co. 513-761-5432
Pa Philadelphia, Herbach & Rademan, Inc. 215-426-1700
Tex Dallas, Southwest Radio Supply 214-233-0611
Va Charlottesville, Carpenter Lighting Prod 804-977-8050
Wash Seattle, Robert E. Priebe Co. 206-682-8242
Wisc Mequon, Taylor Electric 414-241-4321

GATES & CO., INC., GEO. W., Dept. EM, Hempstead Tpke. & Lucille Ave., Franklin Sq., N.Y. 11010, Tel: 212-347-0787; Empl.: 8

Sales Manager: T. E. Schulz, Jr

GC ELECTRONICS, Div. Hydrometals, Dept. EM, 400 So. Wyman St., Rockford, Ill. 61101, Tel: 815-968-9661, TWX: 257318 GC Elect; Empl.: 550 p. 1290

Sales Manager: J. Marshall; *Distributor Manager:* Ed Crockett, V.P. Sls. Mktg.

GCA/BURLINGTON DIV., Dept. EM, 174 Middlesex Tpke., Burlington, Mass. 01803, Tel: 617-272-5600, Telex: 94-9352; Empl.: 130

Local Sales Offices & Reps.
Cal Santa Clara, GCA/IC Systems 408-732-5330
Pa Plymouth Meeting, GCA/IC Systems 215-825-4840
Tex Dallas, GCA/IC Systems 214-661-8402
Exp: N.Y., N.Y., Sumitomo Shoji American

GCA/PRECISION SCIENTIFIC, Dept. EM, 3737 W. Cortland St., Chicago, Ill. 60647, Tel: 312-227-2660, TWX: 910-221-3122; Empl.: 325

Local Sales Offices & Reps.
Cal Los Angeles 213-283-7815
Cal Santa Clara 408-248-5566
Ga Marietta 404-432-8737
Ill Chicago 312-729-1270
Mass Boston 617-227-1515
Mo St. Louis 314-968-3880
NJ Milford 201-686-9392
NC Charlotte 704-332-4850
Ohio Columbus 617-272-8414
Tex Houston 713-785-3238

GCA/SUNNYVALE DIV., Dept. EM, 1050 Kifer Rd., Sunnyvale, Cal. 94086, Tel: 408-732-5330, TWX: 910-339-9211; Empl.: 230

Sales Manager: D. Bauman

Local Sales Offices & Reps.
Ariz Tempe, GCA/Sunnyvale Div. 602-831-1265
Cal Los Angeles, Sumitomo Shoji America 213-627-4783
Cal Santa Clara, GCA/Sunnyvale Div. 408-732-5330
Fla Longwood, Lenz Engrg 305-831-9797
Ind Kokomo, AWI Inc 317-453-7671
Minn Bloomington, Marketiers Corp 612-448-5700
Mo Kansas City, W.A. Shaw Co 816-361-3010
Pa Plymouth Meeting, GCA/Sunnyvale Div. 215-825-4840
Tex Dallas, GCA/Sunnyvale Div. 214-661-8402
Exp: Cal., Burlingame, Traffic Int'l. Corp. 415-348-5131

GECO, INC., Dept. EM, 145 Penn St. Box 423, Millheim, Pa. 16854, Tel: 814-349-5555; Empl.: 8

GEMS SENSORS DIV., See Delaval Turbine, Inc.

GENERAL AUTOMATIC CORP., Dept. EM, 70 Liberty St., Metuchen, N.J. 08840, Tel: 201-494-9300; Empl.: 32

Sales Manager: M. Barron

GENERAL AVIATION ELCTRNS, Dept. EM, 4141 Kingman Dr., Indianapolis, Ind 46225, Tel: 317-546-1111, Telex: 027-445; Empl.: 175

Sales Manager: E. J. Gordon

Local Sales Offices & Reps.
Ala Birmingham, Maitland K. Smith, Inc. 205-967-3080
Ariz Phoenix, P.H. Dempers 602-996-3548
Cal LaPuente, Cook Entrprs 213-964-5254
Cal Sausalito, Roy Colen Sls 415-332-6181
Colo Denver, Lindberg Co 303-758-9033
Conn Hamden, Johnson Assocs 203-737-3661
Fla Ft. Lauderdale, Secom Sys 305-971-4948
Ga Atlanta, Maitland K. Smith, Inc. 404-938-7161
Ga Chamblee, Secom Systems 404-455-0672
Ga Clarkstown, Maitland K. Smith, Inc. 404-491-9020
Ill Park Ridge, Telecom Ventures Ltd. 312-825-0008
Ind Carmel, Dewey Powers Sls 317-846-0790
Iowa Grinnell, Guyer Assocs 515-236-8832
La New Orleans, Anderson Assocs 504-943-5237
Mass Wellesley, Johnson Assocs 617-235-3977
Mich Rochester, Webster Comm* 313-375-0420
Minn St. Paul, Skor, Inc. 612-645-6461
Miss Jackson, Secom Sys 601-981-3051
Mo Riverside, Anderson Assocs 816-741-6158
NH E. Wakefield, Johnson Assocs. 603-522-8512
NJ Fairlawn, Moses & Kline, Inc. 201-791-8538
NM Albuquerque, Lindberg Co 505-881-1006
NY Rochester, Johnson Assocs. 716-473-6030
NY Schenectady, Johnson Assocs 518-393-3939
NC Charlotte, Maitland K. Smith, Inc. 704-372-1026
NC Charlotte, Secom Sys. 704-392-5136
Ohio Shreve, Webster Comm 216-567-3910
Ore Portland, Arva Hudson 503-246-9589
Tenn Tellico Plains, Secom Sys 615-261-2352
Tex Denton, Anderson Assocs 817-387-7077
Tex Hurst, Anderson Assocs 817-268-2327
Tex San Antonio, Anderson Assocs 512-494-6822
Utah Salt Lake City, Lindberg Co. 801-534-1501
Wash Seattle, Arva Hudson 206-455-0773

GENERAL COMPUTERS, INC., Dept. EM, 5990 W. Pico Blvd., Los Angeles, Calif. 90035, Tel: 213-939-7687; Empl.: 20

GENERAL DEVICES CO., INC., Dept. EM, Box 19188, Indianapolis, Ind. 46219, Tel: 317-897-7000, Telex: 27-2169; Empl.: 125 p. 1032-1035

Local Sales Offices & Reps.
Ala Huntsville, Int'l. Scientific Instru. 205-533-6880
Ariz Scottsdale, F. Schoeffler Assocs. 602-959-3011
Cal Downey, Groh Assoc 213-923-0963
Cal Mountain View, G. Woempner Co. 415-964-5454
Cal Van Nuys, J.R. Thomas 213-782-3820
Colo Sedalia, Jensen Representatives 303-688-4154
Conn Cheshire, Coakley, Boyd & Abbett, Inc. 203-272-2261
Fla North Miami, J. Krutek & Assoc. 305-941-6544
Ind Indianapolis, Techn Representatives 317-849-6454
Kans Shawnee Mission, Lowell & Kangas Assocs. 913-631-3515
Md Bethesda, G. Rosen & Assocs. 301-530-8448
Mass Needham, Coakley, Boyd & Abbett, Inc. 617-444-5470
Mich Dearborn, Pitcher Poulin 313-582-5450
Minn St. Paul, Northport Engrg., Inc. 612-698-3841
Mo St. Louis, Lowell & Kangas Assocs. 314-821-4050
NJ Mountainside, Henry G. Richter 201-233-4615
NY Fayettville, H.G. Richter, Inc. 315-637-6713
Ohio Cleveland, Components, Inc. 216-842-2737
Ohio Hamilton, Components, Inc. 513-721-2997
Tex Dallas, Advance Techn Sls 214-361-8584
Tex Houston, Advance Tech Sls. 713-569-6668
Wash Olympia, Bergford & Assocs. 206-866-2001

GENERAL ELEC., Carboloy Systems Dept., Dept. EM, Box 237, Detroit, Mich. 48232, Tel: 313-536-9100, TWX: 810-226-9617; Empl.: 1800

Sales Manager: R. A. Alukonis

Local Sales Offices & Reps.
Cal Orange, Carboloy Sys Dept 714-558-7704
Ill Chicago, Carboloy Sys Dept 312-398-6680
Mich Detroit, Carboloy Sys Dept 313-536-9100
NJ Kenilworth, Carboloy Sys Dept 201-245-7250
NC Charlotte, Carboloy Sys Dept 704-523-6657
Ohio Cleveland, Carboloy Sys Dept 216-831-0235
Tex Houston, Carboloy Sys Dept 713-688-8821

GENERAL ELECTRIC CO., Mobile Radio Dept, Dept. EM, Box 4197, Lynchburg, Va. 24502, Tel: 804-528-7000; Empl.: 4000

Sales Manager: J. Hurley

GENERAL ELEC. CO., Elctrn. Comp. Sls., Dept. EM, Bldg. 23, Rm. 210 1 River Rd., Schenectady, N.Y. 12345 p. 3087

Local Sales Offices & Reps.
Ala Huntsville 205-883-9220
Ariz Phoenix 602-264-1751

Cal	Los Angeles	213-479-7763
Cal	Palo Alto	415-493-2600
Colo	Denver	303-320-3031
Conn	Bridgeport	203-334-1012
Fla	N. Palm Beach	305-628-1811
Ill	Chicago	312-777-4737
Ind	Fort Wayne	219-482-4557
Ind	Indianapolis	317-298-5317
Kans	Overland Pk	913-967-6254
Mass	Wellesley	617-237-2050
Mich	Southfield	313-355-3552
Minn	Minneapolis	612-835-2550
Mo	St. Louis	314-997-8437
NJ	Fairfield	201-227-6050
NY	Albany	518-458-7755
NY	Jericho	516-681-0900
NY	Rochester	716-461-5400
NY	Syracuse	315-456-2196
NC	Greensboro	919-273-6981
Ohio	Cleveland	216-266-2900
Ohio	Dayton	513-298-0311
Okla	Oklahoma City	405-943-9015
Pa	Erie	814-455-5466
Pa	Pittsburgh	412-921-4134
Pa	Wayne	215-962-1500
Tex	Dallas	214-661-8582
Tex	Houston	713-783-6472
Va	Falls Church	703-790-1700
Va	Portsmouth	804-397-8752
Va	Waynesboro	703-943-1151
Wash	Seattle	206-575-2865
Wisc	Milwaukee	414-271-5000

GENERAL ELEC. CO., Laminated & Insulating Matls. Bus. Dep., Dept. EM, Coshocton, Ohio 43812, Tel: 614-622-5310, TWX: 810-255-2921; Empl.: 1100

Sales Manager: R.L. Morris

Local Sales Offices & Reps.

Cal	El Segundo, Insulectro	213-640-1470
Cal	Mountain View, Insulectro	415-969-7010
Fla	Tampa, General Elec. Co.	813-877-8311
Ill	Arlington Heights, Gen. Elec. Co.	312-439-9080
Ind	Indianapolis, General Elec. Co.	317-842-0187
Mass	Westwood, General Elec. Co.	617-329-5340
NC	Greensboro, General Elec. Co.	919-299-2634
Ohio	Elyria, General Elec. Co.	216-322-3749
Pa	Berwyn, General Elec. Co.	215-962-3685
Tex	Irving, Bunker Inds.	214-438-3300

GENERAL ELEC. LAMP GLASS, See General Elec. Lamp Parts & Equip. Sales Oper.

GENERAL ELECTRIC CO., Lamp Components Sls. Oper., Dept. EM, 21800 Tungsten Rd., Cleveland, Ohio 44117, Tel: 216-266-2451

Local Sales Offices & Reps.

Cal	San Jose	408-298-4126
Mass	Newton Upper Falls	617-332-6200
NJ	West Orange	201-736-5305
Ohio	Cleveland	216-266-2451
Pa	Pittsburgh	412-531-5700

GENERAL ELECTRIC-MIDPS, Closed Circuit Television, Dept. EM, 316 East Ninth Street, Owensboro, Kentucky 42301, Tel: 502-926-8600

Sales Manager: Charles R. Thornton

Local Sales Offices & Reps.

Cal	Los Angeles	213-826-4581
Cal	Palo Alto	415-493-4635
Colo	Denver	303-320-3062
Fla	St. Petersburg	813-577-1075
Ga	Atlanta	404-393-1320
Ill	Chicago	312-777-1015
La	Kenner	504-443-4861
Mich	Southfield	313-355-3552
Minn	Minneapolis	612-835-2550
NH	Nashua	603-883-6926
NJ	Cherry Hill	215-923-7027
NJ	Clifton	201-546-1525
NC	Charlotte	704-366-2093
Ohio	Hamilton	513-868-0990
Pa	Pittsburgh	412-921-4134
Tex	Gainsville	817-665-0161
Va	Falls Church	703-790-1705
Wash	Seattle	206-575-2867

GENERAL ELECTRIC CO., Miniature Lamp Dept., Dept. EM, Nela Park, Clevland, Ohio 44112, Tel: 216-266-2121

Local Sales Offices & Reps.

Alas	Achorange	907-272-1211
Cal	Los Angeles	213-723-2541
Cal	Oakland	415-436-9447
Cal	Palo Alto	415-493-0652
Colo	Denver	303-320-3598
Conn	Bridgeport	203-334-1012
Fla	Jacksonville	904-399-5566
Fla	Miami	305-693-3811
Ga	Atlanta	404-897-6390
Haw	Honolulu	808-537-3280
Ill	Chicago	312-671-6390
Ind	Indianapolis	317-547-5511
La	New Orleans	504-835-6421
Md	Baltimore	301-242-5700
Mass	Newton Upper Falls	617-332-6200
Mich	Detroit	313-883-0200
Minn	New Hope	612-535-5151
Mo	North Kansas City	816-471-0123
Mo	St. Louis	314-429-6930
NJ	Newark	201-622-8000
NY	New York	212-896-6000
NY	Rochester	716-461-5900
NY	Utica	315-733-0922
NC	Charlotte	704-376-6585
Ohio	Cincinnati	513-559-3607
Ohio	Cleveland	216-266-4337
Ohio	Columbus	614-294-4115
Okla	Oklahoma City	405-842-4028
Ore	Portland	503-221-5120
Pa	King of Prussia	215-688-5900
Pa	Pittsburgh	412-665-3764
Tenn	Memphis	901-948-2642
Tex	Dallas	214-358-5321
Tex	Houston	713-644-3264
Va	Richmond	804-355-3289
Wisc	Milwaukee	414-462-3860

GENERAL ELEC., Semiconductor Prods., Dept. EM, Electronics Pk., Box 1122, Syracuse, NY 13201, Tel: 315-456-2798, TWX: 710-541-0498; Empl.: 400000

Local Sales Offices & Reps.

Ala	Huntsville	205-883-9220
Ariz	Phoenix	602-264-1751
Cal	Los Angeles	213-479-7763
Cal	Palo Alto	415-493-2600
Cal	San Diego	714-236-1266
Colo	Denver	303-388-5771
Conn	Bridgeport	203-334-1012
Fla	North Palm Beach	305-844-5202
Ill	Chicago	312-777-1600
Ind	Ft. Wayne	219-482-4557
Ind	Indianapolis	317-923-7221
Mass	Wellesley	617-237-2050
Mich	Southfield	313-355-3552
Minn	Minneapolis	612-835-2550
Mo	Kansas City	816-221-4033
Mo	St. Louis	314-429-6941
NJ	Clifton	201-472-8100
NY	Albany	518-458-7755
NY	Great Neck	516-466-8800
NY	Rochester	716-461-5400
NY	Syracuse	315-456-3108
NC	Greensboro	919-273-6981
Ohio	Cleveland	216-266-2900
Ohio	Dayton	216-298-0311
Okla	Oklahoma City	405-943-9015
Pa	Erie	814-455-5466
Pa	Pittsburgh	412-921-9917
Pa	Wayne	215-962-1500
Tex	Dallas	214-661-8582
Va	Falls Church	703-790-1700
Va	Portsmouth	804-397-8752
Va	Waynesboro	703-943-1151
Wash	Seattle	206-575-2866
Wisc	Milwaukee	414-271-5000

GENERAL ELECTRIC CO., Wire & Cable, Dept. EM, 1285 Boston Ave., Bridgeport, Conn. 06602, Tel: 203-334-1012, Telex: 96-4209; Empl.: 1400

Sales Manager: D. A. Pritchard; *Distributor Manager:* C. E. Mindnich

Local Sales Offices & Reps.

Ala	Birmingham, General Electric Co.	205-879-2030
Cal	Los Angeles	213-572-5330
Cal	Oakland	415-638-0725
Conn	Meriden	203-238-6845
Fla	Jacksonville	904-396-3896
Ga	Atlanta	404-393-1320
Ill	Elk Grove Village	312-595-3210
Ind	Indianapolis	317-298-5337
Kans	Overland Park	913-642-9700
Ky	Louisville	502-452-3191
La	New Orleans	504-486-7267
Md	Baltimore	301-944-2273
Mass	Natick	617-237-2050
Mich	Detroit	313-552-3195
Mich	Grand Rapids	616-452-2121
Minn	Minneapolis	612-542-0288
Mo	St. Louis	314-342-7794
NY	Albany	518-458-7243
NY	New York	212-683-6104
NY	Syracuse	315-456-7568
NC	Charlotte	704-372-8541
NC	Greensboro	919-288-7906
Ohio	Cincinnati	513-871-6300
Ohio	Cleveland	216-267-6300
Ore	Portland	503-221-5023
Pa	Cornwells Heights	215-638-3710
Pa	Pittsburgh	412-921-5150
Tenn	Nashville	615-259-4351
Tex	Bedford	817-267-9361
Tex	Houston	713-675-6681
Utah	Salt Lake City	801-364-1894
Wash	Seattle	206-575-2940
Wisc	Milwaukee	414-271-5000

GENERAL ELEC. CO, Wiring Device Bus. Dept., Dept. EM, 95 Hathaway St., Providence, R.I. 02904, Tel: 401-781-1800, Telex: A20EA

Sales Manager: T. M. Kramer

Local Sales Offices & Reps.

Ala	Birmingham	205-933-2670
Ariz	Phoenix	602-264-1751
Cal	El Monte	213-572-5200
Cal	Los Angeles	213-572-5320
Cal	Oakland	415-635-6500
Colo	Denver	303-388-4545
Conn	Hartford	203-246-6841
Fla	Jacksonville	904-398-6944
Fla	Tampa	813-877-8311
Ga	Atlanta	404-897-6116
Ill	Chicago	312-986-3141
Ind	Indianapolis	317-923-7221
Iowa	Bettendorf	319-355-0231
La	New Orleans	504-486-5851
Md	Columbia	301-730-7740
Mass	Wellesley	617-237-2050
Mich	Southfield	313-355-4400
Minn	Minneapolis	612-544-6699
Mo	Kansas City	913-842-9745
Mo	St. Louis	314-342-7670
NJ	Millburn	201-376-9000
NY	Harrison	914-698-7450
NY	Syracuse	315-456-7804
NC	Charlotte	704-375-5571
Ohio	Cincinnati	513-861-3400
Ohio	Cincinnati	513-861-3400
Ohio	Cleveland	216-523-6100
Okla	Oklahoma City	405-528-4521
Ore	Portland	513-221-5028
Pa	Camp Hill	717-761-2304
Pa	Philadelphia	215-568-1800
Pa	Pittsburgh	412-281-9230
SC	Greenville	803-232-1584
Tenn	Memphis	901-332-7460
Tenn	Nashville	615-254-3411
Tex	Dallas	214-631-3110
Tex	Houston	713-623-6440
Tex	San Antonio	512-828-0561
Utah	Salt Lake City	801-364-1818
Va	Richmond	804-288-4071
Wash	Seattle	206-575-2884
Wisc	Milwaukee	414-271-5000

GENERAL-ELECTRO MECHANICAL, Dept. EM, 785 Hertel Ave., Buffalo, N.Y. 14207, Tel: 716-876-9685, Telex: 91-222; Empl.: 121 ..... p. 3090

Sales Manager: B.M. Roberts

GENERAL INDUSTRIES CO., Dept. EM, Taylor & Olive St., Elyria, Ohio 44035, Tel: 216-323-3136, TWX: 810-424-2109; Empl.: 1500

Local Sales Offices & Reps.

Ark	Hot Springs, Meredith Young Assoc.	501-262-1365
Cal	Encino, Viking Sls. Co.	213-788-5501
Ga	Atlanta, Specification Sls	404-448-3900
Ill	Chicago, K-W Assocs.	312-792-2618
Ill	Glenview, J & H Engrg. & Sls.	312-729-2221
Mich	Southfield, T. Barr Sls. Agency, Inc.	313-358-5200
Minn	Minneapolis, J.B. Wright & Assoc.	612-335-7833
NJ	Medford, Mech-Elec Sls. Co.	609-654-8209
NY	New York, P. Saftler Assoc.	212-247-3855
NY	Rochester, R.H. Eisenhart, Inc.	716-473-2657
Ohio	Elyria, B. Sewell	216-323-3136
Ohio	Mansfield, Mong & Assoc.	419-524-2835
Tex	Muenster, Kesco	817-759-2297

GENERAL INSTR. CORP., Microelectronics Div., Dept. EM, 600 W. John St., Hicksville, N.Y. 11802, Tel: 516-733-3107, TWX: 510-221-1866

Local Sales Offices & Reps.

Ariz	Chandler, General Inst. Corp.	602-963-7373
Ariz	Phoenix, Electronic Development & Sls	602-277-7407
Cal	El Segundo, Varigon Assoc.	213-322-1120

Cal Newport Beach, General Inst. Corp. 714-833-9400
Cal Sunnyvale, Quad Rep 408-733-7300
Colo Wheat Ridge, Eggeman Assocs 303-423-3707
Conn Stratford, G. Rosen Co. 203-375-5456
Fla Ft. Lauderdale, Hutto, Hawkins & Peregoy 305-971-5750
Fla Maitland, Hutto, Hawkins & Peregoy 305-831-2474
Ill Chicago, General Inst. Corp. 312-338-9200
Ill Park Ridge, Metcom Assoc. 312-696-1490
Ind Greenwood, V. S. & Assoc. 317-888-2260
Ind South Bend, V. S. & Assoc. 219-291-6258
Iowa Cedar Rapids, PMA 319-362-9177
Kans Overland Park, PMA 913-381-0004
Kans Wichita, PMA 316-264-2662
Md Baltimore, Component Sls. 301-484-3647
Md Towson, General Inst. Corp. 301-296-8010
Mass Framingham, G. Rosen 617-879-5505
Mass Weston, General Inst. Corp. 617-899-8800
Mich Southfield, V. S. & Assoc. 313-559-3680
Minn Minneapolis, Quantum Sls. 612-831-8583
Mo Maryland Heights, PMA 314-569-1220
NJ Teaneck, R.T. Reid Assoc. 201-692-0200
NC Raleigh, Component Sls. 919-782-8433
Ohio Richfield, Bear Mktg. 216-659-3131
Ore Portland, Jas. J. Backer Co. 503-297-3776
Pa Bridgeville, Foster-McClinton 412-941-4800
Pa Erie, Foster-McClinton 814-455-9111
Pa Horsham, General Inst. Corp. 215-674-4800
Pa Huntingdon Valley, Knowles Assoc. 215-947-5641
Tex Houston, Oeler & Menelaides 713-772-0730
Tex Richardson, Oeler & Menelaides 214-234-6334
Wash Seattle, Jas. J. Backer Co. 206-285-1300
WVa Nitro, Foster-McClinton 304-763-5161

GENERAL INSTRUMENT CORP., Discrete Semiconductor Div., Dept. EM, 600 West John St., Hicksville, N.Y. 11802, Tel: 516-733-3333, TWX: 510-221-1865

Sales Manager: G. Stein; *Distributor Manager:* R. Graziano

Local Sales Offices & Reps.

Ala Huntsville, Electro-Mech 205-883-9624
Ariz Phoenix, Mercury Engrg. Sls. 602-949-5054
Cal El Segundo, Varigon Assocs. 213-322-1120
Cal Mountain View, Thresum Assocs 415-965-9180
Cal San Diego, Varigon Assocs. 714-299-5413
Colo Denver, DZ Assocs 303-534-3649
Conn Meriden, Electro Products Sls 203-235-4040
Fla Hollywood, "C" Assocs. 305-922-8917
Ga Atlanta, Electro-Mech Sls. Engrg. Co. 404-449-6337
Ill Chicago, General Instr. Corp. 312-338-9200
Ill Park Ridge, Metcom Assocs. Corp. 312-696-1490
Ind Greenwood, Valentine & Assocs 317-888-2260
Iowa Cedar Rapids, Dy-Tronix 319-377-8275
Md Baltimore, Component Sls. 301-484-3647
Mass Waltham, Electro Products Sls 617-899-8800
Mich Detroit, Nicon Assocs 313-341-7688
Minn Minneapolis, Quantum Sls. 612-831-8583
Mo Independence, Dy-Tronix 816-373-6600
NJ Teaneck, R. T. Reid Assocs. Inc. 201-692-0200
NY Buffalo, Quality Comps. 716-839-4170
NY Manlius, Quality Comps. 315-682-8885
NC Raleigh, Component Sls 919-782-8433
Ohio Cincinnati, G & H Sls. Co. 513-771-8231
Ore Portland, Jas J. Backer 503-297-3776
Pa Narberth, J. Bresson Assocs. 215-664-6460
Tenn Nashville, Electro-Mech 615-256-2516
Tex Dallas, Bonser - Philhower 214-234-8438
Tex Houston, Bonser - Philhower 713-467-4373
Wash Seattle, J. J. Backer Co. 206-285-1300

Local Distributors

Ariz Phoenix, Cramer Elctrns. 602-267-7321
Cal Irvine, Cramer Elctrns. 714-979-3000
Cal San Diego, Cramer Elctrns. 714-565-1881
Cal Santa Ana, Intermark Elctrns. 714-540-1322
Cal Sunnyvale, Diplomat/Westland Inc. 408-734-1900
Colo Wheatridge, Century Elctrns. 303-424-1985
Conn Hamden, Arrow Elctrns. 203-248-3801
Ga Doraville, Cramer Elctrns. 404-455-4054
Ill Elmhurst, Semiconductor Specialists 312-279-1000
Ill Rosemont, Advent Elctrns. 312-298-4210
Ind Ft. Wayne, Ft. Wayne Elctrns. 219-423-3422
Iowa Cedar Rapids, Deeco, Inc. 319-365-7551
Kans Shawnee Mission, Hall-Mark Elctrns. 913-888-4747
Md Savage, Pyttronic Inds. 301-792-0760
Mass Newton, Greene-Shaw Co. 617-969-8900
Mass Newton, A.W. Mayer Co. 617-965-1111
Mich Farmington, Semiconductor Specialists 313-478-2700
Mich Grand Rapids, Stotts-Friedmand Co. 616-459-0216
Minn Minneapolis, Berquist Co., Inc. 612-835-2322
Mo St. Louis, Olive Elctrns. 314-426-4500
Neb Lincoln, Scott Elctrns. Supply 401-466-8221
NJ Morrestown, Arrow Elctrns. 609-235-1900
NJ Saddlebrook, Arrow Elctrns. 201-797-5800
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NY East Syracuse, Cramer Elctrns. 315-437-6671
NY Elmsford, Zeus Comps. 914-592-4120
NY Syosset, Lafayette 516-921-7700
NC Greensboro, Hammond Elctrns. 919-275-6391
Ohio Cleveland, Arrow Elctrns. 216-464-2000
Ohio Dayton, Arrow Elctrns. 513-253-9176
Okla Tulsa, Component Specialties Inc. 918-664-2820
SC Greenville, Hammond Elctrns. 803-233-4121
Tex Dallas, Component Specialties, Inc. 214-357-6511
Tex Houston, Lenert Co. 713-225-1465
Utah Salt Lake City, Alta Elctrns. 801-486-7227
Wash Seattle, Sterling Elctrns. 206-762-9100
Wisc Mequon, Taylor Elctrns. 414-241-4321

GENERAL MAGNETICS, Dept. EM, 211 Grove St., Bloomfield, N.J. 07003, Tel: 201-743-2700; FSC No.: 99165; Empl.: 60 p. 2262-2266

GENERAL MFG. CO., Dept. EM, 724 Ruberta Ave., Glendale, Calif. 91201, Tel: 213-243-2069; FSC No.: 10454

Local Sales Offices & Reps.

Ill Chicago, Electro-Mech. Sls. Co. 312-777-0554

GENERAL MICROWAVE CORP., Dept. EM, 155 Marine St., Farmingdale, NY 11735, Tel: 516-MY4-3600, TWX: 510-224-6406; FSC No.: 11332; Empl.: 120 p. 2870,2871

Sales Manager: M. Wind

Local Sales Offices & Reps.

Cal Los Angeles, RF Assocs. 213-478-1586
Cal Palo Alto, RF Assocs. 415-494-3331
Conn Mt. Carmel, Sci Devices 203-248-9361
Fla Lighthouse Point, Saber Assocs. 305-943-3076
Ga Atlanta, Saber Assocs. 800-327-1181
Ill Mt. Prospect, Cain & Co. 312-253-3578
Iowa Cedar Rapids, Palatine Sls. 319-365-8071
Kans Darby, Palatine Sls., Inc. 316-788-0621
Kans Lenexa, Palatine Sls., Inc. 913-492-7070
Mass Waltham, Sci Devices 617-890-2252
Mo St. Louis, Palatine Sls., Inc. 314-426-7055
NJ West Orange, EF Technical Sls., Inc. 201-731-7203
NY Huntington, EF Technical Sls., Inc. 516-549-1818
NY Liverpool, R & D Assocs. 315-622-2350
NC Raleigh, Saber Assocs. 919-834-3961
Ohio Lancaster, Cain & Co. 614-654-4800
Pa Philadelphia, Eastern Instrumentation 215-927-7777
Tex Dallas, Cain & Co. 214-233-6809
Va McLean, Creative Mktg. Assoc., Ltd. 703-893-6612
Wash Seattle, H. Levinson & Co. 206-323-5100

GENERAL MONITORS, INC., Dept. EM, 3019 Enterprise St., Costa Mesa, Cal. 92626, Tel: 714-540-4895, Telex: 67-8372; Empl.: 130

Sales Manager: R. Kelleher

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Ala Mobile, Horton Instr. Co. 205-476-6808
Alas Anchorage, Alaska Controls, Inc. 907-272-3629
Cal Costa Mesa, Technical Prods. 714-646-8585
Cal Sacramento, E, Freitag 916-489-8831
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Mass Randolph, Spang Controls Co. 617-246-1497
Mich Royal Oak, The Satullo Co. 313-549-3910
Minn Minneapolis, E.R. Berg & Assoc. 612-890-1221
Neb Omaha, Deco Engrg. Prods., Inc. 402-341-4836
NM Albuquerque, R. A. Mayes Co. 505-292-2330
NY Elbridge, L-Tron Corp. 315-689-3787
NY Uniondale, Lyon Indl Sls. 516-485-6787
Ohio Cleveland, Automatic Controls Co 216-631-0333
Ohio Dayton, Hocker Assocs 513-298-8638
Okla Tulsa, J. Schoeffler Co. 918-742-5331
Ore Portland, Set-Point Control Inc. 503-288-8868
Pa Pittsburgh, Elctrn Instrs & Controls 412-563-3040
Pa Wayne, Clifford B. Ives & Co. 215-839-6850
Tex Houston, Groth Equip. Corp. 713-675-6151
Va Richmond, Virginia Tech Assocs. 804-266-9654
Wash Bellevue, Set-Point Control Inc. 206-454-0155
WVa So. Charleston, Allied Controls Co. 304-768-7313

GENERAL RADIO CO., See GenRad

GENERAL RESISTANCE, INC., Dept. EM, 75 Haven Ave., Mt. Vernon, N.Y. 10553, Tel: 914-699-8010, TWX: 710-562-0199; FSC No.: 05591; Empl.: 50

Sales Manager: J L Jamieson

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Cal Los Altos, J. Stone & Assoc. 415-948-4563
Cal Van Nuys, Gordon-Elliot, Inc 213-873-6862
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Fla Clearwater, Teqspec, Inc 813-725-2201
Ill Des Plaines, Marslano Associates, Inc 312-694-2262
Mass Framingham, J.M. Lancaster Co. 617-873-8893
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NM Albuquerque, RUSTCO 505-296-6474
Ohio Dayton, RIXAN Assocs. 513-278-4216
Pa Jenkintown, Stein Instrumentation 215-885-2370
Tex Houston, SESCO 713-668-7840
Tex Richardson, SESCO 214-231-9364
Va Baileys Crossroads, Q.T. Elctrn. Sls. 703-671-4357
Wash Seattle, Datacom Assocs. 206-285-2525

Components

Ariz Scottsdale, Summit Sls. 602-994-4587
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Colo Golden, J.F. Hurlbut Co. 303-279-7796
Conn Washington, TRI-COM Assocs. 203-868-7748
Fla Lighthouse Point, R.C. Simon 305-941-2757
Ga Atlanta, Electro-Mech Sales Engrg Co 404-449-6337
Mass Burlington, TRI-COM Assocs. 617-272-8163
Mich Farmington, W.R. Hummon & Assoc. 313-474-0661
NJ Wallington, Comp-Tech Sls. 201-935-5454
NY New Hyde Park, Comp-Tech Sls. 516-593-2628
Ohio Dayton, RIXAN Assocs. 513-278-4216
Tex Dallas, Blackburn Assocs. 214-692-8885
Utah Salt Lake City, J.F. Hurlbut Co. 801-299-4034
Va Falls Church, BEACON 703-534-1868
Wash Bellevue, TESTCO, Inc. 206-454-7422

GENERAL SCANNING, Dept. EM, 150 Coolidge Ave., Watertown, Mass. 02172, Tel: 617-924-1010, TWX: 710-327-6673; Empl.: 100

GENERAL SEMICONDUCTOR INDUSTRIES, INC., Dept. EM, 2001 W. 10 Pl., Box 3078, Tempe, Ariz. 85281, Tel: 602-968-3101, TWX: 910-950-1942; FSC No.: 24444; Empl.: 300

Sales Manager: D. W. Hutchins; *Distributor Manager:* E. S. Stumbaugh

Local Sales Offices & Reps.

Ala Huntsville, Remco 205-883-9260
Ariz Scottsdale, DAR-C, Inc. 602-948-2240
Cal Del Mar, Reed Elctrn. Mktg. 714-452-1456
Cal Los Alamitos, Reed Elect. Mktg. 714-821-9600
Cal San Carlos, Kottmeier Assocs. 415-592-8333
Fla Ft. Lauderdale, Dyne-A-Mark Corp 305-771-6501
Ill Berkeley/Hillside, Balhorn & Roeser 312-449-3900
Kans Shawnee Mission, Technical Sls. Assoc. 913-888-3330
Md Columbia, Rep-Tron 301-465-6433
Mass Waltham, Datcom 617-891-4600
Mich Livonia, Giesting & Assoc. 313-477-6060
Minn Minneapolis, Professional Sls. Ind. 612-835-1777
Mo Ferguson, Technical Sls. Assocs. 314-725-5361
NM Albuquerque, EMI 505-292-2700
NY Ithaca, Bob Dean, Inc 607-272-2187
NY Westbury, J2 Mktg, Inc. 516-997-6210
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NC Raleigh, Remco 919-787-1461
Ohio Cincinnati, Giesting & Assocs. 513-851-7800
Pa Willow Grove, BGR Assocs. 215-657-3301
Tex Houston, Oeler & Menelaides 713-772-0730
Tex Richardson, Oeler & Menelaides 214-234-6334
Wash Redmond, Desco-Northwest 206-883-6336

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Ariz Phoenix, Moltronics of Arizona 602-272-7951
Ariz Phoenix, Kachina Elctrn. Dist. 602-269-6201
Cal Gardena, Bell Industries 213-321-5802
Cal San Diego, Moltronics 714-278-5020
Cal San Dimas, Zeus Comps. 714-990-1911
Cal Santa Clara, Moltronics 408-244-7600
Cal South Gate, Moltronics 213-773-6521

Cal Sunnyvale, Bell Inds. 408-734-8570
Cal Woodland Hills, JACO 213-884-4560
Colo Wheatridge, Century Elctrns. 303-424-1985
Fla Clearwater, Southland Elctrns. 813-443-4514
Fla Pompano Beach, Zeus Comps. 305-942-4312
Ill Chicago, Bell Inds 312-982-9210
Ind Indianapolis, Sheridan 317-297-3146
Iowa Cedar Rapids, Deeco, Inc. 319-365-7551
Md Columbia, Technico 301-461-2200
Md Gaithersburg, Pioneer Washington Elctrns. 301-948-0710
Mass Burlington, Zeus Comps. 617-273-0750
Mass Lexington, Harvey Electronics 617-861-9200
Mass Natick, Lafayette Indl. Elctrns. 617-879-6300
Mich Farmington, Sheridan 313-477-3800
Mo Kansas City, L Comp. 816-221-2400
Mo Maryland Heights, L Comp. 314-291-6200
NM Albuquerque, Century Elctrns. 505-292-2700
NY Elmsford, Zeus Comps. 914-592-4120
NY Hempstead, Kahgan Comps. 516-538-2300
NY New Hyde Park, Lafayette Indl. Elec. 516-488-6600
NC Greensboro, Pioneer Elctrns. 919-273-4441
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Ohio Cincinnati, Sheridan 513-761-5432
Pa Horsham, Pioneer Elctrns. 215-674-4000
Pa Pittsburgh, Sheridan 412-244-1640
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Utah Salt Lake City, Century Elctrns. 801-972-6969
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GENERAL SENSORS, INC., Dept. EM, P. O. Box 401347, Garland, Tex. 75040, Tel: 214-276-6905; Empl.: 20

Local Sales Offices & Reps.
Ga Lilburn, Motion Technology 404-233-4368
Mich Birmingham, Forand Sls. Co. 313-644-0087
NC Charlotte, Motion Technology 704-525-9855
Tex Richardson, Precision Technology Assocs 214-234-8071

GENERAL SYSTEMS INTERNATIONAL INC., Dept. EM, 1440 Allec, Anaheim, Cal. 92805, Tel: 714-956-7183; Empl.: 55

Local Sales Offices & Reps.
Cal Cupertino, Telemark 408-248-9616
Cal Palo Verdes, Edwards Assoc. 213-377-0975
Colo Denver, Thorson Co. 303-759-0814
Fla Indian Rocks, Tech Reps. Assoc. 305-763-5374
Kans Shawnee Mission, Inland Assoc. 913-362-2366
Mass Waltham, Computer Mktg. Assoc. 617-894-7000
Minn St. Paul, De Beck Assoc. 612-690-1557
Va Annadale, Lankenau Assoc. 703-256-0800

GENERAL TRANSISTOR CORP., Dept. EM, 12591 Crenshaw Blvd., Hawthorne, Cal. 90250, Tel: 213-679-9721, Telex: 664397; FSC No.: 1P738; Empl.: 21

Distributor Manager: M. Monson

Local Sales Offices & Reps.
Cal Los Angeles, Duo Dynamics 213-240-4111
Cal Mountain View, Peninsula Sls 415-968-1985
Mass Canton, Elctrn Component 617-828-7528
Mich Brimingham, Favco Technical Rep. 313-644-0173
Tex Plano, McReynolds Sls 214-424-2248
Wash Seattle, R & R Assocs 206-762-7664

Local Distributors
Cal Costa Mesa, Semicomp Elctrns 213-971-5253
Cal San Diego, Intermark Elctrns 714-279-5200
Colo Denver, Integrated Elctrns 303-534-6121
Fla Riviera Beach, Jo-Ann Distributors 305-845-1155
Mich Livonia, Camelot Elctrns 313-427-8660
NJ Colonia, Lectron 201-574-1313
NY Farmingdale, Semi Specialists of America 516-293-2710
Tex Austin, Rhodes Groos Labs 512-928-0813
Exp: Los Angeles, Air Electro Supply 213-988-4400

GENERAL VALVE CORP., Dept. EM, 110 Rte. 10 Box 342, E. Hanover, N.J. 07936, Tel: 201-887-9460, Telex: 13-6369

Local Sales Offices & Reps.
Ohio Cincinnati, W. Watkins Assocs. 513-891-0313

GEN RAD, Dept. EM, 300 Baker Ave., Concord, Mass. 01742, Tel: 617-369-8770, TWX: 710-347-1051; FSC No.: 24655; Empl.: 1600 p. 4350-4352

Local Sales Offices & Reps.
Cal Irvine 714-540-9830
Cal Santa Clara 408-985-0662
Ga Atlanta 404-394-5380
Ill Schaumburg 312-884-6900
Md Gaithersburg 301-948-7071
Mass Bolton 617-646-0550
NJ Saddle Brook 212-964-2722
Ohio Dayton 513-294-1500
Tex Richardson 214-234-3357

GENTRON CORP., Dept. EM, 6667 N. Sydney Pl., Milwaukee, Wisc. 53209, Tel: 414-351-1660; Empl.: 50

Local Sales Offices & Reps.
Cal Mountain View, Energy Comp. 415-969-0330
Cal San Diego, Power Assocs 714-275-0641
Cal Santa Ana, John Franek Co. 714-832-0290
Colo Denver, Component Sls 303-750-2254
Fla Orlando, Gra-Mar 305-894-3351
Iowa Cedar Rapids, Dy-Tronix 319-377-8278
Mass Sharon, Cummings & Assocs 617-828-8370
Minn St Paul, SKOR 612-645-6461
Mo Hazelwood, Dy-Tronix 314-731-5799
NY Rochester, Ontea 716-464-8636
Ohio Cleveland, K.R.W. Sls. 216-714-4711
Ohio Dayton, K.R.W. Sls. 513-885-3330
Pa Oakmont, K.R.W. Sls. 412-243-2284
Tex Addison, Southland Comp. 214-0603

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Ala Huntsville, W.A. Brown Instrs. 205-883-8660
Ariz Scottsdale, PLS Assocs 602-994-5461
Ariz Tuscon, PLS Assocs 602-745-0004
Cal Cupertino, T. Louis Snitzer Co. 408-257-8333
Cal Del Mar, T. Louis Snitzer Co. 714-226-0305
Cal Los Angeles, T. Louis Snitzer Co. 213-836-6170
Colo Denver, PLS Assocs 303-773-1218
Conn Bridgeport, Tech. Instrs. 203-368-4582
Fla Fort Lauderdale, W.A. Brown Instrs. 305-776-4800
Fla Indialantic, W. A. Brown Instrs. 305-723-0766
Fla Orlando, W.A. Brown Instrs. 305-425-5505
Fla Valparaiso, W. A. Brown Instrs. 904-678-7932
Ga Atlanta, W.A. Brown Instrs. 404-939-1674
Ill Des Plaines, Marsland Assocs. 312-775-1309
Ind Indianapolis, Marsland Assocs. 317-924-3568
La Gretna, W.A. Brown Instrs. 504-366-5766
Mass Wilmington, Technical Instrs. 617-944-3930
Mich Detroit, Comtel Inst. 313-255-1970
Minn Minneapolis, Marsland Assocs. 612-545-4481
Mo Kansas City, Harris-Hanson Co. 816-444-9494
Mo St. Louis, Harris-Hanson Co. 314-432-3611
NJ Fort Lee, K.E. Hughes Co. 201-944-1600
NM Albuquerque, PLS Assocs 505-255-233
NY Albany, Reagan Compar Albany Co. 518-489-477
NY Endwell, Reagan Compar Albany Co. 607-723-966
NY Fairport, Reagan Compar Albany Co. 716-721-223
NY New Hartford, Reagan Compar Albany Co. 315-732-377
NY New York, K. E. Hughes Co. 212-695-008
NY Plainview, Trac Assocs 516-938-766
NC Research Triangle Park, W.A. Brown Instrs. 919-682-238
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SC Columbia, W. A. Brown Instrs. 803-798-329
Tenn Knoxville, W. A. Brown Instrs. 615-690-328
Tex Dallas, J.A. Green Co. 214-631-745
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Wash Bellevue, N.R. Schultz Co. 206-454-030

G & G TRESCO CORP., Dept. EM, 1952 E. Allegheny Ave., Phila., PA 19134, Tel: 215-426-9105, Telex: 834245; Empl.: 250

Sales Manager: G. Schilling

GIANNINI INSTITUTE, Dept. EM, 51555 Madison St Indio, Ca. 92201, Tel: 714-347-2833; FSC No.: 2472

Sales Manager: H. Harrington

GIBSON/EGAN CO., Dept. EM, 2666 East Huntington Dr., Duarte, CA. 91010, Tel: 213-358-0191; Empl.: 4

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Cal San Jose, R.C.L. Associates 408-255-258
NJ Verona, C. K. Wall 201-746-483
Pa Devon, B & A Assocs. 215-688-517
Tex Dallas, Scott Tech. Sls. Co. 214-352-769

GILWAY TECHNICAL LAMP, Dept. EM, 272 Ne Boston Park, Woburn, Mass. 01801, Tel: 617-935-444 Telex: 949-329; Empl.: 5

Sales Manager: G. Wade

GLASSMAN HIGH VOLTAGE, Dept. EM, 124 W Main St., High Bridge, N.J. 08829, Tel: 201-735-880 Empl.: 6 p. 326

Sales Manager: S.H. Glassman

Local Sales Offices & Reps.
Cal South Pasadena, Beckrep, Inc. 213-799-463
Cal Woodside, N-S Assocs 415-854-487
Conn Hamden, Instrument Consits 203-248-417
Mass Waban, Instr Consits 617-969-988

GLASTIC CORP., Dept. EM, 4321 Glenridge Rd Cleveland, Ohio 44121, Tel: 216-486-0100; Empl.: 37

Sales Manager: W. F. Ames; *Distributor Manager:* T. Suhy

GLENAIR, INC., Dept. EM, 1211 Air Way, Glendale, Ca 91201, Tel: 213-247-6000, TWX: 910-497-206 67-3485; FSC No.: 06324; Empl.: 350

Local Sales Offices & Reps.
Ala Huntsville, Brandel-Stephens Co. 205-883-044
Ariz Scottsdale, Runyon Co. 602-959-606
Cal Downey, Buffa Co. 213-923-461
Cal Glendale, Electro-Mech Prods. 213-848-092
Cal San Diego, Earle Assocs. 714-278-544
Cal Santa Clara, Nova-Tronix Elec. Sls. 408-243-953
Colo Englewood, Todd Assocs. 303-761-780
Conn Branford, W. McCoy Co. 203-488-201
Fla Orlando, Brandel-Stephens Co. 305-425-320
Ga Atlanta, Brandel-Stephens Co. 404-261-757
Ill Chicago, Marsten Sls. Co. 312-775-661
Ind Greenwood, Valentine Assoc. 317-888-226
Ind South Bend, Valentine Assoc. 219-282-125
Md Silver Spring, Carwithen Assocs. 301-589-904
Mich Plymouth, Romarc 313-455-030
Minn Minneapolis, Nygaard Sls. 612-881-372
Mo Kansas City, Harris-Hanson Co. 816-444-949
Mo St. Louis, Harris-Hanson Co. 314-432-361
NJ Cherry Hill, PJL Engrg. Sls. 609-428-196
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NM Scottsdale, Goodreau Assocs. 602-994-990
NY Greensboro, Brandel-Stephen Co. 919-274-695
NY Vestal, SHR, Inc 607-729-633
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Ohio Dayton, D. Steffen & Assocs. 513-293-314

Ohio Dayton, A.D. Dircksen & Assoc. 513-256-0351
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Tex Houston, AID Elctrns. 713-777-3882
Tex Irving, AID Electronics, Inc. 214-259-4761
Wash Redmond, Squibb Assoc. 206-885-6991

GLENMARC MFG. INC., Dept. EM, 330 Melvin Dr., Northbrook, Ill. 60062, Tel: 312-272-9030, Telex: 28-3499; Empl.: 13

GLENTEK, INC., Dept. EM, 1559 7th St., Santa Monica, Calif. 90401, Tel: 213-451-4511; FSC No.: 26415; Empl.: 20

GLIDDEN METALS, Chem/Met Div. SCM Corp., Dept. EM, 900 Union Commerce Bldg., Cleveland, Ohio 44115, Tel: 216-771-5121, Telex: 98-5325

Local Sales Offices & Reps.
Cal Commerce 213-721-4071

GLOBE PLASTICS, Dept. EM, 1342 S. Signal Dr., Pomona, Cal. 91766, Tel: 714-623-2747; Empl.: 15

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Sales Manager: L. A. Holsapple

Local Sales Offices & Reps.
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Cal Santa Ana, A.C. Inds. 714-979-9830
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Minn Minneapolis, PSI Co. 612-835-1777
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NY Massapequa, R. McGrath 526-798-0400
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NC Smithfield, ADI Co 919-934-8136
Pa Devon, Kiley Elec 215-687-9340

GLUCO, INC., Dept. EM, Box 336, Monroeville, Pa. 15146, Tel: 412-327-7575; FSC No.: 83508; Empl.: 20

Sales Manager: W. Gluck

GNT AUTOMATIC

GNT AUTOMATIC INC., Dept. EM, 440 Totten Pond Rd., Waltham, Mass 02154, Tel: 617-890-3305, Telex: 923318 p. 1642

Sales Manager: W.T. Hope

Local Sales Offices & Reps.
Mo Excelsior Springs, GNT Automatic 816-637-6330

GOODRICH CO. CHEMICAL DIV (BF), See BFGoodrich Chemical Div

GORDON ENGINEERING CORP., Dept. EM, 67 Del Mar Dr., Brookfield, Conn. 06804, Tel: 203-775-4501; Empl.: 20

Local Sales Offices & Reps.
Ala Huntsville, B J R Reps 205-881-3569
Ariz Phoenix, A. Norton Co. 602-278-6481
Cal Paramount, Fredric Engrg. 213-531-7676
Cal San Francisco, C. Tunnell 415-388-5038
Colo Denver, H. Kaub & Co. 303-399-1520
Conn Brookfield, L. Najman 203-775-4501
Conn Ridgefield, Technical Mgr. Co. 203-438-2740
Fla Clearwater, H.G. Gross Co. 813-446-6649
Ill Northbrook, McFarland Engrg. 312-272-6246
Ind Wabash, Richard Scales Assocs. 219-563-4886
Iowa Des Moines, Deco Engrg. 515-274-9356
Mich Troy, Morco Corp. 313-585-3910
Mo Webster Groves, Components & Equip. 314-962-2799
Neb Omaha, Deco Engrg. 402-341-4836
NY E. Aurora, H.D. McCleery Assoc. 716-652-1042
NC Monroe, Price Equip. Co. 704-283-4788
Ohio Cincinnati, H. C. Jahn 513-521-0172
Ohio Twinsburg, J. Hubbard & Assoc.
Pa Hershey, Niets Assocs. 717-533-3679
Wash Bellevue, Hickey Engrg. Sls. 206-454-0460
Wisc Milwaukee, Star Engrg. Sls. 414-543-3469

GORDOS CORP., Dept. EM, 250 Glenwood Ave., Bloomfield, N.J. 07003, Tel: 201-743-6800, TWX: 710-994-4787; Empl.: 600 ....p. 3492-3499,4076,4077

Sales Manager: D. Husted; *Distributor Manager:* D. V. Husted

Local Sales Offices & Reps.
Ariz Phoenix, Bob Anderson 602-266-2070
Cal San Jose, J.E. Rollins, Field Sls Egr 408-248-6800
Cal Saugus, H. Smith, Field Sls Egr 805-259-8200
Colo Wheatridge, Waugaman Assocs. 303-423-1020
Conn Orange, R.F. Duffy Assocs 203-795-3678
Fla Maitland, Barrett Assocs. 305-678-0172
Ill Chicago, Berndt Assocs. 312-283-0713
Ind Carmel, Berndt Assocs. 317-844-0114
Kans Overland Park, Kebco 913-649-1051
Mass Braintree, R.F. Duffy Assocs. 617-848-3550
Mich Farmington, Miltimore Sls 313-476-2446
Minn Burnsville, Faith Sls Co 612-894-3690
Mo Maryland Heights, Kebco 314-576-4111
NJ Bloomfield, Stephen Kunnmann - Field Sls Engr. 201-743-6800
NM Albuquerque, Waugaman Assocs., Inc. 505-294-1436
NY Fayetteville, Henry G. Richter Inc. 315-637-6713
NC Charlotte, JWL Assocs 704-364-3177
Ohio Cleveland, A.H. Baier Co. & Assoc. 216-461-6161
Ohio Dayton, A.H. Baier Co. & Assoc. 513-276-4128
Tex Dallas, Advance Techn Sls 214-361-8584
Tex Houston, Advance Techn Sls. 713-469-6668
Utah Salt Lake City, Waugaman Assocs. 801-363-0275
Wisc Milwaukee, Berndt Assocs 414-545-8400

Local Distributors
Ala Birmingham, Newark Elctrns 205-942-4044
Ariz Phoenix, Be Switched 602-263-8212
Ariz Phoenix, Arizona Comp 602-279-9446
Ark Little Rock, Carlton-Bates Co 501-562-9100
Cal Lakeside, Mouser Elctrns 714-449-2220
Cal Los Angeles, Electric Switches 213-660-1310
Cal Mt. View, Time Elctrns/N. Cal. 415-965-8000
Cal Riverside, Elctrn Supply 714-683-7300
Cal Sunnyvale, Permag Sierra Corp. 408-738-1080
Cal Torrance, Time Elctrns 213-320-0880
Cal Woodland Hills, Jaco 213-887-7260
Colo Denver, Integrated Elctrns. 303-534-6121
Conn Bloomfield, Newark Elctrns 203-243-2541
Fla Orlando, Hammond Elctrns. 305-849-6060
Ga Atlanta, Newark Elctrns 404-321-0413
Ill Chicago, Newark Elctrns. 312-638-4411
Ill Schaumburg, Control Design 312-882-7232
Ind Indianapolis, Control Design 317-788-4559
Iowa Des Moines, Ramco Co 515-225-6933
Kans Shawnee Mission, Newark Elctrns 913-384-4545
Ky Louisville, Newark Elctrns 502-423-0280
La Metairie, Newark Elctrns 504-888-5174
Md Bethesela, Empire Elctmc. Supply Co. 301-656-3300
Md Glen Burnie, Aztech Elctrns 301-768-6010
Mass Watertown, DRW Elctrns 617-923-1900
Mich Oak Park, Newark Elctrns 313-967-0600
Mich Wyoming, Newark Elctrns 616-241-6681
Minn Minneapolis, Control Design. 612-721-1628
Minn Minneapolis, Control Design. 612-721-1628
Mo St. Louis, Control Design 314-426-3150
NJ Fair Lawn, Relay Specialties 201-797-3313
NJ Kenilworth, Newark Elctrns 201-272-8410
NJ Pennsauken, Resco Elctrns. 609-662-4000
NM Albuquerque, Electronic Devices 505-293-1935
NY Buffalo, Summit Distrib 716-884-3450
NY Farmingdale, DRW Elctrns. Corp. 516-249-2660
NY Hauppauge, Jaco 516-273-5500
NY Rochester, Simcona Elctrns. 716-328-3230
NC Greensboro, Hammond Elctrns. 919-275-6391
Ohio Columbus, Electronics Mktg. 614-299-4161
Ohio Medina, DRW Elctrns 216-722-5531
Ohio Solon, REH Elctrns 216-248-1636
Okla Oklahoma City, Newark Elctrns 405-840-2825
Ore Portland, Radar Electric 503-233-3691
Pa Carnegie, Newark Elctrns. 412-279-5930
Pa Philadelphia, Resco Elctrns 215-925-6900
SC Greenville, Hammond Elctrns 803-233-4121
Tenn Knoxville, Newark Elctrns. 615-584-0134
Tex Dallas, Control Design 214-358-1441
Tex Dallas, K. A. Elctrn. Sls. 214-634-7870
Tex Houston, Solid State Elctrns. 713-785-5436
Utah Salt Lake City, Ballard Supply 801-972-2435
Wash Seattle, Radar Electric 206-282-2511
Wisc Milwaukee, Parts Mart 414-276-1212

GORE, W.L. & ASSOCS., Dept. EM, 555 Paper Mill Rd., Box 8734, Newark, Del. 19711, Tel: 302-738-4880, TWX: 510-666-0825; Empl.: 233

Sales Manager: A. B. Chase

Local Sales Offices & Reps.
Ariz Flagstaff 602-526-1290
Ariz Phoenix 602-248-8631
Cal Newport Beach 714-833-3447
Cal San Mateo 415-697-8058
Colo Denver 303-770-8545
Del Newark 302-738-4880
Fla Orlando 305-898-1034
Md Elkton 301-398-6400
Mass Wakefield 617-246-1818
Minn Bloomington 612-888-4477
NY Skaneateles 315-685-3268
Tex Dallas 214-691-8797

GORMAN-REDLICH MFG. CO., Dept. EM, 6 Curtis St., Athens, Ohio 45701, Tel: 614-593-3150; Empl.: 4

GOTHAM AUDIO CORP., Dept. EM, 741 Washington St., New York, N.Y. 10014, Tel: 212-741-7411, Telex: 12-9269; Empl.: 18

Local Sales Offices & Reps.
Cal Hollywood, Gotham Audio Corp. 213-874-4444

GOULD INC. CIRCUIT PROTECTION & CONTROLS DIV., Dept. EM, 100 Relay Rd., Plantsville, Conn. 06479, Tel: 203-621-6771, TWX: 710-473-0079; Empl.: 450 p. 3500-3506

Sales Manager: R.E. Brodeur; *Distributor Manager:* M. Freyermuth

Local Sales Offices & Reps.
Ala Huntsville, 20th Century Mktg. 205-772-9237
Ariz Tempe, Delta Elctrns. Sls. 602-966-9903
Cal Los Angeles, El-Com Sls. 213-223-1351
Cal Redwood City, Parks & Pruitt Assoc. 415-364-1640
Colo Denver, Elctrn. Sls. 303-771-6300
Conn Cheshire, Selmark Assoc. 203-272-8674
Fla Indiatlantic, Raycom Inc. 305-727-8860
Ga Atlanta, O'Hara Assocs. 404-237-0600
Ill Chicago, D. Dolin Sls. 312-286-6200
Iowa Cedar Rapids, Tech Reps 319-393-5510
Kans Lenexa, Technical Reps. 314-888-0212
Md Bladensburg, Delta Ill Assoc. 301-779-0977
Mass Millis, Selmark Assocs. 617-376-2914
Minn Minneapolis, P.S.I. 612-835-1777
Mo Hazelwood, Tech Reps. 314-731-5200
NH Concord, Selmark Assoc. 603-623-5774
NJ Laurel Springs, B.G.R. Assoc. 609-228-0939
NJ Oakland, Robert Horne Assoc. 201-337-5200
NM Albuquerque, Cleveland Enterprises 505-266-5594
NY Camillius, North Honsinger Assoc. 315-672-3988
NY Ilion, Noeth Honsinger Assoc. 315-894-9943
NY Pittsford, North Honsinger Assoc. 716-461-4750
NC Burlington, P.J. Nahser Co. 919-226-8053
NC Greensboro, D.M.I. 919-885-4634
Ohio Beachwood, Elctrn. Salesmaster 216-831-9555
Ore Portland, Frank Jackson Assoc. 503-645-5476
Pa Pittsburgh, Process Engrg. Co. 412-561-5050
Pa Willow Grove, B.G.R. Assoc. 215-657-3301
RI Cranston, Selmark Assoc. 401-943-5717
Tex Dallas, Bonser-Philhower Sls. 214-234-8438
Tex Houston, Bonser-Philhower Sls. 713-467-4373
Wash Seattle, F. Jackson Co. 206-523-6300
Wisc Milwaukee, D. Dolin Sls. 414-482-1111

Local Distributors
Ala Birmingham, Newark Elexs 205-942-4044
Ariz Phoenix, Cramer/Ariz. 602-267-7321
Cal Los Angeles, El-Com, Inc. 213-223-1351
Cal San Leandro, KEA Distributing 415-352-2277
Cal Sunnyvale, Cramer/San Francisco 408-739-3011

Colo Denver, Newark-Denver Elect. .. 303-757-3351
Colo Englewood, Elctrn Sls..... 303-771-6300
Conn Danbury, Bond Radio 203-744-2274
Fla Ft. Lauderdale, Peerless Radio .. 305-566-5966
Ga Atlanta, Newark Elctrns..... 404-321-0413
Ill Chicago, Newark Elctrns..... 312-638-4411
Ind Fort Wayne, Fort Wayne Elctrns. 219-423-3422
Ind Indianapolis, Graham Elctrn. 317-634-8202
Kans Wichita, Radio Supply..... 316-267-5214
Md Columbia, Technico, Inc..... 301-461-2202
Mass Newton, Cramer Elctrns. 617-969-7700
Mass Newton, Greene-Shaw Co. 617-969-8900
Mich Oak Park, Newark Detroit Elect. 313-968-5638
Minn Minneapolis, Industrial Comps. .. 612-831-2666
Mo St. Louis, Interstate Ind. 314-481-6110
Mont Belgrade, Flamand Elexs 406-388-6606
NJ Moonachie, Cramer/N.J. 201-935-5600
NJ Oakland, Gordon/Horne..... 201-337-5200
NM Albuquerque, Cramer/N.M. 505-243-4566
NY Buffalo, Standard Elctrns..... 716-685-4220
NY Buffalo, Summit Distributing..... 716-884-3450
NY Hauppauge, Cramer 516-231-5600
NY Rome, Rome Elctrn. 315-337-5400
NC Winston-Salem, Kirkman Elect. .. 919-724-0541
Ohio Akron, Akron Elctrns. 216-762-8818
Ohio Dayton, Stotts-Friedman Co. 513-224-1111
Ohio Wickliffe, Gateway-Megatech..... 216-944-8565
Okla Oklahoma City, Electro Enterprises 405-478-1752
Ore Portland, Eoff Elect Co. 503-222-9411
Pa McKeesport, Barno Radio Co..... 412-751-5966
Pa Philadelphia, Philadelphia Elctrns. 215-568-7400
Pa Pittsburgh, Cam Rpc Ind'l. Elctrns. 412-782-3770
Tenn Nashville, Electra Distributing 615-329-3971
Tex Dallas, Sterling Elctrns. 214-357-9131
Tex El Paso, Midland Spec. Co. 915-533-9555
Tex Houston, Geophysical Supply 713-659-2233
Utah Salt Lake City, Alta-Land Elctrns. 801-486-7227
Va Arlington, Republic Elctrns. 703-533-8555
Wash Seattle, Western Elctrns. 206-284-0200
Wisc Madison, Newark Elexs. 808-221-4738
For: Canada Montreal, Quebec,, Specialty Elexs 514-336-4500
For: Canada Rexdale, Ontario,, Future Elexs 416-677-7820

GOULD DATAMETRICS, See Datametrics Inc.

GOULD INC., Electrical Comps. Div., Dept. EM, 123 Smith St., E. Farmingdale, N.Y. 11735, Tel: 516-694-5400, Telex: 96-1348; Empl.: 400

Sales Manager: R. Dorman

Local Sales Offices & Reps.
Ala Birmingham, Bishop & Brogdon.. 205-822-4524
Alas Anchorage, Rostel Corp.
Ariz Phoenix, Tom Geis & Assoc 602-252-7694
Ariz Phoenix, T. Geiss & Assoc. 602-252-7694
Ark Little Rock, Percy Williams & Co. 501-224-2810
Cal Los Angeles, Gould Inc./EPSD .. 213-266-3364
Cal Sacramento, Gould Inc./EPSD .. 916-371-6953
Colo Denver, Stemco Sls. Co. 303-355-3573
Fla Brandon, Gould Inc./ECD..... 813-685-3471
Fla Plantation, Gould Inc EPSD 305-587-6185
Ga Atlanta, Bishop & Brogdon..... 404-522-8124
Idaho Boise, Vordos & Jameson Inc 208-342-2666
Ill Rolling Meadows, Gould, Inc. 312-640-4000
Ind Indianapolis, Arthur A. Boyle 317-257-4363
Kans Mission, Gould Inc. EPSD..... 913-384-4700
Ky Louisville, Pfeiffer-Boyle Sls. Co. 502-634-8314
La Metairie, Rapco Assoc. Inc. 504-887-9500
Md Baltimore, Specialty Elec. Sls. Co. 800-638-3410
Mass Braintree, B.N. Yanow & Co..... 617-848-7300
Mich Detroit, Popkin-Segall Inc. 313-832-1700
Minn Mendota Hgts, Gould Inc. EPSD 612-452-1500
Miss Jackson, Rapco Assoc. 601-982-7421
Mo St. Louis, Cooper Elec. Sls. 314-638-3434
Neb Omaha, Gould Inc. EPSD..... 402-397-1940
NJ E. Brunswick, Gould Inc. EPSD.. 201-238-1022
NY E. Syracuse, Gould Inc. EPSD .. 315-455-5881
NY Farmingdale, Burton Cooper Inc 516-752-9440
NY Jamaica, Warshaw Elec. Co..... 212-525-8150
NY Westchester, Burton Cooper Inc 914-383-1900
NC Charlotte, Gould Inc./ECD..... 704-554-0287
NC High Point, Gould Inc EPSD..... 919-869-5619
Ohio Broadview Hgts, J. Natt & Assoc. 216-526-4200
Okla Tulsa, Gould Inc./ECD 918-743-4081
Pa Philadelphia, Specialty Elec. Sls. Co. 800-638-3410
Pa Pittsburgh, Gould Inc./ECD 412-922-5114
Tenn Nashville, Matthews & Park, Inc. 615-244-7070
Tex Dallas, Gould Inc./EPSD 214-638-8550
Tex Houston, Gould Inc. EPSD..... 713-621-2498
Utah Salt Lake City, L. Vordos Agency 801-521-2111
Va Richmond, Gould Inc. EPSD 804-320-0109
Wash Seattle, No. Elec. Sls..... 206-633-1846
Wisc Milwaukee, D.S. Berry Co..... 414-224-0680

GOULD INC., Electronic Comps. Div., Dept. EM, 4601 N. Arden Dr., El Monte, Cal. 91731, Tel: 213-442-7755, TWX: 910-587-4934 ..... p. 3266

GOULD, INC., Instrs Div, Dept. EM, 3631 Perkins, Cleveland, Ohio 44114, Tel: 216-361-3315, TWX: 810-421-8580; Empl.: 630 ..... p. 2752,2842

Sales Manager: L. A. Hall

Local Sales Offices & Reps.
Ala Huntsville, W.A. Brown Instr., Inc. 205-883-8660
Ariz Phoenix, Gould Inc., Instr Div..... 602-267-7241
Cal Burlingame, Gould Inc., Instr. Div. 415-697-9345
Cal El Monte, Gould Inc., Instr. Div... 213-442-7755
Colo Englewood, Gould Inc., Instr. Div. 303-761-7021
Conn Stratford, Gould Inc., Instr. Div... 203-377-1332
Fla Ft. Lauderdale, W.A. Brown Instrs. 305-776-4800
Fla Ft. Walton Beach, W.A. Brown Instrs. 904-678-7932
Fla Orlando, W.A. Brown Instrs. 305-425-5505
Ga Atlanta, W.A. Brown Instrs. 404-939-1674
Ga Dunwoody, Gould Inc., Instrs Div 404-455-3343
Ill Rolling Meadow, Gould Inc., Instr. Div. 312-640-4000
La Gretna, W.A. Brown Instrs..... 504-626-9701
Md Lanham, Gould Inc., Instr. Div..... 301-459-7350
Mass Burlington, Gould Inc., Instr. Div. 617-272-0750
Mich Southfield, Gould Inc., Instr. Div. 313-355-0900
Minn Minneapolis, Gould Inc., Instr. Div. 612-452-1500
Mo St. Louis, Gould Inc., Instr. Sys. Div. 314-878-6110
NJ Saddle Brook, Gould Inc., Instr. Div. 201-845-0220
NY Schenectady, Gould Inc., Instr. Div. 518-370-1404
NY Syracuse, Gould Inc., Div. 716-222-4490
NC Durham, W. A. Brown Instrs. 919-682-2383
Ohio Cleveland, Gould Inc., Instr. Div. 216-361-3315
Ohio Dayton, Gould Inc., Instr. Div. 513-433-9586
Pa Bala Cynwyd, Gould Inc., Instr. Div. 215-839-7066
Pa Pittsburgh, Gould Inc., Instr. Div. 412-931-3660
SC Columbia, W. A. Brown Instrs 803-798-3297
Tenn Knoxville, W. A. Brown Instrs. 615-482-5761
Tex Dallas, Gould Inc., Instr. Div. 214-241-5131
Tex Houston, Gould Inc., Instr. Div. .. 713-644-3671
Va Richmond, Gould Inc., Instr. Div. .. 804-288-2888
Wash Bellevue, Gould Inc., Instr. Div. .. 206-453-8100

GOULD, INC. INSTR. SYS. DIV. POWER SUPPLY DEPT., Dept. EM, 3631 Perkins Ave., Cleveland, Ohio 44114, Tel: 216-361-3315, TWX: 810-421-8580

Local Sales Offices & Reps.
Ala Huntsville, 20th Century Mktg. Inc. 205-772-9237
Cal Los Angeles, El-Com, Inc. 213-223-1351
Cal Mission Viejo, Powerhouse..... 714-830-5666
Cal Redwood City, Parks & Pruitt Assocs. 415-364-1640
Colo Denver, Electronic Sls. 303-771-6300
Fla Winter Park, Young & Lawrence 305-647-6929
Ga Atlanta, O'Hara Assocs. 404-237-0600
Ill Elk Grove Village, Oasis Sls. Corp. 312-640-1850
Kans Olathe, Technical Reps. 913-782-1177
Md Bladensburg, Delta Ill Assocs..... 301-779-0977
Mass Millis, Selmark Assocs. 617-376-2914
Minn Minneapolis, P.S.I. 612-835-1777
NJ Haddonfield, TAI Corp. 609-854-3011
NJ Wayne, R. Horne Assocs. 201-835-7400
NM Albuquerque, Cleveland Entprs. 505-345-2481
NY East Syracuse, Noeth Honsinger Assocs. 315-463-5718
NY Ilion, Noeth Honsinger Assocs. .. 315-894-9943
NC Burlington, P.J. Nahser 919-226-8053
NC Greensboro, D.M.I. 919-885-4634
Ohio Beachwood, Electronic Salesmasters 216-831-9555
Pa Pittsburgh, Automated Equip. & Engrg. 412-931-7616
Tex Dallas, Ammon & Rizos Co. 214-233-5591
Wash Seattle, F. Jackson Assocs..... 206-523-6300

GOULD/TRUMP-ROSS, See Datametrics/Trump Ross

GOULD, INC., Meas. Sys. Div., Dept. EM, 2230 Statham Blvd., Oxnard, Cal. 93030, Tel: 805-487-8511, Telex: 65-9223; Empl.: 500

Sales Manager: G. Goodrich

Local Sales Offices & Reps.
Ala Anchorage, Engrd. Equip. Co. 907-277-792
Cal Arleta, Roma Sales..... 213-767-636
Cal Torrance, Tech-Ser Inc. 213-538-226
Colo Lakewood, Intermountain Instr. .. 303-237-044
Fla Orlando, Gould Inc., Measurement Sys. Div. 305-894-777
Ga Atlanta, Craft Assocs Co 404-256-042
Haw Honolulu, Atecs Corp 808-845-299
Ill Park Ridge, Fluid Equip. Assocs. 312-692-698
Md Baltimore, Celco 301-483-960
Mass Peabody, JSR Assocs 617-532-034
Mich Madison Heights, WKM Assocs.. 313-588-230
Minn Minneapolis, Waytek Inc. 612-884-231
Mo St. Louis, Industrial Services Lab 314-535-576
NJ Saddle Brook, Gould Inc., Measurement Sys. Div. 201-845-022
NM Albuquerque, Mountaintek, Inc. .. 505-265-852
NY Buffalo, Angus Instruments 716-634-064
NY Lancaster, Lawrence Industrial Sls 716-685-199
NC Indian Trail, Blythe Co..... 704-821-769
Ohio Cleveland, WKM Assocs., Inc..... 216-267-044
Ohio Dayton, WKM Assocs. 513-434-750
Okla Tulsa, Lucas Controls..... 918-749-649
Ore Portland, Branom Instr. Co. 503-283-255
Pa Bristol, Al Roger's Co..... 215-788-507
Pa Fort Washington, Parr Engineering Assocs 215-643-751
Pa Pittsburgh, WKM Assocs. 412-892-295
Pa Pittsburgh, W. B. Wells Co..... 412-833-136
Tex Dallas, Synthetics Inc..... 214-631-174
Tex Houston, Gould Inc., Measurement Sys. Div. 713-688-929
Tex Houston, AWC 713-488-273
Utah Salt Lake City, Process Instrs. & Controls 801-262-556
Wash Seattle, Branom Instr. Co. 206-762-605

GOW-MAC INSTR. CO., Dept. EM, P. O. Box 32 Bound Brook, N.J. 08805, Tel: 201-560-0600, Telex 833-174; Empl.: 45

Sales Manager: R.J. Mathieu

GOWANDA ELECTRONICS CORP., Dept. EM, 17 Broadway Rd., Gowanda, N.Y. 14070, Te 716-532-2236, TWX: 710-529-1211; FSC No.: 2422 Empl.: 200

Local Sales Offices & Reps.
Cal Redwood City, Parks & Pruitt Assocs. 415-364-164
Cal Van Nuys, W.J. Barron Co. 213-780-050
Colo Golden, J.F. Hurlbut Co..... 303-279-779
Ill Chicago, W.F. Hamilton Co..... 312-867-503
Iowa Cedar Rapids, Snider Sls. Co. .. 319-362-441
Mass Reading, Lincoln Assocs. 617-944-902
Mich Southfield, Fred H. Gehrke & Assoc. 313-559-536
Minn Minneapolis, Technical Assoc.... 612-929-672
Mo Maryland Heights, KEBCO..... 314-576-411
NJ Medford, Mech Elec Sls. Co..... 609-654-820
NY Cazenovia, Naylor Elec. Co. 315-655-817
NY Plainview, R. Smith Assoc..... 516-681-315
NC Greensboro, L & D 919-292-320
Ohio Columbus, McFadden Sales Inc. 614-459-128
Tex Dallas, SEI (Southwest Elctrns. Ind.) 214-690-988
Wash Olympia, Bergford and Assocs... 206-943-666

GRADO LABS., INC., Dept. EM, 4614 Seventh Ave Brooklyn, N.Y. 11220, Tel: 212-435-5340

Local Sales Offices & Reps.
Cal North Hollywood, J.W. Steinberg Co. 213-982-670
Cal San Francisco, Meyer, Ross Co. 415-864-888
Conn W. Hartford, R. Smith Co. 203-523-051
Fla Orlando, J. Perfito 305-855-073
Ga Tucker, Audio Sls. 404-938-710
Ill Chicago, T. Pappas & Assocs. .. 312-685-233
Kans Overland Park, Castanet 913-341-121
Mich Farmington, Sound Sls 313-553-800
Minn St. Paul, McGuiness & Assoc 612-941-718
NY Thiells, R.M. Nader Sls Corp. 914-429-512
Ohio Medina, J.H. Podolny Co..... 216-725-881
Okla Norman, L. Bernstein 405-321-320
Ore Portland, Harris Representatives N.W. 503-292-018
Utah Salt Lake City, Partridge Elctrns Sls 801-943-012
Exp: N.Y., Plainview, Delrama Int'l. 516-293-874

GRALEX INDS., Div. Gen. Microwave, Dept. EM, 15 Marine St., Farmingdale, N.Y. 11735, Te 516-694-3600, TWX: 510-224-6406; FSC No.: 1133 Empl.: 25 ..... p. 2750,275

Local Sales Offices & Reps.
Ariz Phoenix, Eltron ... 602-997-1042
Cal Hollywood, Duncan Eng. Sls ... 213-462-5880
Cal Mt. View, Leddy Assoc. ... 415-969-6313
Colo Aurora, Denning Assocs. ... 303-755-7765
DC Washington, H. Wise Co. ... 202-363-9417
Fla Clearwater, Brennan ... 813-446-5006
Haw Honolulu, Aloha Assocs. ... 808-941-1574
Ind Fort Wayne, Scott Elctrns. ... 219-743-1586
Ind Indianapolis, Scott Elctrns. ... 317-897-9976
Mass Waltham, Del Tech. Sls. ... 617-890-1020
Mich Plymouth, Scott Elctrns. ... 313-455-2440
Minn Bloomington, Elctrn. Sls. Agcy ... 612-884-8291
Mo Lake Lotawana, Lotronics ... 816-578-4498
NY Huntington, C.R. Mayer Assoc. ... 516-921-7876
Ohio Cleveland, Scott Elctrns. Inc. ... 216-291-2600
Ohio Columbus, Scott Elctrns. ... 614-236-8619
Ohio Dayton, Scott Elctrns. ... 513-294-0539
Pa Audubon, Daner-Hayes ... 215-666-5005
Pa Pittsburgh, Scott Elctrns. ... 412-781-3112
Tex Dallas, John B. Guenther ... 214-691-8500
Tex Houston, John B. Guenther ... 713-468-0232
Wash Bellevue, Kevin Hall Assocs. ... 206-455-5526

Local Distributors
Cal Irvine, Meter Craft ... 714-979-1420
Cal Santa Clara, Dynametron ... 408-246-6535
Colo Denver, Meter Master Instru ... 303-722-5766
Tex Houston, Meters & Instrs ... 713-644-1631

GRAND TRANSFORMERS, Dept. EM, Box 188, Grand Haven, Mich. 49417, Tel: 616-842-5430; Empl.: 175

Sales Manager: G. Anderson

Local Sales Offices & Reps.
Cal Laguna Hills, English Sls Ass. ... 714-770-2727
Cal Menlo Park, G.R. McKnight Co. 206-284-2200
Fla Orlando, Buchanan & Abrams Assocs.
Ill Streamwood, A Holte & Assocs. 312-837-4066
Mich Grand Rapids, R. Van Riper Sls. 616-452-0464
Minn St. Paul, Arkco Sls ... 612-777-7454
NY Floral Park, MOS Assocs. ... 516-694-5923
Ohio Cleveland, D. Steffen & Assocs. 216-261-5055
Pa Ardmore, Rothenheber & Wurts, Inc. 215-642-6911
RI Kingston, Gerard Forman Co. ... 401-789-3021
Tex Dallas, W.T. Blackburn Assocs. 214-351-9991
Wisc Mequon, Artmor Ltd ... 414-241-4040

GRANT HARDWARE CO., Div. Buildex Inc., Dept. EM, 525 High St., W. Nyack, N.Y. 10994, Tel: 914-EL8-4400, TWX: 914-358-3541; FSC No.: 83508; Empl.: 300

Sales Manager: J. Del Vecchio

Local Sales Offices & Reps.
Cal City of Industry, Grant Hardware Co. 213-330-3242
Cal Menlo Park, The McKnight Co. .. 415-325-2844
Colo Denver, Camel Ectrns Inc ... 303-757-6191
Fla Ft. Lauderdale, Electro-Comp Assocs. 305-491-4141
Ill Des Plaines, Lincoln, Hodges & Associates 312-297-3810
Ind Indianapolis, Carter, McCormic & Peirce 317-844-4175
Kans Overland Park, J. Singer ... 913-381-3684
Mass Lexington, E.F. Del Fino Co. ... 617-862-1118
Mich Farmington Hills, Carter, McCormic & Peirce 313-477-7700
Minn St. Paul, R. G. Ragon, Inc. ... 612-488-0201
NJ Ridgefield, M - D Industries ... 201-941-3113
NY Jericho, HRC Comptech ... 516-822-5550
NY Liverpool, Vertex Corp. ... 315-622-3060
NY Syracuse, Precision Sales ... 315-458-2223
NC Charlotte, J Corn Assocs. ... 704-364-0991
Ohio Cincinnati, Tri State Mktg. Inc. ... 513-761-7993
Ohio Cleveland, Carter McCormic & Peirce 216-779-5100
Ohio Dayton, Carter McCormic & Peirce 513-222-7700
Pa Pittsburgh, Carter McCormic & Peirce 412-372-4415
Tex Dallas, Blackburn Associates ... 214-692-8885
Wash Seattle, Norwest Co. ... 206-282-3707
Wisc Waukesha, Lincoln, Hodges & Assoc 414-542-3087

GRAPHIC CONTROLS CORP., Recording Chart Div., Dept. EM, P.O. Box 1271, Buffalo, N.Y. 14240, Tel: 716-853-7500, Telex: 9-1306; Empl.: 600

Sales Manager: J. Baranowski; *Distributor Manager:* A.J. Amelotte

Local Sales Offices & Reps.
Cal Canoga Park ... 213-347-8621
Cal Santa Clara ... 408-241-9960
Conn Windsor ... 203-688-8501
Ga Atlanta ... 404-451-4738
Ky Louisville ... 502-426-0170
Mich Farmington ... 313-851-6340
Ohio Cincinnati ... 513-385-1476
Ohio Cleveland ... 216-531-8993
Okla Tulsa ... 918-622-3444
Pa Frazer ... 215-647-6565
Tex Houston ... 713-781-9870

GRAPHIC SYSTEMS, Dept. EM, 925 Danville Rd., DL-10, Yanceyville, N.C. 27379, Tel: 919-694-4138

Sales Manager: V. Moore

GRAPHITE METALLIZING CORP., Dept. EM, 1036 Nepperhan Ave., Yonkers, N.Y. 10702, Tel: 914-968-8400, Telex: 13-1571; Empl.: 165 p. 3088,3089

Sales Manager: W. W. Walker G/M

GRAYHILL INC., Dept. EM, 569 Hillgrove Ave., LaGrange, Ill. 60525, Tel: 312-354-1040, TWX: 910-683-1850; FSC No.: 5930; Empl.: 500 p. 1769,3507,4057-4075,4609

Local Sales Offices & Reps.
Ala Huntsville, Rep, Inc. ... 205-881-9270
Ariz Scottsdale, Mercury Engineering Sls. Inc. 602-949-5054
Cal Garden Grove, Impact Elctrns. .. 714-893-8551
Cal Los Altos, Nickerson-Gray Assoc. 415-941-5777
Cal San Diego, Earle Assocs ... 714-278-5441
Colo Denver, Lindberg Co. ... 303-758-9033
Fla Orlando, OEM Mktg. Corp. ... 305-299-1000
Ga Tucker, Rep, Inc. ... 404-938-4358
Ill Elmhurst, Hill-Gray Assoc. ... 312-832-4101
Ind Ft. Wayne, Menze Sls. ... 219-747-5616
Iowa Cedar Rapids, Reid Assoc. ... 319-362-6302
Kans Overland Park, P.M.A. Corp. ... 913-381-0004
Md Woodbine, Naudain Assocs Southern 301-442-2270
Mass Wellesley Hills, M. Scott Co. ... 617-235-0102
Mich Troy, C.B. Jensen & Assoc. ... 313-643-0506
Minn St. Paul, Northport Engrg. Inc. ... 612-698-3841
Mo Maryland Hts, P.M.A. Corp. ... 314-569-1220
NJ Mount Laurel, Naudain Assoc. ... 609-235-1801
NM Albuquerque, Lindberg Co. ... 505-881-1006
NY Great Neck, F. Tylinski Co. ... 516-466-9070
NY Ithaca, B. Dean Inc. ... 607-272-2187
NC Charlotte, R.W. Chapman & Co. 704-525-2421
Ohio Cleveland, A.H. Baier Co. & Assoc. 216-461-6161
Ohio Dayton, A.H. Baier Co. & Assoc. 513-276-4128
Pa Pittsburgh, Covert & Newman Co. 412-531-2002
Tenn Jefferson City, Rep Inc. ... 615-475-4105
Tex Arlington, W.P. Fralia Co. ... 817-640-9101
Tex Houston, W.P. Fralia Co. ... 713-772-1572
Utah Salt Lake City, Lindberg Co. ... 801-534-1500
Wash Seattle, Seatronics, Inc. ... 206-767-4330

Local Distributors
Ala Huntsville, Powell Elctrns ... 205-539-2731
Ariz Phoenix, Kachina Elctrns ... 602-269-6201
Ariz Phoenix, Mirco Elctrns ... 602-997-5931
Cal Los Angeles, Electric Switches .. 213-660-1310
Cal Mountain View, Powell Elctrns. ... 415-964-0820
Cal Riverside, Electronic Supply ... 714-683-7300
Cal Santa Clara, Fisher Switches ... 408-244-6182
Cal Sun Valley, Richey Elctrns ... 213-875-2862
Colo Denver, Electronic Parts ... 303-744-1992
Conn Wallingford, Midan Elctrns ... 203-265-2077
Fla Oakland Park, Peerless Radio .. 305-566-5966
Ga Miami Springs, Powell Elctrns ... 305-592-3260
Ill Broadview, L'Comp - Chicago ... 312-865-7600
Ill Northbrook, Classic Comp Supply 312-272-9650
Ind Evansville, Hutch & Son ... 812-425-7201
Iowa Cedar Rapids, Deeco Inc. ... 319-365-7551
Kans Wichita, Radio Supply ... 316-267-5214
Md Beltsville, Powell Elctrns ... 301-937-4030
Md Gaithersburg, Pioneer/Wash ... 301-948-0710
Mass Boston, Sager ... 617-542-2281
Mass Worcester, R M Elctrns ... 617-756-8311
Mich Livonia, Pioneer/Mich ... 313-525-1800
Mich Livonia, R.S. Elctrns ... 313-525-1155
Minn St. Paul, Gopher Elctrns ... 612-645-0241
Mo Kansas City, Walters Radio ... 816-531-7015
Mo Kansas City, L'Comp - Kansas City 816-221-2400
Mo St. Louis, L'Comp - St. Louis ... 314-647-5505
Nev Lincoln, Scott Elctrns ... 402-466-8221
NJ East Hanover, State Elec. ... 201-887-2550
NM Albuquerque, Walker Radio ... 505-247-2288
NY Binghamton, A.S.I. Elctrns ... 607-723-6326
NY Bohemia, Car-Lac ... 516-567-4200
NY Lynbrook, Peerless Radio ... 516-593-2121
NY Vestal, Harvey/Federal ... 607-748-8211
Ohio Cleveland, Pioneer/Cleveland ... 216-587-3600
Ohio Columbus, Hughes-Peters Inc ... 614-294-5351
Ohio Dayton, Pioneer/Dayton ... 513-236-9900
Okla Oklahoma City, Electro Enterprises 405-478-1752
Ore Portland, United Radio ... 503-233-5346
Pa Erie, Mace Elctrns. ... 814-838-3517
Pa Philadelphia, Powell Elctrns. ... 215-365-1900
Pa Philadelphia, Almo Elctrns. ... 215-698-4000
RI Warwick, W.H. Edwards ... 401-781-8000
Tex Dallas, Solid State
Tex Houston, Harrison Equip ... 713-652-4700
Tex Houston, Kent Elctrns. ... 713-780-7770
Utah Salt Lake City, Standard Supply 801-486-3371
Va Richmond, Meridian ... 804-359-0221
Wash Seattle, Interface Elctrns ... 206-285-3500
Wisc Milwaukee, Marsh Elctrns ... 414-475-6000

GREENLEE TOOL CO., Dept. EM, 2136-12th St., Rockford, Ill. 61101, Tel: 815-963-4881; Empl.: 1200

Local Sales Offices & Reps.
Cal City of Commerce ... 213-721-1147
Ga Atlanta ... 404-448-6121
NY Long Island City ... 212-392-3414
Wisc Milwaukee ... 414-421-3940
Exp: Fla., Coral Gables ... 305-264-5304

GREENRAY INDS., INC., Dept. EM, 840 W. Church Rd., Mechanicsburg, Pa. 17055, Tel: 717-766-0223, TWX: 510-650-4939; FSC No.: 16681; Empl.: 60 p. 2328

Sales Manager: G. R. Kurzenknabe

Local Sales Offices & Reps.
Ala Huntsville, Beacon Elctrns. Assocs. 205-881-5031
Ariz Tempe, Sedco Sales ... 602-968-7791
Cal Los Altos, Cain-White & Co. ... 415-948-6533
Cal Los Angeles, Cain Technology .. 213-476-2251
Colo Boulder, H. Bass Assocs. ... 303-499-7509
DC Washington, Hayden Assocs. ... 202-296-6059
Fla Fort Lauderdale, Beacon Elctrns. 305-971-7320
Ga Atlanta, Beacon Elctrns. ... 404-351-3654
Ill Wauconda, Cudahy Sls. ... 312-526-2484
Mass Reading, Geder Assoc. ... 617-944-3105
NM Albuquerque, Trembly Assocs. .. 505-293-4444
NY Clark Mills, KLM Assocs. ... 315-853-6126
NY Huntington, Andrews & Andrews, Inc. 516-692-8686
NC Greensboro, Beacon Elctrns Assoc. 919-275-9997
Ohio Dayton, F. Ohmer Assoc. ... 513-434-1454

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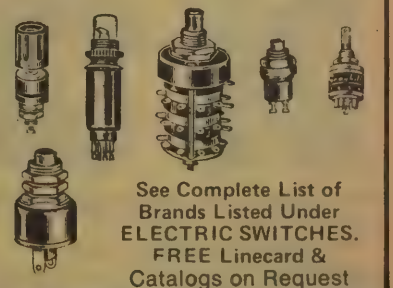
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Exp: Pa., Lemoyne, Elctrns. Int'l. 717-737-8858

GREIBACH INSTR. DIV., Electrical Inst. Svc., Inc., Dept. EM, 25 Dock St., Mt Vernon, N.Y. 10550, Tel: 914-699-9717; FSC No.: 32590; Empl.: 35

Local Sales Offices & Reps.
Cal Laguna Hills, English Sls. Assocs. 714-770-2727
Cal Torrance, English Sales Assocs. 213-772-7272
Ill Evanston, Saffro & Assocs. 312-328-0140
Md Baltimore, Whitcomb Assocs 301-889-1245
Minn Minneapolis, Heimann Co. 612-861-6051
NY Buffalo, R.F. Lamb Co. 716-874-4900
NY Rochester, R.F. Lamb Co. 716-544-5580
NY Schenectady, R.F. Lamb Co. 518-393-4844
NY Syracuse, R.F. Lamb Co. 315-454-2469
Wisc Lake Mills, Saffro & Assocs. 414-648-2605

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GRIES REPRODUCER CO., Div. Coats & Clark Inc., Dept. EM, 162 Beechwood Ave., New Rochelle, N.Y. 10801, Tel: 914-633-8600, TWX: 914-235-2188; Empl.: 600

Local Sales Offices & Reps.
Ariz Scottsdale, Carter Assoc. 602-947-4355
Cal B. A. Dixon, B. A. Dixon Co. 213-268-2661
Cal San Ramon, Leaf Lyons & Assoc. 415-592-6804
Cal Santa Ana, M. Leverso 714-581-6184
Conn Manchester, P. Broussard 203-646-5636
Fla Ft. Lauderdale, Tropi-Tec Co. 305-463-0988
Ill Hinsdale, D. J. Galinski 312-986-1990
Kans Lenexa, Palatine Sls. 913-492-7020
La Shreveport, J.A. Huddleston 318-686-0401
Mich No. Muskegon, Stank Co. 616-744-1814
Mich Warren, Stank Co. 313-573-4920
Minn Minneapolis, Crum Co. 612-824-5394
NY Glen Cove, P. Dollin 516-671-3097
NC Charlotte, B. De Stefani 704-375-3978
Ohio Dayton, C. T. Peterson 513-434-6665
Pa King of Prussia, R.J. Cimperman 215-265-5388
Tex Richardson, Palatine Sls. 214-231-9489
Wash Seattle, R. R. Slater 206-622-2552
Wisc Elm Grove, W. J. Peters 414-786-7180

GRISBY-BARTON, INC., See Gordos Corp.

GRM CORP., Dept. EM, Box 337, Medford, N.J. 08055, Tel: 609-267-7950; FSC No.: 21870; Empl.: 140 p. 1378,1379

Sales Manager: T.A. McGarrity

GROVER PHOTO PRODS., Dept. EM, 341 Arden Ave., Glendale, Cal. 91203, Tel: 213-245-4400; Empl.: 4

GRYCZUK ELECTRONICS, see GECO, Inc.

GTE LENKURT INC., Dept. EM, 1105 County Rd., San Carlos, Cal. 94070, Tel: 415-595-3000, TWX: 910-376-4396; Empl.: 4000

Sales Manager: D. Webster

Local Sales Offices & Reps.
Ga Atlanta 404-261-8282
Ga Atlanta 404-261-8282
Ill Arlington Hgts. 312-398-6700
Ill Arlington Hgts 312-398-6700
NM Albuquerque 505-296-0551
Tex Dallas 214-363-0286
Tex Dallas 214-363-0286
Va Falls Church 703-533-3344
Va Falls Church 703-533-3344

GTE SYLVANIA INC., Dept. EM, Rte. 35, Standish, Maine 04084, Tel: 207-642-4535, TWX: 710-365-0145

Sales Manager: R. E. Stevens

Local Sales Offices & Reps.
Ill Elk Grove Village 312-593-3400
Mich Dearborn 313-582-8754
Ohio Dayton 513-223-6227

GTE SYLVANIA, INC., W.M. Chace Co., Dept. EM, 1600 Beard Ave., Detroit, Mich. 48209, Tel: 313-842-7400; Empl.: 260

Sales Manager: J. W. Leone

Local Sales Offices & Reps.
Ill Elk Grove Village 312-593-3400
Ohio Cleveland 216-267-6800

GTE SYLVANIA, INC., Chem. & Metallurgical Div., Dept. EM, Hawes St., Towanda, Pa. 18848, Tel: 717-265-2121; Empl.: 1400

Sales Manager: J.F. Barnyak

Local Sales Offices & Reps.
Cal Burlingame 415-697-3500
Cal Los Angeles 213-726-1666
Conn Hartford 203-246-0608
Ill Elk Grove Village 312-593-3400
Mass Danvers 617-777-1900
Mich Dearborn 313-582-8754
NJ Teterboro 201-288-9484
NY Camillus 315-672-3111
NC Charlotte 704-334-4671
Ohio Cincinnati 513-793-6440
Ohio Cleveland 216-267-6800
Ohio Dayton 513-223-6227
Pa Philadelphia 215-477-5000
Tex Dallas 214-239-8171

GTE SYLVANIA, Circuit Module Oper., Elctrn. Comps. Grp., Dept. EM, Box 360, Muncy, Pa. 17756, Tel: 717-546-3191; Empl.: 395

Sales Manager: A. M. Serang; *Distributor Manager:* S. R. Sisak

Local Sales Offices & Reps.
Md Phoenix 301-628-2330
Mass Danvers 617-777-1900
NJ Teterboro 201-288-9484

GTE SYLVANIA, Connector Prods. Oper., Dept. EM, Box 29, Titusville, Pa. 16354, Tel: 814-589-7071, TWX: 510-692-6763 p. 1770,1771

Sales Manager: R. Sanders

Local Sales Offices & Reps.
Cal Burlingame 415-697-3500
Fla Orlando 305-859-6220
Ill Elk Grove Village 312-593-3400
Mass Waltham 617-890-9200
NY Camillus 315-672-3111

GTE SYLVANIA, Wilbur B. Driver Co Sub., Dept. EM, 1875 McCarter Hwy., Newark, N.J. 07104, Tel: 201-481-3100; Empl.: 637

Sales Manager: W.R. Brady

Local Sales Offices & Reps.
Cal Los Angeles 213-726-1666
Conn West Hartford 203-233-4047
Ill Elk Grove Village 312-593-3400
NJ Teterboro 201-288-9484
NC Charlotte 704-375-8568
SC Orangeburg 803-534-6910

GTE SYLVANIA INC., Elctrn. Comps. Grp., Dept. EM, 100 First Ave., Waltham, Mass. 02154, Tel: 617-890-9200; Empl.: 4213

Sales Manager: D.R. Kronenwetter; *Distributor Manager:* E. H. Frost

Local Sales Offices & Reps.
Cal Burlingame 415-697-3500
Cal Los Angeles 213-726-1666
Ga Atlanta 404-762-1781
Ill Elk Grove Village 312-593-3400
Mass Waltham 617-890-9200
NJ Teterboro 201-288-9484
Ohio Cleveland 216-267-6800
Tex Dallas 214-239-8171

GTE SYLVANIA INC., Elctrn. Sys. Gp., Dept. EM, 1800 N. Kent St., Washington, D.C. 22209, Tel: 703-841-9020, Telex: 89-9174; Empl.: 5100

GTE SYLVANIA, Gibson Electric Co, Dept. EM, Old William Penn Hwy, Delmont, Pa. 15626, Tel: 800-221-3333; Empl.: 250

Sales Manager: L. E. Antonelli

Local Sales Offices & Reps.
Ark Texarkana, Laput Sls 214-838-4318
Conn Hartford, Gibson Elec 203-249-5823
Ill Elk Grove Village, W. M. Chace 312-593-3400
NC Charlotte 704-334-8940
Ohio Cleveland, W. M. Chace Co. 216-267-6800
Pa Philadelphia 215-879-6733
Tenn Chattanooga, Thomas I. Mastin 615-642-0730

GTE SYLVANIA INC., Miniature Lighting Prods., Dept. EM, W. Main St., Hillsboro, N.H. 03244, Tel: 603-464-5533, TWX: 710-366-0387; Empl.: 350 p. 2479-2481

Sales Manager: J. J. Donelan; *Distributor Manager:* D. F. Smith

Local Sales Offices & Reps.
Cal Los Altos, W.W. Posey Co. 415-948-7771
Cal N. Hollywood, Bassett & Moore 213-766-2117
Colo Arvada, Arrowhead Sales Corp. 303-423-5556
Colo Arvada, Arrowhead Sls. 303-423-5556
Conn West Haven, Coakley, Boyd & Abbett 800-225-8402
Fla Bradenton, Hutto Hawkins Peregoy 813-755-4015
Fla Fort Lauderdale, Hutto, Hawkins, Peregoy 305-971-5750
Fla Maitland, Hutto, Hawkins, Peregoy 305-831-2474
Ga Atlanta, Millar Elctrns 404-261-6160
Ga Atlanta, Millar Elctrns. 404-261-6160
Ill Oak Park, G. E. Finnegan 312-383-9098
Ind Fort Wayne, R. O. Whitesell & Assoc. 219-926-2787
Ind Indianapolis, R. O. Whitesell & Assoc. 317-359-9283
Ind Kokomo, R. O. Whitesell & Assoc. 317-453-3692
Iowa Atlantic, Kimian Sls. 712-243-1626
La Gretna, Cartwright & Bean 504-362-4649
Mass Needham, Coakley, Boyd & Abbett 617-444-5470
Mich Grand Rapids, R.O. Whitesell & Assoc. 616-451-8901
Mich Southfield, R.O. Whitesell & Assoc. 313-559-5454
Mich St. Joseph, R.O. Whitesell & Assoc. 616-983-7337
Minn Minneapolis, Stoss Assocs. 612-925-2757
Miss Jackson, Cartwright & Bean 601-981-1368
Mo Independence, Kimian Sls. 816-796-4026
NJ Long Valley, P.A. Sweeney 201-852-1434
NM Phoenix, Arrowhead Sls. Corp. 502-722-7148
NY Camillus, Callahan-Ferguson Co. 315-487-3870
NY Rochester, Fowler Beach Corp. 716-586-0468
NY Tuckahoe, LCA Sls. 914-961-4700
NC Raleigh, Millar Elctrns. 919-787-0664
NC Raleigh, Millar Elctrns. 919-787-9564
Ohio Cincinnati, R.O. Whitesell & Assoc. 513-521-2290
Ohio Columbus, R. O. Whitesell 614-888-9396
Ohio Dayton, R.O. Whitesell & Assoc. 513-298-9546
Ohio Middleburg Heights, R.O. Whitesell & Assoc. 216-826-4424
Pa Glenside, Shelmar Elctrns. 215-885-0800
Pa Pittsburgh, R.O. Whitesell & Assoc. 412-344-7277
Tenn Memphis, Cartwright & Bean 901-276-4442
Tex Addison, Dunbar Assoc. 214-239-7151
Wash Seattle, Blum & Assocs. 206-285-2590
Wisc Milwaukee, F.C. Du Bois & Assoc. 414-774-3100

GTE SYLVANIA, Tech Prods Div, Dept. EM, 816 Lexington Ave., Warren, Pa 16365, Tel: 814-723-2000 800-221-3333; Empl.: 1880

Sales Manager: R. F. Scalise

Local Sales Offices & Reps.
Cal Burlingame 415-697-3500
Cal Los Angeles 213-726-1666
Conn Watertown 203-274-5435
Fla Orlando 305-859-6220
Ill Elk Grove Village 312-593-3400
Me Bangor 207-947-8386
Mass Danvers 617-777-1900
Mass Waltham 617-890-9200
NH Manchester 603-669-6350
NJ Teterboro 201-288-9484
NY Camillus 315-672-3111
NC Charlotte 704-334-4671
Pa Philadelphia 215-477-5000
Pa Titusville 814-589-7071
Pa York 717-764-9853
Tex Dallas 214-239-8171

GTE SYLVANIA INC., Western Gold & Platinum Sub., Dept. EM, 477 Harbor Blvd., Belmont, Cal. 94002, Tel: 415-592-9440; Empl.: 320

Sales Manager: W.S. Smith

Local Sales Offices & Reps.
Cal Torrance, Western Gold & Platinum Co. 213-375-6191
Fla Boca Raton, Whitmoyer Assoc 305-821-8259

Ill Long Grove, Western Gold & Platinum Co. 312-438-4488
Md Churchville, Bob Dean, Inc. 301-879-2236
Mass Salem, Western Gold & Platinum Co. 617-745-8484
Minn Minneapolis, Western Gold & Platinum Co. 612-920-3288
Pa Drexel Hill, Western Gold & Platinum Co. 215-623-5299
Tex Houston, Lazzara Co 713-493-1351
Utah Salt Lake City, Technical Devices 801-486-6401

GTI/CAPACITOR DIV., Dept. EM, 10060 Willow Creek Rd., San Diego, Cal. 92131, Tel: 714-678-3111, Telex: 69-5056; Empl.: 58

Sales Manager: R. Hotchkiss

Local Sales Offices & Reps.
Ariz Phoenix, Gassner & Clark 602-968-9037
Cal Alhambra, M. W. Rieder & Co. .. 213-283-7694
Cal Long Beach, Semi-Dice 213-597-0358
Colo Parker, Component Sls 303-841-2650
Fla Casselberry, E.I.R., Inc 305-830-9600
Ill Park Ridge, Probe Elctrns 312-696-2828
Ind Ft. Wayne, J & B Engrg 219-483-2813
Kans Shawnee Mission, Mid-America Eltrn Mktg 913-236-4800
Md Baltimore, Cunningham & Assoc. 301-661-4306
Md Lutherville, Cunningham & Assocs. 301-296-4306
Mich W. Bloomfield, GTI Corp. 313-643-6917
Minn Minneapolis, D. G. Perry & Co. .. 612-920-3212
Minn Minneapolis, Don Perry Corp. 612-835-3313
NJ Cherry Hill, J.N. Barrett Assoc .. 609-429-1551
NY Jamaica, M.F.E. 212-322-9400
NY Lynbrook, L.I., P. Saftler Assoc.. 516-593-7880
NY Syracuse, T-Squared Elctrns. ... 315-463-8592
NY Syracuse, T-Squared-L Elctrns. 315-463-8592
NC Charlotte, B. Jackson 704-366-6678
NC Charlotte, Bob Jackson 704-366-6678
Ohio Dayton, Midwest Mktg 513-433-2511
Tex Plano, Mullin's Enterprises 214-423-7618

GTI/TENSOR ELECTRONICS, See GTI Capacitor Div.

GUARDIAN CALIFORNIA, Dept. EM, 4030 W. Spencer St., Torrance, Cal. 90503, Tel: 213-772-8511, TWX: 910-344-7381; Empl.: 48

Sales Manager: E. Notrica; *Distributor Manager:* J. Susswain

Local Sales Offices & Reps.
Ala Huntsville, Electro-Mech Sls. Engr. Co. 205-883-9624
Ariz Phoenix, O'Donnell Assocs. SO W 602-931-8740
Cal Palo Alto, O'Donnell Assocs. 415-327-9260
Cal Torrance, O'Donnell Assocs. 213-328-9710
Colo Denver, Challenge Sls. 303-420-4316
Fla Ft. Lauderdale, CBC Electronics 305-484-7330
Ga Atlanta, Electro-Mech Sls. Engr. Co. 404-449-6337
Haw Honolulu, G Piety Factors 808-841-0185
Ill Chicago, Guardian Elec. Mfg. 312-243-1100
Ind Fort Wayne, Needler Sls. 219-447-2123
Md Ellicott City, Mc Court Co. 301-465-4515
Mass Concord, Sales Engrg. Co. 603-893-5521
Mich Farmington, Miltimore Sls. 313-476-2446
Minn St. Paul, Arkco Sls. 612-777-7454
Mo Hazelwood, Dy-Tronix 314-731-5799
Mo Independence, Dy-Tronix 816-373-6600
NH Salem, Sls. Engrg. 603-893-5521
NJ Englewood, T.O.E. Sls. 201-568-5747
NM Albuquerque, Challenge Sls. 303-420-4316
NY Rochester, Elcom Sales 716-385-1400
NY Whitestone, Dick Horrocks 212-961-6470
Ohio Cleveland, DEPCO 216-289-8188
Ore Beaverton, Barrett-Squibb & Assocs 503-644-2250
Pa Delmont, DEPCO 216-289-8188
Pa Doylestown, T.O.E. Sls. 215-348-5333
Tex Dallas, Ion Assocs. 214-357-9441
Utah Salt Lake City, Challenge Sls. 801-364-2999
Wash Redmond, Barrett-Squibb 206-885-6991

GUARDIAN ELECTRIC CO., Dept. EM, 1550 W. Carroll Ave., Chicago, Ill. 60607, Tel: 312-243-1100, TWX: 25-4116, 910-221-5073; FSC No.: 73949; Empl.: 550 ..... p. 3509-3520

Sales Manager: George Ewmett S/M; *Distributor Manager:* Joseph Kuster

Local Sales Offices & Reps.
Cal Palo Alto, O'Donnell Assocs. 415-327-9260
Cal Torrance, O'Donnell Assocs. 213-328-9710
Colo Arvada, Challenge Sls 303-420-4316
Fla Ft. Lauderdale, C.B.C. Elctrns 305-484-7330
Ga Atlanta, Electro-Mech. Eng. Sls. 404-449-6337
Haw Honolulu, Lee Gaber Co. 808-839-9059
Ill Chicago, F. Nitti 312-243-1100
Ind Ft. Wayne, Needler Sls. Co. 219-447-2123
Ind Indianapolis, Needler Sls. Co. 317-255-8056
Iowa Cedar Rapids, Dy-Tronix 319-377-8275
Mich Farmington, Miltimore Sls. 313-476-2446
Minn St. Paul, Arkco Sls 612-777-7454
Mo Hazelwood, Dy-Tronix 314-731-5799
NH Salem, Sales Engrg 603-893-5521
NY Flushing, Dick Horrocks 212-961-6470
NY Rochester, Elcom Sls. 716-385-1400
NY Syracuse, Elcom Sls 315-463-4638
Ohio Cleveland, Depco 216-289-8188
Ohio Dayton, Depco 513-433-3230
Pa Doylestown, T.O.E. Sls. Inc..... 215-348-2212
Tex Dallas, Ion Assocs 214-357-9441
Tex Houston, Ion Assocs 713-461-5311
Utah Salt Lake City, Challenge Sls 801-266-1500
Wash Redmond, Barrett-Squibb & Assoc. 206-885-6991

GUDEBROD INC., Electronics Div., Dept. EM, 12 S. 12th St., Philadelphia, Pa. 19107, Tel: 215-922-1122

Local Sales Offices & Reps.
Cal Glendale 213-245-2674
Ill Chicago 312-DE7-3025
Mass Boston 617-HA6-5347
NY Valley Stream 516-825-4616
NC Charlotte 704-333-9591
Exp: Valley Stream, Gudebrod, Inc.... 516-825-4616

GUILDLINE INSTRS., INC., Dept. EM, 2 Westchester Plaza, Elmsford, N.Y. 10538, Tel: 914-592-9101; Empl.: 85 ..... p. 2753

Local Sales Offices & Reps.
Ariz Huntsville, Pen-Tech Associates Inc 205-533-0090
Cal Cupertino, T. Louis Snitzer Co. .. 408-257-8333
Cal Los Angeles, T. Louis Snitzer Co 213-836-6170
Colo Arvada, Figaro-Klebba 303-424-0108
Fla Deerfield Beach, Pen-Tech Associates Inc 305-421-4989
Fla Maitland, Pen-Tech Associates Inc 305-645-3444
Fla Maitland, Pen-Tech Associates Inc 305-645-3444
Ga Atlanta, Pen-Tech Associates Inc 404-955-0293
Ill Des Plaines, Marsland Assocs .. 312-694-2262
Ind Indianapolis, Marsland Assoc..... 317-924-3568
Md Wheaton, Brimberg Sls..... 301-946-2670
Minn Minneapolis, Marsland Assocs. .. 612-545-4481
Mo Kansas City, Marsland Assocs. .. 816-966-8400
NM Albuquerque, Trembly Assocs.... 505-266-8616
NC High Point, Pen-Tech Associates Inc 919-883-9125
Utah West Jordan, Figaro-Klebba 801-561-0214

GULTON INDS. ELCTRN. COMPS DIV, See Gulton Inds., Inc, Piezo Products Div.

GULTON INDS., INC., Measurement & Control Systems Div., Dept. EM, Gulton Ind'l. Pk., E. Greenwich, R.I. 02818, Tel: 401-884-6800, TWX: 710-387-1500; Empl.: 400 ..... p. 2840,2841

Sales Manager: Sergio Lopez

Local Sales Offices & Reps.
Ala Huntsville, W.A. Brown Comps... 205-539-4411
Ariz Scottsdale, PLS Assocs 602-944-5461
Cal Cerritos, M.C.S. Div. 213-860-8581
Cal Palo Alto, E.V. Roberts & Assoc. 415-494-1671
Cal San Diego, Mesa Eng. & Sls..... 714-278-8021
Colo Denver, PLS Assocs 303-773-1218
Fla Orlando, W.A. Brown Comp. Inc. 305-851-5747
Ga Chamblee, W.A. Brown Comp.... 404-455-0405
Haw Honolulu, Yett Co. Inc. 808-848-0337
Ill Chicago, Warner Instr. & Sls. 312-631-6778
Ill Chicago, Pivan Engrg. Co. 312-539-4838
Ind Ft. Wayne, Scott Elctrns. 219-743-1586
Ind Indianapolis, Pivan Engrg..... 317-253-1681
Iowa Des Moines, Harry E. Ferris Co. 515-255-5008
La Lafayette, Kemp Engrg..... 318-984-3516
Md New Carrollton, W.A. Brown Equip. Comp. Inc. 703-836-1800
Mich Milford, Milford Scientific 313-685-8912
Minn Minneapolis, Pivan Engrg 612-835-3060
NJ Metuchen, Gulton M.C.S. Div. 201-548-2800
NM Albuquerque, PLS Assocs 505-255-2330
NY Syracuse, Labtronics Inc. 315-454-9314
NC Raleigh, W. A. Brown Comp., ... 919-781-9426
NC Winston-Salem, W.A. Brown Comp. Inc. 919-725-5384
Ohio Cincinnati, Scott Elctrns..... 513-791-2513
Ohio Cleveland, Scott Elctrns..... 216-291-2600
Ohio Cleveland, Instrumentation Sys. 216-561-6100
Ohio Columbus, Scott Elctrns. 614-236-8619
Ohio Dayton, Instrumentation Sys..... 513-294-2838
Okla Tulsa, Kemp Engrg..... 918-299-2636
Pa New Kensington, Bobar Engrg Co. 412-339-3565
Pa Pittsburgh, Instrumentation Sys. 412-327-1111
RI East Greenwich, MCS Div 401-884-6800
Tex Addison, Kemp. Engrg. Co. 214-661-0400
Tex Houston, Kemp Engrg. Co. 713-688-1431
Va Alexandria, W.A. Brown Equip. Comp. Inc. 703-836-1800
Wash Mercer Island, Sales & Engrg. Assoc. 206-232-6550
Wisc Brookfield, Pivan Engrg. Co. 414-786-1940

Local Distributors
Ala Mobile, Instrument & Control Div, Brownell Electro 205-479-8581
Ariz Phoenix, R.V. Weatherford..... 602-272-7144
Ariz Phoenix, Metermaster 602-243-4111
Ark El Dorado, Electra Inc..... 501-862-4901
Ark Little Rock, Carlton Bates Co..... 501-562-9100
Cal Culver City, E.V. Roberts 213-870-9561
Cal Gardena, Instr. Labs 213-770-0650
Cal Glendale, Western Elctrns Supply 213-246-4861
Cal Inglewood, Newark Elctrns. Corp.213-678-0441
Cal Los Angeles, Metermaster..... 213-685-4340
Cal Los Angeles, Fisher/Brownell 213-532-2170
Cal Oakland, Western Electro Mechanical 415-452-1936
Cal Palo Alto, R.V. Weatherford Co. 415-493-5373
Cal Palo Alto, Metermaster..... 415-968-0313
Cal San Diego, R.V. Weatherford Co.714-278-7400
Cal San Diego, Metermaster..... 714-560-4841
Cal San Diego, Acro Sls 714-234-4611
Cal Santa Clara, Fisher/Brownell 408-988-6041
Colo Denver, Waco 303-371-4370
Colo Denver, Insco Co. 303-584-4160
Colo Denver, Newark Elctrns. Corp. .. 303-757-3351
Conn Middletown, Mancib Co. 203-346-6646
Fla Lakeland, A.A. Elctrns. Div. of Auto. Engrg. Co. 813-682-6181
Fla Orlando, Brownell Electro. 305-843-6770
Ga Atlanta, Brownell Electro 404-762-5181
Haw Honolulu, Yett Co. 808-848-0337
Ill Chicago, Newark Elctrns. Corp. 312-638-4411
Ill Elk Grove Village, Meter Makers 312-439-5050
Ill Elk Grove Village, Metermaster 312-593-8650
Ill Oak Park, Pacific Indicator Co. .. 312-383-0220

INDUSTRIAL DISTRIBUTORS
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415/326-5432 654 High St. 94301
SAN FRANCISCO, CA
415/626-1444 1444 Market St. 94102

Ill Peoria, Klaus Radio 309-691-4840
Ill Worth, Premium Instrs. Co. 312-371-0500
Ind Ft. Wayne, Ft. Wayne Elctrns. Supp. 219-423-3422
Ind Indianapolis, Pioneer/Indiana 317-849-7300
Ind South Bend, Radio Dist. Co. 219-287-2911
Kans Overland Park, Brooks Instr..... 913-648-3131
La Harahan, Ind Instrument Works.. 504-733-8355
La Lafayette, Ralph's 318-234-4507
La Shreveport, Analytical Logging .. 318-222-4621
La Shreveport, Indl. Elctrn. Supp..... 318-222-9459
Md Elkridge, Sunshine Scientific Instrs. 301-796-5600
Md Gaithersburg, Pioneer Instrumentation 301-948-0710
Mass Billerica, Metermaster 617-667-8346
Mass Burlington, Mancib Co. 617-272-9450
Mass Norwood, Timer Srv. 617-769-3600
Mich Farmington, Applied Instrs 313-476-9060
Mich Hastings, Hastings Fiberglass Prods. 616-945-9541
Mich Muskegon, Applied Instrs 616-744-1381
Mich Royal Oak, George Instrument Co. 313-576-4700
Minn Duluth, Mielke Elect. Works..... 218-727-7411
Minn Minneapolis, Instr. Control Co..... 612-336-7744
Miss Jackson, Ellington Elctrns. Supp. 601-335-0561
Mo St. Louis, Indl. Srvc. Labs 314-535-5760
Mo St. Louis, Olive Indl. Elctrns. 314-426-4500
Neb Omaha, Scott Elctrns 402-466-8221
NJ Bridgewater, Raritan Instrs. 201-968-2261
NJ Lodi, Elnik Instrs..... 201-779-7388
NJ Newark, Norman Bragar Prods Co. 201-344-1101
NJ Princeton, Science Assocs. 609-924-4470
NM Albuquerque, WACO..... 505-255-1638
NY Albany, Edwin E. Taylor Co. 518-438-7811
NY Buffalo, Summit Distrs. 716-884-3450
NY Clarence, Trott Elctrns 716-634-8500
NY Long Island City, Metermod Istr. Corp. 212-726-4850
NY Rochester, Summit Dist 716-334-8110
NY Westbury, Tech Rep Eng. 516-997-7946
NC Charlotte, Brownell Electro 704-393-4341
NC Charlotte, Sys. Svc. Corp. 704-377-3407
NC Charlotte, J.L. Highsmith Co..... 704-333-7743
NC Matthews, W.K. Hile 704-847-9125
NC Raleigh, Southeastern Radio Supply 919-828-2311
Ohio Cincinnati, Schlemmer Assoc. 513-522-8340
Ohio Cincinnati, Hughes Peters 513-351-2000
Ohio Cleveland, Pioneer Standard Elctrns., Pioneer Elect-Instrs. Lab. 216-587-3600
Ohio Columbus, Hughes Peters 614-294-5351
Ohio Dayton, Pioneer/Dayton, Div. of Pioneer-Standard Elctrns..... 513-236-9900
Okla Tulsa, Oil Capitol Elctrns. Corp. 918-622-8520
Pa New Kensington, Bobar Inst..... 412-339-3565
Pa Philadelphia, Sunshine Scientific Instrs. 215-673-5600
Pa Pittsburgh, CAM/RPC Elctrns 412-782-3770
Tenn Memphis, Brownell Electro. 901-332-9258
Tenn Nashville, Brownell Electro..... 615-889-8230
Tex Beaumont, Ralph Indl. Elctrns. .. 713-833-9443
Tex Corpus Christi, H & H Indl Instruments 512-883-5446
Tex Dallas, Dallas Instrs. 214-341-0504
Tex Dallas, Economy Gauge, Div. of McGatlin 214-243-8370
Tex El Paso, Kernco 915-852-3375
Tex Houston, Van London Co. 713-772-6641
Tex Houston, American Analog..... 713-941-7265
Utah Salt Lake City, Control Equip. Co. 801-487-7741
Va Richmond, Avec Elctrns. Corp. .. 804-359-6071
Va Richmond, Sys Service Corp. 804-231-7309
Wash Seattle, Branom Instrument 206-762-6050
Wash Seattle, Liberty Elctrns 206-453-8300
Wisc Cedarburg, Automation Engrg. Co. 414-377-7500
Wisc Milwaukee, Electro-Mechano Co. 414-272-4050

GULTON INDS., Piezo Prods. Div., Dept. EM, Box 4300, Fullerton, Cal. 92634, Tel: 714-871-2150, TWX: 910-592-1247; Empl.: 100

Sales Manager: J. Sloane

Local Sales Offices & Reps.

Ariz Phoenix, C.T. Fink & Assocs 602-992-9884
Cal Los Angeles, El Com 213-223-1351
Ill Westchester, Wasson-Gallagher 312-261-7517
Ind Fort Wayne, Given Corp. 219-432-5585
Iowa Cedar Rapids, J.R. Sls Engrg 319-393-2232
Md Ellicott City, Marketing Techny .. 301-465-8630
Mass Needham, Coakley, Boyd & Abbett 617-444-5470
Mich Grand Rapids, Elliott Sls Corp.... 616-949-1451
Minn St. Paul, H. Cullen & Assocs. 612-646-7371
Ohio Rocky River, N. Case Assocs. .. 216-333-4120
Tex Dallas, Allied Comps..... 214-238-0408
Tex Houston, Allied Comps 713-960-1962

GULTON INDS., INC., Elctrn. Comps. Div., Dept. EM, Piezo Products Div., Metuchen, N.J. 08840, Tel: 201-548-2800, TWX: 710-998-0592; Empl.: 125

Sales Manager: Earl R. Hanson

Local Sales Offices & Reps.

Cal Mountain View, Tri-Rep..... 415-965-1822
Cal Redondo Beach, California-J.J. Riley Assoc. 213-348-9812
Colo Denver, Comtech..... 303-756-6815
Conn West Haven, Coakley, Boyd & Abbett, Inc. 800-225-8402
Fla Palm Beach Gardens, Florida-Service Representative Assoc. 305-622-4049
Ill Westchester, Wasson-Gallagher 312-261-7517
Iowa Cedar Rapids, J.R. Sls. Engrg. .. 319-393-2232
Md Hyattsville, Eastern Components 301-577-2925
Mass Needham Heights, Coakley, Boyd & Abbett, Inc. 617-444-5470
Mich Grand Rapids, Elko Sls. 616-949-1451
Minn St. Paul, H.A. Cullen 612-646-7371
NJ Wallington, Comp-Tech Sls..... 201-935-5454
NC Winston-Salem, Dula Assocs. 919-768-7166
Ohio Cincinnati, A.C. Wahl..... 513-821-3270
Ohio Lyndhurst, A.C. Wahl 513-821-3270
Okla Tulsa, Allied Comps. 918-939-2848
Tex Dallas, Allied Comps. 214-238-0408

GULTON INDS., SCD Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627, Tel: 714-642-2400, TWX: 910-596-1352; Empl.: 90

Local Sales Offices & Reps.

Ariz Scottsdale, Carter Assocs 602-947-4355
Cal Los Angeles, Ed Landa Co 213-879-0770
Colo Englewood, Dynatech Inc. 303-773-2830
Conn West Sinsbury, Anchor Engrg. Corp. 203-658-6261
Fla Orlando, Glenn Tech. Sls. 305-299-8700
Md Ellicott City, Mktg. Tech. Inc. 301-465-5944
Mass Newton Upper Falls, Anchor Engrg. Corp. 617-964-6205
Minn Minneapolis, Milt Westlund Assocs. 612-866-5002
NY Manhasset, Win-Cor Elctrns. Sls. Corp. 516-627-9474
Pa Philadelphia, Rayco Sls. 215-698-1210
Tex Garland, G.V. Peck Co. 214-341-8311
Tex Houston, G.V. Peck Co. 713-789-7111
Tex Irvine, Gordon V. Peck Co. 713-664-1435

GULTON INDS., INC., Servonic/Instrumentation Div., Dept. EM, 1644 Whittier Ave., Costa Mesa, Cal. 92627, Tel: 714-642-2400, TWX: 910-596-1352; Empl.: 308

Local Sales Offices & Reps.

Cal Los Angeles, Thorson Co.
Colo Littleton, Pond Assocs., Inc..... 303-798-2904
Conn No. Haven, Kitchen & Kutchin, Inc. 203-239-0212
Fla Clearwater, Reynolds & Assocs. 813-726-2373
Fla Ft. Lauderdale, Reynolds & Assocs. 305-581-6611
Fla Hollywood, Reynolds & Assocs. 305-987-6720
Fla Palm Beach Gardens, Reynolds & Assocs. 305-622-6850
Fla St. Petersburg, Reynolds & Assocs. 813-360-1484
Ga Atlanta, Reynolds & Assocs..... 404-252-5360
Kans Leawood, Thunderbird Tech. Sls. & Svcs. 913-642-7220
Kans Wichita, Thunderbird Tech. Sls. & Svcs. 316-684-3941
Md Baltimore, Stemler Assocs., Inc. 301-944-8262
Mass Lexington, Kitchen & Kutchin, Inc. 617-862-8230
Minn Minneapolis, Westlund Assocs. .. 612-886-5002
Mo St. Louis, Thunderbird Tech Sls. & Svcs. 314-567-6488
NJ Cherry Hill, Stemler Assocs. 215-441-0433
NJ Laurel Springs, Stemler Assocs. 215-644-3477
NJ Springfield, SM Service & Tech., Inc. 201-232-2666
NY Chappaqua, R. M. Glueck & Assoc. 914-238-3233
NC Charlotte, Reynolds & Assocs. .. 919-765-8112
Ohio Cleveland, Instrumentation Sys. 216-486-0782
Ohio Dayton, Instrumentation Sys. Inc. 513-294-2838
Pa Pittsburgh, Instrumentation Sys., Inc. 412-243-1111
Pa Warminster, Stemler Assoc. 215-441-0433
Tex Houston, Gordon V. Peck Co..... 713-780-2220
Utah Salt Lake City, Applied Engrg. Prods. Co. 801-582-4942
Va Alexandria, Stemler Assocs. 703-548-7818
Wash Bellevue, Thorson Co..... 206-455-9880
Wisc Milwaukee, Carvel Engrg. Co..... 414-352-6630

HACKENSACK CABLE CORP., See Carolina Stee & Wire Corp.

HACKER INSTRS., INC., Dept. EM, Box 657, Fairfield, N.J. 07006, Tel: 201-226-8450; Empl.: 10

HADES MFG CORP., Dept. EM, 151-A Verdi St., Farmingdale, N.Y. 11735, Tel: 516-249-4244; FSC No.: 51578; Empl.: 38

Sales Manager: G. Brand

HALEX, INC., Dept. EM, 1202 McGaw Ave, Irvine, Ca. 92714, Tel: 714-556-2850, Telex: 65-3442; Empl.: 38

Sales Manager: M. Bergquist; *Distributor Manager:* N. J. Egli

Local Sales Offices & Reps.

Ariz Phoenix, G & R Mktg 602-258-8376
Cal San Jose, electro-Venture 408-997-0955
Fla Orlando, Gra-Mar, Inc..... 305-894-3351
Ill Skokie, Howard Benjamin Assocs 312-966-6622
Mass Lexington, Circuit Sls 617-861-0567
Minn Minneapolis, Bill Deming & Assocs 612-888-5000
Ohio Dayton, Ashby Assocs 513-252-5627
Va Reston, Boyle Assocs..... 703-620-9558

HAMAI ELECTRIC LAMP CO., LTD., Dept. EM 9-26, Kasuga 1-chome, Bunkyo-Ku, Tokyo, Japan 112 Tel: (03) 813-8811, TWX: 272-2408 HAMAI J; Empl.: 200

HAMLIN INC

HAMLIN INC., Dept. EM, Lake & Grove Sts., Lake Mills, Wisc. 53551, Tel: 414-648-2361, TWX: 910-260-3740; Empl.: 800 ..... p. 2482,3522,3523,4079

Local Sales Offices & Reps.

Ariz Phoenix, Shefler-Kahn Co. 602-257-9015
Cal Pico Rivera,, Westrep 213-949-2551
Cal San Diego, Westrep 714-276-0751
Cal Santa Clara, Westrep 408-984-0350
Colo Boulder, R-G Entprs. 303-447-9211
Conn Berlin, White Sls. Co. 203-224-0423
Fla Hollywood, Wallace Elctrn. Sls... 305-961-6640
Fla Tampa, Wallace Elctrn. Sls..... 813-961-1037
Ga Jonesboro, Wallace Elctrn. Sls... 404-471-6297
Ill Chicago, Indl Rep 312-647-7755
Ind Carmel, Rich Elctrn Mktg 317-844-8462
Iowa Marion, Thomas & Modrcin 319-377-6261
Kans Shawnee Mission, Thomas & Modrcin 913-432-2131
Mass Needham, White Sls. Co. 617-444-3676
Mich Detroit, Rathsburg Assocs 313-882-1717
Minn Minneapolis, R-J, Inc. 612-922-1425
Mo Hazelwood, Thomas & Modrcin 314-895-4700
NJ Mount Laurel, Naudain Assoc..... 609-235-1801
NJ West Caldwell, Grimm Siegel 201-575-9300
NM Albuquerque, AQ Elctrns..... 505-883-1003
NY Great Neck, Frank Tylinski Co. .. 516-466-9070
NY Ithaca, Bob Dean, Inc..... 607-272-2187
NC Kernersville, Wallace Elctrn. Sls. 919-993-3993
Tex Dallas, Allied Comp., Inc. 214-238-0408
Tex Houston, Allied Comp., Inc. 713-960-1962
Wash Bellevue, Testco, Inc. 206-454-7422
Wisc Milwaukee, Indl Rep 414-259-0969

Local Distributors

Ala Huntsville, Mock Elctrns. 205-539-2401
Colo Denver, Ind. Elctrns. 303-771-2636
Conn New Briton, Spring & Buckley 203-224-2451
Conn New Haven, Hatry Ectrns. 203-787-5921
Fla Miami, ESL 305-633-6973
Fla Miami, Elctrn Equip Co. 305-871-3500
Fla Tampa, Leader Elctrns 813-870-3315
Ga Augusta, Dixie Radio Supp. 404-722-2055
Ga Norcross, AA Electric 404-449-8670
Ill Chicago, Newark Elctrns..... 312-638-4411
Ill Palatine, Ohm Elctrns..... 312-359-5500
Ill Westmont, RM/Bodelle 312-323-9670
Ind Indianapolis, Graham Elctrns. 317-634-8202
Md Gaithersburg, Pioneer/Washington 301-948-0710
Mass Dedham, Gerber Elctrns. 617-329-2400
Mass Hudson, Heilind Elctrns..... 603-883-9536
Mich Kentwood, R-M Elctrn Co. 616-531-9300
Minn Minneapolis, Diplomat/Electro-Com 612-788-8601
Miss Newton, May Elctrns..... 601-683-3147

Miss Newton, May Elctrns. 601-683-6400
Mo St. Louis, Olive Indl Elctrns 314-426-4500
NJ Fairlawn, Relay Specialties 201-797-3313
NJ Pennsauken, Resco Elctrns. 609-662-4000
NY Buffalo, Summit Dist. 716-884-3450
NY Long Island, Peerless Radio Corp. 516-593-2121
NC Greensboro, Hammond Elctrns. 919-275-6391
NC Winston-Salem, Kirkman Elctrns. 919-722-9131
Ohio Solon, Repco 216-248-8900
Okla Tulsa, Radio, Inc. 918-587-9124
RI Providence, Wm. Dandreta & Co. 401-861-2800
SC Columbia, Dixie Radio Supp. Co. 803-253-5333
Tex Dallas, KA Elctrn. Sls. 214-634-7870
Tex Fort Worth, Allied Elctrns. 817-336-5401
Tex Houston, Harrison Equip. 713-652-4750
Wash Seattle, Radar Elec. Co. 206-282-2511
Wisc Cedarburg, AA Electric 414-377-7500
Wisc Mequin, Lake-View Elctrns Corp. 414-377-8250

HAMMOND MFG. CO., Dept. EM, 385 Nagel Dr., Buffalo, NY 14225, Tel: 716-683-8181, Telex: 91-6452; Empl.: 700

Sales Manager: W. J. Odell

Local Sales Offices & Reps.
Ala Huntsville, MRO Ltd. 205-883-6823
Cal San Mateo, J.E. Lape Co. 415-345-3021
Cal San Mateo, J. E. Lape Co. 415-345-3021
Cal Torrance, Comp. Mktg. Assoc. .. 213-541-2515
Colo Denver, Elctrn. Devices 303-722-5611
Conn Milford, ElectroTech Sls. 203-877-1241
Fla Tampa, Reptronics 813-879-8730
Ill Crystal Lake, Imperial Elec. Co. 312-599-1331
Ill Highland Park, Bransky Sls. 312-433-2375
Kans Overland Park, Slater & Assocs. 913-642-2900
Ky Edgewood, Eleeco Amerace Corp. 606-341-0330
La Kenner, A.S.I. 504-722-2217
Mass Needham, AR Booth & Co. 617-444-4880
Mich Royaloak, Dave Ray Assocs. 313-576-4705
Minn St. Paul, Vikeland Sls 612-645-4647
Mo Maryland Heights, Kebco 314-576-4111
NM Alburquerque, Staley Co. 505-292-0060
NY Buffalo, W.S. Stamp & Assoc. 716-631-3420
NY Hartsdale, Com Tech Sls. Co. 914-761-6644
NY Williamsville, W.S. Stamp Assocs. 716-631-3420
NC Cary, Montgomery Mktg. 919-467-6319
Ohio Chagrin Falls, RPM Indl. Sls. 216-247-3295
Ohio Chagrin Falls, RPM Indl. Sls. 216-247-3295
Okla Tulsa, Kemp Engrg. Co. 918-299-2636
Pa Harleysville, Thomas Jackson Assoc. 215-643-5560
Pa Ingomar, Greye Glass Assoc. 412-366-6664
Tenn Nashville, Charlie Roden & Assoc. 615-262-4128
Tex Dallas, Ralph Matthews Elctrns. 214-783-0552
Utah Salt Lake City, Sage Sls. 801-290-1234
Va Reston, Boyle Assocs. 703-620-9558

Local Distributors
Ala Montgomery, Standard Elec. Machine 205-263-0277
Cal Burlingame, Logan Elctrns. 415-697-6481
Cal Concord, The Odd Assortment .. 415-798-7562
Cal Gardena, California Switch & Signal 213-770-2330
Cal Palo Alto, Zack Elctrns 415-326-5432
Cal Redanto Beach, CSI Control Switches 213-772-1582
Cal Redondo Beach, Electrical Power & Controls 213-772-8890
Cal San Jose, Consolidated Parts 408-263-9521
Cal San Jose, Quement Elctrns. 408-998-5900
Cal San Rafeal, Elctrns. Plus 415-457-0466
Cal Sunnyvale, Pyramid Elctrns. 408-744-1900
Cal Van Nuys, Edmar Elctrns./W Co. 213-782-9020
Conn Milford, Electro Tech Sls. 203-877-1241
Conn Norwalk, Corbra Comps. 203-853-8228
Del Wilmington, Tecot Elec. 302-658-6581
DC Washington, Central Armature .. 202-628-3660
Fla Dania, Summit Elctrns. 305-920-6253
Fla Fort Lauderdale, Telecon Ind. 305-971-2250
Fla Miami, Electro Standard 305-633-6973
Ga Atlanta, Ack Radio 404-351-6340
Ill Arlington Hgts., Martec Assocs. 312-956-8090
Ill Bridgeview, Midwest Control 312-599-7777
Ill Chicago, Revere Elec. Supp. 312-738-3636
Ill Mount Prospect, NuData Elctrns. 312-392-2358
Ill Niles, Joseph Elctrns. 312-297-4200
Ind Indianapolis, Sheridan Sls. 317-295-3146
La Harvey, Lykes Elctrns. 504-368-3355
La Lafayette, Ralph's Elctrns. 318-234-4507
Md Columbia, Technico 301-461-2200
Md Rockville, M.S. Elctrns. 301-340-6400
Mass Cambridge, H. Young, Jr. 617-547-3873
Mass Cambridge, Brownell Electro 617-864-7500
Mass Chicopee, Diplomat Inc. 413-592-9441
Mass Lynn, Land Elctrns. 617-592-2270
Mass Marboro, Marboro Elec. 617-481-4221
Mass Meedham, YDI 617-449-1005
Mass Needham, Needham Elec. 617-444-6980
Mass S. Boston, Ralph Pill Elec. 617-269-8200
Mass Sturbridge, Heritage Elec. 617-347-7166
Mass Waltham, Honeywell, Inc. 617-890-8400
Mass Winchester, Rush Inds. 617-729-5800
Mich Belleville, Dingman Elec. Supp. ... 313-961-1030
Mich Farmington, Sheridan. 313-477-3800
Mich Farmington, Advent Elctrns. 313-477-1650
Mich Lansing, Demco Sturm 517-482-5519
Mich Royal Oak, George Instrs. 313-576-4700
Minn Minneapolis, Acme Elctrns. 612-338-4754
Minn Minneapolis, G.E. Arneson 612-835-2177
Minn Minneapolis, Diplomat 612-788-8601
Minn St. Paul, Price Elec. 612-224-7323
Minn St. Paul, Kim Controls 612-636-9594
Minn St. Paul, Farwell, Ozmum, Kirk & Co. 612-451-4239
Mo Kansas City, Libby Power 816-231-6039
Neb Kearney, Stanel Sound 308-237-2207
NH Amherst, Glen White House 603-673-6290
NH Manchester, K & H Controls 603-622-7005
NJ Mt. Holly, Franklin Elec. 609-345-6154
NJ Perth/Amboy, Electro Power & Controls 201-826-9000
NJ S. Plainfield, Brownell Elec. 201-753-4600
NJ Totowa, Diplomat IPC 201-736-3375
NY Auburn, Auburn Armature 315-253-9721
NY Binghamton, Diehl 607-772-1760
NY Buffalo, Lang Elec. 716-854-2770
NY Buffalo, Genesee 716-873-9661
NY Corning, Corning Elctrns. 607-962-0555
NY Depew, S.S. Elctrns. 716-683-7350
NY Elmsford, Landis & Gyr 914-592-4400
NY E. Syracuse, Diehl Syracuse 315-437-2826
NY Farmingdale, Broadline 516-420-8320
NY Martin-Audio Video 212-541-5900
NY New York, Brownell Electro 212-924-6000
NY New York, Central Elec. 212-782-4880
NY Niagra Falls, Hysen Supplies 716-297-6500
NY Rochester, Simconia Elctrns 716-328-3230
NY Rochester, Zeller Elec. 716-254-8840
NY Rochester, Rowe Elec. 716-275-0010
NY Syracuse, Stewart W. Smith 315-422-0323
NY Watertown, Sen-Con Sys. 315-788-8820
NY Woodbury, Diplomat Elctrn. 516-921-9373
NC Greensboro, Hammond Elctrns. 919-275-6391
Ohio Akron, Sun Radio 216-434-2171
Ohio Akron, Akron Elctrns. 216-237-7271
Ohio Beachwood, Sheridan Sls. 216-831-0130
Ohio Cleveland, Winteradio Elctrn. 216-621-9383
Ohio Columbus, Reptron/Ohio 614-443-0231
Ohio Dayton, Sheridan Sls. 513-223-3332
Ohio Dayton, Diplomat/Ohio 513-228-1080
Ohio N. Royalton, Related Comps. 216-237-7271
Ohio Toledo, Fee & McCarthy 419-693-0765
Pa Allentown, B & H Assocs. 215-435-3534
Pa Lancaster, Multi Elec. 714-392-2128
Pa Monroeville, Expander Inc. 412-373-0300
Pa Philadelphia, Billows Elec. Supp. 215-DE2-9700
Pa Philadelphia, Lindley Elctrns. 215-DA9-7005
Pa Philadelphia, Marino Drive 215-KI6-8200
Pa Philadelphia, Central Elec. 215-742-7373
Pa Pittsburg, Sheridan Sls. 412-244-1640
RI Cranston, Oem Supp. 401-781-0730
SC Greenville, Hammond Elctrns. 803-233-4121
SC W. Columbia, Tamper 803-794-9160
Tenn Columbia, Fisher Elec. 615-833-1922
Tenn Murfreesboro, Neals Elec. 615-893-8004
Tex Dallas, R & R Elctrn. 214-742-1431
Tex Dallas, Digital Facilities 214-241-7600
Tex Dallas, Summers Southland 214-661-5104
Tex Dallas, Ka Elctrns 214-494-2588
Tex Dallas, Graybar 214-744-1421
Tex Dallas, Texas Instrs 214-238-2011
Tex Houston, Quality Comps. 214-387-4949
Wash Pasco, Spectro-Acoustics 509-545-1829
Wash Redmond, Sirco 206-885-5303
Wisc Milwaukee, B & W Electronic 414-784-4420

HANDY & HARMAN, Dept. EM, 850 Third Ave., New York, N.Y. 10022, Tel: 212-752-3400; Empl.: 800

Sales Manager: R. E. Burke

Local Sales Offices & Reps.
Cal El Monte 213-283-8181
Ill Elk Grove Village 312-437-3883
Mass Attleboro 617-226-1000
Mich Southfield 313-569-2373
Ohio Cleveland 216-333-2166
Tex Dallas 214-387-2501

HANSCOM, H.F. CO., INC., Dept. EM, 225 Chapman St., Providence, R.I. 02905, Tel: 401-941-1456; Empl.: 50

HANSEN MFG. CO., see IMC Magnetics Corp., Hansen Mfg. Co.

HAPCO, Dept. EM, Box 1205, Boulder, Colo. 80302, Tel: 303-447-0441; Empl.: 6

HARBISON IND'L. PRODS., INC., Sub Polymer Corp, Dept. EM, 7205 Hibbs La., Levittown, Pa. 19057, Tel: 215-943-9000, Telex: 84-3446; Empl.: 75 p. 1343

Sales Manager: R. S. Spangler

Local Sales Offices & Reps.
Cal Los Angeles 213-660-0088
Conn Hartford 203-232-1716
Del Wilmington 302-478-9385
Ga Atlanta 404-237-9261
Ill Chicago 312-259-1550
Iowa Davenport 319-359-8239
Md Baltimore 301-665-5816
Mich Detroit 313-353-2370
Minn St. Paul 612-222-8468
Mo St. Louis 314-962-9574
NH Nashua 603-882-8675
NJ Parsippany 201-539-3320
NY Rochester 716-271-7888
NY Syosset 516-364-1160
NC Charlotte 704-375-8241
Ohio Cincinnati 513-563-6880
Ohio Cleveland 216-653-9148
Pa Pittsburgh 412-371-1070
Pa Reading 215-929-5858
Tex Houston 713-440-6853
Wash Bellevue 206-455-1234
Wisc Milwaukee 414-545-7520

HARDMAN INC., Dept. EM, 600 Cortlandt St., Belleville, N.J. 07109, Tel: 201-751-3000; Empl.: 85 p. 1291

Local Sales Offices & Reps.
Cal Huntington Beach, Litco Assoc. .. 714-536-8004
Conn W. Hartford, C. Segel Co. 203-236-2027
Mass Newtonville, C. Segel Co. 617-969-6900
NJ Flemington, Lescon Inc. 201-782-2242
NJ Old Bridge, Seaco 201-679-8800
NY DeRuyter, Madison Technical Sls. Co. 315-662-3996
NC Smithfield, Special Electric Co. .. 919-934-7592
Ohio Chagrin Falls, D. L. Guilian Assoc. 216-543-5149
Tex Dallas, Apogee Svcs. Inc. 214-352-2083
Wash Seattle, Atlas Packing & Rubber Co. 206-623-4697
Wisc Milwaukee, Special Electric Co. 800-558-0650

HARREL, INC., Dept. EM, 16 Fitch St., E. Norwalk, Conn. 06855, Tel: 203-866-2573 ..... p. 2267

Sales Manager: W. Becker

Local Sales Offices & Reps.
Cal Sherman Oaks, Windsor Dynamics, Inc. 213-989-3631
Cal Walnut Creek, Viking Instr. 415-933-1221
Fla Coral Springs, Shaw Engrg. & Sls. 305-752-7596
Ga Atlanta, Specialty Equip. & Control Co. 404-394-6633
Kans Overland Park, Carter Elctrns. .. 913-649-6996
Ky Williamstown, C. Burnitt Agency 606-823-6451
Minn Northfield, Com-Cal Inc. 507-645-4530
Mo St. Louis, Carter Elctrns. 314-569-1406
NY Cazenovia, P.M. Decew, Inc. 315-065-8602
NC Charlotte, Beck Sls. 704-366-5366
Ohio North Olmstead, Odessa Instr. Co. 216-734-6777
Pa Elkins Park, Edwin F. Gregg 215 CA4-0248
Tex Dallas, Hatfield & Co.
Tex Houston, Hatfield & Co. 713-468-1703
Va Richmond, Commonwealth Controls 804-358-5700

HARRIS CIRCUITS MFG. CO., Dept. EM, 2712 Colley Ave., Norfolk, VA. 23517, Tel: 804-625-2631

HARRIS CORP., Computer Systems Div., Dept. EM, PO Box 23550, Fort Lauderdale, Fla. 33307, Tel: 305-974-1700, TWX: 510-956-3096; FSC No.: 29436; Empl.: 900

Sales Manager: D. Soule, Mgr., Mktg Comm

Local Sales Offices & Reps.
Cal Newport Beach 714-752-0910
Cal San Mateo 415-349-5037
Colo Denver, Harris Computer Sys 303-770-1663
DC Washington, Harris Computer Sys 202-342-3952
Fla Fort Lauderdale 305-974-1700
Ga Atlanta 404-261-6995

Ill Des Plaines ... 312-299-4427
Kans Shawnee Mission ... 913-384-0882
Mass Wellesley, Harris Computer Sys 617-237-4336
Mo St. Louis ... 314-961-9927
NY Holbrook, Harris Computer Sys 516-588-7970
NY New York, Harris Computer Sys 212-490-0241
NY Rochester, Harris Computer Sys 716-248-2353
Ohio Cleveland, Harris Computer Sys 216-731-8500
Pa Pittsburg, Harris Computer Sys.. 412-931-0414
Tex Dallas ... 214-233-6980
Tex Houston ... 713-667-9451
Wash Seattle ... 206-453-0303

HARRIS CORP., PRD Elctrns. Div., Dept. EM, 6801 Jericho Tpke., Syosset, N.Y. 11791, Tel: 516-364-0400, TWX: 510-222-4494; FSC No.: 77327; Empl.: 1700

Local Sales Offices & Reps.

Ala Huntsville, Gentry Assocs. ... 205-534-9771
Ariz Phoenix, Aztec Enterprises ... 602-994-9185
Cal Cupertino, T. Louis Snitzer Co. .. 408-257-8333
Cal Los Angeles, T. Louis Snitzer Co. 213-836-6170
Cal San Diego, T. Louis Snitzer Co. 714-226-0305
Colo Littletown, Aztec Entprs. ... 303-795-0250
Conn New Canaan, Measurement Consultants 203-966-4630
Fla Orlando, Gentry Assocs. ... 305-894-4401
Ga Atlanta, Gentry Assocs ... 404-455-1206
Ill Chicago, Pivan Engrg. ... 312-539-4838
Ind Indianapolis, Pivan Engrg. ... 317-253-1661
Iowa Cedar Rapids, Pivan Engrg ... 319-377-9434
Kans Shawnee Mission, Pivan Engrg. ... 913-722-1030
Mass Waltham, Measurement Consits. 617-890-4400
Mich Detroit, Comtel Inst. ... 313-255-1970
Minn Minneapolis, Pivan Engrg. ... 612-835-3060
Mo St. Louis, Pivan Engrg. ... 314-567-3636
NJ Englewood, Eastern Instrumentation 201-567-9505
NJ Haddenfield, G.L. Williams Assocs. 609-428-6060
NM Albuquerque, Aztec Entprs. ... 505-255-2460
NY Great Neck, Eastern Instrumentation 516-466-9505
NY Schenectady, N.W. Alexander ... 518-377-0581
NY Westbury, PRD Elctrns. ... 516-364-0400
NC Burlington, Gentry Assocs. ... 919-227-3639
Ohio Cleveland, Comtel Instruts ... 216-442-8080
Ohio Dayton, Comtel Instruts ... 513-298-7573
Okla Tulsa, Data Applications Corp. .. 918-622-3753
Pa Pittsburgh, Comtel Instruts ... 412-922-5720
Tex Houston, Lear Assoc. ... 713-686-1838
Tex Richardson, Lear Assoc. ... 214-231-5388
Tex Universal City, Lear Assoc. ... 512-685-6672
Va Bailey's Crossroads, Q.T. Elctrns. Sls. 703-671-4357
Wisc Brookfield, Pivan Engrg. ... 414-786-1940

HARRIS SEMICONDUCTOR, Dept. EM, Box 883, Melbourne, Fla. 32901, Tel: 305-724-7430, TWX: 510-959-6259; FSC No.: 34371; Empl.: 1700

Local Sales Offices & Reps.

Ala Huntsville, Elctrn. Mktg. Assocs. 205-533-3620
Ariz Scottsdale, Q. T. Wiles & Assocs. 609-971-6250
Cal Goleta, Thorson Co. ... 805-964-8751
Cal Mountain View, Nor-Cal Assocs. 415-961-8121
Cal Newport Beach, Harris Semiconductor 714-540-2176
Cal Palo Alto, Harris Semiconductor 415-964-6443
Cal San Diego, Hadden Assocs. ... 714-565-9444
Colo Denver, Thorson Co. ... 303-759-0809
DC Washington, Harris Semiconductor 202-337-3170
Fla Maitland, Delmac Sls ... 305-423-7562
Fla Pompano Beach, Delmac Sls 305-781-6670
Ill Arlington Heights, Harris Semiconductor 312-437-4712
Ill Elk Grove Village, Oasis Sls. ... 312-640-1850
Ind Fort Wayne, Tech. Rep. ... 219-484-1432
Ind Indianapolis, Tech. Rep. ... 317-849-6454
Ky Louisville, Technical Reps ... 502-451-9818
Md Lanham, L. D. Lowery ... 301-459-1556
Mass Boston, Harris Semiconductor 617-237-5430
Mass Burlington, Mill-Bern Assocs. ... 617-273-1313
Mich Farmington, Miltimore Sls. ... 313-476-2446
Minn Minneapolis, Harris Semiconductor 612-854-3484
Minn St. Paul, Cahill Assocs ... 612-646-7217
NJ Keasby, Addem Group ... 516-549-8400
NM Albuquerque, The Thorson Co. .. 505-265-5655
NY Albany, Reagan/Compar Albany 518-489-7408
NY Melville, Addem Group ... 516-549-8400
NY Melville, Harris Semiconductor .. 516-249-4500
NC Winston Salem, Elctrn. Mktg. Assocs. 919-722-5151
Ohio Chagrin Falls, Midwest Mktg Assocs 216-247-6655
Ohio Dayton, Midwest Mktg Assocs .. 513-433-2511
Ohio Dayton, Harris Semiconductor.... 513-226-0636
Ore Beaverton, N.R. Schultz Co. ... 503-643-1644
Pa Broomall, L. D. Lowery ... 215-356-5300
Pa Philadelphia, Harris Semiconductor 215-687-6680
SC Greenville, Elctrn. Mktg. Assocs. 803-233-4637
Tex Dallas, Kruvand Assocs. ... 214-691-4592
Tex Houston, Kruvand Assocs. ... 713-780-9710
Tex Richardson, Harris Semiconductor 214-231-9031
Va Charlottesville, L. D. Lowery ... 804-973-6672
Wash Bellevue, N.R. Schultz Co. ... 206-454-0300

Local Distributors

Ala Huntsville, Hamilton/Avnet ... 205-533-1170
Ariz Phoenix, Hamilton/Avnet ... 602-275-7851
Ariz Phoenix, R.V. Weatherford ... 602-272-7144
Cal Anaheim, R.V. Weatherford ... 714-634-9600
Cal Costa Mesa, Avnet Elctrn. ... 714-754-6021
Cal Costa Mesa, Schweber ... 714-556-3880
Cal Culver City, Hamilton Electro Sls. 213-558-2011
Cal Glendale, R.V. Weatherford ... 213-849-3451
Cal Mountain View, Hamilton/Avnet 415-961-7000
Cal Palo Alto, R.V. Weatherford ... 415-493-5373
Cal Pomona, R.V. Weatherford ... 714-623-1261
Cal San Diego, Hamilton/Avnet ... 714-279-2421
Cal San Diego, R.V. Weatherford 714-278-7400
Cal Sunnyvale, Western Microtechnology Sls 408-737-1660
Colo Denver, Hamilton/Avnet ... 303-534-1212
Colo Englewood, R.V. Weatherford 303-761-5432
Conn Danbury, Schweber ... 800-645-7381
Conn Georgetown, Hamilton/Avnet ... 203-762-0361
Conn Norwalk, Harvey Elctrns. ... 203-853-1515
Fla Ft. Lauderdale, Hamilton/Avnet 800-432-4884
Fla Hollywood, Schweber ... 305-927-0511
Ga Atlanta, Schweber ... 404-449-9170
Ga Norcross, Hamilton/Avnet ... 404-448-0800
Ill Elk Grove, Schweber ... 312-593-2740
Ill Schiller Park, Hamilton/Avnet 312-678-6310
Kans Lenexa, Hamilton/Avnet ... 913-888-8900
Md Hanover, Hamilton/Avnet ... 301-796-5000
Md Rockville, Schweber ... 301-881-3300
Mass Lexington, Harvey ... 617-861-9200
Mass Waltham, Schweber ... 617-890-8484
Mass Woburn, Hamilton/Avnet
Mich Livonia, Schweber ... 313-525-8100
Mich Livonia, Hamilton/Avnet ... 313-522-4700
Minn Edina, Hamilton/Avnet ... 612-941-3801
Minn Edinprairy, Schweber Elctrns. 612-941-5280
Mo Hazelwood, Hamilton/Avnet ... 314-731-1144
NJ Cedar Grove, Hamilton/Avnet 201-239-0800
NJ Fairfield, Harvey Elctrns. ... 201-227-1262
NJ Mt. Laurel, Hamilton/Avnet ... 609-234-2133
NJ Somerset, Schweber ... 201-469-6008
NM Albuquerque, Hamilton/Avnet 505-765-1500
NY Binghamton, Harvey ... 607-748-8211
NY E. Syracuse, Hamilton/Avnet ... 315-437-2641
NY Rochester, Hamilton/Avnet ... 716-442-7820
NY Rochester, Schweber ... 716-461-4000
NY Westbury , Schweber ... 516-334-7474
NY Westbury, Hamilton/Avnet ... 516-333-5800
NY Woodbury, Harvey ... 516-921-8700
NC Raleigh, Hamilton/Avnet ... 919-829-8030
Ohio Beachwood, Schweber ... 216-464-2970
Ohio Cleveland, Hamilton/Avnet ... 216-461-1400
Ohio Dayton, Hamilton/Avnet ... 513-433-0610
Pa Horsham, Schweber Elctrns ... 215-441-0600
Tex Dallas, Schweber ... 214-661-5010
Tex Dallas, Hamilton/Avnet ... 214-661-8661
Tex Dallas, R.V. Weatherford ... 214-243-1571
Tex Houston, Schweber ... 713-784-3600
Tex Houston, Kent Elctrns ... 713-783-9800
Tex Houston, Hamilton/Avnet ... 713-780-1771
Tex Houston, R.V. Weatherford ... 713-688-7406
Utah Salt Lake City, Hamilton/Avnet.. 801-262-8451
Wash Bellevue, Hamilton/Avnet ... 206-746-8750
Wash Seattle, R.V. Weatherford ... 206-243-6340
Wisc New Berlin, Hamilton/Avnet ... 414-784-4510
For: Can., Mississauga, Ont., Hamilton/Avnet 416-677-7432
For: Can., Mississaugua, Ont., Prelco Elctrns. 416-678-0401
For: Can., Montreal, Que., Hamilton/Avnet 514-331-6443
For: Can., Montreal, Que., Prelco Elctrns. 514-389-8051
For: Can., Ottawa, Ont., Hamilton/Avnet 613-226-1700
For: Can., Ottawa, Ont., Prelco Elctrns. 613-226-3491
For: Can., Vancouver, B.C., Intek ... 604-324-6831

HARSHAW CHEMICAL CO., A Kenanee Industry, Dept. EM, 6801 Cochran Rd., Solon, Ohio 44139, Tel: 216-248-7400, Telex: 980-310; Empl.: 300

Local Sales Offices & Reps.

Cal Los Angeles, D. Henry ... 714-838-634
Cal San Francisco, R. Lowe ... 415-968-217
DC Washington, W. Todd Nuclear Products 703-356-957
Ga Atlanta, R. Sirpak ... 404-255-461
Ill Chicago, N. Pawluk ... 312-325-417
Mass Norwood, K. Babeaux ... 617-769-506
NJ Ramsey, M. Aguinas ... 201-327-885
NJ So. Plainfield, R. Harvey, Optical Prods 201-753-120
Ohio Cleveland, D. Leslie ... 216-248-740
Ohio Solon, R. Kasulones Optical Prods. 216-248-740
Tex Houston, J. Owens ... 713-522-837
Wash Seattle, Showalter Instruments .. 206-455-492

HARTMAN ELECTRICAL MFG., Div. A-T-O Inc Dept. EM, 175 N. Diamond St., Mansfield, Ohio 4490 Tel: 419-524-1411, TWX: 810-448-2814; Empl.: 250

Sales Manager: O. C. Walley

Local Sales Offices & Reps.

Ariz Phoenix, Airsupply Co. ... 606-267-391
Cal Dublin, Airsupply Co. ... 415-829-087
Cal San Diego, Airsupply Co. ... 714-298-112
Cal San Monica, Airsupply Co. ... 213-829-178
Ga Marietta, Airsupply Co. ... 404-422-824
Ill Berkeley, Airsupply Co. ... 312-544-740
Ind Indianapolis, Airsupply Co. ... 317-248-839
Kans Wichita, Airsupply Co. ... 316-683-751
Mass Boston, Airsupply Co. ... 617-232-502
Minn Bloomington, Airsupply Co. ... 612-884-895
Mo Bridgeton, Airsupply Co. ... 314-731-301
NY Clinton, Airsupply Co. ... 315-735-834
NY Huntington Station, Airsupply Co. 516-249-141
Ohio Columbus, Airsupply Co. ... 614-861-112
Ohio Dayton, Airsupply Co. ... 513-224-072
Pa Valley Forge, Airsupply Co. ... 215-933-892
Tex Fort Worth, Airsupply Co. ... 817-355-454
Va Arlington, Airsupply Co. ... 703-525-119
Wash Bellevue, Airsupply Co. ... 206-454-792
Exp: Rye, N.Y., American Avitron ... 914-937-530

HARTWELL CORP., Dept. EM, 900 S. Richfield Ro Placentia, Cal. 92670, Tel: 714-993-4200, TW 910-596-1294; FSC No.: 83014; Empl.: 425

Local Sales Offices & Reps.

NJ Hackensack, Hartwell Corp. ... 201-342-296
Tex Fort Worth, Hartwell Corp. ... 817-535-082

HARWIL CO., Dept. EM, 1548 17th St., Santa Monic Calif. 90404, Tel: 213-394-4710; Empl.: 5

HATHAWAY INSTRUMENTS INC., Dept. EM, 1161 51st St., Tulsa, Okla. 74145, Tel: 918-663-0110, TW 910-845-2129; Empl.: 300

Local Sales Offices & Reps.

Pa Ridgville, Hathaway Instr ... 412-221-165

HATHAWAY INSTRUMENTS, INC., Dept. EM, 525 E. Evans Ave., Denver, Colo. 80222, Tel: 303-756-830 Telex: 45-4542; Empl.: 150

Local Sales Offices & Reps.

Ariz Sun City, WGT Sls. Co. ... 602-977-199
Cal El Monte, Randolph Inds. ... 213-283-790
Cal San Francisco, Davis & Gregory Co. 415-989-413
Colo Denver, K & L Engrg. & Sls. ... 303-759-111
Ga Atlanta, M.J. Fein & Co. ... 404-938-019
Ill Northbrook, M.J. Fein & Co. ... 312-564-043
La Bossier City, Roy L. Adley Co. .. 318-747-218
Mass Holliston, M.J. Fein & Co. ... 617-236-254
Mo Kansas City, Cleaves-Bessmer-Marietti, Inc. 816-353-601
NJ Livingston, M.J. Fein & Co. ... 201-994-357
NY Scarsdale, M.J. Fein & Co. ... 914-472-110
Tex Houston, Van Valin Sls. Co. ... 713-495-960

HAYDON SWITCH & INSTR., INC., Dept. EM, 150 Meriden Rd., Waterbury, Conn. 06705, Te 203-756-7441, TWX: 710-477-2580; FSC No.: 0200 Empl.: 130

Sales Manager: J. F. Moriarty

Local Sales Offices & Reps.

Ala Huntsville, Incotech, Inc. ... 205-837-606
Ariz Phoenix, Airsupply Co. ... 602-267-391
Cal Torrance, Airsupply Co. ... 213-538-508
Conn Litchfield, Norcan Div. of Intrade 203-567-586
Conn Milldale, Wood Sls. ... 203-621-488
Fla Clearwater, WMM Assocs ... 813-442-391
Fla Ft Lauderdale, WMM Assocs. ... 305-772-985
Fla Maitland, WMM Assocs ... 305-831-453
Ill Westchester, Gassner & Clark .. 312-345-424
Iowa Hiawatha, Gassner & Clark Co. 319-393-576
Kans Wichita, Airsupply Co. ... 316-683-751

Mass Needham Hghts, Wood Sls 617-444-1601
Mo Bridgeton, Airsupply Co..... 314-731-3011
NH Wilton, Wood Sls..... 603-654-2961
NJ Springfield, F. F. Sylvester Assocs 201-376-3324
NY Clinton, Airsupply Co. 315-735-8341
Ohio Cleveland, A. H. Baier Co..... 216-461-6161
Ohio Dayton, A. H. Baier Co. 513-276-4128
Pa King of Prussia, Airsupply Co..... 215-265-2717
Tex Fort Worth, Airsupply Co..... 817-335-4541
Vt No. Bennington, Wood Sls 802-447-7890
Va Arlington, Airsupply Co. 703-525-1191
Wash Bellevue, Airsupply Co..... 206-454-7922
Exp: Woodbury, L.I., Transaero, Inc. .. 516-921-7400

-B INSTR. CO., Dept. EM, 4306 N. American St, Philadelphia, Pa. 19140, Tel: 215-329-9125, TWX: 710-670-1574; Empl.: 47

Sales Manager: E. Hiergesell; *Distributor Manager:* R. Miller

Local Sales Offices & Reps.
Cal Encino, Viking Sales 213-788-5501
Cal Oakland, Leland Green Co. 415-836-1880
Ga Atlanta, RCS Co 404-455-8777
Ill Chicago, A.D. Clark..... 312-274-0304
Iowa Marshalltown, A. C. Schilling 515-752-2955
NC Charlotte, JMW Sys. 704-334-8481
Ohio Cleveland, A. A. Fox & Assocs .. 216-871-5635
Tex Dallas, SWK 214-351-9985
Wash Seattle, Fairman Lee Co. 206-244-7262

BS EQUIPMENT DIV., Dept. EM, 3000 Supply Ave., Los Angeles, Calif. 90040, Tel: 213-726-3033, TWX: 910-580-3179; Empl.: 40

Sales Manager: K. Lowery

Local Sales Offices & Reps.
Fla Orlando, Gra-Mar Inc..... 305-894-3351
Ill Itasca, English Sls. Co..... 312-773-9449
Mass Waltham, Etchomatic, Inc. 617-893-2020
NJ Allamuchy, Aztec Assocs. 201-852-1745
NJ Pennington, Chemtek 609-466-1414
Ohio Cleveland, Gilbert Tramer Co..... 216-771-2751
Tex Richardson, Oliver Sls. 214-231-1522
Utah Salt Lake City, Retep 801-486-3141
Va Alexandria, Chemical Etching Equip. & Supply Co. 703-971-2646
Wash Seattle, Chemithon Corp. 206-937-9954

HECON

ECON CORP., Dept. EM, 31 Park Rd., Tinton Falls, N.J. 07724, Tel: 201-542-9200, Telex: 13-2457; Empl.: 200

Sales Manager: P. Shine; *Distributor Manager:* R. Drum

Local Sales Offices & Reps.
Ariz Tempe, Gassner & Clark Co. 602-968-9037
Cal Chatsworth, Hecon Corp..... 213-998-7190
Cal Nevada City, Hecon Corp..... 916-265-5527
Cal Sunnyvale, RDP Instrs. 408-735-9040
Colo Littleton, Radco Elctrns. 303-794-4279
Conn Hartford, Hecon Corp. 617-734-8525
Fla Bradenton, Hutto-Hawkins-Peregoy, Inc. 813-755-4015
Fla Ft Lauderdale, Hutto-Hawkins-Peregoy 305-971-5750
Fla Maitland, Hutto-Hawkins-Peregoy, Inc. 305-831-2474
Ga Douglasville, Hecon Corp. 404-942-5244
Ill Chicago, Hecon Corp..... 312-967-8939
Ind Indianapolis, James Woolgar Co. 317-849-3930
Ky Louisville, James Woolgar Co. .. 502-425-8735
Mass Brookline, Hecon Corp..... 617-734-8525
Minn St. Paul, Howard A. Cullen & Assoc. 612-646-7371
NJ Wayne, Hecon Corp..... 201-839-5454
NY Rochester, Hecon Corp..... 617-734-8525
Ohio Cleveland, Hecon Corp. 216-331-2230
Ore Portland, Fry Controls, Inc. 503-226-2620
Tex Houston, Unidyne 713-772-3170
Exp: Can., Rexdale, Ont., Hecon Can., Inc. 416-675-3663

Local Distributors
Ala Birmingham, Applebee-Church .. 205-879-4417
Ariz Phoenix, Petro Elctrns. 602-269-9375
Cal Burlingame, Control Devices Pacific 415-343-2773
Cal Los Angeles, California Wholesale Elec. Co. 213-723-6711
Cal Los Angeles, Pacific Elctrnc. Sls. 213-663-8060
Cal San Francisco, Steven Engrg. Co. 415-583-5868
Cal San Francisco, Master Distrs. 415-626-0807
Cal Santa Monica, Master Distrs..... 213-829-4656
Conn Middletown, Mancib Co. 203-346-6646
Conn Stratford, State Elctrns. Parts Corp. 203-375-5961
Fla Lakeland, A-A Electric Div. AEC 813-682-6181
Fla Miami, Electro Standards Labs .. 305-633-6973
Ga Atlanta, Applebee-Church 404-451-2747
Ill Addison, Lectron Controls Co..... 312-543-8460
Ill Addison, Lectron Controls 312-543-8460
Ill Chicago, Don Johns, Inc. 312-666-2210
Ill Mount Prospect, Automation Equip. Co. 312-398-7550
Ill Park Ridge, Automation Comp Sls. 312-823-8075
Ind Indianapolis, Graham Elctrns. Sup. 317-634-8202
Kans Overland Park, Parker & Foster, Inc. 913-381-9330
Ky Louisville, D. Johns of Kentucky 502-491-3495
La Kenner, Automation Specialists.. 504-721-3497
Md Baltimore, E.I.L. Instrs. 301-252-1260
Mass Burlington, Mancib Co. 617-272-9450
Mass Worcester, F. X. Bonneau Assocs. 617-754-7655
Mich Detroit, Motion Control Corp..... 313-478-1640
Minn St. Paul, United Elec. Corp. 612-333-1111
Minn St. Paul, Power/Mation Div..... 612-645-0781
Mo University City, E. W. Mooney 314-725-8875
NJ Elmwood Park, Richards Co..... 201-797-6300
NJ Hanover, State Elctrns..... 201-887-2550
NJ Piscataway, Fromm Electric Supply Co. 201-981-0400
NY Albany, Edwin E. Taylor Co. 518-438-7811
NY Buffalo, KOM Lamb, Inc. 716-874-3530
NY Mamaroneck, Logicomp Elctrns. 914-698-9332
NC Winston Salem, Kirkman Elctrns. 919-722-9131
NC Winston-Salem, Kirkman Elctrns. 919-722-9131
Ohio Cincinnati, United Radio, Inc. 513-761-4030
Ohio Dayton, Summit Inds., Inc. 513-434-8192
Ohio Toledo, Toldedo Ind'l. Repair..... 419-382-2261
Ohio Warren, Rem Electronics Supply 216-399-2777
Okla Tulsa, Radio, Inc. 918-587-9123
Ore Portland, Platt Electric Supply ... 503-228-6121
Pa Erie, J. H. Cross Co..... 814-833-1104
Pa Philadelphia, Royal Electric Sup 215-221-1200
Pa Reading, Barbey Elctrns. 215-376-6116
Pa Wilkinsburg, Fulter Instr. Svc., 412-241-6789
SC Greenville, Barker Controls 803-244-6495
Tex Beaumont, Ralph's Ind'l. Elctrns. 713-833-9443
Tex Dallas, Dallas Instrs. 214-349-1180
Tex Dallas, Wholesale Elctrn. Co. 214-824-3001
Tex Houston, Wofford Elctrn. Parts 713-644-1838
Tex Houston, Ralph's Ind'l. Elctrns. .. 713-641-0267
Tex Houston, T & J Instrs..... 713-666-2308
Tex Odessa, Kobe, Inc. 915-362-7391
Va Alexandria, E.I.L. Instrs. 703-354-4330
Va Richmond, Avec Elctrns. Corp. .. 804-359-6071
Wash Seattle, Radar Electric Co. 206-282-2511
Wisc Cedarburg, Automation Engrg. 414-377-7500

HEEGER INC., Dept. EM, 725 Ceres Ave., Los Angeles, Cal. 90021, Tel: 213-627-9310; Empl.: Ten

Local Sales Offices & Reps.
Ala Birmingham, J.F. Russel Co. 205-822-2196
Ariz Phoenix, B.G. Sls. Co..... 602-266-5624
Cal Burlingame, Carelli EMA..... 415-697-8862
Colo Denver, A.E.S. 303-777-8733
Fla Ft. Lauderdale, Unirep 305-527-1556
Ill Chicago, PBE Mkts..... 312-OR4-3018
Ind Mulberry, Maish Sls. 312-296-2322
Mass Farmingham, Northeastern Rep 617-877-4850
Mich Auburn Hgts, S.F. McMedhan 313-852-4308
Minn Minneapolis, A.J. Warner 612-729-7371
Mo St. Louis, K. Kelly & Co..... 314-632-658
NY Camillus, Trademark Elect Assoc
NY Yonkers, J. Brown Elctrn..... 914-779-7330
NC Charlotte, De Witt-Austin Co..... 704-366-4643
Ohio Stow, J.A. Mandabach 216-686-1965
Ore Portland, J.W. Eckersley 503-246-3183
Pa Holland, Parnell Sls. Co. 215-355-9330
Tex Houston, B. Wylds Co. 713-467-0072

HEI, INC., Dept. EM, Jonathan Ind'l. Ctr., Chaska, Minn. 55318, Tel: 612-448-3510, TWX: 910-578-0832; Empl.: 175

Sales Manager: R.D. Young

Local Sales Offices & Reps.
Ala Huntsville, REP, Inc. 205-881-9270
Cal Burlingame, Leddy Assocs. 415-347-5247
Cal Los Angeles, M.A. Stolaroff Co. 213-295-7781
Fla Ft. Lauderdale, CBC Elctrns..... 305-484-7330
Ga Tucker, REP, Inc..... 404-938-4358
Ill Northbrook, Raines-Brin Assocs. 312-498-0890
Mass Andover, Sales Engrg. 617-470-0800
Mich Farmington, Miltimore Sls. 313-476-2446
Minn St. Paul, Cahill Assocs. 612-646-7217
Mo St. Louis, Thunderbird..... 314-567-6488
NJ Pitman, Colrud Corp 609-589-5866
NY Fairport, Franklin Sls. 716-377-6584
NY Massapequa, Coughlin Assoc..... 516-799-7743
NY New Hartford, Franklin Sls. 315-737-5038
NY Syracuse, Franklin Sls..... 315-472-5273
NC Raleigh, REP, Inc. 919-851-3007
Ohio Rocky River, C. H. Dolfuss, Jr. & Co. 216-333-7504
Tenn Jefferson City, REP, Inc. 615-475-4105
Tex Dallas, ION Assocs. 214-357-9441
Wash Bellevue, Comtec 206-453-1188

HEINEMANN ELEC. CO., Dept. EM, Trenton, N.J. 08650, Tel: 609-882-4800; FSC No.: 74193; Empl.: 405 ..... p. 4080

Sales Manager: E. W. Lisnay

Local Sales Offices & Reps.
Ala Birmingham, J. Spader Co. 205-879-1366
Ariz Glendale, O'Donnell Assoc..... 602-938-3120
Cal Burlingame, Campbell & George 415-697-2965
Cal Encino, Porter Co. 213-999-0171
Colo Denver, P.A. Douden..... 303-744-1497
Fla Boca Raton, Conley & Assoc., Inc. 305-395-6108
Fla Oviedo, Conley & Assocs., Inc... 305-365-3283
Fla Tampa, Conley..... 813-933-1759
Ga Decatur, Spader & Associates .. 404-296-3024
Ill Chicago, D. Dolin Sls. 312-286-6200
Ind Ft. Wayne, O. Bromberg 219-447-5783
Ky Louisville, O. Bromberg 502-245-8916
Md Ellicott City, McCourt 301-465-4515
Mass Framingham, Sullivan Tech. Sls. 617-620-0195
Mich Detroit, L. H. Dickelman Co. 313-353-8210
Minn Minneapolis, H. Smith 612-881-3620
Mo St. Louis, Hill & Co..... 314-621-1818
NJ Ridgewood, Ballou, Inc. 201-444-6990
NY Rochester, Canavan-Scanlon 716-442-0720
NY Syracuse, Canavan-Scanlon 315-437-1271
NC Charlotte, J. Rudisill Assocs., Inc. 704-377-6901
Ohio Cincinnati, O. Bromberg 513-771-9333
Ohio Cleveland, Brown Elect. Prod..... 216-331-2072
Okla Tulsa, Comps. Inc..... 918-583-9149

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Pa Pittsburgh, Brown Elec. Equip. 412-279-1101
Tex Dallas, Glidden Electro Equip. 214-341-0610
Tex Houston, Glidden Electro Equip. 713-681-1415
Wash Mercer Island, J. Andersen 206-232-0484
Wisc Thiensville, Control Sales 414-242-4580

HEINEMANN GMBH, see Capintec Instruments

HEITZ, INC., KARL, Dept. EM, 979 Third Ave., New York, N.Y. 10022, Tel: 212-421-5220; Empl.: 15

HELICAL PRODS. CO., INC., Dept. EM, Box 2296, Santa Maria, Cal. 93456, Tel: 805-925-8651, TWX: 910-351-5856; FSC No.: 13201; Empl.: 22

Local Sales Offices & Reps.

Cal Los Angeles, TechRep Assocs. ... 213-641-5830
Ill Chicago, Engineered Sls. 312-867-8434
Md Baltimore, R. P. Luce Co. 301-752-8200
Mass Lexington, Hathaway Elctrn. 617-861-7010
Minn St. Paul, W. Taubert 612-636-6414
NJ Piscataway, R. P. Luce & Co. 201-752-8750
NY DeRuyter, R. P. Kennedy Co. 315-682-2299
NY New Hyde Park, R. P. Luce & Co. 516-437-4550
NY Ravena, R. P. Kennedy Co. 914-876-2700
NY Rochester, R. P. Kennedy Co. 716-271-6322
Ohio Fairborn, Tech. Assocs. 513-878-2484
Pa Philadelphia, R. P. Luce & Co. .. 215-884-8365
Va Richmond, R.P. Luce & Co. 804-283-8587

HELIOTEK, See Spectrolab, Inc.

HELIX SPRING CORP., Dept. EM, 35-10 10th St., Long Island City, N.Y. 11106, Tel: 212-YE2-0303; Empl.: 25

Sales Manager: S. Vegh

HENES PRODUCTS CORP., Dept. EM, 4301 E. Madison St., Phoenix, Ariz. 85034, Tel: 602-275-4126; Empl.: 25

Local Sales Offices & Reps.

Cal Costa Mesa, Scrantom Engrg. Inc. 714-979-6373
Cal Los Altos, C.D. Buerki Co. 415-941-3343
Conn Bridgeport, Tech. Instrs., Inc. 203-368-4582
Ill Roselle, Automated Process, Inc. 312-885-1095
Ind Cumberland, Automated Process, Inc. 317-251-0708
Mass Wilmington, Tech. Insts., Inc. 617-944-3930
Minn Minneapolis, Automated Process, Inc. 612-545-4481
NJ Saddle Brook, L & M Assocs. 201-843-8700
NY Brentwood, L & M Assocs. 516-231-8363
NY New York, L & M Assocs. 212-675-7486
NC Raleigh, F.G. Speidel 919-787-4521
Ohio Dayton, H. Noyes & Assocs. 513-274-2871
Pa Andalusia, L & M Assocs. 215-639-3100
Tex Dallas, R.W. Mureen Co. 214-369-7561
Wisc Milwaukee, Automated Process, Inc. 414-354-4370
Exp: N.Y., New York, E.D. Allmendinger, Inc. 212-269-0090

HENSCHEL CORP., Dept. EM, 14 Cedar St., Amesbury, Mass. 01913, Tel: 617-388-1103, Telex: 94-7444; FSC No.: 28199; Empl.: 130

Local Sales Offices & Reps.

Cal San Francisco, Beck Elc. Supply Co. 415-495-8870
Cal Torrance, Allied Ind. 213-770-0004
La New Orleans, Carstone Corp. 504-525-2231
NJ Jersey City, Henschel Corp. 201-434-1113
NJ Moorestown, C. Gilfillan 609-235-3376
Wash Bellevue, Ralston Cunningham Assocs. 206-455-0316

HEPCO WIRE & CABLE, Dept. EM, Box 76, Garnvl., Garnersville, N.Y. 10923, Tel: 914-947-1220; Empl.: 12

Sales Manager: S. Grant

Local Sales Offices & Reps.

Ga Atlanta, Robert Delano 404-549-0241
Ga Atlanta, Hepco Wire & Cable 404-549-0241

HERAEUS-AMERSIL, INC., Dept. EM, 650 Jernees Mill Rd., Sayreville, NJ 08872, Tel: 201-254-2500, Telex: 84-4596; Empl.: 100

Local Sales Offices & Reps.

Cal Santa Ana, Heraeus-Amersil, Inc.
Mass Plymouth, Heraeus-Amersil, Inc.
Ohio Cleveland, Heraeus-Amersil, Inc.
Tex Dallas, Roy Tindel & Assocs.

HERALD ELECTRONICS, Dept. EM, 6611 N. Lincoln Ave., Chicago, Ill. 60645, Tel: 312-675-1100; Empl.: 13

Sales Manager: H. Katz

Local Sales Offices & Reps.

Ariz Phoenix, H. Moore Sls. Assoc. .. 602-274-4558
Cal Foster City, Steve Olson Sls. 415-572-8886
Cal Northridge, I. Fenton & Assoc. .. 213-363-0971
Fla Miami, L.P. Hench Co. 305-251-4343
Ga Tucker, Audio Sls 404-938-3001
Ill Chicago, Markal Sls 312-282-5800
Ind Indianapolis, Ronald Munn Co. .. 317-546-5556
Md Cockeysville, Joseph Rodimak & Co. 301-666-8128
Mich Detroit, Markal Sls. 313-355-5700
Mich Grand Rapids, Markal Sls. 616-942-2670
NY Middle Village, BCD Sls. 212-894-1331
Tex Houston, Buck Rogers Co. 713-481-6700
Exp: Chicago, Ill., Magnus & Assoc. .. 312-334-1503

HERMETIC SWITCH, INC., Dept. EM, Box 1325, Hwy 92 W., Chickasha, Okla. 73018, Tel: 405-224-4046; Empl.: 100

Sales Manager: D. Posey

Local Sales Offices & Reps.

Cal San Diego, V. Gott & Assocs. 714-272-8452
Cal San Gabriel, V. Gott & Assocs. ... 213-285-2148
Conn Bristol, New England Elctrn. Sls. 203-583-3650
Md Timonium, Heller Sls. 301-252-4780
Mass Canton, New England Elctrn. Sls. 617-828-4835
Mich Troy, Pine Sls. 313-524-1860
Minn Minneapolis, Peterson Elctrns. 612-884-3483
NY Oceanside, Current Ind's. 516-678-3895
Ohio Chagrin Falls, Pine Sls. 216-247-6198

HERTZ FILTER, Dept. EM, 3 Aerial Way, Syosset, N.Y. 11791, Tel: 516-822-4770; Empl.: 22 ..... p. 2633

HEWLETT-PACKARD CO., Dept. EM, 1501 Page Mill Rd., Palo Alto, Cal. 94304, Tel: 415-493-1501, TWX: 910-373-1267; Empl.: 31000 ..... p. 3267

Local Sales Offices & Reps.

Ala Huntsville 205-881-4591
Ariz Phoenix 602-244-1361
Ariz Tucson 602-294-3148
Cal Fullerton 714-870-1000
Cal Los Angeles 213-649-2511
Cal North Hollywood 213-877-1282
Cal Sacramento 916-482-1463
Cal San Diego 714-279-3200
Cal Santa Clara 408-249-7000
Colo Englewood 303-771-3455
Conn New Haven 203-389-6551
Fla Ft. Lauderdale 305-731-2020
Fla Orlando 305-859-2900
Ga Atlanta 404-434-4000
Haw Honolulu 808-955-4455
Ill Rolling Meadows 312-255-9800
Ind Indianapolis 317-842-1000
Iowa Iowa City 319-338-9466
La Kenner 504-443-6201
Md Baltimore 301-944-5400
Md Rockville 301-948-6370
Mass Lexington 617-861-8960
Mich Farmington 313-476-6400
Minn St. Paul 612-636-0700
Mo Kansas City 816-763-8000
Mo Maryland Hghts. 314-567-1455
NJ Paramus 201-265-5000
NM Albuquerque 505-292-1330
NM Las Cruces 505-526-2485
NY Albany 518-458-1550
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Tex Richardson 214-231-6101
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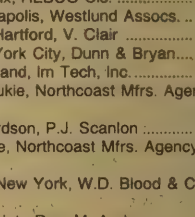
Utah Salt Lake City 801-487-0715
Va Richmond 803-285-3431
Wash Bellevue 206-454-39
Wisc West Allis 414-541-05

HEXACON ELEC. CO., Dept. EM, 621 W. Clay Av
Roselle Park, N.J. 07204, Tel: 201-CH5-6200, Tele
13-8812; Empl.: 150 ..... p. 4293-42

Local Sales Offices & Reps.

Ala Huntsville, BJR Manufacturers' Representatives 205-881-35
Ariz Tucson, Ross Ribaudo 602-299-14
Cal Burlingame, Dillon Stevens 415-697-30
Cal L.A., Dillon Stevens Co. 213-747-92
Conn Woodstock, HDQ & HV Neff 203-974-12
Fla Merritt Island, J.A. Kennedy Co. 305-452-98
Ill Bensenville, Process Specialties, Inc. 312-860-22
Ind Indianapolis, Harvey Guenther 317-897-64
Kans Kansas City, L.E. Bruns 913-287-52
Md Phoenix, REBCO Sls. 301-592-89
Minn Minneapolis, Westlund Assocs. .. 612-866-50
NY New Hartford, V. Clair 315-735-81
NY New York City, Dunn & Bryan 212-964-80
Ohio Cleveland, Im Tech, Inc. 216-826-34
Ore Milwaukie, Northcoast Mfrs. Agency Inc. 503-659-38
Tex Richardson, P.J. Scanlon 214-231-46
Wash Seattle, Northcoast Mfrs. Agency, Inc. 206-284-50
Exp: N.Y., New York, W.D. Blood & Co. 212-344-02
Exp: P.R., Hato Rey, M. Anderson 809-726-02



HEYMAN MFG. CO., Dept. EM, 147 N. Michigan Av
Kenilworth, N.J. 07033, Tel: 201-245-23
800-558-0917, TWX: 710-996-5986; FSC No.: 2852
Empl.: 86 ..... p. 46

Local Sales Offices & Reps.

Wisc Waukesha, Heyman Mfg. Co. (Wisc. calls onl 800-242-09

HGA ELCTRNS., INC., Dept. EM, 519 S. Fifth Ave., M
Vernon, N.Y. 10550, Tel: 914-664-5393; Empl.: 3

Local Distributors

NY New York, General Camera Corp 212-594-87

HI-G CO., INC., Dept. EM, 580 Spring St., Winds
Locks, Conn. 06096, Tel: 203-623-2481, TW
710-420-0592; FSC No.: 02289 ..... p. 3542-35

Local Sales Offices & Reps.

Ala Meridianville, L & D Inc. 205-828-35
Ariz Scottsdale, Fryco 602-945-80
Cal Pico Rivera, Westrep 213-949-25
Cal San Diego, Westrep 714-276-07
Cal Santa Clara, Westrep 408-984-03
Conn Monroe, J.E. Boeing Co. 203-268-76
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Fla Oviedo, Conley Assoc. 305-365-32
Fla Tampa, Conley Assoc. 813-933-17
Ill Mt. Prospect, Magnuson Assocs. 312-956-07
Ind Ft. Wayne, Given Corp. 219-432-55
Md Riderwood, Manreps 301-321-77
Mass Lexington, J.E. Boeing Co. 617-862-25
Mich Grand Rapids, Elliott Sls. Co. 616-949-14
Minn St. Paul, Magnuson Assocs. 612-227-84
Mo St. Charles, Buse Sls. Co. 314-723-11
NY Jericho, HRC Comp-Tech 516-822-55
NY Rochester, Canavan-Scanlon Assoc. 716-442-07
NY Syracuse, Canavan-Scanlon Assoc. 315-437-12
NC Greensboro, L & D Inc. 919-292-32
Ohio Cincinnati, Components 513-866-06
Ohio W. Carollton, Components 216-243-92
Pa Ardmore, Manreps 215-649-63
Tex Dallas, United Comps. 214-324-14
Wash Bellevue, Ruggels Tech. Sls. 206-455-27

Local Distributors

Ala Montgomery, Southern Controls 1-800-392-57
Cal So. San Francisco, G.J. Yamas Co 415-589-83

Cal Woodland Hills, Jaco Elctrns. 213-887-6400
Conn Brideport, Tower-Olshan Corp. .. 203-367-7401
Conn Hartford, F.A. Blesso..... 203-327-6461
Fla Miami, ESL Elctns..... 305-633-6973
Ga Rome, Battey Mach. Co. 404-291-4141
Ill Chicago, Electro-Kinetics 312-286-4200
Ill Mount Prospect, Magnuson Elctns. 312-956-0700
Ind Ft. Wayne, Ft. Wayne Elctrns..... 219-423-3422
Ind Indianapolis, Graham Elctns. 317-634-8486
Kans Wichita, American Elec. Co..... 316-267-5311
Md Baltimore, Dorman Elec. Supply 301-727-0711
Md Savage, Pyttronic Inds..... 301-792-7000
Mass Holliston, Diplomat/New England
Mich Ferndale, Ram Meter 313-398-6767
NY Binghamton, Harvey/Federal..... 607-748-8211
NY Lynbrook, Peerless Radio 516-593-2121
NY Rochester, Masline Elctrns. 716-546-5373
NC Greensboro, Hammond Elctrns. 919-275-6391
Ohio Cincinnati, Graham Mytronic 513-733-1661
Ohio Dayton, Esco Inc..... 513-226-1133
Pa Montgomeryville, Pyttronic Inds. 215-643-2850
SC Greenville, Hammond Elctrns. 803-233-4121
SC Greenville, Hammond Elctrns. 803-233-4120
SD Memphis, Bluff City Distr. Co. 901-725-9500
Tenn Knoxville, Industrial Elctns..... 615-573-7135
Tex Dallas, Dallas Instrs. 214-341-0504
Tex Houston, Electrical Instr. & Meter Co. 713-526-6871
Wash Seattle, Zepher Elctrns. Corp.... 206-575-0922
Wisc Mequon, Taylor Elctric Co..... 414-241-4321
For: Canada, Montreal, Que., Specialty Elctrns. Ltd. 514-336-4500
For: Canada, Toronto, Ont., Specialty Elctrns. Ltd. 416-678-2104

HI-G CO., INC., Relay Div, Dept. EM, Spring St. & Rte. 75, Windsor Locks, Conn. 06096, Tel: 203-623-2481, TWX: 710-420-0592; FSC No.: 02289; Empl.: 420 p. 3530-3541

Local Sales Offices & Reps.
Ala Meridianville, L & D, Inc..... 205-828-3522
Ariz Scottsdale, Fryco..... 602-945-3281
Cal Pico Rivera, Westrep 213-949-2551
Cal San Diego, Westrep 714-276-0751
Cal Santa Clara, Westrep 408-984-0350
Colo Denver, Omega Ltd. 303-758-1508
Conn Easton, J. E. Boeing Co. 203-268-7605
Fla Boca Raton, Conley & Assocs... 305-395-6108
Fla Oviedo, Conley & Assocs. 305-365-3283
Fla Tampa, Conley & Assocs. 813-933-3183
Ill Mt. Prospect, Magnuson Assoc. 312-956-0700
Ind Ft. Wayne, Given Corp. 219-432-5585
Md Riderwood, Manreps Inc..... 301-321-7747
Mass Lexington, J.E. Boeing Co. 617-862-2500
Mich Grand Rapids, Elliot Sales 616-949-1451
Minn St. Paul, R.G. Ragon, Inc. 612-488-0201
Mo St. Charles, Buse Sls. Co. 314-946-6430
NY Jericho, HRC Comp-Tech, Inc. .. 516-822-5550
NY Rochester, Canavan-Scanlon Assoc. 716-424-1830
NY Syracuse, Canavan-Scanlon Assoc. 315-437-1271
NC Greensboro, L & D, Inc. 919-292-3201
Ohio Cincinnati, Components, Inc. 513-866-0661
Ohio Cleveland, Components, Inc. 216-243-9200
Pa Ardmore, Manreps Inc. 215-649-6300
SC Greenville, L&D Inc 803-268-5201
Tex Dallas, United Comps. 214-324-1448
Wash Bellevue, Ruggles Tech. Sls..... 206-455-2778

Local Distributors
Cal Chatsworth, Westates Elctrns. Corp. 213-341-4411
Cal Irvine, Ratel/Terminal 213-924-8387
Cal Los Angeles, Radio Prod. Sls..... 213-748-1271
Cal Mt. View, Ratel/Terminal 415-969-9240
Cal San Diego, Radio Prod. Sls. 714-292-5611
Cal Sunnyvale, Bell Inds..... 408-734-8570
Cal Woodland Hills, Jaco Elctrns. 213-887-7260
Fla Orlando, Hallmark Elctrns. Corp. 305-855-4020
Ill Westmont, RM/Bodelle 312-323-9670
Ind Indianapolis, Graham Elctrns. Sup. 317-634-8202
Kans Wichita, Lee Products..... 316-522-8179
Md Baltimore, Hallmark Elctrns 301-796-9300
Md Savage, Pyttronic Inds..... 301-792-7000
Mass Lexington, Harvey/ R & D Elctrns. 617-861-9200
Mass Waltham, QPL Elctrns 617-861-9200
Minn St. Paul, Ragon Elctrns. 612-488-0201
Mo St. Charles, Lectronix 314-946-6424
NY Binghamton, Harvey/Federal Elctrns. 607-748-8211
NY Hauppauge, Time Elctrn. Sls. 516-273-0100
NY Lynbrook, Peerless Radio 516-593-2121
NY Woodbury, Harvey Radio Co. 516-921-8700
Ohio Dayton, Arrow Elctrns. 513-253-9176
Okla Oklahoma City, Electro-Enterprises Inc. 405-478-1752
Pa Harrisburg, Pyttronic Inds. 717-233-6591
Pa Montgomeryville, Pyttronic Inds. 215-643-2850
Tex Dallas, Hallmark Elctrns. Corp... 214-234-7300
Wash Seattle, Zepher Elctrns..... 206-575-0922
For: Can., Mississauga, Ont., Specialty Elctrns., Ltd. 416-678-2104
For: Can., Montreal, Que., Specialty Elctrns., Ltd. 514-336-4500

HICKOK

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Cal Costa Mesa, FLW 714-751-7512
Cal Palo Alto, Coherent Mktg. 415-327-2217
Conn Hamden, J & J Assoc..... 203-624-7800
Fla Ft. Lauderdale, W.A. Brown..... 305-776-4800
Fla Orlando, W.A. Brown 305-425-5505
Ga Atlanta, W.A. Brown 404-939-1674
La Mandeville, W. A. Brown 504-627-9701
Mass Burlington, J & J Assoc..... 616-272-2606
NJ Plainfield, S. Glassman Assoc. .. 201-561-3866
NY Glen Cove, S. Glassman Assoc. 516-676-1039
NY N. Tonowanda, Labtronics 716-648-0107
NY Syracuse, Labtronics..... 315-454-9314
NY Ulster Park, Labtronics 914-471-2806
NC Durham, W.A. Brown..... 919-682-2383
Ohio Cleveland, Bradcor Inc. 216-261-0888
SC Columbia, W.A. Brown 803-798-3297
Tenn Oak Ridge, W.A. Brown 615-482-5761
Wisc Milwaukee, Star Eng. Sales..... 414-645-3680

HICO HORIZONS INT'L CO., Dept. EM, 716 Willow Rd, Menlo Park, Cal. 94025, Tel: 415-328-1111, TWX: 910-373-1170

Sales Manager: C. R. Long

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Ariz Phoenix, Southwest Electromechanical Engrg 602-993-0250
Cal Los Angeles, Sierra Industrial Engrg 213-624-3123
Cal Menlo Park, Long & Assocs 415-327-1300
Colo Parker, J.S. Heaton..... 303-841-3651
Conn Torrington, Motoreps..... 203-482-3193
Ill Chicago, Engineered Sls 312-867-8434
Md Baltimore, R.L. Wilkinson 301-377-7800
Mass Needham Heights, Motoreps 617-449-3252
Minn St. Paul, Don Nedved Assocs 612-645-2945
Mo St. Louis, Harris Hansen..... 314-432-3611
NJ Red Bank, Motoreps 201-741-3356
NY Albany, H.C. Johnson Agencies 518-456-6667
NY Buffalo, H.C. Johnson Agencies 716-632-7880
NY Rochester, H.C. Johnson Agencies 716-482-3000
Ohio Dayton, BEK Assocs..... 513-278-1343
Pa Glenside, R.L. Wilkinson..... 215-887-5300
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Sales Manager: Geo. Kase, Mktg. Mgr.

Local Sales Offices & Reps.
Ala Huntsville, Currie, Peak & Frazier205-536-5650
Cal Encino, King-Way Assocs. 213-788-4124
Cal Mountain View, Weil & Disman Assocs. 415-965-4300
Colo Denver, J. Smith & Assocs..... 303-442-7100
Fla Orlando, Currie, Peak & Frazier 305-855-0843
Ill La Grange Park, Beirhaus Sls. .. 312-354-5100
Ind Fort Wayne, TX Sls. 219-489-4447
Kans Overland Park, Gordon Fixman Engrg. 913-648-7748
Md Fulton, Gans, Fryling & Pugh..... 301-792-4818
Mass Canton, New England Sls. Corp. 617-828-4835
Mich Birmingham, Clifford Armstrong Co. 313-851-1404
Minn Chanhassen, Jack Barnes Assocs. 612-474-2907
Mo St. Louis, Gordon Fixman Engrg. 314-725-5219
NJ Flanders, K & R Engrg Sls..... 201-584-5235
NM Albuquerque, J. Smith & Assocs. 505-265-3406
NM Albuquerque, Mountain Tek 505-265-8521
NY Liverpool, D. J. Hurley 315-457-1180
NY Pittsford, D. J. Hurley 716-586-6159
NC Greensboro, Currie, Peak & Frazier 919-273-3040
Ohio Cincinnati, John O. Olsen Co. 513-922-2176
Ohio Cleveland, John O. Olsen Co..... 216-752-5444
Ore Portland, Earl & Brown..... 503-245-2283
Pa Pittsburgh, John O. Olsen Co..... 412-279-2550
Tex Richardson, Carl Tinch Sls. Co. 214-231-1322
Va Arlington, Gans, Fryling & Pugh 703-527-3262
Wash Seattle, Earl & Brown..... 206-284-1121
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HIGH SPEED HAMMER CO., INC., Dept. EM, 313 Norton St., Rochester, N.Y. 14621, Tel: 716-CO 6-6740; Empl.: 25

Sales Manager: D.W. Marcellus

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Ill Chicago, R. Ziskal 815-385-9150

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HIGH VOLTAGE DEVICES, INC., Dept. EM, 7435 Ave., Visalia, Cal. 93277, Tel: 209-733-3870, TWX: 910-377-3493; FSC No.: 52306; Empl.: 75

Sales Manager: K.D. Corsetti

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Cal San Jose, Admotus 408-946-1254
Colo Denver, Comp. Sls. 303-841-2650
Ill Elk Grove Village, Micro Sls 312-956-1000
Ind Indianapolis, Electronic Sls & Engrg 317-849-4260
Kans Shawnee Mission, Technical Sls 913-888-3330
Md Columbia, Rep-tron 301-465-6433
Mass Burlington, R. J. Sickles Assoc... 617-272-7285
Mich Southfield, Doral Sls 313-352-1667
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Ohio Dayton, Lyons Corp. 513-278-0714
Ohio Highland Hgts, Lyons Corp..... 216-461-8288
Ore Portland, J.J. Backer Co. 503-297-3776
Ore Salem, J.J. Backer Co..... 503-362-0717
Pa Newton Square, Holdsworth & Co. 215-356-8550
Tex Dallas, Hillman Entprs. 214-827-4790
Wash Seattle, J.J. Backer Co. 206-285-1300

HIGH VOLTAGE ENGRG. CORP., Dept. EM, S. Bedford St., Burlington, Mass. 01803, Tel: 617-272-1313, TWX: 710-332-0245; Empl.: 750

HIGHTEMP RESINS, INC., Dept. EM, 225 Greenwich Ave., Stamford, Conn. 06902, Tel: 203-357-7401; Empl.: 5

HILLS-MCCANNA CO., Dept. EM, 400 Maple Ave., Carpentersville, Ill. 60110, Tel: 312-426-4100, Telex: 72-2442; Empl.: 700

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Cal Santa Fe Springs, Hills-McCanna Co. 213-864-3758
Colo Denver, Collison Berger, Inc. 303-733-3791
Ga Atlanta, Hills-McCanna Co. 404-448-7173
Ill Westmont, Hills-McCanna Co. 312-325-5640
Mich Madison Heights, Bradbury-Kenrick Assoc. 313-564-5410
Mo Maryland Hts, Corva Corp. 314-878-4100
Ohio Cleveland, Hills-McCanna Co. 216-433-4520
Okla Tulsa, C.J. Co. 918-627-8162
Pa Fort Washington, Hills McCanna Co. 215-638-8950
Tex Houston, Hills-McCanna Co. 713-688-5747

HIMMELSTEIN & CO., S., Dept. EM, 2500 Estes Ave., Elk Grove Village, Ill. 60007, Tel: 312-439-8181; Empl.: 40

Sales Manager: K.J. Olsen

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Cal Long Beach, Saber Enterprises 910-341-6412
Colo Littleton, Radco Electronics 303-794-4279
DC D.C., Powell-Pendergraph 301-656-4535
Iowa Bettendorf, White Equip. Co. 319-355-5623
Mass Needham, Addelco Corp. 617-444-4754
Mich Livonia, S. Himmelstein & Co. 313-427-2066
Minn Wayzata, W. A. Sternad Assocs. 612-473-4700
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Tex Houston, Scientific Sls. Co. 713-666-5318
Tex Richardson, Scientific Sls. Co. 214-231-6541
Va Richmond, Powell-Pendergraph 804-264-2341
Wash Bellevue, Topp Engrg. Sls. Corp. 206-747-5401

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Sales Manager: C. Koh

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Sales Manager: Bill Boyer

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Ariz Scottsdale, PLS. Assocs. 602-957-9110
Cal Pasadena, RDX Corp. 213-681-3452
Cal San Diego, RDX Corp. 714-278-6863
Cal Sunnyvale, RDX Corp. 408-734-4500
Colo Denver, PLS Assocs. 303-773-1218
Haw Honolulu, Aloha Assocs. 941-1574
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NJ East Orange, Friedman Assocs. 201-673-2500
NM Aubuquerque, PLS Assocs. 505-255-2330
NY Cazenovia, Peter De Cew Agency 315-HT 3-3261
Ore Portland, Data Power Sls. 206-453-8200
Pa Downingtown, Kenn Ebert-Hipotronics, Inc. 215-269-5898
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Sales Manager: W.S. Bonebright

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Cal Canoga Park, TKO Elctrns., Inc. 213-883-3822
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Pa Pittsburgh, F. Kostman 412-823-3430

HOAGLAND INSTR CO, DIV TECH DEV, Dept. EM, Box 550, Dayton, N.J. 08810, Tel: 201-329-4681, TWX: 710-480-5674; Empl.: 70

Sales Manager: Milt Kaufman

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Sales Manager: H. L. Behm

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Va Virginia Beach, R. W. Mitscher Co. 804-481-7200

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Cal Walnut Creek, W.A. Borden Co. 415-937-5196
Colo Denver, Gaer Sls. 303-777-3740
Conn West Hartford, L. Bell 203-236-0395
Fla Pompano Beach, Shannon Assoc. 305-943-5848
Fla St. Petersburg, Shannon Assocs. 813-822-3146
Ga Atlanta, Holman-Lobsinger Co. 404-256-9120
Haw Honolulu, Specialty Prods. Co. 808-531-0596
Ill Maywood, KGA Engrg. Co. 312-343-6500
Ind Indianapolis, Lester Sls. Co. 317-783-9251
Kans Overland Pk, Arehart-Barnds Sls 913-649-9270
Ky Louisville, Lester Sls. Co. 502-634-8930
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SC West Columbia, R.W. Chapman & Co. 803-796-9796
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WVa Dunbar, Myles F Smith & Assoc 304-768-9910
Wiso Milwaukee, KGA Engrg. Co. 414-355-5500

HOLEX CORP, Dept. EM, 2544 W. Main St., Norristown, Pa. 19401, Tel: 215-539-0828; Empl.: 9

Sales Manager: H.L. Goldberg

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Cal Santa Monica, Kalt 213-870-613
Colo Englewood, National Camera 303-789-189
Ill Chicago, Fisher Scientific Co. 312-378-777
Ill Chicago, McMillan 312-488-410
Iowa Cedar Falls, Porters 319-268-010
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Pa Philadelphia, Herback & Rademan 215-426-170

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Cal San Jose 408-287-888
Ga Chamblee 404-451-032
Ill West Chicago 312-231-309
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Sales Manager: R. Abercrombie

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Cal Carson, Hollis Engrg. 213-518-058
Cal Glendale, Tooltronics, Inc. 213-240-400
Cal Santa Clara, Tooltronics, Inc. 408-241-400
Colo Denver, West/Mark Assoc. 303-922-824
Conn Southport, JCL Assocs 203-255-245
Fla Kissimmee, E.L. Moyson 305-846-634
Fla Kissimmee, Hollis Engrg. 305-846-634
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Ga Norcross, Hollis Engrg. 404-448-704
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Ill Schaumburg, Hollis Engrg. 312-882-802
Ind Indianapolis, Emmtronics Supp & Engrg Co. 317-356-093
Md Baltimore, D.K. Jones & Assocs. 301-752-057
Mich Detroit, E.E.I. of Mich 313-521-150
Minn Minneapolis, M. Westlund Assoc. 612-866-500
Mo Grand View, Production Automation Corp. 816-763-415
NH Manchester, E.P.E. Corp. 603-669-918
NJ Montclair, Hollis Engrg. 201-783-515
NJ Princeton, Krone & Rubin Assoc. 609-452-150
NY Lake Grove, Krone & Rubin Assoc. 609-452-150
NY Rochester, Krone & Rubin Assoc. 716-266-463
Ohio Dayton, A.M.E.S. Corp. 513-435-973
Pa Norristown, Glove Engrg. Co. 215-275-987
Tex Dallas, Tooltronics, Inc. 214-661-070
Tex Grapevine, Hollis Engrg. 817-481-551
Wash Bellevue, Rowe/Northwest 206-455-268

HOLLY PRODUCTIONS, Dept. EM, 1442 Tzena Wa Encinitas, Cal. 92024, Tel: 714-436-5350; Empl.: 7

Sales Manager: R. Schmidt

Local Sales Offices & Reps.

Cal San Diego, Related Products 714-298-491

IOLUB INDUSTRIES, Dept. EM, 413 DeKalb Ave., Sycamore, Ill. 60178, Tel: 815-895-6501, Telex: 25-7359; Empl.: 60

Sales Manager: S. M. DeBoer

IONEYWELL INC:, Commerical Div., Dept. EM, Honeywell Plaza, Minneapolis, Minn. 55408, Tel: 612-887-4023

Sales Manager: J. A. Marshall, Dir. Mktg

Local Sales Offices & Reps.

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Ariz	Phoenix	602-249-7196
Ark	Little Rock	501-372-0166
Cal	Los Angeles	213-726-6000
Cal	Orange	714-558-7400
Cal	Sacramento	916-485-2221
Cal	San Diego	714-292-5311
Colo	Englewood	303-771-2340
Conn	Hartford	203-549-3800
Del	Wilmington	302-762-3100
Fla	Orlando	305-894-3131
Ga	Atlanta	404-321-2000
Haw	Honolulu	808-537-5514
Ill	Chicago	312-478-9266
Ill	Lansing	312-568-4200
Ind	Indianapolis	317-243-0831
Iowa	Des Moines	515-288-3601
Ky	Louisville	502-459-5970
La	New Orleans	504-833-7241
Me	Portland	207-775-3501
Md	Lutherville	301-828-0900
Mass	Boston	617-782-3100
Mich	Farmington Hill	313-478-1600
Mich	Saginaw	517-792-8707
Minn	Minneapolis	612-830-3500
Miss	Jackson	601-956-6311
Mo	Kansas City	816-358-4200
Mo	St. Louis	314-878-2400
Mont	Missoula	406-728-7442
Neb	Omaha	402-393-8300
NJ	Westfield	201-233-9200
NM	Albuquerque	505-345-1656
NY	Albany	518-456-7000
NY	Liverpool	315-451-4000
NY	Long Island City	212-729-4690
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Tex	Houston	713-785-3200
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Va	McLean	703-827-3000
Wash	Seattle	206-233-2000
WVa	Charleston	304-774-5341
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Wyo	Casper	307-265-9333

IONEYWELL INFORMATION SYS INC, Dept. EM, 200 Smith St M5440, Waltham, Mass. 02154, Tel: 617-890-8400

Sales Manager: R.R. Douglas

IONEYWELL, Process Control Div./Ft. Wash., Dept. EM, 1100 Virginia Dr., Ft. Washington, Pa. 19034, Tel: 215-643-1300, TWX: 510-661-0328; Empl.: 2000

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Ala	Birmingham	205-323-2431
Alas	Anchorage	907-344-0522
Ariz	Phoenix	602-249-7178
Ark	Little Rock	501-372-0166
Cal	Los Angeles	213-726-6000
Cal	San Francisco	415-957-2500
Colo	Englewood	303-771-2340
Conn	Hartford	203-549-3800
Fla	Orlando	305-894-3131
Ga	Atlanta	404-321-2000
Ill	Chicago	312-478-9266
Ill	Lansing	312-474-9300
Ind	Indianapolis	317-243-0831
Iowa	Davenport	319-359-3441
Kans	Wichita	316-522-3431
Ky	Louisville	502-459-5970
La	Baton Rouge	504-924-4236
Me	Portland	207-775-3501
Md	Lutherville	301-828-0900
Mass	Boston	617-782-3100
Mich	Farmington Hills	313-478-1600
Mich	Grand Rapids	616-451-0621
Minn	Minneapolis	612-830-3500
Miss	Jackson	601-956-6311
Mo	St. Louis	314-878-2400
Mont	Billings	406-252-5646
Neb	Omaha	402-393-8300
NJ	Westfield	201-233-9200
NM	Albuquerque	505-345-1656
NY	Long Island City	212-392-4300
NY	Syracuse	315-451-4000
NC	Charlotte	704-364-4770
ND	Fargo	701-235-4221
Ohio	Cleveland	216-881-0300
Okla	Oklahoma City	405-848-2811
Ore	Portland	503-235-8411
Pa	Philadelphia	215-226-2400
SC	Columbia	803-779-3240
Tenn	Memphis	901-345-6222
Tex	Houston	713-785-3200
Utah	Salt Lake City	801-487-0681
Va	Richmond	804-285-8211
Wash	Seattle	206-232-2000
WVa	Charleston	304-744-5341
Wisc	Milwaukee	414-771-6300

HONEYWELL MICRO SWITCH DIV., See Micro Switch, Div. Honeywell

HONEYWELL, INC., Test Instrs. Div., Dept. EM, 4800 E. Dry Creek Rd., Box 5227, Denver, Colo. 80217, Tel: 303-771-4700; Empl.: 850 ..... p. 2756,2843

Local Sales Offices & Reps.

Cal	Los Angeles	213-726-6000
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Colo	Denver	303-771-2340
Fla	Orlando	305-894-3131
Ga	Atlanta	404-321-2524
Haw	Honolulu	808-845-2991
Ill	Lansing	312-474-9300
Ill	Skokie	312-674-9770
Md	Lutherville	301-828-0900
Mass	Bedford	617-275-2630
Mich	Farmington Hills	313-478-1600
Minn	Minneapolis	612-830-3500
Mo	St. Louis	314-878-2400
NJ	Westfield	201-233-9200
NM	Albuquerque	505-345-1656
NY	Albany	518-456-7000
NC	Raleigh	919-787-0170
Ohio	Cleveland	216-361-7011
Ohio	Dayton	513-461-4480
Pa	Bala Cynwyd	215-835-2500
Pa	Pittsburgh	412-928-4200
Tex	Dallas	214-387-5322
Tex	Houston	713-785-3200
Va	Mc Lean	703-790-3000
Wash	Mercer Island	206-233-2000

HOPE ELCTRNS., Dept. EM, 20 Newark Pompton Tpke., Wayne, N.J. 07470, Tel: 201-777-3522; Empl.: 20 ..... p. 1006,2329,2872,2873,3272,3273

Local Distributors

NJ	Wayne, Parts Masters	201-777-7706
NY	New York, Can Elctrn. Distributing Corp.	212-893-8300

HOPKINS ENGRG., Dept. EM, 12900 Foothill Blvd., San Fernando, Cal. 91342, Tel: 213-361-8691, TWX: 910-496-1531; Empl.: 100 ..... p. 2632

Local Sales Offices & Reps.

Cal	San Carlos, Kottmeier Assocs., Inc.	415-592-8333
Cal	San Fernando, Hopkins Direct Sls.	213-361-8691
Colo	Golden, J. F. Hurlbut Co.	303-279-7796
Conn	Bristol, New England Elctrn. Sls.	203-583-3650
Fla	Pompano Beach, Saber Assocs.	305-943-3076
Ill	Chicago, K. W. Meyers Co.	312-774-6440
Ind	Indianapolis, K. W. Meyers Co.	317-243-6681
Iowa	Cedar Rapids, G. Fixman Engrg.	319-362-6302
Kans	Overland Park, G. Fixman Engrg. Co.	913-648-7748
Md	Silver Springs, Marktron, Inc.	301-460-6100
Md	Timonium, Marktron, Inc.	301-252-7111
Mass	Canton, New England Elctrns. Sls.	617-828-4835
Mich	Jackson, Norwood Scroggs Co.	517-750-1170
Minn	Minneapolis, K. W. Meyers Co.	612-920-7080
Mo	St. Louis, Gordon Fixman Engineering Co.	314-725-5219
NJ	Cherry Hill, Benco Sls.	609-799-9282
NJ	Wayne, G.T Assocs.	201-694-6040
NY	Rochester, J. G. Welch Assocs.	716-244-1100
NY	Utica, J. G. Welch Assocs.	315-736-7821
NC	Raleigh, Saber Assocs.	800-327-1193
Ohio	Dayton, Berberich Assocs., Inc.	513-433-0342
Pa	Ardmore, Benco Sls.	215-649-3966
Tex	Dallas, Stevens Sls.	214-350-2476
Utah	Salt Lake City, J. F. Hurlbut Co.	801-299-4034
Wash	Seattle, Blum & Assoc.	206-285-2590

Local Distributors

Cal	Irvine, Acacia Sls	714-549-0954

HOPT CO., KARL, Dept. EM, 118 First Ave., Atlantic Highlands, N.J. 07716, Tel: 201-291-0633, Telex: 132496; Empl.: 400

Sales Manager: G.C. Ellis

HOSKINS MFG. CO., Dept. EM, 4445 Lawton Ave., Detroit, Mich. 48208, Tel: 313-895-2860, TWX: 810-221-1409; Empl.: 400

Local Sales Offices & Reps.

Cal	Los Angeles, Hoskins Mfg. Co.	213-685-5550
Conn	Madison, Hoskins Mfg. Co.	203-245-7171
Ill	Chicago, Hoskins Mfg. Co.	312-724-6880
Mo	Maryland Hts., Hoskins Mfg. Co.	314-966-2290
Ohio	Cleveland, Hoskins Mfg. Co.	216-371-9529
Tenn	Knoxville, Hoskins Mfg. Co	615-966-1235

HOTPACK CORP., Dept. EM, 5148 Cottman Ave., Phila., Pa. 19135, Tel: 215-333-1700, TWX: 710-670-1694; Empl.: 130

Local Sales Offices & Reps.

Cal	Reseda, B. Milner Assoc.	213-348-4296
Cal	San Jose, H. Waldeck Assoc.	408-274-9007
Colo	Boulder, Paul W. Adkins Jr.	303-494-7383
Fla	New Port Richey, Delta-Tech Assocs	813-848-0583
Ga	Atlanta, J. L. Morris Assoc.	404-233-5118
Ill	Chicago, A. Stanley Co.	312-674-3373
La	Metairie, Lassco, Inc.	504-892-7480
Mass	Cambridge, Rush Assoc.	617-661-1200
Minn	St. Paul, Mid-West Instrument Co	612-645-0471
NJ	Cherry Hill, F. J. Lucchesi	609-428-3537
NY	New York, Hotpack Corp.	212-247-5554
NY	N. Tonawanda, Harvey Instr Co.	716-694-9500
Ore	Portland, A. W. Shirley	503-234-0281
Pa	Pittsburgh, K. J. Lesker Co.	412-653-0800
Tex	Dallas, South Western Engr. & Equip.	214-827-2621

HOUSTON INSTRUMENT, Div. Bausch & Lomb, Dept. EM, 8500 Cameron Rd., Austin, Tex. 78753, Tel: 512-837-2820, TWX: 910-874-2022; Empl.: 10,000 p. 2844

Sales Manager: T. Hall

Local Sales Offices & Reps.

Ala	Huntsville, J.L. Highsmith & Co.	205-881-3294
Ariz	Scottsdale, Measurement Consits.	602-994-9519
Cal	Los Altos, Casey-Johnston, Inc.	415-941-6892
Cal	Los Angeles, Basic Sys. Corp.	213-938-2833
Colo	Englewood, Davis Assocs.	303-761-9228
Colo	Littleton, Aztec Entprs.	303-795-0250
Fla	Orlando, J.L. Highsmith & Co.	305-293-5202
Ill	Downers Grove, Data Dev.	312-887-8480
Kans	Overland Park, Carter Elctrns. Inc.	913-649-6996
Mass	Framingham, J.M. Lancaster Co.	617-873-8893
Mich	Detroit, Data-Tron	313-354-6421
Mich	Southfield, EQS Sys	313-569-4497
Minn	Chanhassen, Professional Mktg. Svcs.	612-474-5939
Mo	Grandview, Digital Systems Sls.	816-765-3337
Mo	St. Louis, Carter Elctrns. Inc.	314-569-1406
NJ	Cherry Hill, Sci-Rep	609-482-6059
NJ	Englewood, Scientific Dev.-East	201-871-3916
NM	Albuquerque, Data Handling	505-268-4364
NM	Albuquerque, Aztec Entprs.	505-255-2440
NY	Fayetteville, Doolittle Elctrns.	315-637-3222
NC	Charlotte, J.L. Highsmith & Co.	704-333-7743
Ohio	Chesterland, EQS Sys	216-729-2222
Ohio	Wickliffe, Data-Tron	216-585-8421
Okla	Tulsa, Comspec, Inc.	918-936-3631
Pa	King of Prussia, S & S Assocs.	215-265-3450
Pa	Monroeville, Data-Tron	412-243-8421
Tex	Houston, Comspec, Inc.	713-461-4487
Tex	Richardson, Comspec, Inc.	214-234-4137
Va	Fairfax, Nine Assocs.	703-273-1803
Va	Falls Church, Sci-Rep	703-573-8787
Va	Richmond, J.L. Highsmith & Co.	703-272-5888
Wash	Bellevue, Marra & Assoc.	206-641-3535

HOWARD INDUSTRIES, Div. of MSL, Dept. EM, Box 287, Milford, Ill. 60953, Tel: 815-889-4105, TWX: 910-642-2950; Empl.: 500

Sales Manager: A. Grau; *Distributor Manager:* A. Mancuso

Local Sales Offices & Reps.

Ala Huntsville, Electro-Mech Sls. Engrg. 205-883-9624
Ariz Phoenix, Thorson Co. 602-956-5300
Ark Brinkley, Howard Inds 501-734-3300
Cal Los Angeles, Techrep Assocs. 213-641-5830
Cal Santa Clara, Richards & Assocs. 408-246-5860
Colo Denver, Thorson Co. 303-759-0809
Conn Torrington, Motoreps of New England 203-482-3193
Fla Tampa, Tech-Rep Assoc. 813-595-2834
Ga Atlanta, Electro-Mech Sls. Engrg. 404-449-6337
Ill Chicago, K.M.G. Sls. Co. 414-639-9005
Mass Needham Heights, Motoreps of New England 617-449-3252
Mich Southfield, Fred H. Gehrke & Assoc. 313-559-5363
Minn St. Paul, Arkco Sls 612-777-7455
Mo St. Ann, Lawton Sls. Co. 314-725-1330
Mo St. Louis, Howard Inds 314-434-1616
NJ Red Bank, Motoreps of New York 201-741-3356
NM Albuquerque, Thorson Co. 505-265-5655
NC Raleigh, Electro-Mech Sls. Engrg. 919-782-7586
Ohio Dayton, Electrical Sys. Co. 513-434-9822
Ohio Toledo, Electrical Sys 419-475-9390
Ore Portland, Thorson Co. 503-620-5800
Tenn Nashville, Electro-Mech Sls. Engrg. 615-256-2516
Tex Dallas, P.J. Scanlon 214-231-4661
Utah Salt Lake City, Thorson Co. 801-973-7969
Wash Bellevue, Thorson Co. 206-455-9180
Wisc Racine, K.M.G. Sls. Co. 414-639-9005

HOWELL INST. INC., Dept. EM, 3479 W. Vickery Blvd., Ft. Worth, Tex. 76107, Tel: 817-336-7411, Telex: 75-8233; FSC No.: 98869; Empl.: 150

Sales Manager: E. H. Arbuckle

Local Sales Offices & Reps.

Cal Fullerton 714-870-6380
Mo St. Charles 314-946-6911
NY Valley Stream 516-561-9220
Va Norfolk 804-587-4966

HOYT ELECTRICAL INSTR. WORKS, Dept. EM, 19 Linden St., Penacook, N.H. 03301, Tel: 603-753-6321, TWX: 710-228-6942; Empl.: 200 p. 2757

Sales Manager: G. R. Scott

Local Sales Offices & Reps.

Ala Huntsville, W. A. Brown Comps 205-539-4411
Ariz Phoenix, Williams-Assocs 602-947-4297
Cal Hollywood, Duncan Engrg. Sls. Co. 213-462-5880
Colo Denver, Williams-Assocs 303-373-4730
Fla Margate, W. A. Brown Comps. 305-753-1650
Fla Orlando, W. A. Brown Comps 305-851-5747
Ga Chamblee, W. A. Brown Comps 404-455-0405
Kans Shawnee Mission, K & M Sls 913-262-1444
Md New Carrollton, W. A. Brown Equip-Comp 301-577-6105
Mich Farmington, Davis & Martensen Co. 313-474-8300
Minn St. Paul, Kenco Co 612-645-7717
Mo St. Louis, K & M Sls 314-423-2420
NH Penacook, Hoyt Sls 603-753-6321
NJ Berkeley Hgts, NBS Assocs 201-464-8500
NM Albuquerque, Williams-Assocs 505-255-1638
NY Syracuse, Labtronics 315-454-9314
NC Charlotte, K-I Assocs. 704-523-0324
Ohio Cleveland, Val-Skol Sls. 216-526-2156
Pa Warminster, Multi-Meas 215-675-3082
Tenn Knoxville, W. A. Brown Comps 615-637-3523
Tex Houston, Lear Assocs 713-686-1838
Tex Richardson, Lear Assocs 214-231-5388
Va Alexandria, W. A. Brown Equip-Comp 713-836-1800
Wash Bellevue, Elden Bowden Co. 206-885-2615

HRB-SINGER, INC., Dept. EM, Science Park, Box 60, State College, Pa. 16801, Tel: 814-238-4311, TWX: 510-691-2610; Empl.: 575

Local Sales Offices & Reps.

Cal Woodland Hills, G. Osborne 213-888-9916
DC Wash, K.E. O'Neil 202-457-1561
NY Rome, S. A. Di Maggio 315-337-0600
Ohio Dayton, H.L. Schenck 513-252-6484

HUGHES AIRCRAFT CO, Aerospace Grps., Dept. EM, Centinela Ave & Teale St, Culver City, Cal. 90230

HUGHES AIRCRAFT CO., CONNECTING DEVICES DIV., Dept. EM, 17150 Von Karman Ave., Irvine, Cal. 92714, Tel: 714-549-5701, TWX: 910-595-2523; FSC No.: 53669; Empl.: 436 p. 1774

Local Sales Offices & Reps.

Ala Meridianville, L & D, Inc. 205-828-3522
Ariz Tucson, J.C. Goodsell 602-749-5026
Cal Newport Bch., W. E. S. T., Inc. 714-540-9040
Cal Sunnyvale, Quad Rep 408-733-7300
Fla Ft. Lauderdale, Bolton Assocs. 305-491-5161
Fla St. Petersburg, Bolton Assocs. 813-864-2294
Ill Park Ridge, Probe Elctrns 312-696-2828
Iowa Davenport, Ensco-Rep 319-386-6600
Kans Overland Pk, Ensco-Rep 913-381-7557
Md Towson, Kraft Elctrns. Sls. 301-828-5838
Mass Brookline, L-K Harman, Inc. 617-232-6687
Mass Haverhill, L-K Harman, Inc. 617-373-1313
Mass Lee, L-K Harman, Inc. 413-243-1158
Mich Warren, Luebbe Sls 313-574-2230
Minn Mpls., B. Deming & Assocs. 612-888-5000
Mo St. Louis, Ensco-Rep. 314-567-3935
NJ Pompton Plains, T.A. Adamo Assoc. 201-835-5344
NC Greensboro, L & D Inc. 919-292-3201
Ohio Cincinnati, Luebbe Sls. 513-871-4211
Ohio Cleveland, Luebbe Sls. 216-333-0425
Ohio Dayton, Luebbe Sls. 513 294-0426
SC Greenville, L & D Inc. 919-292-3201
Tex Irving, Space Elctrns. 214-251-3636
Va Richmond, L & D Inc. 804-359-0125
Wash Edmonds, Cunningham Sls 206-743-6300
Exp: Cal., Los Angeles, Hughes Int'l 213-534-2121

HUGHES AIRCRAFT CO., Electron Dynamics Div., Dept. EM, 3100 W. Lomita Blvd., Torrance, Cal. 90509, Tel: 213-534-2121, TWX: 910-347-6238; Empl.: 1200

Local Sales Offices & Reps.

Cal Anaheim, Blair Assocs. 714-635-1350
Cal San Jose, MCH Assocs. 408-246-7330
Fla Orlando, E. G. Holmes & Assocs. 305-894-8901
Ga Chamblee, E. G. Holmes & Assocs. 404-451-6161
Ill Chicago, Scientific Sls. Corp. 312-775-7594
Ind Indianapolis, Scientific Sls. Corp. 317-253-4606
Mass Chelmsford, Independent Mktg. Reps. 617-256-8251
Minn Bloomington, Scientific Sls. Corp. 612-881-3300
NH Nashua, Independent Mktg. Reps. 603-889-8285
NM Albuquerque, Fry-Gates Co. 505-298-1875
NY Fayetteville, R.D. Sherman 315-637-9861
NY Rochester, R.D. Sherman Inc. 716-647-3940
NY Tuckahoe, Asco Elctrns. 914-779-8110
Pa Lafayette Hill, M. Lader Co. 215-825-3177
Utah Salt Lake City, Grifco
Va Virginia Beach, E. G. Holmes & Assocs. 804-481-6556
Va Woodbridge, M. Lader Co. 202-296-2497
Wash Seattle, Datacom Assocs. 206-285-2525

HUGHES AIRCRAFT CO., Image Devices Ind'l. Prods. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008, Tel: 714-438-9191, TWX. 910-322-1393; Empl.: 700

HUGHES AIRCRAFT CO., Ind'l. Prods. Div. FACT Sys., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008, Tel: 714-438-9191, TWX: 910-322-1393 p. 2758

Local Sales Offices & Reps.

NH Amherst, Hughes Aircraft Co. 603-883-9594
Tex Dallas, Bradenco 214-243-7261

HUGHES AIRCRAFT CO., Ind'l. Prods. Div., Prod. Equip. Div., Dept. EM, 6155 El Camino Real, Carlsbad, Cal. 92008, Tel: 714-438-9191, TWX: 910-322-1393; Empl.: 500

Sales Manager: P. W. Bullock; *Distributor Manager:* J. C. Brown

Local Sales Offices & Reps.

Ariz Scottsdale, Allen Assocs. 602-994-1305
Cal Cambell, C.D. Buerki Co. 408-374-8040
Cal Glendale, Tooltronics Inc. 213-246-4000
Cal Los Angeles, International Sls. 213-534-2121
Fla Sarasota, William J. Irvine Co 813-955-9656
Ga Lilburn, MacGregor Assocs. 404-921-1300
Ill Chicago, Diethert Angel 312-593-7600
Kans Kansas City, Ransom Assocs. 913-299-2789
Md Baltimore, A.L. Myers Co. 301-426-5583
Mass Acton, E. E. Specialists 617-259-9200
NJ Saddle Brook, L & M Assocs. 201-843-8700
NY Brentwood, L & M Assocs. 516-231-8363
NY New York, L & M Assocs. 212-243-6155
NY Penfield, Upstate Tech. Equip. 716-381-0930
NY Solvay, Upstate Tech. Equip. 315-487-6161
NC Charlotte, MacGregor Assocs. 704-375-1562
Ohio Dayton, R. G. Sidnell & Co. 513-433-7761
Ohio Dayton, R.R.M. Assocs. 513-433-7761
Pa Andalusia, L & M Assocs. 215-639-3100
Tex Dallas, Bradenco 214-358-3278
Utah Salt Lake City, Specialty Sls. Co. 801-262-2979
Wash Seattle, Penryn Sls. & Engrg. 206-783-4339

HUGHES AIRCRAFT CO., Microelectronic Prods Div. Dept. EM, 500 Superior Ave. Dept. E8, Newport Beach Cal. 92663, Tel: 714-759-2411, TWX: 910-596-1374 p. 2331

Sales Manager: W.S. Eckess

Local Sales Offices & Reps.

Ala Huntsville, 20th Century Mktg 205-772-9237
Ariz Phoenix, Toward Engrg. Assocs. 602-955-3193
Cal Mountain View, Caltron Comps. 415-964-3244
Cal San Diego, Wes-K/San Diego 714-271-5048
Cal Van Nuys, Wes-K Assocs. 213-989-3070
Colo Englewood, A-G Electrns. 303-771-8088
Fla Maitland, Delmac Sls. 305-423-1425
Fla Pompano Beach, Delmac Sls 305-781-6670
Ill Des Plaines, Coombs Assocs. 312-298-4830
Kans Prairie Village, Engineering Svcs. Co. 913-649-4000
Md Glen Burnie, Falon Lott & Co 301-744-4611
Mich Southfield, Luebbe Sls. Co. 313-357-0355
Minn St. Paul, Northport Engr. 612-698-3841
Miss Corinth, 20th Century Mktg 601-287-2493
Mo St. Louis, Engineering Svcs. Co. 314-997-1515
NJ Parsippany, Robert Diamond 201-575-7344
NY Bayside, Robert Diamond 212-423-7330
NY Dewitt, Tri Tech Elctrns. 315-446-2881
NY East Rochester, Tri Tech Elctrns. 716-223-5720
NY Great Neck, Cooper-Simon & Co. 516-487-1142
NY Larchmont, Tri Tech Elctrns. 914-834-4423
NC Greensboro, L&D Inc 919-292-3201
Ohio Cincinnati, Luebbe Sls 513-871-4211
Ohio Cleveland, Luebbe Sls. Co. 216-333-0425
Ohio Dayton, Leubbe Sls. Co. 513-294-0426
Pa Balacynwyd, Electro-Comp Sls. 215-667-9360
SC Greenville, L&D Inc 803-268-5201
Tenn Greenville, 20th Century Mktg 615-638-4021
Tex Dallas, Southern State Mktg. 214-387-2489
Tex Houston, Southern State Mktg. 713-665-0991
Wash Vancouver, Ray Over Sls. 206-695-6179
Wisc Milwaukee, Coombs Assocs. 414-671-1945
Exp: Cal., Newport Beach, Hughes Aircraft Co. 714-548-0671

HUGHEY & PHILLIPS, INC., Dept. EM, 3050 N California St., Burbank, Cal. 91505, Tel: 213-849-1104 TWX: 910-498-2252; FSC No.: 94295; Empl.: 47

Sales Manager: R. Bessee, C. E. Stephens; *Distributo Manager:* C. E. Stephens

HULL CORP., Dept. EM, Davisville Rd., Hatboro, Pa 19040, Tel: 215-672-7800, TWX: 510-665-6822; Empl. 275

Local Sales Offices & Reps.

Cal Anaheim, Hull Corp 714-535-0302
Colo Denver, Plateau Machinery 303-534-4072
Kans Mission, Air Hydraulics 913-262-8885
Mich Lambertville, Hull Corp 313-856-2580
Mo St. Louis, Air Hydraulics 314-487-9100
NC Raleigh, Hull Corp 919-851-0817
Pa Hatfield, Molding Methods 215-822-1513
RI Warwick 401-739-2050
Tex Richardson, Hull Corp. 214-234-3371
Exp: Pa. Hatboro 215-672-7800

HUMISEAL DIV., Columbia Chase Corp., Dept. EM 26-60 Bklyn-Queens Expwy., Woodside, N.Y. 11377 Tel: 212-932-0800, Telex: 22-4657; Empl.: 150 p. 1292,1293

Local Sales Offices & Reps.

Cal Alhambra, M.W. Riedel Co. 213-283-7694
Cal Mountain View, Weseloh & Assocs. 415-961-0565
Conn Norwalk, Betronic Assocs. 203-853-7630
Fla Maitland, Barrett Assocs. 305-678-0172
Ill Northbrook, R. T. Howlett & Assoc. 312-498-5444
Kans Kansas City, L.E. Bruns Co. 913-287-5242
Md Cockeysville, Advanced Tech. Sls. 301-666-9027
Mass Waltham, Betronic Assocs. 617-894-8400
Mich Southfield, J.M. Norton Assocs. 313-642-2526
Minn Bloomington, Thomas Mktg. 612-888-5551
NJ Livingston, H. Thaw Sls. 201-992-2711
NY Rochester, Gislason Sls. 716-454-4741
NC Charlotte, Reynolds Cowardin Assocs 704-523-0324
Ohio Cleveland, Marlow Assocs. 216-991-6500
Pa Pittsburgh, Marlow Assocs 412-831-6113
Tex Dallas, R. D. Spooner 214-357-6636
Va Richmond, Reynolds Cowardin Assocs 804-266-3457
Wash Kirkland, R.R. Chase & Assoc. 206-454-2514

Local Distributors
Cal Alhambra, M. W. Riedel & Co. .. 213-283-7694
Cal Mountain View, Target Elctrns. .. 415-961-1170
Tex Dallas, R. D. Spooner Co. 214-357-6636
Wash Kirkland, R.R. Chase & Assocs.. 206-454-2514
For: Can, Scarborough, Ont, Paisley Products of Canada Ltd..... 416-755-2216
For: Japan, Tokyo, Bokusui Brown Company, Ltd 572-8851, J22491
For: Rungis Principal, Spetelec 686-56-65, 25801

JMPHREY, INC., Dept. EM, 9212 Balboa Ave., San Diego, Calif. 92123, Tel: 714-565-6631, TWX: 910-335-2001; Empl.: 110

Local Sales Offices & Reps.
Cal El Monte, TransDynamics..... 213-571-2712
Cal Palo Alto, Harris Assocs. 415-328-3370
Cal San Diego, TransDynamics 714-298-8215
Fla Orlando, Gra-Mar, Inc. 305-894-3351
Kans Wichita, Humphrey, Inc. 316-685-7563
Mass Natick, Wayland Engrg. Sls. 617-655-6080
Mich Farmington, Carter, McCormick & Peirce 313-477-7700
NY Holbrook, Aviatech Int'l. 516-981-9300
NY Plainview, Eastern Metro Assocs. 516-931-1414
Ohio Cleveland, Carter, McCormick & Peirce 216-333-5650
Ohio Dayton, Carter, McCormick & Peirce 513-278-5873
Pa Philadelphia, Humphrey, Inc., Eastern Div. 215-632-6040
Pa Pittsburgh, Carter, McCormick & Peirce 412-824-3760
Tex Dallas, W.N. Rider Co. 214-357-2246
Tex El Paso, Nokomis Prods. 915-778-2801

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JNTER STANLEY ELEC., Dept. EM, 208 Russell St., Nashville, Tenn. 37213, Tel: 615-254-6532; FSC No.: 21675; Empl.: 10

Sales Manager: W. D. Stanley

JNTER TOOLS, See Marshall Inds.

JRST MFG. CORP., Dept. EM, Box 326, Princeton, Ind. 47670, Tel: 812-385-2564, TWX: 810-350-2341; Empl.: 140

Sales Manager: W.W. Taylor

Local Sales Offices & Reps.
Ariz Phoenix, Shefler-Kahn Co. 602-257-9015
Cal Los Angeles, Sierra Ind'l. Engrg. Co. 213-624-3123
Cal Menlo Park, Long & Assoc. 415-327-1300
Colo Englewood, Shefler-Kahn Co. 303-761-2590
Fla Orlando, Cartwright & Bean, Inc. 305-422-4531
Ga Atlanta, Cartwright & Bean, Inc. 404-255-5262
Ill Chicago, D. Dolin Co. 312-286-6200
Ind Indianapolis, Pacer Sls. & Engrg. Co. 317-849-1481
La New Orleans, Cartwright & Bean, Inc. 504-362-4649
Md Glen Arm, Hodgins Assoc. 301-592-7047
Mass Lexington, Hathaway Elctrns..... 617-861-7010
Mich Grand Rapids, R. Van Riper Sls. 616-452-0464
Minn Minneapolis, Banke Assoc..... 612-784-4270
Miss Jackson, Cartwright & Bean, Inc. 601-981-1368
Mo Ferguson, Kinrick Co..... 314-521-4877
NJ Little Falls, D. Carbone..... 201-256-9191
NM Albuquerque, Shefler-Kahn Co., Inc. 505-265-7077
NY Rochester, W.H. Zimmerman Co. 716-586-4450
NY Syracuse, W.H. Zimmerman Co. 315-474-4889
NC Charlotte, Cartwright & Bean, Inc. 704-333-5673
NC Raleigh, Cartwright & Bean, Inc. 919-781-6560
Ohio Chagrin Falls, Kilroy Sls. Co..... 216-247-8997
Tenn Knoxville, Cartwright & Bean, Inc. 615-693-7450
Tenn Memphis, Cartwright & Bean, Inc. 901-276-4442
Tex Dallas, John B. Guenther, Inc.... 214-691-8500
Utah Salt Lake City, Shefler-Kahn Co. 801-484-4222
Wash Gig Harbor, F.H. Haight Co. 206-297-3212
Wisc Oak Creek, D. Dolin 414-355-9100
Exp: New York, Westbury, Minthorne International 516-334-3303

HY-CAL ENGRG, Dept. EM, 12105 Los Nietos Rd., Santa Fe Springs, Cal 90670, Tel: 213-698-7785, Telex: 67-4494; FSC No.: 12199; Empl.: 95

Sales Manager: A.E. Bowman

HYCOMP INC., Dept. EM, Box 250, Maynard, Mass. 01754, Tel: 617-897-4578; Empl.: 30

Sales Manager: N.S. Palazzini

Local Sales Offices & Reps.
Ariz Phoenix, MR Engineering Sls. Co. 602-959-5150
Cal Mountain View, Thresum Assocs. 415-965-9180
Cal Pasadena, Mar-Land Entprs.. 213-681-9440
Ind Indianapolis, Scott Elctrns. 317-897-9976
Ky Louisville, Scott Elctrns. 502-583-3220
Md Ellicott City, J. Winkler Assoc.... 301-465-8630
Mass Waltham, Dynasel Assocs.
NJ Ridgefield, Micro-Plex 201-945-5250
NY Rochester, W.H. Zimmerman, Inc. 716-586-4450
NY Syracuse, W.H. Zimmerman, Inc. 315-474-4889
Ohio Cleveland, Scott Elctrns 810-421-8503

HYBRICON CORP., Dept. EM, 410 Crest Rd., Litteton, Mass. 01460, Tel: 617-861-6692; Empl.: 10

Sales Manager: D. F. Murphy

Local Sales Offices & Reps.
Ala Huntsville, Reynolds & Assocs .. 205-536-1941
Ariz Glendale, Nakoma..... 602-931-9103
Cal Anaheim, Tri-tek..... 714-533-1454
Fla Satellite Beach, Reynolds & Assocs 305-773-4700
Ga Atlanta, Reynolds & Assocs 404-252-5360
Ill Northbrook, Raines-Brin Assocs 312-498-0890
Md Garthersburg, The Wright Co. 301-840-1928
Mich Spring Lake, ImTech, Incorporated 616-842-6460
NH Nashua, Bell Controls..... 603-882-6984
NJ Parlin, JMR Sls Inc 201-727-5335
NY Fayetteville, Martin P. Andrews.. 315-637-5291
NC Winston-Salem, Reynolds & Assocs 919-725-6196
Ohio Cleveland, ImTech Inc 216-826-3400
Ohio Dayton, ImTech Inc 513-278-6507
Tex Dallas, Gray & Assocs 214-783-0329

HYBRID ELECTRONICS INC., Dept. EM, 142 Adams St., Newton, Mass. 02158, Tel: 617-527-2711

Sales Manager: D. Kates

Local Sales Offices & Reps.
Fla Delray Beach, Sales & Research Labs 305-276-1077

Advertisement

HYBRID Electronics designs & manufactures thin film hybrid microcircuits for commercial, professional, and military applications. H.E. will manufacture custom hybrids in large or small prototype quantities at low cost.

HYBRID SYSTEMS CORP., Dept. EM, Crosby Dr., Bedford, Mass. 01730, Tel: 617-275-1570, TWX: 710-326-7584; Empl.: 165

Sales Manager: C. A. Boucher

Local Sales Offices & Reps.
Ariz Scottsdale, DAR-C Inc..... 602-948-2240
Cal Costa Mesa, Relcom..... 714-549-3674
Cal Los Altos, Cain-White & Co. 415-948-6533
Cal Marina del Rey, Relcom..... 213-822-1187
Fla Maitland, Delmac Sls, Inc. 305-423-7562
Ill Wheaton, Len Felder Assoc. 312-665-9070
Md Baltimore, Burgin Kreh Assoc..... 301-788-5200
Mass Holbrook, McLellan Assocs..... 617-767-4771
Minn Minneapolis, Northstar Components 612-553-1888
NJ Haddonfield, Thomas Assocs. 609-854-3011
NY Albany, H.C. Johnson Agencies 518-456-6667
NY Buffalo, H.C. Johnson Agencies 716-632-7880
NY Fayetteville, H.C. Johnson Agencies 315-637-9383
NY Plainview, ERA Inc. 516-822-9890
NY Rochester, H.C. Johnson Agencies 716-482-3000
NC Raleigh, Burgin Kreh Assocs. 919-781-1100
Ohio Dayton, Berberich Assocs..... 513-433-0342
Okla Tulsa, Technical Mktg. 918-622-5984
Pa Glenshaw, H.C. Johnson Agencies 412-961-0414
Tex Dallas, Technical Mktg..... 214-387-3601
Tex Houston, Technical Mktg. 713-777-9228
Va Lynchburg, Burgin Kreh Assocs. 804-845-5600
Wash Tukwila, General Electronics 206-575-4030
Wisc Milwaukee, J.M. Sls. Co. 414-546-0040

HYKON MFG. CO., Dept. EM, 163 E. State St., Box 923, Alliance, Ohio 44601, Tel: 216-821-2320; Empl.: 8

HYPERTRONICS CORP., Dept. EM, 2352 Main St, Concord, Mass. 01742, Tel: 617-897-3236, Telex: 94-0334; FSC No.: 50541; Empl.: 16

Sales Manager: D. Downey

Local Sales Offices & Reps.
Cal N. Hollywood, Jewett Co..... 213-789-8103
Cal San Carlos, Winco Sls..... 415-365-6082
Conn Bethany, Representatives Corp. 203-393-0024
DC Wash, Tyler Griffin Co. EN1-4821
Fla Orlando, Gra-Mar, Inc. 305-894-3351
Ill No. Riverside, Joe Popp Sls. Co. 312-447-6124
Md Baltimore, Tyler Griffin Co..... EN9-4821
Mass Wellesley, Representatives Corp. 617-237-6476
Minn Minneapolis, Electronic Innovators 612-884-7471
NY Huntington, C.R. Mayer Co..... 516-921-7876
Ohio Medina, McShane, Inc. 216-725-4568
Pa Paoli, Tyler Griffin Co..... 215-647-1550
Tex Plano, Burns Technical Sls. 214-423-1231

HY-TEMP TRANSDUCERS, Dept. EM, Box 11522, Philadelphia, Pa. 19116, Tel: 215-947-1200

HYTRONICS CORP., Dept. EM, 6231 72nd Ave. N., Pinellas Park, Fla. 33565, Tel: 813-546-2421; FSC No.: 29525; Empl.: 70

Local Sales Offices & Reps.
Ariz Phoenix, Bob Anderson Co 602-266-2070
Cal Carlsbad, Paul Kaplan 714-729-7332
Cal San Jose, Silicon Valley Sls. 408-997-1493
Colo Englewood, Dynatech, Inc. 303-773-2830
Fla Seminole, Harvey Pipe 813-391-3057
Ill Chicago, Ed Joyner & Co. 312-792-1277
Mass Canton, New England Elctrn. Sls. Corp. 617-828-4835
Mich Grosse Pointe Park, Greiner Assocs. 313-499-0188
Minn Minneapolis, Scott Elctrns..... 612-929-2985
NY Syracuse, J.V. Costello 315-472-0322
NC Greensboro, Raycom, Inc. 919-852-0080
Ohio Dayton, F. L. Ohmer..... 513-434-1454
Pa Furlong, Avenir..... 215-348-8290
Tex Richardson, Vista Engrg. 214-235-4547

I-T-E ELECTRICAL COMPS. GRP., see Gould Inc., Electrical Comps. Div.

IBM INSTRUMENT SYSTEMS, Dept. EM, 1000 Westchester Ave., White Plains, N. Y. 10604, Tel: 914-696-6074 ..... p. 2759

Sales Manager: K. A. Foster

Local Sales Offices & Reps.
Cal Orange 714-835-4412
Cal San Jose..... 408-256-1815
Fla Miami..... 305-442-3520
Md Baltimore..... 301-332-2497
Mo Creve Coeur..... 314-576-5651
NY Poughkeepsie..... 914-485-7471
NY White Plains 914-696-4575
NC Charlotte..... 704-525-8120
NC Greensboro..... 919-273-0872
RI Providence 401-831-4800
Tex Austin..... 512-836-3190
Tex Dallas 214-588-8184

ICO/RALLY CORP., Dept. EM, Edward J. Bush, Palo Alto, Cal. 94303, Tel: 415-324-0970, Telex: 348-335; FSC No.: 51705; Empl.: 35

Distributor Manager: E.J. Bush

Local Sales Offices & Reps.
Cal Palo Alto 415-324-0970
Cal Walnut..... 714-594-1777
NJ Deptford 609-228-4600
Tex Dallas 214-243-8521

ICON DIVISION, U.S.M. Corp., Dept. EM, 156 Sixth St., Cambridge, Mass. 02142, Tel: 617-868-5400, TWX: 710-321-1883; Empl.: 100

Local Sales Offices & Reps.
Cal San Francisco, McFarland Assoc. 408-286-9333
Mass Bedford, AID Engrg Sls 617-663-2225
Mich Detroit, Xanthus 313-391-3235
Minn Minneapolis, Applied Sls. Engrg. 612-544-3308
NY Penfield, Barthel Enterprises 716-377-3018
Ohio Cincinnati, J. Murray Assoc..... 513-662-1616
Ohio Cleveland, Del Steffen Assoc..... 216-461-8333

IDEAL INDUSTRIES INC., Dept. EM, 4450 Becker Pl., Sycamore, Ill. 60178, Tel: 815-895-5181, TWX: 910-639-0613; Empl.: 650

Sales Manager: D. V. Jarvis; *Distributor Manager:* D. V. Jarvis

Local Sales Offices & Reps.
Ala Birmingham, Ideal Industries, Inc. 205-967-8465
Ala Mobile, Zeller & Constantine Inc. 205-479-7667
Ariz Phoenix, Maddox Sls. Co. 602-278-6820
Cal Los Angeles, Ideal Electrical Ind. Inc. 213-726-1213
Cal Pico Rivera, Maddox Sls. Co. 213-949-5433
Cal San Francisco, Maddox Sls. Co. 415-431-2953
Colo Denver, Ideal Inds..... 303-753-0673
Conn Avon, Electrical Agencies, Inc..... 203-673-9296
Conn West Haven, Electrical Agencies, Inc. 203-WE3-2985
Fla Miami, Ideal Inds..... 305-595-9638
Fla Tampa, Ideal Ind. Inc. 813-784-3382
Ga Atlanta, Ideal Industries Inc..... 404-351-4256
Haw Honolulu, H.H. Sawyer Co. 808-847-1411
Ill Chicago, Ideal Industries Inc..... 312-775-4343
Ind Indianapolis, Ideal Industries Inc. 317-632-1461
Iowa Cedar Rapids, F.C. Clatterbaugh Co. 319-364-5557
Iowa Des Moines, F.C. Clatterbaugh Co. 515-282-3213
Kans Kansas City, Walker-Loudermilk Co. 816-483-8200
La Metairie, Zeller & Constantine, Inc. 504-889-1995
Me S. Berwick, Electrical Agencies, Inc. 207-384-5321
Md Millersville, O. T. Hall & Son 301-987-5990
Mass Boston, Electrical Agencies Inc. 617-268-9300
Mich Southfield, Ideal Industries 313-559-4888
Minn Hamel, Elstad Sls. Co. 612-559-4000
Miss Jackson, Zeller & Constantine, Inc. 601-982-2745
Neb Lincoln, F.C. Clatterbaugh Co. .. 402-489-5912
Neb Omaha, F.C. Clatterbaugh Co. .. 402-333-1600
NJ Edison, Ideal Industries Inc. 201-225-1191
NM Albuquerque, Maddox Sls. Co. .. 505-298-2422
NY Canandaiqua, Ideal Industries Inc. 315-394-3411
NY Clifton Park, Ideal Industries Inc. 518-371-5129
NC Charlotte, Ideal Industries Inc. 704-364-3430
Ohio Cincinnati, Ideal Industries Inc..... 513-771-0343
Ohio Cleveland, Ideal Industries Inc. .. 216-831-1600
Okla Oklahoma City, Hamco Sls..... 405-946-6503
Okla Tulsa, Hamco Sls..... 918-627-2262
Ore Portland, Northwest Agencies Inc. 503-227-5004
Pa Philadelphia, Ideal Industries Inc. 609-665-6288
Pa Pittsburgh, Ideal Industries Inc. .. 412-561-8335
SC Columbia, Ideal Industries Inc..... 803-772-1629
Tenn Memphis, Ideal Industries Inc. 901-454-9889
Tenn Nashville, Ideal Industries Inc. 615-646-4575
Tex Dallas, Ideal Inds. 214-369-4850
Utah Salt Lake City, L. W. Williams Co. 801-487-7821
Va Richmond, Ideal Industries Inc. .. 804-746-0626
Wash Seattle, Northwest Agencies Inc.206-MA3-8882
Wisc Pewaukee, Ideal Industries Inc... 414-464-3230

IDEAL PRECISION METER CO., Dept. EM, 214 Franklin St., Brooklyn, N. Y. 11222, Tel: 212-383-6904; Empl.: 150

Local Sales Offices & Reps.
Ariz Phoenix, Thorson Co. 602-956-5300
Cal Santa Clara, Cummings & Assoc. 408-247-8656
Cal Van Nuys, Cummings & Assoc... 213-340-6035
Colo Denver, Cummings & Assoc..... 303-455-6860
Fla Hollywood, A P Assoc. 305-987-6720
Ill Chicago, Ellinger Sls..... 312-763-1570
Ind Angola, Waid & Assoc. 219-833-3522
Iowa Cedar Rapids, H. R. Brown Sls. Co. 319-366-0635
Mass Brookline, Techny Prods. Grp..... 617-731-0858
Mich Benton Harbor, Mc Nabb & Sasoc. 616-925-2166
Minn Minneapolis, R.G. Ragon 612-488-0201
NJ Randolph, M O S Assoc. 201-361-5773
NY Floral Park, M O S Assoc..... 516-487-3966
Ohio Cincinnati, F. E. Kahsar Sls..... 216-653-6808
Pa King of Prussia, Monteiro Assoc. 215-265-0634
Tex Dallas, Blackburn Assocs. 214-692-8885
Va Arlington, Gans, Fryling & Pugh 703-527-3262
Wash Seattle, Seatronics, Inc. 206-767-4330

IEC CORPORATION, Dept. EM, 3100 Longhorn Blvd., Austin, Tex 78759, Tel: 512-836-0547; Empl.: 23

Sales Manager: F. Smith

IEC ELECTRONICS CORP., Dept. EM, 105 Norton St., Newark, N.Y. 14513, Tel: 315-331-7742, TWX: 510-250-2515; Empl.: 460

Local Sales Offices & Reps.
Conn Milldale, Wood Sls..... 203-621-4887
Mass Needham Hgts, Wood Sls 617-444-1601
Mass Seekonk, Wood Sales Corp. 617-336-6320
NH Wilton, Wood Sls..... 603-654-2961
Vt North Bennington, Wood Sls 802-442-7890

IEE/SHADOW, INC., See ITT Shadow Inc.

IET LABS INC., Dept. EM, 761 Old Country Rd, Westbury, N.Y. 11590, Tel: 516-334-5959

ILC DATA DEVICE CORP., Dept. EM, Airport Int'l. Plaza, Bohemia, N.Y. 11716, Tel: 516-567-5600, TWX: 510-228-7324; FSC No.: 19645; Empl.: 340 p. 1644,1645

Sales Manager: J.P. Sheahan, Nat'l. Sls. Mgr.

Local Sales Offices & Reps.
Ala Huntsville, Rep Inc. 205-881-9270
Ariz Phoenix, ILC Data Device Corp. 602-948-3360
Cal No. Hollywood, IIC Data Device 213-982-6454
Cal Palo Alto, Coherent Mrktg. Assocs. 415-327-2217
Colo Denver, Trembly Assoc. 303-739-1195
Fla Casselberry, EIR, Inc. 305-830-9600
Ill Arlington Heights, Dytec/Central 312-394-3380
Md Wheaton, Data Sys. Mktg. 301-933-0900
Mass Burlington, Dynamic Sls. of N.E. 617-272-5676
Minn St. Paul, Dytec/North 612-645-5816
Mo Hazelwood, Dytec/South 314-731-5400
NM Albuquerque, Trembly Assocs. .. 505-266-8616
NY East Syracuse, Nycom, Inc..... 315-437-8343
NY Great Neck, Meas. Tech., Inc.... 212-895-7177
NY Great Neck, Meas. Tech., Inc.... 516-482-3500
Ohio Cincinnati, Luebbe Sls. Co. 513-871-4211
Ohio Cleveland, Luebbe Sls 216-333-0425
Pa King of Prussia, Rivco January Inc. 215-265-5211
Tex Richardson, Lear Assoc 214-231-5388
Wash Redmond, DESCO Northwest 206-883-6336

ILLINOIS CAPACITOR INC., Dept. EM, 6284 W. Oakton, Morton Grove, Ill. 60053, Tel: 312-967-6270, Telex: 72-4361; Empl.: 10 ..... p. 1151

Sales Manager: C. Kurland

Local Sales Offices & Reps.
Ala Huntsville, K & E Inc. 205-993-9720
Ariz Tempe, Jarko Assocs. 602-966-3020
Cal Orange, Sales & Mktg. Assocs. 714-997-5720
Cal San Francisco, Mission Mktg..... 408-732-9611
Cal Van Nuys, Myco Sls..... 213-988-2827
Colo Denver, Elcom 303-770-4400
Fla Maitland, Lawrence Assocs 305-647-1188
Ga Hartwell, K & E Assocs. 404-376-5438
Ill Morton Grove, T-Squared Assocs. 312-965-1515
Iowa Des Moines, Kathrinus-Kelly & Co. 515-532-3218
Kans Shawnee Mission, Kathrinus-Kelly & Co. 913-722-0000
Mass Brookline, Technology Prods. Grp. 617-731-0858
Mich Warren, Dem Elctrns. Sls. 313-755-6660
Minn Minneapolis, Grayden & Flemmer612-941-1120
Miss Corinth, K & E Assocs. 601-287-5369
NY Bronx, Peterson-Rudnick Assoc. 212-671-1923
NY E. Meadow, S. Shapiro Assocs. 516-483-4185
NY Rochester, Net Sls 716-467-4538
Ohio Cincinnati, G & H Sls 513-771-8231
Ore Beaverton, Barrett-Squibb & Assoc. 503-644-2550
Pa Narberth, J. Bresson Assocs. 215-664-6460
Pa Waterford, Bacon Elctrn Sls 814-796-2381
Tex Roanoke, J. Hughes Co. 817-430-1683
Tex Stafford, J. Hughes Co. 713-771-9353
Wash Redmond, Barrett-Squibb & Assocs. 206-885-6991
Wisc Oak Creek, Erdman Sls. Co..... 414-643-0506

Local Distributors
Cal Mountain View, Target Elctrns. .. 415-961-1170
Cal Van Nuys, Myco Sls..... 213-988-2288
Colo Englewood, Ind'l. Elctrns. Inc. 303-771-2636
Mass Wakefield, Semtex..... 617-245-9050
Mich Farmington, CMP Distrs..... 313-477-7700
Mich Livonia, Camelot Elctrns..... 313-427-866
Wisc Oak Creek, Badger Capacitor Sales 414-761-212

ILLUMINATION INDUSTRIES, Dept. EM, 825 Evelyn Ave., Sunnyvale, Cal. 94086, Tel: 408-738-274 TWX: 910-339-9214; Empl.: 80

Local Sales Offices & Reps.
Ariz Scottsdale, Elchem 602-948-496
Colo Denver, Camel Elect. 303-757-619
Fla Ft. Lauderdale, Semquip 305-772-300
Mass Alton, Hohenadel Assoc. 617-245-060
NJ Nutley, D/R Assocs. 201-667-590
Tex Dallas, R. Tindel & Assocs. 214-238-047
Wash Bellevue, Assembequip..... 206-883-664

IMAGE GRAPHICS, INC., Dept. EM, 1525 Kings Hwy Fairfield, Conn. 06430, Tel: 203-333-7918; Empl.: 25

Sales Manager: J.P. Whitley

IMC MAGNETICS CORP., Arizona Div., Dept. EI 1900 East Fifth St., Tempe, Ariz. 85281, T 602-968-4441

Sales Manager: Dick Hoffman

I M C MAGNETICS, Eastern Div., Dept. EM, 570 Ma St., Westbury, N.Y. 11590, Tel: 516-334-7070, TW 510-222-4469; Empl.: 175 ..... p. 2585,30

Sales Manager: Gene Egan

Local Sales Offices & Reps.
Ala Huntsville, Saber Assoc..... 800-327-11
Ariz Scottsdale, Carter Assocs 602-947-43
Cal Los Altos, Recht Assocs. 415-941-03
Cal Los Angeles, Elcom Inc..... 213-223-13
Colo Denver, Linberg Co. 303-758-90
Conn Newtown, Gerber Sls. Corp. 203-426-34
Fla Pompano Beach, Saber Assocs. 800-327-11
Ill Chicago, Berndt Assocs 312-283-07
Ind Angola, Waid & Assocs. 219-833-35
Mass E. Longmeadow, Gerber Sls. Corp. 413-525-30
Mass Waltham, Gerber Sls. Corp..... 617-890-80
Mich Troy, C.B. Jensen & Assoc..... 313-643-05
Minn St. Paul, Northport Eng. 612-698-38
Mo Kansas City, Harris-Hanson Co. 816-444-94
Mo St. Louis, Harris-Hanson Co..... 314-432-36
NJ Haddonfield, Mesa Tech. Assoc. 609-429-95
NY Great Neck, Trionics Assocs. 516-466-23
NY Rochester, Fowler-Beach Corp. 716-586-04
Ohio Dayton, BEK Assocs. 513-278-13
Ore Portland, C. K. Shanks & Assoc. 503-292-56
Tex Dallas, Electra Ill Co. 214-243-59
Utah Salt Lake City, Lindberg Co. 801-534-15
Wash Seattle, C. K. Shanks & Assoc. 206-632-42

IMC MAGNETICS CORP., Hansen Mfg. Co., De EM, Dept. EM, Box 23, Princeton, Ind. 47670, T 812-385-3415, Telex: 27-8458

Sales Manager: Al Bridger

Local Sales Offices & Reps.
Cal Encino, Viking Sales Co. 213-788-55
Conn Essex, Winslow Elec. Co..... 203-767-82
Ill Oakbrook Terrace, Fromm Co... 312-627-95
NJ Englewood Cliffs, Winslow Elect. Co. 201-568-53
NY Fayetteville, H.C. Johnson Agency 315-637-93
NY Rochester, H. C. Johnson Agency 716-482-30
NY Williamsville, H.C. Johnson Agency 716-632-78
Pa Devon, Kiley Elec. Co. 215-687-93
Pa Glen Shaw, H.C. Johnson Agency 412-961-04
Tex Houston, Cary & Assocs..... 713-460-11
Tex Richardson, Carey & Assocs. 214-234-22

IMC MAGNETICS CORP., New Hampshire Div., De EM, Rte. 16B, Rochester, N.H. 03867, T 603-332-5300, TWX: 510-297-4466; Empl.: 200 p. 25

Sales Manager: Stanley Barbas

Local Sales Offices & Reps.
Ala Huntsville, Saber Assoc..... 800-327-11
Ariz Scottsdale, Carter Assocs 602-947-43
Cal Los Altos, Recht Assocs. 415-941-03
Cal Los Angeles, Elcom Inc..... 213-223-13
Colo Denver, Lindberg Co. 303-758-90
Conn Newtown, Gerber Sls. Corp. 203-426-34
Fla Longwood, Saber Assocs..... 800-432-30
Fla Pompano Beach, Saber Assoc... 800-327-11
Ill Rolling Meadows, Sumer Inc. 312-991-85
Mass E. Longmeadow, Gerber Sls. Corp. 413-525-30
Mass Waltham, Gerber Sls. Corp..... 617-890-80

Mich Troy, C.B. Jensen & Assocs 313-643-0506
Minn Minneapolis, Nortec Sls. Inc. 612-835-4447
Mo Kansas City, Harris-Hanson Co. 816-444-9494
Mo St. Louis, Harris-Hanson Co. 314-432-3611
NJ Haddonfield, Mesa Technical Assocs. 609-429-9531
NM Albuquerque, Lindberg Co..... 505-881-1006
NY Great Neck, Trionics Assocs. 516-466-2300
NY Rochester, Fowler-Beach..... 716-586-0468
NC Raleigh, Saber Assoc. 800-327-1193
Ohio Dayton, Bek Assocs..... 513-278-1343
Ore Portland, C. K. Shanks & Assoc. 503-292-5656
Pa Pittsburgh, Dolfuss/Root & Co... 412-221-4420
Tex Dallas, Electra III 214-243-5969
Utah Salt Lake City, Lindberg Co. 801-534-1500
Wash Seattle, C. K. Shanks & Assoc. 206-632-4290

IC MAGNETICS CORP., Western Div., Dept. EM, 6058 Walker Ave., Maywood, Cal. 90270, Tel: 213-583-4785, TWX: 910-321-3089; FSC No.: 99743; Empl.: 110

Sales Manager: Bill Blair

Local Sales Offices & Reps.
Ariz Scottsdale, Carter Associates 602-947-4355
Cal Los Altos, Recht Assocs. 415-941-0336
Cal Los Angeles, El Com Inc..... 213-223-1351
Colo Denver, Lindberg Co. 303-758-9033
Conn Newtown, Gerber Sls. Corp. 203-426-3440
Fla Orlando, Duay Entprs. 305-277-3296
Ill Chicago, Electro-Tech Mktg. Assoc. 312-588-4535
Ind Angola, Wald & Assoc..... 219-833-3522
Mass E. Longmeadow, Gerber Sls. Corp. 413-525-3059
Mass Waltham, Gerber Sls. Corp..... 617-890-8040
Minn St. Paul, Northport Engr. 612-698-3841
Mo Kansas City, Harris-Hanson..... 816-444-9494
Mo St. Louis, Harris-Hanson..... 314-432-3611
NJ Haddonfield, Mesa Tech. Assoc. 609-429-9531
NY Great Neck, Trionic Assocs. 516-466-2300
NY Rochester, SBM Reps. 716-266-1400
Ohio Dayton, Bek Assocs..... 513-278-1343
Ore Portland, C. K. Shanks & Assoc. 503-292-5656
Tex Dallas, M. Kruvand Co. Inc. 214-827-8043
Utah Salt Lake City, Lindberg Co. 801-534-1500
Wash Seattle, C. K. Shanks & Assoc. 206-632-4290

ICAL SERVICE CORP., Dept. EM, 81 Camp Ave, Box 4683, Stamford, Conn 06907, Tel: 203-329-2151, TWX: 710-474-3546; Empl.: 50

ICOR INSTRUMENTATION, INC., Dept. EM, 144 Lamar St., West Babylon, N.Y. 11704, Tel: 516-643-7070; FSC No.: 23132; Empl.: 25

Local Sales Offices & Reps.
Ala Huntsville, Beacon Elect Assoc.. 205-881-5031
Alas Anchorage, Topp Eng Sls 907-344-4537
Cal Pasadena, Beckrep Inc..... 213-799-9586
Cal Suunyvale, Beckrep Inc 408-243-4455
Colo Denver, Instrumentation Sls..... 303-449-2365
Conn Canton, Daner-Hayes 203-693-6010
DC Washington, Powell Pendergraph 301-656-4535
Fla Ft. Lauderdale, Beacon Elect Assoc 305-971-7320
Fla Ft. Wacton Beach, Beacon Elect Assoc 904-244-1550
Fla Orlando, Beacon Elect Assoc 305-647-3498
Ga Atlanta, Beacon Elect. Assoc 404-351-3654
Ill Chicago, Elect. Inst. Assoc. 312-271-3774
Ind Indianapolis, Elect. Inst. Assoc. .. 317-257-7231
Mass Newton Centre, Daner-Hayes 617-969-4650
Mich Saginaw, VonBerg & Assocs. 517-799-0873
Minn Minneapolis, Trask Eng. 612-537-2434
NJ Springfield, RJM Sls 201-467-1210
NY Rochester, Daner-Hayes 716-467-5100
Ohio Cleveland, RDP Assoc..... 216-659-3138
Ohio Dayton, RDP Assoc. 513-253-6175
Ore Portland, Topp Engr. Sls. Corp. 503-244-6265
Pa Audobon, Daner-Hayes..... 215-666-5005
Pa Pittsburgh, Wainwright Tech Sls 412-487-5055
Tenn Oak Ridge, Beacon Elect. Assoc 615-482-2409
Tex Dallas, Concept Sales 214-241-5202
Tex Houston, Concept Sales..... 713-496-2597
Utah Salt Lk City, Instrumentation Sls 801-943-1881
Va Richmond, Powell-Pendergraph.. 804-264-2341
Wash Bellevue, Topp Engrg. Sls. Corp. 206-747-5400

Independent Cable/Midwec, Dept. EM, Box 417 G, Scottsbluff, Neb. 69361, Tel: 308-632-4127, TWX: 910-627-0061; Empl.: 300 ..... p. 1188

Sales Manager: S. K. Morgan

Local Sales Offices & Reps.
Ariz Phoenix, Toward Engr. Assoc..... 602-955-3193
Cal Long Beach, Emerson Kirk Engr. 213-439-9559
Cal Mountain View, Caltron/Pyle Inc. 415-964-3244
Colo Denver, Checkmate Sls,..... 303-773-0666
Conn Newtown, Kanan Assocs..... 203-426-8157
Fla Maitland, Ellis & Assocs. 305-645-1101
Ga Atlanta, G. Duckett Sls. 404-451-3529
Md Baltimore, Kaufholz Assoc. 301-252-3664
Mass Reading, Kanan Assocs..... 617-944-8484
Mich Plymouth, Romarc..... 313-455-0300
Minn St. Paul, Knox Assoc. 612-488-5402
Neb Lincoln, Mktg. Assoc. 402-464-5244
NY E. Syracuse, Nycom 315-437-8343
NY Port Washington, P.D. Aaron 516-883-0600
NC Charlotte, G. Duckett Sls. 404-451-3529
Ohio Dayton, Kimconics Sls.. 513-898-1007
Ore Portland, C.K. Shanks Assoc. 503-292-5656
Pa Newton Square, Kaufholz Assoc. 215-356-5000
Pa Waterford, Kimconics Sls. 814-796-6556
Tex Dallas, United Comps. 214-324-1448
Wash Seattle, C.K. Shanks & Assocs. 206-632-4290

Local Distributors
Cal Belmont, Eric Electronics 415-593-8284
Ind Indianapolis, Ra-Dis-Co..... 317-637-5571
Mass Newton, Greene-Shaw 617-969-8900
NY Buffalo, Summit Dr. 716-884-3450
NY Port Washington, Connector Concepts 516-883-3800
Ohio Cleveland, Gateway 216-944-8565
Ohio Dayton, Arrow Elctrns
Pa Huntington Valley, Hallmark..... 215-355-7300

INDIANA GENERAL, Dept. EM, 1168 Barranca Dr, El Paso, Tx 79935, Tel: 915-593-1621, Telex: 9641370

Sales Manager: R. F. Edgar

Local Sales Offices & Reps.
Cal Los Angeles, Halbar Assocs 213-387-8283
Cal San Mateo, Halbar Assocs 415-349-4700
Conn Old Lyme, Aid Engrg. Sls. Co. .. 203-434-1673
Ill Northfield, Halliday & Lenhart 312-446-9320
Mass Bedford, Aid Engrg Sales Co. 617-663-2225
Mich Troy, Pine Sales 313-524-1860
Minn Wayzata, Joe Little Assocs 612-473-1107
Mo St. Louis, Terry & Hodges 314-965-0746
NY Ballston Lake, Maher-Talty Assocs 518-877-5367
NY Coram, Machine Dynamics 516-473-7770
NC Charlotte, Industrial Drives & Controls 704-535-5414
Ohio Cincinnati, Mattingly Assocs..... 513-563-2555
Pa Philadelphia, Clisby & Assocs 215-425-7724
Tenn Memphis, Ransom Sls Co..... 901-332-0036
Tex DeSoto, Automatic Sys. 214-224-7159
Wash Edmonds, Cunningham Sales 206-743-6300
Wisc Milwaukee, E.A. Dickinson & Assocs 414-264-1080

INDIANA GENERAL, Ferrite Prods, Dept. EM, Crows Mill Rd., Keasbey, N.J. 08832, Tel: 201-826-5100, TWX: 138878, 710-998-0877; Empl.: 1,200

Sales Manager: J Breickner

Local Sales Offices & Reps.
Cal Los Alamitos..... 213-598-0776

INDIUM CORP. OF AMER, Dept. EM, 1676 Lincoln Ave, Box 269, Utica, NY 13503, Tel: 797-1630, Telex: 937363

Sales Manager: J. F. Agen

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Ariz Phoenix, Hecht, Henschen & Assocs 602-275-4411
Cal San Jose, R. C. L. Assocs..... 408-255-2583
Cal Tarzana, Smolen Assocs 231-881-4667
Ind Carmel, L. R. Woodling Co 317-844-7365
Mass Fall River, J. Roger Greenlees .. 617-674-9858
NY Staten Island, Ken Huth Sls..... 212-984-1765
Tex Plano, R.T. Mullins, Jr. 214-423-7618

INDUCTIVE COMPONENTS, INC., Dept. EM, 181 Bridge Rd., Hauppauge, N.Y. 11787, Tel: 516-582-9370; FSC No.: 25159; Empl.: 40 p. 4354-4356

Sales Manager: B. Jansen

Local Sales Offices & Reps.
Ariz Glendale, O'Donnell Assocs..... 602-938-3120
Cal Los Altos, Tauber-Dreyer Kolm.. 415-948-2635
Cal Northridge, Tauber-Dreyer Kolm 213-386-4011
Cal San Diego, Tauber-Dreyer Kolm 714-274-7242
Conn Ridgefield, Phoenix Sls 203-438-9644
Fla Maitland, Barrett Assocs. 305-678-0172
Fla Melbourne, Barrett Assocs. 305-727-2491
Fla Miami, Barrett Assocs. 305-681-4957
Fla St. Petersburg, Barrett Assocs... 813-345-3585
Ill Mount Prospect, Delta Tech Sls. Corp. 312-253-9440
Ind Ft. Wayne, J & B Engrg Sls..... 219-483-2813
Mass Needham, Eastronix 617-449-1550
Minn Minneapolis, Eltron Mktg 612-927-6992
NY Northport, F. F. Marin Co. 516-261-2410
Ore Portland, Elctrn Comp Sls 503-245-2342
Tex Richardson, Barry Sls..... 214-234-0255
Exp: Hauppauge, New York, Inductive Comps 516-582-9370

INDUSTRIAL CONDENSER CORP., Dept. EM, 3243 N. California Ave., Chicago, Ill. 60618, Tel: 312-463-2200; FSC No.: 74861; Empl.: 200

Local Sales Offices & Reps.
Cal Long Beach, W.S. Harmon Co... 213-426-0551
Mass Waltham, Com-Sale 617-890-0011
NJ Haddonfield, TAI Corp. 609-854-3011
NJ South Orange, S. Simberkoff Assocs. 201-763-7900

INDUSTRIAL CONTROL CO., Dept. EM, Central Ave. at Pinelawn, Farmingdale, N.Y. 11735, Tel: 516-694-3000; Empl.: 20 ..... p. 3976,3977

Sales Manager: I. Nobil

INDUSTRIAL DEVICES, Dept. EM, Edgewater, N.J. 07020, Tel: 201-224-4700, Telex: 12-7459; FSC No.: 91802; Empl.: 200 ..... p. 2484,2485

Sales Manager: R. Solowski

Local Sales Offices & Reps.
Cal Los Altos, Frauman Assocs..... 415-941-0660
Cal Los Angeles, Universal Comps .. 213-641-4255
Colo Denver, Connors Inc. 303-934-5829
Conn W. Simsbury, Anchor Engrg. Corp. 203-658-6261
Fla Hollywood, A.P.M. Assoc 305-987-6720
Fla Orlando, A.P.M. Assoc 305-298-2816
Fla Tampa, A.P.M. Assoc 813-886-2457
Ill Chicago, K.D. Engle 312-539-1820
Mass Newton Upper Falls, Anchor Engrg. 617-964-6205
Mich Oak Pk., W. Spenser 313-967-0808
Minn Kansas City, F. P. Williams & Assoc. 816-471-1617
Minn St. Paul, Cahill Assoc. 612-646-7217
NY Albany, Niagara Electric Sls. 518-869-0130
NY Buffalo, Niagara Elec. Sls. 716-886-4000
NY Commack, Kaelber & Mack, Inc. 516-543-2924
NY E. Syracuse, Niagara Electric Sls. 315-437-1656
NY Rochester, Niagara Elec. Sls. Co.716-BR 1-1223
Ore Portland, Earl & Brown..... 503-245-2283
Pa Media, Snyder & Stefkovic Assoc. 215-566-5400
Tenn Chattanooga, Ind'l. Hardgoods Co. 615-267-0907
Tex Dallas, Blackburn Assocs. 214-692-8885
Tex Lubbock, Blackburn Assocs. 806-744-2943
Utah Salt Lake City, Sage Sls 801-290-1234
Va Fairfax, Snyder & Stefkovic Assoc. 703-273-1413
Wash Seattle, Earl & Brown..... 206-284-1121
Exp: NJ Ft. Lee, J.A. Gross 201-944-3609

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Ariz Phoenix, Parts Elctrns. 602-258-6476
Ariz Tucson, Elliot Elctrns. 602-793-1755
Cal Los Angeles, Electric Switches .. 213-664-1141
Cal Los Angeles, Calif Switch & Signal 213-770-2330
Cal Palo Alto, Zack Elctrns. 415-326-5432
Cal Pasadena, Empire Elctrn. Dist. .. 213-681-2711
Cal Pasadena, Dow Radio 213-681-3416
Cal San Diego, Shanks & Wright..... 714-239-0176
Cal San Francisco, Zack Elctrns..... 415-626-1444
Cal San Jose, Quement Elctrns. 408-998-5900
Cal S. San Francisco, Stevens Engrg 415-583-5868
Colo Denver, Wintronics 303-934-2406
Conn Danbury, Bond Radio Elctrns. 203-744-2274
Fla Miami, Electro Standard Lab (ESL) 305-633-6973
Fla Tampa, Leader Elctrns. 813-870-3315
Idaho Pocatello, Kimball Elctrns. 208-232-2201
Ill Chicago, Electro-Kinetics 312-286-4200
Ill Rockford, Mid-West Assocs. 815-962-8036
Ill Villa Park, Melvin Elctrns..... 312-279-5015
Ind Evansville, Hutch & Son..... 812-425-7201
Ind Indianapolis, Graham Elctrns. 317-634-8202
Ind South Bend, Genesis Elctrns 219-287-2911
Iowa Cedar Rapids, Iowa Radio Supply 319-364-6154
Kans Wichita, Interstate Elctrns. 316-264-6316
La Lafayette, Ralph's 318-234-4507
Md Rockville, Capitol Radio Wholesalers 301-881-2270
Md Timonium, MX-IV Elctrns. 301-252-1192
Mass Dedham, Gerber Elctrns. 617-329-2400
Mass Hingham, Sager Electrical Supply 617-749-6700
Mass N. Wilbraham, Ind'l. Comps. Corp. 413-596-3854
Mass Worcester, RM Elctrns..... 617-756-8311

Mich Flint, Shand Elctrns. 313-743-8940
Mich Muskegon, Western Elctrns. Supply Co. 616-722-7628
Minn Minneapolis, Elctrn. Center 612-371-5200
Mo St. Louis, Van Sickle Radio-Elec. 314-621-5000
Mo St. Louis, Olive Ind'l. Elctrns..... 314-426-4500
Neb Lincoln, Scott Elctrn. Supply Corp. 402-466-8221
NH Concord, Evans Radio 603-224-9961
NJ Fairlawn, Relay Specialties Inc... 201-797-3313
NJ Hanover, State Elctrns. Parts Corp. 201-887-2550
NJ Springfield, Route Elctrns. 201-379-7710
NY Albany, E. E. Taylor Co..... 518-438-7811
NY Buffalo, Summit Distrs. 716-884-3450
NY Farmingdale, Broadline Elctrns... 516-420-8320
NY Hempstead, Elctrn. Equip. Co..... 516-538-5510
NY Mt. Vernon, Q.A.R. Ind'l. Elctrn. Sls. 914-699-2224
NY Rochester, Simcona Elctrns. 716-328-3230
NC Raleigh, Southeastern Radio Supply Co. 919-828-2311
Ohio Cincinnati, United Radio 513-761-4030
Ohio Cleveland, CAM/RPC..... 216-461-4700
Ohio Columbus, Hughes Peters 614-294-5351
Ohio Solon, REPCO Inc. 216-248-8900
Ohio Toledo, Warren Radio Co. 419-248-3364
Okla Oklahoma City, Trice Wholesale Elctrns. 405-JA4-4411
Okla Tulsa, Oil Capitol Elctrns. Corp. 918-622-8520
Ore Portland, Central Distrs. 503-234-0711
Pa Allentown, A.A. Peters 215-434-5237
Pa Drexel Hill, Kass Elctrns. Dist..... 215-449-2300
Pa Erie, Mace Elctrns. 814-838-3511
Pa Harrisburg, Cumberland Elctrns. 717-232-9715
Pa Philadelphia, Philadelphia Elctrns. 215-LO8-7400
Pa Pittsburgh, R P C Elctrns. 412-782-3770
Pa Scranton, Pursell Elctrns. 717-346-2011
Pa York, Rosen Elctrns. 717-843-3875
RI Warwick, W.H. Edwards 401-781-8000
SC Columbia, Dixie Radio Supply Co. 803-779-5332
Tenn Knoxville, Roden Electrical Supply 615-524-9851
Tenn Nashville, Randolph & Rice Co. 615-255-5601
Tex Fort Worth, Swieco Inc. 817-335-6521
Tex San Antonio, Sherman Elctrns. Supply 515-224-1001
Utah Salt Lake City, Standard Supply Co. 801-355-2971
Va Arlington, Arlington Elctrn. Wholesalers 703-524-6256
Wash Seattle, Western Elctrns. Co. 206-284-0200
Wisc Milwaukee, Marsh Radio Supply Co. 414-475-6000
For: Can., Calgary, Cam Gard Supply 403-287-0520
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For: Can., Quebec City, Crobel Ltd.. 418-687-1171
For: Can., St. Catharines, Ont., Industro-Serv Elctrns. 416-684-7413
For: Can., Vancouver, B.C., R.A.E. Ind'l. Elctrns. 604-324-7911
For: Can., Victoria, B.C., Queale Elctrns., Ltd. 604-388-6111
For: Can., Willowdale, Ont., Electrosonic Ltd. 416-494-1666

INDUSTRIAL ELCTRN. ENGRS., Dept. EM, 7740 Lemona Ave., Van Nuys, Cal. 91405, Tel: 213-787-0311, TWX: 910-495-1707; Empl.: 220 p. 2483

Sales Manager: J. Hart, P. McEvoy; *Distributor Manager:* G. Daniels

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Ala Huntsville, Technology Mktg. Assocs. (TMA) 205-883-7893
Ariz Phoenix, Gramer & Co..... 602-279-1231
Cal Palo Alto, Held & Mollard 415-965-9321
Cal Torrance, Components Mktg. Assocs. 213-541-2515
Colo Boulder, Component Prod. Sls. Co. 303-442-1100
Conn North Haven, Kitchen & Kutchin 203-239-0212
Fla Orlando, Technology Mktg. Assocs. (TMA) 305-857-3760
Fla Pompano Beach, Technology Mktg. Assocs. (TMA) 305-942-0774
Ill Highland Park, Bransky Sls. 312-433-2375
Ind Carmel, Rich Elctrn. Mktg. 317-844-8462
Ind Ft. Wayne, Rich Elctrn. Mktg. 219-432-5553
Iowa Cedar Rapids, PMA..... 319-362-9177
Kans Overland Park, PMA 913-381-0004
Kans Wichita, PMA 316-264-2662
Md Rockville, Marktron 301-762-6210
Md Timonium, Marktron..... 301-252-7111
Mass Lexington, Kitchen & Kutchin 617-862-8230
Mich Southfield, L.H. Dickelman Co. .. 313-353-8210
Minn Minneapolis, M. Franklin Co. 612-835-6422
Mo Maryland Hgts., PMA 314-569-1220
NM Albuquerque, Int'l. Elctrns. 505-265-6453
NY Albany, Reagan/Compar Albany Inc. 518-489-7408
NY Endwell, Reagan/Compar Albany Inc. 607-723-8743
NY Fairport, Reagan/Compar Albany Inc. 716-271-2230
NY New Hartford, Reagan/Compar Albany 315-732-3775
NY Plainview, E.R.A. 516-822-9890
NC Charlotte, Over & Over 704-527-3070
Ohio Cleveland, Geotronix Inc. Assocs. 216-526-2535
Ohio Columbus, Geotronix Inc. Assocs. 614-457-8472
Ore Portland, Electronic Component Sls. 503-245-2342
Pa King of Prussia, Rivco January .. 215-265-5211
Tex Dallas, E. B. Robertson, Inc. 214-942-2716
Tex El Paso, International Elctrns. 914-778-9761
Tex Houston, E.B. Robertson, Inc. 713-223-0618
Va Charlottesville, Marktron, Inc. 804-973-5874

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Ala Huntsville, CDI 205-883-7501
Ariz Glendale, Tri-Tek Elctrns..... 602-931-6949
Ariz Tempe, Circuit Specialist Co. 602-966-0764
Ark Little Rock, Electro Entprs. 501-664-9207
Cal Garden Grove, Allied Elctrns. 714-894-7581
Cal Manhattan Beach, Prime Electro Prods. Corp. 213-376-3433
Cal Manhattan Beach, U.S. Electro Sls. 213-376-3456
Cal Mountain View, Waltronic Sls. 415-965-41
Cal Santa Monica, Master Dist. 213-829-46
Cal Sun Valley, Richey Elctrns. 213-768-38
Colo Denver, Integrated Elctrns..... 303-534-61
Conn East Haven, JV Elctrns. 203-469-23
Fla Margate, CDI 305-971-49
Fla Miami, Elctrn. Equip. Co. 305-644-48
Fla Winter Park, Elctrn. Equip 305-644-48
Ill Arlington Heights, S & R Corp.. 312-593-25
Ill Elgin, Allied Elctrns..... 312-697-82
Ill Elk Grove Village, GBL Elctrns. Corp. 312-569-27
Ill Rosemont, Advent Elctrns..... 312-298-42
Ill Skokie, Bell Inds. 312-282-54
Ind E. Chicago, Acro Elctrns. 219-397-86
Ind Evansville, Hutch & Son 812-425-72
Ind Indianapolis, Advent Elctrns. 317-297-49
Ind Indianapolis, Ra-Dis-Co..... 317-637-55
Kans Wichita, Radio Supply Co. 316-267-52
La Houma, Kent Elctrns. 504-872-24
Md Beltsville, Treeko Sls. 301-937-82
Md Gaithersburg, Pioneer/Wash..... 301-948-07
Mass Watertown, DRW Elctrns. Corp. 617-923-19
Mass West Newton, A.W. Mayer Co. .. 617-965-11
Mich Farmington, CMP Dist. Co. 313-477-77
Minn Minneapolis, Stark Elctrn. Supply Co. 612-332-13
Mo Kansas City, L Comp..... 816-221-24
Mo St. Louis, Olive Indust. Elctrns. .. 314-863-78
NM Alburquerque, International Elctrns. 505-345-05
NY Elmira, Masline Elctrns. 607-733-56
NY Mamaroneck, Logicomp Elctrns. 914-698-93
NY New York, Holt Electrical Dist. Corp. 212-524-92
NY Rochester, Ossmann Comps. Sls. 716-442-32
NY Rochester, Masline Elctrns. 716-546-53
NC Greensboro, Hammond Elctrns. 919-275-63
Ohio Cleveland, CMP Dist. Co..... 216-333-56
Ohio Dayton, Stolts-Friedman..... 513-298-55
Ohio Dayton, CMP Dist. Co. 513-278-58
Okla Claremore, Electro Entprs..... 918-341-16
Okla Oklahoma City, Electro Entprs.. 405-478-17
Ore Portland, Dunn Elctrns..... 503-285-02
Pa Cornwells Heights, Reliance Mfg. Co. 215-638-82
Pa Philadelphia, Philadelphia Elctrns. 215-365-67
Pa Pittsburgh, CMP Dist. Co..... 412-372-44
Pa Pittsburgh, CMU Tech Elctrns. .. 412-621-26
SC Greenville, Hammond Elctrns. 803-233-41
Tex Bryan, Kent Elctrns. 713-822-15
Tex El Paso, Int'l. Elctrns. 915-778-97
Tex Ft. Worth, Allied Elctrns..... 817-336-54
Tex Grapevine, Metrolex 817-481-37
Tex Houston, Altair Co. 713-462-30
Tex Houston, Kent Elctrns. 713-780-77
Tex Richardson, Altair Co. 214-231-51
Tex Richardson, Southwest Elctrns... 214-234-30
Tex Stafford, Southwest Elctrns. 713-494-60
Wash Seattle, Shannon Ltd. 206-763-05
Wisc Milwaukee, Marsh Elctrns. 414-545-65
For: Can., Calgary, Alb., Paar Ind'l. Elect. 403-287-28
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Cal Los Angeles, Knight Co 213-670-2
Cal Santa Clara, Nova-Tronix..... 408-243-9
Colo Parker, Component Sales 303-841-2
Fla Ft. Lauderdale, Beacon Elctrns. 305-776-6
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Minn St Paul, RG Ragon Co. 612-488-0201
NJ Haddonfield, Mills-Brown Assoc 609-429-1005
NJ Haworth, Kay Sls. 201-384-3261
NY Buffalo, W.A. Franklin Sls. 716-223-5102
NY Commack, PMR..... 516-543-8300
NY Syracuse, W.A. Franklin Sls. 315-472-5273
NY Whitesboro, W.A. Franklin Sls. .. 315-737-5038
Ohio Cleveland, Depco 216-289-8188
Ore Portland, Electronic Component Sales 503-245-2342
Tex Richardson, Barry Sales..... 214-234-0255
Va Falls Church, Beacon North..... 703-534-7200

IDUSTRIAL FABRICATION, Dept. EM, 820 Woodend Ave., Stratford, Conn. 06497, Tel: 203-375-5853; Empl.: 30

Sales Manager: J. Gunzenhauser

IDUSTRIAL MICA DIV., Columbia Chase Corp., Dept. EM, 223 S. Van Brunt St., Englewood, N.J. 07631, Tel: 201-568-7200; Empl.: 150

IDUSTRIAL TEST EQUIP., Dept. EM, 21 Yennicock Ave., Port Washington, N.Y. 11050, Tel: 516-883-1700; FSC No.: 99074 ..... p. 3389

Local Sales Offices & Reps.

Ala Huntsville, Intern'l. Scientific Instru. 205-837-1601
Ariz Phoenix, Luscombe Engrg., Co. 602-274-8128
Cal Pasadena, Luscombe Engrg., Co. 213-684-2000
Ill Chicago, Midwest Elctrn. 312-777-9700
Ind Indianapolis, Midwest Elctrn. Sls. 317-253-0590
NY Great Neck, Industron Assocs., Inc. 516-HU 7-2620
NC Winston Salem, Int'l. Sci. Instrs. 919-722-1783
Pa Melrose Park, R. Meyers Assocs. 215-224-1663
Wisc Milwaukee, Midwest Elctrn. Sls. 414-645-3680
Exp: N.Y., N.Y., Ad. Auriema 212-938-0930

IDL TIMER AN ESTERLINE CO., Dept. EM, U.S. Hwy 287, Parsippany, N.J. 07054, Tel: 201-887-2200, Telex: 13-6494; Empl.: 217

Sales Manager: W. Roginski

Local Sales Offices & Reps.

Ala Huntsville, Vesco 205-539-8716
Cal Cupertino, T.L. Snitzer Co..... 408-257-8333
Cal Del Mar, T.L. Snitzer Co. 714-226-0305
Cal Los Angeles, T.L. Snitzer Co. 213-836-6170
Conn Cheshire, TechMark Overseas Corp. 412-941-6490
Fla Orlando, Buchanan & Abrams Assocs. 305-898-7444
Ill La Grange, PVA Co. 312-352-1037
Ill Palatine, Bu-Nell Engrg Co 312-358-2300
Ind Indianapolis, Val-Skol Sls. 317-926-5063
Md Rockville, Farrell Assocs. 301-424-9460
Mass Newton Center, Daner-Hayes, Inc. 617-969-4650
Mass Stoneham, Ken Corp. 617-438-5464
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Mich Royal Oak, Dave Ray & Assocs. 313-576-4705
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Minn Minneapolis, Production Automation Corp. 612-866-5700
Minn Minneapolis, Heimann Co., Inc. .. 612-861-6051
Mo Grandview, Production Automation Corp. 816-763-4155
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NJ Leonia, Associated Controls & Equip. 201-944-9218
NM Albuquerque, Aztec Entprs. 505-255-2440
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NY Rochester, Ontec..... 716-464-8636
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NC Winston Salem, Radco Co. 919-722-9671
Ohio Aurora, EMA, Inc. 216-562-6104
Ohio Centerville, EMA, Inc. 513-433-2800
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Ore Forest Grove, Doran Sls. Assoc. 503-357-3333
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Pa Audubon, Daner-Hayes, Inc. 215-666-5005
SC Greenville, Barker Instr. & Mach. Co. 803-271-4910
Tex Austin, Crockett Southwest Co. 512-451-8269
Tex Dallas, Crockett Southwest Co. 214-251-1776
Tex Dallas, Techno Assocs 214-357-9213
Tex Dallas, Lund & Co. 214-387-4634
Wash Redmond, Doran Sls. Assocs..... 206-885-1885
Exp: Cal., Los Angeles, Trans World Trade 213-472-0444

INERTIAL MOTORS CORP., Dept. EM, 280 N. Broad St., Doylestown, Pa. 18901, Tel: 215-345-1010, Telex: 83-1633; Empl.: 49

Local Sales Offices & Reps.

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Fla Coral Springs, Shaw Engrg & Sls 305-752-7596
Ind Indianapolis, Scott Elctrns 219-743-1586
Mass , Dynamic Sls..... 617-272-5676
Mich Plymouth, Scott Elctrns 313-455-2440
NJ Englishtown, Triple E..... 201-446-4222
NY Rochester, Sweetco Assn 716-225-2383
NY Schnectady, E.M.B. Technical 518-372-5841
Ohio Cleveland, Scott Elctrns..... 216-291-2600
Ohio Dayton, Scott Elctrns 513-294-0539
Pa Hatboro, QED Elctrns..... 215-674-9600
Wash Tukwila, General Elctrns..... 206-243-5141

INFICON INC., Inficon Leybold-Heraeus Inc., Dept. EM, 6500 Fly Rd, E. Syracuse, N.Y. 13057, Tel: 315-437-0377, TWX: 710-541-0594; Empl.: 80

Sales Manager: D. A. D. Renzo

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Mo Hazelwood, Technical Representatives 314-731-5200
NJ Edison, Intel Corp. 201-985-9100
NM Albuquerque, BFA Corp. 505-292-1212
NM Las Cruces, BFA Corp. 505-523-0601
NY Great Neck, Measurement Tech. 516-482-3500
NY Hauppauge, Intel Corp 516-231-3300
NY Pittsford, T-Squared 716-248-5005
NY Poughkeepsie, Intel Corp. 914-473-2303
NY Rochester, Intel Corp. 716-328-7340
NY Syracuse, T-Squared 315-463-8592
NC Highpoint, Pen-Tech Assocs. 919-883-9125
NC Raleigh, G. White Assocs. 919-787-7016
Ohio Cleveland, Lowry & Assocs. 216-464-8113
Ohio Cleveland, Intel Corp. 216-464-2736
Ohio Dayton, Lowry & Assocs. 513-435-4795
Ohio Dayton, Intel Corp. 513-890-5350
Ore Portland, ES/Chase Co. 503-620-9616
Pa Ft. Washington, Intel Corp. 215-542-9444
Pa Hatboro, Q.E.D. Elctrn 215-674-9600
Pa Pittsburgh, Lowry & Assocs. 412-922-5110
Tenn Germantown, G. White Assocs. 901-754-0483
Tenn Hixon, G. White Assocs. 615-842-7799
Tenn Jonesboro, G. White Assocs. 615-477-8850
Tex Dallas, Intel Corp. 214-241-9521
Tex Dallas, Microsystems Mktg. 214-238-7157
Tex Houston, Microsystems Mktg. 713-783-2900
Tex Houston, Intel Corp. 713-784-3400
Utah Salt Lake City, Mountaintek 801-266-9617
Va Colonial Beach, G. White Assocs. 804-224-4871
Va Lynchburg, G. White Assocs. 804-384-6920
Wash Seattle, E.S./Chase Co. 206-762-4824

Local Distributors

Ala Huntsville, Pioneer 205-837-9300
Ariz Phoenix, Hamilton/Avnet Elctrns 602-275-7851
Cal Costa Mesa, Avnet Elctrns. 714-754-6111
Cal El Segundo, Liberty Elctrns 213-322-8100
Cal Mountain View, Elmar Elctrns 415-961-3611
Cal San Diego, Liberty/San Diego 714-565-9171
Cal Sunnyvale, Cramer/San Fran 408-739-3011
Colo Denver, Hamilton/Avent Elctrns 303-545-1212
Conn North Haven, Cramer/Conn. 203-239-5641
DC Gaithersburg, Pioneer/Wash 301-948-0710
Fla Ft. Lauderdale, Hamilton/Avnet Elctrns 305-971-2900
Fla Orlando, Pioneer 305-859-3600
Ga Norcross, Cramer 404-448-9050
Ill Mt. Prospect, Cramer/Chicago 312-593-8230
Ill Schiller Park, Hamilton/Avnet Elctrns 312-678-6310
Ind Indianapolis, Sheridan Sls 317-297-3146
Kans Overland Park, Hamilton/Avnet Elctrns 913-888-8900
Md Hanover, Hamilton/Avnet 301-796-5000
Mass Newton, Cramer Elctrns 617-969-7700
Mich Livonia, Pioneer/Mich 313-525-1800
Minn Minneapolis, Industrial Comps 612-831-2666
Mo Hazelwood, Hamilton/Avnet Elctrns 314-731-1144
NJ Fairfield, Harvey Elctrns 201-227-1262
NJ Little Falls, Cramer/New Jersey 201-785-4300
NJ Mt. Laurel, Hamilton/Avnet Elctrns 609-234-2133
NM Albuquerque, Hamilton/Avnet Elctrns 505-765-1500
NY E. Syracuse, Hamilton/Avnet Elctrns 315-437-2641

NY Hauppauge, Cramer/Long Island 516-231-5600
NY Rochester, Hamilton/Avnet Elctrns 716-442-7820
NY Woodbury, Harvey Elctrns 516-921-8700
NC Greensboro, Pioneer/Carolina 919-725-8711
NC Raleigh, Hamilton/Avnet Elctrns 919-829-8030
Ohio Cincinnati, Sheridan Sls 513-761-5432
Ohio Cleveland, Pioneer/Cleveland 216-587-3600
Ohio Dayton, Hamilton/Avnet Elctrns 513-433-0610
Ohio Dayton, Sheridan Sls 513-223-3332
Okla Tulsa, Comps Specialties 918-664-2820
Ore Portland, Almac/Stroum Elctrns 503-292-3534
Pa Horsham, Pioneer/Delaware 215-674-4000
Tenn Knoxville, Sheridan Sls 615-588-5386
Tex Dallas, Cramer Elctrns 214-661-9300
Tex Dallas, Component Specialties, Inc. 214-357-6511
Tex Houston, Hamilton/Avnet Elctrns 713-780-1771
Utah Salt Lake City, Hamilton/Avnet Elctrns 801-972-2800
Wash Bellevue, Liberty Elctrns 206-763-8200
Wash Seattle, Almac/Stroum 206-763-2300
Wisc New Berlin, Hamilton/Avnet 414-784-4510
For: Can., Mississauga, Ont., Hamilton/Avnet Elctrns 416-677-7432
For: Can., Ottawa, Ont., Zentronics 613-238-6411
For: Can., Vancouver, BC, L.A. Varah Ltd. 604-873-3211

INTER-COMPUTER ELECTRONICS, DIV. AMER. ELCTRN. LABS., see Data Acquisition Prods. Lab., AEL Inc.

INTER-MARKET, INC., Dept. EM, 1946 Lehigh Ave., Glenview, Ill. 60025, Tel: 312-729-5330, TWX: 910-651-1997; FSC No.: 34165; Empl.: 10

Sales Manager: R. M. Scott; *Distributor Manager:* R. M. Scott

Local Sales Offices & Reps.

Ala Huntsville, Macro Mktg. Assocs. 205-883-9630
Cal San Diego, Van Gott & Assoc. 714-273-4797
Cal San Gabriel, Van Gott & Assoc. 213-285-2148
Colo Denver, Nelson Co. 303-573-1516
Conn Berlin, White Sls. 203-224-0423
Fla Orlando, W. Ben Wimberly Co. 305-423-2514
Ill Glenview, Inter-Market 312-729-5330
Mass Needham, White Sls. 617-444-3676
Minn St. Paul, Kenco Co. 612-645-7717
NY E. Northport, Jarms Assoc. 516-822-7085
NY Syracuse, Nycom Inc. 315-437-8343
Ohio Columbus, McFadden Sls 614-459-1280
Pa Birchrunville, Jadelectronic Associates 215-647-5151
Tex Arlington, Wheelex Inc 817-461-8039
Tex Spring, Wheelex Inc 713-353-3195

INTER-TECH. GRP., INC., Dept. EM, Box 23, Irvington, N.Y. 10533, Tel: 914-LY 1-8822, TWX: 710-564-0802; Empl.: 12 p. 2557,4463

Local Sales Offices & Reps.

Cal Garden Grove, Impact Elctrns. 213-431-3581
Cal San Carlos, Winco Sls. 415-365-6082
Colo Denver, Palmer Assocs. 303-255-9961
Fla Melbourne, Repcom 305-254-1877
Ill Chicago, J. Golton Co. 312-725-7870
Mass Newton, Normell Assocs. 617-969-5478
Minn Minneapolis, Int'l. Sls. 612-831-8423
NY Lynbrook, H.B. Heft 516-LY 9-3351
NY Syracuse, Naylor Elec. 315-GR 2-9183
NC Kennersville, Naylor Assocs. 919-996-4162
Ohio Dayton, BEK Assocs., Inc. 513-278-1343
Pa Ardmore, Freedman Assoc. 215-649-3679
Tex Dallas, J. Clay Co. 214-350-1281
Wash Seattle, H. Levinson 206-323-5100

INTERDATA, see Perkins-Elmer Data Systems/ Terminals Div.

INTERDESIGN INC., Dept. EM, 1255 Reamwood Ave., Sunnyvale, Cal. 94086, Tel: 408-734-8666, TWX: 910-339-9374; Empl.: 50

Sales Manager: G. Stephan

INTERDYNE, Intercette Div., Dept. EM, 14761 Califa St., Van Nuys, Cal. 91411, Tel: 213-787-6800, TWX: 910-495-1754; FSC No.: 31598; Empl.: 20

Sales Manager: W. K. Geist, V.P. Mktg

Local Sales Offices & Reps.

Cal Costa Mesa, King Engrg. 714-645-6873
Cal Los Altos, Cain-White Co. 415-948-6533
Cal Los Angeles, Compu-Quote 213-348-3662
Colo Boulder, Component Prod Sls 303-494-5100
Colo Littleton, Data Systems 303-761-3172
Conn Guilford, R.H. Sturdy 203-453-5424
Fla Ft. Lauderdale, RI Smith 305-772-5100
Fla Winter Park, Young & Lawrence 305-647-6929
Ill Elk Grove Village, L. F. Green Assocs 312-593-0282
Ill Oakbrook, Whitmore & Assoc 312-325-4727
Ind Indianapolis, L. F. Green Assocs 317-293-9827
Md Baltimore, B. White & Assocs. 301-484-5400
Mass Needham, Maguire Assocs 617-444-5128
Mass Wellesley Hills, R.H. Sturdy 617-235-2330
Mich Farmington, Miltmore Sales 313-476-2446
Minn Minneapolis, L. F. Green Assocs 612-571-6666
Minn Minneapolis, Stoss Assocs. 612-925-2757
Mo Kansas City, Nevco 816-421-1751
Mo St Louis, Nevco 314-843-7406
NJ Livingston, Varrelman-Gorman 201-992-2505
NJ Paramus, S D M Reps 201-368-0123
NM Albuquerque, Carl Carlsberg Assoc 505-265-1579
NY Rochester, S D M Reps 716-544-8080
Okla Tulsa, Hugh Daly Co. 918-627-4159
Pa King of Prussia, Rivco 215-265-5211
Pa King of Prussia, Monteiro Assocs. 215-265-0634
Utah Salt Lake City, Data Systems 801-487-8281
Wash Bellevue, Ruggles Tech. Sls. 206-455-2778
Wash Bellevue, Showalter Instrs 206-455-4922

INTERELECTRONICS CORP., Dept. EM, Interelectronics Park, 550 U.S. Rte. 303, Congers, N.Y. 10920, Tel: 914-EL8-8000; Empl.: 82 p. 3276

Sales Manager: M.H. Pintell, Adv. Mgr.; *Distributor Manager:* G. Sherwood

INTERFACE, INC., Dept. EM, 7401 Butherus Dr., Scottsdale, Ariz. 85260, Tel: 602-948-5555, Telex: 668-394; FSC No.: 32311

Local Sales Offices & Reps.

Ala Huntsville, Col-Ins-Co. 305-423-7615
Ariz Scottsdale, Electronic Entprs. 602-946-9860
Cal Concord, Gado Instrument Sls. 415-933-5566
Cal Long Beach, Saber Ent. 213-595-5646
Cal Mountain View, Gado Instr. Sls. 415-961-2222
Conn Hamden, Northeast Engrg. 203-248-4481
Fla Largo, Col-Ins-Co. 305-423-7615
Fla Orlando, Col-Ins-Co. 305-423-7615
Ga Clarkston, Col-Ins-Co. 305-432-7615
Ill Des Plaines, Marsland Assoc. 312-298-2620
Ind Indianapolis, Marsland Assoc. 317-924-3568
Md Randlestown, Beacon North 301-922-1248
Mass Danvers, Northeast Engrg. 617-774-3010
Mich Farmington, Anderson Electrns. 313-476-9161
Minn Minneapolis, Marsland Assoc. 612-545-4481
Mo Kansas City, Marsland Assoc. 816-966-8400
NM Albuquerque, Electronic Entprs. 505-256-3561
NM Las Cruces, Electronic Entprs. 505-524-0126
NY Albany, H. C. Johnson Agencies 518-456-6667
NY Fayetteville, H. C. Johnson Agencies 315-637-9383
NY Manhasset, Northeast Engineer 516-365-9633
NY Rochester, H. C. Johnson Agencies 716-482-3000
NY Williamsville, H.C. Johnson Agencies 716-632-7880
NC Winston-Salem, Col-Ins-Co. 305-423-7615
Ohio Cleveland, Instrumentation Systems 216-486-0782
Ohio Dayton, Instrumentation Systems 513-294-2838
Ore Portland, Topp Engrg. Sls. 503-244-6265
Pa Jenkintown, PDC Corp. 215-887-9610
Pa Pittsburgh, Instrumentation Syst. 412-243-1111
Tex Houston, SESCO-Houston 713-668-9656
Va Falls Church, Beacon North 703-543-7200
Wash Bellevue, Topp Engrg. Sls. 206-747-5400
Wash Richland, Topp Engineering 509-783-7515
Exp: Cal., Los Angeles, Trans-World Trade 213-472-0444

INTERFACE ENGINEERING INC., Dept. EM, 386 Lindelof Ave., Stoughton, Mass. 02072, Tel: 617-344-7383; FSC No.: 14352; Empl.: 18 p. 1648,1649

Local Sales Offices & Reps.

Mass Lynnfield, Grady & Assocs. 617-334-6633
Va Arlington, Gans-Fryling 703-527-3262

INTERLOK, Dept. EM, 770 Airport Blvd., Burlingame, Cal. 94010, Tel: 415-348-5625, TWX: 910-374-2353; Empl.: 30 p. 1037,2423

Sales Manager: F.L. Nelson, Mktg. Mgr.; *Distributor Manager:* B. Loyd

Local Sales Offices & Reps.

Ala Mobile, Hollingsworth & Still 205-344-1641
Ariz Tempe, E.J. Folley & Assoc. 602-894-2345
Ark Little Rock, J.Y. Schoonmaker Co. 501-375-2168
Cal Burlingame, W.J. Purdy Co. 415-347-7701
Cal Los Angeles, Ed Landa Co. 213-879-0770
Cal San Diego, Daniels & Doty Sls. Co. 714-560-6266
Colo Denver, W.J. Purdy Co. 303-777-1411
Conn Meriden, Sturgeon Co. 203-237-1112
Fla Fort Lauderdale, Hollingsworth & Still 305-782-0069
Fla Orlando, Hollingsworth & Still 305-834-2356
Ga Atlanta, Hollingsworth & Still 404-394-3270
Ill Hinsdale, Hill-Gray Assoc. 312-832-4101
Ind Indiaanapolis, Sukup & Cox 317-253-5501
Iowa Marion, Thomas & Modrcin Assoc. 319-377-6261
Kans Shawnee Mission, Thomas & Modrcin Assoc. 913-432-2131
Md Baltimore, S.K. MacDonald 301-254-3380
Mass Needham Hgts, P.R. Sturgeon Co. 617-444-6603
Mich Ferndale, Hilltronics, Inc. 313-398-5556
Minn Minneapolis, S&R Comp Sls 612-544-3022
Mo Hazelwood, Thomas & Modrcin Assoc. 314-895-4700
NJ Bergenfield, Harold Gray Assocs. 201-384-3643
NM Albuquerque, W.J. Purdy Co. 505-266-7959
NY Syracuse, Mar-Com Assocs. 315-437-2843
NC Greensboro, Hollingsworth & Still 919-855-9033
Ohio Richfield, Bear Mktg 216-659-3131
Ohio St. Marys, Thomas Shelby & Co. 419-394-3371
Okla Tulsa, J.Y. Schoonmaker Co. 918-936-1423
Pa Philadelphia, S.K. MacDonald 215-545-1205
Tenn Nashville, Hollingsworth & Still 615-361-8250
Tex Dallas, J.Y. Schoonmaker Co. 214-349-1650
Wash Redmond, Quadra Sls Corp. 206-883-3550

Local Distributors

Ariz Phoenix, Moltronics 602-272-7950
Cal Calabasas, Panel Parts Co. 213-346-8030
Cal Sacramento, Dunlap Elctrns. 916-444-8070
Cal San Diego, Moltronics 714-278-5020
Cal Santa Clara, Moltronics 408-244-7600
Cal Santa Clara, Dynametron 408-246-6530
Cal South Gate, Moltronics 213-773-6520
Cal Sunnyvale, Ratel Elctrns. 408-739-9220
Colo Lakewood, Acacia Sls. 303-232-2880
Fla West Palm Beach, Nurmi Elctrn Supply 305-686-8550
Mass Hingham, Sager Electrical Supply Co. 617-749-6700
Mich Ann Arbor, Wedemeyer Elctrn. Supply Co. 313-665-8610
Minn Minneapolis, Stark Elctrn. Supply Co. 612-332-1320
Mo St. Louis, Olive Indl Electrns 314-426-4500
NJ Bergenfield, Technical Elctrn. Distrs. 201-384-3640
NY Buffalo, Summit Distributors 716-884-3450
Okla Tulsa, Radio, Inc. 918-587-9123
Ore Portland, Dunn Elctrns. 503-285-0210
Pa Philadelphia, Philadelphia Elctrns. 215-568-7400
Tex Houston, Lenert Co. 713-225-1460
Utah Salt Lake City, Calron Elec. Supply 801-487-7450
Va Richmond, Instrument Tech. Rep. 804-275-1430

INTERMATIC, INC., Dept. EM, Intermatic Plaza, Spring Grove, Ill. 60081, Tel: 815-675-2321, Telex: 25-2600, Empl.: 850

Local Sales Offices & Reps.

Ariz Phoenix, T. Geis & Assocs. 602-252-7650
Cal Los Angeles, Intermatic, Inc. 213-627-1500
Cal San Francisco, Keeler, White Co. 415-431-2900
Colo Denver, E.O. Sales 303-778-1900
Fla Coral Springs, T. Fitzgerald 305-561-1950
Ga Atlanta, R. Kolze & Assocs. 404-351-0800
Haw Honolulu, H.H. Sawyer Co. 808-847-1400
Ind Indianapolis, Warble-Purdue & Assoc. 317-632-1400
Iowa Marion, A. Sell & Assocs. 319-377-7300
Kans Shawnee Mission, Stover & Assocs. 913-649-6600
Ky Covington, Bryan, Haley & Hackman 606-291-3800
La New Orleans, United Sls. Assocs. 504-733-8600
Mass Woburn, Yusen Assocs. 617-935-8500
Mich Southfield, Linder Assocs. 313-353-4300
Minn Hamel, Elstad Sales Co. 612-559-4000
Mo Kirkwood, Martin Electrical Sls. 314-966-8600
Neb Omaha, A. Sell & Assoc. 402-572-8700
NJ S. Plainfield, Nash & Cornell 201-756-2400
NM Albuquerque, Maddox Sls. Co. 505-883-6000
NY New Hartford, F.W. Laver & Son 315-724-2300
NC Charlotte, E.F. Lombardi 704-334-1600
Ohio Bedford Heights, Riffle & Assocs. 216-439-5500
Okla Oklahoma City,, Stover & Assocs 405-789-2700
Ore Portland, M.H. Gerrard 503-224-0900
Pa Philadelphia, W.C. Welde & Sons 215-243-1100
Pa Pittsburgh, H.W. Groetzinger Co. 412-322-6200

Tex Dallas, Kissel & Assoc. 214-742-2349
Tex Houston, Kopinitz Co. 713-692-0022
Utah Salt Lake City, J.R. Christensen & Assocs. 801-972-3970
Wash Seattle, Tal Agencies 206-624-3355
Wisc Wauwatosa, G.R. Adams & Assocs. 414-453-7130

ITERNATIONAL COMPS CORP., Dept. EM, 105 Maxess Rd, Melville, N.Y. 11746, Tel: 516-293-1500, TWX: 510-224-6409; Empl.: 100 p. 1155

Distributor Manager: J. De Maria

Local Sales Offices & Reps.
Conn Vernon, G-M Assoc. 203-646-4443
Mass Framingham, G-M Assoc. 617-872-4871
NJ Harrington Park, Metro Technical Sls. 201-768-8495
NY Jericho, Metro Technical Sls. 516-935-3330
NY Syracuse, Nycom 315-437-8343
Pa Philadelphia, Paragon Sls. 215-563-7060
Tex Dallas, United Comps. 214-324-1448

Local Distributors
Conn East Haven, J V Elctrns. 203-469-2321
Conn Westport, Components Plus 203-226-4731
Fla Ft. Lauderdale, NRC, Inc. 305-792-2600
Ind Ft. Wayne, Fort Wayne Elctrns. 219-423-3433
Ind South Bend, Radio Distrs. 219-287-2911
Md Baltimore, Tully Elctrns. 301-788-4200
Mass Newton, Cramer Elctrns. 617-969-7700
Minn Minneapolis, Cassidy Elctrns. 612-835-7746
Mo University City, Olive Elctrn. Supply 314-863-7800
Neb Lincoln, Scott Elctrns. 402-464-8308
NH Concord, Evans 603-224-9961
NY Buffalo, Summit Distrs. 716-884-3450
NY Hauppauge, Components Plus 516-231-9200
NY Jericho, Metro Sls. 516-935-3330
NY Patchogue, T & M
NY Rochester, Masline 716-546-5373
NY Rome, Rome Elctrns. 315-337-5400
NY Syosset, Nasco
Ohio Dayton, Nasco 513-253-8931
Ohio Dayton, Sunray Elctrns 513-253-4114
Okla Tulsa, Radio, Inc. 918-587-9123
Pa Huntingdon Valley, Shap Elctrns. 215-698-9550
Pa Scranton, Pursell 717-346-2011
RI Providence, W. Dandretta & Co. 401-861-2800
Tenn Memphis, Bluff City 901-725-9500
Tenn Memphis, Majestic 901-794-9494
Tex Dallas, KA Elctrn. Sls. 214-634-7870
Tex Houston, Altair Co. 713-462-3029
Utah Salt Lake City, Alta Elctrns. 801-486-7227
Wash Olympia, J & W Elctrns. 206-943-1071
Wisc Mequon, Lakeview Elctrns. 414-377-8250

TERN'L. COMPUTER PRODS., INC., Dept. EM, 2925 Merrell Rd., Dallas, Tex. 75229, Tel: 214-350-6951, Telex: 73-0475; Empl.: 112

Sales Manager: H. S. Hardy, III; *Distributor Manager:* D. Birk

Local Sales Offices & Reps.
Conn Stamford, ICP East Coast Regional Off. 203-327-6263

TERNATIONAL CRYSTAL MFG., Dept. EM, 10 N. Lee St., Oklahoma City, Okla. 73102, Tel: 405-CE 6-3741, TWX: 910-831-3177 p. 2332-2335

TERNATIONAL DATA SCIENCES, Dept. EM, 100 Nashua St., Providence, R.I. 02904, Tel: 401-274-5100, TWX: 710-381-0285; Empl.: 50

Local Sales Offices & Reps.
Ala Huntsville, Col-Ins-Co. 800-327-6600
Alas Anchorage, Transalaska Data Sys 907-344-1141
Ariz Scottsdale, Barnhill Three 602-947-7841
Cal Anaheim, Moxon Elctrns. 714-635-7600
Cal San Diego, Moxon Elctrns 714-292-4820
Cal Santa Clara, Moxon Elctrns 408-249-2491
Colo Denver, Barnhill Three 303-750-1222
Conn Wallingford, IMF Sls. Assocs. 203-265-0215
Fla Orlando, COL-INS-CO. 800-432-4480
Ga Clarkston, COL-INS-CO. 800-327-6600
Ill Rolling Meadows, SEA 312-255-4820
Ind Carmel, SEA 317-846-2591
Md Silver Springs, Terminal Networks 301-622-3535
Mass Wakefield, IMF Sls. Assocs. 617-245-8900
Mich Milford, Milford Sci. 313-685-8912
Minn Minneapolis, SEA 612-425-4455
NJ Cherry Hill, Megargel/Himmelstein Assoc. 609-779-0200
NJ Ridgewood, Instrumentation Sls. Co. 201-445-5210
NM Albuquerque, Barnhill Three 505-299-7658
NY E. Syracuse, Ossmann Instr. 315-437-6666
NY Rochester, Ossmann Instrs 716-328-2230
NY Vestal, Ossman Instrs. 607-785-9947
NC Winston-Salem, Col-Ins-Co. 800-327-6600
NC Winston-Salem, COL-INS-CO. 800-327-6600
Ohio Dayton, Ashby Assocs. 513-252-5627
Ore Portland, Hayes Tech 503-223-7617
Tex Richardson, Barnhill Two 214-231-2573
Utah Salt Lake City, Barhill Three 801-485-8121
Wash Seattle, Hayes Tech 206-763-2210
Wisc Waukesha, SEA 414-547-6637

INTERNATIONAL ELECTRO-MAGNETICS, Dept. EM, 350 N. Eric Dr., Palatine, Ill. 60067, Tel: 312-358-4622; Empl.: 30 p. 1011

Sales Manager: T. Pretto

Local Sales Offices & Reps.
NY New York, United Research Labs 212-751-4660

INT'L. ELCTRN. RESCH., Dept. EM, 135 W. Magnolia Blvd., Burbank, Cal. 91502, Tel: 213-849-2481, TWX: 910-498-2206; FSC No.: 98978; Empl.: 80

Sales Manager: J.S. Smith

Local Sales Offices & Reps.
Ala Huntsville, Murcota Corp. 205-539-8476
Cal Burlingame, J. Logan 415-697-6100
Cal Los Angeles, Ed Landa Co. 213-879-0770
Cal Los Angeles, Ed Landa Co. 213-879-0770
Colo Englewood, Elcom, Inc. 303-770-4400
Fla Clearwater, Lawrence Assocs. 813-443-2698
Fla Maitland, Lawrence Assocs. 305-647-1188
Ill Mt. Prospect, Magnuson 312-956-0700
Kans Leawood, Thunderbird Tech. 913-642-7220
Kans Wichita, Thunderbird Tech. Sls. 316-684-3941
Mass Lexington, Hathaway Elct. 617-861-7010
Mich Pleasant Ridge, Shalco 313-547-4771
Minn St. Paul, Magnuson 612-227-8495
Mo St. Louis, Thunderbird Tech. 314-567-6488
NJ Clifton, Ossman Comps 201-778-8888
NM Albuquerque, Cleveland Entrprs 505-266-5594
NY Bowmansville, Ossman Comps Sls 716-681-9700
NY Huntington, Ossman Comps 516-673-9300
NY Kingston, Ossmann Component Sls. Corp. 914-338-5505
NY Rochester, Ossmann Component Sls. Corp. 716-442-3290
NY Syracuse, Ossmann Component Sls. Corp. 315-454-4477
NY Vestal, Ossmann Component Sls. Corp. 607-785-9949
NC Winston-Salem, Murcota Corp. 919-722-9445
Ohio Centerville, N. Case Assocs. 513-433-0966
Ohio Fairview Park, N. Case Assocs. 216-333-4120
Okla Tulsa, Barry Sls 918-664-8422
Pa Philadelphia, Kenneth B. Erdman Co. 215-224-1833
Pa Pittsburgh, R. F. Clark Co. 412-242-9502
Tex Houston, Barry Sls 713-784-5860
Tex Richardson, Barry Sls 214-234-0255
Utah Salt Lake City, Elcom 801-532-7940
Wash Seattle, F. Jackson Co. 206-523-6300

Local Distributors
Ariz Phoenix, Mirco Elctrn. Distrs. 602-997-6194
Cal Burlingame, Rose Elctrns. 415-348-2740
Cal Los Angeles, Mil-Comm Distrs. 213-478-0525
Colo Denver, Integrated Elctrns 303-534-6121
Colo Englewood, Indl Elctrns 303-771-2636
Conn Norwalk, Park Distrs. 203-853-2011
Fla Clearwater, Lynch Gentry Assocs. 813-443-2697
Ga Atlanta, ACK Radio Supply Co. 404-351-6340
Ill Mt. Prospect, Magnuson Elctrns. 312-956-0700
Md Towson, Jones-Maryland Elctrns. 301-823-5721
Mass Methuen, C & H Elctrns. 603-882-4687
Mass Waltham, Sterling Elctrns. 617-894-6200
Mass West Newton, A. W. Mayer Co. 617-965-1111
Minn St. Paul, Magnuson Elctrns. 612-227-8495
NH Hudson, C & H Elctrns 603-882-4687
NJ Totowa, Diplomat/IPC 201-785-1830
NY Bohemia, Car-Lac Elctrn. Ind'l Sls. 516-567-4200
NY Bowmansville, Ossman Comp Sls 716-681-9700
NY Kingston, Ossman Comp Sls 914-338-5505
NY Rochester, Ossmann Comp. Sls. Corp. 716-442-3290
NY Syracuse, Ossman Comp Sls 315-454-4477
NY Vestal, Ossman Comp Sls 607-785-9949
NY West Hempstead, March Elctrns. 516-486-6511
Ohio Reading, Sheridan Sls. Co. 513-761-5432
Pa Duquesne, Advacom, Inc. 412-469-2601
RI Providence, W. Dandreta & Co. 401-861-2800
Tex Houston, Lenert Co. 713-225-1465
Tex Provo, Omega Elctrns 801-375-4664
Utah Salt Lake City, Kimball Electronics Incorporated 801-328-2075
Wash Seattle, Elwood Inds. 206-523-6300
For: Can., Burlington, Ont., White Radio Ltd. 416-632-6894
For: Can., Montreal, Que., White Radio Ltd. 514-481-0158
For: Can, Vancouver 9, B.C., Bowtek Elec Co 604-736-7677

INTERNATIONAL IDENTIFICATIONS, see Geyer Systems, Inc.

INT'L. INSTRS., Div. Sigma Instrs., Dept. EM, 88 Marsh Hill Rd., Orange, Conn. 06477, Tel: 203-795-4711, TWX: 710-465-2897; Empl.: 275

Distributor Manager: J. Connolly

Local Sales Offices & Reps.
Ala Huntsville, Brandel-Stephens & Co. 205-883-0445
Ariz Tempe, Gassner & Clark 602-968-9037
Cal Burlingame, Engrg. Rep. Co. 415-692-2581
Cal Los Angeles, Barnard & Assocs. 213-973-5050
Cal San Diego, Engrg. Rep. Co. 714-565-6366
Colo Englewood, Tech Sls. 303-761-9710
Fla Deerfield Beach, Brandel-Stephens & Co. 305-427-8558
Fla Orlando, Brandel-Stephens & Co. 305-425-3202
Ga Atlanta, Brandel-Stephens & Co. 404-261-7579
Ill Chicago, Memeco Sls. & Svc. 312-774-0919
Iowa Cedar Rapids, Gassner & Clark 319-393-5763
Kans Shawnee Mission, Tech. Sls. Assoc. 913-888-3330
La Harahan, Williams Equipment Co. 504-737-4082
Md Glen Burnie, New Era Sls. 301-768-6666
Mass Needham Heights, Northeast Reps. 617-449-3093
Minn Wayzata, Yukon Sls. Assocs. 612-473-3274
Mo Ferguson, Tech. Sls. Assocs. 314-725-5361
NJ Stirling, NBS Assocs. 201-464-8500
NY Fayetteville, H.C. Johnson Agencies 315-637-9383
NY Rochester, H.C. Johnson Agencies 716-482-3000
NY Williamsville, H.C. Johnson Agencies 716-632-7880
NC Charlotte, D.G.W., Inc. 704-334-7090
NC Winston Salem, D.G.W., Inc. 919-768-7166
Ohio North Olmsted, Advanced Tech. Assocs. 216-777-8010
Okla Tulsa, Telstar Instr. Corp. 918-628-1011
Ore Portland, Garland Affolter Engr. 503-223-7349
Pa Glenshaw, H.C. Johnson Agencies 412-961-0414
Pa Paoli, Stitzer Assocs. 215-644-5500
Tex Houston, Wilson-Markham Assoc. 713-445-5780
Wash Kirkland, Garland Affolter Engr. 206-822-2275

Local Distributors
Ariz Phoenix, Metermaster 602-243-411
Cal Los Angeles, E.I.L. Instrs. 213-685-7020
Cal Los Angeles, Metermaster 213-685-4340
Cal Palo Alto, Metermaster 415-968-0313
Cal San Diego, Metermaster 714-560-4841
Cal Santa Clara, Dynametron 408-246-6535
Colo Denver, Metermaster Instr. Corp. 303-722-5766
Conn Middletown, Mancib Co. 203-346-6646
Ill Bridgeview, E.I.L. Instrs. 312-430-2292
Ind Indianapolis, E.I.L. Instrs. 317-545-1373
Kans Wichita, Main Elctrns. 316-267-3581
La Harahan, Ind. Instr. Works 504-733-8355
Md Timonium, E.I.L. Instrs. 301-252-1260
Mass Burlington, Mancib Co. 617-272-9450
Mich Ferndale, Ram Meter 313-398-6767
Minn Minneapolis, Control Assemblies Co. 612-544-3364
NY Clarence, Trott Elctrns. 716-634-8500
NY Long Island City, Metermod Instr. Corp. 212-726-4850
Ohio Cleveland, Weschler Electric. 216-251-4606
Ohio Dayton, E.I.L. Instrs. 513-435-2134
Pa Philadelphia, Sunshine Scientific 215-673-5600
Pa Pittsburgh, E.I.L. Instrs. 412-731-5230
Pa Pittsburgh, Cam/Rpc Co. 412-782-3770
Tex Garland, Meter Master 214-271-5671
Tex Houston, Meters & Instr. 713-644-1631
Wash Seattle, Eicher Richards 206-523-7888

INTERNATIONAL MFG SVCS INC., Dept. EM, 50 Schoolhouse La, Portsmouth, R.I. 02871, Tel: 401-683-9700 ..... p. 3700

Sales Manager: J. P. Earabino

Local Sales Offices & Reps.

Cal	Los Altos, PM Sales	415-941-4444
Cal	Los Angeles, Corcoran Assocs	213-823-4589
Cal	Westminister, Corcoran Assocs	714-893-4670
Md	Reisterstown, FBD Sales	301-833-9444
Mass	Needham, Hatch Assocs	617-444-3310
Mo	Kansas City, K-Mar	816-763-5385
NJ	Flanders, K&R Engrg & Sls Co	800-452-9767
NY	New York, K&R Engrg & Sls Co	800-631-9362
NC	Carx, FBD Sls	919-476-7595
Pa	Malvern, K&R Engrg & Sls Co	800-631-9362
RI	Portsmouth, IMS	401-683-9700
SC	Mauldin, FBD Sls	803-288-2323
Va	Portsmouth, FBD Sls	804-484-3162
Wash	Seattle, Blum & Assocs	206-285-2590

INTERNATIONAL POWER MACHINES CORP., Dept. EM, 3328 Executive Blvd., Box 724, Mesquite, Tex. 75149, Tel: 214-288-7501, Telex: 73-0992; Empl.: 104

Sales Manager: J. Donovan

Local Sales Offices & Reps.

Ala	Birmingham, C.S. Phillips Co.	205-870-0640
Ariz	Scottsdale, BFA Corp.	602-994-5400
Cal	Emeryville, Ingalls & Assoc.	415-658-5622
Cal	La Jolla, Wheelock Assoc.	714-454-3473
Cal	Los Angeles, Int'l. Power Machines	714-963-0749
Cal	Sierra Madre, Ontare Sls. Co., Inc.	213-359-1516
Colo	Denver, BFA Corp.	303-837-1247
DC	Washington, Compower	202-547-1325
Fla	Maitland, Rowe Engrg. Sls., Inc.	305-834-2700
Fla	St. Petersburg, Rowe Engrg. Sls., Inc.	813-522-6317
Ga	Dunwoody, General Tech. Reps. Inc.	404-455-1319
Ill	Schaumburg, Tech-Sys.	312-830-0060
La	Chalmette, Stored Power Sys	504-271-4138
Mass	Concord, R.D.S. Assocs.	617-263-1128
Mich	Brighton, Lowry & Assoc., Inc.	313-227-7067
Mich	Royal Oak, Satullo Co.	313-549-3910
Minn	Chanhassen, Professional Mktg. Svcs.	612-474-5939
Mo	St. Louis, Richter Assocs.	314-567-1829
NJ	Passaic Park, ABC Marketing	201-779-8342
NJ	Upper Montclair, D. Cunningham	201-783-4647
NM	Albuquerque, BFA Corp.	505-292-1212
NM	Las Cruces, BFA Corp.	505-523-0601
NY	Bay Shore, Frank E. Klaus	516-968-8544
NY	New York, Hank Zebrowski	201-746-9002
NY	Rochester, Ronco, Inc.	716-442-7900
NY	Town of Tonawanda, Ronco, Inc.	716-873-0760
NC	Charlotte, Purser, London & Edwards	704-333-7549
Ohio	Cleveland, Lowry & Assoc.	216-464-8113
Ohio	Dayton, Lowry & Assoc.	513-435-4795
Ore	Portland, Ingalls Engrg. Co.	503-232-7487
Pa	Camp Hill, Variable Electric Prods	717-737-1675
Pa	Fort Washington, Variable Electric Products Co.	215-884-5375
Pa	Pittsburgh, Muller Harper, Inc.	412-931-6460
Pa	Wescoville, Variable Electric Prods	215-395-4781
Tex	Dallas, Geddys-Eads-Adair	214-233-0337
Tex	Houston, L.P. Spencer & Assocs.	713-944-9291
Tex	Richardson, Tech. Plan Inc.	214-690-1994
Utah	Salt Lake City, BFA Corp.	801-466-6522
Wisc	Milwaukee, Kirchmayer-Seidel Co.	414-462-3512

INTERNATIONAL RECTIFIER CORP., Semiconductor Div., Dept. EM, 233 Kansas St., El Segundo, Cal. 90245, Tel: 213-678-6281, TWX: 910-348-6291; Empl.: 1200 ..... p. 3926-3928

Sales Manager: W. Lewis; *Distributor Manager:* D. Prescott

Local Sales Offices & Reps.

Alas	Anchorage, H.J. Lang & Assoc.	907-279-5741
Ariz	Phoenix, Shefler-Kahn Co.	602-257-9015
Cal	El Segundo, Varigon Assocs	213-322-1120
Cal	El Segundo, Int'l. Rectifier	213-678-2181
Cal	San Diego, Harvey King	714-566-5252
Cal	Santa Clara, Thomas Assocs.	408-247-1252
Colo	Denver, Parker-Webster	303-751-2600
Fla	Ft. Lauderdale, International Rectifier	305-566-5885
Ill	Des Plaines, Int'l. Rectifier	312-299-7181
Ind	Greenwood, Valentine & Assoc.	317-888-2260
Iowa	Cedar Rapids, Seltec Sls. Corp.	319-393-1114
Kans	Lenexa, Palatine Sls, Inc.	913-492-7020
Md	Towson, International Rectifier	301-296-0086
Mass	Lexington, Int'l. Rectifier	617-861-1820
Mass	Lynnfield, The Orion Group	617-245-5220
Mich	Livonia, Int'l. Rectifier	313-477-3131
Minn	Edina, Int'l. Rectifier	612-831-6400
Mo	Hazelwood, Int'l. Rectifier	314-895-3400
NJ	Palisades Park, Int'l. Rectifier	201-943-4554
NM	Albuquerque, Shefler-Kahn Co.	505-296-0749
NY	Buffalo, R.W. Mitscher Co.	716-633-7970
NY	Melville, Astrorep Inc.	516-423-2266
NY	New York, Int'l. Rectifier	212-695-5352
NC	Charlotte, Int'l. Rectifier	704-372-9190
Ohio	Cleveland, Int'l. Rectifier	216-261-2135
Ohio	Kettering, Int'l. Rectifier	513-299-2635
Ore	Beaverton, Vantage Corp.	503-646-3466
Pa	Pittsburgh, Intl Rectifier	412-367-2720
Tenn	Shelbyville, R.W. Mitscher Co.	615-684-2223
Tex	Arlington, W. Pat Fralia Co.	817-640-9101
Tex	Houston, W. Pat Fralia Co.	713-772-1572
Utah	Salt Lake City, Parker-Webster	801-487-5911
Wash	Bellevue, Vantage Corp.	206-455-3460
Wisc	Brookfield, Int'l. Rectifier	414-784-2480

Local Distributors

Ala	Huntsville, Hall-Mark Elctrns.	205-837-8700
Ala	Huntsville, Powell Elctrns.	205-539-2731
Ariz	Phoenix, Kierulff Elctrns.	602-243-4101
Cal	Inglewood, Newark Elctrns.	213-678-0441
Cal	Irvine, Schweber Elctrns.	714-556-3880
Cal	Los Angeles, Kierulff Elctrns.	213-725-0325
Cal	Los Angeles, RPS Elctrns.	213-748-1271
Cal	Mountain View, Abacus	415-961-1500
Cal	Mountain View, Time NOR/Cal Elctrns.	415-965-8000
Cal	Oakland, Brill Elctrns.	415-834-5888
Cal	Palo Alto, Kierulff Elctrns.	415-968-6292
Cal	San Diego, Intermark Elctrns.	714-279-5200
Cal	San Diego, Kierulff Elctrns.	714-278-2112
Cal	Santa Ana, Intermark Elctrns.	213-436-5275
Cal	Sunnyvale, Intermark Elctrns.	408-738-1111
Cal	Torrance, Time Elctrns.-West	213-320-0880
Colo	Denver, Kierulff Elctrns.	303-371-6500
Colo	Denver, Newark Elctrns.	303-SK7-3351
Conn	Danbury, Schweber Elctrns.	203-792-3500
Conn	Hamden, Wilshire Elctrns.	203-281-1166
Fla	Ft. Lauderdale, Hall-Mark Elctrns.	305-971-9280
Fla	Hollywood, Schweber Elctrns.	305-927-0511
Fla	Miami, Powell Elctrns.	305-592-3260
Fla	Orlando, Hall-Mark Elctrns.	305-855-4020
Ga	Atlanta, Schweber Elctrns.	404-449-9170
Ill	Chicago, Newark Elctrns.	312-638-4411
Ill	Chicago, Semiconductor Specialists	312-279-1000
Ill	Elgin, Allied Elctrns.	312-697-8200
Ill	Elk Grove, Schweber Elctrns.	312-593-2740
Ill	Elk Grove Village, Hall-Mark Elctrns.	312-437-8800
Ill	Skokie, Bell Inds.	312-982-9210
Ind	Fort Wayne, Fort Wayne Elctrns.	219-423-3422
Ind	Indianapolis, Graham Elctrns.	317-634-8202
Kans	Overland Park, Hall-Mark Elctrns.	913-888-4747
Md	Baltimore, Hall-Mark Elctrns.	301-796-9300
Md	Rockville, Schweber Elctrns.	301-881-3300
Md	Rockville, Wilshire Elctrns.	301-340-7900
Mass	Burlington, Wilshire Elctrns.	617-272-8200
Mass	Waltham, Schweber Elctrns.	617-890-8484
Mich	Troy, Schweber Elctrns.	313-583-9242
Minn	Eden Praire, Schweber Elctrns.	612-941-5280
Minn	Minneapolis, Hall-Mark Elctrns.	612-884-9056
Minn	Minneapolis, Stark Elctrns.	612-332-1325
Mo	Earth City, Hall-Mark Elctrns.	314-291-5350
Mo	Saint Louis, Olive Elctrns.	314-863-7800
NJ	Cinnaminson, Wilshire Elctrns.	609-786-8990
NJ	Clifton, Wilshire Elctrns./N.J.	201-340-1900
NJ	Somerset, Schweber Elctrns.	201-469-6008
NY	Buffalo, Summit Distrs.	716-884-3450
NY	Endwell, Wilshire Elctrns.	607-754-1570
NY	Farmingdale, Arrow Elctrns.	516-694-6800
NY	Farmingdale, Wilshire Elctrns.	516-293-5775
NY	Freeport, Milgray/N.Y.	516-546-6000
NY	Rochester, Rochester Radio Supply	716-454-7800
NY	Rochester, Schweber Elctrns.	716-461-4000
NY	Westbury, Schweber Elctrns.	516-334-7474
NC	Raleigh, Hall-Mark Elctrns.	919-832-4465
Ohio	Beachwood, Schweber Elctrns.	216-464-2970
Ohio	Cleveland, Arrow Elctrns.	216-464-2000
Ohio	Dayton, Esco Elctrns.	513-226-1133
Okla	Tulsa, T.I. Supply	918-582-8272
Okla	Tulsa, Hall-Mark Elctrns.	918-835-8458
Ore	Portland, United Radio Supply	503-233-5346
Pa	Erie, Mace Elctrns.	814-838-3517
Pa	Horsham, Schweber Elctrns.	215-441-0600
Pa	Huntington Valley, Hall-Mark Elctrns.	215-672-0920
Pa	Philadelphia, Almo Elctrns.	215-698-4000
Pa	Philadelphia, Powell Elctrns.	215-365-1900
Pa	Pittsburgh, CAM/RPC Elect.	412-782-3770
Tex	Dallas, Schweber Elctrns.	214-661-5010
Tex	Dallas, Hall-Mark Elctrns.	214-231-5101
Tex	Dallas, T.I. Supply	214-238-6971
Tex	Houston, Harrison Equip.	713-652-4700
Tex	Houston, Hall-Mark Elctrns.	713-781-6100
Tex	Houston, T.I. Supply	713-777-6011
Tex	Houston, Schweber Elctrns.	713-784-3600
Wash	Tukwila, Kierulff Elctrns.	206-575-4420
WVa	Charleston, McJunkin Corp.	304-348-4907
Wisc	Milwaukee, Marsh Elctrns.	414-475-6000
Wisc	West Allis, Hall-Mark Elctrns.	414-476-1270

INTERNATIONAL SENSOR SYSTEMS, INC., Dept. EM, Aurora Industrial Pk., Box 345, Aurora, Neb 68818, Tel: 402-694-6111; Empl.: 45

Local Sales Offices & Reps.

Ariz	Scottsdale, Aztech Sls. Co.	602-994-5685
Cal	Los Angeles, Mission Mktg. Grp.	714-833-1805
Cal	Millbrae, Ashby Assocs. of N. Cal.	415-692-4443
Colo	Denver, R. W. Masterson Co.	303-771-1485
Fla	Coral Springs, H. A. Inc.	305-463-1600
Ill	Des Plaines, Electro-Comp Sls.	312-297-1455
Ind	Columbus City, TekRep Sales	219-482-2191
Iowa	Cedar Rapids, Dy-Tronix	319-377-8200
Mass	Lynnfield, Grady & Assocs.	617-334-6630
Minn	Minneapolis, R-J Inc.	612-922-1420
Mo	Hazelwood, Dy-Tronix	314-731-5790
Mo	Independence, Dy-Tronix	816-737-6600
Tex	El Paso, Nokomis Consumer Prods.	915-778-2800
Tex	Lewisville, Jim Hughes Co	817-430-1680
Wash	Tukwila, General Elctrns.	206-575-4030

INTERNATIONAL WIRE PRODUCTS CO., Dep EM, 500 W. Main St., Wyckoff, N.J. 07481, Te 201-891-5800, TWX: 710-988-5839; FSC No 201-891-5800

Sales Manager: C. D. Abbott

INTERSIL, INC., Dept. EM, 10900 N. Tantau Ave Cupertino, Cal. 95014, Tel: 408-996-5000, TW 910-338-0228; FSC No.: 32293; Empl.: 2292

Local Sales Offices & Reps.

Ala	Huntsville, K + E Assocs	205-883-972
Ariz	Phoenix, Shefler-Kahn Co.	602-257-901
Cal	Carson, Intersil Inc.	213-532-354
Cal	Cupertino, Intersil, Inc.	408-984-217
Cal	San Diego, Daniels & Doty Sls. Co.	714-560-629
Cal	Sunnyvale, Intersil, Inc.	408-744-06
Colo	Denver, Parker Webster	303-751-26
Fla	Casselberry, E.I.R. Inc.	305-830-96
Fla	Ft. Lauderdale, Intersil	305-772-41
Ill	Franklin Park, Dekotech, Inc.	312-455-51
Ill	Hinsdale, Intersil Inc.	312-986-53
Ind	Ft. Wayne, Delesa Sls.	219-483-95
Ind	Indianpolis, Delesa Sls.	317-894-37
Iowa	Cedar Rapids, Dy-Tronix	319-377-82
Md	Glen Bernie, New Era Sls. Inc.	301-768-66
Mass	Lexington, Intersil, Inc.	617-861-62
Mass	Waltham, Carlisle Techn Sls	617-890-14
Mich	Livonia, Giesting & Assoc.	313-348-90
Minn	Minneapolis, Intersil, Inc.	612-925-18
Miss	Corinth, K + E Assocs	601-287-14
Mo	Hazelwood, Dy-Tronix	314-731-57
Mo	Independence, Dy-Tronix	816-737-11
NJ	Cherry Hill, Barrett Assocs.	609-429-15
NJ	Englewood Cliffs, Intersil, Inc.	201-567-55
NM	Albuquerque, Shefler-Kahn Co.	505-265-70
NY	Endicott, Intersil, Inc.	607-754-74
NY	Syracuse, Nycom, Inc.	315-437-83
NC	Raleigh, B. T. Funderburk	919-782-34
Ohio	Chagrin Falls, Crest Component Sls.	513-851-78
Ohio	Cincinnati, Giesting & Assoc.	216-621-42
Ohio	Cleveland, Giesting & Assocs.	513-278-48
Ohio	Dayton, Intersil, Inc.	513-293-40
Ohio	Dayton, Giesting & Assocs.	419-468-37
Ohio	Galion, Giesting + Assocs	503-649-85
Ore	Beaverton, LD Elctrns.	214-387-24
Tex	Dallas, Southern State Mkt.	214-387-09
Tex	Dallas, Intersil Inc.	713-665-09
Tex	Houston, Southern Sate Mkt.	801-261-10
Utah	Salt Lake City, Parker Webster	206-485-73
Wash	Woodenville, LD Elctrn.	

INTERSTATE ELECTRONICS, Dept. EM, Box 31 Anaheim, Cal. 92803, Tel: 714-772-2811, 635-72 TWX: 655443, 910-591-1197; Empl.: 1700 p. 2760,2

Sales Manager: C. Engle

Local Sales Offices & Reps.
Ala Huntsville, Lee Assocs 205-533-5896
Ariz Scottsdale, Barnhill III 602-947-7841
Cal Costa Mesa, Meas. Assocs. 714-540-7160
Cal Sunnyvale, Amasco 408-733-8690
Colo Denver, Barnhill III 303-750-1222
Conn Hamden, J & J Assoc. 203-624-7800
Fla Winter Haven, Lee Assocs 813-294-5815
Ill Elk Grove Village, Loren Green Assoc. 312-593-0282
Ind Indianapolis, Loren Green Assoc. 317-293-9827
Md Burtonsville, Eastern Instrumentation 301-384-8500
Mass Burlington, J & J Assocs. 617-272-2606
Minn Minneapolis, Loren Green Assoc. 612-781-1661
NJ Cedar Grove, KLS Assocs., Inc. 201-785-4450
NM Albuquerque, Barnhill III 505-299-7658
NY Syracuse, Labtronics, Inc. 315-454-9314
NC Raleigh, Lee Assocs 919-787-5818
Ohio Richmond Heights, Bradcor 216-692-0881
Pa Melrose Park, R. Meyers Assoc. 215-224-1663
Tex Austin, Barnhill II 512-451-0217
Tex Houston, Barnhill II 713-688-9971
Tex Richardson, Barnhill II 214-231-2573
Wash Bellvue, Tasco 206-453-1414

Local Distributors
For: Australia, Crows Nest, NSW, Parameters Pty. Ltd. 02-439-3288
For: Australia, Victoria, Parameters Pty. Ltd. 90-7444
For: Austria, Vienna, Ing. Otto Folger Elektronische Gerate Ges M.B.H. 65/4503
For: Belgium, Bruxelles, Regulation-Mesure S.P.R.L. 771-20-20
For: Can., Downsview, Ont, Radionics Ltd 416-638-0218
For: Can., Montreal, Que, Radionics Ltd 514-735-4565
For: Can., Ottawa, Ontario, Radionics Ltd 613-521-8251
For: Can., Vancouver, B.C., Radionics Ltd 604-732-7317
For: Can., Winnipeg, Man, Radionics Ltd. 204-475-1732
For: Denmark, Golstrup, ITT Instruments .. 02451822
For: England, Hitchin, Hertfordshire, R.E.L. Equip. & Components Ltd. ..... Hitchen (0462) 57181
For: Finland, Helsinki, Havulinna Oy .... (90) 661-451
For: France, Sevres, Tekelec Airtronic 027-7535
For: Israel, Tel-Aviv, Radat International Co., Ltd. 483211-5
For: Italy, Milano, Tekelec Airtronic spa 02-7380641
For: Netherlands, Amsterdam, Tekelec Airtronic N.V. 020-928766/67
For: New Zealand, Auckland, David J. Reid (N.Z.) Ltd. 492-189
For: Norway, Oslo, Scancopter A.S. 02-69-44-90
For: Poland, Warsaw, Unitronix Corp 33-18-46
For: So. Africa, Booysens, Johannesburg, S'Electronics (Pty) Ltd. 838-2169
For: Spain, Madrid, Unitronics, S.A. 242-5204
For: Sweden, Vallingby, M. Stenhardt AB08/739 0050
For: Switzerland, Zurich, Traco Trading Co., Ltd.01/ 360711
For: W. Germany, Muenchen, Neumuller Messtechnik GMBH ..... Munich 089-6118-1

ITERSWITCH, Dept. EM, 770 Airport Blvd., Burlingame, Cal. 94010, Tel: 415-347-8217, TWX: 910-374-2353; Empl.: 30 ..... p. 4082-4085

Sales Manager: F. Nelson Mktg. Mgr.; *Distributor Manager:* B. Loyd

Local Sales Offices & Reps.
Ala Huntsville, Cartwright & Bean 205-533-3509
Ariz Tempe, E.J. Foley & Assoc. 602-894-2345
Ark Little Rock, J.Y. Schoonmaker .. 501-375-2168
Cal Burlingame, W.J. Purdy Co. 415-347-7701
Cal Los Angeles, Ed Landa Co. 213-879-0770
Cal San Diego, Daniels & Doty Sls. Co. 714-560-6266
Colo Denver, W.J. Purdy Co. 303-777-1411
Conn Meriden, Sturgeon Co. 203-237-1112
Fla Ft. Lauderdale, Cartwright & Bean 305-791-3989
Fla Orlando, Cartwright & Bean 305-422-4531
Ga Atlanta, Cartwright & Bean 404-255-5262
Ill Hinsdale, Hill-Gray 312-832-4101
Ind Indianapolis, Sukup & Cox 317-253-5501
Iowa Marion, Thomas & Modrcin Assocs. 319-377-6261
Kans Shawnee Mission, Thomas & Modrcin Assocs. 913-432-2131
Md Baltimore, S.K. MacDonald 301-254-3380
Mass Needham Hgts, P. Sturgeon Co. 617-444-6603
Mich Ferndale, Hilltronics Inc. 313-398-5556
Minn Minneapolis, HMR, Inc. 612-831-7400
Miss Jackson, Cartwright & Bean 601-981-1368
Mo Hazelwood, Thomas & Modrcin Assocs. 314-895-4700
NJ Bergenfield, H. Gray Assoc. 201-384-3643
NM Albuquerque, W. J. Purdy Co. 505-266-7959
NY Syracuse, Mar-Com Assocs. 315-437-2843
NC Charlotte, Cartwright & Bean 704-337-5673
NC Raleigh, Cartwright & Bean Co. 919-781-6560
Ohio Richfield, Bear Mktg. 216-659-3131
Okla Tulsa, J.Y. Schoonmaker Co. 918-936-1423
Pa Philadelphia, S.K. MacDonald 215-545-1205
Tenn Knoxville, Cartwright & Bean 615-693-7450
Tenn Memphis, Cartwright & Bean 901-276-4442
Tex Dallas, J. Schoonmaker 214-349-1650
Wash Redmond, Quadra Sls Corp. 206-883-3550

Local Distributors
Ariz Phoenix, Moltronics 602-272-7951
Cal Los Angeles, Fisher/Brownell 213-532-2170
Cal San Diego, Moltronics 714-278-5020
Cal Santa Clara, Moltronics 408-244-7600
Cal Santa Clara, Fisher/Brownell 408-244-6182
Cal S. Gate, Moltronics 213-773-6521
Colo Denver, Elctrn. Parts Co. 303-744-1992
Fla Fort Lauderdale, Peerless Radio Corp. 305-566-5966
Ill Broadview, L Comp-Chicago 312-865-7600
Mass Lynn, Land Elctrn. Supply Co. 617-592-2220
Mich Livonia, RS Elctrns. 313-525-1155
Mo St. Louis, Olive Indl Elctrns 314-426-4500
NJ Bergenfield, Technical Elctrn. 201-384-3643
NY Buffalo, Summit Distrs. 716-884-3450
NY Rochester, Summit Distrs. 716-334-8110
NC Winston-Salem, Kirkman Elctrns. 919-722-9131
Ohio Cincinnati, Hughes-Peters, Inc. .. 513-351-2000
Ohio Columbus, Hughes-Peters, Inc. .. 614-294-5351
Okla Tulsa, Oil Capitol Elctrns. Corp. 918-622-8520
Ore Portland, Dunn Elctrns. 503-285-0214
Tex Houston, Harrison Equip. Co. 713-652-4750
Utah Salt Lake City, Calron Elect. Supply 801-487-7451
Wisc Mequon, Taylor Electric Co. 414-241-4321

INTRONICS INC., Dept. EM, 57 Chapel St., Newton, Mass. 02158, Tel: 617-332-7350, TWX: 710-335-6835; Empl.: 65

Sales Manager: R Sahaheeny

Local Sales Offices & Reps.
Ariz Tempe, Sedco Sls 602-968-7791
Cal Los Altos Hills, Hoeke-Resser Assoc 415-941-4080
Colo Parker, Technology Mktg Assoc 303-841-3435
Conn Newtown, TPW Co 203-426-0240
Ill Des Plaines, Coombs Assocs 312-298-4830
Iowa Davenport, Ensco Rep 319-386-6600
Kans Overland Park, Ensco-Rep. 913-381-7557
Md Lithicum Hgts, KD Assocs 301-636-1151
Mass Littleton, Hybricon Sls Mfg Rep.. 617-486-3174
Minn New Brighton, TWC Sales 612-636-1770
Mo St. Louis, Ensco-Rep. 314-567-3935
NM Albuquerque, Ron-Tek 505-299-4124
NY Jericho, J-Square Mktg. 516-997-6210
Ohio Vandalia, Walter J. Braver & Assoc 513-898-1224
Ohio Wickliffe, Walter J. Braver & Assoc 216-943-0601
Pa Berwyn, Tucker Assoc 215-644-0142
Tex Richardson, Scientific Sls 214-231-6541

INVINCIBLE GEAR CO., Dept. EM, 14938 Telegraph Rd., Detroit, Mich. 48239. Tel: 313-533-7524; Empl.: 25

IPAC GROUP, INC., Dept. EM, POB 156 3047 Industrial Blvd., Bethel Park, PA 15102, Tel: 412-831-9200, TWX: 510-697-3935

Sales Manager: D. T. Cusack

Local Sales Offices & Reps.
Ala Huntsville, Scientific Instrus 205-533-6880
Cal San Diego, IPAC Group 714-484-0609
Ohio Cleveland, Dietrich & Assocs 216-781-1855
Pa Fort Washington, Parr Engrg Assocs 215-643-7515
Tex Dallas, Remtek 214-387-2855

IRCON INC., Dept. EM, 7555 N. Linder Ave, Skokie, Ill. 60076, Tel: 312-967-5151, Telex: 72-4412; Empl.: 60

Local Sales Offices & Reps.
Ala Huntsville, Burnette Techno-Metrics 205-837-5860
Ariz Scottsdale, J.T. Aldrich Co. 602-945-8598
Cal Costa Mesa, Robinson Tech. Assoc. 714-557-1622
Cal San Diego, R. Brainard Co. 714-274-1333
Cal San Mateo, Ircon, Inc. 415-348-0122
Colo Lakewood, Intermountain Instrs. 303-237-0444
Ill Chicago, Thermo/Cense 312-792-2761
Ind Mishawaka, Engrd Sls Div. Quinvest 219-255-5111
La New Orleans, Mid-South Sls. 504-822-3030
La Shreveport, JDJ Sls. 318-865-2393
Mass Framingham, J.M. Lancaster Co. 617-873-8893
Mass Pittsfield, Ircon, Inc. 413-445-4016
Mich Troy, George R. Peters Assocs. 313-362-1220
Minn Minneapolis, Arjay Sls. 612-854-4972
Mo Kansas City, Boschert & Northcutt 816-561-4050
Mo St. Louis, Floyd Gilliam Assocs .. 314-961-5555
NJ Englewood, Scientific Devices-East 201-871-3916
NY Rochester, Ferrotherm 716-461-5270
NC Matthews, Datatech, Inc. 704-847-4464
Ohio Cincinnati, Schlemmer Assoc. 513-522-8340
Ohio Grafton, A. Risser Co. 216-458-5091
Okla Tulsa, Olson Engrg. Co. 918-742-3720
Ore Portland, Sea-Port Controls 503-283-1950
Pa Glenside, Elcom, Inc. 215-885-1715
Pa Pittsburgh, Weiss Instrs. 412-371-3020
Tenn Memphis, Combustion & Controls Co. 901-525-7402
Tex Houston, JD Inds. 713-468-8087
Utah Salt Lake City, Weidner & Assocs 801-328-3205
Va Richmond, Commonwealth Controls Co. 804-358-5700
Wash Edmonds, Sea-Port Controls 206-775-2580
Wisc Wauwatosa, T. R. Bickler Assocs. 414-453-3772

IRD MECHANALYSIS, INC., Dept. EM, 6150 Huntley Rd., Columbus, Ohio 43229, Tel: 614-885-5376, Telex: 24-5318; Empl.: 250

Local Sales Offices & Reps.
Cal Lafayette 415-283-2065
Cal Tustin 714-838-3446
Ga Atlanta 404-237-4875
Ill Hillside 312-449-0488-89
La Baton Rouge 504-272-0355
Mich Belleville 313-483-2323
Mo St. Louis 314-644-4691
NY New York City 212-687-6754
NY Williamsville 716-632-6699
Pa Rosemont 215-477-0922
Pa Verona 412-795-1606
Tex Arlington 214-352-8312
Tex Houston 713-921-2145

IRISH MAGNETIC RECORDING TAPE, Dept. EM, 270-78 Newtown Rd., Plainview, N.Y. 11803, Tel: 516-293-5582, Telex: 96-7880; Empl.: 17

Sales Manager: G. Krug

Local Sales Offices & Reps.
Ala Pell City, Maitland K. Smith 205-884-1278
Cal Sausalito, Roy Colen Sls 415-332-6181
Cal Van Nuys, Mike Roth Sls. of Cal. 213-989-3738
Colo Denver, Mountain Reps. 303-988-6430
Fla Margate, Florida Elect. Sls. 305-972-0800
Ga Marietta, Maitland K. Smith 404-971-2831
Ga Tucker, Maitland K. Smith 404-938-7161
Ill Skokie, Mike Bermann Sls. 312-675-3740
Ind Indianapolis, Frank McSweeney & Assoc. 317-849-5726
Mich Livonia, Harvey Sls. 313-476-1974
Minn Maple Grove, R.C. Sls. 612-425-5543
NY No. Bellmore, Keller & Assoc. 516-785-2826
NY Skaneateles, Leahy & Thomson 315-685-8122
NC Charlotte, Maitland K. Smith, Inc. 704-372-1026
Pa Willow Grove, R. Lewis Sls. 215-659-0704
Tex Richardson, Campion Sls 214-238-8195
Wash Seattle, Northmar Inc. 206-524-5170
Exp: Plainview, N.Y., Morhan Exporting Corp. 516-293-5582

ISC MAGNETICS DIV., See Aeroflex Labs, Inc. Magnetic Prods Div.

ISKRA, See ISL Products Ltd. (ISKRA)

ISL PRODUCTS LTD. (ISKRA), Dept. EM, 50 Werman Ct., Plainview, N.Y. 11803, Tel: 516-694-2686; Empl.: 25,000 ..... p. 1152-1154,3701,3929

Sales Manager: J. Kawaller, Pres.

Local Sales Offices & Reps.
Cal Santa Ana, Lew Brooks Co. 714-544-8900
Fla Orlando, Publicover Assocs. 305-898-9361
Ill Chicago, Minitron Inc. 312-774-6815

Md Pikesville, Muncy Sls. 301-484-6376
Mass Wollaston, RFC Assocs. 617-472-4234
Tex Dallas, McReynolds Assocs. 214-422-2012
Local Distributors
Ill Des Plaines, Edmar Elctrns. Co. 312-298-8580
NY Bohemia, ADI Elctrns. 516-567-3555
Tex Dallas, McReynolds Elctrn. Sls. 214-422-2012

ISOCHEM RESINS CO., Dept. EM, 99 Cook St., Lincoln, R.I. 02865, Tel: 401-723-2100; Empl.: 26

ISOTEMP RESEARCH INC, Dept. EM, 711 Henry Ave, Charlottesville, VA. 22901, Tel: 804-295-3101; FSC No.: 031785 ..... p. 2337

ITEK CORP. MEAS. SYS. DIV., Dept. EM, Christina St., Newton, Mass. 02161, Tel: 617-969-7300, TWX: 710-335-6783; Empl.: 100 ..... p. 1655
Local Sales Offices & Reps.
Cal Los Angeles, Measurement Sys: Div. 213-641-8251
Colo Denver, BFA Corp 303-837-1247
Fla Orlando, K.S. Chaney, Inc. 305-423-9465
Ill Des Plaines, Marsland Assocs. Inc. 312-298-2620
Ind Indianapolis, Marsland Assocs. Inc. 317-924-3568
Minn Minneapolis, Marsland Assocs. Inc. 612-545-4481
Mo Kansas City, Marsland Assocs... 816-966-8400
NJ Union, Measurement Sys. Div..... 201-964-3000
NM Albuquerque, BFA Corp 505-292-1212
NM Las Cruces, BFA Corp 505-523-0601
Utah Salt Lake City, BFA Corp..... 801-466-6522

ITHACO, INC., Dept. EM, 735 W. Clinton St., Ithaca, N.Y. 14850, Tel: 607-272-7640, TWX: 510-255-9307; Empl.: 120 ..... p. 1007,2634
Sales Manager: J. Hanson
Local Sales Offices & Reps.
Ala Huntsville, W.A. Brown Instr., Inc. 205-883-8660
Cal Cupertino, T. Louis Snitzer Co. .. 408-257-8333
Cal Del Mar, T. Louis Snitzer Co. 714-226-0305
Cal Los Angeles, T. Louis Snitzer Co. 213-836-6170
Colo Boulder, G. Moore Assocs. 303-494-3351
Conn Easton, Jarrold Corp. 203-259-6900
Fla Fort Lauderdale, W.A. Brown Instrs., Inc. 305-776-4800
Fla Melbourne, W.A. Brown Insts. 305-723-0766
Fla Orlando, W.A. Brown Instrs., Inc. 305-425-5505
Fla Valparaiso, W.A. Brown Insts. 904-243-6424
Ga Atlanta, W.A. Brown Instrs., Inc. 404-455-1035
La Mandeville, W.A. Brown Instrs., Inc. 504-626-9701
Md Timonium, Scientific Devices-DC 301-252-8851
Mich Madison Heights, WKM Assocs. 313-588-2300
NJ Englewood, Scientific Devices - East 201-871-3916
NM Albuquerque, Grady Moore Assocs. 505-262-1416
NY Dewitt, DB Assocs. 315-446-0220
NC Durham, W. A. Brown Instrs. 919-682-2383
Ohio Cleveland, WKM Assocs. 216-267-0445
Ohio Dayton, WKM Assocs. 513-434-7500
Ore Portland, Scientific Devices - N.W. 503-292-6934
Pa Pittsburgh, WKM Assocs 412-892-2953
Pa Plymouth Meeting, Sci Devices .. 215-825-9515
SC Columbia, W.A. Brown Instr. Inc. 803-798-3297
Tenn Oak Ridge, W.A. Brown Instr. 615-482-5761
Tex Richardson, Moore Assoc. 214-690-4929
Va Springfield, Scientific Devices-D.C., Inc. 703-451-6500
Va Virginia Beach, Scientific Devices-D.C. 804-461-8133
Wash Bellevue, Scientific Devices-N.W. 206-454-0900
Wash Kennewick, Sci Devices 509-783-3202

ITI ELECTRONICS, INC., Dept. EM, 369 Lexington Ave., Clifton, N.J. 07015, Tel: 201-546-3900, TWX: 710-989-7261; Empl.: 25
Local Sales Offices & Reps.
NJ Madison, Livera-Polk Assoc. 201-377-3220

ITOH ELECTRONICS, INC. (C.), Dept. EM, 280 Park Ave., New York, N.Y. 10017, Tel: 212-682-0420; Empl.: 100 ..... p. 1647
Sales Manager: F.I. Makstein, VP Mktg.
Local Sales Offices & Reps.
Ariz Scottsdale, BFA Corp. 602-946-4215
Cal Marina Del Rey, Delta Mutual Sls. 213-391-0451
Colo Denver, BFA Corp. 303-744-3301
Fla Orlando, Technical Assocs. 305-894-7531
Ill Des Plaines, Coombs Assocs..... 312-298-4830
Ind Indianapolis, Sukup & Cox 317-253-5501
Iowa Cedar Rapids, Tech. Reps. 319-363-2489
Kans Olathe, Tech. Reps. 913-782-1177
La Shreveport, IBL Engrg. & Sls.
Md Silver Spring, Marktron, Inc..... 710-460-6100
Mass Chelmsford, S & S elctrns. 617-459-2578
Mich Farmington Hills, Lowell-Wendt Mktg. 513-866-0661
Minn Hopkins, Grayden & Flemmer 612-941-1120
Mo Hazelwood, Technical Reps. 314-731-5200
NM Las Cruces, BFA Corp. 505-523-0601
NY Mamaroneck, Cane Tech. Sls. .. 914-698-4411
NY Saratoga Springs, S&S..... 518-587-2313
Ohio Cleveland, Components Inc. 216-243-9200
Ohio West Carrollton, Component Inc 513-866-0661
Okla Oklahoma City, IBL Engrg. & Sls. 405-843-9434
Pa Ambler, Denco-Data Equipt Co .. 215-542-9876
SC Spartanburg, Technical Assocs. 803-579-2904
Tex Dallas, IBL Engrg. & Sls. 214-363-2921
Utah Salt Lake City, BFA Corp. 801-466-6522
Va Charlottesville, Marktron, Inc 804-973-5874
Wash Seattle, R. S. Drake Assocs..... 206-763-2755

ITT
CANNON ELECTRIC

ITT CANNON ELECTRIC, Dept. EM, 666 E. Dyer Rd., Santa Ana, Cal. 92702, Tel: 714-557-4700, TWX: 910-595-1131; FSC No.: 71468; Empl.: 2400 p. 1777-1964, Back Cover, Vol. 1
Sales Manager: J. Clark; *Distributor Manager:* D. Conca
Local Sales Offices & Reps.
Ala Huntsville, Brandel-Stephens & Co. 205-883-0445
Ariz Phoenix, ITT Cannon Elec. 602-273-0755
Cal Los Altos, Recht Assocs. 415-941-0336
Cal San Marcos, ITT Cannon Elec. .. 714-743-4554
Colo Boulder, Component Prod. Sls. Co. 303-442-1100
Conn Tolland, ITT Cannon Elec. 203-872-2119
Fla Deerfield Beach, Brandel-Stephens & Co. 305-427-8558
Fla Orlando, Brandel-Stephens & Co. 305-425-3202
Ga Atlanta, Brandel-Stephens & Co. 404-261-7579
Ill Des Plaines, ITT Cannon Elec. .. 312-297-3150
Ind Fort Wayne, ITT Cannon Elec. .. 219-749-1535
Kans Leawood, Thunderbird Tech. Sls. & Svcs. 913-642-7220
Kans Wichita, Thunderbird Tech. Sls. & Svcs. 316-684-3941
Mass Wakefield, ITT Cannon Elec. 617-246-2510
Mich Mount Clemens, ITT Cannon Elec. 313-468-6611
Minn Minneapolis, ITT Cannon Elec. .. 612-854-1973
Mo St. Louis, Thunderbird Tech. Sls. & Svcs. 314-567-6488
Mo St. Louis, ITT Cannon Elec. 314-625-2911
NY Elmsford, ITT Cannon Elec. 914-592-2505
Ohio Kettering, ITT Cannon Elec. 513-434-8181
Ohio Solon, ITT Cannon Elec. 216-248-8800
Pa Blue Bell, ITT Cannon Elec. 215-646-2801
Pa Trevose, Professional Svc. Assocs. 215-245-0513
Tex Dallas, ITT Cannon Elec. 214-661-0302
Tex Houston, ITT Cannon Elec. 713-665-2996
Va Alexandria, ITT Cannon Elect. 703-370-5733
Va Vienna, ITT Cannon Elec. 703-370-5733
Wash Bellevue, ITT Cannon Elec. 206-454-3903
Exp: Cal., Santa Ana, ITT Cannon Elec. 714-557-4700
Local Distributors
Ala Huntsville, Hall-Mark Elctrns. Corp. 205-837-8700
Ariz Phoenix, Liberty Elctrns./Ariz. 602-257-1272
Cal El Segundo, Liberty Elctrns. 213-322-8100
Cal Los Angeles, Kierulff Elctrns. 213-725-0325
Cal Mountain View, Time Elctrns.-Nor/Cal 415-965-8000
Cal San Diego, Liberty Elctrns./San Diego 714-565-9171
Cal San Diego, Cramer Elctrns. 714-565-1881
Cal Sun Valley, Richey Elctrns. 213-875-2862, 768-3800
Cal Torrance, Time Elctrns. West 213-320-0880
Colo Denver, Cramer Elctrns. 303-758-2100
Conn New Haven, A.S.I./Connector Corp. of America 203-624-0127
Fla Orlando, Hall-Mark Elctrns. Corp. 305-855-4020
Ga Atlanta, Electro Air Corp. 404-351-3545
Ill Elk Grove Village, Hall-Mark Elctrns. Corp. 312-437-880
Ill Elmhurst, Genesis Elctrns. 312-530-227
Ill Mt. Prospect, Cramer Elctrns. 312-593-823
Ind South Bend, Genesis Elctrns. 219-287-291
Kans Lenexa, Hall-Mark Elctrns. Corp. 913-888-474
Md Rockville, Schweber Elctrns. 301-881-330
Mass Newton, Cramer Elctrns. 617-964-400
Mass Waltham, Schweber Elctrns. 617-890-848
Mass Woburn, Time Elctrns./New England 617-935-808
Minn Bloomington, Hall-Mark/Min. 612-884-905
Minn Minneapolis, Cramer/Min 612-835-781
Mo Earth City, Hall-Mark/St. Louis .. 314-291-535
NM Albuquerque, Cramer/New Mex. 505-243-456
NY Buffalo, Summit Distributors..... 716-884-345
NY Hauppauge, Time Elctrn. Sls. 516-273-010
NY Plainview, A.S.I./Progress Elctrns. Co. 516-433-170
NY Westbury, Schweber Elctrns..... 516-334-747
NC Winston-Salem, Cramer Elctrns. 919-725-871
Ohio Cleveland, Genesis Elctrns. 216-447-001
Okla Tulsa, Hall-Mark/Tulsa 918-835-845
Pa Clifton Heights, Time/Mid-Atlantic 215-622-250
Pa Philadelphia, Philadelphia Elctrns. 215-568-740
Tex Dallas, Hall-Mark Elctrns. Corp. 214-231-510
Tex Houston, Hall-Mark/Houston 713-781-610
Tex Houston, Harrison Equip. Co. 713-652-470
Wash Seattle, Kierulff Elctrns. 206-575-442
Wisc West Allis, Hall-Mark/Wisc. 414-476-127
For: Can., Calgary, Alb., Cam Gard Supply Ltd. 403-287-052
For: Can., Don Mills, Ont., Saynor Elctrns., Ltd. 416-445-234
For: Can., Edmonton, Alb., Cam Gard Supply Ltd. 403-424-711
For: Can., Halifax, N.S., Cam Gard Supply Ltd. 902-454-858
For: Can., Montreal, Que., Payette Radio Ltd. 514-878-477
For: Can., Ottawa, Ont., Wackid Radio T.V. Labs Ltd. 613-728-182
For: Can., Regina, Saskatchewan, Cam Gard Supply Ltd. 306-525-131
For: Can., Saskatoon, Saskatchewan, Cam Gard Supply Ltd. 306-652-642
For: Can., Scarborough, Ont., Carsten Elctrns. Ltd 416-751-237
For: Can., Vancouver, B.C., L.A. Varah Ltd. 604-873-321
For: Can., Whitby, Ont., ITT Cannon Elec. 416-668-888
For: Can., Willowdale, Ont., Electrosonic Ind'l. Sls. Ltd. 416-494-166
For: Can., Winnipeg, Man., CAM Gard Supply Ltd. 204-786-840

ITT CANNON/ETC TERMINAL PRODUCTS, Dep EM, 29000 Aurora Rd., Solon, Ohio 44139, T 216-248-8800, 800-362-9122, TWX: 98-55 810-427-9404; FSC No.: 98410; 7K539; Empl.: 275
Sales Manager: Tom Kupke; *Distributor Manager:* Cornhoff
Local Sales Offices & Reps.
Ariz Phoenix, ITT Cannon Elec. 602-273-07
Ariz Tempe, Chapman & Assoc. 602-838-94
Cal Anaheim, LoCal Sls. 714-956-15
Cal Belmont, LoDan, Inc. 415-592-46
Cal Santa Ana, ETC Terminal Products 714-557-47
Conn West Simsbury, Anchor Engrg. .. 203-658-62
Fla Deerfield Beach, Brandel-Stephens & Co 305-427-85
Fla Orlando, Brandel-Stephens & Co. 305-425-32
Ga Stone Mountain, Metpco 404-469-06
Ill Arlington Heights, Lo Dan, Inc. .. 312-956-67
Ind Ft. Wayne, J & B Engrg. 219-483-28
Iowa Cedar Rapids, Jerry Vrbik Co. .. 319-366-87
Ky Lexington, T. Lengal & Assoc..... 606-233-71
Md Baltimore, J.A. Maguire Co. 301-377-02
Mass Newton Upper Falls, Anchor Engrg. 617-964-62
Mass Wakefield, ITT Cannon Elec. 617-246-25
Mich Southfield, L.H. Dickelman 313-353-82
Minn Edina, Grayden & Flemmer 612-941-11
Minn Minneapolis, ITT Cannon Elec. .. 612-854-19
Mo Kansas City, F.P. Williams Co. .. 816-471-16
NJ Pennsauken, J.A. Maguire Co. .. 609-665-51
NJ Wayne, GT Assoc. 201-694-60
NY Rochester, Marchese, Masey & Barden Inc 716-544-43
NC Charlotte, JWL Assoc. 704-364-31
Ohio Aurora, Number One Sales 216-562-33
Ohio Kettering, ITT Cannon Elec. 513-434-81

Pa Fort Washington, ETC Terminal Products 215-646-2801
Tex Dallas, ITT Cannon Elec. 214-661-0302
Tex Richardson, Jack Barry Sales 214-234-0255
Wash Seattle, F. Jackson Assoc. 206-523-6300
Wisc Milwaukee, DeVos & Assocs. 414-272-0356
Exp: Santa Ana, Cal., ETC Terminal Products 714-557-4700

Local Distributors
Ala Birmingham, EIS 205-252-9046
Cal Belmont, Advance Electrical Sls. 415-592-4550
Cal Belmont, Lo-Dan Inc 415-592-4600
Cal Sun Valley, Richey Elctrns. 213-875-2862
Colo Denver, Industrial Elctrns. 303-771-2636
Colo Lakewood, Acacia Sls. 303-232-2882
Conn Hartford, Eckhart & Finard 203-246-7411
Fla Casselberry, American Fastener/Comps. 305-831-6630
Fla Dania, Arco Distrs., Inc. 305-925-1999
Fla Orlando, EIS 305-855-7100
Ga Atlanta, EIS 404-355-1651
Ill Arlington Heights, Lo Dan Elctrns. 312-956-6700
Ind Indianapolis, Pioneer/Indiana 317-849-7300
Iowa Cedar Rapids, J. Vrbik Co. 319-366-8733
Kans Kansas City, C. Tennant Elctrns. 913-287-2100
Md Baltimore, ASI Elctrns. 301-265-5100
Mass Newton Upper Falls, In-Stock Prods. Co. 617-964-6200
Mich Livonia, Pioneer/Mich. 313-525-1800
Minn Minneapolis, Bergquist Co. 612-835-2322
Miss Jackson, Ellington Elctrn. Supply 601-355-0561
NJ Jersey City, Cuny & Guerber 201-653-0222
NJ Pennsauken, Resco Elctrns. 609-662-4000
NY Bohemia, Car-Lac Elctrn. Industrial Sls. 516-567-4200
NY Long Island City, Hardware Specialty Co. 212-361-9393
NY Mount Vernon, Qar Industrial Elctrn. Sls. 914-699-2224
NY Rochester, Rochester Radio 716-454-7800
NY Rome, Rome Elctrns. 315-337-5400
NC Charlotte, EIS 704-392-2306
NC Charlotte, J.O. King, Inc. 704-527-0054
Ohio Cincinnati, EIS 513-771-4073
Ohio Cleveland, Pioneer/Cleveland 216-587-3600
Ohio Dayton, Pioneer/Dayton 513-236-9900
Pa Folcroft, Delphi Elctrns 215-534-3900
Pa Pittsburgh, Pioneer/Pittsburgh 412-782-2300
Tenn Memphis, EIS 901-947-4176
Tex Dallas, National Precision Prods. 214-357-3921
Tex Houston, Kent Elctrns. 713-780-7770
Tex Houston, Texas Electrical Wholesalers 713-688-9651
Tex Richardson, Altair Co. 214-231-5166
Va Richmond, EIS 804-649-9221
Wash Seattle, Interface Elctrns. 206-575-3630
Wash Seattle, Frank Jackson Assoc. 206-523-6300
Wisc Mequon, Lake-View Elctrns. Corp. 414-377-8250
For: Can., Burlington, Ont., Neeco Inds., Ltd. 416-632-1403
For: Can., Montreal, Que., Prelco Elctrns. 514-389-8051

ITT Components - Capacitors

ITT COMPS. CAPACITORS, Dept. EM, 1551 Osgood St., N. Andover, Mass. 01845, Tel: 617-686-1110, TWX: 947-130, 710-342-0718 ..... p. 1156-1159

Local Sales Offices & Reps.
Ala Huntsville, Beacon 205-881-5031
Ariz Tempe, Argus Sls. 602-967-8709
Cal Mountain View, Caltron Comps. 415-964-3244
Cal San Diego, Littlefield & Smith 714-455-0055
Cal Woodland Hills, Interstate Mktg Assoc. 213-883-7606
Colo Englewood, Dynatek 303-773-2830
Conn Hamden, Datcom, Inc. 203-288-7005
Fla Ft. Lauderdale, Beacon 305-971-7320
Fla Maitland, Beacon/Maitland 305-647-3498
Ga Atlanta, Beacon, Inc. 404-351-3654
Ill Elk Grove Village, Oasis Sls. Corp. 312-640-1850
Ind Fort Wayne, M/S Sls 219-484-1904
Kans Shawnee Mission, Midtec Assocs 913-441-6565
Md Randallstown, Beacon - North 301-922-1248
Mass Waltham, Datcom 617-891-4600
Mich Grand Rapids, J.L. Montgomery 616-774-9308
Mich Southfield, J.L. Montgomery 313-358-2616
Minn Minneapolis, Clark R. Gibb Co. 612-377-1200
Miss Florissant, Midtec Assocs. 314-837-5200
NJ Fort Lee, L.E.J. Comp Sls 201-944-3642
NJ Pennsauken, J.A. Maguire & Co. 215-627-1670
NM Albuquerque, Tri-Tronix 505-265-0172
NY Buffalo, L.D. Allen 716-837-1955
NY Fairport, L.D. Allen 716-377-3530
NY Melville, L.E.J. Comp Sls 516-694-9090
NY North Syracuse, L.D. Allen 315-458-7470
NC Charlotte, Beacon, Inc. 704-525-7412
Ohio Cleveland, Comps Inc. 216-243-9200
Ohio West Carrollton, Comps Inc. 513-866-0661
Ore Portland, Vantage Corp. 503-297-1714
Tenn Oak Ridge, Beacon 615-482-2409
Tex Austin, Mycrosystems Marketing 512-472-2492
Tex Dallas, Mycrosystems Mktg. 214-238-7157
Tex Houston, Mycrosystems Mktg. 713-783-2900
Utah Salt Lake City, R² Mktg 801-972-5646
Va Falls Church, Beacon-North 703-534-7200
Va Lynchburg, Beacon-North 804-237-4740
Wash Bellevue, Vantage Corp. 206-455-3460

Local Distributors
Ariz Phoenix, R.V. Weatherford 602-272-7144
Ariz Phoenix, Cramer 602-267-7321
Cal Glendale, R.V. Weatherford 213-849-3451
Cal Irvine, Cramer/Los Angeles 714-979-3000
Cal Los Angeles, Western Electro Motive Shepard 213-820-3777
Cal Mountainview, Capacitor Sls. 415-964-8880
Cal San Diego, Shelley-Neumann Inc. 714-453-7133
Cal San Diego, Cramer/San Diego 714-565-1881
Cal Santa Clara, Western Electro Motive Shepard. 408-985-0908
Cal Santa Monica, Frank-Shelley 213-871-0930
Cal Sunnyvale, Cramer/San Francisco 408-739-3011
Cal Woodland Hills, Jaco Elctrns. 213-887-6400
Colo Denver, Cramer/Denver 303-758-2100
Colo Englewood, R.V. Weatherford 303-761-5432
Conn North Haven, Cramer Elec. 203-239-5641
Fla Hollywood, Cramer Elec. 305-929-8181
Fla Orlando, Cramer Elec. 305-894-1511
Ga Norcroff, Cramer/EW Atlanta 404-448-9050
Ill Elmhurst, Semiconductor Spec. 312-279-1000
Ill Mt. Prospect, Cramer/Chicago 312-593-8230
Ind Indianapolis, Semiconductor Spec. 317-243-8271
Iowa Cedar Rapids, Deeco Elec. 319-365-7551
Kans Wichita, Radio Supply Co. 316-267-5216
Md Beltsville, Treeko Sls. 301-937-8260
Md Gaithersburg, Cramer/EW Wash. 301-948-0110
Md Rockville, M/S. Elctrns 301-340-6400
Mass Newton, Impact 617-964-7740
Mass Newton, Cramer Elec. 617-969-7700
Mass Newton, Greenshaw 617-969-8900
Mich Farmington, Semiconductor Spec. 313-478-2700
Mich Livonia, Reptron/Mich. 313-525-2700
Minn Edina, Cramer/Bonn 612-835-7811
Minn Edina, Cassidy Elec. 612-835-7744
Minn Minneapolis, Semiconductor Spec. 612-845-8841
Mo Kansas City, Walters Radio Supply
Mo St. Louis, Olive Ind. Elec. 314-863-7800
NJ Cherry Hill, Cramer/Pa. 609-424-5993
NJ Moonachie, Cramer/N.J. 201-935-5600
NJ Mt. Laurel, I.P.C. Diplomat 609-234-8080
NJ Totowa, Diplomat IPC Corp. 201-785-1830
NM Albuquerque, Cramer/N.M. 505-265-5767
NM Albuquerque, International Elect. 505-265-6453
NY East Syracuse, Cramer/Syracuse 315-437-6671
NY Hauppauge, Jaco Elec. 516-273-5500
NY Hauppauge, Cramer/L.I. 516-231-5600
NY Hauppauge, Cramer/Sys. 516-231-5682
NY Rochester, Cramer/Rochester 716-275-0300
NC Winston-Salem, Cramer/EW Winston-Salem 919-725-8711
Ohio Cleveland, Cramer/Cleveland 216-248-8400
Ohio Columbus, Reptron/Ohio 614-443-0231
Pa Pittsburgh, Semiconductor Spec. 412-781-8120
Tex Austin, Quality Comps. 512-458-4181
Tex Dallas, Quality Comps. 214-887-4949
Tex Dallas, Cramer Elec. 214-661-9300
Tex El Paso, ERA Elctrns. 915-592-4126
Tex El Paso, Intl Elec 915-778-9761
Tex Houston, Quality Comps. 713-789-9320
Utah Salt Lake City, Diplomat Alta Elec. 801-486-7227
Wash Seattle, Zepher Elec. 206-575-0922
Wash Tukwila, Cramer Seattle 206-575-0907
Wisc Mequan, Taylor Elec. 414-241-4321
Wisc Milwaukee, Semiconductor Specialists 414-257-1330

ITT Components - Relays

ITT COMPS. RELAYS, Dept. EM, 1551 Osgood St., N. Andover, Mass. 01845, Tel: 617-686-1110, TWX: 947-130, 710-342-0718 ..... p. 3554-3561

Sales Manager: R. Scanlon; *Distributor Manager:* M. Morel

Local Sales Offices & Reps.
Ala Huntsville, Beacon 205-881-5031
Ariz Tempe, Argus Sls. 602-967-8709
Cal Mountain View, Caltron Comps. 415-964-3244
Cal San Diego, Littlefield & Smith Assocs. 714-455-0055
Cal Woodland Hills, Interstate Mktg. 213-883-7606
Colo Englewood, Dynateck, Inc. 303-773-2830
Conn Lakeville, Conti-Younger 203-929-3294, 203-824-5982
Fla Ft. Lauderdale, Beacon 305-971-7320
Fla Maitland, Beacon 305-647-3498
Ga Atlanta, Beacon 404-351-3654
Ill Elk Grove Village, Oasis Sls. Corp. 312-640-1850
Ind Fort Wayne, M/S Sls 219-484-1904
Kans Olathe, Rush & West Assoc. 913-764-2700
Md Baltimore, J. A. Maguire & Co. 301-377-0223
Md Randallston, J.A. Beacon 301-922-1248
Mass Waltham, Conti-Younger Assocs. 617-890-4582
Mich Grand Rapids, J. L. Montgomery Assoc. 616-774-9308
Mich Southfield, J. L. Montgomery Assoc. 313-358-2616
Minn Minneapolis, Clark R. Gibb Co. 612-377-1200
Mo Ballwin, Rush & West Assoc 314-394-7271
NJ Dunellen, J.A. Maguire & Co. 201-752-8480
NJ Fort Lee, L.E.J. Comps. 201-944-3642
NJ Pennsauken, J.A. Maguire & Co. 215-627-1670
NM Albuquerque, Tri-Tronix 505-265-8400
NY Buffalo, L.D. Allen, Inc. 716-837-1955
NY Fairport, L.D. Allen, Inc. 716-377-3530
NY Melville, L.E.J. Comps. 516-694-9090
NY North Syracuse, L.D. Allen, Inc. 315-458-7470
NY Pleasant Valley, L.D. Allen, Inc. 914-635-3363
NC Charlotte, Beacon 704-525-7412
Ohio Cleveland, Comps Inc 216-243-9200
Ore Portland, Vantage Corp. 503-297-1714
Tenn Oak Ridge, Beacon 615-482-2409
Tex Dallas, Mycrosystmes Mktg. 214-238-7157
Tex Houston, Mycrosystems Mktg. 713-783-2900
Utah Salt Lake City, R² Mktg 801-972-5646
Va Falls Church, Beacon 703-534-7200
Va Lynchburg, Beacon 804-237-4740
Wash Bellevue, Vantage Corp. 206-455-3460

Local Distributors
Ariz Phoenix, Cramer/Ariz. 602-267-7321
Cal Burbank, Switching Devices 213-849-3211
Cal Irvine, Cramer/Los Angeles 714-979-3000
Cal Los Angeles, Western Electromotive Shepard 213-820-3777
Cal San Diego, Cramer/San Diego 714-565-1881
Cal Santa Clara, Western Electromotive Shepard 408-985-0908
Cal Sunnyvale, Cramer/San Francisco 408-739-3011
Cal Woodland Hills, Jaco Elctrns 213-887-6400
Colo Denver, Cramer/Denver 303-758-2100
Conn North Haven, Cramer/Conn. 203-239-5641
Fla Hollywood, Cramer/Hollywood 305-923-8181
Fla Orlando, Cramer/Orlando 305-894-1511
Ga Norcroff, Cramer/Atlanta 404-448-9050
Ill Mount Prospect, Cramer/Chicago 312-593-8230
Iowa Cedar Rapids, Deeco Elctrns. 319-365-7551
Md Beltsville, Treeko Sls 301-937-8260, 301-792-0112
Md Gaithersburg, Cramer/Wash. 301-948-0110
Md Rockville, M/S. Elctrns 301-340-6400
Mass Burlington, Heilind Elctrns. 617-272-5610
Mass Newton, Cramer Elctrns. 617-964-4000
Mich Livonia, Reptron/Mich. Elec. Inc. 313-525-2700
Minn Edina, Cramer/Minn. 612-835-7811
Minn Edina, Cassidy Elctrns. 612-835-7747
NH Hudson, Heilind Elctrns. 603-883-9536
NJ Cherry Hill, Cramer/Pa. 609-424-5993
NJ Little Falls, Diplomat/IPC Corp. 201-785-1830
NJ Moonachie, Cramer/N.J. 201-935-5600
NM Albuquerque, Cramer/N.M. 505-265-5767
NM Albuquerque, Intl Elctrns. 505-265-6453
NY East Syracuse, Cramer/Syracuse 315-437-6671
NY Hauppauge, Cramer/LI 516-231-5600
NY Rochester, Cramer/Roch 716-275-0300

NC Gastonia, JMT Elctrn Supply 704-867-4401
NC Winston-Salem, Cramer Winston-Salem 919-725-8711
Ohio Cleveland, Cramer/Cleveland 216-248-8400
Ohio Columbus, Reptron/Ohio 614-253-7433
Tex Austin, Quality Comp. Aust 512-458-4181
Tex Dallas, Quality Comps. 214-387-4949
Tex Dallas, Cramer Texas 214-661-9300
Tex El Paso, ERA Elctrns 915-592-4126
Tex El Paso, Intern'l Elctrns. 915-778-9761
Tex Houston, Quality Comp. 713-789-9320
Wash Seattle, Zepher Elctrns. 206-575-0922
Wash Tukwila, Cramer/Seattle 206-575-0907

ITT ELECTRON TUBE, Dept. EM, Box 100, Easton, Pa. 18042, Tel: 215-252-7331, Telex: 847494; FSC No.: 20948; Empl.: 550

Local Sales Offices & Reps.
Cal Los Angeles 213-786-0756
Md Baltimore 301-467-5733
Mass Waltham 617-893-5579
NJ Nutley 201-284-2762

GENERAL CONTROLS ITT

ITT GENERAL CONTROLS, Dept. EM, 801 Allen Ave., Glendale, Cal. 91201, Tel: 213-842-6131, TWX: 910-498-2225; Empl.: 1892

Distributor Manager: W. K. Handel

Local Sales Offices & Reps.
Cal Burlingame 415-342-8391
Ill Des Plaines 312-299-2237
Kans Shawnee Mission 913-631-1188
Mich Birmingham 313-642-1830
NJ Teaneck 201-836-2444
Ohio Mayfield Hgts. 216-442-6697
Ohio Troy 513-335-3583
Okla Tulsa 918-627-9145
Pa St. Peters, GC Office 215-469-6009
RI Warwick 401-739-6336
Tenn Hendersonville 615-824-6838
Tex Dallas 214-358-2555
Tex Houston 713-666-4261

ITT GILFILLAN DIV. OF ITT, Dept. EM, 7821 Orion Ave., Van Nuys, Calif. 91409, Tel: 213-988-2600, TWX: 910-495-1787; FSC No.: 24930; Empl.: 1500

ITT HARPER, Dept. EM, 8200 Lehigh Ave., Morton Grove, ILL. 60053, Tel: 312-966-6000, TWX: 910-223-3625; Empl.: 650

Sales Manager: H.K. Swan

Local Sales Offices & Reps.
Cal City of Commerce 213-725-1934
Cal San Leandro 415-357-2655
Colo Denver 303-433-7397
Ga Atlanta 404-696-1242
Ill Elk Grove Village 312-595-7220
NY Castleton-on-Hudson 518-732-7711
Ohio Cleveland 216-464-9475
Tex Houston 713-692-6910
Wisc Milwaukee 414-272-3565

ITT-HIGBIE MFG. CO., Dept. EM, Wagner Rd., Rochester, Mich. 48063, Tel: 313-651-5300, TWX: 810-232-1592; Empl.: 1500

Sales Manager: C. J. Clemens

Local Sales Offices & Reps.
Cal Los Angeles, E.J. Brookes Co. 213-723-8431
Colo Denver, Warrington Co 303-433-3323
Ill Lombard, A.G. Pinder 312-627-4678
Mo St. Louis, Crowley Sls 314-725-7771
NJ Rumson, Phillips Tube Co 201-842-5168

ITT JENNINGS, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 970 McLaughlin Ave., San Jose, Cal. 95122, Tel: 408-292-4025, TWX: 34-6311, 910-338-0159; Empl.: 250 p. 1160-1162,2762,3547-3551,4086,4087

Sales Manager: E. V. Valehrach

Local Sales Offices & Reps.
Ala Huntsville, Brandel-Stephens 205-883-0445
Ariz Scottsdale, BFA Corp. 602-994-5400
Cal San Jose, Silicon Valley Sls. 408-984-6354
Cal Van Nuys, R.F. Specialists 213-785-0503
Colo Aurora, BFA Corp 303-837-1247
Fla Deerfield Beach, Brandel-Stephens 315-427-8558
Fla Orlando, Brandel-Stephens 315-425-3202
Ga Atlanta, Brandel-Stephens 404-261-7579
Ill Chicago, Elctrn Instr Assocs 312-271-3774
Ill Chicago, Berndt Assocs. 312-283-0713
Ind Carmel, Berndt Assoc. 317-844-0114
Ind Indianapolis, Elctrn Instr Assocs 317-257-7231
Iowa Cedar Rapids, Reid Assoc. 319-362-6302
Kans Shawnee Mission, Lowell-Kangas & Assoc. 913-631-3515
Md Silver Spring, Marktron, Inc. 301-460-6100
Md Timonium, Marktron, Inc. 301-252-7111
Mass Haverhill, L. K. Harman Assoc. 617-373-1313
Mich Troy, G. R. Peters Assocs 313-362-1220
Minn Minneapolis, Berndt Assocs 612-835-4818
Mo St. Louis, Lowell-Kangas & Assoc. 314-821-4050
NJ Tenafly, ABC Elctrns. Sls. 201-568-2354
NM Albuquerque, BFA Corp. 505-292-1212
NM Las Cruces, BFA Corp. 505-523-0601
NY East Syracuse, Nycom Inc. 315-437-8343
NY Williston Pk., ABC Elctrn. Sls. 516-747-6610
NC Greensboro, Brandel-Stephens 919-274-6952
Ohio Dayton, Whelan Corp. 513-434-7551
Pa Huntingdon Valley, Omega Elctrns. 215-947-4135
Tex Houston, Barry Sales 713-784-5860
Tex Richardson, Barry Sales 214-234-0255
Utah Salt Lake City, BFA C3rp. 801-466-6522
Va Charlottesville, Marktron 301-460-6100
Wash Bellevue, Conrard-Carlson 206-747-1143
Wisc West Allis, Berndt Assoc. 414-545-8400

ITT NORTH, Microsystems Div, Dept. EM, 700 Hillsboro Pl., Deerfield Beach, Fla. 33441, Tel: 305-421-8450, TWX: 510-953-7253; Empl.: 200 ..... p. 2858

Sales Manager: W. L. Riner

Local Sales Offices & Reps.
Cal Los Alamitos, Reed Electronic Mktg 714-821-9600
Ill Rolling Meadows, Sieger Assocs 312-991-6161
NY Pittsford, Precision Sls 716-381-2820
NY Valley Cottage, LRC Assocs 914-634-7973
Ohio Cincinnati, Giesting Assocs 513-851-7800
Wash Redmond, Desco NW 206-883-6336

ITT POMONA ELECTRONICS

ITT POMONA ELECTRONICS, Dept. EM, 1500 E. 9th St., Box 2767, Pomona, Cal. 91766, Tel: 714-623-3463, TWX: 910-581-3822; FSC No.: 05276; Empl.: 101 ..... p. 1965-2044

Local Sales Offices & Reps.
Ala Madison, South Eastern Assoc... 205-722-9616
Ariz Phoenix, H.A. Moore Sls. Co. 602-274-4558
Ariz Scottsdale, DeAngelo, Rothman & Cheever, Inc. 602-948-2240
Cal Beverly Hills, Intercontinental Aviation 213-274-7578
Cal Culver City, DeAngelo,Rothman 213-398-6239
Cal La Selva Bch., Belchamber & French 408-684-1007
Cal Palo Alto, Engineering Assoc. 415-494-7842
Cal Pasadena, P. Nurches 213-681-8957
Cal San Diego, De Angelo, Rothman & Co. 714-560-5707
Colo Denver, AES, Inc. 303-777-8733
Fla Longwood, Haas/Winfield Co. 305-831-1276
Fla No. Miami, Haas/Winfield Co. 305-945-6544
Ill Northbrook, W.M. Linz 312-498-9600
Ind Carmel, Blind & Assoc., Inc. 317-251-1249
Mass Sharon, A Appell Assoc. 617-784-3439
Mich Grand Rapids, C. Geer 616-247-1656
Mich Royal Oak, C.A. Geer Co. 313-548-1971
Minn Mpls., Heimann Co. 612-861-6051
Mo Kansas City, NEVCO, Inc 816-421-1751
Mo St. Louis, NEVCO 314-843-7406
NJ Cedar Grove, Tobias 201-239-8585
Ohio Mentor, P. Lohse 216-951-3026
Pa Philadelphia, David S. Linz 215-379-0734
SC Greenville, H. C. Norman 803-244-6254
Tex Dallas, Techno Assocs. 214-357-9213
Wash Seattle, Barrett-Squibb & Assoc. 206-885-6991

IEE/SCHADOW, INC., Dept. EM, 8081 Wallace Rd., Eden Prairie, Minn. 55344, Tel: 612-944-1820, Telex: 29-0556; Empl.: 100 ..... p. 4088-4093

Sales Manager: Lyle Hanna

Local Sales Offices & Reps
Ala Huntsville, Beacon 205-881-5031
Ariz Tempe, Argus Sls. 602-967-8709
Cal Mountain View, Caltron Comps .. 415-964-3244
Cal Woodland Hills, Interstate Mktg Assocs 213-883-76
Colo Wheatridge, Waugaman Assocs. 303-423-10
Conn Farmington, R. Perron & Co. 203-673-48
Conn Trumbull, R. Perron & Co. 203-268-96
Fla Ft. Lauderdale, Beacon 305-971-73
Fla Maitland, Beacon 305-647-34
Ga Atlanta, Beacon 404-351-36
Ill Chicago, ILIS, Inc. 312-631-11
Kans Olathe, Rush & West Assocs 913-764-27
Md Randallstown, Beacon 301-922-12
Mass Norwood, R. Perron & Co. 617-762-81
Mich Benton Harbor, R. C. Nordstrom 616-429-85
Mich Lathrop Village, R.C. Nordstrom Co. 313-559-73
Minn St. Paul, Cahill Assocs 612-646-72
Mo Ballwin, Rush & West Assocs 314-394-72
NH Bedford, Ray Perron & Co. 603-472-30
NH Dover, R. Perron & Co. 603-742-23
NM Albuquerque, Tri-Tronix 505-265-84
NY Kenmore, Nycom 716-876-19
NY Mt. Vernon, David Sonkin Assocs. 914-668-98
NY Syracuse, Nycom 315-437-83
NC Charlotte, Beacon 704-525-74
Ohio Dayton, J.C. Hofstetter Co. 513-296-10
Ohio Medina, J.C. Hofstetter Co 216-725-44
Pa Glenside, Wyncote Instrumentation 215-643-24
RI Mt. Penn, Wyncote Instrumentation 215-643-24
Tenn Oak Ridge, Beacon 615-482-24
Tex Arlington, W.P. Fralia Co. 817-640-91
Tex Houston, W. Pat Fralia Co. 713-772-15
Utah Salt Lake City, Waugaman Assocs 801-363-02
Va Falls Church, Beacon 703-534-72
Va Lynchburg, Beacon-North 804-237-47
Wash Seattle, Jas. J. Backer Co. 206-285-13

Local Distributors
Cal Los Angeles, Western Electromotive 213-820-37
Cal Mt. View, Target Elctrns. 415-961-11
Cal Torrance, Time Elctrns. Wese 213-320-08
Colo Denver, Integrated Elctrns. 303-534-61
Conn Waterbury, Suburban Supply 203-757-12
Ill Westmont, R.M. Bodell 312-323-96
Kans Wichita, Radio Supply Co. 316-267-52
Md Beltsville, Treeko Sls. 301-937-82
Mass Boston, Sager Electrical Co. 617-749-67
Mass Waltham, Impact Sls. Co. 617-964-77
Mich Kentwood, R. M. Electrns. 616-531-93
Minn Minneapolis, Berquist Co 612-835-23
NY Mount Vernon, QAR Industrial Electrn. Sls. 914-699-22
Ohio Medina, DRW 216-722-55
Pa Philadelphia, Philadelphia Elctrns 215-568-74
Tex Stafford, Southwest Elctrns. 713-494-60
Wash Seattle, Zepher Elctrn. Sls. Corp. 206-575-09

ITT, Semiconductor Div., Dept. EM, 500 Broadwa Lawrence, MASS 01841, Tel: 617-688-1881, TW 947413, 710-342-1357; Empl.: 1600

Sales Manager: J. Phelan; *Distributor Manager:* Phelan

Local Sales Offices & Reps.
Ala Huntsville, Rep, Inc. 205-881-92
Ariz Tempe, Argus Sls 602-967-87
Cal Encino, ITT Semiconductors. 213-995-15
Cal Mountain View, Nor-Cal Associates 415-961-81
Cal Palo Alto, ITT Semiconductors .. 415-961-52
Cal Reseda, ITT Semiconductors 213-345-52
Cal Woodland Hills, Interstate Mktg. Assocs. 213-883-76
Colo Englewood, Checkmate Sls. 303-773-06
Fla Casselberry, EIR, Inc. 305-830-96
Ga Tucker, ITT Semiconductors 404-939-67
Ill Elk Grove Village, Sieger Assocs. 312-956-09
Ill Rolling Meadows, ITT Semiconductors 312-884-09
Iowa Cedar Rapids, S & O Sls. Co. .. 319-393-18
Md Baltimore, Coulborn-DeGreif 301-247-46
Mass Waltham, Datcom 617-891-46
Mich Livonia, Giesting Assocs. 313-477-60
Minn Minneapolis, Nortec Sls. 612-835-74
Mo Hazelwood, Technical Reps. 314-731-52
NM Albuquerque, Cleveland Entprs. 505-266-55
NY Rochester, L-Mar Assocs. 716-328-52
NY Valley Cottage, LRC Assocs. 914-634-79
Ohio Centerville, ITT Semiconductors 513-435-37
Ohio Cincinnati, Giesting Assocs. 513-931-08
Pa Norristown, PDA Assocs 215-631-04
Tex Dallas, West Assocs. 214-661-94
Tex Dallas, ITT Semiconductors 214-243-78
Wash Tukwila, General Elctrns. 206-575-40

TT SEMICONDUCTORS DISCRETE DEVICES, Dept. EM, 500 Broadway, Lawrence, Mass 01841, TWX: 947413, 710-342-1357

Local Sales Offices & Reps.

Ala	Huntsville, Rep, Inc.	205-881-9270
Ariz	Tempe, Argus Sls	602-967-8709
Cal	Palo Alto, Nor-Cal Assoc	415-961-8121
Cal	Palo Alto, ITT Semiconductors	415-961-5265
Cal	Reseda, ITT Semiconductors	213-345-5270
Cal	Woodland Hills, Interstate Mktg Assoc.	213-883-7606
Colo	Englewood, Checkmate Sls	303-773-0666
Fla	Casselberry, EIR, Inc	305-830-9600
Ga	Tucker, ITT Semiconductors	404-939-6715
Ill	Rolling Meadows, ITT Semiconductors	312-991-7100
Ill	Rolling Meadows, Sieger Assoc.	312-991-6161
Iowa	Cedar Rapids, S & O Sls	319-393-1845
Md	Baltimore, Coulbourn-DeGreit	301-247-4646
Mass	Waltham, Datcom, Inc.	617-891-4600
Minn	Minneapolis, Nortec Sls	612-835-7414
Mo	Hazelwood, Technical Reps	314-731-5200
NM	Albuquerque, Cleveland Entprs	505-266-5594
NY	Rochester, L-Mar Assoc.	716-328-5240
NY	Valley Cottage, LRC Assoc.	914-634-7973
Ohio	Centerville, ITT Semiconductors	513-435-3750
Ohio	Cincinnati, Giesting Assoc.	513-851-7800
Pa	Norristown, PDA Assoc.	215-631-0404
Tex	Dallas, West & Assoc.	214-661-9400
Wash	Tukwila, General Elctrns	206-575-4030

TT TELECOMMUNICATIONS, Apparatus Dept., Dept. EM, Fulton Dr., Corinth, Miss. 38834, Tel: 601-287-3771, TWX: 510-984-0211; Empl.: 2000

TT THERMOTECH, Div. Int'l. Telephone & Telegraph Corp., Dept. EM, 1203 S. 5th St., Hopkins, Minn. 55343, Tel: 612-933-9400, Telex: 29-0414; Empl.: 425 p. 2560,2561

Local Sales Offices & Reps.

Ariz	Phoenix, Toward Engrg. Assoc., Inc.	602-955-3193
Ark	Little Rock, Schmidt & Assocs	501-225-5613
Cal	Glendale, Secana Co.	213-240-7570
Colo	Denver, T. Mc Sherry	303-238-8361
Conn	West Simsburg, R. Russ	203-658-6261
Conn	W. Hartford, D. Kelley	203-233-0870
Fla	St. Petersburg, Florida Div.	813-347-2191
Ill	Chicago, J. Robinson	312-777-6200
Ill	Norridge, B. Reynolds	312-775-2216
Ind	Ft. Wayne, R. McCampbell	219-672-3012
Iowa	Cedar Rapids, Seltec Sls. Corp.	319-393-1114
Ky	Mt. Sterling, M.F. Eubanks	606-498-5955
Mass	Newton Upper Falls, Anchor Engrg.	617-964-6205
Mich	Detroit, G. Hall	313-864-1368
Mich	Farmington, L. George	313-474-1505
Minn	Minneapolis, W. J. Houlihan	612-544-3023
Mo	St. Louis, E. Monnig	314-991-2512
NJ	Union, Plastech	201-687-4810
NY	Manhasset, Kaelber & Mack	516-543-2924
NY	Pittsford, P. B. Schumacher	716-235-6843
NC	Charlotte, Spartan Assoc.	704-523-8419
Ohio	Cleveland, G. Richards	216-221-3634
Pa	Ardmore, Midlantic Plastic Sls.	215-649-2436
Tex	Dallas, Ammon & Rizos	214-233-5591
Tex	Houston, G. Knower	713-781-6240
Wisc	Milwaukee, Indl. Sls. Tech.	414-453-2710

VO INDUSTRIES, Dept. EM, 1109 Green Grove Rd., Neptune, N.J. 07753, Tel: 201-922-3600, Telex: 132-414; Empl.: 10 p. 2268,2269

Sales Manager: J.D. Tannar

Local Sales Offices & Reps.

Cal	Mountainview, J. W. Wilhoit, Inc.	415-961-3660
Cal	Tustin, Sierra-Pacific Engrg., Inc.	714-731-3411
Colo	Denver, Tessco	303-744-1119
Conn	New Preston, N. B. S. Assocs.	203-868-0501
Fla	Orlando, Publicover Assocs.	305-898-9361
Ill	Arlington Heights, Martec Assocs.	312-956-8090
Kans	Overland Park, Parker & Foster, Inc.	913-381-9330
Kans	Wichita, Parker & Foster, Inc.	
Md	Towson, Kraft Elctrn Sls	301-828-5838
Mich	Detroit, E & E Engrg., Inc.	313-371-2000
Minn	St. Paul, Craighead & Assocs.	612-645-0781
Mo	St. Louis, Power-Torque	314-781-2045
NH	Amherst, N B S Assocs	603-673-5800
NJ	Marmora, Holdsworth & Co., Inc.	
NY	Rochester, Ontec	716-464-8636
Ohio	Cleveland, Imaginative Tech.	216-826-3400
Ohio	Dayton, IM Tech, Inc.	513-278-6507
Ore	Portland, Syscom	503-644-2505
Pa	Newton Square, Holdworth & Co.	215-356-8550
Tex	Dallas, Glidden Electro Equip. Co.	214-341-0610
Tex	Houston, Glidden Electro Equip. Co.	713-681-1415
Wisc	Waukesha, Craighead & Assocs.	414-542-2868

Local Distributors

Cal	Oakland, Stove Plumbers Supplies Co.	415-444-1143
Cal	San Jose, Consolidated Parts, Inc.	408-263-9521
Cal	Santa Monica, Master Dist.	213-829-4656
Colo	Denver, Tessco	303-744-1119
Fla	Lakeland, A A Electric, Div. AEC	813-682-6181
Ga	Norcross, A A Electric	404-449-8670
Ill	Arlington Heights, Martec Assocs.	312-965-8090
Kans	Overland Park, De-Mar Assocs.	913-381-6810
Mass	Cambridge, Apollo Elctrns	617-868-3120
Mich	Detroit, E & E Engrg.	313-371-2000
Minn	St. Paul, Power/Mation Div.	612-645-0781
Mo	St. Louis, Power-Torque	314-781-2045
NJ	Cranford, Howman Applied Control Prods	201-276-8261
NY	Clarence, Trott Elctrns	716-634-8500
NY	Rochester, Trott Elctrns	716-586-8251
Ohio	Toledo, Toledo Indl. Repair, Inc.	419-382-2261
Ore	Portland, Portland Electric & Plumbing Co.	503-243-6800
Pa	King of Prussia, Wistex	215-337-1240
Pa	Wilkinsburg, Fuller Instrs.	412-241-6789
Tex	Dallas, Dallas Instrs.	214-349-1180
Wisc	Waukesha, Power/Mation Div.	

IWATA ELECTRIC CO., LTD., Dept. EM, 1-16, I-Chome Soto-Kanda, Chiyoda-ku Tokyo, Japan, Tel: 03-253-2363, Telex: J 24481; Empl.: 70

Distributor Manager: T. Suzuki, (Dir)

Local Sales Offices & Reps.

Cal	Los Angeles, Iwata Elec. Co., Ltd.	213-734-1423

J & S TOOL CO., INC., Dept. EM, 70 Okner Pkwy., Livingston, N.J. 07039, Tel: 201-992-8866, Telex: 139229; Empl.: 45

Sales Manager: K.F. Swenson

J-B-T- SWITCHES, A CUTLER HAMMER CO., Dept. EM, Box 1904, New Haven, Conn. 06509, Tel: 203-772-2220, TWX: 710-465-3165; Empl.: 160 p. 4041

Sales Manager: C. A. Peffer

Local Sales Offices & Reps.

Cal	Anaheim, Cutler-Hammer	714-776-1910
Cal	Menlo Park, Cutler-Hammer	415-854-3757
Fla	Tampa, Cutler-Hammer	813-839-5493
Ga	Atlanta, Cutler-Hammer	404-939-3023
Ill	Broadview, Cutler-Hammer	312-547-7980
Ind	Fort Wayne, W.W. Bieberich	219-432-2537
Ind	New Albany, W. W. Bieberich	812-945-3187
Kans	Kansas City, Cutler-Hammer	913-236-6313
Md	Towson, Cutler-Hammer	301-825-6041
Mass	Newton, Cutler-Hammer	617-244-7514
Mich	Southfield, Cutler-Hammer	313-353-3834
Minn	Minneapolis, Cutler-Hammer	612-831-3560
Mo	St. Louis, Cutler-Hammer	314-567-3311
NY	Melville, Cutler-Hammer	516-595-4424
NY	Rochester, Cutler-Hammer	716-271-5460
Ohio	Dayton, Dolfuss-Root & Co.	513-433-6776
Ohio	Rocky River, Dulfuss-Root & Co.	216-333-7504
Ore	Portland, J.J. Backer Co.	503-297-3776
Pa	Pittsburgh, Dolfuss-Root & Co.	412-561-4125
Pa	Wayne, Cutler-Hammer	215-878-0820
Tex	Dallas, Cutler-Hammer	214-631-3731
Wash	Bellevue, Cutler-Hammer	206-747-5560
Wash	Seattle, J.J. Backer Co.	206-285-1300

JACKSON BROS., (LONDON) LTD., Dept. EM, 258 Bway., New York, N.Y. 10007, Tel: 212-962-5485 p. 1163

Local Sales Offices & Reps.

Ariz	Phoenix, Kay Entprs.	602-242-6787
Cal	Mountain View, Shaw-Tech, Inc.	
Ill	Westchester, W.G. Brouillette	312-345-6500

JAESIC INDUSTRIES CO., Dept. EM, 29830 Beck, Wixom, Mich. 48096, Tel: 313-624-6411; Empl.: 18

Local Sales Offices & Reps.

Fla	Hollywood, R. L. Tomecek Co.	305-752-0226
Fla	Stuart, G. McMaken	305-287-0360
Ill	Lombard, A. Bolin	312-627-6802
Ind	Indianpolis, Ellinger Sls.	317-251-2757
Mich	Bloomfield, Encoe Mktg	313-642-0203
Mich	Detroit, Professional Med. Dist.	313-624-6413

JAMESBURY CORP., Dept. EM, 640 Lincoln St., Worcester, Mass. 01605, Tel: 617-852-0200, TWX: 710-340-1268; Empl.: 1000

Local Sales Offices & Reps.

Ala	Pleasant Grove	205-787-1429
Cal	Mill Valley	415-982-0606
Cal	Westlake Village	213-889-5032
Fla	Jacksonville	904-768-0411
Ill	Northbrook	312-564-4770
La	Baton Rouge	504-344-1933
Mich	Milford	313-547-5070
Mo	St. Charles	314-426-6011
NJ	Madison	212-964-8852
NY	New York	212-964-8852
NY	Rochester	716-671-8173
NY	Syracuse	315-472-8728
NC	Charlotte	704-376-6393
Ohio	Cincinnati	513-579-0847
Ohio	Cleveland	216-449-6311
Ohio	Tallmadge	216-762-3131
Pa	Aliquippa	412-375-0205
Pa	Wayne	215-687-9265
Tex	Houston	713-622-1671
Tex	Roanoke	214-243-6109
Wash	Seattle	206-682-6997
Wash	Vancouver	206-693-1456
Wisc	Milwaukee	414-445-2440
Exp:	Tenn., Murfreesboro	615-256-0643

JAMES ELECTRONICS INC., Dept. EM, 4050 N Rockwell St, Chicago, Ill. 60618, Tel: 312-463-6500, TWX: 910-221-5034

Sales Manager: J. A. Kennedy

Local Sales Offices & Reps.

Ala	Huntsville, Macro Mktg	205-883-9630
Cal	Oakland, Bellove Co	415-658-9011
Fla	Melbourne, Hanson Assocs	305-727-7474
Mass	Norwood, Stan Pierce	617-762-3164
Mich	Pleasant Ridge, Shalco	313-547-4771
Nev	Incline Village, Lee Grant Snyder	702-831-3482
Ohio	Dayton, Dynel Co	513-434-6467
Tex	Lewisville, Jim Hughes Co	817-430-1683
Tex	Stafford, Jim Hughes Co	713-491-2498

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JAN HARDWARE MFG. CO., Dept. EM, 47-27 36th St., Long Island City, N.Y. 11101, Tel: 212-361-0800; FSC No.: 99813; Empl.: 60 ..... p. 2424-2439

Local Sales Offices & Reps.

Ariz	Phoenix, Toward Eng'g. Assocs. Inc.	602-955-3193
Haw	Honolulu, Aloha Assoc.	808-922-3810
Ill	Chicago, Croydon Elect.	312-237-4343
Ind	Huntington, Croydon Elect.	219-422-2311
Md	Woodbine, Naudain Assocs. Southern	301-442-2270
Mass	Brookline, Harman Assocs.	617-232-6687
Mo	Crestwood, Nevco	314-843-7406
Mo	Kansas City, Nevco	816-421-1751
NJ	Bergenfield, H. Gray Assoc.	201-384-3643
NC	Garner, Candor Co.	919-876-4999
Ohio	Cleveland, Goory Sls.	216-777-2011
Pa	Mount Laurel, Naudain Assoc.	215-564-3194
SC	Myrtle Beach, Candor Co.	803-448-8361
Tenn	Chattanooga, Candor Co.	615-894-9686
Tex	Dallas, Loss & Stewart Assoc.	214-747-0081
Va	Richmond, Candor Co.	804-320-7375
Exp:	Can., Scarborough, Ont., Banke Elctrns., Ltd.	416-438-6393

JANCO CORPORATION

JANCO CORP., Dept. EM, Box 3038-Glenoaks Sta., Burbank, Cal. 91504, Tel: 213-845-7473, TWX: 910-498-2701; FSC No.: 91812; Empl.: 180 p. 4096,4097

Local Sales Offices & Reps.

Ariz	Scottsdale, Piper-Goyne	602-946-4437
Ark	Dallas, M. Kruvand Co.	214-827-8043
Cal	Menlo Park, McKnight Co.	415-325-2844
Colo	Arvada, Piper-Goyne Inc.	303-420-4646
Conn	Glastonbury, Barton-Caron Assocs.	203-633-0417
Fla	Orlando, MacKay, Smith & Assocs.	305-277-1513
Ga	Atlanta, N.D. Russell	404-255-2918
Ill	Chicago, Engineered Sls. Co.	312-867-8434
Kans	Wichita, T-Bird Tech. Sls. & Svc.	316-684-2941
Md	Silver Spring, H.R. Sieber Co.	301-589-9110
Mass	Auburndale, Barton-Caron Assocs.	617-332-0342
Minn	Minneapolis, Electro-Serv Co.	612-827-2907
Mo	St. Louis, T-Bird Sls. & Svc.	314-567-6488
NJ	Cherry Hill, Quality Comps. Co.	609-428-6266
NY	Albertson, C.F. Ward	516-742-5561
NC	Charlotte, MacKay, Smith & Assoc.	704-527-0240
Ohio	Cleveland, Comps., Inc.	216-842-2737
Pa	Pittsburgh, Components	412-833-9380
Tex	Dallas, Mark Kruvand Co.	214-827-8043
Wash	Seattle, Norwest Co.	206-282-3707

JAPANESE PRODS. CORP., Dept. EM, 7 Westchester Plaza, Elmsford, N.Y. 10523, Tel: 914-592-8880, Telex: 13-1581; Empl.: 6 p. 3093-3096

Local Sales Offices & Reps.

Cal	Buena Park, Rock Assocs	714-521-6980
Cal	Los Angeles, Halbar Assocs	213-387-8283
Cal	San Mateo, Halbar Assocs	415-349-4700
Fla	Casselberry, D. Lang & Assoc.	305-339-9696
Ga	Pine Lake, Hilco	404-469-8638
Ill	Chicago, Technical Reps Inc	312-248-0300
Mass	Boston, Forbes Engrg	617-744-1693
Mich	Plymouth, A.P. Assoc.	313-459-1200
NY	Syosset, Motion Control Sls	516-921-5656
Ohio	Fairborn, Technical Assoc Inc	513-878-2484
Pa	Devon, Kiley Electric Co.	215-687-9340
Tex	Dallas, Dwayne Clement & Assoc.	214-341-5860
Tex	Houston, Dwayne Clement & Assoc.	713-461-8852
Wash	Sumner, Halbar Assoc	206-939-2080

Local Distributors

Cal	Mountain View, Abacus Elctrns.	415-961-1500
Cal	Santa Monica, Trojan Industries	213-829-1735
Ill	Chicago, Servo Comp.	312-248-0300
Ill	Elgin, Allied Elctrns	312-697-8200
NY	New York, B&B Motor & Control Corp.	212-966-5777
Tex	Fort Worth, Allied Elctrns.	817-336-5401

APOLLO LASERS, Apollo Lasers, Inc., Dept. EM, 6357 Arizonia Cir, Los Angeles, Cal. 90045, Tel: 213-641-4490, Telex: 69-8204; Empl.: 56

Sales Manager: S. Raia

Local Sales Offices & Reps.

Cal	Los Angeles, Javelin	213-641-4490
Colo	Boulder, Profit Lines	303-449-0690
Fla	Sarasota, Enjay Assoc	813-958-9533
Ill	Chicago, DuVall & Assoc	312-774-5115
Mass	Waban, ICI, Inc.	617-969-9881
Minn	Minneapolis, HMR Inc.	612-920-8200
Mo	Kansas City, Tel-Tronics	816-966-8313
NY	Buffalo, Waxman Currant Sls.	716-873-0442
NY	Long Island City, Metrocom Sys Sls	212-786-5891
NY	Pittsford, Waxman Currant Sls.	716-586-8112
Ohio	Cincinnati, United Transifier	513-793-3426
Ohio	Cincinnati, United Transifier	513-793-3426
Pa	Bala-Cynwyd, M. Friedman Assoc.	215-839-3450
Tex	Houston, Sound Ideas Assocs.	713-686-4838
Va	Anandale, Javelin Electrns.	703-978-7558
Wash	Bellevue, R. Merritt Co.	206-746-7337

JAVEX ELCTRNS, See Xit Rod Co

JAY-EL PRODS., Dept. EM, 1859 W. 169th St., Gardena, Calif. 90247, Tel: 213-321-3260, TWX: 910-346-7633; FSC No.: 08719; Empl.: 100

Local Sales Offices & Reps.

Ariz	Phoenix, Thorson Co.	602-956-5300
Cal	Gardena, Jay-El Prods., Inc.	213-323-7130
Cal	Santa Clara, Nova Tronix, Representative	408-243-9530
NH	Manchester, North East Components	603-627-7242
NY	Plainview, Jay-El Direct Sls.	516-931-6195
Pa	Lafayette Hill, R. Tschopp (Direct Sls.)	215-825-3666
Tex	Dallas, Allied Comp.	214-238-0408
Wash	Seattle, Norwest Co.	206-AT 2-3707

JB ELCTRN, TRANSFORMERS, INC., Dept. EM, 2300 W. Armitage Ave., Chicago, Ill 60647, Tel: 312-342-0080, TWX: 910-221-1283; FSC No.: 11700; Empl.: 150

Sales Manager: N.K. Yost

Local Sales Offices & Reps.

Ala	Huntsville, JHU Assoc.	205-536-7455
Cal	Los Alimitos, Westaironics, Inc.	213-431-1101
Cal	Marina Del Rey, Westaironics, Inc.	213-821-7958
Fla	Hollywood, AP Assocs.	305-987-6720
Iowa	Cedar Rapids, Lorenz Sls.	319-393-6912
Wisc	Milwaukee, JM Sls. Co.	414-546-0040

J.D.N. ELECTRONICS INC., Dept. EM, Box 156, 239 Morristown Rd., Gillette, N.J. 07933, Tel: 201-647-2400; Empl.: 12

Local Sales Offices & Reps.

Ala	Huntsville, EMA Inc.	205-837-6061
Fla	Port Richey, H. R. Delaney Sls.	813-842-9176
Ill	Chicago, Croydon Elctrns.	312-237-4343
Wash	Seattle, Walt Spaulding Co.	206-282-9173

JEFFERSON ELEC., Div. Litton Inds., Dept. EM, 840 S. 25th Ave., Bellwood, Ill. 60104, Tel: 312-626-7700, Telex: 72-8402

Distributor Manager: G. Swing

Local Sales Offices & Reps.

Ariz	Phoenix, John Bennan Sls	602-945-2394
Ark	Little Rock, Southland Sls	501-753-4013
Cal	Los Angeles, J. G. Pomeroy Co.	213-263-9381
Cal	San Francisco, Black & Egbert	415-282-0840
Colo	Denver, E-O Sls.	303-778-1900
DC	Washington, Electrical Sls Assoc.	202-261-1858
Fla	Brandon, Swanson & Co.	813-685-4864
Ga	Atlanta, Powell-McLaughlin	404-875-0755
Haw	Honolulu, Atlas Elec Co.	808-524-5866
Ill	Chicago, Electrical Mktg.	312-681-1180
Ind	Indianapolis, Clyde Warble & Assoc.	317-632-1465
Iowa	Cedar Rapids, Joe Bertsch Elec'l Sls	319-366-7719
Ky	Covington, Bryan, Haley & Hackman	606-291-3800
La	New Orleans, Corrigan Mktg.	504-821-5571
Md	Annapolis, Baltimore Electrical Sls Assoc.	301-269-1001
Mass	Stoughton, North Coast Sls	617-344-1007
Mich	Detroit, Electrical Materials	313-541-1650
Mich	Grand Rapids, Electrical Materials	313-942-0128
Minn	Minneapolis, Huyck & Assocs.	612-566-0720
Mo	No. Kansas City, Don Hatfield Sls	816-474-3232
Mo	St. Louis, Electrical Mktg	314-726-2920
NY	New Hartford, F. W. Laver & Son	315-724-2304
NC	Charlotte, W.H. Lassister Sls.	704-523-2736
Ohio	Bedford Hgts, Riffle & Assoc.	216-439-5500
Ohio	Cincinnati, Bryan, Haley Hackman	614-486-6516
Pa	Philadelphia, Electrical Sls Assn.	609-541-7452
Pa	Pittsburgh, Squire T. Mair Assoc.	412-364-3700
Tenn	Memphis, Southland Sls Agts	901-525-0142
Tenn	Nashville, Southland Sls Agts	615-889-4738
Tex	Dallas, The Rich Co	214-742-1758
Tex	Houston, McIver & Slavin Co.	713-868-2571
Utah	Sandy, Pete Farley Agcy	801-561-1588
Va	Mechanicsville, W. H. Lassiter Sls	804-746-4268
Wash	Seattle, Bangs Assocs	206-762-0262
Wisc	Butler, J. F. Nolan & Assoc.	414-781-1140

JEROME INDUSTRIES

JEROME INDUSTRIES CORP., Dept. EM, 391 Lakeside Ave., Orange, N.J. 07050, Tel: 201-678-9595; Empl.: 120 ..... p. 3277

Sales Manager: J. DiGirolamo

Local Sales Offices & Reps.

Ala	Huntsville, Rakes Engrg. & Mktg. Corp.	205-883-9260
Ariz	Tempe, Service Specialist Co	602-966-6990
Cal	San Rafael, Wright Assoc.	415-457-9940
Cal	Santa Monica, REP Assocs.	213-829-5401
Colo	Parker, Mikro Sales	303-841-4131
Fla	Jupiter, Cherry Assoc.	305-746-4591
Ill	Chicago, Ed Joyner & Co.	312-792-1277
Ind	Indianapolis, Electronic Sales & Engrg. Inc.	317-849-4260
Md	Glen Arm, Hodgins Assoc.	301-592-7047
Mass	Woburn, American Marketing Assocs.	617-935-4464
Mich	Warren, DEM Electronic Sales	313-755-6660
Minn	St. Paul, Countrymen Assocs.	612-645-9151
Mo	St. Louis, Engrg. Svc. Co.	314-997-1515
NJ	Plainfield, MEG Electronic Sales	201-757-4332
Tex	Addison, Parvin Sls.	214-661-2401

JERROLD ELECTRONICS CORP., Distr Sls, Dept EM, 200 Witmer Rd., Horsham, Pa. 19044, Tel 215-674-4800, Telex: 834-613

Distributor Manager: B. Wolf

Local Sales Offices & Reps.

Mo	No. Kansas City, W. Woody	816-842-1555
Pa	Horsham, Lenny Elkins	215-674-4800

JERSEY SPECIALTY CO., Dept. EM, Box 248 Burgess Pl., Wayne, N.J. 07470, Tel: 201-694-6200; Empl.: 40

Local Sales Offices & Reps.

Cal	Los Angeles, Erlanger Sls. Co.	213-731-2239
Del	Newark, F. S. Carmine Co.	302-738-5966
Fla	Miami, Raulson & Co.	305-226-6013
Ill	Chicago, Lassers & Co.	312-539-0170
Ind	Indianapolis, D. Powers Sls., Inc.	317-846-0790
Mass	Lynn, Keene Sls. Co.	617-595-2300
Mich	Brighton, Lectro Sls. Co.	313-632-7941
Minn	Minneapolis, Kodo Assoc.	612-881-1259
Mo	Raytown, M. Taraski Sls. Co.	816-358-1442
NJ	Teaneck, Fisher Elctrn. Assocs.	201-837-1200
NY	Liverpool, Lewis-Dunnigan Co.	315-622-2133
NC	Charlotte, D. Austin Co.	704-366-4643
Ohio	Medina, T. Grant Assocs.	216-692-3050
Ore	Portland, R. M. Minthorne	503-246-4556
Tex	Dallas, Crockett Sls. Co.	214-748-8209
Exp:	New York, N.Y., Roburn Agencies	212-989-5938

JETTRON PRODS., Dept. EM, P.O. Box 337, E Hanover, N.J. 07936, Tel: 201-887-0571; FSC No. 04435; Empl.: 30 ..... p. 2045

Local Sales Offices & Reps.

NY	New York, Eltron Export Co.	212-944-7635

JEWELL ELECTRICAL INSTRUMENTS, INC. Dept. EM, Grenier Field, Manchester, N.H. 03108, Tel 603-669-6400, Telex: 943435; Empl.: 400 p. 2764,276

Sales Manager: J. J. McArdle

Local Sales Offices & Reps.

Ala	Huntsville, Currie Peak & Frazier	205-536-5650
Ark	Little Rock, J.Y. Schoonmaker	
Cal	Costa Mesa, F.L.W. Inc.	213-860-4695
Cal	Palo Alto, Held & Mollard	415-965-9320
Cal	San Diego, F.L.W., Inc.	714-277-0995
Conn	Newtown, Gerber Sls. Corp.	203-426-3440
Fla	Orlando, Currie Peak & Frazier	305-855-0845

Ill Chicago, Berndt Assocs 312-283-0713
Iowa Cedar Rapids, Tech Reps 319-393-5510
Kans Lenexa, Tech Reps 913-888-0212
Mass East Longmeadow, Gerber Sls. Corp. 413-523-3059
Mass Waltham, Gerber Sls. Corp..... 617-890-8040
Mich Troy, C. B. Jensen & Assocs 313-643-0506
Minn Edina, M. Foster Co. 612-835-2252
Mo Hazelwood, Tech Reps..... 314-731-5200
NJ Cherry Hill, Trinkle Sls..... 609-795-4200
NM Albuquerque, C.T. Carlberg & Assocs. 505-265-1579
NY Buffalo, D. C. Rudell Assocs 716-634-4300
NY Melville, Comtronics Assocs. 516-249-0505
NC Greensboro, Currie, Peak & Frazier 919-273-3040
Ohio Beachwood, Elctrns. Salesmaster 216-831-9555
Okla Tulsa, J.Y. Schoonmaker 918-936-1423
Ore Portland, Frank Jackson Co. 503-292-2638
Tex Dallas, J.Y. Schoonmaker Co..... 214-394-1650
Wash Seattle, F. Jackson Co. 206-523-6300
Exp: Conn., Cheshire, Techmark Overseas Corp. 412-941-6490

Local Distributors
Ala Huntsville, Pioneer Standard Elctrns 205-837-9300
Ariz Phoenix, Metermaster, Inc..... 602-243-4111
Cal Los Angeles, Metermaster, Inc... 213-685-4340
Cal Los Angeles, E.I.L. Instr..... 213-685-7020
Cal Palo Alto, Metermaster, Inc. 415-968-0313
Cal San Diego, Metermaster, Inc. 714-560-4841
Cal Santa Clara, Dynametron..... 408-246-6535
Colo Denver, Meter-Master Instr. Co. 303-722-5766
Conn Middletown, Mancib Co. 203-346-6646
Fla Orlando, Pioneer Standard Elctrns 305-859-3600
Ill Bridgeview, E.I.L. Instr. 312-430-2292
Ill Elk Grove Village, Metermaster, Inc. 312-593-8650
Ill Oak Park, Pacific Indicator Co.. 312-261-1330
Ind Evansville, Electro Lab Svc..... 812-423-5211
Ind Indianapolis, E.I.L. Instr. 317-545-1373
Md Elkridge, Sunshine Scientific Instrs. 301-796-5600
Md Gaithersburg, Pioneer Instrumentation 301-948-0710
Md Timonium, E.I.L. Instrs. 301-252-1260
Mass Billerica, Metermaster, Inc..... 617-667-8346
Mass Burlington, Mancib Co. 617-272-9450
Mich Ferndale, Ram Meter, Inc. 313-398-6767
Minn Minneapolis, Control Assemblies Co. 612-544-3364
Mo St. Louis, Industrial Svc Labs 314-535-5760
NJ So. Plainfield, Brownell Electro... 201-753-4600
NM Albuquerque, Walker Radio Co. 505-247-2288
NY Clarence, Trott Elctrns 716-634-8500
NY New York, Brownell Electro..... 212-924-6000
NC Greensboro, Pioneer Standard Elctrns 919-273-4441
Ohio Cleveland, Weschler Electrn. Corp. 216-251-4609
Ohio Cleveland, Pioneer/Instrumentation 216-587-3600
Ohio Dayton, Pioneer/Dayton 513-236-9900
Ohio Dayton, E.I.L. Instr. 513-435-2134
Okla Tulsa, Oil Capitol Electrn. Corp. 918-622-8520
Pa Philadelphia, Sunshine Scientific Inst. 215-673-5600
Pa Pittsburgh, EIL/IMPAC 412-731-5230
Pa Pittsburgh, CAM/RPC Indl. Elctrn. 412-782-3770
Tex Dallas, Dallas Instruments 214-349-1180
Tex Dallas, Ultra Instr. 214-357-0297
Tex Garland, Metermaster, Inc..... 214-271-5671
Tex Houston, Geophysical Supply Co. 713-659-2233
Tex Houston, Quality Instr. Labs..... 713-524-0528
Va Alexandria, E.I.L. Instr. 703-354-4330
Va Richmond, Instrument Tech Reps. 804-275-1431
Wash Seattle, Branom Instrs., Co..... 206-762-6050
Wisc Milwaukee, Electro-Mechano Co. 414-272-4050
Exp: Conn, Cheshire, Techmark Overseas Corp. 203-272-3559
For: Can, Downsview, Ontario, Metermaster, Divn. of R. H. Nichols, Ltd..... 416-661-3190

JFD ELECTRONICS COMPONENTS CORP., Dept. EM, 1462 62nd St., Bklyn., N.Y. 11219, Tel: 212-331-1000, TWX: 710-584-2462; Empl.: 325

Local Sales Offices & Reps.
Ala Huntsville, 20th Century Mktg..... 205-772-9237
Ariz Tempe, Argus Sls..... 602-967-8709
Cal Culver City, Bestronics Inc. 213-870-9191
Cal Los Altos, Recht Assocs. 415-941-0336
Colo Denver, Omega Ltd. 303-758-1508
Fla Altamonte Springs, SemTronic Assocs. 305-831-8233
Fla Ft. Lauderdale, SemTronic Assocs. 305-771-0010
Ga Atlanta, G. Duckett Sls. Co..... 404-451-3529
Ill Chicago, MCA 312-992-2090
Ind Indianapolis, Given Corp. 219-432-5585
Kans Prairie Village, Engrg. Svcs. Co. 914-649-4000
Md Timonium, Glen White Assoc..... 301-252-6360
Mich Southfield, Giesting Assoc..... 313-477-6060
Minn St. Louis Park, Beta Engrg. Corp. 612-925-4422
Mo St. Louis, Engrg. Svcs. Co. 314-997-1515
NY Floral Park, MOS Assocs..... 516-487-3966
NY Rochester, R.P. Kennedy Co. 716-271-6322
Ohio Bloomington, Giesting Assoc..... 812-336-0391
Ohio Cincinnati, Giesting Assoc. 513-851-7800
Ohio Galion, Giesting Assoc. 419-468-3737
Pa Philadelphia, S.K. MacDonald 215-545-1205
Tex Dallas, United Comps. 214-861-4306
Wash Seattle, H. Levinson Co..... 206-EA 3-5100
Wisc Milwaukee, Star Engrg. Sls..... 414-543-3469

Local Distributors
Cal Gardena, Bell Inds. 213-321-5802
Cal Sunnyvale, Bell Inds..... 408-734-8570
Cal Sun Valley, Sterling Elctrns. 213-767-5030
Fla Orlando, Hammond Elctrns..... 305-849-6060
Ill Mt. Prospect, Cramer Elctrns. 312-593-8230
Mass Newton, Cramer Elctrns. 617-969-7700
Mass Watertown, Sterling Elctrns..... 617-926-9720
NJ Perth Amboy, Sterling Elctrns..... 201-442-8000
NY Plainview, Fairmont Elctrns..... 516-694-8200
Pa Philadelphia, Almo Elctrns..... 215-676-6000
Tex Dallas, J&S Entprs. 214-324-1448

JKL COMPONENTS CORP., Dept. EM, 2226 Barry Ave., W. Los Angeles, CA 90064, Tel: 213-478-3591, TWX: 910-342-6883; FSC No.: 55335; Empl.: 8

Sales Manager: J.S. Velas

Local Sales Offices & Reps.
Ala Huntsville, Component Sls. Corp. 205-881-4753
Ariz PHoenix, R.E.B. Elctrn. Sls. 602-931-5361
Cal Redwood City, J. S. Heaton Co. 415-367-9000
Cal San Diego, Reed Elctrn. Mktg. .. 714-452-1456
Colo Denver, J. S. Heaton Co. 303-841-3651
Fla Clearwater, Chaco Sls 813-536-9503
Haw Honolulu, Hawaii Elctrn. Sls. 808-845-8207
Ill Mt. Prospect, Magnuson Assocs. 312-956-0700
Ind Indianapolis, Magnuson Assocs.. 317-243-8885
Kans Overland Park, Sheridan Assocs. 913-383-1636
Mass Framingham, KSA of New England 617-875-5464
Mich Farmington, Sheridan Assocs.... 313-477-3800
Minn St. Paul, Magnuson Assocs. 612-227-8495
Mo Florissant, Sheridan Assocs. 314-837-5200
NJ Clifton, Ossmann Comps..... 201-778-8888
NM Albuquerque, Cleveland Entprs. 505-266-5594
NY Buffalo, Ossmann Comps. Sls. Corp. 716-832-4271
NY Kingston, Ossmann Comps. Sls. Corp. 914-338-5505
NY Rochester, Ossmann Comps. Sls. Corp. 716-442-3290
NY Syracuse, Ossmann Comps. Sls. Corp. 315-454-4477
NY Vestal, Ossmann Comps. Sls. Corp. 607-785-9949
NC Raleigh, Component Sls. Corp... 919-832-1897
Ohio Beachwood, Sheridan Assocs. .. 216-831-0130
Ohio Cincinnati, Sheridan Assocs. 513-761-5432
Ohio Dayton, Sheridan Assocs. 513-277-8911
Okla Tulsa, Norvell Assocs. 918-663-1247
Pa Pittsburgh, Sheridan Assocs. 412-244-1640
Tex Dallas, Norvell Assocs..... 214-233-0020
Tex Houston, Norvell Assocs. 713-774-2568

Local Distributors
Cal Los Angeles, Welco Elctrns. 213-254-6187
Cal Mountain View, Target Elecs. 415-961-1170
Colo Denver, Intergrated Elctrns 303-534-6121
Haw Honolulu, Hawaii Elctrn. Sls. 808-845-8207
Ill Mt. Prospect, Magnuson Comp. Sls. 312-956-0700
Mass Framingham, Future 617-879-0860
Mich Farmington, Sheridan Sls. Co..... 313-477-3800
NJ Little Falls, Diplomat 201-785-1830
NY Port Washington, Connector Concepts 516-883-3800
NY Rochester, Ossmann Comp. Sls. 716-442-3290
Ohio Cincinnati, Sheridan Sls. Co. 513-761-5432
Tex Dallas, Norvell Comp. Sls. 214-350-6771
Utah Salt Lake City, Diplomat..... 801-486-7227
For: Can., Montreal, Speciality Elctrns. 514-336-4500
For: Can., Montreal, Que., Cesco Elctrns. Ltd. 514-735-5511

JM TRANSFORMER, Dept. EM, 262 Mott St., New York, N.Y. 10012, Tel: 212-966-4195; Empl.: 3 p. 4357

Sales Manager: J. Millman

JOHANSON MFG. CORP., Dept. EM, Box 329, Boonton, N.J. 07005, Tel: 201-334-2676, TWX: 710-987-8367; Empl.: 240 ..... p. 1164

Local Sales Offices & Reps.
Ariz Scottsdale, Q.T. Wiles & Assocs. 602-971-6250
Cal Menlo Pk., Straube Assocs..... 415-321-9050
Cal Pico Rivera, Westrep 213-949-2551
Fla Orlando, Perrott Assocs., Inc. 305-275-1132
Ind South Bend, C-S Electronic Sales 219-291-6258
Md Columbia, Rep-Tron 301-465-6433
Mass Seekonk, J. Murphy Assocs. 617-761-7153
NJ Wayne, Pak/Com, Inc. 201-944-9393
NY Fayetteville, R.D.-Sherman..... 315-637-9861
Ohio Dayton, Electro-Com..... 513-898-5140
Pa Trevose, P.S.A. 215-245-0513
Tex Arlington, W. Pat Fralia Co. 817-640-9101
Wash Seattle, Northmar 206-524-5170

Local Distributors
Cal Sunnyvale, Diplomat/Westland .. 408-734-1900
Cal Woodland Hills, Jaco Elctrns. ... 213-887-6400
Fla Orlando, Pelcor Co. 305-275-1132
Ill Chicago, Newark Elctrns. 312-638-4411
Md Baltimore, Radio Elec. Svc. 301-823-0700
Mass Medford, Blake Assocs. 617-391-7890
NY Hauppauge, Jaco Elctrns. 516-273-5500
Pa Philadelphia, Philadelphia Elctrns 215-568-7400
Tex Arlington, PATCO Co..... 817-640-9101

JOHANSON DIELECTRICS INC., Dept. EM, Box 6456, Burbank, Cal. 91510, Tel: 213-848-4465, TWX: 910-498-2735; Empl.: 154 ..... p. 1165

Local Sales Offices & Reps.
Ariz Scottsdale, Q.T. Wiles 602-948-5590
Cal Menlo Park, Straube Assocs. 415-323-2476
Cal Pico Rivera, Westrep 213-949-2551
Fla Orlando, Pelcor 305-275-1132
Ill , Johanson Mfg. Co. 312-446-4021
Ind South Bend, C-S Electronic Sls 219-291-6258
Kans Overland Park, Electri-Rep 913-649-2168
Md Silver Springs, Rep-Tron, Inc. 301-593-4844
Mass Seekonk, J. W. Murphy Assoc. .. 617-761-7153
NJ Wayne, Pak/Com 201-696-1871
NY Fayetteville, R.D. Sherman, Inc. 315-637-9861
Ohio Cleveland, Electro-Com 216-886-2404
Pa Philadelphia, Professional Service Assoc. 215-722-8222
Pa Pittsburgh, Electro-Com 216-886-2404
Tex Arlington, W. Pat Fralia Co. 817-640-9101
Wash Seattle, Northmar Inc..... 206-524-5170

JOHNATHAN MFG., Dept. EM, 1101 South Acacia Ave., Fullerton, Calif. 92631, Tel: 714-526-4651, TWX: 910 592-1241; Empl.: 151

Sales Manager: Doris A. Jenkins

Local Sales Offices & Reps.
Cal Fullerton, Jonathan Mfg 714-526-4651
Cal San Jose, Norwest Elctrns..... 408-287-9378
Colo Arvada, Challenge Sls 303-420-4316
Fla Clearwater, WMM Assocs 813-442-3913
Ga Smyrna, Spartech Assocs 404-432-3644
Ill Streamwood, Jonathan Mfg..... 312-289-6850
Kans Overland Park, Gordon Fixman Engr. 913-677-5191
Md Baltimore, Burgin-Kreh Assoc..... 301-788-5200
Mass Burlington, Schaal Associates 617-272-7940
Mich Grand Rapids, Jonathan Mfg..... 616-247-3604
Minn Minneapolis, Jos Co Melius 612-861-3343
Mo St. Louis, Gordon Fixman Engr. 314-725-5219
NJ Teaneck, Jonathan Mfg 201-833-0061
NY Ithaca, Bob Dean, Inc..... 607-272-2187
NC Raleigh, Burgin-Kreh Assoc. 919-781-1100
Ohio Brunswick, Deo-Volente & Assoc. 216-225-2440
Ohio Sylvania, Deo-Volente & Assoc. 419-882-2830
Okla Tulsa, Blair Engineering 918-747-3100
Ore Portland, Houston Co 503-297-5589
Tenn Chattanooga, L & S Industrial Sls 615-894-3253
Tex Dallas, Blair Engrg..... 214-352-8411
Tex Houston, Blair Engrg..... 713-776-0011
Utah Salt Lake City, Challenge Sls 801-364-2999
Va Lynchburg, Burgin-Kreh Assoc.. 804-845-5600
Wash Seattle, Houston Co 206-622-0750

JOHNSON CO., E.F., Dept. EM, 299 10th SW Ave., Waseca, Minn. 56093, Tel: 507-835-6222, Telex: 29-0470; Empl.: 1400 ..... p. 1166-1168,2046-2050

Sales Manager: G. Mena

Local Sales Offices & Reps.

Cal	Redwood City, Logan Sls. Co.	415-369-6726
Cal	Sherman Oaks, Clemick-Neenan & Assoc	213-990-3150
Colo	Denver, Camel Elctrns.	303-757-6191
Fla	Maitland, Hutto-Hawkins-Peregoy, Inc.	305-831-2474
Ga	Atlanta, Millar Elctrns. Inc.	404-261-6160
Ill	Chicago, Ellinger Sls. Corp.	312-763-1570
Iowa	Cedar Rapids, J. Vrbik Co.	319-366-8733
Kans	Overland Park, T.L. Dowell & Assocs.	913-648-7373
Mass	Needham Hgts., P.R. Sturgeon Co.	617-444-6603
Mich	Detroit, R.C. Merchants & Co.	313-535-6000
Minn	Minneapolis, S. Clothier Co.	612-944-3456
NY	Elmont, F.E. Schmitt Co.	516-437-8150
NY	Syracuse, Mar-Com Assocs.	315-437-2843
Ohio	Columbus, McFadden Sls., Inc.	614-459-1280
Pa	Narberth, Bresson Assocs.	215-664-6460
Pa	Pittsburgh, Covert & Newman Co.	412-531-2002
Tenn	Memphis, Cartwright & Bean Inc.	901-276-4442
Tex	Dallas, R.E. Nesbitt Co.	214-357-4601
Wash	Seattle, J.J. Backer Co.	206-285-1300

JOHNSON ELECTRIC COIL CO., Dept. EM, Box 559, Elmhurst, Ill 60126, Tel: 312-833-1800; Empl.: 120

Local Sales Offices & Reps.

Ill	Wheaton, Len Feldor & Assocs.	312-665-9070
Mass	Framingham, K.S.A. of New England	617-875-5464
Minn	Minneapolis, G-II Sls Inc.	612-454-3086
Wisc	Milwaukee, J. M. Sls. Co.	414-546-0040

JOLO INDUSTRIES, INC., Dept. EM, 11861 Cardinal Circle, Garden Grove, Cal. 92643, Tel: 714-636-4940; Empl.: 15

Sales Manager: J.S. Giampiccolo, Jr.

Local Sales Offices & Reps.

Ariz	Tempe, Roland Assocs.	602-838-4867
Cal	Mountain View, Leddy Assocs.	415-969-6313
Colo	Lafayette, Spectrum Sls	303-449-7677
Fla	N. Miami, Irby & Connolly	305-949-5197
Fla	Orlando, Irby & Connolly	305-894-8471
Ill	Arlington, Stuart Inds.	312-255-0227
Md	Hyattsville, Eastern Comps.	301-577-2925
Mass	Brookline, Harman Assocs.	617-232-6687
Minn	Lakeville, Dan'l Engrg. Corp.	612-332-4848
NY	Manhasset, Everett Mktg. Corp.	516-627-7750
NY	Vestal, Systems Hardware Reps.	607-729-6339
Ohio	Cleveland, Geotronix Mktg. Assocs.	216-526-2535
Ohio	Columbus, Geotronix Mktg. Assocs.	614-457-8472
Pa	Flourtown, Eastern Comps. Inc.	215-836-1616
Pa	York, Eastern Comps. Inc.	717-764-3114
Va	Herndon, Eastern Components	703-471-1025
Wash	Kirkland, Manon Engrg.	206-827-7449

Local Distributors

Cal	Sunnyvale, Western Microtechnology Sls	408-737-1660
Fla	Lakeland, AA Electric	813-682-6181
Fla	Miami, Elctrn Equipment	305-871-3500
NY	Manhasset, Everett Mktg.	516-627-7750
SC	Columbia, Dixie Elctrns.	803-253-5333

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Manufacture Quality Electronic Components Dual in-Line IC Sockets, Dual in-Line Headers, Connectors, Strip Sockets, P.C. Test Jacks, P.C. Card Ejector, P.C. Card Edge Connectors and Custom Connectors. All JOLO Sockets Feature Closed-Entry Insulators, Excellent Lead Retention Characteristics, Pedestal Design For Flux Removal and Anti-Wicking Capability.

JONARD INDUSTRIES CORP., Dept. EM, 134 Marbledale Rd., Tuckahoe, N.Y. 10707, Tel: 914-793-0700, TWX: 996570, 710-562-0107; Empl.: 65

Sales Manager: B. Osten; *Distributor Manager:* R. Fersen

JONES ELCTRNS., HIRAM, Dept. EM, 11607 Vanowen St., No. Hollywood, Cal. 91605, Tel: 213-875-0213; FSC No.: 04867; Empl.: 8 p. 1772,1773

Local Sales Offices & Reps.

Tex	Paris, Packard Assocs	214-785-4544
Exp:	N.Y., New York, C. Tennant	212-679-1300

Local Distributors

Tex	Houston, Lenert Co.	713-225-1465
Tex	Paris, Electro Hardware Co.	214-785-4544

JONES & LAUGHLIN STEEL CORP, Dept. EM, 3 Gateway Ctr, Pittsburgh, PA 15263, Tel: 412-565-3207

JORDAN CONTROLS, Dept. EM, 5607 W. Douglas Ave., Milwaukee, Wisc. 53218, Tel: 414-461-9200, Telex: 26-829; Empl.: 65

Local Sales Offices & Reps.

Ariz	Phoenix, Thorson Co.	602-956-5300
Cal	Mountain View, Claypool Controls Co.	415-968-7488
Cal	Santa Ana, Harold Wells Assoc.	714-547-4455
Conn	Simsbury, Canner Assocs.	203-658-5074
Fla	Lakeland, AA Electric	813-682-6181
Ga	Atlanta, F.B. Culwell & Assocs.	404-939-1660
Ill	Chicago, Clarkson Engrg. Co.	312-286-2314
Ind	Indianapolis, Garstang Engrg. Co.	317-632-9903
Kans	Shawnee Mission, W. Hickman Co.	913-362-8066
Mass	Marblehead, Canner Assocs.	617-639-0073
Mich	Birmingham, Electro-Mation Assocs.	313-564-6517
Minn	St. Paul, Kenco Co.	612-645-7717
Mo	St. Louis, Wehco Tech. Sls.	314-997-4420
Neb	Omaha, Wehco Tech. Sls.	402-895-0262
NJ	Newark, N. Brager Co., Inc.	201-344-1100
NY	Buffalo, J.W. Simpson Co.	716-634-3995
NY	New York, N. Brager Co. Inc.	212-697-1050
NC	Charlotte, Beck Sls. & Engrg. Co.	704-366-5366
Ohio	Chagrin Falls, J. Kilroy Corp.	216-247-8997
Pa	Bala Cynwyd, Jackson-Bowden Automation	215-664-9611
Pa	Erie, Foster-McClinton Inc.	814-453-5786
Pa	Pittsburgh, Foster-McClinton Inc.	412-561-4800
Tex	Dallas, Peso-Production Engrg.	214-369-3181
Utah	Salt Lake City, Rust Instrumentation & Control	801-487-5958
Va	Roanoke, Johnson Custom Controls	703-981-0780
WVa	Huntington, Foster-McClinton Inc.	304-736-5161
Exp:	Conn., New Haven, Master-Wright Corp.	203-288-1638

JORDAN ELECTRIC CO., Dept. EM, 14707 Keswick St., Van Nuys, Cal. 91405, Tel: 213-781-3849; FSC No.: 5905; Empl.: 75

Sales Manager: B.M. Barton

Local Sales Offices & Reps.

Ala	Huntsville, Twentieth Century Mktg.	205-772-9237
Ariz	Tempe, Argus Sls.	602-967-8709
Cal	Van Nuys, Jordan Elect. Co.	213-873-5782
Fla	Orlando, Perrott Assocs.	305-275-1132
Md	Ellicott City, Doss Elctrns.	301-465-1336
Md	Hagerstown, Angstrohm Precision	301-739-8722
Mass	Framingham, Murata/Angstrohm Sls. Off.	617-872-4843
Mo	St. Charles, Chesco	314-946-6677
NJ	E. Hanover, HLM Assocs.	201-386-0794
NY	New Hartford, Murata/Angstrohm Sls. Off.	315-732-3507
NY	Northport, HLM Assocs.	516-423-1818
Ore	Portland, C. K. Shanks & Assocs.	503-292-5656
Tex	Houston, B. Hamilton	713-445-7086
Tex	Hurst, Wheelex	817-268-1812
Wash	Seattle, C. K. Shanks & Assocs.	206-632-4290
Wisc	Milwaukee, Star Engrg. Sls.	414-645-3680
Exp:	Can., Toronto, Ont., Wilson Entprs.	416-769-0585

JOSLYN ELCTRN. SYS., Div. Joslyn Mfg. & Supp, Dept. EM, 6868 Cortona Dr., Box 817, Goleta, Cal. 93017, Tel: 805-968-3551, TWX: 910-334-3464; FSC No.: 23663; Empl.: 200

Sales Manager: A. deSouza

Local Sales Offices & Reps.

NJ	Clifton, Grimm, Siegel Assocs.	201-546-5010

JPI, INC., Dept. EM, 1507 San Vicente Blvd., Santa Monica, Cal. 90402, Tel: 213-395-2018; Empl.: 3

Sales Manager: S. Kondo

JULIE RESEARCH LAB., Dept. EM, 211 West 61st St., New York, N.Y. 10023, Tel: 212-245-2727, TWX: 710-581-5138; Empl.: 40 ..... p. 2766-2769,3702

Sales Manager: H. Van Duyne

K & S ENGINEERING, Dept. EM, 6917 W. 59th St., Chicago, ILL. 60638; Empl.: 15

KAHGAN ELECTRONICS CORP., Dept. EM, 55 Peninsula Blvd., Hempstead, NY 11550, Tel: 516-538-2300; Empl.: 12

Local Sales Offices & Reps.

Ala	Huntsville, J.K. Whitfield	205-883-779
Cal	City of Industry, Micrometals	213-968-471
Cal	Huntington Beach, Damco	714-894-812
Cal	Northridge, Damco	213-598-614
Cal	Redwood City, Warren & Hickey Sls	415-368-384
Conn	Madison, A & M Elect. Reps.	203-421-424
Fla	Maitland, T. Pridmore Co.	305-678-017
Fla	Melbourne, T. Pridmore Co.	305-727-249
Fla	Miami, T. Pridmore Co.	305-681-495
Fla	Treasure Island, T. Pridmore Co.	813-360-497
Ill	Chicago, Ropek-Cahill, Inc.	312-631-007
Kans	Overland Park, J. F. Guernsey Co.	913-381-222
Mass	Needham, A & M Elect. Reps.	617-444-817
Mich	Detroit, Nicon Assocs.	313-341-768
Minn	Minneapolis, Thomas Mktg.	612-823-488
NY	Rochester, L. Hart Assocs.	716-244-325
Pa	Camp Hill, Beil-Whitaker	717-233-125
Pa	Harrisburg, Beil-Whitaker	717-652-018
Pa	Orefield, Beil-Whitaker	215-395-015
Pa	Reading, Beil-Whitaker	215-779-261
Tex	Houston, C.R. Colvin Assocs.	713-961-126
Va	Alexandria, Potomac Elctrns.	703-836-163

KAHLE ENGRG. CO., Dept. EM, 3344 Hudson Ave., Union City, N.J. 07087, Tel: 201-867-6500; Empl.: 50

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KALART VICTOR CORP., Dept. EM, Hultenius St., Plainville, Conn. 06062, Tel: 203-747-1663

Sales Manager: J.J. Costag

KALMUS & ASSOC., Dept. EM, 2424 S. 25th Ave., Broadview, ILL. 60153, Tel: 312-343-7004; Empl.: 24

Sales Manager: D.R. Capparelli, Sr., V.P. Sls. & Mktg.

KAMAN SCIENCES CORP., Dept. EM, 1500 Garden of the Gods Rd. P.O. Box 7463, Colorado Springs, Colo. 80933, Tel: 303-599-1500, Telex: 452412; Empl.: 450

Sales Manager: J.W. Matthews

Local Sales Offices & Reps.

Conn	Simsbury, Kaman Sciences	203-821-698
Pa	Bethayres, Control Instr. Sls. Co.	215-676-180

KANTZ ELECTRONIC IND., Dept. EM, 229 W. 4th St., Clifton, N.J. 07011, Tel: 201-772-6785; Empl.: 12

Sales Manager: L. Herold

KAPPA NETWORKS, Dept. EM, 165 Roosevelt Ave., Carteret, N.J. 07008, Tel: 800-631-5653, TWX: 13940 Kappa Cret; Empl.: 60 ..... p. 2404,240

Sales Manager: M. Traum, Dir. Mktg.

Local Sales Offices & Reps.

Cal	Alhambra, M.W. Ridel Co.	213-283-769
Cal	Los Altos, Tauber-Dreyer	415-984-269

Fla Treasure Island, Buening Assocs 813-360-4973
Kans Shawnee Mission, Midtek Assocs 913-441-6565
Mass Norwood, Stan Pierce Inc. 617-762-3164
Minn Osseo, Denny Gaffney Agcy. 612-425-5484
Mo Florissant, Midtek Assocs. 314-837-5200
NJ Carteret, Kappa Networks 201-541-1600
NJ Cherry Hill, Benco Sales 609-424-9442
NY Roslyn Heights, Livera-Polk Assoc. 516-484-1276
Utah Salt Lake City, Monarch Distributing & Representing 801-266-9617

KAPPA SCIENTIFIC CORP., Dept. EM, Box 30585, Santa Barbara, Cal. 93105, Tel: 805-687-9648; Empl.: 4

KARL HOPT CO, See Hopt Co., Karl

KATO ENGINEERING CO., Dept. EM, 1415 1st Ave., Mankato, Minn. 56001, Tel: 507-625-4011, Telex: 29-0786; Empl.: 450

Local Sales Offices & Reps.
Ala Homewood, Evans Controls & Sales 205-871-3355
Cal San Rafael, H. Wells Assocs. 415-454-5730
Cal Santa Ana, Harold Wells Assocs. 714-547-4455
Colo Denver, Century Sls. Co. 303-534-4631
Fla Miami, J. Carl Turner Assocs. 305-625-6556
Fla Orlando, J. Carl Turner Assocs. 305-859-4705
Ga Atlanta, T.S. Williams & Assocs 404-261-3434
Ill Deerfield, Electrocon Inc. 312-948-0320
La Jefferson, General Power & Control Corp. 504-733-7340
Md Baltimore, Wilson Assocs., Inc. 301-485-5100
Mass Sharon, Adcour 617-784-8124
Mich Southfield, Doral Sls. Co. 313-352-1667
Minn St. Paul, Nelson Engrd. Sls., Inc. 612-631-0646
Minn St. Paul, DeBeck Assocs. 612-690-1557
NY Seaford, Greer Tech. Sls., Inc. 516-785-6919
NC Charlotte, Robert W. Chapman & Co. 704-525-2421
Ohio Columbus, Arthur N. Ulrich Co. 614-253-2705
Okla Tulsa, Gibbs Co., Inc. 918-622-1523
Tex Houston, Rollow & Assocs. 713-932-7578
Tex Richardson, Kreekon Energy Svcs. 214-234-5959
Wash Kirkland, Jim Landweer 206-822-2276

KATES SCIENTIFIC INSTRUMENTS, Dept. EM, 142 Adam St, Newton, Mass. 02158, Tel: 614-527-2711

Sales Manager: D. Kates

Local Sales Offices & Reps.
Fla Delray Beach, Kates Sci Instrus 305-276-1077

KAVLICO CORP., Dept. EM, 20869 Plummer St., Chatworth, Cal. 91311, Tel: 213-882-2400, Telex: 65-1481; Empl.: 145

Local Sales Offices & Reps.
Cal Chatsworth, Kavlico Corp. 213-882-2400
Cal San Diego, Mes Engr. & Sls. Assoc. 714-278-8021
Conn Canton, Kavlico Reg. Off. 203-693-0646
Kans Wichita, M. L. Garrison Co. 316-682-1312
Mich Detroit, Sls. Consultants Co.
Minn Minneapolis, Industra Co. 612-929-6224
Tex Dallas, United Technical Mkt. 214-231-5611

KAWECKI BERYLCO INDS., INC., Dept. EM, PO Box 1462, Reading, PA 19603, Tel: 215-929-0781, TWX: 510-651-0677; Empl.: 1925

Local Sales Offices & Reps.
Cal Compton, Kawecki Berylco Ind., Inc. 213-639-5651
Cal Palo Alto, Kawecki Berylco Ind., Inc. 415-323-9625
Conn Thomaston, Eyelets for Industry, Inc. 203-283-8213
Conn Thomaston, Summit Finishing Div. 203-283-4391
Ga Atlanta, Kawecki Berylco Inds., Inc. 404-458-7824
Ill Elk Grove, Kawecki Berylco Inds., Inc. 312-593-3600
Mass Boston, Metalonics Div. 617-268-4450
Mass Waltham, Kawecki Berylco Inds., Inc. 617-890-8270
Mich Dearborn, Kawecki Berylco Inds., Inc. 313-292-0300
NJ Palisades Park, Duramic Prods. 201-947-8313
NY Elmsford, Kawecki Berylco Ind. 914-592-7060
Ohio Cleveland, Kawecki Berylco Inds., Inc. 216-464-8860
Ore Albany, Zirconium Technology Corp. (Zirtech) 503-926-7743
Ore Springfield, National Metallurgical Div. 503-746-7674
Pa Reading, Kawecki Berylco Inds., Inc. 215-929-0781
Pa Revere, Penn Rare Metals Div. 215-847-5121
Tenn Athens, Precision Cast Prods. Div. 615-745-6871
Tex Dallas, Kawecki Berylco Ind. 214-368-3383
Wash Tacoma, Kawecki Berylco Ind. 206-475-9343
Wash Wenatchee, Wenatchee Works 509-663-2165

Local Distributors
Ala Birmingham, J.M. Tull Metals Co. 205-324-8583
Ariz Phoenix, E. Jordan Brookes Co. 602-947-7489
Cal Los Angeles, E. Jordan Brookes Co. 213-723-8431
Cal San Francisco, E. Jordan Brookes Co. 408-241-4844
Conn Torrington, Torrington Brass & Steel Co. 203-482-6581
Fla Jacksonville, J. M. Tull Metals Co. 904-783-1270
Fla Miami, J. M. Tull Metals Co. 305-696-0150
Fla Tampa, J.M. Tull Metals Co. 813-236-5741
Ga Atlanta, J.M. Tull Metals Co. 404-449-1611
Ill Chicago, Guardian Metal Sls. 312-583-4400
Ill Chicago, Meier Metal Servicenters 312-378-8120
Iowa Cedar Rapids, Vincent Brass & Aluminum Co. 319-366-6251
Ky Louisville, Williams & Co. 502-582-3321
La New Orleans, J.M. Tull Metals Co. 504-721-0281
Md Baltimore, Brass & Copper Supply 301-247-5500
Mass Boston, Eastern Metal Mill Prods. 617-329-1200
Mich Detroit, Meier Metal Servicenters 313-398-1900
Minn Minneapolis, Vincent Brass & Aluminum 612-378-1131
Mo St. Louis, Joseph Crowe & Co. 314-842-1353
NJ Hillside, N.Y. Brass & Copper Co. 201-926-5300
NJ Newark, Vincent Brass & Aluminum Co. 201-687-4300
NY Buffalo, Williams & Co. 716-897-2000
NY Buffalo, Ontario Metal Supply 716-668-8200
NY Rochester, Ontario Metal Supply, Co. 716-473-4400
NY Syracuse, Ontario Metal Supply 315-457-5441
NC Charlotte, Vincent Brass & Aluminum Co. 704-372-9900
NC Greensboro, J. M. Tull Metals Co. 919-294-5242
Ohio Cincinnati, Williams & Co. 513-821-5555
Ohio Cleveland, Williams & Co. 216-441-1000
Ohio Cleveland, Williams & Co. 614-294-4898
Ohio Dayton, Meier Metal Servicenters 513-294-0361
Ohio Toledo, Williams & Co. 419-476-7800
Ore Portland, Alaskan Copper & Brass Co. 503-238-7171
Pa Philadelphia, Brass & Copper Sls. 609-786-8800
Pa Pittsburgh, Williams & Co. 412-237-2211
RI Providence, Clifford Metal Sls. Co. 401-861-4100
SC Greensboro, Meier Metal Servicenters 919-668-0001
SC Greenville, J.M. Tull Metals Co. 803-242-5242
Tenn Nashville, Williams & Co. 615-883-9440
Va Richmond, J.M. Tull Metals Co. 804-222-0031
Wash Seattle, Alaskan Copper & Brass Co. 206-623-5800
WVa Charleston, Williams & Co. 304-744-5363
Wisc Milwaukee, Pegg Metals 414-786-1730

KAY ELEMETRICS CORP., Dept. EM, 12 Maple Ave., Pine Brook, N.J. 07058, Tel: 201-227-2000, TWX: 710-734-4347; FSC No.: 80138; Empl.: 70 .... p. 2770

Sales Manager: B. Matton

Local Sales Offices & Reps.
NJ Pine Brook, Kay Elemetrics 201-227-2000

KB ELECTRONICS INC., Dept. EM, 5801 Foster Ave., Brooklyn, N.Y. 11234, Tel: 212-968-8000, TWX: 710 584 2308; Empl.: 75

Sales Manager: A Bueller

Local Sales Offices & Reps.
Cal Freemont, Hartfield, Kennan Freytag 415-863-2200
Cal Los Angeles, TechRep Assocs. 213-641-5830
Fla Ft. Lauderdale, Tropi-Tec Co. 305-463-0988
Fla Palmetto, Tropi Tec 813-729-3112
Ill Oak Brook, A. G. Erickson Assocs. 312-323-1367
Kans Shawnee Mission, Delltron Co. 913-362-5512
Md Chevy Chase, Tyler Griffin Co. 301-951-0112
Mass Bedford, Interact Co. 617-275-2050
Mich Grand Rapids, J Orr Assocs. 616-534-4029
Minn St. Paul, Vikeland Sls. Co. 612-645-4647
Mo St. Louis, Delltron Co. 314-869-4779
Neb Lincoln, Delltron Co 402-464-1485
NJ Roselle, A. E. Nelson Co. 201-241-0678
NY Liverpool, L.P. Garner & Assocs. 315-451-1323
NC Charlotte, Industrial Drives & Controls 704-535-5414
Ohio Dover, A. J. Assocs. 216-343-2224
Pa Monroeville, Howard Deevers Co. 412-372-4000
Pa Paoli, Tyler Griffin Co 215-647-1550
Tex Dallas, K.B.J. Sls Co. 214-661-0788
Wash Vancouver, Hartfield, Kennan, Freytag 503-228-1683

Local Distributors
Ill Rockford, Mid West Associated 815-962-8036

KD COMPONENTS, INC., Dept. EM, 3016 S. Orange Ave., Santa Ana, Cal. 92707, Tel: 714-545-7108; Empl.: 12

Local Sales Offices & Reps.
Cal San Jose, Parsons & Horne 408-247-7327
Fla Oldsmar, NCF Sls. 813-855-4209
Ill Streamwood, Al Holte & Assoc. 312-837-4066
Kans Wichita, E. Carbiner Assoc. 316-682-5782
Mass Sharon, Cummings Assoc. 617-828-8370
Minn Minneapolis, Charles Bohlig Co. 612-922-7011
NJ Wayne, G & A Electronics 201-256-8500
Ohio Cincinatti, G & A Sales 513-771-8231
Ohio Grove City, G & H Sales 614-878-1128
Pa Paoli, Tyler Griffin Co. 215-647-1550
Tex Austin, Cunningham Co. 512-459-8947
Tex Dallas, J. Cunningham Co. 214-233-4303
Tex Houston, J. Cunningham Co. 713-461-4197
Wash Seattle, Northmar, Inc. 206-LA4-5170

Local Distributors
Cal Santa Ana, KD Comps. 714-545-7108
Tex Houston, Lenert Co. 713-225-1465

KDI PYROFILM CORP, Dept. EM, 60 S. Jefferson Rd., Whippany, N.J. 07981, Tel: 201-887-8100, TWX: 710-986-8220; Empl.: 200 .... p. 3728,3729

Local Sales Offices & Reps.
Cal Los Angeles, E. Landa Co. 213-879-0770
Cal Mountain View, J.L. Technical Sls 415-969-5552
Cal San Carlos, Winco 415-365-6082
Colo Littleton, Lange Sls. 303-798-1397
Conn Bethel, Livera-Polk Assocs. 203-748-4639
Fla Orlando, Irby & Connoly, Inc. 305-894-8471
Fla Pompano Beach, Saber Assocs 305-943-3076
Ga Dunwoody, Saber Assocs 800-327-1193
Ill Chicago, Technical Sls 312-237-7210
Ill Northfield, Imex, Ltd. 312-446-8934
Md Columbia, Neal Deoul Assocs. 301-997-4353
Mass Lowell, Russell Engrg. Svc. Co. 617-458-7146
Mich Royal Oak, Satullo Co. 313-549-3910
Minn New Brighton, TWC Sls 612-636-1770
NJ Madison, Livera-Polk Assocs. 201-377-3220
NM Albuquerque, IMEC 505-344-2212
NY Bayside, R. Diamond, Inc. 212-423-7330
NY Camillus, Ontec 315-487-0596
NY Fayetteville, Ontec 315-446-2587
NY Grand Island, Ontec 716-773-9319
NY Rochester, Ontec 716-464-8636
NY Roslyn Heights, Livera-Polk Assocs. 516-484-1276
NC Raleigh, Saber Assocs 800-327-1193
Ohio Cleveland, Satullo Co. 216-486-2800
Pa Ambler, WM Assocs 215-643-4119
Tex Dallas, Hillman Entprs. 214-827-4790
Wash Vancouver, Ray Over Sls. 206-695-4697
Exp: Stamford, Conn., Dage Corp. 203-324-3123

Local Distributors
Cal Los Angeles, Mil-Comm 213-879-0770
Cal Mountain View, Target Elctrns. 415-961-1170
Conn Danbury, Custom Elctms Intl 203-792-2076
Fla N. Palm Beach, Legri S. Resistor 305-626-5400
NJ Bergenfield, Technical Elctrn. Distrs. 201-384-3643
Tex Houston, Lenert Co. 713-225-1465

KEDMAN CO., Dept. EM, Box 25667, Salt Lake City, Utah 84125, Tel: 801-363-4413; Empl.: 60

KEENE CORP, Dept. EM, 345 Park Ave, New York, N.Y. 10022, Tel: 212-421-7122

KEITHLEY INSTRUMENTS INC., Dept. EM, 28775 Aurora Rd., Cleveland, Ohio 44139, Tel: 216-248-0400, Telex: 98-5469; Empl.: 220 ..... p. 2771

Sales Manager: David J. Bartos

Local Sales Offices & Reps.

Ala	Huntsville, W. A. Brown Inst.	205-883-8660
Ariz	Phoenix, Aztec Enterprises	602-944-9185
Cal	Los Angeles, T. L. Snitzer	213-863-6170
Cal	San Diego, T. L. Snitzer	714-226-0305
Cal	San Francisco, T. L. Snitzer	408-257-8333
Colo	Denver, Aztec Enterprises	303-795-0250
Conn	Enfield, Keithley/MECO	800-225-3409
DC	Washington, Elect. Mktg. Assoc.	301-881-5300
Fla	Fort Lauderdale, W. A. Brown Inst.	305-776-4800
Fla	Orlando, W. A. Brown Inst.	305-425-5505
Ga	Atlanta, W. A. Brown Inst.	404-455-1035
Ill	Chicago, Carter Elctrns	312-585-5485
Ind	Indianapolis, Carter Elctrns	317-293-0696
Iowa	Cedar Rapids, Palatine Sls	319-365-8071
Kans	Kansas City, Palatine Sls	913-492-7020
Kans	Wichita, Palatine Sls	316-788-0612
La	Baton Rogue, W. A. Brown Inst.	504-626-9701
Md	Rockville, Elctrn Mktg. Assoc.	301-744-7700
Mass	Boston, Keithley/MECO	617-944-6660
Mich	Detroit, EQS Systems	313-569-4497
Minn	Minneapolis, Carter Elctrns	612-559-1976
Mo	St. Louis, Palatine Sls	314-896-4577
NJ	Paramus, SDM Rep's	201-368-0123
NM	Albuquerque, Aztec Enterprises	505-255-2440
NY	Syracuse, Labtronics	315-454-9314
NC	Durham, W. A. Brown Inst.	919-682-2383
Ohio	Cleveland, EQS Systems	216-729-2222
Ohio	Dayton, EQS Systems	513-434-8993
Ore	Portland, McLaren	503-297-2248
Pa	Philadelphia, Elect. Mktg. Assoc.	215-148-5050
SC	Columbia, W. A. Brown Inst.	803-798-3297
Tenn	Oak Ridge, W. A. Brown Inst.	615-482-5761
Tex	Austin, Palatine Sls	512-451-7463
Tex	Dallas, Palatine Sls	214-231-9489
Wash	Bellevue, McLaren	206-454-3400
Wisc	Milwaukee, Carter Elctrn	414-464-5555

KELTEC FLORIDA, SUB NORLIN IND., Dept. EM, Box 1348, Fort Walton Beach, Fla. 32548, Tel: 904-651-1210, TWX: 510-730-7775; FSC No.: 09062; Empl.: 234

Local Sales Offices & Reps.

Ariz	Scottsdale, PLS Assocs.	602-994-5461
Cal	Los Altos, Stout-Loeswick	415-948-3265
Cal	Los Angeles, Cain Technology	213-476-2251
Cal	Orange, Cain Technology, Inc.	714-997-7311
Colo	Denver, PLS Assocs.	303-773-1218
Iowa	Cedar Rapids, Palatine Sls.	319-365-8071
Kans	Lenexa, Palatine Sls	913-492-7020
Md	Baltimore, VPI	301-685-4206
Mass	Needham Heights, O'Sullivan & Murphy	617-449-4141
Mich	Northville, Micro Sls. Corp.	313-482-1229
Mo	Hazelwood, Palatine Sls.	314-895-4577
NJ	Westfield, Gray & Reed Assocs.	201-233-6616
NM	Albuquerque, PLS Assocs.	505-255-2330
NY	Huntington Station, Gray & Reed Assocs.	516-433-3333
NY	Syracuse, Labtronics	315-454-9314
Ohio	Dayton, Micro Sls. Corp.	513-433-8171
Pa	Montgomerysville, VPI	215-474-3200
Tex	Austin, Palatine Sls	512-451-7463
Tex	Houston, Palatine Sls	713-783-1492
Tex	Richardson, Palatine Sls.	214-231-9489
Utah	Sandy, PLS Assocs.	801-942-2081
Wash	Seattle, Delcom Sls. Co.	206-248-0090

KELTRON CORP., Dept. EM, 225 Crescent St., Waltham, Mass. 02154, Tel: 617-894-0525; Empl.: 35

Sales Manager: T. Chadurjian

Local Sales Offices & Reps.

Cal	Buena Park, Sales Engrs.	213-921-0681
Cal	Mountain View, Tri-Rep	415-965-1822
Ill	Chicago, Scientific Sls.	312-775-7594
Ind	Indianapolis, Scientific Sls.	317-253-4606
Minn	Bloomington, Scientific Sls.	612-881-3300
NJ	Harrington Park, Metro Tech. Sls.	201-768-8495
NY	Jericho, Metro Tech. Sls.	516-935-3330
Pa	Abington, Bach Stewart	215-885-1550
Wash	Bellevue, A. Smith Co.	206-746-6670

KELTRON CORP., Walden Div., Dept. EM, 225 Crescent St., Waltham, Mass. 02154, Tel: 617-894-0525; Empl.: 40

Sales Manager: T. Chadurjian

Local Sales Offices & Reps.

Cal	Buena Park, Sales Engrs.	213-921-0681
Cal	Los Altos, Frauman Assoc.	415-941-0660
Fla	Orlando, G. F. Bohamn Assoc.	305-855-0274
Ill	Chicago, Scientific Sls.	312-775-7594
Ind	Indianapolis, Scientific Sls.	317-253-4606
Minn	Bloomington, Scientific Sls.	612-881-3300
NJ	Flanders, K & R Engrg.	201-584-5235
Ohio	Dayton, F. Ohmer Assoc.	513-434-1454
Pa	Glenside, Koebert Assoc.	215-887-2310
Tex	Dallas, Tesco	214-328-5484
Va	Alexandria, Koebert Assoc.	703-780-3971

KELTRON INSTRUMENT DISPLAYS DIV., Dept. EM, 223 Crescent St., Waltham, Mass. 02154, Tel: 617-894-0525; Empl.: 30

Sales Manager: T. Chadurjian

Local Sales Offices & Reps.

Cal	Buena Park, Sls. Engrs., Ltd.	213-921-0681
Cal	Mountain View, Tri-Rep	415-965-1822
Ill	Chicago, Scientific Sls.	312-775-7594
Ind	Indianapolis, Scientific Sls.	317-253-4606
Minn	Bloomington, Scientific Sls.	612-881-3300
NJ	Harrington Park, Metro Tech. Sls.	201-768-8495
NY	Jericho, Metro Tech. Sls.	516-935-3330
Pa	Abington, Bach-Stewart	215-885-1550
Wash	Bellevue, A. Smith Co.	206-746-6670

KELVIN, Dept. EM, 5919 Noble Avenue, Van Nuys, Cal. 91411, Tel: 213-782-6662, Telex: 65-1417; FSC No.: 07088; Empl.: 250 ..... p. 3704,3705

Sales Manager: R A Featherston

Local Sales Offices & Reps.

Ariz	Scottsdale, Piper Sls.	602-946-4437
Cal	Mountain View, G.C. Woempner Co.	415-964-5454
Cal	San Diego, Wes-K Assoc.	714-271-5048
Colo	Boulder, R-G Entprs.	303-447-9211
Conn	Milford, Todino Engrg. Sls.	203-874-6643
Fla	Fort Lauderdale, Electro-Comp.	305-491-4141
Ga	Smyrna, B-C Elctrns.	404-436-5169
Ill	Des Plaines, Coombs Assoc.	312-298-4830
Kans	Shawnee Mission, Midtec Assoc	913-441-6565
Md	Baltimore, Bernard White Co.	301-484-5400
Mass	Needham Hgts., Todino Engrg.	617-444-7925
Mich	Birmingham, Forand Sls.	313-644-0087
Minn	New Brighton, TWC Sls.	612-636-1770
Mo	Florissant, Midtec Assoc.	314-837-5200
NJ	Medford, Jack McCoy Inc	215-922-7333
NY	Great Neck, Trionic	516-466-2300
NY	Pompey, S.F. Foster	315-677-3333
NY	Webster, S.F. Foster	716-265-2072
Ohio	Englewood, Kimconics Sls.	513-836-9677
Pa	Pittsburgh, Kimconics Sls.	412-367-3013
Tex	Dallas, Allied Comps.	214-238-0408
Tex	Houston, Allied Comps.	713-960-1962
Wash	Tukwila, General Elctrncs.	206-575-4030

Local Distributors

Ariz	Phoenix	602-272-7951
Cal	San Diego	714-278-5020
Cal	Santa Clara	408-244-7600
Cal	South Gate	213-773-6521

KEMTRON ELECTRON PRODS., INC., Dept. EM, 14 Prince Pl., Newburyport, Mass. 01950, Tel: 617-462-4464

KENCO ALLOY & CHEMICAL CO., INC., Dept. EM, 418 W. Belden Ave., Addison, Ill. 60101, Tel: 312-543-2510; Empl.: 12

Sales Manager: J. Rothenbach

Local Sales Offices & Reps.

Ala	Birmingham, Nickerson	205-854-6330
Ariz	Phoenix, K. Jahn Co.	602-956-9060
Cal	Mountain View, Morse Assocs.	415-968-7722
Cal	Santa Fe Springs, Chesleigh & Straley	213-692-7944
Fla	Orlando, Doug Shower Assoc.	305-894-8291
Ind	Indianapolis, Metron Co.	317-897-6463
Mich	Detroit, E.E.I. of Michigan	313-521-1500
Minn	Minneapolis, Conway & Assoc.	612-721-5229
Mo	Springfield, Del-Tech Assocs.	417-881-3667
NH	Londonderry, E.P.E. Corp.	603-669-9181
NJ	Princeton, Krone & Rubin Assocs.	609-452-1500
NY	Lake Grove, LI, Krone & Rubin Assoc.	516-585-3996
NY	Rochester, Krone & Rubin Assoc.	716-266-4631
NC	Charlotte, Nickerson	704-394-5544
NC	Franklin, Nickerson	704-524-6790
NC	Kannapolis, Nickerson	704-938-4647
Ohio	Solon, KDF Co.	216-248-8010
Ore	Portland, Precision Chemical Co.	503-223-8683
Tex	Houston, Production Automation	713-444-1232
Tex	Richardson, Production Automation Corp.	214-231-397
Wash	Tukwila, Precision Chemical Co.	206-575-385
Exp:	Ill., Addison, Kenco Alloy & Chemical Co.	312-543-251

KENNEDY CORP., M.S., Dept. EM, Pickard Dr Syracuse, N.Y. 13211, Tel: 315-455-7077; Empl.: 35

Local Sales Offices & Reps.

Cal	Los Angeles, Fetty/Schoenduve	213-651-405
Cal	Palo Alto, Fetty/Schoenduve	415-321-704
Cal	San Diego, Fetty/Schoenduve	714-292-206
Fla	Coral Springs, Heller Assocs.	305-752-752
Ill	Elk Grove, Loren Green Assocs	312-593-028
Ind	Indianapolis, Loren Green Assocs	317-293-982
NJ	Hackettstown, Sigma Coms.	201-852-647
NY	Long Island, Sigma Coms Assoc	516-226-188
Va	Fairfax, Schibley Assocs	703-591-300

KENTON ENGRG. CORP., Dept. EM, 8232 Christian Ave., Skokie, Ill. 60076, Tel: 312-677-8280; FSC No 18308; Empl.: 23

KENTUCKY ELECTRONICS, Dept. EM, 1204 Inc Dr., Box 507, Owensboro, Ky. 42301, Te 502-684-0431, Telex: 20-4305; Empl.: 300

Sales Manager: W. C. Cundiff

Local Sales Offices & Reps.

Cal	Atherton, Wadsworth-Pacific Mfg. Assocs.	415-321-361
Cal	Hacienda Heights, Wadsworth-Pacific Mfg. Assocs.	213-330-559
Cal	Pacific Palisades, Wadsworth-Pacific Mfg. Assocs.	213-454-431
Ill	Mount Prospect, Lloyd Keplinger	312-945-170
Ky	Glasgow, Barry Jewell	502-651-944
Tex	Dallas, Waddle Sls. Co.	214-638-286

KENYON MAGNETICS INC., Dept. EM, 1040 Gran St, Hoboken, N.J. 07030, Tel: 201-798-6511; FSC No 54194

Sales Manager: J. R. Siegel

KEPCO, INC., Dept. EM, 131-38 Sanford Ave., Flushing N.Y. 11352, Tel: 212-461-7000, TWX: 710-582-263 Empl.: 200 ..... p. 3278-328

Sales Manager: Paul Birman

Local Sales Offices & Reps.

Ala	Huntsville, J.L. Highsmith Co.	205-881-329
Ariz	Tempe, J.F. Hurlbut Co.	602-968-596
Cal	Los Angeles, Windsor Dynamics	213-990-417
Cal	San Francisco, N-S Assocs.	415-854-487
Colo	Denver, J.F. Hurlbut Co.	303-279-779
Conn	Farmington, R. Perron Co.	203-673-482
Conn	Trumball, R. Perron Co.	203-268-963
Fla	Orlando, J.L. Highsmith Co.	305-293-520
Ill	Chicago, Midwest Elctrn. Sls.	312-777-970
Iowa	Cedar Rapids, Midwest Elctrn. Sls.	319-362-441
Kans	Shawnee Mission, K. Kelly & Co.	913-722-000
Md	Baltimore, Eastern Instrumentation	301-792-703
Md	Burtonsville, Eastern Instrumentation	301-384-850
Mass	Boston, R. Perron Co.	617-762-811
Mich	Detroit, Carter McCormick & Peirce Inc.	313-477-770
Minn	Minneapolis, E.C. Elctrn. Sls.	612-831-022
Mo	St. Louis, Kathrinus, Kelly Baumhauer & Co.	314-968-380
NH	Dover, R. Perron & Co.	603-742-232
NM	Albuquerque, Technology Mktg. Assoc.	505-298-432
NY	New York, Eastern Instrumentation	201-567-950
NY	Rochester, NACO Elctrns. Corp.	716-223-449
NY	Syracuse, Naco Elctrns. Corp.	315-699-265
NY	Utica, NACO Elctrns. Corp.	315-732-180
NC	Charlotte, J.L. Highsmith Co.	704-333-774
Ohio	Cleveland, Carter McCormick & Peirce Inc.	216-779-510
Ohio	Dayton, Carter McCormick & Peirce Inc.	513-222-770
Pa	Philadelphia, Eastern Instrumentation	215-927-777
Pa	Pittsburgh, Carter McCormick & Peirce	412-372-441
Tex	Dallas, Airep Elctrns.	214-827-212
Va	Norfolk, Eastern Instrumentation	804-461-400
Va	Richmond, J.L. Highsmith Co.	804-272-588
Wash	Seattle, H. Levinson Co.	206-323-510
Wisc	Milwaukee, Midwest Elctrn. Sls.	404-645-369

KERTRON, INC., Dept. EM, 7516 Central Ind'l. Dr., Riviera Beach, Fla. 33404, Tel: 305-848-9606, TWX: 510-952-7611; FSC No.: 33904; Empl.: 60

Sales Manager: D. A. Raggett

Local Sales Offices & Reps.

Ariz	Scottsdale, Verein Corp	602-948-3571
Cal	Palos Verdes Peninsular, B. Gray & Assocs.	213-373-1820
Cal	Redwood City, Parks & Pruitt	415-364-1640
Colo	Englewood, Inverness Mktg	303-771-4130
Colo	Englewood, Inverness Marketing Assoc.	206-455-5846
Conn	Stamford, Circuit Sls	203-322-0240
Fla	Orlando, G.F. Bohman Assoc.	305-295-5760
Fla	Riviera Beach, Kertron Intl	305-848-9606
Ill	Rolling Meadows, Sieger Assoc.	312-991-6161
Ind	Indianapolis, Techn Reps	317-849-6454
Iowa	Blairstown, Engrg Svs	319-454-6970
Kans	Prairie Village, Engrg. Svc.	913-649-4000
Mass	Lexington, Circuit Sls	617-861-0567
Mich	Brighton, S.A.I. Mktg	313-227-1786
Mich	Grand Rapids, S.A.I. Mktg	616-942-2504
Minn	New Brighton, TWC Sls	612-636-1770
Mo	St. Louis, Engrg. Svcs.	314-997-1515
NJ	Haddonfield, M & S Assoc.	609-429-7055
NY	Commack, Richman Sls	516-543-5532
NC	High Point, Engrg Devices	919-869-7200
Ohio	Beechwood, S.A.I. Mktg	216-292-2982
Ohio	Dayton, S.A.I. Mktg	513-435-3181
Okla	Tulsa, Palatine Engrg. Sls.	918-622-0321
Ore	Portland, Northwest Mktg Assoc.	503-297-2581
Pa	Pittsburgh, S.A.I. Mktg	412-782-5120
Tex	Austin, Palatine Engrg. Sls.	512-451-7463
Tex	Houston, Palatine Engrg. Sls.	713-783-1492
Tex	Richardson, Palatine Engrg. Sls.	214-231-9489
Wash	Bellevue, Northwest Mktg Assoc.	206-455-5846

KEP

KESSLER-ELLIS PRODS., Dept. EM, 120 1st Ave., Atlantic Highlands, N.J. 07716, Tel: 201-291-0500, 800-631-2165, Telex: 13-2496; FSC No.: 28222; Empl.: 50 ..... p. 1650,1651,2270-2272

Sales Manager: L. Frost; *Distributor Manager:* C. Ellis

Local Sales Offices & Reps.

Ala	Huntsville, Electro Mech Sls	205-883-9624
Ariz	Phoenix, Bob Anderson Co	602-266-2070
Cal	Downey, Groh Ass.	213-923-0963
Cal	Los Altos, Serra Assocs.	408-738-1117
Colo	Denver, Palmer Assocs.	303-629-0112
Fla	Clearwater, WMM Assoc.	813-447-2533
Ga	Atlanta, Electro Mech Sls.	404-449-6337
Ill	Des Plaines, Lincoln Hodges	312-297-3810
Ind	Zionsville, Control Sls	317-873-5158
Kans	Shawnee Mission, Midtec Assocs	913-441-6565
Md	Mount Airy, Strayton Assocs	301-831-7007
Mass	Woburn, Gilway Sls. Co.	617-935-4442
Mich	Dearborn, Pitcher-Paulin	313-582-5450
Minn	Minneapolis, R.J. Sls.	612-922-1425
NY	Rochester, Tacom Sls.	716-647-3940
NY	White Plains, Swedelco Inc	914-946-1122
Ohio	Chagrin Falls, RPM Sales	216-247-3295
Pa	Media, W. Reeves	215-566-6709
Pa	Pittsburgh, Grey Glass	412-366-6664
Tenn	Nashville, Electro Mech Sls	615-256-2516
Tex	Addison, Southland Comps	214-361-6651
Utah	Salt Lake City, Palmer Assocs.	801-534-0862
Wisc	Waukesha, Rockwell, Brown, Lincoln, Hodges	414-542-3087

KESTER SOLDER DIV., Litton Systems Inc., Dept. EM, 4201 Wrightwood Ave., Chicago, Ill. 60639, Tel: 312-235-1600; Empl.: 350

Local Sales Offices & Reps.

Cal	Anaheim	714-871-0280
NJ	Newark	201-589-0246

KEUFFEL & ESSER CO., Dept. EM, 20 Whippany Rd., Morristown, N.J. 07960, Tel: 201-285-5181; Empl.: 1800

Local Sales Offices & Reps.

Alas	Anchorage	907-277-2506
Cal	Los Angeles	213-747-7601
Cal	S. San Francisco	415-873-6850
Colo	Denver	303-733-2451
Fla	Jacksonville	904-398-6471
Fla	Orlando	305-423-1641
Ga	Norcross	404-448-6352
Ill	Northbrook	312-564-0880
Kans	Wichita	316-265-8505
Md	Baltimore	301-252-3344
Mich	Troy	313-549-9100
Mo	Kansas City	816-842-9077
Mo	St. Louis	314-773-8500
NJ	Teterboro	201-288-3900
NJ	Trenton	609-882-8000
NY	E. Syracuse	315-437-1417
NY	Long Island City	212-361-2190
NY	New York	212-MU7-6512
Ohio	Cleveland	216-241-7807
Ohio	Cuyahoga Falls	216-929-8371
Ohio	Toledo	419-475-3427
Pa	Ft. Washington	215-643-2570
Tex	Dallas	214-630-8083
Tex	Houston	713-789-9800
Tex	San Antonio	512-223-3811
Va	Arlington	703-524-9000
Va	Norfolk	804-625-2591
Wash	Seattle	206-623-5535
Wisc	Milwaukee	414-444-1890

KEWAUNEE SCIEN. EQUIP. CORP., Dept. EM, 4012 Logan St., Adrian, Mich. 49221, Tel: 517-263-5731; Empl.: 750

Sales Manager: J. A. Peay

KEY TRONIC CORP., Dept. EM, Bldg. 14, Spokane Ind'l. Pk., Spokane, Wash. 99216, Tel: 509-928-8000, TWX: 510-773-1885; FSC No.: 52833; Empl.: 425

Local Sales Offices & Reps.

Ala	Huntsville, Glen White Assocs	205-883-9434
Ariz	Scottsdale, Fred Board Assocs.	602-994-9388
Cal	Canoga Park, Chandler Assocs.	213-340-6103
Cal	Los Altos, Casey-Johnston	415-941-6892
Colo	Denver, Thorson Co.	303-759-0809
Conn	North Haven, Datcom	203-288-7005
Fla	Orlando, Gentry Assocs.	305-894-4401
Ga	Atlanta, Gentry Assocs.	404-237-7272
Ill	Chicago, L-Tec, Inc.	312-286-1500
Ind	Indianapolis, S.A.I. Mktg	317-844-7196
Kans	Overland Park, S.A.I. Mktg	314-837-5200
Md	Timonium, Glen White Assoc.	301-252-6360
Mass	Waltham, Datcom	617-891-4600
Mich	Farmington, S.A.I. Mktg	313-227-1786
Minn	Minneapolis, G. E. Arneson	612-835-2177
Mo	Florissant, S.A.I. Mktg	314-837-5200
NJ	Camden, QED Elctrns.	215-674-9600
NM	Albuquerque, Thorson Co.	505-265-5655
NY	Elmont, Crane & Egert Corp.	516-488-2100
NY	Pittsford, N.H.A., Inc.	716-461-4750
NC	Raleigh, Glen White Assoc.	919-787-7016
Ohio	Beachwood, S.A.I. Mktg	216-292-2982
Ohio	Cincinnati, S.A.I. Mktg	513-761-5432
Ohio	Dayton, S.A.I. Mktg	513-277-8911
Ore	Portland, Western Tech. Sls.	503-297-1711
Pa	Pittsburgh, S.A.I. Mktg	412-782-5120
Tex	Dallas, Ralph Matthews Elctrns.	214-233-0363
Va	Lynchburg, Glen White Assoc.	804-384-6920
Wash	Bellevue, Western Tech. Sls.	206-641-3900
Wisc	Greenfield, L-Tec, Inc.	414-545-8900

Keystone

KEYSTONE CARBON CO., Thermistor Div., Dept. EM, St. Marys, Pa. 15857, Tel: 814-781-1591, Telex: 91-4517; Empl.: 1100 ..... p. 4275-4277

Local Sales Offices & Reps.

Ala	Huntsville, Cartwright & Bean	205-533-3509
Cal	San Carlos, Electro Pacific	415-592-3114
Cal	Sierra Madre, McCornack & Assocs.	213-355-0466
Colo	Denver, Lindberg Co	303-758-9033
Conn	Wethersfield, L.J. Labant	203-529-0048
Fla	Ft. Lauderdale, Cartwright & Bean	305-791-3989
Fla	Orlando, Cartwright & Bean	305-422-4531
Ga	Atlanta, Cartwright & Bean	404-255-5262
Ill	Elk Grove Village, Knoblock & Assoc.	312-593-5940
Ind	Fort Wayne, R.O. Whitesell & Assoc.	219-432-5591
Ind	Indianapolis, R.O. Whitesell & Assoc.	317-359-9283
Ind	Kokomo, R.O. Whitesell & Assoc.	317-453-3592
Iowa	Cedar Rapids, F.A. Noll	319-364-3271
Kans	Shawnee, Benson Engrg.	913-631-4113
Ky	Louisville, R.O. Whitesell & Assoc.	502-897-1569
La	Metairie, Cartwright & Bean	504-834-2350
Md	Baltimore, Coulbourn DeGreif	301-247-4646
Mich	Grand Rapids, J.L. Montogomery Co.	616-774-9308
Mich	Southfield, J.L. Montgomery Assoc.	313-358-2616
Minn	Minneapolis, Stoss Assocs.	612-925-2757
Miss	Jackson, Cartwright & Bean	601-981-1368
NJ	Cinnaminson, T. McLaughlin	609-786-0477
NM	Albuquerque, Lindberg Co	505-881-1006
NY	Pompey, S.F. Foster Co.	315-677-3333
NY	Webster, S.F. Foster Co.	716-265-2072
NC	Charlotte, Cartwright & Bean	704-377-5673
NC	Raleigh, Cartwright & Bean	919-781-6560
Ohio	Cincinnati, R.O. Whitesell & Assoc.	513-521-2290
Ohio	Columbus, R.O. Whitesell & Assoc.	614-888-9396
Ohio	Dayton, R.O. Whitesell & Assoc.	513-298-9546
Ohio	Middleburg Hgts., R.O. Whitesell & Assoc.	216-826-4424
Pa	Pittsburgh, R.O. Whitesell & Assoc.	412-344-7277
Tenn	Greenville, R.O. Whitesell & Assocs.	615-639-6154
Tenn	Knoxville, Cartwright & Bean	615-693-7450
Tenn	Memphis, Cartwright & Bean	901-276-4442
Tex	Dallas, Benson Engrg.	214-352-7541
Utah	Salt Lake City, Lindberg Co.	801-534-1500
Exp:	N.Y., Westbury, Minthorne Int'l.	516-334-3303

Local Distributors

Ill	Chicago, Newark Elctrns	312-638-4411

KEYSTONE ELCTRNS. CORP., Dept. EM, 49 Bleeker St., New York, N.Y. 10012, Tel: 212-475-4600, TWX: 710-581-2861; FSC No.: 91833; Empl.: 50 p. 2052-2056

Sales Manager: L. Pearl; *Distributor Manager:* D. Rosenberg

Local Sales Offices & Reps.

Ariz	Phoenix, Arrowhead Sals	602-277-7148
Cal	Daly City, R. Del Bucchia Assocs.	415-756-1664
Cal	Palos Verdes Est., Vedax	213-378-3685
Colo	Arvada, Arrowhead Sls.	801-487-3444
Conn	Lakeville, Conti-Younger Assocs	203-929-3294
Fla	Lighthouse Point, Jack Krutek Assocs	305-941-6544
Ill	Chicago, Memac Sls.	312-545-1033
Iowa	Cedar Rapids, PMA Corp.	319-362-9177
Kans	Overland Park, Penzner Assocs.	913-381-0004
Kans	Wichita, PMA Corp.	316-264-2662
Md	Baltimore, R. L. Wilkinson	301-377-7800
Mass	Waltham, Conti-Younger Assocs.	617-890-4582
Minn	Minneapolis, Marsh Sls.	612-881-7511
Mo	Maryland Heights, PMA Corp.	314-569-1220
NJ	Berkeley Heights, Cambridge-allen Assocs.	201-464-0203
NJ	Medford Lakes, Component Consultants	609-654-2800
NY	New York City, Cambridge-Allen Assocs.	212-682-5844
NY	Rochester, J. G. Welch Assocs.	716-244-1100
NY	Utica, J. G. Welch Associates	315-736-7821
Ohio	Cleveland, Jim Finnegan & Co	216-238-5905
Tex	Houston, Wheelex Inc.	713-771-2214
Tex	Hurst, Wheelex Inc.	817-268-1812
Wash	Seattle, R. K. Squibb, Inc.	206-632-2450

KGS ELECTRONICS, INC., Dept. EM, 2029 N. Lincoln Ave., Pasadena, Cal. 91103, Tel: 213-798-0786; Empl.: 25 ..... p. 3390

Local Sales Offices & Reps.

Cal	Irvine, Mid-America Avionics Distrib	800-432-7231
Ga	Atlanta, Mark Hutton	404-457-1700
Kans	Wichita, Reps, Inc	800-835-3112
Mass	Norwood, Mid-America Avionics Distrib	800-225-9994
Tenn	Memphis, Mid-America Avionics Distrib	800-238-5796
Tex	Dallas, Mark Hutton	800-527-2587
Tex	Dallas, Mid-America Avionics Distrib	800-492-6610 (In Texas), 800-527-4687 (Outside Texas)
Exp:	Rahway, REA Intl.	201-382-7100

KIDDE, WALTER & CO., Belleville Div., Dept. EM, 675 Main St., Belleville, N.J. 07109, Tel: 201-759-5000, TWX: 710-995-4925

Local Sales Offices & Reps.

Cal	Signal Hill	213-595-5488
Ga	Atlanta	404-451-6122
Ill	LaGrange	312-352-1910
NJ	Totowa	201-785-4224

KIKUSUI ELCTRNS. CORP., Dept. EM, 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan, Tel: 044-41-0111

KILOVAC CORP., Dept. EM, Box 4422, Santa Barbara, Cal. 93103, Tel: 805-684-4560, TWX: 910-336-1141; FSC No.: 18741; Empl.: 110 ..... p. 3563-3568

Local Sales Offices & Reps.

Ariz	Tempe, Gassner & Clark (Arizona)	602-968-9037
Cal	Fremont, Spence Assocs.	415-656-9506
Cal	Los Angeles, Rep. Assocs.	213-829-5401
Conn	Newton, Kanan Assocs.	203-426-8157
Fla	Seminole, Harvey Pipe	813-391-3057
Ill	Westchester, Gassner & Clark	312-345-4245
Iowa	Cedar Rapids, H.R.Brown Sls. Co.	319-366-0635
Kans	Shawnee Mission, M. Bettis	913-362-0772
Kans	Wichita, M.E. Bettis Co.	316-685-7441
Mass	Reading, Kanan Assocs.	617-944-8484
Minn	St. Paul, De Beck	612-690-1557
Mo	St. Louis, M. Bettis	314-429-2099
NM	Albuquerque, Data Handling	505-268-4364
NY	Cazenovia, S.T./Woolard, Co.	315-655-8145
NY	Great Neck, Trionic	516-466-2300
NY	Rochester, Lamb	716-544-5580
NC	Charlotte, DGW, Inc.	704-334-7090
NC	Winston-Salem, DGW, Inc.	919-768-7166
Ohio	Cleveland, Components	216-243-9200
Ohio	W. Carrollton, Components	513-866-0661
Okla	Tulsa, Norvell Assocs., Inc.	918-663-1247
Ore	Portland, Components West, Inc.	503-643-5588
Pa	Library, Components	412-833-9380
Pa	Paoli, Tyler Griffin	215-647-1550
Tex	Austin, Norvell Assocs.	512-458-8106
Tex	Dallas, Norvell Assocs.	214-233-0020
Tex	Houston, Norvell Assoc.	713-988-0022
Wash	Seattle, Components West	206-243-2133

KILOVOLT CORP., Dept. EM, 238 High St., Hackensack, N.J. 07602, Tel: 201-488-7373; Empl.: 22

Local Sales Offices & Reps.

Cal	Sherman Oaks, Windsor Dynamics, Inc.	213-990-4173
Conn	Meriden, Abbott-Allison Co., Inc.	203-237-9232
Ill	Chicago, P. Lind Elctrns. Co.	312-774-1246
Mich	Farmington, Carter, McCormic & Peirce	313-477-7700
Minn	Circle Pines, Lind Elctrns.	612-786-5770
Ohio	Cleveland, Carter McCormic & Peirce	216-779-5100
Ohio	Dayton, Carter, McCormic & Peirce	513-222-7700
Pa	Monroeville, Carter, McCormic & Peirce	412-372-4415

KINETRON CORP., Dept. EM, 1416 Roller Rd, Asbury Park, N.J. 07712, Tel: 201-776-9595; Empl.: 12

KING RADIO CORP., Dept. EM, 400 N. Rogers Rd., Olathe, Kans. 66061, Tel: 913-782-0400, Telex: WJD4-2299; Empl.: 2300

Sales Manager: B. Glover, V.P.; *Distributor Manager:* D. Walker

KINGS ELECTRONICS, Dept. EM, 40 Mabledale Rd., Tuckahoe, N.Y. 10707, Tel: 914-793-5000, TWX: 710-562-0110; FSC No.: 91836; Empl.: 360

Local Sales Offices & Reps.

Alas	Anchorage, H. Lang Assocs.	907-279-5741
Cal	Daly City, R. Del Bucchia & Assoc.	415-756-1664
Cal	Westminster, A. A. Dowers Co.	714-894-1123
Colo	Denver, Lindberg Co.	303-758-9033
Fla	Indian Rocks Beach, Tech-Rep	813-595-2834
Ga	Norcross, Macro-Mktg.	205-883-9630
Ill	Chicago, D. Dolin Sls. Co.	312-286-6200
Iowa	Marion, Thomas & Modrcin Assocs.	319-377-6261
Md	Lutherville, Dougherty Sls. Co.	301-321-7890
Mass	Wellesley Hills, M. Scott Co.	617-235-0102
Mo	St. Louis, Boweng Co.	314-429-7327
NY	Massapequa, Coughlin Assocs.	516-799-7743
NY	Rochester, Telesco Assoc.	716-271-3780
Ohio	Dayton, F. L. Ohmer & Assoc.	513-434-1454
Tex	Dallas, Bradenco	214-358-3278
Wash	Seattle, R. K. Squibb	206-632-2450

KISTLER INSTR. CO., see Sunstrand Data Control, Inc.

KLEIN, MATHIAS & SONS, INC., see Klein Tools, Inc.

KLEIN TOOLS, INC, Dept. EM, 7200 McCormick Rd., Chicago, Ill. 60645, Tel: 312-588-6820, Telex: 72-4431

KMC SYSTEMS INC., Dept. EM, 200 State Highway 17, Mahwah, N.J. 07430, Tel: 201-529-4220, Telex: 138-798; Empl.: 120

Sales Manager: E. Verder

KNOWLES ELCTRNS., INC., Dept. EM, 3100 N. Mannheim Rd., Franklin Park, Ill. 60131, Tel: 312-455-3600, Telex: 72-8397

KOH-I-NOOR RAPIDOGRAPH, Dept. EM, 100 North St., Bloomsbury, N.J. 08804, Tel: 201-479-4124, TWX: 510-235-3340

Sales Manager: R. M. LaBarre

KOLE ENTERPRISES, INC., Dept. EM, 3553 N.W. 50th St., Miami, Fla. 33142, Tel: 305-633-2556; Empl.: 45

Sales Manager: C. Chartrand

KOLIN INDUSTRIES, Dept. EM, 59 W. Pondfield Rd., Bronxville, N.Y. 10708, Tel: 914-961-5065, Telex: 137453; Empl.: 40

Sales Manager: J. Dee

KOLLSMAN INSTR. CO., Dept. EM, Daniel Webster Hwy., Merrimack, N.H. 03054, Tel: 603-889-2500, TWX: 710-366-6883; Empl.: 1100

Local Sales Offices & Reps.

Cal	Long Beach	213-924-1087
DC	Arlington	703-979-1200
Ohio	Xenia	513-429-2999
Wash	Seattle	206-641-4742

KOOLTRONIC INC., Dept. EM, Hamilton Ave., Hopewell, N.J. 08525, Tel: 609-466-3400, Telex: 84-3345; Empl.: 150

Sales Manager: James F. Fournier

Local Sales Offices & Reps.

Ala	Huntsville, Beacon Elctrns	205-881-5031
Ariz	Tempe, Jarko Assocs.	602-966-3020
Cal	Canoga Pk., Ebert Entprs.	213-887-7578
Cal	Santa Clara, Fahrner-Miller Assoc.	408-984-1700
Colo	Denver, McLoud & Raymond	303-756-1589
Fla	Ft. Lauderdale, Beacon Elctrn Assocs	305-971-7320
Fla	Maitland, Beacon Elctrns.	305-647-3498
Ga	Atlanta, Beacon Elctrns	404-351-3654
Ill	Palatine, J. Clark Co.	312-358-5095
Kans	Shawnee Mission, Inland Assoc.	913-362-2366
Md	Randallstown, Beacon North Inc.	301-922-1248
Minn	Minneapolis, C. R. Gibb Co.	612-377-1200
Miss	Hernando, Beacon Elctrn Assocs	601-368-9008
Mo	St. Louis, Inland Assoc.	314-821-3742
NY	Rochester, Precision Sls.	716-473-6310
NY	Syracuse, Precision Sls.	315-458-2223
NC	Charlotte, Beacon Elctrn. Assocs.	704-525-7412
Ohio	Sylvania, Deo-Volente & Assoc.	419-882-2830
Pa	Bala Cynwyd, Elec-Tech Inc.	215-687-5305
Tenn	Oak Ridge, Beacon Elctrn Assocs	615-482-2409
Tex	Dallas, Blackburn Assoc.	214-692-8885
Va	Falls Church, Beacon North Inc.	703-534-1673
Va	Lynchburg, Beacon North	804-237-4740

KOPP GLASS, INC., Dept. EM, Box 8255, Swissvale, Pittsburgh, Pa. 15218, Tel: 412-271-0190; Empl.: 175

KORRY MFG. CO., Dept. EM, 223 8th Ave. N., Seattle, Wash. 98109, Tel: 206-223-5400, TWX: 910-444-2295; Empl.: 156

Local Sales Offices & Reps.

Ariz	Phoenix, Toward Engr. Assoc.	602-955-3193
Cal	Costa Mesa, Gabriel Damon Assoc	714-957-1981
Cal	San Jose, Norwest Elctrs.	408-287-9378
Conn	New Canaan, S. Pierce, Inc.	203-966-4639
Fla	Maitland, W.H. Boggs	305-647-2226
Ga	Atlanta, Craft Assoc. Co.	404-256-0420
Ill	Chicago, Engineered Sls. Co.	312-867-8434
Ind	Fort Wayne, McDonald Sls. Co.	219-747-3650
Kans	Wichita, R. Elston	316-682-7082
Md	Glen Arm, Hodgins Assoc.	301-592-7047
Mass	Norwood, S. Pierce, Inc.	617-762-3164
Minn	St. Paul, Vikeland Sls	612-645-4647
Mo	St. Louis, Ensco-Rep	314-567-3935
NY	New Rochelle, Display Comps. Sls. Co.	914-636-4664
Ohio	Dayton, Whelan Corp.	513-434-7551
Pa	Wescosville, Variable Electric Prods	215-395-4781
Tex	Dallas, Ammon & Rizos	214-233-5591

K R ELECTRONICS, INC., Dept. EM, 91 Avenel St., Avenel, N.J. 07001, Tel: 201-636-1900; Empl.: 18 ..... p. 2635

KRECKMAN, HERB CO., Dept. EM, Cresco, Pa. 18326, Tel: 717-595-2212; Empl.: 4

KRIS INC., Dept. EM, N144 W5660 Pioneer Rd., Cedarburg, Wisc. 53012, Tel: 414-375-1000, TWX: 910-276-3616; Empl.: 100

Sales Manager: B. Garry

KRL ELECTRONICS, Dept. EM, 28 Bridge St., Manchester, N.H. 03101, Tel: 603-668-3210, TWX: 710-220-1662; Empl.: 40 ..... p. 3703

Local Sales Offices & Reps.

Ariz	Mesa, Nakoma	602-834-6549
Cal	Mt. View, Shaw-Tech, Inc.	415-961-4775
Conn	Madison, A & M Electrns. Reps., Inc.	203-421-4242
Fla	Fort Lauderdale, Neil Bronstein	305-581-7517
Ill	Palatine, Professional Sls.	312-359-2253
Mass	Needham, A & M Electrns. Reps., Inc.	617-444-8170
NY	Port Washington, R.E. Breuer Co.	516-883-7810
Ohio	Centerville, EMA, Inc.	513-433-2800

Local Distributors

SC	Myrtle Bch., Candor Co.	803-448-5213
Tex	Dallas, Norvell Assocs.	214-350-6771
Tex	Houston, Norvell Assocs.	713-774-2568
Tex	Tulsa, Norvell Assocs.	918-663-1247
Wash	Seattle, Earl & Brown Co.	206-284-1121

KROHN CERAMICS, INC, See Centerflex Ceramics

KROHN-HITE CORP., Dept. EM, Avon Ind'l Pk., Bodwell St., Avon, Mass. 02322, Tel: 617-580-1660, TWX: 710-345-0831; Empl.: 120 ..... p. 2772,2773

Sales Manager: E. C. Lutfy

Local Sales Offices & Reps.

Ala	Huntsville, Gentry Assocs.	205-534-9771
Ariz	Scottsdale, PLS Assocs., Inc.	602-994-5461
Cal	Inglewood, L&M South., Inc.	213-674-6850
Cal	San Jose, L&M Engrg., Inc.	408-292-3220
Colo	Denver, PLS Assocs., Inc.	303-773-1218
Conn	Canton Center, Tekdata, Inc.	203-525-7647
Fla	Orlando, Gentry Assocs.	305-894-4401
Ga	Atlanta, Gentry Assocs., Inc.	404-455-1206
Haw	Honolulu, Aloha Assocs.	808-941-1574
Ill	Arlington Heights, Dytec/Central	312-394-3380
Ind	Ft. Wayne, Dytec/Central	219-485-0845
Kans	Lenexa, Dytec/South	913-888-0215
La	Lafayette, Kemp Engrg Co., Inc.	318-984-3516
Md	Towson, Sci-Rep	301-321-1411
Mass	Wakefield, Tekdata, Inc.	617-245-5940
Mich	Southfield, EQS Systems	313-569-4497
Minn	St. Paul, Dytec/North	612-645-5816
Mo	St. Louis, Dytec/South	314-731-5400
NJ	Cherry Hill, Sci-Rep	609-482-0059
NM	Albuquerque, PLS Assocs, Inc.	505-255-2330
NY	Elmont, Crane & Egert Corp.	516-488-2100
NY	Rochester, Ossmann Instrs.	716-328-2230
NY	Syracuse, Ossman Instr.	315-437-6666
NY	Vestal, Ossmann Instrs.	607-785-9947
NC	Burlington, Gentry Assocs.	919-227-3639
Ohio	Chesterland, EQS Systems	216-729-2222
Ohio	Dayton, EQS Systems	513-434-8993
Okla	Tulsa, Kemp Engrg Co., Inc.	918-299-2636
Ore	Portland, McLaren, Inc.	503-297-2248
Tex	Dallas, Kemp Engrg Co., Inc.	214-661-0400
Tex	Houston, Kemp Engrg Co., Inc.	713-688-1431
Utah	Sandy, PLS Assoc. Inc	801-942-2081
Va	Falls Church, Sci-Rep	703-573-8787
Wash	Bellevue, McLaren Inc.	206-454-3400

KRYLON DEPT., Borden Chemical, Dept. EM, 180 E. Broad St, Columbus, Ohio 43215, Tel: 614-225-4000

Sales Manager: G. R. Frazier

KRYSTINEL CORP., Dept. EM, Fox Island Rd., Port Chester, N. Y. 10573, Tel: 914-937-5252, TWX: 710-569-1604; Empl.: 135 ..... p. 2562

KSW ELECTRONICS CORP., Dept. EM, South Bedford St., Burlington, Mass. 01803, Tel: 617-273-1730; Empl.: 18

Local Sales Offices & Reps.

Ala	Huntsville, W.A. Brown Comps	205-539-4411
Cal	Encino, CDH Assocs.	213-345-3111
Cal	Los Altos, Stout-Loeswick, Inc.	415-948-3265
Colo	Denver, W.J. Purdy Co.	303-777-1411
Conn	Stamford, Circuit Sls Co.	203-322-0240
Fla	Ft. Wayne, Fiat Engrg Assoc.	219-482-2408
Fla	Orlando, W.A. Brown Comps.	305-851-5747
Ga	Chamblee, W.A. Brown Comps.	404-455-0405
Ill	Addison, Grubb Co.	312-543-8525
Kans	Mission, Midland Engrg. Sls. Assoc.	913-262-6565
Md	Baltimore, Stemler Assocs.	301-944-8262
Mass	Lexington, Circuit Sales Co.	617-861-0567
Minn	Minneapolis, R. J., Inc.	612-922-1425
NJ	Cherry Hill, Stemler Assocs.	609-966-4070
NY	Plandome, F. Spellman Co.	516-627-3399
NC	Raleigh, W.A. Brown Comps	919-781-9426
Ohio	Cincinnati, Frank J. Campisano & Assoc.	513-574-7111
Okla	Tulsa, NORCOM	918-663-1247
Ore	Beaverton, R & R Assocs	503-643-5754
Pa	Coraopolis, Frank J. Campisano & Assoc.	412-264-5151
Tenn	Knoxville, W.A. Brown Comps.	615-637-3523
Tex	Dallas, NORCOM	214-233-0020
Tex	Houston, NORCOM	713-988-0022
Va	Alexandria, Stemler Assocs.	703-548-7818
Wash	Seattle, R and R Assocs	206-762-7664
Wisc	Milwaukee, Grubb Co.	414-545-7810
Exp:	Conn., Stamford, Deltron Corp.	203-322-7300

KULITE SEMICONDUCTOR PROD., Dept. EM, 1030 Hoyt Ave., Ridgefield, N.J. 07657, Tel: 201-945-3000, Telex: 13-5458; Empl.: 180 .... p. 4302

Local Sales Offices & Reps.

Ala	Huntsville, Col-Ins-Co.	205-881-9512
Ariz	Phoenix, Aztec Entrprs.	602-944-9185
Cal	Hollywood, B. J. Wolfe Entprs.	213-877-5518
Cal	Walnut Crk., Dale-Dahl Assocs.	415-933-9595
Colo	Littleton, Aztec Entprs.	303-795-0250
Conn	Hamden, Northeast Engrg.	203-248-4481
DC	Washington, KTP Sys	202-296-8231
Fla	Largo, Col-Ins-Co	800-432-4480
Fla	Orlando, Col-Ins-Co.	305-423-7615
Ga	Clarkston, Col-Ins-Co.	404-299-2138
Ill	Chicago, EIA, Inc.	312-271-3774
Ind	Indianapolis, EIA, Inc.	317-257-7231
La	Baton Rouge, Col-Ins-Co	800-327-6600
Mass	Danvers, Northeast Engrg	617-774-3010
Mich	Brighton, Bamum Co.	313-229-2961
Mich	Detroit, WKM Assoc.	313-588-2300
Minn	New Hope, Trask Engrg	612-537-2434
Mo	St. Louis, Ozark Elctrn Mktg	314-423-7200
NJ	Paramus, Hi-Tech Engrg Sls	201-967-1309
NM	Albuquerque, Aztec Entrprs	505-255-2440
NM	Albuquerque, Amonette Entprs.	505-344-4143
NY	Manhasset, Northeast Engrg	516-365-9633
NY	Williamsville, Maxwell Bennett Assoc.	716-634-2107
NC	Winston-Salem, Col-Ins-Co.	800-327-6600
Ohio	Cleveland, WKM Assocs.	216-267-0445
Ohio	Dayton, WKM Assocs	513-434-7500
Ore	Portland, Brett-Ross	503-232-4184
Pa	Jenkintown, PDC Corp.	215-887-9610
Pa	Pittsburgh, WKM Assocs	412-892-2953
Tex	Dallas, Data Aids Assocs.	214-620-1551
Tex	Houston, Data Aids Assocs.	713-862-6685
Wash	Seattle, Brett-Ross	206-935-8054

KULKA ELEC. CORP., Dept. EM, 520 S. Fulton Ave., Mt. Vernon, N.Y. 10551, Tel: 914-664-4024, TWX: 710-562-0104; Empl.: 500

Sales Manager: P Lauria

Local Sales Offices & Reps.

Ariz	Phoenix, Shefler-Kahn Co.	602-257-9015
Cal	Los Angeles, E E Strassner	213-666-1511
Cal	Redwood City, Warren-Hickey Sls.	415-368-3849
Colo	Englewood, Shefler-Kahn Co.	303-761-2590
Conn	W. Haven, Coakley, Boyd & Abbett	800-225-8402
Fla	Pompano Beach, V&G Sls	305-971-0900
Ga	Atlanta, H&H Mktg.	404-296-9830
Ill	Chicago, Dolin Sls	312-286-6200
Ind	Indianapolis, New Era Sls.	317-299-3400
Kans	Shawnee Mission, Lowell-Kangas & Assocs.	913-631-3515
La	Metairie, J. F. McKinney Sls.	504-887-1723
Md	Glen Burnie, Faion Lott & Co	301-744-4611
Mass	Needham, Coakley, Boyd & Abbett	617-444-5470
Mich	Pleasant Ridge, Shalco	313-547-4771
Mo	St. Louis, Lowell-Kangas & Assocs.	314-821-4050
NM	Albuquerque, Trembly Assocs.	505-266-8616
NY	Great Neck, Cooper-Simon	516-487-1142
Ohio	Richfield, Bear Mktg	216-659-3131
Okla	Tulsa, J. F. McKinney Sls.	918-742-6791
Ore	Portland, Earl & Brown	503-245-2283
Pa	Feasterville, P.S.A., Inc.	215-355-6244
Tex	Dallas, J. F. McKinney Sls.	214-631-9450
Tex	Houston, J. F. McKinney Sls.	713-493-9100
Wash	Seattle, Earl & Brown	206-284-1121

Local Distributors

Ala	Birmingham, MG Elctrns	205-328-4525
Ariz	Phoenix, Parts Elctrns.	602-258-6474
Cal	Los Angeles, Fisher Brownell	213-532-2170
Cal	Los Angeles, Radio Prod. Sls.	213-748-1271
Cal	Santa Clara, Fisher Brownell	408-244-6182
Cal	Sunnyvale, Ratel Elctrns.	408-739-9220
Colo	Denver, Industrial Elctrns.	303-771-2636
Colo	Denver, Integrated Elctrns	303-534-6121
Colo	Denver, Denver Wintronics	303-935-2401
Conn	Danbury, Bond Radio	203-744-2274
Conn	Fairfield, Utronics	203-255-4521
Fla	Ft. Lauderdale, Peerless Radio Corp.	305-566-5966
Fla	Miami, Electronic Equip. Co.	305-871-3500
Fla	Winter Park, Electronic Equip. Co.	305-644-4833
Ill	Addison, Lectro Comps.	312-543-1680
Ill	Broadview, L-Comp.	312-865-7600
Ill	Chicago, Otto Frankenbush/Merrill Elctrns. Div.	312-647-0755
Ill	Peoria, Klaus Radio	309-691-4840
Ill	Rockford, Mid West Associated	815-962-8036
Ill	Rosemount, Advent Elctrns.	312-298-4210
Ill	Schaumburg, Control Design	312-882-7232
Ind	Indianapolis, Ra-Dis-Co, Inc.	317-637-5571
Ind	Indianapolis, Graham Elctrn. Supply	317-634-8486
Ind	South Bend, Radio Distributing Co.	219-287-2911
Iowa	Cedar Rapids, Deeco, Inc.	319-365-7551
Iowa	Des Moines, Mid State Distributing	515-288-7231
Kans	Wichita, Radio Supply Co.	316-267-5216
Ky	Louisville, Peerless Elctrn. Equip.	502-637-7677
La	New Orleans, Radio Parts	504-581-5959
Md	Baltimore, Resco/Baltimore	
Mass	Dedham, Gerber Elctrns.	617-329-2400
Mass	Newton, Greene Shaw Co.	617-969-8900
Mich	Augusta, Great Lakes Elctrns.	616-731-4156
Mich	Farmington, CMP Distrs.	313-477-7700
Mich	Grand Rapids, Stotts Friedman	616-459-0216
Minn	Minneapolis, Control Design	612-721-6555
Minn	St. Paul, Ragon Elctrns.	612-488-0201
Miss	Newton, May Elctrn. Supply	601-683-6511
Mo	Kansas City, Walters Radio Supply	816-531-7015
Mo	St. Louis, L-Comp	816-531-7015
Neb	Lincoln, Scott Elctrns. Supply	402-434-8308
Nev	Reno, Elctrns. Distributing Corp.	702-323-2766
NJ	E. Rutherford, Kappe Electrical Distrs.	201-939-5751
NM	Alburquerque, Walker Radio	505-247-2288
NY	Buffalo, Summit Distrs.	716-884-3450
NY	Elmsford, Ancar Elctrns.	914-592-7100
NY	Lynbrook, Peerless Radio	516-593-2121
NY	Mt. Vernon, Qar Ind'l Elctrns.	914-699-2224
NY	Rochester, Summit Distrs.	716-334-8110
NY	Rochester, Simcona Elctrns.	716-328-3230
NY	Rockville Center, Midway Ind'l	516-764-2400
NC	Raleigh, Southeastern Radio Supply	919-828-2311
NC	Winston-Salem, Kirkman Elctrns.	919-722-9131
Ohio	Cincinnati, United Radio	513-761-4030
Ohio	Cleveland, W. Pattison Supply	216-441-3000
Ohio	Columbus, Hughes Peters	614-294-5351
Ohio	Columbus, Electronics Mktg.	614-299-4161
Ohio	Dayton, John A. Becker Co	513-226-1341
Okla	Oklahoma City, Electric Supply	405-232-5215
Okla	Oklahoma City, Electro Entps.	405-478-1752
Ore	Portland, Eoff Electric Co.	503-222-9411
Pa	Altona, Allegheny Elctrns.	814-946-0871
Pa	Duquesne, Advacom	412-469-2601
Pa	Erie, Mace Elctrns.	814-838-3517
Pa	Montgomeryville, Pyttronic Inds.	215-634-2650
Pa	Philadelphia, Almo	215-698-4000
Pa	Pittsburgh, CAM/RPC Co., Inc.	412-782-3770
Pa	Pittsburgh, CAM/RPC	412-782-3770
Pa	Reading, D. Barbey	215-376-7451
SC	Columbia, Dixie Radio Supply	803-779-5332
Tenn	Knoxville, Industrial Elctrns.	615-573-7135
Tex	Dallas, KA Elctrns Sls.	214-634-7870
Tex	Dallas, Solid State Elctrns.	214-352-2601
Tex	Ft. Worth, Industrial Elctrns	817-731-7321
Tex	Stafford, Southwest Elctrns.	713-494-6021
Utah	Salt Lake City, Ra-Elco, Inc.	801-487-0571
Va	Charlottesville, Virginia Radio Supply	804-296-4184
Wash	Seattle, Almac/Stroum	206-763-2300
Wash	Seattle, Radar Electric	206-282-2511
WVa	Beckley, Halley Elctrns. Co.	304-253-2151
Wisc	Milwaukee, Electronic Expeditors	414-228-8100
Wisc	New Berlin, BW Electronics	414-784-4420
For:	Can., Montreal, Quebec, Cesco Elctrns	416-661-0220
For:	Can., Vancouver, B.C., Intek Electronics Ltd.	604-324-6831

KURMAN RELAY, Dept. EM, 120 Wilbur Place, Bohemia, N.Y. 11716, Tel: 516-567-0009

Local Sales Offices & Reps.

Fla	Clearwater, WMM Assocs.	813-442-3913
Mass	Randolf, Bengal Assocs.	617-961-4120
Mich	Southfield, Luebbe Sls. Co.	313-375-0355
NJ	Medford, Component Consits.	609-654-2800
NY	East Northport, Jarms Assocs.	516-822-7085
NY	Fayetteville, Martin P. Andrews	315-637-5291
Ohio	Cincinnati, Luebbe Sls. Co.	513-871-4211
Ohio	Cleveland, Luebbe Sls. Co.	216-333-0425
Ohio	Dayton, Luebbe Sls. Co.	513-294-0426
Pa	Delmont, Luebbe Sls. Co.	412-468-4019

Local Distributors

Fla	Miami, Electronic Equip.	305-871-3500
Mass	Holyoke, Faicetti & Clark	413-532-9402
NY	Buffalo, Summit Distr.	716-884-3450
NY	Hempstead, Electronic Equip.	516-538-5510
NY	Rochester, Summit Distr.	716-334-8110

KURZ-KASCH, INC., Knob Div., Dept. EM, 711 Hunter Dr., Wilmington, Ohio 45177, Tel: 513-382-0966; Empl.: 250

Sales Manager: A. King

Local Sales Offices & Reps.

Ariz	Phoenix, Mercury Engrg. Sls.	602-279-2367
Cal	Burlingame, Polach & Bensinger	415-697-2525
Cal	Los Angeles, W. S. Harmon Co.	213-937-1460
Colo	Boulder, Front Range Mktg	303-443-4780
Fla	Orlando, AP Assocs	305-298-2816
Haw	Honolulu, Aloha Assocs.	808-941-1574
Ill	Libertyville, R. Klipp Assocs.	312-362-4676
Ind	Carmel, Carter, McCormic & Pierce	317-844-4175
Iowa	Des Moines, KSW Assocs	402-333-2943
La	Chalmette, Ohmtronics	504-271-1976
La	Gretna, Cartwright & Bean	504-362-4649
Mass	Canton, New England Elctrn. Sls. Corp.	617-828-4835
Mich	Farmington, Carter, McCormic & Pierce	313-477-7700
Minn	Minneapolis, S & R Component Sls	612-544-3022
Miss	Jackson, Cartwright & Bean	601-981-1368
Mo	Kansas City, KSW Assocs.	816-385-5240
Neb	Omaha, KSW Assocs	402-571-6001
NJ	Mountain Lakes, Components for Elctrns.	201-334-2921
NM	Albuquerque, A Q Elctrns.	505-883-1003
NY	Rochester, Marchese, Marsey & Barden	716-544-4300
NC	Charlotte, Electronic Marketing Assoc.	
NC	Winston-Salem, Electronic Marketing Assoc.	919-722-5151
Ohio	Cleveland, Carter, McCormic & Pierce	216-333-5650
Ohio	Dayton, Carter, McCormic & Pierce	513-278-2573
Pa	Media, Snyder & Stefkovic Assoc.	215-566-5400
Pa	Pittsburgh, John O. Olsen Co	412-341-8391
SC	Greenville, Electronic Mktg Assoc.	803-233-4637
Tenn	Memphis, Cartwright & Bean	901-276-4442
Tex	Dallas, deForest Sales	214-349-3290
Tex	Garland, deForest Sales	
Va	Fairfax, Snyder & Stefkovic Assoc. Inc.	703-273-1413
Wash	Seattle, R.R. Slater Co.	206-622-2552
Exp:	Can., Scarborough, Ont., John R. Tilton Ltd	416-757-4171

Local Distributors

Ariz	Phoenix, Mirco Elctrns. Dist.	602-944-2281
Ariz	Phoenix, Kachina Elctrn Dist.	602-269-6201
Ark	Little Rock, Carlton-Bates	501-562-9100
Cal	Hollywood, Yale Radio	213-456-3186
Cal	Los Angeles, Master Distributors	213-395-2637
Cal	Mountain View, Waltronic Sls.	415-965-4131
Cal	San Diego, Shanks & Wright	714-239-0176
Cal	San Jose, Quement Elctns.	408-294-0464
Colo	Denver, Elctrn. Parts	303-744-1992
Conn	Waterbury, Suburban Supply	203-757-1251
Fla	Miami, Electronic Equip.	305-871-3500

Ill Champaign, Klaus Radio 217-356-1896
Ill Chicago, Waldom Elctrns 312-585-1212
Ill Chicago, Waldom Elctns. 312-585-1212
Ill Peoria, Klaus Radio
Ind Fort Wayne, Fort Wayne Elctns.
Ind Indianapolis, Grahm Elcrns. 317-634-8486
Iowa Des Moines, Mid-State Elec.
Kans Wichita, Radio Supply Co. 316-276-5216
Ky Louisville, P. I. Burks Co.
La Lafayette, Ralph's Radio Supply 318-234-4507
La Shreveport, Indl Elctrn Supply.... 318-636-7100
Md Rockville, Capitol Radio Wholesalers 301-881-2270
Mass Canton, New England Elec. Sls. 617-828-4835
Mass Worcester, RM Elctrns.
Minn Minn., Cassidy Elctrns.
Minn Minn., Stark Elctrns. 612-332-1325
Mo Kansas City, Walters Radio Supply 816-531-7015
Mo St. Louis, Olive Ind. Elec. 314-863-7800
Neb Lincoln, Scott Elctrn. Supply
NJ Springfield, Federated Purchaser 201-376-8900
NY Buffalo, Summit Dist. 716-884-3450
NY E. Farmingdale, Harrison Elctrns. 516-293-7990
NY Rochester, Summit Dist. 716-334-8100
NC Greensboro, Hammond Elctrns. 919-275-6391
Ohio Cinn., Hughes Peters 513-351-2000
Ohio Columbus, Hughes Peters 614-294-5351
Ohio Solon, REM Elctrns 216-248-1636
Ohio Warren, REM Elctrns Supply 216-399-2777
Okla Tulsa, Radio Inc. 918-587-9123
Ore Portland, Radar Electric 503-233-3691
Pa Levittown, Fox Mil-Spec Parts 215-547-7162
RI Warwick, W.H. Edwards 401-781-8000
SC Greenville, Hammond Elctrns. 803-232-6740
Tenn Knoxville, Industrial Elctrns 615-573-7135
Tenn Nashville, Electra Distributing 615-329-3971
Utah Salt Lake City, Standard Supply Co. 801-355-2971
Va Charlottesville, Virginia Radio
Wash Seattle, Radar Elect Co. 206-282-2511
Wisc Milwaukee, Parts Marts Co. 414-276-4160
Wisc Milwaukee, Marsh Elctrns.
For: Canada, Scarborough, Ont., John R. Tilton Ltd. 416-757-4171

KWIKSET POWDERED METAL PRODS., Kwikset Div-Emhart Inds. Inc., Dept. EM, Box 4250P, Anaheim, Cal. 92803, Tel: 714-535-8111; Empl.: 75

KYROS CORP., Dept. EM, Box 406, Madison, Wisc. 53701, Tel: 608-238-3587; Empl.: 4

L & L SPECIAL FURNACE CO., Dept. EM, 166 Conchester Rd., Twin Oaks, Pa. 19016, Tel: 215-485-7188; Empl.: 32

Local Sales Offices & Reps.
Ohio Cleveland, E.F. Burke, Inc. 216-382-3646
Tex Dallas, Textec 214-233-1928

LAB-LINE INSTRS, Dept. EM, 15th & Bloomingdale, Melrose Park, Ill. 60160, Tel: 312-345-7400, TWX: 910-226-0402; Empl.: 225

LABELON CORP., Dept. EM, 10 Chapin St., Canandaigua, N.Y. 14424, Tel: 716-394-6220, TWX: 510-254-7147; Empl.: 135

Local Sales Offices & Reps.
Cal Los Angeles, R. L. Smith Co. 213-746-1710
Ill Chicago, P. Coridon & Assoc. 312-286-5144
NY New York, Labelon Corp. 212-947-4049

LABORATORY DATA CONTROL, Div. M. Roy Corp., Dept. EM, Box 10235, Riviera Beach, Fla. 33404, Tel: 305-844-5241, Telex: 51-3479; Empl.: 135

Local Sales Offices & Reps.
Ala Huntsville, Newcomb, Assoc. 205-852-0304
Cal Irvine, Lab Data Control 714-547-4281
Colo Boulder, Drummond & Assoc. 303-772-1100
Haw Honolulu, Aloha Assocs
Ill Park Ridge, Laboratory Data Control 312-825-8892
Md Laurel, Lab Data Control 301-498-6655
Mass Walpole, Lab Data Control 617-668-9093
Mo Grandview, Lab Data Control 816-331-4469
NJ Englewood Cliffs, Laboratory Data Control 201-568-8280
NC Raleigh, Newcomb Assoc. 919-893-5721
Ohio Worthington, Munhall Co. 614-888-7700
Tex Houston, Lab Data Control 713-527-0828

LaFrance CORP.

LAFRANCE CORP., Dept. EM, Entprs & Exec Aves, Phila., PA. 19153, Tel: 215-365-8000 ..... p.1038,1039

Local Sales Offices & Reps.
Cal Garden Grove, B.N. Brown 714-530-5020
Fla Apollo Beach, J. Helbein & Assocs 813-645-6993
Ill Winfield, L. Pecina 312-665-3376
Mass Stoneham, R. Anderson 617-438-2424
Ohio Rocky River, D. Montgomery 216-331-0138

LAKE CHEMICAL CO., Dept. EM, 250 N. Washtenaw Ave, Chicago, Ill. 60612, Tel: 312-826-1700; Empl.: 65

LAKESHORE ELECTRIC CORP., Dept. EM, 205 Willis, Bedford, Ohio 44146, Tel: 216-232-0200, Telex: 98-0253; Empl.: 45

Sales Manager: J.M. Cowen

Local Sales Offices & Reps.
Ariz Phoenix, Cullyford Agcy. 602-939-3455
Cal Redondo Beach, Control Switches, Inc. 213-772-1582
Cal San Francisco, Artwel Elec., Inc. 415-467-1880
Colo Denver, M & G Assocs. 303-750-8272
Fla Jacksonville, R.J. Hines 904-641-9503
Fla Miami, A.C. Chaney & Assoc. 305-754-8857
Haw Honolulu, Pacific Energy Equip... 808-373-1037
Ind Indianapolis, Hill Engrg Co 317-849-3381
Iowa Des Moines, I.L. Davidson Co..... 515-288-0958
Ky Covington, Schueler Elec. Sls. .. 606-291-0600
Md Baltimore, Adcour 301-486-1211
Mass Sharon, Adcour 617-784-8123
Mich Detroit, Webco, Inc. 313-862-4673
Minn Minneapolis, C. Hansing Co. 612-926-2244
NY New York, F. Toolan Co. 516-822-8137
Ohio Cleveland, P. Samsonas 216-442-5017
Ore Portland, Lynch Equip. 503-655-4495
Tenn Knoxville, Tubbs Agency 615-577-0689
Tex Garland, Stout-Jennings-Schmidt Co. 214-272-5585
Tex Houston, Stout-Jennings-Schmidt Co. 713-729-1994
Utah Salt Lake City, Tri-Western Assocs. 801-487-1881
Exp: N.J., Trenton, Equip. Export 609-393-6483

LA MARCHE MFG. CO., Dept. EM, 106 Bradrock Drive, Des Plaines, Ill. 60018, Tel: 312-299-1188, Telex: 28-2524; Empl.: 225

Local Sales Offices & Reps.
Ala Birmingham, Evans Controls & Sls. 205-871-3355
Alas Anchorage, John P. Bagoy. 907-274-8531
Ariz Phoenix, Osborn Assoc. 602-279-5556
Cal El Cerrito, Saletta Sls 415-236-9191
Cal Santa Fe Springs, Trojan Battery 213-945-1471
Colo Denver, Hensley Battery & Supply Co. 303-455-3643
Fla Miami, Samsco IN & RNL 305-625-6556
Fla Miami, J. Carl Turner & Assoc... 305-625-6556
Ga Marietta, Charlotte Battery Co... 404-422-1487
Ill Bensenville, Delta Equip. Co. 312-766-6600
Ill Deerfield, Electrocon 312-948-0320
Ind Zionsville, Jack Mahaney 317-873-5027
La New Orleans, Chambers Indust. Supply 504-525-3497
Md Baltimore, Wilson Assoc. 301-485-5100
Mass Sharon, Adcour 617-784-8123
Mich Detroit, Webco, Inc. 313-862-4673
Minn Minneapolis, W. Ruva 612-721-7444
Mo St. Louis, Electrorep 314-872-7300
Neb Omaha, Electric Equip. Sls. Co. 402-556-4198
NJ Hillside, J.P. Grech 201-353-3434
NY Jericho, Frank J. Toolan Co. 516-822-8137
NY Middleport, Electruk Battery Co. 716-735-7711
NY Syracuse, Rep Tech 315-437-2845
NC Charlotte, Charlotte Battery Co. 704-375-3249
NC Charlotte, Robt. W. Chapman & Co 704-525-2421
Ohio Columbus, A. Ulrich. 614-253-2705
Ore Portland, Wagstaff Battery Co. ... 503-282-5531
Pa Consho Hocken, Bohlinger 215-825-0440
Tenn Jackson, D. Hallman 901-423-1366
Tex Dallas, P/S Assocs. 214-341-7066
Tex Houston, Texford Battery Co. 713-222-0125
Tex Odessa, B. McEntyre 915-332-1429
Utah Salt Lake City, Parcom 801-467-0811
Utah Salt Lake City, M.L. Burbidge 801-484-7098
Wash Seattle, Pan West Co. 206-RO2-3834
Wisc Milwaukee, Christofferson Co. 414-351-2090
Wisc Milwaukee, Storage Battery Service Co. 414-962-0160
Exp: Ill., River Forest, S. Isola 312-299-1188

LAMBDA ELCTRNS., Dept. EM, 515 Brd. Hollow Rd., Melville, N.Y. 11746, Tel: 516-694-4200, TWX: 510-224-6484; Empl.: 800

Sales Manager: B. Chenes

Local Sales Offices & Reps.
Ariz Phoenix 602-996-1010
Cal No. Hollywood 213-875-2744
Cal Sunnyvale 408-738-2541
Colo Denver, Lambda Elctrnics 303-779-9561
Del Wilmington, Lambda Elctrns..... 215-279-5644
Fla Largo 813-596-5151
Ill Arlington Heights 312-593-2550
Md Baltimore, Lambda Elctrns 301-792-2988
Mass Lexington 617-861-8585
Minn Minneapolis 612-935-6194
NY Poughkeepsie 914-297-4800
NC Pineville 704-542-1991
Ohio Cleveland 216-585-7808
Pa Norristown 215-279-5644
Tex Dallas 214-341-5130
Tex Houston 713-464-6554
Va Fairfax 301-792-2988
Exp: N.Y., Melville 516-694-4200

LAMINATED FABRICATORS, Dept. EM, 1145 San Mateo Ave., San Bruno, Calif. 94066, Tel: 415-583-5092

Sales Manager: H.L. Jacobs

LAMINATED SHIM CO., INC., See Alinabal

LANCE INDS., Dept. EM, P.O. Box 4156, Sylmar, Calif. 91342, Tel: 213-367-1811

LANGLEY CORP., Dept. EM, P. O. Box 2911, San Diego, Cal. 92112, Tel: 714-264-3181; FSC No.: 8354

Sales Manager: A. Kremm

LANSDALE TRANSISTOR & ELECT., Dept. EM, 3600 W. Osborn Rd, Phoenix, Ariz. 85019, Tel: 602-269-6262, Telex: 669-416; FSC No.: 4N369

Sales Manager: R. Heinz; *Distributor Manager:* R. Heinz

Local Sales Offices & Reps.
Ala Huntsville, REMCO 205-883-926
Ariz Phoenix, Lansdale Transistor & Elctrns 602-269-626
Cal Los Altos, W. W. Posey Co. 415-948-777
Cal San Diego, Van Gott & Assocs.. 714-272-845
Cal San Gabriel, Van Gott & Assocs 213-285-214
Colo Littleton, Lange Sls 303-795-360
Conn Southington, The Orion Grp 203-621-594
Fla Maitland, Delmac Sls 305-423-756
Ill Des Plaines, Janus, Inc. 312-298-933
Ind Indianapolis, Electro Reps 317-255-414
Iowa Cedar Rapids, Palatine North 319-365-807
Kans Derby, Palatine Sls 316-788-062
Kans Lenexa, Palatine Sls 913-492-702
Md Glen Burnie, Tri-Mark 301-768-280
Mass Lynnfield, Orion Group 617-890-317
Mich Gross Pointe Park, Greiner & Assocs 313-499-018
Minn Minneapolis, S & R Comp Sls.... 612-544-302
Mo St. Louis, Palatine Sls 314-895-457
NH Mont Vernon, The Orion Grp 203-621-594
NY Endwell, Tri-Tech Elec. 607-754-109
NY Fairport, Tri-Tech Elec. 716-223-572
NY Fayetteville, Tri-Tech Elec. 315-446-288
NY Jericho, J-Square Mktg. 516-997-621
NY Poughkeepsie, Tri-Tech Elec. 914-473-388
NC High Point, Engrg Devices 919-869-720
Ohio Brunswick, Kimconics Sls 216-225-611
Ohio Englewood, Kimconics Sls 513-836-967
Ore Beaverton, L. D. Elctrns 503-649-617
Pa Pittsburgh, Kimconics 412-367-301
Pa Willow Grove, Harry Nash Assocs 215-657-221
Tex Austin, Palatine Sls 512-451-746
Tex Houston, Palatine Sls 713-783-149
Tex Richardson, Palatine Sls 214-231-948
Va Newport News, Tri-Mark, Inc. 804-874-246
Wash Woodinville, L.D. Elctrns 206-485-731
WVa Newport News, The Orion Grp .. 203-621-594

LANSING RESEARCH CORP., Dept. EM, 730-70 Willow Ave, Ithaca, N.Y. 14850, Tel: 607-272-326 TWX: 510-255-5878

LARK ELECTRONICS, INC., Dept. EM, Box 390, Ne York, N.Y. 10040, Tel: 212-942-2535; FSC No.: 5269

Local Distributors
Cal Santa Fe Springs, McMaster-Carr Supp 213-945-1311
Ill Chicago, Weil Pump ... 312-642-4960

LARSON AERO DEV., Dept. EM, Box 135, Concord, Cal. 94522, Tel: 415-228-7870; Empl.: 15

Local Sales Offices & Reps.
Cal Long Beach, Sabre Entprs. ... 213-595-5646
Cal Mt. View, Gado Instr. Sls. ... 415-961-2222
Fla Maitland, D & E Assoc. ... 305-644-3039
Mich Detroit, TIBY Co. ... 313-547-3550
Ohio Cleveland, TIBY Co. ... 216-371-5335
Ohio Dayton, TIBY Co. ... 513-277-3822

LARSON INSTR. CO., INC., Dept. EM, Greenbush Rd., Orangeburg, N.Y. 10962, Tel: 914-359-3800; Empl.: 14

Sales Manager: A. D. Stephens

Local Sales Offices & Reps.
Cal LaCanada, Lew Brooks Co. ... 213-790-8358
Ind Richmond, Kennedy Sls. ... 317-966-1933
Mass Belmont, Electronic Comps. Svc. 617-484-8680
Pa Ingomar, R. W. Moulton Assocs. 412-366-3333
Tex Houston, T.L.C. ... 713-524-9976
Wash Seattle, Instr. Engrg. ... 206-682-1123

LASER INC., Dept. EM, Laser Lane, Box 537, Sturbridge, Mass. 01566, Tel: 617-347-7314; Empl.: 15

Local Sales Offices & Reps.
Ala Birmingham, SISCO ... 205-251-2076
Cal Palos Verdes Penninsula, W.J. Miller Co 213-375-3001
Haw Honolulu, C and F Machinery Corp. 808-524-1033
Ill Elk Grove Village, Automation Assocs. 312-593-1514
Ind Indianapolis, Emmtronics Supply 317-356-0931
Md Silver Spring, Spectroscopy Sys. 301-949-8261
Mass Waltham, Betronic Assocs. ... 617-894-8400
Mich Detroit, H Teplitz & Co ... 313-534-3306
Minn Minneapolis, Kelly Co. ... 612-571-4057
Mo St. Louis, Automation Comps ... 314-872-7111
NY Buffalo, Robinson Assocs. ... 716-886-7350
NC Waxhaw, W. William Dyrkacz ... 704-847-6557
Ohio Dayton, H. Teplitz & Co. ... 513-277-6531
Okla Oklahoma City, Macor Sls ... 405-737-4631
Ore Portland, Tak Inds. ... 503-227-2401
Pa Southampton, Spectroscopy Sys. 215-357-6644

LASER SYSTEMS CORP., Dept. EM, 117 N. First St., Ann Arbor, Mich. 48104, Tel: 313-761-7150; Empl.: 6

LASER TECHNOLOGY, INC., Dept. EM, 10624 Ventura Blvd., N. Hollywood, Calif. 91604, Tel: 213-763-7091; Empl.: 18

Sales Manager: H.B. McLaughlin

LATTIN RADIO LABS., Dept. EM, 1431 Sweeney, Box 44, Owensboro, Ky. 42301, Tel: 502-683-2868; Empl.: 3

LCOMP ST. LOUIS, INC, Dept. EM, 2550 Harley Dr., Maryland Heights, Mo. 63043, Tel: 314-291-6200, TWX: 910-762-0632

Sales Manager: W. Bridegroom

Local Sales Offices & Reps.
Ill Chicago, LCOMP, Chicago ... 312-865-7600
Mo Kansas City, LCOMP, Kansas City 816-221-2400

LDJ ELECTRONICS, Dept. EM, 1064 Naughton Ave., Troy, Mich. 48084, Tel: 313-689-3623, TWX: 810-232-1509; Empl.: 20

LEACH CORP., Dept. EM, 5915 Avalon Blvd, Los Angeles, Cal. 90003, Tel: 213-232-8221, TWX: 910-321-2303; FSC No.: 35344; Empl.: 500 p. 3570-3577

Sales Manager: D. Cope; *Distributor Manager:* F. Winer

Local Sales Offices & Reps.
Cal San Mateo, Halbar Assocs. ... 415-349-4700
Colo Denver, Brown Technical ... 303-233-0863
Fla Coconut Grove, Craft Assocs ... 305-973-1840
Fla Orlando, Craft Assocs. ... 305-843-5224
Fla Seminole, Craft Assocs ... 813-393-1741
Ga Atlanta, Craft Assocs. ... 404-256-0420
Md Silver Spring, Markton, Inc. ... 301-460-6100
Md Timonium, Marktron ... 301-252-7111
Mass Medford, Blake Assocs. ... 617-391-7890
Mo Ferguson, Leach Corp. ... 314-524-2880
NJ Fort Lee, Leach Corp. ... 201-461-6550
NY Fayetteville, R.D. Sherman ... 315-637-9861
Ohio Dayton, Leach Corp. ... 513-434-8151
Pa Trevose, PSA, Inc. ... 215-245-0513
Tex Dallas, Caton Sales ... 214-661-5792
Va Charlottesville, Marktron, Inc. ... 301-762-6210
Wash Bellevue, Leach Corp. ... 206-746-7263

Local Distributors
Cal El Segundo, Liberty Elctrns. Corp. 213-322-8100
Cal Mountain View, Time/Nor-Cal ... 415-965-8000
Cal Torrance, Time Elctrns. West ... 213-320-0880
Fla Ft. Lauderdale, Time Elctrns-Florida 305-974-4800
Ga Atlanta, Electro Air Corp. ... 404-351-3545
Mass Woburn, Time/New England ... 617-935-8080
NY Hauppauge, Time Elctrn. Sls. ... 516-273-0100
Pa Clifton Heights, Time/Mid-Atlantic 215-622-2500
Tex Dallas, Associated Aircraft Supply 214-331-4381
Wash Bellevue, Liberty/Northwest ... 206-453-8300

LEADER INSTRUMENTS CORP., Dept. EM, 151 Dupont St, Plainview, N.Y. 11803, Tel: 516-822-9300; Empl.: 15 ... p. 2774,2775

LEAR SIEGLER, Elctrn. Instr. Div., Dept. EM, 714 N. Brookhurst St., Anaheim, Cal. 92803, Tel: 714-774-1010, TWX: 910-591-1157; Empl.: 600 p. 2057

Sales Manager: J. Anderson

Local Sales Offices & Reps.
Cal Los Altos, Shannon Assoc. ... 415-325-5233
Cal San Francisco, Shannon Assoc. 415-325-5233
Colo Denver, Moss Elec. ... 303-455-7205
Colo Greeley, Gordon Moss Eltrns. Inc. 303-455-7205
Ga Atlanta, Grady Duckett ... 404-451-3529
Ga Atlanta, Grady Duchett Sls. Co. 404-451-3529
Ill Chicago, Mauer Co. ... 312-677-4771
Ill Skokie, Mauer Co. Inc. ... 312-677-4771
Ind Indianapolis, Electronic Sls. & Engr. Inc. 317-849-4260
Iowa Cedar Rapids, Pallantine Sls. Inc. 319-365-8071
Kans Derby, Pallantine Sls. Inc. ... 316-788-0621
Mass Haverhill, L.K. Harmon & Assocs. 617-373-1313
Mich Detroit, Hummon Assoc. ... 313-474-0661
Mo Hazelwood, Pallatine Sls. Co. ... 314-895-4577
NJ Bellmawr, Mid Atlantic Corp. ... 609-931-5303
NJ Tenafly, ABC Elec. ... 201-568-2354
NJ Tenafly, ABC Elec. Sls. Co. ... 201-568-2354
NM Albuquerque, Moss Elec. ... 505-256-3622
NY Williston Park, ABC Elec. ... 516-747-6610
Ohio Cleveland, Geotronix ... 216-526-2535
Ohio Columbus, Geotronix ... 614-457-8472
Okla Tulsa, Pallatine Sls. Co. ... 918-622-0321
Ore Portland, Syscom ... 503-644-2505
Tex Austin, Pallatine Sls. Co. ... 512-451-7463
Tex Houston, Pallatine Sls. Co. ... 713-783-1492
Tex Richardson, Pallatine Sls. Co. ... 214-231-9489

Local Distributors
For: Can, Ontario, Electronic Packaging Systems, Ltd. ... 613-549-5152
For: Eng., Eastleigh Hants, Vero Electronics Ltd. TWX 851-47-551
For: Japan, Tokyo, Hakuto Co. Ltd. TWX 78-12-2912

LECTROETCH, Dept. EM, 14925 Elderwood Ave., E. Cleveland, Ohio 44112, Tel: 216-451-8080; Empl.: 20

Local Sales Offices & Reps.
Cal El Segundo, Applied Prods. Co. 213-678-6441
Conn Orange, R. F. Duffy Assoc. ... 203-795-3678
Fla Boca Raton, Aeromark Corp. ... 305-395-3320
Mass Braintree, R. F. Duffy Assoc. ... 617-848-3550
Mich Grosse Ile, C.H. Webster ... 313-676-6510
Mo Kansas City, Liepsner & Co. ... 816-421-2511
Mo St. Louis, Wagner Engraving Co. 314-821-3133
NY Rochester, R.A. Haehl ... 716-467-6074
Ohio Cleveland, J.G. Seifert ... 216-451-8080
Pa Feasterville, J.C. Moore ... 215-322-5510
Pa Pittsburgh, E.A. McKinney ... 412-281-3138

LECTROTECH, INC., Dept. EM, 5810 N. Western Ave., Chicago, Ill. 60659, Tel: 312-769-6262; Empl.: 65

Local Sales Offices & Reps.
Ariz Phoenix, P.Z. Ray Assocs. ... 602-942-2502
Cal Culver City, H. Feldman Co. ... 213-397-4471
Cal Newport Beach, Roman Mktg. ... 714-540-2270
Cal San Francisco, Tech. Sls. Assocs. 415-467-1434
Colo Aurora, Aurora Mktg. ... 303-344-1415
Fla Maitland, Hutto, Hawkins, Peregoy Inc. 305-831-2474
Fla Ormond Beach, J.F. Thompson Co. 904-677-2298
Ga Atlanta, Murphy & Cota ... 404-875-2525
Ill Skokie, M. Berman Sls. ... 312-OR5-3740
Kans Shawnee Mission, Maury Bettis Co. 913-362-0772
Md Silver Springs, Mid-Atlantic Sls. 215-657-2815
Mich Detroit, R. Milsk Co. ... 313-354-3310
Minn Minneapolis, Melby-Communications 612-884-7688
Minn St. Paul, C.M. Sales Co. ... 612-699-8004
NH Portsmith, Adams-McGregor
NY East Northport, F. Tabman Sls ... 212-263-4646
NY Syracuse, W. Tauber Co. ... 315-446-7094
NY Tonawanda, Maury Farber Assoc. 716-692-1620
Ohio Cleveland, H. Miller Sls. ... 216-321-3900
RI Lincoln, Adams-McGregor ... 401-726-1300
Tex Dallas, Loss & Stewart Assocs. 214-691-6039
Wash Seattle, D.G. Weber Co. ... 503-254-0686
Exp: Westbury, N. Y., Minthorne Intl Co. 516-334-3303

LEDCO DIV., Wilbrecht Elctrns., Dept. EM, 240 Plato Blvd., St. Paul, Minn. 55107, Tel: 612-222-2791, TWX: 297-428, 910-563-3679; FSC No.: 55292; Empl.: 20 p. 2489-2491

Sales Manager: G. Pylkas (Prod Mgr.)

Local Sales Offices & Reps.
Ariz Phoenix, Toward Engr. ... 602-277-1453
Cal Encino, Porter Co. ... 213-999-0171
Conn Woodbridge, Elctrn. Mktg. Co. ... 203-397-1461
Fla Plantation, Gallagher & Assoc. ... 305-792-9218
Ill Wood Dale, Utronix Sls. ... 312-766-1700
Kans Overland Park, J. F. Guernsey Co. 913-381-2225
Mich Detroit, Nicon ... 313-341-7688
Mo Maryland Hgts., Hitt & Assocs. ... 314-878-5404
NY Buffalo, Telesco Assocs. ... 716-834-1026
Pa Paoli, Stitzer Assoc ... 215-644-5500
Tex Arlington, Hite Elctrn. Sls. Co. ... 817-265-2912
Wash Bellevue, Comtec ... 206-453-1188

Local Distributors
Cal Culver City, National Electro Sls 213-391-6294
Colo Denver, Integrated Elctrns ... 303-534-6121
Minn Minneapolis, Joel Co. ... 612-545-5663
Minn Minneapolis, Stark Elctrn. Supply 612-332-1325
NY Rochester, Ossmann Comp. Sls. Corp. 716-442-3290
Ohio Columbus, Reptron Elctrns. ... 614-253-7433
Wash Seattle, Interface Elctrns. ... 206-285-3500
For: Can. Scarborough, Ontario, Carsten Elctrns., Ltd. ... 416-751-5095

LEDEX INC., Dept. EM, 123 Webster St., Dayton, Ohio 45401, Tel: 513-224-9530, TWX: 810-459-1646, 28-8228-1646; FSC No.: 81840; Empl.: 515 p. 3578,3579,4098,4099

Sales Manager: J. Leland

Local Sales Offices & Reps.
Ariz Scottsdale, Arcom Sls. ... 602-947-5745
Cal Palo Alto, Testco ... 415-324-1900
Cal Woodland Hills, Interstate Mktg. Assocs. 213-883-7606
Colo Boulder, Front Range Mktg. ... 303-443-4780
Conn Trumbull, SIR Assocs. ... 203-268-2560
Fla Orlando, Technical Mktg Assocs. 305-857-3760
Fla Pompano Beach, Technical Mktg. Assocs. 305-942-0774
Ill La Grange Park, Bierhaus Sls., Inc. 312-354-5100
Kans Leawood, Thunderbird Tech. Sls. & Svcs. 913-642-7220
Kans Wichita, Thunderbird Tech. Sls. & Services 316-684-3941
Mass Lexington, SIR Assocs. ... 617-862-1812
Mich Benton Harbor, R.C. Nordstrom & Co. 616-429-8560
Mich Lathrup Village, R.C. Nordstrom & Co. 313-559-7373
Minn Minneapolis, Merrill Franklin Co. 612-927-4361
Mo St. Louis, Thunderbird Tech. Sls. & Svcs. 314-567-6488
NM Albuquerque, Arcom Sls. ... 505-296-0606
NY Liverpool, L.P. Garner Assocs. ... 315-451-1323
NY Oceanside, Bittan Assocs. ... 516-678-6222

NC Research Triangle Park, A.B. Andrews & Co. 919-549-0563
Ohio Cleveland, Del Steffen & Assoc. 216-461-8333
Ohio Dayton, Del Steffen & Assoc. 513-293-3145
Ohio Lexington, Del Steffen & Assoc. 419-884-2313
Pa Philadelphia, V.S. Malta 215-836-5122
Tex Richardson, Thunderbird Tech. Sls. & Svcs. Inc. 214-690-0763
Wash Bellevue, Testco 206-454-7422
Wisc Milwaukee, Bierhaus Sls. Inc. 414-332-0900

LEECE NEVILLE DIV., Sheller Globe Corp., Dept. EM, 1374 East 51st St., Cleveland, Ohio 44103, Tel: 216-431-0740

Local Sales Offices & Reps.
Mich Farmington, Leece-Neville 313-474-4992
Wash Redmond, B. Schmidt 206-454-3077

LEECRAFT MFG. CO., INC., Dept. EM, 21-16 44th Rd., Long Island City, N.Y. 11101, Tel: 212-392-8800, TWX: 710-582-2897; Empl.: 250 ..... p. 2492

Sales Manager: T. J. Marine; *Distributor Manager:* R. Nelson

Local Sales Offices & Reps.
Ala Huntsville, Murcota 205-539-8476
Ark Hot Springs, Meridith Young & Assocs. 501-262-1365
Cal Los Angeles, Hartfield-Kennan-Freytag 213-225-1318
Colo Arvada, Arrowhead Sls. Co. 303-423-5556
Conn Bloomfield, Zaslow Sls. 203-242-7781
Fla Lighthouse Point, J. Krutek & Assoc. 305-941-6544
Ill Elmhurst, Hill & Gray 312-832-4101
Ind Indianapolis, Needler Sls Co..... 317-255-8056
Iowa Des Moines, K-S-W..... 515-279-9235
Ky Nicholasville, W. H. Mathews..... 606-885-5047
Md Woodbine, Naudain Assocs Southern 301-252-5378
Mass North Boro, Zaslow Sls. 617-393-8150
Mich Troy, C. Jensen 313-643-0506
Minn St. Paul, R. Ragon..... 612-488-0201
Mo Kansas City, K-S-W..... 816-358-5240
NJ Mount Laurel, Naudain Assocs .. 609-235-1801
NJ Parlin, T. J. Marine 201-727-0435
NY Great Neck, C. Simon & Co..... 516-487-1142
NY Rochester, B. H. Tollefson Assoc., Inc. 716-271-4141
Ohio Cleveland, Anderson-Bolds 216-229-4700
Pa Philadelphia, Naudain Assocs 609-235-1801
Pa Pittsburgh, R. W. Moulton Assoc. 412-366-3333
Tex Dallas, Erickson Sls Inc..... 214-243-6611
Va Portsmouth, FBD Sls Corp..... 804-484-3162
Wash Vancouver, HKF Assoc. 503-228-1683
Exp: Long Island City, NY, Leecraft Int'l. Corp. 212-392-8800

Local Distributors
Cal El Monte, Kimball Stark 213-444-2594
Cal Inglewood, Newark Electronics .. 213-678-0441
Cal Los Angeles, Fisher/Brownell 213-532-2170
Cal Sacramento, Sacramento Elctrns. 916-441-4821
Cal Santa Clara, Fisher/Brownell 408-244-6182
Cal W. Los Angeles, Western Electromotive/ Shephard Inc..... 213-820-3777
Colo Denver, Denver-Wintronics..... 303-934-2406
Colo Denver, Newark Denver Supplyy 303-757-3351
Conn Waterbury, Suburban Supply Corp. 203-757-1251
Fla Deerfield Beach, American Elctrn. Supply Corp. 305-428-0262
Fla Miami, Electronic Equip..... 305-871-3500
Fla Orlando, Hammond Eletrns..... 305-849-6060
Ill Champaign, Klaus Radio 217-356-1896
Ill Chicago, Newark Elctrns. Corp. 312-638-4411
Ill Northbrook, Classic Components Supply 312-272-9650
Ill Western Springs, Industribution Inc. 312-325-0296
Ind Evansville, Hutch & Son, Inc..... 812-425-7201
Ind Ft. Wayne, Ft. Wayne Elctrns..... 219-423-3422
Ind Indianapolis, Ra-Dis-Co. 317-637-5571
Ind Indianapolis, Graham Elctrns. Supply 317-634-8202
Ky Louisville, P. I. Burks Co. 502-589-3960
La New Orleans, Southern Radio Supply Co. 504-524-2345
Md Rockville, Capitol Radio Wholesalers 301-881-2270
Mass Boston, Sager Electrical Supply 617-542-2281
Mass Newton, Cramer Elctrns, Inc..... 617-969-7700
Mich Ann Arbor, Wedemeyer Elec. Supply 313-665-8611
Mich Livonia, RS Elctrns. 313-525-1155
Minn St. Paul, Gopher Elctrns. 612-645-0241
Mo St. Louis, LCOMP St. Louis, Inc. 314-291-6200
NJ Hanover, State Elctrns., Inc. 201-887-2550
NJ Kenilworth, Newark Elctrns. 201-272-8410
NJ Pennsauken, Resco Elctrns 609-662-4000
NJ Springfield, Federated Purchasers, Inc. 201-376-8900
NY Binghamton, ASI Elctrns. 607-723-6326
NY Buffalo, Summit Distrs. 716-884-3450
NY Elmsford, Ancar/Elctrns. 914-592-7100
NY Mt. Vernon, Qar Ind'l., Elctrns. .. 914-699-2224
NY New York, Barbizon Elect. Co. .. 212-586-1620
NY New York, City Electric Inc. 212-564-5454
NY Rochester, Summit Distrs., Inc. .. 716-334-8110
NY Rockville Center, Midway Indl. Elctrns. 516-764-2400
NY Rome, Rome Elctrns..... 800-962-2153
NC Greensboro, Hammond Elctrns. 919-275-6319
Ohio Akron, Sun Radio Co. 216-434-2171
Ohio Akron, Akron Elctrns..... 216-762-8818
Ohio Cincinnati, Hughes Peters, Inc. .. 513-351-2000
Ohio Cincinnati, Newark Elctrns..... 513-874-5115
Ohio Columbus, Hughes Peters 614-294-5351
Ohio Dayton, S. Friedman 513-298-5555
Ohio Warren, REM Elctrns Supply 216-399-2777
Pa Boston, Barno Radio 412-462-7574
Pa Philadelphia, Philadelphia Elctrns., Inc. 215-568-7400
Pa Philadelphia, Herbach Rademan, Inc. 215-426-1700
Pa Pittsburgh, CAM/RPC..... 412-782-3770
Pa Reading, G. D. Barbey Co. 215-376-7451
RI Providence, W. Dandretta & Co. 401-861-2800
Tenn Kingsport, Radio Elec. Supply Corp. 615-247-8111
Tenn Nashville, Electra Distributing Corp. 615-329-3971
Tex Dallas, Newark Elctrns 214-271-2511
Tex Garland, Newark Elctrns. 214-271-2511
Tex Houston, Newark Elctrns 713-782-4800
Va Richmond, Sterling/Meridian Elctrns. 804-359-0221
Wash Seattle, Almac Stroum Elctrns. .. 206-763-2300
Wisc Milwaukee, Parts Mart Corp. 414-276-4160
Exp: Can., Richmond Hills, Ont., Leecraft Inds. Ltd. 416-889-2744
Exp: Long Island City, N.Y., Leecraft Int. Corp. 212-392-8800
For: Can., Vancouver, B.C., L. A. Varah, Ltd. 604-873-3211
For: Can., Winnipeg, Man., Cam Gard Supply Co., Ltd..... 204-786-8401

LEEDS & NORTHRUP CO., Dept. EM, Sumneytown Pike, North Wales, Pa. 19454, Tel: 215-643-2000; Empl.: 4800 ..... p. 2776-2778,2845

Sales Manager: R.C. Thomas

Local Sales Offices & Reps.
Ala Birmingham..... 205-870-5310
Ala Mobile 205-342-8929
Ariz Phoenix 602-966-3870
Cal Anaheim 714-635-6040
Cal San Mateo 415-349-6656
Colo Denver..... 303-759-2701
Conn Avon 203-678-0270
Del Wilmington 302-478-6970
DC Washington 301-621-1353
Fla Miami..... 305-428-2861
Fla Orlando 305-671-7607
Ga Atlanta..... 404-938-8946
Ill Chicago..... 312-775-4141
Ill South Holland..... 312-596-8480
Ind Indianapolis..... 317-259-7161
Iowa Davenport..... 319-355-6481
Kans Mission 913-432-3727
Ky Louisville 502-897-0631
La Baton Rouge 504-272-4020
La Shreveport 318-861-1861
Md Columbia..... 301-465-9494
Mass Boston..... 617-326-8816
Mich Detroit 313-967-1033
Mich Grand Rapids 616-455-7070
Minn Minneapolis..... 612-835-7722
Mo Kansas City 913-432-3727
Mo St. Louis 314-726-0853
Neb Omaha 402-895-0886
NJ Union 201-686-5200
NY Albany 518-785-1354
NY Buffalo..... 716-836-5900
NY Rochester 716-235-1700
NY Syracuse..... 315-446-8446
NC Raleigh 919-718-4580
NC Winston-Salem 919-765-6580
Ohio Canton..... 216-499-1800
Ohio Cincinnati..... 513-791-2274
Ohio Cleveland 216-291-2100
Ohio Columbus 614-891-1615
Ohio Toledo 419-865-5187
Okla Tulsa 918-622-4515
Ore Portland..... 503-292-8945
Pa Allentown 215-434-4417
Pa Philadelphia 215-646-5500
Pa Pittsburgh 412-561-7808
Pa Sharon..... 412-346-3585
SC Columbia..... 803-772-4770
Tenn Knoxville 615-693-1838
Tenn Memphis 901-365-9026
Tex Beaumont 713-838-6848
Tex Dallas 214-234-3363
Tex Houston..... 713-784-2720
Utah Salt Lake City 801-266-6931
Va Richmond 804-276-9720
Va Roanoke 703-345-9532
Wash Seattle..... 206-747-0044
WVa Charleston 304-342-6678
Wisc Milwaukee..... 414-774-6000

LEEPOXY PLASTICS, Dept. EM, 3324 Ferguson Rd., Ft. Wayne, Ind. 46809, Tel: 219-747-7411; Empl.: 15

LEHIGHTON ELECTRONICS, INC., Dept. EM, RD 1Box 374 Dept M, Lehighton, Pa 18235, Tel: 717-386-4156; Empl.: 65

Sales Manager: L. Miller

Local Sales Offices & Reps.
Cal Covina, Romar Intl. 213-332-8548
Cal Saratoga, Dahlin & Assocs. 408-257-0121
Fla Pompano Beach, Cole-Tek Assocs. 305-781-8110
Mich Spring Lake, Walch Engrg.
NJ Lebanon, Churchill Assocs. 201-236-6055

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LEITZ, INC. E., Dept. EM, Link Crescent, Rockleigh, N.J. 07647, Tel: 201-767-1100, Telex: 13-5356; Empl.: 200

Sales Manager: G. Faulhaber

Local Sales Offices & Reps.
Cal San Francisco 415-873-7560
Ga Tucker..... 404-939-5426/12
Ill Park Ridge 312-692-4133
Md Kensington 301-946-9306

LEKTRA LABS., INC., Dept. EM, 129-07 18th Ave. College Point, N.Y. 11356, Tel: 212-939-7171; Empl.: 60

LEMO USA, Dept. EM, 2015 Second St., Berkeley, Cal 94710; Tel: 415-548-1966, Telex: 335-393

Local Sales Offices & Reps.
Cal Berkeley, Panco Sls 415-548-1966
Cal Berkeley, Caltron Industries..... 415-548-1966
Cal Los Angeles, Ezra Mintz Assocs. 213-670-5410
Ill Northbrook, Raines-Brin Assocs 312-498-0890
Mass Lexington, Zieco..... 617-861-8300
Minn St. Paul, Arkco Sls 612-777-7454
NJ Ho-Ho-Kus, Don J. Fisher Co..... 201-652-0090
NM Albuquerque, Burt Dieruf Assocs 505-299-0989
NY Rochester, Lloyd Hart Assocs.... 716-244-3253
Ore Portland, Earl & Brown Co. 503-245-2283
Tex Lewisville, Jim Hughes Co 817-430-1683
Tex Stafford, Jesse B. Simms - Jim Hughes Co 713-491-2498
Wash Seattle, Earl & Brown Co. 206-284-1121

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LENAPE EQUIPMENT CO, Dept. EM, 558 Lincoln Blvd., Middlesex, NJ. 08846, Tel: 201-356-5353

Sales Manager: J. J. Masorian Jr.

Local Sales Offices & Reps.

Ariz	Phoenix, Karl Jahn Co.	602-956-9060
Cal	Canoga Park, Ladd Assoc	213-998-0254
Cal	Mountain View, Morse Assoc.	415-968-7722
Colo	Golden, J. F. Hurlbut	303-279-7796
Conn	Bridgeport, Technical Instrs	203-368-4582
Fla	Clearwater, Harra Tech Sls	813-461-1639
Ill	Wheaton, Chas D. Atwater Assoc	312-665-0275
Md	New Carrolton, W. A. Brown Equip-Co	301-577-4527
Mass	Wilmington, Tech Instrs.	617-944-3930
Minn	Minneapolis, Chenquip Corp	612-827-5951
NJ	Broomall, Gil-Tec	215-543-7200
NJ	Middlesex, Lenape Equip.	201-356-5353
NY	Vestal, Vestal Elctrns Div.	607-748-3134
NC	Charlotte, Electro-Rep Assoc	704-527-2530
Ohio	Cleveland, Concord Sls Co	216-831-1446
Pa	Whitney, Clark Industrials	412-423-6366
Tex	Houston, Production Automation	713-444-1232
Tex	Richardson, Production Automation	214-231-3979
Utah	Salt Lake City, J F Hurlbut Co	801-969-4034
Va	Alexandria, W A Brown Equip-Co	703-836-1800
Wash	Lynwood, Sys Specialist	206-775-6603
Wisc	Brookfield, O'Donohue Inds	414-781-2900

LENK MFG. CO., INC., See Wall-Lenk Mfg. Co.

LENOX-FUGLE ELCTRNS., INC., Dept. EM, 100 Sylvania Pl., S. Plainfield, N.J. 07080, Tel: 201-756-1164; Empl.: 18

Local Sales Offices & Reps.

Cal	Los Angeles, Western Electromotive/Shephard	213-820-3777
Colo	Arvada, Arrowhead Sls. Corp.	303-772-3483
Fla	Orlando, Ludlum Assocs. Co.	305-894-7761
Ill	Chicago, L-Tec, Inc.	312-286-1500
Mass	Wellesley Hills, M. Scott Co.	617-235-0102
Mo	Kansas City, R. R. Burton Sls. Co.	816-578-4498
NM	Albuquerque, Arrowhead Sls. Corp.	505-247-0287
NY	Rochester, H. C. Johnson Agencies	716-482-3000
NY	Schenectady, E M B Elctrns. Corp.	518-372-5841
NY	Yonkers, J. Brown Elec. Sls. Reps.	914-779-7330
Ohio	Dayton, R. P. Calhoun & Assoc.	513-299-4144
Pa	Philadelphia, Paragon Sls. Co.	215-563-7060
Utah	Salt Lake City, Arrowhead Sls. Corp.	505-247-0287

LENOX INSTR. CO., Dept. EM, 121 E. Luray St., Philadelphia, Pa. 19120, Tel: 215-DA 4-4543; Empl.: 40

Local Sales Offices & Reps.

Pa	Philadelphia, Lenox Instr.	215-324-4543

LEPEL CORP, Dept. EM, 59-21 Queens-Midtown Expwy., Maspeth, N.Y. 11378, Tel: 212-HA 6-4580, Telex: 12303; Empl.: 200

Sales Manager: J. Coiffi

Local Sales Offices & Reps.

Ala	South Birmingham, Dilcher Engrg. Co.	205-252-3300
Cal	Irvine, Lepel High Frequency Labs., Inc.	714-540-1650
Colo	Denver, R. J. Primus	303-433-8997
Conn	Simsbury, T. V. Evans	203-658-5579
Fla	St. Petersburg, Dilcher Engrg. Co.	813-343-1041
Ga	Atlanta, Dilcher Engrg. Co.	404-261-1678
Ill	Chicago, Lepel High Frequency Labs., Inc.	312-832-4225
Ind	Indianapolis, Processing Equip. Co.	317-253-9400
Mass	Wakefield, Eastern Appliance Co.	617-245-8530
Mich	Mount Clemens, E. L. Kemper & Assocs.	313-468-9797
Minn	Minneapolis, C. W. Stone Co.	612-870-8104
Mo	St. Louis, Beaco Equipment Co.	314-965-8600
NC	Charlotte, Dilcher Engrg. Co.	704-364-9272
Ohio	North Canton, H. D. Denton	216-499-3091
Okla	Tulsa, Marsuco	918-584-5271
Pa	Havertown, E. G. Murphy	215-446-4414
Tenn	Chattanooga, Young Equip. Sls.	615-265-3862
Tex	Houston, Selle Alloys & Equip. Co.	713-524-3013
Wash	Seattle, Eustis Co., Inc.	206-623-7060

LEVIT ELECTRONICS, C. M., Dept. EM, 200 Park Ave. S., New York, N.Y. 10003, Tel: 212-777-5517, Telex: 42-2509

Sales Manager: D.H. Spilke; *Distributor Manager:* M Levit

LEVITON MFG. CO., INC., Dept. EM, 59-25 Little Neck Pkwy., Little Neck, N.Y. 11362, Tel: 212-229-4040, TWX: 710-582-2632

LEWISYSTEMS, Menasha Corp., Dept. EM, 426 Montgomery St., Watertown, Wisc. 53094, Tel: 414-261-3162, Telex: 26-9403; FSC No.: 81841; Empl.: 189

Local Sales Offices & Reps.

Ill	Chicago	312-631-1451
Mich	Detroit	313-886-1181
NY	Flushing	212-463-3890
Pa	Latrobe	412-537-5808
Wisc	Milwaukee	414-774-4350

LEXIDATA CORP, Dept. EM, 215 Middlesex Tpke., Burlington, MASS. 01803, Tel: 617-273-2700, TWX: 710-332-1381

LFE CONTROL SYSTEM INDUSTRIES, Dept. EM, 2920 Sand Ysidro Way, Santa Clara, Cal. 95051, Tel: 408-732-9400, TWX: 910-339-9282; Empl.: 135

Sales Manager: D. G. Ridgeway

LFE CORP., Process Control Div., Dept. EM, 1601 Trapelo Rd., Waltham, Mass. 02154, Tel: 617-890-2000, TWX: 92-3445, 710-324-0681; FSC No.: 20905

Sales Manager: R. Arslanian; *Distributor Manager:* C. Davis

Local Sales Offices & Reps.

Ariz	Phoenix, Zeus	602-253-6104
Ariz	Tempe, Trembly Associates	602-967-2058
Cal	Santa Ana, Westlab Inc.	714-979-8472
Cal	Sunnyvale, Mission Mktg.	408-732-9611
Colo	Denver, Trembly Assocs	303-756-1234
Ga	Atlanta, PAR Assocs.	404-393-0018
Ill	Mount Prospect, G & E Instrs.	312-593-5551
Kans	Overland Park, G & E Instrs.	913-649-0121
Mass	Needham, Eastronix, Inc.	617-449-1550
Mich	Royal Oak, George Inst. Co.	313-576-4700
Minn	Minneapolis, CMI	612-566-6930
Nev	Las Vegas, Trembly Assocs	702-739-6816
NJ	Oakland, Applied Process Instrs.	201-337-6163
NM	Albuquerque, Trembly Assocs.	505-266-8616
NY	Clark Mills, KLM Assocs.	315-853-6126
NY	N. Syracuse, KLM Assocs.	315-458-6214
NY	Pittsford, KLM Assocs.	716-381-8350
NC	Charlotte, Par Assoc.	704-597-1804
Ohio	Dayton, Mohawk Intronics	513-434-8873
Okla	Chagrin Falls, RPM Ind'l. Sls.	216-247-3295
Pa	Ingomar, Greye Glass Assoc.	412-366-6664
Pa	Newtown Square, DCI Sys.	215-353-0772
Tex	Fort Worth, Carey-Wolf & Assoc.	817-461-7333
Tex	Houston, Carey-Wolf & Assoc.	713-721-2442
Wash	Seattle, Comptronics	206-284-4842
Exp:	Waltham, Ma, LFE-Export Dept.	617-890-2000

LH RESEARCH, INC., Dept. EM, 1821 Langley, Irvine, Cal. 92714, Tel: 714-546-5279, TWX: 910-595-2540; Empl.: 300 ..... p. 3284,3285

Sales Manager: W. Hersom,-V.P. Dir. Engrg.

Local Sales Offices & Reps.

Ala	Birmingham, Spader & Assocs.	205-879-1366
Ariz	Scottsdale, DeAngelo, Rothman & Cheever	602-948-2240
Cal	Culver City, DeAngelo, Rothman & Co.	213-398-6239
Cal	Irvine, L H Research	714-546-5279
Cal	San Jose, L H Research	408-268-5115
Colo	Denver, PLS Assocs.	303-773-1218
Fla	Oviedo, Conley & Assocs	305-365-3283
Ga	Avondale, Spader & Assocs.	404-296-3024
Ill	Schaumburg, Kingston Comps.	312-529-8055
Iowa	Des Moines, Beams Co.	515-255-1148
Kans	Shawnee Mission, Beams Co.	913-631-0300
Md	Laytonsville, G-T Assocs.	301-949-8060
Mich	Farmington Hills, H. Lowell Co.	313-851-7474
Minn	St. Paul, Cahill Assoc.	612-646-7217
Mo	St. Louis, Beams Co.	314-569-1060
NH	Nashua, Bell Controls	603-882-6984
NJ	Wayne, G & A Sls.	201-256-8500
NY	Syracuse, Nycom, Inc.	315-437-8343
NC	Charlotte, Rudisill Assocs.	704-377-6901
Ohio	Cleveland, Goetronix Mktg. Assocs.	216-526-2535
Ohio	Columbus, Geotronix	614-457-8472
Pa	Ambler, Data Engrg.	215-542-9876
Tex	Dallas, Advance Tech Sls.	214-361-8584
Tex	Houston, Advance Tech. Sls.	713-444-2944
Wash	Seattle, James Anderson	206-232-0484
Exp:	Cal., Reseda, Dynatron Int'l.	213-881-8700

LIBBEY OWENS-FORD CO., Liberty Mirror Div., Dept. EM, 811 Madison Ave., Toledo, Ohio 43695, Tel: 419-247-4797; Empl.: 125

Local Sales Offices & Reps.

Cal	Los Angeles	213-846-2153
Ill	Chicago	312-236-2490
NJ	Fort Lee	201-947-8000
Ohio	Cincinnati	513-563-8920
Tex	Dallas	214-521-3782

LIBERTY CONTROLS INC.

LIBERTY CONTROLS, INC., Dept. EM, 500 Brookforest Ave., Shorewood, Ill. 60431, Tel: 815-725-2241, TWX: 910-633-1557; Empl.: 60 ..... p. 3580,3581

Local Sales Offices & Reps.

Cal	Palo Alto, Alpha Tech. Assoc.	415-494-8717
Cal	Santa Monica, REP Assoc.	213-829-5401
Colo	Englewood, Dynatech	303-773-2830
Fla	Sarasota, R.F. Carlson	813-388-3086
Ill	Chicago, D. Dolin Sls	312-286-6200
Mass	Bedford, CNC Sls.	617-275-2890
Mich	Grand Rapids, R. P. Urban & Assocs.	616-245-0511
Minn	St. Paul, Countryman Assocs.	612-645-9151
Mo	St. Louis, R. Carlson	314-961-4485
NJ	Fort Lee, Necco	201-461-2789
NY	Liverpool, BCS Assoc.	315-652-5762
Ohio	Cleveland, E. Bock	216-331-5212
Ore	Portland, Pacific Electric Sls.	503-235-3456
Pa	Bryn Mawr, Vantage Sls.	215-525-0304
Tex	Dallas, D. Shuhart Co.	214-239-0185

LICON DIV., Illinois Tool Works, Dept. EM, 6615 W. Irving Park Rd., Chicago, Ill. 60634, Tel: 312-282-4040, TWX: 910-221-0275; Empl.: 500

Local Sales Offices & Reps.

Cal	Los Angeles, Licon	213-723-1181
Cal	Menlo Pk., McKnight Co.	415-325-2844
Colo	Englewood, Licon, Div. I.T.W.	303-773-0666
Fla	Clearwater, Perrott Associates, Inc.	813-585-3327
Fla	Ft. Lauderdale, Perrott Associates, Inc.	305-792-2211
Fla	Orlando, Perrott Assoc.	305-275-1132
Ga	Atlanta, Electro Mech.	404-449-6337
Kans	Leawood, Thunderbird Tech. Sls. & Svcs.	913-642-7220
Kans	Wichita, Thunderbird Tech. Sls. & Svcs.	316-684-3941
Md	Randallstown, Beacon	301-922-1248
Mass	Burlington, Licon Div. I.T.W.	617-273-0365
Mich	Birmingham, Licon	313-642-9876
Minn	Minneapolis, Comstrand Inc.	612-571-0000
Mo	St. Louis, Thunderbird Tech. Sls. & Svcs.	314-567-6488
Neb	Lincoln, Mktg. Assoc.	402-464-5244
NJ	Bridgewater, J.F. Coughlin Assocs.	201-725-1327
NJ	Haddonfield, TAI Corp.	609-854-3011
NY	Massapequa, J.F. Coughlin	516-799-7743
NY	Syracuse, Fountain, Young & Co.	315-437-7733
NC	Raleigh, Electro Mech.	919-782-7586
Ohio	Columbus, Rockford Controls	614-231-5890
Ohio	Dayton, Rockford Controls	513-898-5452
Ohio	Euclid, Rockford Controls	216-731-5250
Tenn	Nashville, Electro Mech Sls. Engrg. Co.	615-256-2516
Tex	Microsystems Mktg. Inc., Evans-McDowell	214-238-7157
Tex	Microsystems Mktg. Inc., Evans-McDowell	713-783-2900
Wash	Redmond, Barrett Sls. Northwest Ltd.	206-885-6991

Local Distributors

Ariz	Phoenix, Cramer Elctrns.	602-267-7321
Cal	Burlingame, Rose Elctrns. Distr. Co.	415-348-2740
Cal	Los Angeles, Electric Switches	213-660-1310
Cal	Los Angeles, Kierulff Airline Supply	
Cal	Santa Clara, Fisher Brownell	408-244-6182
Cal	Sun Valley, Richey Elctrn.	213-768-3800
Colo	Denver, Cramer Elctrn.	303-758-2100
Conn	Hartford, L.E. Whelan Co.	203-246-5694
Fla	Miami, Electronic Equip Co.	305-871-3500

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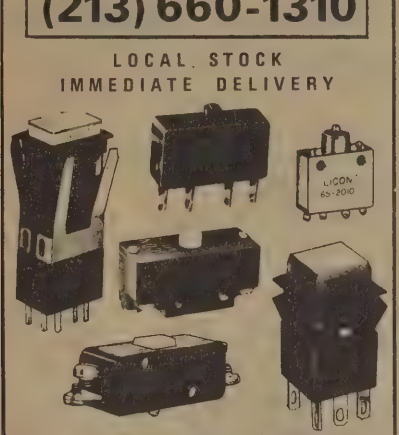

See Complete List of Brands Listed Under ELECTRIC SWITCHES.
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Fla	Orlando, Cramer Elctrns.	305-894-1511
Ill	Chicago, Newark Elctrns. Corp.	312-638-4411
Ill	Chicago, Electronic Expeditors	312-236-1088
Ind	Indianapolis, RA DIS Co.	317-637-5571
Kans	Wichita, Radio Supply Co.	316-267-5214
Me	Kensington, Marine Air Supply	301-949-1353
Mass	Newton, Cramer Elctrns.	617-969-7700
Mass	Watertown, Sterling Elctrns.	617-894-6200
Mass	W. Springfield, Tectrol Assocs.	413-733-3695
Mich	Detroit, Fife Elct. Supply Co.	313-963-1160
Mich	Wyoming, Newark Indl. Elctrns.	616-241-6681
Minn	N. Minneapolis, Stark Elctrns. Supply	612-332-1325
Neb	Lincoln, Scott Elctrns. Supply	402-466-8221
NJ	Hackensack, Nassor Eled. Supply Co.	201-342-3737
NY	Binghamton, ASI Elctrns.	607-723-6326
NY	Buffalo, Summit Distributors	716-884-3450
NY	Farmingdale, Iris Elctrns.	516-420-8400
NC	Winston-Salem, Kirkman Elctrns.	919-722-9131
Ohio	Akron, Akron Elctrns. Supply	216-762-8816
Ohio	Dayton, Esco Elctrns.	513-226-1133
Pa	McKeesport, Barno Radio	412-751-5966
Pa	Montgomeryville, Pyttronics Inds.	215-643-2850
Tex	Dallas, Wholesale Elctrns. Supply	214-824-3001
Tex	Houston, Lenert Co.	713-225-1465
Wash	Bellevue, Bell Industries	206-747-1515
Wisc	Milwaukee, Electronic Expeditors	414-228-8100

LINDEN

LINDEN LABS., INC., Dept. EM, Box 920, State College, Pa. 16801, Tel: 814-355-5491; FSC No.: 20872; Empl.: 100

Sales Manager: L. C. Feltman

Local Sales Offices & Reps.

Cal	Los Angeles, MODCO, Inc.	213-851-1113
Conn	Woodbridge, Elctrn Marketing Co	203-397-1461
Fla	Ft. Lauderdale, Sproch Sls	305-587-3792
Ill	Elk Grove Village, Loren Green Assocs	312-593-0282
Ind	Indianapolis, Loren Green Assocs	317-293-9827
Kans	Derby, Palatine Sls	316-788-0621
Mich	Benton Harbor, McNabb & Assocs	616-925-2166
Minn	Minneapolis, Loren Green Assocs	612-781-1611
Mo	Hazelwood, Palatine Sls	314-895-4577
NY	N. Syracuse, NACO Elctrns Corp.	315-699-2651
NC	Cary, Montgomery Mktg	919-467-6319
Ohio	Cleveland, Jim Finnegan & Co	216-238-5905
Ohio	Worthington, Jim Finnegan & Co	614-885-8522
Pa	Newtown Square, Danton Assocs	215-353-0500
Tex	Richardson, Campion Sls Co.	214-238-8145
Va	Springfield, TEMSCO	703-569-2700
Wash	Seattle, Jon B. Jolly	206-938-4166

LINE ELEC AN ESTERLINE CO., Dept. EM, U.S. Hwy. 287, Parsippany, N.J. 07054, Tel: 201-887-8200, Telex: 13-6494; Empl.: 217

Sales Manager: W. Roginski

Local Sales Offices & Reps.

Ala	Huntsville, Murcota Corp.	205-539-8476
Colo	Arvada, Arrowhead Sls Corp.	303-432-5556
Conn	Berlin, White Sls. Co.	203-224-0423
Fla	Clearwater, Lynch Gentry Assocs.	813-443-2697
Ill	Palatine, Bu-Nell Engrg. Co.	312-358-2300
Mass	Needham, White Sls. Co.	617-444-3676
Mich	St. Clair Shores, J.M. Thorpe Co.	313-779-6363
Minn	Minneapolis, Heimann Co.	612-861-6051
Mo	St. Louis, Deltron Co.	314-869-4779
NJ	Leonia, Associated Controls & Equip.	201-944-9218
NY	Rochester, ONTEC	716-464-8636
NC	Winston-Salem, Murcota Corp.	919-357-9445
Ohio	Cleveland, Val-Skol Sls of Ohio	216-526-2156
Ohio	Dayton, Electro-Com	513-989-5140
Ore	Forest Grove, Doran Sls. Assoc.	503-357-3333
Pa	Abington, Industrial Mktg. Specialists	215-659-0444
Tex	Dallas, Techno Assocs.	214-357-9213
Wash	Redmond, Doran Sls. Assocs.	206-885-1885
Exp:	Cheshire, Techmark Overseas, Corp.	412-941-6490

LINEAR INSTRS. CORP., Dept. EM, 17282 Eastman Ave., Irvine, Cal. 92714, Tel: 714-546-6776, Telex: 68-5613; Empl.: 60

Sales Manager: J.M. Gafner, Mktg. Mgr.

Local Sales Offices & Reps.

Cal	Martinez, Tegal Scientific	415-229-4700
Ill	Deerfield, Serco, Inc.	312-945-8180
La	Kenner, Scimetrics	504-722-4412
Md	Silver Spring, Applied Science Mktg.	301-933-2566
Ohio	Cincinnati, Tekmar Co.	513-761-0633
Tex	Commerce, Scimetrics	214-886-7819
Tex	Houston, Scimetrics	713-772-3609

LINEAR MOTIONS CO., Dept. EM, 17025 Dubesor St., Valinda, Cal. 91744, Tel: 213-333-7056; FSC No.: 5945; Empl.: 6

Sales Manager: L. Wolby

LINEAR NETWORKS CO., Dept. EM, Box 775, Westminster, Cal. 92683, Tel: 213-430-9342; Empl.: 7

LINEMASTER SWITCH CORP., Dept. EM, Box 52, Woodstock, Conn. 06281, Tel: 203-974-1000; FSC No.: 979180; Empl.: 130

LINK COMMUNICATIONS INC., Dept. EM, 260 W. Broadway, New York, N.Y. 10013, Tel: 212-267-2575, Telex: 12-7463; Empl.: 43

Sales Manager: Harvey Oswaks; *Distributor Manager:* Asher Platt

LIPPS, INC., Dept. EM, 1630 Euclid St., Santa Monica, Cal. 90404, Tel: 213-393-0449; Empl.: 200 p. 1012,1013

Sales Manager: K. Combine

Local Sales Offices & Reps.

Mich	Grand Rapids, R.P. Urban Assoc.	616-245-0511
NJ	Teaneck, H. Rude Assoc.	201-836-6778
Ohio	Dayton, Electrical Sys. Co.	815-889-4105
Pa	Huntingdon Valley, Knowles Assocs.	251-947-5641

LISK, G.W. CO., Dept. EM, 2 South St., Clifton Springs, N.Y. 14432, Tel: 315-462-2611, Telex: 97-8395; Empl.: 125

Local Sales Offices & Reps.

Cal	Fullerton, J.J. Crowley	714-870-9671
Colo	Denver, Palmer Assocs.	303-629-0112
Ga	Roswell, Wyco	404-993-5020
Ill	Chicago, K-W Assocs.	312-792-2618
Mich	Farmington Hills, W.R. Hummon & Assocs.	313-474-0661
Ohio	Cincinnati, Tri-State Mktg.	513-761-7993
Okla	Tulsa, Blair Engrg.	918-747-3100
Tex	Dallas, Blair Engrg.	214-352-8411
Tex	Houston, Blair Engrg.	713-776-0011
WVa	Harpers Ferry, W.V. Fox Assocs.	304-725-4333
Wisc	Wauwatosa, Larsen Assocs.	414-258-0529

LITRONIX, Dept. EM, 19000 Homestead Rd., Cupertino, Cal. 95014, Tel: 408-257-7910, TWX: 910-338-0022; FSC No.: 50579; Empl.: 1700 p. 2493

Sales Manager: A.L. Shadlick; *Distributor Manager:* A.L. Shadlick

Local Sales Offices & Reps.

Ala	Huntsville, Rep. Inc.	205-881-9270
Ariz	Phoenix, Q.T. Wiles & Assoc.	602-971-6250
Cal	Los Angeles, Q.T. Wiles & Assoc.	213-478-0183
Cal	Sunnyvale, Trident Assocs.	408-734-5900
Cal	Tustin, Q. T. Wiles	714-832-4952
Colo	Denver, Parker-Webster Co.	303-751-2600
Fla	Casselberry, EIR, Inc	305-830-9600
Ga	Tucker, Rep, Inc	404-938-4358
Ill	Chicago, L-Tec, Inc	312-286-1500
Kans	Overland Park, KEBCO	913-649-1051
Md	Baltimore, Component Sls.	301-484-3647
Mass	Burlington, New England Tech. Sls.	617-272-0434
Minn	St. Paul, Cahill Assocs	612-646-7217
Mo	Maryland Hgts, KEBCO	314-576-4111
NM	Albuquerque, Tri-Tronix Inc.	505-265-8409
NY	Farmingdale, Win Sls	516-249-7859
NY	Pittsford, T-Squared	716-248-5005
NY	Syracuse, T-Squared	315-463-8592
NC	Raleigh, Component Sls.	919-782-8433
Ore	Portland, E.S. Chase	503-620-9616
Pa	Ft. Washington, G.C.M.	215-646-7535
Tenn	Jefferson City, Rep Inc.	615-475-4109
Tex	Dallas, Bonser-Philhower Sls.	214-234-8436
Tex	Houston, Bonxer-Philhower Sls.	713-467-4373
Utah	Salt Lake City, Parker-Webster	801-487-5911
Wash	Seattle, E.S. Chase	206-762-4824

LINEMASTER

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Local Distributors
Ala Huntsville, Hamilton-Avnet 205-533-1170
Ariz Phoenix, Hamilton-Avnet 602-275-7851
Ariz Phoenix, Cramer Elctrns. 602-267-7321
Ariz Phoenix, Moltronics, Inc. 602-272-7951
Cal Culver City, Hamilton Electro Sls. 213-558-2020
Cal Irvine, Cramer Elctrns. 714-979-3000
Cal Mt. View, Hamilton-Avnet 415-961-7000
Cal San Diego, Hamilton-Avnet 714-279-2421
Cal San Diego, Moltronics, Inc. 714-278-5020
Cal San Diego, Cramer Elctrns. 714-565-1881
Cal Santa Clara, Moltronics, Inc. 408-244-7600
Cal Southgate, Moltronics, Inc. 213-773-6521
Cal Sunnyvale, Cramer Elctrns. 408-739-3011
Colo Denver, Cramer Elctrns. 303-758-2100
Colo Denver, Hamilton-Avnet 303-534-1212
Conn Georgetown, Hamilton-Avnet 203-762-0361
Conn Northhaven, Cramer Elctrns. 203-239-5641
Fla Ft. Lauderdale, Hamilton-Avnet 305-971-2900
Fla Hollywood, Cramer Elctrns. 305-921-7878
Fla Orlando, Cramer Elctrns. 305-894-1511
Ga Norcross, Cramer Elctrns. 404-448-9050
Ga Norcross, Hamilton-Avnet 404-448-0800
Ill Mt. Prospect, Cramer Elctrns. 312-593-8230
Ill Rosemont, Advent Elctrns. 312-298-4210
Ill Schiller Park, Hamilton-Avnet 312-678-6310
Ind Indianapolis, Pioneer-Standard 317-849-7300
Iowa Cedar Rapids, Advent Elctrns 319-363-0221
Kans Lenexa, Hamilton-Avnet 913-888-8900
Md Gaithersburg, Cramer Elctrns. 301-792-7602
Md Gaithersburg, Pioneer-Wash. Elctrns. 301-948-0710
Md Hanover, Hamilton-Avnet 301-796-5000
Mass Dedham, Gerber Elctrns. 617-329-2400
Mass Lexington, Harvey Elctrns 617-861-9200
Mass Newton, Cramer Elctrns. 617-964-4000
Mass Woburn, Hamilton-Avnet 617-933-8020
Mich Livonia, Hamilton-Avnet 313-522-4700
Mich Livonia, Pioneer-Mich. 313-525-1800
Minn Edina, Hamilton-Avnet 612-941-3801
Minn Edina, Cramer Elctrns. 612-835-7811
Mo Hazelwood, Hamilton-Avnet 314-731-1144
NJ Cedar Grove, Hamilton-Avnet 201-239-0800
NJ Cherry Hill, Cramer Elctrns. 609-424-5993
NJ Little Falls, Cramer Elctrns 201-785-4300
NJ Mt. Laurel, Hamilton-Avnet 609-234-2133
NM Albuquerque, Century Elctrns. 505-292-2700
NM Albuquerque, Hamilton-Avnet 505-765-1500
NM Albuquerque, Cramer Elctrns. 505-243-4566
NY Buffalo, Summit Distrs. 716-884-3450
NY East Syracuse, Cramer Elctrns. 315-437-6671
NY E. Syracuse, Hamilton-Avnet 315-437-2642
NY Hauppauge, Jaco 516-273-5500
NY Hauppauge, Cramer Elctrns. 516-231-5600
NY Rochester, Hamilton-Avnet 716-442-7820
NY Rochester, Summit Distrs. 716-334-8110
NY Rochester, Cramer Elctrns. 716-275-0300
NY Westbury, Hamilton-Avnet 516-333-5800
NC Greensboro, Pioneer-STD Elctrns. 919-273-4441
NC Raleigh, Hamilton-Avnet 919-819-8030
NC Winston-Salem, Kirkman Elctrns. 919-722-9131
NC Winston-Salem, Cramer Elctrns. 919-725-8711
Ohio Cleveland, Pioneer-Standard 216-587-3600
Ohio Cleveland, Hamilton-Avnet 216-461-1400
Ohio Cleveland, Cramer Elctrns. 216-248-8400
Ohio Dayton, Hamilton-Avnet 513-433-0610
Ohio Dayton, Pioneer-Standard 513-236-9900
Okla Tulsa, Comp Specialties 918-664-2820
Pa Pittsburgh, Pioneer-Standard 412-782-2300
Tex Dallas, Cramer Elctrns. 214-661-9300
Tex Dallas, Component Specialties 214-357-6511
Tex Dallas, Hamilton-Avnet 214-661-8661
Tex Houston, Hamilton-Avnet 713-780-1771
Tex Houston, Component Specialties 713-771-7237
Utah Salt Lake City, Hamilton-Avnet 801-972-2800
Wash Bellevue, Hamilton-Avnet 206-746-8750
Wash Seattle, Almac-Stroum Elctrns 206-763-2300
Wash Seattle, Cramer Elctrns. 206-575-0907
Wisc New Berlin, Hamilton-Avnet 414-784-4510
For: Can., Calgary Alb., Varah's Ltd. 403-276-8818
For: Can., Downsview Ont., Cramer Elctrns. 416-661-9222
For: Can., Hamilton, Ont., L.A. Varah 416-561-9311
For: Can., London, Ont., C.M. Peterson 519-434-3204
For: Can., Mississauga, Ont., Prelco Elctrns 416-678-0401
For: Can., Mississauga, Tor., Hamilton-Avnet 416-677-7432
For: Can., Montreal, Que., Prelco Elctrns. 514-389-8051
For: Can., Montreal, Que., Hamilton-Avnet 514-331-6443
For: Can., Montreal, Que., Future Elctrns. 514-735-5775
For: Can., Ottawa, Ont., Future Elctrns. 613-232-7757
For: Can., Ottawa, Ont., Hamilton-Avnet 613-226-1700
For: Can., Ottawa, Ont., Prelco Elctrns. Ltd. 613-226-3491
For: Can., Toronto, Ont., Future Elctrns. 416-675-7820
For: Can., Vancouver, B.C., L.A. Varah's Ltd. 604-873-3211
For: Can., Willowdale, Ont., Electro Sonic 416-494-1666
For: Can., Winnipeg, Manitoba, L.A. Varah's Ltd. 204-633-6190

Littelfuse Inc.

LITTELFUSE, INC., Dept. EM, 800 E. Northwest Hwy., Des Plaines, Ill. 60016, Tel; 312-824-1188; Empl.: 2000 ..... p. 2494,2495,4100,4101

Local Sales Offices & Reps.
Ala Mobile, Hollingsworth & Still 205-344-1641
Ariz Phoenix, H. Moore Sls. Assocs. 602-274-4558
Cal Burlingame, W.J. Purdy Co. 415-347-7701
Cal Inglewood, J. Berman Co. 213-649-6111
Colo Denver, McLoud & Raymond Co. 303-756-1589
Conn West Hartford, C. Segel Co. 203-236-2027
Fla Ft. Lauderdale, Hollingsworth & Still 305-782-0069
Ga Atlanta, Hollingsworth & Still 404-394-3270
Ill Arlington Heights, C.P. Dombrow Co. 312-253-3326
Ind Indianapolis, L.M. DeVoe Co. 317-842-3245
Iowa West Des Moines, T.L. Dowell & Assocs. 515-225-1620
Kans Overland Park, T.L. Dowell & Assocs. 913-648-7373
Md Silver Spring, Mid Atlantic Sls. 301-593-7749
Mass Newtonville, C. Segel Co. 617-969-6900
Mich Detroit, R.C. Merchant & Co. 313-535-6000
Minn Edina, M. Foster Tech. Sls. 612-835-2252
Mo St. Louis, T.L. Dowell & Assocs. 314-968-4234
NJ Englewood, Bressler & Baum Assocs. 201-569-7600
NJ N. Caldwell, Masin Esco., Inc. 201-226-2550
NM Albuquerque, W.J. Purdy Co. 505-266-7959
NY Buffalo, R.W. Mitscher 716-633-7970
NY Syosset, Masin Esco, Inc. 516-364-0310
NC Greensboro, Hollingsworth & Still 919-855-9033
Ohio Richfield, Bear Mktg. 216-659-3131
Ore Portland, J.V. Belusko Co. 503-222-4279
Pa Greensburg, Bear Mktg. 412-834-2021
Pa. Narbeth, S.A. Jeffries, Inc. 215-664-8500
Pa Reading, Beil & Whitaker 215-779-2610
Tex Dallas, Lund & Co. 214-387-4634
Va Virginia Beach, R.W. Mitscher Co. 804-481-7200
Exp: Ill., Chicago, Littlefuse, Inc. 312-824-1188

LITTON ABS/OEM PRODS DIV., See Sweda International/OEM Prods Div.

LITTON INDS., Electron Tube Div., Dept. EM, 960 Industrial Rd, San Carlos, Calif. 94070, Tel: 415-591-8411, TWX: 34-8484 910-376-4900; FSC No.: 80080; Empl.: 950

Sales Manager: E.D. Taylor

Local Sales Offices & Reps.
DC Washington 202-554-2570
Ga Warner Robins 912-923-3397
NY Melville 516-694-8300
Ohio Dayton 513-258-1243
Pa Williamsport 717-326-3561
Tex Dallas 214-369-2184

LITTON SYSTEMS, INC., Potentiometer Div., Dept. EM, 750 So. Fulton Ave., Mt. Vernon, N.Y. 10550, Tel: 914-664-7733, TWX: 710-562-0129; FSC No.: 04454; Empl.: 300

Sales Manager: G.T. Erbe

Local Sales Offices & Reps.
Cal Van Nuys, G. Mitchell Assocs. 213-989-5111
Colo Boulder, Comp. Prods. Sls. 303-442-1100
Fla Maitland, Lawrence Assocs, Inc. 305-647-1188
Ill Elk Grove Village, Midwest Meridian Corp. 312-437-6531
Iowa Cedar Rapids, Midwest Meridian Corp. 319-365-6561
Mass Allton, Vector Sls. 617-787-2790
Mich Birmingham, Favco Techn Reps 313-644-0173
Mo Maryland Heights, Mid West Meridian Corp. 314-878-4441
Mo St. Louis, Mid West Meridian Corp. 314-878-4441
NY Chappaqua, R.M. Glueck Assocs. 914-238-3233
NY New York, Trionic Assocs., Inc. 516-466-2300
Ohio Dayton, Rixan Assocs., Inc. 513-278-4216
Pa Havertown, Quarracino & Geary 215-449-7500
Tex Hurst, Midwest Meridian Corp. 817-589-1711

LIVERMORE DATA SYSTEMS, INC., Dept. EM, 2050 Research Dr., Livermore, Cal. 94550, Tel: 415-447-2252, TWX: 910-386-8343; Empl.: 40

Local Sales Offices & Reps.
Cal Burlingame, Communico 415-697-2800
Cal Concord, Concord Avionics & Communications 415-798-5322
Cal Costa Mesa, Advanced Video 714-631-0370
Cal Long Beach, Phone Conslts. 213-426-7077
Cal Los Angeles, Pacific Communications 213-760-0144
Cal Redwood City, Communicators 415-365-4000
Cal Sacramento, Communicators 916-381-3380
Cal San Diego, Communicators 714-292-8282
Cal San Francisco, Am/Comm Sys. 415-681-8283
Cal San Luis Obispo, Mid State Sound & Equip 805-544-2191
Cal Santa Ana, Advanced Telecommunications 714-835-5861
Cal Santa Ana, Tab Communications 714-547-6761
Cal Santa Barbara, Communicators 805-682-3741
Ga Atlanta, Flex-Comm Intl 404-237-9242
Mich Southfield, Nation Wide Communications 313-585-4520
Minn Chanhassen, Professional Mktg Svcs 612-474-5939
NY Roslyn Hts., Travco Assoc. 516-621-3223
Ore Lake Oswego, Cartel 503-636-5226
Tex Corpus Christi, American Communications 512-884-0617
Tex San Antonio, American Communications 512-341-8635

LMB HEEGER, INC., Dept. EM, 725 Ceres Ave., Los Angeles, Cal. 90021, Tel: 213-627-9310; Empl.: 11

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Local Sales Offices & Reps.

Ala	Birmingham, J. F. Russell Sls.	205-822-2196
Ariz	Phoenix, B.G. Sls.	602-266-5624
Cal	Burlingame, Carelli-EMA	415-697-8862
Colo	Denver, A.E.S. Inc.	303-777-8733
Fla	Fort Lauderdale, Unirep Inc.	305-527-1556
Ill	Chicago, PBE Mktg.	312-084-3018
Ind	Mulberry, Marsh Sls.	312-296-2322
Mass	Framingham Center, Northeastern Rep.	617-877-4850
Mich	Auburn Hgts, S.F. McMechan	313-852-4308
Minn	Minneapolis, A.J. Warner Co.	612-729-7371
Mo	St. Louis, Kathrinus-Kelly & Co.	314-632-658
NY	Camillus, Trademark	
NY	Yonkers, J. Brown Ele. Reps.	914-779-7330
NC	Charlotte, De Witt-Austen Co	704-366-4643
Ohio	Stow, J.A. Mandabach	216-686-1965
Ore	Portland, J.W. Eckersley	503-246-3183
Pa	Holland, Parnell-Sls. Co.	215-355-9330
Tex	Houston, W. Wylds	713-467-0072

LNR COMMUNICATIONS, INC., Dept. EM, 180 Marcus Blvd., Hauppauge, N.Y. 11787, Tel: 516-273-7111, TWX: 510-227-9871; FSC No.: 51029; Empl.: 200

Local Sales Offices & Reps.

Ariz	Mesa, Grady Moore Assocs	602-839-3458
Cal	Mountain View, Microwave Mktg. Assoc.	415-969-3355
Colo	Lafayette, Grady Moore Assocs	303-494-3351
NM	Albuquerque, Grady Moore Assocs	505-262-1416

LOCATOR ELECTRONICS CO., Dept. EM, South Country Ind'l Pk., Drawer 10609, St. Louis, Mo. 63129, Tel: 314-894-0800, Telex: 44-3437; Empl.: 100

Sales Manager: W. D. Davis, V.P. Sales

LOGICOMP ELECTRNS, INC, See Pres-Air-Trol Corp.

LOGIMETRICS INC., Dept. EM, 121-03 Dupont St., Plainview, NY 11803, Tel: 516-681-4700, TWX: 510-221-1833; FSC No.: 33013; Empl.: 49

Local Sales Offices & Reps.

Cal	Los Angeles, L & M Engrg	213-674-6850
Cal	San Jose, L &M Engrg. North	408-292-3220
Colo	Denver, Scientific Devices Intermountain	303-573-9466
Fla	Clearwater, Teqspec, Inc.	813-725-2201
Fla	Miami, Teqspec, Inc.	305-274-4899
Ga	Atlanta, Teqspec, Inc.	404-455-7222
Kans	Shawnee Mission, Pivan Engrg., Inc.	913-722-1030
Md	Lanham, Brimberg Assocs.	301-552-2200
Mass	Burlington, Tritek Inc.	617-272-4550
Mich	Detroit, Comtel-Sterling	315-255-1970
Mo	St. Louis, Pivan Engrg., Inc.	314-567-3636
NM	Albuquerque, I.M.E.C.	505-883-9010
NY	Commack, Dal-Tech Devices, Inc.	516-543-4776
NY	Skaneateles, Robtron	315-685-5731
Ohio	Cleveland, Comtel-Sterling	216-442-8080
Ohio	Dayton, Comtel-Sterling	513-298-7573
Pa	Ambler, WM Assoc	215-643-4119
Pa	Pittsburgh, Comtel-Sterling	412-922-5720
SC	Greenville, Teqspec, Ill	803-233-1469
Tex	Houston, Scientific Devices S.W.	713-623-4250
Tex	Richardson, Scientific Devices S.W.	214-231-8106

LONDON CHEMICAL CO., Dept. EM, 240 Foster Ave., Bensenville, Ill. 60106, Tel: 312-766-5902, Telex: 72-6360; Empl.: 25

Local Sales Offices & Reps.

Ariz	Phoenix, Arrowhead Sls.	602-277-7148
Cal	Burbank, London Chemical West, Inc.	213-846-8666
Colo	Arvada, Arrowhead Sls. Corp.	303-423-5556
Fla	Miami, Norm Black, Assoc.	305-651-4132
Mass	Waltham, Etchomatic, Inc.	617-893-2020
Minn	Minnatonka, Tonka, Inc.	612-938-9461
Mo	Raytown, Production Automation	816-737-0066
NY	Skaneateles, Spar-Kleen Prods.	315-685-5711
Ohio	Cleveland, Hodson Co.	216-587-4500
Pa	Doylestown, P & C Corp.	215-345-9472
Tex	Dallas, Steven-Daniels Corp.	214-241-2333
Va	Manassas, Pack	703-361-2928
Exp:	Ill., Rensenville, London Chemical Co. Inc. International Dept.	312-287-9477

re Radiometer Electronics A/S

LONDON CO., Dept. EM, 811 Sharon Dr., Westlake, Ohio 44145, Tel: 216-871-8900, Telex: 985276; Empl.: 115 p. 2803

Sales Manager: J.R. Bush

Local Sales Offices & Reps.

Ala	Huntsville, Saber Assoc.	205-534-3386
Ariz	Phoenix, R. A. Mayes Co	602-279-5243
Cal	Encino, C. D. H. Assocs	213-345-3111
Cal	Los Altos, Wright Engrg	415-941-4405
Cal	Los Altos, Wright Engrg.	415-941-4405
Colo	Boulder, R. A. Mayes Co	303-444-0782
Conn	Hamden, Inst. Consultants Inc.	203-288-5246
Fla	Pompano Beach, Saber Assoc.	305-943-3076
Ill	Chicago, Berndt Assoc.	312-283-0713
Mass	Waban, Inst. Consultants Inc.	617-969-9881
Mich	Royal Oaks, Satullo Co.	313-549-3910
Minn	Minneapolis, Berndt Assoc.	612-835-4818
NJ	Springfield, Shortess-Rawson Assoc.	201-467-8585
NM	Albuquerque, R. A. Mayes Co	505-292-2330
NC	Raleigh, Saber Assoc.	919-834-3961
Ohio	Cleveland, Satullo Co.	216-486-2800
Ohio	Cleveland, London Co.	216-871-8900
Pa	Audubon, Holmes Assoc.	215-666-0636
Tex	Houston, R. A. Mayes Co	713-440-9288
Tex	Richardson, R. A. Mayes Co	214-235-3043
Utah	Centerville, R. A. Mayes Co	801-292-6781
Wash	Seattle, Seawell Mktg.	206-783-2043
Wisc	Milwaukee, Berndt Assoc.	414-545-8400

LORANGER MFG. CORP., Dept. EM, Box 948, Warren, Pa. 16365, Tel: 814-723-2250; Empl.: 350

Sales Manager: R. N. Ehrman

Local Sales Offices & Reps.

Ariz	Wickenburg, Sahr Inds.	602-684-7801
Cal	Anaheim, M.T.E. Assocs.	714-998-6790
Cal	Sunnyvale, B. Oppenheim, Inc.	408-733-9000
Fla	Fort Lauderdale, SEMQUIP	305-772-3002
Mass	Waltham, McBar Assoc.	617-890-0233
NJ	Flanders, D. Zingone	201-584-7845
NY	Rochester, Scientific Devices	716-334-2445
Tex	Richardson, C.J. Garvey Co.	214-234-3371

LORD KINEMATICS, Lord Corp., Dept. EM, 1635 W. 12th St., Erie, Pa. 16512, Tel: 814-456-8511; Empl.: 1400

Local Sales Offices & Reps.

Pa	Erie, Lordco Supply, Lord Kinematics	814-456-8511

LPS RESEARCH LABS, Dept. EM, 2050 Cotner Ave., Los Angeles, Cal. 90025, Tel: 213-478-0095, TWX: 910-342-7557; Empl.: 61

Local Sales Offices & Reps.

Cal	Cerritos, B. Einson	213-478-0095
Cal	Novato, V. Mansfield	415-897-7402
Fla	Miami, J. F. Bronner	305-266-2111
Ga	Clarkston, E. R. Eigen	404-292-4154
Ill	Harwood Hgts, L. J. Halek	312-867-9571
Ill	Riverwoods, N. Barton	312-685-7612
Mass	Charlestown, P. Bowes	617-241-7863
Mo	Kansas City, W. M. Skelton	816-436-2358
NJ	Cliffside Park, R. H. Gardner	201-941-1222
Ohio	La Grange, C. A. Karpinski	216-777-4952
Ohio	Vermillion, J. Lacinak	216-777-4952
Tex	Arlington, A. V. Heavin	817-461-9770
Va	Chester, J. J. Tomarchio	804-643-6155
Wash	Seattle, G. R. Marable	206-485-0973

LSI COMPUTER SYSTEMS, INC., Dept. EM, 1235 Walt Whitman Rd., Melville, N.Y. 11746, Tel: 516-271-0400, TWX: 510-226-7833; FSC No.: 55261; Empl.: 25 p. 2859

Sales Manager: R. Colino

Local Sales Offices & Reps.

Ariz	Scottsdale, Verein Corp.	602-948-3571
Cal	San Diego, Mesa	714-278-8021
Cal	Santa Clara, Fischer Assocs	408-733-7350
Colo	Parker, Component Sls	303-841-2650
Ill	Bellwood, Fiat Engrg Assocs	312-547-6200
Ind	Fort Wayne, Fiat Engrg Assocs.	219-482-2408
Md	Fulton, Gans, Fryling & Pugh	301-837-6311
NH	Merrimack, Mech-Tron	603-424-5300
NJ	Wallington, Comp-Tech Sls.	201-935-5454
NY	New Hyde Park, Comp-Tech Sls.	516-593-2628
NY	Penfield, Barthel Entprs	716-377-3018
Ohio	Cleveland, Components, Inc.	216-243-9200
Ohio	West Carrollton, Component, Inc.	513-866-0661
Pa	Wayne, Bartlett Assocs	215-688-7325
Tex	Houston, Jackson Arnold Co.	713-981-5789
Tex	Richardson, Jackson Arnold Co.	214-783-8348
Va	Arlington, Gans, Fryling & Pugh	703-527-3262

L-TRONICS, Dept. EM, 5546 Cathedral Oak Rd., Santa Barbara, Cal. 93111, Tel: 805-967-4859

LUFF RESEARCH, Dept. EM, Box 449, Jackson Hgts. N.Y. 11372, Tel: 212-429-5900; Empl.: 4

Sales Manager: A.M. Christopher

LUFT INSTRS., INC., Dept. EM, Hillside Rd, Lincoln Mass. 01773, Tel: 617-259-9215; Empl.: 25

LUMINATOR DIV., Gulton Industries, Dept. EM, 1200 E Dallas N. Pkwy., Plano, Tex 75074, Tel: 214-424-6511 Telex: 073-2373; Empl.: 300

Sales Manager: J. Pavlik

Local Sales Offices & Reps.

Cal	Pacific Palisades, Ledbetter Assocs.	213-454-2421
Ill	Chicago, Terhune-Van Effen	312-346-0053
Mass	Boston, Sands-Barnard Assocs.	617-631-7533
Tex	Dallas, Blair Engrg. Sls. Co.	214-352-8411
Wash	Kirkland, R.R. Chase & Assocs.	206-454-2514

Local Distributors

Ga	Atlanta, Electro Air Corp.	404-351-3545
NY	Purchase, Aerotech World Trade Corp.	914-428-3500

LUMITRON CORP, Dept. EM, 326 Broad St, Summit N.J. 07901, Tel: 201-273-8998; FSC No.: 6240

Sales Manager: Ann M. Chassie

Local Sales Offices & Reps.

Ill	Elk Grove, Midwest Meridian	312-437-6531
Iowa	Cedar Rapids, Midwest Meridian	319-365-6561
Mich	Birmingham, Ray Antos	313-644-2476
Mo	Maryland Hgts, Midwest Meridian	314-878-4441
Ohio	Dayton, Midwest Meridian	513-256-6960
Pa	Easton, Kendon Co	215-253-3100
Tex	Fort Worth, Midwest Meridian	
Tex	Hurst, Midwest Meridian	817-589-1711

LUNDY ELCTRNS. & SYS., INC., Dept. EM, Robert La., Glen Head, N.Y. 11545, Tel: 516-671-9000, TWX: 510-223-0605, 12-6929; Empl.: 567

Sales Manager: D. Casadonte

Local Sales Offices & Reps.

Cal	Los Angeles	213-487-4040
Cal	San Francisco	415-981-8217
Fla	Pompano Beach	305-943-1500
Ga	Atlanta	404-296-7777
Ill	Chicago	312-726-3103
Mass	Sturbridge	617-347-7619
NJ	Howell	201-364-5799
NC	Charlotte	704-394-1161
Tex	Houston	713-521-0818
Va	Springfield	703-321-7650

LUXO LAMP CORP., Dept. EM, Monument Park, Port Chester, N.Y. 10573, Tel: 914-937-4433, Telex: 137-336; Empl.: 150

Local Sales Offices & Reps.

Cal	Corte Madera, E. Myer	415-332-0445
Cal	Studio City, J. Barnett	213-877-5896
Conn	Norwalk, N. Tarrant	203-866-2420
Ga	Silver Creek, G. Sisson	404-235-2405
Ill	Kenilworth, J.S. Sprenger	312-256-3130
Md	Baltimore, H. Abrams	301-486-3040
Mass	Lynnfield, R.O. Hart	617-426-4200
Minn	St. Louis Park, Borrett & Lee	612-576-2785
NC	Charlotte, Coleman Co.	704-525-2046
Ohio	Cleveland, R. DeLambo	216-732-9943
Ore	Portland, T.E. Ferris	503-644-5147
Tex	Conroe, T. O'Neill	713-273-1215

LVC INDS. INC., Co-Ord Switch Bloc-Lite Divs., Dept EM, 135-25 37th Ave., Flushing, N.Y. 11354, Tel: 212-939-9777; FSC No.: 32759; Empl.: 29 p. 4102,4103

Local Sales Offices & Reps.

Ala	Huntsville, Reynolds & Associates	205-536-1941
Cal	Los Angeles, Dynasales Co.	213-268-1175
Cal	Los Angeles, Dyna Sls. Co.	213-268-1175
Fla	Satellite Beach, Reynolds & Assocs.	305-773-4700
Ga	Atlanta, Reynolds & Assocs.	404-252-5360
Ill	Lombard, Quadtron Assocs.	312-627-6800
Mass	Waban, Instrument Consits.	617-969-9881
Mich	Ferndale, Tiby Co.	313-547-3550
NJ	Cranford, Hyrel-Idalee Assocs.	201-276-5677

NY Valley Stream, Hyrel-Idalee Assocs. 516-825-8955
NC Winston Salem, Reynolds & Assocs. 919-725-6196
Ohio Cleveland, Tiby Co. 216-371-5335
Ohio Dayton, Tiby Co. 513-277-3822
Pa Philadelphia, V.S. Malta 215-836-5122

LYDALL INC, Federal Package Div., Dept. EM, 34016 Nevada Ave. N., Minneapolis, Minn. 55427; Empl.: 50

LYNN ELCTRNS. CORP., Dept. EM, 915 Pennsylvania Blvd., Feasterville, Pa. 19047, Tel: 215-677-6700, TWX: 510-667-1988; FSC No.: 19151; Empl.: 76

Sales Manager: D. Giacomarra

LYON METAL PRODUCTS, INC., Dept. EM, 47 Railroad Ave., Aurora, Ill. 60507, Tel: 312-892-8941, TWX: 910-232-3132; Empl.: 1200

Sales Manager: O. J. Henderson

Local Sales Offices & Reps.
Cal Los Angeles 213-965-0680
Cal San Francisco 415-347-7067
DC Washington 703-683-2755
Ga Atlanta 404-237-9205
Ill Chicago 312-344-5670
Mass Boston 617-848-0338
Mich Detroit 313-352-5860
Minn Minneapolis 612-927-5695
Mo Kansas City 816-363-6801
NJ Union 201-964-6030
NC Charlotte 704-527-0410
Ohio Cincinnati 513-221-4688
Ohio Cleveland 216-241-3535
Pa Pittsburgh 412-344-5577
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Sales Manager: J. F. Huth

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Cal	San Jose, E.J. O'Shea	408-253-0591
Cal	S. El Monte, J. A. McMillin	213-686-0920
Colo	Arvada, B. P. Brenner	303-466-6961
Fla	St. Petersburg, D.A. King	813-381-5344
Ill	Chicago, H.G. Pretat	312-255-6011
Mass	South Deerfield, B.E. Gray	413-665-2225
NJ	Westfield, T.G. Fitch	201-233-8811
NY	Rochester, Fowler-Beach Corp.	716-586-0468
NC	Greensboro, E.A. Siebenaler	919-288-3669
Ohio	Findlay, H.A. Beck	419-424-0592
Pa	Doylestown, F.A. Sank	215-794-7312
Pa	Greenville, John P. Stern	412-588-3197
Tex	Garland, F.H. Hall	214-272-5697
Exp:	New York, N.Y., B. Freudenberg, Inc.	212-757-9130

MAGNETOELASTIC DEVICES, Dept. EM, 74 North St Box 625, Pittsfield, MA 01201

MAGNETRAN CORP., Dept. EM, 5701 Savoy Lane, Houston, Tex. 77036, Tel: 713-785-4202; Empl.: 15

MAGNOS, INCORPORATED, Dept. EM, Old School House Rd., Harvard, Mass. 01451, Tel: 617-456-8880; Empl.: 4

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Sales Manager: K.A. Both

Local Sales Offices & Reps.

Cal	Covina, DCM Assocs.	213-331-7114
Mass	Burlington, New England Tech. Sls. Co.	617-272-0434
Okla	Tulsa, H.J. Daly Co.	918-627-4159
Tex	Dallas, Mycrosystems Mktg.	214-238-7157

MAJOR DATA CONCEPTS, INC., Dept. EM, 1796 Monrovia Ave., Costa Mesa, Cal. 92627, Tel: 714-646-2455; Empl.: 10

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Cal	Santa Ana, Shelly Assocs.	714-549-3414

MALLINCKRODT, INC., Dept. EM, P. O. Box 5840, St. Louis, Mo. 63134, Tel: 314-895-0123, TWX: 910-761-0443; Empl.: 2500

MALLORY BATTERY, P.R. Mallory, Dept. EM, S. Broadway, Tarrytown, N.Y. 10591, Tel: 914-591-7000, TWX: 131548, 710-564-0810; Empl.: 3000

Sales Manager: R. Mainzer

Local Sales Offices & Reps.

Cal	Buena Park	213-921-7939
Cal	San Jose	408-225-9312
Fla	Boca Raton	305-395-1535
Ill	Schiller Park	312-671-3422
Mass	Manchester	617-526-1407
Minn	Connon Falls	612-332-4888
NJ	Cinnaminson	609-829-7902
Ohio	Dayton	513-434-0418
Tex	Lewisville	817-430-1701

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MALLORY CAPACITOR CO., Div. P.R. Mallory, Dept. EM, 3029 E. Washington, Box 372, Indianapolis, Ind. 46201, Tel: 317-856-3731, TWX: 810-260-3940; Empl.: 2800 p. 1014-1017,1170-1185

Sales Manager: Frank Vendely; *Distributor Manager:* Frank Vendely

Local Sales Offices & Reps.

Ariz	Scottsdale	602-949-7788
Cal	La Mirada	213-921-7939
Cal	Los Angeles	714-523-7992
Cal	San Francisco	415-326-4282
Colo	Denver	303-750-4606
Fla	Orlando	305-855-6353
Ill	Chicago	312-364-5750
Mass	Boston	617-965-5011
Mich	Detroit	313-358-3540
Minn	Minneapolis	612-884-2881
Mo	St. Louis	314-291-8223
NJ	Cinnaminson	609-829-7902
NJ	Hillsdale	201-666-3600
NY	Rochester	716-647-3410
NC	Locust	704-888-2704
NC	Statesville, P.R. Mallory	704-872-0586
Ohio	Dayton	513-299-5505
Ore	Portland	503-643-1203
Pa	Carnegie	412-279-4248
Tenn	Hendersonville	615-824-2362
Tex	Dallas	214-324-2448

MANGER ELEC. CO., INC., Dept. EM, W. Henry St., Stamford, Conn. 06902, Tel: 203-348-7761; Empl.: 100

Sales Manager: J. V. Judge

MANHATTAN ELEC. CABLE CORP., Dept. EM, 1 Station Plaza, Rye, N.Y. 10580, Tel: 800-631-7742 & 800-631-3528, Telex: 12-6141; Empl.: 75

Sales Manager: R. Burke; *Distributor Manager:* B. Mello

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Ala Birmingham, John Hoeferlin Assoc. 205-328-8208
Cal Burlingame, Manhattan Elec Cable 415-697-7016
Cal Los Angeles, Manhattan Elec Cable 213-685-5500
Conn Danbury, Mahoney Assoc. 203-792-1299
Conn Danbury, M & S Sls 203-792-1299
Ga Atlanta, Manhattan Elec Cable 404-346-1100
Ill Melrose Park, Manhattan Elec. Cable 312-344-5040
Ind Indianapolis, Charles Scheffler 317-253-6337
Iowa Cedar Rapids, Chambers Elec Sls 319-377-8213-14
Kans Shawnee Missions, Midtec Assocs 913-441-6565
Mich Southfield, Knaus, Holley & Schiller & McBride 313-356-1040
Minn Minneapolis, A. J. Warner 612-729-7371
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Miss Jackson, Walter Bishop & Assocs 601-372-1904
NJ Passaic, Manhattan Elec Cable 201-779-8900
NJ Pennsauken, Elecl Sls Assoc. 609-541-7452
NY Buffalo, The Lewis Agency 716-884-6858
NY New York, Baskai Intl 212-787-3900
NY Rye, Manhattan Elec. Cable 914-967-4080
NC Charlotte, G. M. Hogshead 704-525-1267
Ohio Cleveland, Manhattan Elec Cable 216-749-7500
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Tenn Nashville, E. J. Kutz & Assocs 615-242-1601
Tex Dallas, William Reese Assocs 214-638-6575
Tex Dallas, Larry Bode 214-239-7400
Tex Dallas, George C. Anderson Co 214-HA8-3731
Tex Houston, Texas-Manhattan Elec Cable 713-868-2222
Utah Salt Lake City, Max D. White Co. 801-972-3757
Va Ashland, Hutcheson-Hudson Assocs 804-353-3879
Wash Seattle, Tal Agencies 206-624-3355
WVa Beckley, Vic Leatherberry 304-253-1196
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MANN, HENRY INC., Dept. EM, Mann Rd., Box 496, Huntingdon Valley, Pa. 19006, Tel: 215-355-7200, 800-523-1960, TWX: 510-667-1767; Empl.: 50

Sales Manager: Stephen Rademan

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Cal Costa Mesa, Manix West 714-751-4955
Ill Chicago, EMF Co 312-889-8323
Pa Huntingdon Valley, Henry Mann 215-355-7200

MARATHON BATTERY CO., c/o Marathon Manufacturing Co., Dept. EM, 1900 Marathon Bldg., 600 Jefferson Box 61589, Houston, Tex. 77002, Tel: 817-776-0650, TWX: 910-894-5203; Empl.: 360

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Cal Daly City, R. DelBucchia & Assoc. 415-756-1664
Cal Westminster, A.A. Dowers, Inc. 714-894-1123
Colo Denver, Brown Tech. 303-233-0863
Fla Winter Pk., Young & Lawrence 305-647-6929
Ill Hinsdale, D. Patton 312-325-2170
Kans Wichita, D & O Engrg. Co. 316-264-7358
Mich Farmington Hill, H. Lowell Co. 313-851-7474
Ohio Cleveland, Components, Inc. 216-243-9200
Pa Hummelstown, R.T. Lloyd 717-566-0013
Pa Phila., C.H. Newson & Assoc. 215-248-3377
Tex Dallas, Ion Assocs. 214-357-9441
Tex Houston, Ion Assocs. 713-461-5311
Wash Seattle, Barrett/Squibb 206-855-6991

MARATHON SPECIAL PRODS. CORP., Dept. EM, 13300 Van Camp Rd., Bowling Green, Ohio 43402, Tel: 419-352-8441, TWX: 810-499-2988; Empl.: 150

Sales Manager: C. Bayer (Mktg Mgr); *Distributor Manager:* J. Campisi

Local Sales Offices & Reps.

Ala Pelham, Austin Brown Assocs 205-822-3141
Ariz Scottsdale, Ross-Bloom & Assocs 602-955-5024
Cal Fremont, Hartfield, Kennan, Freytag 415-863-2200
Conn Glastonbury, Barton-Caron Assocs 203-633-9417
Fla New Port Richey, Atkins Sls Assocs 813-868-8739
Ga Atlanta, Austin Brown Assocs 404-457-6381
Ill Glen Ellyn, Andersen Electric Sls 312-469-7805
Ky Louisville, Arthur L. Pickens Co. 502-491-4215
La New Orleans, Townsley St. Paul Assocs 504-482-2089
Md Baltimore, Haacke Assocs 301-889-7875
Mass Auburndale, Barton-Caron Assocs 617-332-2021
Mich Farmington, Willis L. Trombly & Son Co. 313-553-2200
Mo St. Louis, Burgoyne Electrical Sls 314-569-3162
Mont Bigfork, B. L. Peck & Assocs. 406-837-5092
NJ Burlington, Mallon Sales Assocs 609-387-4044
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Tenn Brentwood, Austin Brown Assocs 615-373-2068
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Utah Sandy, Pete Farley Agcy 801-561-1588
Wash Vancouver, Hartfield, Kennan, Freytag 503-228-1683
Wisc Milwaukee, D. S. Berry Co. 414-224-0680

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Ala Montgomery, Southern Controls 205-277-5030
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Cal Fremont, Terminal Sls Corp. 415-656-7722
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Cal San Leandro, Gilson Supp Co. 415-352-6640
Cal Vernon, Argo Elec Sys 213-588-8233
Conn Hartford, Hartford Electric Supp 203-233-3694
Fla Orlando, Maddux Supp Co 305-857-0650
Ga Atlanta, Electrical Controlled Power 404-455-1216
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Ind Indianapolis, Control Design 317-788-4559
Kans Kansas City, Kornfeld-Thorp Elec Co 913-321-7070
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La New Orleans, Long Elec Supp Co 504-522-0562
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Mich Grand Rapids, Ackerman Elec Sys 616-459-83
Mich Livonia, Don Blackburn & Co. 313-261-91
Minn Minneapolis, Control Design 612-721-16
Mo St. Louis, Control Design 314-426-31
Neb Omaha, Lakeland Engrg & Equip 402-734-26
NJ East Rutherford, Kappe Elec Distr 201-939-57
NJ Piscataway, Fromm Elec Supp Co. 201-981-04
NY Buffalo, Wehle Electric 716-854-32
NY New York, Dever & Edds 212-989-11
NC Raleigh, Scott-Parrish Elec Supp 919-833-30
Ohio Cincinnati, Midwest Equip Co. 513-793-40
Ohio Cleveland, Commercial Elec. Co. 216-241-28
Okla Tulsa, Electrical Distr 918-836-86
Pa West Chester, West Chester Elec 215-696-75
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SC Greenville, Black Electrical Sys Co 803-233-41
Tenn Chattanooga, Richardson Elec 615-629-25
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Tex Houston, Nunn Elec Supp Co 713-676-01
Wash Seattle, H. D. Campbell, Inc. 206-634-12
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MARCONI INSTRS., Div. Marconi Elctrns. Inc., Dep EM, 100 Stonehurst Ct., Northvale, N.J. 07647, T 201-767-7250, TWX: 710-991-9752 p. 2780-27

Sales Manager: A. Ramsden

Local Sales Offices & Reps.

Ala Huntsville, Lee Assoc. Mid South Inc. 205-533-58
Ariz Phoenix, D. Menegay 602-994-95
Cal Anaheim, Moxon Elctrns. 714-635-76
Cal San Diego, Moxon Elctrns. 714-292-48
Cal Santa Clara, Moxon Elct. 408-249-24
Fla Winter Haven, Lee Florida 813-294-58
Ga Buford, Lee Assocs., Mid South 404-945-42
Ill Chicago, K.W. Meyers 312-774-64
Ind Indpls., K. Meyers 317-243-66
Md Bethesda, S & S 301-654-14
Mass Stoneham, Ken Corp. 617-438-54
Minn Mpls., K.W. Meyers 612-920-70
Mo Grandview, P. A. C. 816-763-41
NJ Saddle Brook, L & M Assocs. 201-843-87
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NY New York City, L & M Assocs. 212-243-61
NC Raleigh, Lee Assoc. of the Carolinas Inc. 919-787-58
Ohio Waldo, Ohio Instr. 614-726-28
Pa Andalusia, L & M 215-639-31
Pa King of Prussia, S&S Div. of Klinetics 215-265-34
Tex Dallas, Bradenco 214-358-32
Wash Seattle, Tasco 206-453-14

MARINE ELECTRIC RAILWAY PRODS. DIV INC., Dept. EM, 167 National Rd., Edison, N.J. 0881 Tel: 201-287-2810, TWX: 833351, 710-998-0560; FS No.: 00062; Empl.: 100 p. 3391-33

Local Sales Offices & Reps.

Ariz Glendale, Adteck Inc. 602-846-46
Cal Mission Viejo, The Powerhouse 714-830-56
Cal Sausalito, B.H. Ballard Co 415-332-01
Cal Walnut Creek, W. A. Borden Co. 415-937-51
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Fla Orlando, Datarep 305-843-52
Fla Seminole, Datarep 813-393-17
Ill Des Plaines, Marsland Assocs. 312-694-22
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Ill Chicago, Weber Assocs. 312-943-5225
Mich Detroit, W. L. Crawford 313-836-8121
Pa Wayne, Miller & Smith Co. 215-687-0750

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Local Sales Offices & Reps.
Ariz Pheonix, K. Jahn Co. 602-956-9060
Ark Hot Springs, Meredith Young Assocs. 501-262-1365
Cal L.A., National Wire & Cable 213-225-5611
Cal Los Angeles, C.D. LaMoree 213-225-5631
Cal Torrance, Insulation Supply 213-320-9400
Colo Denver, Ward Elec. Supply 303-222-3541
Fla Clearwater, WMM Assocs. 813-442-3913
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Okla Oklahoma City, J. Cole 405-235-1761
Ore Portland, C. Riggs 503-226-3286
Pa Munhall, PEI Sls. Corp. 412-462-6300
Pa Phila., C. Newson 215-248-3377
Tenn Chattanooga, Jackson 615-267-4260
Tex Frankston, Cline & Son 214-876-2223
Wash Seattle, C. Riggs 206-623-5707

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Sales Manager: S. Struble

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Cal Industry, Markem Corp. 213-965-3345
Ill Elk Grove Village, Markem Corp. 312-625-2866
Mo St. Louis, Mfg. Supplies Co. 314-231-7886
NJ Princeton, Markem Corp. 609-452-9191
NC Charlotte, Markem Corp. 704-525-1445
Ohio Cincinnati, L. G. Freeman Co. 513-721-1080
Tenn Nashville, Mfg. Supplies Co. 615-383-2343
Tex Richardson, Markem Corp. 214-231-8297

MARLIN MANUFACTURING CORP., Dept. EM, 12404 Triskett Rd., Cleveland, Ohio 44111, Tel: 216-941-6200; Empl.: 55

Sales Manager: A. Tymkewicz

Local Sales Offices & Reps.
Ariz Phoenix, Carter Assoc. 602-947-4355
Mass Norwell, Bordewieck Engrg. & Sls. 617-659-4915
Mich Detroit, Marlin 313-774-4440
NM Albuquerque, Rontek 505-299-4124
NY Cohoes, HJM Sls. Co. 518-237-3725
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Pa Pittsburgh, Marlin 412-276-7117
Tenn Chattanooga, Coleman Assocs. 615-821-0235
Tex Houston, ANHO Controls 713-931-3240

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Local Sales Offices & Reps.
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Cal El Segundo, Griot Assocs. 213-322-8383
Cal Los Altos, Griot Assocs. 415-941-2533
Cal Tustin, Griot Assocs. 714-838-2330
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Sales Manager: W.T. Browne

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Ala Huntsville, General Hydraulics Corp. 205-859-2670
Cal Tustin, Marotta Scientific Controls 714-544-2160

MARSHALL INDUSTRIES, Hunter Tools, Dept. EM, 9674 Telstar Ave., El Monte, Cal. 91731, Tel: 213-686-0141, TWX: 910-587-1565; Empl.: 75

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Ill Chicago, McBride Sls., Inc. 312-775-1080
Ind Indianapolis, Elctrn. Reps. 317-897-9326
Md Phoenix, Rebco Sls. 301-592-8907
Mass Lynn, J. Grant 617-595-6411
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Pa Easton, Kaiser & Assoc 215-258-6477
Tex Dallas, P.J. Scanlon 214-231-4661
Utah Salt Lake City, Arrowhead Sls. Corp. 801-487-3444

MARTIN RESEARCH, Dept. EM, 3336 Commercial Ave., Northbrook, Ill. 60062, Tel: 312-498-5060; Empl.: 16

Sales Manager: K. S. Berland

Local Distributors
Cal Los Angeles, Semiconductor Specialists 714-549-5215
Ill Elmhurst, Semiconductor Specialists 312-279-1000
Ind Indianapolis, Semiconductor Specialists 317-243-8271
Mich Farmington, Semiconductor Specialists 313-478-2700
Minn Minneapolis, Semiconductor Specialists 612-854-8841
Mo Kansas City, Semiconductor Specialists 816-452-3900
Mo St. Louis, Semiconductor Specialists 314-731-2400
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Mass Waltham, McBar Assocs 617-890-0233
SC Greenville, Southern Peripherals & Instrs 803-233-1469

MASTER APPLIANCE CORP., Dept. EM, 2420 18th St., Box 545, Racine, Wisc. 53403, Tel: 414-633-7791, Telex: 269-505; Empl.: 50

Sales Manager: S. Radwill; *Distributor Manager:* S. Radwill

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Ill Park Ridge, G. E. Collins Sls. 312-823-8075

MASTER SPECIALTIES CO., Dept. EM, 1640 Monrovia St., Costa Mesa, Cal. 92627, Tel: 714-642-2427, Telex: 67-8433; Empl.: 350

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Colo Englewood, Dynatech 303-773-2830
Fla Orlando, Brandel-Stephens & Co. 305-425-3202
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Kans Lenexa, Technical Reps. 914-388-0212
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Mass Andover, R. Purinton 617-475-7055
Mich Ann Arbor, O-M Sls 313-973-9450
Minn Minneapolis, Scott Elctrns. Sls. 612-929-2985
NY Jericho, Electro-Rep 516-938-0540
NY Pittsford, Noeth-Honsinger 716-461-4750
Pa Erie, Ecco Elctrns. 814-459-8822
Pa Huntingdon Valley, Inacker Sls. 215-947-5660
Tex Dallas, Kruvand Assoc. 214-691-4592
Utah Salt Lake City, R² 801-972-5646
Wash Seattle, R & R Assoc. 206-762-7664

Local Distributors
Ala Huntsville, Hamilton Avnet Elctrns 205-533-1176
Ariz Phoenix, Hamilton Avnet Elctrns 602-275-7851
Cal Costa Mesa, Hamilton Avnet Elctrns 714-754-6030
Cal Culver City, Hamilton Avnet Elctrns 213-558-2666
Cal Mountain View, Hamilton Avnet Elctrns 415-961-7000
Cal San Carlos, Sterling Elctrns. 415-592-2353
Cal San Diego, Hamilton Avnet Elctrns 714-279-2421
Cal San Diego, Sterling Elctrns 714-565-2441
Cal Sun Valley, Sterling Elctrns 213-767-5030
Colo Denver, Hamilton Avnet Elctrns 303-534-1212
Conn Georgetown, Hamilton Avnet Elctrns 203-762-0361
Fla Ft. Lauderdale, Hamilton Avnet Elctrns 305-971-2900
Ga Norcross, Hamilton Avnet Elctrns 404-448-0800
Ill Mount Prospect, Magnuson Elctrns 312-956-0700
Ill Schiller Park, Hamilton Avnet Elctrn 312-678-6310
Kans Lenexa, Hamilton Avnet Elctrns 913-888-8900
La New Orleans, Radio Parts 504-581-5959
Md Hanover, Hamilton Avnet Elctrns 301-796-5000

Mass Watertown, DRW Elctrns 617-923-1900
Mass Woburn, Hamilton Avnet Elctrns 717-933-8000
Mich Livonia, Hamilton Avnet Elctrns.. 313-522-4700
Minn Edina, Hamilton Avnet Elctrns.... 612-941-3801
Mo Hazelwood, Hamilton Avnet Electrns 314-731-1144
NJ Cedar Grove, Hamilton Avnet Elctrns 201-239-0800
NJ Mount Lauren, Hamilton Avnet Elctrns 609-234-2133
NM Albuquerque, Hamilton Avnet Elctrns 505-765-1500
NY East Syracuse, Hamilton Avnet Elctrns 315-437-2642
NY Rochester, Hamilton Avnet Elctrns 716-442-7820
NY Rochester, Ossmann Comp Sls 716-442-3290
NY Westbury, Hamilton Avnet Elctrns 516-333-5800
NY Woodbury, Harvey Radio 516-921-8700
NC Raleigh, Hamilton Avnet Elctrns 919-829-8030
Ohio Cleveland, Hamilton Avnet Elctrns 216-461-1400
Ohio Dayton, Hamilton Avnet Elctrns.. 513-433-0610
Okla Tulsa, Norvell Elctrns 918-663-1247
Tex Dallas, Norvell Elctrns 214-233-0020
Tex Dallas, Hamilton Avnet Elctrns .. 214-661-8204
Tex Houston, Norvell Elctrns..... 713-777-1666
Tex Houston, Hamilton Avnet Elctrns 713-780-1771
Utah Salt Lake City, Hamilton Avnet Elctrns 801-262-8451
Wash Bellevue, Hamilton Avnet Elctrns 206-746-8750
Wisc New Berlin, Hamilton Avnet Elctrns 414-784-4510
For: Can., Mississauga, Ont, Hamilton Avnet Elctrns 416-677-7432
For: Can., Ottawa, Ont, Hamilton Avnet Elctrns 613-226-1700
For: Can., Pt. Claire, Que, Coba..... 514-694-1335
For: Can., St. Laurent, Montreal Que, Hamilton Avnet Elctrns 514-331-6443

MASTERITE CORPORATION, Dept. EM, 2841 Lomita Blvd., Torrance, Cal. 90505, Tel: 213-775-3471, TWX: 910-347-6237; FSC No.: 05041; Empl.: 680

Sales Manager: C.J. Huebert; *Distributor Manager:* G. Peterson

Local Sales Offices & Reps.
Ariz Phoenix, S.O. Rush 602-959-3594
Cal Mountain View, West/Mark Assoc. 415-969-1700
Colo Denver, B5 Inc. 303-426-0222
Fla St. Petersburg, Russell Assoc. .. 813-526-2939
Ga Atlanta, Russell Assoc..... 404-255-8422
Ill Barrington, Lancastle Ltd. 312-381-6780
Kans Overland Park, Penzner-Mankus Assoc. 913-381-0004
Mass Waltham, UNESCO..... 617-890-6680
Mich Grand Rapids, R.P. Urban Assoc.616-245-0511
Minn Prior Lake, D.A. Case Assoc. 612-926-0533
Mo Maryland Hghts, Penzner-Mankus Assoc. 314-569-1220
NJ Livingston, Varrelman-Gorman Co. 201-992-2505
NY Camillus, Varrelman-Gorman Co. 315-672-3988
NY Centerport, Varrelman-Gorman Co. 201-992-2505
Ohio Tipp City, Tech. Comps..... 513-667-1216
Pa Newtown Square, Hagy Assoc... 215-459-0504
Tex Dallas, P.J. Scanlon Co..... 214-231-4661

MATERIALS FOR ELCTRNS., Dept. EM, 149-32 132nd St., Jamaica, N.Y. 11430, Tel: 212-322-9400, Telex: 23-2695

MATERIALS RESCH. CORP., Dept. EM, Route 303, Orangeburg, N.Y. 10962, Tel: 914-359-4200, TWX: 710-576-2656; Empl.: 300

Sales Manager: R.A. Styles

Local Sales Offices & Reps.
Cal Mountain View 415-964-7272
Mo Bridgeton..... 314-739-3326
NY West Nyack 914-358-2533
Tex Dallas 214-235-9008

MATHESON GAS PRODUCTS, Dept. EM, Box 85, East Rutherford, N.J. 07073, Tel: 201-933-2400, TWX: 710-989-0173; Empl.: 500

Sales Manager: D. Weadock

Local Sales Offices & Reps.
Cal Cucamonga 714-987-4611
Cal Newark 415-793-2559
Ga Morrow 404-478-7274
Ill Joliet 815-727-4848
Mass Gloucester 617-283-7700
NJ East Rutherford 201-933-2400
Tex La Porte 713-471-2544

MATRIX CORP., Dept. EM, 2260 Distributors Dr., Indianapolis, Ind. 46241, Tel: 317-248-2036; Empl.: 10 ..... p. 1654

MATRIX ENGINEERING CORP., Dept. EM, 17000 S. Western Ave. 19, Gardena, Cal. 90247, Tel: 213-770-0521; Empl.: 7

Local Sales Offices & Reps.
Ariz Phoenix, Davis Co. 602-955-2266
Ill Chicago, EMF Co. Inc. 312-889-8323
Mass Burlington, Contact East Inc. 617-272-5051
Ore Portland, Murphy Ind. Supply Co. 503-226-6081
Pa Feasterville, H. Mann Inc..... 215-355-7200

MATRIX SYSTEMS CORP., Dept. EM, 9411 Lurline Ave., Chatsworth, Cal. 91311, Tel: 213-882-2008, TWX: 910-494-4975; Empl.: 21 ..... p. 2874,3582

Local Sales Offices & Reps.
Ala Huntsville, Reynolds Assoc..... 205-536-1941
Cal Mountain View, IFM, Inc..... 415-961-2828
Cal N. Hollywood, Crown Elctrns. 213-877-3550
Conn Hamden, Instrument Consultants, Inc. 203-288-5246
Fla Satellite Beach, Reynolds & Assocs. 305-773-4700
Haw Honolulu, Aloha Assocs..... 808-941-1574
Ill Chicago, Pivan Engrg., Inc. 312-539-4838
Ind Indianapolis, Pivan Engrg., Inc. .. 317-253-1681
Kans Shawnee Mission, Pivan Engrg... 913-722-1030
Mass Waban, Instrument Consultants, Inc. 617-969-9881
Mich Detroit, Comtel-Instr. Assocs. 313-255-1970
Minn Minneapolis, Pivan Engrg., Inc. .. 612-537-4526
Mo St. Louis, Pivan Engrg., Inc. 314-542-3636
NY Cortland, RJC Assocs. 716-385-2770
NY Scarsdale, Bassin Tech. Sls. Co. 914-723-3334
NC Winston Salem, Reynolds Assoc. 919-725-6196
Ohio Cleveland, Comtel-Instr. Assocs. 216-442-8080
Ohio Dayton, Comtel-Instr. Assocs. 513-298-7573
Okla Tulsa, Carter Assocs. 918-749-3311
Pa Pittsburgh, Comtel-Instr. Assocs. 412-922-5720
Va Fairfax, Schibley Assocs. 703-591-3008
Wisc Brookfield, Pivan Engrg., Inc. 414-786-1940

MATSUO ELCTRNS, Dept. EM, 12831 Western Ave, Ste A, Garden Grove, Cal 92641, Tel: 714-898-0707; Empl.: 723

Sales Manager: J. V. Kennedy; *Distributor Manager:* J. V. Kennedy

Local Sales Offices & Reps.
Ala Huntsville, 20th Century Mktg 205-772-9237
Ariz Glendale, NAKOMA 602-931-9103
Cal Irvine, Celtec Co. 714-557-5021
Cal Redwood City, Logan Sls. 415-369-6726
Cal San Diego, Celtec Co. 714-279-7961
Cal Sherman Oaks, Celtec Co. 213-990-3440
Colo Boulder, R G Entprs..... 303-447-9211
Fla Fort Lauderdale, Reptronics, Inc. 305-763-2856
Fla Tampa, Reptronics, Inc. 813-879-8730
Ill Chicago, Berndt Assocs. 312-283-0713
Ind Greenwood, Valentine & Assocs. 317-888-2260
Ind So. Bend, Valentine & Assocs.... 219-282-1251
Kans Prairie Village, Engrg. Svcs. Co. 913-649-4000
Mass Needham, Hatch Assocs..... 617-444-3310
Mich Southfield, Valentine & Assocs... 313-559-3680
Minn Minneapolis, Berndt Assocs..... 612-835-4818
Mo St. Louis, Engrg. Svcs. Co. 314-997-1515
NJ Haddonfield, Sunday O'Brien..... 609-429-4013
NJ Kenilworth, Ventronics, Inc. 201-272-9262
NM Albuquerque, Southwest Rep 505-242-4673
NY Buffalo, J. McDonough Assoc.... 716-839-2044
Ohio Cleveland, Imtech, Inc. 216-826-3400
Ohio Dayton, Imaginative Techn..... 513-278-6507
Ore Beaverton, L.D. Elctrns..... 503-649-6177
Tex Dallas, Young Sls Co..... 214-341-2900
Tex El Paso, Young Sls Co. 915-584-5842
Wash Woodinville, L. D. Elctrns 206-485-8180
Wisc Milwaukee, Berndt Assocs 414-545-8400

Local Distributors
Ariz Phoenix, Mirco 602-944-2281
Cal Brisbane, USI Intl..... 415-468-4900
Cal Canoga Park, Petell Elctrns..... 213-999-3810
Cal Lakeside, Mouser Elctrns. 714-449-2220
Cal Los Angeles, Western Electromotive/Shephard 213-820-3777
Cal Los Angeles, Energy Elctrns..... 213-670-7880
Cal Palo Alto, Eric Elctrns..... 415-969-4500
Mass West Newton, Mayer, A. W. Co 617-965-1111
NJ Kenilworth, Ventronics..... 201-272-9262
Ore Beaverton, Parrott Elctrns 503-641-3355
Wash Seattle, Shannon, Ltd. 206-763-0545

MATSUO ELEC. CO., Dept. EM, 3-5, 3-chome Sennari-chu, Toyonaka-shi, Osaka, Japan, Tel 06-332-0871, TWX: 523-4164 OSA; Empl.: 700

Local Sales Offices & Reps.
Cal El Segundo, Matsuo Elctrns. of America, Inc. 213-679-0379
Cal Garden Grove, Matsuo Elctrn of Amer

MATTHEWS INTL CORP., Marking Systems Div. Dept. EM, 6515 Penn. Ave., Pittsburgh, Pa. 15206, Tel 412-362-6500, Telex: 86-6215; Empl.: 250

Local Sales Offices & Reps.
Cal La Palma, D. Connor 213-921-0994
Cal San Francisco, T.E. Graves..... 415-474-8300
Ga Atlanta, R.F. Abbs 404-355-6677
Ill Chicago, S.C. Gurtner..... 312-463-0333
NJ Clifton, S. Zeeble..... 201-471-2945
NY Buffalo, D. Robertson 716-856-7812
Ohio Cincinnati, H.C. Bathe..... 513-631-0133
Ohio Cleveland, J. O'Toole 216-696-6676
Pa Philadelphia, S. Zeeble..... 215-482-8792
Pa Pittsburgh, T.J. Keevers 412-362-6500
Tenn Memphis, J.J. Ford 901-525-0316
Tex Dallas, G. Baine..... 214-638-1775
Exp: Pa., Pittsburgh, C.A. Prezikowski 412-362-6500

MAUREY INSTRUMENT CORP., Dept. EM, 4555 W 60th St., Chicago, Ill. 60629, Tel: 312-581-4555; FSC No.: 03942; Empl.: 50

Sales Manager: E. Maurey

Local Sales Offices & Reps.
Ariz Tempe, Whitronics, Inc..... 602-966-4417
Cal Van Nuys, Myco Sls..... 213-988-2288
Fla Coral Springs, Shaw Engrg. & Sls. 305-752-7596
NM Albuquerque, A.L.S. Elctrns. 505-294-8555
NY Jamestown, W.R. Arnold, Inc. 716-664-5402

MAURY MICROWAVE CORP., Dept. EM, 8610 Helms Ave., Cucamonga, Calif. 91730, Tel: 714-987-4715; FSC No.: 13047; Empl.: 30

Sales Manager: T.C. Koster

Local Sales Offices & Reps.
Ala Moulton, Dallas Yeager Co..... 205-974-6438
Cal Cucamonga, Maury Microwave.. 714-987-4715
Cal Cupertino, Dura Elctrn. Sls..... 408-255-2084
Cal Goleta, Thorson Co. 805-964-8751
Cal San Diego, Thorson Co. 714-292-8525
Colo Parker, TMA, Inc..... 303-841-3435
Fla Clearwater, G.F. Bohman Assoc. 813-442-5606
Fla Miami, G.F. Bohman Assoc..... 305-564-3081
Fla Orlando, G.F. Bohman Assoc..... 305-295-5760
Kans Overland Park, J.F. Guernsey Co. 913-381-2225
Md Greenbelt, Riffe Assoc., Inc. 301-474-8600
Mo Maryland Heights, J.F. Guernsey Co. 314-878-5404
NM Albuquerque, TMA, Inc. 505-293-2776
NY Commack, Richman Sls. Co..... 516-543-5532
NY Utica, Richman Sls 315-733-2460
Ohio Dayton, F. L. Ohmer & Assoc. .. 513-434-1454
Tex Dallas, Airep Elctrns..... 214-827-2120
Tex Houston, Airep Electronics Inc. .. 713-944-2055
Wash Bellevue, J. Findlay Co. 206-746-5400

MAXI-SWITCH CO., Dept. EM, 9697 East River Road, Minneapolis, Minn. 55433, Tel: 612-755-7660, TWX: 910-576-2690; Empl.: 100 ..... p. 4104,4105

Sales Manager: D.E. Powellek

Local Sales Offices & Reps.
Ala Huntsville, 20th Century Mktg 205-772-9237
Ariz Scottsdale, Williams Assoc..... 602-947-4297
Ariz Scottsdale, Williams Assocs..... 602-947-4297
Cal Anaheim, R.C. Kruse Assoc..... 714-533-2666
Cal San Jose, The Parsons Co..... 408-247-7327
Colo Denver, Williams Assocs..... 303-373-4730
Colo Denver, Williams Assoc..... 303-373-4730
Fla Pompano, V.G. Sales Co. 305-971-0900
Ill Chicago, Control Sls..... 312-595-2110
Kans Olathe, Rush & West Assoc..... 913-764-2700
Md Lutherville, C & D Sls. 301-296-4306
Mass Chelmsford, M. Flynn 617-256-6229
Mich Detroit, R.P. Urban Assoc. 313-535-2355
Mich Grand Rapids, R.P. Urban & Assocs. 616-245-0511
Minn Minneapolis, Quantum Sls..... 612-831-8583
Miss Michigan City, Jack Fisher Sls .. 601-224-6470
NJ East Orange, Murray Gallagher 201-678-5071
NM Albuqurque, Williams Assocs. 505-255-1638
NY Penfield, John Blair 716-586-1419
NC Cary, Montgomery Mktg. 919-467-6319
Ohio Brecksville, Allen Nace Co..... 216-526-4323
Ohio Englewood, Allen Nace Co 513-836-0931
Ore Portland, Fleehart & Sullivan..... 503-297-1033

Pa Huntingdon Valley, Knowles Assoc 215-947-5641
Tex Austin, West & Assoc 512-451-2456
Tex Dallas, West & Assoc 214-661-9400
Wash Seattle, Fleehart & Sullivan 206-522-1533

MBC ENGINEERING INC., Dept. EM, 2501 Walsh Ave., Santa Clara, Cal. 95050, Tel: 408-244-9242; Empl.: 80

MCCOY ELECTRONICS, Sub Oak Inds. Inc., Dept. EM, Chestnut & Watts, Mt Holly Spr., Pa. 17065, Tel: 717-486-3411, TWX: 510-650-3548; Empl.: 600 p. 2338-2345

Local Sales Offices & Reps.
Ariz Tempe, Argus Sls. 602-967-8709
Cal Los Altos, OAK Inds. Inc. 415-941-1237
Cal Santa Ana, Oak Inds. 213-924-6288
Colo Denver, I.W. Strong & Assocs. 303-292-6900
Fla Altamonte Springs, Oak Inds., Inc. 305-831-5411
Fla Boca Raton, Oak Inds. Inc. 305-735-4495
Ill Crystal Lake, Oak Mid-West 815-459-5000
Iowa Cedar Rapids, Lorenz Sls. 319-393-6912
Md Laurel, Oak Mid-Atlantic 301-776-5514
Mass Norwood, JMG, Inc. 617-762-5333
Minn Minneapolis, Wagner Conslts. Corp. 612-721-2411
Mo Kansas City, Automatic Gen. Elctrn. Sls. 816-333-8206
NJ Clifton, Albert Clarfield 212-757-6454
NJ Haddonfield, Gray Assocs. 609-429-5300
NY Pompey, S.F. Foster Co. 315-677-3333
NY Webster, S.F. Foster Co. 716-265-2072
NC Raleigh, OAK Inds. Inc. 919-876-7591
Ohio Cincinnati, OAK Inds. Inc. 513-851-4411
Ore Portland, Oak Inds. 503-292-0878
Tex Richardson, R.F. Kimball Co. 214-231-3447
Wash Bellevue, Oak Inds 206-453-1810
Exp: N.J., Teaneck, Sylvan Ginsbury Ltd. 201-837-1100

MCFADDEN ELCTRNS. CO., Dept. EM, 8953 S. Atlantic Blvd., South Gate, Cal. 90280, Tel: 213-564-5958; FSC No.: 25750; Empl.: 15

Local Sales Offices & Reps.
Ala Huntsville, Space Engrg. Sls. 205-837-6060
Ind Indianapolis, Tri-State Tech. Sls. 317-924-3568
Mass Salem, Forbes Engrg. 617-744-1693

MCG ELECTRONICS INC., Dept. EM, 160 Brook Ave., Deer Park, N.Y. 11729, Tel: 516-586-5125; FSC No.: 29779; Empl.: 25 p. 4106

Sales Manager: M. J. Coyle

Local Sales Offices & Reps.
Ala Huntsville, Beacon 205-881-5031
Cal Los Angeles, Dyna Sls. 213-268-1175
Fla Ft. Lauderdale, Beacon 305-491-4211
Fla Maitland, Beacon 305-647-3498
Ga Atlanta, Beacon 404-351-3654
Md Randallstown, Beacon 301-922-1248
NC Greensboro, Beacon 919-674-9432
SC Spartanburg, Beacon 803-582-4613
Tenn Oak Ridge, Beacon 615-482-2409
Tex El Paso, Herman Markowitz 817-485-2750
Va Falls Church, D. Snow-Beacon 703-534-1673
Exp: Mass., Medway, Export Manager, Surel International 617-533-2041

MCGILL MFG. CO. INC., Electrical Div., Dept. EM, 909 Lafayette St., Valparaiso, Ind. 46383, Tel: 219-464-4911, TWX: 910-690-4892; Empl.: 295 p. 4107

Local Sales Offices & Reps.
Ark Hot Springs, M. Young Assocs. 501-262-1365
Cal Los Angeles, Allied Factory Reps. 213-666-1564
Cal Santa Clara, Nova-Tronix 408-243-9530
Ill Shaumberg, Thomas Fray 312-299-2354
Ind South Bend, United Export Corp. 219-232-8286
Ind Valparaiso, D. Rickards 317-253-8689
Mass Norwood, R. Perron & Co. 617-762-8114
Mich Stevensville, Ken-Mor Assocs. 616-429-6001
Minn Minneapolis, Elec. Comp. Sls. 612-933-2594
Mo St. Louis, Larco Sls., Inc. 314-863-1242
NY Baldwin, C. Glianna 516-378-2700
NY North Syracuse, Advanced Comp. Corp. 315-699-2671
Ohio Cleveland, Allied Entprs. 216-826-3350
SC Columbia, H. Heaton 803-779-4016
Tex Arlington, Wheelex, Inc. 817-461-8039
Utah Salt Lake City, Sage Sls. 801-290-1234

MC GRAW-EDISON, Edison Elctrns. Div., Daven Comps., Dept. EM, Grenier Field, Manchester, N.H. 03103, Tel: 603-669-0940, TWX: 710-220-1747; FSC No.: 14140; Empl.: 500 p. 4108

Sales Manager: D. Richards

Local Sales Offices & Reps.
Ariz Phoenix, Vertron 602-943-2932
Cal Downey, Groh Assocs 213-923-0963
Cal Santa Clara, Fischer Assocs 408-733-7350
Colo Denver, McLoud & Raymond 303-756-1589
Conn New Canaan, S. Pierce 203-355-9848
Fla St. Petersburg, Kirkwood & Assoc. 813-894-8240
Ill Northfield, Imex, Ltd. 312-446-8934
Ind Ft. Wayne, J&B Engrg Sls 219-483-2813
Kans Shawnee Mission, Technical Sls. Assoc. 913-888-3330
Md Townson, Holden Engrg. Sls. 301-823-3763
Mass Norwood, S. Pierce 617-762-3164
Minn Minneapolis, R. J. Inc. 612-922-1425
Mo Ferguson, Technical Sls. Assoc. 314-725-5361
NY Clay, Tech-Mark 315-669-2261
NY Endicott, Tech-Mark 607-748-7473
NY Jericho, HRC-Comp-Tech 516-822-5550
NY Liverpool, Tech-Mark 315-652-6229
NC Burlington, P.J. Nahser 919-226-8053
Ohio Brecksville, A. Nace Co. 216-526-4323
Ohio Englewood, A. Nace Co. 513-836-0931
Pa Philadelphia, Victor S. Malta Co. 215-836-5122
Pa Pittsburgh, A. Nace Co. 412-922-7225
Tex Houston, Oeler & Menelaides 713-772-0730
Tex Richardson, Oeler & Menelaides 214-234-6334
Wash Seattle, Carlyle Tech. Sls. 206-767-4511
Exp: N.Y., New York, Lothar Sanford Corp. 212-757-3881

MCKAY DYMEK CO., Dept. EM, 111 S. College Ave Box 5000, Claremont, Cal. 91711, Tel: 714-621-6711, TWX: 910-581-4990; Empl.: 31

MCKINSTRY METAL WORKS, INC., Dept. EM, 285 McKinstry Ave., Chicopee, Mass. 01013; Empl.: 80

Local Sales Offices & Reps.
Ala Birmingham, E.J. Ruth Assoc. 205-979-0511
Conn Wallingford, Ray Nelon Co. 203-265-2339
Ga Tucker, Electrical Concepts 404-491-3154
Ill Arlington Hgts, Langdon Engrg Co. 312-364-0830
Ind Zionsville, Control Sales 317-873-5158
Mass Boston, A.A. MacPherson Co 617-296-5510
NJ So. Plainfield, Nash & Cornell 201-756-2400
NY Rochester, Mills Talbot & Co. 716-244-1311
NC Greensboro, Wilson P. Byrd Co. 919-621-3146
Ohio Cleveland, Diversified Electrical Products 216-289-8188
Pa Penndel, Richard H. May Assoc. 215-757-1581

MCL, INC., Dept. EM, 10 North Beach Ave., LaGrange, Ill. 60525, Tel: 312-354-4350, TWX: 910-683-1899; FSC No.: 16469; Empl.: 49 p. 2863

Sales Manager: George Marshall

Local Sales Offices & Reps.
Ariz Tempe, J. Smith & Assocs. 602-968-7025
Cal Cupertino, Allis Assocs. 408-252-2883
Cal Los Angeles, Midwin & Olifson 213-475-8568
Colo Lakewood, J. Smith & Assocs. 303-442-7100
Fla Orlando, Gra-Mar, Inc. 305-894-3351
Haw Honolulu, Aloha Assocs. 808-941-1574
Ill La Grange, MCL, Inc. 312-354-4350
Ill Mt. Prospect, Cain & Co. 312-253-3578
Md Baltimore, Stemler Assocs. 301-944-8262
Mass Reading, Geder Assocs. 617-944-3105
NJ Cherry Hill, Stemler Assocs. 609-966-4070
NJ West Orange, E-F Technical Sls 201-731-7203
NM Albuquerque, J. Smith & Assocs. 505-265-3406
NY Huntington Station, E-F Technical Sls 516-549-1818
NY North Syracuse, Naco Elctrns 315-699-2651
Ohio Lancaster, Cain & Co 614-654-4800
Va Alexandria, Stemler Assocs. 703-548-7818
Exp: Canada, Mississauga, Ont., David R. Beattie, Ltd. 416-822-4414

MCLEAN ENGRG. LABS., Dept. EM, 70 Washington Rd., Princeton Jctn., N.J. 08550, Tel: 609-799-0100, TWX: 510-685-2543; Empl.: 100 p. 2588-2591

Sales Manager: P. M. Stewart

Local Sales Offices & Reps.
Ala Huntsville, W. Brown 205-883-8660
Ariz Tucson, PLS Assocs. 602-994-5461
Cal Cupertino, T. Snitzer 408-257-8333
Cal Del Mar, T. Snitzer 714-226-0305
Cal L.A., T. Snitzer 213-836-6170
Colo Denver, PLS Assoc. 303-773-1218
Conn Bridgeport, Technical Instrs. 203-FO 8-4582
Fla Ft. Lauderdale, W. Brown 305-776-4800
Fla Indialantic Beach, W. A. Brown Instrs. 305-723-0766
Fla Orlando, W. Brown 305-425-5505
Fla Valparaiso, W. A. Brown Instrs. 904-678-7932
Ga Atlanta, W. Brown 404-455-1035
Ill Elmhurst, Scott Assocs. 312-279-5681
La Mandeville, W.A. Brown Inst. Co. 504-626-9701
Mass Wilmington, Tech. Instrs. 617-944-3930
Mich St. Clair Shores, J. Thorpe 313-779-6363
Minn Maple Grove, McLean Engrg-Midwest 612-425-4747
Minn Minneapolis, Scott Elctrn. Sls. 612-929-2985
Mo Kansas City, Harris-Hanson 816-HI4-9494
Mo St. Louis, Harris-Hanson 314-432-3611
NJ Ft. Lee, K.E. Hughes Co. 201-944-1600
NM Albuquerque, PLS Assocs. 505-255-2330
NY Albany, J. Reagan 518-489-4777
NY Endwell, Reagan/Compar Albany 607-723-8743
NY Fairport, Reagan/Compar Albany 716-473-2115
NY New Hartford, J. Reagan 315-732-3775
NC Durham, W. A. Brown Instrs. 919-682-2383
Ohio Cleveland, Marlow Assocs. 216-991-6500
Ohio Dayton, Marlow Assocs. 513-866-4991
Pa Huntingdon Valley, Inacker Sls. 215-947-5660
Pa Pittsburgh, Marlow Assocs. 412-831-6113
SC Columbia, W. A. Brown Instrs. 803-798-3297
Tenn Oak Ridge, W. A. Brown Instrs. 615-482-5761
Tex Dallas, J.A. Green Co. 214-631-7450
Tex Houston, J.A. Green Co. 713-526-2959
Utah Sandy, PLS Assocs. 801-942-2081
Va Alexandria, Dyna Rep. Co. 703-354-1222

MCLEAN ENGRG MIDWEST, Dept. EM, 9560 85th Ave N., Maple Grove, Minn. 55369, Tel: 612-425-4747 p. 2588-2591

Sales Manager: J. Buyse

Refer to McLean Engrg Labs, Princeton Junction, N. J. for sales office information.

MDB SYSTEMS INC., Dept. EM, 1995 N. Batavia St., Orange, Cal. 92665, Tel: 714-998-6900, TWX: 910-593-1339; Empl.: 50

MEASUREMENT SYS., INC., Dept. EM, 121 Water St., Norwalk, Conn. 06854, Tel: 203-838-5561, TWX: 710-468-2185; Empl.: 35 p. 2273

Sales Manager: F.J. Stevens

Local Sales Offices & Reps.
Iowa Cedar Rapids, S & O Sls. Inc. 319-393-1845
Mass Hudson, Data Rep. 617-562-6638
Pa Melrose Park, R. Meyers Assocs. 215-224-1663

MECHANICAL ENGRAVING CO., INC., Dept. EM, 4500 Bullard Ave, Bronx, New York 10470, Tel: 212-324-4455; FSC No.: 99040; Empl.: 35

MECHANICAL ENTERPRISES, Dept. EM, 8000 Forbes Pl., Springfield, VA 22151, Tel: 703-321-8282, TWX: 710-832-0942; Empl.: 20 p. 4160,4161

Sales Manager: R.H. Twyford

Local Sales Offices & Reps.
Ala Huntsville, Beacon Reps. 205-881-5031
Ariz Phoenix, Toward Engrg Assoc. 602-955-3193
Cal Buena Park, Sls. Engrs. Ltd. 213-921-0681
Cal San Diego, Sls. Engrs. Ltd. 714-277-5723
Cal San Jose, John E. Striker Co. 408-252-4220
Colo Arvada, Challenge Sls 303-420-4316
Conn Harwinton, Barc Elctrn. Sls. 203-482-8633
Fla Ft. Lauderdale, Beacon Reps. 305-491-4211
Fla Ft. Walton Beach, Beacon 904-244-1550
Fla Maitland, Beacon Reps. 305-647-3498
Ga Atlanta, Beacon Reps 404-351-3654
Ill Des Plaines, Coombs Assocs. 312-298-4830
Md Glen Arm, Hodgins Assocs. 301-592-7047
Mich Jackson, Norwood Scroggs 517-750-1170
Minn Minneapolis, C.E. Bohlig Co. 612-922-7011
Mo Maryland Hgts, Kebco 314-576-4111
NY Mt. Vernon, Sonkin Assocs. 914-668-9809
NY Rochester, L. Hart 716-244-3253
NC Greensboro, Beacon 919-244-1550
Ohio Cleveland, Depco 216-289-8188
Ohio Dayton, Depco 513-433-3230
Pa Wayne, Hoogins Assoc. 215-688-9056
Tenn Oak Ridge, Beacon Reps. 615-482-2409
Tex Dallas, Stasco 214-239-4517

Utah Salt Lake City, Challenge Sls 801-266-1500
Wash Bellevue, Mann Northwest 206-747-9405
Wisc Milwaukee, Coombs Assocs 414-671-1945

MECHANICAL PRODUCTS, INC., A Norlin Tech Co, Dept. EM, 1824 River St. Box 729, Jackson, Mich. 49204, Tel: 517-782-0391, TWX: 810-253-0827; Empl.: 250

Sales Manager: R. Vangermeersch

Local Sales Offices & Reps.
Ariz Scottsdale, Mercury Engrg. 602-275-8579
Cal Panorama City, Mechanical Prods. 213-781-8966
Cal Pasadena, T. Yeakle 213-684-2275
Fla Pompano Beach, Hutto Hawkins Peregoy, Inc. 305-943-9593
Ill Barrington, Perhats Assocs..... 312-381-6360
Md Leonardtown, Minitec 301-475-8961
Mich Southfield, Eynon-Weyand Assocs. 313-354-3430
Minn Minneapolis, J. J. Exon Co. 612-571-5340
Ohio Dayton, Rockford Controls Ohio 513-898-5452
Ohio Euclid, Rockford Controls Ohio .. 216-731-5250
Pa Jenkintown, Arnold Assocs. 215-742-0600
Tex Dallas, E. B. Robertson, Inc. 214-942-2711

MEDIA RECOVERY INC., Dept. EM, Box 867, Graham, Tex. 76046, Tel: 817-549-5462, Telex: 73-2561; Empl.: 30

Sales Manager: R.C. Foley

Local Sales Offices & Reps.
Cal Santa Monica, Media Recovery of Cal 213-782-8978
Conn Tolland, Media Recovery of N.J. 203-871-1611
Tex Dallas, Media Recovery of Tex .. 214-350-5725
Tex Houston, Media Recovery of Tex 713-681-5464

MEGATEK CORP., Dept. EM, 3931 Sorrento Valley Blvd, San Diego, CA 92121, Tel: 714-455-5590, TWX: 910-335-2056; Empl.: 60

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Ala Huntsville, J. L. Highsmith & Co. 205-881-3294
Ariz Phoenix, Datatrend 602-272-7139
Cal Inglewood, Basic Systems 213-673-4300
Cal San Diego, Basic Systems..... 714-279-9641
Cal Santa Clara, Telemark 408-248-9616
Colo Littleton, Davis Assoc 303-795-1400
Fla Orlando, J. L. Highsmith & Co.. 305-293-5202
Ga Acworth, James L. Highsmith & Co 926-926-7298
Haw Honolulu, Aloha Assocs..... 808-941-1574
Ill Elk Grove Village, Systems Mtkg, Ltd 312-593-6200
Md Beltsville, RDA, Inc 301-937-2215
Mass Lowell, S & S Elctrn 617-459-2578
Mass Lowell, S & S Elctrns..... 617-459-2578
Mich Southfield, Datatron..... 313-354-6421
Minn Chanhassen, Professional Mktg. Svcs. 612-474-5939
Mo Grandview, Digital Sys. Sls..... 816-765-3337
NJ Ridgewood, Hanson Assocs 201-652-7055
NY Rochester, R.G. Engrg 716-385-3021
NC Charlotte, J. L. Highsmith & Co. 704-333-7743
Ohio Wickliffe, Data-tron 216-585-8421
Tex Dallas, Remtek, Inc. 214-387-2855
Wash Bellevue, L.B. Robbins Co..... 206-455-1246

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MEGAVOLT, CORP., Dept: EM, 110 Hobart St, Hackensack, N.J. 07601, Tel: 201-487-0100; Empl.: 15 ..... p. 3286

Sales Manager: H. Tekel

MEGURO ELECTRONICS CORP, Dept. EM, No. 5-1 2-Chome Chuo Meguro-ku, Tokyo, Japan, Tel: Tokyo 715-1211, TWX: 2468208 MEGURO J; Empl.: 250

Sales Manager: T. Date

MEI ENGINEERING, Dept. EM, 662 N. Pottstown Pk., Exton, Pa. 19341, Tel: 215-363-2075

Sales Manager: W. Armstrong

MEISEI CORP., Dept. EM, 2226 Stoner Ave., Los Angeles, Cal. 90064, Tel: 213-478-2123; Empl.: 6

Sales Manager: L. Hanner

MEKO INSTRUMENT CO., Dept. EM, 1311 Air Way, Glendale, Cal. 91201, Tel: 213-240-4664; Empl.: 30

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Ala Huntsville, Murcota Corp..... 205-537-8476
Ariz Phoenix, Elctrn Specialists..... 602-996-3889
Cal Los Angeles, M. A. Stolaroff Co 213-295-7781
Cal Palo Alto, Engineering Assocs. .. 415-494-7842
Cal Redwood City, James S. Heaton Co. 415-367-9000
Cal San Diego, Golden West Elctrns. 714-292-4891
Cal San Diego, M. A. Stolaroff Co.... 714-234-6905
Cal Woodland Hills, Porter Co..... 213-999-0171
Colo Englewood, Dynatech Inc. 303-773-2830
Colo Englewood, Marshall Sls..... 303-770-6224
Colo Parker, James S. Heaton Co. 303-841-3651
Conn Marion, Sands Co..... 203-628-4363
Fla Clearwater, Chaco Sls 813-536-1260
Haw Honolulu, Aloha Assocs..... 808-941-1574
Ill Chicago, C. L. Greenslade Sls... 312-561-0156
Ill Chicago, Electro Tech Mktg. 312-588-4535
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Ind Ft Wayne, Pete Allen 219-489-6717
Kans Shawnee Mission, Midtec Assoc 913-441-6565
Md New Carrollton, W. A. Brown..... 703-836-1800
Minn White Bear Lake, Sims and Assocs. 612-224-4079
NJ Cherry Hill, Danco 609-424-5590
NJ Fort Lee, B. Cameron Assocs. .. 201-461-2595
NY New Rochelle, A & M Assoc 914-235-4672
NY Rome, PDQ
NC Cary, Montgomery Mktg..... 919-467-6319
Ohio Brunswick, Kincomics Sls. Inc.... 216-225-6111
Ohio Cincinnati, Frank E. Kahsar Sales 513-471-9011
Ohio Dayton, Kimcomics Sls. Inc..... 513-898-1783
Ohio Hudson, Burt Williams..... 216-653-6808
Okla Tulsa, Allied Comps. Inc. 918-492-7771
Tex Dallas, Gordon V Peck Co..... 214-783-1011
Tex Dallas, Allied Comps., Inc. 214-238-0408
Tex Houston, Allied Comps. Inc..... 713-960-1962
Tex Houston, Gordon V Peck Co 713-780-2220
Va Alexandria, W. A. Brown..... 703-836-1800
Wash Seattle, W. Spaulding Co. 206-282-9173
Wash Vashon Island, RTS Inc 206-455-2778
WVa Charleston, W. A. Brown 304-342-2700

MELCOR/MATERIALS ELCTRN. PRODS., Dept. EM, 990 Spruce St., Trenton, N.J. 08648, Tel: 609-393-4178, Telex: 84-3314; FSC No.: 32333; Empl.: 75 ..... p. 2592,2593

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Cal Irvine, Melles Griot..... 714-556-8200
Conn Danbury, Melles Griot 203-792-2002

MELOY LABS INC., Instrus. & Sys. Div., Dept. EM, 6715 Electronic Dr., Springfield, Va. 22151, Tel: 703-354-2600, Telex: 89-9440; FSC No.: 6630; Empl.: 475

Sales Manager: R. Pat Connor

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Ariz Phoenix, Pacific Scientific Co. 602-273-7464
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Cal Santa Ana, Pacific Scientific Co. 714-558-6964
Ill Arlington Heights, Martec Assocs. 312-956-8090
Iowa Des Moines, O'Hara Co 515-223-6047
Minn Minneapolis, Arjay Sales 612-854-4972
NJ Neptune City, Meloy Labs 201-774-7163
Ore Portland, Pacific Scientific Co..... 503-256-1770
Pa Pittsburgh, Scientific Pittsburgh .. 412-655-2800
Tex Houston, Meloy Labs 713-782-4185
Wash Seattle, Pacific Scientific Co..... 206-762-4260
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MEMCOR DIV. E-SYSTEMS, See E-Systems, Memcor Div.

MEMODYNE CORP., Dept. EM, 369 Elliot St., Newton Upper Falls, Mass 02164, Tel: 617-527-6600, Telex: 92-2537; Empl.: 25

Sales Manager: N.H. Renaud

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Conn Canton Center, Tekdata 203-693-0719
Haw Honolulu, Hawaii Data Sys..... 808-946-1533
Ill Elmhurst, Scott Assocs. 312-279-5681
Md Fulton, Gans-Fryling 301-792-4818
Mass Wakefield, Tekdata 617-245-5940
Mich South Lyons, Infinity, Inc. 313-437-2705
NY Clark Mills, KLM Assocs. 315-853-6126
NY Elmont, Crane & Egert Corp..... 516-488-2100
NY North Syracuse, KLM Assocs..... 315-458-6214
NY Pittsford, KLM Assocs. 716-381-8350
Ohio Cleveland, Geotronics..... 216-526-2535
Ohio Columbus, Geotronix..... 614-457-8472
Okla Norman, Data Mktg Assoc..... 405-364-8320
Pa Rochester, Geotronix 412-266-4819
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Tex Dallas, Data Mktg 214-661-0300
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Ill Chicago..... 312-620-3200
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La New Orleans 504-522-4401
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Tex Dallas 214-258-3510
Va Richmond 804-288-3116
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Ala Huntsville, Macro-Mktg. 205-883-9630
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Cal Harbor City, Refrigeration Comps 213-325-3420
Cal North Hollywood, Mepco/Electra, Inc. 213-762-2117
Cal San Diego, The Rep Co. 714-292-9001
Cal Santa Clara, Mepco/Electra, Inc. 408-988-2870
Colo Lakewood, Mepco/Electra, Inc... 303-922-8177
Fla Ft. Lauderdale, CBC Elctrns..... 305-484-7330
Fla Longwood, CBC Elctrn. 305-484-7330
Ill Elk Grove Village, Mepco/Electra, Inc. 312-640-2500
Ill Palatine, Technology Sls 312-991-6600
Ill Skokie, Heth, Inc..... 312-282-8737
Ind Ft. Wayne, Insul-Reps..... 219-482-1596
Ind Ft. Wayne, Mepco/Electra, Inc... 219-432-8567
Iowa Cedar Rapids, Lorenz Sls..... 319-393-6912
Iowa Cedar Rapids, PMA Corp..... 319-362-9177
Kans Overland Park, PMA Corp 913-381-0004
Kans Wichita, PMA Corp 316-264-2662
Md Bladensburg, Delta Ill Assocs..... 301-779-0977

Mass Wellesley Hills, Spectrum Assoc. 617-237-2796
Mass Woburn, Mepco/Electra, Inc. 617-935-6920
Mich Farmington, Miltimore Sls., Inc. 313-476-2446
Minn Burnsville, Heth, Inc. 612-333-8494
Minn St. Paul, Northport Engrg 612-698-3841
Mo Maryland Heights, PMA Corp 314-569-1220
NJ Cherry Hill, Mepco/Electra, Inc. 609-667-7662
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NY Endicott, Tech-Mark, Inc. 607-748-7473
NY Hicksville, Mepco/Electra, Inc. 516-935-5311
NY Liverpool, Tech-Mark, Inc. 315-652-6229
NY New City, Macpherson Conner Assoc. 914-638-1775
NC Raleigh, Candor Co. 919-876-4999
Ohio Dayton, Mepco/Electra, Inc. 513-278-5843
Ore Portland, Mepco/Electra 503-645-7722
SC Myrtle Beach, Candor Co. 803-448-8361
Tex Dallas, Mepco/Electra, Inc. 214-231-8274
Tex Houston, Jackson Arnold Co. 713-981-5789
Va Lynchburg, Glen White Assoc. 804-384-6920
Wash Bellevue, Western Techn Sls. 206-641-3900
Wisc Wauwatosa, Larsen Assocs. 414-258-0529

MERECO PRODUCTS DIV., Metachem Resins, Dept. EM, 538 Wellington Ave., Cranston, R.I. 02910, Tel: 401-781-4070; Empl.: 100

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Ariz Phoenix, Gramer & Co. 602-279-1221
Cal Canoga Park, P. Reisman 213-881-2969
Conn Sherman, Lectro Assoc. 203-355-0575
Mass Marlboro, OK Engineering 617-481-6400
NY Northport, Production Sls. 516-757-0336
Ohio Worthington, H. L. Simcox 614-885-8995
Tex El Paso, International Elctrns. 915-778-9761
Utah Salt Lake City, Technical Devices 801-486-6401

MERCURY ELECTRONICS CORP., Dept. EM, 339 E Cottage Place, York, Pa. 17403, Tel: 717-854-9557; Empl.: 35

Local Sales Offices & Reps.
Mich Detroit, R. M. Gardner 313-531-0988
Pa West Chester, S. E. Balint

MERET INC., Dept. EM, 1815 24th St., Santa Monica, Cal. 90404, Tel: 213-828-7496, Telex: 65-2468; Empl.: 12

Local Sales Offices & Reps.
Fla Winter Park, McMahan Assocs. 305-645-0463
Md Silver Spring, Spectro Sys. Corp. 301-949-8261
Mass Burlington, Tritek, Inc. 617-272-4550
NY Greenvale, B. Aaron & Co. 516-621-0630
Pa Wyndmoor, Spectro Sys. Corp. 215-836-1545

MERIDIAN LAB., Dept. EM, 2415 Evergreen Rd., Box 156, Middleton, Wisc. 53562, Tel: 608-836-7571; Empl.: 8

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Cal Pasadena, Research Data Corp. 910-588-3758
Md Lutherville, Phil Knox & Co. 301-252-1288
Minn St. Paul, Morlock & Assoc. 612-645-2303
NJ Fair Lawn, Phil Ross (Par Assoc.) 201-447-3722

MERIX CHEM. CO., Dept. EM, 2234 East 75th St., Chicago, Ill. 60649, Tel: 312-221-8242; Empl.: 15

Sales Manager: E.O. Sonneman; *Distributor Manager:* R. Neuman

MERRIMAC INDS., INC., Dept. EM, 41 Fairfield Pl., West Caldwell, N.J. 07006, Tel: 201-575-1300, TWX: 710-734-4314; FSC No.: 12457; Empl.: 170

Sales Manager: D.S. Brodow

Local Sales Offices & Reps.
Ala Huntsville, Beacon Elctrns. 205-881-5031
Ariz Scottsdale, Territorial Mktg. 602-994-8665
Cal Dana Point, MCA Repco 714-661-1300
Cal Mountain View, Weil & Disman 415-965-4300
Cal Westlake Village, MCA Repco 213-889-5553
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NY Larchmont, T² Elctrns 914-834-6338
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NY Syracuse, T² Elctrns. 315-463-8592
NY Tuckahoe, Spectrum Sls. 914-793-1660
NC Greensboro, Beacon Elctrn Assocs. 919-275-9997
Pa Philadelphia, Eastern Instrumentation of Phila. 215-927-7777
Tenn Oak Ridge, Beacon Elctrn. Assocs. 615-482-2409
Tex Richardson, Carl Tinch Sls. Co. 214-231-1322

MESUR-MATIC ELECTRONICS CORP., Dept. EM, 50 Grove St., Salem, Mass. 01970, Tel: 617-745-7000

Sales Manager: Philip F. Dolan

Local Sales Offices & Reps.
Ariz Phoenix, Eltron Inc. 602-997-1042
Cal Buena Park, Rock Associates 714-521-6980
Cal Menlo Park, Long & Associates 415-327-1300
Fla Coral Springs, Shaw Engineering & Sales 305-752-7596
NJ Tenafly, Budd-Tronics Inc. 201-569-2230
NY Huntington Station, Budd-Tronics Inc 516-673-0142
NY Rexford, N.W. Alexander & Assoc. 518-377-0581
Tex Richardson, Spectra Sales Corp. 214-234-3600
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MET-L-WOOD CORP., Dept. EM, 6755 65th St., Chicago, Ill. 60638, Tel: 312-585-7575, Telex: 25-6106; Empl.: 110

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Fla Largo, Dow Assocs. 813-595-9195
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Sales Manager: K. Sharples

Local Sales Offices & Reps.
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Mass Holbrook, McLellan Assocs 617-767-4771
NJ New Brunswick, Daner-Hayes 201-246-2727
Pa Newtown Square, Holdsworth & Co 215-356-8550

METEX CORP., Dept. EM, 970 New Durham Rd., Edison, N.J. 08817, Tel: 201-287-0800, TWX: 710-998-0578; Empl.: 300 p. 2566

Sales Manager: J. Severinsen

Local Sales Offices & Reps.
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Fla Largo, Semtronic Assocs. 813-586-1404
Fla Lighthouse Point, Saber Assocs. 305-943-3101
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Pa Media, Snyder & Stefkovic Assocs. 215-566-5400
Tex Houston, Barry Sls.
Tex Richardson, Barry Sls. 214-234-0255
Va Fairfax, Snyder & Stefkovic Assocs. 703-273-1413

METHODE ELCTRNS., INC., Dept. EM, 7447 W. Wilson Ave., Chicago, Ill. 60656, Tel: 312-867-9600, TWX: 910-221-2468; Empl.: 900

Distributor Manager: I. Lubor

Local Sales Offices & Reps.
Ariz Scottsdale, F. Board Assocs. 602-994-9388
Cal Burlingame, W. J. Purdy Co. 415-347-7701
Cal Northridge, McDonald & Assocs 213-349-7911
Fla Winter Pk., Young & Lawrence 305-647-6929
Ind Indianapolis, Loomis Assocs. 317-299-5644
Ky Fort Mitchell, G. W. Thelen Co. 606-341-8181
Mass Needham, Maguire Assocs 617-329-0354
Mich Bloomfield Hills, ENCO Mktg. 313-642-0203
Minn St. Paul, Skor 612-645-6461
Mo Hazelwood, Dy-Tronix 314-731-5799
NJ Mountain Lakes, Components for Elctrns. 201-334-2921
NY Pompey, S. F. Foster Co. 315-677-3333
Pa Ft. Washington, B.G.R. Assocs. 215-643-4111
SC Myrtle Beach, Candor Co. 803-448-5213
Tex Dallas, Bonser-Philhower Sls. 214-234-8438
Wash Bellevue, Venture Elctrns 206-454-4594

Methode Electronics, Inc.
Interconnect Products Division

METHODE ELCTRNS, Interconnect Prods Div, Dept. EM, 1700 Hicks Rd, Rolling Meadows, ILL 60008, Tel: 312-392-3500, TWX: 910-687-0760; FSC No.: 95354 p. 2080,2081

Sales Manager: D. W. Rice; *Distributor Manager:* D. W. Rice

Local Sales Offices & Reps.
Ala Huntsville, Ultra Sls 205-539-4156
Ariz Phoenix, Bob Anderson Co 602-266-2070
Cal Burlingame, Wm. J. Purdy 415-347-7701
Cal Northbridge, R. H. McDonald & Assocs 213-349-7911
Colo Denver, Wm. J. Purdy 303-777-1411
Fla Orlando, O. E. M. Mktg 305-299-1000
Ill Highland Park, Bransky Sls 312-433-2375
Ind Indianapolis, Loomis Assocs 317-299-5644
Iowa Cedar Rapids, Dy-Tronix 319-377-8275
Ky Ft Mitchell, G. W. Thelen Co. 606-341-8181
Md Blandensburg, Delta Ill Assoc. 301-779-0977
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Mich Bloomfield Hills, Enco Mktg. 313-642-0203
Minn St. Paul, Skor, Inc. 612-645-6461
NJ Mountain Lakes, Comps for Elctrns 201-334-2921
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NY Pompey, S. F. Foster Co. 315-677-3333
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Mass Bedford 617-275-2440
Mich Southfield 313-424-3569
Minn Minneapolis 612-830-3516
Mo St. Louis 314-878-2400
NY Elmsford 914-592-3200
NY Rochester 716-424-2700
Ohio Cleveland 216-361-7280
Ohio Dayton 513-461-4480
Pa Valley Forge 215-783-7150
Tex Dallas 214-387-5333
Wash Mercer Island 206-233-2010
Wisc Milwaukee 414-771-6300

MICRO TECHNICAL INDUSTRIES, Dept. EM, 1999 S. Coast Hwy., Laguna Beach, Cal. 92651, Tel: 714-494-1036, TWX: 910-587-3425; Empl.: 6

Sales Manager: S. Kellogg

Local Sales Offices & Reps.
Ariz Tempe, Gassner & Clark 602-968-9037
Cal Orange, Sales & Mktg. 714-997-5720
Cal Redwood City, Sinai-Johnson 415-365-6263
Cal Van Nuys, Myco Sale 213-988-2288
Colo Denver, R. G. Bowen & Co. 303-744-2501

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Mo St. Louis, Engrg. Svcs. Co. 314-997-1515
NY Rochester, Net Sls 716- 467-4538
Tex Houston, M. R. Summers Assoc. 713-524-7800

MICROFLAME INC., Dept. EM, 3724 Oregon Ave. S., Minneapolis, Minn 55426, Tel: 612-935-3777; Empl.: 10

Sales Manager: J. Boyer

MICROLAB/FXR, Dept. EM, 10 Microlab Rd., Livingston, N.J. 07039, Tel: 201-992-7700, TWX: 710-994-4850; FSC No.: 00929; Empl.: 69

Local Sales Offices & Reps.
Cal Los Angeles, McDougall/McLaughlin Co. 213-477-8556
Cal San Jose, M.C.H. Assoc. 408-246-7330
Fla Clearwater, R.F. Brennan, Inc. ... 813-446-5006
Ill Elk Grove, R-Tek 312-439-9090
Md Ellicott City, V P I Inc. 301-465-4060
Mass Lowell, Russell Engrg Svcs 617-458-7146
Pa Montgomeryville, V P I, Inc. 215-474-3200
Wash Seattle, Datacom Assocs. 206-329-2989

MICROMETALS, Dept. EM, 1190 N. Hawk, Anaheim, Cal. 92807, Tel: 714-630-7420, TWX: 910-591-1690; FSC No.: 12856; Empl.: 30

Sales Manager: K. Baker, Jr.

Local Sales Offices & Reps.
Cal Santa Clara, King Assocs. 408-249-1022
Fla Sarasota, W. J. Irvine Co. 813-955-9656
Mass Newton Upper Falls, Anchor Engrg. 617-964-6416
NY Hempstead, Kahgan Sls. 516-538-2300

MICRONEL U. S., Dept. EM, 8 Kane Ind. Park, Hudson, Mass. 01749, Tel: 617-568-8542, Telex: 94-8330; Empl.: 25

Sales Manager: B. Linko; *Distributor Manager:* S. W. Linko

MICRON INDUSTRIES CORP., Constant Voltage Div., Dept. EM, 1830 N. 32nd Ave., Stone Park, Ill. 60165, Tel: 312-345-0788; Empl.: 67

Sales Manager: D. Hayes

MICROPHASE CORP., Dept. EM, 35 River Rd., Cos Cob, Conn. 06807, Tel: 203-661-6200, TWX: 710-579-2926; Empl.: 150

Sales Manager: F. S. Parin

Local Sales Offices & Reps.
Cal Mountain View, Weil & Disman Assocs. 415-965-4300
Cal Van Nuys, CW Swift & Assoc 213-989-1133
NY Syracuse, Ossmann Instruments Inc. 315-437-6666
Pa Lafayette Hill, M. Lader Co 215-825-3177
Tex Dallas, Texas Microwave 214-231-5381

MICROPLEX, INC., Dept. EM, 2126 S. Lyon St., Santa Ana, Cal. 92705, Tel: 714-979-8833 p. 1186,1187,3706,3707

MICROSONICS, Div. Sangamo Elec. Co., Dept. EM, 60 Winter St., Weymouth, Mass. 02188, Tel: 617-337-4200, TWX: 710-388-6833; Empl.: 114 p. 2348

Local Sales Offices & Reps.
Cal Los Altos, Tauber-Dreyer Assoc. 415-948-2635
Cal Los Angeles, Tauber-Dreyer 213-368-4011
Cal San Diego, Tauber Assocs. 714-274-7242
Fla Orlando, Technology Mktg. Assoc. 305-857-3760
Fla Pompano Bch., Technology Mktg. Assoc. 305-942-0774
Ind Ft. Wayne, G & D Electrn. Sls., Inc. 219-432-5585
Md Baltimore, Burgin-Kreh Assocs... 301-788-5200
Mass Needham, Reptron 617-449-4141
Minn Minneapolis, Eltron Mktg 612-927-6992
NJ Cherry Hill, Danco 609-424-5590
NY Rochester, Ontec 716-464-8636
NC Winston-Salem, Burgin-Kreh Assoc 919-768-4174
Pa Fairview Vill., Danco 215-627-2218
Tex Richardson, Lear Assocs..... 214-231-5388
Va Lynchburg, Burgin-Kreh 703-845-5600

MICROTECH, Dept. EM, 1420 Conchester Hwy, Boothwyn, Pa. 19061, Tel: 215-459-3566; Empl.: 22

Sales Manager: H. Carter

MICROTRAN CO., INC., Dept. EM, 145 E. Mineola Ave., Valley Stream, N.Y 11582, Tel: 516-561-6050, TWX: 510-225-8412; FSC No.: 00348; Empl. 100 p. 4360-4363

Sales Manager: W. Benscher

Local Sales Offices & Reps.
Ala Birmingham, Nickerson Corp. 205-854-6330
Ariz Scottsdale, F. Schoeffler 602-959-3011
Cal El Monte, Cook Entprs..... 213-686-2120
Cal San Carlos, Kottmeier Assocs. .. 415-592-8333
Colo Denver, Gossard & Assocs..... 303-770-2030
Fla Clearwater, Chaco Sls 813-536-9503
Ill Barrington, Lancastle, Ltd. 312-381-6780
Kans Overland Pk., J.F. Guernsey Co. 913-381-2225
La New Orleans, Coastal Sls. Co. .. 504-737-8074
Md Baltimore, Callas Elctrns., Inc.... 301-744-7711
Mass Reading, Meco 617-944-6660
NJ Englewood Cliffs, E. Glass Assocs. 212-586-8440
NY Rochester, J.G. Welch Assocs., Inc. 716-244-1100
NC Kannapolis, Nickerson Corp. 704-932-6772
Ohio Cincinnati, J.O. Olsen Co. 513-922-2176
Ohio Cleveland, J.O. Olsen..... 216-752-5444
Pa Jenkintown, Arnold Assocs. 215-887-7870
Pa Pittsburgh, J.O. Olsen Co. 412-279-2550
Tenn Memphis, Al Engleman Co. 901-458-6263
Tex Grand Prairie, Howell Sls., Inc. .. 214-AN2-5153
Wash Seattle, Don Newman Co. 206-365-1190
Exp: N.Y., Valley Stream, Microtran Co. 516-561-6050

Local Distributors
Ala Birmingham, MG Elctrns. & Equip. 205-328-4525
Ala Huntsville, Hall-Mark Elctrns..... 205-539-0691
Ariz Phoenix, Moltronics, Inc. 602-272-7951
Cal San Diego, Moltronics, Inc. 714-278-5020
Cal Santa Clara, Moltronics, Inc. 408-244-7600
Cal Santa Monica, Master Distributors 213-829-4656
Cal South Gate, Moltronics, Inc..... 213-773-6521
Colo Denver, Electronic Parts Co. 303-744-1992
Fla Ft. Lauderdale, Peerless Radio Corp. 305-566-5966
Fla Orlando, Hall-Mark Elctrns. 305-855-4020
Ill Rosemont, Advent Elctrns. 312-297-6200
Ind Indianapolis, Graham Elctrns. 317-634-8486
Iowa Cedar Rapids, Deeco, Inc. 319-365-7551
Kans Shawnee Mission, Hall-Mark Elctrns. 913-888-4747
Kans Wichita, Radio Supply Co. 316-267-5216
La Metairie, Trionics 504-837-9025
Md Columbia, Technico 301-461-2200
Md Savage, Pyttronic Inds., Inc..... 301-792-0780
Mass Hingham, Sager Electrical Supply 617-749-6700
Mass Waltham, QPL Elctrn. Distr., Inc. 617-891-0460
Mich Oak Park, Newark-Detroit 313-548-0250
Mich Wyoming, Newark Elctrns 616-241-6681
Minn Minneapolis, Newark-Minneapolis 612-331-6350
Mo Earth City, Hall-Mark Elctrns. 314-291-5350
NJ Springfield, Federated 201-376-8900
NM Albuquerque, Electronics Parts Co. 505-293-6161
NY Binghamton, Harvey Electrs. of Binghamton 607-748-8211
NY Buffalo, Summit Distrs., Inc..... 716-884-3450
NY Farmingdale, Harrison Elctrns. .. 516-293-7979
NY Lynbrook, Peerless Radio Corp. 516-593-2121
NY Rochester, Summit Distributors, Inc. 716-334-8110
NC Raleigh, Southeastern Radio Supply 919-828-2311
NC Raleigh, Southeastern Radio Supply 919-828-2311
Ohio Cincinnati, Newark Elctrns..... 513-874-5115
Ohio Cleveland, Pattison Supply Co... 216-441-3000
Ohio Dayton, J.A. Becker Co..... 513-226-1341
Okla Tulsa, Hall-Mark Elctrns. 918-835-8458
Pa Harrisburg, Pyttronic Inds. 717-233-6591
Pa Huntingdon Valley, Shap Electrns. 215-698-9550
Pa McKeesport, Barno Radio Co..... 412-751-5971
Tenn Nashville, Electra Distributors 615-255-8444
Tex Dallas, Hall-Mark Elctrns..... 214-AD1-6111
Tex Houston, Lenert Co. 713-225-1465
Utah Salt Lake City, Newark Elctrns. 801-486-1048
Wash Seattle, Sterling Elctrns..... 206-762-9100
Wisc Milwaukee, Parts Mart Corp. 414-276-1212

MICROWAVE ASSOCS., Dept. EM, Northwest Industrial Pk., Burlington, Mass. 01803, Tel: 617-272-3000, TWX: 710-332-6789; Empl.: 2,000

Local Sales Offices & Reps.
Ala Huntsville, Techn Mktg Assoc..... 205-883-7893
Ala Huntsville, Tech. Mktg. Assocs... 205-883-7893
Ariz Scottsdale, Microwave Assocs... 602-947-5431
Cal Long Beach, Microwave Assocs. 213-426-9531
Cal Sunnyvale, Microwave Assocs... 408-733-0330
Fla Orlando, Technology Mktg Assoc. 305-857-3760

Fla Ormond Beach, Tech. Mktg. Assocs. 904-672-2314
Fla Pompano Beach, Tech. Mktg. Assocs. 305-942-0774
Ill Franklin Park, Dekotech, Inc. 312-455-5100
Ind Fort Wayne, Delesa Sls. 219-483-9537
Ind Indianapolis, Delesa Sls. 317-894-3778
Iowa Cedar Rapids, Seltec Sls. Corp. 319-393-1114
Kans Andover, Palatine Sls. 316-683-7512
Kans Lenexa, Palatine Sls. 913-492-7020
Kans Shawnee Mission, Midtec Assocs 913-441-6565
Md Baltimore, Burgin-Kreh Assocs. 301-788-5200
Mass Burlington, Burlington Sls., Inc. 617-272-7655
Mich Brighton, S.A.I. Mktg Corp 313-227-1786
Mich Farmington, Sheridan Assocs. 313-477-3800
Mich Grand Rapids, Sheridan Assocs. 616-942-2504
Mo Fiorissant, Midtec Assocs 314-837-5200
Mo St. Louis, Palatine Sls. 314-426-7055
NY Pittsford, T2 Elctrns Co. 716-381-2551
NY Plainview, ERA, Inc. 516-822-9890
NY Syracuse, T2 Elctrns. 315-463-8592
NC Raleigh, Burgin-Kreh Assocs 919-781-1100
NC Winston-Salem, Burgin-Kreh Assocs. 919-768-4174
Ohio Beachwood, Sheridan Assocs. 216-292-2982
Ohio Cincinnati, Sheridan Assocs. 513-761-5432
Ohio Dayton, Sheridan Assocs. 513-435-3181
Ore Portland, C.K. Shanks & Assocs. 503-292-5656
Pa Fort Washington, G.C.M., Inc. 215-646-7535
Pa Pittsburgh, Sheridan Assocs. 412-782-5120
Tex Richardson, Microwave Assocs. 214-234-2463
Va Lynchburg, Burgin-Kreh Assocs. 804-845-5600
Wash Seattle, C.K. Shanks & Assocs. 206-632-4290

MICROWAVE DEVELOPMENT LABS., INC., Dept. EM, 87 Cresent Rd., Needham Hgts., Mass. 02194, Tel: 617-449-0700, TWX: 710-325-1739; Empl.: 180

Sales Manager: R. Tucker

Local Sales Offices & Reps.
Cal Orange, J. E. Hachten Co. 714-998-6020
Cal Palo Alto, J. E. Hachten Co. 415-326-1252
Fla Orlando, Hi Co Assocs., Inc. 305-273-0571
Md Lanham, Brimberg Assoc. 301-552-2200
Mass Wayland, Wayland Engrg. Sls. 617-655-6080
NY DeWitt, D.B. Assocs., Inc. 315-446-0220
NY Great Neck, Trionic Assocs., Inc. 516-466-2300
Pa Lafayette Hill, M. Lader Co. 215-825-3177
Tex Dallas, Texas Microwave 214-231-5381
Wash Seattle, Jon B. Jolly 206-938-4166
Exp: Conn., Stamford, Dage Corp. 203-324-3123

MICROWAVE DIODE CORP., Dept. EM, Washington St-Box 250, W. Stewartstown, NH 03597, Tel: 603-246-3350, TWX: 710-366-7575; Empl.: 15

Local Sales Offices & Reps.
Cal Santa Ana, Rical Assocs. 714-557-6543
Mass Sharon, Cummings Assoc. 617-828-8370

MICROWAVE POWER DEVICES, Dept. EM, Adams Ct., Plainview, N.Y. 11803, Tel: 516-433-1400, TWX: 510-221-1862; Empl.: 85

Local Sales Offices & Reps.
Ala Huntsville, Gentry Assocs. 205-534-9771
Ariz Phoenix, R. A. Mayes Co. 602-279-5243
Cal Inglewood, L & M Engrg. S. 213-674-6850
Cal San Jose, L & M Engrg. 408-292-3220
Colo Boulder, R.A. Mayes Co. 303-444-0782
Fla Orlando, Gentry Assocs. 305-894-4401
Fla St. Petersburg, Gentry Assocs. 813-867-7820
Ill Mt. Prospect, Cain & Co. 312-253-3578
Kans Prairie Village, Engrg. Servs. Co. 913-649-4000
Md Silver Springs, Eastern Instrumentation Corp. 301-384-8500
Mass Burlington, Tritek, Inc. 617-272-4550
Mo St. Louis, Engrg. Serv. Co. 314-997-1515
NJ Englewood, Scientific Devices - East 201-871-3916
NM Albuquerque, R.A. Mayes Co. 505-292-2330
NY Fairport, Naco Elctrns. Corp. 716-223-4490
NY N. Syracuse, Naco Elctrns. Corp. 315-699-2651
NY Utica, NACO Elctrns. 314-732-1801
NC Burlington, Gentry Assocs. 919-227-3639
Ohio Lancaster, Cain & Co. 614-654-4800
Pa Philadelphia, Eastern Instrumentation of Philadelphia 215-927-7777
Tex Houston, R.A. Mayes Co. 713-440-9288
Tex Richardson, R.A. Mayes Co. 214-235-3043
Utah Centerville, R.A. Mayes Co. 801-292-6781
Exp: Fla., Hallandale, Emec Inc. 305-925-6366

MIDCOM INC., Dept. EM, 1650 Tower Blvd., N. Mankato, Minn. 56001, Tel: 507-625-6521, TWX: 910-565-2244; Empl.: 50

Sales Manager: C.R. Wight

Local Sales Offices & Reps.
Cal Mountain View, West/Mark Assocs. 415-969-1700
Cal San Gabriel, Van Gott & Assoc. 213-285-2148
Fla Ft. Lauderdale, Beacon Elctrn. Assoc. 305-971-7320
Fla Maitland, Beacon Elctrn. Assoc. 305-647-3498
Fla Palm Harbour, Beacon Elect. Assoc. 813-784-4812
Ill Downers Grove, Richmar Elctrn. Sls. 312-968-0118
Ind Carmel, Richmar Elctrns. Sls. 317-846-6383
Md Randallstown, Beacon North, Inc. 301-922-1248
NH Nashua, Bell Controls 603-882-6984
NJ Ridgewood, Ballou, Inc. 201-444-6990
NC Raleigh, Component Sls 919-782-8433
Tex Houston, Oeler & Menelaides 713-772-0730
Tex Richardson, Oeler & Menelaides 214-234-6334
Va Falls Church, Beacon North, Inc. 703-534-7200
Va Lynchburg, Beacon North, Inc. 804-237-4740
Wash Bellevue, Olson, Ferree & Assoc. 206-454-1210
Wisc Bulter, Richmar Elctrn. Sls. 414-781-1730

MID-EASTERN INDS., see Eanco, Inc., Mid-Eastern Prods.

MID-WEST METAL PRODS., INC., Dept. EM, 456 E. Donovan Rd., Kansas City, Kans. 66115, Tel: 913-342-8171; Empl.: 150

MIDGARD ELECTRONICS, Dept. EM, 175 California St., Newton, Mass. 02158, Tel: 617-964-4545; Empl.: 7

Sales Manager: R. Zeman

MIDGET LOUVER CO., Dept. EM, 800 Main Ave., Norwalk, Conn. 06852, Tel: 203-866-2342; Empl.: 10

MIDISCO

MIDISCO, Dept. EM, 61 Mall Dr., Commack, N.Y. 11725, Tel: 516-543-4774, TWX: 510-226-7839; FSC No.: 52335 ..... p. 2876-2889

Distributor Manager: Arleen Lauer

Local Sales Offices & Reps.
Cal Los Altos, Jay Stone & Assocs. 415-948-4563
Conn Commack, DAL-Tech Devices 516-543-4776
DC Ellicott City, Doss Elctrns 301-465-1336
Me Chelmsford, BBC Sales 617-256-6593
NJ Ambler, W.M. Assocs 215-643-4119
Tex Richardson, Lear Assocs 214-231-5388
Va Charlottesville, Doss Elctrns 301-465-1336

Local Distributors
Cal Los Altos, Microwave Distrs Co 415-948-4563
DC Ellicott City, Microwave Distrs Co. 301-465-1336
Me Chelmsford, Microwave Distrs Co. 617-256-6593
NJ Ambler, Microwave Distrs Co 215-643-4119
NJ Commack, Microwave Distrs Co. 516-543-4776
Pa Ambler, Microwave Distrs Co 215-643-4119
Tex Richardson, Microwave Distrs Co 214-231-5388

MIDLAND STANDRAD INC., Dept. EM, 603 E. Chicago St. Box 38, Elgin, ILL 60120, Tel: 312-741-6600

Local Sales Offices & Reps.
Ill Chicago, Integrated Industries 312-741-0870
Mich Ann Arbor, O-M Sales 313-973-9450
Ohio Cleveland, O-M Sales 216-585-3659

MIDTEX

MIDTEX, INC., AEMCO DIV., Dept. EM, 1650 Tower Blvd., No. Mankato, Minn. 56001, Tel: 507-625-6521, TWX: 910-565-2244; Empl.: 592 ..... p. 3583

Local Sales Offices & Reps.
Ala Huntsville, Rakes Engrg & Mktg 205-883-9260
Ariz Scottsdale, Sls. Engrg., Inc. 602-994-3230
Cal Inglewood, J. Berman Co. 213-649-6111
Cal Pleasanton, Moulthrop Sls. 415-846-0550
Colo Denver, McLoud & Raymond 303-756-1589
Fla Fort Lauderdale, Hutto-Hawkins-Peregoy 305-971-5750
Fla Maitland, Hutto-Hawkins-Peregoy 305-831-2474
Fla Pompano Beach, Hutto-Hawkins-Peregoy 305-943-9593
Ill Downers Grove, Richmar Elctrns. Corp. 312-968-0118
Ind Carmel, Richmar Elctrns. Corp. 317-846-6383
Md Pikesville, L & M Assocs. 301-484-7970
Mich Detroit, Nicon Assocs. 313-341-7688
Mo Kansas City, Burton Medley Assocs 816-436-0491
NH Nashua, Bell Controls 603-882-6985
NJ Ridgewood, Ballou Inc. 201-444-6990
NY Albany, R. F. Lamb Co. 518-869-3355
NY Buffalo, R. F. Lamb Co. 716-874-1808
NY Rochester, R. F. Lamb Co. 716-544-5580
NY Syracuse, R. F. Lamb Co. 315-455-2469
NC Raleigh, Component Sls. Inc. 919-782-8433
Ohio Cleveland, K.W. Elctrn. Sls. 216-831-8292
Ohio Dayton, K.W. Elctrn. Sls. 513-890-2150
Ohio Worthington, K. W. Elctrn Sls 614-888-0483
Pa Allison Park, K. W. Elctrn Sls 412-487-4300
Pa Allison Park, K.W. Elctrn. Sls. 412-487-4300
Tex Houston, Oeler & Menelaides 713-772-0730
Tex Richardson, Oeler & Menelaides 214-234-6334
Wash Bellevue, Olson, Ferree & Assocs 206-454-1210
Wisc Butler, Richmar Elctrns. Corp. 414-781-1730
Exp: Can., Downsview, Ont. M3J 2E5, Weber Elctrns., Ltd. 416-638-1322

Local Distributors
Cal Carson, Royal Wholesale Electric 213-637-6377
Cal Woodland Hills, Rampart Comps. 213-887-7260
Colo Denver, Integrated Elctrns. 303-534-6121
Fla Oakland Park, Peerless Radio Corp. 305-566-5966
Ill Addison, Lectro Comps. 312-690-1880
Ill Addison, Lectron Controls 312-543-8460
Ill Arlington Heights, S & R Corp. 312-593-2545
Ill Chicago, Newark Electronica 312-638-4411
Iowa Cedar Rapids, Deeco, Inc. 319-365-7551
Iowa Cedar Rapids, J. Vrbik Co. 319-366-8733
Mass Lowell, F. McCartin Co. 617-454-9101
Mass Newton, Green-Shaw Co., Inc. 617-969-8900
Mass West Springfield, Control Engrg. 413-739-5134
Minn Minneapolis, Berquist Co. 612-835-2322
NJ Fairlawn, Relay Specialties 201-797-3313
NY Buffalo, Genesee Radio & Parts Co. 716-858-1287
NY Hempstead, Kahgan Comps. 516-538-2300
NY Rochester, Masline Elctrns. 716-546-5373
NY Rockville Center, Midway Ind. Elctrns. 516-764-2400
Ohio Akron, Sun Radio Co. 216-434-2171
Ohio Akron, Hardware & Supply Co. 216-535-1831
Okla Tulsa, Component Specialties 918-664-2820
Pa Erie, Advacom Inc. 814-455-8110
Tex Dallas, Component Specialties 214-357-6511
Tex Houston, Component Specialties 713-771-7237
Tex San Antonio, Blackburn Drives & Controls 512-349-2621
Utah Provo, Omega Elctrns. 801-375-4664
Utah Salt Lake City, Rand Equip. Corp. 801-487-5631
Wisc Milwaukee, Marsh Elctrns. 414-545-6500
For: Canada, Vancouver, B.C., Intek Elctrns. Ltd. 604-324-6831
For: Can., Dorval, Que., Semad Elctrns. 514-636-4614
For: Can., Downsview, Ont., Semad Elctrns. 416-635-9880
For: Can., Ottawa, Ont., Semad Elctrns. 613-722-6571
For: Can., Scarborough, Ont., Carsten Elctrns. 416-751-2371

MIDWEC DIV INDEPENDENT CABLE, See Independent Cable/Midwec

MIDWEST ALUMINUM, Dept. EM, 7696 W. Michigan Ave., Kalamazoo, MI 49009, Tel: 616-375-3000; Empl.: 100

MIDWEST ELECTRONIC INDUSTRIES, Dept. EM, 4945 W. Belmont Ave., Chicago, Ill. 60641, Tel: 312-685-3500, TWX: 910-221-5247; Empl.: 64

MCI

MIDWEST COMPONENTS, Dept. EM, 1981 Port City Blvd., Muskegon, Mich. 49400, Tel: 616-777-2602, TWX: 510-394-4130; FSC No.: 50157; Empl.: 55 p. 4279-4282

Sales Manager: G.J. Hoffman

Local Sales Offices & Reps.

Ala	Huntsville, Murcota	205-529-8476
Cal	Los Angeles, E. E. Strassner Co.	213-242-8823
Cal	Palo Alto, Testco	415-326-5320
Colo	Westminster, RMS Sls.	303-429-1842
Fla	Light House Pt.,, R. C. Simon	305-941-2757
Ill	Chicago, D. Dolin Sls. Co.	312-286-6200
Ind	Indianapolis, Technical Reps.	317-849-6454
Mass	Framingham, KSA of New England	617-875-5464
Minn	St. Paul, R. G. Ragon	612-488-0201
NJ	Ft. Lee, Necco, Inc.	201-461-2789
NJ	Haddonfield, Thomas Assoc.	609-854-3011
NY	New York, Necco, Inc.	201-461-2789
NY	Syracuse, W.A. Franklin Sls. Co.	315-472-5273
NC	Winston-Salem, Murcota	919-722-9445
Ohio	Datyon, Jay Engrg. Co.	513-253-2151
Ohio	N. Royalton, Jay Engrg. Co.	216-237-4235
Okla	Tulsa, Norvell Assoc.	918-663-1247
Tex	Dallas, Norvell, Assoc.	214-350-6771
Tex	Houston, Norvell, Assoc.	713-777-1666
Wash	Bellevue, Testco	206-454-7422
Wisc	Milwaukee, D. Dolin Sls. Co.	414-482-1111

Local Distributors

Ill	Chicago, Newark Elctrns.	312-638-4411

MIKRON INSTR. CO., Dept. EM, Box 211, Ridgewood, N.J. 07451, Tel: 201-891-7330, TWX: 710-988-5821; Empl.: 40

Sales Manager: J. E. Galbraith

Local Sales Offices & Reps.

Ala	Mobile, Alford, Woods & Childs.	205-343-0300
Ariz	Tempe, Lietz Equip. Co.	602-968-4991
Cal	Gardena, Instr. Lab.	213-770-0650
Cal	Palo Alto, Instr. Lab.	415-328-1040
Colo	Arvada, Challenge Entprs	303-985-5125
Conn	Westport, A. J. Abrams Co.	203-226-3010
Fla	Winter Haven, Engineered Equip. Co.	813-294-6520
Haw	Mililani Town, H. C. Burgess & Assocs.	808-623-3118
Ill	Westchester, Murphy & Dickey	312-344-5660
Iowa	Cedar Rapids, H. E. Ferris	319-362-9156
Iowa	Des Moines, H. E. Ferris	515-255-5008
La	Baton Rouge, Alford, Woods & Childs	504-275-5480
La	Harahan, Alford, Woods & Childs	504-733-9550
Me	Lake Charles, Alford, Woods & Childs	318-439-8173
Mich	Dearborn, Ind. Temperature Control	313-278-2210
Minn	Mound, G. J. Winikates & Co.	612-472-6100
Mo	Kansas City, Midwestern Engineered Equip.	816-531-1077
Mo	St. Louis, EV Miller Co.	314-821-2610
NJ	Brielle, H. W. Good Co.	201-528-5251
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NY	N. Syracuse, Thermal Systems	315-458-5202
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MILBAR, Dept. EM, 530 Washington St., Chagrin Falls, Ohio 44022, Tel: 216-247-4600; Empl.: 75

MILERTRONICS, Dept. EM, 303 Airport Rd, Greenville, S.C. 29607, Tel: 803-242-9232; Empl.: 11

Sales Manager: M. W. Easter; *Distributor Manager:* S. S. Mullikin

Local Sales Offices & Reps.

Conn	Canton, Daner-Hayes	203-426-9094
Mass	Newton Centre, Daner-Hayes	617-969-4650
NY	Canandaigua, Daner Hayes	716-467-5100
NY	Port Washington, Daner-Hayes	516-883-4576
NY	Rochester, Daner-Hayes	716-467-5100
Pa	Audubon, Daner-Hayes	215-666-5005
Vt	Ludlow, Daner Hayes	802-228-8774

MILFORD RIVET & MACH., Dept. EM, 857 Bridgeport Ave., Milford, Conn. 06460, Tel: 203-878-4631, TWX: 964363 710-462-0538; Empl.: 527

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Cal	San Francisco, D. R. Cox	415-441-8666
Colo	Denver, Regional Sls. Co.	303-433-7397
Conn	Southport, R.M. Johnson	203-259-2290
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Ga	Atlanta, G.E. Younginer & Assoc.	803-772-6671
Ill	Elmhurst, Midwest Sls. Off.	314-834-3820
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NY	New York, Affiliated Sls.	212-227-4782
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Pa	Jenkintown, Riley & Aleshire	215-884-1708
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Tenn	Memphis, L. E. Offutt & Co.	901-789-1210
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MILGO ELECTRONIC CORP, See Racal-Milgo, Inc

MILLER, J.W. CO., See Bell Inds.

MILLER, CO. L.C., Dept. EM, 717 Monterey Pass Rd., Monterey Park, Cal. 91754, Tel: 213-268-3611; Empl.: 49

MILLER, SANFORD CORP., See Sanford-Miller Corp.

MILLER-STEPHENSON CHEM. CO., INC., Dept. EM, George Washington Hwy., Danbury, Conn. 06810, Tel: 203-743-4447

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Cal	Los Angeles, Miller-Stephenson Chem.	213-624-3887
Ill	Chicago, Miller-Stephenson Chem.	312-761-4272

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Wash Seattle, D. Smith Sls. Co. 206-633-3160

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Sales Manager: R. Belmont

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Mo St. Louis, Gateway Electronics Corp 314-427-6116
Mo St. Louis, Electronic Mart Inc..... 314-781-7643
NJ Springfield, Route Electronics Inc 201-467-6166
NJ Totowa, Route Electronics 46, Inc 201-256-8555
NM Albuquerque, Electronic Parts Co 515-293-6161
NY Albany, Edwin E. Taylor Co., Inc 518-438-7811
NY Farmingdale, Harrison Radio Corp 516-483-9200
NY Freeport, KRP Electronics Supermart 516-623-3346
NY Hempstead, Davis Elctrns. Corp. 516-483-9200
NY Long Island City, H. L. Dalis, Inc 212-361-1100
NY New York, Taft Electronics 45 Corp 212-575-5194
NY New York, Harvey Radio Company 212-575-5200
NY New York, Martin Audio/Video Corp 212-541-5900
NY New York, Manhattan Electronics Corp 212-354-6240
NY Plainview, A. C. I ELECTRONICS CORP 516-293-6630
NY Rome, Rome Security Devices .. 315-336-0148
Ohio Akron, Akron Electronic Supply Co 216-762-8818
Ohio Dayton, Srepco Electronics Division 513-224-0871
Okla Oklahoma City, Trice Wholesale Elect. Inc 405-524-4411
Ore Portland, Portland Elec & Plumbing 503-243-6800
Pa Harrisburg, Cumberland Electronics Inc 717-233-5883
Pa Philadelphia, Sunshine Scientific, Inc. 215-673-5600
Tex Dallas, Bullet Electronics Inc 214-823-3240
Tex Dallas, KA Electronic Sales 214-634-7870
Tex El Paso, McNicol Electronics 915-566-2936
Tex Houston, Electrotex 713-526-3456
Tex Texarkana, McCulloch Elect. Supply 214-792-6923
Utah Salt Lake City, Standard Supply Co. 801-486-3371
Utah Salt Lake City, Kimball Elctrns., Inc. 801-328-2075
Wash Olympia, J.W. Elctrns., Inc. 206-943-1071
Wash Seattle, Amateur Radio Supply .. 206-767-3222
Wash Seattle, Electronics Supply Co... 206-632-2222
Wash Seattle, ABC Communications.... 206-364-8300
Wash Seattle, Western Electrns. 206-284-0200
Wash Seattle, Radar Electric Co. 206-282-2511
Wash Spokane, H.C.J. Elctrns..... 509-924-2343
Wash Tacoma, A. T. Stewart Company 206-272-1112
Wisc Kenosha, Chester Electronics 414-658-4616
Wisc Madison, Satterfield Electronics 608-257-4801
Wisc Marinette, G. M. Popkey Co., Inc 715-732-0121
Wisc Milwaukee, Electro-Mechano Co. 414-272-4050
Wisc Milwaukee, Parts Mart Corp 414-276-1212
Wisc Oshkosh, Electronic Industries.... 414-235-8930

MOLEX INC., Dept. EM, 2222 Wellington Ct., Lisle, Ill. 60532, Tel: 312-969-4550; Empl.: 1,400 p. 2082-2085

Sales Manager: B. Hickey; *Distributor Manager:* R. Cisek

Local Sales Offices & Reps.
Cal Mt. View, Cindel Sls 415-965-2630
Cal Westlake Village, D. Barton 213-991-2026
Colo Denver, Thorson Co. 303-759-0809
Fla Pompano Beach, V.G. Sls..... 305-971-0900
Ill Crystal Lake, E.S. Healy & Assocs. 815-459-4386
Ind Crawfordsville, D. Miller & Assocs. 317-362-6348
Ind Fort Wayne, Insul-Reps. 219-482-1596
Mich Grosse Pointe Woods, J. Winkler 313-881-1443
Minn Minneapolis, C. Diehl..... 612-854-4448
Mo Bridgeton, Kermit Dye..... 314-291-1694
Neb Lincoln, Delltron Co. 402-464-1485
NH Salem, Sales Engrg. Co. 603-893-5521
NJ Sparta, A.B. Jent 201-729-2128
NJ Springfield, F. F. Sylvester Assocs. 201-376-3324
NY Rochester, L-Mar Assocs. 716-328-5240
NY Victor, D. Nebbia 716-394-3960
ND Mansfield, Bill McBride 419-526-2222
Ohio Dayton, Richard Turner 513-256-9220
Pa Pittsburgh, Sheridan 412-782-5120
Tex Houston, Thorson Co..... 713-783-1492
Tex Richardson, Palatine Sls. Inc. 214-231-9489
Wash Medina, H. Paulman Sls. 206-455-3311

Local Distributors
Cal Chalsworth, Westates 213-341-4411
Cal Inglewood, Force Elctrns..... 213-776-1324
Cal S. San Francisco, Peters-delaet 415-873-9595
Cal Sunnyvale, Westates..... 714-964-1700
Colo Denver, Integrated Elctrns..... 303-534-6121
Fla Pompano Beach, Components South 305-971-0350
Ill Chicago, Waldom Elctrns. 312-585-1212
Ill Crystal Lake, Sub-Sem 815-459-4139
Ill Mount Prospect, Magnuson Elctrns. 312-956-0700
Mass Burlington, Heilind Elctrns..... 617-272-5610
Mass Waltham, Impact 617-893-2850
Mass Watertown, DRW Elctrns..... 617-923-1900
Mich Kentwood, R-M Elctrns. Co..... 616-531-9300
Minn Minneapolis, Industrial Comps. .. 612-831-2666
Mo St. Charles, Lectronix 800-325-3348
NJ Camden, Genral Radio 609-964-8560
NJ Clifton, J-Mar Elctrns 201-772-6400
NY Buffalo, Summit Distrs. 716-884-3450
NY Plainview, Progress Elctrns 516-433-1700
Ohio Beachwood, Sheridan Sls. Co. .. 216-831-0130
Ohio Reading, Sheridan Sls. Co. 513-761-5432
Pa Harrisburg, Pyttronic Inds.
Pa Montgomeryville, Pyttronic Inds. 215-643-2850
Pa Philadelphia, Almo Elctrns 215-698-4000
Tex Dallas, Solid State Elctrns. 214-352-2601
Tex Houston, Solid State Elctrns..... 713-785-5436
Va Lynchburg, Components Unlimited 804-384-6990
Wash Seattle, Almac/Stroum..... 206-763-2300
Wash Seattle, Radar Electric 206-282-2511

MOLON MOTORS & COIL CORP., Dept. EM, 3737 Industrial Ave., Rolling Meadows, Ill. 60008, Tel: 312-259-8700, TWX: 910-687-0428; Empl.: 350

Sales Manager: J. Bailey

Local Sales Offices & Reps.
Cal Torrance, O'Donnell & Assocs... 213-323-9243
Colo Denver, Parker Webster..... 303-770-1972
Conn Bloomfield, Zaslow Sls 203-242-7781
Minn Minneapolis, G. H. Hall Co. 612-537-4143
NY Buffalo, R.W. Mitscher Co..... 716-633-7970
NY Great Neck, Pacent/DiBlasi..... 516-482-4678
NC Raleigh, Rakes Mktg..... 919-787-1461
Ohio Cleveland, E.B. Kaercher 216-TE1-8098
Ohio Peppers Pike, Kaercher 216-831-8098
Pa Ardmore, Manreps..... 215-649-6300
Tenn Huntsville, Rakes Mktg 205-883-9260
Tex Dallas, ION Assocs. 214-357-9441

MONARCH MARKING SYS., Dept. EM, Box 608, Dayton, Ohio 45401, Tel: 513-866-7401; Empl.: 1200

Local Sales Offices & Reps.
Cal Garden Grove 714-893-0511
Cal San Leandro..... 415-351-7243
Ga Atlanta..... 404-691-5455
Ill Chicago..... 312-282-3900
Mass Framingham 617-879-5800
Mich Farmington 313-477-8800
NJ Fairfield 201-227-1855
NY New York 212-736-1715
NC Charlotte 704-535-0520
Ohio Centerville..... 513-433-4351
Tex Dallas 214-631-4890

MONITOR PRODS., Dept. EM, Box 1966, 502 Via Delmonte, Oceanside, Cal. 92054, Tel: 714-433-4510, TWX: 910-322-1381; Empl.: 80 ..... p. 2349

Local Sales Offices & Reps.
Ariz Phoenix, Eltron..... 602-997-1042
Cal Los Altos, S. Loeswick 415-948-3265
Cal San Diego, Rep Co..... 714-292-9001
Cal Sherman Oaks, Astrolonics 213-990-5903
Colo Denver, Electrodyne, Inc. 303-757-7679
Fla Indian Rock Bch., Tech. Rep. Assocs., Inc. 813-595-2834
Iowa Cedar Rapids, H. R. Brown Assoc. 319-366-0635
Md Towson, Kraft Elect Sls 301-828-5838
Mass Burlington, Tritek 617-272-4550
Minn Minneapolis, Elctrn. Innovators .. 612-884-7471
NY Melville, Astrorep..... 516-423-2266
NY N. Syracuse, Advanced Components 315-699-2671
Tex Addison, R. Thomas Co 214-233-8235
Utah Salt Lake City, Electrodyne, Inc. 801-277-8392

MOODY TOOLS, INC., Dept. EM, 1 Culver St., Providence, R.I. 02905, Tel: 401-421-5032; Empl.: 11

Sales Manager: J.H. Moody; *Distributor Manager:* J.H. Moody

Local Sales Offices & Reps.

Ala Birmingham, Henry W. Phillips Co. Inc. 205-967-5248
Cal Long Beach, L. P. Feeley & Assocs. 213-595-5421
Cal San Carlos, A. Williams ... 415-591-7043
Ga Roswell, Henry W. Phillips Co, Inc. 404-992-3070
Ill Palatine, Witz-Knight, Inc. ... 312-358-5990
Kans Lenexa, D.H. Donegan ... 913-888-8284
Md Baltimore, Coastline Sls. Co. ... 301-828-8520
Mich Ann Arbor, Hancock Sls. Co. ... 313-668-7916
Mo Chesterfield, Modern Mktg. ... 314-532-1794
NY New York, A. Mizner Assocs., Inc. 212-989-7227
NY Orchard Park, S & B Tech. Sls. 716-662-5988
NC Charlotte, Henry W. Phillips Co. Inc. 704-394-5544
Ore Portland, R. Minthorne Co. ... 503-246-4556
Pa Pittsburgh, F. Kostman ... 412-823-3430
Tex Arlington, C.W. Cortez Co. ... 817-429-6673

Local Distributors

Ala Huntsville, Mock Elctrns ... 205-539-2401
Alas Anchorage, Yukon Radio Supp ... 907-274-4823
Ariz Tempe, Jensen Tools & Alloys ... 602-968-6241
Ark Little Rock, Carlton-Bates ... 501-562-9100
Cal El Monte, Claude Michael ... 408-732-1100
Cal El Segundo, Wassco ... 213-640-1060
Cal San Jose, James Elctrn Tool ... 408-272-1818
Cal Santa Fe Springs, McMaster Carr Supp 213-945-1311
Colo Denver, Elctrn Parts ... 303-744-1992
Conn Groton, Air Tool Sls & Svc ... 203-673-2714
DC Washington, D.C., W. S. Jenks & Son 202-529-6020
Fla Palm Beach, Claude Michael Inc. 305-622-8590
Ga Chamblee, Wholesale Radio Supp 404-458-0106
Haw Honolulu, Indl Elctrns ... 808-533-6095
Ill Chicago, Newark Elctrns ... 312-638-4411
Ill Chicago, McMaster Carr Supp ... 312-281-1010
Ind Indianapolis, Graham Elctrns ... 317-634-8486
Iowa Cedar Rapids, Newark Elctrns ... 319-362-1171
Kans Kansas City, Claude Michael ... 913-648-6414
Ky Louisville, Peerless Elctrn Equip. Sls 502-636-3336
La Metaire, Newark Elctrns ... 504-888-5174
Md Baltimore, A S I Elctrns ... 301-265-5100
Mass Boston, Claude Michael ... 617-965-5310
Mass Hingham, Sager Elctrns Supp ... 617-749-6700
Mich Lansing, Fulton Radio Supp ... 517-394-5020
Mich Muskegon Hts., Reid Tool Supp 617-726-3561
Minn Duluth, Northwest Radio ... 218-727-1565
Mo Kansas City, Burnstein Applebee 816-756-2525
NJ Kenilworth, Newark Elctrns ... 201-272-8410
NJ Springfield, Route Elctrns ... 201-379-7710
NY Buffalo, Genesee Radio Parts ... 716-873-9661
NY Farmingdale, Claude Michael ... 516-293-4120
NY Jericho, Atlas West ... 516-333-5000
NY New York City, Hammel, Riglander & Co. 212-989-7950
NC Greensboro, Newark Elctrns ... 919-292-7240
Ohio Cincinnati, Hughes Peters ... 513-351-2000
Ohio Columbus, Hughes Peters ... 614-294-5351
Okla Oklahoma City, Newark Elctrns 405-840-2825
Ore Portland, Roger Minthorne ... 503-246-4556
Pa Plymouth Meeting, Techni-Tool ... 215-825-4990
RI Warwick, Newark Elctrns ... 401-738-4010
Tenn Cookeville, Randolph Parks ... 615-526-6184
Tex Dallas, Specialized Prods ... 214-358-4663
Tex Fort Worth, Allied Elctrns ... 312-421-2400
Utah Salt Lake City, Standard Supp ... 801-486-3371
Va Roanoke, Avec Elctrns ... 703-344-6288
Wash Seattle, Claude Michael ... 206-883-1084
Wisc Milwaukee, Parts Mart ... 414-276-1212

MORIRICA ELCTRNS., LTD., Dept. EM, 205 Tozuka-machi, Tozuka-Ku, Yokohama, Japan, Tel: 045-881-2331, Telex: 3822-433; Empl.: 350

Sales Manager: T. Kobori

Local Sales Offices & Reps.

Ill Skokie, Solar Systems Inc.
Wisc Dodgeville, Solar Sys. c/o Silicon Sensors 608-935-2707

MORRIS ENTPRS, Dept. EM, 16799 Schoenborn St, Sepulveda, Cal. 91343, Tel: 213-894-9103, TWX: 6-74681, 910-496-1525; FSC No.: 54918

Sales Manager: J. Dumpert

MORRIS, J.I. CO., Dept. EM, 372 Elm St., Southbridge, Mass. 01550, Tel: 617-764-4394; Empl.: 45

MOTOROLA, INC., Compt. Prods. Clock Oscillator Dept., Dept. EM, 2553 N. Edgington, Franklin Park, Ill. 60131, Tel: 312-451-1000, TWX: 910-227-0799 p. 2350

Sales Manager: Barnie Ill

Local Sales Offices & Reps.

Ala Huntsville, Glenwhite Assoc. ... 205-883-9394
Ariz Scottsdale, F. Board Assocs. ... 602-994-9388
Cal Downey, GROH Assoc. ... 213-923-0963
Cal San Carlos, Kottmeier Assocs. ... 415-592-8333
Fla Clearwater, Perrott Assoc. ... 813-585-3327
Fla Fort Lauderdale, Perrott Assoc. 305-792-2211
Fla Orlando, Perrott Assocs. ... 305-275-1132
Ill Franklin Park, Motorola, Inc. ... 312-451-1000
Ill Skokie, Mar-Con Assocs. ... 312-675-6450
Ind Indianapolis, Sheridan Assocs. ... 317-547-7777
Md Timonium, Glen White Assoc. ... 301-252-6360
Mass Natick, Wayland Engrg. Sls. ... 617-655-6080
Mich Brighton, S.A.I. Mktg ... 313-227-1786
Mo Florissant, S.A.I Mktg ... 314-837-5200
NY Bowmansville, Ossmann Comp. Sls. 716-681-9700
NY Kingston, Ossmann Comp. Sls. ... 914-338-5505
NY N.Y. Great Neck, Trionic Assoc. ... 516-466-2300
NY Rochester, Ossmann Comp. Sls. 716-442-3290
NY Syracuse, Ossmann Comp. Sls. 315-455-6611
NY Vestal, Ossmann Comp. Sls. ... 607-785-9949
NC Raleigh, Glen White Assoc. ... 919-787-7016
Ohio Beachwood, S.A.I Mktg. ... 216-292-2982
Ohio Centerville, S.A.T. Mktg ... 513-435-3181
Ohio Trotwood, S.A.I Mktg ... 513-435-3181
Okla Tulsa, H.J. Daly Co. ... 918-627-4159
Pa Bala Cynwyd, Vantage Sls. Co. 215-667-0990
Pa Pittsburgh, S.A.I. Mktg ... 412-782-5120
Tenn Johnson City, Barnhill Assocs. ... 615-928-0184
Tex Dallas, R.M. Electronics ... 214-233-0363
Tex Houston, R.M. Electronics ... 713-664-7131
Va Lynchburg, Glen White Assoc. ... 804-384-6920
Wash Bellevue, Electronic Sources ... 206-453-0800
Exp: Franklin Park, Ill., Motorola, Inc.. 312-451-1000

Local Distributors

Ala Huntsville, Hall-Mark Electrns. ... 205-837-8700
Ala Huntsville, Hamilton/Avnet Elctrns. 205-533-1170
Ariz Phoenix, Liberty Elctrns./Ariz. ... 602-257-1272
Ariz Phoenix, Harnilton/Avnet Elctrns. 602-275-7851
Cal El Segundo, Liberty Elctrns. ... 213-322-8100
Cal Irvine, Cramer/Los Angeles ... 213-771-8300
Cal Los Angeles, Hamilton Electro Sls. 213-558-2121
Cal Mountain View, Elmar Elctrns. ... 415-961-3611
Cal Mountain View, Hamilton/Avnet Elctrns. 415-961-7000
Cal San Diego, Liberty Elctrns./San Diego 714-565-9171
Cal San Diego, Hamilton/Avnet Elctrns. 714-279-2421
Cal Sunnyvale, Cramer/San Francisco 408-739-3011
Colo Commerce City, Elmar Elctrns. ... 303-287-9611
Colo Denver, Hamilton/Avnet Elctrns. 303-534-1212
Conn Danbury, Schweber Elctrns. ... 203-792-3500
Conn Georgetown, Hamilton/Avnet Elctrns. 203-762-0361
Conn North Haven, Cramer/Conn. ... 203-239-5641
Fla Hollywood, Cramer/Hollywood ... 305-923-8181
Fla Hollywood, Hamilton/Avnet Elctrns. 305-925-5401
Fla Hollywood, Schweber Elctrns. ... 305-927-0511
Fla Orlando, Cramer/Orlando ... 305-894-1511
Ga Atlanta, Cramer/Atlanta ... 404-448-9050
Ga Norcross, Hamilton/Avnet Elctrns. 404-448-0800
Ill Chicago, Newark Elctrns. Corp. 312-638-4411
Ill Chicago, Semiconductor Specialists 312-279-1000
Ill Elk Grove Village, Schweber Elctrns. 312-593-2740
Ill Mount Prospect, Cramer/Chicago 312-593-8230
Ill Schiller Park, Hamilton/Avnet Elctrns. 312-678-6310
Ind Indianapolis, Pioneer/Indianapolis 317-849-7300
Ind Indianapolis, Graham Elctrns. Supply 317-634-8202
Kans Lenexa, Hamilton/Avnet Elctrns. 913-888-8900
Md Gaithersburg, Pioneer/Wash. Elctrns. 301-948-0710
Md Hanover, Hamilton/Avnet Elctrns. 301-796-5000
Md Rockville, Schweber Elctrns. ... 301-881-3300
Md Rockville, Cramer/Wash. ... 301-948-0110
Md Savage, Pyttronic Inds. ... 301-792-7000
Mass Burlington, Hamilton/Avnet Elctrns. 617-273-2120
Mass Lexington, Harvey Elctrns. ... 617-861-9200
Mass Newton Centre, Cramer Elctrns. 617-969-7700
Mass Waltham, Schweber Electronics 617-890-8484
Mich Detroit, RS Elctrns. ... 313-491-1012
Mich Livonia, Hamilton/Avnet Elctrns. 313-522-4700
Mich Livonia, Pioneer/Detroit ... 313-525-1800
Minn Edina, Cramer/Minneapolis ... 612-835-7811
Minn Edina, Hamilton/Avnet Elctrns. ... 612-941-3801
Minn Edina, Schweber Elctrns. ... 612-941-5280
Mo Hazelwood, Hamilton/Avnet Elctrns. 314-731-1144
Mo St. Louis, Hall-Mark Elctrns. ... 314-291-5350
NJ Cedar Grove, Hamilton/Avnet Elctrns. 201-239-0800
NJ Cherry Hill, Cramer/Pennsylvania 609-424-5993
NJ Moorestown, Arrow Elctrns. ... 609-235-1900
NJ Mt. Laurel, Hamilton/Avnet Elctrns. 609-234-2133
NJ Pennsauken, Radio Electric Svc. Co. 609-662-4000
NJ Somerset, Schweber Elctrns. ... 201-469-6008
NM Albuquerque, Hamilton/Avnet Elctrns. 505-765-1500
NY East Syracuse, Hamilton/Avnet Elctrns. 315-437-2642
NY East Syracuse, Cramer/Syracuse 315-437-6671
NY Farmingdale, Arrow Elctrns. ... 516-694-6800
NY Hauppauge, Cramer/L.I. ... 516-231-5600
NY Rochester, Hamilton/Avnet Elctrns. 716-442-7820
NY Rochester, Schweber Elctrns. ... 716-461-4000
NY Rochester, Cramer/Rochester ... 716-275-0300
NY Westbury, Hamilton/Avnet Elctrns. 516-333-5800
NY Westbury, Schweber Elctrns. ... 516-334-7474
NY Woodbury, Harvey Elctrns. ... 516-921-8700
NC Winston-Salem, Cramer/Winston-Salem 919-725-8711
Ohio Beachwood, Schweber Elctrns. ... 216-464-2970
Ohio Cleveland, Hamilton/Avnet Elctrns. 216-461-1400
Ohio Cleveland, Pioneer-Standard Elctrns. 216-587-3600
Ohio Dayton, Hamilton/Avnet Elctrns. 513-433-0610
Ohio Dayton, Pioneer/Dayton ... 513-236-9900
Ohio Solon, Cramer/Cleveland ... 216-248-8400
Pa Philadelphia, Pioneer/Philadelphia 215-674-5710
Pa Pittsburgh, Cameradio ... 412-288-2600
Pa Pittsburgh, Pioneer/Pittsburgh ... 412-782-2300
SC Columbia, Dixie Radio Supply Co. 803-253-5333
Tex Dallas, Sterling Elctrns. ... 214-357-9131
Tex Dallas, Hall-Mark Elctrns. Corp. 214-231-6111
Tex Dallas, Schweber Elctrns. ... 214-661-5010
Tex Dallas, Hamilton/Avnet Elctrns. ... 214-661-8661
Tex El Paso, Midland Specialty Co. ... 915-533-9555
Tex Houston, Hamilton/Avnet Elctrns. 713-526-4661
Tex Houston, Hall-Mark Elctrns. ... 713-781-6100
Tex Houston, Sterling Elctrns. ... 713-627-9800
Utah Salt Lake City, Hamilton/Avnet Elctrns. 801-262-8451
Utah Salt Lake City, Cramer/Utah ... 801-487-4131
Wash Bellevue, Hamilton/Avnet Elctrns. 206-746-8750
Wash Seattle, Almac/Stroum Elctrns. ... 206-763-2300
Wash Seattle, Liberty Elctrns. Corp. ... 206-763-8200
For: Can., Edmonton, Alb., Bowtek Electric 403-426-1072

MOTOROLA SEMICONDUCTOR PRODS., M370, Dept. EM, Box 20912, Phoenix, Ariz. 85036, Tel: 602-244-6900, TWX: 910-951-1334

Local Sales Offices & Reps.

Ala Huntsville ... 205-533-1650
Ariz Phoenix ... 602-994-6326
Cal Orange ... 714-634-2844
Cal San Diego ... 714-560-4644
Cal San Jose ... 408-985-0510
Cal Sherman Oaks ... 213-986-6850
Colo Denver ... 303-773-6800
Conn Hamden ... 203-281-0771
DC Washington ... 301-577-2600
Fla Altamonte Springs ... 305-831-3422
Fla Ft. Lauderdale ... 305-491-8141
Fla St. Petersburg ... 813-576-6030
Ga Atlanta ... 404-394-6627
Ill Park Ridge ... 312-576-2600
Ind Ft. Wayne ... 219-484-0436

Ind Indianapolis ... 317-849-7060
Iowa Cedar Rapids ... 319-377-9439
Kans Mission ... 913-384-3050
Md Lanham ... 301-577-2600
Mass Lexington ... 617-861-1350
Mich Saugatuck ... 616-857-2159
Mich Westland ... 313-261-6200
Minn Minneapolis ... 612-545-0251
Mo St. Louis ... 314-872-7681
NJ River Edge ... 201-488-1200
NY Fishkill ... 914-896-8970
NY Hauppauge ... 516-231-9000
NY Rochester ... 716-381-7220
NY Syracuse ... 315-454-9373
NC Raleigh ... 919-782-7604
Ohio Cleveland ... 216-461-3160
Ohio Dayton ... 513-294-2231
Ohio Worthington ... 614-846-9460
Okla Tulsa ... 918-664-5227
Ore Portland ... 503-297-2235
Pa Ft. Washington ... 215-643-4500
Tenn Knoxville ... 615-690-5592
Tex Austin ... 512-452-7673
Tex Dallas ... 214-661-9829
Tex Houston ... 713-688-4583
Va Charlottsville ... 804-977-3691
Wash Kirkland ... 206-827-4681
Wisc Wauwatosa ... 414-476-5554

MOXON INC., Dept. EM, 2222 Michelson Dr. Bldg. E, Irvine, Cal. 92715, Tel: 714-833-2000, TWX: 910-596-1362; FSC No.: 62767; Empl.: 85

Sales Manager: R. C. Edmunds; *Distributor Manager:* R. C. Edmunds

Local Sales Offices & Reps.
Ala Huntsville, Int'l. Scientific Instrs. 205-533-6880
Cal Los Angeles, Moore Etprs ... 805-259-5983
Cal Santa Clara, Moore Entrprs ... 805-259-5983
Colo Boulder, PAR Associates ... 303-499-4736
Fla Orlando, Truex Assocs. ... 305-859-2160
Ill Arlington, Dytech Central, Inc. ... 312-394-3380
Md Rockville, Farrell Assocs. ... 301-424-9460
Mass Stoneham, Ken Corp. ... 617-438-5464
Mich Southfield, Electro Sls. Assocs. ... 313-424-9075
Mo St. Louis, Dytech South, Inc. ... 314-423-9595
NJ Paramus, SDM Rep, Inc. ... 201-368-0123
NM Albuquerque, Rustco Enterprises 505-296-6474
NY Rochester, SDM Rep, Inc. ... 716-544-8080
NC Winston Salem, Int'l. Scientific Instrs. 919-722-1783
Ohio Cleveland, Electro Sls. Assocs. ... 216-261-5440
Ohio Dayton, Electro Sls. Assocs. ... 513-426-5551
Pa Jenkintown, Stein Instrumentation Corp. 215-885-2370
Tex Dallas, COMSPEC, Inc. ... 214-234-4137
Tex Houston, COMSPEC, Inc. ... 713-461-4487
Wash Seattle, R. Drake Assocs. ... 206-763-2755

MPC PRODS. CORP., Dept. EM, 4200 W. Victoria Ave., Chicago, Ill. 60646, Tel: 312-583-5100, TWX: 910-221-2576; Empl.: 115

MRC ALARM SYSTEMS & DEVICES CO., Dept. EM, 700 W. Virginia St., Milwaukee, Wisc. 53204, Tel: 414-271-4343; Empl.: 16

Sales Manager: C. F. Isonhart

Local Sales Offices & Reps.
Cal San Francisco, P. Flanagan ... 415-282-0840
Cal Westlake Village, K. Jensen ... 213-889-1606
Ga Chamblee, R. J. Shafer ... 404-458-7483
Haw Honolulu, J. J. Harding Co., Ltd. 808-841-0941
Ky Versailles, J. Range ... 606-873-3278
Mont Great Falls, H. James Dist. ... 406-761-2420
NY New York, R. Policastro ... 212-762-6262
Pa Bala-Cynwyd, M. Friedman Assocs. 215-839-3450

MSI ELECTRONICS, INC., Dept. EM, 34-32 57th St., Woodside, N.Y. 11377, Tel: 212-672-6500; FSC No.: 18518; Empl.: 14

Sales Manager: A. Lederman

Local Sales Offices & Reps.
Cal Mt. View, Tri-Rep ... 415-965-1822
Cal Norco, Land and Co. ... 714-734-6338
Fla Lighthouse Point, R. C. Simon ... 305-941-2757
Ill Crystal Lake, Mesa, Inc. ... 815-459-8850
Ind Ft. Wayne, Menze Sls. Inc. ... 219-747-5616
Mass Waltham, Stone Comp Sls ... 617-890-1440
NJ Spring Valley, R. Smith Assocs. 914-354-6067
NY Plainview, R. Smith Assocs. ... 516-681-3155
Pa Jenkintown, Arnold Assocs. ... 215-887-7870
Tex Richardson, C. Tinch Sls. Co. ... 214-231-1322
Va Alexandria, Potomac Elctrns. ... 703-836-1630
Wash Tukwila, General Elctrns. ... 206-575-4030
Wash Vancouver, General Elctrns. ... 206-693-0025
Exp: Woodside, New York, MSI Elctrns. Inc. 212-672-6500

MTS SYSTEMS CORP., Dept. EM, Box 24012, Minneapolis, Minn 55424, Tel: 612-944-4000; Empl.: 500

Sales Manager: K. Floren

Local Sales Offices & Reps.
Cal Downey, MTS Sys ... 213-861-7315
Colo Littleton, MTS Sys ... 303-798-4833
Ga Atlanta, MTS Sys ... 404-451-7803
Ill Spring Grove, MTS Sys ... 312-497-3250
Mass Foxboro, MTS Sys ... 617-543-7763
Mass Westborough, MTS Sys ... 617-366-5532
Mich Bloomfield Hills, MTS Sys ... 313-645-9506
Minn Minneapolis, MTS Sys ... 612-944-4129
Mo St. Charles, MTS Sys ... 314-946-7634
Ohio Dayton, RDP Assocs ... 513-253-6175
Ore Portland, Brett-Ross Inc ... 503-232-4184
Pa Doylestown, MTS Sys ... 215-345-7260
Pa Monroeville, MTS Sys ... 412-325-4475
Tex Lewisville, MTS Sys ... 214-221-1312
Va Alexandria, MTS Sys ... 703-549-0898
Exp: Can., Newmarket, Ont, MTS Sys 416-895-7000
Wash Seattle, Brett-Ross Inc ... 206-935-8054

MU-DEL ELCTRNS., Dept. EM, 2426 Linden La., Silver Spring, Md. 20910, Tel: 301-587-6087; FSC No.: 31563; Empl.: 6

Sales Manager: I. Kuzminsky

Local Sales Offices & Reps.
Ala Huntsville, Anderson Assocs. ... 205-881-6770
Cal Woodland Hills, Interstate Mktg. Assoc. 213-883-7606
Colo Boulder, G. Moore Assocs. ... 303-494-7875
Fla Orlando, Unirep ... 305-295-4817
Haw Honolulu, Aloha Assoc. ... 808-941-1574
Ind Indianapolis, Advanced Comp. Sls. 317-545-6441
Md Greenbelt, Riffe Assocs. ... 301-474-8600
Mass Wakefield, Nerem ... 617-245-4426
NM Albuquerque, Grady Moore Assocs. 505-292-3322
Tex Arlington, J. T. Houston Assoc. ... 817-265-2931
Exp: N.Y., New York, Technitron ... 212-758-2790
Exp: Stamford, Microwave Intl Corp. ... 203-322-6911

MUELLER ELECTRIC, Dept. EM, 1583 E 31st St. Dept. 20, Cleveland, Ohio 44114, Tel: 216-771-5225; Empl.: 156 ... p. 2086,2087

Sales Manager: E.H. deConingh Jr.

Local Sales Offices & Reps.
Ala Hunstville, Cartwright & Bean ... 205-533-3509
Ariz Phoenix, Maddox Sls. Co. ... 602-274-3807
Cal Pico Rivera, Maddox Sls. Co. ... 213-949-5433
Cal San Francisco, Maddox Sls. Co. 415-647-5560
Colo Denver, L B Putnam Co. ... 303-825-5066
Fla Ft. Lauderdale, Cartwright & Bean 305-791-3989
Fla Orlando, Cartwright & Bean ... 305-422-4531
Ga Atlanta, Cartwright & Bean ... 404-255-5262
Ill Libertyville, R. Klipp Assocs. ... 312-362-4676
Ind Indianapolis, Sukup & Cox Inc. .. 317-253-5501
Kans Shawnee Mission, K & M Sls. Co. 913-262-1444
Mass Lynn, Keene Sls. Co. ... 617-595-2300
Mich Ferndale, Hilltronics Inc. ... 313-398-5556
Minn Minneapolis, Electronic Comp. Sls. 612-933-2594
Miss Jackson, Cartwright & Bean ... 601-981-1368
NY Buffalo, R W Mitscher Co. ... 716-633-7970
NY Port Washington, Joseph Assocs. 516-883-7770
NC Charlotte, Cartwright & Bean ... 704-377-5673
NC Raleigh, Cartwright & Bean ... 919-781-6560
Ohio Columbus, Mandabach-Lehner Co. 614-235-0265
Ore Portland, Richard Legg Co. ... 503-292-8824
Pa Easton, Kaiser Assocs. ... 215-258-6477
Tenn Knoxville, Cartwright & Bean ... 615-693-7450
Tenn Memphis, Cartwright & Bean ... 901-276-4442
Tex Waco, Allied Western Co. ... 817-776-3236
Utah Salt Lake City, L B Putnam Co. 801-277-0375
Exp: Can., Toronto, Downsview, W H Cooper & Co. 416-630-3900

MULTI-ELMAC CO., Dept. EM, 22700 Heslip Dr., Novi, Mich. 48050, Tel: 313-349-3990; Empl.: 200

Local Sales Offices & Reps.
Cal Orange, Multi-Elmac Co. ... 714-997-1251
Mich Linden, R. Zerull ... 313-735-7497
Mo Marshall, T.J. McCune ... 816-886-5308
Pa Morrisville, E.F. Weiss ... 215-295-8254
Tex Rockwall, Southwestern Sls. Co. 214-722-6515

MULTIMETRICS DIV. OF COMSTRO, Comstron-Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11580, Tel: 516-546-9700, TWX: 510-225-3699; Empl.: 53

Sales Manager: L. J. Borow, V.P. Sls

Local Sales Offices & Reps.
Ariz Scottsdale, Measurement Consits. 602-994-9519
Cal Signal Hill, Saber Entprs. ... 213-595-5646
Colo Boulder, Measurement Consits. 303-499-5294
Conn Hamden, J & J Assocs. ... 203-624-7800
Fla Longwood, Saber Assocs. ... 800-432-3007
Fla Pompano Beach, Saber Assocs. 800-432-3007
Ga Dunwoody, Saber Assocs. ... 800-327-1181
Kans Shawnee Mission, EIR Co. ... 913-362-0919
Mass Winchester, J & J Assocs. ... 617-729-5770
Mo Hazelwood, EIR Co. ... 314-895-4100
NJ Woodcliff Lake, F & F Assocs
NM Las Cruces, Measurement Consits. 505-265-6471
NY Hicksville, F & F Assocs. ... 516-935-1100
NY Skaneateles, Robtron, Inc. ... 315-685-5731
NC Raleigh, Saber Assocs. ... 800-327-1181
Tex Pasadena, Scientific Devices - Gulf Coast 713-475-0328
Tex Richardson, Scientific Devices SW 214-231-8106
Tex San Antonio, Scientific Devices SW 512-736-3184
Utah Salt Lake City, Measurement Consits. 801-364-3174
Wash Bellevue, Kevin Hall Assocs. ... 206-455-5526
Exp: Can., Ottawa, Ont., Comtest Communications Prods. ... 613-828-5236

MULTI-TRONIX, Dept. EM, 3210 Terry Dr, Toledo, Ohio 43613, Tel: 419-472-0723

Sales Manager: K. L. Schepler

Local Sales Offices & Reps.
Ga Atlanta, Scientific Sls ... 404-252-6808
Ohio Cleveland, G & S Electrical Sls 216-333-2020

MULTIWIRE DIV., KOLLMORGEN, Dept. EM, 31 Sea Cliff Ave, Glen Cove, NY 11542, Tel: 516-448-1000, TWX: 516-671-3155; Empl.: 850

Local Sales Offices & Reps.
Cal Anaheim, Multiwire/West ... 714-991-6030
NH Nashua, Multiwire/New England 603-889-0083
NY Glen Cove, Multiwire/New York 516-448-1117

MUPAC CORP., Dept. EM, 646 Summer St., Brockton, Mass. 02402, Tel: 617-588-6110, TWX: 710-345-0194; Empl.: 70

Local Sales Offices & Reps.
Ala Huntsville, Currie, Peak & Frazier 205-536-5650
Ariz Tempe, Grady Moore Assocs ... 602-829-3458
Cal Glendale, Orion Sls ... 213-240-3151
Cal San Diego, Mupac Corp ... 714-271-1121
Cal Tustin, Orion Sls ... 714-832-9687
Colo Boulder, Grady Moore Assocs .. 303-494-3351
Conn North Haven, Forsberg Sls. ... 203-239-5111
Fla Orlando, Currie, Peak & Frazier 305-855-0843
Ill Elk Grove Village, Loren Green Assocs. 312-593-0282
Ill Mt. Prospect, R. M. Krueger Co. 312-398-6018
Md Columbia, Rep-Tron ... 301-465-6433
Mass Brockton, Forsberg Sls. ... 617-522-6300
Mich Northville, Micro Sls Corp ... 313-482-1229
Minn Minneapolis, L.F. Green Assoc. ... 612-781-1611
Mo Blue Springs, Chesco ... 816-229-1404
Mo St. Charles, Chesco ... 314-946-6677
NJ Englewood, Eastern Instrumentation 201-567-9505
NM Albuquerque, Grady Moore Assocs 505-262-1416
NY No. Tonawanda, Labtronics ... 716-693-2257
NY Syracuse, Labtronics, Inc. ... 315-454-9314
NY Ulster Park, Labtronics ... 914-338-8929
NC Greensboro, Currie, Peak & Frazier 919-273-3040
Ohio Cleveland, Micro Sls Corp ... 216-331-0900
Ohio Dayton, Micro Sls Corp ... 513-433-8171
Pa King of Prussia, Rivco ... 215-265-5211
Tex Houston, Lear Assocs ... 713-686-1838
Tex Richardson, Lear Assocs ... 214-231-5388
Wash Bellevue, Comtec ... 206-453-1188

MURA CORP., Dept. EM, 177 Cantiague Rock Rd, Westbury, NY 11590, Tel: 516-935-3640, Telex: 96-7879; Empl.: 25

Sales Manager: E. Weisl, V.P., Sls.

MURATA CORPORATION OF AMERICA, Dept. EM, 1148 Franklin Rd., S.E., Marietta, Ga. 30067, Tel: 404-952-9777, TWX: 54-2329, 810-766-1531; Empl.: 190

Sales Manager: G. Beylouny

Local Sales Offices & Reps.

Ala	Huntsville, 20th Century Mktg.	205-772-9237
Ariz	Tempe, Argus Sls.	602-967-8709
Cal	Costa Mesa, MCA - Los Angeles	714-754-6660
Cal	Los Altos, Recht. Assocs.	415-941-0336
Colo	Denver, Omega Ltd.	303-758-1508
Conn	Ridgefield, Phoenix Sls	203-438-9644
Fla	Plantation, Innovative Mktg.	305-581-7517
Ill	Chicago, MCA Chicago	312-992-2090
Ind	Indianapolis, Jack W. Harvey Assoc.	317-297-1441
Kans	Prairie Village, Engrg. Svcs. Co.	913-649-4000
Mass	Framingham, MCA Boston	617-872-4843
Mich	Southfield, Luebbe Sls. Co.	313-357-0355
Minn	Golden Valley, Beta Engrg. Corp.	612-546-2215
Mo	St. Louis, Engrg. Svcs. Co.	314-997-1515
NJ	North Caldwell, Masin Esco	201-226-2550
NY	Rochester, R. P. Kennedy Co.	716-271-6322
NC	Charlotte, W. L. Moorhead & Co	704-364-4820
Ohio	Cincinnati, Luebbe Sls. Co.	513-871-4211
Ohio	Cleveland, Luebbe Sls. Co.	216-333-0425
Pa	Willow Grove, H. Nash Asssoc.	215-657-2213
Tex	Dallas, United Comps.	214-324-1448
Utah	Salt Lake City, Omega Ltd.	801-278-6920
Wash	Seattle, H. Levinson	206-323-5100
Wisc	Milwaukee, JM Sls	414-546-0040

MURATA MFG. CO. LTD., Dept. EM, 16, Kaiden Nishijin-cho, Nagaoka-Kyo-Shi, Kyoto, Japan, Tel: 075-921-9111; Empl.: 1700

Local Sales Offices & Reps.

Ga	Marietta, Murata Corp. of America	404-422-9777
Ill	Chicago, Murata Corp. of America	312-992-2090
NY	Elmsford, Murata Corp. of America	914-592-9180

MUSHIELD CO., Dept. EM, 121 Madison St., Malden, Mass. 02148, Tel: 617-321-4410; FSC No.: 22780 p. 2567

Sales Manager: Mark Standley

Local Sales Offices & Reps.

Ala	Huntsville, 20th Century Mktg	205-772-9237
Cal	Burlingame, Polach & Bensinger	415-697-2525
Cal	Sunnyvale, Polach & Bensinger	408-739-8920
Ill	Chicago, Roepek & Cahill	312-631-0070
Mass	Malden, Owen Haszard	617-321-4410
NJ	Union, Pacent-DiBlasi, Inc.	201-687-6914
NY	Great Neck, Pacent-DiBlasi	516-482-4040
NY	Rochester, Dan Hurley Sales	716-586-6159
NY	Syracuse, Dan Hurley Sales	315-457-1180
Tex	Houston, Air Quip Robelyco, Inc.	713-376-6611
Tex	Richardson, Air Quip Robelyco, Inc.	214-234-3285
Exp:	Lakehurst, N.J., Technical Equipment Co.	201-349-1716

MVP ELECTRONICS, Dept. EM, 1161 N. Tustin, Orange, Cal. 92667, Tel: 714-639-9246; Empl.: 2

Sales Manager: P. Vander Plaats

Local Sales Offices & Reps.

NM	Albuquerque, Thorson Co	505-265-5655

Advertisement

We specialize in high frequency logarithmic and feedback amplifiers. Our product line includes video Logarithmic amplifiers with an 80 Db dynamic range, and a frequency response of 40 Mhz. Feedback amplifiers include variable gain amplifiers which are digitally programmable. Both standard and custom designs are available.

MYLEE DIGITAL SCIENCES, Dept. EM, 155 Weldon Pkwy., Maryland Heights, Mo. 63043, Tel: 314-567-3420; Empl.: 100

Sales Manager: G. Graves

Local Sales Offices & Reps.

Alas	Anchorage, Alaska Digital	907-272-4414
Fla	Longboat Key, Mylee Digital Sciences	813-383-1424
Ga	Atlanta, H & B Office Machines	404-872-4236
Ind	Jasper, Ohio Valley Sound	812-482-3535
Iowa	West Des Moines, Electronic Business Sys., Inc.	515-225-2489
La	Gretna, Delta Business Machines	504-368-3402
Md	Towlson, Natl. Business & Security Sys.	301-296-0600
Mass	Boston, Systems Automation, Inc.	617-246-1620
Mich	Ann Arbor, Data Machines Corp.	313-761-0450
Minn	Minneapolis, Information Products, Inc.	612-721-6391
Miss	Clinton, Regional Sls. Corp.	601-924-5696
Mo	St. Louis, Mylee Digital Sciences	314-567-3420
NY	Rochester, Business Machines of NYS	716-271-2010
NC	Raleigh, G. Conner	919-876-1830
Tenn	Memphis, Automation Inc.	901-396-7248
Tex	Dallas, Selectronic Inventory Sys.	214-363-2531
Va	Norfolk, American Business Mach.	804-461-2602

NAMCO CONTROLS, Acme-Cleveland Co., Dept. EM, 170 E. 131st St., Cleveland, Ohio 44108, Tel: 216-268-4200; Empl.: 200

Local Sales Offices & Reps.

Cal	Thousands Oaks	213-937-3881
Fla	Ft. Lauderdale	305-974-2500
Ga	Roswell, 404-427-0241	404-993-0389
Ill	Chicago	312-693-3745
La	Kenner	504-722-6363
Mass	Danvers	617-777-0450
Mich	Detroit	313-357-5414
Mo	Kansas City	816-781-3770
Mo	St. Louis	314-965-5880
NJ	Montclair	201-835-6222
NC	Charlotte	704-392-2155
Ohio	Cincinnati	513-271-1530
Ohio	Cleveland	216-942-1496
Ohio	Jefferson	216-576-4074
Ohio	Tiffin	419-447-1291
Ore	Gresham	503-226-1907
Pa	Philadelphia	215-563-0878
Tex	Dallas	214-363-8900
Tex	Houston	713-464-4662
Wisc	Walworth	416-675-7760

NAN MAC, Dept. EM, 9 Mayhew St., Framingham, Mass. 01701, Tel: 617-872-4811; Empl.: 22

Sales Manager: C. Alex; *Distributor Manager:* J. Manigian

NARDA MICROWAVE CORP., Dept. EM, Plainview, N.Y. 11803, Tel: 516-433-9000, TWX: 510-221-1867; FSC No.: 99899; Empl.: 328

Sales Manager: R. Nopper

Local Sales Offices & Reps.

Cal	Menlo Pk., Straube Assocs.	415-321-9050
Cal	Woodland Hills, Interstate Mktg. Assocs.	213-883-7606
Colo	Denver, Fry-Gates Inc.	303-756-9886
Fla	Orlando, E.G. Holmes & Assocs.	305-894-8901
Ga	Chamblee, E.G. Holmes & Assocs.	404-451-6161
Ill	Chicago, Scientific Sls. Co.	312-775-7594
Ind	Indianapolis, Scientific Sls. Co.	317-253-4606
Kans	Shawnee Mission, EIR Co.	913-362-0919
Md	Rockville, Elctrn. Mktg. Assocs.	301-881-5300
Mass	Burlington, Tritek, Inc.	617-272-4550
Mich	Northville, Micro Sls. Corp.	313-459-1670
Minn	Bloomington, Scientific Sls. Co.	612-881-3300
Mo	Leasburg, EIR Co.	314-895-4100
NJ	Cherry Hill, Megargel/Himmelstein Assoc.	609-779-0200
NJ	Westfield, Gray & Reed Assoc., Inc.	201-233-6116
NM	Albuquerque, IMEC	505-883-9010
NY	E. Syracuse, Ossmann Instrs., Inc.	315-437-6666
NY	Huntington Sta., Gray & Reed Assoc.	516-433-3333
Ohio	Centerville, Micro Sls. Corp.	513-433-8171
Ohio	Cleveland, Micro Sls. Corp.	216-331-0900
Okla	Oklahoma City, Data Mktg. Assocs.	405-528-6071
Tex	Austin, Data Mktg. Assocs.	512-451-5174
Tex	Dallas, Data Mktg. Assocs.	214-661-0300
Tex	Houston, Data Mktg. Assocs.	713-780-2511
Tex	San Antonio, Data Mktg. Assocs.	512-828-0937
Utah	Salt Lake City, Fry-Gates Inc	801-227-0523
Va	Virginia Beach, E.G. Holmes & Assocs.	804-481-6556
Wash	Seattle, SJI Corp.	206-624-9020

NATEL ENGINEERING CO., Dept. EM, 8954 Mason Ave., Canoga Park, Cal. 91306, Tel: 213-882-9620, TWX: 910-494-1959; Empl.: 48 p. 1656

Sales Manager: Ed Berman, Mktg. Mgr.

Local Sales Offices & Reps.

NY	Westbury, J Square Mktg., J. Alford	516-997-6210
Tex	Dallas, Bonser-Philhower	214-234-8438
Tex	Houston, Bonser-Philhower	713-467-4373

NAT'L. BAND & TAG, Dept. EM, 721 York St., Newport, Ky. 41072, Tel: 606-261-2035; Empl.: 50

NATIONAL CAMERA INC., Dept. EM, 2000 W. Union Ave., Englewood, Colo. 80110, Tel: 303-789-1893; Empl.: 65

Sales Manager: A. McLendon, V.P. Mktg.

NATIONAL CAPACITOR SUPPLY, Dept. EM, 11731 Markon Dr, Garden Grove, Cal. 92641, Tel: 213-598-9611, TWX: 910-596-1316; Empl.: 49

Sales Manager: S. Bromberg, VP Sls/Mktg; *Distributor Manager:* R. Ostlie

Local Sales Offices & Reps.

Ala	Huntsville, JHU Assocs.	205-536-7455
Cal	Garden Grv., National Capacitor Supply	714-892-7749
Cal	San Jose, Silicon Valley Sls.	408-997-1493
Cal	San Jose, Silicone Valley Sls.	213-598-9611
Fla	Satellite Beach, Reynolds Assoc	305-773-4700
Ill	Chicago, LGS	312-456-9616
Md	Baltimore, JMS Elctrns.	301-788-8211
Mass	Burlington, Tri-Com Assocs.	617-272-8163
Mich	Grand Rapids, R. P. Urban & Assocs.	616-245-0511
Minn	Minneapolis, Components Group	612-824-4222
NY	Syracuse, MMI Sls.	315-455-5919
Ohio	Cleveland, J. Finnegan & Co.	216-826-1033
Tex	Arlington, D/FW Sls. Co.	817-461-0681

Local Distributors

Cal	Garden Grove, Natl Capacitory Supply	714-892-7749

NAT'L CERAMIC CO., Dept. EM, 500 Southard St., Trenton, N.J. 08602, Tel: 609-394-5373; Empl.: 60

Local Sales Offices & Reps.

Conn	Simsbury, Curtis M. Billard & Co.	203-658-7200
Iowa	Cedar Rapids, J. R. Sls. Engr.	319-393-2232
Mich	Spring Lake, Walch Engrg Co.	616-846-2944
NY	Liverpool, Wadsworth Mfg. Assocs.	315-652-6865

NATIONAL ELECTRONIC SUPPLY, INC., see National Capacitor Supply

NATIONAL ELECTRONICS, Div. Varian Assoc. Inc., Dept. EM, Box 269, Geneva, Ill. 60134, Tel: 312-232-4300, TWX: 910-237-1685; Empl.: 400

Sales Manager: R. Mackowak

Local Sales Offices & Reps.

Cal	Marina Del Ray	213-822-8026
NJ	Springfield	201-467-8020
Ohio	Euclid	216-261-2115

NATIONAL INSTRUMENTS, Dept. EM, 83330 Burnet Rd., Austin, Tex 78758, Tel: 512-453-3475

Sales Manager: Vern Bode

Local Sales Offices & Reps.

Ala	Huntsville, Pen-Tech	205-533-0090
Ariz	Scottsdale, BFA Corp, Ariz	602-994-5400
Cal	Pasadena, Beckrep	213-799-9586
Cal	Sunnyvale, Beckrep	408-268-3205
Colo	Denver, BFA Corp, Ariz	303-837-1247
Conn	Hamden, J & J Assoc.	203-624-7800
Fla	Deerfield Beach, Pen-Tech	305-421-4989
Fla	Maitland, Pen-Tech	305-645-3444
Ga	Atlanta, Pen-Tech	404-955-0293
Iowa	Cedar Rapids, Palantine Sls	319-365-8071
Kans	Derby, Palantine Sls	316-788-0621
Kans	Lenexa, Palantine Sls	913-492-7020
Mo	Hazelwood, Palantine Sls.	314-895-4577
NM	Albuquerque, BFA Corp, Ariz	505-292-1212
NM	Las Cruces, BFA Corp, Ariz	505-523-0601
NC	Highpoint, Pen-Tech	919-883-9125
Utah	Salt Lake City, BFA Corp, Amer	801-466-6522

NATIONAL MICRONETICS, Dept. EM, Route 28, West Hurley, NY 12136, Tel: 914-338-0333; Empl.: 350

Sales Manager: P. A. Rivelli

NATIONAL SECURITY SYSTEMS, Dept. EM, 20 Beechwood Ave., Port Washington, N.Y. 11050

NATIONAL SEMICONDUCTORS, LTD., Dept. EM, 331 Cornelia St., Plattsburgh, N.Y. 12901, Tel: 518-561-3160, TWX: 610-421-3362; Empl.: 150 p. 3138

Sales Manager: Duncan F. Clifton

Local Sales Offices & Reps.

Ala	Huntsville, Glen White Associates	205-883-9394
Ariz	Phoenix, KCE Corp.	
Cal	San Gabriel, Van Gott & Assocs.	213-285-2148
Conn	North Haven, Forsberg Sls	203-239-5111
Fla	Boynton Beach, Tech-Rep Assocs	305-737-6940
Fla	Indian Rocks Beach, Tech-Rep Assocs.	813-595-2834
Ill	Addison, Hill Sls. Corp.	312-543-4111
Kans	Overland Park, Kebco	913-649-2168
Md	Timonium, Glen White Assoc. Inc.	301-252-6360
Mass	Wollaston, RFC Assocs	617-472-4234
Mich	Farmington, Davis-Martensen Co.	313-474-8300
Minn	St. Paul, Northport Engrg.	612-698-3841
Mo	St. Louis, Kebco	314-569-2660
NJ	Nutley, D/R Assoc. of N.J.	201-667-5900
NY	Huntington, Andrews & Andrews, Inc.	516-692-8686
NY	Rochester, Elcom Sls	716-385-1400
Ohio	Cleveland, D. Steffen	216-461-8333
Ohio	Dayton, D. Steffen	513-293-3145
Ore	Beaverton, R&R Electronic Assoc., Inc.	503-643-5754
Tenn	Germantown, Glen White Assocs	901-754-0483
Tex	Dallas, J. Clay Co.	214-350-1281
Va	Lynchburg, Glen White Assoc., Inc.	804-384-6920
Wash	Seattle, R&R Electronic Assoc., Inc.	206-762-7664

NATIONAL SONICS, Div. Envirotech Corp., Dept. EM, 250 Marcus Blvd., Hauppauge, N.Y. 11787, Tel: 516-273-6600, Telex: 14-4545; Empl.: 140

Sales Manager: D. Shaffer

Local Sales Offices & Reps.

Ariz	Phoenix, G. L. Warden & Sons	602-253-1719
Cal	S. San Francisco, Loomis Equip. Co.	415-871-8375
Colo	Denver, R. I. Warden Co.	303-255-2966
Del	Wilmington, Briggs-Cooper Controls	302-478-3548
Fla	Largo, Tech. Comps. & Instrumentation	813-584-1122
Haw	Honolulu, Aloha Assocs.	808-941-1574
Ill	La Grange, Pro-Quip	312-352-5732
Ind	Indianapolis, Chemical Plant Equip.	317-259-8288
La	Baton Rouge, Tech-Quip	504-927-4284
Mass	Norwell, Bordewieck Engrg. Sls. Co.	617-659-4915
Mich	Royal Oak, R. H. Jackson Co.	313-542-5059
Minn	Minneapolis, Simone Engrg.	612-941-5225
Mo	Kansas City, Midwestern Engineered Equip.	816-531-1077
Mo	St. Louis, Scherrer Instrs.	314-644-5362
NY	Orchard Park, Shorteck	716-662-7290
NY	Schenectady, Shorteck	518-355-4096
NY	Westbury, Long Island, Tech-Rep Engrg. Sls. Co.	516-997-7946
NC	Charlotte, M. C. Schroeder Co.	704-392-2260
Ohio	Cincinnati, Chemical Plant Equip.	513-821-3340
Ohio	Cleveland, Thorrat & Hanmer	216-333-5950
Ohio	Columbus, Chemical Plant Equip.	614-252-9600
Okla	Tulsa, Telstar Instr. Corp.	918-628-1011
Pa	Philadelphia, Briggs - Cooper	215-459-1476
Pa	Pittsburgh, Ener-Jet	412-682-0777
Tenn	Concord, L. E. Dotts Assocs.	615-966-1391
Tenn	Memphis, Allan Engrg. Equip.	901-396-3816
Tex	Dallas, Flow Sys.	214-241-1931
Tex	Pasadena, Tech-Quip	713-473-2891
Utah	Salt Lake City, T. R. Brown & Assocs.	801-486-7241
Wash	Seattle, Fairman B. Lee Co.	206-244-7262
Wisc	Appleton, Simone Engrg.	414-731-4111
Wisc	Milwaukee, Simone Engrg.	414-354-3600
Exp:	Can., Kitchener, Ont., Brian Engrg. Ltd.	519-576-2040
Exp:	Can., Montreal, Que., Brian Engrg. Ltd.	514-735-1671
Exp:	Can., N. Vancouver, BC, BCA Indl. Controls	604-988-6321
Exp:	Can., Rexdale, Ont., Brian Engrg. Ltd.	416-248-0226
Exp:	Can., Sarnia, Ont., Brian Engrg. Ltd.	519-337-7591

NAT'L-STANDARD CO., Dept. EM, Niles, Mich. 49120, Tel: 616-683-8100, TWX: 25-8453, 810-270-3153; Empl.: 1000

Sales Manager: J. M. Jenkins; *Distributor Manager:* J. L. Dayton

NATIONAL TEL-TRONICS, Div. Electro Audio Dynamics, Inc., Dept. EM, State Road Hill, Meadville, Pa. 16335, Tel: 814-724-6440, Telex: 914-405; Empl.: 250 ..... p. 2088,2089

Sales Manager: H.F. Gearhart

Local Sales Offices & Reps.

Ala	Huntsville; 20th Century Mktg	205-772-9237
Cal	Burlingame, J. Logan Assocs.	415-697-6100
Cal	Van Nuys, Western Electromotive/Shephard	213-820-3777
Colo	Lafayette, Spectrum Sls	303-449-7677
Fla	Maitland, Barrett Assocs.	305-678-0172
Ill	Chicago, Rozner Sls. Co.	312-283-0022
Ind	Indianapolis, Tech. Reps. Inc.	317-849-6454
Kans	Mission, Admack Sls	913-432-5550
Mass	Framingham, G-M Assocs.	617-872-4871
Mich	Farmington, Miltimore Sls.	313-476-2446
Minn	Minneapolis, Heimann Co.	612-861-6051
NJ	Cherry Hill, Ned Krause Assocs.	609-424-3543
NJ	Nutley, Falk-Baker Assoc.	201-661-2430
NY	E. Syracuse, Nycom	315-437-8343
Ohio	Centerville, Charles V. Clark	513-435-3000
Ohio	Chagrin Falls, D.C. Prior Co.	216-247-8880
Ohio	Cincinnati, R. Makin Assocs.	513-871-2424
SC	Myrtle Beach, Candor Co.	803-448-8361
Tex	Dallas, Allied Comps.	214-238-0408
Wash	Seattle, Earl & Brown	206-284-1121
Exp:	N.Y., Plainview, Empire Exporters Inc.	516-293-5582

Local Distributors

Cal	Burlingame, Logan Elctrn Supply	415-697-6481
Cal	Los Angeles, Western Elctrmotive/Shephard	213-820-3777
Cal	Redondo Beach, Mark Elctrns	213-772-2141
Ill	Chicago, Newark Elctrns	312-638-4411
Ind	Fort Wayne, Fort Wayne Elctrn.	219-423-3422
Ind	Indianapolis, Graham Elctrn	317-634-8486
Md	Bethesda, Empire Elctrns	301-656-3300
Mass	Lynn, Land Elctrns	617-592-2220
NJ	Clifton, J-Mar Elctrns	201-772-6400
NY	Port Washington, Connector Concepts	516-883-3800
Pa	Huntington Valley, Shapp Elctrns	215-698-9550
Tex	Dallas, Circom	214-241-7707
Tex	Ft Worth, Allied Elctrns	817-336-5401
For:	Can., Scarborough, Ontario, Carsten Elctrn	416-751-5095

NATIONAL WIRE & CABLE CORP., Dept EEM, Svc Div., Dept. EM, 136 San Fernando Rd., Los Angeles, Cal. 90031, Tel: 213-225-5611, TWX: 910-321-4155; FSC No.: 04569; Empl.: 114 ..... p. 4612-4626

Local Sales Offices & Reps.

Ariz	Phoenix, Arrowhead Sls. Co.	602-277-7148
Ark	Fort Smith, Electro-Related Products	501-783-7323
Cal	La Jolla, Rep. Sls. Co.	714-454-1500
Cal	Redwood City, National Wire & Cable Corp.	415-365-1952
Cal	San Carlos, David H. Ross Co.	415-591-4411
Colo	Arvada, Arrowhead Sls. Co.	303-423-5556
Conn	Wethersfield, Com/Pak Ltd., Inc.	203-563-4784
Fla	Maitland, J.W. Barrett Assocs.	305-678-0172
Fla	North Miami, J.W. Barrett Assocs.	305-681-4957
Fla	Orlando, National Wire & Cable Corp.	305-898-3801
Ill	Northfield, H.S. Tollaksen Co.	312-441-6644
Md	Glen Burnie, Faion Lott Co.	301-744-4611
Mass	Framingham, Com/Pak Ltd.	617-879-8580
Mich	Warren, Luebbe Sls. Co.	313-574-2230
Minn	Eden Prairie, Tech. Assocs.	612-944-3034
Mo	Grandview, Production Automation	816-763-4155
Mo	Hazelwood, Production Automation	314-731-2331
NJ	Wayne, GT Assoc.	201-694-6040
NY	Ontario Center, Kehoe Comp. Sls.	315-524-2491
Ohio	Cincinnati, Luebbe Sls. Co.	513-871-4211
Ohio	Cleveland, Luebbe Sls. Co.	216-333-0425
Ohio	Dayton, Luebbe Sls. Co.	513-294-0426
Pa	Bala Cynwyd, Vantage Sales Co.	215-667-0990
Tex	Fort Worth, J.H. Gibbs Assocs.	817-237-1455
Wash	Olympia, Bergford Assocs.	206-866-2001

NATIONWIDE ELECTRONIC SYSTEMS, See NES, Inc.

NAUGLER ENGRG., INC., Dept. EM, Off Dunham Rd., Beverly, Mass. 01915, Tel: 617-922-5634; FSC No.: 05222; Empl.: 5

NAZ-DAR INTERNATIONAL, Dept. EM, 1087 N. Branch St., Chicago, Ill 60622

Local Sales Offices & Reps.

Cal	Los Angeles, Naz-Dar Co. of Cal.	213-232-4911
Mich	Troy, Naz-Dar Co. of Mich.	313-588-4900
NY	Long Island City, Naz-Dar Co. of N.Y.	212-784-8140

NCI, INC., Dept. EM, 5900 Australian Ave., W. Palm Beach, Fla. 33407, Tel: 305-842-3201, TWX: 510-952-7618; FSC No.: 26769; Empl.: 380

Sales Manager: W. E. Kauffman, Jr.

Local Sales Offices & Reps.

Ariz	Phoenix, Chapparal-Dorton	602-263-0414
Cal	Los Alamitos, Reed Elctrn. Mktg.	213-598-6676
Cal	San Diego, Reed Elctrn. Mktg.	714-452-1456
Cal	Santa Clara, I. Squared Inc.	408-985-0400
Colo	Parker, J. S. Heaton Co.	303-758-5130
Fla	Fort Lauderdale, CBC	305-484-7330
Fla	Winter Park, CBC, Inc.	305-644-2277
Ga	Atlanta, Macro-Mktg. Assocs.	404-449-7440
Ill	Chicago, Brock & Cushman, Inc.	312-622-4110
Ind	Ft. Wayne, Mepco/Electra	219-432-8567
Kans	Leawood, H. C. Heyde Co.	913-649-8628
Md	Glen Arm, Glen White Assoc.	301-252-6360
Mass	Burlington, New England Tech. Sls.	617-272-0434
Mich	Farmington, Miltimore Sls. Inc.	313-476-2446
Minn	St. Paul, R.G. Ragon, Inc.	612-488-0201
NJ	Cherry Hill, Mepco/Electra	609-667-7662
NJ	Englewood Cliffs, E. Glass Assocs.	201-592-0200
NY	Ontario Center, Kehoe Comps.	315-524-2491
NC	Raleigh, Glen White Assoc.	919-787-7061
Ohio	Cleveland, Baehr, Greenleaf & Assoc.	216-221-9030
Okla	Tulsa, Hugh J. Daly	918-627-4159
Tenn	Johnson City, Glen White Assoc.	615-929-0184
Tex	Dallas, Mepco/Electra,	214-231-8274
Tex	Houston, Jackson Arnold	713-981-5789
Va	Lynchburg, Glen White Assoc.	804-384-6920
Wash	Bellevue, Western Tech Sls.	206-641-3900

Local Distributors

Ariz	Phoenix, Mirco Elctrn. Distrs.	602-997-6194
Ariz	Phoenix, Liberty Elctrns	602-249-2232
Cal	Carson, Hi Rel Distr. Sls.	213-537-6500
Cal	El Segundo, Wyle Labs	213-322-8100
Cal	Mountainview, Elmar Elctrns	415-961-3611
Cal	Palo Alto, Eric Elctrns.	415-969-4500
Cal	San Diego, Liberty Elctrns	
Cal	San Diego, Frank Shelly Elctrn.	714-453-7133
Cal	San Diego, Mock III	714-560-0515
Cal	Santa Monica, Frank Shelly Elctrn.	213-392-3913
Cal	Sun Valley, Q. C. Components	213-768-6110
Cal	Sun Valley, Sterling Elctrns.	213-767-5030
Colo	Commerce City, Elmar Elctrns	303-287-9611
Conn	Hamden, Arrow Elctrn.	203-248-3801
Conn	Norwalk, Harvey	203-853-1515
Fla	Ft. Lauderdale, Arrow Elctrn.	305-776-7790
Fla	Orlando, Pioneer	305-859-3600
Fla	Orlando, T. T. I.	305-859-1000
Ga	Norcross, Lykes Elctrns	404-449-9400
Ill	Elk Grove, Mepco/Electra-CDC	312-593-8220
Md	Baltimore, Arrow Elctrn.	301-247-5200
Mass	Burlington, Lionex	617-272-9400
Minn	Bloomington, Arrow Elctrn.	612-888-5522
Minn	St. Paul, Ragon Inc.	612-488-0201
NJ	Clifton, J-Mar Elctrns	201-772-6400
NJ	Moorestown, Arrow Elctrn.	609-235-1900
NY	Central Islip, Semi Cap	516-582-4400
NY	Farmingdale, Arrow Elctrns.	516-694-6800
NY	Ontario Center, Pace Elctrn. Prods.	315-524-2491
NY	Plainview, Fairmont Elctrn. Sls. Corp.	516-694-8200
Ohio	Dayton, Arrow Elctrn.	513-253-9176
Ohio	Dayton, Pioneer/Dayton	513-236-9900
Ohio	Dayton, Micro-Mil	513-294-6420
Okla	Tulsa, Radio Inc.	918-587-9123
Tex	Austin, Quality Components	512-458-4184
Tex	Dallas, Quality Components	214-387-4949
Tex	Dallas, Component Specialties	214-357-6511
Tex	Ft. Worth, T.T.I.	817-335-8111
Tex	Houston, Component Specialties	713-771-7237
Tex	Houston, Quality Components	713-772-7100
Tex	Richardson, Altair Co.	214-231-5166
Utah	Salt Lake City, Diplomat	801-486-7227
Wash	Bellevue, Liberty Elctrns	206-453-8300
Wash	Seattle, Shannon	206-763-0545

NEC MICROCOMPUTERS, INC., Dept. EM, 173 Worcester Rd, Wellesley, Mass 02181, Tel: 617-237-1910; Empl.: 35

Sales Manager: D. Cruden; *Distributor Manager:* G. Flynn

Local Sales Offices & Reps.

Ala	Huntsville, 20th Century Mktg	205-772-9237
Ariz	Scottsdale, Summit Sls	602-994-4587
Cal	Fullerton, Elctrn Comp Mktg	714-879-9460
Cal	Orange, NEC Microcomputers, Inc.	714-633-2980
Cal	San Diego, Cerco	714-560-9143
Cal	Sunnyvale, Trident Assocs	408-734-5900
Colo	Denver, D/Z Assocs	303-534-3649
Fla	Clearwater, Perrott Assocs	813-585-3327
Fla	Ft. Lauderdale, Perrott Assocs	305-792-2211
Fla	Orlando, Perrott Assocs	305-275-1132
Ill	Palatine, Tech Sls	312-991-6600
Md	Baltimore, C & D Sls	301-661-4306
Mass	Burlington, Contact Sls	617-273-1520
Mass	Waltham, Stone Comp Sls	617-890-1440
Mich	Benton Harbor, R.C. Nordstrom & Co.	616-429-8560
Mich	Lathrup Village, R.C. Nordstrom & Co.	313-559-7373
Minn	Minneapolis, Elctrn Innovators	612-884-7471
Miss	Corinth, 20th Century Mktg	601-287-2493
Mo	Grandview, Burton-Medley Assocs	816-763-5385
Mo	Kansas City, Burton-Medley Assocs	816-436-0491
NM	Albuquerque, Tri-Tronix	505-265-8409
NY	Clarence Center, Tech-Mark	716-741-9106
NY	Endicott, Tech-Mark	607-748-7473
NY	Great Neck, Trionic Assocs	516-466-2300
NY	Liverpool, Tech-Mark	315-652-6229
NY	Melville, NEC Microcomputers, Sls. Off	516-293-5660
NC	Raleigh, Wolffs Sls Svc	919-851-2800
Ohio	Cleveland, Imtech, Inc.	216-826-3400
Ohio	Dayton, Imtech Inc.	513-278-6507
Pa	Willow Grove, Harry Nash Assocs	215-657-2213
Tenn	Greenville, 20th Century Mktg	615-628-4021
Tex	Arlington, W. Pat Fralia	817-640-9101
Tex	Houston, W Pat Fralia	713-772-1572
Wash	Mercer Island, Tri-Tronix N.W.	206-232-4993

NEFF INSTRUMENT CORP., Dept. EM, 1088 E. Hamilton Rd., Duarte, Cal. 91010, Tel: 213-357-2281, TWX: 910-585-1833; Empl.: 55 ..... p. 1657

Local Sales Offices & Reps.

Ala	Huntsville, BCS Assocs.	205-881-6220
Ariz	Phoenix, Cleveland Entprs.	602-944-4679
Cal	Los Angeles, Neff Instrs.	213-357-2281
Colo	Denver, Figaro-Klebba Assocs.	303-424-0108
Conn	Hamden, Pat Jenks Assocs.	203-281-0810
Fla	Orlando, BCS Assocs.	305-896-4881
Ill	Chicago, Torkelson Assocs.	312-446-9085
Ind	Indianapolis, Torkelson Assocs.	317-244-7867
Kans	Mission, Vertec Assocs.	913-677-3200
Mass	Wakefield, Pat Jenks Assocs.	617-246-1590
Mich	Detroit, WKM Assocs	313-588-2300
Minn	Minneapolis, Torkelson Assocs.	612-835-2414
Mo	Kansas City, Vertec Assocs.	314-394-6242
NJ	Cedar Grove, KLS Assocs	201-785-4450
NM	Albuquerque, Cleveland Entprs.	505-266-5594
NY	Rochester, Ossman Instrs.	716-328-2230
NY	Syracuse, Ossman Instrs.	315-437-6666
NY	Vestal, Ossmann Instrs.	607-785-9947
NC	Greensboro, BCS Assocs.	919-273-1918
Ohio	Cleveland, WKM Assocs	216-267-0445
Ohio	Dayton, WKM Assocs	513-434-7500
Okla	Oklahoma City, Data Mktg. Assocs.	405-528-6071
Ore	Portland, Showalter Instr.	503-644-9164
Pa	Philadelphia, PDC Corp.	215-887-9610
Pa	Pittsburgh, WKM Assocs	412-892-2953
Tex	Austin, Data Mktg. Assocs.	512-451-5174
Tex	Dallas, Data Mktg. Assocs.	214-661-0300
Tex	Houston, Data Mktg Assoc.	713-780-2511
Tex	San Antonio, Data Mktg. Assocs.	512-828-0937
Utah	Salt Lake City, Figaro-Klebba Assocs.	801-486-3217
Wash	Seattle, Showalter Instr.	206-455-4922

NELSON ROSS ELCTRNS., Dept. EM, 5 Delaware, Lake Success, N.Y. 11040, Tel: 516-328-1100, TWX: 510-223-0414; FSC No.: 82199; Empl.: 150

Sales Manager: E. F. Feldman

Local Sales Offices & Reps.

Ala	Huntsville, J. L. Highsmith	205-881-3294
Ariz	Scottsdale, BFA Corp.	602-994-5400
Cal	Cupertino, T. Snitzer	408-257-8333
Cal	Del Mar, T. Snitzer	714-226-0305
Cal	Los Angeles, T. Snitzer	213-836-6170
Colo	Boulder, H. Bass Assocs.	303-499-7509
Conn	New Canaan, Measurement Consltnt.	203-966-4630
DC	Washington, Brimberg Sales	301-946-2670
Fla	Boca Raton, James L. Highsmith & Co	305-368-9194
Fla	Orlando, J. Highsmith	305-293-5202
Ill	Chicago, Carter Elctrn.	312-585-5485
Ind	Indianapolis, Cater Elctrn.	317-293-0696
Kans	Overland Park, Carter Elctrn.	913-649-6996
Md	Bartonsville, Eastern Instrumentation Corp.	301-384-8500
Mass	Waltham, Measurement Consltnts.	617-890-4400
Mich	Detroit, H. Teplitz & Co.	313-534-3306
Minn	Minneapolis, Carter Elctrn.	612-559-1976
Mo	St. Louis, Carter Elctrn.	314-569-1406
NJ	West Orange, E-F Tech. Sls.	201-731-7203
NM	Albuquerque, IMEC	505-883-9010
NY	Huntington Station, E-F Tech. Sls.	516-549-1818
NY	Liverpool, R & D Assocs.	315-457-0100
NC	Charlotte, J. Highsmith	704-333-7743
Ohio	Bedford Heights, H. Teplitz & Co.	216-439-3265
Ohio	Dayton, H. Teplitz & Co.	513-277-6531
Ore	Portland, Arva-Hudson, Inc.	503-246-9589
Pa	Philadelphia, Eastern Instrumentation	215-927-7777
Tex	Houston, Lear Assocs.	713-686-1838
Tex	Richardson, Lear Assoc.	214-231-5388
Tex	San Antonio, Data Appls. Corp.	512-732-7176
Va	Norfolk, Bimberg Sales	301-946-2670
Wash	Bellevue, Arva-Hudson, Inc.	206-455-0773
Wisc	Milwaukee, Carter Elctrn.	414-464-5555

NELSON STUD WELDING TRW INC., Dept. EM, 28th & Toledo Ave., Lorain, Ohio 44035, Tel: 216-245-6931; Empl.: 500

Local Sales Offices & Reps.

Ala	Birmingham	205-942-8109
Colo	Denver	303-744-3495
Conn	Hartford	203-236-5218
Fla	Jacksonville	904-725-8881
Ga	Atlanta	404-457-7291
Ind	Ft. Wayne	219-484-5356
Iowa	Des Moines	515-223-6022
Kans	Overland Park	913-381-3060
La	Metairie	504-737-1082
Md	Rockville	301-762-9511
Mich	Southfield	313-357-3700
Minn	Minneapolis	612-884-4108
Mo	St. Louis	314-567-5320
NJ	Palisades Park	201-947-2291
NY	Buffalo	716-876-7790
NC	Winston-Salem	919-724-2262
Ohio	Cincinnati	513-771-1581
Ohio	Cleveland	216-884-4300
Okla	Tulsa	918-627-3487
Ore	Portland	503-281-7693
Pa	Pittsburgh	412-922-2515
SC	Columbia	803-798-0415
Tenn	Memphis	901-452-6770
Tex	Dallas	214-358-1588
Tex	Houston	713-682-3225
Utah	Salt Lake City	801-322-4122
Va	Richmond	804-233-5520
Wisc	Milwaukee	414-351-0705

NES, INC., Dept. EM, 1536 Brandy Pkwy., Streamwood, Ill. 60103, Tel: 312-289-8820, TWX: 910-651-3190; Empl.: 280 ..... p. 2790

Local Sales Offices & Reps.

Ala	Birmingham, Applebee-Church	205-879-4417
Ariz	Tempe, J. Smith & Assocs.	602-968-7025
Cal	Anaheim, Nes	714-635-0432
Cal	Pasadena, RDX Corp.	213-681-3451
Cal	San Diego, RDX Corp.	714-278-6863
Cal	Sunnyvale, RDX Corp.	408-734-4500
Colo	Denver, J. Smith & Assocs.	303-442-7100
Colo	Longmont, Nes	303-772-0226
Fla	Ft. Lauderdale, Reynolds & Assocs.	305-581-6611
Fla	Satellite Beach, Reynolds & Assocs.	305-773-4700
Fla	St. Petersburg, Reynolds & Assocs.	813-360-1484
Ga	Atlanta, Applebee-Church	404-451-2747
Iowa	Blairstown, Engrg. Svcs. Co	319-454-6970
Kans	Prairie Village, Engineering Svcs. Co.	913-649-4000
La	Kenner, Fair Engrg	504-626-7278
Md	Bethesda, S & S Assocs.	301-654-1434
Mich	Ann Arbor, Hal C. Heym	313-971-6552
Mich	Marquette, NWR Elctrns.	906-228-9080
Mich	Saginaw, Hal C. Heym	517-792-7928
Minn	New Hope, Trask Engrg	612-537-2434
Mo	St. Louis, Engineering Svcs. Co.	314-997-1515
NJ	W. Long Branch, Eastern Elec. Sls	201-222-6836
NM	Albuquerque, J. Smith & Assocs.	505-265-3406
NY	Rockaway Park, Eastern Elec. Sls	212-634-8359
Ohio	Cincinnati, Anderson-Bolds	513-272-3351
Ohio	Cleveland, Anderson-Bolds	216-229-4700
Ohio	Worthington, Anderson-Bolds	614-885-3933
Ore	Portland, Fry Controls	503-226-2620
Pa	King of Prussia, S & S Assocs.	215-265-3450
SC	Columbia, Applebee-Church	803-772-3142
Tex	Dallas, BOUCO Sls. Assocs.	214-247-6708
Tex	Houston, BOUCO Sls, Assocs.	713-665-6121
Wash	Seattle, Fry Controls	206-243-1353
Wisc	Waukesah, Michaels Digital Sys.	414-547-6637

NESHAMINY TRANSFORMER, Div. Neshaminy Elctrn., Dept. EM, Edison-Furlong Rd., Furlong, Pa. 18925, Tel: 215-794-7411; Empl.: 160

Local Sales Offices & Reps.

Fla	Maitland, Peregoy, Inc.	305-831-2474
Ill	Elk Grove Village, Control Sales	312-595-2110
NH	Nashua, Bell Controls	603-882-6984
NJ	Haddonfield, Thomas	609-UL 4-3011
NY	Syracuse, W. Zimmerman	315-GR 4-4889
Pa	Philadelphia, Thomas Assocs.	215-627-6615

NESOR ALLOY CORP., Dept. EM, 666 Passaic Ave., W. Caldwell, N.J. 07006, Tel: 201-575-0400; Empl.: 230

Local Sales Offices & Reps.

Ariz	Scottsdale, E.J. Foley & Assoc.	602-945-2665
Ill	Riverside, Mannella & Assoc.	312-447-7724
NJ	Belleville, R. H. B. Sls. Co.	201-687-6220
NJ	Nutley, D & R Assocs.	201-667-5900

NEUSES, INC. (P.K.), Dept. EM, 1401 Rohlwing Rd., Rolling Meadows, Ill. 60008, Tel: 312-253-6555; Empl.: 8

Sales Manager: V. Schuster; *Distributor Manager:* V. Pelletier

NEW ENGLAND INSTR., Dept. EM, 14 Kendal Lane, Natick, Mass. 01760, Tel: 617-873-9711, TWX: 710-346-0398; Empl.: 300 ..... p. 3888-3893

Local Sales Offices & Reps.

Ariz	Scottsdale, O'Donnell Southwest	602-931-8740
Cal	Palo Alto, O'Donnell Assocs.	415-327-9260
Cal	Torrance, O'Donnell Assocs.	213-323-9243
Colo	Denver, Electrodyne	303-757-7679
Conn	Wethersfield, Underwood Sls.	203-563-3046
Ga	Atlanta, Electro-Mech Sls. Eng. Co.	404-256-4414
Ill	Oak Park, J. Popp Sls. Co.	312-626-3711
Kans	Overland Park, Penzner-Mankus Assoc.	913-381-0004
Kans	Wichita, Penzner-Mankus Assoc.	316-264-2662
Md	Silver Spring, Rep-Tron, Inc.	301-593-4844
Mass	Chelmsford, Underwood Sls.	617-256-8191
Mich	Farmington, W.R. Hummon & Assoc.	313-474-0661
Minn	Minneapolis, R.W. Marshall Co.	612-929-0457
Mo	Hazelwood, Penzner-Mankus Assoc.	314-731-4334
NJ	Keasbey, Addem Sales	201-671-2944
NY	Melville, Addem Sales	603-549-8400
NY	New Hartford, KLM Assocs.	315-735-8525
NY	No. Syracuse, KLM Assocs.	315-458-6214
NY	Rochester, KLM Assocs.	716-442-0820
NC	Raleigh, Electro-Mech Sls. Eng. Co.	919-782-6452
Ohio	Cincinnati, Tri-State Mktg.	513-761-7993
Pa	King of Prussia, Monteiro Assocs.	215-265-0634
Tex	Dallas, Mycrosystems Marketing	214-238-7157
Wash	Renton, S. Wilson Co.	206-226-0650

NEW HAMPSHIRE BALL BEARINGS, INC., Dept. EM, Peterborough, N.H. 03458, Tel: 603-924-3311, TWX: 710-364-1805; Empl.: 1000

Local Sales Offices & Reps.

Cal	Carson	213-770-4920
Ill	Des Plaines	312-827-6646
NY	Plainview	516-938-2011
Tex	Dallas	817-589-1303
Tex	Ft. Worth	817-284-1451

Local Distributors

Cal	Los Angeles, Jamaica Bearings	213-649-0480
Fla	Miami, Florida Bearings	305-573-8424
Ga	Atlanta, Dixie Bearings	404-522-7620

Iowa Cedar Rapids, Iowa Midland Supply 319-366-3555
Minn Minneapolis, Arrowhead Bearings 612-335-1111
Mo Kansas City, Bearing Distrs. 816-471-0666
NY Jamaica, Jamaica Bearings 212-526-1350
Okla Tulsa, Allied Brg. Supply 918-583-0164
Pa Pittsburg, Bearings, Inc.
Tex Dallas, Jamaica Brgs. 214-352-8496
Wash Bellevue, J. E. Phillips Co. 206-747-6538

NEW HAVEN WIRE & CABLE, Dept. EM, Hwy. 14E, New Haven, IN 46774, Tel: 219-493-4489; Empl.: 62

Local Sales Offices & Reps.
Ill Wauconda, Miller Sls Co. 312-526-2386
Ind Indianapolis, Jerry T. Yocum 317-842-3257
Ind Kingsbury, New Haven Wire & Cable 219-393-3551
Mo Kirkwood, Drda Sls Co. 314-966-5315
Mo St. Louis, C. S. Ryan Co. 314-993-0350
NY Great Neck, North Hills Inds 516-482-4375

NEW-TRONICS CORP., Dept. EM, 15800 Commerce Park Dr., Brookpark, Ohio 44142, Tel: 216-267-3150; Empl.: 150

Distributor Manager: P. Fritz

Local Sales Offices & Reps.
Ariz Paradise Valley, Vinger Mktg. 602-991-9229
Cal San Jose, Olsheski & Assocs 408-247-4781
Colo Denver, Mountain Reps 303-988-6430
Fla Lakeland, Robert Norman 813-858-8373
Ill Skokie, M. Bermann Sls. 312-675-3740
Ind Indianapolis, Sukup & Cox 317-253-5501
Mich Detroit, Burcaw Co 313-533-7700
Minn Minneapolis, Kodo Assocs 612-881-1255
Mo Liberty, Lectro Reps 816-781-2522
NY Flushing, Bettan Sls. Inc. 212-591-7600
NY Syracuse, Lewis & Dunnigan 315-446-5522
Ohio Novelty, Hank Miller Sls 216-321-3900
Pa Cornwell Hts, Rich Plechner Assocs 215-757-0730
Tenn Gallatin, Graves Sls 615-452-5850
Tex Dallas, I. Harrison 214-661-8760
Tex Dallas, Ivan Harrison Co 214-661-8760
Wash Edmonds, McLaughlin Mktg 206-743-1161
Exp: New York, N.Y., Roburn Agencies Inc. 212-989-5939

NEWCOMB AUDIO PRODUCTS CO., Dept. EM, 12881 Bradley Ave., Sylmar, Cal. 91342, Tel: 213-367-1921

Sales Manager: B. McKnight

Local Sales Offices & Reps.
Ala Birmingham, M.F. Taylor Co. 205-853-3181
Ark Little Rock, Crockett Sls. Co. 501-224-3573
Cal Burlingame, W.J. Purdy Co. 415-347-7701
Colo Colorado Springs, Norris & Co. 303-576-3324
Fla Pompano Beach, M. F. Taylor Co. 305-942-2294
Iowa Des Moines, K.S.W. Assocs. 515-279-9235
Md Silver Spring, M.F. Taylor Co. 301-589-4002
Mass Belmont, A. Reinherz 617-484-7784
Mich Ferndale, Shalco, Inc. 313-547-4771
Minn Minneapolis, S. Olsen & Assoc. 612-929-6121
Mo Kansas City, K.S.W. Assocs. 816-358-5240
Neb Omaha, KSW Assocs. 402-571-6001
NJ Teaneck, Fisher Elctrns. Assocs. 201-837-1200
NY Grand Island, L.J. McTaggart 716-773-9222
NC Charlotte, M.F. Taylor 704-537-7201
Ohio Mansfield, K. White 419-756-3363
Pa Pittsburgh, M.F. Taylor 412-247-1529
Tex Dallas, Crockett Sls. Co. 214-748-8209
Wash Seattle, Vantage Corp. 206-525-2050

NEWPORT LABS., INC., Dept. EM, 630 E. Young St., Santa Ana, Cal. 92705, Tel: 714-540-4914, TWX: 910-595-1787; Empl.: 170 p. 2792,2793

Sales Manager: C. N. Hasley; *Distributor Manager:* C. N. Hasley

Local Sales Offices & Reps.
Ala Huntsville, W.A. Brown 205-883-8660
Ariz Scottsdale, Measurement Consits. 602-994-9519
Cal Costa Mesa, FLW, Inc 714-751-7512
Cal Sunnyvale, RDP Instrs. 408-735-9040
Colo Boulder, Meas. Consits. 303-499-5294
Conn Manchester, Victor Assocs. 203-646-6448
Fla Ft. Lauderdale, W.A. Brown 305-776-4800
Fla Melbourne, W.A. Brown Instrs. 305-723-0766
Fla Orlando, W.A. Brown 305-425-5505
Fla Valparaiso, W. A. Brown 904-243-6424
Ga Atlanta, W.A. Brown 404-939-1674
Ill Chicago, Data Elctrns. 312-283-0300
Ind Indianapolis, Data Elctrns. 317-359-5368
La Mandeville, W.A. Brown 504-626-9701
Md Lanham, Brimberg Sls. 301-552-2200
Mass Southboro, Victor Assocs. 617-481-4010
Mich Southfield, Data-Tron 313-354-6421
Minn Bloomington, Data Elctrns. 612-881-9150
Mo Crestwood, Carlton Co. 314-961-0700
Mo Kansas City, Carlton Co. 816-363-5300
NJ Cherry Hill, Megargel & Himmelstein 609-779-0200
NM Las Cruces, Meas. Consits. 505-526-2491
NY Buffalo, R.F. Lamb 716-874-4900
NY Elmont, Crane & Egert 516-488-2100
NY Rochester, R.F. Lamb 716-544-5580
NY Schenectady, Robert F. Lamb Co. 518-393-4844
NY Syracuse, R. F. Lamb 315-455-2469
NC Durham, W. A. Brown 919-682-2383
Ohio Dayton, Data-Tron 513-223-8421
Ohio Wickliffe, Data-Tron 216-585-8421
Ore Portland, Brett-Ross, Inc. 503-232-4184
Pa Monroeville, Data-Tron 412-243-8421
Pa Philadelphia, Megargel-Himmelstein 609-779-0200
SC Columbia, W. A. Brown 803-798-3297
Tenn Oak Ridge, W. A. Brown 615-482-5761
Tex Houston, Scientific Sls. Co. 713-666-5318
Tex Richardson, Scientific Sls. Co. 214-231-6541
Utah Salt Lake City, Meas. Consits. 801-364-3174
Wash Seattle, Brett-Ross, Inc. 206-935-8054

Local Distributors
Cal Costa Mesa, FLW, Inc 714-751-7512
Cal Pasadena, A-F Sales Engrg. 213-681-5631
Cal San Francisco, Steven Engrg Co. 415-583-5868
Fla Orlando, W.A. Brown Instrs. 305-425-5505
Ill Chicago, Data Elctrncs. Co. 312-283-0300
La New Orleans, Mid-South Sls. Co. 504-822-3030
Mass Southboro, Victor Assocs. 617-481-4010
Minn Bloomington, Data Elctrncs. Co. 612-881-9150
NY Buffalo, Robert F. Lamb Co. 716-874-4900
NY Elmont, Crane & Egert Corp. 516-488-2100
Ohio Wickliffe, Data-Tron 216-585-8421
Pa King of Prussia, Applied Controls, Inc. 215-265-3832
Tex Houston, AWC Texas, Inc. 713-488-2730
Va Richmond, Instrument Tech. Reps. 804-285-3931
Wash Seattle, Brett-Ross, Inc. 206-935-8054

N.Y. TESTING LABS., INC., Dept. EM, 81 Urban Ave., Westbury, N.Y. 11590, Tel: 516-334-7770, TWX: 212-297-1449; Empl.: 50

NH RESEARCH, INC., Dept. EM, 1510 S. Lyon St., Santa Ana, Cal. 92705, Tel: 714-835-1616, Telex: 67-8377; FSC No.: 24862; Empl.: 30

Local Sales Offices & Reps.
Ala Huntsville, Gentry Assocs. 205-534-9771
Cal Santa Ana, Schlines-Richardson 714-832-1949
Del Newark, Dyna Rep Co. 302-738-7081
Fla St. Petersburg, Greenstein Assocs. 813-823-7171
Ga Atlanta, Gentry Assocs. 404-455-1206
Ill Chicago, Pat Lind Elctrns. Co. 312-774-1246
Ind Indianapolis, Pat Lind Elctrns. Co. 317-547-9178
Mass Waltham, W.M. Hague Co. 617-899-5600
Mich Livonia, Electroquipment Sls. 313-569-4497
Minn Circle Pines, Pat Lind Elctrns. Co. 612-786-5770
NJ Ridgewood, Hansen Assocs. 201-652-7055
NC Burlington, Gentry Assocs. 919-227-3639
Ohio Chesterland, Electroquipment Sls. 216-729-2222
Ohio Dayton, Electroquipment Sls. 513-434-8993
Ore Beaverton, Showalter Instrs. 503-646-5196
Tex El Paso, Systems Design Consits. 915-751-4456
Utah Murray, Measurement Consits. Ltd. 801-268-3181
Va Alexandria, Dyna Rep Co. 703-354-1222
Wash Bellevue, Showalter Instr. 206-455-4922

NICOLET INSTRUMENTS CORP., Dept. EM, 5225 Verona Rd., Madison, Wisc. 53711, Tel: 608-271-3333, TWX: 910-286-1713; Empl.: 329 p. 2791

Sales Manager: J. Bartosch

Local Sales Offices & Reps.
Ariz Phoenix, Axtec Entrps. 602-944-9185
Cal Los Angeles, Nicolet Inst Corp 714-752-5812
Cal San Diego, Nicolet Inst Corp 714-454-6274
Cal San Francisco, Nicolet Inst Corp 415-969-1258
Colo Littleton, Aztec Enterprises 303-795-0250
Fla Brandon, Nicolet Inst Corp 813-685-0444
Ill Chicago, Carter Elect. 312-585-5485
Kans Overland Park, Carter Elec. 913-649-6996
Md Silver Spring, Sel-Tronics, Inc. 301-589-3391
Mass Auburndale, Nicolet Instr. 617-969-7420
Mich Ypsilanti, Nicolet Inst Corp 313-484-1313
Minn Minneapolis, Carter Elec 612-559-1976
Mo St. Louis, Carter Elec 314-569-1406
NJ Fairfield, KLS Assocs., Inc. 201-227-2900
NJ Medford, Nicolet Instr. 215-467-7070
NM Albuquerque, Aztec Entrprs. 505-255-2440
NY Liverpool, Rayelco Elctrns., Inc. 315-652-5272
Pa Melrose Park, Robert Meyers Assoc 215-224-1663
Tex Houston, Nicolet Instr. Co. 713-523-9181
Wisc Milwaukee, Carter Elect 414-464-5555

NICOLET SCIENTIFIC CORP., Dept. EM, 245 Livingston St., Northvale, N.J. 07647, Tel: 201-767-7100, TWX: 710-991-9619; Empl.: 96

Local Sales Offices & Reps.
Cal Irvine, Nicolet Scientific 714-549-1199
Ga Tucker, Nicolet Scientific 404-491-0127
Ill Libertyville, Nicolet Scientific 312-367-1380
Md Silver Spring, Nicolet Scientific 301-681-5800
Mass Auburndale, Nicolet Instrument 617-969-7420
NJ Cedar Grove, KLS Assoc. 201-785-4450
NJ Medford, Nicolet Scientific 215-467-7070
NY Liverpool, Rayelco Elctrns. 315-652-5272
Ohio Worthington, Nicolet Scientific 614-888-6060
Tex Houston, Nicolet Scientific 713-523-9181
Wash Bellevue, Scientific Devices/Northwest 206-454-0900

NIDEC AMERICA CORP., Dept. EM, 1821 University Ave., St. Paul, Minn. 55104, Tel: 612-644-9900, Telex: 29-7430; Empl.: 240

Sales Manager: C. Hajec; *Distributor Manager:* R. Johnston

Local Sales Offices & Reps.
Cal Santa Monica, Davidson Assoc. 213-829-1731
Colo Englewood, Dynatech Inc. 303-773-2830
Conn Old Saybrook, ML Assoc 203-388-9718
Fla Clearwater, WMM Assocs. 813-442-3913
Ill Chicago, Engineered Sales 312-867-8434
Md Rockville, LG White Co. 301-770-6556
Mass Marlboro, ML Assoc 617-485-6190
Mich Southfield, Doral Sls. Co. 313-352-1667
Minn St. Paul, Vikeland Sls. 612-645-4647
NY Hartsford, Com-Tec Sls. 914-761-6644
NY Rochester, Upstate Component Sls. 716-377-1555
Ohio Cleveland, A. H. Baler Co 216-461-6161
Ohio Dayton, A. H. Baler Co. 513-276-4128
Pa Paoli, J-Tyler Griffin 215-647-1550
Tex Houston, Zonk Engrg. Co. 713-697-9302
Tex Richardson, Zonk Engrg. Co. 214-238-7651

NIKON, INC., Instr. Div. Ehrenreich Photo-Optical Ind., Dept. EM, 623 Stewart Ave., Garden City, N.Y. 11530, Tel: 516-222-0200, Telex: 96-7806; Empl.: 500

Sales Manager: I. Feldman

Local Sales Offices & Reps.
Ariz Scottsdale, Allen Assocs 602-994-1305
Cal San Francisco, Nikon Inc., Instr Div 415-362-7484
Conn Milford, Ca-Pra 201-878-6337
Fla Pinnelas Park, Blanco, Inc. 813-554-2505
Ga Duluth, Rick Davies 404-448-8464
Ill Chicago, EPOI Chicago 312-647-8100
Ind Muncie, Miller Tool & Guage 317-284-1691
Kans Sedgwick, Sw Instr Co. 316-772-5521
Ky Louisville, Preiser Scientific 502-636-3307
Md Kensington, Nikon Inc., Instr Div 301-933-7900
Mass Wellesley Hills, Nikon Inc., Instr Div 617-969-8600
Minn Minneapolis, Machine Tool Supply 612-721-5371
Minn St. Paul, Bower & Haack 612-646-1335
NJ Piscataway, Micron Optics 201-564-1030
NY Garden City, Nikon Instr. Div. 516-222-0200
NY Rochester, Brook-Anco 716-271-4100
NC Durham, Preiser Scientific 919-688-5583
Pa Ardmore, Optical Apparatus Co. 215-649-6622
Tex Houston, Dolan Scientific Instr. 713-781-6623
Wash Seattle, Nw Scientific Co. 206-524-4595
WVa Charleston, Preiser Scientific 304-344-4031
Wisc Brookfield, Jordan Engrg & Tool Sls 414-781-9722

NIPPON-DENSAN CORP., See Nidec America

NITRON, INC., Dept. EM, 10420 Bubb Rd., Cupertino, Cal. 95014, Tel: 408-255-7550, TWX: 910-338-0222; Empl.: 150

Sales Manager: H. DeRoule

TECHNOLOGY DEV CORP, NJE Div, Dept. EM, Box 50, Culver Rd., Dayton, N.J. 08810, Tel: 201-329-4611, TWX: 710-480-5674; FSC No.: 98380; Empl.: 70

Sales Manager: M. Kaufman

Local Sales Offices & Reps.

Ala Huntsville, Col-Ins-Co. 205-881-9512
Ariz Glendale, Adtek, Inc. 602-846-4650
Cal Mission Viejo, The Powerhouse. 714-830-5666
Conn Manchester, Victor Assocs. 203-646-6648
Fla Orlando, Col-Ins-Co. 305-423-7615
Ga Clarkston, Col-Ins-Co. 404-299-2138
Iowa Cedar Rapids, Palatine Sls. 319-365-8071
Kans Derby, Palatine Sls. 316-788-0621
Kans Lenexa, Palatine Sls. 913-492-7020
Kans Lenexa, Palatine Sales 913-492-7020
La Baton Rouge, Col-Ins-Co. 504-292-1755
Md Gaithersburg, The Wright Co. 301-840-1928
Mass Southboro, Victor Assocs. 617-481-4010
Minn Edina, Grayden & Flemmer 612-941-1120
Minn Edina, Grayden & Flemmer 612-941-1120
Mo Hazelwood, Palatine Sls. 314-895-4577
Mo Hazelwood, Palatine Sls. 314-895-4577
NJ Ho-Ho-Kus, Alto Assocs. 201-447-1770
NJ Long Branch, Mer-Mon 201-229-3172
NJ Long Branch, Mer Mon Elctrn Instrumentation 201-229-3172
NY Plainview, Alto Assocs 516-681-3163
NC Winston-Salem, Col-Ins-Co. 919-748-0297
Okla Richardson, TX, Palatine Sls. 214-231-9489
Tex Austin, Palatine Sls. 512-451-7463
Tex Houston, Palatine Sls. 713-783-1492
Tex Richardson, Palatine Sls. 214-231-9489

N.K.R. PRECISION MFG. CORP., Dept. EM, Rte. 17M, Box 333, Harriman, N.Y. 10926, Tel: 914-782-8562; Empl.: 17

N.L. INDS., INC., BEARINGS DIV., Dept. EM, PO Box 934, Toledo, Ohio 43694, Tel: 419-385-9911, Telex: 28-6413; Empl.: 1000

Sales Manager: R. A. Peterson Cust Svc

Local Sales Offices & Reps.

Cal French Camp 209-982-0961
Cal Los Angeles 213-747-5566
Ga Atlanta 404-876-6316
Ill Elk Grove Village 312-593-2750
NJ Robbinsville 609-587-5705

NL INDUSTRIES, INC., Metal Div., Dept. EM, 1221 Ave. of Americas, New York, N.Y. 10020, Tel: 212-730-2722

Local Sales Offices & Reps.

Cal Oakland 415-261-3600
Colo Denver 303-222-4450
Ga Atlanta 404-876-7361
Ill Chicago 312-226-3700
Ill Granite City 618-452-3000
Mich Detroit 313-893-0100
Minn St. Louis Park 612-929-2675
Neb Omaha 402-393-3024
NJ Perth Amboy 201-826-6000
NY Depew 716-683-6840
Ohio Cincinnati 513-922-4100
Ohio Cleveland 216-621-2361
Ore Portland 503-224-3370
Pa Altoona 814-946-1611
Pa Pittsburgh 412-687-3910
Tex Dallas 214-948-3521

NON-LINEAR SYS., INC., Dept. EM, 533 Stevens Ave., Solana Beach, Cal. 92075, Tel: 714-755-1134, TWX: 910-322-1132; Empl.: 76 ..... p. 2794

Distributor Manager: H. P. Heisig

Local Sales Offices & Reps.

Ala Mobile, Hollingsworth & Still 205-344-1641
Ariz Phoenix, Arrowhead Sls. Corp. 602-277-7148
Cal Cardiff, Tech-Sources Unlimited 714-436-0515
Cal Los Altos, W.W. Posey Co. 415-948-7771
Colo Arvada, Arrowhead Sls. Corp. 303-423-5556
Fla Orlando, Hollingsworth & Still 305-834-2356
Fla Pompano Beach, Hollingsworth & Still 305-782-0069
Ga Atlanta, Hollingsworth & Still 404-394-3270
Haw Honolulu, Hawaii Elctrn. Sls. 808-845-8207
Ill Northbrook, J. T. Houlihan & Assoc. 312-564-3510
Ind Indianapolis, Elctrn Representatives 317-894-1414
Iowa Des Moines, Pacer Sls. Corp. 515-274-3224
Ky Louisville, Elctrn Representatives 502-368-4911
Md Silver Spring, Mid-Atlantic Sls. 301-593-7749
Mass N. Scituate, W.A. Hendrickson Co. 617-545-0652
Mich Ferndale, Shalco 313-547-4771
Minn St. Paul, Skor 612-645-6461
Mo Raytown, Pacer Sls. Corp. 816-358-6638
NY Liverpool, J. Brown Elctrn. Sls. Reps. 315-451-1471
NY Rochester, J. Brown Elctrn. Sls. Reps. 716-266-2728
NY Yonkers, J. Brown Elctrn. Sls. Reps. 914-779-7330
NC Charlotte, Hollingsworth & Still 704-535-4604
Ohio Cleveland, D. Steffen & Assocs. 216-461-8333
Ohio Dayton, D. Steffen & Assocs. 513-293-3145
Ore Portland, J. J. Backer Co. 503-297-3776
Pa Abington, Mid-Atlantic Sls. 215-657-2815
Tex Dallas, Berthold Sls. 214-526-8329
Wash Seattle, Jas. J. Backer Co. 206-285-1300

Local Distributors

Ariz Phoenix, Metermaster 602-273-7331
Cal Los Angeles, Metermaster 213-685-4340
Cal Oakland, Western Electro Mechanical 415-452-1936
Cal Palo Alto, Metermaster 415-968-0313
Cal Santa Ana, Advanced Computer Prods 714-558-8813
Conn N. Branford, Marshall Inds.
Fla Miami, ESL Electronic Distrs. 305-633-6973
Ga Atlanta, Brownell Electro 404-762-5181
Ill Chicago, Union Elctrns. 312-723-1500
Ill Des Plaines, Marshall Inds. 312-298-3700
Ind Indianapolis, Ra-Dis-Co. 317-637-5571
Ky Louisville, P.I. Burks 502-589-3960
La Shreveport, Industrial Elctrns. Supply 318-222-9459
Md Elkridge, Sunshine Scientific Instrs. 301-796-5600
Md Rockville, Capitol Radio Wholesalers 301-881-2270
Md Timonium, E. I. L. Instrs 301-252-1260
Mass Boston, Sager Electrical Supply 617-542-2281
Mass Newton Highlands, Marshall Inds. 617-965-5115
Mich Ferndale, Ram Meter 313-547-1000
Minn Plymouth, Marshall Inds. 612-831-4904 612-559-2211
NY Buffalo, Summit Distrs. 716-884-3450
NY Farmingdale, Marshall Inds. 516-293-4141
NY Rochester, Simcona Elctrns. Corp. 716-328-3230
Ohio Cincinnati, Hughes-Peters 513-351-2000
Ohio Wickliffe, Gateway-Megatech. 216-944-8565
Okla Tulsa, Radio Inc. 918-587-9123
Ore Portland, United Radio Supply 503-434-2171
Pa Allentown, Resco of L.V. 215-435-6743
Pa Philadelphia, Sunshine Scientific Instrs. 215-673-5600
Tenn Chattanooga, Curie Elctrns. 615-266-4728
Tex Dallas, Wholesale Elctrns Supply 214-824-3001
Tex Houston, Madison Elctrn. Supply 713-224-2668
Tex Irving, Electrotex 214-438-2868
Tex San Antonio, Sherman Elctrns. Supply 512-224-1001
Va Arlington, Arlington Elctrn. Wholesalers 703-524-2412
Wash Tukwilla, Central Elctrns. Distrs. 206-575-0711
Wisc Mequon, Taylor Electric 414-241-4321

NORELCOM ELECTRONICS, Dept. EM, 200 Allen Blvd., Farmingdale, N.Y. 11735, Tel: 516-249-7262; Empl.: 10

Local Sales Offices & Reps.

Conn Stratford, LST Sls 203-377-8002
Fla St. Petersburg, Bolton Assocs. 813-864-2294
NY Farmingdale, AG Mar Technology 516-249-1343
NY Northport, F.F. Marin Co 516-261-2410

NORLIN COMMUNICATIONS INC., Dept. EM, 9125 Gaither Rd., Gaithersburg, Md. 20760, Tel: 301-948-5210, TWX: 701-828-9706; Empl.: 340

Local Sales Offices & Reps.

Cal Mountain View 415-969-5777
Md Gaithersburg 301-948-5210

NORSAL INDUSTRIES, INC., Dept. EM, 34 Grand Blvd., Brentwood, N.Y. 11717, Tel: 516-231-4040; FSC No.: 19136; Empl.: 21

Sales Manager: N. Spector

Local Sales Offices & Reps.

Ariz Scottsdale, Elctrn. Entprs. 602-943-9657
Cal Los Angeles, Midwin & Olifson 213-475-8568
Cal Los Gatos, Donahue Assoc. 408-356-1717
Colo Boulder, Sci Devices-Intermountain 303-449-9466
Conn Mount Carmel, Sci Devices 203-248-9361
Fla Clearwater, Brennan Assoc. 813-446-5006
Ill Elk Grove, R-Ter 312-439-9090
Md Severna Park, Delmarva Ltd. 301-647-8007
Mass Topsfield, Aries Assocs 617-887-6495
NM Albuqurque, Elctrn. Entprs. 505-298-0285
NM Las Cruces, Elctrn. Entprs. 505-524-0126
Ohio Dayton, F. L. Ohmer, Assoc. 513-434-1454
Pa Elkins Park, Snow Assocs 215-ES-9-4700
Tex Plano, Elctrn Devices 214-424-0916
Wash Seattle, Datacom 206-285-2525

NORTH AMERICAN PHILIPS CONTROLS CORP., Dept. EM, Cheshire Industrial Pk. Box E, Cheshire, Conn. 06410, Tel: 203-272-0301, Telex: 962421; Empl.: 525 ..... p. 2274,3102,3103

Sales Manager: R. Rock (Mktg Mgr.)

Local Sales Offices & Reps.

Ala Huntsville, W.A. Brown Components 205-539-4411
Cal Palo Alto, Harris Engrg. 415-328-3370
Cal Pico Rivera, Westrep 213-949-2551
Cal San Diego, Westrep 714-276-0751
Colo Littleton, Lange Sls 303-795-3600
Conn Cheshire, Selmark Assocs. 203-272-8764
Fla Coral Springs, W. A. Brown Comps. 305-753-1650
Fla Orlando, W.A. Brown Comps. 305-851-5747
Ga Chamblee, W. A. Brown Comps. 404-455-0405
Ill Rolling Meadows, Sumer 312-394-8500
Ind Ft. Wayne, Temple Engrg. 219-743-0362
Iowa Cedar Rapids, S & O/Nortec Sls. 319-393-1845
Md Lanham, L. D. Lowery 301-459-1556
Mass Millis, Selmark Assocs. 617-376-2914
Mich Troy, McPhail Corp. 313-689-6444
Minn Mpls, Nortec Sls. 612-835-7414
Mo Hazelwood, Dy-Tronix Inc. 314-731-5799
Mo Independence, Dy-Tronix Inc. 816-373-6600
NH Manchester, Selmark Assocs. 603-623-5774
NJ Livingston, A.A. Budde 201-994-1210
NY Rochester, Electra Sls. 716-436-4030
NY Syracuse, Electro Sls. Corp. 315-455-5783
NC Raleigh, W.A. Brown Comps. 919-781-9426
Ohio Cleveland, C. Robinson Co. 216-381-9049
Ohio Dayton, C. Robinson Co. 513-275-2412
Pa Broomall, L.D. Lowery 215-528-5170
RI Cranston, Selmark Assocs. 401-943-5717
Tenn Knoxville, W.A. Brown Comps. 615-637-3523
Tex Richardson, R. Kimball Co. 214-231-3447
Va Charlottesville, L.D. Lowery 804-973-6672
Wash Bellevue, W.M. Buehler Co. 206-455-5512
Wisc Milwaukee, Sumer 414-259-9060

Local Distributors

Cal San Deigo, Sterling Elctrns. 714-565-2441
Cal Sun Valley, Sterling Elctrns. 213-767-5030
Colo Denver, Waco Elctrns. 303-371-4370
Fla Ft. Lauderdale, Peerless Radio Corp. 305-566-5966
Ill Elk Grove Village, G.B.L. Elctrns. 312-593-3220
Minn Minneapolis, Bergquist Co. 612-835-2322
NY Lynbrook, Peerless Radio Corp.
NY Rockville Centre, Midway Industrial Elctrns.
Pa Horsham, Pioneer/Pennsylvania 215-674-5710
Tex Houston, Altair Co. 713-462-3029
Tex Richardson, Altair Co. 214-231-5166

NORTH AMERICAN PHILIPS CONTROLS, Dept. EM, Husky Park, Frederick, Md. 21701, Tel: 301-663-5141, TWX: 710-862-0901; Empl.: 310 p. 3584,3585,4219

Sales Manager: C. Johnston; *Distributor Manager:* B. L. Reeder

Local Sales Offices & Reps.

Ala Huntsville, W. Brown 205-539-4411
Ariz Scottsdale, Williams Assocs. 602-947-4297
Cal Buena Park, Sales Engrs., Ltd. 213-921-0681
Cal Palo Alto, Harris Engrg. 415-328-3370
Cal San Diego, Sales Engrs., Ltd. 714-277-5723
Colo. Littleton, Lange Sls 303-795-3600
Conn Cheshire, Selmark Assoc. 203-272-8764
Fla Coral Springs, W.A. Brown Comps. 305-753-1650
Fla Orlando, W. Brown 305-851-5747
Ga Chamblee, W.A. Brown Comps. 404-455-0405
Ill Deerfield, Thermek, Inc. 312-945-5300
Ind Ft. Wayne, Temple Engrg. 219-743-0362
Iowa Cedar Rapids, S & O/Nortec Sls. 319-393-1845
Kans Overland Park, T.L. Dowell & Assocs. 913-648-7373
Md Baltimore, Coulbourn DeGreif 301-247-4646
Mass Millis, Selmark Assocs. 617-376-2914
Mich Troy, McPhail Corp. 313-689-6444
Minn Minneapolis, Nortec Sls. 612-835-7414
Mo St. Louis, T.L. Dowell & Assocs. 314-968-4234
NH Manchester, Selmark Assocs. 603-623-5774
NJ Pitman, Colrud Co. 609-589-5866
NY Hicksville, Wilson Assocs. 516-931-3007
NY Rochester, Electra Sls. 716-436-4030
NY Syracuse, Electro Sls. Corp. 315-455-5783
NC Raleigh, W.A. Brown 919-781-9426
Ohio Cleveland, C. Robinson 216-381-9049
Ohio Dayton, C. Robinson 513-275-2412
RI Cranston, Selmark Assocs. 401-943-5717
Tenn Knoxville, W. A. Brown Comp 615-637-3523
Tex Richardson, R.F. Kimball Inc. 214-231-3447

Wash Bellevue, W.M. Buehler Co. 206-455-5512

Local Distributors

Fla Ft. Lauderdale, Peerless Radio Corp. 305-566-5966
NY Lynbrook, Peerless Radio Corp. 516-593-2121
NY Rockville Centre, Midway Ind'l. Elctrns. 516-764-2400
Tex Houston, Altair Co. 713-462-3029
Tex Richardson, Altair Co. 214-231-5166

NORTH AMERICAN PHILIPS LIGHTING CORP., Dept. EM, Bank St., Hightstown, N.J. 08520, Tel: 609-448-4000, TWX: 510-685-5651; Empl.: 600

Sales Manager: J. Bland

Local Sales Offices & Reps.

Ariz Phoenix, Stitzer-Dodo Inc 602-944-2237
Cal Burlingame, W.J. Purdy Co. 415-347-7701
Cal El Monte, Cook Entprs. 213-686-2120
Cal San Diego, D & D Sls. Co. 714-560-6266
Colo Denver, W.J. Purdy Co. 303-777-1411
Conn Lakeville, Conti-Younger Assoc. 203-824-5982
Fla Clearwater, R.K. Welter Co 813-535-1837
Fla Orlando, R.K. Welter Co 305-644-9345
Fla Riviera Beach, R.K. Welter Co .. 305-842-5015
Ill Park Ridge, Metcom Assocs. 312-696-1490
Ind Indianapolis, Elctrn Reps 317-894-1414
Kans Shawnee Mission, Lowell-Kangas 913-631-3515
Ky Louisville, Elctrn Reps. 502-368-4911
Mass Waltham, Conti-Younger Assoc. 617-890-4582
Minn Minneapolis, Siedare Assoc. 612-545-5663
Mo St. Louis, Lowell-Kangas 314-821-4050
NJ Fort Lee, Necco OEM. 201-461-2789
NM Albuquerque, William J. Purdy Co 505-266-7959
NY Clay, Tech-Mark 315-699-2261
NY Endicott, Tech-Mark 607-748-7473
NY Liverpool, Tech-Mark 315-652-6229
NC Saluda, R.K. Welter Co 704-693-9628
Ohio Beachwood, Elctrn. Salesmasters 216-831-9555
Pa Flourtown, Eastern Comps. 215-836-1616
Pa Philadelphia, Paragon Sls Co 215-563-7060
Pa York, Eastern Comps 717-764-3114
Tex Dallas, Erickson Sls. 214-243-6611
Tex Sugarland, Erickson Sls. 713-494-9680
Va Herndon, Eastern Comps 703-471-1025

NORTH ATLANTIC INDS., Dept. EM, 200 Terminal Dr., Plainview, N.Y. 11803, Tel: 516-681-8600, TWX: 510-221-1879; FSC No.: 07342; Empl.: 225 p. 1658,2795

Sales Manager: K. Sale

Local Sales Offices & Reps.

Ala Huntsville, BCS Assocs. 205-881-6220
Ala Mobile, BCS Assoc. 205-666-2796
Cal Los Alamitos, Scientific Devices 213-598-7678
Cal Mountain View, Scientific Devices-CA 415-964-4230
Cal North Hollywood, Elect. Standards Repair Svc. 213-765-4224
Cal San Diego, Scientific Devices-CA 714-279-6642
Colo Littleton, Aztec Enterprises 303-795-0250
Conn Canton Ctr, Tekdata 203-525-7647
Fla Orlando, BCS Assocs. 305-896-4881
Ga Decatur, BCS Assocs. 404-321-0980
Ky Valley Station, BCS Assoc. 502-935-9634
Md Lanham, Brimberg Sls. Co. 301-552-2200
Mass Wakefield, Tekdata 617-245-5940
Mich Troy, G. R. Peters Assocs. 313-362-1220
Minn Circle Pines, P. Lind 612-786-5770
Minn Circle Pines, P. Lind 612-786-5770
Mo St. Louis, PEM Sls Co. 314-427-7200
NM Albuquerque, Aztec Enterprises 505-255-2440
NC Greensboro, BCS Assocs. 919-273-1918
Ohio Dayton, ARC Elctrn. Assoc. 513-294-6987
Ohio Rocky River, ARC Elctrn. Assoc. 216-333-8375
Pa Philadelphia, Tech Instru. Sls. 215-836-1212
Tex Richardson, Sci. Sls. 214-231-6541

NORTH ELECTRIC CO., Power Sys Div., Dept. EM, Box 688, Galion, Ohio 44833, Tel: 419-468-8100, TWX: 98-7428, 810-248-2907; Empl.: 1000

Sales Manager: J. Botdorf

Local Sales Offices & Reps.

NJ Cherry Hill, Benco Sls. 609-779-9282

NORTH HILLS ELCTRNS., Dept. EM, Alexander Pl., Glen Cove, N.Y. 11542, Tel: 516-671-5700, Telex: 64-0476; FSC No.: 98821; Empl.: 45 p. 1361,2275,3060,3061,3288,4364

Sales Manager: H.H. Marx

Local Sales Offices & Reps.

Cal Los Angeles, Sodaro Co. 213-478-7733
Cal San Francisco, J. Staschover 415-493-7255
Minn Minneapolis, Heimann Co., Inc. .. 612-861-6051
NJ Neptune, Norman K. Freeman Assoc. 201-988-2244
NY Great Neck, Industron Assocs., Inc. 516-487-2620

NORTH MICROSYSTEMS, See ITT North Microsystems Div

NORTHERN ENGINEERING LABS., Dept. EM, 357 Beloit St., Burlington, Wisc. 53105, Tel: 414-763-3591; FSC No.: 00815; Empl.: 200 ..... p. 2351

Local Sales Offices & Reps.

Cal Los Gatos, R.W. Thompson Assocs. 408-358-2671
Cal Pasadena, P. Nurches Co. 213-796-5844
Colo Parker, James S. Heaton Co. ... 303-841-3651
Fla Clearwater, Brennan Assocs. 813-446-5006
Ill Palatine, M.J. Petersen Assocs. 312-359-8200
Kans Olathe, B. Rush Assocs. 913-764-2700
Mass Needham, Hatch Assocs. 617-444-3310
Minn Chanhassen, Barnes Sls Assocs. 612-474-2907
NJ Bergenfield, H. Gray Assocs. 201-384-3643
NY Cazenovia, Naylor Elctrns. Co. .. 315-655-8174
NC Kernersville, Naylor Assocs 919-996-4162
Ohio Wickliffe, W.J. Brauer & Assocs. 216-943-0601
Pa Oreland, CMS Mktg 215-885-5106
Tex Richardson, Southland Comps., Inc. 214-783-8348
Wash Seattle, ES/Chase Co 206-762-4824

NORTHERN PRECISION LABS., INC., Dept. EM, 202 Fairfield Rd., Fairfield, N.J. 07006, Tel: 201-227-4800, TWX: 710-734-4301; Empl.: 56

NORTHLAKE ENGINEERING, Dept. EM, 999 Anita Ave., Antioch, Ill. 60002, Tel: 312-395-5710; FSC No.: 50638; Empl.: 100

Sales Manager: M.R. Whitman

Local Sales Offices & Reps.

Cal Glendale, JBR Industries 213-242-7324
Cal Redwood City, Parks & Pruitt Assocs. 415-364-1640
Ill Deerfield, Glenn Neal 312-945-5438
Mass Norwell, Bordewieck Engrg. Sls. 617-659-4915
NJ Cherry Hill, Danco Elctrn Sls. 609-424-5590
NY Baldwinsville, Scibetta Reps. 315-622-3993
NY Syosset, Motion Control Sls. 516-921-5656
Ohio Akron, Augey Natalino Assocs. .. 216-725-6071
Ore Forest Grove, Doran Sls. Assocs. 503-357-3333
Tex Richardson, Campion Sls 214-238-8145
Wash Redmond, Doran Sls. Assocs. 206-885-1885

SCOTT & FETZER CO., Northland Div, Dept. EM, 968 Bradley St, Watertown, N.Y. 13601, Tel: 315-782-2350

Sales Manager: Jon F. Wiltse

Local Sales Offices & Reps.

Cal Los Angeles, Rock Assocs 714-521-6980
Ill Chicago, Northland Div 312-428-7862

NORTON ASSOCS., INC., Dept. EM, 10 Di Tomas Ct., Copiague, N.Y. 11726, Tel: 516-842-4666; FSC No.: 08739

NORTON CO., PUBLIC RELATIONS DEPT., Dept. EM, One New Bond St., Worcester, Mass. 01606, Tel: 617-853-1000, TWX: 920428, 710-340-1126; Empl.: 23,000

NORTRAN CO., Dept. EM, 96 Milton Rd, Rochester, New Hampshire 03867, Tel: 603-332-3334, TWX: 510-2974-462; Empl.: 104

Sales Manager: R. A. Bellerive

Local Sales Offices & Reps.

Mass Waltham, Carlisle Technical Sls 617-890-1456
NY White Plains, Swedelco, Inc. 914-946-1122

NORTRONICS CO., INC., Dept. EM, 8101 Tenth Ave., N., Minneapolis, Minn. 55427, Tel: 612-545-0401, Telex: 29-0304; Empl.: 600

Sales Manager: E. Bedell; *Distributor Manager:* J.D. Strand

NOTHELFER WINDING LABS, See NWL Transformers

NOVA ELECTRIC MFG. CO., Dept. EM, 263 Hillside Ave., Nutley, N.J. 07110, Tel: 201-661-3434; FSC No.: 29019; Empl.: 50 ..... p. 3396,3397

Sales Manager: K. Niovitch

Local Sales Offices & Reps.

Cal Los Angeles, Basic Sys. 213-938-2833
Cal Mountain View, Gado Instr. 415-961-2222
Colo Boulder, A.L.S. Elctrns. 303-447-2436
Colo Englewood, Data-Specialties 303-761-5763
Fla Orlando, Data Rep 305-843-5224
Ill Chicago, Ampol Svcs. & Engrg. 312-685-1350
Ind Indianapolis, J. Holsapple Assoc. 317-353-9441
La Lafayette, Kemp Engrg. 318-984-3516
Md Bethesda, Powell-Pendergraph .. 301-656-4535
Mass Wakefield, Bordewieck Engrg. Sls. Co. 617-659-4915
Mich Farmington, Anderson Elctrns. 313-476-9161
Minn Minneapolis, R-J Inc. 612-922-1425
NM Albuquerque, A.L.S. Elctrns. 505-294-8555
NY Elmont, Crane & Egert Corp. 516-488-2100
NY Fayetteville, M.P. Andrews Mfrs. Rep. 315-637-5291
NC Charlotte, J. Rudisill Assoc. 704-377-6901
Ohio Aurora, EMA Inc. 216-562-8516
Ohio Centerville, EMA Inc. 513-433-2800
Okla Tulsa, Paul King Co. 918-836-2501
Ore Portland, Richard Legg Co. 503-792-8824
Pa Philadelphia, Powell-Pendergraph 215-657-0330
Pa Pittsburgh, Wainwright Tech. Sls. 412-487-5055
Tex Dallas, Kemp Engrg. 214-661-0400
Tex Houston, Kemp Engrg. 713-688-1431
Exp: 1 World Trade Center, NY NY, Singer Products Co. 212-432-1400

Local Distributors

For: Norway, Oslo, Ole Nordby

NOVA TRAN CORP., Dept. EM, 360 4th St., Clear Lake, Wisc. 54005, Tel: 715-263-2333, TWX: 910-575-8022; FSC No.: 56643; Empl.: 45

Sales Manager: R. Olson

Local Sales Offices & Reps.

Cal Montclair, Nova Tran Corp, Western Operations 714-985-1874
Cal Montclair, Nova Tran Corp. 714-985-1874
Mass Attleboro, Lawrence Habershaw 617-222-8979
Pa Bethlehem, Steinmetz Assocs. .. 215-868-6101
Pa Bethlehem, Steinmetz Assocs. .. 215-868-6101
Wisc Clear Lake, Nova Tran Corp. 715-263-2333

NOVATRONICS, INC., Dept. EM, Box 878, Pompano Beach, Fla. 33061, Tel: 305-942-5200, TWX: 510-956-9878; Empl.: 175

Sales Manager: J. A. Cianciarulo

NU-CONCEPT COMPUTER SYSTEMS, INC., Dept. EM, Route 309 and Advance Lane, Colmar, Pa. 18915, Tel: 215-822-8400; Empl.: 17

Local Sales Offices & Reps.

Ariz Phoenix, Scottsdale Tool & Supply 602-273-7376
Cal El Monte, Marshall Inds. 213-686-0141
Fla Ft. Lauderdale, Howard Assocs. 305-566-8192
Haw Honolulu, Electrical Equip. Co. Ltd. .. 533-3884
Mass Burlington, Contact East 617-272-5051
Mich Flint, Shand Elctrns. 313-743-8940
NJ Camden, Arch Mfg. & Sls. 609-966-3835
NJ Saddle Brook, Tool-Tronics 201-478-2203
NY Elmhurst, Wilson Assocs. 212-899-0929
NY Farmingdale, Marshall Inds. 800-732-5052
NY Mt. Vernon, Electronic Tool Co. 914-664-0088
NY Thornwood, Electronic Tool Co. 914-769-8070
Ore Portland, Dunn Elctrns. 503-222-4279
Pa Plymouth Meeting, Techni-Tool .. 215-825-4990
Tex Dallas, Techno Assocs. 214-357-9313
WVa Huntington, Electric Supply 304-523-6443
Exp: Ill., Chicago, E.D. Magnus & Assocs. 312-334-1503

NU-METRICS, Dept. EM, P.O. Box 800, Connellsville, Pa. 15425, Tel: 412-628-0400; Empl.: 16

NUCLEAR RESCH. CORP., Dept. EM, 1105 Indl Hwy., Southampton, Pa. 18966, Tel: 215-357-5015; FSC No.: 96696; Empl.: 50

Sales Manager: D.T. McIntyre, V.P.

Local Sales Offices & Reps.

Ariz Scottsdale, J.T. Aldrich Co. 602-945-8598
Cal Inglewood, Charles W. Fowler Co. 213-678-5211
Cal Menlo Park, Charles W. Fowler Co. 415-322-5374
Colo Denver, Charles W. Fowler Co. 303-499-2141
Conn Weston, Westek Co. 203-227-2724
Md Baltimore, MRT Co. 301-685-7425
Mich Detroit, Basic Svc. Corp. 313-837-8820
NJ So. Bound Brook, DCI 201-469-3391
NC Charlotte, BinCo. 704-366-5092
Pa Chadds Ford, Valcon Sls. Engrg. Co. 215-459-2071
Wash Bellevue, Charles W. Fowler Co. 206-454-8600

NUCLEONIC PRODS., Dept. EM, Box 1454, 6660 Variel Ave., Canoga Pk., Cal. 91303, Tel: 213-887-1010, TWX: 910-494-1954, 698481; Empl.: 185

Sales Manager: R. J. Osajda; *Distributor Manager:* Shirley Rogers

Local Sales Offices & Reps.

Ariz Phoenix, Chaparral-Dorton 602-263-0414
Cal Los Angeles, DeAngelo, Rothman & Co. 213-398-6239
Cal Redwood City, Logan Sls. 415-369-6726
Cal San Diego, Earle Assocs 714-278-5441
Conn Lakeville, Conti-Younger Assocs 617-890-4582
Fla Altamonte Springs, "C" Assocs 305-831-1717
Ill Franklin Park, Dekotech, Inc. 312-455-5100
Ind Indianapolis, Frank J. Campisano Co. 317-247-8623
Iowa Cedar Rapids, J.R. Sales Engrg 319-303-2232
Md Baltimore, Component Sls 301-484-3647
Mass Waltham, Conti-Younger Assocs 617-890-4582
Mich Bloomfield Hills, Enco Mktg Inc. 313-642-0203
Minn Minneapolis, Quantum Sls 612-831-8583
Miss Meridan, Herron Assocs 601-483-9306
NY Buffalo, Quality Comps. 716-839-4170
NY Hempstead, Kahgan Sls 516-538-2300
NY Larchmont, Hingston-Walsh 914-834-4423
NY Manilus, Quality Comps 315-682-8885
NC Raleigh, Component Sls 919-782-8433
Ohio Cincinnati, Frank J. Campisano .. 513-574-7111
Ohio Cleveland, Frank J. Campisano 216-468-1515
Ore Portland, Northwest Mktg Assocs 503-297-2581
Pa Narbeth, Jerry Bresson Assocs. 215-664-6460
Wash Bellevue, Northwest Mkt & Assocs 206-455-5846

Local Distributors

Ariz Phoenix, Kachina Elctrns 602-269-6201
Cal El Monte, G. S. Marshall 213-686-0141
Cal Oakland, Brill Elctrns 415-834-5888
Cal Sunnyvale, Intermark Elctrns 408-738-1111
Cal Woodland Hills, Jaco 213-884-4560
Colo Wheatridge, Century 303-424-1985
Fla Ft. Lauderdale, Natl Resistor 305-792-2600
Ill Rosemont, Advent Elctrns 312-297-6200
Ill Westmont, R-M/Bodelle 312-323-9670
Ind Indianapolis, Advent Elctrns 317-297-4910
Iowa Cedar Rapids, Advent Elctrns 319-363-0221
Md Savage, Pyttronic Inds 301-792-0780
Mass Burlington, Zeus Comps 617-273-0750
Mass Newton, G. S. Marshall 617-965-5115
Mich Farmington, Advent Elctrns 313-477-1650
Mich Kentwood, R-M Elctrns 616-531-9300
Minn Minneapolis, Joel Co. 612-545-5669
NM Albuquerque, Century 505-292-2700
NY Elmsford, Zeus Comps 914-592-4120
NY Hempstead, Kahgan Comps 516-538-2300
NC Greensboro, Hammond Elctrns .. 919-275-6391
Okla Tulsa, Comp Specialties 918-664-2820
Ore Portland, Dunn Elctrns 503-285-0214
Pa Montgomeryville, Pyttronic Inds .. 215-643-2850
SC Greenville, Hammond Elctrns 803-233-4121
Tex Dallas, Comp Specialities 214-357-6511
Tex Houston, G. S. Marshall 713-777-0358
Utah Salt Lake City, Century 801-487-8551
Wash Seattle, Zepher 206-575-0922
Wisc Mequon, Taylor Elec 414-241-4321

NURAD, INC., Dept. EM, 2165 Druid Pk. Dr., Baltimore, Md. 21211, Tel: 301-462-1700, TWX; 710-234-1071; Empl.: 50

Local Sales Offices & Reps.

Ga Atlanta, Radford Assocs 404-237-6097
Md Baltimore, C. L. Malinow & Co. .. 301-922-2092
NJ Totowa, H. M. Holzberg Assocs. 201-256-0455
NY New York, Auriema Int'l. Group .. 212-938-0930
Tenn Nashville, Radford Assocs 615-373-0231
Tex Ft. Worth, Carey-Wolf 817-823-5383
Wash Mercer Island, Bennett Engrg. Assocs. 206-232-3550

NUTRONICS, INC., Dept. EM, 1515 N. Harlem Ave., Oak Park, Ill. 60302, Tel: 312-524-1666; Empl.: 170

Sales Manager: E. Nendick

Local Sales Offices & Reps.

Cal Huntington Beach, Damco Sls 714-894-8126
Cal Palo Alto, Nor-Cal Assocs 415-961-8121
Fla Terra Ceia, Component Sls 813-894-4366
Ill Bellwood, Fiat Engrg 312-547-6200
Ill Downers Grove, Momak Sls 312-963-6400
Ill Rolling Meadows, Sumer, Inc. 312-991-8500
Ind Indianapolis, Electronic Sls. 317-849-4260
Mass Sturbridge, Branford Controls 617-347-7367
Minn Minneapolis, Terry Kurschner Sls 612-374-2628
NJ Englewood Cliffs, Sprung/Nussbaum 201-947-6767
NY Fayetteville, Martin P. Andrews .. 315-637-5291
Pa Oreland, CMS Mktg 215-885-5106
Tex Dallas, Wm. Reese Assoc. 713-621-3134
Va Lynchburg, J. A. Griffin 703-384-5236
Wash Seattle, Walt Spaulding 206-282-9173
Wisc Milwaukee, Sumer 414-259-9060

NUVOX ELCTRNS. CORP., Dept. EM, 150 Fifth Ave., New York, N.Y. 10011, Tel: 212-243-2110; Empl.: 6

Sales Manager: Sol Sassoon; *Distributor Manager:* Sol Sassoon

NVF CO., Dept. EM, Box 68, Yorklyn, Del. 19736, Tel: 302-239-5281, Telex: 83-5434; Empl.: 1500

Local Sales Offices & Reps.

Cal Los Angeles, NVF Co 213-723-0291
Conn Hartford, NVF Co 203-247-2770
Del Wilmington, NVF Co 301-239-5281
Ga Atlanta, NVF Co 404-261-2946
Ill Broadview, NVF Co 312-287-1935
Ind Fort Wayne, Insulation Reps 219-482-1596
Mass Westford, NVF Co 617-692-7939
Mo Clayton, NVF Co 314-725-9577
NJ Livingston, NVF Co 201-994-4330
NY New York, NVF Co 212-267-3895
NY Rochester, NVF Co 716-442-1383
NC Charlotte, NVF Co 704-527-0527
Ohio Cincinnati, NVF Co 513-421-0632
Ohio Cleveland, NVF Co 216-255-3417
Pa Coraopolis, NVF Co 412-321-3939
Pa Kennett Square, Technical Prods. Div. 215-444-2800
Pa Radnor, NVF Co 215-528-6760
Tex Fort Worth, NVF Co 817-292-3614
Wisc Waukesha, NVF Co 414-276-6995

NWL TRANSFORMERS, Dept. EM, Rising Sun Rd., Bordentown, N.J. 08505, Tel: 609-298-7300; Empl.: 130 ..... p. 3289,4365

Sales Manager: C. W. Harrison

Local Sales Offices & Reps.

Ill Lincolnwood, Markson Assocs. .. 312-677-3464
Pa Pittsburgh, Instrument Svcs 412-221-3601
WVa Charleston, Instrument Svcs 304-345-0348

NYE, WILLIAM F., INC., Dept. EM, P.O. Box G-927, New Bedford, Mass. 02742, Tel: 617-996-6721; Empl.: 10

NYTRONICS COMPS. GROUP INC., Sub Nytronics, Dept. EM, Orange St., Darlington, S.C. 29532, Tel: 803-393-5421, TWX: 810-665-2182; FSC No.: 83125; Empl.: 250 p. 1190-1201, 1344-1360, 2406, 2407, 3713-3715

Local Sales Offices & Reps.

Ala Huntsville, W.A. Brown Inc. 205-539-4411
Cal Los Altos, W.W. Posey 415-948-7771
Cal Sherman Oaks, Clemick & Neenan & Assoc. 213-990-3150
Fla Fort Lauderdale, W.A. Brown Comp. Inc. 305-776-4800
Fla Orlando, W.A. Brown Comp. Inc. 305-425-5863
Ga Chamblee, W.A. Brown Components 404-455-0405
Ind Indianapolis, Southern Sls. Corp. 317-299-2992
Md Bethesda, Warren Mount Comp. 301-657-9312
Mass Bedford, F.R. Lesser 617-275-7558
Mich Ann Arbor, H.C. Heym Assoc. 313-971-6552
Mich Saginaw, H.C. Neym Assoc. 517-799-7928
Minn Edina, Wagner Consits. 612-721-5781
Mo Grandview, Burton/Medley 816-436-0491
NY Fairport, W.A. Franklin Sls. Corp. 716-223-5102
NY New Hartford, W.A. Franklin Sls. Corp. 315-737-5038
NY Syracuse, W.A. Franklin Sls. Corp. 315-472-5273
NY Valley Cottage, LRC Assocs. 914-634-7973
Ohio Cleveland, Imtech Inc. 216-826-3400
Ohio Dayton, Imtech Inc. 513-278-6507
Pa Narbeth, J. Bresson Assoc. 215-664-6460
Tex Austin, Palatine Sls., Inc. 512-451-7463
Tex Houston, Palatine Sls., Inc. 713-783-1492
Tex Richardson, Palatine Sls., Inc. 214-231-9489
Wash Seattle, Seatronics, Inc. 206-767-4330

Local Distributors

Ala Huntsville, Cramer Elect. 205-539-5722
Cal Carson, Hi Rel 213-537-6500
Cal Gardena, Bell Inds. 213-321-5802
Cal Sunnyvale, Bell Industries 408-734-8570
Colo Denver, Newark Elec. 303-757-3351
DC Beltsville, Newark Elec. 301-937-5085
Fla Ft. Lauderdale, Newark Elect. 305-587-2372
Ga Atlanta, Cramer Elect. 404-448-9050
Ill Chicago, Newark Elect. 312-638-4411
Ill Skokie, Bell Inds. 312-965-7500
Ind Ft. Wayne, Ft. Wayne Elect. 219-742-4346
Iowa Cedar Rapids, Newark Elect. 312-362-1171
Md Baltimore, Radio Elect. 301-823-0070
Md Rockville, Wilshire Elec. 301-340-7900
Mass Newton, Cramer Elect. 617-969-7700
Mass Watertown, Sterling Elec. 617-926-9720
Mich Livonia, Reptron Elctrn. 313-525-2700
Minn Minneapolis, Newark Elect. 216-361-4700
Minn Minneapolis, Joel Co. 612-545-5669
NJ Kenilworth, Newark Elect. 201-272-8410
NY Farmingdale, Pride Elctrns. 516-293-4020
NY Hauppauge, Jaco Elect. 516-273-5981
NY Plainview, ACI Elect. 516-293-6630
NY Plainview, Fairmont Elctrns. 516-694-8200
NC Winston Salem, Cramer Elect. .. 919-725-8711
Ohio Centerville, C.V. Clark 513-435-3000
Ohio Cleveland, Newark Elect. 216-361-4700
Ohio Columbus, Reptron/Ohio 614-443-0231
Pa Montgomeryville, Pyttronic Indust. 215-643-2850
Pa Philadelphia, Philadelphia 215-568-8288
Tex Dallas, Wholesale Elect. 214-824-3001
Utah Salt Lake City, Newark Elect. 801-486-1048
Wash Bellevue, Bell Industries 206-747-1515
Wisc Brookfield, Newark Elect. 414-781-2450
Exp: Can., Montreal 301, Que., Cesco Elctrns. 514-735-5511
For: Germany, 8 Munchenz, Karlstasse, Neumuller GM BH 59 2421

OAK INDS. INC., Switch Div., Dept. EM, Dept. DA, Crystal Lake, Ill. 60014, Tel: 815-459-5000, TWX: 722-447 910-634-3786; FSC No.: 76854; Empl.: 1200 ..... p. 2497-2537,3586-3588,4163-4215

Sales Manager: J. Tucker; *Distributor Manager:* J. Vodnansky

Local Sales Offices & Reps.

Ala Huntsville, Oak Ind Inc 205-881-9470
Ariz Phoenix, Shefler/Kahn Co. 602-257-9015
Cal Los Altos, Oak Ind. Inc. 415-941-1237
Cal Santa Ana, Oak Ind. Inc. 714-540-0565
Colo Denver, I.W. Strong Assoc. 303-292-6900
Conn Waterbury, Oak Ind. Inc. 203-755-8379
Fla Altamonte Springs, Oak Ind. Inc. 305-831-5411
Ill Crystal Lake, Oak Ind. Inc. 815-459-5000
Mass Reading, Oak Ind. Inc. 617-944-0094
Minn Minneapolis, Clark R. Gibb Co. .. 612-377-1200
Mo Earth City, Centech, Inc. 314-291-4230
Mo Raytown, Centech, Inc. 816-358-8100
NJ Haddonfield, Gray Assoc. 609-429-5300
NJ Mountainside, Henry G. Richter Co. 201-233-4615
NM Albuquerque, Shefler/Kahn Co. 505-296-0749
NY Fayetteville, Henry G. Richter Co. 315-637-6713
NC Raleigh, Oak Ind. Inc. 919-876-7591
Ohio Cincinnati, Oak Ind. Inc. 513-851-4411
Ohio Cleveland, Oak Ind. Inc. 216-234-4411
Ore Portland, Oak Ind. Inc. 503-292-0878
Tex Richardson, Oak Ind. Inc. 214-234-8106
Utah Salt Lake City, I.W. Strong Assoc. 801-363-1014
Wash Belleview, Oak Ind. Inc. 206-453-1810

Local Distributors

Ala Huntsville, Hall Mark Elctrns. 205-837-8700
Ariz Phoenix, Parts Elect. of Ariz. 602-258-6476
Ariz Tempe, G.S. Marshall Co. 602-968-6181
Cal Canoga Park, G. S. Marshall Co. 213-999-5001
Cal El Monte, G.S. Marshall Co. 213-686-1500
Cal Inglewood, Newark Elctrns. 213-678-0441
Cal Irvine, G.S. Marshall Co. 714-556-6400
Cal San Diego, G.S. Marshall Co. 714-278-6350
Cal Sunnyvale, G.S. Marshall Co. 408-732-1100
Colo Arvada, G.S. Marshall Co. 303-423-9670
Colo Denver, Newark Elctrns 303-757-3351
Conn No. Branford, G.S. Marshall Co. 203-484-0480
Fla Ft. Lauderdale, Hall Mark Elctrns. 305-971-9280
Fla Orlando, Hall Mark Elctrns. 305-855-4020
Fla Orlando, G.S. Marshall Co. 305-859-1620

Ga Atlanta, Newark Elctrns 404-321-0413
Ill Arlington Heights, Lodan Elctrns. 312-956-6700
Ill Chicago, Newark Elctrns. 312-638-4411
Ill Crystal Lake, Sub-Sem Elctrns .. 815-459-4139
Ill Des Plaines, G.S. Marshall Co... 312-298-3700
Ill Des Plaines, Edmar Elctrns. 312-298-8580
Ill Elk Grove Village, Hall Mark Elctrns. 312-437-8800
Ill Palatine, Ohm/Elctrns. 312-359-5500
Ill Peoria, Klaus Radio..... 309-691-4840
Ind Indianapolis, Graham Elctrns. 317-634-8202
Kans Shawnee Mission, Hall Mark Elctrns. 913-888-4747
Md Baltimore, Hall Mark Elctrns. 301-796-9300
Md Beltsville, Newark Elctrns..... 301-937-5085
Mass Newton, Impact Co 617-964-7740
Mass Newton Highland, G.S. Marshall Co. 617-965-5115
Mass N. Wilbraham, Industrial Comps. 413-596-3854
Mass Watertown, DRW Elctrns..... 617-923-1900
Mass Woburn, Newark Elctrns..... 617-935-8350
Mich Oak Park, Newark Electrns 313-548-0250
Minn Bloomington, Hall Mark Elctrns. 612-884-9056
Minn Minneapolis, Newark Elctrns 612-331-6350
Minn Plymouth, G. S. Marshall Co. 612-559-2211
Mo Earth City, Hall Mark Elctrns. 314-291-5350
NJ Kenilworth, Newark Elctrns 201-272-8410
NJ Springfield, Federated Purchaser 201-376-8900
NY Binghamton, Harvey/Federal Elctrns. 607-748-8211
NY Farmingdale, G.S. Marshall Co. 516-293-4141
NY Farmingdale, DRW Elctrns. 516-249-2660
NY Rochester, Newark Elctrns 716-473-6600
NC Raleigh, Hall Mark Elctrns..... 919-832-4465
NC Raleigh, Southeastern Radio Supply 919-828-2311
Ohio Cincinnati, Newark Elctrns 513-874-5115
Ohio Dayton, G.S. Marshall Co. 513-236-8088
Ohio Medina, DRW Elctrns..... 216-722-5531
Ohio Worthington, Hall Mark Elctrns .. 614-846-1882
Okla Tulsa, S & S Radio Supply 918-582-8242
Okla Tulsa, Hall Mark Elctrns. 918-835-8458
Pa Huntingdon Valley, Hall Mark Elctrns. 215-355-7300
Pa King of Prussia, G.S. Marshall.... 215-337-3330
Tex Austin, Hall Mark Elctrns..... 512-837-2814
Tex Dallas, G.S. Marhsall Co..... 214-233-5200
Tex Dallas, Hall Mark Elctrns..... 214-234-7400
Tex Houston, Hall Mark Elctrns. 713-781-6100
Tex Houston, G. S. Marshall 713-777-0358
Utah Salt Lake City, Newark Elctrns .. 801-486-1048
Wash Bellevue, G.S. Marshall Co..... 206-883-1084
Wash Seattle, Radar Electric Co. 206-282-2511
Wash Seattle, Zepher Elctrn. Sls. 206-575-0922
Wisc West Allis, Hall Mark Elctrns. 414-476-1270

OAKTRON INDS., INC., Dept. EM, Monroe, Wisconsin 53566, Tel: 608-325-2121; Empl.: 250

Local Sales Offices & Reps.

Ariz Phoenix, R. Fissell Co. 602-264-4031
Cal Los Altos, Ewing-Foley, Inc..... 415-941-4525
Cal No. Hollywood, J. Carter Assoc. 213-980-3450
Colo Arvada, C B Elctrn. Mktg..... 303-422-0561
DC Washington, Lienau Assoc. 301-770-6800
Fla No. Miami, Haas/Winfield Co.... 305-945-6544
Fla No. Miami, Winfield Elect. Sls.... 305-945-6544
Ga Atlanta, Millar Elect. 404-261-6160
Ill Chicago, Markal Sls..... 312-282-5800
Ind Indianpolis, Shamrock Elect. 317-842-1795
Md Bethesda, Lienau Assoc. 301-654-8444
Mass Norwood, Rudolph & Macinnes.. 617-769-5450
Minn St. Paul, Norcen Tronix..... 612-854-8494
Mo Kansas City, Nevco, Inc..... 816-421-1751
Mo St. Louis, Nevco, Inc. 314-843-7406
NY Rochester, J. Brown Elect. Sls... 716-266-2728
NY Yonkers, J. Brown Elect. Sls. 914-779-7330
NC Raleigh, Millar Elect. 919-787-9564
Ohio Akron, Shamrock Elect. 216-666-3796
Ohio Dayton, Shamrock Elect 513-298-3052
Pa Butler, Shamrock Elect. 412-282-1660
Pa Philadelphia, Lienau Assoc. 215-464-9444
Tenn Memphis, Al. Engleman Co..... 901-458-6263
Tex Irving, Antle Smith Sls. 214-259-8707
Wash Bellevue, Ron Merritt Co..... 206-746-7337
Exp: Ill., Chicago, E.D. Magnus Assoc. 312-334-1503

OAL ASSOCS., INC., Dept. EM, P.O. Box 64, Escondido, Cal. 92025, Tel: 714-743-7143; Empl.: 10

Local Sales Offices & Reps.

Cal Costa Mesa, Pat Dooley Co. 714-548-2232
Cal Walnut Creek, Wilnat Co. 415-938-9629
Ill Palatine, Jos. Clark Co. 312-358-5095
Mich Southfield, Stewart Sls. Co..... 313-275-5335
Minn Minneapolis, Conway Assocs. 612-884-0022
NY Amityville, Testing Machines 516-842-5400
NY Great Neck, W&A Holland 516-487-8877

OAS INC., Dept. EM, 145 Palasades St., Dobbs Ferry, N.Y. 10522, Tel: 914-693-9001

Sales Manager: N. Merritt

Local Sales Offices & Reps.

Mass Needham Heights, Magyar & Assocs. 617-444-9095
NJ Morristown, Power Sls. & Engrg. 201-539-4212
NJ South Orange, Smith Co. 201-763-1770
Pa Pittsburgh, Weiss Instrs. 412-371-3020
Vt Bennington, Magyar & Assocs. .. 802-442-5858

OCEAN RESEARCH EQUIPMENT, INC., Dept. EM, Box 709, Falmouth, Mass. 02541, Tel: 617-548-5800, Telex: 94-0859; Empl.: 125

ODELL CO., M. P., Dept. EM, 26612 Center Ridge Rd., Cleveland, Ohio 44145, Tel: 216-871-8000; Empl.: 7

Local Sales Offices & Reps.

Ariz Scottsdale, Williams Assocs. 602-947-4297
Cal Carson, Schlines Richardson..... 213-538-5800
Cal Palo Alto, Coherent Mktg. Assoc. 415-327-2217
Colo Denver, Williams Assocs. 303-373-4730
Ill Addison, R. Edward Stemm..... 312-279-2440
Md Rockville, Farrell Assocs. 301-424-9460
Mass Acton, E.E. Specialists 617-259-9200
Mich Madison Heights, WKM Associates 313-588-2300
Minn Minneapolis, R. Edward Stemm 616-922-3643
Mo St. John's, R. Edward Stemm 314-426-2500
NJ East Orange, Friedman Assocs. 201-673-2500
NM Albuquerque, Williams Assocs. .. 505-255-1638
NY Fayetteville, Doolittle Elctrns. Corp. 315-637-3222
Ohio Cleveland, WKM Assocs. 216-267-0445
Ohio Dayton, WKM Assocs. 513-434-7500
Pa Audubon, Holmes Assocs. 215-666-0636
Tex Dallas, Martin, Zienkosky, Browne & Assoc. 214-233-5535
Tex Houston, Martin, Zienkosky, Browne & Assoc. 713-523-7333
Exp: Cleveland, Brandes Int'l. Co. 216-333-0754

OECO CORP., Dept. EM, 712 S.E. Hawthorne Blvd., Portland, Ore. 97214, Tel: 503-238-2440, Telex: 36-0350; FSC No.: 95266; Empl.: 390

Sales Manager: R. J. Bunker

Local Sales Offices & Reps.

Cal Laguna Niguel, J. Wray 714-493-0190
Cal Palo Alto, B & J Sls. 408-744-1880
Fla St. Petersburg, QXI, Inc..... 813-821-2281
Mass Waltham, Omega Sls. Corp. 617-890-1111
Minn Minneapolis, Nortec Sls..... 612-835-7414
Tex Plano, K & H Sls. 214-423-6520

OGALLALA ELCTRNS., Div. Arnold Engrg. Co., Dept. EM, Box 59, Ogallala, Neb. 69153, Tel: 308-284-4093; Empl.: 30

OHIO CARBON CO., Dept. EM, 12508 Berea Rd., Cleveland, Ohio 44111, Tel: 216-252-6100; FSC No.: 76868; Empl.: 75

Local Sales Offices & Reps.

Cal Los Angeles, Marwood Ltd. 213-628-3241
Cal San Francisco, Marwood Ltd. 415-431-7893
Ga Atlanta, Rhyne & Assoc 404-261-4540
Ill Arlington Hgts., Eschner & Keranen 312-259-8184
Ill Chicago, M. Smith 312-787-3371
Kans Lenexa, Palatine Sls 913-492-7020
Md Westminster, M & B Assocs 301-876-2472
Mich Bay City, Allsopp Assoc. 517-684-6120
Mo St. Louis, Palatine Sls..... 314-426-7055
NJ Andover, W. Proshek 201-347-6205
Ohio Cleveland, Greenleaf Assoc. 216-333-5480
Ore Portland, Marwood Ltd. 503-223-5130
Pa Sewickley, R. Clark..... 412-923-1980
Tex Houston, Palatine Sls 713-783-1492
Tex Richardson, Palatine Sls..... 214-231-9489
Wash Seattle, Marwood Ltd..... 206-623-4747

OHIO SEMITRONICS, INC., Dept. EM, 1205 Chesapeake Ave., Columbus, Ohio 43212, Tel: 614-486-9561; FSC No.: 12066; Empl.: 35 p. 4303-4322

Sales Manager: G. Clagett

Local Sales Offices & Reps.

Ala Huntsville, Anderson Assoc..... 205-881-6770

OHMITE®

OHMITE MFG. CO., Dept. EM, 3601 W. Howard St., Skokie, Ill. 60076, Tel: 312-675-2600, TWX: 910-223-0805

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Local Sales Offices & Reps.

Alas Anchorage, H.J. Lang & Assocs. 907-279-5741
Cal Los Angeles, Paul F. Wiley Co... 213-663-8028
Cal Palo Alto, Ohmite Mfg. Co. 415-494-6954
Colo Denver, I.W. Strong & Assocs. .. 303-292-6900
Conn Waterbury, Coakley, Boyd & Abbett, Inc. 203-934-1411
Fla Orlando, Cartwright & Bean..... 305-422-4531
Ga Atlanta, Ohmite Mfg. Co. 404-457-3780
Kans Shawnee Mission, K & M Sls. Co. 913-262-1444
La Gretna, Cartwright & Bean..... 504-363-4649
Mass Needham, Coakley, Boyd & Abbett, Inc. 617-444-5470
Mich Birmingham, Ohmite Mfg. Co. 313-642-6040
Minn St. Paul, Cahill Assocs. 612-646-7217
Mo St. Louis, K & M Sls. Co. 314-423-2420
NJ Hackensack, Ohmite Mfg. Co..... 201-488-3690
NJ Pennsauken, Ohmite Mfg. Co..... 609-663-1703
NY Buffalo, Telesco Assocs. 716-834-1026
NC Charlotte, Poleytec Svs. 704-332-6191
Ohio Cleveland, Ohmite Mfg. Co..... 216-261-6000
Ohio Dayton, Ohmite Mfg. Co. 513-277-6543
Tenn Memphis, Cartwright & Bean..... 901-276-4442
Tex Dallas, Erickson & Vilter Sls..... 214-243-6611
Wash Western Tech. Sls., Western Tech. Sls. 206-641-3900

Local Distributors

Ala Birmingham, MG Elctrns & Equip 205-328-4525
Ariz Phoenix, Sterling Elctrns..... 602-258-4531
Ark Little Rock, Carleton-Bates 501-562-9100
Cal Chatsworth, Westates Elctrns 213-341-4411
Cal Los Angeles, RPS Elctrns 213-748-1271
Cal Mt. View, Elmar Elctrns 415-961-3611
Cal San Francisco, Zack Elctrns 415-626-1444
Colo Denver, Electronic Parts..... 303-744-1992
Conn Hamden, Wilshire Elctrns 203-281-1166
Fla Orlando, Hammond Elctrns 305-849-6060
Ga Atlanta, Lykes Elctrns..... 404-355-2223
Idaho Boise, Kimball Elctrns 208-342-3559
Ill Chicago, Newark Elctrns 312-638-4411
Ill Palatine, Ohm Elctrns 312-359-5500
Ind South Bend, Radio Distrib 219-287-2911
Iowa Cedar Rapids, Deeco, Inc..... 319-365-7551
Kans Wichita, Radio Supp 316-267-5213
Ky Louisville, Peerless Elec Equip... 502-637-7677
La New Orleans, Radio Parts 504-581-5959
Md Baltimore, Resco 301-823-0070
Mass Burlington, Wilshire Elctrns..... 617-272-8200
Mass Newton, Cramer Elctrns 617-969-7700
Mich Ann Arbor, Wedemeyer Elec. Supp 313-665-8611
Mich Oak Park, Newark Elctrns 313-548-0250
Minn Minneapolis, Starks, Inc..... 612-332-1325
Miss Jackson, Ellington Elec. Supp 601-355-0561
Mo St. Louis, L-Comp 314-647-5505
Neb Lincoln, Scott Elctrn Supp 402-464-8308
NH Concord, Evans Radio 603-224-9961
NJ Pennsauken, Resco Elctrns 609-662-4000
NJ Springfield, Fed Purchaser..... 201-376-8900
NY Buffalo, Genessee Radio & Parts 716-873-9661
NY Farmingdale, Arrow Elctrns 516-694-6800
NY Woodbury, Harvey Radio Co. 516-921-8700
NC Greensboro, Hammond Elctrns.. 919-275-6391
Ohio Cleveland, CAM/RPC Elctrns 216-461-4700
Okla Oklahoma City, Trice Wholesale Elec. 405-524-4411
Ore Portland, E off Electric Co. 503-222-9411
Pa Philadelphia, Herbach & Rademan 215-426-1700
RI Providence, W. H. Edwards Co. 401-781-8000
SC Charleston, Radio Laboratories.. 803-723-9811
Tex Dallas, KA Elctrn Sls..... 214-634-7871
Tex Houston, Newark Elctrns 713-782-4800
Utah Salt Lake City, Kimball Elctrns .. 801-328-2071
Va Richmond, Sterling Meridian Elec. 804-359-0221
Wash Seattle, Radar Electric Co. 206-747-9651
WVa Charleston, McJunkin Corp..... 304-348-5211
Wisc Milwaukee, Marsh Radio Supp .. 414-658-4611

OKI ELECTRONICS OF AMERICA, Dept. EM, 403 N.E. 12th Terr., Ft. Lauderdale, Fla. 33334, Te 305-563-6234, TWX: 510-955-9837; Empl.: 250

Sales Manager: C. Fallen; *Distributor Manager:* C. Fallen

Local Sales Offices & Reps.

Cal	Los Angeles, R.F. Assocs.	213-478-1586
Cal	Palo Alto, R.F. Assocs.	415-327-5531
NY	Bayside, R. Diamond Inc.	212-423-7330
NY	Bayside, Hasco Comp	212-428-5155

OKONITE CO., Dept. EM, Box 340, Ramsey, N.J. 07446, Tel: 201-825-0300, TWX: 710-988-1017; Empl.: 1700

Sales Manager: A. C. Coppola

Local Sales Offices & Reps.

Ala	Birmingham	205-592-8968
Ariz	Mesa, The Okonite Co	602-838-8596
Cal	Los Angeles	213-802-1759
Cal	S. San Francisco	415-873-8590
Colo	Denver	303-759-2776
Fla	Tampa	813-877-0581
Ga	Smyrna	404-434-3388
Ill	LaGrange	312-352-7200
La	New Orleans	504-246-3840
Mass	Hingham	617-749-3374
Mich	Southfield	313-569-3230
Minn	Minneapolis	612-888-7925
Mo	Frontenac	314-997-2320
Mo	Kansas City	816-471-6991
NJ	Cherry Hill	215-567-5739
NY	Syracuse	315-479-8313
NC	Charlotte	704-535-6535
Ohio	Cincinnati	513-761-1333
Ohio	Cleveland	216-661-2550
Ore	Portland	503-228-3172
Pa	Pittsburgh	412-344-8181
Tex	Dallas	214-243-3318
Tex	Houston	713-691-3716
Utah	Salt Lake City	801-484-7642
Va	Vienna	703-938-4770
Wisc	Milwaukee	414-476-4550

OLYMPUS CORP. AMERICA, Dept. EM, Two Nevada Dr., New Hyde Park, N.Y. 11040, Tel: 516-488-3880, Telex: 96-0199; Empl.: 150

Sales Manager: P.T. Monachese

OMEGA ENGRG., INC., Dept. EM, Box 4047, Stamford, Conn. 06907, Tel: 203-359-1660, Telex: 99-6404; Empl.: 100 ..... p. 4284,4285

OMNETICS, INC., Dept. EM, Box 113, Syracuse, N.Y. 13211, Tel: 315-699-5262, TWX: 710-545-0235; FSC No.: 52516; Empl.: 100

Sales Manager: A. J. Longo; *Distributor Manager:* A. J. Longo

Local Sales Offices & Reps.

Ark	Fort Smith, Electro-Related Products	501-783-7323
Cal	La Habra, Nolan Assocs.	213-694-2145
Cal	Oakland, Powermatics	415-635-6826
Colo	Denver, TESSCO	303-744-1119
Fla	Casselberry, EIR Inc.	305-830-9600
Ill	Elk Grove Village, Control Sls.	312-595-2110
Mass	Lexington, SIR Assocs.	617-862-1812
Mich	Troy, Xanthus, Inc.	313-689-9966
Mo	St. Louis, Engrg Services	314-997-1515
NJ	Ridgewood, Ballou	212-964-4640
NM	Albuquerque, TESSCO	505-298-2415
NY	No. Syracuse, Leonard D. Allen	315-458-7470
NC	Charlotte, W. E. MacDonald Co.	704-372-7012
Ohio	Columbus, Tom Mulligan & Assoc.	
Ohio	Dayton, W. Hammer & Assocs.	513-435-5432
Ore	Portland, D. Fry Co.	503-226-2620
Pa	Pittsburgh, Trymax Co.	412-823-8400
Tex	Houston, M. R. Summers Assocs.	713-524-7800
Va	Richmond, Marchant-Field Sls. Co.	804-262-7333
Va	Vienna, W. E. MacDonald Co.	703-938-4242
Wash	Seattle, D. Fry Co.	503-226-2620
WVa	Charleston, W. E. MacDonald Co.	304-342-8557
Wisc	Thiensville, Control Sls	414-242-4580

Local Distributors

Fla	W. Palm Beach, Nurmi Elect. Supply	305-686-8553
Ga	Atlanta, Elect. Contr. Prod.	404-455-1216
Ind	Indianapolis, Jackson Controls Co.	317-787-9944
Md	Kensington, Marine Air Supply	301-949-1353
Mass	Springfield, Control Engrg.	413-781-1330
NJ	Fairlawn, Relay Specialties	201-651-0945
NY	Rochester, Simcona Elec. Corp.	716-328-2800
Ohio	Avon Lake, Basic Packaging	216-933-3211
Pa	Braddock, M. Left Radio Parts	412-271-2800
Wisc	Mequon, Taylor Elec. Co.	414-241-4321

OMNICOMP, INC., Dept. EM, 5150 N 16th St, Ste 253, Phoenix, Ariz. 85016, Tel: 602-264-2475; Empl.: 50

OMNITEC CORPORATION, Dept. EM, 2405 S. 20th St., Phoenix, Ariz. 85034, Tel: 602-258-8244; TWX: 910-951-4247; FSC No.: 09736; Empl.: 500

Sales Manager: P. W. Shatusky; *Distributor Manager:* P. W. Shatusky

Local Sales Offices & Reps.

Ala	Huntsville, Gentry Assocs	205-534-9771
Alas	Juneau, Systems Northwest	907-586-6140
Ariz	Scottsdale, BFA Corp.	602-994-5400
Cal	Encino, Data Dimensions	213-990-9200
Cal	Long Beach, C.T.I. Data Sys	213-426-7375
Cal	Los Angeles, Consolidated Data Terminals	213-670-0400
Cal	Oakland, Consolidated Data Terminals	415-638-1222
Cal	San Mateo, Data Dimensions	415-349-7262
Cal	Sunnyvale, Interlink Sys	408-744-1930
Colo	Denver, BFA Corp.	303-837-1247
Conn	Greenwich, Data Dimensions	203-661-1700
DC	Washington, Data Dimensions	202-686-5150
Fla	Fort Lauderdale, Modems Plus	305-587-3849
Fla	Hialeah, Metronix Computers	305-885-4701
Fla	Orlando, Gentry Assocs	305-894-4401
Ga	Atlanta, Ossman/S.P.I. Instrs	404-455-3518
Ga	Atlanta, Data Dimensions	404-433-2023
Ga	Atlanta, Gentry Assocs	404-455-1206
Ga	Decatur, Modems Plus	404-373-2511
Ill	Glen Ellyn, Data Dimensions	312-858-3770
Md	Gaithersburg, Computer Prods. Unltd.	301-840-9524
Mass	Newton, Information Technology	617-969-2100
Mass	Wakefield, Selecterm	617-246-1300
Mich	Detroit, C.G. Distributors	313-255-2661
Mich	Southfield, Data Dimensions	313-358-2600
Minn	Minneapolis, Computer Equip Supplies	612-831-6610
NJ	Cherry Hill, Megargel Himmelstein	609-779-0200
NJ	Cherry Hill, Data Dimensions	609-662-2833
NJ	Morris Plains, Data Dimensions	201-267-2311
NM	Albuquerque, BFA Corp.	505-292-1212
NM	Las Cruces, BFA Corp.	505-523-0601
NY	Albany, Albany Information Sys	518-489-2696
NY	Great Neck, MTJ Sales Co.	212-895-7177
NY	New York, Data Dimensions	212-687-2030
NY	Rochester, Ossmann Instrs.	716-328-2230
NY	Rochester, Albany Information Sys	716-385-1681
NY	Syracuse, Ossman Instrs	315-437-6666
NY	Vestal, Ossmann Instrs.	607-785-9947
NC	Burlington, Gentry Assocs	919-227-3639
Ohio	Cincinnati, Data Dimensions	513-793-6511
Ohio	Cincinnati, C.G. Distributors	513-861-5566
Pa	Pittsburgh, C. G. Distrs.	412-366-5056
Pa	Scranton, Management Svc.	717-344-1732
Tenn	Nashville, Cumberland Data Sys	615-256-4968
Tenn	Nashville, Timesharing Unltd.	615-367-1469
Tex	Dallas, Data Dimensions	214-387-2222
Tex	Houston, Data Dimensions	713-961-4711
Tex	Midland, Midland Data Sys	915-694-9681
Utah	Salt Lake City, BFA Corp.	801-466-6522
Wash	Olympia, SJI Sls	206-943-1577
Wash	Seattle, SJI Sls Co	206-624-9020

OMRON ELECTRONICS, Dept. EM, 233 S. Wacker Dr., Chicago, Ill. 60606, Tel: 312-876-0800, Telex: 28-3539; Empl.: 180 ..... p. 3591

Sales Manager: D. Nelson; *Distributor Manager:* D. Papesh

Local Sales Offices & Reps.

Ala	Montgomery, Control Prods Agcy	205-277-5012
Ariz	Phoenix, Q. T. Wiles & Assocs.	602-971-6250
Cal	Los Angeles, Q. T. Wiles & Assocs.	213-478-0183
Cal	Los Angeles, Ellard E. Strassner Co.	213-242-8823
Cal	Menlo Park, Straube Assocs.	415-321-9050
Cal	San Diego, Q. T. Wiles & Assocs.	714-565-6895
Cal	Tustin, Q. T. Wiles & Assocs.	714-832-4952
Colo	Denver, Straube Assocs.	303-426-0890
Conn	Newtown, Gerber Sls. Corp.	203-426-3440
Fla	Ft. Lauderdale, Bolton Assocs.	305-491-5161
Ga	Avondale Estates, Candor Co.	404-296-1666
Ill	Chicago, L-TEC, Inc.	312-286-1500
Ind	Greenwood, Valentine Schillinger & Assocs.	317-888-2260
Ind	South Bend, Valentine Schillinger & Assocs.	219-291-6258
Kans	Olathe, BC Elctn. Sls.	913-888-6680
Md	Silver Spring, Mid-Atlantic Sls	301-593-7749
Mass	East Longmeadow, Gerber Sls. Corp.	413-525-3059
Mass	Waltham, Gerber Sls. Corp.	617-890-8040
Mich	Benton Harbor, R. C. Nordstrom & Co.	616-429-8560
Mich	Lathrup Village, R. C. Nordstrom & Co.	313-559-7373
Minn	Minneapolis, Quantum Sls.	612-831-8583
Mo	Hazelwood, BC Elctrn. Sls.	314-731-1255
NJ	Cherry Hill, Trinkle Sls.	800-257-8210
NM	Albuquerque, Straube Assocs.	505-292-0295
NY	Jamaica, S-J Assocs.	212-291-3232
NY	Rochester, Andres Comp. Sls.	716-381-3818
NC	Raleigh, Candor Co.	919-876-4999
Ohio	Richfield, Bear Mktg.	216-659-3131
Ore	Beaverton, N. R. Schultz Co.	503-643-1644
Pa	Abington, Mid-Atlantic Sls.	215-657-2815
SC	Myrtle Beach, Candor Co.	803-448-8361
Tex	Dallas, John B. Guenther	214-691-8500
Tex	Houston, Kruvand Assocs.	713-661-3007
Utah	Salt Lake City, Straube Assocs.	801-533-0125
Va	Roanke, Candor Co.	703-989-0995
Wash	Bellevue, N. R. Schultz Co.	206-454-0300
Wash	Seattle, Seatronics	206-767-4330
Wisc	Greenfield, L-TEC, Inc.	414-545-8900

Local Distributors

Ala	Montgomery, Southern Controls	205-277-5030
Ariz	Phoenix, Electro Comps	602-269-6201
Ariz	Phoenix, Kachina Electric	602-269-6201
Cal	Anaheim, Electro Comps Dist	714-634-0222
Cal	Fresno, Control Electric	209-268-4411
Cal	Los Angeles, R.P.S. Elctrns	213-748-1271
Cal	Los Angeles, California Wholesale Electric	213-723-6711
Cal	Los Angeles, Fisher Brownell	213-532-2170
Cal	Los Angeles, Electro Comps Dist	213-264-7100
Cal	San Leandro, Electro Comps Dist	415-352-5210
Cal	Santa Monica, Master Distributors	213-395-2637
Cal	Sunnyvale, Pyramid Elctrns	408-744-1900
Cal	Tustin, Western Switches & Controls	714-731-4333
Colo	Denver, Central Elec Supply	303-893-2111
Conn	Bridgeport, Sprague Elec Supply	203-336-2535
Conn	Norwick, Plank Elec Co.	203-887-1639
Conn	West Hartford, Hartford Elec Supply	203-233-3694
Fla	Ft. Lauderdale, K.S.M. Elctrns	305-739-5880
Ga	Atlanta, Automatic Controls	404-266-0130
Ill	Arlington Hgts, S & R Corp	312-593-2545
Ind	Des Moines, Mechanical & Electrical Warehouse	513-228-5141
Ind	Richmond, Richmond Elec	317-962-6543
Ind	Terre Haute, Walker Elec.	812-232-0461
Kans	Kansas City, Kornfield Thorp Elctrns	913-321-7070
Kans	Wichita, Delta Elec Supply	316-262-3756
La	Shreveport, Industrial Elctrn Supply	318-222-9459
Me	Newport, Gilman Elect. Supply	207-368-4306
Mass	Boston, Eagle Elect Supply	617-268-9500
Mass	Burlington, Heilind Elctrns	617-272-5610
Mass	Fitchburg, Gettens Elect Supply	617-843-3711
Mass	Holyoke, Oakes Elec Co.	203-887-1639
Minn	Minneapolis, Joel Co	612-545-5669
Minn	Minneapolis, Stark Elctrns	612-332-1325
NH	Concord, Evans Radio	603-224-9961
NJ	Fairfield, Monarch Elec	201-227-4151
NJ	Totowa, Diplomat/IPC	201-785-1830
NY	Elmira, Wehle Elec	607-734-5105
NY	Farmingdale, Liberty Elect Supply	516-694-7000
NC	Asheville, Elec Supply	704-255-8899
NC	Gastonia, Diamond Elec Supply	704-867-9500
NC	High Point, Elec Supply	919-885-4191
Ohio	Cincinnati, United Radio	513-761-4030
Ohio	Cleveland, Winter Radio Elctrns	216-621-6831
Ohio	Dayton, Martin Elec Co.	513-228-5141
Ohio	Dayton, Related Comps	513-253-6116
Ohio	North Royalton, Related Comps	216-237-7271
Pa	Allentown, A.H. Peters	215-434-5237
Pa	Erie, Mace Elctrns	814-838-3517
Pa	Pawtucket, Major Elec & Supply	401-724-7100
Pa	Portland, Tek-Elect	503-246-5451
Pa	Willow Grove, Resco Elctrns	215-659-4440
Pa	York, Rosen Elctrns	717-843-3875
Tenn	Knoxville, Industrial Elctrns	615-573-7135
Tenn	Nashville, Advanced Automation	615-367-1741
Tex	Arlington, Cummings Supply	817-274-3356
Tex	Dallas, Watson Elec Supply	214-742-8441
Utah	Salt Lake City, Calnon Elec Supply	801-487-7451
Va	Norfolk, Avec Electrns Corp	703-627-3502
Va	Richmond, Avec Elctrns Corp	804-359-6071
Va	Roanoke, Avec Elctrns Corp	703-344-6288

ON-GUARD CORP. OF AMERICA, Dept. EM, 350 Gotham Pkwy., Carlstadt, NJ 07072, Tel: 201-939-5822, Telex: 13-3364; Empl.: 95

Sales Manager: S. S. Goldman

Local Sales Offices & Reps.

Cal	San Jose, R R & F Co.	408-266-8916
Cal	Van Nuys, Art Szerlip Sls.	213-782-1765
Ill	Bolingbrook, George Sangwin Co.	312-739-7966
Ill	Bolingbrook, Sangwin Co.	312-739-7967
Md	Silver Spring, MFT Co.	301-589-4002
Mich	Ferndale, Irving J. Flanders Assoc.	313-545-4633
NY	Roslyn Heights, Sir Sls.	516-621-7485
NY	Roslyn Hgts, Sir Sls	
NY	State Grand Island, McTaggert Assoc.	716-634-2030
Ohio	Medina, T. Grant Assoc.	216-723-3696
Utah	Salt Lake City, R.D. Mktg.	801-262-0089
Exp:	NY Westbury, Minthorne International	516-334-3303

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Sales Manager: R. H. Wakefield

ONEIDA ELECTRONICS MFG., Dept. EM, POB 678, R.D. #3 Baldwin Ext., Meadville, Pa. 16335, Tel: 814-336-2125; Empl.: 25

Local Sales Offices & Reps.

Cal	Hollywood, Oberman & Renner Sls	213-985-7080
Cal	Selva Beach, Belchamber & French	408-684-1007
Colo	Littleton, Electrotex Sls	303-623-3370
Fla	Lakeland, Dixie Elctrn Assoc.	813-682-6624
Ill	Bolingbrook, George Sangwin Company	312-739-7966
Kans	Shawnee Mission, K&M Sls. Co.	913-262-1444
La	Chalmette, Ohmtronics, Inc.	504-271-1976
Md	Silver Springs, Mid-Atlantic Sls. Co.	301-593-7749
Mass	North Boro, W.B. Pray Sls. Co.	617-393-3434
Mass	Northboro, W. B. Pray Sls	617-393-3434
Mich	Drayton Plains, Polyphase Sls.	313-673-0700
Minn	Maple Grove, R.C. Sls. Co.	612-425-5543
NY	Yonkers, J. Brown Sls. Co.	914-779-7330
Ohio	Dayton, Shamrock Elctrn Sls	513-258-1227
Pa	Abington, J. Robinson	215-657-1256
Pa	Abington, Mid Atlantic Sls	215-657-2815
Tenn	Gallatin, Graves Sls	615-452-5850
Tenn	Memphis, Lewis E. Jones	901-683-7616
Tex	Houston, Ranger Elctrn Sls	713-529-2812
Wash	Seattle, Pacnor Mktg	206-284-8020

OPAMP LABS, INC., Dept. EM, 1033 N. Sycamore Ave, Los Angeles, Cal. 90038, Tel: 213-934-3566; FSC No.: 24699; Empl.: 18 ..... p. 1018

OPT INDS. INC., Data Products Div., Dept. EM, 300 Red School Lane, Phillipsburg, N.J. 08865, Tel: 201-454-2600; Empl.: 160 ..... p. 2352,3291

Sales Manager: J. Smith

Local Sales Offices & Reps.

Cal	Cupertino, Dura Elctrn. Sls.	408-255-2084
Cal	El Segundo, Varigon Assocs.	213-322-1120
Fla	Orlando, Gray-Mar Inc	305-894-3351
Ill	Chicago, Croyden Elctrns.	312-237-4343
Md	Lanham, L.D. Lowery	301-459-1556
Mass	Needham, Addelco Corp.	617-444-4754
Mich	Southfield, Fred H. Gehrke & Assocs.	313-559-5363
NJ	Union, J. Onore	201-687-0668
NY	Hempstead, Kahgan Sls.	516-538-2300
NY	Syracuse, Franklin Sls.	315-472-5273
Pa	Broomall, L.D. Lowery	215-528-5170
Tex	Dallas, Kruvand Assocs	
Va	Charlottesville, L.D. Lowery	804-973-6672
Wash	Kirkland, Freed Assocs.	206-822-8100

OPTICAL COATING DIV, See Optics Group-East

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Local Sales Offices & Reps.

Colo	Golden, J.F. Hurlbut Co	303-279-7796
NJ	Parlin, Triple E	201-727-6454
NY	Locust Valley, Tripple E	516-446-4222
Pa	Abington, Bach-Stewart Assocs.	215-885-1550
Tex	Richardson, Palatine Sls.	214-231-9489
Va	Annandale, J. Hopkins Assocs.	703-323-1641

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Sales Manager: B. Holman

Local Sales Offices & Reps.

Ala	Huntsville, Beacon Elctrns.	205-881-5031
Ariz	Scottsdale, Arcom Sls. Co.	602-947-5745
Cal	Irvine, Celtec Co.	714-557-5021
Cal	Los Altos, Frauman Assocs.	415-941-0660
Cal	San Diego, Celtec Co.	714-279-7961
Cal	Sherman Oaks, Celtec Co.	213-990-3440
Colo	Denver, B-5 Inc.	303-426-0222
Fla	Ft. Lauderdale, Beacon Eltrns.	305-971-7320
Fla	Ft. Walton Beach, Beacon Elctrns	904-244-1550
Fla	Maitland, Beacon Elctrns.	305-647-3498
Ga	Atlanta, Beacon Elctrns.	404-351-3654
Ill	Arlington Heights, Diethert/Angel	312-593-7600
Kans	Derby, Palatine Sls. Inc.	316-788-0621
Kans	Lenexa, Palatine Sls. Inc.	913-492-7020
Md	Randallstown, Beacon Elctrns.	301-922-1248
Mass	Lexington, Zieco	617-861-8300
Mich	Detroit, L.H. Dickelman Co.	313-353-8210
Minn	St. Paul, R.G. Ragon Inc.	612-488-0201
Mo	Hazelwood, Palatine Sls. Inc.	314-895-4577
NJ	Leonia, Scien.-Atlanta	201-461-3650
NY	Bowmansville, Ossmann Comp. Sls.	716-681-9700
NY	Kingston, Ossmann Comp. Sls.	914-338-5505
NY	Rochester, Ossmann Comp. Sls.	716-424-4460
NY	Syracuse, Ossmann Comp. Sls.	315-455-6611
NY	Vestal, Ossmann Comp. Sls.	607-785-9949
NC	Charlotte, Beacon Elctrns.	704-525-7412
Ohio	Cleveland, C.A. Robinson Co.	216-381-9049
Ohio	Dayton, C.A. Robinson Co.	513-275-2412
Tenn	Oak Ridge, Beacon Elctrns.	615-482-2409
Tex	Ft. Worth, Carey-Wolf	817-738-1996
Tex	Garland, Carey-Wolf	817-461-7333
Tex	Houston, Carey-Wolf	713-721-2442
Va	Falls Church, Beacon Elctrns.	703-534-7200
Va	Lynchburg, Beacon Elctrns.	804-237-4740
Wash	Seattle, S.J.I. Corp.	206-624-9020

OPTIMATION, See Julie Research Labs

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Sales Manager. E.T. Andrews

Local Sales Offices & Reps.

Ariz	Scottsdale, Darci	602-948-2240
Cal	Culver City, Darco	213-298-6239
Cal	Cupertino, Dura Electr. Sls.	408-255-2084
Fla	Palm Bay, Spar Tech Assocs.	305-727-8045
Ill	Elk Grove Village, Seiger Assoc.	312-956-0963
Ind	Carmel, Rich Electrn. Mktg.	317-844-8462
Kans	Shawnee Mission, Martec Assocs	913-441-6565
Md	Annapolis, Spectro Systems Corp.	301-268-1984
Md	Silver Spring, Spectro Systems Corp.	301-949-8261
NY	Great Neck, Trionics Assoc.	516-466-2300
NY	Syracuse, Ossman Instr.	315-437-6666
NC	Winston-Salem, Radco Co	919-722-9671
Pa	Southampton, Spectro Systems Corp.	215-357-6644
Tex	Richardson, Vector Sls.	214-234-4291

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OPTO 22, Dept. EM, 5842 Research Dr., Huntington Beach, Cal. 92649, Tel: 714-892-3313, Telex: 692-386; Empl.: 40

Sales Manager: Phil Lord

Local Sales Offices & Reps.

Ariz	Scottsdale, Williams Assocs.	602-947-4297
Cal	San Diego, Cerco	714-560-9143
Cal	Santa Clara, Fahrner-Miller Assocs.	408-984-1700
Colo	Denver, Williams-Assocs.	303-373-4730
Conn	Bethel, Livera-Polk Assocs.	203-748-4639
Fla	Ft. Lauderdale, Bredesen & Assocs.	305-566-3289
Ill	Des Plaines, Coombs Assocs	312-298-4830
Iowa	Cedar Rapids, Iowa Technical Svcs	319-377-5795
Md	Mount Airy, Strayton Assocs.	301-831-7007
Mass	Brockton, Forsberg Sls.	617-522-6300
Mich	Royal Oak, Dave Ray & Assocs	313-576-4705
Minn	Minneapolis, Bitronics Sls. Co.	612-835-7744
NJ	Madison, Livera-Polk Assocs.	201-377-3220
NM	Albuquerque, Williams Assocs.	505-255-1638
NY	North Syracuse, Precision Sls.	315-458-2223
NY	Roslyn Heights, Livera-Polk Assocs.	516-484-1456
NC	Matthews, W. K. Hile Co.	704-847-9125
Ohio	Cleveland, Augnat Assocs	216-273-1211
Ohio	Dayton, E.M.A.	513-433-2800
Pa	Media, W. Reeves Assocs.	215-566-6709
Tex	Plano, R. T. Mullins	214-423-7618
Wash	Seattle, R & R Assocs.	206-762-7664
Wisc	Milwaukee, Taylor Electric	414-241-4321

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Cal	Mt. View, Terminal Elctrns.	415-969-9240
Colo	Denver, Waco Elctrns.	303-371-4370
Fla	Ft. Lauderdale, Power Comps.	305-565-1614
Iowa	Cedar Rapids, Iowa Tech Supply	319-377-5795
Mich	Farmington Hills, Motion Control Corp.	313-478-1640
Mich	Royal Oak, George Instrs	313-576-4700
Minn	Minneapolis, Cassidy Elctrns.	612-835-7747
Mo	St. Louis, Edward W. Mooney Co	314-725-8875
NJ	Madison, Livera-Polk Assocs.	201-377-3220
NY	Buffalo, Summit Distributors	716-884-3450
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Tex	Dallas, Quality Comps.	214-387-4949
Tex	Houston, Altair	713-462-3029
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Wisc	Milwaukee, Taylor Elect.	414-241-4321
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For:	Can., Rexdale, Ontario, Canadian Chromalox Co., Ltd.	416-743-8000
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For:	Germany, Muenchen, Metronik GmbH	089-6114063
For:	Italy, Milano, Beckman Instruments Italiana	68-88-951
For:	Scandanavia, Farsta, Electrona-Telekomponent A.B.	Vx-08-93-08-80
For:	Spain, Madrid, Instrumentos Electronicos de Precision	274-10-07
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Cal Tustin, Orion Sls. 714-832-9687
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Conn Lakeville, Conti-Younger Assocs. 203-824-5982
Fla Clearwater, Lawrence Assoc., Inc. 813-443-2697
Fla Maitland, Lawrence Assoc. 305-647-1188
Ill Chicago, Carlson Elctrn. Sls. 312-956-8240
Ind Indianapolis, Carlson Elctrn. Sls. Co. 317-253-5610
Ind Santa Clara, I², Inc.
Kans Olathe, B. Rush Assocs. 913-764-2700
Md Glen Burnie, Tri-Mark 301-768-2800
Mass Waltham, Conti-Younger Assocs. 617-890-4582
Mich Detroit, R.P. Urban Assocs. 313-535-2355
Mich Grand Rapids, R.P. Urban Assocs. 616-245-0511
Minn Minneapolis, Electronic Innovators 612-884-7471
Mo Ballwin, Rush & West Assoc. 314-394-7271
NJ Ridgefield, Rical Associates 201-945-5250
NM Albuquerque, A.Q. Elctrns. 505-883-1003
NY Ilion, Noeth-Honsinger Assocs. 315-894-9943
NY Pittsford, Noeth-Honsinger Assocs. 716-461-4750
NC Winston Salem, Murcota Corp. 919-722-9445
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Ohio Cleveland, Baehr, Greenleaf & Assocs. 216-221-9030
Ohio Columbus, Baehr, Greenleaf & Assoc. 614-486-4046
Ohio Dayton, Baehr, Greenleaf & Assoc. 513-293-1102
Pa Huntingdon, Knowles Assoc. 215-947-5641
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Tex Houston, M. Kruvand Co. 713-780-9710
Utah Salt Lake City, Waugaman Assocs. 801-363-0275
Wash Tukwila, General Elctrns., Inc. 206-575-4030
Wash Vancouver, General Elctrns., Inc. 206-693-0025
Wisc Milwaukee, Carlson Elctrn. Sls. 414-476-2790

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Ariz Scottsdale, V.C. Elctrns. 602-948-3571
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Cal San Diego, Intermark Elctrns. 714-279-5200
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Cal Santa Anna, Intermark Elctrns. 714-540-1322
Cal Sunnyvale, Diplomat/Westland 408-734-1900
Cal Sunnyvale, Bell Inds. 408-734-8570
Colo Denver, Integrated Elctrns. 303-534-6121
Colo Wheatridge, Century Elctrns. 303-424-1985
Conn East Haven, J V Elctrns 203-469-2321
Conn Norwalk, Park Distributors 203-853-2010
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Ind South Bend, Genesis Elctrns. 219-287-2911
Md Baltimore, Whitney Dist. Inc. 301-944-8080
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Sales Manager: J. R. Osborne

OSHINO ELECTRIC LAMP WORKS, LTD, Dept. EM, 2-5-2, Minami-Shinagawa, Shinagawa-Ku, Tokyo, Japan, Tel: 03-471-8548, Telex: 0242-2117; Empl.: 300 p. 2539

Sales Manager: T. Koyama

Local Sales Offices & Reps.

Cal Costa Mesa, Wamco Tech. Sls., Inc. 714-833-9361

OSLO CONTROLS, Dept. EM, 328 Industrial Ave, Cheshire, Conn. 06410, Tel: 203-272-2794 p. 4218

Sales Manager: J.J. Martinez

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Cal Los Angeles, Minarik Elect. 213-624-3161
Cal Los Angeles, Electro Comps. Dist. 213-264-7100
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Ga Riverdale, C. Crews 404-471-8046
Ill Chicago, G.J. Reilly 312-595-0338
Iowa Des Moines, M. Seskis 515-265-0843
Iowa Des Moines, D. Vandermeulen 515-276-2290
Mass Reading, John W. Conti 617-944-2580
Mich Southfield, Gerald B. Wright 313-645-2120
Minn Minneapolis, C. Johnson 612-888-4957
Miss Boguechitto, James E. Whitehead 601-833-2672
Mo Florissant, P. Stumpe 314-741-4444
Mo Independence, Ernie W. Otis 816-257-2162
NJ Cedar Knolls, C. Knill 201-538-3846
NJ Parlin, J. Stowers 201-727-1853
NY Flushing, John M. Stanisci 212-224-4696
NY Rochester, J. Jenkinson 716-385-3217
NC Charlotte, R.J. Ludes, Sr. 704-366-4963
Ohio London, William G. Fisher 614-852-0078
Ohio Mentor, D. Dye 216-946-9579
Ohio Westlake, D.O. Schneider 216-871-8820
Ore Tigard, J. Davenport 503-639-6644
Tex Euless, L. Johnson 817-267-4828
Tex Houston, W. Parker 713-468-6157
Tex Richardson, J.W. Cissne 214-235-6127
Va Reston, Michael V. Cope 703-437-9078
Wisc Milwaukee, Jack C. Larson 414-871-3899

OTTO ENGRG., INC., Otto Controls Div., Dept. EM, 36 Main St., Carpentersville, Ill. 60110, Tel: 312-428-7171; FSC No.: 21649; Empl.: 48 p. 4216,4217

Local Sales Offices & Reps.

Ariz Glendale, O'Donnell Assocs. Southwest Inc. 602-938-3120
Cal Palo Alto, O'Donnell Assocs. 415-327-9260
Cal San Gabriel, Van Gott & Assocs. 213-285-2148
Fla Orlando, W. Ben Wimberly Co. 305-423-2514
Ill Glen Ellyn, Rockford Controls Co. 312-469-6016
Minn Minneapolis, HMR Inc. 612-920-8200
Mo Kansas City, Harris-Hanson Co. 816-444-9494
Mo St. Louis, Harris-Hanson Co. 314-432-3611
NH Manchester, Northeast Comps. 603-627-7242
NJ Pitman, Colrud Corp. 609-589-5866
NY Great Neck, F. Tylinski Co. 516-466-9070
Ohio Cleveland, A.H. Baier Co. 216-461-6161
Ohio Cleveland, Electro-Com 216-886-2404
Ohio Dayton, Electro-Com 513-276-4128
Tex Dallas, Ion Assocs. 214-357-9441

Local Distributors

Cal Culver City, Avnet Elctrns. Div. 213-870-0111
Cal Los Angeles, Electric Switches, Inc.
Cal N. Hollywood, Flame Entprs. 213-769-2442
Cal N. Hollywood, Flame Enterprises 213-769-2442
Cal Sunnyvale, Pyramid Elctrns. 408-744-1900
Cal Sun Valley, Richey Elctrns.
Conn Windsor Locks, Adam's Aircraft Engrg. 203-623-4456
Ill Schiller Park, Hamilton-Avnet Elctrns.
Ill Skokie, Bell Inds. 312-965-7500
Ind Fort Wayne, Fort Wayne Elctrns. Sys. 219-742-4346
Kans Wichita, Interstate Elctrn. Supply Corp.
Kans Wichita, Air Technics 316-267-2849
Md Gaithersburg, Pioneer-Washington Elctrns. 301-948-0710
Mass Watertown, DRW Elctrns. 617-923-1900
Mich St. Clair Shores, R. Whyte Elec. Prods. Co. 313-293-8200
Mo St. Louis, LCOMP 314-647-5505
NJ Teaneck, Summit 201-837-3644
NY Farmingdale, Harrison Radio Corp. 516-293-7990
NY New York, Dever & Edds 212-989-1100
NY New York, Multiparts Corp. 212-944-4370
NY New York, City Electric Distrs.
NY Plainview, A.C.I. Elctrn. Corp.
NY Woodside, Durham Aircraft Srvc. 212-274-9000
Tenn Nashville, Electra Dist. 615-329-3971
Tex Arlington, ASC Inds. 817-640-1300
Tex Dallas, Associated Aircraft Supply Co.
Wash Bellevue, Bell Inds. Elctrns. Dist. Div.

OVEN INDUSTRIES, INC., Dept. EM, 800 New Holland Ave., Mechanicsburg, Pa. 17055, Tel: 717-766-0721; Empl.: 30

Local Sales Offices & Reps.

Ariz Scottsdale, S.C. Blaker Co. 602-948-3061
Cal San Carlos, Westronics Assoc. 415-592-1417
Ill Skokie, Saffro & Assocs. 312-588-0905
Mass Reading, Geder Assocs. 617-944-3105
Minn Minneapolis, C.E. Bohlig Co. 612-922-7011
NY Huntington, Andrews & Andrews 516-692-8686
NY Syracuse, Mike Antil 315-463-0266
Ohio Medina, McShane, Inc. 216-725-4568
Pa Ambler, W & M Assocs. 215-643-4119
Tex Dallas, Bouco Sls. Assocs. 214-247-6708
Exp: Pa., Lemoyne, Elctrns. Int'l. 717-737-8858

OVENAIRE, Div. Walter Kidde & Co., Dept. EM, 706 Forrest St., Charlottesville, Va. 22901, Tel: 804-977-8050, TWX: 510-587-5461; Empl.: 125 p. 2354-2357

Local Sales Offices & Reps.

Ala Huntsville, L & D, Inc. 205-859-1690

Cal San Mateo, Melvin Sl..... 415-349-7445
Cal Van Nuys, R.L. Assocs. 213-782-7826
Fla Maitland, Ellis & Assocs. 305-645-1101
Ind Fort Wayne, TX Sls., Inc. 219-489-4447
Md Towson, Dickison Sls CO. 301-823-0923
Mass Milton, Naton Assocs., Inc. 617-698-0670
Minn St. Paul, Countryman 612-645-9151
Mo Blue Springs, Chesco 816-229-1404
Mo St. Charles, Chesco 314-946-6677
NJ Cherry Hill, H. J. White Co. 609-428-4544
NJ Springfield, F.F. Sylvester Assocs 201-376-3324
NY Buffalo, Quality Comps. 716-839-4170
NC Greensboro, L & D, Inc. 919-292-3201
Ohio Dayton, O'Donnell & Assocs. 513-435-4300
Tex Dallas, Stevens Sls. 214-350-2476
Va Richmond, L & D, Inc. 804-737-7443
Wash Seattle, Carlyle Tech. Sls. 206-767-4511

OVERLY-HAUTZ CO., Dept. EM, 8617 Clinton Rd., Cleveland, Ohio 44144, Tel: 216-281-1500; Empl.: 70

OWATONNA TOOL CO, See OTC Div, Owatonna Tool Co

OWENS CORNING FIBERGLAS CORP., Dept. EM, Fiberglas Tower Bldg., Toledo, Ohio 43659, Tel: 419-248-8000

OXFORD SPEAKER CO., Dept. EM, 4237 West 42nd Pl., Chicago, Ill. 60632, Tel: 312-927-3715, TWX: 910-221-5029; Empl.: 250

Sales Manager: H. Sundberg

Local Sales Offices & Reps.
Ariz Culver City, H. Feldman Co. 213-870-5973
Cal Culver City, H. Feldman Co. 213-870-5973
Cal San Francisco, Tech. Sls. Assoc. 414-467-1434
Fla St. Petersburg, J.F. Thompson ... 813-866-0045
Idaho Atlantic, Kimian Sls..... 712-243-1626
Ill Chicago, G. MCL Cole Co. 312-774-3535
Mo Independance, Kimian Sls..... 816-796-4026
NY Tuckahoe, L-C-A Sls. Co.
Pa Philadelphia, L-C-A Sls. Co..... 215-667-1788
Wisc Milwaukee, G. MCL Cole Co. 414-251-2011
Exp: New York, N.Y., Roburn Agencies, Inc. 219-989-5939

PACE INC., Dept. EM, 9329 Fraser Ave., Silver Spring, Md. 20910, Tel: 301-587-1696, Telex: 89-8476; Empl.: 65

Local Sales Offices & Reps.
Ala Madison, South Eastern Assoc... 205-772-9616
Cal Mountain View, Tech-Ser Inc. 415-969-9020
Cal Torrance, Tech-Ser Inc. 213-538-2267
Colo Vail, Mile High Elctrns. 303-476-1149
Fla Lake Park, Ron Goforth 305-844-6712
Haw Honolulu, Pacific Instrumentation 808-373-1287
Ill Wauconda, E.T. Champion & Assoc. 312-526-3700
Ind Carmel, Blind & Assocs 317-251-1249
Md Baltimore, A.L. Myers Co. 301-426-5583
Mass Woburn, R.W. Hatfield Co. 617-933-2324
Mich Royal Oak, Murray Percival Co. 313-548-1971
Minn Minneapolis, Production Automation Corp. 612-866-5700
Mo Hazelwood, Production Automation Corp. 314-731-2331
Mo Raytown, Production Automation Corp. 816-737-0066
NY Nesconset, Tool Technology 516-360-0510
NY Warwick, Wingate & Assocs..... 201-825-0747
Ohio Mentor, Perry Lohse Co. 216-951-3026
Pa Media, Gil-Tec 215-565-0403
Tex Dallas, Production Automation Corp. 214-620-0227
Tex Houston, Production Automation Corp. 713-783-4742
Wash Bellevue, Doland Co. 206-454-4952

PACE WIRE & CABLE CORP., Dept. EM, 3590 Oceanside Rd., Oceanside, N.Y. 11572, Tel: 516-678-2275; Empl.: 35

PACIFIC ATLANTIC TRADING CO., Dept. EM, Box 754, El Cerrito, C.A. 94530, Tel: 415-237-5837, TWX: 910-366-7296

Sales Manager: P. Yen; *Distributor Manager:* P. Yen

Local Sales Offices & Reps.
Cal R. Palo Verdes, Queueing Systems Inc. 213-377-6457

PACIFIC ATLANTIC TRADING CO. cont'd

Advertisement

We specialize in triggering systems for Lasers and Triggered spark gaps. Using latest solid state techniques, our PT-00 series accept TTL level in and output up to 600V. into 50 Ohms, repetition rate from 1 shot to 10kHz with ps. jitter and nanosecond delay. The PT-55 Pulsers will trigger from 250V. output range from 30-60kV. Pos. or Neg. All with sub. ns. rise time.

PACIFIC COMMUNICATIONS, Dept. EM, 2041 S. Grand Ave. #A, Santa Ana, Cal. 92705, Tel: 714-546-0147; Empl.: 26

PACIFIC ELECTRICORD CO., Dept. EM, 747 W. Redondo Beach Blvd., Box 10, Gardena, Cal. 90247, Tel: 213-532-6600, TWX: 910-346-7619; Empl.: 475

Sales Manager: D. B. Cory

Local Sales Offices & Reps.
Cal San Diego, AAA Sls. Co. 714-565-0122
Cal San Francisco, Bart Budge Assocs. 415-961-0988
Colo Denver, Clark Mfg Reps..... 303-759-5645
NY New York, Leviton Mfg. 212-229-4040
Tex Dallas, Allied Comps. 214-238-0408
Tex Houston, Allied Comps. 713-691-3961
Wash Bellevue, Comtec 206-453-1188

PACIFIC ELECTRONIC ENTERPRISES, See Pacific Power Source Div

PACIFIC MEAS., INC., Dept. EM, 470 San Antonio Rd, Palo Alto, Calif. 94306, Tel: 415-494-2900, TWX: 910-373-1171; Empl.: 70

Sales Manager: D. Armann

Local Sales Offices & Reps.
Ariz Phoenix, P L S Assocs., Inc. 602-994-5461
Cal Anaheim, Blair Assocs. 714-635-1350
Cal San Jose, MCH Assocs..... 408-246-7330
Colo Denver, P L S Assocs., Inc. 303-773-1218
Fla Orlando, E.G. Holmes & Assocs 305-894-8901
Ga Chamblee, E.G. Holmes & Assocs 404-451-6161
Ill Chicago, E.I.A., Inc. 312-271-3774
Ind Indianapolis, E.I.A., Inc. 317-257-7231
Kans Shawnee Mission, EIR Co. 913-362-0919
Md Rockville, Electronic Mktg Assocs 301-881-5300
Mass Waltham, MC Bar Assocs. 617-890-0233
Mass Waltham, McBar Assocs. 617-890-0233
Mich Northville, Micro Sls. 313-482-1229
Mo Leasburg, EIR Co. 314-895-4100
NJ Haworth, Central Assocs..... 201-568-0808
NM Albuquerque, P L S Assocs., Inc. 505-255-2330
NY East Syracuse, Ossmann Instrus. 315-437-6666
NY Old Bethpage, Central Assocs. .. 516-433-0808
Ohio Centerville, Micro Sls. 513-433-8171
Ohio Cleveland, Micro Sls. 216-331-0900
Okla Oklahoma City, Data Mktg Assocs 405-528-6071
Pa King of Prussia, Electronic Mktg Assocs 215-265-1600
Tex Austin, Data Mktg Assocs 512-451-5174
Tex Dallas, Data Mktg Assocs 214-661-0300
Tex Houston, Data Mktg Assocs 713-780-2511
Tex San Antonio, Data Mktg Assocs 512-828-0937
Utah Sandy, P.L.S. Assocs 801-942-2081
Va Virginia Beach, E.G. Holmes & Assocs 804-481-6556
Wash Seattle, Delcom Sls. 206-248-0090

PACIFIC POWER SOURCE DIV, Dept. EM, 5291 Systems Dr, Huntington Bch, Cal 92649, Tel: 714-898-2691, 800-854-2433; Empl.: 40 p. 3398,3399

Sales Manager: S. Tullock

Local Sales Offices & Reps.
Cal Costa Mesa, Measurement Assocs. 714-540-7160
Cal Costa Mesa, Measurement Assocs 714-540-7160
Conn Canton Center, Tekdata 203-693-0710
Conn W. Hartford, Tekdata Assocs., Inc. 203-525-7647
Ill Elk Grove Village, Loren Green Assocs 312-593-0282
Ind Indianapolis, Loren Green Assocs 317-283-9827
Md Burtonsville, Eastern Instr..... 301-384-8500
Mass Wakefield, Tekdata 617-245-5940
Mich Milford, Scien Devices - Midwest 313-685-8912
Minn Minneapolis, Loren Green Assocs 612-781-1611
NY DeWitt, D & B Assocs. 315-446-0220
NY DeWitt (Syracuse), D&B Assocs 315-446-0220
Ohio Dayton, Scientific Devices - Midwest 513-298-9904
Ohio North Olmsted (Cleveland), Scientific Devices - Midwest 216-779-5155
Tex Houston, Scien Devices - Southwest 713-868-5575
Tex Richardson, Scien Devices - Southwest 214-231-8106
Tex San Antonio, Scien Devices - Southwest 512-736-3164

PACIFIC TECHNOLOGY, Dept. EM, 235 Airport Way, Renton, Wash. 98055, Tel: 206-623-9080, Telex: 32-1051; Empl.: 70

Sales Manager: L. C. Rama; *Distributor Manager:* L. C. Rama

Local Sales Offices & Reps.
Ala Huntsville, Vesco 205-539-8716
Ariz Scottsdale, Utility Prods. 602-947-9326
Cal El Monte, Randolph Industries, Inc. 213-283-7901
Cal Los Angeles, Randolph Inds. 213-283-7901
Cal San Diego, Randolph Inds..... 714-436-3049
Cal Santa Clara, Natkin Srvc..... 408-244-2770
Colo Englewood, Utility Prods., Inc. 303-771-9080
Fla Cocoa Beach, Vesco 305-784-0784
Ill Chicago, Scientific Sls. Corp. 312-775-7594
Ind Indianapolis, Scientific Sls. Corp. 317-253-4606
Kans Kansas City, W. Hickman Co. 913-362-8066
Kans Wichita, W. Hickman Co. 316-264-8882
La Baton Rouge, Vesco 504-923-0297
Mich Birmingham, Thibodeau Engrg. .. 313-642-6620
Minn Bloomington, Scientific Sls. Corp. 612-881-3300
Mo St. Louis, Floyd Gilliam Assoc. .. 314-961-5555
Neb Omaha, W. Hickman..... 402-895-0262
NY Brooklyn, Roytran 212-782-1505
NC Charlotte, Carolina Tech. Rep. .. 704-847-4494
Ohio Cleveland, Morlan & Assocs..... 216-235-1689
Ore Portland, Topp Engrg. 503-244-7265
Pa Pittsburg, Morlan & Assocs..... 412-941-8544
Tex Houston, W. W. Scherwitz Co. .. 713-527-8866
Utah Salt Lake City, Utility Prods. 801-466-2036
Wash Richland, Topp Engrg. Sls..... 509-783-7515

PACKAGED RESINS DIV., Bacon Inds., Inc., Dept EM, 192 Pleasant St., Watertown, Mass. 02172, Tel 617-926-2550, TWX: 710-327-6518; FSC No.: 99098 Empl.: 18

Sales Manager: R.S. Cass

Local Sales Offices & Reps.
Cal Irvine, Bacon Inds 714-556-4170

PAINE INSTRUMENTS, INC., Dept. EM, 2401 S Bayview St., Seattle, Wash. 98144, Tel: 800-426-0366 TWX: 910-444-2164; FSC No.: 13624; Empl.: 52

Sales Manager: R.E. Helmick

Local Sales Offices & Reps.
Ala Huntsville, Tech. Sls..... 205-881-1750
Cal Costa Mesa, Scrantom Engrg., Inc. 714-979-6373
Cal Los Altos, J.C. Meyer & Assocs. 415-964-8844
Ill South Holland, RAECO, Inc. 312-331-6000
Ind Indianapolis, Tri-State Technical Sales 317-924-3564
Iowa Cedar Rapids, G. Fixman Engrg. Co. 319-362-6303
Kans Overland Park, G. Fixman Engrg. Co. 913-648-7744
Kans Wichita, G. Fixman Engrg. Co..... 316-682-9431
Md Rockville, Electronic Mktg. Assoc. 301-744-7700
Mass Peabody, JSR Assoc. 617-532-0340
Mich Farmington, W. R. Hummon & Assocs., Inc. 313-474-0660
Mo St. Louis, G. Fixman Engrg. Co. 314-725-5210
NY Fairport, Naco Elctrns. Corp..... 716-223-4490
NY North Syracuse, NACO Electronics Corp. 315-699-2650
NY Port Washington, Total Mktg Action, Inc. 516-883-2430
NY Utica, NACO Elctrns. Corp. 315-732-1800
NC Charlotte, Ranson, Wallace & Baesel, Inc. 704-334-4240
Ohio Dayton, Hocker Assocs. 513-298-8630
Ohio N. Olmsted, Hocker Assocs. 216-734-4430
Pa King of Prussia, Electronic Mktg. Assoc. 215-265-1600
Tex Houston, Scientific Sls. Co. 713-666-5310
Tex Richardson, Scientific Sls. Co..... 214-231-6540

ILL TOOL WORKS, Illinois Tool Works, Inc., Dept. EM, 900 Follin La, S.E., Vienna, Va. 22180, Tel: 703-281-2810, TWX: 710-833-0682; FSC No.: 19396

Local Sales Offices & Reps.

Ala Huntsville, K & E Assoc. 205-883-9720
Cal Los Angeles, M. A. Stolaroff Co. 213-295-7781
Cal Mountain View, G. Woempner Co. 415-964-5454
Colo Denver, Camel Elctrns., Inc. 303-757-6191
Fla Ft Lauderdale, Delmac Sls 305-781-6670
Fla Maitland, Delmac Sls 305-423-7562
Ga Hartwell, K & E Assoc 404-376-5438
Ill Chicago, Elctrn. Div., Illinois Tool Works, Inc. 312-282-7383
Ind Indianapolis, Paktron Regional Sls. Off. 317-846-5071
Kans Olathe, Rush & West Assoc 913-764-2700
Mass Burlington, Paktron Regional Sls. Off. 617-273-0365
Mich Benton Harbor, R.C. Nordstrom & Co. 616-857-4653
Mich Lathrup Village, R.C. Nordstrom & Co. 313-559-7373
Minn St. Paul, Murnco 612-484-8200
Miss Corinth, K & E Ass 601-287-1471
Mo Ballwin, Rush & West Assoc 314-394-7271
NY Elmont, F.E. Schmitt Co. 516-437-8150
NY New York, Landseas Corp. 212-265-8323
NY Rochester, L-Mar Assocs. 716-328-5240
NY Vestal, L-Mar Assocs. 607-729-6339
NC Garner, K & E Assoc 919-772-8454
Ore Portland, Earl & Brown 503-245-2283
Pa Erie, ECCO Electronic Sls. 814-452-3762
Tex Houston, R.F. Kimball & Co. 800-294-2805
Tex Richardson, R.F. Kimball & Co. 214-231-3447
Wash Seattle, Earl & Brown Co. 206-284-1121

Local Distributors

Ala Huntsville, Hall-Mark 205-837-8700
Ariz Phoenix Kachina 602-269-6201
Cal Irvine, Acacia 714-549-0954
Cal Sunnyvale, Acacia 408-735-0100
Conn Milford, State 203-877-4501
Fla Ft. Lauderdale, Hall-Mark 305-971-9280
Fla Orlando, 7233 Lake Ellenor Dr.
Ill Chicago, Bell 312-982-9210
Ill Westmont, RM 312-323-9670
Ind Indianapolis, Advent 317-297-4910
Md Beltsville, Treeko 301-937-8260
Mass Natick, Future 617-879-0860
Mich Kentwood, R-M Elctrns. 616-531-9300
Minn St. Paul, Gopher 612-645-0241
NJ Cherry Hill, Milgray 215-228-2000
NJ Hanover, State Elctrns. 201-887-2550
NJ Mamaroneck, New Yorker 914-698-7600
NY Rochester, Simcona Elec. 716-328-3230
NC Raleigh, Hall-Mark 919-832-4465
Ohio Columbus, Elctrn Mktg Corp 614-299-4161
Ohio Dayton, KM Co. 513-890-6734
Pa Duquensne, Advacom 412-469-2610
Pa Erie, Advacom 814-455-8110
Tex Houston, Altair 713-462-3029
Tex Richardson, Altair 214-231-5166
Wash Seattle, Zepher 206-575-0922
For: Can., Montreal, Que., Future 514-735-5775

PAK-TRONIC INC., Dept. EM, 4044 N Rockwell St, Chicago, Ill 60618, Tel: 312-478-8585, TWX: 910-221-5034

Sales Manager: J. E. Zenner

Local Sales Offices & Reps.

Cal Berkeley, Paul Rosen Co. 415-526-8286
Conn Durham, Marr Electric Co 203-349-9691
Mich Ann Arbor, O-M Sales Co 313-973-9450
Minn Minneapolis, Robert W. Marshall Co 612-929-0457
Mo St. Louis, Henry Durst & Assocs 314-892-2773
NJ Clifton, Long, Poveromo & Assocs 201-785-2492
NY Brooklyn, Long, Poveromo & Assocs 212-252-5682
NY Rochester, Up-State Comps 716-377-1555
Va Richmond, Advance Controls 804-270-7182
Wash Bellevue, Hickey Engrg Sls 206-454-0460

PALL

PALL CORP., Dept. EM, 30 Sea Cliff Ave., Glen Cove, N.Y. 11542, Tel: 516-671-4000, TWX: 510-223-0606; Empl.: 1800

Local Sales Offices & Reps.

Cal Newport Beach, PTM Western Region 714-673-6760
Conn Bridgeport, Pall Regional Sls. Office 203-335-4273
Ga Marietta, PTM Regional Sls. Office 404-428-6411
Mich Detroit, PTM Regional Sls. Office 313-533-3060
NJ Vauxhall, Pall Trincor Corp. 201-245-8400
Tex Houston, PTM Regional Sls. Office 713-780-7900

Local Distributors

Ala Mobile, AWC Alabama 205-456-8484
Cal El Macero, Mensco 916-758-2255
Cal Santa Clara, Mensco 408-739-8690
Cal S. El Monte, Pall Western 213-686-2786
Colo Denver, Ross Equipment 303-759-4215
Conn Hamden, Pond Technical Sls 203-281-0005
Fla Tampa, James M. Clontz Assoc 813-961-4511
Ga Atlanta, Thomas Engineered 404-261-5070
Haw Honolulu, Berkley Engrg. Co 808-538-1921
Ill Villa Park, Enpro 312-279-2525
La Baton Rouge, Alford, Woods & Childs 504-275-5480
Me Winslow, Kennebec Supply 207-873-2111
Mich Kalamazoo, Hose & Seals 616-375-1290
Mich Taylor, North Central Engrg 313-942-0900
Minn Minneapolis, Industra 612-929-6224
Mo Maryland Heights, Process & Chemical Equip. 314-878-6161
Neb Omaha, H.G. Klug 402-397-8910
NJ Vaux Hall, Pall Trincor 201-269-4779
NY Cortland, Prosco Products 607-753-9113
NY Cortland, Engineered Prod Sls 607-753-9308
NY New York, Marusho Ind 212-697-4661
NC Raleigh, Abernathy Thomas Engrg 919-787-8408
Ohio Cincinnati, Lester Johnson 513-563-6405
Ohio Cleveland, Lester Johnson 216-751-7040
Okla Tulsa, Condit 918-743-6651
Ore Portland, Set Point Control 503-255-2775
Pa Pittsburgh, Biltmore Products 412-563-0808
RI Cranston, Chisholm 800-556-6436
SC Greenville, Abernathy Thomas Engrg 803-288-2833
Tenn Kings Port, Abernathy Thomas Engrg 615-245-6151
Tex El Paso, Enginered Equip. 915-533-4221
Tex Houston, AWC Texas 713-488-2730
Va Richmond, Flomec 804-794-6300
Wash Bellevue, Set Point Control 206-454-0155
Wisc Milwaukee, Chipley & Zeman 414-228-1300
For: Can., Brockville, Ont., Pall Canada Ltd 613-345-2280
For: England, Portsmouth, Pall Mfg Ltd 267-C901
For: Japan, Marusho Ind. Ltd 542-2151

PALL TRINITY MICRO CORP., Dept. EM, Rte. 281, Cortland, N.Y. 13045, Tel: 607-753-6041, TWX: 510-252-0791, 93-7295; Empl.: 390

Sales Manager: M. G. Kachur, VP; *Distributor Manager:* R. H. Hauslein

Local Sales Offices & Reps.

Ala Mobile, F. A. Thomas Co. 205-476-7837
Ala Mobile, AWC Alabama 205-456-8484
Ala Pelham, G. S. Edwards Co. 800-633-8304
Cal S. El Monte, Pall Western Corp. 213-686-2786
Cal Sunnyvale, Mensco 408-739-8690
Colo Denver, Ross Equip. Co. 303-759-4215
Conn Hamden, Pond Tech. Sls. 203-281-0005
Fla Tampa, J. M. Clontz Assocs. 813-961-4511
Ga Atlanta, Thomas Engrg. Co. 404-261-5070
Haw Honolulu, Berkley Engrg. 808-538-1921
Ill Villa Park, Enpro Inc. 312-279-2525
La Baton Rouge, AWC Inc. 504-275-5480
Me Winslow, Kennebec Supply 207-873-2111
Mich Kalamazoo, Hose & Seals Inc. 616-375-1290
Mich Taylor, North Central Engrg. 313-942-0900
Minn Minneapolis, Industra Co. 612-929-6224
Mo Kansas City, Condit Co. 816-561-4660
Mo St. Louis, Durkin Equip. Co. 314-542-1444
Mo St. Louis, Process & Chemical Equip. 314-878-6161
Neb Omaha, H. G. Klug Co. 402-553-1377
NJ Vauxhall, Pall Trincor Corp. 201-245-8400
NY Cortland, E.P.S. Corp. 607-753-9308
NY Cortland, Prosco Prods. 607-753-9113
NC Raleigh, Abernathy-Thomas Engrg. 919-876-1811
Ohio Cleveland, Lester Johnson Co. 216-751-7040
Okla Tulsa, Condit Co. 918-743-6651
Ore Portland, Set Point Control 503-255-2775
Pa Pittsburgh, Biltmore Products Co. 412-563-0808
RI Cranston, Chisholm Corp. 800-556-6436
SC Greenville, Abernathy-Thomas Engrg. 803-288-2833
Tenn Kingsport, Abernathy-Thomas Engrg. 615-245-6151
Tenn Memphis, Condit Co. 901-761-0854
Tenn Nashville, Abernathy-Thomas Engrg. 615-361-6743
Tex El Paso, Engineered Equip. 915-533-4221
Tex Houston, AWC Inc. 713-488-2730
Va Richmond, Flomec Inc. 804-794-6300
Wash Bellevue, Set Point Control 206-454-0155
Wisc Milwaukee, Chipley & Zeman Inc. 414-228-1300

PALOMAR ENGRS., Dept. EM, Box 455, Escondido, Cal. 92025, Tel: 714-747-3343; Empl.: 15

PAMOTOR, Dept. EM, 770 Airport Blvd., Burlingame, Cal. 94010, Tel: 415-347-1203, TWX: 910-374-2353; Empl.: 35 p. 2594-2598

Sales Manager: F.L. Nelson, Mktg. Mgr.; *Distributor Manager:* B. Loyd

Local Sales Offices & Reps.

Ala Huntsville, Cartwright & Bean 205-533-3509
Ariz Tempe, E.J. Foley & Assoc. 602-894-2345
Ark Little Rock, J.Y. Schoonmaker Co. 501-375-2168
Cal Burlingame, W. J. Purdy Co. 415-347-7701
Cal Los Angeles, Ed Landa Co. 213-879-0770
Cal San Diego, Daniels & Doty Sls. Co. 714-560-6266
Colo Denver, W. J. Purdy Co. 303-777-1411
Conn Meriden, Sturgeon 203-237-1112
Fla Ft. Lauderdale, Cartwright & Bean, Inc. 305-791-3989
Fla Orlando, Cartwright & Bean 305-422-4531
Ga Atlanta, Cartwright & Bean 404-255-5262
Ill Elmhurst, Hill-Gray 312-832-4101
Ind Indianapolis, Sukup & Cox 317-253-5501
Iowa Marion, Thomas & Modrcin Assoc. 319-377-6261
Kans Shawnee Mission, Thomas & Modrcin Assoc. 913-432-2131
Md Baltimore, S. K. MacDonald 301-254-3380
Mass Needam Hgts, Sturgeon Co. 617-444-6603
Mich Ferndale, Hilltronics, Inc. 313-398-5556
Minn Edina, M. Foster 612-835-2252
Miss Jackson, Cartwright & Bean 601-981-1368
Mo Hazelwood, Thomas & Modrcin Assoc 314-895-4700
NJ Bergenfield, H. Gray Assoc. 201-384-3643
NM Albuquerque, W. J. Purdy Co. 505-266-7959
NY Syracuse, Mar-Com Assocs. 315-437-2843
NC Charlotte, Cartwright & Bean 704-377-5673
NC Raleigh, Cartwright & Bean Co. 919-781-6560
Ohio Richfield, Bear Mktg. 216-659-3131
Okla Tulsa, J.Y. Schoonmaker Co. 918-936-1423
Pa Philadelphia, S. K. MacDonald 215-545-1205
Tenn Knoxville, Cartwright & Bean 615-693-7450
Tenn Memphis, Cartwright & Bean 901-276-4442
Tex Dallas, J. Y. Schoonmaker Co. 214-349-1650
Wash Redmond, Quadra Sales Corp. 206-883-3550

Local Distributors

Ala Birmingham, Forbes Distributing Co. 205-251-4104
Ala Birmingham, J. W. Clary Co. 205-322-2488
Ariz Phoenix, Moltronics 602-272-7951
Ariz Phoenix, Liberty/Ariz 602-249-2232
Ariz Tucson, Inland Elctrn. Supply 602-294-2628
Ark Little Rock, Carlton-Bates Co. 501-562-9100
Cal El Segundo, Liberty/EL Segundo 213-322-8100
Cal Fresno, J. C. Arbuckle Co. 209-264-6554
Cal Garden Grove, Allied Elctrns. 213-598-8671
Cal Hayward, Dunlap Elctrns. 415-783-9260
Cal Inglewood, Newark/Inglewood 213-678-0441
Cal Mountain View, Abacus Electronics Co. 415-961-1500
Cal Mountain View, Elmar Elctrns. 415-961-3611
Cal Palo Alto, Zack Elctrns. 415-326-5432
Cal Sacramento, Sacramento Elctrns. 916-441-4821
Cal Sacramento, Dunlap Elctrns. 916-444-8070
Cal San Diego, Liberty/San Diego 714-565-9171
Cal San Diego, Moltronics 714-278-5020
Cal Santa Clara, Moltronics 408-244-7600
Cal South Gate, Moltronics 213-773-6521
Cal Sunnyvale, Ratel Elctrns. 408-739-9220
Colo Boulder, Rocky Mountain Elctrn 303-444-5611
Colo Colorado Springs, D&M Elctrns. 303-633-4666
Colo Commerce City, Elmar Elctrns. 303-287-9611
Colo Denver, Elctrn. Parts Co. 303-744-1992
Colo Denver, Fistell Elctrns. Supply Co. 303-244-4691
Colo Denver, Newark/Denver 303-757-3351
Colo Lakewood, Acacia Sls., Inc. 303-232-2882
Conn Danbury, Bond Radio Elctrns. 203-744-2274
Fla Jacksonville, Southeast Elctrns. 904-356-3007
Fla Miami, ESL Elctrn. Distributors 305-633-6973
Fla Miami, Electronic Equip. Co. 305-871-3500

Fla Pensacola, Grice Elctrns. 904-434-2477
Ga Norcross, Lykes Elctrns. Corp. .. 404-449-9400
Haw Honolulu, Honolulu Elctrns. 808-949-5564
Ill Broadview, L Comp - Chicago.... 312-865-7600
Ill Champaign, Klaus Radio 217-356-1896
Ill Chicago, Newark/Chicago 312-638-4411
Ill Elgin, Allied Elctrns..... 312-697-8200
Ill Rockford, Midwest Assocs. 815-962-8036
Ind E. Chicago, Acro Distributors..... 219-397-8681
Ind Ft. Wayne, Ft Wayne Elctrns. 219-423-3422
Ind Indianapolis, Graham Elctrns. Supply 317-634-8202
Ind Indianapolis, Ra-Dis-Co..... 317-637-5571
Ind Michigan City, Tri-State Electrical Supply 219-872-5551
Ky Lexington, Radio Elctrn. Equip. Co. 606-255-6661
Ky Louisville, Peerless Elctrn. Equip. 502-637-7677
La Lafayette, Ralph's Elctrns 318-234-4507
La New Orleans, Lykes Elctrns. Corp. 504-733-3400
La New Orleans, Southern Radio Supply Co. 504-524-2343
La Shreveport, Industral Elctrn. Supply 318-222-9459
Md Baltimore, Resco/Baltimore 301-823-0070
Md Gaithersburg, Pioneer/Wash..... 301-948-0710
Mass Hingham, Sager Electrical Supply Co. 617-749-6700
Mass Lynn, Land Elctrn. Supply Co.... 617-592-2220
Mass No. Wilbraham, Industrial Comps 413-596-3884
Mass Waltham, Sterling Elctrns. 617-894-6200
Mich Ann Arbor, Wedemeyer Elctrn. Supply Co. 313-665-8611
Mich Augusta, Great Lakes Elctrns 616-731-4156
Mich Flint, Shand Elctrns. 313-743-8940
Mich Livonia, RS Elctrns. Co. 313-525-1155
Mich Oak Park, Newark/Detroit 313-967-0600
Mich Wyoming, Newark/Wyoming 616-241-6681
Minn Minneapolis, Electrn Center 612-371-5200
Minn Minneapolis, Newark/Minneapolis 612-331-6350
Mo Kansas City, L Comp - Kansas City 816-221-2400
Mo Maryland Hgts, L Comp - St. Louis 314-291-6200
Mo St. Louis, Olive Ind'l Elctrns. 314-426-4500
Neb Lincoln, Scott Elctrn. Supply Corp. 402-466-8221
Nev Reno, Electronic Distributing Co.. 702-323-2766
NH Concord, Evans Radio 603-224-9961
NJ Kenilworth, Newark/Kenilworth .. 201-272-8410
NY Albany, E. E. Taylor Co..... 518-438-4461
NY Buffalo, Summit Distrs. 716-884-3450
NY Plainview, Fairmont Elctrn. Sls. Corp. 516-694-8200
NY Vestal, Harvey/Federal Elctrns. 607-748-8211
NC Raleigh, Southeastern Radio Supply Co. 919-828-2311
Ohio Cincinnati, Hughes-Peters 513-351-2000
Ohio Cleveland, Repco 216-248-8900
Ohio Cleveland, Pioneer/Cleveland.... 216-587-3600
Ohio Columbus, Hughes-Peters 614-294-5351
Okla Oklahoma City, Elctrn Supply 405-232-5215
Okla Tulsa, Radio, Inc. 918-587-9123
Ore Portland, Dunn Electrns. 503-285-0214
Ore Portland, United Radio Supply.... 503-233-7151
Pa Altoona, Allegheny Elctrns. 814-946-0871
Pa Erie, Mace Elctrns. 814-838-3517
Pa Philadelphia, Almo Elctrns..... 215-698-4000
Pa Philadelphia, Philadelphia Elctrns. 215-568-7400
Pa Pittsburgh, CAM/RPC Ind'l Elctrns. 412-782-3770
RI Warwick, W. H. Edwards Co. 401-781-8000
SC Charleston, Wholesale Radio Supply Co. 803-722-2634
SC Columbia, Dixie Elctrns..... 803-253-5333
Tenn Kingsport, Radio Electric Supply Co. 615-247-8111
Tenn Knoxville, Industrial Elctrns. 615-573-7135
Tenn Memphis, Bluff City Dist. Co..... 901-725-9500
Tex Corpus Christi, Wicks Radio Equip. Co. 512-883-4481
Tex Dallas, Wholesale Elctrns. Supply Co. 214-824-3001
Tex El Paso, Midland Specialty Co... 915-533-9555
Tex Fort Worth, Allied Elctrns. 817-336-5401
Tex Fort Worth, Wholesale Elctrns. Supply Co. 817-261-4122
Tex Houston, Harrison Equip. Co. 713-652-4750
Tex San Antonio, Sherman Elctrns. .. 512-224-1001
Utah Salt Lake City, Calron Electric Supply 801-487-7451
Utah Salt Lake City, Kimball Elctrns.. 801-328-2075
Utah Salt Lake City, Newark/Salt Lake City 801-486-1048
Va Norfolk, Avec Elctrns. Corp. 804-627-3502
Va Richmond, Sterling Elctrns..... 804-226-2190
Wash Bellevue, Liberty/Northwest..... 206-453-8300
Wash Seattle, Radar Electric Co. 206-282-2511
WVa Beckley, Halley Elctrns. 304-253-2561
WVa Charleston, McJunkin Corp..... 304-348-4906
WVa Huntington, Elctrnc. Supply 304-523-6443
Wisc Mequon, Taylor Electric Co. 414-241-4321
Wisc Milwaukee, Parts Mart Corp. 414-276-1212
For: Puerto Rico, San Turce, Elctrn Centre 809-724-3823

PAN AMERICAN TRADE DEVELOPMENT CORP., Dept. EM, 2 Park Ave., New York, N.Y. 10016, Tel: 212-481-1882, TWX: 710-581-6567; Empl.: 120

Sales Manager: I. Weinstein; *Distributor Manager*: R. White

Local Sales Offices & Reps.
Ala Huntsville, Interep Assoc. 205-881-3677
Cal Marina Del Rey, Intervend Inds.. 213-821-7936
Cal Sunnyvale, Trident Assocs..... 408-734-5900
Ga Atlanta, Interep Assoc..... 404-394-7756
Ill Des Plaines, Janus Inc 312-298-9330
Ind Indianapolis, Carter, McCormic & Peirce 317-844-4175
Mich Farmington Hills, Carter, McCormic & Peirce 303-477-7700
NM Albuquerque, Tri Tronix Albuquerque 505-265-8409
Ohio Cleveland, Carter, McCormic & Peirce 216-779-5100
Ohio Dayton, Carter, McCormic & Pierce 513-222-7700
Pa Pittsburgh, Carter, McCormic & Pierce 412-372-4415
Wash Seattle, Seatronics 206-767-4330

PANAMETRICS INC., Dept. EM, 221 Cresent St., Waltham, Mass. 02154, Tel: 617-899-2719, Telex: 92-3406; Empl.: 60

Local Sales Offices & Reps.
Mich Chelsea, Michigan Nondestructive Gage Co. 313-994-5117
Pa Downingtown, Testech 215-269-2705
Pa Pittsburgh, Allegheny Test Svcs 412-882-3800
Tex Dallas, NDE-Aids 214-363-3217

Panasonic

PANASONIC, IND'L. ELCTRN. COMPS., Panasonic, Elctrn. Comps. Div., Dept. EM, Box 1503, Secaucus, N.J. 07094, Tel: 201-348-7000, TWX: 701 992-8920; Empl.: 25 p. 1202-1204,3292,3293,3722,3931

Local Sales Offices & Reps.
Ala Huntsville, Rep, Inc..... 205-881-9270
Ariz Phoenix, Shefler-Kahn Co. 602-257-9015
Cal Cerritos, Panasonic Co. 714-522-3520
Cal Cupertino, Calconn Devices..... 408-996-9616
Cal Los Angeles, West Inc..... 213-625-1868
Cal New Port Beach, West Inc. 714-540-9040
Colo Englewood, Shefler-Kahn Co..... 303-761-3688
Conn Essex, Eastern Sys Sls 203-767-8505
Fla Casselberry, EIR, Inc. 305-830-9600
Fla Coral Springs, EIR, Inc. 305-752-9227
Fla Plantation, EIR, Inc. 305-791-6390
Ga Atlanta, Rep, Inc. 404-938-4358
Ill Chicago, Brock & Cushman..... 312-622-4110
Ill Franklin Park, Panasonic Co. Elctrn. Comps. Dept. 312-455-3105
Iowa Des Moines, B.E.A.M.S., Inc. 515-255-1148
Kans Shawnee Mission, B.E.A.M.S., Inc. 913-631-0300
Md Ellicott City, Tom Davis Marketers 301-461-2209
Mass Burlington, Eastern Sys Sls 617-272-2604
Mich Detroit, NICON Assocs. 313-341-7688
Minn Minneapolis, Jos-Co/Melius..... 612-861-3343
Mo St. Louis, B.E.A.M.S., Inc..... 314-569-1060
NJ Plainfield, Meg Elctrn. Sls. 201-757-4332
NM Albuquerque, Shefler-Kahn Co... 505-296-0740
NY New York, MEG Elctrn. Sls..... 212-233-9059
NY Ontario Center, Kehoe Comp. Sls. 315-524-2491
NC Raleigh, REP. Inc. 919-851-3007
Ohio Columbus, T. Mulligan & Assocs. 614-457-2242
Ore Portland, Electronic Sources 503-292-0701
Pa King of Prussia, Monteiro Associates, Inc. 215-265-0634
Tenn Jefferson City, Rep Inc. 615-475-4105
Tex Addison, Dunbar Assocs. 214-239-7151
Utah Salt Lake City, Shefler-Kahn Co. 801-484-4222
Va Fairfax, Tom Davis Marketers 703-591-7390
Wash Bellevue, Electronic Sources 206-453-0800
Exp: Can., Etabicoke, Ont., RFQ Ltd. 416-626-144

Local Distributors
Ala. Huntsville, Resistacap..... 205-881-927
Cal Burbank, T.A.W. Elctrns Corp 213-846-391
Cal Irvine, Ratel Elctrns..... 714-549-861
Cal Los Angeles, Western Electromotive-Shephard 213-820-377
Cal Mountainview, Capacitor Sls 415-964-888
Cal Mountainview, Terminal Elctrns.. 415-969-924
Cal Sunnyvale, Ratel Elctrns 408-739-922
Colo Denver, Ratel Elctrns 303-934-581
Conn Hamden, Impact Sls 203-281-133
Fla Casselberry, Pace Elctrns 305-834-777
Mass Newton, Impact Elctrns..... 617-964-774
Mich Livonia, RS Elctrns. 313-491-100
Minn Thief River Falls, Digi-Key Corp. 218-681-667
NJ Plainfield, Mars Elctrns. 201-757-433
NY Freeport, Milgray NY..... 516-546-600
NY Ontario Center, Pace Elctrn. Prods. 315-524-249
Pa Duquesne, Advacom, Inc..... 412-469-260
Pa Erie, Advacom, Inc 814-452-376
Tex Addison, Computer Comps. Corp. 214-239-027
Utah Salt Lake City, Standard Supply Co. 801-355-297
Wash Seattle, Almac/Stroum Elctrns... 206-763-230

PanaVise, Dept. EM, 10107 Adella Ave., South Gate, C 90280, Tel: 213-569-8108; Empl.: 29

Sales Manager: J. Hart; *Distributor Manager*: J. Har

Local Sales Offices & Reps.
Cal Burlingame, Carelli - EMA 415-697-628
Cal Carson, Bidwell Sls Assocs..... 213-770-030
Cal Gardena, Bidwell Sls. Assocs..... 213-770-030
Colo Denver, Brake & Assocs. 303-433-853
Ga Atlanta, Hollingsworth & Still 404-394-321
Ga Roswell, Henry W. Phillips Co. .. 404-992-307
Ill Lincolnwood, B. Stein & Co. 312-674-255
Ill Northbrook, Bill Stein & Co..... 312-272-276
Ind Indianapolis, Green/Wissler Sls Co 317-291-22
Kans Overland Park, Thomas L. Dowell & Assocs 913-648-73
Mass Scituate, W.A. Hendrickson Co. 617-545-06
Minn Minneapolis, Borrett & Lee Corp 612-929-00
Mo Silver Springs, Mid-Atlantic Sls Co 301-593-77
NY Commack, Landau & Mack Inc. 516-543-27
NY Phelps, L S M Assocs 315-548-48
Ohio Beachwood, E S M 216-831-95
Ore Portland, Federated Sls/NW 503-233-24
Pa Abington, Mid-Atlantic Sls Co 215-657-28
Tex Dallas, Crockett Sls Co 214-748-81
Tex Dallas, Crockett Sls. 214-748-82
Utah Salt Lake City, Brake & Assocs 801-485-33

PANDUIT

PANDUIT CORP., Dept. EM, 17301 Ridgeland Av Tinley Park, Ill. 60477, Tel: 312-532-1800, Tel 25-4560 ..... p. 4628-46

Local Sales Offices & Reps.
Ala Birmingham, James E. Heusser Agency 205-836-38
Alas Anchorage, AARK of Alaska 907-333-17
Ariz Phoenix, Panduit Corp. 602-252-45
Ark Little Rock, Byron Carson Co.... 501-568-67
Cal Irvine, Panduit Corp. 714-546-57
Cal Los Altos, Ewing-Foley, Inc..... 415-941-45
Cal San Diego, Tak Sales Co. 714-287-67
Colo Denver, I. W. Strong & Assocs... 303-292-66
Conn Glastonbury, Barton-Caron Assocs. 203-633-94
Fla Winter Park, Floritronics 305-886-49
Ga Atlanta, Panduit Corp. 404-393-3
Haw Honolulu, A. J. Vivas Co. 808-941-30
Ill Tinley Park, Panduit Corp. 312-532-18
Ind Fort Wayne, Panduit Corp..... 219-424-49
Ind Indianapolis, Panduit Corp..... 317-251-8
Iowa Marion, Thomas & Modrcin Assoc. 319-377-6
Kans Shawnee Mission, Thomas & Modrcin Assoc 913-432-2
Ky Jeffersontown, A.L. Pickens Co. 502-491-4
Md Rockville, L.G. White & Co. 301-792-0
Mass Auburndale, Barton-Caron Assocs. 617-332-2
Mich Flint, Panduit Corp. 313-233-0
Mich Grand Rapids, Panduit Corp. 616-942-0
Mich Troy, Panduit Corp. 313-362-2

Minn Minneapolis, Electric Comp. Sls. 612-933-2594
Mo Hazelwood, Thomas & Modrcin Assoc. 314-895-4700
NJ Leonia, Panduit Corp. 201-461-7790
NY Rochester, Panduit Corp. 716-244-9480
NY Saratoga Springs, Panduit Corp. 518-869-6913
NY Syracuse, Panduit Corp. 315-476-6161
NC Winston-Salem, L.G. White Southern, Inc. 919-725-3612
Ohio Columbus, Panduit Corp. 614-291-4123
Ohio Fairfield, Panduit Corp. 513-874-0660
Ohio Westlake, Panduit Corp. 216-835-2050
Okla Oklahoma City, Panduit Corp. 405-848-6916
Ore Portland, Panduit Corp. 503-248-1971
Pa Broomall, White/Whiddett Co. 215-353-6343
Pa Carnegie, Myles F. Smith & Assoc. 412-276-5363
Tenn Memphis, Byron Carson Co. 901-345-5187
Tenn Nashville, Panduit Corp. 615-254-7538
Tex Dallas, Panduit Corp. 214-387-2250
Tex Houston, Panduit Corp. 713-869-0941
Wash Bellevue, Panduit Corp. 206-454-7267
Wisc Appleton, H. Mercer Co. 414-739-6223
Wisc Brookfield, H. Mercer Co. 414-786-6431

PANEL COMPONENTS CORP., Dept. EM, 2015 Second St., Berkeley, Cal. 94710, Tel: 415-548-1966, Telex: 335-393

Local Sales Offices & Reps.
Cal Berkeley, Caltron Incs. 415-548-1966
Cal Los Angeles, Ezra Mintz Assoc. 213-670-5410
Ill Northbrook, Raines-Brin Assoc. Inc. 312-498-0890
Mass Lexington, Zieco 617-861-8300
Minn St. Paul, Arkco Sls 612-777-7454
NJ Ho-Ho-Kus, D. J. Fisher Co. 201-652-0090
NM Albuquerque, Burt Dieruf Assoc. 505-299-0989
NY Rochester, Lloyd Hart Assoc. 716-244-3253
Ore Portland, Earl & Brown Co. 503-245-2283
Tex Roanoke, Jim Hughes Co 817-430-1683
Tex Sugar Land, Jesse B. Simms 713-491-2498
Wash Seattle, Earl & Brown Co. 206-284-1121

PANEL CONTROLS CORP., Dept. EM, 1000 Mt. Elliott Ave., Detroit, Mich. 48207, Tel: 313-568-2400; Empl.: 24

Local Sales Offices & Reps.
Ala Chattanooga, Jackson & Assocs. 615-267-4260
Ariz Phoenix, Davia Pkg. Supplies 602-942-5484
Cal Glendale, Bacon Bros. Equip 213-247-3010
Cal Los Angeles, Dale Fukamaki & Assocs 213-299-5006
Cal San Diego, QNS Distributors 714-224-2640
Cal Santa Clara, Advanced Handling Sys 408-988-1833
Cal Westminster, Contronic Devices 714-897-2266
Ill Glenview, F.W. Castle Co. 312-724-3075
Mass Burlington, Contract East 617-272-5051
Mich Dearborn, F.B. Wright Co. 313-843-8250
Minn Anoka, A. & R. Assocs. 612-421-0751
Mo Maryland Heights, Allied Assocs. 314-291-1120
NJ Mountain Lakes, J.P. Dearie Co. 201-334-4848
NC Durham, R.H. Davis Co. 919-596-8472
Ohio Dayton, Dynel Co. 513-434-6467
Ore Portland, Commercial Products Co. 503-286-4040
Tex Dallas, W.W. Cannon Co. 214-357-2846
Utah Salt Lake City, American Handling & Packaging 801-487-4673
Wash Seattle, Commercial Products Co. 206-767-5313

PAR-METAL PRODS. INC., Dept. EM, 1260 Atlantic Ave., Brooklyn, N.Y. 11216, Tel: 212-772-5800; Empl.: 75

Local Sales Offices & Reps.
Ala Huntsville, Remco 205-883-9260
Cal Haywood, Avionics Liason Inc.
Cal Lynwood, D. West Assoc. 213-636-6124
Colo Boulder, Herb Bass Assoc. 303-499-7509
Conn Manchester, Victor Assoc. 203-646-6448
Fla Clearwater, Brennan Assoc. 305-446-5006
Ill Evanston, Saffro & Assoc. 312-328-0140
Mass Southboro, Victor Assoc. 617-481-4010
Minn Minneapolis, Electronic Innovators 612-884-7471
NJ Lebanon, Churchill Assoc. 201-236-6055
NY New York, Miller Co. 212-772-5800
NY Syracuse, C. W. Floring & Assoc. 315-478-2149
Ohio Cleveland, KRW Sls. 216-741-4711
Ohio Dayton, KRW Sls. 513-885-3330
Pa Media, S&S 215-566-5400
Pa Pittsburgh, KRW Sls. 412-243-2284
Tex Richardson, Spectra Sales 214-234-3600
Utah Murray, Measurement Consultants 801-268-3181
Va Fairfax, Snyder & Stefkovic 703-273-1413
Wash Seattle, Avionics Liaison Inc. 206-767-3870

PARABAM, INC., Dept. EM, 3017 E. Las Hermanas St., Compton, Cal. 90221, Tel: 213-537-1771; Empl.: 32

PARAGON ELECT. CO., INC., Sub. of AMF, Dept. EM, 606 Parkway Blvd, P.O. Box 28, Two Rivers, Wisc. 54241, Tel: 414-793-1161, Telex: 26-3450; Empl.: 1000

PARAMETRICS, DIV. ZERO-MAX INDS., Dept. EM, 284 Racebrook Rd., Orange, Conn. 06477, Tel: 203-799-2333; Empl.: 45

Sales Manager: D.W. Maass

PARAMETRIC INDS., INC., Dept. EM, 742 Main St., Winchester, Mass. 01890, Tel: 617-729-7333, Telex: 94-9421; FSC No.: 21455; Empl.: 78

Sales Manager: J.P. Corvino

Local Sales Offices & Reps.
Ariz Tempe, Gassner & Clark 602-968-9037
Cal Cupertino, Allis Assocs. 408-379-2883
Cal Inglewood, L&M Engrg. 213-678-5409
Colo Boulder, H. Bass Assocs. 303-449-7509
Fla Coral Springs, Precision Mktg. Svcs. 305-971-8270
Ill Elk Grove, R-Tek 312-439-9090
Kans Wichita, E. Carbiener Assocs. 316-682-5782
Md Woodbridge, M. Lader Co. 202-296-2497
Mass Winchester, Parametric Inds. 617-729-7333
Mo Maryland Hgts, Kebco Mfrs Reprs 314-576-4111
NJ Morris Plains, Richman Sls. Co. 516-543-5532
NY Utica, Richman Sls. Co. 315-733-2460
Pa Lafayette Hill, M. Lader Co. 215-825-3177
Tex Dallas, Stevens Sls. Co. 214-350-2476
Wash Seattle, Datacom Assocs. 206-285-2525
Exp: Cal., Culver City, J S H International 213-559-6900

PARAPLEGICS MFG., Dept. EM, 304 N. York Rd., Bensenville, Ill. 60106, Tel: 312-625-7740; FSC No.: 3679; Empl.: 65

Sales Manager: V. Caricato

PARLEX CORP, Dept. EM, 145 Milk St., Methuen, Mass. 01844, Tel: 617-685-4341, TWX: 710-342-1538; Empl.: 250

Sales Manager: B. Poor

Local Sales Offices & Reps.
Ariz Scottsdale, Carter Assoc. 602-947-4355
Cal Beverly Hills, Balzar-Wolf Assoc. 213-888-7432
Cal Escondido, Cirolia Elec. Sls 714-743-3015
Cal Fullerton, Parlex Corp 714-526-0222
Cal Santa Clara, Novatronix 408-243-9530
Colo Lafayette, Spectrum Sls 303-449-7677
Conn North Haven, Kitchen & Kutchin 203-288-6596
Fla Ft. Lauderdale, CBC Elctrns 305-484-7330
Ill Palatine, Claeson Assocs 312-359-7230
Md Baltimore, Stemler Assoc. 301-944-8262
Mass Lexington, Kitchen & Kutchin 617-862-8230
Mich Grand Rapids, J.L. Montgomery Assoc. 616-774-9308
Mich Southfield, J.L. Montgomery Assoc. 313-358-2616
Minn Minneapolis, P. Ericson & Associates 612-884-1969
NJ E. Orange, M. Gallagher 201-678-5071
NY Melville, M. Gallagher 516-271-6940
NY Rochester, W.H. Zimmerman 716-586-4450
NY Syracuse, W.H. Zimmerman 315-474-4889
Ohio Aurora, Nationwide Comps Reps 216-562-9666
Okla Bixby, EBR 918-369-5688
Tex Dallas, E.B. Robertson 214-942-2716
Tex Houston, EBR 713-785-6800
Wash Bellevue, J.B. Jolly 206-453-1188

PARSONS MFG. CORP., Dept. EM, 1055 O'Brien Dr., Menlo Park, Cal. 94025, Tel: 415-324-4726; Empl.: 65

Sales Manager: C.E. Plummer

Local Sales Offices & Reps.
Cal So. El Monte, Parsons Mfg. 213-443-3277
Cal So. El Monte, Parsons Mfg. Corp. 213-443-3277
Minn St. Paul, Bonament Heyda Co. 612-484-8531
Ore Portland, Parsons Mfg 503-224-1007
Tex Dallas, Merit Co. 214-620-0021

PASO SOUND PRODUCTS INC., Dept. EM, 14 First St, Pelham, NY 10803, Tel: 914-738-4800; Empl.: 50

Local Sales Offices & Reps.
Cal Hayward, Tech-Rep Assocs 415-785-4531
Cal Los Alamitos, Broom's Elctrns. 213-598-7630
Colo Westminster, Electro-Tek Sls. 303-623-3370
Fla Hialeah, Miguel A. Lopez 305-822-6853
Fla Orlando, John W. Carroll 305-855-1993
Ill La Grange, Marketing Directions 312-352-2055
Ind Huntington, Albrecht & Co. 219-356-1555
La Metaire, McKinney Sls. Co. J. F. 504-454-1132
Mass Natick, Jonel Sales Assocs 617-653-3736
Mich Rochester, Albrecht & Co. 313-652-2520
Minn Maple Grove, RC Sls. 612-425-5543
NY Jericho, Gim Sls. Corp. 516-433-4080
NY Liverpool, Jack Mesnick Sls. 315-622-3211
Ohio Medina, J. H. Podolny Co. 216-725-8814
Okla Tulsa, McKinney Sls. Co., J. R. 918-622-5511
Ore Portland, D. G. Weber Co. 503-234-7671
Pa Glenside, R. Lewis Sls. 215-886-1555
Pa Holland, Par-Nell Sales 215-355-9330
Tex Bellaire, McKinney Sls. Co., J.F. 713-777-9780
Tex Dallas, McKinney Sls. Co., J. F. 214-631-9450

PAYNE ENGRG. CO., Dept. EM, Box 70, Scott Depot, W. Va. 25560, Tel: 304-755-4353, Telex: 88-5452; Empl.: 20

Local Sales Offices & Reps.
Ark Little Rock, Ransom Sls 501-225-7332
Cal Oakland, Powermatic Assoc. 415-635-6909
Cal Tustin, Sierra-Pacific Eng. 714-731-3411
Colo Englewood, Hydrologics, Inc 303-761-6960
Conn Ridgefield, Himes Co.
Conn Ridgefield, Manning & Assocs 203-784-4687
Fla Ft. Lauderdale, R. D. Jacobs 305-462-1932
Ga Lilburn, Motion Techn 404-972-5050
Ill Chicago, Ash Equip. Co.
La Wegganian, Univ Activities 504-341-4281
Me So. Freeport, A. E. Bahrt 207-865-3929
Md Ellicott City, McCourt Co. 301-465-4515
Mass Hingham, R. J. Wilson Assoc. 617-749-7575
Mich Farmington, Applied Instrs. Co. 313-476-9060
Minn St. Paul, Power/Mation Div.
Mo St. Louis, Tines Ind. Sls.
NJ Kenilworth, Wolock & Lott
NY Syracuse, Application Specialists
NC Charlotte, Motion Techn 704-525-9855
Ohio Cincinnati, J. W. Murray & Assoc.
Ohio Cleveland, Collart Co.
Okla Tulsa, "J" Isley, Inc. 918-245-2026
Pa Frazer, Engineered Specialty Prods.
Pa Pittsburgh, Process Engrg. Co.
SC Greenville, Motion Techn 803-271-1608
Tenn Memphis, Ransom Sls 901-332-0036
Tex Houston, Clarke, Inc. 713-526-4908
Va Richmond, Gregg & Assocs. 804-435-1525
Wisc Waukesha, Power/Mation Div. 414-542-2868

PCA ELCTRNS., INC., Dept. EM, 16799 Schoenborn St., Sepulveda, Cal. 91343, Tel: 213-892-0761, TWX: 67-4681, 910-496-1525; FSC No.: 97722; Empl.: 45

Sales Manager: K. Puhl

Local Sales Offices & Reps.
Ariz Phoenix, Toward Engrg. Assocs., Inc. 602-955-3193
Cal San Diego, Littlefield & Smith 714-455-0055
Cal Santa Clara, Fahrner-Miller Assocs 408-984-1700
Colo Englewood, Inverness Mktg. 303-770-2300
Conn Southington, KSA of New England 203-747-5883
Fla Clearwater, Lawrence Assocs., Inc. 813-443-2698
Fla Maitland, Lawrence Assocs. 305-647-1188
Ill Westchester, W. G. Brouillette & Assocs., Inc. 312-345-6500
Iowa Davenport, Ensco-Rep, Inc. 319-386-6600
Kans Overland Park, Ensco-Rep. 913-381-7557
Mass Framingham, KSA of New England 617-875-5464
Minn Minneapolis, J. H. Hanson Co. 612-922-3643
Mo St. Louis, Ensco-Rep. 314-567-3935
NJ Wayne, H. Kagan Assocs. 201-684-7682
NY Fairport, RBG Sls. 716-377-1390
Ohio Cleveland, Weschler Elec. Co. 216-251-4609
Ore Portland, Electronic Compt. Sls. 503-245-2342
Tex Dallas, Blackburn Assocs. 214-692-8885
Utah Murray, Inverness Mktg. 801-266-3490

PCB PIEZOTRONICS, INC., Dept. EM, 5800 Transit Rd., Depew, N.Y. 14043, Tel: 716-684-0001, TWX: 710-263-1371; Empl.: 61

Local Sales Offices & Reps.
Cal Cupertino, Saber Entprs 408-446-4792
Cal Long Beach, Saber Entprs. 213-595-5646
Colo Parker, Western Mktg. Assoc. 303-841-2788
Conn Hamden, Northeast Engrg., Inc. 203-248-4481
Fla Orlando, Physimetrics, Inc. 305-894-8081
Ga Atlanta, Physimetrics, Inc. 404-955-0155
Ill Northfield, Torkelson Assocs. 312-446-9085

Ind Indianapolis, Torkelson Assocs... 317-244-7867
Md Fulton, Gans-Fryling, Inc. 301-837-6311
Mass Danvers, Northeast Engrg., Inc... 617-774-3010
Mich Farmington, Carter, McCormic & Peirce, Inc. 313-477-7700
Minn Minneapolis, Torkelson Assocs. 612-835-2414
Mo St. Louis, Adelphi, Inc. 314-821-1232
NM Albuquerque, Rustco Entprs. 505-292-2741
NY Liverpool, Rayelco Elctrns., Inc. 315-652-5272
NY Manhasset, Northeast Engrg., Inc. 516-365-9633
Ohio Cleveland, Carter, McCormic & Peirce, Inc. 216-333-5650
Ohio Dayton, Carter, McCormic & Peirce, Inc. 513-278-5873
Ore Portland, Brett Assocs. 503-232-4184
Pa Chester Springs, Letronix 215-458-8977
Pa Monroeville, Carter, McCormic & Peirce, Inc. 412-372-4415
Tex Dallas, Tech. Prods., Inc. 214-357-9603
Tex Houston, Technical Prods. 713-777-7360
Utah Logan, Western Mktg. Assoc. 801-753-0073
Va Arlington, Gans-Fryling, Inc. 703-527-3262
Wash Seattle, Brett Assocs. 206-935-8054

PCS., INC., Dept. EM, 750 N. Maple Rd., Saline, Mich. 48176, Tel: 313-429-4971, TWX: 810-223-8153; Empl.: 135

Sales Manager: T. Pellegrino

Local Sales Offices & Reps.
Cal Pomona, PCS. 714-593-7581
Conn Danbury, PCS, Inc. 203-792-0151
Ill Schaumburg, PCS, Inc. 312-843-0800
Minn St. Paul, Cullen & Assocs. 612-646-7371
NJ Palisades Park, PCS, Inc. 201-224-5208
Ohio Cincinnati, Zonic Tech Labs 513-891-6390
Pa Devon, PCS, Inc. 215-687-0186
Tex Houston, Automation, Inc. 713-462-0060
Utah Salt Lake City, T. R. Brown 801-486-7241

PEARCE-SIMPSON, INC., Div/Gladding Corp., Dept. EM, 4701 N.W. 77th Ave., Miami, Fla. 33166, Tel: 305-592-5550, Telex: 51 9379; Empl.: 200

Sales Manager: D. Henry

PEARSON ELCTRNS. INC., Dept. EM, 4007 Transport St., Palo Alto, Cal. 94303, Tel: 415-494-6444; FSC No.: 05280; Empl.: 15

PEERLESS SALES CO., Dept. EM, 4200 W. Chicago Ave., Chicago, Ill 60651, Tel: 312-772-1900; Empl.: 45

Sales Manager: H. Stevens

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Cal Irvine, J. Thommen & Co. 714-551-0845
Cal Mountain View, F. X. Shaw Assoc.
Ga Atlanta, J. W. Bell Jr. & Assoc... 404-237-6819
Haw Honolulu, G. Dougherty 808-847-4144
Ill Palos Park, K. Parr Assocs. 312-448-8488
Ky Louisville, B. Dawson & Assocs.
Minn Minneapolis, J. E. M. Anderson Co. 612-823-6459
NJ W. Trenton, S. Marks & Assocs. 609-882-2328
Ore Portland, Fleehart & Sullivan 503-297-1033
Tex Dallas, Sound Ideas 214-363-0977
Tex Houston, Sound Ideas 713-686-4838
Wash Seattle, Fleehart & Sullivan 206-522-1533

PENN AIRBORNE PRODS., Dept. EM, Industrial Hwy., Southampton, Pa. 18966, Tel: 215-355-3400, Telex: 834759; FSC No.: 25805; Empl.: 33

Sales Manager: W. Williams

Local Sales Offices & Reps.
Cal Palo Alto, Mauldin Co. 415-326-5291
Haw Honolulu, Atecs Corp. 808-841-6694
Iowa Des Moines, H.E. Ferris 515-255-1757
Mich Royal Oak, Stillings Instr. Sys. .. 313-549-6030
Neb Omaha, Interstate Ind'l. Inst. 402-331-3535
Ohio Dublin, Analytco 614-889-1224
Ohio W. Carrollton, Analytco 513-434-8940
Pa Downingtown, Reinbrecht 215-265-6180
Pa Pittsburgh, W. Wells 412-833-1632
Tex Lufkin, Waller Sls. Inc. 713-632-7759
Va Richmond, Instrument Technical Representatives 703-288-7198

PENN ENGRG. & MFG. CORP., Dept. EM, Doylestown, Pa. 18901, Tel: 215-766-8853, TWX: 510-665-9338; FSC No.: 46384; Empl.: 165

Sales Manager: J.W. Segraves

PENN FIBRE & SPECIALTY, Dept. EM, 2020 E. Westmoreland St., Phila., Pa. 19134, Tel: 215-RE 9-4862; Empl.: 60

Sales Manager: W.K. Davis

Local Sales Offices & Reps.
Ill Chicago, B. Finder & Assocs. Inc. 312-262-2020

PENN KEYSTONE CORP., Dept. EM, Division St., Ansonia, Conn. 06401, Tel: 203-734-3301, Telex: 96-3554; FSC No.: 03034; Empl.: 65

Sales Manager: E.M. Parker

Local Sales Offices & Reps.
Cal Huntington Beach, ASC Sls. Co. 714-847-7515
Colo Parker, Comp Sls. 303-841-2650
NJ Pitman, Colrud Co. 609-589-5866
NY Rochester, L. Hart Assoc., Inc. .. 716-244-3253
Ohio Cincinnati, Tri-State Mktg., Inc. .. 513-761-7993

PENNTUBE PLASTICS, Dept. EM, Madison Ave. & Holly St., Clifton Heights, Pa. 19018, Tel: 215-622-2300, Telex: 845-212; Empl.: 145

Local Sales Offices & Reps.
Ariz Scottsdale, Quintec 602-991-2370
Cal Burlingame, Quintec Inds. 415-969-7010
Cal El Segundo, Quintec Inds. 213-640-1400
Cal San Diego, Quintec Inds. 714-276-6604
Fla Largo, Almac Assocs. 813-581-0444
Ill Collinsville, Rubber Plastic & Spec Co. 618-344-4906
Ill Northbrook, R. H. Stone 312-446-2156
Ind Indianapolis, Hoster & Sieloff Assocs. 317-844-9921
Kans Overland Park, Rubber Plastics & Spec Co. 913-677-3396
Mass North Quincy, James L White 401-253-2000
Minn Minneapolis, Aeromat 612-890-4697
NJ Woodbury Heights, Frederick T. Passon 609-848-5229
NY Mineola, R. A. Colucci Co. 516-746-0397
NY Rochester, Pete Williams 716-381-0033
NC Sanford, G. Simpson 919-776-3701
Ohio Brecksville, John G Harmath 216-526-8844
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Tex Richardson, C. J. Garvey Co. 214-234-3371
Wash Seattle, G. G. Gallup 206-525-2543

PENNWALT CORP., Chemical Specialties Div., Dept. EM, Three Pkwy., Philadelphia, Pa. 19102, Tel: 215-587-7000, TWX: 215-569-9748

PENTRONIX DIV, See PTX-Pentronix, Inc

PERFECT GEAR & INSTR. CORP., Sub. Designatronics, Dept. EM, 455 E 10th Ave., Hialeah, Fla 33010, Tel: 305-883-5311, TWX: 810-848-8097; Empl.: 160

PERFECTION MICA CO., see Magnetic Shield Div.

PERKIN-ELMER DATA SYSTEMS, Terminals Div., Dept. EM, Rt. 10 & Emery Ave., Randolph, N.J. 07801, Tel: 201-366-5550, TWX: 710-987-7913; Empl.: 1100

Sales Manager: D. R. Carson

Local Sales Offices & Reps.
Ariz Phoenix 602-894-9121
Cal Los Angeles 213-641-4881
Cal San Diego 714-565-0602
Cal San Francisco 408-249-5540
Cal Tustin 714-544-9093
Colo Denver 303-773-2855
Conn Bloomfield 203-243-9595
DC Washington 703-827-5900
Fla Orlando 305-851-6962
Ga Atlanta 404-457-6361
Ill Chicago 312-437-3547
Mass Boston 617-890-1305
Mich Detroit 313-968-2777
Minn Bloomington 612-884-1757
Mo Kansas City, 913-384-1606 913-492-6377
NJ Fort Lee 201-947-2200
NY Binghamton 607-722-4233
NY Rochester 716-422-6840
Ohio Cleveland 216-461-8344
Ohio Dayton 513-434-4193
Okla Tulsa 918-749-0925
Pa Philadelphia 215-687-2511
Pa Pittsburgh 412-922-8904
Tex Dallas 214-234-8880
Tex Houston 713-783-3060
Wash Seattle 206-455-0680

PERKIN-ELMER CORP., Elctrn. Prods. Dept., Dept. EM, Main Ave., Norwalk, Conn. 06856, Tel: 203-762-4786, TWX: 710-468-3213; Empl.: 40 p. 4367

Local Sales Offices & Reps.
Ariz Scottsdale, Arcom Sls. Co. 602-947-5745
Cal Encino, C.D.H. Assocs. 213-345-3111
Cal San Diego, Qualtronics Corp. 714-224-6555
Colo Denver, Electrodyne Inc. 303-757-76
Fla Ft. Lauderdale, Snow Co. 305-563-24
Md Temple Hills, Wyncote Instrumentation Co. 301-423-85
Mich Grand Rapids, Thies & Assocs... 616-457-20
Pa Ambler, Wyncote Instrumentation Co. 215-643-24
Tex Dallas, Southern Engrg. Co. 214-357-06
Wash Redmond, Quadra Sales Corp... 206-883-35

PERKIN-ELMER ULTEK INC., Dept. EM, Box 109
Palo Alto, Cal. 94303, Tel: 415-967-2100, TW
910-379-6442; Empl.: 150

Sales Manager: B. D. Gottlieb

Local Sales Offices & Reps.
Cal Laguna Hills, Perkin-Elmer Ultek 714-768-31
Cal San Jose, Perkin-Elmer Ultek 408-292-70
Ga Atlanta, W. L. Schoonover, Inc... 404-255-07
Ill Wilmette, Perkin-Elmer Ultek 312-256-26
Ohio North Olmsted, Perkin-Elmer Ultek 216-331-57
Tex Richardson, Yarbrough Southwest 214-690-08
Va Reston, Perkin-Elmer Ultek 703-620-20
Wash Mercer Island, Palmborg and Assocs 206-232-34

PERMA POWER ELCTRNS, Dept. EM, 5615 Howard Ave., Chicago, Ill. 60648, Tel: 312-647-94
Empl.: 20

Local Sales Offices & Reps.
Ark El Dorado, D. Bellew Sls. 501-863-83
Cal Redondo Beach, Oberman-Renner Sls. Co. 213-772-11
Cal San Francisco, Technical Sls. Assocs. 415-467-14
Colo Denver, A. E. S. 303-777-87
Conn West Hartford, Smith Co. 203-523-05
Ill Lincolnwood, W. Linz & Assoc. .. 312-677-20
Ind Indianapolis, Green-Wissler Sls.. 317-291-22
Mich Plymouth, J. Malcolm Flora 313-453-42
Minn St. Paul, W. Engelbretson Co. 612-457-88
Mo Jefferson City, C. A. Vignola Assoc. 314-893-32
NJ Cherry Hill, Trinkle Sls. 609-795-42
NY Commack, Landau & Mack 516-543-27
NY Phelps, L. S. M. Assocs. 315-548-48
NC Greensboro, Adams & Assocs... 919-272-68
Ohio Whitehall, Mandabach-Lehner Co. 614-235-02
Tex Dallas, Berthold Sls. Co. 214-526-83
Wash Seattle, Fleehart & Sullivan 206-522-15

PERMAG CORP., Dept. EM, 88-06 Van Wyck Expw
Jamaica, N.Y. 11418, Tel: 212-657-1818; Empl.: 50

Local Sales Offices & Reps.
Cal Los Angeles, Permag Pacific Corp. 213-776-56
Cal Sunnyvale, Permag Sierra Corp. 408-738-10
Ga Atlanta, Permag Dixie Corp. 404-351-09
Ill Elk Grove Village, Permag Central Corp. 312-956-11
Mass Billerica, Permag Northeast Corp. 617-273-26
Ohio Toledo, Permag Magnetics Corp. 419-385-46
Tex Dallas, Permag Southwest Corp. 214-748-69

PERMALUSTER, INC., Dept. EM, 1844 N. Keysto St., Burbank, Calif. 91504, Tel: 213-849-6454; Empl

PERMANENT MAGNET CO., Dept. EM, 4
Bragdon St., Indianapolis, Ind. 46226,
317-547-1336; Empl.: 150

Local Sales Offices & Reps.
Cal Pasadena, T.W. Yeakle 213-684-22
Ill Hillside, L.M. Holt, Permanent Magnet Co. 312-449-76
Ind Indianapolis, Hoster & Sieloff Assocs. 317-884-99
Mass Wakefield, Howard Jappe Co. 617-245-93
Minn Minneapolis, Peterson Entprs. 612-784-66
NY Manhasset, Kaelber & Mack, Inc. 516-627-66

PERRY AMPLIFIER, Dept. EM, 138 Fuller
Brookline, Mass. 02146, Tel: 617-734-0844; Empl.:

PERRY AMPLIFIER cont'd

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PESCHEL INSTRS., INC., Dept. EM, 1412 Viscaya Pkwy., Cape Coral, Fla. 33904, Tel: 813-542-3164; FSC No.: 92656; Empl.: 19

Local Sales Offices & Reps.

Cal	Fremont, Spence Assocs.	415-656-9506
Cal	Fremont, Peschel West	415-656-1322
Mass	Boston, Sandman Elec. Co.	617-848-2111
NY	White Plains, Benfield Electric Supply	914-948-6660

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PFC, Dept. EM, Community Dr., Great Neck, NY 11022, Tel: 516-487-9320; Empl.: 40 ..... p. 1206,1207

Sales Manager: R. Ash

Local Sales Offices & Reps.

Ariz	Phoenix, Zeus Inc	602-253-6104
Cal	Garden Grove, Impact Elect	213-431-3581
Cal	Santa Clara, Fischer Assoc	408-733-7350
Colo	Golden, J.F. Hurlbut Co	303-279-7796
Conn	Meriden, Sturgeon Co	203-237-1112
Fla	Ft Lauderdale, Electro Comp	305-491-4141
Ill	Westchester, W G Inc	312-344-0690
Ind	Indianapolis, Emmtronics	317-356-0931
Md	Silver Springs, Mid-Atlantic Sls	301-593-7749
Mass	Needham, Sturgeon Co	617-444-6603
Mich	St Clair Shores, Thorpe Co	313-779-6363
Minn	Chanhassen, Barnes Assocs	612-474-2907
NJ	Ardmore PA, W.K. Metz	215-649-3966
NY	Melville, Comtronic Assoc	516-249-0505
NY	Rochester, L-Mar Inc	716-328-5240
NC	Raleigh, B.T. Funderburk	919-782-3493
Ohio	Cleveland, Marlow Assoc	216-991-6500
Pa	Ardmore, W.K. Metz	215-649-3966
Pa	Pittsburgh, Marlow Assoc	412-831-6113
Tex	Houston, Jim Hughes Co	713-771-9353
Tex	Lewisville, Jim Hughes Co	817-430-1683
Wash	Bellevue, SDR²	206-747-9424

PHELPS DODGE CABLE & WIRE CO., Dept. EM, Box 391 Point St., Yonkers, N.Y. 10702, Tel: 914-963-8200, TWX: 710-560-0006; Empl.: 750

Sales Manager: B.K. Cowles, V.P. Sls. & Mktg.

Local Sales Offices & Reps.

Ala	Mobile	205-666-7575
Cal	Los Alamitos	213-598-8638
Cal	Los Angeles	213-728-9153
Cal	Santa Clara	408-247-2131
Colo	Denver	303-455-1012
Fla	Tampa	813-935-8738
Ga	Atlanta	404-691-0140
Haw	Honolulu	808-841-4502
Ill	Des Plaines	312-299-5577
Iowa	Dubuque	319-588-3630
La	Baton Rouge	504-927-1550
La	New Orleans	504-581-7200
La	Shreveport	318-868-1844
Md	Columbia	301-997-4200
Mass	Waltham	617-890-6110
Mich	Royal Oak	313-545-7177
Mich	Southfield	313-557-3000
Minn	Minneapolis	612-835-5517
Miss	Jackson	601-969-0661
Mo	St. Louis	314-863-0424
NY	Rochester	716-244-1311
NY	Yonkers	914-963-8200
NC	Charlotte	704-364-6770
Ohio	Cleveland	216-333-7977
Pa	Carnegie	412-923-1515
Pa	Warminster	215-674-1200
Tenn	Memphis	901-767-8888
Tex	Arlington	214-298-4201
Tex	Houston	713-461-4461
Utah	Salt Lake City	801-268-9393
Va	Richmond	800-638-2818
Wash	Bellevue	206-455-1095

PHELPS DODGE COMMUNICATIONS CO., Dept. EM, 5 Corporate Park Dr., White Plains, N.Y. 10604, Tel: 914-694-1600

Local Sales Offices & Reps.

Cal	Monteray Park	213-268-9330
Fla	Tallahassee	904-222-1579
Ga	Atlanta	404-691-8920
Ill	Des Plaines	312-299-7795
NJ	Marlboro	201-462-1880
NY	White Plains	914-694-1600

PHELPS DODGE MAGNET WIRE CO., Dept. EM, 1302 E. Creighton Ave., Ft. Wayne, Ind. 46803, Tel: 219-456-4444, TWX: 810-332-1501

Local Sales Offices & Reps.

Cal	Santa Ana	714-540-8235
Ill	Des Plaines	312-299-6126
Ind	Fort Wayne	219-456-4444
Mass	Waltham	617-890-5930
Mich	Southfield	313-557-3000
Mo	St. Louis	314-863-0424
NJ	Cranford	201-276-8500
NC	Charlotte	704-364-6770
Ohio	Cleveland	216-398-9300
Tenn	Memphis, Phelps Dodge Magnet Wire Co.	901-767-8888
Wisc	Wauwatosa	414-778-0670

PHILADELPHIA INSULATED WIRE CO. INC., Dept. EM, 333 New Albany Rd., Moorestown, N.J. 08057, Tel: 609-235-6700, TWX: 710-897-0187 ..... p. 4633-4652

Sales Manager: J. Turcich

Local Sales Offices & Reps.

Ariz	Phoenix, Vari-Tron Sls. Co.	602-997-0774
Cal	San Jose, Norwest Elctrns	408-287-9378
Cal	Santa Ana, R.M.S. Assocs.	714-556-4155
Colo	Denver, Royal Supply Co.	303-744-3588
Fla	Vero Beach, J. Rule Assocs.	305-589-5357
Md	Ellicott City, Marketing Technology	301-465-8630
Mass	Framingham, Medfield Assocs.	617-875-4679
Minn	Minneapolis, All Phase Agency	612-835-4940
Mo	St. Louis, Thurderbird	314-567-6488
NJ	S. Orange, Maurice Wachstein	201-272-3850
NY	Camillus, O N T E C	315-487-0596
NY	Fayetteville, O N T E C	315-446-2580
NY	Grand Island, O N T E C	716-773-9319
NY	Mineola, R.A. Colucci Co.	516-746-0397
NY	Rochester, O N T E C	716-464-8636
Ohio	Cleveland, C.J. Voneman Co.	216-333-5500
Ohio	Dayton, C.J. Voneman Co.	513-299-5161
Pa	Ardmore, Martin Assocs	215-649-6332
Tex	Dallas, McCoy Assocs. Co.	214-350-9931

PHILADELPHIA QUARTZ CO, See PQ Corp

PHILAMON, INC., Dept. EM, 33 Dubon Ct., Farmingdale, N.Y. 11735, Tel: 516-249-2700, TWX: 510-224-6512; FSC No.: 95267; Empl.: 27 .... p. 2353

Sales Manager: B.F. Grib

PHILIPS AUDIOCOM PRODS, Philips Audio Video Sys, Dept. EM, 91 McKee Dr, Mahwah, N.J. 07430, Tel: 201-529-3800, TWX: 138023, 710-988-5348

Sales Manager: S. Richard Ravich

NEUTRIK PRODUCTS

PHILIPS AUDIO VIDEO SYS, Neutrik Prods, Dept. EM, 91 McKee Dr., Mahwah, N.J. 07430, Tel: 201-529-3800, TWX: 138023, 710-988-5348

Local Sales Offices & Reps.

Ariz	Scottsdale, Packer Sls	602-949-9443
Cal	Culver City, Marshank Sls	213-559-2591
Cal	Walnut Creek, MacPherson Sls	415-937-1482
Colo	Denver, B & B Elctrn Prods	303-773-6700
Conn	Stamford, J. B. Anthony Co	203-322-9205
Fla	Miami, World Wide Prods	305-754-5475
Ga	Tucker, Elrep Sls	404-938-7108
Ill	Chicago, Theodore Pappas & Assoc.	312-685-2338
Iowa	Des Moines, Beams Co	515-255-1148
Kans	Shawnee Mission, Beams Co	913-631-0300
Md	Silver Spring, Taub Sls	301-622-0300
Mass	Natick, V.F. Sls	617-237-6544
Mich	Canton, V.F. Sls	313-453-8720
Minn	Minneapolis, Kodo Assocs	612-881-1255
Miss	Meridian, Elrep Sls	601-482-5242
Mo	St. Louis, Beams Co	314-569-1060
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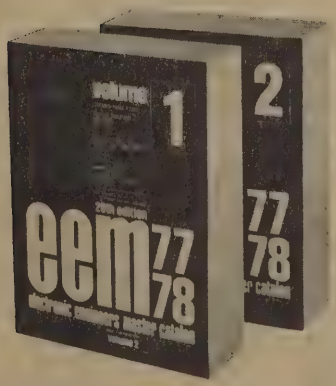

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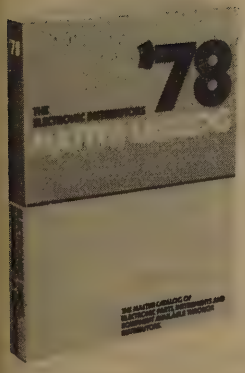

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Wash Bellevue, RTS, Inc. 206-455-2778
Wisc Lake Mills, Saffro and Assocs. .. 414-648-2605

PITTMAN CORP., Dept. EM, 343 Godshall Drive, Harleysville, Pa. 19438, Tel: 215-256-6601, TWX: 510-661-8696; FSC No.: 98938; Empl.: 100 .. p. 3104

Sales Manager: C.A. Pittman, VP

Local Sales Offices & Reps.
Ariz Scottsdale, Williams-Assocs. 602-947-4297
Cal Los Angeles, Halbar Assocs..... 213-387-8283
Cal San Mateo, Halbar Assocs. 415-349-4700
Colo Denver, Williams-Assocs. 303-373-4730
Fla Ft. Lauderdale, Tropi-Tec Co. 305-463-0988
Fla Palmetto, Tropi-Tec Co. 813-729-3112
Ill Chicago, K-W Assocs. 312-792-2618
Ind Fort Wayne, Neal Engrg. Co. 219-484-5090
Ind Indianapolis, Neal Engrg. Company 317-849-4201
Mass Marlboro, M.L. Assocs..... 617-485-6190
Mich Birmingham, J.C. Hofstetter Co. 313-646-3635
Mo St. Louis, Gordon Fixman Engrg. 314-725-5219
NJ Summit, R.A. Potter Assocs. 201-277-0220
NM Albuquerque, Williams-Assocs. .. 505-255-1638
NY Buffalo, Application Specialists .. 716-834-3377
NY East Syracuse, Application Specialists 315-437-2813
NY Rochester, Application Specialists 716-586-6226
NC Charlotte, Electro-Rep Assocs., Inc. 704-527-2530
Ohio Dayton, J.C. Hofstetter Co. 513-296-1010
Ohio Medina, J.C. Hofstetter Co. 216-241-4880
Okla Tulsa, Blair Engrg. Sls. Co. 918-747-3100
Tex Dallas, Blair Engrg. Sls. Co. 214-352-8411
Tex Houston, Blair Engrg. Sls. Co..... 713-776-0011
Wash Sumner, Halbar Assocs..... 206-939-2080

PLASTIC CAPACITORS, INC., Dept. EM, 2623 N. Pulaski Rd., Chicago, Ill. 60639, Tel: 312-489-2229, TWX: 910-221-1354; FSC No.: 99120; Empl.: 125

Sales Manager: F.J. Pavey

Local Sales Offices & Reps.
Ala Huntsville, B.J.R., Inc. 205-881-3569
Cal Los Angeles, E.E. Strassner Co. 213-242-8823
Cal San Jose, Parsons Co..... 408-247-7327
Conn E. Haven, Eagle Assocs. 203-467-6542
Ill Elk Grove Village, Carlson Elctrn. Sls. Co. 312-956-8240
Ind Fort Wayne, W.W. Bieberich, Inc. 219-432-2537
Ind New Albany, W.W. Bieberich, Inc.812-945-3187
Mass Boston, Eagle Assocs. 617-444-3446
Mo St. Louis, Cadon Technical Sls... 314-991-0262
NJ Springfield, F.F. Sylvester Assoc. 201-376-3324
NY Middlesex, Swenson Assocs 315-584-6522
NY Rochester, Swenson Assoc. 716-385-1235
Ohio Cleveland, Electro-Com 216-886-2404
Ohio Dayton, Electro-Com..... 513-898-5140
Pa Flourtown, Eastern Comps., Inc. 215-836-1616
Pa York, Eastern Comps., Inc. 717-764-3114
Tex Dallas, Packard Assocs..... 214-357-5113
Va Herndon, Eastern Comps..... 703-471-1025
Wisc Milwaukee, Carlson Elctrn. Sls. Co. 414-476-2790
Exp: New York, N.Y., B. Freudenberg 212-757-9130

PLASTICS ENGRG. CO., Dept. EM, 3518 Lakeshore Rd., Sheboygan, Wisc. 53081, Tel: 414-458-2121, TWX: 910-264-3873; Empl.: 475

Local Sales Offices & Reps.
Ill La Grange Park, O. B. Buss 312-354-4285
Ill McHenry, Rich Peterson..... 815-385-7547
Mich Marshall, B. L. Young 616-781-5415
Mo Manchester, K. A. Pickell 314-527-0476
NJ North Plainfield, S. C. Dusza 201-757-2059
NC Charlotte, R. P. Draper..... 215-348-3666
Ohio Grafton, E. D. Larrick 216-499-0111
Ohio Hartville, Charles Retert..... 216-877-3762
Pa Erie, N. B. Duffett 814-833-4386
Wisc Plymouth, R. T. Johnson 414-892-8556
Wisc Sheboygan, F. Shaw..... 414-452-7849

PLATO PRODUCTS, INC., Dept. EM, El Monte, Cal. 91731, Tel: 213-283-0466, Telex: 673-488; FSC No.: 32399; Empl.: 60

Local Sales Offices & Reps.
Ariz Phoenix, Scottsdale Tool 602-273-7376
Cal El Segundo, Wassco..... 213-640-1060
Cal San Jose, M. Miller..... 408-246-8181
Cal Santa Clara, Com-Kyl..... 408-249-6220
Colo Arvada, Coast Tool Co. 303-422-3413
Colo Denver, Grenfell Supply..... 303-893-3111
Ill Bensenville, Plato Prods. 312-766-4996
Ill Chicago, E.M.F. Co 312-889-8323
Kans Shawnee Mission, Burke Sls. Co. 913-384-5577
Mich Royal Oak, Murray Percival Co. 313-548-1971
Minn St. Paul, R. G. Ragon Co. 612-488-0201
NJ Mount Arlington, Plato Prods. Inc.201-398-0015
NM Albuquerque, International Elctrns 505-265-6456
NY Guilderland, Solder Pot..... 518-355-1829
Ore Portland, Murphy Supply 503-226-6081
Tex Dallas, Roy E. Davis 214-653-1041
Tex El Paso, International Elctrns..... 915-778-9761

Local Distributors
Ariz Phoenix, Scottsdale Tool & Supply 602-273-7376
Cal El Segundo, Wassco..... 213-640-1060
Cal Santa Clara, COM-KYL 408-249-6220
Colo Arvada, Coast Tool Co. 303-422-3413
Colo Denver, Grenfell Supply Co. 303-893-3111
Ill Chicago, E M F Co 312-889-8323
Kans Shawnee Mission, Burke Sls 913-384-5577
NM Albuquerque, International Elctrns 505-265-6456
NY Guilderland, Solder Pot..... 518-355-1829
NY Honeoye Falls, Solder Pot..... 716-624-3117
Ore Portland, Murphy Indl Supply Co. 503-226-6081
Pa West Kittanning, Solder Pot..... 412-543-5755
Tex Dallas, Roy E. Davis Co. 214-653-1041
Tex El Paso, Intl Elctrns..... 915-778-9761
For: China, Hong Kong, Nanco Electronics Supply 3-642231-5
For: Holland, Helmond, Weld Equip Sales B.V.I.O. (04920) 42225
For: Japan, Tokyo, Hachioji, Asahi Electronics 0426-26-1911

PLESSEY CAPACITORS, Dept. EM, 5334 Sterling Center Dr., Westlake Village, Cal. 91361, Tel: 213-889-4120, TWX: 910-494-4779

Local Sales Offices & Reps.

Cal	San Diego, Jules DeWinne	714-292-1533
Conn	Newtown, Gerber Sls	203-426-3440
Fla	Lighthouse Point, R. C. Simon	305-941-2757
Ill	Chicago, T. B. Hunter Assocs.	312-777-2500
Md	Ellicott City, Doss Elctrns.	301-465-1336
Mass	Waltham, Gerber Sls. Corp.	617-890-8040
Mich	Brighton, S.A.I.	313-227-1786
Mich	Grand Rapids, S.A.I.	616-942-2504
Minn	Minneapolis, P.S.I.	612-835-1777
NY	Buffalo, R. W. Mitscher	716-633-7970
NY	Garden City, Comtronic Assocs.	516-741-8966
NY	Manlius, R. W. Mitscher	315-682-2855
NY	New York, Comtronic	516-249-0505
NY	Pittsford, R. W. Mitscher	716-381-9115
NY	Syracuse, R. W. Mitscher	315-458-1321
NY	West Hurley, R. W. Mitscher	914-679-6151
NC	Raleigh, Bob Dean, Inc.	919-851-7841
Ohio	Beachwood, S.A.I.	216-292-2982
Ohio	Centerville, S.A.I.	513-435-3181
Ohio	Cincinnati, S.A.I.	513-761-5432
Pa	Wynnewood, W. K. Metz	215-649-3966
Tenn	Morristown, Gillum Sls	615-587-2770
Tex	Dallas, Allied Comps.	214-238-0408
Tex	Houston, Allied Comps.	713-960-1962
Wash	Redmond, Quadra Sls	206-883-3550

PLESSEY INC., Dept. EM, 320 Long Island Expwy. S., Melville, N.Y. 11746, Tel: 516-694-7900, TWX: 510-224-6411; Empl.: 2000

Sales Manager: L. Lattanzi

Local Sales Offices & Reps.

Ariz	Mesa, Plessey Inc.	602-969-7281
Cal	Los Angeles, Plessey Inc.	213-390-7844
Cal	Mt. View, Plessey Inc.	415-965-1400
Colo	Vail, Mile High Elctrns.	303-476-1149
Ill	Chicago, Professional Sls. Co.	312-359-2253
Ill	Schiller Park, Plessey Inc.	312-671-2686
Mass	Reading, Plessey Inc.	617-944-7000
NJ	Florham Park, Plessey Inc.	201-822-0500
NY	Melville, Plessey Inc.	516-694-7900
Ohio	Columbus, McFadden Sls. Inc.	614-221-3362
Tex	Dallas, Plessey Inc.	214-235-2307

PLESSEY CERAMIC DIV., Dept. EM, 8th & Harrison Sts., Frenchtown, N.J. 08825, Tel: 201-996-2121, TWX: 510-235-3399; Empl.: 198

Local Sales Offices & Reps.

Ariz	Mesa, Plessey Materials	602-969-7281
Cal	Los Angeles, Plessey Materials	213-390-7844
Cal	Mountain View, Plessey Materials	415-965-1400
NY	Melville, Plessey Materials	516-694-7900
Tex	Dallas, C. Geller	214-341-7026

PLESSEY CHATSWORTH, Dept. EM, 20245 Sunburst St., Chatsworth, Cal. 91311, Tel: 213-341-7770; Empl.: 300

Sales Manager: J. Fulton

PLESSEY ELECTRO-PRODUCTS, Dept. EM, 3860 Centinela Ave., Los Angeles, Cal. 90066, Tel: 213-390-3585, TWX: 910-343-6483 ..... p. 2276

Sales Manager: B. Lewis

PLESSEY ENVIROMENTAL SYS., Dept. EM, 3939 Ruffin Rd., San Diego, Cal. 92123, Tel: 714-278-6500, Telex: 69-5053; Empl.: 40

Sales Manager: G.N. Clausen

Local Sales Offices & Reps.

Md	Rockville, J. Blakely	301-946-0082

PLESSEY SEMICONDUCTORS, Dept. EM, 1674 McGaw Ave., Irvine, Cal. 92714, Tel: 714-540-9979, TWX: 910-595-1930; FSC No.: 52648; Empl.: 14

Local Sales Offices & Reps.

Ala	Huntsville, Remco	205-883-9260
Ala	Huntsville, Remco	205-883-9260
Ariz	Phoenix, Eltron	602-997-1042
Ariz	Phoenix, Thorson Co.	602-956-5300
Cal	Goleta, The Thorson Co.	805-964-8751
Cal	La Jolla, Littlefield & Smith	714-455-0055
Cal	Marina del Rey, Relcom	213-822-1187
Cal	Mountain View, Thresum Assocs.	415-965-9180
Colo	Denver, The Thorson Co	303-759-0809
Conn	Milford, Wayland Engineering Sls	203-878-3755
Fla	St. Petersburg, Kirkwood Assocs.	813-894-8240
Ill	Chicago, Semi. Specialists	312-279-1000
Ill	Elk Grove Village, R-Tech	312-439-9090
Ill	Park Ridge, R F Specialists	312-698-2044
Ill	Schiller Park, Plessey Reg. Office (L. Scalzo)	312-678-3280
Kans	Prairie Village, Engr. Services Co.	913-649-4000
Md	Ellicott City, Applied Engrg. Consultants	301-465-1272
Mass	Wayland, Wayland Engrg. Sls.	617-655-6080
Mich	Brighton, SAI Mktg Corp.	313-227-1786
Minn	Eden Prairie, Technical Assocs.	612-944-3034
Mo	St. Louis, Engr. Services Co.	314-997-1515
NY	Plainview, Robert Smith Assocs	516-681-3155
NY	Plainview, Erde Assocs.	516-822-5357
NY	Skaneateles, Robtron Inc.	315-685-5731
NC	Raleigh, Remco	919-787-1461
Pa	Huntingdon Valley, Dick Knowles Assocs	215-947-5641
Tex	Arlington, W. Pat Fralia Co.	815-740-9101
Tex	Arlington, W. Pat Fralia Co	815-740-9101
Tex	Houston, W. Pat Fralia Co	713-772-1572
Va	Arlington, Applied Engrg Cons.	703-524-6630
Wash	Olympia, Bergford & Assocs.	206-866-2001
WVa	Woodbridge, Applied Engrg. Consultants	703-550-9429

PMI MOTORS, KOLLMORGEN CORP., Dept. EM, 5 Aerial Way, Syosset, NY 11791, Tel: 516-938-8000, TWX: 510-221-1875; Empl.: 180

Sales Manager: J. Rheinhold

Local Sales Offices & Reps.

Ala	Huntsville, Remco	205-883-9260
Cal	Mountain View, Thorson Co	415-964-9300
Cal	Pasadena, PMI Motors	213-796-0189
Colo	Denver, Thorson Co	206-455-9180
Fla	Satellite Beach, Reynolds & Assocs	305-773-4700
Ill	Northfield, Halliday-Lenhart Assocs	312-446-9320
Iowa	Des Moines, I. L. Davidson, Inc.	515-288-0958
Md	Silver Spring, Hal R. Sieber Co.	301-589-9110
Mass	Beverly, PMI Motors	617-922-4007
Mass	Wakefield, Meco, Inc.	617-245-4870
Minn	Wayzata, Joe Little Assocs	612-473-1101
NJ	Williamstown, PMI Motors	609-629-4757
NY	Syosset, Motion Control Sls.	516-921-5656
Ohio	Cleveland, ImTech, Inc.	216-826-3400
Tex	Dallas, Dwayne Clement & Assoc.	214-341-5860
Wash	Bellevue, Thornson Co.	206-455-9180

POLARAD ELCTRN. INSTRS., Dept. EM, 5 Delaware Dr., Lake Success, N.Y. 11040, Tel: 516-328-1100, TWX: 510-223-0414; FSC No.: 82199; Empl.: 150 ..... p. 2800

Sales Manager: E. F. Feldman

Local Sales Offices & Reps.

Ala	Huntsville, J. L. Highsmith	205-881-3294
Ariz	Scottsdale, BFA Corp. of Ariz.	602-994-5400
Cal	Cupertino, T. Snitzer	408-257-8333
Cal	Del Mar, T. Snitzer	714-226-0305
Cal	Los Angeles, T. Snitzer	213-836-6170
Colo	Boulder, H. Bass Assocs.	303-499-7509
Conn	New Canaan, Measurement Consits. Corp.	203-966-4630
DC	D.C., Brimberg Assocs.	301-946-2670
Fla	Boca Raton, James L. Highsmith & Co	305-368-9194
Fla	Orlando, J. Highsmith	305-293-5202
Ill	Chicago, Carter Elctrns.	312-585-5485
Ind	Indianapolis, Carter Elctrns.	317-293-0696
Kans	Overland Park, Carter Elctrns.	913-649-6996
Md	Burtonsville, Eastern Instrumentation Corp.	301-384-8500
Mass	Waltham, Measurement Consits.	617-890-4400
Mich	Detroit, H. Teplitz & Co.	313-534-3306
Minn	Minneapolis, Carter Elctrns.	612-559-1976
Mo	St. Louis, Carter Elctrns.	314-569-1406
NJ	West Orange, E-F Tech. Sls.	201-731-7203
NM	Albuquerque, IMEC	505-883-9010
NY	Huntington Station, E-F Tech. Sls.	516-549-1818
NY	Liverpool, R&D Assocs.	315-457-0100
NC	Charlotte, James L. Highsmith & Co	704-333-7743
Ohio	Bedford Hgts, H. Teplitz & Co.	216-439-3265
Ohio	Dayton, H. Teplitz & Co.	513-277-6531
Ore	Portland, Arva-Hudson, Inc.	503-246-9589
Pa	Phila., East Instrumentation Phila. Inc.	215-927-7777
Tex	Houston, Lear Assocs.	713-686-1838
Tex	Richardson, Lear Assoc.	214-231-5388
Tex	San Antonio, Data Applications	512-732-7176
Va	Norfolk, Brimberg Sls	301-946-2670
Wash	Bellevue, Arva-Hudson, Inc.	206-455-0773
WVa	Charlotte, Brimberg Sls	301-246-2670
Wisc	Milwaukee, Carter Elctrns.	414-464-5555

POLARIS MARINE ELECTRONICS, see Di-Tech Inc.

POLY-SCIENTIFIC, Litton Sys., Dept. EM, 1213 N. Main St., Blacksburg, Va. 24060, Tel: 703-552-3014, TWX: 710-875-3694; Empl.: 450

Local Sales Offices & Reps.

Cal	Huntington Beach	714-968-0434
Fla	Fernpark, Blair Engrg.	305-834-1244
Fla	Orlando, Bilres, Inc.	305-831-1665
Mass	Sturbridge	617-347-9388
Mich	Stochbridge, Erhart Engrg	517-851-8770
Mo	Maryland Heights, Midwest Meridian	314-878-4441
NY	Mineola, Kahn Assocs.	516-742-1900
Ohio	Dayton, INH Component Sls.	513-434-8808
Tex	Fort Worth, Carey, Wolf & Assoc.	817-738-1996
Wash	Bellevue, The Thorson Co	206-455-9180

POLYGON INDS (1977) LTD, Dept. EM, 50 Northline Rd., Toronto, Ont., Can M4B 3E2, Tel. 416-755-3301; Empl.: 75

Sales Manager: R. F. J. Deakin

POLYPHASE INSTR. CO., Dept. EM, 126 E. Fourth St., Bridgeport, Pa. 19405, Tel: 215-279-4660, Telex: 84-6327; FSC No.: 98330; Empl.: 150

Sales Manager: R.H. Simmons

Local Sales Offices & Reps.

Cal	Hollywood, Crown Elctrns.	213-877-3550
Cal	Sunnyvale, RDX Corp.	408-734-4500
Colo	Golden, Callister Assoc.	303-761-0992
Fla	Hollywood, Lectro Mech.	305-920-2291
Ill	Chicago, Probe Elex	312-696-2828
Mass	Needham, Stone Comp. Sls.	617-444-1405
Minn	Wayzata, Little Assoc.	612-473-1107
Mo	Shawnee Mission, Midtec	913-441-6565
NH	Nashua, Stone/Butler	603-888-4410
NY	, Andrews Assoc.	315-637-5291
NY	Valley Cottage, LRC Assocs.	914-634-7973
Ohio	Dayton, Rixan Assoc.	513-278-4216
Pa	Ft. Washington, GCM Assoc.	215-646-7539
Tex	Addison, Southland Comps.	214-783-8340

POLYTRON DEVICES INC., Dept. EM, Box 398 River St. Sta., Patterson, N.J. 07524, Tel: 201-365-0401 ..... p. 3296,3297

PORTER, H.K., INC., Dept. EM, 74 Foley St Somerville, Mass. 02143, Tel: 617-776-8200, Telex 92-1420; Empl.: 250

PORTESCAP US, Dept. EM, 730 Fifth Ave., New York N.Y. 10019, Tel: 212-245-7715, Telex: 14-7267; Empl 14 ..... p. 310

Sales Manager: Peter Thornton, S/M

Local Sales Offices & Reps.

Cal	Hayward	415-886-161
Cal	Simi Valley	805-522-433
NH	Nashua	603-888-400
Ore	Beaverton	503-645-752
Tex	Dallas	214-690-900

Local Distributors

NY	New Hyde Park, Stock Drive Prods.	516-328-330

POSITRONIC INDS., Dept. EM, 208 W. Center St Drawer H, Rogerville, Mo. 65742, Tel: 417-753-285 Telex: 436445; Empl.: 115

Sales Manager: J.E. Myers

Local Sales Offices & Reps.

Ariz	Glendale, Adtek, Inc.	602-846-465
Cal	Del Mar, Interconnect Specialties	714-453-213
Cal	Mountain View, Gene Woempner Co.	415-964-545
Cal	Van Nuys, Interconnect Specialities	213-988-762
Conn	Fairfield, Schumacher/Yarrington	203-259-07
Fla	Clearwater, WMM Assocs	813-442-39
Ill	Arlington Heights, Brainard-Wilson Mktg.	312-437-27
Ind	Indianapolis, Brainard-Wilson	317-844-28
Md	Randallstown, Beacon-No.	301-922-12
NJ	Pitman, Colrud Corp	609-589-58
NY	Melville, Astrorep, Inc.	516-423-22
NY	Pittsford, T-Squared Elctrns.	716-248-50
NY	Syracuse, T-Squared Elctrns.	315-463-85
Ohio	Dayton, Myers Assoc.	513-435-13
Ore	Portland, Electronic Comp Sls.	503-245-23
RI	Warwick, Schumacher/Yarrington	401-884-56
Tex	Houston, Zonk Engrg.	713-697-93
Tex	Richardson, Zonk Engrg. Co.	214-238-76
Va	Falls Church, Beacon-No.	703-534-72
Va	Lynchburg, Beacon-No.	804-237-47
Wisc	Milwaukee, Brainard-Wilson Mktg.	414-527-15

Local Distributors

Cal Manhattan Beach, Prime Electro Sls 213-376-3433
Cal Sunnyvale, Acacia Sls. 408-745-7209
Colo Lake Wood, Acacia Sls. 303-232-2882
Conn Hamden, Impact Elctrns 203-281-1331
Fla Miami, Southeast Connectors 305-887-2635
Ill Chicago, Nep Elctrns 312-745-0711
Mass Newton, Impact Elctrns. 617-964-7740
Minn Minneapolis, Aero-Space Computer Supp 612-884-4725
Mo St. Charles, Finnigan Wire & Cable 314-946-6201
NY Port Washington, Restart Elctrns. 516-883-3500
Ohio Wickliffe, Gateway Megatech 216-944-8565
Tex Addison, Computer Comps. 214-239-0271
Tex Houston, Kent Elctrns. 713-780-7770

POSSIS CORP., Dept. EM, 825 Rhode Island Ave., S., Minneapolis, Minn. 55426, Tel: 612-545-1471, Telex: 29-0516; Empl.: 100

POMONA ELECTRONICS, DIV. OF ITT, See ITT/ Pomona Electronics Div.

POMFRET RESEARCH OPTICS INC., Dept. EM, 817 Long Ridge Rd, Stamford, Conn 06902, Tel: 203-322-6386

Sales Manager: D. Pomfret, Pres.

AMF POTTER & BRUMFIELD

POTTER & BRUMFIELD, Div of AMF, Dept. EM, P.O. Box 322, Princeton, Ind. 47671, Tel: 812-386-1000, TWX: 810-350-2343; Empl.: 3000 p. 3592-3607

Local Sales Offices & Reps.

Ala Huntsville, Cartwright & Bean 205-533-3509
Ariz Phoenix, Howe & Howe Sls. 602-264-7971
Cal Culver City, Bestronics 714-523-1223
Cal Los Altos, E. Recht Assocs. 415-941-0336
Cal San Diego, Bestronics. 714-278-2150
Cal San Juan Capistrano, Potter & Brumfield 714-493-4503
Colo Littleton, Simpson Assocs. 303-794-8381
Fla Orlando, Irby & Connolly, Inc. 305-894-8471
Fla Plantation, Irby & Connolly, Inc. 305-741-1343
Ga Atlanta, Cartwright & Bean, Inc. 404-255-5262
Ill Berkeley/Hillside, Balhorn & Roeser 312-449-3900
Ind Fort Wayne, R.O. Whitesell & Assocs. 219-432-5591
Ind Indianapolis, R.O. Whitesell & Associates, Inc. 317-359-9283
Ind Kokomo, R.O. Whitesell & Assocs. 317-453-3592
Ind Princeton, Potter & Brumfield 812-386-1000
Iowa Cedar Rapids, Balhorn & Roeser 319-377-4814
Kans Overland Park, P-M-A Corp. 913-381-0004
Kans Wichita, P-M-A Corp. 316-264-2662
Ky Louisville, R.O. Whitesell & Assocs. 502-897-1569
La Metairie, Cartwright & Bean, Inc. 504-834-2350
Md Baltimore, Micro-Comp, Inc. 301-247-0400
Mass Braintree, Potter & Brumfield 617-848-6550
Mass Lexington, Hathaway Elctrns., Inc. 617-861-7010
Mich Grand Rapids, R.O. Whitesell & Assoc. 616-942-5420
Mich Southfield, R.O. Whitesell & Assoc. 313-559-5454
Mich St. Joseph, R.O. Whitesell & Assocs. 616-983-7337
Minn Edina, M. Foster Co. 612-835-2252
Miss Jackson, Cartwright & Bean, Inc. 601-981-1368
Mo Maryland Heights, P-M-A Corp. 314-569-1220
NJ Medford, J. McCoy, Inc. 609-428-3444
NM Albuquerque, C.T. Carlberg & Assocs. 505-265-1579
NY Bowmansville, Ossmann Comp. Sls. Corp. 716-681-9700
NY Kingston, Ossmann Comp. Sls. Corp. 914-338-5505
NY Melville, Comtronic Assocs. 516-249-0505
NY Rochester, Ossmann Comp. Sls. Corp. 716-424-4460
NY Syracuse, Ossmann Component Sales Corp. 315-455-6611
NY Vestal, Ossmann Component Sales Corp. 607-785-9949
NC Charlotte, Cartwright & Bean, Inc. 704-337-5673
NC Raleigh, Cartwright & Bean, Inc. 919-781-6560
Ohio Cincinnati, R.O. Whitesell & Assocs. 513-521-2290
Ohio Cleveland, Scott Elctrns., Inc. 216-291-2600
Ohio Columbus, Scott Electronics, Inc. 614-236-8619
Ohio Dayton, R.O. Whitsell & Associates, Inc. 513-298-9546
Okla Tulsa, Comps., Inc. 918-583-9149
Pa Camp Hill, Beil & Whitaker, Inc. 717-233-1254
Pa Harrisburg, Beil & Whitaker, Inc. 717-652-0184
Pa Orefield, Beil & Whitaker, Inc. 215-395-0150
Pa Pittsburg, Scott Electronics, Inc. 412-828-1073
Pa Reading, Beil & Whitaker, Inc. 215-779-2610
Tenn Knoxville, Cartwright & Bean, Inc. 615-693-7450
Tenn Memphis, Cartwright & Bean, Inc. 901-276-4442
Tex Austin, Ammon & Rizos Co. 512-454-5131
Tex Dallas, Ammon & Rizos Co. 214-233-5591
Tex Houston, Ammon & Rizos Co. 713-781-6240
Utah Salt Lake City, Simpson Assocs. 801-486-3731
Wash Seattle, Northmar, Inc. 206-524-5170
Wisc Milwaukee, E.A. Dickinson & Assocs. 414-264-1080

POTTER CO., Dept. EM, Box 337 North Hwy 51, Wesson, Miss. 39191, Tel: 601-643-2216, TWX: 510-981-4072; FSC No.: 13050; Empl.: 200

Local Sales Offices & Reps.

Ariz Phoenix, Chaparral 602-263-0414
Cal Malibu, Potter Co. 213-457-7835
Cal Redwood City, Parks & Pruitt Assoc. 415-364-1640
Cal Woodland Hills, Interstate Mktg. Assocs. 213-883-7606
Colo Denver, Omega Limited 303-758-1508
Fla Ft. Lauderdale, G.F. Bohman Assocs. 305-564-3081
Fla Orlando, G.F. Bohman Assocs. 305-245-5760
Ill Park Ridge, R.F. Specialists 312-698-2044
Kans Shawnee Mission, Martex Assocs 913-441-6565
Mass Pittsfield, Potter Co. 413-499-2677
Mich Grand Rapids, Thies & Assocs. 616-245-0319
Minn Minneapolis, Northport Engrg. 612-698-3841
NJ Haddonfield, Gray Assocs. 609-429-5300
NY Mineola, R.A. Colucci Co. 516-746-0397
NY Syracuse, C.W. Floring & Assoc. 315-478-2149
Ohio Brecksville, A. Nace Co. 216-526-4323
Ohio St. Marys, Potter Co. 513-278-5030
Okla Tulsa, W. Pat Fralia Co. 918-663-8707
Ore Beaverton, LD Elctrns. 503-649-6177
Pa Pittsburgh, Allen Nace Co. 412-922-7225
Tex Fort Worth, W.P. Fralia Co. 817-640-9101
Tex Houston, W.P. Fralia Co. 713-772-1572
Utah Salt Lake City, Omega Limited 801-278-6920

POTTER INSTR. CO. INC., Dept. EM, 151 Sunnyside Blvd., Plainview, N.Y. 11803, Tel: 516-681-3200, Telex: 96-7805; FSC No.: 11-1563362; Empl.: 70

Sales Manager: D. Boland

POWER CONTROL CORP., Dept. EM, 122 Gamma Dr., Pittsburgh, Pa. 15238, Tel: 412-782-3120; Empl.: 65

Sales Manager: W. J. Happel

Local Sales Offices & Reps.

Mass Boston, Eaco Engrg. Corp. 617-782-7440
Mich Saginaw, Von Berg & Assocs. 517-799-0873
NJ Plainfield, Brady Co. 201-753-7988
NY Rochester, H.C. Johnson Agency 716-482-3000
Ohio Cleveland, Whitehill Industrial 216-562-5530
Pa Philadelphia, Norman Rothenheber 215-525-3838

POWER CONVERSION INC., Dept. EM, 70 MacQuesten Pkwy. S., Mt. Vernon, N.Y. 10550, Tel: 914-699-7333, Telex: 99-6640; Empl.: 60

Local Sales Offices & Reps.

Cal Los Altos, Tauber-Dreyer-Kolm. 415-948-2635
Cal Northridge, Tauber-Dreyer Corp. 213-993-0048
Cal San Diego, Tauber Electronics, Inc. 714-274-7242

POWER CONVERSION PRODUCTS INC., Dept. EM, 42 East St., Crystal Lake, Ill. 60014, Tel: 815-459-9100, TWX: 910-634-3356; FSC No.: 31751; Empl.: 95

Sales Manager: C. Seyer

Local Sales Offices & Reps.

Ala Birmingham, John B. Rogers 205-879-2626
Ariz Phoenix, Maydwell & Hartzell 602-275-7644
Cal Brisbane, Maydwell & Hartzell 415-467-4500
Cal Los Angeles, Maydwell & Hartzell 213-685-6310
Cal Los Angeles, R.F. Assocs 213-478-1586
Cal Palo Alto, R.F. Assocs 415-494-3331
Cal San Diego, Maydwell & Hartzell 714-292-0955
Colo Boulder, Comp Product Sls 303-494-5100
Idaho Boise, Alster Comm 203-376-2151
Ill Arlington Hts., Dytec/Central 312-394-3380
Ind Indianapolis, Utility & Indl Prods 317-924-3607
La Chalmette, Lynn Elliott, Co. 504-271-4138
Md Baltimore, Callas Elctrns 301-744-7711
Mass Waltham, Measurement Consits 617-890-4400
Mich Pleasant Ridge, John R. Noyes Co 313-548-5770
Minn Minneapolis, Electrical Jobbers Equip 612-721-4815
Mo Kansas City, Lynn Elliott Co. 816-842-4197
Mo Kirkwood, R.H. Harper 313-966-3694
NJ Cherry Hill, L.H. Walke 609-424-3766
NM Albuquerque, Ralph Black Co. 505-344-3288
NY Buffalo, V. J. Brown 716-839-4232
NY Long Island, Eastern Metro 516-931-1414
NC Charlotte, Jake Rudisill Assoc. 704-377-6901
Ohio Lakewood, Power Engrg Sls 212-226-0278
Okla Oklahoma City, Lynn Elliott Co. 405-842-7885
Okla Tulsa, Lynn Elliott 918-743-7794
Pa Pittsburgh, Muller-Harper & Assoc 412-931-6460
Tex Addison, Lynn Elliott Co. 214-239-8533
Tex Missouri City, Lynn Elliott Co. 713-499-1971
Tex Odessa, Lynn Elliott Co. 915-563-2320

POWER DESIGNS, INC., Dept. EM, 1700 Shames Dr., Westbury, N.Y. 11590, Tel: 516-333-6200, TWX: 510-222-6561; Empl.: 200 p. 3298-3301

Sales Manager: Mrs. R. Roth

Local Sales Offices & Reps.

Ariz Phoenix, Zeus Inc. (Hytronic Meas.) 602-253-6104
Cal North Hollywood, O'Halloran Assocs. 213-877-0173
Cal Palo Alto, O'Halloran Assocs. 415-326-1493
Cal San Diego, O'Halloran Assocs. 714-224-2824
Colo Denver, Zeus Inc. (Hytronic Meas.) 303-770-4400
DC Washington, Powell Pendergraph 301-657-0330
Ill Elk Grove Village, Loren Green & Assocs. 312-593-0282
Ind Indianapolis, Loren Green & Assocs. 317-293-9827
Mass Waltham, Mc Bar Assocs. 617-890-0233
Mich Detroit, H. Teplitz & Co. 313-537-9058
Minn Minneapolis, Loren Green & Assocs. 612-781-1611

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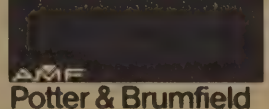
AMF
Potter & Brumfield

NM Albuquerque, Zeus, Inc. 505-268-3941
NY Rochester, Ossmann Instrs..... 716-328-2230
NY Vestal, Ossmann Instrs. 315-785-9947
Ohio Bedford Hghts, H. Tepletz 216-439-3265
Ohio Dayton, H. Teplitz & Co. 513-277-6531
Pa Willow Grove, Powell Pendergraph 215-657-0330
Tex Houston, Scientific Sls 713-666-5318
Tex Richardson, Scientific Sls 214-231-6541
Utah Salt Lake City, Zeus, Inc. 801-466-4924
Va Richmond, Powell-Pendergraph.. 703-264-2341

POWER ELECTRONICS CORP., Dept. EM, 96 Milton Rd., Rochester, New Hampshire 03867, Tel: 603-332-3334, TWX: 510-2974-462; Empl.: 104

Sales Manager: R. A. Bellerive

Local Sales Offices & Reps.
Mass Waltham, Carlisle Technical Sales 617-890-1456
NY White Plains, Swedelco, Inc. 914-946-1122

POWER, INC., Marketing Div., Dept. EM, 12809 Eagle Ridge Dr., Burnsville, Minn. 55337, Tel: 612-890-1360; FSC No.: 25441; Empl.: 500 ..... p. 3302,3303

Local Sales Offices & Reps.
Ala Huntsville, Reynolds & Assocs... 205-536-1941
Fla Ft. Lauderdale, Reynolds & Assocs. 305-581-6611
Fla Satellite Beach, Reynolds & Assocs. 305-773-4700
Fla St. Petersburg, Reynolds & Assocs. 813-360-1484
Fla Winston-Salem, Reynolds & Assoc. 919-725-6196
Ga Atlanta, Reynolds & Assocs. 404-252-5360

POWER INSTRS., INC., Dept. EM, 7352 N. Lawndale Ave., Skokie, Ill. 60076, Tel: 312-676-2300; Empl.: 35

Local Sales Offices & Reps.
Ala Huntsville, Vaughn Electrosources Co. 205-881-8830
Cal Santa Monica, Davidson Assocs.. 213-829-1731
Fla Cocoa Beach, Vaughn Electrosources Co. 305-784-0784
Kans Lenexa, S. Sterling Co..... 913-888-2995
Mich Detroit, S. Sterling Co. 313-255-1970
Mo St. Louis, S. Sterling 314-567-3636
Tex Dallas, Teamwork, Inc. 214-243-5881
Wisc Milwaukee, W. Klinger & Son 414-351-1775

POWER LABS, INC., Dept. EM, 5 Towle Ave., Dover, NH 03820, Tel: 603-742-4613; Empl.: 9

PMIC

POWER/MATE CORP., Dept. EM, 514 S. River St., Hackensack, N.J. 07601, Tel: 201-343-6294, TWX: 710-990-5023; Empl.: 280 ..... p. 3304,3305

Local Sales Offices & Reps.
Ala Huntsville, W.A. Brown 205-883-8660
Ariz Phoenix, Thorson Co. 602-956-5300
Cal Irvine, Power/Mate 714-957-1606
Cal Mountain View, Thorson Co. 415-964-9300
Colo Denver, Thorson Co. 303-759-0809
Conn Hamden, Datcom 203-288-7005
Fla Ft. Lauderdale, W. A. Brown Instr. 305-776-4800
Fla Melbourne, W.A. Brown 305-723-0766
Fla Orlando, W. A. Brown Instr. 305-425-5505
Fla Valparaiso, W.A. Brown 904-678-7932
Ga Atlanta, W. A. Brown Instr. 404-939-1674
Ill Chicago, Data Elctrns. Co. 312-283-0300
Ind Indianapolis, Data Elctrns 317-359-5368
Md Silver Spring, Marktron 301-460-6100
Md Timonium, Marktron 301-252-7111
Mass Waltham, Datcom 617-891-4600
Mich South Lyons, Infinity, Inc. 313-437-2705
Minn Bloomington, Data Elctrns 612-881-9150
Mo Maryland Hghts, Kebco 314-576-4111
NY Elmont, Crane & Egert Corp..... 516-488-2100
NY Fayetteville, R.D. Sherman 315-637-9861
NC Durham, W.A.Brown 919-682-2383
Ohio Aurora, EMA Inc. 216-562-6104
Ohio Centerville, EMA Inc. 513-433-2800
Ore Portland, Thorson Co 503-620-5800
Pa Hatboro, QED Elctrns 215-674-9600
SC Columbia, W A Brown 803-798-3297
Tenn Oak Ridge, W A Brown 615-482-5761
Tex Austin, Thorson Co. 512-451-7527
Tex Dallas, Thorson Co. 214-233-5744
Tex Houston, Thorson Co. 713-771-3504
Wash Bellevue, Thorson Co. 206-455-9180
Wash Seattle, Power/Mate 206-283-1262

POWER-MATIC INC., Dept. EM, 8076 Engineer Rd., San Diego, Cal. 92111, Tel: 714-292-4422, TWX: 910-335-1207

Sales Manager: E. Cooper

Local Sales Offices & Reps.
Cal San Diego, Mesa Engrg 714-278-8037
Cal Torrance, Cutlass Elctrns..... 213-324-7360
Ore Portland, Topp Engrg 503-244-7265
Wash Bellevue, Topp Engrg 206-747-5400

POWER ONE, Dept. EM, Power-One Dr, Camarillo, Cal. 93010, Tel: 805-484-2806, TWX: 910-336-1297; FSC No.: 54407; Empl.: 250 ..... p. 3306

Sales Manager: S. Cole; *Distributor Manager:* S. Cole

Local Sales Offices & Reps.
Ariz Scottsdale, PLS Assocs. 602-994-5461
Cal Los Angeles, A-F Sls. Engrg. Inc. 213-681-5631
Cal San Diego, Col-Rob Elect. 714-565-6814
Cal Santa Clara, Richards Assocs. .. 408-246-5860
Colo Denver, PLS Assocs. 303-773-1218
Conn Hamden, Digital Sls. Assocs..... 203-567-9776
Fla Orlando, Gra-Mar, Inc. 305-894-3351
Ill Chicago, Holsapple & Assoc. 312-858-8355
Ind Indianapolis, Holsapple Assocs. 317-353-9441
Md Lanham, Brimberg Assoc. 301-552-2200
Mass Waltham, Digital Sls. Assoc. 617-899-4300
Minn Minneapolis, Engrg. Prods. Assoc. 612-925-1883
NJ Madison, Livera-Polk Assoc. 201-377-3220
NM Albuquerque, PLS Assocs..... 505-255-2330
NY Roslyn Heights, Livera-Polk Assoc. 516-484-1276
NY Syracuse, C. W. Beach Co..... 315-446-9587
Ore Portland, Jas. J. Backer Co. 503-297-3776
Ore Salem, J. J. Backer Co. 503-362-0717
Tex Dallas, Advance Technical Sales 214-361-8584
Tex Dallas, Solid State Elctrns 214-352-2601
Tex Houston, Advance Technical Sales 713-444-2944
Tex Houston, Solid State Elctrns 713-785-5436
Utah Sandy (Salt Lake City), PLS Assocs 801-942-2081
Wash Seattle, Jas. J. Backer Co. 206-285-1300

Local Distributors
Cal Los Angeles, A-F Sls. Engrg. Inc. 213-681-5631
Cal San Jose, Richards Assocs. 408-246-5860
Colo Denver, PLS Assocs. 303-773-1218
Fla Orlando, GRA-MAR, Inc. 305-894-3351
Ind Indianapolis, Holsapple & Assocs. 317-899-2890
Md Lanham, Brimberg Assoc. 301-552-2200
Mass Waltham, Digital Sls. Assoc. 617-899-4300
Minn Minneapolis, Engineering Prods. Assoc. 612-925-1883
NY Roslyn Hts., Livera-Polk Assoc. 201-377-3220
Tex Dallas, Solid State Elctrns 214-352-2601
Tex Houston, Solid State Elctrns 713-785-5436
Exp. Cal., Los Angeles, Hanex, Inc. .. 213-556-3807
For: Can., Weston, Ont. M9L 1Y6, Duncan Instr. Ltd..... 416-742-4448

POWER-PACK, INC, See Power Labs, Inc

POWER-SCIENCE, INC., Dept. EM, 8076 Engineer Rd., San Diego, Cal. 92111, Tel: 714-292-4422, TWX: 910-335-1207

Sales Manager: E. Cooper

Local Sales Offices & Reps.
Cal San Diego, Mesa Engrg 714-278-8037
Cal Torrance, Cutlass Elctrns..... 213-324-7360
Ore Portland, Topp Engrg 503-244-7265
Wash Bellevue, Topp Engrg 206-747-5400

POWER-SONIC CORP., Dept. EM, Box 5242, 3106 Spring St., Redwood City, Cal. 94063, Tel: 415-364-5001; Empl.: 5

Sales Manager: B. A. Ender; *Distributor Manager:* B. A. Ender

Local Sales Offices & Reps.
Cal Laguna Hills, English Sls Assocs 714-770-2727
Cal Los Angeles, English Sls. Assocs. 714-831-1132
Cal Los Angeles, English Sls Assocs 213-772-7272
Fla Hollywood, Wallace Elctrn Sls.... 305-625-3239
Ga Atlanta, Wallace Elctrn Sls 404-471-6297
Ill Chicago, Ropek-Cahill 312-631-0070
Kans Shawnee Mission, Lowell-Kangas & Assocs 913-631-3515
Md Baltimore, Callas 301-744-7711
Mass Reading, Kanan Assocs..... 617-944-8484
Minn Minneapolis, Tosco Melius 612-861-3343
Mo St. Louis, Lowell-Kangas & Assocs 314-821-4050
NY Wantagh, Dony Tech Sls..... 516-826-5550
NC Kernersville, Wallace Elctrn Sls 919-996-2742
Pa Media, W. Reeves Assocs. 215-566-6709
Tenn Chattanooga, Wallace Elctrn Sls 615-875-0786
Tex Dallas, R. E. Nesbitt Co..... 214-357-4601
Tex Houston, R. E. Nesbitt Co..... 713-224-3633
Wash Bellevue, Vantage Corp..... 206-455-3460

Local Distributors
Ala Birmingham, Forbes Distrib Co... 205-251-4104
Ariz Phoenix, Mountain West Alarm .. 602-263-8831
Cal Garden Grove, Allied Electrns.... 714-894-7581
Cal Hayward, Consolidated Communications 415-783-8181
Cal Los Alamitos, Protection Prods. 213-598-4212
Cal Sunnyvale, C. E. M. Security Prods. 408-735-7744
Cal Van Nuys, Patane Avionics 213-988-4455
Colo Denver, Hensley Battery Co..... 303-455-3643
Fla Miami, ESL Elctrn. Distributors .. 305-633-6973
Ill Chicago, Alarm Supply Co. 312-843-8800
Ill Chicago, Allied Elctrns 312-697-8200
Mass Boston, Security Supply Svc. 617-566-1212
Mass Boston, Alarm Devices Supply .. 617-933-8430
Mich Detroit, Alarm Supply Co. 313-425-2500
Mo St. Louis, Olive Elctrns. 314-863-7800
NY New York, Defensive Security Corp. 516-364-0970
Okla Oklahoma City, Trice Wholesale Elctrns 405-524-4411
Okla Oklahoma City, Electronic Supply Co. 405-232-5215
Ore Portland, Sanderson Safety Supply 503-238-5700
Pa Pittsburgh, Newbrite Inds..... 412-361-1600
Pa Pittsburgh, Triangle Elctrns 412-441-9659
Tex Dallas, Dallas Instrs. 214-349-1180
Tex Ft. Worth, Allied Elctrns 817-336-5401
Tex San Antonio, Sherman Elctrns. Supply 512-224-1001
Exp. Can., Toronto, Ont., Mallory Battery Co. 416-823-4415

POWER SYSTEMS, INC., Dept. EM, 12 Tobey Rd., Bloomfield, Conn. 06002, Tel: 203-243-0357; FSC No.: 50463; Empl.: 100 ..... p. 3308-3311

Sales Manager: E. Elliott, V.P. Mktg

Local Sales Offices & Reps.
Cal Mission Viejo, The Power House 714-830-5666
Conn Washington, Tri-Com Associated 203-868-7748
Fla Clearwater, Brennan Assocs. 813-446-5006
Ill Barrington, Lancastle, Ltd. 312-381-6780
Md Timonium, Heller Sls. 301-252-4780
Mass Waltham, Com-Sale 617-890-0011
Mich Southfield, Electroquipment Sls. 313-569-4497
NH Londonderry, Com-Sale 800-258-5200
NJ Cherry Hill, Scientific Reps. 609-482-0059
NJ Paramus, S.D.N. Representatives 201-368-0123
NY Rochester, S.D.M. Representatives 716-544-8080
NC Franklin, Breenan Assocs..... 704-524-6790
Ohio Chesterland, Electroquipment Sls. 216-729-2225
Ohio Dayton, Electroquipment Sls..... 513-434-8995
Tex Dallas, Jacobson Co 214-363-7581

POWER TECHNOLOGY, INC., Dept. EM, Box 4403 7925 Mablewave Cutoff, Little Rock, Ark. 72204, Te 501-568-1995; Empl.: 26 ..... p. 330

Sales Manager: C. Harper

POWERCUBE CORP., Dept. EM, 214 Calvary St Waltham, Mass. 02154, Tel: 617-891-1830, TWX 710-335-6608; FSC No.: 31557; Empl.: 105

Local Sales Offices & Reps.
Ala Huntsville, REMCO - Huntsville.. 205-883-926
Ariz Phoenix, Interstate Mktg. of Ariz. 602-957-122
Cal Palo Alto, Brooks Tech. Grp..... 415-328-323
Cal Woodland Hills, Interstate Mktg. 213-883-760
Colo Littleton, Simpson Assocs. 303-794-836
Conn Canton Center, Tekdata 203-693-071
Fla Orlando, Technology Mktg Assocs 305-857-376
Fla Pompano Beach, Technology Mktg Assocs 305-942-077
Ill Elk Grove Village, Koby & Assocs 312-439-659
Ind Indianapolis, Ihrig Assocs 317-783-769
Md Ellicott City, Applied Engrg. Consultants 301-465-12
Mass Wakefield, Tekdata 617-245-59
Mich Southfield, Fred H. Gehrke & Assocs 313-559-53
Minn Bloomington, Elctrn Sls Agency 612-884-82
Mo Kansas City, Harris-Hanson..... 816-444-94

Mo St. Louis, Harris-Hanson 314-432-3611
NJ Cherry Hill, Danco Elctrn Sls 609-424-5590
NJ Clifton, Compar New York 201-546-3660
NC Raleigh, Remco-Raleigh 919-787-1461
Ohio Columbus, T. Mulligan & Assocs. 614-457-2242
Ore Portland, Elctrn Sources 503-292-0701
Tex Fort Worth, Carey Wolf & Assocs 817-738-1996
Tex Houston, Carey Wolf & Assocs.. 713-721-2442
Utah Salt Lake City, Simpson Assocs. 801-486-3731
Wash Bellevue, Elctrn Sources 206-453-0800
Wisc Milwaukee, William F Shreiber Assoc 414-545-7800

POWERTEC, INC., Dept. EM, 9168 DeSoto Ave., Chatsworth, Cal. 91311, Tel: 213-882-0004, TWX: 910-494-2092; Empl.: 300 ..... p. 3312,3313

Local Sales Offices & Reps.
Ala Huntsville, Murcota Corp. 205-539-8476
Ariz Scottsdale, Barnhill Three Inc. 602-947-7841
Cal Los Altos, Powertec, Inc. 415-941-6200
Colo Denver, Barnhill Three Inc. 303-750-1222
Conn Hamden, Pat Jenks Associates 203-281-0810
Fla Casselberry, EIR Inc. 305-830-9600
Ill Barrington, Lancastle Ltd. 312-381-6780
Ill Wood Dale, Lancastle Ltd 312-595-8343
Iowa Cedar Rapids, Comstrand 319-377-1575
Kans Shawnee Mission, S.A.I. Mktg 913-441-6565
Md Wheaton, Data Sys. Mktg. 301-933-0900
Mass Wakefield, Pat Jenks Assocs. 617-246-1590
Mich Brighton, S.A.I. Mktg. 313-227-1786
Minn Minneapolis, Comstrand Inc. 612-571-0000
Mo Florissant, S.A.I. Mktg 314-837-5200
NJ Bogota, Neville & Vespo 201-487-1505
NM Albuquerque, Barnhill Three Inc. 505-299-7658
NC Winston-Salem, Murcota Corp. .. 919-722-9445
Ohio Beachwood, SAI Mktg. 216-292-2982
Ohio Centerville, S.A.I. Mktg. 513-435-3181
Pa Huntingdon Valley, R. Knowles Assoc. 215-947-5641
Pa Pittsburg, SAI Mktg 412-782-5120
Tex Dallas, P.J. Scanlon Co. 214-231-4661
Tex Houston, P.J. Scanlon Co. 713-496-1170
Utah Salt Lake City, Barnhill Three Inc. 801-485-8121
Wash Bellevue, A. Smith Co. 206-746-6770

POWERTECH, INC., Dept. EM, 0-02 Fairlawn Ave., Fairlawn, N.J. 07410, Tel: 201-791-5050; FSC No.: 32953; Empl.: 25 ..... p. 3932,3933

POWERTRON CORP., Dept. EM, 3821 Barringer Dr., Charlotte, N.C. 28210, Tel: 704-525-8962, Telex: 57-2444; Empl.: 125

Sales Manager: C. D. Lordo

Local Sales Offices & Reps.
Ariz Tempe, Gassner & Clark 602-968-9037
Cal Bell Flower, Kilowatt 213-925-6595
Cal San Rafael, Kilowatt 415-479-5422
Mass Woburn, Stockwell Tech. Sls. Co. 617-935-5770
Mich Farmington Hills, Electro-Matic .. 313-478-1182
Minn Edina, Merrill Franklin 612-927-4361
Mo Maryland Heights, Hitt Assocs. .. 314-878-5405
NJ East Orange, Murray Gallagher 201-678-5071
Ohio Warren, Mike Senek 216-856-6887
Tex Houston, W.A. Carey & Assoc. .. 713-460-1111
Tex Richardson, W.A. Carey & Assoc. 214-234-2202
Va Richmond, Commonwealth Control 804-358-5700

PPM, INC., Dept. EM, 7575 Bond St., Cleveland, Ohio 44139, Tel: 216-232-4140; Empl.: 20 ..... p. 2801

Sales Manager: A.L. Bletcher

Local Sales Offices & Reps.
Ariz Tempe, J. Smith & Assocs. 602-968-7025
Colo Denver, J. Smith & Assocs. 303-442-7100
Mich Ferndale, Tiby Co. 313-547-3550
NM Albuquerque, J. Smith & Assocs. 505-265-3406
NC Charlotte, Binco 704-366-5092
Ohio Cleveland, Tiby Co. 216-371-5335
Ohio Dayton, Tiby Co. 513-277-3822

PQ CORP., Dept. EM, PQ Corp, Valley Forge, Pa. 19482, Tel: 215-293-7200, TWX: 510-668-3432; Empl.: 600

Sales Manager: O.J. Pladek

PRACTICAL AUTOMATION, INC., Dept. EM, Trap Falls Rd., Shelton, Conn. 06484, Tel: 203-929-5381, Telex: 96-4217; Empl.: 150 ..... p. 1659

Sales Manager: R. Banzaca

Local Sales Offices & Reps.
Cal Montebello, Tucul Engrg. 213-728-7397
Colo Denver, Par Assocs. 303-355-2363
Conn Southbury, J. J. Wild 203-264-9494
Ga Atlanta, Flex-Comm International, Inc. 404-237-9242
Ill Arlington Heights, Martec Assocs., Inc. 312-956-8090
Kans Shawnee Mission, Technical Sls Assocs 913-888-3330
Md Linthicum Hts., KD Associates 301-636-1151
Mass Needham, J. J. Wild 617-444-2366
Mich Detroit, R.P. Urban & Assocs. 313-535-2355
Mich Grand Rapids, R. P. Urban & Assocs. 616-245-0511
Minn Apple Valley, Wenco Sls. 612-866-3639
Mo St. Louis, Technical Sls. Assocs. 314-725-5361
NJ Budd Lake, J. J. Wild 201-691-0441
NM Sandia Park, PAR Assocs South 505-281-5602
NY Clark Mills, KLM Assoc. 315-853-6126
NY Jericho, J. J. Wild 516-935-6600
NY Pittsford, KLM Assoc. 716-381-8350
NY Syracuse, KLM Assocs. 315-458-6214
Tex Dallas, Glidden Engrg. & Elctrn. Eqpt. 214-341-0610
Tex Houston, Glidden Engrg. & Elctrn. Eqpt. 713-681-1415
Wash Bellevue, Tasco, INc. 206-453-1414

PRD ELCTRNS., DIV. OF HARRIS CORP., see Harris Corp., PRD Electronics Div.

PRECISION ELECTRONICS, INC., Dept. EM, 9101 King Ave., Franklin Park, Ill 60131, Tel: 312-678-5350; Empl.: 75

Local Sales Offices & Reps.
Ala Birmingham, M.K. Smith 205-967-3080
Cal Los Angeles, E. E. Strassner Co. 213-666-1511
Cal San Francisco, Meyer & Ross 415-285-8880
Ga Clarkston, M.K. Smith 404-491-9020
Ind Indianapolis, R. Milsk Co. 317-546-5468
Mich Southfield, R. Milsk Co. 313-354-3310
Minn Minneapolis, J. E. Anderson 612-823-6459
NH Londonderry, Associated Sys. 603-434-0731
NJ Westfield, Electro Mktg. 201-232-7531
NC Charlotte, M.K. Smith 704-372-1026
Okla Tulsa, J. F. McKinney Sls. 918-742-6791
Tex Dallas, J. F. McKinney Sls. 214-631-9450
Exp: Ill., Chicago, E.D. Magnus & Associated 312-334-1502
Exp: N.Y., Plainview, Morhan Exporting Corp. 516-293-5582

Local Distributors
Conn Hartford, Communications Prods. 203-522-9117
Mich Grand Rapids, Bursma Radio Supply Co. 616-459-4328
Nev. Reno, Executone of Northern Nev. 702-329-3116
Okla Oklahoma City, Oklahoma Theatre Supply 405-236-8691
Pa Broomal, High Fidelity Hse. 215-544-4420
Tex Fort Worth, H. Jordan Sound 817-626-6790
Tex Odessa, Elctrn. Svc. Center 915-337-0328
Wash Spokane, National Music Svc. Corp. 509-327-7784

PRECISION FILTERS, INC., Dept. EM, 303 W. Lincoln St., Ithaca, N.Y. 14850, Tel: 607-277-3550; FSC No.: 66-II-F & 66-II-I; Empl.: 15 ..... p. 2637

Sales Manager: D. Chandler

Local Sales Offices & Reps.
Ala Huntsville, Lee Assocs. 205-533-5896
Cal Costa Mesa, FLW Inc. 714-751-7512
Cal Los Angeles, FLW Inc. 213-860-4695
Cal San Diego, FLW, Inc. 714-277-0993
Fla Ft. Lauderdale, Lee Assocs. 305-491-7220
Fla Winter Haven, Lee Assocs. 813-294-5815
Ga Buford, Lee Assocs. 404-945-4222
Ill Chicago, Pivan Engrg 312-539-4838
Ind Indianapolis, Pivan Engrg 317-253-1681
Iowa Cedar Rapids, Pivan Engrg 319-377-9434
Kans Shawnee Mission, Pivan Engrg .. 913-722-1030
Md Fulton, Gans, Fryling & Pugh 301-837-6311
Mass Acton, RDS Assocs. 617-263-1128
Minn Minneapolis, Pivan Engrg 612-537-4526
Mo St. Louis, Pivan Engrg 314-567-3636
NY Liverpool, Rayelco Assocs. 315-652-5272
NC Raleigh, Lee Assocs. 919-787-5818
Ohio Columbus, R.D. Cloon Assocs. .. 614-459-2890
Pa Ambler, Denco 215-542-9876
Va Arlington, Gans, Fryling & Pugh 703-527-3262
Wisc Brookfield, Pivan Engineering 414-786-1940

PRECISION LAMP, INC., Dept. EM, 950 N. Rengstorff Ave., Mountain View, Cal. 94043, Tel: 415-965-1333, Telex: 348498; Empl.: 25

Local Sales Offices & Reps.
Ala Birmingham, Maitland K. Smith .. 205-967-3080
Ariz Scottsdale, Williams Assocs 602-947-4297
Cal Los Angeles, Duo Dynamics 213-240-4111
Cal Pleasanton, Moulthrop Sls 415-846-0550
Colo Denver, Williams Assocs 303-373-4730
Fla Lighthouse Point, J. Krutek & Assocs. 305-941-6544
Ga Tucker, Maitland K. Smith 404-938-7161
Ill Chicago, G. McL. Cole Co. 312-774-3535
Ind Indianapolis, Robert Milsk Co. 317-546-5468
Mich Southfield, Robert Milsk Co. 313-354-3310
Minn Minneapolis, R-J Inc. 612-922-1425
Mo Kansas City, Forristal-Young Sls 816-358-6771
NM Albuquerque, Williams Assocs 505-255-1638
NY Rochester, R. P. Kennedy Co. 716-271-6322
NC Charlotte, Maitland K. Smith 704-372-1026
Ohio Cleveland, John O. Olsen Co. 216-752-5444
Pa Newtown Square, J. C. Kershner Assocs 215-356-5000
Tex Dallas, Scott Tech. Sls. 214-352-7698
Wash Bellevue, W.M. Buehler Co. 206-455-5512
Wisc Menomonee Falls, G. McL. Cole Co. 414-251-6083
Exp: Cal., Mountain View, Precision Lamp 415-965-1333

PRECISION MECHANISMS CORP., Dept. EM, 44 Brooklyn Ave., Westbury, N.Y. 11590, Tel: 516-ED 3-5955; FSC No.: 08127; Empl.: 26

Local Sales Offices & Reps.
Cal Cupertino, Eakins ASSOC. 408-255-6494

PRECISION METAL PRODS. CO., Dept. EM, 41 Elm St., Stoneham, Mass. 02180, Tel: 617-438-3650, TWX: 710-393-0113; FSC No.: 86577; Empl.: 54

Local Sales Offices & Reps.
Ariz Phoenix, J. Osborn Assocs. 602-996-1291
Cal Corte Madera, P. Oneal & Assocs. 415-924-1691
Cal Garden Grove, Impact Elctrns., Inc. 213-431-3581
Colo Denver, McLoud & Raymond Co. 303-756-1589
Fla Clearwater, Chaco Sls 813-536-9503
Ga Atlanta, Mr. G. O'Hara 404-237-0600
Ill Hinsdale, Hill-Gray Assocs. 312-325-4810
Ind Indianapolis, New/Era Sls., Inc... 317-299-3400
Mich Lathrup Village, R.C. Nordstrom & Co. 313-559-7373
NY Mount Vernon, Zauderer Assocs., Ins. 914-664-7385
NY Syracuse, C.W. Floring & Assocs. 315-478-2149
NC Greensboro, D M I Mfrs. 919-885-4634
Ohio Cleveland, Electro-Com 216-886-2404
Ohio Dayton, Electro-Com 513-276-3993
Pa Media, Snyder & Stefkovic Assocs. Inc. 215-566-5400
Tex Arlington, Chaparral Inds. 817-265-2418
Wash Woodinville, W.J. Stulgis Co. 206-486-8539

PRECISION MONOLITHICS INC., Dept. EM, 1500 Space Dr., Santa Clara, Cal. 95050, Tel: 408-246-9222, TWX: 910-338-0528; Empl.: 300

Sales Manager: H. Sharek

Local Sales Offices & Reps.
Ala Huntsville, W.A. Brown Comps... 205-539-4411
Ariz Tempe, Argus Sales, Inc. 602-967-8709
Cal Los Angeles, P.M.I. 213-670-3791
Cal San Diego, L & S Assocs. 714-455-0055
Colo Wheatridge, Waugaman Assocs. 303-423-1020
Fla Orlando, Tech Mktg Assoc. 305-857-3760
Fla Palm Bay, P.M.I. 305-725-2900
Fla Pompano Beach, Tech Mktg Assoc. 305-942-0774
Ga Chamblee, W.A. Brown Comps. 404-455-0405
Ill Arlington Heights, P.M.I. 312-437-6697
Ind Indianapolis, Jerry Ihrig Assoc., Inc. 317-783-7630
Iowa Cedar Rapids, Comstrand 319-377-1575
Kans S/B Lenexa, Tech Reps 913-888-0212
Mich Detroit, A. Blumenberg Assocs... 313-557-1934
Mich St. Joseph, A. Blumberg Assoc. 616-983-0481
Minn Minneapolis, Comstrand 612-571-0000
Mo Hazelwood, Tech Reps 314-731-5200
NM Albuquerque, Waugaman Assocs. 505-294-1436
NY Endicott, Tech-Mark, Inc. 607-748-7473
NY Jericho, P.M.I. 516-822-4472
NY Jericho, J-Square Mktg. 516-997-6210
NC Raleigh, W.A. Brown Comps. 919-781-9426
Ohio Cleveland, D. Steffen & Assocs. 216-461-8333
Ohio Dayton, D. Steffen & Assoc. 513-293-3145
Ohio Lexington, D. Steffen & Assoc. .. 419-884-2313
Tenn Knoxville, W. A. Brown Comp. 615-637-3523
Tex Houston, Oeler & Menelaides, Inc. 713-772-0730

Tex Richardson, Oeler & Menelaides, Inc. 214-234-6334
Utah Salt Lake City, S/B Waugaman Assocs. 801-363-0275
Wash Seattle, S/B SJI, Corp. 206-624-9020
Local Distributors
Ala Huntsville, Hallmark Elctrns. 205-837-8700
Ariz Phoenix, Liberty Elctrns 602-257-1272
Ariz Phoenix, Sterling Elctrns. 602-258-4531
Cal Chatsworth, Westates Elctrns. 213-341-4411
Cal Costa Mesa, Westates Elctrns. 714-549-8401
Cal El Segundo, Liberty Elctrns 213-322-8100
Cal Gardena, Bell Industries 213-321-5802
Cal Mountain View, Elmar Elctrns 415-961-3611
Cal San Diego, Liberty Elctrns 714-565-9171
Cal San Diego, Intermark Elctrns. 714-279-5200
Cal Santa Ana, Intermark Elctrns. 714-540-1322
Cal Sunnyvale, Bell Industries 408-734-8570
Cal Sunnyvale, Intermark Elctrns. 408-738-1111
Colo Commerce City, Elmar Elctrns 303-287-9611
Colo Wheatridge, Century Elctrns. 303-424-1985
Conn Norwalk, Harvey Elctrns, 203-853-1515
Fla Ft. Lauderdale, Hallmark Elctrns. 305-971-9280
Fla Orlando, Hallmark Elctrns. 305-855-4020
Ill Elk Grove Village, Pioneer Elctrns. 312-437-9680
Ill Elk Grove Village, Hallmark Elctrns. 312-437-8800
Ind Indianapolis, Pioneer Elctrns. 317-849-7300
Kans Shawnee Mission, Hallmark Elctrns. 913-888-4747
Md Baltimore, Hallmark Elctrns. 301-796-9300
Mass Dedham, Gerber Elctrns. 617-329-2400
Mass Lexington, Harvey Elctrns. 617-861-9200
Mich Livonia, Pioneer Elctrns. 313-525-1800
Minn Bloomington, Hallmark Elctrns. 612-884-9056
Mo Earth City, Hallmark Elctrns. 314-291-5350
NJ Fairfield, Harvey Elctrns. 201-227-1262
NM Albuquerque, Century Elctrns. 505-292-2700
NY Binghamton, Harvey (Federal) Elctrns. 607-748-8211
NY West Henrietta, Harvey Elctrns. 716-334-5920
NY Woodbury, Harvey (Radio) Elctrns. 516-921-8700
NC Raleigh, Hallmark Elctrns. 919-832-4465
Ohio Cleveland, Pioneer Elctrns. 216-587-3600
Ohio Dayton, Pioneer Elctrns. 513-236-9900
Ohio Worthington, Hallmark Elctrns 614-846-1882
Okla Tulsa, Hallmark Elctrns. 918-835-8458
Pa Huntingdon Valley, Hallmark Elctrns. 215-355-7300
Pa Pittsburgh, Pioneer Elctrns. 412-782-2300
Tex Austin, Hallmark Elctrns. 512-837-2814
Tex Dallas, Hallmark Elctrns. 214-234-7300
Tex Dallas, Sterling Elctrns. 214-357-9131
Tex Houston, Hallmark Elctrns. 713-718-6100
Tex Houston, Sterling Elctrns. 713-627-9800
Utah Salt Lake City, Century Elctrns. 801-487-8551
Wash Bellevue, Liberty Elctrns 206-453-8300
Wisc West Allis, Hallmark Elctrns. 414-476-1270
For: Can., Downsview Ont., Westburne Elctrns. 416-635-2980
For: Can., Montreal Que., Cesco Elctrns. 514-735-5511
For: Can., Vancouver, B.C., Intek Elctrns. Ltd. 604-324-6831

PRECISION PAPER TUBE CO., Dept. EM, 1049 S. Noel Ave., Wheeling, Ill. 60090, Tel: 312-537-4250; Empl.: 185
Local Sales Offices & Reps.
Cal Los Angeles, C.E. Riggs, Inc./C.D. Lamoree Co. 213-225-5631
Cal Thousand Oaks, Conductors & Dielectrics 805-492-4818
Conn West Hartford, R.S. Pettigrew & Co. 203-233-8533
Fla Naples, Frank Wood 813-774-6611
Ind Indianapolis, J. Berger 317-357-1494
Kans Lenaxa, TMR Materials Co. 913-888-2606
Mo St. Louis, TMR Materials Co. 314-487-7026
NJ Rocky Hill, Krone & Rubin Assoc. 609-924-0200
NY Webster, J. Giovenco 716-671-6709
Ohio Westlake, Buckeye Bobbin & Mfg. Div. 216-871-9020
Ore Portland, C.E. Riggs Inc./C.D. Lamorree Co. 503-226-3286
Tenn Morristown, Gillum Sls, Inc. 615-587-2770
Wash Seattle, C.E. Riggs Inc./C.D. Lamorree Co. 206-623-5707
Exp: Can., Mississauga, Ont., Anbak Sls., Can., Ltd. 416-625-1061

PRECISION RESISTOR CO., INC., Dept. EM, 109 U.S. Hwy. 22, Hillside, N.J. 07205, Tel: 201-926-3036; FSC No.: 48615; Empl.: 45 p. 3723-3727

PRECISION TIMER CO., Dept. EM, 13 Westbrook Ind'l. Park, Westbrook, Conn. 06498, Tel: 203-399-6253; Empl.: 25
Sales Manager: A. Hockert
Local Sales Offices & Reps.
Cal Buena Park, Sls Engrs 714-871-3035
Conn Westbrook, Precision Timer Co. 203-399-6253
Fla Clearwater, J. J. Galleher Co. 813-461-7706
Ill Elk Grove Village, Control Sls. 312-595-2110
Ind Fort Wayne, Menze Sls 219-747-5616
Mass Sturbridge, Branford Controls Corp 617-347-7367
Minn Minneapolis, Nygaard Sls. 612-881-3727
Mo Hazelwood, Dy-Tronix, Inc. 314-731-5799
NJ Medford, Jack McCoy, Inc. 609-428-3444
NY Rochester, Elcom Sls 716-385-1400
Tex Fort Worth, W. Pat Fralia Co. 817-640-9101

PRECISION TUBE, Dept. EM, Church Rd. & Wissahickon, No. Wales, Pa. 19454, Tel: 215-699-5801, Telex: 84-6439; FSC No.: 82413; Empl.: 170
Local Sales Offices & Reps.
Ariz Tempe, Sedco Sls. 602-968-7791
Cal Mt. View, Walter Assoc., Inc. 415-965-4131
Cal Santa Ana, RMS Assocs. 714-556-4155
Fla Melbourne, Hanson Assocs. 305-727-7474
Ga Alpharetta, K. Ekmark 404-475-4872
Ill Crystal Lake, MESA, Inc. 312-639-3359
Ind Indianapolis, Sukup & Cox, Inc. 317-253-1215
Iowa Cedar Rapids, Snider Sls. Co. 319-362-4410
Mass Burlington, Tri Tek, Inc. 617-272-4550
Minn St. Louis Park, Xylem Co. 612-920-9626
Mo St. Charles, Buse Sls. Co. 314-946-6430
NJ Haddonfield, Sunday-O'Brien 609-429-4013
NY Huntington, CDB Enterprises, Inc. 516-692-5200
NY Utica, B. D. Hummel Co. 315-736-7821
NC Charlotte, McLean Sls. Co. 704-366-2675
Tex Dallas, Stevens Sls. 214-350-2476
Va Fairfax, Schibley Assocs. 703-591-3008
Wash Seattle, Blum & Assocs. 206-285-2590

PREFORMED LINE PRODUCTS CO., Dept. EM, Box 91129, Cleveland, Ohio 44101, Tel: 216-461-5200, Telex: 980-407; Empl.: 450
Local Sales Offices & Reps.
Ala Birmingham, Glenn, Huhman & Mills, Inc. 205-956-6620
Ala Pinson, John C. Ball 205-681-6858
Ariz Scottsdale, R.A. Young of Ariz. 602-991-9191
Ark Little Rock, C.H. Stout, Inc. 501-372-2555
Ark Rogers, Preformed Line Prods. Co. 501-636-7600
Cal La Jolla, R.A. Young & Co. 714-459-1916
Cal Palo Alto, Preformed Line Prods. Co. 415-493-0170
Cal San Francisco, K.M. Ryals Co. 415-495-7090
Cal Woodland Hills, Smith Co. Div. 213-887-8600
Colo Denver, Peterson Co. 303-388-6322
Colo Grand Junction, Peterson Co. 303-245-4908
Colo Littleton, R.J. Hodona 303-979-1079
Conn Bridgeport, A.P. Samuel 203-576-1718
Fla Jacksonville, Belcher & Assocs. 904-724-7811
Fla Miami, Belcher & Assocs. 305-661-3116
Fla Pensacola, Glenn, Huhma & Mills 904-456-5295
Fla St. Petersburg, Belcher & Assocs. 813-822-3531
Ga Atlanta, Belcher & Assocs. 404-255-5481
Ga Decatur, Glenn, Huhman & Mills, Inc. 404-294-6295
Ga Tucker, Preformed Line Prods. Co. 404-938-6820
Haw Honolulu, J.W. Smith 808-988-3079
Ill Freeport, Dale E. Putuah & Assocs 815-235-1133
Ill Schiller Park, JSG Elec. Co. 312-678-5990
Ill Springfield, JSG Elc Co. 217-787-6084
Ind Carmel, Dale E. Putuah & Assocs 317-844-6073
Ind Indianapolis, Cory, Crum & English, Inc. 317-545-8593
Iowa Cedar Rapids, F.C. Clatterbaugh Co. 319-364-5557
Iowa Des Moines, F.C. Clatterbaugh Co. 515-282-3213
Iowa DeWitt, F.C. Clatterbaugh Co. 319-364-5557
Ky Bowling Green, Dyer-Pederson Agency 502-842-9346
Ky Lexington, Dyer-Pederson Agency 606-266-7412
La Baton Rouge, C.H. Stout of La. Inc. 504-927-8097
La New Orleans, C.H. Stout of La. Inc. 504-486-3707
La Shreveport, C.H. Stout of Shreveport, Inc. 318-221-5555
Md Annapolis, P.J. Martini & Assocs. 301-267-7462
Mass Brimfield, E.L. Flowers & Sons 413-245-7922/23
Mich Dearborn, G.R. Horne & Co. 313-561-1360
Mich Jackson, G.R. Horne & Co. 517-536-4387
Minn Fairbault, Dale E. Putuah & Assocs 507-334-2269
Minn Faribualt, Great Lakes Telephone Supply Co. 507-334-2269
Minn Minneapolis, Bergstrom-Verbarg Co. 612-339-0028
Miss Jackson, Curtis H. Stout of Miss 601-353-9602
Mo Carthage, E.J. Snyder 417-358-3037
Mo Kansas City, Cleaves-Bessmer-Marietti, Inc. 816-353-6011
Mo St. Louis, Ken Way Co. 314-961-3062
Neb Lincoln, F.C. Clatterbaugh Co. 402-489-5912
Neb Omaha, Clifford A. Decker 402-391-6570
Neb Omaha, F.C. Clatterbaugh Co. 402-333-1600/1603
NH Hampstead, Robert A. Patterson 603-329-5079
NM Albuquerque, McKinley Sls. Co. 505-293-6277
NY Eastchester, M.N. Snyder & Sons, Inc. 914-337-6000
NY Horseheads, Canavan-Scanlon Assoc. 607-739-0810
NY Rochester, Canavan-Scanlon Assoc. 716-442-0720
NY Syracuse, Canavan-Scanlon Assoc. 315-437-1271
NY West Sand Lake, Canavan-Scanlon Assocs 518-674-5176
NC Charlotte, Engr Sls Co. of Carolina 704-333-8405
NC Raleigh, Engr Sls Co. of Carolina 919-834-1141
Ohio Vermilion, R.S. Howley Co. 216-967-8787
Okla Oklahoma City, C.B. Anderson Elec. Co. 405-751-2771
Okla Tulsa, C.B. Anderson Elec. Co. 918-836-4661
Ore Portland, Shaffer & Nelson, Inc. 503-234-7437
Pa Conshohocken, Electrical Distributors Co. 215-825-1305
Pa Pittsburgh, Burns Elec. Co. 412-823-5874
SC Columbia, Engr. Sls. Co. of Carolina, Inc. 803-799-0830
Tenn Memphis, C.H. Stout of TN, Inc. 901-362-1616
Tenn Nashville, J.S. Baron Assocs. 615-883-4748
Tex Dallas, E.B. Robertson, Inc. 214-942-2711
Tex Houston, E.B. Robertson, Inc. 713-785-6800
Utah Salt Lake City, Shaffer & Nelson, Inc. 801-972-2323
Va Richmond, Electrical Distribs 804-262-5666
Wash Cashmere, Paul Getz 509-782-1029
Wash Richmond, P.J. Martini & Assocs 804-282-0136
Wash Seattle, Shaffer & Nelson, Inc. 206-523-0664
Wash Spokane, Shaffer & Nelson, Inc. 509-624-1339

PREMAX PRODS. DIV., Chisholm-Ryder Co., Dept. EM, Highland & College Aves., Niagara Falls, N.Y. 14305, Tel: 716-285-9186, Telex: 91-531; FSC No.: 74183; Empl.: 350
Local Sales Offices & Reps.
Ariz Phoenix, Shefler-Kahn Co. 602-257-9015
Cal Culver City, DeAngelo, Rotham & Co. 213-398-6239
Cal La Selva Beach, Belchamber & French 408-684-1007
Colo Denver, G. Moss Elctrns., Inc. 303-455-7205
DC Washington, S.K. Macdonald, Inc. 202-265-3938
Kans Shawnee Mission, K & M Sls. Co. 913-262-2444
Md Baltimore, S.K. Macdonald, Inc. 302-254-3380
NY Rockville Centre, L.I., Willgold Elctrn. Sls. Corp. 516-764-4023
Ohio Cleveland, J.O. Olsen Co. 216-752-5444
Ohio Goshen, J.O. Olsen Co. 513-625-6791
Ore Portland, R.M. Minthrone Co. 503-246-4556
Pa Philadelphia, S.K. Macdonald, Inc. 215-545-1205
Pa Pittsburgh, S.K. Macdonald, Inc. 412-366-2643
Tex Carrollton, E. L. Wilks Co. 214-242-5321
Exp: New York City, N.Y., M. Simons & Son Co. 212-227-5513

PREMIER METAL PRODS. CO., Div. Sunshine Mining Co., Dept. EM, 381 Canal Place, Bronx, N.Y. 10451, Tel: 212-993-9200; Empl.: 70 p. 1041-1046
Local Sales Offices & Reps.
Ala Birmingham, Adams & Assocs. 205-979-2459
Ariz Phoenix, MR Engrg. Sls. 602-956-4670
Cal Culver City, DeAngelo, Rothman & Co. 213-398-6231
Cal Menlo Park, G.R. McKnight Co. 415-325-2841
Conn East Haven, Eagle Assocs. 203-467-6541
Fla Orlando, Adams & Assocs. 305-894-7181
Ga Marietta, Adams & Assocs. 404-973-0851
Kans Shawnee Mission, Delltron Co. 913-362-5511

Md Burtonsville, Eastern Instrumentation 301-384-8500
Mass Needham, Eagle Assocs. 617-444-3446
Minn Minneapolis, J.E.M. Anderson Co. 612-823-6459
Mo St. Louis, Delltron Co. 314-869-4779
NY Mt. Vernon, Sonkin Assocs. 914-668-9809
NY New Hyde Park, Harris & Aldrich Sls. 516-488-2622
NY Syracuse, Lewis-Dunnigan Co. 315-446-5522
NC Greenboro, Adams & Assocs. 919-272-6838
Ohio Cleveland, ImTech Inc. 216-826-3400
Pa Easton, Kaiser Assocs. 215-258-6477
Pa Philadelphia, Eastern Instrumentation 215-927-7777
Tenn Knoxville, Adams & Assocs. 615-577-4241
Tex Dallas, G.V. Peck 214-783-1011
Tex Houston, G.V. Peck 713-780-2220
Exp: Hallandale, Fla., Emec, Inc. 305-925-6366

Local Distributors
Ala Opelika, Southern Elctrns. 205-745-5298
Ariz Phoenix, Dalis Elctrns. 602-258-8151
Cal Burlingame, Rose Elect Distrs. 415-348-2740
Cal San Jose, Quement Elctrns. 408-998-5900
Conn Danbury, Bond Radio Elec. Co. 203-744-2274
Fla Miami, Electronic Equip. Co. 305-871-3500
Fla Tampa, Lykes Elctrn. Corp. 813-886-6621
Haw Honolulu, Honolulu Elctrns. 808-949-5564
Ill Elk Grove Vlg., GBL Elctrns. Corp. 312-593-3220
Ind Indianapolis, Graham Elctrns. 317-634-8486
Md Baltimore, A.S.I. Elctrns 301-265-5100
Md Baltimore, Radio Elec. Serv. of Balt. 301-823-0070
Md Bethesda, Empire Elctrn. Supply 301-656-3300
Mass Chicopee, Diplomat/IPC of Mass. 423-592-9441
Mass Hingham, Sager Elctrn, Corp. 617-749-6700
Mass Newton, Greene Shaw Co. 617-969-8900
Mich Augusta, Great Lakes Elctrns. 612-731-4156
Mo Fenton, Television Engr. Dist. 314-343-5605
NJ Hanover, State Elctrns. Pts. 201-887-2550
NJ Springfield, Federated Purchasers 212-DI9-3050
NJ Union City, Nidisco Inc. 201-863-2111
NY Albany, E. E. Taylor Co. 518-438-4461
NY Buffalo, Summit Distrs. 716-884-3450
NY Elmsford, Ancar Elctrns. Supply 914-592-7100
NY Farmingdale, Broadline Elec. Dist. 516-420-8320
NY L. I. C., H.L. Dalis, Inc. 212-361-1100
NY Lynbrook, Peerless Radio Dist Corp. 212-523-3456
NY New York, Martin Audio Corp. 212-541-5900
NY New York, Argil Elec. Ltd. 212-691-8111
NY Port Chester, Wise Elctrns. 914-939-3540
NY Rochester, Summit Distrs. 716-334-8110
NY Rockville, Midway Industrial 516-764-2400
NY Woodbury, Harvey Radio Corp. 516-895-9260
NY Yonkers, Yonkers Elctrns Supply 914-969-6044
Ohio Cleveland, D & N Elctrns. 216-888-7426
Pa Allentown, A. A. Peters 215-434-5237
Pa Philadelphia, Philadelphia Elctrns. 215-568-7400
Pa Reading, Barbey Elctrns. 215-376-6116
RI Providence, W. Dandreta Co. 401-861-2800
Tex Dallas, Summers Southland 214-748-6533
Tex Ft. Worth, Swieco Inc. 817-335-6521
Tex Houston, Lenert Co. 713-225-1465
Va Arlington, Arlington Elctrns. 703-524-2412
Wash Seattle, Radar Electric Co. 206-282-2511

PREMIER MICROWAVE, Dept. EM, 35 New Broad St., Port Chester, N.Y. 10573, Tel: 914-939-8900, TWX: 710-569-1609; FSC No.: 15870; Empl.: 45

Local Sales Offices & Reps.
Cal Los Angeles, R.F. Assocs. 213-478-1586
Cal San Mateo, Melvin Sls. Co. 415-349-7444
Fla Orlando, BC Elctrns. Sls. Corp. 305-894-6071
Ga Smyrna, BC Electrnc. Sls. Corp. 404-436-5169
Ill Chicago, L.G.S. Elctrns. Sls. 312-456-9616
La Metairie, J. F. McKinney Sls. Co. 504-887-1723
Md Catonsville, Callas Elctrns. Dist. 301-744-7711
Mass Natick, Gerald Rosen Co. 617-879-5505
Mo St. Louis, Boweng Tech Rep Corp. 314-429-7327
NY Huntington, C.D.B. Entprs. 516-692-5220
NY Utica, B.D. Hummel Co. 315-796-7921
Ohio Dayton, BEK Assocs. 513-278-1343
Okla Tulsa, J. F. McKinney Sls. 918-742-6791
Tex Bellaire, J. F. McKinney Sls. Co. 713-665-3653
Tex Dallas, J. F. McKinney Sls. 214-631-9450
Va Vinton, BC Elctrnc. Sls. Corp. 703-890-1128
Exp: Cal., No. Hollywood, Air Frame Mfg. & Supply 213-765-2600
Exp: New York, N.Y., Singer World Prods. Inc. 212-432-1400

PRES-AIR-TROL CORP., Dept. EM, 895 Mamaroneck Av., Mamaroneck, N.Y. 10543, Tel: 914-698-2026; Empl.: 6

PRESSURE CONTROLS, INC., Dept. EM, 681 Main St., Belleville, N.J. 07109, Tel: 201-751-5002

Sales Manager: P. Emmarco

PRESTON SCIENTIFIC INC., Dept. EM, 805 E. Cerritos Ave., Anaheim, Cal. 92805, Tel: 714-776-6400, Telex: 655-321; Empl.: 85 ....p. 1008,1009,1664,1665

Sales Manager: Bernard Spear

Local Sales Offices & Reps.
Ala Huntsville, Int'l. Scientific Instrs. 205-533-6880
Ariz Scottsdale, Williams Assocs. 602-947-4297
Cal Anaheim, Preston-Ana 714-776-6400
Cal San Jose, PBC Assocs. 408-377-7001
Colo Denver, Williams Assocs. 303-373-4730
Conn Stratford, Inst. Dynamics Inc. 203-378-6019
Fla Orlando, Truex Assocs. 305-859-2160
Ill Des Plaines, Coombs Assocs. 312-298-4830
Kans Shawnee Mission, Techn. Sls. Assocs. 913-888-3330
Md Greenbelt, Riffe Assocs. 301-474-8600
Mass Wakefield, Instr. Dynamics Inc. 617-245-5100
Mo Ferguson, Techn. Sls. Assocs. 314-725-5361
NJ Ridgewood, Hansen Assocs. 201-652-7055
NM Albuquerque, Williams Assocs. 505-255-1638
NY Rochester, RJC Assocs. 716-248-5040
NC Winston-Salem, Radco 919-722-9671
Ohio Dayton, Hocker Assocs. 513-298-8638
Ohio N. Olmsted, Hocker Assocs. 216-734-4433
Ore Portland, Brennan Assocs. 503-223-7165
Pa Jenkintown, Stein Instrumentation Corp. 215-885-2370
Tex Dallas, Advance Techn. Sls. 214-361-8584
Tex Houston, Advance Techn. Sls. 713-469-6668
Wash Bellevue, Brennan Assocs. 206-454-9332

PRIMO COMPANY LTD., Dept. EM, 25-1, 6-Chome, Mure, Mitakashi, Tokyo, Japan, Tel: 0422-43-3121, Telex: 2822-326; Empl.: 400

Sales Manager: M. Nomura

Local Sales Offices & Reps.
Ill Chicago, Primo Microphone Inc. 312-595-1022

PRIMO MICROPHONE INC., Dept. EM, 2468 Delta La., Elk Grove Village, Ill. 60007, Tel: 312-595-1022, Telex: 28-3474; Empl.: 6

Sales Manager: J. H. Schroeder

Local Sales Offices & Reps.
Conn W. Hartford, Smith Co 203-523-0512
Ga Atlanta, Murphy & Cota 404-875-2525
Ill Chicago, W.J. Doyle Co. 312-274-6685
Ind Fort Wayne, Morris-Cunningham Assoc. 219-485-3612
Ind Indianapolis, Morris-Cunningham Assoc. 317-255-2458
NJ Cherry Hill, Trinkle Sls 609-795-4200
NY Endicott, Tech-Mark 607-748-7473
Ohio Cleveland, Olsen Co. 216-752-5444
Tex Lufkin, Southwest Reps 713-634-2404

PRINCETON APPLIED RESCH. CORP., Dept. EM, Box 2565, Princeton, N.J. 08540, Tel: 609-452-2111, Telex: 84-3409; Empl.: 250

Local Sales Offices & Reps.
Cal Anaheim, Princeton Applied Resch. Corp. 714-635-6710
Cal Burlingame, Princeton Applied Resch. Corp. 415-342-6301
Colo Denver, Fry-Gates Co. 303-756-9886
Ga Chamblee, H.G. Holmes & Assoc. 404-451-6161
Ill Deerfield, Princeton Applied Resrch. Corp. 312-498-5858
Kans Shawnee Mission, EIR Co. 913-362-0919
Md Rockville, Princeton Applied Resch. Corp. 301-881-3120
Mass Bedford, Princeton Applied Resch. Corp. 617-275-2100
Mo Hazelwood, EIR Co. 314-245-6860
NM Albuquerque, Fry Gates Co. 505-298-1875
Ohio Dayton, Princeton Applied Resrch. Corp. 513-278-4221
Tex Richardson, Princeton Applied Research Corporation 214-234-2813
Va Virginia Beach, E.G. Holmes & Assoc. 804-481-6556

PRINCETON CASE CO., Dept. EM, 667 Lehigh Ave., Union, N.J. 07083, Tel: 201-687-1750; Empl.: 60

Sales Manager: S.E. Parker

Local Sales Offices & Reps.
Cal Costa Mesa 714-631-2352

PRINCETON ELCTRN. PRODS., Dept. EM, Box 101, New Brunswick, N.J. 08902, Tel: 201-297-4448, TWX: 710-480-3832; Empl.: 70

Local Sales Offices & Reps.
Ariz Scottsdale, Measurement Cons. 602-994-9519
Cal Anaheim, Moxon 714-635-7600
Cal San Diego, Maxon Elctrns. 714-292-4820
Cal Santa Clara, Moxon 408-249-2491
Colo Evergreen, Mountaintek 303-674-5255
Ga Atlanta, Flex-Comm Int'l 404-237-9242
Md Rockville, Wiltronix 301-460-1454
Mass Cambridge, Media Systems 617-876-0164
NM Albuquerque, Mountaintek 505-294-1491
NY Lindenhurst, Sigma 516-226-1880
Ohio Cleveland, Harvey Teplitz & Co. 216-439-3265
Ohio Dayton, Harvey Teplitz & Co. 513-277-6531
Okla Norman, Data Marketing Assoc. Inc. 405-364-8320
Pa Ambler, Data Engrg. Co. 215-542-9876
Tex Dallas, Data Marketing Assoc. Inc. 214-661-0300
Tex Houston, Data Marketing Assoc. Inc. 713-780-2511
Tex San Antonio, Data Mktg. 512-828-0937
Utah Salt Lake City, Mountaintek 801-278-6920

PRINCO INSTRS., Dept. EM, Industrial Pk., Southampton, Pa. 18966, Tel: 215-EL 5-1500; Empl.: 90

Sales Manager: S. A. Clayton

PROCESS & INSTRS. CORP., Dept. EM, 1943 Broadway, Brooklyn, N.Y. 11207, Tel: 212-452-8380; Empl.: 28

PRODUCTION PROCESS, Div. Ind'l. Marine Elctrns. Inc., Dept. EM, Grenier Ind'l. Park, Londonderry, N.H. 03053, Tel: 603-668-2101; Empl.: 15

Sales Manager: K. Ritzinger

Local Sales Offices & Reps.
Cal Santa Anna, Lew Brooks Co.
Kans Overland Park, G&E Instrs.
Mich Southfield, Static Controls Corp.
NY Buffalo, D & O Engrg.
NY Cazenovia, Peter De Cew
NC Fayetteville, Zim Tek

PROGRAMMED TEST SOURCES, Dept. EM, 194 Old Pickard Rd., Concord, Mass. 01742, Tel: 617-486-3731

Local Sales Offices & Reps.
Pa Melrose Park, Robert Meyers, Assoc. 215-224-1663

PROJECTS UNLIMITED, INC., Dept. EM, 3680 Wyse Rd., Dayton, Ohio 45414, Tel: 513-890-1918, TWX: 810-450-2523; Empl.: 75

Local Sales Offices & Reps.
Ariz Scottsdale, Williams Assocs. 602-947-4297
Cal Inglewood, Basic Sys Corp 213-673-4300
Cal San Carlos, David H. Ross Co. 415-591-4411
Cal San Diego, Basic Sys Corp 714-277-6694
Colo Denver, Williams Assocs. 303-373-4730
Conn Weston, Northeast Reps 203-239-2507
Fla Ft. Lauderdale, C.B.C. Elctrns. 305-484-7330
Fla Longwood, C.B.C. Elctrns 305-831-5380
Ill Addison, R. Stemm, Inc. 312-279-2440
Kans Shawnee-Mission, Florence & Meyer 913-722-5210
Md Glen Arm, Hodgins Assocs 301-592-7047
Mass Needham, Northeast Reps 617-449-3034
Minn Minneapolis, R. W. Marshall Co. 612-929-0457
Mo Kirkwood, Florence & Meyer 314-822-2629
NJ Medford, Jack McCoy 609-428-3444
NJ Wayne, Robert Horne Assoc. 201-835-7400
NM Albuquerque, Williams Assoc. 505-255-1638
NM Albuquerque, Williams Assoc. 505-255-1638
NY Buffalo, Ossmann Cpts 716-681-9700
NY Rochester, Ossmann Comp. Sls. 716-442-3290
NC Charlotte, Dula Assocs 704-334-7090
Ohio Medina, J. C. Hoffstetter 216-241-4880
Ore Portland, Frank Jackson Co. 503-228-1656
Tex Dallas, John B. Guenther 713-468-0232
Wash Seattle, F. Jackson Co. 206-782-2211

Local Distributors
Cal Costa Mesa, Marvac Elctrns. 714-642-0952
Cal Inglewood, Basic Sys 213-673-4300
Cal Sunnyvale, Pyramid Elctrns. 408-744-1900
Colo Denver, WACO 303-371-4370
Mass Needham, Northeast Reps 617-449-3034
Mass Needham, Northeast Reps 617-449-3034
Mich Detroit, Carter McCormic & Peirce 313-477-7700

Mo St. Louis, Olive Elctrns. 314-863-7800
NJ Wayne, Gordon/Horne Inc. 201-835-7400
NY Rochester, Ossmann Comps. 716-442-3290
Ohio Cleveland, Carter McCormic & Peirce 216-333-5650
Utah Salt Lake City, Newark Elctrns. 801-486-1048
Wash Seattle, Frank Jackson 206-782-2211
Wash Seattle, Frank Jackson 206-782-2211
For: Denmark, Copenhagen, Inotec .....(01) 948033
For: England, Rye, East Sussex, Roxburgh Elctrns. Ltd. ..... Rye 3777
For: France, Paris, Decelect 331-98-14
For: Germany, Norderstedt, WPB-Digisound ..... 5-22-17-11(0411)
For: Italy, Milano, Forind Avio 324-120
For: Netherlands, Rotterdam, Van Dam Electronika 010-670022
For: Norway, Oslo, Henaco .....(02) 15-75-50
For: South Africa, Bedfordview, Pace Electronic Comps. 616-5303
For: Spain, Madrid, Diode 45501-40
For: Sweden, Jonkoping, ABH Transmissioner 036-12-58-00
For: Switzerland, Zurich, Egli, Fischer & Co. Ltd. 25-02-34

PROMEMCO, INC., See Inductive Comps., Inc.

PROTECTIVE CONTROLS, INC, See North American Philips Controls, Frederick, Md.

PROTECTIVE ENCLOSURES CO., Dept. EM, 2150 G Elmwood Ave., Buffalo, N.Y. 14207, Tel: 716-876-9855, Telex: 91-244; Empl.: 125

Sales Manager: R.G. Schneider

Local Sales Offices & Reps.
Cal Inglewood, E. Dudley Co. 213-678-9085
Cal Los Altos, Marketek, Inc. 415-941-0882
Colo Denver, The Crump Co 303-426-1443
Conn West Simsbury, Anchor Engrg. Corp. 203-658-6261
Fla Vero Beach, Keeneth Corp. 305-231-2262
Ga Atlanta, Keeneth Corp. 404-952-2202
Ill Chicago, A.J. Ellis Co. 312-262-2708
Iowa Des Moines, F.R. Johnston Co... 515-255-5865
Mass Newton Upper Falls, Anchor Engrg. Corp. 617-964-6205
Mich Grand Rapids, Gillespie Sls. Engrg. Co. 616-949-4741
Mich St. Clair Shores, V. Goethem Co. 313-778-8600
Minn Minneapolis, Krez-Co. 612-561-2640
Mo St. Louis, Tanler & Co. 314-645-0590
NJ Englewood Cliffs, Unisco 201-567-2540
NJ Spotswood, Banico Inc. 201-251-6868
NY Buffalo, R. Schaefer Co. 716-632-4492
Ohio Cincinnati, Gallagher Co. 513-761-1288
Ohio North Olmsted, Plus Sls. 216-734-8989
Okla Tulsa, Koons & Assocs. 918-627-9400
Pa Pittsburgh, Buchanan Sls. Co.... 412-366-6330
Tenn Hendersonville, Burt Lucas Assocs. 615-824-5818
Tex Hutchins, Prior Gaskets 214-225-4201
Wash Seattle, R. J. Matzke Co. 206-682-6758

PROTOTYPE TRANSFORMER CORP., Dept. EM, 545 N Arlington Ave, East Orange, N.J. 07017, Tel: 201-672-2400

Local Sales Offices & Reps.
Fla Satellite Beach, Reynolds & Assocs. 305-773-4700
Mass Wayland, C.H. Whittier & Co. 617-358-7377
Mich Farmington Hills, H. Lowell Co... 313-851-7474
Minn Minneapolis, International Sls Co. 612-881-6683
NJ Fort Lee, B. Cameron Assocs.... 201-461-2595
Pa Philadelphia, W.F. Assocs 215-635-2253
Utah Salt Lake City, Harvey Data Systems 801-571-0129

PTX-PENTRONIX, INC., Dept. EM, 1737 Cicotte, Lincoln Park, Mich. 48146, Tel: 313-388-3100, Telex: 23-0398; Empl.: 12

Sales Manager: J. Schultz

PULEO ELECTRONICS, INC., Dept. EM, 39 Hutcheson Pl., Lynbrook, N.Y. 11563, Tel: 516-599-4875

Sales Manager: J. Puleo

Local Sales Offices & Reps.
Cal San Francisco, Puleo Elctns..... 415-986-8120
Tex Houston, Sesco-Houston 713-688-9656

PULSAR ASSOCS., Dept. EM, 11491 Sorrento Valley Rd., San Diego, Cal. 92121, Tel: 714-455-5933 p. 2802

Sales Manager: L. K. Richter

Local Sales Offices & Reps.
Exp: N.Y., New York, Singer Prods. Co. 212-432-1400

PULSE ENGRG., INC., Dept. EM, Box 12235, San Diego, Cal 92112, Tel: 714-279-5900, TWX: 910-335-1527; Empl.: 700

Sales Manager: J. S. Kerr

Local Sales Offices & Reps.
Cal San Diego 714-279-5900
Cal Santa Clara 408-248-6040
Cal Studio City 213-872-0735
Ga Atlanta 404-766-4728
Ill Chicago 312-992-3720
Mass Needham 617-449-1242

PULSE TECHNIQUES, INC., Dept. EM, 1411 Palisade Ave., Teaneck, N.J. 07666, Tel: 201-837-2575

PURE CARBON CO., INC., Dept. EM, 441 Hall Ave., St. Marys, Pa. 15857; Empl.: 750

Local Sales Offices & Reps.
Cal La Verne, Pure Carbon Co. 714-599-6424
Conn Bristol, Pure Carbon Co. 203-589-5033
Ga Marietta, Pure Carbon Co. 404-433-0407
Ill East Peoria, Pure Carbon Co. 309-699-1935
Ill Park Ridge, Pure Carbon Co. 312-825-7686
Ind Munster, W.C. Boldt 219-931-7091
Mich Canton, Pure Carbon Co. 313-453-7310
NY Rock Hill, Pure Carbon Co. 914-796-3524
Ohio Chagrin Falls, Pure Carbon Co. 216-338-3900
Pa St. Marys, Pure Carbon Co. 814-781-7971
Tex Plano, Pure Carbon Co. 214-423-8943

PYLE-NATIONAL CO, Dept. EM, 1334 N. Kostner Ave, Chicago, Ill 60651, Tel: 312-342-6300, TWX: 25251, 910-221-0335 ..... p. 2090-2095

Sales Manager: J. E. Blake; *Distributor Manager:* R. Hansen

Local Sales Offices & Reps.
Ala Birmingham, Glenn Assocs 404-351-7861
Ariz Phoenix, Arizona Sun Sls 602-253-3178
Cal Emeryville, Pyle-National 415-658-6876
Cal Woodland Hills, Pyle-National 213-999-0230
Colo Lakewood, Repco Electro Sls 303-232-3070
Fla Miami, Glenn Assocs 305-592-7335
Fla Orlando, Glenn Assocs 305-293-7482
Ga Atlanta, Pyle-National 404-955-5314
Haw Honolulu, Joe Liu & Assocs 808-531-8155
Ill Westchester, Pyle-National 312-345-5150
Ind Zionsville, Jack Mahaney 317-873-5027
La Metairie, Aneson Assocs 504-835-6445
Md Glen Burnie, Electrical Sls Assocs 301-761-0071
Mass Natick, Pyle-National 617-237-1428
Mich Southfield, Pyle-National 313-642-3808
Minn Minneapolis, R.D. Little 612-929-4683
Mo Kansas City, Vega Assoc. 816-561-1114
Mo St. Louis, Burgoyne Elec. Sls. 314-569-3162
Mont Missoula, Herb May & Assocs .. 406-728-3469
NH North Hampton, Beaman Assocs 603-964-8876
NJ Edison, Burgoyne Elec. Sls 201-225-0450
NJ Pennsauken, Pyle-National 609-663-5093
NM Albuquerque, Sun Sales 505-345-8321
NY Syracuse, Pyle-National 315-487-5551
Ohio Cincinnati, Hasselbach & Assoc. 513-871-7600
Ohio Cleveland, Pyle-National 216-621-6894
Ohio Pickerington, Hasselbach & Assoc 614-837-0947
Okla Oklahoma City, Don Plummer Sls 405-843-1753
Okla Tulsa, Don Plummer Sls 918-835-0979
Pa Pittsburgh, Pyle-National 412-471-3193
SC Greenville, Pyle-National 803-288-7662
Tenn Memphis, Hicks Sls Agency..... 901-396-5725
Tex Dallas, Jack Morgan 214-358-2431
Tex Houston, Pyle-National 713-440-9812
Utah Salt Lake City, G. T. Sls..... 801-268-2551
Va Richmond, Electrical Sls Assoc. 804-353-0063
Wash Federal Way, Pyle-National 206-941-4410
Exp: Westchester, Ill., Subent Co 312-343-6425

Local Distributors
Cal Carson, Argo Intl 213-775-8841
Cal El Monte, G. E. Supply 213-572-5432
Cal Los Angeles, Norton Elec. Wholesale 213-222-7181
Cal San Leandro, Gilson Supply 415-352-6640
Colo Denver, Con. Elect. Dist. 303-733-5501
Conn Hartford, Hartford Electric Supply 203-233-3614
Fla West Palm Beach, Allied Electric Supply 305-835-8553
Ga Atlanta, Electro Air 404-351-3545
Ill Chicago, Steiner Electric 312-685-7000
Ind Hammond, Electric Supply..... 219-932-8840
Ind Indianapolis, Peerles Elec. Sy..... 317-635-2361
Ind Marion, Universal Elec. 317-664-5185
Iowa Cedar Rapids, VanMeter Co 319-366-5301
La Morgan City, Harvey Supply 504-631-2561
La New Orleans, Long Electric Supply 504-522-0562
La New Orleans, Argo Marine Div... 504-581-1598
Md Baltimore, Electrical Dist. 301-682-5800
Mass Cambridge, H. Young Jr. Co. 617-328-4880
Mich Detroit, Madison Electric..... 313-875-1560
Mich Flint, Royalite 313-238-4641
Mich Kalamazoo, All Phase Elec. Supply 616-381-1114
Mich Lansing, All Phase Elec. Supply 517-489-3791
Mich Livonia, Allen Electric Supply..... 313-937-1220
Mich Madison Heights, McNaughton-McKay 313-399-7500
Mich Saginaw, Standard Elec. 517-754-2461
Mo St. Louis, Melville B. Hall 314-371-7000
NJ Piscataway, Fromm Electric Supply 201-981-0400
NM Farmington, State Electric 505-327-9871
NY Latham, Latham Electric Supply 518-785-6672
NY New York, City Electric Dist. 212-564-5454
NY New York, Hudson Electric Sales 212-962-7000
Ohio Cincinnati, Richards Electric Sy. 513-242-8800
Ohio Cleveland, Milner Electric Co. 216-696-9300
Ohio Columbus, EMCORP..... 614-228-6875
Ohio Dayton, John A. Becker Co. 513-226-1341
Ohio Sandusky, Sandusky Elec. 419-625-4915
Ohio Toledo, Kiemle-Hankins Co..... 419-666-0660
Ore Portland, Portland, Elec. & Plumb. 503-243-6800
Pa Erie, G. E. Supply Co..... 814-453-4751
Pa Erie, Erie Industrial Elec. 814-455-8051
Pa Philadelphia, Colonial Electric Sy. 215-277-8100
Pa Philadelphia, Westinghouse Electric Sy. 215-233-4550
Pa Pittsburgh, C & M Electric Sy..... 412-343-2400
SC Greenville, Graves Elec. Sy. 803-242-6320
Tex Houston, Houston Elec. Dist..... 713-224-4771
Tex Houston, Texas Elec. Wholesalers 713-688-9651
Va Roanoke, G. E. Supply 703-563-4991
Wash Pasco, AMFAC..... 509-547-9731
Wash Seattle, Portland Elec. & Plumb. 206-325-2431
Wisc Racine, Milch Interstate 414-637-4491

PYLON CO., INC., Dept. EM, 51 Newcomb St Attleboro, Mass. 02703, Tel: 617-222-3726; Empl.: 3

Local Sales Offices & Reps.
Cal Fremont, Hartfield, Kennan & Freytag Co. 415-863-2200
Cal Los Angeles, Hartfield, Kennan & Freytag Co. 213-225-1310
Fla Orlando, Buchanan & Abrams Assoc. 305-898-7440
Ill Elk Grove Village, Somers-Reagan 312-593-2710
Mass Plainville, Teknis..... 617-695-3597
Mich Spring Lake, Walch Engrg. Co... 616-846-2940
NJ Summit, R. Potter 201-277-0220
Ohio Worthington, H.L. Simcox..... 614-885-8990
Pa Lafayette Hill, MCD Assocs. 215-828-0560
Tex Dallas, Sivright Co. 214-241-9190
Wash Vancouver, Hartfield, Kennan & Freytag Co. 503-228-1680

HYROFILM RESISTOR CO., See KDI Hyrofilm Cor

Q-TECH CORP., Dept. EM, 2201 Carmelina Ave., Lo Angeles, Cal. 90064, Tel: 213-820-4921, Telex 69-6140; FSC No.: 51774; Empl.: 45 .... p. 2360,236

Sales Manager: H. Phillips

Local Sales Offices & Reps.
Cal Los Altos, Tauber-Dreyer 415-948-263
Cal Northridge, Tauber-Dreyer 213-993-004
Cal San Diego, Tauber Assocs. 714-274-724
Fla Ormond Beach, Tech. Mktg. Assoc. 904-672-231
Fla Pompano Beach, Tech. Mktg. Assoc. 315-942-077
NJ Paramus, Erwin Diamond 201-265-857
NY Centerport, William Carnes Ltd. 516-261-810
NY Fayetteville, Martin P. Andrews 315-637-9734, 637-529
Ohio Dayton, Berberich Assocs. 513-433-034
Tex Houston, TCI Elctrns. 713-774-501

QANTEX, div. North Atlantic Inds., Dept. EM, 20 Terminal Dr., Plainview, N.Y. 11803, Tel: 516-681-835 TWX: 510-221-1879; Empl.: 300

Sales Manager: L. Malmed; *Distributor Manager:* Malmed

Local Sales Offices & Reps.
Ala Huntsville, Lee Assocs..... 205-533-589

Ariz Glendale, Mountaintek 602-938-2864
Cal Inglewood, Basic Systems 213-673-4300
Cal San Diego, Basic Sys 714-279-9641
Cal Santa Clara, Telemark 408-248-9616
Colo Evergreen, Mountaintek 303-674-5255
Fla Ft. Lauderdale, Heimendinger Assoc 305-491-7220
Fla Winter Haven, Heimendinger Assoc. 813-294-5815
Ga Buford 404-457-7117
Ill Chicago, Pivan Engrg. 312-539-4838
Ind Indianapolis, Pivan Engrg. 317-253-1681
Iowa Cedar Rapids, Pivan Engr. 319-377-9434
Kans Shawnee Mission, Pivan Engrg. 913-722-1030
Md Bethesda, Bartlett Assoc. 301-656-3061
Mass Wellesley Hills, Datamart 617-235-5520
Mich Brighton, Lowry & Assoc. 313-227-7067
Minn Minneapolis, Pivan Engrg. 612-537-4501
Mo St. Louis, Pivan Engrg. 314-567-3636
NM Albuquerque, Moutaintek 505-265-8521
NY White Plains, Bartlett Assoc. 914-949-6476
NC Raleigh, Lee Assoc. 919-787-5818
Ohio Cleveland, Lowry & Assoc. 216-464-8113
Ohio Dayton, Lowry & Assoc 513-435-4795
Pa Pittsburgh, Lowry & Assoc 412-922-5110
Pa Wayne, Bartlett 215-688-7325
Tex Dallas, Salcor 214-234-8072
Utah Salt Lake City, Mountaintek 801-278-6920
Wash Bellevue, Scientific Devices NW 206-454-0900
Wisc Brookfield, Pivan Engrg. 414-786-1940

Q.V.S., INC., Dept. EM, 20 North 15th St., East Orange, N.J. 07017, Tel: 201-673-3996; FSC No.: 89820; Empl.: 45

QUALCO, Dept. EM, One First St., Los Altos, Cal. 94022, Tel: 415-964-7666; Empl.: 11

QUALITY THERMISTOR, Dept. EM, 2096 S. Cole Rd. Ste 7, Boise, Idaho 83705, Tel: 208-377-3373

Sales Manager: J. Ketlinski

Local Sales Offices & Reps.

Ala Mobile, Hollingsworth & Still 205-344-1641
Ariz Scottsdale, ARCOM Sls 602-947-5745
Cal San Jose, Silicon Vally Sls 408-984-6354
Cal Tustin, Clemick-Neenan Assoc. .. 714-547-0966
Fla Fort Lauderdale, Hollingsworth & Still 305-782-0069
Fla Orlando, Hollingsworth & Still 305-834-2356
Ga Atlanta, Hollingsworth & Still 404-394-3270
Ill Chicago, Pudlo Assocs 312-631-7110
Ind Ft Wayne, John F. Kilfoil Co 219-424-7719
Mass Needham, Hatch Assocs 617-444-3310
Mo St. Louis, Forristal-Young Sls 816-358-6771
NJ Plainfield, Glassman Assoc 201-561-3866
NY Glen Cove, Glassman Assocs 516-676-1039
NC Greensboro, Hollingsworth & Still 919-855-9033
Ohio Cincinnati, John F. Kilfoil Co. 513-791-6150
Pa CynWyd, Martin Friedman Assoc 215-839-3450
Tenn Nashville, Hollingsworth & Still .. 615-361-8254
Tex Dallas, STASCO 214-239-4517

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QUAKER ELCTRNS., Dept. EM, Box 215, Hunlock Creek, Pa. 18621, Tel: 717-256-7485; Empl.: 5

QUAM-NICHOLS CO., Dept. EM, 234 E. Marquette Rd., Chicago, Ill. 60637, Tel: 312-488-5800; Empl.: 200 ..... p. 1019

Local Sales Offices & Reps.

Cal Gardena, Bidwell Sls. 213-770-0300
Cal Pleasanton, Moulthrop Sls. 415-846-0550
Colo Denver, B. Newman & Co. 303-744-2501
Fla Orlando, Cartwright & Bean 305-422-4531
Ga Atlanta, Cartwright & Bean 404-255-5262
Ill Chicago, R. R. Hutmacher Assoc. 312-631-3248
Ind Indianapolis, R. Milsk Co. 317-546-5468
Kans Overland Park, T. L. Dowell 913-236-8200
Mass Needham, Mullin Technical Sls. Co. 617-444-4780
Mich Southfield, R. Milsk Co. 313-354-3310
Minn Edina, M. Foster Co. 612-835-2252
NJ Cherry Hill, Trinkle Sls 609-795-4200
NY Camillus, Callahan-Ferguson 315-487-3870
NY Port Washington, R.E. Brever Co 516-883-7810
Ohio Beachwood, Electronic Salesmasters 216-831-9555
Ore Portland, J. V. BeLusko Co. 503-222-4279
Tenn Memphis, Cartwright & Bean 901-276-4442
Tex Dallas, El Wilco Inc. 214-242-5329

QUANTRONIX CORP., Dept. EM, 225 Engineers Rd., Smithtown, N.Y. 11787, Tel: 516-273-6900, Telex: 967-782; Empl.: 70

Sales Manager: R.J. Bruno

Local Sales Offices & Reps.

Cal Palo Alto, Quantronix Corp. 408-247-9987

QUANTUM, INC., Dept. EM, Barnes Industrial Pk, Wallingford, CT. 06492, Tel: 203-265-2811, Telex: 953-543

Sales Manager: C. D. Cummings

QUARTZITE PROCESSING, INC., Dept. EM, 6 Holyoke St., Malden, Mass. 02148, Tel: 617-322-1380; Empl.: 11

Sales Manager: P.S. Yanofsky

QUIETROLE CO., Dept. EM, 395 St. John, Spartenburg, S.C. 29302, Tel: 803-582-4837

Local Sales Offices & Reps.

Ohio Euclid, W. Peters Co. 216-261-2330

R-COLUMBIA PRODUCTS, INC., Dept. EM, 2008 St. John's Ave., Highland Park, Ill. 60035, Tel: 312-432-7915; Empl.: 12

Local Sales Offices & Reps.

Cal Beverly Hills, Chas. H. Michel Co 213-274-4903
Fla North Miami, Mort Press Assoc.. 305-895-2262
Ill Romeoville, Sunrise Sls 815-838-1026
Md Cockeysville, Jos. J. Rodimak Co 301-666-8128

RACAL-DANA INSTRUS INC., Dept. EM, 18912 Von Karman Ave., Irvine, Cal. 92715, Tel: 714-833-1234, TWX: 678341, 910-595-1136; FSC No.: 21793; Empl.: 200

Sales Manager: N. Laengrich; *Distributor Manager:* R. Wynne

Local Sales Offices & Reps.

Ala Huntsville, Gentry Assocs., Inc.... 205-534-9771
Ariz Scottdale, PLS 602-994-5461
Cal Irvine, Racal-Dana Instruments .. 714-833-1234
Cal La Jolla, Ward-Davis Assocs. 714-459-3351
Cal Lawndale, Ward-Davis Assocs. .. 213-542-7740
Cal Sunnyvale, Ward-Davis Assocs. 408-245-3700
Colo Denver, PLS 303-773-1218
Conn Hamden, P. Jenks Assocs. 203-281-0810
Fla Orlando, Gentry Assocs., Inc. 305-894-4401
Ga Atlanta, Gentry Assocs. 404-455-1206
Ill Chicago, Pivan Engrg. Co. 312-539-4838
Ind Indianapolis, Pivan Engrg. Co. 317-253-1681
Iowa Cedar Rapids, Pivan Engrg. 319-377-9434
Kans Shawnee Mission, Pivan Engrg. Co. 913-722-1030
Mass Wakefield, P. Jenks Assocs. 617-246-1590
Mich Farmington, Carter, McCormic & Peirce, Inc. 313-477-7700
Minn Minneapolis, Pivan Engrg. Co. 612-835-3060
Mo St. Louis, Pivan Engrg. Co. 314-567-3636
NJ Ft. Lee, Tech. Mktg. Assocs. 201-224-6911
NJ Paramus, SDM Reps. 201-368-0123
NM Albuquerque, PLS 505-255-2330
NY Rochester, SDM Reps. 716-381-9962
NC Burlington, Gentry Assocs. Inc. .. 919-227-3639
Ohio Dayton, Carter, McCormic & Peirce, Inc. 513-222-7700
Ohio Fairview Park, Carter, McCormic & Peirce, Inc. 216-779-5100
Okla Oklahoma City, Data Mktg. Assocs. 405-528-6071
Ore Portland, Pacific Northwest Elec. 503-228-0088
Pa Philadelphia, Eastern Instrumentation of Phil. 215-927-7777
Pa Pittsburgh, Carter, McCormic & Peirce, Inc. 412-372-4415
Tex Austin, Data Mktg Ass. 512-451-5174
Tex Dallas, Data Mktg. Assocs. 214-661-0300
Tex Houston, Data Mktg. Assocs. 713-780-2511
Tex San Antonio, Data Mktg. Assocs. 512-828-0937
Utah Sandy, PLS 801-942-2081
Va McLean, Creative Mktg. Assocs. 703-893-6612
Wash Bellevue, Pacific Northwest Elec. 206-641-6444
Wisc Brookfield, Pivan Engrg. Co. 414-786-1940

Local Distributors

Ala Gadsden, Nickerson Co. 205-547-7718
Cal Inglewood, Ungar Sls Ass. 213-649-6238
Cal Pleasanton, Moulthpop Sls. 415-846-0550
Fla Clearwater, Chaco Sls 813-536-9503
Ill Chicago, G. Mcl. Cole Co. 312-774-3535
Ind Indianapolis, Electronic Reps 317-894-1414
Ky Louisville, Electronic Reps 502-368-4911
Mass Cohassett, Montague Ass. 617-383-0634
Mich Dearborn, Pitcher-Poulin 313-582-5450
Minn Minneapolis, Dick Borrett Co 612-929-0028
Mo St. Louis, Forristal-Young Sls 314-645-2360
Neb Omaha, Forristal-Young Sls 402-333-0800
NJ Cedar Grove, D.F. Tobias Co. 201-239-8585
NC Kannapolis, Nickerson Co. 704-932-6772
Ohio St. Marys, Thomas Shelby Co. .. 419-394-3377
Ore Portland, Jud LeBrun Co. 503-244-6805
Tenn Memphis, Al Engleman Co. 901-458-6263
Tex Richardson, Willoughby-Fowler Co. 214-238-9427
Wisc Menominee Falls, G. McL. Cole Co. 414-251-2011

RACAL-MILGO CORP., Racal-Milgo, Inc., Dept. EM, 8600 N.W. 41st St., Miami, Fla. 33166, Tel: 305-592-8600, TWX: 810-848-6588; Empl.: 1400

Local Sales Offices & Reps.

Cal Campbell, Racal-Milgo 408-377-4575
Cal Los Angeles, Kirby Assoc. 213-879-9045
Cal Mountain View, CSS Telecomm Spec. 415-964-4335
Cal Newport Beach, Racal-Milgo 714-975-0106
Cal Santa Ana, CSS Telecomm Spec. 714-546-8430
Colo Littleton, Cropley, Inc. 303-794-4231
Conn Westport, T.H. Maguire 203-227-1976
DC Washington, Racal-Milgo 202-296-4940
Fla Miami, Racal-Milgo 305-592-8600
Ga Atlanta, Racal-Milgo 404-763-0304
Ill Chicago, HH Sls 312-337-4478
Ill Des Plaines, Racal-Milgo 312-298-7150
Ky Ft. Mitchell, Data Specifications 606-341-4800
Md Silver Spring, Computer Complements Inc 301-589-2802
Mass Danvers, John Melanson & Assoc. 617-774-1220
Mich Farmington Hills, Data Specifications 313-553-9111
Minn Minneapolis, Delta Comm Sys. ... 612-884-0202
Mo Independence, Information Prods 816-252-3700
NJ Bellmawr, Applied Delta Sys 609-931-3100
NY Great Neck, Harvey Krasner Assoc 516-487-0690
NY Ilion, Annese & Assoc 315-895-7469
NY Massapequa, L.E. Walz & Assoc 516-798-3119
NY New York, Racal-Milgo 212-687-5040
Ohio Cleveland, Data Specifications .. 216-333-6740
Ohio Columbus, Data Specifications .. 614-885-6682
Pa Pittsburgh, Applied Delta Sys 412-931-1960
SC Greenville, Racal-Milgo 803-268-7411
Tenn Germantown, Racal-Milgo 901-755-1744
Tex Richardson, Computer Mktg Corp. 214-231-1426
Tex Richardson, Racal-Milgo 214-238-0494
Wash Seattle, CSS Telecomm Spec. .. 206-367-1440
Wisc Milwaukee, Delta Comm Sys. 414-774-1989

RADATRON CORP., Dept. EM, 2424 Niagara Falls Blvd., N. Tonawanda, NY 14120, Tel: 716-731-4171, TWX: 710-269-1792; Empl.: 85

Sales Manager: L. Pauly

Local Sales Offices & Reps.

Cal Moraga, Pickett Sales 415-283-5238
Ga Savannah, Len Sherman Assoc. 912-925-3660
Ill Skokie, Mike Bermann Sls. 312-675-3740
Ind Sharkey, Epstein 317-248-2424
Kans Overland Pk., Howard Sls 913-492-7182
Mich Grand Rapids, Cecil Geer Co. 616-534-9449
Minn Minneapolis, Melby Sls 612-884-7688
NY Valley Cottage, Cohn/Kappel 914-268-9216
Ohio Columbus, Mandabach-Lehner Co. 614-235-0265
Pa Holland, Par-Nel Sls 215-355-9330
Tex Dallas, Collins Co. 214-341-7866
Wash Seattle, DMS/Vantage 206-784-6800

RADIAL CONTROLS, Dept. EM, 2555 E. 55th Place, Indianapolis, Ind. 46220, Tel: 317-255-2796; Empl.: 25

Sales Manager: R.L. Newsom

RADIATION DEVICES CO., INC., Dept. EM, Box 8450, Baltimore, Md. 21234, Tel: 301-628-2240; Empl.: 7

Sales Manager: P. E. Rybak

RADIATION DEVICES CO., INC. cont'd

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RADIATION DYNAMICS, INC., Dept. EM, 316 S. Service Rd., Melville, N.Y. 11746, Tel: 516-752-1660, Telex: 96-7776; Empl.: 215

Sales Manager: R. Malnati

RADIO MATERIALS CO., Div. P.R. Mallory, Dept. EM, 4242 W. Bryn Mawr Ave., Chicago, Ill. 60646, Tel: 312-478-3600, TWX: 910-221-2915; FSC No.: 91418; Empl.: 500

Sales Manager: P. F. Houlihan

Local Sales Offices & Reps.

Ala	Huntsville, Electromech Sls. Eng. Co.	205-883-9624
Ariz	Scottsdale, RMC Div. of P.R. Mallory	602-949-7788
Cal	Buena Park, RMC Div. of P.R. Mallory	213-921-7939
Cal	Palo Alto, RMC Div. of P.R. Mallory	415-326-4282
Colo	Denver, P.R. Mallory Co.	303-750-4606
Conn	East Haven, Eagle Assocs.	203-467-6542
Fla	Orlando, P.R. Mallory & Co.	305-855-6353
Ga	Atlanta, Electromech Sls. Eng. Co.	404-449-6337
Ill	Chicago, Radio Materials Company	312-478-3600
Ill	Chicago, RMC Div. of P.R. Mallory	312-478-3600
Ind	Indianapolis, Mallory Distrib Prods	317-856-3731
Kans	Overland Park, P.R. Mallory Co	913-341-3454
Md	Lutherville, R.L. Gibson	301-825-0989
Mass	Needham, Eagle Assocs	617-444-3446
Mo	Bridgeton, P.R. Mallory & Co.	314-291-8223
NY	Plandome, F. Spellman Co.	516-627-3399
NY	Syracuse, N.J. Matchuk Co.	315-487-6951
NC	Raleigh, Electromech Sls. Eng. Co.	919-782-7586
Ohio	Cincinnati, A.C. Wahl & Assocs.	513-761-5500
Ohio	Dayton, A.C. Wahl & Assocs	513-252-0961
Ohio	Lyndhurst, A.C. Wahl & Assocs	216-461-4930
Ore	Portland, Earl & Brown Co.	503-245-2283
Tenn	Nashville, Electromech Sls. Eng. Co.	615-256-2516
Tex	Dallas, Gordon V. Peck Co	214-783-1011
Tex	Garland, G. Peck Co.	214-341-8311
Tex	Houston, Gordon V. Peck Co	713-780-2220
Va	Lynchburg, James A. Griffin	804-384-5236
Wash	Seattle, Earl & Brown Co.	206-284-1121
Exp:	Indianapolis, Ind., Mallory Int'l. Co.	317-636-5353

Local Distributors

Ind	Indianapolis, Mallory Distributor Products	317-856-3731

RADIOMETER COPENHAGEN, See London Co (The)

RADIO SWITCH, Dept. EM, State Hwy. 79, Marlboro, N.J. 07746, Tel: 201-462-6100

Sales Manager: J.L. Bernard

RAM CHEMS., Div. Whittaker Corp., Dept. EM, 210 E. Alondra Blvd., Gardena, Calif. 90248, Tel: 213-FA 1-0710; Empl.: 65

Sales Manager: R. Steinman

RAMTEK CORP., Dept. EM, 585 N. Mary Ave. P.O. Box 60309, Sunnyvale, Cal. 94086, Tel: 408-735-8400, TWX: 910-339-9379; Empl.: 250

Sales Manager: J. Morris

Local Sales Offices & Reps.

Ala	Huntsville	205-837-7000
Cal	Newport Beach	714-979-5351
Cal	Sunnyvale	408-735-8400
Conn	Stamford	203-348-8804
Ohio	Pepper Pike	216-464-4053
Tex	Plano	214-422-2200
Va	Alexandria	703-960-3550

RANDTRONICS, Dept. EM, 150 Constitution Dr, Menlo Park, Cal: 94025, Tel: 415-328-2640, Telex: 345521

Sales Manager: W. P. Markling

Local Sales Offices & Reps.

Ariz	Phoenix, Western Automation	602-277-2166
Cal	Los Angeles, Power Systems	213-943-7187
Cal	San Francisco, Hanley-Brewton	415-342-9393
Conn	Branford, Tech-Quip Assoc.	203-481-3509
Ga	Atlanta, R.L. Matos & Assoc	404-945-2946
Ill	Chicago, Automation Kinetics	312-654-2775
Mich	Detroit, Electo-Matic	313-478-1182
Minn	Minneapolis, D&P Engineering	612-421-5710
NY	New York, Sales To Industry	516-293-4440
NC	Charlotte, R&L Electric	704-527-5266
Ohio	Cleveland, P.J. Simko & Assoc.	216-932-8079
Tex	Dallas, United Technical Mktg.	214-231-5611
Wash	Seattle, Sweo Engineering	206-641-6330

RANK PRECISION INDS., Dept. EM, 411 Jarvis Ave., Des Plaines, Ill. 60018, Tel: 312-297-7720, Telex: 72-6441; Empl.: 65

Distributor Manager: W. E. Drews

Local Sales Offices & Reps.

Cal	Newport Beach, Omega Inds.	714-642-0746
NY	West Nyack, Rank Precision Ind.	914-358-4450

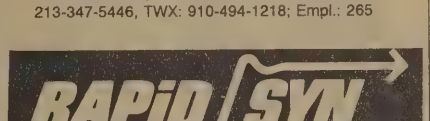
RANSCO INDUSTRIES, Dept. EM, 2221 Statham Blvd., Oxnard, Cal. 93030, Tel: 805-487-7777, Telex: 6-59235; Empl.: 65 p. 2572

Sales Manager: L. W. Benjamin, Gen Sls Mgr.

Local Sales Offices & Reps.

Pa	Valley Forge, Ransco Inds.	215-948-0300

RANTEC DIV., Emerson Elec. Co., Dept. EM, 24003 Ventura Blvd., Calabasas, Calif. 91302, Tel: 213-347-5446, TWX: 910-494-1218; Empl.: 265



RAPIDSYN CO, Div of Dana Corp, Dept. EM, 11901 Burke St., Santa Fe Springs, Cal. 90670, Tel: 213-723-6593, Telex: 69-6352; FSC No.: 32423; Empl.: 290 p. 3106,3107

Sales Manager: R. Summers

Local Sales Offices & Reps.

Cal	Anaheim, Tri-Tek	714-533-1454
Cal	Aptos, Tri-Tek	408-688-8277
Cal	Santa Fe Springs, Rapidsyn Co	213-698-2595
Colo	Englewood, Dynatech	303-773-2830
Conn	Old Saybrook, M.L. Assocs.	203-388-9718
Fla	Orlando, MacKay, Smith & Assocs.	305-277-1513
Ga	Atlanta, MacKay Smith & Assoc.	404-449-7444
Ill	Barrington, G. A. Cridland Co.	312-381-7044
Mass	Marlboro, M.L. Assocs.	617-485-6190
Mich	Southfield, Fred H. Gehrke & Assoc.	313-559-5363
Minn	St. Paul, W.E. Taubert	612-636-6414
Mo	Florissant, Sheridan Assoc.	314-837-5200
NJ	Cherry Hill, R.E. Winter Assocs.	609-429-0696
NJ	Tenafly, ABC Elctrn. Sls. Co.	201-568-2354
NM	Albuquerque, Rontek	505-299-4124
NY	Buffalo, D&O Engineering	716-854-4602
NY	Cazenovia, D & O Engrg	315-655-8602
NY	Williston Park, ABC Elctrn. Sls. Co.	516-747-6610
NC	Charlotte, MacKay, Smith, & Assocs.	704-527-0240
Ohio	Dayton, Electrical Sys. Co.	513-434-9822
Ohio	Toledo, Electrical Sys. Co.	419-475-9390
Okla	Tulsa, Hugh J. Daly Co.	918-627-4159
Tex	Houston, Oeler & Menelaides	713-772-0730
Tex	Richardson, Oeler & Menelaides	214-234-6334
Wash	Vashon, RTS	206-455-2778

RATELCO, INC., Dept. EM, 610 Pontius Ave. N., Dept. EEM, Seattle, Wash. 98109, Tel: 206-624-7770, Telex: 32-1200; Empl.: 60

Sales Manager: D. Terpstra

Local Sales Offices & Reps.

Ariz	Phoenix, Bryant Co.	602-942-0724
Cal	Long Beach, Matzinger Wells Inc.	213-433-1111
Cal	Long Beach, Matzinger-Wells	213-433-1111
Cal	Menlo Park, Howe-Stephens Co.	415-322-1788
Colo	Denver, Hamilton Assocs	303-629-0901
Colo	Denver, Hamilton Assocs., Inc.	303-629-0901
Conn	Wallingford, Total Power Corp.	203-265-2879
Conn	Wallingford, Total Power Corp	203-265-2879
Fla	Maitland, Rowe Engrg Sls	305-834-2700
Ga	Atlanta, Holman-Lobsinger Co.	404-256-9120
Ill	Park Ridge, Electrical Materials & Equip. Co.	312-696-1540
Mass	Framingham, Total Power Corp.	617-237-2024
Mass	Framingham, Total Power Corp	617-237-2024
Minn	Minneapolis, Klass Co., Inc.	612-338-8427
Minn	Minneapolis, The Klass Co.	612-338-8427
NM	Albuquerque, Bryant Co.	505-296-5158
NC	Charlotte, Waggoner-Ver Hill Assoc.	704-523-5476
Pa	Conshohocken, Electrical Distributors Co	215-825-6450
Pa	Pittsburg, Waggoner-Ver Hill Assoc	412-241-5202
Tenn	Chattanooga, J.R. Murray Co.	615-267-3889
Tex	Dallas, E.B. Robertson	214-942-2711
Tex	Houston, E.B. Robertson	713-785-6800
Exp:	Seattle, Ratelco	206-624-7770

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RAULAND, Div. Zenith Radio Corp., Dept. EM, 2407 W. North Ave., Melrose Pk., Ill. 60160, Tel: 312-345-4700

Sales Manager: T.M. Snow

RAWAY BEARING CORP., Dept. EM, 8 Melnick Rd., Monsey, N.Y. 10952, Tel: 914-352-4944; FSC No.: 3110-3120; Empl.: 6

Sales Manager: Rachim Baskin

RAYCHEM CORP., Dept. EM, 300 Constitution Dr., Menlo Park, Cal. 94025, Tel: 415-329-3333, TWX: 910-373-1728; FSC No.: 06090; Empl.: 5100

Local Sales Offices & Reps.

Cal	Irvine	714-833-3630
Cal	San Diego	714-299-9562
Cal	Sherman Oaks	213-788-9872
Colo	Denver	303-758-1936
Conn	Tolland	203-871-0028
Fla	Orlando	305-855-4214
Ga	Atlanta	404-434-9660
Ill	Des Plaines	312-298-1100
Kans	Overland Park	913-649-6930
Kans	Wichita	316-945-0214
Md	Linthicum	301-796-5950
Mass	Hingham	617-749-6850
Minn	Minneapolis	612-529-9114
Mo	Hazelwood	314-731-2030
NJ	Bloomfield	201-744-6261
NJ	Cherry Hill	609-667-4280
NY	Commack	516-864-4400
Ohio	Berea	216-243-3365
Ohio	Cleveland	216-692-2141
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Pa	Coraopolis	412-264-7111
Pa	Johnstown	814-255-1142
Pa	Lionville	215-363-2600
Pa	West Chester	215-692-8660
Tenn	Knoxville	615-637-3027
Tex	Dallas	214-350-8871
Tex	Houston	713-683-8131
Va	Arlington	703-979-4000
Wash	Bellevue	206-455-0903
Exp:	Dorval 760, Quebec Can.	514-636-1680
Exp:	Downsview, Ont, Can.	416-638-1020

RAYMOND ENGRG. INC., Dept. EM, 217 Smith St., Middletown, Conn. 06457, Tel: 203-632-1000, TWX: 710-428-7944; FSC No.: 92059; Empl.: 427

RAYTEK DIV. OPTICAL COATING LAB, Dept. EM, 325 E. Middlefield Rd., Mountain View, Cal. 94043, Tel: 415-961-1650, Telex: 348-351; Empl.: 65

Local Sales Offices & Reps.

Ariz	Phoenix, C. James Vitus Co	602-257-8449
Cal	Los Altos, Wank Tech.	415-941-3339
Cal	Van Nuys, Pacific Thernal Sls.	213-997-1773
Colo	Denver, Engrg Design	303-427-1955
Fla	Clearwater, J. Barber Co.	813-442-8719
Ga	Jonesboro, W.L. Anderson Co.	404-478-9648

Ill Park Ridge, L.R. Fitz Co. 312-631-5488
Ind Indianapolis, Couchman-Conant, Inc. 317-849-9890
Kans Overland Park, Richard Greene Co 913-492-6886
Mass Acton, Abbott Assocs..... 617-263-5047
Mich Orchard Lake, W.C. Fay Co..... 313-851-4750
Minn Minneapolis, Bican Co. 612-827-4734
Mo St. Louis, R. Greene Co. 314-994-0222
Neb Omaha, H.G. Klug Co. 402-397-8910
NJ Fair Lawn, Par Assocs..... 201-447-3722
NM Albuquerque, A.L.S. Elctrns. 505-298-2575
NY Buffalo, Terryberry Engrg Sls 716-632-7404
Ohio Cincinnati, A.H. Parker, Jr..... 513-563-1843
Ohio Lakewood, Franklyn Kirk Co 216-226-1970
Ore Portland, McLaren, Inc..... 503-297-2248
Pa Bridgeport, Advent Elec 215-277-6610
Pa Pittsburgh, Harold A. Woolman Co 412-922-2420
SC Greenville, Ernest C. Capell & Assocs 803-288-4159
Tex Dallas, Leake Co..... 214-826-6350
Tex Houston, Dixon Engrg. 713-644-8052
Wash Bellevue, McLaren, Inc. 206-454-3400
Wisc Sussex, Paragon Instr & Control 414-321-1961

RAYTHEON

RAYTHEON CO., Distributor Prods. Oper., Dept. EM, Fourth Ave., Burlington, Mass. 01803, Tel: 617-272-6400, TWX: 710-332-7641 p. 2096, 2097, 2443-2452, 2660, 3139-3146, 4221-4229

Sales Manager: R. Knight

Local Sales Offices & Reps.
Cal El Monte, Cook Entprs..... 213-686-2120
Cal Oakland, Moulthrop Sls..... 415-261-7676
Colo Denver, Camel Elctrns 303-757-6191
Fla N. Miami, L. Haas Co..... 305-949-9143
Ga Atlanta, Hollingsworth & Still 404-394-3270
Haw Honolulu, Dougherty Entprs. 808-847-4144
Ill Chicago, I.R.I. 312-647-7755
Ind Indianapolis, Green-Wissler Sls. Co. 317-251-9114
Minn Edina, Mel Foster Co. 612-835-2252
Mo Kansas City, Forristal & Young Sls. 816-358-6771
Mo St. Louis, Forristal & Young Sls. 314-645-2360
Neb Omaha, Forristal & Young Sls. .. 402-333-0800
NJ Cherry Hill, Trinkle Sls..... 609-795-4200
NJ Teaneck, Fisher Elctrn. Assoc. .. 201-837-1200
NY Skaneateles, Leahy & Thompson 315-685-8122
Ohio Beachwood, Electronic Salesmasters 216-831-9555
Ohio Cleveland, Imtech 216-826-3400
Ohio Dayton, Imtech..... 513-837-5610
Ore Portland, D.G. Weber Co. 503-234-0686
RI Saunderstown, United Comps. Inc. 617-226-0556
Tenn Memphis, Crockett Sls. Co. 901-388-5410
Tex Dallas, Crockett Sls. Co. 214-748-8209

RAYTHEON CO., Indl. Comps. Oper., Dept. EM, 465 Centre St., Quincy, Mass. 02169, Tel: 617-479-5300, TWX: 710-337-6879

Local Sales Offices & Reps.
Cal Los Angeles 714-898-4444
Cal Mountain View 415-964-4754
Ga Warner Robins, Raytheon Co..... 912-922-8471
Ill Elmhurst 312-833-6760
Mass Burlington 617-899-8400
NY Great Neck 516-482-8480
Ohio Dayton..... 513-254-3571
Tex Dallas 214-233-2939
Va Arlington 703-979-6100
Exp: Lexington, Mass. 617-862-6600

RAYTHEON CO., Spec. Microwave & Device Oper., Dept. EM, Fourth Ave., Burlington, Mass. 01803, Tel: 617-890-8080, TWX: 710-324-6568

Sales Manager: W.C. Jones

Local Sales Offices & Reps.
Cal Mountain View, HDE Systems..... 415-969-7272

RAYTHEON CO., Microwave & Power Tube Div., Dept. EM, 190 Willow St., Waltham, Mass 02154, Tel: 617-899-8400, TWX: 710-324-6568

Local Sales Offices & Reps.
Cal Los Angeles 714-898-4444
Cal Mountain View 415-964-4754
Ga Warner Robins 912-922-8471
Ill Elmhurst 312-833-6760
Mass Burlington 617-899-8400
NY Great Neck 516-482-8480
Ohio Dayton..... 513-254-3571
Tex Dallas 214-233-2939
Va Arlington 703-979-6100
Exp: Mass., Lexington 617-862-6600

RAYTHEON SEMICONDUCTOR, Dept. EM, 350 Ellis St., Mountain View, Cal. 94042, Tel: 415-968-9211, TWX: 910-379-6481; FSC No.: 07933; Empl.: 950

Sales Manager: E. Neubauer; *Distributor Manager:* R. Marshall

Local Sales Offices & Reps.
Ala Huntsville, Macro Mktg 205-883-9630
Ariz Scottsdale, Semper Fi Sls. Co .. 602-945-4556
Cal El Segundo, Varigon Assoc. 213-322-1120
Cal Irvine, Raytheon Semiconductor 714-833-9042
Cal Mountain View, Raytheon Semiconductor 415-969-3475
Cal San Diego, Varigon Assoc. 714-299-5413
Cal Sunnyvale, Quadrep Inc..... 408-733-7300
Colo Denver, Camel Elctrns 308-757-6191
Conn North Haven, Kitchen & Kutchin 203-239-0212
Fla Altamonte, Dyne-a-Mark Corp.... 305-831-2097
Fla Clearwater, Dyne-a-Mark Corp.. 813-441-4702
Fla Fort Lauderdale, Dyne-a-Mark Corp 305-771-6501
Fla St. Petersburg, Raytheon Semiconductor 813-576-2221
Ill Des Plaines, Raytheon Semiconductor 312-297-5540
Ill Elk Grove Village, Carlson Elctrn Sls 312-956-8240
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Kans Shawnee Mission, Midtec Assoc 913-441-6565
Md Pikesville, L & M Assoc 310-484-7970
Mass Lexington, Kitchen & Kutchen 617-862-8230
Mass Newton Lower Falls, Raytheon Co 617-527-0030
Mich Farmington, Miltimore Sls. 313-476-2446
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Minn Bloomington, Elctrn. Sls. Agcy.. 612-884-8291
Minn Minneapolis, Raytheon Co 612-920-7935
NJ Cherry Hill, Raytheon Co 609-663-4066
NY Cicero, Advanced Comps..... 315-699-2671
NY Melville, Raytheon Semiconductor 516-420-0700
NC Winston-Salem, Marco Mktg Assoc 919-788-8145
Ohio Brunswick, Kimconics Sls..... 216-225-6111
Ohio Dayton, Kimconics Sls 513-898-1783
Ore Portland, Northwest Mktg Assoc. 503-297-2581
Pa Bala Cynwyd, Vantage Sls Co .. 215-667-0990
Pa King of Prussia, Monteiro Assoc. 215-265-0634
Tex Dallas, ION Assocs. 214-357-9441
Tex Houston, ION Assocs..... 713-461-5311
Wash Bellevue, Northwest Mktg Assoc 206-455-5846
Wisc Milwaukee, Carlson Elctrn. Sls.... 414-476-2790
Exp: Mt. View, Raytheon Overseas Ltd. 415-968-9211

RAYTHEON/TAG SEMICONDUCTORS LTD., Dept. EM, 43 Third Ave., Burlington, MA. 01803, Tel: 617-272-3704 (3705), TWX: 92-3455, 710-324-6568

Sales Manager: L. May; *Distributor Manager:* Pat Mobilia

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Ariz Scottsdale, Semper Fi Sls 602-945-4556
Cal Marina del Rey, Relcom..... 213-822-1187
Colo Denver, Camel Elctrns 303-757-6191
Conn North Haven, Kitchen & Kutchin 203-239-0212
Fla Altamonte Springs, Dyne-A-Mark 305-831-2097
Fla Clearwater, Dyne-A-Mark..... 813-441-4702
Fla Ft. Lauderdale, Dyne-A-Mark..... 305-771-6501
Ill Elk Grove, Carlson Elctrn Sls 312-956-8240
Ind Indianapolis, Carlson Elctrn Sls.. 317-842-3740
Mass Lexington, Kitchen & Kutchin..... 617-862-8230
Minn Bloomington, Elctrn Sls Agcy 612-884-8291
NY Cicero, Advanced Comps Corp. 315-699-2671
NY Farmingdale, Win Sls 516-249-7859
Ohio Brunswick, Kimconics Sls..... 216-225-6111
Ohio Englewood, Kimconics Sls 513-836-9677
Ore Portland, Northwest Mktg..... 503-297-2581
Pa King of Prussia, Monteiro Assocs 215-265-0634
Pa Pittsburgh, Kimconics Sls..... 412-367-3013
Tex Dallas, Ion Assocs..... 214-357-9441
Tex Houston, Ion Assocs 713-461-5311
Wash Bellevue, Northwest Mktg 206-455-5846
Wisc Milwaukee, Carlson Elctrn Sls.... 414-476-2790

RBM CONTROLS, See Essex Controls Div.

RCA DISTR. & SPECIAL PRODS. DIV., Dept. EM, Deptford, N.J. 08096, Tel: 609-963-8000

RCA PARTS & ACCESSORIES, See RCA Distr. & Special Prods. Div.

RCA SERVICE CO., Div. RCA Corp., Dept. EM, Govt. Svcs. 202-1, Camden, N.J. 08101, Tel: 609-779-5176, TWX: 710-892-0905; Empl.: 5000

Local Sales Offices & Reps.
Cal Camarillo..... 805-482-2154
Va Arlington 703-558-4441

RCI DATA, See Re-el Circuits, Inc.

RCL ELECTRONICS DIV., AMF, Incorporated, Dept. EM, 195 McGregor St., Manchester, N.H. 03102, Tel: 603-627-3831, TWX: 710-220-1876; Empl.: 900 p. 2408-2413,3730-3740,4237

Sales Manager: C Smith; *Distributor Manager:* R Schoonover

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Ariz Tempe, Toribre Entprs..... 602-894-2263
Cal El Segundo, Varigon Assocs..... 213-322-1120
Cal Palo Alto, Held Mollard..... 415-965-9321
Cal San Diego, S.R. Elctrns..... 714-455-0300
Colo Wheatridge, Waugaman Assocs. 303-423-1020
Conn North Haven, Kitchen & Kutchin 203-239-0212
Fla Altamonte Springs, Semtronic Assocs. 305-831-8233
Fla Clearwater, Semtronic Assocs.. 813-461-4675
Ga Hartwell, K & E Assocs. 404-376-5438
Ill Westchester, Gassner & Clark .. 312-345-4245
Ind Indianapolis, Leslie M DeVoe Assocs. 317-842-3245
Iowa Hiawatha, Gassner & Clark 319-393-5763
Kans Derby, Palatine Sls..... 316-788-0621
Kans Lexana, Palatine Sls..... 913-492-7020
Md Baltimore, Micro Comp, Inc..... 301-247-0400
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Mich Grosse Pointe Park, Greiner Assocs. 313-499-0188
Minn Bloomington, Electronic Sls. Agency 612-884-8291
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NM Albuquerque, Waugaman Assocs. 505-294-1436
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NY Jamaica, S J Assocs 212-291-3232
NY Manilus, Quality Comps..... 315-682-8885
NC Garner, K & E Assocs 919-772-8454
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Ohio Worthington, KW Elctrns. Sls. 614-888-0483
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Tex Richardson, R.F. Kimball Co..... 214-231-3447
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Wash Bellevue, Elctrn. Sources 206-453-0800

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Cal Carson, Hi-Rel Dist. Sls..... 213-537-6500
Cal Hawthorne, Electro-Sonics..... 213-679-9781
Cal Los Angeles, Electric Switch 213-660-1310
Cal Mountain View, Capacitor Sls 415-964-8880
Cal San Diego, Mock III Sls. Co. 714-560-0515
Cal Sunnyvale, Diplomat/Westland .. 408-743-1900
Cal Woodland Hills, Jaco Elctrns..... 213-887-7260
Colo Denver, Integrated Elctrns..... 303-534-6121
Colo Lakewood, Acacia Sls. 303-232-2882
Conn Stratford, Electro/Comp. 203-375-5811
Fla Clearwater, Diplomat/Southland 813-443-4514
Fla Ft. Lauderdale, Hall Mark Elctrns 305-971-8280
Fla Ft. Lauderdale, National Resistor Co. 305-792-2600
Fla Orlando, Hall Mark Elctrns..... 305-855-4020
Fla Orlando, Hammond Elctrns..... 305-849-6060
Fla Tampa, Impala Elctrns..... 813-855-4747
Ill Elk Grove Village, Hall Mark Elctrns 312-437-8800
Ill Elks Grove Village, GBL Elctrns. 312-593-3220
Ill Rosemont, Advent Elctrns..... 312-298-4210
Ind Indianapolis, Advent Elctrns 317-257-1227
Iowa Cedar Rapids, Advent Elctrns. .. 329-363-0221
Kans Shawnee Mission, Hall Mark Elctrns 913-888-4747
Md Baltimore, Radio Electric 301-823-0070
Md Baltimore, Arrow Elctrns. 301-247-5200
Md Baltimore, Hall Mark Elctrns 301-796-9300
Mass Burlington, RC Comp. 617-273-1860

Mich Farmington, Advent Elctrns. 313-477-1650
Mich Livonia, Camelot Elctrns. 313-427-8660
Minn Bloomington, Hall Mark Elctrns 612-884-9056
Minn Bloomington, Arrow Elctrns. 612-888-5522
Minn Minneapolis, Diplomat/Electro-Comp. 612-788-8601
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Wisc Milwaukee, Parts Mart 414-276-1212
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Sales Manager: H. J. Roeser

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Ala Birmingham, Austin Brown Assocs. 205-822-3141
Ariz Glendale, Adtek, Inc. 602-846-4650
Ark Eldorado, D. Bellew Sls. 501-863-8325
Cal Los Angeles, Universal Comp. Co. 213-641-4255
Cal Menlo Park, G. R. McKnight Co. 415-325-2844
Colo Englewood, Elcom Inc. 303-770-4400
Conn Norwalk, Betronic Assocs. 203-853-7630
Ga Atlanta, Austin Brown Assoc. 404-457-6381
Ill Glen Ellyn, Rockford Controls 312-469-6016
Ind Indianapolis, Rockford Controls Co. 317-248-2518
Iowa Cedar Rapids, Palatine Sls 319-365-8071
Kans Derby, Palatine Sls 316-788-0621
Kans Lenexa, Palatine Sls. 913-492-7020
La Kenner, D. Bellew Sls. 504-443-3237
Md Randallstown, Beacon North 301-922-1248
Mass Waltham, Betronic Assocs. 617-894-8400
Minn Minneapolis, HMR 612-831-7400
Miss Jackson, Dick Bellew Sls 601-366-6728
Mo Hazelwood, Palatine Sls. 314-895-4577
NY Albany, H.C. Johnson Agencies 518-456-6667
NY Buffalo, H.C. Johnson Ags. 716-632-7880
NY Fayetteville, H.C. Johnson Ags. 315-637-9383
NY Port Washington, TMA 516-883-2432
NY Rochester, H.C. Johnson Ags. 716-482-3000
NC Kernersville, S. K. Wallace Assoc. 919-996-2742
Ohio Cincinnati, Val-Skol Sls. 513-671-3210
Ohio Cleveland, Val-Skol Sls. 216-526-2156
Pa Elkins Park, Kenneth Erdman Co. 215-224-1833
Pa Glenshaw, H. C. Johnson Agencies 412-961-0414
Tenn Brentwood, A. Brown Assoc. 615-373-2068
Tenn Memphis, D. Bellew Sls. 901-365-9437
Tex Houston, EDC 713-692-8204
Tex Plano, EDC 214-424-0916
Utah Salt Lake City, Control Agency, Inc. 801-466-8601
Va Falls Church, Beacon North 703-534-7200
Va Lynchburg, Beacon North 804-237-4740
Wash Seattle, Northmar 206-524-5170

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Ark Little Rock, Carlton-Bates Co. 501-562-9100
Cal Anaheim, Electro Comps. 714-634-0222
Cal Burlingame, Rose Elec. 415-697-5700
Cal Los Angeles, Electric Switches 213-660-1310
Cal San Jose, Consolidated Parts 408-263-9521
Colo Aurora, Component Specialties 303-341-0160
Conn Hartford, Hartford Elec. Supp. 203-233-3694
Fla Miami, Electro Standard Labs 305-633-6973
Ga Atlanta, Electrical Control Prods. 404-455-1216
Ill Addison, Lectro Comps. 312-543-1680
Ill Broadview, LComp Chicago 312-865-7600
Ill Chicago, Otto Frankenbush 312-647-0755
Ill Rockford, Mid-West Assoc.
Ill Schaumburg, Control Design 312-882-7232
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Ind Indianapolis, Control Design 317-788-4559
Kans Wichita, Interstate Elec. Supply 316-264-6316
La New Orleans, Southern Radio 504-524-2343
Md Beltsville, Treeko Sls. 301-937-8260
Mass Waltham, QPL Elec. Dist. 617-891-0460
Mich Union Lake, Double R Elctrn. 313-363-8090
Minn Minneapolis, Control Design 612-721-1629
Mo St. Louis, LComp 314-647-5505
Neb Lincoln, Scott Elctrn. 402-466-8221
NJ Fairlawn, Relay Specialties 201-797-3313
NJ Jersey City, Cuny & Guerber 201-653-0222
NJ So. Plainfield, Brownell Electro. 201-753-4600
NY Buffalo, Summit 716-884-3450
NY Rochester, Summit Elctrn. 716-334-8110
NY Rochester, Requa Elec. Supply 716-442-2020
NC Raleigh, Southeastern Radio
NC Shelby, Dixie Indl. Supply 704-482-5641
Ohio Akron, Akron Elctrn. Supply 216-762-8818
Ohio Cincinnati, Mytronics 513-772-1661
Ohio Cleveland, Repco 216-248-8900
Ohio Dayton, ESCO Inc. 513-224-9192
Okla Tulsa, Radio Inc. 918-587-9123
Ore Portland, Consolidated Elec. Dist. 503-232-3142
Pa Erie, Advacom Inc. 814-455-8110
Pa Philadelphia, Philadelphia Elec. Co. 215-568-7400
Tenn Knoxville, J. R. Stephenson 615-588-7474
Tenn Memphis, Brownell Electro 901-332-9254
Tex Dallas, Dallas Instru. 214-349-1180
Tex Ft. Worth, Swieco 817-335-6521
Utah Salt Lake City, Standard Supply 801-355-2971
Wash Seattle, Radar Elec. 206-282-2511
Wisc Milwaukee, Marsh Elex. 414-475-6000

REAL TIME SYSTEMS INC., Dept. EM, 152 S. MacQuesten Pkwy., Mt. Vernon, N.Y. 10550, Tel: 914-667-0425

Sales Manager: A. Citrin

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Md Silver Spring, Eastern Instrumentation 301-681-6500
Wash Bellevue, Scientific Devices Northwest 206-454-0900

RE-EL CIRCUITS, INC., Dept. EM, 520 Victor Street, Saddle Brook, N.J. 07662, Tel: 201-843-3738; Empl.: 15 p. 1380

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Mass Needham, White Sls. Co. 617-444-3676
NY E. Northport, Jarms Assoc. 516-368-4096
NY Fayetteville, M. P. Andrews Mfrs. Rep. 315-637-5291

RECORDER SYS DIV., See Gulton Inds, Meas. & Control Sys. Div.

RECOTON CORP., Dept. EM, 46-23 Crane St., Long Island City, N.Y. 11101, Tel: 212-392-6442; Empl.: 150

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Cal Culver City, Marshank Sls. Corp. 213-559-2591
Cal Santa Clara, Sierra Mktg 408-988-2833
Colo Aurora, SPS Assocs. 303-341-1776
Fla No. Miami, L. Haas Co. 305-945-6544
Ga Atlanta, Dean Cooper Co. 404-448-5460
Haw Mililani, C & L Dists. 808-623-2762
Ill Chicago, Amex Mktg 312-973-1300
Iowa Des Moines, Beams Co. 515-255-1148
La Metairie, Tape City U.S.A. 504-888-2505
Md Silver Spring, Morris Taylor Co. 301-946-3569
Mass Lynn, Keene Sls. Co. 617-595-2300
Mich Southfield, Aztec Sls. Corp. 313-642-0777
Minn Maple Grove, R. C. Sls. Co. 612-425-5543
NY New York, Newhope Corp. 212-532-7372
NY Yonkers, J. Brown Electr. Sls. Reps. 914-779-7330
Ohio Cleveland, M.S. Sls. Co. 216-382-2060
Pa Philadelphia, Taub Sls. 215-698-9757
Tex El Paso, Steve Brimer Sls 915-778-0567
Tex Houston, Spivey-LeBoeuf Assocs. 713-649-1221
Utah Salt Lake City, SPS Assocs. 801-485-1294
Wash Yakima, Barnsley-Weis Assocs. 509-453-5537

RECTIFIER COMPONENTS CORP., Dept. EM, 1112 Lousons Rd., Union, N.J. 07083, Tel: 201-687-5410, Telex: 138-616; Empl.: 50

Local Sales Offices & Reps.
Ill Chicago, M & S Sls. Co. 312-992-1053
Ill Westchester, W.G. Brouilette & Assoc. 312-345-6500
Mass Needham Hts., Todino Engrg. Sls. Co. 617-444-7925
Mich Detroit, A. Blumenberg Assoc. 313-557-1934
NJ Plainfield, S. Glassman Assocs. 201-561-3866
NY Glen Cove, S. Glassman Assocs. 516-676-1039
Pa Glenshaw, A.H. Riesmeyer 412-486-8640
Pa Willow Grove, H. Nash Assocs. 215-657-2213
Exp: New York, C. Tennant & Sons 212-679-1300

RED POINT CORP., Dept. EM, 105 W. Spazier Burbank, Cal. 91502, Tel: 213-842-4895; Empl.: 12

REDACTRON CORP., Dept. EM, 100 Parkway Dr. S. Hauppauge, N.Y. 11787, Tel: 516-543-8700, Telex 96-7843; Empl.: 550

Sales Manager: H. B. Jamieson; *Distributor Manager:* R. Schadt

Local Sales Offices & Reps.
Cal Pasadena, Burroughs Corp 213-351-6551
Mich Detroit, Burroughs Corp 313-972-7958
NY Hauppauge, Burroughs Corp 516-543-8700

REDINGTON COUNTERS, INC., Dept. EM, 130 Addison Rd., Windsor, Conn. 06095, Tel: 203-688-6207

Local Sales Offices & Reps.
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Cal La Julla, Control Equipment 714-272-6501
Conn Windsor, Redington Counters, Inc. 203-688-6200
Ill Barrington, Count & Control 312-381-7333
Md Silver Spring, H. R. Sciber Co. 301-589-9110
Minn St. Paul, J. D. Co. 612-454-5552
NY Buffalo, Goud Comps 716-634-4400
NY Hartsdale, Com-Tec Sls 914-761-6644
NC Matthews, W. K. Hile Co. 704-847-9125
Ohio Cleveland, Jay Industrial Sls 216-831-9393
Ore Wilsonville, James L. Kearns Co. 503-236-1165
Pa Pittsburgh, R. W. Moulton & Assocs 412-366-3333
Tenn Knoxville, W. K. Hile Co. 615-573-0700
Va Richmond, W. K. Hile Co. 804-275-0791
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Ariz Phoenix, Montgomery Bros. 602-253-3430
Cal Burlingame, Montgomery Bros. 415-697-6500
Colo Denver, Montgomery Bros. 303-759-2740
Fla Titusville, Powertronics, Inc. 305-267-5690
Ill Morton Grove, Thermal Equip. Co. 312-679-6390
Ill Villa Park, Thermal Process Engrg. 312-833-6270
Md Silver Spring, ARA Elctrns. 301-565-2580
Mass Wilmington, Technical Instrs. 617-944-3930
Mich Troy, C. H. Armstrong Co. 313-524-1410

Minn Minneapolis, Production Automation Corp. 612-866-5700
Mo Hazelwood, Production Automation Corp. 314-731-2331
Mo Raytown, Production Automation Corp. 816-737-0066
NJ Bayonne, Selstar Prods. Co. 201-437-1220
NC Raleigh, Powertronics, Inc. 919-787-9090
NC Thomasville, Powertronics, Inc. 919-476-6727
Ore Portland, Montgomery Bros. 503-223-4197
Tex Dallas, Production Automation Corp. 214-620-0227
Utah Salt Lake City, Montgomery Bros., Inc. 801-363-3555
Wash Seattle, Montgomery Bros. 206-762-4100
Wisc Menomonee Falls, W.M. Braun & Assocs. 414-251-8685

REEVES-HOFFMAN DIV., Dynamics Corp. of Amer., Dept. EM, 400 W. North St., Carlisle, Pa. 17013, Tel: 717-243-5929, TWX: 510-650-3510 ..... p. 2363-2365

Sales Manager: B. L. Beittel

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Cal Marino Del Rey 213-821-7950
Cal Santa Clara, L & M Assocs. 408-243-2891
Colo Boulder, R.G. Entprs. 303-447-9211
DC Tampa, A P Assocs 813-886-2457
Fla Orlando, A P Assocs 305-298-2816
Ga Hollywood, A P Assocs 305-987-6720
Md Ellicott City, R. F. Assocs. 301-465-5944
Mass Wakefield, H. Jappe Co. 617-245-9359
NY Larchmont, G.M. Moch Co. 914-834-3530
NC Raleigh, Candor Co. 919-876-4999
Ohio Cincinnati, Tri-State Mktg. 513-761-7993
Pa Philadelphia, C.H. Newson & Assoc. 215-248-3377
SC Myrtle Beach, Candor Co. 803-448-5213
Exp: Cal., Palo Alto, Centauri Trading Co. 415-493-0813

REFAC ELCTRNS. PINLITE®, WILD ROVER®, Dept. EM, Box 809, W. Hill Rd., Winsted, Conn 06098, Tel: 203-379-2731, TWX: 710-449-6464; FSC No.: 28564; Empl.: 80 ..... p. 2540,2541,4220

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Ala Huntsville, Rakes Engrg. & Mktg. Corp. 205-883-9260
Ariz Tempe, E. J. Foley & Assocs. 602-894-2345
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Cal Pasadena, Luscombe Eng. Co. .. 213-684-2000
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Fla Pompano Beach, Delmac Sls. 305-781-6670
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Kans Olathe, BC Elctrn. Sls. 913-888-6680
Mass Canton, New England Elctrn. Sls. Corp. 617-828-4835
Mich Detroit, A. Blumenberg Assocs... 313-557-1934
Mich St. Joseph, A. Blumenberg Assocs. 616-983-0481
Minn Minneapolis, Charles Bohlig Co. 612-922-7011
Mo Hazelwood, BC Elctrn. Sls. 314-731-1255
NJ Parsippany, HLM Assocs. 201-263-1535
NY De Ruyter, R. P. Kennedy Co. Inc. 315-682-2299
NY Northport, HLM Assocs. 516-757-1606
NY Ravena, R. P. Kennedy Co. Inc. 914-876-2700
NY Rochester, R. P. Kennedy Co., Inc. 716-271-6322
NC Cary, Montgomery Mktg. 919-467-6319
Ohio Dayton, J. C. Hofstetter Co. 513-296-1010
Ohio Medina, J. C. Hofstetter Co. 216-241-4880
Pa Huntingdon Valley, Knowles Assocs. 215-947-5641
Tex Dallas, Erickson Sls. 214-243-6611
Tex Sugarland, Erickson Sls. 713-494-9680
Wash Seattle, Northmar 206-524-5171

REGENCY ELECTRONICS, INC., Dept. EM, 7707 Records St., Indianapolis, Ind. 46226, Tel: 317-545-4281; Empl.: 450

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Cal Newport Beach, Roman Mktg 714-540-2270
Fla Tampa, Jack Cameron 813-885-2150
Ga Atlanta, B. Bowlin 404-428-6197
Iowa Des Moines, J.D. Irvine Assoc. .. 515-225-7900
Md Timonium, Tesco, Inc. 301-252-5610
Mass Cohasset, Montague Assocs., Inc. 617-383-0634
Mich Southfield, R. Milsk Co. 313-354-3310
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Minn Minneapolis, R.J. Inc. 612-922-1425
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Tex Dallas, W. Reese & Assoc. 214-638-6575
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NJ Boonton, RFL Inds., Inc. 201-334-3100
NJ Westfield, E.R. Mertz, Inc. 201-232-4643
NY Elbridge, L-Tron Corp. 315-689-3787
NY Latham, L-Tron Corp. 518-785-5032
NY Newark, L-Tron Corp. 607-724-7442
NY Scottsville, L-Tron Corp. 716-436-4410
Ohio Cleveland, Jim Finnegan & Co .. 216-238-5905
Ore Beaverton, Instrumentation/Control Sys., Inc. 503-643-1631
Pa Valley Forge, Gil-Tronics, Inc. ... 215-933-8525
Tex Dallas, Economy Gauge & Instrument Supply 214-243-8370
Tex Houston, Economy Gauge & Instrument Supply 713-688-4494

Local Distributors
Ala Mobile, Brownell Electro 205-479-5405
Cal Glendale, IFM, Inc. 213-246-7261
Cal Mountain View, IFM, Inc. 415-961-2828
Conn Waterbury, Suburban Supply 203-757-1251
Ga Atlanta, Brownell Electro 404-762-5181
Ill Rockford, MD Distributing 815-965-7100
Ind Indianapolis, Rockwell Engrg. 417-251-9453
Mass Boston, Sager Electrical 617-542-2281
Mass Burlington, Instrs./Div of Mancib 617-272-9450
Mass Cambridge, Brownell Electro 617-864-7500
Mich Farmington, C,M,&P Distrs. 313-477-7700
Minn Minneapolis, Waytek, Inc. 612-933-2133
NJ Fairlawn, Relay Specialties 201-797-3313
NJ S. Plainfield, Brownell Electro 201-753-4600
NY Clarence, Trott Elctrns. 716-634-8500
NY New York, Brownell Electro 212-924-6000
NC Charlotte, Brownell Electro 704-394-4341
NC Charlotte, Process Control Parts 704-523-0327
Ohio Cleveland, CMP Distributor Co... 216-333-5650
Ohio Dayton, CMP Distributor Co. 513-278-5873
Pa Monroeville, CMP Distributor Co. 412-372-4415
Pa Philadelphia, Brownell Electro 215-632-3030
Tenn Memphis, Brownell Electro 901-332-9254
Tenn Nashville, Brownell Electro 615-889-8230
Tex Dallas, Economy Gauge & Inst. Supply 214-243-8370
Tex Houston, Economy Gauge & Instrument Supply 713-688-4494

RHG ELCTRNS. LAB., Dept. EM, 161 E. Industry Ct., Deer Park, N.Y. 11729, Tel: 516-242-1100, TWX: 510-227-6083; FSC No.: 15286; Empl.: 90

Sales Manager: S. Wolin

Local Sales Offices & Reps.
Ala Huntsville, Gentry Assocs. 205-534-9771
Ariz Scottsdale, Territorial Mktg 602-994-8665
Cal Los Altos, Cain-White & Co. 415-948-6533
Cal Los Angeles, Thorson Co. 213-937-0790
Cal San Diego, Thorson Co. 714-298-8385
Cal Tustin, Thorson Co. 714-544-5121
Colo Boulder, Herb Bass Assoc. 303-499-7509
Fla Orlando, Gentry Assocs. 305-894-4401
Ga Atlanta, Gentry Assoc. 404-455-1206
Md Annapolis, Hayden Assocs. 202-296-6059
Mass Reading, Geder Assocs. 617-944-3105
NM Albuquerque, IMEC Co. 505-883-9010
NY New Hartford, KLM Assocs. 315-736-5466
NY N. Syracuse, KLM Assocs. 315-458-6214
NY Rochester, KLM Assocs. 716-442-0820
NY Tuckahoe, Spectrum Sls. 914-793-1660
NC Burlington, Gentry Assocs. 919-227-3639
Pa Newtown Square, SWR Assocs. 215-356-8550
Tex Dallas, Cain & Co., Inc. 214-233-6809

RHINO SALES CORP, Dept. EM, Box 367, 620 Andrews Ave, Kewanee, Ill. 61443, Tel: 309-853-4461

Sales Manager: B. B. Martin

Local Sales Offices & Reps.
Cal Placentia, R. S. Ebbert Co. 714-630-7733
Colo Denver, Win Wedge 303-426-1667
Fla Largo, Superior Mfg. Co. 813-596-8303
Ill Willow Springs, Chicago Vibrator Prod 312-839-9600
Iowa Waterloo, Ald Corp. 319-232-8009
Me Portland, D.R. Perkins Co. 207-773-3866
Md Baltimore, T.N. Evans & Assoc. 301-747-3994
Minn Minneapolis, Paul Ohlin Sales 612-929-6924
Mo Butler, Hok Sales Co. 816-679-5787
NY Buffalo, W.U. Townsend 716-834-6556
Va Arlington, Wm. E. Summerbell Co. 703-979-4800

RICHARD-LEE CO., Dept. EM, Box 724, New Providence, N.J. 07974, Tel: 201-276-0710; Empl.: 8

Local Sales Offices & Reps.
Ore Portland, Topp Engineering Sls. Corp. 503-244-6265
Wash Bellevue, Topp Engineering Sls. Corp. 206-747-5400

RIL ELCTRNS., INC., Dept. EM, 1105 Ind'l. Hwy., Southampton, Pa. 18966, Tel: 215-EL 5-1361; Empl.: 25

RIPLEY CO., INC., Dept. EM, 46 Nooks Hill Road, Cromwell, Conn. 06416, Tel: 203-635-2200; Empl.: 120

Sales Manager: R.S. Clark

Local Sales Offices & Reps.
Cal Mountain View, Connolly & Co... 415-967-6988
Cal Tustin, Sierra Pacific Eng. Co 714-731-3411
Ill Chicago, Booth & Assoc. 312-237-7910
Mass Framingham, Sullivan Technical Sls. 617-620-0195
Mo Clayton, Mertens Co. 314-721-0058
NY Great Neck, F. Tylinski Co. 516-466-9070
NY Syracuse, C.W. Floring & Assoc 315-478-2149
Ohio Cleveland, Scott Electronics, Inc. 216-291-2600
Wisc Milwaukee, Bert Wartchow Assoc 414-961-2650
Exp: Cheshire, Techmark Corp 203-272-3559

R L C ELCTRNS., INC., Dept. EM, 83 Radio Cir., Mt. Kisco, N.Y. 10549, Tel: 914-241-1334; FSC No.: 12598; Empl.: 50

Sales Manager: P.H. Wright

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Cal Cupertino, Dura Elctrn. Sls. 408-255-2084
Cal Los Angeles, Midwin & Olifson .. 213-475-8568
Conn Norwalk, Nemarco Assocs. 203-853-2618
DC Washington, M. Lader Co. 202-296-2497
Kans Wichita, Carbiener Assocs. 316-682-5782
Mass Lexington, Lancer Assoc. 617-861-1720
NY Mt. Kisco, RLC 914-241-1334
Pa Lafayette Hill, M. Lader Co. 215-825-3177
Tex Richardson, Vector Sls. 214-234-4291
Va Woodbridge, M. Lader Company 703-494-4731
Wash Seattle, Datacom 206-285-2525

RO ASSOCS., Dept. EM, 3705 Haven Ave., Menlo Park, Cal. 94025, Tel: 415-322-5321, TWX: 910-378-5929; Empl.: 75 ..... p. 3314

Sales Manager: R.D. Okada

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Ala Huntsville, Col-Ins-Co 205-881-9512
Ariz Phoenix, Eltron 602-997-1042
Cal Los Angeles, Powerhouse 714-830-5666
Cal San Diego, Mesa 714-278-8021
Cal San Francisco, Amasco 408-733-8690
Colo Denver, Fry Gates 303-756-9886
Conn Hamden, J&J Assoc. 203-624-7800
DC Wash., G. Fryling 703-527-3262
Fla Orlando, Colinsco 305-423-7615
Fla St. Petersberg, Col-Ins-Co 813-581-8233
Ga Atlanta, Col-Ins-Co 404-299-2138
Ill Chicago, Mar-Con 312-675-6450
Kans Shawnee Mission, Midtec 913-441-6565
La Baton Rouge, Col-Ins-Co 504-292-1755
Md Baltimore, Gans-Fryling 301-837-6311
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Minn Minneapolis, R-J Inc. 612-922-1425
Mo St Louis, Midtec 314-837-5200
NJ Englewood Cliffs, Power Conversion & Cont 201-569-0015
NM Albuquerque, Fry-Gates Co. 505-298-1875
NC Winston Salem, Col-Ins-Co 919-748-0297

Ohio Cleveland, A.H. Baier Co. 216-461-6161
Ohio Dayton, A.H. Baier Co. 513-276-4128
Ore Portland, CK Shanks..... 503-292-5656
Tex Dallas, Cunningham Co 214-233-4303
Tex Houston, Cunningham Co..... 713-461-4197
Utah Salt Lake City, Fry Gates..... 801-272-3641
Wash Seattle, C.K. Shanks..... 206-632-4290

ROBERTSHAW CONTROLS CO., Dept. EM, 3705 Marlane Dr, Grove City, Ohio 43123, Tel: 614-875-2351, TWX: 810-335-2560; Empl.: 500

ROBERTSHAW CONTROLS CO., Ind'l. Instr. Div., Dept. EM, 1910 Byrd Ave Ste 200, Richmond, Va. 23230; Tel: 804-282-5684, TWX: 710-956-0121

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Ala Birmingham, J.W. Eshelman 205-879-3462
Ark Little Rock, Tag Inc. 501-565-7770
Cal Anaheim, Robertshaw Controls.. 213-860-2491
Cal San Diego, G. L. Parkhurst Co... 714-232-0721
Cal So. San Francisco, Robertshaw Controls 415-871-7767
Cal Taft, Oilfield Controls, Inc. 805-763-1561
Colo Denver, Peterson Co. 303-388-6322
Conn Hamden, Pond Tech. 203-288-6278
Haw Kailau, Oahu, CBC, Inc. 808-262-6561
Ill Elk Grove Village, Robertshaw .. 312-437-6060
Ind Indianapolis, Process Controls Co. 317-846-4775
Iowa Clinton, H. G. Klug, Inc. 319-243-3642
Ky Louisville, Control Prods. Co..... 502-367-6421
La Baton Rouge, Control Sys. Consultants 504-924-1227
Mass Boston, Robertshaw Controls Co.617-747-8432
Mich Detroit, G. R. Peters Assoc..... 313-546-1166
Mich Portage, G. R. Peters Assoc..... 616-327-8390
Minn Minneapolis, Northwest Power Equip. 612-646-7904
Mo Kansas City, Power Specialties.. 816-531-6550
Mo St. Louis, C. F. Gast Co. 314-993-2870
Mont Billings, Industrial Sys. 406-252-6671
Neb Omaha, H. G. Klug Co. 402-553-1377
NY Buffalo, Nickles Engrg. Co. 716-773-5399
NY Liverpool, Nickles Engrg. Co..... 315-457-8224
NY New York, Buck Sls. 201-322-8747
NY Rochester, Nickles Engrg. Co..... 716-586-4988
NC Charlotte, BGV Inc. 704-376-8551
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Ohio Cleveland, E. J. Hodan & Assoc. 216-331-9344
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Tenn Knoxville, Robertshaw Controls.. 615-546-0550
Tex Dallas, Controls Intl. Co..... 214-233-9397
Tex Houston, Robertshaw Controls .. 713-498-0500
Tex Odessa, The Barnco Co. 915-332-0293
Utah Salt Lake City, Peterson Co. 801-487-5621
Wash Richmond, Robertshaw Controls 804-358-2301
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Wash Spokane, A. Forsyth 509-326-2700
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Wisc Milwaukee, Allen Engrg. 414-353-5070
Wyo Casper, Moltec..... 307-234-5309
Exp: Richmond, Va., Robertshaw Controls Intl. Mktg. 804-282-9561

ROBICON CORP., Dept. EM, Plus Ind'l. Pk., Pittsburgh, Pa. 15239, Tel: 412-327-7000, Telex: 812-441; Empl.: 225

Local Sales Offices & Reps.
Cal Santa Clara, Thomas Assoc..... 408-247-1252
Colo Pine, Jim Fortuin Inc 303-674-5398
Conn Durham, Marr Electric..... 203-349-9691
Conn Wilton, James H. Burnett Co. 203-762-8862
Ga Atlanta, Hal Homer Assts. 404-255-8669
Ill Park Ridge, Thermo/Cense..... 312-792-2760
Mich Southfield, Harris-Blancett & Assoc. 313-352-9505
Minn St. Paul, Century Controls 614-454-7710
Mo St. Louis, Power-Motion 314-966-0400
NJ S. Orange, Smith Co. 201-763-1770
NY Boston, Markle Co. 716-649-7700
NY Central Valley, Trautmann Assoc 914-928-6333
NY Pittsford, Magna Sales 716-586-8748
NC Charlotte, Southern Electric..... 704-527-5266
Ohio Chagrin Falls, Energy Sys..... 216-247-3436
Ohio Cleveland, PSI Sls. 216-526-5260
Pa Pittsburgh, J & B Sales 412-941-4598
Pa West Chester, Becker Eng. 215-431-4411
RI Ashaway, EMS..... 401-377-4007
Tex Dallas, RC Brown Co 214-350-2371
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Colo Westminster, Electro-Tek Sls., Inc. 303-255-4566
Fla Tampa, Repelect 813-227-5051
Ga Atlanta, Cavendish Sls. Co. 404-394-2642
Haw Honolulu, Gene Piety Factors, Inc. 808-839-9059
Iowa Des Moines, KSW Assocs..... 515-279-9235
Md Baltimore, David Bros. Co..... 301-764-7189
Minn Minneapolis, John E.M. Anderson Co. 612-823-6459
Mo Kansas City, KSW Assocs. 816-363-5651
Neb Omaha, KSW Assocs.
NJ Ridgefield, Bl State Marketers..... 201-943-5888
NY Phelps, LSM Assocs. 315-548-4891
Ohio Columbus, Mandabach Assocs. 614-235-0265
Ore Portland, R. Minthorne 503-246-4556

ROBINS IND'S. CORP., Consumer Products Div., Dept. EM, 75 Austin Blvd., Commack, N.Y. 11725, Tel: 516-543-5200; Empl.: 125

Sales Manager: C. Condike

Local Sales Offices & Reps.
Ala Birmingham, J. Russell Sls. Co. 205-822-2196
Cal N. Hollywood, GDS Mktg 213-877-8191
Cal San Francisco, Olson Sls. 415-573-1600
Colo Westminster, Electro-Tek Sls. 303-529-3070
Fla Tampa, Wallace Elctrn Sls..... 813-961-1037
Haw Honolulu, Lee Gaber Co. 808-839-9039
Ill Chicago, R. R. Hutmacher Assoc. 312-631-3248
Ind Indianapolis, Kimberly Sls..... 317-271-8571
Md Balt., D. H. Brothers Co..... 301-764-7189
Mass Milton, Cowan Assocs. 617-696-0391
Mich Livonia, Harvey Sls 313-476-1974
Minn St. Paul, SKOR 612-645-6461
Mo Kansas City, Forristal Young Sls. 816-358-6771
Mo St. Louis, Forristal Young Sls. 314-645-2360
Neb Omaha, Forristal Young Sls. 402-393-6344
NY Flushing, Bettan Sls. 212-969-7600
NY Latham, L S M Assocs. 518-783-5606
NY Phelps, L S M Assocs. 315-548-4891
Ore Portland, R. Minthorne Co..... 503-246-4556
Pa Newtown Square, G. Conneen Co. 215-353-2241
SC Greenville, H. C. Norman Sls. 803-244-6254
Tex Dallas, Campion Sls..... 214-238-8145
Exp: N.Y., Plainview, Morhan Sls. 516-293-5582

ROBINSON-HALPERN CO., Dept. EM, One Apolio Rd., Plymouth Meeting, Pa. 19462, Tel: 215-825-9200, TWX: 510-660-8637

Sales Manager: C.H. Bach

Local Sales Offices & Reps.
Ala Huntsville, Burnette Techno-Metric 205-837-5860
Ariz Scottsdale, J. T. Aldrich Co. 602-945-8598
Cal Costa Mesa, Robinson Tech. Assoc. 714-557-1622
Cal Palo Alto, A. Barauck Co. 415-327-7711
Fla Maitland, W. H. Boggs 305-647-2226
Ill Fox Lake, W. M. Warlin 312-587-1456
Mich Troy, G. R. Peters Assoc. 313-362-1220
Minn St. Paul, Synergic Engrg. Corp. 612-941-8906
NJ Bogota, Neville & Vespo Corp. .. 201-487-1505
NY Williamsville, M. Bennett Assoc. 716-634-2107
Pa Radnor, Roberts Engrg. Sls. 215-688-6525
Tex Richardson, Scientific Sls. Co..... 214-231-6541
Wash Bellevue, McLaren..... 206-454-3400

ROBISON ELCTRNS., Dept. EM, 3580 Sacramento Dr., San Luis Obispo, Cal. 93401, Tel: 805-544-8000; FSC No.: 19080; Empl.: 90

ROBYN INTERNATIONAL INC., Dept. EM, Box 478 10901 Northland Dr., Rockford, Mich 49341, Tel: 616-866-1557, Telex: 22-6393

Sales Manager: A. E. Taylor

Local Sales Offices & Reps.
Ariz Glendale, Samplin Sls Co 602-938-8643
Cal North Ridge, Irv Fenton Assoc .. 213-363-0971
Ga Savannah, Len Sherman Assocs 912-925-3660
Ill Carlinville, Harold Burger 217-854-2456
Ill Chicago, Lassers & Co..... 312-539-0170
Ind Huntington, Robert Hoke 219-356-1555
Kans Wichita, Ricke Reps 316-942-8277
Mass Framingham, New England Assocs 617-877-4625
Mich Sparta, Charles Easton 616-887-9249
Minn Hopkins, Stan Grodnik Sls..... 612-938-4577
NJ Riverton, Given Assocs..... 609-829-7249
NC Norwood, Gary Thompson 704-474-3465
Ore Eugene, Betty & Don Hayes Entprs 503-485-3416
Pa Dravosburg, Jack Scurle 412-466-0973
Tex Dallas, Port Lemley & Assocs.... 214-350-6482
Tex Houston, Port Lemley & Assocs 713-466-8393

ROCHESTER INSTR SYSTEM, Dept. EM, 255 N. Union St., Rochester, N.Y. 14605, Tel: 716-325-5120, Telex: 978457

Sales Manager: C. H. Clarridge

Local Sales Offices & Reps.
Ala Birmingham, Control Specialists 205-871-9678
Alas Kenai, Industrial Instr Svc..... 907-283-4230
Ariz Phoenix, Utility Products..... 602-959-3455
Ark Little Rock, Jack Tyler Engrg 501-562-2296
Cal Hayward, Rochester Instr Sys.... 415-886-3533
Cal Oakland, Sabre Controls 415-444-0635
Cal Torrance, Rochester Instr Sys.... 213-540-7760
Colo Littleton, Utility Products..... 303-795-1955
Conn Waterbury, Carl Lueders & Co... 203-755-0400
Fla Lorida, Vickers Sales 813-655-1432
Ga Hampton, Rochester Instr Sys.... 404-292-2050
Ill Chicago, United Energy Sys..... 312-631-0255
Ill Glen Ellyn, Rochester Instr Sys 312-469-7166
Ind Indianapolis, A.B. Young Co. 317-255-5416
Kans Lenexa, Matney & Co. 913-888-6900
La Baton Rouge, Rochester Instr Sys. 504-387-6594
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Mich Detroit, Kilo Systems..... 313-537-2069
Mich Grandville, Rochester Instr Sys.. 616-534-0421
Minn Bloomington, Rochester Instr Sys162-854-5358
Mo St. Louis, Promac 314-966-8250
Neb Boys Town, Utility Products 402-895-9221
NJ Hillsdale, CB Assocs..... 201-664-6230
NJ Woodbridge, Rochester Instr Sys 201-636-3833
NY Grand Island, Davco Systems 716-773-6600
NY Rochester, Rochester Instr Sys.. 716-325-5120
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Pa Devon, Rochester Instr Sys 215-687-1790
Tex Houston, Rochester Instr Sys 713-623-4960
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Wash Tacoma, Rochester Instr Sys 206-572-4284
WVa Charleston, Sakff Engrg 304-925-1143

ROCKLAND INSULATED WIRE & CABLE, Dept EM, 87 Broadway, Haverstraw, N.Y. 10927, Tel 914-429-3103; FSC No.: 12111

Local Sales Offices & Reps.
Cal Los Angeles, Bucky Harris Co. .. 213-973-2345

ROCKLAND SYS. CORP., Dept. EM, 230 W. Nyack Rd., W. Nyack, N.Y. 10994, Tel: 914-623-6666, TWX 710-575-2631; Empl.: 80 ..... p. 2804-2806

Local Sales Offices & Reps.
Ariz Phoenix, Cleveland Entprs. 602-944-4675
Cal San Jose, Beckrep 408-268-3205
Cal So. Pasadena, Beckrep 213-799-9586
Colo Aurora, Cleveland Entprs. 303-751-3253
Conn Hamden, Instrument Conslts..... 203-288-5240
Fla Orlando, Truex Assocs. 305-859-2165
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Ill Chicago, EIA..... 312-271-3770
Ind Indianapolis, EIA..... 317-257-7230
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Md Rockville, Mesa 301-881-8430
Mass Newton, Instrument Conslts. 617-969-9880
Mich S. Lyons, Infinity, Inc. 313-437-2700
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NY Buffalo, Labtronics, Inc. 800-962-5700
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Tex Austin, Data Mktg. Assocs. 512-451-5174
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ROCKWELL INT'L., Microelectronic Devices, Dept. EM, Box 3669, 3310 Miraloma Ave., Anaheim, Cal. 92803, Tel: 714-632-3729, TWX: 910-591-1654; FSC No.: 34576; Empl.: 1995

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Cal Los Angeles, Q.T. Wiles & Assocs. 213-478-0183
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Kans Prairie Village, J.G. Twist Co. ... 913-236-4646
Kans Wichita, J.G. Twist Co. 316-686-6685
Ky Louisville, R.O. Whitesell & Assocs. 502-897-1569
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Mich Grand Rapids, R.O. Whitesell & Assocs. 616-942-5420
Mich Southfield, R.O. Whitesell & Assocs. 313-559-5454
Mich St. Joseph, R.O. Whitesell & Assocs. 616-983-7337
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Wisc Wauwatosa, J.G. Twist Co. 414-475-7755

RODAN INDS., see Ametek/Rodan Div.

ROGAN CORP., Dept. EM, 3455 Woodhead Dr., Northbrook, Ill. 60062, Tel: 312-498-2300, TWX: 910-686-0008; Empl.: 85

Sales Manager: E. Rogan

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Cal Torrance, O'Donnell Assocs. 213-323-9243
Colo Arvada, Arrowhead Sls. 303-423-5556
Conn North Haven, Comp Rep Assocs. 203-239-9762
Fla Fort Lauderdale, Electro Comp.. 305-564-8571
Haw Hanalei, TJR Sls. Co.
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Mich Grand Rapids, Montgomery Assocs. 616-774-9308
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NY Jamaica, S-J Assocs. 212-291-3232
Ohio Dayton, J.C. Hofstetter Co. 513-298-0662
Ohio Medina, J.C. Hofstetter Co. 216-241-4880
Tex Dallas, W. Reese Assocs. 214-638-6575
Tex Houston, W. Reese Assocs. 713-621-3134
Utah Salt Lake City, Arrowhead Sls... 801-487-3444
Wash Bellevue, SD-R2 Sls..... 206-747-9424

Local Distributors
Cal Palo Alto, O'Donnell Assocs..... 415-327-9260
Cal Torrance, O'Donnell Assocs. 213-323-9243
Mass Newton, Greene-Shaw Co. 617-969-8900
Mich Livonia, RS Elctrns. 313-525-1155
NJ Pitman, Colrud Co. 609-589-5866
NY Jamaica, Archer Indl Distrib 212-291-3232
Tex Richardson, Southwest Elctrns .. 214-234-3050
Tex Stafford, Southwest Electronics 713-494-6021
For: Can., Mississauga, Ont, Munro Elctrn Comps 416-676-1042

ROGERS CORP., Dept. EM, Rogers, Conn. 06263, Tel: 203-774-9605, TWX: 710-448-0047; Empl.: 1600

Local Sales Offices & Reps.
Ariz Tempe, M. Iosue 602-839-5478
Cal Glendale, Orion Sls. 213-240-3151
Cal Orange, F. R. Fahland 714-998-2580
Cal San Jose, G.W. Spak 408-268-7555
Cal Sunnyvale, Trident Assocs. 415-734-5900
Cal Woodland Hills, A. W. Riel 213-347-7435
Colo Littleton, G. B. Lange 303-795-3600
Conn Danielson, R.F. Robinson 203-774-9061
Conn Essex, D. Dewey, Jr. 203-767-1118
Conn Woodstock Valley, E.A. Neumann 617-332-1285
Fla Plantation, Gallagher & Assocs.. 305-792-9218
Ga Stone Mountain, P.A. Taparauskas 404-938-3400
Ill Edwardsville, W. T. Davison..... 618-288-7786
Ill Hazel Crest, J. R. Menees..... 312-798-5800
Ill Palatine, R.T. Woelfel 312-359-8286
Mich Onsted, B. Widegren..... 517-467-4163
Mich Rochester, Kent & Assocs. 313-651-1890
Minn Coon Rapids, G.S. Jordan 612-757-1496
Minn Fridley, H. R. Crowder 612-560-1340
NJ Springfield, S. Wellen 201-944-7777
NM Albuquerque, Tritronix..... 505-265-0172
NY Pittsford, P. R. Pratt 716-461-1167
NY Saugerties, W.C. Schunmann 914-471-4707
Ohio Xenia, J. Link Forte 513-426-8993
Pa Exton, R.P. Jansen
Pa Sharon, H. A. Harriman 412-347-3129
Tex Richardson, Air-Quip Sales 214-234-3285
Va Reston, Boyle Assoc. 703-620-9558
Va Roanoke, J. L. Settles 703-342-3120
Wash Mercer Island, Tritronix, NW 206-232-4993

R-OHM CORP, Dept. EM, 16931 Milliken Ave, POB 4455, Irvine, Cal. 92716, Tel: 714-546-7750, TWX: 910-595-1721 ..... p. 3742

Sales Manager: B. Fletemeyer

Local Sales Offices & Reps.
Ala Huntsville, Electro-Mech 205-883-9624
Ariz Scottsdale, Mercury Engrg Sls .. 602-949-5054
Cal El Segundo, Varigon Assocs 213-322-1120
Cal Mountain View, Caltron Comps.. 415-964-3244
Cal San Diego, Jack Compere Sls .. 714-271-1840
Colo Denver, B5 303-426-0222
Fla Hollywood, "C" Assocs 305-922-5230
Ga Atlanta, Electro-Mech 404-449-6337
Ill Chicago, M & S Sls..... 312-992-1053
Ill Schaumburg, R-OHM 312-843-0404
Ind Frankfort, C-S Elctrn Sls 317-659-1874
Md Baltimore, Comp Sls 301-484-3647
Mass Burlington, Contact Sls..... 617-273-1520
Mich Southfield, J. L. Montgomery Assocs 313-358-2616
Minn Edina, Mel Foster Tech Sls 612-835-2552
Mo Hazelwood, Dy-Tronix..... 314-731-5799
NJ Teaneck, R. T. Reid Assocs 201-692-0200
NY Buffalo, Jack Mc Donough Assocs 716-839-2044
NC Raleigh, Comp Sls..... 919-782-8433
Ohio Dayton, KW Elctrn Sls 513-890-2150
Okla Tulsa, Hugh J. Daly Co 918-627-4159
Ore Portland, Comps West 503-643-5588
Pa Narberth, Jerry Bresson Assocs 215-839-6770
Tenn Nashville, Electro-Mech 615-256-2516
Tex Dallas, Mycrosystems Marketing 214-238-7157
Utah W. Bountiful, B5 801-292-8991
Wash Seattle, Comps West 206-243-2133

Local Distributors
Ariz Phoenix, Weatherford 602-272-7144
Ariz Phoenix, Mirco Elctrns 602-997-5931
Ariz Phoenix, Kachina 602-269-6201
Cal Gardena, Bell Elctrns 213-515-1800
Cal Glendale, Weatherford 213-849-3451
Cal Los Angeles, Western Electromotive/Shephard 213-820-3777
Cal San Diego, Weatherford..... 714-278-7400
Cal San Diego, Laurelco 714-271-1121
Cal Sunnyvale, Bell Elctrns..... 408-734-8570
Colo Denver, Weatherford..... 303-761-5432
Colo Denver, Integrated Elctrns 303-534-6121
Fla Tampa, Lykes Elctrns 813-886-6646
Ill Chicago, RM Bodell 312-323-9670
Ind South Bend, Radio Distributing .. 219-287-2911
Iowa Cedar Rapids, Iowa Tech Supply 319-377-5795
Kans Wichita, Radio Supply..... 316-267-5213
Md Baltimore, RESCO..... 301-823-0700
Mass Burlington, RC Components..... 617-273-1860
Mich Farmington, CMP..... 313-477-7700
Mich Grand Rapids, RM Electronics .. 616-531-9300
Minn Edina, Cassidy Elctrns 612-835-7744
Mo St. Louis, Olive Indl Elctrns 314-863-7800
NY Buffalo, Summit Distributors..... 716-884-3450
NY Farmingdale, Harrison Radio 516-293-7990
NY Rome, Rome Elctrns..... 315-337-5400
NC Raleigh, RESCO 919-832-2077
Ohio Cincinnati, Sheridan..... 513-761-5432
Ohio Dayton, Sheridan..... 513-223-3332
Okla Tulsa, Cybernetics..... 918-627-4159
Tex Dallas, Quality Comps 214-387-4949
Tex Dallas, Weatherford 214-243-1571
Tex Houston, Weatherford..... 713-688-7406
Wash Bellevue, Bell Industries 206-747-1515
Wash Seattle, Weatherford..... 206-243-6340

ROHN MFG., DIV. UNARCO INDS., See Unarco-Rohn, Div. Unarco Inds. Inc.

ROL-A-CHART DIV., Wm. A. Steward Co., Dept. EM, Box 367, Diamond Springs, Cal. 95619, Tel: 916-622-2437; Empl.: 8

ROLA CO., Div. Pemcor, Inc., Dept. EM, 21010 Miles Pkwy., Cleveland, Ohio 44128, Tel: 216-475-9200, TWX: 810-422-228; Empl.: 600

ROMARNETICS, INC., Dept. EM, 18811 Napa, Northridge, Cal. 91324, Tel: 213-886-1812; Empl.: 15

RONOR SYSTEMS, Dept. EM, Box 80, 145 N. Plains Ind. Park Rd., Wallingford, Conn. 06492, Tel: 203-265-2110; Empl.: 12

ROSEMOUNT INC., Dept. EM, Box 35129, Minneapolis, Minn. 55435, Tel: 612-941-5560; Empl.: 1300

Local Sales Offices & Reps.
Cal Bellflower, Rosemount Inc..... 213-866-8224
Cal Chatsworth, Rosemount Inc. 213-341-3944
Cal San Diego, Rosemount Inc. 714-565-9133
Cal San Jose, Rosemount Inc. 408-269-7550
Colo Boulder, Rosemount Inc. 303-447-9231
Ga Atlanta, Rosemount Inc. 404-256-4806
Ill Chicago, Rosemount Inc. 312-963-0750
La Baton Rouge, Rosemount Inc..... 504-926-8916
Mass Boston, Rosemount Inc. 617-861-0750
Mich Detroit, Rosemount Inc. 313-626-0900
Minn Minneapolis, Arjay Sls. Inc. 612-925-1833
Mo St. Louis, Rosemount Inc..... 314-731-6881
NJ Englewood, Rosemount Inc..... 201-568-6366
NC Charlotte, Rosemount Inc. 704-333-1271
Ohio Cleveland, Rosemount Inc. 216-777-3961
Ohio Dayton, Rosemount Inc. 513-433-6383
Pa Philadelphia, Rosemount Inc..... 215-353-3344
Tex Dallas, Rosemount Inc..... 817-267-3514
Tex Houston, Rosemount Inc. 713-664-8891
Va Richmond, Rosemount Inc..... 804-285-3424
Wash Seattle, Rosemount Inc. 206-747-4900

ROSENTHAL METCERAM CORP, Dept. EM, Huntington Industrial Pk., Providence, R.I. 02907, Tel: 401-943-2200, Telex: 92-7718; Empl.: 300

Local Sales Offices & Reps.
Tex Lewisville..... 214-436-7611

ROSS ENGINEERING CORP., Dept. EM, 559 Westchester Dr., Campbell, Cal. 95008, Tel: 408-377-4621; FSC No.: 23598; Empl.: 40 .... p. 3609

Sales Manager: Hugh C. Ross

Local Sales Offices & Reps.
Cal Mt. View, Energy Devices 415-969-0330
NY Cazenovia, P. DeCew Agency.... 315-655-8602
Wisc Waukesha, Tom Berenson Elec. 414-544-5725

Local Distributors
Md Baltimore, Aerospace Elctrns. Corp.

ROSTONE CORP., Dept. EM, 2781 S. Concord Rd., Lafayette, Ind. 47902, Tel: 317-474-2421, TWX: 810-342-1887; Empl.: 600

Sales Manager: L. Van Camp

ROTATING COMPS DIV, See Aeroflex Labs, Magnetic Prods Div

ROTRON, INC., Dept. EM, Hasbrouck La., Woodstock, N.Y. 12498, Tel: 914-679-2401, TWX: 510-247-9033; Empl.: 871 ..... p. 2600-2605

Sales Manager: P. C. Faxon; *Distributor Manager:* F. P. Casdia

Local Sales Offices & Reps.

Ala Huntsville, 20th Century Mktg. Inc. 205-772-9237
Ariz Phoenix, Shefler-Kahn 602-257-9015
Cal Garden Grove, Rotron District Sls. Office 714-898-5649
Cal Los Altos, Rotron Inc. 415-948-6800
Colo Broomfield, Rotron Inc. 303-469-1710
Fla Orlando, G. Bohman 305-295-5760
Haw Honolulu, R. Clark 808-531-5897
Ill Chicago, Mid West Elctrn. Sls. .. 312-777-9700
Ind Monrovia, MidWest Elctrn. Sls. .. 371-996-2725
Iowa Cedar Rapids, Midwest Elctrn. Sls. 319-393-1845
Kans Raytown, CenTech Inc. 816-358-8100
Mass Lexington, Circuit Sls. 617-861-0567
Mich Farmington, W.R. Hummon & Assoc. 313-474-0661
Minn Mendota Heights, G-11 Sales 612-454-3086
Mo Earth City, CenTech, Inc. 314-291-4230
Mo Raytown, Cen Tech, Inc. 816-358-8100
Mo Raytown, Cen Tech, Inc. 816-358-8100
NJ Springfield, F. Sylvester 201-376-3324
NM Albuquerque, Shefler-Kahn 505-296-0749
NY Woodstock, Rotron Inc. 914-679-2401
NC Charlotte, Over & Over 704-527-3070
Ohio Cincinnati, F. J. Campisano 513-574-7111
Ohio Cleveland, Comp., Inc. 216-243-9200
Okla Okla Cy, Ammon & Rizos 405-373-2748
Pa King of Prussia, C.A. Brenneman 215-337-3190
Tenn Greenville, 20th Century Mktg. Inc. 615-638-4021
Tex Dallas, Ammon & Rizos 214-233-5591
Tex Houston, Ammon & Rizos 713-781-6240
Wash Seattle, Blum & Assocs. 206-285-2590
Wisc Milwaukee, Midwest Elctrn. Sls. 414-645-3680
Exp: N.Y., NY, A. Auriema 212-466-2500

Local Distributors

Ala Huntsville, Hall-Mark Elctrns. 205-837-8700
Ariz Phoenix, Kierulff Elctrns. 602-243-1401
Ariz Phoenix, Cramer/Arizona 602-267-7321
Ariz Phoenix, R.V. Weatherford 602-272-7144
Cal Anaheim, R.V. Weatherford 714-547-0891
Cal Glendale, R.V. Weatherford 213-849-3451
Cal Irvine, Cramer/Los Angeles 213-771-8300
Cal Los Angeles, Kierulff Elctrns. 213-685-5511
Cal Palo Alto, R.V. Weatherford 415-493-5373
Cal Palo Alto, Kierulff Elctrns. 415-968-6292
Cal Pomona, R.V. Weatherford 714-623-1261
Cal San Diego, Cramer/San Diego .. 714-565-1881
Cal San Diego, Kierulff Elctrns. 714-278-2112
Cal San Diego, R.V. Weatherford 714-278-7400
Cal Sunnyvale, Cramer/San Francisco 408-739-3011
Colo Denver, Cramer/Denver 303-758-2100
Colo Denver, Kierulff Elctrns. 303-371-6500
Colo Englewood, R.V. Weatherford 303-761-5432
Conn Hamden, Arrow Elctrns. 203-248-3801
Conn North Haven, Cramer/Connecticut 203-239-5641
Fla Ft. Lauderdale, Arrow Elctrns. 305-776-7790
Fla Ft. Lauderdale, Hall Mark Elctrns. 305-971-9280
Fla Hollywood, Cramer/Ew Hollywood 305-923-8181
Fla Orlando, Hall-Mark Elctrns. 305-855-4020
Fla Orlando, Cramer/Ew Orlando 305-894-1511
Ga Norcross, Cramer/Ew Atlanta 404-448-9050
Ill Elk Grove Village, Kierulff Elctrns. 312-640-0200
Ill Elk Grove Village, Hall Mark Elctrns. Corp. 312-437-8800
Ill Mt. Prospect, Cramer/Chicago .. 312-593-8230
Ind Indianapolis, Pioneer/Indiana 317-849-7300
Kans Shawnee Mission, Hall-Mark Elctrns. 913-888-4747
Md Baltimore, Arrow Elctrns. 301-247-5200
Md Gaithersburg, Cramer/Ew Washington 301-948-0110
Md Gaithersburg, Pioneer/Washington 301-948-0710
Mass Billerica, Kierulff Elctrns. 617-667-8331
Mass Newton, Cramer Elctrns. 617-969-7700
Mass Woburn, Arrow Elctrns. 617-933-8130
Mich Livonia, Pioneer/Michigan 313-525-1800
Mich Livonia, RS Elctrns. 313-525-1155
Minn Bloomington, Arrow Elctrns. 612-835-7811
Minn Edina, Cramer/Minnesota 612-831-2666
Minn Minneapolis, I.C.I. 314-291-5350
Mo Earth City, Hall-Mark Elctrns. 609-424-5930
NJ Cherry Hill, Cramer/Pennsylvania 201-575-6750
NJ Fairfield, Kierulff Elctrns. 201-785-4300
NJ Little Falls, Cramer/New Jersey 609-235-1900
NJ Moorestown, Arrow Elctrns. 609-662-4000
NJ Pennsauken, Resco Elctrns. 201-797-5800
NJ Saddlebrook, Arrow Elctrns. 505-265-5767
NM Alberquerque, Cramer/New Mexico 505-265-5671
NM Alberquerque, R.V. Weatherford 505-293-6161
NM Albuquerque, Electronic Parts Co. 716-884-3450
NY Buffalo, Summit Elctrns 315-437-6671
NY East Syracuse, Cramer/Syracuse 516-694-6800
NY Farmingdale, Arrow Elctrns. 914-896-7530
NY Fishkill, Arrow Elctrns. 516-231-5600
NY Hauppauge, Cramer/Long Island 516-433-5530
NY Hicksville, Kierulff Elctrns 716-275-0300
NY Rochester, Cramer/Rochester .. 919-832-4465
NC Raleigh, Hall-Mark Elctrns. 919-725-8711
NC Winston-Salem, Cramer/Ew Winston-Salem 216-587-3600
Ohio Cleveland, Pioneer/Cleveland 216-248-8400
Ohio Cleveland, Cramer/Cleveland 216-464-2000
Ohio Cleveland, Arrow Elctrns. 513-236-9900
Ohio Dayton, Pioneer/Dayton 513-253-9176
Ohio Kettering, Arrow Elctrns. 918-835-8458
Okla Tulsa, Hall-Mark Elctrns. 609-235-1900
Pa Moorestown, Arrow Elctrns. 412-782-2300
Pa Pittsburgh, Pioneer Standard Elctrns. 214-234-7400
Tex Dallas, Hall-Mark Elctrns. 214-661-9300
Tex Dallas, Cramer/Dallas 214-243-1571
Tex Dallas, R.V. Weatherford 915-779-6647
Tex El Paso, Ideal Industrial Supp 713-781-6100
Tex Houston, Hall-Mark Elctrns. 713-688-7406
Tex Houston, R.V. Weatherford 801-973-6913
Utah Salt Lake City, Kierulff Elctrns. 801-973-6913
Utah Salt Lake City, Kierulff 206-243-6340
Wash Seattle, R.V. Weatherford 206-763-1550
Wash Seattle, Kierulff Elctrns. 206-575-4420
Wash Tukwila, Cramer/Seattle 414-782-2801
Wisc New Berlin, Arrow Elctrns. 514-389-8051
For: Can., Montreal 357, P.Q., Prelco Elctrns., Ltd. 514-878-4771
For: Can., Montreal, Que., Payette Radio 613-237-6150
For: Can., Ottawa, Ont., Prelco Elctrns. Ltd. 416-751-5002
For: Can., Scarborough, Ont., Carsten Elctrns. Ltd. 604-873-3211
For: Can., Vancouver 10, B.C., L.A. Varah 416-494-1666
For: Can., Willowdale, Ont., Electro Sonic Industrial Sales .....

ROWE INDUSTRIES, INC., Dept. EM, 6225 Benore Rd., Toledo, Ohio 43612, Tel: 419-729-9761, TWX: 810-442-1734; Empl.: 80 ..... p. 2098-2100,4653

Sales Manager: D.L. Mang

Local Sales Offices & Reps.

Ala Huntsville, Rowe Enterprize 205-837-3643
Ala Huntsville, Redstone Arsenal 205-881-7049
Ariz Scottsdale, Biedler & Biedler 602-275-5505
Cal Mountain View, V. C. Robinson .. 415-969-4831
Cal Newbury Park, Val C. Robinson 805-529-1331
Cal S. San Francisco, Westarep, Inc. 415-873-8343
Conn Wethersfield, Underwood Sls. Corp. 203-563-3046
Ill Antioch, Tri Delta Sls. 312-395-3980
Md Baltimore, R.A. Wafer Assocs. .. 301-744-1133
Mass Chelmsford, Underwood Sls. Corp. 617-256-8191
NJ Haddonfield, Mills-Brown Assocs. 609-429-1005
NY Melville, Astrorep, Inc. 516-423-2266
NY Rochester, Canavan-Scanlon Assocs. 716-442-0720
NY Syracuse, Canavan-Scanlon Assocs. 315-437-1271
NC Charlotte, Dula Assocs. 704-334-7090
NC Winston-Salem, Dula Assocs. 919-768-7166
Ohio Beachwood, Richardson-Champ Assocs. 216-292-4954
Ohio Cincinnati, Com-Tek Sls. 513-793-3611
Ohio Cleveland, C.J. Voneman Co. 216-333-5500
Ohio Louisville, D.H. Risher & Co. 216-456-5774

RSM SENSITRON SEMICONDUCTOR, DIV. RSM ELECTRON POWER, INC., Dept. EM, 221 W. Industry Ct., Deer Park, N.Y. 11729, Tel: 516-586-7600, Telex: 96-7737; Empl.: 180

Sales Manager: C. Fischer; *Distributor Manager:* H.W. Van Pelt

Local Sales Offices & Reps.

Ariz Phoenix, Vertron 602-943-2932
Cal Lafayette, Phillips Assocs. 415-284-2579
Cal Santa Ana, California Elctrn Mktg 714-835-2702
Fla Pompano Beach, Saber Assoc... 305-943-3076
Ill Elk Grove, R-Tek, Inc. 312-439-9090
Ind Carmel, Rich Elctrn. Mktg. 317-844-8462
Iowa Cedar Rapids, Reid Assocs. 319-362-6302
Mass Waltham, Datcom Inc. 617-891-4600
Minn St. Paul, ArKco Sales 612-777-7454
NM Albuquerque, Technology Mktg Assoc. 505-298-4321
Ohio Dayton, Midwest Marketing Assocs 513-433-2511
Tex Irving, Space Elctrns. Corp. 214-251-3636
Wash Tukwila, General Elctrns. 206-575-4030

R/T LABS., INC., Dept. EM, 4126 Colerain Ave., Cincinnati, Ohio 45223, Tel: 513-681-3444; Empl.: 43

Local Sales Offices & Reps.

Cal Mountain View, Wesloh & Assocs. 415-951-0565
Mass Canton, New England Elctrn. Sls. Corp. 617-828-4835

RTRON CORP., Dept. EM, 7324 Lawndale, Skokie, Ill. 60076, Tel: 312-679-7180; FSC No.: 19130 p. 2638,2639

Sales Manager: R. McLean

Local Sales Offices & Reps.

Ariz Phoenix, Gramer & Co. 602-279-1231
Cal Glendale, GRU Assocs 213-845-8771
Cal Los Gatos, Wedemeyer Sls. 408-378-3883
Cal San Diego, SR Elctrns. 714-455-0300
Conn Orange, NPM Inc. 203-878-4066
Ill Chicago, Rinaldi Inc. 312-763-4848
Mass Franklin, NPM Inc. 617-528-5013
Mich Detroit, R.P. Urban & Assoc. 313-535-2355
Mich Grand Rapids, R.P. Urban & Assoc. 616-245-0511
Minn St. Paul, Cahill Assoc. 612-739-8445
NJ Plainfield, S. Glassman Assoc. .. 201-561-3866
NY Glen Cove, S. Glassman Assoc. 516-676-1039
Ohio Cincinnati, J. Olsen Co. 513-922-2176
Ohio Cleveland, J. Olsen Co. 216-752-5444
Ore Portland, Elctrnc. Comp. Sls. 503-245-2342
Pa Jenkintown, Arnold Assoc. 215-PI 2-0600
Pa Pittsburgh, J. Olsen Co. 412-279-2550
Va Annandale, J. Hopkins Assoc. 703-323-1641

RUSSELL INDS., INC., Dept. EM, 3069 Lawson Blvd., Oceanside, N.Y. 11572, Tel: 516-536-5000

Sales Manager: H. Russell

RYSTL ELECTRONICS CORP., Dept. EM, 328 N.W. 170th St., N. Miami Beach, Fla. 33169, Tel: 305-652-3838, Telex: 51-8842; Empl.: 23

Sales Manager: J. Coster

Local Sales Offices & Reps.

Ala Birmingham, George Powers & Assocs 205-853-8825
Ariz Tempe, Intl Mktg Assocs 602-967-6845
Del Newark, Carmine Assocs 302-731-0697
Fla Miami, Warren Murphy & Assocs 305-558-7622
Ga Douglasville, J. M. Bentley Sls .. 404-949-4846
Mass Dover, Ram Mktg Grp. 617-785-1860
Minn Minneapolis, Heimann Co. 612-861-6051
Mo Jefferson City, Carmine A. Vignola Assocs 314-636-3121
NY New York, Pincus Litman Corp .. 212-685-2020
Ohio Columbus, Mandabach Lehner Co 614-235-1626
Tex Houston, Sidney Katzoff & Assocs 713-666-1636

S & A ELECTRONICS, Div. Scott & Fetzer Co., Dept. EM, 202 W. Florence, Toledo, Ohio 43605, Tel: 419-693-0528; Empl.: 100

SADELCO, INC. , Dept. EM, 299 Park Ave. Weehawken, NJ 07087, Tel: 201-866-0912; Empl.: 38

Sales Manager: M. Brink

SAFEWAY PRODUCTS, Dept. EM, 440 Middlefield St., Middletown, Conn. 06457, Tel: 203-346-6601, TWX: 710-428-7225; Empl.: 241

SAG HARBOR INDS., INC., Dept. EM, Bayview St., Sag Harbor, N.Y. 11963, Tel: 516-725-0440; Empl.: 125

Local Sales Offices & Reps.

Ala	Huntsville, 20th Century Mktg.	205-772-9237
Conn	Kensington, Kenson Co.	203-828-4143
Mich	Grosse Pointe Farms, J.E. Landino Assocs.	313-886-8144

S.A.E.-ALCON DIV, See Nutronics, Inc

SAKI MAGNETICS INC., Dept. EM, 1649 12th St., Santa Monica, Cal. 90404, Tel: 213-451-8611; Empl.: 30

SAMARIUS, INC., Dept. EM, 300 Seymour Ave., Derby, Conn. 06418, Tel: 203-735-7405, TWX: 710-451-2495; Empl.: 50

Local Sales Offices & Reps.

Mass	Waltham, M & S Engineering Sales Co.	617-893-0094

SAMTEC, Dept. EM, 810 Progress Blvd., New Albany, Indiana 47150, Tel: 812-944-6733; FSC No.: 55322; Empl.: 16.

Local Sales Offices & Reps.

Cal	Los Angeles, Ed Landa Co.	213-879-0770
Cal	San Carlos, Kottmeier Assocs.	415-592-8333
Fla	Winter Park, Young & Lawrence	305-647-6929
Ill	Streamwood, Al Holte & Assoc.	312-837-4066
Ind	Indianapolis, Needler Sls	317-255-8056
Mass	Woburn, Belmac Corp.	617-935-6810
Minn	St. Paul, Arkco Sls	612-777-7454
NJ	Verona, C. K. Wall Co., Inc.	201-746-4832
NC	Cary, Montgomery Mktg.	919-467-6319
Ohio	Cleveland, Imtech, Inc.	216-826-3400
Pa	Huntingdon Valley, Inacker Sls. Inc.	215-947-5660
Wash	Redmond, Quadra Sls. Corp.	206-883-3550
Exp:	Ill., Chicago, Worldwide Exports	312-654-1315

SAN FERNANDO ELEC. MFG., Dept. EM, 1501 1st St., San Fernando, Cal. 91341, Tel: 213-365-9411, TWX: 910-496-1535; FSC No.: 96733; Empl.: 1000

Sales Manager: J. Lucia; *Distributor Manager:* J. Lucia

Local Sales Offices & Reps.

Ariz	Tucson, West-Cap Arizona	602-294-2646
Cal	, SF Electric Mfg. Co.	213-365-9411
Cal	Concord, SF Electronic Mfg. Co.	415-825-5133
Conn	Stratford, G. Rosen Co.	203-375-5456
Fla	Clearwater, Perrott Assocs.	813-585-3327
Fla	Orlando, Perrott Assocs.	305-275-1132
Ill	Chicago, Mid Western Regional Off.	312-859-0099
Md	Baltimore, Micro-Comp	301-247-0400
Mass	Framingham, G. Rosen Co.	617-879-5505
NJ	, Eastern Regional Off.	212-245-7292
NY	Chester, San Fernando Elec. Mfg.	914-469-9620
Pa	King of Prussia, SFER Co.	215-337-3488
Tex	Richardson, San Fernando Elec. Mfg.	214-783-1386
Wash	Seattle, General Electronics	206-575-4030

SANFORD-MILLER CORP., Dept. EM, 8 John St., Lynbrook, N.Y. 11563, Tel: 516-593-2025; Empl.: 10 p. 3935

Local Sales Offices & Reps.

Cal	Lynwood, Dick West & Assoc.	213-636-6124

Local Distributors

Ala	Huntsville, Mock Elctrns.	
Alas	Anchorage, Yukon Radio Supply	907-277-7117
Ariz	Phoenix, Dalis Elctrn Supply	602-258-6151
Ark	Little Rock, Carlton-Bates Co.	501-375-2383
Cal	Anaheim, Electro Components Dist	717-634-0222
Cal	San Francisco, Beck Electric Supply	415-495-8870
Conn	New Haven, Hatry Elctrns	203-787-5921
Conn	Waterbury, Bond Radio Elctrns.	203-753-1184
Fla	Orlando, Hammond Elctrns.	
Fla	Pensacola, Grice Elctrns	904-434-2401
Ga	Atlanta, Specialty Dist. Co.	
Ind	Indianapolis, Graham Elctrns	317-634-8486
Ind	So. Bend, Radio Dist. Co.	219-287-2911
Iowa	Davenport, Electrical Equip Co	319-323-8059
Kans	Topeka, Acme Radio Supply	913-235-1363
Ky	Louisville, P.I. Burks Co.	502-589-3960
La	New Orleans, Southern Radio Supply	
Md	Rockville, Capital Radio Wholesalers	301-881-2270
Mass	Medford, Empire Electric Co	617-395-5000
Mass	Worcester, Radio Maintenance	
Mich	Benton Harbor, Benton Harbor Elctrns.	616-WA5-0069
Minn	Duluth, Northwest Radio	218-727-1565
Miss	Jackson, Ellington Elctrn. Supply	601-355-0561
Mo	Joplin, Four State Radio	
Neb	Omaha, Radio Equipt. Co.	
NJ	Bellville, Beltronics Corp.	201-751-2250
NJ	Springfield, Federated Purchaser	201-376-8900
NY	Elmsford, Ancar Elctrns	914-592-7100
NY	New York, Brite Electric Sls	212-687-1313
NY	Rochester, Faulk Mill Supply	716-436-2490
NC	Greenboro, Hammond Elctrns.	919-275-6391
NC	Hickory, Southeastern Radio Supply	919-724-0504
Ohio	Lima, Lima Radio Parts Co	419-228-1220
Okla	Oklahoma City, Elctrn Supply Co	405-232-5215
Okla	Tulsa, Radio Inc.	
Pa	Philadelphia, Herbach & Rademan	215-436-1700
Pa	Reading, Barbey Elctrns.	215-376-7451
Pa	West Chester, West Chester Elctrns.	215-923-1520
RI	Warwick, W. H. Edwards	401-781-8000
SC	Greenville, Black Electric Supply	803-233-4142
SC	Greenville, Sawyer Elctrns.	803-CE5-0438
Tenn	Nashville, Electra Distrib Co.	
Tex	El Paso, Medland Specialty Co.	915-533-3555
Utah	Provo, Central Utah Elctrn Supply	801-373-7522
Va	Portsmouth, Distributors Inc.	804-399-2446
Va	Richmond, Meridian Elctrns.	703-355-0669

SANGAMO CAPACITOR DIV., Dept. EM, Box 128, Pickens, S.C. 29671, Tel: 803-878-6311, TWX: 57-0441, 810-397-2496 p. 1209

Sales Manager: W. Bakes

Local Sales Offices & Reps.

Ariz	Scottsdale, P. Murphy & Assoc.	602-946-2457
Cal	Irvine, Celtec	714-557-5021
Cal	Los Angeles, Celtec	213-990-3440
Cal	Placentia, El-Kap	714-528-3750
Cal	Redwood City, Sangamo	415-364-5066
Cal	San Diego, Celtec Co.	714-279-7961
Colo	Denver, Parker-Webster	303-751-2600
Fla	Oviedo, Conley & Assoc.	305-365-3283
Ill	Roselle, Sangamo	312-894-9170
Kans	Shawnee Mission, K & M Sls. & AAssoc.	913-262-1444
Md	Randallstown, Beacon North	301-922-1248
Mass	Hingham, Sangamo	617-749-7306
Minn	Mpls., S. Clothier	612-944-3456
Mo	St. Louis, K & M Sls. & Assoc.	314-423-2420
NY	Cazenovia, S.T./Woolard Co.	315-655-8145
NY	Elmont, F. E. Schmitt	516-437-8150
Ohio	Rocky River, Sangamo	216-331-5222
Okla	Tulsa, T.J. Ray Co.	918-627-1515
Ore	Portland, C.K. Shanks & Assocs.	503-292-5656
Pa	Ft. Washington, G. C. M., Inc.	215-646-7535
Pa	Pittsburgh, Covert & Newman Co.	412-531-2002
SC	Pickens, Sangamo Elec. Co.	803-878-6311
Tex	Dallas, Bonser-Philhower Sls.	214-234-8438
Tex	Houston, Bonser-Philhower	713-467-4373
Utah	Salt Lake City, Parker-Webster Co.	801-487-5911
Va	Falls Church, Beacon North	703-534-7200
Wash	Seattle, C. K. Shanks & Assoc.	206-632-4290

Local Distributors

Cal	Carson, Hi-Rel Distrib Sls	213-537-6500
Cal	Garden Grove, Natl Capacitor Supp	800-854-2451
Cal	San Diego, Mock Ill Sls	
Cal	Woodland, Jaco Elctrns	213-887-6400
Conn	Stratford, State Elctrns	203-375-5961
Ill	Palatine, Ohm Elctrns	312-359-5500
Mass	Newton, Greene-Shaw	617-969-8900
NJ	Hanover, State Elctrns	201-887-2550
NY	Central Islip, Semi Cap Elctrns	516-437-8150
NY	E. Farmingdale, Harrison Radio Corp.	516-293-7990
NY	Elmont, F. Edwin Schmitt Co	516-437-8150
NY	Freeport, Milgray Elctrns	516-546-6000
NY	Hauppauge, Jaco Elctrns	516-273-5500
NY	Plainview, Fairmont	516-694-8200
Ohio	Dayton, Micro-Mil	513-294-6420
Pa	Huntingdon Valley, Hallmark Elctrns	215-355-7300
Pa	Philadelphia, Phila. Elctrns	215-568-7400
Tex	Fort Worth, Tex-Tronics	817-335-8111
Utah	Salt Lake City, Diplomatic Alta	801-486-4134
Utah	Salt Lake City, Cairon Electric Supp	801-487-7451
Wisc	Thiensville, Lake View Elctrn	414-377-8250
For:	Can., Montreal, Que., Prelco Elctrns	514-389-8051

SANKEN ELEC. CO., Dept. EM, 1-22-8 Nishi-Ikebukuro, Toshima-Ku, Tokyo, Japan, Tel: 03-986-6151, Telex: 272-2323; Empl.: 2,500

Sales Manager: K. Imaizumi; *Distributor Manager:* T. Kunimi

Local Sales Offices & Reps.

Cal	Los Angeles, Energy Elctrn Prods	213-670-7880
Minn	Minneapolis, World Prods	612-835-2117

SAN-O INDUSTRIAL CORP., Dept. EM, 35-P Orville Dr., Bohemia, N.Y. 11716, Tel: 516-567-5556; Empl.: 15

Sales Manager: S. Kimura; *Distributor Manager:* M. Castellano

Local Sales Offices & Reps.

NY	Bohemia, San-O Indl Corp	516-567-5556

SANTA BARBARA RESCH. CTR., Dept. EM, 75 Coromar Dr., Goleta, Cal. 93017, Tel: 805-968-3511, TWX: 213-871-5210; Empl.: 900

SANTA FE TEXTILES INC., Dept. EM, 3151 W. Adams St., Santa Ana, Cal. 92704, Tel: 714-751-7733; Empl.: 20

Sales Manager: J. Tressen; *Distributor Manager:* J. Miller

SANYO ELECTRIC INC., Dept. EM, 51 Joseph St., Moonachie, N.J. 07074, Tel: 201-641-2333, Telex: 134-394; Empl.: 500 p. 3315

Sales Manager: H. Tamada

Local Sales Offices & Reps.

Cal	Compton, Sanyo Electric Inc.	213-537-5830

SARA SALES CO., Dept. EM, P.O. Box 321, San Francisco, Calif. 94101, Tel: 415-934-1331; Empl.: 3

SARKES TARZIAN, INC, See St-Semicon, Inc.

SAVOY ELECTRONICS, Dept. EM, P.O. Box 5727, Ft. Lauderdale, Fla. 33310, Tel: 305-563-1333, Telex: Savoylaud; Empl.: 93

Sales Manager: J. Harris V.P. Sls.

Local Sales Offices & Reps.

Cal	Huntington Beach, Savoy Elctrns/Western Div.	714-968-5166
Cal	San Diego, Qualtronics	714-560-8955
Ill	Wheaton, Archie Joyner Assoc.	312-668-5775
Kans	Shawnee Mission, Midtec Assocs	913-441-6565
Md	Gaithersburg, Wright Co.	301-840-1928
Mass	Wakefield, N.E.R.E.M.	617-245-4426
NJ	Haddonfield, Mesa Tech Assoc.	609-429-9531
Ore	Portland, Roger Pearce Assoc.	503-645-2852
Tex	Dallas, Bradenco Corp.	214-358-3278

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Forty years of Quartz Crystal manufacturing experience. MIL Type - pre aged - cold weld - conventional as well as Coldweld. Guaranteed 24 hour special red arrow service available. Tight tolerance .0005% tolerance standard or ruggerdized construction to meet MIL-C-3098 F. Normal delivery 10 to 15 work days or scheduled monthly deliveries.

SAWYER INDS., Dept. EM, 5649 Peck Rd., Arcadia, Cal. 91006, Tel: 213-442-5981, TWX: 910-587-3534; FSC No.: 18098; Empl.: 140

Local Sales Offices & Reps.

NJ	Tenafly, Budd-Tronics, Inc.	201-569-2230

SC ELECTRONICS, Dept. EM, 530 5th Ave. N.W., New Brighton, Minn. 55112, Tel: 612-633-3131, Telex: 69-1241; Empl.: 130

Sales Manager: R. Thomas

SCANBE DIV., ZERO CORP., Dept. EM, 3445 Fletcher Ave., El Monte, Cal. 91731, Tel: 213-579-2300, TWX: 910-587-3437; Empl.: 200

Local Sales Offices & Reps.

Ala	Huntsville, Powertronics	205-539-3270
Ariz	Glendale, Adtek, Inc.	602-846-4650
Cal	Anaheim, Cen-Tec Sls.	714-991-4440
Cal	Menlo Park, G.R. McKnight Co.	415-325-2844
Cal	San Diego, Zero-West Div.	714-271-7221
Colo	Denver, Fry-Gates Co.	303-756-9886
Conn	Cheshire, Coakley, Boyd & Abbett	203-272-2261

Fla Cape Coral, Fred Field Sls 813-542-7172
Ill Chicago, D Dolin Sls. Co..... 312-286-6200
Ind Indianapolis, Ihrig Assocs 317-783-7630
Kans Mission, Inland Assocs..... 913-362-2366
Md Ellicott City, Doss Elctrns. 301-465-1336
Mass Needham, Coakley, Boyd & Abbett 617-444-5470
Mich St. Clair Shores, J. M. Thorpe.... 313-779-6363
Minn Minneapolis, C. Gibb Co. 612-377-1200
Mo St. Louis, Inland Assocs. 314-821-3742
NJ Wayne, Lorac Sls 201-696-8875
NM Albuquerque, Fry-Gates Co. 505-298-1875
NY DeWitt, Tri-Tech Elctrns., Inc. 315-446-2881
NY Hicksville, Lorac Sls 516-681-8746
NC Winston Salem, Powertronics 919-765-6539
Ohio Cleveland, Marlow Assocs. 216-932-0900
Ohio Dayton, Marlow Assocs..... 513-426-6270
Pa Feasterville, Professional Svc. Assocs. 215-355-6244
SC Greenville, Powertronics..... 803-288-0270
Tex Dallas, E-Tron Sls. 214-348-4749
Utah Salt Lake City, Fry-Gates Co.... 801-272-3641
Wash Bellevue, Olson, Ferree & Assoc.206-454-1210

SCHAEVITZ ENGRG., Dept. EM, U.S. 130, Union Ave., Pennsauken, N.J. 08110, Tel: 609-662-8000, TWX: 710-892-0714; Empl.: 220

Sales Manager: R.L. Anderson

Local Sales Offices & Reps.
Ala Huntsville, JMS Co..... 205-883-0654
Ariz Scottsdale, Meas. Consits..... 602-994-9519
Cal Pasadena, Deniston/JDA 213-254-7755
Cal San Carlos, Elctrn. Engrg. 415-593-2189
Colo Boulder, Meas. Consit. 303-449-5294
Fla Pompano Beach, Colo-Tek Assocs. 305-781-8110
Ill Northfield, Torkelson Assoc. 312-446-9085
Ind Indianapolis, Torkelson Assoc.... 317-244-7867
La Harahan, MG Elctrns. & Equip. .. 504-733-0070
Mass Needham, Addelco Corp. 617-444-4754
Mich Farmington, Anderson Elctrns.... 313-476-9161
Minn New Hope, Trask Engnrg..... 612-537-2434
Mo Manchester, Vertec Assocs. 314-394-6242
NJ Cherry Hill, Markey Engrg..... 609-667-3809
NM Las Cruces, Meas. Consits:..... 505-526-2491
NY Elbridge, L-Tron Corp. 315-689-3787
Ohio Columbus, R.D. Cloon Assoc. 614-459-2890
SC Spartanburg, Henry Cook Assoc. 803-576-8594
Tenn Knoxville, Tool Crib, Inc..... 615-525-6195
Tex Richardson, Concept Sls..... 214-690-4521
Utah Murray, Meas. Consit..... 801-364-3174
Wash Bellevue, A. Smith 206-746-6770

SCHAUER MFG. CORP., Dept. EM, 4500 Alpine Ave., Cincinnati, Ohio 45242, Tel: 513-791-3030, Telex: 21-4576; Empl.: 254

Sales Manager: A.A. Groenewold; *Distributor Manager:* R. Parsons

Local Sales Offices & Reps.
Cal Carson, Associated Reps. Corp. 213-869-2516
Cal Palto Alto, Ellis Enterprises 415-494-1441
Conn East Haven, Eagle Assocs. 203-467-6542
Conn Meriden, Eagle Assocs. 203-467-6542
Fla Dunedin, H. O. Norberg 813-733-9102
Ga Smyrna, B-C Elctrn. Sls. 404-436-5169
Ill Chicago, Ellinger Sls. Corp..... 312-763-1570
Mich Detroit, Rathsburg Assocs..... 313-882-1717
Mo Kansas City, Nevco, Inc..... 816-421-1751
NY Long Island City, D.F. Tobias Co. 212-549-9191
Ohio Cleveland, John O. Olsen Co..... 216-752-5444
Pa Philadelphia, Kenneth B. Erdman Co. 215-224-1833
Tex Dallas, J.Y. Schoonmaker Co.... 214-357-8481
Wash Seattle, DMS/Vantage 206-525-2050

SCHNEIDER INSTR. CO., Dept. EM, 8115 Camargo Rd., Cincinnati, Ohio 45243, Tel: 513-561-6803; Empl.: 17

Local Sales Offices & Reps.
Ala Birmingham, Spader & Assocs... 205-879-1366
Ga Atlanta, Spader & Assocs..... 404-296-3024

SCHONSTEDT INSTR. CO., Dept. EM, 1775 Wiehle Ave., Reston, Va. 22090, Tel: 703-471-1050; Empl.: 40

SCHOTT CORP., Dept. EM, 3140 B Harbor Lane No., Minneapolis, Minn. 55441, Tel: 612-559-2742, TWX: 910-576-2964; FSC No.: 80023; Empl.: 150

Sales Manager: O. Schott

Local Sales Offices & Reps.
Cal Palo Alto, A. Barauck Co. 415-327-7711
Ill Des Plaines, Electro-Comp. Sls. 312-297-1455
Mass Needham, Hatch Assocs. 617-444-3310
Minn Minneapolis, S & R Sls. 612-544-3022
NJ Springfield, F.F. Sylvester Assocs. 201-376-3324
Tex Arlington, Hite Elctrn. Sls: 817-265-2912

SCHOTT OPTICAL GLASS INC., Dept. EM, York Ave., Duryea, Pa. 18642, Tel: 717-457-7485, TWX: 510-671-4535; FSC No.: 23-169-1403; Empl.: 500

Sales Manager: J. Nimmerfroh

Local Sales Offices & Reps.
Cal Fullerton 714-871-0800

SCHRACK ELECTRICAL SALES CORP., Dept. EM, 1140 Broadway Rm 205, New York, N.Y. 10001, Tel: 212-683-0790; Empl.: 3 ..... p. 3610

Local Sales Offices & Reps.
Cal Encino, Viking Sls. Co. 213-788-5501
Colo Denver, Nelson Co. 303-573-1516
Conn Trumbull, SIR Assocs 203-268-2560
Fla Maitland, Barrett Assocs 305-678-0172
Fla Melbourne, Barrett Assocs..... 305-727-2491
Fla No. Miami, Barrett Assocs 305-681-4977
Fla Treasure Island, Barrett Assocs 813-360-4973
Ill Mt. Prospect, R.M. Krueger Co. 312-398-6018
Ind Indianapolis, McCoy Sls 317-888-8396
Iowa Davenport, Ensco-Rep 319-386-6600
Kans Overland Park, Ensco-Rep. 913-381-7557
Md Glen Burnee, Saion Lot & Co 301-744-4611
Mass Lexington, SIR Assocs..... 617-862-1812
Minn Minneapolis, Wendell E. Lee & Assoc. 612-926-1523
Mo St. Louis, Ensco-Rep. 314-567-3935
NJ S. Plainfield, S. Glassman Assocs. 201-561-3866
NY Glen Cove, S. Glassman Assocs. 516-676-1039
NY Rochester, Irondequoit Ind. 716-544-6257
Ohio Cleveland, KRW Sls..... 216-741-4711
Ohio Dayton, KRW Sls. 513-885-3330
Ore Portland, Pacific Elec. Sls. 503-235-3456
Pa Bridgeport, R.D. Freedman Assocs. 215-279-5767
Pa Oakmont, KRW Sls 412-243-2284
Tex Houston, Spectra Sls. Corp. 713-524-7800
Tex Richardson, Spectra Sls. Corp... 214-234-3600

SCHWEITZER, DIV., Kimberly Clark Corp., Dept. EM, Lee, Mass. 01238, Tel: 413-243-1000, TWX: 413-243-2121; Empl.: 750

Local Sales Offices & Reps.
Mass Lee, Schweitzer Div Kimberly-Clark 413-243-1000

SCIENTECH, INC., Dept. EM, 5649 Arapahoe Ave, Boulder, Colo. 80303, Tel: 303-444-1361

Local Sales Offices & Reps.
Ariz Scottsdale, Measurement Consits 602-994-9519
Cal Hawthorne, Barnard & Assocs .. 213-973-5050
Cal Hayward, Avionics Liaison 415-783-1131
Colo Denver, Colorado Scientific 303-832-1461
Ga Atlanta, Schoonover 404-255-0761
Ill Des Plaines, Byron-Ellis Assocs 312-298-7626
Md Laurel, SOC Assocs 301-953-7430
Mass Boston, Industrial Equip 617-426-4406
NJ Somerset, Brinker Instr..... 201-846-4164
NM Albuquerque, Measurement Consits 505-265-6471
Ohio Berea, Byron-Ellis Assocs 216-826-0559

SCIENTIFIC COMMUNICATIONS, Dept. EM, 3425 Kingsley, Garland, Tex. 75041, Tel: 214-271-3685, TWX: 910-860-5172; Empl.: 65

Sales Manager: T. Humphries

Local Sales Offices & Reps.
Cal Anaheim, Blair Assocs..... 714-635-1350
Cal Los Altos, Stout-Loeswick 415-948-3265
DC Washington, R. May - Scientific Comms. 301-887-7387
Fla Ft. Lauderdale, Snow Co. 305-563-2448
Ga Atlanta, MacKay, Smith & Assocs. 404-449-7444
Ill Elk Grove Village, Midwest Meridian Corp. 312-437-6531
Iowa Cedar Rapids, Midwest Meridian Corp. 319-365-6561
Mass Needham Heights, O'Sullivan & Murphy/ Reptron 617-449-4141
Mo Maryland Heights, Midwest Meridian 314-878-4441
NY Greenvale, Bertran D. Aaron & Co. 516-621-0630
Pa Ambler, W M Assocs 215-643-4119
Va Alexandria, Vanguard Engrg. 703-768-1660
Va Arlington, Ray May 703-841-0807
Exp: Md., Rockville, R. F. Int'l. 301-340-1175

SCIENTIFIC RESEARCH CORP, See Trak Microwave Corp

SCIENTIFIC TECHNOLOGY, Dept. EM, 1201 San Antonio Rd., Mountain View, Cal. 94043, Tel: 415-965-0910, Telex: 34-5506; Empl.: 50

Local Sales Offices & Reps.
Ala Huntsville, Technical Sls. 205-881-1750
Cal Mountain View, L. Palmer..... 415-965-0910
Ga Huntsville, Technical Sls..... 205-881-1750
Ill Maywood, KGA Engrg Co 312-343-6500
Md Rockville, L.G. White 301-770-6556
Mass Newton Center, Daner-Hayes 617-969-4650
Mich Saginaw, Von Berg & Assocs..... 517-799-0873
Mich Troy, R. H. Jackson Co. 313-689-9950
NC Winston-Salem, L.G. White & Co. So 919-725-3612
Ohio Cincinnati, H.C. Jahn..... 513-521-0172
Ohio Cleveland, Thorrat & Hanmer 216-333-5950
Pa Ingomar, Greye Glass Assocs. .. 412-366-6664
Tex Dallas, D. Shuhart Co. 214-239-0185
Wisc Hales Corners, Automation Prods. 414-425-2250

SEABOARD ELCTRNS, Dept. EM, 70 Church St., New Rochelle, N.Y. 10805, Tel: 914-632-2818

Sales Manager: J. Hacker; *Distributor Manager:* J. Hacker

SEACOR, INC., Dept. EM, 598 Broadway, Norwood N.J. 07648, Tel: 201-768-6070, Telex: 135-354; Empl. 45

Local Sales Offices & Reps.
Ala Huntsville, 20th Century Mktg 205-772-9237
Ariz Scottsdale, Williams Assoc 609-947-4297
Cal Culver City, Bestronics 213-870-9191
Cal Los Altos, Wedemeyer & Merrill 408-378-3883
Cal San Diego, Bestronics Inc 714-278-2150
Colo Denver, Williams Assocs. 303-373-4730
Fla Orlando, Perrott Assoc..... 305-275-1132
Ill Skokie, Mar-Con 312-675-6450
Kans Praire Village, Engrg Svcs 913-649-4000
Md Meisterstown, F.B.D. Sls 804-484-3162
Mass Canton, D. Taggart 617-828-6064
Mich Troy, C. B. Jensen 313-643-0506
Minn Mpls., Heimann Co. 612-861-6051
Miss Corinth, 20th Century Mktg 601-287-2493
Mo St. Louis, Engrg Svcs 314-997-1515
NJ Dover, Richman Sls Co. 201-584-8444
NJ Nutley, Falk-Baker..... 201-661-2430
NM Albuquerque, Williams Assoc. 505-255-1638
NY Commack, Richman Sls Co..... 516-543-5532
NY Rochester, Ontec..... 716-464-8636
NC Cary, F.B.D. Sls..... 804-484-3162
Ohio Cleveland, Finnegan Co 216-238-5905
Ore Beaverton, Barrett-Squibb 503-644-2550
Pa Ardmore, D. Freedman..... 215-279-5767
Tenn Greenville, 20th Century Mktg.... 615-638-4021
Tex Addison, Southland Comps 214-783-8348
Va Portsmouth, F.B.D. Sls 804-484-3162
Wash Redmond, Barrett Squibb..... 206-885-6991

SEAL-PEEL, INC., Dept. EM, Box 250, Troy, Mich 48099, Tel: 313-588-1055; Empl.: 15

Sales Manager: V. Sheets; *Distributor Manager:* J. A Sheetz, III

Local Sales Offices & Reps.
Cal San Gabriel, Seal-Peel 213-284-9330
Conn Farmington, R.M. Jones & Co. .. 203-677-2654
Okla Tulsa, Marsoco 918-LU4-5273
Tex Fort Worth, O.H. Van Horn Co... 817-335-4484

SEALECTRO CORP., Dept. EM, 225 Hoyt St. Mamaroneck, N.Y. 10543, Tel: 914-698-5600, TWX 710-566-1110; Empl.: 1100 ..... p. 1666,2153

Local Sales Offices & Reps.
Ariz Scottsdale, Fryco..... 602-945-3281
Cal Mt. View, Sealectro West..... 415-965-1211
Cal Sherman Oaks, Sealectro West 213-990-8131
Colo Lafayette, Spectrum Sls..... 303-665-6851
Conn Southbury, J.J. Wild Co. 203-264-9494
Fla Orlando, OEM Marketing Corp... 305-299-1000
Ill Arlington Heights, Diethert-Angel, Inc. 312-593-7600
Iowa Des Moines, Beams. 515-255-1141
Kans Shawnee Mission, Beams..... 913-631-0300
Md Rockville, Mechtronics Sls., Inc. 301-340-2131
Mass Needham, J.J. Wild Co. 617-444-2360
Mo Creve Cover, Beams..... 314-569-1081
NH Salem, Sls Engrg Co 603-893-5521
NJ Budd Lake, Wild & Rutkowski 201-691-0440
NY Jericho, Wild & Rutkowski 516-935-6600
NY Mt. Vernon, Friedman-Smith Co. 914-664-4867
NY Syracuse, I.A. Hotze Assoc. 315-479-6641

Ohio Columbus, McFadden Sls. Co. .. 614-459-1280
Ore Beaverton, N.R. Schultz Co. 503-643-1644
Pa Narberth, S.A. Jeffries Co. 215-664-8500
Pa Southampton, Wild & Rutkowski 215-357-6645
Pa Willow Grove, BGR Assocs. 215-657-3301
Tex Dallas, Allied Comps., Inc. 214-238-0408
Wash Bellevue, N.R. Schultz Co. 206-454-0300

Local Distributors

Ala Huntsville, Powell Elctrns. 205-539-2731
Ala Huntsville, Pioneer Elctrns. 205-837-9300
Ariz Phoenix, R.V. Weatherford Co. .. 602-272-7144
Ariz Phoenix, R.V. Weatherford 602-272-7140
Cal Gardena, Bell Inds. 213-321-5802
Cal Glendale, R.V. Weatherford Co. 213-849-3451
Cal Mr. View, Powell Elctrns. 415-964-0820
Cal Mt. View, Elmar Elctrns. 415-961-3611
Cal Mt. View, Waltronic Sls. 415-964-4131
Cal Palo Alto, R.V. Weatherford Co. 415-321-5373
Colo Denver, Elctrn. Parts Co. 303-744-1992
Colo Denver, Cramer Elctrns. 303-758-2100
Conn N. Haven, Cramer Elctrns 203-239-5641
Fla Hollywood, Cramer Elctrns. 305-921-7878
Fla Miami Springs, Powell Elctrns. .. 305-592-3260
Ill Mt. Prospect, Cramer Elctrns. 312-593-8230
Ind Indianapolis, Graham Elctrn. 317-634-8202
Ind South Bend, Radio Distr. 219-287-2911
Iowa Cedar Rapids, Deeco Inc. 319-365-7551
Kans Wichita, Radio Supp. Co. 316-267-5214
Md Baltimore, Arrow Elctrns. 301-247-5200
Md Beltsville, Powell Elctrn. 301-937-4030
Md Gaithersburg, Pioneer Elctrns. 301-948-0710
Mass Burlington, Milgray Elctrns. 617-272-6800
Mass Newton Center, Cramer Elctrns. 617-969-7700
Mass Woburn, Arrow Elctrns. 617-933-8130
Mich Augusta, Great Lakes Elctrns. 616-731-4156
Minn Minneapolis, Ind. Comps. 612-831-2666
Mo Maryland Hghts, L-Comp 314-291-6200
NJ Mooretown, Arrow Elctrns. 609-235-1900
NJ Saddlebrook, Arrow Elctrns. 201-797-5800
NJ Springfield, Federated Elctrns. .. 201-376-8900
NM Albuquerque, Cramer Elctrns. 505-243-4566
NY Bohemia, Car-Lac Elect. Ind'l. Sls. 516-567-4200
NY Buffalo, Summit Distrs. 716-884-3450
NY E. Syracuse, Cramer Elctrns. 315-437-6671
NY Farmingdale, Arrow Elctrns. 516-694-6800
NY Freeport, Milgray Elctrns. 516-546-6000
NY Hauppauge, Jaco Elctrns 516-273-5500
NY Rochester, Summit Distrs. 716-334-8110
NY Rochester, Cramer Elctrns. 716-275-0300
NC Greensboro, Pioneer Elctrns. 919-273-4441
NC Winston-Salem, Kirkman Elctrn. 919-722-9131
Ohio Cincinnati, Cramer 513-771-6441
Ohio Cleveland, Radio & Elect. Parts 216-248-8900
Ohio Solon, Cramer Elctrns 216-248-8400
Pa Philadelphia, Powell Elctrns. 215-365-1900
Tex Dallas, Tex Instr. Supp. 214-238-6851
Tex Dallas, Wholesale Elctrn. 214-824-3001
Wash Seattle, R.V. Weatherford 206-243-6340
For: Can., Calagary, Alb., L. A. Varah Ltd. 403-276-8818
For: Can., Hamilton, Ont., L.A. Varah Ltd 416-561-9311
For: Can., Mississauga, Ont., Prelco Elctrns 416-678-0401
For: Can. Montreal, Que.
For: Can. Ottawa, Ont., Prelco Elctrns. 613-226-3491
For: Can. Vancouver, B.C., L. A. Varah Ltd. 604-873-3211
For: Can., Winnipeg, Man., L.A. Varah Ltd 204-633-6190

SEASTROM MFG. CO. INC., Dept. EM, 701 Sonora Ave., Glendale, Cal. 91201, Tel: 213-245-9121, TWX: 910-497-2271; FSC No.: 86928; Empl.: 50

Local Sales Offices & Reps.

Ariz Phoenix, Hecht Henschen & Assoc. 602-275-4411
Cal San Jose, A. J. Mollica Co. 408-279-3032
Colo Denver, Industrial Hardware Co. 303-426-1440
Fla Sarasota, RF Carlson Co. 813-365-2992
Ga Atlanta, Electro Mech Sls. Engrg. 404-449-6337
Ill Hinsdale, Hill-Gray Assoc. 312-832-4101
Mich Stockbridge, Erhart Engrg. 313-229-6958
Minn Minneapolis, Giefer Sls. Co. 612-884-2395
NH Spofford, Bahr Sls. Co. 603-352-5444
NY Lindenhurst, Long Island Mach'y Sls. Corp. 516-884-2100
NY Syracuse, T Squared Elctrns. 315-463-8592
NC Raleigh, Electro Mech. Sls. 919-782-7586
Pa Narberth, Samuel A. Jeffries 215-664-8500
Tenn Nashville, Electro Mech. Sls. Engrg. 615-256-2516
Tex Dallas, Blair Engrg. Sls. Co. 214-352-8411
Wash Seattle, F. W. Aurich & Co. 206-284-5561

SEG SUBSIDIARY, Comstron Seg, Dept. EM, 200 E. Sunrise Hwy, Freeport, N.Y. 11520, Tel: 516-546-9700, TWX: 510-225-3699; Empl.: 53

Sales Manager: L. J. Borow, V.P. Sls

Local Sales Offices & Reps.

Ariz Scottsdale, Meas. Consits. 602-994-9519
Cal Inglewood, L & M Engrg. 213-674-6850
Cal Mountain View, CSS Telecommunications Specialists, Inc. 415-964-4335
Cal San Jose, L & M Engrg. 408-292-3220
Colo Boulder, Meas. Consits. 303-449-5294
Conn Hamden, Instrument Consultants 203-288-5246
Conn Hamden, J & J Assocs. 203-624-7800
Fla Brandenton, Saber Assocs. 800-432-3007
Fla Longwood A, Saber Assocs. 800-432-3007
Fla Pompono Beach, Saber Assocs. 800-432-3007
Ga Dunwoody, Saber Assocs. 800-327-1181
Kans Shawnee Mission, EIR Co. 913-362-0919
Mass Waban, Instrument Consultants.. 617-969-9881
Mass Winchester, J & J Assocs. 617-729-5770
Mo Hazelwood, EIR Co. 314-895-4100
NJ Cherry Hill, Scientific Reps 609-482-0059
NJ Woodcliff Lake, F & F Assocs.... 201-778-6767
NM Las Cruces, Meas. Consits. 505-265-6471
NY Hicksville, F & F Assocs. 516-935-1100
NY Skaneateles, Robtron Inc. 315-685-5731
NC Raleigh, Saber Assoc. 800-327-1183
Ohio Chesterland, Electroquipment Sls 216-729-2222
Tex Pasadena, Scientific Devices Gulf Coast 713-475-0328
Tex Richardson, Scientific Devices S.W. 214-231-8106
Tex San Antonio, Scientific Devices S.W. 512-736-3164
Utah Salt Lake City, Meas. Consits. .. 801-364-3174
Va Falls Church, Scientific Assocs .. 703-573-8787
Wash Bellevue, Kevin Hall Assocs. 206-455-5526

SELF-ORGANIZING SYS., see Cosar Corp.

SEL-REX DIV. OXY METAL INDUSTRIES CORP., Dept. EM, 75 River Rd., Nutley, N.J. 07110, Tel: 201-667-5200, TWX: 133-320, 710-989-1423; Empl.: 250

Sales Manager: T. Stanford

Local Sales Offices & Reps.

Cal Buena Park, Oxy Metal Inds. Corp. 213-921-0891
Cal Chatsworth, Sel-Rex Div. 213-882-9444
Ga Atlanta, Oxy Metal Inds. Corp. .. 404-458-9101
Ill Elmhurst, Oxy Metal Inds. Corp. 312-832-9450
NJ Nutley, Sel-Rex Div. 201-667-5200
RI Warwick, Sel-Rex Div. 401-781-0700

SEMICOA, INC., Dept. EM, 333 McCormick Ave., Costa Mesa, Cal. 92626, Tel: 714-979-1900, TWX: 678-315 910-595-1961; FSC No.: 34156; Empl.: 65

Sales Manager: R.L. Boughan

Local Sales Offices & Reps.

Ariz Tempe, Delta Elect Sls. 602-838-5087
Cal LA, Semi-Dice (Chips) 213-597-0358
Cal Los Angeles, Westaironics 213-821-7958
Cal Redwood City, Logan Sls. 415-369-3726
Cal San Diego, Littlefield & Smith 714-455-0055
Colo Denver, P & K Elctrns. 303-573-5350
Conn Wallingford, Com-Sale 203-269-7964
Fla Altamonte Springs, V. G. Sls 305-831-8688
Fla Pompano Beach, V. G. Sls 305-971-0900
Ill Park Ridge, Metcom Assoc. 312-696-1490
Ind Carmel, Rich Elect. Mktg. 317-844-8462
Md Baltimore, Conroy Sls 301-296-2444
Mass Waltham, Com Inc. 617-890-0011
Minn Minneapolis, Furber Sls. Co. 612-881-3620
Mo Blue Springs, Chesco 816-229-1404
Mo St. Charles, Chesco 314-946-6677
NH Londonderry, Com-Sale 603-668-1440
NY New York, R.D. Sherman 315-637-9861
NY NY, WIN-COR 516-627-9474
Ohio Dayton, Del Steffen & Assocs. .. 216-461-8333
Pa Philadelphia, Snow Assocs. 215-379-4092
Tex Dallas, J. Clay Co. 214-350-1281
Wash Bellevue, Olson, Ferree & Assoc 206-454-1210
Exp: Can., Que., RPS Elctrns. 514-331-3377

SEMICON INC., Dept. EM, 10 North Ave., Burlington, Mass. 01803, Tel: 617-272-9015, TWX: 710-332-1919; Empl.: 400

Local Sales Offices & Reps.

Ala Huntsville, W.A. Brown Components Inc. 205-539-4111
Ariz Tempe, Delta Elec. Sls. Corp 602-839-0917
Cal San Jose, Silicon Valley Sls 408-984-6354
Cal Santa Ana, Rical Assocs 714-557-6543
Fla Margate, W.A. Brown Components Inc. 305-753-1650
Fla Orlando, W.A. Brown Components Inc. 305-425-5863
Ga Chamblee, W.A. Brown Components Inc. 404-455-0405
Ill Chicago, Fiat Engrg. Assocs., Inc. 312-547-6200
Kans Olalhe, B. Rush Assocs. 913-764-2700
Md Baltimore, Stemler Assocs. 301-944-8262
Mass Lexington, Circuit Sls. Co. 617-861-0567
Mich Gross Point Park, S. Greiner Assocs. 313-499-0188
Minn St. Paul, Ragon Inc. (R.G.) 612-488-0201
NJ Burlington, Semicon
NJ Cherry Hill, Danco Elctrn Sls Corp. 609-424-5590
NJ Englewood Cliffs, Sprung/Nussbaum 201-947-6767
NY Camillus, Tri-Tech 315-446-2881
NY Larchmont, Hingston-Walsh Assocs., Inc. 914-834-5781
NC Raleigh, W.A. Brown Components Inc. 919-781-9426
Ohio Dayton, The Whelan Corp. 513-434-7551
Pa Cherry Hill, Danco Corp. 609-424-5590
Tex Dallas, ION Assoc. Inc. 214-357-9441
Tex Houston, ION Assoc. Inc. 713-461-5311
Utah Salt Lake City, Challenge Sls 801-364-2999
Wash Seattle, R & R Elctrn Assoc. 206-762-7664
Exp: New York City, N.Y., C. Tennant Sons & Co. 212-679-1300

SEMICONDUCTOR CIRCUITS, INC.
AC/DC and DC/DC Power Sources

SEMICONDUCTOR CIRCUITS, INC., Dept. EM, 306 River St., Haverhill, Mass. 01830, Tel: 617-373-9104, TWX: 710-347-0269; Empl.: 210 p. 3316-3327

Sales Manager: T. Brewster, Prod. Mgr.

Local Sales Offices & Reps.

Ariz Mesa, Nakoma 602-931-9103
Cal Costa Mesa, Xebex 714-540-3245
Cal Sunnyvale, Lee/Allan Assocs. 408-732-2030
Colo Englewood, Klein Aerospace 303-781-4967
Conn Guilford, R.H. Sturdy Co. 203-453-5424
Fla Coral Springs, Heller Assocs. 305-752-7520
Ga Atlanta, Magaro & Assocs 404-252-6609
Ill Chicago, Berndt Assocs. 312-283-0713
Ind Carmel, Bernt Assocs 317-844-0114
Kans Lenexa, Technical Reps 314-888-0212
Md Baltimore, Micro Comp. 301-247-0400
Mass Wellesley Hills, R.H. Sturdy Co. 617-235-2330
Mich Farmington Hills, Lowell-Wendt Mktg 313-553-9800
Minn Minneapolis, Berndt Assocs 612-835-4818
Mo Hazelwood, Technical Reps., Inc. 314-731-5200
NJ Fort Lee, Tecnimat 201-461-8686
NY Clark Mills, KLM Assocs. 315-853-6126
NY North Syracuse, KLM Assocs. 315-458-6214
NY Pittsford, KLM Assocs. 716-381-8350
Ohio Cleveland, Geotronix Mktg. Assoc. 216-526-2535
Ohio Columbus, Geotronix Mktg. Assoc. 614-457-8472
Pa Harleysville, Thomas Jackson Assoc. 215-643-5560
Tex Dallas, Ralph Matthews Elctrns. 214-783-0552
Tex Houston, Ralph Matthews Elctrns. 713-777-9564
Utah Salt Lake City, BFA Corp. 801-466-6522
Wash Bellevue, Olson, Ferree & Assocs. 206-454-1210
Wisc Milwaukee, Bernt Assocs 414-545-8400

SEMICONDUCTOR SPECIALISTS, Dept. EM, Box 66125, O'Hare Intl Airport, Chicago, Ill. 60666, Tel: 312-279-1000, TWX: 910-254-0169

Sales Manager: J. Holler

Local Sales Offices & Reps.

Cal Los Angeles 714-549-5215
Ill Chicago 312-279-1000
Mass Boston 617-272-1610
Mich Detroit 214-358-5211
Minn Minneapolis 612-854-8841
Mo Kansas City 816-452-3900
Mo St. Louis (Hazelwood) 314-731-2400
Pa Pittsburgh 412-781-8120
Wisc Milwaukee 414-257-1330

SEMICONDUCTOR TECHNOLOGY, INC., Dept. EM, 124-14 22nd Ave., College Point, N.Y. 11356, Tel: 212-445-4466, TWX: 710-582-2571; Empl.: 45

Local Sales Offices & Reps.

Ariz Scottsdale, Verein Corp. 601-948-3606
Cal Culver City, DeAngelo, Rothman 213-398-6239
Cal Mountainview, Leddy Assocs. 415-969-6313
Cal San Diego, DeAngelo, Rothman 714-560-5707
Colo Parker, Component Sls 303-841-2650
Conn New Haven, Datcom 203-288-7005
Fla Clearwater, Semtronic Assoc. 813-461-4675
Ill Chicago, Rinaldi 312-763-4848
Ind Fort Wayne, Scott Elect. 219-743-1586
Mass Waltham, Datcom 617-891-4600
Mich Detroit, A. Blumenberg Assoc. .. 313-557-1934
Mich Plymouth, Scott Elect. 313-455-2440
Minn Minneapolis, Charles Bohlig Assoc. 612-922-7011
Mo Maryland Heights, Kebco 314-567-4111
NY Great Neck, Cooper Simon & Co. 516-487-1142
Ohio Cincinnati, Scott Elect. 513-791-2513
Ohio Cleveland, Scott Elect. 216-291-2600
Ohio Columbus, Scott Elect. 614-236-8619
Ohio Dayton, Scott Elect. 513-294-0539
Ohio Dayton, John Cleary Sls. 513-276-3974
Ohio Fairview Park, Norm Case Assocs. 216-333-4120
Ore Portland, Components West 503-643-5588
Pa Pittsburgh, Scott Elect. 412-828-1073
Wash Seattle, Components West 206-243-2133
Wisc Milwaukee, Grubb Co. 414-545-7810

SEMTECH CORP., Dept. EM, 652 Mitchell Rd., Newbury Park, Cal. 91320, Tel: 213-628-5392, TWX: 910-336-1264; FSC No.: 14099; Empl.: 598 ..... p. 1210,1211,3936-3965

Local Sales Offices & Reps.

Ariz Scottsdale, Sls. Engr., Inc. 602-994-3230
Cal La Mesa, F. Nagel Co. 714-565-1499
Cal Newbury Park, Semtech, Western Regional Sls. Off. 213-628-5392
Cal Palo Alto, Semtech Northwestern Sls. Off. 415-494-3113
Colo Denver, Electrodyne 303-759-4409
Fla Winter Park, Semtech Southeastern Dist. Sls. Off. 305-644-5404
Ill La Grange, Semtech Central Regional Sls. Off. 312-352-3227
Md Beltsville, Semtech Mideastern Dist. Sls Off. 301-937-0070
Mass Waltham, Ebbco, Inc. 617-890-1442
Minn Bloomington, Elctrn. Sls. Agcy. .. 612-884-8291
NJ Clifton, Compar NY 201-546-3660
NJ Union, Semtech Eastern Regional Sls. Off. 301-964-9305
NM Albuquerque, RonTek 505-294-4475
Ohio Cincinnati, Scott Elctrns. 513-791-2513
Ohio Cleveland, Scott Elctrns. 216-291-2600
Ohio Columbus, Scott Elctrns. 614-236-8619
Ohio Dayton, Scott Elctrns. 513-294-0539
Ohio Dayton, Semtech Corp. 513-274-8356
Pa Pittsburgh, Scott Elctrns. 412-761-3112
Tex Dallas, Semtech Central District Sls Off. 214-234-6523
Utah Salt Lake City, Electrodyne 801-467-7067
Wash Bellevue, Semtech Corp. 206-455-4807
Wash Bellevue, Ray Over Sls. 206-454-4551
Wash Vancouver, Ray Over Sls. 206-695-6197

Local Distributors

Ala Huntsville, Powell Elctrns. 800-633-2911
Cal Chatsworth, Westates Elctrns. Corp. 213-341-4411
Cal Costa Mesa, Westates Elctrns. Corp. 714-549-8401
Cal Riverside, Elctrn. Supply Co. 714-683-8110
Cal San Diego, Westates Electronics Corp. 714-292-5693
Cal Sunnyvale, Powell Elctrns. 415-964-0820
Cal Sunnyvale, Westates Electronics Corp. 408-733-8383
Cal Sunnyvale, Diplomat/Westland Elctrns. 408-734-1900
Fla Clearwater, Diplomat/Southland Elec. 813-443-4514
Fla Miami Springs, Powell Elctrns. .. 800-432-5080
Md Beltsville, Powell Elctrns. 301-937-4030
Md Bethesda, Empire Elctrns. 301-656-3300
Minn Minneapolis, Stark Elctrns. 612-332-1325
Mo St. Louis, Olive Electronics Inc. .. 314-426-4500
NY Woodbury, Diplomat/Elctrns. 516-921-9373
Ohio Cincinnati, H. Peters 513-381-7625
Ohio Cleveland, W. M. Pattison Supply Co. 216-441-3000
Ohio Columbus, Hughes Peters 614-294-5351
SC Greenville, Hammond 803-233-4121
SC Greenville, Black Electrical Supply
SC Taylors, S/S Electronic Supply .. 803-244-2204
Tex Dallas, Solid State Elctrns. 214-352-2601
Tex Houston, Solid State Elctrns. 713-785-5436
Utah Salt Lake City, Standard Supply Co. 801-355-2971
Wisc Mequon, Taylor Electric Co. 414-241-4321

SENCORE, Dept. EM, 3200 Sencore Dr., Sioux Falls, S.D. 57107, Tel: 605-339-0100, TWX: 910-660-0300; Empl.: 250

SENNHEISER ELCTRN. CORP., Dept. EM, 10 W. 37th St., New York, N.Y. 10018, Tel: 212-239-0190; Empl.: 28

Sales Manager: C. Hofman

Local Sales Offices & Reps.

Ala Birmingham, Paul Hayden Assoc. 205-853-0946
Cal Los Angeles, Morris Tait Assocs. 213-877-4424
Cal North Hollywood, Morris-Tait Assoc. 213-877-4424
Colo Denver, J.A. Gedney Co. 303-572-1900
Conn West Haven, Robert S. Reiss Assoc. 203-933-8542
Fla Miami, Sochin Sls. 305-235-6048
Ga East Point, Paul Hayden Assoc. 404-766-0261
Haw Honolulu, Snider & Assoc. 808-941-2400
Ill Chicago, CEM/S 312-384-1600
Ind Indianapolis, Dewey Powers Sls., Inc. 317-846-0790
Kans Wichita, Forristal-Young Sls. Co. 316-838-7226
Md Bethesda, Gene Rosen & Assoc. 301-530-8448
Mass Framingham, Robert S. Reiss Assoc. 617-620-1171
Mich Rochester, R.A. Albrecht & Co. 313-652-2520
Minn Minneapolis, Clark R. Gibb Co. ... 612-377-1200
Mo Kansas City, Forristal-Young Sls., Co. 816-358-6771
Neb Omaha, Forristal-Young Sls., Co. 402-333-0800
NM Albuquerque, J.A. Gedney Co. .. 505-293-0900
NY Roslyn Heights, Sir Sls., Inc. 516-621-7485
NC Greensboro, Paul Hayden Assoc. 919-288-6754
Ohio Cleveland, Robert W. Peters Co. 215-261-2330
Ore Portland, Harris Reps., NW 503-223-4929
Tex Dallas, Bob Amos & Assoc. 214-823-7820

SENSITIVE RESEARCH INSTRS., Dept. EM, 25 Dock St., Mt. Vernon, N. Y. 10550, Tel: 914-699-9717; FSC No.: 32590; Empl.: 35 ..... p. 2825

Local Sales Offices & Reps.

Ala Huntsville, J. L. Highsmith & Co. 205-881-3294
Ariz Scottsdale, Williams Assocs. 602-947-4297
Cal Laguna Hills, English Sls. Assocs. 714-770-2727
Cal Torrance, English Sls. Assocs. .. 213-772-7272
Colo Denver, Williams Assocs. 303-373-4730
Conn New Canaan, Measurement Consultants Corp. 203-966-4630
DC Washington, Whitcomb Assocs... 202-737-0763
Fla Boca Raton, James L. Highsmith & Co. 305-368-9194
Fla Orlando, J. L. Highsmith & Co. .. 305-293-5202
Ill Evanston, Saffro & Assocs. 312-328-0140
Kans Shawnee Mission, Pivan Engrg. Inc. 913-722-1030
Md Baltimore, Whitcomb Assocs. 301-889-1245
Mass Waltham, Measurement Consits. Corp. 617-890-4400
Mich Detroit, Comtel Instrs. Co. 313-255-1970
Minn Minneapolis, Heimann Co. 612-861-6051
Mo St. Louis, Pivan Engrg. 314-567-3636
NM Alburquerque, Williams Assocs. 505-255-1638
NY Albany, R.F. Lamb Co. 518-869-3355
NY Buffalo, R. F. Lamb Co. 716-874-4900
NY Rochester, R. F. Lamb Co. 716-544-5580
NY Syracuse, R. F. Lamb Co. 315-454-2469
NC Charlotte, J. L. Highsmith & Co. 704-333-7743
Ohio Cleveland, Comtel Instrs. Co. 216-442-8080
Ohio Dayton, Comtel Instrs. Co. 513-298-7573
Okla Oklahoma City, Data Mktg. Assocs., Inc. 405-528-6071
Pa Jenkintown, AMT 215-549-2080
Pa Pittsburgh, Comtel Instrs. Co. 412-922-5720
RI Cumberland, Measurement Consultants Corp. 401-333-6000
Tex Austin, Data Mktg. Assocs. 512-451-5174
Tex Dallas, Data Mktg. Assocs., Inc. 214-661-0300
Tex Houston, Data Mktg. Assocs., Inc. 713-780-2511
Tex San Antonio, Data Mktg. Assoc. 512-828-0937
Va Richmond, J. L. Highsmith & Co. 804-272-5888
Wash Seattle, R. S. Drake Assocs., Inc. 206-763-2755
Wisc Lake Mills, Saffro & Assocs. 414-648-2605

SENSOR TECHNOLOGY, Dept. EM, 21012 Lassen St., Chatsworth, Cal. 91311, Tel: 213-882-4100, TWX: 910-494-4776; Empl.: 250

Sales Manager: Kees Van Der Pool

Local Sales Offices & Reps.

Cal Redwood City, Logan Sales 415-369-6726
Colo Englewood, Marshall Sls. 303-770-6224
Fla Lighthouse Pt., Saber Assocs. 305-943-3076
Ill Chicago, Dolin Sls 312-286-6200
Ind Indianapolis, I Hrig. Assoc. 317-783-7630
Mass Worcester, W. Porter Sls. 617-852-4396
Mich Detroit, A. Blumenberg Assocs... 313-557-1934
Minn Minneapolis, Siedare Assoc. 612-545-5663
NJ Cherry Hill, Bi-Tech, Inc. 609-667-7374
NY Great Neck, Cooper-Simon & Co. 516-487-1142
NY Manlius, Bowser & Sapecky Assoc. 315-682-8885
Ohio Dayton, J.C. Hofstetter Co. 513-296-1010
Ohio Medina, J.C. Hofstetter Co. 216-241-4880
Ore Beaverton, Es Chase Co. 503-649-6177
Wash Seattle, Es/Chase Co. 206-762-4824

SENSORS, INC., Dept. EM, 3908 Varsity Dr., Ann Arbor, Mich. 48104, Tel: 313-973-1400, Telex: 23-5681; Empl.: 35

Local Sales Offices & Reps.

Colo Boulder, Grady Moore Assoc. 303-494-3351
Colo Lafayette, G. Moore Assocs. 303-494-3351
Mass Burlington, Drew Assoc. 617-272-9150
NY N. Lindenhurst, Sigma Communications Assoc. inc. 516-226-1880
NY Rochester, Irondequoit Inds. 716-544-6257
Tex Lucas, Optical Svcs. Co. 214-442-2011

SERMETEL INC., Sub. Teleflex Inc., Dept. EM, 155 Limerick Rd., Limerick, Pa 19468, Tel: 215-948-5100, TWX: 84-6335, 710-637-1263

Local Sales Offices & Reps.

Cal Lawndale 213-973-1142
Okla Midwest City 405-732-1392

SERVO-INSTRUMENTS CORP., Dept. EM, R.R. 1, Box 75B, Spring Valley, Ill. 61362, Tel: 815-664-2348; Empl.: 25

Sales Manager: R.A. Small

Local Sales Offices & Reps.

Ala Huntsville, Young & Lawrence.... 205-539-6575
Conn Bristol, Texell Co. 203-583-0703
Fla Winter Park, Young & Lawrence 305-647-6929
Ill Schaumburg, Kingston Comps. .. 312-529-8055
Iowa Cedar Rapids, Reid Assoc. 319-362-6302
Kans Wichita, Penn
Mass Randolph, Naton Assoc. 617-986-6417
Minn St. Paul, Countryman & Assocs. 612-645-9151
NY Rochester, Upstate Comp. Sls... 716-288-1080
Tex Dallas, McCoy Assocs. 214-350-9931
Tex Houston, McCoy Assocs. 713-649-5756

SERVO-TEK PRODS. CO., Dept. EM, 1086 Goffle Rd., Hawthorne, N.J. 07506, Tel: 201-427-3100; Empl.: 86 ..... p. 3109

Sales Manager: J. Duffy

Local Sales Offices & Reps.

Cal Van Nuys, Servo-Tek Calif. 213-786-0690
Mass Salem, Forbes Engrg. Co. 617-744-1693
Ohio Chagrin Falls, K.F. Nauerz Co. .. 216-338-8450
Tex Richardson, Southwest Mktg Svcs 214-234-8381

SERVOMETER CORP., Dept. EM, 501 Little Falls Rd., Cedar Grove, N.J. 07009, Tel: 201-785-4630; FSC No. 18469; Empl.: 65

Sales Manager: D. Walker

Local Sales Offices & Reps.

Cal Cerritos, B.S. & G. Inc. 213-860-2423
Cal Redwood City, B.S. & G. Inc. 415-365-5440
NY East Aurora, Clarke Thrasher 716-652-0423
Ohio Dayton, H. G. Lake Co. 513-277-818
Ohio Richmond Heights, H. G. Lake Co. 216-486-147

SESCOM, INC., Dept. EM, 12931 Budlong Ave. Box 590, Gardena, Cal. 90247, Tel: 213-770-3510 800-421-1828, TWX: 910-346-7023; Empl.: 21

Sales Manager: F.J. Miller

Local Sales Offices & Reps.

Cal Inglewood, Sescom, Inc. 213-770-351

S G C INC., Dept. EM, 13737 SE 26th St., Bellevue Wash. 98005, Tel: 206-746-6310, Telex: 32-883 Empl.: 28

Local Sales Offices & Reps.
Fla Pompano Beach, Comark 305-785-2000
Mass Sudbury, Commercial Mktg. Assoc. 617-443-9442
Wash Bellevue, S G C Int'l. 206-746-6310

SGL ABRASIVES, Dept. EM, North Pitt St. Ext., Carlisle, Pa. 17013, Tel: 717-243-3471, TWX: 510-560-3513; Empl.: 190

Sales Manager: J.G. Wagner

Local Sales Offices & Reps.
Cal Maywood, J. Mullaney 213-585-5697
Cal San Jose, R. Bailey 408-289-1769
Ill Chicago, D. Cahill 312-498-5688
Ill Northfield, B. Boak 312-446-3374
Ky Louisville, C. Adcock 502-897-6229
Mass Boston, A. Arrandale 617-879-3528
NC Charlotte, T. Arnold 704-535-4279
Pa Allentown, Coleman Assoc. 215-797-0401
Pa Hazleton, Barrett Haentjens Co. 717-455-7711
Pa New Cumberland, J. Tio 717-774-2351
Pa Newtown Square, E. Parkin 215-644-5849
Tex Houston, T. Dolan 713-667-8812
Wisc Milwaukee, R. Kujawski 414-321-1213
Wisc Milwaukee, George Mills 414-639-1225
Wisc Racine, Webster Weiss 414-639-3634

SGL BATTERIES MANUFACTURING CO., A Subsidiary of SGL Industries, Inc., Dept. EM, 14650 Dequindre, Detroit, Mich. 48212, Tel: 313-868-6410; Empl.: 60

Sales Manager: G. Kemp

SGL ELECTRONICS, Dept. EM, 300 Harvard Avenue, Westville, N.J. 08093, Tel: 609-456-7300, TWX: 710-944-0758; Empl.: 60

Sales Manager: R. P. Pagliaro

Local Sales Offices & Reps.
Cal Santa Clara, C. B. King Assocs 408-249-1022
Cal S. Pasadena, Deniston/JDA 213-254-7755
Conn West Simsbury, Anchor Engrg. Corp. 203-658-6261
Fla Orlando, Buchanan & Abrams Assoc. 305-898-7444
Ill Chicago, P.K. Pitt 312-478-3124
Mass Newton Upper Falls, Anchor Engrg. Corp. 617-964-6205
Minn St. Paul, R.G. Ragon 612-488-0201
NJ Berkeley Heights, Cambridge Allen 201-464-0203
NY DeRuyter, R. P. Kennedy Co. 315-662-7996
NY New York, Cambridge Allen Assoc. 212-682-5844
NY Ravena, R.P. Kennedy Co. 518-731-6022
NY Rochester, R.P. Kennedy Co. 716-271-6322
NC Garner, Candor Co 919-876-4999
Ohio Akron, Augnat Assocs 216-239-1621
SC Myrtle Beach, Candor Co 803-448-8361
Tenn Chattanooga, Candor Co 615-894-9686
Tex Dallas, Southwest Elctrn. Inds. ... 214-690-9881
Tex Houston, Dunkel Elctrns Assoc. 713-729-1670
Va Richmond, Candor Co 804-320-7375

SGL HOMALITE, Div. of SGL Inds., Inc., Dept. EM, 11 Brookside Dr., Wilmington, Del. 19804, Tel: 302-652-3686, TWX: 510-666-3450; Empl.: 70

Sales Manager: R.H. Cahill

Local Sales Offices & Reps.
Cal Lynwood, D. West Assocs. 213-636-6124
Cal Palo Alto, R. W. Thompson Assocs. 408-358-2671
Colo Denver, D/Z Assocs 303-534-3649
Conn New Canaan, S. Pierce Assocs. 203-966-4630
Fla Fort Lauderdale, Lawrence Assocs 305-763-5374
Ill Chicago, Electro-Tech Market ... 312-588-4535
Mass Norwood, S. Pierce Assocs. 617-762-3164
Mich Farmington Hills, Lowell-Wendt .. 313-553-9800
NJ Cherry Hill, B & G Assocs. 609-235-4878
NY Skaneateles, Beardsley Assocs. 315-685-7638
NC Winston-Salem, Murcota 919-722-9445
Ohio Akron, Augnat Assocs. 216-239-1621
Tex Richardson, Campion Sls. 214-238-8145
Wash Seattle, J.B. Jolly 206-938-4166

SGL PLASTICS, Dept. EM, Route 248, Nazareth, Pa. 18064, Tel: 215-759-0280; Empl.: 60

Sales Manager: R. Quell

Local Sales Offices & Reps.
Ohio Akron, Augnat Assocs 216-239-1621

SGL PRINTED CIRCUITS, Div. SGL Inds., Inc., Dept. EM, 827 Black Oak Ridge Rd., Wayne, N.J. 07470, Tel: 201-835-2765; Empl.: 34

Sales Manager: R. J. Puzo

Local Sales Offices & Reps.
NJ Cherry Hill, B & G Assoc. 609-235-4878
NJ Fairfield, Glad Assocs. 201-575-1448
Tex Houston, J. Arnold Co. 713-783-7297

SGL WABER®

SGL WABER ELECTRIC, Dept. EM, 300 Harvard Avenue, Westville, NJ 08093, Tel: 609-456-5400, TWX: 710-944-0758; Empl.: 50 ..... p. 4654

Sales Manager: R. C. Waldron

Local Sales Offices & Reps.
Ala Mobile, Hollingsworth & Still 205-478-8108
Ariz Phoenix, C. T. Carlburg & Assoc. 602-997-0774
Cal Burlingame, Carelli-EMA 415-697-6286
Cal Inglewood, Unger Sls. Assocs. .. 213-649-6238
Colo Denver, Walter Eng. Assoc. 303-777-5585
Fla Orlando, Hollingsworth & Still 305-834-2356
Ga Atlanta, Hollingsworth & Still 404-394-3270
Haw Honolulu, Gene Piety Factors 808-839-9059
Ill Chicago, W. Linz Assoc. 312-498-9600
Ind Indianapolis, R. Milsk Co. 317-546-5468
Iowa Des Moines, Kathrinus-Kelly & Co. 515-255-4584
Kans Shawnee Mission, Kathrinus-Kelly & Co. 913-722-0000
Me Kittery Point, K. J. Walsh & Assoc. 207-439-4633
Md Silver Springs, David S. Linz Co. 301-593-2477
Mass Scituate, K. J. Walsh Assocs. 617-545-3145
Mich Southfield, R. Milsk Co. 313-354-3310
Minn Minneapolis, Heimann Co. 612-861-6051
Mo St. Louis, Kathrinus-Kelly 314-968-3800
NJ Hackensack, Jack Brown Elctrn Sls 201-489-2217
NM Albuquerque, C. T. Carlberg & Assoc. 505-265-1579
NY Liverpool, J. Brown Elctrn. Sls. .. 315-451-1471
NY Massapequa Park, Jack Brown Elctrn Sls 516-798-4585
NY Rochester, J. Brown Elctrn Sls. 716-266-2728
NY Whitestone, Jack Brown Elctrn Sls 212-352-2710
NY Yonkers, J. Brown Elctrn. Sls..... 914-779-7330
NC Charlotte, Hollingsworth & Still .. 704-535-4604
Ohio Beechwood, Electrn. Salesmasters 216-831-9555
Ore Salem, Pacnor Mktg. 503-363-6445
Pa Philadelphia, D. S. Linz Co. 215-379-0734
Pa Pittsburgh, Covert & Newman Co. 412-531-2002
Tex Dallas, Lund & Co. 214-387-4634
Wash Seattle, Pacnor Mktg. 206-284-8020
Wisc Brookfield, William M. Linz Assoc 414-782-0630

Local Distributors
Ala Huntsville, Mock Elctrns 205-539-2401
Ariz Phoenix, Parts Elctrn 602-258-6476
Ark Little Rock, Carlton Bates Co..... 501-562-9100
Cal Berkeley, Al Lasher's Dealer Elect. 415-843-5915
Cal Coasta Mesa, Mar Vac Elctrns .. 714-540-3280
Cal El Monte, Claude Michael 213-696-0141
Cal Fullerton, Orvac Elctrns 714-871-1020
Cal Glendale, Western Elctrns 213-246-4861
Cal Hollywood, Yale Radio 213-465-3186
Cal Mt. View, Ratel Elctrns 408-739-9220
Cal Mt. View, Abacus Elctrns 415-961-1500
Cal Oakland, Brill Elctrns 415-834-5888
Cal Pasadena, Dow Radio 213-793-1195
Cal Riverside, Electronic Supply 714-836-7300
Cal San Diego, Shanks & Wright 714-239-0176
Cal San Francisco, Zack Elctrns 415-626-1444
Cal San Jose, Quement Elctrns 408-998-5900
Cal Santa Clara, Com-Kyl, Inc. 408-249-6220
Cal W. Los Angeles, California Elect. Supply 213-393-0503
Colo Colorado Springs, D & M Elctrn Supply 303-633-4666
Colo Denver, Denver Wintronics 303-934-2406
Colo Denver, Elctrn Parts 303-744-1992
Conn Stamford, Mar Le Co. 203-348-2645
Conn Waterbury, Suburban Supply 203-757-1251
Fla Miami, Elctrn Equip 305-871-3500
Fla Miami, ESL Elctrn Distrib 305-633-6973
Fla Orlando, Hammond Elctrns 305-849-6060
Fla Pensacola, Grice Elctrns 904-434-2481
Ga Atlanta, Specialty Distrib 404-873-2521
Ill Chicago, Newark Elctronics 312-638-4411
Ill Niles, Joseph Elctrn 312-297-4200
Ill Peoria, Klaus Radio & Elctrns 309-691-4840
Ind East Chicago, Acro Elctrns 312-357-1269
Ind Ft. Wayne, Ft. Wayne Elctrns 219-423-3422
Ind Indianapolis, Graham Elctrns 317-634-8202
Ind Indianapolis, Radio Distrib 317-257-2231
Ky Louisville, P.I. Burks Co. 502-589-3960
La Lafayette, Ralphs of Lafayette .. 318-234-4507
Md Baltimore, ASI Elctrns 301-265-5100
Md Gaithersburg, Pioneer/Wash Elect. 301-948-0710
Md Rockville, Capitol Radio Wholesalers 301-881-2270
Mass Boston, Sager Elect. Supply 617-542-2281
Mass Dedham, Gerber Elctrns 617-329-2400
Mass Lynn, Land Elect. Supply 617-592-2220
Mass Newton Upper Falls, In-Stock Prods Co. 617-964-6200
Mass W. Newton, A. W. Mayer Co. 617-965-1111
Mich Ann Arbor, Wedemeyer Elect. Supply 313-665-8611
Mich Detroit, RS Elctrns 313-491-1012
Minn Minneapolis, Elctrn Cter 612-371-5200
Minn Minneapolis, Stark Elctrn 612-332-1325
Miss Jackson, Ellington Elect. Supply 601-355-0561
Mo Kansas City, Walters Radio Supply 816-531-7015
Mo St. Louis, Van Sickle Radio 314-621-5000
Mo St. Louis, Olive Indl Elect. 314-863-7800
Neb Lincoln, Scott Elect. Supply 402-466-8221
Neb Omaha, Radio Equip 402-341-7700
NH Concord, Evans Radio 603-224-9961
NJ Camden, General Radio Supply 609-964-8560
NJ Hanover, State Elctrn Parts 201-887-2550
NJ Springfield, Route Elctrns 201-467-0166
NJ Springfield, Federated Purchaser 201-376-8900
NM Albuquerque, Elctrn Parts 505-293-6161
NY Buffalo, Summit Distrib 716-884-3450
NY Farmingdale, Harrison Elctrns 516-293-7990
NY Farmingdale, Broadline Elctrns .. 516-420-8320
NY Long Island City, H. L. Dalis, Inc. 212-361-1117
NY New York, Argil Elctrns 212-691-8111
NY Rochester, Masline Elctrns 716-546-5373
NY Rochester, Simcona Elctrns 716-328-3230
NY Rome, Rome Elctrns 315-337-5400
NY Schenectady, Adirondack Elctrns 518-842-8350
Ohio Akron, Akron Elctrn Supply 216-762-8818
Ohio Cincinnati, Hughes-Peters, Inc. .. 513-351-2000
Ohio Cincinnati, United Radio 513-662-2610
Ohio Cleveland, Pioneer-Standard Elect. 216-587-3600
Ohio Columbus, Hughes-Peters, Inc. .. 614-294-5351
Ohio Dayton, ESCO, Inc. 513-226-1133
Ohio Dayton, Becker Elctrns 513-226-1341
Ohio Solon, Repco 216-248-8900
Ohio Toledo, Warren Radio 419-248-3364
Okla Oklahoma City, Trice Wholesale Elect. 405-524-4411
Okla Tulsa, Radio, Inc. 918-587-9123
Ore Portland, United Radio Supply 503-233-5346
Ore Portland, EOFF Elec 503-222-9411
Pa Allentown, A. A. Peters, Inc. 215-434-5237
Pa Erie, Mace Elctrns 814-838-3511
Pa Philadelphia, Philadelphia Elctrns 215-568-7400
Pa Philadelphia, Herbach & Rademan 215-426-1700
Pa Philadelphia, Almo Elctrns 215-698-4000
Pa Pittsburgh, CAM/RPC 412-782-3770
Pa Plymouth Meeting, Techni-Tool .. 215-825-4990
Pa Reading, Barbey Elctrns 215-376-6116
RI Providence, Wm. Dandreta & Co. 401-861-2800
SC Charleston, Wholesale Radio Supply 803-747-9672
Tenn Nashville, Electra Distrib 615-329-3971
Tex Dallas, Wholesale Elect. Supply 214-824-3001
Tex Ft. Worth, Swieco, Inc. 817-335-6521
Tex Houston, Electrotex 713-941-7016
Tex Houston, Lenert Co 713-225-1465
Tex San Antonio, Sherman Elect. Supply 512-224-1001
Utah Salt Lake City, Standard Supply 801-486-3371
Va Arlington, Arlington Elctrn 703-524-2412
Va Norfolk, Priest Elctrns 703-855-0141
Wash Seattle, Radar Elec 206-282-2511
Wisc Madison, Satterfield Elctrns 608-257-4801
Wisc Milwaukee, C & H Distrib 414-271-2250
Wisc Milwaukee, Marsh Elctrns 414-475-6000

SGS ATES

SGS-ATES SEMICONDUCTOR CORP., Dept. EM, 79 Massasoit St., Waltham, Mass. 02154, Tel: 617-891-3710, Telex: 923495; Empl.: 9000

Local Sales Offices & Reps.

Ala	Huntsville, Rep. Inc	205-881-9270
Ariz	Phoenix, Hecht, Henschen & Assoc.	602-275-4411
Cal	Palo Alto, Shaw-Tech Inc.	415-961-4775
Cal	San Diego, CERCO	714-560-9143
Cal	Santa Ana, Rical	714-557-6543
Colo	Englewood, Elcom	303-770-4400
Fla	Clearwater, Dyne-A-Mark	813-441-4702
Fla	Ft. Lauderdale, Dyne-A-Mark	305-771-6501
Ga	Tucker, Rep. Inc.	404-938-4358
Ill	Bellwood, Fiat Engrg.	312-547-6200
Ind	Indianapolis, Lattronics Mfg.	317-846-5788
Kans	Overland Park, Kebco	913-649-1051
Md	Towson, C.H. Newson & Assocs.	301-296-2293
Mass	Waltham, Stone Comp.	617-890-1440
Mich	Grosse Pointe Park, Greiner Assocs.	313-499-0188
Minn	Minneapolis, L. F. Green Assocs.	612-781-1611
Mo	St. Louis, KEBCO	314-576-4111
NY	Jerico, J. Square Mktg.	516-997-6210
NY	Pompey, S.F. Foster Co.	315-677-3333
NY	Webster, S.F. Foster Co.	716-265-2072
NC	Raleigh, Rep. Inc.	919-851-3007
Ohio	Cleveland, KRW	216-741-4711
Ohio	Dayton, KRW	513-885-3330
Pa	Philadelphia, C.H. Newson & Assoc.	215-248-3377
Tenn	Jefferson City, Rep. Inc.	615-475-4105
Tex	Dallas, Blackburn Assocs.	214-692-8885
Tex	Houston, Blackburn Assoc.	713-784-1989
Utah	Salt Lake City, Elcom	801-532-7940
Va	Reston, Boyle Assocs.	703-620-9558
Wash	Seattle, R & R Assoc.	206-762-7664

Local Distributors

Cal	Hawthorne, General Transistor Corp.	213-679-9721
Cal	Los Angeles, Energy Elctrns. Prods.	213-670-7880
Cal	Mountain View, Energy Sls	415-969-0800
Cal	San Dimas, Zeus Comps.	714-871-0391
Cal	Santa Ana, Emitter Electr.	714-557-7131
Fla	Pompano Beach, Zeus Comps.	305-942-4312
Ill	Des Plaines, Edmar Elctrns. Co.	312-298-8580
Mass	Burlington, Wilshire Elctrns.	617-272-8200
Mass	Burlington, Zeus Comps.	617-273-0750
Mass	Wakefield, Lorcor	617-246-1903
Mass	Wakefield, Semtex	617-245-9050
Mich	Livonia, Camelot Elctrns.	313-427-8660
NJ	Cinnaminson, Wilshire Elctrns.	609-786-8990
NY	Elmsford, Zeus Comps.	914-592-4120
NY	Rochester, Wilshire Elctrns	716-442-9560
Ohio	Dayton, Esco, Inc.	513-226-1133
Tex	Dallas, KA Elctrns. Sls	214-634-7870
Wash	Seattle, Radar Elec. Co.	206-282-2511
For:	Can, Montreal, Prelco Elctrns	514-389-8051
For:	Can, Toronto, Armatel Ltd.	416-961-7960
For:	Mexico, Mexico City, Mexel	905-575-7868

SHAFFSTALL CORP., Dept. EM, 5148 E. 65th St., Indianapolis, Ind. 46220, Tel: 317-842-2077; Empl.: 15

Sales Manager: E.L. Shaffstall, Pres.

Shakespeare, Elctrns & Fiberglass Div., Dept. EM, Box 246, Columbia, S.C. 29202, Tel: 803-779-5800, Telex: 573421; Empl.: 250

Sales Manager: J. Hughes

Local Sales Offices & Reps.

Ariz	Phoenix, J.R. Morgan Agency	602-252-3089
Cal	Foster City, Steve Olson Asso.	415-572-8888
Cal	Los Angeles, Wallace & Wallace	213-747-0401
Fla	Longwood, Art Stayton Asso.	305-862-9529
Ga	Savannah, Len Sherman Assocs.	912-925-3660
Ill	Chicago, Lassers & Co.	312-539-0170
Ind	Indianapolis, Dewey Powers Sls.	317-846-0790
Kans	Overland Park, R.C. Howard	913-492-7182
Md	Silver Spring, B.F. Targoff	301-924-2524
Mass	Norwood, Rudolph-MacInnis	617-769-5450
Minn	Minneapolis, Melby Comm.	612-884-7688
Miss	Jackson, Gordon Clapper	601-956-8661
NY	Syracuse, William Tauber Co.	315-446-7094
NY	Valley Cottage, Cohn & Kappell	914-268-9216
Ohio	Youngstown, Repcom of Ohio	216-788-9404
Ore	Portland, Jud LeBrun Co.	503-244-6805
SC	Columbia, P.B. Boyer Sls. Co.	803-772-9151
Tex	Dallas, Collins Co.	214-341-7866
Utah	Salt Lake City, Jim Hall	801-466-6105

SHALLCO, INC., Dept. EM, Box 1089, Smithfield, N.C. 27577, Tel: 919-934-3135; Empl.: 45 .... p. 4240-4243

Sales Manager: M.D. Sutton

Local Sales Offices & Reps.

Ariz	Phoenix, Chaparral	602-263-0414
Cal	Hawthorne, WCV Co.	213-772-4479
Cal	Los Altos, Westec Elctrns/No	415-948-8880
Cal	Los Angeles, WCV Co.	213-772-4479
Colo	Denver, McLoud & Raymond	303-756-1589
Conn	New Canaan, Stan Pierce, Inc.	203-335-9848
Fla	St. Petersburg, Kirkwood & Assocs	813-894-8240
Ill	Northfield, Imex Ltd	312-446-8934
Ind	Indianapolis, Campisano Assocs	317-247-8623
Iowa	Cedar Rapids, S & O Sls	310-393-1845
Kans	Shawnee Mission, Technical Sls Assocs	913-888-3330
Md	Towson, Holden Engrg Sls	301-823-3763
Mass	Norwood, Stan Pierce, Inc	617-762-3164
Minn	Minneapolis, R. J. Inc	612-922-1425
Mo	Ferguson, Technical Sls Assocs	314-725-5361
NY	Jericho, HRC-Comp-Tech	516-822-5550
NY	Rochester, D. Hurley Sls.	716-586-6159
NC	Burlington, P. J. Nahser Co.	919-226-8053
NC	Smithfield, Byrd & Barbour Sls., Inc.	919-934-8136
Ohio	Brecksville, Allen Nace Co.	216-526-4323
Ohio	Cincinnati, Campisano Assocs.	513-662-1616
Pa	Philadelphia, Victor S. Malta	215-836-5122
Wash	Seattle, Carlyle Tech Sls	206-767-4511
Exp:	New York, NY, Lothar Sanford Corp	212-757-3881

Local Distributors

Cal	Gardena, Bell Industries	213-321-5802
Cal	Hawthorne, Westec Distrib Co	213-772-4479
Cal	Los Altos, Westec Elctrns/No	415-948-8880
Cal	Sunnyvale, Bell Industries	408-734-8570
Fla	Jacksonville, Southeast Elctrns	904-356-3007
Ind	Indianapolis, Graham Elctrns	317-634-8486
Mich	Grand Rapids, Audio Distrib.	616-452-1596
NJ	Roselle, Garden State Indl Elctrns	201-241-9000
NY	Farmingdale, SAI Elctrns	516-293-2710
NY	Woodbury, Harvey Elctrns	212-582-1500
Ohio	Cincinnati, United Radio	513-761-4030
Pa	Philadelphia, Philadelphia Elctrns	215-568-7400
Tenn	Bristol, Broadcast Equip & Supply	615-878-2531
Tex	Dallas, Wholesale Elctrns.	214-824-3001
Wisc	Oshkosh, Elctrn Industries	414-235-8930
For:	Can., Montreal, Que, Braydon Electro Ltd	514-332-5650
For:	Can., Vancouver, B.C., L. A. Varah Ltd	604-873-3211

SHALLCROSS, See Cutler Hammer, Shallcross Resistor Prods.

SHANNON LUMINOUS MAT'LS., Div. Shannon-Glow Inc., Dept. EM, 7356 Santa Monica Blvd., Hollywood, Cal. 90046, Tel: 213-876-2660; Empl.: 10

Local Sales Offices & Reps.

Cal	Downey, Uresco	213-773-3828

SHAPIRO SCIENTIFIC INST., Dept. EM, 3500 E. Coast Hwy., Corona del Mar, Cal. 92625, Tel: 714-675-1024; Empl.: 5

SHELDAHL, INC., Electrical Prods. Div., Dept. EM, Box 170, Northfield, Minn. 55057, Tel: 507-645-5633, TWX: 910-565-2180; Empl.: 350

Local Sales Offices & Reps.

Ariz	Scottsdale, Summit Sls.	602-994-4587
Cal	Lynwood, Application Reps	213-636-6124
Colo	Boulder, Component Prods. Sls. Co.	303-442-1100
Conn	North Haven, Forsberg Sls	203-239-5111
Fla	Ft. Lauderdale, MacKay, Smith & Assocs.	305-467-3888
Fla	Orlando, MacKay, Smith, & Assocs.	305-277-1513
Ga	Atlanta, MacKay, Smith & Assoc.	404-449-7444
Ill	Arlington Hts., Diethert-Angel, Inc.	312-593-7600
Mass	Brockton, Forsberg Sls.	617-522-6300
Mich	Benton Harbor, I.E. Hampton & Assoc.	616-925-0341
Mich	Troy, McPhail Corp.	313-689-6444
NJ	Riverton, Valley Sls. Inc.	609-829-2892
NY	Buffalo, R.W. Mitscher Co.	716-633-7970
NY	Mt. Vernon, Sonkin Assocs	914-668-9809
Ohio	Columbus, McFadden Sls., Inc.	614-459-1280
Ohio	Columbus, McFadden Sls	810-482-1623
Tex	Houston, Aid Elctrns., Inc.	713-777-3882
Tex	Irving, Aid Elctrns., Inc.	214-259-4761
Utah	Salt Lake City, Comp Prods Sls	801-262-0000
Va	Gladys, Ralley Entrprs	804-283-5656
Wash	Vashon, RTS, Inc.	206-455-2778

SHELLER-GLOBE CORP., ELECTRO-MECHANICAL INSTR. DIV., See Electro-Mechanical Instr. Div., Sheller-Globe Corp.

SHIGOTO FAR EAST LTD., Dept. EM, 1500 Broadway, New York, N.Y. 10036, Tel: 212-840-8670, Telex: 22-4219; Empl.: 362 ..... p. 4244

SHOGYO INTERNATIONAL CORP., Dept. EM, 300 Northern Blvd., Great Neck, N.Y. 11021, Tel: 516-466-0911, Telex: 12218

Sales Manager: M.A. Rubin; *Distributor Manager:* H. Rubin

SHUGART ASSOCS., Dept. EM, 415 Oakmead Pkwy, Sunnyvale, Cal. 94086, Tel: 408-733-0100, TWX: 910-339-9355; Empl.: 800

Sales Manager: J. Adkisson

Local Sales Offices & Reps.

Ala	Huntsville, W. A. Brown Instrs.	205-883-8660
Ariz	Phoenix, The Thorson Co.	602-956-5016
Cal	Cupertino, Shugart Assoc.	408-252-6860
Cal	Los Angeles, Shugart Assoc.	714-752-1064
Fla	Orlando, W. A. Brown Instrs.	305-425-5505
Ga	Atlanta, W. A. Brown Instrs.	404-939-1674
Kans	Lenexa, Tech Reps	314-731-5200
La	Manderville, W. A. Brown Instrs.	504-626-9701
Mass	Boston, Shugart Assoc.	617-890-0808
Mich	South Lyons, Infinity Inc.	313-437-2705
Minn	Minneapolis, Shugart Assoc.	612-786-4430
NJ	Ledgewood, Shugart Assoc.	201-584-7539
NC	Durham, W. A. Brown Instrs.	919-682-2383
Pa	Paoli, Action Planning	215-692-2507
SC	Columbia, W. A. Brown Instrs.	803-798-3297
Tenn	Oak Ridge, W. A. Brown Instrs.	615-482-5761
Tex	Dallas, Shugart Assoc.	214-234-3568
Tex	Houston, Microsystems Mktg.	713-783-2900
Wash	Bellevue, Olson, Ferree & Assoc.	206-454-1210

Local Distributors

Cal	Costa Mesa, Avnet Elctrns.	714-754-6111
Cal	Culver City, Hamilton Electro Sls	213-558-2020
Cal	Mountain View, Hamilton/Avnet	415-961-7000
Cal	San Diego, Hamilton/Avnet	714-279-2421
Conn	Georgetown, Hamilton/Avnet	203-762-0361
Mass	Boston, Hamilton/Avnet	617-933-8000
Mich	Livonia, Hamilton/Avnet	313-522-4700
Mo	Hazelwood, Hamilton/Avnet	314-731-1144
NJ	Cedar Grove, Hamilton/Avnet	201-239-0800
NJ	Mount Laurel, Hamilton/Avnet	609-234-2133
NY	Westbury, Hamilton/Avnet	516-533-5800
Ohio	Cleveland, Hamilton/Avnet	216-461-1400
Ohio	Dayton, Hamilton/Avnet	513-433-0610
Tex	Dallas, Hamilton/Avnet	214-661-8661
Tex	Houston, Hamilton/Avnet	713-780-1771
Wash	Bellevue, Hamilton/Avnet	206-746-8750
Wisc	Milwaukee, Hamilton/Avnet	414-784-4510
For:	Can., Mississauga, Ont., Hamilton/Avnet	416-677-7432

SHURE BROTHERS, INC., Dept. EM, 222 Hartrey, Lock Box 1036, Evanston, Ill. 60204, Tel: 312-866-2200, TWX: 72-4381, 910-231-0048

Sales Manager: P. Dalton

SHURITE METERS, Dept. EM, 428 Chapel St., New Haven, Conn. 06508, Tel: 203-787-5824, TWX: 710-465-3165; Empl.: 30

Local Sales Offices & Reps.

Cal	Los Angeles, MODCO	213-851-1113
Cal	Oakland, Moulthrop Sls.	415-261-7676
Colo	Denver, Nelson Co.	303-573-1516
Fla	Longboat Key, R.S. Cushing	813-383-1770
Ill	Oak Park, G. Petitt Co.	312-369-8940
Ind	Fort Wayne, W.W. Bieberich	219-432-2537
Kans	Overland Park, T.L. Dowell & Assocs.	913-236-8200
Md	Reisterstown, Massey Assocs.	301-833-2039
Mich	St. Clair Shores, J.M. Thorpe Co.	313-779-6363
Minn	Minneapolis, Heimann Co.	612-861-6051
NY	Long Island City, D.F. Tobias & Co.	212-545-9191
NC	Raleigh, B.T. Funderburk	919-782-3493
Ohio	Dayton, C.H. Dolfuss, Jr. & Co.	513-275-4831
Ohio	Rocky River, C.H. Dolfuss, Jr. & Co.	216-333-7504
Pa	Media, Snyder & Massey Assocs.	215-566-5400
Pa	Pittsburgh, G.S. Root & Co.	412-561-4125
RI	Lincoln, Adams-McGregor	401-726-1300
Tex	Dallas, Lund & Co.	214-358-4335
Wash	Seattle, J.J. Backer Co.	206-285-1300

SIECOR OPTICAL CABLE, INC, Dept. EM, 631 Miracle Mile, Horseheads, N.Y. 14845, Tel: 607-739-3562, Telex: 932478

Sales Manager: W. Bart Bielawski

SIEMENS-ALLIS, INC., Dept. EM, Box 2168, Milwaukee, Wisc. 53201, Tel: 414-475-3300, Telex: 026-883; Empl.: 5,000

Local Sales Offices & Reps.

Cal	Los Angeles	213-726-0931
Fla	Tampa	813-877-9541
Ga	Atlanta	404-393-0156
Ind	Indianapolis	317-736-7161
Mass	Boston	617-848-5770
Mo	St. Louis	314-567-1074
NJ	Union	201-687-8931
NC	Charlotte	704-364-0412
Ohio	Cleveland	216-333-9090
Ohio	Norwood	513-351-6700
Pa	Haverford	215-527-2501
Tex	Dallas	214-369-7300
Tex	Houston	713-522-1081
Va	Richmond	804-222-8441
Wisc	Milwaukee	414-475-4799
Wisc	Milwaukee	414-475-3724

SIEMENS CORP., Comps Div., Dept. EM, Box 1390, Scottsdale, Ariz. 85252

Local Sales Offices & Reps.

NJ	Iselin, Siemens-Comps	201-494-1000

SIEMENS CORP., Dept. EM, 3 Computer Dr., P.O. Box 5006, Cherry Hill, N.J. 08034, Tel: 609-424-2400, Telex: 845120

Local Sales Offices & Reps.

Cal	North Hollywood, E. Momjian Assocs.	213-764-4891
Cal	Santa Clara, Siemens Corp.	408-244-5034
Fla	Sarasota, W. J. Irvine Co.	813-955-9656
Ill	Downers Grove, Engrg Prods Assocs	312-963-0420
Md	Bethesda, Powell-Pendergraph Inc.	301-656-4535
Mass	Newton Highlands, L & M Sls	617-965-1910
Minn	Minneapolis, Engineering Prods Assoc.	612-925-1883
NJ	Ridgefield, Rical Assocs	201-945-5250
NY	DeWitt, DB Assocs	315-446-0220
Ohio	Dayton, Hocker Assocs.	513-298-8638
Ohio	N. Olmstead, Hocker Assocs.	216-734-4433
Pa	Willow Grove, Powell-Pendergraph Inc.	215-657-0330
Tex	Arlington, Siemens Corp	817-461-1673
Va	Richmond, Powell-Pendergraph Inc.	804-264-2341

SIERRA SCIENTIFIC CORP., Dept. EM, 2189 Leghorn St., Mountain View, Cal. 94043, Tel: 415-969-9315; Empl.: 55

Sales Manager: W. T. Dyall

Local Sales Offices & Reps.

Cal	Cupertino, Ashby Assocs. of No. Cal.	415-996-0411
Cal	Pasadena, A-F Sls. Engrg.	213-681-5631
Mass	Attleboro, Elctrn. Sls. of New England	617-222-4078
Mass	Cambridge, Media Systems	617-876-0164
NJ	Totowa, H.M. Holzberg Assocs.	201-256-0455
NM	Albuquerque, Southwest Video Sys.	505-255-8127
Tex	Dallas, Data Mktg. Assocs.	214-661-0300
Tex	Houston, Data Mktg. Assocs.	713-780-2511
Tex	San Antonio, Data Mktg. Assocs.	512-653-3789
Va	Vienna, Sutter & Co.	703-938-0505
Wash	Seattle, Underwood Assocs.	206-575-0123

SIERRACIN/MAGNEDYNE INC., Dept. EM, 5580 El Camino Real, Box 458, Carlsbad, Cal. 92008, Tel: 714-438-3321, TWX: 910 322-1391; Empl.: 72

Sales Manager: W. D. Caffin

Local Sales Offices & Reps.

Ariz	Scottsdale, Kachina Assocs.	602-947-4472
Cal	Anaheim, Tri-Tek	714-533-1454
Cal	Menlo Park, Long & Assocs	415-327-1300
Fla	Ft. Lauderdale, Electrocomp Assocs.	303-564-8571
Md	Mount Airy, Strayton Assocs	301-831-7007
Mass	Needham Heights, Todino Engrg. Sls., Inc. (TESCO)	617-444-7925
Mich	Southfield, Fred H. Gehrke & Assocs	313-559-5363
Minn	Edina, Grayden & Flemmer	612-941-1120
NY	Huntington, Andrews & Andrews	516-692-8686
NY	Syracuse, Rep Tech	315-437-2845
Ohio	Cleveland, Servo-Mark, Inc.	216-871-2353
Tex	Houston, Oeler & Menelaides	713-772-0730
Tex	Richardson, Oeler & Menelaides	214-234-6334

SIERRACIN/THERMAL SYS., Dept. EM, 13920 S. Broadway, Los Angeles, Cal. 90061, Tel: 213-FA1-4350, TWX: 910-346-6774; FSC No.: 11416; Empl.: 110

Local Sales Offices & Reps.

Ala	Huntsville, Kemp Instrs.	205-837-4304
Cal	Palo Alto, Harris Engr. Assoc.	415-328-3370
Conn	Guilford, R.H. Whitehead Assoc.	203-453-3762
Ill	Deerfield, Thermek, Inc.	312-945-5300
Md	Rockville, Farrell Assocs.	301-424-9460
Mass	Boston, R.H. Whitehead Assocs.	617-542-7676
NJ	East Orange, Friedman Assoc.	201-673-2500
NY	Buffalo, H.C. Johnson Agen.	716-632-7880
NY	Rochester, H.C. Johnson Agen.	716-482-3000
Ohio	Ashland, Stewart & Assocs	419-325-3784
Pa	Glenside, Elcom	215-885-1325

SIFCO METACHEMICAL, Div. Steel Improv. & Forging, Dept. EM, 5708 Schaaf Rd., Independence, Ohio 44131, Tel: 216-881-8600; Empl.: 25

Sales Manager: C.A. Graff

Local Sales Offices & Reps.

Cal	Monrovia, Piddington & Assocs.	213-357-7976
Cal	Pasadena, Piddington Assoc.	213-357-7976
Fla	Orlando, Gulf Atlantic	305-894-0901
Ill	Chicago, Lantry	312-724-3508
Mass	Brookline, Nehfco	617-277-4828
Minn	Minneapolis, Chemquip Corp	612-827-5951
Va	Virginia Beach, Tidewater Maintenance	804-481-7526

SIGMA PLASTRONICS, INC., Dept. EM, 14531-33 Tireman Ave, Dearborn, Mich. 48126, Tel: 313-846-4410

Sales Manager: S. J. Hirshfield

Local Sales Offices & Reps.

Ariz	Scottsdale, S.C. Blaker Co.	602-948-3061
Mass	Wayland, Carl H. Whittier Co.	617-358-7377

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Sales Manager: J.A. Matteson

SIGMA SYS. CORP., Dept. EM, 3163 Adams Ave., San Diego, Calif. 92116, Tel: 714-283-3193; Empl.: 9

Sales Manager: T. Stewart

SIGNAL LABS, INC., Dept. EM, 202 N. State College Blvd., Orange, Cal. 92668, Tel: 714-634-1533; FSC No.: IM 562; Empl.: 20

Sales Manager: Wm. A. Chidester

Local Sales Offices & Reps.

Ariz	Scottsdale, Ed Weinstein	602-945-2194
Cal	Cupertino, Saber Entprs.	408-446-4792
Cal	Long Beach, Saber Entprs.	213-595-5646
Colo	Denver, Peter Kertesz	303-355-2363
Ill	La Grange, PVA Co	312-352-1037
Kans	Shawnee Mission, Bruce Zinsmaster	913-362-5512
Mich	Detroit, Larry Brown	313-482-1229
Minn	Minneapolis, Arrow Techn Sls	612-545-4481
Mo	St. Louis, Delltron Co.	314-869-4779
Neb	Lincoln, Chuck Graves	402-464-1485
NJ	Union City, Malin Assocs	201-865-3333
NM	Sandia Park, PAR Assocs	505-881-5000
NY	Rome, RDQ Assocs	315-337-5300
Ohio	Centerville, Micro Sls	513-433-8171
Ohio	Cleveland, Bill Collier	216-331-0900
Pa	Jenkintown, PDC Corp.	215-887-9610
Tex	Richardson, Spectra Sls	214-234-3600
Wash	Bellevue, SDR²	206-747-9424
Wisc	Menomonee Falls, Ted Cessop	414-251-3262

SIGNAL TRANSFORMER CO., Dept. EM, 500 Bayview Ave., Inwood, N.Y. 11696, Tel: 516-239-7200; FSC No.: 08779; Empl.: 115 ..... p. 4389-4403

Sales Manager: R. Valentino

SIGNATRON, INC., Dept. EM, 12 Hartwell Ave., Lexington, Mass. 02173, Tel: 617-861-1500; Empl.: 30

Sales Manager: J.H. Kelley

SIGNETICS CORP., Dept. EM, 811 E. Arques Ave., Sunnyvale, Cal. 94086, Tel: 408-739-7700, TWX: 910-339-9220; Empl.: 6000

Sales Manager: M. Hackworth; *Distributor Manager:* J. Abram

Local Sales Offices & Reps.

Ala	Huntsville, Murcota	205-539-8476
Ala	Huntsville, Signetics Corp.	205-533-5800
Ariz	Phoenix, Signetics Corp.	602-265-4444
Cal	Inglewood, Signetics Corp.	213-670-1101
Cal	Irvine, Signetics Corp.	714-833-8980
Cal	San Diego, Mesa Engrg.	714-278-8021
Cal	San Diego, Signetics Corp.	714-560-0242
Cal	Sherman Oaks, Astralonics	213-990-5903
Cal	Sunnyvale, Signetics Corp.	408-736-7565
Colo	Aurora, Signetics Corp.	303-751-5011
Colo	Denver, Barnhill Five	303-426-0222
Conn	Newtown, Kanan Assoc.	203-426-8157
Fla	Altamonte Springs, Semtronic Assocs.	305-831-8233
Fla	Clearwater, Semtronic Assocs.	813-461-4675
Fla	Pompano Beach, Signetics Corp.	305-782-8225
Ill	Chicago, L-TEC, Inc.	312-286-1500
Ill	Rolling Meadows, Signetics Corp.	312-259-8300
Ind	Indianapolis, Enco Mktg.	317-546-5511
Kans	Overland Park, Adv. Tech. Sls	913-492-4333
Kans	Wichita, Signetics Corp.	316-683-5652
Md	Baltimore, MICROCOMP, Inc.	301-247-0400
Md	Columbia, Signetics Corp.	301-730-8100
Mass	Reading, Kanan Assocs.	617-944-8484
Mass	Woburn, Signetics Corp.	617-933-8450
Mich	Bloomfield Hills, Enco Mktg	313-642-0203
Minn	Edina, Mel Foster Technical Assoc.	612-835-2252
Minn	Edina, Signetics Corp.	612-835-7455
Mo	St. Louis, Adv. Tech. Sls	314-567-6272
NJ	Cherry Hill, Signetics Corp.	609-665-5071
NJ	Haddonfield, Thomas Assocs. Inc.	609-854-3011
NJ	Piscataway, Signetics Corp.	201-981-0123
NM	Albuquerque, Staley Co.	505-292-0060
NY	Ithaca, Bob Dean, Inc.	607-272-2187
NY	Wappingers Falls, Signetics Corp.	914-297-4074
NY	Woodbury, Signetics Corp.	516-364-9100
NC	Cary, Montgomery Sls.	919-467-6319
Ohio	Centerville, N. Case Assocs.	513-433-0966
Ohio	Fairview Park, N. Case Assocs.	216-333-4120
Ohio	Worthington, Signetics Sls.	614-888-7143
Ore	Portland, Western Tech. Sls.	503-297-1711
Tex	Austin, Cunningham Co	512-459-8947
Tex	Dallas, Cunningham Co.	214-233-4303
Tex	Dallas, Signetics Corp.	214-661-1296
Tex	Houston, Cunningham Co.	713-461-4197
Utah	Centerville, Signetics Corp.	801-290-1292
Utah	Salt Lake City, Barnhill Five	801-292-8991
Wash	Bellevue, Western Tech. Sls.	206-682-1073
Wisc	Greenfield, L-TEC, Inc.	414-545-8900

SILICON TRANSISTOR CORP., Dept. EM, Katrina Rd., Chelmsford, Mass. 01824, Tel: 617-256-3321, TWX: 710-343-0576; FSC No.: 07256; Empl.: 125

Local Sales Offices & Reps.

Ala	Hunstville, Hughes Assoc.	205-536-2127
Ariz	Phoenix, Southwest e/m Engrg.	602-993-0250
Cal	Marina Del Rey, Relcom	213-822-1187
Cal	Sunnyvale, Mission Mktg	408-732-9611
Colo	Denver, Electrodyne	303-757-7679
Fla	Ft. Lauderdale, Perrott Assoc.	305-792-2211
Fla	Orlando, Perrott Assocs.	305-275-1132
Ill	Des Plaines, Coombs Assocs.	312-298-4830
Ind	Indianapolis, Coombs Assocs.	317-251-2757
Kans	Overland Park, Advanced Tech. Sls	913-492-4333
Md	Ellicott City, Mktg Technology	301-465-5944
Mass	Lexington, J. E. Boeing Co.	617-862-2500
Mich	Plymouth, A.P.J. Assoc.	313-459-1200
Minn	St. Paul, Cahill Assocs	612-646-7217

Mo Earth City, Advanced Tech. Sls 314-739-4048
NJ Clifton, Compar New York, Inc... 201-546-3660
NY Cicero, Advanced Comps 315-699-2671
NY Clinton, Advanced Comps 315-853-6438
NY Endicott, Advanced Comps 607-785-3191
NY Scottsville, Advanced Comps 716-889-1429
Ohio Richfield, Bear Mktg. 216-659-3131
Ore Portland, J. J. Backer Co. 503-297-3766
Pa Erie, Ecco Elec. Sls 814-459-8822
Pa Oreland, CMS Mktg. 215-885-5106
Tex Austin, Mycrosystems Mktg. 512-266-1750
Tex Dallas, Mycrosystems Mktg. 214-238-7157
Tex Houston, Mycrosystems Mktg 713-783-2900
Utah Salt Lake City, Electrodyne 801-486-3801
Wash Seattle, J. J. Backer Co. 206-285-1300

SILICONIX, INC., Dept. EM, 2201 Laurelwood Rd., Santa Clara, Cal 95054, Tel: 408-988-8000, TWX: 910-338-0227; FSC No.: 17856; Empl.: 1000

Sales Manager: L. Lynberg, V.P.; *Distributor Manager:* D. Delane

Local Sales Offices & Reps.
Ala Huntsville, Rep., Inc. 205-881-9270
Ariz Phoenix, Siliconix, Inc. 602-252-5885
Cal Huntington Beach, Siliconix, Inc. 213-592-1336
Cal Irvine, Celtec Co. 714-752-6111
Cal San Diego, Celtec Co. 714-279-7961
Cal Santa Clara, Magna Sls. 408-985-1750
Cal Santa Clara, Siliconix, Inc. 408-246-8000
Cal Sherman Oaks, Celtec Co. 213-990-3440
Colo Denver, Barnhill Five 303-426-0222
Colo Littleton, Siliconix, Inc. 303-795-3187
Conn Ridgefield, Phoenix Sls. Co. 203-438-9644
Fla Ft. Lauderdale, Perrott Assoc. 305-792-2211
Fla Largo, Perrott Assocs. 813-585-3327
Fla Orlando, Perrott Assocs. 305-275-1132
Ga Tucker, Rep 404-938-4358
Ill Palatine, Technology Sls. 312-991-6600
Ill Wheeling, Siliconix, Inc. 312-541-0131
Ind Ft. Wayne, Rich Elctrn. Mktg. 219-432-5553
Iowa Cedar Rapids, BC Elec. 319-393-5818
Kans Olathe, BC Elctrns. 913-888-6680
Md Baltimore, Coulbourn DeGreif 301-247-4646
Md Frederick, Coulbourn DeGrief 301-898-7474
Mass Reading, Kanan Asso 617-944-8484
Mass Waltham, Siliconix, Inc. 617-890-7180
Mich Detroit, Rathsburg Assoc. 313-882-1717
Minn Minneapolis, Siliconix, Inc. 612-835-2515
Mo Hazelwood, BC Elctrns. 314-731-1255
NY Melville, R.O.M.E. 516-249-0011
NY Melville, Siliconix, Inc. 516-694-8474
NY Pittsford, T2 Elctrns. 716-381-2551
NY Syracuse, T2 Elctrns. 315-463-8592
NC Cary, Montgomery Mktg. 919-467-6319
Ohio Dayton, Lyons Corp 513-278-0714
Ohio Highland Heights, Lyons Corp 216-461-8288
Pa Ft. Washington, GCM Assoc. 215-646-7535
Tenn Jefferson City, Rep. Inc. 615-475-4105
Tex Dallas, Siliconix 214-234-6927
Tex Richardson, Semiconductor Sls. Assoc. 214-231-6181
Utah W. Bountiful, Barnhill Five 801-292-8991
Wash Seattle, B. Hirsh Co. 206-783-3423
Wisc Milwaukee, JM Sls. 414-546-0040

Local Distributors
Ala Huntsville, Hamilton/Avnet Elctrns. 205-533-1170
Ala Huntsville, Pioneer 205-837-9300
Ariz Phoenix, Hamilton/Avnet Elctrns. 602-275-7851
Cal Costa Mesa, Avnet Elctrns. 714-754-6111
Cal Culver City, Hamilton Electro Sls. 213-558-2121
Cal Mt. View, Hamilton/Avnet Elctrns. 415-961-7000
Cal Mt. View, Elmar Elec. 415-961-3611
Cal San Diego, Hamilton/Avnet Elctrns. 714-279-2421
Colo Commerce City, Elmar Elctrns. 303-287-9611
Colo Denver, Hamilton/Avnet Elec. 303-534-1212
Colo Wheatridge, Century Elec 303-424-1985
Conn Georgetown, Hamilton/Avnet Elctrns. 203-762-0361
Conn Hamden, Wilshire Elec. 203-281-1166
Fla Ft. Lauderdale, Hamilton/Avnet Elctrns. 305-971-2900
Fla Orlando, Pioneeer Elec. 305-859-3600
Ga Norcross, Hamilton/Avnet Elctrns. 404-448-0800
Ill Elk Grove Village, Pioneer 312-437-9680
Ill Elmhurst, Semiconductor Specialists 312-279-1000
Ill Schiller Park, Hamilton/Avnet Elctrns. 312-678-6310
Ind Indianapolis, Pioneer 317-849-7300
Kans Lenexa, Hamilton/Avnet Elctrns 913-888-8900
Md Gaithersburg, Pioneer Elec. 301-948-0710
Md Hanover, Hamilton/Avnet Elctrns. 301-796-5000
Mass Burlington, Wilshire Elec. 617-272-8200
Mass Woburn, Hamilton/Avnet Elctrns. 617-933-8000
Mich Farmington, Semiconductor Specialists 313-478-2700
Mich Livonia, Pioneer 313-525-1800
Mich Livonia, Hamilton/Avnet Elec. 313-522-4700
Minn Edina, Hamilton/Avnet Elec. 612-941-3801
Minn Minneapolis, Industrial Comps 612-831-2666
Minn Minneapolis, Semiconductor Spec. 612-854-8841
Mo Hazelwood, Hamilton/Avnet Elec. 314-731-1144
Mo Hazelwood, Semiconductor Spec. 314-731-2400
Mo Kansas City, Semiconductor Spec. 816-452-3900
NJ Cedar Grove, Hamilton/Avnet Elec. 201-239-0800
NJ Cinnaminson, Wilshire Elec. 609-786-8990
NJ Clifton, Wilshire Elec. 201-340-1900
NJ Mt. Laurel, Hamilton/Avnet Elec. 609-234-2133
NM Albuquerque, Hamilton/Avnet Elec. 505-765-1500
NM Albuquerque, Century Elec 505-292-2700
NM Albuquerque, Alliance Elec 505-292-3360
NY Endwell, Wilshire Elec. 607-754-1570
NY Farmingdale, Wilshire Elec. 516-293-5775
NY Hauppauge, Components Plus 516-231-9200
NY Rochester, Hamilton/Avnet Elec. 716-442-7820
NY Rochester, Wilshire Elec. 716-442-9560
NY Syracuse, Hamilton/Avnet Elec. 315-437-2642
NY Westbury, Hamilton/Avnet Elec. 516-333-5800
NC Greensboro, Pioneer Elec. 919-273-4441
NC Raleigh, Hamilton/Avnet 919-829-8030
Ohio Cleveland, Hamilton/Avnet Elec. 216-461-1400
Ohio Cleveland, Pioneer 216-587-3600
Ohio Dayton, Pioneer 513-236-9900
Ohio Dayton, Hamilton/Avnet Elec. 513-433-0610
Pa Horsham, Pioneer Elec. 215-674-4000
Pa Pittsburgh, Semiconductor Spec. 412-782-2300
Pa Pittsburgh, Semi. Spec. 412-781-8120
Tex Austin, Quality Comps 512-458-4181
Tex Dallas, Hamilton/Avnet Elec. 214-661-8661
Tex Dallas, Quality Comps. 214-387-4949
Tex Houston, Hamilton/Avnet Elec. 713-780-1771
Tex Houston, Quality Comps. 713-772-7100
Utah Salt Lake City, Hamilton/Avnet Elec. 801-972-2800
Utah Salt Lake City, Century Elec 801-972-6969
Wash Bellevue, Liberty Elec 206-453-8300
Wash Bellevue, Hamilton/Avnet Elec. 206-746-8750
Wisc Milwaukee, Semiconductor Specialists 414-257-1330
Wisc New Berlin, Hamilton/Avnet 414-784-4510
For Can., Mississauga Ont., Hamilton/Avnet Elec. 416-677-7432
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For: Can., Montreal, Que, Futere Elec 514-735-5775
For: Can., Ottawa, Ont., Future Elec. 514-735-5775
For: Can., Ottawa, Ont., Hamilton/Avnet Elec. 613-226-1700
For. Can., Rexdale, Ont. M9W 1K5, Future Elec. 416-677-7820
For: Can., Vancouver, BC, R. A. E. Indl. Elec. 604-687-2621

SILTRAN DIGITAL, Dept. EM, 14831 Kitterman, Box 437, Silverado, Cal. 92676, Tel: 714-649-2704

Sales Manager: M.F. Hordeski, Cust. Svcs.

Local Sales Offices & Reps.
Ariz Tucson, G. Moore Assoc. 602-795-3176
Cal San Gabriel, Controls for Industry 213-289-6958
Colo Boulder, G. Moore Assoc. 303-494-3351
NM Albuquerque, G. Moore Assoc. 505-292-3322
NC Charlotte, Binco 704-366-5092
Pa Bethayres, Control Instr. Sls. 215-676-1808
Va Roanoke, Johnson Custom Controls 703-981-0780

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Sales Manager: L.S. Colwell

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La Marrero 504-347-5416
Tex Houston 713-960-8590

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Sales Manager: M. O. Buehring Dir of Sls; *Distributor Manager:* J. Honer

Local Sales Offices & Reps.
Ala Huntsville, Cartwright & Bean 205-533-3509
Alas Anchorage, H.J. Lang 279-5741
Cal Burlingame, W.J. Purdy Assoc 415-347-7701
Cal Monrovia, Simpson Sls. 213-359-8132
Cal Sacramento, W.J. Purdy Assoc. 916-422-0128
Colo Englewood, R.G. Bowen Co. 303-789-1884
Conn Meriden, P.R. Sturgeon 203-237-1112
Fla Ft. Lauderdale, Cartwright & Bean 305-791-3989
Ga Atlanta, Cartwright & Bean 404-255-5262
Ind Indianapolis, L.M. De Voe Co. 317-842-3245
Iowa Des Moines, Kathrinus-Kelly 515-255-4584
Kans Shawnee Mission, Kathrinus-Kelly 913-722-0000
La Metairie, Cartwright & Bean 504-835-6220
Md Baltimore, S.K. MacDonald, Inc. 301-254-3381
Md Wheaton, A. H. Swanson Co. 301-949-7440
Mass Needham Hgts, P.R. Sturgeon Co. 617-444-6603
Mich Detroit, R.C. Merchant Co. 313-535-6000
Mich St. Joseph, R.C. Merchant Co. 616-983-7378
Minn Edina, M. Foster Tech. Sls. 612-835-2252
Miss Jackson, Cartwright & Bean Co. 601-981-1368
Mo St. Louis, Kathrinus-Kelly 314-968-3800
NM Albuquerque, C.T. Carlberg 505-265-1579
NY Buffalo, L.D. Allen Inc. 716-837-1955
NY Fairport, D. Allen Inc. 716-377-3530
NY Great Neck, Simpson Instrs. Sls. 516-482-3103
NY North Syracuse, L.D. Allen Inc. 315-458-7470
NY Pleasant Valley, L.D. Allen Inc. 914-635-3363
NC Charlotte, Cartwright & Bean 704-377-5673
NC Raleigh, Cartwright & Bean 919-781-6560
Ohio Centerville, A. H. Swanson Co. 513-433-6668
Ohio Cincinnati, Baehr-Greenleaf & Assoc. 513-891-3826
Ohio Cleveland, Baehr-Greenleaf & Assoc. 216-221-9030
Ohio Columbus, Baehr-Greenleaf & Assoc. 614-486-4046
Ohio Dayton, Baehr-Greenleaf & Assoc. 513-293-1102
Okla Tulsa, J.Y. Schoonmaker Co. 918-936-1423
Ore Portland, Earl & Brown 503-245-2283
Pa Philadelphia, S.K. Macdonald Inc. 215-545-1205
Pa Pittsburgh, S.K. MacDonald Inc. 412-366-2643
Tenn Knoxville, Cartwright & Bean 615-693-7450
Tenn Memphis, Cartwright & Bean Co. 901-276-4442
Tex Dallas, J.Y. Schoonmaker Co. 214-349-1650
Tex Houston, J. Y. Schoonmaker Co. 713-926-9510
Tex San Antonio, A. H. Swanson Co. 512-361-6919
Wash Seattle, Earl & Brown 206-284-1121
Wisc Milwaukee, E. Dickinson 414-264-1080
Exp: Ill., Elgin, Simpson Electric 312-697-2260

SINCLAIR RADIO LABS., Dept. EM, 122 Rayette Rd. Concord, Ontario, Can. L4K 1B6, Tel: 416-669-1244, Telex: 06-964598; Empl.: 100

Sales Manager: W.H. Galpin

Local Sales Offices & Reps.
NY Tonawanda

SINGER CO., American Meter Div., Dept. EM, 13500 Philmont Ave., Philadelphia, Pa. 19116, Tel: 215-673-2100, TWX: 710-670-0965

Local Sales Offices & Reps.
Ala Birmingham 205-979-0860
Ariz Phoenix 602-265-0217
Cal Fullerton 714-525-8237
Cal San Mateo 415-572-1551
Colo Denver 303-333-0222
Ga Atlanta 404-261-0732
Ill Hinsdale 312-986-0177

Kans Kansas City 913-341-4737
Mass Waltham 617-890-5800
Mich Chelsea 313-475-1122
Minn Minneapolis 612-471-9302
Neb Omaha 402-393-4999
NJ Clark 201-574-2100
Okla Tulsa 918-663-2520
Ore Lake Oswego 503-636-0414
Pa Philadelphia 215-673-2100
Pa Pittsburgh 412-531-2822
Tex Garland 214-276-6134
Tex Houston 713-666-0204
Wash Mercer Island 206-232-2261
Wisc Beaver Dam 414-887-8003

SINGER CO., Kearfott Div., Dept. EM, 1150 McBride Ave., Little Falls, N.J. 07424, Tel: 201-256-4000, TWX: 710-988-5700; Empl.: 4600

Local Sales Offices & Reps.
Ariz Phoenix, Southwest e/m Engrg., Inc. 602-993-0250
Cal Glendale, Singer Co., Kearfott Div. 213-247-8076
Cal San Jose, Richards Assocs. 408-246-5860
Fla Indian Rock Beach, Tech-Rep Assocs., Inc. 813-595-2834
Ill Oakbrook, Singer Co., Kearfott Div. 312-654-0800
Mo St. Louis, Singer Co., Kearfott Div. 314-521-0100
NJ Little Falls, Singer Co., Kearfott Div. 201-256-4000
NC Raleigh, Candor Co., Inc. 919-787-2652
Ohio Dayton, Singer Co., Kearfott Div. 513-222-8942
SC Myrtle Beach, Candor Co., Inc. .. 803-448-5213
Tenn Chattanooga, Candor Co., Inc. .. 615-894-7454
Tex Irving, Singer Co., Kearfott Div. .. 214-252-7423
Va Lynchburg, Candor Co., Inc. 703-846-6579
Wash Renton, Singer Co., Kearfott Div. 206-228-4356
Wash Seattle, J.J. Backer Co. 503-297-3776

SINGER CO., Librascope Div., Dept. EM, 833 Sonora Ave., Glendale, Cal. 91201, Tel: 213-244-6541, TWX: 910-497-2266; Empl.: 1600

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DC Washington 202-223-4100
NJ West Long Branch 201-870-1222

S.I.R. ATLANTA, INC., Dept. EM, 331 Luckie St., N.W., Atlanta, Ga. 30313, Tel: 404-522-6317; Empl.: 15

Sales Manager: C.R. Romanchuk

SIVERS LAB, Dept. EM, Box 90339, Los Angeles, Cal. 90009, Tel: 213-821-0213; Empl.: 200

Local Sales Offices & Reps.
Cal Los Angeles, Cleland & Co. 213-821-0213
Cal Los Gatos, R. Donahue Assocs 408-356-1717
Md Severna Park, Delmarva Engrg Assocs 301-647-8007
Mass Lowell, Russell Engrg Svs 617-458-7146
NY Huntington, CDB Enterprises 516-692-5200

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Cal Los Gatos, Luscombe Engrg. Co. 408-354-6496
Cal Pasadena, Luscombe Engrg. Co. 213-684-2000
Colo Lakewood, Intermountain Instrs. 303-237-0443
Conn Meriden, Abbott-Allison Co. 203-237-9232
Fla Orlando, Datarep, Inc. 305-843-5224
Ga Doraville, Kemp Instrs 404-938-5973
Ill La Grange, Olson Engrg. & Sls. Corp. 312-482-3300
Ind Anderson, K. E. Schneider 317-644-1690
Md Rockville, Farrell Assocs. 301-424-9460
Mass Greenbush, Abbott-Allison Co. .. 617-245-0250
Mich Birmingham, Electro-Mation Assocs. 313-564-6517
Minn Minneapolis, Loren Green Assocs. 612-781-1611
Mo Bridgeton, Williams Equip Co. ... 314-291-7033
NJ Bogota, Neville & Vespo Corp. .. 201-487-1505
NY Elbridge, L-Tron Corp. 315-689-3787
NC Charlotte, Systems Service Corp. 704-377-3407
Ohio Cleveland, Fred R. Sharp Co. 216-464-3820
Pa Glenside, C.A. Briggs Co. 215-885-2244
Pa Pittsburgh, R.W. Moulton & Assocs. 412-366-3333
Tex Dallas, Concept Sls. Co. 214-241-5202
Va Richmond, Systems Svc. Corp... 804-231-7309
Wash Bellevue, Al Smith Co. 206-746-6770
Wisc Milwaukee, Olson Engrg. & Sls. Corp. 414-873-7330

SKOTTIE ELECTRONICS INC., Dept. EM, Line St., Archbold, Pa. 18403, Tel: 717-876-1686, Telex: 831-834; FSC No.: 52085; Empl.: 75

Sales Manager: W. R. Toye; *Distributor Manager:* J. D. Castellano

Local Sales Offices & Reps.
Ariz Scottsdale, The Veren Corp. 602-948-3571
Ariz Scottsdale, Piper Sls. 602-949-8424
Cal Santa Clara, Apollo Assoc 415-941-4218
DC Washington, Harry Wise & Co. .. 202-363-9417
Fla Orlando, Mackay Smith & Assc. 305-277-1513
Ga Atlanta, Mackay Smith & Assc... 404-449-7444
Ill Highland Park, Bransky Sls 312-433-2375
Ind Angola, Waid & Assocs 219-833-3522
Mich Warren, DEM Electronic Sls 313-575-9444
Minn Minneapolis, R-J-Inc. 612-922-1425
Mo Grandview, Burton-Medley Assc. 816-763-5835
NJ Cherry Hill, J. N. Barrett Assc.... 609-429-1551
NJ Kenilworth, Ventronics Inc. 201-272-9262
NY Rochester, Fowler Beach Corp. 716-586-0486
NY Seaford, Henry Abbott 516-781-5256
NC Charlotte, MacKay Smith & Assc. 704-527-0240
Ohio St. Mary's, Thomas Shelby & Co. 419-394-3377
Wash Mercer Island, Tri-Tronix, N.W. .. 206-232-4993
Exp: N.Y. N.Y., AES Electronics 212-371-8120

SKYDYNE,, Div. Brooks & Perkins Inc., Dept. EM, River Rd., Port Jervis, N.Y. 12771, Tel: 914-856-6655, TWX: 510-260-1249; Empl.: 130 ..... p. 1047

SLAUGHTER CO., Dept. EM, Moore & Hailey Sts., P.O. Box 1805, Ardmore, Okla. 73401, Tel: 405-223-4773, TWX: 910-830-6972; FSC No.: 05611 .. p. 2822,2823

SLOAN COMPANY, Dept. EM, 7704 San Fernando Rd., Sun Valley, Cal. 91352, Tel: 213-875-1123, TWX: 910-498-2250; Empl.: 21 ..... p. 2542-2545

Sales Manager: G.M. Elsner

Local Sales Offices & Reps.
Ala Huntsville, JHU Assocs. 205-536-7455
Cal Los Angeles, P. Wiley Co. 213-663-8028
Cal Palo Alto, Shannon Assocs 415-325-5233
Cal San Diego, Wiley Co. 714-571-2773
Colo Englewood, Dynatech 303-773-2830
Conn Meriden, Eagle Assocs. 203-235-9036
Fla Pompano Beach, Cole-Tek Assocs. 305-781-8110
Kans Wichita, Forristal-Young Sls. Co. 316-838-7226
Md Silver Springs, H.R. Sieber Co... 301-389-9110
Mass Pinehurst, Eagle Assocs. 617-444-3446
Mo Kansas City, Forristal-Young Sls. Co. 816-358-6771
Mo St. Louis, Forristal-Young Sls. Co. 314-645-2360
Neb Omaha, Forristal-Young Sls. Co. 402-333-0800
NJ Cherry Hill, Quality Components 609-428-6266
NJ Englewood Cliffs, E. Glass Assocs. 212-586-8440
NY Rochester, J. G. Welch Assocs. 716-244-1100
Ohio Cleveland, Arthur H. Baier Co. .. 216-461-6161
Ohio Dayton, Arthur H. Baier Co. 513-276-4128
Wash Seattle, D. Smith Sls.Co. 206-633-3160

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Ala Huntsville, Powell/Gulf Elctrns. .. 205-539-2731
Cal Los Angeles, El-Com, Inc. 213-223-1353
Cal Sunnyvale, Powell Elctrns. 408-739-4321
Colo Denver, Newark Elctrns. 303-757-3351
Conn Danbury, Bond Radio Elctrns. 203-744-2274
Fla Ft. Lauderdale, Peerless Radio Corp. 305-566-5966
Fla Miami, Powell/Gulf Elctrns. 305-592-3260
Fla Miami, Electronic Equip. Co. 305-635-0421
Fla Winterpark, Electronic Equip. Co. 305-644-4833
Ill Des Plaines, Edmar Elctrns. Co. 312-298-8580
Kans Wichita, Interstate Elctrn. Supply 316-264-6316
Md Beltsville, Powell Elctrns./Wash. 301-937-4030
NY Buffalo, Genesee Radio & Parts 716-873-9661
NY Lynbrook, Peerless Radio Corp. 516-593-2121
Ohio Solon, R. E. H. Elctrns 216-248-1636
Ohio Solon, Repco 216-248-8900
Pa Philadelphia, Powell Elctrns. 215-365-1900
Tex Houston, Altair Co. 713-462-3029
Tex Richardson, Southwest Elctrns... 214-234-3050
Tex Richardson, Altair Co. 214-231-5166
Tex Stafford, Southwest Elctrns. 713-494-6021
Wash Seattle, Zepher Elctrn. Sls. Corp. 206-242-2517

SLOAN TECHNOLOGY CORP., Dept. EM, 535 E. Montecito St., Santa Barbara, Cal. 93103, Tel: 805-963-4431, TWX: 910-334-4901; Empl.: 100

Sales Manager: R. E. Ward

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Cal Sunnyvale, Sloan Technology 408-733-8522
Cal Whittier, Micro-tech West 213-694-2124
Colo Denver, G. O'Brien Sls. Agency 303-477-4713
Ga Atlanta, G.H. Crossley Assocs. .. 404-261-4278
Ill Park Ridge, B. Ellis & Assocs..... 312-298-7626
Mass Boston, Industrial Equip. & Sls. .. 617-227-8112
NY Clifton Park, Empire Technology, Inc. 518-371-2480
NY Rochester, Empire Technology, Inc. 716-225-5820
Pa Pittsburgh, Kurt J. Lesker Co. 412-892-2996
Tex Richardson, Yarbrough Southwest Co. 214-690-0800
Va Fairfax, Capitol Research Equip. 703-560-1616

SMC MICROSYSTEMS CORP., Dept. EM, 35 Marcus Blvd, Hauppauge, N.Y. 11787, Tel: 516-273-3100, TWX: 510-227-8898; FSC No.: 53848; Empl.: 150

Sales Manager: A. Sidorsky; *Distributor Manager:* L. Tarnell

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Cal	Carlsbad, Paul Kaplan	714-729-7332
Cal	Irvine, Turk Enterprises	714-955-1575
Cal	Los Angeles, EEP	213-670-7880
Cal	Palo Alto, Nor-Cal Assocs	415-961-8121
Colo	Denver, D/Z Assocs	303-534-3649
Conn	Southington, The Orion Grp	203-621-5941
Fla	Hollywood, C Assocs	305-922-5230
Ind	Skokie, Mar-Con	312-675-6450
Md	Baltimore, Burgin-Kreh Assocs	301-788-5200
Mass	Burlington, Contact Sls	617-273-1520
Mich	Plymouth, A.P.J. Assocs	313-459-1200
Minn	New Brighton, TWC Sls	612-636-1770
NJ	Keasbey, Addem	516-549-8400
NY	Binghamton, L-Mar	607-723-1513
NY	Melville, Addem	516-549-8400
NY	Rochester, L-Mar	716-328-5240
NY	Syracuse, L-Mar	315-437-7779
NC	Raleigh, Burgin-Kreh Assocs	919-781-1100
Ohio	Cincinnati, G & H Sls	513-771-8231
Ohio	Grove City, G & H Sls	614-878-1128
Pa	Hatboro, QED Elctrns	215-674-9600
Tenn	Kingston, Burgin-Kreh Assocs	615-690-6100
Tex	Dallas, Kruvand Assocs	214-691-4592
Tex	Houston, Kruvand Assocs	713-780-9710
Va	Lynchburg, Burgin-Kreh Assoc	804-845-5600
Wash	Bellevue, SDR² Prods & Sls	206-747-9424

SMITH INC., HERMAN H., Dept. EM, 812 Snediker Ave., Brooklyn, N.Y. 11207, Tel: 212-272-9400, TWX: 710-584-2363; FSC No.: 83330; Empl.: 200 p. 2104-2156

Sales Manager: S. Fleischman; *Distributor Manager:* S. Fleischman

Local Sales Offices & Reps.

Ariz	Phoenix, Shefler-Kahn	602-296-0749
Cal	Los Angeles, E.E. Strassner Co.	213-242-8823
Cal	Redwood City, Warren Assocs	415-368-2801
Colo	Denver, Shefler-Kahn	303-761-2590
Conn	Waterbury, Coakley, Boyd & Abbett	800-225-8402
Fla	Bradenton, Hutto Hawkins Peregoy	813-792-1727
Fla	Maitland, Hutto Hawkins Peregoy	305-831-2474
Fla	Pompano Beach, Hutto Hawkins Peregoy	305-943-9593
Ill	Chicago, J.J. McBride Sls.	312-775-1080
Ind	Indianapolis, Electronic Reps	317-894-1414
Kans	Overland Park, Lowell Kangas & Assoc.	913-631-3515
La	Metairie, J.F. McKinney Sls.	504-454-1132
Md	Lanham, L.D. Lowery	301-459-1556
Mass	Needham Hgts, Coakley, Boyd & Abbett	617-444-5470
Mich	Pleasant Ridge, Shalco	313-547-4771
Minn	Minneapolis, C.R. Gibb	612-377-1200
Mo	St. Louis, Lowell Kangas & Assoc.	314-821-4050
NM	Albuquerque, Shefler-Kahn	505-296-0749
NY	Buffalo, L.D. Allen	716-837-1955
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Wash	Seattle, D. Weber Co.	206-623-5990

SNAP-ON-TOOLS, Dept. EM, 8192-A 28th Ave., Kenosha, Wisc. 53140, Tel: 414-654-8681; Empl.: 2500

Sales Manager: M. Gregory

Local Sales Offices & Reps.

Ala	Birmingham	205-956-1722
Ariz	Phoenix	602-272-2615
Cal	Anaheim	714-635-4550
Cal	Carson	213-321-6223
Cal	Emeryville	415-654-8666
Cal	Santa Clara	408-247-9200
Colo	Denver	303-936-2363
Conn	Wethersfield	203-529-7481
Fla	Jacksonville	904-786-3746
Fla	Miami Lakes	305-558-0292
Ga	Atlanta	404-875-9682
Haw	Kaneohe	808-235-3673
Ill	Elk Grove Village	312-437-6112
Ill	La Grange	312-352-3741
Ind	Indianapolis	317-545-7563
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Mass	Marlboro	617-481-1700
Mich	Farmington Hills	313-476-7300
Minn	Minneapolis	612-927-7994
Mo	Kansas City	816-931-2322
Mo	St. Louis	314-647-2338
Neb	Omaha	402-592-2555
NJ	Delran	609-764-0172
NJ	Fairfield	201-575-1666
NY	Buffalo	716-633-2727
NY	Latham	518-783-9444
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Ohio	Cincinnati	513-771-9114
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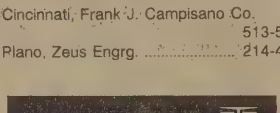
SNELGROVE, C. R. LTD., Dept. EM, 141 Bond Ave., Don Mills 404 Ont., Ont. Can., Tel: 416-447-8531, TWX: 06-966626, 610-492-1354; FSC No.: 02533; Empl.: 175

Sales Manager: Miss H. Silla

Local Sales Offices & Reps.

Cal	Encino, El-Tec Inc.	
Mass	Waban, QRC Co.	
NC	Research Triangle Park, A. B. Andrews & Co.	919-549-0563
Ohio	Cincinnati, Frank J. Campisano Co.	513-574-7111
Tex	Plano, Zeus Engrg.	214-423-2027



SOLA ELECTRIC, Dept. EM, 1717 Busse Rd., Elk Grove Village, Ill. 60007, Tel: 312-439-2800, Telex: 28-0538; Empl.: 450 p. 3342

Sales Manager: Jim Kimball; *Distributor Manager:* Dave Kemp

Local Sales Offices & Reps.

Ala	Huntsville, Cartwright & Bean	205-533-3509
Ariz	Phoenix, Zeus	602-253-6104
Cal	Inglewood, J. Berman Co.	213-649-6111
Cal	Oakland, Moulthrop Sls.	415-846-0550
Colo	Denver, Zeus	1-800-528-4512
Fla	Ft. Lauderdale, Cartwright & Bean	305-791-3989
Fla	Orlando, Cartwright & Bean	305-422-4531
Ga	Atlanta, Cartwright & Bean	404-255-5262
Ill	Chicago, IRI, Inc.	312-647-7755
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Kans	Wichita, Forristal-Young Sls. Co.	316-838-7226
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Miss	Jackson, Cartwright & Bean	601-981-1368
Mo	Kansas City, Forristal-Young Sls. Co.	816-358-6771
Mo	St. Louis, Forristal-Young Sls. Co.	314-645-2360
Neb	Omaha, Forristal-Young Sls. Co.	402-333-0800
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NY	Port Washington, TMA	516-883-2432
NY	Rochester, L-Mar Assocs.	716-328-5240
NY	Syracuse, L-Mar Assocs.	315-437-7779
NC	Charlotte, Cartwright & Bean	704-377-5673
NC	Raleigh, Cartwright & Bean	919-781-6560
Ohio	Cincinnati, Baehr, Greenleaf & Assoc.	513-891-3826
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Ohio	Lakewood, Baehr, Greenleaf & Assoc.	216-221-9030
Ore	Portland, Earl & Brown Co.	503-245-2283
Tenn	Knoxville, Cartwright & Bean	615-693-7450
Tenn	Memphis, Cartwright & Bean	901-276-4442
Tex	Dallas, Erickson Sls.	214-243-6611
Wash	Seattle, Earl & Brown Co.	206-284-1121
Wisc	Milwaukee, Industrial Reps.	414-259-0965

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Sales Manager: Mr. J. C. Hood

Local Sales Offices & Reps.

Ala	Huntsville, Repcom, Inc.	205-534-2235
Ariz	Phoenix, Maddox Sls. Co.	602-274-3807
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Cal	San Francisco, Maddox Sls. Co.	415-431-2953
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NY	Great Neck, F. Tylinski Co.	516-466-9070
Ore	Portland, J.V. BeLusko & Co.	503-222-4279
Pa	York, E. F. Classen & Assoc.	717-741-1689
SC	Greenville, J. B. Jackson Mfg. Rep.	803-244-2508
Tex	Dallas, E. Tron Sls.	214-348-4749
Utah	Salt Lake City, Sage Sls.	801-531-0531
Wisc	Milwaukee, Gaudian Ind. Sls.	

SOLID STATE INC., Dept. EM, 46 Farrand St., Bloomfield, N.J. 07003, Tel: 201-429-8700, TWX: 710-994-4780; Empl.: 110

Sales Manager: T. King

Local Sales Offices & Reps.

Ill.	Chicago, C L Greenslade Sls.	312-561-0156
NJ	Bloomfield, Solid State	201-429-8700
NY	New York, Solid State Inc.	212-964-5682

SOLID STATE CIRCUITS, Dept. EM, 616 Boonville, Springfield, Mo. 65806, Tel: 417-869-4678, TWX: 910-775-4762; Empl.: 145

Local Sales Offices & Reps.

Ala	Huntsville, K & E Assoc.	205-883-9720
Cal	LaJolla, J. Phelan	714-454-6444
Ga	Atlanta, K & E Assoc.	404-376-5438
Ill	Northbrook, Rendell Sls. Co.	312-498-9860
Miss	Corinth, K & E Assoc.	601-287-1471
Mo	Springfield, Del-Tech & Assocs.	417-881-3667
Ohio	Dayton, Berberich & Assocs.	513-433-0342

SOLID STATE ELECTRONICS CORP., Dept. EM, 15321 Rayen St., Sepulveda, Cal. 91343, Tel: 213-894-2271; Empl.: 15

SOLID STATE EQUIPMENT CORP., Dept. EM, 430 Delaware Drive, Fort Washington, Pa. 19034, Tel: 215-643-7900, TWX: 510-661-0197; Empl.: 50

Sales Manager: R. H. Mason

Local Sales Offices & Reps.

Ariz	Scottsdale, Allen Assocs.	602-994-1305
Cal	Sunnyvale, Solid State Equip. Corp.	408-732-5288
Tex	Dallas, Bradenco Corp.	214-243-7261

SOLID STATE RELAYS INTL, Dept. EM, Box 48149 Chicago, Ill. 60648, Tel: 312-932-1660

Sales Manager: D. Winke

Local Sales Offices & Reps.
Cal Orange, The Other Co. 714-997-5664
Ill Rolling Meadows, Sieger Assocs 312-991-6161

SOLIDSTATE CONTROLS, INC., Dept. EM, 600 Oakland Park Ave., Columbus, Ohio 43214, Tel: 614-263-1886, Telex: 24-5338; Empl.: 80

Local Sales Offices & Reps.
Ala Birmingham, Spader & Assocs. 205-879-1366
Ariz Phoenix, Utility Prods. 602-959-3455
Ark Little Rock, Gregory-Salisbury & Co. 501-565-1546
Cal San Francisco, Garland Affolter Engrg. Corp. 415-397-1800
Cal San Gabriel, Garland Affolter Engrg. Corp. 213-287-1149
Colo Littleton, Utility Prods. 303-795-1955
Fla Lake Wales, J. Carter & Assocs. 813-676-1474
Ga Atlanta, M.J. Fein & Co./C.A. Legg 404-938-0190
Ga Decatur, Spader & Assocs. 404-296-3024
Ill Glen Ellyn, J.T. Becker Assocs. 312-858-1910
Ind Indianapolis, Utility & Ind'l. Prods., Inc. 317-924-3607
La New Orleans, Gregory-Salisbury & Co. 504-524-5207
Mass Holliston, M.J. Fein & Co. 617-429-4008
Mich Troy, C.H. Armstrong Co. 313-524-1414
Minn Minneapolis, Electrical Jobbers Equip., Inc. 612-721-4815
Miss Jackson, Gregory-Salisbury & Co. 601-969-1622
Mo Crestwood, Carlton Co. 314-961-0700
Neb Omaha, Utility Prods. 402-895-9221
NJ Livingston, M.J. Fein & Co. 201-994-3575
NY Scarsdale, M.J. Fein & Co. 914-472-1100
Ohio Columbus, R.D. Cloon Assocs. 614-459-2890
Ore Portland, Garland Affolter Engrg. Corp. 503-223-7349
Pa Media, Sys. Control Assocs. 215-565-2077
Tenn Memphis, Gregory-Salisbury & Co. 901-365-6660
Tex Arlington, Pan Tech. Controls 817-640-3232
Tex Houston, Pan Tech. Engrg. 713-623-0640
Utah Salt Lake City, Utility Prods. 801-466-2036
Wash Bellevue, Garland Affolter Engrg. Corp. 206-822-2275

SOLITRON DEVICES, Transistor Div., Dept. EM, 1177 Blue Heron Rd., Riviera Beach, Fla. 33404, Tel: 305-848-4311; TWX: 51-3435, 510-952-7610; FSC No.: 21845; Empl.: 550

Sales Manager: M. Giraud, Jr.

Local Sales Offices & Reps.
Ala Huntsville, A. B. Andrews & Co. 205-539-6817
Ariz Scottsdale, Piper Sls Co 602-946-4437
Cal Canoga Park, TKO 213-883-3822
Cal Mountain View, Caltron Component Corp. 415-964-3244
Colo Arvada, Piper Sls Co 303-420-4646
Conn Washington, Tri-Com Assocs. 203-868-7748
Haw Honolulu, Aloha Assocs. 808-941-1574
Ill Northfield, Torkelson Assocs, Inc. 312-446-9085
Ind Indianapolis, Electro Reps 317-255-4147
Ind Indianapolis, Electro Reps. 317-255-4147
Md Baltimore, Burgin-Kreh Assocs 301-788-5200
Mass Boston, Kenneth Schaeffer 617-535-4703
Mass Burlington, Tri-Com Assocs. 617-272-8163
Mass Burlington, Tri-Com Assocs 617-272-8163
Mich Warren, Luebbe Sls Co 313-574-2230
Minn Minneapolis, Torkelson Assocs 612-835-2414
Mo Saint Charles, Buckman & Assocs. 314-724-6690
NY Jamaica, S-J Sls. Assocs. 212-291-3232
NY Rochester, Ontec, Inc. 716-464-8636
NY Tappan, Solitron Devices 914-359-5050
NY West Nyack, Rubin Sales & Assocs. 914-623-9237
NC Research Triangle Park, A. B. Andrews & Co 919-549-0563
Ohio Cincinnati, Luebbe Sls. Co. 513-871-4211
Ohio Cleveland, Luebbe Sls. Co. 216-333-0425
Ohio Columbus, Luebbe Sls Co 614-475-5504
Ohio Dayton, Luebbe Sls. Co. 513-294-0427
Ore Portland, C. K. Shanks & Assocs. 503-292-5656
Pa Cynwyd, Vantage Sls Co 215-667-0990
Tex Dallas, P. J. Scanlon Co 214-231-4661
Utah Sandy, Piper Sls Co 801-571-5675
Wash Seattle, C. K. Shanks & Assocs. 206-ME2-4290
Exp: Fla., Riviera Beach, Solidev. Int'l. Sls. Corp. 305-848-4311
Exp: Mass, Boston, Kenneth Schaeffer 617-535-4703

Local Distributors
Ariz Phoenix, Mirco Elctrns. 602-944-2281
Cal Anaheim, R. V. Weatherford Co 714-547-0891
Cal Glendale, R.V. Weatherford Co. 213-849-3451
Cal San Diego, Intermark Elctrns 714-279-5200
Cal San Diego, R. V. Weatherford Co 714-278-7400
Cal Santa Ana, Intermark Elctrns. 714-540-1322
Cal Sunnyvale, Intermark Elctrns. 408-738-1111
Cal Sunnyvale, Bell Inds. 408-734-8570
Cal Woodland Hills, JACO Elctrns. 213-884-4560
Colo Englewood, R.V. Weatherford Co. 303-761-5432
Colo Wheat Ridge, Century Elctrns 303-424-1985
Fla Ft. Lauderdale, Hallmark Elctrns. 305-971-9280
Fla Miami, All American 305-754-5531
Fla Orlando, Hallmark Elctrns. 305-855-4020
Ill Elk Grove Village, Hallmark Elctrns. 312-437-8800
Ill Palatine, OHM/Elctrns. 312-359-5500
Ind Ft. Wayne, Ft. Wayne Elctrns. Supply 219-423-3422
La Schreveport, Industrial Elctrns Supp 318-636-7100
Md Columbia, Technico, Inc. 301-461-2200
Mass Dedham, Gerber Elctrns. 617-329-2400
Mass Newton, Green-Shaw 617-969-8900
Mich Grand Rapids, R. M. Elctrns 616-531-9300
Mich Livonia, Reptron Elctrns. 313-525-2700
Minn Minneapolis, Industrial Comps. 612-831-2666
Minn Minneapolis, The Joel Co 612-545-5669
NY Buffalo, Summit Distrib 716-884-3450
NY Elmsford, Zeus Comps. 914-592-4120
NY Farmingdale, Harrison Elctrns 516-293-7990
NY Hauppauge, JACO Elctrns 516-273-1234
NY North Bellmore, Hygrade Elctrns 516-785-6200
NY Rochester, Rochester Radio Supp 716-454-7800
NC Raleigh, Hall-Mark Elctrns 919-832-4465
NC Winston-Salem, Kirkman Elctrns. 919-722-9131
Ohio Columbus, Reptron Elctrns. 614-443-0231
Ohio Dayton, Koehlke Comps
Ohio Dayton, Esco
Okla Tulsa, Component Specialties 918-664-2820
Okla Tulsa, Hall-Mark Elctrns 918-835-8458
Pa Philadelphia, Herbach & Rademan 215-426-1700
Tenn Kingsport, Radio Elctrns. Supply Co. 615-247-8111
Tex Dallas, R.V. Weatherford Co. 214-243-1571
Tex Dallas, Hall-Mark Elctrns 214-231-6111
Tex Dallas, Comp Specialties 214-357-6511
Tex Houston, Harrison Equip Co 713-652-4750
Tex Houston, R.V. Weatherford Co. 713-688-7406
Tex Houston, Component Specialties, Inc. 713-771-7237
Utah Salt Lake City, Century Elctrns. 801-487-8551
Wash Bellevue, Bell Inds. 206-747-1515
Wash Seattle, R. V. Weatherford Co. 206-243-6340
Wisc Milwaukee, Marsh Elctrns 414-475-6000
Exp: Fla., Riviera Beach, Solidev International Sls. Corp. 305-848-4311

SOLITRON/MICROWAVE, Dept. EM, Box 278, Port Salerno, Fla. 33492, Tel: 305-287-5000, TWX: 510-953-7500; FSC No.: 95077; Empl.: 125

Sales Manager: Frank Scalzo

Local Sales Offices & Reps.
Ala Huntsville, Beacon Elctrns. Assoc. 205-881-5031
Ariz Scottsdale, Piper Sls. 602-946-4437
Cal Pico Rivera, Westrep 213-949-2551
Cal San Diego, Westrep 714-276-0751
Cal Santa Clara, Westrep 408-984-0350
Colo Arvada, Piper Sls 303-420-4646
Conn North Haven, Forsberg Sls 617-522-6300
Fla Ft. Lauderdale, Beacon Elctrns. 305-971-7320
Fla Ft Walton Beach, Beacon Elctrns Associates 904-244-1550
Fla Maitland, Beacon Elctrns. 305-647-3498
Ga Atlanta, Beacon Elctrns. 404-351-3654
Ill Downers Grove, Momak Sls 312-963-6400
Ind Indianapolis, Sukup & Cox 317-253-5501
Kans Prairie Village, Engineering Svcs Co 913-649-4000
Md Ellicott City, Applied Engrg. Consultants Inc. 301-465-1272
Mass Brockton, Forsberg Sls. 617-522-6300
Mich Southfield, Luebbe Sales 313-357-0355
Mich Warren, Luebbe Sls Co 313-574-2230
Minn Minneapolis, Wagner Consultants 612-721-5781
Mo St. Louis, Engineering Svs Co. 314-997-1515
NJ Haddonfield, M & S Assocs. 609-429-7055
NJ Wayne, H. Kagan Assocs. 201-684-7682
NY Greenvale, Bertram D. Aaron & Co 516-621-0630
NY Syracuse, Nycom, Inc. 315-437-8343
NC Charlotte, Beacon Elctrns Assocs. 704-525-7412
Ohio Cincinnati, Luebbe Sales 513-871-4211
Ohio Cleveland, Luebbe Sales 216-333-0425
Ohio Columbus, Luebbe Sls Co 614-475-5504
Ohio Dayton, Luebbe Sales 513-294-0426
Tenn Oak Ridge, Beacon Elctrns Assocs. 615-482-2409
Tex Plano, Zeus Engrg. 214-423-2027
Utah Sandy, Piper Sls Co 801-571-5675
Wash Seattle, Harry Levinson 206-323-5100
Exp: N.Y., New York (Japan). Ataka America, Inc. 212-697-7480

Local Distributors
Cal Granada Hills, Acort Industries 213-368-8551
Cal Mt. View, Terminal Elctrns 415-969-9240
Cal Van Nuys, Patane Avionics 213-986-3400
Colo Denver, Ratel Elctrns 303-934-5813
Ill Chicago, Phoenix Co. 312-237-2828
Md Ellicott City, Applied Engrg. Consultants 301-465-1272
NJ Edison, Brothers Elctrns 201-985-3000
NJ Mount Laruel, Aztec Engrg 609-237-0596
NY Brooklyn, Connector Resources 212-383-2208
NY Commack, Microwave Distr 516-543-4771
NY Plainview, Progress Elctrns 516-433-1700
Ohio Dayton, Arrow Elctrns. 513-253-9176
Ohio Dayton, Koehlke Comps. 513-294-0150
Okla Tulsa, Component Specialties 918-664-2820
Tex Dallas, Component Specialties 214-357-6511
Tex Houston, Component Specialties 713-771-7237
For: Can., Dorval, Que, Intl. Rectifier Can 514-631-4696
For: Can., Scarborough, Ont, Intl. Rectifier Can 416-755-7793

SOLTEC CORP., Dept. EM, Box 49, Sun Valley, Cal. 91352, Tel: 213-767-0044, Telex: 67-4188; Empl.: 20

Distributor Manager: L. Cox

Local Sales Offices & Reps.
Ala Huntsville, BCS Assocs 205-881-6220
Cal San Carlos, Elctrn. Engrg. Assocs. 415-593-2189
Colo Arvada, Air-Row Insts. 303-421-4204
Del Wilmington, Electronic Mktg Assoc 302-652-5333
Fla Orlando, BCS Assocs 305-896-4881
Ill Des Plaines, Byron Ellis Assocs. 312-298-7626
Kans Mission, Vertec Assocs. 913-677-3200
Md Rockville, Electronic Mktg Assoc 301-881-5300
Mass Nonantum, ETA Assocs. 617-527-4544
Mich Madison Heights, WKM Assocs. 313-588-2300
Minn New Hope, Trask Engrg 612-537-2434
Mo Manchester, Vertec Assocs. 314-394-6242
NJ Paramus, SDM Reprs. 201-368-0123
NM Albuquerque, Hiltech 505-268-1733
NY Rochester, SDM Reps 716-381-9962
NC Greensboro, BCS Assocs 919-273-1918
Ohio Cleveland, WKM Assocs. 216-267-0445
Ohio Dayton, WKM Assocs. 513-434-7500
Okla Oklahoma City, Data Mktg Assoc 405-528-6071
Ore Portland, Extech, Ltd. 503-292-9219
Pa King of Prussia, Electronic Mktg Assoc 215-265-1600
Pa Pittsburgh, WKM Assocs. 412-892-2953
Tex Dallas, Data Mktg Assoc 214-661-0300
Tex Houston, Data Mktg Assoc 713-780-2511
Utah Salt Lake City, Air-Row Instrs 801-532-6505
Va Richmond, Electronic Mktg Assoc 804-740-2130
Wash Seattle, Extech, Ltd. 206-454-4502

SOMERSET RADIATION LAB., Dept. EM, Box 17066, Washington, DC 20041

SONEX, Dept. EM, 2337 Philmont Ave., Huntingdon Valley, Pa. 19006, Tel: 215-947-6100, TWX: 510-665-5073; Empl.: 31

Sales Manager: M. Dadario

Local Sales Offices & Reps.
Ala Huntsville, J.L. Highsmith & Co. 205-881-3294
Fla Orlando, J.L. Highsmith 305-293-5202
Ind Columbus, Miltronics 812-376-6321
NC Charlotte, J.L. Highsmith & Co. 704-333-7743
Va Richmond, J. L. Highsmith & Co. 804-272-5888

SONIC INTERNATIONAL CORP., Dept. EM, 19241 N. E. San Rafael, Portland, Ore. 97230, Tel: 503-665-0187, Telex: 36-0325; Empl.: 130

Local Sales Offices & Reps.
Ariz Phoenix, Sahara Mktg. 602-278-7497
Cal Los Angeles, P/F Western Sls 213-478-0811
Cal San Diego, Bale Inc 714-566-3845
Cal San Francisco, DK Assocs. 415-543-4123
Colo Englewood, Mtn. Region Assocs 303-761-9421
Fla Miami, Key Mktg 305-871-4516
Ga Atlanta, Ben Elliott & Assoc. 404-434-0053
Ill Chicago, B&R Assocs. 312-545-6882

Ind Indianapolis, Metro Sls 317-283-1035
Kans Leawood, Mike Flannigan & Assoc. 314-394-5208
La Metairie, S&S Sales Agcy 504-831-7741
Md Baltimore, Al Kaiser & Assocs.... 609-654-2114
Mass Arlington, L & R Assocs 617-646-5891
Mich Southfield, Aztec Sls 313-642-0777
Minn Minneapolis, Felsen-Moscoe 612-831-1881
Mo , Mike Flannigan & Assoc. 314-394-5208
Neb Omaha, Mike Flannigan & Assoc. 314-394-5208
Nev Las Vegas, Sahara Mktg 602-278-7497
NJ Medford, Al Kaiser & Assocs..... 609-654-2114
NY New York, B&S Sls 212-736-3035
NY Rochester, V&L Assocs 716-244-7772
NC Charlotte, Top Sls 704-364-7621
Ohio Cleveland, Kam Mktg 216-464-7717
Ore Portland, Wasson & Assocs..... 206-696-3384
Tex Dallas, Fapco Assocs 214-748-6841
Utah Salt Lake City, R&P Sls 801-363-4408
Wash Seattle, Wasson & Assocs..... 206-696-3384

SONOBOND, Sub. Christiana Metals, Dept. EM, 200 E. Rosedale Ave., West Chester, Pa. 19380, Tel: 215-696-4710; Empl.: 50

Local Sales Offices & Reps.
Cal Monrovia, Denton & Anderson Co. 213-359-9304
Fla Jacksonville, Denton & Anderson Co. 904-721-1451
Ill Glen Ellyn, J. M. Collins Assocs. 312-858-6459
Ill Westchester, Denton & Anderson Co. 312-562-3903
Mass Amesbury, ATM World Trade 603-394-7874
Mich Brimingham, Denton & Anderson Co. 313-647-5520
Mich Detroit, Martin Electric Co..... 313-368-2883
Ohio Cleveland, Denton & Anderson Co. 216-831-2010
Pa Cornwell Hgts, Denton & Anderson Co 215-639-8390
Pa Villanova, C.I.V. Co..... 215-525-7054
Tex Garland, Denton & Anderson Co 214-270-7635

SORENSEN CO., Dept. EM, 676 Island Pond Rd., Manchester, N.H. 03103, Tel: 603-668-4500, TWX: 710-220-1339; Empl.: 1,000

Local Sales Offices & Reps.
Ala Huntsville, BCS Assocs. Inc. 205-881-6220
Ariz Tempe, Trembly Assoc. 602-966-4428
Cal San Francisco, Sorensen Co. 415-348-3013
Cal Torrance, Sorensen Co. 213-540-5452
Colo Arvada, Figaro-Klebba Assoc. 303-424-0108
Fla Orlando, BCS Assocs. 305-896-4881
Ill Chicago, Pivan Engrg. Co. 312-539-4838
Ind Indianapolis, Pivan Engrg. Co. 317-253-1681
Iowa Cedar Rapids, Pivan Engrg. Co. 319-377-9434
Kans Shawnee Mission, Pivan Engrg. Co. 913-722-1030
La Lafayette, Kemp Engrg. Co..... 318-984-3516
Md Baltimore, Sci-Rep Inc. 301-992-4350
Mich Detroit, Comtel Instrs. Co. 313-255-1970
Minn Minneapolis, Pivan Engrg. Co. 612-537-4501
Mo St. Louis, Pivan Engrg. Co. 314-567-3636
NJ Cherry Hill, Sci-Rep Inc. 609-482-0059
NJ Paramus, SDM Reps. 201-368-0123
NM Albuquerque, Trembly Assoc. 505-266-8616
NC Greensboro, BCS Assocs. 919-273-1918
Ohio Cleveland, Comtel Instrs. Co. 216-442-8080
Ohio Dayton, Comtel Instrs. Co. 513-298-7573
Okla Tulsa, Kemp Engrg. Co. 918-299-2636
Pa Pittsburgh, Comtel Instrs. Co. 412-922-5720
Tex Addison, Kemp Engrg. 214-661-0400
Tex Houston, Kemp Engrg. 713-688-1431
Va Falls Church, Sci-Rep Inc. 703-573-8787
Wisc Brookfield, Pivan Engrg. Co. 414-786-1940

SORENSON LIGHTED CONTROLS, Dept. EM, 530 Oakwood Ave., W. Hartford, Conn. 06110, Tel: 203-236-3267; Empl.: 100 ..... p. 2546,2547

Local Sales Offices & Reps.
Cal Los Altos, F. Deppong 408-738-1117
Cal Van Nuys, Pacific Switch Controls 213-873-4802
Colo Denver, A. Williams 303-373-4730
Conn West Hartford, Atlantic Switch Controls 203-523-5259
Fla Miami, Switch Controls 305-885-6727
Ill Wheaton, Conectrix, Inc..... 312-653-1130
Mass Quincy, F. Rybak 617-471-0902
Minn Minneapolis, Berquisto Co..... 612-835-2322
Mo Clayton, J. Mertens 314-721-0058
NJ Burlington, R. Circus 609-387-9331
NY Pompey, S. Foster..... 315-677-3333
Ohio Columbus, R. Johnson 614-294-7103
Ore Portland, Electronic Comp. Sls... 503-245-2342
Pa Harrisburg, L. Young..... 717-564-7234
SC Spartanburg, Rick Hadley 803-573-5176
Tex Dallas, Texaswitch, Inc. 214-357-1768

Local Distributors
Cal Van Nuys, Pacific Switch Controls 213-873-4802
Conn Hartford, Atlantic Switch Controls302-523-5259
Fla Miami, Switch Controls 305-885-6727
Ill Wheaton, Conectrix, Inc..... 312-653-1130
Tex Dallas, Texaswitch, Inc. 214-357-1768

SOSHIN ELEC. CO., Dept. EM, 1-18-18 Nakamogome, Ota-Ku, Tokyo, Japan, Tel: (03) 775-2111; Telex: 246-6377; Empl.: 800 ..... p. 1212

Sales Manager: N. Hiraide, Exp. & Imp. Dept.

Local Sales Offices & Reps.
NY Commack, Arco Elctrn..... 516-487-0500

SOTCHER MEASUREMENT, INC., Dept. EM, 1120 Stewart Court, Sunnyvale, Cal. 94086, Tel: 408-732-9171; Empl.: 6

Local Sales Offices & Reps.
Fla Tampa, E. L. Ebert Sls. Agency 813-837-2867
Ill Elk Grove, IMI Equip. Supply..... 312-593-7666

SOUNDCOAT, Dept. EM, 175 Pearl St., Brooklyn, N.Y. 11201, Tel: 212-858-4100, Telex: 125-514; Empl.: 45

Sales Manager: C. Wolaver

Local Sales Offices & Reps.
Colo Denver, E.N. Murray Co. 303-892-1106
Fla Miami, Voyce-Legier, Inc. 305-576-3356
Ga Atlanta, J. L. Underwood Co. 404-691-1500
Ill Des Plaines, Maher Engrg. Co.. 312-824-2124
La Kenner, R. H. Creager Inc. 504-729-6432
Md Crofton, Technical Systems..... 301-261-6600
Mass Ashland, SVA Assocs. 617-881-4009
Mich Madison Heights, J. N. Fauver Co. 313-585-5252
Minn Minneapolis, Horner Co. 612-824-2654
Minn Parkville, Willow Mfg. Co..... 218-741-0073
Mo St. Louis, Fischer Equip. Co. 314-647-1636
NY Buffalo, K & W Industrial Sales Inc. 716-875-9854
NY Scarsdale, Lerner Equip. Co..... 212-SC5-1700
Ohio Cleveland Heights, Acoustic Hazard Solutions Org. 216-321-8878
Ohio Dayton, Anchor Rubber Co..... 513-223-5191
Ohio Toledo, Ottney & Assoc. 419-537-1313
Pa Norristown, Brandon, Assoc. 215-539-4930
Pa Pittsburgh, Busch Co. 412-362-6000
Exp: Can., Ontario, Vibron Ltd..... 416-677-4922

Local Distributors
Colo Denver, E. N. Murray Co 303-892-1106
Fla Miami, Voyce-Legier 305-576-3356
Ga Atlanta, J. L. Underwood 404-691-1500
Ill Des Plaines, Maher Engrg 312-824-2124
La Kenner, R. H. Creager 504-729-6432
Md Crofton, Technical Systems..... 301-261-6600
Mass Ashland, SVA Inc. 617-881-4009
Mich Madison Heights, J. N. Fauver Co. 313-585-5252
Minn Minneapolis, Horner Co. 612-824-2654
Mo St. Louis, Fischer Equip Co..... 314-647-1636
NY New York, Controlled Acoustics 914-725-1700
Ohio Dayton, Anchor Rubber Co..... 513-223-5191
Ohio Toledo, Ottney & Assoc. 419-537-1313
Pa Norristown, Brandon Assoc..... 215-539-4930
Exp: New York, The Soundcoat Co. .. 212-858-4100
For: Australia, Nylex Corp.
For: France, Fodor Intl
For: Italy, Cofermetal

SOUTH RIVER METAL PRODS. CO., Dept. EM, P.O. Box 394, Matawan, N.J. 07747, Tel: 201-566-7087; Empl.: 85

SOUTH SHORE METAL PRODS., INC., Dept. EM, 88 E Allen Blvd., Farmingdale, N.Y. 11735, Tel: 516-249-3322; Empl.: 30

Sales Manager: A.G. Bauer

Advertisement

S.S. offers a stock size line of deep drawn cans trimmed to customer's length requirement at no extra cost. Will also produce special sizes and shapes complete with mounting brackets, studs, etc. - mumetal and other shielding type enclosures are regularly shipped. Tape control drilling and machining available for panel boards, plug in strips, etc. Quality control program to MIL-1-45208.

SOUTHERN ELECTRONICS CO., Dept. EM, 726 So. Flower St., Burbank, Cal. 91502, Tel: 213-845-2458; Empl.: 310 ..... p. 1213

Local Sales Offices & Reps.
Ala Huntsville, Jack Whitfield 205-257-2211
Ariz Scottsdale, Carter Assoc. 602-947-4355
Cal Van Nuys, Myco Sls..... 213-988-2288
Colo Denver, Walter Engrg. 303-777-5585
Conn Wethersfield, Con/Pak 203-563-4784
Fla Altamonte Springs, Semtronic Assoc. 305-831-8233
Fla Largo, Semtronic Assoc. 813-586-1404
Ill Franklin Park, AL&W Sls..... 312-451-1360
Kans Shawnee, J. Guernsey Co. 913-631-2414
Md Ellicott City, T. Davis Marketeers 301-461-2209
Mass Needham, Com/Pack 617-444-1259
Mich St. Clair Shores, J. M. Thorpe Co. 313-779-6363
Minn Minneapolis, Loren Green Assoc. 612-781-1611
NY Hempstead, Kahgan Sls. 516-538-2300
NY Syracuse, Naylor Elec. 315-472-9183
NC Greensboro, L & D, Inc. 919-292-3201
Ohio Lyndhurst, Technical Sls. Assoc. 216-461-0826
Ore Portland, SPS Elctrn. 503-645-3769
Tex Dallas, Cunningham Co. 214-231-2686
Tex Houston, Cunningham Co. 713-461-4197
Va Fairfax, T. Davis Marketeers 703-591-7390

SOUTHWOOD ELECTRONIC CO., Dept. EM, 7624 Lindenwood Dr., Indianapolis, Ind. 46227, Tel: 317-888-0238; Empl.: 5

SPACE ELECTRONICS, INC, Dept. EM, Box 2166, Meriden, Conn. 06450, Tel: 203-265-2945

Sales Manager: Richard Boynton

SPATIAL DATA SYSTEMS, INC., Dept. EM, P.O. Box 249 508 S. Fairview, Goleta, Cal. 93017, Tel: 805-967-2383; Empl.: 20

Sales Manager: M. Schlosser; *Distributor Manager:* M. Schlosser

Local Sales Offices & Reps.
Ala Huntsville, Newcomb Assocs..... 205-852-0304
Ariz Glendale, Mountaintek, Inc. 602-938-2864
Cal Santa Barbara, Dataquip Corporation 805-963-5035
Colo Evergreen, Mountaintek, Inc. 303-674-5255
Conn Southbury, J.J. Wild, Inc. 203-264-9494
Ill Chicago, Brooks Engineering..... 312-944-1227
Md Silver Spring, Applied Science Marketing 301-933-2566
Mass Needhan, J.J. Wild, Inc. 617-444-2366
Mo St. Johns, Mid-West Marketing .. 314-426-2500
NJ Budd Lake, J.J. Wild, Inc..... 201-691-0441
NM Albuquerque, Mountaintek, Inc... 505-265-8521
NY Jericho, Wild & Rutkowski 516-935-6600
NC Research Triangle Park, Newcomb Associates 919-549-0486
Pa Southampton, J.J. Wild, Inc..... 215-357-6645
Tex Dallas, Overall Engineering 214-233-2311
Utah Salt Lake City, Moutaintek, Inc... 801-278-6920

SPEC PLASTICS INC., Dept. EM, 7224 Atoll Ave., No Hollywood, Cal. 91605, Tel: 213-982-0300; Empl.: 43

SPECIALTIES MFG. CO., INC., Dept. EM, 23425 Harper, St. Clair Shores, Mich. 48080, Tel 313-771-2700; Empl.: 6

Local Sales Offices & Reps.
DC Pompano Beach, Hollingsworth & Still 305-782-0069
Fla Orlando, Hollingworth & Still 305-834-2356
Ga Atlanta, Hollingsworth & Still 404-255-8209
Ill Chicago, B. Burns & Assoc..... 312-775-1233
NC Charlotte, Hollingsworth & Still .. 704-535-4604
Pa Philadelphia, Mike Oberst Assoc. 215-743-2512
Tenn Nashville, Hollingsworth & Still .. 615-883-9129

SPECO DIV, Components Specialties, Inc., Dept. EM PO Box 624 1172 Rte 109, Linderhurst, NY 11757, Tel 516-888-7788, Telex: 96-7754; Empl.: 33

Sales Manager: J. J. Ganci

SPECTRACOM CORP., Dept. EM, 1667 Penfield Rd Rochester, N.Y. 14625, Tel: 716-381-4827; Empl.: 6

Local Sales Offices & Reps.
Ala Huntsville, Lee Assocs..... 205-533-5896
Cal N. Hollywood, O'Halloran Assocs. 213-877-0173
Cal Orange, O'Halloran Assocs 714-750-7095
Cal Palo Alto, O'Halloran Assocs. 415-326-1493
Cal San Diego, O'Halloran Assocs .. 714-231-0873
Colo Boulder, A. L. S. Elctrs 303-447-2439

Conn Mt. Carmel, Scientific Devices-Conn 203-248-9361
Fla Indian Harbour Beach, Lee Assocs 305-773-8114
Fla Winter Haven, Lee Assocs. 813-294-5815
Ga Buford, Lee Assocs. 404-945-4222
Ill Chicago, Electronic Instr. Assocs. 312-271-3774
Ind Indianapolis, Electronic Instrs. Assocs. 317-257-7231
Md Silver Spring, Gawler-Knoop Co. 301-589-4406
Mass Waltham, Scientific Devices - N.E. 617-890-2252
Mich Plymouth, Micro Sls 313-459-9444
NJ Englewood, Scientific Devices - East 201-871-3916
NM Albuquerque, A. L. S. Elctrns 505-298-2575
NY Rochester, Spectracom Corp. 716-381-4827
NC Raleigh, Lee Assocs. 919-787-5818
Ohio Cleveland, Micro Sls. Corp. 216-331-0900
Ohio Dayton, Micro Sls. Corp. 513-433-8171
Okla Oklahoma City, Data Mktg. Assoc. 405-528-6071
Tex Austin, Data Mktg. Assoc. 512-451-5174
Tex Dallas, Data Mktg. Assoc. 214-661-0300
Tex Houston, Data Mktg. Assoc. 713-686-9627
Tex San Antonio, Data Mktg. Assoc. 512-828-0937

SPECTRA SONICS, Dept. EM, 770 Wall Ave., Ogden, Utah 84404, Tel: 801-392-7531; Empl.: 25

SPECTRA-STRIP CORP., Dept. EM, 7100 Lampson Ave., Box 415, Garden Grove, Cal. 92642, Tel: 714-892-3361, TWX: 910-596-1314; Empl.: 300 p. 4655

Local Sales Offices & Reps.
Ala Huntsville, W.A. Brown Comps. Inc. 205-539-4411
Cal Menlo Park, G.R. McKnight Co. 415-325-2844
Cal Northridge, R.H. Donald & Assocs. 213-349-7911
Cal San Diego, Hadden Assocs. 714-565-9444
Colo Boulder, Front Range Mktg. 303-443-4780
Conn Wethersfield, Com/Pak Inc. 203-563-4784
Fla Clearwater, Lawrence Assocs. 813-443-2698
Fla Maitland, Lawrence Assocs. 305-647-1188
Ga Chamblee, W. A. Brown Comps. 404-455-0405
Ind Ft. Wayne, J&B Engrg. Sls. Co. 219-483-2813
Mass Framingham, Com/Pak 617-879-8580
Mich Birmingham, J. C. Hofstetter Co. 313-646-3635
Minn Minneapolis, M. Westlund Assocs. 612-866-5002
Mo Kansas City, Nevco 816-421-1751
Mo St. Louis, Nevco 314-843-7406
NJ Clifton, Compar N. Y. Inc. 201-546-3660
NY Endicott, Advanced Comps. Corp.
NY North Syracuse, Advanced Comps. Corp. 315-699-2671
NY Scottsville, Advanced Comps. Corp.
NC Raleigh, W.A. Brown Comps. 919-781-9426
Ohio Dayton, J. C. Hofstetter Co. 513-296-1010
Ohio Medina, J. C. Hofstetter Co. 216-241-4880
Pa Ft. Washington, Kirk-Sandell Inc. 215-643-2100
Tenn Knoxville, W.A. Brown Comps. 615-637-3523
Tex Dallas, McCoy Assocs. 214-350-9931
Tex Houston, C.R. Colvin Assocs. 713-961-1262
Wash Seattle, D. Smith Sls. Co. 206-633-3160

Local Distributors
Ariz Tempe, Marshall Inds. 602-968-6181
Cal Canoga Park, Allied Elctrns. 213-999-5001
Cal El Monte, Marshall Inds. 213-686-0141
Cal Irvine, Ratel Elctrns 714-549-8611
Cal Irvine, Marshall Inds. 714-556-6400
Cal Los Angeles, Fisher-Brownell 213-532-2170
Cal Mountain View, Terminal Elctrns. 415-969-9240
Cal San Diego, Marshall Inds. 714-278-6350
Cal San Diego, El-Com 714-578-0900
Cal Santa Clara, Fisher-Brownell 408-988-6041
Cal Sunnyvale, Marshall Inds. 408-732-1100
Colo Arvada, Marshall Inds. 303-423-9670
Colo Broomfield, Storm Prods. Co. 303-466-1991
Conn No. Branchford, Marshall Inds. 203-484-0488
Fla Orlando, Marshall Inds. 305-859-1620
Ill Des Plaines, Marshall Inds. 312-298-3700
Ill Palatine, Ohm/Elctrns. 312-359-5500
Kans Wichita, Radio Supply Co. 316-267-5213
Md Beltsville, Vertex Elctrns. 301-937-0180
Mass Newton Highland, Marshall Inds. 617-965-5115
Mass Waltham, QPL Elctrn. Dist. 617-891-0460
Mass Woburn, Pacer Elctrns. 617-935-8330
Minn Plymouth, Marshall Inds. 612-559-2211
Mo Maryland Hgts, L Comp 314-291-6200
NY Buffalo, Summitt Elec. 716-884-3450
NY Farmingdale, Vertex Elec. 516-293-9880
NY Farmingdale, Marshall Inds. 516-293-4141
Ohio Dayton, Marshall Inds. 513-898-1105
Pa King of Prussia, Marshall Inds. 215-337-3330
Pa Montgomeryville, Pyttronic Ind. 215-643-2850
Tex Dallas, Solid State Elec. 214-352-2601
Tex Dallas, Marshall Inds. 214-233-5200
Tex Houston, Marshall Inds. 713-777-0358
Tex Houston, Kent Elctrns 713-780-7770
Utah Salt Lake City, Standard Supp. 801-486-3371
Wash Bellevue, Marshall Inds. 206-883-1084
Wash Tukwila, Interface Elec. 206-575-3120

SPECTRAL DYNAMICS CORP., Dept. EM, Box 671, San Diego, Cal. 92112, Tel: 714-565-8211, TWX: 910-335-2022; Empl.: 400

Local Sales Offices & Reps.
Ala Huntsville, BCS Assocs. 205-881-6220
Alas Anchorage, Industrial Analyzing & Instrumentation 907-344-5619
Ariz Phoenix, R. A. Mayes Co. 602-279-5243
Cal El Monte, Spectral Dynamics - L.A. District Office 213-686-0970
Cal Sunnyvale, Spectral Dynamics 408-733-0602
Colo Boulder, R. A. Mayes Co. 303-444-0782
Conn Hamden, Northeast Engrg. Inc. 203-248-4481
Fla Orlando, BCS Assocs. 305-896-4881
Ill Chicago, Berndt Assoc., Inc. 312-283-0713
Ind Indianapolis, Tri-State Tech. Sls. 317-924-3568
Md Riverdale, Spectral Dynamics - Wash. Area Distr. Off. 301-779-5580
Mass Danvers, Northeast Engrg. 617-774-3010
Mich Southfield, Spectral Dynamics 313-358-0880
Minn Minneapolis, Berndt Assocs. 612-835-4818
Mo St. Louis, Adelphi 314-821-1232
NM Albuquerque, R. A. Mayes Co. 505-292-2330
NY DeWitt (Syracuse), DB Assocs. 315-446-0220
NY Great Neck, MTI 516-482-3500
NC Greensboro, BCS Assocs. 919-273-1918
Ohio Cleveland, WKM Assocs. 216-267-0445
Ore Portland, Brett-Ross, Inc. 503-232-4184
Pa Chester Springs, Letronix 215-458-8977
Pa Pittsburgh, WKM Assocs 412-892-2953
Tex Houston, Carey-Wolf & Assoc., Inc. 713-721-2442
Utah Centreville, R. A. Mayes Co. 801-292-6781
Wash Seattle, Brett-Ross, Inc. 206-935-8054
Wisc Milwaukee, Berndt Assocs. 414-545-8400

SPECTROL ELECTRONICS CORP., Dept. EM, 17070 East Gale Ave., City of Industry, Cal. 91745, Tel: 213-964-6565, TWX: 910-584-1314; Empl.: 600 p. 3904-3910

Sales Manager: F. McGeoy; *Distributor Manager:* D. Mathews

Local Sales Offices & Reps.
Ala Huntsville, Electronics Marketing Association 205-533-3620
Ariz Phoenix, Howe & Howe Sls. 602-264-7971
Cal Mountain View, Factory Sls. Off. 415-964-3260
Cal Pico Rivera, Westrep 213-949-2551
Cal San Diego, Daniels & Doty Sls. 714-560-6266
Cal Sherman Oaks, Astralonics 213-990-5903
Colo Denver, Lindberg Co. 303-758-9033
Conn North Haven, Kitchen & Kutchin 203-239-0212
Fla Altamonte Springs, Semtronic Assocs. 305-831-8233
Fla Largo, Semtronic Assocs. 813-586-1404
Ill Downers Grove, Momak Sls. 312-963-6400
Iowa Hiawatha, Gassner & Clark 319-393-5763
Md Glen Burnie, New Era Sls. 301-768-6666
Mass Lexington, Kitchen & Kutchin 617-862-8230
Mich Troy, CB Jensen 313-643-0506
Minn St. Paul, Murnco 612-484-8200
Mo Kansas City, Harris-Hanson 816-444-9494
Mo St. Louis, Harris-Hanson Co. 314-432-3611
NJ Haddonfield, Sunday-O'Brien 609-429-4013
NM Albuquerque, Lindberg Co. 505-881-1006
NY Fayetteville, Tri-Tech Elctrns. 315-446-2881
NY Plainview, E.R.A., Inc. 516-822-9890
NC Winston-Salem, Elctrns Mktg Assoc 919-722-5151
Ohio Cincinnati, Luebbe Sls. Co. 513-871-4211
Ohio Cleveland, Luebbe Sls. Co. 216-333-0425
Ohio Dayton, Luebbe Sls. Co. 513-294-0426
Ore Beaverton, Barrett Squibb & Assoc. 503-644-2250
Pa Pittsburgh, R.F. Clark Co. 412-242-9500
SC Greenville, Elctrns Mktg Assoc 803-233-4637
Tex Dallas, Allied Comp 214-238-0408
Tex Houston, Allied Comp 713-960-1962
Utah Salt Lake City, Lindberg Co. 801-534-1501
Wash Redmond, Barrett Squibb & Assocs 206-885-6991

Local Distributors
Ala Huntsville, Hall-Mark/Huntsville 205-837-8700
Ariz Phoenix, Kierulff 602-243-1401
Ariz Phoenix, Sterling Elec. 602-258-4531
Cal Anaheim, Weatherford Co. 714-634-9600
Cal Glendale, Weatherford Co. 213-849-3451
Cal Los Angeles, Kierulff 213-685-5511
Cal Mt. View, Abacus 415-961-1500
Cal Palo Alto, Kierulff 415-968-6292
Cal Pomona, Weatherford Co. 714-623-1261
Cal San Carlos, Sterling Elec. 415-592-2353
Cal San Diego, Kierulff 714-278-2112
Cal San Diego, Moltronics 714-278-5020
Cal Southgate, Moltronics 213-773-6521
Cal Sun Valley, Sterling Elec. 213-767-5030
Colo Denver, Newark/Denver El. 303-757-3351
Colo Denver, Kierulff 303-371-6500
Colo Englewood, R.V. Weatherford 303-761-5432
Conn East Haven, J.V. Elctrns 203-469-2321
Conn Hamden, Arrow Elec. 203-248-3801
Fla Ft. Lauderdale, Hall-Mark 305-971-9280
Fla Orlando, Hall-Mark 305-855-4020
Ill Chicago, Newark 312-638-4411
Ill Elk Grove, Kierulff 312-640-0200
Ill Elk Grove Village, Lakeland Elect. 312-595-1000
Ill Elk Grove Village, Hall-Mark/Chicago 312-437-8800
Ind Indianapolis, Graham 317-634-8202
Iowa Cedar Rapids, Deeco, Inc. 319-365-7551
Kans Shawnee Mission, Hall-Mark/Kansas 913-888-4747
La Metairie, Sterling Elec. 504-887-7610
Md Baltimore, Arrow Elec. 202-737-1700
Md Baltimore, Hall-Mark/Baltimore 301-796-9300
Mass Billerica, Kierulff 617-667-8331
Mass Dedham, Gerber Elec. 617-329-2400
Mass Newton, Cramer 617-969-7700
Mass Watertown, Sterling El. 617-926-9720
Mich Detroit, Newark Elec. 313-548-0250
Mich Farmington, Northland 313-477-3200
Mich Kentwood, R-M Co. 616-531-9300
Minn Minneapolis, Hall-Mark 612-884-9056
Minn St. Paul, Gopher Elec. 612-645-0241
Mo Earth City, Hall-Mark 314-291-5350
NJ Camden, General Radio 609-964-8560
NJ Moorestown, Arrow/Angus 609-235-1900
NJ Perth Amboy, Sterling Elect. 201-442-8000
NM Albuquerque, Sterling 505-345-6601
NY Buffalo, Summit Dist. 716-884-3450
NY Farmingdale, Arrow Elec. 516-694-6800
NY Rochester, Rochester Radio 716-454-7800
NC Greensboro, Hammond Elec. 919-275-6391
NC Raleigh, Hall-Mark 919-832-4465
Ohio Cincinnati, Newark Elec. 513-874-5115
Ohio Cleveland, RPC Elec. 216-461-4700
Ohio Cleveland, Newark Elec. 216-361-4700
Ohio Cleveland, Arrow Elec. 216-464-2000
Ohio Columbus, Electronics Mktg. 614-299-4161
Ohio Dayton, Arrow Elec. 513-253-9176
Okla Tulsa, Hall-Mark/Tulsa 918-835-8458
Okla Tulsa, T.I. Supp. 918-437-4555
Pa McKeesport, Barno Radio 412-462-7575
Pa Philadelphia., Hall-Mark 215-355-7300
Pa Pittsburgh, RPC Elec. 412-782-3770
SC Greenville, Hammond Elec. 803-233-4121
Tex Austin, Sterling Elctrns 512-836-1341
Tex Austin, Hall-Mark/Austin 512-837-2814
Tex Dallas, Sterling 214-357-9131
Tex Dallas, Hall-Mark/Dallas 214-231-5101
Tex Dallas, Texas Instr. Supply 214-238-6971
Tex Houston, Hall-Mark/Houston 713-781-6100
Tex Houston, Newark Elec. 713-782-4800
Tex Houston, Sterling Elec. 713-623-6600
Utah Salt Lake City, Altaland 801-486-7227
Utah Salt Lake City, Newark Elec. 801-486-1048
Wash Seattle, Weatherford Co. 206-243-6340
Wash Tukwila, Kierulff Elec. 206-575-4420
Wisc West Allis, Hall-Mark 414-476-1270
For: Can., Don Mills, Ont., Saynor Elec. 416-445-2340
For: Can., Vancouver, B.C., Deskin 604-324-6331

SPECTROLAB, INC., Dept. EM, 12500 Gladstone Ave., Sylmar, Cal. 91342, Tel: 213-365-4611, TWX: 910-496-1488; Empl.: 250

SPECTRUM CONTROL, INC., Dept. EM, 152 E. Main St., Fairview, Pa. 16415, Tel: 814-474-5593, TWX: 510-669-6848; FSC No.: 33095; Empl.: 240 p. 2642-2649

Sales Manager: W. R. Crotty; *Distributor Manager:* C. Pirro

Local Sales Offices & Reps.
Cal Fullerton, M.A. Stolaroff Co. 714-879-5998
Cal Los Angeles, M.A. Stolaroff Co. 213-295-7781
Cal San Diego, M.A. Stolaroff Co. 714-234-6905
Ill Chicago, Gassner & Clark Co. 312-345-4245
Iowa Hiawatha, Gassner & Clark Co. 319-393-5763
NJ Martinsville, Spectrum Control Inc. 201-469-6056
Exp: Pa., Fairview, Spectrum Control, Inc. 814-747-5593

Local Distributors
Ala Huntsville, Hall-mark 205-837-8700

Ariz Phoenix, Moltronics 602-272-7951
Cal Los Angeles, Moltronics 213-773-6521
Cal San Diego, Moltronics 714-278-5020
Cal Santa Clara, Moltronics 408-244-7600
Fla Ft. Lauderdale, Hall Mark 305-971-9280
Fla Orlando, Hallmark 305-855-4020
Ill Elk Grove, Hallmark 312-437-8800
Kans Shawnee Mission, Hallmark 913-888-4747
Md Baltimore, Hallmark 301-796-9300
Minn Bloomington, Hallmark 612-884-9056
Mo Earth City, Hallmark 314-291-5350
NJ Perth Amboy, Metuchen Capacitors 201-442-0050
NC Raleigh, Hallmark 919-832-4465
Ohio Cincinnati, Schuster Electric Co 513-984-1600
Ohio Columbus, Hall-Mark Elctrns 614-846-1882
Okla Tulsa, Hallmark 918-835-8458
Pa Philadelphia, Hallmark 215-355-7300
Tex Austin, Hallmark 512-837-2814
Tex Dallas, Hallmark 214-234-7300
Tex Houston, Hall-Mark 713-781-6100
Wisc West Allis, Hallmark 414-476-1270
For: Eng., Birmingham, Steatite Insulations 021 454-6961
For: France, Paris, Steatite Insulations 021 454-6961
For: Germany, Munchen, Comtronics 089 643011
For: Italy, Milano, Giazza Spotorno, Special Ind. 68-87951/2/3

SPECTRUM TECHNOLOGY INC., Dept. EM, 300 Frederic Lopez Rd., Goleta, Cal. 93017, Tel: 805-964-7791, TWX: 910-334-1163; FSC No.: 32464; Empl.: 60 ..... p. 2366,2367

Sales Manager: R. Intilia

Local Sales Offices & Reps.
Cal Marina Del Rey, Westaironics Inc 213-821-7958
Cal Mountain View, West/Mark Assocs. 415-969-1700
Colo Littleton, Lange Sls 303-795-3600
Conn Milford, Todino Engrg. Sls 203-874-6643
Fla Pompano Beach, Mesa/South 305-943-7306
Ill Elgin, Spectrum Tech. Assoc. 312-695-8552
Mass Needham, Todino Engrg. Sls. 617-444-7925
NJ Clifton, Compar N.Y., Inc. 201-546-3660
NJ Haddonfield, Mesa Tech. Assocs. 609-429-9531
NM Albuquerque, I.M.E.C. 505-883-9010
Tex Dallas, ION Assocs. 214-357-9441
Tex Houston, ION Assocs. 713-461-5311
Va Fairfax, Schibley Assocs. 703-591-3008
Wash Bellevue, Olsen, Ferree & Assocs. 206-454-1210

SPELLMAN HIGH VOLTAGE ELCTRNS. CORP., Dept. EM, 7 Fairchild Ave., Plainview, N.Y. 11803, Tel: 516-822-2130, TWX: 710-593-4135; Empl.: 130 ..... p. 3330,3331

Local Sales Offices & Reps.
Cal Pasadena, A-F Sls. 213-681-5631
Fla Coral Springs, H.A. Inc. 305-752-7520
Ill Chicago, Ropex-Cahill 312-631-0070
Kans Shawnee Mission, Mid-Tec Assoc. 913-441-6565
Mass Concord, Nortech Engrg. Sls. 617-259-0032
NJ Englewood, Eastern Instrumentation 201-567-9505
NM Albuquerque, Cleveland Entprs .. 505-266-5594
Pa Flourtown, Eastern Components 215-836-1616
Tex Richardson, Barry Sls 214-234-0255
Va Herndon, Eastern Comps 703-471-1025

SPEMCO SWITCHES, See Specialties Mfg. Co.

SPRAGUE ELEC. CO., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247, Tel: 413-664-4411, TWX: 92-6415, 710-369-1360; FSC No.: 56289; Empl.: 9500

Sales Manager: Sr. VP Sls & Mktg C. G. Killen; *Distributor Manager:* A. Bascombe

Local Sales Offices & Reps.
Ala Huntsville, Sprague Elec. Co. 205-883-0520
Ariz Tempe, Sprague Elec. Co. 602-279-5435
Cal Burlingame, W. J. Purdy Co. 415-347-7701
Cal Inglewood, Sprague Elec. Co. 213-649-2600
Cal San Diego, KCE Corp. 714-278-7640
Colo Denver, W.J. Purdy Co. 303-777-1411
Conn Trumbull, Sprague Elec. Co. 203-261-2551
DC Washington, Sprague Elec. Co. .. 202-337-7820
Fla Longwood, Sprague Elec. Co. 305-831-3636
Ill Schiller Park, Sprague Elec. Co. 312-678-2262
Ind Indianapolis, Sprague Elec. Co. .. 317-253-4247
Mass North Adams, Sprague Elec. Co. 413-664-4411
Mass Norwood, R. Perron & Co. 617-762-8114
Mass Waltham, Sprague Elec. Co. 617-899-9100
Mich Jackson, Sprague Elec. Co. 517-787-3934
Minn Minneapolis, HMR, Inc. 612-920-8200
Mo St. Louis, Sprague Elec. Co. 314-781-2420
NJ Cherry Hill, Sprague Elec. Co. .. 609-795-2299
NJ Cherry Hily, Trinkle Sls. Inc. 609-795-4200
NJ Wayne, Sprague Elec. Co. 201-696-8200
NM Albuquerque, W. J. Purdy Co. 505-266-7959
NY Mamaroneck, Wm. Rutt, Inc. 914-698-8600
NY Melville, Sprague Elec. Co. 516-549-4141
NY Syracuse, Sprague Elec. Co. 315-437-7311
NY Syracuse, Mar-Com Assocs. 315-437-2843
NC Winston-Salem, Electronic Mktg. Assocs. 919-722-5151
Ohio Beachwood, Elctrn. Salesmasters Inc. 1-800-362-2616
Ohio Dayton, Sprague Elec. Co. 513-278-0781
Tex Richardson, Sprague Elec. Co. .. 214-235-1256
Va Lexington, Sprague Elec. Co. 703-463-9161
Wash Seattle, Sprague Elec. Co. 206-632-7761

SPRAGUE PRODUCTS CO., Dept. EM, 481 Marshall St., No. Adams, Mass. 01247, Tel: 413-664-4481, TWX: 710-369-1363; FSC No.: 56289 ..... p. 1216,1217

Sales Manager: Pres. B. J. Shine; *Distributor Manager:* A. Bascomb

Local Sales Offices & Reps.
Ariz Phoenix, Stitzer -Dodd 602-944-2237
Cal Burlingame, W. J. Purdy Co. 415-347-7701
Cal Los Angeles, N. Bevan Assocs. 213-559-0534
Cal Sacramento, W. J. Purdy Co. 916-422-0128
Cal San Diego, KCE Corp. 714-278-7640
Colo Denver, W. J. Purdy Co. 303-777-1411
Fla Fort Lauderdale, UniRep, Inc. 305-527-1556
Haw Honolulu, Hawaii Elctrns. Sls. 808-845-8207
Ill Chicago, D. Dolin Sls. Co. 312-286-6200
Ind Mulberry, Maish Sls. 317-638-8484
Mass Waltham, Sprague Prods. Co. 617-899-9840
Minn Minneapolis, HMR, Inc. 612-831-7400
Mo Kansas City, Nevco, Inc. 816-421-1751
Mo St. Louis, Nevco, Inc. 314-843-7406
NJ Cherry Hill, Trinkle Sls. Inc. 609-795-4200
NJ Cranford, G. G. Burnett 914-698-8600
NM Albuquerque, W. J. Purdy Co. 505-266-7959
NY Mamaroneck, W. Rutt, Inc. 914-698-8600
NY Syracuse, Paston-Hunter Co. 315-437-2992
NC Winston-Salem, Elctrns. Mktg. Assocs. 919-722-5151
Ohio Beachwood, Elctrn. Salesmasters 216-831-9555
SC Greenville, Elctrn. Mktg. Assoc. .. 803-233-4637
Tex Dallas, Lund & Co. 214-387-4634
Wash Seattle, Fleehart & Sullivan, Inc. 206-522-1533

SPRAGUE-GOODMAN ELECTRONICS, INC., Dept. EM, 134 Fulton Ave., Garden City Park, N.Y. 11040, Tel: 516-746-1385, Telex: 14-4533; FSC No.: 52769; Empl.: 25 ..... p. 1215

Sales Manager: H. Morgan

Local Sales Offices & Reps.
Ala Huntsville, Electronic Mktg. Assoc. 205-533-6640
Ariz Tempe, Sprague Elec. Co. 602-279-5435
Cal Burlingame, W. J. Purdy Co. 415-347-7701
Cal Los Angeles, R.F. Assocs. Inc. .. 213-478-1586
Cal San Diego, H. King, Inc. 714-566-5252
Colo Denver, W. J. Purdy Co. 303-777-1411
Conn Farmington, R. Perron & Co. 203-673-4825
Conn Trumbull, R. Perron & Co. 203-268-9631
Fla Clearwater, Dyne-A-Mark Corp. 813-441-4702
Fla Ft. Lauderdale, Dyne-A-Mark Corp. 305-771-6501
Ill Chicago, Croyden Elctrns. Inc. .. 312-237-2828
Ind Huntington, Croyden Elctrns. 219-422-2311
Iowa Marion, T & M Assoc. 319-377-6261
Kans Shawnee Mission, T & M Assoc. 913-432-2131
Md Pikesville, Imagitron Sls. 301-484-1411
Mass Norwood, R. Perron & Co. 617-762-8114
Mich Jackson, Sprague Elec. Co. 517-787-3934
Minn Minneapolis, HMR 612-920-8200
Mo Hazelwood, T&M Assoc. 314-895-4700
NH Dover, R. Perron & Co. 603-742-2321
NJ Dover, Richman Salesco-Wenco 201-584-8444
NM Albuquerque, W. J. Purdy Co. 505-266-7959
NY , Richman Salesco 516-543-5532
NY Commack, Richman Salesco 516-543-5532
NY Utica, Micro Comp Sls 315-733-2460
NC Winston-Salem, Electronic Mktg. Assoc. 919-722-5151
Ohio Beachwood, Electronic Salesmasters 216-831-9555
Pa Landisville, Imagitron Sls. 717-898-7633
SC Greenville, Elctrn. Mktg. Assoc. .. 803-268-1125
Tex Austin, Stevens Sls 512-472-8598
Tex Dallas, Stevens Sls 214-350-2476
Wash Seattle, Sprague Elec. Co. 206-632-7761

Local Distributors
Ariz Phoenix, Sterling Elctrns. 602-258-4531
Cal Carlson, Hi-Rel Distributor Sales 213-537-6500
Cal Garden Grove, Natl Capacitor Supp 714-892-7749
Cal San Diego, Shelley Neumann 714-453-7133
Cal South Gate, Moltronics 213-773-6521
Ill Chicago, Phoenix Co. of Chicago 312-237-2828
Ill Skokie, Bell Industries 312-965-7500
Mass Bellerica, Kieruff Elctrns 617-667-8331
Mass Burlington, Wilshire Elctrns. 617-272-8200
NY Central Islip, Bomark Elctrns 516-234-7300
NY Freeport, Milgray Elctrns 516-546-6000
NY New York, New Yorker Elctrns .. 212-OR4-5120
NY Port Washington, Connector Concepts 516-883-3800
Pa Montgomeryville, Pyttronic Industries 215-643-2850
Wisc Milwaukee, Elctrn Erpeditors 414-228-8100

SPRENGNETHER INSTR. CO., W.F., Dept. EM, 4567 Swan St., St. Louis, Mo. 63110, Tel: 314-535-1682, TWX: 44-2399 SPRENCO STL; Empl.: 25

Sales Manager: K. D. Scott

SQUARE D CO., Dept. EM, 4041 N. Richards, Dept. SA-711 Box 472, Milwaukee, Wisc. 53201, Tel: 414-332-2000, Telex: 996472; Empl.: 15000

SQUIRES ELECTRONICS INC., Dept. EM, 8900 S.W. Burnham Rd. F-13, Tigard, Ore. 97223, Tel: 503-620-4686

SRC DIV., MOXON INC., See Moxon Inc.

S S A C INC., Dept. EM, Box 395, Liverpool, N.Y. 13088, Tel: 315-622-1000; Empl.: 87

Sales Manager: D. Lawrie; *Distributor Manager:* J. Arnold

Local Sales Offices & Reps.
Ariz Phoenix, Cramer Elec. 602-267-7321
Cal Glendale, Hundley Co. 213-240-3600
Cal Sunnyvale, Cramer Elec. 408-739-3011
Colo Denver, Cramer Elec. 303-758-2100
Conn North Haven, Cramer Elec. 203-239-5641
Fla Lakeland, AA Electric 813-682-6181
Ga Norcross, AA Electric 404-449-8670
Ill Chicago, P/N Indl. Sls. 312-761-7887
Ind Indianapolis, Bryant Control Inc. 317-788-0761
Mass Newton, Cramer Elec. 617-964-4000
Minn St. Paul, J. D. Co. 612-454-5552
NJ Fairlawn, Relay Specialties 201-797-3313
NY E. Northport, Jarms Assoc. 516-822-7085
NY Rochester, Upstate Component Sls. 716-288-1080
Ohio Cleveland, Cramer Elec. 216-248-8400
Pa Jenkintown, Arnold Assocs. 215-742-0600
Tex Dallas, Cramer Elec. 214-661-9300
Wash Tukwila, Cramer Elec. 206-575-0907
Wisc Cederburg, TFL Assoc. 414-377-7030
Exp: New Haven, Maston-Wright Corp. 203-288-1638

STA-WARM ELEC. CO., Dept. EM, 116 N. Chestnut St., Ravenna, Ohio 44266, Tel: 216-296-6461, Telex: 98-6488; Empl.: 18

STACKPOLE CARBON CO., Carbon Div., Dept. EM, St. Marys, Pa. 15857, Tel: 814-781-1234, TWX: 510-693-4511; FSC No.: 78488

STACKPOLE CARBON CO., Electronic Comps. Div./ Soft Ferrites/Special Purpose Resistors, Dept. EM, St. Mary's, Pa. 15857, Tel: 814-781-1234, TWX: 510-693-4511 ..... p. 2568,2569,3745

Refer To: SCC/Elctm. Comps. Div. - Fixed Comp. Resistors For Sales Office Information

STACKPOLE CARBON CO., Elctrn. Comps. Div.-Fixed Comp. Resistors & Carbon Film Resistors, Dept. EM, Kane, Pa. 16735, Tel: 814-837-7000, TWX: 510-695-8404; FSC No.: 78488 ..... p. 3744

Local Sales Offices & Reps.
Ariz Scottsdale, Summit Sale 602-994-4587
Cal Los Gatos, Luscombe Engr. of S.F. 408-354-6496
Cal Pasadena, Luscombe Engr. of L.A. 213-684-2000
Cal San Diego, Wes-K Assocs 714-271-5048
Cal Van Nuys, Wes-K Assoc. 213-989-3070
Colo Englewood, Checkmate Sls. Inc. 303-773-0666
Conn Plantsville, R. J. Pisaneschi 203-628-9505

Fla Maitland, Delmac Sls. Inc. 305-423-7562
Ga Peachtree City, J.A. Creighton .. 404-487-8550
Ill Des Plaines, Stackpole Carbon Co. 312-297-0270
Ind Bloomington, Stackpole Carbon Co. 812-339-6166
Kans Overland, Ensco-Rep 913-381-7557
La Baton Rouge, R.F. Gallagher..... 504-924-4995
Md Baltimore, Stemler Assoc., Inc. .. 301-944-8262
Mass Lowell, E.F. Delaney,Jr. 617-459-2381
Mich Birmingham, J.E. Vollmer Jr. 313-644-3571
Minn Minneapolis, HMR Inc. 716-633-7970
Mo St. Louis, Ensco-Rep. Inc. 314-567-3935
NJ Englewood Cliffs, Sprung/Nussbaum 201-947-6767
NY Buffalo, R.W. Mitscher 716-633-7970
NC Raleigh, R.W. Mitscher 919-828-0575
Ohio Dayton, J.B. MacDonald 513-298-8727
Ohio Hudson, D. J. Mohr 216-653-2255
Ohio Toledo, J.F. Clark 419-382-1813
Ore Beaverton, Vantage Corp. 503-646-3466
Pa Oreland, CMS Mktg 215-887-1325
Pa Pittsburgh, H.S. Swoyer 412-256-2538
Tenn Johnson City, R.W. Mitscher Co. 615-929-1141
Tenn Shelbyville, R. W. Mitscher 615-684-4544
Tex Dallas, M.N. Herbst 214-239-2497
Va Virginia Bch., R.W. Mitscher..... 804-481-7200
Wash Bellevue, Vantage 206-455-3460

Local Distributors

Ariz Phoenix, Dalis Radio & TV Supply 602-254-8471
Ariz Phoenix, Sterling Elctrn..... 608-258-4531
Cal Indlewood, Resistor Specialists .. 213-641-6380
Cal San Diego, Shelley-Neuman Inc. 714-453-7133
Cal Santa Monica, Shelley Elctrns.... 213-392-3913
Cal Sunnyvale, Acacia Sls 408-745-7200
Fla Dania, Summit Elctrn 305-920-6253
Fla Orlando, Hammond Elctrns 305-849-6060
Fla Orlando, TTT II Inc. 305-859-1000
Fla Tampa, Lykes Elctrns, Industrial Div. 813-886-6621
Ill Elk Grove Village, Pioneer/Chicago 312-437-9680
Ill Melrose Park, Belford Elctrns 312-666-0337
Ill Palatine, OHM Elctrn 312-359-5500
Ill Rockford, GC Elctrns 815-968-9661
Ill Skokie, Bell Indus 312-965-7500
Ind Ft. Wayne, Ft. Wayne Elect. 219-423-3422
Ind Indianapolis, Pioneer/Ind 317-849-7300
Iowa Cedar Rapids, Deeco Inc. 319-365-7551
La Metairie, Sterling Elctrns..... 504-887-7610
La Shreveport, Industrial Elctrn Supply 318-222-9459
Md Baltimore, Whitney Dist. 301-944-8080
Md Gaithersburg, Pioneer/Wash 301-948-0710
Mass Dedham, Gerber Elctrns..... 617-329-2400
Mass Hingham, Sager Electrical Supply 617-749-6700
Mass Newton, Impact Elctrns..... 617-964-7740
Mass Wilbraham, Industrial Comps..... 413-596-3834
Mich Livonia, Pioneer Mich. 313-525-1800
Minn Minneapolis, Stark Elctrn Supply 612-332-1325
Mo St. Louis, Olive Ind. Elctrns 314-863-7800
NJ Hanover, State Elctrn Parts 201-887-2550
NJ Roselle, Garden State Ind. Elect. 201-241-9000
NJ Totowa, Diplomat/IPC..... 201-785-1830
NY Binghamton, A.S.I. Elctrns 607-723-6326
NY Buffalo, Summit Dist. Inc. 716-884-3450
NY Buffalo, Wehle Elctrns 716-854-3270
NY Farmingdale, Command Elctrns 516-293-1212
NY Farmingdale, Broadline Elctrns .. 516-791-6152
NY Freeport, Milgray Elctrns 516-546-6000
NY Hempstead, Elctrn Equip 516-538-5510
NY Mt. Vernon, Qar Indl Elect. Sls .. 914-699-2224
NY Rochester, Rochester Radio Supply 716-454-7800
NY Rochester, Masline Elctrn 716-546-5373
NY Rochester, Simcona Elctrns..... 716-328-3230
NY Rockville Centre, Midway Indl Elctrns 516-764-2400
NC Winston-Salem, Kirkman Elect. .. 800-334-0158
Ohio Cincinnati, Hughes Peters Inc.... 513-351-2000
Ohio Cleveland, Pioneer/Cleveland 216-587-3600
Ohio Columbus, Hughes Peters Inc. .. 614-294-5351
Ohio Dayton, Esco 513-226-1133
Ohio Dayton, Pioneer/Dayton 513-236-9900
Okla Tulsa, Radio Inc. 918-587-9123
Pa Cornwells Hghs, Reliance Merchandizing Co. 215-638-8200
Pa Devon, Peak Elctrns 215-687-9822
Pa Erie, Advacom 814-455-8110
Pa Montgomeryville, Pyttronic Ind. .. 215-643-2850
Pa Phila., Simco Elctrns 215-229-1880
Pa Philadelphia, Herbach & Rademan 215-426-1700
Pa Pittsburgh, CAM/RPC..... 412-782-3770
Pa York, Rosen Elctrns Co..... 717-843-3875
SC Columbia, Dixie Radio Supply 803-253-5333
Tenn Knoxville, Industrial Elctrns..... 615-573-7135
Tex Dallas, KA Elctrn Sls..... 214-634-7870
Tex Dallas, Wholesale Elctrn Supply 214-745-1292
Tex El Paso, Era Elctrns 915-592-4126
Tex Ft. Worth, Textronics..... 817-429-1440
Tex San Antonio, Sherman Elctrn Supply 512-224-1001
Utah Salt Lake City, Cairon Elec 801-487-7451
Va Charlottesville, Virginia Radio Supply 804-296-4184
Wash Seattle, Shannon Ltd. 206-763-0545
Wisc Mequon, Lakeview Elctrns 414-377-8250

STACKPOLE CARBON CO/PERM CERAMIC MAGNETS & MAGNETIZABLE POWDER, Magnet Div., Dept. EM, Kane, Pa. 16735, Tel: 814-837-7000, TWX: 510-695-8360

STACKPOLE COMPONENTS CO., Dept. EM, Box 14466, Raleigh, N.C. 27610, Tel: 919-828-6201, TWX: 510-928-0520; FSC No.: 78488 p. 3743,4245,4247,4249-4253,4278

Local Sales Offices & Reps.

Ariz Scottsdale, Summit Sls. 602-994-4587
Ark Englewood, Checkmate Sls. 303-773-0666
Cal Los Gatos, Luscombe Engr. of S.F. 408-354-6496
Cal Pasadena, Luscombe Engr. of L.A. 213-684-2000
Cal San Diego, WesK Assocs 714-271-5048
Cal Van Nuys, Wes-K Assoc. 213-989-3070
Conn Plantsville, R.J. Pisaneschi..... 203-628-9505
Fla Maitland, Delmac Sls. 305-423-7562
Ga Peachtree City, J.A. Creighton .. 404-487-8550
Ill Des Plaines, Stackpole Carbon Co. 312-297-0270
Ind Bloomington, Stackpole Carbon Co. 812-339-6166
Kans Overland Park, Ensco-Rep..... 913-381-7557
La Baton Rouge, R.F. Gallagher..... 504-924-4995
Md Baltimore, Stemler Assoc. 301-944-8262
Mass Lowell, E.F. Delaney, Jr..... 617-459-2381
Mich Birmingham, J.E. Vollmer, Jr..... 313-644-3571
Minn Minneapolis, HMR, Inc. 716-633-7970
Minn Minneapolis, Bitronics 612-835-7744
Mo St. Louis, Ensco-Rep..... 314-567-3935
NJ Englewood Cliffs, Sprung/Nussbaum 201-947-6767
NY Buffalo, R.W. Mitscher 716-633-7970
NC Raleigh, R.W. Mitscher 919-828-0575
Ohio Dayton, J.B. MacDonald..... 513-298-8727
Ohio Hudson, D.J. Mohr..... 216-653-2255
Ohio Toledo, J.F. Clark 419-382-1813
Ore Beaverton, Vantage Corp. 503-646-3466
Pa Oreland, CMS Mktg 215-887-1325
Pa Pittsburgh, H.S. Swoyer 412-256-2538
Tenn Johnson City, R.W. Mitscher Co 615-929-1141
Tenn Shelbyville, R.W. Mitscher 615-684-4544
Tex Dallas, M.N. Herbst 214-239-2497
Va Virginia Beach, R.W. Mitscher 804-481-7200
Wash Bellevue, Vantage Corp..... 206-455-3460

Local Distributors

Ariz Phoenix, Mirco Distrib 602-997-6194
Cal Lakeside, Mouser Elecs 714-449-2220
Cal San Leandro, Electro Comps Distribs 415-352-5210
Cal Sun Valley, Richey Elecs 213-768-3800
Colo Denver, Integrated Elctrns 303-534-6121
Fla Orlando, Hammond Elctrns 810-850-4121
Ill Elk Grove Vil, Pioneer/Chicago.. 312-437-9680
Ill Palatine, OHM Elecs..... 312-359-5500
Ind Ft Wayne, Ft Wayne Elecs 219-423-3427
Ind Indianapolis, Pioneer/Indiana 317-849-7300
Iowa Cedar Rapids, Deeco Inc..... 319-365-7551
Md Baltimore, Whitney Dist..... 301-944-8080
Md Gaithersburg, Pioneer/Washington 301-948-0710
Mass Newton, Impact Sls..... 617-964-7740
Mich Livonia, Pioneer/Michigan..... 313-525-1800
Minn Minneapolis, H Starks Inc..... 612-332-1325
NJ Roselle, Garden State Elecs 201-241-9000
NY Buffalo, Summit Dist 716-884-3450
NY Hempstead, Elec Eqpt Co 516-538-5510
NC Greensboro, Hammond Elecs 919-275-6391
Ohio Cleveland, Pioneer/Cleveland
Ohio Dayton, Pioneer/Dayton..... 513-236-9900
Ohio Mt Vernon, QAR Ind Elec Sls 914-699-2224
Pa Horsham, Pioneer/Philadelphia .. 215-674-4000
Pa Pittsburgh, Pioneer/Standard..... 412-782-2300
SC Columbia, Dixie Radio Supply 803-253-5333
Tex Dallas, KA Elecs 214-634-7870
Va Charlottesville, Virginia Radio Supply 804-296-4184
Wash Seattle, Zepher Elecs..... 206-242-2517
Wisc Mequon, Lakeview Elecs 414-377-8250

STACKPOLE COMPONENTS CO., Dept. EM, P.O. Box M, Farmville, Va. 23901, Tel: 804-392-4111, TWX: 710-874-3710 ..... p. 4246

Refer to Stackpole Components Co. Raleigh, N.C. for sales office & distributor information

STACO, INC., Dept. EM, 301 Gaddis Blvd., Dayton, Ohio 45403, Tel: 513-253-1191, TWX: 810-459-1798, 288-032; FSC No.: 83008; Empl.: 135 .. p. 4404,4405

Sales Manager: D. James

Local Sales Offices & Reps.

Cal Costa Mesa, Stacoswitch..... 714-549-3041
Cal Santa Clara, Thomas Assocs 408-247-1252
Colo Englewood, R.G. Bowen Co..... 303-789-1884
Conn Brookfield, Hathaway Elctrns. 203-775-4469
Conn West Hartford, Hathaway Elctrns., Inc. 203-521-4614
Fla Pembroke Pines, Wallace Elctrn Sls 305-961-6640
Fla Tampa, Wallace Elctrn Sls..... 813-961-1037
Ga Atlanta, Millar Elctrn. Sls..... 404-261-6160
Haw Honolulu, Elctrns. Sls. & Svc..... 808-845-8207
Ill Evanston, Saffro & Assocs. 312-328-0140
Ind Indianapolis, Southern Sls. Co. .. 317-299-2992
Iowa Des Moines, KSW Assocs..... 515-279-9235
La Metairie, McKinney Sls. Co..... 504-454-1132
Md Columbia, Eastern Comps..... 301-730-4744
Mass Lexington, Hathaway Elctrns., Inc. 617-861-7010
Mich Lawton, Shalco, Inc. 616-624-1109
Mich Pleasant Ridge, Shalco, Inc. 313-547-4771
Minn St. Paul, SKOR 612-645-6461
Mo Kansas City, KSW Assocs. 816-358-5240
Mo Kirkwood, KSW Assocs. 314-966-8490
Neb Omaha, KSW Assocs. 402-571-6001
NJ Plainfield, Levison Sls. Co..... 201-561-3866
NM Albuquerque, C.T. Carlberg & Assocs. 505-265-1579
NY Buffalo, R.F. Lamb Co. 716-874-4900
NY Glen Cove, Levison Sls Co..... 516-676-1039
NY Rochester, R.F. Lamb Co. 716-544-5580
NY Schenectady, R.F. Lamb Co..... 518-869-3355
NY Syracuse, R.F. Lamb Co..... 315-454-2469
NY Valley Stream, Levison Sls. Co. 516-561-9696
NC Raleigh, Millar Elctrns., Inc. 919-787-9564
Ohio Cleveland, Marlow Assocs. 216-991-6500
Ohio Dayton, Marlow Assocs..... 513-866-4991
Okla Tulsa, McKinney Sls. Co. 918-622-5511
Ore Beaverton, Barrett-Squibb & Assocs 503-644-2550
Pa Flourtown, Eastern Comps. 215-836-1616
Pa Pittsburgh, Marlow Assocs..... 412-831-6113
Pa York, Eastern Comps..... 717-764-3114
Tex Bellaire, McKinney Sls. Co. 713-777-9780
Tex Dallas, McKinney Sls. Co. 214-631-9450
Va Herndon, Eastern Comps..... 703-471-1025
Wash Redmond, Barrett-Squibb & Assocs. 206-885-6991
Wisc Lake Mills, Saffro & Assocs. 414-648-2605

STACO, INC., Dept. EM, 625 S. "G" St., Richmond, Ind. 47374, Tel: 317-966-4513, TWX: 810-459-1798, 288-032; Empl.: 200

Sales Manager: H. Shulman

Local Sales Offices & Reps.

Ala Huntsville, W.A. Brown Comps .. 205-539-4411
Ariz Tempe, Delta Elctrns 602-966-9903
Cal Costa Mesa, Stacoswitch-Sls Reps 714-549-3041
Cal Santa Clara, Snyder Sls..... 408-247-9208
Colo Arvada, Sage Sls..... 303-841-2487
Fla Orlando, W.A. Brown Comps..... 305-851-5747
Ga Chamblee, W.A. Brown Comps.. 404-455-0405
Haw Honolulu, Hawaii Elctrns..... 808-845-8207
Ill Skokie, Saffro & Assocs..... 312-588-0905
Ind Indianapolis, Southern Sls 317-299-2992
Iowa Cedar Rapids, Palatine Sls 319-365-8071
Kans Derby, Palatine Sls 316-788-0621
Md Hyattsville, Eastern Comps 301-577-2925
Mass Newton, Impact Sls..... 617-964-7740
Mich Southfield, Fred Gehrke & Assocs 313-559-5363
Minn Minneapolis, Clark R. Gibb Co .. 612-377-1200
Mo Hazelwood, Palatine Sls..... 314-895-4577
NY Buffalo, Robert F. Lamb Co. 716-874-4900
NY Rochester, Robert F. Lamb Co. 716-544-5580
NY Syracuse, Robert F. Lamb Co. .. 315-455-2469
NY Valley Stream, Levison Sls 516-561-9698
NC Raleigh, W.A. Brown Comps 919-781-9426
Ohio Cleveland, Marlow Assocs..... 216-991-6500
Ohio Dayton, Marlow Assocs 513-866-4991
Ore Beaverton, Barrett/Squibb & Assocs 503-644-2550
Pa Flourtown, Eastern Comps..... 215-836-1616
Tex Richardson, Barry Sls..... 214-234-0255

Utah Salt Lake City, Sage Sls 801-290-1234
Wash Redmond, Barrett/Squibb & Assocs 206-885-6991
Wisc Menomonee Falls, Walter M. Braun & Assocs 414-251-8685

STACOSWITCH, INC., Dept. EM, 1139 Baker St., Costa Mesa, Cal. 92626, Tel: 714-549-3041, TWX: 910-595-1507; FSC No.: 12522; Empl.: 100

Local Sales Offices & Reps.
Cal Newark, Snyder Sls. 415-792-8323
Colo Denver, Camel Elctrns., Inc. 303-757-6191
Conn Marion, Sands Co. 203-628-4363
Fla Lighthouse Pt., Saber Assocs. 305-943-3076
Ga Dunwoody, Saber Assocs 305-943-3067
Ind Fort Wayne, J & B Engrg. Sls. 219-483-2813
Iowa Cedar Rapids, H. R. Brown Sls. 319-366-0635
Kans Olathe, B-C Elctrn. Sls. 913-888-6680
Md Rockville, Marktron 301-762-6210
Mich Grand Rapids, R.P. Urban & Assocs. 616-245-0511
Minn St. Paul, Murnco 612-484-8200
Mo Hazelwood, B-C Elctrn. Sls. 314-731-1255
NJ Wayne, G.T. Assocs. 201-694-6040
NY Syracuse, Lenard Co. 315-379-9191
NC Raleigh, Saber Assocs. 919-834-3961
Ohio Cleveland, C.A. Robinson Co. 216-381-9049
Ohio Dayton, C.A. Robinson Co. 513-275-2412
Pa Media, W. Reeves Assocs. 215-566-6709
Tex Dallas, R. Matthews Elctrns. 214-233-0363
Va Charlottesville, Marktron 703-973-5874
Wash Seattle, Seatronics 206-767-4330
Exp: New York, Technitron Intl 212-758-2790

Local Distributors
Ariz Phoenix, R.V. Weatherford 602-272-7144
Cal Glendale, R.V. Weatherford 213-849-3451
Cal San Diego, R.V. Weatherford 714-278-7400
Cal Santa Ana, Norstan 714-540-4165
Cal Sunnyvale, Pyramid Elctrns 408-744-1900
Colo Englewood, R.V. Weatherford 303-761-5432
NY Lynbrook, Peerless Radio Corp. 516-593-2121
NC Winston-Salem, Kirkman Elctrns, Ltd. 919-722-9131
Tex Dallas, R.V. Weatherford 214-243-1571
Tex Stafford, Southwest Elctrns 713-494-6021
Wash Seattle, R.V. Weatherford Co. 206-243-6340
For: Can., Vancouver, B.C., Intek Elctrns, Ltd 604-324-6831

Advertisement

Stacoswitch manufacturers non-lighted and lighted display pushbutton switches and indicators, including single lamp and 4-lamp units. Choice of switch action, 2PDT or 4PDT, 3-5 amp rating, 28VDC/115VAC. QPL and industrial/commercial. Company also manufactures Low Profile Keyboards with or without LED illumination for function identification.

STANCOR/ESSEX GRP, Dept. EM, 3501 W. Addison, Chicago, Ill. 60618, Tel: 312-463-7400, TWX: 910-221-5466; FSC No.: 80089

Sales Manager: R. Bender; *Distributor Manager:* M. E. Mader

Local Sales Offices & Reps.
Ariz Phoenix, W. B. Knight Co. 714-271-7817
Cal Burlingame, Polach & Bensinger Inc. 415-697-2525
Cal Los Angeles, W. Bert Knight Co. 213-670-2833
Colo Denver, R.G. Bowen Co. 303-722-4641
Fla Ft. Lauderdale, Hollingsworth & Still 305-782-0069
Fla Orlando, Hollingsworth & Still, Inc. 305-834-2356
Ga Atlanta, Hollingsworth & Still, Inc. 404-394-3270
Ill Glenview, Reigel Asoc. 312-729-3824
Ind Ft Wayne, Giesting Asc 219-486-1912
Iowa Des Moines, Kathrinus-Kelly & Co. 515-255-4584
Kans Shawnee Mission, Kathrinus-Kelly Co. 913-722-0000
Md Reisterstown, Massey Asc 301-833-2039
Mass Wellesley Hills, M. Scott Co. 617-235-0102
Mich Livonia, Giesting Asc. 313-477-6060
Minn St. Paul, Murnco 612-484-8200
Mo St. Louis, Kathrinus-Kelly & Co. 314-968-3800
NM Albuquerque, C.T. Carlberg & Assocs. 505-265-1579
NY Binghamton, Precision Sls 607-648-3686
NY Pittsford, Precision Sls 716-381-2820
NY Syracuse, Precision Sls 315-458-2223
NY Valley Cottage, LRC 914-634-7973
Ohio Cincinnati, Giesting Asc 513-851-7800
Ohio Galion, Giesting Asc 419-468-3737
Ore Beaverton, DMS/Vantage 503-646-3466
Pa Waterford, Bacon Sls 814-796-2381
Pa Willow Grove, BGR 215-657-3301
Tenn Memphis, Mid-South Sls. Assoc. 901-272-1209
Tex Dallas, R.E. Nesbitt Co. 214-357-4601
Tex Houston, R.E. Nesbitt 713-224-3633
Wash Bellevue, DMS/Vantage Corp. 206-455-3460
Wash. Seattle, DMS/Vantage 206-525-2050
Exp: NYC, New York, Roburn Agencies 212-989-5939

STANDARD CONDENSER CORP., Dept. EM, 1065 W. Addison St., Chicago, Ill. 60613, Tel: 312-327-5440

Local Sales Offices & Reps.
Cal Los Gatos, Wedemeyer Sls 408-378-3883
Ill Chicago, Rinaldi Inc. 312-763-4848
Mass Canton, New England Elctrn. Sls. 617-828-4835
Minn St. Paul, Cahill & Assoc. 612-646-7217
NY Syracuse, J.V. Costello 315-472-0322
Ohio Cleveland, J. O. Olsen Co. 216-752-5444
Ore Portland, Electronic Comp Sls. 503-245-2342
Pa Jenkintown, Arnold & Assoc. 215-PI2-0600

STANDARD CONTROLS, See Paine Instruments

STANDARD ENGINEERING, Dept. EM, 44800 Industrial Dr., Fremont, Cal. 94538, Tel: 415-657-7555, TWX: 910-381-6048; Empl.: 40

Sales Manager: T. E. Pluta

Local Sales Offices & Reps.
Cal Fremont, Standard Engrg. 415-657-7555
Va Reston, Standard Engrg 703-467-4033

STANDARD GRIGSBY INC., Dept. EM, 920 Rathbone Ave., Aurora, Ill. 60507, Tel: 312-844-4300, TWX: 910-232-3138; Empl.: 350 ..... p. 4254;4255

Local Sales Offices & Reps.
Ala Huntsville, Elctrn. Mktg. Assoc. 205-533-6640
Ariz Scottsdale, Piper Sls 602-949-8424
Cal Culver City, DeAngelo Rothman & Co. 213-398-6239
Cal San Diego, DeAngelo Rothman & Co. 714-560-5707
Cal Santa Clara, Nova-tronix 408-243-9530
Colo Arvada, Piper Sls 303-420-4646
Conn Southington, KSA of New England 203-747-5883
Fla Clearwater, WMM Assoc. 813-442-3913
Fla Ft. Lauderdale, WMM Assoc. 305-772-9850
Fla Maitland, WMM Assoc. 305-831-4530
Ill Sowners Grove, Momak Sls. 312-963-6400
Ind Indianapolis, Southern Sls. Corp. 317-257-7575
Kans Olathe, Elctrn. Sls. Co. 913-782-2850
Mass Framingham, KSA of New England 617-875-5464
Mass Waltham, Conti-Younger Assoc. 203-929-3294
Mich Benton Harbor, McNabb & Assoc. 616-925-2166
Minn St. Paul, Northport Engrg. 612-698-3841
NJ Mountain Lakes, Comps. For Elctrns. 201-334-2921
NY Cazenovia, S. T. Woolard Co. 315-655-8145
NY Rochester, D.L. Eiss 716-889-1919
NC Winston Salem, Electronic Mktg. Assoc. 919-722-5151
Ohio Cincinnati, Luebbe Sls. 513-871-4211
Pa Ft. Washington, Kirk-Sandell 215-643-2100
SC Greenville, Elctrn. Mktg. Assoc. 802-233-4637
Tex Arlington, Wheelex 817-461-8039
Wash Redmond, Quadra Sls. 206-883-3550

STANDARD PNEUMATIC MOTOR CO., Dept. EM, Box 10030, Reno, Nev. 89510, Tel: 702-329-6311, Telex: 354-467; FSC No.: 53623; Empl.: 65

Sales Manager: D. Demarzie

Local Sales Offices & Reps.
Cal Pasadena, Standard Pneumatic 800-648-5470
Cal Santa Clara, Standard Pneumatic 800-648-5470
Fla Merritt Island, James A. Kennedy 305-452-9821
Ga Atlanta, Standard Pneumatic 800-648-5055
Ill Chicago, Standard Pneumatic 800-648-5055
Nev Reno, Standard Pneumatic Motor Co. 800-648-5055
NJ Maple Shade, Standard Pneumatic 800-648-5055

STANDARD POWER, INC., Dept. EM, 1400 S. Village Way, Santa Ana, Cal. 92705, Tel: 714-558-8512, TWX: 910-595-1760; Empl.: 135 ..... p. 3332-3335

Sales Manager: C.L. Goldsworth

Local Sales Offices & Reps.
Ala Huntsville, White, Glen Assocs 205-883-9394
Ariz Phoenix, O'Donnell Assocs. 602-938-3120
Cal Palo Alto, O'Donnell Assoc. 415-327-9260
Cal Torrance, O'Donnell Assoc. 213-328-9710
Colo Denver, Parker-Webster Co. 303-751-2600
Conn Meriden, R. Sturgeon Co. 203-237-1112
Fla Clearwater, WMM Assocs. 813-442-3913
Fla Ft. Lauderdale, WMM Assocs 305-772-9800
Fla Maitland, WMM Assocs 305-831-4530
Ill Des Plaines, Janus, Inc. 312-298-9330
Ind Ft. Wayne, J & B Engrg Sls. Co. 219-483-2813
Kans Shawnee Mission, Lowell-Kangas & Assoc. 913-631-3515
La New Orleans, Lykes Elctrns 504-733-3400
Md Timonium, Glen White & Assoc. 301-252-6360
Mass Needham Hgts, Sturgeon Co. 617-444-6603
Mich Spring Lake, Imtech 616-842-6460
Minn Minneapolis, Arneson & Co. 612-835-2177
Mo St. Louis, Lowell-Kangas & Assoc. 314-821-4050
NY Hopewell Junction, Net Sls 914-226-8874
NY Huntington, Standard Power 516-549-5104
NY Pittsford, Net Sls 716-467-4538
NC Raleigh, Glen White & Assoc. 919-787-7016
Ohio Cleveland, Imtech 216-826-3400
Ohio Dayton, Imtech 513-278-6507
Tenn Germantown, White, Glen Assocs 901-754-0483
Tenn Jonesboro, White, Glen Assocs. 615-477-8850
Tex Dallas, Semiconductor Sls. Assocs. 214-231-6181
Tex Houston, Semiconductor Sls. Assocs. 713-661-0681
Utah Salt Lake City, Parker Webster Co. 801-487-5911
Va Lynchburg, Glen White & Assocs. 804-384-6920
Wash Bellevue, W.M. Buehler 206-455-5512
Wisc Elm Grove, Key Entprs 414-784-3390
Exp: Cal., Los Angeles, Trans World Trade 213-472-0444

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Ariz Phoenix, Liberty Elctrns 602-249-2232
Ariz Phoenix, R.V. Weatherford Co. 602-272-7144
Cal Anaheim, R.V. Weatherord Co. 714-547-0891
Cal Burlingame, Rose Elctrns 415-348-2740
Cal El Segundo, Liberty Elctrns 213-322-8100
Cal Glendale, R.V. Weatherford Co. 213-849-3451
Cal Los Angeles, Export Sls Transworld Trade 213-472-0444
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Cal Palo Alto, R.V. Weatherford Co. 415-493-5373
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Cal San Diego, Liberty Elctrns 714-565-9171
Cal San Diego, R.V. Weatherford 714-278-7400
Colo Englewood, R.V. Weatherford Co. 303-761-5431
Conn Hamden, Arrow Elctns. 203-248-3801
Fla Ft. Lauderdale, Arrow Elctrns. 305-776-7790
Fla Miami, Lykes Elctrns. 305-633-8538
Fla Orlando, Hammond Elctrns. 305-849-6060
Fla Tampa, Lykes Elctrns. 813-886-6621
Ga Norcross, Lykes Elctrns. 404-449-9400
Haw Honolulu, Industrial Elctrns. 808-533-6095
Ill Broadview, LComp-Chicago 312-865-7600
Ill Westmont, RM Elctrns 312-323-9670
Ind East Chicago, Acro Elctrns. 219-397-8681
Ind Ft. Wayne, Ft. Wayne Elctrns. 219-423-3422
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Ind Indianapolis, Graham Elctrns. 317-634-8202
Kans Wichita, Radio Supply 316-267-5216
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Md Baltimore, Arrow Elctrns. 301-247-5200
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Mich Grand Rapids, R.S. Elctrns. 616-241-3483
Mich Kentwood, RM Elctrns. 616-531-9300
Mich Livonia, RS Elctrns. 313-525-1155
Minn Bloomington, Arrow Elctrns. 612-888-5522
Minn Minneapolis, Northern Electrns. Specialist 612-835-2177
Mo Florissant, Sheridan Sls 314-837-5200
Mo Kansas City, LCOMP-Kansas City Inc. 816-221-2400
Mo St. Louis, Van Sickle Radio Elctrns. 314-621-5000
Mo St. Louis, Lcomp-St. Louis Inc. 314-291-6200
Neb Lincoln, Scott Elctrn. Supply Co. 402-464-8308
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NJ Saddlebrook, Arrow Elctrns. 201-797-5800
NY Buffalo, Summit Distribs 716-884-3450
NY Corning, Corning Elctrns. 607-962-0555
NY Farmingdale, Harrison Elctrns. Corp. 516-293-7990

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NY Huntington, Standard Power 516-549-5104
NY Mt. Vernon, QAR Ind'l. Sls. 914-699-2224
NY Rochester, Rochester Radio Supply Co. 716-454-7800
NC Greensboro, Hammond Elcrns. .. 919-275-6391
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Ohio Beachwood, Sheridan Sls 216-831-0130
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Ohio Cleveland, Arrow Elctrns. 216-464-2000
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Ohio Dayton, Sheridan Sls 513-223-3332
Ohio Dayton, Esco, Inc. 513-226-1133
Ohio Toledo, RS Elctrns. 419-531-5544
Okla Oaklahoma City, Radio Inc. 405-235-1551
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Tex Houston, R.V. Weatherford Co.. 713-688-7406
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Wash Bellevue, Liberty Elctrns..... 206-453-8300
Wash Seattle, R.V. Weatherford Co.... 206-243-6340
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STANDARD WIRE & CABLE, Dept. EM, 2345 Alaska Ave., El Segundo, Cal. 90245, Tel: 213-973-2345, TWX: 910-340-6758, 65-3423; FSC No.: 04946; Empl.: 105 p. 4656

Sales Manager: L. Sperber (Dir of Mktg - W)

Local Sales Offices & Reps.
Ala Huntsville, K & E Assocs. Inc. 205-883-9720
Ariz Phoenix, Standard Wire & Cable Co. 602-269-2501
Cal Palo Alto, Standard Wire & Cable Co. 415-328-3082
Conn Woodbridge, Elctrn. Mktg. Co..... 203-397-1461
Fla Orlando, Buchanan & Abrams Assoc. 305-898-7444
Md Timonium, L.H. Kolman & Co. 301-752-8756
Mass Attleboro, Standard Wire & Cable Co. 617-226-1500
Mo Independence, Standard Wire & Cable Co. 816-461-0040
NJ Cinnaminson, Scott Sls. 609-829-2991
NJ Mountain Lakes, Components for Elctrns. 201-334-2921
NY DeWitt, T. H. Marden 315-446-9280
Ohio Cleveland, Jim Finnegan & Co... 216-238-5905
Wash Vancouver, Standard Wire & Cable Co. 206-696-4645
Wisc Northfield, W.F. Hess 715-673-4342
Exp: Cal., Los Angeles, Standard Wire & Cable Co. 213-973-2345

Standex Electronics

STANDEX ELECTRONICS, Dept. EM, 4538 Camberwell Rd., Cincinnati, Ohio 45209, Tel: 513-871-3777, TWX: 810 461 2345; Empl.: 60 p. 4256

Local Sales Offices & Reps.
Ala Huntsville, Jack Eberle 205-837-9296
Ariz Scottsdale, Carter Assocs 602-947-4355
Cal Burlingame, J. Logan & Assocs. 415-697-6100
Cal Los Angeles, El-Com, Inc. 213-223-1351
Conn Lakeville, Conti-Younger Assocs 203-435-9320
Fla Plantation, Gallagher & Assocs.. 305-473-2101
Ill Chicago, Ed Joyner & Co 312-792-1277
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Ind Indianapolis, Morris-Cunningham & Assoc. 317-255-2458
Ky Fern Creek, R.W. Mitscher Co... 502-239-8927
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Minn Minneapolis, Quantum Sls 612-831-8583
Mo Kansas City, Nevco, Inc. 816-421-1751
Mo St. Louis, Nevco..... 314-843-7406
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NC Raleigh, R. W. Mitscher 919-876-6139
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Pa Ardmore, W. K. Metz 215-649-3966
Tenn Johnson City, R.W. Mitscher Co. 615-929-1141
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Sales Manager: T. McGarvey; *Distributor Manager:* J. Pollock

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Ariz Scottsdale, Goodreau & Assoc. 602-994-9909
Cal Costa Mesa, Stanford Applied Engrg. 714-540-9256
Cal Irvine, Caltronics 714-751-9162
Cal San Diego, SR Elctrns..... 714-565-8411
Cal Santa Clara, Stanford Applied Engrg. 408-243-9200
Cal Sunnyvale, Caltronics 408-739-3070
Colo Boulder, Stanford Applied Engrg. 303-449-9100
Colo Denver, Electrodyne 303-757-7679
Conn Wethersfield, Underwood Sls..... 203-563-9166
Fla Casselberry, EIR, Inc. 305-830-9600
Fla Clearwater, EIR Inc. 813-447-5192
Fla Coral Springs, EIR Inc. 305-752-9227
Fla Hialeah, EIR Inc. 305-557-0856
Fla Maitland, EIR Inc..... 305-647-4691
Fla Plantation, EIR 305-791-6390
Ga Stone Mountain, H & H Mktg. 404-296-9830
Haw Honolulu, Adtech, Inc. 808-941-0708
Ill Downers Grove, Momak Sls. 312-963-6400
Ind Ft. Wayne, J & B Engrg. 219-483-2813
Iowa Hiawatha, Gassner & Clark Co. 319-393-5763
Kans Shawnee Mission, Midtec Asso. 913-441-6565
Md Baltimore, Component Sls 301-467-8255
Md Baltimore, Component Sls..... 301-484-3647
Md Bethesda, H & M Assoc. 301-986-8869
Mass Chelmsford, Underwood Sls 617-256-8191
Minn Minneapolis, G.E. ARneson 612-835-2177
Mo Florissant, Midtec Asso. 314-837-5200
NH Nashua, Stanford Applied Eng'g 603-889-2866
NH Nashua, Caltronics 603-889-2866
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STANTON MAGNETICS, INC., Dept. EM, Terminal Dr., Plainview, N.Y. 11803, Tel: 516-OV1-0200, TWX: 510-221-1845; Empl.: 300

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Cal Beverly Hills, Trego Sls. Co. 213-274-8351
Cal Redwood City, H & K Sls., ... 415-637-1400
Colo Aurora, Scowcroft & Assocs..... 303-371-5280
Conn Stamford, John B. Anthony Co... 203-322-9202
Fla Hollywood, Third Century Mktg. 305-947-7107
Ga Atlanta, Elmar Assoc. 404-938-2821
Ill Skokie, Irving W. Rose Assocs... 312-674-6790
Kans Overland Park, William Menezes & Assoc. 913-649-2680
Md Bethesda, Gene Rosen & Assocs. 301-530-8448
Mass Marblehead, Willson Sls. Co..... 617-631-4016
Minn St. Paul, Smith Engrg. Assocs. .. 612-646-4851
NY Albany, Ava Marketing Inc. 518-458-7715
Ohio Cleveland, F. A. Daugherty Co.... 216-Hi9-1122
Ohio Lakewood, Team, Inc. 216-228-2170
Pa McMurray, C. S. Cooper & Assocs. 412-941-6473
Tex Dallas, Charles Lucas Sls. Co. .. 214-330-8181
Wash Seattle, Henry Joncas Co. 206-363-9200

STANTRON DIV., Wyco Metal Products, Dept. EM, 6914 Beck Ave., N. Hollywood, Cal. 91605, Tel: 213-875-0800, TWX: 910-499-2177; FSC No.: 06514; Empl.: 55 ..... p. 1048

Sales Manager: D. V. Fury

Local Sales Offices & Reps.
Ariz Phoenix, Shefler-Kahn Co. 602-257-9015
Ark Hot Springs, Barry Sls. Co. 501-624-3215
Cal Los Angeles, Ed Landa Co. 213-879-0770
Cal Pleasanton, Moulthrop Sls. Inc... 415-846-0550
Colo Aurora, Robbins & Assocs. 303-399-6618
Conn Canton Center, Tekdata 203-692-0719
Fla Tampa, Wallace Elctrn. Sls..... 813-961-1036
Ga Jonesboro, Wallace Elctrn. Sls... 404-471-6297
Haw Honolulu, EMC Corp. 808-847-1138
Ill Chicago, Berndt Assocs. 312-283-0713
Ind Carmel, Berndt Assoc. 317-844-0114
Kans Shawnee Mission, Midtec Assoc. 913-441-6565
Md Silver Springs, Ara Elctrns., Inc. 301-565-2585
Mass Wakefield, Tekdata 617-245-5940
Minn Minneapolis, Berndt Assocs. 612-835-4818
NJ Wayne, G.T. Assocs..... 201-694-6040
NM Albuquerque, Shefler-Kahn Co... 505-265-7077
NY Rochester, Gislason Sls. 716-454-4741
NC Kernersville, Wallace Elctrn. Sls. 919-996-2742
Ohio Cincinnati, J.O. Olsen Co. 513-922-2176
Ohio Cleveland, J.O. Olsen Co. 216-752-5444
Pa Glenside, Ara Elctrns., Inc. 215-887-5250
Pa Pittsburgh, J.O. Olsen Co. 412-279-2550
Tenn Chattanooga, Wallace Elctrn. Sls. 615-875-0786
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Tex Richardson, Barry Sls. Co..... 214-234-0255
Va Richmond, ARA Elctrns. 804-285-9309
Wash Seattle, D. Smith Sls. 206-633-3160
Wisc Milwaukee, Berndt Assoc. 414-545-8400

STAR MICRONICS INC., Dept. EM, Pan Am Building, Ste 2308, 200 Park Ave, New York, N.Y. 10017, Tel: 212-986-6770, TWX: 710-581-4082 ..... p. 1020,1021

Sales Manager: M. Yamaguchi

STAR PORCELAIN CO., Dept. EM, 71 Muirhead Ave., Box 1267, Trenton, N.J. 08638, Tel: 609-392-3154; Empl.: 180

STAR TRON CORP., Dept. EM, 58 Curtis St., Providence, R.I. 02909, Tel: 401-274-5090; FSC No.: 32494; Empl.: 30

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Conn Milford, Cuming Assoc. 203-878-3946
Ill Elgin, Spectrum Techn 312-695-8552
Mass Waltham, JS Engineering Sls. 617-891-5883
NY Syosset, SGS Sls. & Mktg., Ltd. 516-921-5335
RI Providence, Star-Tron Corp. 401-274-5090

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Sales Manager: G. Markley

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Sales Manager: A. Q. Testone

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Colo Aurora, Aurora Equip Co..... 303-751-8814
Conn Vernon, Robert Dickerman..... 203-872-7172
Fla Ft. Lauderdale, Howard Assocs 305-771-0858
Ill Elk Grove Village, O'Connell & Assocs. 312-640-6970
Ill Glen Ellyn, H.F. Wilson Engrg Co. 312-469-8473

Kans Derby, Production Automation Corp. 316-788-3352
Mass Framingham, Microdon, Inc. 617-879-3800
Minn Minneapolis, Production Automation Corp. 612-884-2426
Mo Grandview, Production Automation Corp. 816-763-4155
Mo Hazelwood, Production Automation Corp. 314-731-2331
NH Hampton, Tilco 603-926-6001
NY Clifton Springs, Hans Belitz 315-462-5202
NC Monroe, McCoy-Ellison, Inc. 704-283-8511
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Ohio Lakewood, Complex Inc. 216-521-5516
Pa Broomall, Gil-Tec 215-543-7200
Pa Havertown, J.L. Beatty, Inc. 215-528-6617
RI Coventry, Toyenco, Inc. 401-822-0350
Tex Houston, Production Automation Corp. 713-444-1232
Tex Richardson, Production Automation Corp. 214-231-3979
Wash Seattle, Demarest & Assocs 206-523-3210

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NC Monroe, McCoy-Ellison 704-283-8511
Pa Havertown, J.L. Beatty 215-528-6617

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Ariz Scottsdale, E.E. Black & Assocs. 602-947-2007
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Cal Northridge, R.H. McDonald & Assocs. 213-349-7911
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Cal Santa Clara, Nova-Tronix 408-243-9530
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Fla Eustis, R.K. Welter Co. 904-357-7796
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Mich Grand Rapids, Elliott Sls. 616-949-1451
Minn Lakeville, Dan'l Engrg. Corp. 612-332-4848
Minn Lakeville, Dan'l Engrg 612-332-4848
NJ Marmora, Kaygar Assocs. 609-398-5229
NY Manlius, Bowser & Sapecky Assocs. 315-682-8885
NY Valley Stream, Levison Sls. Co. 516-LO1-9696
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Ore Portland, J.J. Backer Co. 503-297-3776
SC Mauldin, Carl Hart 803-288-2323
Tex Garland, deForest Sls Co 214-349-3290
Va Portsmouth, F.B.D. Sls. 804-484-3162
Wash Seattle, J.J. Backer Co. 206-285-1300
Wash Seattle, Jas. J. Backer Co. 206-285-1300

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STERLING TRANSFORMER CORP., Dept. EM, 510 Driggs Ave., Brooklyn, N.Y. 11211, Tel: 212-782-4200; Empl.: 55 ..... p. 2641,4407-4411

Sales Manager: P.H. Odessey

Local Sales Offices & Reps.

Cal Palo Alto, Mauldin Co. 415-326-5291
Cal Van Nuys, Timco Sls. 213-781-7370
NY Rockville Centre, Willgold Elec. Sls. 516-RO 4-4022

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Conn Northford, D.H. Rausch 203-484-0094
Ill Oak Brook, Sterling Div. 312-887-0315
Minn Minneapolis, Bergquist Co. 615-835-2322
NC Charlotte, R.W. Chapman & Co. 704-525-2421
Ohio Chagrin Falls, Electrolock, Inc. .. 216-543-5125
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Ariz Phoenix, MR Engrg Sls. 602-956-4670
Cal Inglewood, H.M.C., Inc. 213-645-6953
Cal Palo Alto, W Engrg Sls. 415-964-2564
Colo Wheatridge, Waugaman Assocs 303-423-1020
Fla Altamonte Springs, Semtronic Assocs 305-831-8233
Fla Clearwater, Semtronic Assocs .. 813-461-4675
Ill Mt. Prospect, Magnuson Assocs 312-956-0700
Ind Indianapolis, Magnuson Assocs.. 317-243-8885
Kans Overland Park, John F. Guernsey Co. 913-381-2225
Md Ellicott City, A.O. Elctrns 301-942-8883
Minn St. Paul, Magnuson Assocs 612-227-8495
NJ Berkeley Hghts, Assoc Measurement & Control 201-464-5100
NM Albuquerque, Waugaman Assocs 505-294-1436
NY Lewiston, Watmet 716-285-3595
Ohio Brecksville, Allen Nace Co. 216-526-4323
Ohio Englewood, Allen Nace Co. 513-836-0931
Pa Ambler, Denco 215-542-9876
Pa Pittsburgh, Allen Nace Co. 412-922-7225
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Ill Westchester, Murphy & Dickey .. 312-344-5660
Md Finksbury, W.H. Cooke & Co., Inc. 301-833-8200
Mich Troy, G.R. Peters Assocs. 313-362-1220
Mo St. Louis, C.O. Leaver Co. 314-WO8-1500
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Ohio Cincinnati, Beedle Equip. Co. 513-793-0140
Ohio Shaker Heights, Martin-Rettger, Inc. 216-283-5600
Ore Portland, J.L. Kearns Co., Inc. 503-236-1165
Pa King of Prussia, WisTex 215-337-1240
Tex Bellaire, Brice Co. 713-666-1788
Tex Dallas, Brice Co. 214-233-9808
Wisc Wauwatosa, T. R. Bickler Assocs. 414-784-2600

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Local Sales Offices & Reps.

Ariz Phoenix, Vari-Tron Sls. Co. 602-997-0774
Cal Burlingame, J. Logan & Assoc. .. 415-697-6100
Cal Chatsworth, SDP West Coast 213-822-6226
Colo Denver, McSherry & Assoc. 303-238-8361
Conn Windsor, W. Y. Bogle Corp. 203-688-8305
Fla Orlando, Irby & Connolly 305-894-8471
Ill Chicago, A. Woods & Assoc. Inc. 312-283-7400
Md Pikesville, Imagitron Sls. Co. 301-484-1411
Mass Woburn, R. W. Hatfield 617-933-2324
Mich Lathrup Village, R. C. Nordstrom & Co. 313-559-7373
Minn Wayzata, J. Little Assocs. 612-473-1107
NJ So. Amboy, Addem II 201-721-6449
NY Clarence, Rep-Tech Inc. 716-684-6250
NY New Hyde Park 516-328-3300
NY Syracuse, Rep-Tech Inc. 315-454-2445
NC Charlotte, Reynolds Cowardin Assoc. 704-523-0324
Ohio Columbus, Rockford Controls Ohio Inc. 614-231-5890
Ohio Dayton, Rockford Controls Ohio Inc. 513-278-7362
Ohio Euclid, Rockford Controls Ohio Inc. 216-731-5250
Tenn Chattanooga, C. H. Cloer & Assocs. 615-877-6783
Tex Richardson, Zonk Eng. Co. 214-238-7651
Va Richmond, Reynolds Cowardin Assoc. 703-266-3457
Va Roanoke, Reynolds Cowardin Assoc.
Wash Seattle, Northmar, Inc. 206-524-5170

STOELTING CO., Dept. EM, 1350 S. Kostner Ave., Chicago, Ill. 60623, Tel: 312-522-4500; Empl.: 50

Sales Manager: D. A. Peterson

STORM PRODUCTS CO., Dept. EM, 112 S. Glasgow St., Inglewood, Cal. 90301, Tel: 213-776-8141; Empl.: 225

Local Sales Offices & Reps.

Ariz Phoenix 602-269-3485
Cal Inglewood 213-776-8141
Cal Palo Alto 415-494-6621
Colo Broomfield 303-466-1991
Tex Dallas 214-330-1381

STOW LABS., INC., Dept. EM, Kane Ind'l. Dr., Hudson, Mass. 01749, Tel: 617-562-9347, Telex: 94-8330; Empl.: 15

Local Sales Offices & Reps.

Cal San Carlos, Westronics Assoc. .. 415-592-1417
Mass Hingham, R.J. Wilson 617-749-7575
Mich Detroit, Marsh Equip. Co. 313-869-9200
Mo St. Louis, Delltron Co.
NJ N. Plainfield, Brady Co. 201-753-7988
NY Albany, T. Carse Sls. Co. 518-785-5844
Exp: N.Y., NY, Multiparts 212-944-4370

STRUTHERS-DUNN, INC., Dept. EM, Lamb's Rd., Pitman, N.J. 08071, Tel: 609-589-7500, TWX: 510-686-7510; FSC No.: 78290; Empl.: 450

Sales Manager: W.L. Capewell; *Distributor Manager:* S.R. Webb

Local Sales Offices & Reps.

Ala Huntsville, Rep, Inc. 205-881-9270
Ariz Scottsdale, DAR-C, Inc. 602-948-2240
Ark Little Rock, Ransom Sls. Co., Inc. 501-225-7332
Cal Culver City, DeAngelo, Rothman & Co., Inc. 213-398-6239
Cal Palo Alto, Held & Mollard, Inc. .. 415-965-9321
Cal San Diego, DeAngelo, Rothman & Co., Inc. 714-560-5707
Colo Denver, D. E. Bond Assocs. 303-756-1234
Fla Miami, Ludlum Assocs. Co. 305-592-6524
Fla Orlando, Ludlum Assocs. Co. 305-894-7761
Ga Tucker, Rep, Inc. 404-938-4358
Ill Glen Ellyn, Rockford Controls Co. 312-469-6016
Iowa Bettendorf, White Equipment Co. 319-355-5623
Kans Wichita, Avionics Engrg. Sls. Co. 316-264-6201
La Baton Rouge, Automation Specialists, Inc. 504-923-2810
La Kenner, Automation Specialists, Inc. 504-722-2217
La La Houma, Automation Specialists 504-868-8775
Md Baltimore, Stemler Assocs., Inc. 301-944-8262
Mass Sturbridge, Branford Controls Corp. 617-347-7367
Mich Southfield, L. H. Dickelman Co. 313-353-8210
Minn Minneapolis, HMR, Inc. 612-831-7400
Mo Maryland Heights, Hitt & Assocs. 314-878-5404
Mo Raytown, E. A. Mais Co. 816-356-0800
NJ Pitman, Struthers-Dunn, Inc. 609-589-7500
NJ West Caldwell, Grimm, Siegel Assocs., Inc. 201-575-9300
NY Buffalo, H. C. Zang Agency 716-877-3677
NY Rochester, Rush Instrs. 716-271-3170
NC Charlotte, J. Rudisill Assocs., Inc. 704-377-6901
Ohio Cincinnati, Beedle Equip. Co. 513-793-0140
Ohio Columbus, Rockford Controls Ohio 614-231-5890
Ohio Euclid, Rockford Controls Ohio .. 216-731-5250
Okla Tulsa, Kemp Engrg. Co., Inc. 918-299-2636
Pa Philadelphia, Struthers-Dunn, Pitman, N.J. 609-589-7500
Pa Pittsburgh, R. F. Clark Co. 412-242-9500
Tenn Jefferson City, REP, Inc. 615-475-4105
Tenn Memphis, Ransom Sls. Co., Inc. 901-332-0036
Tex Arlington, W. Pat Fralia Co. 817-640-9101

Tex Houston, Automation Specialists, Inc. 713-789-6310
Tex Houston, W. Pat Fralia Co., Inc. 713-772-1572
Va Alexandria, Stemler Assocs. Inc. 703-548-7818
Wash Seattle, Eicher-Richards Co. 206-523-7888

ST-SEMICON INC, Semiconductor Div., Dept. EM, 415 No. College Ave., Bloomington, Ind. 47401, Tel: 812-332-1435, TWX: 810-351-1384; Empl.: 100

Local Sales Offices & Reps.
Ala Huntsville, Murphy & Cota Co. 205-539-8476
Ark El Dorado, D. Bellew Sls. Co. 501-863-8325
Cal Redwood City, Parks & Pruitt Assocs. 415-364-1640
Cal Torrence, Mitronics 213-323-7934
Colo Denver, Nelson Co. 303-573-1516
Fla Lighthouse Point, Jack Krutek & Assoc. 305-941-6544
Ga Atlanta, Murphy & Cota Co. 404-875-2525
Ill Chicago, Saffro & Assocs. 312-328-0140
Ind Indianapolis, Sukup & Cox 317-253-5501
Kans Leawood, Thunderbird Sls. Co. 913-642-7220
Kans Wichita, Thunderbird Sls. Co. 316-684-3941
La Kenner, D. Bellew Sls. Co. 504-443-3237
Mass Reading, C.E. Godfrey Co. 617-944-2230
Mich Warren, Dem Elctrn. Sls. 313-575-9444
Minn Minneapolis, Scott Elctrn. Sls. 612-929-2985
Mo St. Louis, Thunderbird Sls. 314-567-6488
NJ S. Orange, S. Simberkoff Sls. 201-763-7900
NC Winston-Salem, Murphy & Cota Co. 919-722-9445
Ohio Cleveland, Del Steffen & Assocs. 216-461-8333
Ohio Dayton, D. Steffen & Assocs. 513-293-3145
Pa Trevose, PSA Inc. 215-245-0513
Tex Dallas, RM Elctrns. 214-783-0552
Tex Houston, R. Matthews & Assoc. 713-664-7131
Wash Bellevue, SD-R2 Prods. & Sls. 206-747-9424

STURDILITE ANGLE STEEL DIV., Kewanee Scientific Equip. Corp., Dept. EM, Plainwell, Mich. 49080, Tel: 616-685-5402; Empl.: 140

Sales Manager: L. Draves

SUMMIT ENGINEERING CORP., Dept. EM, Box 938, Bozeman, Mont. 59715, Tel: 406-587-4511, TWX: 910-975-1950; Empl.: 230

Sales Manager: J. W. Drain

Local Sales Offices & Reps.
Cal Carson, Hasbach 213-636-0808
Cal Mountain View, George Shukov 408-736-5210
Cal San Carlos, S K Sys 415-592-1648
Colo Arvada, Figaro Klebba Assocs 303-424-0108
Conn Norwalk, Mach Drives & Controls 203-846-2007
Ga Atlanta 404-255-8900
Ill Downers Grove 312-852-6060
Ill La Grange, Trend Mach 312-482-3637
Ind Indianapolis, Joachim & Jones Mach 317-788-1501
Kans Kansas City, John Downie 816-436-5085
Mass Auburn 617-757-0010
Mass Needham, Tom McMurtrie 617-449-3632
Mich Grosse Pointe Park, MCU 313-882-8461
Mich Warren 313-758-5000
Minn New Brighton, Dan McClain 612-636-6377
NJ Fairfield, Suburban Tool & Mach 201-575-0660
NY Jamestown, Web Machinery 716-488-1935
NC Charlotte, Deaderick & Royster 704-332-7774
Ohio Cleveland, Dave Heidenreich 216-524-3971
Ohio Columbus, Indl Machinery Co. 614-224-3534
Ohio Perrysburg, Maumee Valley 419-874-3164
Pa Scranton, Wesel Mfr Co 717-344-7177
Pa West Chester 215-692-8040
Tex Arlington 817-469-7444
Utah Salt Lake City, Neway 801-363-8171
Va Salem, Shenandoah 703-389-8141
Wash Seattle, Perine 206-762-0580

SUNBANK ELCTRNS., INC., Dept. EM, 3110 Winona, Box 6669, Burbank, Cal. 91505, Tel: 213-849-1191, TWX: 910-498-2251; FSC No.: 07418; Empl.: 99

Sales Manager: C.E. Kirk

Local Sales Offices & Reps.
Ala Huntsville, Technology Mktg. Assoc. 205-883-7893
Ariz Phoenix, Zeus, Inc. 602-253-6104
Cal Burbank, Sunbank Elctrns. 213-849-1191
Cal Chatsworth, Elcon Elctrns. 213-882-6760
Cal Los Altos, Elliott Recht Assoc. 415-941-0336
Colo Englewood, Component Prods Sls Co 303-442-1100
Conn Wethersfield, Underwood Sls. 203-563-3046
Fla Orlando, Technology Mktg. Assoc. 305-857-3760
Fla Pompano Bch., Technology Mktg. Assoc. 205-942-0774
Kans Leawood, Thunderbird Tech. Sls. & Serv. 913-642-7220
Kans Wichita, Thunderbird Tech. Sls. & Serv. 316-684-3941
Md Ellicott City, Mktg Technology 301-465-5944
Mass Chelmsford, Underwood Sls. 617-256-8191
Mich Warren, Luebbe Sls. 313-574-2230
Minn Bloomington, Marsh Sls. 612-888-0540
Mo St. Louis, Thunderbird Tech. Sls. 314-567-6488
NJ Haddonfield, Mills-Brown Assoc. 609-429-1005
NJ Pompton Plains, T.A. Adamo Sls. 201-835-5344
NM Albuquerque, Zeus, Inc. 503-256-9831
NY East Syracuse, Fountain, Young & Co. 315-437-7733
NY Kingspark, T.A. Adamo Sls 516-724-2039
Ohio Cincinnati, Luebbe Sls. 513-871-4211
Ohio Cleveland, Luebbe Sls. 216-333-0425
Ohio Columbus, Luebbe Sls. 614-475-5504
Ohio Dayton, Luebbe Sls. 513-294-0426
Tex Dallas, E.F. Aymond Co. 214-826-7620
Wash Bellevue, Comtec Mktg. & Sls. Eng. 206-453-1188

SUNDSTRAND DATA CONTROL, Dept. EM, Overlake Ind'l. Pk., Redmond, Wash. 98052, Tel: 206-885-3711, TWX: 910-449-2860; Empl.: 1140

Local Sales Offices & Reps.
Ala Huntsville, I.S.I. 205-533-6880
Cal Los Angeles, Sundstrand Svc. Corp. 213-670-0231
Cal Los Angeles, O. Miller Assoc. 213-937-1300
Cal Palo Alto, Egbert Engineering 415-326-1387
Cal San Marino, Dale-Dahl Assocs. 213-682-3417
Cal Walnut Creek, Dale-Dahl Associates 415-933-9595
Colo Denver, Shefler-Kahn Co. 303-761-2540
Conn Glastonbury, Sundstrand Svc. Corp. 203-633-4810
DC Washington, Sundstrand Svc. Corp. 202-965-4650
Fla Longwood, Southern Data Assoc. 305-831-3311
Fla St. Petersburg, Russell Assoc. 813-525-3941
Ga Atlanta, Russell Assoc. 404-255-8422
Ill Chicago, Pivan Engrg. 312-539-4838
Ill Rockford, Russell Assoc. 815-964-5463
Ind Indianapolis, Pivan Engrg. 317-253-1681
Kans Shawnee Mission, Pivan Engrg. 913-722-1030
Md Wheaton, Sales Technology Inc. 301-622-3700
Mass Needham, Addelco Corp. 617-444-4754
Mass Waltham, Russell Assoc. 617-899-6500
Mich Detroit, Comtel-Sterling Co. 313-255-1970
Mich St. Clair, Russell Assoc. 313-329-9081
Minn Minneapolis, Pivan Engrg. 612-537-4501
Mo St. Louis, Pivan Engrg. 314-567-3636
NJ Bogota, Neville & Vespo Corp. 201-487-1505
NJ Fair Haven, Russell Assoc. 201-747-0600
NM Albuquerque, Shefler-Kahn Co. 505-296-0749
NY Bay Shore, Russell Assoc. 516-666-6500
NY Jamaica, Sundstrand Svc. Corp. 212-656-8606
NY Williamsville, M. Bennett Assoc. 716-634-2107
Ohio Cincinnati, Russell Assoc. 513-771-5391
Ohio Cleveland, Comtel-Sterling Co. 216-442-8080
Ohio Dayton, Comtel-Sterling Co. 513-298-7573
Ohio Dayton, Sundstrand Svc. Corp. 513-258-0141
Pa Pittsburgh, Comtel-Sterling Co. 412-922-5720
Pa Radnor, Roberts Eng. Sls. Co. 215-688-6525
Tex Arlington, Sundstrand Svc. Corp. 817-640-1834
Tex Houston, C.M. Asfahl Agency 713-526-9669
Utah Salt Lake City, Shefler-Kahn Co. 801-484-4222
Wash Bellevue, Sundstrand Svc. Corp. 206-453-1393
Wisc Brookfield, Pivan Engrg. 414-786-1940

SUNSHINE SCI. INSTRS., INC., Dept. EM, 1810 Grant Ave., Philadelphia, Pa. 19115, Tel: 215-OR 3-5600; Empl.: 30

Local Sales Offices & Reps.
Cal LaMirada, P. H. DuBois 714-521-1481
Md Elkridge, Sunshine Scientific 301-796-5600

SUPEREX ELECTRONICS CORP., Dept. EM, 151 Ludlow St., Yonkers, N.Y. 10705, Tel: 914-965-6906-8, Telex: 13-1584; Empl.: 112

Sales Manager: M. Solomon, Mktg

Superior Cable Corp. Dept. EM, Box 489, Hickory, N.C. 28601, Tel: 704-328-2171, Telex: 800-510, TWX: 510-934-1204; Empl.: 600

Sales Manager: J. English

Local Sales Offices & Reps.
Cal Menlo Park, R. Westwood 415-349-3003
Ga Atlanta, K. Powley 404-424-6898
Ill Naperville, T. Lyons 312-420-8220
Mo Grandview, R. Wohlberg 816-761-9800
NC Hickory, N.C. Cox 704-328-1682
Pa Hershey, B. Butterworth 717-249-4867
Tenn Gallatin, E. Huffman 615-452-7299
Tex Dallas, B. Pitts 214-328-0343
Wash Enumclaw, P. Armentrout 206-852-5365

SUPERIOR CARBON PRODS., INC., Dept. EM, 9115 George Ave., Cleveland, Ohio 44105, Tel: 216-883-4880; Empl.: 120

Local Sales Offices & Reps.
Cal Tustin, Sierra-Pacific Engrg. 714-731-3411
Conn Stamford, Engineered Comps. 203-329-0500
Ill Chicago, K-W Assocs 312-792-2618
Ohio W. Unity, Superior Carbon Prods. 419-924-2121
Pa Pittsburgh, Superior Carbon Prods. 412-766-1466
Tex Dallas, Ryco Engrg. 214-368-0135
Tex Houston, Ryco Engrg. 713-467-6655

SUPERIOR ELECTRIC CO., Dept. EM, 1000 Middle St., Bristol, Conn. 06010, Tel: 203-582-9561, TWX: 962-446, 710-454-0682; FSC No.: 58474; Empl.: 1000 p. 2159,3110,3111,3401,4412,4413

Sales Manager: H. W. Lorenson; *Distributor Manager:* A. Nicholson

Local Sales Offices & Reps.
Cal Redwood City, Superior Elec. 415-369-8203
Cal Woodland Hills, Superior Elec. 213-999-2150
Colo Denver, W. J. Purdy Co. 303-777-1411
Fla Maitland, Hutto, Hawkins, Peregoy, Inc. 305-831-2474
Ill Glen Ellyn, Superior Elec. 312-858-2960
Ind Indianapolis, Mktg. Engrs. 317-546-1523
Kans Overland Park, T.L. Dowell & Assocs. 913-648-7373
Md College Park, Superior Elec. 301-277-3235
Mass Wellesley Hills, Superior Elec. 617-237-0750
Mich Detroit, Superior Elec. 313-967-1011
NY E. Rochester, Superior Elec. 716-381-9210
NY Tarrytown, Superior Elec. 914-631-8600
NC Charlotte, Superior Elec. 704-535-5846
Ohio Medina, Superior Elec. 216-725-8887
Pa Blue Bell, Superior Electric 215-248-5770
Tex Dallas, Superior Elec. 214-350-1368
Wash Seattle, J.J. Backer Co. 206-285-1300

SUPERIOR FLUX & MFG. CO., Dept. EM, 95 Alpha Park, Cleveland, Oh 44143, Tel: 216-461-3315; Empl.: 9

Local Distributors
Ariz Phoenix, Scottsdale Tool 602-273-7376

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Cal Irvine, C. Michael, Inc. 714-556-6414
Cal San Diego, C. Michael, Inc. 714-278-2102
Cal Santa Clara, Com-Kyl, Inc. 408-249-6220
Cal Sunnyvale, C. Michael, Inc. 408-739-8720
Colo Arvada, C. Michael, Inc. 303-423-9670
Fla Palm Beach Gardens, C. Michael, Inc. 305-523-6464
Ill Des Plaines, C. Michael, Inc. 312-298-0440
Mass Newton Highlands, C. Michael, Inc. 617-965-5310
Minn Edina, C. Michael, Inc. 612-831-7997
NY Farmingdale, C. Michael, Inc. 516-293-4141
Ohio Dayton, C. Michael, Inc. 513-898-1100
RI Providence, Technical Assocs. .. 401-331-9156
Tex Dallas, C. Michael, Inc. 214-233-7650
Wash Bellevue, C. Michael, Inc. 206-883-1084
For: England, Buckinghamshire, SL8 5SB, Nightingale Chemical Co., Ltd. 53 The Parade
For: Israel, Tel Aviv 65 172, A. Bidnei Ltd., 84 Allenby Rd.
For: Japan, Osaka Higashi-ku, Matsushita Electric Trading Co., Ltd.
For: West Germany, Alsterdorfer Strasse, Detakta 2 Hamburg 39

SUPERIOR MFG. & INSTRUMENT CORP., Dept. EM, 19-36 38th St., Long Island City, N.Y. 11105, Tel: 212-932-1800, TWX: 710-582-2626; Empl.: 80

Sales Manager: T. Grieco

Local Sales Offices & Reps.
Cal Los Altos, W. Selbach 415-964-1325
Cal Manhattan Beach, R. Johnson.... 213-545-4649
NH Rindge, A.T. Clarke 603-899-6662

SWEDA INT'L., OEM Prods., Dept. EM, 34 Maple Ave., Pine Brook, N.J. 07058, Tel: 201-575-8100; Empl.: 75

Local Sales Offices & Reps.
Cal Grenada Hills 213-363-7419
Mass Waltham 617-891-7545

SWITCHCRAFT, INC., Dept. EM, 5555 N. Elston, Chicago, Ill. 60630, Tel: 312-792-2700, TWX: 910-221-5199; FSC No.: 82389; Empl.: 1000

Local Sales Offices & Reps.
Ala Huntsville, Cartwright & Bean 205-533-3509
Ariz Phoenix, Howe & Howe 602-264-7971
Cal Los Angeles, Wiley Co. 213-663-8028
Cal San Carlos, D.H. Ross Co. 415-591-4411
Cal San Diego, Wiley Co. 514-571-2773
Colo Denver, G. Moss Elctrns. 303-455-7205
Fla Ft. Lauderdale, Cartwright & Bean 305-791-3989
Fla Orlando, Cartwright & Bean..... 305-422-4531
Ga Atlanta, Cartwright & Bean 404-255-5262
Haw Honolulu, Dougherty Entprs. 808-847-4144
Ill Chicago, B. Burns & Assocs..... 312-775-1233
Ind Indianapolis, Mktg. Engrs..... 317-546-1523
Iowa W. Des Moines, T.L. Dowell & Assocs. 515-225-1620
Kans Overland Pk., T.L. Dowell & Assocs. 913-648-7373
La Metarie, Cartwright & Bean 504-835-6220
Mass Boston, Anderson Sls. Assocs. .. 617-227-2980
Mich Detroit, R.C. Merchant & Co..... 313-535-6000
Mich St. Joseph, R. C. Merchant Co. 616-983-7378
Minn Edina, M. Foster Tech. Sls. Inc. 612-835-2252
Miss Jackson, Cartwright & Bean 601-981-1368
Mo St. Louis, T.L. Dowell & Assocs. 314-968-4234
NJ Cherry Hill, Trinkle Sls..... 609-795-4200
NJ No. Caldwell, Masin-Esco, Inc. .. 201-226-2550
NM Albuquerque, G. Moss Elctrns., Inc. 505-256-3622
NY Syosset, Masin-Esco Inc. 516-364-0310
NY Syracuse, Mar-Com Assocs. 315-437-2843
NC Charlotte, Cartwright & Bean..... 704-377-5673
NC Raleigh, Cartwright & Bean 919-781-6560
Ohio Richfield, Bear Mktg. 216-659-3131
Okla Tulsa, J.Y. Schoonmaker Co. 918-963-1423
Tenn Knoxville, Cartwright & Bean..... 615-693-7450
Tenn Memphis, Cartwright & Bean..... 901-276-4442
Tex Dallas, J.Y. Schoonmaker 214-349-1650
Tex Houston, J.Y. Schoonmaker Co. 713-926-9510
Wash Bellevue, Comtec 206-453-1188

SWS SILICONES CORP., Dept. EM, Box 428, Adrian, Mich. 49221, Tel: 517-263-5711, TWX: 510-450-2606; Empl.: 500

Local Sales Offices & Reps.
Cal Los Angeles 213-385-5341
Cal San Francisco 415-544-9645
Ill Chicago 312-454-5760
NJ Edison 201-572-4451

SYNTHANE TAYLOR CORP., An Alco Standard Corporate Partner, Dept. EM, Box 835, Valley Forge, Pa. 19482, Tel: 215-666-0300, Telex: 846-323; Empl.: 1000

Local Sales Offices & Reps.
Cal LaVerne 714-593-1341
Cal Los Angeles 213-966-7461
Cal San Francisco 415-591-8929
Conn Avon 203-678-0385
Ga Atlanta 404-237-0416
Ill Arlington Heights 312-437-8660
Ill Chicago 312-569-2838
Ind Indianapolis 317-923-2102
Md Baltimore 301-828-9365
Mass Boston 617-969-5945
Mich Detroit 313-646-8868
Minn Minneapolis 612-888-5207
Mo Kansas City 913-432-3355
Mo St. Louis 314-721-1300
NJ Newark 201-447-4597
NY Binghamton 607-722-7850
NY Northport 516-757-7171
NY Rochester 716-586-0413
Ohio Cleveland 216-371-3775
Ohio Dayton 513-293-3357
Pa Pittsburgh 412-391-7230
Tenn Knoxville 615-525-1991
Tex Dallas 214-231-9939
Va Richmond 804-358-3465
Wisc Milwaukee 414-962-0890

SYNTRONIC INSTRUMENTS INC., Dept. EM, 100 Industrial Rd., Addison, Ill. 60101, Tel: 312-543-6444, TWX: 910-651-2191; Empl.: 160 ..... p. 1362,1363

Local Sales Offices & Reps.
Cal Los Altos, Frauman Assocs. 415-941-0660
Cal Pasadena, A-F Sls. Eng. 213-681-5631
Colo Wheatridge, Waugaman Assocs. 303-423-1020
Conn New Canaan, Stan Pierce Inc..... 203-966-4630
Fla Pompano Beach, Saber Assoc... 305-943-3076
Mass Norwood, S. Pierce, Inc. 617-762-3164
Minn Minneapolis, Torkelson Assocs. 612-835-2414
Mo St. Louis, Ensco-Rep. 314-567-3935
NJ Fairlawn, G.D. Harris Assocs. 201-796-5200
NM Albuquerque, Waugaman Assoc. 505-294-1436
Pa Flourtown, Eastern Comps. 215-836-1616
Tex Irving, Space Elctrns. 214-251-3636
Utah Salt Lake City, Waugaman Assocs. 801-363-0275
Va Herndou, Eastern Comps. 703-471-1025
Exp: N.J., Teaneck, S. Ginsbury Ltd... 201-837-1100

SYRACUSE ELCTRNS. CORP., Dept. EM, Box 566, Syracuse, N.Y. 13201, Tel: 315-488-4911; Empl.: 120

Local Sales Offices & Reps.
Cal San Rafael, Wells Assocs. 415-454-5730
Cal Sherman Oaks, Gee Assocs. 213-788-5961
Conn Glastonburry, Barton-Caron Assocs. 203-633-9417
Fla Orlando, Publicover Assocs. 305-898-9361
Ill Mount Prospect, Automation Equip. Co. Inc. 312-398-7550
Ind Indianapolis, Southern Sls. 317-299-2992
Kans Shawnee Mission, Lowell-Kangas & Assocs. 913-631-3515
Mass Auburndale, Barton-Caron Assocs. 617-332-2021
Mich Dearborn, Pitcher-Poulin 313-582-5450
Minn Minneapolis, K. C. Brooks 612-544-3179
Mo St Louis, Lowell-Kangas & Assocs. 314-821-4051
NY Baldwinsville, Scibetta Reps. 315-622-3993
NY Bogota, Neville & Vespo..... 201-487-1505
NC Pine Lake, Hilco Inc. 404-469-8638
Ohio Cleveland, D. Steffen & Assocs. 216-461-8333
Ore Portland, Huggins & Assocs. 505-287-2203
Pa Philadelphia, K. B. Erdman Co. .. 215-224-1833
Tenn Memphis, R. Jordan Assocs. 901-452-7441
Exp: Can, Toronto, Ont., Renfrew Electric 416-461-3511

SYSCON INT'L., INC., Dept. EM, 1239 South Bend Ave., So. Bend, Ind. 46617, Tel: 219-287-5916, Telex: 258-8325; Empl.: 20

Sales Manager: T.W. Eaglesham

SYS-TEC INC., Dept. EM, 877 Third St. S.W., New Brighton, Minn. 55112, Tel: 612-636-6373; Empl.: 20

Local Sales Offices & Reps.
Ala Huntsville, Technical Sls. 205-881-1750

SYSTEMS DATA INC., Dept. EM, 1941 W. Market St., Akron, Ohio 44313, Tel: 216-867-2197; Empl.: 12

Local Sales Offices & Reps.
Mich Detroit, W-K-M Assocs. 313-892-2500
Ohio Cleveland, W-K-M Assocs..... 216-267-0445
Ohio Dayton, W-K-M Assocs. 513-434-7500
Pa Pittsburgh, W-K-M Assocs..... 412-892-2953

SYSTEMS INSTRS. RESEARCH, See S.I.R. Atlanta, Inc

SYSTEMS RESEARCH LABS. INC., Dept. EM, 2800 Indian Ripple Rd. , Dayton, Ohio 45440, Tel: 513-426-6000, TWX: 810-450-2621; FSC No.: 513-426-1984; Empl.: 825

Local Sales Offices & Reps.
Cal Reseda, Sys Research Labs 213-996-5242
Fla Ft. Walton Beach, WNG Assocs 904-243-1775
Va Arlington, DDC Inc. 703-892-2231
Va Newport News, Rasa Div 804-595-8847

SYSTEMS INTEGRATION ASSOC., Dept. EM, RD #1 Box 126, Glenmoor, Pa. 19343, Tel: 215-286-5136; Empl.: 6

Sales Manager: F. Rehhausser; *Distributor Manager:* F. Rehhausser

Local Sales Offices & Reps.
Cal Redwood City, Product Assoc. .. 415-368-0640
Md Wheaton, Data Systems Mktg.... 301-933-0900

SYSTEMS SOLVERS, Dept. EM, Box 873, Lake Elmo, Minn. 55042, Tel: 612-439-0022

Local Sales Offices & Reps.
Minn Edina, Comtel/Pivan Engrg 612-835-3060
Pa Spinnerstown, Nicholas A. Bazil 215-538-0767

SYSTONICS, INC., Dept. EM, Box 121, Winchester, Mass. 01890, Tel: 617-729-4439; Empl.: 3

SYSTRON-DONNER CORP., Dept. EM, 10 Systron Dr., Concord, Cal. 94518, Tel: 415-676-5000, TWX: 910-481-9472; FSC No.: 52542; Empl.: 1400 p. 3340,3371

Local Sales Offices & Reps.
Ala Huntsville, Scientific Devices 205-536-1969
Cal Los Alamitos, Scientific Devices 213-598-7678
Cal Mountain View, Scientific Devices 415-964-4230
Cal San Diego, Scientific Devices 714-279-6642
Colo Boulder, Scientific Devices..... 303-449-9466
Conn Mount Carmel, Scientific Devices 203-248-9361
Fla Orlando, Scientific Devices 305-841-8180
Haw Honolulu, Aloha Assoc. 808-941-1574
Ill Bloomingdale, Scientific Devices 312-894-5470
Ind Indianapolis, Scientific Devices .. 314-783-2111
Kans Shawnee Mission, Scientific Devices 913-362-8700
Md Timonium, Scientific Devices 301-252-8851
Mass Waltham, Scientific Devices..... 617-890-2252
Mich Milford, Scientific Devices..... 313-685-8912
Minn Minneapolis, Scientific Devices .. 612-944-3515
Mo St. Louis, Scientific Devices..... 314-842-2535
NJ Englewood, Scientific Devices 201-871-3916
NM Albuquerque, Scientific Devices 505-293-3494
NY Rochester, Scientific Devices..... 716-334-2445
NC Raleigh, Scientific Devices 919-872-7066
Ohio Dayton, Scientific Devices 513-298-9904
Ohio No. Olmstead, Scientific Devices 216-779-5155
Ore Portland, Scientific Devices 503-292-6934
Pa Plymouth Meeting, Scientific Devices 215-825-9515
Tex Houston, Scientific Devices 713-475-0328
Tex Richardson, Scientific Devices.... 214-231-8106
Tex San Antonio, Scientific Devices.. 512-736-3164
Va Springfield, Scientific Devices 703-451-6500
Va Virginia Beach, Scientific Devices 804-461-8133
Wash Bellevue, Scientific Devices 206-454-0900

SYSTRON-DONNER, Advanced Components Div., Dept. EM, 735 Palomar Ave., Sunnyvale, Cal. 94086, Tel: 408-735-9660, TWX: 910-339-9309; Empl.: 40

Refer to Systron-Donner Corp. for sales office information.

SYSTRON DONNER, Data Products Div., Dept. EM, 735 Detroit Ave., Concord, Cal. 94518, Tel: 415-798-9900, TWX: 910-481-5780; Empl.: 140

Refer to Systron-Donner Corp. for sales office information

SYSTRON-DONNER INSTR. DIV., Dept. EM, 10 Systron Dr., Concord, Cal. 94518, Tel: 415-676-5000, TWX: 910-481-9479; FSC No.: 52542; Empl.: 650

Refer to Systron-Donner Corp. for sales office information.

SYSTRON DONNER, CONCORD INSTRUMENT DIV., see Systron Donner Advanced Components

SYSTRON-DONNER MICROWAVE DIV., Dept. EM, 14844 Oxnard St., Van Nuys, Cal. 91409, Tel: 213-786-1760, TWX: 910-495-1786; Empl.: 350

Refer Systron-Donner Corp. for sales office information

SYT CORPORATION, Dept. EM, 1220 Barranca, El Paso, Tex. 79935, Tel: 915-593-1234; Empl.: 40

Sales Manager: L.P. Crum; *Distributor Manager:* L.P. Crum

Local Sales Offices & Reps.

Ariz	Phoenix, J.R. Morgan Agcy	602-252-3089
Cal	Harbor City, Jensen Mktg	213-325-9092
Cal	Los Altos, W.W. Posey Co.	415-948-7771
Fla	Sarasota, Enjay Assocs.	813-958-9533
Ga	Marietta, Guyer & Assocs	404-971-2831
Haw	Honolulu, Larry A. Blakely Co.	
Md	Fulton, S.A. Jeffries, Inc.	301-792-7452
Minn	St. Paul, Skor	612-645-6461
Ohio	Cincinnati, Cartwright Comm	513-984-4220
Pa	Narberth, S.A. Jeffries, Inc.	215-664-8500
Tex	Dallas, El Wilco	214-242-5321
Exp:	Chicago, Magnus Overseas Corp	312-334-1502
Exp:	Miami, West Indies Sls	305-592-8188
Exp:	Westbury, Minthorne Intl Co.	516-334-3303

T&B/ANSLEY CORP., Sub. Thomas & Betts, Dept. EM, 3208 Humboldt St., Los Angeles, Cal. 90031, Tel: 213-223-2331, TWX: 68-6109 910-321-3938; Empl.: 250

Distributor Manager: B. Farnum

Local Sales Offices & Reps.

Ariz	Phoenix, Stitzer-Dodd	602-944-2237
Cal	Los Angeles, T&B/Ansley	213-223-2331
Cal	San Jose, T&B/Ansley	408-267-2434
Colo	Littleton, Simpson Assoc.	303-794-8381
Conn	Madison, Femco Sls.	203-245-1505
Conn	New Milford, T&B/Ansley	203-355-0000
Fla	Ft. Lauderdale, T&B/Ansley	305-772-3279
Ill	Woodridge, T&B/Ansley	312-697-5340
Ind	Indianapolis, Technical Reps.	317-849-6454
Iowa	Cedar Rapids, PMA Inc.	319-362-9177
Kans	Overland Park, PMA Inc.	913-381-0004
Kans	Wichita, PMA Inc.	316-264-2662
Md	Bowie, T&B/Ansley	301-249-5245
Mich	Southfield, Representative Elctrn. Prods.	313-559-1080
Minn	Bloomington, T&B/Ansley	612-881-2721
Mo	Maryland Heights, PMA Inc.	314-569-1220
NH	Merrimack, T&B/Ansley	617-326-8411
NJ	Avenel, T&B/Ansley	201-549-3434
NY	Selden, T&B/Ansley	516-473-8128
NY	Shortsville, T&B/Ansley	716-289-3400
NC	Raleigh, Wolff's Elctrn Sls.	919-851-2800
Ohio	Columbus, T&B/Ansley	614-890-3414
Ore	Beaverton, Vantage Corp.	503-646-3466
Pa	Washington, T&B/Ansley	201-689-4930
Utah	Salt Lake City, Simpson Assoc.	801-486-3731
Wash	Bellevue, Vantage Corp.	206-455-3460

T & B/THOMAS & BETTS, Dept. EM, 36 Butler St., Elizabeth, N.J. 07207, Tel: 201-354-4321, Telex: 13-8236; FSC No.: 59730; Empl.: 2000

Sales Manager: N.R. DeWeese, VP Sls.

Local Sales Offices & Reps.

Cal	Carson	213-770-4670
Cal	Santa Clara	408-243-9883
Colo	Aurora	303-344-5585
Ga	Atlanta	404-355-6260
Ill	Bloomingdale	312-894-2010
Mass	Braintree	617-843-0373
Mich	Detroit	303-682-2711
Minn	Minneapolis	612-333-2419
Mo	Hazelwood	314-731-3338
NJ	Moorestown	609-234-0505
NJ	So. Plainfield	201-561-4700
NY	Chittenango	315-687-7213
NC	Charlotte	704-568-6868
Ohio	Cincinnati	513-271-6686
Tex	Houston	713-461-0610

T-BAR INC., Dept. EM, 141 Danbury Rd., Wilton, Conn. 06897, Tel: 203-762-8351, TWX: 710-479-3216; Empl.: 167 ..... p. 3611,4259

Local Sales Offices & Reps.

Ala	Huntsville, REMCO	205-883-9260
Ala	Huntsville, REMCO	205-883-9260
Ariz	Tempe, J. F. Hurlbut Co.	602-968-5962
Cal	Palo Alto, Engineering Assocs.	415-494-7842
Cal	San Gabriel, Van Gott & Assocs.	213-285-2148
Colo	Golden, J. F. Hurlbut Co.	303-279-7796
Conn	Madison, A & M Electronic Reps.	203-421-4242
Fla	St. Petersburg, Tech. Rep. Assocs.	813-577-2779
Ill	Skokie, Saffro & Assocs.	312-588-0905
Ind	Fort Wayne, McDonald Sales Co.	219-747-3650
Ind	Indianapolis, McDonald Sls. Co.	317-359-0200
Kans	Shawnee, Lowell-Kangas and Assocs.	913-631-3515
Md	Silver Spring, Carwithen Assocs.	301-589-9040
Mass	Needham, A & M Electronic Reps Inc.	617-444-8170
Minn	Minneapolis, C. E. Bohlig Co.	612-922-7011
Mo	St. Louis, Lowell-Kangas & Assocs.	314-821-4050
NJ	Fort Lee, Tecnimat	201-461-8686
NY	Clark Mills, KLM Assoc.	315-853-6126
NY	N. Syracuse, KLM Assocs.	315-458-6214
NY	Rochester, KLM Assocs.	716-442-0820
Ohio	Aurora, EMA, Inc.	216-562-6104
Ohio	Centerville, EMA Inc.	513-433-2800
Tenn	Jackson, REMCO	901-424-0142
Tex	Dallas, McCoy Assocs. Co.	214-350-9931
Tex	Houston, Unidyne	713-772-3170
Wash	Seattle, D. Smith Sls. Co.	206-633-3160

Local Distributors

Cal	Chatsworth, Rampart div. Jaco Elctns.	213-998-2200
Ill	Chicago, Newark Elctrns.	312-638-4411
La	Shreveport, Industrial Elctrn. Supply	318-9459
Mass	Boston, Sager Electrical Supply Co.	617-542-2281
Tex	Ft. Worth, Allied Elctrns.	817-336-5401
Tex	Stafford, Southwest Elctrns.	713-494-6021

T-F ELECTRONICS INC., Dept. EM, 9415 Neils Thompson Dr., Austin, Tex. 78759, Tel: 512-836-7323; FSC No.: 50307; Empl.: 13

T-M VACUUM PRODS., Dept. EM, Warrington & Rowland, Riverton, N.J. 08077, Tel: 609-829-2000; Empl.: 30

Sales Manager: H. O. Walp, Jr.

Local Sales Offices & Reps.

Pa	Fort Washington, Gordon Seiter Assoc.	215-542-1717

TA INSTRUMENT CASE CO., Dept. EM, 4625 Alger St., Los Angeles, Cal 90039, Tel: 213-242-8855, TWX: 910-497-4780; Empl.: 40

Local Sales Offices & Reps.

Ariz	Phoenix, Tri-Fab Sls.	602-265-3341
Cal	Los Angeles, TA Instr. Case Co.	213-242-8855
Cal	San Diego, Wm. Gibson	714-223-6120
Colo	Denver, Omega Ltd.	303-758-1508
Conn	Sherman, R. P. Mahan Co.	617-237-1040
Ga	Atlanta, Southern Comps.	404-921-6929
Md	Rockville, L. G. White & Co.	301-770-6556
NJ	King of Prussia, White-Keystone Inc.	215-265-1817
NJ	Wayne, GT Assocs.	201-694-6040
NY	Syracuse, I. A. Hotze Co.	315-479-6641
Ohio	Cincinnati, F.D. Borchelt	513-851-7586
Tex	Arlington, Bell Comp.	
Tex	Houston, C.R. Calvin Assoc.	
Utah	Salt Lake City, Omega, Ltd.	801-278-6920
Wash	Renton, D & D Sls.	206-226-4120

TAB BOOKS, Dept. EM, Monterey & Pinola Aves., Blue Ridge Summit, Pa. 17214, Tel: 717-794-2191

Sales Manager: B. Sites

TAIYO DENKI CO., LTD., Dept. EM, 225-3 7-cho Nakamachi, Ohtori, Sakai City, Japan 593, Tel: (SAKAI) 0723-62-8281, Telex: 5374-744; Empl.: 200

TALLY CORP., Dept. EM, 8301 S. 180th St., Kent, Wash. 98103, Tel: 206-251-5500, Telex: 32-0200; Empl.: 500

Sales Manager: H. Mader VP Mktg

Local Sales Offices & Reps.

Cal	Orinda, Tally Corp.	415-254-8350
Cal	Redondo Beach, Tally Corp.	213-378-0805
Cal	San Jose, Tally Corp.	408-247-0897
Fla	Miami, Tally Corp	305-665-5751
Ill	Oakbrook, Tally Corp	312-325-9788
Mass	Boston, Tally Corp.	617-272-8070
NY	Melville, Tally Corp.	516-694-8444
Tex	San Antonio, Tally Corp.	512-735-0614
Va	Reston, Tally Corp	703-471-1145
Wash	Kent, Tally Corp.	206-251-6730

TALK-A-PHONE CO., Dept. EM, 5013 No. Kedzie Ave., Chicago, Ill. 60625, Tel: 312-539-1100

TAPE-ATHON CORP., Dept. EM, 502 S. Isis Ave., Inglewood, Cal 90301, Tel: 213-776-6933; Empl.: 62

TAPECON, INC., Dept. EM, 475 River St., Rochester, N.Y. 14612, Tel: 716-621-8400; Empl.: 80

Sales Manager: J. Cucinelli

Local Sales Offices & Reps.

Cal	Anaheim, Advance Elec. Sls.	714-870-0300
Conn	W Hartford, Pettigrew Co	203-233-8533
Fla	Melbourne, Hanson Assoc.	305-727-7474
Ga	Atlanta, Prehler Inc.	404-451-4266
Ill	Chicago, Prehler Inc.	312-384-6100
Mass	W Newton, Pettigrew Co	617-969-5770
Minn	St. Paul, Prehler Inc.	612-776-1541
NJ	Princeton, Krone & Rubin	609-452-1500
NC	Greensboro, L. & D. Inc.	919-292-3201
Ohio	Cleveland, Prehler Inc.	216-267-2650
Va	Richmond, L. & D. Inc.	804-359-0125
Wash	Seattle, Advance Sls.	206-762-2262

TAPESWITCH CORP. AMER., Dept. EM, 100 Schmitt Blvd., Farmingdale, N.Y. 11735, Tel: 516-694-6312, Telex: 14-4611; Empl.: 100 .... p. 4257

TASKER SYSTEMS, Dept. EM, 20131 Sunburst St., Chatsworth, Cal. 91311, Tel: 213-341-3010, TWX: 910-494-1214; FSC No.: 09017; Empl.: 250

Local Sales Offices & Reps.

NJ	Red Bank, T. Schweers	201-747-5353
Va	Arlington, J. Seelinger	703-528-2231

TAUBER ELECTRONICS, Dept. EM, 3650 Clairemont Dr., Ste. 8, San Diego, Cal. 92117, Tel: 714-274-7242 ..... p. 3343

Local Sales Offices & Reps.

Ariz	Glendale, Tauber Assocs.	602-937-0550
Cal	Los Altos, Tauber Dreyer Corp.	415-948-2635
Cal	Northridge, Tauber Dreyer Corp.	213-993-0048

TAU-TRON INC., Dept. EM, 11 Esquire Rd., N. Billerica, Mass. 01862, Tel: 617-667-3874, TWX: 710-347-1570; Empl.: 65

Sales Manager: J. E. Hanley

Local Sales Offices & Reps.

Ariz	Tempe, J. F. Hurlbut Co.	602-968-5962
Cal	Pasadena, Beckrep Inc.	213-799-4634
Colo	Golden, J. F. Hurlbut Co.	303-279-7796
Fla	Largo, Synergetic Reps	813-596-5331
Ga	Atlanta, Magaro & Assocs	414-252-6609
Haw	Honolulu, Aloha Assocs.	808-941-1574
Md	Gaithersburg, Sls Technology	301-340-0015
Minn	Minneapolis, Waytek	612-884-2317
Ohio	Dayton, Ashby Assocs	513-252-5627
Ohio	Lyndhurst, Ashby Assocs	216-461-8026
Tex	Dallas, Bradenco Corp.	214-243-7261
Wash	Seattle, Rush S. Drake Assocs.	206-763-2755

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TAURUS CORP., Dept. EM, Academy Hill, Lambertville, N.J. 08530, Tel: 609-397-2390 .. p. 1667

Local Sales Offices & Reps.

Cal	Los Angeles, R. Sweet	213-477-4517
Cal	Pasadena, Sci. Sls.	213-793-1244

Fla Clearwater, Brennan Assoc. 813-446-5006
Ohio Wickliffe, W.J. Brauer 216-943-0601
Pa Pittsburgh, W.J. Brauer 412-921-3213

TAYLOR ELECTRIC, INC., Dept. EM, 2410 Hwy 281 N., Marble Falls, Tex. 78654, Tel: 512-693-3522; Empl.: 30

Local Sales Offices & Reps.
Cal Mountain View, J. W. Wilhoit Co. 415-961-3660
Cal San Diego, John C. Henberger Co. 714-292-5772
Cal Woodland Hills, LaGorio Sls. Co. 213-348-9880
Colo Parker, Mikro Sls., Co. 303-841-4131
Conn Storrs, R.C. Campbell Co. 203-456-1212
Fla Coral Springs, Dineen – Assocs. 305-752-1646
Ga Atlanta, Powell-McLaughlin 404-875-0755
Ill Palatine, Bu-Nell Engrg. Co. 312-358-2300
Iowa Iowa City, R. L. Wildauer Co. 319-338-1338
Kans Overland Park, Arehart-Barnds Sls. 913-649-9270
La Harahan, MacKenroth-Robbins & Assoc. 504-733-7524
Mich Grand Rapids, John M. Perry Co. 616-949-0271
Mich Southfield, Holley, Schiller & McBride 313-356-1040
Minn Minneapolis, R.D. Schwen Engrg. Co. 612-553-1398
Mo St. Louis, Mfrs Rep 314-961-2787
NJ Paramus, Topinka Assocs 201-265-7305
NY Buffalo, A. C. Schultz Inc. 716-839-1010
NC Matthews, C. C. Niedringhaus Co. 704-847-9288
Ohio Cincinnati, Phillips Sls 513-791-3926
Ohio Cleveland, Matthew M. Haley & Sons 216-238-3650
Ore Portland, Syscom Engrg. Co. 503-644-2505
Pa Penndel, R. May Assocs. 215-757-1581
Pa Pittsburgh, Gormley Elec 412-371-4111
Tenn Memphis, R. T. Electrical Sls..... 901-452-4550
Tex Dallas, Andres & Boruch 214-821-3601
Tex Houston, T. D. McDaniel Co. 713-649-8606
Utah Salt Lake City, Darger Co. 801-355-2873
Va Richmond, J. H. Thrower Co. 804-794-6819
Wisc Wauwatosa, Babco, Inc. 414-778-0390

TAYLOR-WINFIELD CORP., Dept. EM, 1052 Mahoning Ave. NW, Warren, Ohio 44482, Tel: 216-399-8861, Telex: 098-2433; Empl.: 300

Local Sales Offices & Reps.
Cal Monrovia, Denton & Anderson Co. 213-359-9304
Colo Denver, Duboc-Lane & Monckton, Inc. 303-623-1261
Fla Jacksonville, Denton & Anderson Co. 904-721-1451
Ill Westchester, Denton & Anderson Co. 312-562-3903
Mich Birmingham, Denton & Anderson Co. 313-647-5520
Ohio Cleveland, Denton & Anderson Co. 216-831-2010
Pa Cornwell Heights, Denton & Anderson Co. 215-639-8390
Tex Garland, Denton & Anderson Co. 214-270-7635

T. C. CENTRONIC, Dept. EM, King Henry's Dr, Addington, Croydon CR9 0BG, Great Britain, Tel: U.K.-Lodge Hill 42121/U.S.A.-201-233-7200, TWX: U.K.-896474/USA-138275

Sales Manager: R. S. Mason; *Distributor Manager:* A. R. Green

Local Sales Offices & Reps.
Cal Cupertino, Dynetics Intl 408-257-7776
Cal Pasadena, A & F Sales Engrg ... 213-681-5631
Haw Honolulu, Aloha Assocs 808-941-1574
Ill Des Plaines, Coombs Assocs 312-298-4830
Ind Ft. Wayne, Fiat Engrg 219-482-2408
Kans Derby, Palatine North 316-788-0621
Mass Amesbury, ATM World Trade 603-394-7874
Minn Minneapolis, Intl Sls..... 612-831-8423
NJ Mountainside, Centronic Main Office 201-233-7200
NY Elbridge, L-Tron Corp. 315-689-3787
Pa Glenside, Wyncote Instrumentation 215-643-2440
Tex Richardson, Palatine South 214-231-9489
Wash Bellevue, SD-R³ 206-747-9424

T. D. J. CO., Div. Iveron Corp., Dept. EM, 1152 Morena Blvd., San Diego, Cal. 92110, Tel: 714-276-5920

Sales Manager: R. Scherr

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TEABERRY ELECTRONICS, Dept. EM, 6330 Castleplace Dr., Indianapolis, Ind. 46250, Tel: 317-842-0280, Telex: 27-2296; Empl.: 76

Sales Manager: C. Duke

Local Sales Offices & Reps.
Ind Indianapolis 317-842-0280

TEC, INC., Dept. EM, 2727 N. Fairview, Tuscon, Ariz. 85705, Tel: 602-792-2230, TWX: 910-952-1377; Empl.: 300

Sales Manager: W. Maguire; *Distributor Manager:* T. Pyle

Local Distributors
Cal Burlingame, Rose Elctrn Distrib Co. 415-348-2740
Cal Burlingame, Logan Elctrn Sls 415-697-6481
Cal Costa Mesa, Components Ctr.... 714-979-0433
Cal El Segundo, Zentron 213-772-2650
Cal San Diego, Mock III Sls Co..... 714-560-0515
Fla Oakland Park, Peerless Radio Corp 305-566-5966
Ga Norcross, AA Electric 404-449-8670
Ill Chicago, Electro-Tech Mktg Assoc. 312-588-4535
Mass Burlington, Heilind Elctrns..... 617-272-5610
Minn Minneapolis, Bergquist Co 612-835-2322
NH Hudson, Heilind Elctrns..... 603-883-9536
NY Mt. Vernon, ASAP Elctrn 914-699-2727
NY North Syracuse, ANDCO 315-699-2660
Ohio Piqua, DAY-CAP 513-773-4750
Ohio Solon, REH Elctrns 216-248-1636
Wisc Mequon, Lake-View Elctrns 414-377-8250
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TECCOR ELECTRONICS, INC., Dept. EM, 1101 Pamela Dr., Box 669, Euless, Tex. 76039, Tel: 817-267-2601, TWX: 910-890-5706; Empl.: 980

Sales Manager: J. Keffer; *Distributor Manager:* J. Dempsay

Local Sales Offices & Reps.
Ala Huntsville, Cartwright & Bean 205-533-3509
Ariz Tempe, Delta Elctrns 602-966-9903
Cal Mountain View, Thresum Assocs. 415-965-9180
Cal San Diego, Hadden Assocs. 714-565-9444
Cal Torrance, O'Donnell Assocs..... 213-328-9710
Colo Denver, W. J. Purdy Co..... 303-777-1411
Fla Ft. Lauderdale, Cartwright & Bean 305-791-3989
Fla Orlando, Cartwright & Bean..... 305-422-4531
Ga Atlanta, Cartwright & Bean 404-255-5262
Ill Elk Grove Village, John G. Twist Co. 312-593-0200
Ind Fort Wayne, R.O. Whitesell & Assocs. 219-432-5591
Ind Indianapolis, R.O. Whitesell & Assocs. 317-359-9283
Ind Kokomo, R.O. Whitesell & Assocs. 317-453-3592
Iowa Cedar Rapids, John G. Twist Co. 319-393-8703
Kans Prairie Village, J.G. Twist Co. ... 913-236-4646
Kans Wichita, J. G . Twist Co..... 316-686-6685
Ky Louisville, R.O. Whitesell & Assocs. 502-897-1569
La Metairie, Cartwright & Bean..... 504-834-2350
Md Baltimore, Component Sls 301-484-3647
Mass Walpole, KCA Comps. 617-668-6695
Mich Grand Rapids, R.O. Whitesell & Assocs. 616-942-5420
Mich Southfield, R.O. Whitesell & Assocs. 313-559-5454
Mich St. Joseph, R.O. Whitesell & Assocs. 616-983-7337
Minn Minneapolis, Elec. Comp. Sls. 612-933-2594
Miss Jackson, Cartwright & Bean 601-981-1368
Mo St. Louis, J. G. Twist Co. 314-432-2830
Neb Lincoln, J.G. Twist Co. 402-474-5151
NM Albuquerque, W.J. Purdy Co. 505-266-7959
NY Jamaica, S-J Assocs. 212-291-3232
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Ore Portland, Quadra Sls 503-225-0350
Pa Pittsburgh, R.O. Whitesell & Assocs. 412-344-7277
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Tenn Memphis, Cartwright & Bean..... 901-276-4442
Tex Houston, Oeler & Menelaides 713-772-0730
Tex Richardson, Oeler & Menelaides 214-234-6334
Wash Redmond, Quadra Sls 206-883-3550
Wisc Wauwatosa, J. G. Twist Co..... 414-475-7755

TECH-ETCH/BRAUN, Dept. EM, 45 Aldrin Rd., Plymouth, Mass. 02360, Tel: 617-747-0300; Empl.: 125

Sales Manager: R.H. Robecki

TECH LABS., INC., Dept. EM, Bergen & Edsall Blvds., Palisades Pk., N.J. 07650, Tel: 201-944-2221; Empl.: 65 ..... p. 4260,4261

Sales Manager: K.K. Garrison

Local Sales Offices & Reps.
Ariz Phoenix, Spectrum Assocs. 602-997-6324
Cal Palo Alto, Held & Mollard, Inc. .. 415-965-9321
Cal Sant Ana, Spectrum Assocs:..... 213-323-0603
Colo Englewood, Inverness Mktg. 303-770-2300
Conn New Preston, NBS Assoc. 203-868-0501
Ga Atlanta, Grady Duckett Sls. 404-451-3529
Ill Glenview, Crimson Engrg. Co..... 312-724-1780
Kans Shawnee Mission, Midtec Assocs 913-441-6565
Mich Jackson, N. Scroggs Co. 517-750-1170
Minn Minneapolis, Quantum Sls..... 612-831-8583
Mo Florissant, Midtec Assocs..... 314-837-5200
NJ Fort Lee, Bob Cameron, Inc. 201-461-2595
NJ Haddonfield, F.W. Churchill 609-429-7871
NY Dix Hills, L. K. Haner Assoc. 516-864-2220
NY Pittsford, Net Sls..... 716-467-4538
Ohio Cincinnati, A. C. Wahl & Assoc. 513-761-5500
Ohio Lyndhurst, A. C. Wahl & Assoc. 216-449-1788
Ore Portland, SPS Elctrns. 503-645-3769
Pa Pittsburgh, Waggoner-VerHill Assoc. 412-241-5202
Tex Dallas, Southwest Elctrns. 214-690-9881
Tex Houston, Southwest Elctrns. 713-729-1670

TECH MATERIALS INC., Dept. EM, 5 Wellington Rd., Lincoln, R.I. 02865, Tel: 401-333-1700, TWX: 710-384-0600; Empl.: 125

Sales Manager: C.B. Harlan

Local Sales Offices & Reps.
Cal Los Angeles, E. J. Brookes Co.
Cal Santa Clara, E. J. Brookes Co.
Ill Zion, A. O. Capp Co.
Ind Carmel, Larry Woodling Co. 317-844-7365
Ind Indianapolis, J. C. Butler Sls. & Engrg.
Mich Detroit, J. C. Butler Sls. 313-358-1410
Ohio Milford, J. C. Butler Sls. & Engrg.

TECH SERV., INC., BRS/LVE Div, Dept. EM, 5301 Holland Dr., Beltsville, Md 20705, Tel: 301-474-3400; Empl.: 110

Sales Manager: J.W. Webster

TECH SPRAY, INC., Dept. EM, Box 949, Amarillo, Tex. 79105, Tel: 806-372-8523; Empl.: 23

Sales Manager: R.G. Russell

Local Sales Offices & Reps.
Cal Burlingame, Ewing & Foley 415-941-4525
Cal Van Nuys, Obermann-Renner Sls. 213-997-1124
Colo Denver, Brake & Assocs. 303-433-8531
Fla Tampa, Wallace Assoc. 813-961-1037
Ill Chicago, B. Burns Assocs..... 312-775-1233
Ind Indianapolis, Electronic Reps. 317-897-9326
Mass Lynn, Keene Sls. 617-595-2300
Mich Milford, Polyphase Sls. 313-685-3003
Minn Minneapolis, R.C. Sls. 612-425-5543
Mo St. Louis, Kathrinus-Kelly & Co. 314-968-3800

NY N. Bellmore, L. W. Keller Assoc. 516-785-2826
NY Rochester, Leahy & Thompson.. 315-685-8122
Ohio Medina, T. Grant Assoc. 216-725-6528
Ore Seattle, Minthorne Company 503-246-4556
Pa Philadelphia, D. Linz Co. 215-379-0734
Tex Dallas, Crockett Sls. Co. 214-748-8209
Exp: New York, Roburn Agencies 212-989-5939

TECHCON SYSTEMS INC., Dept. EM, 16016 So. Figueroa St., Gardena, Cal 90248, Tel: 213-532-9601; Empl.: 25

Sales Manager: S.L. Morse

Local Sales Offices & Reps.
Ariz Tempe, West More Co. 602-994-1387
Cal Los Angeles, Chesleigh & Straley 213-687-6661
Cal Mt. View, K. R. Anderson Co. 415-961-6007
Colo Denver, WACO Elctrns.
Fla Ft. Lauderdale, Howard Assoc... 800-327-5553
Mass Danvers, Ashby Cross Co 617-777-0480
Mich Detroit, Cummisken & Assoc. 313-885-6635
Minn Minneapolis, MIT Co. 612-333-8281
NJ Cherry Hill, H. S. Bancroft Corp. 609-854-8000
NY Batavia, Adhesives Appl Systems 716-343-4333
Tex Grand Prairie, C. P. Waggoner Co. 214-264-1601
Wash Seattle, Atlas Packing & Rubber Co. 206-623-4697
Wisc Milwaukee, Ellsworth Co. 414-352-1230

TECHMAR CORP., Dept. EM, 2232 S. Cotner Ave., Los Angeles, Cal. 90064, Tel: 213-478-0046; Empl.: 9 p. 1049

TECHNI-TOOL

TECHNI-TOOL, INC., Total Spectrum, Tool Supplier, Dept. EM, Apollo Road, Plymouth Meeting, Pa. 19462, Tel: 215-825-4990, Telex: 834-763; Empl.: 20 p. 4297

Local Sales Offices & Reps.
Ariz Phoenix, Camel Elctrns. 602-959-5635
Colo Denver, Camel Electronics 303-757-6191
Fla St. Cloud, Hubersen 305-892-5313
Ill Mt. Prospect, Earl T. Champion & Assoc. 312-593-1150
Md Silver Spring, Eastern Instrumentation 301-622-4200
Mass Hudson, Data Rep 617-481-0333
NJ Belford, Wingate Assocs 201-787-3412
NY Hauppauge, Tool Technology 516-360-0510
NY Skaneateles, Skanatron 315-685-3745
NY Warwick, Wingate Assocs 914-986-2179
Ohio Cincinnati, Modern Industrial Sls. Co. 513-542-6969
Pa Drexal Hill, J. Mahoney 215-622-7970
Pa Philadelphia, WF Assoc. 215-CA4-4120
Wash Bellevue, Doland Co 206-454-4952

TECHNIC, INC., Dept. EM, Box 965, Providence, R.I. 02901, Tel: 401-781-6100, Telex: 927514; Empl.: 100

Sales Manager: A. A. Amtos

Local Sales Offices & Reps.
Cal Santa Ana, Technic, Inc. 714-547-8077
Ill Arlington Hgts., Technic, Inc. 312-262-2662
Tex Irving, Technic, Inc. 214-252-6595

TECH. DEVICES CO., Dept. EM, 11250 Playa Ct., Culver City, Calif. 90230, Tel: 213-870-3751; FSC No.: 04772; Empl.: 21

Sales Manager: J. Cochran; *Distributor Manager:* J. Cochran

Local Sales Offices & Reps.
Ark Little Rock, Carlton-Bates 501-562-9100
Cal Inglewood, Tracker, Inc. 213-645-6060
Cal Menlo Park, West Engrg. Sls. Co. 415-325-2885
Colo Denver, Todd-Associates, Inc. 303-744-2313
Fla Orlando, W. B. Wimberly Co. 305-GA5-3083
Fla Orlando, Buchanan & Abrams Assocs., Inc. 305-423-8995
Ill Chicago, F. Tye Sls. Co. 312-283-1227
Ind Indianapolis, Blind & Assocs., Inc. 317-251-1249
Md Phoenix, REBCO Sls. 301-592-8907
Mass Woburn, R. W. Hatfield Co. 617-933-2324
Mich Kentwood, The C.A. Geer Co. 616-534-7449
Minn St. Paul, Sales Service Machine Tool Co. 612-MI 6-8663
Mo Kansas City, Paloma Sls Co. 816-358-7272
NJ Belle Mead, Equipment Consultants 201-359-4100
NY Syracuse, J.V. Costello 315-472-0322
Ohio Cleveland, Electro Entprs., Inc. 216-261-7670
Pa Lansdowne, W. F. Satterthwaite & Co. 215-623-5100
Tex Houston, E D C Co. 713-692-8204
Tex Plano, E D C Co 214-424-0916
Wash Seattle, Process Sys. 206-246-0224

TECHNICAL MAT'L., Dept. EM, 700 Fenimore Rd., Mamaroneck, N.Y. 10543, Tel: 914-698-4800, TWX: 137-358, 710-566-1100; Empl.: 160

Sales Manager: N. H. DePasquale

Local Sales Offices & Reps.
Exp: N.Y., Mamaroneck, T.M.C. 914-698-4800

TECHNICAL RESEARCH & MFG., INC., Dept. EM, Kelly Ave. Grenier Field, R.F.D. #3, Manchester, N.H. 03103, Tel: 603-668-0120, TWX: 710-220-6765; Empl.: 25

Sales Manager: A. Marin

Local Sales Offices & Reps.
Cal Los Angeles, R F Assocs. 213-478-1586
Cal Palo Alto, R F Assocs. 415-494-3331
Fla Saber Assoc. 305-943-3076
Mass Needham Hgts., Reptron 617-449-4141
Va Fairfax, Schibley Assoc. 703-591-3008

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TECHNIPOWER
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TECHNIPOWER, INC., Dept. EM, Commerce Pk Box 222, Danbury, Ct 06810, Tel: 203-748-7001; FSC No.: 13850; Empl.: 120 p. 3344

Sales Manager: R. Iannoccone

Local Sales Offices & Reps.
Ariz Pasadena, Technipower 213-357-2356
Colo Denver, Electrodyne 303-759-4409
Conn Manchester, Victor Assocs. 203-646-6448
Ill Chicago, Allen Woods & Assoc. 312-283-7400
Iowa Davenport, Ensco-Rep 319-386-6600
Kans Overland Park, Ensco-Rep. 913-381-7557
Md Rockville, Farrell Assocs. 301-424-9460
Mass Southboro, Victor Assocs 617-481-4010
Mich Farmington Hills, W.R. Hummon & Assocs 313-474-0661
Minn Minneapolis, Electronic Innovators 612-884-7471
Mo St. Louis, Ensco-Rep, Inc. 314-567-3935
NJ Tenafly, ABC Elctrns Sls 201-568-2354
NM Albuquerque, Rontek 505-299-4124
NY North Tarrytown, ABC Elctrns Sls 914-631-2650
NY Williston Park, ABC Elctrns Sls.. 516-747-6610
Ohio Cleveland, Components Inc. 216-243-9200
Ohio Dayton, Components Inc. 513-866-0661
Ore Portland, Topp Engrg. Sls. 503-244-6265
Tex Houston, Scientific Sls. 713-666-5723
Tex Richardson, Scientific Sls. 214-231-6541
Utah Salt Lake City, Electrodyne 801-486-3801
Wash Bellevue, Topp Engrg. Sls. 206-747-5400
Wash Richland, Topp Engrg Sls. 509-783-7515
Exp: Can., Burlington, Ont., White Radio Ltd. 416-632-6894
Exp: Can., Montreal, Que., White Radio Ltd. 514-481-0158

TECHNITROL, INC., Dept. EM, 1952 E. Alleghany, Philadelphia, Pa. 19134, Tel: 215-426-9105, Telex: 834245; FSC No.: 90095; Empl.: 350 p. 2416,2417,4414,4415

Sales Manager: W.A. Chamberlin

Local Sales Offices & Reps.
Ariz Phoenix, Q. T. Wiles 602-971-6250
Cal San Clemente, J.H. Eichert 714-492-4525
Cal San Rafael, Wright Assocs. 415-457-9940
Colo Englewood, Dynatech 303-773-2830
Fla Orlando, G.F. Bohman Assocs. 305-855-0274
Ill Wauconda, Cudahy Sls. 312-526-2484
Mass Newton, Normell Assoc. 617-969-5478
Minn Minneapolis, Quantum Sls. 612-831-8583
NY Fairport, TAC Assoc. 716-377-1742
NY Jericho, J. Square Mktg. 516-997-6210
Ohio Fairborn, LP Assocs. 513-223-9975
Pa Easton, The Kendon Co. 215-253-3100
Pa Philadelphia, Technitrol 215-426-9105
Tex Dallas, Southern State Mktg. 214-387-2489
Tex Houston, Southern State Mktg. 713-665-0991

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TECHNO-COMPS. CORP., Dept. EM, 7803 Lemona, Van Nuys, Cal. 91405, Tel: 213-781-1642, TWX: 910-495-2015; FSC No.: 17826; Empl.: 100

Sales Manager: T. Hoerth

Local Sales Offices & Reps.
Ariz Tempe, Argus Sls. 602-967-8709
Cal Los Altos, Oak Inds. Inc. 415-941-1237
Cal Santa Ana, Oak Inds. Inc. 213-924-6288
Fla Orlando, Oak Inds. Inc. 305-671-4111
Ill Crystal Lake, Oak Inds. Inc. 815-459-5000
Kans Leawood, H.C. Heyde Co. 913-649-8628
Mass Reading, Oak Inds. Inc. 617-944-0094
Minn Minneapolis, C.R. Gibb Co. 612-377-1200
NJ Haddonfield, Mills-Brown Inc. 609-429-1005
NJ Wayne, R. Horne Assoc. 201-337-5200
NY No. Syracuse, Advanced Comps. 315-699-2671
NC Raleigh, Oak Inds. Inc. 919-876-7591
Ohio Cincinnati, Oak Inds. Inc. 513-851-4411
Ore Portland, Oak Industries 503-292-0878
Tex Ft. Worth, W. Fralia 817-640-9101
Exp: Colo., Denver, I. W. Strong 303-292-6900

Local Distributors
Cal Los Angeles, Radio Products Sls. 213-748-1271
NJ Wayne, Gordon/Horne 201-337-5200
NY N. Syracuse, ANDCO 315-699-2660
Ohio Centerville, I.P.D., Inc. 573-435-2086
Tex Arlington, Patco Supply 817-640-9101

TECHSONICS, Dept. EM, Box 251, El Prado, N.M. 87529, Tel: 505-758-4555; Empl.: 10

TECKNIT, Dept. EM, 129 E. Dermody St., Cranford, N.J. 07016, Tel: 201-272-5500, TWX: 710-996-5961; FSC No.: 07700; Empl.: 125

Sales Manager: Richard Lamp

Local Sales Offices & Reps.
Ariz Scottsdale, Williams Assocs., Inc. 602-947-4297
Cal Glendale, Gru Assoc. 213-845-8771
Colo Denver, Williams Assocs., Inc. 303-373-4730
Fla Maitland, Lawrence Assoc., Inc. 305-647-1188
Ga Chamblee, Holmes Assoc. 404-451-6161
Ill Arlington Height, Diethert/Angel 312-593-7600
Ind Fort Wayne, Scott Electronics, Inc. 219-743-1586
Ind Indianapolis, Scott Electronics, Inc. 317-897-9976
Md Pikesville, Bernard White & Co. 301-484-5400
Mich Farmington Hills, Lowell-Wendt Mktg. Co. 313-553-9800
Minn St. Paul, Heyda Co., Bonament 612-484-8531
Mo Kansas City, Harris-Hanson Co. 816-444-9494
Mo St. Louis, Harris-Hanson Co. 314-432-3611
NM Albuquerque, Williams Assocs., Inc. 505-255-1638
NY Guilderland, Electro-Modular Systems 518-456-2665
NY Rochester, J.G. Welch Assoc. 716-244-1100
Ohio Cleveland, Scott Electronics, Inc. 216-291-2600
Pa Pittsburgh, Scott Electronics, Inc. 412-828-1073
Wash Vancouver, Over Sales, Ray 800-526-5856

TECNETICS, INC., Dept. EM, Box 910,, Boulder, Colo. 80306, Tel: 303-442-3837, TWX: 910-940-3246; Empl.: 85 p. 3345

Sales Manager: V.L. Garrison

Local Sales Offices & Reps.

Ala	Huntsville, W.A. Brown Comps., Inc.	205-539-4411
Ariz	Scottsdale, C.T. Carlberg & Assocs.	602-277-2808
Cal	Inglewood, L & M Engrg. South	213-674-6850
Cal	San Jose, L & M Engrg., Inc.	408-292-3220
Colo	Denver, Electro-Rep	303-744-2821
Conn	New Canaan, S. Pierce, Inc.	203-966-4630
Fla	Coral Springs, W.A. Brown Comps., Inc.	305-753-1650
Fla	Orlando, W.A. Brown Comps., Inc.	305-851-5747
Ga	Chamblee, W.A. Brown Comps. Inc.	404-455-8732
Ill	Chicago, K.W. Meyers Co.	312-774-6440
Ind	Indianapolis, K.W. Meyers Co.	317-243-6681
Kans	Overland Park, Ensco-Rep, Inc.	913-381-7557
Md	Burtonville, Eastern Instrumentation Corp.	301-384-8500
Mass	Norwood, S. Pierce, Inc.	617-762-3164
Mich	Royal Oak, Satullo Co.	313-549-3910
Minn	Minneapolis, K.W. Meyers Co.	612-920-7080
Mo	St. Louis, Ensco-Rep, Inc.	314-567-3935
NJ	Carlstadt, Comp-Tech Sls	201-935-5454
NM	Albuquerque, C.T. Carlberg & Assocs.	505-265-1579
NY	Fayetteville, M.P. Andrews, Inc.	315-637-5291
NC	Raleigh, W.A. Brown Comps., Inc.	919-787-9069
Ohio	Cleveland, Satullo Co.	216-486-2800
Pa	Melrose Park, R. Meyers Assocs.	215-224-1663
Tenn	Knoxville, WA Brown Comps Inc	615-637-3523
Tex	Addison, R.R. Thomas Co.	214-233-8235
Wash	Seattle, SJI Corp	206-624-9020

TEK-WAVES, INC., See Frequency Elctrns.

TEKA PRODS. INC., Dept. EM, 15-04 130th St., College Point, N.Y. 11356, Tel: 212-939-3030, TWX: 710-582-4946; Empl.: 15

Sales Manager: B. Freifeld

Local Sales Offices & Reps.

Cal	Santa Ana, Mann Southwest	714-558-3202
Cal	Santa Clara, Mann Electronics	408-246-9393
Conn	Milford, Cuming Assoc	203-878-3946
Fla	Orlando, Bob Dean Inc.	305-851-2480
Ill	Palatine, M.J. Petersen & Assoc.	312-359-8200
Md	Churchville, Bob Dean Inc.	301-879-2236
Mass	Burlington, Contact Sls	617-273-1520
Minn	Eden Prairie, Fred Peterson Co.	612-941-5400
NY	Commack, PMR	516-543-8300
NY	Ithaca, Bob Dean Inc.	607-272-2187
NC	Raleigh, Bob Dean Inc	919-851-7841
Ohio	Dayton, Elcomp Mktg	513-434-8021
Tex	Dallas, Stasco	214-239-4517
Wash	Belleve, Mann North West	206-454-3859

TEKNEKRON/TRAX, See Trax Video Labs.

TEKTRONIX, INC., Dept. EM, Box 500, Beaverton, Ore. 97077, Tel: 503-644-0161, TWX: 910-467-8708; FSC No.: 80009; Empl.: 13,000

Sales Manager: L. Kasch

Local Sales Offices & Reps.

Ala	Huntsville	205-881-2912
Ariz	Phoenix	602-244-9795
Cal	Concord	415-254-5353
Cal	Irvine	714-556-8080
Cal	San Diego	714-292-7330
Cal	Santa Clara	408-249-5500
Cal	Woodland Hills	213-999-1711
Colo	Englewood	303-773-1611
Conn	Milford	203-877-1494
Fla	Fort Lauderdale	305-731-1220
Fla	Orlando	305-894-3911
Fla	Pensacola	904-476-1897
Ga	Atlanta	404-451-7241
Haw	Honolulu	808-847-1138
Ill	Rolling Meadows	312-259-7580
Ind	Indianapolis	317-545-2351
Kans	Overland Park	913-341-3344
La	New Orleans	504-837-8454
Md	Lutherville	301-321-7000
Md	Rockville	301-948-7151
Mass	Lexington	617-861-6800
Mich	Farmington Hills	313-478-5200
Minn	St. Paul	612-484-8571
Mo	Hazelwood	314-731-4696
NJ	Springfield	201-379-1670
NM	Albuquerque	505-265-5541
NY	Latham	518-785-3353
NY	North Syracuse	800-962-1095
NY	Poughkeepsie	914-454-7540
NY	Rochester	716-244-2600
NY	Woodbury	516-364-9060
NC	Raleigh	919-782-5624
Ohio	Cleveland	216-884-6558
Ohio	Dayton	513-859-3681
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Ore	Tigard	503-639-7691
Pa	Blue Bell	215-825-6400
Pa	Monroeville	412-373-3250
Tex	Dallas	214-233-7791
Tex	Houston	713-783-1910
Tex	San Antonio	512-434-4334
Utah	Salt Lake City	801-484-8501
Va	Hampton	804-826-4020
Wash	Seattle	206-575-0180

TEL LABS, INC., Dept. EM, 154 Harvey Rd., Londonderry, N.H. 03053, Tel: 603-625-8994, TWX: 710-220-1844; FSC No.: 94322; Empl.: 180 p. 3747-3751

Local Sales Offices & Reps.

Ala	Huntsville, Beacon Elctrn. Sls.	205-881-5031
Ariz	Phoenix, MR Engrg. Sls. Co.	602-956-4670
Cal	Palto Alto, Engineering Assocs	415-494-7842
Cal	San Gabriel, Van Gott & Assocs	213-285-2148
Fla	Ft. Lauderdale, Beacon Elctrn. Assocs.	305-971-7320
Fla	Ft. Walton Beach, Beacon Elctrn Assocs	904-244-1550
Fla	Maitland, Beacon Elctrn. Assocs.	305-647-3498
Ga	Atlanta, Beacon Elctrn. Assocs.	404-351-3654
Ill	Northfield, Feller Assocs.	312-446-8065
Mass	Wollaston, RFC Assocs.	617-472-4234
NJ	Clifton, Clarfield Assocs.	212-757-6454
NJ	Collingswood, K. Randall Co.	609-854-3323
NY	Bowmansville, Ossmann Comp. Sls. Corp.	716-681-9700
NY	Kingston, Ossmann Comp. Sls. Corp.	914-338-5505
NY	Rochester, Ossmann Comp. Sls. Corp.	716-442-3290
NY	Syracuse, Ossmann Comp. Sls. Corp.	315-454-4477
NY	Vestal, Ossmann Comp. Sls. Corp.	607-785-9949
NC	Greensboro, Beacon Elctrn. Sls.	919-275-9997
Ohio	Akron, Augnat Assocs	216-239-1621
Okla	Tulsa, Norcom, Inc.	918-663-1247
Pa	Pittsburgh, Augnat Assocs	412-281-8283
Tenn	Oak Ridge, Beacon Electrnic Assocs	615-482-2409
Tex	Dallas, Norcom, Inc.	214-233-0020
Tex	Houston, Norcom, Inc.	713-988-0022
Wash	Bellevue, Olson, Ferree & Assocs	206-454-1210

Local Distributors

Md	Baltimore, Radio Elect.	301-823-0070

TELAUTOGRAPH CORP., Dept. EM, 8700 Bellanca Ave., Los Angeles, Cal. 90045, Tel: 213-641-3690, TWX: 910-328-6117; Empl.: 300

Local Sales Offices & Reps.

Cal	Los Angeles	213-776-3556
Cal	San Francisco	415-467-3212
Ga	Atlanta	404-636-3194
Ill	Chicago	312-622-7111
La	New Orleans	504-282-4635
Mich	Detroit	313-564-5520
NJ	Clifton	201-772-2740
Tex	Houston	713-688-9505
Exp:	Cal., Los Angeles	213-641-3690

TELCO PRODUCTS CO., Dept. EM, 44 Sea Cliff, Glen Cove, NY 11542, Tel: 516-759-0300; Empl.: 34

Sales Manager: R. H. Tietjen; *Distributor Manager:* R. H. Tietjen

TELECOMMUNICATIONS TECHNIQUES CORP., Dept. EM, 112 Frederick Ave., Rockville, Md. 20850, Tel: 301-340-8443; Empl.: 18

Sales Manager: J.A. Sciulli

Local Sales Offices & Reps.

Cal	San Jose, Lencom Assocs.	408-684-0366
Cal	San Jose, Lencom Assocs.	408-684-0366
Conn	Fairfield, Higgins Inds.	203-259-2113
Conn	Fairfield, Higgins Ind	203-259-2113
Fla	Largo, Synergetic Rep	813-596-5331
Ga	Atlanta, Magaro & Assocs	404-252-6609
Ill	Elmhurst, Kay Sls	312-279-3666
Md	Gaithersburg, Wright Co.	301-840-1995
NJ	Berkeley Heights, AMC	201-464-5100
Tex	Richardson, Synergistic Sls	214-231-8014

TELECTRO SYS. CORP., Dept. EM, 96-18 43rd Ave., Corona, N.Y. 11368, Tel: 212-651-8900; Empl.: 65

Sales Manager: H. Sussman

TELEDYNE AEROSPACE SYSTEMS, Dept. EM, 1007 E. 10th St., Fairmont, Minn. 56031, Tel: 507-235-3355, TWX: 910-565-2120; FSC No.: 24600; Empl.: 70

Local Sales Offices & Reps.

Ariz	Phoenix, Bob Anderson Co.	602-266-2070
Cal	Carlsbad, GRU Assocs	714-729-7332
Cal	Glendale, GRU Assocs	213-845-8771
Cal	Mission Viejo, GRU Assocs	714-586-1992
Cal	Mountain View, Shaw Tech	415-961-4775
Fla	Melbourne, Repcom	305-254-1877
Mass	Weston, J. Goode Assoc.	617-235-3900
Minn	Minneapolis, P. Ericson & Assocs.	612-884-1969
NJ	Neshanic Station, J & L Assocs.	201-369-3791
Ohio	Dayton, Ashby Assocs. Inc. of Ohio	513-252-5627
Tex	Dallas, R. D. Spooner Co.	214-357-6636
Va	Shipman, R.P. Assocs.	804-263-5981
Wash	Seattle, Carlyle Techl Sls	206-767-4511

TELEDYNE BIG BEAM, Dept. EM, 290 E. Prairie St., Crystal Lake, Ill. 60014, Tel: 815-459-6100, Telex: 72-2460

Sales Manager: C.J. Ortmeyer, V.P.

Local Sales Offices & Reps.

Ala	Birmingham, C. Fedorenchik	205-592-4692
Ariz	Phoenix, N.A.C. Agencies	602-247-8191
Cal	La Mirada, E. L. Steensen Assocs.	213-921-8686
Cal	San Carlos, Lumineering Sales/Service	415-592-3008
Colo	Denver, I. W. Strong & Assocs., Inc.	303-292-6900
Fla	Lithia, Ralston-White	813-737-3160
Fla	Miami, Ralston-White	305-667-8038
Fla	St. Petersburg, Ralston-White	813-821-0243
Ga	Atlanta, Whit-Shaw Co., Inc.	404-351-8400
Ill	Lincolnwood, Tilkin & Cagen Associates	312-676-0382
Ind	Indianapolis, Tilkin & Cagen Assocs.	317-925-7776
Iowa	Dubuque, Bill Vahl Lighting Sls.	319-582-6304
Kans	Kansas City, Conrad Co. Inc.	913-621-3021
Ky	Jeffersontown, A.L. Pickens Co.	502-491-4215
La	New Orleans, United Sales Assocs., Inc.	504-733-8711
Md	Catonsville, T. G. Weinstein Co.	301-788-3636
Mass	Marblehead, Sands Assocs	617-631-7533
Mass	Needham, A.R. Booth & Co., Inc.	617-444-4880
Mich	Grosse Pointe Park, J. L. Miner Assocs.	313-886-5878
Minn	Minneapolis, P. Ohlin Sls. Co.	612-929-6924
Mo	Overland, A. Haumesser Co.	314-997-1776
NJ	Teaneck, T. G. Weinstein Co.	201-836-1033
NY	Syracuse, Diversified Lighting Sys	315-455-5811
NC	Charlotte, C. M. Furman Co.	704-375-2332
Ohio	Cincinnati, Redmond-Lewis & Assocs.	513-931-5060
Ohio	Cleveland, Miller-Curtis Assocs., Inc.	216-447-0040
Okla	Oklahoma City, C. B. Anderson Electric Co.	405-235-0716
Okla	Tulsa, C. B. Anderson Electric Co.	918-836-4661
Ore	Portland, A. Shaw Co.	503-224-3001
Pa	Meadowbrook, T.G. Weinstein Co.	215-886-0680
Pa	Pittsburgh, Gormley Elect.	412-371-4111
Tex	Corpus Christi, G & E Sls.	512-884-7707
Tex	Houston, Lighting & Electrical Sls. Co., Inc.	713-923-7781
Tex	Irving, Adra Electric Prods. Co.	214-254-4114
Tex	San Antonio, G. & Sales	512-342-9459
Wisc	Greendale, R. S. Knoblauch & Assocs.	414-258-8813

TELEDYNE CAMERA SYS., Dept. EM, 131 N. Fifth Ave., Arcadia, Cal. 91006, Tel: 213-359-6691, Telex: 675-423; Empl.: 96

Sales Manager; C. R. Redd

TELEDYNE-CRYSTALONICS, Dept. EM, 147 Sherman St., Cambridge, Mass. 02140, Tel: 617-491-1670, TWX: 710-320-1196; FSC No.: 12498; Empl.: 155

Distributor Manager: W. J. Kilgarriff

Local Sales Offices & Reps.

Ala	Huntsville, E.M.A., Inc.	205-533-6640
Ariz	Scottsdale, Runyon Co.	602-959-6060
Cal	Fullerton, Elctrn. Comp. Mktg.	714-879-9460
Cal	Marina Del Ray, Westaironics Inc.	213-821-7958

Cal San Carlos, Kottmeir Assoc. 415-592-8333
Fla Almonte Springs, V.G. Sls..... 305-831-8688
Fla Orlando, R. Simmons 305-831-8688
Fla Pompano Beach, V.G. Sls..... 305-971-0900
Ill Bellwood, Fiat Eng. Assoc..... 312-547-6200
Ill Westmont, Bodelle Co..... 312-323-9670
Ind Ft. Wayne, T.X. Sls. 219-489-4447
Md Rockville, Mechtronics Sls. 301-340-2130
Mass Brookline, Technology Prod. Group 617-731-0858
Minn St. Paul, R.G. Ragon..... 612-488-0201
NJ Union, Comp-Tech. Sls. 201-687-2484
NJ Wallington, Comp-Tech. Sls. 201-935-5454
NM Albuquerque, Power Entprss. 505-881-8537
NY New Hyde Park, Comp-Tech Sls. 516-593-2628
NY Rochester, J. Semple Assoc. 716-544-8583
NC Winston-Salem, E.M.A., Inc. 919-722-5151
Ohio Cleveland, KW Elctrn. Sls. 216-831-8292
Ohio Dayton, KW Elctrn. Sls. 513-890-2150
Pa Allison Park, KW Elctrn. Sls. 412-487-4300
Pa Bala Cynwd, Vantage Sls. 215-667-0990
SC Greenville, Electronic Mktg. Assoc. 803-233-4637
Tex Addison, Southland Comps..... 214-233-0603
Wash Bellevue, SD-R² 206-747-9424

TELEDYNE/GEOTECH, Dept. EM, Box 28277, Dallas, Tex. 75228, Tel: 214-271-2561, Telex: 73-2394; FSC No.: 99019; Empl.: 440

TELEDYNE GURLEY, Dept. EM, 514 Fulton St., Troy, N.Y. 12181, Tel: 518-272-6300, TWX: 710-443-8156

Sales Manager: K.E. Wilson, Mktg. Mgr.

TELEDYNE MECCA, Dept. EM, Box 36393, Houston, Tex. 77036, Tel: 713-772-2811; Empl.: 75

TELEDYNE MICRONETICS, Dept. EM, 7155 Mission Gorge Rd., San Diego, Calif. 92120, Tel: 714-583-3525, TWX: 910-335-2085; Empl.: 66

Local Sales Offices & Reps.
Colo Parker, Technology Mktg. 303-841-3435
DC Arlington, E. T. Phillips 703-979-5084
Fla Clearwater, Brennan Assocs. 813-446-5006
Kans Wichita, Dy-Tronix 316-943-6221
Mass Burlington, Tritek 617-272-4550
Mo Hazelwood, Dy-Tronix..... 314-731-5799
NM Albuquerque, Technology Mktg. 505-298-4321

TELEDYNE MICROWAVE, Dept. EM, 1290 Terra Bella Ave., Mountain View, Cal. 94040, Tel: 415-968-2211, TWX: 910-379-6939; FSC No.: 24402; Empl.: 200

Local Sales Offices & Reps.
Cal Los Altos, Cain White Co. 415-948-6533
Cal Los Angeles, Cain Technology .. 213-476-2251
Fla Clearwater, Brennan Assoc. 813-446-5006
Ill Mt. Prospect, Cain & Co. 312-253-3578
Md Columbia, N. Deoul Assoc. 301-997-4353
Mass Burlington, Tritek 617-272-4550
NJ Fort Lee, Technical Mktg. Assocs. 201-224-6911
NY Fayetteville, G. Sherman 315-637-9861
Ohio Lancaster, Cain & Co. 614-654-4800
Tex Ft. Worth, Carey-Wolf Assoc. 817-738-1996

TELEDYNE PENN-UNION ELEC., Dept. EM, Box 723, Edinboro, Pa. 16412, Tel: 814-734-1631, Telex: 914-490; Empl.: 500

Sales Manager: P. F. Amann, V.P. Sls

Local Sales Offices & Reps.
Ala Birmingham, C.S. Phillips Co. 205-870-0640
Ariz Phoenix, Arizona Sun Sls..... 602-253-3178
Cal Los Angeles, E.S. Condon Co. .. 213-726-7926
Cal San Jose, Kruger Russ..... 408-288-8667
Colo Denver, Empire Electrical Sls 303-744-1776
Conn West Haven, Electrical Agencies 203-933-2985
Conn West Haven, Electrical Agencies 203-933-2985
Fla Jacksonville, Arnold-Bryant 904-246-4361
Fla Miami, Arnold-Bryant..... 305-661-0715
Fla St. Petersburg, Arnold-Bryant 813-343-6959
Ga Atlanta, I.A. Hoge Assoc. 404-758-6815
Ga Norcross, Southern Comps 404-921-6929
Haw Kailua, Don Thomas & Assoc..... 808-262-4818
Ill Elk Grove Village, Hanke Co. 312-593-8500
Ill Morton, Hanke Co. 309-265-5888
Ind Indianapolis, Roth-Mooney Elec. Agency 317-634-4850
Iowa Cedar Rapids, A. Sell & Assoc. 319-233-3070
Iowa Des Moines, A. Sell & Assoc. 505-278-0024
Iowa Dewitt, A. Sell & Assoc. 319-659-5598
Iowa Marion, A. Sell & Assoc. 319-377-7388
Kans Overland Park, T & W Sls. 913-649-4411
La Kenner, Jeanes Enterprises..... 504-721-6221
Me S. Berwick, Electrical Agencies.. 207-384-5321
Md Reistertown, Campbell & Assoc. 301-833-7372
Mass S. Boston, Electrical Agencies.... 617-268-9300
Mich Dearborn, D.P. Seyfried Co. 313-274-4900
Minn Hopkins, Electro-Sls 612-933-3430
Miss Jackson, Jeanes Enterprises..... 601-981-5535
Mo Manchester, R.E. Kennedy Co. .. 314-391-8840
Neb Omaha, A. Sell & Assoc. 402-572-8767
NM Albuquerque, Deskin-Martin Assoc. 505-345-6641
NY Camillus, Mills, Talbot Co..... 315-672-3074
NY Jamaica, Warshaw Electric 212-525-8150
NY Jamestown, Elmer J. Monagan .. 716-484-9360
NY Loudenville, Mills, Talbot Co..... 716-484-9360
NY Rochester, Mills, Talbot Co..... 716-244-1311
NC Cary, F. Woods Agency 919-467-6366
NC Hickory, Fred Woods Acy 704-328-5932
Ohio Cincinnati, J.G. Gates Co. 513-521-4335
Ohio Cleveland, K.R. Dodge Co. 216-461-6482
Okla Oklahoma City, And Power Sls. 405-751-5861
Ore Portland, George M. Roth Co 503-233-5561
Pa Drexel Hill, W.B. Siegfried Assoc. 215-353-2000
Pa Pittsburgh, H.E. Ransford Co. 412-884-3425
SC Lexington, F. Woods Agency..... 803-359-6753
Tenn Memphis, Jeanes Enterprises 901-683-3763
Tex Arlington, F.A. Roso Co..... 817-461-7903
Tex Houston, Wiltex Electrical Sls 713-464-4817
Utah Salt Lake City, Melville Sls. Co. 801-363-3363
Va Ashland, Campbell & Assoc. 804-798-4743
Va Herndon, Campbell & Assoc 703-620-9735
Va Roanoke, Campbell & Assoc. 703-345-1503
Wash Seattle, Northwest Agencies 206-623-8882
Wash Spokane, Northwest Agencies.... 509-747-0683
WVa Charleston, H.E. Ransford Co. .. 304-343-4546
Wisc Brookfield, Hanke Co..... 414-781-3932
Wisc Green Bay, Hanke Co 414-499-8289
Wisc Milwaukee, A.W. Schwind Co..... 414-228-7330

TELEDYNE PHILBRICK, Dept. EM, 17 Allied Dr. Rte 128, Dedham, Mass. 02026, Tel: 617-329-1600, TWX: 710-348-6726; Empl.: 250

Local Sales Offices & Reps.
Ala Huntsville, Col-Ins-Co..... 800-327-6600
Ariz Scottsdale, PLS Assocs. 602-994-5461
Cal Cupertino, T. Louis Snitzer Co. .. 408-257-8333
Cal Del Mar, T. Louis Snitzer Co. 714-226-0305
Cal Los Angeles, T. Louis Snitzer Co. 213-836-6170
Colo Denver, PLS Assocs..... 303-773-1218
Conn Canton Center, Tekdata, Inc..... 213-693-0710
Fla Largo, Col-Ins-Co. 800-432-4480
Fla Orlando, Col-Ins-Co. 305-423-7615
Ga Clarkston, Col-Ins-Co..... 800-327-6600
Haw Kailua, Lanikai Elctrns. 808-262-6286
Ill Des Plaines, Janus, Inc. 312-298-9330
Ind Carmel, Carter, McCormic & Pierce 317-844-4175
Iowa Cedar Rapids, BC Elctrncs Sls. 319-393-5818
Kans Olathe, BC Elctrncs Sls..... 913-888-6680
Md Rockville, Elctrn. Mktg. Assocs. 301-881-5300
Mass Wakefield, Tek Data 617-245-5940
Mich Farmington, Carter, McCormick & Peirce 313-477-7700
Minn Minneapolis, Elctrn Innovators 612-884-7471
Mo Hazelwood, BC Elctrns Sls..... 314-731-1255
NM Albuquerque, PLS Assocs..... 505-255-2330
NY Clark Mills, KLM Assocs..... 315-853-6126
NY Elmont, Crane & Egert 516-488-2100
NY No. Syracuse, KLM Assocs. 315-458-6214
NC Winston-Salem, Col-Ins-Co..... 800-327-6600
Ohio Dayton, Carter, McCormic & Peirce 513-222-7700
Ohio Fairview Park, Carter, McCormick & Peirce 216-779-5100
Pa King of Prussia, Elctrn. Mktg. Assocs. 215-265-1600
Tex Dallas, Mycrosystems Mktg..... 214-238-7157
Tex Houston, Mycrosystems Mktg 713-783-2900
Utah Sandy, PLS Assocs..... 801-942-2081
Wash Summer, Halbar Assocs. 206-863-7398

TELEDYNE RELAYS, Dept. EM, 3155 W. El Segundo Blvd., Hawthorne, Cal 90250, Tel: 213-973-4545, TWX: 910-325-6600 ..... p. 3612-3621

Local Sales Offices & Reps.
Ala Huntsville, Interep Asso. Inc. 205-881-3677
Ariz Scottsdale, Arcom Sales 602-947-5745
Cal San Jose, Teledyne Relays NORCAL 408-378-1600
Colo Denver, B-5 Inc..... 303-426-0222
Conn Stratford, G. Rosen Co. 203-375-5456
Fla Satellite Beach, Reynolds & Assocs. 305-773-4700
Ga Atlanta, Interep Asso. Inc. 404-394-7756
Ill Glen Ellyn, Teledyne Relays, MWRO 312-858-1090
Ind Indianapolis, Ihrig Assocs. 317-783-7630
Kans Overland Pk., Ensco Rep. 913-381-7557
Md Timonium, Heller Sls. 301-252-4780
Mass Framingham, G. Rosen Co. 617-879-5505
Mich Birmingham, J.C. Hofstetter Co. 313-646-3635
Mich Grand Rapids, J.C. Hofstetter Co. 616-942-0650
Minn Minneapolis, S. Clothier Co..... 612-888-4666
Mo St. Louis, Ensco-Rep. 314-567-3935
NJ West Long Branch, Teledyne Relays 201-229-5900
NY Mount Vernon, Friedman-Smith Elctrns. 914-664-4866
NY Syracuse, I.A. Hotze Co. 315-479-6641
NC Cary, Montgomery Mktg. 919-467-6319
Ohio Dayton, J.C. Hofstetter Co. 513-296-1010
Ohio Medina, J.C. Hofstetter Co. 216-241-4880
Pa Bala Cynwyd, Vantage Sls. Co. 215-667-0990
Tex Houston, Vista Assocs. 713-661-0119
Tex Richardson, Vista Assocs. 214-235-4547
Utah W. Bountiful, B5 Inc. 801-292-8991
Wash Bellevue, W.M. Buehler Co..... 206-455-5512

Local Distributors
Ala Huntsville, Pioneer Elctrns 205-837-9300
Ariz Phoenix, Kierulff Elctrns 602-243-4101
Ariz Phoenix, Liberty Elctrns 602-249-2232
Cal Los Angeles, Kierulff Elctrns..... 213-685-5511
Cal Los Angeles, Liberty Elctrns. 213-322-8100
Cal Mt. View, Elmar Elctrns. 415-961-3611
Cal Palo Alto, Kierulff Elctrns. 415-968-6292
Cal San Diego, Kierulff Elctrns. 714-278-2112
Cal San Diego, Liberty Elctrns..... 714-565-9171
Colo Commerce City, Elmar/Denver Elctrns 303-287-9611
Colo Denver, Kierulff Elctrns. 303-371-6500
Colo Wheatridge, Century Elctrns..... 303-424-1985
Conn Orange, Milgray 203-795-0711
Fla Orlando, Pioneer 305-859-3600
Fla Winter Park, Milgray 305-647-5747
Ill Elk Grove Village, Kierulff Elctrns 312-640-0200
Ill Elk Grove Village, Pioneer/Chicago 312-437-9680
Ind Indianapolis, Pioneer/Indianapolis 317-849-7300
Kans Overland Park, Milgray/Kansas City Inc. 913-236-8800
Md Gaithersburg, Pioneer/Maryland 301-948-0710
Md Lanham, Milgray/Washington 301-459-2222
Mass Billerica, Kierulff Elctrns 617-667-8331
Mass Burlington, Milgray/New England 617-272-6800
Mass Natick, Future Elctrns 617-879-0860
Mich Livonia, Pioneer/Michigan..... 313-525-1800
Minn Minneapolis, Stark Elctrns..... 612-332-1325
Minn Minneapolis, Stark Elctrns 612-333-3361
NJ Cherry Hill, Milgray/Delaware Valley 609-424-1300
NJ Fairfield, Kierulff Electrns 201-515-6750
NM Albuquerque, Century Elctrns..... 505-292-2700
NY Buffalo, Summit Dist..... 716-884-3450
NY Freeport, Milgray Elctrns..... 516-546-6000
NY Rochester, Summit Distributors.. 716-334-8110
NC Greensboro, Pioneer 919-273-4441
Ohio Cleveland, Pioneer/Cleveland 216-587-3600
Ohio Cleveland, Milgray/Cleveland 216-881-8800
Ohio Dayton, Pioneer/Dayton 513-236-9900
Okla Tulsa, Comp Specialties..... 918-664-2820
Pa Horsham, Pioneer/Delaware Valley 215-674-4000
Pa Horsham, Pioneer/Delaware Valley 215-674-5710
Pa Pittsburgh, Pioneer/Pittsburgh 412-782-2300
Tex Austin, Component Spec 512-459-3307
Tex Dallas, Solid State Elctrns. 214-352-2601
Tex Dallas, Component Spec 214-357-6511
Tex Houston, Component Spec 713-771-7237
Tex Houston, Solid State Elctrns..... 713-785-5436
Utah Salt Lake City, Century Elctrns. 801-466-6000
Utah Salt Lake City, Century Elctrns.. 801-972-6969
Utah Salt Lake City, Kierulff Elctrns.... 801-973-6913
Wash Bellevue, Liberty Elctrns..... 206-453-8300
Wash Tukwila, Kierulff Elctrns 206-575-4420

TELEDYNE ROTOLITE, Dept. EEM, Dept. EM, 328 Essex St., Stirling, N.J. 07980, Tel: 201-647-1040, TWX: 710-986-3017

Sales Manager: Karl Von Brook

Local Sales Offices & Reps.
Ala Birmingham, Photocopy 205-595-8316
Ark Little Rock, Farrell Schaer Blueprint 501-375-3273
Cal Culver City, Universal Rotolite.... 213-559-8460
Cal San Francisco, Thomas Reproductions 415-431-8900
Conn Vernon, Walter W. Fredrick Assocs 203-646-2962
Del New Castle, Reproduction Center 302-328-5019
DC Columbia, Maryland Blueprint 301-992-9611
Ga Atlanta, Gen Sls & Srvc, Sub Atlanta Blueprint 404-696-4670

Ill Chicago, Walruth Whiteprint Equip Co 312-427-0177
Ill Des Plaines, Teledyne Post 312-299-1111
Ind Lafayette, Blueprint Specialty & Supply 317-742-6976
Iowa Cedar Rapids, Rapids Reproductions 319-364-2473
La Shreveport, Ridgway's 318-221-0647
Md Columbia, Maryland Blueprint 301-992-9611
Mass Gloucester, Walter W. Fredrick Assocs 617-283-1174
Mich Southfield, Dunn Blue Print 313-356-4118
Mich Troy, Teledyne Post 313-689-4540
Minn St. Cloud, Mueller Reproduction 612-251-9525
Miss Jackson, Neely Blueprint & Supply 601-354-3523
Mo Kansas City, Royal Bluepring 816-221-2225
Mo St. Louis, Rotolite 314-832-2091
Neb Omaha, Standard Blueprint 402-341-7890
Nev Las Vegas, Las Vegas Blueprint 702-385-1661
NJ Kenilworth, Brewer Assocs 201-276-7800
NM Albuquerque, Reliable Reproductions 505-247-1578
NY New York, Rotolite 212-685-4067
NY Pittsford, Rotolite Elliott 716-385-1463
NY Valhalla, Rotolite Hahn 914-949-9594
NY Valhalla, Rotolite of Florida 914-949-1253
NY Woodside, Lanell Co 212-728-7060
NC Hickory, Rex F. Miller & Co 704-322-2500
ND Fargo, Mathison Co 701-232-8971
Ohio Cleveland, Elite Business Svc 216-248-3341
Ohio Columbus, Key Blueprint 614-272-7564
Okla Tulsa, J. D. Young Co 918-582-9955
Ore Portland, Cascade A & E 503-224-0681
Pa Philadelphia, Teledyne Post 215-627-6493
Pa Pittsburgh, A. H. Mathias & Co 412-281-1800
SC Columbia, Piedmont Printmakers & Supply 803-254-6295
SD Sioux Falls, Mathison Co 605-336-2437
Tenn Nashville, Arrow Products 615-255-1261
Tex Dallas, Ridgway's 214-630-3333
Tex Irving, Teledyne Post 214-445-0171
Utah Riverton, Osborne Engrg & Supply 801-254-3991
Utah Salt Lake City, Photo Blue 801-355-1713
Va Richmond, R. R. Sharpless Co 804-649-7551
Wash Seattle, Dieterich Post Co 206-623-8690
WVa Charleston, H. T. Hall Co 304-343-5671
Wisc Milwaukee, Teledyne Post 414-374-4660
Exp Stirling, Teledyne Rotolite 201-647-1040

TELEDYNE SEMICONDUCTOR, Dept. EM, 1300 Terra Bella Ave., Mountain View, Cal. 94040, Tel: 415-968-9241, TWX: 910-379-6494; FSC No.: 15818; Empl.: 2000

Sales Manager: C. Bigelow; *Distributor Manager:* M. Whelan

Local Sales Offices & Reps.
Ala Huntsville, Electronic Mfrs. Agents 205-533-6640
Ariz Tempe, Sedco Sls. 602-968-7791
Cal Culver City, Bestronics, Inc. 714-870-9191
Cal Irvine, Bestronics, Inc. 714-979-9910
Cal Los Angeles, Teledyne Semiconductor 213-826-6639
Cal Mountain View, Teledyne Semiconductor 415-968-9241
Cal Redwood City, J.S. Heaton Co. 415-367-9000
Cal San Diego, Bestronics, Inc. 714-743-3015
Colo Wheat Ridge, Waugaman Assoc. 303-423-1020
Fla Fort Lauderdale, H.H. Peregoy 305-971-5750
Fla Maitland, H.H. Peregoy 305-831-2474
Ill Des Plaines, Teledyne Semiconductor 312-299-6196
Ill Westchester, Gassner & Clark Co. 312-345-4245
Ind Fort Wayne, Given Corp. 219-432-5585
Iowa Cedar Rapids, PMA Corp. 319-362-9177
Kans Overland Park, PMA Corp. 913-381-0004
Kans Wichita, PMA Corp. 316-264-2662
Md Ellicott City, Mktg Technology 301-465-5944
Mass Waltham, Dynasel Assoc. 617-890-6777
Mich Ann Arbor, A.P.J. Assocs. 313-971-8870
Minn Minneapolis, Marsh Sls. Co. 612-881-7511
Mo Hazelwood, PMA Corp. 314-731-4334
Mo Maryland Hgts, Penzner-Mankus Corp 314-569-1220
NH Salem, Teledyne Semiconductor 603-893-9551
NJ Haddonfield, Sunday-O'Brien 609-429-4013
NM Albuquerque, Waugaman Assocs 505-294-1436
NY Buffalo, Bowser & Sapecky Assocs. 716-839-4170
NY Manlius, Bowser & Sapecky Assocs. 315-682-8885
NY Melville, Addem Sls 516-549-8400
NY Stony Brook, Teledyne Semiconductor 516-751-5640
NC Winston-Salem, Elctrn Mktg Assocs 919-722-5151
Ohio Richfield, N. Bear Corp.-Bear Mktg. 216-659-3131
SC Greenville, Elctrn Mktg Assocs 919-722-5151
Tenn Knoxville, Elctrn Mfrs Agts 615-966-1286
Tex Arlington, Wheelex, Inc. 817-461-8039
Tex Spring, Wheelex, Inc. 713-353-3195
Utah Salt Lake City, Waugaman Assoc. 801-363-0275
Wash Bellevue, SD. R2 206-747-9424

Local Distributors
Ala Huntsville, Powell Elctrns 205-539-2731
Ariz Phoenix, Kierulff Elctrns Co 602-243-4101
Cal Chatsworth, Westates Elctrns 213-341-4411
Cal Los Angeles, Kierulff Elec. 213-685-5511
Cal Palo Alto, Kierulff Elec. 415-968-6292
Cal San Diego, Kierulff Elec. 714-278-2112
Cal San Diego, Intermark Elctrns 714-279-5200
Cal Santa Ana, Intermark Elctrns 714-540-1322
Cal Sunnyvale, Intermark Elctrns 408-738-1111
Cal Sunnyvale, Western Microtechnology Sls 408-737-1660
Cal Sunnyvale, Diplomat/Westland 408-734-1900
Cal Tustin, Kierulff Elec. 714-731-5711
Cal Woodland Hills, JACO Elctrns 213-884-4560
Colo Denver, Kierulff Elctrns 303-371-6500
Colo Wheat Ridge, Century Elctrns 303-424-1985
Conn Norwalk, Harvey Elctrns 203-853-1515
Fla Clearwater, Diplomat/Southland 813-443-4514
Fla Orlando, Hammond Elctrns 305-849-6060
Ill Chicago, Bell Industries 312-982-9210
Ill Elk Grove Village, Kierulff Elec. 312-640-0200
Ill Rosemont, Advent Elctrns 312-298-4210
Ind Indianapolis, Advent Elctrns 317-297-4910
Iowa Cedar Rapids, Deeco, Inc. 319-365-7551
Kans Wichita, Radio Supply 316-267-5213
Md Columbia, Technica, Inc. 301-461-2220
Md Savage, Pyttronic Industries 301-792-0780
Mass Billerica, Kierulff Elec. 617-667-8331
Mass Burlington, Milgray Elctrns 617-272-6800
Mass Dedham, Gerber Elctrns 617-329-2400
Mass Natick, Future Elctrns 617-879-0860
Mich Farmington, Diplomat/Northland 313-477-3200
Mich Livonia, Rep-tron, Inc. 313-525-2700
Minn Minneapolis, Diplomat/Electro-Com Corp. 612-788-8601
Mo Kansas City, Walters Radio Supply 816-531-7015
NJ Clifton, Wilshire Elctrns 201-340-1900
NJ Fairfield, Kierulff Elctrns 201-575-6750
NM Albuquerque, Century Elctrns 505-292-2700
NM Albuquerque, Alliance Elctrns 505-292-3360
NY Buffalo, Summit Distributors 716-884-3450
NY Elmsford, Zeus Comps 914-592-4120
NY Endwell, Wilshire Elctrns 607-754-1570
NY Freeport, Milgray Elctrns 516-546-6000
NY Hauppauge, JACO Elctrns 516-273-5500
NY Hicksville, Kierulff Elctrns 516-433-5530
NY Rochester, Summit Elctrns 716-334-8110
NC Greensboro, Hammond Elctrns 919-275-6391
Ohio Columbus, Elctrns Mktg 614-299-4161
Ohio Columbus, Hughes-Peters 614-294-5351
Pa Montgomeryville, Pyttronic Industries 215-643-2850
Pa Philadelphia, Almo Elctrns 215-698-4021
Tex Austin, Comp Specialties 512-459-3307
Tex Dallas, Solid State Elctrns 214-352-2601
Tex Dallas, Comp Specialties 214-357-6511
Tex Houston, Comp Specialities 713-771-7237
Tex Houston, Solid State Elctrns 713-785-5205
Utah Salt Lake City, Diplomat/Alta Elctrns 801-486-7227
Utah Salt Lake City, Century Elctrns 801-972-6969
Wash Tukwila, Kierulff Elctrns 206-575-4420
Wisc Milwaukee, Parts Mart Corp. 414-276-1212

TELEFUNKEN, See AEG Telefunken

TELEPHONICS CORP., Dept. EM, 770 Park Ave., Huntington, N.Y. 11743, Tel: 516-549-6000, TWX: 510-226-6983; Empl.: 500

TELESIS LABORATORY, Dept. EM, Box 387, Chillocothe, Ohio 45601, Tel: 614-773-1414; Empl.: 18

Sales Manager: J. Eley

TELETERMINAL CORP., Dept. EM, 12 Cambridge St., Burlington, Mass. 01803, Tel: 617-272-8504, TWX: 710-332-6365; Empl.: 13

Local Sales Offices & Reps.
Cal Copertino, Eakins Assocs. 408-255-6494
Conn Hamden, J & J Assocs. 203-624-7800
Mass Burlington, J & J Assocs.
Tex Dallas, Salcor 214-234-8072

TELETYPE CORP., Dept. EM, 5555 Touhy Ave., Skokie, Ill. 60076, Tel: 312-982-2000, TWX: 25-4051, 910-223-3611; Empl.: 5,000

Local Sales Offices & Reps.
Cal City of Commerce 213-724-6040
Cal San Francisco, Teletype Corp 408-745-4205
NJ Fairfield 201-575-8240

TELETYPEWRITER COMM. SPEC. INC., Dept. EM, 550 Springfield Ave, Berkeley Hts, N.J. 07922, Tel: 201-464-5310, TWX: 13-6479, 710-986-3016

Sales Manager: L. S. Van't Slot; *Distributor Manager:* L. S. Van't Slot

Local Distributors
NJ Berkeley Hgts, Teletypewriter Comm Specialists 201-464-5310

TELEVISION EQUIP. ASSOCS., Dept. EM, Box 260, South Salem, N.Y. 10590, Tel: 914-763-8893, TWX: 710-763-8893

Local Sales Offices & Reps.
Cal Los Angeles, Tri Tronics 213-877-9912
Colo Evergreen, Didier/Denver 303-674-6000
Md Rockville, Wiltronix 301-460-1454
Mich Farmington Hills, H M Dyer 313-478-2157
Tex Paris, G. Sudduth 214-785-5764
Wash Seattle, J. Nutting 206-364-9911

TELEX COMMUNICATIONS, INC., Dept. EM, 9600 Aldrich Ave., So., Minneapolis, Minn. 55420, Tel: 612-884-4051, Telex: 29-7053; Empl.: 1200

Local Sales Offices & Reps.
Ark Little Rock, J.Y. Schoonmaker 501-375-2168
Cal Burbank, Koessler Sls., Inc. 213-849-5716
Cal Oakland, Moulthrop Sls. 415-846-0550
Cal Reseda, Irv Strauber 213-344-7979
Colo Denver, McLoud & Raymond Co. 303-756-1589
Fla Miami, World Wide Prods. 305-754-5475
Ga Chamblee, Techn. Sys. 404-457-0426
Ga Marietta, T. Koran 404-971-8171
Ill Lincolnwood, Wm. M. Linz Co. 312-498-9600
Ill Wheaton, Tom Mouhelis 312-690-8406
Ind Indianapolis, Sukup & Cox, Inc. 317-253-5501
Iowa Atlantic, Kimian Sls. Co. 712-243-1626
Md Baltimore, D. Brothers Co. 301-764-7189
Mass Wellesley Hills, M. Scott Co. 617-235-0102
Mich Pleasant Ridge, Shalco, Inc. 313-547-4771
Minn Minneapolis, Dale Swain 612-938-1585
Minn Minneapolis, Clark R. Gibb Co. 612-377-1200
NY Flushing, Bettan Sls., Inc. 212-591-7600
NY Syracuse, Lewis & Dunnigan Co 315-446-5522
NY Woodhaven, Alan Sarfaty 212-846-1952
Ohio Cleveland, Imtech 216-826-3400
Ohio Columbus, Lee Knox 614-846-1183
Okla Tulsa, J.Y. Schoonmaker 918-936-1432
Pa Newtown Square, G.M. Conneen Co. 215-353-2241
Tex Dallas, J.Y. Schoonmaker 214-349-1650
Tex Houston, J.Y. Schoonmaker 713-926-9510
Wash Seattle, Fleehart & Sullivan 206-522-1533

TELMAR, INC., Dept. EM, 1150 W. Third Ave., Columbus, Ohio 43212, Tel: 614-299-2165; Empl.: 8

Sales Manager: G. R. Scott

TELONIC/BERKELEY, Dept. EM, 2700 DuPont Dr., Irvine, Cal. 92715, Tel: 714-833-3300, 800-854-3813, TWX: 910-595-2556; FSC No.: 04423; Empl.: 120 p. 3063

Sales Manager: R. Aaron

Local Sales Offices & Reps.
Cal Cupertino, T. L. Snitzer Co. 408-257-8333
Cal Del Mar, T. L. Snitzer Co. 714-454-2191
Cal Los Angeles, T. L. Snitzer Co. 213-836-6170
Md Silver Spring, Gawler-Knoop 301-589-4406

TELVAC INSTR. CO., Dept. EM, 7534 Atoll Ave. F. N. Hollywood, Cal. 91605, Tel: 213-983-2535; Empl.: 3

Sales Manager: J. Broeker

TEMPIL DIV., Big Three Inds, Dept. EM, Hamilton Blvd., So. Plainfield, N.J. 07080, Tel: 201-757-8300, Telex: 138-662; Empl.: 30

Sales Manager: M. Olesin; *Distributor Manager:* M. Olesin

TEMPKEY INC., Dept. EM, 2155 Park Blvd., Pale Alto, Cal. 94306, Tel: 415-326-2151, Telex: 334447; Empl.: 5

Sales Manager: G. C. Ziman

Local Sales Offices & Reps.
Ariz Phoenix, Industrial Prods. Corp. 602-246-8487

Cal Costa Mesa, Robinson Technical Assocs. 714-557-1622
Colo Manitou Springs, Martin Assocs 303-685-5992
Conn Woodbury, Engineering Assocs.. 203-263-4161
Ill Elk Grove Village, Loren Green Assocs. 312-593-0282
Md Baltimore, Al Rogers Co. 301-744-4162
Minn Minneapolis, Bican Co. 612-827-4734
NM Albuquerque, Industrial Prods. Corp. 505-256-3561
Okla Oklahoma City, Bill Pitts Co 405-526-8944
Pa Bristol, Al Rogers Co. 215-788-5071
Tex Houston, Component Sls. 713-521-9771
Wash Edmonds, Whitco Sls. 206-776-1970

TEMPO INSTRUMENT, INC., Dept. EM, 51 E. Bethpage Rd., Plainview, N.Y. 11803, Tel: 516-694-4400, TWX: 510-224-6421; FSC No.: 07031; Empl.: 120

Local Sales Offices & Reps.

Industrial Prods. Group.
Ill River Forest, F. I. Tourtlot Co. 312-771-6300
Mich Brighton, Cesko Sls Co 313-227-5061
NJ Hohokus, Alto 201-447-1770
NY Northport, Pro Comps 516-261-0662
NY Plainview, Alto Assocs 516-681-3163
NY Rochester, H.C. Johnson 716-482-3000
Pa Audubon, Daner-Hayes 215-666-5005

Military Prods. Group.
Mich Southfield, Luebbe Sls. Co. 313-357-0355
NJ Clifton, Avionics Equip. Inc. 201-772-1956
Ohio Cincinnati, Luebbe Sls. Co. 513-871-4211
Ohio Dayton, Luebbe Sls. Co. 513-294-0426
Tex Arlington, Cal-Tex Ind. 817-461-0303
Wash Bellevue, M. Poggi Co. 206-454-2323

TEMPOSONICS INC., Dept. EM, 131 East Ames Ct, Plainview, N.Y. 11803, Tel: 516-694-4400, TWX: 510-224-6421

Sales Manager: W. Brenner

TEMPTRONIC CORPORATION, Dept. EM, 40 Glen Ave., Newton, Mass. 02159, Tel: 617-965-3420, Telex: 92-2526; Empl.: 50

Sales Manager: H.P. Mierop

Local Sales Offices & Reps.
Ariz Scottsdale, Allen Assocs. 602-994-1305
Cal Palo Alto, Coherent Mktg. Assocs. 415-327-2217
Fla Ft. Lauderdale, Lenz Engrg Co. 305-739-2546
Fla Longwood, Lenz Engrg. Co. 305-831-9797
Ill Chicago, Electronic Inst. Assoc. 312-271-3774
Ind Indianapolis, Electronic Inst. Assoc. 317-257-7231
Md Rockville, Research Technology 301-881-5780
Mass Allston, TEC Systems 617-787-3370
NY Elmont, Crane & Egert Corp. 516-488-2100
NC Greensboro, Lenz Engrg. Co. 919-299-7879
Ore Vernonia, Gene C. Christofferson Assoc. 503-222-9595
Tex Austin, Comspec, Inc. 512-837-3881
Tex Dallas, Comspec, Inc. 214-234-4137
Tex Houston, Comspec, Inc. 713-461-4487
Utah Salt Lake City, Specialty Sls. Co. 801-262-2979

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Sales Manager: S. Tussman

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Ala Huntsville, FM Assocs, Ltd 205-536-9990
Ariz Scottsdale, Wiliams Assocs 602-947-4297
Cal Sunnyvale, Equipment Sls. 408-739-8011
Cal Van Nuys, Environment Assocs. 213-994-1404
Colo Denver, Williams Assoc. 303-373-4730
Conn Hamden, Equipment Sls. Co. 203-281-4578
Fla Lake Worth, I. R. Associates 305-588-2200
Fla Orlando, FM Assocs. 305-851-5710
Ga Atlanta, FM Assocs 404-634-7830
Ill Des Plaines, Marsland Assoc 312-298-2620
Ind Indianapolis, Marsland Assoc. 371-924-3568
Mass Chelmsford, Equip Sls Co. Inc. 617-256-8547
Mich Centerline, Dietrich & Assoc 313-754-6450
Mich Lanham, Brimberg Sales Inc 301-552-2200
Minn Minneapolis, Marsland Assoc. 612-545-4481
Mo Kansas City, Marsland Assocs. 816-966-8400
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NJ Bernardsville, Richard Wenke 201-766-5553
NJ Mt. Laurel, Dittco Inc 609-235-4565
NJ Mt. Laurel, Dittco, Inc. 609-235-4565
NM Albuquerque, Williams Assocs. 505-255-1638
NY Fayetteville, M.P. Andrews 315-637-3144
NC Greensboro, FM Assocs. 919-294-2754
Ohio Cleveland, Dietrich & Assocs. 216-781-1855
Ohio Dayton, Dietrich & Assoc 513-223-6042
Pa Pittsburg, Dietrich & Assoc. Inc. 412-892-2992
Tex Dallas, Carey, Wolf & Assocs. 817-461-7333
Tex Ft. Worth, Carey, Wolf & Assoc 817-461-7333
Tex Houston, Carey, Wolf & Assoc 713-721-2442
Wash Bellevue, Showalter Instrs, Inc 206-455-4922

TENOR CO., INC., Dept. EM, 17020 W. Rogers Dr., New Berlin, Wisc. 53151, Tel: 414-782-3800, Telex: 26-706; Empl.: 53

Sales Manager: R. Turnbull

Local Sales Offices & Reps.
Ala Birmingham, Spader & Assocs 205-879-1366
Ark Little Rock, Jordan/Marlar/Hale 501-378-0421
Cal Montebello, Tucul Eng. 213-728-7397
Cal Orinda, Redwood Controls 415-254-0311
Colo Denver, J.H. Dorough 303-424-9341
Conn Trumbull, Sir Assocs. 203-268-2560
Fla Tampa, Louis & Assocs 813-621-8994
Ga Decatur, Spader & Assocs. 404-296-3024
Ill Chicago, T. A. Kloempken & Co. 312-775-3050
Ill Rock Island, Carlin Automation Sls Co. 309-788-1275
Kans Prairie Village, Engrg. Svcs. Co. 913-649-4000
La Denham Springs, Process Meas & Monitors Co. 504-344-3882
Mass Lexington, Sir Assocs. 617-862-1812
Mich Royal Oak, Ed Kiefer Assoc. 313-543-4927
Minn Burnsville, E. R. Berg & Assocs 612-890-1221
Mo St. Louis, Engrg. Svcs. Co. 314-997-1515
NJ Bogota, Neville & Vespo 201-487-1505
NY Albany, O.R. Lawrence 518-456-4444
NY Buffalo, O.R. Lawrence 716-839-4422
NY Syracuse, O.R. Lawrence 315-455-5587
NC Matthews, W.K. Hile 704-847-9125
Ohio Cincinnati, J.W. Murray 513-574-7111
Ohio Parma, Motion Control Comp. 216-888-7070
Okla Tulsa, Furtney 918-747-6490
Pa Malvern, Miller & Dietz 215-647-7373
Tenn Knoxville, W.K. Hile Co. 615-573-0700
Tex Garland, Stout-Jennings-Schmidt Co. 214-272-5585
Tex Houston, Dan Bray & Assocs 713-771-8820
Va Richmond, W.K. Hile Co. 804-275-0799
Wisc Brookfield, Schrade-Batterson 414-781-5660

TENSOLITE CO., Div. Carlisle Corp, Dept. EM, Old Post Rd., Rte. 9A, Buchanan, N.Y. 10511, Tel: 914-737-5600, TWX: 710-573-2341

Local Sales Offices & Reps.
Cal Torrance 213-320-7600

TEN-TEC INC., Dept. EM, Industrial Park, Sevierville, Tenn. 37862, Tel: 615-453-7172; Empl.: 140

TERADO CORP., Dept. EM, 1068 Raymond Ave., St. Paul, Minn. 55108, Tel: 612-646-2868; Empl.: 25

Local Sales Offices & Reps.
Cal Torrance, Barstow & Doran Inc. 213-325-4140
Ill Chicago, Weisz Assocs. 312-637-9117
Mass Northboro, W.B. Pray Sls., Inc. 617-393-3434
Minn Mpls., A. J. Warner 612-729-7371
NY Plainview, Morhan Exporting Corp. 516-293-5582

TERADYNE COMPONENTS, Dept. EM, 4 Pittsburgh Ave, Nashua, NH 03060, Tel: 603-889-5156, TWX: 710-228-1431; FSC No.: 31413; Empl.: 500

Sales Manager: S. Harris, Dir. Mktg

Local Sales Offices & Reps.
Cal Fullerton, Teradyne Comps., Inc. 714-871-1930
Cal Santa Clara, Nova-Tronix 408-243-9530
Colo Denver, R. W. Masterson Co. 303-771-1482
Fla Largo, Tech-Rep Assocs. 813-595-2834
Ill Downers Grove, Richmar Elctrns. Corp. 312-968-0118
Md Baltimore, Cunningham & Assoc. 301-661-4306
Mass Lynnfield, Genex Assoc. 617-334-3442
Minn Minneapolis, TWC Sls. 612-784-8834
Minn New Brighton, TWC Sales 612-636-1770
NY Commack, Hingston Walsh Assoc. 516-543-0241
NY Larchmont, Hingston-Walsh Assocs. 914-834-5781
NY Pittsford, T-Squared Elctrns 716-248-5005
NY Syracuse, T-Squared Elctrns 315-463-8592
Pa Fort Washington, G.C.M., Inc. 215-646-7535
Wisc Butler, Richmar Elctrns. Corp. 414-781-1730

TERMINAL DATA CORP. OF MD, Dept. EM, 11878 Coakley Circle, Rockville, Md. 20852, Tel: 301-881-7655; Empl.: 8

Local Sales Offices & Reps.
Cal Capistrano Beach, Farrell Assoc. 714-496-0982
Ill Addison, E. Stemm, Inc. 312-279-2442
Mass Wakefield, IMF Sls. 617-245-8900
Mo St. Louis, Midwest Mktg. 314-426-2500
NJ Wayne, G & A Sls. 201-256-8500
NM Albuquerque, Mountaintek 505-294-1491
Ohio Medina, McShane, Inc. 216-725-4588

TESCOM INSTR. DIV., Dept. EM, 2600 Niagara La. N., Minneapolis, Minn. 55441, Tel: 612-559-9000, Telex: 29-0488; Empl.: 200

Sales Manager: R.V. Aronson

TESTLINE, Dept. EM, 1625 White Drive, Titusville, Fla. 32780, Tel: 305-267-7212, TWX: 510-950-3043; Empl.: 54

Sales Manager: T.J. Simpson

Local Sales Offices & Reps.
Ariz Phoenix, Thorson Co. 602-956-5300
Cal Los Alamitos, Scientific Devices 213-598-7678
Cal Mountain View, Scientific Devices 415-964-4230
Cal San Diego, Scientific Devices 714-279-6642
Cal Westminster, Testline 714-898-2700
Colo Denver, PAR Assoc. 303-355-2363
Fla West Palm Beach, Production Sls. Assoc. 305-689-0575
Ga Atlanta, Teqspec II 404-455-7222
Ill Chicago, Carter Elctrns. 312-585-5485
Ind Indianapolis, Carter Elctrns. 317-293-0696
Kans Overland Park, Carter Elctrns. 913-649-6996
Mass Andover, Testline 617-475-5455
Mass Waltham, W.M. Hague Co. 617-899-5600
Mich Milwaukee, Carter Elctrns 414-464-5555
Mich Plymouth, Micro Sls. 313-459-1670
Minn Minneapolis, Carter Elctrns. 612-559-1976
Mo St. Louis, Carter Elctrns 314-569-1406
NM Sandia Park, Par Assocs 505-881-5000
Ohio Centerville, Micro Sls. 513-433-8171
Ohio Cleveland, Micro Sls. 216-331-0900
Ore Beaverton, Showalter Instrs 503-644-9164
Tex Dallas, Crockett SW 214-251-1776
Tex San Antonio, Ashcraft Assoc. 512-824-7267
Va Bailey's Crossroads, Q. T. Elctrns. 703-671-3570
Wash Bellevue, Showalter Instrs 206-455-4922
Wisc Greendale, Testline 414-529-1104

Local Distributors
Mo St. Louis, Carter Elctrns. 314-569-1406

TEST PROBES, INC., Dept. EM, Box 2113, La Jolla, Cal. 92038

Sales Manager: P. Kraus

TEXAS INSTRUMENTS, Connector Systems, Dept. EM, 34 Forest St., Attleboro, Mass. 02703, Tel: 617-222-2800 ..... p. 2160-2165

Local Sales Offices & Reps.

Ala	Huntsville, Beacon Elctrns.	205-881-5031
Ariz	Phoenix, Shefler Kahn Co.	602-257-9015
Cal	Los Altos, Ewing-Foley Inc.	415-941-4525
Cal	Los Angeles, Universal Comps.	213-641-4255
Cal	San Diego, Earle Assocs	714-278-5441
Colo	Boulder, R. G. Enterprises	303-447-9211
Conn	Milford, Todino Engrg. Sls.	203-874-6643
Fla	Ft. Lauderdale, Beacon Elctrns.	305-971-7320
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Ind	Indianapolis, Mktg. Engrs.	317-546-1523
Kans	Olathe, Rush & West Assocs.	913-764-2700
Mass	Needham Hts., Todino Engrg. Sls.	617-444-7925
Mich	Southfield, Valentine & Assocs	313-559-3680
Mo	Ballwin, Rush & West Assocs.	314-394-7271
NJ	Haddonfield, Sunday-O'Brien	609-429-4013
NJ	West Caldwell, Grimm & Siegel Assoc.	201-575-9300
NM	Albuquerque, Shefler Kahn Co.	505-296-0749
NY	Bowmansville, Ossman Comp. Sls. Corp.	716-681-9700
NY	Kingston, Ossman Comp. Sls. Corp.	914-338-5505
NY	Pittsford, Noeth-Honsinger Assoc.	716-461-4750
NY	Rochester, Ossman Comp. Sls.	716-442-3290
NY	Syracuse, Ossman Comp. Sls. Corp.	315-454-4477
NY	Vestal, Ossman Comp. Sls.	607-785-9949
NC	Charlotte, Beacon Elctrns.	704-525-7412
Ohio	Brunswick, Kimconics Sls.	216-225-6111
Ohio	Dayton, Kimconics Sls.	513-898-1783
Pa	Waterford, Kimconics Sls.	814-796-6556
Tenn	Oak Ridge, Beacon Elctrns.	615-482-2409
Tex	Dallas, Ion Assocs.	214-357-9441
Tex	Houston, Ion Assocs.	713-461-5311
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Local Distributors

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Ariz	Phoenix, Micro Elctrns. Distrs.	602-944-2281
Ariz	Phoenix, R.V. Weatherford	602-272-7144
Cal	Anaheim, R.V. Weatherford Co.	714-547-0891
Cal	El Segundo, T. I. Supply Co.	213-973-2571
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Cal	Irvine, Cramer/Los Angeles	213-771-8300
Cal	Los Angeles, Kierulff L. A.	213-685-5511
Cal	Mountainview, Time Elctrns	415-965-8000
Cal	Palo Alto, Kierulff Elctrns.	415-968-6292
Cal	Palo Alto, R.V. Weatherford Co.	415-493-5373
Cal	Pomona, R.V. Weatherford Co.	714-623-1262
Cal	Sacramento, Dunlap Elctrns	916-442-5801
Cal	San Diego, Cramer/San Diego	714-565-1881
Cal	San Diego, Kierulff San Diego	714-278-2112
Cal	San Diego, R.V. Weatherford Co.	714-278-7400
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Colo	Denver, Kierulff-Denver	303-371-6500
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Fla	Orlando, Cramer/EW Orlando	305-894-1511
Fla	Winter Park, Milgray Elctrns.	305-647-5747
Ga	Atlanta, Cramer/EW Atlanta	404-448-9050
Ga	Doraville, Arrow Elctrns	404-934-2928
Ill	Arlington Heights, T.I. Supply Co.	312-593-7660
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Ill	Chicago, Kierulff	312-640-0200
Ill	Des Plaines, Newark Elctrns.	312-298-1420
Ill	Elmhurst, Semiconductor Specialists Inc.	312-279-1000
Ill	Mt. Prospect, Cramer/Chicago	312-593-8230
Ind	Ft. Wayne, Fort Wayne Elctrns. Supply	219-742-4346
Ind	Indianapolis, Graham Elctrns.	317-635-5453
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Md	Rockville, MS Elctrns.	301-340-6400
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Mass	Dedham, Gerber Radio Supply Co.	617-329-2400
Mass	Newton, Cramer/Inc	617-969-7700
Mass	Waltham, T.I. Supply Co.	617-890-0510
Mass	Woburn, Arrow Elctrns.	617-933-8130
Mass	Woburn, Time Elctrns.	617-935-8080
Mich	Ann Arbor, Arrow Elctrns	313-971-8220
Mich	Detroit, R.S. Elctrns.	313-491-1000
Mich	Farmington, Diplomat Northland	313-477-3200
Minn	Bloomington, Arrow Elctrns	612-887-6400
Minn	Edina, Cramer/Minn.	612-835-5350
Minn	Minneapolis, Newark Elctrns.	612-331-6350
Minn	Minneapolis, Semiconductor Specialists	612-854-8841
Minn	Minneapolis, Ind'l Comps.	612-831-2666
Mo	Kansas City, Semiconductor Specialists	816-452-3900
Mo	St. Louis, Olive Ind. Electrns.	314-863-7800
NH	Manchester, Arrow Elctrns.	603-668-6968
NJ	Camden, General Radio Supply Co.	609-964-8560
NJ	Cherry Hill, Cramer-PA.	609-424-5993
NJ	Clark, T.I. Supply Co.	201-382-6400
NJ	Monachie, Cramer/NJ	201-935-5600
NJ	Moorestown, Arrow/Angus.	609-235-1900
NJ	Rutherford, Kierulff N.J.	201-935-2120
NJ	Saddlebrook, Arrow Elctrns.	201-797-5800
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NY	Buffalo, Summit Dist.	716-884-3450
NY	Farmingdale, Arrow Elctrns.	516-694-6800
NY	Fishkill, Arrow Elctrns	914-896-7530
NY	Freeport, Milgray Elctrns.	516-546-6000
NY	Hauppague, Cramer/L.I.	516-231-5600
NY	Hicksville, Kierulff N.Y.	516-433-5530
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NC	Winston-Salem, Cramer/EW Winston-Salem	919-725-8711
Ohio	Cleveland, Cramer Cleveland	216-248-7740
Ohio	Cleveland, Arrow Elctrns	216-464-2000
Ohio	Dayton, Esco Inc.	513-226-1133
Ohio	Kettering, Arrow Elctrns	513-253-9176
Ore	Portland, Almac/Stroum Elctrns.	503-292-3534
Pa	Pittsburg, Semiconductor Specialists	412-781-8120
Tex	Austin, T.I. Supply Co.	512-454-2531
Tex	Dallas, R.V. Weatherford Co.	214-243-1571
Tex	Dallas, Quality Comps	214-387-4949
Tex	Dallas, Cramer-Tex	214-661-9300
Tex	Dallas, T.I. Supply Co.	214-238-6925
Tex	Houston, T.I. Supply Co.	713-785-4800
Tex	Houston, R.V. Weatherford Co.	713-688-7406
Va	Falls Church, Controlled Distrib.	703-533-3500
Wash	Seattle, Cramer/Seattle	206-763-5755
Wash	Seattle, Almac/Stroum Electrns.	206-763-2300
Wash	Seattle, R.V. Weatherford Co.	206-243-6340
Wash	Tukwila, Kierulff-Seattle	206-763-1550
Wisc	Brookfield, Newark Elctrns.	414-781-2450
Wisc	Mequon, Taylor Elctrns.	414-241-4321
Wisc	Oak Creek, Arrow Elctrns	414-764-6600
For:	Can., Montreal, Que., Cesco Elctrns. Ltd.	514-735-5511
For:	Can., Montreal, Que., Future Elctrns. Corp.	514-735-5775
For:	Can., Ottawa, Ont., Cesco Elctrns. Ltd.	613-729-5118
For:	Can., Ottawa, Ont., Future Elctrns. Corp.	613-232-7757
For:	Can., Quebec City, Que., Cesco Elctrns. Ltd.	418-524-4641
For:	Can., Rexdale Ont., Cramer/Can.	416-675-7820
For:	Can., Scarborough, Ont., Carsten Elec. Ltd.	416-751-2371
For:	Can., Toronto, Ont., Cesco Elctrns. Ltd.	416-661-0220
For:	Can., Toronto, Ont., Future Elctrns. Corp.	
For:	Can., Vancouver, B.C., RAE Elctrns.	604-687-2621
For:	Can., Willow Dale, Ont., Electrosonic	416-247-2171
For:	Can., Vancouver, B.C., Varah's Ltd.	604-873-3211

TEXAS INSTRUMENTS CONTROL PRODS. DIV., Dept. EM, 34 Forrest St., Attleboro, Mass. 02703, Tel: 617-222-2800, TWX: 710-346-0566 92-7708

Sales Manager: B. Haun

Local Sales Offices & Reps.

Cal	El Segundo	213-973-2571
Cal	Sunnyvale	408-732-1840
Fla	Ft. Lauderdale	305-733-3300
Fla	Winter Park	305-644-3535
Ill	Arlington Hgts.	312-640-2985
Ind	Fort Wayne	219-424-5174
Ind	Indianapolis	317-248-8555
Ky	Louisville	502-451-2920
Md	Timonium	301-252-1740
Mass	Attleboro	617-222-2800
Mich	Kalamazoo	616-327-6877
Mich	Southfield	313-353-0830
Mich	Tecumsch	517-423-8559
Minn	Edina	612-835-3628
Mo	St. Louis	314-569-0801
NJ	Clark	201-574-9800
NY	East Syracuse	315-463-9291
NC	Charlotte	704-527-0930
Ohio	Cleveland	216-464-2990
Ohio	Dayton	513-258-3877
Ohio	Sidney	513-498-3299
Tenn	Brentwood	615-373-5190
Tex	Dallas	214-238-6901
Tex	Houston	713-776-6511
Va	Richmond	804-643-0530
Wisc	Brookfield	414-786-3346

TEXSCAN CORP., Dept. EM, 2446 N. Shadeland Dr., Indianapolis, Ind. 46219, Tel: 317-357-8781, TWX: 272110, 810-341-3184; FSC No.: 23042; Empl.: 180 ..... p. 2830

Sales Manager: R. Shevlot

Local Sales Offices & Reps.

Ariz	Phoenix, Cleveland	602-944-4679
Cal	Los Angeles, R.F. Assocs.	213-478-1586
Cal	Palo Alto, R.F. Assocs.	415-494-3331
Colo	Aurora, Cleveland Colo.	303-751-3252
Fla	Orlando, Truex Assoc.	305-859-2160
Ga	Atlanta, Spartech	404-432-3644
Haw	Honolulu, Aloha Assoc.	808-941-1574
Ill	North Brook, E.I.A.	312-271-3774
Ind	Indianapolis, E.I.A.	317-257-7231
Mass	South Chelmsford, Independent Mktg. Reps	617-256-8251
Mich	Detroit, Micro Sls.	313-482-1229
NJ	Dover, PRW Corp.	201-366-9421
NJ	Hazlet, Mer-Mon Elctrns.	201-229-3172
NM	Albuquerque, Cleveland Assoc.	505-266-5594
NY	Bayside, R. Diamond	212-423-7330
Ohio	Cleveland, Micro Sls.	216-734-7452
Ohio	Dayton, Micro Sls.	513-433-8171
Tex	Dallas, Airep Elect.	214-827-2120
Va	Baileys Crossroads, Q.T. Elect.	703-671-4357
Va	Falls Church, Sci-Rep	703-573-8787
Wash	Seattle, Jon Jolly	206-938-4166

TEXSCAN MICROWAVE, Dept. EM, 2446 N. Shadeland, Indianapolis, Ind. 46219, Tel: 317-357-8781, TWX: 271-2110, 810-341-3184; FSC No.: 23042; Empl.: 180

Sales Manager: R. Shevlot

Local Sales Offices & Reps.

Ariz	Phoenix, Cleveland Entprs.	602-944-4679
Cal	Los Angeles, RF Assocs.	213-478-1586
Cal	Palo Alto, RF Assocs.	415-494-3331
Colo	Aurora, Cleveland Colorado	303-751-3252
Colo	Wheatridge, Cleveland Entprs.	
Fla	Orlando, Truex Assocs.	305-859-2160
Ga	Smyrna, Sprartech Assocs.	404-432-3644
Haw	Honolulu, Aloha Assocs.	808-941-1574
Ill	Chicago, Electronic Instr. Assocs.	312-271-3774
Ind	Indianapolis, Electronic Instr. Assocs.	317-257-7231
Mass	South Chelmsford, Independant Mktg. Reps.	617-256-8251
Mich	Detroit, Micro Sls.	313-482-1229
NJ	Dover, PRW	201-366-9421
NJ	Long Branch, Mer Mon Elctrns	201-229-3172
NM	Albuquerque, Cleveland Entprs.	505-266-5594
NY	Bayside, R. Diamond, Inc.	423-7330
Ohio	Centerville, Micro Sls.	513-433-8171
Ohio	Cleveland, Micro Sls.	216-331-0900
Ohio	Cleveland, Micro Sales	216-734-7452
Ohio	Dayton, Micro Sales	513-433-8171
Tex	Dallas, Airep Elctrns	214-827-2120
Va	Annadale, Q.T.	703-941-4242

Local Distributors

For:	Can., Montreal, Que., Hamilton/Avnet Elec.	514-331-6443

TEXTOOL PRODUCTS, INC., Dept. EM, 1410 W. Pioneer Dr., Irving, Tex. 75061, Tel: 214-259-2676; Empl.: 140

Sales Manager: J.S. Stoddart

Local Sales Offices & Reps.

Ala	Huntsville, Tech Rep.	
Ariz	Scottsdale, Hagestad & Co.	602-945-0902
Cal	Cupertino, Bogen & Assoc.	408-257-4461
Cal	La Crescenta, Mulvin & Co.	213-245-1081
Colo	Denver, Electrodyne	303-757-7679
Fla	Indian Rocks Beach, Tech Rep.	813-595-2834

Fla Largo, Tech Rep.
Ill Chicago, IRI Inc. 312-774-6525
Minn Minneapolis, Production Automation Corp. 612-866-5700
Mo Raytown, Production Automation Corp. 816-737-0066
NJ Verona, C.K. Wall Co. 201-746-4832
Wash Seattle, B. Hirsh. 206-783-3423

THALNER ELECTRONIC LABS, INC., Dept. EM, 7235 Jackson Rd., Ann Arbor, Mich. 48103, Tel: 313-761-4506; Empl.: 20

Sales Manager: J. Jackson

Local Sales Offices & Reps.
Cal Chatsworth, Mktg. Specialists 213-341-1471
Cal Hayward, Tech-Rep Assocs. 415-785-4531
Colo Denver, Mile High Mktg. 303-759-5841
Ill Chicago, Ray R. Hutmacher Assocs. 312-631-3248
Mo St. Louis, Rancilio Assocs. 314-842-6443
NH Londondery, Associated Sys. 603-434-0731
Pa Horsham, Video Mktg. 215-343-3000

THERM-O-DISC, INC., Dept. EM, South Main St., Mansfield, Ohio 44907, Tel: 419-756-5911, Telex: 987455; Empl.: 1200

Sales Manager: W.H. Lomax

THERM-O-LAB CORP., Dept. EM, 6940 Farmdale Ave., N. Hollywood, Cal. 91605, Tel: 213-875-0105, Telex: 69-8111; FSC No.: 09152; Empl.: 30

Local Sales Offices & Reps.
Cal Los Altos, Westec Elctrns.
Colo Denver, Electronic Sls.
Ill Chicago, Ash Equip. Co.
Kans Prairie Village, Engineering Svcs. Co.
Minn Lakeville, Caco Co.
Mo St. Louis, Engineering Svcs. Co.
NY Queens Village, L. A. Buscaglia
Ohio Dayton, E. V. Swenson
Pa Media, W. Reeves Assocs.
Tenn Chattanooga, C.H. Cloer & Assoc.

THERMAL AMER. FUSED QUARTZ, Dept. EM, Change Bridge Rd., Montville, N.J. 07045, Tel: 201-334-7770, Telex: 136477; Empl.: 65

Sales Manager: G.A. Miller

THERMALLOY, INC., Dept. EM, 2021 W. Valley View, Dallas, Tex 75234, Tel: 214-243-4321, TWX: 910-860-5542; Empl.: 250 p. 3966

Sales Manager: L. Tucker

Local Sales Offices & Reps.
Ala Huntsville, Interep Assoc. 205-881-3677
Ariz Phoenix, Q.T. Wiles & Assoc. 602-971-6250
Cal Los Angeles, Q.T. Wiles & Assoc. 213-478-0183
Cal Menlo Park, Straube Assocs. 415-321-9050
Cal Tustin, Q.T. Wiles & Assoc. 714-832-4952
Colo Denver, Lindberg Co. 303-758-9033
Fla Clearwater, Dyne-A-Mark 813-441-4702
Fla Ft. Lauderdale, Dyne-A-Mark 305-771-6501
Ga Atlanta, Interep Assoc. 404-394-7756
Ill Elk Grove Village, John G. Twist Co. 312-593-0200
Ind Ft. Wayne, R.O. Whitesell & Assoc. 219-432-5591
Ind Indianapolis, R.O. Whitesell & Assoc. 317-359-9283
Ind Kokomo, R.O. Whitesell & Assoc. 317-453-3592
Iowa Cedar Rapids, Palatine Sls. 319-365-8071
Kans Derby, Palatine Sls. 316-788-0621
Kans Lenexa, Palatine Sls. 913-492-7020
Ky Louisville, R.O. Whitesell & Assoc. 502-897-1569
Mich Grand Rapids, R.O. Whitesell & Assoc. 616-942-5420
Mich Southfield, R.O. Whitesell & Assoc. 313-559-5454
Mich St. Joseph, R.O. Whitesell & Assoc. 616-983-7337
Minn St. Paul, Northport Engrg. 612-698-3841
Mo Hazelwood, Palatine Sls., Inc. 314-895-4577
NH Salem, Sales Engrg Co. 603-893-5521
NJ Cherry Hill, Trinkle Sales 609-795-4200
NM Albuquerque, Lindberg Co. 505-881-1006
NY Jamaica, S-J Assocs. 212-291-3232
NY No. Syracuse, Advanced Comps. Corp. 315-699-2671
NC Charlotte, Over & Over, Inc. 704-527-3070
Ohio Cincinnati, R.O. Whitesell & Assoc. 513-521-2290
Ohio Columbus, R.O. Whitesell & Assoc. 614-888-9396
Ohio Dayton, R.O. Whitesell & Assoc. 513-298-9546
Ohio Middleburg Heights, R.O. Whitesell & Assoc. 216-826-4424
Ore Portland, Earl & Brown Co. 503-245-2283
Pa Pittsburgh, R.O. Whitesell & Assoc. 412-344-7277
Tex Garland, Carter Assoc. 214-276-7151
Tex Houston, Carter Assoc. 713-789-1680
Utah Salt Lake City, Lindberg Co. 801-534-1500
Wash Seattle, Earl & Brown Co. 206-284-1121
Wisc Wauwatosa, John G. Twist Co. 414-475-7755

Local Distributors
Ariz Phoenix, R. V. Weatherford 602-272-7144
Ariz Tempe, G. S. Marshall 602-968-6181
Cal Anaheim, R. V. Weatherford 714-547-0891
Cal Canoga Park, G.S. Marshall 213-999-5001
Cal El Monte, G. S. Marshall 213-686-0141
Cal El Segundo, T. I. Supp. 213-973-2571
Cal Glendale, R. V. Weatherford 213-849-3451
Cal Irvine, G. S. Marshall 714-556-6400
Cal Palo Alto, R. V. Weatherford 415-321-5373
Cal Pomona, R. V. Weatherford 714-623-1261
Cal San Diego, G. S. Marshall 714-278-6350
Cal San Diego, R. V. Weatherford 714-278-7400
Cal San Diego, Moltronics 714-278-5020
Cal South Gate, Moltronics 213-773-6521
Cal Sunnyvale, Intermark Elctrns. 408-738-1111
Cal Sunny Vale, T. I. Supply 408-732-5555
Cal Sunnyvale, G. S. Marshall 408-732-1100
Colo Arvada, G. S. Marshall 303-423-9670
Colo Colorado Springs, D&M Elctrn Supply 303-633-4666
Colo Englewood, R. V. Weatherford 303-761-5432
Conn Hamden, Arrow Elctrns. 203-248-3801
Conn North Branford, G. S. Marshall 203-484-0488
Conn Waterbury, Suburban Supp. 203-757-1251
Fla Ft. Lauderdale, Arrow Elctrns. 305-776-7790
Fla Orlando, Hammond Elctrns. 305-849-6060
Fla Orlando, G. S. Marshall 305-859-1620
Ga Norcross, Lykes Elctrns. 404-449-9400
Ill Arlington Heights, T. I. Supply Co. 312-593-7660
Ill Chicago, Semiconductor Specialists 312-279-1000
Ill Des Plaines, G. S. Marshall 312-298-3700
Ill Elgin, Allied Elctrns. 312-697-8200
Ill Northbrook, Classic Comps 312-272-9650
Ind Evansville, Hutch & Son, Inc. 812-425-7155
Ind Ft. Wayne, Fort Wayne Elctrns. Sup. 219-423-3422
Iowa Cedar Rapids, Deeco 319-365-7551
Kans Wichita, Radio Supply Co. 316-267-5216
Md Gaithersburg, Pioneer Washington Elctrns. 301-948-0710
Mass Burlington, Heilind Elctrns. 617-272-5610
Mass Dedham, Gerber Elctrns. 617-329-2400
Mass Newton, G. S. Marshall 617-965-5115
Mich Farmington Hills, Advent Elctrns. 313-477-1650
Minn Bloomington, Arrow Elctrns. 612-888-5522
Minn Minneapolis, Stark Elctrns. Supp. 612-332-1325
Minn Plymouth, G. S. Marshall 612-559-2211
Mo St. Louis, Olive Electronics, Inc. 314-426-4500
NH Hudson, Heilind Elctrns. 603-883-9536
NJ Clark, T. I. Supp. 201-382-6400
NJ Moorestown, Arrow Angus 609-235-1900
NJ Saddle Brook, Arrow Elctrns 201-797-5800
NM Albuquerque, Intl Elctrns. 505-265-6453
NY Binghamton, Harvey/Federal Elctrns. 607-748-8211
NY Bohemia, Car-Lac Elctrn. Ind. Sls. 516-567-4200
NY Buffalo, Summit Distr. 716-884-3450
NY Farmingdale, G. S. Marshall 516-293-4141
NY Farmingdale, Arrow Electronics 516-694-6822
NY Rochester, Summit Elctrns of Rochester 716-334-8110
NY Rochester, Rochester Radio Supp. 716-454-7800
NC Greensboro, Hammond Elctrns. of Carolina 919-275-6391
NC Raleigh, Southeastern Radio Supply 919-828-2311
Ohio Cleveland, Pioneer-Standard Elctrns 216-587-3600
Ohio Columbus, Elctrns. Mktg. 614-299-4161
Ohio Dayton, Arrow Elctrns. 513-253-9176
Ohio Dayton, Pioneer/Dayton 513-236-9900
Ohio Dayton, ESCO 513-226-1133
Okla Tulsa, Radio, Inc. 918-587-9123
Pa Pittsburgh, Pioneer/Pittsburgh 412-782-2300
SC Greenville, Hammond Elctrns of Carolina 803-233-4121
Tenn Kingsport, Radio Elec. Supp. 615-247-8111
Tenn Nashville, Electra Dist. 615-329-3971
Tex Dallas, R. V. Weatherford 214-243-1571
Tex Dallas, T. I. Supp. 214-238-2011
Tex Dallas, G. S. Marshall 214-233-5200
Tex El Paso, Intl Elctrns 915-778-9761
Tex Ft. Worth, Allied Elctrns. 817-336-5401
Tex Houston, R. V. Weatherford 713-688-7406
Utah Salt Lake City, Standard Supply 801-486-3371
Wash Bellevue, G. S. Marshall 206-883-1084
Wash Seattle, R. V. Weatherford 206-762-4200
Wash Seattle, Radar Elec. 206-282-2511
Wisc Maquon, Taylor Elec. 414-241-4321
Wisc Milwaukee, Marsh Elctrns. 414-475-6000
For: Can. Montreal, Que., Deskin Sls. 514-331-2860
For: Can., Vancouver, B.C., Deskin Sls. 604-324-6331
For: Markham, Ontario, Deskin Sales 416-495-1412

THERMAX WIRE CORP., Dept. EM, 32-02 Linden Pl., Flushing, N.Y. 11354, Tel: 212-939-8300, TWX: 710-582-2551; Empl.: 130

Sales Manager: R. Prusak

Local Sales Offices & Reps.
Ala Huntsville, G. White Assocs. 205-883-9394
Ariz Phoenix, South West Engrg. 602-944-1521
Cal Mtn. View, Sonic Wire Sls. 415-965-4646
Cal Van Nuys, Sonic Wire Sls. 213-781-3490
Colo Denver, West Mark Assocs. 303-433-7181
Fla Pompano Beach, Varrelman-Gorman Co. 305-971-0900
Fla Winter Park, Varrelman-Gorman Co. 305-425-1611
Ill Chicago, Dearborn Wire Co. 312-696-1000
Md Glen Arm, Glen White Assocs. 301-252-6360
Mass Clinton, F. J. Coleman Co. 617-368-0116
Mich Grand Rapids, Thies Assocs. 616-457-2052
Minn Edina, Wagner Components 612-941-6310
Mo St. Charles, Buckman 314-724-6690
NJ Dover, V & G Co. 201-992-2505
NJ Livingston, Varrelman-Gorman Co. 201-992-2505
NC Raleigh, G. White Assoc. 919-787-7016
Ohio Cinncinnati, A.C. Wahl Co. 513-821-3270
Tenn Johnson City, G. White Assoc. 615-928-0184
Tex Dallas, United Components 214-324-1448
Va Lynchburg, G. White Assoc. 804-846-4624
Wash Bellevue, D. Smith Sls. 206-633-3160

THERMO ELEC. CO., INC., Dept. EM, 109 Fifth St., Saddle Brook, N.J. 07662, Tel: 201-843-5800, TWX: 710-990-5108; Empl.: 350

Sales Manager: J.L. Baldanza

Local Sales Offices & Reps.
Cal North Hollywood, Thermo Elc. 213-765-5276
Cal San Francisco, Thermo Elec. 415-254-0990
Colo Denver, Ross Equipment Co. 303-759-4215
Ga Atlanta, Thermo Elec. 404-451-3733
Ill Hinsdale, Thermo Elec. 312-325-2840
Ind Indianapolis, Thermo Elec. Enterprise 9508
Ky Louisville, Thermo Elec. Enterprise 9510
La Baton Rouge, Alford, Woods & Childs 504-275-5480
Mass Norwood, Thermo Elec. 617-769-2370
Minn Wayzata, Yukon Sales Assoc. 612-473-3274
NJ Fair Lawn, Thermo Elec. 201-791-9683
NY New York, Thermo Elec. 212-564-2560
NY Rochester, Thermo Elec. 716-377-4632
Ohio Cincinnati, Thermo Elec. Enterprise 9510
Ohio Cleveland, Thermo Elec. 216-433-4510
Ohio Columbus, Thermo Elec. Enterprise 9510
Pa Fort Washington, Arobone & Cline 215-628-9292
Tex Dallas, Thermo Elec. 214-352-7778
Tex Houston, Thermo Elec. 713-664-5466
Va Richmond, Arobone & Cline 804-643-7373
Wash Bellevue, Antec Corp. 206-454-2442
WVa Charleston, Process Instr. Equip. Co. 304-344-2337

THERMO SYSTEMS, INC, See TSI, Inc

THERMOELECTRICS, See Borg-Warner Thermoelectrics.

THERMOMETRICS, INC., Dept. EM, 808 US Hwy No. 1, Edison, N.J. 08817, Tel: 201-287-2870; Empl.: 85

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THERMOSEN, INC., Dept. EM, 375 Fairfield Ave., Stamford, Conn. 06904, Tel: 203-324-6125; FSC No.: 00428

Local Sales Offices & Reps.

Cal	Montebello, Tucul Engrg. Co.	213-728-7397
Cal	San Carlos, Electronic Engrg. Assoc.	415-593-2189
Colo	Denver, Lindberg Co.	303-758-9033
Mass	Newton, Normell Assocs.	617-969-5478
Minn	Minneapolis, International Sls. Co.	612-831-8423
NJ	Ho-Ho-Kus, D. J. Fisher Co.	201-652-0090
NM	Albuquerque, Lindberg Co.	303-758-9033
Ohio	Cincinnati, John O. Olsen Co.	513-922-2176
Ohio	Cleveland, John O. Olsen Co.	216-752-5444
Ore	Portland, Syscom	503-644-2505
Pa	Glenside, Elcom, Inc.	215-885-1715
Tex	Dallas, John B. Guenther, Inc.	214-691-8500
Tex	Houston, John B. Guenther, Inc.	713-568-0232
Utah	Salt Lake City, Lindberg Co.	801-534-1500
Vt	Bennington, Magyar Assocs.	802-442-5858

THERMOTECH, See ITT Thermotech.

THERMOTRON CORP., Dept. EM, Kollen Park Dr., Holland, Mich 49423, Tel: 616-392-1492, TWX: 810-292-6164; Empl.: 300

Local Sales Offices & Reps.

Cal	Campbell, Thermotron	408-371-5961
Cal	Chatsworth, Thermotron	213-882-5030
Fla	Orlando, Newco	305-422-7700
Ga	Atlanta, Newco	404-691-6077
Ill	Northfield, Torkelson Assoc	312-446-9085
Ind	Indianapolis, Torkelson Assoc	317-244-7867
Kans	Shawnee Mission, Walter Hickman	913-362-8066
Mich	Royal Oak, Satullo	313-549-3910
Minn	Minneapolis, Torkelson Assoc	612-835-2414
Mo	St Louis, Adelphi	314-821-1232
Neb	Omaha, Walter Hickman	402-571-4600
NY	Merrick, Spacetronics	516-868-1800
Ohio	Cleveland, Satullo	216-486-2800
SC	Florence, Newco	803-669-2988
Tex	Dallas, Thermotron	214-231-3663

THETA INSTR. CORP., Dept. EM, 24 Dwight Pl., Fairfield, N.J. 07006, Tel: 201-227-1700, Telex: 13-8621; Empl.: 85

Sales Manager: R. Kemp

Local Sales Offices & Reps.

Cal	Encino, King-Way Assocs.	213-788-4124
Ill	Des Plaines, Theta Onstr. Corp.	312-297-3525
NJ	Hillsdale, C. B. Assocs.	201-664-6230

THETA-J RELAYS, INC., Dept. EM, 1 De Angelo Drive, Bedford, Mass 01730, Tel: 617-275-2575; Empl.: 12

Sales Manager: A. Mowatt

Local Sales Offices & Reps.

Ariz	Scottsdale, Fryco, Inc.	602-945-3281
Cal	Los Angeles, Corcoran Assocs.	213-823-2425
Cal	Redwood City, Parks & Pruitt Assoc.	415-364-1640
Cal	San Diego, Earle Assoc.	714-278-5441
Colo	Denver, D/Z Assocs	303-934-7392
Conn	Stamford, Francis J. Bigda	203-322-0240
Fla	Jupiter, Cherry Assoc.	305-746-4591
Ind	Frankfort, C-S Elctrn Sls	317-659-1874
Kans	Overland Park, Reese & Assocs.	913-648-7748
Md	Glen Burnie, New Era Sls	301-768-6666
Mass	Boston, R. H. Whitehead Assocs	617-542-7676
Mich	Bloomfield Hills, Enco Mktg.	313-642-0203
Mo	St. Louis, Reese & Assocs.	314-725-5219
NY	Endwell, Net Sls	607-754-1445
NY	Huntington, C.R. Mayer Co.	516-921-7876
NY	Pittsford, Net Sls	716-467-4538
NC	Bethania, Lee Ltd	919-924-8245
Ohio	Dayton, The Lyons Corp.	513-278-0714
Ohio	Highland Hghts, The Lyons Corp.	216-461-8288
Tex	Dallas, Gordon V. Peck Co.	214-783-1011
Tex	Houston, Gordon V. Peck Co.	713-780-2220
Wash	Bellevue, Comtec	206-453-1188
Exp:	CT., Stamford, Deltron Corp.	203-322-7300

THICKFILM INT'L, Dept. EM, 1610 Mt Vernon Ave., Alexandria, VA 22301, Tel: 703-548-3340, TWX: 710-832-0049

Sales Manager: P. Gundotra

Local Sales Offices & Reps.

Mass	N. Andover, Nand Svcs. Co.	617-688-6740
Ore	Beaverton, R & R Assocs.	206-762-7664
Wash	Seattle, R & R Assocs.	503-643-5754

THINCO DIV. HULL CORP., Dept. EM, Davisville Rd., Hatboro, Pa. 19040, Tel: 215-675-5000, TWX: 510-665-6822; Empl.: 20

Sales Manager: H.A. DePalma

THOMAS & BETTS CO., See T & B/Thomas & Betts Co.

THOMAS ELCTRNS., INC., Dept. EM, 100 Riverview Dr., Wayne, N.J. 07470, Tel: 201-696-5200, TWX: 710-988-5836; Empl.: 265

Local Sales Offices & Reps.

Ala	Saber Assocs.	205-534-3387
Cal	Los Altos, Cain-White & Co.	415-948-6533
Cal	Pasadena, A-F Sls. Engrg., Inc.	213-681-5631
Colo	Wheatridge, Waugaman Assocs., Inc.	303-423-1020
Fla	Lighthouse, Saber Assocs.	305-943-3076
Md	Hyattsville, Eastern Comps.	301-577-2925
Mass	Norwood, Stan Pierce, Inc.	617-762-3164
NC	Raleigh, Saber Assocs.	919-834-3961
Ore	Portland, Components West	503-643-5588
Pa	Flourtown, Eastern Comps.	215-836-1616
Tex	Irving, Space Elctrns.	214-251-3636
Wash	Seattle, Components West	206-243-2133
Exp:	Fairfield, N.J., Pantronics, Inc.	201-575-1177
Exp:	N.Y., Far East, Mercantile (KBK)	212-687-8564
Exp:	Teaneck, N.J., Sylvan Ginsbury	201-837-1100

THOMAS & SKINNER, INC., Dept. EM, Box 150-B,, Indianapolis, Ind. 46206, Tel: 317-923-2501, Telex: 02-7335; Empl.: 200

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Cal	Los Angeles, T. & Skinner, Inc.	213-532-0960
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THOMSON-CSF, See Dumont Electron Tubes & Devices Corp.

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THORDARSON MEISSNER, Electronic Ctr., Dept. EM, Mt. Carmel, Ill. 62863, Tel: 618-262-5121, TWX: 510-525-2254; FSC No.: 96256; Empl.: 600
p. 4417-4428

3M CO., see listing under letter "M"

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La	New Orleans, Wm. S. Huey Co.	504-866-6341
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Cal	Pico Rivera, Westrep	213-949-2551
Cal	San Diego, Westrep	714-276-0751
Cal	Santa Clara, Westrep-North	408-984-0350
DC	Washington, D.C., Mechtronics Sls	301-340-2130
Ga	Douglasville, 20th Century Mktg.	404-458-0374
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Kans	Overland Park, PMA Corp.	913-381-0004
Md	Lutherville, Mechtronics Sls	301-340-2130
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NM	Albuquerque, Lindberg Co.	505-881-1006
NC	Winston-Salem, D.G.W., Inc.	991-768-7166
Ohio	Cincinnati, Giesting Assocs.	513-051-7800
Okla	Oklahoma City, Ammon & Rizos	405-373-2748
Tex	Dallas, Ammon & Rizos	214-233-5591
Tex	Houston, Ammon & Rizos	713-781-6240
Utah	Salt Lake City, Lindberg Co.	801-534-1500
Va	Virginia Beach, Mechtronics Sls	301-340-2130
Wash	Seattle, Seatronics, Inc.	206-767-4330
Exp:	N.Y., Mammroneck, Sealectro Corp.	914-698-5600

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TMC SYSTEMS (ARIZ.) INC., See Dale Electronics, Inc

TOBE DEUTSCHMANN LABS., INC., Dept. EM, Box 74, Canton, Mass. 02021, Tel: 617-828-3366, Telex: 92-4427; FSC No.: 21966; Empl.: 55

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Ill	Northfield, Torkelson Assoc.	312-446-9085
Ind	Fort Wayne, Scott Elect.	219-743-1586
Ind	Indianapolis, Scott Elect.	317-897-9976
Ind	Indianapolis, Torkelson Assoc.	317-244-7867
Mass	Concord, Nortech Eng. Sls	617-259-0032
Mass	Westboro, Nortech Eng. Sls.	617-366-9273
Mich	Plymouth, Scott Elect.	313-455-2440
Minn	Minneapolis, Torkelson Assoc.	612-835-2414
Ohio	Cincinnati, Scott Elect.	513-791-2513
Ohio	Cleveland, Scott Elect.	216-291-2600
Ohio	Columbus, Scott Elect.	614-236-8619
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Pa	Pittsburgh, Scott Elect.	412-828-1073
Tex	Garland, Ray-May Assoc.	214-271-0878

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Sales Manager: S. Edward

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Ariz	Tucson, Inland Elec. Supply	602-889-5301
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Cal	San Jose, Quement Elctrns.	408-998-5900
Conn	Danbury, Pilgrim Elctrns.	203-743-4617
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Ga	Atlanta, Specialty Supply	404-873-2521
Ill	Chicago, Joseph Elctrn. Supply	312-622-7766
Ind	Evansville, Hutch & Son	812-425-7201
Ind	Peterburg, Tri State Elec. Supply	812-354-8496
Kans	Wichita, Radio Supply	316-267-5213
Ky	Louisville, P.I. Burks	502-589-3960
La	Lafayette, Ralph's of Lafayette	318-234-4507
Me	Portland, Commercial Distr.	207-275-5644
Md	Bethesda, Empire Elec. Supply	301-656-3300
Mass	Lynn, M/K Sys.	617-599-0550
Mich	Mushegan, Electronic Distr.	616-599-0550
Miss	Meridan, Hooper Elec. Supply	601-693-2668
Mo	St. Louis, Potter Elec.	314-878-4321
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NJ	Hoboken, Atlantic Supply	201-963-4334
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NY	Farmingdale, Gem Elctrns.	516-249-6996
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NY	Syosset, Lafayette Radio Elctrns.	516-921-7100
NC	Greensboro, Carolina Radio Supply	919-275-6391
Ohio	Dayton, K Elctrns.	513-426-1877
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SC	Greenville, Black Elec. Supply	803-233-4142
Tenn	Memphis, Brownell Elec. Distr.	901-332-9254
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Va	Richmond, Meridian Elctrns.	703-355-6521
Wash	Seattle, Pearl Elctrns.	206-622-6200

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TOPAZ ELECTRONICS, Dept. EM, 3855 Ruffin Rd., San Diego, Cal. 92123, Tel: 714-279-0831, TWX: 910-355-1526; FSC No.: 06049; Empl.: 195 p. 3402-3406

Sales Manager: G. Marks

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Cal	Hacienda Heights, Topaz Elctrns	213-696-1455
Cal	La Jolla, Wheelock Assocs	714-454-3473
Cal	Sunnyvale, Lee/Allan Assocs	408-732-2030
Colo	Denver, BFA Corp	303-837-1247
DC	Washington D.C., Compower	202-547-1325
Fla	Orlando, Gentry Assocs	305-894-4401
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Ga	Atlanta, Gentry Assoc.	404-455-1206
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Ill	Arlington Heights, Electron Sls	312-255-7790
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Mich	Farmington Hills, Carter, McCormic & Peirce	313-477-7700
Minn	Minneapolis, White Sls	612-566-6320
Mo	St. Louis, Carter Electrns	314-569-1406
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NH	Nashua, Power Conversion Sys	603-889-8262
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NJ	Englewood Cliffs, Power Conversion & Control	201-569-0015
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Ohio	Fairview Park, Carter, McCormic, Peirce	216-779-5100
Okla	Tulsa, SESCO	918-622-3868
Pa	Monroeville, Carter, McCormic & Peirce	412-372-4415
Pa	Monroeville, Carter, McCormic, Peirce	412-372-4415
Tex	Dallas, SESCO	214-231-9364
Tex	Houston, SESCO	713-688-9656
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Mass	Wilmington, Allied Electrns	617-942-0150
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Mass	Reading, Charles E. Godfrey Co.	617-944-2230

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Cal	Irvine, Celtec Co.	714-577-5021
Cal	San Diego, Celtec Co.	714-279-7961
Cal	Santa Clara, Torin Corp.	408-246-8585
Cal	Santa Clara, I² Inc	408-985-0400
Cal	Sherman Oaks, Celtec Co.	213-990-3440
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Colo	Denver, Electrodyne Inc.	303-759-4409
Conn	West Hartford, Torin Corp.	203-568-3790
Fla	Orlando, Gra-Mar, Inc.	305-894-3351
Ill	Bloomingdale, Torin Corp.	312-893-1307
Ill	Elk Grove Village, Oasis Sls	312-640-1850
Ill	Moline, Torin Corp	309-764-3342
Ind	Rochester, Torin Corp.	219-223-3181
Ky	Louisville, Torin Corp.	502-896-4363
Md	Rockville, Marktron, Inc.	301-762-6210
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NY	Rochester, Torin Corp.	716-586-8750
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Okla	Tulsa, Blair Engrg.	918-747-3100
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Pa	King of Prussia, G.S. Marshall	215-337-3330
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Wash	Bellevue, G.S. Marshall Co.	206-883-1084

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Sales Manager: H. Foland

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Pa	Birchrunville, Jadelectronic Assocs.	215-647-5151
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Tex	Houston, Oeler & Menelaides	713-772-0730
Wash	Bellevue, Western Tech. Sls.	206-641-3900

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TOROTRON, Dept. EM, 255 Washington St., Mt. Vernon, N.Y. 10553, Tel: 914-664-2050; Empl.: 6 p. 2831

TORQ ENGINEERED PRODUCTS, INC., Dept. EM, 32 W. Monroe St., Bedford, Ohio 44146, Tel: 216-232-4100; Empl.: 135

TORQUE SYSTEMS, SUB. ROTRON/EG & G CO., Dept. EM, P.O. Box 588, 225-E. Crescent St., Waltham, Mass. 02154, Tel: 617-891-0230, Telex: 923-424; Empl.: 150 p. 3128

Sales Manager: B. Hainey

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Ga	Atlanta, MacKay, Smith & Assoc.	404-449-7444
Ill	Northbrook, Traco Engineering Co.	312-564-2288
Mich	Troy, Xanthus, Inc.	313-391-3235
NY	Rochester, Sweetco Assocs.	716-225-2383
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Wash Bellevue, Sweo Engrg..... 206-641-6330

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Md Baltimore, W.S. Warrington & Assoc. 301-823-8759
Mass Needham Hgts., N.E. Reps., Inc. 617-449-3034
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NY Albany, H.C. Johnson Agencies 518-456-6667
NY Fayetteville, H.C. Johnson 315-NE 7-9383
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NY Williamsville, H.C. Johnson 716-632-7880
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Ohio Copley, Eljay Assoc. 216-666-3774
Pa Glenshaw, H.C. Johnson Agencies 412-961-0414
Pa Willow Grove, BGR Assocs..... 215-657-3301
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Tex Richardson, Delta Components.. 817-572-1195

TOYO COMM. EQUIP. CO. LTD., Dept. EM, 484 Tsukakoshi 3-Chome Saiwai-Ku, Kawasaki, 210 Japan, Tel: Tokyo 406-3355, TWX: 2423001 TOYOCO J; Empl.: 1800 ..... p. 2374

Sales Manager: N. Takezawa

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Ga Smyrna, B-C Elctrns. Sls..... 404-436-5169
Ill Chicago, Ellinger Sls. 312-763-1570
Kans Shawnee Mission, Maury-Bettis Co. 913-362-0772
Mich Rochester, Webster Assoc. 800-521-2333
Minn St. Paul, Skor..... 612-645-6461
Ohio Cincinnati, Cartwright Comm. 513-984-4220
Tex Dallas, Maynard & Gunn Sls. 214-528-9090
Wash Seattle, Arva/Hudson 206-455-0773
Exp: Hallandale, Fla., EMEC, Inc. 305-925-6366

TRA-CON, INC., Dept. EM, 55 North St., Medford, Mass. 02155, Tel: 617-391-5550; Empl.: 35

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Tex Houston, Puffer Supp. Co. 713-668-9457

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Ohio Dayton, BOCO..... 513-224-0220

TRACOR, INC., Dept. EM, 6500 Tracor La., Austin, Tex. 78721, Tel: 512-926-2800, Telex: 776-414; Empl.: 4,000

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NJ Union, Tracor, Inc. 201-964-1631
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Tex Austin, Targa, Inc. 512-476-1599
Tex Austin, Tracor Instrs. 512-926-2800

Ind'l Instrs. Time & Frequency
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Cal Calabasas, M. Shovlowsky 213-348-3402
Fla Ft. Lauderdale, BCS Assocs..... 305-735-7641
Fla Orlando, BCS Assocs. 305-896-4881
Md Rockville, T E Corp. 301-340-0303
Mass Waltham, Technical Entprs. 617-890-5300
NC Greensboro, BCS Assocs. 919-273-1918
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Wash Seattle, Showalter-Judd, Inc..... 206-624-9020

Medical Instrs.
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Fla Titusville, Tele-Acoustics 305-267-1600
Ga Atlanta, Tracor, Inc..... 404-633-9571
Ga Austell, Telemetrics..... 404-252-1030
Ill Chicago, Audiological Svc. & Supply Co. 312-281-1531
Md Silver Spring, Creighton Assoc... 301-588-8528
Mass Lawrence, Medical Engrg. Assoc. 617-683-8711
Minn Minneapolis, Electro-Medic, Inc. 612-920-4777
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NC Chapel Hill, Monitor Inc. 919-967-2228
Ohio Cincinnati, S.K. Foster Assoc. 513-531-7020
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Tenn Kingsport, Safeco Equip. Co..... 615-246-4164
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Wash Seattle, Safety & Supply Co..... 206-762-8500

Navigation
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Fla Tampa, Promar 813-876-7677
Md Rockville, T E Corp. 301-340-0303

Trak Microwave Corp., Dept. E8, Dept. EM, 4726 Eisenhower Blvd.,, Tampa, Fla. 33614, Tel: 813-884-1411, Telex: 52827; FSC No.: 32533; Empl.: 145 ..... p. 3064,3065

Sales Manager: T.L. Roberts

Local Sales Offices & Reps.
Ala Huntsville, Synergetic Representatives, Inc 205-883-6483
Ariz Tempe, Argus Sales 602-967-8709
Cal Los Angeles, McDougall/McLaughlin Co. 213-477-8556
Cal Mountain View, Weil & Disman Assocs. 408-446-0746
Cal Mountain View, Weil & Disman Assoc. 415-965-4300
Fla Largo, Synergetic Representatives 813-596-5331
Ga Atlanta, Magaro & Associates 404-252-6609
Ind Ft. Wayne, TX Sales, Inc..... 219-489-4447
Iowa Cedar Rapids, J.R. Sls. Engrg. .. 319-393-2232
Md Conowingo, M. Lader Company 301-272-7040
Mass Andover, Bee Assoc..... 617-475-2124
Minn Minneapolis, Deerland Distributors, Inc. 612-331-6433
Mo Bridgeton, Dy-Tronix, Inc. 314-731-5799
NY Liverpool, R&D Assocs. 315-622-2350
NY Tuckahoe, ASCOR Elctrns., Inc. 914-779-8110
Pa Lafayette Hill, M. Lader Co..... 215-825-3177
Tex Dallas, Cain & Co..... 214-233-6809
Utah Salt Lake City, Monarch Distributing & Representing Co. 801-226-9617
Va Woodbridge, M. Lader Co. 703-494-3321
Wash Seattle, Datacom Assocs. 206-285-2525
Exp: Conn., Stamford, Dage Corp. 203-324-3123

TRAK SYSTEMS, Div. TRAK Microwave Corp., Dept. EM, 4722 Eisenhower Blvd., Dept. E8, Tampa, Fla. 33614, Tel: 813-884-1411, Telex: 52-827; FSC No.: 11165; Empl.: 42 ..... p. 1668-1671

Sales Manager: Tom Roberts

Local Sales Offices & Reps.
Cal Los Angeles, Mac Dougall/McLaughlin Co. 213-477-8556
Cal Mountain View, Weil & Disman .. 415-965-4300
Fla Largo, Synergetic Reps. 813-596-5331
Ga Atlanta, Magaro & Assocs. 404-252-6609
Ill Mt. Prospect, Cain & Co. 312-253-3578
Md Ashton, Blackwood Assocs 301-924-2858
Mo Hazelwood, Dy-Tronix Inc. 314-731-5799
Mo Independence, Dy-Tronix Inc..... 816-737-1100
NJ North Plainfield, Brady Co..... 201-753-7988
NY Liverpool, R & D Assocs. 315-622-2350
Ohio Lancaster, Cain & Co. 614-654-4800
Pa Lafayette Hill, M. Lader Co..... 215-825-3177
Tex Dallas, Cain & Co..... 214-233-6809
Exp: Stamford, Conn., Dage Corp. 203-324-3123

TRAM CORP., Dept. EM, Box 187, Winnisquam, N.H. 03289, Tel: 603-524-0622, TWX: 510-298-1125; Empl.: 100

Sales Manager: R. O'Callaghan

Local Sales Offices & Reps.
Cal Van Nuys, M. Roth Sls. 213-989-3738
Colo Colorado Springs, Norris & Co... 303-576-3324
Ill Skokie, M. Berman Sls. 312-675-3740
Ind Indianapolis, L. M. Devoe Co. 317-257-1227
Minn Bloomington, A.R. Sls ..... 612-881-623?
Neb Lincoln, Marketing Assocs..... 402-464-5244
Ohio Dayton, Comm Sls 513-698-6218
Pa Mt. Gretna, GWB Assocs. 717-272-3446
Pa Mt. Gretna, G.W.B. Assoc. 717-272-3446
Tex Houston, Ranger Elctrns. 713-529-2812

TRAN SPECTRA INC., Dept. EM, Box 9, Airport Rd., Greenfield, Tenn. 38230, Tel: 901-235-2218; Empl.: 150

Sales Manager: T. M. Smith

Local Sales Offices & Reps.
Ariz Phoenix, H. Premil Sls. Co. 602-939-6787
Cal Los Altos, Schwenin Assocs..... 415-941-3737
Cal Placentia, George Williams & Assocs 714-528-6782
Conn Thomaston, Electro Prods. Sls... 203-235-4040
Fla Jupiter, Brosey Ents. 305-622-6045
Ga Roswell, Electro-Services, Inc. .. 404-993-0389
Ill Palatine, Ray E. Berg Jr. 312-991-3081
Ind Indianapolis, L. M. DeVoe Co. 317-842-3245
Md Chevy Chase, Tyler Griffin Co.... 215-647-1550
Mass Waltham, Electro Prods. Sls..... 617-899-1570
Minn Bloomington, Electronic Sls. Agcy., Inc. 612-884-8291
Mo Lake Lotawana, Lotronics 816-578-4498
NJ Clifton, A. Clarfield 212-757-6454
NY Fairport, RBG Sls. 716-377-1390
Ohio Cleveland, Electro-Com 216-886-2404
Ohio Dayton, Electro-Com..... 513-898-5140
Ore Portland, Electronic Comp. Sls... 503-245-2342
Pa Paoli, Tyler Griffin Co..... 215-647-1550
Tenn Nashville, Electro-Svcs., Inc. 615-373-9362
Tex Dallas, West & Assocs., Inc. 214-661-9400

TRANEX INC., Dept. EM, 1599 Stierlin Rd., Mountain View, Cal. 94043, Tel: 415-968-9292; FSC No.: 17474; Empl.: 130

Local Sales Offices & Reps.
Cal Santa Ana..... 714-835-8684
Colo Colorado Springs..... 303-392-3432

TRANSMED SCIENTIFIC, Dept. EM, 860-C Capitolio Way, San Luis Obispo, Cal. 93401, Tel: 805-541-1103; Empl.: 24

TRANS-MET ENGRG., Dept. EM, 601 S. Palm St., La Habra, Cal. 90631, Tel: 213-691-2266; Empl.: 15

Local Sales Offices & Reps.
Ala Huntsville, Burmette Techno-Metrics 205-837-5860
Cal Laguna Beach, I.N.S.S. 714-979-6680
Cal Redwood City, Marchi Assocs. .. 415-364-3411
Colo Denver, Tessco 303-744-1119
Conn Westport, A. J. Abrams 203-226-3010
Fla Maitland, Wade H. Boggs Sls. Eng. Rep 305-647-2226
Haw Mililani Town, H.C. Burgess & Assocs. 808-623-3118
Ill Chicago, Thermo/Cense 312-792-2760
Minn Minneapolis, Arjay Sls. 612-854-4972
NJ Cinnaminson, Control Equip. 609-829-1447
NJ Springfield, R.J.M. Sls. Co. 201-467-1210
NY East Rochester, Thermal Systems 716-377-1970
NY Syracuse, Thermant Sys of Syracuse 315-458-5202
NC Matthews, W.K. Hile Co..... 704-847-9125
Ohio Brecksville, D & B Engr 216-526-6320
Ohio Cincinnati, G. Drysdale & Assoc 513-528-2200
Pa Pittsburgh, Process Eng 412-561-5050
Tenn Knoxville, Hile Controls..... 615-573-0700
Tex Pasadena, Askco..... 713-472-3688
Va Chester, Hile Controls 804-275-0799
Exp: Conn., New Haven, Masten-Wright Corp 203-288-1636

TRAN-TEC CORPORATION, Dept. EM, Box 1022 Columbus, Neb. 68601, Tel: 402-564-2748; Empl.: 35

Local Sales Offices & Reps.
Cal Redwood City, Woodworth Co.... 415-365-0252
Cal Tustin, Sierra-Pacific Engrg. Co. 714-731-3411
Colo Aurora, Robbins & Assocs. 303-399-6611
Fla Pinellas Park, Russell Assocs. .. 813-526-1134
Ga Atlanta, Russell Assocs. 404-225-8423
Ind Indianapolis, Scott Elctrns, Inc. .. 317-897-9970
Iowa Cedar Rapids, J. VRBIK Co. 319-366-8733
Md Bel Air, Russell Assocs. 301-879-9180
Mass Wakefield, H.C. Jappe Co..... 617-245-9350
NJ Fair Haven, Russell Assocs. 201-747-0600
NY Bay Shore, Russell Assocs..... 516-666-6500
NY Syracuse, Naylor Electric Co. 315-656-2250
Ohio Cleveland, D. Steffen & Assocs. 216-461-8330
Tex Dallas, Russell Assocs. 214-369-3170
Wash Bellevue, Russell Assocs. 206-455-3690

TRANS AMERICAN TRANSFORMER, Dept. EM 142 Peconic Ave., Medford, N.Y. 11763, Tel: 516-654-1880; Empl.: 23

Sales Manager: W. Kolb

TRANS-TECH, Dept. EM, 12 Meem Ave., Gaithersburg, Md. 20760, Tel: 301-948-3800, TWX: 89-8303, 710-828-0549; FSC No.: 14591; Empl.: 47

Sales Manager: E.T. Fleming; *Distributor Manager:* E.T. Fleming

Local Sales Offices & Reps.

Cal	Orange, J.E. Hachten Co.	714-998-6020
Cal	Palo Alto, J.E. Hachten Co.	415-326-1252
Exp:	Md, Gaithersburg, Trans. Tech. International Sls. Corp.	301-948-3800

TRANS-TEK, INC., Dept. EM, Rte. 83, Ellington, Conn. 06029, Tel: 203-872-8351, Telex: 99207; FSC No.: 27109; Empl.: 26

TRANSCO PRODS., INC., Dept. EM, 4241 Glencoe Ave., Venice, Cal. 90291, Tel: 213-822-0800, TWX: 910-343-6469; Empl.: 358

Local Sales Offices & Reps.

Cal	Santa Clara, Ed Galvan	408-249-7772
Fla	Clearwater, Southeastern Comp. Sls.	813-447-1911
Ga	Marietta, John Underhill	404-428-0995
Md	Ellicott City, VPI, Inc.	301-685-4206
NH	Concord, R. C. Bishop	617-891-1683
NY	Bayside, R. L. Diamond inc.	212-423-7330
Ohio	Middletown, W. Tudor Morris	513-423-0332
Pa	Dresher, Joseph Belcher	215-886-4806
Tex	Plano, Ronald B. Patton	214-424-1916

TRANSCON MFG. CO, See Amrad Corp

TRANSDATA INC., Dept. EM, P.O. Box 518, Dublin, Ohio 43017, Tel: 614-889-0350, Telex: 246-686; Empl.: 35

Sales Manager: V.J. Bellisari, Jr.; *Distributor Manager:* V.J. Bellisari, Jr.

Local Sales Offices & Reps.

Ariz	Phoenix, Arizona Sun Sls	602-253-3178
Ark	Little Rock, C. H. Stout	501-374-8201
Cal	Emeryville, Ingalls Assocs	415-658-5622
Cal	Oakland, W. Nott Co.	415-654-3747
Colo	Denver, K.&L. Engrg & Sls	303-759-1115
Fla	Maitland, Rowe Engrg. Sls.	305-834-2700
Fla	St. Petersburg, Rowe Engrg. Sls.	813-522-6317
Ga	Atlanta, E.A. Thornwell, Inc.	404-351-6535
Ill	Glen Ellyn, J. T. Becker Assoc.	312-858-1911
Ind	Indianapolis, Utility & Indl. Prods.	317-924-3607
La	Baton Rouge, Curtis H. Stout Of Louisiana	504-927-8097
La	New Orleans, C. H. Stout of La.	504-486-3707
La	Shreveport, C. H. Stout of Shreveport	318-425-5485
Mass	Brimfield, E.L. Flowers & Sons	413-245-7922
Mich	Southfield, Lax Assocs	313-357-2366
Minn	Minneapolis, The Mark Co	612-920-1009
Miss	Clinton, C. H. Stout of Mississippi	601-924-7611
Mo	Manchester, Vertec Assocs	314-394-6242
Mo	St. Louis, Electrorep	314-872-7300
NY	Rochester, Canavan-Scanlon Assocs	716-424-1830
NY	Syracuse, Canavan-Scanlon Assocs	315-655-3052
NC	Cary, Fred Woods Agency	919-467-6366
NC	Hickory, Fred Woods Agency	704-328-5932
Ohio	Cincinnati, Lax Assocs	513-771-4411
Ohio	Cleveland, Lax Assocs	216-226-8815
Ore	Portland, Ingalls & Assocs	503-232-7487
Pa	Media, Systems Control Assoc.	215-565-2077
Pa	Pittsburgh, Lax Assocs	412-833-5477
SC	Lexington, Fred Woods Agency	803-356-3738
Tenn	Chattanooga, J.R. Murray Co	615-267-3889
Tenn	Memphis, C. H. Stout of Tenn.	901-362-1616
Tex	Dallas, Gettys-Eads-Adair	214-233-0337
Tex	Houston, Gettys-Eads-Adair	713-781-3005
Va	Ashland, Campbell & Assocs	804-798-4743
Va	Roanoke, Campbell & Assocs, Inc.	703-774-7411

TRANSICOIL, INC., Dept. EM, Worcester, Pa. 19490, Tel: 215-277-1300, TWX: 510-660-0132; Empl.: 175

Sales Manager: P. Schoenacher Off & Govt.

Local Sales Offices & Reps.

Ariz	Scottsdale, Runyon Co.	602-959-6060
Cal	Altadena, Don Murray Entprs.	213-681-5031
Cal	Irvine, Comar Co	714-540-1219
Conn	Enfield, MECO	203-745-9050
Fla	Orlando, Technology Mktg Assoc.	305-857-3760
Ill	Rosemont, P D S Sls.	312-299-2284
Kans	Overland Park, ENSCO-REP, Inc.	913-381-7557
Md	Baltimore, Stemler Assocs., Inc.	301-944-8262
Mass	Reading, M.E.C.O.	617-944-6660
Mo	St. Louis, ENSCO-REP, Inc.	314-567-3935
NJ	Cherry Hill, Stemler Assocs., Inc.	609-966-4070
NJ	Kinnelon, Avionics Engrg. Sales, Inc.	201-838-8105
NY	Buffalo, Bowser & Sapecky Assocs., Inc.	716-839-4170
NY	Manlius, Bowser & Sapecky Assocs., Inc.	315-682-8885
Pa	Warminster, Stemler Assocs.	215-441-0433
Va	Alexandria, Stemler Assoc.	703-548-7818
Wash	Bellevue, W.M. Buehler Co.	206-455-5512
Exp:	Pa., Worcester, Transicoil	215-277-1300

TRANSISTOR DEVICES, Dept. EM, 85 Horsehill Rd., Cedar Knolls, N.J. 07927, Tel: 201-267-1900; Empl.: 298

Sales Manager: J. A. Gilson

Local Sales Offices & Reps.

Ala	Huntsville, Technology Mktg. Assocs.	205-883-7893
Cal	Costa Mesa, FLW Inc.	714-751-7512
Cal	Cupertino, E. Reid Miller	408-257-6927
Fla	Orlando, Technology Mktg Assocs.	305-857-3760
Fla	Pompano Beach, Technology Mktg. Assoc.	305-942-0774
Ill	Elmhurst, Scott Assocs.	312-279-5681
Md	Ellicott City, Dyna-Rep Co.	301-992-4350
Mass	Lexington, E.F. Delfino, Inc.	617-862-1118
NJ	Ridgewood, Hansen Assocs.	201-652-7055
NY	Vestal, Systems Hardware Reps.	607-729-6339
Ohio	Medina, McShane Inc.	216-725-4568
Pa	Fort Washington, GCM Inc.	215-646-7535
Tex	Lewisville, J. Hughes Co.	817-430-1683
Va	Alexandria, Dyna-Rep Co.	703-354-1222
Exp:	New York, N.Y., Singer Products	212-432-1400

TRANSMAGNETICS, INC., Dept. EM, 210 Adams Blvd., Farmingdale, N.Y. 11735, Tel: 516-293-3100, TWX: 510-224-6420; FSC No.: 17755; Empl.: 28 p. 1673

Local Sales Offices & Reps.

Cal	Campbell, Sedillo Co.	408-374-5220

TRANSPARENT CONDUCTORS INC., Dept. EM, 26 Coromar Dr., Box 549, Goleta, Cal. 93017, Tel: 805-968-3561, TWX: 910-334-1180; Empl.: 10

Sales Manager: D. Feldman

Advertisement

Manufacturer of Liquid Crystal Displays featuring Hermetically sealed large area displays for applications such as Changeable Signs, Clocks, Visual Paging Systems, Scoreboards, Remote Readouts and other displays requiring Long Distance and/or Large Audience and/or High Ambient Light Viewing. Quotations for Custom LCD Requirements are invited.

TRANSTECTOR SYSTEMS, Dept. EM, 532 Monterey Pass Rd., Monterey Park, Cal. 91754, Tel: 800-648-3387, Telex: 338647; FSC No.: 30992; Empl.: 27

Sales Manager: F. Honorof; *Distributor Manager:* R. Odenberg

TRAX VIDEO LABS, Dept. EM, 2020 Milvia St., Berkeley, Cal. 94704, Tel: 415-843-0606; FSC No.: 56636; Empl.: 13

Sales Manager: D. Gilblom

Local Sales Offices & Reps.

Cal	Cupertino, Ashby Assocs	415-996-0411
Cal	San Diego, Perspective Meas	714-278-8931
Colo	Denver, Scien Systems	303-623-6447
Conn	Stonington, Elctrn Sls New England	203-443-2646
Ill	Palatine, Joseph Clark Co.	312-358-5095
Mass	Attleboro, Elctrn Sls New England	617-222-4078
NJ	Totowa, HM Holzberg Assocs	201-256-0455
Ohio	Dayton, Ashby Assocs	513-252-5627
Ohio	Lyndhurst, Ashby Assocs	216-461-0826
Tex	Richardson, Arnold Barnes Assocs	214-235-4543
Va	Vienna, Sutter & Co	703-938-0505
Wash	Seattle, Scient Systems	206-783-6888
Exp:	Mass., Cambridge, Techexport	617-661-9424

TRENDAR, Dept. EM, 630 Clyde Ave., Mountain View, Cal. 94040, Tel: 415-965-0350, TWX: 910-379-6573; FSC No.: 53431; Empl.: 65

Sales Manager: D. Harter

Local Sales Offices & Reps.

Ala	Huntsville, BSC Assoc.	205-881-6220
Alas	Anchorage, Harry J. Lang & Assoc.	907-279-5741
Ariz	Scottsdale, Barnhill 3	602-947-7841
Cal	Burbank, ISI Sls Group	213-849-7181
Cal	San Diego, ISI Sls Group	714-278-7752
Cal	Santa Clara, ISI Sls Group	408-244-1505
Colo	Denver, Barnhill 3	303-750-1222
Conn	Glastonbury, IRI Sls Group	203-633-0777
Fla	Orlando, BCS Assoc.	305-896-4881
Haw	Honolulu, EMC Corp	808-847-1138
Ill	Rolling Meadows, CCI Sls. Group	312-398-0850
Ind	Indianapolis, CCI Sls. Group	317-244-2456
Md	Kensington, Mid-Atlantic Sls. Group	301-881-3370
Mass	Waltham, IRI Sls Group	617-890-1600
Mich	Madison Heights, WKM Assoc.	313-588-2300
Minn	Minneapolis, CCI Sls. Group	612-884-4336
Mo	Hazelwood, CCI Sls. Group	314-731-3388
Mo	Kansas City, CCI Sls. Group	816-454-5836
NJ	Clifton, SBM Sls Group	201-778-4040
NM	Albuquerque, Barnhill 3	505-299-7658
NY	Rochester, SBM Sls Group	716-226-1400
NC	Greensboro, BCS Assoc.	919-273-1918
Ohio	Cleveland, WKM Assoc.	216-267-0445
Ohio	Dayton, WKM Assoc.	513-434-7500
Pa	King of Prussia, CCI Sls. Group	215-265-4040
Pa	Pittsburgh, WKM Assoc.	412-892-2953
Tex	Austin, Barnhill 2	512-451-0217
Tex	Houston, Barnhill 2	713-688-9971
Tex	Richardson, Barnhill 2	214-231-2573
Utah	Salt Lake City, Barnhill 3	801-485-8121
Wash	Seattle, ISI Sls Group	206-575-3765

TRG,, Div. of Alpha Inds., Dept. EM, 20 Sylvan Rd, Woburn, Mass. 01801, Tel: 617-935-5150, TWX: 710-393-1236; FSC No.: 53536; Empl.: 350

Sales Manager: D. M. Loger

Local Sales Offices & Reps.

Ala	Huntsville, Gentry Assocs., Inc.	205-534-9771
Cal	Cupertino, Dura Electronic Sales	408-255-2084
Cal	Los Angeles, Cain Technology	213-476-2251
Fla	Orlando, Gentry Assocs., Inc.	305-894-4401
Ga	Atlanta, Gentry Assocs.	404-448-2365
Ill	Elk Grove Village, L. F. Green & Assocs.	312-593-0282
Ind	Indianapolis, L. F. Green & Assocs.	317-293-9827
Kans	Prairie Village, Engrg. Svcs. Co.	913-649-4000
Md	Glen Burnie, Microcomp	
Mich	Detroit, Comtel-Sterling	313-255-1970
Minn	Minneapolis, L. F. Green & Assocs.	612-781-1611
Mo	St. Louis, Engrg. Svcs. Co.	314-997-1515
NY	E. Syracuse, Ossmann Instrs.	315-437-6666
NY	Huntington, CDB Entprs., Inc.	516-692-5200
Ohio	Cleveland, Comtel-Sterling	216-442-8080
Pa	Pittsburgh, Comtel-Sterling	412-922-5720
Tex	Garland, Vector Sls.	214-276-4518
Wash	Renton, S. Wilson Co.	206-226-0650

TRI-COM, INC., Dept. EM, 12216 Parklawn Dr., Rockville, Md. 20852, Tel: 301-770-5585; Empl.: 35

Sales Manager: Lester E. Brown

Local Sales Offices & Reps.

Ala	Huntsville, Currie, Peak & Frazier	205-536-5650
Ariz	Tucson, G. Moore Assocs.	602-795-3176
Cal	Los Angeles, L.L. Stoake	213-370-8251
Cal	San Diego, L.L. Stoakes	714-274-6281
Colo	Boulder, Grady Moore Associates	303-494-0398
Md	Ashton, Blackwood Assocs	301-924-2858
Mass	Wayland, Wayland Engrg. Sls.	617-655-6080
NM	Albuquerque, G. Moore Assocs.	505-292-3322
NY	Melville, Astrorep Inc.	516-423-2266
Tex	Arlington, John T. Houston Associates	817-265-2931

TRI-EX TOWER CORP., Dept. EM, 7182 Rasmussen Ave., Visalia, Cal. 93277, Tel: 209-732-8383; Empl.: 31

Sales Manager: C.C. Blyleven

Local Sales Offices & Reps.

Cal	Los Angeles, Wallace & Wallace	213-747-0401
Cal	Redwood City, Logan Sls.	415-369-6726
Colo	Denver, K–C Marketers	303-733-5561
Conn	Wallingford, Adams-McGregor	203-269-5816
Ga	Atlanta, J.E. Joyner & Assoc.	404-691-1776
Mass	Scituate, Adams-McGregor	617-545-2213
Mich	Rochester, Webster Comms.	800-521-2333
Mo	Kansas City, Nevco Inc.	816-421-1751
NY	Flushing, Bettan Sls.	212-591-7600
NY	New York, P.M. Sales Co	800-448-4511

RI Lincoln, Adams-McGregor 401-726-1300
Tex Dallas, I. Harrison Co..... 214-239-2479
Va Springfield, G. Sly Assocs..... 703-569-1200
Wash Seattle, Merle McLaughlin Mktg 206-743-1161

TRI-TRONICS CO. INC., Dept. EM, 619 Enterprise Drive, Dept. EE, Oak Brook, Ill. 60521, Tel: 312-654-3255; Empl.: 25

Local Sales Offices & Reps.
Ark North Little Rock, Jordan/Marlar/Hale, Inc. 501-378-0421
Cal Alameda, Bes-Co Sls 415-865-5404
Colo Golden, J.F. Hurlbut Co..... 303-279-7796
Conn West Hartford, A. Hatton Assoc. 203-233-3613
Fla Clearwater, J.J. Galleher Co. 813-461-7707
Ill Hinsdale, Dwight Smith & Assoc. 312-323-8900
Iowa Davenport, Volco Co. 319-326-5233
Iowa Des Moines, Volco Co..... 515-283-1650
Kans Shawnee Mission, Walter Hickman Co. 913-362-8066
Mass Norwell, Bordewieck Eng. Sls. Co. 617-659-4915
Mich Saginaw, Dick Von Berg & Assoc. 517-372-5496
Mich Southfield, Fred Gerhke & Assoc. 313-559-5363
Minn Minneapolis, Volco Co. 612-933-6631
Mo St. Louis, Pem Sls. Co..... 314-427-7200
Neb Omaha, Volco Co..... 402-393-5141
NJ Clifton, Faber Assocs..... 201-773-8900
NY Rochester, T.F. Humnicky Assocs. 716-254-3640
NC Charlotte, L.P. Spoon Co. 704-372-3290
Ohio Columbus, Rockford Controls Ohio Inc. 614-231-5890
Ohio Euclid, Rockford Controls Ohio Inc. 216-731-5250
Tenn Memphis, Jordan/Marlar/Hale, Inc. 901-452-7441
Tenn Nashville, Jordan/Marlar/Hale, Inc. 615-361-3006
Tex Dallas, Dwayne Clement & Assoc. 214-341-5860
Utah Salt Lake City, J. F. Hurlbut Co. 801-229-4034
Va Richmond, Virginia Tech. Assoc. 703-266-9654
Wash Seattle, H. M. Denny Co. 206-282-7200
Exp: Conn., Cheshire, Techmark Corp.203-272-3559

TRIAD-UTRAD, Distr Svcs., Dept. EM, 305 N. Briant St., Huntington, Ind. 46750, Tel: 219-356-6500, TWX: 810-333-1532; Empl.: 600 ..... p. 4442-4448

Sales Manager: J. R. Miller

Local Sales Offices & Reps.
Ala Birmingham, Henry W. Phillips Co. 205-967-5248
Alas Anchorage, H.J. Lang & Assocs. 907-279-5741
Ariz Phoenix, Shefler-Kahn Co. 602-257-9015
Ark El Dorado, D. Bellew Sls. Co. 501-863-8325
Cal No. Hollywood, J. Carter 213-980-3450
Cal Redwood City, Logan Sls. Co. .. 415-369-6726
Colo Denver, McLoud & Raymond Co. 303-756-1589
Conn Madison, A&M Elctrn. Reps. 203-421-4242
Fla Bradenton, Hutton-Haskins-Peregoy 813-792-1727
Fla Ft. Lauderdale, Hutto-Hawkins-Peregoy 305-971-5750
Fla Maitland, Hutto-Hawkins-Peregoy 305-831-2474
Ga Rosewll, H. W. Phillips Co..... 404-992-3070
Haw Honolulu, Hawaii Elctrn. Svc..... 808-845-8207
Ill Wilmette, J. Wasserman Assocs. 312-256-3566
Ind Indianapolis, Green-Wissler Sls.. 317-291-2232
Iowa Des Moines, T. L. Dowell, Inc.... 515-225-1620
Kans Overland Park, T.L. Dowell, Inc. 913-648-7373
La Kenner, D. Bellew Sls. Co. Inc... 504-443-3237
Md Catonsville, Pecore Assocs..... 301-744-4434
Mass Needham, A&M Elctrn. Reps. 617-444-8170
Mich Detroit, R.C. Merchant & Co..... 313-535-6000
Mich St. Joseph, R.C. Merchant & Co. 616-983-7378
Minn Minneapolis, C.R. Gibb Co. 612-377-1200
Miss Jackson, Dick Bellew Sls 610-366-6728
Mo St. Louis, T.L. Dowell, Inc. 314-968-4234
NM Albuquerque, Shefler-Kahn Co. Inc. 505-296-0749
NY Oceanside, Artie Wasserman Assoc. 516-536-8666
NY Rochester, Marches, Marsey, Barden 716-544-4300
Ohio Cincinnati, F.E. Kahsar Sls. 513-471-9011
Ohio Hudson, F.E. Kahsar Sls. 216-653-6808
Okla Tulsa, J.Y. Schoonmaker 918-936-1423
Ore Portland, J.J. Backer Co. 503-297-3776
Ore Salem, J. J. Backer Co. 503-362-0717
Pa Abington, Mid-Atlantic Sls. Co. .. 215-657-2815
Tenn Memphis, D. Bellew Sls. Co. 901-365-9437
Tex Dallas, J. Y. Schoonmaker Co... 214-349-1650
Wash Seattle, J.J. Backer Co. 206-285-1300
Exp: Westbury, N.Y., Minthorne Int'l.. 516-334-3303

TRIANGLE MICROWAVE INC., Dept. EM, 9B Great Meadow La, East Hanover, NJ 07936, Tel: 201-884-1423, TWX: 710-986-8202; FSC No.: 53432

Sales Manager: M. Rabinowitz

Local Sales Offices & Reps.
Ala Huntsville, Scientific Devices-SE 205-536-1969
Ariz Scottsdale, Williams Assocs 602-947-4297
Cal Cupertino, Allis Assocs..... 408-252-2883
Cal Los Angeles, RL Components.... 213-823-1048
Colo Denver, Williams Assocs 303-373-4730
Fla Orlando, Scientific Devices-SE .. 305-841-8180
Haw Honolulu, Aloha Assocs 808-941-1574
Ill Chicago, Pivan Engrg 312-539-4838
Kans Prairie Village, Engrg Svcs..... 913-649-4000
Md Silver Springs, Spectro Systems 301-949-8261
Mass Andover, Bee Assocs 617-475-2124
Mich Detroit, Comtel Instrs 313-255-1970
Mo St. Louis, Engrg Svcs 314-997-1515
NM Albuquerque, Williams Assocs.... 505-255-1638
NY Greenvale, Bertram Aaron 516-621-0630
NY Liverpool, R&D Assocs..... 315-457-0100
NY New York, Ad. Auriema 212-938-0930
NC Raleigh, Scientific Devices-SE.... 919-872-7066
Pa Montgomeryville, V.P.I., Inc..... 215-474-3200
Tex Dallas, Airep Elctrns 814-827-2120
Wash Seattle, G.M. Gillett & Assocs.... 206-284-3344

TRIANGLE PWC, Dept. EM, Box 711, New Brunswick, N.J. 08903, Tel: 201-745-5500, TWX: 844426, 710-480-6240

Sales Manager: S. Fishman; W. Daneker

Local Sales Offices & Reps.
Ala Birmingham, J. Gasque & Assoc. 205-879-4167
Cal Los Angeles, H. Kemp 213-723-3687
Cal San Francisco, R. Wallace..... 415-824-8701
Colo Denver, R. Glover 303-934-6550
Fla Tampa, Swanson & Co. 813-621-0808
Ga Atlanta, Berry-Elsberry 404-355-9296
Ill Elk Grove Village, Electri-Agency 312-439-5030
Ind Indianapolis, Lester Sls. 317-783-9251
Iowa Cedar Rapids, Bertsch Elec. Sls. 319-366-7719
Kans Shawnee Mission, Stover & Assoc. 913-649-6600
La Harahan, Mackenroth & Robbins 504-733-7524
Md Baltimore, Downie Turner Buress 301-889-3470
Mich Oak Park, Electrical Matls. 313-541-1650
Minn Minneapolis, Dunn Sls. 612-831-4887
Mo Kirkwood, Martin Elec. Sls. 314-966-8659
NH Bedford, A.J. Barrett 603-472-3672
NJ Milltown, W.F. O'Connor..... 201-828-5454
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NY Port Chester, Leary Assoc. 212-597-2250
NY Rochester, E. Cook 716-865-0179
NC Charlotte, J. Cushman 704-523-3312
Ohio Cincinnati, Goldschmidt Sls..... 513-586-0080
Ohio Cleveland, G. Stofer 216-333-0733
Ore Portland, Shaffer & Nelson 503-234-7437
Pa Upper Darby, McDevitt Iuliucci .. 215-449-8100
RI Cranston, Langelier Co. 401-781-0050
Tenn Memphis, J. Billingsley 901-767-3945
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Conn W. Hartford..... 203-233-7308
Del Wilmington 215-637-2890
Ill Naperville 312-357-5162
Mo Bridgeton..... 314-837-7550
NY W. Babylon 516-248-7340
Ohio London 513-421-3447
Tex Arlington 817-277-0761
Wash Seattle..... 206-363-2644

TRIDAK, INC., Dept. EM, Del Mar Dr., Brookfield, Conn. 06804, Tel: 203-744-3060; Empl.: 12

TRIMM, INC., Dept. EM, 400 W. Lake, Box 489, Libertyville, Ill. 60048, Tel: 312-362-3700; Empl.: 90 ..... p. 2247

Sales Manager: P. Bottorff; *Distributor Manager:* P. Bottorff

Local Sales Offices & Reps.
Cal Palo Alto, JM Assocs..... 415-327-1260
Cal Van Nuys, RF Specialists..... 213-785-0503
Md Kensington, Forti-Austin Assocs. 301-949-1706

TRIO-TECH, INC. OF CALIF., Trio-Tech Int., Dept. EM, 2435 N. Naomi St., Burbank, Calif. 91504, Tel: 213-846-9200, TWX: 910-498-2709; Empl.: 115

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Ariz Scottsdale, Topping Assocs. 602-994-9669
Cal Marina del Rey, Relcom..... 213-822-1187
Cal Solana Beach, Arthur Rock Assocs. 714-755-4703
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Ill Des Plaines, Process Specialties 312-860-2288
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Md Timonium, G. White Assoc. 301-252-6360
Minn Minneapolis, Production Automation 612-884-2426
Mo Grandview, Production Automation 816-763-4155
Mo Hazelwood, Production Automation 314-731-2331
NY Chappaqua, Micrel Assoc. 914-238-4961
NY Lewistown, Watmet, Inc..... 716-285-3595
Pa Colmar, E. L. Assocs. 215-822-2510
Tex Dallas, Production Automation.... 214-620-0227
Tex Dallas, Stu Hamilton Assocs..... 214-350-4344

TRIPLETT CORP., Dept. EM, 286 Harmon Rd., Bluffton, Ohio 45817, Tel: 419-358-5015, TWX: 810-490-2400 ..... p. 2826-2829

Sales Manager: J. Weldy

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Ariz Phoenix, Shefler-Kahn Co. 602-257-9015
Cal Burlingame, Polach & Bensinger 415-697-2525
Cal Inglewood, J. Berman Co., Inc. .. 213-649-6111
Colo Englewood, Shefler-Kahn 303-761-2590
Fla Ft. Lauderdale, Hutto-Hawkins-Peregoy, Inc. 305-971-5750
Fla Maitland, Hutto-Hawkins-Peregoy, Inc. 305-831-2474
Ga Atlanta, Millar Elctrns. 404-261-6160
Haw Honolulu, Kems, Inc. 808-847-1395
Ill Berkeley, G. Petitt Co. 312-449-8000
Ind Ft. Wayne, W. Bieberich Inc. 219-432-2537
Ind New Albany, W. Bieberich Inc. .. 812-945-3187
Kans Overland Park, T. Dowell Inc. 913-648-7373
Md Reisterstown, Massey Assoc. 301-833-2039
Mich Grosse Point Woods, A & D Electronic Sales 313-884-1956
Minn Minneapolis, Heimann Co. 612-861-6051
Mo St. Louis, T.L. Dowell, Inc. 314-968-4234
NJ North Caldwell, Masin Esco Inc. 201-226-2550
NY Rochester, Marchese, Marsey & Barden, Assoc., Inc. 716-544-4300
NY Syosset, Masin Esco Inc. 516-364-0310
NC Raleigh, Millar Elctrns. 919-787-9564
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Ohio Rocky River, Dolfuss-Root..... 216-333-7504
Ore Portland, J.J. Backer Co. 503-297-3776
Pa Media, Snyder & Sterfkovic..... 215-566-5400
Pa Pittsburgh, Dolfuss-Root 412-221-4420
RI Lincoln, Adams-McGregor 401-726-1300
Tex Dallas, Lund & Co. 214-387-4634
Wash Seattle, J.J. Backer Co. 206-285-1300

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Cal Glendale, Western Electronic Supply Corp. 213-246-4861
Cal Los Angeles, Metermaster Div.. 213-685-4340
Cal Los Angeles, E.I.L. Instrs..... 213-685-7020
Cal Palo Alto, Metermaster Div. 415-968-0313
Cal Santa Clara, Dynametron..... 408-246-6535
Cal Sonoma, Schmidt Elec..... 707-938-8416
Colo Denver, Meter-master..... 303-722-5766
Conn Middletown, Mancib Co. 203-346-6646
Fla Orlando, Instr. & Control Div., Brownell-Electro 305-843-6775
Ga Atlanta, Instr. & Control, Div., Brownell-Electro 404-762-5181
Haw Honolulu, Kems, Inc. 808-847-1395
Ill Elk Grove, Vil. Meter-makers..... 312-439-5050
Ill Elk Grove, Vil. Metermaster..... 312-593-8650
Ill Oak Park, Pacific Indicator..... 312-261-1330
Kans Overland Park, Brooks Elec. 913-648-3131
La Harahan, Industrial Inst. Works .. 504-733-8350
Md Elkridge, Sunshine Sc. 301-796-5600
Md Savage, Pyttronic..... 301-792-0780
Md Timonium, E.I.L. 301-252-1260
Mass Burlington, Mancib Co. 617-272-9450
Mich Ferndale, Ram Meter, Inc. 313-398-6767
Minn Minneapolis, Instr. Control 612-336-7740
Mo St. Louis, Ind. Serv. 314-535-5760
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NJ N. Caldwell, Hosica Labs 201-256-7720
NY Clarence, Trott Elctrns..... 716-634-8500

NY L.I.C., Metermod Inst. 212-726-4850
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NC Raleigh, Speed Instr. Div. Owen-Barbot 919-876-4919
Ohio Cleveland, Pioneer/Std. 216-587-3600
Ohio Cleveland, Weschler Elec. 216-251-4609
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Pa Phila., Sunshine Sc..... 215-673-5600
Pa Pittsburgh, E.I.L. 412-731-5230
Pa Pittsburgh, CAM/RPC..... 412-782-3770
Tenn Memphis, Instr. & Control, Div. Brownell-Electro..... 901-332-9254
Tenn Nashville, Inst. & Control, Div. Brownell-Electro 615-889-8230
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Tex Dallas, Ultra Inst. 214-357-0297
Tex Garland, Metermaster..... 214-271-5671
Tex Houston, Quality Inst. 713-524-0528
Tex Houston, Meters & Instrs. Corp. 713-644-1631
Tex Odessa, Whitlock Inst. 915-337-3412
Va Richmond, I.T.R..... 804-275-1431
Wash Seattle, Eicher-Richards 206-523-7888
Wisc Milwaukee, Electro-Mechano 414-272-4050

TRIPP-LITE, Dept. EM, 133 N. Jefferson, Chicago, Ill. 60606, Tel: 312-346-3040

TRIRIDGE CORP., Dept. EM, Box 12420, Pittsburgh, Pa. 15231, Tel: 412-899-2288, TWX: 710-789-3020; FSC No.: 31951; Empl.: 50

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Cal Los Altos, Merrill & Co 408-378-3883
Cal San Diego, Van Gott & Assocs. 714-273-4797
Cal San Gabriel, V. Gott & Assocs... 213-285-2148
Colo Denver, Omega, Ltd..... 303-758-1508
Fla Clearwater, Lawrence Assocs.... 814-443-2698
Ga Atlanta, Electro-Mech Sls Engr. 404-449-6337
Ill Glendale Hts., Trend-Tronics..... 312-963-2210
Mass Reading, C.E. Godfrey Co..... 617-944-2230
Mich Dearborn, Pitcher-Poulin, Inc. 313-582-5450
Minn Minneapolis, Elctrn. Innovators .. 612-884-7471
NY Manhasset, Win-Cor Elctrn. Sls. Corp. 516-627-9474
NC Raleigh, Electro-Mech Sls Engr. 919-782-7586
Tenn Nashville, Electro-Mech Sls Engr.615-256-2516
Tex Garland, Ray-May Assocs..... 214-276-5214
Va Falls Church, Beacon-North..... 703-534-7200

TRIVEX, Dept. EM, 3180 Redhill Ave., Costa Mesa, Cal. 92626, Tel: 714-546-7781, TWX: 910-595-2589; Empl.: 180

Sales Manager: R. Martin

Local Sales Offices & Reps.
NJ Fort Lee 201-461-4712

TRO DYNE CORP., Dept. EM, 900 Corporate Dr., Mahwah, N.J. 07430, Tel: 201-529-1800, TWX: 710-988-2138; FSC No.: 17346

Sales Manager: M. Cuozzo

TROMPETER ELECTRONICS, INC., Dept. EM, 8936 Comanche, Chatsworth, Cal. 91311, Tel: 213-882-1020, TWX: 910-494-1210; FSC No.: 14949; Empl.: 95

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Ariz Phoenix, Aztec 602-944-9185
Cal Los Angeles, Trompeter Elctrns., Inc. 213-882-1020
Cal Menlo Park, Long & Assocs. 415-327-1300
Colo Littleton, Aztec Entprs. 303-795-0250
Conn Milford, Todino Engrg. Sls. 203-874-6643
Fla Orlando, Currie, Peak & Frazier, Inc. 305-855-0843
Ill Chicago, Ropek Cahill Inc. 312-631-0070
Md Silver Spring, Sel-Tronics, Inc..... 301-589-3391
Mass Needham Heights, Todino Engrg. Sls., Inc. 617-444-7925
Minn Minneapolis, Engrg. Prods. Assocs. 612-925-1883
Mo St. Louis, Engineering Svcs. Co. 314-997-1515
NJ Saddlebrook, L & M Assocs. 201-843-8700
NM Albuquerque, Aztec Entprs. 505-255-2440
NY New York, L & M Assocs. 212-243-6155
NC Greensboro, Currie, Peak & Frazier, Inc. 919-273-3040
Ohio Cleveland, Geotronix Mktg. Assoc. 216-526-2535
Ohio Columbus, Geotronix Mktg. Assoc. 614-457-8472
Pa Andalusia, L & M Assocs. 215-639-3100
Tex Austin, Martin, Ziekosky, Browne & Assoc. 512-454-4371
Tex Dallas, Martin, Ziekosky, Browne & Assoc. 214-233-5535
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Sales Manager: L. C. Yager; *Distributor Manager:* L. C. Yager

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Cal Belmont, C. B. Process 415-592-4545
Cal Long Beach, Viets Engrg..... 213-426-2107
Cal San Diego, Cal-Chem Sls. 714-299-9434
Fla Hollywood, Victor Metal Finishing 305-981-1969
Haw Honolulu, C & F Machinery 808-524-1033
Ind Noblesville, F. W. Gill & Assocs. 317-773-8605
Iowa Abilene, Dal Beisel 913-263-2440
Iowa Oskaloosa, Grady Co. 515-673-3130
Kans Mission, Grady Co. 913-262-1231
Mich Southfield, American Envivosales 313-559-6145
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NY Lyons, Finishing Sys..... 315-946-6661
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Ohio Akron, Friess Vacublast 216-836-9011
Okla Oklahoma City, Tri-Mech Co. 405-478-2558
Pa York, Finishing Sys. Co. 717-854-7814
Tex Dallas, Allied Machinery & Supply 214-358-1401
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Va Chesapeake, H. Norton & Co..... 804-482-3734
Wash Seattle, Andrew Sproul Assoc. .. 206-789-3300
Wisc Menomonee Falls, Fritz Engrg. .. 414-251-6590

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Sales Manager: H. Halverson

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Cal Los Alamitos, Scientific Devices 213-598-7678
Cal Mountain View, Scientific Devices 415-964-4230
Cal San Diego, Scientific Devices 714-279-6642
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Fla Orlando, Scientific Devices 305-841-8180
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Ind Indianapolis, Scientific Devices .. 317-783-2111
Kans Shawnee Mission, Scientific Devices 913-362-8700
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Pa Plymouth Meeting, Scientific Devices 215-825-9515
Tex Richardson, Scientific Devices.... 214-231-8106
Va Springfield, Scientific Devices 703-451-6500
Wash Bellevue, Scientific Devices 206-454-0900
Exp: Cal., Pasadena, Kinemetrics, Inc. 213-795-2220

TRUTONE ELCTRNS., INC., Dept. EM, 7315 Fulton Ave., No. Hollywood, Cal. 91605, Tel: 213-875-0423; Empl.: 50

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NC Greensboro, Adams & Assocs. .. 919-272-6838
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Ore Lake Oswego, McMillan Elctrns. 503-636-6257
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Mich Southfield, R. O. Whitesell & Assoc. 313-559-5454
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Va Richmond, TRW Sls. Office 804-288-8334
Wash Bellevue, N. R. Schultz Co. 206-454-0300
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Ala Huntsville, TRW Sls Elctrns. 205-772-9656
Ariz Scottsdale, Q.T. Wiles & Assocs. 602-971-6250

Cal Los Angeles, Q.T. Wiles & Assocs. 213-478-0183
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Ohio Middleburg Hgts., R. O. Whitesell & Assocs. 216-826-4424
Ore Beaverton, N.R. Schultz Co. 503-643-1644
Pa Bala Cynwyd, TRW Sls Off. 215-667-3400
Pa Pittsburgh, R.O. Whitesell & Assocs. 412-344-7277
Tenn Greenville, R.O. Whitesell & Assocs 615-639-6154
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Tex Dallas, TRW Elctrns. 214-387-3030
Tex Houston, TRW Elctrns. 713-772-5541
Utah Salt Lake City, Straube Assocs. 801-322-1828
Va Richmond, TRW Elctrns. 804-288-8334
Wash Bellevue, N.R. Schultz Co. 206-454-0300
Wisc Wauwatosa, J.G. Twist Co. 414-475-7755

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Ala Huntsville, Hall Mark Elctrns. Corp. 205-837-8700
Ariz Phoenix, R. V. Weatherford Co. 602-272-7144
Cal Chatsworth, Westates Elect. 213-341-4411
Cal Gardena, Bell Ind. 213-321-5802
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Cal Sunnyvale, Bell Inds. 408-734-8570
Colo Englewood, R.V. Weatherford Co. 303-761-5432
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Colo Hamden, Arrow Elctrn. 203-248-3801
Fla Ft. Lauderdale, Hall-Mark Elect. 305-971-9280
Fla Ft. Lauderdale, Arrow Elctrn. 305-776-7790
Fla Orlando, Hall-Mark Elect. 305-855-4020
Fla Palm Bay, Arrow Electrn. 305-725-1480
Ga Doraville, Arrow Elctrn. 404-455-4054
Ill Elk Grove Village, Hall-Mark Elect. 312-437-8800
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Mass Burlington, Wilshire Elctrns. 617-272-8200
Mass Woburn, Arrow Electrn. 617-933-8130
Minn Bloomington, Arrow Electrn. 612-887-6400
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Mo Earth City, Hall-Mark Elctrn. 314-291-5350
NJ Cinnaminson, Wilshire Elect/Phil 609-786-8990
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NJ Moorestown, Arrow Electrn. 609-235-1900
NJ Saddlebrook, Arrow Electrn. 201-797-5800
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NY Endwell, Wilshire Electrn/N.Y. 607-754-1570
NY Farmingdale, Arrow Electrn. 516-694-6800
NY Farmingdale, Wilshire Elect/L.I. 516-293-5775
NY Kernersville, Arrow Electrn. 919-996-2039
NY Lynbrook, Peerless Radio 516-593-2121
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NY Rome, Rome Elctrns. Inc. 315-735-2249
NC Raleigh, Hall-Mark Electrn. 919-832-4465
Ohio Columbus, Elctrn. Mktg. 614-299-4161
Okla Tulsa, Hall-Mark Elctrn. 918-835-8458
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Pa Philadelphia, Phila Electrn. 215-568-7400
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Va Charlottesville, Va. Radio Supply 804-296-4184
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Wisc West Allis, Hall Mark Midwest 414-476-1270
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TRW/CINCH CONNECTORS, Electronic Comp. Div. of TRW Inc., Dept. EM, 1501 Morse Ave., Elk Grove Village, Ill. 60007, Tel: 312-439-8800, TWX: 910-222-1796 ..... Inside Back Cover, Vol. 1

Sales Manager: B. Walthall; *Distributor Manager:* A. Coumont

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Cal Mountain View, TRW ECD 415-969-2252
Cal Tustin, G.T. Wiles & Assocs. 714-832-4952
Colo Denver, Straube Assoc. 303-426-0890
Conn Orange, Comtronics Assocs. 203-795-3515
Conn Rowayton, TRW/ECD 203-853-4466
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Fla Orlando, TRW ECD 305-857-3650
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Ind Indianapolis, R.O. Whitesell 317-359-9283
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Mich St. Joseph, R.O. Whitesell & Assocs. 616-270-3180
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Mo St. Louis, J. G. Twist Co. 314-432-2830
Neb Lincoln, J. G. Twist Co. 402-474-5151
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Wisc Wauwatosa, J. G. Twist Co. 414-475-7755

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Alas Anchorage, Yukon Radio/Electronics, Inc. 907-277-1497
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Ariz Phoenix, Kierulff Elctrns. 602-243-4101
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Md Baltimore, Resco/Baltimore..... 301-823-0070
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Mich Livonia, R.S. Elect. Corp. 313-525-1155
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Mich Muskegon, Fitzpatrick Elec. 616-722-6621
Mich Oak Park, Newark Elctrns..... 313-548-0250
Mich Wyoming, Newark Elctrns. 616-241-6681
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Minn Minneapolis, Newark Elctrns..... 612-331-6350
Minn Minneapolis, Stark Elec. Supp. .. 612-332-1325
Minn Plymouth, Marshall Ind. 612-559-2211
Minn St. Paul, Gopher Elctrns. 612-645-0241
Miss Jackson, Ellington Elctrn. Supp. 601-355-0561
Mo Earth City, Hall-Mark Elect. Corp. 314-291-5350
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Mo St. Louis, Olive Ind'l. Elctrns..... 314-426-4500
Mo St. Louis, Van Sickle Radio Elctrns. 314-621-5000
Mont Billings, Elctrn. Supp. Co. 406-252-2197
Neb Lincoln, Scott Elctrn. Supp. 402-434-8308
Neb Omaha, Radio Equip. Co..... 402-341-7700
Nev Las Vegas, Metcalf Elctrns. 702-384-2151
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NJ Camden, General Radio Supp. Co. 609-964-8560
NJ Clark, Tex. Instrs. Supp..... 201-382-6400
NJ Clifton, Wilshire Elect./N.J. 201-340-1900
NJ Hanover, State Elec. Parts Corp. 201-887-2550
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NJ Moorestown, Arrow Elect. 609-235-1900
NJ Pennsauken, Radio Elec. Svc. Co. 609-662-4000
NJ Saddlebrook, Arrow Elctrns. 201-797-5800
NM Albuquerque, Intl. Electronics ..... no phone #
NY Albany, E. E. Taylor Co. 518-489-5600
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NY Buffalo, Summit Dist..... 716-884-3450
NY Commack, Conco Elctrns. Corp. 516-543-8300
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NC Greensboro, Hammond Elec. of Carolina 919-275-6391
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Ohio Dayton, ESCO, Inc. 513-226-1133
Ohio Toledo, Warren Radio Co. 419-248-3364
Ohio Warren, REM Elctrn. Supp. 216-399-2777
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Okla Tulsa, Radio, Inc. 918-587-9123
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Pa Scranton, Pursell Elctrns. 717-346-2011
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Pa York, Rosen Elctrns. 717-843-7881
RI Providence, Wm. Dandreta & Co. 401-861-2800
SC Charleston, Wholesale Radio Supp. 803-747-9672
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SC Greenville, Hammond Elctrns. 803-233-4121
SC Greenville, Dixie Radio Supply .. 803-232-5357
Tenn Kingsport, Radio Elec. Supp. 615-247-8111
Tenn Knoxville, Industrial Elctrns. 615-573-7135
Tenn Knoxville, Bondurant Bros Co.... 615-573-9157
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Tex Abilene, R & R Elctrns. Supp. 915-677-2974
Tex Amarillo, R & R Elctrns. Supp. .. 806-374-2866
Tex Austin, Hall-Mark Elect. Corp. 512-837-2814
Tex Corpus Christi, Wicks Radio Equip. Co. 512-884-8285
Tex Dallas, Hall-Mark Elctrns. Corp. 214-234-7400
Tex Dallas, Tex. Instr. Supp. 214-238-6821
Tex Dallas, Summers Southland Supply 214-748-6533
Tex Dallas, Marshall Industries 214-233-5200
Tex Dallas, R. V. Weatherford Co..... 214-243-1571
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Tex El Paso, Midland Specialties Co. 915-533-9555
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Tex Lubbock, R & R Elctrns. Supp. .. 806-765-7727
Tex McAllen, Rio Radio Supp. 512-682-5224
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Utah Salt Lake City, Standard Supp. Co. 801-486-3371
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Va Arlington, Arlington Elctrn. Wholesalers 703-524-2412
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Va Roanoke, Peoples Radio & TV Supply Co. 703-342-8933
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Wash Seattle, Intercoastal, Inc. 206-763-1820
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WVa Huntington, Elctrn. Supp. Inc..... 304-523-6443
Wisc Milwaukee, Marsh Electrn. 414-475-6000
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Wisc Milwaukee, Elctrn. Expeditors, Inc. 414-228-8100
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Cal Tustin, Q.T. Wiles & Assocs. 714-832-4952
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Kans Prairie Village, J.G. Twist Co. 913-236-4646
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Mich Southfield, R.O. Whitesell & Assocs. 313-559-5454
Mich St. Joseph, R.O. Whitesell & Assocs. 616-270-3180
Minn Minneapolis, J. G. Twist 612-854-4600
Mo St. Louis, J.G. Twist Co..... 314-432-2830
Neb Lincoln, J. G. Twist Co..... 402-474-5151
NM Albuquerque, Straube Assocs. .. 505-265-7759
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Ohio Cincinnati, R.O. Whitesell & Assocs. 513-521-2290
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Ohio Dayton, R.O. Whitesell & Assoc. 513-298-9546
Ohio Middleburg Heights, R.O. Whitesell & Assocs. 216-826-4424
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Cal San Diego, Hamilton/Avnet Elctrns. 714-279-2421
Colo Denver, Hamilton/Avnet Elctrns. 303-534-1212
Conn Georgetown, Hamilton/Avnet Electronics 203-762-0361
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Ill Schiller Park, Hamilton/Avnet Elctrns. 312-678-6310
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Kans Lenexa, Hall-Mark Elctrns. 913-888-4747
Md Baltimore, Hall-Mark Elctrns. Corp. 301-796-9300
Md Hanover, Hamilton/Avnet Elctrns. 301-796-5000
Md Towson, Jaco Electronics
Mass Reading, Jaco Electronics 617-944-8484
Mass Woburn, Hamilton/Avnet Elctrns. 617-933-8000
Mich Livonia, Hamilton/Avnet Elctrns. 313-522-4700
Mich Livonia, Pioneer/Michigan..... 301-525-1800
Minn Bloomington, Hall–mark Elctrns. Corp. 612-884-9056
Minn S. Edina, Hamilton/Avnet Elctrns. 612-941-3801
Mo Earth City, Hall-Mark Elctrns. Corp. 314-291-5350
Mo St. Louis, Hamilton/Avnet Elctrns. Corp. 314-731-1144
NJ Cedar Grove, Hamilton/Avnet Elctrns. 201-200-0800
NM Albuquerque, Hamilton/Avnet Elctrns. 505-765-1500
NY E. Syracuse, Hamilton/Avnet Elctrns. 315-437-2641
NY Happaugue, Jaco Electronics 516-273-5500
NY Rochester, Jaco Elect. J.G. Welsh, Assoc 716-244-1100
NY Rochester, Hamilton/Avnet Corp. 716-422-7820
NY Westbury, Hamilton/Avnet Elctrns. 516-333-5800
NC Raleigh, Hall-Mark Elctrns. Corp. 919-832-4465
Ohio Cleveland, Pioneer/Cleveland 216-587-3600
Ohio Cleveland, Hamilton/Avnet Corp. 216-461-1400
Ohio Dayton, Hamilton/Avnet Elctrns. 513-443-0610
Ohio Dayton, Pioneer/Dayton 513-236-9900
Ohio Worthington, Hall-Mark Elect. Corp 614-846-1882
Okla Tulsa, Hall-Mark Elctrns. Corp. .. 918-835-8458
Pa Feasterville, Jaco Elect./Vista Sales 215-322-7420
Pa Huntington Valley, Hall-Mark Electrns. Corp. 215-355-7300
Pa Pittsburgh, Pioneer/Pittsburgh 412-782-2300
Tex Austin, Hall-Mark Elctrns. Corp. 512-837-2814
Tex Dallas, Hall-Mark Elctrns. Corp. 214-234-7300
Tex Dallas, Hamilton/Avnet Elctrns... 214-661-8661
Tex Houston, Hall-Mark Elctrns. Corp. 713-781-6100
Tex Houston, Hamilton/Avnet Elctrns. 713-780-1771
Utah Salt Lake City, Hamilton/Avnet Elctrns. 801-972-2800
Wash Bellevue, Hamilton/Avnet Elctrns. 206-746-8750
Wisc West Allis, Hall-Mark Elctrns. Corp. 414-476-1270
For: Can., Mississauga Ont., Jaco Electronics 416-274-1269
For: Can., Mississauga, Ont., Hamilton/Avnet Elctrns. 416-677-7432
For: Can., Montreal, Que., Hamilton/Avnet Elctrns. 514-331-6443
For: Can., Ottawa, Ont., Hamilton/Avnet Elctnrs. 613-226-1700

TRW ELECTRONICS, Dept. EM, 10880 Wilshire Blvd., Los Angeles, Cal 90024, Tel: 213-475-6777

TRW HOLYOKE WIRE & CABLE

TRW/HOLYOKE WIRE & CABLE, Dept. EM, 775 New Ludlow Rd., South Hadley, Mass. 01075, Tel: 413-533-3961, TWX: 710-351-6636; Empl.: 410 Inside Back Cover, Vol. 1

Local Sales Offices & Reps.

Ala Huntsville, TRW Sls. Off. 205-772-9656
Ariz Scottsdale, Q. T. Wiles & Assoc. 602-971-6250
Cal Los Angles, Q. T. Wiles & Assoc. 213-478-0183
Cal Menlo Park, Straube & Assoc. .. 415-321-9050
Cal Tustin, Q. T. Wiles & Assoc. 714-832-4952
Colo Denver, Straube & Assoc. 303-426-0890
Conn Orange, Comtronics Assoc. 203-795-3515
Conn Rowayton, TRW Sls. Off. 203-853-4466
Fla Fort Lauderdale, TRW Sls. Off... 305-721-1700
Fla Orlando, TRW Sls. Off. 305-857-3650
Ill Elk Grove Village, Twist & Co. .. 312-593-0200
Ind Fort Wayne, R. O. Whitesell & Assoc. 219-432-5591
Ind Indianapolis, R. O. Whitesell Assoc. 317-359-9283
Ind Kokomo, R. O. Whitesell & Assoc. 317-453-3592
Iowa Cedar Rapids, J. G. Twist Co..... 319-393-8703
Kans Prairie Village, J. G. Twist Co..... 913-236-4646
Kans Wichita, J. G. Twist Co. 316-686-6685
Ky Louisville, R. O. Whitesell..... 502-897-1569
Md Baltimore, TRW Sls Off.
Mass Waltham, TRW Sls. Off. 617-890-3232
Mich Grand Rapids, R. O. Whitesell & Assoc. 616-942-5420
Mich Southfield, R. O. Whitesell & Assoc. 313-559-5454
Mich St. Joseph, R. O. Whitesell & Assoc. 616-270-3180
Minn Minneapolis, J. G. Twist Co. 612-854-4600
Mo St. Louis, Twist & Co. 314-432-2830
Neb Lincoln, J. G. Twist Co..... 402-474-5151
NM Albuquerque, Straube Assocs. .. 505-265-7759
NY Melville, Comtronics 516-249-0505
NY Rochester, TRW Elect. Comps... 716-461-3070
NC Charlotte, TRW Sls. Off. 704-507-1344
Ohio Cincinnati, R. O. Whitesell & Assoc. 513-521-2290
Ohio Columbus, R. O. Whitesell & Assoc. 614-888-9396
Ohio Dayton, R.O. Whitesell & Assoc. 513-298-9546
Ohio Middleburg Heights, R. O. Whitesell & Assoc. 216-826-4424
Ore Beaverton, N. R. Schultz Co..... 503-643-1644
Pa Bala Cynwyd, TRW Sls. Office .. 215-667-3400
Pa Pittsburgh, R. O. Whitesell & Assoc. 412-344-7277
Tenn Greenville, R. O. Whitesell & Assoc. 615-639-6154
Tex Austin, TRW Sls. Off. 512-451-2959
Tex Dallas, TRW Sls. Off. 214-387-3030
Tex Houston, TRW Sls. Office 713-772-5541
Utah Salt Lake City, Straube Assoc... 801-322-1828
Va Richmond, TRW Sls. Off. 804-288-8334
Wash Bellevue, N. R. Schultz Co. 206-454-0300
Wisc Wauwatosa, J. G. Twist Co..... 414-475-7755

TRW IRC NETWORKS

TRW/IRC NETWORKS, Dept. EM, 4222 S. Staples St., Corpus Christi, Tex. 78411, Tel: 512-854-4872 Inside Back Cover, Vol. 1

Sales Manager: B. Wagner

Refer to TRW/IRC Resistors, Phila., Pa. for sales office information.

TRW/IRC RESISTORS, Dept. EM, 2850 Mt. Pleasant St., Burlington, Iowa 52601 Inside Back Cover, Vol. 1

Refer to TRW/IRC Resistors Phila., Pa. for distributor & sales office information.

TRW/IRC RESISTORS, Dept. EM, Greenway Rd., Boone, N.C. 28607, Tel: 704-264-8861, TWX: 510-936-3241 ..... Inside Back Cover, Vol. 1

Sales Manager: Jack Simpson

Refer to TRW/IRC Resistors Phila., Pa. for distributor & sales office information.

TRW IRC RESISTORS

TRW/IRC RESISTORS, Dept. EM, 401 N. Broad St., Philadelphia, Pa. 19108, Tel: 215-923-8230, TWX: 710-670-1392; Empl.: 600 .. Inside Back Cover, Vol. 1

Local Sales Offices & Reps.

Ala Huntsville, TRW Sls. Off. 205-772-9656
Ariz Phoenix, Q.T. Wiles & Assoc. 602-971-6250
Cal Los Angeles, Q.T. Wiles & Assoc. 213-478-0183
Cal Menlo Park, Straube & Assoc. .. 415-321-9050
Cal Tuslin, Q.T. Wiles & Assoc. 714-832-4952
Colo Westminster, Straube & Assoc... 303-426-0890
Conn Orange, C.P.S. 203-795-3515
Conn Rowayton, TRW Sls. Office 203-853-4466
Fla Fort Lauderdale, TRW Sls. Office 305-721-1700
Fla Orlando, TRW Sls. Off. 305-857-3650
Ill Elk Grove Village, Twist & Co. .. 312-593-0200
Ind Fort Wayne, R.O. Whitesell Assoc. 219-359-9283
Ind Indianapolis, R.O. Whitesell 317-359-9283
Ind Kokomo, R.O. Whitesell Assoc... 317-453-3592
Iowa Cedar Rapids, J.G. Twist Co. 319-393-8703
Kans Prairie Village, J. G. Twist & Co. 913-236-4646
Kans Wichita, J.G. Twist Co. 316-686-6685
Ky Louisville, R.O. Whitesell Assoc. 502-897-1569
Md Baltimore, TRW Sls. Off. 301-426-1241
Mass Waltham, TRW Sls. Off. 617-890-3232
Mich Grand Rapids, R.O. Whitesell & Assoc. 616-942-5420
Mich Southfield, R.O. Whitesell..... 313-559-5454
Mich St. Joseph, R.O. Whitesell Assoc. 616-270-3180
Minn Minneapolis, J.G. Twist Co. 612-854-4600
Mo St. Louis, Twist & Co. 314-432-2830
Neb Lincoln, J.G. Twist Co. 402-474-5151
NM Albuquerque, Straube Assocs. .. 505-265-7759
NY Melville, Comtronics 516-741-8966
NY Rochester, TRW Sls. Off. 716-424-2830
NC Charlotte, TRW 714-527-1344
Ohio Cincinnati, R.O. Whitesell & Assoc. 513-521-2290
Ohio Columbus, R.O. Whitesell & Assoc. 614-888-9396
Ohio Dayton, R.O. Whitesell 513-298-9546
Ohio Middleburgh Heights, R. O. Whitesell & Assoc. 216-826-4424
Ore Beaverton, N.R. Schultz Co. 503-643-1644
Pa Bala Cynwyd, TRW Sls. Off. 215-667-3400
Pa Pittsburgh, R.O. Whitesell & Assoc. 412-344-7277
Tenn Greenville, R. O. Whitesell & Assoc. 615-639-6154
Tex Austin, TRW Sls. Off. 512-451-2959
Tex Dallas, TRW Sls. Off. 214-387-3030
Tex Houston, TRW Sls. Office 713-772-5541
Utah Salt Lake City, Straube Assoc./Mountain States 801-322-1828
Va Richmond, TRW Sls. Off. 804-288-8334
Wash Bellevue, N.R. Schultz Co. 206-454-0300
Wisc Wauwatosa, J.G. Twist Co. 414-475-7755

Local Distributors

Cal Gardena, Bell Industries 213-321-5838
Cal Glendale, R. V. Weatherford 213-849-3451
Cal Irvine, Schweber Elctrns..... 714-556-3880
Cal Palm Bay, Arrow 305-725-1480
Cal Palo Alto, R. V. Weatherford 415-493-5373
Cal Palo Alto, Kierulff Elctrns 415-968-6292
Cal Riverside, Elctrn Supply 714-683-7300
Cal Sunnyvale, Bell Industries 408-734-8570
Cal Woodland Hills, Jaco Elctrns..... 213-887-6400
Conn Hamden, Wilshire Elctrns 203-281-1166
Fla Tampa, Lykes Elctrns 813-886-6621
Ga Doraville, Arrow 404-455-4054
Ill Skokie, Bell Industries..... 312-965-7500
Ind Indianapolis, Graham Elctrns..... 317-634-8202
Iowa Cedar Rapids, Deeco 319-365-7551
Md Baltimore, Arrow 301-247-5200
Md Rockville, Wilshire Elctrns 301-340-7900
Mass Burlington, Wilshire Elctrns..... 617-272-8200
Mass Woburn, Arrow..... 617-933-8130
Mich Farmington Hills, Advent Elctrns 213-477-1650
Mich Livonia, RS Elctrns 315-525-1155
Minn Bloomington, Arrow..... 612-887-6400
Mo St. Louis, Olive Ind Elec. 314-426-4500
NJ Clifton, Wilshire Elctrns..... 201-340-1900
NJ Hanover, State Elctrns 201-887-2550
NJ Moorestown, Arrow 609-235-1900
NJ Saddle Brook, Arrow..... 201-797-5800
NY Endwell, Wilshire Elctrns 607-754-1570
NY Farmingdale, Wilshire Elctrns 516-293-5775

NY Farmingdale, Arrow 516-694-6800
NY Hauppauge, Jaco Elctrns 516-273-5500
NY Rochester, Rochester Radio 716-454-7800
NY Vestal, Harvey Elctrns 607-748-8211
NC Kernersville, Arrow 919-996-2039
Ohio Columbus, Electronic Mktg 614-299-4161
Ohio Dayton, Arrow 513-253-9176
Okla Tulsa, Radio, Inc. 918-587-9123
Pa Montgomeryville, Pyttronic Industries 215-643-2850
Pa Philadelphia, Philadelphia Elec. .. 215-568-7400
Tex Dallas, R. V. Weatherford 214-243-1571
Tex Dallas, Marshall Ind. 214-233-5200
Tex El Paso, Int Elctrns 915-778-9761
Tex Fort Worth, Allied Elctrns 817-336-5401
Tex Houston, Marshall Ind. 713-777-9158
Tex Houston, R. V. Weatherford 713-688-7406
Utah Salt Lake City, Calron Elec 801-487-7451
Wash Seattle, Robert E. Priebe Co. 206-682-8242
Wisc Milwaukee, Marsh Elctrns 414-475-6000

TRW LSI PRODUCTS

TRW LSI PRODUCTS, Dept. EM, One Space Pk., Redondo Beach, Cal. 90278, Tel: 213-535-1831, TWX: 910-325-6611

Sales Manager: Don Bullock

Refer to TRW/Cinch Connectors for sales office information.

TRW SEMICONDUCTORS

TRW POWER SEMICONDUCTORS, Dept. EM, 14520 Aviation Blvd., Lawndale, Cal. 90260, Tel: 213-679-4561, TWX: 910-325-6206

Sales Manager: M. Queen

Refer to TRW RF Semiconductors for sales office information.

TRW SEMICONDUCTORS

TRW RF SEMICONDUCTORS, Dept. EM, 14520 Aviation Blvd., Lawndale, Cal. 90260, Tel: 213-679-4561, TWX: 910-325-6206; FSC No.: 01281; Empl.: 1055 ..... Inside Back Cover, Vol. 1

Sales Manager: J. Frazier

Local Sales Offices & Reps.

Ala Huntsville, TRW Elctrn. Comps. 205-772-9656
Ariz Scottsdale, Q.T. Wiles & Assocs. 602-971-6250
Cal Los Angeles, Q.T. Wiles & Assocs. 213-478-0183
Cal Menlo Park, Straube Assocs. 415-321-9050
Cal Tustin, Q.T. Wiles & Assocs. 714-832-4952
Colo Denver, Straube Assocs. 303-426-0890
Conn Orange, C.P.S. Corp. 203-795-3515
Conn Rowayton, TRW Elctrn. Comps. 203-853-4466
Fla Ft. Lauderdale, TRW Electr. Comps. 305-721-1700
Fla Orlando, TRW Elctrn. Comps. 305-857-3650
Ill Elk Grove, J.G. Twist Co. 312-593-0200
Ind Fort Wayne, R.O. Whitesell & Assocs. 219-432-5591
Ind Indianapolis, R.O. Whitesell & Assocs. 317-359-9283
Ind Kokomo, R.O. Whitesell & Assocs. 317-453-3592
Iowa Cedar Rapids, J.G. Twist Co. 319-393-8703
Kans Prairie Village, J.G. Twist Co. 913-236-4646
Kans Wichita, J. G. Twist Co. 316-686-6685
Ky Louisville, R.O. Whitesell Assocs. 502-879-1569
Md Baltimore, TRW Sls. Off. 301-426-1241
Mass Waltham, TRW Elctrn. Comps. .. 617-890-3232
Mich Grand Rapids, R.O. Whitesell & Assocs. 616-942-5420
Mich Southfield, R.O. Whitesell & Assocs. 313-559-5454
Mich St. Joseph, R.O. Whitesell & Assocs. 616-270-3180
Minn Minneapolis, J.G. Twist Co. 612-854-4600
Mo St. Louis, J.G. Twist Co. 314-432-2830
Neb Lincoln, J.G. Twist Co. 402-474-5151
NM Albuquerque, Straube Assocs. .. 505-292-0295
NY Melville, Comtronics 516-249-0505
NY Rochester, TRW Elctrn. Comps. 716-461-3070
NC Charlotte, TRW Elctrn. Comps. .. 704-507-1344
Ohio Cincinnati, R.O. Whitesell & Assocs. 513-521-2290
Ohio Columbus, R.O. Whitesell & Assocs. 614-888-9396
Ohio Dayton, R.O. Whitesell & Assocs. 513-298-9546
Ohio Middleburg Hts., R.O. Whitesell & Assocs. 216-826-4424
Ore Beaverton, N.R. Schultz Co. 503-643-1644
Pa Bala Cynwyd, TRW Elctrn. Comps. 215-667-3400
Pa Pittsburgh, R.O. Whitesell & Assocs. 412-344-7277
Tenn Greenville, R.O. Whitesell & Assoc. 615-639-6154
Tex Austin, TRW Sls. Off. 512-451-2959
Tex Dallas, TRW Elctrns. Comps. 214-387-3030
Tex Houston, TRW Elctrn. Comps..... 713-772-5541
Utah Salt Lake City, Straube Assocs. 801-322-1828
Va Richomnd, TRW Elctrn. Comps. 804-288-8334
Wash Bellevue, N.R. Schultz Co. 206-454-0300
Wisc Wauwatosa, J.G. Twist Co. 414-475-7755

Local Distributors

Ala Huntsville, Hall-Mark Elctrns. 205-837-8700
Ariz Phoenix, Cramer/Ariz. 602-267-7321
Ariz Phoenix, R.V. Weatherford Co. .. 602-272-7144
Cal Anaheim, R.V. Weatherford Co. 714-547-0891
Cal Chatsworth, Westates Elctrn. Corp. 213-341-4411
Cal Gardena, Bell Inds. 213-321-5802
Cal Glendale, R.V. Weatherford Co. . 213-849-3451
Cal Irvine, Cramer/Los Angeles 714-979-3000
Cal Palo Alto, R.V. Weatherford Co. 415-493-5373
Cal Pomona, R.V. Weatherford Co. ... 714-623-1261
Cal San Diego, R.V. Weatherford Co. 714-278-7400
Cal San Diego, Cramer/San Diego .. 714-565-1881
Cal Sunnyvale, Cramer/San Francisco 408-739-3011
Cal Sunnyvale, Bell Inds. 408-734-8570
Cal Woodland Hills, Semiconductor Concepts 213-884-4560
Colo Denver, Cramer/Denver 303-758-2100
Colo Englewood, R.V. Weatherford Co. 303-761-5432
Conn North Haven, Cramer/Conn. 203-239-5641
Fla Ft. Lauderdale, Hall-Mark Elctrns. Corp. 305-971-9280
Fla Hollywood, Cramer/EW Hollywood 305-923-8181
Fla Orlando, Cramer/EW Orlando .. 305-894-1511
Fla Orlando, Hall-Mark Elctrns. Corp. 305-855-4020
Fla Tampa, Lykes Elctrns. 813-886-6621
Ga Norcross, Cramer/EW Atlanta .. 404-448-9050
Ill Elk Grove Village, Hall-Mark Elctrns. Corp. 312-437-8800
Ill Mt. Prospect, Cramer/Chicago .. 312-593-8230
Kans Shawnee Mission, Hall-Mark Elctrns. Corp. 913-888-4747
Md Baltimore, Hall-Mark Elctrns. Corp. 301-796-9300
Md Gaithersburg, Cramer/EW Wash. 301-948-0110
Md Hanover, Cramer/EW Baltimore 301-796-5790
Md Rockville, Wilshire Elctns. 301-340-7900
Md Savage, Pyttronic Inds. 301-792-0780
Mass Burlington, Wilshire Elctrns. 617-272-8200
Mass Newton, Cramer Elctrns. 617-969-7700
Minn Bloomington, Hall-Mark Elctrns. Corp. 612-884-9056
Minn Edina, Cramer/Bonn 612-835-7811
Mo Earth City, Hall-Mark Elctrns. Corp. 314-291-5350
NJ Cherry Hill, Cramer/Pa. 215-923-5950
NJ Cinnaminson, Wilshire Elctrns. 609-786-8990
NJ Clifton, Wilshire Elctrns. 201-340-1900
NJ Moonachie, Cramer/N.J. 201-935-5600
NM Albuquerque, Cramer/N.M. 505-265-5767
NM Albuquerque, R.V. Weatherford Co. 505-842-0868
NY Buffalo, Summit Distr. 716-884-3450
NY East Syracuse, Cramer/Syracuse 315-437-6671
NY Farmingdale, Wilshire Elctrns. 516-293-5775
NY Hauppauge, Semiconductor Concepts 516-273-1234
NY Hauppauge, Cramer/L.I. 516-231-5600
NY Johnson City, Wilshire Electrns. 607-797-1236
NY Rochester, Cramer/Rochester .. 716-275-0300
NY Rochester, Rochester Radio 716-454-7800
NY Rochester, Summit Distr. 716-334-8110
NC Raleigh, Hall-Mark Elctrns. Corp. 919-832-4465
NC Raleigh, Pyttronic Inds. 919-782-6370
NC Winston-Salem, Cramer/EW Winston-Salem 919-725-8711
Ohio Cleveland, Cramer/Cleveland 216-248-8400
Ohio Columbus, Electronic Mktg. Corp. 614-299-4161
Ohio Dayton, Electmic Mktg. Corp. 513-294-0434
Okla Tulsa, Hall-Mark Elctrns. Corp. .. 918-835-8458
Okla Tulsa, Radio Inc. 918-587-9123
Pa Harrisburg, Pyttronic Inds. 717-233-6591
Pa Huntingdon Valley, Hall-Mark Elctrns. Corp. 215-355-7300
Pa Montgomeryville, Pyttronic Inds. 215-643-2850
Pa Philadelphia, Almo Elctrns. 215-698-4000
Pa Pittsburgh, Pyttronic Inds. 412-276-6722
Tex Austin, Hall-Mark Elctrns. Corp. 512-837-2814
Tex Dallas, R.V. Weatherford Co. 214-243-1571
Tex Dallas, Cramer/Tex. 214-661-9300
Tex Dallas, Hall-Mark Elctrns. Corp. 214-231-6111
Tex Houston, R.V. Weatherford Co... 713-688-7406
Tex Houston, Hall-Mark Elctrns. Corp. 713-781-6100
Utah Salt Lake City, Calron Elctrns. .. 801-487-7451
Wash Seattle, R.V. Weatherford Co. 206-243-6340
Wisc West Allis, Hall-Mark Electrns. Corp. 414-476-1270

TRW UTC TRANSFORMERS

TRW/UTC TRANSFORMERS, Dept. EM, 150 Varick St., New York, N.Y. 10013, Tel: 212-255-3500, TWX: 710-581-2722; Empl.: 325 ..Inside Back Cover, Vol. 1

Local Sales Offices & Reps.

Ala Huntsville, TRW Sls Ectrn. Comps. 205-772-9656
Ariz Scottsdale, Q.T. Wiles & Assocs. 602-971-6250
Cal Los Angeles, Q.T. Wiles & Assocs. 213-478-0183
Cal Menlo Park, Straube Assocs. 415-321-9050
Cal Tustin, Q.T. Wiles & Assocs. 714-832-4952
Colo Denver, Straube Assocs. 303-426-0890
Conn Orange, Comtronics 203-795-3515
Conn Rowayton, TRW Sls Elctrns. Comps. 203-853-4466
Fla Fort Lauderdale, TRW Sls Elctrns. Comps. 305-721-1700
Fla Orlando, TRW Sls Ectrn. Comps. 305-857-3650
Ill Elk Grove Village, J. G. Twist Co. 312-593-0200
Ind Fort Wayne, R. O. Whitesell & Assoc. 219-432-5591
Ind Indianapolis, R. O. Whitesell & Assoc. 317-359-9283
Ind Kokomo, R. O. Whitesell & Assoc. 317-453-3592
Iowa Cedar Rapids, J. G. Twist Co. 319-393-8703
Kans Prairie Village, J. G. Twist Co. 913-236-4646
Kans Wichita, J. G. Twist Co. 316-686-6685
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Md Baltimore, TRW Sls. Off. 301-426-1041
Mass Waltham, TRW Elctrn. Comps. .. 617-890-3232
Mich Grand Rapids, R. O. Whitesell & Assoc. 616-942-5420
Mich Southfield, R. O. Whitesell & Assoc. 313-559-5454
Mich St. Joseph, R. O. Whitesell & Assoc. 616-270-3180
Minn Minneapolis, J.G. Twist Co. 612-854-4600
Mo St. Louis, J. G. Twist Co. 314-432-2830
Neb Lincoln, J.G. Twist Co. 402-474-5151
NM Albuquerque, Straube Assocs/Mtn. States 505-265-7759
NY Melville, Comtronic Assocs. 516-249-0505
NY Rochester, TRW Elctrns. Comps. 716-461-3070
NC Charlotte, TRS Sls 704-507-1344
Ohio Cincinnati, R.O. Whitesell & Assocs. 513-521-2290
Ohio Columbus, R.O. Whitesell & Assoc. 614-888-9396
Ohio Dayton, R. O. Whitesell & Assoc. 513-298-9546
Ohio Middleburgh Heights, R. O. Whiteseli & Assoc. 216-826-4424
Ore Beaverton, N.R. Schultz Co. 503-643-1644

Pa Bala Cynwyd, TRW Elctrn. Comps. 215-667-3400
Pa Pittsburgh, R. O. Whitesell & Assocs. 412-344-7277
Tenn Greenville, R. O. Whitesell & Assoc. 615-639-6154
Tex Austin, TRW Sls Elctrn. 512-451-2959
Tex Dallas, TRW Sls Ectrn. Comps. 214-387-3030
Tex Houston, TRW Sls Elctrns. 713-772-5541
Utah Salt Lake City, Straube Assocs./Mtn. States 801-322-1828
Va Richmond, TRW Sls Elctrns. 804-288-8334
Wash Bellevue, N.R. Schultz 206-454-0300
Wisc Wauwatosa, J. G. Twist Co. 414-475-7755

Local Distributors

Ala Huntsville, Hall-Mark 205-837-8700
Ariz Phoenix, R. V. Weatherford 602-272-7144
Cal Anaheim, R. V. Weatherford 714-634-9600
Cal Chatsworth, Westates Electronics 213-341-4411
Cal Gardena, Bell Industries 213-321-5802
Cal Glendale, R. V. Weatherford 213-849-3451
Cal Irvine, Cramer Electronics 714-979-3000
Cal Pamona, R. V. Weatherford 714-623-1261
Cal Riverside, Electronic Supply 714-787-9220
Cal San Diego, R. V. Weatherford 714-278-7400
Cal Sunnyvale, Bell Industries 408-734-8570
Cal Sunnyvale, Cramer Electronics 408-739-3011
Cal Woodland Hills, Rampart Components 213-887-7260
Colo Commerce City, Elmar/Denver 303-287-9611
Colo Denver, Cramer/Denver 303-758-2100
Colo Englewood, R. V. Weatherford 303-761-5431
Fla Ft. Lauderdale, Arrow Electronics 305-776-7790
Fla Miami, Electronic Equipment 305-871-3500
Fla Orlando, Cramer/Orlando 305-894-1511
Fla Orlando, Hall-Mark 305-855-4020
Fla Orlando, Hammond Electronics 305-849-6060
Fla Tampa, Lykes Electronics 813-886-6621
Ga Norcross, Lykes Electronics 404-449-9400
Ga Norcross, Cramer/Atlanta 404-448-9050
Haw Honolulu, Precision Radio Ltd. 808-537-5291
Ill Chicago, Newark Electronics 312-638-4411
Ill Elk Grove Village, Pioneer/Chicago 312-437-9680
Ill Elk Grove Village, Hall-Mark 312-437-8800
Ill Mt. Prospect, Cramer Electronics 312-593-8230
Ill Peoria, Klaus Radio 310-691-4840
Ind Indianapolis, Pioneer/Indianapolis 317-849-7300
Ind Indianapolis, Graham Electronics 317-634-8202
Ind Southbend, Radio Distributing 219-674-9100
Iowa Cedar Rapids, Deeco, Inc. 319-365-7551
Iowa Davenport, Klaus Radio, Inc. 319-323-9761
Kans Shawney Mission, Hall-Mark 913-888-4747
Kans Wichita, Interstate Electronics Supply 316-264-6316
Ky Louisville, P. I. Burks, Co., Inc. 502-589-3960
La New Orleans, Lykes Systems 504-486-5881
Md Baltimore, Hall-Mark 301-621-1685
Md Gaithersburg, Cramer/Washington 301-948-0110
Md Gaithersburg, Pioneer/Washington 301-948-0710
Md Rockville, Wilshire Electronics 310-340-7900
Md Savage, Pyttronic Industries 301-792-7000
Mass Burlington, Wilshire Electronics 617-272-8200
Mass Newton, Cramer Electronics 617-969-7700
Mass W. Newton, A. W. Mayer Co. 617-965-1111
Mass Woburn, Arrow Electronics 617-933-8130
Mass Worchester, R. M. Electronics 617-756-8311
Mich Ann Arbor, Wedmeyer Electronic Supply 313-665-8611
Mich Farmington, Advent Electronics 313-477-1650
Mich Kentwood, R. M. Electronics 616-531-9300
Mich Livonia, R. S. Electronics 313-525-1155
Mich Livonia, Pioneer/Michigan 313-525-1800
Minn Minneapolis, Hall-Mark 612-884-9056
Mo Earth City, Hall-Mark 314-291-5350
Mo Kansas City, Walters Radio Supply 816-531-7015
Mo St. Louis, Van Sickle Radio 314-621-5000
Neb Lincoln, Scott Electronics 402-466-8221
Neb Omaha, J. B. Distributing 402-341-5525
NJ Cinnamenson, Wilshire Electronics 609-786-8990
NJ Clifton, Wilshire Electronics 201-340-1900
NJ Hanover, State Electronics 201-887-2550
NJ Saddle Brook, Arrow Electronics 201-797-5800
NJ Springfield, Federated Purch. 201-376-8900
NY Binghamton, Harvey Radio 607-748-8211
NY Buffalo, Radio Equipment 716-874-2690
NY Buffalo, Summitt Distributing 716-884-3450
NY Farmingdale, Arrow Electronics 516-694-6800
NY Farmingdale, Harrison Electronics 516-293-7990
NY Hauppauge, Cramer Electronics 516-231-5600
NY Hauppauge, Rampart Components 516-273-1111
NY Johnson City, Wilshire Electronics 607-797-1236
NY Lynbrook, Peerless Radio Corp. 516-593-2121
NY Poughkeepsie, Higgins & Sheer 914-471-3510
NY Rochester, Rochester Radio Supply 716-454-7800
NY Troy, Trojan Electronics 518-274-4481
NY White Plains, Westchester Electronics 914-949-2400
NY Woodbury, Harvey Radio 516-921-8700
NC Raleigh, Hall-Mark 919-832-4465
NC Winston-Salem, Cramer 919-725-8711
Ohio Akron, Akron Electronics 216-762-8816
Ohio Cincinnati, United Radio 513-761-4030
Ohio Cleveland, Pioneer/Cleveland 216-587-3600
Ohio Columbus, Electronic Marketing 614-299-4161
Ohio Columbus, Hughes-Peters 641-294-5351
Ohio Dayton, Pioneer/Dayton 513-236-9900
Ohio Solon, Radio & Electronics 216-248-8900
Okla Tulsa, Radio Inc. 918-587-9123
Okla Tulsa, Hall-Mark 918-835-8458
Pa Huntington Valley, Hall-Mark 215-355-7300
Pa Montgomeryville, Pyttronic Industries 215-643-2850
Pa Philadelphia, Almo Electronics 215-698-4000
Pa Pittsburgh, CAM/RPC 412-782-3770
Pa Pittsburgh, Pioneer/Pittsburgh 412-782-2300
Tenn Nashville, Electra Distributing 615-329-3971
Tex Dallas, Hall-Mark 214-231-5101
Tex Dallas, R. V. Weatherford 214-243-1571
Tex Fort Worth, Swieco, Inc. 817-335-6521
Tex Houston, Hall-Mark 713-781-6100
Tex Houston, Harrison Equipment 713-652-4750
Tex Houston, R. V. Weatherford 713-688-9406
Utah Salt Lake City, Calron Electronics 801-487-7451
Wash Seattle, Radar Electric 206-282-2511
Wash Seattle, Liberty Electronics 206-763-8200
Wash Seattle, R. V. Weatherford 206-243-6340
Wisc Milwaukee, Parts Mart Corp. 414-276-4160
Wisc Milwaukee, Marsh Electronics 414-475-6000
Wisc West Allies, Hall-Mark 414-476-1270

TRYGON ELECTRONICS, See Systron Donner, Instr. Div.

TSI INC, Dept. EM, 500 Cardigan Rd., Box 3394, St. Paul, Minn. 55165, Tel: 612-483-0900, Telex: 297-482; Empl.: 100

Local Sales Offices & Reps.

Ala Huntsville, Burnette Techno-Metrics 205-837-5860
Cal San Marino, Dale-Dahl Assocs. 213-682-3417
Cal Walnut Creek, Dale-Dahl Assocs. 415-933-9595
Colo Parker, Technology Mktg. Assoc. 303-841-3435
Conn Bloomfield, Thermo-Systems 203-242-1393
Fla Maitland, Wade Boggs 305-647-2226
Ga Atlanta, Craft Assoc. Co. 404-256-0420
Md Fulton, Gans, Fryling & Pugh Inc. 301-837-6311
NM Albuquerque, Technology Mktg. Assoc. 505-298-4321
Ohio Dayton, Instrumentation Sys. 513-294-2838
Ore Portland, McLaren 503-297-2248
Pa Pittsburgh, Instrumentation Sys. 412-243-1111
Va Arlington, Gans, Fryling & Pugh Inc. 703-527-3262
Wash Bellevue, McLaren 206-454-3400

TT ELCTRNS., INC., Dept. EM, 2214 S. Barry Ave., Los Angeles, Cal. 90064, Tel: 213-478-8224; FSC No.: 07766 p. 2654-2656

Sales Manager: J. F. Sodaro

Local Sales Offices & Reps.

Cal Culver City, Sodaro 213-478-7733

TTS, Dept. EM, 2928 Nebraska Ave., Santa Monica, Cal. 90404, Tel: 213-829-2611, TWX: 910-343-6453, 65-2428; Empl.: 10

Sales Manager: L. Winters

TURNER DIV., Conrac, Dept. EM, 716 Oakland Rd. N.E., Cedar Rapids, Iowa 52402, Tel: 319-366-8311, Telex: 46-4437; Empl.: 600

Local Sales Offices & Reps.

Ala Birmingham, M.F. Taylor Co. 205-853-0336
Cal Culver City, W. Alderson Co., Inc. 213-837-1398
Cal Redwood City, Sinai-Johnson 415-365-6263
Colo Colorado Springs, Norris & Co. 303-576-3324
Fla Orlando, M.F. Taylor Co. 305-851-2566
Ill Winfield, Ashpole Assocs. 312-665-7787
Ind Indianapolis, Kingston Assoc. 317-353-9406
Iowa Des Moines, K-S-W Assocs. 515-279-9235
Md Catonsville, M.F. Taylor Co. 301-747-5718
Md Silver Springs, M.F. Taylor Co. 301-946-3569
Mass Needham, Piper Assocs. 617-449-1144
Mass W. Boylston, Piper Assocs. 617-835-3161
Mich Rochester, R.A. Albrecht Co. 313-652-2520
Minn Edina, M.E.R. Assoc. 612-941-7181
Mo Kansas City, K-S-W Assocs. 816-358-5240
NY Buffalo, R.W. Mitscher Co. 716-633-7970
NY Rockville Centre, Willgold Elctrn. Sls. Corp. 516-764-4022
NC Charlotte, M.F. Taylor Co. 704-537-7201
Ohio Columbus, Weller Elctrns. Sls., Inc. 614-885-7819
Ore Salem, Pacnor Mktg. 503-363-6445
Pa Philadelphia, M.F. Taylor Co. 215-336-2654
Tex Richardson, T.H. Moss Co. 214-783-7522
Wash Seattle, Pacnor Mktg. 206-284-8020

TYCO INSTRUMENT DIV, See Data Instruments, Inc.

TYCO, Saphicon, Dept. EM, 16 Hickory Dr., Waltham, Mass. 02154, Tel: 617-890-2400

Local Sales Offices & Reps.

Cal Atherton, Wadsworth Pacific Mfg. Assoc. 415-321-3619

UBER GRAFIC INSTRS., Dept. EM, Box 4, Palo Alto, Cal. 94302, Tel: 415-327-4732; Empl.: 2

UCE, INC., Dept. EM, 20 N. Main St., Norwalk, Conn. 06854, Tel: 203-838-7509; Empl.: 12

UFAD CORP., Dept. EM, 700 36th St. S.E., Grand Rapids, Mich. 49508, Tel: 616-241-6000; Empl.: 15

Sales Manager: J. Heibel

UID ELECTRONICS DIV., AMF Inc., Dept. EM, 4105 Pembroke Rd., Hollywood, Fla. 33021, Tel: 305-981-1211, TWX: 510-954-9810; Empl.: 350 p. 2248,4262-4267

Sales Manager: E. Gillilan, (Dir, Sls & Mktg)

Local Sales Offices & Reps.

Ala Huntsville, K & E Assocs 205-883-9720
Ariz Scottsdale, Arcom Sls. Co. 602-947-5745
Cal El Segundo, Varigon Assocs. 213-322-1120
Cal Menlo Park, G.R. McKnight Co. 415-325-2844
Cal San Diego, SR Electronics 714-455-0300
Colo Denver, B-5 303-426-0222
Conn Vernon, G-M Assoc. 203-646-4443
Fla Ft. Lauderdale, CBC Elctrns 305-484-7330
Fla Longwood, CBC Elctrns 305-831-5380
Ga Hartwell, K & E Assocs 404-376-5438
Ill Elk Grove Village, J.G. Twist Co. 312-593-0200
Ind Ft. Wayne, R.O. Whitesell & Assoc. 219-432-5591
Ind Indianapolis, R.O. Whitesell & Assoc. 317-359-9283
Ind Kokomo, R.O. Whitesell & Assocs. 317-453-3592
Iowa Cedar Rapids, J.G. Twist Co. 319-393-8703
Kans Prairie Village, J.G. Twist Co. 913-236-4646
Kans Wichita, J. G. Twist Co. 316-686-6685
Ky Louisville, R.O. Whitesell & Assoc. 502-897-1569
Md Baltimore, Micro-Comp 301-247-0400
Mass Framingham, G-M Assocs. 617-872-4871
Mich Grand Rapids, R.O. Whitesell & Assoc. 616-942-5420
Mich Southfield, R.O. Whitesell & Assoc. 313-559-5454
Mich St. Joseph, R.O. Whitesell & Assoc. 616-983-7337
Minn Minneapolis, R-J, Inc. 612-922-1429
Miss Corinth, K & E Assocs 601-287-1471
Mo St. Louis, J.G. Twist Co. 314-432-2830
Neb Lincoln, John G. Twist Co. 402-474-5151
NH Dover, G-M Assoc. 603-742-6800
NJ Haddonfield, TAI 609-854-3011
NM Albuquerque, Arcom Sls. Co. 505-296-0606
NY Buffalo, Quality Comps 716-839-4170
NY Jamaica, S-J Sls. Assocs. 212-291-3230
NY Manlius, Quality Comps 315-682-8881
NC Garner, K & E Assocs 919-772-8454
Ohio Cincinnati, R.O. Whitesell & Assoc. 513-521-2290
Ohio Columbus, R. O. Whitesell & Assoc. 614-888-9390
Ohio Dayton, R. O. Whitesell & Assoc. 513-298-9540
Ohio Middleburg Heights, R. O. Whitesell & Assoc. 216-826-4420
Ore Portland, Electronic Sources 503-292-0700
Pa Pittsburgh, R. O. Whitesell & Assoc. 412-344-7270
RI Narragansett, G-M Assocs. 401-789-1350
Tenn Greeneville, R. O. Whitesell & Assoc. 615-639-6150
Tex Dallas, ION Assocs 214-357-9440

Tex Houston, Allied Comps. 713-960-1962
Tex Houston, ION Assocs 713-461-5311
Utah West Bountiful, B-5 Inc. 801-292-8991
Wash Seattle, Electronic Sources 206-453-0800
Wisc Wauwatosa, J.G. Twist 414-475-7755

Local Distributors
Ala Huntsville, Powell Elctrns. 205-539-2731
Cal Hawthorne, Electro-Sonic Compts. 213-679-9881
Cal Lakeside, Mouser Electrical Corp. 714-449-2220
Cal Los Angeles, Elec. Switches 213-660-1310
Ill Rockford, G.C. Elctrns. 815-968-9661
Mass Bellingham, Dowiak Assoc. 617-966-0404
Minn Minneapolis, R-J-I 612-922-1425
NY Jamaica, EBY Sls. 212-291-3232

ULTRA CARBON CORP., Dept. EM, Box 747, Bay City, Mich. 48707, Tel: 517-894-2911, TWX: 810-265-1222; Empl.: 150

ULTRA-VIOLET PRODS., INC., Dept. EM, 5100 Walnut Grove Ave., San Gabriel, Cal. 91778, Tel: 213-285-3123, Telex: 688-461; Empl.: 75

Sales Manager: S. Spoden

Local Sales Offices & Reps.
Md Severna Park 301-647-7333
Mich Howell, Ultra-Violet Prods, Inc.... 517-546-0053

ULTRASONIC CORP., Dept. EM, Box 672, Pipestone, Minn. 56164, Tel: 507-825-5441; Empl.: 10

ULTRONIX, INC., Dept. EM, P.O. Box 1090, Grand Junction, Col. 81501, Tel: 303-242-0810, TWX: 910-929-6965; FSC No.: 05347; Empl.: 172

Sales Manager: M. E. Hayes

Local Sales Offices & Reps.
Ala Meridianville, L&D Assoc. 205-828-3522
Ariz Phoenix, Southwest Engrg. 602-993-0250
Cal Hawthorne, WCV Co. 213-772-4479
Cal Redwood City, WESTEC Elects. No. 415-488-8880
Colo Parker, Impact Sls. 303-281-1331
Conn Hamden, Impact Sls. Co. 203-281-1331
Conn Stamford, Dage Corp. 203-324-3123
Fla Maitland, Ellis & Assocs. 305-645-1101
Ill Chicago, Electro Tech Mark. Assoc 312-588-4535
Md Glen Burnie, Aztech Elecs 301-760-6245
Mass Newton, Impact Sls. Co. 617-964-7740
Mich Warren, DEM Elctrn. Sls. 313-575-9444
Minn Minneapolis, S. Clothier Co. 612-944-3456
NJ Cherry Hills, Danco Corp. 609-424-5590
NY Rochester, J. G. Welch Assoc. 716-244-1100
NC Greensboro, L & D Inc. 919-292-3201
Ohio Centerville, Charles V. Clark & Co. 513-435-3000
Ohio Cincinnati, J.O. Olsen Co. 513-922-2589
Ohio Cleveland, J.O. Olsen Co. 216-752-5444
Ore Beaverton, R & R Assoc. 503-643-5754
Pa Pittsburgh, J. O. Olsen 412-279-2550
Tex Dallas, J.B. Guenther, Inc. 214-691-8500
Tex Houston, J.B. Guenther, Inc. 713-468-0232
Va Richmond, L&D 804-359-0125
Wash Seattle, R & R Assoc. 206-762-7664
Exp: Stamford, Conn., Dage Corp. 203-324-3123

ULVAC NORTH AMERICA, Dept. EM, Colchester Plaza, Colchester, VT 05446, Tel: 802-879-6325, TWX: 510-299-0007; Empl.: 600

UNARCO-ROHN, Div. Unarco Inds., Dept. EM, Box 2000, Peoria, Ill. 61656, Tel: 309-697-4400, TWX: 910-652-0646; Empl.: 290

Local Sales Offices & Reps.
Alas Anchorage, Far North Reps. 907-337-1221
Cal Burlingame, William J. Purdy Co. 415-347-7701
Cal Van Nuys, Art Szerlip Sales Co 213-782-1765
Colo Denver, R.G. Bowen Co. 303-789-1884
Fla Lakeland, Dixie Elctrn. Assoc. 813-682-6624
Iowa Des Moines, B.E.A.M.S. 515-255-1148
Mass N. Scituate, W.A. Hendrickson Co. 617-545-0652
Minn Minneapolis, S. Olsen & Assoc. 612-929-6121
NJ Teaneck, S. Fisher Elctrn. Assoc. 201-837-1200
NM Albuquerque, C.T. Carlberg & Assoc. 505-265-1579
NY Syracuse, Leonard D. Allen Inc. 315-458-7470
NY Tuckahoe, L-C-A Sls. Co. 914-961-4700
Ohio St. Marys, T. Shelby & Co. 419-394-3377
Tenn Gallatin, Graues Sls 615-452-5850
Tex Dallas, B. Townsend 214-243-6703
Wash Seattle, DMS/Vantage 206-525-2050

UNDERWRITERS SAFETY DEVICE, An Eltra Co., Dept. EM, 7300 W. Wilson Ave., Chicago, Ill. 60656, Tel: 312-867-4600, TWX: 910-221-3474; Empl.: 145

Sales Manager: S. I. Ege

Local Sales Offices & Reps.
Ala Decatur, Tenn-Tech Sls 205-350-0630
Ariz Phoenix, M.R. Engrg Sls Co 602-956-4670
Ark Hot Springs, Meridith Young Assocs 501-262-1365
Cal Canoga Park, R. C. Kruse & Assocs 213-341-3020
Cal Palo Alto, O'Donnell Assocs, North 415-327-9260
Colo Boulder, Front Range Mktg 303-443-4780
Fla Ft. Lauderdale, Tropi-Tec 305-463-0988
Ill Deerfield, Thermek, Inc. 312-945-5300
Ill Park Ridge, B. Conrardy Co 312-692-2226
Ill Vernon Hills, W. D. Engrg & Sls 312-367-7766
Kans Leawood, Thunderbird Tech Sls 913-642-7220
Kans Wichita, Thunderbird Tech Sls.... 316-684-3941
Md Accokeek, Metro Elctrl Assocs .. 301-927-5353
Mass Chelmsford, M. Flynn 617-256-6229
Mich Brooklyn, W. C. Moburg & Assocs 517-592-6801
Minn Minneapolis, C. Listug 612-537-6740
Mo St. Louis, Thunderbird Tech Sls 314-567-6488
Nev Eastern, R. C. Kruse Assocs 314-567-6488
Nev Western, O'Donnell Assocs, North 314-567-6488
NY Larchmont, G. M. Moch Co 914-834-3530
NY Rochester, Elcom Sls 716-385-1400
NC Raleigh, The Candor Co. 919-876-4999
ND Eastern, C. Listug 919-876-4999
Ohio Cleveland, Hiltebrant Ind Sls 216-333-5600
Ohio Dayton, J. Kelley Co. 513-274-3224
Pa Pittsburgh, Tech Equip Mktg Co. 412-341-3011
Pa Willow Grove, Tech Parts. 215-659-6900
SC Myrtle Beach, The Candor Co.... 803-448-8361
Tenn Chattanooga, Candor Co 615-894-9686
Tex Ft. Worth, T. J. Small Co 817-332-6353
Wash Seattle, Temco Northwest 206-935-4845

Local Distributors
Ariz Phoenix, Brown Wholesale Electric Co. 602-275-8521
Cal Carson, Royal Wholesale Elec. Co. 213-979-9700
Cal San Leandro, Electro Comps. 415-352-5210
Cal Van Nuys, Amfac Electrical Supply Co. 213-997-8505
Colo Denver, CEC 303-399-6931
Conn Hartford, Allied Electric Supply .. 203-527-6405
Fla Lakeland, A-A Electric Supply 813-682-6181
Ga Atlanta, Electric Sls. & Svc. 404-355-7034
Ga Norcross, A-A Electric, Inc. 404-449-8670
Ill Arlington Heights, S & R Corp. .. 312-593-2545
Ill Chicago, Steiner Electric Supply 312-685-7000
Ill Chicago, Revere Electric Supply 312-738-3636
Ill Rockford, Muntz Electric Supply 815-968-8866
Iowa West Des Moines, Ramco 515-225-6933
Md Bladensburg, Prince George Electric Supply 301-779-1000
Mass Boston, Controller Svc. & Sls.... 617-269-1300
Mass Lowell, C & I Electrical Supply Co. 617-458-3364
Mich Adrian, Electric Wholesale Supply 313-265-5148
Mich Ann Arbor, Madison Electric 313-665-6131
Mich Detroit, Madison Electric. 313-875-1560
Mich Jackson, Electric Wholesale Supply 517-782-7121
Mich Pontiac, Standard Electric 313-332-9261
Minn Minneapolis, Sterling Electric..... 612-332-4571
Mo St. Louis, National Electric 314-241-4600
NJ Cherry Hill, Fromm Electric Supply 609-662-8300
NJ Dover, Kahant Electrical Supply 201-366-2966
NY Buffalo, Lang Electric 716-854-2770
NY Syracuse, Baldwin Hall 315-463-9251
NC Matthews, Carolina Tech. Reps. 704-847-4494
Okla Claremore, Besco Electric Supply 918-341-5724
RI Providence, Controller Svc. & Sls. 401-781-7100
Tex Dallas, Fuses, Inc. 214-387-3301
Va Lynchburg, Mid-State Electric Supply 804-846-6555
Va Richmond, Dixie Electric Supply Corp. 804-355-8003
Wash Seattle, Coast Warehouse, c/o Temco Northwest 206-935-3200
Wisc Cedarburg, A-A Electric Supply 414-377-8000
Wisc Milwaukee, Standard Electric Supply 414-272-8100
Wyo Casper, CEC Inc. 307-266-1278
For: Can., Toronto, Ontario, Great Lakes Electrical Ltd. 416-255-8161

UNGAR, DIV., Eldon Inds., Inc., Dept. EM, 233 E. Manville St., Compton, Cal. 90220, Tel: 213-774-5950, Telex: 69-1575

Sales Manager: T.H. Naylor, V.P. Mktg.

Local Sales Offices & Reps.
Ala Birmingham, M.F. Taylor Co. 615-822-0479
Cal Burlingame, Elvey-Proctor Co..... 415-347-2994
Cal Inglewood, Ungar Sls. Assocs. .. 213-649-6238
Colo Denver, K-C Marketers. 303-733-5561
Fla Orlando, M.F. Taylor Co. 305-851-2566
Fla Pompano Beach, Morris F. Taylor Co. 305-942-2294
Ill Chicago, G. McL. Cole Co. 312-774-3535
Ind Indianapolis, F. J. McSweeney & Assocs. 317-849-5726
Iowa Des Moines, KSW Assocs. 515-279-9235
Kans Baxter Springs, P M I Sls. 316-856-3660
La New Orleans, Texport Co. 504-486-6073
Md Silver Spring, M.F. Taylor Co. 301-589-4002
Mass Needham, Mullin Tech. Sls. Co. 617-444-4780
Mich Southfield, R. Milsk Co. 313-354-3310
Minn Minneapolis, Conway & Assocs 612-721-5229
Mo Kansas City, KSW Assocs. 816-358-5240
NY Great Neck, Frank Tylinski Co.. 516-466-9070
NY Guilderland, Solder Pot, Inc. 518-355-1829
NY Oceanside, Bittan Assocs. 516-678-6222
NC Charlotte, M.F Taylor Co. 704-333-8791
Ohio Lakewood, Baehr, Greenleaf & Assocs. 216-221-9030
Okla Tulsa, Texport Co. 918-939-1727
Pa Willow Grove, Morris F. Taylor Co. 215-657-3982
Tenn Memphis, Texport Co. 901-683-0880
Tex Carrollton, E-Tron Sls. 214-245-6633
Tex Richardson, Texport Co. 214-238-7117
Wash Seattle, Andrew Sproul Assocs. 206-789-3300
Wisc Menomonee Falls, G. McL. Cole Co. 414-251-2011

UNHOLTZ-DICKIE CORP., Dept. EM, 3000 Whitney Ave., Hamden, Conn. 06518, Tel: 203-288-3358, Telex: 128285; Empl.: 49 ..... p. 2575

Local Sales Offices & Reps.
Ala Huntsville, W. Brown 205-539-4411
Cal Redondo Beach, Unholtz-Dickie Corp. 213-378-9418
Conn Hamden, W.W. Jarowey Co. 203-288-3010
Fla Margate, W. Brown 305-753-1650
Fla Orlando, W. Brown 305-425-5863
Ga Chamblee, W A Brown Comps. 404-455-0405
Kans Wichita, Aero-Hill Sls. 316-943-6371
Mich Farmington, Anderson Elctrns..... 313-476-9161
NC Raleigh, W. Brown. 919-781-9426
Ohio Cleveland, Dietrich & Assocs. 216-781-1855
Ohio Dayton, Dietrich & Assocs. 513-223-6042
Pa Pittsburgh, Dietrich & Assocs. 412-892-2992
Tenn Knoxville, W. A. Brown 615-637-3523
Tex Houston, Mott Assocs. 713-777-5773

UNICO, INC., Dept. EM, 3725 Nicholson Rd., Franksville, Wisc. 53126, Tel: 414-886-5678, TWX: 910-271-2385; Empl.: 125

Sales Manager: M.E. Grant

Local Sales Offices & Reps.
Mich Detroit, Unico, Inc. 313-559-6767
Ore Beaverton, Unico, Inc. 503-644-3195
Pa Pittsburgh, Unico, Inc. 412-486-3883

UNIFORM TUBES INC., MicroDelay Division, Dept. EM, Collegeville, Pa. 19426, Tel: 215-539-0700, Telex: 84-6428; FSC No.: 93306; Empl.: 400 .. p. 3066,3067

Sales Manager: Lloyd Deery

Local Sales Offices & Reps.
Ariz Tempe, Jarko Assoc. 602-966-3020
Cal Los Altos, Marketek, Inc. 415-941-0882
Cal Newport Bch., Uniform Tubes 714-642-5950
Cal Van Nuys, C.W. Swift & Assoc. 213-989-1133
Colo Denver, Industrial Hardware Co. 303-426-1443
Fla Miami, Floritronics 305-688-6775
Fla Winter Park, Floritronics Inc. 305-886-4818
Ill Des Plaines, Coombs Assocs..... 312-298-4830
Ill Elk Grove Village, Uniform Tubes 312-640-0494
Ill Schiller Pk., Uniform Tubes 312-671-2717
Ind Indianapolis, Coombs Assocs. 317-897-5424
Md Wheaton, Brimberg Sls. 301-946-2670
Mass Wakefield, J. Murphy 617-761-7153
Mich Milford, T. Mulligan & Assocs. 313-363-5575
Mo Grandview, Beneke & McCaul, Inc. 816-765-2998
Mo St. Louis, Beneke & McCaul 314-434-6242
NJ Moorestown, Norman Stern..... 609-234-0661
NY Mt. Vernon, Friedman-Smith Elctrn. Sls. 914-664-4866
NY Syracuse, I.A. Hotze Assocs. 315-479-6641

Ohio Columbus, T. Mulligan & Assocs. 614-457-2242
Pa Feasterville, PSA, Inc. 215-355-6244
Tex Richardson, Vector Sls. Co. 214-234-4291
Wash Redmond, Barrett Squibb Assocs. 206-885-6991
Wisc Milwaukee, Coombs Assoc. 414-671-1945
Exp: N.Y., New York, Ad. Auriema, Inc. 212-938-0930

Local Distributors
Cal Los Altos, Marketek, Inc. 415-941-0882
Cal Van Nuys, C. W. Swift Assocs. 213-989-1133
Cal Van Nuys, C. W. Swift & Assocs 213-989-1133
Md Wheaton, Brimberg Sls. 301-946-2670
Mass Medford, Blake Assocs. 617-391-7890
Mass Wakefield, J. Murphy 617-761-7153
NY Mt. Vernon, Friedman-Smith Co. 914-664-4866
For: Can., Montreal, Que., Braydon Electro Ltd. 514-332-5650

UNIMAX SWITCH CORP., Sub. Unimax Group, Inc., Dept. EM, Ives Rd., Wallingford, Conn. 06492, Tel: 203-269-8701, TWX: 96-3485, 710-476-1394; FSC No.: 80207; Empl.: 300 p. 4268

Sales Manager: James W. Pogmore; *Distributor Manager:* G. T. Bracci

Local Sales Offices & Reps.
Ala Huntsville, Rep., Inc. 205-881-9270
Ariz Scottsdale, DeAngelo, Rothman & Cheever, Inc. 602-948-2240
Cal LA, M.A. Stolaroff 213-295-7781
Cal Los Altos, Ewing-Foley 415-941-4525
Colo Englewood, Todd 303-761-7801
Conn Bloomfield, Zaslow Sls. 203-242-7781
Fla Oviedo, Conley & Assoc. 305-365-3283
Ga Tucker, Rep., Inc. 404-938-4358
Ill Chicago, Wasson-Gallagher 312-261-7517
Ill Westchester, Wasson-Gallagher 312-344-0690
Ind Ft. Wayne, O.H. Bromberg
Iowa West Des Moines, Greg Newell Inc. 515-274-0386
Ky. Louisville, O. H. Bromberg 502-245-8916
La Kenner, Automation Supplies 504-721-3497
Md Rockville, L.G. White 301-770-6556
Mass Northboro, Zaslow Sls. 617-393-8150
Mich Grosse Pointe Park, Greiner Assoc. 313-499-0188
Minn Mpls., Jos-Co. Sls. Engrg. 612-861-3343
Mo St. Louis, Hill & Co. 314-621-1818
NJ West Caldwell, Grimm, Siegel Assoc. 201-575-9300
NY Rochester, Canavan-Scanlon Assoc. 716-442-0720
NY Syracuse, Canavan-Scanlon Assoc. 315-437-1271
NC Winston-Salem, L.G. White 919-725-3612
Ohio Cincinnati, O.H. Bromberg 513-771-9333
Ohio Medina, J. Hofstetter 216-241-4880
Pa Broomall, White-Whiddett 215-353-6343
Tex Dallas, Glidden Electro. Equip. 214-341-0610
Tex Houston, Glidden Electro Equip. 713-681-1415
Wash Mercer Island, J. H. Andersen 206-232-0484

Local Distributors
Ala Decatur, Forbes Distributing Co. 205-353-4762
Ala Montgomery, Southern Controls 205-277-5030
Ariz Phoenix, Electro Comps. 602-258-2665
Cal Los Angeles, Minarik Elec. Co. 213-624-3161
Cal Los Angeles, Fisher/Brownell 213-532-2170
Cal Sacremento, Dunlap Elctrns
Cal Santa Clara, Fisher/Brownell 408-244-6182
Colo Denver, Fistell's Elec. Supply 303-244-4691
Conn Danbury, Greene Elec. Sup. 203-748-5648
Conn Fairfield, Utronics 203-255-4521
Conn Orange, Milgray Elctrns. 203-795-0712
Conn W. Hartford, Atlantic Switch Controls 203-523-5259
Fla Hialeah, Switch Controls 305-820-0892
Fla Miami, Elctrn. Equip. 305-871-3500
Fla Winter Park, Milgray Elctrns. 305-647-5747
Ill Arlington Hgts., LoDan Elctrns. 312-956-6700
Ill Chicago, Newark Elctrns. 312-638-4411
Ill Westmont, Bodelle Co. 312-323-9670
Ill Wheaton, Connectrix 312-653-1460
Ky Louisville, Marine Elect. Apparatus 502-587-6511
Me Portland, J. Leen Co. 207-774-6266
Md Lanham, Milgray Elctrns. 301-793-3993
Md Rockville, Capitol Radio 301-881-2270
Mass Bellinglam, Dowiak Assoc. 617-966-0404
Mass Boston, Sager Elec. Supply 617-542-2281
Mass Burlington, Milgray Elctrns. 617-272-6800
Mich Farmington, Commerce Elec. Supply
Mich St. Clair Shores, SPEMCO
Mo Kansas City, Electro Sls. 816-221-0303
Nev Reno, Electronic Distr. Co. of Nevada 702-323-2766
NJ Cherry Hill, Milgray Elctrns. 609-424-1300
NY Buffalo, Summit Distrs. 716-884-3450
NY Freeport, Milgray Elctrns. 516-546-6000
NY Hempstead, Elctrn. Equip. 516-538-5510
NY Rochester, Summit Elctrns. 716-334-8110
NY Sodus, AED Distrs. 315-483-6561
NY W. Nyack, Douglaston Elect. 914-358-6966
NY Woodside, Switches Unlimited 212-651-0935
NC Winston-Salem, Kirkman Elect. 919-722-9131
Ohio Cincinnati, Midwest Equip. Co. 513-793-4060
Ohio Cleveland, Milgray Elctrns. 216-881-8800
Ohio Dayton, Duellman Elec. 513-461-5010
Okla Tulsa, Radio, Inc.
Pa Philadelphia, Herbach & Rademan 215-426-1700
Tex Dallas, Ind. Equip. Co. 214-271-5494
Tex Dallas, Texaswitch, Inc. 214-357-1768
Tex Odessa, Superior Elect. 915-332-0276
Va Alexandria, Technical Distrs. 703-971-8979
Wash Seattle, Zepher Elctrns. 206-575-0922
Wisc Mequon, Taylor Electric Co. 414-241-4321
For: Can., Burlington, Ont., Motion Control Devices, Ltd. 416-637-9369
For: Can., Vancouver, B.C., Canadian Dynamics Ltd. 604-325-3201

UNIMETRICS CORP., Mektron Div., Dept. EM, 1853 Raymond Ave., Anaheim, Cal. 92801, Tel: 714-879-3777; FSC No.: 5905; Empl.: 30

Sales Manager: D.F. Cantu, Jr.

UNION CARBIDE CORP., Battery Products Div., Dept. EM, 270 Park Ave., New York, N.Y. 10017, Tel: 212-551-3763 p. 3346,3347

Local Sales Offices & Reps.
Cal San Francisco 415-765-1000
Ga Atlanta 404-633-6161
Ill Chicago 312-454-2000
NJ Hackensack 201-646-0220
Ohio Cleveland 216-621-4200
Tex Dallas 214-631-0010

UNION CARBIDE, CHEMICALS & PLASTICS, Dept. EM, 270 Park Ave., New York, N.Y. 10017, Tel: 212-551-3763

Local Sales Offices & Reps.
Cal Long Beach 213-435-3721
Cal San Francisco, Union Carbide, Chemicals & Plastics 800-421-3724
Ga Atlanta 404-633-6161
Ill Chicago 312-454-2000
Ind Indianapolis Enterprise 2226
Ky Louisville Enterprise 2226
Md Baltimore 301-944-8211
Mass Needham Heights 617-444-5400
Mich Detroit 313-354-0800
Mich Southfield 313-354-0800
Minn Minneapolis 800-621-2510
Mo Kansas City 800-621-8236
Mo St. Louis 314-726-0324
NJ Hackensack 201-646-1111
NJ Moorestown 609-235-6200
NY New York 212-695-5054
NC Charlotte 704-364-1400
Ohio Cincinnati 513-272-0206
Ohio Cleveland 216-621-4200
Pa Philadelphia 215-923-3200
Pa Pittsburgh 412-922-5700
Tex Dallas 800-631-0010

UNION CARBIDE CORP. ELCTRNS. DIV., Components Dept., Dept. EM, Box 5928, Greenville, S.C. 29606, Tel: 803-963-6300, Telex: 57-0496; FSC No.: 31433; Empl.: 2000 p. 1222-1282

Sales Manager: T. J. Roper; *Distributor Manager:* J. V. DePolo

Local Sales Offices & Reps.
Ariz Phoenix, Union Carbide-Comps. Dept. 602-264-7332
Cal Marina Del Rey, Union Carbide-Comps. Dept. 213-821-8824
Cal Mt. View, Union Carbide-Comps. Dept. 415-969-9390
Cal San Diego, Union Carbide Comps. 714-279-4500
Colo Denver, Parker-Webster Co. 303-751-2600
Fla Ft. Lauderdale, Union Carbide Corp.-Comps. Dept. 305-563-6706
Ill Schaumburg, Union Carbide-Comps. Dept. 312-843-1030
Ind Carmel, Union Carbide Corp.-Comps. Dept. 317-844-7756
Iowa Cedar Rapids, Seltec Sls. Corp. 319-393-1114
Kans Olathe, BC Electronic Sales 913-888-6680
Md Ellicott City, Union Carbide Corp.-Comps. Dept. 301-596-6233
Mass Needham Heights, Union Carbide-Comps. Dept. 617-444-5400
Mich Birmingham, Union Carbide-Comps. Dept. 313-642-9800
Minn Minneapolis, S. Clothier Co. 612-944-3456
Mo Hazelwood, BC Electronic Sales 314-731-1255
NY East Syracuse, Hamilton/Avnet Elctrns.
NY Liverpool, Union Carbide-Comps. Dept. 315-451-0720
NY Tarrytown, Union Carbide-Comps. Dept. 914-345-2047
Ohio Worthington, Union Carbide Comps 614-436-1510
Pa Exton, Union Carbide-Comps. Dept. 215-363-8310
SC Greenville, Union Carbide-Comps. Dept. 803-963-6606
Tenn Sewanee, Union Carbide-Comps. Dept. 615-598-5809
Tex Dallas, Union Carbide-Cor s. Dept. 214-387-3970
Tex Houston, Union Carbide-Comps. Dept. 713-621-1000
Utah Salt Lake City, Parker-Webster Co. 801-261-1058
Exp: S.C., Greenville, Union Carbide-Comps. Dept. 803-963-6300

Local Distributors
Ala Huntsville, Hamilton/Avnet Elctrns. 205-533-1170
Ala Huntsville, Hall-Mark Elctrns. Corp. 205-837-8700
Ariz Phoenix, Hamilton/Avnet Elctrns. 602-275-7851
Cal Costa Mesa, Avnet Elctrns. 714-754-6071
Cal Culver City, Hamilton Electro Sls. 213-558-2131
Cal Irvine, Schweber Elctrns. 714-556-3880
Cal Mountain View, Hamilton/Avnet Elctrns. 415-961-7000
Cal San Diego, Hamilton/Avnet Elctrns. 714-279-2421
Cal Sunnyvale, Bell Elctrns. Corp. 408-734-8570
Cal Woodland Hills, JACO Elctrns. 213-887-6400
Colo Denver, Hamilton/Avnet Elctrns. 303-534-1212
Conn Danbury, Schweber Elctrns. 203-792-3500
Conn Georgetown, Hamilton/Avnet Elctrns. 203-762-0361
Conn Hamden, Wilshire Elctrns. 203-281-1166
Fla Fort Lauderdale, Hall-Mark Elctrns. Corp. 305-971-9280
Fla Ft. Lauderdale, Hamilton/Avnet Elctrns. 305-971-2900
Fla Hollywood, Schweber Elctrns. 305-927-0511
Fla Orlando, Hall-Mark Elctrns. Corp. 305-855-4020
Ga Atlanta, Hamilton/Avnet Elctrns. 404-448-0800
Ga Atlanta, Schweber Elctrns. 404-449-9170
Ill Elk Grove Village, Hall-Mark Elctrns. Corp. 312-437-8800
Ill Elk Grove Village, Schweber Elctrns. 312-593-2740
Ill Schiller Park, Hamilton/Avnet Elctrns. 312-678-6310
Ind Indianapolis, Graham Elctrns. 317-634-8203
Kans Lenexa, Hamilton/Avnet Elctrns. 913-888-8900
Kans Shawnee Mission, Hall-Mark Elctrns. Corp. 913-888-4747
Md Baltimore, Hamilt/Avnet Elctrns. 301-796-5000
Md Baltimore, Hall-Mark Elctrns. Corp. 301-796-9300
Md Baltimore, Technico, Inc. 301-461-2200
Md Rockville, Schweber Elctrns. 301-881-2970
Mass Burlington, Wilshire Elctrns. 617-272-8200
Mass Burlington, Hamilton/Avnet Elctrns. 617-933-8000
Mass Lexington, Harvey Elctrns. Supply 617-861-9200
Mass Waltham, Schweber Elctrns. 617-890-8480
Mich Livonia, Hamilton/Avnet Elctrns. 313-522-4700
Mich Troy, Schweber Elctrns. 313-583-9240
Minn Bloomington, Hall-Mark Elctrns. Corp. 612-884-9050
Minn Eden Prairie, Schweber Elctrns. 612-941-5280
Minn Edina, Hamilton/Avnet Elctrns. 612-941-3800
Mo Earth City, Hall-Mark Elctrns. Corp. 314-291-5350
Mo Hazelwood, Hamilton/Avnet Elctrns. 314-731-1140
Mo Kansas City, LCOMP Kansas City 816-221-2400
NJ Cedar Grove, Hamilton/Avnet Elctrns. 201-239-0800
NJ Clifton, Wilshire Elctrns. 201-340-1900
NJ Mt. Laurel, Hamilton/Avnet Elctrns. 609-234-2133
NJ Somerset, Schweber Elctrns. 201-469-6000
NM Albuquerque, Hamilton/Avnet Elctrns. 505-765-1500

NY Buffalo, Summit Distrs. 716-884-3450
NY Endwell, Wilshire Electronics 607-754-1570
NY E. Syracuse, Hamilton/Avnet Electronics 315-437-2641
NY Hauppauge, JACO Elctrns. 516-273-5500
NY Rochester, Summit Distrs. 716-334-8110
NY Rochester, Schweber Elctrns. 716-461-4000
NY Rochester, Hamilton/Avnet Elctrns. 716-442-7820
NY Westbury, Schweber Elctrns..... 516-334-7474
NY Westbury, Hamilton/Avnet Elctrns. 516-333-5800
NC Raleigh, Hall-Mark Elctrns. Corp. 919-832-4465
NC Raleigh, Hamilton/Avnet Elctrns 919-829-8030
NC Winston-Salem, Kirkman Elctrns. 919-722-9131
Ohio Beachwood, Schweber Elctrns... 216-464-2970
Ohio Cleveland, Hamilton/Avnet Elctrns. 216-461-1400
Ohio Dayton, Pioneer/Dayton Elctrns. 513-236-9900
Ohio Dayton, Hamilton/Avnet Elctrns. 513-433-0610
Okla Tulsa, Hall-Mark Elctrns. Corp. .. 918-835-8458
Pa Huntington Valley, Hall-Mark Elctrns. 215-355-7300
Tex Austin, Hall-Mark Elctrns. Corp. 512-837-2814
Tex Dallas, Hamilton/Avnet Elctrns... 214-661-8661
Tex Dallas, Schweber Elctrns. 214-661-5010
Tex Dallas, Hall-Mark Elctrns. Corp. 214-234-7400
Tex Houston, Hall-Mark Elctrns. 713-781-6100
Tex Houston, Hamilton/Avnet Elctrns. 713-526-4661
Tex Houston, Schweber Elctrns..... 713-784-3600
Utah Salt Lake City, Hamilton/Avnet Elctrns. 801-972-2800
Wash Seattle, Hamilton/Avnet Elctrns. 206-746-8750
Exp: Can., Montreal, Que., Hamilton/Avnet Elctrns. 514-331-6443
For: Can., Mississuaga, Ont., Hamilton/Avnet Elctrns. 416-677-7432
For: Can., Ottawa, Ont., Hamilton/Avnet Elctrns. 613-226-1700

UNION CARBIDE CORP., Crystal Prods. Dept., Elctrns Div, Dept. EM, 8888 Balboa Ave., San Diego, Cal. 92123, Tel: 714-279-4500, Telex: 695-465; Empl.: 160

Sales Manager: J.J. Beeman

Local Sales Offices & Reps.
Cal Marina Del Rey 213-822-0441
Cal Mountain View 415-965-2128
Cal San Diego 714-279-4500
Mass Needham Hgts. 617-444-5400
NJ Bound Brook 201-356-8000

Local Distributors
For: England, London, The Roditi Corporation, Ltd. (01) 437-1997
For: Japan, Tokyo, TDK Elctrns Co .. (03) 257-2445
For: West Germany, Hamburg, The Roditi Corp, GmbH 040 721 7095

UNION CARBIDE CORP., Linde Div., Dept. EM, 270 Park Ave., New York, N.Y. 10017, Tel: 212-551-3763

Local Sales Offices & Reps.
Ala Birmingham 205-879-4681
Cal Long Beach 213-435-3721
Cal San Francisco 415-765-1000
Colo Denver 303-722-4621
Ga Atlanta 404-633-6161
Ill Chicago 312-454-2000
Kans Shawnee Mission 913-362-2200
Mass Needham Heights 617-444-5400
Mich Farmington 313-478-1500
Mo Creve Coeur 314-567-4455
NJ Moorestown 609-235-6200
NY Buffalo 716-854-1616
Ohio Cleveland 216-621-4200
Okla Tulsa 918-622-8822
Pa Philadelphia 609-235-6200
Pa Pittsburgh 412-922-5700
Tex Dallas 214-631-0010
Tex Houston 713-621-1000

UNIROYAL, INC., Dept. EM, 1230 Ave. of Americas, New York, N.Y. 10020, Tel: 212-489-4000; Empl.: 55,600

Local Sales Offices & Reps.
Cal Santa Ana 714-545-5551
Cal South San Francisco 415-873-5900
Cal Vernon 213-581-7281
Colo Denver 303-388-2481
Ga Atlanta 404-366-4650
Ill Chicago 312-890-2969
Ill Elk Grove 312-595-7180
Md Baltimore 301-485-8904
Mass Dedham 617-329-2060
Mass Springfield 413-781-8620
Minn St. Louis Park 612-546-2528
Mo St. Louis 314-567-1745
NJ Jersey City 201-432-4222
NY Buffalo 716-668-0404
NC Charlotte 704-334-0893
Ohio Akron 419-732-2151
Ohio Cincinnati 513-242-5807
Ohio Port Clinton 419-732-2151
Ore Milwaukie 503-659-7277
Pa McKees Rocks 412-771-3500
Pa Philadelphia 215-742-7010
Tenn Memphis 901-794-7440
Tex Dallas 214-631-2404
Tex Houston 713-462-0004
Wash Seattle 206-767-7066

UNIT INDUSTRIES, INC., Dept. EM, 529 S. Raymond Ave., Fullerton, Cal. 92631, Tel: 714-871-4161; Empl.: 22

UNITED DETECTOR TECH., Dept. EM, 2644 30th St., Santa Monica, Cal. 90405, Tel: 396-3175, Telex: 65-2413; Empl.: 70

Sales Manager: D. Wagenet, D. Cropsey; *Distributor Manager:* E. Murphy

Local Sales Offices & Reps.
Ariz Scottsdale, Measurement Consultants 602-994-9519
Cal Los Angeles, CH Scientific..... 213-476-7341
Cal Palo Alto, CH Scientific 415-967-8939
Colo Lafayette, Grady Moore Assoc... 303-494-3351
Fla Orlando, Physimetrics, Inc..... 305-894-8081
Ga Atlanta, Physimetrics..... 404-955-0155
Ill Des Plaines, B. Ellis Assocs. 312-298-7626
Md Randallstown, Beacon North 301-922-1248
Mass Marblehead, Northeast 617-631-9500
NM Albuquerque, Grady Moore Assoc. 505-262-1416
NY North Lindenhurst, Sigma Communications 516-226-1880
NY Rochester, Irondequoit Inds. 716-544-6257
Ohio Berea, B. Ellis Assocs. 216-826-0559
Pa Willow Grove, H. Nash Assocs... 215-657-2213
Tex Richardson, Moore Assocs 214-690-4929
Va Falls Church, Beacon North..... 703-534-7200
Va Lynchburg, Beacon North..... 804-237-4740
Wash Bellevue, TASCO 206-453-1414

UNITED ELEC. CONTROLS CO., Dept. EM, 85A School St., Watertown, Mass. 02172, Tel: 617-WA 6-1000, TWX: 617-092-2445; Empl.: 350

Local Sales Offices & Reps.
Ill Rolling Meadows 312-259-6700
NJ Edison 201-548-7100

UNITED MICROTRONICS, INC., Dept. EM, 5-15 48th Ave., Long Island City, N.Y. 11101, Tel: 212-ST 6-0478; Empl.: 15

Local Sales Offices & Reps.
Cal No. Hollywood, Crown Elctrns.... 213-877-3550
Cal Redwood City, Woodworth Co... 415-365-0252
Ill Chicago, Electro-Tech Mktg. Assoc. 312-588-4535
Mass Wakefield, Nerem Assocs. 617-245-4426
NM Albuquerque, R. A. Mayes Co. .. 505-293-8010
NY New York, United Microtronics .. 212-ST6-0478
Tex Dallas, R. A. Mayes Co. 214-276-2006
Tex Houston, R. A. Mayes Co. 713-493-2803
Exp: N.J., Cresskill, Lars Microwave .. 201-871-0024

UNITED MINERAL & CHEM. CORP., Dept. EM, 129 Hudson St., New York, N.Y. 10013, Tel: 212-966-4330, TWX: 232685, 710-581-5799; Empl.: 78

Local Sales Offices & Reps.
CHEMICAL DEPARTMENT
Ariz Tuscon, Charles Neighbors 602-297-9377
Cal Moraga, Baxter Entprs 415-376-8040
Cal Mountain View, Tech Ser. Inc.... 415-969-9020
Cal Torrance, Tech Ser. Inc..... 213-538-2267
Conn West Hartford, R.S. Pettigrew & Co. Inc. 203-233-8533
Ill Chicago, G & D Assocs 312-235-3235
Mass W. Newton, R. S. Pettigrew & Co. 617-969-5770
NC Skyland, Skytronics..... 704-684-2235
RI Cranston, Essex Intl 401-467-7586
Tex Richardson, Ralph Marston 214-235-3577

ELECTRONIC COMPONENTS
Cal Inglewood, Ungar Sales Assocs. 213-649-6238
Colo Parker, Technology Mktg 801-485-9381
Fla Orlando, Irby & Connolly 305-894-8471
Ill Evanston, Saffro & Assocs. 312-328-0140
Ind Indianapolis, Loomis Assocs 317-299-5644
Mass New Bedford, R. E. Crabbe..... 617-998-1250
Mich Ferndale, Hilltronics, Inc. 313-398-5556
NY Syracuse, Rolmar Components, Inc. 315-487-6951
NC Kannapolis, Nickerson Corp..... 704-938-4647
Ohio Cleveland, Greenleaf & Assocs. 216-333-5480
Pa Philadelphia, H.A. Goodman Co. 215-247-7116
Tex Richardson, Thornton Sls. 214-231-6891

UNITED PRODS. CO., See Automatic Coil

UNITED REFINING & SMELTING CO., Dept. EM, 3700 N. Runge Ave., Franklin Park, Ill. 60131, Tel: 312-455-8800; Empl.: 32

UNITED STATES CRYSTAL CORP., Dept. EM, 3605 McCart St., Ft. Worth, Tex. 76110, Tel: 817-921-3014, TWX: 910-893-4084; Empl.: 75 p. 2375

Sales Manager: T. J. Nastase; *Distributor Manager:* T. J. Nastase

Local Sales Offices & Reps.
Ariz Tempe, Delta Elctrn Sls 602-966-9903
Cal San Gabriel, Van Gott & Assoc.. 213-285-2148
Cal San Rafael, Keith W. Casey Assoc. 415-479-5464
Cal Van Nuys, Mike Roth Sls 213-989-3738
Colo Denver, William J. Purdy 303-777-1411
Fla Orlando, Irby & Connolly 303-894-8471
Ga Atlanta, Cavendish & Roberts 404-233-6679
Ill Arlington Heights, Brainard-Wilson Mktg. 312-437-2700
Ind Carmel, Brainard-Wilson Mkg..... 317-844-2800
Ind Mulberry, Maish Sls. 317-296-2322
Mass Needham Heights, Coakley, Boyd, & Abbott 617-444-5470
Mass Northboro, Pray Sls. 617-393-3434
Mich St. Clair Shores, Jack M. Thorpe Co. 313-779-6363
Minn Minneapolis, Kodo Assocs..... 612-881-7188
NJ Berkeley Heights, Cambridge-Allen & Assoc. 201-464-0203
NJ Englewood, Stan Axelrod Assoc. 201-871-0600
NY Skaneateles, Leahy & Thomson 315-685-8122
NC Warne, Cavendish & Roberts 704-389-8850
Ohio Cleveland, Marlow Assoc. 216-932-0900
Pa Broomall, L.D. Lowery 215-356-5300
Tex Dallas, John B. Guenther 214-691-8500
Wisc Milwaukee, Brainard-Wilson Mkg 414-527-1500

UNITED SYSTEMS, Dept. EM, 918 Woodley Rd., Dayton, Ohio 45403, Tel: 513-254-6251, TWX: 810-459-1728; FSC No.: 16152; Empl.: 135 .. p. 2832

Local Sales Offices & Reps.
Ala Huntsville, J.L. Highsmith & Co. 205-881-3294
Cal Long Beach, Saber Entprs. 213-595-5646
Cal Mountain View, IFM, Inc..... 415-961-2828
Colo Denver, Fry-Gates Co. 303-756-9886
Conn Newtown, R.J. Sickles Assoc. 203-426-3339
Fla Lake Park, J.L. Highsmith & Co. 305-844-2013
Fla Orlando, J.L. Highsmith & Co..... 305-293-5202
Ill Des Plaines, Marsland Assocs... 312-298-2620
Ind Indianapolis, Marsland Assocs. .. 317-924-3568
Kans Overland Park, Carter Elctrns. .. 913-649-6996
Mass Burlington, R. J. Sickles Assocs. 617-272-7285
Mich Detroit, Comtel-Instr. Co. 313-255-1970
Minn Minneapolis, Marsland Assocs. .. 612-545-4481
Mo St. Louis, Carter Elctrns. 314-569-1406
NJ Cherry Hill, Scientific Representatives 609-482-0059
NM Albuquerque, F. Gates Co..... 505-298-1875
NY Fayetteville, M.P. Andrews, Inc. 315-637-3144
NY Tuckahoe, Spectrum Sls. 914-793-1660
NC Charlotte, J.L. Highsmith & Co... 704-333-7743
Ohio Cleveland, Comtel-Instr. Co. 216-442-8080
Ohio Dayton, Comtel-Instr. Co..... 513-298-7573
Pa Pittsburgh, Comtel-Instr. Co. 412-922-5720
Tex Austin, MZB & Assocs. 512-454-4457
Tex Dallas, MZB & Assocs..... 214-233-5535
Tex Houston, MZB & Assocs. 713-523-7333
Va Falls Church, Scientific Assocs. Inc. 703-573-8787
Va Richmond, J.L. Highsmith ad Co. 804-272-5888
Wash Bellevue, Topp Engrg. Sls. Corp. 206-747-5401

UNITED
Wiring and Manufacturing Co.

UNITED WIRING & MFG. CO., Dept. EM, 2608 Electonic La. #404, Dallas, Tex. 75220, Tel: 214-350-4978, Telex: 73-2662; Empl.: 40 p. 1300-1311

Sales Manager: R. E. Whitehead

Local Sales Offices & Reps.

Conn	Hartford, Cable Assocs	203-525-5016
Ill	Northbrook, Raines Brin Assocs	312-498-0890
Mich	Spring Lake, Walch Engrg Co.	616-846-2944
NY	Guilderland, Solder-Pot	518-355-1829
Ohio	Cleveland, C.S.A. Elctrn Sls Agency	216-333-2088
Tex	Dallas, J.B. Gunther Co.	214-691-8500
Tex	Dallas, United Solder Wrap Sls.	214-350-8531

Local Distributors

Cal	Garden Grove, Allied Elctrns.	714-894-7581
Cal	Santa Clara, Allied Elctrns.	408-985-2323
Ill	Elgin, Allied Elctrns.	312-697-8200
Md	Landover, Allied Elctrns.	301-773-5050
Mass	Wilmington, Allied Elctrns.	617-942-0150
Tex	Dallas, United Wiring & Mfg.	214-350-4978
Tex	Fort Worth, Allied Elctrns.	817-336-5401

UNITRACK DIV., Calabro Plastics, Inc., Dept. EM, 8738 W. Chester Pike, Upper Darby, Pa. 19082, Tel: 215-789-3820, TWX: 510-662-6066; Empl.: 25 p. 1050,1051

Local Sales Offices & Reps.

Cal	Los Angeles, Porter A. Williams	213-748-8555
Cal	Sunnyvale, Ruby Sls	408-739-5333
Colo	Broomfield, CMR	303-466-1573
Ill	Des Plaines, Lincoln Hodges & Assoc.	312-297-3810
Ind	Carmel, Blind & Assoc	317-251-1249
Mass	Northboro, Henik Assoc.	617-393-3127
Mich	Grand Rapids, C.A. Geer Co.	616-247-1656
Minn	St. Paul, Countrymen Assoc. Co.	612-645-9151
Mo	Blue Springs, Chesco	816-229-1404
NJ	Lebanon, Churchill Assocs.	201-236-6055
NY	Syracuse, Lenard Co	315-479-9191
NC	Cary, Montgomery Mktg.	919-467-6319
Ohio	Mansfield, Benchmark Sys.	419-756-9211
Ohio	Mansfield, Retronics, Inc.	419-756-9956
Pa	King of Prussia, Rivco January	215-265-5211
Tex	Dallas, Ion Assoc.	214-357-9441
Va	Herndon, Eastern Comps	703-471-1025
Wash	Tukwila, General Elctrns.	206-243-5141

Local Distributors

Cal	Los Angeles, El-Com, Inc.	213-223-1351
Cal	Sunnyvale, Ruby Stok Co.	408-739-5333
Colo	Denver, Integrated Elctrns. Co.	303-534-6121
Mass	Waltham, Henik Assoc.	617-891-5660
Mass	Woburn, Rush Industries	617-935-2400
Mich	Farmington, CMP Distributor Div.	313-477-7700
NC	Winston-Salem, Kirkman Elctrns., Inc	919-724-0541
Ohio	Dayton, ESCO, Inc.	513-226-1133
Pa	Philadelphia, Philadelphia Elctrns., Inc.	215-568-7400
Tenn	Nashville, Electra Distributing Co.	615-329-3971
Tex	Richardson, Air Quip/Robleyco	214-234-3285

UNITRODE, Dept. EM, 21044 Ventura Blvd., Box 548, Woodland Hills, Cal. 91364, Tel: 213-347-5402, TWX: 910-494-1227

Local Sales Offices & Reps.

Ala	Huntsville, 20th Century Mktg	205-772-9237
Ariz	Scottsdale, Fred Board Assocs.	602-994-9388
Cal	Los Altos, Wedemeyer/Merrill	415-961-5803
Cal	San Diego, Daniels & Doty Sls Co.	714-560-6266
Cal	Santa Ana, Rical Assocs	714-557-6543
Cal	Woodland Hills, Unitrode Computer Prods	213-347-5402
Colo	Denver, Omega Ltd.	303-758-1508
Fla	Ft. Lauderdale, CBC Elctrns	305-484-7330
Ill	Elk Grove Village, Oasis Sls	312-640-1850
Ind	Indianapolis, Technical Reps	317-849-6454
Iowa	Cedar Rapids, Engrg Svcs Co	319-362-0503
Kans	Prairie Village, Engrg Svcs Co	913-649-4000
Md	Glen Arm, Glen White Assocs.	301-252-6360
Mass	Burlington, New England Tech Sls	617-272-0434
Mich	Farmington, Miltimore Sls.	313-476-2446
Minn	St. Paul, Unitrode Computer Prods	612-854-0555
Mo	St. Louis, Engrg Svcs Co	314-997-1515
NJ	Englewood Cliffs, Ed Glass Assocs	212-586-8440
NM	Albuquerque, Reptronix	505-881-8001
NY	Rochester, Electra Sls	716-436-4030
NY	Syracuse, Electra Sls	315-541-0418
NC	Raleigh, Glen White Assocs.	919-787-7016
Ohio	Cincinnati, Makin Assocs	513-871-2424
Pa	Waterford, Bacon Elctrn Sls	814-796-2381
Tenn	Greenville, 20th Century Mktg.	615-638-4021
Tex	Houston, Semiconductor Sls Assocs	713-661-0681
Tex	Richardson, Semiconductor Sls Assocs	214-231-6181
Va	Lynchburg, Glen White Assocs	804-846-1624
Wash	Seattle, Blum & Assocs	206-285-2590

Unitron
INCORPORATED

UNITRON INC., Dept. EM, 2826 W. Kingsley Rd., Box 2159, Garland, Tex. 75041, Tel: 214-271-4531, Telex: 73-0644; FSC No.: 6130; Empl.: 75 p. 3362-3364

Sales Manager: R. L. Beutel

Local Sales Offices & Reps.

Ariz	Tempe, Trembly Assocs	602-966-4428
Mass	Holbrook, McLellan Assocs	617-767-4771
NM	Albuquerque, Trembly Assocs.	505-266-8616
Tex	Garland, Unitron, Inc.	214-271-4531

UNIVERSAL ELCTRNS. CORP., Dept. EM, 20747 Dearborn St., Chatsworth, Cal. 91311, Tel: 213-998-7712; Empl.: 20

Sales Manager: N. Strid, Sls. Mgr.

Local Sales Offices & Reps.

Cal	Los Altos, Jay Stone Assocs.	415-493-7911
Conn	Danbury, ABC Elctrn Sls	203-743-9441
Minn	Minneapolis, Elctrn Innovators	612-884-7471
NJ	Tenafly, ABC Elctrn Sls	201-568-2354
NY	No. Tarrytown, ABC Elctrn Sls	914-631-2650
NY	Williston Park, ABC Elctrn Sls.	516-747-6610
Tex	Dallas, Vista Assocs	214-722-6785
Tex	Houston, Vista Assocs	713-661-0119

UNIVERSAL MFG. CO., INC., Dept. EM, 1168 Grove St., Irvington, N.J. 07111, Tel: 201-374-9800, TWX: 710-995-4647; Empl.: 75

Sales Manager: M. Mayer

Local Sales Offices & Reps.

Cal	Los Altos, Westec Elctrns. North	415-948-8885
Cal	Van Nuys, Transformer Equip Materials	213-782-3444
Minn	Minnetonka, Baillie Sls. & Engrg. Co.	612-938-1830

UNIVERSAL PRODUCTS ENGRG., Dept. EM, 1230 Racine St., Racine, Wisc. 53403, Tel: 414-637-9789; Empl.: 20

UNIVERSAL RELAY CORP., Dept. EM, 42 White St., New York, N.Y. 10013, Tel: 212-925-6900, TWX: 710-581-4461; Empl.: 30

Sales Manager: S. Soloway

UNIVERSAL VOLTRONICS CORP., Dept. EM, 27 Radio Circle Dr., Mt. Kisco, N.Y. 10549, Tel: 914-241-1300, TWX: 710-571-2142; Empl.: 200 p. 3348,3349

Sales Manager: B. Ressler

Local Sales Offices & Reps.

Cal	Redwood City, Pruitt-Parks	415-364-1640
Colo	Denver, Fry Gates Co.	503-756-9886
Fla	Winter Park, McMahan Assocs.	305-645-0463
Mass	Waltham, Waitt Tech. Sls.	617-891-8195
Mich	Southfield, Electroquitment Sls.	313-569-4497
Minn	Mpls., R.J. Sls.	612-922-1425
NM	Albuquerque, Fry Gates Co.	505-298-1875
Ohio	Chesterland, Electroquitment Sls.	216-729-2222
Ohio	Dayton, Electroquitment Sls.	513-434-8993

UNIVERSITY COMPUTING CO., Dept. EM, 8303 Elmbrook Dr. Box 4791, Dallas, Tex. 75247, Tel: 214-688-7100, TWX: 910-861-4990; Empl.: 1200

Local Sales Offices & Reps.

Cal	El Segundo	213-322-3093
Cal	San Francisco	415-421-6240
Fla	St. Petersburg	813-576-7373
Ill	Chicago	312-368-0995
Mass	Burlington	617-272-6350
Mich	Troy	313-879-9300
NJ	North Brunswick, 201-828-3900	
NY	New York	212-421-8850
Okla	Tulsa	918-582-0975
Tex	Dallas	214-655-8822
Tex	Houston	713-790-1200
Va	Falls Church, University Computing	703-790-9414
Wash	Bellevue, University Computing	206-453-8829

UNIVERSITY SOUND, Altec Corp., Dept. EM, 1515 S. Manchester, Anaheim, Cal. 92803, Tel: 714-774-2900, Telex: 655415; Empl.: 1000

Sales Manager: R. Means

Local Sales Offices & Reps.

Cal	Anaheim	714-774-0251
Cal	Carson, Bidwell Sales Assocs.	213-770-0300
Cal	Redwood City, Warren Assocs	415-368-9483
Colo	Arvada, C. B. Elctrn. Mktg.	303-422-0561
Fla	Miami Beach, Seaman Sls. Inc.	305-271-5728
Ga	Atlanta, H. Phillips	404-992-3070
Ill	Chicago, Lassers & Co.	312-539-4722
Ind	Indianapolis, F. McSweeney	317-849-5726
Md	Kensington, Forti Assoc.	301-949-1706
Mass	Northboro, W. B. Pray Sales	617-393-3434
Mich	Detroit, Burcaw Co. & Assocs.	313-533-7700
Minn	Minneapolis, Kodo Assocs.	612-881-1255
Mo	Kansas City, Nevco, Inc.	816-421-1751
NJ	Elizabeth	201-289-7200
NJ	Willingboro, Austin Assocs	609-871-9290
NY	Phelps, LSM Assocs.	315-548-4891
Ohio	North Olmsted, Avcom, Inc.	216-777-5001
Pa	Enon Valley, Nebco Assocs. Inc.	216-457-2333
Tex	Dallas, Miller & Assocs.	214-661-5002
Wash	Seattle, Vector Corp.	206-322-4343
Exp:	Anaheim, Cal., Altec	714-774-2900

Local Distributors

Ala	Birmingham, Sound Engrg. Serv. Co.
Alas	Anchorage, Systems Co.
Ariz	Phoenix, Dalis Elect. Supply
Ark	Texarkana, Lavender Distributing
Cal	Los Angeles, Radio Prods.
Cal	Riverside, Electronic Supply
Cal	San Francisco, Zack Elctrns.
Cal	San Jose, Alco Paramount
Colo	Arvada, Electro Media of Colo.
Conn	New Haven, Hatry of New Haven
Del	Wilmington, Radio Electric Svc.
DC	Wash., Shrader Sound
Fla	Orlando, Hammond Elctrns.
Ga	Atlanta, Specialty Distributing
Haw	Honolulu, Precision Radio
Idaho	Boise, Aatronics Inc.
Ill	Chicago, Newark Elctrns.
Ill	Niles, Joseph Elctrns.
Ind	Indianapolis, Graham Elctrns.
Iowa	Des Moines, Mid-State Dist.
Kans	Wichita, Radio Supply
Ky	Louisville, Peerless Electric
La	New Orleans, Southern Radio Supply
Me	Auburn, Radio Supply Co.
Md	Rockville, Capitol Radio Wholesalers
Mass	Boston, SESCO
Mass	New Bedford, Burns Electric
Mich	Grand Rapids, Electronic Sound Equip.
Mich	Lavonia, R. S. Elctrns
Minn	Minneapolis, Team Central
Miss	Jackson, Sound & Communications
Mo	St. Louis, Sound Sys.
Mont	Missoula, Northwest Distrs.
Neb	Omaha, Radio Equip. Co.
Nev	Las Vegas, Hurley Elctrns.
NH	Concord, Evans Radio
NH	Concord, Evans Radio
NJ	Hillside, Leader Elect.
NJ	Springfield, Disco Elctrns.
NY	Albany, Ft. Orange Elect.
NY	Buffalo, Radio Equip. Co.
NY	N. White Plains, Sound Equip. Corp.
NY	Rochester, Rochester Radio Supply
NC	Raleigh, Southeastern Radio Supp
NC	Raleigh, Southeastern Radio Supply
ND	Fargo, Sound, Inc.
Ohio	Cleveland, Winteradio
Ohio	Dayton, Srepco
Okla	Oklahoma City, Trice Wholesale
Ore	Portland, Central Distrs.
Pa	Pittsburgh, CAM-RPC
RI	Providence, W. Dandreta & Co.
SC	Columbia, Dixie Radio Supply Co.
SD	Sioux Falls, Sioux Sound Co.
Tenn	Memphis, Business Music Corp
Tex	Dallas, Miller & Assocs.
Tex	Houston, Sterling & Elctrns.
Utah	Salt Lake City, General Communications
Vt	Essex Junction, IES Elctrns.
Va	Richmond, Avec Elctrns.
Wash	Seattle, Vector Corp.
WVa	Charleston, Electronic Specialists
Wisc	Milwaukee, Sound Sys. Co.
Wyo	Cheyenne, Wycomco

Exp: Cal., Anaheim, Altec International
For: Can., N. Vancouver, B.C., C. L. Thompson, Ltd.
For: Can., Scarborough, Ontario, J. R. Tilton, Ltd.

U.S. COMPONENTS INC., Dept. EM, 35 Carlough Rd., Bohemia, N.Y. 11716, Tel: 212-824-1600, TWX: 710-593-2141; FSC No.: 97954; Empl.: 85

Sales Manager: H. Nalbantian; *Distributor Manager:* H. Nalbantian

Local Sales Offices & Reps.

Ala	Huntsville, Reynolds & Assocs.	
Ariz	Phoenix, Chaparral-Dorton	602-263-0414
Cal	Pico Rivera, Westrep	213-949-2551
Cal	San Diego, Westrep	714-276-9030
Cal	Santa Clara, Westrep	408-265-0312
Fla	Hollywood, Reynolds & Assocs.	305-987-6720
Fla	Sattelite Beach, Reynolds & Assocs.	305-773-4700
Fla	St. Petersburg, Reynolds & Assocs.	813-360-1484
Ga	Atlanta, Reynolds & Assocs.	404-252-5360
Haw	Honolulu, B. Kolans & Co.	
Ill	Chicago, Phoenix Co.	312-237-2828
Ind	Huntington, Phoenix Co.	219-422-2311
Kans	Shawnee Mission, Thomas & Modrcin Assocs.	913-HE2-2131
Md	Ellicott City, Mktg Technology	301-465-5944
Mass	Clinton, F.J. Coleman & Co.	617-368-0116
Mich	Birmingham, Forand Sls. Co.	313-644-0087
Minn	Minnetonka, K.L. Tannehill	612-935-0353
Mo	Hazelwood, Thomas & Modrcin Assocs.	314-838-6446
NJ	Madison, Livera-Polk Assocs.	201-FR7-3220
NY	Fayetteville, R.W. Jackson Co.	315-637-3851
NY	Roslyn Heights, Livera-Polk Assocs.	516-484-1276
NC	Greensboro, L & D Inc.	919-292-3201
Ohio	Vandalia, W.J. Brauer Assocs.	216-943-0601
Pa	Philadelphia, C.H. Newson & Assocs.	215-248-3377
Pa	Pittsburgh, W.J. Brauer Assocs.	412-921-3213
Tex	Dallas, Elcom	214-EM8-3578

U.S. ELCTRNS., Dept. EM, 500 Long Branch Ave., Long Branch, N.J. 07740, Tel: 201-870-9500; Empl.: 48

Sales Manager: R. Bruckner

Local Sales Offices & Reps.

NJ	Livingston, Thaw Sls.	201-992-2711

U.S. INSTR. RENTALS, INC., Dept. EM, 951 Industrial Rd., San Carlos, Cal. 94070, Tel: 415-592-9225; Empl.: 83

Local Sales Offices & Reps.

Ala	Huntsville, BCS Assocs.	205-881-1220
Ariz	Phoenix, U.S. Instr Rentals	602-257-1345
Cal	Burbank, U.S. Instr. Rentals	213-849-5861
Cal	Mountain View, CSS Telecomm	415-964-4335
Cal	Newport Beach, U.S. Instr. Rentals	714-752-6851
Cal	San Carlos, U.S. Instr. Rentals	415-592-9230
Colo	Denver, U.S. Instr. Rentals	303-779-0523
Conn	Watertown, U.S. Instr Rentals	1-800-631-5541
Fla	Melbourne, U.S. Instr. Rentals	305-259-3004
Fla	Orlando, BCS Assocs.	305-896-4881
Ga	Atlanta, U.S. Instr Rentals	404-955-4473
Ill	Des Plaines, U.S. Instr. Rentals	312-296-5050
Kans	Kansas City, U.S. Instr Rentals	913-677-0011
Md	Rockville, U.S. Instr. Rentals	301-340-1353
Mass	Wakefield, U.S. Instr. Rentals	617-246-1515
Mich	Detroit, U.S. Instr Rentals	313-493-1919
NJ	Rahway, U.S. Instr. Rentals	201-381-3500
NY	Huntington, U.S. Instr Rentals	516-271-7132
NY	Rochester, U.S. Inst Rentals	
NC	Greensboro, BCS Assocs.	919-273-1918
Ohio	Cleveland, U.S. Instr. Rentals	216-475-6647
Ohio	Dayton, U.S. Instr Rentals	513-863-4446
Okla	Tulsa, U.S. Instr Rentals	918-492-7333
Pa	Philadelphia, U.S. Instr Rentals	215-293-9266
Tex	Houston, U.S. Instr Rentals	713-923-2223
Tex	Richardson, U.S. Instr. Rentals	214-234-3392

USM CORP., "POP" Rivet & Eyelet Divs., Dept. EM, 510 River Rd., Shelton, Conn. 06484, Tel: 203-735-9341, TWX: 710-451-3734; Empl.: 375

U.S. TERMINALS INC.

U.S. TERMINALS, Dept. EM, 7502 Camargo Rd., Cincinnati, Ohio 45243, Tel: 513-561-8145, TWX: 810-461-2290; FSC No.: 12615

Sales Manager: G.L. Stepp

Local Sales Offices & Reps.

Ariz	Phoenix, Gramer & Co.	602-279-1231
Ill	Chicago, L-Tec, Inc.	312-286-1500
Iowa	Cedar Rapids, J.R. Sls. Engrg., Inc.	319-393-2232
Mass	Needham, A & M Elctrn. Rep.	617-444-8170

Advertisement

- Slip lock Teflon terminals
- Press type Teflon terminals
- Printed circuit terminals
- Sockets test point & jacks
- Grounding terminals
- Binding posts--Teflon--install fast
- Miniature high voltage connectors
- DIP/DIL/IC & transistor sockets
- Miniature patch cords & receptacles
- Automatic installation equipment

UTE MICROWAVE, Dept. EM, 3500 Sunset Ave., Asbury Park, N.J. 07712, Tel: 201-922-1009, Telex: 13-2461; FSC No.: 26231; Empl.: 15

Local Sales Offices & Reps.

Ariz	Scottsdale, Fryco	602-495-3821
Cal	N. Hollywood, Crown Elctrns.	213-877-3550
Fla	Winter Haven, Lee Assocs	813-294-5815
Mass	Wakefield, Nerem	617-245-4426
Mo	Florissant, Sheridan Assoc.	314-837-5200
NM	Albuquerque, A.L.S. Elec.	505-298-2575
NY	Commack, Richman Sls.	516-543-5532
NY	Utica, B.D. Hummel Co.	315-736-7821
Pa	Hatboro, Mer-Mon Sls.	215-672-5565
Tex	Dallas, Airep Elctrns	214-827-2120
Va	Baileys Crossroads, Q.T. Elctrn.	703-671-4357
Exp:	Conn., Stamford, Microwave Int'l	203-322-6911

VACTEC, INC., Dept. EM, 2423 Northline Blvd., Maryland Heights, Mo. 63043, Tel: 314-872-8300, TWX: 910-764-0811; Empl.: 310 p. 3148,3149

Sales Manager: D. Hartley; *Distributor Manager:* D. Hartley

Local Sales Offices & Reps.

Ariz	Phoenix, Arrowhead Sls. Corp.	602-277-7148
Cal	Encino, King-Way Assocs.	213-788-4124
Colo	Arvada, Arrowhead Sls. Corp.	303-423-5556
Conn	Madison, A & M Elctrn. Reps.	203-421-4242
Fla	Orlando, Buchanan & Abrams Assocs.	305-898-7444
Ill	Chicago, T.B. Hunter Assocs.	312-777-2500
Ind	Fort Wayne, Scott Elctrns., Inc.	219-743-1586
Ind	Indianapolis, Scott Elctrns., Inc.	317-897-9977
Kans	Prairie Village, Engrg. Svcs. Co.	913-649-4000
Md	Baltimore, R.L. Wilkinson, Inc.	301-377-7800
Mass	Needham, A & M Elctrn. Reps.	617-444-8170
Mich	Detroit, H.D. Mysing	313-537-5460
Minn	Edina, M. Foster Co.	612-835-2252
Mo	St. Louis, Engrg. Svcs. Co.	314-997-1515
NY	Syracuse, C.W. Beach Co.	315-446-9587
Ohio	Cincinnati, Scott Elctrns.	513-791-2513
Ohio	Cleveland, Scott Elctrns.	216-291-2600
Ohio	Columbus, Scott Elctrns., Inc.	614-236-8619
Ohio	Dayton, Scott Elctrns., Inc.	513-294-0539
Okla	Tulsa, Allied Comps.	918-492-7771
Pa	Pittsburgh, Scott Elctrns.	412-828-1073
Pa	Willow Grove, Techparts	215-659-6900
Tex	Austin, Allied Comps.	512-459-0761
Tex	Dallas, Allied Comps.	214-238-0408
Tex	Houston, Allied Comps.	713-960-1962
Wash	Seattle, B. Hirsh Co.	206-783-3423
Exp:	Chicago, Ill., J.D. Marshall Int'l., Inc.	312-583-6060

Local Distributors

Cal	Encino, King Way West	213-788-4124
Cal	Palo Alto, Zack Elctrns.	415-326-5432
Colo	Denver, Integrated Elctrns. Co.	303-534-6121
Ill	Chicago, Newark Elctrns.	312-638-4411
Mass	Newton, A.W. Mayer	617-965-1111
Mo	St. Louis, Olive Ind'l Elec.	314-863-7800
Tex	Dallas, Circom Inc	214-241-7707
Exp:	Canada, Vancouver, B.C., R-A-E Indl. Elctrns. Ltd.	687-2621

VACTRONIC LAB. EQUIP., INC., Dept. EM, 65 Brightside Ave., E. Northport, N.Y. 11731, Tel: 516-AN 1-2660; Empl.: 10

VACUUM PRODS., INC., Dept. EM, 25 Dock St., Mt. Vernon, N.Y. 10550, Tel: 914-664-7330; FSC No.: 23322; Empl.: 5

VACUUM RESCH. MFG., Dept. EM, 3100 Crow Canyon Rd., San Ramon, Cal. 94583, Tel: 415-837-7241; Empl.: 24

Local Sales Offices & Reps.

Cal	Palos Verdes Penin., C-T Prod. Co.	213-377-9983
Cal	Pleasanton, Jolliff Engrg. Co.	415-846-2667
Fla	Clearwater, Harra Techn Sls	813-461-1639
Ga	Atlanta, W. L. Schoonover, Inc.	404-255-0761
Ill	Chicago, Clarkson Engrg. Co.	312-286-2314
Ill	Des Plaines, B. Ellis Assocs.	312-298-7626
Mass	Boston, Industrial Equip. & Sls. Corp.	617-426-4406
NY	Commack, Electrolab Equip. Co.	516-543-0378
Pa	Paoli, T. Griffin Co.	215-644-7710
Pa	Pittsburgh, K. J. Lesker Co.	412-892-2996
Wash	Seattle, Penryn, Inc.	206-783-4334

VALHALLA SCIENTIFIC, INC., Dept. EM, 7707 Convoy Ct., San Diego, Cal. 92111, Tel: 714-277-2732; Empl.: 15

Sales Manager: K. Clark

Local Sales Offices & Reps.

Ala	Huntsville, Currie, Peak & Frazier, Inc.	205-536-5650
Ariz	Tempe, Trembly Assocs.	602-966-4428
Cal	Mountain View, MANCO	415-964-7281
Cal	San Diego, Mesa Engrg.	714-278-8021
Cal	Torrance, Cutlass	213-324-7360
Colo	Parker, Technology Mktg. Assocs.	303-841-3435
Fla	Orlando, Currie, Peak, & Frazier, Inc.	305-855-0843
Haw	Honolulu, E.M.C. Corp.	808-847-1138
Ill	Arlington Heights, Dytec/Central	312-394-3380
Ind	Ft. Wayne, Dytec/Central	219-485-0845
Kans	Overland Park, Dytec/South	913-384-2710
La	Baton Rouge, SESCO	504-924-5102
Md	Silver Spring, Sel-Tronics	301-589-3391
Mass	Needham, Addelco Corp.	617-444-4754
Mass	Needham, Addelco Corp.	617-444-4754
Mich	Farmington, Carter, McCormic & Peirce	313-477-7700
Minn	St. Paul, Dytec/North	612-645-5816
Mo	St. Louis, Dytec/South	314-423-9595
Nev	Las Vegas, Trembly Assocs	702-739-6816
NJ	Englewood, Eastern Instrumentation	201-567-9505
NM	Albuquerque, Trembly Assocs.	505-266-8616
NY	Rochester, Scientific Devices	716-334-2445
NC	Greensboro, Currie, Peak & Frazier, Inc.	919-273-3040
Ohio	Cleveland, Carter, McCormic & Peirce	216-779-5100
Ohio	Dayton, Carter, McCormic & Peirce	513-222-7700
Pa	Melrose Park, R.A. Meyers Assocs.	215-224-1663
Tex	Dallas, SESCO	214-231-9364
Tex	Houston, SESCO	713-688-9656
Wash	Seattle, J.B. Jolly, Inc.	206-938-4166

VALTEC CORP, Valpey-Fischer Div, Dept. EM, 75 South St, Hopkinton, Mass. 01748, Tel: 617-435-6831, Telex: 94-8332

Local Sales Offices & Reps.

Ala	Huntsville, Beacon Elctrns	205-881-5031
Cal	Mountain View, Thresum Assocs	415-965-9180
Cal	San Diego, Littlefield & Smith Assocs	714-455-0055
Cal	Santa Ana, Rical Assocs	714-557-6543
Conn	Hamden, Impact Sls	203-281-1331
Fla	Ft. Lauderdale, Beacon Elctrns	305-971-7320
Ga	Atlanta, Beacon Elctrns	404-351-3654
Ill	Chicago, Indl Reps	312-647-7755
Ind	Fort Wayne, M&N Prods	219-747-2461
Kans	Wichita, Forristal-Young	316-838-7226
Md	Baltimore, Bernard White & Co.	301-484-5400
Mass	Newton, Impact Sls	617-964-7740
Mich	Southfield, Rep Elctrn Prods	313-559-1080
Minn	Minneapolis, Bitronics Sls	612-835-7744
Mo	Kansas City, Forristal-Young	816-358-6771
NJ	Cherry Hill, Danco Elctrns	609-424-5590
NY	Fayetteville, Martin P. Andrews Co	315-637-9734
NY	Melville, Astrorep	516-423-2266
NC	Charlotte, Beacon Elctrns	704-525-7412
Ohio	Rocky River, Norm Case Assoc	216-333-4120
Tenn	Oak Ridge, Beacon Elctrns	615-482-2409
Wash	Bellevue, Olson, Ferree & Assocs	206-454-1210
Wisc	Milwaukee, Indl Reps	414-259-0965

VAN NORMAN MOLDING CO., Dept. EM, 9599 S. 76th Ave., Bridgeview, Ill. 60455, Tel: 312-284-0118; Empl.: 80

Sales Manager: R.I. Andre, Gen. Mgr.

VANGUARD RELAY CORP., Dept. EM, 225 Cortland St., Lindenhurst, N.Y. 11757, Tel: 516-226-5000

Sales Manager: B.S. Gilman

Local Sales Offices & Reps.

NJ W. Caldwell, Peterson-Rudmick Assoc.201-CA 6-4363

NY New York, Peterson-Rudmick Assoc. 212-671-1923

Advertisement

VANGUARD manufactures an extensive line of general purpose relays and hybrid Time Delay Relays covering a broad range of industrial applications. Relay types from 1 to 4 poles and 2 to 20 amps. Models include open, plug-in, enclosed, printed circuit use, antenna, sensitive and contactor with many models listed by U/L. Time delay relays are plug-in and panel mounted units having solid state circuitry and relay output. VANGUARD offers you quality products, competitive pricing, responsive service and dependable deliveries. Full literature available upon request.

VARADYNE INDUSTRIES, INC., Dept. EM, 1520 Cloverfield Blvd., Santa Monica, Cal. 90404, Tel: 213-829-2984, TWX: 910-343-6856; FSC No.: 26654; Empl.: 325 ..... p. 1284,1285

Sales Manager: B. Catterson; *Distributor Manager:* B. Catterson

Local Sales Offices & Reps.

Ala Huntsville, Technology Mktg. Assoc. 205-883-7893
Ariz Scottsdale, Fred Board Assocs. 602-994-9388
Cal Irvine, Celtec Co. 714-557-5021
Cal Redwood City, J. S. Heaton Co. 415-367-9000
Cal San Diego, Celtec Co. 714-279-7961
Cal Sherman Oaks, Celtec Co. 213-990-3440
Colo Parker, J. S. Heaton Co. 303-841-3651
Conn North Haven, Kitchen & Kutchin 203-239-0212
Fla Orlando, Technology Mktg. Assocs. 305-857-3760
Fla Pompano Beach, Technology Mktg. Assocs. 305-942-0774
Ill Rolling Meadows, Sieger Assocs.312-991-6161
Ind Ft. Wayne, R. O. Whitesell Assoc. 219-432-5591
Ind Indianapolis, R. O. Whitesell Assoc. 317-359-9283
Ind Kokomo, R. O. Whitesell Assoc. 317-453-3592
Iowa Cedar Rapids, Dy-Tronix 319-377-8275
Ky Louisville, R. O. Whitesell Assoc. 502-897-1569
Md Glen Burnie, Trie-Mark, Inc. 301-768-2800
Mass Lexington, Kitchen & Kutchin 617-862-8230
Mich Grand Rapids, R. O. Whitesell Assoc. 616-942-5420
Mich Southfield, R. O. Whitesell Assoc. 313-559-5454
Mich St. Joseph, R. O. Whitesell Assoc. 616-983-7337
Minn Bloomington, Thomas Mktg. 612-888-5551
Mo Hazelwood, Dy-Tronix 314-731-5799
Mo Independence, Dy-Tronix 816-737-1100
NM Albuquerque, Power Entprs 505-881-8537
NY Port Washington, P. D. Aaron Assoc. 516-883-0600
NY Rochester, D.L. Eiss Assocs. 716-889-1919
NC Hy-Point, Engrg Devices 919-869-7200
Ohio Cincinnati, R. O. Whitesell Assoc.513-521-2290
Ohio Columbus, R. O. Whitesell Assoc. 614-888-9396
Ohio Dayton, R. O. Whitesell Assoc. 513-298-9546
Ohio Middleburg Hghts, R. O. Whitesell Assoc. 216-826-4424
Ore Beaverton, R & R Elctrns. 503-643-5754
Pa Fort Washington, GCM Assocs. 215-646-7535
Pa Pittsburgh, R. O. Whitesell Assoc. 412-344-7277
Tenn Greeneville, R. O. Whitesell Assoc. 615-639-6154
Tex Dallas, M. Kruvand Assocs. 214-691-4592
Tex Houston, M. Kruvand Assocs. 713-780-9710
Wash Seattle, R & R Elctrncs. Assoc. 206-762-7664
Exp: New York, N.Y. (S. Africa), NPNTelex 12325 212-541-9056

Local Distributors

Ariz Phoenix, Mirco Elctrncs. 602-997-5931
Ariz Tempe, Marshall Inds 602-968-6181
Cal Canoga Park, Marshall Inds. 213-999-5001
Cal El Monte, Marshall Inds 213-686-0141
Cal Garden Grove, National Elctrncs. Supply 714-892-7749
Cal Palo Alto, Eric Elctrncs. 415-969-4500
Cal San Diego, Mock III Sls. Co. 714-560-0515
Cal San Diego, Marshall Elctrns. 714-278-6350
Cal Sunnyvale, Marshall Inds. 408-732-1100
Cal Van Nuys, Edmar Elctrns. 213-782-9020
Colo Arvada, Marshall Inds 303-423-9670
Colo Denver, Integrated Elctrns. 303-534-6121
Conn North Brandford, Marshall Inds. 203-484-0488
Fla Clearwater, Diplomat/Southland, Inc. 813-443-4514
Fla Orlando, Marshall Inds. 315-859-1620
Ill Des Plaines, Marshall Inds. 312-298-3700
Ill Des Plaines, Edmar Elctrns. 312-298-8580
Ind Indianapolis, Sheridan Sls 317-297-3146
Mass Chicopee, Diplomat/I.P.C. Corp. 413-592-9441
Mass Newton, Greene-Shaw Co. 617-969-8900
Mass Newton, Marshall Inds. 617-965-5115
Mich Farmington Hills, Sheridan Sls. Co. 313-477-3800
Minn Minneapolis, Stark Elctrns. 612-332-1325
Minn Plymouth, Marshall Inds. 612-559-2211
NY Farmingdale, Marshall Inds. 516-293-4141
Ohio Cincinnati, Sheridan Sls. Co. 513-761-5432
Ohio Dayton, Marshall Inds. 513-898-1105
Pa King of Prussia, Marshall Inds. 215-337-3330
Tex Dallas, Marshall Inds. 214-233-5200
Tex Houston, Marshall Inds. 713-777-0358
Wash Bellevue, Marshall Inds. 206-883-1084
Wash Seattle, Shannon Ltd. 206-763-0545

VARFLEX CORP., Dept. EM, 514 W. Court St., Rome, N.Y. 13440, Tel: 315-336-4400; FSC No.: 79074; Empl.: 120 ..... p. 2848

Sales Manager: J. N. Wright

Local Sales Offices & Reps.

Ariz Phoenix, Elec. Specialty 602-275-5736
Ark Little Rock, Hisco 501-568-3105
Cal Anaheim, Electrical Specialty Co.714-630-7050
Cal Los Angeles, Electrical Spec. Co. 213-724-9600
Cal San Diego, Elec. Specialty Co. 714-239-1345
Cal So. San Francisco, Electrical Spec. Co. 415-589-9611
Colo Denver, Elec. Specialty 303-321-0226
Ga Atlanta, Prehler Elec. Insulation 404-449-8156
Ill Chicago, Prehler Elec. Insulation 312-384-6100
Ky Louisville, E & H Elec. Supply 502-587-0991
Me York, F.H. Hart 207-363-3679
Minn St. Paul, Prehler Elec. Insulation 612-452-2470
Mo University City, E.P. Gund 314-862-1650
NY Carle Pl., W. R. Murphy 516-333-6122
NY Liverpool, W.T. Elliott 315-652-3690
NC High Point, Prehler Elec. Insulation 919-887-2676
Ohio Cleveland, Prehler Elec. Insulation 216-267-2650
Ore Portland, Elec. Specialty 503-227-3601
Pa Ardmore, Martin Assocs. 215-649-6332
Pa Pittsburgh, E.B. Beach Co. 412-242-0400
Tex Garland, Hisco 214-272-5411
Tex Houston, Hisco 713-683-0311
Tex San Antonio, Hisco 512-657-4110
Utah Salt Lake City, Elec. Specialty 801-487-9805
Wash Seattle, Elec. Specialty 206-682-3434

Local Distributors

Ariz Phoenix, Electrical Specialty 602-275-5736
Ark Little Rock, Hisco 501-568-3105
Cal Anaheim, Electrical Specialty 714-630-7050
Cal Los Angeles, Electrical Specialty 213-724-9600
Cal San Diego, Electrical Specialty 714-239-1345
Cal So. San Francisco, Electrical Specialty 415-589-9611
Colo Denver, Electrical Specialty 303-321-0226
Ga Atlanta, Prehler Electrical Insulation 404-449-8156
Ill Chicago, Prehler Electrical Insulation 312-384-6100
Ky Louisville, E & H Electric Supply 502-587-0991
Minn St. Paul, Prehler Electrical Insulation 612-452-2470
NC High Point, Prehler Electrical Insulation 919-887-2676
Ohio Cleveland, Prehler Electrical Insulation 216-267-2650
Ore Portland, Electrical Specialty 503-227-3601
Pa Pittsburgh, E.B. Beach Co. 412-242-0400
Tex Garland, Hisco 214-272-5411
Tex Houston, Hisco 713-683-0311
Tex San Antonio, Hisco 512-657-4110
Utah Salt Lake City, Electrical Specialty 801-487-9805
Wash Seattle, Electrical Specialty 206-682-3434
Exp: Canada, Mississauga, Ont., Electric Insulation & Fibre Co. 416-624-0700

VARIAN ASSOCS., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303, Tel: 415-493-4000, TWX: 910-373-1731; Empl.: 8800

Local Sales Offices & Reps.

Ariz Scottsdale 602-947-5461
Cal Downey (L.A.) 213-927-3415
Cal Irvine 714-955-1050
Cal Los Altos 415-968-7630
Cal Marina Del Rey 213-822-8026
Cal Palo Alto 415-493-4000
Cal San Diego 714-279-5900
Cal Santa Clara 408-248-6040
Cal Santa Monica 213-828-5588
Cal Studio City 213-872-0735
Colo Wheatridge 303-425-0413
Fla Clearwater 813-446-8513
Ga Atlanta 404-955-1397
Ga Atlanta 404-256-9363
Ga College Park 404-766-4728
Ill Chicago 312-992-3720
Ill Geneva 312-232-4300
Ill Park Ridge 312-825-6686
Ky Louisville 502-897-0171
Md Cheverly 301-773-7010
Mass Lexington 617-861-7200
Mass Needham 617-449-1242
Mass Waltham 617-890-4560
Mo Dellwood 314-521-8866
NJ Mount Laurel 609-235-6800
NY Floral Park 212-822-3700
NY Springfield 212-376-6600
NY Syracuse 315-437-2568
Ohio Dayton 513-258-3930
Ohio Euclid 216-261-2115
Tenn Knoxville 615-690-3252
Tex Dallas 214-231-5936
Tex Houston 713-783-1800
Tex Richardson 214-235-2385
Wash Bellevue 206-454-2911

VARIAN ASSOCS., Instrument Div., Dept. EM, 611 Hansen Way, Palo Alto, Cal. 94303, Tel: 415-493-4000, TWX: 910-373-1731

Sales Manager: J. Brake

Local Sales Offices & Reps.

Cal Downey 213-927-3415
Cal Los Altos 415-968-8141
Colo Wheatridge 303-425-0413
Ga Atlanta 404-955-1392
Ill Park Ridge 312-825-7772
Ky Louisville 502-897-0171
Md Cheverly 301-772-3683
Mass Waltham 617-890-8430
NJ Florham Park 201-822-3700
NY Syracuse 315-437-6464
Ohio Euclid 216-261-2115
Tex Houston 713-783-1800
Wash Seattle 206-454-2910

VARO ELECTRON DEVICES, INC., Dept. EM, 2203 W. Walnut St., Garland, Tex. 75040, Tel: 214-272-3561 TWX: 910-860-5093; FSC No.: 27777; Empl.: 250

Local Sales Offices & Reps.

NJ Eatontown 201-229-1400
Va Arlington 703-920-4500

VARO, INC, Power Systems Div., Dept. EM, 2201 Walnut, Garland, Tex. 75040, Tel: 214-276-6141, TWX: 910-860-5093; Empl.: 1500 ..... p. 3407

Sales Manager: C. L. Payne

Local Sales Offices & Reps.

NJ Eatontown, L. Donnelly 201-229-1400
Va Arlington, A. Fiedler & M. Walker 703-920-4500

VARO SEMICONDUCTOR, INC., Dept. EM, 1000 N Shiloh Rd., Garland, Tex. 75040, Tel: 214-271-8511 TWX: 910-860-5178; Empl.: 1500

Local Sales Offices & Reps.

Ala Huntsville, 20th Century Mktg. Inc. 205-772-923
Ariz Scottsdale, Summit Sls. 602-994-458
Cal Los Altos, W.W. Posey Co. 415-948-777
Cal Los Angeles, Corcoran Assoc. 213-823-458
Cal Westminster, Corcoran Assoc. 714-893-467
Colo Parker, Technology Mktg. 303-841-343
Conn North Haven, Comp Rep Assocs.203-239-976
Fla Orlando, OEM Mktg. Corp. 305-299-100
Ill Des Plaines, Coombs Assocs. 312-298-483
Ill Elk Grove Village, Varo Semiconductor 312-593-886
Ind Indianapolis, Tech. Reps, Inc. 317-849-645
Kans Overland Park, Kebco 913-649-105
Mass Needham, Comp Rep Assocs. 617-444-248

Mich Farmington, Davis-Martensen Co. 313-474-8300
Minn Minneapolis, Nortec Sls. 612-835-7414
Mo Maryland Heights, Kebco 314-576-4111
NY Great Neck, Cooper-Simon & Co. 516-487-1142
NY Ithaca, B. Dean, Inc. 607-272-2187
NC High Point, Engineering Devices Corp. 919-869-7200
Ohio Dayton, J.C. Hofstetter Co. 513-296-1010
Ohio Medina, J.C. Hofstetter Co. 216-241-4880
Ore Portland, Western Technical Sales 503-297-1711
Tex Addison, Ammon & Rizos 214-233-5591
Utah Salt Lake City, Technology Mktg. Assoc. 801-485-9381
Wash Bellevue, Western Technical Sales 206-641-3900
Wisc Brookfield, Varo Semiconductor 414-782-7590

/ECTOR ASSOCS., Dept. EM, 3831 Horse Block Rd, Yaphank, N.Y. 11980, Tel: 516-924-0100, TWX: 510-228-2650; Empl.: 50

Sales Manager: S. Bienstock

Local Sales Offices & Reps.

Cal Los Angeles, T. Louis Smitzer Co. 213-836-6170
Md Germantown, Sales Tech. 301-340-0015
Mich Southfield, Electroquipment Sls. 313-569-4497
NJ Englewood, Eastern Instr. 201-567-9505
Ohio Chesterland, Electroquipment Sls. 216-729-2222
Tex Houston, Data Aids Assocs. 713-862-6685
Wash Seattle, Hayes Tech. 206-763-2210

/ECTOR ELECTRONIC CO., INC., Dept. EM, 12460 Gladstone Ave., Dept. EP, Box 4336, Sylmar, Cal. 91342, Tel: 213-365-9661; TWX: 910-496-1539; FSC No.: 82893; Empl.: 98 ..p. 1052-1056,1312-1319,2249

Sales Manager: F. L. Hill

Local Distributors

Ala Birmingham, J.W. Clary Co. 205-322-2486
Ariz Phoenix, Dalis Radio/T.V. Supply 602-258-8151
Cal Inglewood, Newark Elctrns. Co. 213-678-0441
Cal Los Angeles, RPS, Inc. 213-748-1271
Cal Mountain View, Abacus Elctrns. Co. 415-961-1500
Cal Oakland, Brill Elctrns. 415-834-5888
Cal Palo Alto, Zack Elctrns. 415-326-5432
Cal Pasadena, Dow Radio 213-793-1195
Cal Pasadena, Empire Elctrns. Distr. 213-681-2711
Cal Pomona, R. V. Weatherford Co. 714-623-1261
Cal Riverside, Electronic Supply Riverside 714-683-8110
Cal Sacramento, Dunlap Elctrns. 916-444-8070
Cal San Diego, RPS Elctrns. 714-292-5611
Cal San Diego, Shanks & Wright 714-239-0176
Cal San Francisco, Zack Elctrns. 415-626-1444
Cal San Jose, Quement Elctrns. 408-998-5900
Colo Denver, Electronic Parts 303-744-1992
Colo Denver, Newark-Denver Elctrn. Supply Co. 303-757-3351
Fla Orlando, Powell-Florida Elctrns. 305-859-1450
Haw Honolulu, Honolulu Elctrns. 808-949-5564
Haw Honolulu, Precision Radio 808-537-5291
Ill Chicago, Newark Elctrns. Corp. 312-638-4411
Ill Elgin, Allied Elctrn. Corp. 312-697-8200
Ill Niles, Joseph Elctrns. 312-297-4200
Ill Palatine, Ohm/Elctrns. 312-359-5500
Ill Peoria, Klaus Radio 309-691-4840
Ind Indianapolis, RA-DIS-CO 317-637-5571
Ind Indianapolis, Graham Elctrn. Supply 317-634-8202
Iowa Cedar Rapids, Deeco, Inc. 319-365-7551
Ky Louisville, P.I. Burks Co. 502-589-3960
Md Baltimore, A S I Elctrns. 301-265-5100
Md Beltsville, Powell Elctrns.-Wash. 301-474-1030
Md Rockville, Capitol Radio Wholesalers 301-942-7505
Mass Boston, Cramer Elctrns. 617-969-7700
Mass Boston, Gerber Elctrns. 617-329-2400
Mass Boston, Land Elctrn. Supply 617-592-2220
Mass Hingham, Sager Electrical Supply Co. 617-542-2281
Mich Ann Arbor, Wedemeyer Elctrn. Supply Co. 313-665-8611
Mich Detroit, Newark - Detroit Elctrns. 313-548-0250
Mich Detroit, RS Elctrns. 313-491-1000
Minn St. Paul, Gopher Elctrns. Co. 612-645-0241
Mo St. Charles, Lectronix 314-946-6426
Mo St. Louis, Olive Industrial Elctrns. 314-863-7800
Neb Lincoln, Scott Elctrn. Supply Corp. 402-464-8308
NJ Camden, General Radio Supply Co. 609-964-8560
NJ E. Hanover, State Elctrn. Parts Corp. 201-887-2550
NJ Pennsauken, RESCO Elctrns. Div. ASTREX 609-662-4000
NM Albuquerque, Elctrn. Parts Co. 505-293-6161
NY Buffalo, Summit Distrs. 716-884-3450
NY Rochester, Simcona Elctrns. 716-328-3230
NY Rockville Centre, Midway Industrial Elctrns. 516-764-2400
NY Woodbury, Harvey Radio 516-921-8700
NC Greensboro, Pioneer/Carolina 919-273-4441
NC Raleigh, Southeastern Radio Supply Co. 919-828-2311
Ohio Akron, Akron Elctrns. Supply 216-762-8818
Ohio Cleveland, Pioneer/Cleveland 216-587-3600
Ohio Columbus, Thompson Elctrn. Supply 614-228-6191
Ohio Columbus, Hughes Peters Co. 614-294-5351
Ohio Dayton, Stotts Friedman Co. 513-298-5555
Okla Oklahoma City, Trice Wholesale Elctrns. 405-524-4411
Okla Tulsa, Radio, Inc. 918-587-9123
Ore Portland, Almac-Stroum 503-292-3534
Ore Portland, United Radio Supply 503-233-5346
Pa Drexel Hill, Kass Elctrn. Distr. 215-449-2300
Pa Philadelphia, Powell Elctrns. 215-365-1900
Pa Pittsburgh, CAM/RPC 412-782-3770
RI Providence, Wm. Dandreta & Co. 401-861-2800
Tenn Memphis, Bluff City Distributing Co. 901-276-4501
Tex Dallas, Wholesale Elctrn. Supply 214-824-3001
Tex Fort Worth, Wholesale Elctrn. Supply 817-336-0561
Tex Fort Worth, Allied Elctrns. 817-336-5401
Tex Garland, Newark-Dallas Elctrns. Corp. 214-271-2511
Tex Houston, Harrison Equip. Co. 713-652-4700
Utah Salt Lake City, Ballard Supply Co.
Va Richmond, AVEC Elctrns. Corp. 804-359-6071
Wash Seattle, Radar Electric Co. 206-282-2511
Wash Seattle, Almac/Stroum 206-763-2300
Wisc Milwaukee, Marsh Elctrns. 414-545-6500
Wisc Milwaukee, Parts Mart Corp. 414-276-4160
Exp: Cal., Los Angeles, Trans-World Trade
For: Can., Downsview, Ont., CESCO Elctrns., Ltd. 416-661-0220
For: Can., Montreal, Que., CESCO Elctrns. Ltd. 514-735-5511
For: Can., Ottawa, Ont., CESCO Elctrns. Ltd. 613-729-5118
For: Can., Vancouver, B.C., R-A-E Ind'l. Elctrns. Ltd. 604-687-2621
For: Can., Willowdale, Ont., Electro Sonic 416-494-1666

VECTROL, INC., Dept. EM, 110 Douglas Rd, Oldsmar, Fla. 33557, Tel: 813-855-4621; Empl.: 56

Sales Manager: R. Boggs

Local Sales Offices & Reps.

Cal Bell Flower, Kilowatt Control 213-925-6595
Cal San Francisco, Artwell Elec. Co. 415-467-1880
Cal Santa Ana, Westronix 714-979-8472
Ga Doraville, PAR Assocs. 404-393-0018
Ill Chicago, Markson Assocs. 312-267-1905
Md Mount Airy, Strayton Associates 301-831-7007
Mass Needham, Eastronix, Inc. 617-449-1550
Mich Dearborn, Industrial Temperature Control Co. 313-278-2210
NJ Ridgewood, Ballou Inc. 201-444-6990
NY Lancaster, Lawrence Industrial Sls. 716-685-1993
Ohio Cleveland, Drivex-North Inc. 216-486-1600
Ohio Dayton, Mohawk Intronics 513-434-8873
Ore Portland, D. Hand & Assocs. 503-254-5519
Pa Pittsburgh, G. Glass & Assocs. 412-366-6664
Pa Valley Forge, Gil-Tronics 215-933-8525
Tex Dallas, Titan Reps. 214-661-5350
Wisc Milwaukee, E.A. Dickinson & Assocs. 414-264-1080

VECTRON LABS., INC., Dept. EM, 166 Glover Ave., Norwalk, Conn. 06850, Tel: 203-853-4433, TWX: 710-468-3796; FSC No.: 27802; Empl.: 125 p. 2376-2378

Local Sales Offices & Reps.

Ala Huntsville, Saber Assoc. 800-327-1193
Cal Los Angeles, Fetty/Schoenduve 213-651-4050
Cal Palo Alto, Fetty/Schoenduve 415-321-7041
Cal San Diego, F. Schoenduve 714-292-5136
Colo Parker, Technical Mktg. Assocs. 303-841-3435
Conn Enfield, Meco 203-225-3409
Fla Pampono Beach, Saber Assoc. 800-327-1193
Ga Atlanta, Saber Assoc. 800-327-1193
Ill Skokie, Heth Inc. 312-282-8737
Ind Indianapolis, Ihrig Assocs. 317-783-7630
Kans Overland Park, Ensco-Rep., Inc. 913-381-7557
Mass Reading, Meco 617-944-6660
Mich Detroit, R.P. Urban Assocs. 313-535-2355
Mich Grand Rapids, R. P. Urban Assocs. 616-245-0511
Minn Burnsville, Heth, Inc. 612-333-8494
Mo St. Louis, Ensco-Rep 314-567-3935
NJ Woodcliff Lake, F & F Assoc. 201-778-6767
NM Albuquerque, Technical Mktg. Assocs 505-298-4321
NY Coram, F & F Assoc 516-928-9666
NY Syracuse, Rep Tech 315-437-2845
NC North Hills, Saber Assoc. 800-328-1193
Ohio Brecksville, A. Nace Co. 216-526-4323
Ohio Englewood, A. Nace Co. 513-836-0931
Pa Newtown Sq., SWR Assocs. 215-356-8550
Pa Pittsburgh, A. Nace Co. 412-922-7225
Tex Dallas, Texas Avionics 214-363-6324
Va Springfield, Temsco 703-569-2700
Wash Seattle, Datacom 206-285-2525

VEEDER-ROOT, Dept. EM, 70 Sargeant St., Hartford, Conn. 06102, Tel: 203-527-7201, Telex: 9-9219; Empl.: 1200

Local Sales Offices & Reps.

Cal Burlingame 415-697-6830
Cal Glendale 213-245-8421
Conn Hartford 203-247-0133
Ill Des Plaines 312-824-0188
Md Baltimore 301-296-2177
Mich Detroit 313-886-4485
Minn Minneapolis 612-831-1711
NJ Ridgewood 201-445-2401
NY Rochester 716-586-1779
NC Charlotte 704-544-7545
Ohio Cincinnati 513-271-6200
Ohio Cleveland 216-229-2634
Pa Willow Grove 215-887-0708
SC Greenville 803-288-2133
Tex Arlington 214-252-3360

VEETRONIX, Dept. EM, Box 209, 136 W. 7th St., Cozad, Neb. 69130, Tel: 308-784-4000; Empl.: 25 .... p. 4269

Local Sales Offices & Reps.

Cal San Gabriel, Van Gott Assoc. 213-285-2148
Cal Santa Clara, Ruby Sls. Co. 408-739-5333
Colo Denver, G. Moss Elect. Sls. 303-985-8815
Conn Bethany, Representatives Corp. 203-393-0024
Iowa Marion, Thomas & Modrcin Assoc. 319-377-6261
Kans Shawnee Mission, Thomas & Modrcin Assoc. 913-432-2131
Mass Wellesly, Representatives Corp. 617-237-1786
Mo Hazelwood, Thomas & Modrcin Assoc. 314-895-4700
NY Plainview, R. Smith Assocs. 516-681-3155
NY Spring Valley, R. Smith Assocs. 914-352-1067
NY Syracuse, Lenard Co, 315-479-9191
Ohio Akron, Shamrock Elctns. 216-666-1400
Ohio Dayton, Shamrock Elctns. 513-298-3052
Pa Paoli, Stitzer Assocs. 215-644-5500
Exp: Ill., Chicago, Magnus & Assocs. 312-334-1503

VEGA PRECISION LABS., Dept. EM, 800 Follin La., Vienna, Va. 22180, Tel: 703-938-6300, Telex: 89-2521; Empl.: 289 ..... p. 2864

Sales Manager: William B. Howells

Local Sales Offices & Reps.

Cal El Cajon 714-448-3240
Fla Ft. Walton Beach 904-863-1282

VELONEX, INSTRUMENT DIV., Dept. EM, 560 Robert Ave., Santa Clara, Cal. 95050, Tel: 408-244-7370, TWX: 910-338-0114; Empl.: 60

Local Sales Offices & Reps.

Ala Huntsville, BCS Assoc. 205-881-6220
Ariz Phoenix, R.A. Mayes Co. 602-279-5243
Cal Oakland, Advanced Technology 415-452-1401
Cal So. Pasadena, Beckrep 213-799-9586
Colo Boulder, R.A. Mayes Co. 303-444-0782
Conn Hamden, Instrument Consultants 203-288-5246
DC Washington , Gans-Frying 703-527-3262
Fla Orlando, BCS Assoc. 305-896-4881
Ill Chicago, K.W. Meyers Co. 312-774-6440
Ind Indianapolis, K.W. Meyers Co. 317-243-6681
Md Fulton, Gans-Fryling, Inc. 301-837-6311
Mass Waban, Instrument Consultants 617-969-9881
Mich Detroit, Hocker Assocs. 313-549-3910
Minn Minneapolis, K.W. Meyers Co. 612-920-7080
NM Albuquerque, R.A. Mayes & Co. 505-292-2330
NY Plainview, Eastern Metro Assocs. 516-931-1414
NY Rochester, Scientific Devices 716-334-2445
NC Greensboro, BCS Assoc 919-273-1918
Ohio Cleveland, Hocker Assocs. 216-235-6504
Ohio Dayton, Hocker Assocs. 513-298-8638
Pa Melrose Park, R. Meyers Assocs. 215-224-1663
Tex Houston, R.A. Mayes Co. 713-461-5385
Tex Richardson, R.A. Mayes Co. 214-235-3043

Va Arlington, Gans-Fryling, Inc. 703-527-3262

VELONEX, DISPLAY PRODS., Dept. EM, 560 Robert Ave., Santa Clara, Cal. 95050, Tel: 408-244-7370, TWX: 910-338-0114; Empl.: 60

Local Sales Offices & Reps.

Ala Huntsville, BCS Assocs. 205-881-6220
Ariz Phoenix, R.A. Mayes Co. 602-279-5243
Cal Los Altos, Hoeke-Reeser 415-941-4080
Cal Pasadena, Beckrep 213-799-9586
Colo Broomfield, R.A. Mayes Co. 303-444-0782
Conn Hamden, Instrument Consultants 203-288-5246
Fla Orlando, BCS Assocs. 305-896-4881
Ill Chicago, K.W. Meyers Co. 312-774-6440
Ind Indianapolis, K.W. Meyers Co. 317-243-6681
Md Fulton, Gans-Fryling, Inc. 301-837-6311
Mass Waban, Instrument Consultants .. 617-969-9881
Minn Minneapolis, K.W. Meyers Co. 612-920-7080
NM Albuquerque, R.A. Mayes Co. 505-292-2330
NY Huntington, CDB Enterprises 516-692-5200
NC Greensboro, BCS Assocs. 919-273-1918
Ohio Medina, McShane, Inc. 216-725-4568
Pa King of Prussia, Rivco 215-265-5211
Tex Dallas, R.A. Mayes Co. 214-235-3043
Tex Houston, R.A. Mayes Co. 713-461-5385
Va Arlington, Gans-Fryling, Inc. 703-527-3262
Wash Bellevue, Desco Northwest 206-455-9325

VEMALINE PRODS. DIV., Ostbys & Barton Co., Dept. EM, 487 Jefferson Blvd., Warwick, R.I. 02886, Tel: 401-739-7600; FSC No.: 08730; Empl.: 130 ..... p. 2454-2456,3970-3972

Sales Manager: C.J. Dawkins; *Distributor Manager:* C.J. Dawkins

Local Sales Offices & Reps.

Ariz Phoenix, Eagle Sales 602-948-1677
Cal San Gabriel, Van Gott & Assoc. 213-285-2148
Cal Sunnyvale, Ruby Sls. Corp. 408-739-5333
Colo Englewood, Eagle Sales 303-770-2300
Fla Cocoa, Electro Comp. 305-452-9568
Fla Ft. Lauderdale, Electro Comp. 305-564-8571
Ill Chicago, Ropek-Cahill 312-287-7292
Ind Indianapolis, McCoy Elctrn Sls .. 317-888-8396
Mass Wellesley Hills, M. Scott Co. 617-235-0102
Mich Grand Rapids, R. P. Urban Assoc. 616-245-0511
Mo St. Louis, Cadon Technical Sls... 314-991-0262
NY Huntington, Andrews & Andrews, Inc. 516-692-8686
NC Greensboro, E. Boltz Sales 919-272-6822
Ohio Cincinnati, Loesch Assoc. 606-331-4332
Ohio Cleveland, Loesch Assoc. 216-241-4581
Pa Abington, IMS Co. 215-659-0444
Tex Dallas, Blackburn Assoc. 214-351-9991
Tex Houston, Blackburn Assoc. 713-784-1989
Wash Seattle, Rhodes & Assoc. 206-244-1982
Exp: N. Y. New Rochelle, Montclair Elctrns. 914-576-1400

Local Distributors

Cal Encino, Rush Inds. 213-986-8533
Cal Sunnyvale, Ruby Stok Co. 408-739-5333
Conn Norwalk, Park Distributors 203-853-2011
Fla Miami, Electronic Equip. 301-871-3500
Mass Woburn, Rush Inds. 617-935-2400
Mich Augusta, Great Lakes Elctrns. 616-731-4156
Minn Minneapolis, Cassidy Elctrns. 612-835-7747
NJ Green Brook, Green Brook Elctrns. 201-968-3500
NJ Springfield, Federated Purchaser 201-376-8900
NY Bohemia, Car-Lac Elex. 516-567-4200
NY Buffalo, Summite Elex. 716-884-3450
NY Farmingdale, Broadline Elex. 516-420-8320
NY Rockville Centre, Midway Industrial Elex. 516-764-2400
NC Kinston, Southeastern Radio & Supply
Okla Tulsa, Radio, Inc. 918-587-9123
Pa Altoona, Allegheny Elex. 814-946-0871
SC Columbia, Dixie Radio 803-253-5333
Tex Ft. Worth, Industry Elctrns. 817-531-2961
Tex Richardson, Altair Inc. 214-263-8783
Va Charlottesville, Virginia Radio Supply 703-296-4184
Exp: N.Y., New Rochelle, Montclair Elex. 914-576-1400

VENT-RAK, DIV., General Devices Co., Dept. EM, P.O. Box 19188, Indianapolis, Ind. 46219, Tel: 317-897-7000, Telex: 27-2169; Empl.: 125 ..... p. 1034,1035

Sales Manager: J. Bradford

Local Sales Offices & Reps.

Ala Huntsville, Int'l. Scientific Instru. 205-533-6880
Ariz Scottsdale, F. Schoeffler Assoc. 602-948-3470
Cal Downey, Groh Associates 213-923-0963
Cal Mt. View, G. C. Woempner Co... 415-964-5454
Cal Van Nuys, J. R. Thomas. 213-782-3820
Colo Sedalia, Jensen Representatives 303-688-4154
Conn Cheshire, Coakley, Boyd & Abbett, Inc. 203-272-2261
Fla North Miami, J. Krutek & Assoc. 305-941-6544
Ind Indianapolis, Tech. Reps. 317-849-6454
Kans Shawnee Mission, Lowell Kangas & Assoc. 913-631-3515
Md Bethesda, G. Rosen & Assocs., Inc. 301-530-8448
Mass Needham, Coakley, Boyd & Abbett, Inc. 617-444-5470
Mich Dearborn, Pitcher Poulin, Inc. 313-582-5450
Minn St. Paul, Northport Engrg., Inc. .. 612-698-3841
Mo St. Louis, Lowell-Kangas & Assoc. 314-821-4050
NY Fayetteville, H.G. Richter, Inc. 315-637-6713
NY Mountainside, H.G. Richter 201-233-4615
Ohio Cincinnati, Components 513-721-2997
Ohio Cleveland, Components 216-842-2737
Tex Dallas, Advance Tech. Sls. 214-361-8584
Tex Houston, Advance Tech Sls. 713-569-6668
Wash Olympia, Bergford Assoc. 206-866-2001
Exp: Ind., Indianapolis, General Devices Co. 317-897-7000

VENTURE DEVELOPMENT CORP., Dept. EM, One Washington St., Wellesley, Mass. 02181, Tel: 617-237-5080; Empl.: 10

Sales Manager: B. Yankum

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VENUS SCIENTIFIC, INC., Dept. EM, 399 Smith St., Farmingdale, N.Y. 11735, Tel: 516-293-4100, TWX: 510-224-6492; Empl.: 163 ..... p. 3351

Sales Manager: T. Krilovitch

Local Sales Offices & Reps.

Ariz Scottsdale, Piper Sls Co. 602-946-4437
Cal Los Altos, Westec Elctrns./North 415-948-8880
Cal No. Hollywood, O'Halloran Assoc. 213-877-0173
Fla Lighthouse Point, Saber Assocs. 305-943-3076
Ill Park Ridge, R. F. Specialists 312-698-2044
Ind Ft. Wayne, J&B Engrg. Sls. Co. 219-483-2813
Mass Norwood, Stan Pierce Inc. 617-762-3164
Minn St. Paul, Cullen Assocs. 612-646-7371
Mo Ferguson, Kinrick Co. 314-521-4877
NY Plainview, E.R.A. Inc. 516-822-9890
NY Syracuse, Nycom Inc. 315-437-8343
Ohio Chagrin Falls, Crest Component Sls. 216-543-9808
Tex Richardson, P.J. Scanlon Co. 214-231-4661
Va Alexandria, Vanguard Engrg. Sls. 703-768-1660
Wash Bellevue, Olson, Ferrea and Associates 206-454-1210

VERNITECH, Div. of Vernitron Corp., Dept. EM, 300 Marcus Blvd., Deer Pk., N.Y. 11729, Tel: 516-586-5100, TWX: 510-227-6079; Empl.: 150 ..... p. 1674,1675,2278,2279,3130,3131

Sales Manager: S. Wexler

Local Sales Offices & Reps.

Cal Los Altos, Servodata 415-964-1325
Cal Los Angeles, Halbar Assocs. 213-387-8283
Cal San Mateo, Halbar Assocs. 415-349-4700
Colo Parker, Technology Mktg. Assoc. 303-841-3435
Conn Cheshire, Selmark Assocs. 203-272-8764
Fla Altamonte Springs, QXI 305-331-1001
Fla Clearwater, Tech. Comp. & Insts. 813-584-1122
Fla St. Petersburg, QXI 813-821-2281
Fla Tamarac, QXI 305-485-6030
Ill Chicago, Electro-Tech Mktg. Assoc. 312-588-4535
Ill Lansing, Van Meter Insts. 312-474-3580
Iowa Cedar Rapids, Palatine Sls. 319-365-8071
Kans Andover, Palatine Sls. 316-683-7512
Kans Derby, Palatine Sls. 316-788-0621
Kans Lenexa, Palatine Sls. 913-492-7020
Kans Wichita, Palatine Sls. 316-788-0621
Md Baltimore, Callas Elctrns. 301-744-7711
Md Baltimore, R.P. Luce & Co. 301-752-8200
Mass Millis, Selmark Assocs. 617-376-2914
Mass Norwell, Bordewieck Eng. Sls. 617-659-4915
Mich Lathrup Village, RC Nordstrom & Co. 313-559-7373
Minn Minneapolis, R-J Inc. 612-922-1425
Mo Hazelwood, Dytronix 314-731-5799
Mo Independence, Dytronix 816-737-6600
Mo St. Louis, Palatine Sls. 314-426-7055
NH Concord, Selmark Assocs. 603-623-5774
NJ Cherry Hill, Lanson Assocs. 609-424-4670
NJ Piscataway, R.P. Luce & Co. 201-752-8750
NM Albuquerque, Technology Mktg. 505-298-4321
NY Endicott, Tech-Mark, Inc. 607-748-7473
NY Endwell, Net Sls. Co. 315-754-8138
NY New Hyde Park, R.P. Luce & Co. 516-437-4550
NY Pittsford, Net Sls. Co. 716-482-9633
NY Westbury, Tech-Rep Eng. Sls. 516-997-7946
Ohio Dayton, George Lessis 513-294-1551
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Okla Tulsa, Pan Tech. 918-747-2494
Pa Philadelphia, R.P. Luce & Co. 215-884-8365
Tex Arlington, Pan Tech. Controls 817-640-3232
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Tex Dallas, J.B. Guenther 214-691-8500
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Sales Manager: S.W. Silverman

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Cal Los Angeles, Halbar Assocs. 213-387-8283
Cal San Mateo, Halbar Assocs. 415-349-4700
Colo Parker, Techn. Mktg. Assocs. 303-841-3435
Conn North Haven, Kitchen & Kutchin 203-239-0212
Fla Ft. Lauderdale, Electrocomp Assocs 305-491-4141
Fla St. Petersburg, Electrocomp Assocs. 813-822-9673
Iowa Cedar Rapids, Dy-Tronix 319-377-8275
Md Baltimore, Callas Elctrns. 301-744-7711
Mass Lexington, Kitchen & Kutchin 617-862-8230
Mich Lathrup Village, R.C. Nordstrom Co. 313-559-7373
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Mo Bridgetown, Dy-Tronix 314-731-5799
NJ Cherry Hill, Lanson Assocs. 609-424-4670
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NY Jericho, Metro Tech. Sls. 516-935-3330
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Tex Dallas, M. Kruvand Co. 214-827-8040
Wash Sumner, Halbar Assocs. 206-939-2080

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Cal Santa Ana, RMS Assocs. 714-556-4151
Cal Santa Clara, Nova-Tronix Elec. Sls. 408-243-9530
Cal Tustin, R.J.M. Assoc. 714-832-7630
Colo Englewood, R.G. Bowen Co. 303-789-1881
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Ga Atlanta, Cartwright & Bean, Inc. 404-255-5260
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Ind Indianapolis, Scott Elctrns., Inc... 317-897-9971
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Miss Jackson, Cartwright & Bean, Inc. 601-981-1361
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NH Dover, R. Perron & Co. 603-742-2320
NJ West Caldwell, Grimm, Siegel Assoc. 201-575-9300
NM Albuquerque, C.T. Carlberg & Assoc. 505-265-1570
NC Charlotte, Cartwright & Bean, Inc. 704-337-5670
Ohio Cleveland, Scott Elctrns., Inc. 216-291-2600
Pa Broomall, L.D. Lowery 215-356-5300
Pa Pittsburgh, Scott Elctrns., Inc. 412-781-3100
Tenn Memphis, Cartwright & Bean, Inc. 901-276-4440
Tex Arlington, Wheelex Inc. 817-461-8030
Wash Redmond, Barrett Squibb Inc. 206-885-6950

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Sales Manager: R Romanic Filters R. Roch Ceramics

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Ariz Phoenix, Gassner & Clark Co. 602-968-9031
Cal Los Angeles, E. Mintz 213-670-5420
Cal Palo Alto, Fetty/Schoenduve, Inc. 415-321-7040
Kans Mission, Admack Sls. Co. 913-432-5500
NY Fairport, TAC Assocs. 716-377-1700

NY New York, Metro-Long Island Corp. 212-873-5710
Ohio Bedford, Vernitron Piezoelectric Div. 216-232-8600
Tex Houston, Oeler & Menelaides 713-772-0730
Tex Richardson, Oeler & Menelaides 214-234-6334

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Distributor Manager: M. Geller

Local Sales Offices & Reps.
Ala Huntsville, Beacon Elctrns..... 205-881-5031
Cal Los Angeles, Dyna Sls. Co..... 213-268-1175
Colo Englewood, A-G Elctrns..... 303-771-8088
Conn Milford, Todino Engrg..... 203-874-6643
Fla Ft. Lauderdale, Beacon Elctrns. 305-491-4211
Fla Maitland, Beacon Elctrns..... 305-647-3498
Fla Palm Beach Gardens, Beacon Elctrns. 305-622-2770
Ga Atlanta, Beacon Elctrns..... 404-351-3654
Ill Des Plaines, Marsland Assoc. 312-298-2620
Ind Indianapolis, Marsland Assoc. 317-359-0200
Md Pikesville, L & M Assoc..... 301-484-7970
Mass Needham Heights, Todino Engrg. 617-444-7925
Minn Minneapolis, Marsland Assoc. 612-545-4481
Mo Kansas City, Marsland Assoc. 816-966-8400
NY Fairport, Tech-Mark..... 716-223-1252
NY Hauppauge, Vero Elect. 516-234-0400
NY Liverpool, Tech-Mark 315-652-6229
NC Greensboro, Beacon Elctrns..... 919-674-9432
Ore Portland, SPS Elctrns. 503-297-3862
Pa Jenkintown, Stein Instrumentation 215-885-2370
SC Spartanburg, Beacon Elctrns. 803-582-4613
Tenn Oak Ridge, Beacon Elctrns..... 615-482-2409
Tex Garland, G.V. Peck Co. 214-341-8311
Tex Houston, G.V. Peck Co. 713-789-7111

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NY Bronx, O.K. Machine & Tool 212-994-6600
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NY Hempstead, Davis Elctrns..... 516-483-9200
NY New York, Argil Elctrns. 212-691-8111
Ore Portland, Dunn Elctrns..... 503-285-0214
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RI E. Greenwich, Electronic Hobby Supply 401-885-1969
Tex Houston, City Elctrns..... 713-621-1060
Wash Seattle, Radar Elect..... 206-282-2511

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Sales Manager: M. Druskoff

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Ala Gadsden, Rickles Elec & Comm 205-547-2534
Ark North Little Rock, Philipps Electrical & Appl. Co. 501-835-6033
Cal Carson, C & A Elctrn Enterprises 213-834-5868
Cal Eureka, Sequoia Stereo 707-443-8431
Cal Pomona, COSYSCO, Inc. 714-629-5518
Cal Rio Linda, Elctrn Enterprises 916-991-2010
Cal San Jose, Tele-Com Elctrns 415-274-4479
Cal San Marcos, Westcom 714-744-0700
Cal Vallejo, ZacKit Corp 707-644-6676
Colo Aurora, Comm Specialties 303-755-7544
Colo Colorado Springs, A.E.S. Comm Div. Wes-Com Inc 303-475-7050
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Iowa Fort Dodge, Bob Smith Elctrns .. 515-576-3886
La New Orleans, Frank L. Beier Radio 504-837-2680
Md Baltimore, Amateur Radio Center 301-889-5214
Mass Medford, Tufts Radio Elctrns..... 617-395-8280
Mich Detroit, Adams Distrib Co. 313-584-4640
Mich Detroit, Radio Supply & Engrg (R.S.E. Elctrns) 313-831-3175
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Wisc Milwaukee, Amateur Elctrn Supply 414-442-4200

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Ala Huntsville, F. Gandolfi & Assoc. 504-834-0128
Cal Palo Alto, Gado Intr. Sls. 415-961-2222
Conn Easton, JBL Assoc. 203-281-3161
Fla Jupiter, Jupiter Eng. Co..... 305-746-3984
Ill Morton Grove, Omega Control Sys 312-679-6449
Kans Leawood, Leemark Engrs 913-648-0124
Mo St. Louis, Fixman Engrg 314-725-5219
NM Albuquerque, A-Tek Co. 505-265-8325
NY Fayetteville, Magyar Assoc..... 802-442-5858
Ohio Chesterland, Electroquipment Sls. 216-729-2222
Tex Houston, Scientific Sls. Co. 713-666-5318
Tex Richardson, Scientific Sls. Co..... 214-231-6541
Wash Bellevue, Topp Eng. Sls. 206-747-5400

VIBRAC CORP., Dept. EM, 11 Alpha Rd., Chelmsford, Mass. 01824, Tel: 617-256-6581; Empl.: 70

Sales Manager: B. Chrane

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Cal Burlingame, Engrg. Reps..... 415-692-2581
Cal Los Angeles, Kirby Assoc. 213-879-9045
Conn Newtown, Daner-Hayes 203-426-9094
Ga Atlanta, Motion Technology 404-972-5050
Mass Newton Center, Daner-Hayes 617-969-4650
Mich Northville, PMR Assoc. 313-348-2460
NJ So. Orange, Daner-Hayes 201-763-1771
NY Port Washington, Daner-Hayes .. 516-883-4576
NY Rochester, Daner-Hayes 716-467-5100
NC Charlotte, Motion Technology 704-525-9855
Pa Audubon, Daner-Hayes..... 215-666-5005
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Sales Manager: D.R. Butler; *Distributor Manager:* E. J. Sunyog

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Cal Belmont, Littrell Western Sls. 415-592-3346
Cal Los Angeles, Littrell Western Sls. 213-261-0164
Fla Ocala, L. K. Savey 904-236-2628
Ill Glen Ellyn, H. Hulseberg Co..... 312-469-0350
Mass Belmont, R. C. Cutting Co..... 617-489-1137
Mich Southfield, V. E. Sorge 313-352-1176
NJ Edison, Affiliated Sls. Co. 201-572-0777
Tex Richardson, C. J. Garvey 214-234-3371

VICLAN INC., Dept. EM, Box 81403, 7373A Engineer Rd., San Diego, Cal. 92138, Tel: 714-292-1411, TWX: 910-335-1264; FSC No.: 51959

Sales Manager: J. R. Maurer

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Ariz Phoenix, Eltron 620-997-1042
Cal Los Angeles, Mission Mktg. Grp. 213-246-7119
Cal San Jose, Electro-Venture 408-997-0955
Colo Denver, Gossard & Assocs 303-770-2030
Ill Glenview, Crimson Engrg. Co..... 312-724-1780
Kans Overland Park, Advanced Tech. Sls. 913-492-4333
Mass Framingham, Microdon 617-879-3800
Mich Detroit, Component Services..... 313-891-1022
Minn Bloomington, Peterson Elctrns. .. 612-884-3483
NJ Bridgewater, Kyocera Int'l 201-526-6448
NJ Clifton, Compar New York 201-546-3660
NJ Haddonfield, Sunday-O'Brien..... 609-429-4013
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Sales Manager: E. F. Henckel

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Cal Chatsworth, Marketing Specialists 213-341-1471
Cal Hayward, Tech-Rep Associates 415-785-4531
Colo Denver, Mile-High Mktg 303-759-5841
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Mass Needham, Piper Assocs. Inc. 617-449-1144
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Minn St. Paul, Skor..... 612-645-6461
Mo Raytown, Pacer Corp..... 816-358-6638
NM Albuquerque, C.T. Carlberg & Assocs. 505-265-1579
NY New City, I. Langbaum & Assoc. 914-634-1141
Ohio Columbus, Weller Elctrn. Sls. 614-885-7819
Tenn Tullahoma, Lester Vihon..... 615-455-5767
Tex Dallas, Techno Assocs. 214-357-9213
Wash Kirkland, Cable Market Spec., Inc. 206-822-4113

Local Distributors
Cal Los Angeles, Vicon Los Angeles 213-341-4035
Cal San Francisco, Vicon San Fran.. 415-782-3300
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Ill Oak Park, Vicon Chicago..... 312-848-4422
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Sales Manager: E. M. Colasanto

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Cal Mountain View, Cindel Sls..... 415-965-2630
Cal Northridge, R.H. McDonald Assocs 213-349-7911
Colo Denver, R.W. Masterson Co..... 303-771-1482
Conn New London, Sel-Tronics Corp. 203-442-2514
Ga Roswell, Electro Srvcs..... 404-993-0389
Ill Elk Grove Village, J.G. Twist Co. 312-593-0200
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Ky Louisville, Waddle & Marquart, Inc. 502-897-6419
Md Reisterstown, F.B.D. Sls. Corp... 301-833-9444
Mass Shrewsbury, Sel-Tronics Corp. .. 617-844-6127
Mich Plymouth, A.P.J. Assocs..... 313-459-1200
Minn Minneapolis, Carl A. Listug Sls. Co. 612-537-6740
Mo St. Louis, J.G. Twist Co..... 314-432-2830
NJ Haworth, Kay Sls Assocs. Co. .. 201-384-3261
NY Fairport, W.A. Franklin Sls. Corp. 716-223-5102
NY Great Neck, Marvin J. Grober.... 516-487-6074
NY Mamaroneck, Osach Co. 914-698-8555
NY New Hartford, W.A. Franklin Sls. Corp. 315-737-5038

NY Syracuse, W.A. Franklin Sls. Corp. 315-472-5273
Ohio Cincinnati, Makin Assocs. 513-871-2424
Pa Abington, R.T. Pearson Sls. 215-887-0186
Tenn Nashville, Electro Srvcs. 615-373-9362
Tex Arlington, Wheelex 817-461-8039
Tex Spring, Wheelex 713-353-3195
Va Portsmouth, F.B.D. Sls. Corp. 804-484-3162
Wisc Mequon, Wm. R. Bolles & Assocs. 414-241-3320

VICTOREEN, INC., Dept. EM, 10101 Woodland Ave., Cleveland, Ohio 44104, Tel: 800-321-9990, TWX: 810-421-8287; Empl.: 350 p. 3774-3778

Sales Manager: C.A. Lockert

Local Sales Offices & Reps.
Cal Los Angeles, Victoreen, Inc. 213-832-2227
Cal San Francisco, Victoreen, Inc. 415-933-6635
Ga Atlanta, Victoreen Inst. Div. 404-577-2736
Ill Chicago, Victoreen Instr. Div. 312-541-0540
Mass Canton, Victoreen Instr. Div. 617-227-6724
NJ Trenton, Victoreen Instr. Div. 212-744-7646
Ohio Cleveland, Victoreen Instr. Div. 216-795-8200
Pa Pittsburgh, Victoreen, Inc. 412-884-9009
Tex Richmond, Victoreen Instr. Div. 713-342-3018
Va Newport News, Victoreen Instr. Div. 703-548-2838

VICTORY ENGRG. CORP., Dept. EM, Victory Rd., Springfield, N.J. 07081, Tel: 201-379-5900, TWX: 710-983-4430; Empl.: 300

Sales Manager: J. Bacek

Local Sales Offices & Reps.
Ala Huntsville 205-881-9270
Ariz Phoenix 602-279-1221
Cal Los Angeles 213-651-4050
Cal Palo Alto 415-321-7041
Colo Arvada 303-423-5556
Conn Hamden 203-281-1331
Fla Clearwater 813-585-3327
Fla Ft. Lauderdale 305-792-2211
Fla Orlando 305-275-1132
Ga Tucker 404-938-4358
Ill Chicago 312-286-1500
Ind Fort Wayne 219-743-1586
Ind Indianapolis 317-897-9976
Md Towson 301-825-9637
Mass Newton 617-964-7740
Mich Farmington 313-474-8300
Minn Minneapolis 612-831-8423
NJ Bergenfield 201-384-3643
NJ Cherry Hill 609-429-1551
NY Rochester 716-586-0468
Ohio Cincinnati 513-791-2513
Ohio Cleveland 216-291-2600
Ohio Columbus 614-236-8619
Ohio Dayton 513-294-0539
Pa Pittsburgh 412-828-1073
Tex Dallas 214-690-9881
Tex Houston 713-729-1670
Wash Seattle 206-783-3423
Exp: New York, N.Y. 212-248-9700

VIDAIRE ELECTRONICS MFG., Dept. EM, 150 Buffalo Ave., Freeport, N.Y. 11520, Tel: 516-623-6696; Empl.: 20

Local Sales Offices & Reps.
Ala Birmingham, H.W. Phillips Co. 205-967-5248
Cal Van Nuys, Art Szerlip Sls Co. 213-782-1765
Colo Aurora, Aurora Mrktg 303-751-2027
Fla Ft. Lauderdale, Sproch Sls. 305-587-3792
Fla New Port Richey, Sproch Sls 813-849-6067
Ga Atlanta, H. W. Phillips Co. 404-992-3070
Ill Chicago, Ellinger Sls. Corp. 312-763-1570
Ind Speedway, Omega Sls 317-299-7029
Ky Louisville, Omega Sls 502-957-5614
La New Orleans, Crockett Sls. Co.
Mass Woburn, W & D Mktg 617-935-5610
Mich Bloomfield, S. F. McMechan 313-852-4308
Minn Saint Paul, RMS Mrktg 612-774-3798
NH Manchester, W & D Mrktg 603-622-5097
NY Albany, Audio Mrktg Team 518-438-8060
NY Cheektowaga, Audio Mrktg Team 716-833-4466
NY Valley Cottage, Cohn & Kappel 914-268-9216
NC Charlotte, H. W. Phillips Co. 704-536-9797
Ohio St. Mary's, REPP Co. 419-392-4724
Pa Bethlehem, Les Benner 215-865-3014
Pa Pittsburgh, Tanner Co. 412-561-4687
Tex Dallas, Crockett Sls. Co. 214-748-8209
Tex Houston, Crockett Sls 713-488-7853
Wash Edmonds, McLaughlin Mrktg 206-743-1161
Exp: New York, NY, Singer Prods. Co. 212-432-1400

VIDEO AUTOMATION SYSTEMS INC., Dept. EM, Rte 1—Box 21A, Pound Ridge, N.Y. 10576, Tel: 914-764-4613; Empl.: 5

Local Sales Offices & Reps.
Ill Danville, S. Autor 217-442-1391

VIDEO RESEARCH CORPORATION, Dept. EM, 6985 Garden Rd., Riviera Beach, Fla. 33404, Tel: 305-842-2867; Empl.: 140

VIKING ELECTRONICS, Dept. EM, 406 2nd St., Hudson, Wisc. 54016, Tel: 715-386-5188; Empl.: 10

VIKING INDS., INC., Dept. EM, 9324 Topanga Cyn Blvd., Chatsworth, Cal. 91311, Tel: 213-882-6275, TWX: 910-494-2094; Empl.: 670

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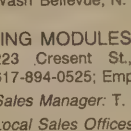
Cal Belmont, LoDan, Inc. 415-592-4600
Cal Downey, Buffa Co 213-923-4618
Cal Glendale, JBR Industries 213-242-7324
Cal San Diego, Mesa Engrg & Sls. 714-278-8021
Colo Denver, Intermountain Agcy Sls 303-571-1870
Colo Englewood, Elcom, Inc. 303-770-4400
Conn No. Haven, Forsberg Sls. 203-239-5111
Fla Altamonte Springs, V.G. Sls. 305-831-8688
Fla Pompano Beach, V. G. Sls 305-971-1870
Ill Westchester, Wasson-Gallagher Co. 312-261-7517
Md Columbia, Rep-Tron, Inc. 301-953-7580
Mass Brockton, Forsberg Sls. 617-522-6300
Mass Wakefield, Viking Inds. 617-245-4110
Mich Dearborn, Pitcher-Poulin 313-582-5450
Minn Bloomington, Elctrn Sls Agcy Sls 612-884-8291
Mo Kansas City, Harris-Hanson Co. 816-444-9494
Mo St. Louis, Harris-Hanson Co. 314-432-3611
NJ Keasbey, Addem 1 Sls 516-549-8400
NJ Riverton, Valley Sls 609-829-2892
NY Deer Park, Aines Sls. Corp. 516-586-2788
NY Melville, Addem 1 Sls Corp. 516-549-8400
NY Rochester, Electra Sls. 716-436-4030
NY Syracuse, Electra Sls. Corp. 315-455-5783
NC Winston-Salem, Dula Assocs. 919-768-7166
Ohio Cleveland, K. W. Elctrn Sls 216-831-8292
Ohio Dayton, K. W. Elctrn Sls. 513-890-2150
Ohio Worthington, K. W. Elctrn Sls 614-888-0483
Ore Beaverton, N. R. Schultz Co. 503-643-1644
Pa Allison Park, K. W. Elctrn Sls 412-487-4300
Pa Malvern, Valley Sls 215-647-5750
Tex Dallas, Bonser-Philhower Sls. 214-234-8438
Tex Houston, Bonser-Philhower Sls 713-467-4373
Utah Salt Lake City, Elcom, Inc. 801-532-7940
Wash Bellevue, N. R. Schultz Co. 206-454-0300

VIKING MODULES, Div. of Keltron Corp., Dept. EM, 223 Cresent St., Waltham, Mass. 02154, Tel: 617-894-0525; Empl.: 30

Sales Manager: T. Chadurjian

Local Sales Offices & Reps.
Pa Audubon, Holmes Assocs. 215-666-0636



VIRGINIA PANEL CORP., Dept. EM, Box 1106, 1400 New Hope Rd., Waynesboro, Va. 22980, Tel: 703-942-8376, TWX: 710-839-0406; Empl.: 70 p. 2253

Local Sales Offices & Reps.
Cal West Lake Village, J. E. Taylor Jr. 213-889-0748
Md Silver Spring, M.L. Councell 301-587-1755
NJ Ridgewood, Hansen Assocs. 201-652-7055

VIRTIS CO., Dept. EM, Rte. 208, Gardiner, N.Y. 12525, Tel: 914-255-5000, Telex: 926474; Empl.: 105

Sales Manager: J. K. Henebry

VISHAY RESISTIVE SYSTEMS GRP., Vishay Intertechnology Inc., Dept. EM, 63 Lincoln Hwy., Malvern, Pa. 19355, Tel: 215-644-1300, TWX: 510-668-8944; Empl.: 500 p. 3780,3781,3911

Sales Manager: A. Troianello, Dir of Mktg

Local Sales Offices & Reps.
Ala Huntsville, F M Assoc. Ltd. 205-536-7912
Ariz Scottsdale, Runyon Co., Inc. 602-959-6060
Cal Pico Rivera, Westrep 213-949-2551
Cal San Diego, Westrep 714-276-0751
Cal Santa Clara, Westrep 408-984-0350
Colo Denver, DZ Assocs 303-534-3649
Conn North Haven, Comp Rep Assoc. 203-239-9762
Fla Boca Raton, Conley Assocs. Inc. 305-395-6108
Fla Oviedo, Conley Assocs. Inc. 305-365-3283
Fla Tampa, Conley Assocs. Inc. 813-933-1759
Ill Elk Grove Village, Oasis Sls 312-640-1850
Iowa Cedar Rapids, Comstrand 319-377-1575
Kans Shawnee Mission, Techn. Sls. 913-888-3330
Md Lutherville, J.A. Dougherty Sls. 301-321-7890
Mass Needham, Comp Rep 617-444-2484
Mich Jackson, N. Scroggs 517-750-1170
Minn Mpls., Comstrand, Inc. 612-571-0000
Mo Ferguson, Technical Sls. Assoc. 314-725-5361
NJ Flanders, K & R Engrg. Sls. Co. 800-452-9767
NM Albuquerque, Data Handling 505-268-4364
NY Buffalo, Robert F. Lamb 716-874-4900
NY Syracuse, Robert F. Lamb 315-455-2469
Ohio Cleveland, A. H. Baier 216-461-6161
Ohio Dayton, A H Baier Co. & Assoc. 513-276-4128
Ore Portland, F. Jackson Assoc. 503-292-2638
SC Spartanburg, H. Cook Assoc. 803-576-8594
Tex Dallas, Stolle Hamilton 214-243-5377
Tex Seabrook, Stolle Hamilton 713-488-3707
Wash Seattle, F. Jackson 206-523-6300

Local Distributors
Cal Pico Rivera, Westrep 213-949-2551
NJ Flanders, K & R Engrg. Sls. Co.
Ohio Cleveland, RD Elctrns. 216-461-9090

VISUAL COMMUNICATIONS CO, Dept. EM, PO Box 986, El Segundo, CA 90245, Tel: 213-822-4727 p. 2550,2551

Sales Manager: J. Savage

Local Sales Offices & Reps.
Ala Huntsville, Beacon Elctrns 205-881-5031
Ariz Phoenix, Bob Anderson Co 602-266-2070
Cal Carson, Assoc Representatives Co 213-639-2211
Cal Los Altos, Wedemeyer/Merrill 415-961-5803
Cal San Diego, Varigon/Arc 714-229-5413
Colo Arvada, Challenge Sls 303-420-4316
Conn Hamden, Comtek 203-288-5291
Fla Ft Lauderdale, Beacon Elctrns 305-971-7320
Fla Maitland, Beacon Elctrns 305-647-3498
Ga Atlanta, Beacon Elctrns 404-351-3654
Ill Elk Grove, R-Tek 312-439-9090
Mass Canton, Comtek 617-828-2948
Mich Benton Harbor, R C Nordstrom & Co 616-429-8560
Mich Lathrup Village, R C Nordstrom & Co 313-559-7373
Minn Minneapolis, C E Bohlig Co 612-922-7011
NH Peterborough, Comtek 603-924-7307
NY Mattydale, Walter M Onyx Co 315-479-6561
NY Plainview, Robert Smith Assocs 516-681-3155
NY Spring Valley, Robert Smith Assoc 914-354-6067
NC Charlotte, Beacon Elctrns 704-525-7412
Ohio Dayton, Dynel Co 513-434-6467
Tenn Oak Ridge, Beacon Elctrns 615-482-2409
Tex Dallas, Jim Hughes Co 817-430-1683
Tex Houston, Jim Hughes Co 713-491-2498
Utah Salt Lake City, Challenge Sls 801-364-2999
Va Falls Church, Beacon No 703-534-7200
Wash Seattle, Northmar Inc 206-524-5170
Exp: Litchfield, Intrade Inc 203-567-5901

Local Distributors
Ala Huntsville, Controlled Distrib 205-883-7501
Ariz Tempe, Service Specialist 602-966-6990
Cal Costa Mesa, Orange County Comps 714-979-3597
Cal Los Angeles, Electric Switch 213-660-1310
Cal Sunnyvale, Ratel Elctrns 408-739-9220
Fla Margate, Controlled Distrib 305-971-4950
Mass Newton, Cramer Elctrns 617-969-7700
Okla Tulsa, Altair Co 918-665-0524
Tex Dallas, Altair Co 214-231-5166
Tex Houston, Altair Co 713-462-3029
Va Falls Church, Controlled Distrib 703-533-3500
Wisc Mequon, Lake-View Elctrns 414-377-8250
Exp: Litchfield, Norcon Div 203-567-5901

VISUAL INFORMATION INSTITUTE INC., Dept EM, Box 33, Xenia, Ohio 45385, Tel: 513-376-4361 FSC No.: 27432; Empl.: 18

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Cal Cupertino, Ashby Assocs. of N. Cal. 408-996-041

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Sales Manager: N. R. Marhevka

Local Sales Offices & Reps.

Ala	Huntsville, W.A. Brown Comps	205-539-4411
Ariz	Phoenix, R.E.B. Elctrn Sls	602-931-5361
Cal	Del Mar, Reed Elctrn Mktg	714-452-1456
Cal	Los Alamitos, Reed Elctrn Mktg	213-598-6676
Cal	Santa Clara, Fahrner-Miller Assoc.	408-984-1700
Colo	Denver, R.W. Masterson Co.	303-771-1482
Conn	Hamden, Impact Sales Co.	203-281-1331
Fla	Orlando, W.A. Brown Comps	305-425-5863
Ga	Chamblee, W.A. Brown Comps	404-455-0405
Ill	Skokie, Mar-Con Assoc.	312-675-6450
Kans	Overland Park, Ensco-Rep	913-381-7557
Md	Hyattsville, Eastern Comps	301-577-2925
Mass	Newton, Impact Sls	617-964-7740
Mich	Farmington Hills, Lowell-Wendt Mktg	313-553-9800
Minn	Minneapolis, El Pak Co	612-535-2671
Mo	St. Louis, Ensco-Rep	314-567-3935
NY	Endicott, Advanced Comps	607-785-3191
NY	North Syracuse, Advanced Comps	315-699-2671
NY	Oceanside, Bittan Assoc.	516-678-6222
NY	Scottsville, Advanced Comps	716-889-1429
NC	Raleigh, W.A. Brown Comps	919-781-9426
Ohio	Dayton, J.C. Hofstetter	513-296-1010
Ohio	Medina, J.C. Hofstetter	216-241-4880
Ore	Portland, C.K. Shanks & Assoc.	503-292-5656
Pa	Flourtown, Eastern Comps	215-836-1616
Tex	Dallas, Edward F. Aymond Co.	214-826-7620
Wash	Seattle, C.K. Shanks & Assoc.	206-632-4290

VIZ MANUFACTURING CO., Dept. EM, 335 E. Price St., Phila, Pa. 19144, Tel: 215-844-2626 ..... p. 2833

Sales Manager: Bob Liska, Dir. Mktg.

Local Sales Offices & Reps.

Cal	Gardenia, Bidwell Sls	213-770-0300
Cal	Redwood City, Warren Hickey Sls.	415-368-3849
Colo	Denver, R & D Sls.	303-934-5445
Fla	Ft. Lauderdale, Unirep, Inc.	305-527-1556
Ga	Roswell, Henry W. Phillips Co.	404-992-3070
Ill	Rolling Meadows, Sumer Inc	312-991-8500
Ind	Indianapolis, Robert Milsk Co.	317-546-5468
Kans	Wichita, Forristal-Young Sls. Co.	316-838-7226
Md	Baltimore, Par-Nell Sls. Co.	301-655-2944
Mass	Natick, Jonel Sls	617-653-3736
Mich	Southfield, Robert Milsk Co.	313-354-3310
Minn	Minneapolis, Clark R. Gibb Co	612-377-1200
Mo	Kansas City, Forristal-Young Sls. Co.	816-358-6771
Mo	St. Louis, Forristal-Young Sls. Co.	314-645-2360
Neb	Omaha, Forristal-Young Sls. Co.	402-333-0800
NJ	Fort Lee, TMC Sls., Corp.	201-944-8340
NY	Skaneateles, Leahy & Thompson	315-685-8122
Ohio	Cincinnati, John O. Olson Co.	513-625-6791
Ohio	Cleveland, John O. Olson Co.	216-752-5444
Pa	Holland, Par-Nell Sls. Co.	215-355-9330
Pa	Pittsburg, John O. Olson Co.	412-341-8391
Tex	Dallas, Crockett Sls. Co.	214-748-8209
Wash	Seattle, Pachor Mktg	206-284-8020

VOICE IDENTIFICATION INC., Dept. EM, Box 714, Somerville, N.J. 08876, Tel: 201-526-3408; Empl.: 6

VOLTARC TUBES, Dept. EM, 102 Linwood Ave., Fairfield, Conn. 06430, Tel: 203-255-2633, Telex: 96-4337; Empl.: 105

VOLTEX CO., INC., Dept. EM, 115 Marine St., Farmingdale, N.Y. 11735, Tel: 516-CH 9-2336; Empl.: 55

Sales Manager: S. Vogel

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Sales Manager: Metro Sirko

Local Sales Offices & Reps.

Ariz	Tempe, Sedco Sales	602-968-7791
Cal	Downey, Trimarco/Wright	213-861-8244
Cal	Los Altos, Wright Engrg.	415-941-4405
Cal	Santa Monica, F. Shelley Elctrns.	213-392-3913
Colo	Wheat Ridge, Eggeman Assocs	303-423-3707
Conn	Milford, Wayland Engrg. Sls.	203-878-3755
DC	Washington, M. Lader Co.	202-296-2497
Fla	Maitland, Delmac Sls	305-423-7562
Ill	Westchester, Gassner & Clark	312-345-4245
Kans	Shawnee Mission, Florence & Meyer, Inc.	913-722-5210
Mass	Natick, Wayland Engrg. Sls.	617-655-6080
Minn	St. Paul, Countryman Associates	612-645-9151
Mo	Kirkwood, Florence & Meyer	314-822-2629
NJ	Wallington, Comp-Tech Sls.	201-935-5454
NY	New Hyde Park, Comp-Tech Sls.	516-593-2628
Ohio	Dayton, Elcomp Mktg	513-434-8021
Ore	Portland, Elctrn Comp Sls	503-245-2342
Pa	Jenkintown, Arnold Associates	215-887-7870
Tex	Plano, Zeus Engrg. Assocs.	214-423-2027
Va	Woodbridge, M. Lader Co.	703-494-4731

Local Distributors

Cal	Santa Monica, F. Shelley Elctrns.	213-392-3913
Cal	Van Nuys, Patane Avionics	213-988-4455

VORNE INDS., INC., Dept. EM, 5023 W. Belmont Ave., Chicago, Ill. 60641, Tel: 312-725-3077; Empl.: 20

Local Sales Offices & Reps.

Cal	Hollywood, Desco	213-462-5880
Cal	S. San Francisco, Steven Engrg.	415-583-5868
Colo	Littleton, Eissler Sales & Srvc.	303-794-1779
Conn	Meriden, Abbott-Allison Co.	203-237-9232
Ill	Chicago, Vorne Ind	312-725-3077
Ind	Indianapolis, Bryant Control	317-784-0261
Kans	Shawnee Mission, Tech. Sls	913-888-3330
Md	Sykesville, C.A. Briggs Co.	301-781-4863
Mich	Detroit, Static Controls	313-537-2975
Minn	Minneapolis, Loren Green Assoc.	612-781-1611
Mo	St. Louis, Tech. Sls	314-725-5361
NY	Buffalo, A.C. Schultz	716-839-1010
NY	Forest Hills, Jack Miller Assoc.	212-263-4446
NY	Marcellus, A.C. Schultz	315-673-1279
NC	Greensboro, Motion Control Sys.	919-272-4181
Ohio	Cincinnati, Nelcor	513-871-2816
Ohio	Cleveland, Bock Assoc.	216-331-5212
Pa	Erie, Moulton Assoc.	814-455-5640
Pa	Glenside, C. A. Briggs Co.	215-885-2244
Pa	Pittsburgh, Moulton Assoc.	412-366-3333
Tex	Garland, Stout/Jennings/Schmidt	214-272-5585
Tex	Houston, Stout/Jennings/Schmidt	713-729-1994
Va	Chesterfield, Motion Control	804-590-1387
Wisc	Milwaukee, Dickinson & Assoc.	414-264-1080

VRN ST PETERSBURG, DIV. VERNITRON, Dept. EM, 2801 72nd St N. Box 44000, St. Petersburg, FL 33743, Tel: 813-347-2181, TWX: 523417, 810-863-0357; Empl.: 550 ..... p. 3913-3918

Local Sales Offices & Reps.

Ala	Huntsville, Rep, Inc.	205-881-9270
Ariz	Scottsdale, Toribre	602-894-2263
Ariz	Tempe, Toribre Entprs.	602-894-2263
Cal	Los Angeles, Darco	213-398-6239
Cal	Sunnyvale, Quadrep	408-733-7300
Cal	Tustin, Darco	
Colo	Littleton, Simpson Assocs.	303-794-8381
Conn	Farmington, Ray Perron & Co.	203-673-4825
Conn	Trumbull, Ray Perron & Co.	203-268-9631
Fla	Clearwater, WMM Assocs.	813-442-3913
Fla	Ft. Lauderdale, WMM Assocs.	305-972-9850
Fla	Maitland, WMM Assocs.	305-831-4530
Ga	Rucker, Rep, Inc	404-766-4913
Ill	Elk Grove Village, J.G. Twist Co.	312-593-0200
Ind	Ft. Wayne, R.O. Whitesell & Assocs.	219-432-5591
Ind	Indianapolis, R.O. Whitesell & Assocs.	317-359-9283
Ind	Kokoma, R.O. Whitesell & Assocs.	317-453-3592
Iowa	Cedar Rapids, J.G. Twist Co.	319-393-8703
Kans	Prairie Village, J.G. Twist Co.	913-236-4646
Kans	Wichita, J.G. Twist	316-686-6685
Ky	Louisville, R.O. Whitesell & Assocs.	502-897-1569
Md	Lanham, Lowery Assocs	301-459-1556
Mass	Norwood, Ray Perron & Co.	617-762-8114
Mich	Grand Rapids, R.O. Whitesell & Assocs.	616-942-5420
Mich	Southfield, R.O. Whitesell & Assocs.	313-559-5454
Mich	St. Joseph, R.O. Whitesell & Assocs.	616-983-7337
Minn	Minneapolis, J.G. Twist Co.	612-854-4600
Mo	St. Louis, J.G. Twist	314-432-2830
Neb	Lincoln, John G. Twist Co	402-474-5151
NH	Dover, Ray Perron & Co	693-742-2321
NJ	North Caldwell, Masin-Esco	201-226-2550
NY	Buffalo, Quality Comp.	716-839-4170
NY	Manlius, Quality Comps	315-682-8885
NY	Syosset, Masin Esco	516-364-0310
NC	Raleigh, Rep., Inc.	919-851-3007
Ohio	Cincinnati, R.O. Whitesell & Assocs.	513-521-2290
Ohio	Columbus, R.O. Whitesell & Assocs.	614-888-9396
Ohio	Dayton, R.O. Whitesell & Assocs.	513-298-9546
Ohio	Middelburg Hgts., R.O. Whitesell & Assocs.	216-826-4424
Ore	Portland, Elctrn Sources	503-292-0701
Pa	Broomall, Lowery Assocs.	215-356-5300
Pa	Pittsburgh, R.O. Whitesell & Assocs.	412-344-7277
Tenn	Greenville, R.O. Whitesell & Assocs.	615-639-6154
Tenn	Jefferson City, Rep, Inc	615-475-4105
Tex	Arlington, W. Pat Fralia Co.	817-640-9101
Utah	Salt Lake City, Simpson	910-925-5607
Va	Charlottesville, Lowery Assocs.	804-973-6672
Wash	Bellevue, Elctrn. Sources	206-453-0800
Wisc	Wauwatosa, J.G. Twist Co.	414-475-7755

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Ariz	Phoenix, Kachina Elec. Dist.	602-269-6201
Cal	Gardena, Bell Inds	213-321-5802
Cal	Garden Grove, Allied Elctrns	213-598-8671
Cal	Sunnyvale, Bell Inds	408-734-8570
Cal	Woodland Hills, Jaco Elctrns	213-887-7260
Colo	Denver, Ratel Elctrns	303-934-5813
Conn	Wallingford, Midan Elctrns	203-265-2077
Fla	Clearwater, Diplomat Southland	813-443-4514
Fla	Ft. Lauderdale, NRC Elctrns	305-792-2600
Fla	Orlando, T. T. I - II	305-859-1000
Fla	Tampa, Impala Elctrns	813-885-4747
Fla	Tampa, Lykes Electronics Corp.	813-886-6621
Ill	Chicago, Bell Inds	312-982-9210
Ill	Elgin, Allied Elctrns	312-421-2400
Ill	Peoria, Klaus Radio	303-691-4840
Ill	Rosemont, Advent Elctrns	312-298-4210
Ind	Indianapolis, Graham Elctrns	317-634-8202
Iowa	Cedar Rapids, Deeco	319-365-7551
Mass	Hingham, Sager Elect Supp.	617-749-6700
Mass	W. Newton, A.W. Mayer Co.	617-965-1111
Mich	Farmington Hills, Advent Elctrns	313-477-1650
Mich	Livonia, RS Elctrns	313-525-1155
Minn	Minneapolis, Industrial Comps	612-831-2666
Mo	Kansas City, L. Comp Kansas City	816-221-2400
Mo	St. Louis, Olive Electronics	314-426-4500
Neb	Lincoln, Scott Elctrn Supply	402-466-8221
Neb	Omaha, Scott Elctrn Supply	402-734-6750
NH	Concord, Evans Radio	603-224-9961
NJ	Clifton, J Mar Elctrns	201-772-6400
NJ	Hanover, State Elctrns Parts	201-887-2550
NY	Binghamton, Harvey Federal Elctrns	607-748-8211
NY	Buffalo, Standard Elctrns	716-685-4330
NY	Farmingdale, Pride Elctrns	516-293-4020
NY	Hauppauge, Jaco Elctrns	516-273-5500
NY	Rochester, Rochester Radio Supp	716-454-7800
NY	Rome, Rome Elctrns	315-337-5400
NC	Raleigh, Southeastern Radio Supp	919-828-2311
Ohio	Columbus, Electronics Mktg	614-299-4161
Ohio	Dayton, Esco	513-226-1133
Okla	Tulsa, Radio	918-587-9123
Pa	Erie, Mace Elctrns	814-838-3511
Pa	Harrisburg, Pyttronic Inds	717-233-6591

Pa Montgomeryville, Pyttronic Inds.. 215-643-2850
Pa Philadelphia, Philadelphia Elctrns 215-568-7400
Pa Philadelphia, TRW Elctrn Supp .. 215-923-8230
RI Providence, Wm. Dandreta Co .. 401-861-2800
SC Columbia, Dixie Elctrns..... 803-779-5332
Tenn Memphis, Bluff City Distr 901-725-9500
Tex Austin, Galtronics..... 512-452-5773
Tex Fort Worth, T. T. I..... 817-335-8111
Tex Fort Worth, Allied Elctrns..... 817-336-5401
Tex San Antonio, Sherman Elctrns.... 512-224-1001
Utah Salt Lake City, Calron Elec. Supp 801-487-7451
Va Charlottesville, Virginia Radio Supp 804-296-4184
Wash Seattle, Robert E. Priebe Co..... 206-682-8242
Wisc Milwaukee, Marsh Elctrns 414-475-6000

VU-DATA CORP., Dept. EM, 7170 Convoy Ct., San Diego, Cal. 92111, Tel: 714-279-6572, TWX: 910-335-1586; FSC No.: 34160; Empl.: 31

Sales Manager: H. Wardein

Local Sales Offices & Reps.

Ala Huntsville, W.A. Brown Instr. 205-883-8660
Ariz Phoenix, Zeus, Inc. 602-253-6104
Cal Los Alamitos, Scientific Devices-Cal. 213-598-7678
Cal Mountain View, Scientific Devices-Cal. 415-964-4230
Cal San Diego, Scientific Devices-Cal. 714-279-6642
Colo Westminster, Zeus, Inc. 800-528-4512
Conn Hamden, P. Jenks Assocs. 203-281-0810
Fla Orlando, W.A. Brown Instrs. 305-425-5505
Ga Atlanta, W.A. Brown Instrs. 404-939-1674
Ill Arlington Hts., Dytec Central..... 312-394-3380
Ind Ft. Wayne, Dytec Central..... 219-485-0845
Kans Lenexa, Dytec South..... 913-888-0215
Kans Overland Park, Dytec South 913-384-2710
La Mandeville, W.A. Brown Instrs. .. 504-626-9701
Md Burtonsville, Eastern Instrumentation Corp. 301-384-8500
Mass Wakefield, P. Jenks Assocs. 617-246-1590
Mich Madison Heights, WKM Assocs. 313-588-2300
Minn St. Paul, Dytec North 612-645-5816
Mo St. Louis, Dytec South 314-731-5400
NJ Paramus, SDM Reps., Inc. 201-368-0123
NM Albuquerque, Zeus, Inc. 505-268-3941
NY Rochester, SDM Reps., Inc..... 716-381-9962
NC Durham, W. A. Brown Instruments, Inc. 919-682-2383
Ohio Cleveland, WKM Assocs. 216-267-0445
Ohio Dayton, WKM Assocs. 513-434-7500
Okla Oklahoma City, Data Marketing Associates 405-528-6071
Ore Portland, Pacific Northwest Electronics 503-228-0008
Pa Hatboro, Q.E.D. Electronics, Inc. 215-674-9600
Pa Pittsburgh, WKM Assocs. 412-892-2953
SC Columbia, W.A. Brown Instrs. 803-798-3297
Tenn Oak Ridge, W.A. Brown Instrs. .. 615-482-5761
Tex Austin, Data Mktg. Assocs. 512-451-5174
Tex Dallas, Data Mktg. Assocs. 214-661-0300
Tex Houston, Data Mktg. Assocs. 713-780-2511
Tex San Antonio, Data Mktg. Assocs. 512-828-0937
Wash Bellevue, Wilson Applied Instrs. 206-641-6444

W & M MFG., Dept. EM, 187 Lafayette St., New York, N.Y. 10013, Tel: 212-925-2252; Empl.: 20 ..... p. 2255

Sales Manager: P. Machtinger

WABASH METAL PRODS., Dept. EM, 1569 Morris St., Wabash, Ind. 46992, Tel: 219-563-1184, Telex: 23-2451; Empl.: 70

Local Sales Offices & Reps.

Ala Decatur, P.D.C. Equip. 205-350-9544
Ariz Scottsdale, R. A. Dean..... 602-948-5080
Cal Aneheim, J. Farley Sls..... 714-992-4603
Cal Claremont, J. Farley 714-624-2755
Cal San Mateo, Tom Rugg 415-349-3914
Colo Denver, Applied Machine Tool Co. 303-426-1105
Ga Atlanta, Phoenix Plastic Machinery Co. 404-458-2839
Ill Palos Hills, B. Hogan 312-422-0909
Ind Michigan City, Howard A. Mondientz 219-872-3050
Iowa Clear Lake, W.M. Bachmann Associates 515-357-4664
Mass Westboro, Detenber Sls. Co..... 617-890-1767
Mich Southfield, Murray A. Percival Co. 313-356-5710
Minn Minneapolis, K.F. Wennik Co. 612-835-4373
NJ Roselle, Vicor Plastic Equip. 201-241-3475
Pa Pittsburgh, Plastic Machinery Sys. 412-563-5111
Tex Dallas, Mercer Engrs. 214-233-5472
Tex Houston, Mercer Engrs. 713-529-6121
Va Alexandria, Chemical Etching Equip. & Supply Co. 703-971-2646
Wash Hoodsport, Gordon Earsley Co. 206-877-9707
Wisc Menomonee Falls, F. S. Carver 414-255-2540

WABASH RELAY & ELCTRNS., Dept. EM, Box 708, Wabash, Ind. 46992, Tel: 219-563-2191, TWX: 810-290-2722; Empl.: 200 ..... p. 3622-3625

Local Sales Offices & Reps.

Ala Huntsville, Technology Mktg. Assoc. 205-883-7893
Ariz Phoenix, Mr. Engrg. Sls. Co. 602-956-4670
Cal Los Angeles, Halbar 213-387-8283
Cal San Mateo, Halbar 415-349-4700
Colo Denver, Walter Engrg. 303-777-5585
Conn North Stonington, Dynasel Assocs 203-535-3963
Fla Orlando, Tech Mktg Assocs 305-434-5026
Fla Pompano Beach, Tech. Mktg. Assoc. 305-942-0774
Ill Palatine, M.J. Petersen Assocs. 312-359-8200
Ind Fort Wayne, M/S Sales 219-484-1904
Md Baltimore, Burgin-Kreh Assoc.... 301-788-5200
Mass Waltham, Dynasel Assocs 617-890-6777
Minn St. Paul, Skor..... 612-645-6461
Mo Raytown, CenTech, Inc. 816-358-8100
NJ Clark, Dolan Assocs..... 201-382-2797
NY Rochester, Upstate Comp. Sls... 716-377-1555
NC Raleigh, Burgin-Kreh Assocs 919-833-6085
Pa Schwenksville, David Humes Sls 215-489-4163
Tenn Kingston, Burgin-Kreh Assocs 615-690-6100
Tex Austin, Stevens Sls Co..... 512-472-8598
Tex Dallas, Stevens Sales Co. 214-350-2476
Va Lynchburg, Burgin-Kreh Assoc. .. 804-845-5600
Wash Sumner, Halbar Assoc..... 206-939-2080

WABASH TRANSFORMER CORP., Dept. EM, 1375 Swan St., Huntington, Ind. 46750, Tel: 219-356-8300, TWX: 810-333-1533; Empl.: 400

Sales Manager: B. Fouse

Local Sales Offices & Reps.

Ala Huntsville, Technology Mktg. Assocs. 205-883-7893
Ariz Phoenix, MR Engrg. Sls.
Cal Los Angeles, Halbar Assocs..... 213-387-8283
Fla Pompano Beach, Technology Mktg. Assocs. 305-942-0774
Ill Palatine, M. J. Petersen & Assocs. 312-359-8200
Ind Wabash, Wabash Transformer .. 219-563-3111
Md Baltimore, Burgin-Kreh Assocs... 301-788-5200
Mass Waltham, Dynasel Assocs..... 617-890-6777
Minn St. Paul, SKOR 612-645-6461
Mo Raytown, Centech, Inc.... 816-358-8100
NJ Clark, Dolan Assocs..... 201-382-2797
NY Rochester, Upstate Component Sls. 716-377-1555
NC Raleigh, Burgin-Kreh Assocs. 919-781-1100
Pa Schwenksville, David Humes Sls 215-489-4163
Tenn Kingston, Burgin-Kreh Assocs 615-690-6100
Wash Buckely, Halbar Assocs..... 206-939-2080

WABER ELECTRIC, See SGL Waber Electric.

WADSWORTH ELECTRIC MFG. CO., Dept. EM, 20 W. 11th St., Covington, Ky. 41011, Tel: 606-431-0900

Sales Manager: H. C. Morrison

Local Sales Offices & Reps.

Cal Los Angeles, Michel Bros. 213-749-7587
Cal San Francisco, Black & Egbert Assocs. 415-282-0840
Colo Denver, Empire Electrical Sls. Co. 303-986-1838
Fla Clearwater, J.F. Graff 813-442-1734
Ga Atlanta, J. C. White 404-938-0433
Ill Chicago, Wadsworth Elec. Mfg. Co. 312-467-1245
Ind Indianapolis, A.L. Clifford & Co. 317-639-5248
Kans Overland Park, H.R. Stein 913-381-4303
Ky Covington, W. D. Fleck..... 606-431-0900
La New Orleans, S.M. Redmann, Inc. 504-486-5421
Mass Boston, Pierce Co..... 617-268-8816
Mich Detroit, Wadsworth Elec. Mfg. Co. 313-872-0277
Minn Minneapolis, Dunn & Assoc. 612-831-4887
NJ Fair Lawn, J.R. Barker 201-797-6354
NY New Hartford, F. Walter Laver & Son, Inc. 315-724-0184
NC Greensboro, A.W. Cheek 919-288-2213
Ohio South Euclid, H. I. Covitt 216-382-4473
Okla Jenks, W.G. Parker Co. 918-299-5449
Ore Portland, M.S.T. Pacific..... 503-235-4137
Pa Bethel Park, D.W. Phillips..... 412-833-5155
Pa Philadelphia, Wadsworth Elec. Mfg. Co. 215-627-4691
Tenn Powell, D. L. Holbert..... 615-922-8320
Tex Dallas, R. H. Hanson 214-748-2211
Utah Salt Lake City, Bruce-Emmett.... 801-467-2663
Wisc Brown Deer, Ele'l. Sales 414-355-5550

WAHL CLIPPER CORP., Dept. EM, 2902 Locust St., Sterling, Ill. 61081, Tel: 815-625-6525; Empl.: 150

Sales Manager: Noel H. Walker

Local Sales Offices & Reps.

Ariz Phoenix, R. Fissell Co. 602-264-4031
Cal Gardena, Bidwell Sls Assocs..... 213-770-0300
Cal Los Altos, Ewing-Foley, Inc..... 415-941-4525
Cal N. Hollywood, Oberman Renner Sls 213-985-7080
Colo Denver, Mountain Reps 303-988-6430
Fla Fort Lauderdale, Unirep 305-527-1556
Ga Atlanta, Elmar Assocs. 404-938-2821
Ill Bolingbrook, G. Sangwin Co..... 312-739-7966
Ind Indianapolis, Electronic Reps. 317-894-1414
Md Catonsville, Pecore Assocs..... 301-744-7427
Mass Natick, Jonel Sales Assocs..... 617-653-3736
Mich Rochester, R.A. Albrecht & Co. 313-652-2520
Minn Minneapolis, Norcentronics 612-854-8494
Mo Raytown, Pacer Corp. Co. 816-358-6638
NY E. Syracuse, Lewis-Dunnigan Co. 315-446-5522
NY Lindenhurst, L. W. Keller & Assocs., Inc. 516-888-7790
NY Pamona, L. W. Keller & Assocs., Inc. 516-785-2826
NY Scarsdale, L. W. Keller & Assocs., Inc. 516-785-2826
Ohio St. Marys, T. Shelby & Co., Inc. 419-394-3377
Pa Ashton, Kaiser Assocs. 215-459-4517
Pa Easton, Kaiser Assocs. 215-258-6477
Tex Dallas, Maynard & Gunn 214-528-9090
Tex Houston, Maynard & Gunn..... 713-497-0544
Wash Seattle, D. Smith Sls. Co. 206-633-3160

WALDES KOHINOOR, INC., Dept. EM, 47-16 Austel Pl., Long Island City, N.Y. 11101, Tel: 212-392-3100, Telex: 126-829; Empl.: 500

Sales Manager: J. F. Gearing

Local Sales Offices & Reps.

Cal Anaheim, R. P. Winship 213-749-8271
Ga Atlanta, D. C. Fillingame..... 404-394-0366
Ill Bolingbrook, G. P. Watkins..... 312-739-6329
Ind Noblesville, Davis/Haslam, Inc... 317-773-6311
Iowa Bettendorf, F. J. Bradley 319-355-3100
Kans Shawnee, Benson Engrg. Co. 913-631-4113
Ky Louisville, Petrie-Ingram Co. 502-459-0280
Mass Worcester, D. Kelleher 617-757-3929
Mich Southfield, Armstrong, Doran..... 313-559-4828
NY Fayetteville, J. D. Bodie 315-637-6350
NY Floral Park, A. Bernstein 212-343-3339
NY Mount Vernon, H. D. Hartman.... 914-664-2020
Ohio Cleveland, Petrie-Ingram Co..... 216-442-5530
Ohio Kettering, Petrie-Ingram Co..... 513-434-6332
Pa King Of Prussia, J.C. Botta 215-265-8242
Tex Dallas, Benson Engrg. Co. 214-352-7541
Wisc Brookfield, R. V. Petershack 414-784-0385

WALDMAN CORP., Dept. EM, 3 Eastmans Rd. Parsippany, NJ 07054, Tel: 212-964-8622; Empl.: 100

Sales Manager: H. Zilliox

Local Sales Offices & Reps.

Cal Menlo Park, Straube Assocs. 415-321-9050

WALDOM ELECTRONICS, INC., Dept. EM, 4327 W 69th St, Chicago, Ill. 60629, Tel: 312-585-1212, Telex: 25-4604; FSC No.: 92219; Empl.: 127 ..... p. 2254

Sales Manager: M. Halley

Local Sales Offices & Reps.

Cal Burlingame, W.J. Purdy Co..... 415-347-7701
Cal Inglewood, Ungar Sls. Assocs. .. 213-649-6238
Cal Los Angeles, Wiley Co 213-663-8028
Cal Sacramento, W. J. Purdy Co. 916-422-0128
Cal San Francisco, Tech. Sls. Assocs. 415-467-1434
Colo Denver, W.J. Purdy Co. 303-777-1411
Fla Pembroke Pines, Wallace Elctrn. Sls. 305-961-6640
Fla Tampa, Wallace Elctrn. Sls..... 813-961-1037
Ga Roswell, H.W. Phillips Co. 404-992-3070
Ill Chicago, Ellinger Sls. Corp..... 312-763-1570
Ind Indianapolis, Green-Wissler Sls Co 317-291-2232
La Chalmette, Ohmtronics..... 504-271-1976
Md Catonsville, Pecore Assocs..... 301-744-4434
Mass Norwood, Rudolph & Mac Innis.. 617-769-5450
Mich Drayton Plains, Polyphase Sls. Co. 313-673-0700
Minn Maple Crove, R.C. Sls. 612-425-5543
Minn St. Paul, MURNCO 612-484-8200

Mo Kansas City, Nevco, Inc. 816-421-1751
Mo St. Louis, Nevco, Inc. 314- 843-7406
NJ Boonton, Total Mktg. Action 201-263-2946
NM Albuquerque, W.J. Purdy Co. 505-266-7959
NY Lindenhurst, Louis W. Keller Assocs. 516-888-7790
NY Pittsford, Net Sls 716-467-4538
NY Port Washington, Total Mktg. Action 516-883-2432
Ohio St. Marys, T. Shelby & Assocs. 419-394-3377
Pa Abington, Mid-Atlantic Sls. Co. 215-657-2815
Tex Dallas, Erickson Sls. 214-243-6611
Wash Seattle, Pacnor Mktg 206-284-8020

Local Distributors

Ala Huntsville, Powell Elctrns. 205-539-2731
Ala South Birmingham, Forbes Distributing 205-251-4104
Ariz Tucson, Inland Elctrns. 602-889-5301
Cal Costa Mesa, Component Center 714-979-0433
Cal Mountain View, Abacus Elctrns. 415-961-1500
Cal Mountain View, Powell Elctrns. 415-964-0820
Cal Sacramento, Dunlap Elctrns. 916-444-8070
Cal San Diego, Shanks & Wright 714-239-0176
Cal Sepulveda, Coast Air, Inc. 213-893-7881
Cal Sunnyvale, Ratel Elctrns. 408-739-9220
Colo Denver, Integrated Elctrns. 303-534-6121
Colo Denver, Electronic Parts Co. 303-744-1992
Colo Lakewood, Acacia Sls. 303-232-2882
Conn Hartford, Hatry of Hartford 203-527-1881
Fla Miami, Electronic Equip. 305-871-3500
Fla Miami, Electro-Standards Lab 305-633-6973
Fla Miami Springs, Powell Elctrns. 305-592-3260
Fla Orlando, Hammond Elctrns. 305-849-6060
Fla Pensacola, Grice Elctrns. 904-434-2481
Ga Norcross, Lykes Elctrns. 404-449-9400
Haw Honolulu, Precision Radio Ltd. 808-537-5291
Ill Champaign, Klaus Radio 217-356-1896
Ill Elk Grove Village, GBL Elctrns. 312-593-3220
Ill Palatine, OHM Elctrns. 312-359-5500
Ill Peoria, Klaus Radio/Peoria 309-691-4840
Ill Rosemont, Advent Elctrns. 312-298-4210
Ind Evansville, Hutch & Son 812-425-7201
Ind Evansville, Ohio Valley Sound 812-425-6173
Ind Indianapolis, RA-DIS-CO 317-637-5571
Ind South Bend, Radio Dist. 219-287-2911
Iowa Cedar Rapids, Deeco, Inc. 319-365-7551
Kans Wichita, Radio Supply Co. 316-267-5214
Ky Louisville, P. I. Burks Co. 502-589-3960
La Lafayette, Ralph's 318-234-4507
La New Orleans, Wm. B. Allen Supply Co. 504-525-8222
La New Orleans, Southern Radio Supply 504-524-2343
La New Orleans, Lykes Elctrns. 504-733-3400
Md Beltsville, Powell Elctrns. 301-937-4030
Md Rockville, Capitol Radio Wholesalers 301-881-2270
Mass Burlington, Heilind Elctrns. 617-272-5610
Mass Dedham, Gerber Elctrns. 617-329-2400
Mass Lynn, Land Elctrns. 617-592-2220
Mass Newton, Cramer Elctrns. 617-969-7700
Mass North Wilbraham, Industrial Comps. 413-596-3854
Mich Ann Arbor, Wedemeyer Elctrns. 313-665-8611
Mich Farmington, Advent Elctrns. 313-477-1650
Minn St. Paul, Gopher Elctrns. 612-645-0241
Miss Jackson, Ellington Elctrn. Supply 601-355-0561
Mo Kansas City, Walters Radio Supply 816-531-7015
Mo St. Louis, Olive Inds. Elctrns. 314-426-4500
Mo St. Louis, Van Sickle 314-621-5000
Neb Lincoln, Scott Elctrn. Supply 402-466-8221
Nev Reno, Edco 702-323-2766
NJ Springfield, Federated Purchaser 201-376-8900
NM Albuquerque, Elctrn. Parts Co. 505-293-6161
NM Albuquerque, Walker Radio Co. 505-247-2288
NY Bohemia, Car-Lac Elctrn. Supply 516-567-4200
NY Buffalo, Genesee Radio & Parts Co. 716-873-9661
NY Buffalo, Summit Radio Distributing 716-884-3450
NY Farmingdale, Broadline Elctrns. 516-420-8320
NY Lynbrook, Peerless RAdio Corp. 516-593-2121
NY Mt. Vernon, QAR Industrial Electronics Supply 914-699-2224
NY New York, Center Ind'l. Elctrns. 212-989-6363
NY Port Chester, Wise Elctrns. 914-939-3940
NY Richmond Hill, Anchor Elctrns. 212-846-2420
NY Rochester, Simcona Elctrns. 716-328-3230
NC Charlotte, Dixie Radio Supply 704-377-5413
NC Greensboro, Hammond Elctrns. 919-275-6391
NC Raleigh, Southeastern Radio Supply 919-828-2311
NC Winston-Salem, Kirkman Elctrns. 919-722-9131
Ohio Akron, Sun Radio 216-434-2171
Ohio Cincinnati, United Radio 513-761-4030
Ohio Cleveland, Wm. Pattison Supply 216-441-3000
Ohio Columbus, Hughes-Peters, Inc. 614-294-5351
Ohio Dayton, ESCO 513-226-1133
Ohio Lima, Lima Radio Parts 419-228-1220
Ohio Solon, Repco 216-248-8900
Okla Tulsa, Oil Capitol Elctrns. 918-622-8520
Pa Drexel Hill, Kass Elctrns. 215-449-2300
Pa Erie, Mace Elctrns. 814-838-3517
Pa Philadelphia, Powell Elctrns. 215-365-1900
Pa Pittsburgh, CAM/RPC 412-782-3770
SC Columbia, Dixie Radio Supply 803-779-5332
SC Greenville, Dixie Radio Supply 803-232-5357
Tenn Nashville, Electra Distributing Co. 615-329-3971
Tex Dallas, Wilkinson Brothers 214-747-1571
Tex El Paso, Midland Specialty 915-533-9555
Tex Fort Worth, Swieco, Inc. 817-335-6521
Tex Houston, Newark-Houston 713-782-4800
Tex Houston, Geophysical Supply 713-659-2233
Va Arlington, Arlington Elctrns. 703-524-2412
Va Norfolk, Priest Elctrns. 804-855-0141
Wisc Milwaukee, Parts Mart 414-276-1212
Wisc Milwaukee, Marsh Radio Elctrns. 414-475-6000
Cal Hawthorne, Electro-Sonic Comps 213-679-9781
Cal N. Hollywood, Elctrn Hardware Ltd. 213-982-6100
Ga Atlanta, Ack Radio Supply 404-351-6340
Ind East Chgo., Acro Elctrns Corp. 219-397-8681
Ky Louisville, Peerless Elctrn Equip 502-637-7677
Okla Oklahoma City, Radio Supply 405-737-7641
Pa Braddock, M. Leff Radio Parts 412-271-2800
SC Greenville, Hammond Elctrns. 803-233-4121
Tenn Kingsport, Radio Electric Supply Co. 615-247-8111
Tenn Knoxville, Bondurant Bros. 615-573-9151
Tex Beaumont, Ralph's Ind'l. Elctrns. 713-833-9443
Tex Dallas, KA Elctrns. Sls. 214-634-7870
Tex Dallas, Electrotex 214-234-0433
Utah Salt Lake City, Standard Supply Co. 801-486-3371
Wisc Madison, Satterfield Elctrns 608-257-4801
For: Canada, Calgary, Alta., Smalley's Elctrns., Ltd. 403-253-0331
For: Canada, Edmonton, Alberta, Smalley's Elctrns., Ltd. 403-484-0001
For: Canada, Edmonton, Alta., Cardinal Industrial Elctrns. 403-455-4122
For: Canada, London, Ont., C.M. Peterson Co., Ltd. 519-434-3204
For: Canada, Montreal, P.Q., Payette Radio Ltd. 514-878-4771
For: Canada, Montreal, P.Q., Hooker Elctrns. Ltd. 514-487-5151
For: Canada, Ottawa, Ont., Wackid Radio TV Lab. Ltd. 613-728-1821
For: Canada, Quebec City, Que., Crobel Ltd. 418-524-5201
For: Canada, Vancouver, B.C., R.A.E. Ind'l. Elctrns. 604-687-2621

WALKER SCIENTIFIC, INC., Dept. EM, Rockdale St., Worcester, Mass. 01606, Tel: 617-852-3674, Telex: 92-0489; Empl.: 83

Sales Manager: B. Langley

Advertisement

WALKER/MAGNEMETRICS: Magnetic Measuring Instrumentation

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Coercivity Meters
Fluxmeters
Gaussmeters (Hall & NMR)
Integrator

WALKER/MAGNION: Laboratory Magnet Systems

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Laboratory Power Supplies (Regulated and Unregulated)
Susceptibility systems
Magnetic Field Control Instruments
Sweep Instruments

WALL A. T. CO., Dept. EM, 55 Service Ave., Warwick, R.I. 02889, Tel: 401-739-0740, TWX: 710-382-1535; Empl.: 52

Sales Manager: R. Huntsman; *Distributor Manager:* R. Huntsman

WALL-LENK MFG. CO., Dept. EM, Box 3349, Dept. EEM-71, Kinston, N.C. 28501, Tel: 919-527-4186; Empl.: 90

Local Sales Offices & Reps.

Cal Garden Grove, Kendall Mktg. 714-971-1122
DC Washington, DC, H. Wise & Co. 202-363-9417
Fla Ft. Lauderdale, Norm Black Assocs 305-523-0516
Ill Chicago, Midwest Elctrn. Sls. 312-777-9700
Ind Monrovia, Midwest Elctrn Sls. 317-996-2725
Mass Woburn, Yankee Tech Sls 617-933-1529
Minn Minneapolis, Bitronics Sls. Co. 612-835-7744
NJ Bergenfield, H. Gray Assocs. 201-384-3643
NY Syracuse, Leonard D. Allen 315-458-7470
NC Raleigh, George M. Wolff & Assocs 919-851-2800
Ohio Cleveland, Mfrs Distribution Ctr. 216-886-2404
Tenn Memphis, Henry Carson 901-398-6194
Tex Houston, Gulf Southwest Sls 713-777-8241

WARD LEONARD ELEC. CO. INC., Sub. Unimax Group Inc., Dept. EM, 31 South St., Mt. Vernon, N.Y. 10550, Tel: 914-664-1000, TWX: 710-562-0144; FSC No.: 63743; Empl.: 600

Local Sales Offices & Reps.

Ala Huntsville, Macro Mktg Assoc. 205-883-9630
Ariz Tempe, Argus Sls. 602-967-8709
Cal Buena Park, Sales Engrs Ltd. 714-521-8673
Cal Buena Park, Sales Engrs. Ltd. 714-521-8673
Cal San Carlos, Electro-Pacific 415-593-3114
Cal San Diego, Sales Engrs Ltd. 714-227-5723
Colo Englewood, J & B Sales 303-761-9181
Ga Atlanta, Macro-Mktg. 404-449-7440
Ga Roswell, Ward Leonard Elec. 404-992-4242
Ill Elmhurst, Ward Leonard 312-279-5490
Ill Palatine, Bu-Nell 312-358-2300
Iowa Cedar Rapids, Technical Reps 319-393-5510
Kans Lenexa, Technical Reps 913-888-0212
Md Baltimore, Faion Lott & Co. 301-744-4611
Mass Framingham, KSA of New England 617-875-5464
Mich Troy, W. Van Leuven & Assoc. 313-583-1717
Minn Minneapolis, Hallock Co. 612-920-6100
Mo Hazelwood, Technical Reps 314-731-5200
Mo St. Louis, R. Greene Co. 314-644-2666
NY Mt. Vernon, Ward Leonard 914-664-1000
NY Williamsville, Ward Leonard 716-634-4300
NC Charlotte, Electro Rep. Assoc. 704-527-2530
NC Winston Salem, Macro-Mktg Assoc. 919-788-8145
Ohio Cincinnati, Goldschmidt Elec. Sls 513-641-1708
Ohio Cleveland, Ward Leonard 216-842-4414
Ohio Cleveland, O'Neill & Ruffing 216-331-4273
Pa Phila., S.K. MacDonald 215-545-1205
Tex Richardson, Spectra Sls. 214-234-3600
Wash Seattle, H.M. Denny Co. 206-282-7200
Exp: New York, NY, ITT Export Corp. 212-334-0020

Local Distributors

Cal Burlingame, Electric Control Devices 415-347-3871
Cal Gardena, Bell Inds 213-321-5802
Cal No. Hollywood, Daring Co. 213-766-3728
Cal Sunnyvale, Bell Inds 408-734-8570
Conn Danbury, Bond Radio Elctrns. 203-744-2274
Conn E. Hartford, R & S Elctrn Distrs 203-528-9901
Conn Naugatuck, S.C.R. Electric 203-729-8274
Conn Norwalk, Park Distrs 203-853-2010
Conn Stratford, Stepco Elctrns 203-375-5961
Fla Dania, Summit Elctrns Fla 305-920-6253
Fla Hollywood, Cramer E. W. 305-923-8181
Haw Honolulu, Electric Svcs Dillingham 808-845-2911
Ill Skokie, Bell Inds 312-965-7500
Ky Lexington, Lexington Ind. Svcs 606-255-0818
Md Baltimore, Blanco Elctrns 301-788-4200
Mass Holliston, Diplomat Elctrns 617-429-4120
Mass Newton, Greene-Shaw 617-969-8900
Mass Newton, Cramer Intl 617-969-7700
Mich Waltham, Sterling Elctrns 617-894-6200
NJ Hanover, State Elctrns 201-887-2550
NJ Springfield, Federated Purchaser 201-376-8900
NM Binghamton, Federal Elctrns 607-748-8211
NY Buffalo, Summit Dist. 716-884-3450
NY Mount Vernon, QAR Elctrns. 914-699-2224
NY Portchester, Wise Elctrns 914-939-3940
NY Poughkeepsie, Higgins & Sheer 914-471-3510
NY Rockville Centre, Midway Ind. Elctrns 516-764-2400
NC Raliegh, Southeastern Radio Supply 919-828-2311
Ohio Cleveland, Milner Elec 216-696-9300
Ohio Cleveland, Specialized Comp Sls 216-464-0405
Ohio Dayton, Stotts-Friedman 513-224-1117
Ohio Toledo, Girkins Elec 419-243-9238
Pa Erie, Advacom 814-455-8110
Pa Montgomeryville, Pyttronic Ind. 215-643-2850
Pa Philadelphia, Almo Elctrns 215-698-4000
Pa Pittsburgh, CAM/R.P.C. Elctrns. 412-782-3770
Tex Plano, Custom Distrs 214-423-8770
Wisc Germantown, Hydro-Electro 414-255-5555

WARNER ELEC. BRAKE & CLUTCH CO., Dept. EM, Beloit, Wisc. 53511, Tel: 815-389-3771; Empl.: 1200

Local Sales Offices & Reps.

Ala Birmingham ... 205-942-0244
Cal Newport Beach ... 714-549-4004
Cal San Jose ... 408-688-9507
Conn Old Lyme ... 203-646-5337
Ga Tucker ... 404-938-2913
Ill Chicago ... 312-775-7570
Ind Indianapolis ... 317-299-3101
Iowa Bettendorf ... 309-762-0112
Ky Union ... 606-371-3141
Md Baltimore ... 301-879-7916
Mass Abington ... 617-326-7100
Mich Troy ... 313-689-7515
Mich Ypsilanti ... 313-689-3100
Minn Minneapolis ... 612-335-7277
Mo Warrensburg ... 816-421-8499
NJ Madison ... 201-377-4800
NY Liverpool ... 315-458-0500
Ohio Cincinnati ... 513-891-4813
Ohio Mentor ... 216-357-3509
Pa Philadelphia ... 215-233-1216
RI Warwick ... 401-738-0070
Tenn Powell ... 615-688-2324
Tex Dallas ... 214-327-1268
Wash Seattle ... 206-523-2206
Wisc Milwaukee ... 414-871-8022

Local Distributors

Ala Birmingham, Motion Inds. ... 205-251-3231
Ariz Phoenix, Western Bearing ... 602-273-1641
Ark Little Rock, Allied Ark. Bearing ... 501-375-4691
Cal Los Angeles, L. A. Rubber Co. ... 213-263-4131
Cal San Diego, N. A. D'Arcy Co. ... 714-274-8700
Colo Denver, Distributor Specialist ... 303-433-8376
Conn Norwalk, Machine Drives & Controls 203-846-2007
Fla Orlando, Miller Bearings of Orlando 305-849-6000
Ga Atlanta, Southern Belting & Transmission 404-875-1651
Idaho Twin Falls, C. W. Silver Co. ... 208-733-0460
Ill Chicago, Dodge Chicago Industrial Equip. 312-225-8500
Ind Indianapolis, Scherer Elec. Co. ... 317-635-3466
Iowa Davenport, Industrial Engrg. Equip. Co.
Kans Wichita, Industrial Bearing & Transmission 316-267-0353
Ky Louisville, Louisville Mill Supply Co. 502-583-3875
La New Orleans, McLellan Equip. Co. 504-524-3415
Me Bangor, Advance Bearing & Supply Co. 207-947-6583
Md Baltimore, Carey Machinery & Supply Co. 301-485-2323
Mass Boston, W. M. Pike Assocs. ... 617-426-5375
Mass Worchester, Advance Bearing & Supply Co. 617-791-6322
Mich Detroit, Industrial Comp. ... 313-838-8000
Minn Minneapolis, J. E. Braas Co. ... 612-869-3246
Miss Jackson, Motion Inds. ... 601-948-1896
Mo Kansas City, Industrial Bearing & Transmission 816-471-6616
Neb Omaha, Precision Bearing & Transmission 402-341-4050
NJ Somerset, Slingman Inds. ... 201-249-3500
NM Albuquerque, Western Bearing Co. 505-247-0222
NY Maspeth, Patron Transmission Co. 212-326-3050
NY New York, Patron Transmission Co. 212-226-1140
NC Charlotte, Mize Co. ... 704-375-5761
NC Greensboro, Cross Sls. & Engrg. Co 919-275-6365
Ohio Cincinnati, Queen City Supply Co. 513-761-4210
Ohio Cleveland, Wood-Compton Co. ... 216-587-5200
Okla Oklahoma City, Industrial Bearing & Transmission ... 405-236-2416
Ore Portland, Power Transmission & Bearing Prods. ... 503-227-1271
Pa Pittsburgh, Transmission Equip. Co. 412-431-2100
RI Providence, Machine Parts Corp. 401-274-4333
SC Greenville, B. L. Montague Co., Inc. 803-233-2745
Tenn Chattanooga, Electric Motor Sls. & Supply Co. 615-267-1804
Tex Dallas, Burgess Inds. ... 214-630-7600
Utah Salt Lake City, C. W. Silver Co. 801-355-5373
Vt North Springfield, Standard Industrial, Inc. 802-886-2251
Va Richmond, C. A. Weaver Co. ... 804-282-6501
Wash Seattle, Washington Belt & Rubber Co. 206-623-5650
Wisc Milwaukee, A. C. Supply Co. ... 414-342-5870
For: Can., North Burnaby, B.C., Elworthy & Co. Ltd. 604-299-4341
For: Can., Toronto, Ont., N. Smith Belting Ltd. 416-789-5797
For: Puerto Rico, Ponce, Bearings & Transmission Co.
For: Switzerland, Lausanne, Warner Elect. Inc. 021-27-75-81
For: United Kingdom, Bishop Auckland, Co. Durham, Warner Electric Ltd. ... 4000

WATERBURY PRESSED METAL DIV., WPM, Inc., Dept. EM, 407 Brookside Rd., Waterbury, Conn. 06720, Tel: 203-756-8891; Empl.: 85

Sales Manager: P. W. Allen, Prod. Sls. Mgr.

Local Sales Offices & Reps.

Conn Bristol, Texell Co ... 203-583-0703
Ga Monroe, Waterbury Pressed Metal Div. 404-267-8058

WATERS MFG., INC., Dept. EM, Longfellow Ctr., Wayland, Mass. 01778, Tel: 617-358-2777; Empl.: 125

Sales Manager: D. Russell

Local Sales Offices & Reps.

Ariz Phoenix, Eltron ... 602-997-1042
Cal Buena Park, Sls. Engrs. Ltd. ... 714-521-8673
Cal Redwood City, Woodworth Co. ... 415-365-0252
Colo Englewood, Dynatech Inc. ... 303-773-2830
Conn Trumbull, Sir Assocs. ... 203-268-2560
Ill Lagrange Park, Bierhaus Sls ... 312-354-5100
Mass Lexington, Sir Assocs ... 617-862-1812
Mich Detroit, R.P. Urban & Assocs. ... 313-535-2355
Mich Grand Rapids, R.P. Urban & Assocs. 616-245-0511
Minn Hopkins, F. Peterson Co. ... 612-941-5400
Mo St. Louis, Ozark Elctrn. Mktg., Inc. 314-423-7200
NJ So. Orange, S. Simberkoff Assocs. 201-763-7900
Ohio Dayton, INH Component Sls. ... 513-434-8808
Ohio Dayton, H. Teplitz & Co. ... 513-277-6531
Tex Richardson, Barry Sls ... 214-234-0255
Utah Sandy, Dynatech ... 801-942-4387
Wash Seattle, Avionics Liaison, Inc. ... 206-767-3870
Wisc Milwaukee, Bierhaus Sls. ... 414-332-0900

WATKINS-JOHNSON CO., Dept. EM, 3333 Hillview Ave., Palo Alto, Cal. 94304, Tel: 415-493-4141, TWX: 34-8415, 910-373-1253; FSC No.: 14482; Empl.: 2,000

Local Sales Offices & Reps.

Cal El Segundo ... 213-640-1980
Cal Palo Alto ... 415-493-4141
Cal Scotts Valley ... 408-438-2100
Fla Altamonte Springs ... 305-834-8840
Md Gaithersburg ... 301-948-7550
Mass Lexington ... 617-861-1580
NJ Red Bank ... 201-842-2422
Ohio Fairborn ... 513-426-8303
Tex Dallas ... 214-234-5396

WATLOW ELEC. MFG. CO., Dept. EM, 12001 Lackland Rd., St. Louis, Mo. 63141, Tel: 314-878-4600, Telex: 44-2428; Empl.: 230

Local Sales Offices & Reps.

Cal Belmont, A. Merendino ... 415-595-3888
Cal Torrance, Carlin Assoc. ... 213-542-3553
Ga Atlanta, R. Starnes ... 404-458-2068
Ill Chicago, J. Priest & Assocs. ... 312-992-1220
Mass Natick, Electrical Comp. ... 617-655-2225
Mich Detroit, D. Martignon ... 313-651-0500
Mo St. Louis, S. Siracusa ... 314-878-4600
NJ Ft. Lee, Feld-Magee ... 201-461-4484
NY Buffalo, H. H. Cardozo ... 716-834-3377
NY E. Syracuse, R. H. Nichols ... 315-437-2813
NY Rochester, J. F. Serr ... 716-586-6226
Ohio Cincinnati, M. Jordahl ... 513-683-4500
Ohio Medina, S. Bohnenkamp ... 216-723-1502
Pa Warrington, G. Baker ... 215-345-8130
Tex Dallas, K. Dawson Co. ... 214-241-3843

WAVECOM, Dept. EM, 9036 Winnetna Ave., Northridge, Cal. 91324, Tel: 213-882-3010, Telex: 67-4259; FSC No.: 28979; Empl.: 50

Sales Manager: Mel Marcus, VP-Mktg.

Local Sales Offices & Reps.

Ariz Scottsdale, Territorial Mktg. ... 602-994-8665
Cal Cupertino, Allis Assocs ... 408-252-2883
Cal Los Angeles, Fetty/Schoenduve 213-651-4050
Cal San Diego, Fetty/Schoenduve ... 714-292-5136
Colo Denver, Thorson Co. ... 303-759-0809
Conn Norwalk, Nemarco Assocs ... 203-853-2618
Fla Palm Bay, Spartech Assocs. ... 305-727-8045
Ga Smyrna, Spartech Assocs. ... 404-432-3644
Ill Park Ridge, RF Specialists ... 312-698-2044
Ind Fort Wayne, RF Specialists ... 219-485-8982
Ind Indianapolis, RF Specialists ... 317-783-7630
Iowa Cedar Rapids, J. R. Sls. Engrg. 319-393-2232
Kans Overland Park, Professional Mktg. Assoc. 913-381-0004
Kans Wichita, Professional Mktg. Assoc. 316-264-2662
Mass Lexington, Lancer Assocs. ... 617-861-1720
Mo Maryland Heights, Professional Mktg. Assoc. 314-569-1220
NM Albuquerque, Thorson Co. ... 505-265-5655
NY Skaneateles, Robtron ... 315-685-5731
Tex Richardson, Leak Assocs. ... 214-231-5388
Va McLean, Creative Mktg Assoc. ... 703-893-6612
Wash Bellevue, James Findlay Co. ... 206-746-5400
Exp: Cal., Palto Alto, California Int'l. Trade Corp 415-328-1460

WAVELINE, INC., Dept. EM, Box 718, W. Caldwell, N.J. 07006, Tel: 201-226-9100, TWX: 710-734-4324; FSC No.: 00443; Empl.: 95

Local Sales Offices & Reps.

Ala Huntsville, Beacon Elctrn. Assocs. 205-881-5031
Ariz Scottsdale, Territorial Mktg. ... 602-994-8665
Cal Cupertino, Allis Assocs. ... 408-379-2883
Cal Los Angeles, Midwinz Olifson ... 213-475-8568
Fla Ft. Lauderdale, Beacon Elctrn. ... 305-776-6074
Fla Maitland, Beacon Elctrn. Assn. ... 305-647-3498
Ga Atlanta, Beacon Elctrn. ... 404-351-3654
Ky Ft. Mitchel, GW. Thelen Co. ... 606-341-8181
Md Glen Arm, Hodgins Assocs. ... 301-592-7047
Mass Needham Hgts., Reptron, Inc. ... 617-449-4141
NJ W. Caldwell, Waveline, Inc. ... 201-226-9100
NY Skaneateles, Robtron, Inc. ... 315-685-5731
NC Greenboro, Beacon Electrns. ... 919-674-9453
Ohio Stow, GW Thelen Co. ... 216-688-0915
SC Spartanburg, Beacon Elctrn. Assoc. 803-582-4613
Tex Richardson, Palatine Sls. ... 214-231-9489
Exp: N.J., Teaneck, Sylvan Ginsbury 201-837-1100

WAVETEK®

WAVETEK, Dept. EM, 9045 Balboa Ave., San Diego, Cal 92123, Tel: 714-279-2200, TWX: 910-335-2007; Empl.: 470 ... p. 2836

Local Sales Offices & Reps.

Ala Huntsville, W.A. Brown Instrs. ... 205-883-8660
Ariz Scottsdale, BFA Corp. ... 602-994-5400
Cal Lawndale, Ward/Davis Assoc. ... 213-542-7740
Cal San Diego, Ward/Davis Co. ... 714-459-3351
Cal Sunnyvale, Ward/Davis Assoc. ... 408-245-3700
Colo Denver, BFA Corp. ... 303-837-1247
Conn Hamden, P. Jenks Assocs. ... 203-281-0810
Fla Ft. Lauderdale, W.A. Brown Instrs. 305-776-4800
Fla Melbourne, W.A. Brown Instrs. ... 305-723-0766
Fla Orlando, W.A. Brown Instrs. ... 305-425-5505
Fla Valparaiso, W.A. Brown Instrs. ... 904-678-7932
Ga Atlanta, W.A. Brown Instrs. ... 404-455-1035
Ill Chicago, Carter Elctrns. ... 312-585-5485
Ind Indianapolis, Carter Elctrns. ... 317-293-0696
Kans Overland Park, Carter Elctrns. ... 913-649-6996
La Mandeville, W.A. Brown Instrs. ... 504-626-9701
Mass Wakefield, P. Jenks Assocs. ... 617-246-1590
Mich Madison Heights, WKM Assocs. 313-588-2300
Minn Minneapolis, Carter Elctrns. ... 612-559-1976
Mo St. Louis, Carter Elctrns. ... 314-569-1406
NJ Englewood, Eastern Instrumentation 201-567-9505
NJ N. Syracuse, NACO Elctrns. Corp. 315-699-2651
NM Albuquerque, BFA Corp. ... 505-292-1212
NM Las Cruces, BFA Corp. ... 505-523-0601
NY Fairport, Naco Elctrns ... 716-223-4490
NY Utica, Naco Elctrns ... 315-732-1801
NC Durham, W.A. Brown Instrs. ... 919-682-2383
Ohio Cleveland, WKM Assocs. ... 216-267-0445
Ohio Dayton, WKM Assocs. ... 513-434-7500
Okla Oklahoma City, Data Mktg. Assoc. 405-528-6071
Ore Lake Oswego, Wilson Applied Instrs. 503-636-0965
Pa Philadelphia, Eastern Instrumentation 215-927-7777
Pa Pittsburgh, WKM Assocs. ... 412-892-2953
SC Columbia, W.A. Brown Instrs. ... 803-798-3297
Tenn Oak Ridge, W.A. Brown Instrs. ... 615-482-5761
Tex Austin, Data Mktg. Assoc. ... 512-451-5174

Tex Dallas, Data Mktg. Assoc. 214-661-0300
Tex Houston, Data Mktg. Assocs. 713-780-2511
Tex San Antonio, Data Mktg. Assocs. 512-828-0937
Utah Salt Lake City,, BFA Corp 801-466-6522
Va McLean, Creative Mktg. Assoc... 703-893-6612
Wash Bellevue, Wilson Applied Instrs. 206-641-6444
Wisc Milwaukee, Carter Elctrns. 414-464-5555

WAVETEK INDIANA, INC., Dept. EM, 66 N. First Ave., Beech Grove, Ind. 46107, Tel: 317-783-3221, TWX: 810-341-3226; Empl.: 300 ..... p. 2835

Local Sales Offices & Reps.
Ala Huntsville, W.A. Brown Instrs. 205-539-4411
Ariz Scottsdale, BFA Corp. 602-946-4215
Cal La Jolla, Ward/Davis Assoc. 714-459-3351
Cal Lawndale, Ward/Davis Assoc. .. 213-542-7740
Cal Sunnyvale, Ward/Davis Assoc... 408-245-3700
Colo Aurora, BFA Corp..... 303-344-3800
Conn Hamden, P. Jenks Assoc. 203-281-0810
Fla Ft. Lauderdale, W.A. Brown Instrus. 305-776-4800
Fla Ft. Walton Beach, W.A. Brown Instrus. 904-243-6424
Fla Melbourne, W.A. Brown Instrs. .. 305-723-0766
Fla Orlando, W.A. Brown Instrus. 305-425-5505
Ga Atlanta, W.A. Brown Instrus. 404-455-1035
Ill Chicago, Carter Elctrns. 312-585-5485
Ind Indianapolis, Carter Elctrns. 317-293-0696
Kans Overland Park, Carter Elctrns. .. 913-649-6996
La Gretna, W.A. Brown Instrus..... 504-366-5805
Mass Wakefield, P. Jenks Assoc. 617-246-1590
Mich Madison Hts., WKM Assocs. 313-588-2300
Minn Minneapolis, Carter Elctrns. 612-559-1976
Mo St. Louis, Carter Elctrns. 314-569-1406
NM Albuquerque, BFA Corp..... 505-292-1212
NM Las Cruces, BFA Corp. 505-523-0601
NY Fairport, Naco Elctrns. 716-244-4720
NY Great Neck, L.I., Eastern Instrumentation 516-466-9505
NY N. Syracuse, Naco Elctrns. 315-699-2651
NY Utica, Naco Elctrns..... 315-732-1801
NC Durham, W.A. Brown Instrus..... 919-682-2383
Ohio Cleveland, WKM Assocs. 216-267-0445
Ohio Dayton, WKM Assocs. 513-434-7500
Okla Oklahoma City, Data Mktg. Assoc. 405-528-6071
Pa Philadelphia, Eastern Instrumentation 215-927-7777
Pa Pittsburgh, WKM Assocs. 412-892-2953
SC Columbia, W.A. Brown Instrs. 803-772-7803
Tenn Oak Ridge, W.A. Brown Instrs. .. 615-482-5761
Tex Austin, Data Mktg. Assocs. 512-451-5174
Tex Dallas, Data Mktg. Assoc. 214-661-0300
Tex Houston, Data Mktg. Assoc. 713-686-9627
Tex San Antonio, Data Mktg. Assoc. 512-828-0937
Utah Salt Lake City, BFA Corp. 801-466-6522
Va McLean, Creative Mktg. Assoc... 703-893-6612
Wash Renton, Wilson Applied Instrs..... 206-228-5880
Wisc Milwaukee, Carter Elctrns. 414-464-5555

WEBBER MANUFACTURING CO., Dept. EM, P.O. Box 217, Indianapolis, Ind. 46206, Tel: 317-357-8681; FSC No.: 6636; Empl.: 40

Sales Manager: P.T. Richardson

WEBER TECH PRODUCTS, Dept. EM, 360 Merrimack St., Lawrence, Mass 01842, Tel: 617-687-2400, TWX: 710-342-0765; Empl.: 36

Sales Manager: D. E. Bishop

WEIDMULLER TERMINATIONS, INC., Dept. EM, 4326 Eubank Rd., Richmond, Va. 23231, Tel: 804-226-2877, Telex: 822-376; Empl.: 27

Sales Manager: C. O. Otto; *Distributor Manager:* J. J. Nemceff

Local Sales Offices & Reps.
Cal Emeryville, G. E. Honn Co. 415-653-0737
Cal Huntington Beach 714-848-0122
Cal Westlake Village 213-991-2740
Colo Brighton, Intermountain Agency Sls. 303-659-2350
Fla Ft. Lauderdale, KSM Elctrns Inc. 305-739-5880
Ga Smyrna 404-435-1078
Ill Arlington Heights, Martec Assocs. 312-956-8090
Ill Davis 815-248-2064
Mass Norwood, JMG, Inc..... 617-762-5333
Mass Revere..... 617-289-2122
Mich Southfield, Engles-Klae Co. 313-48075
Minn Minneapolis, R.D. Schwen Eng. Inc. 612-553-1398
Mo Kansas City
NY Rochester, Ontec..... 716-464-8636
NY Wappinger Falls..... 914-462-6515
Ohio Cleveland, K. R. Dodge Co..... 216-461-6482
Ohio Mentor..... 216-255-1990
Pa Philadelphia 215-676-1942
Tex Cypress..... 713-469-4917
Tex Missouri City, Elliott Co. 713-499-1571
Va Richmond 804-226-2877
Wash Seattle, Electrical Agents NW, Inc.
Wash S.E., Bothell 206-485-6495

Local Distributors
Ohio Cleveland, Electrical Equip. Co. 216-461-6482
Tex Houston, Nelson-Gulf Coast 713-453-0186

WEINSCHEL ENGRG. CO., Dept. EM, One Weinschel La., Gaithersburg, Md. 20760,. Tel: 301-948-3434, TWX: 89-8352, 710-828-9705; FSC No.: 93459; Empl.: 220

Sales Manager: R. Bastien

Local Sales Offices & Reps.
Ala Huntsville, Beacon Elctrns. Assoc. 205-881-5031
Ariz Scottsdale, PLS Assocs. 602-994-5461
Cal La Jolla, Ward Davis Assoc. 714-459-3351
Cal Lawndale, Ward Davis Assoc..... 213-542-7740
Cal Sherman Oaks, G. McNamara .. 213-990-8606
Cal Sunnyvale, Ward Davis Assoc. .. 408-245-3700
Colo Denver, PLS Assocs. 303-773-1218
Fla Ft. Lauderdale, Beacon Elctrns. Assoc. 305-971-7320
Fla Ft. Walton Beach, Beacon Elctrns Assoc. 904-244-1550
Fla Maitland, Beacon Elctrns. Assoc. 305-647-3498
Ga Atlanta, Beacon Elctrns. Assoc. 404-351-3654
Ill Arlington Heights, Dytec Central Inc. 312-394-3380
Ind Ft. Wayne, Dytec Central..... 219-485-0845
Kans Lenexa, Dytec South..... 913-888-0215
Mass Burlington, R.J. Sickles Assoc. .. 617-272-7285
Mich Detroit, Comtel Instr. Co. 313-255-1970
Minn St. Paul, Dytec North 612-645-5816
Mo St. Louis, Dytec South 314-731-5400
NJ Ft. Lee, Tech. Mktg. 201-244-6911
NM Albuquerque, PLS Assocs..... 505-255-2330
NY Fairport, Naco Electronics Corporation 716-223-4490
NY No. Syracuse, Naco Elctrns. 315-699-2651
NY Utica, Naco Elctrns..... 315-732-1801
NC Charlotte, Beacon Elctrns. Assoc. 704-525-7412
Ohio Cleveland, Comtel Instr. Co. 216-442-8080
Ohio Dayton, Comtel Instrs..... 513-298-7573
Ore Portland, Rush Drake Assocs 503-224-3145
Pa Philadelphia, Eastern Inst. 215-927-7777
Pa Pittsburgh, Comtel Instr. Co. 412-922-5720
Tenn Oak Ridge, Beacon Elctrns. Assoc. 615-482-2409
Tex Dallas, Cain & Co..... 214-233-6809
Tex San Antonio, Ashcraft Assocs. .. 512-824-7267
Utah Sandy, PLS Assocs..... 801-942-2081
Va McLean, Creative Mktg. Assocs. 703-893-6612
Wash Seattle, Rush Drake Assoc..... 206-763-2755

WELCH ALLYN, INC., Indl. Prods. Div., Dept. EM, Skaneateles Falls, N.Y. 13153, Tel. 315-685-5788, TWX: 710-545-0203; Empl.: 400

Sales Manager: C. Benoit

Local Sales Offices & Reps.
Ariz Scottsdale, P. Murphy Assocs. .. 602-946-2457
Cal Palo Alto, O'Donnell Assocs. North 415-327-9260
Cal Torrence, O'Donnell Assocs. 213-328-9710
Colo Boulder, R. A. Mayes Co. 303-444-0782
Fla Jupiter, Cherry Assocs. 305-746-4591
Ill Des Plaines, Coombs Assocs..... 312-298-4830
Ind Indianapolis, Coombs Assocs. 317-251-2757
Mass Holden, Richard A. Poulin Assocs. 617-829-6948
Mich Birmingham, Forand Sls. Co..... 313-644-0087
Minn Minneapolis, J. J. Exon Co. 612-571-5340
NJ Millburn, Graydon-Sherman 201-467-1400
NM Albuquerque, R. A. Mayes Co. .. 505-292-2330
NY Syracuse, W. H. Zimmerman..... 315-474-4889
Ore Portland, J. J. Backer Co. 206-285-1300
Pa Abington, R. Ritter..... 215-884-6849
Tex Houston, R. A. Mayes Co. 713-461-5385
Tex Richardson, R. A. Mayes Co. 214-235-3043
Utah Centerville, R. A. Mayes Co. 801-292-6781
Wash Seattle, J. J. Backer Co. 206-285-1300
Wisc Greendale, Coombs Assocs. 414-421-2300

WELCO INDS. INC., Dept. EM, 9027 Shell Ave., Cincinnati, Ohio 45236, Tel: 513-891-6600, TWX: 810-461-2574; Empl.: 160

Local Sales Offices & Reps.
Ga Atlanta, H. Homer & Assocs..... 404-457-5561
Ill Park Ridge, L. Fitz Co. 312-631-5488
Mass Salem, Forbes Engrg. Co. 617-744-1693
Minn St. Paul, Craighead & Assoc. 612-645-0784
Mo Kansas City, Horsepower Control Sys. 816-471-6363
NJ Kenilworth, Wolock & Lott Co. .. 201-241-4333
NY Rochester, Ross Equip. Co..... 716-271-5660
NC Charlotte, Ind'l. Drives & Controls 704-535-5414
Ohio Richfield, Wood-Compton Co. 216-659-6126
Pa Media, H.B. Stallings & Assocs. 215-566-4100
Va Richmond, S.D. Harmon & Co. .. 804-358-5700
Wisc Milwaukee, Dietz Elec. Co. 414-645-3000

WELLER-XCELITE WISS, THE COOPER GROUP, Dept. EM, Box 728, Apex, NC 27505, Tel: 919-362-7511, Telex: 579497

Sales Manager: J.J. Barrese

WELLS ELECTRONICS, INC., Weltek Div., Dept. EM, 1801 S. Main St., South Bend, Ind. 46613, Tel: 219-287-5941, Telex: 25-8325; Empl.: 33

Local Sales Offices & Reps.
Cal Hacienda Heights, Wadsworth-Pacific Mfg. Assoc. 213-330-5592
Colo Parker, Component Sls 303-841-2650
Fla Ft. Lauderdale, Semquip, Inc. 305-772-3002
Ind Noblesville, King Sls 317-842-1035
Mass Lowell, T. M. Assoc. 617-686-5536
Mich Royal Oak, Murray Percival & Co. 313-548-1971
Minn Minneapolis, Peterson Elctrns 612-884-3483
Mo Kansas City, Paloma Sls 816-358-7272
NY Lindenhurst, Sigma Communications Assocs. 516-226-1880
NY Liverpool, Feikert Assocs. 315-652-5577
NC Bethania, Lee Ltd. 919-924-8245
Ohio Dayton, Electro Entprs., Inc. 513-426-6071
Pa Glenside, ARA Elctrns 215-887-5250
Tex Dallas, Tech. Processes Co. 214-352-3957
Wash Seattle, Demarest & Assocs..... 206-523-0600
Wisc Milwaukee, M. W. Entprs..... 414-352-9150

WER INDUSTRIAL, Div. Emerson Elec. Co., Dept. EM, 3036 Alt Blvd., Grand Island, N.Y. 14072, Tel: 716-773-2321, Telex: 91-6459; Empl.: 440

Sales Manager: R. D. Bob; *Distributor Manager:* D. Mitchell

Local Sales Offices & Reps.
Cal Burlingame, Engineering Reps. Co. 415-348-5042
Cal Fullerton, Devoe Engrg. Co..... 714-871-8076
Colo Littleton, R.L. Palmer Co. 303-779-1624
Conn Avon, WER Hartford District Office 203-678-0424
Conn Ridgefield, Himes Co. 203-438-0884
Conn Unionville, Tor-Axial Drive Comps. 203-673-3592
Fla Clearwater, Arroyo Process Equip. 813-576-5294
Ga Atlanta, H. Homer & Assocs..... 404-457-5561
Ill Antioch, Wer Illinois Regional 312-395-2830
Mass Mansfield, R.T. Engineering Service 617-339-9339
Mass North Andover, WER Boston District Office 617-686-7306
Mich Troy, W. Van Leuven & Assoc.
Minn Minneapolis, E. E. Rempfer & Assoc. 612-935-8271
Mo Manchester, Wer St. Louis District Office 314-391-1919
NJ Kenilworth, Wolock & Lott 201-241-4333
NY Buffalo, Ross Equip. Co..... 716-634-0990
NY Elmira, Ross Equip. Co. 607-734-1324
NY Rochester, Ross Equip. Co..... 716-271-5660
NY Syracuse, Ross Equip. Co. 315-463-6691
NC Charlotte, Wer Charlotte District Office 704-537-4364
Ohio Cincinnati, Wer Cincinnati District Office 513-561-8217
Ohio Northfield, WER Penn.-Ohio Regional Office 216-657-2290
Ohio Northfield, WER Cleveland District Office 216-468-0513
Pa Frazer, Engineered Drives & Controls 215-647-4661
Pa Frazer, WER Philadelphia District Office 215-648-0272
Tex Dallas, WER Dallas District Office 214-369-0961
Va Richmond, Harmon Commonwealth Corp. 804-358-5888
Wash Tenino, Camco Engineering Co. 206-264-4380

Local Distributors
Cal Arcata, Ind. Elec. Svc. Co..... 707-822-2485
Cal Burlington, Engrg. Reps. Co. 415-692-2581
Cal Fullerton, Devoe Engrg. Co..... 714-871-8076
Conn Ridgefield, Himes Co. 203-438-0884

Fla Clearwater, Arroyo Process Equip. 813-576-5294
Ga Atlanta, Hal Homer Assoc. 404-457-5561
Ill Chicago, Chicago Elect. Co. 312-226-2900
Ind Fort Wayne, H. J. Schroeder Co. 219-423-3586
Mass Mansfield, R. T. Engrg. Svc. 617-339-9339
Mich Detroit, D. P. Brown of Saginaw 313-841-5800
Mich Saginaw, D. P. Brown of Saginaw 517-799-9400
Minn Minneapolis, Transmission Sls. Co. 612-935-0254
Minn South St. Paul, Farwell Indust. 612-451-4222
NJ Kenilworth, Wolock & Lott 201-241-4333
NY Buffalo, Ross Equip. Co. 716-634-0990
NY Elmira, Ross Equip. Co. 607-734-1324
NY Rochester, Ross Equip. Co. 716-271-5660
NY Syracuse, Ross Equip. Co. 315-463-6691
NC Asheville, Mize Co. 704-255-8791
NC Charlotte, Mize Co. 704-375-5761
Ohio Akron, Nat'l. Elect. Coil 216-762-9301
Ohio Chagrin Falls, Automation Svcs. & Consult. 216-543-8146
Ohio Cincinnati, Cincinnati Armature Works 513-761-3123
Ohio Youngstown, Youngstown Elect. Svc. 216-743-1128
Pa Ardmore, Able Ind. Dist. 215-649-4545
Pa Ellwood City, Elect. Spec. 412-758-5811
Pa Frazer, Engineered Spec. Prds. 215-647-4661
Pa Trexlertown, Able Ind. Dist. 215-398-0447
RI Coventry, Himes Co. 401-828-5028
SC Columbia, J. W. Vaughn Co. 803-779-2690
SC Florence, Mize Co., Inc. 803-665-1181
SC Greenville, J. W. Vaughn Co. 803-232-2421
Tenn Chattanooga, Richardson Elect. 615-629-2521
Tex Houston, Varicraft Power Sys. 713-449-0211
Tex Houston, Ind. Drive Maintenance 713-681-6942
Tex Richardson, Solid State Drives 214-231-2333
Va Richmond, Transmission Prod. 804-233-8351
Va Roanoke, Transmission Prod. 703-344-2093
Wisc Germantown, Hydro-Electro Equip. 414-255-5555

WERTRONIX CORP, See Powertron Corp

WESCO ELECTRICAL CO., Dept. EM, 201 Munson St., Greenfield, Mass. 01301, Tel: 413-774-4358; FSC No.: 12673; Empl.: 165 ..... p. 1286-1289

Local Sales Offices & Reps.
Fla Casselberry, EIR Inc. 305-830-9600
Ill Chicago, LGS Elctrns. Corp. 312-456-9616
Ind Columbus, J.H. Weaver Co. 812-372-3625
Md Towson, Habco Elctrns., Inc. 301-825-9637
Mass Randolph, Bengal Assocs 617-961-4120
Mich Dearborn, Pitcher-Poulin, Inc. 313-582-5450
Minn Bloomington, Electronic Sls. Agcy. 612-884-8291
NJ Whippany, Livera-Polk Assocs. 201-377-3220
NY Roslyn Heights, Livera-Polk Assocs. 516-484-1276
NC Knightdale, Leigh Sls. 919-266-0105
Ohio Vandalia, W. Brauer & Assoc. 513-898-1224
Ohio Wickliffe, W. Brauer & Assoc. 216-943-0601
Pa Pittsburgh, W. Brauer & Assoc. 412-921-3213
Tex Dallas, Blackburn Assocs. 214-692-8885
Wash Redmond, Desco Northwest 206-883-6336

WEST COAST ELECTRICAL MFG. CO., Dept. EM, 14045 Garfield Ave, Paramount, Cal. 90723, Tel: 213-633-1010; FSC No.: 81823

Sales Manager: W. E. Seal

WEST COAST RESCH. CORP., Dept. EM, Box 25061, Los Angeles, Cal. 90025, Tel: 213-478-8833; FSC No.: 51276; Empl.: 21

Local Sales Offices & Reps.
Ariz Scottsdale, Williams Assocs. 602-947-4297
Cal No. Hollywood, Crown Electrns. 213-877-3550
Cal San Francisco, Sara Scientific Sls. 415-934-1331
Colo Denver, Williams Assocs. 303-373-4730
Fla Miami, M & B Co 305-274-8538
Ill Champaign, Dynamic Sls 217-344-3551
Ill Lombard, Quadtron Assocs. 312-627-6800
Md Rockville, Ed Winston & Co 301-881-5780
NM Albuquerque, Williams Assocs. 505-255-1638
SC Greenville, Acro Intl 803-244-9739
Exp: N.Y., New York, Betadyne 212-964-7700

WEST INSTRS, Gulton Inds, M. C. S. Div., Dept. EM, Gulton Indl Pk, E. Greenwich, RI 02818, Tel: 401-884-6800, TWX: 710-387-1500

Sales Manager: W. Hunt; *Distributor Manager:* W. Hunt

Local Sales Offices & Reps.
Ala Huntsville, James L. Highsmith & Co. 205-881-3294
Ariz Scottsdale, Williams Assocs 602-947-4297
Ark Benton, Gilbert & Assocs 501-372-5916
Cal Gardena, Instrument Lab 213-770-0650
Cal Palo Alto, Instrument Lab 415-328-1040
Colo Denver, Williams Assocs 303-373-4730
Fla Clearwater, J. J. Gallagher 813-461-7706
Ga Acworth, James L. Highsmith & Co. 404-926-7298
Ill Chicago, E. A. Warner & Assocs 312-631-6778
Ind South Bend, Robinson Equip 219-287-3030
Iowa Des Moines, Harry E. Ferris Co. 515-255-5008
La New Orleans, Gilbert & Assocs 504-866-7444
Mass Norwood, Gibson Engrg 617-769-3600
Mich Farmington, Applied Instrs 313-476-9060
Minn Minneapolis, C. T. Sls 612-374-1241
Mo Kansas City, Jeffrey Equip 314-966-3506
Mo St. Louis, Jeffrey Equip 816-561-4050
NJ Newark, Norman Brager Co. 201-344-1100
NM Albuquerque, Williams Assocs 505-255-1632
NY Albany, Niagara Elec Sls 518-869-0130
NY Buffalo, Niagara Elec Sls 716-886-4000
NY E. Syracuse, Niagara Elec. Sls 315-437-1656
NY Rochester, Niagara Elec Sls 716-271-1223
NC Charlotte, James L. Highsmith Co. 704-333-7743
Ohio Cincinnati, Schlemmer Assocs 513-522-8340
Ohio Cleveland, Instrument Service & Equipment 216-237-3200
Okla Tulsa, Olso Engrg 918-742-3720
Ore Portland, Barom Instr 503-285-9861
Pa King of Prussia, Wistex, Inc. 215-337-1240
Pa New Kensington, Bobar Instrs. 412-339-3565
Tenn Memphis, Gilbert & Assocs 901-767-7894
Tex Arlington, Pan Tech Controls 817-640-3232
Tex Houston, Pan Tech Engrg 813-623-0640
Va Richmond, James L. Highsmith & Co. 804-272-5888
Wash Seattle, Branom Instr 206-762-6050
Wisc Menomonee Falls, Fritz Engrg Sls 414-251-6590

Local Distributors
Conn Stamford, Omega Engrg 203-359-1660
Fla Tampa, Applied Indl Technology 813-238-7927
Ga Atlanta, Southeast Engrg Sls 404-449-5937
Ill Chicago, McMaster Carr 312-281-1010
Ohio Toledo, Fee & McCarthy 419-693-0765
Tex Dallas, Dan Cox Co. 214-387-0222
Tex Dallas, Economy Gauge 713-460-5200
For: Can., Ont., Metermaster 416-661-3190

WESTAMP, INC., Dept. EM, 1542 15th St., Santa Monica, Cal. 90404, Tel: 213-393-0401; Empl.: 50

Local Sales Offices & Reps.
Cal San Mateo, Halbar Assocs 415-349-4700
Cal Santa Monica, Westamp 213-393-0401
Ill Chicago, Drivetec 312-622-7900
Ill Lincolnwood, Andrometon 312-675-6824
Mass Wellesley Hills, R. H. Sturdy Co 617-235-2330
Mich Adrian, Westamp 517-263-4172
Mich Troy, Xanthus 313-689-9966/67/68
Minn Wayzata, Joe Little Assocs 612-473-1107
Mo St. Louis, Power Ponents 314-822-0736
NY Pittsford, Magna Sls. 716-586-8748
NY White Plains, Westamp 914-949-7949
Ohio Cincinnati, Dorsey Alexander Assoc. 513-221-7518
Ohio Cleveland, Servo-Mark 216-871-2353
Pa Hatboro, QED Elctrns 215-674-9600
SC Greenville, Indicon Corp. 803-271-1608

WESTERN COATING CO., Dept. EM, 1287 Combermere, Troy, Mich 48084, Tel: 313-588-3311; Empl.: 15

Sales Manager: V. Sheets; *Distributor Manager:* J. A. Sheetz, III

Local Sales Offices & Reps.
Cal San Gabriel, Western Coating Co. 213-283-9331
Fla Miami, Palmer Supplies Co. 305-633-8007
Ill Chicago, Baron-Blakeslee 312-522-8600
La Alexandrea, American Indl Supp Co. 318-442-5883
Mich Benton Harbor, Kendall Indl 616-925-0005
Ohio Dayton, R.M. Reutlinger & Assocs 513-298-3855
Ohio Rocky River, Griff Otte 216-331-4139
Pa Havertown, Pakoil Co. 215-446-5273
Tex Dallas, Exchange Tool Supply 214-631-7720

WESTERN COIL & ELEC. CO., Dept. EM, 215 State St., Racine, Wisc. 53403, Tel: 414-632-4741; Empl.: 15

Sales Manager: E.M. Matsen

Local Sales Offices & Reps.
Ill Crystal Lake, C.B. Bruse 815-459-2230

WESTERN DIGITAL CORP., Dept. EM, 3128 Red Hill Ave. Box 2180, Newport Beach, Cal. 92663, Tel: 714-557-3550, TWX: 910-595-1139; FSC No.: 52840; Empl.: 350

Sales Manager: A. Mattal; *Distributor Manager:* A Mattal

Local Sales Offices & Reps.
Ala Huntsville, Murcota Corp. 205-539-8476
Cal Burlingame, W. J. Purdy Co. 415-347-7701
Cal Los Altos, P.M. Sls 415-941-4444
Cal Los Angeles, Ed Landa Co 213-879-0770
Fla Ft. Lauderdale, Dyne-A-Mark Corp. 305-771-6501
Ill Des Plains, Janus Inc 312-298-9330
Iowa Cedar Rapids, S & O Sls. 319-393-1845
Md Glenburnie, New Era Sls, Inc. 301-768-6666
Md Rockville, Marktron, Inc. 301-762-6210
Md Timonium, Marktron, Inc. 301-252-7111
Mass Woburn, Component Tech Inc 617-933-5390
Mich Grosse Pointe Prk, Griener Assoc 313-499-0188
Minn Minneapolis, Marsh Sls 612-881-7511
Mo Kansas City, Nevco, Inc. 816-421-1751
NY Plainview, E.R.A., Inc. 516-822-9890
NC Murcota, Winston Salem 919-722-9445
NC Winston Salem, Murcota Corp. 919-722-9445
Ohio Centerville, Engrg Mktg Assoc 513-433-2800
Ohio Dayton, Engrg. Mktg. Assocs. 513-433-2800
Pa Ft. Washington, GCM Assoc 215-646-7535
Tex Dallas, West & Assocs 214-661-9400

WESTERN ELECTRONIC PRODS. CO., Dept. EM, 107 Los Molinos, San Clemente, Cal. 92672, Tel: 714-492-4677; FSC No.: 13988

Local Sales Offices & Reps.
Cal Costa Mesa, Vale Electronic Assocs 714-751-3450
Ill Northfield, F. William Castle Co. 312-441-5155
Mass Needham Heights, Sturgeon Co. 617-444-6603
Minn Minneapolis, Xylem Co. 612-920-9626
NJ Mountain Lakes, J. P. Dearie Company 201-334-4848
Ohio Cincinnati, Schlemmer Assocs. 513-522-8340
Tex Houston, Jordan Equip. Co., Inc. 713-498-6212
Exp: Torrance, Cal., Unitool Corp. 213-772-0751

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Sales Manager: W.A. Hartman; *Distributor Manager:* F.W. Grew

Local Sales Offices & Reps.
Cal Lynwood 213-636-0911
Cal San Francisco 415-283-1970
Conn Stamford 203-324-4148
DC Washington 703-528-5010
Ill Chicago 312-437-9744
Okla Tulsa 918-622-1049
Pa Pittsburgh 412-471-0744
Tex Houston 713-626-9880
Wash Seattle 206-259-0922

WESTERN GEAR CORP., Electro Prods. Oper., Dept. EM, 14724 East Proctor, City of Industry, Cal 91749 Tel: 213-968-6525, TWX: 910-346-6704; Empl.: 300

Local Sales Offices & Reps.
Cal Lynwood 213-636-0911
Cal San Francisco 415-283-1970
Conn Stamford 203-324-4148
Ga Atlanta 404-351-4723
Ill Chicago 312-437-9744
Pa Pittsburgh 412-471-0744
Tex Houston 713-626-9880
Va Arlington 703-528-5010
Wash Everett 206-259-0922

WESTERN INDICATOR CO., See Dupree, Inc.

WESTINGHOUSE CANADA LTD., Dept. EM, Box 510, Hamilton, Ont., Can., Tel: 416-528-8811, Telex 02-1655

WESTINGHOUSE ELEC., Process Equip./ Consumables Dept, Dept. EM, Box 300, Sykesville, Md. 21784, Tel: 301-795-2800; Empl.: 300

WESTINGHOUSE ELECTRIC CORP., Indl & Gov't Tube, Dept. EM, Westinghouse Circle, Horseheads, N.Y. 14845

WESTINGHOUSE ELEC., Lamp Div., Dept. EM, Parts Sls., 1 Westghse Plaza, Bloomfield, N. J. 07003, Tel: 201-465-3325

Local Sales Offices & Reps.

Ark	Little Rock	501-375-2471
Cal	Los Angeles	213-482-9660
Cal	San Francisco	415-445-2000
Colo	Denver	303-825-0441
Conn	Hartford	203-249-5792
Fla	Miami	305-634-5461
Ga	Atlanta	404-361-5200
Ill	Chicago	312-461-7200
Ind	Indianapolis	317-632-3301
La	New Orleans	504-486-6141
Md	Baltimore	301-792-7600
Md	Laurel	301-953-2300
Mass	Belmont	617-IV 4-6020
Mich	Southfield, 313-352-9000	617-IV 4-6020
Minn	Minneapolis	612-927-6551
Mo	Kansas City	816-483-4711
Mo	St. Louis	314-421-6911
NJ	East Orange	201-465-2482
NY	New York	212-692-3211
NY	Richmond Hill	212-VI 7-9800
NY	Rochester	716-232-4380
NC	Charlotte	704-377-3471
Ohio	Cincinnati	513-475-7301
Ohio	Cleveland	216-475-7301
Pa	Bala Cynwyd, 215-MO 7-7600	216-475-7301
Pa	Pittsburgh	412-255-3800
Tex	Dallas	214-631-2811
Utah	Salt Lake City	801-486-8751
Va	Richmond	703-649-9061
Wash	Tukwila	206-623-7001

WESTINGHOUSE ELEC. CORP., Relay-Instr. Div., Dept. EM, 95 Orange St., Newark, N.J. 07101, Tel: 201-465-0222; Empl.: 1200

Local Sales Offices & Reps.

Ala	Birmingham	205-871-0366
Ala	Mobile	205-344-4273
Ariz	Phoenix	602-258-7211
Ark	Little Rock	501-376-3462
Cal	Bakersfield	805-327-7633
Cal	Compton	213-638-7781
Cal	Emeryville	415-652-3770
Cal	Fresno	209-233-0576
Cal	Los Angeles	213-482-9660
Cal	Riverside	714-682-6551
Cal	Sacramento	916-922-7071
Cal	San Diego	714-279-0233
Cal	San Francisco	415-445-2000
Cal	Sunnyvale	408-735-2601
Colo	Denver	303-825-0441
Conn	Hartford	203-249-5792
DC	Washington	202-833-5000
Fla	Jacksonville	904-356-5811
Fla	Miami	305-634-5461
Fla	Tampa	813-837-7171
Ga	Albany	912-436-0144
Ga	Atlanta	404-885-5200
Haw	Honolulu	808-839-0311
Idaho	Boise	208-344-2502
Ill	Aurora	312-897-4293
Ill	Chicago	312-461-7200
Ill	Danville	217-442-1901
Ill	Peoria	309-673-0754
Ill	Rockford	815-398-3591
Ind	Evansville	812-425-7146
Ind	Ft. Wayne	219-483-6476
Ind	Hammond	219-844-9400
Ind	Indianapolis	317-632-3301
Ind	So. Bend	219-287-1051
Iowa	Cedar Rapids	319-366-0781
Iowa	Davenport	319-323-2761
Iowa	Des Moines	515-283-2081
Kans	Wichita	316-263-2295
Ky	Louisville	502-459-5440
La	Baton Rouge	504-344-9448
La	New Orleans	504-486-6141
La	Shreveport	318-425-2435
Me	Augusta	207-623-4571
Md	Towson	301-828-5400
Mass	Boston	617-542-0600
Mass	Springfield	413-734-3101
Mass	Worcester	617-853-2680
Mich	Grand Rapids	616-456-1531
Mich	Jackson	517-787-3630
Mich	Saginaw	517-793-8680
Mich	Southfield	313-352-9000
Minn	Duluth	218-727-1541
Minn	Minneapolis	612-927-6551
Miss	Jackson	601-354-2373
Mo	Kansas City	816-421-7122
Mo	St. Louis	314-421-6911
Mont	Butte	406-792-2301
Neb	Omaha	402-397-2820
NJ	E. Orange	201-465-0222
NM	Albuquerque	505-265-6647
NY	Albany	518-459-1820
NY	Buffalo	716-854-3966
NY	New York	212-692-3211
NY	Olean	716-372-0040
NY	Rochester	716-232-4380
NY	Syracuse	315-463-9581
NY	Watertown	315-788-7700
NC	Charlotte	704-377-3471
NC	Greensboro	919-273-5563
NC	Raleigh	919-834-4375
Ohio	Akron	216-376-2171
Ohio	Cincinnati	513-475-7400
Ohio	Cleveland	216-579-2121
Ohio	Columbus	614-272-4000
Ohio	Dayton	513-228-9601
Ohio	Toledo	419-255-2205
Ohio	Youngstown	216-744-8911
Okla	Oklahoma City	405-232-8565
Okla	Tulsa	918-583-3191
Ore	Eugene	503-342-3083
Ore	Portland	503-224-4200
Pa	Allentown	215-433-3296
Pa	Bala Cynwyd	215-667-7600
Pa	Erie	814-453-4381
Pa	Johnstown	814-288-1559
Pa	Pittsburgh	412-255-3800
Pa	Wilkes Barre	717-825-7337
Pa	Williamsport	717-326-4289
SC	Columbia	803-256-1511
SC	Greenville	803-232-5695
Tenn	Chattanooga	615-267-9146
Tenn	Kingsport	615-247-5167
Tenn	Knoxville	615-522-8101
Tenn	Memphis	901-526-8546
Tenn	Nashville	615-327-4911
Tex	Amarillo	806-372-3259
Tex	Beaumont	713-898-1157
Tex	Corpus Christi	512-883-9236
Tex	Dallas	214-631-2811
Tex	El Paso	915-542-1744
Tex	Houston	713-621-9000
Tex	Odessa	915-337-1822
Tex	San Antonio	512-223-9181
Utah	Salt Lake City	801-486-8751
Va	Richmond	703-285-3909
Va	Roanoke	703-342-8925
Wash	Seattle	206-623-7001
Wash	Spokane	509-535-3521
WVa	Bluefield	304-325-3651
WVa	Charleston	304-346-9606
WVa	Fairmont	304-363-0400
WVa	Huntington	304-529-7146
WVa	Wheeling	304-232-4100
Wisc	Appleton	414-739-2313
Wisc	Madison	608-257-4517
Wisc	Milwaukee	414-264-6400

WESTINGHOUSE ELEC. CORP., Semiconductor Div., Dept. EM, Armbrust Rd., Youngwood, Pa. 15697, Tel: 412-925-7272, TWX: 510-468-2840; Empl.: 600 p. 3973

Sales Manager: S.R. Hunt; *Distributor Manager:* R. Bonkowski

Local Sales Offices & Reps.

Cal	Culver City, Bestronics	213-870-9191
Cal	Los Angeles, Westinghouse	213-572-4849
Cal	Mt. View, Westinghouse Elec.	415-965-0305
Cal	San Diego, Bestronics	714-278-2150
Cal	Santa Clara, Magna Sls.	408-985-1750
Colo	Denver, Lindberg Co.	303-758-9033
Conn	Collinsville, Gerber Sls. Corp.	203-693-2651
Conn	Newtown, Gerber Sls. Corp.	203-426-3440
Conn	Old Saybrook, Gerber Sls Corp.	203-388-4386
Fla	Orlando, Lawrence Assoc.	305-592-8600
Ill	Chicago, Westinghouse Elec.	312-887-8922
Iowa	Cedar Rapids, Dy-Tronix Inc.	319-377-8275
Md	Baltimore, Westinghouse Elect.	301-828-5400
Mass	Boston, Westinghouse Elec.	617-237-6950
Mass	E. Longmeadow, Gerber Sls. Corp.	413-525-3059
Mass	Waltham, Gerber Sls. Corp.	617-890-8040
Mich	Brighton, S.A.I. Mktg.	313-227-1786
Mich	Grand Rapids, S.A.I. Mktg.	616-942-2504
Minn	Minneapolis, Comstrand, Inc.	612-571-0000
Mo	St. Louis, Dy-Tronix Inc.	314-731-5799
NJ	Haddonfield, Thomas Assocs.	609-854-3011
NM	Albuquerque, Lindberg Co.	505-881-1006
NY	Clinton, Advanced Comp. Corp.	315-853-6438
NY	Endicott, Advanced Comp. Corp.	607-785-3191
NY	Hempstead, Westinghouse Elec.	516-489-2200
NY	Kings Park, J.L. Sls. Assoc.	516-979-9086
NY	N. Syracuse, Advanced Comp. Corp.	315-699-2671
NY	Scottsville, Advanced Comp. Corp.	716-889-1429
NC	Charlotte, Westinghouse Elec.	704-377-3471
Ohio	Cincinnati, S.A.I. Mktg.	513-761-5432
Ohio	Cleveland, S.A.I. Mktg.	216-292-2982
Ohio	Dayton, S.A.I. Mktg.	513-435-3181
Ohio	Dayton, Westinghouse Elec.	513-228-9627
Pa	Youngwood, Westinghouse Elec	412-925-7272
Tex	Dallas, Kruvand Assocs.	214-691-4592
Tex	Houston, Kruvand Assocs.	713-780-9710
Utah	Salt Lake City, Lindberg Co.	801-534-1500
Wash	Seattle, Quadra Sls. Corp.	206-883-3550
Wisc	Milwaukee, Westinghouse Elec.	414-786-0260

Local Distributors

Ala	Birmingham, ACK Semiconduuctors, Inc.	205-322-0588
Ala	Huntsville, Hamilton/Avnet	205-533-1170
Ariz	Phoenix, Hamilton/Avnet of Ariz.	602-275-7851
Cal	Costa Mesa, Avnet Elctrns.	714-754-6111
Cal	Los Angeles, Hamilton Electro Sls.	213-558-2121
Cal	Mountain View, Hamilton/Avnet Elctrns.	415-961-7000
Cal	San Diego, Hamilton/Avnet	714-279-2421
Colo	Denver, Hamilton/Avnet	303-534-1212
Conn	Georgetown, Hamilton/Avnet	203-762-0361
Conn	No. Haven, Cramer	203-239-5641
Fla	Ft. Lauderdale, Hamilton/Avnet	305-971-3491
Fla	Hollywood, Cramer	305-923-8181
Fla	Orlando, Cramer	305-894-1511
Ga	Atlanta, Specialty Distributing	404-873-2521
Ga	Atlanta, Hamilton/Avnet	404-448-0800
Ga	Atlanta, Cramer	404-448-9050
Ga	Augusta, Specialty Distributing	404-722-1526
Ill	Chicago, Complete Reading Electric	312-454-1234
Ill	Chicago, Semiconductor Specialists, Inc.	312-279-1000
Ill	Chicago, Hamilton/Avnet	312-678-6310
Ind	Fort Wayne, Fort Wayne Elctrns. Supply Inc.	219-423-3422
Ind	Indianapolis, RA-DIS-CO	317-637-5571
Kans	Kansas City, Hamilton/Avnet	913-888-8900
Md	Baltimore, Hamilton/Avnet	301-796-5000
Md	Rockville, Cramer	301-948-0110
Mass	Boston, Schweber Elctrns.	617-890-8484
Mass	Boston, Cramer Elctrns.	617-969-7700
Mass	Boston, Hamilton/Avnet	617-933-8020
Mich	Detroit, Hamilton/Avnet	313-522-4700
Mich	Detroit, Semiconductor Specialists, Inc.	313-478-2700
Mich	Detroit, Sheridan Sls. Co.	313-477-3800
Minn	Minneapolis, Schweber Elctrns.	612-941-5280
Minn	Minneapolis, Hamilton/Avnet	612-941-3801
Minn	Minneapolis, Semiconductor Specialists, Inc.	612-854-8841
Mo	Kansas City, Semiconductor Specialists	816-452-3900
Mo	North Kansas City, LComp Kansas City, Inc.	816-221-2400
Mo	St. Louis, Semiconductor Specialists	314-731-2400
Mo	St. Louis, Hamilton/Avnet	314-731-1144
NJ	Cedar Grove, Hamilton/Avnet	201-239-0800
NJ	Cinnaminson, Wilshire Elctrns.	609-786-8990
NJ	Moonachie, Cramer/N.J.	201-935-5600
NJ	Moorestown, Arrow Elctrns.	609-235-1900
NJ	Mt. Laurel, Hamilton/Avnet	609-234-2133
NJ	Summerset, Schweber Elctrns.	201-469-6008
NM	Albuquerque, Hamilton/Avnet	505-765-1500
NY	East Syracuse, Cramer/Syracuse	315-437-6671
NY	E. Syracuse, Hamilton/Avnet	315-437-2642
NY	Hauppauge, Cramer/Systems	516-231-5600
NY	NASCO, NASCO	516-822-9450
NY	Rochester, Hamilton/Avnet	716-442-7820
NY	Rochester, Cramer/Rochester	716-275-0300
NY	Rochester, Schweber Elctrns.	716-461-4000
NY	Westbury, Hamilton/Avnet	516-333-5800
NY	Westbury, Schweber Elctrns.	516-334-7474
NC	Winston-Salem, Cramer	919-725-8711
Ohio	Cincinnati, Sheridan Sls. Co.	513-761-5432
Ohio	Cleveland, Hamilton/Avnet	216-461-1400
Ohio	Cleveland, Sheridan Sls. Co.	216-831-0130
Ohio	Columbus, Hughes-Peters, Inc.	614-294-5351
Ohio	Dayton, Hamilton/Avnet	513-433-0610
Pa	Pittsburgh, CAM/RPC	412-782-3770
Tex	Dallas, Altair Co.	214-231-5166
Tex	Dallas, Hamilton/Avnet	214-661-8661

Tex Houston, Altair Co. 713-462-3029
Tex Houston, Complete Reading Electric 713-224-5731
Tex Houston, Hamilton/Avnet 713-780-1771
Utah Salt Lake Cty, Hamilton/Avnet .. 801-262-8451
Wash Seattle, Hamilton/Avnet 206-746-8750
WVa Charleston, McJunkin Corp..... 304-348-4965
Wisc Milwaukee, Taylor Elctrns. 414-241-4321
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Sales Manager: J.D. Watson

Local Sales Offices & Reps.
Ala Huntsville, Kemp Instrs. Co..... 205-837-4304
Cal Monterey Pk., Weston Instrs..... 213-268-9271
Fla Orlando, Col-Ins-Co., Inc..... 305-423-7615
Ill Chicago, Weston Instrs. 312-352-3500
Iowa Cedar Rapids, Tech. Reps. Inc... 319-363-2489
Kans Derby, Pallatine Eng. Co. 316-788-0621
Md Columbia, Tech. Sls. Assoc. 301-730-1400
Mass Boston, Weston Instrs. 617-246-1800
Mich Detroit, Nicon Assocs..... 313-341-7688
Mo Kansas City, Tech. Reps. Inc. 913-782-1177
Mo St. Louis, Tech. Reps. Inc. 314-731-5200
NJ Fort Lee, Tecnimat 201-461-8686
NJ Newark, Weston Instrs..... 210-242-2600
NY Syracuse, Weston Instrs. 315-454-3226
Ohio Cincinnati, Luebbe Sls. Co. 513-871-4211
Ohio Cleveland, Luebbe Sls. Co. 216-333-0425
Ohio Dayton, Luebbe Sls. Co. 513-294-0426
Okla Tulsa, Kemp Engrg. Co. 918-299-2636
Pa Philadelphia, Weston Instrs. 215-665-8270
Tex Addison, Kemp Engrg. Co. 214-661-0400
Wash Mercer Island, S.E.A. 206-232-6550

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Ala Huntsville, Brownell-Electro 205-536-2451
Ala Huntsville, Cramer/E. W.-Huntsville 205-539-5722
Ala Mobile, Brownell-Electro..... 205-479-5405
Ariz Phoenix, Cramer/Ariz. 602-263-1112
Ariz Phoenix, J. E. Redmowd Supply Co. 602-244-0311
Ariz Phoenix, Metermaster/Phoenix .. 602-243-4111
Cal Glendale, R. V. Weatherford Co. Instrument Div..... 213-849-3451
Cal Irvine, Cramer/Los Angeles..... 213-771-8300
Cal Los Angeles, Metermaster/Los Angeles 213-685-4340
Cal Monterey Park, Weston Instrs. .. 213-268-1795
Cal Oakland, Western Electro-Mechanical 415-452-1936
Cal Palo Alto, Metermaster..... 415-968-6292
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Cal San Diego, Arco Sls..... 714-282-8115
Cal San Diego, Cramer/San Diego .. 714-565-1881
Cal San Diego, Metermaster..... 714-278-2112
Cal Sunnyvale, Cramer/San Francisco 408-739-3011
Colo Denver, Cramer/Denver..... 303-758-2100
Colo Denver, Insco Co. 303-255-7665
Colo Denver, Ryall Elec. 303-222-7721
Colo Englewood, Weatherford Inst. 303-761-5432
Conn Middletown, Mancib Co. 203-346-6646
Conn North Haven, Cramer/Conn. 203-239-5641
Del Wilmington, Eng. Sys. & Des. 302-571-1195
Fla Hollywood, Cramer/EW-Hollywood 305-923-8181
Fla Miami, Electro-Standard Labs..... 305-633-6973
Fla Orlando, Cramer/EW-Orlando .. 305-894-1511
Fla Orlando, Brownell-Electro 305-423-5589
Ga Altanta, Brownell-Electro 404-767-8761
Ga Atlanta, Cramer/EW Atlanta 404-448-9050
Haw Honolulu, Westinghouse Electric Co. Honolulu Electric Prods. Co..... 808-839-7261
Ill Chicago, Newark Elctrns. Corp. 312-638-4411
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Ill Chicago, Weston Instrs. 312-352-3500
Ill Chicago, W. H. Leary Co. 312-721-3832
Ill Mt. Prospect, Cramer/Chicago .. 312-593-8230
Ill Oak Park, Pacific Indicator..... 312-261-1330
Ind Indianapolis, Graham Elctrns. Supply 317-634-8202
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Kans Wichita, Radio Supply Co. 316-267-5214
Ky Louisville, E & H Electric Supply 502-587-0991
La Harahan, Industrial Instrt. Works 504-733-8355
La Kenner, Butler & Land 504-722-6363
La Lafayette, Ralph's Elctrns. 318-234-4507
La Shreveport, Ind'l Elctrn. Supply Co. 318-422-9459
Md Columbia, Weston Instrs. 301-730-1400
Md Gaithersburg, Cramer/EW-Wash. 301-948-0110
Md Hanover, Cramer/EW-Baltimore 301-354-0100
Mass Billerica, Metermaster..... 617-667-8346
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Mich Livonia, Cramer/Detroit 313-425-7000
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Minn Edina, Cramer/Bonn 612-835-7811
Minn Minneapolis, Environ Elctrnc. Labs. 612-888-7795
Minn Minneapolis, Instrumentation Svs.612-544-8916
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Mo Kansas City, L Comp. 816-221-2400
Mo St. Louis, Ind'l Svc. Labs..... 314-535-5760
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Mo St. Louis, Scherer Instrs. 314-644-5362
NJ *Belleville, Marshall Instrs. Co. .. 201-751-1190
NJ Cherry Hill, Cramer/Pennsylvania 609-424-5993
NJ Moonachie, Cramer/NJ 201-935-5600
NJ Newark, Weston Instrs..... 201-824-4433
NJ S. Plainfield, Brownell-Elctro 201-753-4600
NY Albany, E. E. Taylor Co..... 518-438-7811
NY Buffalo, Summit Distrs. 716-884-3450
NY Clarence, Trott Elctrns..... 716-634-8500
NY Endwell, Cramer/Binghamton 607-754-6661
NY Great Neck, Scient Leasing..... 516-487-7800
NY Hauppauge, Cramer/LI..... 516-231-5600
NY Mount Vernon, Electrical Instrt. Svs. 914-699-9717
NY New York, Nilsson Elec. Labs. .. 212-925-1730
NY New York, Herman H. Sticht Co. 212-RE-2-8613
NY New York, Brownell-Electro. 212-675-2400
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NY Syracuse, Cramer/Syracuse..... 315-437-6671
NC Charlotte, Mill Power Supply Co. 704-527-2800
NC Charlotte, Brownell Elctro. 704-394-4341
NC Raleigh, Cramer/E.W. Raleigh .. 919-876-2371
NC Winston Salem, Cramer/EW-Winston-Salem 919-725-8711
Ohio Cincinnati, Cramer/Tri-States 513-771-6441
Ohio Cincinnati, Hughes Peters 513-351-2000
Ohio Cleveland, Christie Laboratories216-PR-1-0355
Ohio Cleveland, Cramer/Cleveland.... 216-248-8400
Ohio Cleveland, Pioneer Standard Elctro. Instr. Lab. Div..... 216-587-3600
Ohio Columbus, Hughes-Peters 614-294-5351
Ohio Dayton, Pioneer/Dayton Div. of Pioneer Std. Corp. 513-224-0871
Okla Okla. Cty., Hunzicken Bros..... 405-239-7771
For: Can., Mississauga, Ont., Weston Instrs. Div. Schulmberger of Can., Ltd. 416-277-3191
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Okla Tulsa, Butler & Land 918-664-8633
Okla Tulsa, Tri-State Instr. Lab. 918-WE-6-0489
Okla Tulsa, Cramer/Tulsa..... 918-836-3371
Pa Harrisburg, Pyttronic Inds 717-233-6591
Pa Philadelphia, Herbach & Rademan 215-426-1700
Pa Philadelphia, Weston Instrs. 215-665-8270
Pa Pittsburg, Pioneer Std. 412-782-2300
Pa Pittsburg, Cameradio Co. 717-391-7400
Pa Pittsburg, Emmay Co. 412-655-3988
Pa Pittsburgh, Process Engrg. Co. .. 412-561-2242
Tenn Memphis, Brownell Elctro, ... 901-332-9254
Tenn Nashville, Elctra Distributing Co. 615-329-3971
Tenn Nashville, Brownell Elec. 615-889-8230
Tex Austin, Consol Elec. Dist. 512-477-9407
Tex Beaumont, Straughn Elctrns..... 713-838-4563
Tex Dallas, Cramer/Tex..... 214-350-1355
Tex Dallas, Dallas Inst. Inc. 214-341-2990
Tex Dallas, Butler & Land 214-361-6631
Tex Dallas, Weston Instrs. 214-241-1481
Tex El Paso, Butler & Land..... 914-544-8222
Tex Garland, Tucker Elctrns. Co. 214-348-8800
Tex Houston, Butler & Land 713-464-4662
Tex Houston, Weston Instrs. 713-681-1358
Tex Houston, Geophysical Supply Co. 713-CA-4-0621
Tex Houston, Houston Flow Measurement Co. 713-JA-2-5141
Tex Texas City, Consol Elec. Dist.... 713-948-2508
Utah Salt Lake City, Cramer/Utah..... 801-487-3681
Va Richmond, Inst. Tech. Reps. 804-285-3931
Wash Seattle, Branom Instrt. Co..... 206-622-7320
Wash Seattle, Eicher-Richards Co. 206-LA-3-7888
Wash Seattle, Cramer/Seattle..... 206-762-5755
Wash Seattle, Almac/Stroum Elctrns... 206-763-2300
Wash Seattle, Weatherford Inst..... 206-243-6340
Wash Spokane, Ind. Inst. Sply..... 509-534-9353
WVa S. Charleston, Allied Controls Co. 304-768-7313
Wisc Milwaukee, Electro-Mechano..... 414-272-4050
Wisc Milwaukee, Cramer/Wisc. 414-462-8300

WESTON SCHLUMBERGER, see Weston Components & Controls

WESTON COMPONENTS & CONTROLS, Div. Sangamo Weston Inc., Dept. EM, Archbald, Pa. 18403, Tel: 717-876-1500, TWX: 831873, 510-656-2902; FSC No.: 94271; Empl.: 783 ..... p. 3896-3903

Sales Manager: J. Cousins

Local Sales Offices & Reps.
Ariz Scottsdale, Piper-Goyne, Inc..... 602-949-8424
Cal San Diego, Wes-K Assocs. 714-271-5048
Cal Santa Clara, Nova-Tronix..... 408-243-9530
Cal Van Nuys, Wes-K Assocs. 213-989-3070
Colo Englewood, Piper-Goyne, Inc. 303-973-2777
Conn Hamden, Impact Elctrns. 203-281-1331
Fla Clearwater, Perrott Assocs..... 813-585-3327
Fla Orlando, Perrott Assocs. 305-275-1132
Ill Skokie, Marcon Assocs. 312-675-6450
Kans Overland Park, Ensco-Rep, Inc. 913-381-7557
Md Baltimore, B. White & Co. 301-484-5400
Mass Waltham, Impact Sls. Co..... 617-893-2850
Mich Birmingham, J.C. Hofstetter..... 313-646-3635
Minn St. Paul, R. G. Ragon, Inc..... 612-488-0201
Mo St. Louis, Ensco-Rep, Inc. 314-567-3935
NY Albany, Reagan/Compar, Albany, Inc. 518-489-4777
NY Melville, Addem 516-549-8400
Ohio Dayton, J. C. Hofstetter Co. 513-296-1010
Ohio Medina, J. C. Hofstetter Co. 216-241-4880
Pa Narberth, Electro-Comp Sls. 215-664-3576
Tex Houston, Vista Assocs..... 713-661-0119
Tex Richardson, Vista Assocs. 214-235-4547
Wash Bellevue, Comtec 206-453-1188

Local Distributors
Ala Birmingham, MG Elctrns. 205-328-4525
Ariz Phoenix, Mirco 602-944-2281
Cal Carson, Hi Rel Distributor Sls..... 213-774-8200
Cal Costa Mesa, Components Center Inc. 714-979-0433
Cal Gardena, Bell Industries 213-321-5802
Cal San Diego, S. Neumann..... 814-453-7133
Cal San Diego, Electronic Distributor 714-274-7242
Cal Sunnyvale, Acacia Sls. 408-735-0100
Cal Woodland Hills, Rampart 213-887-6400
Conn Stratford, State Elctrns. Parts 203-375-5961
Fla Tampa, Impala Elctrns. 813-885-4747
Ill Elk Grove Village, GBL Elctrns... 312-593-3220
Ill Skokie, Bell Inds. 312-965-7500
Ind Indianapolis, Graham Elctrns. 317-634-8486
Kans Kansas City, Tennant Elctrns. 913-287-2100
Md Baltimore, Radio Elec. Service Co. 301-823-0070
Md Beltsville, Treeko Sls. 301-937-8260
Mass Waltham, Impact Sls. 617-893-2850
Mich Detroit, RS Elctrns. 313-491-1012
Minn St. Paul, Ragon Elctrns. 612-488-0201
Mo St. Louis, Olive Industrial Elctrns. 314-863-7800
NJ Fairfield, Electro Spec. 201-575-7370
NJ Haddonfield, Mid-Atlantic 609-428-8288
NJ Hanover, State Elctrns..... 201-887-2550
NJ Perth Amboy, Sterling Elctrns.... 201-442-8000
NY Farmingdale, Iris Elctrns. 516-420-8400
NY Freeport, Milgray Elctrns. 516-546-6000
NY Hauppauge, Rampart Comps. 516-273-1111
NY Plainview, Fairmont Elctrn. Sls.. 516-694-8200
NY West Babylon, Delmar Elctrns. .. 516-420-1234
NY West Hempstead, March Elctrns. 516-486-6511
NY Woodbury, Tennant Elctrns..... 516-364-9070
Ohio Dayton, Stotts Friedman..... 513-253-9172
Ohio Dayton, NASCO, Inc. 513-253-8843
Ohio Dayton, Arrow Elctrns. 513-253-9172
Ohio Solon, Repco 216-248-8900
Pa Devon, Peak Elctrns. Corp. 215-687-9822
Pa Erie, ADVACOM, Inc. 814-455-8110
Pa Hatboro, Henwarr 215-675-4104
Pa Huntingdon Valley, Shap Elctrns. 215-698-9550
Pa Montgomeryville, Pyttronic Inds. 215-643-2850
Tex Dallas, Tex-Tronics 817-335-8111
Tex Dallas, Solid State Elctrns. 214-352-2601
Tex Fort Worth, Tex-Tronics 817-335-8111
Tex Houston, Solid State of Tex. 713-785-5436
Va Charlottesville, Virginia Radio 804-296-4184
Wash Seattle, Zepher Elctrns. Sls. 206-242-2517

WESTRONICS, Dept. EM, 5050 Mark IV Pkwy. Box 4619, Fort Worth, Tex. 76106, Tel: 817-625-2311; Empl.: 250

Local Sales Offices & Reps.
Ariz Scottsdale, J. T. Aldrich Co. 602-945-8596
Cal Los Angeles, McCamey-Jones, Inc. 213-263-9812

Cal Palo Alto, Priz-Co. 415-326-9333
Cal San Diego, McCarney-Jones, Inc. 714-270-4333
Colo Lakewood, Intermountain Instr., Inc. 303-237-0443
Conn Durham, Marr Elec. Co. 203-349-9691
Fla Cantonment, C.B. Metcalf Co. 904-476-7710
Fla Ruskin, LeRoy Rogers Co. 813-645-1453
Ill Schaumburg, Ray Knitten Assoc 312-690-6360
Iowa Bettendorf, DECO 319-355-2679
Iowa Des Moines, DECO 515-274-9356
La Baton Rouge, Del Rio 504-927-9167
Md Baltimore, Adcons, Inc. 301-655-5542
Mich Royal Oak, Day Ray Assocs. 313-576-4700
Minn Minneapolis, Arjay Sls., Inc. 612-925-1833
Mo Kansas City, Lucas Controls 816-753-5332
Mo St. Louis, Promac, Inc. 314-966-8250
Neb Omaha, Deco 402-341-4836
NJ Cinnaminson, Control Equip. Co. 609-829-1447
NM Albuquerque, IMEC 505-883-0610
NY Grand Island, Davco Systems 716-773-6600
NY Nanuet, Hudson Valley Controls, Inc. 914-623-2236
NC Charlotte, Systems Svc. Corp. 704-377-3407
Ohio Dayton, RDP Assoc 513-253-6175
Ohio Twinsburg, Crown Equip. Co. 216-656-2023
Okla Tulsa, Lucas Controls Co. 918-749-6491
Ore Portland, Brett Assocs., Inc. 503-232-4184
Pa Pittsburgh, Gilson Engrg. Sls., Inc. 412-931-6114
RI Narragansett, D. E. Haase Assoc. 401-789-3763
Tenn Hixson, G. Grant Co. 615-875-4633
Tex Fort Worth, Southwest Controls Co. 817-268-1569
Tex Houston, Haltom Co. 713-782-5625
Utah Sandy, Priz. Co. 801-261-0804

WHITE INSTRS., INC., Dept. EM, Box 698, Austin, Tex. 78767, Tel: 512-892-0752; FSC No.: 03945; Empl.: 35

WHITMOR WIRE & CABLE, Dept. EM, 13161 Sherman Way Bldg. B, No. Hollywood, Cal. 91605, Tel: 213-764-6296; FSC No.: 15851; Empl.: 29 .... p. 4662

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Cal El Segundo, C.W. Saxon & Assocs. 213-EA2-2111
Okla Oklahoma City, R.E. Chappell 405-751-0097
Pa Narberth, S.A. Jeffries, Inc. 215-MO4-8500

WHITTAKER CORP., Dept. EM, 10880 Wilshire Blvd., Los Angeles, Cal. 90024, Tel: 213-475-9411, Telex: 674891; Empl.: 12,600

WIDE BAND ENGRG. CO. INC., Dept. EM, Box 21652, Phoenix, Ariz. 85036, Tel: 602-254-1570; Empl.: 6

Local Sales Offices & Reps.
Colo Boulder, H. Bass Assocs. 303-499-7509
Mass Wakefield, Nerem 617-245-4426

WIDE RANGE ELECTRONICS CORP., Dept. EM, 2119 Schultz Rd., St. Louis, Mo. 63141, Tel: 314-567-5366, Telex: 44-2560; Empl.: 13

Sales Manager: A.S. Russell

Local Sales Offices & Reps.
Cal Hollywood, Wide Range Elctrns. Corp. 213-463-7311

WILBRECHT ELECTRONICS, INC., Dept. EM, 240 Plato Blvd., St. Paul, Minn. 55107, Tel: 612-222-2791, TWX: 910-563-3679; Empl.: 250

Local Sales Offices & Reps.
Ariz , Toward Engrg. 602-955-3193
Fla Plantation, Gallagher & Assocs. 305-473-2101
Ill , Memac Sls. 312-545-1033

WILCOXON RESEARCH, Dept. EM, 12526 Parklawn Dr., Rockville, Md. 20852, Tel: 301-229-4432, Telex: 898-342; Empl.: 13

Sales Manager: M. Kisiel

WILD ROVER, See Refac Elctrns./Wild Rover.

WILDER ENGRG. PRODS, INC., Dept. EM, 1948 Ridge Ave., Evanston, ILL 60201, Tel: 312-769-4110; Empl.: 30

WILEY & SONS INC., J., Dept. EM, 605 3rd Ave., New York, N.Y. 10016, Tel: 212-867-9800; Empl.: 700

WILLIAMS PRECIOUS METAL DIV., Williams Gold Refining, Dept. EM, 2978 Main St., Buffalo, N.Y. 14214, Tel: 716-837-1000; Empl.: 150

Sales Manager: G. Keller

Local Sales Offices & Reps.
Ariz Scottsdale, Hill & Co. 602-948-8452
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Cal Mountain View, Charter Ind'l. Sls. Co. 415-961-5514
Ill Zion, A.O. Capp Co. 312-872-8311
Ind Indianapolis, J.C. Butler Sls. & Engr. Corp. 317-253-5143
Mass Attleboro, E.J. Hughes Assocs. 617-226-0050
Mass Beverly, E.J. Hughes Assocs. 617-927-7171
NJ Wyckoff, Component Parts Unlimited 201-445-6242
NY Penfield, J. Lazor Assocs. 716-385-3300
Pa Broomall, A.M. Tech. Sls. Co. 215-356-0574
Tex Richardson, R. Marston Co. 214-235-3824

WILMAD GLASS CO., INC., Dept. EM, Buena, N.J. 08310, Tel: 609-697-3000, TWX: 510-687-8911; Empl.: 135

WILMAR ELCTRNS. INC., Dept. EM, 2430 Amsler St., Torrance, Cal. 90505, Tel: 213-326-6668; FSC No.: 25248; Empl.: 25

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Neb Omaha, Bert Gurney & Assoc. 402-342-8445
NY Scarsdale, M. J. Fein & Co 914-472-1100
Ohio Dayton, Bek Assocs. 513-278-1343
Pa Oreland, Tech. Instr. Sls. Co. 215-836-2222

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WILMAR ELECTRONICS, INC. is a manufacturer of Protective Relays, Power Monitors and Solid State Sensors. Over/undervoltage relays, over/underfrequency relays, reverse power relays, phase failure & phase sequence relays; current, differential, paralleling, overload relays. Power factor relays, monitors & Test Equipment.

WILMORE ELCTRNS. CO., Dept. EM, Box 2973, W. Durham Sta., Durham, N.C. 27705, Tel: 919-489-3318; Empl.: 40 .... p. 3352,3353

Sales Manager: J.L. Harris

WILSON ELECTRONICS, Dept. EM, PO Box 19000, Las Vegas, Nev 89119, Tel: 702-739-1931, Telex: 684-522; Empl.: 175

Sales Manager: J. Flatt; *Distributor Manager:* Mac Harrison

H. F. WILSON ENGRG. CO., Dept. EM, 475 Taft Ave, Box 2938, Glen Ellyn, Ill. 60137; Tel: 312-469-8473, Telex: 72-1438; Empl.: 18

Sales Manager: H. Wilson; *Distributor Manager:* R. Carroll

Local Sales Offices & Reps.
Mich Grand Rapids, H.F. Wilson Engr. Co. 616-453-8257
Minn St. Paul, G. Klossner & Assocs. 612-483-8862
Mo Bridgeton, H. F. Wilson Engrg. Co. 314-291-5556
Tex Richardson, W. Rice Co. 214-691-6495

WILSON CO., H. M., Dept. EM, 11501 Chimney Rock Rd., Houston, Tex. 77035, Tel: 713-729-1183; Empl.: 3

Sales Manager: H. M. Wilson

Local Sales Offices & Reps.
Ariz Phoenix, R. A. Mayes Co 602-279-5243
Colo Boulder, R. A. Mayes Co 303-444-0782
Conn New Haven, Vibration Sls and Svc 203-389-1527
NM Albuquerque, R. A. Mayes Co 505-292-2330
Pa Chester Springs, Letronix 215-458-8977
Tex Dallas, Carey-Wolf Assocs. 817-738-1996
Tex Houston, Carey-Wolf Assocs. 713-721-2442
Utah Centerville, R. A. Mayes Co 801-292-6781

WILTRON CO., Dept. EM, 825 E. Middlefield Rd., Mt. View, Cal 94043, Tel: 415-969-6500, TWX: 910-379-6578; FSC No.: 20944; Empl.: 240

Sales Manager: W. Baxter

Local Sales Offices & Reps.
Ala Huntsville, Currie, Peak & Frazier 205-536-5650
Ariz Tempe, Trembly Assocs. 602-966-4428
Cal Anaheim, Blair Assocs. 714-635-1350
Cal Mt. View, Wiltron Co. 415-969-6500
Cal San Jose, MCH Assocs. 408-246-7330
Colo Denver, Trembly Assoc. 303-759-1195
Fla Orlando, Currie, Peak & Frazier 305-855-0843
Ill Chicago, EIA, Inc. 312-271-3774
Ind Indianapolis, EIA, Inc.
Md Baltimore, Sci-Rep 301-321-1411
Mass Waltham, McBar Assocs. 617-890-0233
Mich Southfield, EQS Systems 313-569-4497
NJ Haworth, Central Assocs. 201-568-0808
NJ Pennsauken, Himmelstein Assoc. 609-662-3081
NM Albuquerque, Trembly Assocs. 505-266-8616
NY East Syracuse, Ossmann Instrs. 315-437-6666
NY Plainview, Central Assocs. 516-433-0808
NY Rochester, Ossman Instrs. 716-328-2230
NC Greensboro, Currie, Peak & Frazier 919-273-3040
Ohio Chesterland, EQS Systems 216-729-2222
Va Falls Church, Sci-Rep 703-573-8787
Wash Seattle, Delcom Sls. Co. 206-248-0090

WINEGARD CO., Dept. EM, 3000 Kirkwood St., Burlington, Iowa 52601, Tel: 319-753-0121; Empl.: 400

Sales Manager: J.S. Ridge

WINTEK CORP., Dept. EM, 902 N. 9th St., Lafayette, Ind. 47904, Tel: 317-742-6802; Empl.: 6

Sales Manager: P. A. Wintz

Local Sales Offices & Reps.
Ala Huntsville, Intl Sci Instrs 205-533-6800
Cal San Jose, PBC Assocs 408-377-7001
Colo Parker, Western Mktg Assocs
Md Wheaton, Data Sys Mktg 301-933-0900
Mass Lynnfield, Newmar Assocs 617-245-7960
NJ Haddonfield, G.L. Williams Assocs 609-428-6060
NM Albuquerque, Western Mktg Assocs 505-298-4134
NY Great Neck, Industron Assocs 516-487-2620
NY Rochester, RJC Assocs 716-248-5040
Ohio Dayton, E.V. Swenson 513-435-2772
Utah Salt Lake City, Western Mktg Assocs 801-272-5665

WIREFLEX INCORPORATED, Dept. EM, 502 Old Route 30 East, Bourbon, Ind. 46504, Tel: 219-342-5315, TWX: 810-297-2662; Empl.: 62

Sales Manager: P. Herndon

WIREMOLD CO., Dept. EM, West Hartford, Conn. 06110, Tel: 203-233-6251, TWX: 710-425-6281, 9-9318; Empl.: 800

Sales Manager: R. C. Hill

Local Sales Offices & Reps.
Cal Danville, J.R. Griffin 415-433-5744
Cal Los Angeles, Airey-Thompson 213-264-1533
Colo Denver, R.B. Schumann 303-534-1058
Conn Farmington, E.W. Selnau 203-673-4979
Conn Hartford, Home Office 203-233-6251
DC Washington, T.J. Pugh 301-868-6437
Fla Coral Springs, John Lampert 305-753-1666
Fla Tampa, J.D. Whetsell 813-988-5860
Ga Decatur, R.L. Pace 404-981-4385
Ill Homewood, M. J. Tully 312-297-3240
Ill Lombard, J.E. Reisch 312-297-3240
Ill New Lenox, F. P. Stack 312-297-3240
Ill Palatine, R. E. Horn 312-297-3240
Ind Nashville, J. H. Hays 317-247-0500
Iowa Harlan, W.J. Kelley 402-344-2656
La New Orleans, United Sls. Assoc. 504-733-8711
Md Baltimore, A.B. French 301-825-1305
Mass Boston, Wiremold Co. 617-246-1131
Mich Livonia, R. Frazier 313-227-9599
Minn Minneapolis, H.G. Schendel 612-920-6886
Mo Kansas City, V.A. Meier 816-452-9076
Mo St. Louis, A.F. Tubbesing 314-842-2455
NJ Englishtown, John E. Finley 212-233-3328
NJ Jersey City, P.F. McGovern 201-963-3280
NY Babylon, A.C. Bradbury 516-587-2318

NY North Syracuse, A. Simone 315-451-0400
NY Rochester, D. R. Bowman 716-544-8581
NC Charlotte, H.M. Short 704-334-7060
Ohio Cincinnati, Wiremold Co. 513-821-3254
Ohio Cleveland, Larry L. Owen 216-781-5135
Okla Oklahoma City, R. Diachenko 405-751-1080
Ore Portland, D.A. King 503-228-1990
Pa Glenmoore, W.A. Gibson 215-469-6453
Pa Philadelphia, R.B. French 215-887-0964
Pa Pittsburgh, W. Simon 412-421-9491
Tex Dallas, W.R. Moseley 214-637-6432
Tex Houston, R. LeMaster 713-523-1316
Utah Salt Lake City, D.E. Blomquist .. 801-533-9303
Wash Seattle, Strohecker, Inc. 206-623-0357
Wash Spokane, W.D. Beach 509-624-2518
Wisc Milwaukee, E. J. Szopinski 414-251-4020

WISCO DIV ESB INC, See ESB Wisco Inc

WONDER CORP OF AMERICA, Dept. EM, 24 Harborview Ave, Stamford, Conn. 06904, Tel: 203-357-1850, Telex: 965838; Empl.: 90

Sales Manager: L.M. Dorflinger

WORKMAN ELECTRONIC PRODS., INC., Dept. EM, Box 3828, Sarasota, Fla. 33578, Tel: 813-371-4242, TWX: 810-864-0401; Empl.: 150

Sales Manager: J.M. Price

Local Sales Offices & Reps.
Ala Birmingham, Maitland K. Smith Inc. 205-967-3080
Cal Gardena, Bidwell Sls. Assoc. 213-770-0300
Cal Gardena, Bidwell Sls Assoc 213-770-0300
Cal Redwood City, Sinai-Johnson Inc. 415-365-6263
Colo Colorado Springs, Norris & Co... 303-576-3324
Fla Miami, Raulson & Co. 305-264-6003
Ga Tucker, Maitland K. Smith 404-939-5838
Ill Winfield, Ashpole Assoc. 312-665-7787
Ind Carmel, Mid-Central Sls.
Iowa Des Moines, Lectro Reps 515-276-6387
Kans Edwardsville, Lectro Reps, Inc. .. 913-441-3661
Ky Fern Creek, Mid-Central Sls. 502-239-5614
Mass Natick, Jonel Sls Assoc 617-653-3736
Mich Detroit, Burcaw Co. & Assoc. 313-533-7700
Minn Burnsville, Ashpole Assoc 612-890-8045
Mo Liberty, Lectro Reps, Inc. 816-781-2522
Mo St. Charles, Lectro Reps, Inc. 314-723-8736
NJ Englewood, S. Axelrod Assoc. .. 201-871-0600
NY Camillus, Callahan-Ferguson Co. 315-487-3870
NY Manilus, Callahan-Ferguson Co. 315-682-9301
NC Burlington, E.P. Ester & Co. 919-584-1568
Ohio Jamestown, H. Miller Sls. Co. 513-675-2059
Ohio Novelty, H. Miller Sls. Co. 216-321-3900
Ohio Wickliffe, H. Miller Sls. Co. 216-585-3278
Pa Easton, Kaiser Assoc. 215-258-6484
Pa Monroeville, H. Miller Sls. 412-327-7766
Tex Dallas, Techno Assocs. 214-357-9213
Wash Seattle, D. Smith Sls. Co. 206-633-3160
Exp: Fla., Miami Lakes, West Indies Sls. 305-592-8188

WORNER ELCTRN. DEVICES, Dept. EM, 121 N. Main St., Rankin, Ill. 60960, Tel: 217-397-2201; Empl.: 27

Local Sales Offices & Reps.
Cal Burbank, Koessler Sales 213-849-5716

WOVEN ELCTRNS., Southern Weaving Co., Dept. EM, Box 189, Mauldin, S. C. 29662, Tel: 803-963-5131, TWX: 810-287-2091; Empl.: 180 ..... p. 4663

Sales Manager: E. A. Ross Jr.

Local Sales Offices & Reps.
Cal Anaheim, Solomon Tech. Sls. 714-634-2081
Cal Redwood City, Solomon Tech. Sls. 415-367-0835
Cal Redwood City, STS 408-446-9707
Fla Pompano Beach, V. G. Sls. 305-971-0900
Ill Chicago, Electrical Cable & Access. 312-266-0102
Kans Shawnee, Zinsmaster & Assocs. 913-362-5512
Md Bethesda, Warren Mount Co. 301-657-9312
Minn Minneapolis, P. Ericson & Assoc. 612-884-1969
NH Hampton Falls, R. C. Thuet Co. 603-778-0760
NJ Neshanic Sta., R.C. Thuet Co. .. 201-369-4875
NC Greensboro, E. Logan Tontz Co. 919-299-3641
Ohio Cincinnati, SAI, Mktg. Corp. 513-761-5432
Pa Jenkintown, Warren Mount Co... 215-886-0383
Pa York, Warren Mount Co. 717-757-5823

Local Distributors
Cal L.A., Elctrn Connexion 714-997-1826
Fla Orlando, Deanco 305-851-2480
NY Ithaca, Deanco 607-272-2198
Tex Houston, Lenert 713-225-1468

WROUGHT WASHER MFG., INC., Dept. EM, 2100 S. Bay St., Milwaukee, Wisc. 53207, Tel: 414-744-0771, TWX: 910-262-3101; Empl.: 250

WYLE COMPUTER PRODS., Dept. EM, 3200 Magruder Blvd., Hampton, Va 23666, Tel: 804-838-0122, TWX: 710-882-0086; Empl.: 25

Local Sales Offices & Reps.
Ala Huntsville, James L. Highsmith & Co 205-881-3294
Cal Cupertino, Ashby Assocs 408-996-0411
Colo Denver, Fry-Gates Co. 303-756-9886
Fla Boca Raton, James L Highsmith & Co 305-368-9194
Fla Orlando, James L Highsmith & Co 305-293-5202
La Baton Rouge, Microcomputer Sys 504-927-3717
NJ North Bergen, Critides Technical Assocs 201-868-4300
NM Albuquerque, Fry-Gates Co. 505-298-1875
NC Charlotte, James L Highsmith & Co 704-333-7743
Ohio Dayton, Ashby Assocs 513-252-5627
Ohio Lyndhurst, Ashby Assocs 216-461-0826
Utah Salt Lake City, Fry-Gates Co. 801-277-0523
Va James L Highsmith & Co 804-272-5888

XCITON CORP, Dept. EM, Shaker Park, 5 Hemlock St, Latham, NY 12110, Tel: 518-783-7726, TWX: 710-444-4962

Sales Manager: C. Jurus; *Distributor Manager:* C. Jurus

Local Sales Offices & Reps.
Ariz Scottsdale, Verein Corp 602-948-3571
Cal Menlo Park, G.R. McKnight Co. 415-325-2844
Cal Santa Ana, Rical Assocs 714-557-6543
Conn Farmington, Ray Perron & Co. .. 203-673-4825
Fla Orlando, G.F. Bohman Assocs .. 305-295-5760
Ill Arlington Hgts, Brainard Wilson Mktg 312-437-2700
Ind Carmel, Brainard Wilson Mktg.... 317-844-2800
Kans Shawnee Mission, Lowell-Kangas & Assocs 913-631-3515
Md Pikesville, L.M. Assocs 301-484-7970
Mass Norwood, Ray Perron & Co. 617-762-8114
Mich Detroit, Nicon Assocs 313-341-7688
Minn Minneapolis, Bohlig & Assocs 612-922-7011
Mo St. Louis, Lowell-Kangas & Assocs 314-821-4050
NY Floral Park, MOS Assocs..... 516-487-3966
NY Syracuse, C.W. Beach Co. 315-446-9587
Pa Media, W. Reeves Assocs 215-566-6709
Tex Dallas, John B. Guenther Inc. 214-691-8500
Tex Houston, John B. Guenther Inc. 713-468-0232
Wash Seattle, H. Levinson Co 206-323-5100
Wisc Milwaukee, Brainard Wilson Mktg 414-527-1500

Local Distributors
Ariz Phoenix, Cramer Elctrns..... 602-267-7321
Cal Los Angeles, Cramer Elctrns..... 714-979-3000
Cal San Diego 714-565-1881
Cal San Francisco, Cramer Elctrns
Cal Van Nuys, Edmar Elctrns 213-782-9020
Colo Wheatridge, Century Elctrns
Conn North Haven, Cramer Elctrns 203-239-5641
DC Washington, Cramer Elctrns 301-948-0110
Fla Orlando, Cramer Elctrns 305-894-1511
Ga Atlanta, Cramer Elctrns 404-448-9050
Ill Des Plaines, Edmar Elctrns 312-298-8580
Ill Glenview, Inter Market Inc..... 312-729-5330
Md Baltimore, Cramer Elctrns 301-796-5790
Mass Dedham, Gerber Elctrns..... 617-329-2400
Mass Newton, Cramer Elctrns..... 617-969-7700
Mich Farmington, Diplomat/Northland 313-477-3200
Mich Livonia, Camelot Elctrns..... 313-427-8660
Minn Edina, Cramer Elctrns..... 612-835-7811
Mo St. Louis, Diplomat 314-645-8550
NJ Cherry Hill, D.F. Assocs 609-428-3455
NJ Moonachie, Cramer Elctrns 201-935-5600
NM Albuquerque, Cramer Elctrns 505-243-4566
NY Hauppauge, Cramer Elctrns 516-231-5600
NY Rochester, Cramer Elctrns..... 716-275-0300
NY Rome, Rome Elctrns..... 315-337-5400
NY Woodbury, Diplomat Elctrns..... 516-921-9373
NC Winston-Salem, Cramer Elctrns 919-725-8711
Ohio Cleveland, Cramer Elctrns 216-248-8400
Ohio Columbus, Reptron 614-253-7433
Tex Dallas, K.A. Elctrn Sls..... 214-634-7870
Tex Houston, Cramer Elctrns 800-492-6940
Utah Salt Lake City, Bell Inds..... 801-972-6969
Va Charlottesville, Virginia Radio 804-296-4184
Wash Seattle, Cramer Elctrns 206-575-0907
Wisc Milwaukee, Marsh Elctrns 414-475-6000

Y-L PRODUCTS CO., INC., Dept. EM, Box 188, Yeadon, Pa. 19050, Tel: 215-LU3-2800

Sales Manager: W.R. Law

Local Sales Offices & Reps.
Cal San Francisco, Sara Scientific Sls. 415-421-3172
Fla Pompano Beach, Cole-Tek Assoc. 305-781-8110
NJ Metuchen, Motion Control Devices 201-494-6161
Tex Richardson Park, Thunderbird Tech Sls 214-690-0763

XIT ROD CO, Dept. EM, PO Box 128, Beaumont, Cal. 92223, Tel: 714-845-3986; Empl.: 60

YELLOW SPRINGS INSTRUMENT CO., Dept. EM, Box 279, Yellow Springs, Ohio 45387, Tel: 513-767-7241, Telex: 205437; Empl.: 300

Sales Manager: J. Gerdes; *Distributor Manager:* R. Heggemann

Local Sales Offices & Reps.
Ariz Tucson, Grady Moore & Assocs. 602-795-3176
Cal Pasadena, RDX Corp. 213-681-3451
Cal San Diego, RDX Corp. 714-278-6863
Cal Sunnyvale, RDX Corp. 408-734-4504
Colo Lafayette, Grady Moore & Assocs. 303-494-3351
Fla Orlando, Datarep, Inc. 305-843-5224
Ga Atlanta, Craft Assoc. 404-256-0420
Ill Chicago, Liz Industrial Sls. 312-943-5122
Mass Norwell, Bordewieck Engrg. Sls. Co. 617-659-4915
Mich Brighton, Cesko Sls. Co. 313-227-5061
NJ Cinnaminson, Control Equip., Inc. 609-829-1447
NJ Springfield, RJM Sls. 201-467-1210
NM Albuquerque, Grady Moore & Assocs. 505-262-1416
NY Syracuse, Labtronics. 315-454-9314
NC Charlotte, Sloan Assoc., Inc. 704-523-2122
Ohio Cleveland, RDP Assoc. 216-659-3138
Ohio Dayton, RDP Assocs. 513-253-6175
Pa Pittsburgh, RDP Assoc. 412-487-2217
Tex Dallas, MZB & Assoc. 214-233-5535
Va Falls Church, Sci-Rep 703-573-8787
Va Richmond, Sloan Assoc., Inc. 804-359-6051
Wash Bellevue, Topp Engrg Sls. 206-747-5400

Local Distributors
Cal Pasadena, RDX Corp. 213-792-4041
Cal Sunnyvale, RDX Corp. 408-734-4504
Fla Orlando, Datarep Inc. 305-843-5224
Ill Chicago, Liz Ind'l Sls. 312-943-5122
Ill Chicago, Newark Elec. Corp. 312-638-4411
La Harvey, Gordon Instr. Co. 504-368-6152
Mass Norwell, Bordewieck Engr. 617-659-4915
Mich Brighton, Cesko Sls. Co. 313-227-5061
Minn Minneapolis, Pilot Ind. Corp. 612-941-7400
NJ Cinnaminson, Control Equip. Inc. 609-829-1447
NJ Springfield, RJM Sls. 201-467-1210
NY E. Rochester, Thermal Sys. Inc. 716-377-1970
NY Syracuse, Thermal Sys. 315-458-5202
NC Charlotte, Sloan Assoc. 704-523-2122
Ohio Dayton, Whelan Corp. 513-434-7551
Tenn Chattanooga, Coleman Assoc. .. 615-821-0235
Tex Ft. Worth, Southwest Controls .. 817-268-1569
Va Richmond, Sloan Assocs. 804-359-6051

YEWTEC CORP., See Yokogawa Corp. of America

YIG-TEK CORP., Dept. EM, 1725 De La Cruz Blvd., Santa Clara, Cal. 95050, Tel: 408-244-3240, TWX: 910-338-0293; Empl.: 69

Sales Manager: W. E. Briggs

Local Sales Offices & Reps.
Ariz Scottsdale, Territorial Mktg 602-994-8665
Cal Mountain View, R. Donahue Assoc. 408-356-1717
Cal Van Nuys, C.W. Swift & Assocs. 213-873-4778
Colo Denver, Thorson Co. 303-759-0809
Fla Palm Bay, Spartech Assocs. 305-727-8045
Ga Smyrna, Spartech Assocs. 404-432-3644
Ill Northfield, Feller Assocs 312-446-8065
Kans Shawnee Mission, EIR Co 913-362-0919
Me Ogunquit, Micronic Assoc. 207-646-9525
Md Baltimore, VPI Mktg. 301-685-4206
Ohio Centerville, Micro Sls 513-433-8171
Pa Lafeyette Hill, M. Lader Co 215-825-3177
Tex Dallas, Stevens Sls 214-350-2476
Wash Seattle, Rush Drake Assocs. 206-763-2755

YOKOGAWA CORP. OF AMERICA, Dept. EM, 5 Westchester Plaza, Elmsford, N.Y. 10523, Tel: 914-592-6767, TWX: 714-567-1256; Empl.: 15 ..... p. 2837,2846

Sales Manager: J.V. Stegenga

Local Sales Offices & Reps.
Ala Huntsville, Technical Sls. 205-881-1750

Ariz Tempee, J. Smith & Assoc. 602-968-7025
Cal Palo Alto, Held & Mollard 415-965-9321
Cal Santa Ana, L. Brooks Co. 714-544-8900
Colo Lakewood, J. Smith & Assoc. 303-442-7100
Conn Hamden, Applied Measurements 203-288-5288
Fla Orlando, RJC Assoc. 305-894-7371
Ill Arlington Heights, Dytec/Central 312-394-3380
Kans Overland Park, Dytec/South 913-384-2710
Md Reisterstown, Massey Assocs.... 301-833-2039
Mass Acton, Applied Measurements.... 617-263-2766
Minn Minneapolis, Volco Co. 612-933-6631
Mo Hazelwood, Dytec/South 314-731-5400
NM Albuquerque, J. Smith & Assoc., Inc. 505-265-3406
NY Liverpool, Rayelco Elctrns..... 315-652-5272
NY Port Chester, Radiation Elctrns. 914-937-2300
Ohio Columbus, Measurement Instrs. 614-274-1144
Pa Philadelphia, Tech. Instr. Sls..... 215-836-2222
Tex Houston, EV Smith Sls. Co..... 713-649-5756
Va Richmond, Meter Metric 804-285-3932
Wash Seattle, S J I Corp. 206-624-9020

Local Distributors
Ala Mobile, Brownell Electro..... 205-479-8581
Ariz Phoenix, Metermaster 602-243-4111
Cal Gardena, E.I.L. 213-321-5891
Cal Glendale, Western Elctrn Supply 213-246-4861
Cal Los Angeles, Metermaster..... 213-685-4340
Cal Oakland, Western Electro 415-452-1936
Cal Palo Alto, Metermaster..... 415-968-0313
Cal San Diego, Metermaster..... 714-560-4841
Conn Middletown, Mancib..... 203-346-6646
Fla Miami, Electro Standard Lab 305-633-6973
Fla Orlando, Brownell Electro 305-843-6775
Ga Atlanta, Brownell Electro 404-762-5181
Ill Bridgeview, E.I.L. 312-430-2292
Ill Chicago, W.H. Leary 312-721-3832
Ill Chicago, Electro Indus 312-736-0999
Ill Elk Grove Village, Meter Makers 312-439-5050
Ill Elk Grove Village, Metermaster 312-593-8650
Ill Oak Park, Pacific Indicator..... 312-261-1330
Ill Rockford, Rockford Instrt. Lab .. 815-397-1004
Ill Skokie, Sargent Welch Scien 312-677-0600
Ind Indianapolis, Rockwell Engrg. 317-251-9453
Ind Indianapolis, EIL 317-545-1373
Ky Bowling Green, Electrical Sls. Engrg. 502-842-6728
La New Orleans, Industrial Instrs. Works 504-733-8355
Md Savage, Pyttronic Inds..... 301-792-7000
Md Timonium, E.I.L. 301-252-1260
Mass Billerica, Metermaster 617-667-8346
Mass Burlington, The Mancib Co. 617-272-9450
Mich Ferndale, Ram Meter 313-398-6767
Minn Golden Valley, Instrumentation Svcs 612-544-8916
Minn Minneapolis, Electric Scientific.... 612-933-4671
Mo Overland Park, Brooks Elctrn 913-648-3131
Mo St. Louis, Industrial Svc. Lab 314-535-5760
Mo St. Louis, Scherrer Instrs..... 314-644-5362
NJ South Plainfield, Brownell Electro 201-753-4600
NJ Totowa, Ampower Elctrn. Instr... 201-742-3215
NY Clarence, Trott Elctrns..... 716-634-8500
NY Long Island City, Meter Mod Instrs. 212-726-4850
NY Mount Vernon, Electrical Instr. Svc. 914-699-9717
NY New York, Nilsson Electric Lab.. 212-925-1730
NC Charlotte, Brownell Electro 704-394-4341
Ohio Cleveland, Cam/Ohio 216-461-4700
Ohio Cleveland, Christie Lab..... 216-651-4100
Ohio Dayton, E.I.L. 513-435-2134
Ore Portland, Westcon 503-283-0132
Pa Philadelphia, Herbach & Rademan 215-426-1700
Pa Philadelphia, Sunshine Scien Instr 215-673-5600
Pa Philadelphia, Rumsey Elec Co. .. 215-456-2529
Pa Pittsburgh, CAM RPC 412-288-2600
Pa Pittsburgh, E.I.L. 412-731-5230
Tenn Memphis, Brownell Electro..... 901-332-9258
Tenn Nashville, Brownell Electro..... 615-889-8230
Tex Beaumont, Straughn Elctrns 713-838-4563
Tex Garland, Metermaster..... 214-271-5671
Tex Houston, Meter & Instrs..... 713-644-1631
Tex Houston, Nunn Electric Supply Corp. 713-676-0100
Va Alexandria, E.I.L. 703-354-4330
Va Richmond, I.T.R..... 804-275-1431
Wash Seattle, Eicher Richards..... 206-523-7888
Wisc Milwaukee, Electro Mechano Co. 414-272-4050

ZENITH CONTROLS INC., Dept. EM, 830 West 40th St., Chicago, Ill. 60609, Tel: 312-247-6400, Telex: 25-3703; Empl.: 125

Sales Manager: V. Helford

Local Sales Offices & Reps.
Ariz Phoenix, A. Norton Co. 602-278-6481
Cal El Cerrito, Saletta Sls. 415-236-9191
Cal Irvine, Dennis Don & Assoc. 213-860-0551
Colo Englewood, L.S. Reed & Co..... 303-761-6154
Conn Stratford, M. A. Selmon Co. 203-377-3525
Fla Brandon, J. Meeks & Assoc. 813-689-6137
Ga Atlanta, Holman-Lobsinger Co. Inc. 404-256-9120
Ill Westchester, Wasson-Gallagher Inc. 312-344-0690
Ind Indianapolis, Indiana Electrical Sls. 317-849-3880
Kans Overland Park, Arehart-Barnds Sls 913-649-9270
La New Orleans, A. Levin & Assoc. Inc. 504-524-8489
Md Bladensburg, D. Ewing & Assoc 301-779-1555
Mich Livonia, A.J. Riopelle Co. 313-464-6114
Minn Minneapolis, A.M. Johnson Co. .. 612-927-8741
Mo Hazelwood, L.E. Brunson Co. 314-731-3104
Neb Omaha, Electric Equip. Sls. Co. 402-339-4140
NJ Parlin, Martech..... 201-721-2200
NY Buffalo, H. C. Zang 716-877-3677
NY Latham, Thomas Carse Sls Co.. 518-785-5844
NY New York, NEPA Inc. 212-594-3152
NC Charlotte, L.P. Spoon Inc. 704-372-3290
Ohio Rocky River, Loesch Assoc. Inc. 216-333-0077
Pa Oreland, Lengemann & Vetter.... 215-884-5375
Tenn Memphis, Vincent Sls. Agency .. 901-682-4187
Tex Dallas, Andres & Boruch Co..... 214-621-3601
Tex Houston, Robert R. Barr & Assoc. 713-622-0667
Utah Sandy, Pete Farley Agcy 801-561-1588
Va Richmond, Marchant & Field Sls. 804-262-7333
Wash Seattle, Clair Stebbins Co..... 206-CH 6-1170
Wisc Menohonee Falls, E.M.E. Assoc. 414-255-3010

ZENRAD CONTROLS CO., Dept. EM, 529 E. Gutierrez St., Santa Barbara, Ca. 93103, Tel: 805-965-4996; FSC No.: 33180; Empl.: 10

Sales Manager: A. Radford

ZERO CORP., Dept. EM, 777 Front St., Burbank, Cal. 91502, Tel: 213-846-4191; Empl.: 1260

Local Sales Offices & Reps.
Ala Huntsville, Powertronics 205-539-3270
Ariz Phoenix, Howe & Howe Sls., Inc. 602-264-7971
Cal Burbank, Zero-West Div. 213-846-4191
Cal Palo Alto, Northern Cal. Sls. Off. 415-964-7700
Cal San Diego, San Diego Sales Off. 714-271-7221
Colo Denver, Fry-Gates Co. 303-756-9886
Fla Cape Coral, F. Field Sls. 813-542-7172
Fla Clearwater, Richard Straker 813-531-8991
Fla St. Petersburg, Jim Angelos 813-531-8991
Ill Elk Grove Village, Carlson Elctrns. Sls. 312-956-8420
Ind Indianapolis, L.M. DeVoe Co..... 317-842-3245
La New Orleans, Davies Assocs. 504-522-9026
Md Baltimore, R. P. Luce & Co..... 301-752-8200
Mass Monson, Zero-East Div. 413-267-5561
Mich Bloomfield Hills, Favco Technical Reps 313-644-0173
Minn Bloomington, Electronic Sls. Agcy. Inc. 612-884-8291
Mo Raytown, Cadon Tech Sls 816-356-7685
Mo St. Louis, Cadon Technical Sls... 314-991-0262
NJ Piscataway, R.P. Luce & Co..... 201-752-8750
NM Albuquerque, Fry-Gates 505-298-1875
NY East Syracuse, Fountain Young & Co. 315-437-7733
NY New Hyde Park, R.P. Luce & Co.516-437-4550
NC Greensboro, Mac Adams 919-299-6332
NC Winston-Salem, Powertronics 919-765-6539
Ohio Richfield, N. Bear Corp. 216-659-3131
Pa Ft. Washington, Kirk-Sandell 215-643-2100
Pa Pittsburgh, B.E. Gibson 412-823-8310 32;tl;it
SC Greenville, Powertronics..... 803-288-0270
Tex Dallas, J. Gibbs & Assocs..... 817-430-1861
Tex Fort Worth, J. Gibbs & Assocs... 817-237-1455
Tex Houston, Electra Sls. 713-748-8235
Utah Salt Lake City, Fry-Gates..... 801-272-3641
Va Richmo.nd, R. P. Luce & Co 804-282-8587
Wash Vashon, Ruggles Tech. Sls..... 206-455-2778
Exp: Can., Mississauga, Ont., Pipe/Thompson, Ltd. 416-274-1269

Local Distributors
Ariz Phoenix, Dalis Elctrn Supply ... 602-254-8471
Cal Anaheim, R. V. Weatherford ... 714-634-9600
Cal Glendale, R.V. Weatherford Co. 213-849-3451
Cal Palo Alto, R. V. Weatherford 415-493-5373
Cal San Diego, R. V. Weatherford.... 714-278-7400
Colo Englewood, R. V. Weatherford .. 303-761-5432
Fla Miami, Electronic Equip. 305-871-3500
Ind Indianapolis, Ra-Dis-Co..... 317-637-5571
Md Beltsville, Treeko Sls., Inc. 301-937-8260
Mass Winchester, Rush Industries, Inc. 617-729-5800
Mich Kentwood, R.M. Elctrns.
Minn Minneapolis, Indl Comps 612-831-2666
NM Albuquerque, Intrl Elctrns 505-265-6453
NY Binghamton, ASI Electronics, Inc.
NY Bohemia, CAR-LAC Elctrn. Industries Sls. 516-567-4200
NY Mt. Vernon, Qar Indl Elec. Sls.... 914-699-2224
Ohio Cincinnati, Hughes-Peters, Inc. .. 513-351-2000
Ohio Cleveland, CMP Distributor 216-779-5100
Ohio Columbus, Hughes-Peters Inc.
Pa Wayne, Peak Elctrns..... 215-293-9000
Tex Dallas, Solid State Elec. Co. of Tx. 214-352-2601
Tex El Paso, Inter Electrns 915-778-9761
Tex Houston, R. V. Weatherford..... 713-688-7406
Va Newport News, Yorktown Elec. & Supply 804-599-3110
Wash Seattle, Zepher Elctrn. Sls. Corp.206-575-0922
For: Can, Montreal, Que, Future Elctrns 514-735-5775

ZETA LABORATORIES, INC., Dept. EM, 3265 Scott Blvd., Santa Clara, Cal. 95051, Tel: 408-246-6001, TWX: 910-338-7336; FSC No.: 31260; Empl.: 85

Sales Manager: C.P. Dudley

Local Sales Offices & Reps.
Ariz Scottsdale, Territorial Marketing 602-994-8665
Cal Santa Clara, Zeta Labs. 408-246-6001
Cal Tustin, Zeta Labs. 714-731-2341
Colo Parker, Technical Mktg. Assocs. 303-841-3435
Fla Clearwater, Brennan Assocs. 813-446-5006
Md Lanham, Brimberg Sls. 301-552-2200
NH Windham, Repco Co. 603-893-9539
NJ Woodcliff Lake, F & F Assocs. .. 201-778-6767
NM Albuquerque, Technical Mktg. Assocs. 505-298-4321
NY E. Syracuse, Ossmann Instrs. 315-437-6666
NY Hicksville, F & F Assocs. 516-935-1100
Pa Philadelphia, Eastern Instr. of Phila. 215-927-7777
Tex Dallas, Texas Avionics 214-368-3566
Utah Salt Lake City, Technical Mktg. Assocs. 801-485-9381

ZEUS IND'L. PRODS., Dept. EM, Foot of Thompson St., Raritan, N.J. 08869, Tel: 201-526-0800, TWX: 710-480-9346; Empl.: 38 ..... p. 2849

Sales Manager: John Worley

ZIATECH CORP, Dept. EM, 10762 LaRoda Dr, Cupertino, Cal. 95014, Tel: 408-996-7082

Local Sales Offices & Reps.
Ala Huntsville, Pen-Tech Assocs 205-533-0090
Cal Cupertino, MAC-1 408-257-9880
Cal Fountain Valley, MAC-1 714-839-3341
Cal San Diego, Earle Assocs 714-278-5441
Cal Woodland Hills, MAC-1..... 213-347-1374
Conn New Haven, Computer Mktg 203-789-0113
Fla Maitland, Pen-Tech Assocs 305-645-3444
Ga Atlanta, Pen-Tech Assocs 404-955-0293
Ill Chicago, Data Elctrns..... 312-283-0300
Ind Indianapolis, Data Elctrns..... 317-359-5368
Iowa Cedar Rapids, Technical Reps .. 319-393-5510
Kans Lenexa, Technical Reps 314-888-0212
Md Rockville, Q.E.D. 215-674-9600
Mass Waltham, Computer Mktg 617-894-7000
Mich Brighton, Lowry & Assocs 313-227-7067
Minn Minneapolis, Data Elctrns..... 612-786-9666
Mo Hazelwood, Technical Reps..... 314-731-5200
NY Pittsford, T-Squared 716-381-2551
NY Syracuse, T-Squared 315-463-8592
NC High Point, Pen-Tech Assoc 919-883-9125
Ohio Cleveland, Lowry & Assocs
Ohio Dayton, Lowry & Assocs
Ore Beaverton, ES/Chase Co..... 503-642-2732
Pa Hatboro, Q.E.D. 215-674-9600
Wash Seattle, ES/Chase Co 206-762-4824

ZI-TECH DIV., Aikenwood Corp., Dept. EM, Box 26, 2151 Park Blvd., Palo Alto, Cal. 94302, Tel: 415-326-2151, Telex: 334-447; Empl.: 15

Sales Manager: J. Ziman

Local Sales Offices & Reps.
Ariz Phoenix, Ind'l Prod..... 602-246-8487
Cal Costa Mesa, Robinson Technical Assocs. 714-557-1622
Cal Menlo Park, Smith-Clark Engrg.. 415-325-0633
Cal Mountain View, Energy Comps... 415-969-0330
Cal San Diego, Mesa Elctrns..... 714-278-8037
Colo Englewood, G. M. Wallace & Assocs 303-761-5800
Fla W. Palm Beach, Production Sls. Assocs. 305-689-0575
Ill Chicago, Plastiflo..... 312-235-3306
Ill Elk Grove Village, Loren Green Assocs. 312-593-0282

Ind	Indianapolis, Loren Green Assocs.	317-293-9827
Ind	Indianapolis, DeHaven Engrg.	317-297-1294
Md	Baltimore, A. Rogers Co.	301-744-4162
Md	Silver Springs, Gawler Inc.....	301-589-4406
Mass	Newton Center, Daner-Hayes Inc.	617-969-4650
Minn	Minneapolis, Loren Green Assocs.	612-781-1611
NJ	Allentown, Disc Sls.....	609-259-3056
NJ	Englishtown, Triple E.....	201-446-4222
NM	Albuquerque, Indl Prods	505-256-3561
NY	New York, McIntosh Equip. Corp.	212-349-3288
NY	Vestal, Vestal Elctrn Devices.....	607-748-3134
Ohio	Bedford, Industrial Pump & Equip. Corp.	216-439-2424
Pa	Bristol, A. Rogers Co.	215-788-5071
Tex	Houston, Component Sls. Svc. ..	713-442-8127

ZIERICK MFG. CORP., Dept. EM, 44 Radio Circle, Mt. Kisco, N.Y. 10549, Tel: 914-666-2911, TWX: 710-571-2143; Empl.: 90

Sales Manager: L. T. Noyes

Local Sales Offices & Reps.

Ga	Stone Mountain, H & H Mktg.	404-296-9830
Ill	Palatine, Claeson Assocs.	312-359-7230
NY	Mount Kisco, Zierick Mfg. Corp.	914-666-2911
Ohio	Aurora, EMA, Inc.	216-562-6104
Ohio	Centerville, Engrg. Mktg. Assocs. (EMA)	513-433-2800

Local Distributors

Cal	Los Angeles, Timco Inc.	213-254-5101
Ill	Chicago, Waldom, Inc.	312-585-1212

ZIPPERTUBING CO., Dept. EM, 13000 S. Broadway, Los Angeles, Cal. 90061, Tel: 213-321-3901, TWX: 910-346-6713; Empl.: 120

Local Sales Offices & Reps.

Ariz	Phoenix	602-967-8888
NJ	Totowa	201-256-4980
Ohio	Cleveland	216-734-3286
Tex	Carrollton	214-245-3112

ZONIC TECHNICAL LABS., Dept. EM, 8927 Rossash Ave., Cincinnati, Ohio 45236, Tel: 513-891-6390, TWX: 810-461-2470; Empl.: 50

Local Sales Offices & Reps.

Ala	Huntsville, Lee Assocs Mid South	205-533-5896
Cal	Anaheim, The Kadushin Grp	714-635-0432
Cal	Pasadena, RDX Corp.....	213-681-3451
Cal	San Diego, RDX Corp.	714-278-6863
Cal	Sunnyvale, RDX Corp.	408-734-4500
Conn	Hamden, Northeast Engrg.....	203-248-4481
Ga	Buford, Lee Assocs Mid South ..	404-945-4222
Mass	Danvers, Northeast Engrg.....	617-774-3010
Mo	St. Louis, Adelphi, Inc.	314-821-1232
NY	Manhasset, Northeast Engrg	516-365-9633
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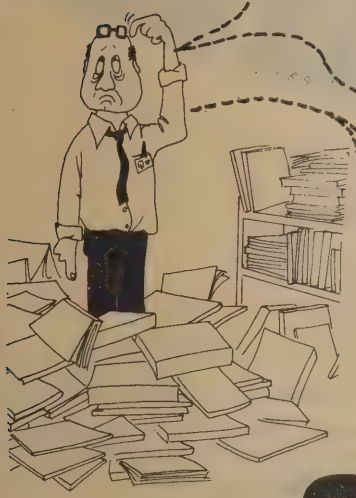

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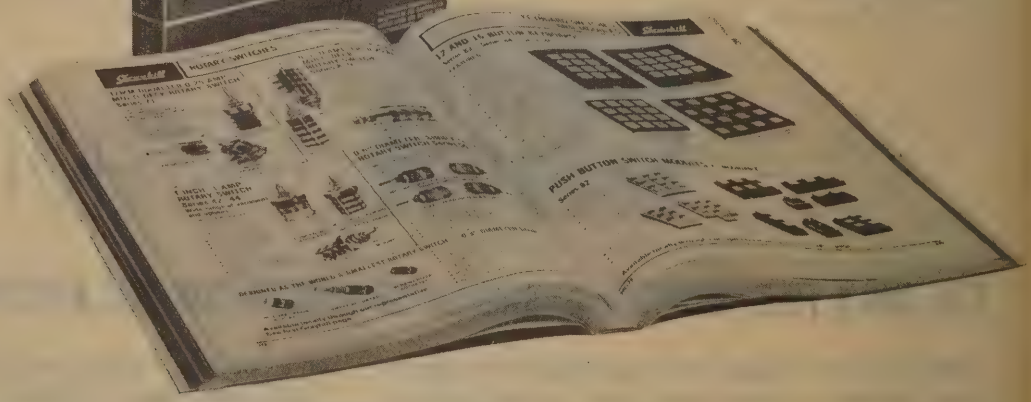

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ABACUS MICROSYSTEM - Information Control Corp.
ABACUS MICROWARE - Information Control Corp.
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ABSAFIL - Fiberfil Div. Dart Ind.
ABSORBO MOP - Clean Room Prods.
ABSORBO-WIPE - Clean Room Prods.
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ACCELOGRAPH - Humphrey, Inc.
ACCESS PROCESS - Amphenol North America Div.
ACCESS 100 - Amphenol North America Div.
ACCOPAC - Armstrong Cork Co.
ACCOTHERM - Armstrong Cork Co.
ACCUCHART - Gould, Inc.
ACCUCOM - International Data Sciences
ACCUDATA - Honeywell, Inc.
ACCUDEX - Aerotech, Inc.
ACCU-DIALS - Rogan Corp.
ACCUFILM - Bishop Graphics
ACCUFLEX - Eagle Signal
ACCU-FLO - Beckman Instrs., (AISSD)
ACC-U-IOK - Control Systems Research, Inc.
ACCULINE - Hollis Engrg., Inc.
ACCULOCK - Emerson, Industrial Controls Div.
ACCULOG - Emerson, Industrial Controls Div.
ACCUMAT - Hotpack Corp.
ACCUMODE - Endevco
ACCUPOWER - Emerson, Industrial Controls Div.
ACCUPRINT - Bishop Graphics
ACCUSCALES - Bishop Graphics
ACCUSONIC - Ocean Research Equipment, Inc.
ACCUSPEDE - Emerson, Industrial Controls Div.
ACCU/STAT - Siemens-Allis, Inc.
ACCU-STRATES - Accumet Engineering Corp.
ACCUTRIM - Vishay Resistive Systems Grp.
ACOUSTALLOY - Electro-Voice
ACOUSTA-MASTER - Bogen Div.
ACOUSTAZIP - Zippertubing Co.
ACOUSTIFOAM - Electro-Voice
ACROD - Acme Elec. Heating Corp.
ACROM - Acme Elec. Heating Corp.
ACRYLAFIL - Fiberfil Div. Dart Ind.
ACRYLWELD - Hardman Inc.
ACTEC - Auto-trol Corp.
ACTIONATOR - Honeywell
ACTO - Systron-Donner Corp.
ACUFLEX - Jaesic Industries Co.
ACU-MIN - Moody Tools, Inc.
ADAM - E & L Instruments, Inc.
ADAPT-O-MOUNT - Overly-Hautz Co.
ADD 8000 - E & L Instruments, Inc.
ADJUST-A-SEELS - APM-Hexseal
ADJUSTOHM - Ward Leonard Elec. Co. Inc.
ADJUSTO TORQ - General-Electro Mechanical
ADLAKE - Adams & Westlake Co.
AD-MU-00 - Ad-Vance Magnetics
AD–MU–48 - Ad-Vance Magnetics
AD-MU-78 - Ad-Vance Magnetics
AD-MU-80 - Ad-Vance Magnetics
ADVENTURER - Vichek Plastics Co.
AD/380 - Auto-trol Corp.
AEI - Calvert Elctrns., Inc.
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AEROCOAX - ARI Inds., Inc.
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AEROGARD - ARI Inds., Inc.
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AEROPAK - ARI Inds., Inc.
AEROROD - ARI Inds., Inc.
AEROSEAL - ARI Inds., Inc.
AEROTORCH - Wall-Lenk Mfg. Co.
AE-16 ROSIN - Bow Solder Products
AE-21 NOCHAR - Bow Solder Products
AGAMP - GTE Lenkurt Inc.
AGASTAT - Control Products Div.
AGGREGOMETER - Chrono-log Corp.
AGNICON - GTE Sylvania
AGNOSTICK - GTE Sylvania
AIMSERT - Aimsco Inc.
AIMSLOCK - Aimsco Inc.
AIRE-REQULATOR - Atlas Electric Devices
AIRFLEX - Eaton Corp.
AIROTOR - Torin Corp.
AIR PAC - Hobson Bros., Inc.
AIRPOWER - Avionic Instrs. Inc.
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ALAUTRONEX - Sel-Rex Div. Oxy Metal Industries Corp.
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ALLEN-HEAD - Allen Mfg. Co.
ALLMETAL - Allmetal Screw Products Co., Inc.
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ALNICO 9 NB - Thomas & Skinner, Inc.
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ANNIVERSARY - Wall-Lenk Mfg. Co.
ANP 9 - Gulton Inds., Inc.
ANTEX - Antex Div.
ANTI-STATIC #79 - Merix Chem. Co.
ANTI-STATIC #79-QL - Merix Chem. Co.
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ARCHER - Allied Electronics
ARCOLYTICS - Arco Electronics Inc.
ARCOM - Atlantic Research Corp.
ARCO OR AE - Soshin Elec. Co.
ARGENTOMERSE - Technic, Inc.
ARKOMAX - Arnold Engineering Co.
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ARMALOK - Armstrong Cork Co.
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ARMCO NITRONIC 33 - Armco Steel Corp.
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ARMCO ORIENTED ELECTRICAL STEELS - Armco Steel Corp.
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ARULAB - Arenberg Ultrasonic Inc.
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ASTRO BOA FLEX - Astrolab, Inc.
ASTRO-COBRA-FLEX - Astrolab, Inc.
ASTRODOME - General Elec. Co.
ASTROFLO - Astro Dynamics
ASTROGIDE - Bivar, Inc.
ASTROLIFT - Astro Dynamics
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ASTROLOK - Astrolab, Inc.
ASTROMAST TOWERS - Astro Research Corp.
ASTROSCAT - RF Systems, Inc.
ASTROTOWER - Astro Research Corp.
ASTRO/348 - Amphenol North America Div.
ASYMPTOTIC CALORIMETER - Hy-Cal Engrg
ATMOSCOPE - Edsyn, Inc.
ATOM - Sprague Elec. Co.
ATOMICLAD II - GTE Sylvania
ATTACHE PHONE - Livermore Data Systems, Inc.
ATTENUATOR-RATED FERRAMICS - Indiana General
AUDIO BATON - Blonder-Tongue Labs., Inc.
AUDIO HAILER - Audio Equip.
AUDIOTEX - GC Electronics
AUDIOVOICE - PASO Sound Products Inc.
AURION-X - Sel-Rex Div. Oxy Metal Industries Corp.
AUROBOND - Sel-Rex Div. Oxy Metal Industries Corp.
AUTAC - Viking Inds., Inc.
AUTO-AMP - Hills-McCanna Co.
AUTOBALANCE - Ballantine Laboratories, Inc.
AUTO-BOOST - Microtran Co., Inc.
AUTO-BRIDGE - Beckman Instrs.
AUTOCON - Sprague Elec. Co.
AUTO-DRAFT - Auto-trol Corp.
AUTO-FLOW - Keuffel & Esser Co.
AUTO-GAIN - Ithaco, Inc.
AUTOHET - EIP, Incorporated
AUTOJUMPER - Autosplice/Dv Gen Staple
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AUTOLOC - Keithley Instruments Inc.
AUTOLUG - Autosplice/Dv Gen Staple
AUTOMAC - Cardinal Control Co.
AUTOMAGIC - Telex Communications, Inc.
AUTOMAGNETIC - RFL Inds.
AUTO-MAP - Auto-trol Corp.
AUTOMEMORY - Pacific Meas., Inc.
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AUTOTAPE - Cubic Corp.
AUTOTEMP - Howell Inst. Inc.
AUTO-TEN - Robins Broadcast & Sound Equipment Corp.
AUTOTRAK - Addison Div. Muirhead, Inc.
AUTRONEX - Sel-Rex Div. Oxy Metal Industries Corp.
AVEL - Avel Lindberg Ltd.
AVIKRIMP - ITT Cannon/ETC Terminal Products
AWAC - Copperweld Bimetallics
AXIAL FLOW - Singer Co.
AXIAL TRAVEL SWITCH - Electronic Applications Co.
AXIMAX - Rotron, Inc.
AXIOHM - Ward Leonard Elec. Co. Inc.
B - Bourns, Inc.
B-A-C-T - LocAtor Electronics Co.
BAILATCH - Hartwell Corp.
BAKELITE - Union Carbide, Chemicals & Plastics
BALCO - GTE Sylvania
BAL-CON - Eby Company
BALDWIN - BLH Elctrns.
BALDWIN - BEI Elctrns., Inc.
BALLISTIC FLOW CALIBRATOR - Flow Technology, Inc.
BALLISTRAK - Flow Technology, Inc.
BALL-LOK - Avibank Mfg. Inc.
BALL PAINT MARKERS - Markal Co.
BANC-LOK - Cherry Fasteners
BANDIT - Summit Engineering Corp.
BAND-O-CODE - Storm Products Co.
BANDOMATIC - Burndy Corporation
BANTAM - Burndy Corporation
BANTAM ROTA-CRIMP - Amp Inc.
BAREBONES RECORDERS - Astro-Med
BAR-LOK - Dennison Mfg. Co.
BARRATRON - Litton Inds.
BARRIER/CAP - American Technical Ceramics
"BARRIER" RESINS - Sigma Plastronics, Inc.
BAUD VERTER - Intern'l. Computer Prods., Inc.
BAZOOKA - Air-Vac Engrg. Co.
BDT - Sel-Rex Div. Oxy Metal Industries Corp.
BEAM-O-MATIC - Teledyne Big Beam
BEAR - Norton Co., Public Relations Dept.
BEAR-TEX - Norton Co., Public Relations Dept.
BEAU - Vernitron Elec. Comps.
BEAVER - Cornell-Dubilier Electronics
BED ALERT - Sprague Elec. Co.
BEE LINE - Hughes Aircraft Co., Connecting Devices Div.
BELDFOIL - Belden Corp.
BELLOWFORM - Continental Connector Corp.
BELT-LINE - U.S. Terminals
BEMAC II - Electric Machinery Mfg. Co.
BEMCOIL - Bemco, Inc.
BENCHMARK - L & L Special Furnace Co.
BENCHMASTER - Tenney Engrg., Inc.
BERG - Erikson Specialized Tool Co.
BERGCON - Berg Electronics
BERGFLO - Berg Electronics
BERGLANCE - Berg Electronics
BERGLOK - Berg Electronics
BERGOLD - Berg Electronics
BERGPIN - Berg Electronics
BERGPOST - Berg Electronics
BERGSTIK - Berg Electronics
BERYLCO - Kawecki Berylco Inds., Inc.
BESPONDER - Vega Precision Labs.
BEST - Oxford Speaker Co.
BET - Motorola Semiconductor Prods.
BEVELOID - Invincible Gear Co.
BICROAMP - Bicron Elctrns. Co.
BI-FILM - Bourns, Inc.
BIG BEAM - Teledyne Big Beam
BIG INCH - Haydon Switch & Instr., Inc.
BIG PAC - New Haven Wire & Cable
BIG STICK -
BIG STICK II -
BIG-7 - Holub Industries
BIMET - Handy & Harman
BI-MOD - Crown Microwave, Inc.
BIMODE - Varian Assocs.
BINAVERTER - Metric Systems Corp.
BIODE - Transmed Scientific
BIOLINK - Transmed Scientific
BIO-SOLV - Beckman Instrs., (AISSD)
BIPAX - Tra-Con, Inc.
BIRACO - Birnbach Co., Inc.
BIRD-EYE - Faratron Corp.
BISCUIT - Rotron, Inc.
BISTABLE AMPLIFIER - Cross Electronics Inc.
BIT - TRW/UTC Transformers
BIT-P - TRW/UTC Transformers
BITRAN - Fabri-Tek, Inc.
B.I.T.S. - Addison Div. Muirhead, Inc.
BITSWITCH - Stanford Applied Engrg
BLACK BEAUTY - Sprague Elec. Co.
BLACK CAT - Cornell-Dubilier Electronics
BLACK-DAYLITE - General Elec. Co.
BLACK KNIGHT -
BLACK-MAGIC - T&B/Ansley Corp.
BLACK MAGIC - Recoton Corp.
BLACK-OUT - Info-Lite Corp.
BLACO-TRON - Baron-Blakeslee
BLAK-RAY - Ultra-Violet Prods., Inc.
BLAZER - Airtrol Corp.
BLAZER 40D - Fanon/Courier Corp., Subs.
BLENDMASTER - Hull Corp.
BLEND-OHM - Methode Elctrns., Inc.
BLI - Beukers Labs., Inc.

B-LINE - Bourns, Inc.
BLOC-LITE - LVC Inds. Inc.
BLUE DOT - Maury Microwave Corp.
BLUE MACS - T&B/Ansley Corp.
BLUE MACS - T&B/Ansley Corp.
BLUE MACS - T&B/Ansley Corp.
BLUE-POINT - Snap-On-Tools
BLUE RIBBON - Amphenol North America Div.
BLUE STUFF - Tech Spray, Inc.
BME CHIPS - Centralab/USCC
BOARDMASTER - Graphic Systems
BOMB-TAIL - Amp Inc.
BONDALUM - Craig Sys. Corp.
BONDEZE(R)-M - Phelps Dodge Magnet Wire Co.
BOOMERANG - Benthos, Inc.
BOOTS - Cherry Fasteners
BORAL - Kawecki Berylco Inds., Inc.
BORD PAK - Buckeye Stamping Co.
BOSS - Bostitch
BOSS - Molex Inc.
BOSTFLEX - Boston Insulated Wire & Cable Co.
BOSTGARD - Boston Insulated Wire & Cable Co.
BOSTRAD - Boston Insulated Wire & Cable Co.
BOUYOUCOS - Beckman Instrs.
BOXER - I M C Magnetics
BOXER - IMC Magnetics Corp.
BOYD BOLT - Tridair Inds.
BRAKE-PAK - Ambi-Tech Inds. Inc.
BRANDENBURG - Zi-Tech Div.
BRAND 5 - Robins Ind's. Corp.
BRANSONIC - Branson Cleaning Equip. Co.
BRILLO-LOCK - Evans Corp., George
BRIMAR - Inter-Tech. Grp., Inc.
BRITESORB - P Q Corp.
BROAD-BAND RATED FERRAMICS - Indiana General
BROWN BOOSTER - Micron Industries Corp.
BRUSH - Gould, Inc.
B-T ELECTROCOLOR - Blonder-Tongue Labs., Inc.
BTR - Lord Kinematics
BUBBLTROL - Autocon Inds.
BUCHANAN - Control Products Div.
BUDDYBUZZER - Tapeswitch Corp. Amer.
BUGBOOKS - E & L Instruments, Inc.
BULK METAL - Vishay Resistive Systems Grp.
BULLET - T & B/Thomas & Betts
BULLET-NOSE - Sealectro Corp.
BULLS-EYE - Hughes Aircraft Co., Connecting Devices Div.
BULPLATE - Sprague Elec. Co.
BUNTING - N.L. Inds., Inc., Bearings Div.
BUSS - Bussmann Manufacturing
BUSTLE - NES, Inc.
BUTTERFLY - Licon Div.
BUTTONEER - Dennison Mfg. Co.
BW ORBITAL RIVETER - Black & Webster, Inc.
BYTREX - Data Instruments Inc.
CABFOAM - Soundcoat
CABINETROL - General Elec. Co.
CABLE CAGE - Taylor Electric, Inc.
CABLE MAKER - Amp Inc.
CABLEMASTER - Chatsworth Data Corp
CABLEMATIC - Ripley Co., Inc.
CABLE-RAP - Amrad Corp.
CADCO - Cadillac Plastic & Chemical
CADNICA - Sanyo Electric Inc.
CAGE-TROL - Electric Machinery Mfg. Co.
CAI - Communication Assocs., Inc.
CALCOMP - California Computer Prods.
CALECTRO - GC Electronics
CALFAX - Tridair Inds.
CALI-BRAIN - B & K Precision Prods. of Dynascan
CALORIMIXER - Cutler-Hammer, Inc.
CALROD - General Elec. Co.
CAMBI-CARD - Cambridge Thermionic Corp.
CAMBION - Cambridge Thermionic Corp.
CAMPER - Teledyne Big Beam
CAPABLE - Computer Automation, Inc.
CAPCON - Capcon, Inc.
CAPLET - Pylon Co., Inc.
CAPLUGS - Caplugs Div.
CAPOPAD - Bivar, Inc.
CAPS - ITT Cannon Electric
CAP-SURE - Industrial Devices
CARAVEL - Rotron, Inc.
CARAVELLE 40D - Fanon/Courier Corp., Subs.
CARB-O-LOCK - General Elec.
CARBOLOY - General Elec.
CARBOLUBE - Carbone Lorraine Industries Corp.
CARDILINE - Electro-Voice
CARDOPULL - Bivar, Inc.
CAREFREE - Eagle-Picher Inds.
CAREFREE NAGNUM - Eagle-Picher Inds.
CAROUSEL IV & IVA - Delco Electronics Div.
CARTROL - Pacific Technology
CARY - Varian Assocs.
CAST - Harris Corp.
CASTOMATIC - Federated Metals Corp.
CATABOND - NVF Co.
CATALOG #100 - Workman Electronic Prods., Inc.
CATT - Gulton Inds.
CAVMATIC - Phillips Mfg. Co.
C-B - Caddel-Burns Mfg. Co., Inc.
CBE - Westinghouse Elec. Corp.
CB-MATE - Bird Electronic Corp.
CC DISC - Alpha Data Incorporated
CC ENVELOPED BY Q - Coil-Q Corp.
CC-4 - Multiwire Div., Kollmorgen
CC-4 - Photocircuits Div., Kollmorgen
CDM - Curtis Industries Inc.
CDP - Electro-Voice
CE-CON - Eby Company
CEE WEE - CW Industries
CELCI - Tecknit
CELLULINE - Belden Corp.
CEM - Varian Assocs.
CENTAUR - Rotron, Inc.
CENTIGRID - Teledyne Relays
CENTI-LOC - ITT Cannon Electric
CENTRA-GAP - Thomas & Skinner, Inc.
CENTRICORE - Magnetic Metals Co.
CENTRISAFE - Trio-Tech, Inc. of Calif.
CENTRISORT - Trio-Tech, Inc. of Calif.
CENTRONIC - Bailey Instrs., Inc.
CENTRY - Leeds & Northrup Co.
CENTURA - Leviton Mfg. Co., Inc.
CERACIRCUIT - Sprague Elec. Co.
CERADOT - CTS Corp.
CERAFIL - AVX Ceramics
CERALAM - AVX Ceramics
CERA-LYTIC - Sprague Elec. Co.
CERAMICON - Erie Technological Products
CERAMIKIT - Sprague Elec. Co.
CERAMIPEC - Murata Mfg. Co. Ltd.
CERA-MITE - Sprague Elec. Co.
CERAMO - Thermo Elec. Co., Inc.
CERAMOCOUPLE - Thermo Elec. Co., Inc.
CERAMOLITHIC - Centralab/USCC
CERAMVAR - GTE Sylvania
CERA-PLATE - Sprague Elec. Co.
CERASEAL - AVX Ceramics
CERATRCLS - CTS Corp.
CERATRIM - CTS Corp.
CERATRON - Murata Mfg. Co. Ltd.
CERCHIP - Sprague Elec. Co.
CERMIDE - CTS Corp.
CEROC - Sprague Elec. Co.
CEROD - Sprague Elec. Co.
CEROL - AVX Ceramics
CERT - Times Fiber Comm. Inc.
CERTI-CRIMP - Amp Inc.
CERTI-LOK - Amp Inc.
CERTIMESH - Pall Trinity Micro Corp.
CERTI-SEAL - Amp Inc.
CHALLENGER - Bogen Div.
CHALLENGER - Equipto Enclosure Systems
CHA-MP - Amp Inc.
CHANNELITE - Channel Inds.
CHANNELLIGHT - Hotpack Corp.
CHANNELTRON - Galileo Electro-Optics Corp.
CHARABAND - Dataproducts Corp.
CHASE - T & B/Thomas & Betts
CHASSIS-TRAK - General Devices Co., Inc.
CHECK-LITE - Adalet-PLM Div
CHEK-A-COLOR - GTE Sylvania Inc.
CHEK-SORT - Lundy Elctrns. & Sys., Inc.
CHEMFLUOR - Chemplast, Inc.
CHEMGRIP - Chemplast, Inc.
CHEMINAX - Raychem Corp.
CHEMTRON - COSAR Corp.
CHERRY LOCK - Cherry Fasteners
CHINALAK - Dolph, John C. Co.
CHO-NECTOR - Chomerics, Inc.
CHO-SEAL - Chomerics, Inc.
CHO-SHRINK - Chomerics, Inc.
CHO-SIL - Chomerics, Inc.
CHO-THERM - Chomerics, Inc.
CHRO-BAR - VIZ Manufacturing Co.
CHROMAFOIL - Essex Grp - Indl Wire Prods Div.
CHROMA-LINE - Simpson Electric Co.
CHROMATO-VUE - Ultra-Violet Prods., Inc.
CHROMATRIX - GTE Sylvania Inc.
CHROMA 80 - Memorex Corp.
CHROMA 90 - Memorex Corp.
CHROMEL - Hoskins Mfg. Co.
CHROM-O-SCOPE - Capintec Instruments, Inc.
CHROMSTAR - Winegard Co.
CHRONETIC - Haydon Switch & Instr., Inc.
CHRONOLOGGER - NES, Inc.
CHRONO-PAR - Chrono-log Corp.
CI - Curtis Industries Inc.
CIMCLAD - Cincinnati Milacron
CIMRON - California Instrs.
CINTEL - Rank Precision Inds.
CIRCLE "B" - Bristol Saybrook Co.
CIRCUIT BOARD CARRIERS - Parsons Mfg. Corp.
CIRCUIT-DECK - Beckman Instrs.
CIRCUITIP - Amp Inc.
CIRCUITRACER - Desco Mfg. Co.
CIRCUITRIM - VRN St Petersburg, Div. Vernitron
CIRCUIT RYDER - Raytek Div. Optical Coating Lab
CIRCUIT-STIK - Bishop Graphics
CIRCUIT ZAPS - Bishop Graphics
CIRKITBLOCK: - Powercube Corp.
CIRQPIL - Cir-Q-Tel, Inc.
CITY STICK -
CJ - Omega Engrg., Inc.
CLASPCON - Molex Inc.
CLASSETTE - Audiotronics Corp.
CLASSIC - Carter Motor Co.
CLEAN-N-DRI - Clean Room Prods.
CLEAN SOUND - Recoton Corp.
CLEAR-ALL - Nu-Concept Computer Systems, Inc.
CLEARFLEX - Columbia Elctrn. Cables
CLEAR-PASS - Sprague Elec. Co.
CLETALOY - Superior Carbon Prods., Inc.
CLEVELAND - Eaton Corp.
CLEVELAND - Eaton Corp.
CLF - General Elec. Co.
CLINCHER - Jamesbury Corp.
CLINCHER - Berg Electronics
CLINIFLOW - Carolina Medical Elctrns., Inc.
CLIP - Wonder Corp of America
CLIP-A-DIP - Micro Electronic Systems, Inc.
CLIPLITE - Visual Communications Co
CLORINOL - Sprague Elec. Co.
C-L-X - Okonite Co.
CMC - Carter Mfg. Corp.
CMC1200 - Cubic Corp.
CML MACARR - Marine Electric Railway Prods. Div., Inc.
CO/ALR - Leviton Mfg. Co., Inc.
COAXICLAMP - Amp Inc.
COAXICON - Amp Inc.
COAXITUBE - Precision Tube
COAXWITCH - Bird Electronic Corp.
COBRA - B & K Precision Prods. of Dynascan
COBREFLEX - University Sound
CODABAR - Monarch Marking Sys.
CODASYN - ADRET/COMSTRON
CODE NO. 249 - Oak Inds. Inc.
COHRLASTIC - Connecticut Hard Rubber Co.
COJAX - Dynatech Data Sys
COLOR BEAM - Winegard Co.
COLOR BRIGHT 85 RE - GTE Sylvania Inc.
COLOR BRIGHT 85 XR - GTE Sylvania Inc.
COLOR-BRITE - Perma Power Elctrns
COLOR CORD - Pacific Electricord Co.
COLOR-KEYED - T & B/Thomas & Betts
COLORMASTER - Lance Inds.
COLOR/MATIC - Lektra Labs., Inc.
COLOR SCREEN 85 - GTE Sylvania Inc.
COLORVUE - CATV Communications
COMBAT - Carborundum Co.
COMBO - Metex Corp.
COMBO POLASTRIP - Metex Corp.
COMBO - Electro-Techniques, Inc.
COMBO STRIP - Metex Corp.

COMBO-2 - Metex Corp.
COMFORM I - Pace Inc.
COMFORT SOUND - Telex Communications, Inc.
COMLINE - Piezo Technology Inc.
COMPAC - Semtech Corp.
COMPAC - Compac
COMPACLINE - Vicon Industries Inc.
COMPAC SERIES COUNTERS - ENM
COMPACT - TRW/UTC Transformers
COM-PAK - Lambda Elctrns.
COM-PAK MARK II - Lambda Elctrns.
COMPARASCOPE - National Camera Inc.
COMPARASYSTEM - National Camera Inc.
COMPLIMITER - Spectra Sonics
COMPLOT - Houston Instrument
COMPULIFT - Litton Systems, Inc.
COMPULYTIC - Sprague Elec. Co.
COMPUTAMITE - Cornell-Dubilier Electronics
COMSTOC - Keuffel & Esser Co.
COMTEC - Auto-trol Corp.
COMTRAN - Fabri-Tek, Inc.
CONACURE - Conap, Inc.
CONAPOXY - Conap, Inc.
CONATHANE - Conap, Inc.
CONCENTRIKIT - CTS Corp.
CONCO-FOAM - Consolidated Wire & Assoc. Corps.
CONDOR - IMC Magnetics Corp.
CONDUCTING TWENTY/TWENTY - Packaged Resins Div.
CONDUCTWEEZ - Pace Inc.
CONDUX - Hardman Inc.
CO-NETIC - Magnetic Shield Div.
CONFUZZ - Tecknit
CONHEX - Sealectro Corp.
CONITEL - Leeds & Northrup Co.
CONMAX - Tecknit
CONNECTO-BLOK - T & B/Thomas & Betts
CON-O-CLAD - Conax Corp.
CONOGRAPHICS - Hughes Aircraft Co.
CONQUEROR 40D - Fanon/Courier Corp., Subs.
CONRAD-MISSIMER DIVISION - Bemco, Inc.
CONSIL - Handy & Harman
CONTACT KLEEN - Chemtronics, Inc.
CONTEMPO - Par-Metal Prods. Inc.
CONTEMPO - ITT General Controls
CONTROFLEX - Tapeswitch Corp. Amer.
CONTROLPAC - Eagle Signal
CONTROL PLUS - MKC Electronics
CONVERTI-FUSE - General Elec. Co.
CONVULEX - Raychem Corp.
COOKE - Rank Precision Inds.
COOL GLO - Bishop Graphics
CO-ORD - LVC Inds. Inc.
COPALUM - Amp Inc.
COPATCH - Dynatech Data Sys
COPEL - Hoskins Mfg. Co.
COPIER I - Telex Communications, Inc.
COPIER II - Telex Communications, Inc.
COPIER IV - Telex Communications, Inc.
COPLAMOS - SMC Microsystems Corp.
COPPERPLY - Nat'l-Standard Co.
COPPER SWEAT - Bow Solder Products
COPSCAN - Fanon/Courier Corp., Subs.
COPYCORDER - Hecon Corp.
COPYPHONE III - Telautograph Corp.
CORDS LIMITED - Essex Grp - Indl Wire Prods Div.
CORGUIDE - Corning Glass Works
CORNING - Corning Science Products
CORONOL - General Electric Co.
CORRGARD -
CORTEM - Carbone Lorraine Industries Corp.
CORTITE - Carbone Lorraine Industries Corp.
COTERM - Dynatech Data Sys
COUNT MODULES - Practical Automation, Inc.
COUNTROLLER - Veeder-Root
COUPLATE - Centralab
COUPLOID - Invincible Gear Co.
COWECO - Coil Winding Equip. Co. Inc.
CPPC - Clifton Precision
CRADLE - Gould Inc. Circuit Protection & Controls Div.
CRADLECLIP - Electrovert
CRAIG - Kalart Victor Corp.
CRAMOLIN - Caig Labs., Inc.
CRANEGARD - Dillon, W.C. & Co.
CRANEMATE - Randtronics
CRESCENT - Waldes Kohinoor, Inc.
CRIMP-ACON - Methode Elctrns., Inc.
CRIS-PIC - Kalart Victor Corp.
CRITERIA SYSTEM - Reliability Inc.
CRL - Centralab
CRL (WITHIN A DIAMOND) - Centralab
CROMA-FLEX - Advance Electrical Mfg
CROMA TWIST - Advance Electrical Mfg
CROMA WEAVE - Advance Electrical Mfg
CROP-TROL - Honeywell
CROSSFIRE - Channel Master Div. Avnet
CROSSFLO - Torin Corp.
CRT - Daburn Electronics & Cable Corp.
CRT-PAC - Semtech Corp.
CRUCORE - Colt Industries
CRUISE CONTROL - Jaesic Industries Co.
CRYOFIT - Raychem Corp.
CRYO-PANEL - High Vacuum Equip. Corp.
CRYOTERM - Maury Microwave Corp.
CRYSTAL-CLEAR - Packaged Resins Div.
CRYSTAL-HET - Princeton Applied Resch. Corp.
CSI - Markem Corp.
CSI - Capacitor Specialists
CS3 - Midgard Electronics
CTC-71 - Alpha Metals, Inc.
CUBATH - Sel-Rex Div. Oxy Metal Industries Corp.
CUBE-PAC: - Powercube Corp.
CUBIC - Memorex Corp.
CUBIC - Memorex Corp.
CUBITAPE - Cubic Corp.
CUBOND - Glidden Metals
CUCLAD - 3M Co.
CUE/SPLICE - Tapecon, Inc.
CUFLEX - 3M Co.
CUPAC - Semtech Corp.
CUPRON - GTE Sylvania
CUPRONEL - GTE Sylvania
CURRENT GUN PROBE - Bell, Inc., F.W.
CURRISTOR - General Resistance, Inc.
CURTIS INDACHRON - Curtis Instrs., Inc.
CURVACORE - Siemens-Allis, Inc.
CUSIL - GTE Sylvania Inc.
CV-D - Electro-Voice
C-W - Caddel-Burns Mfg. Co., Inc.
CYBERTONE - Cybersonic Div.
CYCLEASE - Ram Chems.
CYCL-FLEX - Eagle Signal
CYCLOHM - Howard Industries
CYCLONAIR - Rotron, Inc.
CYCLOPTIC - American Optical Corp.
CYCLO-RUBBER - Hardman Inc.
C2R - General Semiconductor Industries, Inc.
C-21 - Hughes Aircraft Co., Connecting Devices Div.
DAFLEX - Daburn Electronics & Cable Corp.
DAFLON - Daburn Electronics & Cable Corp.
DAG - Acheson Colloids Co.
DAGLAS (R) - Phelps Dodge Magnet Wire Co.
DAKA WARE - Davies Molding Co., Harry
DALIC - Sifco Metachemical
DALITE - Daburn Electronics & Cable Corp.
DAMS - Bromberg Engineering
DANAMETER - Racal-Dana Instrus Inc.
DANGER ZONE - Teledyne Big Beam
DAN-L - DAN-L Inc.
DANNER - Gotham Audio Corp.
DANYON - Daburn Electronics & Cable Corp.
DAPON - FMC Corp.
DAPRENE - Daburn Electronics & Cable Corp.
DASHER - Data General Corp.
DASH FLASHER - Teledyne Big Beam
DATAB - Brady Co., W. H.
D.A.T.A.BOOK - D.A.T.A. Inc.
DATACOLOR 703 - Spatial Data Systems, Inc.
DATACOLOR 704 - Spatial Data Systems, Inc.
DATADYNE - Datadyne Corp.
DATAGRID - Bendix Corp.
DATAKOAT - Datak Corp.
DATA KROME - Kollsman Instr. Co.
DATA-LIT - Litronix
DATALITE - Dialight
DATAMARK - Datak Corp.
DATA MARK - Memorex Corp.
DATAMETRICS - Datametrics Inc
DATA-MONITOR - Tec, Inc.
DATA PANEL - Tec, Inc.
DATARAMA - Ferranti-Packard, Ltd. Elec. Div.
DATA-SCREEN - Tec, Inc.
DATASEEKER - Dataprobe, Inc.
DATA SKRIPT - Kollsman Instr. Co.
DATATAB - Altek Corp.
DATA TEK 9600 - Atlantic Research Corp.
DATA-TRAK - Research, Inc.
DATA-VOICES - Datawest Corp.
DATAWATCH - Metrix Instrument Co.
DATAX - Data Translation
DAYONITE - Vicon Industries Inc.
DDS - Westronics
DEARBORN - Sprague Elec. Co.
DEARBORN - Sprague Elec. Co.
DECAP - Dynaloy, Inc.
DECITRAK - Theta Instr. Corp.
DECOHM - Davis Elec. Co.
DECORA - Leviton Mfg. Co., Inc.
DECO-RAY - Fusion Systems Corp.
DEECEEDUCER - Solid State Electronics Corp.
DEEP COUNTRY - Teledyne Big Beam
DEEP CYCLE - SGL Batteries Manufacturing Co.
DEFENDER -
DEFLEX - APM-Hexseal
DEFOREST - Dumont Oscilloscope Labs.
DEGRESTIL - Electrovert
DEI MOTOR GUARD - Diversified Electronics Inc.
DEKABOX - E.S.I. Inc.
DEKABOX - Electro Sci. Inds.
DEKABRIDGE - Electro Sci. Inds.
DEKABRIDGE - E.S.I. Inc.
DEKADIAL - Electro Sci. Inds.
DEKAMATIC - Electro Sci. Inds.
DEKAMATIC - E.S.I. Inc.
DEKAPACITOR - Electro Sci. Inds.
DEKAPOT - E.S.I. Inc.
DEKAPOT - Electro Sci. Inds.
DEKASTAT - E.S.I. Inc.
DEKASTAT - Electro Sci. Inds.
DEKAVIDER - E.S.I. Inc.
DEKAVIDER - Electro Sci. Inds.
DEKTAK - Sloan Technology Corp.
DEL-CON - Delco Electronics Div.
DELMICA - Del Electronics
DELTABESTON - General Electric Co.
DELTAFILM - Sprague Elec. Co.
DELT ALERT - Delta Products
DELTAPLY - Sprague Elec. Co.
DELTAPLY - Sprague Elec. Co.
DELTA-T - Gotham Audio Corp.
DELTAVERTA - Hybrid Systems Corp.
DEMOD - General Magnetics
DENSI-LUX - Lektra Labs., Inc.
DENSI-METER - Lektra Labs., Inc.
DENSI-TIMER - Lektra Labs., Inc.
DENSITOCOLOR - Heitz, Inc., Karl
DENSITROL - Princo Instrs.
DEPEND-A-BOND - Alpha Metals, Inc.
DEPENDEX - High Voltage Engrg. Corp.
DESCO - Dietz Design, Inc.
DESICOTE - Beckman Instrs., (AISSD)
DESIGNERS - Motorola Semiconductor Prods.
DESIGN III - Ann Arbor Terminals, Inc.
DET-O-JET - Alconox Inc.
DEWPROBE - Honeywell
DFA - Pall Corp.
D-I - Perkin-Elmer Ultek Inc.
DIAC - Racal-Dana Instrus Inc.
DIACTOR - General Elec. Co.
DIAL-A-GAIN - Unholtz-Dickie Corp.
DIAL-AN-AMP - General Resistance, Inc.
DIAL-AN-OHM - General Resistance, Inc.
DIAL-A-SOURCE - General Resistance, Inc.
DIALATCH - Hartwell Corp.
DIAL-A-TEMP - Hexacon Elec. Co.
DIALATROL - Honeywell
DIAL-A-VIDER - General Resistance, Inc.
DIAL-A-VOLT - General Resistance, Inc.
DIAL & CODER - Delta Products
DIAL-FLO - Hotpack Corp.
DIALIFE BANDS - Monarch Marking Sys.
DIAL-IT - Holub Industries
DIAMFILE - Jonard Industries Corp.
DIAMOND GRIP - Amp Inc.
DIAMONITE - Diamonite Products Div.
DIAZO-JET - Teledyne Rotolite
DIB - Varo Semiconductor, Inc.
DI-CAP - Dielectric Laboratories, Inc.

DIEKUT STIK-ONS - Bishop Graphics
DIFFAXIAL - University Sound
DIF FILTERS - ESC Elctrns. Corp.
DIFFRACTION HORN - Electro-Voice
DIFILM - Sprague Elec. Co.
DIG - Nova Tran Corp.
DIGIBIT - Tech Serv., Inc.
DIGICHEK - Applied Control Co.
DIGICOM - E-Systems Inc.
DIGICOUNT - Itek Corp. Meas. Sys. Div.
DIGI DECK - Intern'l. Computer Prods., Inc.
DIGI DESIGNER - E & L Instruments, Inc.
DIGIDIAL - Beckman Instrs.
DIGI-KLIPS - Components Corp.
DIGILINE - Itek Corp. Meas. Sys. Div.
DIGILOGGER - NES, Inc.
DIGIMAX - Leeds & Northrup Co.
DIGIMITE - Thermo Elec. Co., Inc.
DIGIPHASE - Racal-Dana Instrus Inc.
DIGI-PROBE - Automatic Production Systems Inc.
DIGISCALE - Itek Corp. Meas. Sys. Div.
DIGISCOPE - E-H Resch. Labs., Inc.
DIGISEC - Itek Corp. Meas. Sys. Div.
DIGI-SHAFT - Computer Conversions Corp.
DIGISTROBE - Power Instrs., Inc.
DIGISWITCH - Digitran Co.
DIGITEC - United Systems
DIGITEMP - Delta Design, Inc.
DIGITENN - Tenney Engrg., Inc.
DIGITEST FOURTEEN - National Camera Inc.
DIGITREND - Doric Sci., Div. Emerson Elec. Co.
D I LINE - UNGAR, Div.
DI-MAG - Electro Corp.
DI-MIN-ODE - General Semiconductor Industries, Inc.
DIODE-LITE - Dialight
DIP-A-DIP - Micro Electronic Systems, Inc.
DIP ALARM - Projects Unlimited, Inc.
DIP-BIT - Cambridge Thermionic Corp.
DIP-C - Grayhill Inc.
D-I-P DELAY LINES - Pulse Engrg., Inc.
DIP-DRY - Allied Chemical Corp.
DIP FLASH - Projects Unlimited, Inc.
DIP GUARD - AVX Ceramics
DIP-LITE - Refac Elctrns. Pinlite, Wild Rover
DIP/LOC - Everett/Charles, Inc.
DIP-PAC - Elfab Corp.
DIP-PAK - Fidelity Chem. Prods. Corp.
DI-PROX - Electro Corp.
DIPSWITCH - Mc Graw-Edison
DIRECTOR - Fanon/Courier Corp., Subs.
DIRECTRON - Sanford-Miller Corp.
DIRECTWELD - ITT-Higbie Mfg. Co.
DISCAPS - Radio Materials Co.
DISCOHM - Ward Leonard Elec. Co. Inc.
DISC-R-KAP - Centralab/USCC
DISPLADUCER - Larson Aero Dev.
DISSOPAD - Bivar, Inc.
DISTIK - Stanford Applied Engrg
DI-T - TRW/UTC Transformers
DIVIDER BOX - LEWISystems
D-LASAR - University Computing Co.
DLRO - Biddle, James G.
DMS - Zonic Technical Labs.
DMS/TSA - Zonic Technical Labs.
DOCUFAX - Alden Elctrn. & Impulse Recording Equip. Co.
DOLFLEX - Dolph, John C. Co.
DOLPHON - Dolph, John C. Co.
DOLPHSEAL - Dolph, John C. Co.
DOLPH-SPRAY - Dolph, John C. Co.
DOMINO - Sprague Elec. Co.
DOROIDAL - Cambridge Thermionic Corp.
DO-T - TRW/UTC Transformers
DOUBLE/BUBBLE - Hardman Inc.
DOUBLE DIAMOND - H-B Instr. Co.
DOUBLE-DIP - Grayhill Inc.
DOUBLE-SEAL - Jamesbury Corp.
DOUBLE-TALK - New-Tronics Corp.
DOW KEY - Kilovac Corp.
DPR - Hardman Inc.
DRAGON - Okonite Co.
DRI-FLO - Singer Co.
DRIFT-LOCK FLUXMETER - Walker Scientific, Inc.
DRI-MOD - Crown Microwave, Inc.
DRM2000 - Meterex Corp.
DRYATROL - Pall Trinity Micro Corp.
D-SODR SYSTEMS - Pace Inc.
DTF - Frequency Elctrns.
DU - Beckman Instrs., (AISSD)
DUALATCH - Amp Inc.
DUALAY - Okonite Co.
DUALCON - Molex Inc.
DUAL-COOLED - Siemens-Allis, Inc.
DUAL DIGITAL - Alden Elctrn. & Impulse Recording Equip. Co.
DUAL FLEX - Standard Grigsby Inc.
DUAL HI/LO FILTER - Rockland Sys. Corp.
DUAL-SCAN - GRM Corp.
DUAL-TROL - Indl Timer An Esterline Co.
DUCTER - Biddle, James G.
DUET - Sprague Elec. Co.
DUMONT E.R.P - Dutrex Inds., Inc.
DUNCO - Struthers-Dunn, Inc.
DUOBOND - Belden Corp.
DUODIAL - Beckman Instrs.
DUOFOIL - Belden Corp.
DUO MOUNT - South River Metal Prods. Co.
DUO-PATH - Innovation Industries Inc.
DUOSTAT - Beckman Instrs., (AISSD)
DUOSTAT - Duotone Co.
DUOTONE DIAMOND - Duotone Co.
DUOTROL - Autocon Inds.
DUO-TYNE - Amp Inc.
DURA-BLUE - Beckman Instrs., (AISSD)
DURAC - H-B Instr. Co.
DURACELL - Mallory Battery
DURA CLAD - Aladdin Elctrns.
DURACOLOR - Columbia Elctrn. Cables
DURA-CON - TRW/Cinch Connectors
DURA-DRY - FTS Systems Inc.
DURAFOAM - Columbia Elctrn. Cables
DURA-INK - Markal Co.
DURAMIC - Singer Co.
DURA-PAC - H-B Instr. Co.
DURASEL - Alpha Components Corp.
DURATEMP - Varian Assocs.
DURATHERM - Boston Insulated Wire & Cable Co.
DURATRAK - Gen Rad
DURON - Sprague Elec. Co.
DUROTHERM - Hexacon Elec. Co.
DUR-X-THANE - Whitmor Wire & Cable
DV 5 - JFD Electronics Components Corp.
DYAD - Soundcoat
DYKANOL - Corneli-Dubilier Electronics
DYMAC - Spectral Dynamics Corp.
DYNAC - Dynisco
DYNACOTE - Radiation Dynamics, Inc.
DYNA-CRIMP - Amp Inc.
DYNA-CU - Larson Aero Dev.
DYNA-FLEX - Lord Kinematics
DYNAFORM - Amphenol North America Div.
DYNA-JET - B & K Precision Prods. of Dynascan
DYNAKIT - Dynaco Inc.
DYNALOAD - Transistor Devices
DYNAMAG - Radiation Dynamics, Inc.
DYNAMASTER - Bristol Div. Acco
DYNA-MATE - General Elec. Co
DYNA-MATE II - General Elec. Co
DYNAMATIC - Eaton Corp.
DYNAMITRON - Radiation Dynamics, Inc.
DYNA-MOD - Dynair Elctrns. Inc.
DYNAMONITOR - Endevco
DYNA-PATCH - Dynatech Data Sys
DYNA-PHASE 35 - Stanton Magnetics, Inc.
DYNAPHONIC - Allied Electronics
DYNAPOUR - Ajax Magnethermic Corp.
DYNA-RACE - Grant Hardware Co.
DYNASOLVE - Dynaloy, Inc.
DYNASTAT - Static Inc.
DYNA-SWITCH - Dillon, W.C. & Co.
DYNA-SWITCH - Dynatech Data Sys
DYNATACH - Electric Tachometer Corp.
DYNA-TEST - Dynatech Data Sys
DYNATRAC - Ithaco, Inc.
DYNA-TROL - L & L Special Furnace Co.
DYNATROL - Automation Prdts.
DYNA-TUNE - Dynair Elctrns. Inc.
DYNOGRAPH BALANCERS - Annis R B Co.
DY-NOS-STICK - Nu-Concept Computer Systems, Inc.
DYTEK - Aerospace Avionics, Inc.
D²AMS - Bromberg Engineering
D5 - Chemtronics, Inc.
E - Electro Switch Corp.
EAGLE "A" - Eagle Magnetic Co.
EAGLE "AA" - Eagle Magnetic Co.
EAGLE "AAA" - Eagle Magnetic Co.
EARSET - Telex Communications, Inc.
EARSPLITTER - Kolin Industries
EASTOBOND - Eastman Chem. Prods.
EASY-FLO - Handy & Harman
EASYMATCH - Alford Mfg. Co.
EASYPOXY - Conap, Inc.
EASY-STRIP - Holub Industries
EATON - Eaton Corp.
EATON - Eaton Corp.
EATON - Eaton Corp.
EATON BRAND - Eaton Corp.
EB-CON - Eby Company
E-CASE - Ann Arbor Terminals, Inc.
ECCENTRIX - Tridair Inds.
ECCO - Emerson & Cuming, Inc.
ECCOL - Sprague Elec. Co.
E-CELL DEVICES - Plessey Electro-Products
ECG - GTE Sylvania Inc.
ECHO - Fanon/Courier Corp., Subs.
ECHORDER - RIL Elctrns., Inc.
ECHORDETTE - RIL Elctrns., Inc.
ECLIPSE S100,S200,C300 - Data General Corp.
ECONISTOR - General Resistance, Inc.
ECON-O-CLAD - Engelhard Minerals & Chem.
ECONOFIRE - Electro Mats. Corp. Amer.
ECONOFLUX - Alpha Metals, Inc.
ECONOGIDE - Bivar, Inc.
ECONO JET - Teledyne Rotolite
ECONO-KING - Hotpack Corp.
ECONO-LAP - Accumet Engineering Corp.
ECONOLINE - Sprague Elec. Co.
ECONO-LINE - Oak Inds. Inc.
ECONOLITE - Chicago Switch, Inc.
ECONO-MASTER - L & L Special Furnace Co.
ECONOMITE - Chicago Switch, Inc.
ECONOPAK - Electrovert
ECONO-PLY LABELERS - Monarch Marking Sys.
ECONO-PLY LABELS - Monarch Marking Sys.
ECONO-POLISH - Accumet Engineering Corp.
ECONOPOT - New England Instr.
ECONO-SKAN - Skan-A-Matic Corp.
ECON-O-TAPE - Engelhard Minerals & Chem.
ECONOVAP - T-M Vacuum Prods.
ECS - Environmental Container Sys., Inc.
EDDYSTONE - Marconi Instrs.
EDGECON - Molex Inc.
EDGEGARD HOOD - Baker Co., Inc.
EDGE-ON - Burndy Corporation
EDGE-PAC - Elfab Corp.
EDGE-TITE - Burndy Corporation
EDGE-TO-DOME - T-Bar Inc.
EDU - Efratom California, Inc.
EEV - Calvert Elctrns., Inc.
EFCOR - Gould Inc.
E-FORM - Acme Chemical & Insulation Co.
EFR - Efratom California, Inc.
E-GAS - Matheson Gas Products
EIDOPHON - Conrac Corp.
E-KOTE - Acme Chemical & Insulation Co.
ELASTIC STOP NUTS - ESNA Division
ELASTIPAR - Times Fiber Comm. Inc.
ELASTIPAR - Times Fiber Comm. Inc.
ELASTO-FLEX II - Craig Sys. Corp.
ELECTRIC LACQUER - Dolph, John C. Co.
ELECTRICORD - Pacific Electricord Co.
ELECTROC - Sprague Elec. Co.
ELECTRO-CAM - Control Systems Research, Inc.
ELECTROCOM - Electrocom Inds.
ELECTROCRAFT - GC Electronics
ELECTRO CUT - Automatic Die Cutting Mch
ELECTRODAG - Acheson Colloids Co.
ELECTRODUCT - Electrovert
ELECTROFEED - Black & Webster, Inc.
ELECTRO-FLEX - Electro Space Fabricators, Inc.
ELECTROFLO - Electrovert
ELECTRO-GRIP - Coil Co. of Amer.
ELECTROLAB - Digiac Corp.
ELECTRO-LAP SEAL - Okonite Co.
ELECTROMATE - Beckman Instrs., (AISSD)
ELECTROMAX - Leeds & Northrup Co.
ELECTRO MODULE - Warner Elec. Brake & Clutch Co.

ELECTRON EAR - Telex Communications, Inc.
SONALERT - Mallory Capacitor Co.
ELECTRONIK - Honeywell
ELECTRO-PAC - Instr. & Control Sys., Inc.
ELECTROPANE R - Libbey Owens-Ford Co.
ELECTROPUNCH - Black & Webster, Inc.
ELECTROSCAN 30 - Beckman Instrs., (AISSD)
ELECTROSET - Black & Webster, Inc.
ELECTRO-SHIELD - Estes Engrg. Co.
ELECTROSTAT - WER Industrial
ELECTROTABLE - Black & Webster, Inc.
ELECTRO-TACH - Electro Corp.
ELECTROTAPE - Cubic Corp.
ELECTRO TIME - Clare & Co., C.P.
ELECTROTRIM - Electrovert
ELECTRO-TY - Electrovert
ELECTRO-VOICE - Electro-Voice
ELECTRO-WASH - Chemtronics, Inc.
ELGARD - Elgar Corporation
ELIMINATOR - Electro-Voice
ELINCO - Electric Indicator Co., Inc.
ELIPTI-GRIP - T & B/Thomas & Betts
ELITES - E & L Instruments, Inc.
ELLIPT-O-REEL - Gabriel Elctrns. Inc.
ELMCO - Elden Mfg. Co.
ELMET - Philips Elmet Corp.
ELPH - Thermo Elec. Co., Inc.
ELT ALERT - L-Tronics
ELTRALEC - Workman Electronic Prods., Inc.
ELVOX - PASO Sound Products Inc.
EL-100 - Electrol Co., Inc.
EL-120 - Electrol Co., Inc.
EL-20 - Electrol Co., Inc.
EL-300 - Electrol Co., Inc.
EMA IRON - Electronautics
EMCOR - G. F. Business Equipment, Inc.
EMERALD - Irish Magnetic Recording Tape
EMICO - Electro-Mechanical Instru. Div.
EMI MESH STRIP - Metex Corp.
EMLOCK - Cablewave Systems Inc.
E-MODULE - Branson Cleaning Equip. Co.
EMPCO - Carolina Medical Elctrns., Inc.
EMRALON - Acheson Colloids Co.
EMT - Gotham Audio Corp.
ENCOM - Encom Prods. Co., Inc.
ENDECO - Enterprise Development Corp
ENDURA - Wonder Corp of America
ENERCON - Control Products Div.
ENERGIZED - Alpha Metals, Inc.
ENERGY MISERS - Technology Dev Corp
ENERGY OVERLOAD - Teledyne Big Beam
ENERGY SAVERS - Technology Dev Corp
ENER/PAK - Siemens-Allis, Inc.
ENGALOY - Engelhard Minerals & Chem.
ENSOLITE - Uniroyal, Inc.
ENVIRO-BLOC -
ENVIRO-BOND -
ENVIRONOL - Aerovox Inds., Inc.
ENVIRO-SWITCH - Giannini Institute
ENVIRO VAC - High Vacuum Equip. Corp.
E-PAC - Instr. & Control Sys., Inc.
EPCAR - BFGoodrich Chemical Div
EPIBASE - Motorola Semiconductor Prods.
EPICAP - Motorola Semiconductor Prods.
EPITAPE - Epicom, Inc.
EPIVIEW - Epicom, Inc.
EPOCAP - Hardman Inc.
EPOCEL - Pall Corp.
EPOCRETE - Hardman Inc.
EPOCURE - Hardman Inc.
EPOI - Nikon, Inc.
EPOLAST - Hardman Inc.
EPOLENE - Eastman Chem. Prods.
EPOMARINE - Hardman Inc.
EPOSET - Hardman Inc.
EPOSOLVE - Hardman Inc.
EPOWELD - Hardman Inc.
EPOXY TAB - Lake Chemical Co.
EPOXY-10 - Soundcoat
EPSILAM-10 - 3M Co.
EPTAK - Eagle Signal
E-QUALIDYNE - Shure Brothers, Inc.
EQUIPT-AIR - Equipto Enclosure Systems
EQUIPTO - Equipto Enclosure Systems
ERDAC MODEL 1000 - Macrodyne Inc.
ERDAC MODEL 1100 - Macrodyne Inc.
ERICKSON - T & B/Thomas & Betts
ERSA - Caig Labs., Inc.
ERSA TIP 1G - Edsyn, Inc.
ESCAP - Portescap US
ESCON - Guardian California
ESCOSIL - Esco Products
ESIAC - Electro Sci. Inds.
ESIAC - E.S.I. Inc.
ESIPOT - E.S.I. Inc.
ESIPOT - Electro Sci. Inds.
E-SOLDER - Acme Chemical & Insulation Co.
ESTANE - BFGoodrich Chemical Div
ESTAR - Sprague Elec. Co.
ESTAREL - Sprague Elec. Co.
ES-TOOLS - Emporium Specialties Co., Inc.
ETCH/PATH SYSTEM 100 - Qualco
ETCH/PATH SYSTEM 200 - Qualco
ETERNACELL - Power Conversion Inc.
ETHOFIL - Fiberfil Div. Dart Ind.
ETS - Digiac Corp.
EUC/ARDA - Electrovert
E-V - Electro-Voice
EVADER -
EVANOHM - GTE Sylvania
EVENT 1000 - Applied Data Commun.
EVENT 2000 - Applied Data Commun.
EVERDUR - Anaconda Company Brass Division
EVERFAST - Ambroid Co.
EVM - Electro-Voice
EXBUG - Motorola Semiconductor Prods.
EXECUTIVE - Fanon/Courier Corp., Subs.
EXEC & VIP - Teledyne Big Beam
EXORCISER - Motorola Semiconductor Prods.
EXORDISK - Motorola Semiconductor Prods.
EXORPRINT - Motorola Semiconductor Prods.
EXORTERM - Motorola Semiconductor Prods.
EXPANDOMATIC - Beckman Instrs., (AISSD)
EXPEEDITER - Teledyne Rotolite
EX SERIES - Teledyne Big Beam
EXTENDED RANGE - Sigma Sys. Corp.
EXTRA - Beckman Instrs., (AISSD)
EXTRALYTIC - Sprague Elec. Co.
EYECOM 108PT - Spatial Data Systems, Inc.
E-Z-CODE - T & B/Thomas & Betts
E-Z-DUO - Wadsworth Electric Mfg. Co.
E-Z-RED - Wadsworth Electric Mfg. Co.
E–Z RELEASE - Continental Connector Corp.
E-Z-TRIM - Bourns, Inc.
E-2 - Information Displays, Inc.
FABMIKA - Sprague Elec. Co.
FABRITEMP - Trans-Met Engrg.
FACELOID - Invincible Gear Co.
FACT - Hughes Aircraft Co.
FAN-FOLD - United Wiring & Mfg. Co.
FARM-O-STAT - Honeywell
FARVAL - Eaton Corp.
FASFLEX I - Shugart Assocs.
FAS'N-IT - Ambroid Co.
FAST - ABA Electromechanical Sys. Inc.
FAST - Lake Chemical Co.
FASTAIRE - Humphrey, Inc.
FASTATCH - Centralab
FASTEMP - Amprobe Instrument
FAST FIT - Cambridge Products Corp.
FASTIN-FASTON - Amp Inc.
FASTLINE - Fabri-Tek, Inc.
FASTON - Amp Inc.
FASTRAK - Gen Rad
FASTRAPS - Grayhill Inc.
FAST SCAT 204 - RF Systems, Inc.
FAST STEPPER - Grover Photo Prods.
F.A.T - Advanced Circuitry
FATHOM -
FAZE SENTRY - Coilcraft
FDD 110/200 - General Systems International Inc.
FEATHER - Rotron, Inc.
FEATHERIDE - Electro-Voice
FE, FI, FO - TRW/UTC Transformers
FERRAMIC - Indiana General
FERREX - Metex Corp.
FERRIMAG - Colt Industries
FERROSEARCH - Rank Precision Inds.
FETRON - Teledyne Semiconductor
FEURLON - Rogers Corp.
FFB - General-Electro Mechanical
FFC - General-Electro Mechanical
FFRB - General-Electro Mechanical
FIBERCOM - Radiation Devices Co., Inc.
FIBERFRAX - Carborundum Co.
FIBER-LITE - Dolan-Jenner Inds., Inc.
FIBERLOY - Rogers Corp.
FIBERTEMP - Trans-Met Engrg.
FIBROFLEX - Rank Precision Inds.
FIBROX - Rank Precision Inds.
FI-CORD - Heitz, Inc., Karl
FIDELEX - Fidelity Chem. Prods. Corp.
FIDELPLATE - Fidelity Chem. Prods. Corp.
FIELDIAL - Varian Assocs.
FIELDLAB - Beckman Instrs., (AISSD)
FILAMITE - NVF Co.
FILMATIC - Ill Tool Works
FILMBRID - Merrimac Inds., Inc.
FILMISTOR - Sprague Elec. Co.
FILMITE - Sprague Elec. Co.
FILMTRIM - Sprague-Goodman Electronics, Inc.
FILTER-CLEAN - Hollis Engrg., Inc.
FILTERCON - Erie Technological Products
FILTER FLO DIFFUSER - Weber Tech Products
FILTEROL - Sprague Elec. Co.
FILTER-RATED FERRAMICS - Indiana General
FINAL AIR - Aluminum Filter Co.
FINCO - Finney Co.
FINGRIP - Burndy Corporation
FIN-PAC - Semtech Corp.
FIRE AWAY - Kidde, Walter & Co.
FIREFLY - Dupree, Inc.
FIREROD - Watlow Elec. Mfg. Co.
FIRON - Electro Mats. Corp. Amer.
FIVE/TEN - Sloan Technology Corp.
FIX-A-DIP - Micro Electronic Systems, Inc.
FIXMASTER - Rexnord Inc.
FLAMENOL - General Electric Co.
FLAMON - Bailey Meter Co.
FLASH FLOW WELDER - Ewald Instrs. Corp.
FLASH STRIPPER - Ewald Instrs. Corp.
FLATFORMER - Inductive Components, Inc.
FLAT-HEAD - Signal Transformer Co.
FLAT PLATE - Rantec Div.
FLATSO - KDI Pyrofilm Corp
FLEXAGUIDE - Airtron
FLEX-A-PLUG - General Elec. Co.
FLEX'ATOR - Ametek, Inc
FLEXCON - Air-O-Tronics Prods.
FLEX-E-GEAR - Berg Inc., Winfred M.
FLEX-E-GRIP - Berg Inc., Winfred M.
FLEXFOAM - Columbia Elctrn. Cables
FLEXFOIL - Columbia Elctrn. Cables
FLEXIBUS - PCS., Inc.
FLEXI-COOL - FTS Systems Inc.
FLEXI-DRY - FTS Systems Inc.
FLEXI GLOVE - Clean Room Prods.
FLEXITE - Markel Corp.
FLEX-KEY - Flex Key Corp.
FLEXLEAD - Markel Corp.
FLEXLIFE - Columbia Elctrn. Cables
FLEX-LOCK - Namco Controls
FLEXLOK - Burndy Corporation
FLEXOBOND - Packaged Resins Div.
FLEXOPRENE - Standard Wire & Cable
FLEX-PAK - Bogen Div.
FLEXSTRIP - T&B/Ansley Corp.
FLEXSWITCH - Sheldahl, Inc.
FLEXTAC - Hypertronics Corp.
FLEXTECH - Markel Corp.
FLEXTEMP - Caplugs Div.
FLEXTENSION - Tech Spray, Inc.
FLEXTIME - Hecon Corp.
FLEXVYN - Tensolite Co.,
FLEX-WELD - T&B/Ansley Corp.
FLIP-A-DIP - Micro Electronic Systems, Inc.
FLIP LOC - Viking Inds., Inc.
FLIP-PAK - Delaval Turbine Inc.
FLIPPY - Information Terminals
FLIP–R - Mini-Systems, Inc.
FLOATING SHUTTLE - Qantex
FLOATROL - Autocon Inds.
FLO FUSE - Marotta Sci. Controls, Inc.
FLOMONITOR - Flow Technology, Inc.
FLO-RITE - Kester Solder Div.
FLOTRAC - Hull Corp.
FLOW-FORM - ITT Harper
FLUORALLOY - Beckman Instrs., (AISSD)

FLUOROGLIDE - Chemplast, Inc.
FLUORO-XECON - Metex Corp.
FLUOR-X - Nuclear Resch. Corp.
FLUSH-SEAL PRESSURE PLUGS - Allen Mfg. Co.
FLUX-OFF - Chemtronics, Inc.
FOAMCONE - Teledyne Micronetics
FOAMFLEX - Cablewave Systems Inc.
FOAM/FOIL - Tapecon, Inc.
FOAM WIPE - Clean Room Prods.
FOBALLOY - Plessey Inc.
FONO-MAGIC - R-Columbia Products, Inc.
FORBON - NVF Co.
FORM-A-DIP - Micro Electronic Systems, Inc.
FORMALDAFIL - Fiberfil Div. Dart Ind.
FORUM - Robins Broadcast & Sound Equipment Corp.
FOTOFET - Teledyne-Crystalonics
FOTOLECTRIC - Worner Elctrn. Devices
FOUNDATION - Westinghouse Elec. Corp.
FRAHM - Biddle, James G.
FREEZ-IT - Chemtronics, Inc.
FREON - E.I. DuPont de Nemours & Co.
FREQMETER - Solid State Electronics Corp.
FRICTION-AIRE - Blue M Electric Co.
FRIGICHIP - Melcor/Materials Elctrn. Prods.
FRIGITOTE - Melcor/Materials Elctrn. Prods.
FRK - Efratom California, Inc.
FROST AID - Chemtronics, Inc.
FROST-OFF - Merix Chem. Co.
FRT - Efratom California, Inc.
FULMAR - IMC Magnetics Corp.
FUNELET - Circon Corp.
FUSECOR - Whitmor Wire & Cable
FUSEPLUG - Arco Electronics Inc.
FUSETRON - Bussmann Manufacturing
FUSIONBRAZED - ITT-Higbie Mfg. Co.
FUSIONWELD - ITT-Higbie Mfg. Co.
FUTURA - Beckman Instrs., (AISSD)
FUZZ BUTTONS - Tecknit
FWACO - Aimsco Inc.
FYRITE - Bacharach Instrument Co.
FYR-LACE - Gudebrod Inc.
GALITE - Galileo Electro-Optics Corp.
GAMMAMET - GTE Sylvania
GAMMATROL - Nuclear Resch. Corp.
GAP KAP - Centralab/USCC
GARALEASE - Ram Chems.
GARALYST - Ram Chems.
GARDSMAN - Gulton Inds., Inc.
GARDSMAN - West Instrs
GAROX - Ram Chems.
GAS-POINTER - Bacharach Instrument Co.
GEMCOR - General-Electro Mechanical
GE-MOV - General Elec. Co.
GE-MOV VARISTORS - General Elec.
GENALEX - General Elec. Co.
GENESOLV - Allied Chemical Corp.
GENIE - General Electric Co.
GEO-MARINE - Glenair, Inc.
GEON - BFGoodrich Chemical Div
GEOPRENE - General Electric Co.
GEOSOL - Belden Corp.
GEOTROL - General Electric Co.
GIANT - General Instr. Corp.
GIANT II - General Instr. Corp.
GIBSILOY - GTE Sylvania
GIBSON GIRL - Robins Ind's. Corp.
GIGA-TRIMS - Johanson Mfg. Corp.
GLASCOTE - Dolph, John C. Co.
GLASGUARD - AVX Ceramics
GLASROD - Glastic Corp.
GLASS AMP - General Instrument Corp.
GLASSIVATED - Motorola Semiconductor Prods.
GLASWITCH - Revere Corp. of America
GLENNITE - Gulton Inds.
GLIDCOP - Glidden Metals
GLOBAR - Carborundum Co.
GLO-DOT - Industrial Devices
GOAT - Craig Sys. Corp.
GOLD STAR - Winegard Co.
GOLD TOP - General Elec. Co.
GP/DUROID - Rogers Corp.
GP-2 DAMPING SHEET - Soundcoat
GP-612 - Gulton Inds., Inc.
GRAHAM - Barker Elec. Sls.
GRALEX - General Microwave Corp.
GRAND SLAM - Potter Instr. Co. Inc.
GRAPHALLAST - Graphite Metallizing Corp.
GRAPHALLOY - Graphite Metallizing Corp.
GRAPHILM - Graphite Metallizing Corp.
GRAPHLON - Graphite Metallizing Corp.
GRAPHMETEX - Graphite Metallizing Corp.
GRAVEL MACHINES - Eastern Marking Machine Corp.
GRAVITAIN - Pall Trinity Micro Corp.
GREAT OUTDOORS - Teledyne Big Beam
GREENCAPS - Radio Materials Co.
GREENLINE (FINCO) - Finney Co.
GREEN PEAK CELL - Sensor Technology
GRIPEZE (R) - Phelps Dodge Magnet Wire Co.
GRIPLET CONNECTOR - Berg Electronics
GRIPRING - Waldes Kohinoor, Inc.
GRIPWELL - Hartwell Corp.
GROMMES - Precision Electronics, Inc.
GROMMET STRIP - Electrovert
GROMSTRIP - ICO/Rally Corp.
GROOVAC - Duotone Co.
GROUNDAMATIC - Leviton Mfg. Co., Inc.
GR874R - Gen Rad
GR900 - Gen Rad
GUARDETTE - General Elec. Co.
GUDE-DIAL CORD & CHAMPION-DIAL CORD - Gudebrod Inc.
GUDE-GLASS - Gudebrod Inc.
GUDELACE - Gudebrod Inc.
GUDE-NYLACE - Gudebrod Inc.
GUDE-SPACE - Gudebrod Inc.
GUDE-TEMP - Gudebrod Inc.
GUDE-TIES - Gudebrod Inc.
GUY-GRIP DEAD-END - Preformed Line Products Co.
GYROFLEX - Singer Co.
GYROPOISE - Stanton Magnetics, Inc.
GYROSURVEYOR - Humphrey, Inc.
HACKENSACK - Carolina Steel & Wire Corp.
HAILER JR - Audio Equip.
HALLTRON - Ohio Semitronics, Inc.
HALSTED PRESS - Wiley & Sons Inc., J.
HAM-MATE - Bird Electronic Corp.
HAMPTON MFG. - Mann, Henry Inc.
HAND-HOLE -
HANDIBIN - LEWISystems
HAN-D-MAG - Annis R B Co.
HANDY FLUX - Handy & Harman
HANDYLAB - Motorola Semiconductor Prods.
HAND-Y-TEST - Micro Electronic Systems, Inc.
HANSCOM-TIES - Hanscom, H.F. Co., Inc.
HARDSET - Hardman Inc.
HASCO - Nat'l. Band & Tag
HAWK - International Data Sciences
HAYSITE - Synthane Taylor Corp.
HC HOLTZER - Eastern Air Devices Motor Div.
HD - Clean Room Prods.
HDC - Pall Corp.
HEAT-A-DIP - Micro Electronic Systems, Inc.
HEAT GUARD - Hexacon Elec. Co.
HEAT-LES - Pall Corp.
HEAT PROVER - Bailey Meter Co.
HEATRAM - Power Designs, Inc.
HEATRAX - ICO/Rally Corp.
HEAT-SEAL STIK - Lake Chemical Co.
HEBBAR - Melles Griot
HEETSTRIP - Therm-O-Lab Corp.
HELIAX - Andrew Corp.
HELIAX - Andrew Corp.
HELI-CAL - Helical Prods. Co., Inc.
HELICOP HUT - Craig Sys. Corp.
HELICORD - Storm Products Co.
HELIDEL - Beckman Instrs.
HELIFLUX - Schonstedt Instr. Co.
HELILUBE - Beckman Instrs.
HELIOTEK - Spectrolab, Inc.
HELIPOT - Beckman Instrs.
HELITRIM - Beckman Instrs.
HELIX DESIGN - Beckman Instrs.
HEP - Motorola Semiconductor Prods.
HERALD - Herald Electronics
HERGA - Pres-Air-Trol Corp.
HERGAIR - Pres-Air-Trol Corp.
HERMASEAL - Durakool
HERMEFLEX - Singer Co.
HERMETICOOL - Tenney Engrg., Inc.
HEX-A-CORN - APM-Hexseal
HEXCLAD - Plessey Inc.
HEXSEALS - APM-Hexseal
HEX WIK - Hexacon Elec. Co.
HEYCO - Heyman Mfg. Co.
HGA/TRANSTECH - HGA Elctrns., Inc.
HG BRIGHT GOLD - Technic, Inc.
HIATT CLIPS - Electrovert
HI-BLUE CELL - Sensor Technology
HI-BREAK - General Elec. Co.
HI-BRITE, SHANNON-GLOW - Shannon Luminous Mat'ls.
HICKORY BRAND -
HI-COAT - Murata Mfg. Co. Ltd.
HI-COR - Alpha Metals, Inc.
HI-D JAX - Switchcraft, Inc.
HI-D SWITCH - Switchcraft, Inc.
HI-ETCH - General Elec. Co.
HI-EX - Kidde, Walter & Co.
HI-FLUX - Annis R B Co.
HI FY - Varian Assocs.
HI-GAUSS - Annis R B Co.
HIGHER - Information Displays, Inc.
HIGHER TIMESHARE - Information Displays, Inc.
HI-GRIP - Holub Industries
HI-JUL - Sprague Elec. Co.
HILGER WATTS - Rank Precision Inds.
HI/LO FILTER - Rockland Sys. Corp.
HI-MEG - Dolph, John C. Co.
HINIL - Teledyne Semiconductor
HINJON - T & B/Thomas & Betts
HIPOTRODE - Hipotronics, Inc.
HI POW - Electronautics
HIPPO-CLIP - Mueller Electric
HIRAD - Times Fiber Comm. Inc.
HI-SPEED - Holub Industries
*HIT - TRW/UTC Transformers
HI-TEMP - Fenwal Elctrns.
HI-THERM - Dolph, John C. Co.
HI-THRO - Allied Chemical Corp.
HIVAC EPOXIES - Sigma Plastronics, Inc.
HI-VAR - Sprague Elec. Co.
HI-VOLT - Industrial Devices
HI-Z - Ross Engineering Corp.
HKP - Porter, H.K., Inc.
HLT - Tridair Inds.
HMC - American Electronic Labs.
HOBBY TIME - Western Coil & Elec. Co.
HOLLI-CUTTER - Hollis Engrg., Inc.
HOMALITE-LR - SGL Homalite
HOMOSIL - Heraeus-Amersil, Inc.
HONEY BEE - Hurst Mfg. Corp.
HOPPER STAKER - Cambridge Thermionic Corp.
HOPSTRETCHER - Gabriel Elctrns. Inc.
HORIZON LINE - General Elec. Co.
HORNET - Hexacon Elec. Co.
HOSPITAL/INDUSTRIAL - General Elec. Co
HOT-SHOT - Capintec Instruments, Inc.
HOT TIP - Air-O-Tronics Prods.
HOTWEEZERS - Meisei Corp.
HUBLOC - Stock Drive Prods.
HUGOLD AIR PRESS - Black & Webster, Inc.
HUMIDOLAIN - Star Porcelain Co.
HUMISTAT - American Instr. Co.
HUSTLER - New-Tronics Corp.
HY-A-SIL - Sanford-Miller Corp.
HYBRIDGE - Alford Mfg. Co.
HY-BUTE/60 - General Elec. Co.
HYCAR CTBN - BFGoodrich Chemical Div
HYDENT - Burndy Corporation
HYDRIVE - Infodex, Inc.
HYDROFEED - Components Corp.
HYDRO-FLOW FLUID - Kenco Alloy & Chemical Co., Inc.
HYDROSOLV - Alpha Metals, Inc.
HYDROTECTOR - American Instr. Co.
HYFEN - Burndy Corporation
HY-FI - Varian Assocs.
HYGRADE - Markel Corp.
HYGRO-CEL - American Instr. Co.
HYGRO-CHAMP - American Instr. Co.
HYGRODYNAMICS - American Instr. Co.
HYGROSENSOR - American Instr. Co.
HYGROTRAN - American Instr. Co.
HYJOULE - Associated Research, Inc.
HYLINK - Burndy Corporation
HYLOK - Burndy Corporation
HYLUG - Burndy Corporation
HYPASS - Sprague Elec. Co.

HYPERCON - Sprague Elec. Co.
HYPERGRAF - Lundy Elctrns. & Sys., Inc.
HYPERSCAN - Lundy Elctrns. & Sys., Inc.
HYPER SEL - Alpha Components Corp.
HYPERTAC - Industrial Electronic Hardware
HYPERTAC - Hypertronics Corp.
HYPOINT - Burndy Corporation
HYPOT - Associated Research, Inc.
HYPRESS - Burndy Corporation
HYRING - Burndy Corporation
HY-THERM - Hy-Cal Engrg
IBR - Varo Semiconductor, Inc.
ICE-TROL - Honeywell
ICE41, ICE48, ICE80, ICE85, ICE86 - Intel Corp.
ICSOTIMER - Instr. & Control Sys., Inc.
ID CON - Molex Inc.
IDEA - Harris Corp.
IDENTOLINE - Brady Co., W. H.
IDIGRAF - Information Displays, Inc.
IDIIOM/II - Information Displays, Inc.
I-DIT - TRW/UTC Transformers
I-DOT - TRW/UTC Transformers
IDRAW - Information Displays, Inc.
IEE-APOLLO - Industrial Elctrn. Engrs.
IEE-ARGUS - Industrial Elctrn. Engrs.
IEE-ATLAS - Industrial Elctrn. Engrs.
IEE-AURORA - Industrial Elctrn. Engrs.
IEE-ELECTRA - Industrial Elctrn. Engrs.
IEE-HELIOS - Industrial Elctrn. Engrs.
IEE-HERCULES - Industrial Elctrn. Engrs.
IEE-IRIS - Industrial Elctrn. Engrs.
IEE-JUPITER - Industrial Elctrn. Engrs.
IEE-PROSWITCH - Industrial Elctrn. Engrs.
IEE-TITAN - Industrial Elctrn. Engrs.
IMAGESCOPE - Galileo Electro-Optics Corp.
IMCAIR - IMC Magnetics Corp.
IMCOM - I M C Magnetics
IMCON - Andersen Laboratories Inc.
IMCOOL - I M C Magnetics
IMIDEZE (R) A - Phelps Dodge Magnet Wire Co.
IMLEC - Inter-Market, Inc.
IMMERSION GOLD - Sel-Rex Div. Oxy Metal Industries Corp.
IMPAC - Semtech Corp.
IMPAC - Modular Audio Products
IMPAC - New Haven Wire & Cable
IMPAC - Velonex, Display Prods.
IMPACT-O-GRAPH - Chatsworth Data Corp
IMPAC 3 - Semtech Corp.
IMPERIAL LINE - UNGAR, Div.
IMPERVITRAN - Micron Industries Corp.
IMPLION - KSW Electronics Corp.
INCERT - Rosenthal Metceram Corp
INCOR - Incor Instrumentation, Inc.
INCUSIL 10 - GTE Sylvania Inc.
INCUSIL 15 - GTE Sylvania Inc.
INDEX-SYN - Control Systems Research, Inc.
INDOMICA - Industrial Mica Div.
INDOMICA - Humiseal Div.
INDUCT-A-RING - Unholtz-Dickie Corp.
INDUCTOSYN - Farrand Controls Div.
INDUCTOSYN - Del Electronics
INDUCTROL - General Elec. Co.
INDUSITE - Industrial Mica Div.
INDUSTRIAL 24KT GOLD - Technic, Inc.
INDUSTRITE - Boston Insulated Wire & Cable Co.
INDUSTROL 812 - Research, Inc.
INFINITRON - Bourns, Inc.
INFINITRON - Bourns, Inc.
INFINITY BRAND - ITT Harper
INFO-LITE - Info-Lite Corp.
INFOS - Data General Corp.
INFOTRAK - Leeds & Northrup Co.
INFRASIL - Heraeus-Amersil, Inc.
INSCO - Electro-Optical Inds., Inc.
INSITE - Intel Corp.
INSTA-CODE - Panduit Corp.
INSTA-LEAD - Storm Products Co.
INSTAMATOR - Diversified Electronics Co.
INSTANT LETTERING - Datak Corp.
INSTANT WELD - Oneida Electronics Mfg.
INSTA-TEST - Grand Transformers
INSTATHERM - Barnes Engrg. Co.
INSUL-BOLT - Pylon Co., Inc.
INSULCON - Carborundum Co.
INSULET - Pylon Co., Inc.
INSULETS - T & B/Thomas & Betts
INSULINER - T & B/Thomas & Betts
INSULINK - Burndy Corporation
INSULKRIMP - ITT Cannon/ETC Terminal Products
INSUL-MATE - Air-O-Tronics Prods.
INSULSPLICE - Autosplice/Dv Gen Staple
INSULTEK - Int'l. Elctrn. Resch.
INSULUBE - Int'l. Elctrn. Resch.
INSULUG - Burndy Corporation
INTEGRA - Par-Metal Prods. Inc.
INTEGRID - Elgin Elctrns., Inc.
INTELLEC - Intel Corp.
INTERCAP - International Comps Corp.
INTERCEPT. - Intersil, Inc.
INTERCETTE - Interdyne
INTERCHECK - Guildline Instrs., Inc.
INTERCHIP - International Comps Corp.
INTERCON - Dynatech Corp.
INTERFACE: A - Electro-Voice
INTERFACE 33 - Amco Engineering Co.
INTERKIT - International Comps Corp.
INTERLITE - International Comps Corp.
INTERMATIC - Intermatic, Inc.
INTERNATIONAL SERVICEMASTER - International Comps Corp.
INTEROHM - International Comps Corp.
INTERROSPONDER - Vega Precision Labs.
INTERSHAKE - Atlantic Research Corp.
INTERVOX - International Comps Corp.
INTER-8-WEAVE - Magnetic Shield Div.
INTRACON - Dynatech Corp.
INTRASPOT - Vicon Industries Inc.
INVERTER-RATED FERRAMICS - Indiana General
INVERTO-TRAN - Pulse Engrg., Inc.
INVERTRON - California Instrs.
INVOLOID - Invincible Gear Co.
IOCHROME - Materials Resch. Corp.
"ION-AIR" - Static Inc.
IONFLO - TSI Inc
"ION-FLOW" - Static Inc.
IONOGRAPH - Alpha Metals, Inc.
IPAC - Instr. & Control Sys., Inc.
IRISH - Irish Magnetic Recording Tape
IRON GRIP, V-GRIP - Equipto
ISBC - Intel Corp.
ISLATROL - Control Concepts Corp.
ISOBASE - Endevco
ISOBOX - Endevco
ISO-CURVE - Fenwal Elctrns.
ISO-ELASTIC - Chatillon John & Sons
ISOFARAD - Sprague Elec. Co.
ISOFILM - General Elec. Co.
ISOFORMER - Elcor Prods. Neotec Elctrns. Inc.
ISO-LATCH - General Valve Corp.
ISOLATIONIST - CEA
ISOLENE - Hardman Inc.
ISOLIMITER - Solidstate Controls, Inc.
ISO-LIT - Litronix
ISO-OP-AMP - Burr-Brown
ISO-PAK - Stevens-Arnold, Inc.
ISOPIL - Cir-Q-Tel, Inc.
ISOPLY - Elcor Prods. Neotec Elctrns. Inc.
ISOPODS - Hughes Aircraft Co
ISOPOLAR REFERENCE - Data Precision Corporation
ISOREX - Elcor Prods. Neotec Elctrns. Inc.
ISO-SEAL - Chatillon John & Sons
ISOSHEAR - Endevco
ISOTHERM - Victory Engrg. Corp.
ISO-TIP - Wahl Clipper Corp.
ITECO - Industrial Test Equip.
ITRON - Chemcut Corp.
IVACON - Deltec Corp.
IXF - Piezo Technology Inc.
I² - American Microsystems, Inc.
JAB-IN - Marlin Manufacturing Corp.
JACKEY - Allen Mfg. Co.
JAK-SWITCH - Chicago Switch, Inc.
JANETTE - Eastern Air Devices Motor Div.
JANSET - Jan Hardware Mfg. Co.
JAQUET - Sticht Co., Inc. Herman H.
JARECKI - Taylor-Winfield Corp.
JEM - Howell Inst. Inc.
JETCAL - Howell Inst. Inc.
JET-FLECS - Molex Inc.
JETFLOW - Ajax Magnethermic Corp.
JET PAK - Tape-Athon Corp.
JET PLATER - Sel-Rex Div. Oxy Metal Industries Corp.
JET-TEMP - General Elec. Co.
JOLTA - Jan Hardware Mfg. Co.
JONES - TRW/Cinch Connectors
JOTDRAFT - Datak Corp.
J-PAK - Theta-J Relays, Inc.
J--W - Bacharach Instrument Co.
KALAR - Hardman Inc.
KALENE - Hardman Inc.
KALEX - Hardman Inc.
KALOTRON - Thermosen, Inc.
KAMAG 14+18 - Kato Engineering Co.
KAPSEAL - Minnesota Rubber Co.
KARADIO - ATR Electronics, Inc.
KARAK - Ohio Carbon Co.
KARATCLAD - Sel-Rex Div. Oxy Metal Industries Corp.
KARI - Zi-Tech Div.
KASIL - P Q Corp.
K-DET - Hurst Mfg. Corp.
KEENSERTS - Tridair Inds.
KEEPER - Beckman Instrs., (AISSD)
KELTIP - Degussa Corporation
KELVIN KLAMPS - Electro Sci. Inds.
KELVIN KLIPS - E.S.I. Inc.
KELVIN KLIPS - Electro Sci. Inds.
KEMET - Union Carbide Corp. Elctrns. Div.
KEMFUZE - Bel Fuse
KEMPURE - Kewaunee Scien. Equip. Corp.
KENCOR - Kenton Engrg. Corp.
KEN-RAD - General Elec. Co.
KERN - Heitz, Inc., Karl
K & H - Gotham Audio Corp.
KIFIS - Kollsman Instr. Co.
KILO-PAC - Velonex, Instrument Div.
KILOVAC - Kilovac Corp.
KILOVOLT STAC - Semtech Corp.
KIMFAN - Schweitzer, Div.
KIMFOL - Schweitzer, Div.
KIMFONE - Schweitzer, Div.
KINAMATIC - General Elec. Co.
KINATROL - General Elec. Co.
KINGSPLICE - Autosplice/Dv Gen Staple
KINK-LOC - Radio Materials Co.
KINOPTIK - Heitz, Inc., Karl
KINTRAC VII - Beckman Instrs., (AISSD)
KISTLER - Sundstrand Data Control
KITTRAY ASSEMBLY CENTER - Parsons Mfg. Corp.
KLEEN-STRIP - National Wire & Cable Corp.
KLEENTROL - R-Columbia Products, Inc.
KLEER-PAK - Sprague Elec. Co.
KLEER SPRAY - Chemtronics, Inc.
KLIP-BLOK - Vector Electronic Co., Inc.
KLIPPON - Weidmuller Terminations, Inc.
KLIPRING - Waldes Kohinoor, Inc.
KLIP SELS - International Rectifier Corp.
KLIPSOCKET - Chicago Switch, Inc.
KLIPTITE - Kulka Elec. Corp.
KLIXON - Texas Instruments Control Prods. Div.
KNIGHT STICK -
KNOBPOT - Bourns, Inc.
KODACEL - Eastman Chem. Prods.
KOEPFER - Zi-Tech Div.
KOLOR-KODE - UNITRACK Div.
KONEKT-ALL - Jonard Industries Corp.
KONTACT RESTORER - Chemtronics, Inc.
KONTACT 60 - Jonard Industries Corp.
KONTAKT-CHEMIE - Regmo Data Corp.
KONTAKT WL - Regmo Data Corp.
KONTAKT 60 - Regmo Data Corp.
KONTAKT 61 - Regmo Data Corp.
KOOLER-GUIDE - UNITRACK Div.
KOOLER-KAGE - UNITRACK Div.
KOOLER-KROWN - UNITRACK Div.
KORLESS ELECTRODES - Uniform Tubes Inc.
KORVEX - Chemplast, Inc.
KPMP - Kwikset Powdered Metal Prods.
K-PRENE - Di-Acro
KRAK-STIK - Lake Chemical Co.
KRALASTIC - Uniroyal, Inc.
KRECO - Kreckman, Herb Co.
KRIMPTITE - ITT Cannon/ETC Terminal Products
K-SET - Michigan Magnetics
KSI - Kates Scientific Instruments
KSR - General Elec. Co.
KTNCASSY - Times Fiber Comm. Inc.

KV-PAC - Semtech Corp.
KV PAC PLUS - Semtech Corp.
KVPAC SR. - Semtech Corp.
KWICK-KONNECT - Sealectro Corp.
KWIKSET SEAL-BOLT - Kwikset Powdered Metal Prods.
KWIKSET SEAL-LOK - Kwikset Powdered Metal Prods.
KWIK-TAB - Accurate Electronics Corp.
KW PAC - Semtech Corp.
KYREAD - Kyros Corp.
LAB - TRW/UTC Transformers
LABPOT - Bourns, Inc.
LA-CO - Lake Chemical Co.
LA-CO ICC - Lake Chemical Co.
LAFRANCE - LaFrance Corp.
LAM - Crown Microwave, Inc.
LAMBDA - Electrovert
LAMICOR - NVF Co.
LAMPLIGHTER - Cardinal Control Co.
LAMTAC - Hypertronics Corp.
LANCELOK - Amp Inc.
LANDCOM - Turner Div.
LAPFLO - Pace Inc.
LASE-A-LIGN - Laser Inc.
LASERSCRIBE - Quantronix Corp.
LASERTRIM - Apollo Lasers Inc.
LASTEC - Laser Technology, Inc.
LASTOFLEX - Lord Kinematics
LATICRETE - Uniroyal, Inc.
LAVOLAIN - Star Porcelain Co.
LC - JFD Electronics Components Corp.
LC2 - Fifth Dimension
LD-400 - Lord Kinematics
LEAK-PRUF - Alpha Metals, Inc.
LE CARBONE - Carbone Lorraine Industries Corp.
LE CARBONE-AD - Carbone Lorraine Industries Corp.
LECTR-AU-LYTE - Sel-Rex Div. Oxy Metal Industries Corp.
LECTROFILM - General Elec. Co.
LECTROLESS - Sel-Rex Div. Oxy Metal Industries Corp.
LECTRO-NIC - Sel-Rex Div. Oxy Metal Industries Corp.
LECTURE - Robins Ind's. Corp.
L.E.D. - Packaged Resins Div.
LEEBOND - Leepoxy Plastics
LEE-BUS - Atlee Corp.
LEECAST - Leepoxy Plastics
LEE-STRIP - Atlee Corp.
LEE-TAC - Atlee Corp.
LEICA - Leitz, Inc. E.
LEKTRA/LITE - Lektra Labs., Inc.
LEKTRON - PASO Sound Products Inc.
LEPAK - Lepel Corp
LEVELAIR - Electrovert
LEVEL-TEK - Robertshaw Controls Co.
LEVEL-TEL - Robertshaw Controls Co.
LEV-O-LET - Leviton Mfg. Co., Inc.
LEVOLIER - McGill Mfg. Co. Inc.
LEV-O-LOCK - Leviton Mfg. Co., Inc.
LEWIS VERTICAL - Universal Products Engrg.
LGH - Amp Inc.
LID - Amperex Electronic Corp.
LIFESAVER - Teledyne Big Beam
LIGHT CONDITIONING - Leviton Mfg. Co., Inc.
LIGHT WATCHMAN - Ripley Co., inc.
LIMITAMP - General Elec. Co.
LIMITRON - Bussmann Manufacturing
LIMITSTAT - Hotpack Corp.
LINEAR PROX - Electro Corp.
LINE-O-LITE - Industrial Devices
LINE RADIATOR - Electro-Voice
LINE RADIATOR - Electro-Voice
LINE-VOLT - Industrial Devices
LINISTOR - Keystone Carbon Co.
LINK/CHEK - Com/Tech Systems Inc.
LINOBATE - Crystal Technology
LIQUIFLEX - Siemens-Allis, Inc.
LIQUI-NOX - Alconox Inc.
LIRA - Mine Safety Appliances Co.
LITE-A-DIP - Micro Electronic Systems, Inc.
LITE BOX - Brunswick Instr.
LITE-MIKE - EG&G, Inc.
LITHOCON - Princeton Elctrn. Prods.
LITTEL JAX - Switchcraft, Inc.
LITTEL PLUG - Switchcraft, Inc.
LITTEL SWITCH - Switchcraft, Inc.
LITTLE CAESAR - ITT Cannon Electric
LITTLE CHAMP - Channellock, Inc.
LITTLE GEM - Equipto
LITTLE GEM - Sjoberg, C. & Son, Inc.
LITTLE GEM - Sjoberg, C. & Son, Inc.
LITTLE GIANT -
LITTLE JOE - MacDonald & Co.
LITTLE L-PER - L-Tronics
LITTLE 7 - Holub Industries
LITTL-LYTIC - Sprague Elec. Co.
LIVE-LOCK - Tridair Inds.
LMB - Heeger Inc.
LMB - LMB Heeger, Inc.
LOAD MANAGER - Pacific Technology
LOAD-PAK - Delaval Turbine Inc.
LO-CATE - Beukers Labs., Inc.
LOCATOR - LocAtor Electronics Co.
LOCK-A-DIP - Micro Electronic Systems, Inc.
LOCKIT-SOCKET - U.S. Terminals
LOCKTITE - T & B/Thomas & Betts
LOCKWELL - Hartwell Corp.
LO-COG - Pittman Corp.
LOCOST - Julie Research Lab.
LOC-TRAC - Alpha Wire Corp.
LO-CYCLE - Annis R B Co.
LO-FLO - Singer Co.
LOGAN - Instruments for Industry, Inc.
LOGCELL - Fifth Dimension
LOGICAL CONNECTION - A.P. Products
LOGICTESTER - Trendar
LOGILINE - Sprague Elec. Co.
LOGIPAK - Sprague Elec. Co.
LOGITRAN - Fabri-Tek, Inc.
LOGO-LITE - Zero Corp.
LOHMETER - Alpha Components Corp.
LOKON - Allen Mfg. Co.
LONCO COPPERBRITE - London Chemical Co.
LONCO SEALBRITE - London Chemical Co.
LONCO SONIC-SOLVE - London Chemical Co.
LONCOTERGE - London Chemical Co.
LONER - Edsyn, Inc.
LONGFELLOW - Waters Mfg., Inc.
LONGHAIR - Stanton Magnetics, Inc.
LORCAP - Arco Electronics Inc.
LO-SMOKE - Boston Insulated Wire & Cable Co.
"LOUD-N-CLEAR" - Robins Ind's. Corp.
LO-VOLT - Industrial Devices
LOW PROFILE - Airtrol Corp.
LOW-VAR - Republic Elctrns. Corp.
LOXARMOR - Okonite Co.
LOX THERMISTOR - Victory Engrg. Corp.
LPB - Unimax Switch Corp.
LR SERIES - E & L Instruments, Inc.
LSHV - Boston Insulated Wire & Cable Co.
LST - Hotpack Corp.
LTN & LTNM - Fenwal Elctrns.
LUBE-LOK - Electrofilm, Inc.
LUBRI-BOND - Electrofilm, Inc.
LUBRI-SHINE - Tech Spray, Inc.
LUG-IT - T & B/Thomas & Betts
LUMAPAC - EWC, Inc.
LUMEN METER - EG&G, Inc.
LUMITEN - Robins Broadcast & Sound Equipment Corp.
LUXICON - Dolan-Jenner Inds., Inc.
LX-CJ - Omega Engrg., Inc.
LYREC - Gotham Audio Corp.
LYRIC - Rotron, Inc.
MACK RELAYS - Mack Elec. Devices
MADT - Sprague Elec. Co.
MAE - Lundy Elctrns. & Sys., Inc.
MAGCENTRIC - Cambridge Thermionic Corp.
MAGFLO - Hotpack Corp.
MAGIC CIRCLE - A.R.F. Products
MAGIC SERIES - Delco Electronics Div.
MAGIC TIP - Marshall Industries
MAGIC WAND - Sticht Co., Inc. Herman H.
MAGMAN - Stearns Magnetics Inc.
MAGMOD - General Magnetics
MAGNACAPS - Radio Materials Co.
MAGNAGLO - Magnaflux Corp.
MAGNAPAK - Westinghouse Elec.
MAGNA-SET - Princo Instrs.
MAGNATRAK - Westinghouse Elec.
MAGNECORD - Telex Communications, Inc.
MAGNE-GAGE - American Instr. Co.
MAGNELOGIC - Coilcraft
MAGNEMETRICS - Walker Scientific, Inc.
MAGNEMODULES - Stearns Magnetics Inc.
MAGNERASER - Amplifier Corp. of America
MAGNEREED - Solid State Electronics Corp.
MAGNESEARCH - RFL Inds.
MAGNESIL - Magnetics
MAGNETIC TWEEZER - Orbit Inds.
MAGNETREATER - RFL Inds.
MAGNETTE - Heinemann Elec. Co.
MAGNION - Walker Scientific, Inc.
MAGNI-WHIRL - Blue M Electric Co.
MAGOLITE - Varian Assocs.
MAG-PAC - Elfab Corp.
MAGSENSE - Pioneer Instrumentation
MAGTECH - Magnetic Technology
MAJOR - Rotron, Inc.
MANIX MFG - Mann, Henry Inc.
MANSON - Okonite Co.
MARAGLAS - Acme Chemical & Insulation Co.
MARASET - Acme Chemical & Insulation Co.
MARCOFLEX - Oak Inds. Inc.
MARINE BIG STICK -
MARINEFAX - Alden Elctrn. & Impulse Recording Equip. Co.
MARINE LANCER -
MARINER - Intech/Function Modules
MARINE SEABEE -
MARK C - Cole Instrument
MARK-EL - Acme Model Engrg. Co.
MARKETTE - Memorex Corp.
MARK I - Tech. Devices Co.
MARK II - Tech. Devices Co.
MARK III - Tech. Devices Co.
MARK III - Gulton Inds., Inc.
MARK IV - CATV Communications
MARK IV HAMMER - Dataproducts Corp.
MARK IX - Tech. Devices Co.
MARKSMAN - Gulton Inds., Inc.
MARK TEN, MARK TEN "B", MARK TEN "C" - Delta Products
MARK V - CATV Communications
MARK V - Tech. Devices Co.
MARK VI - Tech. Devices Co.
MARK X - Memorex Corp.
MARK XI - Memorex Corp.
MARK 4 - Auto-trol Corp.
MARLOX - Marlin Manufacturing Corp.
MARTECH - Markel Corp.
MARZ R - Materials Resch. Corp.
MAS - TRW/UTC Transformers
MASKCOAT - Western Coating Co.
MASK-N-GLASS - Chemtronics, Inc.
MASQ-MATIC - Sel-Rex Div. Oxy Metal Industries Corp.
MASTERCOUNT - Master Elctrn. Controls
MASTERLINE - Blonder-Tongue Labs., Inc.
MASTER-MITE - Master Appliance Corp.
MASTERTIME - Master Elctrn. Controls
MASTR - General Electric Co.
MAT - Sprague Elec. Co.
MAT - TRW/UTC Transformers
MATE-N-LOK - Amp Inc.
MATRI DOT - Practical Automation, Inc.
MATRIX IV - Zero Corp.
MAX-C - JFD Electronics Components Corp.
MAXI-COLOR - Belden Corp.
MAXIDEK - Digi-Data Corp.
MAXI-DRY - FTS Systems Inc.
MAXI-QUBETM - American Technical Ceramics
MAZEMASTER - Addison Div. Muirhead, Inc.
MCI-II - Hollis Engrg., Inc.
M.C.M. - Electro-Craft Corp.
MCMOS - Motorola Semiconductor Prods.
MCRT - Himmelstein & Co., S.
MCS - Intel Corp.
MC² - Pyle-National Co
MDTL - Motorola Semiconductor Prods.
MD-1 - E & L Instruments, Inc.
MD12 - Fabri-Tek, Inc.
MEASUROMETER - Analogic Corp.
MECL - Motorola Semiconductor Prods.
MECL 10,000 - Motorola Semiconductor Prods.
MEDI-SAFE - Brand-Rex Co.
MEDWIRE - Cohn Corp., Sigmund
MEGABEAM -
MEGACHASSIS - Intel Corp.

MEGAMEMORY - Electronic Memories & Magnetics Corp.
MEGATROMETER - Penn Airborne Prods.
MEGAVOICE - PASO Sound Products Inc.
MEG-CHEK - Associated Research, Inc.
MEGGER - Biddle, James G.
MEGMETER - Ross Engineering Corp.
MEGOHMER - Sticht Co., Inc. Herman H.
MEGRAPHIC - Megatek Corp.
MEKTHERM - Rogers Corp.
MEKTRON - Rogers Corp.
MELACEL - Palt Trinity Micro Corp.
MELCOR - Melcor/Materials Elctrn. Prods.
MEM-O-REE - Mylee Digital Sciences
MEMORY N/C - Summit Engineering Corp.
MEMOTRON - Hughes Aircraft Co.
MEN AT WORK - Teledyne Big Beam
MENEHUNE MAGIC GLUE - Oneida Electronics Mfg.
MENTOR - Biddle, James G.
MERCOTAC - Meridian Lab.
MERIX ANTI-STATIC FOR RECORDS - Merix Chem. Co.
MET - Sprague Elec. Co.
MET - Minnesota Electric Tech. Inc.
MET - TRW/UTC Transformers
META-CAST - Mereco Products Div.
META-DUCT - Mereco Products Div.
METALASTIC - Metex Corp.
METALEX - Metex Corp.
METALOK - Burndy Corporation
METAL STICKERS - Hughes Aircraft Co.
METAMETER - Bristol Div. Acco
METANET - Sprague Elec. Co.
METATONE - Bristol Div. Acco
METATRONIC - Bristol Div. Acco
META 4 - Digital Scientific
MET COIL - Rosenthal Metceram Corp
METFILM - Sprague Elec. Co.
MET GOLD - Rosenthal Metceram Corp
MET-LOC - Deutsch Fastener Corp.
METOXILITE - Semtech Corp.
MET PAC - Rosenthal Metceram Corp
METRISITE - Gould, Inc.
METRO BASKET - Metropolitan Wire Corp.
METROBEAM - Metrologic Instruments, Inc.
METRO CARTS - Metropolitan Wire Corp.
METRO-CHECK - Metropolitan Circuits Inc.
METRO-COAT - Metropolitan Circuits Inc.
METRO-COLOR - Belden Corp.
METRO MAGIC - Levit Electronics, C. M.
METROTUBE - Levit Electronics, C. M.
METSO - P Q Corp.
ME-2 - Scanbe Div., Zero Corp.
MHTL - Motorola Semiconductor Prods.
MICACLAD - Electric Machinery Mfg. Co.
MIC AMP R MODULES - Avantek, Inc.
MICAP - Tobe Deutschmann Labs., Inc.
MICAPAK - Mica Corporation
MICAPLY - Mica Corporation
MICHIGAN - Electro-Voice
MICLAD - Siemens-Allis, Inc.
MICRO-ACOUSTIC - Frazier, Inc.
MICROAUTOSTAT - Static Inc.
MICRO BEAD - Victory Engrg. Corp.
MICROCAP - American Technical Ceramics
MICROCHOPPER - Solid State Electronics Corp.
MICROCLAREED - Clare & Co., C.P.
MICRO-CLEAN - Hollis Engrg., Inc.
MICRO-CNC - Summit Engineering Corp.
MICROCOAX - Uniform Tubes Inc.
MICROCUBE - Engelmann Microwave
MICRO-ETCH - Buckbee Mears Co.
MICROFIBRE - Balston, Inc.
MICRO-FILTER - RF Interonics
MICROFLASH - EG&G, Inc.
MICROFLEX - Eagle Signal
MICROFORK - Murata Mfg. Co. Ltd.
MICROFUSE - Littelfuse, Inc.
MICRO-GATOR - Mueller Electric
MICROGUIDE - Norsal Industries, Inc.
MICRO HANDLER - Bulova Systems & Instrument Corp.
MICROHEX - Sealectro Corp.
MICRO I - Delevan Div., Coil Prods.
MICRO-JAX - Switchcraft, Inc.
MICRO-KLEAN II - AMF Inc.
MICROLET - Circon Corp.
MICROMAP - Intel Corp.
MICRO-MASTER - Keuffel & Esser Co.
MICROMATIC - Ill Tool Works
MICRO-MESH - Buckbee Mears Co.
MICRO-MINAC - Singer Co.
MICRONOVA - Data General Corp.
MICRONOX - Caddock Electronics, Inc.
MICRONTA - Allied Electronics
MICRO-OPTIC - Dolan-Jenner Inds., Inc.
MICRO-PAC - Semtech Corp.
MICROPAC BASIC - PCS., Inc.
MICROPAC MODULES - PCS., Inc.
MICROPAC RT - PCS., Inc.
MICROPAC 80/A - PCS., Inc.
MICROPIN - ITT Cannon Electric
MICROPIX - Litton Inds.
MICRO-PLUG - Switchcraft, Inc.
MICROPROBE - Circon Corp.
MICROPROCESS - University Computing Co.
MICRORAM - Electronic Memories & Magnetics Corp.
MICROREED - Solid State Electronics Corp.
MICRO-SCREEN - AMF Inc.
MICROSEARCH - Rank Precision Inds.
MICROSOCKET - ITT Cannon Electric
MICROSPEC - Beckman Instrs., (AISSD)
MICRO-STAC - Semtech Corp.
MICROSTAR - American Optical Corp.
MICRO-SYNCLAMPS - Timber-Top, Inc.
MICRO-T - Motorola Semiconductor Prods.
MICRO TECH - Sprague Elec. Co.
MICROTEL - GTE Lenkurt Inc.
MICROTEMP MULTIPROTECTOR - Micro
MICROTEMP - Micro
MICROTOOL - Circon Corp.
MICRO-TOPOGRAPHER - Gould, Inc.
MICROTRON - Litton Inds.
MICRO-VECTORBORD - Vector Electronic Co., Inc.
MICRO VIDEO METROLOGY - Circon Corp.
MICROVOX - Micro Communications Corp.
MICROVOX WAFER - Micro Communications Corp.
MICRO WYND II - AMF Inc.
MICROZONE - Beckman Instrs., (AISSD)
MIDA - Motorola Semiconductor Prods.
MIDGET - Sprague Elec. Co.
MIDGET - Harris Corp.
MIDGI-CODER - Refac Elctrns. Pinlite, Wild Rover
MIDGI-COUNTER - Refac Elctrns. Pinlite, Wild Rover
MIDGI-DIAL - Theta Instr. Corp.
MIDGI-LITE - Refac Elctrns. Pinlite, Wild Rover
MIDIDEK - Digi-Data Corp.
MIDWAY - Leviton Mfg. Co., Inc.
MIGHTY MITE -
MIKBUG - Motorola Semiconductor Prods.
MIKE-O-METER - Sprague Elec. Co.
MILCLAD - Cincinnati Milacron
MIL-ENE 783551 - Gore, W.L. & Assocs.
MIL-E-STORE - Dataproducts Corp.
MILK-TROL - Honeywell
MILLIKEN - Teledyne Camera Sys.
MILLISEC - Stevens-Arnold, Inc.
MIL-LOC - Deutsch Fastener Corp.
MILMASTER - Electron-Machine Corp.
MIL-ON 941877 - Gore, W.L. & Assocs.
MILROS - Alpha Metals, Inc.
MILWAUKEE WROT - Wrought Washer Mfg., Inc.
MINA-GEAR - General Elec. Co.
MINEAC - Barnes Engrg. Co.
MIN-E-PITCH - Berg Inc., Winfred M.
MINERALIGHT - Ultra-Violet Prods., Inc.
MINESPOT - Mine Safety Appliances Co.
MINIATURE - DAN-L Inc.
MINI-AUD - Dynair Elctrns. Inc.
MINI-BAL - Dynair Elctrns. Inc.
MINI BEE - Hurst Mfg. Corp.
MINIBLOC - Motorola Semiconductor Prods.
MINIBOX - Plessey Capacitors
MINIBREAKER - Mechanical Products, Inc.
MINIBUG - Motorola Semiconductor Prods.
MINI-BULK - Baron-Blakeslee
MINI/BUS - Rogers Corp.
MINIBUTTON - Digitran Co.
MINI-CATOR - Industrial Devices
MINICHINE - Pace Inc.
MINI-CONSOLE - Techmar Corp.
MINI-CUBER - American Technical Ceramics
MINI-DAP - Dynair Elctrns. Inc.
MINI-DATA RECORDER - Raymond Engrg. Inc.
MINI-DAV - Dynair Elctrns. Inc.
MINI-DAVS - Dynair Elctrns. Inc.
MINIDEK - Digi-Data Corp.
MINI-DEK - Braemar Computer Devices
MINI-DIAL - Theta Instr. Corp.
MINI-DIP - Refac Elctrns. Pinlite, Wild Rover
MINIDISC PACKAGE - Hughes Aircraft Co.
MINIDISK - Information Terminals
MINIDISKETTE - Shugart Assocs.
MINI-DOT - Industrial Devices
MINIDRIVE - Qantex
MINIDUCTOR - TRW/UTC Transformers
MINI-FADE - Dynair Elctrns. Inc.
MINIFLOPPY - Shugart Assocs.
MINI-GATOR - Mueller Electric
MINI-GUN - Raychem Corp.
MINI HANDLER - Bulova Systems & Instrument Corp.
MINI-IMP - T-M Vacuum Prods.
MINIKEY - Digitran Co.
MINILEVER - Digitran Co.
MINILOAD - Bird Electronic Corp.
MINILOK - Burndy Corporation
MINILYTIC - Sprague Elec. Co.
MINI-MATRIX - NES, Inc.
MINI-METOXILITE - Semtech Corp.
MINI-METRIC - Allen-Bradley Co.
MINI-MIKE - Chicago Switch, Inc.
MINI MITE - Thermo Elec. Co., Inc.
MINI-MIX - Switchcraft, Inc.
MINI-MOD - Dynair Elctrns. Inc.
MINI MODEM - Cermetek, Inc.
MINI-MONITOR - Bird Electronic Corp.
MINI-MOP - Dynair Elctrns. Inc.
MINI-MOV - General Elec. Co.
MINIOHM - General Resistance, Inc.
MINI-POWER - Integrated Circuits, Inc.
MINI-PRE - Dynair Elctrns. Inc.
MINIPROGRAMMER - Cole Instrument
MINI-PROX - Electro Corp.
MINI-RAYCORDER - Raymond Engrg. Inc.
MINI-READER - American Instr. Co.
MINIREED - Solid State Electronics Corp.
MINISAT - Powertech, Inc.
MINISCAT - RF Systems, Inc.
MINI SENTRY - Laser Systems Corp.
MINISERT - Berg Electronics
MINISERVO - Esterline Angus
MINI-SLIDE - Industrial Devices
MINI-SPEED - Electro Corp.
MINISPLICE - Autosplice/Dv Gen Staple
MINI-SPLIT - Dynair Elctrns. Inc.
MINISTAC - Semtech Corp.
MINISTAC FAST - Semtech Corp.
MINISTIC - Semtech Corp.
"MIN-ISTOR" - Quality Thermistor
MINI-STORE - Dataproducts Corp.
MINISTREAKER - Shugart Assocs.
MINI-STUD - Semtech Corp.
MINI-STUD - Semtech Corp.
MINISWITCH - Digitran Co.
MINI-SYNCLAMPS - Timber-Top, Inc.
MINITAC - Hypertronics Corp.
MINI-TACH - Electro Corp.
MINITAPE - Cubic Corp.
MINI-TECH - International Data Sciences
MINI-TEST - Industrial Devices
MINI-TEST - International Data Sciences
MINITHIN - Thermax Wire Corp.
MINI-TWISTER - Storm Products Co.
MINI-VOLT - Industrial Devices
MINI-3 - Dynair Elctrns. Inc.
MINI-6 - Dynair Elctrns. Inc.
MINNI E - Amphenol North America Div.
MINNISCRUBBERS - Tech Spray, Inc.
MIPS - Tasker Systems
MIRROPANE - Libbey Owens-Ford Co.
MISCO REDLINE - Minneapolis Speaker Co.
MISSILITE - Oak Inds. Inc.
MIX-KIT - Hardman Inc.
MKS BARATRON - MKS Instrs., Inc.
MLC - Radio Materials Co.
ML6 - Meridian Lab.
MMD-1 - E & L Instruments, Inc.
MOBILARM - Midwest Electronic Industries

MOBILEFLASH - Midwest Electronic Industries
MOBILFONE - Mobil Electronics, Inc.
MOBILITE - Midwest Electronic Industries
MOBILMATIC - Mobil Electronics, Inc.
MOBILPAGE - Midwest Electronic Industries
MOBILPAK - Mobil Electronics, Inc.
MOBILTEL - GTE Lenkurt Inc.
MOBILTEMP - Midwest Electronic Industries
MOBILTONE - Mobil Electronics, Inc.
MOD-CAB - Par-Metal Prods. Inc.
MODEL AP - ITT General Controls
MODEL D DECADE - ITT General Controls
MODEL T - Hurst Mfg. Corp.
MODEL UP - ITT General Controls
MOD POT - Allen-Bradley Co.
MODSCAN - LFE Control System Industries
MOD-U-CARD - NES, Inc.
MODU/FLEX - Industrial Fabrication
MODULAIR - Rotron, Inc.
MODULE-MASQ - Sel-Rex Div. Oxy Metal Industries Corp.
MODULE-MATIC - Sel-Rex Div. Oxy Metal Industries Corp.
MODULE-X - Sel-Rex Div. Oxy Metal Industries Corp.
MODULINE - Oak Inds. Inc.
MODUL/MATIC - Lektra Labs., Inc.
MODULOAD - Bird Electronic Corp.
MODULOK - Burndy Corporation
MODUPAC - Analogic Corp.
MODUPERF - Data Specialties
MODUPRINT - Practical Automation, Inc.
MODUPULSE - Vicon Industries Inc.
MODUTRIM - JFD Electronics Components Corp.
MOHAWK - Rotron, Inc.
MOISTURPUMP - Electro Impulse
MOLALLOY - Pure Carbon Co., Inc.
MOLAN - Harrel, Inc.
MOLD-EASE CONC. PCR - Merix Chem. Co.
MOLDED HEAT - Sierracin/Thermal Sys.
MOLGARD - Ram Chems.
MOLYDAG - Acheson Colloids Co.
MOLYSPRAY - Philips Elmet Corp.
MONARCH - Carter Motor Co.
MONOBEAM - Beckman Instrs., (AISSD)
MONOBLOC - Erie Technological Products
MONOBOND - Packaged Resins Div.
MONOCERAM - San Fernando Elec. Mfg.
MONOCHIP - Interdesign Inc.
MONO-GLASS - Centralab/USCC
MONO-KAP - Centralab/USCC
MONOLYTHIC - Sprague Elec. Co.
MONOPOXY - Hardman Inc.
MONOSET - Telex Communications, Inc.
MONOXOR - Bacharach Instrument Co.
MORNICK - COSAR Corp.
MOR-PAC - Semtech Corp.
MOTOGARD - Power Control Corp.
MOTOMATIC - Electro-Craft Corp.
MOTOTROL - Autocon Inds.
MOUNTY - Teledyne Big Beam
MPC - Maury Microwave Corp.
MPF - Maury Microwave Corp.
MP12 - Fabri-Tek, Inc.
MR. BATTERY - Power, Inc.
MR. CLEAN - Chicago Switch, Inc.
MRTL - Motorola Semiconductor Prods.
MSP - Joslyn Elctrn. Sys.
MSTRE GRIP - Mereco Products Div.
MS-111 - Miller-Stephenson Chem. Co., Inc.
MS-122 - Miller-Stephenson Chem. Co., Inc.
MS-1500 EN-RUST NONFLAMMABLE - Miller-Stephenson Chem. Co., Inc.
MS-160 FREON - Miller-Stephenson Chem. Co., Inc.
MS-166 EN-STAT - Miller-Stephenson Chem. Co., Inc.
MS-170 1,1,1 - Miller-Stephenson Chem. Co., Inc.
MS-175 FREON - Miller-Stephenson Chem. Co., Inc.
MS-180 FREON - Miller-Stephenson Chem. Co., Inc.
MS-185 FREON - Miller-Stephenson Chem. Co., Inc.
MS-190/MS-190 HD - Miller-Stephenson Chem. Co., Inc.
MS-200 - Miller-Stephenson Chem. Co., Inc.
MS-220 AERO-DUSTER - Miller-Stephenson Chem. Co., Inc.
MS-226 COBRA - Miller-Stephenson Chem. Co., Inc.
MS-230 CONTACT RE-NU - Miller-Stephenson Chem. Co., Inc.
MS-238 CONTACT RE-NU & LUBE - Miller-Stephenson Chem. Co., Inc.
MS-240 QUIK-FREEZE - Miller-Stephenson Chem. Co., Inc.
MS-260 - Miller-Stephenson Chem. Co., Inc.
MS-450 - Miller-Stephenson Chem. Co., Inc.
MS-500 PORTA-VAC - Miller-Stephenson Chem. Co., Inc.
MS-520 PORTA-PUMP - Miller-Stephenson Chem. Co., Inc.
MTLC - JFD Electronics Components Corp.
MTM - Raymond Engrg. Inc.
MTNS - General Instr. Corp.
MTOS - General Instr. Corp.
MTTL - Motorola Semiconductor Prods.
MU-CAPS - Republic Elctrns. Corp.
MUCON - Republic Elctrns. Corp.
MUFFIN - Rotron, Inc.
MULTIBIT - Electronic Memories & Magnetics Corp.
MULTI-CELL II - Motorola Semiconductor Prods.
MULTI-CJ - Omega Engrg., Inc.
MULTI-COMP - Sprague Elec. Co.
MULTI-COOL - FTS Systems Inc.
MULTIDEX - Oak Inds. Inc.
MULTIDIAL - Spectrol Electronics Corp.
MULTIDUCTOR - Ajax Magnethermic Corp.
MULTIFLASH - EG&G, Inc.
MULTIMEMORY - Electronic Memories & Magnetics Corp.
MULTI MITE - Thermo Elec. Co., Inc.
MULTI-MODE TONOTRON - Hughes Aircraft Co.
MULTIPAK - PTX-Pentronix, Inc.
MULTIPLE MICROFLASH - EG&G, Inc.
MULTIPLIER - Hollingsworth Solderless Terminal Co.
MULTI-PRINTER - ITT General Controls
MULTIREED - Thermosen, Inc.
MULTI-STRIP 834484 - Gore, W.L. & Assocs.
MULTI-SWAGE - Bead Elctrns.
MULTI-SWITCH - Switchcraft, Inc.
MULTISYN - Del Electronics
MULTI-TERM - Stanford Applied Engrg
MULTI-TET 680712 - Gore, W.L. & Assocs.
MULTIWIRE - Multiwire Div., Kollmorgen
MULTIWIRE - Photocircuits Div., Kollmorgen
MULT-PAC - Elfab Corp.
MUSHIELD - MuShield Co.
MUSICASTER - Electro-Voice
MU-STAT - Princo Instrs.
MVM - JFD Electronics Components Corp.
MW MRTL - Motorola Semiconductor Prods.
MXM-100 - Midgard Electronics
MX2503 - Meterex Corp.
MX2578 - Meterex Corp.
MYKROY - Synthane Taylor Corp.
MYSTR - Waters Mfg., Inc.
NAFOAM - National Wire & Cable Corp.
NAFOIL - National Wire & Cable Corp.
NANALINE - Bel Fuse
NANISTOR - General Resistance, Inc.
NANOHEX - Sealectro Corp.
NANOMEMORY - Electronic Memories & Magnetics Corp.
NANOS - Rotron, Inc.
NANO-SKAN - Skan-A-Matic Corp.
NANOTRAN - Stevens-Arnold, Inc.
NARROW-CAPS - Republic Elctrns. Corp.
NATIONAL - Nat'l. Band & Tag
NATITE - Nat'l Ceramic Co.
NCC STANTS - Matsuo Elec. Co.
NEG'ATOR - Ametek, Inc
NELWELD - Nelson Stud Welding TRW Inc.
NEPTUNE - San Fernando Elec. Mfg.
NETIC - Magnetic Shield Div.
NEUMANN - Gotham Audio Corp.
NEUTRALITE - Siemens-Allis, Inc.
NEUTRONEX - Sel-Rex Div. Oxy Metal Industries Corp.
NEW EASY - Porter, H.K., Inc.
N-GAS - Matheson Gas Products
NIAL - GTE Sylvania
NICKELPLY - Nat'l-Standard Co.
NICORO - GTE Sylvania Inc.
NICORO 80 - GTE Sylvania Inc.
NICUSIL 3 - GTE Sylvania Inc.
NIGHT LARK - Teledyne Big Beam
NIGHTSUN - Spectrolab, Inc.
NIGUARD - AVX Ceramics
NIMPAC - Velonex, Instrument Div.
NIORO - GTE Sylvania Inc.
NIROMET - GTE Sylvania
NIRON - GTE Sylvania
NI SPAN C ALLOY 902 - Engelhard Minerals & Chem.
NITEGARD - General Electric-MIDPS
NITE-HAWK - LocAtor Electronics Co.
NITROPHYL - Rogers Corp.
NIXIE - Burroughs Corp.
NO ARC - Chemtronics, Inc.
NOBRUSH - Gerator Corporation
NOISEFOE - Mine Safety Appliances Co.
NO-MAR - PIC Design Div.
NO-NIK - Clauss Cutlery Co.
NONTACT - Trans-Met Engrg.
NORAC - Boston Insulated Wire & Cable Co.
NORBATHERM - Cross Electronics Inc.
NORDBAK - Rexnord Inc.
NORDIC - Viking Inds., Inc.
NORELCO - North American Philips Lighting Corp.
NORMATIC - Square D Co.
NORMATYPE - Keuffel & Esser Co.
NORPAK - Square D Co.
NORSEMAN - Erikson Specialized Tool Co.
NORSMAN - Viking Inds., Inc.
NORTH SEEKER - Humphrey, Inc.
NO-SLIP - PIC Design Div.
NOVA- - Data General Corp.
NOVADISC - Data General Corp.
NOVAERTER - Nova Electric Mfg. Co.
NP-7 - Gulton Inds., Inc.
N-S ROCKET WIRE - Nat'l-Standard Co.
NTP - Gotham Audio Corp.
NU BLAC - Star Porcelain Co.
NU-COLOR - Oneida Electronics Mfg.
NURL-LOC - Elctrn. Molding Corp.
NUSYN - Mesur-Matic Electronics Corp.
NUTSERT - Avibank Mfg. Inc.
NYEBAR - Nye, William F., Inc.
NYETACT - Nye, William F., Inc.
NYLAFIL - Fiberfil Div. Dart Ind.
NYLAKRIMP - ITT Cannon/ETC Terminal Products
NYLATCH - Hartwell Corp.
NYLEZE (R) - Phelps Dodge Magnet Wire Co.
NYLOBOND - Amp Inc.
NYLOCLIP - Burndy Corporation
NYLODE - Fiberfil Div. Dart Ind.
NYLOX - Hardman Inc.
NYSTAGMOTRAC - Beckman Instrs., (AISSD)
NYTYE - Heyman Mfg. Co.
#800 DIPSERT IC BASE - Solder Removal Co.
#880 INSERTIC TOOL - Solder Removal Co.
#885 PUL-N-SERTIC TOOL - Solder Removal Co.
OBSERVER - Blonder-Tongue Labs., Inc.
ODIN - Viking Inds., Inc.
ODS - Wiremold Co.
OFFSCAT - RF Systems, Inc.
O-GAS - Matheson Gas Products
OHFST - Heraeus-Amersil, Inc.
OHIOHM - Ohio Carbon Co.
OHMEGA - Mica Corporation
OILDAG - Acheson Colloids Co.
OILON PV80 - Cadillac Plastic & Chemical
OILOSTATIC - Okonite Co.
OKOCLAD - Okonite Co.
OKOCORD - Okonite Co.
OKOFLEX - Okonite Co.
OKOGUARD - Okonite Co.
OKOLENE - Okonite Co.
OKOMETAL - Okonite Co.
OKOPRENE - Okonite Co.
OKOSEAL - Okonite Co.
OKOSHEATH - Okonite Co.
OKOTHERM - Okonite Co.
OLYMPIC SERIES - C-COR Elctrns.
OMAG, MULTISCOPE - Heitz, Inc., Karl
OMEGA - Beckman Instrs., (AISSD)
OMEGACLAD - Omega Engrg., Inc.
OMEGALOK - Omega Engrg., Inc.
OMEGA METER - Kenco Alloy & Chemical Co., Inc.
OMEGATITE - Omega Engrg., Inc.
OMMI-COAT - Nuclear Resch. Corp.
OMNEPHASE - Omnetics, Inc.
OMNETIME - Omnetics, Inc.
OMNI-AMP - Omega Engrg., Inc.
OMNI CELL - Metex Corp.

OMNICLOSURE - Techmar Corp.
OMNICON - Bausch & Lomb, A.S. Div.
OMNIDAPTOR - Aldshir Mfg.
OMNIFEROUS - Nicolet Scientific Corp.
OMNIFLO - Flow Technology, Inc.
OMNI-GLOW - Industrial Devices
OMNIGRAPHIC - Houston Instrument
OMNI-II - Sloan Technology Corp.
OMNI-LERT - Industrial Devices
OMNIPROX - Scientific Technology
OMNISCRIBE - Houston Instrument
OMNISORT - E-Systems Inc.
OMNI-SPRA - Tech Spray, Inc.
OMNITESTER - Automatic Production Systems Inc.
OMNY-BUS - Methode Elctrns., Inc.
OMNY-PAC - Methode Elctrns., Inc.
ONE-DROP - Oneida Electronics Mfg.
ON THE BALL - Merix Chem. Co.
ON THE ROAD - Teledyne Big Beam
OPEN-AIRE - Sennheiser Elctrn. Corp.
OPERATIONAL FILTER - Rockland Sys. Corp.
OPTEC - Auto-trol Corp.
OPTECON - DATA TECHnology, Inc.
OPTICEL I - UCE, Inc.
OPTIMA - Optima Enclosures
OPTION BLOCKS - Pulse Engrg., Inc.
OPTITHERM - Barnes Engrg. Co.
OPTI-TRACK - Auto-trol Corp.
OPTIVUE PLUS - Channel Master Div. Avnet
OPTO PACK - Sensor Technology
OPTOSAFE - Scientific Technology
OPTOSIL - Heraeus-Amersil, Inc.
OPTOSWITCH - Scientific Technology
ORANGE DROP - Sprague Elec. Co.
ORASORB - Sel-Rex Div. Oxy Metal Industries Corp.
ORBITORR - Sloan Technology Corp.
ORCON - Switchcraft, Inc.
ORIGINAL BRIGHT GOLD - Sel-Rex Div. Oxy Metal Industries Corp.
OROCLAD - Technic, Inc.
OROMERSE - Technic, Inc.
OROMERSE BR - Technic, Inc.
OROSENE 999 - Technic, Inc.
OROSENE 999 GOLD - Technic, Inc.
OROTEMP 24 GOLD - Technic, Inc.
OROTHERM HT - Technic, Inc.
ORTHOMODE - Varian Assocs.
ORTHONOL - Magnetics
ORTHONULL - Gen Rad
ORTHOSIL - Thomas & Skinner, Inc.
ORTHOSTAR - Aertech Industries
ORYX - Telvac Instr. Co.
OSCIDUCER - Solid State Electronics Corp.
OSHINO LAMPS - Oshino Electric Lamp Works, Ltd
OUTDOORSMAN - Teledyne Big Beam
OXSIL - Sprague Elec. Co.
OXYTRON - Sel-Rex Div. Oxy Metal Industries Corp.
OYLTITE-STIK - Lake Chemical Co.
O-30 - General Elec.
PACE - A & D Electrical Instruments
PACECOM - Pace Wire & Cable Corp.
PACENTER - Pace Inc.
PACENTER - Pace Inc.
PACE/PAK - International Rectifier Corp.
PACER - Sprague Elec. Co.
PACPOLE - Electrovert
PACPOLE - Electrovert
PADLOAD - MFE Corp.
PAGEMASTER - Bogen Div.
PAINTSTIKS - Markal Co.
PAK-RAK - UNITRACK Div.
PAK SERIES - Sloan Technology Corp.
PAK-X-TRAC - Nu-Concept Computer Systems, Inc.
PALCO - GTE Sylvania Inc.
PALL - Pall Trinity Micro Corp.
PALLABAR - Technic, Inc.
PALLADEX - Sel-Rex Div. Oxy Metal Industries Corp.
PALLADIUM RT - Technic, Inc.
PALLAMERSE - Technic, Inc.
PALLCELL - Pall Corp.
PALL CELL - Pall Trinity Micro Corp.
PALL-FLO - Pall Trinity Micro Corp.
PALLMATIC - Pall Trinity Micro Corp.
PALORO - GTE Sylvania Inc.
PAMCO - Paraplegics Mfg.
PANALYZER - Panametrics Inc.
PANAPLEX - Burroughs Corp.
PANAPRESS -
PAN-A-TROL - General Elec. Co.
PANAVOX - Wilder Engrg. Prods, Inc.
PANCAKE - Wiremold Co.
PANDUCT (R) - Panduit Corp.
PANEL MITE - Tech Labs., Inc.
PANHANDLE - GTE Lenkurt Inc.
PAN-L-CLAD - Photo Chemical Prods. Cal.
PAN-L-SCREW - Dupree, Inc.
PAN-TERM - Panduit Corp.
PAN-TERM (R) - Panduit Corp.
PANTHER - Okonite Co.
PAN-TY (R) - Panduit Corp.
PAPER RITER - Lake Chemical Co.
PARACONVERTER - LNR Communications, Inc.
PARAJUST - Parametrics, Div. Zero-Max Inds.
PARARECEIVER - LNR Communications, Inc.
PARATROL - Parametrics, Div. Zero-Max Inds.
PATCH-OHM - Cambridge Thermionic Corp.
PATHE ELECTRONIC - Heitz, Inc., Karl
PATHFINDER - Astro-Med
PATHFINDER - Brady Co., W. H.
PATRIOT - Rotron, Inc.
PCB IMPAC - Semtech Corp.
PCQ - Ultra-Violet Prods., Inc.
PC-6 - Princeton Elctrn. Prods.
PDQ - Stanford Applied Engrg
PEAC - Barnes Engrg. Co.
PEAK ACCELERATION RECORDER - Engdahl Enterprises
PEAKLITE - Penn Keystone Corp.
PEAK SHOCK ANNUNCIATOR - Engdahl Enterprises
PEAK SHOCK RECORDER - Engdahl Enterprises
PEC (WITHIN A DIAMOND) - Centralab
PEDALINE - Line Elec an Esterline Co.
PED-A-VAC - Pace Inc.
PEE-WEE - Mueller Electric
PEGI - Adalet-PLM Div
PEM - Penn Engrg. & Mfg. Corp.
PEMFLEX - Penn Engrg. & Mfg. Corp.
PEMHEX - Penn Engrg. & Mfg. Corp.
PEMSERT - Penn Engrg. & Mfg. Corp.
PEM-SERTER - Penn Engrg. & Mfg. Corp.
PENFILE - Jonard Industries Corp.
PEN-RAY - Ultra-Violet Prods., Inc.
PENTAFLOW - Pamotor
PEP-500 - Princeton Elctrn. Prods.
PERI-APOLLAR - Heitz, Inc., Karl
PERMA-CELL - General Elec. Co.
PERMAFOAM - Columbia Elctrn. Cables
PERMALEX - General Elec. Co.
PERMALINE - Columbia Elctrn. Cables
PERMANODE - Sel-Rex Div. Oxy Metal Industries Corp.
PERMA-RESIN - Photo Chemical Prods. Cal.
PERMA-SHIELD - Brady Co., W. H.
PERMA-TORQ - Cambridge Thermionic Corp.
PERMOHM - Belden Corp.
PERMOPAD - Bivar, Inc.
PERSONA-PHONE - Telex Communications, Inc.
PESTILYZER - Varian Assocs.
PETROSORB - Pall Trinity Micro Corp.
P-F - Gagne Assocs., Inc.
PHANTOM POWER - Gotham Audio Corp.
PHAZOR - Industrial Test Equip.
PHENOLITE - NVF Co.
PHENOWELD - Hardman Inc.
PHONE/SCRIBER - Alpha Components Corp.
PHOTACT - Keuffel & Esser Co.
PHOTENTIOMATIC - Moririca Elctrns., Ltd.
PHOTOBRIDGE - Moririca Elctrns., Ltd.
PHOTO ETCH - Datak Corp.
PHOTO-LUX - Photo Chemical Prods. Cal.
PHOTOMOD - Clairex Elctrns. Inc.
PHOTO-OPTIC - Dolan-Jenner Inds., Inc.
PHOTOREPEATER - GCA/Burlington Div.
PIANO-DIP - Grayhill Inc.
PICABOND - Amp Inc.
PIC-A-DIP - Micro Electronic Systems, Inc.
PIC-A-RATIO - PIC Design Div.
PICOCLAREED - Clare & Co., C.P.
PICOFUSE - Littelfuse, Inc.
PICOMIN - Endevco
PICO-PAC - Velonex, Instrument Div.
PICOREED - Clare & Co., C.P.
PICOTEMP - Micro
PICOTRIM - Voltronics Corp.
PIDG - Amp Inc.
PIELEFORK - Murata Mfg. Co. Ltd.
PIELEOSCILATOR - Murata Mfg. Co. Ltd.
PIERCE - Lake Chemical Co.
PIEZITE - Endevco
PIEZOBALANCE - TSI Inc
PIEZOTITE - Murata Mfg. Co. Ltd.
PIEZOTRON - Sundstrand Data Control
PIGGY - T & B/Thomas & Betts
PIGMY-HIPPO - Mueller Electric
PIL - TRW/UTC Transformers
PIN BAR - Lear Siegler
PINHEAD - Sprague Elec. Co.
PINLITE - Refac Elctrns. Pinlite, Wild Rover
PIN SAVER - Air-O-Tronics Prods.
PINSETTER - Molex Inc.
PIONEER - Magnetic Products, Inc.
PIP - TRW/UTC Transformers
PIPETITE PASTE & STIK - Lake Chemical Co.
PIPIX - Litton Inds.
PISTONCAP - Sprague Elec. Co.
PISTONCAP - Sprague-Goodman Electronics, Inc.
PITMO - Pittman Corp.
PITOT HEATER CURRENT DETECTOR - Micro Technical Industries
PITRAN - Stow Labs., Inc.
PIXIE - Endevco
PIXIEPOT - Duncan Electronics, Inc.
PLANETGEAR - Haydon Switch & Instr., Inc.
PLAQOHM - Ward Leonard Elec. Co. Inc.
PLASLODE - Fiberfil Div. Dart Ind.
PLASLUBE - Fiberfil Div. Dart Ind.
PLASMAC - National Electronics
PLASMAFLUX - Walker Scientific, Inc.
PLASMA-LUX/PLASMALUX - Cherry Electrical Prods. Corp.
PLASMA-POWER - Crestronics Inc
PLASTI-BOND - Amp Inc.
PLASTIBOX - LEWISystems
PLASTIFORM - 3M Co.
PLASTI-GRIP - Amp Inc.
PLASTILEASE - Ram Chems.
PLASTI-METAL - Anchor Plastics
PLASTI-PAK - Centralab
PLASTO-JOINT STIK - Lake Chemical Co.
PLATANEX - Sel-Rex Div. Oxy Metal Industries Corp.
PLATANIUM ANODES - Sel-Rex Div. Oxy Metal Industries Corp.
PLATINUM N - Technic, Inc.
PLATINUM TP - Technic, Inc.
PLENCO - Plastics Engrg. Co.
PLIKE - Marshall Industries
PLUG-IN ANALYZERS - Nelson Ross Elctrns.
PLUGMOLD - Wiremold Co.
PLUG-N-PROBE - Air-O-Tronics Prods.
PLUG STAT - Control Prods., Inc.
PLUMBICON - Amperex Electronic Corp.
PLYCON - Methode Elctrns., Inc.
PLYO-DUCT - Methode Elctrns., Inc.
PMB - General-Electro Mechanical
PMC - General-Electro Mechanical
POCKET MAGNETOMETERS - Annis R B Co.
POGO CONTACT - Pylon Co., Inc.
POGO LAMP - Dupree, Inc.
POKE-HOME - Amphenol North America Div.
POLAFRAME - Metex Corp.
POLA-H - Metex Corp.
POLARBEAM -
POLARFLEX 10 - Western Coating Co.
POLARHEX - Hughes Aircraft Co., Connecting Devices Div.
POLARING - Metex Corp.
POLARIZING SCREWLOCKS - Continental Connector Corp.
POLASHEET - Metex Corp.
POLASTICK - Metex Corp.
POLASTRIP - Metex Corp.
POL-LAR - Precision Paper Tube Co.
POLY-C - General Elec. Co.
POLYCARBAFIL - Fiberfil Div. Dart Ind.
POLY-CLEAN - Hollis Engrg., Inc.
POLYCYCLE - General Elec. Co.
POLY-DIMENSIONAL - Amco Engineering Co.
POLYDYNE - General Elec. Co.

POLYFOAM - Essex Grp - Indl Wire Prods Div.
POLYLEWTON - LEWISystems
POLY-LOK -
POLY Q - Beckman Instrs., (AISSD)
POLYRAD - Brand-Rex Co.
POLYSCIN - Harshaw Chemical Co.
POLYSEAL - General Elec. Co.
POLY-SEAL RESINS - Sigma Plastronics, Inc.
POLYTRAN - Harshaw Chemical Co.
POLYTWIST - Poly-Scientific
POLYVOLT - General Elec. Co.
POP RIVETS - USM Corp.
PORCUPINE - Metex Corp.
PORCUPINE METALASTIC - Metex Corp.
PORON - Rogers Corp.
PORTALARM - Scientific Technology
PORTAMETRIC - E.S.I. Inc.
PORTAMETRIC - Electro Sci. Inds.
PORTATEMP - Trans-Met Engrg.
PORTA-TRACE - Gagne Assocs., Inc.
PORTIONATOR - Glenmarc Mfg. Inc.
POSI-GROUND - Hexacon Elec. Co.
POSISTOR - Murata Mfg. Co. Ltd.
POSITRAK - Delta Design, Inc.
POWER - Integrated Circuits, Inc.
POWERACE - A.P. Products
POWERBASE - Motorola Semiconductor Prods.
POWERBLOCK POWER SYSTEM - Powertech, Inc.
POWER COMMANDER - RIL Elctrns., Inc.
POWER DIP - Theta-J Relays, Inc.
POWER-DYNE - Raymond Engrg. Inc.
POWERFET - Teledyne-Crystalonics
POWER-GLAS - General Elec.
POWERGRIP - Uniroyal, Inc.
POWERHOUSE - Teledyne Big Beam
POWER-LINE - University Sound
"POWER LINE EMULATOR" - Ratelco, Inc.
POWERLYTIC - Sprague Elec. Co.
POWERMAKER - Topaz Electronics
POWER MARK + - General Elec. Co.
POWER-MATIC - Power-Matic Inc.
POWER MOV - General Elec. Co.
POWER-O-MATIC 60 - Blue M Electric Co.
POWER-O-MATIC 70 - Blue M Electric Co.
POWER-O-MATIC 80 - Blue M Electric Co.
POWER-PLUS - Fanon/Courier Corp., Subs.
POWER POINT - Electro-Voice
POWERSTAT - Superior Electric Co.
POWER-STYLE - Square D Co.
POWERTHERM - Gentron Corp.
POWERTRON - Industrial Test Equip.
POWER/VAC - General Elec. Co.
POWER VERTER - Alpha Components Corp.
POW-R-DISC - Westinghouse Elec. Corp.
POW'R ETCH - Datak Corp.
POXYLUBE - General Devices Co., Inc.
PRAM - Harris Semiconductor
PRECISION - GCA/Precision Scientific
PRECISION - GCA/Precision Scientific
PRECISION - GCA/Precision Scientific
PRECISION - GCA/Precision Scientific
PRECISION - GCA/Precision Scientific
PRECISION - GCA/Precision Scientific
PRECO - Precision Paper Tube Co.
PREENX - General Electric Co.
P/REL - Standard Grigsby Inc.
PRE-MET FILTER - Sel-Rex Div. Oxy Metal Industries Corp.
PREP-LAP - Taylor-Winfield Corp.
PRES-LOC - Deutsch Fastener Corp.
PRESSERTS - Precision Metal Prods. Co.
PRESS-FIT - Sealectro Corp.
PRESSLITE - Oak Inds. Inc.
PRESS-SURE-MATE - Molex Inc.
PRESSURE-LOCK - General Elec. Co
PRESSURETROL - Honeywell
PRESTEST - Cutler-Hammer, Inc.
PRIMO - Primo Company Ltd.
PRINCESS LINE - UNGAR, Div.
PRINCETON 801 - Princeton Elctrn. Prods.
PRINTACT - Executone, Printact Relay Div.
PRINT-LOK - Sprague Elec. Co.
PRINTOHM - Sprague Elec. Co.
PRITCHARD PHOTOMETER - Photo Research Corp.
PROBEYE - Hughes Aircraft Co.
PROBOTROL - Autocon Inds.
PROFESSIONAL - Components Corp.
PROFIL - Fiberfil Div. Dart Ind.
PRO I - Telex Communications, Inc.
PROKAR - Sprague Elec. Co.
PROLOID - Teledyne Micronetics
PROMAX 500 - General Elec.
PRO-MED - Jaesic Industries Co.
PROMPT - Intel Corp.
PRONG-LOCK - Waldes Kohinoor, Inc.
PROPELLON - Heeger Inc.
PROPIMAX - Rotron, Inc.
PROPORTIONALL - Hotpack Corp.
PRO-TEC - Jaesic Industries Co.
PROTECTOCOATS - Alpha Metals, Inc.
PROTECTOSWITCH - Black & Webster, Inc.
PROTECTOX - Technic, Inc.
PROTISTOR - Carbone Lorraine Industries Corp.
PROTO-BOARD - Continental Specialties Corp.
PROTO-CLIP - Continental Specialties Corp.
PROTONEX - Sel-Rex Div. Oxy Metal Industries Corp.
PROTOTYPES BY KOTOKAST - Minnesota Rubber Co.
PROXAGARD - Gordon Engineering Corp.
PROXISWITCH - Photobell Co., Inc.
P*-SHOOTER (*POLYMER) - Hardman Inc.
PSI - Tridair Inds.
PSS - PASO Sound Products Inc.
PSS - Pall Trinity Micro Corp.
PTM-66 - Lektra Labs., Inc.
PUL-A-DIP - Micro Electronic Systems, Inc.
PULL-THRU - Hughes Aircraft Co., Connecting Devices Div.
PULSCRIPT - General Elec. Co.
PULSECURITY - A.R.F. Products
PULSE-DOT - Circon Corp.
PULSELECTOR - A.R.F. Products
PULSENDER - A.R.F. Products
PULSE-RATED TOROIDS - Indiana General
PULSIGNAL - A.R.F. Products
PULSISTOR - Victory Engrg. Corp.
PULTEC - Pulse Techniques, Inc.
PUPPETS - Bishop Graphics
PUR-A-GOLD - Sel-Rex Div. Oxy Metal Industries Corp.
PUREBIDE - Pure Carbon Co., Inc.
PUREBON - Pure Carbon Co., Inc.
PUSH-PENNY - T & B/Thomas & Betts
PV - Berg Electronics
PVB - Electro Sci. Inds.
PVB - E.S.I. Inc.
PVCA - Brand-Rex Co.
PVZ - General Elec. Co.
PWR-PAC - Elfab Corp.
PYRAL - Gotham Audio Corp.
PYRANOL - General Elec. Co.
PYRANOL TRANSFORMER - General Elec. Co.
PYR-AU-BOND - Sel-Rex Div. Oxy Metal Industries Corp.
PYROBOND-PT-333 - Ultra Carbon Corp.
PYROCON - Alnor Instrument Co.
PYROFUZE - Cohn Corp., Sigmund
PYROMARK - Tempil Div.
PYROMATIC - Alnor Instrument Co.
PYRO PANEL - Research, Inc.
PYRO-TECH - Ultra Carbon Corp.
PYROTEST - West Instrs
PYROTEST - Gulton Inds., Inc.
PYROTROLLER - Alnor Instrument Co.
PYROTRON - Bailey Meter Co.
PZT - Vernitron Piezoelectric Div.
QC - Electro-Voice
QCC - Alpha Wire Corp.
Q-FLEX - Sundstrand Data Control
QHT - General Elec. Co.
QIKLATCH - Burndy Corporation
QIKSTACK - Burndy Corporation
QO - Square D Co.
QR - Tridair Inds.
QSR - General Elec. Co.
QUAD - CVC Products, Inc.
QUAD-O-DYN - Minnesota Rubber Co.
QUAD-O-STAT - Minnesota Rubber Co.
QUADRADAR - ITT Gilfillan Div. of ITT
QUADRAPHASIC CONVERSION - Data Precision Corporation
QUADRA-POWR - Jamesbury Corp.
QUAD-X - Minnesota Rubber Co.
QUALIFIER 901 - Fairchild Sys. Technology
QUANTACHRON - Matrix Corp.
QUANTUM - Channel Master Div. Avnet
QUANTUM L - Memorex Corp.
QUAT 2 - Clean Room Prods.
QUELARC - Pyle-National Co
QUENCHARC - Ill Tool Works
QUICK-CRIMP - Gould Inc.
QUICKDRAW - Summit Engineering Corp.
QUICK-E-POLES - Wiremold Co.
QUICKEY - Chomerics, Inc.
QUICKIE - Berg Electronics
QUICK-SET - H-B Instr. Co.
QUICK-SITE - H-B Instr. Co.
QUICK-TRACER - VIZ Manufacturing Co.
QUICK-WEDGE - Kedman Co.
QUIET - RHG Elctrns. Lab.
QUIETROLE - Quietrole Co.
QUIK/BUS - Rogers Corp.
QUIK-CHANGE - Industrial Devices
QUIK-CIRCUIT - Bishop Graphics
QUIK-E - Pioneer Instrumentation
QUIK/PIK - Akro-Mils, Inc.
QUIK-WRAP - Jonard Industries Corp.
QUIL - Motorola Semiconductor Prods.
QUINSTEP - Berger-Lahr Corp
QUINTRONIC - Berger-Lahr Corp
QUSO - P Q Corp.
QWIK-TY - Glenair, Inc.
Q200 - Barco Chem. Prods. Inc.
RA-CON - Eby Company
RADAR SEN - Radatron Corp.
RADAX - Electro-Voice
RADEL - Union Carbide, Chemicals & Plastics
R.A.D.I. - Westronics
RADI-FLUX - Hy-Cal Engrg
RADIOHM - Centralab
RAHAM - General Microwave Corp.
RAILITE - Tensolite Co.,
RAINBOW - Oak Inds. Inc.
RAISEDLAY - Engelhard Minerals & Chem.
RALLY - Wonder Corp of America
RALLY RAP - ICO/Rally Corp.
RAMANEL - Ram Chems.
RAMASET - Ram Chems.
RAMCON - Hills-McCanna Co.
RAM-PAC POWER SOURCES - Reliability Inc.
RAM PART - Ram Chems.
RAMROD - Motorola Semiconductor Prods.
RANGE RIDER - International Data Sciences
RAPIDOGRAPH - Koh-I-Noor Rapidograph
RAPIDOGRAPH - Koh-I-Noor Rapidograph
RAPIDOMETRIC - Koh-I-Noor Rapidograph
RAPID RACK - Scanbe Div., Zero Corp.
RAPIDRAW - Koh-I-Noor Rapidograph
RAPID-SET - Mereco Products Div.
RAPID-SYN - Rapidsyn Co
RATIOHMIC RESISTANCE - Data Precision Corporation
RATIOMETRIC OHMS - Racal-Dana Instrus Inc.
RATIO-PROBE - Capintec Instruments, Inc.
RATIO-SCOPE - Capintec Instruments, Inc.
RAYCHRON - Bristol Saybrook Co.
RAYCORDER - Raymond Engrg. Inc.
RAYLAY - Solid State Electronics Corp.
RAYMASTER - Gates & Co., Inc., Geo. W.
RAYMER - Trutone Elctrns., Inc.
RAYNGER - Raytek Div. Optical Coating Lab
RAYOTUBE - Leeds & Northrup Co.
RAYOVIN - Raychem Corp.
RAYSISTOR - Raytheon Co.
RAYSISTOR - Raytheon Co.
RAYTHEON/TAG - Raytheon/TAG Semiconductors Ltd.
R-CASE - Ann Arbor Terminals, Inc.
REACTALLOY - Electro Mats. Corp. Amer.
REACTOSPEED - Autocon Inds.
REACTROL - General Elec. Co.
READ-A-DIP - Micro Electronic Systems, Inc.
REAL-AL - Acme Chemical & Insulation Co.
REALISTIC - Allied Electronics
REAL TIME I, II, III - Datawest Corp.
RECIPROMATIC - Gen Rad
RE-CIRK-IT - Heinemann Elec. Co.
RE-COIL - Miller, Co. L.C.
RECTODYNE - Christie Elec.

RED CAP - Erie Technological Products
REDDI-WRAP - Storm Products Co.
REDDY - T & B/Thomas & Betts
RED-EYE - Capintec Instruments, Inc.
RED LIGHTNING - Superior Flux & Mfg. Co.
RED-LIT - Litronix
RED MARVEL - Superior Flux & Mfg. Co.
RED TOP - Sprague Elec. Co.
RED TOP - H-B Instr. Co.
REEDLAYS - Computer Comps.
REEVELEC - Reeve Electronics, Inc.
REF BLOC - Hy-Cal Engrg
REF CEL - Hy-Cal Engrg
REFLEX - Christie Elec.
REGADYNE - Control Products Corp.
REGAL - Commercial Elec. Heating Devices & Mfg., Inc.
REGATRAN - Electronic Measurements
REGATRON - Electronic Measurements
REGENT - Carter Motor Co.
REGULIMIT - Hotpack Corp.
REGULINER - Solidstate Controls, Inc.
REGULTYIC - Sprague Elec. Co.
REGU/TRAN - Siemens-Allis, Inc.
REGUTRON - Electric Machinery Mfg. Co.
REJECTAPAK - Rank Precision Inds.
RELIABRAZE - Alpha Metals, Inc.
RELI-ACON - Methode Elctrns., Inc.
RELIACOR - Alpha Metals, Inc.
RELIAFOAM - Alpha Metals, Inc.
RELIALAB - Tenney Engrg., Inc.
RELI-ALOK - Methode Elctrns., Inc.
RELIANCE - Singer Co.
RELI-APAC - Methode Elctrns., Inc.
RELI-APLANE - Methode Elctrns., Inc.
RELI-APLUG - Methode Elctrns., Inc.
RELIAROS - Alpha Metals, Inc.
RELIASOLV - Alpha Metals, Inc.
RELIATEMP - Tenney Engrg., Inc.
RELY-OHM - Engelhard Minerals & Chem.
REMOVE-A-PAD - Dynaloy, Inc.
REMOV-IC - Solder Removal Co.
REMRAD - Nuclear Resch. Corp.
RESDELOC - Fanon/Courier Corp., Subs.
RESINITE - Precision Paper Tube Co.
RESISTON - Bourns, Inc.
RESIST-O-STAT - General Resistance, Inc.
RESISTOX - Glidden Metals
RESISTWEEZ - Pace Inc.
RESNET - Beckman Instrs.
RESOLON - Duncan Electronics, Inc.
RESPONSE SPECTRUM ANNUNCIATOR - Engdahl Enterprises
RESPONSE SPECTRUM RECORDER - Engdahl Enterprises
RE-TIP - Solder Removal Co.
RETRACTO - Times Fiber Comm. Inc.
REVERBERTRON - Robins Broadcast & Sound Equipment Corp.
REVER-SYNCLAMPS - Timber-Top, Inc.
REV-TROL - Electrol Co., Inc.
RHENEX - Sel-Rex Div. Oxy Metal Industries Corp.
RHENIUM A - Technic, Inc.
RHEOMET - Kester Solder Div.
RHINO-HIDE - Pacific Electricord Co.
RHODEX - Sel-Rex Div. Oxy Metal Industries Corp.
RHODIUM SULPHATE TP - Technic, Inc.
RIBBON WRAP - Gore, W.L. & Assocs.
RIBFLEX - Ward Leonard Elec. Co. Inc.
RIGID-TUBE - Unarco-Rohn
RIGIMESH - Pall Corp.
RIM - Princeton Applied Resch. Corp.
RING-GUN - Waldes Kohinoor, Inc.
RING-JECTOR - Waldes Kohinoor, Inc.
RING-MOUNT - Waldes Kohinoor, Inc.
RING-O-MAT - Waldes Kohinoor, Inc.
RIPPLE ROUND - Alpha Metals, Inc.
RIPPLEWELD - Ill Tool Works
RIVET-LOC - Sealectro Corp.
R/M PREDICTOR - University Computing Co.
R-N - Res-Net Corp.
ROBISTAT - Robicon Corp.
ROBOT - Heitz, Inc., Karl
ROBOTEC - Power Designs, Inc.
ROCK-A-LITE - Leecraft Mfg. Co., Inc.
ROCK CLOCK - Telesis Laboratory
ROCKETTE - Cutler-Hammer, Inc.
ROCK-WIPE SWITCH - Cherry Electrical Prods. Corp.
RODAR - GTE Sylvania
ROHN - Unarco-Rohn
ROL-A-CHART - Rol-a-chart Div.
ROLLTEMP - Trans-Met Engrg.
ROLLTRONIC - Trans-Met Engrg.
ROLOCON - Meridian Lab.
ROLOX - Hardman Inc.
ROL-PAK - Waldes Kohinoor, Inc.
ROSITE 3250 & 3550 - Rostone Corp.
ROSITE 3450 - Rostone Corp.
ROSITE 3550FM - Rostone Corp.
ROTA-CRIMP - Amp Inc.
ROTOCODE - Cherry Electrical Prods. Corp.
ROTOCON - Meridian Lab.
ROTOLITE MARK III - Teledyne Rotolite
ROTOPULSER - Dynapar Corp.
ROTOSIL - Heraeus-Amersil, Inc.
ROTO-TELLITE - Master Specialties Co.
ROTO-TRACK - Barnes Engrg. Co.
ROTRAN - Inland Motor Div. Kollmorgen
ROYALITIC - Industrial Condenser Corp.
ROYTRON - Sweda Int'l.
RP INDUSTRIAL FILTER - Research Prods. Corp.
RP MV EZ KLEEN AIR FILTER - Research Prods. Corp.
RP SUPER E Z KLEEN AIR FILTER - Research Prods. Corp.
RT - Allied Chemical Corp.
RT/DUROID - Rogers Corp.
RTS/EMULATOR - Com/Tech Systems Inc.
RUBICON - Penn Airborne Prods.
RUBRGLAS - APM-Hexseal
RUF-NEK - Hughes Aircraft Co., Connecting Devices Div.
RUSH - Eraser Co.
RUSTRAK - Gulton Inds., Inc.
RUTHENEX - Sel-Rex Div. Oxy Metal Industries Corp.
RUTHENIUM TP - Technic, Inc.
RX GEARS - Instru-Lec Corp.
SABER-CHAMP - American Instr. Co.
SABRE TOOTH - T & B/Thomas & Betts
SAFE-ALARM - Thermax Wire Corp.
SAFE-PAK - Delaval Turbine Inc.
SAFESCAN - Dolan-Jenner Inds., Inc.
SAFE START - Jaesic Industries Co.
SAFE-T-KLIP - Industrial Devices
SAFE-T-KORD - Industrial Devices
SAFETY-SPEC - Cadillac Plastic & Chemical
SAF-T-PLUG - Dynamic Instr. Corp.
SA-FUSE - Electric Machinery Mfg. Co.
SAKALLOY - Saki Magnetics Inc.
SALI - Adalet-PLM Div
SALMET - Heeger Inc.
SAL-MET - LMB Heeger, Inc.
SAM - Decitek
SAMGUARD - Aerolite Elexs Corp.
SAMR - Brelonix, Inc.
SAM-100 - Brelonix, Inc.
SAN-DEL - Odell Co., M. P.
SANS-A-FUSE - Workman Electronic Prods., Inc.
SAR - Varo Semiconductor, Inc.
SARA-SONIC - Sara Sales Co.
SARA 7 - Sara Sales Co.
SAUCER - Rotron, Inc.
SBG - Mallinckrodt, Inc.
SCA - Semicoa, Inc.
SCANFARE - Fanon/Courier Corp., Subs.
SCAN-X - Del Electronics
SCIENCE FAIR - Allied Electronics
SCOPE--MOBILE - Tektronix, Inc.
SCOTCH - 3M Co.
SCOTCHCAST - 3M Co.
SCOTCHFLEX - 3M Co.
SCOTCHTITE - 3M Co.
SCR-RATED - Indiana General
SD5 - Chemtronics, Inc.
SEALDBIN, SEALDTANK, SEALDRUM - Uniroyal, Inc.
SEALECTROBOARD - Sealectro Corp.
SEALECTROCARD - Sealectro Corp.
SEALECTROSWITCH - Sealectro Corp.
SEALFLEX - Electric Machinery Mfg. Co.
SEALINK - Burndy Corporation
SEALOCK - General Elec. Co
SEAL-PAC - General Elec. Co.
SEAL-STOP - Seal-Peel, Inc.
SEARCH & RESCUE - Teledyne Big Beam
SECRECY RESIN - Sigma Plastronics, Inc.
SECRE/DATA - Com/Tech Systems Inc.
SECRE/FAX - Com/Tech Systems Inc.
SECRE/VOX - Com/Tech Systems Inc.
SECUR-A-TACH - Dennison Mfg. Co.
SECUR-A-TIE - Dennison Mfg. Co.
SECURE-COPY VIDEO CASSETTE - Video Automation Systems Inc.
SECURIKEY - National Security Systems
SE-CUR-IT - Ambroid Co.
SE/DUROID - Rogers Corp.
SEED - Belden Corp.
SEELBOLTS - APM-Hexseal
SEELRIVITS - APM-Hexseal
SEELSKREWS - APM-Hexseal
SE EYELETS - USM Corp.
SEICO - Syscon Int'l., Inc.
SELECTAKRIMP - ITT Cannon/ETC Terminal Products
SELECTASHAFT - Centralab
SELECT-A-SHELF - LEWISystems
SELECTION - Beckman Instrs., (AISSD)
SELECTOFRAME - Plessey Inc.
SELECTROL - Autocon Inds.
SELF-LOC-K - AirBorn, Inc.
SELF-ORGANIZING - COSAR Corp.
SELF-SCAN - Burroughs Corp.
SELISTOR - Eastern Delta Corp.
SELLECTRIC - Leviton Mfg. Co., Inc.
SEL-MASQ - Sel-Rex Div. Oxy Metal Industries Corp.
SEMIAC - Alpha Components Corp.
SEMI/DYNE - LogiMetrics Inc.
SEMINAR PROGRAM - E & L Instruments, Inc.
"SE" MONOGRAM - Sprague Elec. Co.
SEMPAC - Semtech Corp.
SENSABLE - Hy-Cal Engrg
SENSALL - National Sonics
SENSAR - Winegard Co.
SENSCO - Electro-Optical Inds., Inc.
SENSIFLEX - Gagne Assocs., Inc.
SENSIMETER - Hy-Cal Engrg
SENSOMATIC IMPRINTER/APPLICATOR - Monarch Marking Sys.
SENS-PAK - Delaval Turbine Inc.
SENTINEL - Kidde, Walter & Co.
SENTRILINE - Bird Electronic Corp.
SENTRY - Electro-Voice
SEPT - Sprague Elec. Co.
SEQUENTORR - Sloan Technology Corp.
SERDEX MODULES - Analog Devices, Inc.
SERENDIP - Teledyne Relays
SERIES 200 - Ann Arbor Terminals, Inc.
SERIES 50 - Everett/Charles, Inc.
SERMABOND - SermeTel Inc.
SERMALOY - SermeTel Inc.
SERMALUBE - SermeTel Inc.
SERMASEAL - SermeTel Inc.
SERVO-CAP - Centralab/USCC
SERVO-LINEAR - Electro-Voice
SERVOSPEED - Electro-Devices, Inc.
SETCHELL CARLSON - SC Electronics
SF/DUROID - Rogers Corp.
SGL POWER MASTER - SGL Waber Electric
SGL WABER - SGL Waber Electric
SHADOW -
SHAWNEE - Automatic Timing & Controls Co.
SHEARITE - Amp Inc.
SHIELD CELL - Metex Corp.
SHIELDFLEX - Magnetic Metals Co.
SHIELD-KON - T & B/Thomas & Betts
SHIELDMESH - Metex Corp.
SHIELDMU - Magnetic Metals Co.
SHIELDSCREEN - Metex Corp.
SHIELD-STRIPP - Gagne Assocs., Inc.
SHIELD TAPE - Metex Corp.
SHIELD-VU - Metex Corp.
SHIELD WRAP - Metex Corp.
SHOCKWATCH - Media Recovery Inc.
SHOOTING STAR - Wilson Electronics
SHORT STOP - Ambi-Tech Inds. Inc.
SHRINKDOWN - Markel Corp.
SHURE SQUEEZER - T & B/Thomas & Betts
SHURE STAKE - T & B/Thomas & Betts
SIERRACORE - Sierracin/Thermal Sys.
SIGNAFAX - Alden Elctrn. & Impulse Recording Equip. Co.

SIGNAFLO - T&B/Ansley Corp.
SIGNAGUARD - Signatron, Inc.
SIGNALEX - Staver Co., Inc.
SIGNAL KICKER - Turner Div.
SIGNALOCK - LogiMetrics Inc.
SIGNET -
SIL-CLAD - Electric Machinery Mfg. Co.
SILCO-FLEX - Siemens-Allis, Inc.
SILCORO 60 - GTE Sylvania Inc.
SILENT PAGER - Baumker Mfg. Co.
SILFLEX - Varflex Corp.
SIL-FOS - Handy & Harman
SILGAN - SWS Silicones Corp.
SILGAR - Alpha Components Corp.
SILICANE - Packaged Resins Div.
SILIC-O-NETIC - Heinemann Elec. Co.
SILICONTROL - Vectrol, Inc.
SILIC-O-RINGS - APM-Hexseal
SILIKROMES - APM-Hexseal
SILOHM - Carbone Lorraine Industries Corp.
SILVAINT - Murata Mfg. Co. Ltd.
SILVALOY - Engelhard Minerals & Chem.
SILVERCAP - Del Electronics
SILVERFILM - Industrial Condenser Corp.
SILVER-GRIP - PIC Design Div.
SILVER SERIES - Teledyne Big Beam
SILVERWELD - Bourns, Inc.
SILVREX - Sel-Rex Div. Oxy Metal Industries Corp.
SIMON - Harris Semiconductor
SIMPSON 260 - Simpson Electric Co.
SIMULINE - Seg Subsidiary
SIMULINE - Comstron Seg.
S.I.R. - Acme Electric
SIVICON - Amperex Electronic Corp.
SKAN-COAX - Skan-A-Matic Corp.
SKINNY DIP - San Fernando Elec. Mfg.
SKIP-A-DIP - Micro Electronic Systems, Inc.
SKIPPER - Rotron, Inc.
SKOTCAP - Skottie Electronics Inc.
SKYBLEND - Copperweld Bimetallics
SKY CAP - AVX Ceramics
SKY-TIE - Adalet-PLM Div
SL - Mallinckrodt, Inc.
SLEEV-SCRU - Pylon Co., Inc.
SLIC-TITE WITH TEFLON - Lake Chemical Co.
SLIDELINE - Duncan Electronics, Inc.
SLIDE LITE - Leecraft Mfg. Co., Inc.
SLIM-CAPS - Republic Elctrns. Corp.
SLIM JIM - Michigan Magnetics
SLIM JR. - Hexacon Elec. Co.
SLIMLINE - Hartwell Corp.
SLIMLINE - NES, Inc.
SLIMPAC - Semtech Corp.
SLIMPAC JR. - Semtech Corp.
SLIMPAC SR. - Semtech Corp.
SLIM SR. - Hexacon Elec. Co.
SLIM-TRACK - Barnes Engrg. Co.
SLIP-LOCK - U.S. Terminals
SLIT-N-WRAP - Vector Electronic Co., Inc.
SLO-BLO - Littelfuse, Inc.
SLO-SYN - Superior Electric Co.
SMART COUNTERS - Nu-Metrics
SMART/MICRO-MUX - Digital Communications Assoc., Inc.
SMART MONITOR - Ann Arbor Terminals, Inc.
SMART/MUX - Digital Communications Assoc., Inc.
SMART/NETWORK - Digital Communications Assoc., Inc.
SMITTY - Marshall Industries
-S/N- - Micro-Measurements Div.
SNAIL - Pylon Co., Inc.
SNAPBLOCKS - Kulka Elec. Corp.
SNAP-IN - Tridair Inds.
SNAPLITE - Leecraft Mfg. Co., Inc.
SNAP-LOCK - Namco Controls
SNAP-ON - Snap-On-Tools
SNAP-PAK - Waldes Kohinoor, Inc.
SNAPPER - Torque Systems, Sub. Rotron/EG & G Co.
SNAPPY FUSE HOLDER - Oneida Electronics Mfg.
SNAPSEELS - APM-Hexseal
SNAP-TITE - Centralab
SNAPTRACK - RDI/Reed Devices, Inc.
SNAPTROL - CTS Corp.
SNAP-WRAP - Amphenol North America Div.
SNIFFER - Bacharach Instrument Co.
SNIPE - Oak Inds. Inc.
SNORTINI - Edsyn, Inc.
SOCKS - T & B/Thomas & Betts
SOCREM - Portescap US
SODEREZE (R) - Phelps Dodge Magnet Wire Co.
SODER-MASK - Solder Removal Co.
SODER-WICK - Solder Removal Co.
SODR-X-TRACTOR - Pace Inc.
SOFT SWITCHING - Elgin Elctrns., Inc.
SOFTY - Clauss Cutlery Co.
SO-HOT - Therm-O-Lab Corp.
SOLAR HEATER - Casso-Solar Corp.
SOLAR UNITUBE HEATER - Casso-Solar Corp.
SOLDAPULLT - Edsyn, Inc.
SOLDASIP - Edsyn, Inc.
SOLDAVAC - Edsyn, Inc.
SOLDER COATER-LEVELER - Hollis Engrg., Inc.
SOLDERCON - Molex Inc.
SOLDEREX - Sel-Rex Div. Oxy Metal Industries Corp.
SOLDER MASTER - Hexacon Elec. Co.
SOLDERPAK - Raychem Corp.
SOLDER SLEEVE - Raychem Corp.
SOLDER TACTS - Raychem Corp.
SOLDER-WRAP - United Wiring & Mfg. Co.
SOLID-GEL - Elpower Corp.
SOLID PHASE - McKay Dymek Co.
SOLISTRAND - Amp Inc.
SOLOK - Berg Electronics
SOLU BRIDGE - Beckman Instrs.
SOLU CHEK - Beckman Instrs.
SOLU METER - Beckman Instrs.
SOL-U-SALT - Sel-Rex Div. Oxy Metal Industries Corp.
CAEON 27 & 28 - Caig Labs., Inc.
SONAC - Delavan Electronics, Inc.
SONA GRAPH - Kay Elemetrics Corp.
SONBLASTER - Ultrasonic Corp.
SON-CASTER - Techsonics
SONIC SENTRY - Delta Products
SONOCASTER - Electro-Voice
SONOSOLDER - Sonobond
SONOTITE - Linden Labs., Inc.
SONOWELD - Sonobond
SON-TECTOR - Techsonics
SOUNDCASTER - PASO Sound Products Inc.
SOUND DIRECTOR - Argos Products Co., Inc.
SOUNDFAB - Soundcoat
SOUNDFOAM - Soundcoat
SOUNDFOAM MUFF. - Soundcoat
SOUNDFOIL - Soundcoat
SOUNDMAT - Soundcoat
SOUND POWER - Vidaire Electronics Mfg.
SOUND SPOT - Electro-Voice
SOUND STICKS - GTE Sylvania Inc.
SPACEMAKER - Siemens-Allis, Inc.
SPACE SAVER - Gould Inc.
SPADE-LOK - Amp Inc.
SPARKCAPS - Radio Materials Co.
SPARTAN - Rotron, Inc.
SPASAVER - Chicago Switch, Inc.
SPEC-MASTER - Leviton Mfg. Co., Inc.
SPEC STAT - Control Prods., Inc.
SPECTRA - Photo Research Corp.
SPECTRA-FLEX - Spectra-Strip Corp.
SPECTRA-GP - Spectra-Strip Corp.
SPECTRA-INK - Spectra-Strip Corp.
SPECTRASCOPE - Spectral Dynamics Corp.
SPECTRA-STRIP - Spectra-Strip Corp.
SPECTRA-TWIST - Spectra-Strip Corp.
SPECTRA-ZIP - Spectra-Strip Corp.
SPECTROCHROM - Beckman Instrs., (AISSD)
SPECTROCOLORIMETER - Beckman Instrs., (AISSD)
SPECTRONIC - Bausch & Lomb, A.S. Div.
SPECTROSIL - Thermal Amer. Fused Quartz
SPECTROSUN - Spectrolab, Inc.
SPECTRUM - Spectracom Corp.
SPEECH DIRECTOR - Argos Products Co., Inc.
SPEEDFOIL - Armstrong Cork Co.
SPEED NUT - Eaton Corp.
SPEEDOMAX - Leeds & Northrup Co.
SPEEDREADER - Singer Co.
SPEED SERTS - Tridair Inds.
SPEED SERVO II - Esterline Angus
SPEEDY - Clauss Cutlery Co.
SPEEDY-TYS - Waldom Electronics, Inc.
SPEMCO - Specialties Mfg. Co., Inc.
SPHINCTER - Pylon Co., Inc.
SPINGUARD - AVX Ceramics
SPIRADEL - Allen Avionics, Inc.
SPIRAFIL - Cablewave Systems Inc.
SPIRAKORE - General Elec. Co.
SPIRAL - Rotron, Inc.
SPIRALTRON - Galileo Electro-Optics Corp.
SPIRAL WRAP HEATERS - Sierracin/Thermal Sys.
SPIRAP - Amp Inc.
SPIRA-SHIELD - Magnetic Shield Div.
SPIR'ATOR - Ametek, Inc
SPIROBAND - Electrovert
SPLIT/TRAN - Signal Transformer Co.
SPOTCHECK - Magnaflux Corp.
SPOT-LOK - Allen Mfg. Co.
SPOTMATIC - Auric Corp.
SPOTMETER - Photo Research Corp.
SPRAGUE - Sprague Elec. Co.
SPRING KIT - Helix Spring Corp.
SPRINGTER - Pylon Co., Inc.
SPRITE - Rotron, Inc.
SPUTTERGUN - Sloan Technology Corp.
SPUTTERSPHERE TM - Materials Resch. Corp.
SQUARISTOR - General Resistance, Inc.
SQUINT-SKAN - Skan-A-Matic Corp.
S.R.M. - Sealectro Corp.
SRO - Electro-Voice
S-R-4 - BLH Elctrns.
SSV - Unarco-Rohn
STABELEX - Industrial Condenser Corp.
STABILENE - Keuffel & Esser Co.
STABILINE - Superior Electric Co.
STABILIZER 100 - Hollis Engrg., Inc.
STABILIZER 150 - Hollis Engrg., Inc.
STABLE-K - Republic Elctrns. Corp.
STACER - Ametek, Inc
STACK-N-NEST - LEWISystems
STACPAC - Semtech Corp.
STA-FLUX - Hollis Engrg., Inc.
STAKE FASTENER - Dupree, Inc.
STA-KON - T & B/Thomas & Betts
STANCOTE - Standard Wire & Cable
STANDCO - Sticht Co., Inc. Herman H.
STANFLEX - Standard Wire & Cable
STANOMERSE - Technic, Inc.
STANTROL - ARI Inds., Inc.
STAPLE-PRUF - Columbia Elctrn. Cables
STAR - National Camera Inc.
STARBOARD WATCH - Teledyne Big Beam
STAR-LINE - Pyle-National Co
STA-STRAP (R) - Panduit Corp.
STATHAM - Gould, Inc.
STAT-I-CHART - Rol-a-chart Div.
STATIFLEX - Siemens-Allis, Inc.
STATOS - Varian Assocs.
STATUS-INDICATOR - Industrial Elctrn. Engrs.
STATUS SEEKER - Dataprobe, Inc.
STAVOLT - Christie Elec.
STA-VO-TROL - General Elec. Co.
STEM - Astro Research Corp.
STEP - Chrono-log Corp.
STEREO DYNETIC - Shure Brothers, Inc.
STEREOSTAR - American Optical Corp.
STEREO-V - Electro-Voice
STEREO-V - Electro-Voice
STI - Scientific Technology
STICK-A-DIP - Micro Electronic Systems, Inc.
STICKY FINGERS - Instrument Specialties
STICPAC - Semtech Corp.
STIKI-BAK - Acme Chemical & Insulation Co.
STIK KLIPS - Daburn Electronics & Cable Corp.
STIK-ON HEATERS - Sierracin/Thermal Sys.
STORED-ARC - Nelson Stud Welding TRW Inc.
STORM-FLEX - Storm Products Co.
STRAINRITE - Star Porcelain Co.
STRAPPING - Electrovert
STRATE-BREAKS - Coors Porcelain Co.
STRATO-THERM - Amp Inc.
STRESSCOAT - Magnaflux Corp.
STRIPETTE - Lundy Elctrns. & Sys., Inc.
STRIPMASTER - Ideal Industries Inc.
STRIP PACK - Elgin Elctrns., Inc.
STRIP-PAK - Stanford Applied Engrg
STRIPSWITCH - UID Electronics Div.
STRIPTROL - CTS Corp.
STRIPTWEEZ - Pace Inc.
STROBETTE - Power Instrs., Inc.

STROBOLUMER - Gen Rad
STROBOSLAVER - Gen Rad
STROBOTAC - Gen Rad
STRUTSCAT - RF Systems, Inc.
STUR-D-DIAL CORD - Gudebrod Inc.
STURDI-STAND - Hexacon Elec. Co.
STUR-D-LACE - Gudebrod Inc.
STURGES - Electronic Batteries, Inc.
STYCAST - Emerson & Cuming, Inc.
STYLINE - Vicon Industries Inc.
STYRACON - Sprague Elec. Co.
STYRAFIL - Fiberfil Div. Dart Ind.
SUB-MINAX - Amphenol North America Div.
SUB-OUNCER - TRW/UTC Transformers
SUB-SUB-OUNCER - TRW/UTC Transformers
SULFAMEX - Sel-Rex Div. Oxy Metal Industries Corp.
SULFIL - Fiberfil Div. Dart Ind.
SUNSWITCH - Ripley Co., Inc.
SUNVERTER - Abacus Controls Inc.
SUPER-BAND - CATV Communications
SUPERBRIDGE - Motorola Semiconductor Prods.
SUPER CAESAR - ITT Cannon Electric
SUPER CASTER - Electro-Voice
SUPER CHAMP - Amp Inc.
SUPERCON - Superior Electric Co.
SUPERCORDER - Astro-Med
SUPERCORDX - General Electric Co.
SUPERCORONOL - General Electric Co.
SUPERECTIFIER - General Instrument Corp.
SUPER ERECTA SHELF - Metropolitan Wire Corp.
SUPERFAST - Semtech Corp.
SUPERFLEX - Columbia Elctrn. Cables
SUPER FROST AID - Chemtronics, Inc.
SUPERIOR CONNECTION - Superior Flux & Mfg. Co.
SUPER-K - Republic Elctrns. Corp.
SUPERMATEC - Hotpack Corp.
SUPER MITE - Thermo Elec. Co., Inc.
SUPERNOVA - Data General Corp.
SUPERPAC 180 - PCS., Inc.
SUPER-PLAST - Stock Drive Prods.
SUPERPOT - Consolidated Resistance Co. America
SUPER Q - MSI Electronics, Inc.
SUPERREEL - Memorex Corp.
SUPERSAFE - Superior Flux & Mfg. Co.
SUPER-SONAX - Electro-Voice
SUPERSTRATE R - Materials Resch. Corp.
SUPER-STRIP - A.P. Products
SUPER SWITCHER - Powertec, Inc.
SUPER-SYNCLAMPS - Timber-Top, Inc.
SUPER-TORQ - Allen Mfg. Co.
SUPER TUN-O-WASH - Chemtronics, Inc.
SUPER-TWISTAGUIDE - Airtron
SUPER-40 - Airtron
SUPRAMESH - Pall Trinity Micro Corp.
SUPRASIL - Heraeus-Amersil, Inc.
SUPRASIL-W - Heraeus-Amersil, Inc.
SURE-TY - Gould Inc.
SURFAMAX - Pall Trinity Micro Corp.
SURFANALYZER - Gould, Inc.
SURGITRON - Joslyn Elctrn. Sys.
SURMETIC - Motorola Semiconductor Prods.
SUS-TENSION - Lektra Labs., Inc.
SWAGE-BOND - Bourns, Inc.
SWAP-A-DIP - Micro Electronic Systems, Inc.
SWEEP CHANALYST - VIZ Manufacturing Co.
SWEMAR - Leader Instruments Corp.
SWIDGET - CW Industries
SWIDGET, JR. - CW Industries
SWIFTACHMENTS - Dennison Mfg. Co.
SWING-SEAL - Jamesbury Corp.
SWING-WA - General Elec. Co.
SWITCHING-REGULATOR RATED FERRAMICS - Indiana General
SWITCHMODE - Motorola Semiconductor Prods.
SWITCH-PAK - Stevens-Arnold, Inc.
SWITCH-TRAN - Stevens-Arnold, Inc.
SWIVLTOP - Moody Tools, Inc.
SY-BONDEZE (R) - Phelps Dodge Magnet Wire Co.
SYDEWYNDER - CW Industries
SYNCHRODRIVE - Vibra-Metrics, Inc.
SYNCHRO-PAC - Electric Machinery Mfg. Co.
SYNCHROSTAT - Electric Machinery Mfg. Co.
SYNCHRO SWEEP GENERATORS - Nelson Ross Elctrns.
SYNCHROTEL - Kollsman Instr. Co.
SYNCLAMPS - Timber-Top, Inc.
SYNC-LOC - Bristol Saybrook Co.
SYNCRODRIVE - Vibra-Metrics, Inc.
SYNCRONOMETER - Gen Rad
SYNC-TROL - Electric Machinery Mfg. Co.
SYNDUCTION - Siemens-Allis, Inc.
SYNTHAR - Industrial Condenser Corp.
SYNTHINOL - Consolidated Wire & Assoc. Corps.
SYNTHITE - Dolph, John C. Co.
SYNTHOLVAR - Varflex Corp.
SYSTEM 150 - Information Displays, Inc.
SYSTEM 547 - Chemcut Corp.
SYSTEM 6 - Himmelstein & Co., S.
SYSTROL - Control Systems Research, Inc.
S-42 ALLOY - Sel-Rex Div. Oxy Metal Industries Corp.
TAB-GUN - Sigma Sys. Corp.
TABLOCK - Torin Corp.
TABL-TOP - Sel-Rex Div. Oxy Metal Industries Corp.
TACHLITE - Power Instrs., Inc.
TACH-PAK - Airpax Elctrns.
TACH-TROL - Airpax Elctrns.
TAG-RING - Glenair, Inc.
TAIYOHM - Taiyo Denki Co., Ltd.
TAK-ETTE - Power Instrs., Inc.
TALAR - Singer Co.
TANITE - Sprague Elec. Co.
TANKARD - Automatic Timing & Controls Co.
TANKTROL - Autocon Inds.
TANOX - Sprague Elec. Co.
TANTALEX - Sprague Elec. Co.
TANTALITE - Crystal Technology
TANTALYTIC - General Elec. Co.
TANTAPAK - Sprague Elec. Co.
TANTOROID - Sprague Elec. Co.
TAPE CABLE - Brand-Rex Co.
TAPE/FOIL - Tapecon, Inc.
TAPELESS TAPE MEASURE - ENM
TAPE PAK - Ideal Industries Inc.
TAPERLOCK - Cablewave Systems Inc.
TAPESWITCH - Tapeswitch Corp. Amer.
TAPIT - Chicago Switch, Inc.
TAP-LITE - Pacific Electricord Co.
TA'POT - Howell Inst. Inc.
TAPTONE - Benthos, Inc.
TARGET - S & A Electronics
TARNIBAN - Technic, Inc.
TARZAN - Rotron, Inc.
TAURUS - Nova Electric Mfg. Co.
TAYLORCLAD - Synthane Taylor Corp.
TAYLOR HOBSON - Rank Precision Inds.
TAYLORITE - Synthane Taylor Corp.
TAYLORON - Synthane Taylor Corp.
TAYP-AIR - Amp Inc.
TAY-TRONIC - Taylor-Winfield Corp.
TBA - Sprague Elec. Co.
TDI - Transistor Devices
TDL - Hollis Engrg., Inc.
TDM - Transistor Devices
TDMD - Transistor Devices
TEACHWARE - Fabri-Tek, Inc.
TECH-CRAFT - Bogen Div.
TECHNIC CASH REGISTER - Technic, Inc.
TECHNIC CY(-)LESS COPPER - Technic, Inc.
TECHNIC CY(-)LESS GOLD - Technic, Inc.
TECHNIC GOLD SAVER - Technic, Inc.
TECHNI-GOLD HS - Technic, Inc.
TECHNI-GOLD 25 - Technic, Inc.
TECHNIMATIC - Technical Mat'l.
TECHNI-PLATINUM - Technic, Inc.
TECHNI-RHODIUM - Technic, Inc.
TECHNI-RITE - Gulton Inds., Inc.
TECHNI SILVER CY(-)LESS - Technic, Inc.
TECHNISTRIP AU - Technic, Inc.
TECH-TIN - Technic, Inc.
TECKSHIELD - Tecknit
TECKSTIK - Tecknit
TECKSTRIP - Tecknit
TEC-LITE - Tec, Inc.
TEE-LOCK - General Elec.
TEK - Tektronix, Inc.
TEKARD CASE - Des Tek Ind.
TEKARDS - Des Tek Ind.
TELCAR - BFGoodrich Chemical Div
TELCO - GC Electronics
TELCON - Inter-Tech. Grp., Inc.
TELE-BEAM II - Kalart Victor Corp.
TELECAP - Sprague Elec. Co.
TELE-CONNECT - SYT Corporation
TELEDYNE - Herald Electronics
TELE-FI - Telex Communications, Inc.
TELEFILTER - Sprague Elec. Co.
TELE-PAC - Elfab Corp.
TELE-POWER POLES - Wiremold Co.
TELEPRODUCTS - Atlantic Research Corp.
TELEQUIPMENT - Tektronix, Inc.
TELESCAN - Autocon Inds.
TELESCRIBER - Telautograph Corp.
TELESET - Telex Communications, Inc.
TELESPONDER - Vega Precision Labs.
TELESTEP - Autocon Inds.
TELETALE - MRC Alarm Systems & Devices Co.
TELE-TORQUE - OTC Div Owatonna Tool Co
TELETROL - Autocon Inds.
TELEVAC - Fredericks Co.
TELEVEX - Aldshir Mfg.
TELEVISION TUBE CADDY–TV - Argos Products Co., Inc.
TEL-EYE - Autocon Inds.
TEL-OHMIKE - Sprague Elec. Co.
TEMARS - Endevco
TEMFLEX - 3M Co.
TEM/GUIDE - UTE Microwave
TEMPCAL - Howell Inst. Inc.
TEMPEREX - Sel-Rex Div. Oxy Metal Industries Corp.
TEMPGARD - Tenney Engrg., Inc.
TEMPILABELS - Tempil Div.
TEMPILAQ - Tempil Div.
TEMPIL PELLETS - Tempil Div.
TEMPILSTIK - Tempil Div.
TEMPKEY - Zi-Tech Div.
TEMP-LACE - Gudebrod Inc.
TEMPOGIDE - Bivar, Inc.
TEMP-R-GLAS - Connecticut Hard Rubber Co.
TEMP-R-TAPE - Connecticut Hard Rubber Co.
TEMPRUF - Chatillon John & Sons
TEMPSCRIBE - Bacharach Instrument Co.
TEMPSISTOR - Midwest Components
TEMPSTAT - Hotpack Corp.
TEMP-TERMS - ITT Cannon/ETC Terminal Products
TENITE - Eastman Chem. Prods.
TENNA/FLEX - Cablewave Systems Inc.
TENNA ROTOR - Alliance Mfg. Co.
TENSOL-THERM - Tensolite Co.,
TENULINE - Bird Electronic Corp.
TERG-A-ZYME - Alconox Inc.
TERM-ACON - Methode Elctrns., Inc.
TERMALINE - Bird Electronic Corp.
TERMALUM - Amp Inc.
TERMASHIELD - Amp Inc.
TERMI-BLOK - Amp Inc.
TERMI CETTE - Intern'l. Computer Prods., Inc.
TERMIDISK - Intern'l. Computer Prods., Inc.
TERMI-FOIL - Amp Inc.
TERMI-GRID - Amp Inc.
TERMINUS - Poly-Scientific
TERMINYL - Amp Inc.
TERMI-PLATE - Amp Inc.
TERMI-POINT - Amp Inc.
TERMI-TWIST - Amp Inc.
TESTCLIP - Trendar
TEST LEAD CADDY - Air-O-Tronics Prods.
TETCO - Electric Tachometer Corp.
TETRA ETCH - Gore, W.L. & Assocs.
TETRINOX - Caddock Electronics, Inc.
TEXTOLITE - General Elec. Co.
TGS - Figaro Engrg. Inc.
TGS - Figaro Engrg. Inc.
T HEAD - Amp Inc.
THE BIG LOOK - General Elec. Co.
THE FAULT FINDER - Sotcher Measurement, Inc.
THE LITTLE TORCH - Tescom Instr. Div.
THERMAC - Research, Inc.
THERMAIR - Thermo Elec. Co., Inc.
THERM-AL - Acme Chemical & Insulation Co.
THERMALERT - Raytek Div. Optical Coating Lab
THERMALEZE (R) N - Phelps Dodge Magnet Wire Co
THERMAL MAPPER - Bendix Corp.
THERMASPLICE - Amp Inc.
THERMATRACE - Barnes Engrg. Co.
THERMAZEL - Thermax Wire Corp.
THERMAZIP - Zippertubing Co.
THERMCOAT CC - Omega Engrg., Inc.
THERMCOAT CO & COL - Omega Engrg., Inc.

THERMCOAT HT - Omega Engrg., Inc.
THERMCOAT KIT - Omega Engrg., Inc.
THERMCOAT SL - Omega Engrg., Inc.
THERMICATOR - Marlin Manufacturing Corp.
THERMILINEAR - Yellow Springs Instrument Co.
THERMIVOLT - Yellow Springs Instrument Co.
THERMO-ALARM - Mack Elec. Devices
THERMOBEAD - Thermometrics, Inc.
THERMOCHIP - Melcor/Materials Elctrn. Prods
THERMOCHUCK - Temptronic Corporation
THERMODUR - Sterling
THERMOFIT - Raychem Corp.
THERMOFLAG - Staver Co., Inc.
THERMOFLAKE - Thermometrics, Inc.
THERMOFLO - TSI Inc
THERMOFORM - Precision Paper Tube Co.
THERMOGUN - Raychem Corp.
THERMOHM - Leeds & Northrup Co.
THERMOLAIN - Star Porcelain Co.
THERMOLASTIC - Cox & Co., Inc.
THERMOMATIC - Teledyne Rotolite
THERMOMELT - Markal Co.
THERMONIC - Taylor-Winfield Corp.
THERMOPAD - Motorola Semiconductor Prods.
THERMOPAK - Teccor Electronics, Inc.
THERMOPART - Pace Inc.
THERMOPATCH - Cox & Co., Inc.
THERMOPOXY COMPOUND - Sterling
THERMOPROBE - Micro Technical Industries
THERMOROD - Thermometrics, Inc.
THERM-O-SCOPE - Capintec Instruments, Inc.
THERMOSHEET - Cox & Co., Inc.
THERMOSPOT - Temptronic Corporation
THERMO STACK - Fabri-Tek, Inc.
THERMOSTREAM REGISTRATION PENDING - Temptronic Corporation
THERMOTAB - Teccor Electronics, Inc.
THERMOTAPE - Cox & Co., Inc.
THERMO-TECTOR - General Elec. Co.
THERMOTERM - Maury Microwave Corp.
THERM-O-TRAC - Hexacon Elec. Co.
THERMOVANE - Staver Co., Inc.
THERMOWATT - Motorola Semiconductor Prods.
THERMOWIRE - Cox & Co., Inc.
THE SHORT STOP - Sotcher Measurement, Inc.
THETA-GATE FIRING - National Electronics
THE VIP -
THIN-HEET - Safeway Products
THINISTOR - Victory Engrg. Corp.
THINLAY - Advanced Materials Systems
THINLINE - Republic Elctrns. Corp.
THINPAK - American Zettler, Inc.
THINSHIELD - CEA
THIN-TRIMS - Johanson Mfg. Corp.
THINVERTER - Arnold Magnetics Corp.
THINWALL - Precision Paper Tube Co.
THIRSTY FOAM - Clean Room Prods.
THORKOM - Viking Inds., Inc.
THORN - Inter-Tech. Grp., Inc.
THORN-BRIMAR - Inter-Tech. Grp., Inc.
THRULINE - Bird Electronic Corp.
THRU-PASS - Sprague Elec. Co.
THUMB MITE - Tech Labs., Inc.
THY-MO-TROL - General Elec. Co.
THYRI-POWER - Solidstate Controls, Inc.
THYRISTROL - Cross Electronics Inc.
THYRITE - General Elec. Co.
TIBOR - Kawecki Berylco Inds., Inc.
TICKOPRES - Monarch Marking Sys.
TIMATCH - Times Fiber Comm. Inc.
TIME CAPSULE - Artisan Elctrns. Corp.
TIMECHECK - Vicon Industries Inc.
TIME ELECTRONICS - Zi-Tech Div.
TIME-O-LITE - Indl Timer An Esterline Co.
TINEON - Leecraft Mfg. Co., Inc.
TINI-JAX - Switchcraft, Inc.
TINI-PLUG - Switchcraft, Inc.
TINNERMAN BRAND - Eaton Corp.
TINSIL - Bow Solder Products
TINY-GLOW - Industrial Devices
TINY L - Aladdin Elctrns.
TINYMAG - Torwico Elctrns., Inc.
TINYMAX - Torwico Elctrns., Inc.
TINYMITE - Renbrandt, Inc.
TINY-MITE - Industrial Devices
TINY-PAK - Mini-Systems, Inc.
TINY TRIM - Kappa Networks
TISAN - Artisan Elctrns. Corp.
TITAL - Kawecki Berylco Inds., Inc.
TITE-BITE - T & B/Thomas & Betts
TKASSY - Times Fiber Comm. Inc.
TLC - Berg Electronics
T-LITE - GTE Sylvania Inc.
TMI - Tau-Tron Inc.
TOBOL - Tobe Deutschmann Labs., Inc.
TOGGLE-DIP - Grayhill Inc.
TOG-L-LOK - Channellock, Inc.
TONG TEST - Columbia Electric Mfg. Co.
TONOTRON - Hughes Aircraft Co.
TOP BRASS - Electro-Voice
TOPHEL - GTE Sylvania
TOPHET - GTE Sylvania
TORK PAK - Raymond Engrg. Inc.
TORMAX - IMC Magnetics Corp.
TOROYD - Universal Mfg. Co., Inc.
TORQLINER - Cambridge Thermionic Corp.
TORQOMETER - Snap-On-Tools
TORQ SWITCH - Torq Engineered Products, Inc.
TORQSYN REMOTE POSITIONER - Vernitron Corp.
TORQUE PACK - Raymond Engrg. Inc.
TORQUE-PEAK - Standard Pneumatic Motor Co.
TORQUE-RITE - Himmelstein & Co., S.
TORQUE WATCH - Waters Mfg., Inc.
TORR SEAL - Varian Assocs.
T-O-T - Lake Chemical Co.
TOUCH DRY - Markem Corp.
TOUCH MOS - American Microsystems, Inc.
TP-100 - Barco Chem. Prods. Inc.
TRA-BOND - Tra-Con, Inc.
TRA-CAST - Tra-Con, Inc.
TRACER-FLO - Trio-Tech, Inc. of Calif.
TRACER-TECH - Shannon Luminous Mat'ls.
TRACTORADIO - ATR Electronics, Inc.
TRA-DUCT - Tra-Con, Inc.
TRAKFET - Analog Devices, Inc.
TRAK-4 - Tape-Athon Corp.
TRAN BAL - Bodine Co.
TRANSACTIVE DPIS - Analogic Corp.
TRANS-BOX - Vichek Plastics Co.
TRANSCAP - Erie Technological Products
TRANSELECTRIC - Encom Prods. Co., Inc.
TRANSFILTER - Vernitron Piezoelectric Div.
TRANSISTAR - Mallinckrodt, Inc.
TRANSKON - Molex Inc.
TRANS–O–MATIC - Lakeshore Electric Corp.
TRANS-START - Electric Machinery Mfg. Co.
TRANSVOLT - Guildline Instrs., Inc.
TRANSZORB - General Semiconductor Industries, Inc.
TRENDICATOR - Doric Sci., Div. Emerson Elec. Co.
TRENDSCAN - Leeds & Northrup Co.
TRENDTRAK - Leeds & Northrup Co.
TRIAC KOOLER - UNITRACK Div.
TRI-BEAM - Western Coil & Elec. Co.
TRI-BREAK - General Elec. Co.
TRI/CLAD - General Elec. Co.
TRICOLOR - Photo Research Corp.
TRIDUNDANT - LNR Communications, Inc.
TRIFURON - Molex Inc.
TRIGAC - Singer Co.
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TRIMATRON - Leviton Mfg. Co., Inc.
TRIMIT - Bourns, Inc.
TRIM KITTM - American Technical Ceramics
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TRIMPOT - Bourns, Inc.
TRIM-STEP - Datametrics/Trump Ross
TRI—PHASIC CONVERSION - Data Precision Corporation
TRIPLEGARD - Joslyn Elctrn. Sys.
TRIPLE MATE - Edsyn, Inc.
TRIPLEMATIC - Hardman Inc.
TRIPLOC - Pyle-National Co
TRITON I - Teledyne Rotolite
TROL AID - Chemtronics, Inc.
TROL-A-TEMP - EWC, Inc.
TROLEX - CTS Corp.
TRON - Bussmann Manufacturing
TROUBLESHOOTER - Teledyne Big Beam
TR-SERIES - PASO Sound Products Inc.
TRUARC - Waldes Kohinoor, Inc.
TRUE BLUE - PIC Design Div.
TRUFLEX - Texas Instruments Control Prods. Div.
TRU-GLIDE - Johnathan Mfg.
TRU-MITE - Datametrics/Trump Ross
TRUMP-ROSS - Datametrics Inc
TRU-ROTA - Datametrics/Trump Ross
TRU-TAC - Datametrics/Trump Ross
T-SCREEN -
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TT-PLUG - Switchcraft, Inc.
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TUFFCOTE - Tensolite Co.,
TUFFLITE - Tensolite Co.,
TUFF-TAINER - Vichek Plastics Co.
TUF-TEST - Gudebrod Inc.
TUF-TIES - Amrad Corp.
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TWIST "N" FLAT - Spectra-Strip Corp.
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UDEL - Union Carbide, Chemicals & Plastics
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ULTRA-LITE - Wonder Corp of America
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ULTRAVERTER - Blonder-Tongue Labs., Inc.
ULTRAVOX - PASO Sound Products Inc.
ULTREX - Baker Chemical Co., J.T.
ULTROHM - Ultronix, Inc.
ULTROL - Brand-Rex Co.

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UNGARMATIC - UNGAR, Div.
UNIBASE - Motorola Semiconductor Prods.
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UNICARD - A.P. Products
UNICERAM - JFD Electronics Components Corp.
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UNI-CORE - Alpha Metals, Inc.
UNI-CURVE - Fenwal Elctrns.
UNIDAPTOR - Aldshir Mfg.
UNIDEX - Aerotech, Inc.
UNIDEX - Oak Inds. Inc.
UNIDYNE - Shure Brothers, Inc.
UNI-LASER - Laser Inc.
UNILINE - University Sound
UNIMORPH - Vernitron Piezoelectric Div.
UNI-PAC - Methode Elctrns., Inc.
UNIPLY - Power Designs, Inc.
UNIRING - Burndy Corporation
UNI-ROTOR - Astro Dynamics
UNISEAL - Electro-Voice
UNISPHERE - Shure Brothers, Inc.
UNI-STRAND - Belden Corp.
UNITIZED - General Elec. Co.
UNITRACK - UNITRACK Div.
UNITWIST - Jan Hardware Mfg. Co.
UNIVERSAL - Mueller Electric
UNIVERSAL PILOT HOUSING - GTE Sylvania Inc.
UNIVERSAL SWITCH ADJUSTABLE (USA) - Artisan Elctrns. Corp.
UNIVERSAL TIME CAPSULE - Artisan Elctrns. Corp.
UNIWATT - Motorola Semiconductor Prods.
UNIWELD - Endicott Coil Co.
UNREEL - Belden Corp.
UPI - Intel Corp.
URAFIL - Fiberfil Div. Dart Ind.
USE - U.S. Elctrns.
US-2 - Scanbe Div., Zero Corp.
U-TILE-MU - Amuneal Mfg. Corp.
UTILI-SPLICE - Amp Inc.
UTILI-TAP - Amp Inc.
UTILI-TENSHUN - Amp Inc.
UVEX - Eastman Chem. Prods.
VACPAC - Hull Corp.
VAC-SEAL - Perkin-Elmer Ultek Inc.
VAC SORB - Varian Assocs.
VACTROL - Vactec, Inc.
VACULOY - Alpha Metals, Inc.
VACU-SEALED - Benthos, Inc.
VAC-U-SEL - General Elec. Co.
VACUTEC - Atomergic Chemetals Corp Co.
VADAC - E-Systems Inc.
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VEROBOX - Vero Electronics
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WAVEFORM EDUCTOR - Princeton Applied Resch Corp.
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WELC-TROL - Welco Inds. Inc.
WELDOHM - Belden Corp.
WELDOX - Hardman Inc.
WELLFLEX - Cablewave Systems Inc.
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WEST-ING ARC - Westinghouse Elec.
WESTKIT - West Instrs
WHISPER - Rotron, Inc.
WHISPERCABLE - Thermax Wire Corp.
WHITE KNIGHT -
WHO'S - Gudebrod Inc.
WIBA - Electrovert
WIDEBETA - Beckman Instrs., (AISSD)
WILD ONE - Wilder Engrg. Prods, Inc.
WILD ROVER - Refac Elctrns. Pinlite, Wild Rover
WILEY INTERSCIENCE - Wiley & Sons Inc., J.
WILKINS - Barker Elec. Sls.
WILLARD - ESB Wisco Inc.
WILSON ELECTRONICS - Wilson Electronics
WINCHESTER RELAYS - Elctrn. Instr. & Specialty
WINDJAMMER - Ametek/Lamb Electric
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WIRETEMP - Trans-Met Engrg.
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XECOTE - Metex Corp.
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XEMENT - Metex Corp.
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X-L - Transistor Devices
XLS - Wall-Lenk Mfg. Co.
XL-TC - Brand-Rex Co.
X-OLENE - Okonite Co.
X SERIES - Teledyne Big Beam
XTRADUR - Hexacon Elec. Co.
X-VAR - Fidelity Chem. Prods. Corp.
X-WAY STIC - Semtech Corp.
YELLOW HANDLE - Amp Inc.
YELLOW JACKET - Turner Div.
YELLOW JACKET - Sprague Elec. Co.
YELLOW 77 - Ideal Industries Inc.

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Y-R-LOC - Taylor Electric, Inc.
Z AMP - General Resistance, Inc.
ZAP GUN - Raychem Corp.
ZEBRA - Tecknit
ZERO AMP - Spectra Sonics
ZERO CENTURION - Zero Corp.
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ZEROMATIC - Beckman Instrs., (AISSD)
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ZERO-SPACE SERIES - Zero Corp.
ZERO-TRAK - Zero Corp.
ZESTRON - COSAR Corp.
ZIFCON - Molex Inc.
ZIFTAC - Hypertronics Corp.
ZIG-ZAG - Unarco-Rohn
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ZIPCON - Molex Inc.
ZIP DIP - Textool Products, Inc.
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ZIP-IN - Equipto
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Z-TROL - Electron-Machine Corp.
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ZYGLO - Magnaflux Corp.
20/20 - Westinghouse Elec. Corp.
3-WIRE LINE - UNGAR, Div.
5-WAY - Superior Electric Co.
5X5 R - Telex Communications, Inc.
7MAG - Merix Chem. Co.
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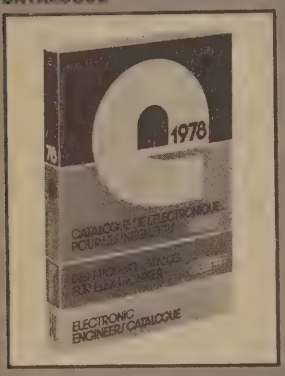

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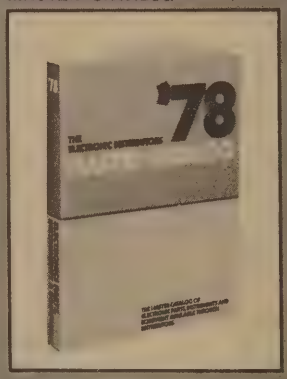

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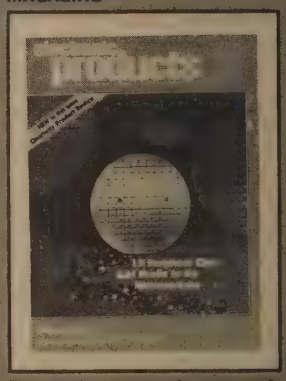

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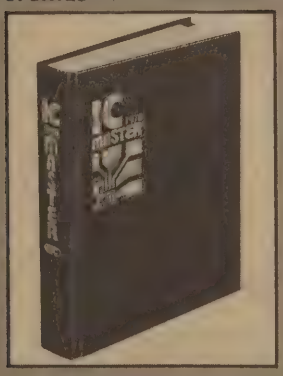

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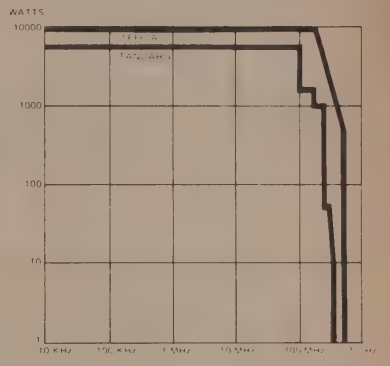
SERIES L 4-5000 WATTS 10 KHz-350 MHz

The L Series represents a group of broadband, Class A linear amplifiers. Standard models up to 5,000 watts and special models up to 10,000 watts of RF power with up to five decades of bandwidth in the 10 KHz to 450 MHz frequency range.

Model	RF Power (watts)	Frequency
Solid State		
4L	4	1-350 MHz
6LA	6	3-150 MHz
10L	10	1-300 MHz
10LA	10	1-110 MHz
30LA	30	1-110 MHz

Model	RF Power (watts)	Frequency
Solid State/Tubes		
30L	30	1-250 MHz
40L	40	1-240 MHz
60LA	60	4-150 MHz
100L	100	10 KHz - 220 MHz
100LM8	100	1-220 MHz
100LM9	100	1-200 MHz
200L	200	1-200 MHz
500L	500	10 KHz - 220 MHz
500LM8	500	1-220 MHz
500LM9	500	1-200 MHz
1000L	1000	10 KHz - 220 MHz
1000LM8	1000	1-220 MHz
1000LM9	1000	1-200 MHz
1500LA	1500	1-150 MHz
5000LA	5000	1-100 MHz

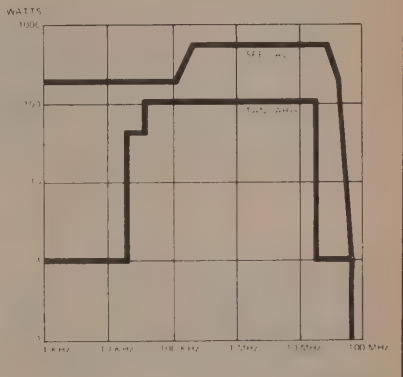


SERIES A 1-100 WATTS 100 Hz-70 MHz

MODEL 100A15

These all solid state linear amplifiers provide low and moderate RF power with up to three decades of bandwidth. Standard models up to 100 watts and special models up to 500 watts from 100 Hz to 70 MHz.

Model	RF Power (watts)	Frequency
1A70	1	100 Hz - 70 MHz
6A15	6	20 KHz - 15 MHz
20A15	20	20 KHz - 15 MHz
40A12	40	20 KHz - 12 MHz
50A15	50	20 KHz - 15 MHz
100A15	100	35 KHz - 15 MHz
700A	700	10 - 250 KHz

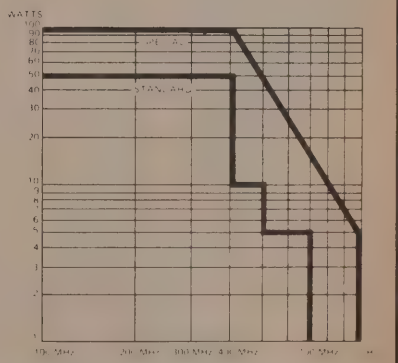


SERIES H 10-50 WATTS 120 MHz-700 MHz

MODEL 10HA

Available in sub-octave bandwidths from 100 to 1,000 MHz, these all solid state, non-linear amplifiers provide moderate RF power in a rugged, economical package. Up to 50 watts with standard models and 100 watts with special models.

Model	RF Power (watts)	Frequency
10HU	10	120-220 MHz
10HA	10	225-410 MHz
50HA	50	225-410 MHz
10HB	10	300-500 MHz

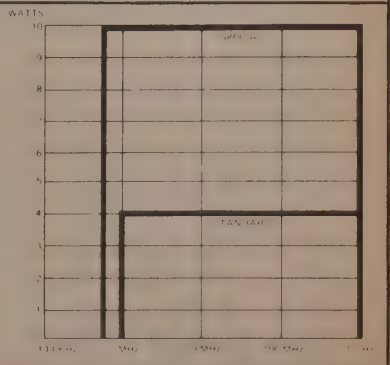


SERIES W 0.3-4 WATTS 1 MHz-1000 MHz

MODEL 1W1000

Our newest series of ultra-wide band, all solid state linear amplifiers provide RF power over greater than three decades of bandwidth. Standard models up to four watts and special models up to 10 watts. Units useful from 500 KHz to 1 GHz.

Model	RF Power (watts)	Frequency
W1000	0.35	1-1000 MHz
1W1000	1	1-1000 MHz
4W1000	4	1-1000 MHz



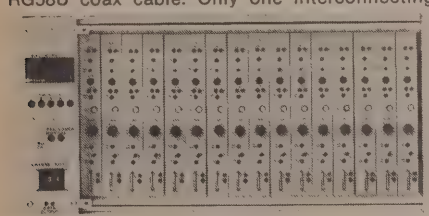
DYNAMICS

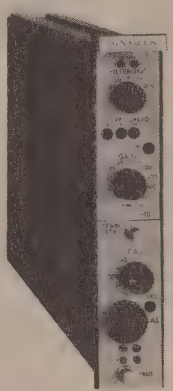
DIVISION OF WAUGH CONTROLS CORP. • 9001 FULLBRIGHT AVE., CHATSWORTH, CA 91311 • (213) 998-0121 • TELEX 69-6171

For over a decade Dynamics has been the acknowledged leader in the design and manufacture of instrumentation amplifiers for aerospace, laboratory and industrial applications. A complete range of differential amplifiers with various options and extra performance features, such as selectable filters, separate input and output zero controls and strain gauge power supply, are available. Many models have dual isolation 100mA outputs, full scale zero offset controls, galvanometer matching networks and switched or fixed current limiting provisions.

MODEL 7700 SIXTEEN CHANNEL MUX SIGNAL CONDITIONING SYSTEM

Dynamics Model 7700 supplies amplification, excitation, calibration, and output filtering for strain gages, thermocouple, and other types of transducers. The system is comprised of two major subsystems. The subsystems may be separated by up to 2500 feet of RG58U coax cable. Only one interconnecting cable is required between the two subsystems for all sixteen data channels, therefore, eliminating 93% of the interconnecting cabling.



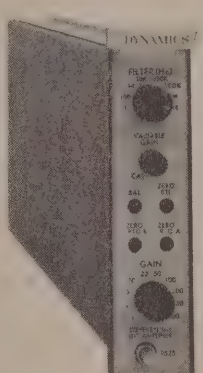


MODEL 7600 UNIVERSAL AMPLIFIER SIGNAL CONDITIONING SYSTEM

Choice of 10 front panel plug-in Signal Conditioning Modules. Amplifier features: gains to 2500; 120 dB CMRR at ±20 Volts; 125 kHz bandwidth; filter; offset control; output level controls; tape; galvo and VCO outputs; and integrated circuits. Ten Signal Conditioning Modules: isolated strain-gage power supply; autobridge balance; built-in reference junction and linearization for thermocouples; linear 2, 3, or 4 wire system for RTD's; Servo; Pot; Piezo Resistive; EMF; Carrier Amp; Charge Amp; and Designer's Card for universal system operation.

MODEL 7521 50 Volt Common-Mode/Wide Band DC Amplifier

Designed for use in data acquisition systems having common-mode voltage levels up to ±50V. The unit utilizes integrated circuits. Twelve options are offered. Complete compatibility with Dynamics 7514, 7520 and 7525 amplifier line.



MODEL 7525 Wide Band (DC to 2 MHz) Differential DC Amplifier

Designed to provide maximum speed, performance, and reliability in high speed data acquisition systems. Compatible with all tape recorders for direct recording.

MODEL 6364A Precision "Active" Electronic Filters

Phase matching to within 1° is possible in the Linear Phase mode. Terminal Slopes of 36 dB/Octave are standard with Butterworth and/or Linear Phase characteristics. Four different low-pass frequency multipliers cover the frequency band DC to 1MHz.

MODEL	GAIN RANGE	ACCURACY	OUTPUT	COMMON MODE	FREQUENCY RESPONSE	SLEWING RATE	NOISE	ZERO STABILITY
7521	0.01 to 3300 16 steps	±0.1%	±10V,±100mA	120dB ±50V	—3dB above 75kHz	1.5V/μs	4.0μV/RTI	±2μV plus ±0.4μV/°C RTI
7521/U	0.01 to 3300 16 steps	±0.1%	±10V,±100mA	120dB ±300V	—3dB above 75kHz	1.5V/μs	6.0μV/RTI	±2μV plus ±0.5μV/°C RTI
7525	1.0 to 1000 10 steps	±0.1%	±10V,±100mA	120dB ±20V	—3dB above 2mHz	2 0V/μs	1.5μV/RTI	±3μV plus ±1.2μV/°C RTI
7600	1.0 to 1000 10 steps	±0.1%	±10V,±100mA	120dB ±50V	—3dB above 75kHz	1.5V/μs	4.0μV/RTI	±2μV plus ±0.4μV/°C RTI

Dynamics Electronic Products is represented throughout the United States and the world. Please see our representative listings in the index.

Power Amplifiers

Using solid-state technology to replace bulky tube-type equipment, ENI's broadband amplifiers are tomorrow ideas available today. ENI's Class A power amplifiers already cover the frequency spectrum of 10 kHz to 1 GHz, with power outputs ranging from 300 milliwatts to over 4000 watts. And we're still climbing. Driven by any signal generator, frequency synthesizer or sweeper, ENI's compact portable amplifiers are completely broadband and untuned. Amplifying inputs of AM, FM, SSB, TV and pulse modulations with minimum distortion, these rugged units are versatile power sources for general laboratory work, RFI/EMI testing, signal distribution, RF transmission, laser modulation, data transmission, NMR, ultrasonics and more.

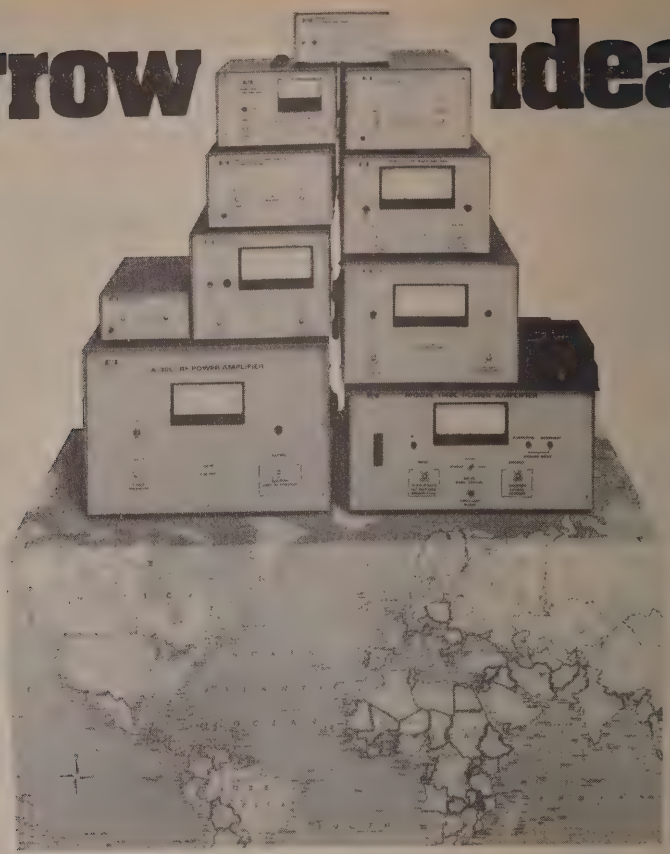
Designed to be unconditionally stable and failsafe (impervious to severe load conditions including open or short circuit loads), ENI power amplifiers will deliver their rated power to any load, regardless of match.

For information write: ENI, 3000 Winton Rd. So., Rochester, New York 14623. Call 716-473-6900. TELEX 97-8283 ENI ROC.

ENI

World's Leader in Power Amplifiers

Tomorrow ideas



400 WATT/1040L
- 10 kHz to 500 kHz
- Up to 700 Watts Output
- Useful Power up to 1 MHz
- Built-in True Average Power Meter

Primarily designed as a transducer drive source, and for use in high power ultrasonic laboratory applications. Any load impedance may be connected to the output without fear of damage or oscillation.

1.4 KILOWATT/1140L
- 9 kHz to 250 kHz
- All Solid State
- Weighs less than 45 lbs.
- Works from 115 Volt Outlet

A revolutionary development in high power solid state amplifiers, the 1140L is designed for high power RF heating, ultrasonics and laboratory applications. Optional matching transformers will deliver full power to any load impedance from 3 ohms to 800 ohms balanced or unbalanced.

150 WATT/240L
- 20 kHz to 10 MHz Coverage
- Up to 150 Watts Output
- 40 Watts Linear Class A Power
- Works into any Load Impedance

Extraordinary performance in a wide range of transducer drive applications. The 240L is a high quality laboratory instrument for ultrasonics, biological research and electro-optic modulation.

100 WATT/3100L
- 250 kHz to 105 MHz
- Up to 180 Watts Pulse
- Driven by any Signal Generator
- Extremely Rugged

Designed to replace bulkier tube amplifiers, the model 3100L provides reliable and maintenance-free operation for NMR, ultrasonics and communications applications.

150 WATT/A150
- 300 kHz to 35 MHz
- Up to 250 Watts Pulse and CW
- No Bandswitching
- Works Into Any Load Impedance

An ultra-linear Class A design, the A150 will "boost" the output of any signal source by a flat 55 dB and provide its full forward power into any load impedance. High quality laboratory unit, for NMR, ultrasonics and biological research.

300 WATT/A300
- 300 kHz to 35 MHz
- Up to 500 Watts Pulse and CW
- 55 dB + 1 dB Gain
- Portable

Highest power in a portable package. Top quality signal transmission in AM, SSB and pulse communication systems. Cannot be damaged by mistuned antenna.

40 WATT/440LA
- 150 kHz to 300 MHz
- 40 Watts Class A Linear
- State-of-the-Art
- Up to 75 Watts CW and Pulse

The widest band solid-state power amplifier available at its 40 watt powe level, the ENI 440LA is truly a state-of the-art instrument. As a drive source fo high resolution acousto-optic modulators and deflectors, the model 440L is invaluable.

10 WATT/510L
- Flat 1.7 to 500 MHz
- 1.3 to 515 MHz Usable Coverage
- 9.5 Watts Linear Output
- Microelectronic Construction

An ultra-linear Class A design, the 510L provides faithful reproduction of the input waveform for AM, FM, SSB, CATV pulse and other complex modulations The use of microwave transistors on th film substrates, microstrip circuitry, a plug-in modules make this unit reliabl and easy to service.

1 WATT/601L
- 0.8 to 1000 MHz
- 1 Watt of Linear Power
- Flat 37 dB Gain
- Over 2 Watts Saturated

A full 1 Watt of power 0.8 to 1000 MHz when driven by any laboratory signal generator. Exceptional as a general purpose laboratory instrument and for TV signal distribution systems.

from the world's leader.

THE COMPANY.
ENI amplifiers and RF products are manufactured in its modern 25,000 square foot plant located in Rochester, N.Y. Formed in 1969, ENI's dedication to engineering excellence has resulted in a growing list of more than 4,000 customers. To provide unequaled service and applications assistance, ENI maintains a network of 55 representative field offices, located throughout the world. Engineering assistance and consultation is always available, without obligation, from our field representatives as well as from factory offices in the U.S. and the United Kingdom.

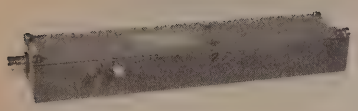
THE PRODUCTS.
Covering the widest frequency spectrum, ENI offers a full line of solid-state power amplifiers, power multicouplers and matching transformers with outputs ranging from milliwatts to kilowatts. Capable of being driven by virtually any signal source, ENI amplifiers are versatile and flexible sources of power. Completely broadband and untuned, these highly linear units will amplify inputs of AM, FM, SSB, TV and pulse modulations with minimum distortion. Although all power amplifiers will deliver rated power to a matched load, **only ENI amplifiers will deliver their rated power to any load regardless of match.**

THE GUARANTEE.
ENI offers a Free 10-Day evaluation of all products. A 1-Year Warranty, including all parts and labor. Authorized factory service (which is available in the U.S.A., Europe and Asia). 100 percent inspection. And, 100 percent burn-in of all completed units.

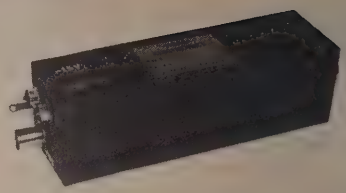
ENI

Now that you have seen a few of our units, perhaps you would like to receive the new and informative catalog of our full line of amplifiers and multicouplers. If so, please write:
ENI, 3000 Winton Rd. So., Rochester, New York 14623.
Call 716-473-6900. TELEX 97-8283 ENI ROC.

HOPE ELECTRONICS

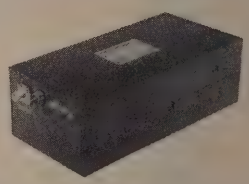


AMPLIFIERS



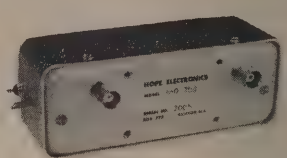
WIDE BAND — I F — PULSE

Model	Bandwidth	Gain	Flatness	VSWR	Noise Figure	Output Level	Price 1 - 24
PA200-20	1 to 200 MHZ	20 db	±.5 db	<1.5:1	<8 db	.5V	$195.00
PA200-40	1 to 200 MHZ	40 db	±.5 db	<1.5:1	<8 db	.5V	$295.00
A300-30	100 KHZ to 300 MHZ	30 db	±.75 db	<1.5:1	<12 db	.5V	$275.00
A30-6-30E	27 to 33 MHZ	30 db		<1.3:1	<4 db	.1V	$145.00
A60-10-25E	55 to 65 MHZ	25 db		<1.3:1	<4 db	.1V	$145.00



WIDE BAND AMPLIFIERS
GENERAL PURPOSE LABORATORY TYPE

Model	Bandwidth	Gain	Flatness	Input Impedance	Output Level	Price 1 - 24
A60-20A	500 KHZ-60 MHZ	20 db	±0.5 db	50Ω	1.5V	$150.00
A60-20B	1 KHZ-60 MHZ	20 db	±0.5 db	50Ω	1.5V	$165.00
A20-20	1 KHZ-20 MHZ	20 db	±0.5 db	1 meg	1.5V	$185.00



D C AMPLIFIERS
MODULAR AND LAB TYPE

Model	Bandwidth	Gain	Input Impedance	Output Level	Price 1 - 24
DCA-20H-100	DC to 20 HZ	X100	1 meg	10V into 1KΩ	$100.00
DCA-20K-100	DC to 20 KHZ	X100	1 meg	10V into 1KΩ	$150.00
DCA-2M-100	DC to 2 MHZ	X100	100K	5V into 600Ω	$100.00
DCA-10K-100	DC to 10 KHZ	X100	100K	1V into 1KΩ	$ 50.00

ALL ABOVE AVAILABLE WITH CABINET AND POWER SUPPLY. ADD $50.00 TO PRICE.

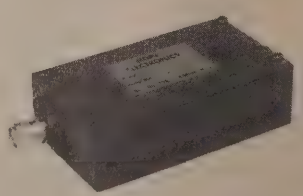
FILTERS

Cutoff Frequency Range ..... 10 HZ — 300 MHZ
3 db Bandwidth Range ... 5% to 10% Model FBP Only
VSWR ..... Less than 1.5:1
Nominal Impedance ..... 50Ω, 75Ω, 600Ω, or 10 K

Send Us Your Filter Specification

Hope Electronics would welcome the opportunity to design and build a filter custom fit to your needs.

MODEL FLP — LOWPASS
MODEL FHP — HIGHPASS
MODEL FBP — BANDPASS

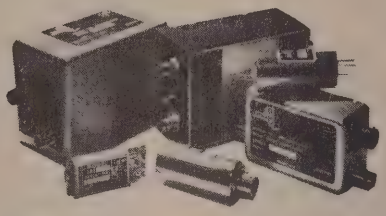


FROM $55.00

HOPE ELECTRONICS 20 NEWARK POMPTON TURNPIKE, WAYNE N.J. 07470 (201) 777-3522

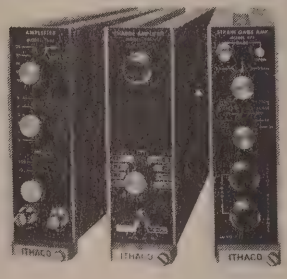
ITHACO
Versatility
in AC instrumentation

Low noise AC preamplifiers



- Preamps for High and Low Impedance Sources
- Frequency Range 0.1 Hz to 1 MHz
- Gains to 10^3 (60 dB)
- Premium Noise Performance with Minimal Power Drain
- Voltage, Charge and Current Inputs

nstrumentation amplifiers

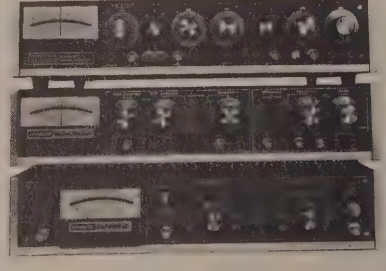


- Amplifiers for Voltage, Charge, and Strain Gage Inputs
- Single–Ended and Differential; Rack and Case Mountable
- Selectable Frequency Response
- Gains to 90 dB; Frequency Range 1 Hz to 100 kHz

AUTO-GAIN® amplifiers and accessories

- Computer, Automatic and Manual Gain Control
- Selectable Frequency Response
- Single–Ended and Differential; Rack Mountable
- Gain Range –12 dB to +78 dB
- Frequency Range 1 Hz to 100 kHz
- Mux/Demux available for recording status of up to 32 amplifiers on a single tape channel

DYNATRAC® ock-in amplifiers, analyzers, and narrowband voltmeters



- Sensitivity from 100nV to 1V rms Full Scale
- Bandwidths from 100 Hz to .001 Hz
- Optional Noise, Ratio and Phase Measurement Capability
- High Dynamic Reserve Heterodyne Signal Processing

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ITHACO

PRESTON

FLOATING DIFFERENTIAL
Highest Performance with

8300 XWB Series Floating Differential Instrumentation Amplifiers.

Preston's amplifiers deliver precision many times better than any other amplifier! Our "Balanced Precision" 8300 XWB Series have greatly improved performance to overcome the FOUR major sources of instrumentation amplifier errors!

COMMON MODE REJECTION — Preston's CMR of 150 db at DC and 130 db at 60 Hz reduces errors by a factor of 3 to 10 times over the "next best" amplifier!

TEMPERATURE STABILITY — Preston is 2 to 5 times better with a Gain TC of only 10 ppm/°C and Zero Shift of less than 0.1uV/°C RTI!

PUMPOUT CURRENT — 10 times better! Stays under ½ nanoamp over the entire temperature operating range!

OVERLOAD RECOVERY — 10 times as fast! Recovers to within 0.01% in 30 usec!

The 8300 XWB Series gives you many combinations of ACCURACY, LINEARITY and BANDWIDTH from which to choose, and every model has its own integral power supply and mounts in standard RETMA racks.

For complete information on the entire line of Preston instrumentation amplifiers, request your copies of our technical literature and our 12 page "Balanced Precision" brochure that shows how to determine the true performance of your instrumentation system.

Five basic models provide versatility to meet every need —

MODEL	A	B	C	D	E
Gain	Ten Steps plus Variable to 2500 X		Ten Steps Fixed to 1000 X		Fixed 1X to 2000 X
Gain Accuracy	±0.01%		±0.1%		±0.01%
Gain Linearity	±0.005%	±0.01%			
Drift (μV/°C)	0.1 μV RTI ±20 μV RTO	0.3 μV RTI ±100 μV RTO			
Bandwidth	Selectable to 100 kHz			Preset up to 100 kHz (max)	

And every model meets all of these performance specifications:

Input Impedance	100 Megohms shunted by less than 0.001 μfd at DC
Input Noise	3 μV (100 kHz bandwidth)
Pumpout Current	Less than 0.2 nanoamps at constant temperature and less than 0.01 nanoamps change/°C
Common Mode Rejection	150 db at DC, 130 db at 60 Hz, 110 db at 400 Hz
Common Mode Voltage	350 Volts maximum peak AC or DC
Bandwidth	DC to 100 kHz
Gain Stability	0.01% (six month term)
Settling Time	30 μsec to within 0.01% of input signal
Long Term Zero Drift	±5 μV RTI, ±1 mV RTO (six month term)
Output Noise	0.2 millivolts peak
Output Capability	±10 volts at 100 ma.

Many system interfacing features are also available as options:

- Programmable Gain and Bandwidth.
- Low Pass Filter.
- Four Pole Bessel Low-Pass Filter.
- Dual and Triple Outputs.
- Binary Gain Steps.
- Output Coding of Gain and Bandwidth.
- Calibrate Relay.
- 110 Volt Input Overload Protection.
- Multiplexer Switch.
- Full Scale Offset Control.

For complete information, ask for our 'Amplifier Options' brochure.

INSTRUMENTATION AMPLIFIERS
Many Data System Features

PRESTON

DX and MX Series Instrumentation Amplifiers

with big amplifier performance in a new, smaller panel-mounted chassis.

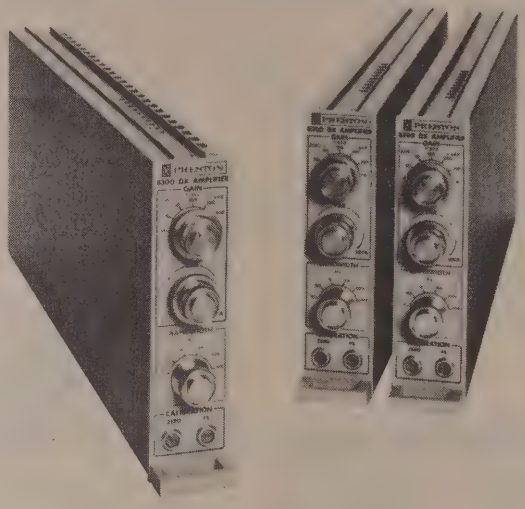
DX Series — Models "A1", "A2", "A3" and "HDX"

Developed to deliver high accuracy at a unit price under $300, the specifications for these compact instrumentation amplifiers include —

6 Selectable Bandwidths	1 Hz, 10 Hz, 100 Hz, 1 kHz, 10 kHz and 40 kHz.
7 Selectable Gains (*)	10, 20, 50, 100, 200, 500 and 1000, plus variable gain.
Gain Accuracy	0.05%
Gain Linearity	0.005%
Settling Time	50 microseconds to within 0.01%.
Pumpout Current	Less than 1 nanoamp @ 25°C and Less than 10 nanoamps @ 50°C.
Common Mode Rejection (*)	130 db @ DC, 108 db @ 60 Hz (@ K=1000)
Common Mode Voltage (*)	10 volts peak.
Input Impedance	100 Megohms.
Input Noise (1 σ)	Less than 3 microvolts @ 40 kHz and .2 microvolts @ 10 Hz.
Output Noise (1 σ)	Less than 200 microvolts.
Output Level	±5 or ±10 volts full scale at 100 milliamps.

(*) Models "A3" and "HDX" have 10 gains from 1 to 1000 plus increased CMR and CMV.

Ten of these new amplifiers fit into a 7 inch high, 19 inch wide rack, and all include a full complement of front panel controls.



MX Series — Model "B"

Now you can get all of Preston's "Balanced Precision" performance in the new 'compact' size!

5 Selectable Bandwidths	10 Hz, 100 Hz, 1 kHz, 10 kHz, and WB.
Maximum Bandwidth	80 kHz at 10 volts peak-peak.
10 Selectable Gains	1, 2, 5, 10, 20, 100, 200, 500, 1000, plus variable gain.
Gain Accuracy	±0.01% full scale.
Gain Linearity	±0.01% full scale.
Common Mode Rejection	150 db @ DC, 120 db @ 60 Hz, 110 db @ 400 Hz.
Common Mode Voltage	350 Volts pk-pk AC or DC.

— plus all of the gain stability, zero stability, and output capability specifications of Preston's 8300 XWB Series Amplifiers!

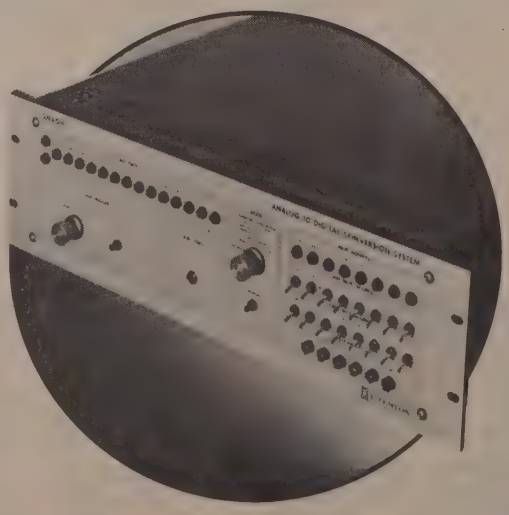
Preston is the Leader in High Accuracy Analog-to-Digital Conversion Systems, too!

With the widest range of resolutions, conversion speeds, analog front-end amplifier/multiplexers and computer interface capabilities, Preston's ADCs are right for every data acquisition system.

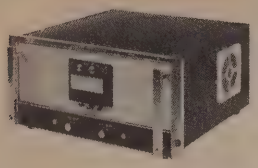
For a complete description of Preston's ADC Systems, see Pages 1664 and 1665 in this volume of **eem.**

PRESTON SCIENTIFIC INCORPORATED
805 East Cerritos Avenue,
Anaheim, California 92805
Telephone: (714) 776-6400
TELEX 65-5321

PRESTON



crown WIDEBAND POWER AMPLIFIERS



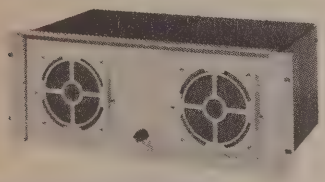
M600 SINGLE-CHANNEL AMPLIFIER

Power Bandwidth +1 −0dB, DC-40KHz at 1,000 VA into 4 ohms, maximum power at 2.5 ohms. **IM Distortion** Under 0.01% from 0.01 VA to 600 VA. **Frequency Response** ±1dB DC-100 KHz at 1 VA into 8 ohms. **Phase Response** +0° −15° DC-20KHz. **Hum and Noise** 120dB below full output (20Hz-20KHz). **Slewing Rate** 32 volts per microsecond. **Output Indicator** Calibrated peak voltage output meter with adjustable hi-lo indicator lights. **Inputs** Wide choice of input configurations using plug-in modules. **Weight** 92 lbs. **Dimensions** 19″-w, x 19″-d, x 8¾″-h. **Price** $1,795 rack mount.

M2000 SINGLE-CHANNEL AMPLIFIER

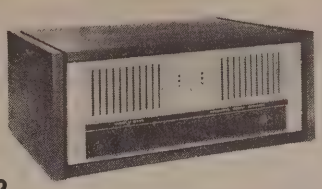
(not shown, equals two M600 units)

Power Bandwidth +1 −0dB, DC-40KHz at 2,000 VA into 8 ohms. Other specifications similar to model M600. **Weight** 200 lbs. **Dimensions** 19″-w, x 17½″-h, x 19″-d. **Price** $3,590 rack mount.



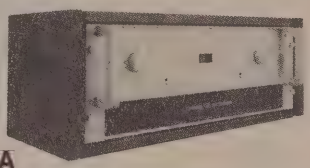
FN-1 FAN PACKAGE

Provides cooling air for D-75, D-150A or DC-300A amplifiers, 115 volts AC, 50 watts. **Dimensions** 19″-w, x 9¾″-d, x 7″-h. **Price** $120.



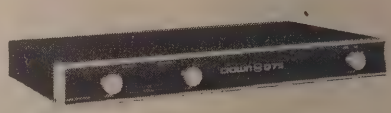
SA-2 DUAL-CHANNEL AMPLIFIER

Power Bandwidth +1dB −0dB, DC-30KHz at 220VA, 8 ohms. **Bridge output** +1dB −0dB, DC-25KHz at 800 VA, 8 ohms; +1dB −0dB, DC 50KHz at 200VA, 8 ohms; +1dB −0dB, DC-25KHz at 400VA, 4 ohms. **IM Distortion** Under 0.01% 0.25VA to 220VA, 8 ohms. **Frequency Response** ±1dB DC to 100KHz, 1VA. **Phase Response** +0° −15° DC to 20KHz at 1VA. **Hum and Noise** 115dB below 220VA. **Output Impedance** Less than 7 milliohms in series with less than 1 microhenry. **Slewing Rate** 40V per microsecond. **DC Drift** under 3mv to 55°C. **Weight** 50 lbs. **Dimensions** 19″-w, x 14″-d, x 7″-h. **Price** $1395 rack mount. Also available as PSA-2 with balanced XLR inputs, hi-lo filters, test tone generator, audio compresssor. Lifting handles optional.



DC300A DUAL-CHANNEL AMPLIFIER

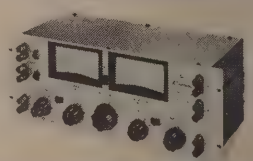
Power Bandwidth +1dB −0dB, DC-20KHz at 180 VA each channel, 8 ohms. **Bridge Output** +1dB DC-20KHz at 360 VA, 16 ohms. **IM Distortion** Under 0.05%, .25 VA to 155 VA, 8 ohms. **Frequency Response** ±1dB, DC-100KHz 1 VA. **Phase Response** +0°, −15° DC to 20KHz at 1 VA. **Hum and Noise** 110dB below 180 VA. **Output Impedance** Less than 7 milliohms in series with less than 3 microhenries. **Slewing Rate** 8V per microsecond. **DC Drift** Under 3 mv to 55°C. **Weight** 55 lbs. **Dimensions** 19″-w, x 9¾″-d, x 7″-h. **Price** $899 rack mount.



D75 DUAL-CHANNEL AMPLIFIER

Power Bandwidth +1dB −0dB, 35Hz-15KHz at 35VA, 8 ohms. **Bridge Output** +1dB −0dB, 20Hz-15KHz at 70 VA, 16 ohms. **IM Distortion** Under 0.05%, .25 VA to 35 VA, 8 ohms. **Frequency Response** ±1.2dB 5Hz-100KHz at 1 VA into 8 ohms. **Phase Response** +10°, −15°, 20Hz-20KHz at 1 VA. **Hum and Noise** 106dB below 30 VA. **Output Impedance** Less than 15 milliohms in series with 3 microhenries. **Slewing Rate** 6V per microsecond. **Voltage Gain** 20.6dB. **Weight** 10 lbs. **Dimensions** 19″-w, x 9¾″-d, x 7″-h. **Price** $349 rack mount.

crown INTERMODULATION DISTORTION ANALYZER

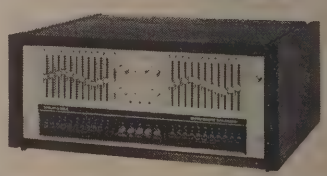


Residual IM Guaranteed under 0.005%, and within 5% of full scale. **Circuitry** FET solid state. **IM Ranges** 0.1, 0.3, 1, 3, 10, 30, 100% full scale on separate IM meter. **Sensitivity** 17mv sensitivity for testing low-level devices; metered, variable LF/HF ratio; internal oscillators 60Hz and 7KHz (SMPTE); provision for external oscillators from 10-150Hz (LF) and 2.5K-20KHz (HF) ranges; constant output impedance. **Plotting** Master "tracking" attenuator, acting on input and output, permits rapid IM plots of the test device—over a 45dB output range in 5dB steps. **Dimensions** 19″-w, x 8¾″-d, x 7″-h. **Price** $675 rack mount, optional walnut cabinet available.

crown DL-2 DUAL-CHANNEL CONTROL SYSTEM

The DL-2 has eight push button or logic controlled inputs, digitally controlled gain adjustments, ISO loudness compensation, shelving and band pass tone controls. The DL-2 comes complete with a separate power module and a separate phono module. Special features include: external signal processor inputs, mixable inputs, 24V RMS balanced output, seven segment gain displays, gain tracking to 0.2dB, 5-7 second muting, tape monitor and tape copying inputs and outputs. REMOTE CONTROL for input selection, power, on/off, mute, volume, balance, 31 position (±0.2dB over 50dB range) channel blend. **Frequency Response** ±0.2dB 3Hz to 100KHz. **Gain** 20dB. **Hum and Noise** −97dB. **Output** 12V RMS maximum. **Phono Module** RIAA response, hum and noise 85dB, gain 30-50dB, input 33-330mv, output 11V RMS. **DL-2 Dimensions** 19″-w, x 14½″-d, x 7½″-h. **Weight** 20 lbs. **Price** $1995.

crown EQ-2 DUAL-CHANNEL EQUALIZER



Eleven bands per channel for full control from 20Hz to 20KHz. ±15dB boost and cut per band. Filters are half octave constant band-width, set on octave centers. Each filter is adjustable ±0.5 octave of center frequency. Channels can be cascaded for half octave centers. Also includes low and high frequency flexible shelving controls. Balanced or unbalanced inputs and outputs. Clip level indicators and turn on muter. **Frequency response** ±1dB 20Hz to 20KHz. **Clip level** 10 V RMS. **Hum & Noise** 90dB. **IM Distortion** <0.01%. 110-125 VAC, 12 watts. **Dimensions** 19″-w, x 7″-h, x 14½″-d. **Weight** 16 lbs. **Price** $995. Rack mount.

crown VFX-2A DUAL-CHANNEL VARIABLE FILTER

One low pass and one high pass filter per channel, switch selectable to the bandpass mode and continuously variable from 20Hz to 20KHz. 18dB per octave Butterworth filters. Balanced and unbalanced inputs and outputs. ±0.1dB 20Hz to 20KHz. 10V output maximum. **IM Distortion** <0.1%. **Signal to Noise** 113dB. 2 watts, 117VAC. **Dimensions** 19″-w, x 3½″-h, x 5¾″-d. **Weight** 6 lbs. **Price** $329. Rack mount.

crown INDUSTRIAL 1718 W. Mishawaka Road, Elkhart, Indiana 46514 **219/294-5571**

iem.®

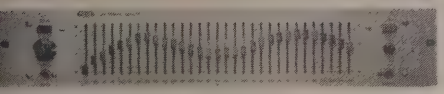
INTERNATIONAL ELECTRO MAGNETICS, INC.

ERIC DRIVE AND CORNELL AVENUE, PALATINE, ILLINOIS 60067 (312) 358-4622

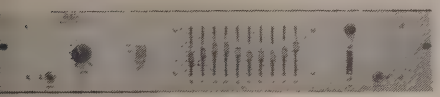
PROFESSIONAL AUDIO EQUIPMENT

iem. OPTRO

GRAPHIC EQUALIZERS



MODEL 231 —
THIRTY ONE ⅓ OCTAVE



MODEL 213 —
TEN OCTAVE

Both cover the entire audio spectrum and permit complete control of spectral balance. Both models are normally used with unity gain, input to output.

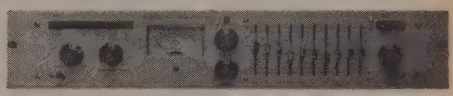
The Optro Model 213 offers 10 in-line, linear controls to control boost or cut-off for each octave. A filter in/out key enables a preset equalization to be switched in or out for specific program requirements. An input level control effects overall gain.

In the Model 231 thirty one in-line slide controls control boost or cut of each ⅓rd octave. A filter in/out key enables preset equalization to be switched in or out for particular programs. The Model 231 is probably the most flexible graphic equalizer — providing detailed emphasis or de-emphasis of even small sound spectrum segments.

The Dual Band Limiter-Compressor operates over two independent bands, one below and the other above 300 Hz. The independent release times in each band prevent high level low frequency signals modulating the audio level in the other band.

A long release time is provided in the low band to prevent signal distortion whilst it is possible to maintain a shorter release time in the high band.

This system ensures a more balanced sound whilst maintaining a constant high level of modulation.

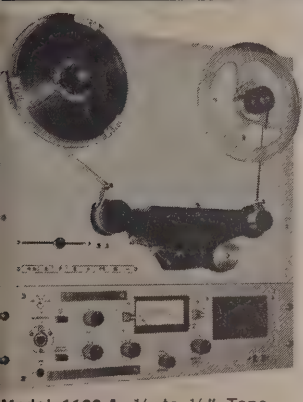


The Model 740 Audio Processor combines a microphone amplifier, a limiter compressor, an audio gate, a graphic equalizer and a line drive amplifier in one compact rack package.

Taking only 3½″ of rack space, the Audio Processor is one of the most versatile and useful units to become available to the professional audio engineer.

Overall frequency response is 30 - 15 kHz. ±0.5 dB. The unit contains its own regulated power supplies with overcurrent protection.

MULTI-CHANNEL MAGNETIC TAPE RECORDERS



Model 1100-A: ¼ to ½″ Tape
Model 1100-B: ½ to 1″ Tape

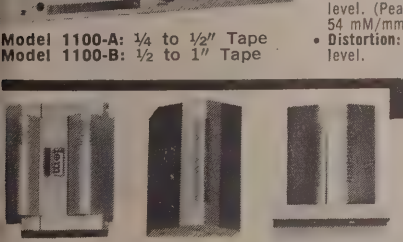
With configurations ranging from 1 to 32 track, the 1000 & 1100 Series handles ½, ¼, 1, 2, & 3 tape on spools of up to 14″ diameter. The basic layout consists of a console or rack mounted tape transport with power supplies and track amplifiers. The tape transport itself consists of a precision machined aluminum plate on which all components, including the solid state control box, are mounted. Servo control of the spooling motors provides constant tape tension from start to finish of the reel, smooth tape handling being assured by a direction sensed dynamic braking system. Disc brakes are provided as holding brakes when the transport is stationary. The servo capstan motor is crystal-locked, providing absolutely steady tape drive. Headblocks are plug in and quickly interchangeable, and incorporate all equalization components, enabling instant change of head format and equalization. Record bias frequency is crystal-locked. Although push button selectable 3 speeds (7½, 15 and 30 i.p.s.) are standard, an inbuilt vari-speed facility permits continuous variation from 7½ to 30 i.p.s.

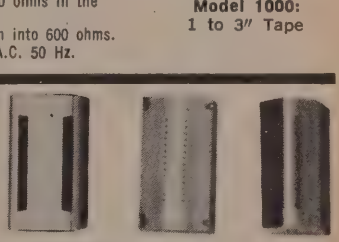
These decks are a professional user's dream; they are robust, reliable and efficient. Designed for heavy duty, continuous use, they are typical of the New Era range being marketed by IEM.

- **Tape Speed:** 7.5, 15, or 30 i.p.s. Also vari-speed from 7.5 to 30 i.p.s.
- **Replay response** (at 15 i.p.s.): ±1 dB 30 Hz to 15 kHz.
- **Overall response** (at 15 i.p.s.): ±2 dB 30 Hz to 15 kHz.
- **Noise:** Better than 68 dB below peak record level.
- **Distortion:** Less than 2.5% T.H.D. at peak record level. (Peak record level is equivalent to 54 mM/mm track width.)
- **Distortion:** Less than 1% T.H.D. at normal record level.
- Crosstalk: Better than 50 dB between adjacent tracks.
- **Wow and flutter:** Less than 0.07% R.M.S. in the band 0.5 Hz to 250 Hz.
- **Input impedance:** 10K ohm balanced.
- **Input level range:** +2 dBm to +24 dBm for peak level on tape.
- **Output impedance:** Less than 100 ohms in the band 30 Hz to 15 kHz.
- **Output level:** +24 dBm maximum into 600 ohms.
- **Power requirements:** 220-250 V.A.C. 50 Hz.

Model 1000:
1 to 3″ Tape

PRECISION MAGNETIC HEADS





SPECIFICATIONS

AUDIO — IRIG — ANALOG

Type Designation	Application	No. of Tracks	Track Width	Track Spacing	Inductance @ 1KC	Bias	Output	Tape Speed IPS
R4N5	Record	4	.080	.130	10 mh	3.5 ma @ 100KC		15/30
P4N5	Playback	4	.080	.130	700 mh	—	1KC 20KC 5.5 mv 12 mv	15/30
E8N1	Erase	8	.080	.130	1.5 mh	30 ma @ 100KC		15/30
R8N1	Record	8	.070	.130	15 mh	3.5 ma @ 100KC		15/30
P8N1	Playback	8	.070	1.30	1.2 henry	—	1KC 5 mv	15/30
R16L2	Record	16	.070	.127	3.5/15 mh	6./2 ma @ 150KC		15/30
P16L2	Playback	16	.070	.127	3.8/900 mh	—	0.4/6.0 mv 1K	15/30
E16L2	Erase	16	.080	.127	0.6/1.2 mh	75/50 ma @ 150KC		15/30
E24L2	Erase	24	.050	.085	100 uh	200 ma @ 60KC		15/30
R24L2	Record	24	.040	.085	3.5 mh	7 ma @ 120KC		15/30
P24L2	Playback	24	.040	.085	800 mh	—	1KC 15KC 3 mv 8 mv	15/30

FERRITE HI-SPEED DUPLICATION

FERRITE Head Type	IEM Type	No.	Inductance @ 1 KHz	Gap Size	Bias Current At 1MHz Wavelength .003 ma	.0007	Bias Current At 2 MHz	Audio Current	Cross Talk
Full Track ¼″	RF1L2	393-5	700 uh	.0003	6.2	4.7	—	.0005	NA
Half Track ¼″	RF1/2L2	394-3	—	—	5.5	4.2	—	.0005	NA
Two Track ¼″	RF2L2	395-5	—	—	5.6	4.1	—	.0005	56 DB
4-Track Stereo ¼″	RF2 4L2	858 1	—	—	4.5	3.5	13.0	.0012	58 DB
Quadraphonic ¼″	RF4L2	871 1	700 uh		4.5	3.5	—	.0005	50 DB
8-Track ¼″	RF2 8L2	324W	1.0 mh	.0003	3.8	3.0	—	.0005	58 DB
8-Track Quad ¼″	RF2 8L2	850 1	350 uh	.00015	6.2	4.7	9.0	.0006	55 DB
2-Track 150	RF...15	863 1	700 uh		4.6	3.6		.0005	48 DB
2-Track Stereo 150	RF2 4L15	441 17	700 uh		4.6	3.8		.0005	35 DB
Half Track 150	RF1 2L15	468-5	700 uh	.00015	4.5	3.6	—	.0005	NA

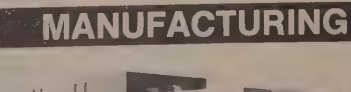
DIGITAL COMPUTER

Application	No. of Tracks	Track Width	Track Spacing	Inductance @ 1KC	Bit Density BPI	Read Output MV p/p	Saturation Current NRTZ	Tape Speed IPS
Hi Density Read	20	.020	.049	3 mh	900	10 mv	—	150
Hi Density Write	20	.027	.049	150 uh	900	—	100 ma	150
Med. Density Read	7	.030	.070	12 mh	556	40 mv		120
Med. Density Write	7	.048	.070	150 uh	556		50 ma	120
Hi Density	30	.012	.042	80 mh	800	4.5 mv	3.0 ma	71½
Read Write								
Hi Density	4	.025	.026	50 mh	5000	4.0 mv	1.8 ma	7½ip
Read Write								
Read Write	9	.040	.055	12 mh	1000	40 mv	—	120
Read	9	.042	.055	300 uh	1000	—	100 ma	120

HEAD RECONDITIONING

IEM has established a complete servicing department for the reconditioning of magnetic heads and assemblies. Featuring a rapid turnaround time (within 24 hours in most cases), your heads will be lapped, ultrasonically cleaned, checked electrically, and microscopically inspected. If the heads are sent on assemblies, the assemblies will be taken apart, cleaned, reassembled and optically aligned. Flutter rollers will be resurfaced if they are grooved.

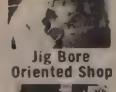
MANUFACTURING AND DESIGN CAPABILITIES



IEM, since 1958, with exceptional personnel stability plus ultra modern, total facilities, has become one of the most dependable suppliers of mass produced and special magnetic heads as well as OEM recording systems.

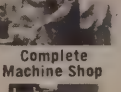
SEND FOR BULLETINS

Jig Bore Oriented Shop



NBS Traceable Testing

Complete Machine Shop

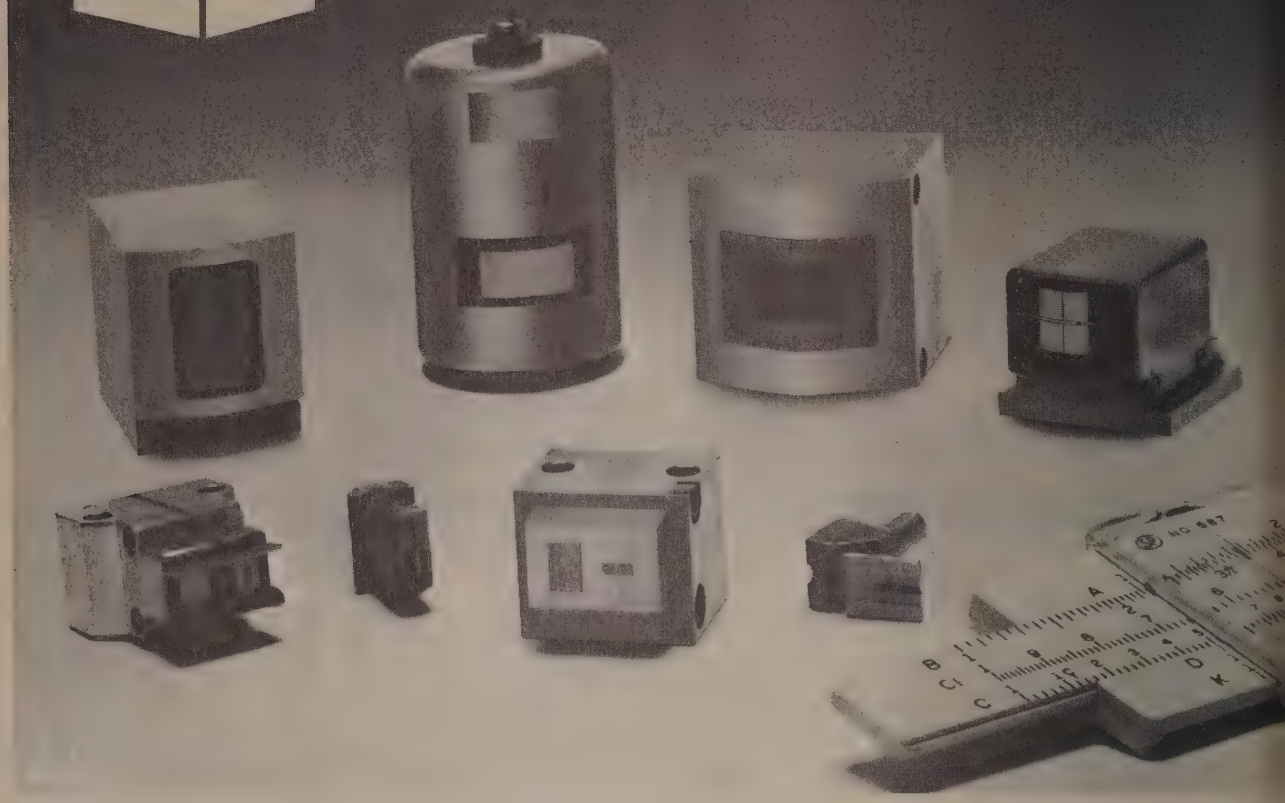


Microscope Equipment Lines

Computer Controlled Production

Micro Inch Measuring Lab

LIPPS..INC magnetic recording heads



LIPPS . . INC. is the oldest independent head manufacturer in the United States. We are a production-oriented facility with engineering and development capabilities that enable us to produce long life as well as conventional heads. **LIPPS . . INC.** produces a complete line of high quality recording heads for Professional Audio, Analog, Digital and special purpose applications.

Our unique methods have always enabled us to furnish top quality, precision products to our customers at very competitive prices. **LIPPS . . INC.** does everything in-house to assure the quality and scheduling aspects of our product. Some of which are:

photolab — chemical milling — hydrogen annealing — transfer molding — vacuum depositing — complete capability to machine, profile, slice and lap ferrite and ceramic materials—complete in-house machine shop.

PRE-ALIGNED HEAD ASSEMBLIES

LIPPS . . INC. offers a variety of precision-made head assemblies, complete and ready to mount on your transport. Renew your existing equipment for finer reproduction quality, or update older quipment to accommodate the newer multi-channel recording techniques.

REFURBISHMENT REPLACEMENT SERVICE AUDIO • ANALOG • DIGITAL • For the End User

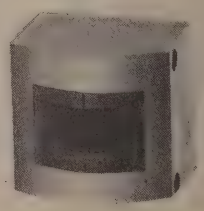
Enjoy maximum usage for a fraction of the original cost. Utilize our reconditioning service to obtain maximum use of existing heads.

We will be pleased to furnish prices for special assemblies, including AUDIO, ANALOG and DIGITAL. Most assemblies are serviced in three to five working days.

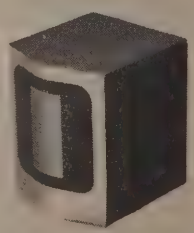
LIPPS . . INC. manufactures a complete line of monaural, stereo and multichannel heads for replacement of original heads in name-brand recorders. Our heads are guaranteed to equal or exceed the requirements of original equipment.

We also maintain a complete relapping and replacement service for Ampex and RCA Video Tape Recorder Audio Heads, and some loaners are available.

EXTENDED LIFE HEAD



FERRITE CERAMIC CONSTRUCTION

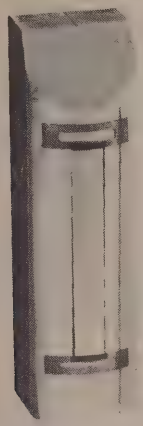


20 TRACKS IN LINE, ½"

SPECIALIZED PRECISION MAGNETIC RECORDING HEADS

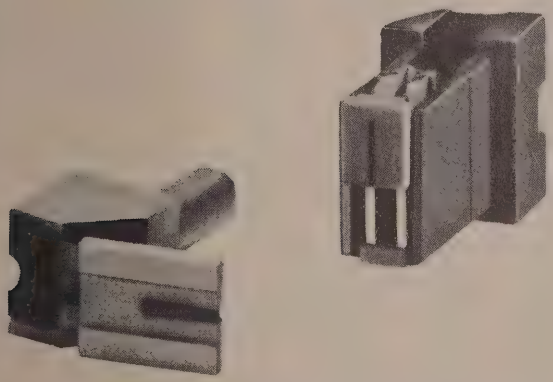
When you require more channels on narrower tape widths, **LIPPS . . INC.** is the one to contact. Our more than 30 years of head manufacturing and our unique manufacturing methods has enabled us to produce more tracks in less space than any other head manufacturer.

PROFESSIONAL AUDIO AND FILM RECORDING HEADS



TYPICAL AUDIO STACK FOR RCA TYPE VIDEO TAPE RECORDER

COMMERCIAL AND MILITARY TYPE FLYING HEADS, FOR DRUM AND DISC APPLICATIONS

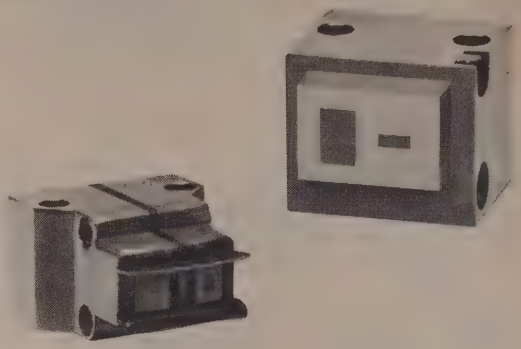


Fixed and flying drum heads for read and write operations, low and high frequency. Designed specifically for new and direct replacement requirements for drums of four inch to eighteen inch diameter and typical rotational speeds of 1800 RPM and higher.

MEDICAL HEADS

Slow speed (1/8 IPS) reproduce head for cardiac recorder. Extremely well shielded against hum pick-up. Very high output. Inductances up to 200 Henries.

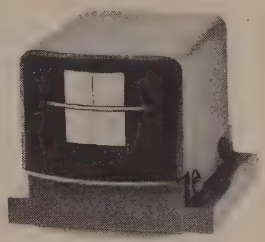
DIGITAL READ/WRITE HEADS FOR CASSETTE AND CARTRIDGE



LIPPS . . INC. manufactures a complete line of digital read/write heads for cassette and cartridge application. With single and multichannel configuration for .150 and ¼ inch format.

Data rates range to 3200 FRPI at tape speeds of up to 120 IPS.

CREDIT CARD AND MICR READ/WRITE HEADS



Magnetic stripe card and ticket read and read/write heads with specifications which meet IATA, ABA and Thrift requirements. These single and multi-track magnetic heads have proven themselves in millions of hours of actual operation. The life factor ranks as one of the highest in practical use today. Our conventional heads average 300K passes. Our long life versions offer over a million passes. Typical data rates are above 400 FRPI at 15 IPS card speed. We also manufacture a complete line of MICR heads.

We are basically a manufacturer of custom heads designed to individual requirements. Your specifications will receive immediate attention when sent to us for quotation, and our engineering staff is always available to assist in any way.

We look forward to having the opportunity to manufacture a product built to your exacting requirements at a competitive price.

If you're having problems in your current head program contact us, we may have the answer.

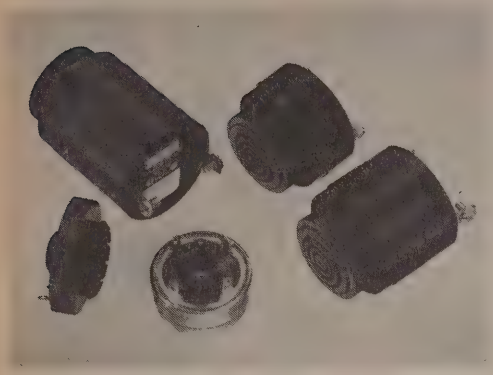
Robert J. Cross
Executive Vice President

OUR 30TH YEAR 1947 - 1977

LIPPS..INC
magnetic recording heads

1630 euclid street, santa monica, calif. 90404
(213) 450-1324 / 871-0777

MALLORY Sonalert®
ELECTRONIC AUDIBLE SIGNALS



Mallory sonalert signals produce an audible tone by electronic means.

A soft soothing tone or a pleasant chime may be used as a gentle reminder. A more urgent "attention getting" message can be delivered by a louder pulsing or beeping Sonalert signal. For emergencies, or to cut through heavy background noise, a very loud sound blast is available.

Four tone frequencies, three loudness levels and seven modes, or rhythms, may be combined to produce over 30 distinctive and useful sounds.

Sonalert signals may be powered by any electrical source ranging from single cell batteries to industrial power lines. Very little electrical power is required making them ideally suitable for portable battery operated equipment. This low power feature allows the Sonalert signal to be turned on or off with a low power transistor, SCR, or integrated circuit. Completely solid state with no moving parts, no arcing, and no mechanical wear, the Mallory Sonalert signals will give you many years of trouble-free efficient service.

PART AND MODEL NUMBER	LOUDNESS CATEGORY	MOUNTING METHOD	CASE STYLE	FREQUENCY ±500 Hz	MINIMUM SOUND LEVEL dB (A) AT TWO FEET		OPERATING VOLTAGE MIN. MAX. *AC/DC NON-POLAR ALL OTHERS D.C. ONLY		TYPICAL OPERATING CURRENT MA	
					AT MIN. V	AT MAX. V			AT MIN. V	AT MAX. V
CONTINUOUS TONE										
SC110N	LOUD	PANEL	D	2900	80	95	*30	120	8	28
SC616N	LOUD	PANEL	C	2900	80	95	6	16	4	16
SC616NL	LOUD	PANEL	C-3	2900	80	95	6	16	4	16
SC628AN	LOUD	PANEL	D	2900	80	95	* 6	28	8	28
SC648AN	LOUD	PANEL	D	2900	80	95	*10	48	8	28
SBM2	MEDIUM	PRINTED BOARD	F	2900	55	68	1	4	1	8
SBM428	MEDIUM	PRINTED BOARD	F	2900	64	78	4	28	1.8	14
SNP428	MEDIUM	SNAP IN PANEL	B	2900	64	78	4	28	1.8	14
SC110	MEDIUM	PANEL	D	2900	68	80	*30	120	4	16
SC110D	MEDIUM	PANEL	D	1900	60	75	*30	120	4	16
SC110H	MEDIUM	PANEL	D	4500	68	80	*30	120	4	16
SC110M†	MEDIUM	PANEL	D	2900	68	80	*30	120	4	16
SC250	MEDIUM	PANEL	D	2900	68	80	*60	250	4	16
SC250D	MEDIUM	PANEL	D	1900	60	75	*60	250	4	16
SC250H	MEDIUM	PANEL	D	4500	68	80	*60	250	4	16
SC628	MEDIUM	PANEL	C	2900	68	80	6	28	3	14
SC628A	MEDIUM	PANEL	D	2900	68	80	* 6	28	4	16
SC628AD	MEDIUM	PANEL	D	1900	60	75	* 6	28	4	16
SC628AH	MEDIUM	PANEL	D	4500	68	80	* 6	28	4	16
SC628D	MEDIUM	PANEL	C	1900	60	75	6	28	3	14
SC628H	MEDIUM	PANEL	C	4500	68	80	6	28	3	14
SC628L	MEDIUM	PANEL	C-3	2900	68	80	6	28	3	14
SC628M†	MEDIUM	PANEL	C	2900	68	80	6	28	3	14
SC628MD†	MEDIUM	PANEL	C	1900	60	75	6	28	3	14
SC648	MEDIUM	PANEL	C	2900	68	80	10	48	3	14
SC648A	MEDIUM	PANEL	C	2900	68	80	*10	48	4	16
SC648AD	MEDIUM	PANEL	D	1900	60	75	*10	48	4	16
SC648AH	MEDIUM	PANEL	D	4500	68	80	*10	48	4	16
SC648D	MEDIUM	PANEL	C	1900	60	75	10	48	3	14
SC648H	MEDIUM	PANEL	C	4500	68	80	10	48	3	14
SC1.5	SOFT	PRINTED BOARD	A	3500	60 @ 1.5 V		1	4	4 @ 15 V	
SC6	SOFT	PRINTED BOARD	A	3500	70 @ 6 V		4	8	12 @ 6 V	
SC12	SOFT	PRINTED BOARD	A	3500	70 @ 12 V		8	15	14 @ 12 V	
SC18	SOFT	PRINTED BOARD	A	3500	70 @ 18 V		14	22	16 @ 18 V	
SC24	SOFT	PRINTED BOARD	A	3500	70 @ 24 V		20	30	16 @ 24 V	
SNP428F	SOFT	SNAP IN PANEL	B	2900	55	70	4	28	1.8	14
SC110E	SOFT	PANEL	D	1900	55	65	*30	120	3	14
SC110F	SOFT	PANEL	D	2900	55	70	*30	120	1	4
SC250E	SOFT	PANEL	D	1900	55	65	*60	250	3	14
SC250F	SOFT	PANEL	D	2900	55	70	*60	250	1	4
SC628AE	SOFT	PANEL	D	1900	55	65	* 6	28	3	14
SC628AF	SOFT	PANEL	D	2900	55	70	* 6	28	1	4
SC648AE	SOFT	PANEL	D	1900	55	65	*10	48	3	14
SC648AF	SOFT	PANEL	D	2900	55	70	*10	48	1	4
SC628E	SOFT	PANEL	C	1900	55	68	6	28	3	8
SC628F	SOFT	PANEL	C	2900	55	70	6	28	.5	3

† Military Version

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(317) 856-3731

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PART AND MODEL NUMBER		LOUDNESS CATEGORY	MOUNTING METHOD	CASE STYLE	FREQUENCY ±500 Hz	MINIMUM SOUND LEVEL dB (A) AT TWO FEET AT MIN. V	AT MAX. V	OPERATING VOLTAGE MIN.	MAX. *AC/DC NON-POLAR ALL OTHERS D.C. ONLY	TYPICAL OPERATING CURRENT MA AT MIN. V	AT MAX. V
FAST PULSE TURNS ON AND OFF AT 2 TO 9 PULSES PER SECOND DEPENDING UPON VOLTAGE AT 50% DUTY CYCLE.	**SLOW PULSE** TURNS ON AND OFF AT .5 TO 1.5 PULSES PER SECOND DEPENDING UPON VOLTAGE AT 50% DUTY CYCLE.										
SC110NP	SC110NJ	LOUD	PANEL	D	2900	80	95	*30	120	8	28
SC616NP	SC616NJ	LOUD	PANEL	C	2900	80	95	6	16	4	16
SC628ANP	SC628ANJ	LOUD	PANEL	D	2900	80	95	* 6	28	8	28
SC648ANP	SC648ANJ	LOUD	PANEL	D	2900	80	95	*10	48	8	28
SBM616P	SBM616J	MEDIUM	PRINTED BOARD	F	2900	68	78	6	16	1	4
SC110DP	SC110DJ	MEDIUM	PANEL	E	1900	60	75	*30	120	4	16
SC110HP	SC110HJ	MEDIUM	PANEL	E	4500	68	80	*30	120	4	16
SC110P	SC110J	MEDIUM	PANEL	E	2900	68	80	*30	120	4	16
SC250DP	SC250DJ	MEDIUM	PANEL	E	1900	60	75	*60	250	4	16
SC250HP	SC250HJ	MEDIUM	PANEL	E	4500	68	80	*60	250	4	16
SC250P	SC250J	MEDIUM	PANEL	E	2900	68	80	*60	250	4	16
SC616P	SC616J	MEDIUM	PANEL	C-1	2900	68	78	6	16	1	4
SC616P-1	SC616J-1	MEDIUM	PANEL	C-2	2900	68	78	6	16	1	4
SC628ADP	SC628ADJ	MEDIUM	PANEL	E	1900	60	75	* 6	28	4	16
SC628AHP	SC628AHJ	MEDIUM	PANEL	E	4500	68	80	* 6	28	4	16
SC628AP	SC628AJ	MEDIUM	PANEL	E	2900	68	80	* 6	28	4	16
SC628DP	SC628DJ	MEDIUM	PANEL	D	1900	60	75	6	28	3	14
SC628HP	SC628HJ	MEDIUM	PANEL	D	4500	68	80	6	28	3	14
SC628MP†		MEDIUM	PANEL	D	2900	68	80	6	28	3	14
SC628P	SC628J	MEDIUM	PANEL	D	2900	68	80	6	28	3	14
SC648ADP	SC648ADJ	MEDIUM	PANEL	E	1900	60	75	*10	48	4	16
SC648AHP	SC648AHJ	MEDIUM	PANEL	E	4500	68	80	*10	48	4	16
SC648AP	SC648AJ	MEDIUM	PANEL	E	2900	68	80	*10	48	4	16
SC110EP	SC110EJ	SOFT	PANEL	E	1900	55	68	*30	120	3	14
SC110FP	SC110FJ	SOFT	PANEL	E	2900	55	70	*30	120	4	16
SC250EP	SC250FJ	SOFT	PANEL	E	1900	55	68	*60	250	3	14
SC250FP	SC250FJ	SOFT	PANEL	E	2900	55	70	*60	250	4	16
SC628AEP	SC628AEJ	SOFT	PANEL	E	1900	55	68	* 6	28	3	14
SC628AFP	SC628AFJ	SOFT	PANEL	E	2900	55	70	* 6	28	4	16
SC628EP	SC628EJ	SOFT	PANEL	D	1900	55	68	6	28	3	8
SC628FP	SC628FJ	SOFT	PANEL	D	2900	55	70	6	28	3	14

SHORT PULSE
TURNS ON AND OFF AT .5 TO 1.5 PULSES PER SECOND DEPENDING UPON VOLTAGE AT 10% DUTY CYCLE.

SC110K	MEDIUM	PANEL	E	2900	68	80	*30	120	4	16
SC628K	MEDIUM	PANEL	D	2900	68	80	6	28	3	14
SC110FK	SOFT	PANEL	E	2900	55	70	*30	120	4	16
SC628FK	SOFT	PANEL	D	2900	55	70	6	28	3	14

COMBINED CONTINUOUS OR PULSING SOUND IN ONE PACKAGE.
WHEN POWER TERMINALS ARE CONNECTED, THIRD TERMINAL MAY BE SWITCHED FROM COMMON TO POSITIVE TO SELECT EITHER CONTINUOUS OR PULSING SOUND. SWITCHING CURRENT IS LESS THAN .15 MILLIAMP.

CONTINUOUS - FAST PULSE	**CONTINUOUS - SLOW PULSE**										
SBM616PC	SBM616JC	MEDIUM	PRINTED BOARD	F	2900	68	78	6	16	1	4

FAST WARBLE **SLOW WARBLE**
PRODUCES TWO TONES ALTERNATELY WHEN USED WITH ADDITIONAL CONTINUOUS TONE UNIT.

SC628W (USE WITH SC628D OR SC628H)	SC628JW	MEDIUM	PANEL	D-1	2900	68	80	6	28	3	16
SC628FW (USE WITH SC62E)	SC628FJW	SOFT	PANEL	D-1	2900	55	70	6	28	3	14

CHIME TONE
A PLEASANT SOUND WHICH CHIMES EVERY ONE OR TWO SECONDS AS LONG AS VOLTAGE IS APPLIED.

SC616CP	MEDIUM	PANEL	D	2900	68	80	6	16	3	8

CHIRP
A UNIQUE SOUND WHICH PULSES AT 20-60 PULSES PER SECOND RATE.

SC110Q	MEDIUM	PANEL	C	2900	68	80	*30	120	3	10
SC616Q	MEDIUM	PANEL	C-1	2900	68	78	6	16	1	4

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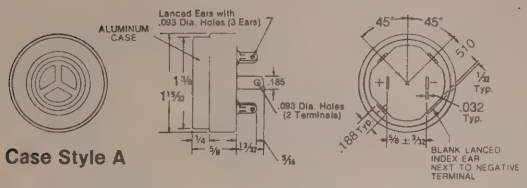
CASE STYLES

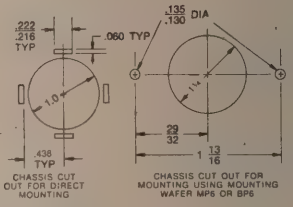
OUTLINE DIMENSIONS
FRACTIONS ±1/32 DECIMALS ±.01



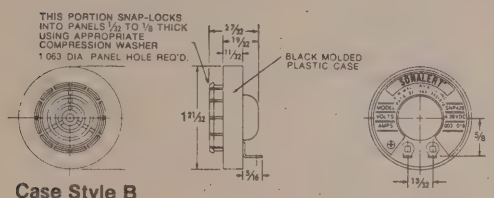
Case Style A

Terminals—.032 steel, tin plated with .093 dia. wire hole, will accept standard 3/16" quick disconnect.

BP6 BAKELITE MOUNTING WAFER



Mounting—Four lanced twist mount ears per EIA std. RS395 are provided for mounting. Terminals are electrically isolated from case and mounting ears. Also may be mounted using mounting wafer number MP6 for uninsulated mounting or mounting wafer number BP6 to insulate case from chassis.

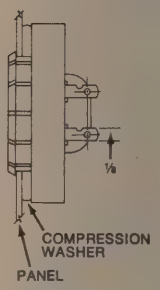

THIS PORTION SNAP-LOCKS INTO PANELS 1/32 TO 1/8 THICK USING APPROPRIATE COMPRESSION WASHER
1.063 DIA. PANEL HOLE REQ'D.
BLACK MOLDED PLASTIC CASE

Case Style B

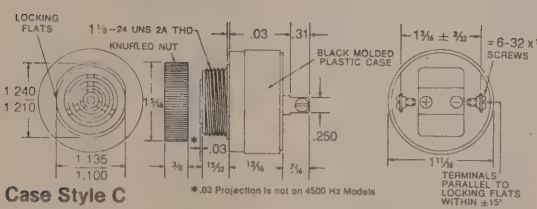
Terminals—.016 brass, hot tin finish with .076 wire hole. Terminal will accept standard 1/8" quick disconnect.

Mounting—Panel hole 1.063 ± .005 diameter should be punched from the back side so that locking fingers enter on the slightly rounded edge of the hole. Assemble proper compression washer and press into panel hole until locking fingers snap over hole edge. Installation pressure should be applied only at the circumference of the device.

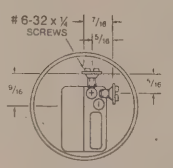
PANEL THICKNESS	COMPRESSION WASHER NO.
11-12 GA. (.125-.109)	PW1
13-17 GA. (.093-.056)	PW2
18-22 GA. (.050-.031)	PW3



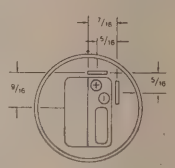
TYPICAL PANEL INSTALLATION


LOCKING FLATS
1 1/8-24 UNS 2A THD
KNURLED NUT
BLACK MOLDED PLASTIC CASE
.250
TERMINALS PARALLEL TO LOCKING FLATS WITHIN ±15°
*.03 Projection is not on 4500 Hz Models

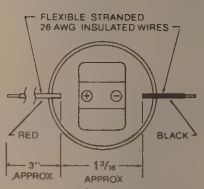
Case Style C



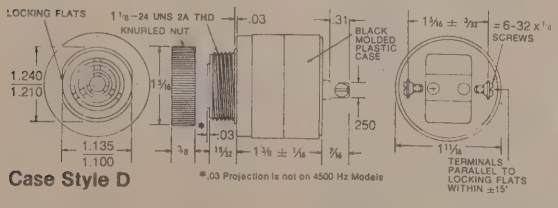
Case Style C-1



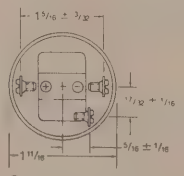
Case Style C-2



Case Style C-3

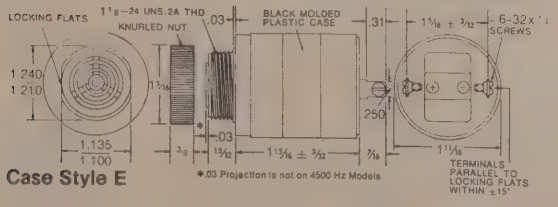

LOCKING FLATS
1 1/8-24 UNS 2A THD
KNURLED NUT
BLACK MOLDED PLASTIC CASE
.250
TERMINALS PARALLEL TO LOCKING FLATS WITHIN ±15°
*.03 Projection is not on 4500 Hz Models

Case Style D



Case Style D-1

Terminals—.032 brass, tin plated, tapped for #6-32 screw. Two #6-32 cadmium or zinc plated steel screws included. Will accept standard 1/4" quick disconnect.


LOCKING FLATS
1 1/8-24 UNS 2A THD
KNURLED NUT
BLACK MOLDED PLASTIC CASE
.250
TERMINALS PARALLEL TO LOCKING FLATS WITHIN ±15°
*.03 Projection is not on 4500 Hz Models

Case Style E

Mounting—Remove black plastic nut and insert threaded front through 1.25" hole punched in panel. If orientation is needed, note locking flats on drawing. Screw nut back on. Do not overtighten. To substitute natural finished aluminum nut add C to catalog number. To substitute black anodized aluminum nut add B to catalog number. Example: — SC628B.

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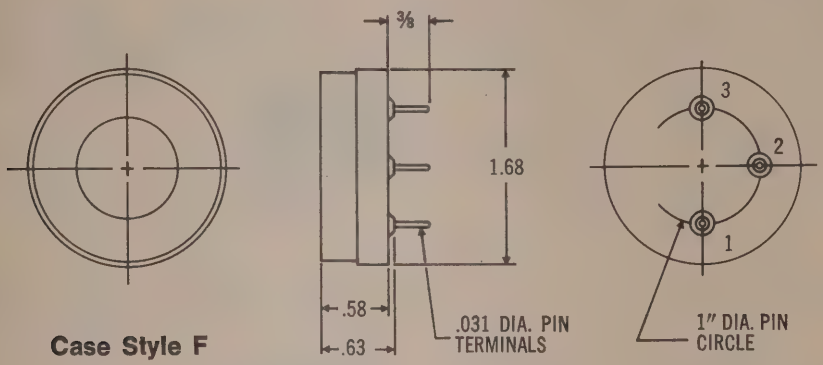
CASE STYLES



Case Style F

ENVIRONMENTAL SPECIFICATIONS

Surge voltage
15% over maximum rated voltage applied for less than one minute.

Reverse voltage — DC models
Maximum reverse polarity equal to rated voltage for one minute. Some models may sound softly when subjected to reversed polarity voltage.

Life
Continuous — 100 hours continuous operation at 65°C with maximum rated voltage applied.

Intermittent — A duty cycle of 1 minute on, 5 minutes off, a minimum of 1000 times at room temperature and maximum rated voltage applied.

Storage temperature
−40°C to +85°C.

Operating temperature
−30°C to +65°C

Humidity
The Sonalert signal will operate after having been subjected to 95% Relative Humidity at +40°C continuously for 100 hours. After removal from test, the unit should be allowed to dry a minimum of 4 hours at room temperature before operation. Units will deliver original output characteristics.

Vibration
The Sonalert signal is to be mounted in the standard manner on a mounting panel. The specimens can be subjected to a harmonic motion having an amplitude of 0.03 inch (0.06 inch maximum total excursion). The frequency shall be varied uniformly between a limit of 10 and 55 Hertz. The entire frequency range from 10 to 55 Hertz and return to 10 Hertz should be traversed in approximately one minute. Motion is to be applied for two hours in each of 3 mutually perpendicular planes (total 6 hours). This test is to be conducted while the Sonalert signal is not operating. After completion of test, Sonalert signals will meet original specifications.

Salt spray
The Sonalert signal meets original specified operating conditions after being subjected to 96 hours in an atomized salt spray. The spray consists of a 5% salt solution atomized by a forced air supply. The solution is sprayed through a nozzle into a chamber maintained at 35°C. After the test, the unit is removed and washed in running water not warmer than 40°C. Use a soft hairbrush or plastic bristle brush, lightly brushing to remove salt deposits from the unit. The cleaned Sonalert signals are placed on absorbent material with the nose cone pointed downward and allowed to dry at room temperature for 24 hours prior to use.

Terminal strength
5 pounds, applied axially for a period of 5 minutes. This is considered a destructive test.

INDUSTRY LISTINGS

Underwriters laboratories
The following models are listed as recognized components — audible signal appliances. Guide Number USCT2, Yellow Card Number S1290.

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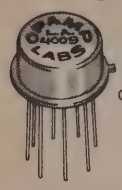
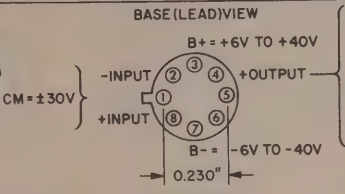
AMPLIFIERS – OSCILLATORS
POWER SUPPLIES – AUDIO CONSOLES
F.O.B. LOS ANGELES, CA.
Send for FREE CATALOG and 50 APPLICATIONS

OPAMP LABS INC.
1033 N. SYCAMORE AVENUE
LOS ANGELES, CA. 90038
(213) 934-3566

MODEL 4009 MEDIUM VOLTAGE D.C. OPERATIONAL AMPLIFIER



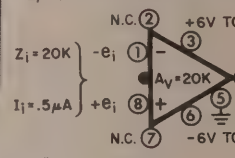


@ B± = ±36V
Z_o = 2.5K
e_o = ±30V/50K
$C_L \leq 0.1\mu F$
SLEW RATE = 10V/μS
A_V = 800
NOISE = 2μV

SIZE: TO-5 8-LEAD WT: 0.1 OZ. PRICE: $12.00/EA

MODEL 423 D.C. OPERATIONAL AMPLIFIER (REPAIRABLE)

●D.C. TO 150KC ● ±20mV OFFSET ● ±10μV/°C DRIFT
● 2μV (-115dbm) NOISE ● 0.1% T.H.D.

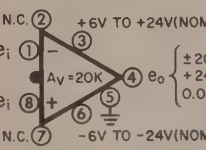


B± = ±24V (NOM.)
±18V/8Ω
12W RMS
40W PK (AUDIO)

OCTAL PLUG-IN
SIZE: 1-1/2" x 3-1/4" x 2-1/2" H. WT: 7 OZ. PRICE: $40.00/EA

MODEL 425 D.C. OPERATIONAL AMPLIFIER

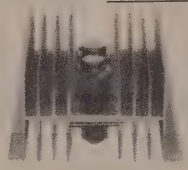
Z_i = 20K
±20mV OFFSET
I_i = 0.5μA
±20μV/°C
CM: ±20V
NOISE: 1μV (-120dbm)

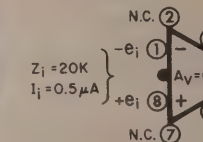


±20V/1K/D.C. - 100KC
+24dbm/D.C. - 50KC
0.05% T.H.D.

OCTAL PLUG-IN
SIZE: 1" DIA x 1-5/8" H WT: 2 OZ PRICE: $30.00/EA.

MODEL 440 50W. D.C. THRU AUDIO OPERATIONAL POWER AMPLIFIER





@ B± = 36V
±30V/8Ω
100W PK
50W RMS

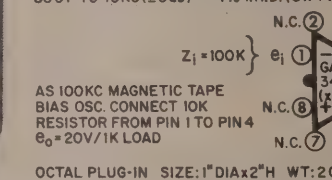
OCTAL PLUG-IN
SIZE: 4-3/4" x 5-1/2" x 2-5/8" H WT: 20 OZ PRICE: $45.00/KIT, $60.00/WIRED

MODEL SM-100 DUAL 50W. OR MONO 100W. D.C. THRU AUDIO OPERATIONAL POWER AMPLIFIER

DESCRIPTION: PANEL-CHASSIS WITH HARDWARE, TWO 440KR POWER AMPLIFIER KITS, ONE WIRED AND TESTED 536 POWER SUPPLY, PC-SM 100 CONVERTIBLE STEREO, 50W OR MONO 100W PRINTED CIRCUIT BOARD AND ALL NECESSARY COMPONENTS.
SIZE: 7" H x 19" W x 7" D
WT: 15 LBS PRICE: $200.00/KIT, $280.00/WIRED

MODEL 34 AMPLIFIER-BIAS OSCILLATOR

20CY TO 20KC (±1db) 0.25% T.H.D. (+18dbm)
50CY TO 10KC (±3db) 1% T.H.D. (8W PK)
SINGLE POLARITY POWER SUPPLY



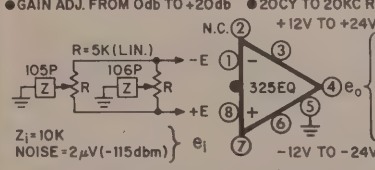
+24V (NOM.)
Z_o = 1Ω
$R_L \geq 4\Omega$
SHORT PROOF
$C_L \leq 1\mu F$

AS 100KC MAGNETIC TAPE BIAS OSC. CONNECT 10K RESISTOR FROM PIN 1 TO PIN 4
e_o = 20V/1K LOAD

OCTAL PLUG-IN SIZE: 1" DIA x 2" H WT: 2 OZ PRICE: $25.00/EA

MODEL 325 EQ EQUALIZATION AMPLIFIER

● GAIN ADJ. FROM 0db TO +20db ● 20CY TO 20KC RESPONSE

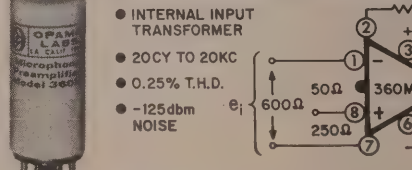


±18V/600Ω
+24dbm OUTPUT IS IN-PHASE WITH INPUT
0.1% T.H.D.

EQ CONTROL KITS: 105P & 106P ($25.00/EA)
OCTAL PLUG-IN SIZE: 1" DIA x 2" H WT: 2 OZ PRICE: $35.00/EA

MODEL 360M MICROPHONE PREAMPLIFIER

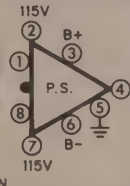
● INTERNAL INPUT TRANSFORMER
● 20CY TO 20KC
● 0.25% T.H.D.
● -125dbm NOISE



GAIN	Rg
60db	NONE
50db	15K
40db	3.3K
30db	1K

OCTAL PLUG-IN SIZE: 1" DIA x 2" H WT: 2 OZ PRICE: $35.00/EA

POWER SUPPLIES (REPAIRABLE)

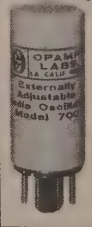


OCTAL PLUG-IN WITH BOLT-DOWN PROVISIONS

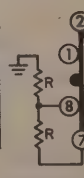
MODEL	DESCRIPTION	SIZE (INCHES)	PR-EA
*515P	± 15V @ ± 50mA	2x3x2 H	$30
522	± 24V @ ± 150mA	2x3x2 H	30
523	± 24V @ ± 2A	3.25x5.25x4.25 H	45
*524P	± 24V @ ± 40mA	2x3x2 H	30
525	± 24V @ ± 1A	3x4x3.25 H	40
526	± 24V @ ± 4A	5x5.50x4.25 H	50
536	± 36V @ ± 3A	5x5.50x4.25 H	50
*523R	± 24V @ ± 1.5A	3.25x5.25x4.25 H	60
54	+ 24V @ +700mA	3x4x1.75 H	30

*REGULATED

MODEL 700 AUDIO OSCILLATOR (EXTERNALLY ADJUSTABLE)



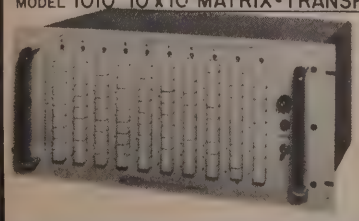
FREQ	R(±5%)	FREQ	R(±5%)
16CY	NONE	1KC	1.6K
50CY	43K	2KC	800Ω
100CY	20K	5KC	320Ω
200CY	9.1K	10KC	160Ω
440CY	3.6K	12KC	130Ω
500CY	3.2K	15KC	100Ω



3V (+10dbm)
R_L = 600Ω
0.5% T.H.D.

OCTAL PLUG-IN SIZE: 1" DIA x 2" H WT: 2 OZ PRICE: $35.00/EA

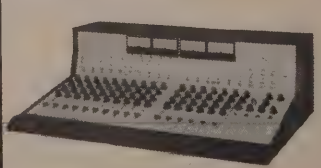
MODEL 1010 10 x 10 MATRIX-TRANSFORMER ISOLATED INPUTS AND OUTPUTS



- 10K INPUT IMPEDANCE
- UNITY GAIN
- 24 dbm OUTPUT
- 80 db ISOLATION
- LIGHTED PUSH-ON/OFF SW
- BARRIER TERMINALS ON BACK PANEL
- INTERNALLY REGULATED P.S.

SIZE: 8-3/4" H x 19" W x 14" D
WT: 32 LBS PRICE: $2,200.00

AUDIO CONSOLES



1604-TV

MODEL	DESC.	PRICE KIT	PRICE WIRED
802-TV	8 IN-2 OUT	$4,100	$6,300
1204-RS	12 IN-4 OUT	6,000	9,500
1204-TV	12 IN-4 OUT	5,900	9,500
1604-RS	16 IN-4 OUT	7,400	11,800
1604-TV	16 IN-4 OUT	6,700	11,100
2008-RS	20 IN-8 OUT	10,900	17,000

TV = TELEVISION RS = RECORDING STUDIO
KITS: IN STOCK F.O.B. LOS ANGELES, CA.
DATE: AUGUST, 1977

Quam: Loudspeakers The Sound Decision

	MODEL NUMBER	SIZE (Inches) AND SHAPE	FREQUENCY RESPONSE (Hertz)	POWER HANDLING CAPACITY (Watts)	VOICE COIL IMPEDANCE (Ohms)	VOICE COIL DIAMETER (Inches)	MAGNET MATERIAL AND WEIGHT (Ounces)	DEPTH (Inches)	SHIPPING WEIGHT* (Lbs.)	NET PRICE
GENERAL PURPOSE										
MINIATURE	2A05	2 RD	300 Hz to 6.5K Hz	1	3-4	9/16	.52AV	7/8	1/4	4.11
	22A05Z100	2-1/4 RD	300 Hz to 6.5K Hz	1	100	9/16	.52AV	1	1/4	4.32
	23A05	2 x 3 Oval CM	200 Hz to 10K Hz	1	3-4	9/16	.52AV	1-1/8	1/4	4.62
	23A05Z8R	2-1/2 RD	250 Hz to 3K Hz	1-1/2	8-10	9/16	.52AV	1-1/8	1/4	3.96
	27A05Z100	2-3/4 RD	200 Hz to 5K Hz	1	100	9/16	52AV	1-1/16	1/4	4.23
4 OHM IMPEDANCE	26A07	2 x 6 Oval CM	150 Hz to 7K Hz	2	3-4	9/16	65AV	1-19/32	1/2	4 44
	4A05	4 SQ	200 Hz to 11K Hz	2-1/2	3-4	9/16	52AV	1-1/2	1/2	3.87
	46A2	4 x 6 Oval CM	150 Hz to 10K Hz	4	3-4	3/4	1 2AV	1-11/16	1	5.13
	5A1	5 PC	125 Hz to 9K Hz	3-1/2	3-4	9/16	65Q8	1-13/16	3/4	4.41
	52C10	5-1/4 PC	125 Hz to 9K Hz	10	3-4	1	10BF	2-1/4	2-1/4	7.92
	57A2	5 x 7 Oval CM	90 Hz to 11K Hz	6	3-4	3/4	1 2Q8	2-5/16	1	5.79
	6A2	6-1/2 PC	80 Hz to 12K Hz	6	3-4	3/4	1 2Q8	2-3/16	1	5.76
	69A2	6 x 9 Oval CM	75 Hz to 10K Hz	8	3-4	3/4	1 2Q8	2-3/4	1-1/4	6.45
	8C5	8 PC	70 Hz to 11K Hz	9	3-4	3/4	4 8BF	3	2	7.41
8 OHM IMPEDANCE	30C25Z8	3 SQ	200 Hz to 12K Hz	3	8-10	9/16	2 35BF	1-3/16	3/4	4.71
	35A2Z8	3 x 5 Oval CM	100 Hz to 9K Hz	4	8-10	3/4	1.2AV	1-11/16	1/2	5 10
	4A1Z8	4 SQ	200 Hz to 11K Hz	3	8-10	9/16	.65Q8	1-5/8	3/4	4 32
	4C25Z8	4 SQ	200 Hz to 11K Hz	3-1/2	8-10	9/16	2 35BF	1-5/8	3/4	4 95
	4C5Z8	4 SQ	175 Hz to 15K Hz	7	8-10	3/4	4 8BF	1-5/8	1	5 82
	46A1Z10	4 x 6 Oval CM	100 Hz to 10K Hz	3-1/2	8-10	9/16	65Q8	1-11/16	3/4	4.71
	5A1Z8	5 PC	125 Hz to 9K Hz	3-1/2	8-10	9/16	65Q8	1-13/16	3/4	4 41
	52A1Z8	5-1/4 PC	100 Hz to 9K Hz	4	8-10	9/16	65Q8	1-7/8	3/4	4.65
	69A2Z10	6 x 9 Oval CM	75 Hz to 10K Hz	8	8-10	3/4	1 2Q8	2-3/4	1-1/4	6 45
COMMERCIAL SOUND	8A1PA	8 PC	90 Hz to 12K Hz	6	8-10	3/4	1.2AV	2-11/16	1-1/2	6.54
	8C5PA	8 PC	80 Hz to 7K Hz	8	8-10	1	4.8BF	3	2	7.71
BACKGROUND MUSIC AND PUBLIC ADDRESS	8C6PAS	8 RD Shallow	80 Hz to 7K Hz	10	8-10	1	6BF	2-1/8	2-1/2	9.24
	8C10PA	8 RD	60 Hz to 10K Hz	15	8-10	1	10BF	3-1/8	3	9.21
	8C10DVFR	8 PC	60 Hz to 10K Hz	15	8-10/DUAL	1	10BF	2-1/8	3	10.29
	10C10PA	10 RD	80 Hz to 10K Hz	14	8-10	1	10BF	3-25/32	4-1/4	11.79
	12C6PAS	12 RD Shallow	50 Hz to 9K Hz	15	8-10	1	6BF	3-1/2	8	12 60
	8C6PAX	8 PC	85 Hz to 19K Hz	12	8-10	1	6BF	3	2-1/2	8 46
	8C10PAX	8 PC	85 Hz to 19K Hz	15	8-10	1	10BF	3-1/8	2-3/4	8.97
	8C12PA	8 RD	60 Hz to 9K Hz	18	8-10	1-1/4	12BF	3-1/8	3-1/4	12.09
	12C10PAX	12 RD	50 Hz to 17K Hz	18	8-10	1	10BF	4-3/4	4-1/4	12 45
	12C12PAX	12 RD	50 Hz to 17K Hz	25	8-10	1-1/4	12BF	4-1/2	5-1/2	15 18
OUTDOOR	3A07OT	3-1/2 SQ	200 Hz to 9K Hz	2-1/2	3-4	9/16	.65AV	1-7/16	1/2	4 02
	3A07Z450T	3-1/2 SQ	200 Hz to 9K Hz	2-1/2	45	9/16	65AV	1-7/16	1/2	4.14
	4A20T	4 SQ	150 Hz to 6K Hz	4	3-4	3/4	1 2AV	1-5/8	3/4	5 19
	4A2Z80T	4 SQ	150 Hz to 6K Hz	4	8-10	3/4	1.2AV	1-5/8	3/4	5.19
	8C6PAOT	8 PC	125 Hz to 9K Hz	10	8-10	1	6.0BF	3	2-1/2	8 76
COMMUNICATIONS	2A05Z8	2 RD	300 Hz to 6.5K Hz	1	8-10	9/16	.52AV	7/8	3 oz.	4.11
	2A05Z100	2 RD	300 Hz to 6.5K Hz	1	100	9/16	.52AV	7/8	3 oz.	4 26
MOBILE RADIO	22A05Z8	2-1/4 RD	300 Hz to 6.5K Hz	1	8-10	9/16	.52AV	1	3 oz.	4.17
	23A05Z8	2 x 3 oval	200 Hz to 10K Hz	1	8-10	9/16	.52AV	1-1/8	1/4 lb.	4.62
	25A05Z8R	2-1/2 RD	250 Hz to 3K Hz	1-1/2	8-10	9/16	.52AV	1-1/8	1/4 lb.	3 96
	25A07	2-1/2 SQ	200 Hz to 10K Hz	1-1/2	3-4	9/16	.65AV	1-1/4	1/4 lb.	4.02
	25A07Z8	2-1/2 SQ	200 Hz to 10K Hz	1-1/2	8-10	9/16	.65AV	1-1/4	1/4	4 02
	26A07Z8	2 x 6 oval CM	150 Hz to 7K Hz	2	8-10	9/16	65AV	1-19/32	1/2 lb.	4.44
	27A05Z8	2-3/4 RD	200 Hz to 5K Hz	1	8-10	9/16	52AV	1-1/16	1/4 lb	4.11
	30A05	3 SQ	200 Hz to 12K Hz	2	3-4	9/16	52AV	1-3/16	3 oz	3.63
	30A05R	3 RD	250 Hz to 8K Hz	2	3-4	9/16	52AV	1-3/16	1/4 lb	3 69
	30A05Z8	3 SQ	200 Hz to 12K Hz	2	8-10	9/16	52AV	1-3/16	1/4 lb	3 63
	30A05Z8R	3 RD	250 Hz to 11K Hz	2	8-10	9/16	52AV	1-3/16	1/4 lb	3 69
	3A05	3-1/2 SQ	150 Hz to 12K Hz	2	3-4	9/16	52AV	1-5/16	3 oz	3.69
	3A05R	3-1/2 RD	200 Hz to 11K Hz	2	3-4	9/16	52AV	1-3/8	1/4 lb	3.75
	3A05Z8	3-1/2 RD	150 Hz to 12K Hz	2	8-10	9/16	52AV	1-5/16	3 oz	3.69
	3A05Z8R	3-1/2 RD	200 Hz to 11K Hz	2	8-10	9/16	.52AV	1-3/8	1/4 lb.	3.75
	35A05	3 x 5 oval CM	150 Hz to 7K Hz	2	3-4	9/16	.52AV	1-1/2	5 oz.	3.87
	35A05Z8	3 x 5 oval CM	150 Hz to 7K Hz	2	8-10	9/16	.52AV	1-1/2	5 oz.	3.87
INTERCOM	2A05Z45	2 RD	300 Hz to 6.5K Hz	1	45	9/16	52AV	7/8	1/4	4.23
	22A05Z45	2-1/4 RD	300 Hz to 6.5K Hz	1	45	9/16	52AV	1	1/4	4 29
	25A07Z45	2-1/2 SQ	200 Hz to 10K Hz	1-1/2	45	9/16	65AV	1-1/4	1/4	4 14
	27A05Z45	2-3/4 RD	200 Hz to 5K Hz	1	45	9/16	52AV	1-1/16	1/4	4 23
	30A05Z45	3 SQ	200 Hz to 12K Hz	2	45	9/16	52Av	1-3/16	1/4	3.75
	30A05Z100	3 SQ	200 Hz to 12K Hz	2	100	9/16	52AV	1-3/16	1/4	3.78
	4A1Z45	4 SQ	200 Hz to 11K Hz	3 0	45	9/16	65Q8	1-9/16	3/4	4 47
	5A1Z45	5 PC	125 Hz to 9K Hz	3-1/2	45	9/16	65Q8	2-5/16	3/4	4 56
	8C6Z45	8 PC	85 Hz to 12K Hz	12	45	1	6 0BF	3	2-1/2	8 31

TRANSFORMERS	MODEL NUMBER	POWER RATING	PRIMARY VOLTS	PRIMARY TAPS	INSERTION LOSS (Db)	MOUNTING CENTERS	CORE SIZE	SECONDARY LOAD (Ohms)	SHIPPING WEIGHT	NET PRICE
	TBL25	4W	25	1/4-1/2-1-2-4W	6	2"	1/2 x 5/8	8	1/2 lb	4 20
	TCL25	8W	25	1/2-1-2-4-8W	6	2-3/8"	5/8 x 5/8	8	3/4 lb	4 50
	TBL70	4W	70.7	1/4-1/2-1-2-4W	3	2"	1/2 x 5/8	8	1/2 lb	4 20
	TCL70	8W	70.7	1/2-1-2-4-8W	3	2-3/8"	5/8 x 5/8	8	3/4 lb	4 50
	TBLU	5W	25/70	5/16-5/8-1-1/4-2-1/2-5W	1.0/5	2"	1/2 x 5/8	8	1/2 lb	6 30

*AV — Alnico V; BF — Ceramic; Q8 — High Energy; RD — Round; SQ — Square; PC — Pin Cushion; CM — Corner Mount.

These are just 65 of the 7000 speakers we manufacture. Variations to your particular needs include weather proofing, flame retardants, special voice coil impedances, single-tone speakers, etc.

See your distributor for information or contact: QUAM-NICHOLS COMPANY 234 East Marquette Road / Chicago, IL 60637 / Phone (312) 488-5800

MINIATURE SOLID STATE ELECTRONIC

BUZZER

U.S. PAT. NO. 3,887,914
UL YELLOW CARD S2015

RMB SERIES

GENERAL PURPOSE, EASY INSTALLATION

Extraordinary audio penetration, long life, and compact rugged construction are combined together in Star's RMB series. Guaranteed to exceed 300 hours continuous use over a broad range of physical and operational parameters.

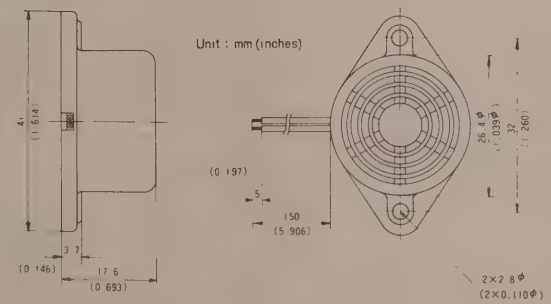
APPLICATIONS:

- Automotive warning and monitoring indicators
- Aircraft
- Computer Peripherals
- Radar Detectors
- Microwave Devices
- Scientific Instruments and test apparatus

SPECIFICATIONS:

MODEL		RMB-06	RMB-12	RMB-24
Operating Voltage DC(V)		4≈8	7≈16	20≈28
Max. Current (mA)		43	25	21
Temperature Range (°C)		−40≈+80		
Sound Output at 100cm (dB)		75		
Weight (g)		18		
Connections	Positive (+)	Red		
	Negative (−)	Black		

DIMENSIONS:



SERIES SMB

VARIETY OF APPLICATIONS, WIDE TEMPERATURE OPERATING RANGE

The SMB's rich sound characteristics cover a spectrum of the most easily recognized frequencies. A pleasing warning signal is emitted that cannot be ignored. Guaranteed to exceed 200 hours continuous use.

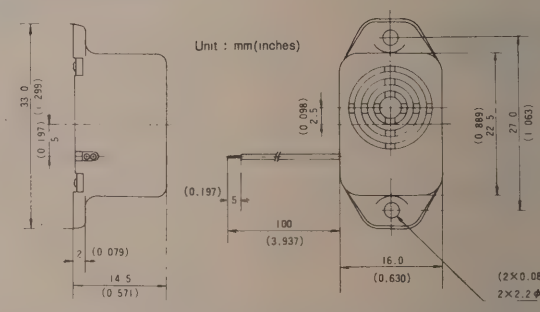
APPLICATIONS:

- Alarm Clocks
- Automotive Accessories
- Computer Peripherals
- Microwave oven timing controls
- Portable and battery operated equipment
- Intercoms and phone sets
- Radar Detectors

SPECIFICATIONS:

MODEL		SMB-01	SMB-06	SMB-12	SMB-24
Operating Voltage DC(V)		1.1≈2	3≈7	7≈17	16≈30
Max. Current (mA)		17	23	14	16
Temperature Range (°C)		−20≈+60		−40≈+80	
Sound Output at 100cm (dB)			70		
Weight (g)			10		
Connections	Positive (+)	Red	Orange	Red	Orange
	Negative (−)	Black	White	White	Black

DIMENSIONS:

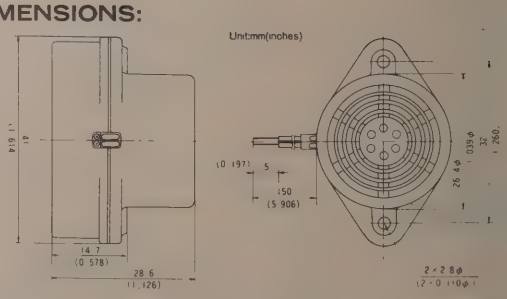


MODEL IMBs ARE AVAILABLE FOR PULSED SOUND OUTPUT

SPECIFICATIONS:

MODEL		IMB-06	IMB-12
Operating Voltage DC(V)		4≈8	6≈16
Max. Current (mA)		45	28
Temperature Range (°C)		−40≈+80	
Sound Output at 100cm (dB)		75	
Weight (g)		24	
Cycle (Sec.)		0.5 & 1.0	
Duty		1:1	
Connections	Positive (+)	Red	
	Negative (−)	Black	

DIMENSIONS:



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Subsidiary of star mfg. co., ltd.

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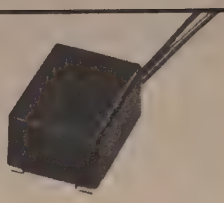
NEW

MINIATURE SOLID STATE ELECTRONIC

BUZZER

U.S. PAT. NO. 3,974,499
UL YELLOW CARD S2015



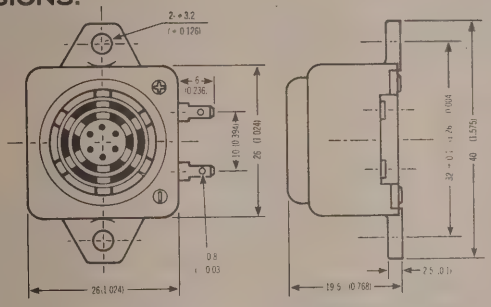
PMB SERIES

ECONOMICAL, VALUE ENGINEERED FOR SOUND OUTPUT, SMALL SIZE, AND QUICK CONNECTIONS

SPECIFICATIONS:

MODEL	PMB-03	PMB-06	PMB-12	PMB-24
Operating Voltage DC(V)	2≈4	4≈8	6≈16	16≈30
Max. Current (mA)	35	33	23	21
Temperature Range (°C)	−20≈+60			
Sound Output at 20cm (dB)	90			

DIMENSIONS:



MMB-01 SERIES

ONE OF THE SMALLEST BUZZERS IN THE WORLD

Star's MMB series is the state-of-the-art in miniature electronic buzzers. Tiny size, high efficiency, and value are obtained through use of a custom IC. As all circuitry is solid state, the MMB's simplicity of design provides high reliability not found in conventional "make and break" type alarms. There are no mechanical points to arc or require maintenance, and RF noise is non-existent.

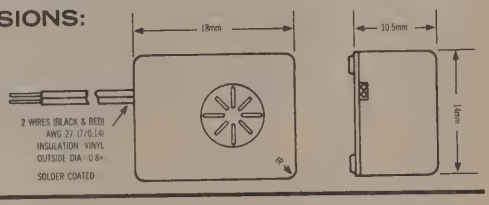
APPLICATIONS:

- Alarm Clocks
- Timers and Control Devices
- Portable and Battery operated equipment
- Computer Peripherals

SPECIFICATIONS:

MODEL	MMB-01
Operating Voltage DC(V)	1.1≈ 2.0
Max. Current (mA)	15
Sound Output at 8" (20cm)	70 dB min. at 1.5VDC
Operating Temperature (°C)	−10≈+50
Storage Temperature(°C)	−20≈+70
Weight (g)	5

DIMENSIONS:



SDB SERIES

Star's SDB series was developed as a simple solution to the most inherent design problem of electronic smoke detectors. Its proven technology combines value engineering, high reliability, and outstanding audio performance.

Typical CMOS smoke detector IC's or discrete transistors easily drive the SDB. A control or trigger terminal is built into the design. Transient protection is also included. Thus, systems users save money through elimination of SCR's, diodes, and other components.

As all circuitry is solid state, the SDB differs significantly from conventional "make and break" type alarms. There are no mechanical points to ignite hazardous vapors and cause explosions. RF noise, arcing, and electrical contact maintenance are non-existent.

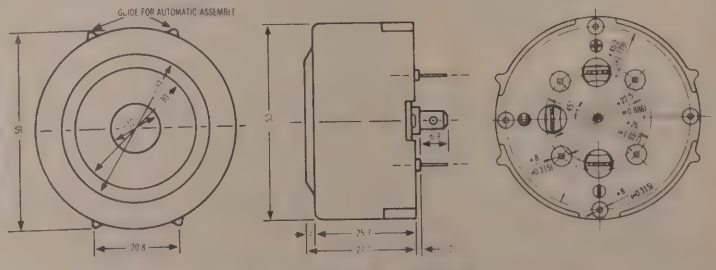
Rich sound characteristics cover a spectrum of the most easily recognized frequencies. A warning signal is emitted that cannot be ignored.

Manufactured to Star's rigorous quality control and reliability standards, the SDB is guaranteed to meet or exceed UL 464.

SPECIFICATIONS:

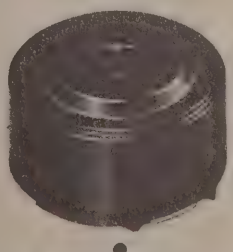
MODEL	SDB-12TS	CONDITIONS	SDB-09TS	CONDITIONS
Operating Voltage (V)	6≈13	4V≦Vt	5≈10	5V≦Vt
Sound Output (dB) at 10 feet	Min. 85	Vh≦9V, Vt=7V	Min. 85	Vh≦8V, Vt=0.2V
Current (mA)	Max. 110	Vh≦10.5V, Vt=7V	Max. 100	Vh≦8V, Vt=6V
Leakage Current (mA)	Max. 1	Vh≦13V, Vt=0.2V	Max. 1	Vh≦9.5V, Vt=0.2V
Trigger Current (mA)	Max. 2	V≦13V, Vt=7V	Max. 2	Vh≦9V, Vt=7V
Operating Temp. (°C)	−10≈+55		−10≈+55	
Weight (g)	50		50	

DIMENSIONS:



APPLICATIONS:

- Burglar and fire alarms
- Gas and smoke detectors
- Security systems
- Warning devices



star micronics, inc
Subsidiary of star mfg. co., ltd.

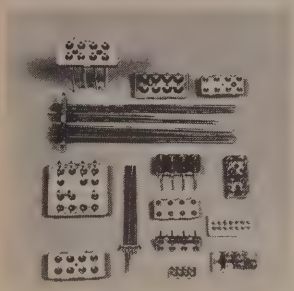
Pan Am Building, Suite 2308 E, 200 Park Avenue,
New York, New York 10017 (212) 986-6770 TWX: 710-581-4082

AIRPAX™ Hermetic Seals Glass / Ceramic-to-Metal Seals

■ Combining the most competent, experienced seals engineers with unsurpassed manufacturing facilities, production methods, and in-house plating capability . . . Airpax provides glass/ceramic seals of the highest quality and reliability. The engineering staff maintains close supervision of each order, always with an eye toward conscientious adherence to delivery schedules. The Airpax quality control program meets and exceeds MIL-Q-9858. Government source inspection is offered for military requirements.

For further information on Airpax Glass/Ceramic-to-Metal Seals capability, request Short Form Catalog 4002 and Bulletin 4001, a complete facilities report.

Relay Headers

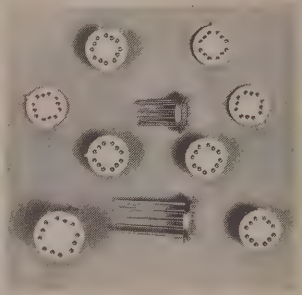


Airpax manufactures compression-type hermetic seals which will withstand extreme conditions of mechanical strain, vibration, thermal shock, and corrosive atmospheres. Bodies and terminals are of selected steels and alloys, and are fused with highly specialized glasses.

Single Pin Terminals

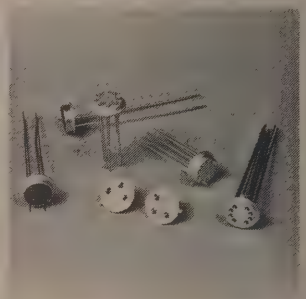
Available with flanged, straight wall (no flange), and threaded bodies. Can be supplied with any flange diameter, flange thickness, body diameter, or body length. Terminals are available in a variety of electrode diameters, lengths, materials, and configurations.

TO-8's



Available in 3-pin to 16-pin configurations, with optional brazed ground pins for special applications. To insure excellent die bonding and solderability, the TO-8 is supplied with Airpax's high purity Gold finish.

TO-5 Headers



The complete line of Airpax TO-5 transistor bases covers a wide variety of pin lengths, pin quantity, and pin configurations. In addition to the standard TO-5, with all glass construction, Airpax makes an all-metal version with individual insulated leads, brazed or welded ground pins.

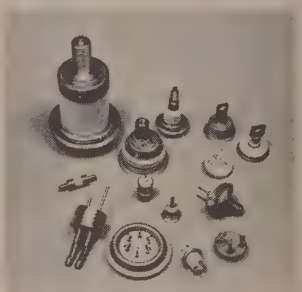
TO-46 Headers

TO-46, or light emitting diode headers are available with various lead lengths, number of insulated leads, and with or without butt welded pins. To assure best die bonding, solderability, heat resistance, and weldability, Airpax's high purity Gold is standard finish.

Lens Caps

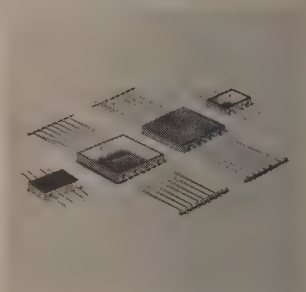
A number of standard design lens cap series are available for a variety of installation conditions. Special window diameters and other configurations of mounting rings, as well as special plating, may be utilized to meet your most stringent requirements.

Ceramic-to-Metal Seals



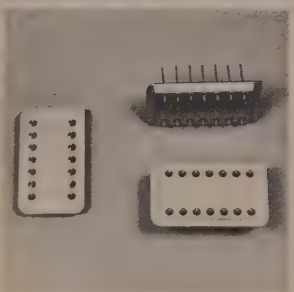
Airpax manufactures a complete line of ceramic-to-metal seals of all configurations. They are excellent electrical insulators, have high thermal dissipation, and operate at high temperatures. They maintain their hermeticity under adverse temperatures, shock, and vibration conditions.

Frame Packages



Airpax offers to the Hybrid micro-circuit manufacturer a significant improvement in flat packaging reliability . . . the all-metal package. Monolithic metal construction imparts high mechanical strength and greater heat dissipation to the Airpax flat pack.

Dual In-Lines

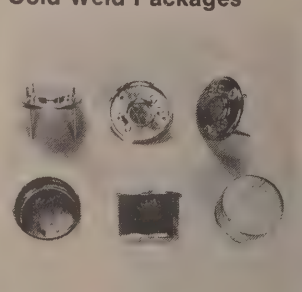


Airpax makes a variety of all-metal plug-in packages. All-metal construction results in extremely high mechanical strength, excellent heat dissipation, and provides maximum cubical content. Available in both Kovar and steel and, for non-magnetic applications, stainless steel.

Actuators

A complete line of Kovar actuators and pushers are available in the standard clear glass version, or can be fabricated in a variety of colors for indentification purposes. Airpax actuators can be produced with a number of compound bends for unlimited design flexibility.

Cold Weld Packages



Airpax manufacturers a complete line of solid copper weld packages. Cold welding prevents contamination that is prevalent in most other manufacturing techniques.

Custom Specials

Airpax engineers will work with your engineers, designing and developing the best hermetic seal for your application. Their intimate knowledge of electronics, metallurgy, glass sealing, ceramic metalizing and brazing can often simplify your problem and reduce your costs.

AIRPAX ELECTRONICS ▪ CAMBRIDGE DIVISION ▪ CAMBRIDGE, MARYLAND 21613
Phone: (301) 228-4600 Telex: 8-7715 TWX: 710-865-9655

Quality Cabinets & Consoles

Styled or Plain

Over 800 selections of cabinets and consoles available on 5-Work-Day Shipment from stock. Ask for your free Catalog 500.

Introducing our new Catalog 600-A available in Spring of 1978. Data Writer Desks, Work Desks, & Small Instrument Cabinets.

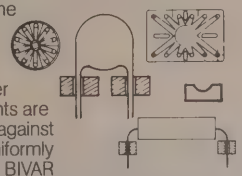
An infinite variety of cabinets and consoles available from the Easy Order System. 8 to 10 weeks shipment. Includes color selections. Ask for your free Catalog 400-A and Color Catalog 310-A-1.
Our sales representatives are available for your assistance. Inquire about our dealer program.

AMCO

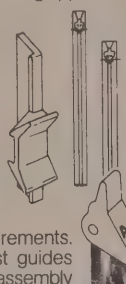
AMCO ENGINEERING CO.
Manufacturers of Quality Cabinets Since 1943
7333 W. Ainslie St., Chicago, Ill. 60656
Phone (312) 867-8500 TWX 910-221-5192

Can you find solutions to your design and cost problems from these standard Bivar Packaging Aids?

Yes. Because someone else probably had a similar problem before you did. In fact, during the past decade BIVAR has introduced *nearly 1,000 standard products,* most designed originally to solve costly Printed Circuit Board packaging or component mounting problems. These have resulted in lower assembly costs, fewer rejects and improved quality of product appearance and performance.



Take for example, the advantages of accurately supporting transistors, capacitors and other devices. Components are protected, insulated against heat damage and uniformly positioned by using BIVAR **PERMANENT MOUNTS** and **SPACERS,** made of durable Nylon per MIL-M-20693A. Hundreds of standard styles for virtually any PCB component; low-cost and carried in stock by the thousands. For accurate, uniform component spacing above PCB surfaces, over 400 standard sizes of BIVAR **WASH-AWAY SPACERS** assure proper filleting and heat dissipation, and eliminate lead stresses and strains, washing away in warm or hot running water without a trace of residue. These extremely low-cost devices, designed for exacting application for almost any component, substantially reduce rejects and rework.



BIVAR can mean the difference in cost-savings and *real* PCB packaging design flexibility with the industry's most complete line of **SNAP-IN CARD GUIDES;** lengths from 2½" through 14", made of reinforced molded Nylon. Snap them into card cages or sheet metal at *your* spacing requirements. For 1/16" PCBs, these low-cost guides feature rigidity, card insertion and assembly ease, and are stocked for immediate shipment.

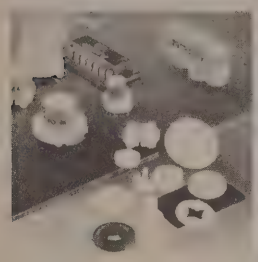
For new, demanding designs, BIVAR Flame Retardant Card Guides offer the same range of sizes made of 94 V-O U.L. rated material; help the designer to meet flammability specifications. New *Deep Channel Card Guides,* with a .200" slot depth for maximum retention under shock and vibration or for larger PCBs. All stocked at low, cost-savings prices.

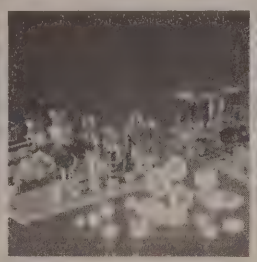
Components, circuitry and cards will be protected from undue stresses, and PCB insertion or removal will be easier with BIVAR **CARD EJECTORS,** designed for 1/16", 3/32", and 1/8" boards; 18 styles, including locking versions to prevent accidental card release. Molded from Nylon per MIL-M-20693A, and U.L. rated 94 V-2 material, these helpful ejectors meet most demanding requirements. Ejectors can be marked permanently for identification, are available in 13 standard colors and are furnished with stainless steel mounting pins.

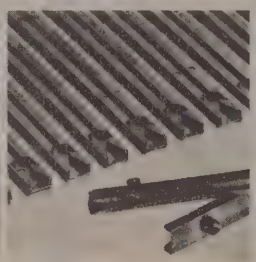
BIVAR PCB HANDLES make circuit board handling easier and provide an excellent way to

to code or identify each board. Made from Natural White Nylon per MIL-M-20693A and U.L. rated 94 V-2 material, they meet demanding packaging specifications; standard colors and markings are available.

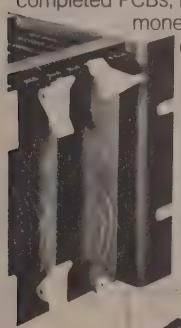
Yes, you can find solutions to *your* design and cost problems from this growing family of Packaging Aids. And, if you have special needs they can be answered too.







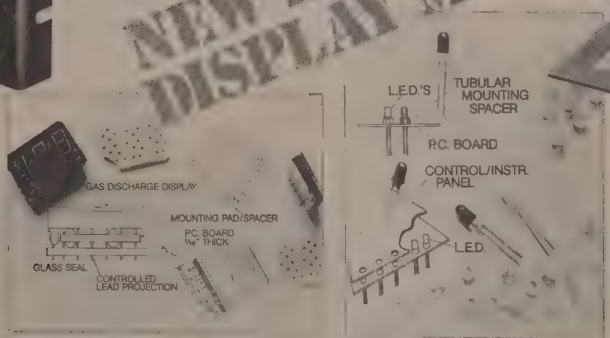
Whether you are mounting components on PCBs, or packaging completed PCBs, BIVAR can provide answers that will save time, money, and improve your product's appearance. Find out about the BIVAR *"Cost Savers."* Choose from over 900 standard products.

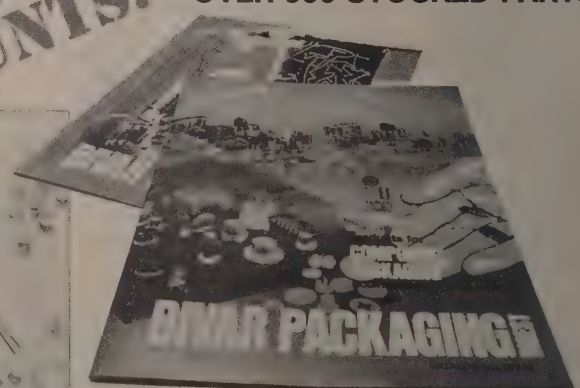


2 new catalogs and pricing free.

OVER 900 STOCKED PARTS.

NEW LIGHTED DISPLAY MOUNTS!





PACKAGING PROGRESS BY **Bivar**

GAS DISCHARGE DISPLAY MOUNTS
Answer uniform production mounting problems, protecting glass seals, establishing parallel surfaces to P.C.B.'s and eliminating paralax. Pads are of Nylon per MIL-M-20693A, Comp. A, Type 1, U.L. rated 94V-2 material, and act as pin straightener, guiding leads into P.C.B. hole pattern.

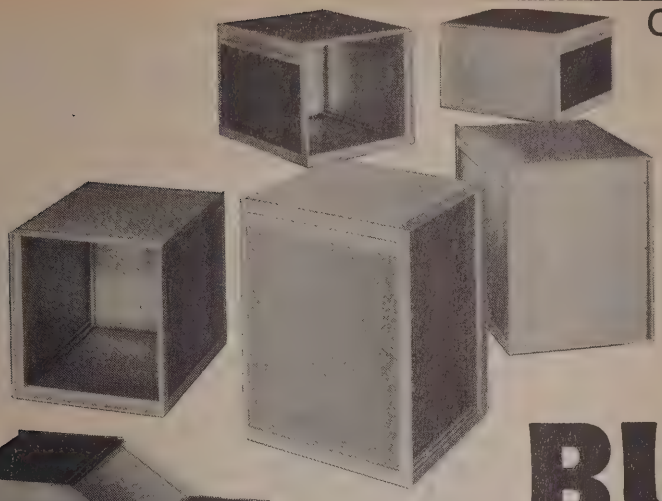
L.E.D. MOUNTING SPACERS
Firmly support L.E.D.'s above P.C.B. surfaces maintaining bases parallel to board surfaces, preventing paralax. Rigidity of mounts prevent bending or tilting of L.E.D.'s during handling and final assembly. Heights from .080" through .380" in .005" increments, 61 standard sizes are available from stock.

BIVAR, INC., 1617 E. Edinger Avenue, Santa Ana, CA 92705 **Phone (714) 547-5832**

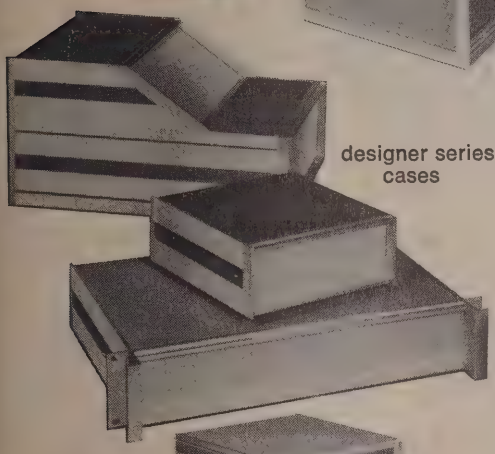
CABINETS

Buckeye Cabinets are formed of anodized aluminum extrusions and suede-finish panels in attractive designer colors. Integral handles conveniently formed from side extrusions. Easy access back panels for simpler maintenance.

Universal 19″ front panel widths with heights in standard increments from 12.25″ to 28″. Two models in ten sizes available from stock: slip-in front panel, or open-front models with nut tracks for screw-in panels to complement instrumentation. All extrusions feature thread-tracks for mounting braces and brackets.



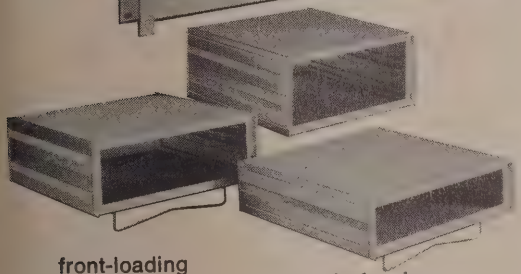
BUCKEYE enclosures and packaging components



designer series cases

Buckeye Cases have a framework of aluminum extruded shapes for strength and durability. Standard components are combined to create custom case sizes with off-the-shelf prices. All standard heights from 3½″ to 12¼″ are available, with depth either 13″ or 20″.

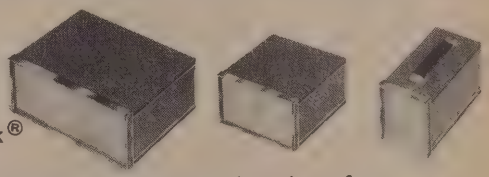
Cases feature anodized satin finish on extrusions and face plate, accented by colorful suede-finish paint on recessed portions and top. Eye-catching slant front case available for offset control panels — in a variety of sizes. Retractable locking tilt stand; spring-loaded, push button, access top panels; carrying handles and integral rack mounting handles available for most models.



front-loading cases

CASES

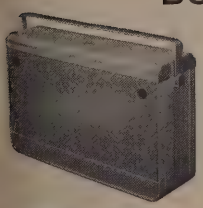
Anodized aluminum cases trimmed with suede-finish decorator colors. Standard 19″ widths in five stock heights from 5¼″ to 12¼″. All cases available with four nylon feet and retractable, self-locking tilt stand.



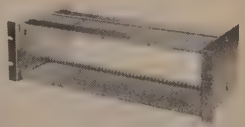
BPC bord-pak® cases

Rugged cases in three popular sizes for packaging integrated modular circuitry. Designed to incorporate 4½″ circuit board card guides. All cases feature recessed satin-anodized front panels, polished aluminum frame trim and durable gray pebble-grain finish. Larger sizes — BPC-1000 and BPC-1500 — feature retractable tilt stands and four nylon feet. Smallest unit — BPC-500 — has handy carrying handle.

BUCK-I-PAK™

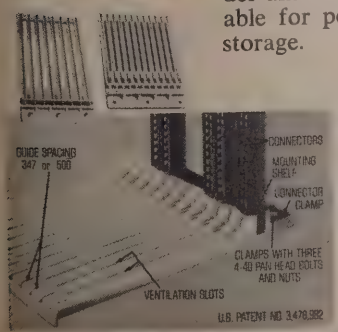


Handy portable instrument case. Made of extruded aluminum shapes with suede-finish colors. Measures 11½″ h. x 18″ w. x 5¼″ d. Chassis is removable for assembly line component installation. Top panel is opened by flush push buttons. Hinged control cover and handle fold neatly under unit. Ideal for battery-power or adaptable for power access with built-in cord storage.



RACKS

Buckeye circuit board racks have aluminum support bars connected to flanged end plates. Ideal for stacking or mounting into stationary systems. Four sizes available: from the 19″ Full Rack which can hold 4 sets of guides, to the ¼ Rack, capable of holding one set of 4½″ or 6″ guides. End plates have adjustment slots for different board widths.



GUIDES — Vented ABS modules, molded in four colors, for speedy packaging of circuitry. Models to accommodate 4½″, 6″ or 9″ board lengths, with tracks spaced either .347 or .500 for maximum card density. Ingenious alignment studs on mounting shelf and clamps allow fast, easy assembly of connectors.

Also see Buckeye quality Matching Instrument Series Knobs and Retractable Tilt Stands in section 2400.

®the BUCKEYE stamping co.
555 Marion Road, Columbus, Ohio 43207
Phone: (614) 445-8433

"QUALITY PRODUCTS SINCE 1902"

COMPAC™ LOW COST RFI SHIELDED CASES

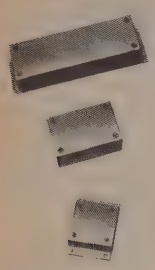
"OFF THE SHELF" solutions to your RF problems

COMPAC's line of cases gives the customer the choice of BLANK CASE assemblies without connectors, STANDARD CASES with flange mounted RF connectors and RFI filter feedthroughs, a CUSTOM LINE of cases made to order at low cost, and the new RFT series.

COMPAC's RFI shielded cases are effective from 60 to ≥ 100 dB @ 100 MHz. Even greater shielding capacity is achieved when an RFI gasket is positioned between the covers and the case frame. The cases are made of extruded aluminum alloy Type 6063-T5 with .12 thick walls. The top and bottom covers are made of .062 thick aluminum alloy, Type 5052-H32. Case enclosures are completely finished with a chemical film per MIL-C-5541 1A, which makes for excellent conductivity. (Prices start from $6.47 each in lots of 100.)

COMPAC'S BLANK SERIES

Consists of blank cases in 14 standard sizes, with five various heights (.75, 1.00, 1.38, 1.75, 2.12). All have top and bottom covers mounted in place with four flat head machine screws. Extended covers are available to give mounting flexibility.



Case[1] Part No	TABULATION CHART							
	A	B	C	D	E	F	H	J
5110-	1.50	1.50	*	*	1.875	2.25	.25	.12
5111-	1.50	2.00	1.000	1.500	2.375	2.75	.25	.12
5112-	1.50	2.50	1.000	2.000	2.875	3.75	.25	.12
5113-	1.50	6.00	1.000	5.500	6.375	6.75	.25	.12
5114-	1.75	1.75	1.250	1.250	2.125	2.50	.25	.12
5115-	1.75	3.00	1.250	2.500	3.375	3.75	.25	.12
5116-	2.00	2.00	1.500	1.500	2.375	2.75	.25	.12
5117-	2.00	3.00	1.500	2.500	3.375	3.75	.25	.12
5118-	2.00	4.00	1.500	3.500	4.375	4.75	.25	.12
5119-	2.00	5.00	1.500	4.500	5.375	5.75	.25	.12
5120-	2.00	6.00	1.500	5.500	6.375	6.75	.25	.12
5121-	3.00	3.00	2.500	2.500	3.375	3.75	.25	.12
5122-	3.00	5.00	2.500	4.500	5.375	5.75	.25	.12
5123-	3.00	6.00	2.375	5.375	6.375	6.75	.31	.19

[1](a) Any case size in above column includes top and bottom covers, and (4) #6-32 flat head screws.
(b) Other size cases available; contact factory.
*#5110 includes only two mounting screws.

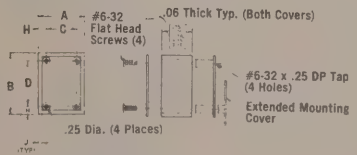
HOW TO ORDER:

5111 — 138 — 0

Case Part No.

Case Height
075 = 0.75
100 = 1.00
138 = 1.38
175 = 1.75
212 = 2.12

Cover Type
0 = Std. Flush
1 = Extended (1), Flush (1)

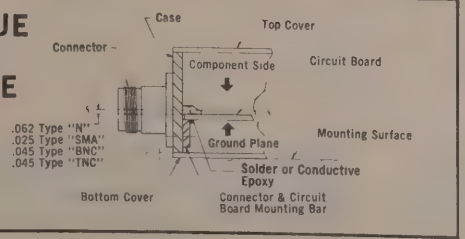


CASE MATERIAL
Case — Alum. 6063-T5
Covers — Alum. 5052-H32
Finish — Chemical Film per MIL-C-5541, Class 1A

COMPAC'S STANDARD SERIES

Consists of 10 standard case sizes, each having a top and bottom flush cover mounted in place with four screws (extended covers available), and a selection of four hole flange mounted "female" connectors (SMA, TNC, N, BNC) all military approved per MIL-C-39012. One nut plate is supplied with each connector which secures the connector to the case, and supports the circuit board providing an excellent ground plane. COMPAC's cases offer very easy accessibility to the circuit board. By removing the four screws, the top and bottom covers disengage to allow complete accessibility to both sides of the board.

A UNIQUE DESIGN FEATURE

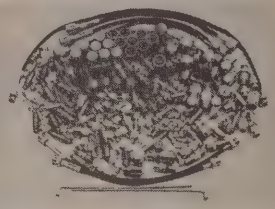


COMPAC™
COMPAC
279-I SKIDMORE ROAD
DEER PARK, NEW YORK 11729
(516) 667-3933

COMPAC'S CUSTOM SERIES

Serves the need for special design requirements where size, type and location of connectors and feedthroughs are important. COMPAC makes these cases in 14 basic case sizes found in the "blank" series. COMPAC works from drawings supplied by the customer to reduce design and drafting time, and makes the special cases to their specifications. COMPAC furnishes at no cost a software package consisting of to-scale, reproducible "A" size drawing forms. COMPAC also has the facilities to fabricate RF cases in all sizes. Contact factory for details.

ACCESSORY GROUP

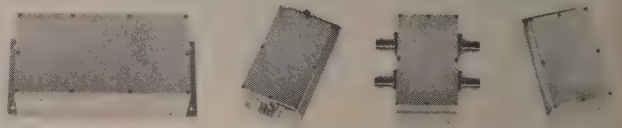


COMPAC provides a full line of accessories including the following:

- CIRCUIT BOARDS
- RF GASKETS
- FILTERS/FEEDTHRUS
- CONNECTORS
- COAXIAL ATTENUATORS
- COAXIAL TERMINATIONS
- TEST CABLES
- ADAPTERS

NEW RFT SERIES

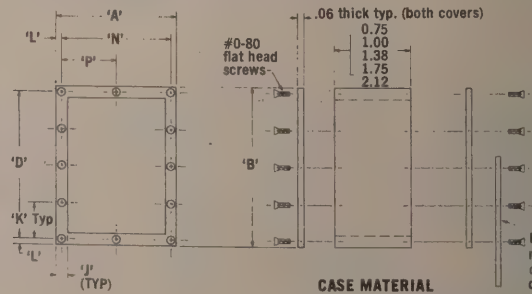
A complete line of new RFI shielded enclosures has been added to the broad product line available from COMPAC, Deer Park, New York, case designers and manufacturers. Identified as the RFT Series, the cases are available in 14 basic sizes from 1½" square to 3" x 6" cases in five heights ranging from ¾" to 2⅛". (Cases start at $10.33 each in lots of 100.)

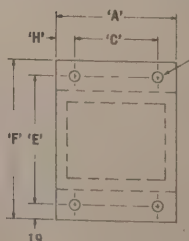


Below are shown the exact specifications for the new **RFT SERIES:**

Case[1] Part No.	TABULATION CHART											
	A	B	C	D	E	F	H	J	K	L	N	P
R-5110-	1.50	1.50	1.000	1.375	1.875	2.25	.25	.12	.687	.06	1.375	—
R-5111-	1.50	2.00	1.000	1.875	2.375	2.75	.25	.12	.937	.06	1.375	—
R-5112-	1.50	2.50	1.000	2.375	2.875	3.25	.25	.12	1.187	.06	1.375	—
R-5113-	1.50	6.00	1.000	5.875	6.375	6.75	.25	.12	1.468	.06	1.375	—
R-5114-	1.75	1.75	1.250	1.625	2.125	2.50	.25	.12	.812	.06	1.625	—
R-5115-	1.75	3.00	1.250	2.875	3.375	3.75	.25	.12	1.437	.06	1.625	—
R-5116-	2.00	2.00	1.500	1.875	2.375	2.75	.25	.12	.937	.06	1.875	.937
R-5117-	2.00	3.00	1.500	2.875	3.375	3.75	.25	.12	1.437	.06	1.875	.937
R-5118-	2.00	4.00	1.500	3.875	4.375	4.75	.25	.12	1.291	.06	1.875	.937
R-5119-	2.00	5.00	1.500	4.875	5.375	5.75	.25	.12	1.218	.06	1.875	.937
R-5120-	2.00	6.00	1.500	5.875	6.375	6.75	.25	.12	1.468	.06	1.875	.937
R-5121-	3.00	3.00	2.500	2.875	3.375	3.75	.25	.12	1.437	.06	2.875	1.437
R-5122-	3.00	5.00	2.500	4.875	5.375	5.75	.25	.12	1.218	.06	2.875	1.437
R-5123-	3.00	6.00	2.375	5.812	6.375	6.75	.31	.19	1.453	.09	2.812	1.406

[1] (a) Any case size in above column includes top and bottom covers, and #0-80 flat head screws.
(b) Other size cases available, contact factory.





CASE MATERIAL
Case — Alum. 6063-T5
Covers — Alum. 5052-H32
Finish — Chemical Film per MIL-C-5541, Class 1A

EXTENDED MOUNTING COVER
Material: .06 Thick Alum. 5052-H32
Finish: Chemical Film per MIL-C-5541, Class 1A

HOW TO ORDER:

R-5111 — 138 — 0

Case Part No.

Case Height
075 = 0.75
100 = 1.00
138 = 1.38
175 = 1.75
212 = 2.12

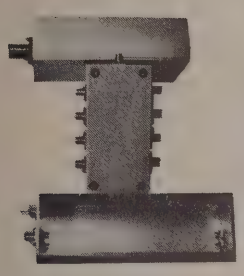
Cover Type
0 = Std. Flush
1 = Extended (1), Flush (1)

LOW COST RFI SHIELDED CASES

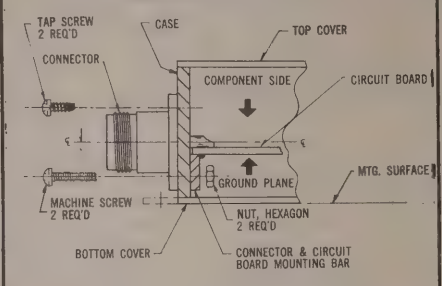
"OFF THE SHELF" solution to your RF problems

COMPAC
279-1 SKIDMORE ROAD
DEER PARK, NEW YORK 11729
(516) 667-3933

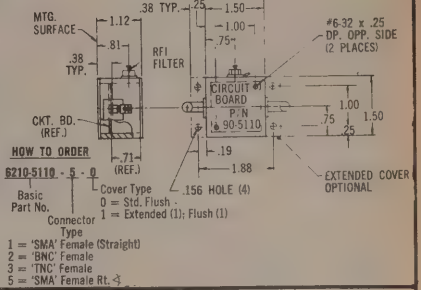
COMPAC'S STANDARD SERIES



CONNECTOR INSTALLATION

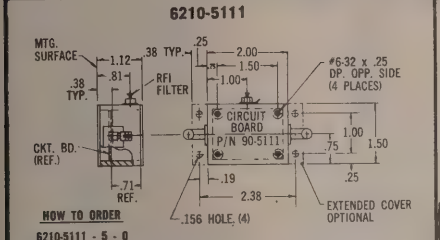


6210-5110



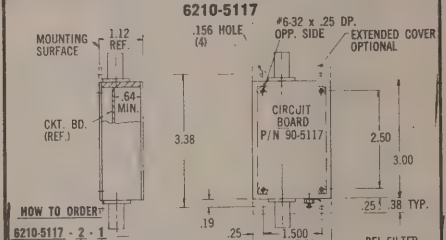
HOW TO ORDER
6210-5110 - 5 - 0
Basic Part No.
Cover Type: 0 = Std. Flush; 1 = Extended (1); Flush (1)
Connector Type:
1 = 'SMA' Female (Straight)
2 = 'BNC' Female
3 = 'TNC' Female
5 = 'SMA' Female Rt. ∢

6210-5111



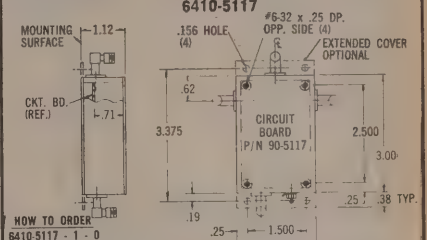
HOW TO ORDER
6210-5111 - 5 - 0
Basic Part No.
Cover Type: 0 = Std. Flush; 1 = Extended (1); Flush (1)
Connector Type:
1 = 'SMA' Female (Straight)
5 = 'SMA' Female Rt. ∢

6210-5117



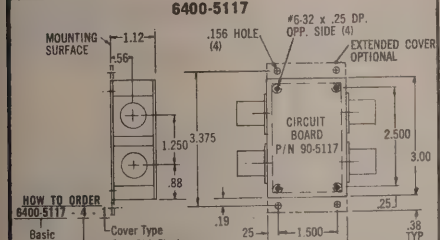
HOW TO ORDER
6210-5117 - 2 - 1
Basic Part No.
Cover Type: 0 = Std. Flush; 1 = Extended (1); Flush (1)
Connector Type:
1 = 'SMA' Female
2 = 'BNC' Female
3 = 'TNC' Female
4 = N Female

6410-5117



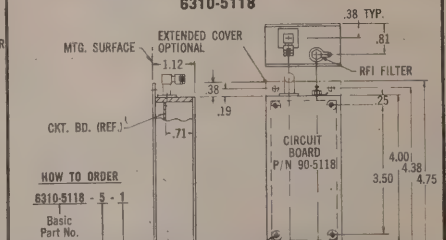
HOW TO ORDER
6410-5117 - 1 - 0
Basic Part No.
Cover Type: 0 = Std. Type; 1 = Extended (1); Flush (1)
Connector Type:
1 = 'SMA' Female (Straight)
5 = 'SMA' Female Rt. ∢

6400-5117



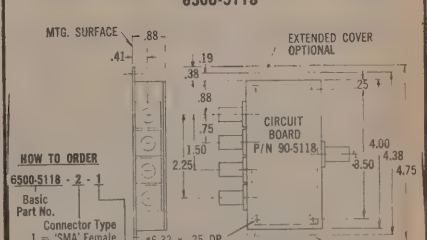
HOW TO ORDER
6400-5117 - 4 - 1
Basic Part No.
Cover Type: 0 = Std. Flush; 1 = Extended (1); Flush (1)
Connector Type:
1 = 'SMA' Female
2 = 'BNC' Female
3 = 'TNC' Female
4 = 'N' Female

6310-5118



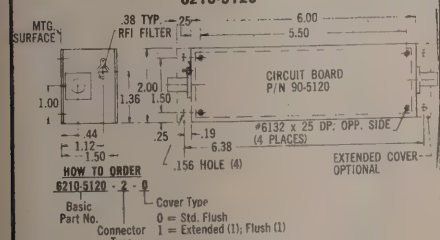
HOW TO ORDER
6310-5118 - 5 - 1
Basic Part No.
Connector Type:
1 = 'SMA' Female (Straight)
5 = 'SMA' Female Rt. ∢
Cover Type: 0 = Std. Flush; 1 = Extended (1); Flush (1)

6500-5118



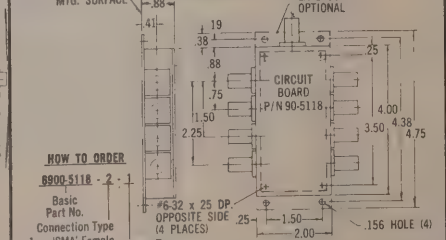
HOW TO ORDER
6500-5118 - 2 - 1
Basic Part No.
Connector Type:
1 = 'SMA' Female
2 = 'BNC' Female
3 = 'TNC' Female
Cover Type: 0 = Std. Flush; 1 = Extended (1); Flush (1)

6210-5120



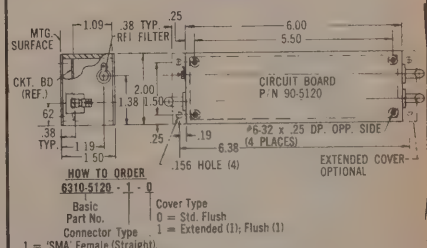
HOW TO ORDER
6210-5120 - 2 - 0
Basic Part No.
Cover Type: 0 = Std. Flush; 1 = Extended (1); Flush (1)
Connector Type:
1 = 'SMA' Female
2 = 'BNC' Female
3 = 'TNC' Female

6900-5118



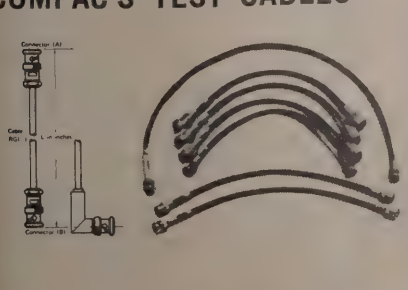
HOW TO ORDER
6900-5118 - 2 - 1
Basic Part No.
Connection Type:
1 = 'SMA' Female
2 = 'BNC' Female
3 = 'TNC' Female
Cover Type: 0 = Std. Flush; 1 = Extended (1); Flush (1)

6310-5120



HOW TO ORDER
6310-5120 - 1 - 0
Basic Part No.
Cover Type: 0 = Std. Flush; 1 = Extended (1); Flush (1)
Connector Type:
1 = 'SMA' Female (Straight).
5 = 'SMA' Female (Right Angle)

COMPAC'S TEST CABLES



Conn. Types = Conn. P/N		Conn. Types = Conn. P/N	
N Male	NM	SMA Male	SM
N Female	NF	SMA Female	SF
BNC Male	BM	SMB Male	SMBM
BNC Female	BF	SMB Female	SMBF
TNC Male	TM	SMC Male	SMCM
TNC Female	TF	SMC Female	SMCF
		UHF Male	UM
Length	**Price (1-9)**	**Length**	**Price (1-9)**
12″	$12.95	48″	$15.70
18″	$13.50	60″	$16.50
24″	$14.00	72″	$17.35
36″	$14.85		

Prices with cable types: RG55, RG58, RG59, RG62, RG141, RG142, RG174, RG188, RG214 and RG223 (Any connector combination) also 0.085 and 0.141 Semi-Rigid.

COMPAC Part Numbers = CONNECTOR (A) — RG( ) — CONNECTOR (B) — LENGTH in inches.

EXAMPLE: RNM — 58 — BF-36 is a 3-foot, RG58 Cable Assembly with a right angle Type N Male and a BNC Female. Price = $14.85 and $3.50 for one right angle connector.

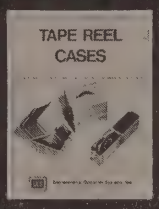
NOTES:

A. All connectors are (where possible) in accordance with MIL-C-39012.
B. Finish — Type N, TNC, BNC — Non-tarnish — Bright Alloy; SMA — gold plated.
C. Other cable and connector types are readily available.
D. Length — L equals overall length of cable assembly in inches.
E. For right angle connector, prefix connector part number with "R" and add $3.50 to cable assembly price for each right angle connector.

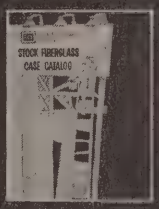
ECS transit, carrying, and operating cases provide maximum protection for precision equipment and sensitive instrumentation during transport and field operation. These cases are pressure molded fiberglass, using a technique that maximizes the glass content of the laminate, resulting in exceptional strength and impact resistance. Engineered specifically to withstand rough handling and hostile environments, they will meet all applicable military specifications, afford protection over a −65° F to +160° F temperature range and exceed military requirements for tensile, compressive, and flexural strength. These cases are impervious to moisture, corrosion, and fungus growth.

Offered in 1200 case sizes by part number, in a choice of 30 standard colors, ECS cases and cabinets are available to meet your specifications for the transportation and field operation of your equipment. Custom designs are available for special applications.

These enclosures have been proven in the severest environments, successfully protecting such equipment as military calibration systems, offshore instrumentation, flight line equipment, television and other communications equipment, electro-optical equipment, minicomputers and peripherals, time and frequency standards, dental, medical and surgical equipment, precision tools, and electronic test and measurement equipment of all kinds.



4 pages



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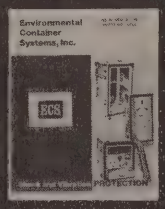
92 pages



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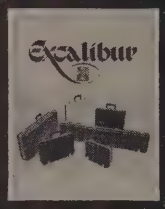


4 pages

IMPENETRABLE CASES PROTECT SENSITIVE ELECTRONIC EQUIPMENT

Customer logo molded into case
Adjustable instrument support brackets
Cam-operated, recessed latches
Shock mounted EIA-RETMA frame (19-in. width)
Standard rack heights from 5.37 inches to 47.37 inches
Pressure molded fiberglass case shells
Elastomer shock mounts
Heavy duty, recessed handles

ECS

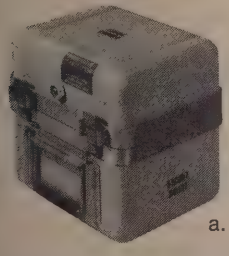
ENVIRONMENTAL CONTAINER SYSTEMS, INC.

3560 Rogue River Hwy./P.O. Box 188/Grants Pass, Oregon 97526/(503) 476-8871

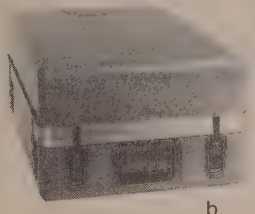
CASES FOR HOSTILE TRANSPORTATION ENVIRONMENTS

Military Transit Cases

Transit cases that meet MIL-C-4150, MIL-T-4734, MIL-T-21200, and MIL-T-28800 specifications are designed and manufactured by E.C.S. Pressure molded fiberglass is the only material able to withstand the rigorous testing required by these specifications without denting, fracturing, or functional damage. Typical configurations are shown in photos a. and b.



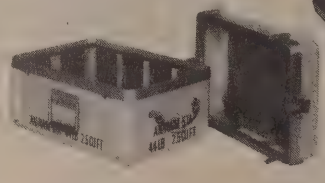
a.



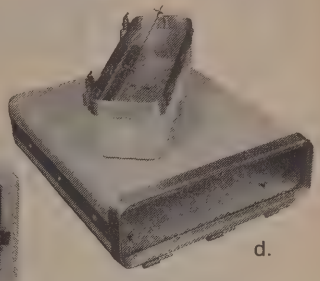
b.

Military Combination Cases

These combination cases meet the same military specifications as the high performance transit cases but are designed for field operation as well. Combination case shown in photo c. includes a cable connector in the rear and is designed for mounting in an instrumentation cabinet. RFI shielded case shown in photo d. is designed for a standard 19" rack width instrument.



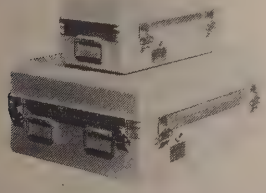
c.



d.

HEAVY-DUTY CASES

These rugged, heavy-duty cases are designed to withstand extreme handling and transportation hazards. Each case is waterproof, individually tested in our hot water submersion tank. Each is equipped with a manual air relief valve; anodized, heavy-duty extrusion closure; rugged, cam-action latches; spring-loaded steel handles with neoprene grips; extra fiberglass corner and edge reinforcement; and an interior elastomeric water-vapor barrier. The top shell is removable, not hinged.

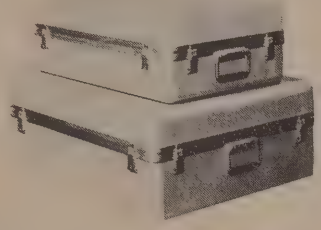


VALISE CASES

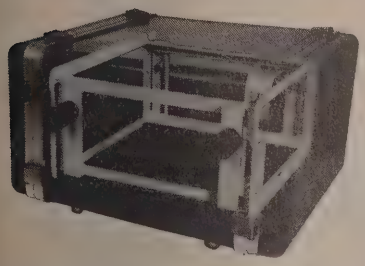
These powder-grey valise cases are accented with satin anodized, gasketed, extrusion closures; nickel-plated locking latches; color coordinated handle; neoprene bumper feet; and an aluminum piano hinge with stay hinge for 90° opening of the case.

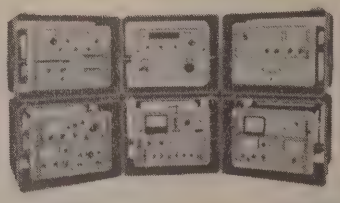
TRANSIT CASES

These sturdy transit cases are ideal for most industrial and commercial applications. They are equipped with gasketed, rainproof extrusion closures; spring tension latches; spring-loaded handles with neoprene grips; and a durable aluminum piano hinge with stay hinge for 90° opening of the case.



TRANSPORTABLE CABINETS FOR RACK MOUNT EQUIPMENT





ECS Part Number	Rack Height	Instrument Capacity Minimum	Maximum
39-351-0537	5.375	20 lb.	75 lb.
39-339-0887	8.875	20 lb.	75 lb.
39-338-1062	10.625	30 lb.	130 lb.
39-338-1237	12.375	25 lb.	100 lb.
39-338-1412	14.125	30 lb.	130 lb.
39-338-1587	15.875	30 lb.	130 lb.
39-338-1762	17.625	30 lb.	130 lb.
39-338-1937	19.375	30 lb.	130 lb.
39-350-2112	21.125	50 lb.	250 lb.
39-350-2287	22.875	50 lb.	250 lb.
39-350-2462	24.625	50 lb.	250 lb.
39-350-2637	26.375	50 lb.	250 lb.
39-350-2812	28.125	50 lb.	250 lb.
39-350-2987	29.875	50 lb.	250 lb.
39-350-3162	31.625	50 lb.	250 lb.
39-350-3337	33.375	50 lb.	250 lb.
39-350-4737	47.375	70 lb.	320 lb.

ECS transportable cabinets provide instant portability for your delicate instrumentation.

Simply secure your equipment within this shock-mounted case, and it will be protected from rough handling and environmental hazards. Remove the front and rear covers using cam-action latches, and instrumentation is ready to be operated within the case.

These rugged, pressure-molded fiberglass enclosures have performed outstanding service in many severe applications, military and commercial. They have withstood drop tests, shock tests, vibration tests and a variety of environmental tests.

Options

Each transportable cabinet is available with a variety of options including three drawer sizes, power strip, slides, recessed latches and handles, special colors, Military certification and special mounting dimensions.

We've got more going for us than just good looks

Like Quality. Service. Price.

These days most enclosure manufacturers are telling you how good they can make your product look. In that regard we're no different. But we've got more to offer than just colors and style.

Through years of experience we've put together a quality product line with plenty of sell. A line that's value engineered to meet your specific requirements for either heavy-duty or commercial applications.

If one of our modulars won't do the job we'll modify, redesign, or custom build to your standards. We can provide equipment in just about any color you'd like, and give you on-time delivery as well.

So, if you need a quality enclosure system to compliment your product, give us a try. You'll find our line comprehensive and our price competitive. And by the way, we do look good too!

Equipto — your best buy in electronic cabinetry. Write today for your copy of our free illustrated brochure.

FOUR LINES OF MODULAR ENCLOSURES

■ **Equipto Heavy-Duty Line**
The ultimate in cabinetry — vertical racks, sloped front consoles and specials.

■ **Competitively priced Challenger Line**
Designed for lighter weight commercial applications — double slope and low profile consoles, bench top racks, full line of accessories.

■ **Electronic Desks**
Totally new modular desk systems — achieve any custom configuration of units without the higher cost!

■ **Instrument Enclosures**
Available in aluminum or steel, in 60 sizes. Full line of accessories.

Note: Ask about our "special cabinet evaluation" offer.

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SECTIONAL

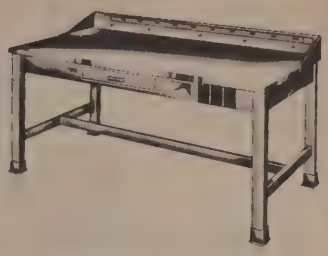
Electronic

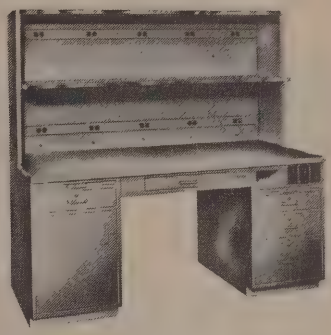
LABORATORY TEST FURNITURE

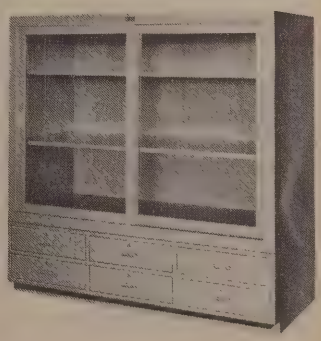
FOR

INDUSTRIAL • MILITARY • SCHOOL

APPLICATIONS

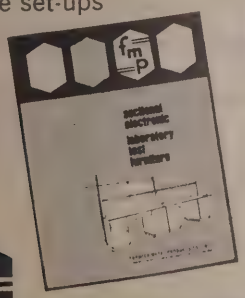






Formica's sectional electronic test furniture is designed *by* engineers *for* engineers to provide the utmost in serviceability. Individual prefabricated sections are constructed to afford the greatest possible number of combinations, then factory assembled to suit the exact requirements of your laboratory or classroom. Design features also provide at least 50% more available working area over other types now in use. Made of heavy gauge furniture steel, Formica's rugged construction means many extra years of service even in hard use.

For school purposes, the unusual adaptability of Formica's many specialized turrets and pedestals — whether for single or double set-ups



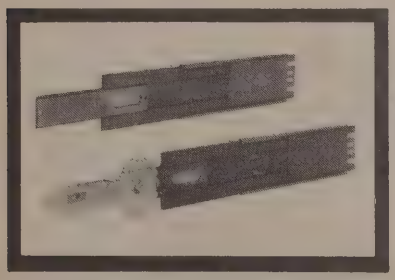
Write for our new catalog and further specifications.

FORMICA METAL PRODUCTS COMPANY, INC.

CORPORATION WAY • MEDFORD, MASSACHUSETTS 02155

CHASSIS-TRAK®... SLIDES FOR EVEN THE MOST UNUSUAL APPLICATIONS

Chassis-Trak solid bearing slides are exceptionally compact, low cost, side mounted, slides for commercial and military application. Permanently lubricated with Poxylube® molybdenum disulfide dry film lubricant to provide smooth sliding action. Chassis-Trak solid bearing slides offer a high degree of immunity to shock and vibration and all slides offer lock-out and quick-disconnect as standard features. Pencil-thin design permits installation of standard 17" chassis in standard 19" panel racks. All solid bearing slides are cold-rolled steel except Model D-600 which is lightweight, hard coated aluminum. Write for Catalog CT104.



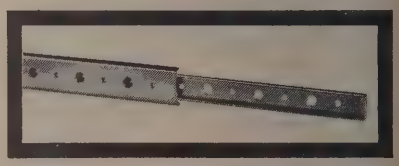
Series	Load Capacity lbs./pr.	Lengths
C300	85	10" to 24"
C230	125	12" to 24"
D-600	125	10" to 24"
CT	175	10" to 24"
CTR	175	10" to 24"
CTH	275	14" to 24"
CTHR	275	14" to 24"

HOW TO SELECT CHASSIS-TRAK SOLID BEARING SLIDES

Slides are furnished in pairs, with each right and left slide consisting of a stationary section, a corresponding intermediate section and a chassis section. Most solid bearing slides are available with a choice of three stationary sections (determined by the type of mounting), a single intermediate section (used for all combinations), and a choice of four chassis sections (determined by the need for easy access to chassis for servicing). A Quick-Disconnect system standard on all Solid Bearing slides, permits the chassis to be removed quickly and easily from the cabinet for servicing when necessary.

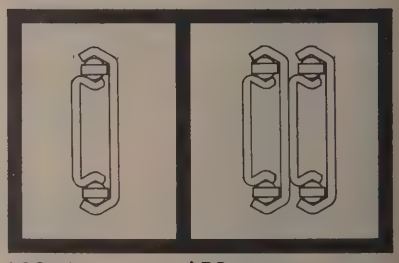
LINEAR BALL BEARING SLIDES

Designed for especially smooth travel and extra long life under maximum loads, these slides are made of cold-rolled steel and operate on carbon steel ball bearings. Available in several models, with optional cabinet mount and/or lock-out. Write for Catalog CT185.



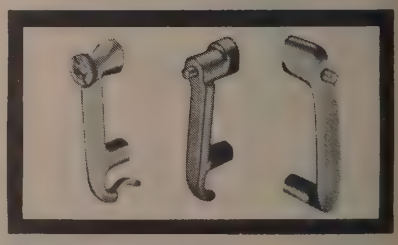
LBS-11—Two Section Model

LBS-12—Three Section Model



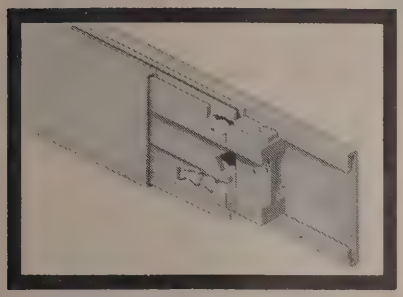
LBS-11 **LBS-12**

Series	Load Capacity lbs./pr.	Lengths
LBS-11	100	12" to 28"
LBS-12	250	12" to 28"



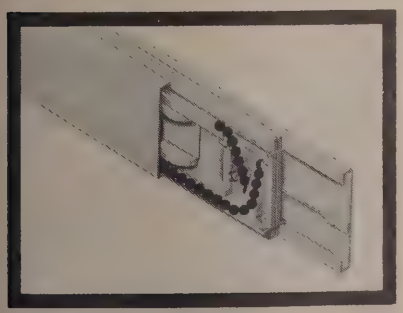
Chassis-Trak Handles

Chassis-Trak Slides



Models D-1002 D-1016

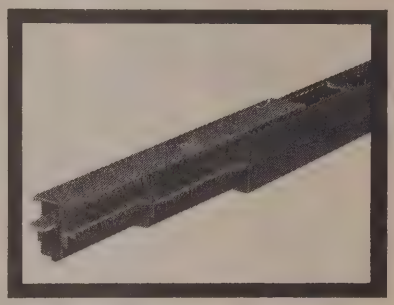
CIRCULATING BALL BEARING SLIDES
Chassis-Trak circulating ball bearing slides are designed to support weights up to 500 lbs. per pair over considerable lengths. Slides are side mounted with a bottom mount option. Military applications (Models D-1002 and D-1016) are constructed from cold-rolled steel cadmium plated and dipped in irridite. They are furnished with Poxylube finish and stainless steel balls. Commercial versions (D-1506 and D-1507) are cold-rolled steel zinc plated and dipped in irridite. They come with carbon steel balls and utilize "cross-over" end caps which allow minimum thickness of slide to weight ratio. Model D-1507 offers patented, synchronized, two-way travel so load can be moved smoothly in either direction of center. Write for Catalog CT129B.



Models D-1506 D-1507

Series	Load Capacity up to 500 lbs.	Lengths	Special Feature
D-1002	500 lbs.	20" - 60" in 4" incr.	Mil version
D-1016	500 lbs.	20" - 60" in 4" incr.	Lock-out
D-1506	500 lbs.	20" - 30" in 4" incr.	Comm. version
D-1507	500 lbs.	20" - 30" in 4" incr.	2-way-travel

BOTTOM MOUNT SLIDES
Five different models offer load-carrying capacities from 150 lbs./pr. to 1,000 lbs./pr. These slides are made from cold-rolled steel, cadmium plated and irridite dipped, and are available with solid-bearing surfaces or roller bearing, depending on the model. Slides feature smooth operation, dependability and long life for heavy-duty applications. Write for Catalog CT-107C.

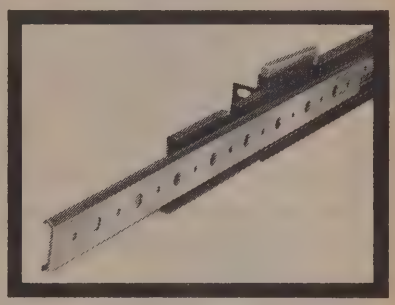


Series	Load Cap. lbs./pr.	Lengths
B-200 (solid)	50	10" to 24"
C-938 (roller)	400	12" to 24"
D-1065 (roller)	600	12" to 24"
D-1050 (roller)	1000	22" to 36"

HYBRID SLIDE
This new design is a combination Linear Ball Bearing and Solid Bearing Slide, which combines ease of movement with economy and dependability.

This slide is ½" thick and at full extension can carry up to 200 lbs. per pair.

Features include 18 in. through 30 in. lengths, disconnect, lock-out and two way travel.



Series	Load Cap. lbs./pr.	Lengths
D-125	200	18" to 30"

Chassis-Trak
Dept. EM P.O. 19188
Indianapolis, Indiana 46219
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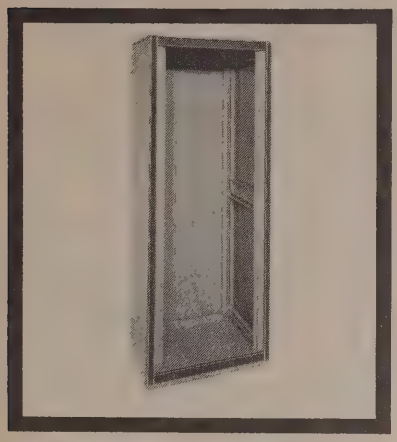
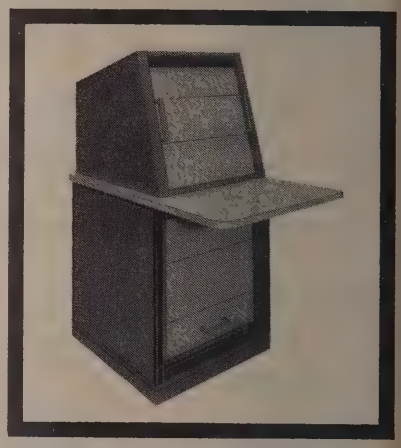
VENT-RAK®... ELECTRONIC CABINETS AS BEAUTIFUL AS THEY ARE FUNCTIONAL



6000 Series Basic Modules

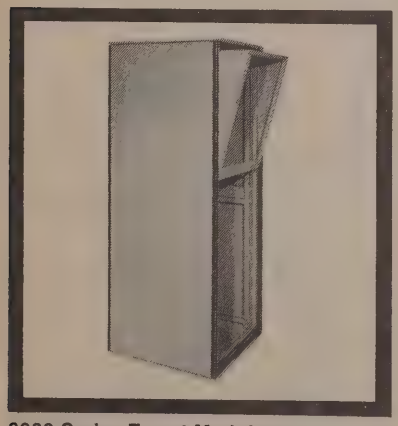
BASIC MODULE has heavy-duty heliarc welded frame with hinged and removable side panels for multiple-bay installations. Vertical panel openings are from 17.56" to 77.06" in 1.75" R.E.T.M.A. increments. Overall height is 5-1/8" greater than the vertical panel opening. Overall width is 24". Choose from 24" or 30" depths. Suitable for military, commercial, and OEM applications, standard features include rear door with magnetic closing latch, adjustable rear mounting rails, and modern style in blue or tan. Custom factory installed options are available.



6000 Series Slope Front Module

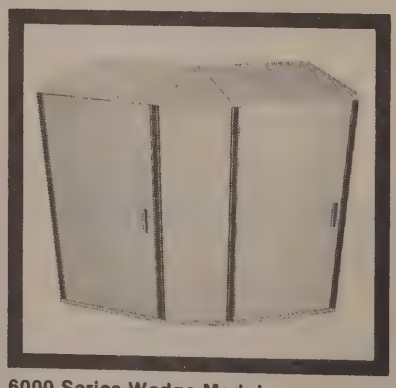
SLOPE FRONT MODULE has a 12.06" vertical panel opening and comes with a slope or flat top. All units have adjustable 10 gauge front and rear mounting angles. The removable rear door has a handle with magnetic latch. Top and sides are fixed and the bottom is open. Optional bottom cover is available.

KEYBOARD MODULE has 2 standard depths. The 31.5" depth has a 5.31" vertical panel opening and the 37.5" has a 10.56" vertical panel opening. Modules have fixed panel mounting flanges with .22 inch diameter clearance holes. Both top and bottom of the units are open.



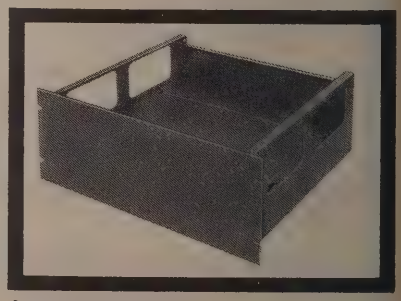
6000 Series Turret Modules

TURRET MODULES come in a choice of three assembly configurations which make sighting of visual readout information convenient from any work position. Turret bolts easily to the basic Cabinet Module at any desired location in the vertical front panel opening. These Turrets can be positioned to face upward or downward.



6000 Series Wedge Modules

WEDGE MODULES can be used in conjunction with each other to form console arrangements. The Vent-Rak Wedge Modules make assembly of curved console arrangements stable and attractive. Available in 30° - 45° - 60° configurations, with open sides and removable rear panels for easy entry.



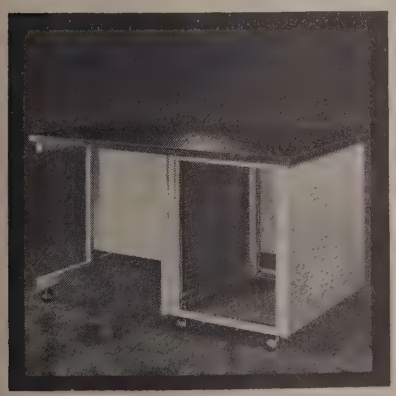
Assembled Chassis

MODULAR CHASSIS
Shipped unassembled, with all required mounting hardware, these modular chassis are easy to put together. The chassis consist of a front panel, pair of chassis sides, rear support panel and a chassis plate. Standard Vent-Rak chassis are 17" wide, for a 19" front panel opening width. A choice of seven heights from 3½" to 14" and four chassis depths from 8½" to 21¼" offer a wide selection. These chassis have a loading capacity of 100 lbs. per sq. ft. Write for Catalog VR-117-A.

Vent-Rak Cabinets

6200 Series 1000 Series

HEAVY, MEDIUM & LIGHT DUTY CABINETS
Vent-Rak offers Heavy, Medium and Light duty cabinetry. 1000 Series—Heavy duty for all Commercial/Military Applications. Heliarc welded steel or aluminum construction. 7000 Series—Medium duty for Commercial/Military Applications. Heliarc welded frame has removable side panels for Multi-Bay installations. 3000 Series—Light duty for Commercial/Military Applications. Can be specified in Multi-Bay configurations. All Vent-Rak cabinets are in compliance with Federal Standard RS-310, RETMA/EIA measurements and increments. 6200 Series—Economical, Commercial version of 6000 Series.



9000 Series Desk

Stylish desk, printers stands and work tables are available.

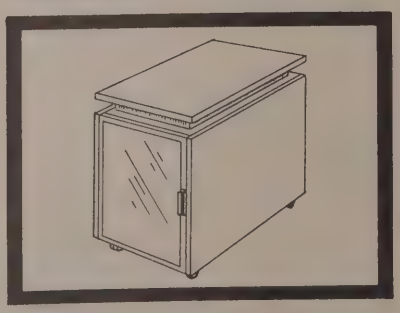
OPTIONS / VENTRAK CABINETS
Starting with the basic cabinet, it is possible to add accessories as required for your specific application. Typical available options include: EMI-RFI shielding, front door, airflo distribution panels, louvers,, blowers, plug mold, bus bar, cable entry boxes, cutouts, recessed base, caster base, lifting eyes, bezels, removable rear panel, mounting "Z"s, writing surfaces, heavy duty dolly, adjustable rails, special colors, etc. For full details, write for the catalog on the particular series cabinet you are interested in.

Consoles are available as assembled units. Write for Catalog VR-143-A.

ACCESSORIES
A complete assortment of Cable Retractors and Cable Carriers permit power cables to move easily when chassis is extended and fold and retract out of the way when chassis is returned. Model C-4005 and C-4006 Cable Retractors have a spring loaded, telescoping action and require only 7/8" clearance in closed position. Both can be used with a pivoting chassis. C-990 Cable Carrier has a three point mount providing complete support for heavy, cumbersome cables. "V" configuration will extend up to 30", yet closes to only 1½" behind the chassis. Write for Catalog VR-133-A.

Pagotta Tops (for better ventilation) are offered for application to all cabinet series as well as work tables.

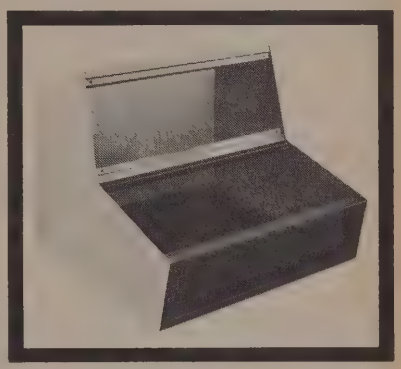
Cable Carrier



Pagotta Top

4300 SERIES
DESK TOP CONSOLES
The 4300 Series Desk Top Consoles incorporate a fresh appearance. This series is available in three end panel configurations . . . LARGE (Models C-4301 and C-4302). MEDIUM (Models C-4303 and C-4304) and SMALL (Models C-4305, C-4306 and C-4307). LARGE and MEDIUM can be furnished in standard 19" or 14¼" (¾ size) panel opening widths. SMALL is available in standard 19", 14¼" (¾ size) and 9½" (½" size) panel opening widths. These consoles are constructed of aluminum end panels and steel struts with black finish.

Consoles are available in kits or as assembled units. Write for Catalog VR-143-A.



Desk Top Console

SPECIAL NOTICE:
General Devices is now actively producing Seismic tested cabinets for the Nuclear Power Industry.

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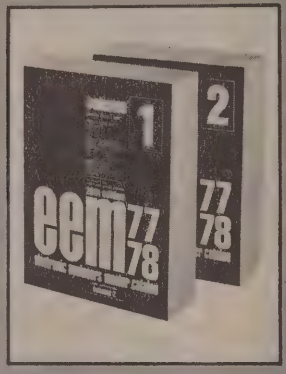
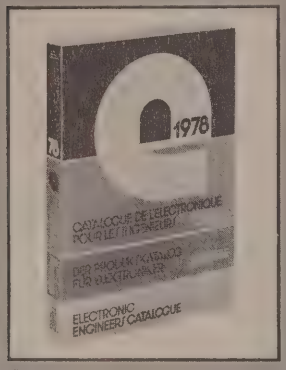


The "blue-ribbon" catalog/directory that has become "the standard of the industry" for electronic engineers, buyers and specifiers.

ELECTRONIC ENGINEERS CATALOGUE



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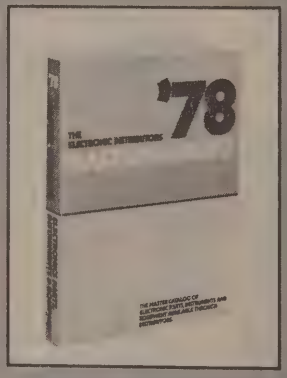

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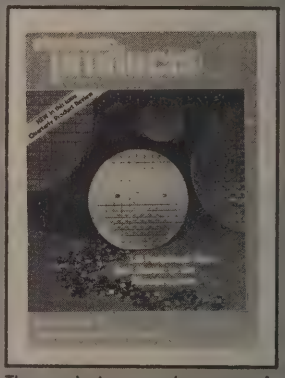
ELECTRONIC PRODUCTS MAGAZINE —



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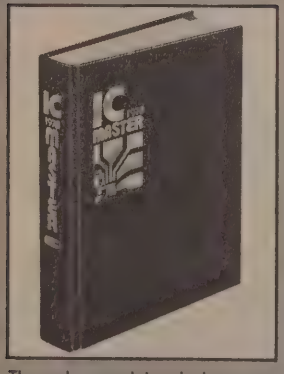

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Module, Case and Cabinet Systems

INTERLOK
ONE OF THE PURDY GROUP OF COMPANIES

770 AIRPORT BOULEVARD, BURLINGAME, CALIFORNIA 94010 • TEL (415) 348-5625 • TWX 910-374-2353

Features

- Modern, easy-to-clean design in a variety of panel mounting, table top or portable units.
- Sturdy, lightweight aluminum members and textured, vinyl-clad panels.
- Easy access for maintenance.
- Application as dual or multi-putpose racks, standard, table and 19" cases.
- Immediate off-the-shelf delivery.

Modular Design
The modules, cases and floor cabinets are built on the modular principal. Depending on the application, they can be fitted with auxiliary components and accessories for optimum utilization.

This modular design allows design engineers almost total flexibility.

Materials
Aluminum is the structural material. The anodized aluminum sections and the colored vinyl-coated aluminum cover panels contribute to the elegant, modern appearance of INTERLOK.

Colors
The standard color of INTERLOK Model 150 cabinets is light blue. For Models 30 and 36, the standard color is electric blue.

Edge Connectors
All edge connectors currently in use can be fitted by using supplementary assembly sections.

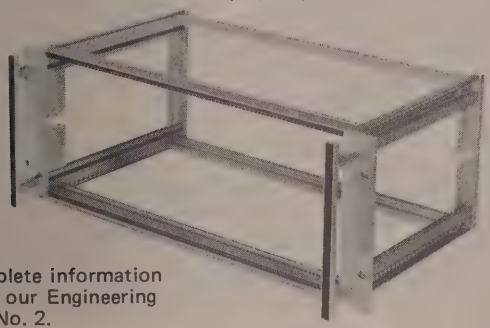
Packaging
Cases, modules and cabinet models are delivered unassembled. Assembly available at added cost.

Dimensonsal Units
The overall height of modules, card frames and plug-in cases and the acceptance height of cabinets is based on height units (E) per DIN Standard 41 494. One E equals 1¾" or 44.45 mm. The 19" insert width (483 mm) of the 19" floor cabinets corresponds to the overall width of 19" modules, 19" card frames, 19" cases and the 19" cabinet front panels.

For INTERLOK card frames with a 5.08 mm (2/10") pitch unit T is used for the acceptance width.

19-inch Universal Card Frames, Model 12

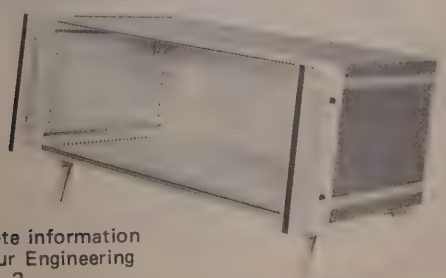
Application: As dual-purpose or multi-purpose racks, accepts front and rear insertion of cards, etc.
Height Units:
2E = 88.9 mm (3.5")
3E = 133.35 mm (5.25")
4E = 177.8 mm (7.0")
5E = 222.25 mm (8.75")
6E = 266.7 mm (10.5")
Width Installed: 81T = 411.48 mm (16.2").
Depth Installed: 181 mm (7.13"), 241 mm (9.49"), 301 mm (11.85"), 421 mm (16.57").



For complete information write for our Engineering Bulletin No. 2.

Universal Case, Model 30

Application: as standard, table and 19" instrument case.
Height Units:
2E = 88.9 mm (3.5")
3E = 133.35 mm (5.25")
4E = 177.8 mm (7.0")
5E = 222.25 mm (8.75")
6E = 266.7 mm (10.5")
Width Installed: 40T = 203.20 mm (8.0"). 60T = 304.80 mm (12.0"), 81T = 411.48 mm (16.2").
Depth Overall: 184.8 mm (7.28"), 244.8 mm (9.64"), 304.8 mm (12.00"), 424.8 mm (16.72").



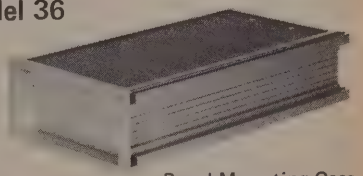
For complete information write for our Engineering Bulletin No. 2.

Instrument Case, Model 36

Features: front panel recessed by 12.7 mm (.50").
Application: for control and regulating instruments, switches, etc. Panel mounting and tabletop case, available with angled feet; case dimensions and recess in accordance with standard government built-in switch board appliances (DIN Standard 43 700).
Useable Depths: 146 mm (5.75"), 206 mm (8.11"), 266 mm (10.47"), 326 mm (12.83").

Front Frame					
Height		Width		Depth	
mm	In.	mm	In.	mm	In.
72	2.83	144	5.67		
72	2.83	288	11.34		
72	2.83	432	11.01	146	5.75
96	3.78	96	3.78	206	8.11
96	3.78	192	7.56		
96	3.78	384	15.12	266	10.47
144	5.67	144	5.67	326	12.83
144	5.67	288	11.34		
144	5.67	432	17.01		

For complete information write for our Engineering Bulletin No. 4.



Panel Mounting Case

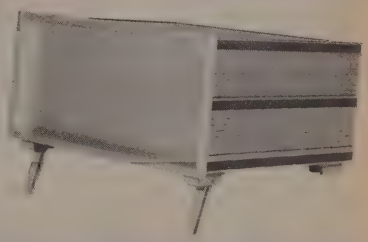


Table Model Case with Adjustable Feet

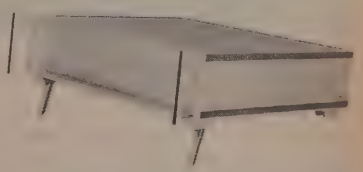
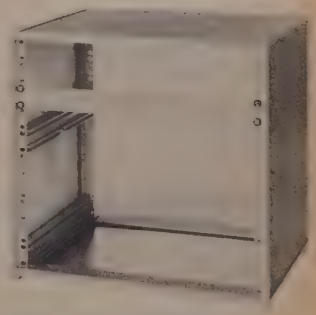


Table Model Case with Bar Handles

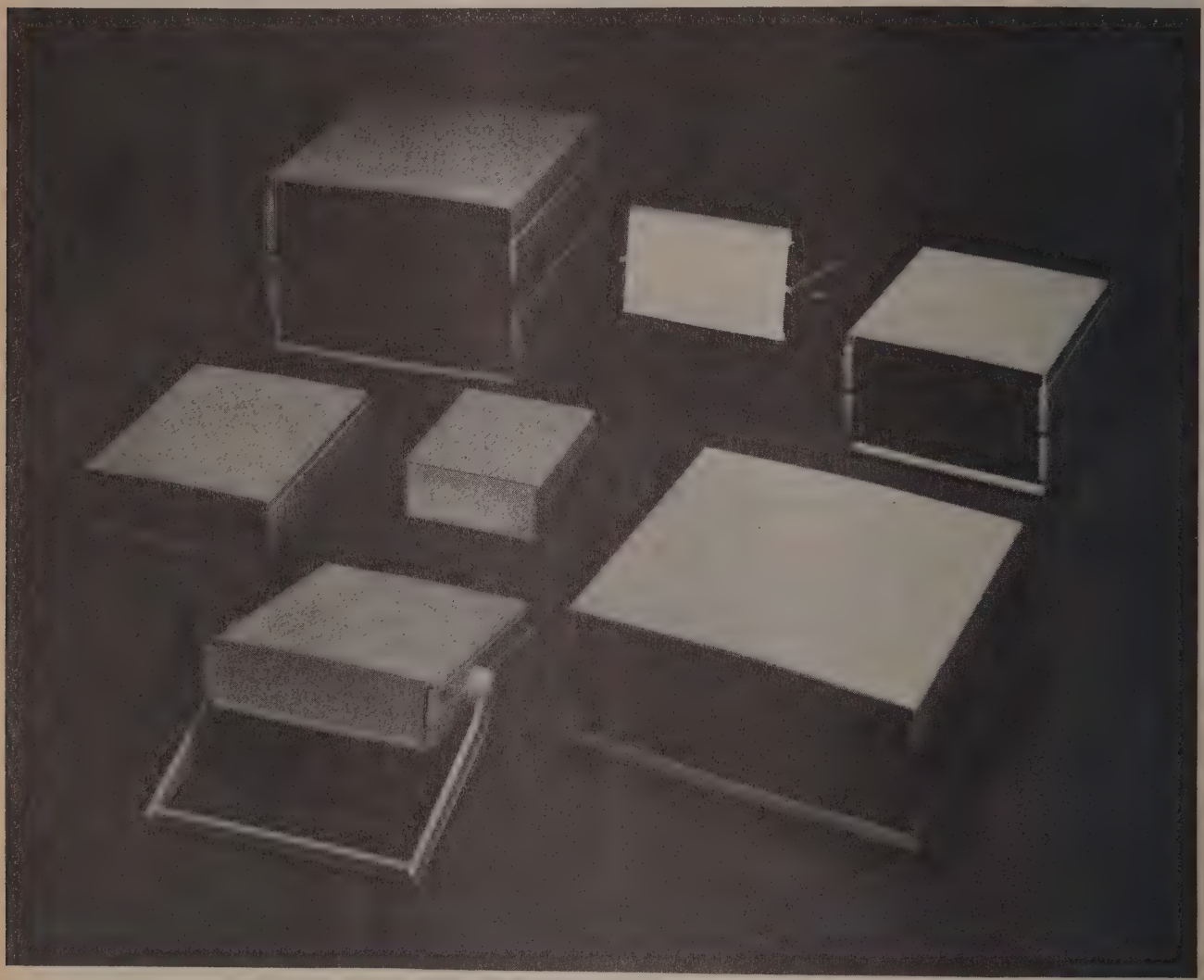
19-inch Cabinet Model 150

Application: Storage of 19" modules, card frames and cases with a pitch of 5.08 mm (.20").
Height Units:
3E = 133.35 mm (5.25")
4E = 177.8 mm (7.0")
5E = 222.25 mm (8.75")
6E = 266.7 mm (10.5")
10E = 444.5 mm (17.5")
Width Installed: 450 mm (17.72").
Depth Installed: 225 mm (8.86"), 345 mm (13.58"), 465 mm (18.31")



For complete information write for our Engineering Bulletin No. 6.

LA FRANCE SERIES C ENCLOSURES



AVAILABLE IN OVER 25 SIZES AND COUNTLESS VARIATIONS

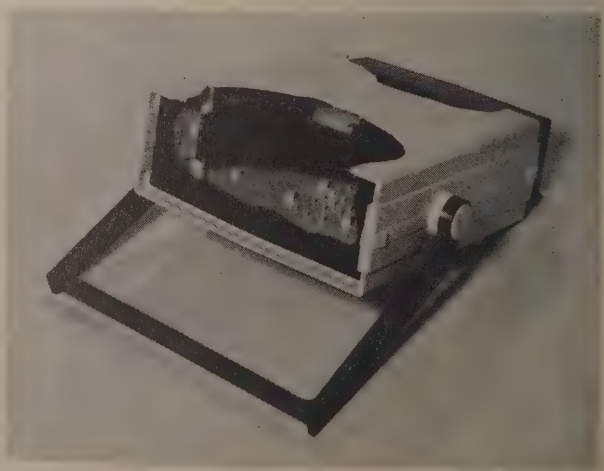
LaFrance C Series Instrument Housings have been designed to meet the ever expanding needs of today's electronic industry. Versatile and durable, they offer you substantial cost reductions.

FEATURES

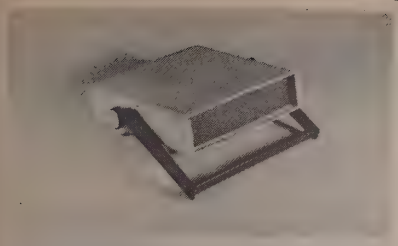
- Sturdy, durable, molded ABS ⅛" thick. Will last the lifetime of your product.
- Integral mounting bosses and vertical card slides.
- Available in tan, grey, or black textured colors.
- Complete with all hardware including feet.
- Front and Rear Panels available.

AVAILABLE OPTIONS

- Card slide adaptor for easy P.C. Card storage.
- Rail adaptor for mounting P.C. Cards, power supply, or chassis.
- Custom color combinations.
- Front and Rear Panel blanks.
- Die cast zinc or molded ABS panels customized to your specifications.
- RFI EMI Shielding.



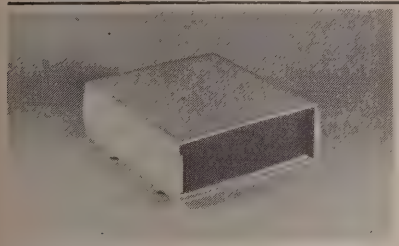
TYPICAL CASE CONSTRUCTION



CH SERIES

The Series CH Case is an intermediate size enclosure featuring a unique spring detended six-position handle.

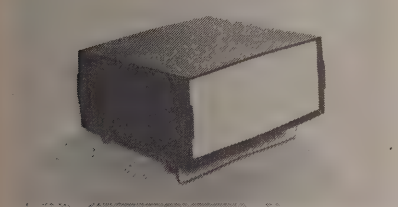
Model No.	(Dimensions in Inches) Height	Width	Depth	Weight (Lbs.)
CH 200	2 7/16	8 1/2	9 1/4	1.56
CH 225	2 11/16	8 1/2	9 1/4	1.56
CH 250	2 15/16	8 1/2	9 1/4	1.63
CH 275	3 3/16	8 1/2	9 1/4	1.63
CH 300	3 7/16	8 1/2	9 1/4	1.69
CH 325	3 11/16	8 1/2	9 1/4	1.69



C SERIES

Identical to the Series CH Case, but without handle assembly.

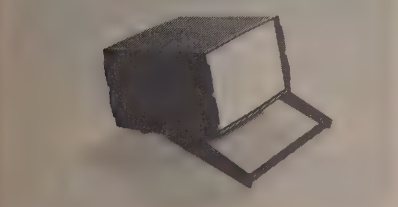
Model No.	(Dimensions in Inches) Height	Width	Depth	Weight (Lbs.)
C 200	2 7/16	8 1/2	9 1/4	1.38
C 225	2 11/16	8 1/2	9 1/4	1.38
C 250	2 15/16	8 1/2	9 1/4	1.44
C 275	3 3/16	8 1/2	9 1/4	1.44
C 300	3 7/16	8 1/2	9 1/4	1.50
C 325	3 11/16	8 1/2	9 1/4	1.50



CL AND CLB SERIES

A larger enclosure with all the basic features. Available with and without tilt stand.

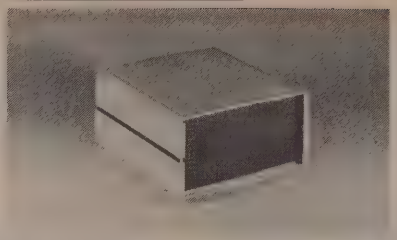
Model No.	With Tilt Stand	(Dimensions in Inches) Height	Width	Depth	Weight (Lbs.)
CL 400	CLB 400	4 1/2	12 1/2	11 5/8	1.94
CL 425	CLB 425	4 3/4	12 1/2	11 5/8	1.94
CL 450	CLB 450	5	12 1/2	11 5/8	2.00
CL 475	CLB 475	5 1/4	12 1/2	11 5/8	2.00
CL 500	CLB 500	5 1/2	12 1/2	11 5/8	2.06
CL 525	CLB 525	5 3/4	12 1/2	11 5/8	2.06



SERIES CHS

A basic Series CH format used where additional height is required.

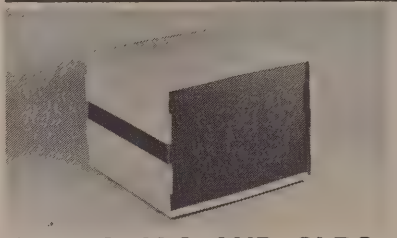
Model No.	(Dimensions in Inches) Height	Width	Depth	Weight (Lbs.)
CHS 400	4 7/16	8 1/2	9 1/4	2.19
CHS 500	5 7/16	8 1/2	9 1/4	2.38
CHS 600	6 7/16	8 1/2	9 1/4	2.56



SERIES CS

Dimensionally the same as the Series CHS Case but used where handle assembly is not required.

Model No.	(Dimensions in Inches) Height	Width	Depth	Weight (Lbs.)
CS 400	4 7/16	8 1/2	9 1/4	2.00
CS 500	5 7/16	8 1/2	9 1/4	2.19
CS 600	6 7/16	8 1/2	9 1/4	2.38



SERIES CLS AND CLBS

A large, very versatile case. This enclosure includes all features offered in all other housings. Tilt Stand available.

Model No.	With Tilt Stand	(Dimensions in Inches) Height	Width	Depth	Weight (Lbs.)
CLS 625	CLBS 625	6 3/4	12 1/2	11 5/8	4.12
CLS 725	CLBS 725	7 3/4	12 1/2	11 5/8	4.31
CLS 825	CLBS 825	8 3/4	12 1/2	11 5/8	4.50

SERIES CM

The Series CM is a smartly styled desk top miniature enclosure, featuring lightweight and exceptional durability.

Model No.	With Tilt Stand	(Dimensions in Inches) Height	Width	Depth	Weight (Lbs.)
CM 5-125	1 1/2	5 1/16	5 1/4	.50
CM 5-162	1 7/8	5 1/16	5 1/4	.56
CM 5-200	2 1/4	5 1/16	5 1/4	.62
CM 6-150	1 3/4	6 1/16	6 1/4	.62
CM 6-187	2 1/8	6 1/16	6 1/4	.69
CM 6-225	2 1/2	6 1/16	6 1/4	.75

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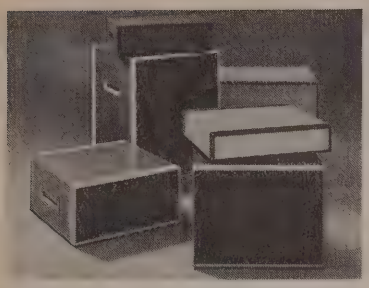
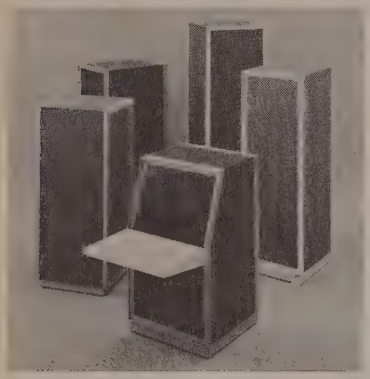
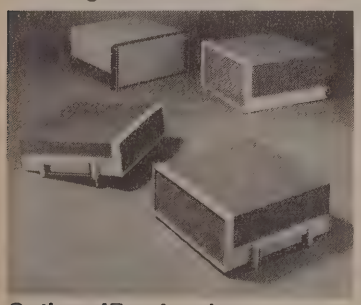


Optima Instrument Cabinets — 72 aluminum models designed to house EIA standard 19 and 24 inch panel instruments. Choose textured, smooth finishes. Perforated surfaces at no extra cost.

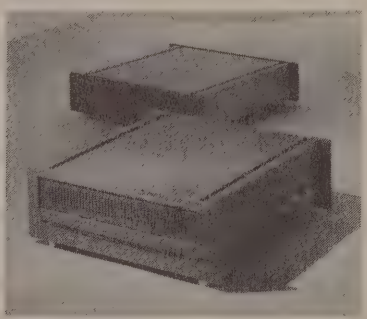


Optima Vertical Cabinets — 71 models for EIA standard 19 and 24 inch panel widths. Select any two color combination from an eleven color spectrum of designer colors.



Optima 17 — A unique combination of chassis and case with simply great access and styling. Available in four panel heights and two depths with four configurations — vertical cabinet adaptable and more.

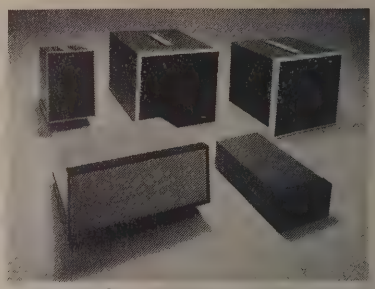
Optima Desk—The professional look in Data Consoles. Built-in storage space and generous leg room. Top design permits routing cables into the pedestal at any point along the back edge. Standard widths are 24″, 45″ and 66″, each in a choice of keyboard or desk heights.



Optima PAK — Structural foam sides provide increased electrical, thermal and sound insulation. Chassis-panel assembly slides into the front of the case and is secured with no visible front panel hardware. Choose from 4 panel heights and 19 or 17 inch panel widths.

We make you look better

OPTIMA®
Scientific-Atlanta



Optima Small Cases — Mobile, versatile and rugged with usable inside space ranging from 133.6 to 1445.4 cubic inches. Feature quick access and a flush, self-retracting handle with trim strip.

Optima Accent Cases — Besides offering you a wide choice of standard sizes, colors and finishes, we can cut these beauties to your own specs. With solid walnut or metal slides, sloped or vertical front panels or whatever.

Optima Consoles — An intelligent system of instrument housings, work and storage space. Precisely crafted in steel, and plastic laminates. Available in one, two and three-bay units.

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Division of Sunshine Mining Company

PRODUCTS COMPANY

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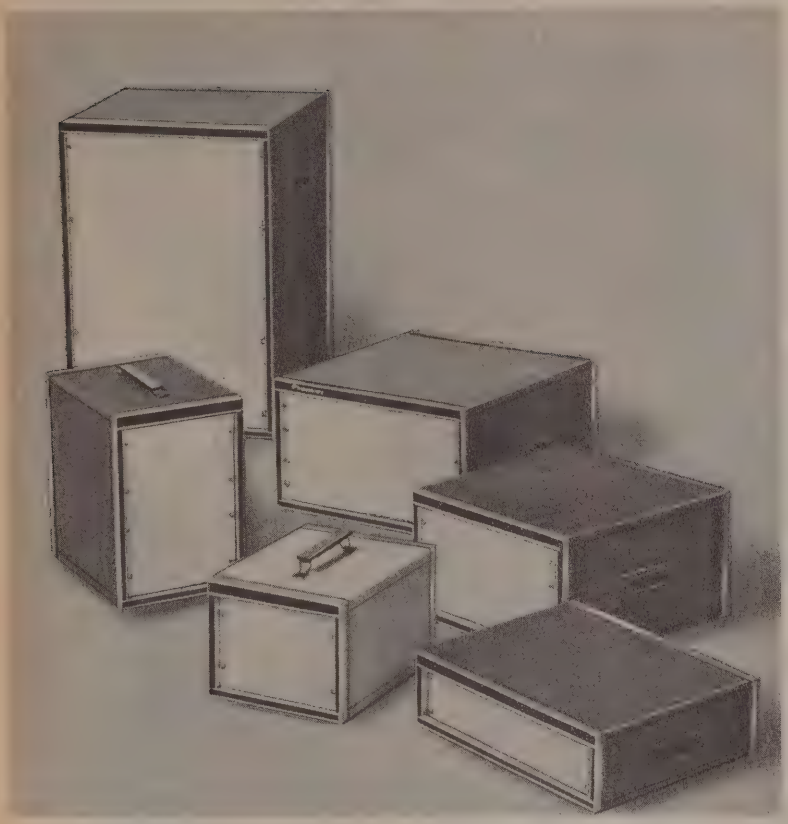
TRIMLINE TIC SERIES INSTRUMENT CASES



Available in 88 Standard Sizes

11 Panel Heights: 3½, 5¼, 7
8¾, 10½, 12¼, 14, 17½
21, 24½, 28

3 Panel to Panel Depths: 13, 17, 21

3 Panel Widths: 19, 15⅝ *, 9½ **

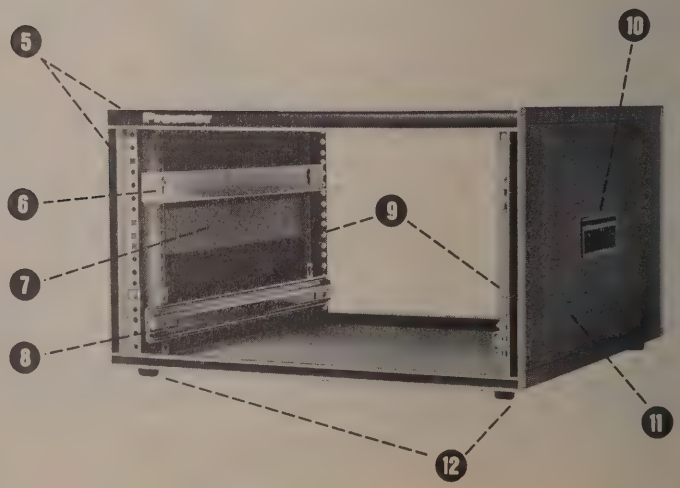
***Special Size:**

A special design size (15⅝" Panel Width) has been incorporated into the Trimline Instrument Case line which makes the entire case easily adaptable into standard 19" rack systems.

**9½" widths are limited to 13" or 17" panel to panel depths.

TIC Series Construction Details (front and rear identical)

5. Trim: Extruded, anodized aluminum with black vinyl inlay.
6. Chassis/Shelf Support (accessory TIA Series)
7. Welded stiffener channel and hand grip support
8. Full extention slides with mounting hardware (accessory TFE Series)
9. Recessed panel mounting channels and structural supports (4 per case) Standard EIA & WE hole spacing provide for frontal mounting and internal equipment mounting. Hardware supplied.
10. Carrying Grip
11. Case Body: welded, formed steel (20 ga.) with welded 16 ga. channel gusseting and channel stiffeners.
12. Non-marring feet



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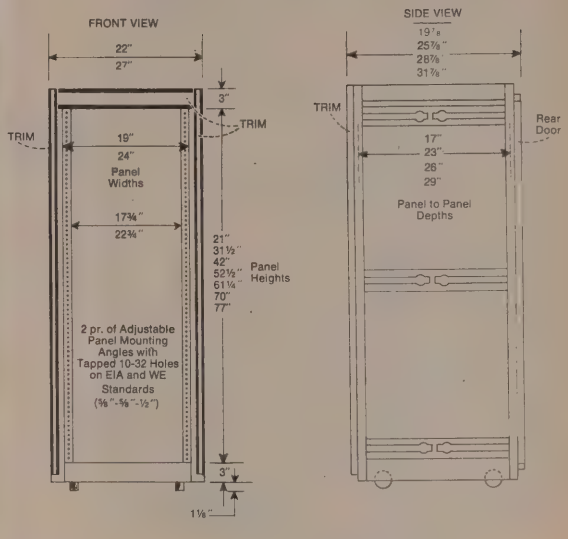
Trimline TVA Series

BASIC NOMINAL SIZES

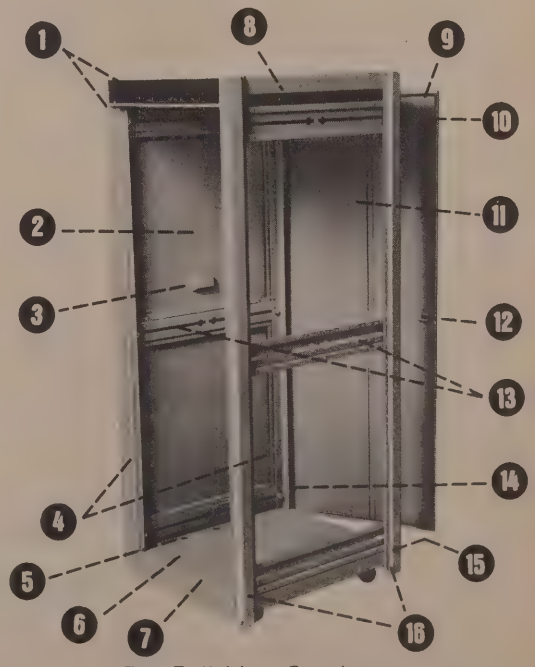


30° & 45° matching wedge frames are available for multiple bay console configurations.

TVA Series Vertical Assembly—Construction Details
(1 Frame, 2 End Panels, Rear Door)

1. Trim: extruded anodized aluminum with textured vinyl inlays provide 1" recess for door mounting or panel area
2. Outside removable flush end panels (16 ga.)
3. Recessed hand grip for panel removal
4. 2 pr. panel mounting angles, fully adjustable front to rear with tapped 10-32 holes on EIA & WE Standards spacing (12 ga.)
5. 1" dia. holes for cable entry beneath base
6. Recessed caster mounting holes
7. 1 piece formed steel base provides for heavy equipment mounting area and concealed caster mounting (14 ga.)
8. 1 piece solid top for extra rigidity and squareness (14 ga.)
9. Foam gasketing (3 sides)
10. Magnetic closure gasket
11. Door stiffener channel
12. Keyed latch and brushed aluminum pull handle
13. Horizontal cross-brace and panel mounting angle supports
14. Quick release, spring loaded door hinges (top and bottom)
15. 1⅛" dia. knock-outs for rear cable entry underneath rear door
16. Formed steel uprights (14 ga.) provide ½" recess to panel mounting angles

All features shown are standard in the Trimline TVA Series
Welded, formed steel construction



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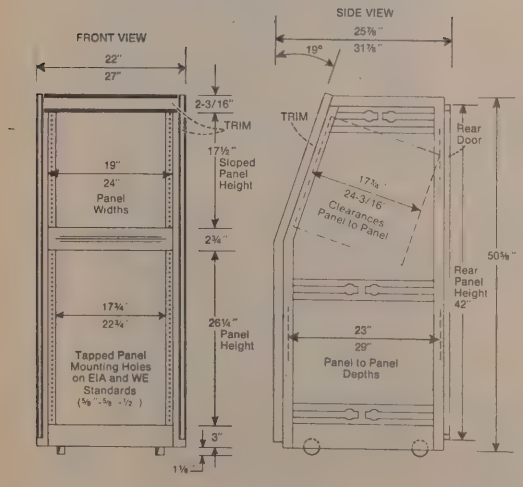
TRIMLINE TSA SERIES SLOPED FRONT PANEL ENCLOSURE

TSA Series Sloped Front Panel Assembly—
(1 Frame, 2 End Panels, Rear Door)
General Construction Details are the same as the Vertical Assemblies.

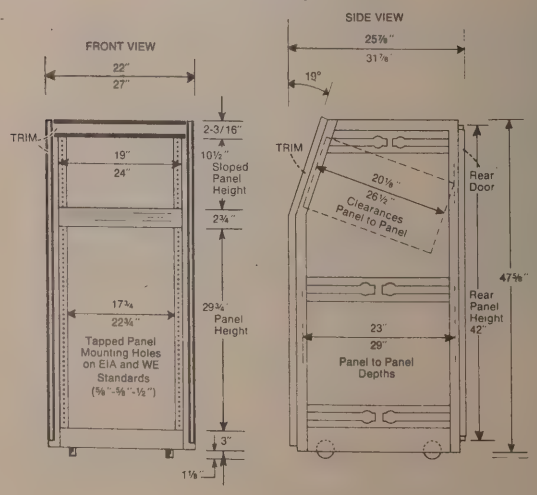
30° & 45° matching wedge frames are available for multiple bay console configurations.

BASIC NOMINAL SIZES

19°—17½" Sloped Panel



19°—10½" Sloped Panel



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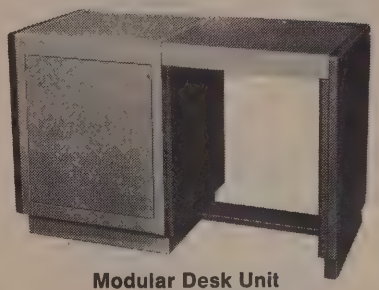
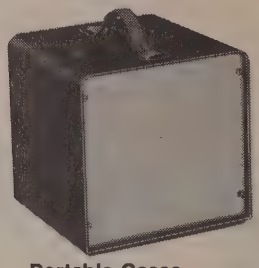
Modular Racks, Cabinets & Consoles

Desk Cabinets

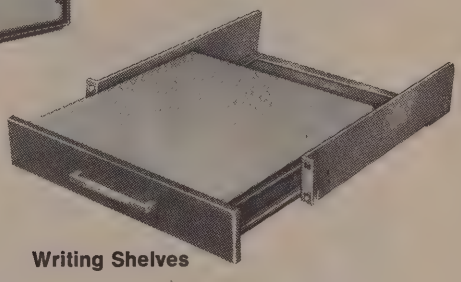


Modular Desk Unit



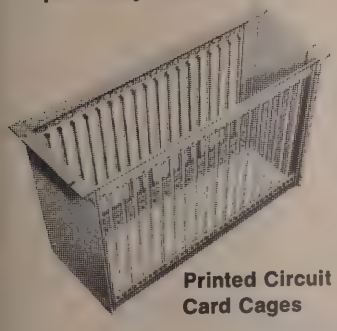
Portable Cases

Sloped Front Desk Cabinets



Writing Shelves

Open Relay Racks

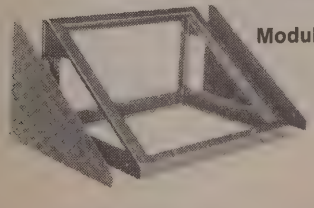


Printed Circuit Card Cages

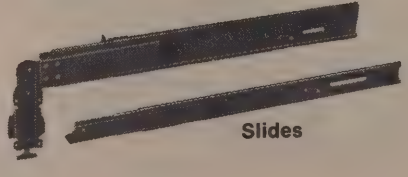
Premier Modular Enclosure Systems offer maximum flexibility, adaptability and esthetic value requirements in the electronic, electrical and electro-mechanical fields. The range of standard units in various widths, depths, heights and shapes available offers a full variety of combinations and configurations necessary to meet the space and human engineering customized requirements for enclosure systems used in modern packaging. There are distinct advantages in using the Premier Modular Systems: "In house" costs for development and design requirements are drastically reduced, standardized production economies are realized, and delivery schedules are considerably faster.

Modifications available for Premier Modular units offer additional adaptability for "special" requirements.

Send for our NEW full line catalog



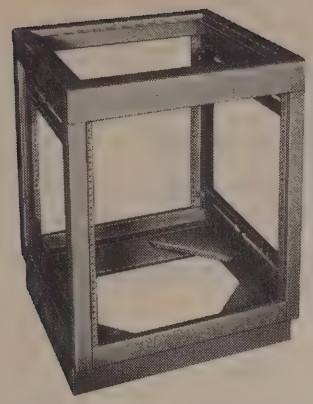
Modular Turrets



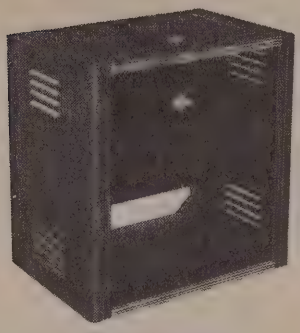
Slides

Available Through Local Distributors—Send For Full Line Catalog

PREMIER METAL PRODUCTS COMPANY/A Division of Sunshine Mining Company
381 Canal Place • Bronx, New York 10451 • (212) 993-9200

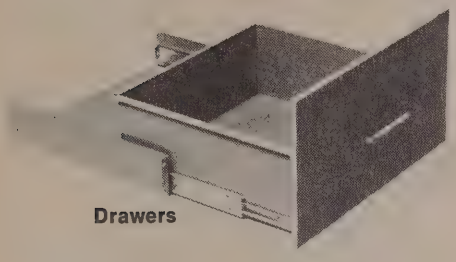


Modular Desk Height Cabinets

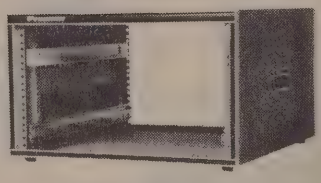


Desk Cabinets

Sloping Panel Cabinets



Drawers



Desk Cabinets
Instrument Cases

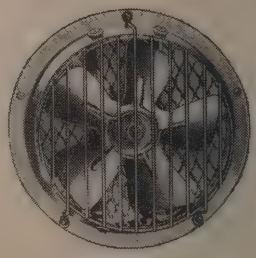
Solid Skin Cabinets

PREMIER PRODUCT LINES Premier manufactures a full line of Standard housings, enclosures and accessories for the Electronics Industry. Modified and special enclosures are also available on quotation.

Modular Enclosures	*Chassis*
Sloping Front Consoles	*Panels*
Sloping Instrument Cases	*Boxes*
Desk Cabinets, welded & KD	*Slides*
Relay Rack Cabinets, welded & KD	*Blowers*
Channel Relay Racks	*Fans*
Cases & Small Cabinets	*Hardware*
P.C. Card Holders & Guides	*Accessories*

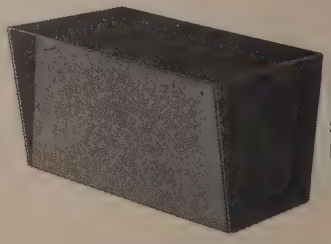
Premier offers a variety of color coordinated standard textured and smooth finishes to allow "Customized" system design possibilities.

Send for our NEW full line catalog



Fans

Blowers



Small
Instrument Cases

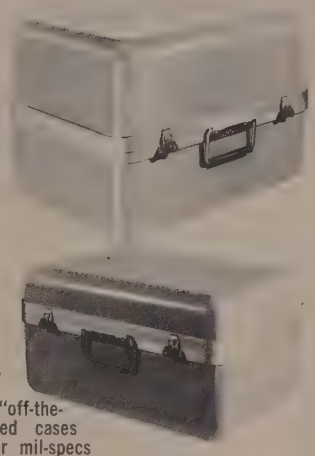
Available Through Local Distributors—Send For Full Line Catalog

PREMIER METAL PRODUCTS COMPANY/A Division of Sunshine Mining Company
381 Canal Place, Bronx, New York 10451 • (212) 993-9200

SAFE, ECONOMICAL PROTECTION-

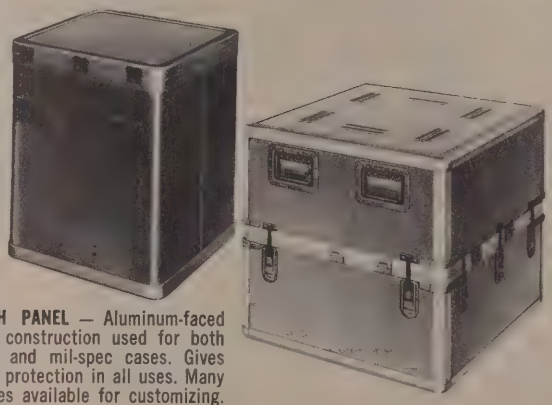
You've just described a Skydyne Case!

Industry's most complete line of fiberglass, ABS, and sandwich constructed protective cases. Provides maximum in-transit security against shock, vibration and hazardous environments to your valuable equipment or product. Backed by 30 years' experience.



FIBERGLASS—Skydyne offers a complete line of quality fiberglass cases, standard "off-the-shelf" or custom-engineered cases available for commercial or mil-specs applications.

ECONOGLASS — All the advantages of fiberglass protection at a new low price! Perfect for commercial use. Can be customized to fit any specific need.



SANDWICH PANEL — Aluminum-faced sandwich construction used for both industrial and mil-spec cases. Gives maximum protection in all uses. Many accessories available for customizing.

ABS THERMOPLASTIC — a natural for customized shapes. Extremely inexpensive tooling. Strong and lightweight. Skydyne offers ABS plastics parts capabilities also.

CUSTOM-DESIGNED STRUCTURAL CONTAINERS — Built to your specifications of Skydyne's unique aluminum-faced sandwich panel. Fastest delivery in the industry. Meets all applicable mil-specs where necessary.

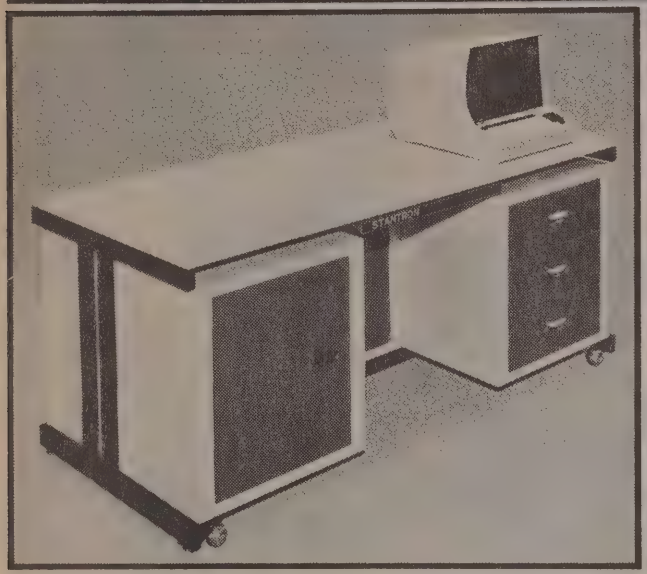
For complete information on Skydyne's protective cases, call or write . . .

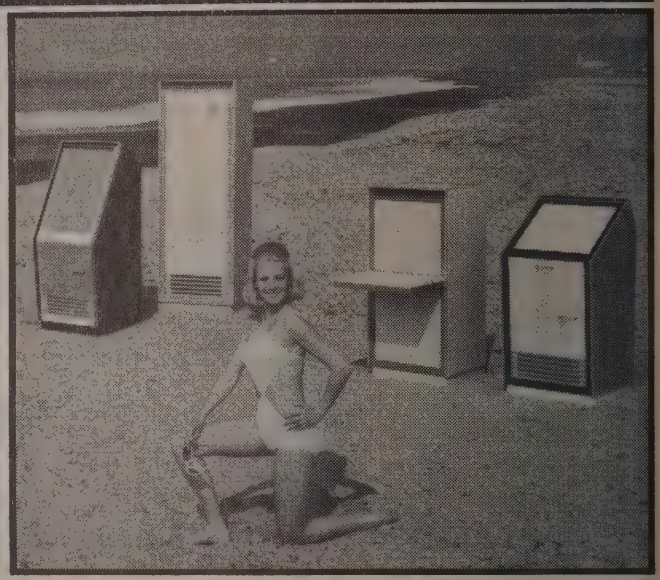
Skydyne®

River Road, Port Jervis, N. Y. 12771 • (914) 856-6655

A b+p Brooks & Perkins Company

MODULAR ELECTRONIC CABINETS and COMPUTER PERIPHERAL FURNITURE





STANTRON is a leading manufacturer of **MODULAR ELECTRONIC CABINETS** and **COMPUTER PERIPHERAL FURNITURE.**

The **MODULAR ELECTRONIC CABINETS** are used to enclose:

- Electronic Equipment
- Instrumentation Equipment
- Test Equipment
- Automation Equipment
- Audio Equipment
- Sound/Paging Equipment
- Closed Circuit Television Equipment
- Communication Equipment
- Hydraulic Equipment
- Electrical Equipment

The modular type of cabinetry with a wide variety of accessories allows the user to design his own enclosure/console/housing. The **STANTRON** line of cabinetry combines all of the necessary functional characteristics, such as ease of wiring and installation of equipment, mobility, loading capacity and structural strength with beauty in styling.

With the recent introduction of **STANTRON's COMPUTER PERIPHERAL FURNITURE** line, it is now possible to design "The Total System" by combining it with our **MODULAR ELECTRONIC CABINETS.** Both lines are dimensionally compatible. The **COMPUTER PERIPHERAL FURNITURE** line offers a variety of sizes, "desk leg" styles, colors and accessories. All desk assemblies are shipped "all-welded" together. "Nuts and Bolts" are not required. By taking this approach, we have given our customers the required structural strength.

WRITE OR CALL FOR FREE LITERATURE

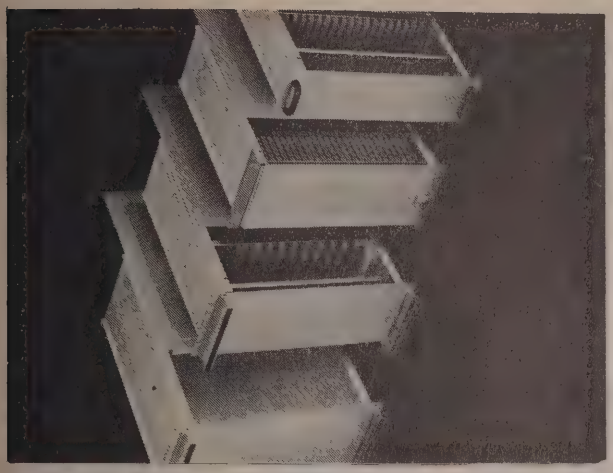
STANTRON® MODULAR ELECTRONIC CABINETS COMPUTER PERIPHERAL FURNITURE

DIVISION WICO METAL PRODUCTS

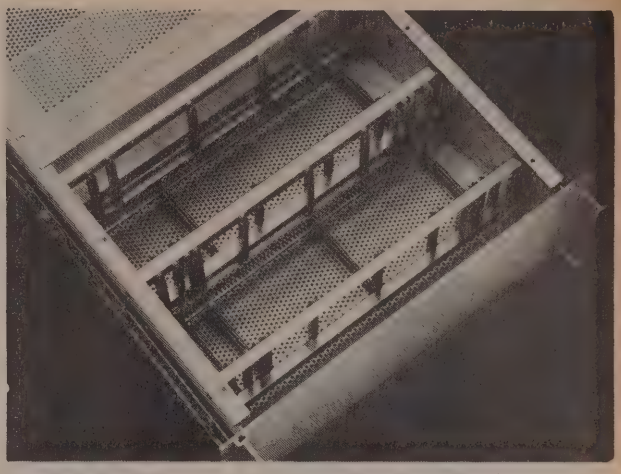
6914-18 Beck Avenue • North Hollywood, California 91605
Phone: (213) 875-0800 TWX: 910-499-2177

TECHMAR OMNICLOSURE™

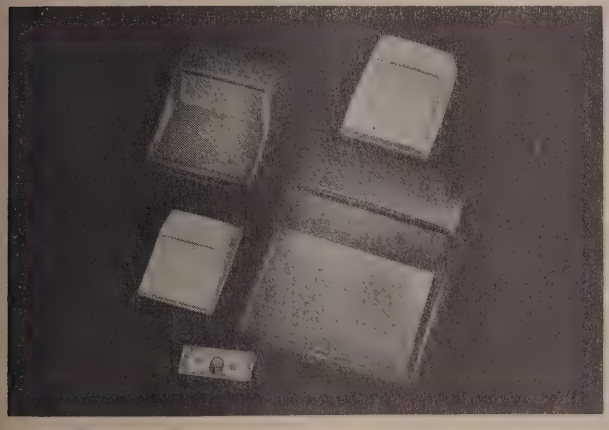
HAS IN STOCK FOR IMMEDIATE SHIPPING ANYWHERE:



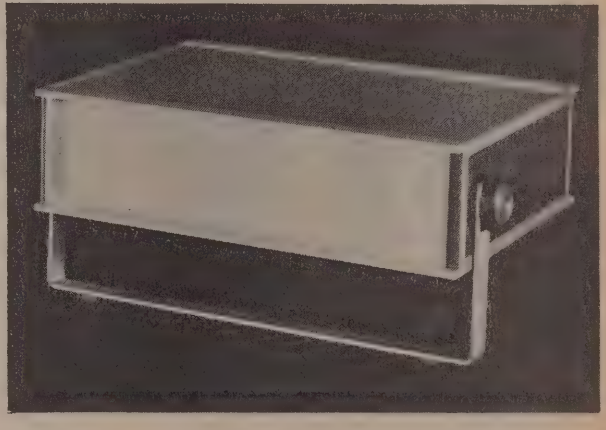
RACK-MOUNTING CHASSIS kits and parts in 7 EIA heights with pre-punched hole patterns for assembling in thousands of configurations; many options and accessories.



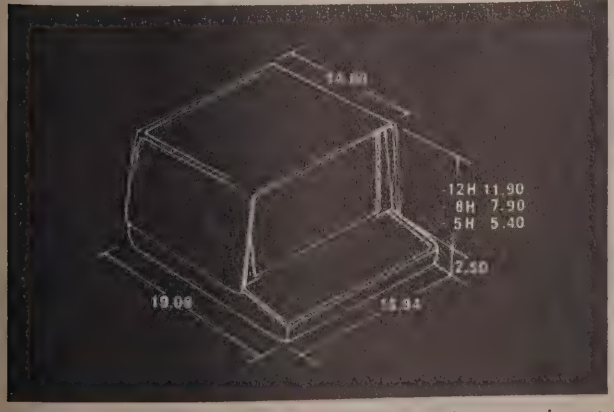
CARD CAGE kits and parts, plated steel guide frames and connector rails, plastic snap-in guides. For assembling in rack-mounting chassis units.



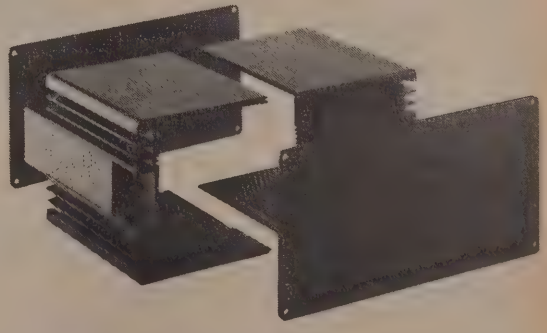
MINI-CONSOLES for enclosing small instruments economically in high style. Textured high-impact thermoplastic. Stocked in various sizes and colors.



PORTABLE INSTRUMENT ENCLOSURE kits in 54 configurations with optional swing handle/tilt stand, PC card capability, choice of 5 vinyl trims.



DATA TERMINAL CABINETS to dress up input/output systems which may include CRTs. Hood (3 heights) and base are molded polyurethane in choices of colors, all in stock.



SUBASSEMBLY HOUSINGS, black anodized aluminum, integral card guides. Parts for 45 configurations in stock, 3 x 3 x 4 to 8 x 8 x 4, including 9 with heat sinks.

FREE CATALOG INCLUDES DIMENSIONS AND PRICES.

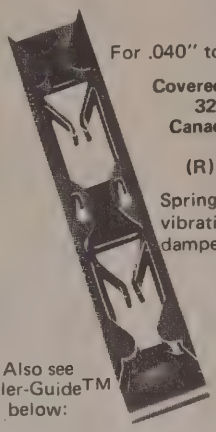
TECHMAR CORPORATION, 2232 SO. COTNER AVE., LOS ANGELES, CA 90064, PHONE (213) 478-0046

UNITRACK CARD GUIDES

Any p.c. card—large, small, "hot" or to be grounded can be held firmly with the patented spring finger action that *only UNITRACK guides offer.* Vibration and shock dampening are features no other guide offers. The cantilever spring action grips cards from .040" to .100" thick, yet they slide smoothly . . . insertion or extraction. UNITRACK guides are available in standard sizes or in long lengths for customer make up of polycarbonate plastic, phosphor bronze, beryllium copper or plastic or metal in an extruded housing. UNITRACK card guides are accepted for military or commercial applications.

Prices: Depending on quantity and size.
Standard UNITRACK Guides—14 to 26¢

Snap in button or hole for quick assembly.



PLASTIC or METAL

For .040" to .100" thick cards.

Covered by U.S. Patent Numbers 3231785, 3950057 and Canadian Patent No. 766819

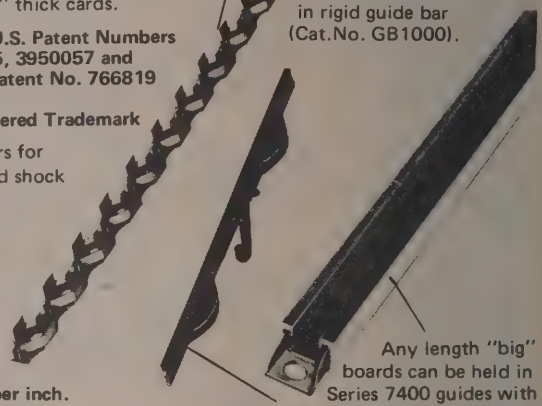
(R)Registered Trademark

Spring fingers for vibration and shock dampening.

Also see Kooler-Guide™ below:

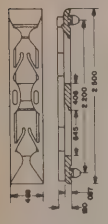
Metal for "hot" boards or grounding.

Series 1000 metal guides can be mounted to chassis or used in rigid guide bar (Cat.No. GB1000).

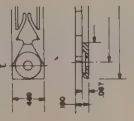


Any length "big" boards can be held in Series 7400 guides with plastic segments and rigid guide bar.

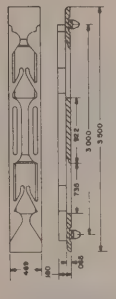
Series 1000 Metal Guides—from 3½¢ per inch.
Series 4700 Guides—from 7½¢ per inch.



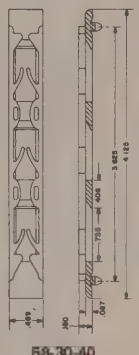
2500-38



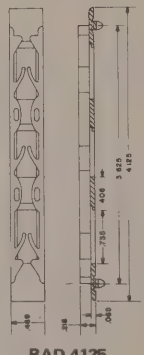
2500-38CB



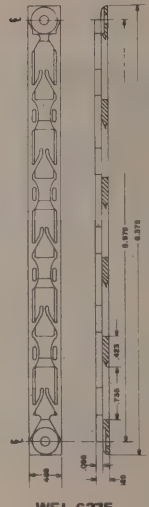
SPC-3000



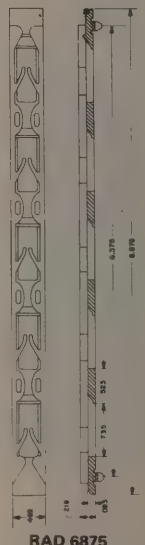
58-30-40



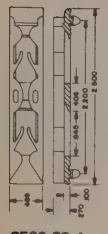
RAD 4125



WEL 6375

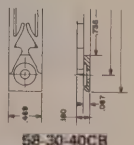


RAD 6875

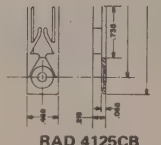


2500-38-4

SPC-3000CB



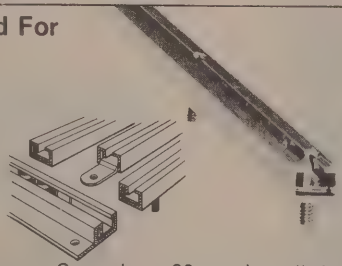
58-30-40CB

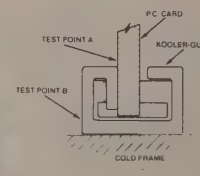


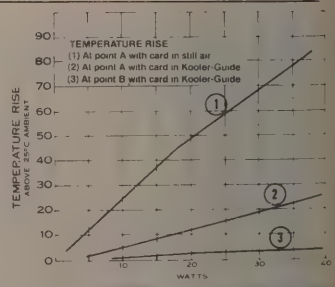
RAD 4125CB

Kooler-Guide™ Patent Applied For

Outstanding heat transfer through the card guide that also serves as a heat sink. Available for both 1/16" or 1/8" boards. Metal (phosphor bronze, beryllium copper, stainless steel) spring loaded fingers press p.c. card into contact with guide over entire length for quick, effective heat transfer.
Also available with mounting studs **(add 5¢ per stud). Cat. No. KG 375**
Price: 13¢ per inch depending on quantity and metal.





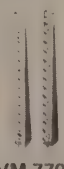

TEMPERATURE RISE
(1) At point A with card in still air
(2) At point A with card in Kooler-Guide
(3) At point B with card in Kooler-Guide
TEMPERATURE RISE ABOVE 25°C AMBIENT
WATTS

Curve shows 30 watt heat dissipation with Kooler Guide.

VERSAMOUNT® Brackets

in metal or plastic for mounting p.c. cards, vertically on chassis.

VM 7500 with Board-Lok™



VM 7700

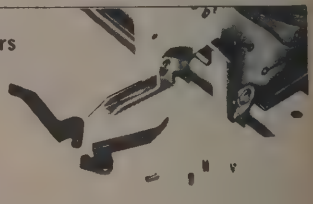
Wherever you need to mount a p.c. card on a chassis, the Versamount provides a firm support bracket. Made in plastic (VM7500) or metal (VM7700) so that grounding can be accomplished. **VM7500 Price from 55¢ a pair up. VM7700 Price $1.60 a pair up**

Board-Lok used with VM 7500 positively locks board in. Board-Lok **Price from 15¢ ea.**

Kolor-Kode™ Card Extractors

Lightweight, strong, epoxy coated stainless steel ejectors either extract or insert cards easily. Available in 12 electronic colors for circuitry identification.

Cat. No. L1000-6 for 1/16" card
L1000-9 for 3/32" card
L1000-12 for 1/8" card
L1000-15 for 5/32" card



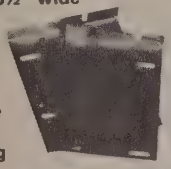
Price 12¢ to 19¢

Use with Extractor Bar, Cat. No. HB1708 (same price as HB1701)

UNITRACK
CARD RACKS

Low cost, easy-to-assemble, sturdy, rigid racks built to standard EIA sizes for mounting in 19" cabinetry. These racks can be supplied complete, or the individual parts may be ordered separately. Versacage card racks are available in these standard sizes. Specials are also available.

Cat. No.	Card Size	Price
VC-119-450	3½" to 4½" wide, up to 6½" long	$23.00
VC-119-625	4½" to 6¼" wide up to 6½" long	24.00
VC-119-800	6¼" to 8" wide up to 6½" long	25.00
VC-119-975	9¾" wide up to 6½" long	26.00
VC-219-450	3½" to 4½" wide up to 9¼" long	26.50
VC-219-625	4½" to 6¼" wide up to 9¼" long	27.50
VC-219-800	6¼" to 8" wide up to 9¼" long	28.50
VC-219-975	9¾" wide up to 9¼" long	29.50
VC-119-D-450	For two cards 4½" wide up to 6½" long	38.00
VC-219-D-450	For two cards 4½" wide up to 9¼" long	45.00
VC 1700	Single Rack: 6" deep end plates for cards up to 5½" wide	19.00



End Plates

Versacage end plates may be purchased separately. **Prices range from $5.00, depending on size and quantity.**

HOLDER BARS AND CONNECTOR BARS

Angle Bracket

Pre-punched bars of rigid aluminum extrusions are available for three card packaging densities . . . .200", .500" or .750" centers.

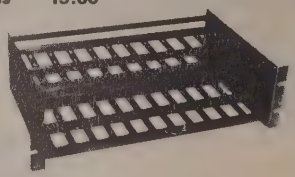
Pre-punched bars also available for offset connectors.

Price of Connector Bars (Cat. No. CB1702) —from $1.50 ea.
Price of Holder Bars (Cat. No. HB1701) —from $1.50 ea.
Price of Angle Brackets—25¢ ea.

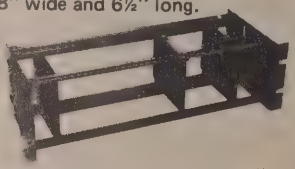
Back Panel Accessories

Versacage End Plates accept special brackets (Cat. No. UB-) so that back panel may be removed or attached in one piece when using wire wrapping connection techniques. Standard and special sizes available.

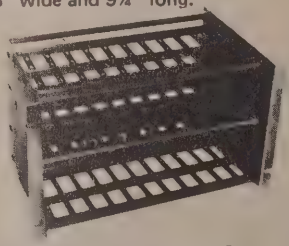
Price: from 75c



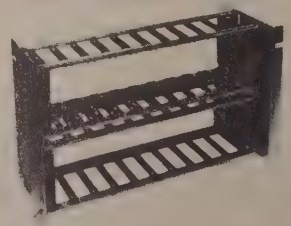
SERIES 119—Sizes for cards 3½" to 8" wide and 6½" long.



SERIES 219—Sizes for cards 3½" to 8" wide and 9¼" long.



SERIES 119-D—Similar to Series 119 but for two rows of cards.

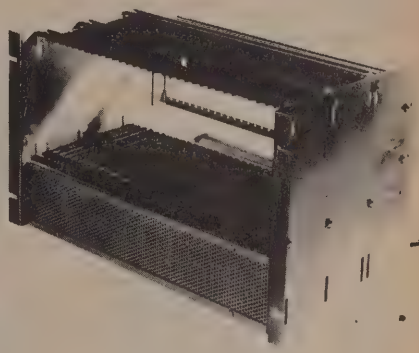


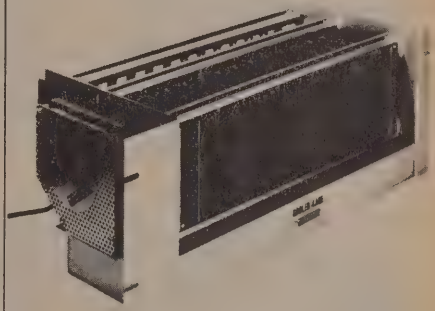
SERIES 219-D—Similar to Series 219 but for two rows of cards.

Kooler-Kage™ (U.S. Pat. No. 3967874)

Card Cages with Integral Blowers.

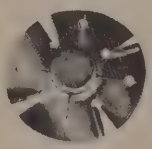
Cool an individual cage full of boards with Series TBKK-119 Series or TBKK-219 Series Kooler-Kages with tangential blowers for maximum cooling (100 cfm). For all standard card sizes shown on left. **Prices from $88.09 to $110.00.**





Cat. No. VCKK119-450 incorporates a plenum chamber and centrifugal blower for cooling over entire cage. Compact blower provides 25 cfm. **Price $95.00 complete with guides.**

Kooler-Krown **Kooler—Kollar**



Heat Dissipators

Triac Kooler

Both Kooler-Krown™ and Kooler-Kollar™ provide effective heat dissipation for heat producing components in standard can packages. Triac-Kooler™ efficiently cools packaged triacs and power tab transistors.

DK-300 (Kooler-Kollar) for TO5—from 7¢
KK-750 (Kooler-Krown) for TO3—from 24¢
KK-300 (Kooler-Krown) for TO5—from 10¢
KK-500 (Kooler-Krown) for TO8 and 66—from 10¢
TR-60 (Triac Kooler) for Triacs—from 17¢

UNITRACK®

UNITRACK Div., Calabro Plastics, Inc.
8738 West Chester Pike, Upper Darby, Pa. 19082, Telephone (215)789-3820

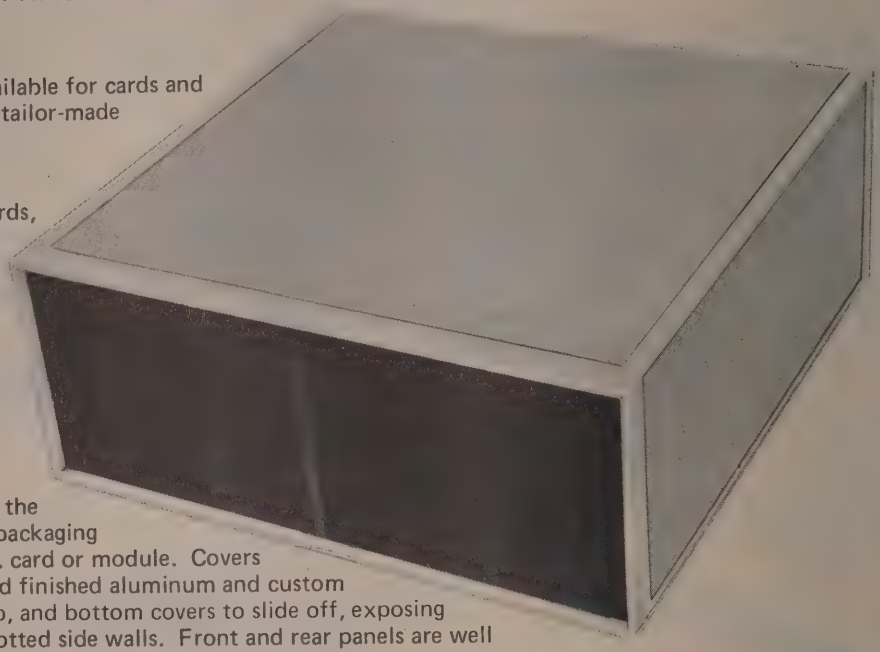
Sales Representatives and Stocking Distributors in major industrial areas.

Send for Complete Catalog and Prices.

VECTOR-PAK CONTEMPO STYLE ENCLOSURES

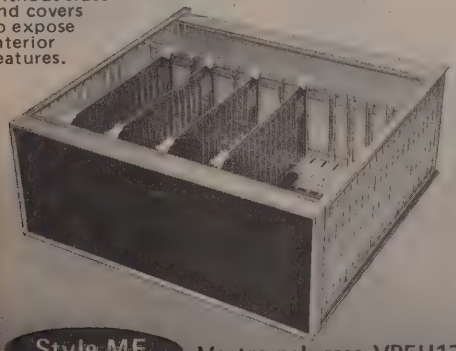
FOR FREE STANDING OR RACK MOUNTING APPLICATIONS

- Smart vinyl finishes
- Interior mounting systems available for cards and modules without usual costly tailor-made fabrication.
- Easily assembled interior
- Full supporting line of p.c. cards, modules, guides, connectors, interconnect systems.
- Available in 15 sizes, 11 colors, hundreds of combinations.
- All cases and systems shipped assembled, unless ordered unassembled (U)



New Vector-pak cases combine sophisticated styling suitable for the finest instruments with interior packaging systems for almost any sized p.c. card or module. Covers are made with vinyl and anodized finished aluminum and custom extrusions which allow sides, top, and bottom covers to slide off, exposing the sturdy cross members and slotted side walls. Front and rear panels are well supported, yet easily removable.

VP9[ ]17[ ]17 style, special. Shown without sides and covers to expose interior features.

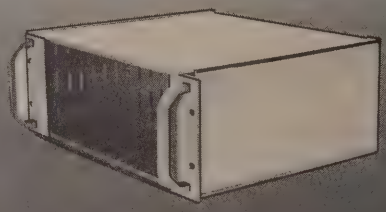


BASIC VECTOR-PAK ENCLOSURES WITHOUT INTERIOR MOUNTING SYSTEMS

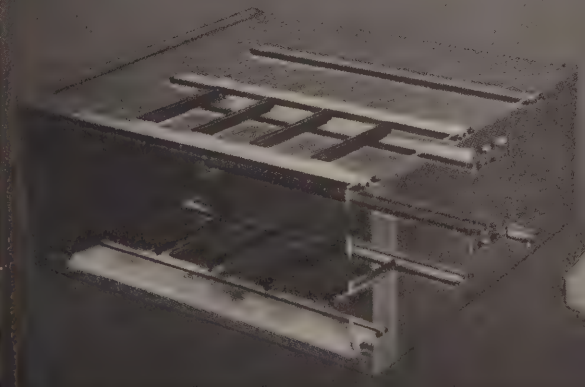
Part number	Height	Width	Depth	Finish top & side covers
VP3H17-10	3.76	17.58	10.4	Dark Blue Vinyl
VP3C17-10	3.76	17.58	10.4	Gold Vinyl
VP5H17-13	5.51	17.58	13.4	Dark Blue Vinyl
VP5K17-13	5.51	17.58	13.4	Sky Blue Vinyl
VP5-17-13	5.51	17.58	13.4	Clear Anodized
VP11C17-17	10.75	17.58	17.1	Gold Vinyl
VP7H17-13	7.26	17.58	13.4	Dark Blue Vinyl
VP7K17-13	7.26	17.58	13.4	Light Blue Vinyl
VP11H17-21	10.75	17.58	21.6	Dark Blue Vinyl
VP7P17-13	7.26	17.58	13.4	Walnut Vinyl
VP9H17-21	9.01	17.58	21.6	Dark Blue Vinyl
VP9K17-21	9.01	17.58	21.6	Light Blue Vinyl
VP9C17-21	9.01	17.58	21.6	Gold Vinyl
VP9P17-21	9.01	17.58	21.6	Walnut Vinyl

OTHER COLORS AVAILABLE AT FACTORY

Style MF **Vector-pak case VP5H17E13** is 17.58" wide x 13.4.. deep x 5.5" high, equipped with guides for inserting eight 2" wide x 6.6" long EFP modules from front. Has blue vinyl finished top and side covers. Supplied completely assembled. Order modules separately.



Front rack mounts available for all models. Write factory



SLOPE FRONT MODELS — VS Series

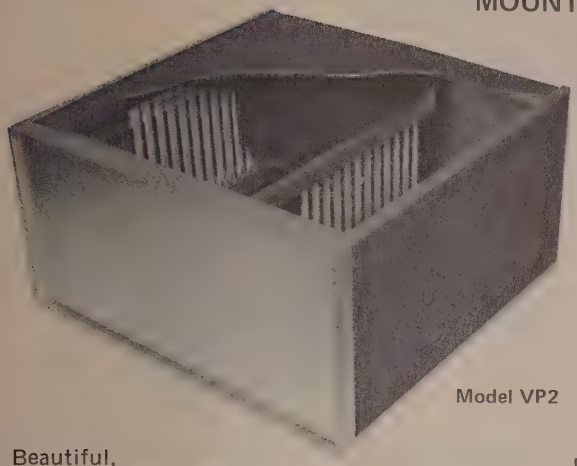
Two off-the-shelf models available: 5.5 inches high by 17.58 inches wide by 17.1 inches deep and 9.01 inches high by 17.58 inches wide by 21.6 inches deep. Other sizes to order. Write factory.

In the interest of improved design and performance, Vector reserves the right to make changes in its specifications without prior notice.

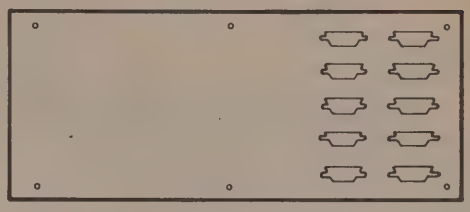
VECTOR ELECTRONIC COMPANY, INC., 12460 Gladstone Avenue, Sylmar, CA 91342 Phone (213) 365-9661 TWX 910-496-1539

VECTOR-PAK ENCLOSURES

ASSEMBLED ENCLOSURES with INTERIOR MOUNTING SYSTEMS



Model VP2

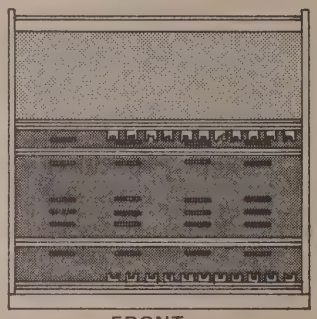


BP17-9 ACCESSORY PANEL

Input/out connector rear panel offers 10 connector cutouts for ITT Cannon DB25S type 25 pin connectors. May be mounted on VP1 or VP2 case with cutouts on right or left side.

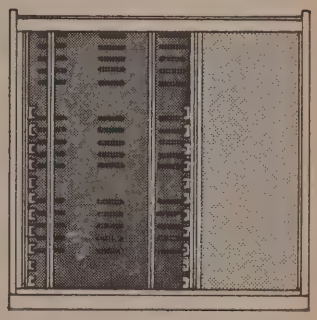
ORDERING INFORMATION

- Beautiful, sturdy blue vinyl finished aluminum, fully assembled.
- Heavy extruded aluminum cross members for mounting furnished adjustable plastic card guides.
- Motherboard and/or connector mounting structure, power supply chassis plate included. (Order motherboard, connectors separately.)
- Slide-off sides, top and perforated bottom, and detachable front and rear panels.
- Holds up to 21 5.3 inch by 10 inch cards in adjustable guides (12 pair furnished).
- 17.58 inches wide by 17.1 inches deep by 9.01 inches high.



FRONT

VP1 – "Altair" style – cards mount perpendicular to front panel.



FRONT

VP2 – "IMSAI" style–cards mount parallel to front panel.

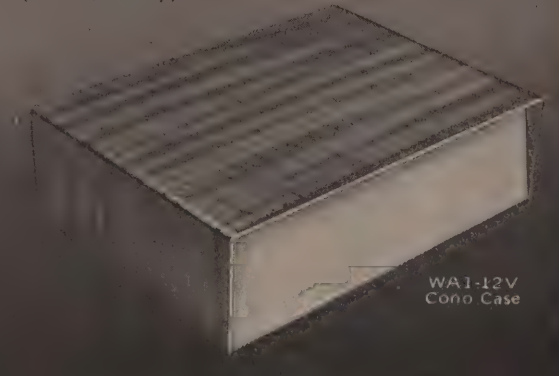
CONO SERIES INSTRUMENT CASES

- PROFESSIONAL APPEARANCE
- LOW COST BUT QUALITY
- QUICK ACCESS
- STURDY 0.062 INCH THICK ALUMINUM CASES WITH VINYL FINISHED COVERS OR OVERALL CLEAR ANODIZED FINISH
- FURNISHED WITHOUT INTERIOR STRUCTURE FOR MAXIMUM FLEXIBILITY

Smartly styled desk top enclosures for electrical and electronic assemblies. Two sets of oval ventilation holes across rear chassis bottom and on upper area of back panel provide excellent convection cooling. Listed accessory dark plastic overlay panel gives smart appearance and is transparent to "LEDs" and indicator lamps. Furnished completely assembled with four ¼ inch high adhesive mounting bump feet. Other colors available are gold, avocado, burnt orange, walnut grain, blue, beige, white, light gray, black. (Write factory).

Cat. No.	Stock Cover Finish	Overall Approximate Dimensions Width	Depth	Height
WA1-4V	Dark Blue Vinyl	11 (279)	8 (203)	4 (102)
WA2-4V	Dark Blue Vinyl	14 (356)	11 (279)	
WA1-12V	Walnut Grain Vinyl	11 (279)	8 (203)	
WA2-12V	Walnut Grain Vinyl	14 (356)	11 (279)	
WA1-1A	Clear Anodized Satin Finish	11 (279)	8 (203)	

Accessory: Plastic overlay panel for WA-1 series M6234-3-1; For WA2 series M 6234-3-2



WA1-12V Cono Case

In the interest of improved design and performance, Vector reserves the right to make changes in its specifications without prior notice.

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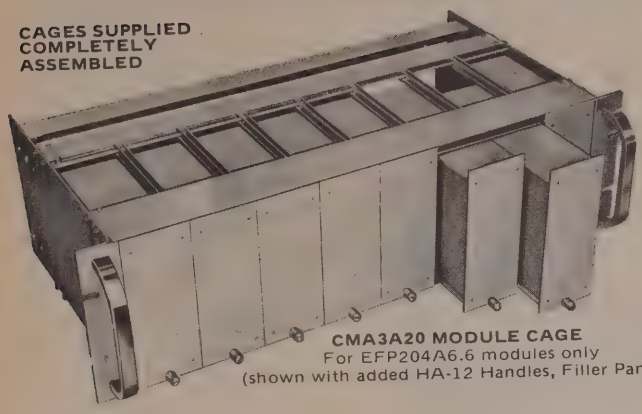
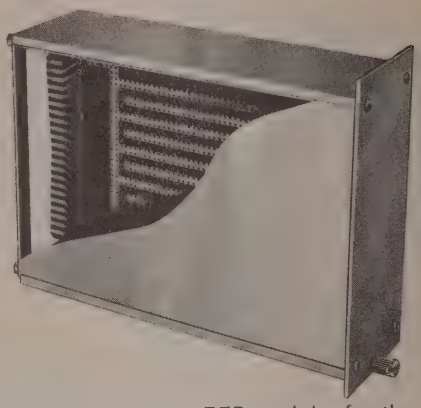
Vector MODULE CAGES

CAGES SUPPLIED COMPLETELY ASSEMBLED



CMA3A20 MODULE CAGE
For EFP204A6.6 modules only
(shown with added HA-12 Handles, Filler Panels)



EFP MODULE
EFP204A66F
cutaway

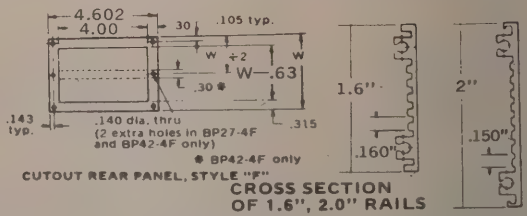
VECTOR-STRUT MODULE CAGES – These all-aluminum cages for 19 inch rack or table-top mounting with Vector encasements provide sturdy, mechanically excellent housings in which to house electronic assemblies. Units are shipped completely assembled;and modules, which are ordered separately, may be plugged in immediately after assembly. Module cages have a finished professional appearance which enhances equipment packaged within. Module guides are pre-installed in the cages for ten 1.6 inch wide, eight 2 inch wide, or five 3 inch wide EFP modules.

Connectors may be mounted to the two rear cross members (T-struts) which come pre-loaded with required 4/40 steel nuts. Alternately, punched metal connector plates may be attached to the rear cross members. In either case, the slotted cage side walls and bracket mounts on the cross members provide easy connector position adjustments. All cage parts are satin finished anodized aluminum. Special conductive iridite finish for RFI application available on order. Cages for other size modules and special RFI modules for these cages are available on order.

EFP MODULES – EFP modules for the accompanying Vector-Strut cages are anodized all-aluminum cases supplied in 1.6", 2" or 3" wide sizes. They consist of a blank 0.080 inch thick front panel with attachment hardware, blank or "OF" type 0.080 inch thick back panel for protruding circuit card edge fingers, two rear sliding covers, plus top and bottom rails with 0.075 inch wide grooved inner surface for circuit cards. Jack screw is provided to facilitate module insertion/withdrawal. Circuit boards or Plugbords are held by the 0.075 inch wide grooves which run the entire length of the top and bottom rails. Lateral card positioning is accomplished with furnished hardware.

Modules are supplied unassembled for user fabrication required, followed by assembly.

Fifty-five other Modules are also available in widths including 1" and 4.5" and lengths of 4.5" and 11.5". Fully assembled matching cages are also available. Specials to order – write factory for additional information.



ORDERING INFORMATION

module cage no.	description	module size & circuit board accommodated	number modules to order per cage	module part number: open rear panel type	module part number: closed rear panel type†
CMA3A16	Assembled module cage 5¼" high x 19" wide x 9" deep w/ guides installed for 10 EFP modules 1.6" wide x 6.6" long	1.6" wide x 6.6" long for 4½" x 6½" card	10	EFP164A66F	EFP164A66
CMA3A20	Assembled module cage 5¼" high x 19" wide x 12" deep w/guides installed for 8 EFP modules 2" wide x 6.6" long	2" wide x 6.6" long for 4½" x 6½" card	8	EFP204A66F	EFP204A66
CMA4A20	Assembled module cage 5¼" high x 19" wide x 9" deep w/ guides installed for 8 EFP modules 2" wide x 9.7" long.	2" wide x 9.7" long for 4½ x 9.6" card	8	EFP204A97F	EFP204A97
CMA8A30	Assembled module cage 8¾ high x 15" deep x 19" wide w/ guides installed for 5 EFP modules 3" wide x 8" long	3" wide x 9.7" long for 7.99' x 9.6" card	5	special order	EFP308A97

SPECIAL DESIGN? send for "design your own cage" form

ACCESSORIES

Filler panels—For closing gap between side wall and end module position. Supplied 3" wide with rack mounting and handle holes; user cuts to width. For 5¼ cages, FP52-2; for 8¼ cages, FP87-2.

Encasement—For CMA3A16, CMA3A20, order encasement CE-55-95. For CMA4A20, order CE-55-125.

Extra module front and closed rear panels—

	1.6" MODULES	2" MODULES	3" MODULES
FRONT	FP16A52	FP2A52	FP3A87
REAR	BP13-4	BP17-4	BP27-8

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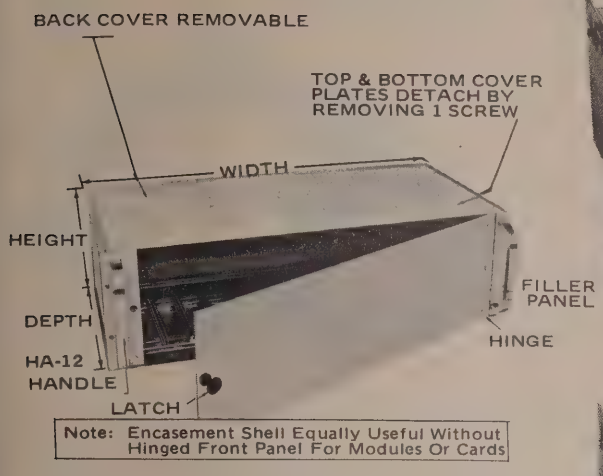
Vector VERSATILE CARD CAGES

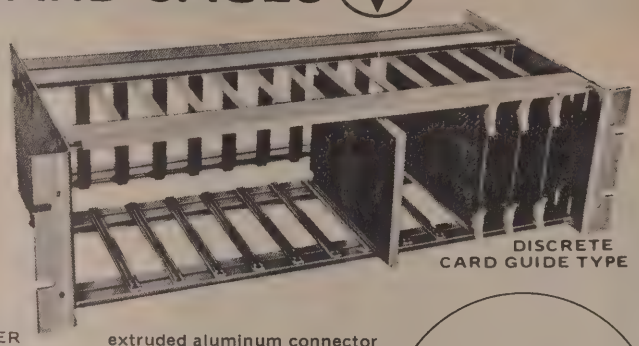


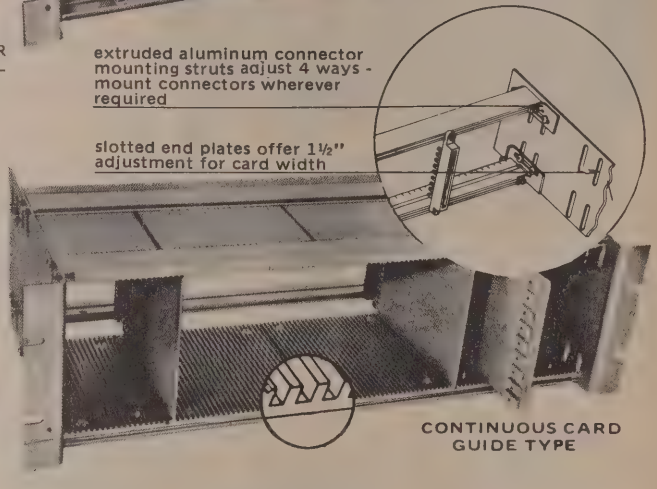
Note: Encasement Shell Equally Useful Without Hinged Front Panel For Modules Or Cards

CAGE ENCASEMENT SHELL NO. CE-55-95 WITH CCK 13 CAGE

Plus Hinged Front Panel No. HP52-1 and HA12 Handles

ALSO SEE VECTOR-PAK ENCLOSURES WITH BUILT-IN GUIDES




extruded aluminum connector mounting struts adjust 4 ways - mount connectors wherever required
slotted end plates offer 1½" adjustment for card width
CONTINUOUS CARD GUIDE TYPE

NEW AND BEAUTIFUL CAGE ENCASEMENTS — The CE Series Cage Encasement Shells provide the finishing touch needed when a portable table-top unit is desired, rather than rack mounting. Good accessibility is provided by easily removable top, bottom and rear covers. In addition, the cage can be quickly removed from the encasement shell by removing the screws from the front panel and the top and bottom covers. Supplied in knock-down form consisting of two assembled side panels, plus top, bottom and rear covers and required screws. The hinged front panel is an optional accessory (see below).

HINGED FRONT PANEL — SIDE HINGED Hinged front panels, for card protection and improved appearance, come in easily assembled kit form which includes the hinged panel with latch, striker plate and two filler panels. Panels are of one eighth inch thick aluminum with a clear anodized finish. All members (except screws) are clear anodized aluminum. (See ordering information on card cages for part numbers and dimensions.)

ASSEMBLED CARD CAGES

- **Supplied fully assembled — riveted card guides**
- **Connectors are easily positioned without hole drilling**
- **Accommodate most popular card sizes**
- **Adjustable for different card widths**
- **Ruggedly handsome — Industrial quality — Anodized finish**

Two connector mounting struts at rear are bracket mounted and furnished with twenty-one pairs of captive 4/40 nuts which may be positioned anywhere for fast, easy connector mounting. Heavy aluminum side walls have standard hole pattern for rack mounting. Card marker strips are included.

DISCRETE GUIDE TYPE — Cage supplied with riveted aluminum or plastic card guides for one sixteenth inch thick cards attached to heavy extruded aluminum cross members.

CONTINUOUS PLATE TYPE — For maximum card density and position flexibility. Extruded aluminum plates with 0.075 inch wide, 0.100 inch deep grooves on 0.150 inch centers are riveted to heavy aluminum cross pieces.

ORDERING INFORMATION

CARD CAGES													SIDE HINGED FRONT PANELS	CAGE ENCASEMENTS			
Card Size Range			Discrete Guide Type				Continuous Extruded Metal Plate Type			Card Cage Dimensions				Encasement Dimension			
Width Max.	Width Min.	Length Max.	No. Posit.	Cd. Spac-ing	Plastic Guides	Metal Guides	No. Posit.	Cd. Spac-ing	Part No.	O/A Wdth.	O/A Dpth.	O/A Hght.		Part No.	O/A Wdth.	O/A Dpth.	O/A Hght.
4½"	3"	6½"	21	¾"	CCK13P	CCK13	108	.150	CCK3	19"	9"	5¼"	HP52-1	CE55-95	19"	9.5"	5.5"
4½"	3"	4½"	21	¾"	CCK13AP	CCK13A	—	None	—	19"	9"	5¼"	HP52-1	CE55-95	19"	9.5"	5.5"
4½"	3"	9.6"	21	¾"	CCK14P	CCK14	108	.150	CCK4	19"	12"	5¼"	HP52-1	CE55-125	19"	12.5"	5.5"
6¼"	4¾"	9.6"	21	¾"	CCK15P	CCK15	108	.150	CCK5	19"	12"	7"	HP70-1	—	None	—	
7.98"	6½"	6½"	21	¾"	CCK16P	CCK16	108	.150	CCK6	19"	9"	8¾"	HP87-1	—	None	—	
7.98"	6½"	9.6"	21	¾"	CCK17P	CCK17	108	.150	CCK7	19"	12"	8¾"	HP87-1	CE90-125	19"	12.5"	9.0"

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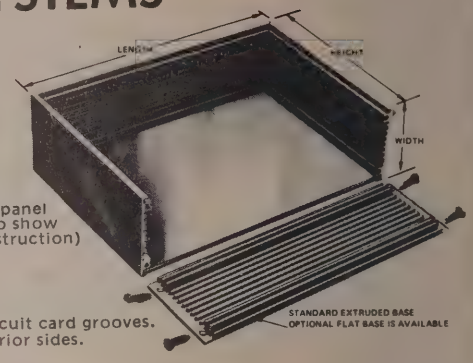
Vector
INSTRUMENT CASES & PATCHBOARD SYSTEMS

HANDLE, BEZEL & TILT BASE EXTRA



(one side panel omitted to show interior construction)

.075" wide circuit card grooves. 4 interior sides.

MULTI-MOD CASES – Multi-Mod cases offer the user the classic simplicity of extruded aluminum formed into an instrument or component case having both strength and functional beauty. Available in a wide variety of sizes, finishes and colors, all models have a clear anodized finish, unless otherwise indicated, and a series of interior 0.075" wide longitudinal grooves which hold circuit boards, mounting plates, and the sliding side covers which provide easy interior access. Removal of only four screws permits removal of the base plate, sliding side covers, and interior circuit card(s). Decorative extruded aluminum bezels are available on some models for an even more finished front panel appearance. Special sizes and finishes are available to order – write factory. (Handles, Bezels, Tilt Bases)

Clear Anodized Finish Catalog No.	Color Anodized Finish Catalog No.	Frame Color	Panel Color	Width	Length	Height	Circuit Card & Panel Size	Part No. for Interior Fitting Prepunched Epoxy Glass Board w/.042 Holes 0.1x 0.1†
W16-31-31B				1.6	3.10	3.10	2.98x2.98	29P29
W20-28-46B				2.0	2.85	4.60	2.73x1.40	—
W20-46-31B	W20D46D31	Blue	Blue	2.0	4.61	3.10	4.50x2.98	44P29
	W20E46E31	Black	Black	2.0	4.61	3.10	4.50x2.98	44P29
	W20G46G46	Gold	Gold	2.0	4.61	4.61	4.50x2.98	44P29
W20-66-46B				2.0	6.61	4.61	6.50x4.50	64P44
W30-46-46B				3.0	4.60	4.60	4.50x4.50	44P44
W30-66-46B	W30D66-46	Blue	Clear	3.0	6.61	4.61	6.50x4.50	64P44
W30-86-46B	W30D86D46	Blue	Blue	3.0	8.61	4.61	8.50x4.50	84P44
W45-66-46B				4.5	6.61	4.61	6.50x4.50	64P44
W45-86-46B	W45E86D46	Black	Blue	4.5	8.61	4.61	8.50x4.50	84P44
	W45E86E46	Black	Black	4.5	8.61	4.61	8.50x4.50	84P44
W45-10-46B				4.5	10.0	4.61	9.88x4.50	98P44
W45-10-66B				4.5	10.00	6.61	9.88x6.50	—

†order separately

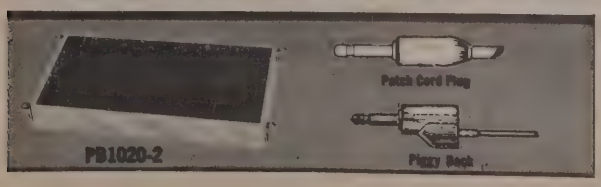
FIXED PANEL PATCHBOARDS – Reliable, low cost programming panels for maximum program flexibility at minimum cost. Available in sizes with 20, 50, 100, 200, and 300 contacts, spaced on .265" grid. Wrap-around beryllium copper nickle gold plated contacts handle up to five amps, and are located behind protected entry hole for damage-free years of use. Supplied with standard alpha-numeric markings or custom markings to order. Full line of color coded .090" tip diameter patchcords, including piggy backs available.

cat no.	contacts	outside dimensions width	height
PB210-2	20	2.985" x	.865"
PB510-2	50	2.985" x	1.660"
PB1010-2	100	2.985" x	2.985"
PB1020-2	200	5.635" x	2.985"
PB1520-2	300	5.635" x	4.310"

PATCH CORDS†

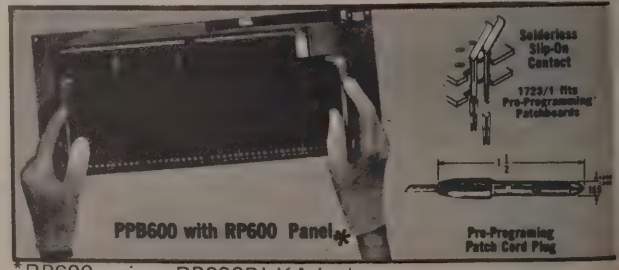
standard	piggyback	length
K2.06	K9.06	6"
K2.09	K9.09	9"
K2.15	K9.15	15"
K2.02-1	—	jumper

†plugs are attached at each end.



VECTOR PRE-PROGRAMING PATCHBOARDS – Vector pre-programing patchboard systems are made with 204, 300, 600 and 1200 contacts. Long-lived beryllium copper, nickle or gold contacts assure reliability over thousands of cycles. Transverse engagement cycle assures post patching capability. Complete line of color-coded patch cords available. Removable programing panels supplied with standard alpha-numeric markings, blank or customer supplied markings.

recpt. frame cat. no	outside dim. W.	H.	no. of contacts	Mating Remov. Panels std. marked cat. no.	unmarked cat. no.
PPB204	10 3/8"	6"	204	RP204BLK	RP204BLKA
PPB300	10 3/8"	6"	300	RP300BLK	RP300BLKA
PPB450	16"	6"	450	RP450BLK	RP450BLKA
PPB600	16"	6"	600	RP600BLK	RP600BLKA
PPB1200	17"	10 3/4"	1200	RP1200BLK	RP1200BLKA



*RP600 series. RP600BLKA is shown.

In the interest of improved design and performance, Vector reserves the right to make changes in its specifications without prior notice.

VECTOR ELECTRONIC COMPANY, INC., 12460 Gladstone Avenue, Sylmar, CA 91342; phone (213) 365-9661, TWX (910) 496-1539

Arco Mica

DIPPED MICA MIL-C-5D

- Types DM5; DM10; DM15; DM19; DM20; DM30; DM42; or CM04; CM05; CM06; CM07; CM08.
- Rated voltages: 50, 100, 300 and 500 VDCW plus high voltage types up to 2500 VDCW.
- Capacitance: 1pf to 100,000 pf with tolerances of ±5%, ±2%, ±1%, ±0.5%.
- Available in standard (4CR) units or single coat (SCDM or 1CR) types.

SINGLE PLATE MICA

Unique new low cost miniature design ideally suited for IF amplification and high frequency circuits, and can be used for bypass and coupling applications to replace some Film and Ceramic capacitors:

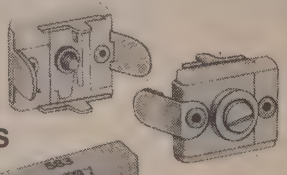
- High-Q rating.
- Voltages available: 50 VDCW and 500 VDCW.
- Capacitance range: 5 pf to 750 pf.
- Controlled temperature coefficients.
- Operating temperature: —30°C to +85°C.

HIGH RELIABILITY MICA MIL-C-39001A

- Designed to meet the most critical design requirements.
- Similar to dipped Mica types except designed for reliability levels of L (2%); M (1%); P (0.1%); and R (0.01%) per 1000 hours.
- Types CMR03; 04; 05; 06; 07; and 08.
- Rated voltages: 100, 300 and 500 VDCW.
- Temperature Ranges:
  O = —55°C to +125°C
  P = —55°C to +150°C

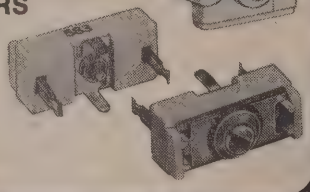
MOLDED MICA MIL-C-5

- Types CM15; CM20; CM30; and CM35.
- Similar to dipped Mica features except completely molded design.
- Rated voltages: 100, 300 and 500 VDCW.
- Capacitance: 1pf to 20,000 pf with tolerances of ±5%, ±2%, ±1%.



VARIABLE TRIMMERS & PADDERS

- Variable Mica capacitors with steatite base ideal for stable circuits and communications equipment.
- Capacitances: up to 3055 pf.
- Voltages: 175 VDCW to 500 VDCW with flash tests to 1000 VDC.
- Special assemblies available (brackets, shafts, solder lug and P.C. types).

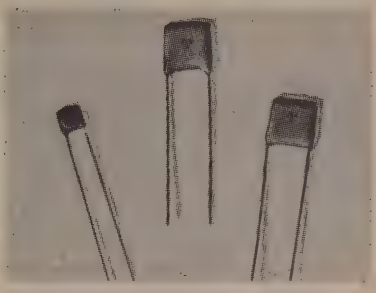


Arco Ceramic

CERAMIC DISC

General purpose design for low cost and wide selection of values and voltages for by-pass and coupling applications in IF and RF circuits.

- Voltage ranges: 25, 50, 100, 1000 VDCW.
- Tolerances: ±10%, ±20%, +80%—20%, GMV.
- Capacitance Range: 3.3 pf to 100,000 pf.
- Designed to EIA temperature characteristics.

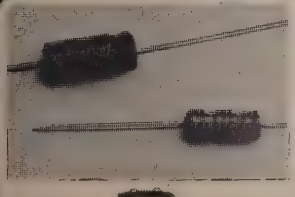


MONOLITHIC CERAMIC

General Purpose • NPO • 15% T.C. Stable Miniature size for circuits where stability and size are of prime importance.

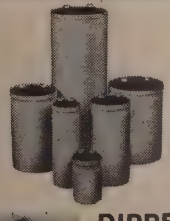
- Voltages: 50 and 100 VDCW.
- Capacitance Range: 2.7 pf thru 4.7 mfd.
- Dipped durez construction for moisture resistance and durability.

Arco Electrolytic



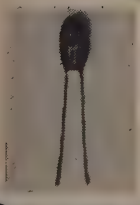
MINIATURE ALUMINUM

- Axial and radial lead miniature designs with proven dependability.
- For use in entertainment or industrial equipment with either transistor or electron tube circuitry.
- Use in filtering, coupling and by-pass applications.
- Available in 6 to 350 VDC.
- Capacitances from 1 mfd to 10,000 mfd.



COMPUTER GRADE

- Computer grade capacitors are available in tubular vertical designs.
- Low ESR, and low leakage currents.
- Long shelf life.
- Designed with pressure-type safety vents.
- Welded terminals on tubular types.
- Large selection of voltages and capacitance ranges.

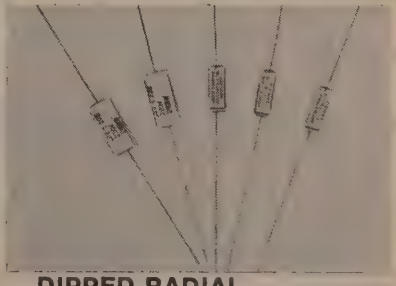


DIPPED TANTALUM

Highly stable miniature units. Low cost suitable for applications in transistorized commercial entertainment, automotive and industrial electronic equipment.

- Capacitance: 0.1 to 470 mfd.
- Tolerances: ±20% and ±10%.
- Temperature Range: —55°C to +85°C.
- Voltage Range: 3 to 50 VDCW.
- Epoxy dipped design.

Arco Film



DIPPED RADIAL POLYESTER

- 100 VDC

MYLAR PAPER

- 200, 400, 600, 1600 VDC

WRAP AND FILL METALIZED POLYESTER

SUBMINIATURE POLYPROPYLENE

AXIAL MYLAR POLYESTER

Arco ELECTRONICS, INC.

Arco ... first in CAPACITORS

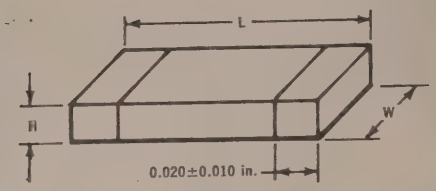
400 Moreland Road, Commack, NY 11725 Tel. (516) 864-7000 • Twx 510-226-0241
9822 Independence Ave., Chatsworth, CA 91311 Tel. (213) 882-8707 • Twx 910-494-1919

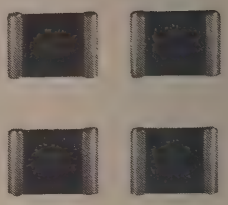
ACI INDUSTRIAL MONOLITHIC CERAMIC CAPACITORS

CHIP CAPACITORS

Features

- Superior Quality
- Excellent Solderability
- High Reliability
- Economics of Size and Cost
- Voltages 25 to 200 VDC
- Tolerances: Above 10pF to ±5%
  Below 10pF to ±0.25pF
- Silver Palladium Termination Standard
- Solder Coated Termination Available





Temperature Characteristics (T.C.)	Capacitance Range
NPO(COG)	.5pF to 6800pF
BX(X7R)	10pF to .22mF
AF(Z5U)	1000pF to 1.0mF

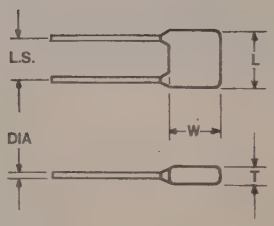
Dimensions (Inches)

Style	L	W	H
C15	.050 ±.008	.040 ±.008	.050 max.
C30	.080 ±.008	.030 ±.008	.050 max.
C35	.080 ±.008	.050 ±.008	.050 max.
C3216	.120 ±.008	.060 ±.008	.050 max.
C52	.125 ±.012	.100 ±.012	.075 max.
C62	.180 ±.012	.080 ±.012	.075 max.
C65	.175 ±.012	.125 ±.012	.075 max.
C72	.175 ±.012	.050 ±.012	.075 max.
C76	.220 ±.020	.200 ±.020	.075 max.

DIPPED RADIALS

Features

- Superior Quality
- High Reliability
- Voltages 25 to 200 VDC
- Tolerances: Above 10pF to ±5%
  Below 10pF to ±.25pF
- Economics of Size and Cost
- Hermetically Sealed Construction



Temperature Characteristics (T.C.)	Capacitance Range
NPO(COG)	.5pF to .01mF
AX(X7R)	10pF to .47mF
AF(Z5U)	1000pF to 4.7mF

Dimensions (Inches)

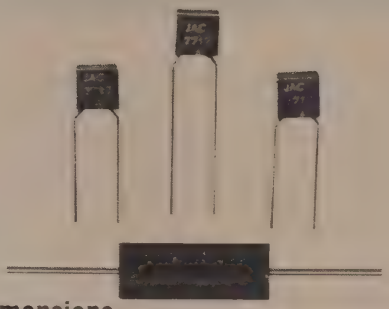
Style	L (max.)	W (max.)	T (max.)	L.S.
FD35	.125	.125	.100	.100
FD52	.150	.150	.100	.100
FD58	.200	.200	.125	.100
FD76	.300	.300	.150	.200
FD85	.400	.250	.150	.200
FD95	.500	.500	.200	.400

AMERICAN COMPONENTS INC. DEPT. EM, 8th AVENUE AT HARRY ST. / P.O. BOX 152 / EXTON, PA 19428
TELEPHONE (215) 825-6200 / TWX 510-660-9268

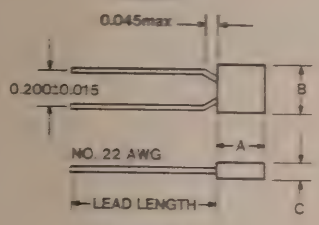
ACI ESTABLISHED RELIABILITY/MIL-C-39014 MONOLITHIC CERAMIC CAPACITORS

Features

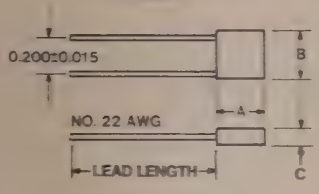
- S Failure Rate Levels
- Radial and Axial Lead Types
- Economics of Size and Cost
- Molded for Optimum Environmental Performance



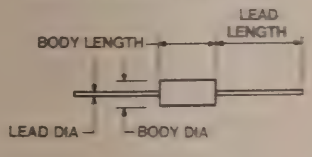
CKR05



CKR06



CKR11 / CKR12 / CKR14



Performance and Dimensions

ACI Type	Type Mil MIL-C-39014	Capacitance Range	Dimensions in Inches				
			Body Length (A)	Body Width (B)	Body Thickness (C)	Min. Lead Length	Lead Dia. ±.0015
MR5	CKR05	10pF to 0.1mFd	0.190 ±.010	0.190 ±.010	0.090 ±.010	1.250	0.025
MR6	CKR06	1200pF to 0.15mFd	0.290 ±.010	0.290 ±.010	0.090 ±.010	1.250	0.025

Leads are OFHC tinned copper.

Performance and Dimensions

ACI Type	Mil Type MIL-C-39014	Capacitance Range	Dimensions in Inches			
			Body Length ±.005	Body Dia. ±.005	Lead Length	Lead Dia. ±.0015
ME	CKR11	10pF to 0.01mFd	0.165	0.095	1.500 ±.125 −.000	0.016
ML	CKR12	5600pF to 0.039mFd	0.250	0.090	1.500 ±.125 −.000	0.016
MS	CKR14	.012mFd to 0.1mFd	0.395	0.135	1.500 ±.125 −.000	0.250

Leads are OFHC tinned copper.

Temperature Characteristic Features

Mil Designation	Max. Cap. Change	Operating Temperature	Operating Volt. Range	Dissipation Factor	Insulation Resistance	Capacitance Tolerance
BX	±15%	−55°C to +125°C	50W VDC 200W VDC	2.5% Max.	100,000 Megohms	±10% ±20%

How to Order

CKR05 BX 103 K R

STYLE/TYPE
(See Above)

TEMPERATURE CHARACTERISTIC FEATURES

CAPACITANCE IN PICOFARADS (pF)
2 Significant Figures
Last Digit # of Zeros

TOLERANCE
K = ±10%
M = ±20%

FAILURE RATE
S = .001%
R = .01%
P = .1%
M = 1%
L = 2%

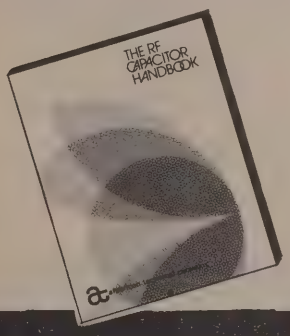
AMERICAN COMPONENTS INC. Insulco DEPT. EM, 8th AVENUE AT HARRY ST. / P.O. BOX 152 / CONSHOHOCKEN, PA. 19428
TELEPHONE (215) 825-6200 / TWX 710-668-9268

ATC UHF/MICROWAVE CHIP CAPACITORS

American Technical Ceramics, the recognized leader in RF capacitor technology, offers a product line of outstanding quality and reliability to meet the most demanding requirements of the design engineer.

Unique features of construction, enforced by the highest quality control standards, are responsible for the consistent quality and high performance of ATC porcelain and ceramic capacitors. ATC capacitors are available in a wide variety of sizes and styles, and there is a capacitor to meet the requirements of almost any design application.

The severe thermal shock to which capacitors are subjected by direct soldering during circuit assembly can destroy the integrity of conventional capacitors, permitting flux and solvents to penetrate the dielectric. ATC porcelain capacitors have outstanding reliability and ultra-stable performance due to their hermetic, self-encapsulated porcelain construction. Rare metal internal electrodes are molecularly bonded and sealed in a monolith of non-porous porcelain, providing a rugged and hermetic structure that is not degraded by the circuit assembly process. ATC's design of the chip capacitor internal structure has resulted in the most reliable porcelain capacitors available proven by extensive testing programs of approximately 2 million component hours per month.



The ATC barrierCap™ termination is now standard on all pellets and leaded capacitors. The terminations remain intact under the most severe thermal shock, and are not dissolved away even by the most careless soldering. They easily withstand a 5 minute submersion in 375° solder pot without leaching, while retaining complete solderability. Migration is virtually eliminated and a bond strength greater than 30 lbs. is typical for "B" Case capacitors (110 mils square) with nail head leads.

Laser Marking is available on ATC capacitors for quick and complete identification of capacity value and tolerance. This highly legible and permanent marking results in no degradation of performance or reliability and is impervious to all cleaning solvents.

The RF Capacitor Handbook presents over 250 pages of comprehensive detail design considerations and uses for miniature chip and leaded RF capacitors. You'll find theoretical and empirical high-frequency circuit design equations, especially at high RF power levels and frequencies, actual test data at frequencies from 100 MHz to 3 GHz, and practical design methods for increasing gain and power, DC to RF conversion efficiency, bandwidth, transistor lifetime, circuit MTBF, and low-noise performance. Request a copy from your representative or direct from ATC.

MILITARY PRODUCTS

American Technical Ceramics is QPL Listed for the latest established reliability Military Specifications for Ceramic Capacitors (MIL-C-55681/4 and /5), and MIL-C-11272/16, /17, and /18, for UHF/Microwave Capacitors.

For MIL-C-55681/4 and /5, the QPL List includes BG (90 ± 20 PPM/°C) characteristic (ATC 100 Series), and BP (0 ± 30 PPM/°C) characteristic (ATC 700 Series) established reliability. CDR 11, 12, 13, 14, and 21 through 25 are available in both the above characteristics.

For MIL-C-11272/16, /17 and /18, the QPL List includes CY81 through CY89 (ATC 100 Series.)

ATC has complete Government approved Hi-Rel testing facilities as well as RF production testing capability through 2.5 GHz.

american technical ceramics
DIV. OF PHASE IND. INC.

For further information, request a copy of the ATC Military Products Manual.

ATC UHF/MICROWAVE CHIP CAPACITORS

ATC 100 HIGH Q

UHF/MICROWAVE PORCELAIN CAPACITORS

Ultra High Q even at high ambient temperatures and at extremely high currents.

High power operation through microwave frequencies. Extremely low ESR and high dielectric strength.

High self-resonant frequencies.

Low noise figure in receiving systems due to low ESR.

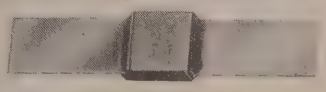
Ultra stable performance assured by hermetic, self-encapsulating porcelain construction.

Capacitance Range:
- Case A-0.1 pF to 100 pF, to 50 WVDC, standard values per RETMA 5% Table.
- Case B-0.1 pF to 1000 pF, to 500 WVDC, standard values per RETMA 5% Table.

IR: 10^6 Megohms Min. @ 25°C, 10^5 Megohms Min. @ 125°C up to and including 470 pF;
10^5 Megohms Min. @ 25°C, 10^4 Megohms Min. @ 125°C, 510 to 1000 pF.

Available in Case A and B Chips, Pellets and all Case B Leaded Styles.

ATC 100E



HIGH CURRENT, HIGH VOLTAGE PORCELAIN CAPACITORS

For demanding requirements in HF transmitting equipment.

Capacitance Range:
- 10 pF to 20,000 pF to **3600 WVDC**, to 12 Amps RMS, standard values per RETMA 10% Table.

IR: 10^5 Megohms Min. @ 25°C, 10^4 Megohms Min. @ 125°C, up to and including 1800 pF;
10^4 Megohms Min. @ 25°C, 10^3 Megohms Min. @ 125°C, 2200 pF to 20,000 pF.

Available in Chips, Pellets and Axial Ribbon Leaded Style.

ATC 111 μcap™

MILLIMETER WAVELENGTH MICROCAPS™

For use at frequencies as high as 50 GHz. Rugged construction to minimize handling problems.

Sizes compatible with Microstrip line.

Capacitance Range:
- 0.1 pF to 100 pF, to 200 WVDC, standard values per RETMA 10% Table.

Impervious to static discharge failures.

IR: As high as 10^{12} Ohms.

Mechanical Configurations:
- Sizes from 0.025" x 0.025" x 0.01" max. through 0.1 x 0.1 x 0.01 max.

NOTE: Higher voltage is available for all ATC Series on special order. Consult factory.

ATC 175

ULTRA HIGH Q PORCELAIN CAPACITORS

Q is typically four times higher than ATC 100 at Microwave frequencies.

Capacitance Range:
- 0.1 pF to 100 pF to 500 WVDC, standard values per RETMA 5% Table.

IR: 10^4 Megohms Min. @ 25°C, 10^3 Megohms Min. @ 175°C at rated voltage.

Available in Case B Pellets and Microstrips.

ATC 200

HIGH CAPACITY CERAMIC CAPACITORS

High packaging density, stable high K chip capacitors for coupling and bypass applications.

Capacitance Range:
- Case A, 510 pF to 0.01 MF, 50 WVDC, standard values per RETMA 10% Table.
- Case B, 0.005 MF to 0.1 MF, 50 WVDC, standard values per RETMA 10% Table.

IR: 10,000 Megohms minimum.

Available in Case A and B Chips, Pellets and Case B Leaded Styles.

ATC 700

TEMPERATURE STABLE CERAMIC CAPACITORS

Ultra-stable NPO's with RF characterization.

Capacitance Range:
- Case A, 0.1 pF to 1000 pF to 50 WVDC, standard values per RETMA 10% Table.
- Case B, 0.1 pF to 5100 pF to 500 WVDC, standard values per RETMA 10% Table.

IR: 10^{12} Ohms Min. up to 1800 pF;
10^{11} Ohms Min. 1800 pF and above @ 25°C; one-tenth these values @ 125°C.

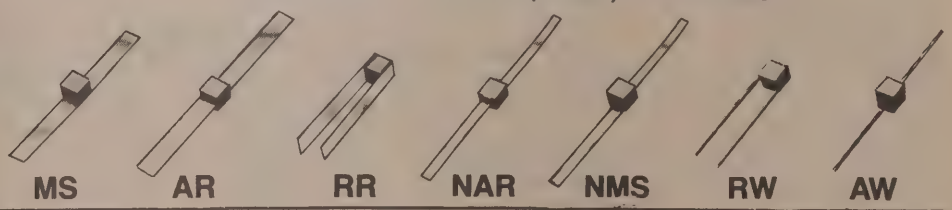
Available in Case A and B Chips, Pellets and Case B Leaded Styles.

CASE A — 0.055" (1.4mm) CUBE CHIP & PELLET

CASE B — 0.110" (2.79mm) CUBE CHIP & PELLET

CAPACITORS SHOWN ACTUAL SIZE

CASE B LEADED STYLES – 0.110" (2.79mm) CUBE BODIES



ATC PART NUMBER CODE:

ATC 100 B 910 F AW 500 X

- ATC 100 — Series
- B — Case Size
- 910 — Capacitance
- 910 — Indicates number of zeros following digits of capacitance in picofarads
- F — Capacitance Tolerances
- AW — Termination
- 500 — WVDC
- X — Laser Marking

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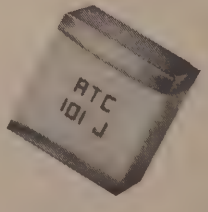

Laser Marking is available on ATC Capacitors.

american technical ceramics
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Woodbury, N.Y.
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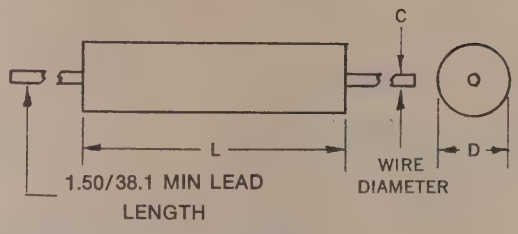
GlasGuard®

Glass Cased, Axial Lead Capacitors

Dimensions (Inches/Millimeters)

Style	L Max.	Dia. Max.	Wire Dia. Nom.
GC10	.170/4.32	.100/2.54	.020/.508
GC70	.260/6.60	.100/2.54	.020/.508



Electrical Specifications

Temperature Coefficient

COG: A Temperature Coefficient — 0 ±30 ppm/°C, −55° to +125°C

X7R: C Temperature Coefficient — ±15%, −55° to +125°C

Z5U: E Temperature Coefficient — +22, −56%, +10° to +85°C

Capacitance Test 25°C (MIL-STD-202 Method 305)

COG: Measured at 1 VRMS max at 1KHz (1MHz for 1000 pf or less)

X7R: Measured at 1 VRMS max at 1KHz (1MHz for 100 pf or less)

Z5U : Measured at .5 VRMS max at 1KHz

Dissipation Factor 25°C

COG: .15% max at 1KHz, 1 VRMS max (1MHz for 1000 pf or less)

X7R: 2.5% max at 1KHz, 1 VRMS max (1MHz for 100 pf or less)

Z5U: 3.0% max at 1KHz, .5 VRMS max

Moisture Resistance (MIL-STD-202 Method 106)

COG, X7R, Z5U: Ten cycles with no voltage applied

Insulation Resistance 25°C (MIL-STD-202 Method 302)

COG and X7R: 100K megohms or 1000 megohms-mfd whichever is less

Z5U: 10K megohms or 500 megohms-mfd whichever is less

Dielectric Withstanding Voltage 25°C (Flash Test)

COG and X7R: 300% rated voltage for 5 seconds with 50 ma. max charging current

Z5U: 200% rated voltage for 5 seconds with 50 ma. max charging current

Life Test (1000 hrs)

COG and X7R: 200% rated voltage at +125°C

Z5U: 150% rated voltage at +85°C

Temperature Cycling (MIL-STD-202 Method 102, condition D at rated elevated temperature)

COG and X7R: −55° to +125°C

Z5U: −55° to +85°C

Immersion Cycling (MIL-STD-202 Method 104, condition A)

Capacitance Range in pf

AVX Style	CHAR. A		CHAR. C		CHAR. E	
	100 VDC	50 VDC	100 VDC	50 VDC	100 VDC	50 VDC
GC10	10 to 270	10 to 470	560 to 2700	560 to 10,000	3300 to 6800	5600 to 18,000
GC70	22 to 680	22 to 1000	1000 to 10,000	1000 to 33,000	5600 to 15,000	10,000 to 100,000

AVAILABLE CAPACITANCE TOLERANCES

J = ±5% (A, C)
K = ±10% (A, C)
M = ±20% (A, C, E)
Z = +80 −20% (E)
P = GMV (E)

How to Order

GC70 1 C 10 3 K

- K — Capacitance Tolerance Code
- 3 — Multiplier (Number of Zeros)
- 10 — Significant Figures of Capacitance
- C — Temperature Characteristic
- 1 — Voltage: 1 = 100 V; 5 = 50 V
- GC70 — Style

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SKYCAP®

Dipped Monolithic, Radial Lead Capacitors

Electrical Specifications

Temperature Coefficient

COG: A Temperature Coefficient — 0 ±30 ppm/°C, −55° to +125°C

X7R: C Temperature Coefficient — ±15%, −55° to +125°C

Z5U: E Temperature Coefficient — +22, −56%, +10° to +85°C

Capacitance Test 25°C (MIL-STD-202 Method 305)

COG: Measured at 1 VRMS max at 1KHz (1MHz for 1000 pf or less)

X7R: Measured at 1 VRMS max at 1KHz (1MHz for 100 pf or less)

Z5U : Measured at .5 VRMS max at 1KHz

Dissipation Factor 25°C

COG: .15% max at 1KHz, 1 VRMS max (1MHz for 1000 pf or less)

X7R: 2.5% max at 1KHz, 1 VRMS max (1MHz for 100 pf or less)

Z5U: 3.0% max at 1KHz, .5 VRMS max

Moisture Resistance (MIL-STD-202 Method 106)

COG, X7R, Z5U: Ten cycles with no voltage applied

Insulation Resistance 25°C (MIL-STD-202 Method 302)

COG and X7R: 100K megohms or 1000 megohms-mfd whichever is less

Z5U: 10K megohms or 500 megohms-mfd whichever is less

Dielectric Withstanding Voltage 25°C (Flash Test)

COG and X7R: 300% rated voltage for 5 seconds with 50 ma. max charging current

Z5U: 200% rated voltage for 5 seconds with 50 ma. max charging current

Life Test (1000 hrs)

COG and X7R: 200% rated voltage at +125°C

Z5U: 150% rated voltage at +85°C

Temperature Cycling (MIL-STD-202 Method 102, condition D at rated elevated temperature)

COG and X7R: −55° to +125°C

Z5U: −55° to +85°C

Immersion Cycling (MIL-STD-202 Method 104, condition A)

Capacitance Range in pf

AVX Style	CHAR. A		CHAR. C		CHAR. E	
	100 VDC	50 VDC	100 VDC	50 VDC	100 VDC	50 VDC
3418	4.7 to 330	4.7 to 560	100 to 5600	100 to 15,000	1000 to 8200	1000 to 27,000
3429	180 to 3300	180 to 6800	3900 to 68,000	3900 to 100,000	5600 to 100,000	5600 to 330,000
3430	3300 to 18,000	3300 to 27,000	56,000 to 270,000	56,000 to 680,000	100,000 to 470,000	100,000 to 1.0 mfd
3431	18,000 to 39,000	18,000 to 68,000	180,000 to 470,000	180,000 to 1.0 mfd	330,000 to 1.0 mfd	330,000 to 2.2 mfd
3432	4700 to 68,000	4700 to 100,000	330,000 to 680,000	330,000 to 2.2 mfd	1.0 mfd to 2.2 mfd	1.0 mfd to 4.7 mfd
3439	180 to 3300	180 to 6800	3900 to 68,000	3900 to 100,000	5600 to 100,000	5600 to 330,000
3440	3300 to 18,000	3300 to 22,000	56,000 to 270,000	56,000 to 680,000	100,000 to 470,000	100,000 to 1.0 mfd

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CERAMIC CAPACITORS

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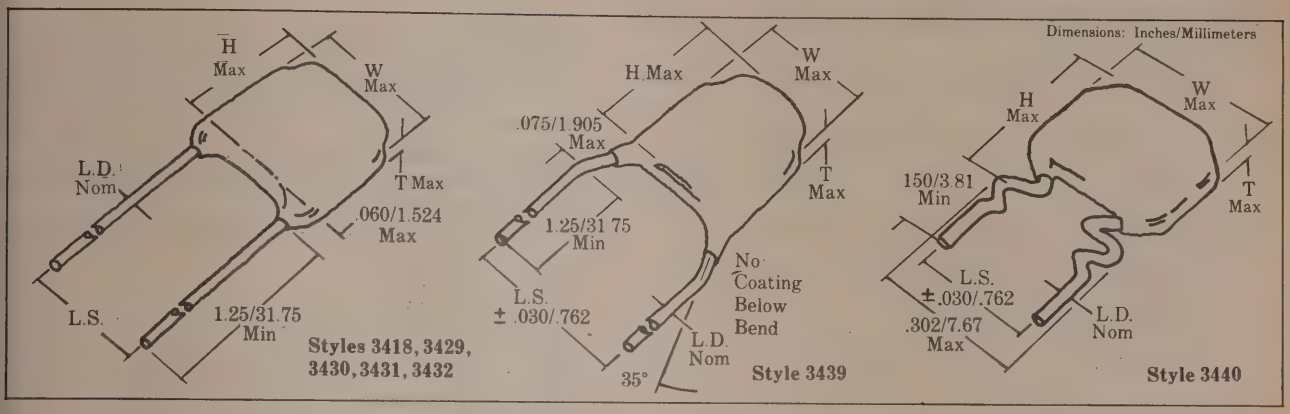
SKYCAP®



Dimensions (Inches/Millimeters)

AVX Style	3418	3429	3430	3431	3432	3439	3440
Width	.150 3.81	.200 5.08	.300 7.62	.400 10.16	.500 12.70	.200 5.08	.390 9.906
Height	.150 3.81	.200 5.08	.300 7.62	.400 10.16	.500 12.70	.200 5.08	.400 10.16
Thickness	.100 2.54	.125 3.175	.150 3.81	.150 3.81	.200 5.08	.125 3.175	.160 4.064
Lead Spacing	.100 2.54	.100 2.54	.200 5.08	.200 5.08	.400 10.16	.200 5.08	.250 .635
Lead Diameter	.020 .508	.020 .508	.020 .508	.020 .508	.025 .635	.020 .508	.020 .508

AVAILABLE CAPACITANCE TOLERANCES

D = ±.5 pf (A) Below 10 pf
J = ±5% (A, C)
K = ±10% (A, C)
M = ±20% (A, C, E)
Z = +80 −20% (E)
P = GMV (E)

How to Order

3429 050 E 10 4 Z

- Capacitance Tolerance Code
- Multiplier (Number of Zeros)
- Significant Figures of Capacitance
- Temperature Characteristic
- Voltage 050 = 50V, 100 = 100V
- Style

THESE PRODUCTS AVAILABLE FROM AVX CERAMICS FRANCHISED DISTRIBUTORS

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CERAMIC CAPACITORS

AVX CERAMICS

CERAMIC CAPACITORS

AVX CERALAM® CHIPS

Ceramic Chip Capacitors
Approved to MIL-C-55681 as Designated

Electrical Specifications

Temperature Coefficient

COG: A Temperature Coefficient — 0 ±30 ppm/°C, −55° to +125°C

X7R: C Temperature Coefficient — ±15%, −55° to +125°C

Z5U: E Temperature Coefficient — +22%, −56%, +10° to +85°C

Capacitance Test 25°C (MIL-STD-202 Method 305)

COG: Measured at 1 VRMS max at 1KHz (1MHz for 1000 pf or less)

X7R: Measured at 1 VRMS max at 1KHz (1MHz for 100 pf or less)

Z5U: Measured at .5 VRMS max at 1KHz

Dissipation Factor 25°C

COG: .1% max at 1KHz, 1 VRMS max (1MHz for 1000 pf or less)

X7R: 2.5% max at 1KHz, 1 VRMS max (1MHz for 100 pf or less)

Z5U: 3.0% max. at 1KHz, .5 VRMS max

Insulation Resistance 25°C (MIL-STD-202 Method 302)

COG and X7R: 100K megohms or 1000 megohms-mfd whichever is less

Z5U: 10K megohms or 500 megohms-mfd whichever is less

Dielectric Withstanding Voltage 25°C (Flash Test)

COG and X7R: 300% rated voltage for 5 seconds with 50 ma. max charging current

Z5U: 200% rated voltage for 5 seconds with 50 ma. max charging current

Life Test (1000 hrs)

COG and X7R: 200% rated voltage at +125°C

Z5U: 150% rated voltage at +85°C

Moisture Resistance (MIL-STD-202 Method 106)

COG, X7R, Z5U: Ten cycles with no voltage applied

Temperature Cycling (MIL-STD-202 Method 102, condition D at rated elevated temperature)

COG and X7R: −55° to +125°C

Z5U: −55° to +85°C

Immersion Cycling (MIL-STD-202 Method 104, condition A)

Capacitance Range in pf

AVX Style/ EIA Style/ MIL-C-55681	A Coefficient		C Coefficient			E Coefficient		
	100 VDC	50 VDC	100 VDC	50 VDC	25 VDC	100 VDC	50 VDC	25 VDC
ULA05	1 to 330	1 to 680	100 to 1800	100 to 8200	100 to 15,000	1000 to 6800	1000 to 18,000	1000 to 27,000
ULA10 CC0805 (1) CDR01 (2)	1 to 560	1 to 1200	150 to 3900	150 to 10,000	150 to 22,000	2700 to 10,000	2700 to 33,000	2700 to 56,000
ULA15	1 to 1000	1 to 1800	150 to 5600	150 to 2200	150 to 39,000	2700 to 22,000	2700 to 56,000	2700 to 82,000
ULA75	180 to 1800	180 to 3300	1000 to 10,000	1000 to 39,000	1000 to 82,000	5600 to 33,000	5600 to 100,000	5600 to 150,000
ULA70 CC1805 (1) CDR02 (2)	220 to 2200	220 to 3900	3300 to 12,000	3300 to 47,000	3300 to 100,000	10,000 to 39,000	10,000 to 100,000	10,000 to 180,000
ULA35	330 to 2700	330 to 5600	2700 to 15,000	2700 to 68,000	2700 to 100,000	18,000 to 56,000	18,000 to 180,000	18,000 to 270,000
ULA78 CC1808 (1) CDR03 (2)	330 to 3900	330 to 8200	2700 to 22,000	2700 to 100,000	2700 to 180,000	18,000 to 68,000	18,000 to 220,000	18,000 to 330,000
ULA55 CDR04 (2)	100 to 6800	1000 to 12,000	10,000 to 39,000	10,000 to 150,000	10,000 to 270,000	33,000 to 120,000	33,000 to 390,000	33,000 to 560,000
ULA65 CDR05 (2)	2200 to 15,000	2200 to 27,000	33,000 to 100,000	33,000 to 330,000	33,000 to 680,000	100,000 to 270,000	100,000 to 820,000	100,000 to 1.2 mfd
ULA60 CC2225 (1) CDR06 (2)	3300 to 18,000	3300 to 33,000	33,000 to 100,000	33,000 to 470,000	33,000 to 680,000	100,000 to 330,000	100,000 to 1.0 mfd	100,000 to 1.5 mfd

(1) EIA-RS198 designation
(2) MIL-C-55681 designation

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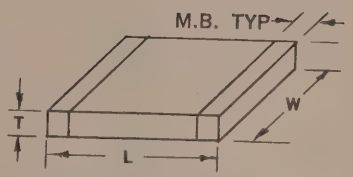
AVX Limited, Holder Rd., Aldershot, Hampshire, GU124RG England • Aldershot (0252) 312131 Telex: 858473

AVX CERALAM® CHIPS

Ceramic Chip Capacitors
Approved to MIL-C-55681 as Designated

Dimensions (Inches/Millimeters)

AVX Type	L		W		T		M.B.		Styles EIA-RS198 MIL-C-55681
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
ULA05	.060 1.52	.040 1.01	.060 1.52	.040 1.01	.050 1.27	.020 0.50	.015 .381	.005 .127	
ULA10	.090 2.28	.070 1.77	.060 1.52	.040 1.01	.050 1.27	.020 0.50	.030 .760	.010 .254	CC 0805 CDR 01
ULA15	.105 2.66	.085 2.15	.060 1.52	.040 1.01	.050 1.27	.020 0.50	.030 .760	.010 .254	CC 1055
ULA35	.135 3.42	.115 2.92	.110 2.79	.090 2.28	.060 1.52	.020 0.50	.040 1.01	.010 .254	CC 1210
ULA75	.160 4.06	.140 3.55	.060 1.52	.040 1.01	.060 1.52	.020 0.50	.040 1.01	.010 .254	
ULA55	.185 4.69	.165 4.19	.135 3.42	.115 2.92	.060 1.52	.020 0.50	.040 1.01	.010 .254	CC 1812 CDR 04
ULA65	.195 4.95	.175 4.44	.260 6.60	.240 6.09	.060 1.52	.020 0.50	.040 1.01	.010 .254	CDR 05
ULA70	.195 4.95	.165 4.19	.060 1.52	.040 1.01	.060 1.52	.020 0.50	.040 1.01	.010 .254	CC 1805 CDR 2
ULA78	.195 4.95	.165 4.19	.090 2.28	.070 1.77	.060 1.52	.020 0.50	.040 1.01	.010 .254	CC 1808 CDR 03
ULA60	.235 6.09	.210 5.33	.260 6.60	.235 6.09	.060 1.52	.020 0.50	.040 1.01	.010 .254	CC 2225 CDR 06



For solder coated lands:
Add .015/.381 to L
Add .010/.254 to W and T

VOLTAGE

1 = 100 V
5 = 50 V
2 = 25 V

101 = 100 pf - third digit signifies number of zeros. Values below 10 pf use "R" in place of decimal point (5R6 = 5.6 pf).

AVAILABLE TERMINATIONS

1. Palladium Silver (AVX Standard Termination)
2. Palladium Silver Solder Alloy 62-36-2
7. NiGuard®-Silver, Nickel, Gold Plated
8. NiGuard®-Solder Alloy 62-36-2

AVAILABLE CAPACITANCE TOLERANCES

C = ±.25 pf (A)
D = ±.5 pf (A)
F = ±1% (A)
G = ±2% (A)
H = ±3% (A)
J = ±5% (A, C)
K = ±10% (A, C)
M = ±20% (C, E)
Z = +80 −20% (E)
P = GMV (E)

How to Order

ULA15 5 A 10 1 K 1

- 1 — Termination
- K — Capacitance Tolerance Code
- 1 — Multiplier (Number of Zeros)
- 10 — Significant Figures of Capacitance
- A — Temperature Characteristic
- 5 — Voltage
- ULA15 — Style

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AVX Limited, Holder Rd., Aldershot, Hampshire, GU124RG England • Aldershot (0252) 312131 Telex: 858473

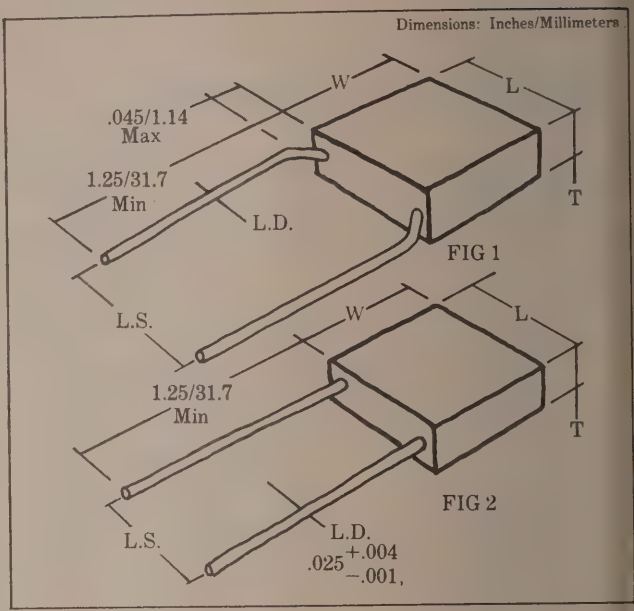
CERALAM® MOLDED RADIAL LEAD

MIL-C-11015, MIL-C-39014, MIL-C-20

ELECTRICAL CHARACTERISTICS

Style	Voltages	Capacitance Range
CK05, CKR05	200V 100V 50V	10-1000pf 1200-.01mfd .012-.1mfd
CK06	200V 100V 50V	120pf-10,000pf 12,000pf-100,000pf 120,000pf-1.0mfd
CKR06	200V 100V 50V	1200pf-10,000pf 12,000pf-100,000pf 120,000pf-1,000,000pf
CKR08	50V	1.2-2.0mfd
CC05, CC09, CCR05, CCR09	200V 100V 50V	1.0-332pf 348-1780pf 1870-3320pf
CC06, CCR06	200V 100V 50V	390-1800pf 2200-4700pf 5100pf-.018mfd
CC07, CCR07	200V 100V 50V	2200-3300pf 5600pf-.012mfd .015-.1mfd
CC08, CCR08	200V 100V 50V	3900-4700pf .015-.018mfd .056-.068mfd

Dimensions: Inches/Millimeters



CROSS REFERENCE: CASE SIZE CHART

AVX		Per Mil-Spec			Case Size (Inches)			
Figure	Style	MIL-C-11015	MIL-C-39014	MIL-C-20	Length	Width	Thickness	Lead Spacing
1	MC50	CK05	CKR05	CCR05/CC05	.190 ± .010	.190 ± .010	.090 ± .010	.200 ± .015
2	MC54	—	—	CCR09/CC09	.190 ± .010	.190 ± .010	.090 ± .010	.100 ± .015
2	MC60 SC60	CK06	CKR06	CCR06/CC06	.290 ± .010	.290 ± .010	.090 ± .010	.200 ± .015
2	SC60	—	CKRO8	—	.290 ± .010	.290 ± .010	.145 ± .015	.200 ± .015
2	MC95	—	—	CCR07/CC07	.480 ± .020	.480 ± .020	.140 ± .010	.400 ± .020
2	PM68	—	—	CCR07/CC07	.480 ± .020	.480 ± .020	.200 Max.	.400 ± .020
2	PM96	—	—	CCR08/CC08	.480 ± .020	.480 ± .020	.240 ± .010	.400 ± .020

HOW TO ORDER: As per appropriate Military Specification

THESE PRODUCTS AVAILABLE FROM AVX CERAMICS FRANCHISED DISTRIBUTORS

AVX Ceramics, P.O. Box 493, Olean, N.Y. 14760 • Tel: (716) 372-6611 • TWX: 510-245-2815

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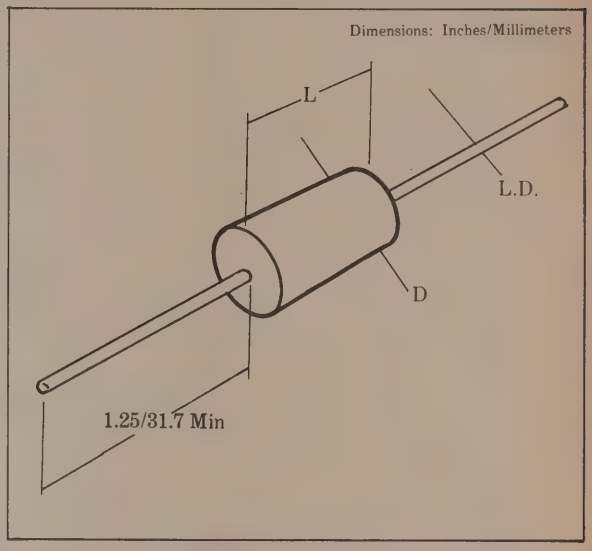
AVX Limited, Holder Rd., Aldershot, Hampshire, GU124RG England • Aldershot (0252) 312131 Telex 858473

CERALAM® MOLDED AXIAL LEAD CAPACITORS

MIL-C-11015, MIL-C-39014, MIL-C-20

ELECTRICAL CHARACTERISTICS

Style	Voltages	Capacitance Range
CK12, CKR11	100V 50V	10-4700pf 5600pf-.01mfd
CK13, CKR12	100V 50V	5600pf-.01mfd .012-.047mfd
CK14, CKR14	100V 50V	.012-.1mfd .12-.27mfd
CK15, CKR15	100V 50V	.12-.33mfd .47-1.0mfd
CK16, CKR16	100V 50V	.47-1.0mfd 2.2-3.3mfd
CC75, CCR75	200V 100V 50V	.1-75pf 82-220pf 270-680pf
CC76, CCR76 CCR77	200V 100V 50V	82-120pf 270-390pf 820-1000pf
CC77, CCR77	200V 100V 50V	150-680pf 470-220pf 2700-5600pf
CC78 CCR78	200V 100V 50V	820-3300pf 3900-12,000pf 15,000-27,000pf
CC79 CCR79	200V 100V 50V	3900-10,000pf 15,000-39,000pf 47,000-82,000pf



CROSS REFERENCE: CASE SIZE CHART

AVX	Per Mil-Spec			Case Size (Inches)	
AVX Style	MIL-C-11015	MIL-C-39014	MIL-C-20	Length	Diameter
MC10	CK12	CKR11	CCR75/CC75	.160 ± .010	.090 ± .010
MC70	CK13	CKR12	CCR76/CC76	.250 ± .010	.090 ± .010
MC20	CK14	CKR14	CCR77/CC77	.390 ± .010	.140 ± .010
MC85	CK15	CKR15	CCR78/CC78	.500 ± .020	.250 ± .015
MC86	—	—	—	.690 ± .020	.250 ± .010
MC87	CK16	CKR16	CCR79/CC79	.690 ± .020	.350 ± .015

HOW TO ORDER: As per appropriate Military Specification

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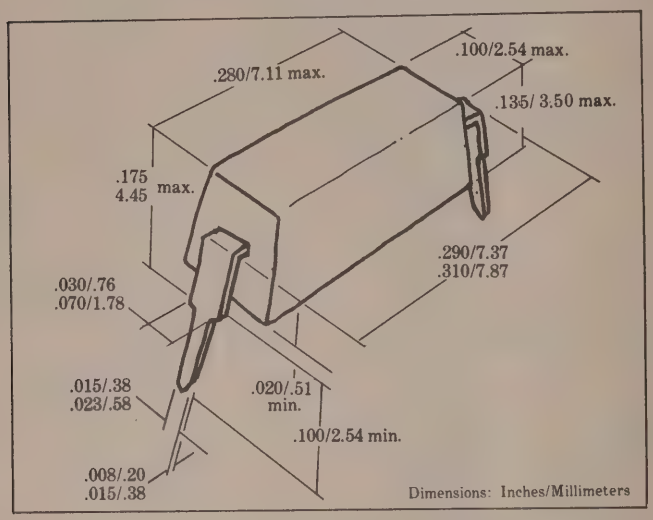
AVX Limited, Holder Rd., Aldershot, Hampshire, GU124RG England • Aldershot (0252) 312131 Telex 858473

DIPGuard®

Molded Dual-In-Line Capacitors
AVX Style: DG01



ELECTRICAL SPECIFICATIONS

Temperature Coefficient
COG: A Temperature Coefficient — 0 ±30 ppm/°C, −55° to +125°C
X7R: C Temperature Coefficient — ±15%, −55° to +125°C
Z5U: E Temperature Coefficient — +22, −56%, +10° to 85°C

Capacitance Test 25°C (MIL-STD-202 Method 305)
COG: Measured at 1 VRMS max at 1KHz (1MHz for 1000 pf or less)
X7R: Measured at 1 VRMS max at 1KHz (1MHz for 100 pf or less)
Z5U: Measured at .5 VRMS max at 1KHz

Dissipation Factor 25°C
COG: .15% max at 1KHz, 1 VRMS max (1MHz for 1000 pf or less)
X7R: 2.5% max at 1 KHz, 1 VRMS max (1MHz for 100 pf or less)
Z5U: 3.0% max at 1KHz, .5 VRMS max

Moisture Resistance (MIL-STD-202 Method 106)
COG, X7R, Z5U: Ten cycles with no voltage applied

Insulation Resistance 25°C (MIL-STD-202 Method 302)
COG and X7R: 100K megohms or 1000 megohms-mfd whichever is less
Z5U: 10K megohms or 500 megohms-mfd whichever is less

Dielectric Withstanding Voltage 25°C (Flash Test)
COG and X7R: 300% rated voltage for 5 seconds with 50 ma. max charging current
Z5U: 200% rated voltage for 5 seconds with 50 ma. max charging current

Life Test (1000 hrs)
COG and X7R: 200% rated voltage at +125°C
Z5U: 150% rated voltage at +85°C

Temperature Cycling (MIL-STD-202 Method 102, condition D at rated elevated temperature)
COG and X7R: −55° to +125°C
Z5U: −55° to +85°C

Immersion Cycling (MIL-STD-202 Method 104, condition A)

Capacitance Ranges

COG (A)		X7R (C)		Z5U (E)	
100 VDC	50VDC	100VDC	50VDC	100VDC	50VDC
10-2700 pf	10-3900 pf	150 pf - .027 mfd	150 pf - .1 mfd	.01 - .047 mfd	.01 - .22 mfd

How to Order:

DG01 5 E 10 4 Z

- Z — Capacitance Tolerance Code
- 4 — Multiplier (Number of Zeros)
- 10 — Significant Figures of Capacitance
- E — Temperature Characteristic
- 5 — Voltage: 1 = 100 V; 5 = 50 V
- DG01 — Style

AVAILABLE CAPACITANCE TOLERANCES

J = ±5% (A, C)
K = ±10% (A, C)
M = ±20% (A, C, E)
Z = +80 −20% (E)
P = GMV (E)

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Add Dept. EM to address to tell them you saw it in eem

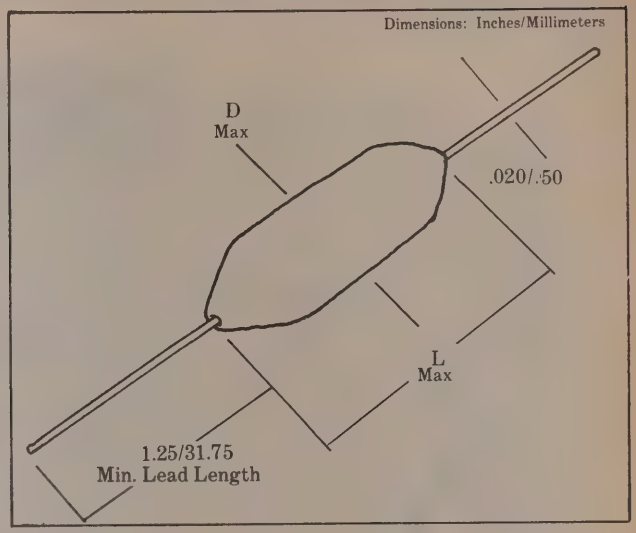
CERAMIC CAPACITORS

AVX CERAMICS

CERAMIC CAPACITORS

SpinGuard®

Epoxy Coated, Axial Lead Capacitors



DIMENSIONS (Inches/Millimeters)

AVX Style	SG02	SG03	SG04	SG05
Length	.190/4.83	.290/7.37	.290/7.37	.420/10.66
Diameter	.100/2.54	.100/2.54	.150/3.81	.150/3.81

ELECTRICAL SPECIFICATIONS

Temperature Coefficient
COG: A Temperature Coefficient — 0 ±30 ppm/°C, −55° to +125°C
X7R: C Temperature Coefficient — ±15%, −55° to +125°C
Z5U: E Temperature Coefficient — +22, −56%, +10° to 85°C
Z5V: V Temperature Coefficient — +22, −82%, +10° to 85°C

Capacitance Test 25°C (MIL-STD-202 Method 305)
COG: Measured at 1 VRMS max at 1KHz (1MHz for 1000 pf or less)
X7R: Measured at 1 VRMS max at 1KHz (1MHz for 100 pf or less)
Z5U and Z5V: Measured at .5 VRMS max at 1KHz

Dissipation Factor 25°C
COG: .15% max at 1KHz, 1 VRMS max (1MHz for 1000 pf or less)
X7R: 2.5% max at 1 KHz, 1 VRMS max (1MHz for 100 pf or less)
Z5U: 3.0% max at 1KHz, .5 VRMS max
Z5V: 4.0% max at 1KHz, .5 VRMS max

Insulation Resistance 25°C (MIL-STD-202 Method 302)
COG and X7R: 100K megohms or 1000 megohms-mfd whichever is less
Z5U and Z5V: 10K megohms or 500 megohms-mfd whichever is less

Dielectric Withstanding Voltage 25°C (Flash Test)
COG and X7R: 300% rated voltage for 5 seconds with 50 ma. max charging current
Z5U and Z5V: 200% rated voltage for 5 seconds with 50 ma. max charging current

Life Test (1000 hrs)
COG and X7R: 200% rated voltage at +125°C
Z5U and Z5V: 150% rated voltage at +85°C

Moisture Resistance (MIL-STD-202 Method 106)
COG, X7R, Z5U, Z5V: Ten cycles with no voltage applied

Temperature Cycling (MIL-STD-202 Method 102, condition D at rated elevated temperature)
COG and X7R: −55° to +125°C
Z5U and Z5V: −55° to +85°C

Immersion Cycling (MIL-STD-202 Method 104, condition A)

Capacitance Range in pf

AVX Style	Char. A		Char. C		Char. E		Char. V	
	100VDC	50VDC	100VDC	50VDC	100VDC	50VDC	100VDC	50VDC
SG02	10 to 330	10 to 470	150 to 5,600	150 to 12,000	6,800 to 15,000	6,800 to 68,000	15,000 to 22,000	15,000 to 82,000
SG03	100 to 680	100 to 1,200	1000 to 15,000	1000 to 47,000	15,000 to 33,000	15,000 to 150,000	15,000 to 39,000	15,000 to 180,000
SG04	470 to 3,900	470 to 4,700	10,000 to 47,000	10,000 to 100,000	33,000 to 150,000	33,000 to 330,000	39,000 to 180,000	39,000 to 470,000
SG05	1,000 to 4,700	1,000 to 6,800	27,000 to 100,000	27,000 to 220,000	68,000 to 180,000	68,000 to 680,000	150,000 to 220,000	150,000 to 820,000

How to Order

SG03 1 A 56 1 J

- Capacitance Tolerance Code
- Multiplier (Number of Zeros)
- Significant Figures of Capacitance
- Temperature Characteristic
- Voltage: 1 = 100V; 5 = 50V
- Style

AVAILABLE CAPACITANCE TOLERANCES

J = ±5% (A, C)
K = ±10% (A, C)
M = ±20% (A, C, E, V)
Z = +80 −20% (E, V)
P = GMV (E, V)

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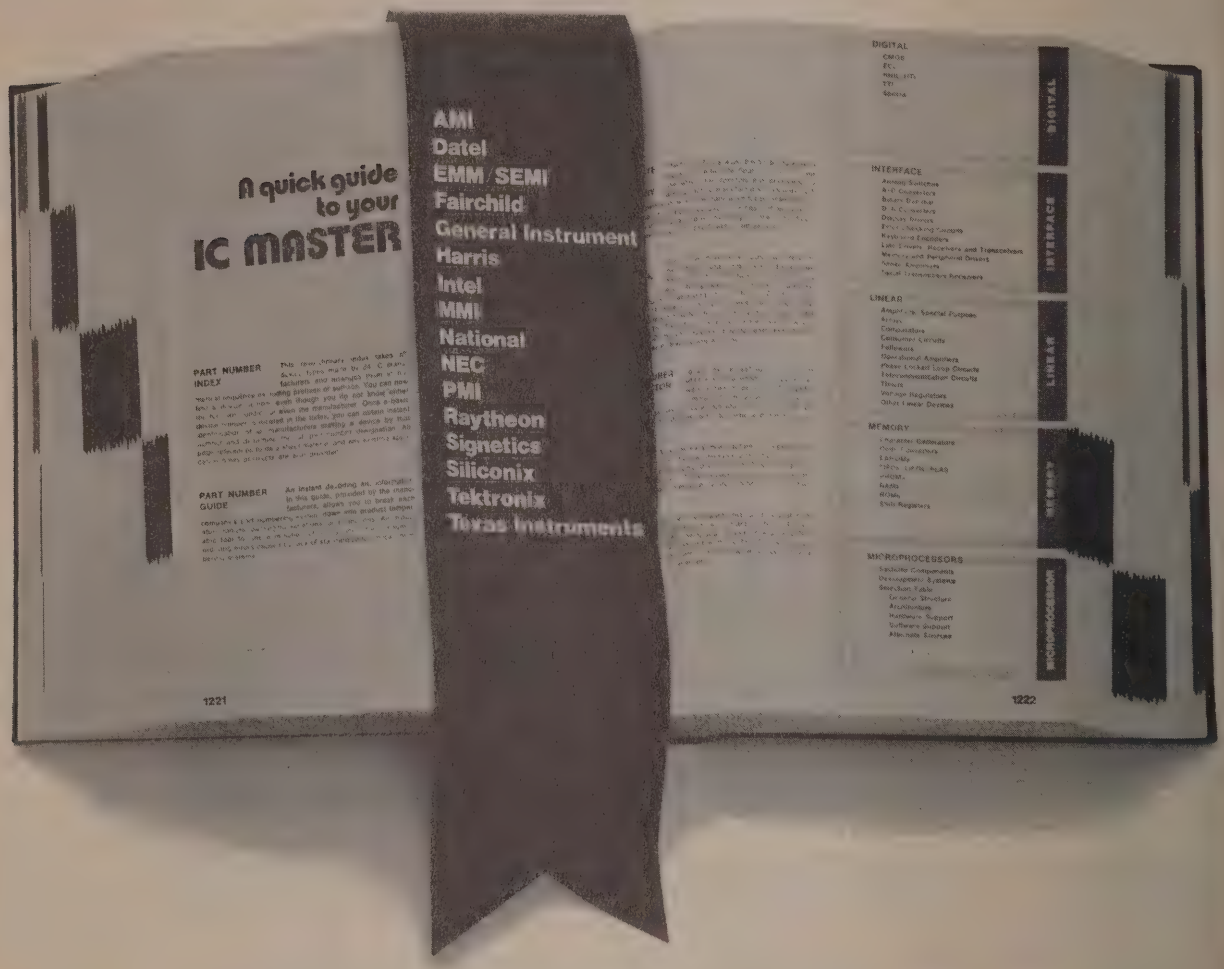
A GOOD BOOK IS KNOWN BY THE COMPANIES IT KEEPS.



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AXEL ELECTRONICS, INC.
A UNIT OF GENERAL SIGNAL CORPORATION
134-20 Jamaica Avenue, Jamaica, NY 11418
(212) AX 1-3900

DRIMICA CAPACITORS

TYPE DESIGNATION

MP	2	B	G	503	K
TYPE	TERMINALS	ENCLOSURE	VOLTAGE	CAPACITANCE	CAPACITANCE TOLERANCE

TYPE
The type is identified by two letters.
MP indicates **DRIMICA** pulse capacitor.
MD indicates **DRIMICA** D-C capacitor.
ME indicates **DRIMICA** low inductance energy discharge capacitor.

TERMINALS
†1 — INSERTS : 8-32UNC-2B x 0.25 Deep
2 — TURRETS :
3 — SCREWS : 8-32UNC-2A x 0.38 Long
‡4 — PIGTAILS : .040 Dia. x 2″ long nickel plated copper.
‡5 — TABS : .010 thick x 0.50 wide x 2″ long
†6 — LEADS : insulated, flexible, 12″ long
7 — OTHER : per special requirements

† Available in Epoxy Cases Only.
‡ Available in Mylar* Wrap Only.

ENCLOSURE
A ..... MYLAR* WRAP
B ..... EPOXY CASE
C ..... EPOXY FLAT RECTANGULAR
D ..... EPOXY FLAT DISC
E ..... EPOXY MOLDED

VOLTAGE

SYMBOL	RATING	SYMBOL	RATING
F	600	P	6000
G	1000	R	7500
H	1500	S	10,000
J	2000	T	12,500
K	2500	W	15,000
L	3000	X	20,000
M	4000	Y	25,000
N	5000	Z	30,000 or greater

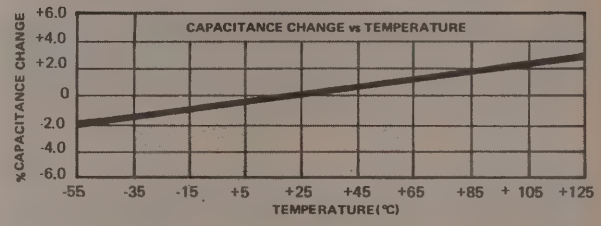
CAPACITANCE
The nominal capacitance value expressed in picofarads (pf) is identified by a three digit number; the first two digits are significant figures and the last digit specifies the number of Zeros to follow:
ex: 503 = 50,000 picofarad = 0.05MFD

CAPACITANCE TOLERANCE

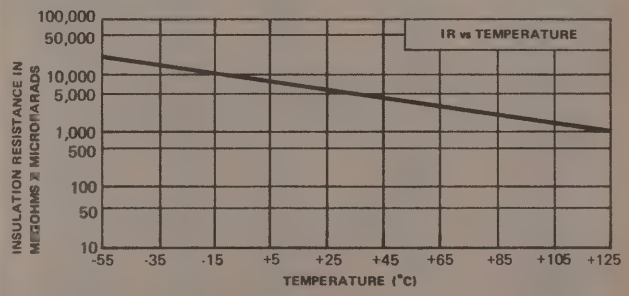
SYMBOL	TOLERANCE (±)
G	2%
J	5%
K	10%
M	20%

PERFORMANCE CURVES

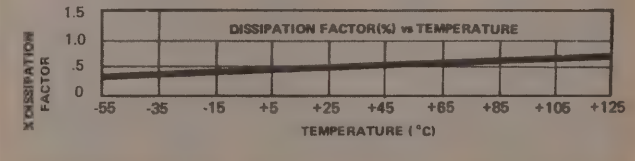
CAPACITANCE
(Ref. Mil-STD-202, Method 305)
Test Frequency:
1000 Hz < 1.0 UF Rating
60 Hz = 1.0 UF Rating



INSULATION RESISTANCE
(Ref. Mil-STD-202, Method 302)
Electrification 500 VDC for a time period not greater than 2 minutes.



DISSIPATION FACTOR
Frequency and equipment same as that for capacitance.



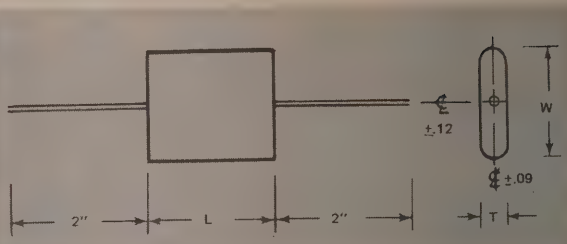
* DU PONT TRADEMARK

Axel

A UNIT OF GENERAL SIGNAL CORPORATION
134-20 Jamaica Avenue, Jamaica, NY 11418
(212) AX 1-3900

DRIMICA CAPACITORS

Axel Mylar*Wrap D-C Capacitors employ a dielectric system of reconstituted mica paper impregnated with a thermosetting resin. The outer wrapper is heavy gauge Mylar* and the ends are filled with a high quality epoxy. The capacitors are normally supplied with .040" diameter solder coated copper terminations. Other configurations are available as indicated on page 4. These capacitors are ideally suited for power supply filters, by-pass and coupling-blocking applications.



PART NO.	MFD	L	W	T
1000 WVDC				
MD4AG254K	0.25	2.12	1.82	0.19
MD4AG504K	0.50	2.12	1.82	0.37
MD4AG105K	1.0	2.12	1.82	0.72
MD4AG205K	2.0	2.12	1.82	1.42
MD4AG405K	4.0	3.25	2.07	1.45
MD4AG605K	6.0	3.25	2.07	2.16
MD4AG805K	8.0	3.25	2.07	2.87
MD4AG106K	10.0	3.25	2.07	3.58
2000 WVDC				
MD4AJ104K	0.10	2.12	1.40	0.18
MD4AJ254K	0.25	2.12	1.94	0.28
MD4AJ504K	0.50	2.12	1.94	0.53
MD4AJ105K	1.0	2.12	1.94	1.04
MD4AJ205K	2.0	3.25	2.90	0.78
MD4AJ405K	4.0	3.25	2.90	1.54
MD4AJ605K	6.0	3.25	2.90	2.29
3000 WVDC				
MD4AL103K	0.010	1.62	0.59	0.13
MD4AL253K	0.025	1.62	0.88	0.19
MD4AL503K	0.050	1.62	0.88	0.38
MD4AL104K	0.10	2.12	1.50	0.24
MD4AL254K	0.25	2.12	2.125	0.42
MD4AL504K	0.50	2.12	2.125	0.83
MD4AL105K	1.0	3.25	2.57	0.75
MD4AL205K	2.0	3.25	2.57	1.48
MD4AL405K	4.0	4.38	2.35	2.23
4000 WVDC				
MD4AM103K	0.010	1.62	0.68	0.22
MD4AM253K	0.025	1.62	1.02	0.31
MD4AM503K	0.050	1.62	1.02	0.62
MD4AM104K	0.10	2.12	2.03	0.35
MD4AM254K	0.25	2.12	2.50	0.69
MD4AM504K	0.50	2.12	2.50	1.34
MD4AM105K	1.0	4.38	2.28	1.05
MD4AM205K	2.0	4.38	2.28	2.07
5000 WVDC				
MD4AN103K	0.01	2.12	1.25	0.11
MD4AN253K	0.025	2.12	1.44	0.19
MD4AN503K	0.05	2.12	1.93	0.28
MD4AN104K	0.10	2.12	1.93	0.53
MD4AN254K	0.25	3.25	2.30	0.56
MD4AN504K	0.50	3.25	2.30	1.10
MD4AN105K	1.0	3.25	2.30	2.15

PART NO.	MFD	L	W	T
6000 WVDC				
MD4AP103K	0.01	2.25	1.03	0.17
MD4AP253K	0.025	3.25	1.44	0.19
MD4AP503K	0.05	3.25	1.90	0.26
MD4AP104K	0.10	3.25	1.90	0.48
MD4AP254K	0.25	4.38	2.38	0.62
MD4AP504K	0.50	4.38	2.38	1.21
MD4AP105K	1.0	4.38	2.38	2.39
7500 WVDC				
MD4AR103K	0.010	3.75	1.06	0.19
MD4AR253K	0.025	4.38	1.82	0.20
MD4AR503K	0.05	4.38	1.82	0.37
MD4AR104K	0.10	4.38	1.82	0.70
MD4AR254K	0.25	4.38	2.81	0.94
MD4AR504K	0.50	4.38	2.81	1.85
10,000 WVDC				
MD4AS103K	0.010	3.62	1.36	0.31
MD4AS253K	0.025	3.62	1.84	0.45
MD4AS503K	0.050	3.62	1.84	0.82
MD4AS104K	0.10	3.62	2.31	1.15
MD4AS254K	0.25	3.62	3.66	1.82
12,500 WVDC				
MD4AT502K	0.005	2.50	1.13	0.40
MD4AT103K	0.010	2.50	1.13	0.81
MD4AT253K	0.025	3.62	1.80	0.56
MD4AT503K	0.050	3.62	1.80	1.02
MD4AT104K	0.10	4.38	2.12	1.22
MD4AT254K	0.25	4.62	3.18	1.83
15,000 WVDC				
MD4AW252K	0.0025	3.62	0.56	0.41
MD4AW502K	0.0050	3.62	0.56	0.73
MD4AW103K	0.010	3.62	1.40	0.56
MD4AW253K	0.025	3.62	1.90	0.80
MD4AW503K	0.050	3.62	1.90	1.50
MD4AW104K	0.10	3.62	1.90	2.83
20,000 WVDC				
MD4AX252K	0.0025	3.62	0.71	0.56
MD4AX502K	0.0050	3.62	0.97	0.74
MD4AX103K	0.010	3.62	1.38	0.91
MD4AX253K	0.025	4.62	1.85	1.07
MD4AX503K	0.050	4.62	1.85	2.00

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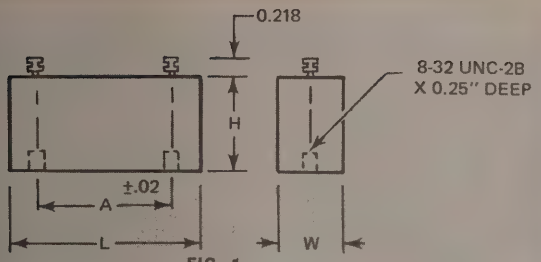

FIG. 1

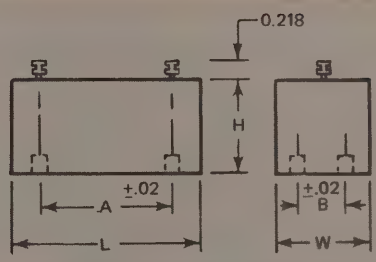

FIG. 2

Axel Epoxy Case D-C Capacitors employ a dielectric system of reconstituted mica paper impregnated with a thermosetting resin. They are housed in epoxy-glass laminate cases and vacuum potted with a unique epoxy system, resulting in a solid homogeneous package. These capacitors are ideally suited for power supply filters, by-pass and coupling-blocking applications.

PART NO.	MFD	L	W	H	FIG.	A	B
1000 WVDC							
MD2BG254K	0.25	1.75	1	0.75	1	1.38	—
MD2BG504K	0.50	1.75	1	1.38	1	1.38	—
MD2BG105K	1.0	1.75	1	2.75	1	1.38	—
MD2BG205K	2.0	3.75	2	1.12	2	3.25	1.50
MD2BG405K	4.0	3.75	2	1.50	2	3.25	1.50
MD2BG605K	6.0	3.75	2	2.00	2	3.25	1.50
MD2BG805K	8.0	3.75	2	3.00	2	3.25	1.50
MD2BG106K	10.0	3.75	2	3.62	2	3.25	1.50
MD2BG126K	12.0	3.75	3	2.50	2	3.25	2.50
MD2BG156K	15.0	3.75	3	3.62	2	3.25	2.50
2000 WVDC							
MD2BJ104K	0.10	1.75	1	0.75	1	1.38	—
MD2BJ254K	0.25	1.75	1	1.38	1	1.38	—
MD2BJ504K	0.50	1.75	1	2.00	1	1.38	—
MD2BJ105K	1.0	3.75	2	1.12	2	3.25	1.50
MD2BJ205K	2.0	3.75	2	1.50	2	3.25	1.50
MD2BJ405K	4.0	3.75	2	2.38	2	3.25	1.50
MD2BJ605K	6.0	3.75	3	2.50	2	3.25	2.50
MD2BJ805K	8.0	3.75	3	2.88	2	3.25	2.50
MD2BJ106K	10.0	3.75	3	3.38	2	3.25	2.50
MD2BJ126K	12.0	3.75	3	4.00	2	3.25	2.50
MD2BJ156K	15.0	3.75	3	5.00	2	3.25	2.50
3000 WVDC							
MD2BL104K	0.10	1.75	1	1.38	1	1.38	—
MD2BL254K	0.25	3.75	2	1.00	2	3.25	1.50
MD2BL504K	0.50	3.75	2	1.25	2	3.25	1.50
MD2BL105K	1.0	3.75	2	1.75	2	3.25	1.50
MD2BL205K	2.0	3.75	2	2.62	2	3.25	1.50
MD2BL405K	4.0	3.75	3	3.12	2	3.25	2.50
MD2BL605K	6.0	3.75	3	4.25	2	3.25	2.50
4000 WVDC							
MD2BM104K	0.10	1.75	1	2.00	1	1.38	—
MD2BM254K	0.25	3.75	2	1.12	2	3.25	1.50
MD2BM504K	0.50	3.75	2	1.50	2	3.25	1.50
MD2BM105K	1.0	3.75	2	2.38	2	3.25	1.50
MD2BM205K	2.0	3.75	3	2.88	2	3.25	2.50
MD2BM405K	4.0	3.75	3	5.00	2	3.25	2.50
5000 WVDC							
MD2BN104K	0.10	3.75	2	1.12	2	3.25	1.50
MD2BN254K	0.25	3.75	2	1.50	2	3.25	1.50
MD2BN504K	0.50	3.75	2	2.38	2	3.25	1.50
MD2BN105K	1.0	3.75	2	3.62	2	3.25	1.50
MD2BN205K	2.0	3.75	3	4.00	2	3.25	2.50
MD2BN405K	4.0	6.00	3	4.50	2	5.50	2.50

PART NO.	MFD	L	W	H	FIG.	A	B
6000 WVDC							
MD2BP104K	0.10	3.75	2	1.00	2	3.25	1.50
MD2BP254K	0.25	3.75	2	2.00	2	3.25	1.50
MD2BP504K	0.50	3.75	3	2.50	2	3.25	2.50
MD2BP105K	1.0	3.75	3	4.00	2	3.25	2.50
MD2BP205K	2.0	6.00	3	4.00	2	5.50	2.50
7500 WVDC							
MD2BR104K	0.10	3.75	2	1.00	2	3.25	1.50
MD2BR254K	0.25	3.75	2	3.00	2	3.25	1.50
MD2BR504K	0.50	3.75	3	3.38	2	3.25	2.50
MD2BR105K	1.0	3.75	3	5.00	2	3.25	2.50
MD2BR205K	2.0	6.00	3	4.75	2	5.50	2.50
10,000 WVDC							
MD2BS503K	0.05	3.75	2	1.00	2	3.25	1.50
MD2BS104K	0.10	3.75	2	2.38	2	3.25	1.50
MD2BS254K	0.25	3.75	2	3.62	2	3.25	1.50
MD2BS504K	0.50	3.75	3	4.00	2	3.25	2.50
MD2BS105K	1.0	6.00	3	4.75	2	5.50	2.50
12,500 WVDC							
MD2BT503K	0.05	3.75	2	2.00	2	3.25	1.50
MD2BT104K	0.10	3.75	2	2.62	2	3.25	1.50
MD2BT254K	0.25	6.00	3	2.12	2	5.50	2.50
MD2BT504K	0.50	6.00	3	4.00	2	5.50	2.50
MD2BT105K	1.0	6.00	5	5.00	2	5.50	4.50
15,000 WVDC							
MD2BW253K	0.025	3.75	2	1.75	2	3.25	1.50
MD2BW503K	0.05	3.75	2	2.38	2	3.25	1.50
MD2BW104K	0.10	3.75	3	2.50	2	3.25	2.50
MD2BW254K	0.25	6.00	3	4.00	2	5.50	2.50
MD2BW504K	0.50	6.00	5	5.00	2	5.50	4.50
20,000 WVDC							
MD2BX103K	0.010	3.75	2	1.00	2	3.25	1.50
MD2BX253K	0.025	3.75	2	2.00	2	3.25	1.50
MD2BX503K	0.05	3.75	2	3.62	2	3.25	1.50
MD2BX104K	0.10	3.75	3	4.00	2	3.25	2.50
MD2BX254K	0.25	6.00	3	4.75	2	5.50	2.50
25,000 WVDC							
MD2BY103K	0.010	3.75	2	2.00	2	3.25	1.50
MD2BY253K	0.025	3.75	2	3.00	2	3.25	1.50
MD2BY503K	0.05	6.00	3	2.12	2	5.50	2.50
MD2BY104K	0.10	6.00	3	4.00	2	5.50	2.50
MD2BY254K	0.25	6.00	5	5.00	2	5.50	4.50

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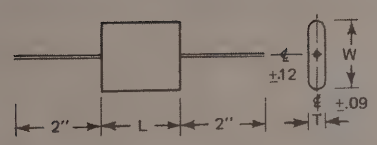

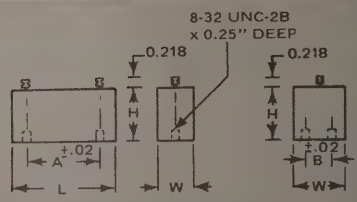

FIG. 1 FIG. 2

PART NO.	MFD	L	W	T	MAX. PRF†	MAX. Ip‡
			600 V			
MP4AF503K	0.05	1.88	0.68	0.25	5000	500
MP4AF104K	0.10	1.88	1.00	0.34	5000	350
MP4AF254K	0.25	2.38	1.62	0.34	5000	225
MP4AF504K	0.50	3.38	1.88	0.41	5000	150
MP4AF105K	1.0	3.38	1.88	0.81	3500	135
MP4AF205K	2.0	3.38	1.88	1.61	2300	115
			1000 V			
MP4AG103K	0.01	2.00	0.53	0.08	5000	700
MP4AG503K	0.05	2.00	0.72	0.25	5000	310
MP4AG104K	0.10	2.00	0.88	0.38	4000	250
MP4AG254K	0.25	2.00	1.43	0.53	2500	200
MP4AG504K	0.50	2.00	1.43	1.03	1500	180
MP4AG105K	1.0	4.00	2.25	0.71	1250	140
MP4AG205K	2.0	4.50	2.75	0.86	1000	110
			3000 V			
MP4AL501K	0.0005	1.25	0.62	0.15	5000	35
MP4AL102K	0.0010	1.25	0.62	0.15	5000	50
MP4AL152K	0.0015	1.50	0.62	0.15	5000	60
MP4AL252K	0.0025	1.75	0.62	0.18	5000	60
MP4AL502K	0.005	2.00	0.68	0.22	3300	65
MP4AL103K	0.010	2.00	0.68	0.44	2500	75
MP4AL253K	0.025	2.00	1.87	0.58	1500	75
MP4AL503K	0.05	2.50	2.25	0.60	1250	75
MP4AL104K	0.10	4.00	2.25	0.60	1000	75
MP4AL254K	0.25	4.50	2.75	1.00	1000	75
			5000 V			
MP4AN501K	0.0005	1.25	0.75	0.31	5000	25
MP4AN102K	0.0010	1.25	1.18	0.31	5000	25
MP4AN152K	0.0015	1.50	1.12	0.28	5000	35
MP4AN252K	0.0025	2.00	1.12	0.28	4000	50
MP4AN502K	0.005	2.50	1.50	0.31	3500	60
MP4AN103K	0.010	3.00	2.00	0.25	2500	70
MP4AN253K	0.025	3.00	2.25	0.62	1500	70
MP4AN503K	0.05	4.00	2.25	0.83	1250	70
MP4AN104K	0.10	4.50	2.75	1.10	1000	70
			10,000 V			
MP4AS501K	0.0005	1.31	1.31	0.62	5000	35
MP4AS102K	0.0010	1.50	1.50	0.62	3500	55
MP4AS152K	0.0015	1.75	1.75	0.62	3000	75
MP4AS252K	0.0025	2.00	1.75	0.62	2000	95
MP4AS502K	0.005	3.50	1.75	0.62	2000	100
MP4AS103K	0.010	4.00	2.12	0.75	1500	100
MP4AS253K	0.025	4.50	2.75	1.25	1000	100
			15,000 V			
MP4AW501K	0.0005	2.00	1.38	0.56	4000	125
MP4AW102K	0.0010	2.00	1.75	0.70	2000	125
MP4AW152K	0.0015	2.00	1.88	0.88	2000	125
MP4AW252K	0.0025	2.50	2.25	0.75	1500	170
MP4AW502K	0.005	4.00	2.25	0.75	1250	250
MP4AW103K	0.010	4.50	2.75	1.00	1000	250

PART NO.	MFD	L	W	H	FIG.	A	B	MAX. PRF†	MAX. Ip‡
				600 V					
MP2BF503K	0.05	2.50	0.50	0.93	1	2.00	—	5000	1000
MP2BF104K	0.10	2.50	0.50	1.25	1	2.00	—	5000	700
MP2BF254K	0.25	3.00	0.50	1.88	1	2.50	—	5000	450
MP2BF504K	0.50	4.00	0.66	2.12	1	3.50	—	5000	300
MP2BF105K	1.0	4.00	1.06	2.12	2	3.50	.50	3500	270
MP2BF205K	2.0	4.00	1.86	2.12	2	3.50	1.25	2300	230
				1000 V					
MP2BG103K	0.01	2.75	0.33	0.78	1	2.25	—	5000	1400
MP2BG503K	0.05	2.75	0.50	0.97	1	2.25	—	5000	620
MP2BG104K	0.10	2.75	0.63	1.12	1	2.25	—	4000	500
MP2BG254K	0.25	2.75	0.78	1.68	1	2.25	—	2500	400
MP2BG504K	0.50	2.75	1.28	1.68	2	2.25	.75	1500	360
MP2BG105K	1.0	4.50	1.00	2.50	2	4.00	.50	1250	280
MP2BG205K	2.0	5.00	1.25	3.00	2	4.50	.75	1000	220
				3000 V					
MP2BL501K	0.0005	1.75	0.38	0.88	1	1.25	—	5000	35
MP2BL102K	0.0010	1.75	0.38	0.88	1	1.25	—	5000	50
MP2BL152K	0.0015	2.00	0.38	0.88	1	1.50	—	5000	60
MP2BL252K	0.0025	2.25	0.38	0.88	1	1.75	—	5000	60
MP2BL502K	0.005	2.50	0.38	0.88	1	2.00	—	3300	65
MP2BL103K	0.010	2.50	0.69	0.88	1	2.00	—	2500	75
MP2BL253K	0.025	2.50	1.12	2.12	2	2.00	.62	1500	75
MP2BL503K	0.05	3.00	1.00	2.50	2	2.50	.50	1250	75
MP2BL104K	0.10	4.50	1.00	2.50	2	4.00	.50	1000	75
MP2BL254K	0.25	5.00	1.25	3.00	2	4.50	.50	1000	75
				5000 V					
MP2BN501K	0.0005	1.75	0.50	1.00	1	1.25	—	5000	25
MP2BN102K	0.0010	1.75	0.50	1.43	1	1.25	—	5000	25
MP2BN152K	0.0015	2.00	0.50	1.38	1	1.50	—	5000	35
MP2BN252K	0.0025	2.50	0.50	1.38	1	2.00	—	4000	50
MP2BN502K	0.005	3.00	0.50	1.75	1	2.50	—	3500	60
MP2BN103K	0.010	3.50	0.50	2.25	1	3.00	—	2500	70
MP2BN253K	0.025	3.50	0.88	2.50	1	3.00	—	1500	70
MP2BN503K	0.05	4.50	1.00	2.50	2	4.00	.50	1250	70
MP2BN104K	0.10	5.00	1.25	3.00	2	4.50	.75	1000	70
				10,000 V					
MP2BS501K	0.0005	1.81	0.88	1.56	1	1.31	—	5000	35
MP2BS102K	0.0010	2.00	0.88	1.75	1	1.50	—	3500	55
MP2BS152K	0.0015	2.25	0.88	2.00	1	1.75	—	3000	75
MP2BS252K	0.0025	2.50	0.88	2.00	1	2.00	—	2000	95
MP2BS502K	0.005	4.00	0.88	2.00	1	3.50	—	2000	100
MP2BS103K	0.010	4.50	0.88	2.38	1	4.00	—	1500	100
MP2BS253K	0.025	5.00	1.50	3.00	2	4.50	.75	1000	100
				15,000 V					
MP2BW501K	0.0005	2.50	0.81	1.62	1	2.00	—	4000	125
MP2BW102K	0.0010	2.50	0.95	2.00	1	2.00	—	2000	125
MP2BW152K	0.0015	2.50	1.12	2.12	2	2.00	.62	2000	125
MP2BW252K	0.0025	3.00	1.00	2.50	2	2.50	.50	1500	170
MP2BW502K	0.005	4.50	1.00	2.50	2	4.00	.50	1250	250
MP2BW103K	0.010	5.00	1.25	3.00	2	4.50	.75	1000	250

† In Pulses/sec. based upon operation in still air at 25°C ambient. For higher ambients average power must be reduced accordingly or forced cooling employed ‡ In Amperes * DU PONT TRADEMARK

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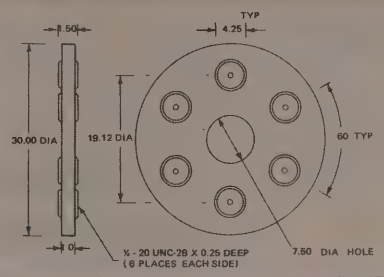
LOW INDUCTANCE ENERGY DISCHARGE CAPACITORS/SERIES ME1D



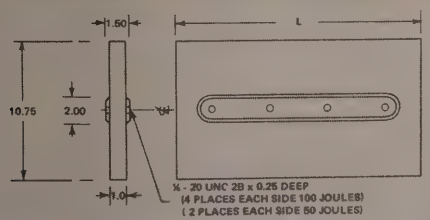
THREADED STUDS AVAILABLE UPON REQUEST

Axel Flat Disc Capacitors employ a dielectric system of reconstituted mica paper impregnated with thermosetting resin and encapsulated in epoxy. This method of construction insures low self inductance by elimination of unnecessary case insulation and high voltage oil seal bushings normally encountered in other forms of constructions.

The flat configuration lends itself to stacking of capacitors to achieve higher voltages in reasonable heights. The round design permits co-axial return discharge paths and the open inside diameter provides further versatility to the user.

PART NUMBER	CAPACITANCE (MICROFARADS)	VOLTAGE (KILOVOLTS)	INDUCTANCE (NANOHENRIES)	ENERGY (JOULES)
ME1DW195K	1.90	15	< 2	225
ME1DX115K	1.12	20	< 2	225
ME1DY724K	.72	25	< 2	225
ME1DZ494K	.49	30	< 2	225
ME1DZ284K	.28	40	< 2	225
ME1DZ184K	.18	50	< 2	225

LOW INDUCTANCE ENERGY DISCHARGE CAPACITORS/SERIES ME1C



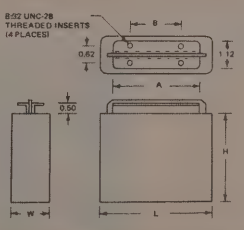
THREADED STUDS AVAILABLE UPON REQUEST

Axel Flat Rectangular Capacitors employ a dielectric system of reconstituted mica paper impregnated with thermosetting resin and encapsulated in epoxy. This method of construction insures low self-inductance by elimination of unnecessary case insulation and high voltage oil seal bushings normally encountered in other forms of construction.

The flat configuration lends itself to stacking of capacitors to achieve higher voltages in reasonable heights. The rectangular design permits greater efficiency in the use of available space.

PART NUMBER	CAPACITANCE (MFD)	VOLTAGE (KILOVOLTS)	INDUCTANCE (NANOHENRIES)	ENERGY (JOULES)	L
ME1CW444K	0.44	15	< 5	50	11.25
ME1CX254K	0.25	20	< 5	50	11.25
ME1CY164K	0.16	25	< 5	50	11.25
ME1CZ114K	0.11	30	< 5	50	11.25
ME1CZ603K	0.06	40	< 5	50	11.25
ME1CZ403K	0.04	50	< 5	50	11.25
ME1CW884K	0.88	15	< 3	100	21.25
ME1CX504K	0.50	20	< 3	100	21.25
ME1CY324K	0.32	25	< 3	100	21.25
ME1CZ224K	0.22	30	< 3	100	21.25
ME1CZ124K	0.12	40	< 3	100	21.25
ME1CZ803K	0.08	50	< 3	100	21.25

LOW INDUCTANCE ENERGY DISCHARGE CAPACITORS/SERIES ME6E



Axel Flat Line Capacitors make available a series of low to intermediate energy discharge low inductance capacitors employing a dielectric system of reconstituted mica paper impregnated with thermosetting resin and encapsulated in epoxy. This method of construction insures low self inductance by elimination of unnecessary case insulation and high voltage oil seal bushings normally encountered in other forms of construction. The terminals of these units are ideal for connection to a continuing parallel plane transmission line (flat line).

PART NUMBER	CAPACITANCE (MFD)	VOLTAGE (KILOVOLTS)	INDUCT. (NANOHENRIES)	ENERGY (JOULES)	L	W	H	A	B
ME6EG106K	10	1	< 10	5	4.75	1.75	3.5	3	2
ME6EJ405K	4	2	< 10	8	4.75	1.75	3.5	3	2
ME6EL205K	2	3	< 10	9	4.75	1.75	3.5	3	2
ME6EM155K	1.5	4	< 10	12	4.75	1.75	3.5	3	2
ME6EN105K	1.0	5	< 10	12.5	4.75	1.75	3.5	3	2
ME6EP694K	0.69	6	< 10	12.5	4.75	1.75	3.5	3	2
ME6ER424K	0.42	7.5	< 10	12.0	4.75	1.75	3.5	3	2
ME6ES244K	0.24	10.0	< 10	12.0	4.75	1.75	3.5	3	2
ME6EG206K	20	1	< 15	10	6.75	1.75	4.75	5	4
ME6EJ805K	8	2	< 15	16	6.75	1.75	4.75	5	4
ME6EL405K	4	3	< 15	18	6.75	1.75	4.75	5	4
ME6EM305K	3	4	< 15	24	6.75	1.75	4.75	5	4
ME6EN205K	2	5	< 15	25	6.75	1.75	4.75	5	4
ME6EP145K	1.4	6	< 15	25	6.75	1.75	4.75	5	4
ME6ER844K	0.84	7.5	< 15	24	6.75	1.75	4.75	5	4
ME6ES504K	0.50	10.0	< 15	24	6.75	1.75	4.75	5	4

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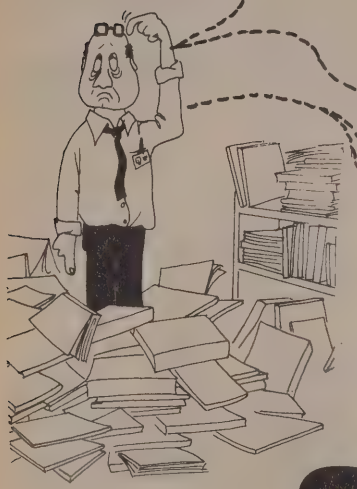

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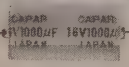
CAPACITORS
CAE & CRE SERIES
ELECTROLYTIC AXIAL LEAD AND RADIAL LEAD TYPES

CAE SERIES

INTRODUCTION
The CAE Series Miniature Aluminum Electrolytic Capacitors are highly reliable and are manufactured to meet the extended temperature range of −40°C to +85°C. The low leakage, low dissipation factor capacitors feature all welded construction and subminiature can sizes. They are ideally suited for solid state, commercial and industrial applications where miniature size, low cost and high quality are requirements. Available in capacitances from .47 mfd up to 10,000 mfd.

CRE SERIES

INTRODUCTION
The CRE Series Miniature Aluminum Electrolytic Capacitors are suitable for easy PC insertion. These low priced, high quality capacitors are being used today by thousands of manufacturers throughout the world. The CRE Series Capacitors have an operating temperature of −40°C to +85°C with low leakage and a low dissipation factor. They are ideally suited for solid state, commercial and industrial applications where miniature size, low cost and high quality are requirements. Capacitance range is from .47 mfd up to 15,000 mfd.

SPECIFICATIONS
1. Operating Temperature Range: −40°C to +85°C; above 160 WV −25°C to +85°C.
2. Rated Voltage Range: 6.3 WV to 500 WV.
3. Capacitance Tolerance: (Measured at a frequency of 120 Hz).
   (a) Units with a nominal capacitance of 4.7 or less −10% to +75%.
   (b) Units with nominal capacitance above 4.7 −10% to +50%.
   (c) Closer tolerance available on special order.
4. Leakage Current UA:
   (a) (After 5 minutes with rated voltage) Less than .03V +4.
   (b) 160 WV and above .03 CV +10.
   (c) Low leakage units available.
5. Tangent of Loss Angle (tan): (Measured at a frequency of 120 Hz). Shall be less than:

Rated Voltage	Tangent of the Loss Angle	Rated Voltage	Tangent of the Loss Angle
6.3	.25	100	.08
10	.20	160	.18
16	.17	200	.18
25	.15	250	.18
35	.13	315	.18
50	.10	400	.23
63	.10	450	.23
80	.10	500	.23

6. Life Test: (Applying rated voltage at 85 ±2°C for 1000 ±12 hours continuously).
   (a) Leakage Current: Less than the value specified in No. 4.
   (b) Variation of Capacitance: Within ±20% of the initial value.
   (c) Tangent of the Loss Angle: Less than 200% of the value specified in No. 5.
   (d) Appearance: No notable change.
7. Hot Storage: (At 85 ±2°C for 500 ±12 hours without applying voltage) same findings as in life test (No. 6).
8. Stability at low temperature (Impedance/ratio) at 120 Hz:

Rated Voltage	Z-40°C/Z 20°C		Z-25°C/Z 20°C
	C ≤1,000 mf	C >1,000 mf	C <1,000 mf
6.3	8	12	
10	6	9	
16	4	6	
25	4	6	
35	4	4	
50	4	4	
63	4	4	
80	4	4	
100	4	4	
160			12
200			12
250			12
315			24
350			24
400			60
450			60
500			60

C = Nominal Capacitance in Microfarads
Z 20 = Impedance in ohms at +20°C
Z-40 = Impedance in ohms at −40°C
Z-25 = Impedance in ohms at −25°C

Ripple Current: The capacitors will withstand RMS ripple current at 120 Hz and +85°C as listed for each capacitor shown in table below (microamps).

CAE/RATED VOLTAGE (VDC)

Cap. (μF)	6.3	10	16	25	35	50	63	80
1						18	18	18
2.2						27	27	27
3.3					29	34	34	43
4.7					35	40	40	51
10			40	45	60	75	75	80
22	55	55	70	88	100	100	125	140
33	68	75	100	110	120	140	170	175
47	81	95	125	130	170	180	220	240
100	155	165	172	225	270	300	390	410
220	225	320	335	345	450	480	630	670
330	350	400	420	500	600	700	800	840
470	420	470	540	625	750	820	1000	1100
1000	800	800	1000	1050	1200	1400	1450	
2200	1150	1350	1450	1650	1700	2200		
3300	1400	1450	1950	2150	2500			
4700	1510	1850	2100					

Cap. (μF)	100	160	200	250	315	350	400	450	500
1	20			18	18	18	18	18	17
2.2	32		26	32	32	35	35	35	30
3.3	48	33	46	43	43	47	45	45	44
4.7	57	44	60	50	55	65	55	55	50
10	100	100	100	100	100	145	150	150	145
22	160	190	190	165	185	185	185	185	180
33	210	190	220	220	210	235	230	230	250
47	320	255	280	250	280	280	255	275	
100	470	480	500	440	440	550			
220	700	750	930						
330	870								
470	1200								

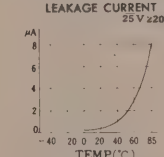
CRE/RATED VOLTAGE (VDC)

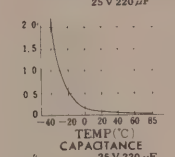
Cap. (μF)	6.3	10	16	25	35	50	63	80
1						15	15	15
2.2						20	20	22
3.3						25	27	35
4.7					35	35	35	40
10			40	50	60	60	70	75
22		50	70	75	95	100	125	125
33		75	90	100	120	140	155	170
47	65	90	120	130	150	170	220	250
100	155	155	185	215	270	310	390	430
220	225	300	335	345	420	480	630	650
330	330	400	410	455	600	700	750	800
470	420	450	490	625	700	800	900	
1000	730	730	910	960	1200			
2200	1050	1300	1400					

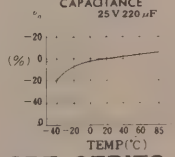
Cap. (μF)	100	160	200	250	315	350	400	450
1	15					14	17	17
2.2	22			26	30	30	30	35
3.3	35	26	39	39	43	43	45	50
4.7	40	40	45	50	55	55	55	60
10	80	75	85	100	105	145	150	155
22	140	145	160	170	184	215	200	
33	195	160	185	200	210			
47	270	215	230	245				
100	430	350						

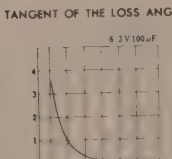
See Temperature Charts to the right.

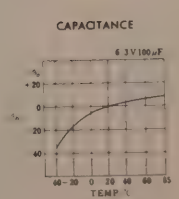
TEMPERATURE CHARACTERISTIC DATA (FROM −40°C TO +85°C)

CAE SERIES
LEAKAGE CURRENT


TANGENT OF THE LOSS ANGLE


CAPACITANCE


CRE SERIES
CAPACITANCE
TANGENT OF THE LOSS ANGLE




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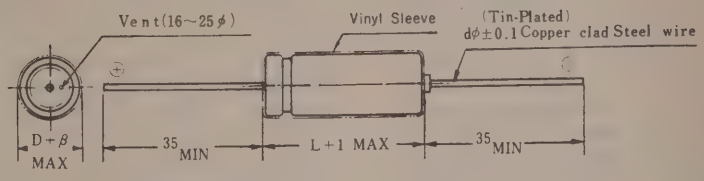
CAPACITORS
CAE SERIES
MINIATURE ALUMINUM ELECTROLYTIC AXIAL LEAD TYPE

DIAGRAM



CAE SERIES — AXIAL

Working Voltage / Surge Voltage		6.3 / 8	10 / 13	16 / 20	25 / 32	35 / 44	50 / 63	63 / 79	80 / 100	100 / 125
CAPACITANCE (MFD)	1						.249x.492 (6.3x12.5)	.249x.492 (6.3x12.5)	.249x.492 (6.3x12.5)	.249x.492 (6.3x12.5)
	2.2						.249x.492 (6.3x12.5)	.249x.492 (6.3x12.5)	.249x.492 (6.3x12.5)	.249x.492 (6.3x12.5)
	3.3						.249x.492 (6.3x12.5)	.249x.492 (6.3x12.5)	.315x.630 (8x16)	.315x.630 (8x16)
	4.7					.249x.492 (6.3x12.5)	.249x.492 (6.3x12.5)	.249x.492 (6.3x12.5)	.315x.630 (8x16)	.315x.630 (8x16)
	10			.249x.492 (6.3x12.5)	.249x.492 (6.3x12.5)	.249x.492 (6.3x12.5)	.315x.630 (8x16)	.315x.630 (8x16)	.315x.630 (8x16)	.315x.787 (8x20)
	15			.249x.492 (6.3x12.5)	.249x.492 (6.3x12.5)	.249x.492 (6.3x12.5)	.315x.630 (8x16)	.315x.630 (8x16)	.315x.630 (8x16)	.315x.787 (8x20)
	22		.200x.500 (5x12.5)	.249x.492 (6.3x12.5)	.315x.630 (8x16)	.315x.630 (8x16)	.315x.630 (8x16)	.315x.787 (8x20)	.394x.787 (10x20)	.394x.787 (10x20)
	33		.249x.492 (6.3x12.5)	.249x.492 (6.3x12.5)	.315x.630 (8x16)	.315x.630 (8x16)	.315x.787 (8x20)	.394x.787 (10x20)	.394x.787 (10x20)	.394x1.240 (10x31.5)
	47		.249x.492 (6.3x12.5)	.315x.630 (8x16)	.315x.630 (8x16)	.315x.787 (8x20)	.394x.787 (10x20)	.394x.787 (10x20)	.394x.984 (10x25)	.492x1.240 (12.5x31.5)
	100	.236x.630 (6x16)	.315x.630 (8x16)	.315x.787 (8x20)	.394x.787 (10x20)	.394x.787 (10x20)	.394x.984 (10x25)	.394x1.240 (10x31.5)	.492x1.240 (12.5x31.5)	.630x1.240 (16x31.5)
	150	.315x.630 (8x16)	.315x.630 (8x16)	.315x.787 (8x20)	.394x.787 (10x20)	.394x.787 (10x20)	.394x.984 (10x25)	.394x1.240 (10x31.5)	.492x1.240 (12.5x31.5)	.630x1.240 (16x31.5)
	220	.315x.787 (8x20)	.394x.787 (10x20)	.394x.787 (10x20)	.394x.984 (10x25)	.492x1.240 (12.5x31.5)	.492x1.240 (12.5x31.5)	.630x1.240 (16x31.5)	.630x1.575 (16x40)	.709x1.575 (18x40)
	330	.394x.787 (10x20)	.394x.787 (10x20)	.394x.984 (10x25)	.492x1.240 (12.5x31.5)	.492x1.240 (12.5x31.5)	.630x1.240 (16x31.5)	.630x1.575 (16x40)	.882x1.575 (22.4x40)	.882x1.575 (22.4x40)
	470	.394x.787 (10x20)	.394x.984 (10x25)	.394x1.240 (10x31.5)	.492x1.240 (12.5x31.5)	.630x1.240 (16x31.5)	.630x1.575 (16x40)	.709x1.575 (18x40)	.882x1.575 (22.4x40)	.882x1.97 (22.4x50)
	1000	.492x1.240 (12.5x31.5)	.492x1.240 (12.5x31.5)	.630x1.240 (16x31.5)	.630x1.575 (16x40)	.709x1.575 (18x40)	.882x1.575 (22.4x40)	.882x1.97 (22.4x50)		
	2200	.630x1.240 (16x31.5)	.630x1.575 (16x40)	.709x1.575 (18x40)	.882x1.575 (22.4x40)	.882x1.575 (22.4x40)	.984x2.50 (25x63)			
	3300	.630x1.575 (16x40)	.709x1.575 (18x40)	.882x1.575 (22.4x40)	.984x1.97 (25x50)	.984x2.50 (25x63)				
	4700	.709x1.575 (18x40)	.882x1.575 (22.4x40)	.882x1.97 (22.4x50	.984x2.50 (25x63)					
	6800	.882x1.97 (22.4x50)	.882x1.97 (22.4x50)	.984x2.50 (25x63)						
	10,000	.984x1.97 (25x50)	.984x2.50 (25x63)							

CAE-H SERIES — HIGH VOLTAGE

Working Voltage / Surge Voltage		160 / 200	200 / 250	250 / 300	315 / 365	350 / 400	400 / 450	450 / 500	500 / 550
CAPACITANCE (MFD)	1	.249x.492 (6.3x12.5)	.249x.492 (6.3x12.5)	.315x.630 (8x16)	.315x.630 (8x16)	.315x.630 (8x16)	.315x.787 (8x20)	.315x.787 (8x20)	.394x.787 (10x20)
	2.2	.249x.630 (6.3x12.5)	.315x.630 (8x16)	.315x.787 (8x20)	.315x.787 (8x20)	.394x.787 (10x20)	.394x.984 (10x25)	.394x.984 (10x25)	.394x1.240 (10x31.5)
	3.3	.315x.630 (8x16)	.315x.787 (8x20)	.394x.787 (10x20)	.394x.787 (10x20)	.394x.984 (10x25)	.394x1.240 (10x31.5)	.394x1.240 (10x31.5)	.492x1.240 (12.5x31.5)
	4.7	.315x.787 (8x20)	.394x.787 (10x20)	.394x.787 10x20)	.394x.984 (10x25)	.394x1.240 (10x31.5)	.492x1.240 (12.5x31.5)	.492x1.240 (12.5x31.5)	.492x1.240 (12.5x31.5)
	10	.394x.984 (10x25)	.394x.984 (10x25)	.394x1.240 (10x31.5)	.492x1.240 (12.5x31.5)	.492x1.240 (12.5x31.5)	.630x1.240 (16x31.5)	.630x1.240 (16x31.5)	.630x1.575 (16x40)
	22	.492x1.240 (12.5x31.5)	.492x1.240 (12.5x31.5)	.492x1.240 (12.5x31.5)	.630x1.575 (16x40)	.709x1.575 (18x40)	.882x1.575 (22.4x40)	.882x1.575 (22.4x40)	.882x1.575 (22.4x40)
	33	.492x1.240 (12.5x31.5)	.630x1.240 (16x31.5)	.630x1.575 (16x40)	.709x1.575 (18x40)	.882x1.575 (22.4x40)	.882x1.575 (22.4x40)	.882x1.575 (22.4x40)	.984x1.97 (25x50)
	47	.630x1.240 (16x31.5)	.630x1.575 (16x40)	.709x1.575 (18x40)	.882x1.575 (22.4x40)	.882x1.575 (22.4x40)	.882x1.97 (22.4x50)	.984x1.97 (25x50)	
	100	.882x1.575 (22.4x40)	.882x1.575 (22.4x40)	.882x1.97 (22.4x50)	.984x1.97 (25x50)	.984x2.50 (25x63)			
	220	.984x1.97 (25x50)	.984x2.50 (25x63)						

NOTE: Smaller cases available on special order.

SIZES ARE SUBJECT TO CHANGE WITHOUT NOTICE

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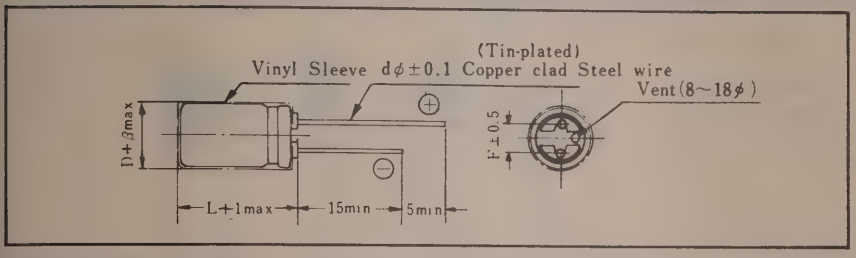
CAPACITORS
CRE SERIES
MINIATURE ALUMINUM ELECTROLYTIC RADIAL LEAD TYPE



SPECIFICATIONS
LEAD SPACING & LEAD DIAMETER

Can Dia. (D)	Lead Spacing (F)	Lead Dia. (d)	AWG
.197	.075 ±.020	.020	24
.249	.100 ±.020	.020	24
.315	.140 ±.020	.020	24
.394	.200 ±.020	.024	22
.492	.200 ±.020	.024	22
.630	.300 ±.020	.024	22
.709	.300 ±.020	.0315	20
.882	.400 ±.020	.0315	20
.984	.500 ±.020	.032	20
1.18	.600 ±.020	.032	20

STANDARD RATING & CASE SIZE (DxL) EXPRESSED IN INCHES & (MILLIMETERS)
CRE SERIES — RADIAL

CAPACITANCE (mfd)	Working Voltage / Surge Voltage	6.3 / 8	10 / 13	16 / 20	25 / 32	35 / 44	50 / 63	63 / 79	100 / 125
	.47						.197x.453 (5x11.5)	.197x.453 (5x11.5)	.197x.453 (5x11.5)
	1.0						.197x.453 (5x11.5)	.197x.453 (5x11.5)	.197x.453 (5x11.5)
	2.2						.197x.453 (5x11.5)	.197x.453 (5x11.5)	.249x.453 (6.3x11.5)
	3.3						.197x.453 (5x11.5)	.197x.453 (5x11.5)	.315x.453 (8x11.5)
	4.7					.197x.453 (5x11.5)	.249x.453 (6.3x11.5)	.249x.453 (6.3x11.5)	.315x.453 (8x11.5)
	10			.197x.453 (5x11.5)	.249x.453 (6.3x11.5)	.249x.453 (6.3x11.5)	.315x.453 (8x11.5)	.315x.453 (8x11.5)	.394x.492 (10x12.5)
	15		.197x.453 (5x11.5)	.249x.453 (6.3x11.5)	.249x.453 (6.3x11.5)	.249x.453 (6.3x11.5)	.315x.453 (8x11.5)	.315x.453 (8x11.5)	.394x.492 (10x12.5)
	22		.197x.453 (5x11.5)	.249x.453 (6.3x11.5)	.315x.453 (8x11.5)	.315x.453 (8x11.5)	.394x.492 (10x12.5)	.394x.492 (10x15.5)	.394x.787 (10x20)
	33		.249x.453 (6.3x11.5)	.249x.453 (6.3x11.5)	.315x.453 (8x11.5)	.394x.492 (10x12.5)	.394x.605 (10x15.5)	.394x.605 (10x15.5)	.492x.787 (12.5x20)
	47	.249x.453 (6.3x11.5)	.249x.453 (6.3x11.5)	.315x.453 (8x11.5)	.394x.492 (10x12.5)	.394x.492 (10x12.5)	.394x.605 (10x15.5)	.394x.787 (10x20)	.492x.984 (12.5x25)
	100	.315x.492 (8x12.5)	.315x.492 (8x12.5)	.394x.492 (10x12.5)	.394x.605 (10x15.5)	.394x.787 (10x20)	.492x.787 (12.5x20)	.492x.984 (12.5x20)	.630x.984 (16x25)
	150	.315x.492 (8x12.5)	.315x.492 (8x12.5)	.394x.492 (10x12.5)	.492x.787 (12.5x20)	.492x.984 (12.5x25)	.492x.984 (25.5x25)	.492x.984 (12.5x25)	.630x.984 (16x25)
	220	.394x.492 (10x12.5)	.394x.605 (10x15.5)	.394x.787 (10x20)	.492x.787 (12.5x20)	.492x.984 (12.5x25)	.630x.984 (16x25)	.630x1.24 (16x31.5)	.709x1.575 (18x40)
	330	.394x.605 (10x15.5)	.394x.787 (10x20)	.492x.787 (12.5x20)	.492x.984 (12.5x25)	.630x.984 (16x25)	.630x1.24 (16x31.5)	.630x1.39 (16x35.5)	.882x1.575 (22.4x40)
	470	.394x.787 (10x20)	.492x.787 (12.5x20)	.492x.787 (12.5x20)	.630x.984 (16x25)	.630x.984 (16x25)	.630x1.390 (16x35.5)	.630x1.24 (16x31.5)	.882x1.24 (22.4x31.5)
	1000	.492x.984 (12.5x25)	.492x.984 (12.5x25)	.630x.984 (16x25)	.630x1.39 (16x35.5)	.709x1.39 (18x35.5)	.882x1.575 (22.4x40)	.882x1.575 (22.4x40)	1.18x1.575 (30x40)
	2200	.630x.984 (16x25)	.630x1.24 (16x31.5)	.709x1.39 (18x35.5)	.882x1.575 (22.4x40)	.984x1.575 (25x40)	.984x1.97 (25x50)	1.18x1.575 (30x40)	
	3300	.630x1.39 (16x35.5)	.709x1.575 (18x40)	.882x1.575 (22.4x40)	.984x1.575 (25x40)	.984x1.575 (25x40)	.984x1.97 (25x50)		
	4700	.709x1.575 (18x40)	.882x1.575 (22.4x40)	.882x1.575 (22.4x40)	.984x1.97 (25x50)	1.18x1.575 (30x40)			
	6800	.882x1.575 (22.4x40)	.984x1.575 (25x40)	.984x1.97 (25x50)	1.18x1.97 (30x50)				
	10,000	.984x1.575 (25x40)	1.18x1.575 (30x40)	1.18x1.97 (30x50)					
	15,000	1.18x1.575 (30x40)	1.18x1.97 (30x50)						

CRE-H SERIES — HIGH VOLTAGE

CAPACITANCE (mfd)	Working Voltage / Surge Voltage	160 / 200	200 / 250	250 / 300	315 / 365	350 / 400	400 / 450	450 / 500
	.47	.197x.453 (5x11.5)	.197x.453 (5x11.5)	.197x.453 (5x11.5)	.197x.453 (5x11.5)	.315x.551 (8x14)	.394x.630 (10x16)	.394x.630 (10x16)
	1.0	.197x.453 (5x11.5)	.197x.453 (5x11.5)	.197x.453 (5x11.5)	.197x.453 (5x11.5)	.315x.551 (8x14)	.394x.630 (10x16)	.394x.630 (10x16)
	2.2	.249x.453 (6.3x11.5)	.249x.453 (6.3x11.5)	.315x.551 (8x14)	.394x.630 (10x16)	.394x.630 (10x16)	.394x.787 (10x20)	.492x.787 (12.5x20)
	3.3	.315x.551 (8x14)	.394x.630 (10x16)	.394x.630 (10x16)	.394x.787 (10x20)	.394x.787 (10x20)	.492x.787 (12.5x20)	.492x.984 (12.5x25)
	4.7	.394x.630 (10x16)	.394x.630 (10x16)	.394x.787 (10x20)	.492x.787 (12.5x20)	.492x.787 (12.5x20)	.492x.984 (12.5x25)	.630x.984 (16x25)
	10	.394x.787 (10x20)	.492x.787 (12.5x20)	.492x.984 (12.5x25)	.630x.984 (16x25)	.630x.984 (16x25)	.630x1.240 (16x31.5)	.630x1.390 (16x35.5)
	22	.492x.984 (12.5x25)	.630x.984 (16x25)	.630x.984 (16x25)	.630x1.390 (16x35.5)	.709x1.390 (18x35.5)	.709x1.575 (18x40)	
	33	.630x.984 (16x25)	.630x1.240 (16x31.5)	.630x1.240 (16x31.5)	.709x1.575 (18x40)			
	47	.630x1.240 (16x31.5)	.709x1.240 (18x31.5)	.709x1.240 (18x31.5)				
	100	.709x1.575 (18x40)						

NOTE: Smaller sizes are available on special order.

CAPAR COMPONENTS CORPORATION
303 Crossways Park Drive / Woodbury, New York 11797
Telephone: (516) 364-2610
Toll Free: 800-645-7474 / Telex: 144678

CAPACITORS
CDT SERIES
EPOXY DIPPED SOLID TANTALUM CAPACITORS

INTRODUCTION

CAPAR's Solid Tantalum Capacitors are manufactured for both high reliability over the temperature range of −55°C to +85°C, and low cost. Their external coating is an advanced electrostatic epoxy powder which can endure severe moisture.

Type CDT Capacitors are ideal for many applications where low cost, high capacitance, and small sizes benefit the product. The long life and stability of solid tantalum reduces servicing and will insure customer satisfaction in your product.

SPECIFICATIONS

1. Operating Temperature Range: −55°C to +85°C.
2. Voltage Range: 3.15 VDC to 50 VDC.
3. Capacitance Range: .1 mfd to 470 mfd.
4. Capacitance Tolerance: ±20%, ±10%.
5. Leakage Current: 1 = .02 CV or 1 microamp, whichever is greater where, 1 = max. leakage current (MA), c = rated capacitance (MF). V = rated voltage (V). Leakage current shall be measured after a 5 minute application of the rated dc working voltage through a 1000 ohm resistor.
6. Dissipation Factor

Capacitance	DF
.1 mfd - 47 mfd	8%
68 mfd - 100 mfd	10%
150 mfd - 470 mfd	12%

STANDARD RATING & CASE SIZE (DxL) EXPRESSED IN INCHES & (MILLIMETERS)

CAPACITANCE (μ)	Working Voltage / Surge Voltage	3.15 / 4	6.3 / 8	10 / 13	16 / 20	25 / 32	35 / 46	50 / 65
	.1 mfd							.177x.315 (4.5x8)
	.15							.177x.315 (4.5x8)
	.22							.177x.315 (4.5x8)
	.33						.177x.315 (4.5x8)	.197x.354 (5x9)
	.47						.177x.315 (4.5x8)	.236x.424 (6x10.5)
	.68					.177x.315 (4.5x8)	.197x.354 (5x9)	.236x.424 (6x10.5)
	1.0				.177x.315 (4.5x8)	.197x.354 (5x9)	.197x.354 (5x9)	.236x.424 (6x10.5)
	1.5			.177x.315 (4.5x8)	.197x.354 (5x9)	.197x.354 (5x9)	.236x.424 (6x10.5)	.256x.433 (6.5x11)
	2.2		.177x.315 (4.5x8)	.197x.354 (5x9)	.197x.354 (5x9)	.236x.424 (6x10.5)	.236x.424 (6x10.5)	.256x.433 (6.5x11)
	3.3	.177x.315 (4.5x8)	.197x.354 (5x9)	.197x.354 (5x9)	.236x.424 (6x10.5)	.236x.424 (6x10.5)	.236x.424 (6x10.5)	.256x.500 (6.5x12.7)
	4.7	.197x.354 (5x9)	.197x.354 (5x9)	.236x.424 (6x10.5)	.236x.424 (6x10.5)	.236x.424 (6x10.5)	.256x.433 (6.5x11)	.256x.500 (6.5x12.7)
	6.8	.197x.354 (5x9)	.236x.424 (6x10.5)	.236x.424 (6x10.5)	.236x.424 (6x10.5)	.256x.433 (6.5x11)	.256x.433 (6.5x11)	.350x.650 (8.9x16.5)
	10	.236x.424 (6x10.5)	.236x.424 (6x10.5)	.236x.424 (6x10.5)	.256x.433 (6.5x11)	.256x.433 (6.5x11)	.296x.512 (7.5x13)	.350x.650 (8.9x16.5)
	15	.236x.424 (6x10.5)	.236x.424 (6x10.5)	.256x.433 (6.5x11)	.256x.433 (6.5x11)	.296x.512 (7.5x13)	.335x.551 (8.5x14)	.350x.650 (8.9x16.5)
	22	.236x.424 (6x10.5)	.256x.433 (6.5x11)	.256x.433 (6.5x11)	.296x.512 (7.5x13)	.335x.551 (8.5x14)	.394x.612 (10x15.5)	
	33	.256x.433 (6.5x11)	.256x.433 (6.5x11)	.296x.512 (7.5x13)	.335x.551 (8.5x14)	.394x.612 (10x15.5)	.433x.631 (11x16)	
	47	.256x.433 (6.5x11)	.296x.512 (7.5x13)	.335x.512 (8.5x14)	.394x.612 (10x15.5)	.433x.631 (11x16)	.452x.571 (11.5x17)	
	68	.296x.512 (7.5x13)	.335x.512 (8.5x14)	.394x.612 (10x15.5)	.433x.631 (11x16)	.452x.571 (11.5x17)	.475x.850 (12x21.6)	
	100	.335x.512 (8.5x14)	.394x.612 (10x15.5)	.433x.631 (11x16)	.452x.571 (11.5x17)	.472x.571 (12x17)		
	150	.394x.612 (10x15.5)	.433x.631 (11x16)	.452x.571 (11.5x17)	.472x.571 (12x17)			
	220	.433x.631 (11x16)	.452x.571 (11.5x17)	.472x.571 (12x17)	.475x.850 (12x21.5)			
	330	.452x.571 (11.5x17)	.472x.571 (12x17)	.475x.850 (12x21.5)				
	470	.472x.571 (12x17)						

SIZES ARE SUBJECT TO CHANGE WITHOUT NOTICE

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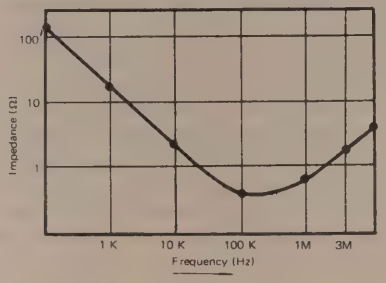
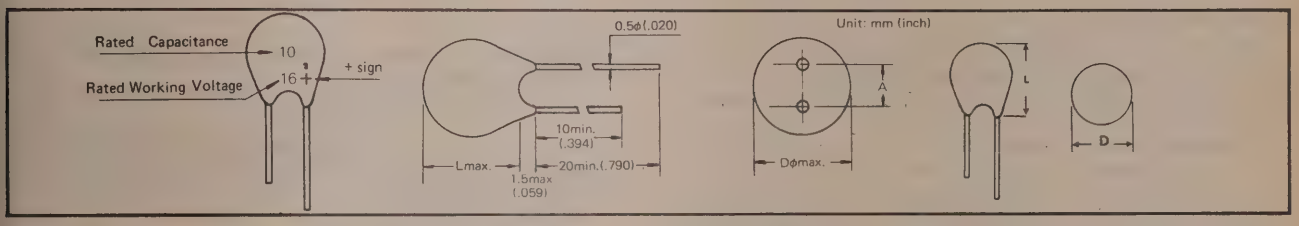
CAPACITORS
CDT SERIES
EPOXY DIPPED
SOLID TANTALUM CAPACITORS

LEAD SPACING
EXPRESSED IN INCHES AND MILLIMETERS

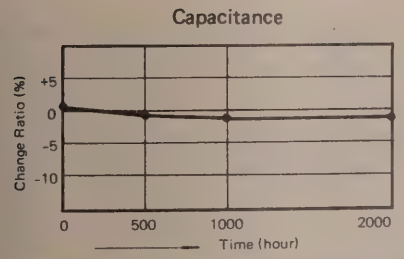
D-diameter (in.)	D-diameter (mm)	A-lead space (in.)	A-lead space (mm)
.177	(4.5)	.100	(2.5)
.197	(5)	.100	(2.5)
.236	(6)	.100	(2.5)
.256	(6.5)	.100	(2.5)
.296	(7.5)	.200	(5.0)
.335	(8.5)	.200	(5.0)
.394	(10)	.200	(5.0)
.433	(11)	.200	(5.0)
.452	(11.5)	.200	(5.0)
.472	(12)	.200	(5.0)

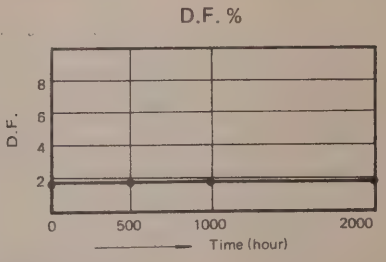
IMPEDANCE CHARACTERISTICS

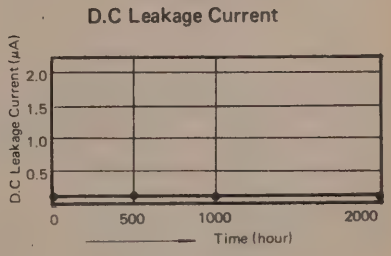




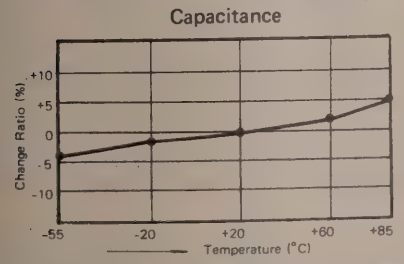
LIFE CHARACTERISTICS

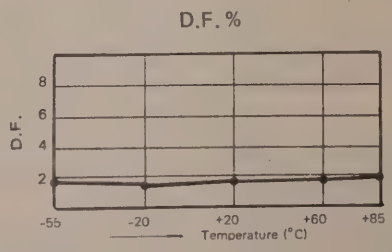


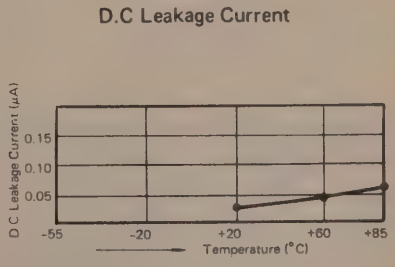




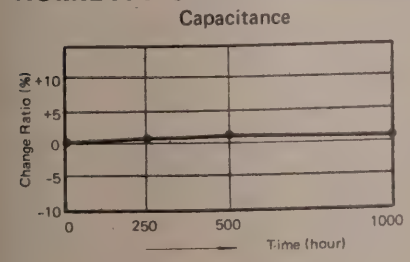
TEMPERATURE CHARACTERISTICS

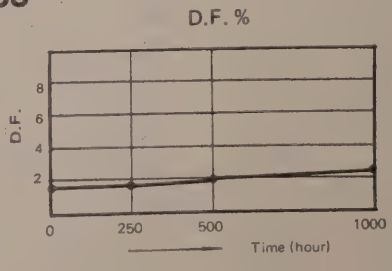


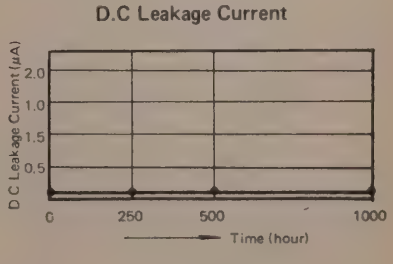




HUMIDITY CHARACTERISTICS







SIZES ARE SUBJECT TO CHANGE WITHOUT NOTICE

CAPAR COMPONENTS CORPORATION
303 Crossways Park Drive / Woodbury, New York 11797
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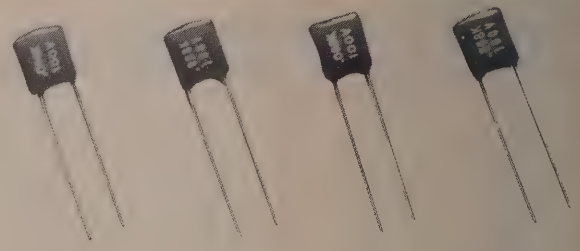
CAPACITORS
CEM SERIES
SUBMINIATURE POLYESTER FILM

INTRODUCTION

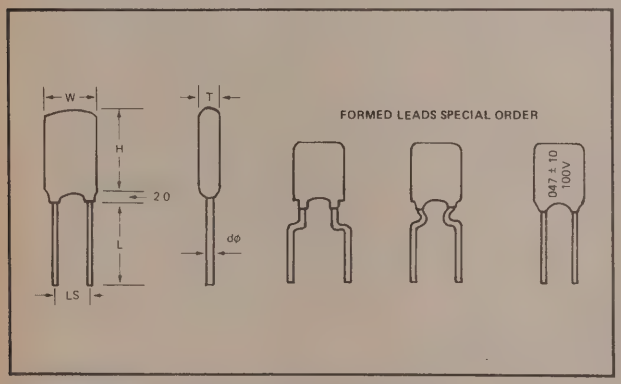
The CEM Subminiature Polyester Film Capacitor is suitable for easy insertion in PC boards. They are protected against moisture and soldering iron contact by four coatings of epoxy. The capacity and voltage are printed by thermo setting onto the body of the unit to insure legibility after production handling. The CEM capacitors may be used in many applications, such as filtering, bypass, coupling, low volt vacuum tube or transistor circuits, etc., in entertainment and commercial equipment. These capacitors may be operated at 85°C at full rated voltage.



We can supply lead spacing to your specifications.

SPECIFICATIONS

1. Capacitance Tolerance: ±10% (K), ±5% (J).
2. Voltage Range: 100, 250, 400 VDC working.
3. Dielectric Strength: 2.5 times rated working voltage applied for 1 minute at 25°C.
4. Dissipation Factor: Less than 1% at 1 kHz at 25°C.
5. Temperature Range: −25°C to +85°C.
6. Insulation Resistance: 30,000 megohms (min.) at 25°C.
7. Humidity Resistance: After 100 hours at a relative humidity of 90%-95% at 40°C and 16 hours at normal humidity at 25°C (no voltage applied):
   (a) Capacitance shall be within 10% of that measured before test.
   (b) Insulation resistance shall be greater than 2,700 megohms.
8. Life Test: Capacitor will withstand 250 hours at 85°C with test voltage of 1.5 times rated working voltage applied. At conclusion of test:
   (a) IR shall be greater than 4,500 megohms.
   (b) DF shall not exceed 1%.
   (c) Capacitance shall be within 8% of that measured before test.



DIMENSIONS — INCHES & (MILLIMETERS) (MAXIMUM SIZES)

Value	Height (H)	Width (W)	Thickness (T)	Lead-Space (LS)	Lead Diam. (d)
100 WV					
.001 mfd	.472 (12.0)	.217 (5.5)	.138 (3.5)	.100 (2.5)	.020 (.5)
.0015	.472 (12.0)	.217 (5.5)	.138 (3.5)	.100 (2.5)	.020 (.5)
.0022	.472 (12.0)	.236 (6.0)	.138 (3.5)	.100 (2.5)	.020 (.5)
.0033	.472 (12.0)	.236 (6.0)	.138 (3.5)	.120 (3.0)	.020 (.5)
.0047	.472 (12.0)	.236 (6.0)	.138 (3.5)	.120 (3.0)	.020 (.5)
.0056	.472 (12.0)	.236 (6.0)	.138 (3.5)	.120 (3.0)	.020 (.5)
.0068	.472 (12.0)	.236 (6.0)	.138 (3.5)	.120 (3.0)	.020 (.5)
.01	.472 (12.0)	.256 (6.5)	.158 (4.0)	.140 (3.5)	.020 (.5)
.015	.472 (12.0)	.276 (7.0)	.158 (4.0)	.160 (4.0)	.020 (.5)
.022	.472 (12.0)	.296 (7.5)	.158 (4.0)	.180 (4.5)	.020 (.5)
.033	.492 (12.5)	.335 (8.5)	.178 (4.5)	.200 (5.0)	.020 (.5)
.047	.512 (13.0)	.374 (9.5)	.217 (5.5)	.240 (6.0)	.020 (.5)
.056	.512 (13.0)	.394 (10.0)	.217 (5.5)	.240 (6.0)	.024 (.6)
.068	.512 (13.0)	.394 (10.0)	.236 (6.0)	.275 (7.0)	.024 (.6)
.1	.551 (14.0)	.512 (13.0)	.354 (9.0)	.300 (7.5)	.024 (.6)
.15	.768 (19.5)	.512 (13.0)	.354 (9.0)	.315 (8.0)	.024 (.6)
.22	.787 (20.0)	.591 (15.0)	.374 (9.5)	.325 (8.5)	.024 (.6)
.33	.925 (23.5)	.649 (16.5)	.374 (9.5)	.400 (10.5)	.024 (.6)
.47	1.02 (26.0)	.748 (19.0)	.532 (13.5)	.500 (12.5)	.024 (.6)

Value	Height (H)	Width (W)	Thickness (T)	Lead-Space (LS)	Lead Diam. (d)
250 WV					
.001 mfd	.472 (12.0)	.256 (6.5)	.158 (4.0)	.120 (3.0)	.020 (.5)
.0015	.472 (12.0)	.256 (6.5)	.158 (4.0)	.120 (3.0)	.020 (.5)
.0022	.472 (12.0)	.256 (6.5)	.158 (4.0)	.120 (3.0)	.020 (.5)
.0033	.472 (12.0)	.256 (6.5)	.158 (4.0)	.120 (3.0)	.020 (.5)
.0047	.472 (12.0)	.256 (6.5)	.158 (4.0)	.120 (3.0)	.020 (.5)
.0056	.472 (12.0)	.256 (6.5)	.158 (4.0)	.120 (3.0)	.020 (.5)
.0068	.472 (12.0)	.276 (7.0)	.178 (4.5)	.160 (4.0)	.020 (.5)
.01	.492 (12.5)	.296 (7.5)	.178 (4.5)	.160 (4.0)	.020 (.5)
.015	.472 (12.0)	.335 (8.5)	.197 (5.0)	.180 (4.5)	.020 (.5)
.022	.512 (13.0)	.374 (9.5)	.217 (5.5)	.240 (6.0)	.020 (.5)
.033	.551 (14.0)	.414 (10.5)	.256 (6.5)	.260 (6.5)	.024 (.6)
.047	.571 (14.5)	.472 (12.0)	.296 (7.5)	.275 (7.0)	.024 (.6)
.056	.571 (14.5)	.472 (12.0)	.296 (7.5)	.275 (7.0)	.024 (.6)
.068	.649 (16.5)	.492 (12.5)	.315 (8.0)	.275 (7.0)	.024 (.6)
.1	.768 (19.5)	.571 (14.5)	.335 (8.5)	.325 (8.5)	.024 (.6)
.15	.797 (20.5)	.649 (16.5)	.414 (10.5)	.400 (10.0)	.024 (.6)
.22	.984 (25.0)	.670 (17.0)	.414 (10.5)	.400 (10.0)	.024 (.6)
.33	1.00 (25.5)	.768 (19.5)	.532 (13.5)	.475 (12.0)	.028 (.7)
.47	1.08 (27.5)	.797 (20.5)	.571 (14.5)	.520 (13.0)	.028 (.7)
400 WV					
.001	.472 (12.0)	.256 (6.5)	.158 (4.0)	.120 (3.0)	.020 (.5)
.0015	.472 (12.0)	.256 (6.5)	.158 (4.0)	.120 (3.0)	.020 (.5)
.0022	.472 (12.0)	.256 (6.5)	.158 (4.0)	.120 (3.0)	.020 (.5)
.0033	.472 (12.0)	.276 (7.0)	.158 (4.0)	.140 (3.5)	.020 (.5)
.0047	.492 (12.5)	.296 (7.5)	.178 (4.5)	.160 (4.0)	.020 (.5)
.0056	.492 (12.5)	.296 (7.5)	.178 (4.5)	.160 (4.0)	.020 (.5)
.0068	.492 (12.5)	.315 (8.0)	.197 (5.0)	.180 (4.5)	.020 (.5)
.01	.532 (13.5)	.374 (9.5)	.217 (5.5)	.220 (5.5)	.024 (.6)
.015	.532 (13.5)	.532 (13.5)	.236 (6.0)	.240 (6.0)	.024 (.6)
.022	.571 (14.5)	.571 (14.5)	.276 (7.0)	.260 (6.5)	.024 (.6)
.033	.649 (16.5)	.649 (16.5)	.335 (8.5)	.260 (6.5)	.024 (.6)
.047	.768 (19.5)	.768 (19.5)	.354 (9.0)	.275 (7.0)	.024 (.6)
.056	.768 (19.5)	.768 (19.5)	.374 (9.5)	.275 (7.0)	.024 (.6)
.068	.797 (20.5)	.797 (20.5)	.374 (9.5)	.315 (8.0)	.024 (.6)
.1	1.00 (25.5)	1.00 (25.5)	.433 (11.0)	.360 (9.0)	.028 (.7)
.15	1.00 (25.5)	1.00 (25.5)	.453 (11.5)	.420 (10.5)	.028 (.7)
.22	1.04 (26.5)	1.04 (26.5)	.532 (13.5)	.475 (12.0)	.028 (.7)
.33	1.10 (28.0)	1.10 (28.0)	.670 (17.0)	.600 (15.0)	.028 (.7)
.47	1.10 (28.0)	1.10 (28.0)	.670 (17.0)	.600 (15.0)	.028 (.7)

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CAPACITORS
CCD SERIES
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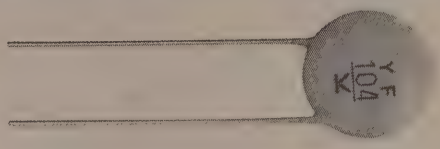
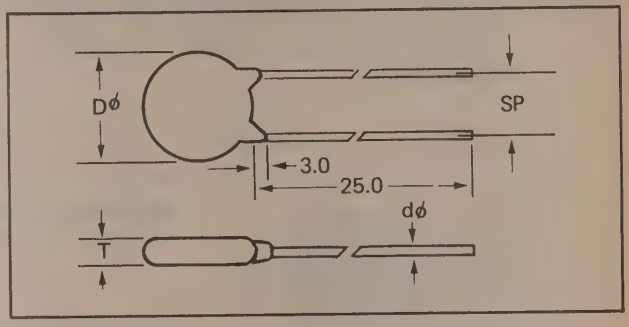
INTRODUCTION

CAPAR's High Dielectric Constant Ceramic Disc Capacitors are designed for today's Transistor Circuitry. These discs have excellent moisture-proof, heat resistance and life characteristics. The CCD Series discs are being used today in by-pass and coupling circuits, in a wide variety of commercial and entertainment equipment. CAPAR stocks millions of these components in all the popular sizes, voltages and tolerances. They are very low in price to insure cost savings for your production.





FEATURES

1. Barium titanate ceramic dielectric of high dielectric constant.
2. High capacitance values available in small sizes.
3. Resin dipped and wax impregnated.
4. Excellent heat and moisture resistance.
5. Negligible decrease in insulation resistance due to temperature increase.

SPECIFICATIONS

1. Operating Temp. and Characteristics:

Capar Type	EIA RS-198	Temp. Range (°C)	Capacitance Change (%)
YA:	Y5E	−30 to +85	±5
YB:	Y5P, Y5R	−30 to +85	±10
YE:	Y5R	−25 to +85	−55 to +20
YF:	Y5V	−25 to +85	−80 to +30

2. Capacitance Range:
   YA: 1.0 pf to 22,000 pf
   YB: 1,000 pf to 22,000 pf
   YE: 3,000 pf to 68,000 pf
   YF: 5,000 pf to 200,000 pf
3. Working Voltage: 16, 25, 50 VDC.
4. Withstanding Voltage: 2.5 times of rated working voltage for 1-5 seconds.
5. Maximum Dissipation Factor:
   Type YA, YB, YE: 2.5%
   Type YF: 5%.
6. Insulation Resistance: Min. 10,000 Mohms at 50 VDC for 1 minute.
7. Capacitance Tolerance: K: 10%, M: 20%, Z: −20% to +80%.
8. Lead Pull Test: Withstand axial pull of 0.5 Kgrs. for 1-5 seconds.
9. Lead Bend Test: Withstand 2 turns of 90° with 0.5 Kgrs. load.

DIMENSIONS — INCHES & (MILLIMETERS) (MAXIMUM) — 50 WV

Capacitance	Temp. Char.	Cap. Tol.	Diameter (D)	Thickness (T)	Lead Space (SP)	Lead Diam. (d)
1.0-220 pf	YB, YA	M	.250 (6.3)	.160 (4.0)	.100 (2.5)	.016 (.4)
270-470 pf	YB, YA	M	.250 (6.3)	.160 (4.0)	.100 (2.5)	.016 (.4)
560 pf	YB, YA	M	.250 (6.3)	.160 (4.0)	.160 (4.0)	.020 (.5)
680 pf	YB, YA	M	.250 (6.3)	.160 (4.0)	.160 (4.0)	.020 (.5)
820 pf	YB, YA	M	.250 (6.3)	.160 (4.0)	.160 (4.0)	.020 (.5)
1000 pf	YB, YA	M	.250 (6.3)	.160 (4.0)	.160 (4.0)	.020 (.5)
1500 pf	YB, YA	M	.250 (6.3)	.160 (4.0)	.200 (5.0)	.020 (.5)
2200 pf	YB, YA	M	.312 (7.9)	.160 (4.0)	.200 (5.0)	.020 (.5)
2700 pf	YB, YA	M	.312 (7.9)	.160 (4.0)	.200 (5.0)	.020 (.5)
3300 pf	YB, YA	M	.345 (8.7)	.160 (4.0)	.240 (6.0)	.020 (.5)
3900 pf	YB, YA	M	.394 (10.0)	.160 (4.0)	.240 (6.0)	.020 (.5)
4700 pf	YB, YA	M	.394 (10.0)	.160 (4.0)	.240 (6.0)	.020 (.5)
5600 pf	YB, YA	M	.500 (12.7)	.160 (4.0)	.240 (6.0)	.020 (.5)
6800 pf	YB, YA	M	.500 (12.7)	.160 (4.0)	.240 (6.0)	.020 (.5)
8200 pf	YB, YA	M	.500 (12.7)	.160 (4.0)	.280 (7.0)	.020 (.5)
.01 mfd	YB, YA	M	.500 (12.7)	.160 (4.0)	.280 (7.0)	.020 (.5)
.022 mfd	YB, YA	M	.580 (14.7)	.160 (4.0)	.350 (9.0)	.020 (.5)
3300 pf	YE	M, Z	.250 (6.3)	.160 (4.0)	.160 (4.0)	.020 (.5)
4700 pf	YE	M, Z	.250 (6.3)	.160 (4.0)	.160 (4.0)	.020 (.5)
6800 pf	YE	M, Z	.276 (7.0)	.160 (4.0)	.200 (5.0)	.020 (.5)
.01 mfd	YE	M, Z	.345 (8.7)	.160 (4.0)	.240 (6.0)	.020 (.5)
.015 mfd	YE	M, Z	.370 (9.6)	.160 (4.0)	.240 (6.0)	.020 (.5)
.022 mfd	YE	M, Z	.414 (10.5)	.160 (4.0)	.280 (7.0)	.020 (.5)
.033 mfd	YE	M, Z	.512 (13.0)	.160 (4.0)	.280 (7.0)	.020 (.5)
.047 mfd	YE	M, Z	.545 (13.9)	.160 (4.0)	.280 (7.0)	.020 (.5)
.068 mfd	YE	M, Z	.645 (16.4)	.160 (4.0)	.350 (9.0)	.020 (.5)
5000 pf	YF	Z	.250 (6.3)	.160 (4.0)	.160 (4.0)	.020 (.5)
.01 mfd	YF	Z	.250 (6.3)	.160 (4.0)	.160 (4.0)	.020 (.5)
.022 mfd	YF	Z	.312 (7.9)	.160 (4.0)	.200 (5.0)	.020 (.5)
.047 mfd	YF	Z	.414 (10.5)	.160 (4.0)	.240 (6.0)	.020 (.5)
.05 mfd	YF	Z	.440 (11.2)	.160 (4.0)	.240 (6.0)	.020 (.5)
.1 mfd	YF	Z	.500 (12.7)	.160 (4.0)	.280 (7.0)	.020 (.5)
.2 mfd	YF	Z	.710 (18.7)	.160 (4.0)	.350 (9.0)	.020 (.5)

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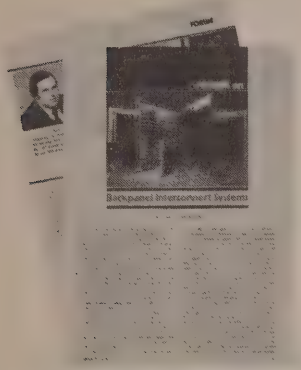

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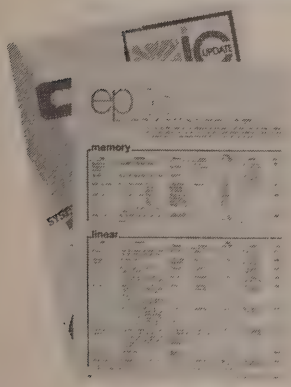

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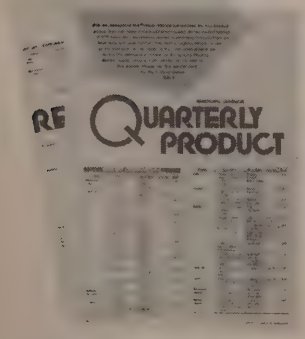

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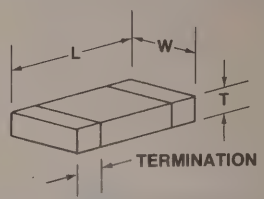
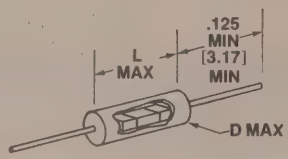


CHIP CAPACITORS

CENTRE PART NO.	MAXIMUM CAPACITANCE									SIZES		
	NP0 (pf)			W5R (mfd)			Z5U (mfd)			L	W	T
	50v	100v	200v	50v	100v	200v	50v	100v	200v			
uc01	620	470	270	.02	.01	.0056	.022	.0082	.001	.080 [2.03]	.050 [1.27]	.055 max. [1.40 max.]
uc02	1000	680	420	.027	.015	.0082	.033	.01	.0015	.100 [2.54]	.050 [1.27]	.065 max. [1.65 max.]
uc21	3300	2500	1500	.082	.047	.027	.12	.047	.0082	.125 [3.17]	.095 [2.41]	.065 max. [1.65 max.]
uc31	6800	4700	3900	.2	.12	.082	.27	.1	.018	.180 [4.57]	.120 [3.05]	.065 max. [1.65 max.]
uc33	3900	3300	2200	.1	.068	.042	.2	.082	.012	.180 [4.57]	.080 [2.03]	.065 max. [1.65 max.]
uc34	5600	4200	3000	.15	.1	.056	.22	.1	.015	.160 [4.06]	.130 [3.30]	.065 max. [1.65 max.]
uc35	20000	15000	10000	.47	.33	.2	1.0	.39	.068	.260 [6.60]	.220 [5.59]	.065 max. [1.65 max.]
uc36	15000	12000	8200	.39	.28	.15	.82	.33	.056	.245 [6.22]	.205 [5.21]	.065 max. [1.65 max.]
uc37	12000	10000	6800	.33	.22	.12	.68	.3	.047	.180 [4.57]	.265 [6.73]	.065 max. [1.65 max.]
uc39	33000	33000	22000	.68	.68	.42	2.0	.68	.12	.360 [9.14]	.320 [8.13]	.065 max. [1.65 max.]
uc40	18000	12000	8200	.42	.25	.15	.68	.27	.047	.325 [8.25]	.155 [3.94]	.065 max. [1.65 max.]
uc41	50000	50000	33000	1.5	1.0	.68	3.9	1.2	.22	.460 [11.68]	.420 [10.67]	.065 max. [1.65 max.]
uc43	2200	1800	1000	.05	.033	.018	.082	.033	.0056	.180 [4.57]	.050 [1.27]	.065 max. [1.65 max.]
uc44	20000	15000	10000	.47	.33	.2	82	33	.056	.225 [5.71]	.250 [6.35]	.065 max. [1.65 max.]

Note: Tolerance on dimensions-
± .010 for less than .100 [± .25 for less than 2.54]
± .015 for .100 or greater [± .38 for 2.54 or greater]



GLASS SEALED DEVICES

CENTRE PART NO	NPO(COG)									
	G1710			G2610			G4015			
L MAX	.170 [4.32]			.260 [6.60]			.400 [10.16]			
D MAX	.100 [2.54]			.100 [2.54]			.150 [3.81]			
Capacitance (pf)	WVDC			WVDC			WVDC			Capacitance Code (EIA)
	200	100	50	200	100	50	200	100	50	
1.0										100
1.2										120
1.5										150
1.8										180
2.2										220
2.7										270
3.3										330
3.9										390
4.7										470
5.6										560
6.8										680
8.2										820
10										101
12										121
15										151
18										181
22										221
27										271
33										331
39										391
47										471
56										561
68										681
82										821
100										102
120										122
150										152
180										182
220										222
270										272
330										332
390										392
470										472
560										562
680										682
820										822
1000										103
1200										123
1500										153
1800										183
2200										223
2700										273
3300										333
3900										393
4700										473
5600										563
6800										683
8200										823
10 000										104
12 000										123
15 000										153
18 000										183
22 000										223
27 000										273
33 000										333
39 000										393
47 000										473
56 000										563
68 000										683
82 000										823
100 000										104
120 000										124
150 000										154
180 000										184
220 000										224
270 000										274
330 000										334

CENTRE PART NO.	X7R(W)									
	G1710			G2610			G4015			
L MAX	.170 [4.32]			.260 [6.60]			.400 [10.16]			
D MAX	.100 [2.54]			.100 [2.54]			.150 [3.81]			
Capacitance (pf)	WVDC			WVDC			WVDC			Capacitance Code (EIA)
	200	100	50	200	100	50	200	100	50	
68										683
82										823
100										104
120										124
150										154
180										184
220										224
270										274
330										334
390										394
470										474
560										564
680										684
820										824
1000										105
1200										125
1500										155
1800										185
2200										225

CENTRE PART NO.	Y5V									
	G1710			G2610			G4015			
L MAX	.170 [4.32]			.260 [6.60]			.400 [10.16]			
D MAX	.100 [2.54]			.100 [2.54]			.150 [3.81]			
Capacitance (pf)	WVDC			WVDC			WVDC			Capacitance Code (EIA)
	100	50	25	100	50	25	100	50	25	
470										471
560										561
680										681
820										821
1000										102
1200										122
1500										152
1800										182
2200										222
2700										272
3300										332
3900										392
4700										472
5600										562
6800										682
8200										822
10 000										103
12 000										123
15 000										153
18 000										183
22 000										223
27 000										273
33 000										333
39 000										393
47 000										473
56 000										563
68 000										683
82 000										823
100 000										104
120 000										124
150 000										154
180 000										184
220 000										224
270 000										274
330 000										334
390 000										394
470 000										474
560 000										564
680 000										684
820 000										824
1 000 000										105
1 200 000										125
1 500 000										155
1 800 000										185
2 200 000										225

Metric dimensions are shown in brackets.

CENTRE ENGINEERING

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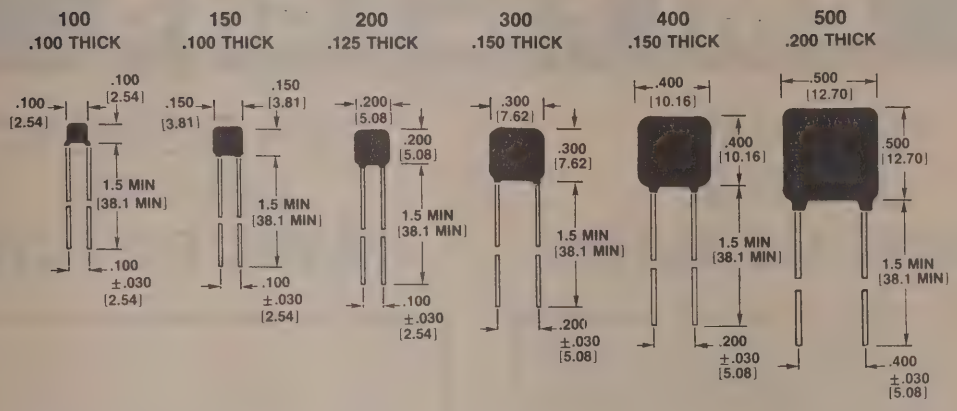

POLYMER COATED LEADED DEVICES

Multi-layer polymer coated leaded devices for applications in circuits requiring high dielectric constant in order to provide maximum capacitance to volume ratio consistent with excellent performance and reliability at temperatures between –55°C and 125° C Single layer construction offers most economical means for by-pass and non-critical coupling applications consistent with extremely high capacitance-to-volume ratio.

POLYMER COATED LEADED DEVICES

ULTRA STABLE 100 Volt -55° C to 125° C

PART NUMBER	CAP.	TOL.
100-100 NPO 109B	1.	±.1pF
100-100 NPO 129B	1.2	±.1pF
100-100 NPO 159B	1.5	±.1pF
100-100 NPO 189B	1.8	±.1pF
100-100 NPO 229C	2.2	±.25pF
100-100 NPO 279C	2.7	±.25pF
100-100 NPO 339C	3.3	±.25pF
100-100 NPO 479D	4.7	±.5pF
100-100 NPO 569D	5.6	±.5pF
100-100 NPO 689D	6.8	±.5pF
100-100 NPO 829D	8.2	±.5pF
100-100 NPO 100K	10	±10%
150-100 NPO 150K	15	±10%
150-100 NPO 220K	22	±10%
200-100 NPO 330K	33	±10%
200-100 NPO 470K	47	±10%
200-100 NPO 680K	68	±10%
200-100 NPO 101K	100	±10%
200-100 NPO 151K	150	±10%
200-100 NPO 221K	220	±10%
200-100 NPO 331K	330	±10%
200-100 NPO 471K	470	±10%
200-100 NPO 681K	680	±10%
200-100 NPO 102K	1000	±10%
300-100 NPO 152K	1500	±10%
300-100 NPO 222K	2200	±10%
300-100 NPO 332K	3300	±10%
400-100 NPO 472K	4700	±10%
400-100 NPO 682K	6800	±10%
400-100 NPO 103K	.01	±10%

STABLE 100 Volt -55° C to 125° C

PART NUMBER	CAP.	TOL.
100-100 W5R 151K	150	±10%
100-100 W5R 221K	220	±10%
100-100 W5R 331K	330	±10%
150-100 W5R 471K	470	±10%
150-100 W5R 681K	680	±10%
200-100 W5R 102K	1000	±10%
200-100 W5R 152K	1500	±10%
200-100 W5R 222K	2200	±10%
200-100 W5R 332K	3300	±10%
200-100 W5R 472K	4700	±10%
200-100 W5R 682K	6800	±10%
200-100 W5R 103K	.01	±10%
300-100 W5R 153K	.015	±10%
300-100 W5R 223K	.022	±10%
300-100 W5R 333K	.033	±10%
300-100 W5R 473K	.047	±10%
300-100 W5R 683K	.068	±10%
300-100 W5R 104K	.1	±10%
400-100 W5R 224K	.22	±10%
500-100 W5R 334K	.33	±10%
500-100 W5R 474K	.47	±10%
500-100 W5R 564K	.56	±10%

STABLE 50 Volt

PART NUMBER	CAP.	TOL.
400-050 W5R 334K	.33	±10%
400-050 W5R 474K	.47	±10%
500-050 W5R 684K	.68	±10%
500-050 W5R 105K	1.0	±10%

GENERAL PURPOSE

100 Volt -55° C to 85° C PART NUMBER	CAP.	TOL.	50 Volt -55° C to 85° C PART NUMBER
100-100-601-471M	470	±20%	100-050-601-471M
100-100-601-681M	680	±20%	100-050-601-681M
100-100-601-102M	1000	±20%	100-050-601-102M
100-100-601-152M	1500	±20%	100-050-601-152M
150-100-601-182M	1800	±20%	150-050-601-182M
150-100-601-222M	2200	±20%	150-050-601-222M
150-100-601-272M	2700	±20%	150-050-601-272M
150-100-601-332M	3300	±20%	150-050-601-332M
200-100-601-472M	4700	±20%	200-050-601-472M
200-100-601-682M	6800	±20%	200-050-601-682M
200-100-601-103M	.01	±20%	200-050-601-103M
200-100-601-153M	.015	±20%	200-050-601-153M
200-100-601-223M	.022	±20%	200-050-601-223M
200-100-601-273M	.027	±20%	200-050-601-273M
200-100-601-333M	.033	±20%	200-050-601-333M
200-100-601-473M	.047	±20%	200-050-601-473M
200-100-601-683M	.068	±20%	200-050-601-683M
	.1	±20%	200-050-601-104M
300-100-601-104M	.1	±20%	300-050-601-104M
300-100-601-154M	.15	±20%	200-050-601-154M
300-100-601-224M	.22	±20%	300-050-601-224M
300-100-601-274M	.27	±20%	
300-100-601-334M	.33	±20%	300-050-601-334M
300-100-601-474M	.47	±20%	300-050-601-474M
400-100-601-684M	.68	±20%	300-050-601-684M
400-100-601-105M	1.0	±20%	300-050-601-105M
500-100-601-155M	1.5	±20%	400-050-601-155M
500-100-601-225M	2.2	±20%	400-050-601-225M
	3.3	±20%	500-050-601-335M
	4.7	±20%	500-050-601-475M

These catalog pages contain only a sample of ceramic capacitors available from Centre Engineering. For additional information please write or call for our new catalog.

Metric dimensions are shown in brackets.

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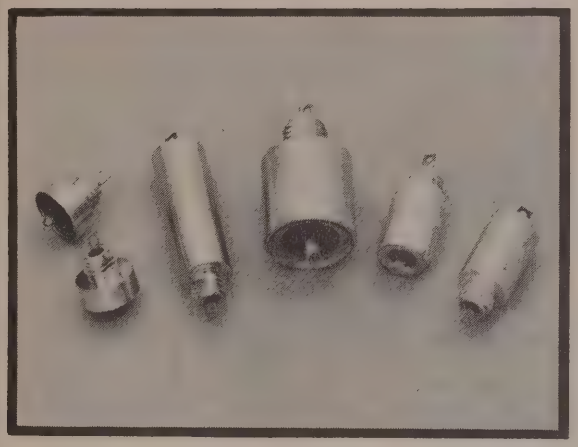
EMI FILTERS

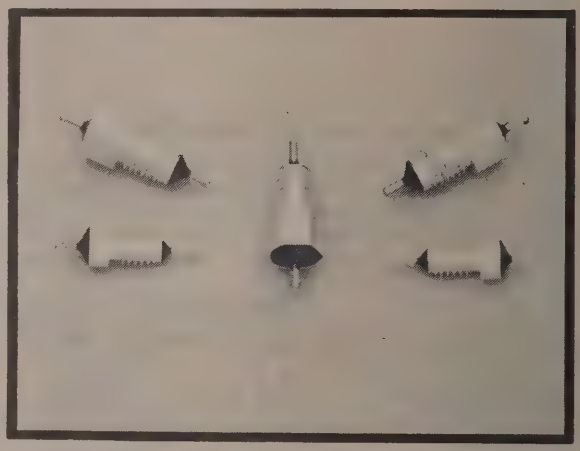
BROADBAND LOW PASS CERAMIC EMI FILTERS



Designed, fabricated and tested to comply with Mil-F-15733 or your exact specifications, Centre's Broadband Low Pass Ceramic EMI filters attenuate high frequency energy in the 10 KHz to 10 GHz range. Centre's basic ceramic monolithic capacitor forms the vital nucleus of this EMI filter used in quality sensitive applications. Centre's stringent in-house quality control program, including mechanical, environmental and electrical testing, assures the utmost in product reliability and performance.

- Frequency range 10 KHz to 10 GHz
- Current ratings — 60 MA to 20 AMP
- AC voltage ratings — 125 VAC and 185 VAC to 400 Hz
- DC voltage ratings — 50 VDC to 300 VDC
- C, L, Pi and T Sections available
- Insertion loss — 4 db to > 80 db over the frequency range
- Standard and custom designs
- Hermetically sealed
- Variety of diameters — .375, .410 and .645
- Variety of plating available (electro-tin, gold and silver)

HIGH FREQUENCY LOW PASS CERAMIC EMI FILTERS



Offering the advantages of small size and minimum weight, Centre's High Frequency Low Pass (HFLP) Ceramic EMI filters are available in three styles. They provide reliable attenuation in the 10 MHz to 10 GHz frequency range. Through intensive in-process control from raw materials to finished product, Centre's HFLPs meet rigid military and exact customer specifications.

- Frequency range 10 MHz to 10 GHz
- Current ratings — 3 AMP to 10 AMP
- Voltage rating — 200 VDC
- Insertion loss — 10 db to > 80 db over the frequency range
- Extremely small size in a variety of compact packages
- Higher attenuation than typical feedthrough capacitors
- Contact, eyelet and bolt styles available
- Capacitance from 2500 pf to 5500 pf

QUALITY SETS STANDARDS

The following is a selection of the more advanced Aluminum Electrolytic Capacitors that meet today's stringent electronic and environmental demands.

This partial listing on pages — offers you a wide choice of extended Temperature range units for special electric/electronic requirements — (Low impedance, High frequency, Low ESR, Low DC Leakage, Maximum Ripple Limits, Extended Capacitance, and High Vibration and Shock Resistance).

On pages and , a selector guide lists all standard Extended Temperature Range, Computer Grade, and Industrial Grade capacitors available from Industrial Distributors.

Write for complete details on:

- Dipped Mica Capacitors, Established Reliability (CMR/MIL-C-39001), MIL Spec (CMO/MIL C-5), and Industrial.
- Standard and Special EMI Filters.
- Film Dielectric Capacitors.
- Electro-Mechanical Relays.
- A.C. Motor Run (Non-PCB, Pressure Interrupter) and Motor Start, SCR Commutating and Lighting Capacitors.
- High Voltage and Energy Storage D.C. Capacitors.
- Tantalum Foil and Wet Anode Electrolytic Capacitors.
- Power Factor Correction Capacitors.

THE MARK OF QUALITY IS ON EVERYTHING WE MAKE

CDE

CORNELL-DUBILIER ELECTRIC CORPORATION

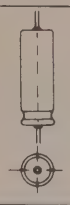
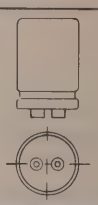
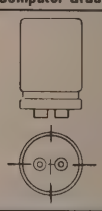
SUBSIDIARY OF FEDERAL PACIFIC ELECTRIC COMPANY

150 Avenue L, Newark, N.J. 07101/35 Mobile Dr., Toronto, Ontario, Canada M4A2P6

Electrolytic Capacitors, Aluminum

CDE CORNELL-DUBILIER

SELECTOR GUIDE

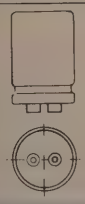
		Extended Temperature Range					Computer Grade	
FORM FACTOR								
CDE CATALOG DESIGNATION	UFT/UFTA	UHH	UHL	HNLH	UPC	UFH	FAH/FAL	FAHM/FALM
OPERATING TEMP. RANGE LOW	−55°C	−55°C	−55°C	−80°C	−55°C	−55°C	−40°C	−40°C
OPERATING TEMP. RANGE HIGH	+105°C	+105°C	+125°C	+110°C	+105°C	+105°C	+85°C	+85°C
VOLTAGE all DC except where otherwise noted	5 to 200	5 to 200	5 to 200	3 to 150	6.3 to 100	5 to 200	3 to 450	3 to 100
CAPACITANCE Range, Mfd	50 to 16,000	16 to 13,000	3.3 to 1,000	1 to 600	47 to 1200	190 to 310,000	70 to 1,000,000	900 to 1,000,000
CAPACITANCE + Standard Tolerance	+75%	+75%	+75%	+75%	+100%	5 to 50V: +100% >50V: +75%	3 to 50V: +100% 51 to 350V: +75% >350V: +50%	3 to 50V: +100% >50V: +75%
CAPACITANCE −	−10%	−10%	−10%	−10%	−10%	−10%	−10%	−10%
% MINIMUM CAPACITANCE @ lowest rated temperature depending on voltage	70% to 90%	65% to 90%	70% to 90%	50% to 75%	70% to 75%	60% to 65%	40% to 50%	40% to 50%
DISSIPATION FACTOR, Max. 120Hz @ 25°C	% D.F. = $\frac{ESR \times C}{13.26}$ ESR Range .022 to 2.6 ohms	% D.F. = $\frac{ESR \times C}{13.26}$ ESR Range .04 to 8.7 ohms	≦30V: 20% >30V: 10%	≦15V: 20% 16-50V: 15% >50V: 10%	≦15V: 15% 20–40V: 10% 50–100V: 7%	% D.F. = $\frac{ESR \times C}{13.26}$ ESR Range .010 to .68 ohms	% D.F. = $\frac{ESR \times C}{13.26}$ ESR Range .01 to 1.7 ohms	% D.F. = $\frac{ESR \times C}{13.26}$ ESR Range .01 to .38 ohms
LEAKAGE milliamp., unless otherwise stated or shown @ 25°C	$0.5 \sqrt{CV}$ μ amps	$0.5 \sqrt{CV}$ μ amps	2.0 to 10.0 μ amps depending on rating	1.0 to 13.5 μ amps	5.5 to 23.9 μ amps	$.0015 \sqrt{CV}$	$.006 \sqrt{CV}$	$.006 \sqrt{CV}$
RIPPLE CURRENT milliamp. @ 120Hz and max. rated temp.	100 to 3,000	100 to 3,000	80 to 1900	10 to 316	610 to 2230	700 to 17,000	660 to 30,600	1700 to 30,600
LIFE Operating @ max. rated tem.	2,000 hours	2,000 hours	2,000 hours	2,000 hours	2,000 hours	2,000 hours	2,000 hours	2,000 hours
LIFE Shelf	2 years	2 years	2 years	1 year @ 40°C	1 year @ 40°C	2 years	2 years	2 years
CASE MATERIAL	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum
TERMINALS	Four leads	Axial lead	Axial lead	Axial lead	PC	Screw	Screw	Screw
MOUNTINGS	Lead	Lead	Lead	Lead	Lead	Ring	Ring	Ring
DIMENSIONS Inches	.785 x 1.843 to 1.035 x 3.843	.660 x 1.187 to 1.035 x 3.687	.281 x .937 to .375 x 2.687	.25 x .625 to .375 x 1.5	.525 x 1.165 to .525 x 1.790	1.375 x 2.125 to 3.0 x 8.625	1.375 x 2.125 to 3.0 x 8.625	1.375 x 2.125 to 3.0 x 8.625
CDE CATALOG, CLASS NO.	201.68	201.63	201.62	201.17	201.40	201.65	201.87	201.47

*Type WNP is non-polarized version of WBR.
NA = Not Applicable

CDE CORNELL-DUBILIER

Electrolytic Capacitors, Aluminum

SELECTOR GUIDE (Cont'd)

Computer Grade			Industrial Grade				
							FORM FACTOR
FAM	NLW	WHB	WNP*, WBR	LMT	PC	ETW	CDE CATALOG DESIGNATION
−40°C	−40°C	−40°C	−40°C	−40°C	−40°C	+25°C	OPERATING TEMP. RANGE — LOW
+85°C	+105°C	+85°C	<450V: +85°C >450V: +65°C	+85°C	+85°C	+65°C	OPERATING TEMP. RANGE — HIGH
3 to 100	3 to 150	2.5 to 450	3 to 700	3 to 150	6 to 100	110 to 330 VAC	VOLTAGE All DC except where otherwise noted.
600 to 600,000	1 to 1500	1 to 18,000	1 to 45,000	1 to 100	1 to 1,000	14 to 765	CAPACITANCE — Range, Mfd
+100%	75%	2.5 to 75V: +75% >75V: +50%	3 to 50V: +150% 51 to 350V: +100% >350V: +75%	+100%	+150%	+10%	CAPACITANCE — + Standard Tolerance
−10%	−10%	−10%	−10%	−10%	−15%	−10%	CAPACITANCE — +
50%	50% to 60% depending on voltage	40% to 60%	35% to 55% depending on voltage	60%	0-10V: 40% >10V: 50%	N.A.	% MINIMUM CAPACITANCE @ lowest rated temperature depending on voltage
% D.F. = $\frac{ESR \times C}{13.26}$ ESR Range .003 to .091 ohms	% D.F. = $\frac{ESR \times C}{13.26}$ ESR Range .31 to 200 ohms	% D.F. = $\frac{ESR \times C}{13.26}$ ESR Range .06 to 205 ohms	% D.F. = $\frac{ESR \times C}{13.26}$ ESR Range .038 to 250 ohms	% D.F. = $\frac{ESR \times C}{13.26}$ ESR Range 3.3 to 340 ohms	20% to 40% depending on voltage rating	10% Power Factor	DISSIPATION FACTOR, MAX. 120 Hz @ 25°C
$.006\sqrt{CV}$	1.0 to 53.0 μ amps depending on rating	$.002\sqrt{CV}$	$.006\sqrt{CV}$	5.0 to 50.0 μ amps depending on rating	8 to 230 micro amps	N.A.	LEAKAGE milliamp., unless otherwise stated or shown @ 25°C
3.0 to 40.0	20 to 1100	20 to 3650	10 to 7800	12 to 150	10 to 200	N.A.	RIPPLE CURRENT milliamp. @ 120 Hz and max. rated temp.
2,000 hours	2,500 hours	2,000 hours	2,000 hours	2,000 hours	500 hours	50,000 starts @ 65°C	LIFE — Operating @ max. rated temp.
2 years	2 years	2 years	2 years	1 year @ 40°C	1 year @ 40°C	1 year @ 25°C	LIFE — Shelf
Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Phenolic	CASE MATERIAL
Screw	Axial lead	Axial lead	Axial lead	Axial lead	PC	Lug	TERMINALS
Ring	Lead	Lead	Lead	Lead	Lead	Bracket or ring	MOUNTINGS
1.375 x 2.125 to 3.0 x 8.625	.260 x .562 to .385 x 2.250	.510 x 1.161 to 1.010 x 3.661	.260 x .562 to 1.385 x 4.161	.260 x .562 to .385 x 1.312	.312 x .50 to .50 x 1.0	1.437 x 2.75 to 2.562 x 4.375	DIMENSIONS (Inches)
201.24	201.13	201.38	201.26	201.06	201.10	209.01	CDE CATALOG, CLASS NO.

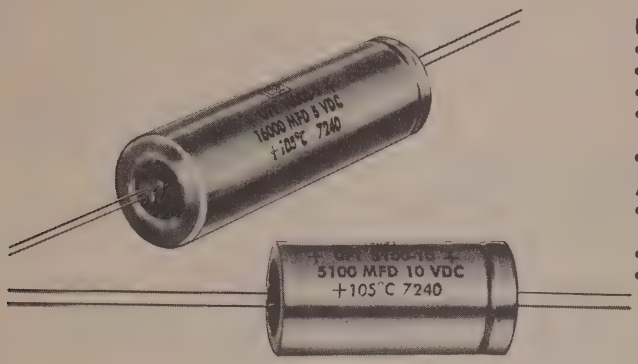
Electrolytic Capacitors, Aluminum

CDE CORNELL-DUBILIER

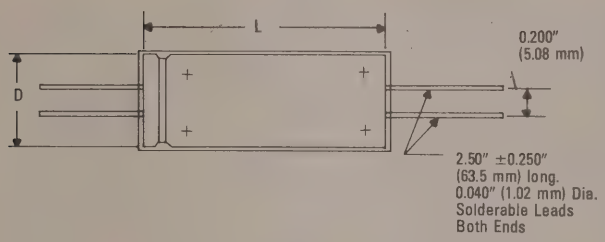
Class 201.68

Types UFT/UFTA

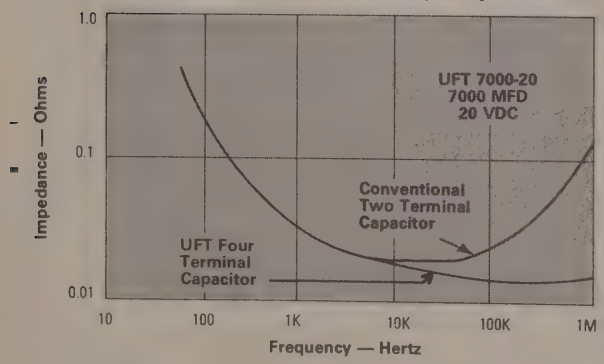
EXTENDED TEMPERATURE RANGE, LOW IMPEDANCE, HIGH FREQUENCY (−55°C to +105°C)



Outline Drawing



Typical Impedance vs. Frequency Curve



FEATURES

- Ultra low impedance above 10KHz
- Broad temperature range
- Low ESR (Equivalent Series Resistance)
- Shock and high frequency vibration resistant
- UFT* has No. 18 AWG and UFTA* No. 16 AWG leads

APPLICATIONS

- Designed for switching regulator power supplies
- High gain amplifiers
- Critical circuits where operation at high frequency is necessary yet still have a high degree of reliability and low failure rate under adverse environmental conditions.

The unique four terminal construction and internal assembly techniques dramatically reduce the inductance to approximately one nanohenry. As a result, the impedance does not increase at frequencies above 10KHz, but actually decreases to a value approximately equal to the ESR and then remains essentially flat as shown in the impedance-frequency curve. These capacitors also provide effective isolation of the load from the power source.

In a typical switching regulator power supply, UFT and UFTA capacitors perform the following functions:

1. Adequately filter the fundamental frequency ripple current.
2. Localize and filter the high frequency megahertz ripple.
3. Prevent high frequency noise from feeding back into the power line.

The UFT and UFTA are designed for continuous duty operation over the temperature range of −55°C to +105°C (−67°F to +221°F). They are shock and vibration resistant and unaffected by chlorinated cleaning solvents.

Capacitance ratings available are 50 to 16,000 Mfd. Voltage ratings available are 5 to 200 VDC at 105°C. The maximum capacitance change from the 25°C value over the temperature range of −55°C to +105°C is ±25%.

Unlike conventional axial lead capacitors, the DC current flows through the aluminum rods located in the center of the capacitors. Under certain conditions, up to 45 amperes DC load current can be handled. This current is limited by the temperature rise due to the DC load current and ripple current, the ambient temperature, and external loads.

The capacitors are capable of withstanding a minimum of 2000 hours life test at rated DC voltage and ripple current at 105°C.

*Patent pending

CAPACITANCE CHANGE WITH TEMPERATURE:

The maximum capacitance changes from measured +25°C values are:

VOLTAGE RANGE	TEMPERATURE						
	−55°C	−40°C	−30°C	−20°C	0°C	+85°C	+105°C
5 to 50 VDC	−25%	−20%	−15%	−10%	−6%	+15%	+25%
over 50 VDC	−20%	−15%	−10%	− 8%	−5%	+15%	+25%

Table 1

(Continued on next page)

CDE CORNELL-DUBILIER

Electrolytic Capacitors, Aluminum

EXTENDED TEMPERATURE RANGE, LOW IMPEDANCE, (cont'd)

Standard Ratings - (not normally stocked but readily available)

CAP (MFD)	TYPE† UFT or UFTA	Insulated Case Size D X L* (Inches)	Max. Impedance 25°C (OHMS) 10KHz-1MHz	RMS Ripple Current for 10°C Rise 10KHz-1MHz (Amperes)
5 VDC RATED — 7 VDC SURGE				
2400	2400-5	0.785 x 1.843	0.110	1.50
3300	3300-5	0.785 x 2.343	0.080	1.80
3700	3700-5	0.910 x 1.843	0.071	1.90
4400	4400-5	0.785 x 2.843	0.060	2.50
5000	5000-5	0.910 x 2.343	0.053	2.50
5700	5700-5	0.785 x 3.343	0.047	3.10
6700	6700-5	0.910 x 2.843	0.039	3.20
7200	7200-5	1.035 x 2.343	0.037	3.50
8800	8800-5	0.910 x 3.343	0.030	4.00
10000	10000-5	1.035 x 2.843	0.026	4.60
13000	13000-5	1.035 x 3.343	0.020	5.60
16000	16000-5	1.035 x 3.843	0.017	7.00
7.5 VDC RATED — 10 VDC SURGE				
2000	2000-7.5	0.785 x 1.843	0.130	1.40
3000	3000-7.5	0.910 x 1.843	0.087	1.80
3800	3800-7.5	0.785 x 2.843	0.070	2.40
4400	4400-7.5	0.910 x 2.343	0.059	2.40
4800	4800-7.5	1.035 x 1.843	0.055	2.40
5000	5000-7.5	0.785 x 3.343	0.053	3.00
5800	5800-7.5	0.910 x 2.843	0.046	3.10
6200	6200-7.5	1.035 x 2.343	0.043	3.30
7500	7500-7.5	0.910 x 3.343	0.035	3.80
9000	9000-7.5	1.035 x 2.843	0.029	4.40
11000	11000-7.5	1.035 x 3.343	0.024	5.30
14000	14000-7.5	1.035 x 3.843	0.019	6.60
10 VDC RATED — 15 VDC SURGE				
1700	1700-10	0.785 x 1.843	0.144	1.30
2300	2300-10	0.785 x 2.343	0.107	1.70
2600	2600-10	0.910 x 1.843	0.094	1.70
3000	3000-10	0.785 x 2.843	0.082	2.20
3600	3600-10	0.910 x 2.343	0.068	2.20
4100	4100-10	0.785 x 3.343	0.060	2.80
4800	4800-10	0.910 x 2.843	0.051	2.90
5100	5100-10	1.035 x 2.343	0.048	3.20
6300	6300-10	0.910 x 3.343	0.039	3.60
7500	7500-10	1.035 x 2.843	0.033	4.10
9700	9700-10	1.035 x 3.343	0.025	5.00
12000	12000-10	1.035 x 3.843	0.021	6.20
16 VDC RATED — 20 VDC SURGE				
1400	1400-16	0.785 x 1.843	0.149	1.20
1900	1900-16	0.785 x 2.343	0.110	1.60
2100	2100-16	0.910 x 1.843	0.100	1.60
2700	2700-16	0.910 x 2.343	0.077	2.00
3400	3400-16	0.785 x 3.343	0.061	2.60
4200	4200-16	1.035 x 2.343	0.050	2.90
5200	5200-16	0.910 x 3.343	0.041	3.30
6100	6100-16	1.035 x 2.843	0.035	3.90
6400	6400-16	0.910 x 3.843	0.033	4.10
8000	8000-16	1.035 x 3.343	0.026	4.70
10000	10000-16	1.035 x 3.843	0.021	5.90
20 VDC RATED — 25 VDC SURGE				
1200	1200-20	0.785 x 1.843	0.170	1.20
1600	1800-20	0.910 x 1.843	0.011	1.50
2200	2200-20	0.785 x 2.843	0.092	2.00
2400	2400-20	0.910 x 2.343	0.084	1.90
2900	2900-20	0.785 x 3.343	0.070	2.50
3400	3400-20	0.910 x 2.843	0.060	2.60
3700	3700-20	1.035 x 2.343	0.055	2.70
4500	4500-20	0.910 x 3.343	0.045	3.30
5300	5300-20	1.035 x 2.843	0.039	3.50
7000	7000-20	1.035 x 3.343	0.030	4.50
8600	8600-20	1.035 x 3.843	0.024	5.50
25 VDC RATED — 30 VDC SURGE				
900	900-25	0.785 x 1.843	0.224	1.05
1200	1200-25	0.785 x 2.343	0.168	1.40
1600	1600-25	0.785 x 2.843	0.126	1.75
2000	2000-25	0.910 x 2.343	0.102	1.90
2500	2500-25	1.035 x 2.343	0.081	2.40
2800	2800-25	0.910 x 2.843	0.072	3.00
3600	3600-25	1.035 x 2.843	0.056	3.25
4700	4700-25	1.035 x 3.343	0.043	4.00
5700	5700-25	1.035 x 3.843	0.036	4.65

CAP (MFD)	TYPE† UFT or UFTA	Insulated Case Size D X L* (Inches)	Max. Impedance 25°C (OHMS) 10KHz-1MHz	RMS Ripple Current for 10°C Rise 10KHz-1MHz (Amperes)
30 VDC RATED — 40 VDC SURGE				
700	700-30	0.785 x 1.843	0.262	1.00
900	900-30	0.785 x 2.343	0.204	1.25
1300	1300-30	0.785 x 2.843	0.141	1.70
1600	1600-30	0.910 x 2.343	0.114	1.75
2000	2000-30	1.035 x 2.343	0.092	2.25
2200	2200-30	0.910 x 2.843	0.083	2.35
2800	2800-30	1.035 x 2.843	0.066	3.00
3000	3000-30	0.910 x 3.343	0.061	2.90
3600	3600-30	1.035 x 3.343	0.051	3.60
4500	4500-30	1.035 x 3.843	0.041	4.40
40 VDC RATED — 50 VDC SURGE				
550	550-40	0.785 x 1.843	0.322	0.90
700	700-40	0.785 x 2.343	0.255	1.15
900	900-40	0.910 x 1.843	0.197	1.20
1200	1200-40	0.910 x 2.343	0.147	1.55
1500	1500-40	1.035 x 2.343	0.117	2.05
1700	1700-40	0.910 x 2.843	0.104	2.15
2300	2300-40	0.910 x 3.343	0.077	2.60
2900	2900-40	1.035 x 3.343	0.061	3.40
3600	3600-40	1.035 x 3.843	0.050	4.10
50 VDC RATED — 75 VDC SURGE				
300	300-50	0.785 x 1.843	0.280	0.93
400	400-50	0.785 x 2.343	0.212	1.15
530	530-50	0.910 x 1.843	0.160	1.25
700	700-50	0.910 x 2.343	0.120	1.60
870	870-50	1.035 x 2.343	0.098	2.10
1000	1000-50	0.910 x 2.843	0.085	2.15
1200	1200-50	1.035 x 2.843	0.070	2.80
1600	1600-50	1.035 x 3.343	0.053	3.40
2000	2000-50	1.035 x 3.843	0.042	4.25
75 VDC RATED — 100 VDC SURGE				
200	200-75	0.785 x 1.843	0.384	0.78
260	260-75	0.785 x 2.343	0.295	1.00
350	350-75	0.910 x 1.843	0.218	1.10
450	450-75	0.910 x 2.343	0.171	1.40
570	570-75	1.035 x 2.343	0.136	1.85
650	650-75	0.910 x 2.843	0.118	1.95
850	850-75	0.910 x 3.343	0.090	2.25
1000	1000-75	1.035 x 3.343	0.077	2.95
1300	1300-75	1.035 x 3.843	0.059	3.55
100 VDC RATED — 125 VDC SURGE				
130	130-100	0.785 x 1.843	0.530	0.70
170	170-100	0.785 x 2.343	0.405	0.90
230	230-100	0.910 x 1.843	0.300	0.93
300	300-100	0.910 x 2.343	0.230	1.20
380	380-100	1.035 x 2.343	0.180	1.55
430	430-100	0.910 x 2.843	0.159	1.60
550	550-100	1.035 x 2.843	0.125	2.10
700	700-100	1.035 x 3.343	0.098	2.65
850	850-100	1.035 x 3.843	0.080	3.15
150 VDC RATED — 200 VDC SURGE				
70	70-150	0.785 x 1.843	0.780	0.65
90	90-150	0.785 x 2.343	0.610	0.80
120	120-150	0.910 x 1.843	0.455	0.83
150	150-150	1.035 x 1.843	0.362	1.10
200	200-150	1.035 x 2.343	0.273	1.40
300	300-150	0.910 x 3.343	0.181	1.80
380	380-150	1.035 x 3.343	0.143	2.35
470	470-150	1.035 x 3.843	0.095	2.85
200 VDC RATED — 250 VDC SURGE				
50	50-200	0.785 x 1.843	0.780	0.60
85	85-200	0.910 x 1.843	0.460	0.75
100	100-200	0.910 x 2.343	0.390	0.95
150	150-200	0.910 x 2.843	0.259	1.25
200	200-200	1.035 x 2.843	0.195	1.67
250	250-200	0.910 x 3.843	0.156	1.90
320	320-200	1.035 x 3.843	0.122	2.50

CAPACITANCE TOLERANCE −10% +75%

*Dimensions include insulating sleeve and epoxy coated seals for protection from cleaning solvents.
†Order by complete type number; e.g. UFT2400-5 or UFTA2400-5.

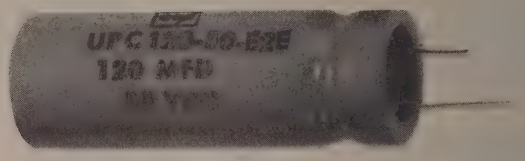
Electrolytic Capacitors, Aluminum

CDE CORNELL-DUBILIER

Class 201.40

Type UPC

EXTENDED TEMPERATURE RANGE, LOW IMPEDANCE, HIGH FREQUENCY, SINGLE-ENDED MINIATURE (−55°C to +105°C)



FEATURES

Very Low Impedance
Broad Temperature Range
Long Storage and Operating Life
Low Resistance and Inductance
Safe with Cleaning Solvents

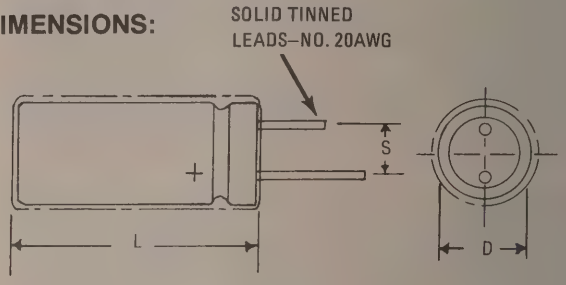
APPLICATIONS

Switching Power Supplies
Hi-Frequency Filters
Hi-Ripple Miniature Equipment
Cold-Temperature Instrumentation
Industrial Telemetry

RATINGS

Capacitance — 27 to 1200 uF
Voltage — 6.3 to 100 Vdc
Tolerance — −10 + 100%

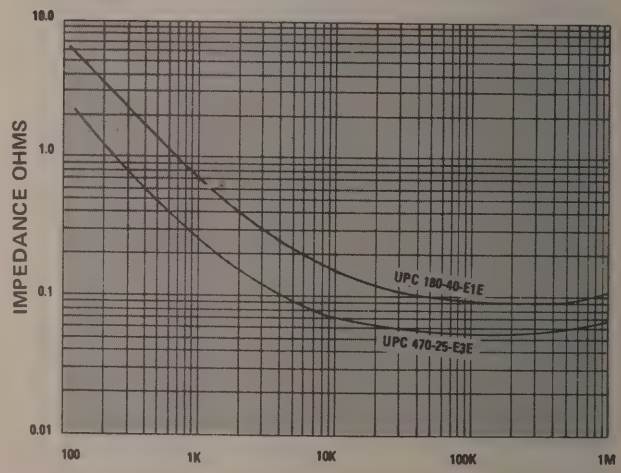
DIMENSIONS:



Type UPC Capacitors provide low impedance for high frequency filtering through 1 MHz. They typically exhibit series inductance of less than 12 nH and ESR of about ½ standard industrial-grade miniature aluminum electrolytics. The UPC is an excellent choice as an output filter capacitor in a low-power, low-voltage switching supply. Although the filtering impedance is significantly higher than a comparable UFT above 150 kHz, the UPC's lower cost makes it an appropriate choice for applications without stringent EMI requirements. It is especially recommended for high frequency applications like switching regulators but it's rugged construction and wide temperature range make the UPC the right choice for many industrial applications.

The UPC is a polarized single-ended, aluminum electrolytic capacitor with an advanced wide-temperature electrolyte. Typical frequency performance is shown at the right and Standard Ratings and characteristics appear on this and the following page.

TYPICAL IMPEDANCE vs. FREQUENCY



Standard Ratings

CAP MFD	Part Number	Maximum Insulated Case Size (D x L) Inches	Maximum Insulated Case Size (D x L) mm	25°C Max. DC Leakage (μA)	ESR ±50% 25°C 120 Hz (Ohms)	Impedance ±50% +25°C (Ohms) 20KHz-100KHz	Max. RMS Ripple Current (Amperes) @ 85° 20KHz-100KHz
6.3 VDC RATED - 9 VDC SURGE							
680	UPC680-6.3-E1E	0.525 x 1.165	13.3 x 29.6	5.5	0.15	0.08	1.36
820	UPC820-6.3-E2E	0.525 x 1.462	13.3 x 37.1	6.0	0.11	0.06	1.70
1200	UPC1200-6.3-E3E	0.525 x 1.790	13.3 x 45.5	7.3	0.07	0.04	2.23
12 VDC RATED - 16 VDC SURGE							
470	UPC470-12-E1E	0.525 x 1.165	13.3 x 29.6	8.7	0.19	0.10	1.21
680	UPC680-12-E2E	0.525 x 1.462	13.3 x 37.1	10.4	0.13	0.07	1.57
1000	UPC1000-12-E3E	0.525 x 1.790	13.3 x 45.5	12.7	0.09	0.05	2.00
15 VDC RATED - 20 VDC SURGE							
390	UPC390-15-E1E	0.525 x 1.165	13.3 x 29.6	9.9	0.19	0.08	1.36
560	UPC560-15-E2E	0.525 x 1.462	13.3 x 37.1	11.8	0.13	0.06	1.70
820	UPC820-15-E3E	0.525 x 1.790	13.3 x 45.5	14.3	0.09	0.04	2.23
20 VDC RATED - 30 VDC SURGE							
330	UPC330-20-E1E	0.525 x 1.165	13.3 x 29.6	12.1	0.20	0.08	1.36
390	UPC390-20-E2E	0.525 x 1.462	13.3 x 37.1	13.2	0.14	0.06	1.70
560	UPC560-20-E3E	0.525 x 1.790	13.3 x 45.5	15.8	0.10	0.04	2.23

(Continued on next page)

CDE CORNELL-DUBILIER

Electrolytic Capacitors, Aluminum

EXTENDED TEMPERATURE RANGE, LOW IMPEDANCE, HIGH FREQUENCY, SINGLE-ENDED MINIATURE (−55°C to +105°C)

Standard Ratings (Continued)

CAP MFD	Part Number	Maximum Insulated Case Size (D x L) Inches	mm	25°C Max. DC Leakage (μA)	ESR ±50% 25°C 120 Hz (Ohms)	Impedance ±50% +25°C (Ohms) 20KHz-100KHz	Max. RMS Ripple Current (Amperes) @ 85° 20KHz-100KHz
25 VDC RATED - 40 VDC SURGE							
270	UPC270-25-E1E	0.525 x 1.165	13.3 x 29.6	13.7	0.24	0.09	1.28
330	UPC330-25-E2E	0.525 x 1.462	13.3 x 37.1	15.2	0.17	0.07	1.57
470	UPC470-25-E3E	0.525 x 1.790	13.3 x 45.5	18.1	0.12	0.05	2.00
40 VDC RATED - 55 VDC SURGE							
180	UPC180-40-E1E	0.525 x 1.165	13.3 x 29.6	17.9	0.35	0.16	0.96
270	UPC270-40-E2E	0.525 x 1.462	13.3 x 37.1	21.9	0.25	0.12	1.20
390	UPC390-40-E3E	0.525 x 1.790	13.3 x 45.5	26.3	0.17	0.08	1.58
50 VDC RATED - 75 VDC SURGE							
82	UPC82-50-E1E	0.525 x 1.165	13.3 x 29.6	15.1	0.46	0.16	0.96
120	UPC120-50-E2E	0.525 x 1.462	13.3 x 37.1	18.3	0.34	0.12	1.20
180	UPC180-50-E3E	0.525 x 1.790	13.3 x 45.5	22.4	0.23	0.08	1.58
60 VDC RATED - 85 VDC SURGE							
68	UPC68-60-E1E	0.525 x 1.165	13.3 x 29.6	16.5	0.65	0.19	0.88
82	UPC82-60-E2E	0.525 x 1.462	13.3 x 37.1	18.1	0.47	0.14	1.11
120	UPC120-60-E3E	0.525 x 1.790	13.3 x 45.5	21.9	0.33	0.10	1.41
100 VDC RATED - 150 VDC SURGE							
27	UPC27-100-E1E	0.525 x 1.165	13.3 x 29.6	17.3	1.7	0.56	0.61
39	UPC39-100-E2E	0.525 x 1.462	13.3 x 37.1	20.8	1.3	0.42	0.76
47	UPC47-100-E3E	0.525 x 1.790	13.3 x 45.5	22.9	0.88	0.28	1.00

COMPUTER GRADE, SCREW TERMINAL, LOW IMPEDANCE (−40°C to +85°C)

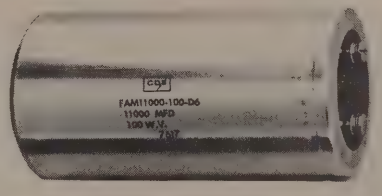
Developments by CDE in low resistance electrolytes and paper separators, combined with increased quantity of multiple anode and cathode tabs welded to the terminals, have resulted in very low ESR capacitors.

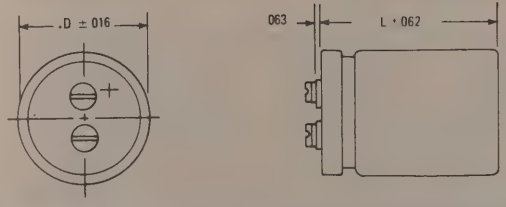
Another advantage of the design of the FAM is lower impedance at high frequencies, which is important for high ripple current applications such as switching power supply filtering.

The "low screw" terminals are tapped to accept 10-32 screws furnished with each capacitor.

The operating temperature range of this capacitor is from −40°C to +85°C (−40°F to +185°F)

The ratings shown are the highest nominal capacitance for each case size in the standard FAM line. Intermediate, unlisted values are also available.





Standard Ratings (Not normally stocked but readily available)

CAP. MFD.	Type† FAM	Uninsulated Case Size• (Inches) D x L	Impedance ± 50% 20 KHz (Ohms)	Maximum Ripple RMS Amps @ 85°C 120 Hz	20 KHz
3 VDC RATED — 4 VDC SURGE					
11500	11500-3-A1	1.375 x 2.125	0.0123	5.0	7.0
23000	23000-3-A2	1.375 x 3.125	0.0073	8.0	10.0
30000	30000-3-A3	1.375 x 4.125	0.0063	10.0	11.0
40000	40000-3-A6	1.375 x 5.625	0.0049	12.0	14.0
50000	50000-3-B2	2.0 x 3.125	0.0037	12.0	14.0
75000	75000-3-B3	2.0 x 4.125	0.0035	21.0	24.0
100000	100000-3-B6	2.0 x 5.625	0.0026	28.0	32.0
125000	125000-3-C3	2.5 x 4.125	0.0029	31.0	36.0
175000	175000-3-C6	2.5 x 5.625	0.0021	31.0	36.0
200000	200000-3-D3	3.0 x 4.125	0.0027	40.0	40.0
290000	290000-3-D6	3.0 x 5.625	0.0027	40.0	40.0
600000	600000-3-D9	3.0 x 8.625	0.0027	40.0	40.0

CAP. MFD.	Type† FAM	Uninsulated Case Size• (Inches) D x L	Impedance ± 50% 20 KHz (Ohms)	Maximum Ripple RMS Amps @ 85°C 120 Hz	20 KHz
6.5 VDC RATED — 8 VDC SURGE					
10000	10000-6.5-A1	1.375 x 2.125	0.0121	5.0	6.0
17000	17000-6.5-A2	1.375 x 3.125	0.0083	8.0	9.0
26000	26000-6.5-A3	1.375 x 4.125	0.0062	10.0	11.0
39000	39000-6.5-A6	1.375 x 5.625	0.0043	12.0	15.0
43000	43000-6.5-B2	2.0 x 3.125	0.0050	12.0	14.0
68000	68000-6.5-B3	2.0 x 4.125	0.0032	22.0	26.0
95000	95000-6.5-B6	2.0 x 5.625	0.0023	30.0	35.0
110000	110000-6.5-C3	2.5 x 4.125	0.0026	30.0	35.0
165000	165000-6.5-C6	2.5 x 5.625	0.0020	32.0	37.0
185000	185000-6.5-D3	3.0 x 4.125	0.0026	38.0	40.0
265000	265000-6.5-D6	3.0 x 5.625	0.0026	40.0	40.0
425000	425000-6.5-D9	3.0 x 8.625	0.0026	40.0	40.0

†Order by complete type number; e.g. FAM 11500-3 A1, which indicates Type—Capacitance—Working Voltage—Case Code.
•Dimensions are uninsulated. Standard unit is supplied with plastic insulating sleeve. Add .031" ±.031" to diameter and .031" ±.062" to length for insulated dimensions.
CAPACITANCE TOLERANCE: −10% +100%

(Continued on next page)

Electrolytic Capacitors, Aluminum

CDE CORNELL-DUBILIER

COMPUTER GRADE, SCREW TERMINAL
LOW IMPEDANCE (−40°C to +85°C) Cont'd.

Standard Ratings (Continued)

CAP. MFD.	Type† FAM	Uninsulated Case Size• (Inches) D x L	Impedance ± 50% 20 KHz (Ohms)	Maximum Ripple RMS Amps @ 85°C 120 Hz	Maximum Ripple RMS Amps @ 85°C 20 KHz
10 VDC RATED — 12 VDC SURGE					
7100	7100-10-A1	1.375 x 2.125	0.0117	5.0	6.0
12000	12000-10-A2	1.375 x 3.125	0.0080	8.0	9.0
18500	18500-10-A3	1.375 x 4.125	0.0060	11.0	12.0
26000	26000-10-A6	1.375 x 5.625	0.0047	12.0	14.0
28000	28000-10-B2	2.0 x 3.125	0.0056	12.0	14.0
48000	48000-10-B3	2.0 x 4.125	0.0032	21.0	25.0
68000	68000-10-B6	2.0 x 5.625	0.0022	30.0	35.0
79000	79000-10-C3	2.5 x 4.125	0.0026	30.0	35.0
110000	110000-10-C6	2.5 x 5.625	0.0020	32.0	37.0
130000	130000-10-D3	3.0 x 4.125	0.0026	37.0	40.0
190000	190000-10-D6	3.0 x 5.625	0.0026	40.0	40.0
300000	300000-10-D9	3.0 x 8.625	0.0026	40.0	40.0
15 VDC RATED — 20 VDC SURGE					
5400	5400-15-A1	1.375 x 2.125	0.0205	4.0	5.0
10000	10000-15-A2	1.375 x 3.125	0.0125	6.0	7.0
15000	15000-15-A3	1.375 x 4.125	0.0104	8.0	10.0
17000	17000-15-A6	1.375 x 5.625	0.0091	8.0	9.0
23000	23000-15-B2	2.0 x 3.125	0.0085	9.0	11.0
37000	37000-15-B3	2.0 x 4.125	0.0054	17.0	21.0
52000	52000-15-B6	2.0 x 5.625	0.0038	22.0	26.0
60000	60000-15-C3	2.5 x 4.125	0.0041	22.0	26.0
88000	88000-15-C6	2.5 x 5.625	0.0029	26.0	31.0
97000	97000-15-D3	3.0 x 4.125	0.0038	30.0	36.0
145000	145000-15-D6	3.0 x 5.625	0.0026	40.0	40.0
230000	230000-15-D9	3.0 x 8.625	0.0026	40.0	40.0
20 VDC RATED — 25 VDC SURGE					
3800	3800-20-A1	1.375 x 2.125	0.0186	4.0	5.0
6300	6300-20-A2	1.375 x 3.125	0.0130	6.0	7.0
10000	10000-20-A3	1.375 x 4.125	0.0105	8.0	10.0
15000	15000-20-A6	1.375 x 5.625	0.0068	9.0	11.0
21000	21000-20-B2	2.0 x 3.125	0.0060	11.0	13.0
26000	26000-20-B3	2.0 x 4.125	0.0053	16.0	20.0
37000	37000-20-B6	2.0 x 5.625	0.0035	23.0	27.0
44000	44000-20-C3	2.5 x 4.125	0.0038	23.0	27.0
60000	60000-20-C6	2.5 x 5.625	0.0028	26.0	31.0
70000	70000-20-D3	3.0 x 4.125	0.0037	31.0	37.0
97000	97000-20-D6	3.0 x 5.625	0.0026	40.0	40.0
160000	160000-20-D9	3.0 x 8.625	0.0025	40.0	40.0
25 VDC RATED — 30 VDC SURGE					
2700	2700-25-A1	1.375 x 2.125	0.0222	4.0	5.0
4200	4200-25-A2	1.375 x 3.125	0.0163	5.0	6.0
7700	7700-25-A3	1.375 x 4.125	0.0114	8.0	10.0
8500	8500-25-A6	1.375 x 5.625	0.0102	8.0	10.0
10000	10000-25-B2	2.0 x 3.125	0.0076	8.0	10.0
16500	16500-25-B3	2.0 x 4.125	0.0065	14.0	17.0
24000	24000-25-B6	2.0 x 5.625	0.0045	20.0	25.0
28000	28000-25-C3	2.5 x 4.125	0.0040	21.0	26.0
42000	42000-25-C6	2.5 x 5.625	0.0027	24.0	30.0
46000	46000-25-D3	3.0 x 4.125	0.0045	28.0	34.0
65000	65000-25-D6	3.0 x 5.625	0.0033	37.0	40.0
125000	125000-25-D9	3.0 x 8.625	0.0024	40.0	40.0
30 VDC RATED — 40 VDC SURGE					
2100	2100-30-A1	1.375 x 2.125	0.0245	3.0	4.0
3400	3400-30-A2	1.375 x 3.125	0.0173	5.0	6.0
5600	5600-30-A3	1.375 x 4.125	0.0131	7.0	9.0
7000	7000-30-A6	1.375 x 5.625	0.0108	7.0	9.0
9500	9500-30-B2	2.0 x 3.125	0.0077	8.0	10.0
14000	14000-30-B3	2.0 x 4.125	0.0067	14.0	17.0
17500	17500-30-B6	2.0 x 5.625	0.0049	18.0	22.0
23000	23000-30-C3	2.5 x 4.125	0.0052	21.0	26.0
35000	35000-30-C6	2.5 x 5.625	0.0034	23.0	29.0
33000	33000-30-D3	3.0 x 4.125	0.0046	27.0	34.0
51000	51000-30-D6	3.0 x 5.625	0.0035	37.0	40.0
78000	78000-30-D9	3.0 x 8.625	0.0024	40.0	40.0

CAP. MFD.	Type† FAM	Uninsulated Case Size• (Inches) D x L	Impedance ± 50% 20 KHz (Ohms)	Maximum Ripple RMS Amps @ 85°C 120 Hz	Maximum Ripple RMS Amps @ 85°C 20 KHz
40 VDC RATED — 50 VDC SURGE					
1800	1800-40-A1	1.375 x 2.125	0.0235	3.0	4.0
3000	3000-40-A2	1.375 x 3.125	0.0168	5.0	6.0
4400	4400-40-A3	1.375 x 4.125	0.0143	6.0	8.0
6500	6500-40-A6	1.375 x 5.625	0.0097	7.0	9.0
8400	8400-40-B2	2.0 x 3.125	0.0070	8.0	10.0
10000	10000-40-B3	2.0 x 4.125	0.0066	12.0	16.0
14000	14000-40-B6	2.0 x 5.625	0.0059	17.0	22.0
16000	16000-40-C3	2.5 x 4.125	0.0066	18.0	23.0
28000	28000-40-C6	2.5 x 5.625	0.0038	21.0	27.0
31000	31000-40-D3	3.0 x 4.125	0.0052	25.0	33.0
47000	47000-40-D6	3.0 x 5.625	0.0035	36.0	40.0
63000	63000-40-D9	3.0 x 8.625	0.0025	40.0	40.0
50 VDC RATED — 65 VDC SURGE					
1100	1100-50-A1	1.375 x 2.125	0.0281	3.0	4.0
2100	2100-50-A2	1.375 x 3.125	0.0202	4.0	5.0
3100	3100-50-A3	1.375 x 4.125	0.0170	5.0	7.0
4200	4200-50-A6	1.375 x 5.625	0.0124	6.0	8.0
4900	4900-50-B2	2.0 x 3.125	0.0100	6.0	8.0
6600	6600-50-B3	2.0 x 4.125	0.0091	10.0	13.0
9500	9500-50-B6	2.0 x 5.625	0.0071	14.0	18.0
14000	14000-50-C3	2.5 x 4.125	0.0069	17.0	23.0
17500	17500-50-C6	2.5 x 5.625	0.0054	18.0	24.0
18000	18000-50-D3	3.0 x 4.125	0.0076	20.0	27.0
31000	31000-50-D6	3.0 x 5.625	0.0044	30.0	40.0
47000	47000-50-D9	3.0 x 8.625	0.0029	40.0	40.0
60 VDC RATED — 75 VDC SURGE					
1000	1000-60-A1	1.375 x 2.125	0.0287	3.0	4.0
1750	1750-60-A2	1.375 x 3.125	0.0189	4.0	5.0
2600	2600-60-A3	1.375 x 4.125	0.0160	5.0	7.0
3300	3300-60-A6	1.375 x 5.625	0.0127	6.0	8.0
4700	4700-60-B2	2.0 x 3.125	0.0083	6.0	8.0
6200	6200-60-B3	2.0 x 4.125	0.0076	12.0	16.0
8200	8200-60-B6	2.0 x 5.625	0.0070	13.0	18.0
9700	9700-60-C3	2.5 x 4.125	0.0043	15.0	21.0
12500	12500-60-C6	2.5 x 5.625	0.0058	17.0	23.0
15500	15500-60-D3	3.0 x 4.125	0.0071	21.0	28.0
22000	22000-60-D6	3.0 x 5.625	0.0052	28.0	38.0
36000	36000-60-D9	3.0 x 8.625	0.0032	40.0	40.0
75 VDC RATED — 95 VDC SURGE					
800	800-75-A1	1.375 x 2.125	0.0264	3.0	4.0
1350	1350-75-A2	1.375 x 3.125	0.0172	4.0	6.0
2100	2100-75-A3	1.375 x 4.125	0.0139	5.0	7.0
3000	3000-75-A6	1.375 x 5.625	0.0096	6.0	8.0
3200	3200-75-B2	2.0 x 3.125	0.0092	6.0	8.0
5000	5000-75-B3	2.0 x 4.125	0.0083	10.0	14.0
7000	7000-75-B6	2.0 x 5.625	0.0060	13.0	19.0
8200	8200-75-C3	2.5 x 4.125	0.0070	15.0	21.0
11500	11500-75-C6	2.5 x 5.625	0.0051	16.0	23.0
13500	13500-75-D3	3.0 x 5.625	0.0048	36.0	29.0
19000	19000-75-D6	3.0 x 5.625	0.0048	36.0	40.0
31000	31000-75-D9	3.0 x 8.625	0.0029	40.0	40.0
100 VDC RATED — 125 VDC SURGE					
600	600-100-A1	1.375 x 2.125	0.0180	3.0	4.0
875	875-100-A2	1.375 x 3.125	0.0128	4.0	6.0
1300	1300-100-A3	1.375 x 4.125	0.0104	5.0	7.0
1600	1600-100-A6	1.375 x 5.625	0.0090	5.0	7.0
1950	1950-100-B2	2.0 x 3.125	0.0083	6.0	9.0
3200	3200-100-B3	2.0 x 4.125	0.0069	9.0	12.0
4300	4300-100-B6	2.0 x 5.625	0.0053	12.0	17.0
5000	5000-100-C3	2.5 x 4.125	0.0070	13.0	18.0
7000	7000-100-C6	2.5 x 5.625	0.0050	14.0	20.0
7500	7500-100-D3	3.0 x 4.125	0.0073	19.0	26.0
11000	11000-100-D6	3.0 x 5.625	0.0053	30.0	40.0
18000	18000-100-D9	3.0 x 8.625	0.0032	38.0	40.0

†Order by complete type number; e.g. FAM 2100-30-A1, which indicates Type—Capacitance—Working Voltage—Case Code.
•Dimensions are uninsulated. Standard unit is supplied with plastic insulating sleeve. Add .031" ±.031" to diameter and .031" ±.062" to length for insulated dimensions.
CAPACITANCE TOLERANCE: 10% +100%

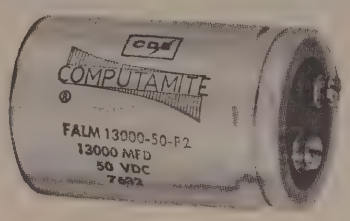
CDE CORNELL-DUBILIER

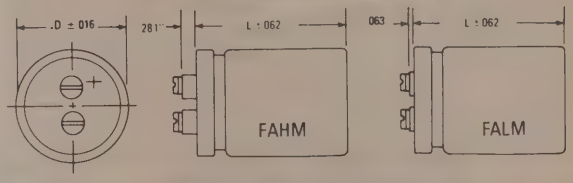
Electrolytic Capacitors, Aluminum

COMPUTER GRADE, SCREW TERMINAL, EXTENDED CAPACITANCE, COMPUTAMITE® (−40° to +85°C)

The ratings shown are the highest nominal capacitance for each case size in the standard line. Intermediate, unlisted values are also available. The FAHM has "high screw" terminals, the FALM has "low screw" terminals, and both have tapped terminals to accept 10-32 screws furnished with each capacitor.

CDE's FAHM and FALM "Computamite" electrolytics are extended capacitance units with ratings which exceed those of the FAH and FAL. They are reliable, long-life capacitors designed for power supply filtering, industrial control equipment, energy storage, and other applications where the smallest size with high mfd x volts are important. These units are designed for continuous duty operation over the temperature range of −40°C to +85°C (−40°F to +185°F).





Standard Ratings

(Not normally stocked but readily available)

CAP. MFD.	Type† FAHM or FALM	Uninsulated Case Size* (Inches) D x L	Max. ESR +25°C 120 Hz (Ohms)	Maximum Ripple 120 Hz (AMPS) +85°C	+65°C
3 VDC RATED — 4 VDC SURGE					
25000	25000-3-A1	1.375 x 2.125	0.150	2.8	3.9
39000	39000-3-A2	1.375 x 3.125	0.087	4.2	5.9
56000	56000-3-A3	1.375 x 4.125	0.060	5.7	7.9
80000	80000-3-A6	1.375 x 5.625	0.051	7.0	9.8
100000	100000-3-E3	1.75 x 4.125	0.037	8.4	11.7
92000	92000-3-B2	2.0 x 3.125	0.046	7.3	10.2
130000	130000-3-B3	2.0 x 4.125	0.030	10.1	14.1
190000	190000-3-B6	2.0 x 5.625	0.021	13.8	19.3
220000	220000-3-C3	2.5 x 4.125	0.017	15.4	21.5
310000	310000-3-C6	2.5 x 5.625	0.010	22.7	31.7
295000	295000-3-D3	3.0 x 4.125	0.016	17.7	24.7
420000	420000-3-D6	3.0 x 5.625	0.012	23.1	32.3
1000000	1000000-3-D9	3.0 x 8.625	0.010	30.2	40.0
6 VDC RATED — 8 VDC SURGE					
22000	22000-6-A1	1.375 x 2.125	0.150	2.8	3.9
34000	34000-6-A2	1.375 x 3.125	0.087	4.2	5.8
53000	53000-6-A3	1.375 x 4.125	0.060	5.7	7.9
76000	76000-6-A6	1.375 x 5.625	0.052	6.9	9.6
82000	82000-6-E3	1.75 x 4.125	0.037	8.4	11.7
75000	75000-6-B2	2.0 x 3.125	0.047	7.2	10.0
115000	115000-6-B3	2.0 x 4.125	0.030	10.1	14.1
165000	165000-6-B6	2.0 x 5.625	0.022	13.4	18.7
180000	180000-6-C3	2.5 x 4.125	0.018	14.9	20.8
255000	255000-6-C6	2.5 x 5.625	0.016	18.0	25.2
280000	280000-6-D3	3.0 x 4.125	0.017	17.2	24.1
400000	400000-6-D6	3.0 x 5.625	0.013	22.2	31.1
565000	565000-6-D9	3.0 x 8.625	0.010	30.2	40.0
10 VDC RATED — 12 VDC SURGE					
15000	15000-10-A1	1.375 x 2.125	0.160	2.7	3.7
27000	27000-10-A2	1.375 x 3.125	0.092	4.1	5.7
39000	39000-10-A3	1.375 x 4.125	0.064	5.5	7.7
60000	60000-10-A6	1.375 x 5.625	0.050	7.0	9.8
69000	69000-10-E3	1.75 x 4.125	0.040	8.1	11.3
59000	59000-10-B2	2.0 x 3.125	0.049	7.1	9.9
92000	92000-10-B3	2.0 x 4.125	0.030	10.2	14.1
130000	130000-10-B6	2.0 x 5.625	0.023	13.1	18.3
150000	150000-10-C3	2.5 x 4.125	0.018	14.9	20.8
215000	215000-10-C6	2.5 x 5.625	0.017	17.4	24.3
205000	205000-10-D3	3.0 x 4.125	0.017	17.2	24.0
290000	290000-10-D6	3.0 x 5.625	0.013	22.2	31.0
480000	480000-10-D9	3.0 x 8.625	0.010	30.2	40.0
15 VDC RATED — 18 VDC SURGE					
13000	13000-15-A1	1.375 x 2.125	0.170	2.6	3.6
19000	19000-15-A2	1.375 x 3.125	0.095	4.0	5.6
30000	30000-15-A3	1.375 x 4.125	0.066	5.4	7.5
46000	46000-15-A6	1.375 x 5.625	0.052	6.9	9.6
49000	49000-15-E3	1.75 x 4.125	0.041	8.0	11.2
45000	45000-15-B2	2.0 x 3.125	0.051	6.9	9.6
65000	65000-15-B3	2.0 x 4.125	0.034	9.5	13.3
100000	100000-15-B6	2.0 x 5.625	0.023	13.1	18.3
115000	115000-15-C3	2.5 x 4.125	0.020	14.2	19.9
165000	165000-15-C6	2.5 x 5.625	0.018	17.0	23.8
170000	170000-15-D3	3.0 x 4.125	0.018	16.7	23.4
240000	240000-15-D6	3.0 x 5.625	0.013	22.0	30.8
345000	345000-15-D9	3.0 x 8.625	0.010	30.2	40.0

CAP. MFD.	Type† FAHM or FALM	Uninsulated Case Size* (Inches) D x L	Max. ESR +25°C 120 Hz (Ohms)	Maximum Ripple 120 Hz (AMPS) +85°C	+65°C
20 VDC RATED — 25 VDC SURGE					
8200	8200-20-A1	1.375 x 2.125	0.180	2.5	3.5
13500	13500-20-A2	1.375 x 3.125	0.110	3.7	5.1
19500	19500-20-A3	1.375 x 4.125	0.071	5.2	7.2
28000	28000-20-A6	1.375 x 5.625	0.062	6.3	8.8
35000	35000-20-E3	1.75 x 4.125	0.045	7.6	10.6
32000	32000-20-B2	2.0 x 3.125	0.055	6.7	9.3
46000	46000-20-B3	2.0 x 4.125	0.034	9.5	13.3
66000	66000-20-B6	2.0 x 5.625	0.024	12.8	17.9
76000	76000-20-C3	2.5 x 4.125	0.020	14.2	19.8
115000	115000-20-C6	2.5 x 5.625	0.019	16.5	23.1
110000	110000-20-D3	3.0 x 4.125	0.018	16.8	23.5
160000	160000-20-D6	3.0 x 5.625	0.014	21.4	29.9
240000	240000-20-D9	3.0 x 8.625	0.010	30.2	40.0
25 VDC RATED — 30 VDC SURGE					
7200	7200-25-A1	1.375 x 2.125	0.190	2.4	3.3
11500	11500-25-A2	1.375 x 3.125	0.100	3.9	5.4
18000	18000-25-A3	1.375 x 4.125	0.074	5.1	7.1
26000	26000-25-A6	1.375 x 5.625	0.058	6.5	9.1
30000	30000-25-E3	1.75 x 4.125	0.048	7.3	10.2
27000	27000-25-B2	2.0 x 3.125	0.058	6.5	9.1
42000	42000-25-B3	2.0 x 4.125	0.035	9.3	13.0
61000	61000-25-B6	2.0 x 5.625	0.026	12.3	17.2
70000	70000-25-C3	2.5 x 4.125	0.021	13.8	19.3
105000	105000-25-C6	2.5 x 5.625	0.020	16.1	22.5
100000	100000-25-D3	3.0 x 4.125	0.019	16.3	22.8
145000	145000-25-D6	3.0 x 5.625	0.014	21.4	29.9
225000	225000-25-D6	3.0 x 8.625	0.010	30.2	40.0
30 VDC RATED — 40 VDC SURGE					
5000	5000-30-A1	1.375 x 2.125	0.230	2.2	3.0
9000	9000-30-A2	1.375 x 3.125	0.130	3.4	4.7
13000	13000-30-A3	1.375 x 4.125	0.080	4.9	6.8
18500	18500-30-A6	1.375 x 5.625	0.057	6.6	9.2
24000	24000-30-E3	1.75 x 4.125	0.051	7.1	9.9
22000	22000-30-B2	2.0 x 3.125	0.062	6.3	8.8
32000	32000-30-B3	2.0 x 4.125	0.040	8.7	12.1
45000	45000-30-B6	2.0 x 5.625	0.029	11.7	16.4
50000	50000-30-C3	2.5 x 4.125	0.030	11.5	16.1
72000	72000-30-C6	2.5 x 5.625	0.021	15.7	21.9
71000	71000-30-D3	3.0 x 4.125	0.026	13.9	19.4
100000	100000-30-D6	3.0 x 5.625	0.018	18.9	26.4
165000	165000-30-D9	3.0 x 8.625	0.011	28.8	40.0
40 VDC RATED — 50 VDC SURGE					
3800	3800-40-A1	1.375 x 2.125	0.210	2.3	3.2
6900	6900-40-A2	1.375 x 3.125	0.120	3.6	5.0
10000	10000-40-A3	1.375 x 4.125	0.080	3.8	5.3
15000	15000-40-A6	1.375 x 5.625	0.058	6.5	9.1
18000	18000-40-E3	1.75 x 4.125	0.055	6.9	9.6
17000	17000-40-B2	2.0 x 3.125	0.066	6.1	8.5
24000	24000-40-B3	2.0 x 4.125	0.040	8.7	12.1
35000	35000-40-B6	2.0 x 5.625	0.028	11.9	16.6
39000	39000-40-C3	2.5 x 4.125	0.024	12.9	18.0
55000	55000-40-C6	2.5 x 5.625	0.022	15.3	21.4
55000	55000-40-D3	3.0 x 4.125	0.021	15.5	21.7
78000	78000-40-D6	3.0 x 5.625	0.015	20.7	29.0
125000	125000-40-D9	3.0 x 8.625	0.011	28.8	40.0

FAHM/FALM also available in units of 50, 60, 75, and 100 volts, DC rated

† Order by complete type number, e.g., FAHM25000-3-A1 or FALM25000-3-A1.

* Dimensions are uninsulated. Standard units are supplied with plastic insulating sleeves. Add 0.031" ±0.031" to diameter and 0.031" ±0.062" to length for insulated dimensions.

CAPACITANCE TOLERANCE: 3-50 VDC: -10% +100% 51-100 VDC: -10% + 75%

CRC ESTABLISHED RELIABILITY CAPACITORS

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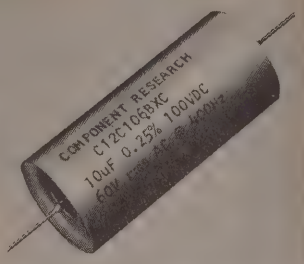
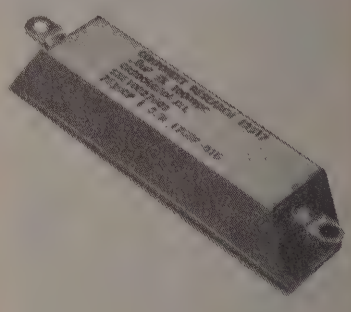
CRITICAL PROGRAMS QUALIFICATION

Trident	Mark 46
Lance Missile	Mark 48
F15 Aircraft	Sparrow
F18 Aircraft	Viking
Space Shuttle	And many others



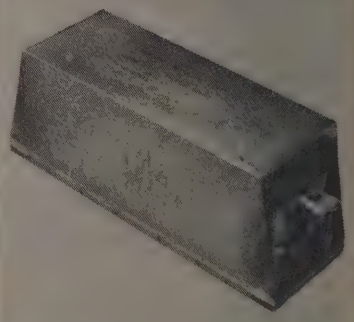
CRC hermetically sealed plastic film capacitors are acknowledged world wide as the highest quality and performance type available. Standard tubular metallized polycarbonate capacitor, AC rated to 40KHz and qualified to MIL-C-83421/01 is shown here.

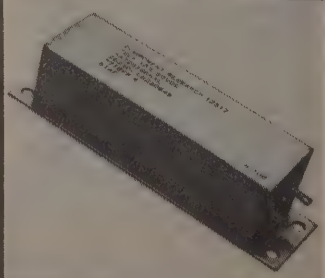
Type 55 foil polypropylene capacitors are used in power resonating applications up to 160KHz and with fast switching, high peak current devices. A typical 10uF capacitor in a 1.25″ diameter x 3.375″ length can handle up to 50A rms under continuous duty operation. Its ESR at 100KHz is approximately 0.0016 ohms which is typical of the low loss inherent in these capacitors.



CRC square profile capacitors are designed for thermal conduction to heat sinks in space operation. They are used where high energy current handling, low power loss and minimum heat rise is required in a vacuum environment. CRC capacitors can virtually change power loss from watts to milliwatts for critical applications.

Aircraft EMI Filtering: The custom capacitor shown weighs less than 2 pounds and handles 115A feedthru current in addition to 30A of reactive current. The capacitor is rated 120uF at 140V rms at 125°C and is specially constructed of metallized polysulfone to withstand possible internal worst-case heat rise of 150°C in operation. The attenuation is remarkable for this type product and is used in the F18 Aircraft Program for 400Hz line filtering.





This 75uF, 50VDC, metallized polycarbonate capacitor is 1″ square by 3¾″ long and is rated at 10A rms at 25KHz at 100°C. Each capacitor receives 168 hours of AC voltage at 25KHz to produce 10A rms in combination with 50VDC applied during burn-in at 100°C.

A VIEW OF CRC
CAPACITOR MANUFACTURING

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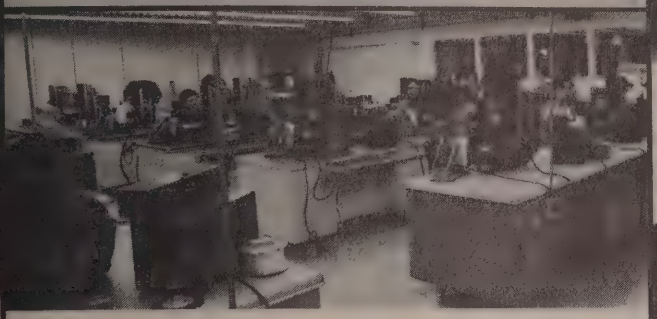
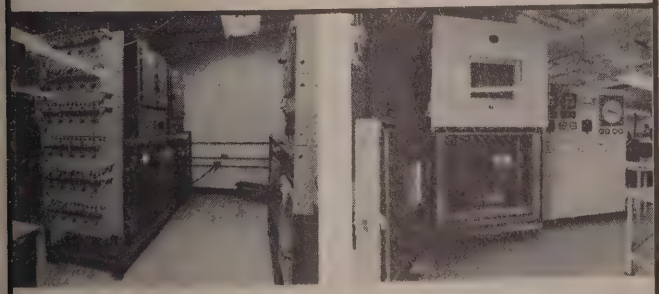


WINDING DEPARTMENT: CRC manufactures special winding machines to produce their unique rugged winding sections. Rigid quality control is enforced to achieve highest standards of performance and uniformity.

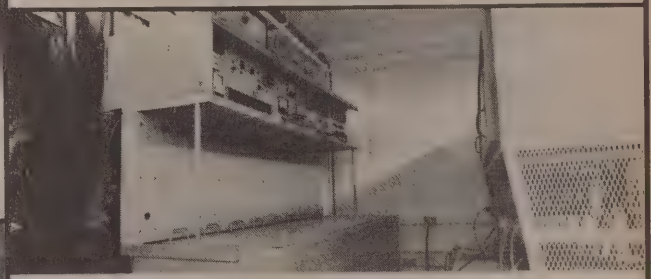
CAPACITOR ASSEMBLY DEPARTMENT: Ideal assembly conditions are achieved by air conditioning and natural lighting combined with high intensity background lighting.



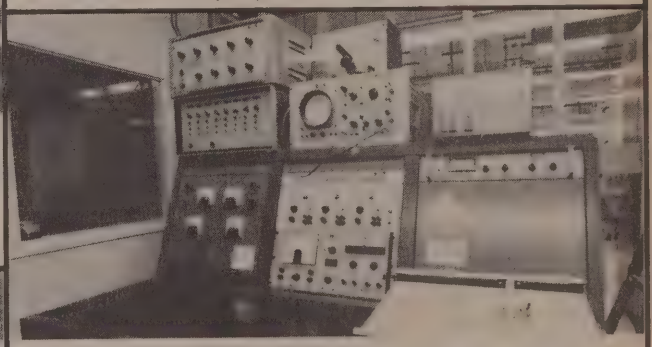
BURN-IN AND TEMPERATURE CYCLING: CRC capacitors receive 100% burn-in before and after installation in their hermetically sealed cases. 100% thermal aging or shock is performed prior to seal tests. Burn-in ovens are shown above left. CRC has over 1000KVA of unique AC generators operating from 400Hz to 100KHz for AC burn-in of capacitors.

The 12 foot high shock chamber above right, was used to qualify CRC metallized polycarbonate capacitors for 500 shocks from −55°C to +125°C in the space shuttle program. CRC has over 200 cubic feet of thermal shock and aging work space available for 100% processing of capacitors.

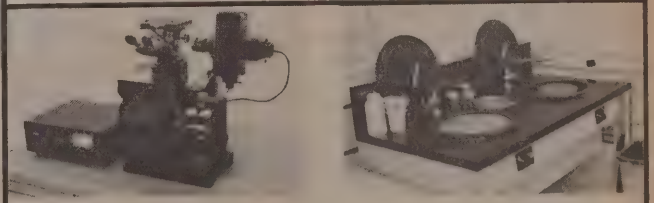
CALIBRATION EQUIPMENT: One out of approximately four employees is dedicated to quality control, assurance, and inspection. Hundreds of precision instruments for parametric measurement are maintained under constant calibration. CRC supplies capacitors for laboratory standards use throughout the world.



LIFE TEST CHAMBERS: At CRC Life Testing is a way of life. In CRC test facilities, over 10,000 capacitors are in life test 24 hours a day, every day of the year. For MIL-C-83421 retention of qualification, for special programs and for CRC research needs, life tests are conducted under DC, AC, and combined AC and DC life.



ENVIRONMENTAL TESTING: Vibration, shock and many other stress tests are conducted in our modern qualification laboratories where capacitance parameters can be accurately monitored for sensitive changes to study how our products can constantly be improved.



PARTS DISSECTION ANALYSIS: CRC conducts in-house potting grinding, polishing, and dissection of samples periodically taken from production to study possible failure modes and for general information use. Metallurgical microscopes, grinding and polishing equipment together with various specialized instruments permit thorough analysis and quality assurance control of total production.

CRC ESTABLISHED RELIABILITY CAPACITORS

SPECIAL SCREENING FOR CRITICAL APPLICATIONS

Component Research capacitors are used in critical applications where their reliability and performance can affect the success of an entire program involving years of preparation and billions of dollars of program cost. For over a decade, aerospace programs from Apollo to Viking have used CRC capacitors for timing circuits and other control circuits, essential for controlling spacecraft millions of miles from earth, after years of space travel.

You can depend upon CRC to provide the most reliable capacitor and screening plan for your critical applications. Following are typical screening plans for standard and special applications.

VIKING QUALIFIED POLYSULFONE

A specially screened G14 type has been supplied for the Viking space program which must withstand 135°C sterilization temperatures for 600 hours, very high levels of shock and vibration, and then perform in a very high impedance circuit at low voltage levels without intermittent conditions developing. During such tests some capacitors have been observed to develop problems at low temperature and special screening methods are used in this super-critical application to 100% monitor for breakdowns during temperature cycling.

400 HZ AC BURN-IN

R12 Polycarbonate capacitors are the same as the series K12 capacitors listed in the catalog except for 100% AC burn-in at 140% of rated RMS volts at 400 Hz for 16 hours at 100°C. The 400 Hz AC testing is becoming popular as a means of achieving high reliability in aircraft programs where a faulty capacitor could lead to serious consequences. The R12 type of screening will ultimately become a standard burn-in method of testing AC capacitors for MIL-C-83421. 100% recorded readings of capacitance, dissipation factor, and insulation resistance, can be provided, before and after burn-in.

40 KHZ BURN-IN & CORONA SCREENING

Type BF51 teflon foil capacitors are being used in a high frequency switching application with a rise time of less than 1 microsecond, in a limited space. Typically a 0.025 uF, 400 VDC rated teflon foil, oil impregnated capacitor operates with; 200 volt peak to peak, 10 KHz square wave voltage conditions, a rise and fall time of 100 nanoseconds, in a 0.312 x 1.063 case. Under these conditions this teflon capacitor is relatively cool with peak current of 30 amps developed at a 20 KHz repetition rate.

Following is the 100% screening used for this AC application.

1. **Burn-in** for 48 hours at 125°C. Apply 180 VRMS at 40 KHz ±5%.
2. **Thermal aging** temperature cycle 5 times −65°C to +125°C. Per MIL-C-83421.
3. **Seal Test** Bake for 4 hours at 125°C. Check for oil leakage or visual damage.
4. **Corona Test** Apply 400 VRMS at 60 Hz and check for evidence of corona inception.
5. **AC Stress Test** Apply 100 Hz square wave voltage, terminal to terminal, for 1 minute, per MIL-C-83421/1, at 1000 volts peak to peak.
6. **DC Hipot** Apply 800 VDC terminal to terminal and to case at 25°C for 1 minute, per MIL-C-83421.
7. **Insulation Resistance** when measured wtih 400 VDC at 25°C, 1,000,000 megohms minimum.
8. **% Capacitance** at 1 KHz.
9. **% Dissipation factor** at 10 KHz, 0.01% maximum.
10. **Final visual** and mechanical inspection.

40 KHZ AC BURN-IN

Special 40 KHz burn-in for type 12 polycarbonate capacitors is available at maximum rated conditions of the RMS AC voltage conditions of Table I of MIL-C-83421/1. Typically, a 0.1 uF, 30 VDC rated type C12A104 or A12A104 is receiving 10 volts RMS AC at 40 KHz, at 100°C, for 168 hours, a special screening for the Trident program.

SCREENING FOR SPACE APPLICATIONS

Type J11 teflon and J12 polycarbonate capacitors receive 96 hours burn-in and other screening conditions as required by JPL for their space applications. If you have a JPL or similar space agency subcontract, we will be happy to coordinate capacitor specification preparation to facilitate procurement with minimum delay and effort.

105°C SCREENED POLYSTYRENE CAPACITORS

Series L53 105°C screened polystyrene capacitors are one of the many unique Component Research capacitor products which demonstrate CRC superior performance and outstanding quality. The following screening plan for a space application is typical of the many custom screening procedures we have available for the most critical and sophisticated applications.

L53 SCREENING PER TP619

Test Step	Test	Conditions	Limits	Record Readings
1	Burn-in	At 140% of rated voltage at 105°C for 16 hours.	No opens or shorts	NO
2	Temperature Cycling	5 cycles from −65°C to +85°C.	No evidence of physical damage	NO
3	Gross Leak	Helium bomb for 1 hour at 75 PSI. Place in alcohol and check for bubbles.	No bubbles	NO
4	Fine Leak Test	Place in helium leak detector and evacuate and check for leakage.	1×10^{-6} atm/cm³/sec. max. leakage rate	NO
5	AC Dielectric Strength	Apply 100 Hz square wave from lead to lead at min. peak voltage of 3X rated DC voltage for 1 min. minimum.	No opens or shorts	NO
6	DC Dielectric Strength	Apply 2X rated DC voltage, lead to lead and lead to case for 1 minute minimum.	No opens or shorts	NO
7	Insulation Resistance	At 25°C at rated voltage. Charge time 1 minute. Allow 1 minute additional charge time/uF for values above 1 uF.	Ref. MIL-C-83421	YES
8	Capacitance % Tolerance	At 1 KHz at 25°C.	Ref. MIL-C-83421	YES
9	Dissipation Factor	At 1 KHz at 25°C. Above 1 uF measure at .1 KHz.	.02% Max.	YES
10	Serialize parts that pass above screening tests.			
11	DC Dielectric Strength	Apply 2X rated DC voltage, lead to lead and lead to case for 1 minute minimum.	No opens or shorts	NO
12	Insulation Resistance	At 25°C at rated voltage. Charge time 1 minute. Allow 1 minute additional charge time/uF for values above 1 uF.	Ref. MIL-C-83421	YES
13	Capacitance % Tolerance	At 1 KHz at 25°C.	Ref. MIL-C-83421	YES
14	Dissipation Factor	At 1 KHz at 25°C. Above 1 uF measure at .1 KHz.	.02% Max.	YES
15	Burn-In	At 140% of rated DC voltage at 85°C for 100 hours.	No opens or shorts	NO
16	Temperature Cycling	5 cycles from −65°C to +85°C.	No evidence of physical damage	NO
17	DC Dielectric Strength	Apply 2X rated DC voltage, lead to lead and lead to case for 1 minute minimum.	No opens or shorts	NO
18	Insulation Resistance	At 25°C at rated voltage. Charge time 1 minute. Allow 1 minute additional charge time/uF for values above 1 uF.	Ref. MIL-C-83421	YES
19	Capacitance % Tolerance	At 1 KHz at 25°C.	Ref. MIL-C-83421	YES
20	Dissipation Factor	At 1 KHz at 25°C. Above 1 uF measure at .1 KHz.	.02% Max.	YES
21	Visual Inspection	Inspect condition of leads, case and marking per CRC Method 875.	N/A	NO

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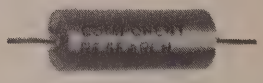
CRC ESTABLISHED RELIABILITY CAPACITORS

HIGHER RELIABILITY SCREENING

CRC SCREENS AND TESTS MANY ORDERS TO SPECIFIC CUSTOMER REQUIREMENTS FOR HIGHER RELIABILITY. IN ADDITION, CRC PERFORMS MANY IN-HOUSE TESTS THAT ARE NOT REQUIRED BY THE CUSTOMER, BUT WHICH CRC FEELS WILL IMPROVE QUALITY AND RELIABILITY. BELOW IS CRC'S MANUFACTURING AND INSPECTION FLOW PLAN FOR METALLIZED POLYCARBONATE CAPACITORS SUPPLIED TO TRIDENT SPECIFICATION 2864019.

MANUFACTURING AND INSPECTION FLOW PLAN



1. CAPACITOR MATERIAL INSPECTION
2. IDENTIFY PROCESS PAPERWORK WITH MATERIAL LOT NUMBERS
3. CAPACITOR SUB-ASSEMBLY
4. CAPACITOR SUB-ASSEMBLY INSPECTION
5. SPECIAL VACUUM PROCESSING
6. INPROCESS ELECTRICAL TESTING
7. VACUUM PROCESSING
8. NITROGEN BACKFILL
9. HERMETIC SEAL
10. INITIAL INSPECTION OF COMPLETED CAPACITOR AT 7X MAGNIFICATION

COMPONENT RESEARCH 100% PRE-SCREENING

1. 100% Screen and test per MIL-C-83421, table 4.
2. Select parts for Trident order.
3. Sample test capacitance, I.R. % D.F. & ESR at 25°C. Record readings on five samples.
4. Burn-in for 16 hours at 100°C at 40KHz at rated RMS voltage (100% test).
5. Thermal aging, 5 cycles −65°C to +125°C (100% test).
6. Seal test, fine leak (100% test).
7. I.R. at 125°C terminal to terminal (100% test, record samples).
8. I.R. at 25°C terminal to terminal (100% test, record samples).
9. Tolerance assort at 25°C at 10KHz (100% test).
10. Record capitance drift for 5 samples.
11. % dissipation factor at 25°C at 10KHz (100% test, record samples).
12. ESR at 25°C at 100KHz (record 5 samples only).
13. Select 2 random samples and dissect for product conformance.
14. Quality control manager review of data for lot acceptance.

QUALITY CONFORMANCE INSPECTION PER 2864019

TEST STEP	TEST	TEST CONDITIONS	TEST METH. MIL-C-83421	TEST LIMIT	QUALITY LEVEL
1	% CAPACITANCE TOLERANCE	At 25°C at 10KHz	4.7.8	±1%	100% TEST
2	BURN-IN	168 hrs. @ 100°C @ 40KHz @ maximum rated RMS voltage	4.7.2	There shall be no evidence of physical damage	100% TEST
3	THERMAL AGING	10 cycles from −65°C to +125°C	4.7.3	There shall be no evidence of physical damage	100% TEST
4	SEAL TEST (FINE LEAK)	Helium bomb and check for helium leak	4.7.5	$1x10^{-6}$atm/cm³/sec. max. leak rate	100% TEST
5	SEAL TEST (GROSS LEAK)	Per MIL-C-83421	4.7.5	No bubble stream	100% TEST
6	AC SQUARE WAVE TERMINAL TO TERMINAL	Apply 100Hz square wave at a peak to peak voltage of 3 times DC rated voltage	4.7.6	No shorts	100% TEST
7	DC HI-POT	Apply 200% of rated DC voltage from terminal to terminal and terminals to case for 60 seconds minimum	4.7.6	No shorts	100% TEST
8	INSULATION RESISTANCE TERMINAL TO TERMINAL	At +125°C at rated DC voltage	4.7.7	1,000 meg's-uF, need not exceed 10,000 megohms	100% TEST
9	INSULATION RESISTANCE TERMINAL TO TERMINAL	At 25°C at rated DC voltage	4.7.7	100,000 meg's-uF, need not exceed 1,000,000 megohms	100% TEST
10	% CAPACITANCE TOLERANCE	At 25°C at 10KHz	4.7.8	±1%	100% TEST
11	% CAPACITANCE DRIFT FROM STEP 1 TO 10	At 25°C at 10KHz referenced to initial reading	4.7.8	±0.5%	100% TEST
12	% DISSIPATION FACTOR	At 25°C at 10KHz	4.7.9	0.5%	100% TEST
13	RADIOGRAPHIC INSPECTION	Two views at 90° per OD 48491	N/A	Per OD 48491	100% TEST
14	VISUAL MECHANICAL INSPECTION	Per 2864019	4.7.1	Per 2864019	1.0% AQL

NOTE: 5% PDA (percent defective allowable) or 1 device, whichever is greater for each test step 7, 8, 9, 11, 12 and 13.

CRC ESTABLISHED RELIABILITY CAPACITORS

GENERAL PRODUCT INFORMATION

ORDERING INFORMATION — Terms: Our terms are net 30 days to customers approved by our credit department. All shipments are F.O.B., Santa Monica, Calif. **Delivery:** Most items listed are available from stock or within 10 weeks for quantities up to 1000 pieces. **Minimum Order:** Minimum billing per order is $30.00. **Complete Part Number:** Please make certain that you have complete part number to avoid any errors or delays. Please check part number instructions in individual specification pages.

PATENT INFORMATION — CRC capacitors are exclusively manufactured under one or more of the following patents and additional patents pending: 3,238,428; 3,260,906; 3,292,063; 3,506,895; 3,539,886; 3,603,849; 3,626,362.

CONSTRUCTION INFORMATION — All standard capacitors listed are hermetically sealed after vacuum process and both gross leak and helium leak tested for true hermeticity. Unless otherwise specified all parts listed are metal cased, tubular, with both wire terminals isolated from the metal case.

PART NUMBER OBSOLESCENCE — Due to changes in military specifications for which we are qualified, upgrading of our catalog specifications, or size reduction, part numbers formerly used may now be obsolete. We urge our customers to change their existing drawings to indicate the new part numbers for old and new design, wherever possible. If you are unable to make this change, CRC will continue to supply and mark parts indefinitely to the old specifications.

INSTALLATION INSTRUCTIONS — To prevent damage to the hermetic seal joint, use a tweezer type heat sink between the soldering iron and solder beads when soldering within ¼" of beads. Prior to lead bending or twisting, protect glass seals and solder joints by gripping with a small pliers, area of leads near solder beads.

Contaminating films on the glass seal surfaces may occur during customer handling and installation of capacitors. To preserve the high insulation resistance inherent in CRC capacitors, clean the glass seal surfaces thoroughly with acetone or chlorinated hydrocarbon fluid.

CAPACITOR MEASUREMENT INFORMATION — The high quality of CRC capacitors may be difficult to evaluate unless sufficiently sensitive and accurate equipment is utilized in conjunction with proper measurement techniques.

Capacitance bridges equal to the General Radio 1620A are recommended for best accuracy of capacitance. This bridge is satisfactory for dissipation factor measurement of capacitors up to 1 uF. CRC has developed a special bridge capable of accurately measuring dissipation factor of capacitors up to 100 uF or more at frequencies up to 1KHz. For inspection of DF of larger than 1 uF capacitors it is suggested that you use samples correlated by our measurement laboratory.

Insulation resistance measurement is performed by Component Research Co. using leakage current methods which are repeatable to 1 picoamp for capacitors less than 0.1 uF. Larger values require adequate charge time to minimize dielectric absorption effects. Guard boxes are used to perform leakage current and dielectric absorption measurements.

SPECIAL MATCHING — We can assort capacitors into sets of two or more capacitors matched for capacitance value within ±0.1% of each other at nominal cost. Where capacitors must track with temperature, they can be supplied in matched sets as closely at ±0.1% over their temperature range. Capacitors of opposing temperature coefficient slopes can be supplied to obtain lower temperature coefficients than for standard types.

SPECIAL CAPACITOR VALUES — If your application requires odd values such as 0.10015 uF ±0.1% or 0.9999 uF ±0.25%, such requirements are readily met from our large stock of standard and non-standard values. Individual capacitors can be permanently marked or tagged with discrete values accurate to six places if required.

SPECIAL VOLTAGE RATINGS — Problems of size may occur when replacement of a poor quality capacitor is required. Under certain conditions such as restricting the operating temperature, or limiting DC hipot to 150% of rated volts, a substantial size reduction is possible. Check with our applications engineering department for our recommendations in such cases.

SPECIAL PART NUMBER IDENTIFICATION — CRC believes that there is a sufficient choice of capacitors in this catalog to satisfy virtually all applications. In the event you have any requirement involving a modification of our specifications, the following special identification will be used.

Example: X11B154BW588 (typical special part number). "X" preceding the part number indicates a special customer requirement. The number group at the end of the part number is assigned as a unique identification of the special manufacturing and inspection instructions. In example shown, "588" is a typical unique identification number.

STANDARD CRC CASE SIZES & WEIGHTS

CRC No. Case	CASE DIMENSIONS IN INCHES A Diam.	B Length	C Length	Typical* Weight ±20% Accuracy (ounces)
CF329-1	.170	.500	.700	.0353
CF329-2	.170	.562	.762	.0424
CF329-3	.170	.687	.887	.0459
CF329-4	.193	.562	.762	.0459
CF329-5	.193	.687	.887	.0459
CF329-6	.193	.813	1.013	.0494
CF329-7	.235	.562	.762	.0494
CF329-8	.235	.687	.887	.0565
CF329-9	.235	.813	1.013	.0635
CF329-10	.312	.687	.887	.0883
CF329-11	.312	.813	1.013	.0953
CF329-12	.312	1.063	1.263	.1059
CF329-13	.400	.813	1.013	.1412
CF329-14	.400	1.063	1.263	.2118
CF329-15	.400	1.375	1.575	.2118
CF329-16	.500	1.125	1.325	.2824
CF329-17	.500	1.375	1.575	.3177
CF329-18	.562	1.125	1.325	.4059
CF329-19	.562	1.375	1.575	.4589
CF329-20	.562	1.875	2.075	.6072
CF329-21	.670	1.375	1.575	.6354
CF329-22	.670	1.875	2.075	.7589
CF329-23	.750	1.875	2.075	.9884
CF329-24	1.00	1.875	2.075	1.6061
CF329-25	1.00	2.375	2.575	1.9768
CF329-26	1.00	2.625	2.825	2.2945

CRC No. Case	CASE DIMENSIONS IN MILLIMETERS A Diam.	B Length	C Length	Typical* Weight ±20% Accuracy (grams)
CF329-1	4.32	12.70	17.78	1.0
CF329-2	4.32	14.28	19.36	1.2
CF329-3	4.32	17.45	22.53	1.3
CF329-4	4.90	14.28	19.36	1.3
CF329-5	4.90	17.45	22.53	1.3
CF329-6	4.90	20.65	25.73	1.4
CF329-7	5.97	14.28	19.36	1.4
CF329-8	5.97	17.45	22.53	1.6
CF329-9	5.97	20.65	25.73	1.8
CF329-10	7.93	17.45	22.53	2.5
CF329-11	7.93	20.65	25.73	2.7
CF329-12	7.93	27.00	32.08	3.0
CF329-13	10.16	20.65	25.73	4.0
CF329-14	10.16	27.00	32.08	6.0
CF329-15	10.16	34.93	40.01	6.0
CF329-16	12.70	28.58	33.66	8.0
CF329-17	12.70	34.93	40.01	9.0
CF329-18	14.28	28.58	33.66	11.5
CF329-19	14.28	34.93	40.01	13.0
CF329-20	14.28	47.63	52.71	17.2
CF329-21	17.02	34.93	40.01	18.0
CF329-22	17.02	47.63	52.71	21.5
CF329-23	19.05	47.63	52.71	28.0
CF329-24	25.40	47.63	52.71	45.5
CF329-25	25.40	60.33	65.41	56.0
CF329-26	25.40	71.63	76.71	65.0

*The typical weights shown above apply to all capacitor types listed in our catalog. The ±20% weight tolerance covers variations in density for a given case size part made from teflon or any other listed dielectric. The weight tolerance also makes allowance for foil or metallized construction.

Please contact us if more accurate weight information is required for any given series of capacitors.

CRC ESTABLISHED RELIABILITY CAPACITORS

OPTIONS AVAILABLE FOR STANDARD CAPACITORS

CRC can supply the standard capacitors listed in this catalog with more closely specified limits and with special characteristics by additional processing, screening, and selection. Following is a list of some options and characteristics available when you are required to meet special design or operating conditions.

LINEAR TC SLOPE FOR RESISTOR MATCHING

CRC series A95 polystyrene capacitors provide the closest approximation to a straight line plot for capacitance vs temperature over the range of −50°C to +85°C, with less than 150PPM/°C in negative slope. Larger capacitor values appear to have lower TC than smaller capacitor values. Typically values ranging 0.01uF average −100 PPM/°C and 1.0uF range −40PPM/°C. The normal worst case limits in non-linearity of TC slopes are ±50PPM/°C for all A93 polystyrene capacitors. Slopes are available as low as ±10PPM/°C for the full temperature range of −50°C to +85°C. This slope is a permanent characteristic and will remain constant with temperature cycling and time.

CRC series A95 metallized polypropylene capacitors have a more negative slope, generally −300PPM/°C with linearity limits of ±50PPM/°C. CRC foil polypropylene capacitors which are not oil impregnated generally have a TC slope of −225PPM/°C. Foil capacitors also have a greater dielectric hysteresis than metallized types which evidences itself by a capacitance shift at 25°C when a capacitor is alternately cycled from cold to hot temperatures.

Typically this offset is from 0.01% to 0.15% for metallized capacitors when measured at 25°C after exposure to −50°C and +125°C. Foil capacitors usually have an offset of 0.05% to 0.25% under the same conditions. Operation over a more limited temperature range results in a reduced offset.

CRC can provide capacitors with minimum offset and specific linearities and slopes by 100% screening and selection.

±10PPM/°C TRACKING MATCHED CAPACITORS

In some applications it is desirable to have several capacitors of the same value track together over a specified temperature range.

Frequently good linearity is not mandatory provided all capacitors although non-linear, follow the same pattern of varying in capacitance with temperature. In other applications a set of different capacitors must track within a defined ratio limit of each other as temperature changes.

From its large stock of 100% screened and batch controlled high reliability capacitors, CRC can furnish many combinations of desired matched capacitors in a minimum of time.

MATCHED SETS TO ±0.05% ACCURACY

CRC can provide matched sets of two or more capacitors with readings of ±0.05% of each other although the purchase tolerance is as high as ±1%. This is more economical than purchasing individual capacitors to ±0.1% or ±.25% tolerances.

0.003% DIELECTRIC ABSORPTION CAPACITORS

Special teflon capacitors having less than 0.003% dielectric absorption are available for minimum offset error in sample and hold type applications.

In one special application 1uF teflon capacitors are 100% screened by viewing their individual slopes of recovery voltage on an oscilloscope. These capacitors receive a 10 volt peak pulse, ten milliseconds wide, with a 1 millisecond discharge time. The oscilloscope indicates the recovery voltage for an additional 100 milliseconds. This test method more closely approximates fast switching application conditions than the dielectric absorption test methods covered in military specifications.

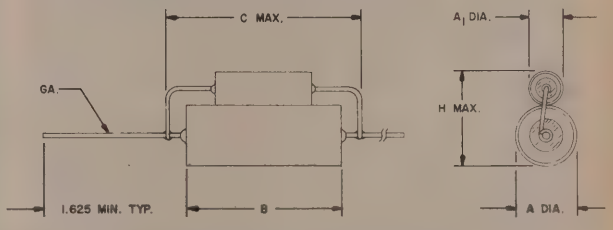
ZERO TEMPERATURE COEFFICIENT BY TC MATCHED PAIRS

It is difficult to obtain zero TC over a wide temperature range but over a more limited range CRC can provide a TC as low as zero ±5PPM/°C by pairing two **capacitors** with opposing slopes. Typically an A93 polystyrene capacitor matched with the same value A12 polycarbonate capacitor will match to zero ±30PPM/°C from −10°C to +85°C, as off the shelf purchased items.

If lower TC than this is required, we can 100% measure and match for closer temperature coefficient.

"PIGGYBACK" PERMANENTLY CONNECTED MATCHED CAPACITORS

Customers sometimes prefer the matched capacitors connected together as one to prevent their separation prior to installation. CRC standards are made by "piggyback" connection of trimmers which can provide accuracies to ±0.05%. Shown below is a figure of a "piggyback" connected matched capacitor.



50,000,000 MEGOHMS INSULATION RESISTANCE

This may seem incredible but CRC is supplying special 1uF teflon capacitors which measure up to 5,000,000 megohms at 100°C, and up to 50,000,000 megohms at temperatures from 25°C to −40°C.

CRC is developing new methods of measuring to higher levels of insulation resistance and believes it will be able to verify that specially selected smaller values such as 0.1uF can be supplied to meet a specification of 500,000,000 megohms. When you use capacitors in such sensitive applications certain errors and disturbances not normally observed become visible. Some of these are described below.

LOW "PIEZO ELECTRIC LIKE" VOLTAGE GENERATION CAPACITORS

When capacitors are subjected to a temperature change they generate a voltage which may vary from capacitor to capacitor in a lot and from one style of capacitor to another. Voltages up to ten millivolts per °C have been observed and the voltage output generally does not increase linearly with temperature. In some cases there actually will be voltage reversal during a temperature run in a given direction.

If the capacitor is not connected to a high impedance measurement device during the tests this voltage output may not be seen as it will be discharging through the low resistance input of ordinary voltmeters if these are being used for measurement. CRC supplies specially selected 0.5uF, 50VDC teflon capacitors similar to the J11B504 style to meet a requirement of 0.5 millivolts maximum/°C voltage generation, for a critical application.

FAILURE ANTICIPATION, AND IMPROVED CAPACITOR RELIABILITY WITH 100% SCREENING

CRC ESTABLISHED RELIABILITY CAPACITORS

Plastic film dielectric type capacitors can provide remarkably good electrical characteristics and high reliability but it takes a combination of sound construction, suitable film quality, exacting process control, and 100% testing to achieve this.

We are listing below some pitfalls to avoid because we are concerned with a proliferation of marginal quality capacitors frequently used in high reliability level aerospace and industrial applications. Additional information appears on page 1107.

MIS-APPLICATION OF CAPACITORS IN AC CIRCUITS

■ The highest quality capacitor will fail if you are exceeding its ratings by subjecting it to excessive voltage and current stresses. In sinusoidal applications metallized capacitors that warm up over 20°C after several hours of operation are considered a borderline case, and you may be applying too high an RMS voltage or frequency.

■ If the capacitors you are using have higher than normal dissipation factor readings, this may be a sign of high series resistance caused by poor terminations on the capacitor section. The square wave AC screening for one minute covered in MIL-C-83421/1 is a good way of eliminating capacitors with gross dissipation factor quality.

■ If dissipation factor limits are set too high as post test requirements, suspect capacitors will pass the square wave test. In fact terminations may have been damaged by this test, but are permitted to pass what we consider are abnormally high DF limits. A termination that is poor at room temperature generally should be worse at higher temperature and increased heating caused by power loss at the terminations may cause ultimate degeneration and possible failure.

■ We consider 100% AC burn-in at elevated temperature an excellent method of checking for good terminations. Burn-in should be followed by 100% dissipation factor examination.

■ In SCR commutation and transistor switching type applications, heat rise of a metallized capacitor is not always a good means of determining if the capacitor can handle the non-sinusoidal current pulses usually encountered if the capacitor is subjected to relatively high peak currents at a low duty cycle. Capacitor may suddenly open after hours, possibly months of operation, while never having shown more than a few degrees of warm-up during operation.

■ A recent example of operating beyond specified limits resulting in ultimate failure is shown by the following experiment performed on three 0.033uF, 30VDC, Type E12A333, metallized polycarbonate capacitors.

The capacitors were placed in parallel to form a 0.1uF load into the output of a CRC designed power generator supplying a 60 volt peak to peak square wave at a 20KHz repetition rate.

An examination of the current pulses developed indicated that the capacitors were handling a peak current of 8.4 amps with a cosine type waveshape having a 1.2u second width at the base.

The capacitors were operated for 100 hours at 25°C with less than 2°C heat rise. If we compare the MIL-C-83421/1 rated current at 40KHz of 0.18A rms maximum for a 0.033uF 30VDC capacitors, with the peak current of 2.8 amps during this test, it appears that these capacitors can handle this level.

A more conservative level which we intend to verify by long term is 1.8 amps maximum peak current based on a peak current not to exceed ten times the 40KHz RMS rated current of 0.18A for this capacitor. After increasing the square wave voltage to 80 volts peak to peak, the capacitors opened up.

The peak current during this test period was approximately 3.8 amps which is more than twenty times the RMS rated current of 0.18 amps. This is an example of how much higher in peak current CRC capacitors can be stressed, but certainly we do not recommend that you go to extremes in using these capacitors.

■ We recommend that you send us your oscilloscope current and voltage waveforms for analysis if you have non-sinusoidal applications.

■ As an example a 0.1uF 100VDC rated A12C104 or K12C104 capacitor maximum rated at 0.9A RMS could be operated with 9 amps of peak current provided you did not exceed a 10KHz repetition rate.

■ Additional AC pulse data appears on pages 1102 and 1109.

CAPACITOR OPENS & INTERMITTENTS AFTER ENVIRONMENTAL TESTING OR LONG TERM STORAGE

■ CRC has frequently been requested to replace "Brand X" metallized capacitors (which may have cost 50% less). Problems began to plague production lines long after being qualified for the application and long after passing initial breadboard and preproduction tests.

■ Unfortunately many specifications and programs do not take time into consideration. Capacitor terminations may withstand DC burn-in, DC life, and even AC life but may start to break down as a result of expansion and contraction of all the metal and plastic materials involved in the construction of a capacitor.

■ The extreme differences in dimensional change between plastic and metal materials as a result of temperature cycling may result in microscopic ruptures of termination joints, possible electrode oxidation and generally unstable termination series resistance.

■ Component Research Company patented stress free termination design and precise quality control eliminates the above problems. This is the reason we recommend 100% temperature cycling or thermal aging followed by screening as described above.

■ Our goal is to continue to provide increasing amounts of detailed information and data of this type. In this manner the reliability and safety of electronic equipment needed for military and commercial transportation or general usage equipment will be enhanced and maintained.

CRC ESTABLISHED RELIABILITY CAPACITORS

RELIABILITY QUESTIONS AND ANSWERS

AC RATED CAPACITORS

What are the limiting factors restricting the use of metallized polycarbonate capacitors for AC applications?

A properly manufactured and screened capacitor can handle considerable RMS and peak currents from −55°C to +125°C without significant case temperature heat rise. The dissipation factor of capacitors to be used in AC applications must be uniformly low to limit the watts loss incurred usually by capacitors with a high (ESR) equivalent series resistance.

We recommend a maximum dissipation factor of 0.15% at 1KHz as the acceptance test limit. All capacitors should be subjected to temperature cycling prior to final measurement of DF to observe if they remain less than 0.15%. This test eliminates problems which may occur in use, after storage, or operation at extreme temperatures, leading to higher DF and operational failure.

CRC catalog page 1117 contains the maximum RMS current and voltage ratings for sinusoidal conditions, continuous duty cycle, at 400Hz and 40KHz. For conditions other than shown, send to our sales office a sketch of the current and voltage waveforms under worst case and normal operating conditions. Include all other information necessary for quotation purposes.

Is polycarbonate better than other dielectrics for AC applications?

If size, weight, cost, or operating temperatures were not important considerations, then other dielectric style capacitors are superior to polycarbonate.

As an example, CRC can supply polystyrene, teflon, or polypropylene AC capacitors with approximately ten times lower loss than the series 12 polycarbonate capacitors.

Polysulfone introduced as a new product on pages 1126-1129, is slightly better than polycarbonate for AC applications below 100°C, and can be used above 125°C (the limit for polycarbonate), to 150°C with proper voltage derating.

CRC considers mylar and paper dielectric styles too lossy for AC applications and therefore does not recommend this type for such requirements. Additional information on AC capacitors appears on other pages of this catalog.

What type of screening test will assure that the polycarbonate capacitors are reliable for AC applications?

Once it has been determined that your application requirements can be met by CRC standard polycarbonate series 12 capacitors, the screening test used by CRC and incorporated into MIL-C-83421/1 will be sufficient to provide the quality assurance needed.

As an example 100% of the capacitors are temperature cycled then are subjected to a square wave voltage at 100Hz at 300% of rated DC voltage for peak to peak amplitude.

During this test the capacitors must handle approximately 35 microsecond wide current pulses for one minute at a rate of 200 per second.

A routine examination of the current and voltage waveforms during square wave hipot of 10 uF, 50VDC type CRH capacitors, shows that with 150 volts peak to peak voltage at 100Hz applied, the peak current is 85 amps. This is equivalent to operation with a half sine wave peak current pulse of 8.5 amps/uF at a 200 PPS rate. SEE WAVEFORMS AT RIGHT.

Following the square wave voltage stress test the capacitors must meet 0.15% max. dissipation factor limits.

As shown on catalog page 5, life testing of CRC metallized polycarbonate capacitors at 400Hz and 4000Hz is performed continuously as retention of qualification to MIL-C-83421/1.

Are the new CRC series 12 AC rated polycarbonate capacitors higher in cost than their earlier type PL and PG capacitors supplied since 1965?

A study of series 12 polycarbonate prices, shows that with few exceptions price reductions (particularly for closer tolerances and larger uF values) are the rule. An examination of the series 12 specifications shows higher guaranteed performance and continuous retention of qualification testing. This in itself represents a substantial price decrease in terms of value adding without increased cost.

Why are CRC low dissipation factor polycarbonate capacitors replacing commonly manufactured capacitors in AC applications?

There is a risk that the dissipation factor of such capacitors will increase with use and result in hot spots at the terminations. Field failures of such capacitors have been reported where the capacitors have exploded and caused fire damage.

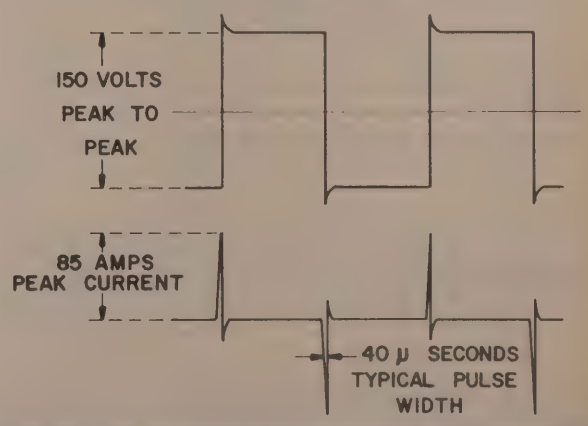
It may be possible to use ordinary higher DF capacitors without noticeable problems at 400Hz provided that RMS voltage is sufficiently low such that the RMS current is limited. Heat sinking will also help prevent excess heat rise due to poor quality terminations.

Interestingly enough CRC polycarbonate capacitors have a lower dissipation factor at temperatures from 75°C to 125°C than at 25°C which lowers their effective heat rise at higher temperatures. Where the current source is limited, higher DF capacitors may not heat sufficiently to short, but may gradually suffer from increasing DF to the point where they are effectively open.

What is the maximum current that can be applied to MIL-C-83421/1 capacitors?

The 40KHz current and voltage ratings listed in Table I of the Mil-Spec and also shown on page 1117 of this catalog are based upon continuous operation under sinusoidal conditions. It is essential that any use under conditions exceeding these limits be discussed further with our applications engineers for elimination of failures. Under certain conditions, the capacitors can be used at higher frequencies and in square wave filtering applications. For good reliability it is best to study these special applications on an individual basis. CRC plans to provide data tables showing allowable working conditions during higher frequency sinusoidal, pulsed, and non-sinusoidal conditions.

TYPICAL VOLTAGE AND PEAK CURRENT WAVEFORMS SHOWN FOR A12B106, 10 uF, 50 V, METALLIZED POLYCARBONATE CAPACITOR DURING THE ONE MINUTE AC SQUARE WAVE SCREENING AT 100 Hz.



CRC

VOLTAGE/TEMPERATURE SCANNING FOR CAPACITOR FAULTS

AUTOMATIC SURVEILLANCE SYSTEM

Automatic surveillance system for detection of capacitor faults. "High impedance" operation is simulated to prevent undetected "clearing". Combined temperature and voltage ramping during computer scanning induces worst case fault conditions. Each capacitor is measured approximately 800 times in each temperature cycle from −65°C to +125°C and from 0 to 30VDC.

Voltage is slowly ramped at approximately 1 volt per minute to limit current and permit scanning thru the full spectrum of low voltage operation from 0 to 30VDC.

Temperature is slowly ramped at approximately 1°C per minute to detect all thermally induced faults while scanning thru the full spectrum of environmental exposure from −65°C to +125°C.

Computer scanning system continuously records individual capacitor serial number with fault and temperature voltage conditions for failure analysis if required.

Computer scanning system continuously monitors and records conditions at time of fault such as voltage and temperature with data traceable back to capacitor tested.

Each capacitor is batch controlled for controlled PDA limiting of faults for very critical applications.

This exclusive CRC test system provides most reliable and in depth screening assurance for all types of capacitors foil or metallized where combined voltage temperature dynamic stresses conceivably can induce some abnormal mode of behavior.

Special screening operations and procedures can be offered to suit individual customer requirements.

TYPICAL CRC SCREENING

The miniature low voltage metallized capacitors manufactured by CRC have been engineered to prevent breakdowns and only on rare occasion have breakdowns been reported to us.

We now have a system for detecting the most elusive intermittent capacitor behavior. This screening should eliminate capacitors which may act intermittently in the field on rare occasion.

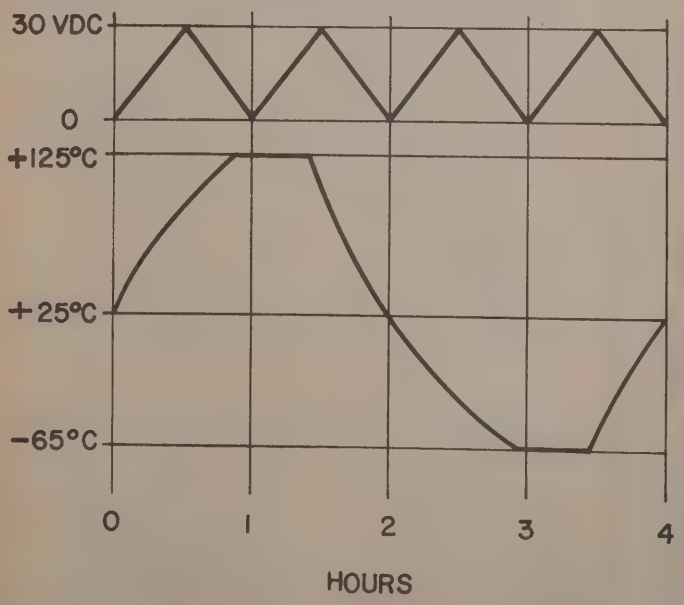
During CRC testing the current is limited to approximately 0.05 microjoules of energy to simulate conditions in which a capacitor could breakdown and fail to clear itself.

They are simultaneously slowly brought up and down in voltage as they are temperature cycled. Using a specially designed (patent applied for) power source and sensitive fault detection system, the capacitors are electronically scanned using a sophisticated Gen. Radio GR 2230.

Each capacitor screened by this system is typically tested over 800 times per cycle for abnormalities such as shorts, opens, intermittents, and low insulation resistance while the capacitor is operating at extremely low to approximately 30VDC levels. At the same time the capacitors are being alternately frozen and heated to induce all possible failure modes if the capacitor is less than perfect.

CRC capacitors 100% screened by this exclusive low energy fault detection system can now provide the highest possible reliability for the most sensitive high impedance applications.

TYPICAL VOLTAGE/ TEMPERATURE RAMP SCREENING CYCLE



This General Radio model 2230 Component Test Systems is used in conjunction with CRC specially designed ramp generators, cycling chambers, and interface equipment for voltage/ temperature capacitor fault-scanning.

Add Dept. EM to address to tell them you saw it in eem

HIGH PULSE CURRENT HANDLING METALLIZED CAPACITORS

Foil type capacitors constructed from low loss dielectric plastic films such as Teflon, Polypropylene, or polystyrene are generally most capable of handling high peak currents at extremely fast switching rates.

Metallized capacitors are approximately one third to one half the size of metal foil capacitors and can be used in most AC applications formerly considered the domain of metal foil types.

As an example a 10uF, 30VDC, metallized polycarbonate capacitor type G12A106 was charged at 30VDC and discharged into a 0.02 ohm vacuum switch at a 1 PPS rate for days to determine if it would open up. There was no noticeable effect on ESR or dissipation factor as a result of this test.

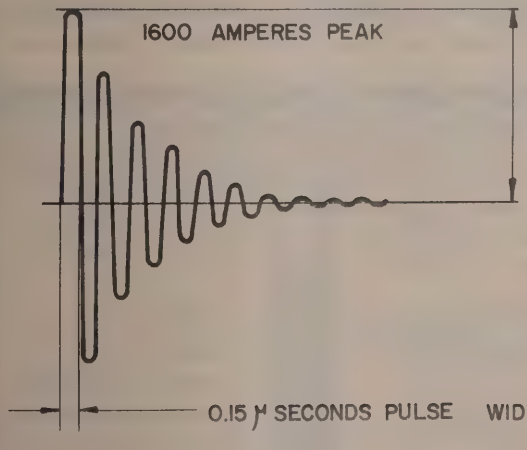
During this test the first ½ sine discharge current pulse was approximately 180 amperes and decayed to zero current after several 100KHz resonant cycles.

We attempted to open this miniature 10uF capacitor by charging it with 100VDC which resulted in a first ½ sine pulse current of 500 amperes peak at a 1 PPS rate for several hours. Despite the voltage overstress applied and the extremely high peak capacitor current developed, we could not degrade the termination quality of the G12A106 capacitor.

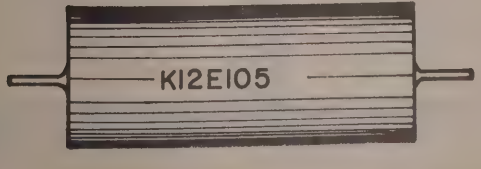
We can conclude that CRC miniature metallized polycarbonate capacitors are capable of handling enormous discharge current provided the repetition rate is slow.

A study is now being conducted by CRC to determine the optimum AC operating conditions with maximum energy density under high current pulse conditions for metallized vs. metal foil capacitors.

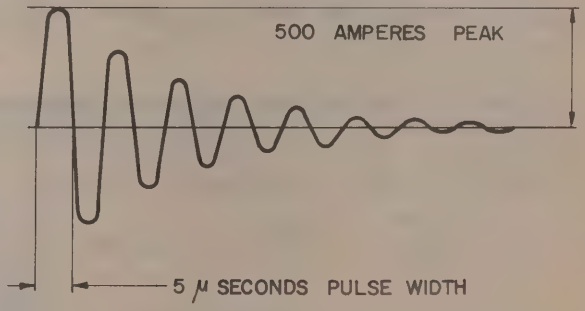
These tests will determine what repetition rate conditions require a larger foil capacitor instead of a smaller metallized film capacitor for failure-free operation.



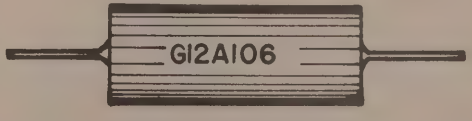
IN THIS TEST A 1 uF, 400VDC, METALLIZED POLYCARBONATE CAPACITOR, TYPE K12E105, IN A 0.750" X 1.875" CASE DEVELOPED 1600 AMPERES PULSE CURRENT WHEN DISCHARGED INTO A 0.02 OHM SWITCH LOAD AFTER CHARGE AT 800VDC. REPETITION RATE WAS 1 PPS AND NO DEGRADATION OF ESR OR DISSIPATION FACTOR OR CASE WARM-UP WAS MEASURABLE AFTER SEVERAL HOURS OF OPERATION.



ACTUAL SIZE OF THE 1uF, 400VDC CAPACITOR TESTED AT DEVELOPED PULSE CURRENTS UP TO 2600 AMPERES PEAK TO PEAK AT 1PPS RATE.



CAPACITOR DISCHARGE CURRENT SHOWN FOR TYPE G12A106 METALLIZED POLYCARBONATE CAPACITOR, 10 uF, 30VDC, AFTER CHARGE AT 100VDC AND DISCHARGE INTO A 0.02 OHM SWITCH LOAD. REPETITION RATE WAS ONE PULSE PER SECOND AND THE RESONANT FREQUENCY RESULTING FROM DISCHARGE INTO THE LOAD IS 100KHz.



ACTUAL SIZE OF THE 10uF, 30VDC CAPACITOR TESTED AT DEVELOPED PULSE CURRENTS UP TO 900 AMPERES TO PEAK AT 1 PPS RATE.

IF YOUR APPLICATION REQUIRES MAXIMUM RELIABILITY, SMALLEST SIZE, AND OPERATION IN CRITICAL AEROSPACE OR INDUSTRIAL ENVIRONMENTS, CRC APPLICATION ENGINEERS WILL BE PLEASED TO REVIEW YOUR SPECIFICATIONS FOR CORRECT CAPACITOR USAGE.

COMPONENT RESEARCH CO., INC. ▪ 1655 26TH STREET • SANTA MONICA, CALIF. 90404 • (213) 829-3611 TWX (910) 343-6864

CRC ESTABLISHED RELIABILITY CAPACITORS

MANUFACTURING AND INSPECTION FLOW PLAN

MIL-C-83421/1 • MIL-C-39022/9 • STANDARD CAPACITORS

100% INSPECTION PER MIL-C-83421 & MIL-C-39022

The high reliability capacitor screening plans developed by Component Research Co. have been adopted by space and military contractors throughout the world for critical programs. The new general specification MIL-C-83421 incorporates much of the screening features shown below at an attempt to provide a "state of the art" capacitor specification for general industrial and aerospace use.

Our flow plan for manufacturing and inspection shown below covers the steps used to process and screen all of our polycarbonate, teflon, polystyrene and polysulfone film capacitors. The individual specifications shown in the catalog list the actual screening performed for each style. A choice of three quality levels provides different degrees of intensive screening to assure the highest possible quality at lowest cost. Special screening plans are available which include tests such as 100% corona inception inspection, 40KHz AC burn-in at 100°C, high impedance monitoring for intermittent conditions at low voltage during temperature cycling, ESR inspection at 100KHz, dielectric absorption effects with rapid switching rates and varying temperature, and many other sensitive measurement phenomena.

100% PROCESSED AND SCREENED

Steps 1-6 show the 100% processing (up to and including hermetic sealing), of MIL-C-39022/9 and MIL-C-83421/1 qualified polycarbonate and CRC standard capacitors — Polycarbonate, Teflon, Polystyrene and Polysulfone. The quality level selected will be determined by the individual capacitor specification.

PROCESSING STEPS

A. CAPACITOR MATERIAL INSPECTION
B. IDENTIFY PROCESS PAPERWORK WITH MATERIAL LOT NUMBERS
C. CAPACITOR SUB-ASSEMBLY INSPECTION
D. SPECIAL VACUUM PROCESSING
E. HERMETIC SEAL AFTER NITROGEN BACK-FILL
F. INITIAL INSPECTION OF COMPLETED CAPACITOR (7X POWER)

QUALITY LEVEL 1 MIL-C-83421/1 & MIL-C-39022/9

1. BURN-IN
2. TEMPERATURE CYCLING
3. HELIUM LEAK TEST AND GROSS LEAK TEST
4. AC-DIELECTRIC STRENGTH
5. DC-DIELECTRIC STRENGTH
6. INSULATION RESISTANCE
7. % CAPACITANCE TOLERANCE
8. % DISSIPATION FACTOR
9. SELECTION FOR PERFORMANCE GRADES
10. REPEAT ELECTRICAL MEASUREMENT AND RECORD DATA AS REQUIRED
11. CONDUCT SPECIAL MEASUREMENT WHEN REQUIRED BY CUSTOMER
12. FINAL VISUAL INSPECTION OF WORKMANSHIP, MARKING, PAPERWORK AND PACKAGING
13. SHIP CERTIFICATE OF COMPLIANCE WITH PARTS

Highest reliability capacitors with standard or special screening for Apollo, Viking, and other space programs. Also used in military and ultra high quality industrial applications.

Qualified for space, critical applications, F15 aircraft, Trident, space shuttle and other programs.

QUALITY LEVEL 2 MIL-C-39022/9

1. BURN-IN
2. TEMPERATURE CYCLING
3. HELIUM LEAK TEST AND GROSS LEAK TEST
4. AC-DIELECTRIC STRENGTH
5. DC-DIELECTRIC STRENGTH
6. INSULATION RESISTANCE
7. % CAPACITANCE TOLERANCE
8. % DISSIPATION FACTOR
9. FINAL VISUAL INSPECTION OF WORKMANSHIP, MARKING, PAPERWORK, AND PACKAGING
10. SHIP C OF C WITH PARTS

High reliability capacitors screened for space, missile and industrial applications. Qualified for many programs such as The Tow Missile, The Lance Missile and F15 aircraft.

QUALITY LEVEL 3 MIL-C-83421/1 & MIL-C-39022/9

1. TEMPERATURE CYCLING
2. HELIUM LEAK TEST AND GROSS LEAK TEST
3. AC-DIELECTRIC STRENGTH
4. DC-DIELECTRIC STRENGTH
5. INSULATION RESISTANCE
6. % CAPACITANCE TOLERANCE
7. % DISSIPATION FACTOR
8. FINAL VISUAL INSPECTION OF WORKMANSHIP, MARKING, PAPERWORK AND PACKAGING
9. SHIP C OF C WITH PARTS

High reliability capacitors with reduced screening and performance levels for lower cost high volume programs, such as missiles, aircraft and telephone equipment applications.

Random samples from completed production lots of all quality levels are periodically tested.

These tests may consist of Insulation Resistance at high temperature, Dielectric Absorption, Temperature Coefficient and AC stress analysis tests.

In addition, samples are life tested for retention of qualification.

CRC *ESTABLISHED RELIABILITY CAPACITORS*

PERIODIC TESTING PROGRAM

FOR RETENTION OF QPL MIL-C-83421/1

GROUP "B" INSPECTION PER MIL-C-83421, TABLE IV

GROUP B, SUBGROUPS 1, 2 AND 3: In order to maintain qualification, Component Research Company performs Periodic Testing (Quality Conformance Testing). Capacitors are selected from current production lots of CRH01 through CRH00 styles, which have successfully completed 100% "Group A" inspection shown on page 1106.

SUBGROUP 1 TESTS

10 Each CRH Style Monthly

- Barometric Pressure
- Insulation Resistance at Max. Rated Temperature
- Temperature Coefficient
- Life (2,000 Hours)

SUBGROUP 2 TESTS

CRH01 Parts Jan., July
CRH02 Parts Feb., Aug.
100 Volt Parts March, Sept.
200 Volt Parts April, Oct.
400 Volt Parts May, Nov.

- AC Conditioning 250 Hours
- Dissipation Factor
- Insulation Resistance
- △ Capacitance

SUBGROUP 3 TESTS

18 Parts Every 6 Months, Consisting of CRH01, CRH02, CRH03, CRH04 and CRH05

- Vibration
- Salt Spray
- Immersion
- Solderability
- Shock
- Moisture Resistance
- Terminal Strength
- Resistance to Solvents

DC LIFE TEST PERFORMED MONTHLY

GROUP B, SUBGROUP 1 FOR ALL CRH STYLES COVERING ALL FAILURE RATE LEVELS

Capacitors are DC-Life tested at 100°C and at 140% of the rated D.C. voltage for 2,000 hours. (This is an acceleration factor of 5:1, approximately).

EXAMINATION OR TEST	CONDITIONS	POST TEST LIMITS CRH01, CRH02, CRH03, CRH04, and CRH05	POST TEST LIMITS CRH06, CRH07, CRH08, CRH09, and CRH00
Barometric Pressure	P[illegible] MIL-C-83421	No breakdowns	No breakdowns
Insulation Resistance	@ Rated voltage @ 125°C	2,000 Megs-uF need not exceed 20,000 Megs	1,000 Megs-uF need not exceed 10,000 Megs
Temperature Coefficient	△ Cap. at −55°C Retrace at 25°C △ Cap. at +125°C	−1.5% to 0.5% max. ±0.1% max. +0.8% to −0.5% max.	−2.0% to −0.5% max. ±0.25% max. ±2.0% max.

POST LIFE TEST LIMITS AFTER 2,000 HOURS LIFE

Insulation Resistance at Rated Voltage and 25°C	Insulation Sleeves	10,000 Megs min.	10,00 Megs min.
	Terminal to Terminal	100,000 Meg-uF need not exceed 1,000,000 Megs	33,333 Megs-uF need not exceed 333,333 Megs
	Terminals to Case	10,000 Megs min.	10,000 Megs min.
△ Capacitance % change with life	At 1KHz and 25°C	±2% max. of initial value	±4% max. of initial value
% Dissipation Factor	At 1KHz and 25°C	0.25% max.	0.35% max.

AC-SINUSOIDAL LIFE TEST PERFORMED MONTHLY

Capacitors are AC life tested for 250 hours at 100°C and at 140% of the rated RMS voltage at the applicable test frequency as shown in Table V. This test is performed monthly in order to verify the AC RMS voltage and current ratings.

POST AC TEST LIMITS

Insulation Resistance at Rated Voltage and 25°C	100,000 Megs-uF, need not exceed 1,000,000 Megs
Capacitance % Change at 1KHz and 25°C	2% max. of initial value
% Dissipation Factor at 25°C	0.25% max.

TABLE V AC-LIFE TEST PARAMETERS PER MIL-C-83421/1

CRH Style	Equiv. CRC Type	DC Volts Rating	400 Hz AC RMS Volts Rating	250 Hours at 100°C Life Test Conditions: AC RMS Volts	250 Hours at 100°C Life Test Conditions: Frequency in Hertz
01	A12A	30	22	30	4,000
02	A12B	50	36	50	4,000
03	A12C	100	60	84	4,000
04	A12D	200	120	168	400
05	A12E	400	240	336	400

CRC ESTABLISHED RELIABILITY CAPACITORS

THERMAL SHOCK TEST
500 CYCLES

DATA COVERS A12A 30VDC METALLIZED POLYCARBONATE CAPACITORS

Applications such as the space shuttle require capacitors which can withstand many thermal shock cycles without deterioration of terminations.

In 1976 George C. Marshall Space Flight Center contracted Component Research to manufacture and test MIL-C-83421/1 style parts to withstand 500 thermal shock cycles, while maintaining electrical integrity without becoming intermittent.

One hundred and fifty capacitors incorporating design improvements (which have been implemented in all standard parts since completion of the test) were manufactured and subsequently underwent 500 thermal shock cycles.

One hundred and forty nine (149) capacitors survived the tests. Failure analysis of the failed part was due to a poor solder joint, initially detected during acceptance tests as having poor dissipation factor and equivalent series resistance measurements. Operator error precluded the capacitor being eliminated from the test program.

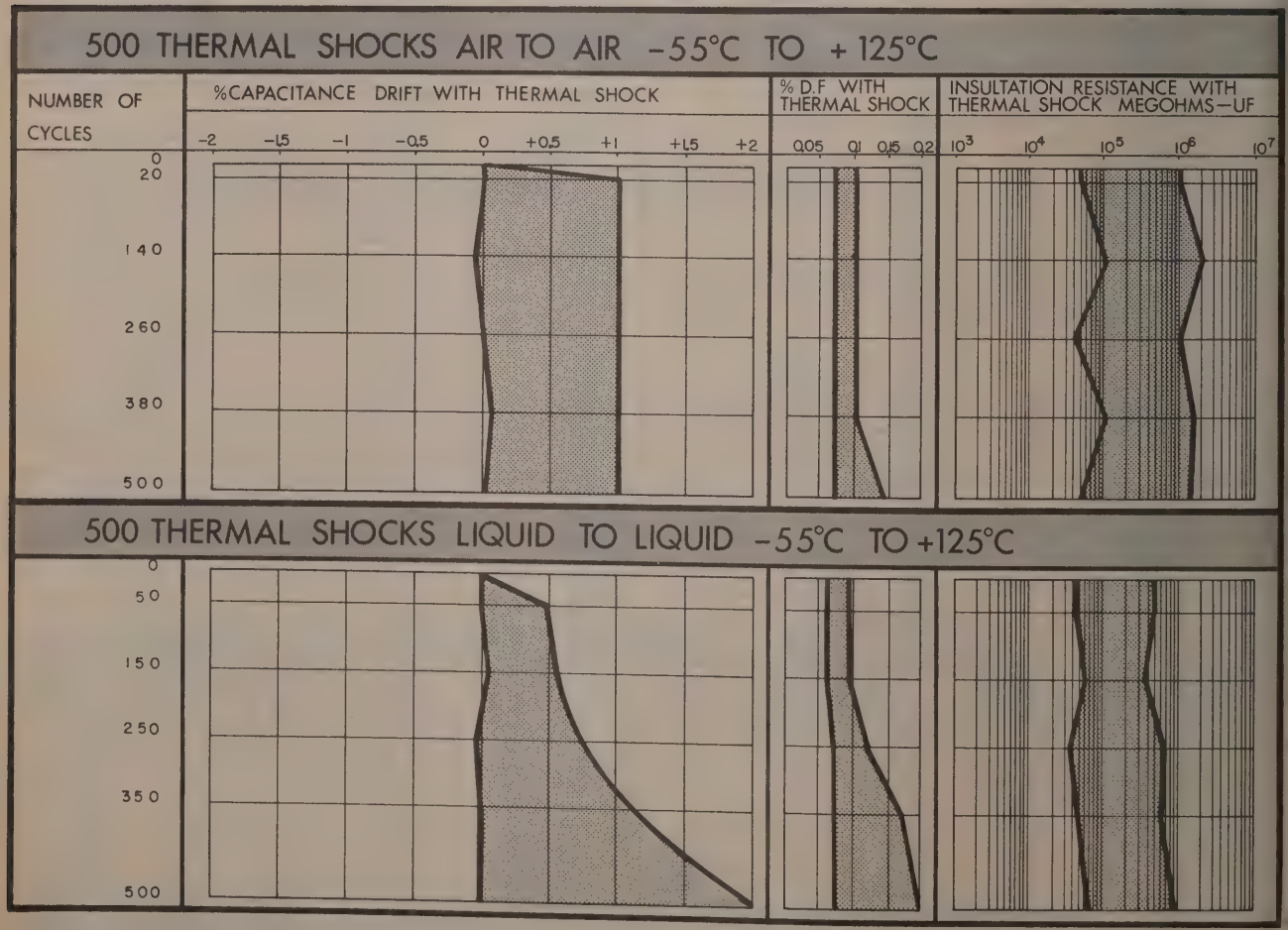
HIGHLIGHTS OF 500 THERMAL SHOCK CYCLE TEST

■ **60 capacitors were subjected to 500 thermal shock cycles** for accelerated test in liquid to liquid, at the rate of fifty (50) cycles per day. The capacitors were immersed into each liquid for sixty (60) seconds and transferred from one bath to another within fifteen (15) seconds. The temperature extremes were −55°C and 125°C.

TEST RESULTS: (60 CAPACITORS)
+0.84% MAXIMUM CAPACITANCE DRIFT
0.11% MAXIMUM DISSIPATION FACTOR @ 1KHz
0.22% MAXIMUM DISSIPATION FACTOR @ 10KHz
0.19 OHMS MAXIMUM EQUIVALENT SERIES RESISTANCE @ 100KHz
1.6×10^7 MEG's-uF MINIMUM INSULATION RESISTANCE
■ ALL PARTS PASSED 1×10^{-8} ATM/CM³/SEC MAX LEAK RATE

■ **90 capacitors were subjected to 500 thermal shock cycles** in air to air, at the rate of one (1) cycle per hour. The dwell time at each temperature extreme was a minimum of thirty (30) minutes. The maximum transfer time from one chamber to another was sixty (60) seconds. The temperature extremes were −55°C to +125°C.

TEST RESULTS: (90 CAPACITORS)
+6.3% MAXIMUM CAPACITANCE DRIFT
0.095% MAXIMUM DISSIPATION FACTOR @ 1KHz
0.46% MAXIMUM DISSIPATION FACTOR @ 10KHz
0.53 OHMS MAXIMUM EQUIVALENT SERIES RESISTANCE @ 100KHz
9.7×10^5 MEG'S-uF MINIMUM INSULATION RESISTANCE



CRC ESTABLISHED RELIABILITY CAPACITORS

LIFE TEST
40,000 HOURS

PURPOSE OF 40,000 HOUR LIFE TEST

In 1972 CRC decided to conduct long term life tests on 50VDC metallized polycarbonate capacitors to study the effects of operation at 100°C and rated voltage on capacitance drift, insulation resistance, and dissipation factor.

After five years of test (including approximately 10 months of overstress at 125°C and 280% of rated DC), CRC is pleased to report that our capacitors are highly recommended for long life requirements.

In 1970 thousands of CRC metallized polycarbonate capacitors were used in an underwater cable application requiring a minimum of 20 years operation without failure. There have been no reported failures to date in this critical application or in others, such as long term space probes.

In early 1978 CRC commenced similar life testing of most standard catalog capacitor styles to furnish data which will enable the design of circuits based on expected life for many decades of use.

HIGHLIGHTS OF 40,000 HOUR LIFE TESTING

Test conditions were 50VDC at 100°C for 12,000 hours for 45 capacitors resulting in 0.27% max. capacitance drift, 0.17% max. dissipation factor, and 750,000 megs-uF minimum insulation resistance.

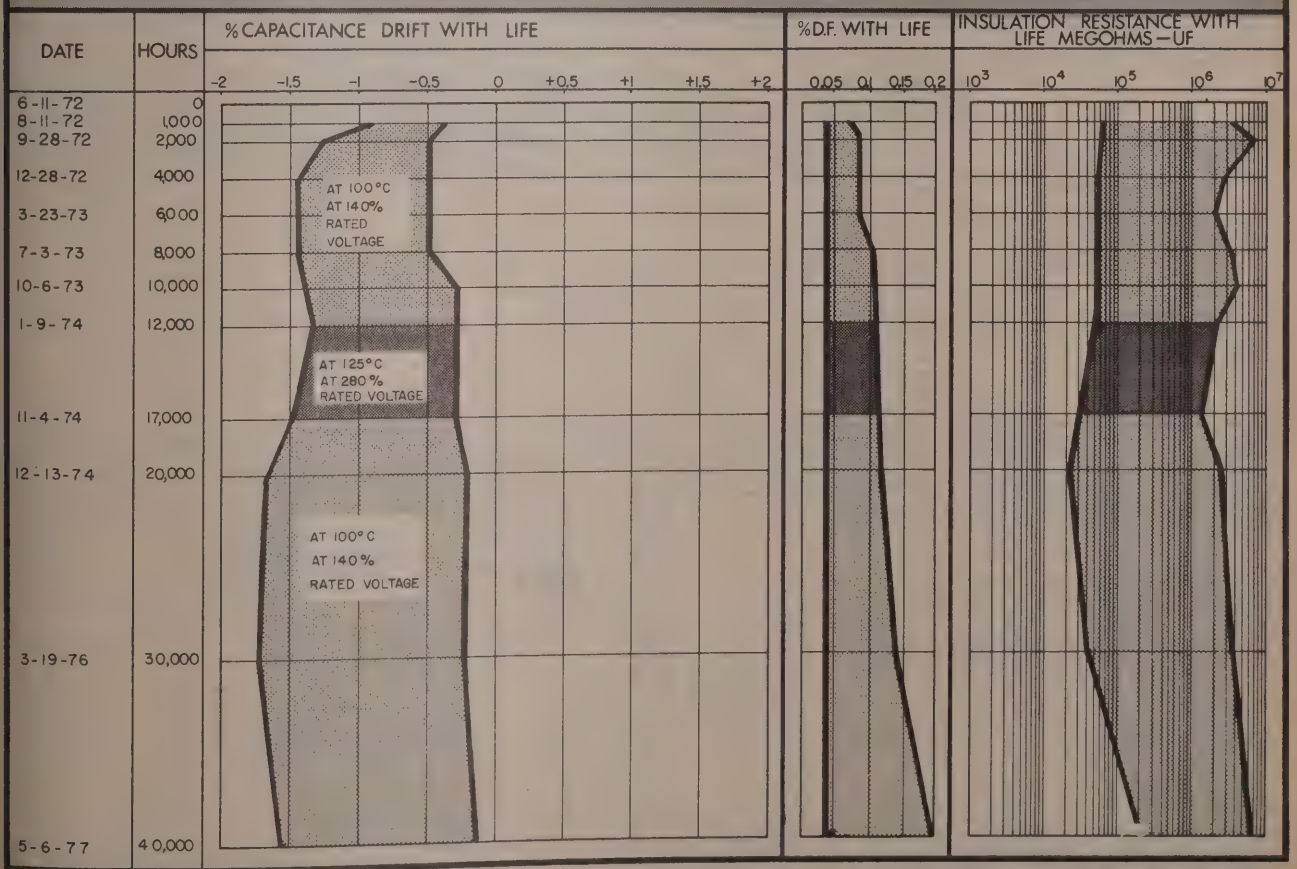
5000 additional hours (in error) were at 125°C and 70VDC which is actually at 280% of rated voltage considering that 50% derating is required from 100°C to 125°C.

As a result one capacitor shorted, capacitance drift was −1.5% worst case. Dissipation factor remained 0.17% max. and insulation resistance was 1,000,000 Megs-uF minimum.

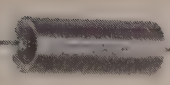
Life testing was continued from 17,000 to 40,000 hours at 50VDC and 100°C with 1.25% max. capacitance drift, 0.19% max. dissipation factor, and 35,000 megs-uF minimum insulation resistance at end of test.

It is obvious that considerably reduced drift and parametric change would have resulted if the 5000 hr. overstress period had not occurred.

LONG TERM DC LIFE TEST DATA AT 100°C AT 140% OF RATED VOLTAGE



CRC



1.0 μF 30VDC

ACTUAL SIZE CAPACITOR

TYPES A12 & K12 METALLIZED POLYCARBONATE

PRODUCT FEATURES

QUALIFIED TO MIL-C-83421/01 FAILURE RATE S.

HERMETICALLY SEALED, HIGH RELIABILITY SCREENED FOR CRITICAL AEROSPACE APPLICATIONS.

AC RATED FROM 22VRMS TO 240VRMS AT FREQUENCIES FROM 0 TO 400Hz. RATINGS TO 40KHz AT LOWER VOLTAGE RATINGS, −65°C TO +100°C WITH DERATED OPERATION AT 125°C, DC RATED 30VDC TO 400VDC.

100% RELIABILITY SCREENING, INCLUDES BURN-IN, TEMPERATURE CYCLING, FINE LEAK TESTS, AND AC SQUARE WAVE TESTS.

LOW LOSS, RUGGED INTERNAL TERMINATIONS QUALIFIED FOR ALL HI-REL PROGRAMS (CRC PATENTED CONSTRUCTION).

CAPACITORS HAVE BEEN THERMAL SHOCK TESTED FOR 1000 CYCLES FROM −65°C to +125°C, AIR TO AIR AND LIQUID TO LIQUID, SEE PAGE 1112.

CAPACITORS OF SAME DESIGN AND CONSTRUCTION HAVE BEEN LIFE TESTED TO 40,000 HOURS, SEE PAGE 1113.

AVAILABLE IN STANDARD TOLERANCES: 0.25%, 0.5%, 1%, 2%, 5%, 10%. OTHER TOLERANCES AVAILABLE ON REQUEST.

TYPICAL APPLICATIONS

- ☐ CRITICAL TIMING CIRCUITS
- ☐ FIXED TUNING CIRCUITS
- ☐ FILTERING—LOW FREQUENCY
- ☐ TEMPERATURE COMPENSATION
- ☐ COUPLING AND DECOUPLING
- ☐ FEEDBACK CIRCUITS
- ☐ POWER SUPPLY FILTERING
- ☐ GYRO CIRCUITS
- ☐ PULSE FORMING NETWORKS
- ☐ INTEGRATING CIRCUITS

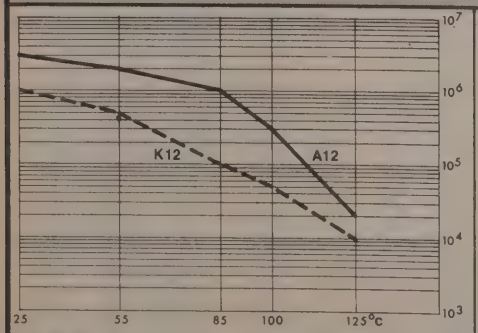
LIFE TEST DATA CRC TEST REPORT #77TR116

TEST RESULTS FOR SERIES A12 CAPACITORS LIFE TESTED FOR 2000 HOURS AT 100°C AT 140% OF RATED DC VOLTAGE.

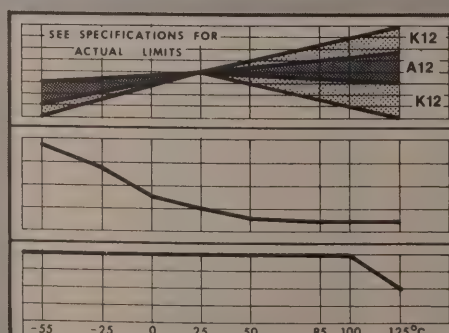
THERE WERE NO FAILURES FOR THIS TEST.

LIST OF CAPACITORS SUBMITTED TO LIFE TEST			INSULATION RESISTANCE IN MEGOHMS AT 25°C			% CAPACITANCE CHANGE WITH LIFE			% DISSIPATION FACTOR AT 25°C WITH LIFE		
CRC TYPE	uF VALUE	Q'TY TESTED	POST TEST LIMITS (MIN. I.R.)	TEST RESULTS LOW	TEST RESULTS HIGH	POST TEST LIMITS (MAX. △C)	TEST RESULTS LOW	TEST RESULTS HIGH	POST TEST LIMITS (MAX. D.F.)	TEST RESULTS LOW	TEST RESULTS HIGH
A12A	.1	20	$1x10^6$	$3x10^6$	$4x10^6$	±2.0	0.00	+.40	.25	.07	.08
A12A	.001	20	$1x10^6$	$1x10^7$	$30x10^6$	±2.0	−.38	+.06	.25	.05	.05
A12B	1.0	20	$1x10^5$	$8x10^5$	$1x10^6$	±2.0	−.03	+.18	.25	.04	.05
A12B	.018	20	$1x10^6$	$1.2x10^7$	$2.5x10^7$	±2.0	−.33	−.16	.25	.07	.08
A12C	4.7	20	$2x10^4$	$1.1x10^5$	$5x10^5$	±2.0	−.13	−.06	.25	.04	.05
A12C	.039	20	$1x10^6$	$1.4x10^7$	$2x10^7$	±2.0	−.07	+.05	.25	.08	.08
A12D	.56	30	$1.8x10^5$	$1.6x10^6$	$1.8x10^6$	±2.0	−.03	+.05	.25	.05	.06
A12E	.01	30	$1x10^6$	$4x10^7$	$6.6x10^7$	±2.0	+.02	−.16	.25	.07	.07

TYPICAL CURVES•



INSULATION RESISTANCE WITH TEMPERATURE IN MEGOHMS (0.1 μF OR LESS)



% CAPACITANCE CHANGE WITH TEMPERATURE

% DISSIPATION FACTOR WITH TEMPERATURE

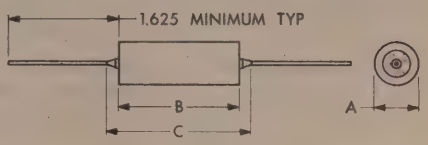
% VOLTAGE RATING WITH TEMPERATURE

A12 & K12 PART NUMBER SYSTEM CASE DIMENSIONS

PART NUMBER SYSTEM

A12 A 104 J S W

- SERIES NO.
- DC VOLTAGE RATING
- PICOFARAD CODE (See explanation)
- CAPACITANCE TOLERANCE
- SLEEVING CODE: S = MYLAR SLEEVING; X = SLEEVING NOT REQUIRED
- LEAD MATERIAL CODE: W = TINNED COPPER CLAD STEEL; C = TINNED OXYGEN FREE COPPER



VOLT. CODE	VDC	TOL. CODE	%	INCHES	MM	INCHES	MM	INCHES	MM
A	30	A	0.1	.025	.635	.400	10.16	1.000	25.40
B	50	B	0.25	.032	.813	.500	12.70	1.063	27.00
C	100	D	0.5	.040	1.016	.562	14.27	1.125	28.58
D	200	F	1	.170	4.32	.670	17.02	1.375	34.93
E	400	G	2	.193	4.90	.687	17.45	1.875	47.63
		J	5	.235	5.97	.750	19.05	2.375	60.33
		K	10	.312	7.93	.813	20.65	2.625	66.68

LEAD WIRE SIZE	
CASE DIAMETER (INCHES)	LEAD WIRE SIZE #AWG
0.312 and smaller	22 (.025″)
0.400 and 0.500	20 (.032″)
0.562 and larger	18 (.040″)

CASE DIMENSIONS*	TOLERANCE LIMITS (INCHES)
"A" Diameter	±.010 Without Sleeving +0.02 −0.00 With Mylar Sleeving
"B" Case Length	±0.03 With or Without Sleeving
"C" Bead to Bead Max. Length	The lengths shown in table are maximum and include solder beads. CRC "C" dimension for A12 and K12 capacitors is 0.1″ less than MIL-C-83421/1 requires.

* Lead material for case dia. 0.500 & smaller, tinned copperclad steel (Type W). Lead material for case dia. 0.562 & larger, tinned oxygen-free copper (Type C).

	TYPE 12A 30VDC			TYPE 12B 50VDC			TYPE 12C 100VDC			TYPE 12D 200VDC			TYPE 12E 400VDC		
uF	Diam. A	Length B	Length C	Diam. A	Length B	Length C	Diam. A	Length B	Length C	Diam. A	Length B	Length C	Diam. A	Length B	Length C
.001	.170	.500	.600	.170	.500	.600	.170	.500	.600	.170	.562	.662	.193	.562	.662
.0012	.170	.500	.600	.170	.500	.600	.170	.500	.600	.170	.562	.662	.193	.562	.662
.0015	.170	.500	.600	.170	.500	.600	.170	.500	.600	.170	.562	.662	.193	.562	.662
.0018	.170	.500	.600	.170	.500	.600	.170	.500	.600	.170	.562	.662	.193	.562	.662
.002	.170	.500	.600	.170	.500	.600	.170	.500	.600	.170	.562	.662	.193	.562	.662
.0022	.170	.500	.600	.170	.500	.600	.170	.500	.600	.170	.562	.662	.193	.562	.662
.0027	.170	.500	.600	.170	.500	.600	.170	.500	.600	.170	.562	.662	.235	.562	.662
.0033	.170	.500	.600	.170	.500	.600	.170	.500	.600	.170	.562	.662	.235	.562	.662
.0039	.170	.500	.600	.170	.500	.600	.170	.500	.600	.170	.562	.662	.235	.562	.662
.0047	.170	.500	.600	.170	.500	.600	.170	.500	.600	.170	.562	.662	.235	.562	.662
.005	.170	.500	.600	.170	.500	.600	.170	.500	.600	.170	.562	.662	.235	.562	.662
.0056	.170	.500	.600	.170	.500	.600	.170	.500	.600	.170	.562	.662	.235	.562	.662
.0068	.170	.500	.600	.170	.500	.600	.170	.562	.662	.170	.562	.662	.235	.687	.787
.0082	.170	.500	.600	.170	.562	.662	.170	.562	.662	.193	.562	.662	.235	.687	.787
.01	.170	.500	.600	.170	.562	.662	.170	.687	.787	.193	.562	.662	.235	.687	.787
.012	.170	.500	.600	.170	.562	.662	.170	.687	.787	.193	.562	.662	.235	.687	.787
.015	.170	.500	.600	.170	.562	.662	.170	.687	.787	.235	.562	.662	.235	.813	.913
.018	.170	.500	.600	.193	.562	.662	.193	.687	.787	.235	.687	.787	.312	.813	.913
.02	.170	.500	.600	.193	.562	.662	.193	.687	.787	.235	.687	.787	.312	.813	.913
.022	.170	.500	.600	.193	.562	.662	.193	.687	.787	.235	.687	.787	.312	.813	.913
.027	.170	.562	.662	.193	.562	.662	.193	.687	.787	.312	.687	.787	.312	.813	.913
.033	.170	.562	.662	.193	.562	.662	.193	.687	.787	.312	.687	.787	.312	.813	.913
.039	.170	.562	.662	.170	.687	.787	.235	.687	.787	.312	.687	.787	.312	.813	.913
.047	.170	.562	.662	.170	.687	.787	.235	.687	.787	.312	.687	.787	.400	.813	.913
.05	.170	.562	.662	.170	.687	.787	.235	.687	.787	.312	.687	.787	.400	.813	.913
.056	.170	.562	.662	.193	.687	.787	.235	.687	.787	.312	.813	.913	.400	.813	.913
.068	.170	.687	.787	.193	.687	.787	.235	.813	.913	.312	.813	.913	.400	.813	.913
.082	.170	.687	.787	.193	.813	.913	.312	.687	.787	.312	.813	.913	.400	1.063	1.163
.1	.193	.687	.787	.193	.813	.913	.312	.687	.787	.312	.813	.913	.400	1.063	1.163
.12	.193	.687	.787	.235	.687	.787	.312	.687	.787	.312	.813	.913	.400	1.063	1.163
.15	.235	.562	.662	.235	.687	.787	.312	.813	.913	.400	1.063	1.163	.400	1.375	1.475
.18	.235	.687	.787	.235	.813	.913	.312	.813	.913	.400	1.375	1.475	.500	1.375	1.475
.20	.235	.687	.787	.235	.813	.913	.312	.813	.913	.400	1.375	1.475	.500	1.375	1.475
.22	.235	.687	.787	.235	.813	.913	.312	.813	.913	.400	1.375	1.475	.500	1.375	1.475
.27	.235	.687	.787	.312	.687	.787	.312	1.063	1.163	.500	1.375	1.475	.562	1.375	1.475
.33	.235	.687	.787	.312	.687	.787	.312	1.063	1.163	.500	1.375	1.475	.562	1.375	1.475
.39	.235	.687	.787	.312	.813	.913	.400	1.063	1.163	.500	1.375	1.475	.562	1.875	1.975
.47	.312	.687	.787	.312	.813	.913	.400	1.063	1.163	.500	1.375	1.475	.562	1.875	1.975
.50	.312	.687	.787	.312	.813	.913	.400	1.063	1.163	.500	1.375	1.475	.562	1.875	1.975
.56	.312	.687	.787	.400	.813	.913	.400	1.063	1.163	.500	1.375	1.475	.562	1.875	1.975
.68	.312	.687	.787	.400	.813	.913	.500	1.125	1.225	.562	1.375	1.475	.750	1.875	1.975
.82	.312	.813	.913	.400	1.063	1.163	.500	1.125	1.225	.562	1.875	1.975	.750	1.875	1.975
1.0	.312	.813	.913	.400	1.063	1.163	.562	1.125	1.225	.562	1.875	1.975	.750	1.875	1.975
1.2	.312	.813	.913	.400	1.063	1.163	.562	1.125	1.225	.562	1.875	1.975	1.0	1.875	1.975
1.5	.400	.813	.913	.400	1.063	1.163	.562	1.375	1.475	.670	1.875	1.975	1.0	2.375	2.475
1.8	.400	.813	.913	.400	1.063	1.163	—	—	—	.750	1.875	1.975	1.0	2.375	2.475
2.0	.400	.813	.913	.500	1.125	1.225	.670	1.375	1.475	.750	1.875	1.975	1.0	2.375	2.475
2.2	.400	.813	.913	.500	1.125	1.225	.670	1.375	1.475	.750	1.875	1.975			
2.5	—	—	—	—	—	—	—	—	—	.750	1.875	1.975			
2.7	.400	.813	.913	.500	1.375	1.475	.670	1.875	1.975	.750	1.875	1.975			
3.0	.400	1.063	1.163	.500	1.375	1.475	.670	1.875	1.975	1.0	1.875	1.975			
3.3	.400	1.063	1.163	.500	1.375	1.475	.670	1.875	1.975	1.0	1.875	1.975			
3.9	.400	1.375	1.475	.562	1.375	1.475	.750	1.875	1.975	1.0	2.375	2.475			
4.7	.500	1.375	1.475	.670	1.375	1.475	.750	1.875	1.975						
5.0	.500	1.375	1.475	.670	1.375	1.475	.750	1.875	1.975						
5.6	.500	1.375	1.475	.670	1.375	1.475	.750	1.875	1.975						
6.8	.562	1.375	1.475	.670	1.875	1.975	1.0	2.375	2.475						
8.0	.562	1.375	1.475	.670	1.875	1.975	1.0	2.375	2.475						
8.2	.562	1.375	1.475	.670	1.875	1.975	1.0	2.375	2.475						
10.0	.562	1.375	1.475	.670	1.875	1.975	1.0	2.375	2.475						
12.0	.562	1.875	1.975												
15.0	.562	1.875	1.975												
20.0	.670	1.875	1.975												
22.0	.670	1.875	1.975												

PICOFARAD CODE: CAPACITANCE EXPRESSED IN PICOFARADS AS A 3-DIGIT NUMBER. FIRST TWO DIGITS REPRESENT THE FIRST TWO SIGNIFICANT FIGURES. THE LAST DIGIT REPRESENTS THE NUMBER OF ZEROES TO FOLLOW. **EXAMPLE: 104 = 100,000 PICOFARADS.**

CRC ESTABLISHED RELIABILITY CAPACITORS

TYPES A12 & K12 METALLIZED POLYCARBONATE

SPECIFICATIONS QUALITY CONFORMANCE

CONSTRUCTION: METALLIZED POLYCARBONATE DIELECTRIC, HERMETICALLY SEALED, EXTENDED METAL FILM ELECTRODES, AXIAL LEADS ISOLATED FROM CASE.

ENVIRONMENTAL: CAPACITORS MEET ALL ENVIRONMENTAL REQUIREMENTS AND ARE QUALIFIED TO MIL-C-83421/1.

A12 AND K12 SPECIFICATIONS

OPERATING TEMPERATURE	−65°C to +100°C		At full rated voltage, derate linearly to 50% of rated voltage at 125°C.
DIELECTRIC ABSORPTION	0.1% maximum		At 25°C when measured per MIL-C-83421.
DISSIPATION FACTOR	0.15% maximum		At 25°C when measured per MIL-C-83421.
AC SQUARE WAVE	100Hz, 60 seconds minimum		At 25°C at a peak to peak voltage of 3 times rated DC voltage, terminal to terminal per MIL-C-83421.
DIELECTRIC STRENGTH	200% rated DC voltage		At 25°C from terminal to terminal and terminal to case for 60 seconds minimum.
TEMPERATURE COEFFICIENT (IN % CAPACITANCE)	A12	−0.5% to +0.8%	From +25°C to +125°C
	K12	±2%	
	A12	−0.5% to −1.5%	From −55°C to 25°C
	K12	−0.5% to −2.0%	
CAPACITANCE STABILITY (IN % CAPACITANCE)	A12	±0.2%	When measured at any two corresponding temperature points taken in five successive temperature cycles from −65°C to +125°C.
	K12	±0.25%	
HERMETIC SEAL	1×10^{-6} atm/cm³/sec.		Maximum leak rate.
INSULATION RESISTANCE	See Insulation Resistance Table		Measured from terminal to terminal at rated DC voltage and 5 minutes charge time. Values greater than 1uF, allow an additional minute/uF charge time.

MINIMUM INSULATION RESISTANCE AT RATED DC VOLTAGE

FOR VALUES OVER 0.1uF DIVIDE LIMIT SHOWN BY uF TO OBTAIN MINIMUM I.R.
EXAMPLE: A 0.5uF, SERIES A12 CAPACITOR AT 25°C IS 300,000 ÷ 0.5 = 600,000 MEGOHMS.

RANGE	STYLE	25°C	55°C	85°C	100°C	125°C
.001 TO 0.1uF	A12	3,000,000 Megohms	2,000,000 Megohms	1,000,000 Megohms	300,000 Megohms	20,000 Megohms
	K12	1,000,000 Megohms	500,000 Megohms	100,000 Megohms	50,000 Megohms	10,000 Megohms
GREATER THAN 0.1uF	A12	300,000 Megohms-uF	200,000 Megohms-uF	100,000 Megohms-uF	30,000 Megohms-uF	2,000 Megohms-uF
	K12	100,000 Megohms-uF	50,000 Megohms-uF	10,000 Megohms-uF	5,000 Megohms-uF	1,000 Megohms-uF

A12 AND K12 QUALITY CONFORMANCE INSPECTION

TEST NO.	TEST	TEST CONDITIONS	TEST METH. MIL-C-83421	TEST LIMIT	QUALITY LEVEL A12	QUALITY LEVEL K12
1	BURN-IN	48 hrs. minimum at 125°C, at 140% rated DC voltage	4.7.2	No physical damage	100% Test	Not Req'd
2	THERMAL AGING	10 cycles minimum from −65°C to +125°C (5 cycles min. for K12)	4.7.3	No physical damage	100% Test	100% Test
3	SEAL TEST (FINE LEAK)	Helium bomb 45 PSI for 1 hr. minimum, check for helium leak	4.7.5	1x10 ⁶atm/cm³/sec. max.	100% Test	100% Test
4	SEAL TEST (GROSS LEAK)	Per MIL-C-83421	4.7.5	No continuous bubble stream	100% Test	100% Test
5	AC SQUARE WAVE (TERMINAL TO TERMINAL)	Apply 100Hz at a peak to peak voltage of 3 times DC rated voltage for 60 seconds minimum	4.7.6	No shorts	100% Test	100% Test
6	DC HI-POT (TERMINAL TO TERMINAL AND TERMINALS TO CASE)	Apply 200% of rated DC voltage for 60 seconds minimum	4.7.6	No shorts	100% Test	100% Test
7	INSULATION RESISTANCE (TERMINAL TO TERMINAL)	At 25°C at rated DC voltage	4.7.7	Per I.R. Table	100% Test	100% Test
8	% CAPACITANCE TOLERANCE	At 25°C at 1KHz	4.7.8.	Per part number	100% Test	100% Test
9	% DISSIPATION FACTOR	At 25°C at 1KHz, values above 1uF measure at 0.1KHz	4.7.9	0.15% max.	100% Test	100% Test
10	VISUAL AND MECHANICAL INSPECTION	For marking, dimensions, and workmanship	4.7.1	Per specification	1.0% AQL	1.0% AQL

1. Capacitors are packaged and shipped with Certification of Conformance. 2. Traceability to production and test records by permanent marking of parts with date code lot. 3. Process and inspection data is maintained on file per NHB 5300.4 (1C), MIL-Q-9858 and MIL-STD-790.

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CRC ESTABLISHED RELIABILITY CAPACITORS

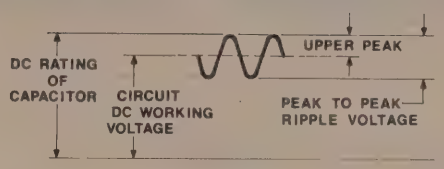
TYPES A12 & K12 AC RATINGS

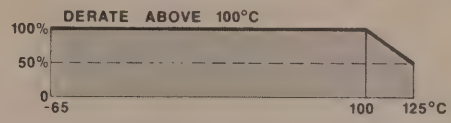
1. THE COMBINED DC AND AC VOLTAGES SHOULD NOT EXCEED THE DC RATINGS, SEE FIGURE.

2. CAPACITORS MAY BE OPERATED AT HIGHER FREQUENCIES, AT REDUCED RMS VOLTAGE SUCH THAT MAX. AC CURRENT RATINGS ARE NOT EXCEEDED.

3. CAPACITORS CAN HANDLE PULSE CURRENTS UP TO 100 TIMES GREATER THAN THE PEAK CURRENTS CALCULATED FROM THE RATED RMS RATING (PROVIDED SLOW REPETITION RATES ARE USED).

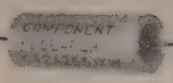
IF THERE IS ANY DOUBT A SKETCH OF THE VOLTAGE AND CURRENT WAVE FORMS WITH TIME BASE SHOULD BE SENT TO CRC FOR ANALYSIS.





	TYPE 12A 30VDC			TYPE 12B 50VDC			TYPE 12C 100VDC			TYPE 12D 200VDC			TYPE 12E 400VDC		
	AC RATINGS			AC RATINGS			AC RATINGS			AC RATINGS			AC RATINGS		
uF	RMS Volts 400Hz	RMS Volts 40KHz	Max. RMS Amps	RMS Volts 400Hz	RMS Volts 40KHz	Max. RMS Amps	RMS Volts 400Hz	RMS Volts 40KHz	Max. RMS Amps	RMS Volts 400Hz	RMS Volts 40KHz	Max. RMS Amps	RMS Volts 400Hz	RMS Volts 40KHz	Max. RMS Amps
.001	22.0	22.0	.006	36.0	36.0	.009	60.0	60.0	.015	120.0	80.0	.020	240.0	100.0	.025
.0012	22.0	22.0	.007	36.0	36.0	.011	60.0	60.0	.018	120.0	80.0	.024	240.0	100.0	.030
.0015	22.0	22.0	.008	36.0	36.0	.013	60.0	60.0	.022	120.0	80.0	.030	240.0	100.0	0.37
.0018	22.0	22.0	.010	36.0	36.0	.016	60.0	60.0	.027	120.0	80.0	.036	240.0	100.0	.045
.002	22.0	22.0	.011	36.0	36.0	.018	60.0	60.0	.030	120.0	80.0	.040	240.0	100.0	.050
.0022	22.0	22.0	.012	36.0	36.0	.020	60.0	60.0	.033	120.0	80.0	.044	240.0	100.0	.055
.0027	22.0	22.0	.015	36.0	36.0	.024	60.0	60.0	.041	120.0	80.0	.054	240.0	100.0	.068
.0033	22.0	22.0	.018	36.0	36.0	.030	60.0	60.0	.050	120.0	80.0	.066	240.0	100.0	.083
.0039	22.0	22.0	.021	36.0	36.0	.035	60.0	60.0	.058	120.0	80.0	.078	240.0	100.0	.097
.0047	22.0	22.0	.026	36.0	36.0	.042	60.0	60.0	.071	120.0	80.0	.094	240.0	100.0	.12
.005	22.0	22.0	.028	36.0	36.0	.045	60.0	60.0	.075	120.0	80.0	.10	240.0	100.0	.13
.0056	22.0	22.0	.031	36.0	36.0	.050	60.0	60.0	.084	120.0	80.0	.11	240.0	100.0	.14
.0068	22.0	22.0	.037	36.0	36.0	.061	60.0	60.0	.10	120.0	80.0	.14	240.0	100.0	.17
.0082	22.0	22.0	.045	36.0	36.0	.074	60.0	60.0	.12	120.0	80.0	.16	240.0	100.0	.21
.01	22.0	22.0	.055	36.0	36.0	.090	60.0	60.0	.15	120.0	80.0	.20	240.0	100.0	.25
.012	22.0	22.0	.066	36.0	36.0	.11	60.0	59.0	.18	120.0	78.0	.23	240.0	100.0	.30
.015	22.0	22.0	.082	36.0	36.0	.14	60.0	58.0	.22	120.0	76.0	.29	240.0	94.0	.35
.018	22.0	22.0	.100	36.0	36.0	.16	60.0	57.0	.26	120.0	74.0	.33	240.0	90.0	.41
.02	22.0	22.0	.11	36.0	36.0	.18	60.0	55.0	.28	120.0	71.0	.36	240.0	88.0	.44
.022	22.0	22.0	.12	36.0	36.0	.20	60.0	53.0	.29	120.0	68.0	.37	240.0	85.0	.47
.027	22.0	22.0	.15	36.0	36.0	.24	60.0	51.0	.34	120.0	65.0	.44	240.0	81.0	.55
.033	22.0	22.0	.18	36.0	36.0	.30	60.0	50.0	.41	120.0	62.0	.51	240.0	78.0	.65
.039	22.0	22.0	.22	36.0	36.0	.35	60.0	48.0	.47	120.0	60.0	.59	240.0	75.0	.73
.047	22.0	22.0	.26	36.0	36.0	.42	60.0	47.0	.55	120.0	57.0	.67	240.0	71.0	.83
.05	22.0	22.0	.28	36.0	36.0	.45	60.0	46.0	.58	120.0	56.0	.70	240.0	70.0	.88
.056	22.0	22.0	.31	36.0	36.0	.50	60.0	46.0	.64	120.0	56.0	.78	240.0	67.5	.95
.068	22.0	22.0	.37	36.0	34.0	.58	60.0	42.0	.71	120.0	50.0	.85	240.0	60.0	1.02
.082	22.0	22.0	.45	36.0	32.0	.66	60.0	38.0	.78	120.0	44.0	.90	240.0	50.0	1.03
.1	22.0	22.0	.55	36.0	30.0	.75	60.0	36.0	.90	120.0	42.0	1.10	240.0	46.0	1.20
.12	22.0	22.0	.66	36.0	30.0	.90	60.0	35.0	1.05	120.0	40.0	1.20	240.0	44.5	1.34
.15	22.0	22.0	.83	36.0	26.0	.98	60.0	33.0	1.24	120.0	36.0	1.34	240.0	40.0	1.50
.18	22.0	22.0	1.00	36.0	25.0	1.13	60.0	31.0	1.40	120.0	34.0	1.54	240.0	38.0	1.70
.20	22.0	20.0	1.00	36.0	24.0	1.20	60.0	30.0	1.50	120.0	33.0	1.65	240.0	37.0	1.85
.22	22.0	18.5	1.02	36.0	23.0	1.27	60.0	27.0	1.50	120.0	32.0	1.76	240.0	35.0	1.93
.27	22.0	17.0	1.15	36.0	19.0	1.28	60.0	24.0	1.62	120.0	29.0	1.96	240.0	33.0	2.24
.33	22.0	16.0	1.32	36.0	18.0	1.48	60.0	23.0	1.90	120.0	28.0	2.31	240.0	32.0	2.65
.39	22.0	15.0	1.46	36.0	17.0	1.66	60.0	22.0	2.15	120.0	27.0	2.63	240.0	32.0	3.14
.47	22.0	14.0	1.65	36.0	15.7	1.85	60.0	21.0	2.47	120.0	26.0	3.06	240.0	31.0	3.64
.50	22.0	13.5	1.69	36.0	15.2	1.90	60.0	20.0	2.50	120.0	25.0	3.13	240.0	30.0	3.75
.56	22.0	12.9	1.81	36.0	14.4	2.01	60.0	19.0	2.64	120.0	23.0	3.17	240.0	29.0	4.05
.68	22.0	12.0	2.04	36.0	14.0	2.38	60.0	16.0	2.72	120.0	20.0	3.40	240.0	26.0	4.50
.82	22.0	10.0	2.05	36.0	12.0	2.46	60.0	14.0	2.87	120.0	18.0	3.70	240.0	23.4	4.80
1.0	22.0	8.4	2.10	36.0	10.0	2.50	60.0	12.0	3.00	120.0	15.0	3.75	240.0	20.8	5.20
1.2	22.0	7.2	2.15	36.0	9.1	2.73	60.0	11.0	3.25	120.0	13.5	4.05	240.0	18.3	5.50
1.5	22.0	5.8	2.17	36.0	7.7	2.90	60.0	10.0	3.75	120.0	12.0	4.50	240.0	16.0	6.00
1.8	22.0	4.8	2.2	36.0	6.6	3.00	—	—	—	120.0	11.0	5.00	240.0	15.0	6.80
2.0	22.0	4.4	2.2	36.0	6.2	3.10	60.0	8.1	4.10	120.0	10.0	5.00	240.0	14.0	7.00
2.2	22.0	4.0	2.2	36.0	5.8	3.20	60.0	7.5	4.12	120.0	9.1	5.00			
2.5	—	—	—	—	—	—	—	—	—	120.0	8.0	5.00			
2.7	22.0	3.3	2.2	36.0	5.0	3.34	60.0	6.5	4.40	120.0	7.7	5.20			
3.0	22.0	2.9	2.2	36.0	4.5	3.40	60.0	6.0	4.51	120.0	7.0	5.27			
3.3	22.0	2.7	2.2	36.0	4.2	3.5	60.0	5.5	4.55	120.0	6.5	5.36			
3.9	22.0	2.3	2.2	36.0	3.7	3.6	60.0	5.0	4.90	120.0	5.5	5.40			
4.7	22.0	1.9	2.2	36.0	3.1	3.6	60.0	4.3	5.00						
5.0	22.0	1.8	2.2	36.0	2.9	3.6	60.0	4.0	5.00						
5.6	22.0	1.6	2.2	36.0	2.6	3.6	60.0	3.6	5.00						
6.8	22.0	1.3	2.2	36.0	2.1	3.6	60.0	3.0	5.00						
8.0	22.0	1.1	2.2	36.0	1.8	3.6	60.0	2.5	5.00						
8.2	22.0	1.1	2.2	36.0	1.8	3.6	60.0	2.4	5.00						
10.0	22.0	.88	2.2	36.0	1.4	3.6	60.0	2.0	5.00						
12.0	22.0	.73	2.2												
15.0	22.0	.59	2.2												
20.0	22.0	.44	2.2												
22.0	22.0	.40	2.2												

CRC



2.5 μF 30VDC
ACTUAL SIZE CAPACITOR

TYPE G12 METALLIZED POLYCARBONATE

NEW PRODUCT FEATURES

MINIATURE SIZE TO REPLACE NON-HERMETIC WRAP AND FILL AND MOLDED CAPACITORS.

HERMETICALLY SEALED, HIGH RELIABILITY SCREENED FOR CRITICAL AEROSPACE APPLICATIONS.

AC RATED FROM 22VRMS TO 120VRMS AT FREQUENCIES UP TO 20KHz, −65°C to 100°C, WITH DERATED OPERATION AT 125°C. DC RATED 30VDC TO 200VDC.

100% RELIABILITY SCREENING, INCLUDES BURN-IN, TEMPERATURE CYCLING, FINE LEAK TESTS, AC SQUARE WAVE TESTS.

G12 CAPACITORS WILL ULTIMATELY APPEAR IN MIL-C-83421/02 AND ARE PRESENTLY DESIGNED INTO MANY NAVY AND AIRFORCE PROGRAMS.

LOW LOSS, RUGGED INTERNAL TERMINATIONS QUALIFIED FOR ALL HI-REL PROGRAMS (CRC PATENTED CONSTRUCTION).

LOWEST PRICED, HIGH RELIABILITY, METALLIZED FILM CAPACITORS FOR HIGH VOLUME PROGRAM USE.

AVAILABLE IN STANDARD CAPACITANCE TOLERANCES, ±1%, ±2%, ±5%, ±10%. OTHER TOLERANCES AVAILABLE ON REQUEST.

TYPICAL APPLICATIONS

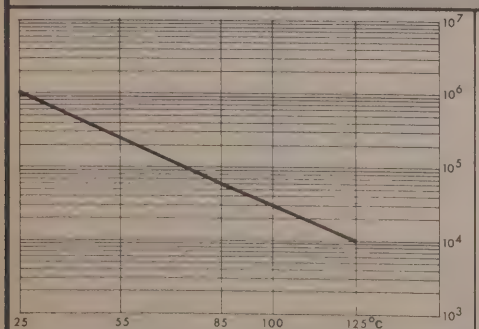
- ☐ CRITICAL TIMING CIRCUITS
- ☐ FIXED TUNING CIRCUITS
- ☐ FILTERING—LOW FREQUENCY
- ☐ TEMPERATURE COMPENSATION
- ☐ COUPLING AND DECOUPLING
- ☐ FEEDBACK CIRCUITS
- ☐ POWER SUPPLY FILTERING
- ☐ GYRO CIRCUITS
- ☐ PULSE FORMING NETWORKS
- ☐ INTEGRATING CIRCUITS

LIFE TEST DATA CRC TEST REPORT #78TR129

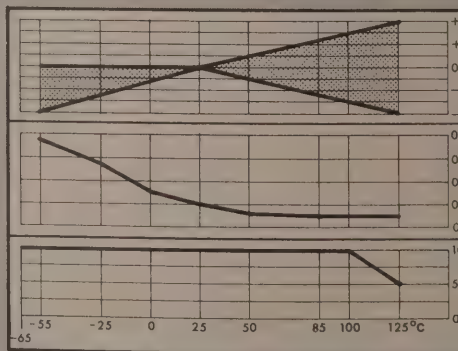
TEST RESULTS FOR 180 SERIES G12 CAPACITORS LIFE TESTED FOR 2000 HOURS AT 100°C AT 140% OF RATED DC VOLTAGE. THERE WERE NO FAILURES FOR THIS TEST.

LIST OF CAPACITORS LIFE TESTED			INSULATION RESISTANCE IN MEGOHMS AT 25°C			% CAPACITANCE CHANGE WITH LIFE			% DISSIPATION FACTOR AT 25°C WITH LIFE		
CRC TYPE	uF VALUE	Q'TY TESTED	POST TEST LIMITS (MIN. I.R.)	TEST RESULTS LOW	TEST RESULTS HIGH	POST TEST LIMITS (MAX. △C)	TEST RESULTS LOW	TEST RESULTS HIGH	POST TEST LIMITS (MAX. D.F.)	TEST RESULTS LOW	TEST RESULTS HIGH
G12A102	.001	20	3.3×10^5	1.5×10^7	3×10^7	±2	0.000	−.245	.25	.035	.055
G12A153	.015	20	3.3×10^5	1.5×10^7	3×10^7	±2	−.055	−.215	.25	.06	.08
G12B102	.001	20	3.3×10^5	2×10^7	5×10^7	±2	+.005	+.15	.25	.045	.055
G12B684	.68	20	4.9×10^4	1.9×10^6	5×10^6	±2	−.035	−.13	.25	.045	.055
G12C222	.0022	20	3.3×10^5	5×10^7	1×10^8	±2	+.01	−.225	.25	.055	.065
G12C305	3.0	20	1.1×10^4	2.7×10^5	8.3×10^5	±2	0.00	+.07	.25	.04	.045
G12D333	.033	20	3.3×10^5	2×10^7	2.8×10^7	±2	−.005	−.22	.25	.07	.075
G12D564	.56	20	5.9×10^4	1.7×10^6	3.4×10^6	±2	−.06	−.15	.25	.045	.055

TYPICAL CURVES



INSULATION RESISTANCE WITH TEMPERATURE IN MEGOHMS (0.1 μF OR LESS)



% CAPACITANCE CHANGE WITH TEMPERATURE

% DISSIPATION FACTOR WITH TEMPERATURE

% VOLTAGE RATING WITH TEMPERATURE

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Add Dept. EM to address to tell them you saw it in eem

GRC ESTABLISHED RELIABILITY CAPACITORS

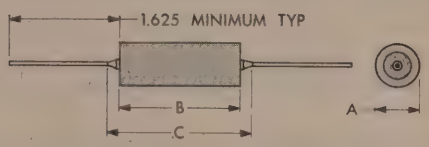
TYPE G12 METALLIZED POLYCARBONATE

PART NUMBER SYSTEM CASE DIMENSIONS

PART NUMBER SYSTEM

G12A104 J S W

- SERIES NO.
- DC VOLTAGE RATING
- PICOFARAD CODE (See explanation)
- CAPACITANCE TOLERANCE
- SLEEVING CODE: S = MYLAR SLEEVING
  X = SLEEVING NOT REQUIRED
- LEAD MATERIAL CODE: W = TINNED COPPER CLAD STEEL



VOLT. CODE	VDC	TOL. CODE	%	INCHES	MM	INCHES	MM	INCHES	MM
A	30	F	1	.025	.635	.400	10.16	1.000	25.40
B	50	G	2	.032	.813	.500	12.70	1.063	27.00
C	100	J	5	.040	1.016	.562	14.27	1.125	28.58
D	200	K	10	.170	4.32	.670	17.02	1.375	34.93
				.193	4.90	.687	17.45	1.875	47.63
				.235	5.97	.750	19.05	2.375	60.33
				.312	7.93	.813	20.65	2.625	66.68

LEAD WIRE SIZE	
CASE DIAMETER (INCHES)	LEAD WIRE SIZE #AWG
0.312 and smaller	22 (.025″)
0.400 and 0.500	20 (.032″)

CASE DIMENSIONS*	TOLERANCE LIMITS (INCHES)
"A" Diameter	±.010 Without Sleeving +0.02 −0.00 With Mylar Sleeving
"B" Case Length	±0.03 With or Without Sleeving
"C" Bead to Bead Max. Length	The lengths shown in table are maximum and include solder beads

* LEAD MATERIAL FOR ALL CASE SIZES, TINNED COPPERCLAD STEEL (TYPE W)

	TYPE G12A 30VDC				TYPE G12B 50VDC				TYPE G12C 100VDC				TYPE G12D 200VDC			
uF	Basic P/N	Diam. A	Length B	Length C	Basic P/N	Diam. A	Length B	Length C	Basic P/N	Diam. A	Length B	Length C	Basic P/N	Diam. A	Length B	Length C
.001	G12A102	.170	.500	.600	G12B102	.170	.500	.600	G12C102	.170	.500	.600	G12D102	.170	.500	.600
.0012	G12A122	.170	.500	.600	G12B122	.170	.500	.600	G12C122	.170	.500	.600	G12D122	.170	.500	.600
.0015	G12A152	.170	.500	.600	G12B152	.170	.500	.600	G12C152	.170	.500	.600	G12D152	.170	.500	.600
.0018	G12A182	.170	.500	.600	G12B182	.170	.500	.600	G12C182	.170	.500	.600	G12D182	.170	.500	.600
.002	G12A202	.170	.500	.600	G12B202	.170	.500	.600	G12C202	.170	.500	.600	G12D202	.170	.500	.600
.0022	G12A222	.170	.500	.600	G12B222	.170	.500	.600	G12C222	.170	.500	.600	G12D222	.170	.500	.600
.0027	G12A272	.170	.500	.600	G12B272	.170	.500	.600	G12C272	.170	.500	.600	G12D272	.170	.500	.600
.0033	G12A332	.170	.500	.600	G12B332	.170	.500	.600	G12C332	.170	.500	.600	G12D332	.170	.500	.600
.0039	G12A392	.170	.500	.600	G12B392	.170	.500	.600	G12C392	.170	.500	.600	G12D392	.170	.500	.600
.0047	G12A472	.170	.500	.600	G12B472	.170	.500	.600	G12C472	.170	.500	.600	G12D472	.170	.500	.600
.005	G12A502	.170	.500	.600	G12B502	.170	.500	.600	G12C502	.170	.500	.600	G12D502	.170	.500	.600
.0056	G12A562	.170	.500	.600	G12B562	.170	.500	.600	G12C562	.170	.500	.600	G12D562	.170	.500	.600
.0068	G12A682	.170	.500	.600	G12B682	.170	.500	.600	G12C682	.170	.500	.600	G12D682	.170	.500	.600
.0075	G12A752	.170	.500	.600	G12B752	.170	.500	.600	G12C752	.170	.500	.600	G12D752	.170	.562	.662
.0082	G12A822	.170	.500	.600	G12B822	.170	.500	.600	G12C822	.170	.500	.600	G12D822	.170	.562	.662
.01	G12A103	.170	.500	.600	G12B103	.170	.500	.600	G12C103	.170	.500	.600	G12D103	.170	.687	.787
.012	G12A123	.170	.500	.600	G12B123	.170	.500	.600	G12C123	.170	.500	.600	G12D123	.170	.687	.787
.015	G12A153	.170	.500	.600	G12B153	.170	.500	.600	G12C153	.170	.500	.600	G12D153	.170	.687	.787
.018	G12A183	.170	.500	.600	G12B183	.170	.500	.600	G12C183	.170	.562	.662	G12D183	.193	.687	.787
.02	G12A203	.170	.500	.600	G12B203	.170	.500	.600	G12C203	.170	.562	.662	G12D203	.193	.687	.787
.022	G12A223	.170	.500	.600	G12B223	.170	.500	.600	G12C223	.170	.562	.662	G12D223	.193	.687	.787
.027	G12A273	.170	.500	.600	G12B273	.170	.500	.600	G12C273	.170	.562	.662	G12D273	.193	.687	.787
.033	G12A333	.170	.500	.600	G12B333	.170	.500	.600	G12C333	.170	.562	.662	G12D333	.193	.687	.787
.039	G12A393	.170	.500	.600	G12B393	.170	.500	.600	G12C393	.170	.562	.662	G12D393	.235	.687	.787
.047	G12A473	.170	.500	.600	G12B473	.170	.500	.600	G12C473	.193	.562	.662	G12D473	.235	.687	.787
.05	G12A503	.170	.500	.600	G12B503	.170	.500	.600	G12C503	.193	.562	.662	G12D503	.235	.687	.787
.056	G12A563	.170	.500	.600	G12B563	.170	.500	.600	G12C563	.193	.562	.662	G12D563	.235	.687	.787
.068	G12A683	.170	.500	.600	G12B683	.170	.562	.662	G12C683	.235	.562	.662	G12D683	.312	.687	.787
.075	G12A753	.170	.500	.600	G12B573	.170	.562	.662	G12C753	.235	.562	.662	G12D753	.312	.687	.787
.082	G12A823	.170	.562	.662	G12B823	.170	.562	.662	G12C823	.235	.562	.662	G12D823	.312	.687	.787
.1	G12A104	.170	.562	.662	G12B104	.193	.562	.662	G12C104	.235	.687	.787	G12D104	.312	.687	.787
.12	G12A124	.170	.562	.662	G12B124	.193	.562	.662	G12C124	.235	.687	.787	G12D124	.312	.687	.787
.15	G12A154	.170	.562	.662	G12B154	.193	.562	.662	G12C154	.235	.687	.787	G12D154	.312	.813	.913
.18	G12A184	.193	.562	.662	G12B184	.235	.562	.662	G12C184	.235	.687	.787	G12D184	.312	.813	.913
.20	G12A204	.193	.562	.662	G12B204	.235	.562	.662	G12C204	.235	.687	.787	G12D204	.312	.813	.913
.22	G12A224	.193	.562	.662	G12B224	.235	.562	.662	G12C224	.235	.687	.787	G12D224	.312	.813	.913
.27	G12A274	.235	.562	.662	G12B274	.235	.687	.787	G12C274	.312	.687	.787	G12D274	.312	1.063	1.163
.33	G12A334	.235	.562	.662	G12B334	.235	.687	.787	G12C334	.312	.813	.913	G12D334	.312	1.063	1.163
.39	G12A394	.235	.562	.662	G12B394	.235	.687	.787	G12C394	.312	.813	.913	G12D394	.400	1.063	1.163
.47	G12A474	.235	.687	.787	G12B474	.312	.687	.787	G12C474	.400	.687	.787	G12D474	.400	1.063	1.163
.50	G12A504	.235	.687	.787	G12B504	.312	.687	.787	G12C504	.400	.687	.787	G12D504	.400	1.063	1.163
.56	G12A564	.235	.687	.787	G12B564	.312	.687	.787	G12C564	.400	.687	.787	G12D564	.400	1.063	1.163
.68	G12A684	.235	.813	.913	G12B684	.312	.687	.787	G12C684	.400	.813	.913	G12D684	.500	1.125	1.225
.75	G12A754	.235	.813	.913	G12B754	.312	.687	.787	G12C754	.400	.813	.913	G12D754	.500	1.125	1.225
.82	G12A824	.235	.813	.913	G12B824	.312	.687	.787	G12C824	.400	.813	.913	G12D824	.500	1.375	1.475
1.0	G12A105	.235	.813	.913	G12B105	.312	.813	.913	G12C105	.400	1.063	1.163	G12D105	.500	1.375	1.475
1.2	G12A125	.235	.813	.913	G12B125	.312	.813	.913	G12C125	.400	1.063	1.163	G12D125	.500	1.375	1.475
1.5	G12A155	.312	.813	.913	G12B155	.400	.813	.913	G12C155	.400	1.375	1.475				
1.8	G12A185	.312	.813	.913	G12B185	.400	.813	.913	G12C185	.400	1.375	1.475				
2.0	G12A205	.312	.813	.913	G12B205	.400	.813	.913	G12C205	.500	1.375	1.475				
2.2	G12A225	.312	.813	.913	G12B225	.400	.813	.913	G12C225	.500	1.375	1.475				
2.5	G12A255	.312	.813	.913	G12B255	.400	.813	.913	G12C255	.500	1.375	1.475				
2.7	G12A275	.312	1.063	1.163	G12B275	.400	1.063	1.163	G12C275	.500	1.375	1.475				
3.0	G12A305	.312	1.063	1.163	G12B305	.400	1.063	1.163	G12C305	.500	1.375	1.475				
3.3	G12A335	.312	1.063	1.163	G12B335	.400	1.063	1.163	G12C335	.500	1.375	1.475				
3.9	G12A395	.312	1.063	1.163	G12B395	.400	1.375	1.475								
4.7	G12A475	.400	1.063	1.163	G12B475	.500	1.375	1.475								
5.0	G12A505	.400	1.063	1.163	G12B505	.500	1.375	1.475								
5.6	G12A565	.400	1.063	1.163	G12B565	.500	1.375	1.475								
6.8	G12A685	.400	1.375	1.475	G12B685	.500	1.375	1.475								
7.5	G12A755	.400	1.375	1.475	G12B755	.500	1.375	1.475								
8.2	G12A825	.400	1.375	1.475	G12B825	.500	1.375	1.475								
10.0	G12A106	.500	1.375	1.475												

PICOFARAD CODE: CAPACITANCE EXPRESSED IN PICOFARADS AS A 3-DIGIT NUMBER. FIRST TWO DIGITS REPRESENT THE FIRST TWO SIGNIFICANT FIGURES. THE LAST DIGIT REPRESENTS THE NUMBER OF ZEROES TO FOLLOW. **EXAMPLE: 104 = 100,000 PICOFARADS.**

CRC ESTABLISHED RELIABILITY CAPACITORS

TYPE G12 METALLIZED POLYCARBONATE

SPECIFICATIONS QUALITY CONFORMANCE

CONSTRUCTION: METALLIZED POLYCARBONATE DIELECTRIC, HERMETICALLY SEALED, EXTENDED METAL FILM ELECTRODES, AXIAL LEADS ISOLATED FROM CASE.

ENVIRONMENTAL: CAPACITORS MEET ALL ENVIRONMENTAL REQUIREMENTS AND WILL QUALIFY TO MIL-C-83421/2.

G12 SPECIFICATIONS

OPERATING TEMPERATURE	−65°C to +100°C	At full rated voltage, derate linearly to 50% of rated voltage at 125°C.
DIELECTRIC ABSORPTION	0.1% maximum	At 25°C when measured per MIL-C-83421.
DISSIPATION FACTOR	0.15% maximum	At 25°C when measured per MIL-C-83421.
AC SQUARE WAVE	100Hz, 60 seconds minimum	At 25°C at a peak to peak voltage of 2 times rated DC voltage, terminal to terminal per MIL-C-83421.
DIELECTRIC STRENGTH	200% DC volts	At 25°C from terminal to terminal and terminal to case for 60 seconds minimum.
TEMPERATURE COEFFICIENT	±2% 0% to −2%	From 25°C to +125°C. From 25°C to −55°C.
CAPACITANCE STABILITY	±0.25%	When measured at any two corresponding temperature points taken in five successive temperature cycles from −65°C to +125°C.
HERMETIC SEAL	1×10^{-6}atm/cm³/sec.	Maximum leak rate.
INSULATION RESISTANCE	See I.R. Table	Measured from terminal to terminal at rated DC voltage and 5 minutes charge time. Values greater than 1uF, allow an additional minute/uF charge time.

MINIMUM INSULATION RESISTANCE AT RATED DC VOLTAGE

FOR VALUES OVER 0.1uF DIVIDE LIMIT SHOWN BY uF TO OBTAIN MINIMUM I.R. EXAMPLE: A 0.18uF CAPACITOR AT 25°C IS 100,000 ÷ 0.18 = 555,555 MEGOHMS.

RANGE	25°C	85°C	100°C	125°C
.001 TO 0.1uF	1,000,000 Megohms	60,000 Megohms	30,000 Megohms	10,000 Megohms
GREATER THAN 0.1uF	100,000 Megohms-uF	6,000 Megohms-uF	3,000 Megohms-uF	1,000 Megohms-uF

G12 QUALITY CONFORMANCE INSPECTION

TEST NO.	TEST	TEST CONDITIONS	TEST METH. MIL-C-83421	TEST LIMIT	QUALITY LEVEL
1	BURN-IN	48 hrs. minimum at 125°C, at 140% rated DC voltage	4.7.2	No physical damage	100% Test
2	THERMAL AGING	10 cycles minimum from −65°C to +125°C	4.7.3	No physical damage	100% Test
3	SEAL TEST (FINE LEAK)	Helium bomb 45 PSI for 1 hr. minimum, check for helium leak	4.7.5	1x10⁻⁶atm/cm³/sec. max.	100% Test
4	SEAL TEST (GROSS LEAK)	Per MIL-C-83421	4.7.5	No continuous bubble stream	100% Test
5	AC SQUARE WAVE (TERMINAL TO TERMINAL)	Apply 100Hz at a peak to peak voltage of 2 times DC rated voltage for 60 seconds minimum	4.7.6	No shorts	100% Test
6	DC HI-POT (TERMINAL TO TERMINAL AND TERMINALS TO CASE)	Apply 200% of rated DC voltage for 60 seconds minimum	4.7.6	No shorts	100% Test
7	INSULATION RESISTANCE (TERMINAL TO TERMINAL)	At 25°C at rated DC voltage	4.7.7	100,000 megohm-uF, need not exceed 1,000,000 megohms	100% Test
8	% CAPACITANCE TOLERANCE	At 25°C at 1KHz	4.7.8	Per part number	100% Test
9	% DISSIPATION FACTOR	At 25°C at 1KHz, values above 1uF measure at 0.1KHz	4.7.9	0.15% max.	100% Test
10	VISUAL AND MECHANICAL INSPECTION	For marking, dimensions, and workmanship	4.7.1	Per specification	1.0% AQL

1. Capacitors are packaged and shipped with Certification of Conformance. 2. Traceability to production and test records by permanent marking of parts with date code lot. 3. Process and inspection data is maintained on file per NHB 5300.4 (1C), MIL-Q-9858 and MIL-STD-790.

CRC ESTABLISHED RELIABILITY CAPACITORS

TYPE G12 METALLIZED POLYCARBONATE

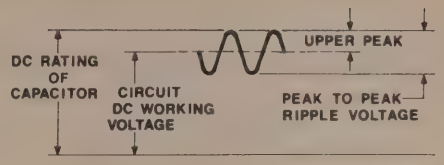
AC RATINGS

1. THE COMBINED DC AND AC VOLTAGES SHOULD NOT EXCEED THE DC RATINGS, SEE FIGURE.

2. CAPACITORS MAY BE OPERATED AT HIGHER FREQUENCIES, AT REDUCED RMS VOLTAGE SUCH THAT MAX. AC CURRENT RATINGS ARE NOT EXCEEDED.

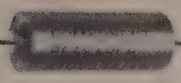
3. CAPACITORS CAN HANDLE PULSE CURRENTS UP TO 100 TIMES GREATER THAN THE PEAK CURRENTS CALCULATED FROM THE RATED RMS RATING (PROVIDED SLOW REPETITION RATES ARE USED).

IF THERE IS ANY DOUBT A SKETCH OF THE VOLTAGE AND CURRENT WAVE FORMS WITH TIME BASE SHOULD BE SENT TO CRC FOR ANALYSIS.



	TYPE G12A 30VDC			TYPE G12B 50VDC			TYPE G12C 100VDC			TYPE G12D 200VDC		
	MAXIMUM RATING			MAXIMUM RATING			MAXIMUM RATING			MAXIMUM RATING		
uF	RMS Volts	Freq. In KHz	RMS Amps	RMS Volts	Freq. In KHz	RMS Amps	RMS Volts	Freq. In KHz	RMS Amps	RMS Volts	Freq. In KHz	RMS Amps
.001	22.0	20.0	.003	36.0	20.0	.0057	60.0	20.0	.008	120.0	20.0	.015
.0012	22.0	20.0	.003	36.0	20.0	.0066	60.0	20.0	.009	120.0	20.0	.018
.0015	22.0	20.0	.004	36.0	20.0	.0078	60.0	20.0	.011	120.0	20.0	.022
.0018	22.0	20.0	.005	36.0	20.0	.0096	60.0	20.0	.013	120.0	20.0	.027
.002	22.0	20.0	.006	36.0	20.0	.0108	60.0	20.0	.015	120.0	20.0	.030
.0022	22.0	20.0	.006	36.0	20.0	.0120	60.0	20.0	.017	120.0	20.0	.033
.0027	22.0	20.0	.007	36.0	20.0	.0144	60.0	20.0	.021	120.0	20.0	.041
.0033	22.0	20.0	.009	36.0	20.0	.018	60.0	20.0	.025	120.0	20.0	.050
.0039	22.0	20.0	.011	36.0	20.0	.021	60.0	20.0	.028	120.0	20.0	.058
.0047	22.0	20.0	.013	36.0	20.0	.026	60.0	20.0	.036	120.0	20.0	.071
.005	22.0	20.0	.014	36.0	20.0	.028	60.0	20.0	.038	120.0	20.0	.075
.0056	22.0	20.0	.015	36.0	20.0	.031	60.0	20.0	.042	120.0	20.0	.084
.0068	22.0	20.0	.019	36.0	20.0	.037	60.0	20.0	.050	120.0	20.0	.10
.0075	22.0	20.0	.022	36.0	20.0	.041	60.0	20.0	.055	120.0	20.0	.11
.0082	22.0	20.0	.023	36.0	20.0	.045	60.0	20.0	.070	120.0	20.0	.12
.01	22.0	20.0	.028	36.0	20.0	.055	60.0	20.0	.075	120.0	20.0	.15
.012	22.0	20.0	.033	36.0	20.0	.066	60.0	20.0	.090	120.0	20.0	.18
.015	22.0	20.0	.041	36.0	20.0	.082	60.0	20.0	.11	120.0	20.0	.22
.018	22.0	20.0	.049	36.0	20.0	.100	60.0	20.0	.13	120.0	19.2	.26
.02	22.0	20.0	.055	36.0	20.0	.11	60.0	20.0	.15	120.0	18.6	.28
.022	22.0	20.0	.060	36.0	20.0	.12	60.0	20.0	.17	120.0	17.6	.29
.027	22.0	20.0	.070	36.0	20.0	.15	60.0	20.0	.20	120.0	16.8	.34
.033	22.0	20.0	.090	36.0	20.0	.18	60.0	20.0	.25	120.0	16.6	.41
.039	22.0	20.0	.11	36.0	20.0	.22	60.0	20.0	.29	120.0	16.1	.47
.047	22.0	20.0	.13	36.0	20.0	.26	60.0	20.0	.35	120.0	15.6	.55
.05	22.0	20.0	.14	36.0	20.0	.28	60.0	20.0	.38	120.0	15.5	.58
.056	22.0	20.0	.15	36.0	20.0	.31	60.0	20.0	.42	120.0	15.3	.64
.068	22.0	20.0	.19	36.0	20.0	.37	60.0	20.0	.51	120.0	13.9	.71
.075	22.0	20.0	.21	36.0	20.0	.41	60.0	20.0	.56	120.0	13.2	.74
.082	22.0	20.0	.23	36.0	20.0	.45	60.0	20.0	.62	120.0	12.7	.78
.1	22.0	20.0	.28	36.0	20.0	.55	60.0	20.0	.75	120.0	12.0	.90
.12	22.0	20.0	.33	36.0	20.0	.66	60.0	20.0	.90	120.0	11.7	1.05
.15	22.0	20.0	.40	36.0	20.0	.83	60.0	17.4	.98	120.0	11.0	1.24
.18	22.0	20.0	.49	36.0	20.0	1.00	60.0	16.7	1.13	120.0	10.4	1.40
.20	22.0	20.0	.55	36.0	20.0	1.00	60.0	16.0	1.20	120.0	10.0	1.50
.22	22.0	20.0	.61	36.0	20.0	1.00	60.0	15.4	1.27	120.0	9.1	1.62
.27	22.0	20.0	.74	36.0	18.9	1.15	60.0	12.6	1.28	120.0	8.0	1.90
.33	22.0	20.0	.91	36.0	17.8	1.32	60.0	12.0	1.48	120.0	7.7	2.15
.39	22.0	20.0	1.07	36.0	16.6	1.46	60.0	11.4	1.66	120.0	7.4	2.47
.47	22.0	20.0	1.29	36.0	15.6	1.65	60.0	10.5	1.85	120.0	7.0	2.47
.50	22.0	20.0	1.38	36.0	15.0	1.69	60.0	10.1	1.90	120.0	6.7	2.50
.56	22.0	18.8	1.45	36.0	14.4	1.81	60.0	9.6	2.01	120.0	6.3	2.64
.68	22.0	17.4	1.63	36.0	13.3	2.04	60.0	9.3	2.38	120.0	6.1	3.10
.75	22.0	15.9	1.64	36.0	12.1	2.04	60.0	8.6	2.42	120.0	5.7	3.20
.82	22.0	14.5	1.64	36.0	11.0	2.05	60.0	8.0	2.46	120.0	5.4	3.30
1.0	22.0	12.2	1.68	36.0	9.3	2.10	60.0	6.7	2.50	120.0	4.5	3.40
1.2	22.0	10.4	1.72	36.0	7.9	2.15	60.0	6.0	2.7	120.0	3.9	3.50
1.5	22.0	8.4	1.74	36.0	6.4	2.17	60.0	5.2	2.9			
1.8	22.0	7.1	1.76	36.0	5.4	2.2	60.0	4.4	3.0			
2.0	22.0	6.4	1.76	36.0	4.8	2.2	60.0	4.1	3.1			
2.2	22.0	5.8	1.76	36.0	4.4	2.2	60.0	3.9	3.2			
2.5	22.0	5.1	1.76	36.0	3.9	2.2	60.0	3.5	3.25			
2.7	22.0	4.7	1.76	36.0	3.6	2.2	60.0	3.3	3.30			
3.0	22.0	4.3	1.76	36.0	3.3	2.2	60.0	3.0	3.40			
3.3	22.0	3.9	1.76	36.0	3.0	2.2	60.0	2.83	3.50			
3.9	22.0	3.3	1.76	36.0	2.5	2.2						
4.7	22.0	2.7	1.76	36.0	2.1	2.2						
5.0	22.0	2.6	1.76	36.0	2.0	2.2						
5.6	22.0	2.3	1.76	36.0	1.7	2.2						
6.8	22.0	1.9	1.76	36.0	1.4	2.2						
7.5	22.0	1.7	1.76	36.0	1.3	2.2						
8.2	22.0	1.6	1.76	36.0	1.2	2.2						
10.0	22.0	1.3	1.76									

CRC



.39 μF 50VDC
ACTUAL SIZE CAPACITOR

TYPE A10 — **DOUBLE LAYER METALLIZED PLASTIC DIELECTRIC**

NEW PRODUCT FEATURES

AC RATED FROM 36VRMS TO 240VRMS AT FREQUENCIES UP TO 400Hz, −65°C to 100°C, WITH DERATED OPERATION AT 125°C. RATINGS TO 40KHz AT LOWER VOLTAGE RATINGS, DC RATED 50VDC TO 400VDC.

HERMETICALLY SEALED, HIGH RELIABILITY SCREENED FOR CRITICAL AEROSPACE APPLICATIONS.

100% RELIABILITY SCREENING, INCLUDES BURN-IN, TEMPERATURE CYCLING, FINE LEAK TESTS, AC SQUARE WAVE TESTS AND HIGH IMPEDANCE FAULT SCANNING.

INSULATION RESISTANCE, 3,000,000 MEGOHMS MINIMUM, ALL VALUES UP TO 0.1uF.

LOW LOSS, RUGGED INTERNAL TERMINATIONS FOR ALL HI-REL PROGRAMS (CRC PATENTED CONSTRUCTION).

AVAILABLE IN 1%, 2%, 5% AND 10% CAPACITANCE TOLERANCE FROM 50VDC TO 400VDC. OTHER TOLERANCES AVAILABLE ON REQUEST.

TYPICAL APPLICATIONS

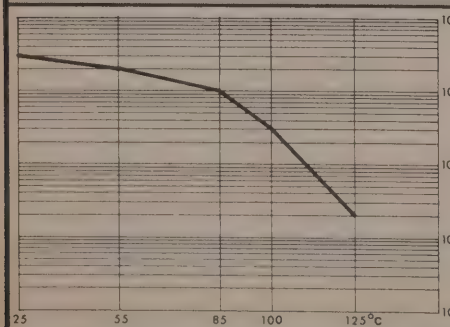
- ☐ CRITICAL TIMING CIRCUITS
- ☐ FIXED TUNING CIRCUITS
- ☐ FILTERING—LOW FREQUENCY
- ☐ TEMPERATURE COMPENSATION
- ☐ COUPLING AND DECOUPLING
- ☐ FEEDBACK CIRCUITS
- ☐ POWER SUPPLY FILTERING
- ☐ GYRO CIRCUITS
- ☐ PULSE FORMING NETWORKS
- ☐ INTEGRATING CIRCUITS

LIFE TEST DATA CRC TEST REPORT #XT-1307

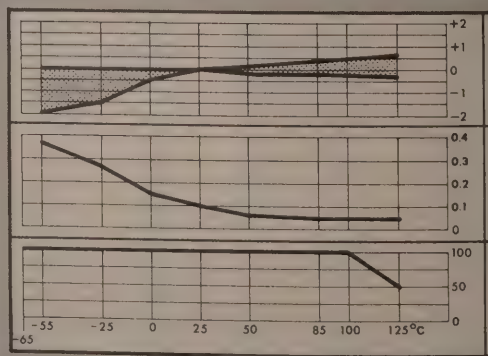
TEST RESULTS FOR 100 SERIES CR1178 CAPACITORS LIFE TESTED FOR 2000 HOURS AT 100°C AT 140% OF RATED DC VOLTAGE. THERE WERE NO FAILURES FOR THIS TEST. CR1178 CAPACITORS ARE THE SAME CONSTRUCTION AND DESIGN AS TYPE A10. (CR1178B RATED AT 50VDC, CR1178D RATED AT 200VDC.)

LIST OF CAPACITORS LIFE TESTED			INSULATION RESISTANCE IN MEGOHMS AT 25°C			% CAPACITANCE CHANGE WITH LIFE			% DISSIPATION FACTOR AT 25°C WITH LIFE		
CRC TYPE	uF VALUE	Q'TY TESTED	POST TEST LIMITS (MIN. I.R.)	TEST RESULTS LOW	TEST RESULTS HIGH	POST TEST LIMITS (MAX. △C)	TEST RESULTS LOW	TEST RESULTS HIGH	POST TEST LIMITS (MAX. D.F.)	TEST RESULTS LOW	TEST RESULTS HIGH
CR1178B	2.55	20	3.9×10^{4}	3.1×10^{5}	5×10^{5}	±2	0.00	−.035	.25	.06	.07
CR1178B	.56	20	1.8×10^{5}	1.4×10^{6}	2.7×10^{6}	±2	+.005	+.255	.25	.06	.075
CR1178D	.39	20	2.6×10^{5}	1.4×10^{6}	2.9×10^{6}	±2	+.005	−.085	.25	.065	.075
CR1178D	.47	20	2×10^{5}	2.04×10^{6}	4.04×10^{6}	±2	±.005	±.055	.25	.065	.075
CR1178D	1.0	20	9.9×10^{4}	4.0×10^{5}	1.8×10^{6}	±2	+.005	−.055	.25	.05	.095

TYPICAL CURVES



INSULATION RESISTANCE WITH TEMPERATURE IN MEGOHMS (0.1 μF OR LESS)



% CAPACITANCE CHANGE WITH TEMPERATURE

% DISSIPATION FACTOR WITH TEMPERATURE

% VOLTAGE RATING WITH TEMPERATURE

COMPONENT RESEARCH CO., INC. ▪ 1655 26TH STREET ▪ SANTA MONICA, CALIF. 90404 ▪ (213) 829-3615. TWX: (910) 343-6864

CRC ESTABLISHED RELIABILITY CAPACITORS

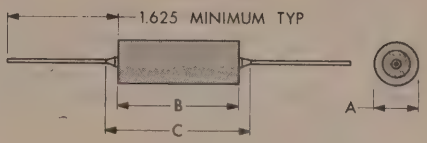
TYPE A10 — DOUBLE LAYER METALLIZED PLASTIC DIELECTRIC

CASE DIMENSIONS AND PART NUMBER SYSTEM

PART NUMBER SYSTEM

A10 B 104 J S W

- SERIES NO.
- DC VOLTAGE RATING
- PICOFARAD CODE (See explanation)
- CAPACITANCE TOLERANCE
- SLEEVING CODE: S = MYLAR SLEEVING; X = SLEEVING NOT REQUIRED
- LEAD MATERIAL CODE: W = TINNED COPPER CLAD STEEL; C = TINNED OXYGEN FREE COPPER



VOLT. CODE	VDC	TOL. CODE	%	INCHES	MM	INCHES	MM	INCHES	MM
B	50	F	1	.025	.635	.400	10.16	1.000	25.40
				.032	.813	.500	12.70	1.063	27.00
C	100	G	2	.040	1.016	.562	14.27	1.125	28.58
				.170	4.32	.670	17.02	1.375	34.93
D	200	J	5	.193	4.90	.687	17.45	1.875	47.63
				.235	5.97	.750	19.05	2.375	60.33
E	400	K	10	.312	7.93	.813	20.65	2.625	66.68

LEAD WIRE SIZE	
CASE DIAMETER (INCHES)	LEAD WIRE SIZE #AWG
0.312 and smaller	22 (.025″)
0.400 and 0.500	20 (.032″)
0.562 and larger	18 (.040″)

CASE DIMENSIONS	TOLERANCE LIMITS (INCHES)
"A" Diameter	±.010 Without Sleeving
	+0.02 −0.00 With Mylar Sleeving
"B" Case Length	±0.03 With or Without Sleeving
"C" Bead to Bead Max. Length	The lengths shown in table are maximum and include solder beads

uF	TYPE A10B 50VDC RATED				TYPE A10C 100VDC RATED				TYPE A10D 200VDC RATED				TYPE A10E 400VDC RATED			
	Basic P/N	Diam. A	Length B	Length C	Basic P/N	Diam. A	Length B	Length C	Basic P/N	Diam. A	Length B	Length C	Basic P/N	Diam. A	Length B	Length C
.001	A10B102	.170	.500	.600	A10C102	.170	.500	.600	A10D102	.170	.562	.662	A10E102	.193	.562	.662
.0012	A10B122	.170	.500	.600	A10C122	.170	.500	.600	A10D122	.170	.562	.662	A10E122	.193	.562	.662
.0015	A10B152	.170	.500	.600	A10C152	.170	.500	.600	A10D152	.170	.562	.662	A10E152	.193	.562	.662
.0018	A10B182	.170	.500	.600	A10C182	.170	.500	.600	A10D182	.170	.562	.662	A10E182	.193	.562	.662
.002	A10B202	.170	.500	.600	A10C202	.170	.500	.600	A10D202	.170	.562	.662	A10E202	.193	.562	.662
.0022	A10B222	.170	.500	.600	A10C222	.170	.500	.600	A10D222	.170	.562	.662	A10E222	.193	.562	.662
.0027	A10B272	.170	.500	.600	A10C272	.170	.500	.600	A10D272	.170	.562	.662	A10E272	.235	.562	.662
.0033	A10B332	.170	.500	.600	A10C332	.170	.500	.600	A10D332	.170	.562	.662	A10E332	.235	.562	.662
.0039	A10B392	.170	.500	.600	A10C392	.170	.500	.600	A10D392	.170	.562	.662	A10E392	.235	.562	.662
.0047	A10B472	.170	.500	.600	A10C472	.170	.500	.600	A10D472	.170	.562	.662	A10E472	.235	.562	.662
.005	A10B502	.170	.500	.600	A10C502	.170	.500	.600	A10D502	.170	.562	.662	A10E502	.235	.562	.662
.0056	A10B562	.170	.500	.600	A10C562	.170	.687	.787	A10D562	.170	.562	.662	A10E562	.235	.562	.662
.0068	A10B682	.170	.500	.600	A10C682	.170	.687	.787	A10D682	.170	.562	.662	A10E582	.235	.687	.787
.0075	A10B752	.170	.562	.662	A10C752	.170	.687	.787	A10D752	.193	.562	.662	A10E752	.235	.687	.787
.0082	A10B822	.170	.562	.662	A10C822	.170	.687	.787	A10D822	.193	.562	.662	A10E822	.235	.687	.787
.01	A10B103	.170	.562	.662	A10C103	.170	.687	.787	A10D103	.193	.562	.662	A10E103	.235	.687	.787
.012	A10B123	.170	.562	.662	A10C123	.170	.687	.787	A10D123	.193	.562	.662	A10E123	.235	.687	.787
.015	A10B153	.170	.562	.662	A10C153	.170	.687	.787	A10D153	.235	.562	.662	A10E153	.235	.813	.913
.018	A10B183	.193	.562	.662	A10C183	.193	.687	.787	A10D183	.235	.687	.787	A10E183	.312	.813	.913
.02	A10B203	.193	.562	.662	A10C203	.193	.687	.787	A10D203	.235	.687	.787	A10E203	.312	.813	.913
.022	A10B223	.193	.562	.662	A10C223	.193	.687	.787	A10D223	.235	.687	.787	A10E223	.312	.813	.913
.027	A10B273	.193	.562	.662	A10C273	.193	.687	.787	A10D273	.312	.687	.787	A10E273	.312	.813	.913
.033	A10B333	.193	.562	.662	A10C333	.193	.687	.787	A10D333	.312	.687	.787	A10E333	.312	.813	.913
.039	A10B393	.170	.687	.787	A10C393	.235	.687	.787	A10D393	.312	.687	.787	A10E393	.312	.813	.913
.047	A10B473	.170	.687	.787	A10C473	.235	.687	.787	A10D473	.312	.687	.787	A10E473	.400	.813	.913
.05	A10B503	.170	.687	.787	A10C503	.235	.687	.787	A10D503	.312	.687	.787	A10E503	.400	.813	.913
.056	A10B563	.193	.687	.787	A10C563	.235	.687	.787	A10D563	.312	.813	.913	A10E563	.400	.813	.913
.068	A10B683	.193	.687	.787	A10C683	.235	.813	.917	A10D683	.312	.813	.913	A10E683	.400	.813	.913
.075	A10B753	.193	.813	.913	A10C753	.312	.687	.787	A10D753	.312	.813	.913	A10E753	.400	1.063	1.163
.082	A10B823	.193	.813	.913	A10C823	.312	.687	.787	A10D823	.312	.813	.913	A10E823	.400	1.063	1.163
.1	A10B104	.193	.813	.913	A10C104	.312	.687	.787	A10D104	.312	.813	.913	A10E104	.400	1.063	1.163
.12	A10B124	.235	.687	.787	A10C124	.312	.687	.787	A10D124	.312	.813	.913	A10E124	.400	1.063	1.163
.15	A10B154	.235	.687	.787	A10C154	.312	.813	.913	A10D154	.400	1.063	1.163	A10E154	.400	1.375	1.475
.18	A10B184	.235	.813	.913	A10C184	.312	.813	.913	A10D184	.400	1.063	1.163	A10E184	.500	1.375	1.475
.20	A10B204	.235	.813	.913	A10C204	.312	.813	.913	A10D204	.400	1.375	1.475	A10E204	.500	1.375	1.475
.22	A10B224	.312	.687	.787	A10C224	.312	.813	.913	A10D224	.400	1.375	1.475	A10E224	.500	1.375	1.475
.27	A10B274	.312	.687	.787	A10C274	.312	1.063	1.163	A10D274	.500	1.375	1.475	A10E274	.562	1.375	1.475
.33	A10B334	.312	.813	.913	A10C334	.312	1.063	1.163	A10D334	.500	1.375	1.475	A10E334	.562	1.375	1.475
.39	A10B394	.312	.813	.913	A10C394	.400	1.063	1.163	A10D394	.500	1.375	1.475	A10E394	.562	1.875	1.975
.47	A10B474	.400	.813	.913	A10C474	.400	1.063	1.163	A10D474	.500	1.375	1.475	A10E474	.562	1.875	1.975
.50	A10B504	.400	.813	.913	A10C504	.400	1.063	1.163	A10D504	.500	1.375	1.475	A10E504	.562	1.875	1.975
.56	A10B564	.400	.813	.913	A10C564	.400	1.063	1.163	A10D564	.500	1.375	1.475	A10E564	.562	1.875	1.975
.68	A10B684	.400	.813	.913	A10C684	.500	1.125	1.225	A10D684	.562	1.375	1.475	A10E684	.750	1.875	1.975
.75	A10B754	.400	1.063	1.163	A10C754	.500	1.125	1.225	A10D754	.562	1.875	1.975	A10E754	.750	1.875	1.975
.82	A10B824	.400	1.063	1.163	A10C824	.500	1.125	1.225	A10D824	.562	1.875	1.975	A10E824	.750	1.875	1.975
1.0	A10B105	.400	1.063	1.163	A10C105	.562	1.125	1.225	A10D105	.562	1.875	1.975	A10E105	.750	1.875	1.975
1.2	A10B125	.500	1.063	1.163	A10C125	.562	1.125	1.225	A10D125	.562	1.875	1.975	A10E125	1.000	1.875	1.975
1.5	A10B155	.500	1.063	1.163	A10C155	.562	1.375	1.475	A10D155	.670	1.875	1.975	A10E155	1.000	2.375	2.475
1.8	A10B185	.500	1.125	1.225	A10C185	.670	1.375	1.475	A10D185	.750	1.875	1.975	A10E185	1.000	2.375	2.475
2.0	A10B205	.500	1.125	1.225	A10C205	.670	1.375	1.475	A10D205	.750	1.875	1.975	A10E205	1.000	2.375	2.475
2.2	A10B225	.500	1.375	1.475	A10C225	.670	1.375	1.475	A10D225	.750	1.875	1.975				
2.5	A10B255	.500	1.375	1.475	A10C255	.670	1.875	1.975	A10D255	.750	1.875	1.975				
3.0	A10B305	.562	1.375	1.475	A10C305	.670	1.875	1.975	A10D305	1.000	1.875	1.975				
3.3	A10B335	.562	1.375	1.475	A10C335	.670	1.875	1.975	A10D335	1.000	1.875	1.975				
4.0	A10B405	.670	1.375	1.475	A10C405	.750	1.875	1.975	A10D405	1.000	2.375	2.475				
4.7	A10B475	.670	1.375	1.475	A10C475	.750	1.875	1.975								
5.0	A10B505	.670	1.375	1.475	A10C505	.750	1.875	1.975								
6.8	A10B685	.670	1.875	1.975	A10C685	1.000	2.375	2.475								
8.0	A10B805	.670	1.875	1.975	A10C805	1.000	2.375	2.475								
10.0	A10B106	.750	1.875	1.975	A10C106	1.000	2.375	2.475								

PICOFARAD CODE: CAPACITANCE EXPRESSED IN PICOFARADS AS A 3-DIGIT NUMBER. FIRST TWO DIGITS REPRESENT THE FIRST TWO SIGNIFICANT FIGURES. THE LAST DIGIT REPRESENTS THE NUMBER OF ZEROES TO FOLLOW. **EXAMPLE: 104 = 100,000 PICOFARADS.**

CRC ESTABLISHED RELIABILITY CAPACITORS

TYPE A10 — DOUBLE LAYER METALLIZED PLASTIC DIELECTRIC

SPECIFICATIONS AND QUALITY CONFORMANCE

CONSTRUCTION: DOUBLE LAYER, METALLIZED PLASTIC DIELECTRIC HERMETICALLY SEALED, EXTENDED METAL FILM ELECTRODES, LEADS ISOLATED FROM CASE.

ENVIRONMENTAL: CAPACITORS MEET ALL ENVIRONMENTAL REQUIREMENTS OF MIL-C-83421.

A10 SPECIFICATIONS

OPERATING TEMPERATURE	−65°C to +100°C	At full rated voltage, derate linearly to 50% of rated voltage at 125°C.
DIELECTRIC ABSORPTION	0.1% maximum	At 25°C when measured per MIL-C-83421.
DISSIPATION FACTOR	0.15% maximum	At 25°C when measured per MIL-C-83421.
AC SQUARE WAVE	100Hz, 60 seconds minimum	At 25°C at a peak to peak voltage of 3 times rated DC voltage, terminal to terminal per MIL-C-83421.
DIELECTRIC STRENGTH	200% DC volts	At 25°C from terminal to terminal and terminals to case for 60 seconds minimum.
TEMPERATURE COEFFICIENT	±1% 0% to −2%	From 25°C to +125°C. From 25°C to −55°C.
CAPACITANCE STABILITY	±0.2%	When measured at any two corresponding temperature points taken in five successive temperature cycles from −65°C to +125°C.
HERMETIC SEAL	1×10^{-6} atm/cm³/sec.	Maximum leak rate.
INSULATION RESISTANCE	See I.R. Table	Measured from terminal to terminal at rated DC voltage and 5 minutes charge time. Values greater than 1uF, allow an additional minute/uF charge time.

MINIMUM INSULATION RESISTANCE AT RATED DC VOLTAGE

FOR VALUES OVER 0.1uF DIVIDE LIMIT SHOWN BY uF TO OBTAIN MINIMUM I.R. EXAMPLE: A 0.18uF CAPACITOR AT 25°C IS 300,000 ÷ 0.18 = 1,666,666 MEGOHMS.

RANGE	25°C	85°C	100°C	125°C
.001 TO 0.1uF	3,000,000 Megohms	500,000 Megohms	200,000 Megohms	20,000 Megohms
GREATER THAN 0.1uF	300,000 Megohms-uF	50,000 Megohms-uF	20,000 Megohms-uF	2,000 Megohms-uF

A10 QUALITY CONFORMANCE INSPECTION

TEST NO.	TEST	TEST CONDITIONS	TEST METH. MIL-C-83421	TEST LIMIT	QUALITY LEVEL
1	BURN-IN	48 hrs. minimum at 125°C, at 140% rated DC voltage	4.7.2	No physical damage	100% Test
2	THERMAL AGING	10 cycles minimum from −65°C to +125°C	4.7.3	No physical damage	100% Test
3	SEAL TEST (FINE LEAK)	Helium bomb 45 PSI for 1 hr. minimum, check for helium leak	4.7.5	1×10^{-6} atm/cm³/sec. max.	100% Test
4	SEAL TEST (GROSS LEAK)	Per MIL-C-83421	4.7.5	No continuous bubble stream	100% Test
5	AC SQUARE WAVE (TERMINAL TO TERMINAL)	Apply 100Hz at a peak to peak voltage of 3 times DC rated voltage for 60 seconds minimum	4.7.6	No shorts	100% Test
6	DC HI-POT (TERMINAL TO TERMINAL AND TERMINALS TO CASE)	Apply 200% of rated DC voltage for 60 seconds minimum	4.7.6	No shorts	100% Test
7	INSULATION RESISTANCE (TERMINAL TO TERMINAL)	At 25°C at rated DC voltage	4.7.7	300,000 megohm-uF, need not exceed 3,000,000 megohms	100% Test
8	% CAPACITANCE TOLERANCE	At 25°C at 1KHz	4.7.8	Per part number	100% Test
9	% DISSIPATION FACTOR	At 25°C at 1KHz, values above 1uF measure at 0.1KHz	4.7.9	0.15% max.	100% Test
10	FAULT SCANNING	With temperature from +125°C to −65°C	N/A	No Faults	100% Test
11	VISUAL AND MECHANICAL INSPECTION	For marking, dimensions, and workmanship	4.7.1	Per specification	1.0% AQL

1. Capacitors are packaged and shipped with Certification of Conformance. 2. Traceability to production and test records by permanent marking of parts with date code lot. 3. Process and inspection data is maintained on file per NHB 5300.4 (1C), MIL-Q-9858 and MIL-STD-790.

CRC ESTABLISHED RELIABILITY CAPACITORS

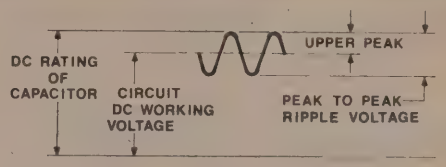
A10 AC RATINGS

1. THE COMBINED DC AND AC VOLTAGES SHOULD NOT EXCEED THE DC RATINGS, SEE FIGURE.

2. CAPACITORS MAY BE OPERATED AT HIGHER FREQUENCIES, AT REDUCED RMS VOLTAGE SUCH THAT MAX. AC CURRENT RATINGS ARE NOT EXCEEDED.

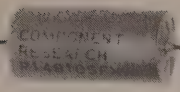
3. CAPACITORS CAN HANDLE PULSE CURRENTS UP TO 100 TIMES GREATER THAN THE PEAK CURRENTS CALCULATED FROM THE RATED RMS RATING (PROVIDED SLOW REPETITION RATES ARE USED).

IF THERE IS ANY DOUBT A SKETCH OF THE VOLTAGE AND CURRENT WAVE FORMS WITH TIME BASE SHOULD BE SENT TO CRC FOR ANALYSIS.



uF	TYPE A10 50VDC AC RATINGS			TYPE A10 100VDC AC RATINGS			TYPE A10 200VDC AC RATINGS			TYPE A10 400VDC AC RATINGS		
	RMS Volts 400Hz	RMS Volts 40KHz	Max. RMS Amps	RMS Volts 400Hz	RMS Volts 40KHz	Max. RMS Amps	RMS Volts 400Hz	RMS Volts 40KHz	Max. RMS Amps	RMS Volts 400Hz	RMS Volts 40KHz	Max. RMS Amps
.001	36.0	36.0	.009	60.0	60.0	.015	120.0	80.0	.020	240.0	100.0	.025
.0012	36.0	36.0	.010	60.0	60.0	.018	120.0	80.0	.024	240.0	100.0	.030
.0015	36.0	36.0	.013	60.0	60.0	.022	120.0	80.0	.030	240.0	100.0	.037
.0018	36.0	36.0	.016	60.0	60.0	.027	120.0	80.0	.036	240.0	100.0	.045
.002	36.0	36.0	.018	60.0	60.0	.030	120.0	80.0	.040	240.0	100.0	.050
.0022	36.0	36.0	.020	60.0	60.0	.033	120.0	80.0	.044	240.0	100.0	.055
.0027	36.0	36.0	.024	60.0	60.0	.041	120.0	80.0	.054	240.0	100.0	.068
.0033	36.0	36.0	.030	60.0	60.0	.050	120.0	80.0	.066	240.0	100.0	.083
.0039	36.0	36.0	.035	60.0	60.0	.058	120.0	80.0	.078	240.0	100.0	.097
.0047	36.0	36.0	.042	60.0	60.0	.071	120.0	80.0	.094	240.0	100.0	.12
.005	36.0	36.0	.045	60.0	60.0	.075	120.0	80.0	.10	240.0	100.0	.13
.0056	36.0	36.0	.050	60.0	60.0	.084	120.0	80.0	.11	240.0	100.0	.14
.0068	36.0	36.0	.061	60.0	60.0	.10	120.0	80.0	.14	240.0	100.0	.17
.0075	36.0	36.0	.067	60.0	60.0	.11	120.0	80.0	.15	240.0	100.0	.19
.0082	36.0	36.0	.074	60.0	60.0	.12	120.0	80.0	.16	240.0	100.0	.21
.01	36.0	36.0	.090	60.0	60.0	.15	120.0	80.0	.20	240.0	100.0	.25
.012	36.0	36.0	.11	60.0	59.0	.18	120.0	78.0	.23	240.0	100.0	.30
.015	36.0	36.0	.14	60.0	58.0	.22	120.0	76.0	.29	240.0	94.0	.35
.018	36.0	36.0	.16	60.0	57.0	.26	120.0	74.0	.33	240.0	90.0	.41
.02	36.0	36.0	.18	60.0	55.0	.28	120.0	71.0	.36	240.0	88.0	.44
.022	36.0	36.0	.20	60.0	53.0	.29	120.0	68.0	.37	240.0	85.0	.47
.027	36.0	36.0	.24	60.0	51.0	.34	120.0	65.0	.44	240.0	81.0	.55
.033	36.0	36.0	.30	60.0	50.0	.41	120.0	62.0	.51	240.0	78.0	.65
.039	36.0	36.0	.35	60.0	48.0	.47	120.0	60.0	.59	240.0	75.0	.73
.047	36.0	36.0	.42	60.0	47.0	.55	120.0	57.0	.67	240.0	71.0	.83
.05	36.0	36.0	.45	60.0	46.0	.58	120.0	56.0	.70	240.0	70.0	.88
.056	36.0	36.0	.50	60.0	46.0	.65	120.0	56.0	.78	240.0	67.5	.95
.068	36.0	34.0	.58	60.0	42.0	.71	120.0	50.0	.85	240.0	60.0	1.02
.075	36.0	33.0	.62	60.0	40.0	.75	120.0	47.0	.88	240.0	55.0	1.03
.082	36.0	32.0	.66	60.0	38.0	.78	120.0	44.0	.90	240.0	50.0	1.03
.1	36.0	30.0	.75	60.0	36.0	.90	120.0	42.0	1.10	240.0	46.0	1.20
.12	36.0	30.0	.90	60.0	35.0	1.05	120.0	40.0	1.20	240.0	44.5	1.34
.15	36.0	26.0	.98	60.0	33.0	1.24	120.0	36.0	1.34	240.0	40.0	1.50
.18	36.0	25.0	1.13	60.0	31.0	1.40	120.0	34.0	1.54	240.0	38.0	1.70
.20	36.0	24.0	1.20	60.0	30.0	1.50	120.0	33.0	1.65	240.0	37.0	1.85
.22	36.0	23.0	1.27	60.0	27.0	1.50	120.0	32.0	1.75	240.0	35.0	1.93
.27	36.0	19.0	1.28	60.0	24.0	1.62	120.0	29.0	1.96	240.0	33.0	2.24
.33	36.0	18.0	1.48	60.0	23.0	1.90	120.0	28.0	2.31	240.0	32.0	2.65
.39	36.0	17.0	1.66	60.0	22.0	2.15	120.0	27.0	2.63	240.0	32.0	3.14
.47	36.0	15.7	1.85	60.0	21.0	2.47	120.0	26.0	3.06	240.0	31.0	3.64
.50	36.0	15.2	1.90	60.0	20.0	2.50	120.0	25.0	3.13	240.0	30.0	3.75
.56	36.0	14.4	2.01	60.0	19.0	2.64	120.0	23.0	3.17	240.0	29.0	4.05
.68	36.0	14.0	2.38	60.0	16.0	2.72	120.0	20.0	3.40	240.0	26.0	4.60
.75	36.0	13.0	2.44	60.0	15.0	2.81	120.0	19.0	3.56	240.0	24.0	4.50
.82	36.0	12.0	2.46	60.0	14.0	2.87	120.0	18.0	3.70	240.0	23.4	4.80
1.0	36.0	10.0	2.50	60.0	12.0	3.00	120.0	15.0	3.75	240.0	20.8	5.20
1.2	36.0	9.1	2.73	60.0	11.0	3.25	120.0	13.5	4.05	240.0	18.3	5.50
1.5	36.0	7.7	2.90	60.0	10.0	3.75	120.0	12.0	4.50	240.0	16.0	6.00
2.0	36.0	6.2	3.10	60.0	8.1	4.10	120.0	10.0	5.00	240.0	14.0	7.00
2.2	36.0	5.8	3.20	60.0	7.5	4.12	120.0	9.1	5.00			
2.5	36.0	5.4	3.40	60.0	7.0	4.40	120.0	8.6	5.00			
3.0	36.0	4.5	3.40									
3.3	36.0	4.2	3.50									
4.0	36.0	3.7	3.60									
4.7	36.0	3.1	3.60									
5.0	36.0	2.9	3.60									
6.8	36.0	2.1	3.60									
8.0	36.0	1.8	3.60									
10.0	36.0	1.4	3.60									

CRC



1.0 μF 50VDC
ACTUAL SIZE CAPACITOR

TYPE P14 METALLIZED POLYSULFONE

NEW PRODUCT FEATURES

MINIATURE SIZE - RATED TO 150°C OPERATION.

HERMETICALLY SEALED, HIGH RELIABILITY AC SCREENED FOR AEROSPACE APPLICATIONS.

AC RATED FROM 36VRMS TO 240VRMS AT FREQUENCIES UP TO 20KHz, −65°C TO 125°C WITH 50% DERATED OPERATION AT 150°C.

DC RATED FROM 50VDC TO 400VDC, −65°C TO 125°C WITH 50% DERATED OPERATION AT 150°C.

P14 CAPACITORS WILL ULTIMATELY APPEAR IN MIL-C-83421/3, AND ARE PRESENTLY DESIGNED INTO MANY MILITARY PROGRAMS.

LOW LOSS, RUGGED INTERNAL TERMINATIONS, QUALIFIED FOR ALL HIGH RELIABILITY PROGRAMS (CRC PATENTED CONSTRUCTION).

LOW CAPACITANCE DRIFT AND TC, HIGH INSULATION RESISTANCE.

AVAILABLE IN STANDARD CAPACITANCE TOLERANCES ±1%, ±2%, ±5%, ±10%. OTHER TOLERANCES AVAILABLE ON REQUEST.

TYPICAL APPLICATIONS

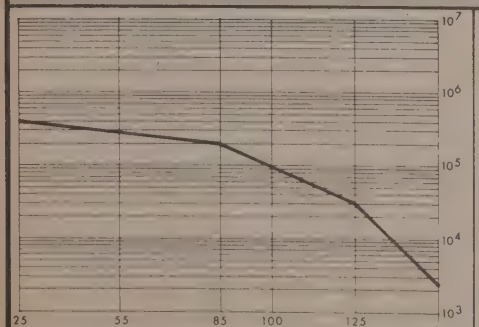
- ☐ CRITICAL TIMING CIRCUITS
- ☐ FIXED TUNING CIRCUITS
- ☐ FILTERING—LOW FREQUENCY
- ☐ TEMPERATURE COMPENSATION
- ☐ COUPLING AND DECOUPLING
- ☐ FEEDBACK CIRCUITS
- ☐ POWER SUPPLY FILTERING
- ☐ GYRO CIRCUITS
- ☐ PULSE FORMING NETWORKS
- ☐ INTEGRATING CIRCUITS

LIFE TEST DATA CRC TEST REPORT #78TR129

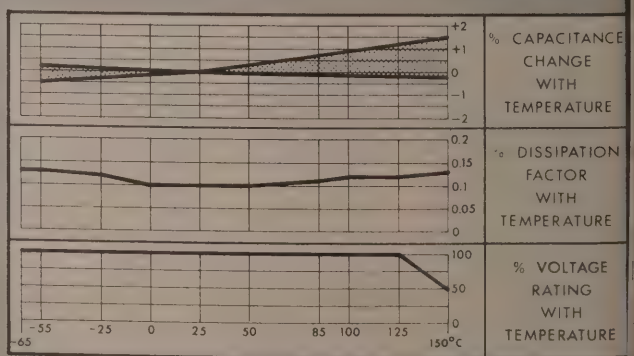
TEST RESULTS FOR 180 SERIES H14 CAPACITORS LIFE TESTED FOR 2000 HOURS AT 125°C AT 140% OF RATED DC VOLTAGE. THERE WERE NO FAILURES FOR THIS TEST. H14 CAPACITORS ARE THE SAME CONSTRUCTION AND DESIGN AS P14.

LIST OF CAPACITORS SUBMITTED TO LIFE TEST			INSULATION RESISTANCE IN MEGOHMS AT 25°C			% CAPACITANCE CHANGE WITH LIFE			% DISSIPATION FACTOR AT 25°C WITH LIFE		
CRC TYPE	uF VALUE	Q'TY TESTED	POST TEST LIMITS (MIN. I.R.)	TEST RESULTS LOW	TEST RESULTS HIGH	POST TEST LIMITS (MAX. △C)	TEST RESULTS LOW	TEST RESULTS HIGH	POST TEST LIMITS (MAX. D.F.)	TEST RESULTS LOW	TEST RESULTS HIGH
H14B	.047	15	$1.3x10^5$	$8x10^6$	$1.6x10^7$	±2	−.2	−.25	.25	.07	.08
H14B	.015	15	$1.3x10^5$	$1.6x10^7$	$5x10^7$	±2	+.02	+.14	.25	.06	.07
H14B	.0022	20	$1.3x10^5$	$1.2x10^7$	$5x10^7$	±2	−.01	−1.3	.25	.04	.07
H14A	.02	20	$1.3x10^5$	$1x10^7$	$1.5x10^7$	±2	0.00	−.26	.25	.04	.06
H14A	.005	20	$1.3x10^5$	$6x10^6$	$3x10^7$	±2	0.00	−1.5	.25	.05	.09

TYPICAL CURVES



INSULATION RESISTANCE WITH TEMPERATURE IN MEGOHMS (0.1 μF OR LESS)

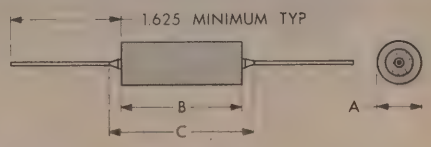


PART NUMBER SYSTEM

P14 B 104 J S W

- SERIES NO.
- DC VOLTAGE RATING
- PICOFARAD CODE (See explanation)
- CAPACITANCE TOLERANCE
- SLEEVING CODE: S = MYLAR SLEEVING; X = SLEEVING NOT REQUIRED
- LEAD MATERIAL CODE: W = TINNED COPPER CLAD STEEL; C = TINNED OXYGEN FREE COPPER

P14 CASE DIMENSIONS AND PART NUMBER SYSTEM



VOLT. CODE	VDC	TOL. CODE	%	INCHES	MM	INCHES	MM	INCHES	MM
B	50	F	1	.025	.635	.400	10.16	1.000	25.40
C	100	G	2	.032	.813	.500	12.70	1.063	27.00
Y	150	J	5	.040	1.016	.562	14.27	1.125	28.58
D	200	K	10	.170	4.32	.670	17.02	1.375	34.93
V	300			.193	4.90	.687	17.45	1.875	47.63
E	400			.235	5.97	.750	19.05	2.375	60.33
				.312	7.93	.813	20.65	2.625	66.68

LEAD WIRE SIZE		CASE DIMENSIONS*	TOLERANCE LIMITS (INCHES)
CASE DIAMETER (INCHES)	LEAD WIRE SIZE #AWG		
0.312 and smaller	22 (.025")	"A" Diameter	±.010 Without Sleeving +0.02 −0.00 With Mylar Sleeving
0.400 and 0.500	20 (.032")	"B" Case Length	±0.03 With or Without Sleeving
0.562 and larger	18 (.040")	"C" Bead to Bead Max. Length	The lengths shown in table are maximum and include solder beads

* Lead material for case dia. 0.500 & smaller, tinned copperclad steel (Type W). Lead material for case dia. 0.562 & larger, tinned oxygen-free copper (Type C).

CAP. uF	TYPE P14B 50VDC (36Vrms AC)			TYPE P14C 100VDC (60Vrms AC)			TYPE P14Y 150VDC (90Vrms AC)			TYPE P14D 200VDC (120Vrms AC)			TYPE P14V 300VDC (180Vrms AC)			TYPE P14E 400VDC (240Vrms AC)		
	Diam. A	Length B	Length C	Diam. A	Length B	Length C	Diam. A	Length B	Length C	Diam. A	Length B	Length C	Diam. A	Length B	Length C	Diam. A	Length B	Length C
.001	.170	.500	.600	.170	.500	.600	.170	.500	.600	.170	.562	.662	.193	.562	.662	.193	.562	.662
.0012	.170	.500	.600	.170	.500	.600	.170	.500	.600	.170	.562	.662	.193	.562	.662	.193	.562	.662
.0015	.170	.500	.600	.170	.500	.600	.170	.500	.600	.170	.562	.662	.193	.562	.662	.193	.562	.662
.0018	.170	.500	.600	.170	.500	.600	.170	.500	.600	.170	.562	.662	.193	.562	.662	.193	.562	.662
.002	.170	.500	.600	.170	.500	.600	.170	.500	.600	.170	.562	.662	.193	.562	.662	.193	.562	.662
.0022	.170	.500	.600	.170	.500	.600	.170	.500	.600	.170	.562	.662	.193	.562	.662	.193	.562	.662
.0027	.170	.500	.600	.170	.500	.600	.170	.500	.600	.170	.562	.662	.193	.562	.662	.193	.687	.787
.0033	.170	.500	.600	.170	.500	.600	.170	.500	.600	.170	.562	.662	.193	.562	.662	.193	.687	.787
.0039	.170	.500	.600	.170	.500	.600	.170	.500	.600	.170	.562	.662	.193	.562	.662	.193	.687	.787
.0047	.170	.500	.600	.170	.500	.600	.170	.500	.600	.170	.562	.662	.193	.562	.662	.193	.687	.787
.005	.170	.500	.600	.170	.500	.600	.170	.500	.600	.170	.562	.662	.193	.562	.662	.193	.687	.787
.0056	.170	.500	.600	.170	.500	.600	.170	.500	.600	.170	.562	.662	.193	.562	.662	.193	.687	.787
.0068	.170	.500	.600	.170	.500	.600	.170	.562	.662	.193	.562	.662	.193	.687	.787	.235	.687	.787
.0075	.170	.500	.600	.170	.500	.600	.170	.562	.662	.193	.562	.662	.193	.687	.787	.235	.687	.787
.0082	.170	.500	.600	.170	.500	.600	.170	.562	.662	.193	.562	.662	.193	.687	.787	.235	.687	.787
.01	.170	.500	.600	.170	.562	.662	.193	.562	.662	.193	.687	.787	.235	.687	.787	.312	.687	.787
.012	.170	.500	.600	.170	.562	.662	.193	.562	.662	.193	.687	.787	.235	.687	.787	.312	.687	.787
.015	.170	.500	.600	.170	.562	.662	.193	.562	.662	.193	.687	.787	.235	.687	.787	.312	.687	.787
.018	.170	.562	.662	.193	.562	.662	.193	.687	.787	.235	.687	.787	.312	.687	.787	.312	.813	.913
.02	.170	.562	.662	.193	.562	.662	.193	.687	.787	.235	.687	.787	.312	.687	.787	.312	.813	.913
.022	.170	.562	.662	.193	.562	.662	.193	.687	.787	.235	.687	.787	.312	.687	.787	.312	.813	.913
.027	.170	.562	.662	.193	.562	.662	.193	.687	.787	.235	.687	.787	.312	.687	.787	.312	.813	.913
.033	.170	.562	.662	.193	.562	.662	.193	.687	.787	.235	.687	.787	.312	.687	.787	.312	.813	.913
.039	.170	.562	.662	.193	.562	.662	.193	.687	.787	.235	.687	.787	.312	.687	.787	.312	.813	.913
.047	.193	.562	.662	.193	.687	.787	.235	.687	.787	.312	.687	.787	.312	.813	.913	.400	.813	.913
.05	.193	.562	.662	.193	.687	.787	.235	.687	.787	.312	.687	.787	.312	.813	.913	.400	.813	.913
.056	.193	.562	.662	.193	.687	.787	.235	.687	.787	.312	.687	.787	.312	.813	.913	.400	.813	.913
.068	.193	.562	.662	.193	.687	.787	.235	.687	.787	.312	.687	.787	.312	.813	.913	.400	.813	.913
.075	.193	.687	.787	.235	.687	.787	.312	.687	.787	.312	.813	.913	.400	.813	.913	.400	1.063	1.163
.082	.193	.687	.787	.235	.687	.787	.312	.687	.787	.312	.813	.913	.400	.813	.913	.400	1.063	1.163
.1	.193	.687	.787	.235	.687	.787	.312	.687	.787	.312	.813	.913	.400	.813	.913	.400	1.063	1.163
.12	.193	.687	.787	.235	.687	.787	.312	.687	.787	.312	.813	.913	.400	.813	.913	.400	1.063	1.163
.15	.235	.687	.787	.312	.687	.787	.312	.813	.913	.312	.813	.913	.400	1.063	1.163	.500	1.125	1.225
.18	.235	.687	.787	.312	.687	.787	.312	.813	.913	.400	.813	.913	.400	1.063	1.163	.500	1.125	1.225
.20	.235	.687	.787	.312	.687	.787	.312	.813	.913	.400	.813	.913	.400	1.063	1.163	.500	1.125	1.225
.22	.235	.687	.787	.312	.687	.787	.312	.813	.913	.400	.813	.913	.400	1.063	1.163	.500	1.125	1.225
.27	.312	.687	.787	.312	.813	.913	.400	.813	.913	.400	1.063	1.163	.500	1.375	1.475	.562	1.375	1.475
.33	.312	.687	.787	.312	.813	.913	.400	.813	.913	.400	1.063	1.163	.500	1.375	1.475	.562	1.375	1.475
.39	.312	.687	.787	.312	.813	.913	.400	.813	.913	.400	1.063	1.163	.500	1.375	1.475	.562	1.375	1.475
.47	.312	.813	.913	.400	.813	.913	.400	1.063	1.163	.500	1.125	1.225	.562	1.375	1.475	.670	1.375	1.475
.50	.312	.813	.913	.400	.813	.913	.400	1.063	1.163	.500	1.125	1.225	.562	1.375	1.475	.670	1.375	1.475
.56	.312	.813	.913	.400	.813	.913	.400	1.063	1.163	.500	1.125	1.225	.562	1.375	1.475	.670	1.375	1.475
.68	.400	.813	.913	.400	1.063	1.163	.500	1.125	1.225	.562	1.375	1.475	.670	1.375	1.475	.670	1.375	1.475
.75	.400	.813	.913	.400	1.063	1.163	.500	1.125	1.225	.562	1.375	1.475	.670	1.375	1.475	.670	1.375	1.475
.82	.400	.813	.913	.400	1.063	1.163	.500	1.125	1.225	.562	1.375	1.475	.670	1.375	1.475	.670	1.875	1.975
1.0	.400	.813	.913	.400	1.063	1.163	.500	1.125	1.225	.562	1.375	1.475	.670	1.375	1.475	.670	1.875	1.975
1.2	.400	1.063	1.163	.500	1.125	1.225	.562	1.375	1.475	.670	1.375	1.475	.670	1.875	1.975	.750	1.875	1.975
1.5	.400	1.063	1.163	.500	1.125	1.225	.562	1.375	1.475	.670	1.375	1.475	.670	1.875	1.975	.750	1.875	1.975
1.8	.500	1.125	1.225	.500	1.375	1.475	.670	1.375	1.475	.670	1.875	1.975	.750	1.875	1.975	1.000	1.875	1.975
2.0	.500	1.125	1.225	.500	1.375	1.475	.670	1.375	1.475	.670	1.875	1.975	.750	1.875	1.975	1.000	1.875	1.975
2.2	.500	1.125	1.225	.500	1.375	1.475	.670	1.375	1.475	.670	1.875	1.975	.750	1.875	1.975	1.000	1.875	1.975
2.5	.562	1.375	1.475	.670	1.375	1.475	.670	1.875	1.975	.750	1.875	1.975	1.000	1.875	1.975	1.000	2.375	2.475
2.7	.562	1.375	1.475	.670	1.375	1.475	.670	1.875	1.975	.750	1.875	1.975	1.000	1.875	1.975	1.000	2.375	2.475
3.0	.562	1.375	1.475	.670	1.375	1.475	.670	1.875	1.975	.750	1.875	1.975	1.000	1.875	1.975	1.000	2.375	2.475
3.3	.562	1.375	1.475	.670	1.375	1.475	.670	1.875	1.975	.750	1.875	1.975	1.000	1.875	1.975			
3.9	.562	1.375	1.475	.670	1.375	1.475	.670	1.875	1.975	.750	1.875	1.975	1.000	1.875	1.975			
4.7	.670	1.375	1.475	.670	1.875	1.975	.750	1.875	1.975	1.000	1.875	1.975	1.000	2.375	2.475			
5.0	.670	1.375	1.475	.670	1.875	1.975	.750	1.875	1.975	1.000	1.875	1.975	1.000	2.375	2.475			
5.6	.670	1.375	1.475	.670	1.875	1.975	.750	1.875	1.975	1.000	1.875	1.975	1.000	2.375	2.475			
6.8	.670	1.375	1.475	.670	1.875	1.975	1.000	1.875	1.975	1.000	2.375	2.475						
7.5	.670	1.875	1.975	.750	1.875	1.975	1.000	1.875	1.975	1.000	2.375	2.475						
8.2	.670	1.875	1.975	.750	1.875	1.975	1.000	1.875	1.975	1.000	2.375	2.475						
10.0	.670	1.875	1.975	.750	1.875	1.975	1.000	1.875	1.975	1.000	2.375	2.475						
12.0	.750	1.875	1.975	1.000	1.875	1.975	1.000	2.375	2.475									
15.0	.750	1.875	1.975	1.000	1.875	1.975	1.000	2.375	2.475									
18.0	1.000	1.875	1.975	1.000	2.375	2.475												
20.0	1.000	1.875	1.975	1.000	2.375	2.475												
22.0	1.000	1.875	1.975	1.000	2.375	2.475												
25.0	1.000	2.375	2.475															
27.0	1.000	2.375	2.475															

PICOFARAD CODE: CAPACITANCE EXPRESSED IN PICOFARADS AS A 3-DIGIT NUMBER. FIRST TWO DIGITS REPRESENT THE FIRST TWO SIGNIFICANT FIGURES. THE LAST DIGIT REPRESENTS THE NUMBER OF ZEROES TO FOLLOW. **EXAMPLE 104 = 100,000 PICOFARADS.**

CRC ESTABLISHED RELIABILITY CAPACITORS

TYPE P14 METALLIZED POLYSULFONE

SPECIFICATIONS AND QUALITY CONFORMANCE

CONSTRUCTION: METALLIZED POLYSULFONE DIELECTRIC, HERMETICALLY SEALED, EXTENDED METAL FILM ELECTRODES, AXIAL LEADS ISOLATED FROM CASE.

ENVIRONMENTAL: CAPACITORS MEET ALL ENVIRONMENTAL REQUIREMENTS AND WILL QUALIFY TO MIL-C-83421/3.

P14 SPECIFICATIONS

OPERATING TEMPERATURE	−65°C to +125°C	At full rated voltage, derated linearly to 50% of rated voltage at 150°C.
DIELECTRIC ABSORPTION	0.1% maximum	At 25°C when measured per MIL-C-83421.
DISSIPATION FACTOR	0.15% maximum	At 25°C when measured per MIL-C-83421.
AC SQUARE WAVE	100Hz, 60 seconds minimum	At 25°C at a peak to peak voltage of 2 times rated DC voltage, terminal to terminal per MIL-C-83421.
DIELECTRIC STRENGTH	200% DC volts	At 25°C from terminal to terminal and terminals to case for 60 seconds minimum.
TEMPERATURE COEFFICIENT	+1.5% to −0.25% +0.2% to −0.5%	From 25°C to +150°C. From 25°C to −55°C.
CAPACITANCE STABILITY	±0.25%	When measured at any two corresponding temperature points taken in five successive temperature cycles from −65°C to +150°C.
HERMETIC SEAL	1×10^{-6} atm/cm³/sec.	Maximum leak rate.
INSULATION RESISTANCE	See I.R. Table	Measured from terminal to terminal at rated DC voltage and 5 minutes charge time. Values greater than 1uF, allow an additional minute/uF charge time.

MINIMUM INSULATION RESISTANCE AT RATED DC VOLTAGE

FOR VALUES OVER 0.5uF DIVIDE LIMIT SHOWN BY uF TO OBTAIN MINIMUM I.R. EXAMPLE: A 0.68uF CAPACITOR AT 25°C IS 200,000 ÷ 0.68 = 294,117 MEGOHMS.

RANGE	25°C	85°C	125°C	150°C
.001 TO 0.5uF	400,000 Megohms	200,000 Megohms	30,000 Megohms	2,500 Megohms
GREATER THAN 0.5uF	200,000 Megohms-uF	100,000 Megohms-uF	15,000 Megohms-uF	1,250 Megohms-uF

P14 QUALITY CONFORMANCE INSPECTION

TEST NO.	TEST	TEST CONDITIONS	TEST METH. MIL-C-83421	TEST LIMIT	QUALITY LEVEL
1	BURN-IN	96 hrs. minimum at 125°C, at 120% rated AC voltage at 400Hz	4.7.2	No physical damage	100% Test
2	THERMAL AGING	10 cycles minimum from −65°C to +125°C	4.7.3	No physical damage	100% Test
3	SEAL TEST (FINE LEAK)	Helium bomb 45 PSI for 1 hr. minimum, check for helium leak	4.7.5	1×10^{-6} atm/cm³/sec. max.	100% Test
4	SEAL TEST (GROSS LEAK)	Per MIL-C-83421	4.7.5	No continuous bubble stream	100% Test
5	AC SQUARE WAVE (TERMINAL TO TERMINAL)	Apply 100Hz at a peak to peak voltage of 2 times DC rated voltage for 60 seconds minimum	4.7.6	No shorts	100% Test
6	DC HI-POT (TERMINAL TO TERMINAL AND TERMINALS TO CASE)	Apply 200% of rated DC voltage for 60 seconds minimum	4.7.6	No shorts	100% Test
7	INSULATION RESISTANCE (TERMINAL TO TERMINAL)	At 25°C at rated DC voltage	4.7.7	200,000 megohm-uF, need not exceed 400,000 megohms	100% Test
8	% CAPACITANCE TOLERANCE	At 25°C at 1KHz	4.7.8	Per part number	100% Test
9	% DISSIPATION FACTOR	At 25°C at 1KHz, values above 1uF measure at 0.1KHz	4.7.9	0.15% max.	100% Test
10	VISUAL AND MECHANICAL INSPECTION	For marking, dimensions, and workmanship	4.7.1	Per specification	1.0% AQL

1. Capacitors are packaged and shipped with Certification of Conformance. 2. Traceability to production and test records by permanent marking of parts with date code lot. 3. Process and inspection data is maintained on file per NHB 5300.4 (1C), MIL-Q-9858 and MIL-STD-790.

COMPONENT RESEARCH CO., INC. ▪ 1655 26TH STREET • SANTA MONICA, CALIF. 90404 • (213) 829-3615. TWX (910) 343-6864

CRC ESTABLISHED RELIABILITY CAPACITORS

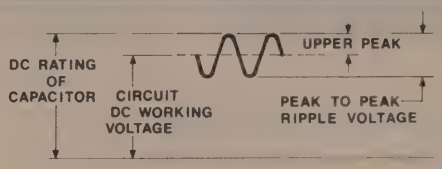
P14 AC RATINGS

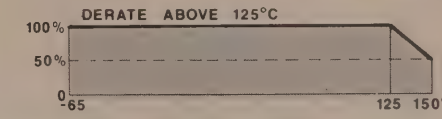
1. THE COMBINED DC AND AC VOLTAGES SHOULD NOT EXCEED THE DC RATINGS, SEE FIGURE.

2. CAPACITORS MAY BE OPERATED AT HIGHER FREQUENCIES, AT REDUCED RMS VOLTAGE SUCH THAT MAX. AC CURRENT RATINGS ARE NOT EXCEEDED.

3. CAPACITORS CAN HANDLE PULSE CURRENTS UP TO 100 TIMES GREATER THAN THE PEAK CURRENTS CALCULATED FROM THE RATED RMS RATING (PROVIDED SLOW REPETITION RATES ARE USED).

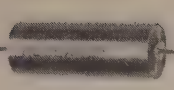
IF THERE IS ANY DOUBT A SKETCH OF THE VOLTAGE AND CURRENT WAVE FORMS WITH TIME BASE SHOULD BE SENT TO CRC FOR ANALYSIS.





uF	TYPE P14B 50VDC			TYPE P14C 100VDC			TYPE P14Y 150VDC			TYPE P14D 200VDC			TYPE P14V 300VDC			TYPE P14E 400VDC		
	MAXIMUM RATING			MAXIMUM RATING			MAXIMUM RATING			MAXIMUM RATING			MAXIMUM RATING			MAXIMUM RATING		
	RMS Volts	Freq. In KHz	RMS Amps	RMS Volts	Freq. In KHz	RMS Amps	RMS Volts	Freq. In KHz	RMS Amps	RMS Volts	Freq. In KHz	RMS Amps	RMS Volts	Freq. In KHz	RMS Amps	RMS Volts	Freq. In KHz	RMS Amps
.001	36.0	40.00	.14	60.0	40.00	.14	90.0	40.00	.14	120.0	40.00	.25	180.0	40.0	.4	240.0	40.0	.4
.0012	36.0	40.00	.14	60.0	40.00	.14	90.0	40.00	.14	120.0	40.00	.25	180.0	40.0	.4	240.0	40.0	.4
.0015	36.0	40.00	.14	60.0	40.00	.14	90.0	40.00	.14	120.0	40.00	.25	180.0	40.0	.4	240.0	40.0	.4
.0018	36.0	40.00	.14	60.0	40.00	.14	90.0	40.00	.14	120.0	40.00	.25	180.0	40.0	.4	240.0	40.0	.4
.002	36.0	40.00	.14	60.0	40.00	.14	90.0	40.00	.14	120.0	40.00	.25	180.0	40.0	.4	240.0	40.0	.4
.0022	36.0	40.00	.14	60.0	40.00	.14	90.0	40.00	.14	120.0	40.00	.25	180.0	40.0	.4	240.0	40.0	.4
.0027	36.0	40.00	.14	60.0	40.00	.14	90.0	40.00	.14	120.0	40.00	.25	180.0	40.0	.4	240.0	40.0	.6
.0033	36.0	40.00	.14	60.0	40.00	.14	90.0	40.00	.14	120.0	40.00	.25	180.0	40.0	.4	240.0	40.0	.6
.0039	36.0	40.00	.14	60.0	40.00	.14	90.0	40.00	.14	120.0	40.00	.25	180.0	40.0	.4	240.0	40.0	.6
.0047	36.0	40.00	.14	60.0	40.00	.14	90.0	40.00	.14	120.0	40.00	.25	180.0	40.0	.4	240.0	40.0	.6
.005	36.0	40.00	.14	60.0	40.00	.14	90.0	40.00	.14	120.0	40.00	.25	180.0	40.0	.4	240.0	40.0	.6
.0056	36.0	40.00	.14	60.0	40.00	.14	90.0	40.00	.14	120.0	40.00	.25	180.0	40.0	.4	240.0	40.0	.6
.0068	36.0	40.00	.14	60.0	40.00	.14	90.0	40.00	.25	120.0	40.00	.40	180.0	40.0	.6	240.0	40.0	1.0
.0075	36.0	40.00	.14	60.0	40.00	.14	90.0	40.00	.25	120.0	40.00	.40	180.0	40.0	.6	240.0	40.0	1.0
.0082	36.0	40.00	.14	60.0	40.00	.14	90.0	40.00	.25	120.0	40.00	.40	180.0	40.0	.6	240.0	40.0	1.0
.01	36.0	40.00	.14	60.0	40.00	.25	90.0	40.00	.40	120.0	40.00	.60	180.0	40.0	1.0	240.0	40.0	1.4
.012	36.0	40.00	.14	60.0	40.00	.25	90.0	40.00	.40	120.0	40.00	.60	180.0	40.0	1.0	240.0	40.0	1.4
.015	36.0	40.00	.14	60.0	40.00	.25	90.0	40.00	.40	120.0	40.00	.60	180.0	40.0	1.0	240.0	40.0	1.4
.018	36.0	40.00	.25	60.0	40.00	.40	90.0	40.00	.60	120.0	40.00	1.00	180.0	40.0	1.4	240.0	40.0	1.6
.02	36.0	40.00	.25	60.0	40.00	.40	90.0	40.00	.60	120.0	40.00	1.00	180.0	40.0	1.4	240.0	40.0	1.6
.022	36.0	40.00	.25	60.0	40.00	.40	90.0	40.00	.60	120.0	40.00	1.00	180.0	40.0	1.4	240.0	40.0	1.6
.027	36.0	40.00	.25	60.0	40.00	.40	90.0	40.00	.60	120.0	40.00	1.00	180.0	40.0	1.4	240.0	40.0	1.6
.033	36.0	34.00	.25	60.0	32.00	.40	90.0	33.00	.62	120.0	40.00	1.00	180.0	37.7	1.4	240.0	32.3	1.6
.039	36.0	32.00	.28	60.0	29.00	.42	90.0	30.00	.66	120.0	40.00	1.20	180.0	32.0	1.4	240.0	27.4	1.6
.047	36.0	32.00	.34	60.0	28.00	.50	90.0	30.00	.80	120.0	39.70	1.40	180.0	30.3	1.6	240.0	25.5	1.8
.05	36.0	32.00	.36	60.0	28.00	.53	90.0	30.00	.84	120.0	37.30	1.40	180.0	28.4	1.6	240.0	24.0	1.8
.056	36.0	31.70	.40	60.0	27.50	.58	90.0	30.00	.94	120.0	33.30	1.40	180.0	25.4	1.6	240.0	21.4	1.8
.068	36.0	29.00	.45	60.0	27.40	.70	90.0	29.00	1.10	120.0	27.40	1.40	180.0	21.0	1.6	240.0	17.0	1.8
.075	36.0	29.00	.50	60.0	25.00	.70	90.0	28.00	1.20	120.0	27.00	1.50	180.0	21.0	1.8	240.0	17.0	2.0
.082	36.0	28.00	.53	60.0	25.00	.78	90.0	26.00	1.20	120.0	26.00	1.60	180.0	19.5	1.8	240.0	16.3	2.0
.1	36.0	26.60	.60	60.0	25.00	.94	90.0	24.80	1.40	120.0	21.30	1.60	180.0	16.0	1.8	240.0	13.3	2.0
.12	36.0	26.00	.70	60.0	25.00	1.10	90.0	20.70	1.40	120.0	17.80	1.60	180.0	13.3	1.8	240.0	11.1	2.0
.15	36.0	25.00	.85	60.0	24.80	1.40	90.0	18.96	1.60	120.0	16.00	1.80	180.0	12.0	2.0	240.0	11.0	2.4
.18	36.0	24.60	1.00	60.0	20.70	1.40	90.0	15.80	1.60	120.0	13.30	1.80	180.0	10.0	2.0	240.0	11.0	3.0
.20	36.0	22.20	1.00	60.0	18.70	1.40	90.0	14.20	1.60	120.0	12.00	1.80	180.0	9.0	2.0	240.0	10.0	3.0
.22	36.0	20.00	1.00	60.0	16.90	1.40	90.0	12.90	1.60	120.0	11.00	1.80	180.0	8.1	2.0	240.0	10.0	3.0
.27	36.0	20.00	1.20	60.0	15.80	1.60	90.0	11.80	1.80	120.0	10.00	2.00	180.0	8.0	2.4	240.0	10.0	4.2
.33	36.0	16.00	1.20	60.0	13.00	1.60	90.0	9.70	1.80	120.0	8.80	2.20	180.0	8.0	3.0	240.0	8.7	4.3
.39	36.0	14.00	1.20	60.0	11.00	1.60	90.0	8.20	1.80	120.0	8.20	2.40	180.0	8.0	3.5	240.0	7.3	4.3
.47	36.0	14.00	1.50	60.0	10.20	1.80	90.0	7.90	2.10	120.0	8.00	2.80	180.0	8.0	4.3	240.0	6.4	4.5
.50	36.0	13.30	1.50	60.0	9.60	1.80	90.0	7.80	2.20	120.0	8.00	3.00	180.0	7.6	4.3	240.0	6.0	4.5
.56	36.0	11.90	1.50	60.0	8.60	1.80	90.0	7.60	2.40	120.0	7.60	3.20	180.0	6.8	4.3	240.0	5.4	4.5
.68	36.0	11.90	1.80	60.0	7.80	2.00	90.0	7.30	2.80	120.0	7.40	3.80	180.0	5.9	4.5	240.0	5.0	5.0
.75	36.0	10.60	1.80	60.0	7.10	2.00	90.0	7.10	3.00	120.0	7.40	4.20	180.0	5.3	4.5	240.0	4.4	5.0
.82	36.0	9.75	1.80	60.0	6.50	2.00	90.0	6.50	3.00	120.0	7.00	4.30	180.0	4.9	4.5	240.0	4.1	5.0
1.0	36.0	8.00	1.80	60.0	5.80	2.20	90.0	5.30	3.00	120.0	5.70	4.30	180.0	4.0	4.5	240.0	3.3	5.0
1.2	36.0	7.40	2.00	60.0	5.70	2.60	90.0	5.30	3.60	120.0	5.00	4.50	180.0	3.7	5.0	240.0	3.3	6.0
1.5	36.0	5.90	2.00	60.0	5.30	3.00	90.0	5.10	4.30	120.0	4.00	4.50	180.0	3.0	5.0	240.0	2.7	6.0
1.8	36.0	5.70	2.30	60.0	5.10	3.50	90.0	4.40	4.50	120.0	3.70	5.00	180.0	3.0	6.0	240.0	2.4	6.4
2.0	36.0	5.10	2.30	60.0	4.70	3.50	90.0	4.00	4.50	120.0	3.30	5.00	180.0	2.7	6.0	240.0	2.1	6.4
2.2	36.0	4.60	2.30	60.0	4.20	3.50	90.0	3.60	4.50	120.0	3.00	5.00	180.0	2.4	6.0	240.0	2.0	6.4
2.5	36.0	4.60	2.60	60.0	4.80	4.50	90.0	3.60	5.00	120.0	3.20	6.00	180.0	2.3	6.4	240.0	1.9	7.0
2.7	36.0	4.30	2.60	60.0	4.40	4.50	90.0	3.30	5.00	120.0	3.00	6.00	180.0	2.1	6.4	240.0	1.7	7.0
3.0	36.0	3.90	2.60	60.0	4.00	4.50	90.0	3.30	5.00	120.0	2.70	6.00	180.0	2.0	6.4	240.0	1.6	7.0
3.3	36.0	3.50	2.60	60.0	3.60	4.50	90.0	2.70	5.00	120.0	2.40	6.00	180.0	1.7	6.4	240.0	1.4	7.0
3.9	36.0	3.00	2.60	60.0	3.10	4.50	90.0	2.30	5.00	120.0	2.10	6.00	180.0	1.5	6.4			
4.7	36.0	2.80	3.00	60.0	2.80	5.00	90.0	2.30	6.00	120.0	1.80	6.40	180.0	1.3	7.0			
5.0	36.0	2.60	3.00	60.0	2.70	5.00	90.0	2.10	6.00	120.0	1.70	6.40	180.0	1.2	7.0			
5.6	36.0	2.40	3.00	60.0	2.40	5.00	90.0	1.90	6.00	120.0	1.50	6.40	180.0	1.1	7.0			
6.8	36.0	2.00	3.00	60.0	2.00	5.00	90.0	1.60	6.00	120.0	1.30	6.40						
7.5	36.0	2.00	3.50	60.0	2.00	6.00	90.0	1.50	6.40	120.0	1.20	7.00						
8.2	36.0	1.90	3.50	60.0	1.95	6.00	90.0	1.40	6.40	120.0	1.14	7.00						
10.0	36.0	1.60	3.50	60.0	1.60	6.00	90.0	1.14	6.40	120.0	.93	7.00						
12.0	36.0	1.50	4.00	60.0	1.4	6.40	90.0	1.04	7.00									
15.0	36.0	1.20	4.00	60.0	1.14	6.40	90.0	.83	7.00									
18.0	36.0	1.18	4.80	60.0	.98	6.60												
20.0	36.0	1.10	4.80	60.0	.88	6.60												
22.0	36.0	.97	4.80	60.0	.80	6.60												
25.0	36.0	.96	5.40															
27.0	36.0	.88	5.40															

CRC



.068 μF 50VDC
ACTUAL SIZE CAPACITOR

TYPES J11 AND K11 METALLIZED TEFLON

NEW PRODUCT FEATURES

HIGH INSULATION RESISTANCE: 10,000,000 MEGOHMS MINIMUM. (FOR J11 SERIES, ALL VALUES UP TO 0.1uF).

LOW DIELECTRIC ABSORPTION: 0.01% MAXIMUM VOLTAGE RECOVERY.

LONG TERM STABILITY: LESS THAN 0.5% CAPACITANCE DRIFT AFTER 2000 HRS. AT 125°C AT RATED VOLTS.

SERIES 11 CAPACITORS HAVE BEEN QUALIFIED FOR USE IN SPACE AND MISSILE SYSTEMS WHERE MAXIMUM RELIABILITY AND LOW DIELECTRIC LOSS ARE ESSENTIAL.

TYPICAL APPLICATIONS

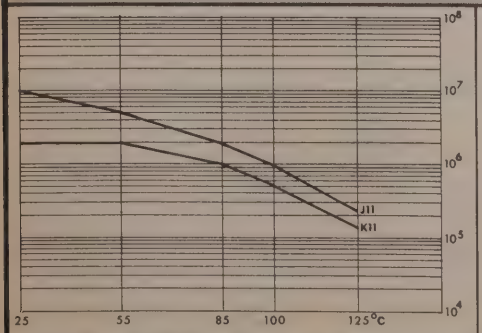
- ☐ CRITICAL TIMING CIRCUITS
- ☐ FIXED TUNING CIRCUITS
- ☐ FILTERING—LOW FREQUENCY
- ☐ TEMPERATURE COMPENSATION
- ☐ COUPLING AND DECOUPLING
- ☐ FEEDBACK CIRCUITS
- ☐ POWER SUPPLY FILTERING
- ☐ GYRO CIRCUITS
- ☐ PULSE FORMING NETWORKS
- ☐ INTEGRATING CIRCUITS

LIFE TEST DATA CRC TEST REPORT #XT1303

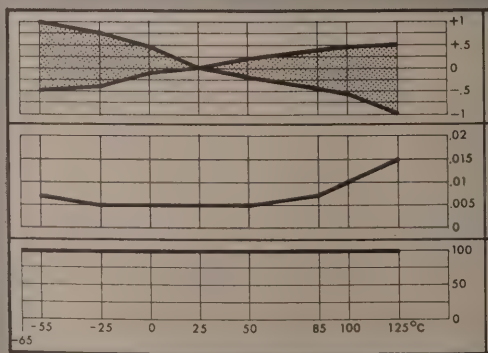
TEST RESULTS FOR 80 SERIES D11B CAPACITORS LIFE TESTED FOR 2000 HOURS AT 125°C AT 140% OF RATED DC VOLTAGE. THERE WERE NO FAILURES FOR THIS TEST. D11B CAPACITORS ARE THE SAME CONSTRUCTION AND DESIGN AS J11-K11 SERIES.

LIST OF CAPACITORS LIFE TESTED			INSULATION RESISTANCE IN MEGOHMS AT 25°C			% CAPACITANCE CHANGE WITH LIFE			% DISSIPATION FACTOR AT 25°C WITH LIFE		
CRC TYPE	uF VALUE	Q'TY TESTED	POST TEST LIMITS (MIN. I.R.)	TEST RESULTS LOW	TEST RESULTS HIGH	POST TEST LIMITS (MAX. △C)	TEST RESULTS LOW	TEST RESULTS HIGH	POST TEST LIMITS (MAX. D.F.)	TEST RESULTS LOW	TEST RESULTS HIGH
D11B	0.1	12	$5x10^5$	$3.9x10^6$	$5x10^7$	±1	−.035	−.35	.2	.01	.065
D11B	0.22	32	$5x10^5$	$2x10^6$	$2.5x10^7$	±1	−.01	+.85	.2	.005	.075
D11B	0.47	11	$5x10^5$	$1x10^6$	$1x10^6$	±1	−.005	+.58	.2	.01	.10
D11B	1.0	6	$2.5x10^5$	$5.2x10^5$	$3.8x10^6$	±1	−.005	+.24	.2	.01	.12
D11B	0.5	20	$5x10^5$	$3.8x10^6$	$5x10^7$	±1	+.02	+.48	.2	.01	.02

TYPICAL CURVES



INSULATION RESISTANCE WITH TEMPERATURE IN MEGOHMS (0.1 μF OR LESS)



% CAPACITANCE CHANGE WITH TEMPERATURE

% DISSIPATION FACTOR WITH TEMPERATURE

% VOLTAGE RATING WITH TEMPERATURE

COMPONENT RESEARCH CO., INC. ▪ 1655 26TH STREET ▪ SANTA MONICA CALIF. 90404 ▪ (213) 829-3615. TWX: (910) 343-686

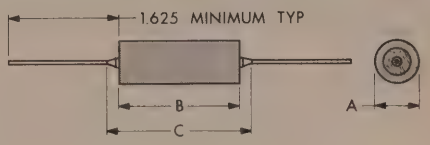
CRC ESTABLISHED RELIABILITY CAPACITORS

J11 & K11 CASE DIMENSIONS & PART NUMBERING SYSTEM

PART NUMBER SYSTEM

J11 B 104 J S A

- SERIES NO.
- DC VOLTAGE RATING
- PICOFARAD CODE (See explanation)
- CAPACITANCE TOLERANCE
- SLEEVING CODE: S = MYLAR SLEEVING, X = SLEEVING NOT REQUIRED
- LEAD MATERIAL CODE: A = SOLDERABLE LEADS



PICOFARAD CODE: CAPACITANCE EXPRESSED IN PICOFARADS AS A 3-DIGIT NUMBER. FIRST TWO DIGITS REPRESENT THE FIRST TWO SIGNIFICANT FIGURES. THE LAST DIGIT REPRESENTS THE NUMBER OF ZEROES TO FOLLOW. **EXAMPLE: 104 = 100,000 PICOFARADS.**

VOLT. CODE	VDC	TOL. CODE	%	INCHES	MM	INCHES	MM	INCHES	MM
B	50	F	1	.025	.635	.400	10.16	1.000	25.40
				.032	.813	.500	12.70	1.063	27.00
C	100	G	2	.040	1.016	.562	14.27	1.125	28.58
				.170	4.32	.670	17.02	1.375	34.93
D	200	J	5	.193	4.90	.687	17.45	1.875	47.63
				.235	5.97	.750	19.05	2.375	60.33
E	400	K	10	.312	7.93	8.13	20.65	2.625	66.68

LEAD WIRE SIZE	
CASE DIAMETER (INCHES)	LEAD WIRE SIZE #AWG
0.312 and smaller	22 (.025″)
0.400 and larger	20 (.032″)

CASE DIMENSIONS*	TOLERANCE LIMITS (INCHES)
"A" Diameter	±.010 Without Sleeving
	+0.02 −0.00 With Mylar Sleeving
"B" Case Length	±0.03 With or Without Sleeving
"C" Bead to Bead Max. Length	The lengths shown in table are maximum and include solder beads

* LEAD MATERIAL FOR ALL CASE SIZES SHALL BE SOLDERABLE (TYPE A)

	BASIC PART NO. 50VDC					BASIC PART NO. 100VDC					BASIC PART NO. 200VDC				
uF	J11	K11	Diam. A	Length B	Length C	J11	K11	Diam. A	Length B	Length C	J11	K11	Diam. A	Length B	Length C
.001	J11B102	K11B102	.235	.687	.887	J11C102	K11C102	.235	.687	.887	J11D102	K11D102	.235	.687	.887
.0012	J11B122	K11B122	.235	.687	.887	J11C122	K11C122	.235	.687	.887	J11D122	K11D122	.235	.687	.887
.0015	J11B152	K11B152	.235	.687	.887	J11C152	K11C152	.235	.687	.887	J11D152	K11D152	.235	.687	.887
.0018	J11B182	K11B182	.235	.687	.887	J11C182	K11C182	.235	.687	.887	J11D182	K11D182	.235	.687	.887
.002	J11B202	K11B202	.235	.687	.887	J11C202	K11C202	.235	.687	.887	J11D202	K11D202	.235	.687	.887
.0022	J11B222	K11B222	.235	.687	.887	J11C222	K11C222	.235	.687	.887	J11D222	K11D222	.235	.687	.887
.0027	J11B272	K11B272	.235	.687	.887	J11C272	K11C272	.235	.687	.887	J11D272	K11D272	.235	.687	.887
.0033	J11B332	K11B332	.235	.687	.887	J11C332	K11C332	.235	.687	.887	J11D332	K11D332	.235	.687	.887
.0039	J11B392	K11B392	.235	.687	.887	J11C392	K11C392	.235	.687	.887	J11D392	K11D392	.235	.687	.887
.0047	J11B472	K11B472	.235	.687	.887	J11C472	K11C472	.235	.687	.887	J11D472	K11D472	.235	.687	.887
.005	J11B502	K11B502	.235	.687	.887	J11C502	K11C502	.235	.687	.887	J11D502	K11D502	.235	.687	.887
.0056	J11B562	K11B562	.235	.687	.887	J11C562	K11C562	.235	.687	.887	J11D562	K11D562	.235	.687	.887
.0068	J11B682	K11B682	.235	.687	.887	J11C682	K11C682	.235	.687	.887	J11D682	K11D682	.235	.687	.887
.0082	J11B822	K11B822	.235	.687	.887	J11C822	K11C822	.235	.687	.887	J11D822	K11D822	.235	.687	.887
.01	J11B103	K11B103	.235	.687	.887	J11C103	K11C103	.235	.687	.887	J11D103	K11D103	.235	.687	.887
.012	J11B123	K11B123	.235	.687	.887	J11C123	K11C123	.235	.687	.887	J11D123	K11D123	.235	.687	.887
.015	J11B153	K11B153	.312	.687	.887	J11C153	K11C153	.312	.687	.887	J11D153	K11D153	.312	.687	.887
.018	J11B183	K11B183	.312	.687	.887	J11C183	K11C183	.312	.687	.887	J11D183	K11D183	.312	.813	1.013
.02	J11B203	K11B203	.312	.687	.887	J11C203	K11C203	.312	.687	.887	J11D203	K11D203	.312	.813	1.013
.022	J11B223	K11B223	.312	.687	.887	J11C223	K11C223	.312	.687	.887	J11D223	K11D223	.312	.813	1.013
.027	J11B273	K11B273	.312	.687	.887	J11C273	K11C273	.312	.813	1.013	J11D273	K11D273	.312	.813	1.013
.033	J11B333	K11B333	.312	.687	.887	J11C333	K11C333	.312	.813	1.013	J11D333	K11D333	.400	.813	1.013
.039	J11B393	K11B393	.312	.687	.887	J11C393	K11C393	.400	.813	1.013	J11D393	K11D393	.400	1.063	1.263
.047	J11B473	K11B473	.312	.687	.887	J11C473	K11C473	.400	.813	1.013	J11D473	K11D473	.400	1.063	1.263
.05	J11B503	K11B503	.312	.687	.887	J11C503	K11C503	.400	.813	1.013	J11D503	K11D503	.400	1.063	1.263
.056	J11B563	K11B563	.312	.813	1.013	J11C563	K11C563	.400	.813	1.013	J11D563	K11D563	.400	1.063	1.263
.068	J11B683	K11B683	.312	.813	1.013	J11C683	K11C683	.400	.813	1.013	J11D683	K11D683	.400	1.063	1.263
.082	J11B823	K11B823	.312	.937	1.137	J11C823	K11C823	.400	1.063	1.263	J11D823	K11D823	.500	1.125	1.325
.1	J11B104	K11B104	.312	.937	1.137	J11C104	K11C104	.400	1.063	1.263	J11D104	K11D104	.500	1.125	1.325
.12	J11B124	K11B124	.312	1.063	1.263	J11C124	K11C124	.500	1.125	1.325	J11D124	K11D124	.500	1.375	1.575
.15	J11B154	K11B154	.312	1.063	1.263	J11C154	K11C154	.500	1.125	1.325	J11D154	K11D154	.562	1.375	1.575
.18	J11B184	K11B184	.400	1.063	1.263	J11C184	K11C184	.500	1.125	1.325	J11D184	K11D184	.562	1.375	1.575
.20	J11B204	K11B204	.400	1.063	1.263	J11C204	K11C204	.562	1.125	1.325	J11D204	K11D204	.562	1.375	1.575
.22	J11B224	K11B224	.400	1.063	1.263	J11C224	K11C224	.562	1.125	1.325	J11D224	K11D224	.562	1.375	1.575
.27	J11B274	K11B274	.400	1.063	1.263	J11C274	K11C274	.562	1.125	1.325	J11D274	K11D274	.670	1.375	1.575
.33	J11B334	K11B334	.500	1.125	1.325	J11C334	K11C334	.562	1.125	1.325	J11D334	K11D334	.670	1.375	1.575
.39	J11B394	K11B394	.500	1.125	1.325	J11C394	K11C394	.562	1.375	1.575	J11D394	K11D394	.562	1.875	2.075
.47	J11B474	K11B474	.562	1.125	1.325	J11C474	K11C474	.670	1.375	1.575	J11D474	K11D474	.670	1.875	2.075
.50	J11B504	K11B504	.562	1.125	1.325	J11C504	K11C504	.670	1.375	1.575	J11D504	K11D504	.670	1.875	2.075
.56	J11B564	K11B564	.562	1.125	1.325	J11C564	K11C564	.670	1.375	1.575	J11D564	K11D564	.670	1.875	2.075
.68	J11B684	K11B684	.562	1.125	1.325	J11C684	K11C684	.670	1.875	2.075	J11D684	K11D684	.750	1.875	2.075
.82	J11B824	K11B824	.562	1.375	1.575	J11C824	K11C824	.670	1.875	2.075	J11D824	K11D824	.750	1.875	2.075
1.0	J11B105	K11B105	.670	1.375	1.575	J11C105	K11C105	.670	1.875	2.075	J11D105	K11D105	.750	1.875	2.075
1.5	J11B155	K11B155	.670	1.875	2.075	J11C155	K11C155	.750	1.875	2.075	J11D155	K11D155	1.00	1.875	2.075
2.0	J11B205	K11B205	.670	1.875	2.075	J11C205	K11C205	1.00	1.875	2.075	J11D205	K11D205	1.00	2.375	2.575

CRC ESTABLISHED RELIABILITY CAPACITORS

TYPE J11 METALLIZED TEFLON

SPECIFICATIONS AND QUALITY CONFORMANCE

CONSTRUCTION: METALLIZED TEFLON DIELECTRIC, HERMETICALLY SEALED, EXTENDED METAL FILM ELECTRODES, LEADS ISOLATED FROM CASE.

ENVIRONMENTAL: CAPACITORS MEET ALL ENVIRONMENTAL REQUIREMENTS OF MIL-C-83421, EXCEPT VIBRATION AT 20g AND SHOCK AT 50g.

J11 SPECIFICATIONS

OPERATING TEMPERATURE	−65°C to +125°C	At full rated voltage.
DIELECTRIC ABSORPTION	0.01% maximum	At 25°C when measured per MIL-C-83421.
DISSIPATION FACTOR	0.05% maximum	At 25°C when measured per MIL-C-83421.
DIELECTRIC STRENGTH	200% rated voltage	At 25°C from terminal to terminal and terminals to case for 60 seconds minimum.
TEMPERATURE COEFFICIENT	Referenced to 25°C −55°C −25°C 0°C 50°C 85°C 100°C 125°C	From −0.5% to +1.0% From −0.35% to +0.75% From −0.1% to +0.45% From −0.2% to +0.2% From −0.45% to +0.4% From −0.65% to +0.45% From −1.0% to +0.5%
CAPACITANCE STABILITY	±0.10%	When measured at any two corresponding temperature points taken in five successive temperature cycles from −65°C to +125°C.
HERMETIC SEAL	1×10^{-6}atm/cm³/sec.	Maximum leak rate.
INSULATION RESISTANCE	See I.R. Table	Measured from terminal to terminal at rated DC voltage and 5 minutes charge time. Values greater than 1uF, allow an additional minute/uF charge time.

MINIMUM INSULATION RESISTANCE AT RATED DC VOLTAGE

FOR VALUES OVER 0.1uF DIVIDE LIMIT SHOWN BY uF TO OBTAIN MINIMUM I.R. EXAMPLE: A 0.68uF CAPACITOR AT 25°C IS 1,000,000 ÷ 0.68 = 1,475,000 MEGOHMS.

RANGE	25°	55°C	85°C	100°C	125°C
.001 TO 0.1uF	10,000,000 Megohms	5,000,000 Megohms	2,000,000 Megohms	1,000,000 Megohms	250,000 Megohms
GREATER THAN 0.1uF	1,000,000 Megohms-uF	500,000 Megohms-uF	200,000 Megohms-uF	100,000 Megohms-uF	25,000 Megohms-uF

J11 QUALITY CONFORMANCE INSPECTION

TEST NO.	TEST	TEST CONDITIONS	TEST METH. MIL-C-83421	TEST LIMIT	QUALITY LEVEL
1	BURN-IN	48 hrs. minimum at 125°C, at 140% rated DC voltage	4.7.2	No physical damage	100% Test
2	THERMAL AGING	10 cycles minimum from −65°C to +125°C	4.7.3	No physical damage	100% Test
3	SEAL TEST (FINE LEAK)	Helium bomb 45 PSI for 1 hr. minimum, check for helium leak	4.7.5	1×10^{-6}atm/cm³/sec. max.	100% Test
4	SEAL TEST (GROSS LEAK)	Per MIL-C-83421	4.7.5	No continuous bubble stream	100% Test
5	DC HI-POT (TERMINAL TO TERMINAL AND TERMINALS TO CASE)	Apply 200% of rated DC voltage for 60 seconds minimum	4.7.6	No shorts	100% Test
6	INSULATION RESISTANCE (TERMINAL TO TERMINAL)	At 25°C at rated DC voltage	4.7.7	Per I.R. Table	100% Test
7	% CAPACITANCE TOLERANCE	At 25°C at 1KHz	4.7.8	Per part number	100% Test
8	% DISSIPATION FACTOR	At 25°C at 1KHz, values above 1uF measure at 0.1KHz	4.7.9	0.05% max.	100% Test
9	VISUAL AND MECHANICAL INSPECTION	For marking, dimensions, and workmanship	4.7.1	Per specification	1.0% AQL

1. Capacitors are packaged and shipped with Certification of Conformance. 2. Traceability to production and test records by permanent marking of parts with date code lot. 3. Process and inspection data is maintained on file per NHB 5300.4 (1C), MIL-Q-9858 and MIL-STD-790.

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CRC ESTABLISHED RELIABILITY CAPACITORS

TYPE K11 METALLIZED TEFLON

SPECIFICATIONS AND QUALITY CONFORMANCE

CONSTRUCTION: METALLIZED TEFLON DIELECTRIC, HERMETICALLY SEALED, EXTENDED METAL FILM ELECTRODES, LEADS ISOLATED FROM CASE.

ENVIRONMENTAL: CAPACITORS MEET ALL ENVIRONMENTAL REQUIREMENTS OF MIL-C-83421, EXCEPT VIBRATION AT 20g AND SHOCK AT 50g.

K11 SPECIFICATIONS

OPERATING TEMPERATURE	−65°C to +125°C	At full rated voltage.
DIELECTRIC ABSORPTION	0.01% maximum	At 25°C when measured per MIL-C-83421.
DISSIPATION FACTOR	0.1% maximum	At 25°C when measured per MIL-C-83421.
DIELECTRIC STRENGTH	200% rated voltage	At 25°C from terminal to terminal and terminals to case for 60 seconds minimum.
TEMPERATURE COEFFICIENT	Referenced to 25°C −55°C −25°C 0°C 50°C 85°C 100°C 125°C	 From −0.5% to +1.0% From −0.35% to +0.75% From −0.1% to +0.45% From −0.2% to +0.2% From −0.45% to +0.4% From −0.65% to +0.45% From −1.0% to +0.5%
CAPACITANCE STABILITY	±0.10%	When measured at any two corresponding temperature points taken in five successive temperature cycles from −65°C to +125°C.
HERMETIC SEAL	1×10^{-6}atm/cm³/sec.	Maximum leak rate.
INSULATION RESISTANCE	See I.R. Table	Measured from terminal to terminal at rated DC voltage and 5 minutes charge time. Values greater than 1uF, allow an additional minute/uF charge time.

MINIMUM INSULATION RESISTANCE AT RATED DC VOLTAGE

FOR VALUES OVER 0.1uF DIVIDE LIMIT SHOWN BY uF TO OBTAIN MINIMUM I.R. EXAMPLE: A 0.18uF CAPACITOR AT 25°C IS 200,000 ÷ 0.18 = 1,111,000 MEGOHMS.

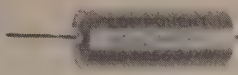
RANGE	25°C	55°C	85°C	100°C	125°C
.001 TO 0.1uF	2,000,000 Megohms	2,000,000 Megohms	1,000,000 Megohms	500,000 Megohms	150,000 Megohms
GREATER THAN 0.1uF	200,000 Megohms-uF	200,000 Megohms-uF	100,000 Megohms-uF	50,000 Megohms-uF	15,000 Megohms-uF

K11 QUALITY CONFORMANCE INSPECTION

TEST NO.	TEST	TEST CONDITIONS	TEST METH. MIL-C-83421	TEST LIMIT	QUALITY LEVEL
1	THERMAL AGING	5 cycles minimum from −65°C to +125°C	4.7.3	No physical damage	100% Test
2	SEAL TEST (FINE LEAK)	Helium bomb 45 PSI for 1 hr. minimum, check for helium leak	4.7.5	1x10⁻⁶atm/cm³/sec. max.	100% Test
3	SEAL TEST (GROSS LEAK)	Per MIL-C-83421	4.7.5	No continuous bubble stream	100% Test
4	DC HI-POT (TERMINAL TO TERMINAL AND TERMINALS TO CASE)	Apply 200% of rated DC voltage for 60 seconds minimum	4.7.6	No shorts	100% Test
5	INSULATION RESISTANCE (TERMINAL TO TERMINAL)	At 25°C at rated DC voltage	4.7.7	Per I.R. Table	100% Test
6	% CAPACITANCE TOLERANCE	At 25°C at 1KHz	4.7.8	Per part number	100% Test
7	% DISSIPATION FACTOR	At 25°C at 1KHz, values above 1uF measure at 0.1KHz	4.7.9	0.1% max.	100% Test
8	VISUAL AND MECHANICAL INSPECTION	For marking, dimensions, and workmanship	4.7.1	Per specification	1.0% AQL

1. Capacitors are packaged and shipped with Certification of Conformance. 2. Traceability to production and test records by permanent marking of parts with date code lot. 3. Process and inspection data is maintained on file per NHB 5300.4 (1C), MIL-Q-9858 and MIL-STD-790.

CRC



.056 μF 50VDC
ACTUAL SIZE CAPACITOR

TYPE A91 — METALLIZED FOIL TEFLON

PRODUCT FEATURES

AC AND DC RATED TO 150°C AT FULL RATED VOLTAGE.

HERMETICALLY SEALED, HIGH RELIABILITY SCREENED FOR CRITICAL AEROSPACE APPLICATIONS.

AC RATED FROM 36VRMS TO 240VRMS AT FREQUENCIES FROM 0 TO 400 Hz. RATINGS AT 40KHz AT LOWER VOLTAGE RATINGS.

HIGH INSULATION RESISTANCE, 10,000,000 MINIMUM. ALL VALUES UP TO 0.1uF.

LOW DIELECTRIC ABSORPTION, 0.01% MAXIMUM VOLTAGE RECOVERY.

LOW LOSS, RUGGED INTERNAL TERMINATIONS FOR ALL HI-REL PROGRAMS (CRC PATENTED CONSTRUCTION).

0.1% MAXIMUM SHELF DRIFT FOR 10 YEARS (OR IN NORMAL USE).

AVAILABLE IN 1%, 2%, 5% AND 10%, CAPACITANCE TOLERANCE FROM 50VDC TO 400VDC. OTHER TOLERANCES AVAILABLE ON REQUEST.

TYPICAL APPLICATIONS

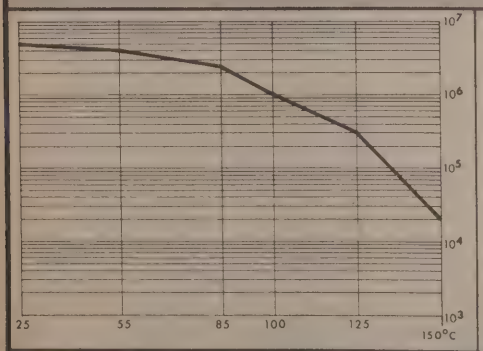
- ☐ CRITICAL TIMING CIRCUITS
- ☐ FIXED TUNING CIRCUITS
- ☐ FILTERING—LOW FREQUENCY
- ☐ TEMPERATURE COMPENSATION
- ☐ COUPLING AND DECOUPLING
- ☐ FEEDBACK CIRCUITS
- ☐ POWER SUPPLY FILTERING
- ☐ GYRO CIRCUITS
- ☐ PULSE FORMING NETWORKS
- ☐ INTEGRATING CIRCUITS

LIFE TEST DATA CRC TEST REPORT #XT-1306

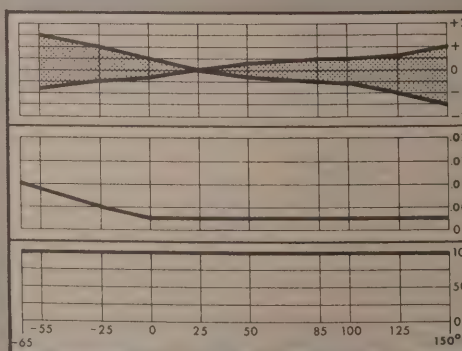
TEST RESULTS FOR D51 SERIES CAPACITORS LIFE TESTED FOR 2000 HOURS AT 125°C AT 140% OF RATED DC VOLTAGE. THERE WERE NO FAILURES FOR THIS TEST. D51 CAPACITORS ARE THE SAME CONSTRUCTION AND DESIGN AS A91.

LIST OF CAPACITORS SUBMITTED TO LIFE TEST			INSULATION RESISTANCE IN MEGOHMS AT 25°C			% CAPACITANCE CHANGE WITH LIFE			% DISSIPATION FACTOR AT 25°C WITH LIFE		
CRC TYPE	uF VALUE	Q'TY TESTED	POST TEST LIMITS (MIN. I.R.)	TEST RESULTS LOW	TEST RESULTS HIGH	POST TEST LIMITS (MAX. △C)	TEST RESULTS LOW	TEST RESULTS HIGH	POST TEST LIMITS (MAX. D.F.)	TEST RESULTS LOW	TEST RESULTS HIGH
D51C	.01	48	3.3×10^6	2.5×10^7	5×10^7	±2	−.01	−.56	.05	−.01	.02
D51C	.002	6	3.3×10^6	2.5×10^7	5×10^7	±2	−.15	−.64	.05	−.01	−.01
D51C	.0039	5	3.3×10^6	2×10^7	1×10^8	±2	−.075	−.64	.05	−.01	−.01
D51C	.02	10	3.3×10^6	2×10^7	1×10^8	±2	−.01	−.33	.05	−.01	−.01

TYPICAL CURVES



INSULATION RESISTANCE WITH TEMPERATURE IN MEGOHMS (0.1 μF OR LESS)



% CAPACITANCE CHANGE WITH TEMPERATURE

% DISSIPATION FACTOR WITH TEMPERATURE

% VOLTAGE RATING WITH TEMPERATURE

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CRC ESTABLISHED RELIABILITY CAPACITORS

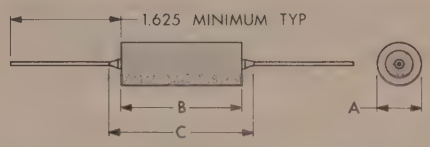
TYPE A91 METALLIZED FOIL TEFLON

CASE DIMENSIONS AND PART NUMBER SYSTEM

PART NUMBER SYSTEM

A91B104JSW

- SERIES NO.
- DC VOLTAGE RATING
- PICOFARAD CODE (See explanation)
- CAPACITANCE TOLERANCE
- SLEEVING CODE: S = MYLAR SLEEVING
  X = SLEEVING NOT REQUIRED
- LEAD MATERIAL CODE: W = TINNED COPPER CLAD STEEL
  C = TINNED OXYGEN FREE COPPER



PICOFARAD CODE: CAPACITANCE EXPRESSED IN PICOFARADS AS A 3-DIGIT NUMBER. FIRST TWO DIGITS REPRESENT THE FIRST TWO SIGNIFICANT FIGURES. THE LAST DIGIT REPRESENTS THE NUMBER OF ZEROES TO FOLLOW. **EXAMPLE: 104 = 100,000 PICOFARADS.**

VOLT. CODE	VDC	TOL. CODE	%	INCHES	MM	INCHES	MM	INCHES	MM
B	50	F	1	.025	.635	.400	10.16	1.000	25.40
				.032	.813	.500	12.70	1.063	27.00
C	100	G	2	.040	1.016	.562	14.27	1.125	28.58
				.170	4.32	.670	17.02	1.375	34.93
D	200	J	5	.193	4.90	.687	17.45	1.875	47.63
				.235	5.97	.750	19.05	2.375	60.33
E	400	K	10	.312	7.93	.813	20.65	2.625	66.68

LEAD WIRE SIZE		CASE DIMENSIONS*	TOLERANCE LIMITS (INCHES)
CASE DIAMETER (INCHES)	LEAD WIRE SIZE #AWG		
0.312 and smaller	22 (.025″)	"A" Diameter	±.010 Without Sleeving +0.02 −0.00 With Mylar Sleeving
0.400 and 0.500	20 (.032″)	"B" Case Length	±0.03 With or Without Sleeving
0.562 and larger	18 (.040″)	"C" Bead to Bead Max. Length	The lengths shown in table are maximum and include solder beads

* Lead material for case dia. 0.500 & smaller, tinned copperclad steel (Type W). Lead material for case dia. 0.562 & larger, tinned oxygen-free copper (Type C).

uF	TYPE A91B 50VDC RATED				TYPE A91C 100VDC RATED				TYPE A91D 200VDC RATED				TYPE A91E 400VDC RATED			
	Basic P/N	Diam. A	Length B	Length C	Basic P/N	Diam. A	Length B	Length C	Basic P/N	Diam. A	Length B	Length C	Basic P/N	Diam. A	Length B	Length C
.001	A91B102	.193	.562	.662	A91C102	.235	.562	.662	A91D102	.235	.687	.787	A91E102	.235	.687	.787
.0012	A91B122	.193	.562	.662	A91C122	.235	.562	.662	A91D122	.235	.687	.787	A91E122	.235	.687	.787
.0015	A91B152	.193	.562	.662	A91C152	.235	.562	.662	A91D152	.235	.687	.787	A91E152	.235	.687	.787
.0018	A91B182	.193	.562	.662	A91C182	.235	.562	.662	A91D182	.235	.687	.787	A91E182	.235	.687	.787
.002	A91B202	.193	.562	.662	A91C202	.235	.562	.662	A91D202	.235	.687	.787	A91E202	.235	.687	.787
.0022	A91B222	.193	.562	.662	A91C222	.235	.562	.662	A91D222	.235	.687	.787	A91E222	.235	.687	.787
.0027	A91B272	.193	.562	.662	A91C272	.235	.562	.662	A91D272	.235	.687	.787	A91E272	.312	.687	.787
.0033	A91B332	.193	.562	.662	A91C332	.235	.562	.662	A91D332	.235	.687	.787	A91E332	.312	.687	.787
.0039	A91B392	.193	.562	.662	A91C392	.235	.562	.662	A91D392	.235	.687	.787	A91E392	.312	.687	.787
.0047	A91B472	.193	.562	.662	A91C472	.235	.562	.662	A91D472	.235	.687	.787	A91E472	.312	.687	.787
.005	A91B502	.193	.562	.662	A91C502	.235	.562	.662	A91D502	.235	.687	.787	A91E502	.312	.687	.787
.0056	A91B562	.193	.562	.662	A91C562	.235	.562	.662	A91D562	.235	.687	.787	A91E562	.312	.687	.787
.0068	A91B682	.235	.562	.662	A91C682	.235	.687	.787	A91D682	.312	.687	.787	A91E582	.312	.813	.913
.0075	A91B752	.235	.562	.662	A91C752	.235	.687	.787	A91D752	.312	.687	.787	A91E752	.312	.813	.913
.0082	A91B822	.235	.562	.662	A91C822	.235	.687	.787	A91D822	.312	.687	.787	A91E822	.312	.813	.913
.01	A91B103	.235	.562	.662	A91C103	.235	.687	.787	A91D103	.312	.687	.787	A91E103	.312	.813	.913
.012	A91B123	.235	.562	.662	A91C123	.235	.687	.787	A91D123	.312	.687	.787	A91E123	.312	.813	.913
.015	A91B153	.235	.687	.787	A91C153	.312	.687	.787	A91D153	.312	.813	.913	A91E153	.400	.813	.913
.018	A91B183	.235	.687	.787	A91C183	.312	.687	.787	A91D183	.312	.813	.913	A91E183	.400	.813	.913
.02	A91B203	.312	.687	.787	A91C203	.312	.813	.913	A91D203	.400	.813	.913	A91E203	.400	1.063	1.163
.022	A91B223	.312	.687	.787	A91C223	.312	.813	.913	A91D223	.400	.813	.913	A91E223	.400	1.063	1.163
.027	A91B273	.312	.687	.787	A91C273	.312	.813	.913	A91D273	.400	.813	.913	A91E273	.400	1.063	1.163
.033	A91B333	.312	.687	.787	A91C333	.312	.813	.913	A91D333	.400	.813	.913	A91E333	.400	1.063	1.163
.039	A91B393	.312	.813	.913	A91C393	.312	.813	.913	A91D393	.400	1.063	1.163	A91E393	.500	1.125	1.225
.047	A91B473	.312	.813	.913	A91C473	.312	.813	.913	A91D473	.400	1.063	1.163	A91E473	.500	1.125	1.225
.05	A91B503	.312	.813	.913	A91C503	.312	.813	.913	A91D503	.400	1.063	1.163	A91E503	.500	1.125	1.225
.056	A91B563	.312	.813	.913	A91C563	.312	.813	.913	A91D563	.400	1.063	1.163	A91E563	.500	1.125	1.225
.068	A91B683	.400	.813	.913	A91C683	.312	1.063	1.163	A91D683	.500	1.125	1.225	A91E683	.500	1.375	1.475
.075	A91B753	.400	.813	.913	A91C753	.312	1.063	1.163	A91D753	.500	1.125	1.225	A91E753	.500	1.375	1.475
.082	A91B823	.400	.813	.913	A91C823	.312	1.063	1.163	A91D823	.500	1.125	1.225	A91E823	.562	1.375	1.475
.1	A19B104	.400	.813	.913	A91C104	.312	1.125	1.225	A91D104	.500	1.375	1.475	A91104	.670	1.375	1.475
.12	A91B124	.400	.813	.913	A91C124	.312	1.125	1.225	A91D124	.500	1.375	1.475	A91E124	.670	1.375	1.475
.15	A91B154	.400	.813	.913	A91C154	.312	1.125	1.225	A91D154	.500	1.375	1.475	A91E154	.670	1.375	1.475
.18	A91B184	.400	1.063	1.163	A91C184	.312	1.125	1.225	A91D184	.562	1.375	1.475	A91E184	.670	1.875	1.975
.20	A91B204	.400	1.063	1.163	A91C204	.312	1.125	1.225	A91D204	.670	1.375	1.475	A91E204	.670	1.875	1.975
.22	A91B224	.400	1.063	1.163	A91C224	.312	1.125	1.225	A91D224	.670	1.375	1.475	A91E224	.670	1.875	1.975
.27	A91B274	.500	1.125	1.225	A91C274	.312	1.125	1.225	A91D274	.670	1.375	1.475				
.33	A91B334	.500	1.125	1.225	A91C334	.562	1.375	1.475	A91D334	.670	1.875	1.975				
.39	A91B394	.500	1.125	1.225	A91C394	.562	1.375	1.475	A91D394	.670	1.875	1.975				
.47	A91B474	.562	1.125	1.225	A91C474	.670	1.375	1.475	A91D474	.750	1.875	1.975				
.50	A91B504	.562	1.125	1.225	A91C504	.670	1.375	1.475	A91D504	.750	1.875	1.975				
.56	A91B564	.562	1.375	1.475	A91C564	.670	1.375	1.475								
.68	A91B684	.562	1.375	1.475	A91C684	.670	1.875	1.975								
.75	A91B754	.670	1.375	1.475	A91C754	.750	1.875	1.975								
.82	A91B824	.670	1.375	1.475	A91C824	.750	1.875	1.975								
1.0	A91B105	.670	1.375	1.475	A91C105	.750	1.875	1.975								
1.2	A91B125	.670	1.375	1.475												

CRC ESTABLISHED RELIABILITY CAPACITORS

TYPE A91 METALLIZED FOIL TEFLON

SPECIFICATIONS AND QUALITY CONFORMANCE

CONSTRUCTION: METALLIZED FOIL—TEFLON DIELECTRIC, HERMETICALLY SEALED, EXTENDED METAL FILM ELECTRODES, AXIAL LEADS ISOLATED FROM CASE.

ENVIRONMENTAL: CAPACITORS MEET ALL ENVIRONMENTAL OF MIL-C-83421 EXCEPT VIBRATION AT 20g's AND SHOCK AT 50g's.

A91 SPECIFICATIONS

OPERATING TEMPERATURE	−65°C to +150°C	At full rated voltage.
DIELECTRIC ABSORPTION	0.01% maximum	At 25°C when measured per MIL-C-83421.
DISSIPATION FACTOR	0.02% maximum	At 25°C when measured per MIL-C-83421.
AC SQUARE WAVE	100Hz, 60 seconds minimum	At 25°C at a peak to peak voltage of 3 times rated DC voltage, terminal to terminal per MIL-C-83421.
DIELECTRIC STRENGTH	200% rated DC voltage	At 25°C from terminal to terminal and terminals to case for 60 seconds minimum.
TEMPERATURE COEFFICIENT	Referenced to 25°C −55°C −25°C 0°C 50°C 85°C 100°C 125°C 150°C	 +1.5% to −0.8% +1.0% to −0.5% +0.5% to −0.3% +0.3% to −0.3% +0.5% to −0.5% +0.5% to −0.8% +0.6% to −1.0% +1.0% to −1.5%
CAPACITANCE STABILITY	±0.25%	When measured at any two corresponding temperature points taken in five successive temperature cycles from −65°C to +125°C.
HERMETIC SEAL	1×10^{-6}atm/cm³/sec.	Maximum leak rate.
INSULATION RESISTANCE	See I.R. Table	Measured from terminal to terminal at rated DC voltage and 5 minutes charge time. Values greater than 1uF, allow an additional minute/uF charge time.

MINIMUM INSULATION RESISTANCE AT RATED DC VOLTAGE	RANGE	25°C	85°C	100°C	125°C	150°C
	.001 TO 0.2uF	10,000,000 Megohms	2,000,000 Megohms	1,000,000 Megohms	250,000 Megohms	20,000 Megohms
	GREATER THAN 0.2uF	1,000,000 Megohms	200,000 Megohms	100,000 Megohms	25,000 Megohms	2,000 Megohms

A91 QUALITY CONFORMANCE INSPECTION

TEST NO.	TEST	TEST CONDITIONS	TEST METH. MIL-C-83421	TEST LIMIT	QUALITY LEVEL
1	BURN-IN	16 hrs. minimum at 125°C at 140% AC rated voltage, at 400Hz or 240VRMS, whichever is less	4.7.2	No physical damage	100% Test
2	THERMAL AGING	5 cycles minimum from −65°C to +125°C	4.7.3	No physical damage	100% Test
3	SEAL TEST (FINE LEAK)	Helium bomb for 45 PSI for 1 hr. minimum, check for helium leak	4.7.5	1×10^{-6}atm/cm³/sec. max.	100% Test
4	SEAL TEST (GROSS LEAK)	Per MIL-C-83421	4.7.5	No continuous bubble stream	100% Test
5	AC SQUARE WAVE (TERMINAL TO TERMINAL)	Apply 100Hz at a peak to peak voltage of 3 times DC rated voltage for 60 seconds minimum	4.7.6	No shorts	100% Test
6	DC HI-POT (TERMINAL TO TERMINAL AND TERMINALS TO CASE)	Apply 200% of rated DC voltage for 60 seconds minimum	4.7.6	No shorts	100% Test
7	INSULATION RESISTANCE (TERMINAL TO TERMINAL)	At 25°C at rated DC voltage	4.7.7	Per I.R. Table	100% Test
8	% CAPACITANCE TOLERANCE	At 25°C at 1KHz	4.7.8	Per part number	100% Test
9	% DISSIPATION FACTOR	At 25°C at 1KHz, values above 1uF measure at 0.1KHz	4.7.9	0.02% max.	100% Test
10	VISUAL AND MECHANICAL INSPECTION	For marking, dimensions, and workmanship	4.7.1	Per specification	1.0% AQL

1. Capacitors are packaged and shipped with Certification of Conformance. 2. Traceability to production and test records by permanent marking of parts with date code lot. 3. Process and inspection data is maintained on file per NHB 5300.4 (1C), MIL-Q-9858 and MIL-STD-790.

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CRC ESTABLISHED RELIABILITY CAPACITORS

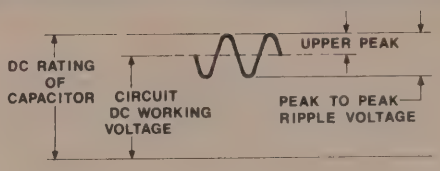
TYPE 91 AC RATINGS

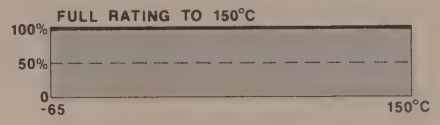
1. THE COMBINED DC AND AC VOLTAGES SHOULD NOT EXCEED THE DC RATINGS, SEE FIGURE.

2. CAPACITORS MAY BE OPERATED AT HIGHER FREQUENCIES, AT REDUCED RMS VOLTAGE SUCH THAT MAX. AC CURRENT RATINGS ARE NOT EXCEEDED.

3. CAPACITORS CAN HANDLE PULSE CURRENTS UP TO 100 TIMES GREATER THAN THE PEAK CURRENTS CALCULATED FROM THE RATED RMS RATING (PROVIDED SLOW REPETITION RATES ARE USED).

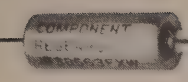
IF THERE IS ANY DOUBT, A SKETCH OF THE VOLTAGE AND CURRENT WAVE FORMS WITH TIME BASE SHOULD BE SENT TO CRC FOR ANALYSIS.





	TYPE A91B 50VDC			TYPE A91C 100VDC			TYPE A91D 200VDC			TYPE A91E 400VDC		
	AC RATINGS			AC RATINGS			AC RATINGS			AC RATINGS		
uF	RMS Volts 400Hz	RMS Volts 40KHz	Max. RMS Amps	RMS Volts 400Hz	RMS Volts 40KHz	Max. RMS Amps	RMS Volts 400Hz	RMS Volts 40KHz	Max. RMS Amps	RMS Volts 400Hz	RMS Volts 40KHz	Max. RMS Amps
.001	36.0	36.0	.009	60.0	60.0	.015	120.0	80.0	.020	240.0	100.0	.025
.0012	36.0	36.0	.011	60.0	60.0	.018	120.0	80.0	.024	240.0	100.0	.030
.0015	36.0	36.0	.013	60.0	60.0	.022	120.0	80.0	.030	240.0	100.0	.037
.0018	36.0	36.0	.016	60.0	60.0	.027	120.0	80.0	.036	240.0	100.0	.045
.002	36.0	36.0	.018	60.0	60.0	.030	120.0	80.0	.040	240.0	100.0	.050
.0022	36.0	36.0	.020	60.0	60.0	.033	120.0	80.0	.044	240.0	100.0	.055
.0027	36.0	36.0	.024	60.0	60.0	.041	120.0	80.0	.054	240.0	100.0	.068
.0033	36.0	36.0	.030	60.0	60.0	.050	120.0	80.0	.066	240.0	100.0	.083
.0039	36.0	36.0	.035	60.0	60.0	.058	120.0	80.0	.078	240.0	100.0	.097
.0047	36.0	36.0	.042	60.0	60.0	.071	120.0	80.0	.094	240.0	100.0	.12
.005	36.0	36.0	.045	60.0	60.0	.075	120.0	80.0	.10	240.0	100.0	.13
.0056	36.0	36.0	.050	60.0	60.0	.084	120.0	80.0	.11	240.0	100.0	.14
.0068	36.0	36.0	.061	60.0	60.0	.10	120.0	80.0	.14	240.0	100.0	.17
.0075	36.0	36.0	.067	60.0	60.0	.11	120.0	80.0	.15	240.0	100.0	.19
.0082	36.0	36.0	.074	60.0	60.0	.12	120.0	80.0	.16	240.0	100.0	.21
.01	36.0	36.0	.090	60.0	60.0	.15	120.0	80.0	.20	240.0	100.0	.25
.012	36.0	36.0	.11	60.0	59.0	.18	120.0	78.0	.23	240.0	100.0	.30
.015	36.0	36.0	.14	60.0	58.0	.22	120.0	76.0	.29	240.0	94.0	.35
.018	36.0	36.0	.16	60.0	57.0	.26	120.0	74.0	.33	240.0	90.0	.41
.02	36.0	36.0	.18	60.0	55.0	.28	120.0	71.0	.36	240.0	88.0	.44
.022	36.0	36.0	.20	60.0	53.0	.29	120.0	68.0	.37	240.0	85.0	.47
.027	36.0	36.0	.24	60.0	51.0	.34	120.0	65.0	.44	240.0	81.0	.55
.033	36.0	36.0	.30	60.0	50.0	.41	120.0	62.0	.51	240.0	78.0	.65
.039	36.0	36.0	.35	60.0	48.0	.47	120.0	60.0	.59	240.0	75.0	.73
.047	36.0	36.0	.42	60.0	47.0	.55	120.0	57.0	.67	240.0	71.0	.83
.05	36.0	36.0	.45	60.0	46.0	.58	120.0	56.0	.70	240.0	70.0	.88
.056	36.0	36.0	.50	60.0	46.0	.64	120.0	56.0	.78	240.0	67.0	.95
.068	36.0	34.0	.58	60.0	42.0	.71	120.0	50.0	.85	240.0	60.0	1.02
.075	36.0	33.0	.61	60.0	40.0	.75	120.0	47.0	.88	240.0	55.0	1.03
.082	36.0	32.0	.66	60.0	38.0	.78	120.0	44.0	.90	240.0	50.0	1.03
.1	36.0	30.0	.75	60.0	36.0	.90	120.0	42.0	1.10	240.0	46.0	1.20
.12	36.0	30.0	.90	60.0	35.0	1.05	120.0	40.0	1.20	240.0	44.5	1.34
.15	36.0	26.0	.98	60.0	33.0	1.24	120.0	36.0	1.34	240.0	40.0	1.50
.18	36.0	25.0	1.13	60.0	31.0	1.40	80.0	34.0	1.54	240.0	38.0	1.70
.20	36.0	24.0	1.20	60.0	30.0	1.50	80.0	33.0	1.65	240.0	37.0	1.85
.22	36.0	23.0	1.27	60.0	27.0	1.50	80.0	32.0	1.76	240.0	35.0	1.93
.27	36.0	19.0	1.28	60.0	24.0	1.62	80.0	29.0	1.96	240.0	33.0	2.24
.33	36.0	18.0	1.48	60.0	23.0	1.90	80.0	28.0	2.31			
.39	36.0	17.0	1.66	60.0	22.0	2.15	80.0	27.0	2.63			
.47	36.0	15.7	1.85	60.0	21.0	2.47	80.0	26.0	3.06			
.50	36.0	15.2	1.90	60.0	20.0	2.50	80.0	25.0	3.13			
.56	36.0	14.4	2.01	60.0	19.0	2.64	80.0	23.0	3.17			
.68	36.0	14.0	2.38	60.0	16.0	2.72						
.75	36.0	13.0	2.44	60.0	15.0	2.81						
.82	36.0	12.0	2.46	60.0	14.0	2.87						
1.0	36.0	10.0	2.50	60.0	12.0	3.00						
1.2	36.0	9.1	2.73									

CRC



.056 μF 50VDC
ACTUAL SIZE
CAPACITOR

TYPES A93-J93-K93
METALLIZED PLASTIC SUBSTRATE
POLYSTYRENE

5,000,000 MEGOHMS MIN. INSULATION RESISTANCE FOR VALUES 0.2uF AND LESS.

0.02% MAXIMUM DIELECTRIC ABSORPTION.

0.1% MAXIMUM SHELF DRIFT FOR 10 YEARS (OR IN NORMAL USE).

UTILIZES CRC UNIQUE PATENTED, RUGGED, LOW LOSS LEAD TERMINATIONS, QUALIFIED FOR ALL HI-REL PROGRAMS.

HERMETICALLY SEALED, HIGH RELIABILITY SCREENED FOR CRITICAL AEROSPACE PROGRAMS.

100% RELIABILITY SCREENING, INCLUDES BURN-IN, TEMPERATURE CYCLING, FINE LEAK TEST, AC SQUARE WAVE TEST.

SIMILAR GENERIC PARTS HAVE BEEN QUALIFIED FOR TRIDENT PROGRAM.

AVAILABLE IN ±0.1% TO ±10% CAPACITANCE TOLERANCE FROM 50VDC TO 400VDC.

AC AND DC RATED.

TYPICAL APPLICATIONS

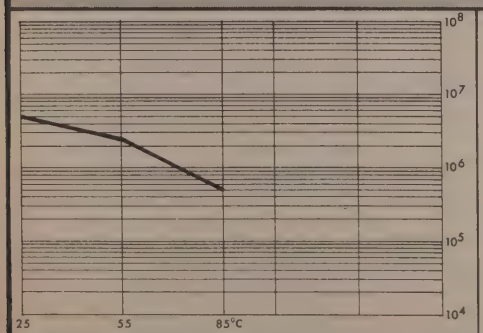
- ☐ CRITICAL TIMING CIRCUITS
- ☐ FIXED TUNING CIRCUITS
- ☐ FILTERING—LOW FREQUENCY
- ☐ TEMPERATURE COMPENSATION
- ☐ COUPLING AND DECOUPLING
- ☐ FEEDBACK CIRCUITS
- ☐ POWER SUPPLY FILTERING
- ☐ GYRO CIRCUITS
- ☐ PULSE FORMING NETWORKS
- ☐ INTEGRATING CIRCUITS

LIFE TEST DATA CRC TEST REPORT #XT1304

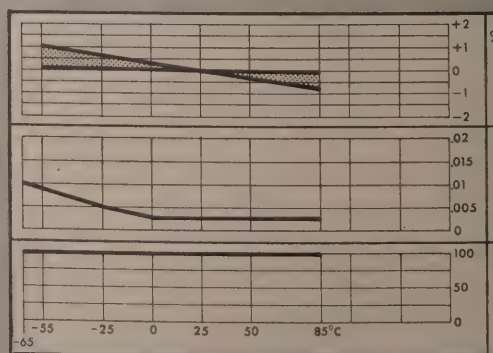
TEST RESULTS FOR 75 SERIES N53 CAPACITORS LIFE TESTED FOR 2000 HOURS AT +85°C AT 140% OF RATED DC VOLTAGE. THERE WERE NO FAILURES FOR THIS TEST. N53 CAPACITORS ARE THE SAME CONSTRUCTION AND DESIGN AS A93 SERIES CAPACITORS.

LIST OF CAPACITORS LIFE TESTED			INSULATION RESISTANCE IN MEGOHMS AT 25°C			% CAPACITANCE CHANGE WITH LIFE			% DISSIPATION FACTOR AT 25°C WITH LIFE		
CRC TYPE	uF VALUE	Q'TY TESTED	POST TEST LIMITS (MIN. I.R.)	TEST RESULTS LOW	TEST RESULTS HIGH	POST TEST LIMITS (MAX. △C)	TEST RESULTS LOW	TEST RESULTS HIGH	POST TEST LIMITS (MAX. D.F.)	TEST RESULTS LOW	TEST RESULTS HIGH
N53B	.012	20	$5x10^5$	$2x10^7$	$5x10^7$	0.5	0.00	+.26	.05	.01	.01
N53B	.1	20	$5x10^5$	$1x10^7$	$5x10^7$	0.5	−.03	+.29	.05	.01	.01
N53B	.82	15	$5x10^5$	$5x10^6$	$4x10^7$	0.5	−.02	+.18	.05	.01	.01
N53C	.02	5	$5x10^5$	$3.3x10^7$	$5x10^7$	0.5	−.025	+.245	.05	.01	.01
N53C	.039	5	$5x10^5$	$5.5x10^6$	$1x10^8$	0.5	−.01	+.30	.05	.01	.01
N53C	.068	20	$5x10^5$	$1x10^7$	$2x10^7$	0.5	+.06	+.22	.05	.01	.01

TYPICAL CURVES



INSULATION RESISTANCE WITH TEMPERATURE IN MEGOHMS (0.1 μF OR LESS)



% CAPACITANCE CHANGE WITH TEMPERATURE

% DISSIPATION FACTOR WITH TEMPERATURE

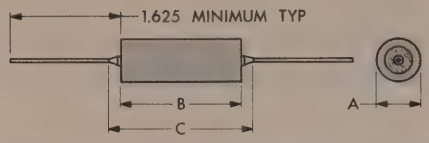
% VOLTAGE RATING WITH TEMPERATURE

A93, J93 & K93 PART NUMBER SYSTEM CASE DIMENSIONS

PART NUMBER SYSTEM

A93 B 104 J S W

- SERIES NO.
- DC VOLTAGE RATING
- PICOFARAD CODE (See explanation)
- CAPACITANCE TOLERANCE
- SLEEVING CODE: S = MYLAR SLEEVING; X = SLEEVING NOT REQUIRED
- LEAD MATERIAL CODE: W = TINNED COPPER CLAD STEEL; C = TINNED OXYGEN FREE COPPER



VOLT. CODE	VDC	TOL. CODE	%	INCHES	MM	INCHES	MM	INCHES	MM
B	50	A	0.1	.025	.635	.400	10.16	1.000	25.40
		B	0.25	.032	.813	.500	12.70	1.063	27.00
C	100	D	0.5	.040	1.016	.562	14.27	1.125	28.58
		F	1	.170	4.32	.670	17.02	1.375	34.93
D	200	G	2	.193	4.90	.687	17.45	1.875	47.63
		J	5	.235	5.97	.750	19.05	2.375	60.33
E	400	K	10	.312	7.93	.813	20.65	2.625	66.68

LEAD WIRE SIZE	
CASE DIAMETER (INCHES)	LEAD WIRE SIZE #AWG
0.312 and smaller	22 (.025″)
0.400 and 0.500	20 (.032″)
0.562 and larger	18 (.040″)

CASE DIMENSIONS*	TOLERANCE LIMITS (INCHES)
"A" Diameter	±.010 Without Sleeving +0.02 −0.00 With Mylar Sleeving
"B" Case Length	±0.03 With or Without Sleeving
"C" Bead to Bead Max. Length	The lengths shown in table are maximum and include solder beads

* Lead material for case dia. 0.500 & smaller, tinned copperclad steel (Type W). Lead material for case dia. 0.562 & larger, tinned oxygen-free copper (Type C).

uF	TYPES A93B - J93B - K93B 50VDC RATED				TYPES A93C - J93C - K93C 100VDC RATED				TYPES A93D - J93D - K93D 200VDC RATED				TYPES A93E - J93E - K93E 400VDC RATED			
	Basic P/N	Diam. A	Length B	Length C	Basic P/N	Diam. A	Length B	Length C	Basic P/N	Diam. A	Length B	Length C	Basic P/N	Diam. A	Length B	Length C
.001	93B102	.193	.562	.662	93C102	.193	.687	.787	93D102	.235	.687	.787	93E102	.312	.687	.787
.0012	93B122	.193	.562	.662	93C122	.193	.687	.787	93D122	.235	.687	.787	93E122	.312	.687	.787
.0015	93B152	.193	.562	.662	93C152	.193	.687	.787	93D152	.235	.687	.787	93E152	.312	.687	.787
.0018	93B182	.193	.562	.662	93C182	.193	.687	.787	93D182	.235	.687	.787	93E182	.312	.687	.787
.002	93B202	.193	.562	.662	93C202	.193	.687	.787	93D202	.235	.687	.787	93E202	.312	.687	.787
.0022	93B222	.193	.562	.662	93C222	.193	.687	.787	93D222	.235	.687	.787	93E222	.312	.687	.787
.0027	93B272	.193	.562	.662	93C272	.193	.687	.787	93D272	.235	.687	.787	93E272	.312	.687	.787
.0033	93B332	.193	.562	.662	93C332	.193	.687	.787	93D332	.235	.687	.787	93E332	.312	.687	.787
.0039	93B392	.193	.562	.662	93C392	.193	.687	.787	93D392	.235	.687	.787	93E392	.312	.687	.787
.0047	93B472	.193	.562	.662	93C472	.193	.687	.787	93D472	.235	.687	.787	93E472	.312	.687	.787
.005	93B502	.193	.562	.662	93C502	.193	.687	.787	93D502	.235	.687	.787	93E502	.312	.687	.787
.0056	93B562	.193	.562	.662	93C562	.193	.687	.787	93D562	.235	.687	.787	93E562	.312	.687	.787
.0068	93B682	.193	.562	.662	93C682	.193	.687	.787	93D682	.235	.687	.787	93E682	.312	.687	.787
.0075	93B752	.193	.687	.787	93C752	.193	.813	.913	93D752	.235	.813	.913	93E752	.312	.813	.913
.0082	93B822	.193	.687	.787	93C822	.193	.813	.913	93D822	.235	.813	.913	93E812	.312	.813	.913
.01	93B103	.193	.687	.787	93C103	.193	.813	.913	93D103	.235	.813	.913	93E103	.312	.813	.913
.012	93B123	.193	.687	.787	93C123	.193	.813	.913	93D123	.235	.813	.913	93E123	.312	.813	.913
.015	93B153	.235	.687	.787	93C153	.235	.813	.913	93D153	.312	.813	.913	93E153	.400	.813	.913
.018	93B183	.235	.813	.913	93C183	.312	.813	.913	93D183	.400	.813	.913	93E183	.400	1.063	1.163
.02	93B203	.235	.813	.913	93C203	.312	.813	.913	93D203	.400	.813	.913	93E203	.400	1.063	1.163
.022	93B223	.235	.813	.913	93C223	.312	.813	.913	93D223	.400	.813	.913	93E223	.400	1.063	1.163
.027	93B273	.235	.813	.913	93C273	.312	.813	.913	93D273	.400	.813	.913	93E273	.400	1.063	1.163
.033	93B333	.235	.813	.913	93C333	.312	.813	.913	93D333	.400	.813	.913	93E333	.400	1.063	1.163
.039	93B393	.312	.813	.913	93C393	.400	.813	.913	93D393	.400	1.063	1.163	93E393	.500	1.063	1.163
.047	93B473	.312	.813	.913	93C473	.400	.813	.913	93D473	.400	1.125	1.225	93E473	.500	1.125	1.225
.05	93B503	.312	.813	.913	93C503	.400	.813	.913	93D503	.400	1.125	1.225	93E503	.500	1.125	1.225
.056	93B563	.312	.813	.913	93C563	.400	.813	.913	93D563	.400	1.125	1.225	93E563	.500	1.125	1.225
.068	93B683	.400	.813	.913	93C683	.400	1.063	1.163	93D683	.500	1.125	1.225	93E583	.500	1.375	1.475
.075	93B753	.400	.813	.913	93C753	.400	1.063	1.163	93D753	.500	1.125	1.225	93E753	.500	1.375	1.475
.082	93B823	.400	.813	.913	93C823	.400	1.063	1.163	93D823	.500	1.125	1.225	93E823	.500	1.375	1.475
.1	93B104	.400	.813	.913	93C104	.400	1.063	1.163	93D104	.500	1.125	1.225	93E104	.500	1.375	1.475
.12	93B124	.400	.813	.913	93C124	.400	1.063	1.163	93D124	.500	1.125	1.225	93E124	.500	1.375	1.475
.15	93B154	.400	1.063	1.163	93C154	.500	1.125	1.225	93D154	.500	1.375	1.475	93E154	.562	1.375	1.475
.18	93B184	.400	1.063	1.163	93C184	.500	1.125	1.225	93D184	.500	1.375	1.475	93E184	.562	1.375	1.475
.20	93B204	.400	1.063	1.163	93C204	.500	1.125	1.225	93D204	.500	1.375	1.475	93E204	.562	1.375	1.475
.22	93B224	.400	1.063	1.163	93C224	.500	1.125	1.225	93D224	.500	1.375	1.475	93E224	.562	1.375	1.475
.27	93B274	.500	1.125	1.225	93C274	.500	1.375	1.475	93D274	.562	1.375	1.475	93E274	.670	1.375	1.475
.33	93B334	.500	1.125	1.225	93C334	.500	1.375	1.475	93D334	.562	1.375	1.475	93E334	.670	1.375	1.475
.39	93B394	.500	1.375	1.475	93C394	.562	1.375	1.475	93D394	.670	1.375	1.475	93E394	.670	1.875	1.975
.47	93B474	.562	1.375	1.475	93C474	.670	1.375	1.475	93D474	.670	1.875	1.975	93E474	.750	1.875	1.975
.50	93B504	.562	1.375	1.475	93C504	.670	1.375	1.475	93D504	.670	1.875	1.975	93E504	.750	1.875	1.975
.56	93B564	.562	1.375	1.475	93C564	.670	1.375	1.475	93D564	.670	1.875	1.975	93E564	.750	1.875	1.975
.68	93B684	.670	1.375	1.475	93C684	.670	1.875	1.975	93D684	.750	1.875	1.975	93E684	1.000	1.875	1.975
.75	93B754	.670	1.875	1.975	93C754	.750	1.875	1.975	93D754	1.000	1.875	1.975	93E754	1.000	2.375	2.475
.82	93B824	.670	1.875	1.975	93C824	.750	1.875	1.975	93D824	1.000	1.875	1.975	93E824	1.000	2.375	2.475
1.0	93B105	.670	1.875	1.975	93C105	.750	1.875	1.975	93D105	1.000	1.875	1.975	93E105	1.000	2.375	2.475
1.2	93B125	.750	1.875	1.975	93C125	1.000	1.875	1.975								
1.5	93B155	.750	1.875	1.975	93C155	1.000	1.875	1.975								
1.8	93B185	1.000	1.875	1.975	93C185	1.000	2.375	2.475								
2.0	93B205	1.000	1.875	1.975	93C205	1.000	2.375	2.475								
2.2	93B225	1.000	1.875	1.975												
2.5	93B255	1.000	2.125	2.225												
2.7	93B275	1.000	2.125	2.225												

PICOFARAD CODE: CAPACITANCE EXPRESSED IN PICOFARADS AS A 3-DIGIT NUMBER. FIRST TWO DIGITS REPRESENT THE FIRST TWO SIGNIFICANT FIGURES. THE LAST DIGIT REPRESENTS THE NUMBER OF ZEROES TO FOLLOW. **EXAMPLE: 104 = 100,000 PICOFARADS.**

TYPES A93-J93-K93 METALLIZED PLASTIC SUBSTRATE POLYSTYRENE

SPECIFICATIONS QUALITY CONFORMANCE

OPERATING TEMPERATURE	−65°C to 85°C	At full rated voltage.
DIELECTRIC ABSORPTION	0.02% maximum	At 25°C when measured per MIL-C-83421.
DISSIPATION FACTOR	0.02% maximum	At 25°C when measured per MIL-C-83421.
DIELECTRIC STRENGTH	200% rated voltage	At 25°C from terminal to terminal and terminals to case for 60 seconds minimum.
TEMPERATURE COEFFICIENT	−80 ±50 PPM/°C −60 ±50 PPM/°C	For values 0.001uF to 0.0082uF For values 0.01uF to 2.7uF Special polystyrene capacitors can be supplied with a temperature coefficient of −20 to −100 PPM/°C that is linear to ±30 PPM/°C and ±10 PPM/°C. A wide selection is available of large uF values in bathtub and custom cases.
CAPACITANCE STABILITY	0.03% maximum Drift	With five cycles from −25°C to +85°C
HERMETIC SEAL	1×10^{-6}atm/cm³/sec.	Maximum leak rate.
INSULATION RESISTANCE	See I.R. Table	Measured from terminal to terminal at rated DC voltage and 5 minutes charge time. Values greater than 1uF, allow an additional minute/uF charge time.

MINIMUM INSULATION RESISTANCE AT RATED DC VOLTAGE

FOR VALUES OVER 1.0uF DIVIDE LIMIT SHOWN BY uF TO OBTAIN MINIMUM I.R. EXAMPLE: A 2.0uF CAPACITOR AT 25°C IS 1,000,000 ÷ 2 = 500,000 MEGOHMS.

RANGE	25°C	55°C	85°C
0.001 TO 0.1uF	10,000,000 Megohms	5,000,000 Megohms	1,000,000 Megohms
GREATER THAN 0.1uF	1,000,000 Megohms-uF	500,000 Megohms-uF	100,000 Megohms-uF

A93 - J93 - K93 QUALITY CONFORMANCE INSPECTION

TEST NO.	TEST	TEST CONDITIONS	TEST METH. MIL-C-83421	TEST LIMIT	QUALITY LEVEL A93	J93	K93
1	BURN-IN	48 hrs. minimum at 85°C at 140% rated DC voltage.	4.7.2	There shall be no physical damage	100%	100%	Not Req'd
2	THERMAL AGING	From −65°C to +85°C, 20 cycles min. for A53 - J53, 5 cycles min. for K53	4.7.3	There shall be no physical damage	100%	100%	100% Test
3	SEAL TEST (FINE LEAK)	Helium bomb 45 PSI for 1 hr. minimum, check for helium leak	4.7.5	1×10^{-6}atm/cm³/sec. max.	100% Test	100% Test	100% Test
4	SEAL TEST (GROSS LEAK)	Place in 85°C hot water for 60 seconds minimum and observe for bubbles	4.7.5	No continuous bubble stream	100% Test	100% Test	100% Test
5	AC SQUARE WAVE (TERMINAL TO TERMINAL)	Apply 100Hz square wave at a peak to peak voltage of 3 times DC rated voltage for 60 seconds minimum	4.7.6	No shorts	100% Test	100% Test	100% Test
6	DC HI-POT (TERMINAL TO TERMINAL AND TERMINALS TO CASE)	Apply 200% of rated DC voltage for 60 seconds minimum	4.7.6	No shorts	100% Test	100% Test	100% Test
7	INSULATION RESISTANCE (TERMINAL TO TERMINAL)	At 25°C at rated DC voltage	4.7.7	Per I.R. Table	100% Test	100% Test	100% Test
8	% CAPACITANCE TOLERANCE	At 25°C at 1KHz	4.7.8	Per part number	100% Test	100% Test	100% Test
9	% DISSIPATION FACTOR	At 25°C at 1KHz, values above 1uF measure at 0.1KHz	4.7.9	0.02% max.	100% Test	100% Test	100% Test
10	VISUAL AND MECHANICAL INSPECTION	For marking, dimensions, and workmanship	4.7.1	Per specification	100%	1.0% AQL	1.0% AQL
11	SERIALIZE PARTS	N/A	N/A	N/A	100%	Not Req'd	Not Req'd
12	MEASURE INITIAL CAPACITANCE	At 25°C at 1KHz record reading	4.7.8	Per part number	100% Test	Not Req'd	Not Req'd
13	BURN-IN	48 hrs. minimum at 85°C at 100% rated DC voltage	4.7.2	There shall be no physical damage	100%	Not Req'd	Not Req'd
14	THERMAL AGING	5 cycles from −65°C to +85°C	4.7.3	There shall be no physical damage	100%	Not Req'd	Not Req'd
15	SEAL TEST (FINE LEAK)	Helium bomb 45 PSI for 1 hr. minimum, check for helium leak	4.7.5	1×10^{-6}atm/cm³/sec. max. leak rate	100% Test	Not Req'd	Not Req'd
16	DC HI-POT (TERMINAL TO TERMINAL)	Apply 200% of rated DC voltage for 60 seconds minimum	4.7.6	No shorts	100% Test	Not Req'd	Not Req'd
17	INSULATION RESISTANCE	At 25°C at rated DC voltage	4.7.7	Per I.R. Table	100% Test	Not Req'd	Not Req'd
18	% CAPACITANCE DRIFT	At 25°C at 1KHz, record % drift from initial (Step 12)	4.7.8	0.5% max. change	100% Test	Not Req'd	Not Req'd
19	% CAPACITANCE TOLERANCE	At 25°C at 1KHz	4.7.8	Per part number	100% Test	Not Req'd	Not Req'd
20	% DISSIPATION FACTOR	At 25°C at 1KHz, values above 1uF measure at 0.1KHz	4.7.9	0.02% max.	100% Test	Not Req'd	Not Req'd
21	VISUAL AND MECHANICAL INSPECTION	For marking, dimensions, and workmanship	4.7.1	Per specification	1.0% AQL	Not Req'd	Not Req'd

CRC ESTABLISHED RELIABILITY CAPACITORS

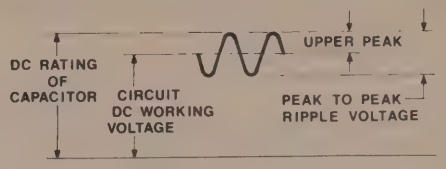
TYPES A93-J93-K93 POLYSTYRENE AC RATINGS

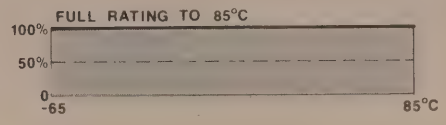
1. THE COMBINED DC AND AC VOLTAGES SHOULD NOT EXCEED THE DC RATINGS, SEE FIGURE.

2. CAPACITORS MAY BE OPERATED AT HIGHER FREQUENCIES, AT REDUCED RMS VOLTAGE SUCH THAT MAX. AC CURRENT RATINGS ARE NOT EXCEEDED.

3. CAPACITORS CAN HANDLE PULSE CURRENTS UP TO 100 TIMES GREATER THAN THE PEAK CURRENTS CALCULATED FROM THE RATED RMS RATING (PROVIDED SLOW REPETITION RATES ARE USED.

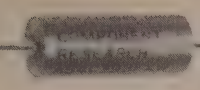
IF THERE IS ANY DOUBT, A SKETCH OF THE VOLTAGE AND CURRENT WAVE FORMS WITH TIME BASE SHOULD BE SENT TO CRC FOR ANALYSIS.





uF	TYPES A93 - J93 - K93 50VDC MAXIMUM AC RATINGS			TYPES A93 - J93 - K93 100VDC MAXIMUM AC RATINGS			TYPES A93 - J93 - K93 200VDC MAXIMUM AC RATINGS			TYPES A93 - J93 - K93 400VDC MAXIMUM AC RATINGS		
	RMS Volts	Freq. In KHz	RMS Amps	RMS Volts	Freq. In KHz	RMS Amps	RMS Volts	Freq. In KHz	RMS Amps	RMS Volts	Freq. In KHz	RMS Amps
.001	36.0	40.0	.009	60.0	40.0	.015	120.0	40.0	.03	240.0	40.0	.06
.0012	36.0	40.0	.011	60.0	40.0	.018	120.0	40.0	.036	240.0	40.0	.072
.0015	36.0	40.0	.013	60.0	40.0	.022	120.0	40.0	.044	240.0	40.0	.088
.0018	36.0	40.0	.016	60.0	40.0	.027	120.0	40.0	.054	240.0	40.0	.108
.002	36.0	40.0	.018	60.0	40.0	.03	120.0	40.0	.06	240.0	40.0	.12
.0022	36.0	40.0	.020	60.0	40.0	.033	120.0	40.0	.066	240.0	40.0	.132
.0027	36.0	40.0	.024	60.0	40.0	.041	120.0	40.0	.082	240.0	40.0	.16
.0033	36.0	40.0	.030	60.0	40.0	.045	120.0	40.0	.09	240.0	40.0	.18
.0039	36.0	40.0	.035	60.0	40.0	.059	120.0	40.0	.12	240.0	40.0	.24
.0047	36.0	40.0	.042	60.0	40.0	.071	120.0	40.0	.14	240.0	40.0	.28
.005	36.0	40.0	.045	60.0	40.0	.075	120.0	40.0	.15	240.0	40.0	.30
.0056	36.0	40.0	.050	60.0	40.0	.084	120.0	40.0	.17	240.0	40.0	.34
.0068	36.0	40.0	.061	60.0	40.0	.102	120.0	40.0	.2	240.0	40.0	.4
.0075	36.0	40.0	.067	60.0	40.0	.11	120.0	40.0	.22	240.0	40.0	.44
.0082	36.0	40.0	.074	60.0	40.0	.12	120.0	40.0	.24	240.0	40.0	.48
.01	36.0	40.0	.090	60.0	40.0	.15	120.0	40.0	.30	240.0	40.0	.60
.012	36.0	40.0	.11	60.0	40.0	.18	120.0	40.0	.36	240.0	40.0	.72
.015	36.0	40.0	.14	60.0	40.0	.22	120.0	40.0	.44	240.0	40.0	.88
.018	36.0	40.0	.16	60.0	40.0	.27	120.0	40.0	.54	240.0	40.0	1.1
.02	36.0	40.0	.18	60.0	40.0	.3	120.0	40.0	.6	240.0	40.0	1.2
.022	36.0	40.0	.20	60.0	40.0	.33	120.0	40.0	.66	240.0	40.0	1.3
.027	36.0	40.0	.24	60.0	40.0	.41	120.0	40.0	.82	240.0	40.0	1.6
.033	36.0	40.0	.30	60.0	40.0	.45	120.0	40.0	.9	240.0	40.0	1.8
.039	36.0	40.0	.35	60.0	40.0	.59	120.0	40.0	1.2	240.0	40.0	2.4
.047	36.0	40.0	.42	60.0	40.0	.71	120.0	40.0	1.4	240.0	40.0	2.9
.05	36.0	40.0	.45	60.0	40.0	.75	120.0	40.0	1.5	240.0	40.0	3.0
.056	36.0	40.0	.50	60.0	40.0	.84	120.0	40.0	1.7	240.0	35.5	3.0
.068	36.0	40.0	.61	60.0	40.0	1.0	120.0	40.0	2.0	240.0	34.1	3.5
.075	36.0	40.0	.67	60.0	40.0	1.1	120.0	40.0	2.2	240.0	30.9	3.5
.082	36.0	40.0	.74	60.0	40.0	1.2	120.0	40.0	2.4	240.0	28.3	3.5
.1	36.0	40.0	.90	60.0	40.0	1.5	120.0	40.0	3.0	240.0	23.2	3.5
.12	36.0	36.9	1.0	60.0	40.0	1.8	120.0	33.1	3.0	240.0	19.3	3.5
.15	36.0	40.0	1.4	60.0	40.0	2.2	120.0	30.9	3.5	240.0	17.7	4.0
.18	36.0	40.0	1.6	60.0	40.0	2.7	120.0	25.8	3.5	240.0	14.7	4.0
.20	36.0	40.0	1.8	60.0	40.0	3.0	120.0	23.2	3.5	240.0	13.2	4.0
.22	36.0	40.0	2.0	60.0	36.2	3.0	120.0	21.1	3.5	240.0	12.0	4.0
.27	36.0	40.0	2.4	60.0	34.4	3.5	120.0	19.6	4.0	240.0	11.0	4.5
.33	36.0	40.0	3.0	60.0	28.1	3.5	120.0	16.1	4.0	240.0	9.0	4.5
.39	36.0	40.0	3.5	60.0	32.6	4.0	120.0	15.3	4.5	240.0	8.5	5.0
.47	36.0	37.6	4.0	60.0	25.4	4.5	120.0	14.1	5.0	240.0	7.0	5.0
.50	36.0	35.4	4.0	60.0	23.8	4.5	120.0	13.2	5.0	240.0	6.6	5.0
.56	36.0	31.6	4.0	60.0	21.3	4.5	120.0	11.8	5.0	240.0	5.9	5.0
.68	36.0	28.6	4.5	60.0	19.5	5.0	120.0	10.7	5.5	240.0	5.5	6.0
.75	36.0	29.5	5.0	60.0	19.4	5.5	120.0	10.6	6.0	240.0	6.2	7.0
.82	36.0	27.0	5.0	60.0	17.8	5.5	120.0	9.7	6.0	240.0	5.6	7.0
1.0	36.0	22.1	5.0	60.0	14.6	5.5	120.0	7.9	6.0	240.0	4.6	7.0
1.2	36.0	20.4	5.5	60.0	13.2	6.0						
1.5	36.0	16.2	5.5	60.0	10.6	6.0						
1.8	36.0	14.7	6.0	60.0	10.3	7.0						
2.0	36.0	13.2	6.0	60.0	9.28	7.0						
2.2	36.0	12.06	6.0									
2.5	36.0	11.5	6.5									
2.7	36.0	10.66	6.5									

CRC



.047 μF 100VDC
ACTUAL SIZE CAPACITOR

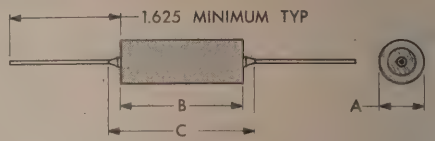
TYPE A54 FOIL POLYSULFONE

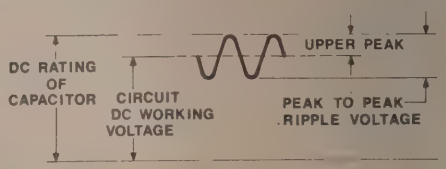
PART NUMBERING SYSTEM, CASE DIMENSIONS, AC RATINGS

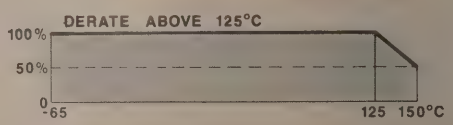
PART NUMBER SYSTEM

A54 C 104 J S W

- SERIES NO.
- DC VOLTAGE RATING
- PICOFARAD CODE (See explanation)
- CAPACITANCE TOLERANCE
- SLEEVING CODE: S = MYLAR SLEEVING; X = SLEEVING NOT REQUIRED
- LEAD MATERIAL CODE: W = TINNED COPPER CLAD STEEL; C = TINNED OXYGEN FREE COPPER







CONSTRUCTION: POLYSULFONE DIELECTRIC, EXTENDED FOIL ELECTRODES, HERMETICALLY SEALED, LEADS ISOLATED FROM CASE.

ENVIRONMENTAL: CAPACITORS MEET ALL ENVIRONMENTAL REQUIREMENTS OF MIL-C-83421 EXCEPT VIBRATION AND SHOCK. VIBRATION IS AT 20 g's AND SHOCK AT 50 g's.

VOLT. CODE	VDC	TOL. CODE	%	INCHES	MM	INCHES	MM	INCHES	MM	LEAD WIRE SIZE		CASE DIMENSIONS*	TOLERANCE LIMITS (INCHES)
										CASE DIAMETER (INCHES)	LEAD WIRE SIZE #AWG		
C	100	F	1	.025	.635	.400	10.16	1.000	25.40	0.312 and smaller	22 (.025")	"A" Diameter	±.010 Without Sleeving
				.032	.813	.500	12.70	1.063	27.00				+0.02 −0.00 With Mylar Sleeving
V	300	G	2	.040	1.016	.562	14.27	1.125	28.58				
				.170	4.32	.670	17.02	1.375	34.93	0.400 and 0.500	20 (.032")	"B" Case Length	±0.03 With or Without Sleeving
D	200	J	5	.193	4.90	.687	17.45	1.875	47.63				
				.235	5.97	.750	19.05	2.375	60.33	0.562 and larger	18 (.040")	"C" Bead to Bead Max. Length	"C" Dimension is 0.2" maximum more than "B" dimension in table
E	400	K	10	.312	7.93	.813	20.65	2.625	66.68				

* Lead material for case dia. 0.500 & smaller, tinned copperclad steel (Type W). Lead material for case dia. 0.562 & larger, tinned oxygen-free copper (Type C).

	TYPE A54C 100VDC					TYPE A54D 200VDC					TYPE A54V 300VDC					TYPE A54E 400VDC				
			AC RATINGS					AC RATINGS					AC RATINGS					AC RATINGS		
uF	Dia. A	Length B	Max. RMS Volts 20 KHz	Max. RMS Volts 100 KHz	Max. RMS Amps	Dia. A	Length B	Max. RMS Volts 20 KHz	Max. RMS Volts 100 KHz	Max. RMS Amps	Dia. A	Length B	Max. RMS Volts 20 KHz	Max. RMS Volts 100 KHz	Max. RMS Amps	Dia. A	Length B	Max. RMS Volts 20 KHz	Max. RMS Volts 100 KHz	Max. RMS Amps
.001	.193	.562	60	60	.038	.193	.562	120	120	.075	.193	.562	180	180	.113	.193	.687	240	240	.15
.0012	.193	.562	60	60	.045	.193	.562	120	120	.090	.193	.562	180	180	.135	.193	.687	240	240	.18
.0015	.193	.562	60	60	.056	.193	.562	120	120	.112	.193	.562	180	180	.169	.193	.687	240	240	.22
.0018	.193	.562	60	60	.067	.193	.562	120	120	.135	.193	.562	180	180	.202	.193	.687	240	240	.27
.002	.193	.562	60	60	.075	.193	.562	120	120	.150	.193	.562	180	180	.225	.193	.687	240	240	.30
.0022	.193	.562	60	60	.083	.193	.562	120	120	.165	.193	.562	180	180	.248	.193	.687	240	240	.33
.0027	.193	.562	60	60	.101	.193	.562	120	120	.202	.193	.687	180	180	.304	.193	.687	240	240	.4
.0033	.193	.562	60	60	.124	.193	.562	120	120	.247	.193	.687	180	180	.371	.193	.687	240	240	.5
.0039	.193	.562	60	60	.146	.193	.562	120	120	.293	.193	.687	180	180	.439	.193	.687	240	240	.6
.0047	.193	.562	60	60	.176	.193	.687	120	120	.353	.193	.687	180	180	.529	.235	.687	240	240	.7
.0056	.193	.562	60	60	.210	.193	.687	120	120	.420	.193	.687	180	180	.623	.235	.687	240	240	.85
.0068	.193	.687	60	60	.255	.193	.687	120	120	.511	.235	.687	180	180	.766	.312	.687	240	240	1.0
.0075	.193	.687	60	60	.282	.235	.687	120	120	.563	.235	.687	180	180	.845	.312	.687	240	240	1.13
.0082	.193	.687	60	60	.308	.235	.687	120	120	.615	.235	.687	180	180	.923	.312	.687	240	240	1.23
.01	.235	.687	60	60	.375	.235	.687	120	120	.750	.312	.687	180	180	1.13	.312	.687	240	224	1.4
.012	.235	.687	60	60	.451	.235	.687	120	120	.902	.312	.687	180	172	1.3	.312	.687	240	200	1.5
.015	.235	.687	60	60	.561	.312	.687	120	120	1.12	.312	.687	180	150	1.4	.312	.813	240	190	1.8
.018	.312	.687	60	60	.674	.312	.687	120	120	1.35	.312	.687	180	134	1.5	.312	.813	240	178	2.0
.02	.312	.687	60	60	.750	.312	.687	120	112	1.4	.312	.813	180	132	1.65	.400	.813	240	168	2.1
.022	.312	.687	60	60	.822	.312	.687	120	110	1.5	.312	.813	180	130	1.8	.400	.813	240	158	2.2
.027	.312	.687	60	60	1.02	.312	.813	120	106	1.8	.312	.813	180	118	2.0	.400	.813	240	148	2.5
.033	.312	.687	60	60	1.22	.312	.813	120	98	2.0	.400	.813	180	108	2.2	.400	1.063	240	130	2.7
.039	.312	.813	60	60	1.46	.400	.813	120	90	2.2	.400	.813	180	98	2.4	.400	1.063	240	117	2.9
.047	.312	.813	60	60	1.76	.400	.813	120	82	2.4	.400	.813	180	85	2.5	.400	1.063	240	102	3.0
.056	.400	.813	60	60	2.07	.400	.813	120	73	2.5	.400	1.063	180	78	2.7	.500	1.125	240	100	3.5
.068	.400	.813	60	53	2.2	.400	1.063	120	65	2.7	.400	1.063	180	67	2.8	.500	1.125	240	96	4.0
.075	.400	.813	60	50	2.4	.400	1.063	120	61	2.9	.400	1.063	180	63	3.0	.500	1.375	240	97	4.6
.082	.400	.813	60	49	2.5	.400	1.063	120	59	3.0	.500	1.125	180	61	3.15	.500	1.375	240	98	5.0
.1	.400	1.063	60	44	2.7	.500	1.125	120	55	3.4	.500	1.125	180	56	3.50	.562	1.375	240	85	5.3
.12	.400	1.063	60	37	2.8	.500	1.125	120	48	3.6	.500	1.125	180	53	4.00	.562	1.375	240	75	5.6
.15	.400	1.063	60	31	2.9	.500	1.125	120	43	4.00	.500	1.375	180	48	4.50	.562	1.375	240	53	6.0
.18	.400	1.063	60	27	3.0	.500	1.375	120	40	4.50	.500	1.375	180	45	5.00					
.2	.500	1.125	60	26	3.3	.500	1.375	120	38	4.75	.562	1.375	180	45	5.63					
.22	.500	1.125	60	25	3.4	.500	1.375	120	37	5.00	.562	1.375	180	45	6.00					
.27	.500	1.125	60	22	3.8	.562	1.375	120	33	5.50										
.33	.500	1.125	60	20	4.13	.562	1.375	120	29	6.00										
.39	.500	1.375	60	20	5.00															
.47	.562	1.375	60	20	6.00															

CRC ESTABLISHED RELIABILITY CAPACITORS

TYPE A54 FOIL POLYSULFONE

SPECIFICATIONS QUALITY CONFORMANCE

1. THE COMBINED DC AND AC VOLTAGES SHOULD NOT EXCEED THE DC RATINGS, SEE FIGURE. **2.** CAPACITORS MAY BE OPERATED AT HIGHER FREQUENCIES, AT REDUCED RMS VOLTAGE SUCH THAT MAX. AC CURRENT RATINGS ARE NOT EXCEEDED. **3.** TYPE A54 CAPACITORS CAN HANDLE MUCH HIGHER PULSE REPETITION RATES THAN METALLIZED CAPACITORS.

A54 SPECIFICATIONS

OPERATING TEMPERATURE	−65°C to +125°C	At full rated voltage, derate linearly to 50% of rated voltage at 150°C.
DIELECTRIC ABSORPTION	0.1% maximum	At 25°C when measured per MIL-C-83421.
DISSIPATION FACTOR	0.1% maximum	At 25°C when measured per MIL-C-83421.
AC SQUARE WAVE	100Hz, 60 seconds minimum	At 25°C at a peak to peak voltage of 3 times rated DC voltage, terminal to terminal per MIL-C-83421.
DIELECTRIC STRENGTH	200% DC volts	At 25°C from terminal to terminal and terminals to case for 60 seconds minimum.
TEMPERATURE COEFFICIENT	±2% maximum capacitance change	From −55°C to +150°C.
CAPACITANCE STABILITY	±0.25%	When measured at any two corresponding temperature points taken in five successive temperature cycles from −65°C to +125°C.
HERMETIC SEAL	1×10^{-6} atm/cm³/sec.	Maximum leak rate.
INSULATION RESISTANCE	See I.R. Table	Measured from terminal to terminal at rated DC voltage and 5 minutes charge time. Values greater than 1uF, allow an additional minute/uF charge time.

MINIMUM INSULATION RESISTANCE AT RATED DC VOLTAGE

FOR VALUES OVER 0.1uF DIVIDE LIMIT SHOWN BY uF TO OBTAIN MINIMUM I.R. EXAMPLE: A0.18uF CAPACITOR AT 25°C is 100,000 ÷ 0.18 = 555,000 MEGOHMS.

RANGE	25°C	85°C	125°C	150°C
.001 TO 0.1uF	1,000,000 Megohms	500,000 Megohms	30,000 Megohms	2,500 Megohms
GREATER THAN 0.1uF	100,000 Megohms-uF	50,000 Megohms-uF	3,000 Megohms-uF	250 Megohms-uF

A54 QUALITY CONFORMANCE INSPECTION

TEST NO.	TEST	TEST CONDITIONS	TEST METH. MIL-C-83421	TEST LIMIT	QUALITY LEVEL
1	BURN-IN	48 hrs. minimum at 125°C, at 120% rated AC voltage at 400Hz not to exceed 240VRMS	4.7.2	No physical damage	100% Test
2	THERMAL AGING	10 cycles minimum from −65°C to +125°C	4.7.3	No physical damage	100% Test
3	SEAL TEST (FINE LEAK)	Helium bomb 45 PSI for 1 hr. minimum, check for helium leak	4.7.5	1×10^{-6} atm/cm³/sec. max.	100% Test
4	SEAL TEST (GROSS LEAK)	Per MIL-C-83421	4.7.5	No continuous bubble stream	100% Test
5	AC SQUARE WAVE (TERMINAL TO TERMINAL)	Apply 100Hz at a peak to peak voltage of 2 times DC rated voltage for 60 seconds minimum	4.7.6	No shorts	100% Test
6	DC HI-POT (TERMINAL TO TERMINAL AND TERMINALS TO CASE)	Apply 200% of rated DC voltage for 60 seconds minimum	4.7.6	No shorts	100% Test
7	INSULATION RESISTANCE (TERMINAL TO TERMINAL)	At 25°C at rated DC voltage	4.7.7	100,000 megohms-uF, need not exceed 1,000,000 megohms	100% Test
8	% CAPACITANCE TOLERANCE	At 25°C at 1KHz	4.7.8	Per part number	100% Test
9	% DISSIPATION FACTOR	At 25°C at 10KHz	4.7.9	0.1% max.	100% Test
10	VISUAL AND MECHANICAL INSPECTION	For marking, dimensions, and workmanship	4.7.1	Per specification	1.0% AQL

1. Capacitors are packaged and shipped with Certification of Conformance. **2.** Traceability to production and test records by permanent marking of parts with date code lot. **3.** Process and inspection data is maintained on file per NHB 5300.4 (1C), MIL-Q-9858 and MIL-STD-790.

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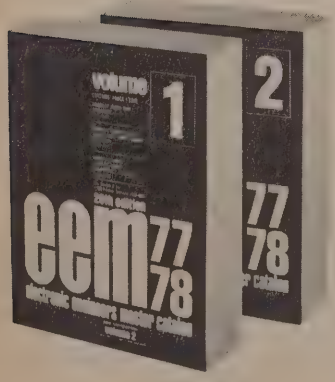

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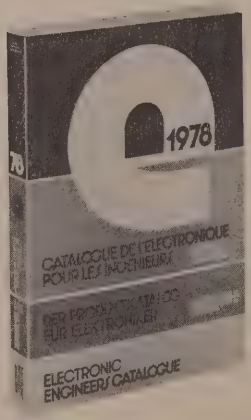

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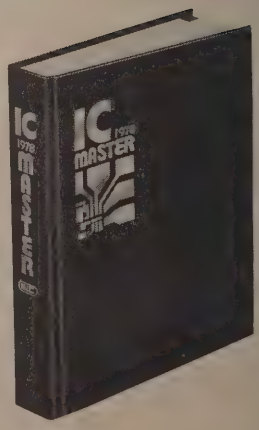

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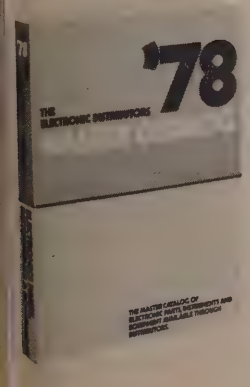

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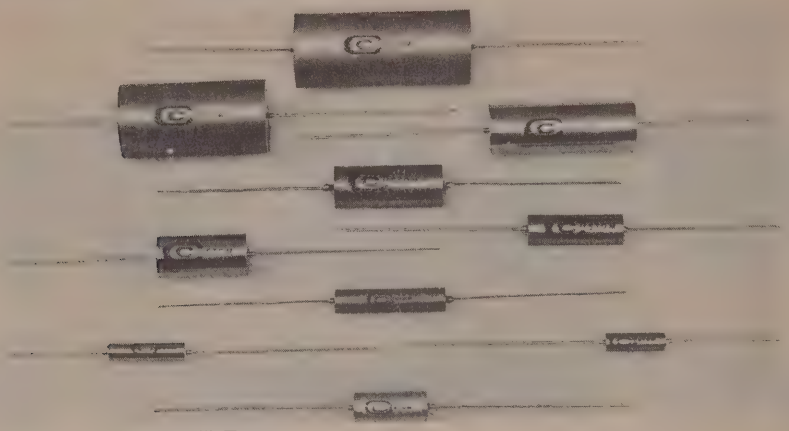
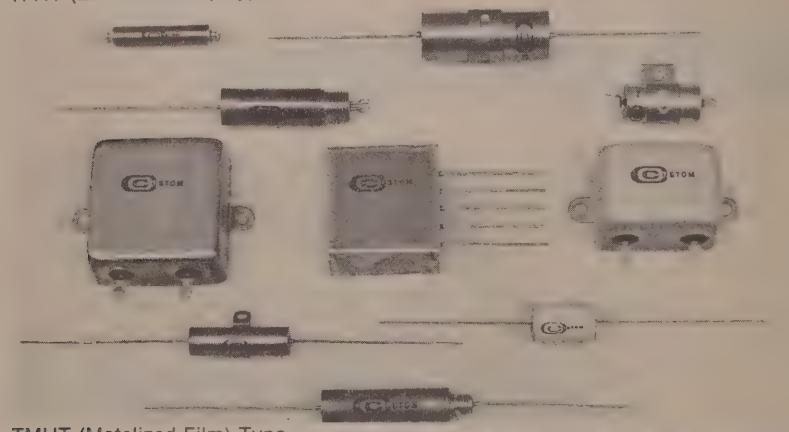
CUSTOM Balco for DEPENDABLE FILM CAPACITORS



TFHT (Extended Foil) Type



TMHT (Metalized Film) Type

STANDARD SERIES made of DuPont TEFLON®

Electrical Ratings

Capacitance Range: 0.0001μf to 4.0μf
Capacitance Tolerance: ±0.25 to ±20%
Voltage Range: 50 WVDC to 600 WVDC
Temperature Coefficent: -90 ±40ppm/°C — Metalized Film
-100 ±100ppm/°C — Extended Foil
Dissipation Factor: 0.10% max.@25°C — Metalized Film
0.02% max.@25°C — Extended Foil

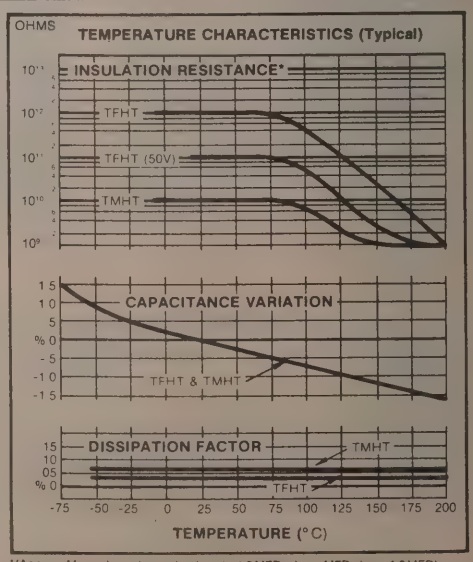
For High Insulation Resistance on High Temperature Applications

Standard series capacitors of DuPont TEFLON® offers you an ultrastable, low loss, low temperature coefficient capacitor that is ideally suited for high insulation resistance requirements up to 200°C (Specials to 250°C).

Two different internal construction styles are offered to the circuit design engineer: **Extended Foil** - for use in high power resonant and pulse circuits. **Metalized Film** - for resistor coefficient matching and for use in subminiature circuits.

Standard leads are tinned copper-clad steel. Tubular cases are brass - 100% tinned.

Custom has what design engineers need . . . Depend on it. For FREE Facilities Brochure and Balco Product Bulletin T-1, write or call:



*(Approx. Min. values shown, in ohms to 1.0 MFD, ohms, MFD above 1.0 MFD)

CUSTOM ELECTRONICS, Inc.
5 Browne St., Oneonta, N.Y. 13820
Ph: (607) 432-3880 TWX: 520-241-8292

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Sleep better with Elpac Caps!

You'll sleep better, build better, when you use Elpac Film Capacitors. Elpac Caps relieve suffering from instrumentation failure and communications equipment breakdowns. Reduces stress caused by worry and over-work due to high energy discharge collapse.

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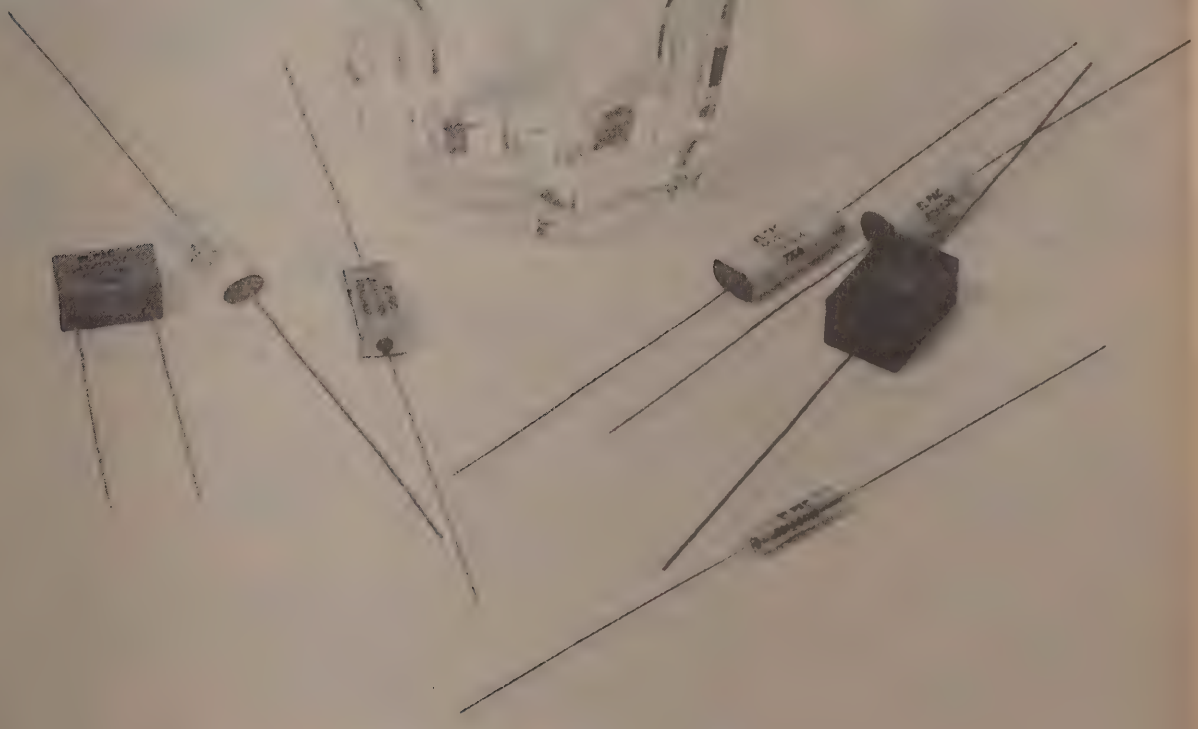


Another Little Beauty from ELPAC.

F-DYNE ELECTRONICS CO.

DEPT. EM, 449 HOWARD AVE.,
BRIDGEPORT, CONN. 06605

MINIATURE FILM DIELECTRIC CAPACITORS

(203) 367-6431 or TWX 710-453-0087

Listed is a sampling from F-Dyne's large assortment of film dielectric capacitors.

POLYESTER (MYLAR) FOIL

Cap. Range: .0003-10 mfds
Volt. Range: 50-2000 vdc
Temp. Range: −55 to 125°C
IR: 50 K (meg) (mfds) or 100 K megs
DF: .75% max.

METALLIZED POLYESTER

Cap. Range: .01-50 mfds
Volt. Range: 50 vdc-10 kvdc
Temp. Range: −55 to 125°C
IR: 25 k (meg) (mfds) or 50 K megs
DF: 1% max.

POLYCARBONATE FOIL

Cap. Range: .0003-5 mfds
Volt. Range: 25-1000 vdc
Temp. Range: −55 to 125°C
IR: 75 K (meg) (mfds) or 500 K megs
DF: .3% max.

METALLIZED POLYCARBONATE

Cap. Range: .01-50 mfds
Volt. Range: 50-1000 vdc
Temp. Range: −55 to 125°C
IR: 30 K (meg) (mfds) or 150 K megs
DF: .3% max.

POLYPROPYLENE FOIL

Cap. Range: .0003-5 mfds
Volt. Range: 50-1000 vdc
Temp. Range: −55 to 105°C
IR: 100 K (meg) (mfds) or 500 K megs
DF: .1% max.

METALLIZED POLYPROPYLENE

Cap. Range: .01-50 mfds
Volt. Range: 50 V-10,000 vdc
Temp. Range: −55 to 105°C
IR: 50 K (meg) (mfds) or 100 K megs
DF: .2% max.

POLYSULFONE FOIL

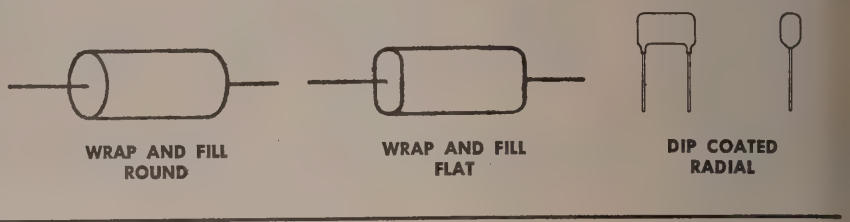
Cap. Range: .0003-5 mfds
Volt. Range: 25-1000 vdc
Temp. Range: −55 to 150°C
IR: 75 K (meg) (mfds) or 500 K megs
DF: .3% max.

METALLIZED POLYSULFONE

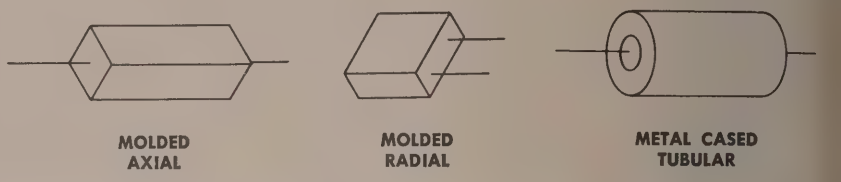
Cap. Range: .01-50 mfds
Volt. Range: 50 V to 600 vdc
Temp. Range: −55 to 150°C
IR: 30 K (meg) (mfds) or 150 K megs
DF: .3% max.

POLYSTYRENE FOIL

Cap. Range: .0005-5 mfds
Volt. Range: 50-600 vdc
Temp. Range: −55 to 85°C
IR: 100 K (meg) (mfds) or 500 K megs
DF: .1% max.

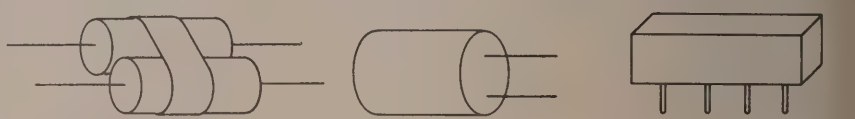


WRAP AND FILL ROUND | WRAP AND FILL FLAT | DIP COATED RADIAL

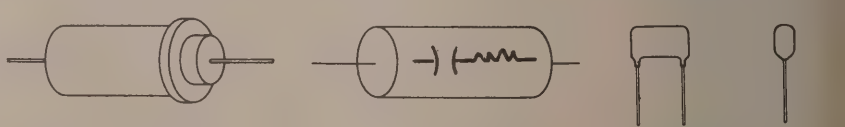


MOLDED AXIAL | MOLDED RADIAL | METAL CASED TUBULAR

METAL CASED RECTANGULAR | HIGH VOLTAGE | AC DESIGNS



MATCHED CAPACITORS | PC TYPE — TUBULAR | MULTIPLE CAPACITOR ASSEMBLIES



FEED THRU ASSEMBLY | R/C NETWORKS | DIP COATED RC NETWORK

F-Dyne high quality film dielectric capacitors are designed and manufactured to provide the very best electrical characteristics in the smallest size consistent with reliable performance.

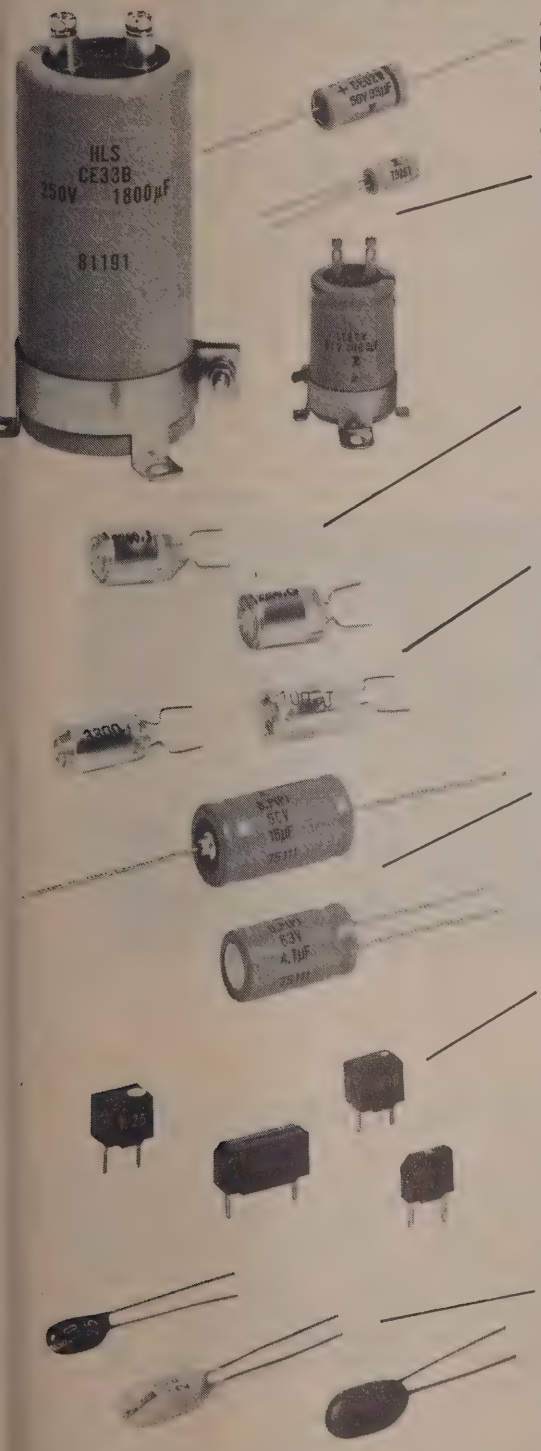
F-Dyne precision film capacitors are readily available in 10 pf capacitance increments, i.e., 430 pf, 440 pf or .18763, .18764, etc. Tolerances may be as low as .25% or .1% with matched pairs.

For fast delivery of standard or special film dielectric capacitors, call F-Dyne — (203) 367-6431 or TWX 710-453-0087.

West Coast customers may call Southern Electronics Co., 726 South Flower Street, Burbank, Calif. 91502, (213) 845-2458 for information of service. Southern Electronics is wholly owned by F-Dyne Electronics (see Page 1213).

New — F-Dyne opened a third capacitor plant at West Palm Beach, Florida in January of 1978, to better serve customers in the South East.

FUJITSU: CAPACITORS



ALUMINUM ELECTROLYTIC CAPACITORS

Large capacitance, high-reliability capacitors designed specifically for televisions, radios, tape recorders, and other audio/visual products, and various applications in transistor circuits. Chlorinated vinyl-covered aluminum electrolytic capacitors with rubber insulating sleeves and choice of single end (radial) leads, axial leads, or solder-plated terminal lugs. Operating temperatures range from −40°C to +85°C for applications up to 100 volts, and from −25°C to +85°C for applications of 160 volts and higher. Manufactured to conform with W characteristics in JIS-C-5141. Prices range down to $0.03, depending on quantity and model.

STYCON 500 SERIES FILM CAPACITORS

Developed to have excellent heat resistance characteristics and still offer the best capacitor performance on the market. Can be safely mounted on PC board even at the flow soldering conditions of 260°C for 5 seconds or 300°C for 3 seconds. Operating temperature range from −10°C to +85°C for applications up to 50 Vdc. Stands only 15mm above PC board and requires only a 5mm spacing. Price range down to 3.5 cents depending on quantity and model.

STYCON 600 SERIES FILM CAPACITORS

Has all the excellent features of the Stycon 500 described above but improved to offer a greater range electrostatic capacity coverage. Specifications are otherwise similar. Temperature range from −25°C to +85°C for applications up to 50 Vdc. Price range down to 3.5 cents, depending on quantity and model.

NON-POLARIZED CAPACITORS FOR ACOUSTIC NETWORKS

Special aluminum electrolytic capacitors designed specifically for applications in acoustic network units. Excellent characteristics combined with extremely narrow static tolerance range. Operating temperature range −40°C to +85°C. Leakage currents: CV= 1000 I=0.06 CV +10, CV>1000 I=0.04 CV +30. Price range down to 12 cents, depending on quantity and model.

BY-PASS CAPACITORS FOR HIGH SPEED TTL AND ECL

Solid electrolytic capacitors designed to by-pass noise generated in power supply lines. Eliminates need for additional ceramic/film capacitors, and to permit PCB mounting on high density boards.

1. Aluminum solid electrolytic capacitors for high speed pulse-TTL
2. Tantalum solid electrolytic capacitors for ultra high speed pulse-ECL

Capacitors have low ESR against rise and fall of high speed pulse, low inductance, and the same lead pitch as DIP package IC terminals. Operating temperatures range from −55°C to +85°C. Prices range down to 15 cents depending on quantity and model. Fail-safe molded construction prevents capacitors from burning up.

ALOXON SR-20 AND LL-20 CAPACITORS WITH NON-FLAMMABLE ANODES

Miniaturized solid electrolytic capacitors constructed with enlarged surface area on the anode plate. Aluminum anode plates are not flammable. Operating temperatures range from −55°C to +85°C. Reverse voltage is only about one-fourth of forward working voltage, giving these capacitors high reliability and long life. Low leakage currents: SR20 Series – less than 0.06 CV or 3 microamperes; LL20 Series – less than 0.1 CV or 3 micro-amperes, less than 0.1 CV or 5 micro-amperes. Solid molded construction for greatest efficiency. Prices range down to 5 cents, depending on quantity and model.

FUJITSU

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COMPONENT SALES DIVISION
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PARKESBURG, PENNSYLVANIA 19365
PHONE: 215-593-2424
TWX 510-663-0322

CERAMIC CAPACITORS

CAPACITANCE RANGE: 3pf to .001mf. Tested at 0.5 to 5.0 volts RMS, 1 MHz (NPO, N750, N3300 units), 1 kHz (EIA code X5T, X5U units), +25°C and 70% maximum relative humidity.

CAPACITANCE TOLERANCE: ±10% or ±20% as listed.

WORKING VOLTAGE: 5000, 7500, 15000 or 20000 volts DC as listed.

DIELECTRIC STRENGTH: 150% of rated Working Voltage.

INSULATION RESISTANCE: Initial, 10,000 megohms minimum. After humidity test, 1000 megohms minimum. Tested at 1000 volts DC maximum.

TEMPERATURE CHARACTERISTIC: NPO, N750, N3300, X5T or X5U as listed.

OPERATING TEMPERATURE RANGE: −55°C to +85°C.

HUMIDITY PROTECTION: Silicone coated.

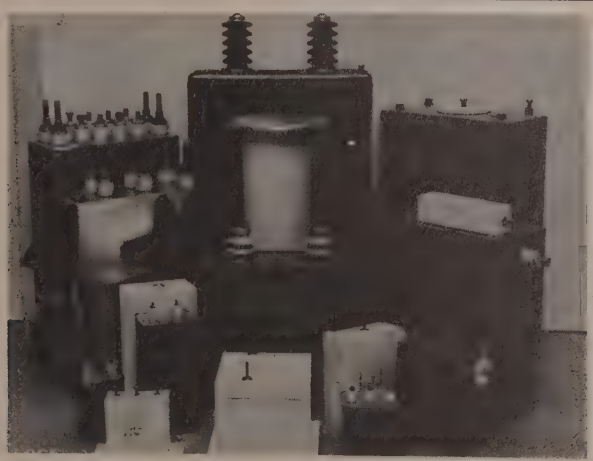
LEADS: Tinned wire.

TERMINALS: Silver plated.

MARKING: Trademark, catalog number, capacitance, tolerance, voltage and temperature coefficient or EIA temperature characteristic code.

High Energy RF rated ceramic transmitting capacitors are designed primarily for use in applications where high RF currents, high KVA ratings and high working voltages exist. Special capacitor design such as: Water Cooled Ceramic Capacitors, Air Cooled Ceramic Capacitors, Slug Capacitors, RF Transmitting Capacitors, reduces self-inductance to permit higher frequency operation. A humidity resistant silicone coating and long flashover path assures safe, high voltage operation in free air. Units also feature stable temperature-capacitance characteristics and rugged mechanical construction for maximum reliability.

These capacitors are extensively used in transmitters, antennas, induction heaters, X-ray, diathermy and electronic welding equipment.



OIL FILLED CAPACITORS

High Energy encases the oil filled capacitors in heavy gauge steel which is heliarc welded to insure maximum strength. In addition, High Energy also uses a high impact thermoplastic housing eliminating the need for insulators and allowing for considerable versatility in mounting. May be operated in air, oil or dielectric gases including SF_6. The terminals are flush mounted female threaded inserts. High Energy also designs and manufactures many custom oil filled configurations. Consult the factory for information.

DC Capacitors • AC Capacitors • Pulse Capacitors • Laser Discharge Capacitors • Corona-free Capacitors • Energy Discharge Capacitors • Plastic Cased Capacitors • Water Cooled Capacitors • Low Loss High Frequency Capacitors • High Energy Density Capacitors • Marx Generator Capacitors • Xenon Flash Lamp Capacitors • Photo Copy Capacitors • Filter Capacitors • Tuning Capacitors • Capacitor Systems • Ultrasonic Generator Capacitors • X-ray Capacitors • Commutation Capacitors • Capacitors for Line Modulators • Special Capacitor Applications.

ILLINOIS CAPACITOR, INC.

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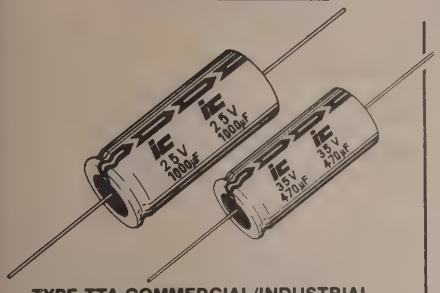
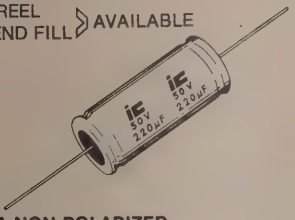
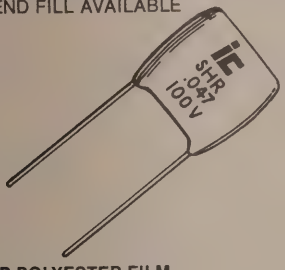


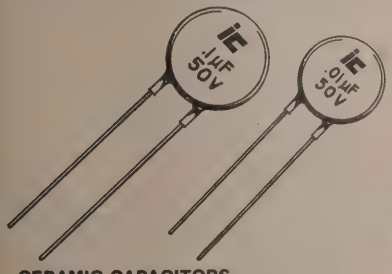
TYPE TTA COMMERCIAL/INDUSTRIAL ELECTROLYTIC CAPACITORS
0.47 MFD TO 22,000 MFD
6.3 WVDC TO 500 WVDC
-40°C +85°C MINIMUM
2000 HOUR OPERATION
TAPE & REEL AVAILABLE
EPOXY END FILL AVAILABLE



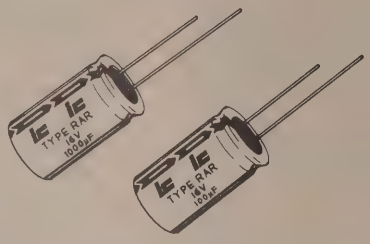
TYPE BPA NON-POLARIZED ELECTROLYTIC CAPACITORS
0.47 MFD TO 220 MFD
16 WVDC TO 50 WVDC
-25°C +85°C MINIMUM
1000 HOUR OPERATION
EPOXY END FILL AVAILABLE



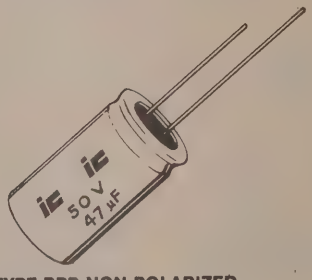
TYPE SHR POLYESTER FILM CAPACITORS
NON-INDUCTIVE WINDING
.001 MFD TO .47 MFD
100 WVDC TO 630 WVDC
±10% AND ±5% TOLERANCE



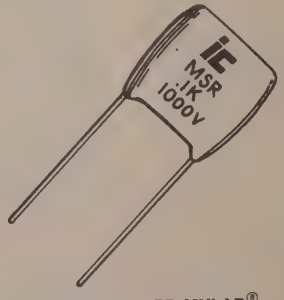
CERAMIC CAPACITORS
TYPE BCR TEMPERATURE STABLE
TYPE GCR AND TYPE GQR
GENERAL PURPOSE
1 PFD TO .1 MFD
50 WVDC AND 500 WVDC
±20%, ±10% AND +80% –20%



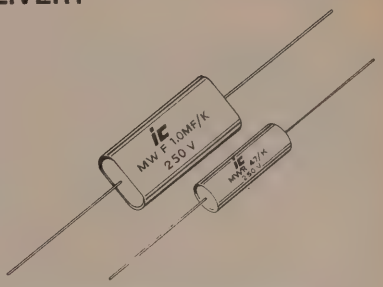
TYPE RAR COMMERCIAL/INDUSTRIAL ELECTROLYTIC CAPACITORS
0.47 MFD TO 4,700 MFD
6.3 WVDC TO 450 WVDC
-40°C +85°C MINIMUM
2000 HOUR OPERATION
EPOXY END FILL AVAILABLE



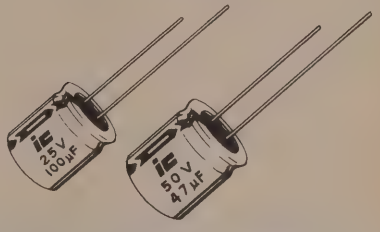
TYPE BPR NON-POLARIZED ELECTROLYTIC CAPACITORS
0.47 MFD TO 100 MFD
16 WVDC TO 50 WVDC
-25°C +85°C MINIMUM
1000 HOUR OPERATION
EPOXY END FILL AVAILABLE



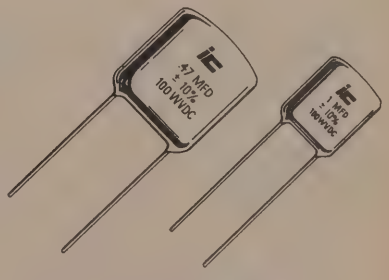
TYPE MSR METALLIZED MYLAR® CAPACITORS
NON-INDUCTIVE WINDING
.01 MFD TO 2.2 MFD
250 WVDC TO 1000 WVDC
±10% AND ±5% TOLERANCE



TYPE MWF-MWR METALLIZED MYLAR CAPACITORS
WRAP AND FILLED CONSTRUCTION
NON-INDUCTIVE WINDING
250 WVDC TO 1600 WVDC
.01 MFD TO 10 MFD
±10% AND ±5% TOLERANCE
TAPE & REEL AVAILABLE



TYPE PCR CONSUMER/COMMERCIAL ELECTROLYTIC CAPACITORS
0.47 MFD TO 100 MFD
6.3 WVDC TO 50 WVDC
-40°C +85°C MINIMUM
1000 HOUR OPERATION



TYPE UMR POLYESTER FILM CAPACITORS
INDUCTIVE WINDING
.001 MFD TO .47 MFD
100 WVDC
±10% AND ±5% TOLERANCE

Please Call for your specialized capacitor requirements.

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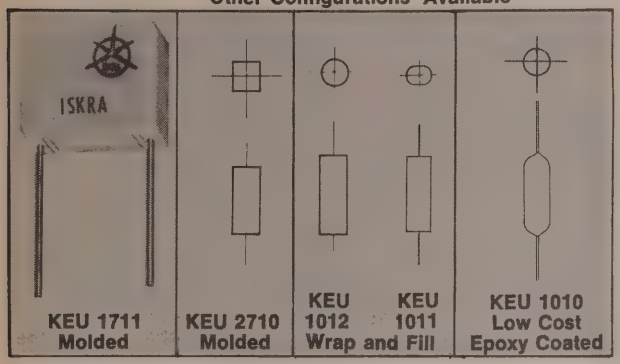
METALLIZED POLYESTER FILM CAPACITORS

Other Configurations Available



FEATURES

△ High insulation resistance
△ Low dielectric loss
△ Wide temperature range
△ High humidity resistance
△ Very small dimensions
△ Self-healing properties

CONSTRUCTION

△ Metallized polyester foil with excellent electrical characteristics.
△ Plastic coating permits operation under exceptionally humid climatic conditions.
△ Contact surface applied by high pressure spraying and connecting wires are soldered reducing possibility of failures or unsatisfactory contact during operation.
△ Self-healing properties guarantee greater than usual operating efficiency.
△ Flammability per UL 492.

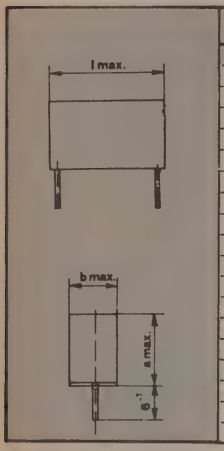
TECHNICAL DATA

Temperature Range: −40°C to +85°C.
Humidity test: Per EIA specifications RS 376
Capacitance tolerance: ±5%, ±10%, ±20%.
Rated voltage Vn: 100V-, 250V-, 400V-, 630V-, 1000V-.
Allowable a.c. voltage to 60 Hz: 63V∼, 160V∼, 200V∼, 220V∼, 250V∼.
Dielectric loss tg at 20°C: $\leqslant 80\times10^{-4}$ at 1 kHz
$\leqslant 200\times10^{-4}$ at 10 kHz.
Inductance: <20nH measured at terminal length of 6mm.
Test voltage (2s): 1.6×Vn.

Insulation resistance at 20°C and 100V-:

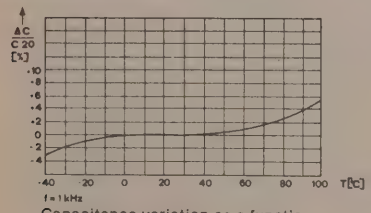
$C \leqslant 0.33\mu F$	$C > 0.33\mu F$
Vn ⩽100V-	Vn ⩽100V-
$R = 15\times10^3$ MΩ	$R\times C = 5\times10^3$s
Vn >100V-	Vn >100V-
$R = 30\times10^3$ MΩ	$RR\times C = 10^4$s

The capacitors can be used to a temperature of 100°C, by which the working voltage at a temperature above 85°C is less than the rated voltage by 1.25% for every °C.

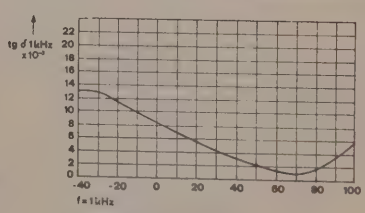


CAPACITANCE VALUES	AVAILABLE HOUSING SIZES				
	100V	250V	400V	630V	1000V
0.01	1	1	1	2	4
0.015	1	1	1	3	5
0.022	1	1	1	3	5
0.033	1	1	2	4	7
0.047	1	1	3	5	7
0.068	1	2	4	6	9
0.1	1	3	5	8	10
0.15	2	4	5	9	11
0.22	3	5	7	9	12
0.33	4	6	8	11	
0.47	4	7	10	12	
0.68	5	8	11		
1	6	10	12		
1.5	8	11			
2.2	9	12			
3.3	10				
4.7	11				
6.8	12				

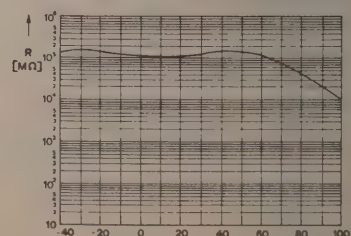
SIZE OF HOUSING	l (LENGTH)		a (HEIGHT)		b (WIDTH)		Lead Spacing ±0.5 ±0.02		Lead Dia. ±0.5 ±0.002	
	INCH	MM	INCH	MM	INCH	MM	INCH	MM	INCH	MM
1	0.512	13	0.413	10.5	0.177	4.5	0.40	10	0.024	0.6
2	0.512	13	0.453	11.5	0.217	5.5	0.40	10	0.024	0.6
3	0.512	13	0.492	12.5	0.256	6.5	0.40	10	0.024	0.6
4	0.709	18	0.472	12	0.236	6	0.60	15	0.031	0.8
5	0.709	18	0.531	13.5	0.295	7.5	0.60	15	0.031	0.8
6	0.709	18	0.610	15.5	0.374	9.5	0.60	15	0.031	0.8
7	1.063	27	0.630	16	0.276	7	0.90	22.5	0.031	0.8
8	1.063	27	0.650	16.5	0.295	7.5	0.90	22.5	0.031	0.8
9	1.063	27	0.728	18.5	0.354	9.0	0.90	22.5	0.031	0.8
10	1.063	27	0.787	20	0.433	11	0.90	22.5	0.031	0.8
11	1.260	32	0.827	21	0.472	12	1.10	27.5	0.031	0.8
12	1.260	32	0.925	23.5	0.551	14	1.10	27.5	0.031	0.8



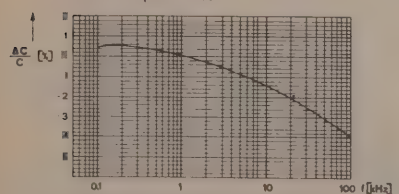
Capacitance variation as a function of the temperature.



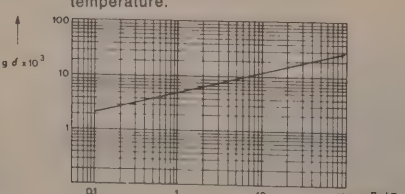
Tangent loss as a function of the temperature.



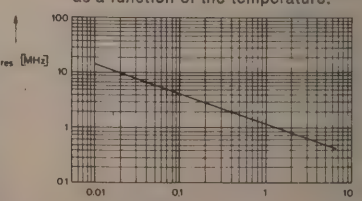
Variation of insulation resistance as a function of the temperature.



Capacitance variation as a function of the frequency.



Tangent loss as a function of the frequency.



Resonance frequency as a function of the capacitance at a terminal lead length of 6mm.

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CAPACITORS

KCU — METALLIZED POLYCARBONATE CAPACITORS

The ISKRA KCU Series is suitable for applications requiring low leakage, high stability and small physical size.

Technical data:

Capacitance range: from 0.01μF to 10μF.
Capacitance tolerance: $\pm$20% ($\pm$10% on request).
Rated voltages Vn: 63V, 100V, 160V, 250V, 400V, 630V d.c.
Permitted variable voltages: 40V, 63V, 100V, 160V, 200V, 220V a.c.
Test voltage: 1.6 × Vn
Climatic category: according to IEC Publ. 68.40/085/21 or DIN 40040 GPF.
Dielectric loss ∂ at 1kHz and 20°C: C $\leqslant$1μF . . . 50×10^{-4}
C $>$1μF . . . 80×10^{-4}

This capacitor in all other respects is identical to the KEU range, i.e., KCU 1610, 1611, 1710, 1711.

KNB — METALLIZED POLYPROPYLENE CAPACITORS

The ISKRA KNB Series is suitable for working under heavy duty electrical conditions, such as pulse loading and suppression purposes.

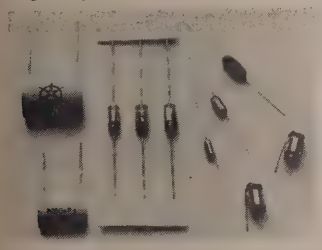
Capacitance range: 10μF to 2.2μF.
Capacitance tolerance: $\leqslant$0.1μF $\pm$20%.
$>$0.1μF $\pm$10%.
Rated voltage: 250 a.c.
Test voltage: (750V d.c. 2 Secs. between windings)
(2500V a.c. 2 Secs. between windings and can)

Types

KNB 1511: Capacitance range $\leqslant$0.68μF
KNB 1441: Capacitance range: $>$0.68μF.

Both types are housed in a plastic case protected with an epoxy resin with 6mm long radial terminals and climatic category in accordance with IE 68.25/085/21 or DIN 40040 HPF. Type KNB 1012 is a standard winding, coated with self-adhesive foil and with axial terminals.

POLYSTYRENE CAPACITORS



Welded construction suited for high stability close tolerance applications.

Types:

KSN 1010:

For use where no climatic requirement is necessary. Standard with axial eccentric terminals.
Capacitance range from 5pF to 27,000pF Climatic category IEC Publ. 68.10/070/04 or DIN 40040 JSG.

KSO 1010:

This capacitor is similar to KSN but has a protective coat of epoxy resin and is supplied for printed circuit applications.
Climatic category IEC Publ: 68.10/070/04 or DIN 40040 GSF.

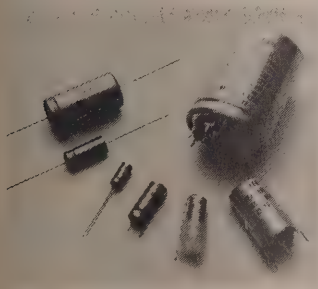
KSC 1010:

This capacitor is similar to KSO but the terminals are concentric axial.
Capacitance range from 33pF to 0.22μF.

Technical data:

Rated capacitance Cn: according to standard E24; intermediate values on request.
Rated capacitance tolerance:
$\pm$pF: Cn 40pF (F)
$\pm$2.5% Cn 39pF (H) $\pm$10% Cn 10pF (K)
$\pm$5% Cn 20pF (J) $\pm$20% Cn 5pF (M)
Capacitors with different tolerances supplied on request.
Rated voltages Vn: 25V, 63V, 160V, 250V, 630V, 1000V d.c.
Test voltage: 3 × Vn.
Vn 63V $\pm$0.5% C +0.4pF.
Vn 63V $\pm$0.2% C +0.4pF.
Temperature coefficient of capacitance ($-$160 $\pm$80) +10^{-6}/C.

ELECTROLYTIC CAPACITORS



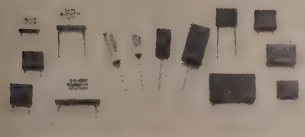
ISKRA produces electrolytic capacitors for general use and for incorporating into radio and TV receivers, tape recorders and audio as well as for measuring, control and regulating equipment.

The most popular types are shown in the tabulation.

*Climatic category: 25/85/56.
*Capacitors produced in accordance with: IEC 68, 103 and DIN 41332, Class II (2).

Types	Version	Capacitors Range	Working Voltage
EEA 2141	Axial	10μF - 22,000μF	4V - 450V d.c.
EEA 2071	Axial	0.33μF - 3300μF	4V - 450V d.c.
EEA 2081	Radial	0.33μF - 3300μF	4V - 350V d.c.
EEA 2151	Radial	10μF - 22,000μF	4V - 450V d.c.
EEA 2111	Radial	68μF - 47,000μF	10V - 450V d.c.
EEA 2112-4	Radial	Multi capacitance	160V - 450V d.c.
EEA 2011	Radial	1μF - 3300μF	4V - 100V d.c.

KFU — POLYESTER FOIL CAPACITORS



This series uses high quality polyester dielectric. Shields are of Al or Sn foil. Coils are wound irregularly so that contact is arranged at the side. The capacitors are low-inductive types suitable for pulse loading.

Types:

KFU 1010:

These capacitors are protected with an epoxy resin and fitted with 35mm long axial terminals.

KFU 1511:

These capacitors are similar to the KFU 1010 but are encapsulated into a plastic body and sealed with an epoxy resin, and with 6mm long radial terminals.

Technical data:

Capacitance range: from 1000pF to 1μF.
Capacitance tolerance:
C $\leqslant$0.1μF $\pm$20% ($\pm$10% on request)
C $\geqslant$0.1μF $\pm$20% ($\pm$10% on request)
Rated voltages Vn: 125V, 250V, 400V, 630V, 100V, 160V, 200V, 250V a.c.
Test voltage: 2×Vn.
Climatic category: according to IEC Publ. 68.40/085/21 or DIN 40040 GPF.
Dielectric loss tan ∂ at 1kHz and 20°C: $\leqslant$60×10^{-4}.
Insulation resistance Ri at 20°C: C $\leqslant$0.33μF Ri $\geqslant$30,000MΩ.

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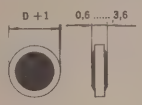
CERAMIC CAPACITORS

DISC — WAFER — TRAPEZOIDAL — TUBULAR — FEED-THROUGH

△ **Exceptionally High Quality Control on Ceramic Materials**
△ **Complete (100%) Testing**
△ **Longer Shelf Life**

DISC CAPACITORS HIGH VOLTAGE TYPES / KV1
From 1 kV to 8 kV — EIA Types (Y5P/25P) (Y5U/25U)

BUTTON DISC CAPACITORS 500V / K2P
EIA Types (Y5P/Z5P) (Y5U/Z5U)



WAFER CAPACITORS 50V / P1
Range 4700 to 4700 pF

TUBULAR CAPACITORS, HIGH VOLTAGE PULSE TYPE / CIM
1.5 kV to 4 kV

TUBULAR CAPACITORS 500V / C1
0,1 pF to 30,000 pF

SAFETY TYPE DISC CAPACITORS / KZ
For AC Applications

REDUCED TITANATE DISC/KR1
.001 mFd to .18 mFd 50 V for bypass application

SUBMINIATURE DISC CAPACITORS 500V / K1

Tolerances Available: ±1% to −20 and +80%

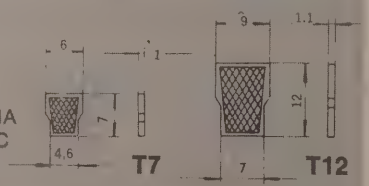
△ Engineering Note: Type No.'s (I.E. D10) also specifies nominal diameter of the part.

	C (pF)				
D (mm)	**5,5**	**7**	**10**	**14**	**18**
P 100	0,5 3	>3 4,7	>4,7 9,1	>9,1 18	
NP 0	1,0 7,5	>5,5 15	>15 27	>27 51	
N 150	1,0 8,2	>7,5 16	>16 33	>33 62	
N 750	2,2 22	>22 33	>33 62	>62 120	>120 160
N 1500	4,7 24	>24 56	>56 100	>100 220	>220 300
M 2000	47 330	>330 510	>510 1200	>1200 2200	
M 3000	150 360	>360 510	>820 1800	>1800 3600	
M 6000	270 680	>680 1200	>1200 3300	>3300 7500	>7500 10000
R (mm)	**2,5**	**5**	**5**	**7,5**	**7,5**

NICKEL PLATED

TRAPEZOIDAL CAPACITORS 500V / T7 / T12

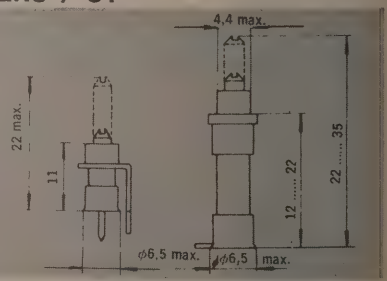
1 ..... 56 pF
P 100 ..... N 1500
150 ..... 3600 pF
M 2000 ..... M 6000
(Y5P/Z5P) (Y5U/Z5U) EIA
(2B4/2A5) (2E4/2D5) IEC
4,7 ..... 91 pF
330 ..... 560 pF



△ All dimensions given in millimeters — tolerances ±0.5.

TUBULAR TRIMMERS / CT

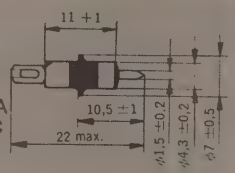
2,0 ..... 62 pF
8 16
470 ..... 1200 pF
0,7/3,7 pF ..... 4/13 pF
0,4/2 pF ..... 1/9 pF



FEED-THROUGH CAPACITORS 500V

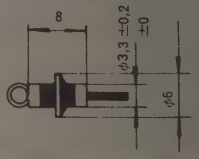
S1

1 ..... 68 pF
P 100 ..... N 1500
180 ..... 2400 pF
M 2000 ..... M 3000 ..... M 6000
(Y5P/Z5P) (Y5T/Z5T) (Y5U/Z5U) EIA
(2B4/2A5) (2D4/2C5) (2E4/2D5) IEC



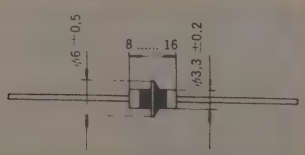
S2

1,5 ..... 270 pF
220 ..... 8200 pF
P 100 ..... N 1500
M 2000 ..... M 6000
(Y5P/Z5P) (Y5U/Z5U) EIA
(2B4/2A5) (2E4/2D5) IEC



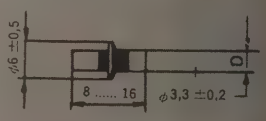
S5

1,5 ..... 100 pF
220 ..... 2700 pF
P 100 ..... N 1500
M 2000 ..... M 6000
(Y5P/Z5P) (Y5U/Z5U) EIA
(2B4/2A5) (2E4/2D5) IEC



S21

P 100 ..... N 1500
M 2000 ..... M 6000
(Y5P/Z5P) (Y5U/Z5U) EIA
(2B4/2A5) (2E4/2D5) IEC



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Tubes — Receiving, Industrial, Special Purpose, Antique.
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Miniature Lamps — Incandescent, Neon Glow.
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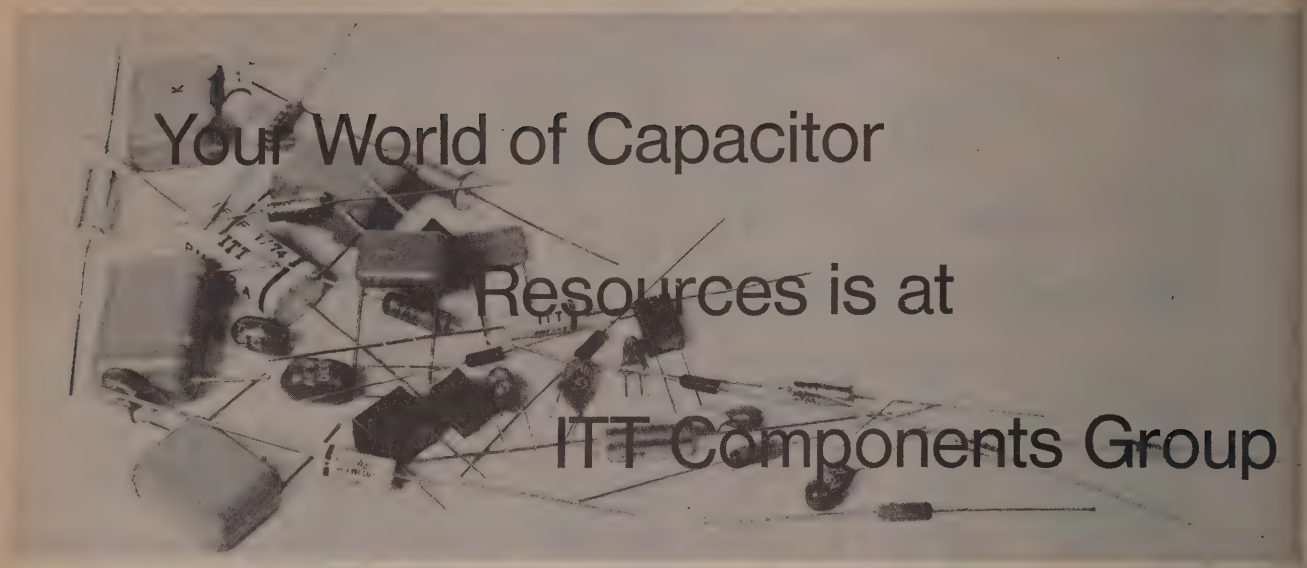
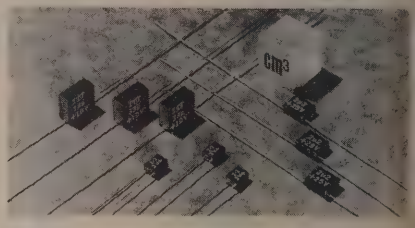


TAG—EPOXY DIPPED TANTALUM CAPACITOR

Economical radial leaded solid tantalum capacitor with an extremely stable oxide layer allows: Low leakage current, small size, 15 different case sizes, capacitance 0.1—680uF, tolerance range ±20% (±10%), voltage 3—6.3—10—16—20—25—35—50 volts. Temperature range —55 to +85°C. Four different lead crimps.

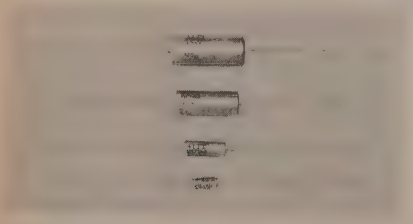
TAP—EPOXY DIPPED TANTALUM CAPACITOR

Professional radial leader solid tantalum capacitor with an extremely stable oxide layer: Extremely low leakage current, small size, 6 different case sizes, capacitance 0.1 to 330uF. Tolerance range ±20% (±10%). Voltage 3—6—10—15—20—25—35—50 volts. Temperature range —55 to +85°C. Dissipation factor from 4 to 10%, high reliability data, high surge voltage.



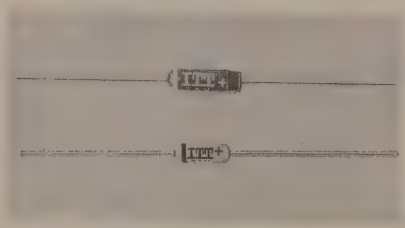
TAH—MINIATURE RECTANGULAR SOLID TANTALUM CAPACITORS

General purpose miniature solid tantalum capacitors with anode encased in resin with either axial or radial leads, in five standard case sizes. Capacitance range: .0047 to 150μF, voltage range: 4 to 35 volts, temperature range: —55° C to 125° C. Ideal for applications where space is limited.



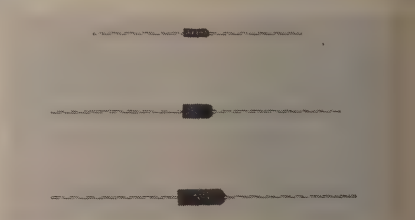
TAA—METAL ENCASED TANTALUM CAPACITOR

Popular military style, axial leaded solid tantalum capacitor, hermetically sealed, four standard case sizes, capacitance range: .01 to 330μF, voltage range: 6 to 75 volts, temperature range: —80° C to 125° C.



TAX—GLASS ENCAPSULATED TANTALUM CAPACITOR

Professional, axial leaded, hermetically sealed—100% tested: solid tantalum capacitor with an extremely stable oxide layer. Extremely low leakage current, two case sizes A & B, capacitance 0.1 to 47uF, tolerance range ±20% (±10%). Voltage 6.3 to 50 VDC. Temperature range —80 to +125°. High reliability.

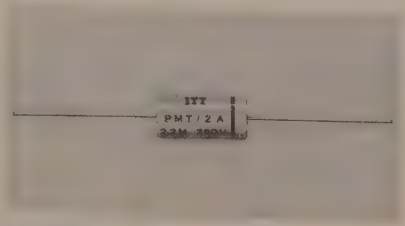


TAR—EPOXY MOLDED TANTALUM CAPACITOR

Subminiature, axial leaded solid tantalum capacitor, ideal for use in high speed automatic insertion applications, extremely low leakage current, three case sizes, capacitance range 0.1 to 68μF, voltage range 6.3 to 35 volts, temperature range —55° C to +85° C.

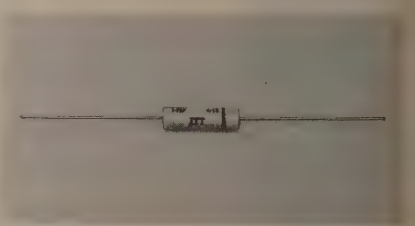
PMT-2R—MOLDED METALIZED POLYESTER CAPACITOR

Resin molded, radial leaded metalized polyester capacitor, rugged construction, non-flammable, self-healing properties, capacitance range: .01 to 4.7μF; voltage range: 100 to 630 volts, temperature range: —55° C to 100° C (without derating), high reliability.



PMT-2A—FLAT METALIZED POLYESTER CAPACITOR

Film wrapped, resin end fill construction, axial leaded metalized polyester capacitors. Self-healing properties, capacitance range .01 to 22μF, voltage range: 100 to 630 volts, temperature range: —55°C to 125°C. High reliability.



PMT-2T—TUBULAR METALIZED POLYESTER CAPACITOR

Film wrapped, resin end fill construction, axial leaded metalized polyester capacitors, self-healing properties, capacitance range: .01 to 10μF, voltage range: 100 to 630 volts, temperature range: —55° C to 125° C. High reliability.

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DIPPED TANTALUM CAPACITORS

TAG—Standard Ratings

Working Voltage (V) →	3	6.3	10	16	20	25	35	50
Surge Voltage (V) →	3.6	7.6	12	19.2	24	30	42	60
Capacitance (μf) ↓	Case size/Max. leakage current (μA)							
0.1							1/2	1/2
0.15							1/2	1/2
0.22							1/2	1/2
0.33							1/2	2/2
0.47							1/2	2/2
0.68							1/2	3/2
1.0							1/2	4/2
1.5						1/2	2/2	5/4
2.2				1/2		2/3	3/4	6/5
3.3			1/2	2/2		3/4	4/6	7/8
4.7		1/2	2/2	3/4		4/6	5/8	8/12
6.8	1/2	2/2	3/3	4/5		5/9	6/12	8/17

Working Voltage (V) →	3	6.3	10	16	20	25	35	50
Surge Voltage (V) →	3.6	7.6	12	19.2	24	30	42	60
Capacitance (μf) ↓	Case size/Max. leakage current (μA)							
10.0	1/2	3/3	4/5	5/8		6/13	7/17	11/20
15.0	2/2	4/5	5/7	6/12	7/15	8/19	9/20	
22.0	3/3	5/7	6/11	7/18	8/20	9/20	11/20	
33.0	4/5	6/10	7/17	9/20	9/20	10/20	12/20	
47.0	5/7	7/15	8/20	10/20	11/20	12/20	14/20	
68.0	6/10	8/20	9/20	11/20	12/20	13/20		
100.0	7/15	9/20	11/20	13/20	14/20			
150.0	8/20	11/20	13/20	15/20				
220.0	9/20	12/20	14/20					
330.0	11/20	14/20						
470.0	13/20							
680.0	14/20							

TAP—Standard Ratings

Working Voltage (V) →	4	6	10	15	20	25	35	50
Surge Voltage (V) →	5.3	8	13	20	26	32	46	65
Capacitance (μf) ↓	Case size/Max. leakage current (μA)							
0.1							1/1	1/1
0.15							1/1	1/1
0.22							1/1	1/1
0.33							1/1	1/1
0.47							1/1	2/1
0.68							1/1	2/1
1.0						1/1	1/1	3/1
1.5				1/1		2/1	2/1	3/2
2.2			1/1	2/1		2/1	3/1	4/2
3.3		1/1	2/1	2/1	3/1	3/1	3/2	4/3
4.7		2/1	2/1	3/2	3/2	3/2	4/2	5/3
6.8		2/1	3/2	3/2	3/2	3/3	4/3	5/4

Working Voltage (V) →	4	6	10	15	20	25	35	50
Surge Voltage (V) →	5.3	8	13	20	26	32	46	65
Capacitance (μf) ↓	Case size/Max. leakage current (μA)							
10.0	3/1	3/2	3/2	3/2	4/3	4/4	4/5	5/6
15.0	3/2	3/2	3/2	4/3	4/4	4/5	5/5	
22.0	3/2	3/2	4/3	4/5	5/5	5/10	5/10	
33.0	4/3	4/3	4/5	5/5	5/10	5/10	6/10	
47.0	4/4	4/4	5/5	5/10	5/15	6/15	6/10	
68.0	4/5	4/5	5/10	5/10	6/15	6/15		
100.0	5/10	5/10	5/15	6/15	6/15			
150.0	5/10	5/10	6/20	6/20				
220.0	6/15	6/15	6/20					
330.0	6/20	6/20						
470.0								
680.0								

TAH—Standard Ratings

Working Voltage (V) →	4	6.3	10	16	20	25	35
Surge Voltage (V) →	5	8	13	20	26	33	46
Capacitance (μf)	Case size/Max. leakage current (μA)						
0.0047							G 0.5
0.0068							G 0.5
0.01							G 0.5
0.015							G 0.5
0.022							G 0.5
0.033							G 0.5
0.047							G 0.5
0.068							G 0.5
0.10							G 0.5
0.15							G 0.5
0.22							G 0.5
0.33							G 0.5
0.47							G 0.5
0.68						G 0.5	H 1.0

Working Voltage (V) →	4	6.3	10	16	20	25	35
Surge Voltage (V) →	5	8	13	20	26	33	46
Capacitance (μf)	Case size/Max. leakage current (μA)						
1.0					G 0.5		H 1.0
1.5				G 0.5			H 1.0
2.2			G 0.5			H 1.0	J 3.0
3.3		G 0.5			H 1.0		J 3.0
4.7	G 0.5			H 1.0			J 3.0
6.8			H 1.0			J 3.0	K 3.0
10		H 1.0			J 3.0	K 3.0	L 9.0
15	H 1.0			J 3.0	K 3.0	K 3.0	L 9.0
22			J 3.0	K 3.0			L 9.0
33		J 3.0	K 3.0			L 9.0	
47	J 3.0	K 3.0			L 9.0		
68	K 3.0			L 9.0			
100			L 9.0				
150		L 9.0					

AXIAL LEADED SOLID TANTALUM CAPACITORS

TAA—Standard Ratings

Working Voltage (V) →	6	10	15	20	25	35	50	60	75
Surge Voltage (V) →	8	13	20	26	33	46	65	84	98
Capacitance (μf)	Case size/ Max. leakage current (μA)								
.01						A 0.1	A 0.1	A 0.5	A 0.5
.012						A 0.1	A 0.1	A 0.5	A 0.5
.015						A 0.1	A 0.1	A 0.5	A 0.5
.018						A 0.1	A 0.1	A 0.5	A 0.5
.022						A 0.1	A 0.1	A 0.5	A 0.5
.027						A 0.1	A 0.1	A 0.5	A 0.5
.033						A 0.1	A 0.1	A 0.5	A 0.5
.039						A 0.1	A 0.1	A 0.5	A 0.5
.047				A 0.1		A 0.1	A 0.1	A 0.5	A 0.5
.056				A 0.1		A 0.1	A 0.1	A 0.5	A 0.5
.068				A 0.1		A 0.1	A 0.1	A 0.5	A 0.5
.082				A 0.1		A 0.1	A 0.1	A 0.5	A 0.5
.1				A 0.5	A 0.5	A 0.5	A 0.5	A 0.5	A 0.5
.12				A 0.5	A 0.5	A 0.5	A 0.5	A 0.5	A 0.5
.15				A 0.5	A 0.5	A 0.5	A 0.5	A 0.5	A 0.5
.18				A 0.5	A 0.5	A 0.5	A 0.5	A 0.5	A 0.5
.22				A 0.5	A 0.5	A 0.5	A 0.5	A 0.5	A 0.5
.27				A 0.5	A 0.5	A 0.5	A 0.5	A 0.5	A 0.5
.33			A 0.5	A 0.5	A 0.5	A 0.5	A 0.5	A 0.5	A 0.5
.39			A 0.5	A 0.5	A 0.5	A 0.5	A 0.5	A 0.5	A 0.5
.47			A 0.5	A 0.5	A 0.5	A 0.5	A 0.5	A 0.5	A 0.5
.56			A 0.5	A 0.5	A 0.5	A 0.5	A 0.5	A 0.5	A 0.5
.68			A 0.5	A 0.5	A 0.5	A 0.5	A 0.5	A 0.5	A 0.5
.82			A 0.5	A 0.5	A 0.5	A 0.5	A 0.5	B 0.5	B 0.5
1.0		A 0.5	A 0.5	A 0.5	A 0.5	A 0.5	A 0.5	B 0.5	B 0.5
1.2		A 0.5	A 0.5	A 0.5	A 0.5	B 0.5	B 0.5	B 0.5	B 0.5
1.5		A 0.5	A 0.5	A 0.5	A 0.5	B 0.5	B 0.5	B 0.5	B 1.0

Working Voltage (V) →	6	10	15	20	25	35	50	60	75
Surge Voltage (V) →	8	13	20	26	33	46	65	84	98
Capacitance (μf)	Case size/ Max. leakage current (μA)								
1.8		A 0.5	A 0.5	A 0.5	B 0.5	B 0.5	B 0.5	B 0.5	B 1.0
2.2	A 0.5	A 0.5	A 0.5	A 0.5	B 0.5	B 1.0	B 1.0	B 1.0	B 1.5
2.7	A 0.5	A 0.5	A 0.5	B 0.5	B 0.5	B 1.0	B 1.0	B 1.0	B 1.5
3.3	A 0.5	A 0.5	A 0.5	B 1.0	B 1.0	B 1.0	B 2.0	B 2.0	B 2.0
3.9	A 0.5	A 0.5	B 0.5	B 1.0	B 1.0	B 1.0	B 2.0	B 2.0	B 2.0
4.7	A 0.5	A 0.5	B 1.0	B 1.0	B 1.0	B 1.0	B 3.0	C 3.0	C 6.0
5.6	A 0.5	B 0.5	B 1.0	B 1.0	B 1.0	B 1.0	C 3.0	C 3.0	C 6.0
6.8	A 0.5	B 1.0	B 1.0	B 1.0	B 1.0	B 2.0	C 3.0	C 4.0	C 10.0
8.2	B 0.5	B 1.0	B 1.0	B 1.0	B 1.0	C 3.0	C 3.0	C 5.0	C 10.0
10.0	B 0.5	B 1.0	B 1.0	B 1.0	B 1.0	C 3.0	C 3.0	C 6.0	C 10.0
12	B 0.5	B 1.0	B 1.0	B 1.0	C 1.0	C 3.0	C 3.0	C 6.0	D 10.0
15	B 1.0	B 1.0	B 2.0	B 2.0	C 2.0	C 3.0	C 6.0	D 9.0	D 14.0
18	B 1.0	B 1.0	B 2.0	C 3.0	C 3.0	C 3.0	C 6.0	D 10.0	
22	B 1.0	B 2.0	B 3.0	C 3.0	C 3.0	C 6.0	D 6.0	D 12.0	
27	B 1.0	B 2.0	C 3.0	C 3.0	C 3.0	D 6.0			
33	B 1.0	B 2.0	C 3.0	C 3.0	C 3.0	D 6.0			
39	B 1.0	B 2.0	C 3.0	C 3.0	C 3.0	D 6.0			
47	B 2.0	C 3.0	C 6.0	C 6.0	D 6.0	D 10.0			
56	B 2.0	C 3.0	C 6.0	D 6.0	D 10.0				
68	C 3.0	C 3.0	D 6.0	D 6.0					
82	C 3.0	C 3.0	C 6.0	D 6.0					
100	C 3.0	C 6.0	D 6.0	D 10.0					
120	C 3.0	C 6.0	D 6.0						
150	C 6.0	D 10.0	D 10.0						
180	C 6.0	D 10.0							
220	D 6.0	D 10.0							
270	D 6.0								
330	D 10.0								

TAX—Standard Ratings

Working Voltage (V) →	6.5	10	16	20	25	35	50
Surge Voltage (V) →	8	13	20	26	32	46	65
Capacitance (μf)	Case size/Max. leakage current (μA)						
0.1	→	→	→	→	→	A 0.5	A 0.5
0.15	→	→	→	→	→	A 0.5	A 0.5
0.22	→	→	→	→	→	A 0.5	A 0.5
0.33	→	→	→	→	→	A 0.5	A 0.5
0.47	→	→	→	→	→	A 0.5	A 0.5
0.68	→	→	→	→	→	A 0.5	A 0.5
1.0	→	→	→	→	→	A 0.5	A 0.5
1.5	→	→	→	→	A 0.5	B 0.5	A 0.5
2.2	→	→	→	A 0.5	B 0.5	B 1.0	A 1.0
3.3	→	→	A 0.5	→	B 1.0	B 1.0	B 2.0
4.7	→	A 0.5	→	→	B 1.0	B 1.0	B 3.0
6.8	A 0.5	→	B 1.0	→	B 1.0	B 2.0	
10.0	→	B 1.0	→	→	B 1.0		
15.0	B 1.0	→	→	B 2.0			
22.0	→	→	B 3.0				
33.0	→	B 2.0					
47.0	B 2.0						

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Components ITT

METALIZED MYLAR CAPACITORS

PMT-2R—Standard Ratings

Working Voltage (V) →	100	250	400	630
	Dimensions X x Y x Z (inches)			
Capacitance (μf)	Case size/Max. leakage current (μA)			
0.010			0.532 x 0.354 x 0.197	0.532 x 0.434 x 0.236
.015			0.532 x 0.354 x 0.197	0.532 x 0.434 x 0.236
.022			0.532 x 0.354 x 0.197	0.532 x 0.434 x 0.236
.033		0.532 x 0.354 x 0.197	0.532 x 0.434 x 0.236	0.749 x 0.473 x 0.276
.047		0.532 x 0.354 x 0.197	0.532 x 0.434 x 0.236	0.749 x 0.473 x 0.276
.068	0.532 x 0.354 x 0.197	0.532 x 0.434 x 0.236	0.749 x 0.473 x 0.276	0.749 x 0.591 x 0.354
.10	0.532 x 0.354 x 0.197	0.532 x 0.434 x 0.236	0.749 x 0.473 x 0.276	1.024 x 0.788 x 0.394
.15	0.532 x 0.434 x 0.236	0.749 x 0.473 x 0.276	0.749 x 0.591 x 0.354	1.024 x 0.788 x 0.394
.22	0.532 x 0.434 x 0.236	0.749 x 0.473 x 0.276	1.024 x 0.788 x 0.394	1.024 x 0.788 x 0.394

Working Voltage (V) →	100	250	400	630
	Dimensions X x Y x Z (inches)			
Capacitance (μf)	Case size/Max. leakage current (μA)			
.33	0.749 x 0.473 x 0.276	0.749 x 0.591 x 0.354	1.024 x 0.788 x 0.394	1.026 x 0.906 x 0.512
.47	0.749 x 0.473 x 0.276	0.749 x 0.591 x 0.354	1.024 x 0.788 x 0.394	1.026 x 0.906 x 0.512
.68	0.749 x 0.591 x 0.354	1.024 x 0.788 x 0.394	1.26 x 0.906 x 0.512	
1.0	0.749 x 0.591 x 0.354	1.024 x 0.788 x 0.394	1.26 x 0.906 x 0.512	
1.5	1.024 x 0.788 x 0.394	1.26 x 0.906 x 0.512		
2.2	1.024 x 0.788 x 0.394	1.26 x 0.906 x 0.512		
3.3	1.26 x 0.906 x 0.512			
4.7	1.26 x 0.906 x 0.512			

PMT-2T—Standard Ratings

Working voltage (V) →	100	250	400	630
	Dimensions D x L (inches)			
Capacitance (μf)	Case size/Max. leakage current (μA)			
0.01				.236 x .551
0.015			.236 x .551	.276 x .551
0.022			.276 x .551	.315 x .551
0.033		.236 x .551	.276 x .630	.256 x .748
0.047		256 x .551	.315 x .630	.295 x .748
0.068		.256 x .630	.315 x .748	.354 x .748
0.1	.236 x .551	.295 x .630	.374 x .748	.413 x .748
0.15	.276 x .551	.295 x .748	.433 x .748	.394 x 1.043
0.22	.335 x .551	.335 x .748	.394 x 1.043	.453 x 1.043
0.33	.276 x .748	.354 x .827	.492 x 1.043	.551 x 1.043

Working Voltage (V) →	100	250	400	630
	Dimensions D x L (inches)			
Capacitance (μf)	Case size/Max. leakage current (μA)			
0.47	.315 x .748	.413 x .827	.492 x 1.240	.571 x 1.240
0.68	.374 x .748	.413 x 1.043	.591 x 1.240	.591 x 1.772
1.	.433 x .748	.492 x 1.043	.709 x 1.240	.669 x 1.772
1.5	.394 x 1.043	.531 x 1.240	.709 x 1.772	
2.2	.472 x 1.043	.630 x 1.240	.866 x 1.772	
3.3	.512 x 1.240	.768 x 1.240	1.024 x 1.772	
4.7	.591 x 1.240	.748 x 1.772		
6.8	.709 x 1.240	.886 x 1.772		
10	.846 x 1.240	1.063 x 1.772		

PMT-2A—Standard Ratings

Working Voltage (V) →	100	250	400	630
	Dimensions A x B x C x D (inches)			
Capacitance (μf)	Case size/Max. leakage current (μA)			
0.01				.120 x .320 x .510 x .028
0.015				.160 x .350 x .510 x .028
0.022			.120 x .240 x .510 x .028	.220 x .390 x .510 x .031
0.033			.160 x .280 x .510 x .028	.160 x .350 x .710 x .031
0.047		.120 x .280 x .510 x .028	.140 x .260 x .170 x .028	.200 x .390 x .710 x .031
0.068		.160 x .320 x .510 x .028	.180 x .300 x .170 x .031	.260 x .430 x .710 x .031
0.1		.120 x .280 x .710 x .028	.240 x .350 x .710 x .031	.200 x .480 x 1.020 x .031
0.15	.160 x .280 x .510 x .028	.180 x .320 x .710 x .031	.280 x .430 x .710 x .031	.280 x .510 x 1.020 x .031
0.22	.200 x .320 x .510 x .031	.240 x .350 x .710 x .031	.200 x .470 x 1.020 x .031	.350 x .590 x 1.020 x .031
0.33	.160 x .280 x .170 x .028	.280 x .390 x .710 x .031	.260 x .510 x 1.020 x .031	.400 x .630 x 1.220 x .031
0.47	.200 x .320 x .710 x .031	.200 x .470 x 1.020 x .031	.350 x .590 x 1.020 x .031	.470 x .710 x 1.220 x .031

Working Voltage (V) →	100	250	400	630
	Dimensions A x B x C x D (inches)			
Capacitance (μf)	Case size/Max. leakage current (μA)			
0.68	.240 x .350 x .710 x .031	.240 x .510 x 1.020 x .031	.350 x .590 x 1.220 x .031	
1	.320 x .430 x .710 x .031	.320 x .590 x 1.020 x .031	.470 x .750 x 1.220 x .031	
1.5	.240 x .470 x 1.020 x .031	.350 x .630 x 1.220 x .031	.470 x .870 x 1.220 x .031	
2.2	.280 x .510 x 1.020 x .031	.430 x .710 x 1.220 x 0.31	.470 x .870 x 1.650 x .031	
3.3	.350 x .630 x 1.020 x .031	.470 x .910 x 1.220 x .031	.430 x .980 x 2.130 x .031	
4.7	.370 x .670 x 1.220 x .031	.470 x .910 x 1.650 x .031	.470 x 1.060 x 2.130 x .031	
6.8	.450 x .790 x 1.220 x .031	.470 x .910 x 2.130 x .031		
10	.450 x .870 x 1.650 x .031	.550 x 1.140 x 2.130 x .031		
15	.510 x .950 x 1.650 x .031			
22	.510 x .980 x 2.130 x .031			

TAR—Standard Ratings

Working Voltage (V) →	6.3	10	16	20	25	35
Surge Voltage (V) →	8	13	20	26	33	46
Capacitance (μF)	Case size/Max. leakage current (μA)					
0.1						A/1.0
0.12						A/1.0
0.15						A/1.0
0.18						A/1.0
0.22						A/1.0
0.27						A/1.0
0.33						A/1.0
0.39						A/1.0
0.47						A/1.0
0.56						A/1.0
0.68						A/1.0
0.82						A/1.0
1.0						A/1.0
1.2						B/1.0
1.5					R/1.0	B/1.0
1.8					R/1.0	B/1.0
2.2					R/1.0	B/1.0
2.7				R/1.0	S/1.0	B/1.0
3.3			R/1.0	S/1.0	S/1.0	B/1.0
3.9			R/1.0	S/1.0	S/1.0	B/2.0
4.7		R/1.0	S/1.0	S/1.0	S/1.0	B/2.0
5.6		R/1.0	S/1.0	S/1.0	S/2.0	C/3.0
6.8		R/1.0	S/1.0	S/1.0	S/2.0	C/3.0
8.2	R/1.0	S/1.0	S/1.0	S/2.0	T/3.0	C/4.0
10	R/1.0	S/1.0	S/1.0	S/2.0	T/3.0	C/4.0
12	R/1.0	S/1.0	S/2.0	T/3.0	T/4.0	
15	S/1.0	S/1.0	S/2.0	T/3.0	T/4.0	
18	S/1.0	S/1.0	T/3.0	T/4.0		
22	S/1.0	S/2.0	T/3.0	T/4.0		
27	S/2.0	T/3.0	T/4.0			
33	S/2.0	T/3.0	T/4.0			
39	T/3.0	T/4.0				
47	T/3.0	T/4.0				
56	T/4.0					
68	T/4.0					

Note: All capacitors are supplied in the highest voltage available at a given capacitance value and case size.

vacuum capacitors

ITT Jennings offers the broadest available line of high voltage capacitors for radio frequency applications. Units are available in glass and ceramic envelopes with working voltage ratings of 2 kv to 36 kv, at capacitance values to 5000 pfd, with current ranges to 420 Amps RMS (air-cooled) and 1,000 Amps RMS (water-cooled), depending upon capacity, frequency, and working voltage. The design of ITT Jennings Vacuum and Gas capacitors allows a number of electrical, mechanical and environmental advantages which include:

1) HIGH VOLTAGE—The high dielectric strength allows maximum voltage levels for a given capacitance rating.
2) HIGH CURRENT—Extremely low losses occur because of the dielectric, low loss glass and ceramic envelopes, and heavy copper construction. ITT Jennings capacitors are able to handle large currents at high RF frequencies that would destroy other types of capacitors.
3) COMPACT DESIGN—Units are quite small for their power handling capabilities.
4) HIGH Maximum to Minimum CAPACITY RATIO—Capacity change ratios are available to 140:1, making them desirable for wide tuning ranges.
5) SELF-HEALING—The design construction permits moderate overloads that would damage other materials.
6) HIGH ALTITUDE OPERATION—Vacuum capacitors are free from internal degradation due to extreme environmental conditions.

VACUUM FIXED CAPACITORS

Peak Voltage Kilovolts				Capacity pF	Continuous RMS Amperes[2] (Max.)	Nominal Dimensions[3] (Inches)	
Test 60 Hz	RF Working[1] (Peak)		Type*			Length	Diameter
5	3	G	JCSL	1000, 1500, 2000	75	4.0	2.9
5	3		JSLF	5000	120	2.9	4.1
15	9		JCSF	25, 40, 50, 80, 120, 150	40	1.7	1.7
15	9		JCS	250, 400, 500	90	4.0	3.1
15	9		MCI	500, 750, 1000	120	4.1	4.1
15	9		MMC	1500, 2000, 5000	220	13.0	9.3
15	9		MMCI	2000	200	4.9	6.1
15	9	C	CFDP	2000	200	3.3	5.6
12	7		CFDS	1000	95	4.6	3.8
20	12	G	MC	500, 750, 1000	155	8.4	5.0
30	18		MLC	500, 750, 1000	200	9.3	4.5
30	18	C	CY	1, 2, 3, 4, 5	12	3.3	0.8
35	25		CLF1	6, 12, 25, 50, 75, 100	87	6.5	2.3
30	20		CLF1	150, 200, 250	100	6.5	2.6
30	18		CFED	150, 300	140	3.6	3.4
25	15		CFED	500, 750, 1000	180	3.8	4.6
35	21		CFFP	2000	360	5.8	8.2
55	33	G	MMHC	450	210	9.3	6.1
45	27		MMHC	1000	310	13.0	9.3
60	36	C	CFHD	12, 25, 50, 100	145	5.2	3.4
60	36		CFHD	200, 300	240	5.4	4.6
55	33		CFHP	450	300	5.5	5.6
50	30		CFHP	1000	350	6.2	7.2
50	30		CFTB	1000	420	7.4	10.7

GAS FIXED CAPACITORS

Peak Voltage Kilovolts				Capacity pF	Continuous RMS Amperes[2] (Max.)	Nominal Dimensions[3] (Inches)	
Test 60 Hz	RF+DC	RF Working	Type*			Length	Diameter
20	18	12	C CGF1-1000	1000	215	3.5	4.8
35	30	21	CGF2-1000	1000	270	4.0	6.0
50	40	30	CGF2-450	450	290	5.5	5.7
50	40	30	CGF2-500	500	290	5.5	5.7

* G = Glass; C = Ceramic

[1] RF working voltage is the maximum RF voltage that can be applied to the capacitor over the 2-32 MHz frequency range, provided the RF current rating is not exceeded.

[2] RF current rating is dependent upon capacity, frequency and working voltage. Write for complete applications data.

[3] Dimensions of largest unit in a series.

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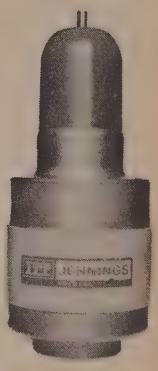
DIVISION OF INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION

vacuum variable capacitors

Peak Voltage Kilovolts				Capacity pF	Continuous RMS Amperes[2] (Max.)	Nominal Dimensions[3] (Inches)	
Test 60 Hz	RF Working[1] (Peak)		Type*			Length	Diameter
5	3	G	UCSL	4-250	35	4.1	2.2
5	3		USLS	5-465, 5-500, shorting	40	5.7	2.3
5	3		USL	5-500	35	5.8	2.4
5	3		UCSL	5-750, 7-1000, 10-1500, 20-2000	75	8.3	3.1
3	2		UCSL	50-3000, 100-5000	80	8.8	4.1
5	3	C	CSV1	5-500	45	5.8	2.4
5	5		CMV2	6-500	38	3.6	1.8
5	5		CMV1	8-650	40	4.3	1.7
5	3		CVCE	10-750	80	7.1	3.4
3	3		CMV1	8-1000	40	4.3	1.7
5	3		CSV1	10-1000	70	5.0	3.1
5	3		CVCD	10-1500, 20-2000, 50-3000	100	8.3	4.6
5	5		CMV2	20-2000	80	5.3	3.8
5	5		CMV1	25-4000	70	6.5	3.3
15	9	G	UCSB	5-100	45	4.9	2.4
15	9		UCS	5-200, 10-400, 25-500	60	9.0	3.1
15	9		UCSXF	12-1000, 15-1200	70	10.0	4.3
15	9		UCSX	25-1000	70	9.8	3.7
15	9		VMMC	50-1000, 100-2000	200	15.6	6.1
12	7		UCSXF	20-1500, 50-2300	70	10.0	5.1
15	9	C	CVDP	35-1500, 50-2300	160	9.8	5.6
15	9	G	VMMC	100-5000	200	21.3	9.2
15	9	C	CADD	3-30	20	4.1	1.3
15	9		CSVF	12-500	70	7.9	3.6
15	9		CVDD	6.5-50, 10-100	65	6.6	2.4
15	9		CVDD	10-300, 20-500	95	7.5	3.4
20	12		CVEP	25-500, 50-1000, 100-1500	210	10.2	7.2
15	9		CVDD	25-1000	150	8.0	4.6
15	9		CVEP	100-2000	200	10.2	7.2
60	36	G	UHC	10-75	75	11.4	5.0
55	33	C	CVHP	10-250, 25-450, 30-650	215	11.9	7.2
40	24		CVFP	15-250, 25-450	170	9.6	5.6
50	30		CWV2	20-250, 25-450, 30-650 (water cooled)	840	17.9	7.6
55	33		CVHE	25-650 (air cooled)	375	12.5	7.2
40	24		CVFP	20-750, 35-1000	225	11.7	7.2
50	30		CVHP	60-1000	215	14.5	8.0
45	27		CAV1	60-1000 (air cooled)	250	14.5	8.6
50	30		CWV1	100-1000 (water cooled)	800	21.6	8.6
40	24		CVHC	100-1600 (air cooled)	500	17.8	8.0
60	36		CWV1	100-1600 (water cooled)	1000	23.0	12.5
40	24		CWV2	100-1600 (water cooled)	790	25.0	8.6
35	21		CVFP	100-2000	220	14.5	8.2



GAS VARIABLE CAPACITORS

Peak Voltage Kilovolts				Capacity pF	Continuous RMS Amperes[2] (Max.)	Nominal Dimensions[3] (Inches)	
Test 60 Hz	RF Working[1]		Type*			Length	Diameter
5	3	C	CHV1	1.5-45	15	2.9	0.9
15	9		CHV1	2.5-50	30	6.4	1.4
7	5		CHV1	12-200	55	7.3	3.8

* G = Glass; C = Ceramic

[1] RF working voltage is the maximum RF voltage that can be applied to the capacitor over the 2-32 MHz frequency range, provided the RF current rating is not exceeded.

[2] RF current rating is dependent upon capacity, frequency and working voltage. Write for complete applications data.

[3] Dimensions of largest unit in a series.

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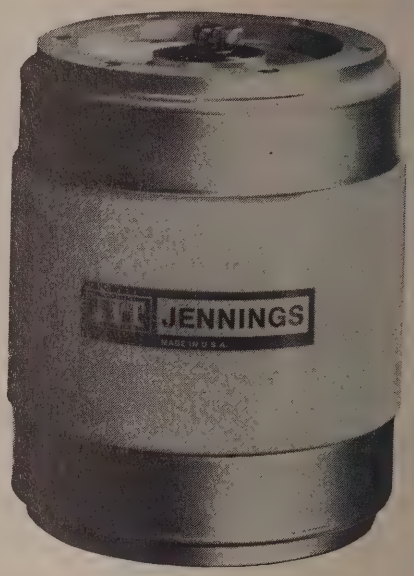
DIVISION OF INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION

vacuum capacitors

CTV SERIES TRIMMABLE-FIXED† VACUUM CAPACITORS FOR POWER APPLICATIONS — THE FIXED CAPACITOR YOU CAN TRIM

- Adjustment from 5% to 30% of nominal capacitance
- From 18 to 1377 pF in discrete steps
- Peak 60 Hz test voltages to 50 KV
- High current ratings — to 150 A rms
- Compact — 5.5″ long x 4.5″ dia.



These new devices offer designers a new means of achieving the exact capacitance required in high power circuits. Incorporating in one package a trimmer in parallel with a large fixed capacitance, they eliminate the need to use large, fully variable capacitors or the use of multiple fixed capacitors in many applications. They are ideal solutions for filter circuits, antenna phasing and matching networks in high power communications gear and for dielectric heaters and other high power RF equipment.

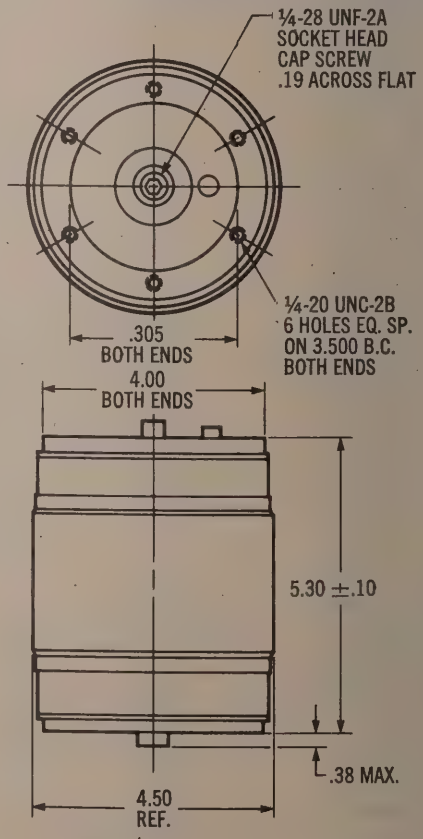
With ceramic envelope construction, they have fixed, concentric capacitor plates, in the core of which is a set of plates attached to a small sealed bellows which is adjusted by a screw. Because the trimmable section conducts only a small portion of the total current, these units have a very large current rating for their size.

SPECIFICATIONS

60 Hz Test Voltage KV, Pk	Model	Capacity Range - pF	Working Voltage KV, Pk	Maximum Current Rating* Amps - RMS
10	CTV3-356-0010	338 - 374	6	150*
10	CTV3-441-0010	419 - 463	6	125*
10	CTV3-480-0010	456 - 504	6	150*
10	CTV3-596-0010	566 - 626	6	125*
10	CTV3-655-0010	622 - 688	6	150*
10	CTV3-789-0010	749 - 829	6	125*
10	CTV3-914-0010	868 - 960	6	150*
10	CTV3-1048-0010	995 - 1100	6	125*
10	CTV3-1195-0010	1135 - 1255	6	150*
10	CTV3-1312-0010	1247 - 1377	6	125*
20	CTV1-86-0020	76 - 96	12	125*
20	CTV1-149-0020	137 - 159	12	125*
20	CTV1-234-0020	220 - 248	12	125*
20	CTV3-247-0020	234 - 260	12	150*
20	CTV1-326-0020	306 - 346	12	125*
50	CTV2-26-0050	18 - 34	35	85
50	CTV2-35-0050	32 - 38	35	125*
50	CTV2-41-0050	34 - 48	35	85
50	CTV2-52-0050	39 - 65	35	85
50	CTV2-80-0050	65 - 95	35	85
50	CTV2-122-0050	107 - 137	35	85

* Current can be increased with forced air cooling, consult factory.
† Patents pending

DIMENSIONAL DRAWING



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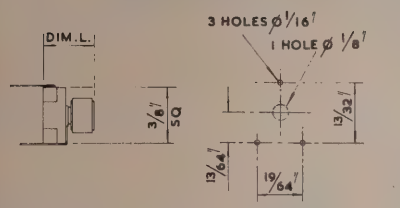
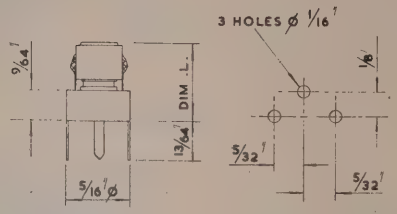
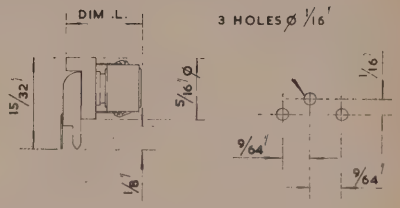
JACKSON BROTHERS (LONDON) LTD



PART Nº	MAX CAP.	MIN CAP.	DIM. L. MAX CAP.	DIM. L. MIN CAP.	TEMP COEFF PPM/°C
5640/PCT	10 pF	<2pF	23/64"	1/2"	+200 ±200
5646	25pF	<2pF	15/32"	23/32"	+200 ±200

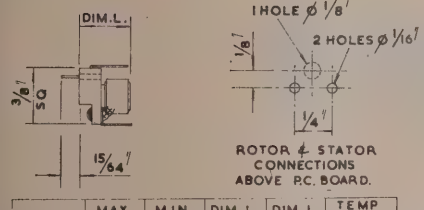


PART Nº	MAX CAP.	MIN CAP.	DIM. L. MAX CAP.	DIM. L. MIN CAP.	TEMP COEFF PPM/°C
6060/VPC	5pF	<2pF	5/16"	13/32"	+250 ± 200
5750/VPC	10pF	<2pF	13/32"	35/64"	+250 ± 200
5890/VPC	15pF	<2pF	7/16"	5/8"	+250 ±200
6030/VPC	20pF	<2pF	9/16"	7/8"	0 ±100

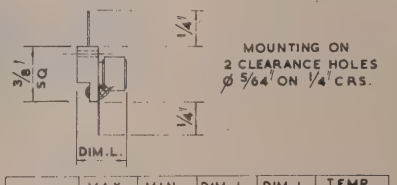


PART Nº	MAX CAP.	MIN CAP.	DIM. L. MAX.CAP.	DIM. L. MIN.CAP.	TEMP COEFF PPM/°C
6060/HPC	5 pF	<2pF	5/16"	13/32"	+250 ±200
5750/HPC	10pF	<2pF	13/32"	35/64"	+250 ±200
5890/HPC	15pF	<2pF	7/16"	5/8"	+250 ±200
6030/HPC	20pF	<2pF	9/16"	7/8"	0 ±100

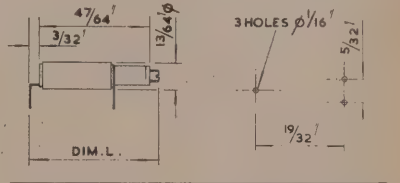
Trimming



PART Nº	MAX CAP.	MIN CAP.	DIM. L. MAX CAP.	DIM. L. MIN CAP.	TEMP COEFF PPM/°C
5640/PM	10pF	<2pF	23/64"	1/2"	+200 ±200



PART Nº	MAX CAP.	MIN. CAP.	DIM. L. MAX CAP.	DIM. L. MIN CAP.	TEMP COEFF PPM/°C
5640	10pF	<2pF	23/64"	1/2"	+200 ±200



PART Nº	MAX CAP.	MIN CAP.	DIM. L. MAX CAP.	DIM. L. MIN CAP.	TEMP COEFF. PPM/°C
4462/HPC	8 pF	0·25pF	29/32"	1 7/32"	-50 ±150

Transmitting

VARIABLE CAPACITORS

Listed above, on this page, is a selection of our highly successful P.T.F.E. dielectric miniature *multi-turn* Trimmer Capacitors. These are widely used in VHF and UHF applications.

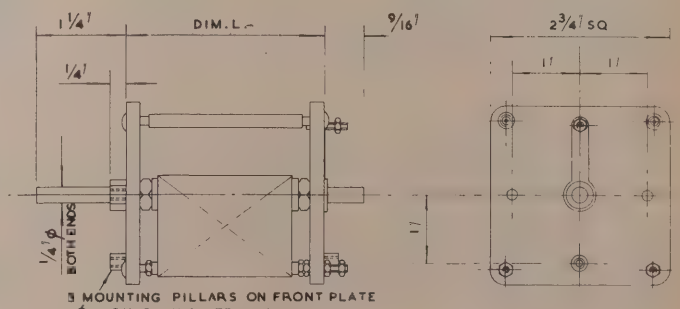
We have also listed, on the right, some of our high voltage air dielectric Variable Capacitors for Transmitter work.

Together these represent a small selection from our comprehensive range of Variable Capacitors, Drive Mechanisms, Stand-Off Insulators and Displacement Transducers.

Full details can be obtained from:

SWEDGAL ELECTRONICS INC.,
258 BROADWAY, NEW YORK, N.Y. 10007, U.S.A.
TEL. NO: (212) 962-5485.

ENGLAND: Jackson Brothers (London) Limited
Kingsway, Waddon, Croydon CR9 4DG. Tel: 01-681 2754



PART Nº.	DIM. L.	MAX CAPACITY IN PF.	MIN CAPACITY IN PF.	VANE THICKNESS	AIR GAP.	TEST VOLTS
5720 / 14	8 3/8"	950	32	·036"	·050"	3 KV
5720 / 13	6 5/16"	650	23	·036"	·050"	3 KV
5720 / 12	4 25/32"	450	20	·036"	·050"	3 KV
5720 / 11	3 39/64"	300	14	·036"	·050"	3 KV
5720 / 10	8 3/8"	1500	35	·036"	·036"	2 KV
5720 / 9	4 11/16"	75	14	·064"	·128"	6 KV
5720 / 8	6 5/16"	100	18	·064"	·128"	6 KV
5720 / 7	8 3/8"	150	26	·064"	·128"	6 KV.
5720 / 6	3 39/64"	150	12	·064"	·064"	4 KV
5720 / 5	4 25/32"	250	20	·064"	·064"	4 KV
5720 / 4	6 5/16"	350	25	·064"	·064"	4 KV
5720 / 3	8 3/8"	500	33	·064"	·064"	4 KV
5720 / 2	6 5/16"	1000	25	·036"	·036"	2 KV
5720 / 1	3 39/64"	500	15	·036"	·036"	2 KV

PART Nº.	DIM. L.	MAX CAPACITY IN PF.	MIN CAPACITY IN PF.	VANE THICKNESS	AIR GAP.	TEST VOLTS
5720/8/SS	6 5/16"	50	15	·064"	·128"	6 KV
5720/7/SS	8 3/8"	75	18	·064"	·128"	6 KV
5720/6/SS	3 39/64"	75	11	·064"	·064"	4 KV
5720/5/SS	6 5/16"	125	15	·064"	·064"	4 KV
5720/4/SS	6 5/16"	150	16	·064"	·064"	4 KV
5720/3/SS	8 3/8"	250	26	·064"	·064"	4 KV
5720/2/SS	6 5/16"	500	23	·036"	·036"	2 KV
5720/1/SS	3 39/64"	250	14	·036"	·036"	2 KV

Johanson Variable Capacitors

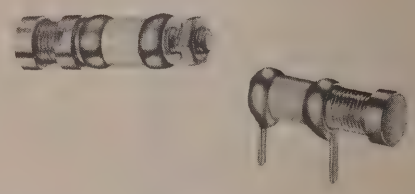
Standard Air Capacitors

- ☐ Capacitance ranges: .8 to 30pf
- ☐ Q's to > 10,000
- ☐ Excellent tuning stability and low dynamic noise
- ☐ Patented* self locking constant torque adjustment mechanism
- ☐ Qualified to MIL-C-14409D, some models QPL approved
- ☐ Engineering prototype kit JK-500

*U.S. Patent No. 3,469,160

Miniature Air Capacitors

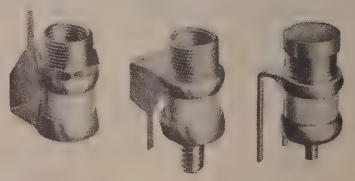
- ☐ Capacitance ranges: .35 to 10pf
- ☐ Q's to > 10,000
- ☐ Patented* self locking constant torque adjustment mechanism
- ☐ Ideal for miniature microwave, VHF and UHF applications
- ☐ Qualified to MIL-C-14409D
- ☐ Engineering prototype kit JK-500



*U.S. Patent No. 3,469,160

Vertical Mount Air Capacitors

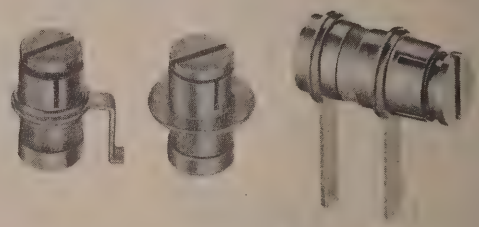
- ☐ Capacitance ranges: .6 to 20pf
- ☐ Q's to > 10,000
- ☐ Space saving advantage over standard printed circuit types
- ☐ Patented* self locking constant torque adjustment mechanism
- ☐ Approximately zero T/C
- ☐ Meets applicable portions of MIL-C-14409D



*U.S. Patent No. 3,469,160

Giga-Trim Capacitors

- ☐ Capacitance ranges 0.2 to 8.0pf
- ☐ Q's over 4000 at 250 MHz
- ☐ Ideal for microwave oscillators and filters
- ☐ Qualification test data available
- ☐ Engineering prototype kit JK-720
- ☐ Meets MIL-C-14409D rotational life requirements

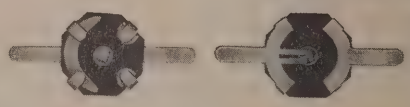


actual size

(JMC 7261)

Thin-Trim Ceramic Capacitors

- ☐ Capacitance value to 40pf
- ☐ Q's to > 3000 at 100 MHz
- ☐ Ideal for sub-miniature hybrid circuit applications
- ☐ MIL-C-81 qualified
- ☐ Zero backlash, square drive tuning
- ☐ Engineering prototype kits JK-940 (5mm size), JK-941 and JK-942 (3mm size)



actual size

(JMC 9403 4mm)

Alternate Lead Styles

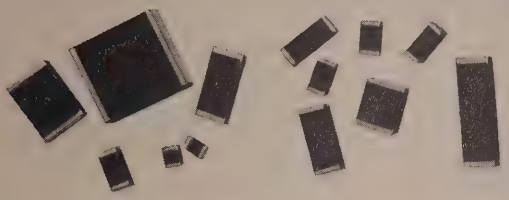
Variable Ceramic Capacitors

- ☐ Low cost
- ☐ Broad tuning range: 5-70pf
- ☐ Top, side and bottom tuning styles available
- ☐ Ideal for crystal oscillators, CATV amplifiers and all varieties of test and communication equipment
- ☐ MIL-C-81 approved
- ☐ Engineering prototype kit JK-930

Johanson

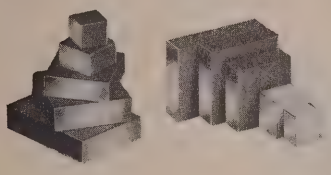
Johanson Manufacturing Corporation
400 Rockaway Valley Road
Boonton, New Jersey 07005
(201) 334-2676
TWX 710-987-8367

Johanson Dielectrics Ceramic Chip Capacitors



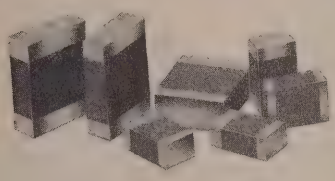
Ultra High Capacitance Chip Capacitors

Fourteen configurations are available in four basic dielectrics: NPO/COG, BX/X7R, Z5U, and Y5V characteristics, to meet MIL-C-55681A and EIA 198B specifications. Capacitors feature high volume efficiency of capacitance, and are ideal for hybrid circuit applications.



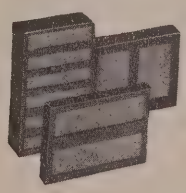
High Voltage Chip Capacitors

Available in either NPO/COG or BX/X7R dielectric, these units are designed to obtain high voltage values to 4000 VDCW. Typical applications include high voltage power supplies and voltage multiplier circuits.



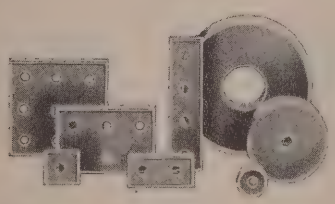
High Q Microwave Chip Capacitors

High Q microwave chip capacitors are available in four basic sizes, displaying excellent performance in the VHF, UHF and microwave ranges. The configuration, insertion loss and resonance-free performance make these chips ideal for microstrip and hybrid MIC applications.



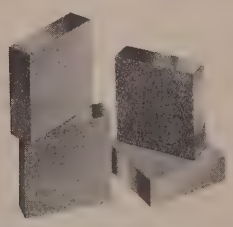
Multiple Capacitor Arrays

Custom designed multiple capacitor elements are ideal for multiple circuit coupling, filtering, bypass and high voltage multiplier circuits. Multiple capacitor arrays are practical replacements for individually bonded chips in hybrid circuits and are available in a variety of dielectric characteristics.



Feed-Thru Capacitors

Designed for use in filter networks and as signal by-pass elements, ceramic feed-thru capacitors are available in circular, square and rectangular (multi-feed-thru) configurations in NPO/COG, BX/X7R, Z5U or Y5V dielectrics.



Ceramic Capacitor Wafers (Single Layer)

Ideally suited for micromodule and miniature hybrid integrated circuits where low profile requirements preclude the use of conventional multilayer chip capacitors. These units are used as by-pass, shifter, blocking and filtering elements, (to 18 GHZ in microwave applications). Custom configurations are also available for high voltage applications to 15 KV.

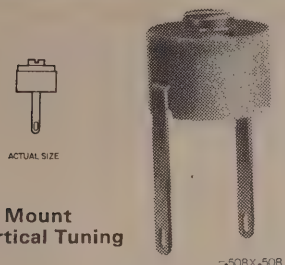
Johanson DIELECTRICS, INC.

Johanson Dielectrics Inc.
2220 Screenland Drive
Burbank, California 91505
(213) 848-4465
TWX 910-498-2735

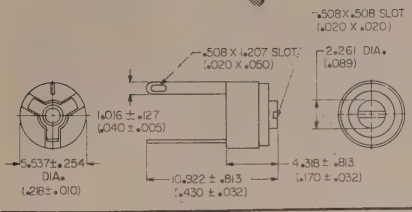
JOHNSON

E. F. JOHNSON COMPANY, WASECA, MINNESOTA 56093

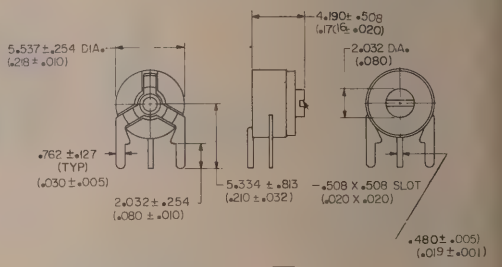
Sub-Miniature Ceramic Disc Trimmers



PC Mount
Vertical Tuning



100 SERIES. This sub-miniature ceramic disc trimmer exhibits extreme environmental stability and long life due to the encapsulation of the rotor plate in titanate. Diameter is .218" on PC Mount Vertical tuning and Horizontal tuning. The stator is high alumina for lower loss and higher strength — a necessity for extreme environmental conditions. Smooth linear tuning is realized by precision lapping of bearing surfaces. Designed to meet or exceed performance criteria of MIL-C-81B. Operating range is −55° to 125° C. NPO temperature characteristics, Type A. Working voltage 100 VDC up to 85°C, 50 VDC up to 125°C. Peak withstanding voltage is greater than twice the working voltage.



PC Mount
Horizontal
Tuning

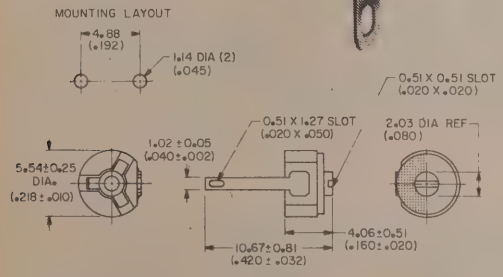
PC Vertical Cat. No.	PC Horizonal Cat. No.	Nominal Capacity (pF) Max.	Min.
274-0009-005	274-0009-105	9.0	2.5
274-0020-005	274-0020-105	20.0	3.5
274-0025-005	274-0025-105	25.0	5.0

Micro J.® 90 Series Trimmer Capacitors

This new low cost sub-miniature ceramic disc trimmer with non-encapsulated rotor plate occupies less than .007 cubic inches and has a diameter of only .218". The stator is high alumina for lower loss and higher strength — a necessity for extreme environmental conditions. Lapped bearing surfaces produce smooth tuning. Peak withstanding voltage is greater than twice the working voltage. Operating range is −55°C to 125°C. Working voltage 100 VDC up to 85°C, 50 VDC to 125°C.

PC MOUNT
VERTICAL TUNING

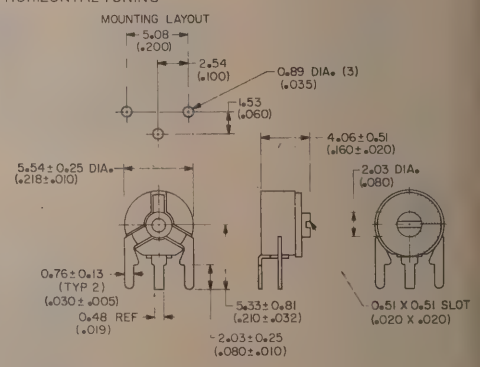
VERTICAL TUNING



Upper dimensions in mm;
lower dimensions () in inches.

PC MOUNT
HORIZONTAL TUNING

HORIZONTAL TUNING



SPECIFICATIONS

Part Number	Capacitance (pF) Min.	Max.	Temperature Characteristics
274-1003-005	1.5	3.0	A
274-1003-105	1.5	3.0	A
274-1009-005	3.0	9.0	A
274-1009-105	3.0	9.0	A
274-1015-005	4.5	15.0	C
274-1015-105	4.5	15.0	C
274-1022-005	7.0	22.0	G
274-1022-105	7.0	22.0	G

TEMPERATURE CHARACTERISTICS
(Percent Change from 25°C)

Dielectric Code	-55°C Min.	Max.	85°C Min.	Max.	125°C Min.	Max.
A	-6.25	+2.0	-2.5	+2.0	-4.2	+3.4
C	-1.0	+6.5	-4.0	-1.0	-6.7	-1.7
G	0.0	+14.0	-8.0	-3.0	-14.0	-5.0

JOHNSON

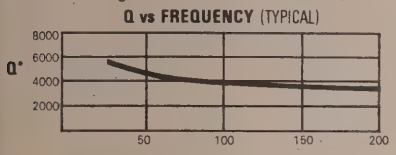
E. F. JOHNSON COMPANY, WASECA, MINNESOTA 56093

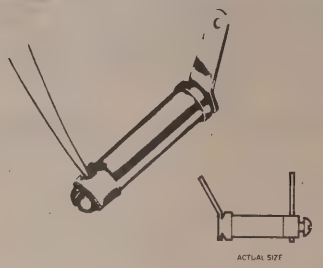
Sub-Miniature Teflon Trimmers

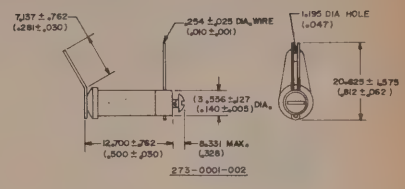
Teflon Dielectric Sub-Miniature Teflon® Trimmers

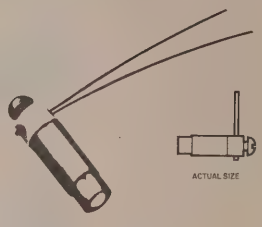
These trimmer capacitors are ideally suited for VHF and UHF applications requiring low minimum capacity and delta C. They provide high resolution and electrical stability. Low temperature coefficient: plus 50 ± 50 ppm/°C. Insulation resistance 10^6 megohms. Temperature range −55° to + 150°C. High resistance to shock and vibration. Metal parts are gold plated. Insulation is Teflon.®

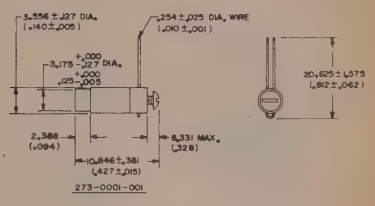
®Teflon is a registered trade name of DuPont





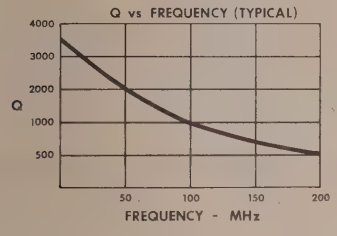






Cat. No.	Mounting	Nominal Capacity (pF) Max.	Nominal Capacity (pF) Min.	Torque Oz. In.	Peak Withstanding Voltage	Adjustment Turns Per Inch
273-0001-001	PC	1.5	.25	.2-3.0	2,000	80
273-0001-002	Solder Lug	1.5	.25	.2-3.0	2,000	80

Micro-T™ Capacitors



This new Micro-T series provides all the advantages of machined plate construction in a substantially size reduced form. PC mount versions mount interchangeably with our Micro-J ceramic trimmers and competitive equivalents.

Metal parts are silver plated and Iridited for excellent conductivity and ease in soldering. Ceramic is 95% high aluminum Grade L-624 or better. Temperature coefficient is a low +45 ±45 ppm/°C. Torque of .5 to 3.5 oz/inches holds rotor securely under vibration.

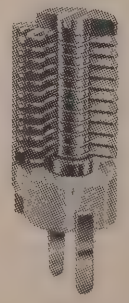
SPECIFICATIONS

Vertical Tuning Cat. No.	Horizontal Tuning Cat. No.	Nominal Capacity (pF) Max.	Nominal Capacity (pF) Min.	Length
PC MOUNT				
186-0603-005	**186-0603-105**	3.0	1.0	.29
186-0607-005	**186-0607-105**	6.5	1.2	.37
186-0613-005	**186-0613-105**	12.7	1.5	.54
186-0419-005	**186-0419-105**	19.0	1.6	.50

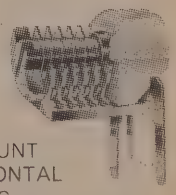
Vertical Tuning Cat. No.	Horizontal Tuning Cat. No.	Nominal Capacity (pF) Max.	Nominal Capacity (pF) Min.	Length
STRIPLINE MOUNT				
186-0603-175	**186-0603-165**	3.0	1.0	.29
186-0607-175	**186-0607-165**	6.5	1.2	.37
186-0613-175	**186-0613-165**	12.7	1.5	.54
186-0419-175	**186-0419-165**	19.0	1.6	.50

NOTE: **Peak Withstanding Voltage**

186-0600 Series	**150V**
186-0400 Series	**100V**

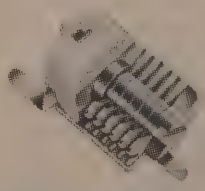


PC MOUNT
VERTICAL TUNING



PC MOUNT
HORIZONTAL
TUNING

STRIPLINE MOUNT
VERTICAL TUNING



STRIPLINE MOUNT
HORIZONTAL TUNING

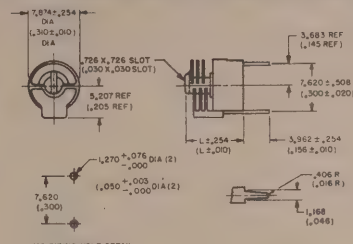
JOHNSON

E. F. JOHNSON COMPANY, WASECA, MINNESOTA 56093

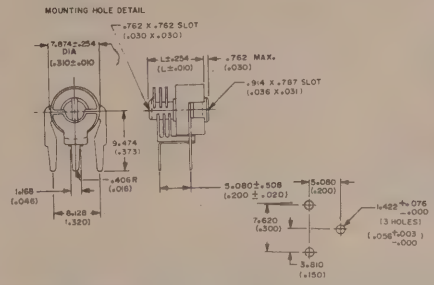
Air Variable Capacitors

Johnson sub-miniature air variable capacitors are available in a variety of sizes, mounting configurations and section types. Rotors and stators are precision machined from one piece of solid brass for outstanding stability, uniformity and freedom from moisture entrapment. They offer high "Q" . . . typically 2000 @ 150 MH_2 and exceptionally low temperature coefficient: Type T plus 30± 15 ppm/°C; Type U plus 45± 15 ppm/°C. Metal parts are silver-plated. Types U and V ceramic are steatite grade L-423 or better. Type T ceramic is 95% Alumina grade L-624 or better.

ACTUAL SIZE
Vertical
Tuning



ACTUAL SIZE
Horizontal
Tuning

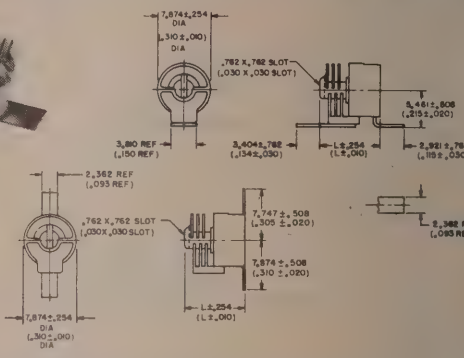


Type "T" Air Variable Capacitors

Designed to meet or exceed E1A-RS 204 and MIL-STD-202C methods 204 A and 201 A. Offer excellent retrace characteristics. Can be supplied with tuning slot on both ends of rotor. High temperature versions available as specials.

ACTUAL SIZE
Horizontal
Tuning

ACTUAL SIZE
Vertical
Tuning



PC Mount

Vert. Tuning Cat. No.	Horiz. Tuning Cat. No.	Nominal Capacity (pF) Max.	Min.	Length (In.)
187-0103-005	187-0303-105	5.4	1.3	.36
187-0106-005	187-0306-105	11.0	1.7	.47
187-0109-005	187-0309-105	15.7	1.9	.58

Stripline Mount

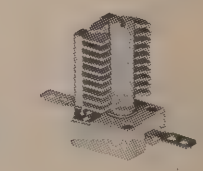
Vert. Tuning Cat. No.	Horiz. Tuning Cat. No.	Nominal Capacity (pF) Max.	Min.	Length (In.)
187-0103-175	187-0103-165	5.4	1.3	.36
187-0106-175	187-0106-165	11.0	1.7	.47
187-0109-175	187-0109-165	15.7	1.9	.58

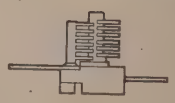
Also available as specials with minimum of 4 plates to maximum of 20 plates.

Type "U" Capacitors

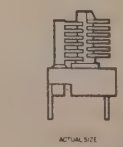
Cat. No.	Nominal Capacity (pF) Max.	Min.	Plates	L ±1/32"	Peak Withstanding Voltage	Air Gap
Two-Hole Mounting / Type "U" Capacitors—Single Section						
189-0501-004	4.2	1.2	4	27/64"	650	.010"
189-0502-004	6.7	1.3	6	15/32"	650	.010"
189-0503-004	9.2	1.4	8	33/64"	650	.010"
189-0504-004	11.6	1.5	10	9/16"	650	.010"
189-0505-004	14.1	1.7	12	39/64"	650	.010"
189-0506-004	16.7	1.8	14	43/64"	650	.010"
189-0507-004	19.3	2.0	16	23/32"	500	.010"
189-0508-004	21.9	2.2	18	49/64"	500	.010"
189-0509-004	24.5	2.4	20	13/16"	500	.010"

Cat. No.	Nominal Capacity (pF) Max.	Min.	Plates	L ±1/32"	Peak Withstanding Voltage	Air Gap
Printed Circuit Mounting / Vertical Type "U" Capacitors—Single Section						
189-0501-005	4.2	1.2	4	27/64"	650	.010"
189-0502-005	6.7	1.3	6	15/32"	650	.010"
189-0503-005	9.2	1.4	8	33/64"	650	.010"
189-0504-005	11.6	1.5	10	9/16"	650	.010"
189-0505-005	14.1	1.7	12	39/64"	650	.010"
189-0506-005	16.7	1.8	14	43/64"	650	.010"
189-0507-005	19.3	2.0	16	23/32"	500	.010"
189-0508-005	21.9	2.2	18	49/64"	500	.010"
189-0509-005	24.5	2.4	20	13/16"	500	.010"

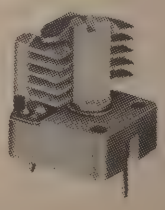


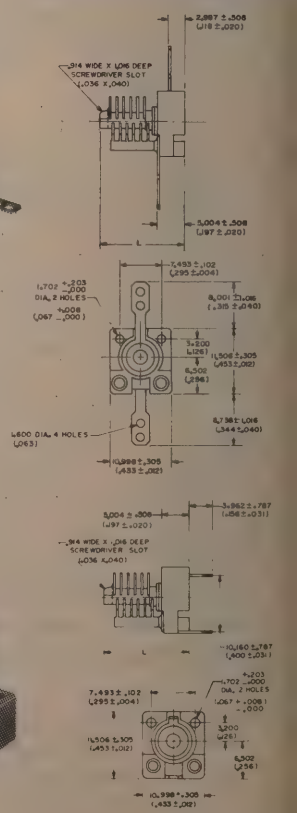


ACTUAL SIZE



ACTUAL SIZE





Fairmont...First in capacitors and resistors

At Fairmont, we're specialists. We specialize in a limited number of lines, but we maintain depth of product behind these lines. We also specialize in giving the service you need when you need it, hard-to-find or discontinued parts, and established reliability components.

Capacitors

Acushnet Capacitor
ADI
Aerovox
American Components Inc. (A.C.I.)
Arco
Callins Industries (I.E.I.)
Cal-R
Centralab
Cornell Dubilier
Elmenco
General Instrument/Miconics
Gulton Industries
Hilton
I.E.I. (Callins Industries)
J.F.D.
Mallory
NCI
Nytronics
Republic Electronics (Mucon)
Sakata
San Fernando (West-Cap)
Sangamo
Skottie
Sprague
Tansitor
Voltronics
West/Cap (San Fernando)

Resistors, Potentiometers & Trimmers

Airco/Speer
ADI
American Components (A.C.I.)
Cal-R
Clarostat
CTS
Dale
I.R.C./T.R.W.
Memcor
Nytronics (Sage)
Sakata
Sprague
Tepro of Florida
Wagner (Vamister)
Welwyn
Weston Components

Specialty Lines

Adtech Power (Power Supplies)
Airco Speer (Jeffers)—R.F. Choke
Alpha Wire & Cable
Amphenol
AND Light Emitting Diodes
Applied Engineering (A.E.P.) Connectors
Arco Relays and Connectors
Bussman
C&K Switch
EDI—Electronic Devices, Inc.
Excel
Globe Gel Cel Rechargeable Batteries
Gulton Ind. (Thermistors)
I.P.I. Illuminated Products
Littelfuse
Loctite Adhesives
J. W. Miller
Nytronics Inductors
Otto Controls
Pamotor
Polaroid Industrial Film and Cameras
Rodan Industries (Thermistors)

Unlike some distributors who carry a little of everything, we carry a lot of a few. We have in-depth stock of every MIL and INDUSTRIAL part we carry. So when you need more than one of a kind, you won't have to frantically call dozens of people to round up all the parts you need. You'll get them all at Fairmont.

That's because we maintain a computerized parts inventory system that ensures a continual parts availability to all our customers.

Fairmont 516-694-8200

ELECTRONIC SALES CORPORATION

35 South Service Road, Plainview, New York 11803 / TWX-510-224-6445 / Cable Address: FESCO PLAINVIEW

MALLORY

TANTALUM SOLID ELECTROLYTIC CAPACITORS

TYPE	DESCRIPTION	TERMINALS	TEMP. RANGE (°C)	VOLTAGE RANGE (WVDC)	CAP. RANGE (μF)	STANDARD TOLERANCE (% μF)	CASE SIZES DIA.xLGTH. (INCHES) HxWxD (INCHES)	FEATURES	TIB*
TAS TXA	Metal Tubular, Axial Lead Hermetic Seal	Wire Leads 22 AWG 24 AWG	−80 to +125	6 to 75	.0047 to 1000	±5 ±10 ±20	.125x.250 .175x.438 .279x.650 .341x.750	Standard Capacitance - TAS Extended Capacitance - TXA Low DC Leakage Temperature Stable High Capacity Long Shelf Life	4-801 4-801A
TAE	Metal Tubular, Epoxy Fill Axial Lead	Wire Leads 22 AWG 24 AWG	−55 to +85	6 to 75	.0047 to 1000	±10 ±20	.126x.265 .175x.325 .175x.452 .279x.650 .341x.750	High Shock & Vibration Capability	4-85
TER	Mylar Sleeved Metal Tubular, Axial Lead Hermetic Seal	Wire Leads 22 AWG 24 AWG	−55 to +125	6 to 75	.0047 to 1000	±5 ±10 ±20	.135x.286 .185x.474 .289x.686 .351x.786	MIL-C-39003D CSR13, 23, 33 High Reliability	4-813
THF	Mylar Sleeved Metal Tubular, Axial Lead Hermetic Seal	Wire Leads 22 AWG	−80 to +125	6 to 50	5.6 to 300	±10 ±20	.289x.686 .351x.786	4.5 Amps Ripple Capability, Low ESR at High Freq. from 1 kHz-100 kHz	4-805
TIM	Rectangular Molded Epoxy Radial Lead	Wire Leads Single Ended 22 AWG 24 AWG	−55 to +125	3 to 50	.082 to 220	±10 ±20	.340x.228x.105 .225x.285x.170 .335x.360x.170 .375x.600x.195	High Density Mounting Automatic Insertion Capability	4-806
TAC	Molded Epoxy Tubular, Axial Lead	Wire Leads 22 AWG 24 AWG	−55 to +125	3 to 50	.082 to 330	±10 ±20	.105x.300 .148x.350 .180x.350 .200x.540 .310x.720 .375x.885	Automatic Insertion Capability High Shock & Vibration Capability	4-806
TDM	Epoxy Dipped, Rectangular Radial Lead	Wire Leads Single Ended 24 AWG	−55 to +85	6 to 50	.10 to 330	±10 ±20	.27x.27x.18 .33x.32x.21 .37x.40x.22 .40x.40x.25 .46x.48x.32 .56x.58x.32	Low Profile Low Cost High Volumetric Efficiency	4-814
TDC	Plastic Dipped, Radial Lead	Wire Leads LD Spacing .125 & .250	−55 to +85	6 to 50	.10 to 1000	±10 ±20	.17x.35 .25x.50 .35x.65 .40x.75	Low Cost Extended Capacitance Temp. Stable Long Storage Life	4-810A
TDL	Plastic Dipped, Radial Lead	Wire Leads LD Spacing .10 & .20	−55 to +85	3 to 50	.10 to 680	±10 ±20	.18x.28 .20x.30 .26x.36 .34x.40 .40x.56 .44x.68	Low Cost Low Profile Long Storage Life	4-810A
HAT	Plastic Filled Metal Tubular, Axial Lead	Wire Leads	−55 to +85	6 to 100	.027 to 47	±10 ±20	.07x.12 .07x.17 .10x.25 .14x.25	Subminiature High Volumetric Efficiency	4-812

* Technical Information Bulletin

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MALLORY

TANTALUM WET SLUG CAPACITORS

TYPE	DESCRIPTION	TERMINALS	TEMP. RANGE (°C)	VOLT. RANGE (WVDC)	CAP. RANGE (μF)	STD. TOL. (% μF)	CASE SIZES DIA. x LGTH. (Inches) H x W x D (Inches)	FEATURES	TIB*
TLX	Silver Tubular, Axial Lead, Hermetic Seal Mylar Sleeve	Wire Leads 22 AWG	−55 to +125	6 to 125	1.7 to 2200	±5 ±10 −15 +20 −15 +30 −15 +50	.219 x .515 .312 x .703 .406 x .828 .406 x 1.12	MIL-C-39006 CLR65 & CLR69 High CV Long Life High Reliability	4-607
TLS	Silver Tubular, Axial Lead Elastomer Seal	Wire Leads 22 AWG	−55 to +125	6 to 125	1.7 to 2200	±5 ±10 −15 +20 −15 +30 −15 +50	.188 x .453 .281 x .644 .375 x .766 .375 x 1.06	MIL-C-3965 Styles CL64 & CL65, Low DCL Wide Temp. Range	4-605
CTL	Copper Alloy Tubular, Axial Lead, Elastomer Seal	Wire Leads 22 AWG	−55 to +125	6 to 125	3.6 to 1200	±10 −15 +20 −15 +30 −15 +50	.188 x .453 .281 x .644 .375 x .766 .375 x 1.06	Low Cost Low DCL Wide Temp. Range	4-610
CMT	Copper Alloy Tubular, Red Plastic, Case Insulated	Wire Leads 24 AWG	−55 to +85	6 to 60	1 to 450	±20	.115 x .300 .115 x .403 .145 x .600 .225 x .778	Low Cost, High Cap, Miniature Size	4-609
MTP	Silver Tubular, Red Plastic, Axial Lead Case Insulated	Wire Leads 24 AWG	−55 to +85	6 to 60	3.3 to 470	±20	.115 x .300 .115 x .403 .145 x .600 .225 x .778	High Cap, Miniature Size	4-606
TAP	Silver Tubular, Black Plastic, Axial Lead Case Insulated	Wire Leads 24 AWG	−55 to +85	6 to 90	2 to 330	−15 +75 −15 +50 −15 +20 −10 +20 ±10	.226 x .504 .226 x .560 .226 x .847	Low ESR, Miniature Size	4-602
TNT	Silver Tubular, Yellow Plastic, Axial Lead Case Insulated	Wire Leads 24 AWG	−55 to +85	3 to 50	2 to 80	−15 +75	.163 x .347 .163 x .472	Low DCL, Miniature Size	4-601
TAH	Silver Tubular, Green Plastic, Axial Lead Case Insulated	Wire Leads 24 AWG	−55 to +125	4 to 60	2 to 330	−15 +75 ±10 −10 +20 −15 +20 −15 +50	.238 x .470 .238 x .600 .238 x .810	Miniature Size, Wide Temp. Range, Low DCL	4-603
XTM XTK XTH XTL XTV	Metal Can, Single or Dual Ended, Hermetic Seal	Wire Leads, Screw, Stud, Solder Lug, Turret	−55 to 200°C	20 to 900	2 to 2200	−15 +75 −15 +50 ±20	.656x.438x1.78 .875x.540x4.06 1.13 x.600x2.81	MIL-C-39006 CLR10, 14 & 17 High Reliability Rugged Construction Very High Temp. High Cap & Voltage	4-501
TL	Metal Case Rectangular, Glass to Metal Seal	Solder Lugs	−55 to +125	15 to 150	70 to 2400	±20	1.062x1.275x.690 1.375x1.275x.690 1.625x1.275x.690 2.000x1.275x.690 2.500x1.275x.690	MIL-C-3965 Style CL55, Low DCL, Wide Temp. Range	4-901

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ALUMINUM ELECTROLYTIC CAPACITORS

TYPE	DESCRIPTION	TERMINALS	TEMP. RANGE (°C)	VOLTAGE RANGE (WVDC)	CAP. RANGE (μF)	STANDARD TOLERANCE (% μF)	CASE SIZES DIA.xLGTH. (INCHES) HxWxD (INCHES)	FEATURES	TIB*
TT	Aluminum Tubular, Axial Lead	Wire Leads	−40 to +85	3 to 150	1 to 4600	−10 +100	.26x .62 to .75 .31x .62 to .75 .37x .62 to 1.50 .44x1.00 to 2.00 .50x1.00 to 2.00 .62x1.00 to 1.50	Miniature, All Welded Construction Low DCL, Low ESR	4-104
TTX	Aluminum Tubular, Axial Lead	Wire Leads	−55 to +85	3 to 150	1 to 2500	−10 +50	.26x .62 to .75 .31x .62 to .75 .37x .62 to 1.50 .44x1.00 to 2.00 .50x1.00 to 2.00 .62x1.00 to 1.50	Miniature, All Welded Construction Low DCL, Low ESR	4-105
TCW	Aluminum Tubular, Axial Lead	Wire Leads	−20 to +85	3 to 450	2 to 36,000	−10 +100	.50x1.12 to 2.12 .62x1.12 to 2.62 .75x1.12 to 2.75 .87x1.37 to 3.12 1.00x1.37 to 3.89	All Welded Construction	4-103
TC	Aluminum Tubular, Axial Lead or Single Ended	Wire Leads, Solder Lugs, PC Lugs	−40 to +85 −30 to +85	50 to 300 301 to 450	10 to 2250 10 to 150	−10 +100 −10 +50	.62x1.12 to 2.62 .75x1.06 to 2.69 .87x1.31 to 2.69 1.00x1.31 to 3.81	Single or Dual Section, Rugged, Choice of Terminals	4-102
TCX	Aluminum Tubular, Axial Lead	Wire Leads	−55 to +105	3 to 150	10 to 26,000	−10 +100 −10 +50	.50x1.12 to 2.12 .62x1.12 to 2.62 .75x1.12 to 2.62 .87x1.12 to 3.12 1.00x1.12 to 3.62	High Temperature Computer Grade Low DCL, Low ESR All Welded Constructeion	0-311
TCG	Aluminum Tubular, Axial Lead	Wire Leads	−40 to +85	3 to 450	2 to 36,000	−10 +75 −10 +50 −10 +100	.50x1.12 to 2.12 .62x1.12 to 2.62 .75x1.12 to 2.62 .87x1.12 to 3.12 1.00x1.12 to 3.62	Computer Grade High Cap, Low DCL, Low ESR All Welded Construction	4-307
VPR	Aluminum Can, Vertical Mount Single Ended	Wire Leads, Plug-in	−55 to +105	3 to 150	22 to 19,000	−10 +100 −10 +50	.50x1.00 to 1.62 .75x1.12 to 3.62 .87x1.12 to 3.62 1.00x1.12 to 3.62	Miniature, All Welded Low DCL, Low ESR Low ESL, High Temperature, High Ripple Current	4-106
FP PFP	Aluminum Can, Twist-Tab or PC Vertical Mount	Solder Lugs, Wire Wrap, PC Lugs	−30 to +85	6 to 450	20 to 44,000	−10 +150 −10 +100 −10 +50	.75x1.50 to 3.00 1.00x1.50 to 4.00 1.37x1.75 to 5.00 1.37x1.50x5.00	Single or Multi-Section	4-101
CGS	Aluminum Can, Bracket Mount	Solder Lugs, Screw Inserts	−40 to +85	3 to 450	10 to 920,000	−10 +75 −10 +50	1.00x1.75 to 4.12 1.37x1.75 to 5.62 1.75x2.12 to 5.62 2.00x2.12 to 5.62 2.50x3.12 to 5.62 3.00x3.62 to 8.62	Computer Grade Low DCL, Low ESR High Performance	4-303

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ALUMINUM ELECTROLYTIC CAPACITORS

TYPE	DESCRIPTION	TERMINALS	TEMP. RANGE (°C)	VOLTAGE RANGE (WVDC)	CAP. RANGE (μF)	STANDARD TOLERANCE (% μF)	CASE SIZES DIA.xLGTH. (INCHES) HxWxD (INCHES)	FEATURES	TIB*
CG	Aluminum Can, Bracket Mount	Solder Lugs, Screw Inserts	−40 to +85	3 to 450	10 to 630,000	−10 +75 −10 +50	1.00x1.75 to 4.12 1.37x1.75 to 5.62 1.75x2.12 to 5.62 2.00x2.12 to 5.62 2.50x3.12 to 5.62 3.00x3.62 to 8.62	Computer Grade Low DCL, Low ESR Long Life	4-304
CGR	Aluminum Can, Bracket Mount	Low or High Post Screw Inserts	−55 to +85	3 to 200	220 to 320,000	−10 +75 −10 +50	1.37x1.75 to 5.62 1.75x2.12 to 5.62 2.00x2.12 to 5.62 2.50x3.12 to 5.62 3.00x3.62 to 5.62	Computer Grade Low DCL, Extremely Low ESR High Ripple Current	4-313
SFC	Aluminum Can, Bracket or Buss-Bar Mount	Buss-Bar Screw	−40 to +85	6 to 50	6800 to 100,000	−0 +100	3.00x4.12 to 5.62	Computer Grade Low DCL, Ultra-Low ESR, Ultra-High Ripple .Capability	4-310
HC NP	Bakelite Case, Single Ended	Screw	−40 to +85	3 to 450 3 to 450NP	65 to 40,000 30 to 32,000	−10 +150 −10 +100 −10 +50 ±25%	1.44x2.75 to 2.06x4.37	Rugged Hi-Pot Case, Versatile Mounting NP—Non-Polar	4-301
QLA	Aluminum Can, 4 Terminal Feed Through	Wire Leads	−55 to +105	5 to 200	50 to 16,000	−10 +75 −10 +50	.75x1.62 to 3.62 .87x1.62 to 3.62 1.00x1.62 to 3.62	High Temperature, Low DCL, Extremely Low ESR, High Ripple Current, Ultra Low ESL	4-107

MOTOR START & MOTOR RUN CAPACITORS

P	Bakelite Case, Round Single Ended	Screw, Solder Lugs, Quick Connect	−40 to +85	AC Volts 110 to 330	21 to 1326	−0 +20	1.44x2.75 to 4.37 1.81x3.37 to 4.37 2.06x3.37 to 4.37 2.56x4.37	Motor Start, Intermittent AC Duty	4-22 & Supl.
CRN	Aluminum or Terne Plate Steel Can, Round Oval & Rectangular, Single Ended	Quick Connect, Solder Lugs	−55 to +70 (PCB Free)	AC Volts 165 to 660	1 to 65	±10% ±6%	1.69x2.16x1.31 to 9.50x3.66x1.97	Motor Run, Continuous AC Duty Non-PCB	4-403

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MALLORY

TANTALUM WET SLUG CAPACITORS

CTL TYPE—LOW COST, MINIATURE, HIGH CAPACITANCE, POLAR

LOWER COST—LOW DC LEAKAGE

The Mallory CTL Capacitor is a low-cost miniature polar wet slug tantalum capacitor in a Mallory proprietary low-cost copper-alloy case. The CTL offers MIL-C-3965C Type CL64 and CL65 ratings at lower cost than the comparable silver case Type TLS.

The CTL is specifically designed for high volumetric efficiency with extremely low d.c. leakage. They are ideally suited for energy storage and critical timing circuits.

The CTL has the same reliable end seal construction as the TLS. This new improved seal was introduced to withstand the extended thermocycling of MIL-C-39006B. A total of 17.86 million unit-hours of storage time have been accumulated with this new seal demonstrating the reliability. No defects have been found thus showing a failure rate of less than .006%/1000 hours with 60% confidence.

The construction of the CTL includes a sintered tantalum anode slug supported on shock pads within the proprietary copper-alloy case. The slug, via an extending tantalum lead wire, is butt welded to a nickel positive lead and surrounded by liquid electrolyte. The case is double-sealed by precision grooving and by roll-crimping onto a special elastomer end bushing and o-ring. Both the nickel positive lead and the copper negative lead are tinned for easy soldering. For additional information send for TIB-4-610.

SPECIFICATIONS

- **Capacitance**
  1.7 to 1200 μF
- **Voltage**
  6 to 125 VDC
- **Tolerance**
  ±5% to +50%/−15%
- **Temperature**
  −55°C to +85/125°C
- **Case Sizes**
  4 sizes .188 x .453 to .375 x 1.062
- **Grade**
  Miniature Industrial

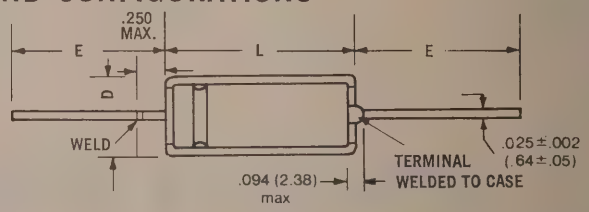
KEY FEATURES

- High Capacitance
- Very Low DC Leakage
- Small Size

APPLICATIONS

- Tight-fit Instrumentation
- Stable Timing Circuits
- Power Filtering & Decoupling
- Audio Coupling & Bypass
- High Charging Current Circuits
- Low Source Impedance Circuits

SIZE AND CONFIGURATIONS



CASE SIZE	UNINSULATED DIAMETER D ±.016 IN. (±.40mm)	UNINSULATED LENGTH L +.031 −.016 IN. (+.80 −.40mm)	INSULATED DIAMETER D MAXIMUM IN. (mm)	INSULATED LENGTH L ±.031 IN. (±.80mm)	E LEAD LENGTH ±.25 IN. (±6.35mm)
A	.188 (4.78)	4.53 (11.51)	.219 (5.56)	.484 (12.30)	1.50 (38.10)
B	.281 (7.14)	.641 (16.28)	.312 (7.94)	.672 (17.07)	2.25 (57.15)
C	.375 (9.53)	.766 (19.46)	.406 (10.32)	7.97 (20.24)	2.25 (57.15)
F	.375 (9.53)	1.062 (26.99)	.406 (10.32)	1.094 (27.78)	2.25 (57.15)

Note: The case insulation shall extend .016 inch minimum, .062 maximum beyond each end. However, when a shrink-fitted insulation is used, it shall lap over the ends of the capacitor body.

MAXIMUM CAPACITANCE—VOLTAGE PER CASE SIZE

CASE SIZE	WORKING VOLTAGE (WVDC) MAXIMUM CAPACITANCE IN μF 6	8	10	15	25	30	50	60	75	100	125
A	68	56	47	33	22	15	10	8.2	6.8	4.7	3.6
B	270	220	180	120	100	68	47	39	33	22	14
C	560	430	390	270	180	150	82	68	56	43	25
F	1200	850	750	540	350	300	160	140	110	86	56

For high-volume applications any capacitance value from 1.7 ΩF to the maximum capacitance of this table may be ordered.

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TANTALUM WET SLUG CAPACITORS

CMT TYPE — LOW COST, SUBMINIATURE

SPECIFICATIONS

- **Capacitance**
  1.0 to 450 μF
- **Voltage**
  6 to 60 VDC
- **Tolerance**
  ±10% & ±20%
- **Temperature**
  −55°C to +85°C
- **Case Sizes**
  4 Sizes .115 x .30 to .225 x .778
- **Grade**
  Miniature Industrial

KEY FEATURES

- High Volumetric Efficiency
- Very Low DC Leakage
- Subminiature Size

APPLICATIONS

- Tight-fit Instrumentation
- Miniature Circuits
- Timing
- Bypass
- Filtering
- Coupling
- Energy Storage

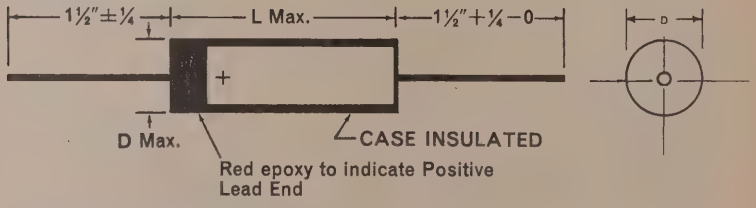
LOWER COST, SUBMINIATURE TUBULAR WET SLUG — POLAR

The CMT Capacitor is a miniature polar wet slug tantalum capacitor in a Mallory-proprietary copper alloy case. The CMT offers significant cost savings over similar miniature capacitors in silver cases such as Mallory MTP and Sprague 146D.

The CMT facilitates the design of high component-density equipment. Its low-profile geometry and high capacitance-voltage product allow considerable savings in printed circuit space. Its excellent high frequency performance and temperature range allow use in a wide variety of circuit applications.

The construction of the CMT includes a sintered tantalum anode positioned on supports within the Malloy-exclusive case. The anode is contacted by liquid electrolyte which is positively sealed in the case by roll crimping on a special elastomer end plug. A solderable nickel lead is welded externally to the tantalum anode riser. An outer insulating sleeve covers the entire case and red epoxy end-fill. The red epoxy covers and strengthens the anode positive lead weld. For additional information send for TIB-4-609.

SIZE AND CONFIGURATIONS



Lead Size: .020" ±.001 Diameter
Lead Material: Positive, Tinned Nickel; Negative, Tinned Copper
Polarity Marking: Plus Signs Around the Anode End

CASE SIZE	LENGTH	DIAMETER	APPROXIMATE WEIGHT (PER UNIT IN GRAMS)
D	.300	.115	0.40
A	.403	.115	0.50
B	.600	.145	1.00
C	.778	.225	2.60

MAXIMUM CAPACITANCE — VOLTAGE PER CASE SIZE

CASE CODE	WORKING VOLTAGE (WVDC) MAXIMUM CAPACITANCE IN μF						
	6	10	15	20	30	50	60
D	15	10	8	6.8	6	4.0	3.3
A	47	30	20	15	10	6.8	5.6
B	180	120	80	60	45	30	22
C	450	300	200	150	120	78	68

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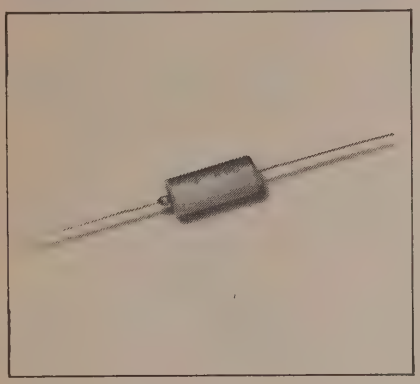
TANTALUM SOLID ELECTROLYTE CAPACITORS

THF TYPE—HIGH RIPPLE PERFORMANCE

FOR SWITCHING REGULATOR POWER SUPPLY APPLICATIONS



ONE REPLACES UP TO FOUR CSR TYPES

The THF solid tantalum capacitor is designed to offer low impedance to ripple current at frequencies above 1 kHz through 100 kHz. Special patented configuration sintered anodes provide lower equivalent series resistance (ESR) at these frequencies in comparison to conventional type solid tantalum capacitors. Lower ESR means lower power losses. Lower power loss characteristics result in savings in space, weight and cost by substituting one THF for as many as four conventional CSR 13 type capacitors to bypass or filter unwanted ripple currents. Ripple Current ratings by part number are shown in the TIB 4-805A. The solid electrolyte combined with the hermetic seal provides an inherently long life time and very stable electrical characteristics over a temperature range of −80°C through 125°C. For additional information send for TIB 4-805A.

SPECIFICATIONS

- **Capacitance**
  5.6 to 330 μF
- **Voltage**
  6 to 50 VDC
- **Tolerance**
  Standard ±20% — ±10% optional
- **Temperature**
  −80°C to +125°C
- **Case Size**
  2 sizes, .29 x .69 & .35 x .79 inches

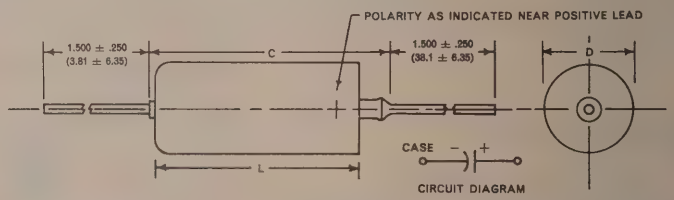
KEY FEATURES

- High Ripple Current
- Low ESR
- Lower Impedance at High Frequencies
- Small Size
- Extremely Stable Capacitance
- Hermetic Seal
- Long Life

APPLICATIONS

- Switching Regulators
- High Frequency Power Supplies
- By-pass Filtering

SIZE AND CONFIGURATIONS



CASE CODE	UNINSULATED CASE DIMENSIONS D +.016 −.010 IN. (+.41 −.25mm)	UNINSULATED CASE DIMENSIONS L ±.031 IN. (±.79mm)	INSULATED CASE DIMENSIONS D +.016 −.010 IN. (+.41 −.25mm)	INSULATED CASE DIMENSIONS L ±.031 IN. (±.79mm)	OVERALL DIMENSIONS C MAX. IN. (mm)	LEAD DIAMETER A +.005 −.001 IN. (+.127 −.025mm)
F	.279 (7.08)	.650 (16.5)	.289 (7.34)	.686 (17.4)	.822 (20.9)	.025 (.635)
G	.341 (8.66)	.750 (19.1)	.351 (8.91)	.786 (19.9)	.622 (23.4)	.025 (.635)

MAXIMUM CAPACITANCE — VOLTAGE PER CASE SIZE

CASE CODE	WORKING VOLTAGE (WVDC) 6	10	15	20	35	50
	MAXIMUM CAPACITANCE IN μF					
F	180	120	68	47	22	18
G	330	220	150	100	47	22

MAXIMUM RIPPLE CURRENT @ 10 kHz PER RATED WORKING VOLTAGE @ 25°C

WVDC	6	10	15	20	35	50
MAXIMUM RMS RIPPLE IN mA	4600	4000	3700	3000	2600	2000

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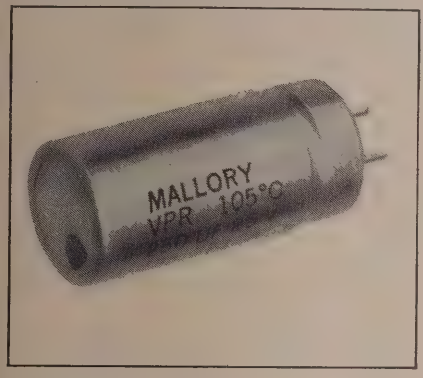
MALLORY

ALUMINUM ELECTROLYTIC CAPACITORS

VPR TYPE — SINGLE-ENDED FOR SWITCHING REGULATORS AND OTHER HIGH FREQUENCY APPLICATIONS

FOR SWITCHING REGULATOR POWER SUPPLY APPLICATIONS



LOW IMPEDANCE AT 10 kHz AND 20 kHz

The VPR is specifically designed for use in high frequency switching regulators where low impedance and low inductance characteristics are required. Low ESR and excellent μF stability allows the VPR to handle high ripple current at high frequency over wide temperature range. These low loss high frequency characteristics make the VPR an ideal by pass and coupling capacitor in EDP equipment.

The VPR is designed for vertical PC mounting with a choice of 5 mounting configurations. The ½" diameter size has standard .200 lead spacing while larger diameter sizes are furnished with 3 leads including a stability lead all positioned for easy standard PC mounting. The ½" diameter size can also be furnished with a stability lead welded to the bottom of the can. For additional information send for Technical Information Bulletin 4-106.

SPECIFICATIONS

- **Capacitance**
  To 20,000 μF
- **Voltage**
  3 to 150 VDC
- **Tolerance**
  −10% +50%, −10% +75%
- **Temperature**
  −55°C to +105°C
- **Case Sizes**
  22 sizes available from ½" x 1" to 1" x 3⅝" for vertical mounting in PC boards
- **Grade**
  Industrial, Computer Grade

KEY FEATURES

- Low Impedance, Low ESR
- Low Inductance
- High Ripple Current Capability
- Wide Operating Temperature Range
- Excellent Temperature Stability
- Can Wall Safety Vent
- Five Different Lead Configurations

APPLICATIONS

- Switching Regulators
- High Frequency Coupling
- By Pass Circuits

VPR CONFIGURATIONS

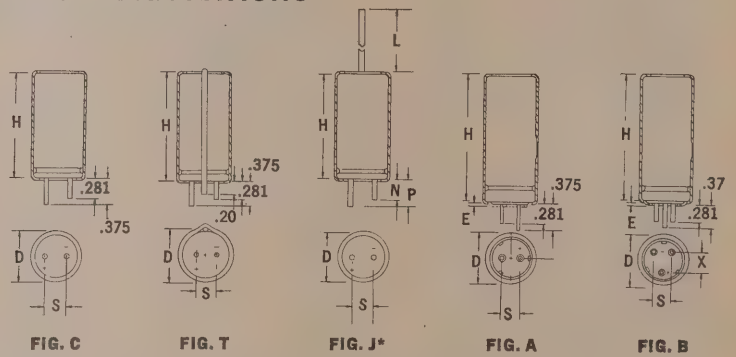


FIG. C FIG. T FIG. J* FIG. A FIG. B

NOTES:
1. Fig. J. Leads N, L, P are furnished 1" long or to length specified
2. Dimension "E" stand-off is nominally 0.100

TABLE OF DIMENSIONS

CASE SIZE	CASE CODE	UNINSULATED D ±.015 IN. (mm)	UNINSULATED H ±.031 IN. (mm)	INSULATED D ±.015 IN. (mm)	INSULATED H ±.015 IN. (mm)	FIG. A S	FIG. B S	FIG. B X	LEAD WIRE SIZE DIA. AWG
½x1	E1A	.500 (12.7)	1.00 (25.4)	.515 (13.1)	1.02 (25.9)				.032 #20
½x1¼	E1E	.500 (12.7)	1.25 (31.8)	.515 (13.1)	1.29 (33.0)				.032 #20
½x1⅝	E1L	.500 (12.7)	1.625 (41.3)	.515 (13.1)	1.64 (41.7)				.032 #20
¾x1⅛	J1C	.750 (19.1)	1.125 (28.6)	.765 (19.4)	1.14 (28.9)	.25	.20	.30	.040 #18
¾x1⅝	J1L	.750 (19.1)	1.625 (41.3)	.765 (19.4)	1.64 (41.7)	.25	.20	.30	.040 #18
¾x2⅛	J2C	.750 (19.1)	2.125 (53.9)	.765 (19.4)	2.14 (54.4)	.25	.20	.30	.040 #18
¾x2⅝	J2L	.750 (19.1)	2.625 (66.7)	.765 (19.4)	2.64 (67.1)	.25	.20	.30	.040 #18
¾x3⅛	J3C	.750 (19.1)	3.125 (79.4)	.765 (19.4)	3.14 (79.8)	.25	.20	.30	.040 #18
¾x3⅝	J3L	.750 (19.1)	3.625 (92.1)	.765 (19.4)	3.64 (92.5)	.25	.20	.30	.040 #18
⅞x1⅛	L1C	.875 (22.2)	1.125 (28.6)	.890 (22.6)	1.14 (28.9)	.30	.25	.40	.040 #18
⅞x1⅝	L1L	.875 (22.2)	1.625 (41.3)	.890 (22.6)	1.64 (41.7)	.30	.25	.40	.040 #18
⅞x2⅛	L2C	.875 (22.2)	2.125 (53.9)	.890 (22.6)	2.14 (54.4)	.30	.25	.40	.040 #18
⅞x2⅝	L2L	.875 (22.2)	2.625 (66.7)	.890 (22.6)	2.64 (67.1)	.30	.25	.40	.040 #18
⅞x3⅛	L3C	.875 (22.2)	3.125 (79.4)	.890 (22.6)	3.14 (79.8)	.30	.25	.40	.040 #18
⅞x3⅝	L3L	.875 (22.2)	3.625 (92.1)	.890 (22.6)	3.64 (92.5)	.30	.25	.40	.040 #18
1x1⅛	N1C	1.00 (25.4)	1.125 (28.6)	1.015 (28.8)	1.14 (28.9)	.40	.30	.40	.040 #18
1x1⅜	N1G	1.00 (25.4)	1.375 (34.9)	1.015 (28.8)	1.39 (35.3)	.40	.30	.40	.040 #18
1x1⅝	N1L	1.00 (25.4)	1.625 (41.3)	1.015 (28.8)	1.64 (41.7)	.40	.30	.40	.040 #18
1x2⅛	N2C	1.00 (25.4)	2.125 (53.9)	1.015 (28.8)	2.14 (54.4)	.40	.30	.40	.040 #18
1x2⅝	N2L	1.00 (25.4)	2.625 (66.7)	1.015 (28.8)	2.64 (67.1)	.40	.30	.40	.040 #18
1x3⅛	N3C	1.00 (25.4)	3.125 (79.4)	1.015 (28.8)	3.14 (79.8)	.40	.30	.40	.040 #18
1x3⅝	N3L	1.00 (25.4)	3.625 (92.1)	1.015 (28.8)	3.64 (92.5)	.40	.30	.40	.040 #18

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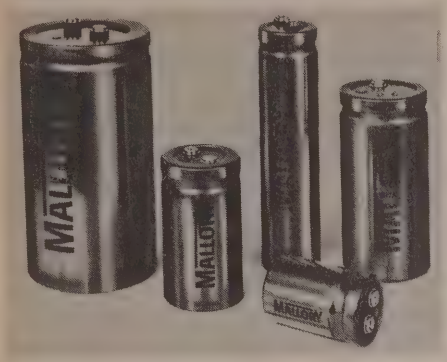
MALLORY

ALUMINUM ELECTROLYTIC CAPACITORS

CGR TYPE—LOW ESR, HIGH-RIPPLE COMPUTER GRADE

FOR SWITCHING REGULATOR POWER SUPPLY APPLICATIONS



The CGR is specifically designed as a low ESR, high ripple current power supply filtering capacitor in a rugged aluminum can with a choice of high or low 10-32 screw insert terminal assemblies. The CGR is outstanding in low ESR and DC leakage current plus high ripple current capability over broad temperature and frequency ranges.

With capacitances up to 320,000 μF and ripple capability up to 35.9 amperes at 20 kHz at +85°C the CGR handles extreme application requirements with ease and reliability. The CGR has been quite successfully utilized as an output capacitor in some high frequency switching regulator power supplies. For applications requiring high capacitance/voltage ratings where specifically low ESR and high ripple are not extremely critical Mallory Type CGS is recommended. For applications requiring exceptionally long life Mallory Type CG excels.

See CGR Bulletin 4-313 for 576 standard design ratings, associated part numbers, basic electrical parameters and typical performance curves.

SPECIFICATIONS

- **Capacitance**
  140 to 320,000 μF
- **16 Voltages**
  3 to 200 WVDC
- **Capacitance Tolerance**
  −10% +50%, −10% +75%
- **Temperature**
  −55°C to +85°C
- **Case Sizes**
  36 Sizes 1.375 x 1.750 to 3.00 x 5.625
- **Grade**
  High Performance

KEY FEATURES

- Safety Vent Construction
- Wide Variety of Cylindrical Case Sizes
- Choice of Terminals High or Low Post, 10-32 Screw Tapped
- High Ripple Capability Up to 35.9 Amps @ 20 kHz and +85°C
- Low ESR/Low Leakage Current
- 576 Standard Design Ratings (Not Normally Stocked But Readily Available)

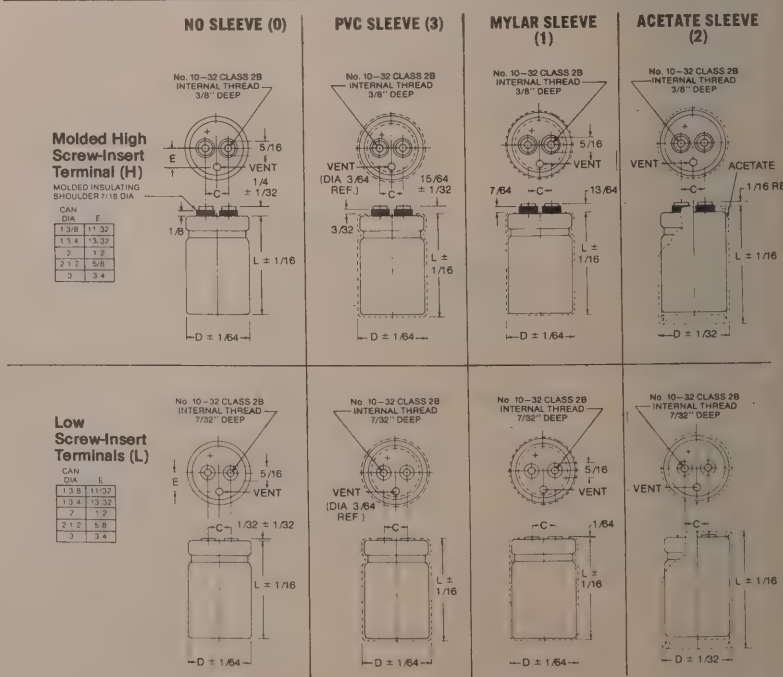
APPLICATIONS

- Computers, Mainframe and Mini
- Hi-Ripple Power Supplies
- Energy Storage Applications
- X-Ray Equipment
- Medical Equipment
- Telecommunication
- Broadcast Equipment
- Industrial Test Equipment
- Power Filtering

SIZE AND CONFIGURATIONS

UNINSULATED CASE SIZES

DIAMETERS	R	U	V	W	X
DIA. CODE	1⅜"	1¾"	2"	2½"	3"
LENGTHS:	R1N 1¾ R2C 2⅛ R2L 2⅝ R3C 3⅛ R3L 3⅝ R4C 4⅛ R4L 4⅝ R5C 5⅛ R5L 5⅝	U2C 2⅛ U2L 2⅝ U3C 3⅛ U3L 3⅝ U4C 4⅛ U4L 4⅝ U5C 5⅛ U5L 5⅝	V2C 2⅛ V2L 2⅝ V3C 3⅛ V3L 3⅝ V4C 4⅛ V4L 4⅝ V5C 5⅛ V5L 5⅝	W3C 3⅛ W3L 3⅝ W4C 4⅛ W4L 4⅝ W5C 5⅛ W5L 5⅝	X3L 3⅝ X4C 4⅛ X4L 4⅝ X5C 5⅛ X5L 5⅝



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MALLORY

ALUMINUM ELECTROLYTIC CAPACITORS

CGR TYPE — LOW ESR, HIGH-RIPPLE COMPUTER GRADE (Cont'd)

FOR SWITCHING REGULATOR POWER SUPPLY APPLICATIONS

TYPICAL CAPACITANCE/VOLTAGE DATA TABLE TYPE CGR STANDARD RATINGS

CAPACITANCE (μF)	CASE SIZE DIA.xLENGTH (INCHES)	MAX. ESR (OHMS) +25°C		MAX. AC RIPPLE CURRENT (AMPS RMS) +85°C		MAX. DCL (mA) +25°C	MALLORY STANDARD PART NUMBER
		120 Hz	20 kHz	120 Hz	20 kHz		
30 Volts DC Working, 45 Volts DC Surge							
2,200	1.375x1.750	.050	.0350	3.8	4.6	0.39	CGR222U030R1N3PH
3,300	1.375x2.125	.033	.0231	5.0	6.0	0.47	CGR332U030R2C3PH
4,800	1.375x2.625	.023	.0161	6.6	7.9	0.57	CGR482U030R2L3PH
4,900	1.750x2.125	.033	.0248	5.7	6.6	0.58	CGR492U030U2C3PH
6,300	1.375x3.125	.018	.0126	8.1	9.7	0.65	CGR632U030R3C3PH
6,800	2.000x2.125	.026	.0195	7.1	8.2	0.68	CGR682U030V2C3PH
7,100	1.750x2.625	.023	.0173	7.5	8.6	0.69	CGR712U030U2L3PH
7,400	1.375x3.625	.015	.0105	9.4	11.3	0.71	CGR742U030R3L3PH
8,900	1.375x4.125	.013	.0091	10.9	13.1	0.78	CGR892U030R4C3PH
9,300	1.750x3.125	.018	.0135	9.3	10.7	0.79	CGR932U030U3C3PH
9,900	2.000x2.625	.018	.0135	9.3	10.7	0.82	CGR993U030V2L3PH
10,000	1.375x4.625	.011	.0077	12.4	14.9	0.82	CGR103U030R4L3PH
11,000	1.750x3.625	.015	.0113	10.7	12.3	0.86	CGR113U030U3L3PH
11,000	1.375x5.125	.010	.0070	13.8	16.6	0.86	CGR113U030R5C3PH
12,000	2.000x3.125	.013	.0098	11.4	13.1	0.90	CGR123U030V3C3PH
13,000	1.750x4.125	.013	.0098	12.4	14.3	0.94	CGR133U030U4C3PH
13,000	1.375x5.625	.009	.0063	15.3	18.4	0.94	CGR133U030R5L3PH
15,000	2.000x3.625	.012	.0090	13.1	15.1	1.01	CGR153U030V3L3PH
15,000	1.750x4.625	.011	.0083	14.1	16.2	1.01	CGR153U030U4L3PH
17,000	1.750x5.125	.010	.0075	15.7	18.1	1.07	CGR173U030U5C3PH
18,000	2.000x4.125	.010	.0075	15.2	17.5	1.10	CGR183U030V4C3PH
19,000	1.750x5.625	.009	.0068	17.4	20.0	1.13	CGR193U030U5L3PH
21,000	2.500x3.125	.010	.0085	15.1	16.3	1.19	CGR213U030W3C3PH
21,000	2.000x4.625	.009	.0068	17.2	19.8	1.10	CGR213U030V4L3PH
24,000	2.000x5.125	.008	.0060	19.2	22.1	1.27	CGR243U030V5C3PH
25,000	2.500x3.625	.009	.0077	17.4	18.8	1.30	CGR253U030W3L3PH
27,000	2.000x5.625	.007	.0053	21.2	24.4	1.35	CGR273U030V5L3PH
30,000	2,500x4.125	.007	.0060	20.1	21.7	1.42	CGR303U030W4C3PH
35,000	3.000x3.625	.008	.0068	20.3	21.9	1.50	CGR353U030X3L3PH
36,000	2.500x4.625	.006	.0051	22.7	24.5	1.50	CGR363U030W4L3PH
41,000	2.500x5.125	.006	.0051	25.3	27.3	1.50	CGR413U030W5C3PH
42,000	3.000x4.125	.007	.0060	23.3	25.2	1.50	CGR423U030X4C3PH
46,000	2.500x5.625	.005	.0043	27.9	30.1	1.50	CGR463U030W5L3PH
49,000	3.000x4.625	.006	.0051	26.4	28.5	1.50	CGR493U030X4L3PH
56,000	3.000x5.125	.005	.0043	29.3	31.6	1.50	CGR563U030X5C3PH
63,000	3.000x5.625	.0045	.0038	32.2	34.8	1.50	CGR633U030X5L3PH

TABLE OF POPULAR STANDARD CGR MAXIMUM CAPACITANCE, SIZE/VOLTAGE RATINGS

For Complete Technical Data See Mallory CGR Bulletin 4-313.

CASE SIZE	CASE CODE	MAXIMUM MFDS PER CASE SIZE RATED DC WORKING VOLTS/SURGE VOLTS							
		6.3/10	7.5/12	16/20	20/30	35/50	75/100	100/135	200/225
1⅜x1¾	R1N	9,000	8,000	5,100	3,000	1,700	550	220	140
1⅜x2⅛	R2C	13,000	12,000	7,700	4,600	2,600	830	330	220
1⅜x4⅛	R4C	36,000	32,000	20,000	12,000	6,900	2,200	900	590
1⅜x5⅛	R5C	48,000	42,000	27,000	16,000	9,200	2,900	1,200	790
1¾x3⅛	U3C	38,000	34,000	21,000	12,000	7,300	2,900	1,100	770
1¾x4⅛	U4C	54,000	48,000	31,000	18,000	10,000	4,100	1,600	1,000
1¾x5⅛	U5C	72,000	64,000	41,000	24,000	13,000	5,500	2,200	1,400
1¾x5⅝	U5L	81,000	72,000	46,000	27,000	15,000	6,200	2,500	1,600
2x3⅛	V3C	53,000	47,000	30,000	17,000	10,000	4,000	1,600	1,000
2x4⅛	V4C	74,000	66,000	42,000	25,000	14,000	5,700	2,300	1,500
2x5⅛	V5C	99,000	88,000	57,000	33,000	19,000	7,600	3,000	2,000
2x5⅝	V5L	110,000	99,000	64,000	37,000	21,000	8,500	3,400	2,200
2½x3⅛	W3C	89,000	79,000	51,000	30,000	17,000	6,800	2,700	1,800
2½x4⅛	W4C	120,000	110,000	72,000	42,000	24,000	9,600	3,900	2,500
2½x5⅛	W5C	160,000	150,000	96,000	56,000	32,000	12,000	5,200	3,400
2½x5⅝	W5L	180,000	160,000	100,000	63,000	36,000	14,000	5,800	3,800
3x4⅛	X4C	170,000	150,000	99,000	58,000	33,000	13,000	5,300	3,500
3x5⅛	X5C	230,000	200,000	130,000	78,000	44,000	17,000	7,100	4,700
3x5⅝	X5L	260,000	230,000	140,000	88,000	49,000	19,000	8,000	5,200

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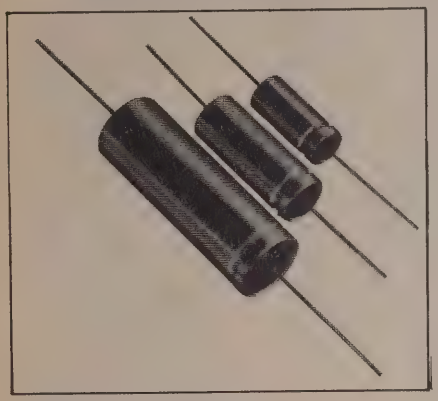
MALLORY

ALUMINUM ELECTROLYTIC CAPACITORS

TCX TYPE—EXTENDED TEMPERATURE RANGE TUBULAR COMPUTER GRADE

FOR SWITCHING REGULATOR POWER SUPPLY APPLICATIONS



LOW ESR AND HIGH RIPPLE CAPABILITY

The TCX is designed as a high performance capacitor of Computer Grade quality and reliability. The use of a special electrolyte system provides low DCL, low ESR, and capacitance stability at extreme low and high operating temperatures. The low-loss characteristics in the TCX provides higher ripple current capability than specified in conventional aluminum electrolytic capacitors.

Mechanical construction features a combination molded plastic and rubber ring end seal to insure a tight positive seal of the capacitor. A pressure sensitive safety vent is formed to a controlled thickness in the capacitor can wall to provide protection in case of overload or voltage reversal applied to the capacitor.

For additional information send for Technical Information Bulletin 0-311.

SPECIFICATIONS

- **Capacitance**
  To 26000 μF
- **Voltage**
  3 to 150 VDC
- **Tolerance**
  −10% +75%, −10% +50%
- **Temperature**
  −55°C to +105°C
- **Case Sizes**
  27 sizes available from ½" x 1⅛" to 1" x 3⅝"
- **Grade**
  Industrial, Computer Grade

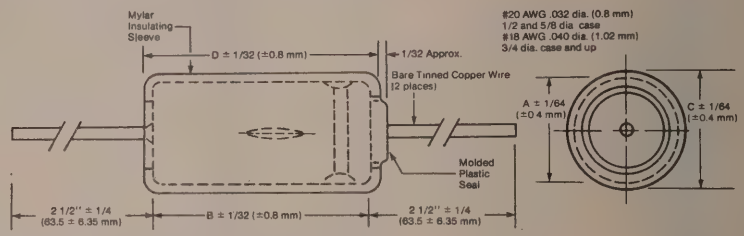
KEY FEATURES

- Low DCL, Low ESR
- High Ripple Current Capability
- Excellent Temperature Stability
- Wide Operating Temperature Range
- Long Life
- Can Wall Safety Vent
- Combination Molded Plastic and Rubber Ring End Seal

APPLICATIONS

- Coupling
- Filtering
- Bypass
- Timing
- Energy Storage

SIZE AND CONFIGURATIONS


Mylar Insulating Sleeve
D ± 1/32 (±0.8 mm)
1/32 Approx.
Bare Tinned Copper Wire (2 places)
#20 AWG .032 dia. (0.8 mm) 1/2 and 5/8 dia. case
#18 AWG .040 dia. (1.02 mm) 3/4 dia. case and up
A ± 1/64 (±0.4 mm)
C ± 1/64 (±0.4 mm)
Molded Plastic Seal
2 1/2" ± 1/4 (63.5 ± 6.35 mm)
B ± 1/32 (±0.8 mm)
2 1/2" ± 1/4 (63.5 ± 6.35 mm)

½, ⅝, ¾, ⅞ and 1" Diameter Container

CASE SIZE	CASE CODE	UNINSULATED A INCHES (mm)	UNINSULATED B INCHES (mm)	INSULATED C INCHES (mm)	INSULATED D INCHES (mm)
½x1⅛	E1C	.500 (12.70)	1.125 (28.57)	.515 (13.10)	1.140 (28.97)
½x1⅜	E1G	.500 (12.70)	1.375 (34.92)	.515 (13.10)	1.390 (35.32)
½x1⅝	E1L	.500 (12.70)	1.625 (41.27)	.515 (13.10)	1.640 (41.67)
½x2⅛	E2C	.500 (12.70)	2.125 (53.97)	.515 (13.10)	2.140 (54.37)
⅝x1⅛	G1C	6.25 (15.87)	1.125 (28.57)	.640 (16.27)	1.140 (28.97)
⅝x1⅜	G1G	6.25 (15.87)	1.375 (34.92)	.640 (16.27)	1.390 (35.32)
⅝x1⅝	G1L	6.25 (15.87)	1.625 (41.27)	.640 (16.27)	1.640 (41.67)
⅝x2⅛	G2C	6.25 (15.87)	2.125 (53.97)	.640 (16.27)	2.140 (54.37)
⅝x2⅝	G2L	6.25 (15.87)	2.625 (56.67)	.640 (16.27)	2.640 (67.07)
¾x1⅛	J1C	.750 (19.05)	1.125 (28.57)	.765 (19.44)	1.140 (28.97)
¾x1⅜	J1G	.750 (19.05)	1.375 (34.92)	.765 (19.44)	1.390 (35.32)
¾x1⅝	J1L	.750 (19.05)	1.625 (41.27)	.765 (19.44)	1.640 (41.67)
¾x2⅛	J2C	.750 (19.05)	2.125 (53.98)	.765 (19.44)	2.140 (54.37)
¾x2⅝	J2L	.750 (19.05)	2.625 (66.67)	.765 (19.44)	2.640 (67.07)
⅞x1⅛	L1C	.875 (22.22)	1.125 (28.57)	.890 (22.62)	1.140 (28.97)
⅞x1⅜	L1G	.875 (22.22)	1.375 (34.92)	.890 (22.62)	1.390 (35.32)
⅞x1⅝	L1L	.875 (22.22)	1.625 (41.27)	.890 (22.62)	1.640 (41.67)
⅞x2⅛	L2C	.875 (22.22)	2.125 (53.97)	.890 (22.62)	2.140 (54.37)
⅞x2⅝	L2L	.875 (22.22)	2.625 (66.67)	.890 (22.62)	2.640 (67.07)
⅞x3⅛	L3C	.875 (22.22)	3.125 (79.37)	.890 (22.62)	3.140 (79.77)
1x1⅛	N1C	1.000 (25.40)	1.125 (28.57)	1.015 (25.80)	1.140 (28.97)
1x1⅜	N1G	1.000 (25.40)	1.375 (34.92)	1.015 (25.80)	1.390 (35.32)
1x1⅝	N1L	1.000 (25.40)	1.625 (41.27)	1.015 (25.80)	1.640 (41.67)
1x2⅛	N2C	1.000 (25.40)	2.125 (53.97)	1.015 (25.80)	2.140 (54.37)
1x2⅝	N2L	1.000 (25.40)	2.625 (66.67)	1.015 (25.80)	2.640 (67.07)
1x3⅛	N3C	1.000 (25.40)	3.125 (79.37)	1.015 (25.80)	3.140 (79.77)
1x3⅝	N3L	1.000 (25.40)	3.625 (92.07)	1.015 (25.80)	3.640 (92.47)

MILLIMETERS ARE IN PARENTHESES

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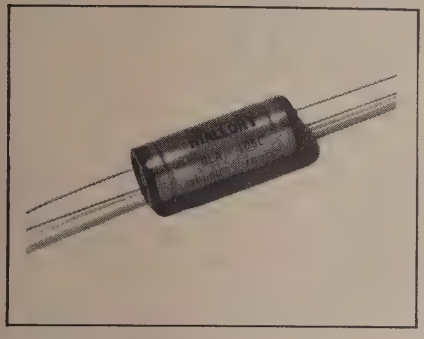
MALLORY

ALUMINUM ELECTROLYTIC CAPACITORS

QLA TYPE—FOUR TERMINAL

FOR SWITCHING REGULATOR POWER SUPPLY APPLICATIONS



LOW INDUCTANCE LOW IMPEDANCE ABOVE 10 kHz

The QLA is an aluminum electrolytic capacitor designed as a four-terminal feed-through device to provide low inductance and low impedance at operating frequencies well above 10 kHz. Conventional two terminal electrolytic capacitors inherently exhibit inductance loss above 10 kHz resulting in instability. The four-terminal QLA offers an inductance limit of 2 nH at 1 MHz making it ideal for use in switching regulators.

The QLA is offered in axial lead form with positive and negative leads at both ends. Either end may be used for the input with the opposite end as the output to filter high frequency ripple. High capacitance values combined with low impedance and inductance losses allows the electrolytic capacitor to be now considered for high frequency applications.

For additional information send for Technical Information Bulletin 4-107.

SPECIFICATIONS

- **Capacitance**
  To 16000 μF
- **Voltage**
  5 to 200 VDC
- **Tolerance**
  −10% +75%, −10% +50%
- **Temperature**
  −55°C to +105°C
- **Case Sizes**
  15 sizes available from ¾" x 1⅝" to 1" x 3⅝"

KEY FEATURES

- Low Inductance Above 10 kHz
- Low Impedance
- High Ripple Current Capability
- Wide Operating Temperature Range
- Can Wall Safety Vent

APPLICATIONS

- Switching Regulators
- High Frequency Coupling

SIZE AND CONFIGURATIONS

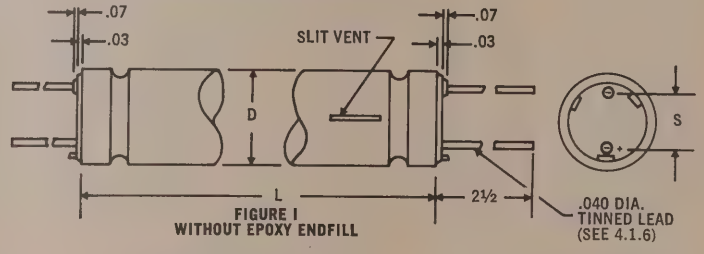


FIGURE I
WITHOUT EPOXY ENDFILL

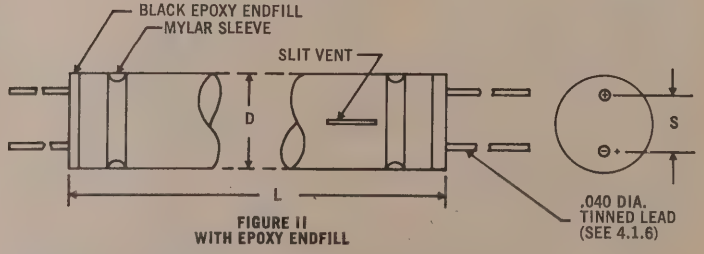


FIGURE II
WITH EPOXY ENDFILL

STANDARD CASE SIZES

CASE SIZE	FIGURE I UNINSULATED D ±.015"	FIGURE I UNINSULATED L ±.031"	FIGURE I INSULATED D +.015" −.031"	FIGURE I INSULATED L ±.062"	FIGURE II EPOXY END SEAL D ±.031	FIGURE II EPOXY END SEAL L (MAX.)	S
¾x1⅝	0.750	1.625	0.770	1.650	0.770	1.843	0.25
¾x2⅛	0.750	2.125	0.770	2.150	0.770	2.343	0.25
¾x2⅝	0.750	2.625	0.770	2.650	0.770	2.843	0.25
¾x3⅛	0.750	3.125	0.770	3.150	0.770	3.343	0.25
¾x3⅝	0.750	3.625	0.770	3.650	0.770	3.843	0.25
⅞x1⅝	0.875	1.625	0.895	1.650	0.895	1.843	0.30
⅞x2⅛	0.875	2.125	0.895	2.150	0.895	2.343	0.30
⅞x2⅝	0.875	2.625	0.895	2.650	0.895	2.843	0.30
⅞x3⅛	0.875	3.125	0.895	3.150	0.895	3.343	0.30
⅞x3⅝	0.875	4.625	0.895	3.650	0.895	3.843	0.30
1x1⅝	1.000	1.625	1.020	1.650	1.020	1.843	0.40
1x2⅛	1.000	2.125	1.020	2.150	1.020	2.343	0.40
1x2⅝	1.000	2.625	1.020	2.650	1.020	2.843	0.40
1x3⅛	1.000	3.125	1.020	3.150	1.020	3.343	0.40
1x3⅝	1.000	3.625	1.020	3.650	1.020	3.843	0.40

MALLORY CAPACITOR COMPANY
a division of P.R. MALLORY & CO. INC. P.O. Box 1284, Indianapolis, Indiana 46206
(317) 856-3731

MALLORY

ALUMINUM ELECTROLYTIC CAPACITORS

CGS TYPE — HIGH-PERFORMANCE COMPUTER GRADE

BETTER PERFORMANCE AND RIPPLE CAPACITY

The CGS Capacitor is a high-performance computer grade aluminum electrolytic capacitor in a rugged aluminum can with a choice of mounting and terminal configurations. The CGS excels in initial electrical performance and high ripple capability.

For capacitors having extremely low ESR and DCL, and for applications requiring low temperature, high frequency and high ripple current capabilities Mallory Type CGR is recommended. For applications requiring exceptionally long life, Mallory Type CG excels. But, for work-horse power filtering and energy storage applications, the CGS is the top performer. With capacitances up to 920,000 μF and ripple capability up to 30 amperes rms at 85°C the CGS handles extreme application requirements with ease.

See Mallory CGS bulletin 4-303A for 996 standard design ratings, a complete application guide, typical performance curves, and full performance characteristics.

SPECIFICATIONS

- **Capacitance**
  25 to 920,000 μF
- **Voltages**
  3 to 450 WVDC
- **Tolerance**
  −10% +50%, −10% +75%
- **Temperature**
  −40°C to +85°C
- **Case Sizes**
  46 Sizes 1 x 1.75 to 3 x 8.625
- **Grade**
  High Performance Industrial

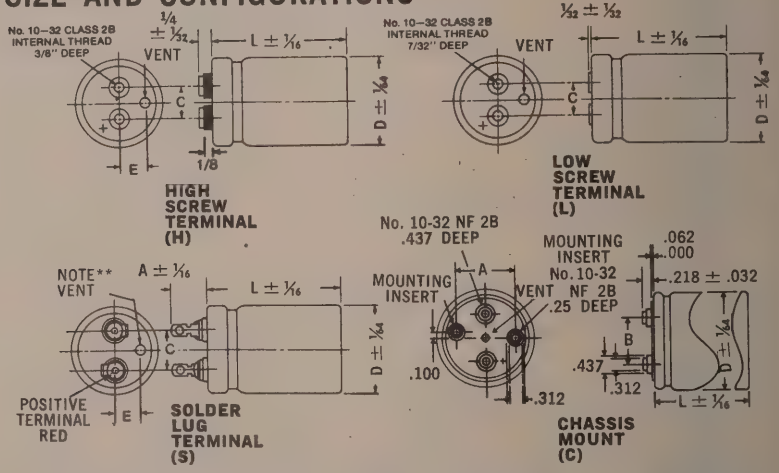
KEY FEATURES

- Safety Vent Construction
- Widest Variety of Cylindrical Case Sizes
- Choice of Terminals — High or Low Screw or Solder Lugs
- Chassis or Buss Mounting
- Long Life/High Ripple
- Low ESR/Low Leakage Current
- 996 Standard Design Ratings (Not normally stocked but readily available)

APPLICATIONS

- Computers, Mainframe and Mini
- Hi-Ripple Power Supplies
- Energy Storage Applications
- Precision X-Ray Equipment
- Reliable Medical Equipment
- Long-Life Telecommunication
- Rugged Broadcast Equipment
- Industrial Test Equipment
- Power Filtering and Decoupling
- Long-Time Timing Circuits
- Audio Coupling and Bypass

SIZE AND CONFIGURATIONS



** NOTE: 1" dia. units incorporate a slit vent in side of can instead of vent in the top.

CAN DIA. "D"	MOUNTING INSERT "A"	ELECTRICAL INSERT "B"
1.75	.752 — .764	.735 — .760
2.0	.885 — .907	.885 — .907
2.50	1.235 — 1.255	1.135 — 1.158
3.0	1.785 — 1.805	1.235 — 1.255

Not available in 1 inch or 1.375 diameters.

OUTLINE DIMENSIONS (INCHES) UNINSULATED CASE SIZES

DIA. CODE	N*	R	U	V	W	X
DIAMETERS	1"	1⅜"	1¾"	2"	2½"	3"
LENGTHS:	N1N 1¾	R1N 1¾	U2C 2⅛	V2C 2⅛	W3C 3⅛	X3L 3⅝
	N2C 2⅛	R2C 2⅛	U2L 2⅝	V2L 2⅝	W3L 3⅝	X4C 4⅛
	N2L 2⅝	R2L 2⅝	U3C 3⅛	V3C 3⅛	W4C 4⅛	X4L 4⅝
	N3C 3⅛	R3C 3⅛	U3L 3⅝	V3L 3⅝	W4L 4⅝	X5C 5⅛
	N3L 3⅝	R3L 3⅝	U4C 4⅛	V4C 4⅛	W5C 5⅛	X5L 5⅝
	N4C 4⅛	R4C 4⅛	U4L 4⅝	V4L 4⅝	W5L 5⅝	X5R 5⅞
		R4L 4⅝	U5C 5⅛	V5C 5⅛		X6L 6⅝
		R5C 5⅛	U5L 5⅝	V5L 5⅝		X7L 7⅝
		R5L 5⅝				X8L 8⅝

* NOTE: 1" diameter solder lug only. All other diameters available with 10-32 tapped inserts or solder lug terminals.

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MALLORY

ALUMINUM ELECTROLYTIC CAPACITORS

CGS TYPE — HIGH-PERFORMANCE COMPUTER GRADE

TYPICAL CAPACITANCE/VOLTAGE DATA TABLE

CAP. μF	CASE SIZE	MAX. ESR (OHMS) 120 Hz +25°C	MAX. AC RIPPLE AMPS ms 120 Hz +85°C	MAX. DCL (mA) +25°C	MALLORY STANDARD PART NUMBER	CAP. μF	CASE SIZE	MAX. ESR (OHMS) 120 Hz +25°C	MAX. AC RIPPLE AMPS ms 120 Hz +85°C	MAX. DCL (mA) +25°C	MALLORY STANDARD PART NUMBER
20 VOLTS DC WORKING, 25 VOLTS DC SURGE											
2,100	1.000x1.750	.32	1.2	1.23	CGS212U020N1N3PS	37,000	2.000x3.625	.028	8.5	5.16	CGS373U020V3L3PH
3,200	1.000x2.125	.21	1.7	1.52	CGS322U020N2C3PS	38,000	1.750x4.625	.023	9.8	5.23	CGS383U020U4L3PH
4,400	1.375x1.750	.16	2.1	1.78	CGS442U020R1N3PH	43,000	1.750x5.125	.020	10.0	5.56	CGS433U020U5C3PH
4,600	1.000x2.625	.15	2.2	1.82	CGS462U020N2L3PS	45,000	2.000x4.125	.023	9.9	5.69	CGS453U020V4C3PH
6,000	1.000x3.125	.11	2.7	2.08	CGS602U020N3C3PS	48,000	1.750x5.625	.018	12.2	5.88	CGS483U020U5L3PH
6,600	1.375x2.125	.11	2.8	2.18	CGS662U020R2C3PH	52,000	2.000x4.625	.020	10.0	6.00	CGS523U020V4L3PH
7,100	1.000x3.625	.095	3.2	2.26	CGS712U020N3L3PS	53,000	2.500x3.125	.023	10.0	6.00	CGS533U020W3C3PH
8,500	1.000x4.125	.079	3.7	2.47	CGS852U020N4C3PS	60,000	2.000x5.125	.018	10.0	6.00	CGS603U020V5C3PH
9,500	1.375x2.625	.075	3.7	2.62	CGS952U020R2L3PH	63,000	2.500x3.625	.019	11.7	6.00	CGS633U020W3L3PH
12,000	1.375x3.125	.057	4.5	2.94	CGS123U020R3C3PH	67,000	2.000x5.625	.016	14.0	6.00	CGS673U020V5L3PH
12,000	1.750x2.125	.070	4.0	2.94	CGS123U020U2C3PH	76,000	2.500x4.125	.016	13.6	6.00	CGS763U020W4C3PH
14,000	1.375x3.625	.049	5.3	3.17	CGS143U020R3L3PH	87,000	3.000x3.625	.020	12.8	6.00	CGS873U020X3L3PH
16,000	2.000x2.125	.062	4.6	3.39	CGS163U020V2C3PH	88,000	2.500x4.625	.014	15.4	6.00	CGS883U020W4L3PH
17,000	1.375x4.125	.041	6.1	3.50	CGS173U020R4C3PH	100,000	2.500x5.125	.012	17.3	6.00	CGS104U020W5C3PH
17,000	1.750x2.625	.049	5.2	3.50	CGS173U020U2L3PH	100,000	3.000x4.125	.017	14.9	6.00	CGS104U020X4C3PH
20,000	1.375x4.625	.035	7.0	3.79	CGS203U020R4L3PH	110,000	2.500x5.625	.011	19.1	6.00	CGS114U020W5L3PH
23,000	1.375x5.125	.031	7.8	4.07	CGS233U020R5C3PH	120,000	3.000x4.625	.014	16.9	6.00	CGS124U020X4L3PH
23,000	1.750x3.125	.037	6.4	4.07	CGS233U020U3C3PH	130,000	3.000x5.125	.013	18.8	6.00	CGS134U020X5C3PH
24,000	2.000x2.625	.043	6.0	4.16	CGS243U020V2L3PH	150,000	3.000x5.625	.011	20.8	6.00	CGS154U020X5L3PH
26,000	1.375x5.625	.027	8.7	4.33	CGS263U020R5L3PH	160,000	3.000x5.875	.011	21.8	6.00	CGS164U020X5R3PH
27,000	1.750x3.625	.032	7.5	4.41	CGS273U020U3L3PH	180,000	3.000x6.625	.009	24.5	6.00	CGS184U020X6L3PH
31,000	2.000x3.125	.033	7.4	4.72	CGS313U020V3C3PH	200,000	3.000x7.625	.008	28.6	6.00	CGS204U020X7L3PH
32,000	1.750x4.125	.027	8.6	4.80	CGS323U020U4C3PH	230,000	3.000x8.625	.007	30.0	6.00	CGS234U020X8L3PH

TABLE OF POPULAR STANDARD CGS MAXIMUM CAPACITANCE, SIZE/VOLTAGE RATINGS

For Complete Technical Data See Mallory CGS Bulletin 4-303A.

CASE SIZE	CASE CODE	MAXIMUM MICROFARADS (μF) PER CASE SIZE — RATED DC WORKING VOLTS/SURGE VOLTS										
		5/7	10/12	15/18	25/30	40/50	60/75	75/95	150/175	200/250	300/350	450/525
1x1¾	N1N	5,800	4,500	3,100	1,500	890	600	400	110	95	40	25
1x2⅝	N2L	12,000	9,700	6,800	3,300	1,900	1,300	870	250	200	90	60
1x4⅛	N4C	23,000	18,000	12,000	6,200	3,500	2,400	1,600	470	380	170	110
1⅜x2⅛	R2C	18,000	13,000	9,700	4,800	2,700	1,800	1,200	360	290	130	85
1⅜x3⅛	R3C	34,000	26,000	18,000	9,000	5,100	3,500	2,300	680	550	250	160
1⅜x4⅛	R4C	48,000	37,000	25,000	12,000	7,300	4,900	3,300	970	780	350	230
1⅜x5⅛	R5C	64,000	49,000	34,000	17,000	9,700	6,600	4,400	1,200	1,000	470	300
1⅜x5⅝	R5L	72,000	55,000	38,000	19,000	10,000	7,400	4,900	1,400	1,100	530	340
1¾x3⅛	U3C	63,000	48,000	33,000	16,000	9,500	6,500	4,300	1,200	1,000	460	300
1¾x4⅛	U4C	89,000	68,000	47,000	23,000	13,000	9,200	6,100	1,700	1,400	650	420
1¾x5⅛	U5C	110,000	91,000	63,000	31,000	18,000	12,000	8,100	2,300	1,900	870	560
1¾x5⅝	U5L	130,000	100,000	71,000	35,000	20,000	13,000	9,100	2,600	2,100	980	630
2x3⅛	V3C	40,000	58,000	40,000	19,000	11,000	7,400	4,800	1,400	1,100	540	350
2x4⅛	V4C	120,000	94,000	66,000	32,000	18,000	12,000	8,400	2,400	2,000	900	580
2x5⅛	V5C	160,000	120,000	88,000	43,000	24,000	17,000	11,000	3,300	2,600	1,200	780
2x5⅝	V5L	180,000	140,000	99,000	49,000	28,000	19,000	12,000	3,700	3,000	1,300	880
2½x3⅛	W3C	120,000	98,000	68,000	33,000	18,000	12,000	8,200	2,400	2,000	1,000	590
2½x4⅛	W4C	200,000	160,000	110,000	55,000	31,000	21,000	14,000	4,100	3,300	1,500	990
2½x5⅛	W5C	270,000	210,000	140,000	73,000	42,000	28,000	19,000	5,500	4,500	2,000	1,300
2½x5⅝	W5L	310,000	240,000	160,000	83,000	47,000	32,000	21,000	6,200	5,000	2,300	1,400
3x4⅛	X4C	280,000	220,000	150,000	76,000	43,000	29,000	19,000	5,700	4,600	2,100	1,300
3x5⅛	X5C	380,000	290,000	200,000	100,000	58,000	39,000	26,000	7,700	6,200	2,800	1,800
3x5⅝	X5L	430,000	330,000	230,000	110,000	65,000	44,000	29,000	8,600	7,000	3,100	2,000
3x8⅝	X8L	640,000	490,000	340,000	170,000	98,000	67,000	44,000				

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MALLORY

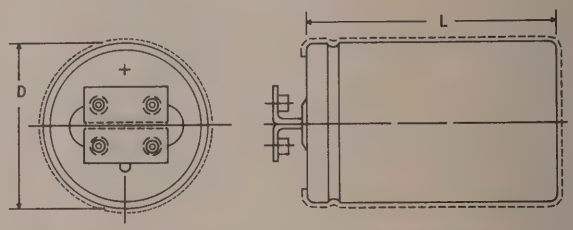
ALUMINUM ELECTROLYTIC CAPACITORS

SFC TYPE—LOW IMPEDANCE AND HIGH RIPPLE CURRENT APPLICATIONS

Design features of the SFC capacitor, including welded plate to terminal connections and massive bus type terminals have made it possible to significantly lower the equivalent series resistance and inductance of the SFC capacitor type as compared to the conventional computer grade capacitor design.

The lower AC loss characteristics of the SFC capacitor are manifested in lower equivalent series resistance, inductance and impedance over a wide frequency range. This improved efficiency makes the SFC an excellent selection for those applications where high ripple current is encountered or where extremely low impedance is required. In some instances, a single SFC capacitor can be used in place of several conventional capacitors.

SIZE AND CONFIGURATIONS



CASE CODE	NO OUTER SLEEVE		OUTER INSULATION		TYPICAL WEIGHT IN GRAMS
	D ±0.031	L ±0.062	D MAX.	L MAX.	
X4C	3.000	4.125	3.078	4.250	555
X5L	3.000	5.625	3.078	5.750	666

STANDARD RATINGS

CAP. MFDS	DC WORKING VOLTAGE	DC SURGE VOLTAGE	CASE SIZE	CATALOG NUMBER*	MAX. ESR (OHMS) 120 Hz	MAX. DCL	MAX. RIPPLE CURRENT IN AMPS @ 85°C		MAX. IMPEDANCE (OHMS) AT 10 kHz & 25°C	CASE CODE
							60 Hz	120 Hz		
56,000	6	8	3x4⅛	SFC563006X4C3	.0025	1.0	30.0	36.0	.0020	X4C
100,000	6	8	3x5⅝	SFC104006X5L3	.0020	1.5	40.0	48.0	.0015	X5L
47,000	7.5	10	3x4⅛	SFC4737R5X4C3	.0030	1.0	28.0	35.0	.0020	X4C
68,000	7.5	10	3x5⅝	SFC6837R5X5L3	.0025	1.5	32.0	40.0	.0015	X5L
33,000	10	15	3x4⅛	SFC333010X4C3	.0030	1.5	25.0	30.0	.0020	X4C
56,000	10	15	3x5⅝	SFC563010X5L3	.0025	2.0	30.0	37.0	.0015	X5L
27,000	15	20	3x4⅛	SFC273015X4C3	.0050	1.8	18.0	24.0	.0040	X4C
39,000	15	20	3x5⅝	SFC393015X5L3	.0035	2.4	24.0	30.0	.0030	X5L
18,000	20	30	3x4⅛	SFC183020X4C3	.0060	2.1	15.0	20.0	.0055	X4C
27,000	20	30	3x5⅝	SFC273020X5L3	.0040	2.7	20.0	26.0	.0035	X5L
15,000	25	40	3x4⅛	SFC153025X4C3	.0075	2.5	13.0	18.0	.0075	X4C
22,000	25	40	3x5⅝	SFC223025X5L3	.0050	3.0	18.0	24.0	.0045	X5L
12,000	30	45	3x4⅛	SFC123030X4C3	.0090	3.0	11.0	16.0	.008	X4C
18,000	30	45	3x5⅝	SFC183030X5L3	.0060	3.5	16.0	22.0	.005	X5L
8,200	40	55	3x4⅛	SFC822040X4C3	.012	3.5	10.0	15.0	.0085	X4C
12,000	40	55	3x5⅝	SFC123040X5L3	.010	4.0	15.0	20.0	.0055	X5L
6,800	50	70	3x4⅛	SFC682050X4C3	.015	5.0	9.0	12.0	.009	X4C
10,000	50	70	3x5⅝	SFC103050X5L3	.012	5.0	12.0	16.0	.006	X5L

* For units without PVC insulation sleeves, substitute "0" for "3" as the last digit in the catalog number.
NOTE: Higher Capacitance Values available. Consult Mallory Capacitor Company.

MALLORY CAPACITOR COMPANY
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Add Dept. EM to address to tell them you saw it in eem

MALLORY

AC-OIL PAPER DIELECTRIC CAPACITORS

NON-PCB TYPE BIONOL Ⓣ CAPACITORS

SPECIFICATIONS

- **Capacitance**
  1 to 60 MFD
- **Voltage**
  170 VAC to 660 VAC
- **Operating Frequency**
  50 to 60 Hertz
- **Capacitance Tolerance**
  ±10% Standard and ±6% Special
- **Dissipation Factor**
  0.6% Max.
- **Case Temperature**
  −55°C to +70°C
- **Case Styles**
  Round, Flat Ovals, Rectangular
- **Case Sizes**
  2" dia. 1¼" FO, 1½" FO, 1¾" FO, 2" FO, and Small Rectangular 1 1/16" to 9½" Heights

KEY FEATURES

- Internal Protector
- Environmentally Acceptable with Biodegradable Dielectric Fluid
- Wide Range of Case Styles and Sizes
- Long Life and High Reliability
- Double Rolled Seams
- Steel Cases

SUGGESTED APPLICATIONS

- Air Conditioning
- Business Machines
- Fan Motors
- Power Supplies
- Refrigeration
- Industrial Control
- Phase Shifting
- H.I.D. Lighting

NON-PCB WITH U.L. RECOGNIZED PROTECTOR

Mallory Bionol Ⓣ capacitors contain a biodegradable dielectric fluid for environmental compatibility. They also incorporate a U.L. recognized internal protective device to minimize the hazard of case rupture in the event of capacitor failure. These capacitors are useful in a variety of applications where continuous operation is required on the normal AC Power source available in home and industry.

They offer good reliability and long life and are designed to meet the intent of EIA Standard RS-454 — characteristic "D." For additional information send for Technical Information Bulletin 4-403.

FOR COMPLETE DETAILS
WRITE FOR TECHNICAL INFORMATION BULLETIN 4-403

MALLORY CAPACITOR COMPANY
a division of P.R. MALLORY & CO. INC. P.O. Box 1284, Indianapolis, Indiana 46206
(317) 856-3731

CALL
(714) 979-8833
OR TWX
FOR PROMPT SERVICE

DIRECT SALES CATALOG

MONOLITHIC CERAMIC CHIP CAPACITORS

CAPACITANCE RANGE

Style	Dimension (Inches) L x W x T (Max).	Dielectric Type: NPO 50 WVDC	NPO 100 WVDC	X7R 50 WVDC	X7R 100 WVDC
MCA	.050 x .040 x .040	18 pF- 390 pF	18 pF- 270 pF	180 pF- .01 μFd	180 PF-4700 pF
MCB	.080 x .050 x .050	18 pF-1000 pF	18 pF- 560 pF	220 pF-.015 μFd	220 pF-5600 pF
MCC	.100 x .050 x .060	18 pF-1500 pF	18 pF-1000 pF	220 pF-.027 μFd	220 pF- .01 μFd
MCD	.120 x .100 x .065	150 pF-5600 pF	150 pF-3900 pF	1500 pF-.120 μFd	1500 pF- .039 μFd
MCE	.050 x .050 x .040	18 pF- 390 pF	18 pF- 270 pF	220 pF-.012 μFd	220 pF-6800 pF
MCF	.080 x .080 x .050	18 pF-1000 pF	18 pF- 560 pF	220 pF-.015 μFd	220 pF- .018 μFd
MCG	.150 x .050 x .050	18 pF-2700 pF	18 pF-1950 pF	120 pF-.047 μFd	120 pF- .02 μFd
MCH	.230 x .250 x .070	100 pF- .027 μFd	100 pF- .01 μFd	4700 pF- .47 μFd	4700 pF- .20 μFd

1% AND 2% CUSTOM TRIMMED TO VALUE
HIGH VOLTAGE CHIP CAPACITORS TAILORED TO YOUR NEEDS.

HOW TO ORDER MCB X 101 K 50 PS

STYLE
MCA
MCB
MCC
MCD
MCE
MCF
MCG
MCH

DIELECTRIC
N = NPO (COG)
X - X7R (BX)

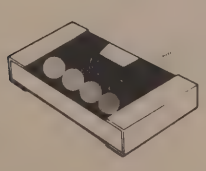
CAPACITANCE VALUE
Two significant figures, Third figure denotes number of zeros. Use "R" to denote decimal point
e.g.
101 - 100 pF

CAPACITANCE TOLERANCE
Standards
J = 5%
K = 10%
M = 20%
Z = +80−20%
Available on request
F = 1%
G = 2%

WORKING VOLTAGE
50 WVDC
100 WVDC

TERMINATION MATERIAL
P = Platinum-Palladium Gold (PtPdAu)
PS = PtPdAu with Solder Dip (SN/62)

COLOR CODE MARKED CHIP CAPACITORS



COLOR DOTS

Custom color code marking of chip capacitors in accordance with EIA standard RS-198 or to your particular color code system. Ask for free samples.

Standard colors are used as specified in the GEN-101 RETMA chart supplied by the Electronic Industries Association. All color coded parts are marked with a permanent marking ink which exceeds all the performance requirements of MIL-STD-202 for chemical resistance.

MICROPLEX. INC.
2126 SOUTH LYON STREET / SANTA ANA, CALIFORNIA 92705 / (714) 979-8833, CALL COLLECT OR TELETYPE
PRECISION MICROELECTRONIC COMPONENTS SINCE 1970

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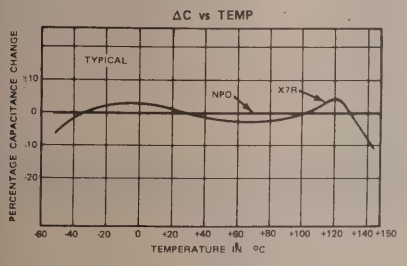
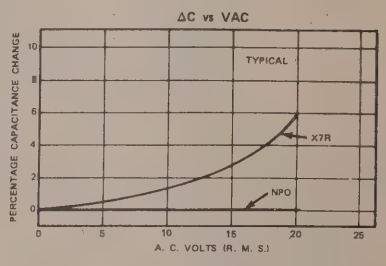
OR TWX
FOR PROMPT
SERVICE

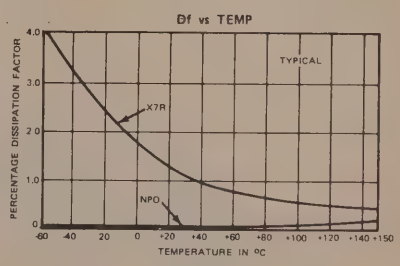
GENERAL SPECIFICATIONS

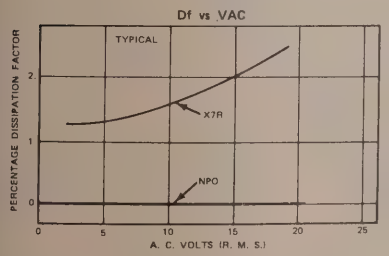
	NPO	X7R
Operating Temperature	−55°C to +125°C	−55°C to +125°C
Capacitance Change	0 ±30 ppm	±15%
Dissipation Factor	.15% @ 1 kHz, 25°C	2.5% max @ 1 kHz, 25°C
Insulation Resistance	100,000 Meg or 1000 Meg/mfd. whichever is less @ 25°C 10,000 Meg or 100 Meg/mfd. whichever is less @ 125°C	100,000 Meg or 1000 Meg/mfd. whichever is less @ 25°C 10,000 Meg or 100 Meg/mfd. whichever is less @ 125°C
Dielectric Withstanding Voltage (Flash Test)	2.5 x WVDC @ 25°C	2.5 x WVDC @ 25°C
Life Test	2.0 x WVDC @ 125°C, 1000 Hrs.	2.0 x WVDC @ 125°C, 1000 Hrs.
Test Conditions for Capacitance and D.F.	1-100 pF @ 1 MHz, ±50 kHz @ 25°C Above 100 pF @ 1 kHz, ±50 Hz @ 25°C	1-100 pF @ 1 MHz, ±50 kHz @ 25°C Above 100 pF @ 1 kHz, ±50 Hz @ 25°C
Test Voltage	1.0 ±.2 VRMS	1.0 ±.2 VRMS
Capacitance Tolerance and Codes	Standard tolerances available J (±5%), K (±10%), M (±20%), Z (−80%−20%) Upon request F (±1%), G (±2%)	J (±5%), K (±10%), M (±20)

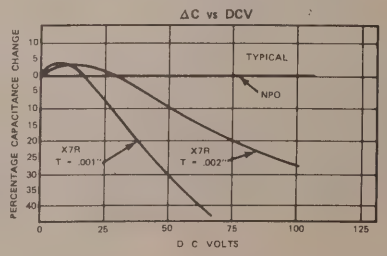
TYPICAL DIELECTRIC CHARACTERISTICS

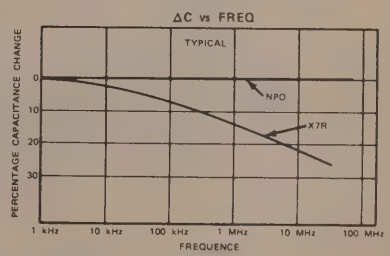


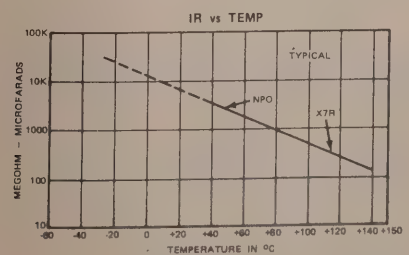


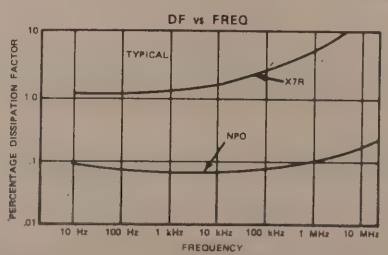












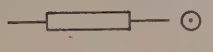
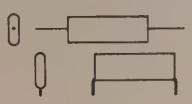
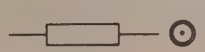
MICROPLEX. INC.
2126 SOUTH LYON STREET / SANTA ANA, CALIFORNIA 92705 / (714) 979-8833, CALL COLLECT OR TELETYPE
PRECISION MICROELECTRONIC COMPONENTS SINCE 1970

INDEPENDENT CABLE/MIDWEC an Eltra company

Capacitors

P.O. BOX 417 • SCOTTSBLUFF, NEBRASKA 69361
Telephone: 308-632-4127 • TWX: 910-627-0061

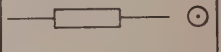
MYLAR FOIL

TYPE	CONFIGURATION	CASE STYLE	CAP RANGE (MFDS)	VOLT RANGE (VDC)
3		Plastic Wrap & Fill	.001 to 2.00	100 to 1000
3F 3FR		Plastic Wrap & Fill	.001 to 2.00	100 to 600
3X		Plastic Wrap & Fill	.010 to 5.00	up to 100
E3F		Epoxy	.001 to 2.00	100 or 200
E3FR		Epoxy	.0010 to 1.00	100 or 200
D3		Epoxy Dip	.001 to .68	100
P3		Phenolic	.001 to 2.00	100 to 600

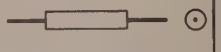
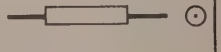
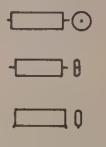
POLYSTYRENE-FOIL

4		Plastic Wrap & Fill	.001 to 1.000	100 to 600

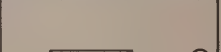
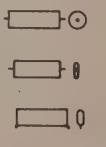
POLYPROPYLENE-FOIL

TYPE	CONFIGURATION	CASE STYLE	CAP RANGE (MFDS)	VOLT RANGE (VDC)
5		Plastic Wrap & Fill	.0001 to 1.000	160

METALLIZED MYLAR

7		Plastic Wrap & Fill	.0047 to 10.00	200 to 600
7T		Plastic Wrap & Fill	.01 to 20.0	100
7X 7XF 7XFR		Plastic Wrap & Fill	.10 to 22.00	100

METALLIZED POLYCARBONATE

12		Plastic Wrap & Fill	.01 to 10.00	100
12X 12XF 12XFR		Plastic Wrap & Fill	.10 to 20.00	50

The above configurations are only a sampling of our standard units available. For more information, write for our catalog.

Specials are our specialty. If you don't see it, ask! We supply a standard line of products; however, we build to your individual needs. Contact us for specific applications.

CATALOGUE DE L'ELECTRONIQUE POUR LES INGENIEURS
DER PRODUKTKATALOG FÜR ELEKTRONIKER
ELECTRONIC ENGINEERS CATALOGUE

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The ELECTRONIC ENGINEERS CATALOGUE is the only comprehensive, trilingual catalogue/source-directory of electronic products available to—and from—Western Europe.

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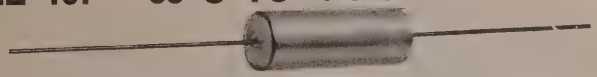
Nytronics Components Group, Inc.
ORANGE STREET, DARLINGTON, S. C. 29532
(803) 393-5421 — TWX 810-665-2182

POLYESTER FILM CAPACITORS

POLYESTER FILM CAPACITORS EXTENDED FOIL/FILM WRAP/EPOXY END FILL STYLE 107 −55°C TO +125°C



ELECTRICAL AND ENVIRONMENTAL CHARACTERISTICS

CAPACITANCE MEASUREMENTS
Capacitors of 1.0 μF or less shall be measured at a frequency of 1000 Hz. Capacitors greater than 1.0 μF shall be measured at 60 Hz. The standard capacitance tolerance is 20%. Other tolerances are available upon request.

Reference: MIL-STD-202, Method 305.

TEMPERATURE CHARACTERISTICS
The maximum change in capacitance from the measured value at +25°C shall be −6% at −55°C, and +15% at +125°C.

DISSIPATION FACTOR
When measured as specified in Paragraph 1, the dissipation factor at +25°C shall not exceed 0.6% for values up to 1.0 μF and shall not exceed 1.0% for greater capacitance values.

INSULATION RESISTANCE
When measured at +25°C, and rated voltage (or 500 VDC, whichever is less), the insulation resistance shall be a minimum of 50,000 megohm-microfarads, but need not exceed 100,000 megohms. The period of electrification shall not exceed two minutes.

Reference: MIL-STD-202, Method 302.

VOLTAGE DERATING
The capacitors may be operated at full rated voltage from −55°C to +85°C, or with linear derating to 50% of rated voltage above +85°C with a maximum temperature of +125°C.

VOLTAGE TEST
When tested at +25°C, the capacitors shall withstand the indicated DC test voltages for a period of one minute:

Terminal to terminal	200% of DC rating
Terminal to case (less than .235 diameter)	200% of DC rating
Terminal to case (greater than .235 diameter)	400% of DC rating or 2,000 VDC, whichever is less

Reference: MIL-STD-202, Method 301.

LIFE TESTING
When tested for 1000 hours at 150% of the appropriate rated voltage for the test temperature, the capacitors shall exhibit no more than one failure in twelve pieces tested. Alternatively, an accelerated +125°C test may be performed at the +85°C voltage rating for a period of 250 hours. A failure is defined as:

a) A capacitance change of more than 10% of its initial value;
b) A dissipation factor greater than that specified in Paragraph 3;
c) An insulation resistance less than ⅓ that specified in Paragraph 4; or
d) A permanent open or short.

VIBRATION
The capacitors will meet or exceed in the vibration requirements of MIL-STD-202, Method 201.

NYTRONICS CATALOG NUMBERING SYSTEM

107 B 103 M

- **107** — Nytronics Style
- **B** — D.C. Voltage Rating: B = 100V, C = 200V, E = 400V, F = 600V
- **103** — Capacitance. In μμf. The first two digits are the significant figures, the third is the number of zeros.
- **M** — Capacitance Tolerance: F = ±1%, P = ±2%, J = ±5%, K = ±10%, M = ±20%

Note: Special capacitance values, voltage ratings and sizes available to customer requirements.

PHYSICAL SIZE TOLERANCES

	100 Volts DC & 200 Volts DC		400 Volts DC	
DIAMETER	Up to .158	+.032 −.000	Up to .218	±.032
	.159 to .200	+.040 −.000	.219 to .500	±.046
	Over .200	+.050 −.000	Over .500	±.062
LENGTH		+1/16 −0		+3/32 −1/16

TINNED COPPERWELD LEADS
No. 22 AWG. (.025) for cases up to .325 Dia.
No. 20 AWG. (.032) for cases .326 thru 1.0 Dia.
No. 18 AWG. (.040) for cases above 1.0 Dia.

Lead Length: 1⅜" Min.

Also available are the following styles with characteristics similar to Type 107.

STYLE 103
Flat Press with Axial Leads
Extended Foil Construction
Polyester Film Dielectric
Film Wrap-Epoxy Endfill
−55°C to +125°C Operation

STYLE 118
Round Body with Axial Leads
Extended Foil Construction
Polyester Film Dielectric
Polyethylene Case-Epoxy Endfill
−55°C to +100°C Operation

STANDARD RATINGS

Capacitance μf	Dia. x Length		Cat. No.
100 VOLTS DC WORKING			
.001	.138	3/8	107B102M
.0015	.138	3/8	107B152M
.0022	.138	3/8	107B222M
.0033	.138	3/8	107B332M
.0047	.138	3/8	107B472M
.0068	.138	3/8	107B682M
.0082	.138	3/8	107B822M
.01	.158	3/8	107B103M
.015	.158	21/32	107B153M
.022	.158	21/32	107B223M
.027	.158	21/32	107B273M
.033	.158	21/32	107B333M
.047	.190	21/32	107B473M
.068	.220	21/32	107B683M
.082	.265	21/32	107B823M
.1	.265	11/16	107B104M
.12	.300	3/4	107B124M
.15	.330	3/4	107B154M
.22	.350	15/16	107B224M
.27	.350	1 1/16	107B274M
.33	.385	1 1/16	107B334M
.39	.415	1 1/16	107B394M
.47	.450	1 1/16	107B474M
.56	.490	1 1/16	107B564M
.68	.540	1 1/16	107B684M
.82	.570	1 1/16	107B824M
1.	.590	1 3/16	107B105M
1.5	.670	1 3/16	107B155M
1.8	.730	1 3/16	107B185M
2.0	.700	1 1/2	107B205M
200 VOLTS DC WORKING			
.001	.138	3/8	107C102M
.0015	.138	3/8	107C152M
.0022	.138	3/8	107C222M
.0033	.138	3/8	107C332M
.0047	.138	3/8	107C472M
.0068	.138	3/8	107C682M
.0082	.138	3/8	107C822M
.01	.158	3/8	107C103M
.015	.158	21/32	107C153M
.022	.158	21/32	107C223M
.027	.158	21/32	107C273M
.033	.158	21/32	107C333M
.047	.190	21/32	107C473M
.068	.220	21/32	107C683M
.082	.265	21/32	107C823M
.1	.265	11/16	107C104M
.12	.285	13/16	107C124M
.15	.315	13/16	107C154
.22	.325	1 1/16	107C224M
.27	.330	1 3/16	107C274M
.33	.360	1 3/16	107C334M
.39	.395	1 3/16	107C394M
.47	.430	1 3/16	107C474M
.56	.465	1 3/16	107C564M
.68	.510	1 3/16	107C684M
.82	.580	1 3/16	107C824M
1.	.590	1 5/16	107C105M
1.5	.680	1 7/16	107C155M
1.8	.740	1 7/16	107C185M
2.0	.750	1 7/16	107C205M
400 VOLTS DC WORKING			
.001	.156	5/8	107E102M
.0015	.156	5/8	107E152M
.0022	.156	5/8	107E222M
.0033	.156	5/8	107E332M
.0047	.187	5/8	107E472M
.0068	.218	5/8	107E682M
.0082	.234	5/8	107E822M
.01	.250	5/8	107E103M
.015	.296	5/8	107E153M
.022	.312	3/4	107E223M
.027	.281	7/8	107E273M
.033	.312	7/8	107E333M
.047	.343	7/8	107E473M
.068	.375	1	107E683M
.082	.406	1	107E823M
.1	.421	1	107E104M
.12	.468	1	107E124M
.15	.468	1 1/4	107E154M
.22	.546	1 3/8	107E224M
.27	.609	1 3/8	107E274M
.33	.593	1 5/8	107E334M
.39	.625	1 5/8	107E394M
.47	.671	1 5/8	107E474M
.56	.718	1 3/4	107E564M
.68	.796	1 3/4	107E684M
.82	.812	1 7/8	107E824M
1.	.812	2	107E105M
1.5	.921	2 1/4	107E155M
1.8	1.015	2 1/4	107E185M
2.0	1.093	2 1/4	107E205M

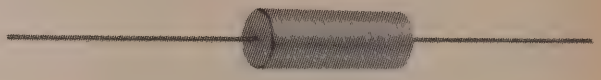
Special capacitance values, tolerances and sizes are available on request.

Nytronics Components Group, Inc.
ORANGE STREET, DARLINGTON, S. C. 29532
(803) 393-5421 — TWX 810-665-2182

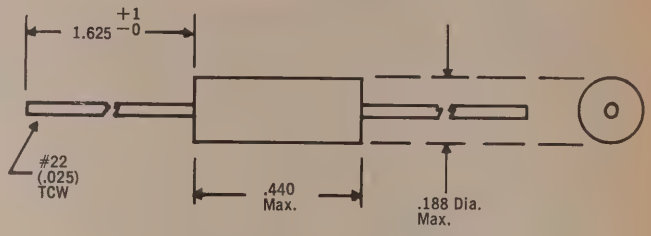
MOLDED MYLAR CAPACITORS

TYPE 111 MOLDED MYLAR* CAPACITORS

MOLDED IN RUGGED FLAME-RETARDANT MOLDING COMPOUND



Nytronics Type 111 Capacitors were developed for applications requiring excellent capacitance stability, superior humidity resistance and high insulation resistance. The capacitor element is non-inductively wound with mylar dielectric and extended foil.



ELECTRICAL AND ENVIRONMENTAL CHARACTERISTICS

CAPACITANCE
Shall be within the specified limits when measured at a frequency of 1 KHz at +25°C.

DISSIPATION FACTOR
Shall not exceed 1% when measured as above.

INSULATION RESISTANCE
When measured at +25°C and with rated voltage applied for 2 minutes, shall be a minimum of 50,000 megohms.

DIELECTRIC STRENGTH
Shall withstand 2.5X rated voltage for one minute.

OPERATING TEMPERATURE
−55°C to +85°C at full rated voltage; derated linearly to 50% of rated voltage at 125°C.

LIFE TEST
250 hours, at +85°C and 150% of rated voltage or, at +125°C with 85°C rated voltage applied. One failure in twelve allowed.

MOISTURE RESISTANCE
Capacitors shall meet the humidity requirements of MIL-STD-202E, Method 106D, 5 cycles.

Capacity MFD†	100 VDC	200 VDC
.001	111B102K	111C102K
.0012	111B122K	111C122K
.0015	111B152K	111C152K
.0018	111B182K	111C182K
.0022	111B222K	111C222K
.0027	111B272K	111C272K
.0033	111B332K	111C332K
.0039	111B392K	111C392K
.0047	111B472K	111C472K
.0056	111B562K	111C562K
.0068	111B682K	111C682K
.0082	111B822K	111C822K
.01	111B103K	

NYTRONICS CATALOG NUMBERING SYSTEM

111 — Nytronics Type

B — D.C. Rated Voltage
B = 100V
C = 200V

103 — Capacitance
In Picofarads. The 1st 2 digits are the significant figures. The 3rd is the number of zeroes.

K — Capacitance Tolerance
J = ±5%
K = ±10%
M = ±20%
Other tolerances available on request.

Intermediate capacitance values available
* Dupont Trade Name
† Other values and sizes available soon; inquiries invited

Nytronics Components Group, Inc.
ORANGE STREET, DARLINGTON, S. C. 29532
(803) 393-5421 — TWX 810-665-2182

POLYSTYRENE CAPACITORS

POLYSTYRENE CAPACITORS

EXTENDED FOIL FILM WRAP/EPOXY END-FILL STYLE 133

−55°C TO +85°C

ELECTRICAL AND ENVIRONMENTAL CHARACTERISTICS

CAPACITANCE MEASUREMENTS
Capacitors of 1.0 μF or less shall be measured at a frequency of 1000 Hz.

Capacitors greater than 1.0 μF shall be measured at 60 Hz.

The standard capacitance tolerance is 20%. Other tolerances are available upon request.

Reference: MIL-STD-202, Method 305.

TEMPERATURE CHARACTERISTICS AND STABILITY
When measured over the full operating range, the Temperature Coefficient shall be −120ppm/°C ±30ppm/°C.

There shall be less than 0.1% change per year in capacitance when operated between +20°C and +50°C.

After cycling from −55°C to +75°C, the capacitance shall not vary more than 0.2% from its initial measurement at +25°C.

DISSIPATION FACTOR
When measured as specified in Paragraph 1, the dissipation factor at +25°C shall not exceed 0.1%.

INSULATION RESISTANCE
When measured at +25°C, and rated voltage (or 500 VDC, whichever is less), the insulation resistance shall be a minimum of 200,000 megohm-microfarads, but need not exceed 500,000 megohms. The period of electrification shall not exceed two minutes.

Reference: MIL-STD-202, Method 302.

VOLTAGE DERATING
The capacitors may be operated at full rated voltage from −55°C to +65°C, or with linear derating to 60% of rated voltage above +65°C to the maximum operating temperature of +85°C.

VOLTAGE TEST
When tested at +25°C, the capacitors shall withstand the indicated DC test voltages for a period of one minute:

Terminal to terminal	200% of DC rating
Terminal to case (less than .235 diameter)	200% of DC rating
Terminal to case (greater than .235 diameter)	400% of DC rating or 2,000 VDC, whichever is less

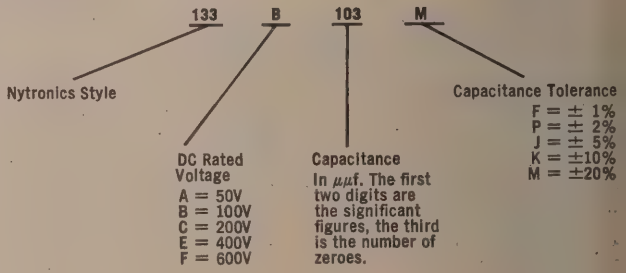
Reference: MIL-STD-202, Method 301.

LIFE TESTING
When tested at 85°C for 250 hours at full 65°C rated voltage, the capacitors shall exhibit no more than one failure in twelve pieces tested. A failure is defined as:

a) A capacitance change of more than 6% of its initial value;
b) A dissipation factor greater than that specified in Paragraph 3;
c) An insulation resistance less than 60% that specified in Paragraph 4; or
d) A permanent open or short.

VIBRATION
The capacitors will meet or exceed the vibration requirements of MIL-STD-202, Method 201.

NYTRONICS CATALOG NUMBERING SYSTEM



Note: Special capacitance values, voltage ratings and sizes available to customer requirement.

Intermediate value available.

STANDARD RATINGS AT 85°C

50 VOLTS DC WORKING

Capacitance MFD	Diameter	Length	Cat. No.
.001	.218	.625	133A102M
.0015	.218	.625	133A152M
.0022	.218	.625	133A222M
.0033	.218	.625	133A332M
.0039	.218	.625	133A392M
.0047	.218	.625	133A472M
.0068	.218	.625	133A682M
.0082	.218	.625	133A822M
.01	.218	.625	133A103M
.015	.260	.625	133A153M
.022	.260	.750	133A223M
.027	.290	.750	133A273M
.033	.325	.750	133A333M
.039	.350	.812	133A393M
.047	.375	.812	133A473M
.068	.390	.937	133A683M
.082	.420	.937	133A823M
.1	.420	.937	133A104M
.12	.460	1.000	133A124M
.15	.460	1.125	133A154M
.18	.500	1.125	133A184M
.22	.600	1.125	133A224M
.27	.655	1.437	133A274M
.39	.703	1.437	133A394M
.47	.734	1.562	133A474M

100 VOLTS DC WORKING

Capacitance μf	Diameter	Length	Cat. No.
.001	.218	.750	133B102M
.0015	.218	.750	133B152M
.0022	.218	.750	133B222M
.0033	.218	.750	133B332M
.0039	.218	.750	133B392M
.0047	.218	.750	133B472M
.0068	.234	.750	133B682M
.0082	.234	.750	133B822M
.01	.296	.750	133B103M
.012	.296	.750	133B123M
.015	.296	.750	133B153M
.022	.318	.875	133B223M
.027	.328	.875	133B273M
.033	.343	.875	133B333M
.039	.359	.875	133B393M
.047	.375	.875	133B473M
.068	.406	1.000	133B683M
.082	.460	1.000	133B823M
.1	.460	1.000	133B104M
.15	.460	1.125	133B154M
.18	.500	1.125	133B184M
.22	.600	1.125	133B224M
.27	.655	1.437	133B274M
.39	.703	1.437	133B394M
.47	.734	1.562	133B474M

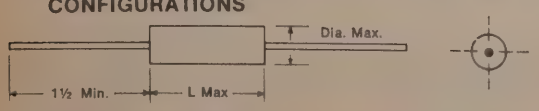
200 VOLTS DC WORKING

Capacitance μf	Diameter	Length	Cat. No.
.001	.218	.750	133C102M
.0015	.218	.750	133C152M
.0022	.218	.750	133C222M
.0033	.218	.750	133C332M
.0039	.218	.750	133C392M
.0047	.218	.750	133C472M
.0068	.234	.750	133C682M
.0082	.234	.750	133C822M
.01	.296	1.000	133C103M
.012	.296	1.000	133C123M
.015	.296	1.000	133C153M
.022	.318	1.000	133C223M
.027	.375	1.000	133C273M
.033	.375	1.000	133C333M
.039	.437	1.125	133C393M
.047	.437	1.125	133C473M
.068	.500	1.125	133C683M
.082	.562	1.375	133C823M
.1	.500	1.375	133C104M
.15	.625	1.375	133C154M
.18	.687	1.375	133C184M
.22	.687	1.812	133C224M
.27	.687	1.812	133C274M
.39	.875	1.812	133C394M
.47	1.000	1.812	133C474M

400 VOLTS DC WORKING

Capacitance μf	Diameter	Length	Cat. No.
.001	.218	.750	133E102M
.0015	.218	.750	133E152M
.0022	.218	.750	133E222M
.0033	.218	.750	133E332M
.0039	.218	.750	133E392M
.0047	.218	.750	133E472M
.0068	.234	.750	133E682M
.0082	.234	.750	133E822M
.01	.320	1.000	133E103M
.012	.320	1.000	133E123M
.015	.400	1.000	133E153M
.022	.400	1.000	133E223M
.027	.450	1.125	133E273M
.033	.450	1.125	133E333M
.039	.515	1.125	133E393M
.047	.515	1.125	133E473M
.068	.562	1.125	133E683M
.082	.562	1.375	133E823M
.1	.640	1.375	133E104M
.15	.640	1.812	133E154M
.18	.700	1.812	133E184M
.22	.750	1.812	133E224M
.27	.750	1.812	133E274M
.39	1.000	1.812	133E474M
.47	1.000	1.812	133E474M

CONFIGURATIONS



LEAD WIRE SIZE

No. 22 AWG. (.025) for cases up to .325 Dia.

No. 20 AWG. (.032) for cases .326 thru 1.0 Dia.

No. 18 AWG. (.040) for cases above 1.0 Dia.

Nytronics Components Group, Inc.
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POLYESTER CAPACITORS

METALLIZED POLYESTER CAPACITORS TYPE 188 FILM WRAP / EPOXY END FILL −55°C TO +125°C

Type 188 Capacitors features extremely small size, light weight and self clearing metallized construction which virtually eliminates catastrophic failures. Well suited for Voltage Multiplier Circuits in TV power supplies and Electrostatic copiers. Also ideal for Potting or encapsulating in Electronic Sub assemblies, Power supplies, etc.

CAPACITANCE
Measurements shall be made at 1000 cycles per second for capacitance values thru 1. MFD and at 60 cycles per second for values over 1. MFD.

CAPACITANCE TOLERANCE
Standard capacitance tolerance is ±20% (M). Closer tolerances available upon request.

DISSIPATION FACTOR
The dissipation factor shall not exceed 1% when measured at 25°C. Measurements shall be made at 1000 Hz for capacitance values thru 1. MF and at 60 Hz for higher values.

TEST VOLTAGE
Capacitors shall withstand 200% of rated DC voltage for one minute at 25°, with the charging and discharge current limited to a maximum of 1. Ampere.

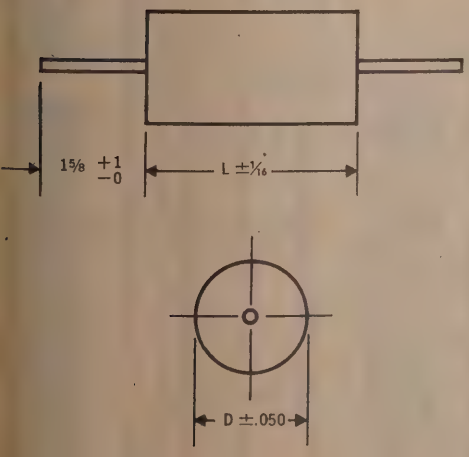
OPERATING TEMPERATURES
−55°C to +125°C.

LIFE TEST
Capacitors shall withstand a life test of 250 hours at 125°C, with 140% of the 125°C rated DC voltage applied. A resistance of one ohm per volt of applied voltage shall be inserted in series with the capacitor.

VOLTAGE DERATING
These capacitors will operate as full DC voltage ratings at 85°C. For operation at temperatures above 85°C, see Figure 4.

VIBRATION
Capacitors shall withstand a vibration test per Method 204, Test condition B of MIL-STD-202B as modified by MIL-C-27287. After test, the I.R. will be equal to or greater than ⅓ of the initial requirement.

HUMIDITY TEST
These capacitors shall meet the humidity test requirements of MIL-STD-202 Method 103B, test condition B. After testing the I.R. will be equal to or greater than ⅓ of the initial requirement.



Lead Sizes
.160 dia. — .250 = .020
.251 dia. — .500 = .025
.501 dia. & over = .032

Capacitance	Diameter	Length	Cat. No.
600 VOLTS DC WORKING			
.010	.20	.53	188F103M
.012	.18	.65	188F123M
.015	.20	.65	188F153M
.018	.22	.65	188F183M
.022	.23	.65	188F223M
.027	.25	.65	188F273M
.033	.28	.65	188F333M
.039	.26	.78	188F393M
.047	.28	.78	188F473M
.056	.30	.78	188F563M
.068	.32	.78	188F683M
.082	.35	.78	188F823M
.10	.33	.97	188F104M
.12	.35	.97	188F124M
.15	.39	.97	188F154M
.18	.44	.97	188F184M
.22	.42	1.17	188F224M
.27	.45	1.17	188F274M
.33	.50	1.17	188F334M
.39	.55	1.17	188F394M
.47	.54	1.45	188F474M
.56	.58	1.45	188F564M
.68	.63	1.45	188F684M
.82	.63	1.68	188F824M
1.0	.69	1.68	188F105M
1.2	.75	1.68	188F125M
1.5	.84	1.68	188F155M
2.0	.83	2.25	188F205M
2.5	.92	2.25	188F255M
3.0	1.00	2.25	188F305M

Capacitance	Diameter	Length	Cat. No.
100 VOLTS DC WORKING			
.010	.16	.40	188B103M
.012	.16	.40	188B123M
.015	.16	.40	188B153M
.018	.16	.40	188B183M
.022	.16	.40	188B223M
.027	.16	.40	188B273M
.033	.16	.40	188B333M
.039	.18	.40	188B393M
.047	.20	.40	188B473M
.056	.16	.53	188B563M
.068	.16	.53	188B683M
.082	.17	.53	188B823M
.10	.19	.53	188B104M
.12	.20	.53	188B124M
.15	.19	.65	188B154M
.18	.21	.65	188B184M
.22	.23	.65	188B224M
.27	.25	.65	188B274M
.33	.27	.65	188B334M
.39	.29	.65	188B394M
.47	.26	.78	188B474M
.56	.28	.78	188B564M
.68	.30	.78	188B684M
.82	.33	.78	188B824M
1.0	.36	.78	188B105M
1.2	.34	.97	188B125M
1.5	.37	.97	188B155M
2.0	.42	.97	188B205M
2.5	.42	1.17	188B255M
3.0	.45	1.17	188B305M
3.5	.49	1.17	188B355M
4.0	.52	1.17	188B405M
4.5	.49	1.45	188B455M
5.0	.52	1.45	188B505M
200 VOLTS DC WORKING			
.010	.16	.40	188C103M
.012	.17	.40	188B123M
.015	.19	.40	188C153M
.018	.21	.40	188C183M
.022	.16	.53	188C223M
.027	.17	.53	188C273M
.033	.19	.53	188C333M
.039	.20	.53	188C393M
.047	.18	.65	188C473M
.056	.20	.65	188C563M
.068	.21	.65	188C683M
.082	.23	.65	188C823M
.10	.25	.65	188C104M
.12	.27	.65	188C124M
.15	.30	.65	188C154M
.18	.27	.78	188C184M
.22	.30	.78	188C224M
.27	.32	.78	188C274M
.33	.35	.78	188C334M
.39	.33	.97	188C394M
.47	.35	.97	188C474M
.56	.38	.97	188C564M
.68	.42	.97	188C684M
.82	.46	.97	188C824M
1.0	.45	1.17	188C105M
1.2	.49	1.17	188C125M
1.5	.54	1.17	188C155M
2.0	.56	1.45	188C205M
2.5	.61	1.45	188C255M
3.0	.67	1.45	188C305M
3.5	.65	1.68	188C355M
4.0	.69	1.68	188C405M
4.5	.73	1.68	188C455M
5.0	.77	1.68	188C505M
400 VOLTS DC WORKING			
.010	.20	.40	188E103M
.012	.16	.53	188E123M
.015	.17	.53	188E153M
.018	.19	.53	188E183M
.022	.20	.53	188E223M
.027	.18	.65	188E273M
.033	.20	.65	188E333M
.039	.21	.65	188E393M
.047	.23	.65	188E473M
.056	.25	.65	188E563M
.068	.27	.65	188E683M
.082	.25	.78	188E823M
.10	.27	.78	188E104M
.12	.29	.78	188E124M
.15	.32	.78	188E154M
.18	.35	.78	188E184M
.22	.33	.97	188E224M
.27	.36	.97	188E274M
.33	.39	.97	188E334M
.39	.42	.97	188E394M
.47	.46	.97	188E474M
.56	.44	1.17	188E564M
.68	.48	1.17	188E684M
.82	.54	1.17	188E824M
1.0	.53	1.45	188E105M
1.2	.57	1.45	188E125M
1.5	.63	1.45	188E155M
2.0	.65	1.68	188E205M
2.5	.73	1.68	188E255M
3.0	.79	1.68	188E305M
3.5	.85	1.68	188E355M
4.0	.78	2.25	188E405M
4.5	.83	2.25	188E455M
5.0	.87	2.25	188E505M

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Type 189 Capacitors features extremely small size, light weight and self clearing metallized construction which virtually eliminates catastrophic failures. Well suited for Voltage Multiplier Circuits in TV power supplies and Electrostatic copiers. Also ideal for Potting or encapsulating in Electronic Sub assemblies, Power supplies, etc.

CAPACITANCE
Measurements shall be made at 1000 cycles per second for capacitance values thru 1. MFD and at 60 cycles per second for values over 1. MFD.

CAPACITANCE TOLERANCE
Standard capacitance tolerance is ±20% (M). Closer tolerances available upon request.

DISSIPATION FACTOR
The dissipation factor shall not exceed 1% when measured at 25°C. Measurements shall be made at 1000 Hz for capacitance values thru 1. MF and at 60 Hz for higher values.

TEST VOLTAGE
Capacitors shall withstand 200% of rated DC voltage for one minute at 25°, with the charging and discharge current limited to a maximum of 1. Ampere.

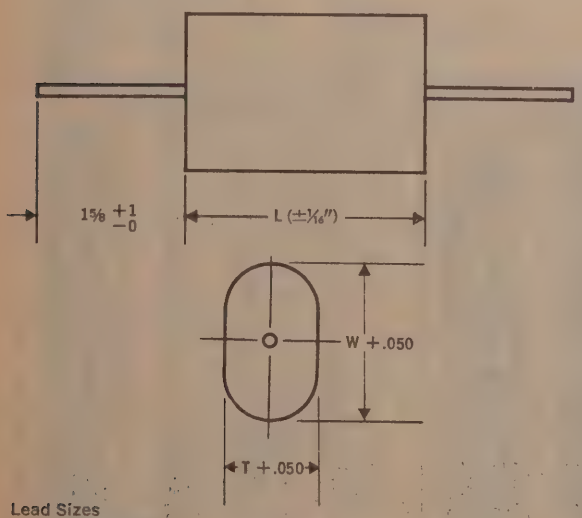
OPERATING TEMPERATURES
−55°C to +125°C.

LIFE TEST
Capacitors shall withstand a life test of 250 hours at 125°C, with 140% of the 125°C rated DC voltage applied. A resistance of one ohm per volt of applied voltage shall be inserted in series with the capacitor.

VOLTAGE DERATING
These capacitors will operate as full DC voltage ratings at 85°C. For operation at temperatures above 85°C, see Figure 4.

VIBRATION
Capacitors shall withstand a vibration test per Method 204, Test condition B of MIL-STD-202B as modified by MIL-C-27287.

HUMIDITY TEST
These capacitors shall meet the humidity test requirements of MIL-STD-202 Method 103B, test condition B. After testing the I.R. will be equal to or greater than ⅓ of the initial requirement.



Lead Sizes	
Nom. Body Length	Lead Dia.
Thru .530	.020
.650 thru .970	.025
Above .970	.032

Capacitance	Thickness	Width	Length	Cat. No.
600 VOLTS DC WORKING				
.010	.12	.25	.53	189F103M
.012	.13	.26	.53	189F123M
.015	.15	.28	.53	189F153M
.018	.17	.30	.53	189F183M
.022	.19	.32	.53	189F223M
.027	.21	.34	.53	189F273M
.033	.24	.37	.53	189F333M
.039	.21	.34	.65	189F393M
.047	.24	.37	.65	189F473M
.056	.22	.35	.78	189F563M
.068	.25	.38	.78	189F683M
.082	.27	.40	.78	189F823M
.10	.30	.43	.78	189F104M
.12	.32	.48	.78	189F124M
.15	.36	.52	.78	189F154M
.18	.33	.49	.97	189F184M
.22	.37	.53	.97	189F224M
.27	.36	.52	1.17	189F274M
.33	.40	.56	1.17	189F334M
.39	.44	.60	1.17	189F394M
.47	.49	.65	1.17	189F474M
.56	.41	.57	1.68	189F564M
.68	.45	.61	1.68	189F684M
.82	.51	.67	1.68	189F824M
1.0	.58	.74	1.68	189F105M
1.2	.64	.80	1.68	189F125M
1.5	.73	.89	1.68	189F155M
2.0	.69	.89	2.25	189F205M
2.5	.80	1.00	2.25	189F225M
3.0	.87	1.07	2.25	189F305M

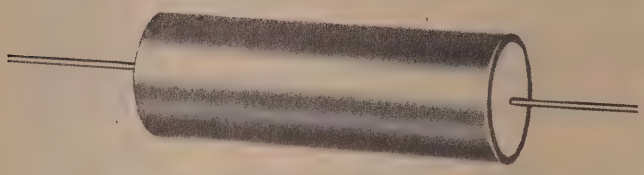
INTERMEDIATE VALUES AVAILABLE.

Capacitance	Thickness	Width	Length	Cat. No.
100 VOLTS DC WORKING				
.010	.10	.20	.40	189B103M
.012	.10	.20	.40	189B123M
.015	.10	.20	.40	189B153M
.018	.10	.20	.40	189B183M
.022	.10	.20	.40	189B223M
.027	.10	.20	.40	189B273M
.033	.10	.20	.40	189B333M
.039	.10	.20	.40	189B393M
.047	.10	.22	.40	189B473M
.056	.11	.24	.40	189B563M
.068	.10	.20	.53	189B683M
.082	.10	.20	.53	189B823M
.10	.10	.20	.53	189B104M
.12	.10	.23	.53	189B124M
.15	.12	.25	.53	189B154M
.18	.14	.27	.53	189B184M
.22	.17	.30	.53	189B224M
.27	.19	.32	.53	189B274M
.33	.21	.34	.53	189B334M
.39	.24	.37	.53	189B394M
.47	.21	.34	.65	189B474M
.56	.23	.36	.65	189B564M
.68	.27	.40	.65	189B684M
.82	.24	.37	.78	189B824M
1.0	.26	.42	.78	189B105M
1.2	.29	.45	.78	189B125M
1.5	.33	.49	.78	189B155M
2.0	.32	.48	.97	189B205M
2.5	.36	.52	.97	189B255M
3.0	.35	.51	1.17	189B305M
3.5	.38	.54	1.17	189B355M
4.0	.41	.57	1.17	189B405M
4.5	.44	.60	1.17	189B455M
5.0	.47	.63	1.17	189B505M
6.0	.52	.68	1.17	189B605M
8.0	.46	.62	1.68	189B805M
10.0	.53	.69	1.68	189B106M
200 VOLTS DC WORKING				
.010	.10	.20	.40	189C103M
.012	.10	.20	.40	189C123M
.012	.10	.20	.40	189C153M
.018	.13	.23	.40	189B183M
.022	.13	.26	.40	189C223M
.027	.10	.20	.53	189C273M
.033	.12	.22	.53	189C333M
.039	.12	.25	.53	189C393M
.047	.13	.26	.53	189C473M
.056	.14	.27	.53	189C563M
.068	.16	.29	.53	189C683M
.082	.18	.31	.53	189C823M
.10	.20	.33	.53	189C104M
.12	.22	.35	.53	189C124M
.15	.26	.39	.53	189C154M
.18	.24	.37	.65	189C184M
.22	.26	.39	.65	189C224M
.27	.24	.37	.78	189C274M
.33	.27	.40	.78	189C334M
.39	.30	.43	.78	189C394M
.47	.33	.46	.78	189C474M
.56	.37	.50	.78	189C564M
.68	.32	.48	.97	189C684M
.82	.35	.51	.97	189C824M
1.0	.35	.51	1.17	189C105M
1.2	.38	.54	1.17	189C125M
1.5	.43	.59	1.17	189C155M
2.0	.52	.68	1.17	189C205M
2.5	.46	.62	1.68	189C255M
3.0	.49	.65	1.68	189C305M
3.5	.54	.70	1.68	189C355M
4.0	.58	.74	1.68	189C405M
4.5	.62	.78	1.68	189C455M
5.0	.64	.84	1.68	189C505M
6.0	.70	.90	1.68	189C605M
8.0	.84	1.04	1.68	189C805M
10.0	.75	.95	2.25	189C106M
400 VOLTS DC WORKING				
.010	.14	.24	.40	189E103M
.012	.10	.23	.53	189E123M
.015	.11	.21	.53	189E153M
.018	.12	.22	.53	189E183M
.022	.12	.25	.53	189E223M
.027	.13	.26	.53	189E273M
.033	.15	.28	.53	189E333M
.039	.17	.30	.53	189E393M
.047	.19	.32	.53	189E473M
.056	.21	.34	.53	189E563M
.068	.23	.36	.53	189E683M
.082	.26	.39	.53	189E823M
.10	.23	.36	.65	189E104M
.12	.25	.38	.65	189E124M
.15	.24	.37	.78	189E154M
.18	.26	.39	.78	189E184M
.22	.30	.43	.78	189E224M
.27	.33	.46	.78	189E274M
.33	.36	.52	.78	189E334M
.39	.33	.49	.97	189E394M
.47	.33	.53	.97	189E474M
.56	.34	.50	1.17	189E564M
.68	.38	.54	1.17	189E684M
.82	.43	.59	1.17	189E824M
1.0	.48	.64	1.17	189E105M
1.2	.54	.70	1.17	189E125M
1.5	.46	.62	1.68	189E155M
2.0	.54	.70	1.68	189E205M
2.5	.60	.80	1.68	189E255M
3.0	.67	.87	1.68	189E305M
3.5	.73	.93	1.68	189E355M
4.0	.78	.98	1.68	189E405M
4.5	.69	.89	2.25	189E455M
5.0	.75	.95	2.25	189E505M

Nytronics Components Group, Inc.
ORANGE STREET, DARLINGTON, S. C. 29532
(803) 393-5421 — TWX 810-665-2182

TUBULAR CAPACITORS

HIGH VOLTAGE TUBULAR CAPACITORS DUAL DIELECTRIC/OIL IMPREGNATED PHENOLIC CASED/EPOXY END FILL/TYPE 161



RECOMMENDED APPLICATIONS

Nytronics Type 161 Capacitors are well-suited for use in Oscilloscopes, Electronic Air Cleaners, Power Supplies of industrial devices, and related equipment. The design of these capacitors employs a Paper/Polyester Film Section, oil impregnated, incased in a phenolic tube designed specifically for high voltage application. A unique epoxy endfill process precludes oil seepage which occasionally occurs in similar designs.

TYPICAL RATINGS

CAP/MFD	3000 VDC	5000 VDC	8000 VDC	10,000 VDC
.005	½ x 1½	5/16 x 1⅞	¾ x 2	¾ x 2½
.01	5/16 x 1⅞	¾ x 1⅞	¾ x 2¼	⅞ x 2½
.05	¾ x 2 1/16	1 x 2½	1 x 4¼	1½ x 3⅛

NOTE: Other Ratings can be designed to your specifications.

OPERATING TEMPERATURE

−55°C to +85°C at full rated voltage.

DISSIPATION FACTOR

Will not exceed 1% at 25°C.

MEASUREMENTS

Capacitance up to 1 microfarad are measured at a frequency of 1000 cycles per second and capacitances over 1 microfarad at 60 cps.

DIELECTRIC STRENGTH TEST

Units will withstand a potential of 150% of rated voltage applied for one minute at 25°C.

STANDARD TOLERANCE

±20%. Other tolerances available on request.

STANDARD MARKING

Nytronics, Part No., Capacitance, Voltage, and Date Code.

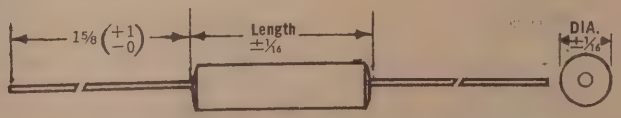
INSULATION RESISTANCE

When measured at the applicable test temperature with an electrification time of two minutes at 500 volts shall be equal to or greater than the values listed below:

Test Temperature	25°C	85°C
Megohms X Microfarads	2000	10
except that the insulation resistance in megohms need not exceed	25000	250

MOISTURE RESISTANCE

These capacitors will meet the moisture resistance requirements of EIA Specification RS-164, which requires units to withstand a 95% Relative Humidity at 40°C, except time of exposure may be increased to 500 hours. After exposure and subsequent drying periods, the insulation resistance will not be less than ⅓ of the initial requirement.



Tinned Copperweld Leads #20 AWG (.032) for sizes to ⅝" Dia.
#18 AWG (.040) for sizes ⅝" Dia. and over.

Nytronics Components Group, Inc.
ORANGE STREET, DARLINGTON, S. C. 29532
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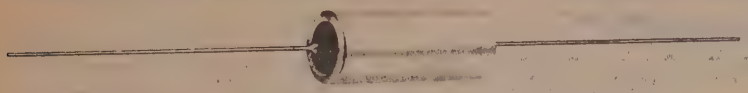
POLYSTYRENE FILM CAPACITORS

POLYSTYRENE FILM CAPACITORS HERMETICALLY SEALED TYPE 231 −65°C to +85°C



ELECTRICAL AND ENVIRONMENTAL CHARACTERISTICS

1. CAPACITANCE MEASUREMENTS

Capacitors of 1.0 μF or less shall be measured at a frequency of 1000 Hz. Capacitors greater than 1.0 μF measured at 60 Hz.
Tolerances of ±20%, ±10%, ±5%, ±2%, ±1% are standard. Tolerances closer than ±1% are available upon request.
Reference: MIL-STD-202, Method 305.

2. TEMPERATURE/CHARACTERISTICS AND STABILITY

When measured over the full operating range, the Temperature Coefficient shall be −120 ppm/°C ±30 ppm/°C.
There shall be less than 0.1% change per year in capacitance when operated between +20°C and +50°C. When cycled from −55°C to +75°C, the capacitance shall not vary more than 0.2% from its initial measurement.

3. DISSIPATION FACTOR

When measured as specified in Paragraph 1, the dissipation factor at +25°C shall not exceed 0.1%.

4. INSULATION RESISTANCE

When measured at +25°C, and rated voltage (or 500 VDC, whichever is less), the insulation resistance shall be a minimum of 200,000 megohm-microfarads, but need not exceed 500,000 megohms. The period of electrification shall not exceed two minutes.
Reference: MIL-STD-202, Method 302.

5. VOLTAGE DERATING

The capacitors may be operated at full rated voltage from −55°C to +85°C.

6. VOLTAGE TEST

When tested at +25°C, the capacitors shall withstand the indicated DC test voltages for a period of one minute:
Terminal to terminal 200% of DC rating
Terminal to case 200% of DC rating
Reference: MIL-STD-202, Method 301.

7. LIFE TESTING

When tested at 85°C for 250 hours at 140% of the rated voltage, the capacitors shall exhibit no more than one failure in twelve pieces tested. A failure is defined as:
a) A capacitance change of more than 6% of its initial value;
b) A dissipation factor greater than that specified in Paragraph 3;
c) An insulation resistance less than 60% that specified in Paragraph 4; or
d) A permanent open or short.

8. VIBRATION

The capacitors will meet or exceed the vibration requirements of MIL-STD-202, METHOD 201.

NYTRONICS CATALOG NUMBERING SYSTEM

231 A 3 E 104 M 2

NYTRONICS TYPE
231 Polystyrene

TERMINALS
Wire Leads
No. 22 AWG. (.025) for case Dia. .312 and under
No. 20 AWG. (.032) for case Dia. over .312

CIRCUIT
Circuit 1 Circuit 3

DC RATED VOLTAGE
B = 100
C = 200
E = 400
F = 600

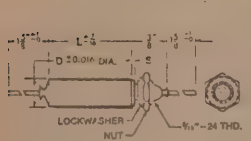
CAPACITANCE
In uuf. The first two digits are the significant figures, the third is the number of zeroes.

CAPACITANCE TOLERANCE
M = ±20%
K = ±10%
J = ±5%
G = ±2%
F = ±1%

STYLE

CONFIGURATIONS

Circuit 1

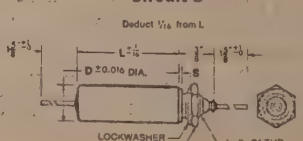


STYLE 3

D	S
.400	.020
.562	.031
and up	

Minimum D=.400"

Circuit 3



STANDARD RATINGS

100 VOLTS DC WORKING

Nytronics Part No.	Capacitance μf	Dia. ±.016	Length ±1/16
231A1B822K	.0082	.235	15/16
231A1B103K	.01	.235	15/16
231A1B123K	.012	.235	15/16
231A1B153K	.015	.235	15/16
231A1B183K	.018	.312	15/16
231A1B223K	.022	.312	15/16
231A1B273K	.027	.312	15/16
231A1B333K	.033	.312	15/16
231A1B393K	.039	.312	15/16
231A1B473K	.047	.400	15/16
231A1B563K	.056	.400	15/16
231A1B683K	.068	.400	15/16
231A1B823K	.082	.562	15/16
231A1B104K	.10	.562	15/16
231A1B124K	.12	.562	15/16
231A1B154K	.15	.562	15/16
231A1B184K	.18	.562	1 3/16
231A1B224K	.22	.562	1 3/16
231A1B274K	.27	.670	1 3/16
231A1B334K	.33	.670	1 3/16
231A1B394K	.39	.670	1 1 7/16
231A1B474K	.47	.670	1 1 7/16
231A1B564K	.56	.670	1 1 7/16
231A1B684K	.68	.750	1 1 7/16
231A1B824K	.82	1.000	1 1 7/16
231A1B105K	1.0	1.000	1 1 7/16
231A1B125K	1.2	1.000	1 1 7/16

200 VOLTS DC WORKING

231A1C472K	.0047	.235	15/16
231A1C562K	.0056	.235	15/16
231A1C682K	.0068	.235	15/16
231A1C822K	.0082	.312	15/16
231A1C103K	.01	.312	15/16
231A1C123K	.012	.312	15/16
231A1C153K	.015	.312	15/16
231A1C183K	.018	.312	15/16
231A1C223K	.022	.400	15/16
231A1C273K	.027	.400	15/16
231A1C333K	.033	.400	15/16
231A1C393K	.039	.400	15/16
231A1C473K	.047	.562	15/16
231A1C563K	.056	.562	15/16
231A1C683K	.068	.562	15/16
231A1C823K	.082	.562	15/16
231A1C104K	.10	.562	15/16
231A1C124K	.12	.562	15/16
231A1C154K	.15	.670	15/16
231A1C184K	.18	.670	15/16
231A1C224K	.22	.670	1 1 7/16
231A1C274K	.27	.670	1 1 7/16
231A1C334K	.33	.750	1 1 7/16
231A1C394K	.39	1.000	1 1 7/16
231A1C474K	.47	1.000	1 1 7/16
231A1C564K	.56	1.000	1 1 7/16

400 VOLTS DC WORKING

231A1E222K	.0022	.235	15/16
231A1E272K	.0027	.235	15/16
231A1E332K	.0033	.235	15/16
231A1E392K	.0039	.235	15/16
231A1E472K	.0047	.312	15/16
231A1E562K	.0056	.312	15/16
231A1E682K	.0068	.312	15/16
231A1E822K	.0082	.312	15/16
231A1E103K	.01	.312	15/16
231A1E123K	.012	.312	15/16
231A1E153K	.015	.400	15/16
231A1E183K	.018	.400	15/16
231A1E223K	.022	.400	15/16
231A1E273K	.027	.562	15/16
231A1E333K	.033	.562	15/16
231A1E393K	.039	.562	15/16
231A1E473K	.047	.562	15/16
231A1E563K	.056	.562	15/16
231A1E683K	.068	.562	1 3/16
231A1E823K	.082	.670	1 3/16
231A1E104K	.10	.670	1 3/16
231A1E124K	.12	.562	1 1 7/16
231A1E154K	.15	.670	1 1 7/16
231A1E184K	.18	.670	1 1 7/16
231A1E224K	.22	.750	1 1 7/16
231A1E274K	.27	.750	1 1 7/16
231A1E334K	.33	1.000	1 1 7/16
231A1E394K	.39	1.000	1 1 7/16
231A1E474K	.47	1.000	1 1 7/16

600 VOLTS DC WORKING

231A1F102K	.001	.235	15/16
231A1F122K	.0012	.235	15/16
231A1F152K	.0015	.235	15/16
231A1F182K	.0018	.235	15/16
231A1F222K	.0022	.312	15/16
231A1F272K	.0027	.312	15/16
231A1F332K	.0033	.312	15/16
231A1F392K	.0039	.312	15/16
231A1F472K	.0047	.312	15/16
231A1F562K	.0056	.312	15/16
231A1F682K	.0068	.312	15/16
231A1F822K	.0082	.312	15/16
231A1F103K	.01	.400	15/16
231A1F123K	.012	.400	15/16
231A1F153K	.015	.562	15/16
231A1F183K	.018	.562	15/16
231A1F223K	.022	.562	15/16
231A1F273K	.027	.562	15/16
231A1F333K	.033	.562	1 3/16
231A1F393K	.039	.562	1 3/16
231A1F473K	.047	.670	1 3/16
231A1F563K	.056	.670	1 3/16
231A1F683K	.068	.562	1 1 7/16
231A1F823K	.082	.670	1 1 7/16
231A1F104K	.10	.670	1 1 7/16
231A1F124K	.12	.750	1 1 7/16
231A1F154K	.15	1.000	1 1 7/16
231A1F184K	.18	1.000	1 1 7/16
231A1F224K	.22	1.000	1 1 7/16

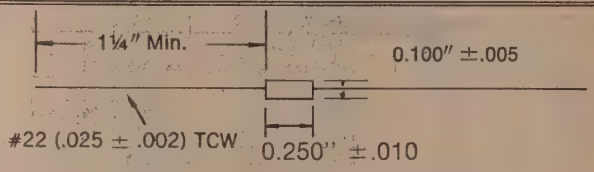
Nytronics Components Group, Inc.
ORANGE STREET, DARLINGTON, S. C. 29532
(803) 393-5421 — TWX 810-665-2182

CERAMIC CAPACITORS

The DECI-CAP

4.7 pF to 27,000 pF in 49 Standard Values.
Available from stock for Immediate Delivery.
Epoxy molded for highest performance and reliability.
High density cordwood packaging facilitated by single size.
(.100 diameter x .250 length for entire range.)

DECI-CAPS offer the design engineer unique epoxy-molded reliability and a new high standard in performance. These subminiature ceramic capacitors feature low power factor and exhibit outstanding stability over the entire —55° to +125°C operating range. Rugged epoxy molded envelope and high quality ceramic dielectric is designed to meet the environmental requirements of MIL-C-11015.



Electrical Characteristics	Deci-Cap
Capacitance Range, pF	4.7 to 27,000
Working Voltage 4.7 to 470 pF 560-27000	 200 VDC 100 VDC
Standard Tolerance	±10%
Dissipation Factor	.025 Max.
I.R., Megohms	20,000 Min.
Max. Change from 25°C Capacitance, −55 to +125°C	±15%

Cap., pF	Deci-Cap Cat. No.
4.7	DC-047
5.6	DC-056
6.8	DC-068
8.2	DC-082
10	DC-100
12	DC-120
15	DC-150
18	DC-180
22	DC-220
27	DC-270
33	DC-330
39	DC-390
47	DC-470
56	DC-560
68	DC-680
82	DC-820
100	DC-101
120	DC-121
150	DC-151
180	DC-181
220	DC-221
270	DC-271
330	DC-331
390	DC-391
470	DC-471

Cap., pF	Deci-Cap Cat. No.
560	DC-561
680	DC-681
820	DC-821
1000	DC-102
1200	DC-122
1500	DC-152
1800	DC-182
2200	DC-222
2700	DC-272
3300	DC-332
3900	DC-392
4700	DC-472
5600	DC-562
6800	DC-682
8200	DC-822
10000	DC-103
12000	DC-123
15000	DC-153
18000	DC-183
22000	DC-223
27000	DC-273

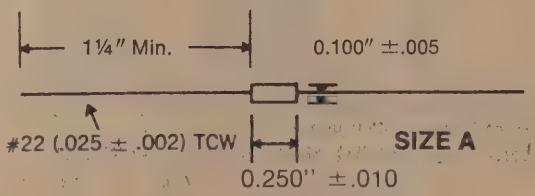
Add K to Cat. No. for ±10% Tol., J for ±5%, M for ±20%

The NYT-CAP

NPO SERIES

Ultra High Stability —0 ± 25 ppm/°C Temperature Coefficient.
Transfer Molded Epoxy Case for high component density.
New extended range to 10,000 pF.
Available from stock.

A new development from Nytronics' ceramic research laboratory now makes possible the manufacture of an extremely stable ceramic capacitor in a miniature package size. Now you can have the capacitor stability long desired for use in oscillators, filters, and other critical circuitry.



ELECTRICAL CHARACTERISTICS

Capacitance Range: 4.7 pF to 220 pF.

Capacitance Tolerance: ±10% Standard; others available.

Working Voltage: 200 Volts D.C.

Temperature Coefficient: ±25 ppm/°C over temperature range of −55°C to +125°C.

Dissipation Factor: Less than 0.001 at 25°C.

Insulation Resistance: 100,000 Megohms at 25°C. (Minimum)

Nytronics Part No.	Capacity (pF)	Case Size
NC-047	4.7	A
NC-056	5.6	A
NC-068	6.8	A
NC-082	8.2	A
NC-100	10	A
NC-120	12	A
NC-150	15	A
NC-180	18	A
NC-220	22	A
NC-270	27	A
NC-330	33	A

Nytronics Part No.	Capacity (pF)	Case Size
NC-390	39	A
NC-470	47	A
NC-560	56	A
NC-680	68	A
NC-820	82	A
NC-101	100	A
NC-121	120	A
NC-151	150	A
NC-181	180	A
NC-221	220	A

Note: Hybrid Manufacturers — Also available from stock as monolithic (unencapsulated) chips for micro-circuit applications. "A" chip size is .170 X .065 X .070; "B" is .280 X .195 X .070. Other specs same as above. To order use part No. prefix NCU in place of NC.

Nytronics Components Group, Inc.
ORANGE STREET, DARLINGTON, S. C. 29532
(803) 393-5421 — TWX 810-665-2182

HERMETICALLY SEALED CAPACITORS

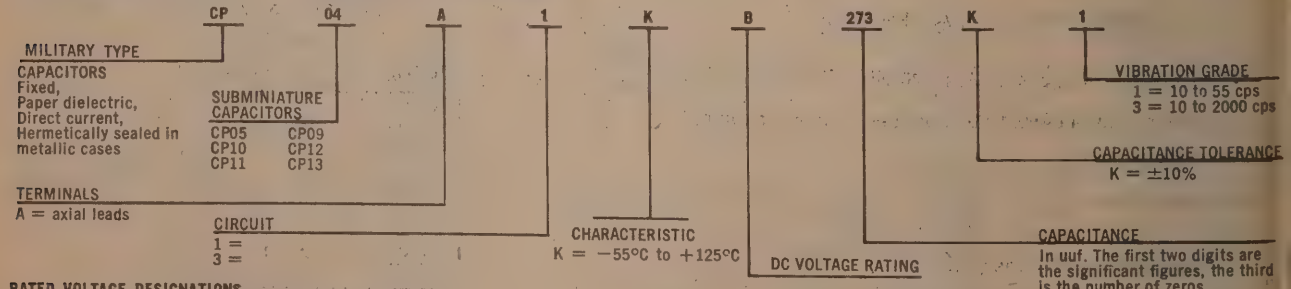
HERMETICALLY SEALED CAPACITORS CP04 THRU CP09 TO MIL-C-25

μF	WVDC	TYPE CP04A1* Plain Metal Case Char. K −55°C to +125°C	Size* D. x L.
.001	600	CP04A1KF102K3	.235 x ¾
.0015	600	CP04A1KF152K3	.235 x ¾
.0022	600	CP04A1KF222K3	.235 x ¾
.0033	600	CP04A1KF332K3	.235 x ¾
.0047	600	CP04A1KF472K3	.235 x ¾
.0068	600	CP04A1KF682K3	.235 x ¾
.01	400	CP04A1KE103K3	.235 x ¾
	600	CP04A1KF103K3	.312 x ⅞
.015	200	CP04A1KC153K3	.235 x ¾
	600	CP04A1KF153K3	.312 x ⅞
.022	200	CP04A1KF223K3	.235 x ¾
	600	CP04A1KF223K3	.312 x ⅞
.033	100	CP04A1KB333K3	.235 x ¾
	400	CP04A1KE333K3	.312 x ⅞
	600	CP04A1KF333K3	.400 x ⅞
.047	200	CP04A1KC473K3	.312 x ⅞
	400	CP04A1KE473K3	.400 x ⅞
	600	CP04A1KF473K3	.400 x 1⅛
.068	200	CP04A1KC683K3	.312 x ⅞
	400	CP04A1KE683K3	.400 x 1⅛
	600	CP04A1KF683K3	.400 x 1⅜
.1	100	CP04A1KB104K3	.312 x ⅞
	200	CP04A1KC104K3	.400 x ⅞
	400	CP04A1KE104K3	.400 x 1⅜
	600	CP04A1KF104K3	.562 x 1⅛
.15	100	CP04A1KB154K3	.400 x ⅞
	200	CP04A1KC154K3	.400 x 1⅛
	400	CP04A1KE154K3	.562 x 1⅛
	600	CP04A1KF154K3	.562 x 1⅜
.22	100	CP04A1KB224K3	.400 x 1⅜
	200	CP04A1KC224K3	.400 x 1⅜
	400	CP04A1KE224K3	.562 x 1⅜
	600	CP04A1KF224K3	.562 x 1⅞
.33	100	CP04A1KB334K3	.400 x 1⅜
	200	CP04A1KC334K3	.562 x 1⅛
	400	CP04A1KE334K3	.562 x 1⅞
	600	CP04A1KF334K3	.670 x 1⅞
.47	100	CP04A1KB474K3	.562 x 1⅛
	200	CP04A1KC474K3	.562 x 1⅜
	400	CP04A1KE474K3	.670 x 1⅞
	600	CP04A1KF474K3	.750 x 2⅛
.68	100	CP04A1KB684K3	.562 x 1⅜
	200	CP04A1KC684K3	.562 x 1⅞
	400	CP04A1KE684K3	.750 x 2⅛
	600	CP04A1KF684K3	1.0 x 1⅞
1.0	100	CP04A1KB105K3	.562 x 1⅞
	200	CP04A1KC105K3	.670 x 1⅞
	400	CP04A1KE105K3	1.0 x 1⅞

μF	WVDC	TYPE CP08A1 Plain Metal Case Char. K −55°C to +125°C	Size* D. x L.
.001	600	CP08A1KF102K3	.235 x ¾
.0015	600	CP08A1KF152K3	.235 x ¾
.0022	600	CP08A1KF222K3	.235 x ¾
.0033	400	CP08A1KE332K3	.235 x ¾
	600	CP08A1KF332K3	.312 x ⅞
.0047	200	CP08A1KC472K3	.235 x ¾
	600	CP08A1KF472K3	.312 x ⅞
.0068	200	CP08A1KC682K3	.235 x ¾
	600	CP08A1KF682K3	.312 x ⅞
.01	100	CP08A1KB103K3	.235 x ¾
	600	CP08A1KF103K3	.312 x ⅞
.015	100	CP08A1KB153K3	.235 x ¾
	400	CP08A1KE153K3	.312 x ⅞
	600	CP08A1KF153K3	.400 x ⅞
.022	200	CP08A1KC223K3	.312 x ⅞
	600	CP08A1KF223K3	.400 x ⅞
.033	200	CP08A1KC333K3	.312 x ⅞
	400	CP08A1KE333K3	.400 x ⅞
	600	CP08A1KF333K3	.400 x 1⅛
.047	100	CP08A1KB473K3	.312 x ⅞
	200	CP08A1KC473K3	.400 x ⅞
	400	CP08A1KE473K3	.400 x 1⅛
	600	CP08A1KF473K3	.400 x 1⅜
.068	200	CP08A1KC683K3	.400 x ⅞
	400	CP08A1KE683K3	.400 x 1⅜
	600	CP08A1KF683K3	.562 x 1⅛
.1	100	CP08A7KB104K3	.400 x ⅞
	200	CP08A1KC104K3	.400 x 1⅛
	400	CP08A1KE104K3	.562 x 1⅛
	600	CP08A1KF104K3	.562 x 1⅜
.15	100	CP08A1KB154K3	.400 x 1⅛
	200	CP08A1KC154K3	.400 x 1⅜
	400	CP08A1KE154K3	.562 x 1⅜
	600	CP08A1KF154K3	.562 x 1⅝
.22	100	CP08A1KB224K3	.400 x 1⅜
	200	CP08A1KC224K3	.562 x 1⅛
	400	CP08A1KE224K3	.562 x 1⅝
	600	CP08A1KF224K3	.670 x 1⅝
.33	100	CP08A1KB334K3	.562 x 1⅛
	200	CP08A1KC334K3	.562 x 1⅜
	400	CP08A1KE334K3	.670 x 1⅝
	600	CP08A1KF334K3	.750 x 2⅛
.47	100	CP08A1KB474K3	.562 x 1⅜
	200	CP08A1KC474K3	.562 x 1⅝
	400	CP08A1KE474K3	.750 x 2⅛
	600	CP08A1KF474K3	.750 x 2⅜
.68	100	CP08A1KB684K3	.562 x 1⅝
	200	CP08A1KC684K3	.670 x 1⅝
1.0	100	CP08A1KB105K3	.670 x 1⅝
	200	CP08A1KC105K3	.750 x 2⅛

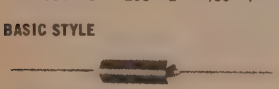
NOTE: The capacitors listed in this table have a capacitance tolerance of ±10%.
* For case grounded reduce L dimension by ¼". Above listing are ratings listed in Mil-C-25C. Other values are available in Nytronics Commercial Equivalents.
** For CP05 and CP09 add .0625 to Diameter and ⅛" to Length.

NYTRONICS CATALOG NUMBERING SYSTEM

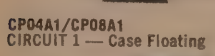


RATED VOLTAGE DESIGNATIONS
(DC working at 40°C, except for characteristic K which is 85°C)
B = 100 C = 200 E = 400 F = 600 G = 1000

BASIC STYLE

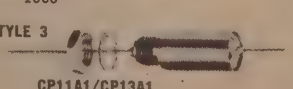


CP04A1/CP08A1
CIRCUIT 1 — Case Floating

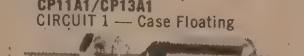


CP04A3/CP08A3
CIRCUIT 3 — Case Grounded

STYLE 3

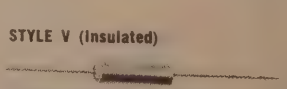


CP11A1/CP13A1
CIRCUIT 1 — Case Floating

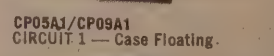


CP11A3/CP13A3
CIRCUIT 3 — Case Grounded

STYLE V (Insulated)

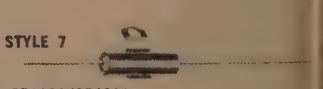


CP05A1/CP09A1
CIRCUIT 1 — Case Floating



CP05A3/CP09A3
CIRCUIT 3 — Case Grounded

STYLE 7



CP10A1/CP12A1
CIRCUIT 1 — Case Floating

CP10A3/CP12A3
CIRCUIT 3 — Case Grounded

Nytronics Components Group, Inc.
ORANGE STREET, DARLINGTON, S. C. 29532
(803) 393-5421 — TWX 810-665-2182

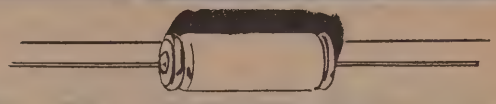
MIL TYPE CP25 - CP29
MIL-C-25

MIL-C-25 (LATEST REVISION) CP25 TO CP29

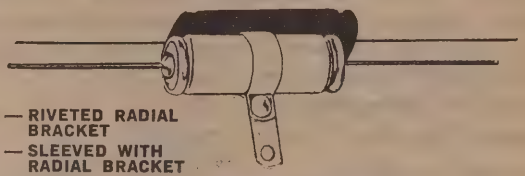
Available in capacitances from .003 thru 0.1 mf and voltages of 1500 VDC.

Type Designation[1]	Rated Voltage	Capacitance μf
CP2-A-EC104-	200	.1
CP2-A-EC254-	200	.25
CP2-A-EC504-	200	.5
CP2-A-EF302-	600	.003
CP2-A-EF602-	600	.006
CP2-A-EF103-	600	.01
CP2-A-EF203-	600	.02
CP2-A-EF503-	600	.05
CP2-A-EF104-	600	.1
CP2-A-EF254-	600	.25
CP2-A-EF504-	600	.5
CP2-A-EG302-	1,000	.003
CP2-A-EG602-	1,000	.006
CP2-A-EG103-	1,000	.01
CP2-A-EG203-	1,000	.02
CP2-A-EG503-	1,000	.05
CP2-A-EG104-	1,000	.1
CP2-A-EG254-	1,000	.25
CP2-A-EH302-	1,500	.003
CP2-A-EH602-	1,500	.006
CP2-A-EH103-	1,500	.01
CP2-A-EH203-	1,500	.02
CP2-A-EH503-	1,500	.05
CP2-A-EH104-	1,500	.1

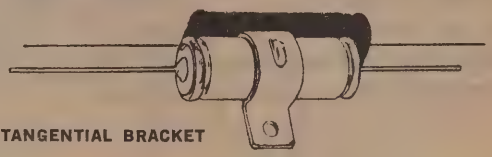
[1] Complete type designation will include additional symbols to complete style designation and to indicate circuit and capacitance tolerance.



CP25 — UNINSULATED BODY
CP26 — INSULATED BODY



CP27 — RIVETED RADIAL BRACKET
CP28 — SLEEVED WITH RADIAL BRACKET



CP29 — TANGENTIAL BRACKET

TYPE - DESIGNATION EXAMPLE (CP25A1EC104K)

CP25	A	1	E	C	104	K	3
STYLE	TERMINAL	CIRCUIT (1, 2 or 3)	CHARACTERISTIC	VOLTAGE C = 200 V F = 600 V H = 1500 V	CAPACITANCE	CAPACITANCE TOLERANCE K = 10%	VIBRATION GRADE

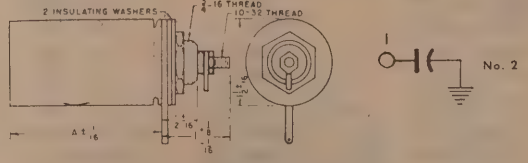
CP40, CP41 (TYPES PCM, PCIM)

Available in capacitances from .25 mf thru 4.0 mf and voltages of 600 VDC thru 1500 VDC.

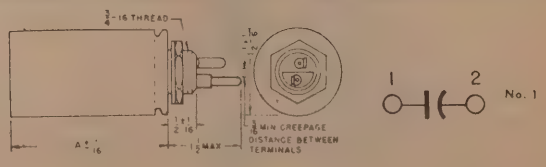
Type Designation 1/	DC Voltage Rating (see fig. 2) Volts	Capacitance μf
CP4----F105K1	600	1
CP4----F205K1	600	2
CP4----F405K1	600	4
CP4----G105K1	1,000	1
CP4----G205K1	1,000	2
CP4----H254K1	1,500 3/	0.25
CP4----H504K1	1,500	0.5
CP4----H105K1	1,500	1

TYPE - DESIGNATION EXAMPLE (CP40B1EF105K)

CP40	B	1	E	F	105	K	1
STYLE (40 or 41)	TERMINAL (B or C)	CIRCUIT (1 or 2)	CHARACTERISTIC	VOLTAGE (F, G or H) F = 600 V G = 1000 V H = 1500 V	CAPACITANCE	TOLERANCE	VIBRATION GRADE



CIRCUIT DIAGRAM — CP40
Available with (C) or (B) Terminals

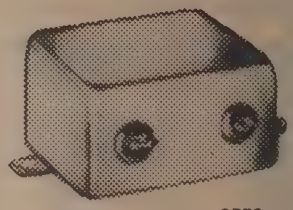


CIRCUIT DIAGRAM — CP41
Available only with (B) Terminal

Nytronics Components Group, Inc.
ORANGE STREET, DARLINGTON, S. C. 29532
(803) 393-5421 — TWX 810-665-2182

**MIL TYPE
CP53, CP54, CP55
MIL-C-25**

CAPACITORS MIL TYPE CP53, CP54, CP55



CP53

Section assembled in hermetically sealed tin-coated drawn-shell container. Mineral-oil impregnated and filled. Lug-type terminal seals. Meets requirements of MIL-C-25.

Temperature Rating: −55°C to +85°C.

Standard Tolerance: −10% to +20%.

PDM VARIATIONS

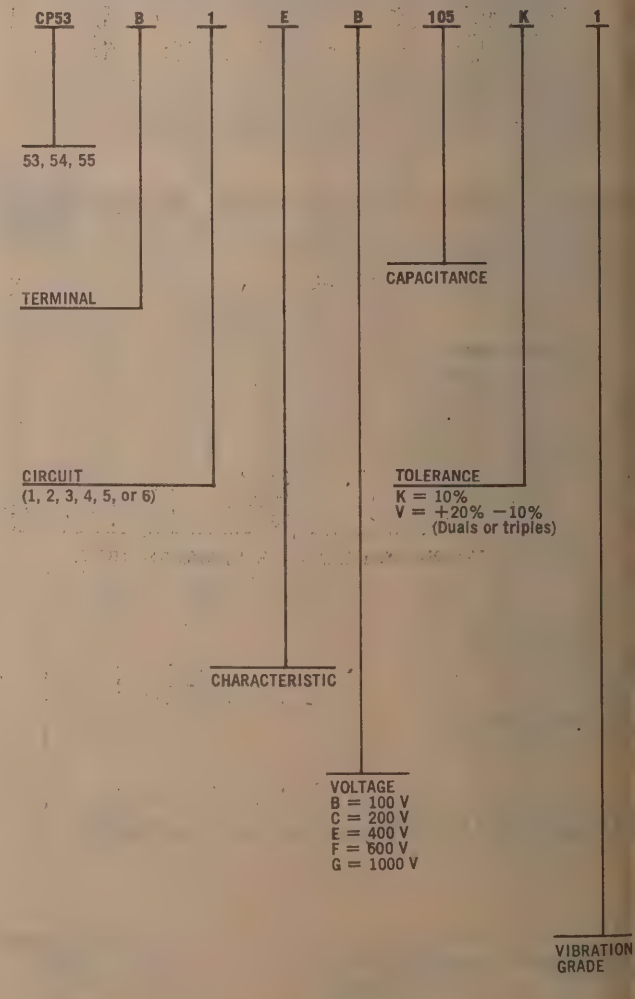
MIL Type CP53, with terminals on side.

PDMT (CP54) With terminals on top.

PDMB (CP55) With terminals on the bottom.

Type Designation	DC Voltage Rating Volts	Capacitance µf
CP5-B- - B105K1	100	1
CP5-B-EB205K1	100	2
CP5-B- - B405K1	100	4
CP5-B-FC504K1	200	0.5
CP5-B-EC105K1	200	1
CP5-B-EC205K1	200	2
CP5-B-EF254K1	600	0.25
CP5-B- - F504K1	600	0.5
CP5-B- - F105K1	600	1
CP5-B-EF205K1	600	2
CP5-B-EG503K1	1,000	0.05
CP5-B-EG104K1	1,000	0.1
CP5-B- - G254K1	1,000	0.25
CP5-B-EG504K1	1,000	0.5
CP5-B-EG105K1	1,000	1
CP5-B-EF503V1	600	0.05-0.05
CP5-B-EF104V1	600	0.1 -0.1
CP5-B- - F254V1	600	0.25-0.25
CP5-B- - F504V1	600	0.5 -0.5
CP5-B-EF105V1	600	1 -1
CP5-B-EG503V1	1,000	0.05-0.05
CP5-B- - G104V1	1,000	0.1 -0.1
CP5-B-EG254V1	1,000	0.25-0.25
CP5-B-EG504V1	1,000	0.5 -0.5
CP5-B5-E504V1	400	0.5 -0.5 -0.5
CP5-B5-F104V1	600	0.1 -0.1 -0.1
CP5-B5EF254V1	600	0.25-0.25-0.25
CP5-B5EF504V1	600	0.5 -0.5 -0.5
CP5-B5EG503V1	1,000	0.05-0.05-0.05
CP5-B5EG104V1	1,000	0.1 -0.1 -0.1
CP5-B5EG254V1	1,000	0.25-0.25-0.25

TYPE-DESIGNATION EXAMPLE (CP53B1EB105K)

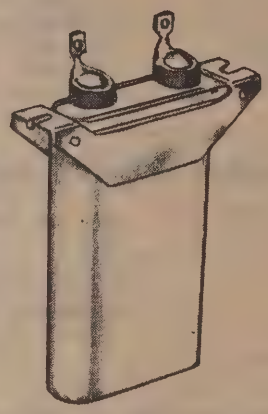


Nytronics Components Group, Inc.
ORANGE STREET, DARLINGTON, S. C. 29532
(803) 393-5421 — TWX 810-665-2182

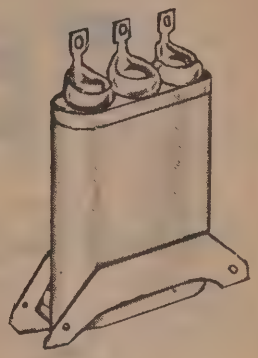
MIL TYPE
CP69, CP67, CP91
MIL-C-25

CAPACITORS MIL TYPE CP67, CP69

Type Designation	DC Voltage Rating Volts	Capacitance μf
CP6-B-EF503K1	600	0.05
CP6-B-EF104K1	600	0.1
CP6-B-EF254K1	600	0.25
CP6-B-EF504K1	600	0.5
CP6-B--F105K1	600	1
CP6-B-EG103K1	1,000	0.01
CP6-B-EG203K1	1,000	0.02
CP6-B-EG503K1	1,000	0.05
CP6-B--G104K1	1,000	0.1
CP6-B-EG254K1	1,000	0.25
CP6-B--G504K1	1,000	0.5
CP6-B-EF503V1	600	0.05-0.05
CP6-B-EF104V1	600	0.1 -0.1
CP6-B-EF254V1	600	0.25-0.25
CP6-B--F504K1	600	0.5 -0.5
CP6-B-EG103V1	1,000	0.01-0.01
CP6-B-EG203V1	1,000	0.02-0.02
CP6-B--G503V1	1,000	0.05-0.05
CP6-B--G104V1	1,000	0.1 -0.1
CP6-B--G254V1	1,000	0.25-0.25
CP6-B-5-F503V1	600	0.05-0.05-0.05
CP6-B5EFP04V1	600	0.1 -0.1 -0.1
CP6-B5-F254V1	600	0.25-0.25-0.25
CP6-B5EG103V1	1,000	0.01-0.01-0.01
CP6-B5EG203V1	1,000	0.02-0.02-0.02
CP6-B5EG503V1	1,000	0.05-0.05-0.05
CP6-B5EG104V1	1,000	0.1 -0.1 -0.1



CP69

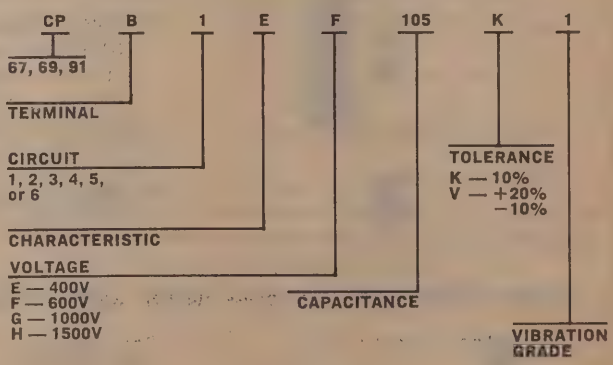


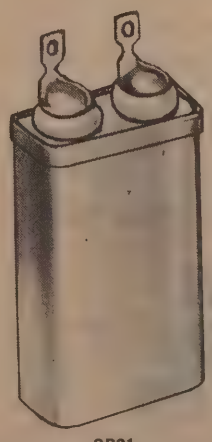
CP67

CAPACITORS MIL TYPE CP91 SERIES

Type Designation	DC Voltage Rating Volts	Capacitance μf	Capacitance Tolerance
CP91B-KE104K1	400	0.1	K
CP91B-KE254K1	400	0.25	K
CP91B1KE504K1	400	0.5	K
CP91B-E105K1	400	1	K
CP91B-EF503K1	600	0.05	K
CP91B-EF254K1	600	0.25	K
CP91B-EF504K1	600	0.5	K
CP91B-F105K1	600	1	K
CP91B-EG103K1	1,000	0.01	K
CP91B-EG203K1	1,000	0.02	K
CP91B-EG503K1	1,000	0.05	K
CP91B-EG104K1	1,000	0.1	K
CP91B-EG254K1	1,000	0.25	K
CP91B-G504K1	1,000	0.5	K
CP91B6EE503V1	400	0.05-0.05	V
CP91B6EE104V1	400	0.1 -0.1	V
CP91B6EE504V1	400	0.5 -0.5	V
CP91B6EF503V1	600	0.05-0.05	V
CP91B6-F104V1	600	0.1 -01	V
CP91B6EF254V1	600	0.25-0.25	V
CP91B6-F504V1	600	0.5 -0.5	V
CP91B6EG103V1	1,000	0.01-0.01	V
CP91B6EG203V1	1,000	0.02-0.02	V
CP91B6EG503V1	1,000	0.05-0.05	V
CP91B6-G104V1	1,000	0.1 -0.1	V
CP91B6-G254V1	1,000	0.25-0.25	V
CP91B6EH103V1	1,500	0.01-0.01	V
CP91B6EH503V1	1,500	0.05-0.05	V

TYPE DESIGNATION EXAMPLE





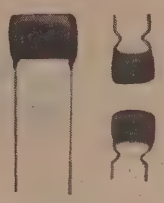
CP91

NOTE: AVAILABLE WITH SPADE-LUG OR FOOTED BRACKET

Panasonic®

POLYESTER CAPACITORS

TYPE ECQ-M (Radial lead — durez resin coated)



- Rated voltages/capacitances:
  - 50 VDC
  - 50 VDC miniature — from 0.47 to 0.001
  - 100 VDC — from 0.47 to 0.001
  - 200 VDC — from 0.47 to 0.001
  - 400 VDC — from 0.47 to 0.001
  - 600 VDC — from 0.1 to 0.001
- Capacitance tol.: ±5% (J), ±10% (K), ±20% (M)
- Insul. resistance (at 25°C): less than 0.33μF ≥9000 megohms; more than 0.33μF ≥3000 megohms x μF
- Dissipation factor: ≤1.0% @ 1 kHz
- Withstand voltage: rated voltage x 250% (for 1 sec.)
- Temp. range: −40°C to +85°C
- Available with straight or crimp leads

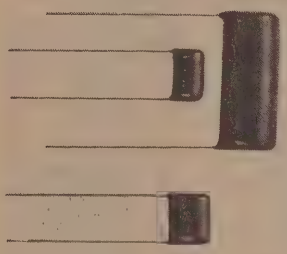
TYPE ECQ-Z (Axial leads — with epoxy coating)

Ideal for automatic insertion equipment.

- Rated voltages: 50, 100 & 200 VDC
- Withstand voltage: Rated voltage x 250% for (1 sec.)
- Insul. resistance: ≥25,000 megohms @ 25°C
- Dissipation factor: ≥1.0% @ 1 kHz
- Temp. range: −40°C to +85°C
- Tape and reel packaging

METALLIZED POLYESTER CAPACITORS

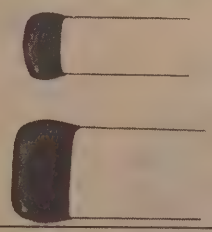
TYPE ECQ-E (Radial leads — covered with epoxy resin)



For general purpose use.

- Rated voltages/capacitances:
  - 100 VDC — from 0.10 to 10.0 μF
  - 250 VDC — from 0.047 to 2.2 μF
  - 400 VDC — from 0.047 to 2.2 μF
  - 630 VDC — from 0.015 to 1.5 μF
  - 1000 VDC — from 0.001 to 0.1 μF
- Capacitance tol.: ±5% (J), ±10% (K), ±20% (M)
- Insul. resistance: Less than 0.33 μF, ≥9000 megohms; 0.33 μF or more, ≥3000 megohms x μF
- Dissipation factor: ≤1.0% @ 1 kHz
- Withstand voltage: rated voltage x 1.5 (1 min.)
- Operating temp.: −40°C ~ +85°C
- Noncombustible, noninductive
- Available with straight or crimp-leads

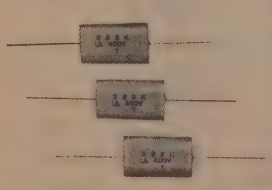
TYPE ECQ-UD (UL listed — Radial lead covered with epoxy resin)



For across-the-line bypass and antenna coupling.

- Rated voltage: 125 VAC
- Capacitance tol.: ±10% (K), ±20% (M)
- Insul. resistance: ≥10,000 megohms @ 25°C
- Dissipation factor: ≤1.0% @ 1 kHz
- Withstand voltage: 1000 VAC (1 min.)
- Operating temp.: −25°C ~ +85°C
- Noncombustible, noninductive
- Available with straight or crimp-leads

TYPE ECQ-T (Axial leads)



For general communications equipment.

- Rated voltage/capacitances:
  - 250 VDC — from 0.15 to 10.0 μF
  - 400 VDC — from 0.068 to 3.3 μF
  - 630 VDC — from 0.033 to 2.2 μF
- Capacitance tol.: ±5% (J), ±10% (K) ±20% (M)
- Insul. resistance: ≥3000 megohms x μF @ 25°C
- Dissipation factor: ≤1.0% @ 1 kHz
- Withstand voltage: Rated voltage x 1.5 (1 min.)
- Operating temp.: −40°C ~ +85°C

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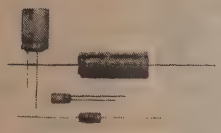
JUST SLIGHTLY AHEAD OF OUR TIME

Panasonic®

ALUMINUM ELECTROLYTIC CAPACITORS

L SERIES

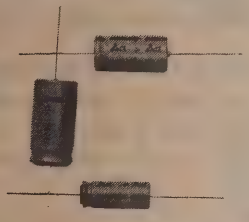


A complete range over 200 standard electrolytics for commercial, industrial and entertainment use — in both radial and axial designs.

- Rated working voltage range: 6.3 to 100 VDC

- Rated capacitance range: 0.47 to 2200 μF (@ 120 Hz and +25°C)
- Capacitance tol.: Over 4.7 μF, −10 to +50%; 4.7 μF or less, −10 to +75%
- Operating temp.: −40°C to +85°C
- Load life: 1000 hr. @+85°C
- Lead forming available

EXTENDED L SERIES

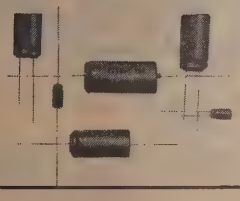


Compact sizes, with low voltage and high capacitance ratings. Radial and axial leads available.

- Rated working voltage range: 6.3 to 100 VDC

- Rated capacitance range: 220 to 10,000 μF
- Capacitance tol.: −10 to +50%
- Operating temp.: −40°C to +85°C
- Load life: 1000 hr. @ +85°C.

Z SERIES

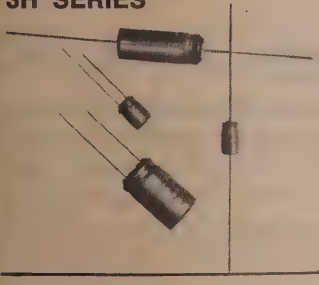


For wide variety of applications requiring low leakage and low impedance, in both radial and axial lead types.

- Working voltage range: 6.3 to 50 VDC

- Capacitance range: 0.1 to 2200 μF
- Capacitance tol.: ±20%
- Operating temp.: −40°C to +85°C
- Leakage current: 0.002 CV +1 μA max.
- Load life: 2000 hr. at +85°C
- Lead forming available

3H SERIES

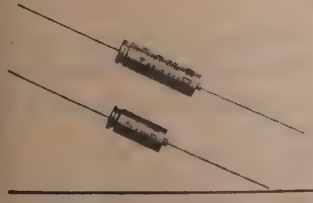


Very wide temperature range and excellent low temperature stability characteristics, while meeting most stringent environmental characteristics — in both radial and axial lead types.

- Rated working voltage range: 16 to 63 VDC

- Rated capacitance range: 1 to 470 μF
- Capacitance tol.: ±20%
- Operating temp.: −40°C to +125°C
- Leakage current: 0.002 CV or 2 μA, whichever is greater
- Load life: 2000 hr. @ +105°C or 1000 hr. @ +125°C

4H SERIES



Characteristics similar to those of solid tantalum types. Operate over wide temperature range. Axial lead types only.

- Rated working voltage range: 16 to 63 VDC

- Rated capacitance range: 1 to 220 μF
- Capacitance tol.: ±20%
- Operating temp.: −70°C to +155°C
- Leakage current: 0.002 CV μA max. (2 μA min.)
- Load life: 2000 hr. @+155°C

TS SERIES

Self-mounting for PCB

- Rated DC working voltage range: 16 to 200 VDC
- Rated capacitance range: 220 to 10,000 μF

- Capacitance tol.: −10 to +50%
- Operating temp.: −40°C to +85°C (−25°C to +85°C for 160 VDC and above)
- Load life: 1000 hr. @ +85°C

Panasonic®

ALUMINUM ELECTROLYTIC CAPACITORS

HIGH VOLTAGE SERIES

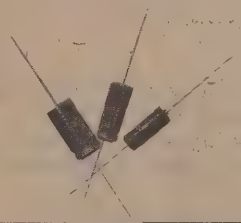
- Rated working voltage range:
  160 to 450 VDC (radial lead type)
  160 to 500 VDC (axial lead type)
- Rated capacitance range:
  1 to 100 μF (radial)
  1 to 220 μF (axial)
- Capacitance tol.:
  −10 to +50% over 4.7 μF
  −10 to +75% less than 4.7 μF
- Operating temp.: −25°C to +85°C
- Load life: 1000 hr. @ +85°C

NON-POLAR SERIES

Exhibit extremely stable characteristics when used in DC circuits exposed to reversing current or AC. Radial lead types only.

- Rated working voltage range: 16 to 50 VDC
- Rated capacitance range: 1 to 1000 μF
- Capacitance tol.: −10 to +100%
- Operating temp.: −25°C to +85°C
- Load life: 1000 hr. @ +85°C

CROSSOVER NETWORK SERIES (Bi-Polar)

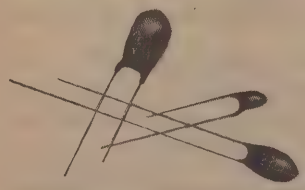


Specially designed for use in crossover networks for 2, 3 and 4-way high-fidelity speaker systems. Available in axial or radial leads.

- Rated working voltages: 25 and 50 VDC
- Rated capacitance: 1 to 100 μF
- Capacitance tol.: ±20%
- Operating temp.:
  −40°C to +85°C (axial)
  −25°C to +85°C (radial)
- Tan. δ: 0.06 max. (axial)
  0.10 max. (radial)
- Load life: 1000 hr. @ +85°C

SOLID TANTALUM ELECTROLYTIC CAPACITORS

SQ SERIES



Resin dipped. Nonflammable.

- Rated working voltage range: 3.15 to 50 VDC
- Rated capacitance range: 0.1 to 220 μF
- Operating temp.: −55°C to +85°C
- Capacitance tol.: ±20% (±10% available)
- Load life: 2000 hr. @ +85°C
- Lead forming available

CERAMIC TRIMMER CAPACITORS

NW & NX SERIES (THIN TYPE) (3.5 & 5.0mm dia.)

The ECV-INW and ECV-INX Series are microminiature, thin-type, rotary ceramic trimmers. Ideal for slow-fast adjustment of electronic wrist watches and other devices, such as portable wireless, medical and other microelectronic equipment, that require minute impedance level control and precise adjustment of time constants.

- Insul. resistance: 10,000 megohms at 100 VDC
- Withstand voltage: 110 VDC
- Operating temp.: −25°C to +85°C
- Working volt.: 50 WVDC @ +85°C

ZW SERIES (5, 7 & 8mm dia.)

For time constant and impedance adjustments.

- Insul. resistance: 10,000 megohms min. @ 250 VDC
- Withstand voltage: 500 VDC
- Operating temp.: −25°C to +85°C
- Working volt.: 250 WVDC @ +85°C
- Top, side or rear adjustment

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UNITED PRICING REPORTS

the single source that speeds up invoicing, pricing, quoting, purchasing and estimating

Electronic component prices change so fast, you'd need a team of people just to keep up.

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The whole process is simple. All information is organized alphabetically by manufacturer. And each manufacturer's price schedule is listed by part number in numerical/alphabetical sequence.

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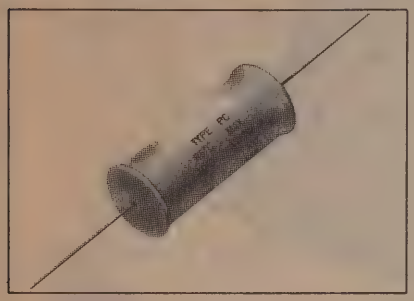
pfc PRECISION FILM CAPACITORS



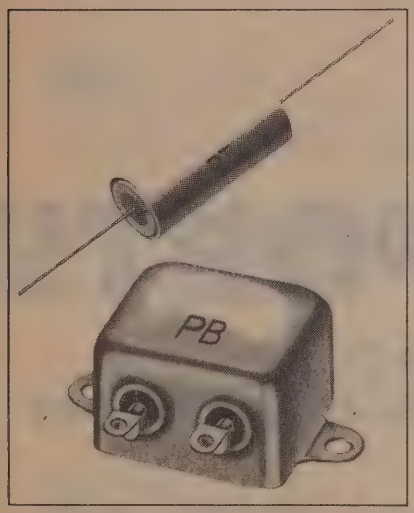
superior environmental protection

type PM: Heat stable polyester jacket—

type PC: Irradiated polyolefin jacket—

type PJ: Fused polystyrene jacket—

Excellent for precision filters, delay lines and precision timing circuits and other applications where size, performance and cost are critical.



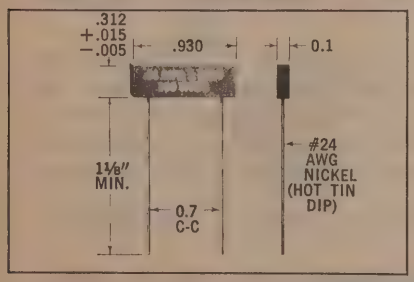
for military applications and hostile environments

type PT, and ST tubular

type PB, and SB rectangular bathtub cans

hermetically sealed—metal cases

These units exceed all requirements of MIL-C-19978 and optimize performance characteristics of polystyrene film. Excellent for critical applications where high IR, Q, exceptional stability, low DF and absorption are mandatory. Intended primarily for analog and digital computers, calculators, high Q tuned circuits, integrators, precision filter circuits, pulse networks, servo systems and reference capacitors.



type PE 0.1" thickness

Uniform lead spacing for p-c use. Uniform size and flush mounting. Both weldable and solderable leads. Rugged, moisture proof construction.

specifications

CAPACITANCE RANGE: .001 to .01 mfd (other values are available upon request).

TOLERANCE: ±5%, ±2%, ±1%, ±½%, ±¼%, ±0.1%.

VOLTAGE RATING: 100 VDCW.

INSULATION RESISTANCE: 10^{13} ohms minimum at 25°C — 10^{12} ohms at 85°C.

DISSIPATION FACTOR: 0.01% maximum at 25°C — 0.02 maximum at 85°C.

DIELECTRIC ABSORPTION: 0.05% maximum at all temperatures.

general specifications

DISSIPATION FACTOR:
When measured at or referred to 1 kHz dissipation factor shall not exceed the following: .0001 at 23°C and .0002 at 85°C.

INSULATION RESISTANCE:
When measured at applicable test temperature shall equal or exceed the following values:

	23°C	85°C	
megohm x mfd	10^6	1.5×10^5	
except the insulation resistance in megohms need not exceed	2×10^6	3×10^5	PC, PJ
	10^8	10^6	PB, PT, SB, ST

DIELECTRIC ABSORPTION:
When tested in accordance with paragraph 4.6.15 of MIL-C-19978, the dielectric absorption shall not exceed 0.05% over the entire operating temperature range.

STABILITY:
Long term (1 year) capacitance drift under maximum operating conditions shall not exceed the following limits for types shown.
Types PC, PJ, PT, PB: ±0.1%
Types SC, SJ, ST, SB: ±0.05%

TEMPERATURE COEFFICIENT:
TC of all PFC capacitors listed is negative 120 ±15 PPM/°C.

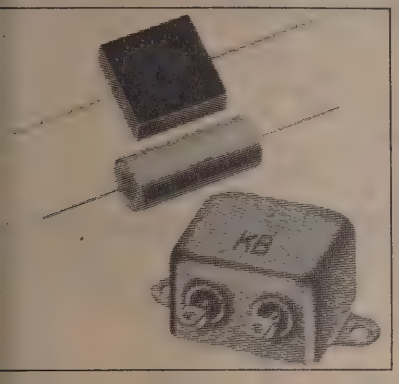
VOLTAGE:
All listed units are available to 5000 VDC.

TOLERANCES:
±0.1%, ±.25%, ±.50%, ±1%, ±2%, ±3%, ±5%, ±10%.

CAPACITANCE:
.001 MFD to 0.5 MFD: Types PC, PJ.
0.1 MFD to 5.0 MFD: Types PB, SB, PT, ST, SPT

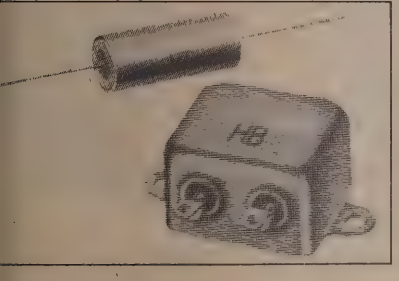
100 COMMUNITY DRIVE, GREAT NECK, NEW YORK 11022, (516) 487-9320

pfc PRECISION FILM CAPACITORS



zero temperature coefficient
type KE flat epoxy encapsulated
type KT tubular
type KB rectangular bathtub cans
hermetically sealed—metal cases

A unique combination of Polystyrene and Mica dielectrics resulting in a capacitor offering a truly ZERO TEMPERATURE COEFFICIENT (±10 ppm/°C from −55°C to +85°C standard production ±5 ppm/°C also available) with the ultimate in long term STABILITY. Type KT and KB capacitors will meet or exceed all requirements of MIL-C-19978, for PRECISION-OSCILLATORS, TIMING CIRCUITS, and RC NETWORKS.



temperature-stable small size
type HT tubular
type HB rectangular bathtub cans
hermetically sealed—metal cases

An exclusive PFC design modifying the temperature characteristics of the dielectric film to provide capacitors insensitive to temperature changes (±0.1% change to 85°C).

NEW! ultra-miniature polystyrene—type SPT

¼ the volume of standard designs—
comparable performance specifications

hermetically sealed — 100 volt rating

Capacitance	Diam.	Length
.12	.312	7/8
.15	.312	1.0
.22	.400	1.0
.33	.400	1 1/8
.68	.500	1 1/8
.82	.500	1 7/16

Capacitance	Diam.	Length
1.0	.562	1 7/16
2.0	.562	1 13/16
2.5	.670	1 7/8
3.5	.750	1 7/8
5.0	1.00	1 15/16

WHERE CUSTOM DESIGNS ARE STANDARD

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ASU Industries — Arco Electronics pfc Centre Eng. Automatic Connector

MUCON® SUBminiature CERAMIC CAPACITORS

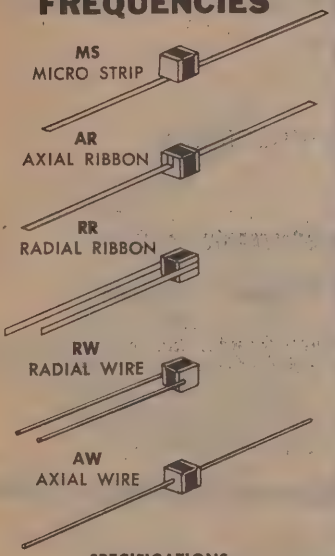
ULTRA-STABLE NPO MU-CAPS®
MOST STABLE MINIATURE CAPACITOR AVAILABLE

T.C.--ZERO ±30 PPM/°C

SQUARE ... from 1 PF. to .22 MF.

TUBULAR ... from 1 PF. to .22 MF.

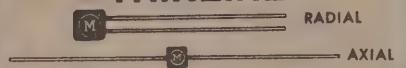
ULTRA Q MICROWAVE FREQUENCIES



SPECIFICATIONS

Capac. Range: .1 Pf thru 1000 Pf
WVDC: 50 thru 500 VDC
Q @ 1 MHZ: 10,000 minimum
Temp. Coeff.: +90 ±20ppm/°C

THINLINE



Mucon's Thinline Capacitors are made of the following 16 different ceramic bodies for a broad choice of size and electrical properties:

Temperature-Compensating Materials:	NP0	N080	N150
	N220	N330	N450
	N750	N1400	N2400
	N3300	N4700	N5600

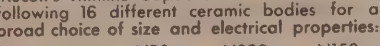
General Purpose Materials: LOW-VAR, STABLE-K, HIGH-K & SUPER-K for wide range of stability and capacitance.

SPECIFICATIONS

Capacitance Range:
TEMP.-COMP. BODIES 1/2 pf - 2200 pf
GEN. PURPOSE BODIES 50 pf - 150,000 pf
Voltages: 25 WVDC, 50WVDC, 200 WVDC
Leads: Tinned Copper or Nickel
Shapes: Square, rectangular, single or multiple element.

RIBBON LEADS

Style RLA

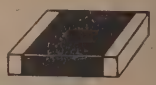


Size and specifications same as "Thinline" capacitors shown above, except radial and axial tinned copper ribbon leads, approximately .006" thick x 3/32" wide for units with max. size of .150" and up; .045" wide for smaller units.

CHIPS SINGLE LAYER

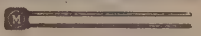
Sizes: .030" Sq. and up
Capacitance: SUPER-K Ceramic 150 PF. to 10,000 PF.
HIGH-K " 100 PF. to 5,000 PF.
STABLE-K " 50 PF. to 2,700 PF.
LOW-VAR " 20 PF. to 1,000 PF.
TEMP. COMP. " 1 PF. to 330 PF.
Electrodes: Normally silver. Other precious metals on request
Voltage: 50 WVDC

CHIPS MONOLITHIC MULTILAYER



Sizes: From .050" x .050" x .050" to .610" x .310" x .080"
Capacitance: STABLE-K Ceramic 10 PF. to 2 MF.
NPO " 1 PF. to .027 MF.
Electrodes: Normally silver. Other precious metals on request
Voltage: 50 WVDC

M-CAPS



are monolithic capacitors with maximum capacitance/volume ratio in a choice of 3 dielectrics to cover all requirements. From .100" square to .300" square.

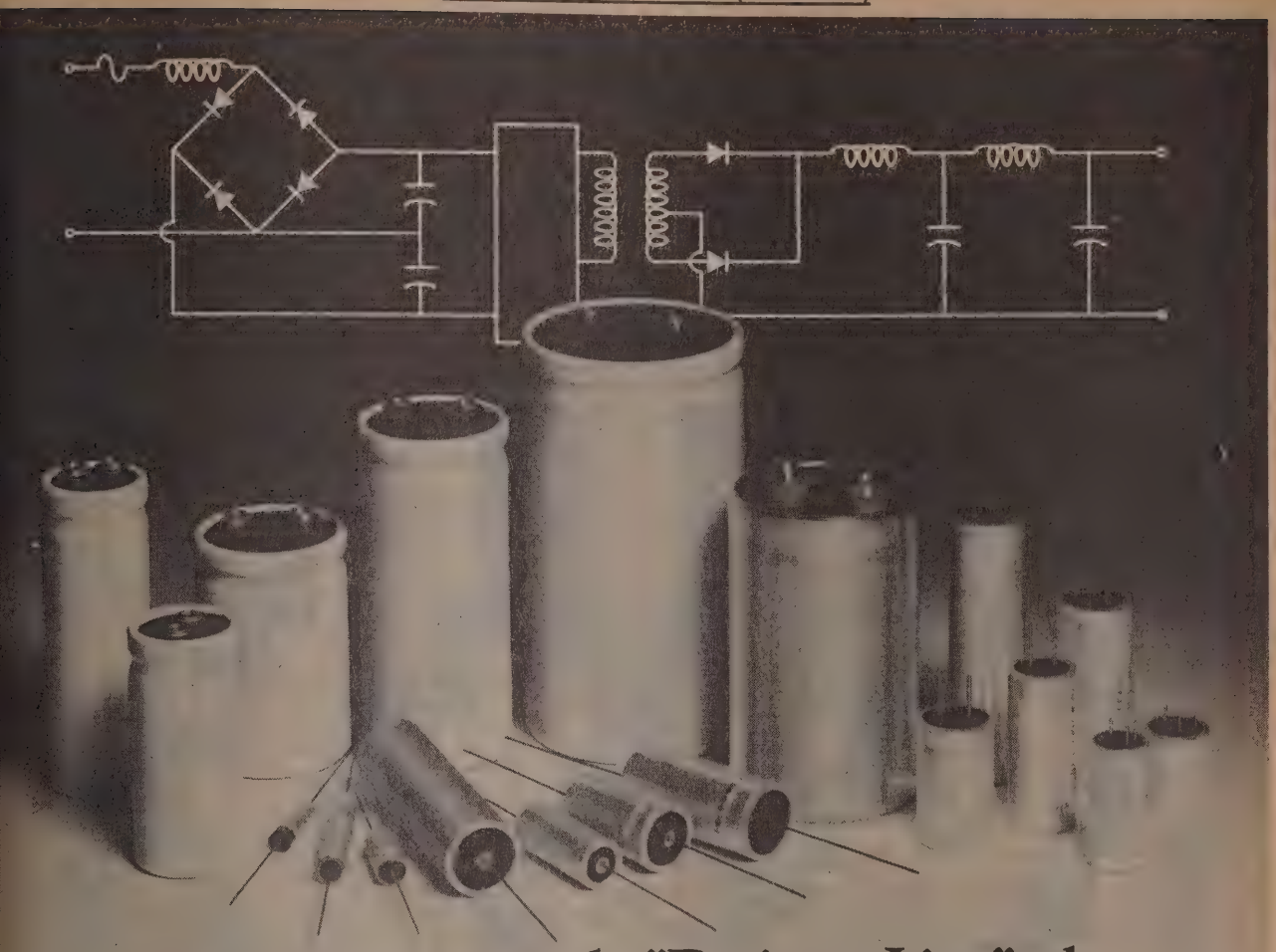
NPO	STABLE-K	HIGH-K
2.2-33,000 PF.	120 PF.-1MF.	470 PF. -1MF.

WRITE FOR FREE CATALOG LISTING COMPLETE DETAILED SPECIFICATIONS FOR ALL MUCON SUB-MINIATURE CERAMIC CAPACITORS, & CHIPS

QPL
MIL-C-11015
CK05 and CK06
CK12 thru CK16

QPL MIL-C-20G
ESTABLISHED RELIABILITY
CCR05 thru CCR09 CCR75 thru CCR79
CC05 thru CC09 CC75 thru CC79

REPUBLIC ELECTRONICS CORP. 176 E. 7th St., PATERSON, N.J. 07524 201-279-0300 TWX 710-988-5908



Sangamo presents the "Designer Line"...the most complete selection of aluminum electrolytic capacitors in the industry.

Sangamo's "Designer Line" opens the door to a world of new design options for you. It's the industry's most complete line of capacitors for switching power supplies. With features and performance characteristics never before available from a single source.

The "Designer Line" includes five capacitor types for the input side... ten for the output side. All backed by Sangamo's reliability and technical expertise.

And we help still more. With engineering assistance and innovative application ideas whenever you want them.

Write for specs (refer to Catalog numbers included in listing, right), or call for a no-obligation consultation. Sangamo Capacitors Division, Box 128, Pickens, SC 29671; phone (803) 878-6311; TWX: 810-397-2496; Telex: 57-9441.

Input Capacitors

Features:

- High voltage—150/200/250V
- High capacitance—to 7400 μF at 200V
- *Fourier compensated ripple current ratings to 10 amps at 85°C
- Operating temperatures to 125°C
- Up to 2,000 hours life at maximum temperatures

Types Available	Temp. Range to:
DCM Thermal Pack	85° C/CAT. 2231F
500 Thermal Pack	85° C/CAT. 2236G
066 Computer Grade	85° C/CAT. 2241C
057 Premium Grade	105° C/CAT. 2244A
557 Premium Grade	125° C/CAT. 2240C

*Requires contact with Sangamo Engineers for special application assistance.

Output Capacitors

Features:

- Low impedance to 100 kHz
- High capacitance to 465,000 μF
- 10 kHz to 100 kHz ripple current ratings to 40 amps
- Operating temperatures to 125°C
- Symmetrical tolerance for capacitance and ESR
- Up to 2,000 hours life at maximum temperatures

Types Available	Temp. Range to:
500R Thermal Pack	85° C/CAT. 2236E
100 Power Pack	105° C/CAT. 2271C
101 Thermal Pack	85° C/CAT. 2272A
101X Thermal Pack	85° C/CAT. 2272A
NEW! 139R Thermal Pack	85° C/CAT. 2273
300 Premium Grade	105° C/CAT. 2260A
301 Premium Grade	105° C/CAT. 2260A
301A Premium Grade	105° C/CAT. 2260A
057 Premium Grade	105° C/CAT. 2244A
557 Premium Grade	125° C/CAT. 2240C

SANGAMO WESTON
Schlumberger

SEMTECH NPO MONO-CHIPS
HIGH VOLTAGE CERAMIC CAPACITORS

	1 kV					2 kV					3 kV					4 kV					5 kV				
SIZE	SCMC 2520	SCMC 3530	SCMC 4540	SCMC 5550	SCMC 6560	SCMC 2520	SCMC 3530	SCMC 4540	SCMC 5550	SCMC 6560	SCMC 2520	SCMC 3530	SCMC 4540	SCMC 5550	SCMC 6560	SCMC 2520	SCMC 3530	SCMC 4540	SCMC 5550	SCMC 6560	SCMC 2520	SCMC 3530	SCMC 4540	SCMC 5550	SCMC 6560
L	.25″	.35″	.45″	.55″	.65″	.25″	.35″	.45″	.55″	.65″	.25″	.35″	.45″	.55″	.65″	.25″	.35″	.45″	.55″	.65″	.25″	.35″	.45″	.55″	.65″
W	.20″	.30″	.40″	.50″	.60″	.20″	.30″	.40″	.50″	.60″	.20″	.30″	.40″	.50″	.60″	.20″	.30″	.40″	.50″	.60″	.20″	.30″	.40″	.50″	.60″
T (MAX.)	.15″	.15″	.15″	.15″	.15″	.15″	.15″	.15″	.15″	.15″	.15″	.15″	.15″	.15″	.15″	.20″	.20″	.20″	.20″	.20″	.25″	.25″	.25″	.25″	.25″
MB (MAX.)	.030″	.040″	.040″	.040″	.040″	.030″	.040″	.040″	.040″	.040″	.030″	.040″	.040″	.040″	.040″	.030″	.040″	.040″	.040″	.040″	.030″	.040″	.040″	.040″	.040″
CAPACITANCE																									
10 pF																									
12 pF																									
15 pF																									
18 pF																									
22 pF																									
27 pF																									
33 pF																									
39 pF																									
47 pF																									
56 pF																									
68 pF																									
82 pF																									
100 pF																									
120 pF																									
150 pF																									
180 pF																									
220 pF																									
270 pF																									
330 pF																									
390 pF																									
470 pF																									
560 pF																									
680 pF																									
820 pF																									
1000 pF																									
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3300 pF																									
3900 pF																									
4700 pF																									
5600 pF																									
6800 pF																									
8200 pF																									
.01 μFd																									
.012 μFd																									
.015 μFd																									
.018 μFd																									
.022 μFd																									
.027 μFd																									
.033 μFd																									
.039 μFd																									
.047 μFd																									

EIA CODE
100
120
150
180
220
270
330
390
470
560
680
820
101
121
151
181
221
271
331
391
471
561
681
821
102
122
152
182
222
272
332
392
472
562
682
822
103
123
153
183
223
273
333
393
473

DIELECTRIC TYPE (K) ..... NPO Also available: X7R DIELECTRIC

TEMPERATURE COEFFICIENT (T.C.) ..... Less than 30 ppm/°C; −55°C to +125°C

DISSIPATION FACTOR (D.F.) ..... Less than .0015 (.15%) @ 1 KHZ, 1 VAC, 25°C

INSULATION RESISTANCE (I.R.) ..... 100 K meg Ω or 1000 meg Ω-microfarads, whichever is less (25°C, 500 VDC)

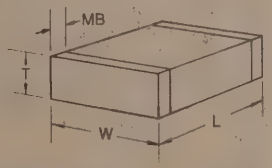
AGING 0

DIELECTRIC WITHSTANDING VOLTAGE ..... 1.2 Times Rated Voltage* @ 25°C

VOLTAGE COEFFICIENT (V.C.) 0

DIMENSIONAL TOLERANCE ..... ± .010 or ± 5%, whichever is greater

*Dielectric Withstanding Voltage Test on Monolithic Chips is conducted with charging current limited to 10 mA and the discharge current limited to 5 A.



ORDERING INSTRUCTIONS:

SCMC 6560	NPO	822	K	A	2
PART SIZE SCMC 2520 SCMC 3530 SCMC 4540 SCMC 5550 SCMC 6560	DIELECTRIC MATERIAL NPO	CAPACITANCE (EIA CODE) Last digit indicates number of zeroes following the first two digits. Ex: 822=8200 pF	CAPACITANCE TOLERANCE J=5% K=10% M=20%	TERMINATION A=Silver D=Palladium Silver	VOLTAGE RATING 1 KV 2 KV 3 KV 4 KV 5 KV

SEMTECH CORPORATION
652 Mitchell Road, Newbury Park, California 91320
(805) 498-2111, (213) 628-5392 / TWX: 910-336-1264

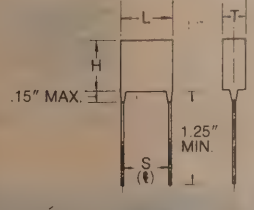
Add Dept. EM to address to tell them you saw it in eem

SEMTECH "GOLD-CAP" X7R RADIALS
HIGH VOLTAGE CERAMIC CAPACITORS

	1 kV					2 kV					3 kV					4 kV					5 kV					
SIZE	SCMC 2520E	SCMC 3530E	SCMC 4540E	SCMC 5550E	SCMC 6560E	SCMC 2520E	SCMC 3530E	SCMC 4540E	SCMC 5550E	SCMC 6560E	SCMC 2520E	SCMC 3530E	SCMC 4540E	SCMC 5550E	SCMC 6560E	SCMC 2520E	SCMC 3530E	SCMC 4540E	SCMC 5550E	SCMC 6560E	SCMC 2520E	SCMC 3530E	SCMC 4540E	SCMC 5550E	SCMC 6560E	
L (MAX.)	.40″	.50″	.60″	.70″	.80″	.40″	.50″	.60″	.70″	.80″	.40″	.50″	.60″	.70″	.80″	.40″	.50″	.60″	.70″	.80″	.40″	.50″	.60″	.70″	.80″	
H (MAX.)	.35″	.45″	.55″	.65″	.75″	.35″	.45″	.55″	.65″	.75″	.35″	.45″	.55″	.65″	.75″	.35″	.45″	.55″	.65″	.75″	.35″	.45″	.55″	.65″	.75″	
T (MAX.)	.25″	.25″	.25″	.25″	.25″	.25″	.25″	.25″	.25″	.25″	.25″	.25″	.25″	.25″	.25″	.30″	.30″	.30″	.30″	.30″	.35″	.35″	.35″	.35″	.35″	
S ± .030″	.280″	.380″	.480″	.580″	.680″	.280″	.380″	.480″	.580″	.680″	.280″	.380″	.480″	.580″	.680″	.280″	.380″	.480″	.580″	.680″	.280″	.380″	.480″	.580″	.680″	
CAPACITANCE																										EIA CODE
82 pF																										820
100 pF																										101
120 pF																										121
150 pF																										151
180 pF																										181
220 pF																										221
270 pF																										271
330 pF																										331
390 pF																										391
470 pF																										471
560 pF																										561
680 pF																										681
820 pF																										821
1000 pF																										102
1200 pF																										122
1500 pF																										152
1800 pF																										182
2200 pF																										222
2700 pF																										272
3300 pF																										332
3900 pF																										392
4700 pF																										472
5600 pF																										562
6800 pF																										682
8200 pF																										822
.01 μFd																										103
.012 μFd																										123
.015 μFd																										153
.018 μFd																										183
.022 μFd																										223
.027 μFd																										273
.033 μFd																										333
.039 μFd																										393
.047 μFd																										473
.056 μFd																										563
.068 μFd																										683
.082 μFd																										823
.100 μFd																										104
.12 μFd																										124
.15 μFd																										154
.18 μFd																										184
.22 μFd																										224
.27 μFd																										274
.33 μFd																										334
.39 μFd																										394

DIELECTRIC TYPE (K) ..... X7R Also available: NPO DIELECTRIC
TEMPERATURE COEFFICIENT (T.C.) ..... ± 15% −55 to +125°C
DISSIPATION FACTOR (D.F.) ..... 2.5% max 1 KHZ 1 VAC 25°C
INSULATION RESISTANCE (I.R.) ..... 100 K meg Ω or 1000 meg Ω-microfarads, whichever is less (25°C, 500 VDC)
AGING ..... 1% per decade
DIELECTRIC WITHSTANDING VOLTAGE ..... 1.2 Times Rated Voltage* @ 25°C
VOLTAGE COEFFICIENT (V.C.) ..... Less than 10% at 50V per mil.
DIMENSIONAL TOLERANCE ..... ± .010 or ± 5%, whichever is greater

*Dielectric Withstanding Voltage Test on Gold-Caps is conducted with charging current limited to 10 mA and the discharge current limited to 5 A.



ORDERING INSTRUCTIONS:

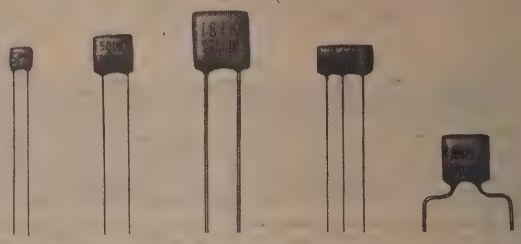
SCMC 3530E	X7R	822	K	A	2
PART SIZE	DIELECTRIC MATERIAL	CAPACITANCE (EIA CODE)	CAPACITANCE TOLERANCE	TERMINATION	VOLTAGE RATING
SCMC 2520E SCMC 3530E SCMC 4540E SCMC 5550E SCMC 6560E	X7R	Last digit indicates number of zeroes following the first two digits. Ex: 822=8200 pF	K=10% M=20% V=+100%−0% Z=+80%−20%	A=Silver D=Palladium Silver	1 KV 2 KV 3 KV 4 KV 5 KV

SEMTECH CORPORATION
652 Mitchell Road, Newbury Park, California 91320
(805) 498-2111, (213) 628-5392 / TWX: 910-336-1264

SOSHIN MICA CAPACITORS

FMCON

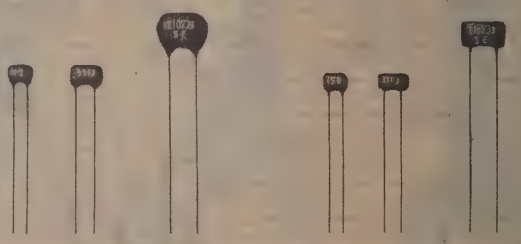
A new silver-coated mica capacitor for radio, TV applications. Low temperature coefficient, small, economical. FMCON for 50WV.
V-FMCON for transistor circuit.



Type		Capacitance Range (pF)		tolerance	Sizes (mm)						Leads (mm)			
					W.H (MAX)		T (MAX)		S (±1)		ℓ (MIN)		ϕ (±0.1)	
500WV	50WV	500WV	50WV		500WV	50WV	500WV	50WV	500WV	50WV	500WV	50WV	500WV	50WV
FM05	V-FM05	1~33	1~50	G.J.K	7.0	7.0	3.5	3.5	2.5	2.5	20.0	20.0	0.4	0.4
FM07	V-FM07	34~75	51~120	G.J.K	8.0	8.0	3.5	3.5	4.0	4.0	20.0	20.0	0.4	0.4
FM09	V-FM09	76~120	121~220	G.J.K	10.0	10.0	3.5	3.5	5.0	5.0	20.0	20.0	0.5	0.5
FM11	V-FM11	121~220	221~330	G.J.K	12.0	12.0	4.5	4.5	7.5	7.5	20.0	20.0	0.5	0.5
FM13	V-FM13	221~330	331~470	G.J.K	14.0	14.0	4.5	4.5	7.5	7.5	20.0	20.0	0.5	0.5
FM15	—	331~470	—	G.J.K	16.0	—	4.5	—	10.0	—	20.0	20.0	0.6	—

DIPPED MICA CAPACITORS

Temperature tests prove superiority: These dipped mica capacitors withstand 2000 hrs at 40°C, 90% to 95% humidity. Usable temperature range −55°C to +150°C.
Miniature type, DM05, also available.
All types meet MIL-C-5D specifications.



Type	Maximum allowable capacitance (pF)			tolerance	Sizes (mm)															Leads (mm)		
					ONE COAT type									STANDARD type								ONE COAT STANDARD
					500WV			300WV			100WV			500WV			300WV			100WV					
STANDARD type	100 WV	300 WV	500 WV		W MAX	H MAX	T MAX	W MAX	H MAX	T MAX	W MAX	H MAX	T MAX	W MAX	H MAX	T MAX	W MAX	H MAX	T MAX	W MAX	H MAX	T MAX	A ±0.04	D AWG	C MIN
DM05	200	120	—	D.F.G.J.K	—	—	—	6.3	5.3	4.3	6.3	5.3	4.3	—	—	—	6.8	6.3	4.8	6.8	6.3	4.8	3.0	0.4	32.0
DM10	470	360	250	D.F.G.J.K	7.8	5.8	3.5	7.8	6.0	3.8	7.8	6.0	3.8	9.9	9.6	5.5	10.1	9.9	5.8	10.1	9.9	5.8	3.5	0.4	32.0
DM15	1,600	1,200	750	D.F.G.J.K	10.6	7.6	4.5	10.6	7.6	4.5	10.6	7.6	4.5	12.7	10.9	6.3	12.7	10.9	6.3	12.7	10.9	6.3	5.9	0.64	32.0
DM19	8,200	6,800	5,100	D.F.G.J.K	16.7	12.7	8.1	16.2	12.4	6.9	16.5	12.4	7.6	18.0	14.9	9.3	17.5	14.4	8.3	17.7	14.7	8.8	8.7	0.8	32.0
DM20	18,000	12,300	10,000	D.F.G.J.K	19.3	13.4	10.1	19.0	12.9	9.1	19.3	13.2	9.3	20.8	16.0	11.4	20.5	15.2	10.1	20.8	15.7	11.1	11.0	0.8	32.0
DM30	40,000	30,000	22,000	D.F.G.J.K	—	—	—	—	—	—	—	—	—	21.3	23.6	12.1	21.0	23.3	11.6	21.3	23.3	11.9	11.0	1.0	32.0
DM40	25,000	20,000	15,000	D.F.G.J.K	—	—	—	—	—	—	—	—	—	25.6	19.0	9.9	25.8	19.2	10.4	25.6	19.0	9.9	15.0	1.0	32.0
DM42	100,000	69,000	51,000	D.F.G.J.K	—	—	—	—	—	—	—	—	—	37.5	23.3	12.0	37.5	23.6	12.1	38.1	23.9	12.5	26.9	1.0	32.0

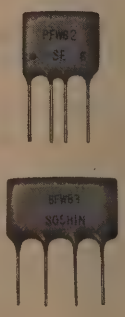
PRINTED FILTERS

Small, revolutionary new coils FM radio antenna coupling use bandpass filter.

- Used in antenna circuit to pass only FM broadcast band and reject unwanted signals without adjustment.
- Monolithic construction minimizes variation.
- Fewer assembly stage bring costs way down.
- Input 75Ω unbalance type and 300Ω balance type (BFWB3).

Item	Rating
Dimensions	BFWB3 20×13×4 PFWB2 15×13×4
Passband	87.5—108MHz Under 3dB Manufactured to frequency bands in each country.
In-band ripple	1dB max.
Stop band	Over 20dB at 55MHz Over 20dB at 150MHz

Applications: Circuit connection use for both common emitter and common base.

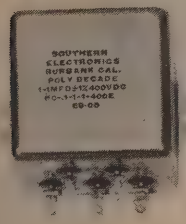


SOSHIN ELECTRIC CO., LTD.
1-18-18 Nakamagome, Ohta-ku, Tokyo, Japan, TELEX 246-6377
Agent Arco Electronics, Inc.
(616) 864-7000 WX 510-228-0241
(213) 882-8707 WX 910-494-1919

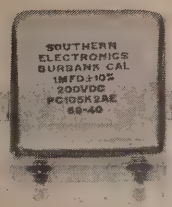
SOUTHERN ELECTRONICS COMPANY

DEPT. EM, 726 S. FLOWER ST. / BURBANK, CALIF. 91502

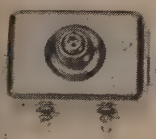
A Wholly Owned Subsidiary of
F-DYNE ELECTRONICS COMPANY



DECADE



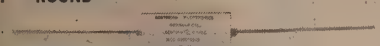
BATHTUB



ADJUSTABLE

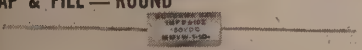
PLUG-IN

H.S. — ROUND

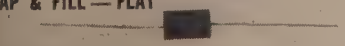


H.S. — RECTANGULAR

WRAP & FILL — ROUND



WRAP & FILL — FLAT



RECTANGULAR — AXIAL

RECTANGULAR — RADIAL

DIP COATED — RADIAL

PROMPT SERVICE ON SPECIAL AND STANDARD CAPACITORS AND FILTERS

Capacitors and filters are available from Southern Electronics to meet your special application requirements. Non-standard values, tolerances and case configurations can be supplied from stock or with quick delivery.

A full line of standard film and Kraft-film dielectric capacitors is also available from stock or with a short delivery cycle.

POLYESTER (MYLAR) FOIL

.0001 — 10 mfds
25 — 2000VDC
−55 to +125°C
50K (meg) (mfds) or 100K megs
.75%

GENERAL LIMITS

Cap. Range
Volt Range
Temp. Range
IR
PF

METALLIZED POLYESTER

.01 — 50 mfds
50 — 15000VDC
−55 to +125°C
25K (meg) (mfds) or 50K megs
1% max.

POLYCARBONATE FOIL

.0001 — 5 mfds
25 — 1000VDC
−55 to +125°C
75K (meg) (mfds) or 500K megs
.3% max.

GENERAL LIMITS

Cap. Range
Volt Range
Temp. Range
IR
PF

METALLIZED POLYCARBONATE

.01 — 50 mfds
50 — 1000VDC
−55 to +125°C
30K (meg) (mfds) or 150K megs
.3% max.

POLYPROPYLENE FOIL

.0001 — 5 mfds
50 — 1000VDC
−55 to +105°C
100K (meg) (mfds) or 100K megs
.2% max.

GENERAL LIMITS

Cap. Range
Volt Range
Temp. Range
IR
PF

METALLIZED POLYPROPYLENE

.01 — 50 mfds
50 — 10000VDC
−55 to +125°C
50K (meg) (mfds) or 100K megs
.2%

POLYSULFONE FOIL

.0001 — 5 mfds
25 — 1000VDC
−55 to +150°C
75K (meg) (mfds) or 500K megs
.3% max.

GENERAL LIMITS

Cap. Range
Volt Range
Temp. Range
IR
PF

METALLIZED POLYSULFONE

.01 — 50 mfds
50 — 600VDC
−55 to +150°C
30K (meg) (mfds) or 150K megs
.3% max.

POLYSTYRENE FOIL

.0001 — 5 mfds
50 — 1000VDC
−55 to +85°C
100K (meg) (mfds) or 500K megs
.1% max.

GENERAL LIMITS

Cap. Range
Volt Range
Temp. Range
IR
PF

METALLIZED POLYSTYRENE

Available on special request

TEFLON FOIL

.001 — 5 mfds
50 — 600VDC
−55 to +160°C
1000K (meg) (mfds) or 2000K megs
.01%

GENERAL LIMITS

Cap. Range
Volt Range
Temp. Range
IR
PF

METALLIZED TEFLON

.001 — 20 mfds
50 — 600 VDC
−55 to +140°C
500K (meg) (mfd) or 1000K megs
.2%

For related products available through S.E.C. or F-Dyne see EEM Page 1148

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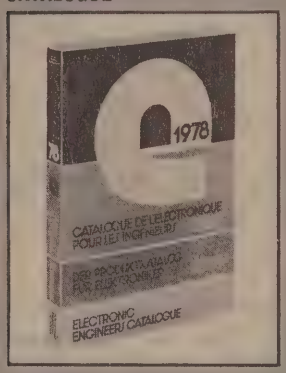

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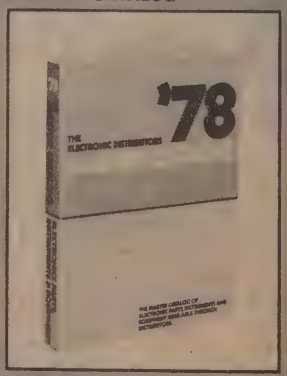

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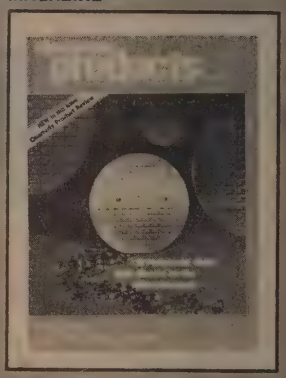

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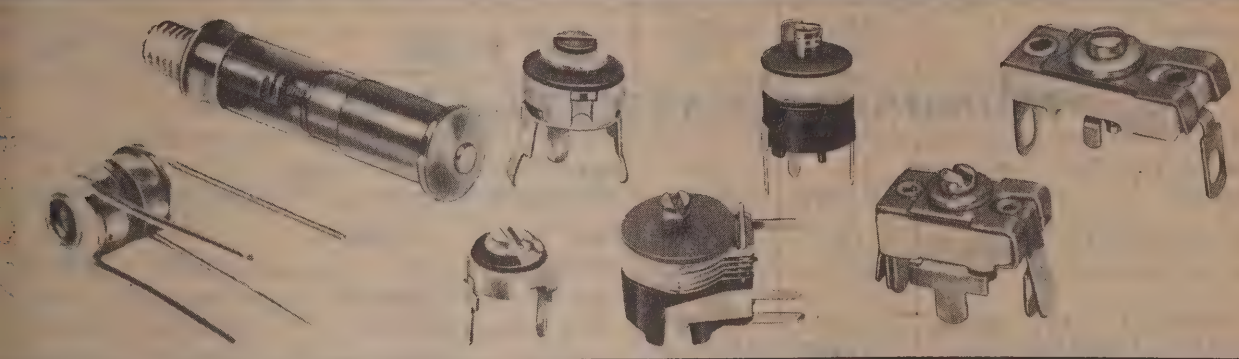

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Description	Voltage Range	Capacitance Range	Description	Voltage Range	Capacitance Range
ALUMINUM ELECTROLYTIC CAPACITORS					
Types TE, 500D, TVA . . . tubular, axial-lead	1 to 600 WVDC	1.0 to 40,000 μF	Types 672D, 673D...tubular, single-ended, extended temp. range	6.3 to 250 WVDC	4.7 to 4700 μF
Types 501D, WH11D . . . tubular, axial-lead, economy type	3 to 150 WVDC	.47 to 15,000 μF	Types TVL, TVLU . . . cylindrical, twist-prong	6 to 600 WVDC	2.0 to 10,000 μF
Types 600D, 601D, 630D . . . tubular, axial-lead, extended temp. range	5 to 250 WVDC	3.3 to 13,000 μF	Types 36D, 36DX . . . cylindrical, female threaded terminals	3 to 450 WVDC	50 to 390,000 μF
Type 604D . . . tubular, four-terminal, extended temp. range	5 to 200 WVDC	50 to 16,000 μF	Type 32DR . . . cylindrical, female threaded terminals, minimum ESR	7.5 to 100 WVDC	410 to 310,000 μF
Type 39D . . . tubular, axial-lead, high capacitance	3 to 450 WVDC	1 to 18,000 μF	Type 602D . . . cylindrical, female threaded terminals, high ripple	5 to 100 WVDC	250 to 220,000 μF
Types 502D, 503D . . . tubular, single-ended	6.3 to 63 WVDC	0.47 to 6800 μF	Type 622D . . . cylindrical, female threaded, extended temp. range	5 to 55 WVDC	2800 to 67,000 μF
			Type 432D . . . cylindrical, stacked-foil construction	6 to 50 WVDC	470 to 100,000 μF
SOLID TANTALUM CAPACITORS					
Types 935D, 936D, 939D . . . 1, 2, or 4 capacitors per DIP package	10 to 35 WVDC	6.8 to 33 μF	Type 162D . . . tubular, axial-lead, metal case, resin end seals	2 to 50 WVDC	.0047 to 68 μF
Types 196D, 199D . . . epoxy-dipped, radial leads	3 to 50 WVDC	0.1 to 680 μF	Type 193D . . . rectangular, molded, tab terminals or leadless with solderable pads	3 to 35 WVDC	0.1 to 100 μF
Types 182D, 183D . . . ultra-miniature tubular or rectangular	2 to 50 WVDC	.0010 to 220 μF	Types CS12, CS13 . . . tubular, axial-lead, to MIL-C-26655	6 to 100 WVDC	.0047 to 330 μF
Types 150D, 151D . . . tubular, axial-lead, metal case, hermetically sealed	6 to 125 WVDC	.0023 to 1000 μF	Types CSR13, CSR23 . . . tubular, axial-lead, established reliability, to MIL-C-39003	6 to 100 WVDC	.0047 to 1000 μF
FOIL TANTALUM CAPACITORS					
Series 110D . . . tubular, axial-lead	3 to 300 WVDC	.15 to 2500 μF	Types CLR25/27, CLR35/37 . . . tubular, axial-lead, established reliability, to MIL-C-39006	15 to 300 WVDC	0.12 to 580 μF
Series CL20, CL30 . . . tubular, axial-lead, to MIL-C-3965	2 to 300 WVDC	0.12 to 580 μF			
SINTERED-ANODE TANTALUM CAPACITORS					
Types 109D, 130D, 146D . . . tubular, axial-lead	4 to 150 WVDC	1.7 to 2200 μF	Type CLR65 . . . tubular, axial-lead, established reliability, to MIL-C-39006	6 to 125 WVDC	1.7 to 1200 μF
Types 135D, 137D, 138D . . . tubular, axial-lead, gelled-electrolyte	6 to 150 WVDC	1.7 to 1200 μF	Types 200D, 202D . . . rectangular assemblies, hermetically sealed	4 to 500 WVDC	14.0 to 22,000 μF
Types CL64/65, CL66/67 . . . tubular, axial-lead, to MIL-C-3965	6 to 125 WVDC	1.7 to 560 μF			

FOR COMPLETE LISTINGS, SEE LATEST ISSUE OF SPRAGUE CATALOG C-564.

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Description	Voltage Range	Capacitance Range
FILM CAPACITORS		
Type 416P . . . tubular, axial-lead, polyester, film wrapped	50 to 600 WVDC	.001 to 1.0 μF
Type 192P . . . tubular, axial-lead, polyester, heat-shrunk sleeve	80 to 400 WVDC	.0001 to .47 μF
Type 431P . . . tubular, axial-lead, polyester, metallized, metal case	50 to 600 WVDC	.0015 to 12.0 μF
Type 260P . . . tubular, axial-lead, polycarbonate, metallized, metal case	200 WVDC	.01 to 10.0 μF
Types 225P, 418P, PS . . . tubular, radial-lead, polyester, epoxy-coated	100 to 2000 WVDC	.001 to 1.0 μF
Type DF . . . tubular, radial-lead, polyester, metallized, epoxy-coated	100 to 200 WVDC	.15 to 5.5 μF
Type 715P . . . tubular, radial-lead, polypropylene, epoxy-coated	200 to 1600 WVDC	.001 to .47 μF
CERAMIC CAPACITORS		
Type 292C . . . tubular, axial-lead, multi-layer, molded	50 to 100 WVDC	1.0 pF to .47 μF
Series 940C . . . 1, 2, 4, 7, or 8 capacitors per DIP Package	50 to 400 WVDC	10 pF to 1.0 μF
Type 460C . . . single in-line package, 8 pins, 7 capacitors	100 WVDC	18 pF to .01 μF
Type GA . . . disc, general application	500 to 7500 WVDC	1.5 pF to .1 μF
Type HK . . . disc, High-K for by-pass / coupling	500 to 1000 WVDC	.001 to .1 μF
Types TG, HY . . . disc, coupling and by-pass, miniaturized	12 to 100 WVDC	.0047 to .47 μF
Types 2SS, 10SS, 10TS . . . disc, frequency-stable and temperature stable	250 to 1000 WVDC	3.3 pF to .022 μF
Series 10T . . . disc, temperature-compensating	1000 WVDC	1.0 to 2200 pF
Types CKR05, CKR06 . . . rectangular, molded, MIL style	50 to 200 WVDC	10 to 220,000 pF
Types 1C, 2C, 3C, 5C . . . rectangular, multi-layer, resin-coated	50 to 100 WVDC	10.0 pF to 3.3 μF
Type 7C . . . rectangular, multi-layer, saddle-base, resin-coated	50 to 100 WVDC	51.0 pF to 4.7 μF
PAPER CAPACITORS		
Types 91P, 96P, 191P, 196P . . . tubular, axial-lead	100 to 1000 WVDC	.001 to 1.0 μF
Types CP04/5/8/9 . . . tubular, axial-lead, to MIL-C-25C	100 to 1000 WVDC	.001 to 1.0 μF
Types CR, BP . . . rectangular, oil-impregnated	400 to 7500 WVDC	.05 to 12.0 μF
Types CP53, 61, 72 . . . rectangular, oil-impregnated, to MIL-C-25C	100 to 2000 WVDC	.05 to 12.0 μF
PAPER-FILM CAPACITORS		
Type 118P . . . tubular, axial-lead, metal-encased, metallized	200 to 600 WVDC	.01 to 12.0 μF
MICA CAPACITORS		
Types MW, CM04/5/6 . . . rectangular, epoxy-coated, for 125°C operation	500 WVDC	1 to 5100 pF

FOR COMPLETE LISTINGS, SEE LATEST ISSUE OF SPRAGUE CATALOG C-564.

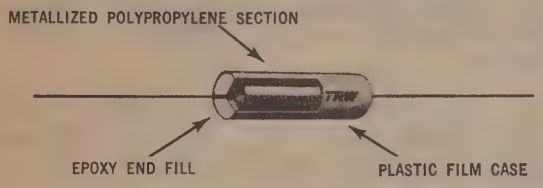
TRW CAPACITORS

METALLIZED POLYPROPYLENE DIELECTRIC
TYPE X363UW
Subminiature . . . Instrument Grade

DESIGN HIGHLIGHTS

- Long stable life
- Very high insulation resistance
- Lowest dissipation factor
- Humidity resistant
- Saves on size and weight
- Capacitance tolerance to 1%

CUT-AWAY SHOWS CONSTRUCTION



Used for a number of years in the non-precision power capacitor field, polypropylene has now been developed by TRW Capacitors as a dielectric for miniaturized precision capacitors exhibiting unique and outstanding electrical and environmental characteristics. Particularly worthy of note is its stability. The X363UW exhibits negligible shift in capacitance under long term exposure to humidity, operating life, and temperature cycling. Insulation resistance, dielectric absorption and dissipation factor properties are all the equivalent of or superior to those of polystyrene.

SPECIFICATIONS

Insulation Resistance .....Minimum values.

Temperature	+25°C	+85°C	+105°C
Megohms X Microfarads	300,000	30,000	3,000
Need Not Exceed (Megohms)	500,000	50,000	5,000

Measured after two minutes electrification at 200 volts.

Dissipation Factor .....Less than 0.1% at 25°C when measured at or referred to 1000 ± 20 Hz for capacitance values up to and including 10.0 mfd.

Dielectric Strength .....Twice rated voltage for one minute through a limiting resistance of 100 ohms/volt.

Dielectric Absorption .....When tested per MIL-C-19978 the dielectric absorption shall not exceed .05%. Shorter test methods produce lower results. For further information, consult TRW Engineering.

Capacitance .....Shall be within specified tolerance when measured at or referred to 1000 ± 20 Hz for values up to and including 10.0 mfd. at 25° ± 5°C.

Temperature Range .....−55° to 105°C with no voltage derating.

METALLIZED POLYESTER
Type X601PE-X601CPE
Dipped Epoxy Coating

DESIGN HIGHLIGHTS

- Ultra miniature, lightweight
- Tough, Rugged Case
- Styled for maximum packaging efficiency
- Capacitance values to 10 mfd.
- Tolerances to ±5%

CUT-AWAY SHOWS CONSTRUCTION

The X601PE was designed for quality capacitor applications utilizing the advance technology of TRW. It is ideally designed for "Space Age" applications requiring the best the industry has to offer in minimum size and weight, consistent with maximum reliability.
The X601PE line is now available in a full range of values from .01 to 10.0 mfd in 100 and 200 VDC. The unit is excellent in electrical and environmental performance throughout this range.

SPECIFICATIONS

Insulation Resistance.....Table 1, minimum values.

Temperature	+25°C	+85°C	+125°C
Megohms X Microfarads	20,000	2,000	20
Need Not Exceed (Megohms)	30,000	5,000	50

Measured after 2 minutes electrification at rated voltage.

Dissipation Factor.....Less than 1.0% when measured at or referred to 1000 ± 20 Hz for capacitance values up to and including 1.0 mfd. at 25°C ± 5°C. Capacitance values greater than 1.0 mfd. measured at 60 ± 6 Hz.

Dielectric Strength.....Twice rated voltage for 1 minute through 100 ohms per volt limiting resistance.

Humidity Resistance.....Tested as outlined in MIL-STD-202, Method 103, Condition B, no voltage applied. After final conditioning, IR no less than ⅓ minimum values listed in Table I.

Life Test.....500 hours at +100°C and 125% of rated volts.

Temperature Range.....−55°C to 100°C, to 125°C with 50% derating.

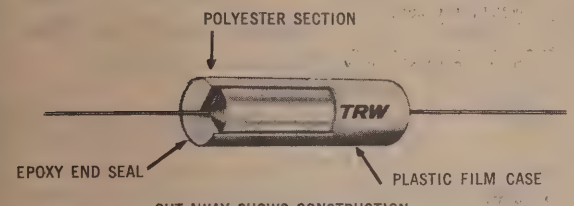
Construction.....Metallized Polyester, non-inductive winding.

TRW CAPACITORS

POLYESTER DIELECTRIC
Type 663UW

DESIGN HIGHLIGHTS

- For Maximum space saving
- "Instrument" quality
- Tough, moisture resisting case
- Conservatively rated
- Tolerances to ±1%



CUT-AWAY SHOWS CONSTRUCTION

Type 663UW capacitors are compatible in size with other subminiature transistor components. In addition, they are conservatively designed and rated for long life and reliable service in high quality equipment and instrument applications. The Polyester winding is covered with a thin, tough plastic case adding less than 1/64" to the body diameter. The dense thermo-setting epoxy endfill bonds securely to the lead and case. This line is designed and rated for long life and reliable service.

SPECIFICATIONS

Insulation Resistance ..... Greater than 70,000 megohms-microfarads at 25° C, but the IR need not exceed 140,000 megohms.

Dissipation Factor ..... Less than 1.0% when measured at or referred to 1000 ± 20 Hz for capacitance values up to and including 1.0 mfd. at 25°C. ± 5°C. Capacitance values greater than 1.0 mfd. measured at 60 ± 6 Hz.

Lead Pull Test ..... Steady force of 4 lbs. applied axially for 60 sec. on diameters up to .359—8 lbs. on dia. over .359.

Life Test ..... 250 hours at 85°C and 125% of Rated Voltage. No more than one failure allowed of 18 units tested.

Dielectric Strength ..... 2 times rated voltage for one minute through a limiting resistance of 100 ohms/volt.

Humidity Resistance ..... Will meet or exceed requirements of MIL-C-27287, Paragraph 3.12, when tested in accordance with MIL-Std.-202, Method 103, Condition B. One failure allowed of 18 units tested.

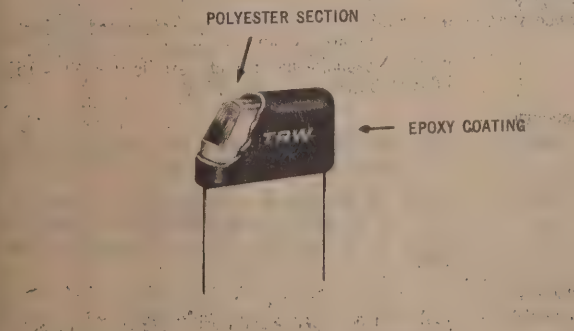
Temperature Range ..... May be operated at rated voltage from —55°C. to +85°C and to +125°C with 50% derating.

Winding Design ..... Extended foil construction.

POLYESTER DIELECTRIC
Type 601PE-601CPE
Dipped Epoxy Coating

DESIGN HIGHLIGHTS

- Styled for "High Density" packaging
- Extremely stable
- Ideal replacement for ceramic discs
- High insulation resistance
- Full range of values
- Tolerances to ±5%



Now available in the full range from 35V to 600 V and .001 to 1.0 mfd, the "slim" 601 series is even more valuable in high density applications. Thin, modular packaging provides maximum capacitance for minimum chassis area. It is engineered to replace ceramic discs where stability with temperature change is important.

SPECIFICATIONS

Insulation Resistance ..... Minimum values according to Table 1. (Refer to graph for IR at other temperatures).

Temperature	+25°C	+85°C	+125°C
Megohms X Microfarads	50,000	2,000	20
Need Not Exceed (Megohms)	100,000	5,000	100

Measured after 2 minutes electrification at 100 VDC or rated voltage, whichever is greater.

Dissipation Factor ..... Less than 1.0% when measured at or referred to 1000 ±20 Hz for capacitance values up to and including 1.0 mfd. at 25°C ±5°C. Capacitance values greater than 1.0 mfd. measured at 60 ±6 Hz.

Dielectric Strength ..... Twice rated voltage for 1 minute through 100 ohms per volt limiting resistance.

Humidity Resistance ..... These designs comply with test requirements per MIL-STD-202, method 103, Condition B, no voltage applied. Minimum resistance after test, 15,000 megohms.

Life Test ..... 1000 hrs. @ +85°C and 125% of rated voltage. No more than one failure allowed of 24 units tested.

Temperature Cycling ..... MIL-STD-202 method 102, condition D, no voltage applied. Minimum insulation resistance after test 25,000 megohms. Less than 1% change in capacitance.

Capacitance Tolerance ..... Within specified tolerance when measured at 1000 ±20 Hz, 25 ± 5°C (standard is 20%).

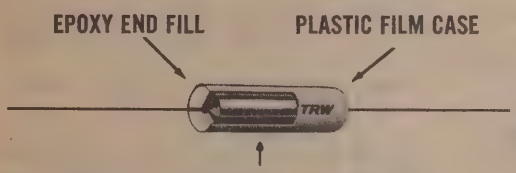
Temperature Range ..... May be operated at rated voltage from —55°C to +85°C. Derate to 50% when operating at 125°C.

TRW CAPACITORS

METALLIZED POLYCARBONATE
Type X463UW

DESIGN HIGHLIGHTS

- Small Size—Lightweight
- Very Low Temperature Coefficient
- Fully Rated from —55°C to +125°C
- High Insulation Resistance
- Excellent Retrace
- Tolerances to ±1%



Metallized Polycarbonate SECTION

The increasing demand for reduction in size and weight coupled with requirements for enhanced circuit performance, requires capacitors which incorporate the latest developments in component technology. TRW has now introduced a capacitor which combines the improved electrical performance of polycarbonate and the size and weight reductions associated with a metallized dielectric.

SPECIFICATIONS

Insulation Resistance.....Table 1, minimum values.

Temperature	+25°C	+85°C	+125°C
Megohms X Microfarads	60,000	6,000	600
Need Not Exceed (Megohms)	200,000	50,000	5,000

Measured after 2 minutes electrification at rated voltage.

Dissipation Factor.....Less than 0.3% at 25°C when measured at or referred to 1000 ±20Hz for capacitance values up to and including 10 mfd.

Dielectric Strength.....Twice rated voltage for one minute through a limiting resistance of 100 ohms/volt.

Life Test.....250 hours at 125°C and 140% rated voltage with no more than 1 failure out of 12 units tested.

Temperature Range.....—55°C to +125°C with no voltage derating.

Humidity Resistance.....No more than one failure allowed of 12 units tested when tested as outlined in MIL-STD-202, Method 103, Condition B, with 100 volts or rated voltage applied, whichever is less.

METALLIZED DIELECTRIC
Type X440

DESIGN HIGHLIGHTS

- Minimum Possible Size—Lightweight
- Very Low Temperature Coefficient
- Fully Rated from —55°C to +125°C
- High Insulation Resistance
- Tolerances to ±1%

The X440 has been specifically designed to be a real help in the ever increasing problem of fitting components in todays miniaturized designs. Its absolute minimum size, precision dimensions, and the close tolerance lead spacing permit space savings impossible before. Additionally, the highly impossible electrical properties of polycarbonate are of immense value in modern high performance circuitry.

Standoffs on the bottom of the premolded case provide for rigid, secure mounting and facilitate cleaning of the printed circuit boards. Leads are uniformly and accurately spaced on .200" centers.

SPECIFICATIONS

Voltage Rating.....50 VDC from —55°C to +125°C.

Insulation Resistance.....Greater than 500,000 megohms @ 25°C.

Dissipation Factor.....Less than .3% at 1K Hz @ 25°C.

Capacitance Change with Temperature.....a. Between 0°C and 125°C, as referenced to 25°C, capacity change will not exceed +½ —1½%.
b. TC of capacitance characteristic is 0 +50 —150 PPM/°C between 0°C and 125°C.

Dielectric Strength.....200% of rated voltage applied for 2 minutes through limiting resistance of 100 ohm/volt.

Life Test.....Tested in accordance with Mil-C-27287, 250 hrs., 125°C @ 1.4 RV.IR greater than 70% of original requirement, DF less than .3%, cap. change less than 1%.

Humidity Resistance.....Tested in accordance with Mil-C-27287, 40°C, 95% RH, 240 hours. IR greater than 10 gigaohms @ 25°C. DF less than .3%.

Lead Pull Test...5 lbs. in any direction.

Construction.....Metallized polycarbonate dielectric, non-inductive winding. Epoxy case with standoffs.

Leads.....24 gauge tinned solid wire on .2" centers.

TRW CAPACITORS

FLAT METALLIZED POLYESTER CAPACITORS

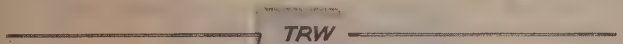
Type X659F — Smallest Possible Size

"The New Dimension Capacitor"

DESIGN HIGHLIGHTS

- Smallest Possible Size
- High Insulation Resistance
- Self-Healing — Long Stable Life
- Full Voltage Range
- Capacitance Values to 20.0 MFD

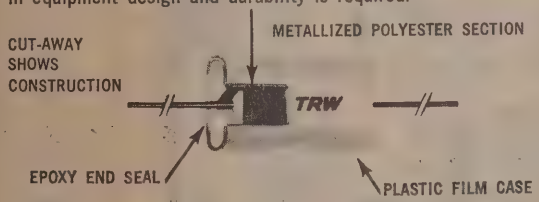
Axial Leads Plastic Film Case



ACTUAL SIZE — .047 MFD 100 VDC

TRW Type X659F adds a complete new dimension to circuit board layout by providing a metallized polyester, wound flattened capacitor, in sizes never before available. This advance design which utilizes the very thin gauges of metallized polyester, coupled with TRW's advanced manufacturing technology and in-house metallizing capability and control, offers the same rugged durability and reliability as all TRW Capacitors.

This basic reliability and the proven performance record of metallized polyester makes the X659F the ideal choice where freedom in equipment design and durability is required.



APPLICATIONS — Commercial and Instrument Use

Used to solve many packaging problems where maximum space economy is required. The oval shape allows either vertical mounting or flat horizontal board hugging mounting. Metallized polyester offers trouble-free equipment operation and is structured for utilization in commercial and instrument grade products. The X659F's light weight and very small size make it ideally suited to small portable equipment where size and weight are prime consideration.

SPECIFICATIONS

Insulation Resistance .... Minimum values

Insulation Resistance	+25°C	+85°C	+125°C
Megohms & Microfarads	30,000	3,000	50
Need not Exceed (Megohms)	30,000	3,000	50

Measured after 2 minutes electrification at rated voltage

Dissipation Factor ..... Less than 1.0% when measured at or referred to 1000 ±20 cps for capacitance values up to and including 1.0 mfd at 25 ±5°C except for units having a thickness dimension of .170 or less, the DF shall not exceed 1.5%. Capacitance values greater than 1.0 mfd measured at 60 ±6 cps.

Temperature Range ..... −55°C to 100°C; to +125°C with 50% derating.

Humidity Resistance .... Tested as outlined in MIL-STD-202C, Method 103B, Condition A. After final conditioning IR, no less than ⅓ minimum values listed in Table 1. Dielectric strength to withstand test as outlined in Para. 3.4. One failure allowed of 18 units tested.

Dielectric Strength ..... 200% rated voltage for one minute through a limiting resistance of 100 ohms/volts.

Life Test ..... 250 hours at 100°C; to 125°C with 50% derating.

Lead Pull Test .. Tested as outlined in MIL-STD-202C, Method 211, Condition A. Will withstand force of the following magnitude:
4½ lbs. — thickness up to and including .359
9 lbs. — thickness over .359

Vibration Test . Tested as outlined in MIL-STD-202C, Method 204, Condition B. Entire body shall be rigidly mounted to vibration apparatus. Vibration shall be 4 hours in each of 2 directions, parallel and perpendicular to major axis. Capacitors measured during last cycle in each direction for open or short circuit. One failure allowed of 12 units tested.

Capacitance ... Shall be within specified tolerance when measured at or referred to 1000 ±20 cps for values up to and including 1.0 mfd at 25 ±5°C. Capacitance values greater than 1.0 mfd measured at 60 ±6 cps.

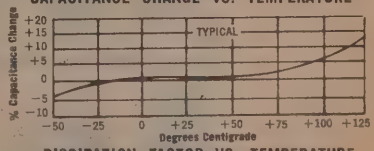
Capacitor Tolerance ..... Standard tolerance ±20%; also available in ±10% and ±5%.

DIMENSIONS

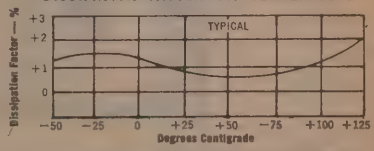
Capacitance in MFDS	50 WVDC			100 WVDC			200 WVDC			400 WVDC		
	T	W	L	T	W	L	T	W	L	T	W	L
.01	—	—	—	—	—	—	—	—	—	.145	.250	7/16
.012	—	—	—	—	—	—	—	—	—	.130	.215	1/2
.015	—	—	—	—	—	—	—	—	—	.140	.245	1/2
.018	—	—	—	—	—	—	—	—	—	.155	.260	1/2
.022	—	—	—	—	—	—	—	—	—	.145	.250	5/16
.027	—	—	—	—	—	—	—	—	—	.160	.265	5/16
.033	—	—	—	—	—	—	—	—	—	.180	.285	5/16
.039	—	—	—	—	—	—	—	—	—	.170	.275	5/16
.047	—	—	—	.125	.230	7/16	.140	.245	1/2	.165	.340	5/8
.056	—	—	—	.135	.240	7/16	.155	.260	1/2	.160	.340	11/16
.068	—	—	—	.120	.225	1/2	.140	.245	5/16	.180	.360	11/16
.082	—	—	—	.130	.235	1/2	.155	.265	5/16	.200	.380	11/16
.1	.140	.245	7/16	.145	.250	1/2	.155	.260	5/8	.190	.365	13/16
.12	.155	.260	7/16	.160	.265	1/2	.170	.275	5/8	.210	.390	13/16
.15	.135	.240	1/2	.150	.255	5/8	.170	.275	11/16	.240	.415	13/16
.18	.150	.245	1/2	.165	.270	5/8	.165	.340	11/16	.265	.445	15/16
.22	.120	.225	1/2	.180	.265	5/8	.185	.365	13/16	.260	.440	15/16
.27	.135	.240	1/2	.180	.285	5/8	.175	.350	13/16	.255	.535	15/16
.33	.125	.230	5/16	.155	.335	11/16	.195	.375	13/16	.265	.545	1 1/16
.39	.140	.245	5/16	.170	.350	11/16	.215	.395	13/16	.295	.570	1 1/16
.47	.155	.260	5/16	.160	.340	13/16	.210	.390	13/16	.330	.605	1 1/16
.56	.170	.275	5/8	.180	.360	13/16	.230	.410	13/16	.365	.640	1 1/16
.68	.165	.270	5/8	.200	.380	13/16	.225	.500	13/16	.370	.650	1 1/4
.82	.180	.285	5/8	.220	.400	13/16	.225	.500	13/16	.415	.690	1 1/4
1.0	.155	.335	11/16	.220	.395	15/16	.250	.525	13/16	.360	.735	1 1/2
1.25	.180	.355	13/16	.250	.425	13/16	.285	.565	13/16	.410	.785	1 1/2
1.5	.165	.345	13/16	.240	.515	13/16	.280	.555	13/8	.400	.775	1 3/4
1.8	.205	.385	13/16	.235	.515	13/16	.310	.590	13/8	.445	.820	1 3/4
2.0	.220	.400	13/16	.250	.530	13/16	.295	.675	13/8	.475	.850	1 3/4
3.0	.245	.425	15/16	.280	.560	13/8	.350	.725	1 1/2	—	—	—
4.0	.290	.470	15/16	.335	.610	13/8	.420	.795	1 1/2	—	—	—
5.0	.265	.525	13/16	.345	.720	13/8	.420	.795	1 3/4	—	—	—
8.0	.350	.610	13/16	.425	.800	1 1/2	—	—	—	—	—	—
10.0	.345	.605	13/8	.480	.855	1 1/2	—	—	—	—	—	—
12.0	.355	.715	13/8	.470	.845	1 3/4	—	—	—	—	—	—
14.0	.355	.715	1 1/2	.515	.890	1 3/4	—	—	—	—	—	—
16.0	.385	.740	1 1/2	—	—	—	—	—	—	—	—	—
18.0	.410	.765	1 1/2	—	—	—	—	—	—	—	—	—
20.0	.430	.790	1 1/2	—	—	—	—	—	—	—	—	—

TEMPERATURE CHARACTERISTIC CURVES

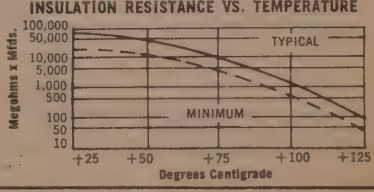
CAPACITANCE CHANGE VS. TEMPERATURE



DISSIPATION FACTOR VS. TEMPERATURE



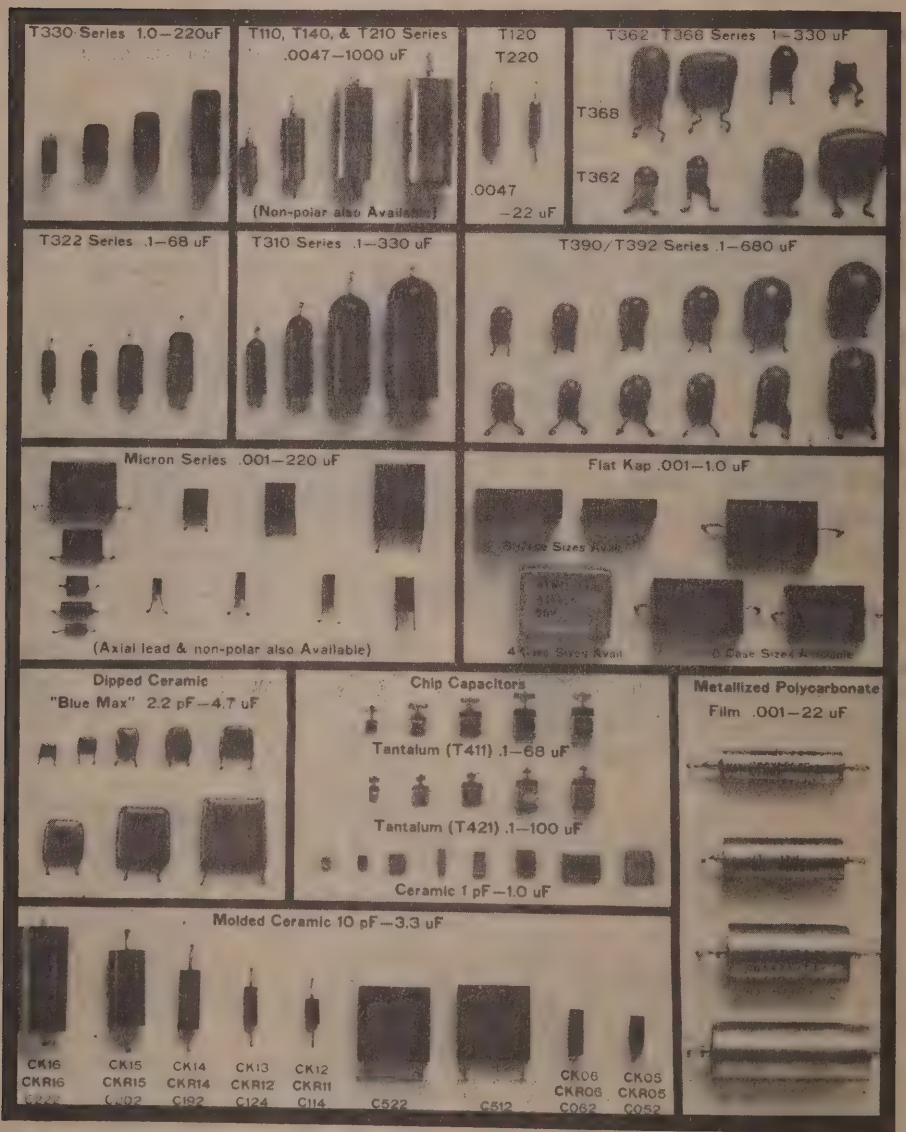
INSULATION RESISTANCE VS. TEMPERATURE



UNION CARBIDE

KEMET®

TANTALUM, CERAMIC AND FILM CAPACITORS



CONDENSED CATALOG

F-2644m 4/78

KEMET CAPACITOR REFERENCE

UNION CARBIDE

Tantalum Capacitor Performance Curves, Catalog Numbering Systems and Military Approval Information.

					TANTALUM REFERENCE
SOLID TANTALUM	HERMETIC SEAL	Standard and CSR13	Popular Military Style — Axial Lead — 4 case sizes — High Volumetric Efficiency. Reference includes CSR13 capacitors which are available to S failure rate level.	.0047-330 μF 6-125 VDC	T110 CSR13 Pg 5-15
		Non-Polar and CSR91	Designed for applications where reversal of polarity is the prime consideration. Axial Lead — 4 case sizes. Comparable performance to T110 Series.	.0023-160 μF 6-125 VDC	T111 CSR91 Pg 16-23
		Miniature and CSR09	Compact especially designed for cordwood construction and packaging applications where space is a premium. Matches standard resistor and diode sizes.	.0047-22 μF 6-125 VDC	T120 CSR09 Pg 24-28
		Extended Range and CSR23	Extended range (to 1000 μF-6V) in standard MIL cases. Also, available in T242 Series (CSR23) and in T141 Series (non-polar version).	.82-1000 μF 6-60 VDC	T140 CSR23 CSR33 Pg 29-31
		High Reliability	The ultimate in high reliability solid tantalums with failure rates as low as .100%/K hrs. Manufactured to KEMET's specification GR500 which outlines the most sophisticated and accurate reliability measurement method in the industry.	.0047-1000 μF 6-125 VDC	GR500 Pg 32
	MOLDED AND DIPPED	Molded-Axial	Uses the same highly refined process employed for the famous military type, KEMET T110 Series. 4 case sizes. Ideal for application in commercial and industrial electronic equipment.	.10-330 μF 6-50 VDC	T310 Pg 33-34
		Molded-Axial Miniature	Molded axial featuring extremely high capacitance-to-volume ratio. 4 case sizes. Precision dimensions permits use in high speed automatic insertion applications.	.1-68 μF 2-50 VDC	T322 Pg 35
		Molded-Radial	Compact precision molded space saving rectangular shape provides superior packing factor and space utilization in high density packaging applications.	.10-220 μF 6-50 VDC	T330 Pg 36-37
		Dipped .125 or .250 Spacing	Economical — Radial Lead — Dip Coated Epoxy Encapsulation. Excellent performance characteristics over full temperature range. Available in 6 case sizes.	.10-330 μF 6-50 VDC	T362 T368 Pg 38
		Dipped .100 & .200 Spacing	For industrial and commercial circuit applications. Low profile with .100" and .200" lead spacing for .1" PC board grids. 6 case sizes.	.1-680 μF 3-50 VDC	T390 T392 Pg 39
		Subminiature Plastic Sealed	Complete line of subminiature plastic sealed tantalums designed for use in micro-miniaturized, high density circuits. Available in a variety of case styles, sizes, and lead configurations in polar and non-polar versions.	.001-220 μF 2-50 VDC	MICRON Pg 40-43
	CHIP	Rectangular	The ultimate in volumetric efficiency. Designed for hybrid circuits and PC board applications. Copper Counter-Electrode permits assembly temperatures to 300°C and continuous operating temperatures to 175°C.	.10-100 μF 4-50 VDC	T411 T421 Pg 44-45

Ceramic Capacitor General Description, Typical Performance Curves, Electrical Characteristics, and Catalog Numbering System.

					CERAMIC REFERENCE
CERAMIC	MIL LEADED	MIL-C-11015D	Manufactured to MIL-C-11015D requirements. Includes CK05, CK06, CK12, CK13, CK14, CK15, and CK16 capacitors.	10 pF-3.3 μF 50-200 VDC	KEMET CK & CKR SERIES Pg 47-52
		MIL-C-39014C	Established Reliability — CKR05, CKR06, CKR11, CKR12, CKR14, CKR15, and CKR16 capacitors available to "R" (0.01%/K hrs.) failure rate level in most styles.	10 pF-3.3 μF 50-100 VDC	
	KEMET	NPO & MIL-C-20	Ultra-stable monolithic ceramic capacitors in standard radial and axial lead MIL-CK/CKR sizes 0 ±30 PPM/°C. MIL-C-20 styles CC and CCR.	1-82,000 pF 50-200 VDC	NPO MIL-C-20 Pg 52-53
		High Reliability	The ultimate in high reliability monolithic ceramics, GR900 capacitors are manufactured in a Class 100 clean room. These capacitors meet or exceed all performance specifications such as MIL-C-39014, MIL-C-20, and MIL-C-55681. Requirements of applicable military "established reliability."	1 pF-1.8 μF 50-200 VDC	GR900 Pg 54
		DIPPED "Blue Max"	Economical, radial lead, epoxy dipped maximum CV range monolithic Ceramic Capacitors in three dielectrics — COG Ultra-Stable; X7R Stable and Z5U General Purpose. 6 precision case sizes.	1.0 pF-6.8 μF 50, 100, 200 VDC	BLUE MAX. Pg 55-57
	CHIPS	"Solder Guard"	8 standard sizes in two precision dielectrics — BX and NPO. Exclusive "Solder Guard" end metalization, for high temperature assembly.	1-1,000,000 pF 50-100 VDC	CHIP 0805-2225 Pg 58
		MIL-C-55681	New military established reliability CKR01, CKR05 ceramic chip capacitors for critical applications — 6 case sizes.	10-470,000 pF 50-100 VDC	CDR CHIP Pg 59
FILM	FLAT KAP	MIL-C-55514	Ultra Stable Parylene Film — Available to 0 ±50 PPM/°C and Capacitance Tolerance to ±½%. 8 case sizes radial and axial leads.	.001-1 μF 50 VDC	F310 F311 Pg 60-61
	METALLIZED POLY-CARBONATE	MIL-C-83421 MIL-C-39022	Ultra Stable, High Purity Metallized Polycarbonate Film — Hermetically Sealed and Capacitance Tolerance to ±1%. AC rated to 40 KHz.	.001-22 μF 400 VDC	F24— F14— Pg 62-63

KEMET SOLID TANTALUM CAPACITORS

UNION CARBIDE

KEMET CATALOG NUMBERING SYSTEM — TANTALUM CAPACITORS

T 110 A 105 K 050 A S — C

TANTALUM

SERIES
Listed Below

CASE SIZE
A / B / C / D

PICOFARAD CODE
First two digits represent significant figures. Third digit specifies number of zeros to follow.

CAP TOLERANCE
M — ±20% G — ±2%
K — ±10% F — ±1%
J — ±5% X — Other

Voltage at 85°C

FAILURE RATE
A — Not Applicable P — 0.1%/k hrs.
L — 2%/k hrs. R — 0.01%/k hrs.
M — 1%/k hrs. S — 0.001%/k hrs.

SPECIFICATION (when necessary)
C100 — Uninsulated Capacitors
C7000 — Reeling Per EIA Specification RS-296
Other — As Applicable
(All capacitors are sleeved unless specified as above.)

LEAD MATERIAL
Listed Below

SERIES

HERMETIC
T110-Polar
T111-Non-Polar
T120-Miniature
T140-Extended Range

ESTABLISHED/HIGH RELIABILITY
T210-GR500/J
T211-GR500/N
T212-CSR13
T213-CSR91
T220-GR500/Z
T222-CSR09
T240-GR500/A
T242-CSR23
T252-CSR33

CHIPS
T411-Rectangular
T421-Miniature Rectangular

PLASTIC
T310-Molded Axial Lead
T322-Extended Range Axial
T330-Molded-Radial Lead
T362-Dipped-.250 Spacing
T368-Dipped-.125 or .250 Spacing
T370-Micron-Rectangular-Radial
T371-Micron-Non-Polar-Radial
T372-Micron-Rectangular-Axial
T373-Micron-Non-Polar-Axial
T374-Micron-Cylindrical-Radial
T376-Micron-Cylindrical-Axial
T378-Micron-Ribbon Leads-Axial
T380-Micron Midgets-Rectangular-Radial
T382-Micron Midgets-Rectangular-Axial
T384-Micron Midgets-Cylindrical-Radial
T386-Micron Midgets-Cylindrical-Axial
T390-Dipped-Commercial Grade
T392-Dipped-Commercial Grade

LEAD MATERIAL

S — Standard

Available on special order. Contact your sales representative.

F — Bare Nickel
G — Gold Plated Nickel
E — Copperweld
D — Gold Dumet
H — Solder Coated Nickel
I — Alloy 180 (Bare)
J — Alloy 180 (Solder)
M — Kovar (Gold)
K — Alloy 52 (Solder)
L — Alloy 52 (Gold)
U — Formerly standard for T411 and T421 Series Chip Capacitors. "S" should now be substituted.
Z — Other (Requires C Spec)

MILITARY TYPE DESIGNATIONS & PART NUMBERING *MIL-C-39003

CSR 13 B 565 K M

TYPE
Capacitors, Fixed, Solid Electrolyte, Tantalum Established Reliability

STYLE
Tubular Case — Always Sleeved
13 — Standard
09 — Miniature
23 — Extended Range
33 — Extended Range Low Leakage
91 — Non-Polar

VOLTAGE

	VDC Working		VDC Surge	
Symbol	85°C	125°C	85°C	125°C
B	6	4	8	5
C	10	7	13	9
D	15	10	20	12
E	20	13	26	16
F	35	23	46	28
G	50	33	65	40
H	75	50	98	64
J	100	67	130	86

FAILURE RATE LEVEL IN % PER 1000 HOURS

L — 2 R — 0.01
M — 1 S — 0.001
P — 0.1

CAPACITANCE TOLERANCE

K — ±10% M — ±20%

CAPACITANCE

Expressed in Picofarads (1 microfarad = 1,000,000 picofarads). First two digits represent significant figures. Last digit specifies the number of zeros to follow.

Examples
565 — 5,600,000 = 5.60 μF
564 — 0,560,000 = .56 μF
563 — 0,056,000 = .056 μF

This Military Part Numbering System is not correct in accordance with the current specifications. The correct current designation for a CSR part number is the MIL Specification Number, followed by the Specification (slash) Sheet Number and Dash Number (i.e. — MIL-C-39003/01-2270). However, the part number breakdown shown above is still widely used and is shown for reference.

KEMET APPROVED FAILURE RATE LEVELS — MIL-C-39003C

Style	Description	KEMET Series	Approved F.R. Level	Style	Description	KEMET Series	Approved F.R. Level
CSR09	Polar-Subminiature	T222	S (0.001%/K Hrs.)	CSR33	Polar-Extended Range Low Leakage	T252	R (0.01%/K Hrs.)
CSR13	Polar-Standard MIL Case	T212	S (0.001%/K Hrs.)				
CSR23	Polar-Extended Range	T242	S (0.001%/K Hrs.)	CSR91	Non-Polar	T213	S (0.001%/K Hrs.)

KEMET SOLID TANTALUM CAPACITORS

UNION CARBIDE

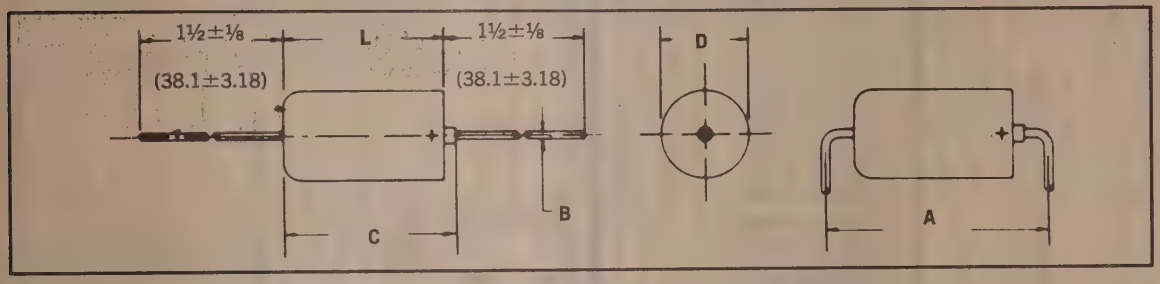
T110 SERIES — POLAR TYPE

KEMET standard MIL case hermetic sealed T110 Series are the leading solid tantalum capacitors in use today. They are compact, ruggedly built, designed for miniaturized circuitry, and are especially suited for coupling, by-pass, filtering, and R-C timing circuits. They exhibit excellent stability, extremely low DC leakage current, dissipation factor, and impedance over a wide temperature and frequency range.

Available in standard EIA capacitance values from .0047-330 μF in ±20%, ±10%, and ±5% tolerances and working voltages from 6-125 VDC.

Included in the following T110 Series table is a complete listing of MIL-C-39003 CSR13 capacitors which KEMET is approved to manufacture to the S (0.001%/K hrs.) failure rate level. For additional info refer to KEMET Cat. F-1851H.

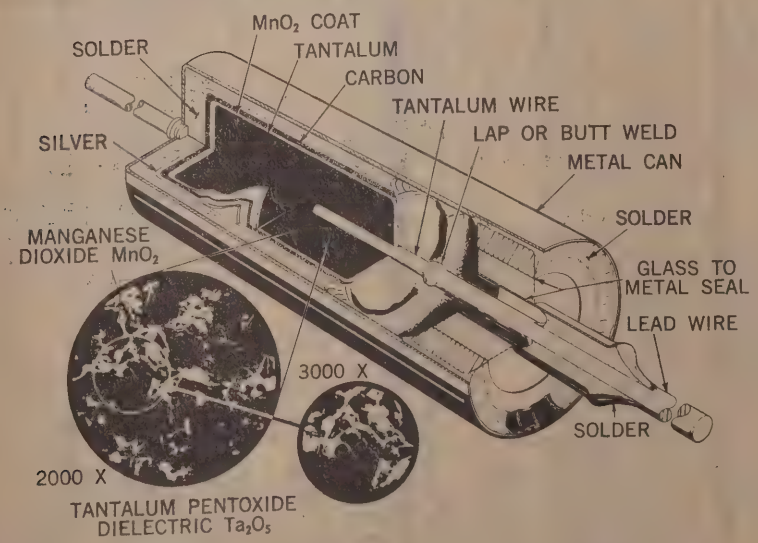
CAPACITOR OUTLINE DRAWINGS



DIMENSIONS — INCHES & (MILLIMETERS)

Case Size	Uninsulated D ±0.005 ±(.13)	Uninsulated L ±0.031 ±(.79)	Insulated D ±0.010 ±(.25)	Insulated L ±0.031 ±(.79)	A Nom.	B ±.001 ±(.03)	C Max.	Max. Wt. Grams
A	0.125 (3.18)	0.250 (6.35)	0.135 (3.43)	0.286 (7.26)	0.5 (12.7)	0.020 (.51)	0.422 (10.72)	.57
B	0.175 (4.45)	0.438 (11.13)	0.185 (4.70)	0.474 (12.04)	0.7 (17.78)	0.020 (.51)	0.610 (15.49)	1.41
C	0.279 (7.09)	0.650 (16.51)	0.289 (1.34)	0.686 (17.42)	1.0 (25.4)	0.025 (.64)	0.822 (20.88)	5.0
D	0.341 (8.66)	0.750 (19.05)	0.351 (8.92)	0.786 (19.96)	1.1 (27.94)	0.025 (.64)	0.922 (23.42)	8.5

T110 SERIES — CROSS SECTION



TYPICAL KEMET AXIAL T110 SERIES SOLID TANTALUM CAPACITOR

KEMET SOLID TANTALUM CAPACITORS

UNION CARBIDE

T110 SERIES & CSR13 CAPACITOR REFERENCE

Capacitance µF	Case Size	Capacitance Tolerance	KEMET T110 SERIES 1/ Kemet Catalog Number	Leakage Current µA 25° Max	Max DF 25°C 120Hz	MIL-C-39003 CSR13 CAPACITORS (MIL-C-39003/1E) DASH NUMBER REFERENCE - FAILURE RATE LEVEL (%/1000 hrs.) ★L (2.0)	M(1.0)	P(0.1)	R(0.01)	S(0.001)	2/ Kemet Catalog Number
6 VOLT RATING AT 85°C – 4 VOLT RATING AT 125°C											
2.2	A	5,10,20	T110A225__006AS	0.5	4						
2.7	A	5,10,20	T110A275__006AS	0.5	4	All CSR13 Capacitors are available to the "S" Failure Rate Level					
3.3	A	5,10,20	T110A335__006AS	0.5	4						
3.9	A	5,10,20	T110A395__006AS	0.5	4						
4.7	A	5,10,20	T110A475__006AS	0.5	4						
5.6	A	5	T110A565J 006AS	0.5	4	0001	5001	5201	5401	5601	T212A565J 006_S
5.6	A	10	T110A565K006AS	0.5	4	2001	2241	2481	2721	2961	T212A565K006_S
5.6	A	20	T110A565M006AS	0.5	4						
* 6.8	A	5	T110A685J 006AS	0.5	6	0002	5002	5202	5402	5602	T212A685J 006_S
* 6.8	A	10	T110A685K006AS	0.5	6	2002	2242	2482	2722	2962	T212A685K006_S
* 6.8	A	20	T110A685M006AS	0.5	6	2003	2243	2483	2723	2963	T212A685M006_S
8.2	B	5,10,20	T110B825__006AS	0.5	6	★L Failure Rate dash numbers refer to Mil-C-39003/1A, 1B, & 1C capacitors only. (Not available to Mil-C-39003/1D or 1E Specification.)					
10.0	B	5,10,20	T110B106__006AS	0.5	6						
12.0	B	5,10,20	T110B126__006AS	0.5	6						
15.0	B	5,10,20	T110B156__006AS	1.0	6						
18.0	B	5,10,20	T110B186__006AS	1.0	6						
22.0	B	5,10,20	T110B226__006AS	1.0	6						
27.0	B	5,10,20	T110B276__006AS	1.0	6						
33.0	B	5,10,20	T110B336__006AS	1.0	6						
39.0	B	5,10,20	T110B396__006AS	1.0	6						
47.0	B	5	T110B476J 006AS	2.0	6	0003	5003	5203	5403	5603	T212B476J 006_S
47.0	B	10	T110B476K006AS	2.0	6	2004	2244	2484	2724	2964	T212B476K 006_S
47.0	B	20	T110B476M006AS	2.0	6	2005	2245	2485	2725	2965	T212B476M 006_S
* 56.0	B	5	T110B566J 006AS	2.0	6	0004	5004	5204	5404	5604	T212B566J 006_S
* 56.0	B	10	T110B566K006AS	2.0	6	2006	2246	2486	2726	2966	T212B566K 006_S
* 56.0	B	20	T110B566M006AS	2.0	6						
68.0	C	5,10,20	T110C686__006AS	3.0	6						
82.0	C	5,10,20	T110C826__006AS	3.0	6						
100.0	C	5,10,20	T110C107__006AS	3.0	6						
120.0	C	5,10,20	T110C127__006AS	3.0	6						
150.0	C	5	T110C157J 006AS	6.0	6	0005	5005	5205	5405	5605	T212C157J 006_S
150.0	C	10	T110C157K006AS	6.0	6	2007	2247	2487	2727	2967	T212C157K 006_S
150.0	C	20	T110C157M006AS	6.0	6	2008	2248	2488	2728	2968	T212C157M 006_S
*180.0	C	5	T110C187J 006AS	6.0	6	0006	5006	5206	5406	5606	T212C187J 006_S
*180.0	C	10	T110C187K006AS	6.0	6	2009	2249	2489	2729	2969	T212C187K 006_S
*180.0	C	20	T110C187M006AS	6.0	6						
220.0	D	5,10,20	T110D227__006AS	6.0	8						
270.0	D	5	T110D277J 006AS	6.0	8	0007	5007	5207	5407	5607	T212D277J 006_S
270.0	D	10	T110D277K006AS	6.0	8	2010	2250	2490	2730	2970	T212D277K 006_S
270.0	D	20	T110D277M006AS	6.0	8						
*330.0	D	5	T110D337J 006AS	10.0	8	0008	5008	5208	5408	5608	T212D337J 006_S
*330.0	D	10	T110D337K006AS	10.0	8	2011	2251	2491	2731	2971	T212D337K 006_S
*330.0	D	20	T110D337M006AS	10.0	8	2012	2252	2492	2732	2972	T212D337M006_S
10 VOLT RATING AT 85°C – 7 VOLT RATING AT 125°C											
1.0	A	5,10,20	T110A105__010AS	0.5	3						
1.2	A	5,10,20	T110A125__010AS	0.5	4						
1.5	A	5,10,20	T110A155__010AS	0.5	4						
1.8	A	5,10,20	T110A185__010AS	0.5	4						
2.2	A	5,10,20	T110A225__010AS	0.5	4						
2.7	A	5,10,20	T110A275__010AS	0.5	4						
3.3	A	5,10,20	T110A335__010AS	0.5	4						
3.9	A	5	T110A395J 010AS	0.5	4	0009	5009	5209	5409	5609	T212A395J 010_S
3.9	A	10	T110A395K010AS	0.5	4	2013	2253	2493	2733	2973	T212A395K010_S
3.9	A	20	T110A395M010AS	0.5	4						
* 4.7	A	5	T110A475J 010AS	0.5	4	0010	5010	5210	5410	5610	T212A475J 010_S
* 4.7	A	10	T110A475K010AS	0.5	4	2014	2254	2494	2734	2974	T212A475K010_S
* 4.7	A	20	T110A475M010AS	0.5	4	2015	2255	2495	2735	2975	T212A475M010_S
5.6	B	5,10,20	T110B565__010AS	0.5	4						
6.8	B	5,10,20	T110B685__010AS	1.0	6						
8.2	B	5,10,20	T110B825__010AS	1.0	6						
10.0	B	5,10,20	T110B106__010AS	1.0	6						
12.0	B	5,10,20	T110B126__010AS	1.0	6						
15.0	B	5,10,20	T110B156__010AS	1.0	6						
18.0	B	5,10,20	T110B186__010AS	1.0	6						
22.0	B	5,10,20	T110B226__010AS	2.0	6						
27.0	B	5	T110B226J 010AS	2.0	6	0011	5011	5211	5411	5611	T212B276J 010_S
27.0	B	10	T110B276K010AS	2.0	6	2016	2256	2496	2736	2976	T212B276K010_S
27.0	B	20	T110B276M010AS	2.0	6						
33.0	B	5	T110B336J 010AS	2.0	6	0012	5012	5212	5412	5612	T212B336J 010_S
33.0	B	10	T110B336K010AS	2.0	6	2017	2257	2497	2737	2977	T212B336K010_S
33.0	B	20	T110B336M010AS	2.0	6	2018	2258	2498	2738	2978	T212B336M010_S
* 39.0	B	5	T110B396J 010AS	2.0	6	0013	5013	5213	5413	5613	T212B396J 010_S
* 39.0	B	10	T110B396K010AS	2.0	6	2019	2259	2499	2739	2979	T212B396K010_S
* 39.0	B	20	T110B396M010AS	2.0	6						

Higher CV values in comparable case sizes are available in KEMET T140 Series. Refer to pages 29-31.

*Parent Values

KEMET

SOLID TANTALUM CAPACITORS

UNION CARBIDE

T110 SERIES & CSR13 CAPACITOR REFERENCE

Capacitance µF	Case Size	Capacitance Tolerance	KEMET T110 SERIES 1/ Kemet Catalog Number	Leakage Current µA 25° Max.	Max DF % 25°C 120Hz	MIL-C-39003 CSR13 CAPACITORS (MIL-C-39003/1E) DASH NUMBER REFERENCE FAILURE RATE LEVEL (% / 1000 hrs.) ★L (2.0)	M(1.0)	P(0.1)	R(0.01)	S(0.001)	2/ Kemet Catalog Number
10 VOLT RATING AT 85°C – 7 VOLT RATING AT 125°C											
47.0	C	5,10,20	T110C476__010AS	3.0	6	All CSR13 Capacitors are available to the "S" Failure Rate Level					
56.0	C	5,10,20	T110C566__010AS	3.0	6						
68.0	C	5,10,20	T110C686__010AS	3.0	6						
82.0	C	5	T110C826J 010AS	3.0	6	0014	5014	5214	5414	5614	T212C826J 010_S
82.0	C	10	T110C826K010AS	3.0	6	2020	2260	2500	2740	2980	T212C826K 010_S
82.0	C	20	T110C826M010AS	3.0	6						
* 100.0	C	5	T110C107J 010AS	6.0	6	0015	5015	5215	5415	5615	T212C107J 010_S
* 100.0	C	10	T110C107K010AS	6.0	6	2021	2261	2501	2741	2981	T212C107K 010_S
* 100.0	C	20	T110C107M010AS	6.0	6	2022	2262	2502	2742	2982	T212C107M 010_S
* 120.0	C	5	T110C127J 010AS	6.0	6	0016	5016	5216	5416	5616	T212C127J 010_S
* 120.0	C	10	T110C127K010AS	6.0	6	2023	2263	2503	2743	2983	T212C127K 010_S
* 120.0	C	20	T110C127M010AS	6.0	6						
150.0	D	5,10,20	T110D157__010AS	10.0	6						
180.0	D	5	T110D187J 010AS	10.0	6	0017	5017	5217	5417	5617	T212D187J 010_S
180.0	D	10	T110D187K010AS	10.0	6	2024	2264	2504	2744	2984	T212D187K 010_S
180.0	D	20	T110D187M010AS	10.0	6						
* 220.0	D	5	T110D227J 010AS	10.0	8	0018	5018	5218	5418	5618	T212D227J 010_S
* 220.0	D	10	T110D227K010AS	10.0	8	2025	2265	2505	2745	2985	T212D227K 010_S
* 220.0	D	20	T110D227M010AS	10.0	8	2026	2266	2506	2746	2986	T212D227M 010_S
15 VOLT RATING AT 85°C – 10 VOLT RATING AT 125°C											
0.33	A	5,10,20	T110A334__015AS	0.5	3	★L Failure Rate dash numbers refer to Mil-C-39003/1A, 1B, & 1C capacitors only. (Not available to Mil-C-39003/1D or 1E Specification.)					
0.39	A	5,10,20	T110A394__015AS	0.5	3						
0.47	A	5,10,20	T110A474__015AS	0.5	3						
0.56	A	5,10,20	T110A564__015AS	0.5	3						
0.68	A	5,10,20	T110A684__015AS	0.5	3						
0.82	A	5,10,20	T110A824__015AS	0.5	3						
1.0	A	5,10,20	T110A105__015AS	0.5	3						
1.2	A	5,10,20	T110A125__015AS	0.5	4						
1.5	A	5,10,20	T110A155__015AS	0.5	4						
1.8	A	5,10,20	T110A185__015AS	0.5	4						
2.2	A	5,10,20	T110A225__015AS	0.5	4						
2.7	A	5	T110A275J 015AS	0.5	4	0019	5019	5219	5419	5619	T212A275J 015_S
2.7	A	10	T110A275K015AS	0.5	4	2027	2267	2507	2747	2987	T212A275K 015_S
2.7	A	20	T110A275M015AS	0.5	4						
* 3.3	A	5	T110A335J 015AS	0.5	4	0020	5020	5220	5420	5620	T212A335J 015_S
* 3.3	A	10	T110A335K015AS	0.5	4	2028	2268	2508	2748	2988	T212A335K 015_S
* 3.3	A	20	T110A335M015AS	0.5	4	2029	2269	2509	2749	2989	T212A335M 015_S
3.9	B	5,10,20	T110B395__015AS	0.5	4						
4.7	B	5,10,20	T110B475__015AS	1.0	4						
5.6	B	5,10,20	T110B565__015AS	1.0	4						
6.8	B	5,10,20	T110B685__015AS	1.0	6						
8.2	B	5,10,20	T110B825__015AS	1.0	6						
10.0	B	5,10,20	T110B106__015AS	1.0	6						
12.0	B	5,10,20	T110B126__015AS	1.0	6						
15.0	B	5,10,20	T110B156__015AS	2.0	6						
18.0	B	5	T110B186J 015AS	2.0	6	0021	5021	5221	5421	5621	T212B186J 015_S
18.0	B	10	T110B186K015AS	2.0	6	2030	2270	2510	2750	2990	T212B186K 015_S
18.0	B	20	T110B186M015AS	2.0	6						
* 22.0	B	5	T110B226J 015AS	3.0	6	0022	5022	5222	5422	5622	T212B226J 015_S
* 22.0	B	10	T110B226K015AS	3.0	6	2031	2271	2511	2751	2991	T212B226K 015_S
* 22.0	B	20	T110B226M015AS	3.0	6	2032	2272	2512	2752	2992	T212B226M 015_S
27.0	C	5,10,20	T110C276__015AS	3.0	6						
33.0	C	5,10,20	T110C336__015AS	3.0	6						
39.0	C	5,10,20	T110C396__015AS	3.0	6						
47.0	C	5,10,20	T110C476__015AS	6.0	6						
56.0	C	5	T110C566J 015AS	6.0	6	0023	5023	5223	5423	5623	T212C566J 015_S
56.0	C	10	T110C566K015AS	6.0	6	2033	2273	2513	2753	2993	T212C566K 015_S
56.0	C	20	T110C566M015AS	6.0	6						
* 68.0	C	5	T110C686J 015AS	6.0	6	0024	5024	5224	5424	5624	T212C686J 015_S
* 68.0	C	10	T110C686K015AS	6.0	6	2034	2274	2514	2754	2994	T212C686K 015_S
* 68.0	C	20	T110C686M015AS	6.0	6	2035	2275	2515	2755	2995	T212C686M 015_S
82.0	D	5,10,20	T110D826__015AS	6.0	6						
100.0	D	5,10,20	T110D107__015AS	6.0	6						
120.0	D	5	T110D127J 015AS	6.0	6	0025	5025	5225	5425	5625	T212D127J 015_S
120.0	D	10	T110D127K015AS	6.0	6	2036	2276	2516	2756	2996	T212D127K 015_S
120.0	D	20	T110D127M015AS	6.0	6						
*150.0	D	5	T110D157J 015AS	10.0	6	0026	5026	5226	5426	5626	T212D157J 015_S
*150.0	D	10	T110D157K015AS	10.0	6	2037	2277	2517	2757	2997	T212D157K 015_S
*150.0	D	20	T110D157M015AS	10.0	6	2038	2278	2518	2758	2998	T212D157M 015_S

1/ To complete T110 Series Catalog Number, insert Capacitance Tolerance Symbol in the 9th Character, as shown on page 4.
2/ To complete T212 Series Catalog Number, insert Failure Rate Symbol in the 13th Character.

Higher CV values in comparable case sizes are available in KEMET T140 Series. Refer to pages 29-31.

*Parent Values

KEMET SOLID TANTALUM CAPACITORS

UNION CARBIDE

T110 SERIES & CSR13 CAPACITOR REFERENCE

Capacitance µF	Case Size	Capacitance Tolerance	KEMET T110 SERIES 1/ Kemet Catalog Number	Leakage Current µA 25° Max.	Max DF % 25°C 120Hz	DASH NUMBER REFERENCE - FAILURE RATE LEVEL (%/1000 hrs.) ★L (2.0)	M(1.0)	P(0.1)	R(0.01)	S(0.001)	2/ Kemet Catalog Number
20 VOLT RATING AT 85°C – 13 VOLT RATING AT 125°C											
0.047	A	5,10,20	T110A473_020AS	0.1	3						
0.056	A	5,10,20	T110A563_020AS	0.1	3	All CSR13 Capacitors are available to the "S" Failure Rate Level					
0.068	A	5,10,20	T110A683_020AS	0.1	3						
0.082	A	5,10,20	T110A823_020AS	0.1	3						
0.1	A	5,10,20	T110A104_020AS	0.5	3						
0.12	A	5,10,20	T110A124_020AS	0.5	3						
0.15	A	5,10,20	T110A154_020AS	0.5	3						
0.18	A	5,10,20	T110A184_020AS	0.5	3						
0.22	A	5,10,20	T110A224_020AS	0.5	3						
0.27	A	5,10,20	T110A274_020AS	0.5	3						
0.33	A	5,10,20	T110A334_020AS	0.5	3						
0.39	A	5,10,20	T110A394_020AS	0.5	3						
0.47	A	5,10,20	T110A474_020AS	0.5	3						
0.56	A	5,10,20	T110A564_020AS	0.5	3						
0.68	A	5,10,20	T110A684_020AS	0.5	3						
0.82	A	5,10,20	T110A824_020AS	0.5	3						
1.0	A	5,10,20	T110A105_020AS	0.5	3						
1.2	A	5	T110A125J 020AS	0.5	4	0027	5027	5227	5427	5627	T212A125J 020_S
1.2	A	10	T110A125K020AS	0.5	4	2039	2279	2519	2759	2999	T212A125K020_S
1.2	A	20	T110A125M020AS	0.5	4						
1.5	A	5	T110A155J 020AS	0.5	4	0028	5028	5228	5428	5628	T212A155J 020_S
1.5	A	10	T110A155K020AS	0.5	4	2040	2280	2520	2760	3000	T212A155K020_S
1.5	A	20	T110A155M020AS	0.5	4	2041	2281	2521	2761	3001	T212A155M020_S
1.8	A	5	T110A185J 020AS	0.5	4	0029	5029	5229	5429	5629	T212A185J 020_S
1.8	A	10	T110A185K020AS	0.5	4	2042	2282	2522	2762	3002	T212A185K020_S
1.8	A	20	T110A185M020AS	0.5	4						
* 2.2	A	5	T110A225J 020AS	0.5	4	0030	5030	5230	5430	5630	T212A225J 020_S
* 2.2	A	10	T110A225K020AS	0.5	4	2043	2283	2523	2763	3003	T212A225K020_S
* 2.2	A	20	T110A225M020AS	0.5	4	2044	2284	2524	2764	3004	T212A225M020_S
2.7	B	5,10,20	T110B275_020AS	0.5	4						
3.3	B	5,10,20	T110B335_020AS	1.0	4						
3.9	B	5,10,20	T110B395_020AS	1.0	4						
4.7	B	5,10,20	T110B475_020AS	1.0	4						
5.6	B	5,10,20	T110B565_020AS	1.0	4						
6.8	B	5,10,20	T110B685_020AS	1.0	6						
8.2	B	5	T110B825J 020AS	1.0	6	0031	5031	5231	5431	5631	T212B825J 020_S
8.2	B	10	T110B825K020AS	1.0	6	2045	2285	2525	2765	3005	T212B825K020_S
8.2	B	20	T110B825M020AS	1.0	6						
10.0	B	5	T110B106J 020AS	1.0	6	0032	5032	5232	5432	5632	T212B106J 020_S
10.0	B	10	T110B106K020AS	1.0	6	2046	2286	2526	2766	3006	T212B106K020_S
10.0	B	20	T110B106M020AS	1.0	6	2047	2287	2527	2767	3007	T212B106M020_S
12.0	B	5	T110B126J 020AS	1.0	6	0033	5033	5233	5433	5633	T212B126J 020_S
12.0	B	10	T110B126K020AS	1.0	6	2048	2288	2528	2768	3008	T212B126K020_S
12.0	B	20	T110B126M020AS	1.0	6						
* 15.0	B	5	T110B156J 020AS	2.0	6	0034	5034	5234	5434	5634	T212B156J 020_S
* 15.0	B	10	T110B156K020AS	2.0	6	2049	2289	2529	2769	3009	T212B156K020_S
* 15.0	B	20	T110B156M020AS	2.0	6	2050	2290	2530	2770	3010	T212B156M020_S
18.0	C	5,10,20	T110C186_020AS	3.0	6						
22.0	C	5,10,20	T110C226_020AS	3.0	6						
27.0	C	5	T110C276J 020AS	3.0	6	0035	5035	5235	5435	5635	T212C276J 020_S
27.0	C	10	T110C276K020AS	3.0	6	2051	2291	2531	2771	3011	T212C276K020_S
27.0	C	20	T110C276M020AS	3.0	6						
33.0	C	5	T110C336J 020AS	3.0	6	0036	5036	5236	5436	5636	T212C336J 020_S
33.0	C	10	T110C336K020AS	3.0	6	2052	2292	2532	2772	3012	T212C336K020_S
33.0	C	20	T110C336M020AS	3.0	6	2053	2293	2533	2773	3013	T212C336M020_S
39.0	C	5	T110C396J 020AS	3.0	6	0037	5037	5237	5437	5637	T212C396J 020_S
39.0	C	10	T110C396K020AS	3.0	6	2054	2294	2534	2774	3014	T212C396K020_S
39.0	C	20	T110C396M020AS	3.0	6						
* 47.0	C	5	T110C476J 020AS	6.0	6	0038	5038	5238	5438	5638	T212C476J 020_S
* 47.0	C	10	T110C476K020AS	6.0	6	2055	2295	2535	2775	3015	T212C476K020_S
* 47.0	C	20	T110C476M020AS	6.0	6	2056	2296	2536	2776	3016	T212C476M020_S
56.0	D	5	T110D566J 020AS	6.0	6	0039	5039	5239	5439	5639	T212D566J 020_S
56.0	D	10	T110D566K020AS	6.0	6	2057	2297	2537	2777	3017	T212D566K020_S
56.0	D	20	T110D566M020AS	6.0	6						
68.0	D	5	T110D686J 020AS	6.0	6	0040	5040	5240	5440	5640	T212D686J 020_S
68.0	D	10	T110D686K020AS	6.0	6	2058	2298	2538	2778	3018	T212D686K020_S
68.0	D	20	T110D686M020AS	6.0	6	2059	2299	2539	2779	3019	T212D686M020_S
82.0	D	5	T110D826J 020AS	6.0	6	0041	5041	5241	5441	5641	T212D826J 020_S
82.0	D	10	T110D826K020AS	6.0	6	2060	2300	2540	2780	3020	T212D826K020_S
82.0	D	20	T110D826M020AS	6.0	6						
*100.0	D	5	T110D107J 020AS	10.0	6	0042	5042	5242	5442	5642	T212D107J 020_S
*100.0	D	10	T110D107K020AS	10.0	6	2061	2301	2541	2781	3021	T212D107K020_S
*100.0	D	20	T110D107M020AS	10.0	6	2062	2302	2542	2782	3022	T212D107M020_S

1/ To complete T110 Series Catalog Number, insert Capacitance Tolerance Symbol in the 9th Character, as shown on page 4.
2/ To complete T212 Series Catalog Number, insert Failure Rate Symbol in the 13th Character.

Higher CV values in comparable case sizes are available in KEMET T140 Series. Refer to pages 29-31.

*Parent Values

KEMET

SOLID TANTALUM CAPACITORS

UNION CARBIDE

T110 SERIES & CSR13 CAPACITOR REFERENCE

Capacitance µF	Case Size	Capacitance Tolerance	KEMET T110 SERIES 1/ Kemet Catalog Number	Leakage Current µA 25° Max.	Max D.F.% 25°C. 120Hz	DASH NUMBER REFERENCE - FAILURE RATE LEVEL (%/1000 hrs.) ★L (2.0)	M(1.0)	P(0.1)	R(0.01)	S(0.001)	2/ Kemet Catalog Number
35 VOLT RATING AT 85°C – 23 VOLT RATING AT 125°C											
0.0047	A	5,10,20	T110A472_035AS	0.1	3						
0.0056	A	5,10,20	T110A562_035AS	0.1	3						
0.0068	A	5,10,20	T110A682_035AS	0.1	3						
0.0082	A	5,10,20	T110A822_035AS	0.1	3						
0.01	A	5,10,20	T110A103_035AS	0.1	3						
0.012	A	5,10,20	T110A123_035AS	0.1	3						
0.015	A	5,10,20	T110A153_035AS	0.1	3						
0.018	A	5,10,20	T110A183_035AS	0.1	3						
0.022	A	5,10,20	T110A223_035AS	0.1	3						
0.027	A	5,10,20	T110A273_035AS	0.1	3						
0.033	A	5,10,20	T110A333_035AS	0.1	3						
0.039	A	5,10,20	T110A393_035AS	0.1	3						
0.047	A	5,10,20	T110A473_035AS	0.1	3						
0.056	A	5,10,20	T110A563_035AS	0.1	3						
0.068	A	5,10,20	T110A683_035AS	0.1	3						
0.082	A	5,10,20	T110A823_035AS	0.1	3						
0.1	A	5,10,20	T110A104_035AS	0.5	3						
0.12	A	5,10,20	T110A124_035AS	0.5	3						
0.15	A	5,10,20	T110A154_035AS	0.5	3						
0.18	A	5,10,20	T110A184_035AS	0.5	3						
0.22	A	5,10,20	T110A224_035AS	0.5	3						
0.27	A	5,10,20	T110A274_035AS	0.5	3						
0.33	A	5,10,20	T110A334_035AS	0.5	3						
0.39	A	5,10,20	T110A394_035AS	0.5	3						
0.47	A	5,10,20	T110A474_035AS	0.5	3						
0.56	A	5,10,20	T110A564_035AS	0.5	3						
0.68	A	5,10,20	T110A684_035AS	0.5	3						
0.82	A	5,10,20	T110A824_035AS	0.5	3						
* 1.0	A	5,10,20	T110A105_035AS	0.5	3						
1.2	B	5,10,20	T110B125_035AS	0.5	4						
1.5	B	5,10,20	T110B155_035AS	0.5	4						
1.8	B	5,10,20	T110B185_035AS	0.5	4						
2.2	B	5,10,20	T110B225_035AS	1.0	4						
2.7	B	5,10,20	T110B275_035AS	1.0	4						
3.3	B	5,10,20	T110B335_035AS	1.0	4						
3.9	B	5,10,20	T110B395_035AS	1.0	4						
* 4.7	B	5,10,20	T110B475_035AS	1.0	4						
5.6	B	5	T110B565J 035AS	1.0	4	0043	5043	5243	5443	5643	T212B565J 035_S
5.6	B	10	T110B565K035AS	1.0	4	2063	2303	2543	2783	3023	T212B565K 035_S
5.6	B	20	T110B565M035AS	1.0	4						
* 6.8	B	5	T110B685J 035AS	2.0	4	0044	5044	5244	5444	5644	T212B685J 035_S
* 6.8	B	10	T110B685K035AS	2.0	4	2064	2304	2544	2784	3024	T212B685K 035_S
* 6.8	B	20	T110B685M035AS	2.0	4	2065	2305	2545	2785	3025	T212B685M 035_S
8.2	C	5,10,20	T110C825_035AS	3.0	4						
10.0	C	5,10,20	T110C106_035AS	3.0	4						
12.0	C	5,10,20	T110C126_035AS	3.0	4						
15.0	C	5,10,20	T110C156_035AS	3.0	4						
18.0	C	5,10,20	T110C186_035AS	3.0	4						
*22.0	C	5	T110C226J 035AS	6.0	4	0045	5045	5245	5445	5645	T212C226J 035 _S
*22.0	C	10	T110C226K035AS	6.0	4	2066	2306	2546	2786	3026	T212C226K 035 _S
*22.0	C	20	T110C226M035AS	6.0	4	2067	2307	2547	2787	3027	T212C226M 035 _S
27.0	D	5	T110D276J 035AS	6.0	4	0046	5046	5246	5446	5646	T212D276J 035 _S
27.0	D	10	T110D276K035AS	6.0	4	2068	2308	2548	2788	3028	T212D276K 035 _S
27.0	D	20	T110D276M035AS	6.0	4						
33.0	D	5	T110D336J 035AS	6.0	4	0047	5047	5247	5447	5647	T212D336J 035_S
33.0	D	10	T110D336K035AS	6.0	4	2069	2309	2549	2789	3029	T212D336K 035_S
33.0	D	20	T110D336M035AS	6.0	4	2070	2310	2550	2790	3030	T212D336M035_S
39.0	D	5	T110D396J 035AS	6.0	4	0048	5048	5248	5448	5648	T212D396J 035_S
39.0	D	10	T110D396K035AS	6.0	4	2071	2311	2551	2791	3031	T212D396K 035_S
39.0	D	20	T110D396M035AS	6.0	4						
*47.0	D	5	T110D476J 035AS	10.0	4	0049	5049	5249	5449	5649	T212D476J 035_S
*47.0	D	10	T110D476K035AS	10.0	4	2072	2312	2552	2792	3032	T212D476K 035_S
*47.0	D	20	T110D476M035AS	10.0	4	2073	2313	2553	2793	3033	T212D476M035_S
50 VOLT RATING AT 85°C – 33 VOLT RATING AT 125°C											
0.0047	A	5	T110A472J 050AS	0.1	3	0050	5050	5250	5450	5650	T212A472J 050_S
0.0047	A	10	T110A472K050AS	0.1	3	2074	2314	2554	2794	3034	T212A472K 050_S
0.0047	A	20	T110A472M050AS	0.1	3	2075	2315	2555	2795	3035	T212A472M050_S
0.0056	A	5	T110A562J 050AS	0.1	3	0051	5051	5251	5451	5651	T212A562J 050_S

All CSR13 Capacitors are available to the "S" Failure Rate Level

1/ To complete T110 Series Catalog Number, insert Capacitance Tolerance Symbol in the 9th Character, as shown on page 4.
2/ To complete T212 Series Catalog Number, insert Failure Rate Symbol in the 13th Character.

Higher CV values in comparable case sizes are available in KEMET T140 Series. Refer to pages 29-31.

*Parent Values

*Parent Values

KEMET

SOLID TANTALUM CAPACITORS

UNION CARBIDE

T110 SERIES & CSR13 CAPACITOR REFERENCE

Capacitance µF	Case Size	Capacitance Tolerance	KEMET T110 SERIES 1/ Kemet Catalog Number	Leakage Current µA 25° Max	Max DF % 25°C 120Hz	MIL-C-39003 CSR13 CAPACITORS (MIL-C-39003/1E) DASH NUMBER REFERENCE - FAILURE RATE LEVEL (%/1000 hrs.) ★L (2.0)	M(1.0)	P(0.1)	R(0.01)	S(0.001)	2/ Kemet Catalog Number
50 VOLT RATING AT 85°C – 33 VOLT RATING AT 125°C											
0.0056	A	10	T110A562K050AS	0.1	3	2076	2316	2556	2796	3036	T212A562K050_S
0.0056	A	20	T110A562M050AS	0.1	3						
0.0068	A	5	T110A682J 050AS	0.1	3	0052	5052	5252	5452	5652	T212A682J 050_S
0.0068	A	10	T110A682K050AS	0.1	3	2077	2317	2557	2797	3037	T212A682K050_S
0.0068	A	20	T110A682M050AS	0.1	3	2078	2318	2558	2798	3038	T212A682M050_S
0.0082	A	5	T110A822J 050AS	0.1	3	0053	5053	5253	5453	5653	T212A822J 050_S
0.0082	A	10	T110A822K050AS	0.1	3	2079	2319	2559	2799	3039	T212A822K050_S
0.0082	A	20	T110A822M050AS	0.1	3						
0.01	A	5	T110A103J 050AS	0.1	3	0054	5054	5254	5454	5654	T212A103J 050_S
0.01	A	10	T110A103K050AS	0.1	3	2080	2320	2560	2800	3040	T212A103K050_S
0.01	A	20	T110A103M050AS	0.1	3	2081	2321	2561	2801	3041	T212A103M050_S
0.012	A	5	T110A123J 050AS	0.1	3	0055	5055	5255	5455	5655	T212A123J 050_S
0.012	A	10	T110A123K050AS	0.1	3	2082	2322	2562	2802	3042	T212A123K050_S
0.012	A	20	T110A123M050AS	0.1	3						
0.015	A	5	T110A153J 050AS	0.1	3	0056	5056	5256	5456	5656	T212A153J 050_S
0.015	A	10	T110A153K050AS	0.1	3	2083	2323	2563	2803	3043	T212A153K050_S
0.015	A	20	T110A153M050AS	0.1	3	2084	2324	2564	2804	3044	T212A153M050_S
0.018	A	5	T110A183J 050AS	0.1	3	0057	5057	5257	5457	5657	T212A183J 050_S
0.018	A	10	T110A183K050AS	0.1	3	2085	2325	2565	2805	3045	T212A183K050_S
0.018	A	20	T110A183M050AS	0.1	3						
0.022	A	5	T110A223J 050AS	0.1	3	0058	5058	5258	5458	5658	T212A223J 050_S
0.022	A	10	T110A223K050AS	0.1	3	2086	2326	2566	2806	3046	T212A223K050_S
0.022	A	20	T110A223M050AS	0.1	3	2087	2327	2567	2807	3047	T212A223M050_S
0.027	A	5	T110A273J 050AS	0.1	3	0059	5059	5259	5459	5659	T212A273J 050_S
0.027	A	10	T110A273K050AS	0.1	3	2088	2328	2568	2808	3048	T212A273K050_S
0.027	A	20	T110A273M050AS	0.1	3						
0.033	A	5	T110A333J 050AS	0.1	3	0060	5060	5260	5460	5660	T212A333J 050_S
0.033	A	10	T110A333K050AS	0.1	3	2089	2329	2569	2809	3049	T212A333K050_S
0.033	A	20	T110A333M050AS	0.1	3	2090	2330	2570	2810	3050	T212A333M050_S
0.039	A	5	T110A393J 050AS	0.1	3	0061	5061	5261	5461	5661	T212A393J 050_S
0.039	A	10	T110A393K050AS	0.1	3	2091	2331	2571	2811	3051	T212A393K050_S
0.039	A	20	T110A393M050AS	0.1	3						
0.047	A	5	T110A473J 050AS	0.1	3	0062	5062	5262	5462	5662	T212A473J 050_S
0.047	A	10	T110A473K050AS	0.1	3	2092	2332	2572	2812	3052	T212A473K050_S
0.047	A	20	T110A473M050AS	0.1	3	2093	2333	2573	2813	3053	T212A473M050_S
0.056	A	5	T110A563J 050AS	0.1	3	0063	5063	5263	5463	5663	T212A563J 050_S
0.056	A	10	T110A563K050AS	0.1	3	2094	2334	2574	2814	3054	T212A563K050_S
0.056	A	20	T110A563M050AS	0.1	3						
0.068	A	5	T110A683J 050AS	0.1	3	0064	5064	5264	5464	5664	T212A683J050_S
0.068	A	10	T110A683K050AS	0.1	3	2095	2335	2575	2815	3055	T212A683K050_S
0.068	A	20	T110A683M050AS	0.1	3	2096	2336	2576	2816	3056	T212A683M050_S
0.082	A	5	T110A823J 050AS	0.1	3	0065	5065	5265	5465	5665	T212A823J 050_S
0.082	A	10	T110A823K050AS	0.1	3	2097	2337	2577	2817	3057	T212A823K050_S
0.082	A	20	T110A823M050AS	0.1	3						
0.1	A	5	T110A104J 050AS	0.5	3	0066	5066	5266	5466	5666	T212A104J 050_S
0.1	A	10	T110A104K050AS	0.5	3	2098	2338	2578	2818	3058	T212A104K050_S
0.1	A	20	T110A104M050AS	0.5	3	2099	2339	2579	2819	3059	T212A104M050_S
0.12	A	5	T110A124J 050AS	0.5	3	0067	5067	5267	5467	5667	T212A124J 050_S
0.12	A	10	T110A124K050AS	0.5	3	2100	2340	2580	2820	3060	T212A124K050_S
0.12	A	20	T110A124M050AS	0.5	3						
0.15	A	5	T110A154J 050AS	0.5	3	0068	5068	5268	5468	5668	T212A154J 050_S
0.15	A	10	T110A154K050AS	0.5	3	2101	2341	2581	2821	3061	T212A154K050_S
0.15	A	20	T110A154M050AS	0.5	3	2102	2342	2582	2822	3062	T212A154M050_S
0.18	A	5	T110A184J 050AS	0.5	3	0069	5069	5269	5469	5669	T212A184J 050_S
0.18	A	10	T110A184K050AS	0.5	3	2103	2343	2583	2823	3063	T212A184K050_S
0.18	A	20	T110A184M050AS	0.5	3						
0.22	A	5	T110A224J 050AS	0.5	3	0070	5070	5270	5470	5670	T212A224J 050_S
0.22	A	10	T110A224K050AS	0.5	3	2104	2344	2584	2824	3064	T212A224K050_S
0.22	A	20	T110A224M050AS	0.5	3	2105	2345	2585	2825	3065	T212A224M050_S
0.27	A	5	T110A274J 050AS	0.5	3	0071	5071	5271	5471	5671	T212A274J 050_S
0.27	A	10	T110A274K050AS	0.5	3	2106	2346	2586	2826	3066	T212A274K050_S
0.27	A	20	T110A274M050AS	0.5	3						
0.33	A	5	T110A334J 050AS	0.5	3	0072	5072	5272	5472	5672	T212A334J 050_S
0.33	A	10	T110A334K050AS	0.5	3	2107	2347	2587	2827	3067	T212A334K050_S
0.33	A	20	T110A334M050AS	0.5	3	2108	2348	2588	2828	3068	T212A334M050_S
0.39	A	5	T110A394J 050AS	0.5	3	0073	5073	5273	5473	5673	T212A394J 050_S
0.39	A	10	T110A394K050AS	0.5	3	2109	2349	2589	2829	3069	T212A394K050_S
0.39	A	20	T110A394M050AS	0.5	3						
0.47	A	5	T110A474J 050AS	0.5	3	0074	5074	5274	5474	5674	T212A474J 050_S
0.47	A	10	T110A474K050AS	0.5	3	2110	2350	2590	2830	3070	T212A474K050_S
0.47	A	20	T110A474M050AS	0.5	3	2111	2351	2591	2831	3071	T212A474M050_S
0.56	A	5	T110A564J 050AS	0.5	3	0075	5075	5275	5475	5675	T212A564J 050_S
0.56	A	10	T110A564K050AS	0.5	3	2112	2352	2592	2832	3072	T212A564K050_S
0.56	A	20	T110A564M050AS	0.5	3						
0.68	A	5	T110A684J 050AS	0.5	3	0076	5076	5276	5476	5676	T212A684J 050_S
0.68	A	10	T110A684K050AS	0.5	3	2113	2353	2593	2833	3073	T212A684K050_S
0.68	A	20	T110A684M050AS	0.5	3	2114	2354	2594	2834	3074	T212A684M050_S

1/ To complete T110 Series Catalog Number, insert Capacitance Tolerance Symbol in the 9th Character, as shown on page 4.
2/ To complete T212 Series Catalog Number, insert Failure Rate Symbol in the 13th Character.

Higher CV values in comparable case sizes are available in KEMET T140 Series. Refer to pages 29-31.

*Parent Values

KEMET SOLID TANTALUM CAPACITORS

UNION CARBIDE

T110 SERIES & CSR13 CAPACITOR REFERENCE

Capacitance µF	Case Size	Capacitance Tolerance	KEMET T110 SERIES 1/ Kemet Catalog Number	Leakage Current µA 25° Max.	Max DF % 25 C 120Hz	MIL–C–39003 CSR13 CAPACITORS (MIL–C–39003/1E) DASH NUMBER REFERENCE - FAILURE RATE LEVEL (%/1000 hrs.) *L (2.0)	M(1.0)	P(0.1)	R(0.01)	S(0.001)	2/ Kemet Catalog Number
50 VOLT RATING AT 85°C – 33 VOLT RATING AT 125°C											
0.82	A	5	T110A824J 050AS	0.5	3	0077	5077	5277	5477	5677	T212A824J 050_S
0.82	A	10	T110A824K050AS	0.5	3	2115	2355	2595	2835	3075	T212A824K050_S
0.82	A	20	T110A824M050AS	0.5	3						
* 1.0	A	5	T110A105J 050AS	0.5	3	0078	5078	5278	5478	5678	T212A105J 050_S
* 1.0	A	10	T110A105K050AS	0.5	3	2116	2356	2596	2836	3076	T212A105K050_S
* 1.0	A	20	T110A105M050AS	0.5	3	2117	2357	2597	2837	3077	T212A105M050_S
1.2	B	5	T110B125J 050AS	0.5	4	0079	5079	5279	5479	5679	T212B125J 050_S
1.2	B	10	T110B125K050AS	0.5	4	2118	2358	2598	2838	3078	T212B125K050_S
1.2	B	20	T110B125M050AS	0.5	4						
1.5	B	5	T110B155J 050AS	0.5	4	0080	5080	5280	5480	5680	T212B155J 050_S
1.5	B	10	T110B155K050AS	0.5	4	2119	2359	2599	2839	3079	T212B155K050_S
1.5	B	20	T1 0B155M050AS	0.5	4	2120	2360	2600	2840	3080	T212B155M050_S
1.8	B	5	T110B185J 050AS	0.5	4	0081	5081	5281	5481	5681	T212B185J 050_S
1.8	B	10	T110B185K050AS	0.5	4	2121	2361	2601	2841	3081	T212B185K050_S
1.8	B	20	T110B185M050AS	0.5	4						
2.2	B	5	T110B225J 050AS	1.0	4	0082	5082	5282	5482	5682	T212B225J 050_S
2.2	B	10	T110B225K050AS	1.0	4	2122	2362	2602	2842	3082	T212B225K050_S
2.2	B	20	T110B225M050AS	1.0	4	2123	2363	2603	2843	3083	T212B225M050_S
2.7	B	5	T110B275J 050AS	1.0	4	0083	5083	5283	5483	5683	T212B275J 050_S
2.7	B	10	T110B275K050AS	1.0	4	2124	2364	2604	2844	3084	T212B275K050_S
2.7	B	20	T110B275M050AS	1.0	4						
3.3	B	5	T110B335J 050AS	2.0	4	0084	5084	5284	5484	5684	T212B335J 050_S
3.3	B	10	T110B335K050AS	2.0	4	2125	2365	2605	2845	3085	T212B335K050_S
3.3	B	20	T110B335M050AS	2.0	4	2126	2366	2606	2846	3086	T212B335M050_S
3.9	B	5	T110B395J 050AS	2.0	4	0085	5085	5285	5485	5685	T212B395J 050_S
3.9	B	10	T110B395K050AS	2.0	4	2127	2367	2607	2847	3087	T212B395K050_S
3.9	B	20	T110B395M050AS	2.0	4						
* 4.7	B	5	T110B475J 050AS	3.0	4	0086	5086	5286	5486	5686	T212B475J 050_S
* 4.7	B	10	T110B475K050AS	3.0	4	2128	2368	2608	2848	3088	T212B475K050_S
* 4.7	B	20	T110B475M050AS	3.0	4	2129	2369	2609	2849	3089	T212B475M050_S
5.6	C	5	T110C565J 050AS	3.0	4	0087	5087	5287	5487	5687	T212C565J 050_S
5.6	C	10	T110C565K050AS	3.0	4	2130	2370	2610	2850	3090	T212C565K050_S
5.6	C	20	T110C565M050AS	3.0	4						
6.8	C	5	T110C685J 050AS	3.0	4	0088	5088	5288	5488	5688	T212C685J 050_S
6.8	C	10	T110C685K050AS	3.0	4	2131	2371	2611	2851	3091	T212C685K050_S
6.8	C	20	T110C685M050AS	3.0	4	2132	2372	2612	2852	3092	T212C685M050_S
8.2	C	5	T110C825J 050AS	3.0	4	0089	5089	5289	5489	5689	T212C825J 050_S
8.2	C	10	T110C825K050AS	3.0	4	2133	2373	2613	2853	3093	T212C825K050_S
8.2	C	20	T110C825M050AS	3.0	4						
10.0	C	5	T110C106J 050AS	3.0	4	0090	5090	5290	5490	5690	T212C106J 050_S
10.0	C	10	T110C106K050AS	3.0	4	2134	2374	2614	2854	3094	T212C106K050_S
10.0	C	20	T110C106M050AS	3.0	4	2135	2375	2615	2855	3095	T212C106M050_S
12.0	C	5	T110C126J 050AS	3.0	4	0091	5091	5291	5491	5691	T212C126J 050_S
12.0	C	10	T110C126K050AS	3.0	4	2136	2376	2616	2856	3096	T212C126K050_S
12.0	C	20	T110C126M050AS	3.0	4						
15.0	C	5	T110C156J 050AS	6.0	4	0092	5092	5292	5492	5692	T212C156J 050_S
15.0	C	10	T110C156K050AS	6.0	4	2137	2377	2617	2857	3097	T212C156K050_S
15.0	C	20	T110C156M050AS	6.0	4	2138	2378	2618	2858	3098	T212C156M050_S
* 18.0	C	5	T110C186J 050AS	6.0	4	0093	5093	5293	5493	5693	T212C186J 050_S
* 18.0	C	10	T110C186K050AS	6.0	4	2139	2379	2619	2859	3099	T212C186K050_S
* 18.0	C	20	T110C186M050AS	6.0	4						
* 22.0	D	5	T110D226J 050AS	6.0	4	0094	5094	5294	5494	5694	T212D226J 050_S
* 22.0	D	10	T110D226K050AS	6.0	4	2140	2380	2620	2860	3100	T212D226K050_S
* 22.0	D	20	T110D226M050AS	6.0	4	2141	2381	2621	2861	3101	T212D226M050_S
60 VOLT RATING AT 85°C – 40 VOLT RATING AT 125°C											
0.0047	A	5,10,20	T110A472_060AS	0.5	3						
0.0056	A	5,10,20	T110A562_060AS	0.5	3						
0.0068	A	5,10,20	T110A682_060AS	0.5	3						
0.0082	A	5,10,20	T110A822_060AS	0.5	3						
0.01	A	5,10,20	T110A103_060AS	0.5	3						
0.012	A	5,10,20	T110A123_060AS	0.5	3						
0.015	A	5,10,20	T110A153_060AS	0.5	3						
0.018	A	5,10,20	T110A183_060AS	0.5	3						
0.022	A	5,10,20	T110A223_060AS	0.5	3						
0.027	A	5,10,20	T110A273_060AS	0.5	3						
0.033	A	5,10,20	T110A333_060AS	0.5	3						
0.039	A	5,10,20	T110A393_060AS	0.5	3						
0.047	A	5,10,20	T110A473_060AS	0.5	3						
0.056	A	5,10,20	T110A563_060AS	0.5	3						
0.068	A	5,10,20	T110A683_060AS	0.5	3						
0.082	A	5,10,20	T110A823_060AS	0.5	3						
0.1	A	5,10,20	T110A104_060AS	0.5	3						
0.12	A	5,10,20	T110A124_060AS	0.5	3						
0.15	A	5,10,20	T110A154_060AS	0.5	3						

All CSR13 Capacitors are available to the "S" Failure Rate Level

*L Failure Rate dash numbers refer to Mil–C–39003/1A, 1B, & 1C capacitors only. (Not available in Mil–C–39003/1D or 1E Specification.)

Higher CV values in comparable case sizes are available in KEMET T140 Series. Refer to pages 29-31.

*Parent Values

KEMET SOLID TANTALUM CAPACITORS

UNION CARBIDE

T110 SERIES & CSR13 CAPACITOR REFERENCE

Capacitance µF	Case Size	Capacitance Tolerance	KEMET T110 SERIES 1/ Kemet Catalog Number	Leakage Current µA 25° Max.	Max D.F.% 25°C 120Hz	MIL-C-39003 CSR13 CAPACITORS (MIL-C-39003/1E) DASH NUMBER REFERENCE - FAILURE RATE LEVEL (%/1000 hrs.) ★L (2.0)	M(1.0)	P(0.1)	R(0.01)	S(0.001)	2/ Kemet Catalog Number
60 VOLT RATING AT 85°C – 40 VOLT RATING AT 125°C											
0.18	A	5,10,20	T110A184_060AS	0.5	3						
0.22	A	5,10,20	T110A224_060AS	0.5	3						
0.27	A	5,10,20	T110A274_060AS	0.5	3						
0.33	A	5,10,20	T110A334_060AS	0.5	3						
0.39	A	5,10,20	T110A394_060AS	0.5	3						
0.47	A	5,10,20	T110A474_060AS	0.5	3						
0.56	A	5,10,20	T110A564_060AS	0.5	3						
0.68	A	5,10,20	T110A684_060AS	0.5	3						
0.82	B	5,10,20	T110B824_060AS	0.5	3						
1.0	B	5,10,20	T110B105_060AS	0.5	3						
1.2	B	5,10,20	T110B125_060AS	0.5	4						
1.5	B	5,10,20	T110B155_060AS	0.5	4						
1.8	B	5,10,20	T110B185_060AS	0.5	4						
2.2	B	5,10,20	T110B255_060AS	1.0	4						
2.7	B	5,10,20	T110B275_060AS	1.0	4						
3.3	B	5,10,20	T110B335_060AS	2.0	4						
3.9	B	5,10,20	T110B395_060AS	2.0	4						
4.7	C	5,10,20	T110C475_060AS	3.0	4						
5.6	C	5,10,20	T110C565_060AS	3.0	4						
6.8	C	5,10,20	T110C685_060AS	4.0	4						
8.2	C	5,10,20	T110C825_060AS	5.0	4						
10.0	C	5,10,20	T110C106_060AS	6.0	4						
12.0	C	5,10,20	T110C126_060AS	6.0	4						
15.0	D	5,10,20	T110D156_060AS	9.0	4						
18.0	D	5,10,20	T110D186_060AS	10.0	4						
22.0	D	5,10,20	T110D226_060AS	12.0	4						
75 VOLT RATING AT 85°C – 50 VOLT RATING AT 125°C											
0.0047	A	5,10,20	T110A472_075AS	0.5	3						
0.0056	A	5,10,20	T110A562_075AS	0.5	3						
0.0068	A	5,10,20	T110A682_075AS	0.5	3						
0.0082	A	5,10,20	T110A822_075AS	0.5	3						
0.01	A	5,10,20	T110A103_075AS	0.5	3						
0.012	A	5,10,20	T110A123_075AS	0.5	3						
0.015	A	5,10,20	T110A153_075AS	0.5	3						
0.018	A	5,10,20	T110A183_075AS	0.5	3						
0.022	A	5,10,20	T110A223_075AS	0.5	3						
0.027	A	5,10,20	T110A273_075AS	0.5	3						
0.033	A	5,10,20	T110A333_075AS	0.5	3						
0.039	A	5,10,20	T110A393_075AS	0.5	3						
0.047	A	5,10,20	T110A473_075AS	0.5	3						
0.056	A	5,10,20	T110A563_075AS	0.5	3						
0.068	A	5,10,20	T110A683_075AS	0.5	3						
0.082	A	5,10,20	T110A823_075AS	0.5	3						
0.1	A	5	T110A104J 075AS	0.5	3	0095	5095	5295	5495	5695	T212A104J 075_S
0.1	A	10	T110A104K075AS	0.5	3	2142	2382	2622	2862	3102	T212A104K075_S
0.1	A	20	T110A104M075AS	0.5	3	2143	2383	2623	2863	3103	T212A104M075_S
0.12	A	5	T110A124J 075AS	0.5	3	0096	5096	5296	5496	5696	T212A124J 075_S
0.12	A	10	T110A124K075AS	0.5	3	2144	2384	2624	2864	3104	T212A124K075_S
0.12	A	20	T110A124M075AS	0.5	3						
0.15	A	5	T110A154J 075AS	0.5	3	0097	5097	5297	5497	5697	T212A154J 075_S
0.15	A	10	T110A154K075AS	0.5	3	2145	2385	2625	2865	3105	T212A154K075_S
0.15	A	20	T110A154M075AS	0.5	3	2146	2386	2626	2866	3106	T212A154M075_S
0.18	A	5	T110A184J 075AS	0.5	3	0098	5098	5298	5498	5698	T212A184J 075_S
0.18	A	10	T110A184K075AS	0.5	3	2147	2387	2627	2867	3107	T212A184K075_S
0.18	A	20	T110A184M075AS	0.5	3						
0.22	A	5	T110A224J 075AS	0.5	3	0099	5099	5299	5499	5699	T212A224J 075_S
0.22	A	10	T110A224K075AS	0.5	3	2148	2388	2628	2868	3108	T212A224K075_S
0.22	A	20	T110A224M075AS	0.5	3	2149	2389	2629	2869	3109	T212A224M075_S
0.27	A	5	T110A274J 075AS	0.5	3	0100	5100	5300	5500	5700	T212A274J 075_S
0.27	A	10	T110A274K075AS	0.5	3	2150	2390	2630	2870	3110	T212A274K075_S
0.27	A	20	T110A275M075AS	0.5	3						
0.33	A	5	T110A334J 075AS	0.5	3	0101	5101	5302	5501	5701	T212A334J 075_S
0.33	A	10	T110A334K075AS	0.5	3	2151	2391	2631	2871	3111	T212A334K075_S
0.33	A	20	T110A334M075AS	0.5	3	2152	2392	2632	2872	3112	T212A334M075_S
0.39	A	5	T110A394J 075AS	0.5	3	0102	5102	5302	5502	5702	T212A394J 075_S
0.39	A	10	T110A394K075AS	0.5	3	2153	2393	2633	2873	3113	T212A394K075_S
0.39	A	20	T110A394M075AS	0.5	3						
0.47	A	5	T110A474J 075AS	0.5	3	0103	5103	5303	5503	5703	T212A474J 075_S
0.47	A	10	T110A474K075AS	0.5	3	2154	2394	2634	2874	3114	T212A474K075_S
0.47	A	20	T110A474M075AS	0.5	3	2155	2395	2635	2875	3115	T212A474M075_S
0.56	A	5	T110A564J 075AS	0.5	3	0104	5104	5304	5504	5704	T212A564J 075_S
0.56	A	10	T110A564K075AS	0.5	3	2156	2396	2636	2876	3116	T212A564K075_S
0.56	A	20	T110A564M075AS	0.5	3						
* 0.68	A	5	T110A684J 075AS	0.5	3	0105	5105	5305	5505	5705	T212A684J 075_S
* 0.68	A	10	T110A684K075AS	0.5	3	2157	2397	2637	2877	3117	T212A684K075_S
* 0.68	A	20	T110A684M075AS	0.5	3	2158	2398	2638	2878	3118	T212A684M075_S

All CSR13 Capacitors are available to the "S" Failure Rate Level

*L Failure Rate dash numbers refer to Mil– C–39003/1A, 1B, & 1C capacitors only. (Not available to Mil–C–39003/1D or 1E Specification.)

Higher CV values in comparable case sizes are available in KEMET T140 Series. Refer to pages 29-31.

*Parent Values

KEMET

SOLID TANTALUM CAPACITORS

UNION CARBIDE

T110 SERIES & CSR13 CAPACITOR REFERENCE

			KEMET T110 SERIES			MIL–C–39003 CSR13 CAPACITORS (MIL–C–39003/1E)					
Capacitance µF	Case Size	Capacitance Tolerance	1/ Kemet Catalog Number	Leakage Current µA 25° Max.	Max D.F.% 25°C 120Hz	DASH NUMBER REFERENCE - FAILURE RATE LEVEL (%/1000 hrs.) ★L (2.0)	M(1.0)	P(0.1)	R(0.01)	S(0.001)	2/ Kemet Catalog Number
75 VOLT RATING AT 85°C – 50 VOLT RATING AT 125°C											
0.82	B	5	T110B824J 075AS	0.5	3	0106	5106	5306	5506	5706	T212B824J 075_S
0.82	B	10	T110B824K075AS	0.5	3	2159	2399	2639	2879	3119	T212B824K 075_S
0.82	B	20	T110B824M075AS	0.5	3						
1.0	B	5	T110B105J 075AS	0.5	3	0107	5107	5307	5507	5707	T212B105J 075_S
1.0	B	10	T110B105K075AS	0.5	3	2160	2400	2640	2880	3120	T212B105K 075_S
1.0	B	20	T110B105M075AS	0.5	3	2161	2401	2641	2881	3121	T212B105M 075_S
1.2	B	5	T110B125J 075AS	0.5	4	0108	5108	5308	5508	5708	T212B125J 075_S
1.2	B	10	T110B125K075AS	0.5	4	2162	2402	2642	2882	3122	T212B125K 075_S
1.2	B	20	T110B125M075AS	0.5	4						
1.5	B	5	T110B155J 075AS	1.0	4	0109	5109	5309	5509	5709	T212B155J 075_S
1.5	B	10	T110B155K075AS	1.0	4	2163	2403	2643	2883	3123	T212B155K 075_S
1.5	B	20	T110B155M075AS	1.0	4	2164	2404	2644	2884	3124	T212B155M 075_S
1.8	B	5	T110B185J 075AS	1.0	4	0110	5110	5310	5510	5710	T212B185J 075_S
1.8	B	10	T110B185K075AS	1.0	4	2165	2405	2645	2885	3125	T212B185K 075_S
1.8	B	20	T110B185M075AS	1.0	4						
2.2	B	5	T110B225J 075AS	1.5	4	0111	5111	5311	5511	5711	T212B225J 075_S
2.2	B	10	T110B225K075AS	1.5	4	2166	2406	2646	2886	3126	T212B225K 075_S
2.2	B	20	T110B225M075AS	1.5	4	2167	2407	2647	2887	3127	T212B225M 075_S
2.7	B	5	T110B275J 075AS	1.5	4	0112	5112	5312	5512	5712	T212B275J 075_S
2.7	B	10	T110B275K075AS	1.5	4	2168	2408	2648	2888	3128	T212B275K 075_S
2.7	B	20	T110B275M075AS	1.5	4						
3.3	B	5	T110B335J 075AS	2.0	4	0113	5113	5313	5513	5713	T212B335J 075_S
3.3	B	10	T110B335K075AS	2.0	4	2169	2409	2649	2889	3129	T212B335K 075_S
3.3	B	20	T110B335M075AS	2.0	4	2170	2410	2650	2890	3130	T212B335M 075_S
* 3.9	B	5	T110B395J 075AS	2.0	4	0114	5114	5314	5514	5714	T212B395J 075_S
* 3.9	B	10	T110B395K075AS	2.0	4	2171	2411	2651	2891	3131	T212B395K 075_S
* 3.9	B	20	T110B395M075AS	2.0	4						
4.7	C	5	T110C475J 075AS	6.0	4	0115	5115	5315	5515	5715	T212C475J 075_S
4.7	C	10	T110C475K075AS	6.0	4	2172	2412	2652	2892	3132	T212C475K 075_S
4.7	C	20	T110C475M075AS	6.0	4	2173	2413	2653	2893	3133	T212C475M 075_S
5.6	C	5	T110C565J 075AS	6.0	4	0116	5116	5316	5516	5716	T212C565J 075_S
5.6	C	10	T110C565K075AS	6.0	4	2174	2414	2654	2894	3134	T212C565K 075_S
5.6	C	20	T110C565M075AS	6.0	4						
6.8	C	5	T110C685J 075AS	10.0	4	0117	5117	5317	5517	5717	T212C685J 075_S
6.8	C	10	T110C685K075AS	10.0	4	2175	2415	2655	2895	3135	T212C685K 075_S
6.8	C	20	T110C685M075AS	10.0	4	2176	2416	2656	2896	3136	T212C685M 075_S
8.2	C	5	T110C825J 075AS	10.0	4	0118	5118	5318	5518	5718	T212C825J 075_S
8.2	C	10	T110C825K075AS	10.0	4	2177	2417	2657	2897	3137	T212C825K 075_S
8.2	C	20	T110C825M075AS	10.0	4						
*10.0	C	5	T110C106J 075AS	10.0	4	0119	5119	5319	5519	5719	T212C106J 075_S
*10.0	C	10	T110C106K075AS	10.0	4	2178	2418	2658	2898	3138	T212C106K 075_S
*10.0	C	20	T110C106M075AS	10.0	4	2179	2419	2659	2899	3139	T212C106M 075_S
12.0	D	5	T110D126J 075AS	10.0	4	0120	5120	5320	5520	5720	T212D126J 075_S
12.0	D	10	T110D126K075AS	10.0	4	2180	2420	2660	2900	3140	T212D126K 075_S
12.0	D	20	T110D126M075AS	10.0	4						
*15.0	D	5	T110D156J 075AS	14.0	4	0121	5121	5321	5521	5721	T212D156J 075_S
*15.0	D	10	T110D156K075AS	14.0	4	2181	2421	2661	2901	3141	T212D156K 075_S
*15.0	D	20	T110D156M075AS	14.0	4	2182	2422	2662	2902	3142	T212D156M 075_S
100 VOLT RATING AT 85°C – 67 VOLT RATING AT 125°C											
0.0047	A	5	T110A472J 100AS	0.5	3	0122	5122	5322	5522	5722	T212A472J 100_S
0.0047	A	10	T110A472K100AS	0.5	3	2183	2423	2663	2903	3143	T212A472K 100_S
0.0047	A	20	T110A472M100AS	0.5	3	2184	2424	2664	2904	3144	T212A472M 100_S
0.0056	A	5	T110A562J 100AS	0.5	3	0123	5123	5323	5523	5723	T212A562J 100_S
0.0056	A	10	T110A562K100AS	0.5	3	2185	2425	2665	2905	3145	T212A562K 100_S
0.0056	A	20	T110A562M100AS	0.5	3						
0.0068	A	5	T110A682J 100AS	0.5	3	0124	5124	5324	5524	5724	T212A682J 100_S
0.0068	A	10	T110A682K100AS	0.5	3	2186	2426	2666	2906	3146	T212A682K 100_S
0.0068	A	20	T110A682M100AS	0.5	3	2187	2427	2667	2907	3147	T212A682M 100_S
0.0082	A	5	T110A822J 100AS	0.5	3	0125	5125	5325	5525	5725	T212A822J 100_S
0.0082	A	10	T110A822K100AS	0.5	3	2188	2428	2668	2908	3148	T212A822K 100_S
0.0082	A	20	T110A822M100AS	0.5	3						
0.01	A	5	T110A103J 100AS	0.5	3	0126	5126	5326	5526	5726	T212A103J 100_S
0.01	A	10	T110A103K100AS	0.5	3	2189	2429	2669	2909	3149	T212A103K 100_S
0.01	A	20	T110A103M100AS	0.5	3	2190	2430	2670	2910	3150	T212A103M 100_S
0.012	A	5	T110A123J 100AS	0.5	3	0127	5127	5327	5527	5727	T212A123J 100_S
0.012	A	10	T110A123K100AS	0.5	3	2191	2431	2671	2911	3151	T212A123K 100_S
0.012	A	20	T110A123M100AS	0.5	3						
0.015	A	5	T110A153J 100AS	0.5	3	0128	5128	5328	5528	5728	T212A153J 100_S
0.015	A	10	T110A153K100AS	0.5	3	2192	2432	2672	2912	3152	T212A153K 100_S
0.015	A	20	T110A153M100AS	0.5	3	2193	2433	2673	2913	3153	T212A153M 100_S
0.018	A	5	T110A183J 100AS	0.5	3	0129	5129	5329	5529	5729	T212A183J 100_S
0.018	A	10	T110A183K100AS	0.5	3	2194	2434	2674	2914	3154	T212A183K 100_S
0.018	A	20	T110A183M100AS	0.5	3						
0.022	A	5	T110A223J 100AS	0.5	3	0130	5130	5330	5530	5730	T212A223J 100_S
0.022	A	10	T110A223K100AS	0.5	3	2195	2435	2675	2915	3155	T212A223K 100_S
0.022	A	20	T110A223M100AS	0.5	3	2196	2436	2676	2916	3156	T212A223M 100_S

Higher CV values in comparable case sizes are available in KEMET T140 Series. Refer to pages 29-31. *Parent Values

KEMET SOLID TANTALUM CAPACITORS

UNION CARBIDE

T110 SERIES & CSR13 CAPACITOR REFERENCE

Capacitance µF	Case Size	Capacitance Tolerance	KEMET T110 SERIES 1/ Kemet Catalog Number	Leakage Current µA 25° Max.	Max DF % 25°C 120Hz	MIL-C-39003 CSR13 CAPACITORS (MIL-C-39003/1E) DASH NUMBER REFERENCE - FAILURE RATE LEVEL (%/1000 hrs.) ★L (2.0)	M(1.0)	P(0.1)	R(0.01)	S(0.001)	2/ Kemet Catalog Number
100 VOLT RATING AT 85°C – 67 VOLT RATING AT 125°C											
0.027	A	5	T110A273J 100AS	0.5	3	0131	5131	5331	5531	5731	T212A273J 100_S
0.027	A	10	T110A273K100AS	0.5	3	2197	2437	2677	2917	3157	T212A273K100_S
0.027	A	20	T110A273M100AS	0.5	3						
0.033	A	5	T110A333J 100AS	0.5	3	0132	5132	5332	5532	5732	T212A333J 100_S
0.033	A	10	T110A333K100AS	0.5	3	2198	2438	2678	2918	3158	T212A333K100_S
0.033	A	20	T110A333M100AS	0.5	3	2199	2439	2679	2919	3159	T212A333M100_S
0.039	A	5	T110A393J 100AS	0.5	3	0133	5133	5333	5533	5733	T212A393J 100_S
0.039	A	10	T110A393K100AS	0.5	3	2200	2440	2680	2920	3160	T212A393K100_S
0.039	A	20	T110A393M100AS	0.5	3						
0.047	A	5	T110A473J 100AS	0.5	3	0134	5134	5334	5534	5734	T212A473J 100_S
0.047	A	10	T110A473K100AS	0.5	3	2201	2441	2681	2921	3161	T212A473K100_S
0.047	A	20	T110A473M100AS	0.5	3	2202	2442	2682	2922	3162	T212A473M100_S
0.056	A	5	T110A563J 100AS	0.5	3	0135	5135	5335	5535	5735	T212A563J 100_S
0.056	A	10	T110A563K100AS	0.5	3	2203	2443	2683	2923	3163	T212A563K100_S
0.056	A	20	T110A563M100AS	0.5	3						
0.068	A	5	T110A683J 100AS	0.5	3	0136	5136	5336	5536	5736	T212A683J 100_S
0.068	A	10	T110A683K100AS	0.5	3	2204	2444	2684	2924	3164	T212A683K100_S
0.068	A	20	T110A683M100AS	0.5	3	2205	2445	2685	2925	3165	T212A683M100_S
0.082	A	5	T110A823J 100AS	0.5	3	0137	5137	5337	5537	5737	T212A823J 100_S
0.082	A	10	T110A823K100AS	0.5	3	2206	2446	2686	2926	3166	T212A823K100_S
0.082	A	20	T110A823M100AS	0.5	3						
0.1	A	5	T110A104J 100AS	0.5	3	0138	5138	5338	5538	5738	T212A104J 100_S
0.1	A	10	T110A104K100AS	0.5	3	2207	2447	2687	2927	3167	T212A104K100_S
0.1	A	20	T110A104M100AS	0.5	3	2208	2448	2688	2928	3168	T212A104M100_S
0.12	A	5	T110A124J 100AS	0.5	3	0139	5139	5339	5539	5739	T212A124J 100_S
0.12	A	10	T110A124K100AS	0.5	3	2209	2449	2689	2929	3169	T212A124K100_S
0.12	A	20	T110A124M100AS	0.5	3						
0.15	A	5	T110A154J 100AS	0.5	3	0140	5140	5340	5540	5740	T212A154J 100_S
0.15	A	10	T110A154K100AS	0.5	3	2210	2450	2690	2930	3170	T212A154K100_S
0.15	A	20	T110A154M100AS	0.5	3	2211	2451	2691	2931	3171	T212A154M100_S
0.18	A	5	T110A184J 100AS	0.5	3	0141	5141	5341	5541	5741	T212A184J 100_S
0.18	A	10	T110A184K100AS	0.5	3	2212	2452	2692	2932	3172	T212A184K100_S
0.18	A	20	T110A184M100AS	0.5	3						
0.22	A	5	T110A224J 100AS	0.5	3	0142	5142	5342	5542	5742	T212A224J 100_S
0.22	A	10	T110A224K100AS	0.5	3	2213	2453	2693	2933	3173	T212A224K100_S
0.22	A	20	T110A224M100AS	0.5	3	2214	2454	2694	2934	3174	T212A224M100_S
0.27	A	5	T110A274J 100AS	0.5	3	0143	5143	5343	5543	5743	T212A274J 100_S
0.27	A	10	T110A274K100AS	0.5	3	2215	2455	2695	2935	3175	T212A274K100_S
0.27	A	20	T110A274M100AS	0.5	3						
0.33	A	5	T110A334J 100AS	0.5	3	0144	5144	5344	5544	5744	T212A334J 100_S
0.33	A	10	T110A334K100AS	0.5	3	2216	2456	2696	2936	3176	T212A334K100_S
0.33	A	20	T110A334M100AS	0.5	3	2217	2457	2697	2937	3177	T212A334M100_S
0.39	A	5	T110A394J 100AS	0.5	3	0145	5145	5345	5545	5745	T212A394J 100_S
0.39	A	10	T110A394K100AS	0.5	3	2218	2458	2698	2938	3178	T212A394K100_S
0.39	A	20	T110A394M100AS	0.5	3						
0.47	A	5	T110A474J 100AS	0.5	3	0146	5146	5346	5546	5746	T212A474J 100_S
0.47	A	10	T110A474K100AS	0.5	3	2219	2459	2699	2939	3179	T212A474K100_S
0.47	A	20	T110A474M100AS	0.5	3	2220	2460	2700	2940	3180	T212A474M100_S
0.56	A	5	T110A564J 100AS	0.5	3	0147	5147	5347	5547	5747	T212A564J 100_S
0.56	A	10	T110A564K100AS	0.5	3	2221	2461	2701	2941	3181	T212A564K100_S
0.56	A	20	T110A564M100AS	0.5	3						
0.68	B	5	T110B684J 100AS	0.5	3	0148	5148	5348	5548	5748	T212B684J 100_S
0.68	B	10	T110B684K100AS	0.5	3	2222	2462	2702	2942	3182	T212B684K100_S
0.68	B	20	T110B684M100AS	0.5	3	2223	2463	2703	2943	3183	T212B684M100_S
0.82	B	5	T110B824J 100AS	0.5	3	0149	5149	5349	5549	5749	T212B824J 100_S
0.82	B	10	T110B824K100AS	0.5	3	2224	2464	2704	2944	3184	T212B824K100_S
0.82	B	20	T110B824M100AS	0.5	3						
1.0	B	5	T110B105J 100AS	0.5	3	0150	5150	5350	5550	5750	T212B105J 100_S
1.0	B	10	T110B105K100AS	0.5	3	2225	2465	2705	2945	3185	T212B105K100_S
1.0	B	20	T110B105M100AS	0.5	3	2226	2466	2706	2946	3186	T212B105M100_S
1.2	B	5	T110B125J 100AS	0.5	3	0151	5151	5351	5551	5751	T212B125J 100_S
1.2	B	10	T110B125K100AS	0.5	3	2227	2467	2707	2947	3187	T212B125K100_S
1.2	B	20	T110B125M100AS	0.5	3						
1.5	B	5	T110B155J 100AS	1.0	3	0152	5152	5352	5552	5752	T212B155J 100_S
1.5	B	10	T110B155K100AS	1.0	3	2228	2468	2708	2948	3188	T212B155K100_S
1.5	B	20	T110B155M100AS	1.0	3	2229	2469	2709	2949	3189	T212B155M100_S
1.8	B	5	T110B185J 100AS	1.0	3	0153	5153	5353	5553	5753	T212B185J 100_S
1.8	B	10	T110B185K100AS	1.0	3	2230	2470	2710	2950	3190	T212B185K100_S
1.8	B	20	T110B185M100AS	1.0	3						
2.2	B	5	T110B225J 100AS	1.5	3	0154	5154	5354	5554	5754	T212B225J 100_S
2.2	B	10	T110B225K100AS	1.5	3	2231	2471	2711	2951	3191	T212B225K100_S
2.2	B	20	T110B225M100AS	1.5	3	2232	2472	2712	2952	3192	T212B225M100_S
2.7	B	5	T110B275J 100AS	1.5	3	0155	5155	5355	5555	5755	T212B275J 100_S
2.7	B	10	T110B275K100AS	1.5	3	2233	2473	2713	2953	3193	T212B275K100_S
2.7	B	20	T110B275M100AS	1.5	3						

1/ To complete T110 Series Catalog Number, insert Capacitance Tolerance Symbol in the 9th Character, as shown on page 4.
2/ To complete T212 Series Catalog Number, insert Failure Rate Symbol in the 13th Character.

Higher CV values in comparable case sizes are available in KEMET T140 Series. Refer to pages 29-31.

KEMET SOLID TANTALUM CAPACITORS

UNION CARBIDE

T110 SERIES & CSR13 CAPACITOR REFERENCE

Capacitance µF	Case Size	Capacitance Tolerance	KEMET T110 SERIES 1/ Kemet Catalog Number	Leakage Current µA 25° Max.	Max. D.F.% 25° C. 120Hz	MIL-C-39003 CSR13 CAPACITORS (MIL-C-39003/1E) DASH NUMBER REFERENCE - FAILURE RATE LEVEL (%/1000 hrs.) ★L (2.0)	M (1.0)	P (0.1)	R (0.01)	S (0.001)	2/ Kemet Catalog Number
100 VOLT RATING AT 85°C – 67 VOLT RATING AT 125°C											
3.3	C	5	T110C335J 100AS	6.0	3	—	5156	5356	5556	5756	T212C335J 100—S
3.3	C	10	T110C335K100AS	6.0	3	—	5157	5357	5557	5757	T212C335K100—S
3.3	C	20	T110C335M100AS	6.0	3	—	5158	5358	5558	5758	T212C335M100—S
3.9	C	5	T110C395J 100AS	6.0	3	—	5159	5359	5559	5759	T212C395J 100—S
3.9	C	10	T110C395K100AS	6.0	3	—	5160	5360	5560	5760	T212C395K100—S
4.7	C	5	T110C475J 100AS	6.0	3	—	5161	5361	5561	5761	T212C475J 100—S
4.7	C	10	T110C475K100AS	6.0	3	—	5162	5362	5562	5762	T212C475K100—S
4.7	C	20	T110C475M100AS	6.0	3	—	5263	5363	5563	5763	T212C475M100—S
5.6	C	5	T110C565J 100AS	6.0	3	—	5164	5364	5564	5764	T212C565J 100—S
5.6	C	10	T110C565K100AS	6.0	3	—	5165	5365	5565	5765	T212C565K100—S
6.8	C	5	T110C685J 100AS	6.0	3	—	5166	5366	5566	5766	T212C685J 100—S
6.8	C	10	T110C685K100AS	6.0	3	—	5167	5367	5567	5767	T212C685K100—S
6.8	C	20	T110C685M100AS	6.0	3	—	5168	5368	5568	5768	T212C685M100—S
8.2	D	5,10,20	T110D825_100AS	6.0	3						
10.0	D	5,10,20	T110D106_100AS	6.0	3						
125 VOLT RATING AT 85°C – 82 VOLT RATING AT 125°C											
0.0047	A	5,10,20	T110A472_125AS	1.0	3						
0.0056	A	5,10,20	T110A562_125AS	1.0	3						
0.0068	A	5,10,20	T110A682_125AS	1.0	3						
0.0082	A	5,10,20	T110A822_125AS	1.0	3						
0.01	A	5,10,20	T110A103_125AS	1.0	3						
0.012	A	5,10,20	T110A123_125AS	1.0	3						
0.015	A	5,10,20	T110A153_125AS	1.0	3						
0.018	A	5,10,20	T110A183_125AS	1.0	3						
0.022	A	5,10,20	T110A223_125AS	1.0	3						
0.027	A	5,10,20	T110A273_125AS	1.0	3						
0.033	A	5,10,20	T110A333_125AS	1.0	3						
0.039	A	5,10,20	T110A393_125AS	2.0	3						
0.047	A	5,10,20	T110A473_125AS	2.0	3						
0.056	A	5,10,20	T110A563_125AS	2.0	3						
0.068	A	5,10,20	T110A683_125AS	2.0	3						
0.082	A	5,10,20	T110A823_125AS	2.0	3						
0.1	A	5,10,20	T110A104_125AS	2.0	3						
0.12	A	5,10,20	T110A124_125AS	2.0	3						
0.15	A	5,10,20	T110A154_125AS	2.0	3						
0.18	A	5,10,20	T110A184_125AS	2.0	3						
0.22	A	5,10,20	T110A224_125AS	2.0	3						
0.27	A	5,10,20	T110A274_125AS	2.0	3						
0.33	A	5,10,20	T110A334_125AS	2.0	3						
0.39	B	5,10,20	T110B394_125AS	2.0	3						
0.47	B	5,10,20	T110B474_125AS	2.0	3						
0.56	B	5,10,20	T110B564_125AS	2.0	3						
0.68	B	5,10,20	T110B684_125AS	2.0	3						
0.82	B	5,10,20	T110B824_125AS	2.0	3						
1.0	B	5,10,20	T110B105_125AS	2.0	3						
1.2	B	5,10,20	T110B125_125AS	2.0	3						
1.5	B	5,10,20	T110B155_125AS	2.0	3						
1.8	B	5,10,20	T110B185_125AS	2.0	3						
2.2	B	5,10,20	T110B225_125AS	2.0	3						
2.7	C	5,10,20	T110C275_125AS	6.0	3						
3.3	C	5,10,20	T110C335_125AS	6.0	3						
3.9	C	5,10,20	T110C395_125AS	6.0	3						
4.7	C	5,10,20	T110C475_125AS	6.0	3						
5.6	C	5,10,20	T110C565_125AS	6.0	3						
6.8	C	5,10,20	T110C685_125AS	6.0	3						
8.2	D	5,10,20	T110D825_125AS	6.0	3						
10.0	D	5,10,20	T110D106_125AS	6.0	3						

All CSR13 Capacitors are available to the "S" Failure Rate Level

*L Failure Rate dash numbers refer to Mil-C-39003/1A, 1B, & 1C capacitors only. (Not available to Mil-C-39003/1D or 1E Specification.)

Higher CV values in comparable case sizes are available in KEMET T140 Series. Refer to pages 29-31.

CAPACITOR MARKINGS

Marking: Unless otherwise specified by special order, standard marking of T110 Series capacitors consists of the following:

A CASE

	EXAMPLE
Line 1. Polarity and Series	+T110
Line 2. Mfg's Identification and Capacitance Tol.	K 10%
Line 3. Nominal Capacitance — (µF) ("R" indicates decimal)	R56µF
Line 4. Voltage	100V
Line 5. Date Code (e.g.: 7412R, or, 412RX,)	412RX

B, C, & D CASE

	EXAMPLE
Line 1. Polarity and Series	+T110
Line 2. Manufacturer's Identification	KEMET
Line 3. Nominal Capacitance — (µF) ("R" indicates decimal)	8R2µF
Line 4. Voltage and Capacitance Tolerance	100V 10%
Line 5. Date Code (e.g.: 7412R, or, 7412RX,)	7812RX

KEMET

SOLID TANTALUM CAPACITORS

UNION CARBIDE

T111 SERIES — NON-POLAR & T213 (CSR91)

Primarily designed for use in tuned low frequency circuits, phasing low voltage AC motors, servo systems and other applications where reversal of polarity is a primary consideration. Compact unit consists of two polar T110 Series hermetically sealed, tantalum capacitors electrically and mechanically connected back-to-back and supported by an outer corrosion-resistant metal sleeve. They exhibit comparable electrical and performance characteristics of T110 Series. Available in capacitance values ranging from .0023 to 160 μF in ±20%, ±10%, and ±5% tolerances in working voltages from 6 to 125 VDC at +85°C. Also available in extended range version (T141 Series) and as MIL-C-39003 CSR91 Capacitors (T213 Series). For further information refer to KEMET T111 Series Catalog.

CAPACITOR OUTLINE DRAWINGS

STANDARD DIMENSIONS BY CASE SIZE — INCHES & (MILLIMETERS)

Uninsulated Case Size	A ±.062 (±1.57)	B ±.001 (±.03)	D ±.010 (±.25)	L ±.031 (±.79)	C Max. (Max.)
A	0.91 (23.11)	.020 (.51)	0.147 (3.73)	0.565 (14.35)	0.750 (19.05)
B	1.29 (32.77)	.020 (.51)	0.194 (4.93)	0.916 (23.27)	1.130 (28.70)
C	1.83 (46.48)	.025 (.64)	0.300 (7.62)	1.340 (34.04)	1.525 (38.74)
D	2.03 (51.56)	.025 (.64)	0.362 (9.19)	1.540 (39.12)	1.725 (43.82)

Insulated Case Size	A ±.062 (±1.57)	B ±.001 (±.03)	D +.010 (+.25) −.015 (−.38)	L ±.031 (±.79)	C Max. (Max.)
A	0.91 (23.11)	.020 (.51)	0.161 (4.09)	0.575 (14.61)	0.750 (19.05)
B	1.29 (32.77)	.020 (.51)	0.207 (5.26)	0.955 (24.26)	1.130 (28.70)
C	1.83 (46.48)	.025 (.64)	0.314 (7.98)	1.350 (34.29)	1.525 (38.74)
D	2.03 (51.56)	.025 (.64)	0.376 (9.55)	1.550 (39.37)	1.725 (43.82)

T111 SERIES — NON-POLAR SOLID TANTALUM CAPACITORS

Capacitance μF	Case Size	*Capacitance Tolerance ± %	KEMET T111 SERIES 1/ Kemet Catalog Number	Leakage Current μA 25° Max	Max D.F. % 25° C 120 Hz	CSR91 CAPACITORS PER MIL-C-39003/4B DASH NUMBER REFERENCE - FAILURE RATE (%/1K HRS) M (1.0)	P (0.1)	R (0.01)	S (0.001)	2/ Kemet Catalog Number
6 VOLT RATING AT 85° C – 4 VOLT RATING AT 125° C										
1.9	A	10,20	T111A195_006AS	0.5	4					
2.3	A	10,20	T111A235_006AS	0.5	4					
2.8	A	20	T111A285M006AS	0.5	4					
2.8	A	10	T111A285K006AS	0.5	4	0221	0441	0661	0881	T213A285K006_S
3.4	A	10	T111A345K006AS	0.5	6	0222	0442	0662	0882	T213A345K006_S
3.4	A	20	T111A345M006AS	0.5	6	0223	0443	0663	0883	T213A345M006_S
13.0	B	10,20	T111B136_006AS	1.0	6					
16.0	B	10,20	T111B166_006AS	1.0	6					
19.0	B	10,20	T111B196_006AS	1.0	6					
23.0	B	10	T111B236K006AS	2.0	6	0224	0444	0664	0884	T213B236K006_S
23.0	B	20	T111B236M006AS	2.0	6	0225	0445	0665	0885	T213B236M006_S
28.0	B	10	T111B286K006AS	2.0	6	0226	0446	0666	0886	T213B286K006_S
28.0	B	20	T111B286M006AS	2.0	6					
41.0	C	10,20	T111C416_006AS	3.0	6					
50.0	C	10,20	T111C506_006AS	3.0	6					
60.0	C	10,20	T111C606_006AS	3.0	6					
75.0	C	10	T111C756K006AS	6.0	6	0227	0447	0667	0887	T213C756K006_S
75.0	C	20	T111C756M006AS	6.0	6	0228	0448	0668	0888	T213C756M006_S
90.0	C	10	T111C906K006AS	6.0	6	0229	0449	0669	0889	T213C906K006_S
90.0	C	20	T111C906M006AS	6.0	6	0230	0450	0670	0890	T213C906M006_S
110.0	D	10,20	T111D117_006AS	6.0	8					
130.0	D	10	T111D137K006AS	6.0	8	0231	0451	0671	0891	T213D137K006_S
130.0	D	20	T111D137M006AS	6.0	8	0232	0452	0672	0892	T213D137M006_S
160.0	D	10	T111D167K006AS	10.0	8	0233	0453	0673	0893	T213D167K006_S
160.0	D	20	T111D167M006AS	10.0	8	0234	0454	0674	0894	T213D167M006_S

1/ To complete T111 Series Catalog Number, insert Capacitance Tolerance Symbol in the 9th Character, as shown on page 4.
2/ To complete T213 Series Catalog Number, insert Failure Rate Symbol in the 13th Character as shown on page 4.
*±5% Capacitance Tolerance Capacitors are also available in T111 Series.

KEMET

SOLID TANTALUM CAPACITORS

UNION CARBIDE

T111 SERIES — NON-POLAR SOLID TANTALUM CAPACITORS

Capacitance µF	Case Size	*Capacitance Tolerance ± %	KEMET T111 SERIES 1/ Kemet Catalog Number	Leakage Current µA 25° Max	Max D.F. % 25° C 120 Hz	CSR91 CAPACITORS PER MIL-C-39003/4B DASH NUMBER REFERENCE - FAILURE RATE (%/1K HRS) M (1.0)	P (0.1)	R (0.01)	S (0.001)	2/ Kemet Catalog Number
10 VOLT RATING AT 85° C – 7 VOLT RATING AT 125° C										
1.3	A	10,20	T111A135_010AS	0.5	4					
1.6	A	10,20	T111A165_010AS	0.5	4					
1.9	A	10	T111A195K010AS	0.5	4	0235	0455	0675	0895	T213A195K010_S
1.9	A	20	T111A195M010AS	0.5	4					
2.3	A	10	T111A235K010AS	0.5	4	0236	0456	0676	0896	T213A235K010_S
2.3	A	20	T111A235M010AS	0.5	4	0237	0457	0677	0897	T213A235M010_S
9.0	B	10,20	T111B905_010AS	1.0	6					
11.0	B	10,20	T111B116_010AS	2.0	6					
13.0	B	10	T111B136K010AS	2.0	6	0238	0458	0678	0898	T213B136K010_S
13.0	B	20	T111B136M010AS	2.0	6					
16.0	B	10	T111B166K010AS	2.0	6	0239	0459	0679	0899	T213B166K010_S
16.0	B	20	T111B166M010AS	2.0	6	0240	0460	0680	0900	T213B166M010_S
19.0	B	10	T111B196K010AS	2.0	6	0241	0461	0681	0901	T213B196K010_S
19.0	B	20	T111B196M010AS	2.0	6					
23.0	C	10,20	T111C236_010AS	3.0	6					
28.0	C	10,20	T111C286_010AS	3.0	6					
34.0	C	10,20	T111C346_010AS	3.0	6					
41.0	C	10	T111C416K010AS	3.0	6	0242	0462	0682	0902	T213C416K010_S
41.0	C	20	T111C416M010AS	3.0	6					
50.0	C	10	T111C506K010AS	6.0	6	0243	0463	0683	0903	T213C506K010_S
50.0	C	20	T111C506M010AS	6.0	6	0244	0464	0684	0904	T213C506M010_S
60.0	C	10	T111C606K010AS	6.0	6	0245	0465	0685	0905	T213C606K010_S
60.0	C	20	T111C606M010AS	6.0	6	0246	0466	0686	0906	T213C606M010_S
75.0	D	10,20	T111D756_010AS	10.0	6					
90.0	D	10	T111D906K010AS	10.0	6	0247	0467	0687	0907	T213D906K010_S
90.0	D	20	T111D906M010AS	10.0	6					
110.0	D	10	T111D117K010AS	10.0	8	0248	0468	0688	0908	T213D117K010_S
110.0	D	20	T111D117M010AS	10.0	8	0249	0469	0689	0909	T213D117M010_S
15 VOLT RATING AT 85° C – 10 VOLT RATING AT 125° C										
0.6	A	10,20	T111A604_015AS	0.5	4					
0.75	A	10,20	T111A754_015AS	0.5	4					
0.9	A	10,20	T111A904_015AS	0.5	4					
1.1	A	10,20	T111A115_015AS	0.5	4					
1.3	A	10	T111A135K015AS	0.5	4	0250	0470	0690	0910	T213A135K015_S
1.3	A	20	T111A135M015AS	0.5	4					
1.6	A	10	T111A165K015AS	0.5	4	0251	0471	0691	0911	T213A165K015_S
1.6	A	20	T111A165M015AS	0.5	4	0252	0472	0692	0912	T213A165M015_S
4.1	B	10.20	T111B415_015AS	1.0	6					
5.0	B	10.20	T111B505_015AS	1.0	6					
6.0	B	10.20	T111B605_015AS	1.0	6					
7.5	B	10.20	T111B755_015AS	2.0	6					
9.0	B	10	T111B905K015AS	2.0	6	0253	0473	0693	0913	T213B905K015_S
9.0	B	20	T111B905M015AS	2.0	6					
11.0	B	10	T111B116K015AS	3.0	6	0254	0474	0694	0914	T213B116K015 S
11.0		20	T111B116M015AS	3.0	6	0255	0475	0695	0915	T213B116M015_S
13.0	C	10,20	T111C136_015AS	3.0	6					
16.0	C	10,20	T111C166_015AS	3.0	6					
19.0	C	10,20	T111C196_015AS	3.0	6					
23.0	C	10,20	T111C236_015AS	6.0	6					
28.0	C	10	T111C286K015AS	6.0	6	0256	0476	0696	0916	T213C286K015_S
28.0	C	20	T111C286M015AS	6.0	6					
34.0	C	10	T111C346K015AS	6.0	6	0257	0477	0697	0917	T213C346K015_S
34.0	C	20	T111C346M015AS	6.0	6	0258	0478	0698	0918	T213C346M015_S
41.0	D	10,20	T111D416_015AS	6.0	6					
50.0	D	10,20	T111D506_015AS	6.0	6					
60.0	D	10	T111D606K015AS	6.0	6	0259	0479	0699	0919	T213D606K015_S
60.0	D	20	T111D606M015AS	6.0	6					
75.0	D	10	T111D756K015AS	10.0	6	0260	0480	0700	0920	T213D756K015_S
75.0	D	20	T111D756M015AS	10.0	6	0261	0481	0701	0921	T213D756M015_S
20 VOLT RATING AT 85° C – 13 VOLT RATING AT 125° C										
0.34	A	10,20	T111A344_020AS	0.5	3					
0.41	A	10,20	T111A414_020AS	0.5	3					
0.5	A	10,20	T111A504_020AS	0.5	3					
0.6	A	10	T111A604K020AS	0.5	4	0262	0482	0702	0922	T213A604K020_S
0.6	A	20	T111A604M020AS	0.5	4					
0.75	A	10	T111A754K020AS	0.5	4	0263	0483	0703	0923	T213A754K020_S
0.75	A	20	T111A754M020AS	0.5	4	0264	0484	0704	0924	T213A754M020_S
0.9	A	10	T111A904K020AS	0.5	4	0265	0485	0705	0925	T213A904K020_S
0.9	A	20	T111A904M020AS	0.5	4					
1.1	A	10	T111A115K020AS	0.5	4	0266	0486	0706	0926	T213A115K020_S
1.1	A	20	T111A115M020AS	0.5	4	0267	0487	0707	0927	T213A115M020_S

1/ To complete T111 Series Catalog Number, insert Capacitance Tolerance Symbol in the 9th Character, as shown on page 4.
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KEMET SOLID TANTALUM CAPACITORS

UNION CARBIDE

T111 SERIES — NON-POLAR SOLID TANTALUM CAPACITORS

Capacitance µF	Case Size	*Capacitance Tolerance ± %	KEMET T111 SERIES 1/ Kemet Catalog Number	Leakage Current µA 25° Max	Max D.F. % 25° C 120 Hz	CSR91 CAPACITORS PER MIL-C-39003/4B DASH NUMBER REFERENCE - FAILURE RATE (%/1K HRS) M (1.0)	P (0.1)	R (0.01)	S (0.001)	2/ Kemet Catalog Number
20 VOLT RATING AT 85° C – 13 VOLT RATING AT 125° C										
1.9	B	10,20	T111B195__020AS	1.0	4					
2.3	B	10,20	T111B235__020AS	1.0	4					
2.8	B	10,20	T111B285__020AS	1.0	4					
3.4	B	10,20	T111B345__020AS	1.0	6					
4.1	B	10	T111B415K020AS	1.0	6	0268	0488	0708	0928	T213B415K020__S
4.1	B	20	T111B415M020AS	1.0	6					
5.0	B	10	T111B505K020AS	1.0	6	0269	0489	0709	0929	T213B505K020__S
5.0	B	20	T111B505M020AS	1.0	6	0270	0490	0710	0930	T213B505M020__S
6.0	B	10	T111B605K020AS	1.0	6	0271	0491	0711	0931	T213B605K020__S
6.0	B	20	T111B605M020AS	1.0	6					
7.5	B	10	T111B755K020AS	2.0	6	0272	0492	0712	0932	T213B755K020__S
7.5	B	20	T111B755M020AS	2.0	6	0273	0493	0713	0933	T213B755M020__S
11.0	C	10,20	T111C116__020AS	3.0	6					
13.0	C	10	T111C136K020AS	3.0	6	0274	0494	0714	0934	T213C136K020__S
13.0	C	20	T111C136M020AS	3.0	6					
16.0	C	10	T111C166K020AS	3.0	6	0275	0495	0715	0935	T213C166K020__S
16.0	C	20	T111C166M020AS	3.0	6	0276	0496	0716	0936	T213C166M020__S
19.0	C	10	T111C196K020AS	3.0	6	0277	0497	0717	0937	T213C196K020__S
19.0	C	20	T111C196M020AS	3.0	6					
23.0	C	10	T111C236K020AS	6.0	6	0278	0498	0718	0938	T213C236K020__S
23.0	C	20	T111C236M020AS	6.0	6	0279	0499	0719	0939	T213C236M020__S
28.0	D	10	T111D286K020AS	6.0	6	0280	0500	0720	0940	T213D286K020__S
28.0	D	20	T111D286M020AS	6.0	6					
34.0	D	10	T111D346K020AS	6.0	6	0281	0501	0721	0941	T213D346K020__S
34.0	D	20	T111D346M020AS	6.0	6	0282	0502	0722	0942	T213D346M020__S
41.0	D	10	T111D416K020AS	6.0	6	0283	0503	0723	0943	T213D416K020__S
41.0	D	20	T111D416M020AS	6.0	6					
50.0	D	10	T111D506K020AS	10.0	6	0284	0504	0724	0944	T213D506K020__S
50.0	D	20	T111D506M020AS	10.0	6	0285	0505	0725	0945	T213D506M020__S
35 VOLT RATING AT 85° C – 23 VOLT RATING AT 125° C										
0.0023	A	10,20	T111A232__035AS	0.1	3					
0.0028	A	10,20	T111A282__035AS	0.1	3					
0.0034	A	10,20	T111A342__035AS	0.1	3					
0.0041	A	10,20	T111A412__035AS	0.1	3					
0.005	A	10,20	T111A502__035AS	0.1	3					
0.006	A	10,20	T111A602__035AS	0.1	3					
0.0075	A	10,20	T111A752__035AS	0.1	3					
0.009	A	10,20	T111A902__035AS	0.1	3					
0.011	A	10,20	T111A113__035AS	0.1	3					
0.013	A	10,20	T111A133__035AS	0.1	3					
0.016	A	10,20	T111A163__035AS	0.1	3					
0.019	A	10,20	T111A193__035AS	0.1	3					
0.023	A	10,20	T111A233__035AS	0.1	3					
0.028	A	10,20	T111A283__035AS	0.1	3					
0.034	A	10,20	T111A343__035AS	0.1	3					
0.041	A	10,20	T111A413__035AS	0.1	3					
0.05	A	10,20	T111A503__035AS	0.5	3					
0.06	A	10,20	T111A603__035AS	0.5	3					
0.075	A	10,20	T111A753__035AS	0.5	3					
0.09	A	10,20	T111A903__035AS	0.5	3					
0.11	A	10,20	T111A114__035AS	0.5	3					
0.13	A	10,20	T111A134__035AS	0.5	3					
0.16	A	10,20	T111A164__035AS	0.5	3					
0.19	A	10,20	T111A194__035AS	0.5	3					
0.23	A	10,20	T111A234__035AS	0.5	3					
0.28	A	10,20	T111A284__035AS	0.5	3					
0.34	A	10,20	T111A344__035AS	0.5	3					
0.41	A	10,20	T111A414__035AS	0.5	3					
0.5	A	10,20	T111A504__035AS	0.5	3					
0.6	B	10,20	T111B604__035AS	0.5	4					
0.75	B	10,20	T111B754__035AS	0.5	4					
0.9	B	10,20	T111B904__035AS	0.5	4					
1.1	B	10,20	T111B115__035AS	1.0	4					
1.3	B	10,20	T111B135__035AS	1.0	4					
1.6	B	10,20	T111B165__035AS	1.0	4					
1.9	B	10,20	T111B195__035AS	1.0	4					
2.3	B	10,20	T111B235__035AS	1.0	4					
2.8	B	10	T111B285K035AS	1.0	4	0289	0509	0729	0949	T213B285K035__S
2.8	B	20	T111B285M035AS	1.0	4					
3.4	B	10	T111B345K035AS	2.0	4	0290	0510	0730	0950	T213B345K035__S
3.4	B	20	T111B345M035AS	2.0	4	0291	0511	0731	0951	T213B345M035__S

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KEMET

SOLID TANTALUM CAPACITORS

UNION CARBIDE

T111 SERIES — NON-POLAR SOLID TANTALUM CAPACITORS

Capacitance µF	Case Size	*Capacitance Tolerance ± %	KEMET T111 SERIES 1/ Kemet Catalog Number	Leakage Current µA 25° Max	Max D.F. % 25° C 120 Hz	CSR91 CAPACITORS PER MIL-C-39003/4B DASH NUMBER REFERENCE FAILURE RATE (%/1K HRS) M (1.0)	P (0.1)	R (0.01)	S (0.001)	2/ Kemet Catalog Number
35 VOLT RATING AT 85° C – 23 VOLT RATING AT 125° C										
4.1	C	10,20	T111C415__035AS	3.0	4					
5.0	C	10,20	T111C505__035AS	3.0	4					
6.0	C	10,20	T111C605__035AS	3.0	4					
7.5	C	10,20	T111C755__035AS	3.0	4					
9.0	C	10,20	T111C905__035AS	3.0	4					
11.0	C	10	T111C116K035AS	6.0	4	0292	0512	0732	0952	T213C116K035__S
11.0	C	20	T111C116M035AS	6.0	4	0293	0513	0733	0953	T213C116M035__S
13.0	D	10	T111D136K035AS	6.0	4	0294	0514	0734	0954	T213D136K035__S
13.0	D	20	T111D136M035AS	6.0	4					
16.0	D	10	T111D166M035AS	6.0	4	0295	0515	0735	0955	T213D166K035__S
16.0	D	20	T111D166M035AS	6.0	4	0296	0516	0736	0956	T213D166M035__S
19.0	D	10	T111D196K035AS	6.0	4	0297	0517	0737	0957	T213D196K035__S
19.0	D	20	T111D196M035AS	6.0	4					
23.0	D	10	T111D236K035AS	10.0	4	0298	0518	0738	0958	T213D236K035__S
23.0	D	20	T111D236M035AS	10.0	4	0299	0519	0739	0959	T213D236M035__S
50 VOLT RATING AT 85° C – 33 VOLT RATING AT 125° C										
0.0023	A	10	T111A232K050AS	0.1	3	1171	1241	1311	1381	T213A232K050__S
0.0023	A	20	T111A232M050AS	0.1	3	1172	1242	1312	1382	T213A232M050__S
0.0028	A	10	T111A282K050AS	0.1	3	1173	1243	1313	1383	T213A282K050__S
0.0028	A	20	T111A282M050AS	0.1	3					
0.0034	A	10	T111A342K050AS	0.1	3	1174	1244	1314	1384	T213A342K050__S
0.0034	A	20	T111A342M050AS	0.1	3	1175	1245	1315	1385	T213A342M050__S
0.0041	A	10	T111A412K050AS	0.1	3	1176	1246	1316	1386	T213A412K050__S
0.0041	A	20	T111A412M050AS	0.1	3					
0.005	A	10	T111A502K050AS	0.1	3	1177	1247	1317	1387	T213A502K050__S
0.005	A	20	T111A502M050AS	0.1	3	1178	1248	1318	1388	T213A502M050__S
0.006	A	10	T111A602K050AS	0.1	3	1179	1249	1319	1389	T213A602K050__S
0.006	A	20	T111A602M050AS	0.1	3					
0.0075	A	10	T111A752K050AS	0.1	3	1180	1250	1320	1390	T213A752K050__S
0.0075	A	20	T111A752M050AS	0.1	3	1181	1251	1321	1391	T213A752M050__S
0.009	A	10	T111A902K050AS	0.1	3	1182	1252	1322	1392	T213A902K050__S
0.009	A	20	T111A902M050AS	0.1	3					
0.011	A	10	T111A113K050AS	0.1	3	1183	1253	1323	1393	T213A113K050__S
0.011	A	20	T111A113M050AS	0.1	3	1184	1254	1324	1394	T213A113M050__S
0.013	A	10	T111A133K050AS	0.1	3	1185	1255	1325	1395	T213A133K050__S
0.013	A	20	T111A133M050AS	0.1	3					
0.016	A	10	T111A163K050AS	0.1	3	1186	1256	1326	1396	T213A163K050__S
0.016	A	20	T111A163M050AS	0.1	3	1187	1257	1327	1397	T213A163M050__S
0.019	A	10	T111A193K050AS	0.1	3	1188	1258	1328	1398	T213A193K050__S
0.019	A	20	T111A193M050AS	0.1	3					
0.023	A	10	T111A233K050AS	0.1	3	1189	1259	1329	1399	T213A233K050__S
0.023	A	20	T111A233M050AS	0.1	3	1190	1260	1330	1400	T213A233M050__S
0.028	A	10	T111A283K050AS	0.1	3	1191	1261	1331	1401	T213A283K050__S
0.028	A	20	T111A283M050AS	0.1	3					
0.034	A	10	T111A343K050AS	0.1	3	1192	1262	1332	1402	T213A343K050__S
0.034	A	20	T111A343M050AS	0.1	3	1193	1263	1333	1403	T213A343M050__S
0.041	A	10	T111A413K050AS	0.1	3	1194	1264	1334	1404	T213A413K050__S
0.041	A	20	T111A413M050AS	0.1	3					
0.05	A	10	T111A503K050AS	0.5	3	1195	1265	1335	1405	T213A503K050__S
0.05	A	20	T111A503M050AS	0.5	3	1196	1266	1336	1406	T213A503M050__S
0.06	A	10	T111A603K050AS	0.5	3	1197	1267	1337	1407	T213A603K050__S
0.06	A	20	T111A603M050AS	0.5	3					
0.075	A	10	T111A753K050AS	0.5	3	1198	1268	1338	1408	T213A753K050__S
0.075	A	20	T111A753M050AS	0.5	3	1199	1269	1339	1409	T213A753M050__S
0.09	A	10	T111A903K050AS	0.5	3	1200	1270	1340	1410	T213A903K050__S
0.09	A	20	T111A903M050AS	0.5	3					
0.11	A	10	T111A114K050AS	0.5	3	1201	1271	1341	1411	T213A114K050__S
0.11	A	20	T111A114M050AS	0.5	3	1202	1272	1342	1412	T213A114M050__S
0.13	A	10	T111A134K050AS	0.5	3	1203	1273	1343	1413	T213A134K050__S
0.13	A	20	T111A134M050AS	0.5	3					
0.16	A	10	T111A164K050AS	0.5	3	1204	1274	1344	1414	T213A164K050__S
0.16	A	20	T111A164M050AS	0.5	3	1205	1275	1345	1415	T213A164M050__S
0.19	A	10	T111A194K050AS	0.5	3	1206	1276	1346	1416	T213A194K050__S
0.19	A	20	T111A194M050AS	0.5	3					
0.23	A	10	T111A234K050AS	0.5	3	1207	1277	1347	1417	T213A234K050__S
0.23	A	20	T111A234M050AS	0.5	3	1208	1278	1348	1418	T213A234M050__S
0.28	A	10	T111A284K050AS	0.5	3	1209	1279	1349	1419	T213A284K050__S
0.28	A	20	T111A284M050AS	0.5	3					
0.34	A	10	T111A344K050AS	0.5	3	1210	1280	1350	1420	T213A344K050__S
0.34	A	20	T111A344M050AS	0.5	3	1211	1281	1351	1421	T213A344M050__S
0.41	A	10	T111A414K050AS	0.5	3	0300	0520	0740	0960	T213A414K050__S
0.41	A	20	T111A414M050AS	0.5	3					
0.5	A	10	T111A504K050AS	0.5	3	0301	0521	0741	0961	T213A504K050__S
0.5	A	20	T111A504M050AS	0.5	3	0302	0522	0742	0962	T213A504M050__S

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KEMET SOLID TANTALUM CAPACITORS

UNION CARBIDE

T111 SERIES — NON-POLAR SOLID TANTALUM CAPACITORS

Capacitance µF	Case Size	★Capacitance Tolerance ± %	KEMET T111 SERIES 1/ Kemet Catalog Number	Leakage Current µA 25° Max	Max. D F % 25° C 120 Hz	CSR91 CAPACITORS PER MIL-C-39003/4B DASH NUMBER REFERENCE - FAILURE RATE (%/1K HRS) M (1.0)	P (0.1)	R (0.01)	S (0.001)	2/ Kemet Catalog Number
50 VOLT RATING AT 85° C – 33 VOLT RATING AT 125° C										
0.6	B	10	T111B604K050AS	0.5	4	1212	1282	1352	1422	T213B604K050__S
0.6	B	20	T111B604M050AS	0.5	4					
0.75	B	10	T111B754K050AS	0.5	4	2001	2101	2201	2301	T213B754K050__S
0.75	B	20	T111B754M050AS	0.5	4	2002	2102	2202	2302	T213B754M050__S
0.9	B	10	T111B904K050AS	0.5	4	1215	1285	1355	1425	T213B904K050__S
0.9	B	20	T111B904M050AS	0.5	4					
1.1	B	10	T111B115K050AS	1.0	4	1216	1286	1356	1426	T213B115K050__S
1.1	B	20	T111B115M050AS	1.0	4	1217	1287	1357	1427	T213B115M050__S
1.3	B	10	T111B135K050AS	1.0	4	1218	1288	1358	1428	T213B135K050__S
1.3	B	20	T111B135M050AS	1.0	4					
1.6	B	10	T111B165K050AS	2.0	4	1219	1289	1359	1429	T213B165K050__S
1.6	B	20	T111B165M050AS	2.0	4	1220	1290	1360	1430	T213B165M050__S
1.9	B	10	T111B195K050AS	2.0	4	1221	1291	1361	1431	T213B195K050__S
1.9	B	20	T111B195M050AS	2.0	4					
2.3	B	10	T111B235K050AS	3.0	4	1222	1292	1362	1432	T213B235K050__S
2.3	B	20	T111B235M050AS	3.0	4	1223	1293	1363	1433	T213B235M050__S
2.8	C	10	T111C285K050AS	3.0	4	1224	1294	1364	1434	T213C285K050__S
2.8	C	20	T111C285M050AS	3.0	4					
3.4	C	10	T111C345K050AS	3.0	4	1225	1295	1365	1435	T213C345K050__S
3.4	C	20	T111C345M050AS	3.0	4	1226	1296	1366	1436	T213C345M050__S
4.1	C	10	T111C415K050AS	3.0	4	1227	1297	1367	1437	T213C415K050__S
4.1	C	20	T111C415M050AS	3.0	4					
5.0	C	10	T111C505K050AS	3.0	4	1228	1298	1368	1438	T213C505K050__S
5.0	C	20	T111C505M050AS	3.0	4	1229	1299	1369	1439	T213C505M050__S
6.0	C	10	T111C605K050AS	3.0	4	0303	0523	0743	0963	T213C605K050__S
6.0	C	20	T111C605M050AS	3.0	4					
7.5	C	10	T111C755K050AS	6.0	4	0304	0524	0744	0964	T213C755K050__S
7.5	C	20	T111C755M050AS	6.0	4	0305	0525	0745	0965	T213C755M050__S
9.0	C	10	T111C905K050AS	6.0	4	0306	0526	0746	0966	T213C905K050__S
9.0	C	20	T111C905M050AS	6.0	4					
11.0	D	10	T111D116K050AS	6.0	4	0307	0527	0747	0967	T213D116K050__S
11.0	D	20	T111D116M050AS	6.0	4	0308	0528	0748	0968	T213D116M050__S
60 VOLT RATING AT 85° C – 40 VOLT RATING AT 125° C										
0.0023	A	10,20	T111A232__060AS	0.5	3					
0.0028	A	10,20	T111A282__060AS	0.5	3					
0.0034	A	10,20	T111A342__060AS	0.5	3					
0.0041	A	10,20	T111A412__060AS	0.5	3					
0.005	A	10,20	T111A502__060AS	0.5	3					
0.006	A	10,20	T111A602__060AS	0.5	3					
0.0075	A	10,20	T111A752__060AS	0.5	3					
0.009	A	10,20	T111A902__060AS	0.5	3					
0.011	A	10,20	T111A113__060AS	0.5	3					
0.013	A	10,20	T111A133__060AS	0.5	3					
0.016	A	10,20	T111A163__060AS	0.5	3					
0.019	A	10,20	T111A193__060AS	0.5	3					
0.023	A	10,20	T111A233__060AS	0.5	3					
0.028	A	10,20	T111A283__060AS	0.5	3					
0.034	A	10,20	T111A343__060AS	0.5	3					
0.041	A	10,20	T111A413__060AS	0.5	3					
0.05	A	10,20	T111A503__060AS	0.5	3					
0.06	A	10,20	T111A603__060AS	0.5	3					
0.075	A	10,20	T111A753__060AS	0.5	3					
0.09	A	10,20	T111A903__060AS	0.5	3					
0.11	A	10,20	T111A114__060AS	0.5	3					
0.13	A	10,20	T111A134__060AS	0.5	3					
0.16	A	10,20	T111A164__060AS	0.5	3					
0.19	A	10,20	T111A194__060AS	0.5	3					
0.23	A	10,20	T111A234__060AS	0.5	3					
0.28	A	10,20	T111A284__060AS	0.5	3					
0.34	A	10,20	T111A344__060AS	0.5	3					
0.41	B	10,20	T111B414__060AS	0.5	3					
0.5	B	10,20	T111B504__060AS	0.5	3					
0.6	B	10,20	T111B604__060AS	0.5	4					
0.75	B	10,20	T111B754__060AS	0.5	4					
0.9	B	10,20	T111B904__060AS	0.5	4					
1.1	B	10,20	T111B115__060AS	1.0	4					
1.3	B	10,20	T111B135__060AS	1.0	4					
1.6	B	10,20	T111B165__060AS	2.0	4					
1.9	B	10,20	T111B195__060AS	2.0	4					
2.3	C	10,20	T111C235__060AS	3.0	4					
2.8	C	10,20	T111C285__060AS	3.0	4					
3.4	C	10,20	T111C345__060AS	4.0	4					

1/ To complete T111 Series Catalog Number, insert Capacitance Tolerance Symbol in the 9th Character, as shown on page 4.
2/ To complete T213 Series Catalog Number, insert Failure Rate Symbol in the 13th Character as shown on page 4.
*±5% Capacitance Tolerance Capacitors are also available in T111 Series.

KEMET SOLID TANTALUM CAPACITORS

UNION CARBIDE

T111 SERIES — NON-POLAR SOLID TANTALUM CAPACITORS

Capacitance µF	Case Size	★Capacitance Tolerance ± %	KEMET T111 SERIES 1/ Kemet Catalog Number	Leakage Current µA 25° Max	Max D.F. % 25°C 120 Hz	CSR91 CAPACITORS PER MIL-C-39003/4B DASH NUMBER REFERENCE - FAILURE RATE (%/1K HRS) M (1.0)	P (0.1)	R (0.01)	S (0.001)	2/ Kemet Catalog Number
60 VOLT RATING AT 85° C – 40 VOLT RATING AT 125° C										
4.1	C	10,20	T111C415__060AS	5.0	4					
5.0	C	10,20	T111C505__060AS	6.0	4					
6.0	D	10,20	T111D605__060AS	6.0	4					
7.5	D	10,20	T111D755__060AS	9.0	4					
9.0	D	10,20	T111D905__060AS	10.0	4					
11.0	D	10,20	T111D116__060AS	12.0	4					
75 VOLT RATING AT 85° C – 50 VOLT RATING AT 125° C										
0.0023	A	10,20	T111A232__075AS	0.5	3					
0.0028	A	10,20	T111A282__075AS	0.5	3					
0.0034	A	10,20	T111A342__075AS	0.5	3					
0.0041	A	10,20	T111A412__075AS	0.5	3					
0.005	A	10,20	T111A502__075AS	0.5	3					
0.006	A	10,20	T111A602__075AS	0.5	3					
0.0075	A	10,20	T111A752__075AS	0.5	3					
0.009	A	10,20	T111A902__075AS	0.5	3					
0.011	A	10,20	T111A113__075AS	0.5	3					
0.013	A	10,20	T111A133__075AS	0.5	3					
0.016	A	10,20	T111A163__075AS	0.5	3					
0.019	A	10,20	T111A193__075AS	0.5	3					
0.023	A	10,20	T111A233__075AS	0.5	3					
0.028	A	10,20	T111A283__075AS	0.5	3					
0.034	A	10,20	T111A343__075AS	0.5	3					
0.041	A	10,20	T111A413__075AS	0.5	3					
0.05	A	10,20	T111A503__075AS	0.5	3					
0.06	A	10,20	T111A603__075AS	0.5	3					
0.075	A	10,20	T111A753__075AS	0.5	3					
0.09	A	10,20	T111A903__075AS	0.5	3					
0.11	A	10,20	T111A114__075AS	0.5	3					
0.13	A	10,20	T111A134__075AS	0.5	3					
0.16	A	10,20	T111A164__075AS	0.5	3					
0.19	A	10,20	T111A194__075AS	0.5	3					
0.23	A	10,20	T111A234__075AS	0.5	3					
0.28	A	10,20	T111A284__075AS	0.5	3					
0.34	A	10	T111A344K075AS	0.5	3	0309	0529	0749	0969	T213A344K075__S
0.34	A	20	T111A344M075AS	0.5	3	0310	0530	0750	0970	T213A344M075__S
0.41	B	10	T111B414K075AS	0.5	3	2008	2108	2208	2308	T213B414K075__S
0.41	B	20	T111B414M075AS	0.5	3					
0.5	B	10	T111B504K075AS	0.5	3	2009	2109	2209	2309	T213B504K075__S
0.5	B	20	T111B504M075AS	0.5	3	2010	2110	2210	2310	T213B504M075__S
0.6	B	10	T111B604K075AS	0.5	4	2011	2111	2211	2311	T213B604K075__S
0.6	B	20	T111B604M075AS	0.5	4					
0.75	B	10	T111B754K075AS	1.0	4	2012	2112	2212	2312	T213B754K075__S
0.75	B	20	T111B754M075AS	1.0	4	2013	2113	2213	2313	T213B754M075__S
0.9	B	10	T111B904K075AS	1.0	4	2014	2114	2214	2314	T213B904K075__S
0.9	B	20	T111B904M075AS	1.0	4					
1.1	B	10	T111B115K075AS	1.5	4	2015	2115	2215	2315	T213B115K075__S
1.1	B	20	T111B115M075AS	1.5	4	2016	2116	2216	2316	T213B115M075__S
1.3	B	10	T111B135K075AS	1.5	4	2017	2117	2217	2317	T213B135K075__S
1.3	B	20	T111B135M075AS	1.5	4					
1.6	B	10	T111B165K075AS	2.0	4	0311	0531	0751	0971	T213B165K075__S
1.6	B	20	T111B165M075AS	2.0	4	0312	0532	0752	0972	T213B165M075__S
1.9	B	10	T111B195K075AS	2.0	4	0313	0533	0753	0973	T213B195K075__S
1.9	B	20	T111B195M075AS	2.0	4					
2.3	C	10	T111C235K075AS	6.0	4	2003	2103	2203	2303	T213C235K075__S
2.3	C	20	T111C235M075AS	6.0	4	2004	2104	2204	2304	T213C235M075__S
2.8	C	10	T111C285K075AS	6.0	4	2005	2105	2205	2305	T213C285K075__S
2.8	C	20	T111C285M075AS	6.0	4					
3.4	C	10	T111C345K075AS	10.0	4	2006	2106	2206	2306	T213C345K075__S
3.4	C	20	T111C345M075AS	10.0	4	2007	2107	2207	2307	T213C345M075__S
4.1	C	10	T111C415K075AS	10.0	4	0314	0534	0754	0974	T213C415K075__S
4.1	C	20	T111C415M075AS	10.0	4					
5.0	C	10	T111C505K075AS	10.0	4	0315	0535	0755	0975	T213C505K075__S
5.0	C	20	T111C505M075AS	10.0	4	0316	0536	0756	0976	T213C505M075__S
6.0	D	10	T111D605K075AS	10.0	4	0317	0537	0757	0977	T213C605K075__S
6.0	D	20	T111D605M075AS	10.0	4					
7.5	D	10	T111D755K075AS	14.0	4	0318	0538	0758	0978	T213D755K075__S
7.5	D	20	T111D755M075AS	14.0	4	0319	0539	0759	0979	T213D755M075__S

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KEMET

SOLID TANTALUM CAPACITORS

UNION CARBIDE

T111 SERIES — NON-POLAR SOLID TANTALUM CAPACITORS

Capacitance µF	Case Size	*Capacitance Tolerance ± %	KEMET T111 SERIES 1/ Kemet Catalog Number	Leakage Current µA 25° Max	Max D.F. % 25° C 120 Hz	CSR91 CAPACITORS PER MIL-C-39003/4B DASH NUMBER REFERENCE FAILURE RATE (%/1K HRS) M (1.0)	P (0.1)	R (0.01)	S (0.001)	2/ Kemet Catalog Number
100 VOLT RATING AT 85° C — 67 VOLT RATING AT 125° C										
0.0023	A	10	T111A232K100AS	0.5	3	0320	0540	0760	0980	T213A232K100_S
0.0023	A	20	T111A232M100AS	0.5	3	0321	0541	0761	0981	T213A232M100_S
0.0028	A	10	T111A282K100AS	0.5	3	0322	0542	0762	0982	T213A282K100_S
0.0028	A	20	T111A282M100AS	0.5	3					
0.0034	A	10	T111A342K100AS	0.5	3	0323	0543	0763	0983	T213A342K100_S
0.0034	A	20	T111A342M100AS	0.5	3	0324	0544	0764	0984	T213A342M100_S
0.0041	A	10	T111A412K100AS	0.5	3	0325	0545	0765	0985	T213A412K100_S
0.0041	A	20	T111A412M100AS	0.5	3					
0.005	A	10	T111A502K100AS	0.5	3	0326	0546	0766	0986	T213A502K100_S
0.005	A	20	T111A502M100AS	0.5	3	0327	0547	0767	0987	T213A502M100_S
0.006	A	10	T111A602K100AS	0.5	3	0328	0548	0768	0988	T213A602K100_S
0.006	A	20	T111A602M100AS	0.5	3					
0.0075	A	10	T111A752K100AS	0.5	3	0329	0549	0769	0989	T213A752K100_S
0.0075	A	20	T111A752M100AS	0.5	3	0330	0550	0770	0990	T213A752M100_S
0.009	A	10	T111A902K100AS	0.5	3	0331	0551	0771	0991	T213A902K100_S
0.009	A	20	T111A902M100AS	0.5	3					
0.011	A	10	T111A113K100AS	0.5	3	0332	0552	0772	0992	T213A113K100_S
0.011	A	20	T111A113M100AS	0.5	3	0333	0553	0773	0993	T213A113M100_S
0.013	A	10	T111A133K100AS	0.5	3	0334	0554	0774	0994	T213A133K100_S
0.013	A	20	T111A133M100AS	0.5	3					
0.016	A	10	T111A163K100AS	0.5	3	0335	0555	0775	0995	T213A163K100_S
0.016	A	20	T111A163M100AS	0.5	3	0336	0556	0776	0996	T213A163M100_S
0.019	A	10	T111A193K100AS	0.5	3	0337	0557	0777	0997	T213A193K100_S
0.019	A	20	T111A193M100AS	0.5	3					
0.023	A	10	T111A233K100AS	0.5	3	0338	0558	0778	0998	T213A233K100_S
0.023	A	20	T111A233M100AS	0.5	3	0339	0559	0779	0999	T213A233M100_S
0.028	A	10	T111A283K100AS	0.5	3	0340	0560	0780	1000	T213A283K100_S
0.028	A	20	T111A283M100AS	0.5	3					
0.034	A	10	T111A343K100AS	0.5	3	0341	0561	0781	1001	T213A343K100_S
0.034	A	20	T111A343M100AS	0.5	3	0342	0562	0782	1002	T213A343M100_S
0.041	A	10	T111A413K100AS	0.5	3	0343	0563	0783	1003	T213A413K100_S
0.041	A	20	T111A413M100AS	0.5	3					
0.05	A	10	T111A503K100AS	0.5	3	0344	0564	0784	1004	T213A503K100_S
0.05	A	20	T111A503M100AS	0.5	3	0345	0565	0785	1005	T213A503M100_S
0.06	A	10	T111A603K100AS	0.5	3	0346	0566	0786	1006	T213A603K100_S
0.06	A	20	T111A603M100AS	0.5	3					
0.075	A	10	T111A753K100AS	0.5	3	0347	0567	0787	1007	T213A753K100_S
0.075	A	20	T111A753M100AS	0.5	3	0348	0568	0788	1008	T213A753M100_S
0.09	A	10	T111A903K100AS	0.5	3	0349	0569	0789	1009	T213A903K100_S
0.09	A	20	T111A903M100AS	0.5	3					
0.11	A	10	T111A114K100AS	0.5	3	0350	0570	0790	1010	T213A114K100_S
0.11	A	20	T111A114M100AS	0.5	3	0351	0571	0791	1011	T213A114M100_S
0.13	A	10	T111A134K100AS	0.5	3	0352	0572	0792	1012	T213A134K100_S
0.13	A	20	T111A134M100AS	0.5	3					
0.16	A	10	T111A164K100AS	0.5	3	0353	0573	0793	1013	T213A164K100_S
0.16	A	20	T111A164M100AS	0.5	3	0354	0574	0794	1014	T213A164M100_S
0.19	A	10	T111A194K100AS	0.5	3	0355	0575	0795	1015	T213A194K100_S
0.19	A	20	T111A194M100AS	0.5	3					
0.23	A	10	T111A234K100AS	0.5	3	0356	0576	0796	1016	T213A234K100_S
0.23	A	20	T111A234M100AS	0.5	3	0357	0577	0797	1017	T213A234M100_S
0.28	A	10	T111A284K100AS	0.5	3	0358	0578	0798	1018	T213A284K100_S
0.28	A	20	T111A284M100AS	0.5	3					
0.34	B	10	T111B344K100AS	0.5	3	0359	0579	0799	1019	T213B344K100_S
0.34	B	20	T111B344M100AS	0.5	3	0360	0580	0800	1020	T213B344M100_S
0.41	B	10	T111B414K100AS	0.5	3	0361	0581	0801	1021	T213B414K100_S
0.41	B	20	T111B414M100AS	0.5	3					
0.5	B	10	T111B504K100AS	0.5	3	0362	0582	0802	1022	T213B504K100_S
0.5	B	20	T111B504M100AS	0.5	3	0363	0583	0803	1023	T213B504M100_S
0.6	B	10	T111B604K100AS	0.5	3	0364	0584	0804	1024	T213B604K100_S
0.6	B	20	T111B604M100AS	0.5	3					
0.75	B	10	T111B754K100AS	1.0	3	0365	0585	0805	1025	T213B754K100_S
0.75	B	20	T111B754M100AS	1.0	3	0366	0586	0806	1026	T213B754M100_S
0.9	B	10	T111B904K100AS	1.0	3	0367	0587	0807	1027	T213B904K100_S
0.9	B	20	T111B904M100AS	1.0	3					
1.1	B	10	T111B115K100AS	1.5	3	0368	0588	0808	1028	T213B115K100_S
1.1	B	20	T111B115M100AS	1.5	3	0369	0589	0809	1029	T213B115M100_S
1.3	B	10	T111B135K100AS	1.5	3	0370	0590	0810	1030	T213B135K100_S
1.3	B	20	T111B135M100AS	1.5	3					
1.6	C	10,20	T111C165_100AS	6.0	3					
1.9	C	10,20	T111C195_100AS	6.0	3					
2.3	C	10,20	T111C235_100AS	6.0	3					
2.8	C	10,20	T111C285_100AS	6.0	3					
3.4	C	10,20	T111C345_100AS	6.0	3					
4.1	D	10,20	T111D415_100AS	6.0	3					
5.0	D	10,20	T111D505_100AS	6.0	3					

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KEMET

SOLID TANTALUM CAPACITORS

UNION CARBIDE

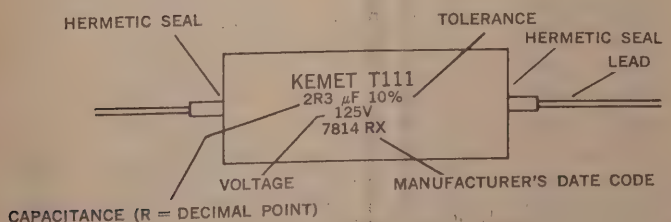
T111 SERIES — NON-POLAR SOLID TANTALUM CAPACITORS

Capacitance µF	Case Size	*Capacitance Tolerance ± %	KEMET T111 SERIES 1/ Kemet Catalog Number	Leakage Current µA 25° Max	Max D.F. % 25° C 120 Hz	CSR91 CAPACITORS PER MIL-C-39003/4B DASH NUMBER REFERENCE - FAILURE RATE (%/1K HRS) M (1.0)	P (0.1)	R (0.01)	S (0.001)	2/ Kemet Catalog Number
125 VOLT RATING AT 85° C – 82 VOLT RATING AT 125° C										
0.0023	A	10,20	T111A232_125AS	1.0	3					
0.0028	A	10,20	T111A282_125AS	1.0	3					
0.0034	A	10,20	T111A342_125AS	1.0	3					
0.0041	A	10,20	T111A412_125AS	1.0	3					
0.005	A	10,20	T111A502_125AS	1.0	3					
0.006	A	10,20	T111A602_125AS	1.0	3					
0.0075	A	10,20	T111A752_125AS	1.0	3					
0.009	A	10,20	T111A902_125AS	1.0	3					
0.011	A	10,20	T111A113_125AS	1.0	3					
0.013	A	10,20	T111A133_125AS	1.0	3					
0.016	A	10,20	T111A163_125AS	1.0	3					
0.019	A	10,20	T111A193_125AS	2.0	3					
0.023	A	10,20	T111A233_125AS	2.0	3					
0.028	A	10,20	T111A283_125AS	2.0	3					
0.034	A	10,20	T111A343_125AS	2.0	3					
0.041	A	10,20	T111A413_125AS	2.0	3					
0.05	A	10,20	T111A503_125AS	2.0	3					
0.06	A	10,20	T111A603_125AS	2.0	3					
0.075	A	10,20	T111A753_125AS	2.0	3					
0.09	A	10,20	T111A903_125AS	2.0	3					
0.11	A	10,20	T111A114_125AS	2.0	3					
0.13	A	10,20	T111A134_125AS	2.0	3					
0.16	B	10,20	T111B164_125AS	2.0	3					
0.19	B	10,20	T111B194_125AS	2.0	3					
0.23	B	10,20	T111B234_125AS	2.0	3					
0.28	B	10,20	T111B284_125AS	2.0	3					
0.34	B	10,20	T111B344_125AS	2.0	3					
0.41	B	10,20	T111B414_125AS	2.0	3					
0.5	B	10,20	T111B504_125AS	2.0	3					
0.6	B	10,20	T111B604_125AS	2.0	3					
0.75	B	10,20	T111B754_125AS	2.0	3					
0.9	B	10,20	T111B904_125AS	2.0	3					
1.1	B	10,20	T111B115_125AS	2.0	3					
1.3	C	10,20	T111C135_125AS	6.0	3					
1.6	C	10,20	T111C165_125AS	6.0	3					
1.9	C	10,20	T111C195_125AS	6.0	3					
2.3	C	10,20	T111C235_125AS	6.0	3					
2.8	C	10,20	T111C285_125AS	6.0	3					
3.4	C	10,20	T111C345_125AS	6.0	3					
4.1	D	10,20	T111D415_125AS	6.0	3					
5.0	D	10,20	T111D505_125AS	6.0	3					

1/ To complete T111 Series Catalog Number, insert Capacitance Tolerance Symbol in the 9th Character, as shown on page 4.
2/ To complete T213 Series Catalog Number, insert Failure Rate Symbol in the 13th Character as shown on page 4.
*±5% Capacitance Tolerance Capacitors are also available in T111 Series.

CAPACITOR MARKING

Unless otherwise specified by special order, standard marking of T111 Series capacitors is shown in Figure 3.



Standard Marking for Non-Polar Solid Tantalum Capacitors

KEMET SOLID TANTALUM CAPACITORS

UNION CARBIDE

T120 & T222 (CSR09) POLAR MINIATURE TANTALUMS

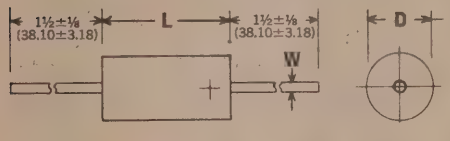
KEMET ultra-miniature T120 Series solid tantalum capacitors are designed especially for cordwood construction modules. They offer circuit designers the highest density solid tantalum capacitors on the market. For example, the A case is two-thirds the size of the standard A case in T110 Series capacitors.

The T120 Series capacitors employ a unique glass-to-metal compression end seal which has no protruding eyelet. This flush end seal construction makes T120 Series capacitors ideally suited for all cordwood circuits, point-to-point wiring and other high density packaging applications. The capacitors consist of a dry porous tantalum pellet hermetically sealed in a solder coated metal case with solder coated alloy 52 and solder coated nickel leads.

The T120 Series capacitors provide highly reliable performance. They meet the environmental characteristics of the established reliability specification MIL-C-39003 as well as the less demanding requirements of MIL-C-26655B.

T120 Series capacitors are available in capacitance values ranging from .0047 to 22 microfarads in ±20, ±10, and ±5% tolerances; and in DC working voltage from 6 to 125. They are constructed for continuous duty at nameplate voltage over a temperature range from −55°C to +85°C. Operation at +125°C is equally as reliable when nameplate voltage is derated one-third.

CAPACITOR OUTLINE DRAWING



DIMENSIONS—INCHES & (MILLIMETERS)

Case Size	Uninsulated D ±0.005 (±.13)	Uninsulated L	Insulated D	Insulated L	Wire Diameter
A	.085 (2.16)	.245+.015 −.010 (6.22+.38 −.25)	.090±.009 (2.29±.23)	.250+.031 −.015 (6.35+.79 −.38)	.016+.005 −.001 (.41+.13 −.03)
B	.127 (3.23)	.375±.015 (9.53±.38)	.138±.010 (3.51±.25)	.390±.015 (9.91±.38)	.016+.005 −.001 (.41+.13 −.03)

KEMET T120 SERIES — POLAR SOLID TANTALUM CAPACITORS

Capacitance µF	Case Size	Capacitance Tolerance ± %	KEMET T120 SERIES 1/ Kemet Catalog Number	Leakage Current µA 25° Max.	Max D.F. % 25° C 120 Hz	CSR09 CAPACITORS PER MIL-C-39003/2B DASH NUMBER REFERENCE - FAILURE RATE (%/1K HRS) M (1.0)	P (0.1)	R (0.01)	S (0.001)	2/ Kemet Catalog Number
6 VOLT RATING AT 85° C — 4 VOLT RATING AT 125° C										
1.2	A	10,20	T120A125__006AS	0.6	6					
1.5	A	10,20	T120A155__006AS	0.6	6					
1.8	A	10,20	T120A185__006AS	0.6	6					
2.2	A	10,20	T120A225__006AS	0.6	6					
2.7	A	10	T120A275K006AS	0.6	6	0001	0061	0121	0181	T222A275K006__S
2.7	A	20	T120A275M006AS	0.6	6					
3.3	A	10,20	T120A335__006AS	0.6	6					
8.2	B	10,20	T120B825__006AS	2.0	6					
10.0	B	10,20	T120B106__006AS	2.0	6					
12.0	B	10,20	T120B126__006AS	2.0	6					
15.0	B	10,20	T120B156__006AS	2.0	6					
18.0	B	10	T120B186K006AS	2.0	6	0002	0062	0122	0182	T222B186K006__S
18.0	B	20	T120B186M006AS	2.0	6					
22.0	B	10,20	T120B226__006AS	3.0	6					
10 VOLT RATING AT 85° C — 7 VOLT RATING AT 125° C										
0.22	A	10,20	T120A224__010AS	1.0	6					
0.27	A	10,20	T120A274__010AS	1.0	6					
0.33	A	10,20	T120A334__010AS	1.0	6					
0.39	A	10,20	T120A394__010AS	1.0	6					
0.47	A	10,20	T120A474__010AS	1.0	6					
0.56	A	10,20	T120A564__010AS	1.0	6					
0.68	A	10,20	T120A684__010AS	1.0	6					
0.82	A	10,20	T120A824__010AS	1.0	6					
1.0	A	10,20	T120A105__010AS	1.0	6					
1.2	A	10,20	T120A125__010AS	1.0	6					
1.5	A	10,20	T120A155__010AS	1.0	6					
1.8	A	10	T120A185K010AS	1.0	6	0007	0067	0127	0187	T222A185K010__S
1.8	A	20	T120A185M010AS	1.0	6					
2.2	A	10	T120A225K010AS	1.0	6	0008	0068	0128	0188	T222A225K010__S
2.2	A	20	T120A225M010AS	1.0	6					
3.3	B	10,20	T120B335__010AS	2.0	6					
3.9	B	10,20	T120B395__010AS	2.0	6					
4.7	B	10,20	T120B475__010AS	2.0	6					
5.6	B	10,20	T120B565__010AS	2.0	6					
6.8	B	10,20	T120B685__010AS	2.0	6					
8.2	B	10,20	T120B825__010AS	2.0	6					
10.0	B	10	T120B106K010AS	2.0	6	0009	0069	0129	0189	T222B106K010__S

1/ To complete Catalog Number, insert Capacitance Tolerance Symbol in 9th Character. M = ±20%, K = ±10%, J = ±5%.
2/ To complete Catalog Number, insert Failure Rate Symbol in the 13th Character as shown on page 4.

KEMET SOLID TANTALUM CAPACITORS

UNION CARBIDE

KEMET T120 SERIES — POLAR SOLID TANTALUM CAPACITORS

Capacitance µF	Case Size	Capacitance Tolerance ± %	KEMET T120 SERIES 1/ Kemet Catalog Number	Leakage Current µA 25° Max.	Max D.F. % 25° C 120 Hz	CSR09 CAPACITORS PER MIL-C-39003/2B DASH NUMBER REFERENCE - FAILURE RATE (%/1K HRS) M (1.0)	P (0.1)	R (0.01)	S (0.001)	2/ Kemet Catalog Number
10 VOLT RATING AT 85° C – 7 VOLT RATING AT 125° C										
10.0	B	20	T120B106M010AS	2.0	6					
12.0	B	10	T120B126K010AS	2.0	6	0010	0070	0130	0190	T222B126K010_S
12.0	B	20	T120B126M010AS	2.0	6					
15.0	B	10	T120B156K010AS	2.0	6	0011	0071	0131	0191	T222B156K010_S
15.0	B	20	T120B156M010AS	2.0	6					
18.0	B	10,20	T120B186_010AS	3.0	6					
15 VOLT RATING AT 85° C – 10 VOLT RATING AT 125° C										
0.33	A	10,20	T120A334_015AS	1.0	6					
0.39	A	10,20	T120A394_015AS	1.0	6					
0.47	A	10,20	T120A474_015AS	1.0	6					
0.56	A	10,20	T120A564_015AS	1.0	6					
0.68	A	10,20	T120A684_015AS	1.0	6					
0.82	A	10,20	T120A824_015AS	1.0	6					
1.0	A	10	T120A105K015AS	1.0	6	0012	0072	0132	0192	T222A105K015_S
1.0	A	20	T120A105M015AS	1.0	6					
1.2	A	10	T120A125K015AS	1.0	6	0013	0073	0133	0193	T222A125M015_S
1.2	A	20	T120A125M015AS	1.0	6					
1.5	A	10	T120A155K015AS	1.0	6	0014	0074	0134	0194	T222A155K015_S
1.5	A	20	T120A155M015AS	1.0	6					
1.8	B	10,20	T120B185_015AS	2.0	6					
2.2	B	10,20	T120B225_015AS	2.0	6					
2.7	B	10,20	T120B275_015AS	2.0	6					
3.3	B	10,20	T120B335_015AS	2.0	6					
3.9	B	10,20	T120B395_015AS	2.0	6					
4.7	B	10,20	T120B475_015AS	2.0	6					
5.6	B	10,20	T120B565_015AS	2.0	6					
6.8	B	10,20	T120B685_015AS	3.0	6					
8.2	B	10	T120B825K015AS	3.0	6	0015	0075	0135	0195	T222B825K015_S
8.2	B	20	T120B825M015AS	3.0	6					
20 VOLT RATING AT 85° C – 13 VOLT RATING AT 125° C										
0.10	A	10,20	T120A104_020AS	0.6	4					
0.12	A	10,20	T120A124_020AS	0.6	4					
0.15	A	10,20	T120A154_020AS	0.6	4					
0.18	A	10,20	T120A184_020AS	0.6	4					
0.22	A	10,20	T120A224_020AS	0.6	4					
0.27	A	10,20	T120A274_020AS	0.6	4					
0.33	A	10,20	T120A334_020AS	0.6	4					
0.39	A	10,20	T120A394_020AS	0.6	4					
0.47	A	10,20	T120A474_020AS	0.6	4					
0.56	A	10	T120A564K020AS	1.0	4	0016	0076	0136	0196	T222A564K020_S
0.56	A	20	T120A564M020AS	1.0	4					
0.68	A	10	T120A684K020AS	1.0	4	0017	0077	0137	0197	T222A684K020_S
0.68	A	20	T120A684M020AS	1.0	4					
0.82	A	10	T120A824K020AS	1.0	4	0018	0078	0138	0198	T222A824K020_S
0.82	A	20	T120A824M020AS	1.0	4					
1.0	A	10	T120A105K020AS	1.0	4	0019	0079	0139	0199	T222A105K020_S
1.0	A	20	T120A105M020AS	1.0	4					
1.2	B	10,20	T120B125_020AS	2.0	4					
1.5	B	10,20	T120B155_020AS	2.0	4					
1.8	B	10,20	T120B185_020AS	2.0	4					
2.2	B	10,20	T120B225_020AS	2.0	4					
2.7	B	10,20	T120B275_020AS	2.0	4					
3.3	B	10	T120B335K020AS	2.0	4	0020	0080	0140	0200	T222B335K020_S
3.3	B	20	T120B335M020AS	2.0	4					
3.9	B	10	T120B395K020AS	2.0	4	0021	0081	0141	0201	T222B395K020_S
3.9	B	20	T120B395M020AS	2.0	4					
4.7	B	10	T120B475K020AS	2.0	4	0022	0082	0142	0202	T222B475K020_S
4.7	B	20	T120B475M020AS	2.0	4					
5.6	B	10	T120B565K020AS	3.0	4	0023	0083	0143	0203	T222B565K020_S
5.6	B	20	T120B565M020AS	3.0	4					
6.8	B	10	T120B685K020AS	3.0	4	0024	0084	0144	0204	T222B685K020_S
6.8	B	20	T120B685M020AS	3.0	4					
35 VOLT RATING AT 85° C – 23 VOLT RATING AT 125°										
0.0047	A	10,20	T120A472_035AS	0.6	4					
0.0056	A	10,20	T120A562_035AS	0.6	4					
0.0068	A	10,20	T120A682_035AS	0.6	4					
0.0082	A	10,20	T120A822_035AS	0.6	4					
0.010	A	10,20	T120A103_035AS	0.6	4					
0.012	A	10,20	T120A123_035AS	0.6	4					

1/ To complete Catalog Number, insert Capacitance Tolerance Symbol in 9th Character. M = ±20%, K = ±10%, J = ±5%.
2/ To complete Catalog Number, insert Failure Rate Symbol in the 13th Character as shown on page 4.

KEMET

SOLID TANTALUM CAPACITORS

UNION CARBIDE

KEMET T120 SERIES — POLAR SOLID TANTALUM CAPACITORS

Capacitance µF	Case Size	Capacitance Tolerance ± %	KEMET T120 SERIES 1/ Kemet Catalog Number	Leakage Current µA 25° C Max	Max D.F. % 25° C 120 Hz	CSR09 CAPACITORS PER MIL-C-39003/2B DASH NUMBER REFERENCE - FAILURE RATE (%/1K HRS) M (1.0)	P (0.1)	R (0.01)	S (0.001)	2/ Kemet Catalog Number
35 VOLT RATING AT 85° C — 23 VOLT RATING AT 125° C										
0.015	A	10,20	T120A153__035AS	0.6	4					
0.018	A	10,20	T120A183__035AS	0.6	4					
0.022	A	10,20	T120A223__035AS	0.6	4					
0.027	A	10,20	T120A273__035AS	0.6	4					
0.033	A	10,20	T120A333__035AS	0.6	4					
0.039	A	10,20	T120A393__035AS	0.6	4					
0.047	A	10,20	T120A473__035AS	0.6	4					
0.056	A	10,20	T120A563__035AS	0.6	4					
0.068	A	10,20	T120A683__035AS	0.6	4					
0.082	A	10,20	T120A823__035AS	0.6	4					
0.10	A	10,20	T120A104__035AS	0.6	4					
0.12	A	10,20	T120A124__035AS	0.6	4					
0.15	A	10,20	T120A154__035AS	0.6	4					
0.18	A	10,20	T120A184__035AS	0.6	4					
0.22	A	10,20	T120A224__035AS	0.6	4					
0.27	A	10,20	T120A274__035AS	0.6	4					
0.33	A	10	T120A334K035AS	1.0	4	0025	0085	0145	0205	T222A334K035__S
0.33	A	20	T120A334M035AS	1.0	4					
0.39	A	10	T120A394K035AS	1.0	4	0026	0086	0146	0206	T222A394K035__S
0.39	A	20	T120A394M035AS	1.0	4					
0.47	A	10	T120A474K035AS	1.0	4	0027	0087	0147	0207	T222A474K035__S
0.47	A	20	T120A474M035AS	1.0	4					
0.56	B	10,20	T120B564__035AS	1.0	4					
0.68	B	10,20	T120B684__035AS	1.0	4					
0.82	B	10,20	T120B824__035AS	1.0	4					
1.0	B	10,20	T120B105__035AS	1.0	4					
1.2	B	10,20	T120B125__035AS	1.0	4					
1.5	B	10,20	T120B155__035AS	1.0	4					
1.8	B	10,20	T120B185__035AS	1.0	4					
2.2	B	10	T120B225K035AS	3.0	4	0028	0088	0148	0208	T222B225K035__S
2.2	B	20	T120B225M035AS	3.0	4					
2.7	B	10	T120B275K035AS	3.0	4	0029	0089	0149	0209	T222B275K035__S
2.7	B	20	T120B275M035AS	3.0	4					
50 VOLT RATING AT 85° C — 33 VOLT RATING AT 125° C										
0.0047	A	10,20	T120A472__050AS	0.6	4					
0.0056	A	10,20	T120A562__050AS	0.6	4					
0.0068	A	10,20	T120A682__050AS	0.6	4					
0.0082	A	10,20	T120A822__050AS	0.6	4					
0.010	A	10,20	T120A103__050AS	0.6	4					
0.012	A	10,20	T120A123__050AS	0.6	4					
0.015	A	10,20	T120A153__050AS	0.6	4					
0.018	A	10,20	T120A183__050AS	0.6	4					
0.022	A	10,20	T120A223__050AS	0.6	4					
0.027	A	10,20	T120A273__050AS	0.6	4					
0.033	A	10,20	T120A333__050AS	0.6	4					
0.039	A	10,20	T120A393__050AS	0.6	4					
0.047	A	10,20	T120A473__050AS	0.6	4					
0.056	A	10,20	T120A563__050AS	0.6	4					
0.068	A	10,20	T120A683__050AS	0.6	4					
0.082	A	10,20	T120A823__050AS	0.6	4					
0.10	A	10,20	T120A104__050AS	0.6	4					
0.12	A	10,20	T120A124__050AS	0.6	4					
0.15	A	10,20	T120A154__050AS	0.6	4					
0.18	A	10,20	T120A184__050AS	0.6	4					
0.22	A	10	T120A224K050AS	1.0	4	0030	0090	0150	0210	T222A224K050__S
0.22	A	20	T120A224M050AS	1.0	4					
0.27	A	10	T120A274K050AS	1.0	4	0031	0091	0151	0211	T222A274K050__S
0.27	A	20	T120A274M050AS	1.0	4					
0.33	B	10,20	T120B334__050AS	2.0	4					
0.39	B	10,20	T120B394__050AS	2.0	4					
0.47	B	10,20	T120B474__050AS	2.0	4					
0.56	B	10,20	T120B564__050AS	2.0	4					
0.68	B	10,20	T120B684__050AS	2.0	4					
0.82	B	10,20	T120B824__050AS	2.0	4					
1.0	B	10,20	T120B105__050AS	2.0	4					
1.2	B	10,20	T120B125__050AS	2.0	4					
1.5	B	10	T120B155K050AS	3.0	4	0032	0092	0152	0212	T222B155K050__S
1.5	B	20	T120B155M050AS	3.0	4					
1.8	B	10	T120B185K050AS	3.0	4	0033	0093	0153	0213	T222B185K050__S
1.8	B	20	T120B185M050AS	3.0	4					

1/ To complete Catalog Number, insert Capacitance Tolerance Symbol in 9th Character. M = ±20%, K = ±10%, J = ±5%.
2/ To complete Catalog Number, insert Failure Rate Symbol in the 13th Character as shown on page 4.

KEMET

SOLID TANTALUM CAPACITORS

UNION CARBIDE

KEMET T120 SERIES — POLAR SOLID TANTALUM CAPACITORS

Capacitance µF	Case Size	Capacitance Tolerance ± %	KEMET T120 SERIES 1/ Kemet Catalog Number	Leakage Current µA 25° Max.	Max D.F. % 25° C 120 Hz	CSR09 CAPACITORS PER MIL-C-39003/2B DASH NUMBER REFERENCE - FAILURE RATE (%/1K HRS) M (1.0)	P (0.1)	R (0.01)	S (0.001)	2/ Kemet Catalog Number
75 VOLT RATING AT 85° C – 50 VOLT RATING AT 125° C										
0.0047	A	10,20	T120A472__075AS	0.6	4					
0.0056	A	10,20	T120A562__075AS	0.6	4					
0.0068	A	10,20	T120A682__075AS	0.6	4					
0.0082	A	10,20	T120A822__075AS	0.6	4					
0.010	A	10,20	T120A103__075AS	0.6	4					
0.012	A	10,20	T120A123__075AS	0.6	4					
0.015	A	10,20	T120A153__075AS	0.6	4					
0.018	A	10,20	T120A183__075AS	0.6	4					
0.022	A	10,20	T120A223__075AS	0.6	4					
0.027	A	10,20	T120A273__075AS	0.6	4					
0.033	A	10,20	T120A333__075AS	0.6	4					
0.039	A	10,20	T120A393__075AS	0.6	4					
0.047	A	10	T120A473K075AS	1.0	4	0034	0094	0154	0214	T222A473K075__S
0.047	A	20	T120A473M075AS	1.0	4					
0.056	A	10	T120A563K075AS	1.0	4	0035	0095	0155	0215	T222A563K075__S
0.056	A	20	T120A563M075AS	1.0	4					
0.068	A	10	T120A683K075AS	1.0	4	0036	0096	0156	0216	T222A683K075__S
0.068	A	20	T120A683M075AS	1.0	4					
0.082	A	10	T120A823K075AS	1.0	4	0037	0097	0157	0217	T222A823K075__S
0.082	A	20	T120A823M075AS	1.0	4					
0.10	A	10	T120A104K075AS	1.0	4	0038	0098	0158	0218	T222A104K075__S
0.10	A	20	T120A104M075AS	1.0	4					
0.12	A	10	T120A124K075AS	1.0	4	0039	0099	0159	0219	T222A124K075__S
0.12	A	20	T120A124M075AS	1.0	4					
0.15	A	10	T120A154K075AS	1.0	4	0040	0100	0160	0220	T222A154K075__S
0.15	A	20	T120A154M075AS	1.0	4					
0.18	A	10	T120A184K075AS	2.0	4	0041	0101	0161	0221	T222A184K075__S
0.18	A	20	T120A184M075AS	2.0	4					
0.22	B	10	T120B224K075AS	2.0	4	0042	0102	0162	0222	T222B224K075__S
0.22	B	20	T120B224M075AS	2.0	4					
0.27	B	10	T120B274K075AS	2.0	4	0043	0103	0163	0223	T222B274K075__S
0.27	B	20	T120B274M075AS	2.0	4					
0.33	B	10	T120B334K075AS	2.0	4	0044	0104	0164	0224	T222B334K075__S
0.33	B	20	T120B334M075AS	2.0	4					
0.39	B	10	T120B394K075AS	2.0	4	0045	0105	0165	0225	T222B394K075__S
0.39	B	20	T120B394M075AS	2.0	4					
0.47	B	10	T120B474K075AS	2.0	4	0046	0106	0166	0226	T222B474K075__S
0.47	B	20	T120B474M075AS	2.0	4					
0.56	B	10	T120B564K075AS	2.0	4	0047	0107	0167	0227	T222B564K075__S
0.56	B	20	T120B564M075AS	2.0	4					
0.68	B	10	T120B684K075AS	2.0	4	0048	0108	0168	0228	T222B684K075__S
0.68	B	20	T120B684M075AS	2.0	4					
0.82	B	10	T120B824K075AS	2.0	4	0049	0109	0169	0229	T222B824K075__S
0.82	B	20	T120B824M075AS	2.0	4					
1.0	B	10	T120B105K075AS	3.0	4	0050	0110	0170	0230	T222B105K075__S
1.0	B	20	T120B105M075AS	3.0	4					
1.2	B	10	T120B125K075AS	3.0	4	0051	0111	0171	0231	T222B125K075__S
1.2	B	20	T120B125M075AS	3.0	4					
100 VOLT RATING AT 85° C – 67 VOLT RATING AT 125° C										
0.0047	A	10,20	T120A472__100AS	1.0	4					
0.0056	A	10,20	T120A562__100AS	1.0	4					
0.0068	A	10,20	T120A682__100AS	1.0	4					
0.0082	A	10,20	T120A822__100AS	1.0	4					
0.010	A	10,20	T120A103__100AS	1.0	4					
0.012	A	10,20	T120A123__100AS	1.0	4					
0.015	A	10,20	T120A153__100AS	1.0	4					
0.018	A	10,20	T120A183__100AS	1.0	4					
0.022	A	10,20	T120A223__100AS	1.0	4					
0.027	A	10,20	T120A273__100AS	1.0	4					
0.033	A	10,20	T120A333__100AS	1.0	4					
0.039	A	10,20	T120A393__100AS	1.0	4					
0.047	A	10,20	T120A473__100AS	1.0	4					
0.056	A	10,20	T120A563__100AS	1.0	4					
0.068	A	10,20	T120A683__100AS	1.0	4					
0.082	A	10,20	T120A823__100AS	1.0	4					
0.10	A	10,20	T120A104__100AS	1.0	4					
0.12	A	10,20	T120A124__100AS	1.0	4					
0.15	B	10,20	T120B154__100AS	2.5	4					
0.18	B	10,20	T120B184__100AS	2.5	4					
0.22	B	10,20	T120B224__100AS	2.5	4					
0.27	B	10,20	T120B274__100AS	2.5	4					
0.33	B	10,20	T120B334__100AS	2.5	4					

1/ To complete Catalog Number, insert Capacitance Tolerance Symbol in 9th Character. M = ±20%, K = ±10%, J = ±5%.
2/ To complete Catalog Number, insert Failure Rate Symbol in the 13th Character as shown on page 4.

KEMET

SOLID TANTALUM CAPACITORS

UNION CARBIDE

KEMET T120 SERIES — POLAR SOLID TANTALUM CAPACITORS

Capacitance µF	Case Size	Capacitance Tolerance ± %	KEMET T120 SERIES 1/ Kemet Catalog Number	Leakage Current µA 25° Max.	Max D.F. % 25° C 120 Hz	CSR09 CAPACITORS PER MIL-C-39003/2B DASH NUMBER REFERENCE - FAILURE RATE (%/1K HRS) M (1.0)	P (0.1)	R (0.01)	S (0.001)	2/ Kemet Catalog Number
100 VOLT RATING AT 85° C — 67 VOLT RATING AT 125° C										
0.39	B	10,20	T120B394__100AS	2.5	4					
0.47	B	10,20	T120B474__100AS	2.5	4					
0.56	B	10,20	T120B564__100AS	2.5	4					
0.68	B	10,20	T120B684__100AS	2.5	4					
0.82	B	10,20	T120B824__100AS	2.5	4					
125 VOLT RATING AT 85° C — 82 VOLT RATING AT 125° C										
0.0047	A	10,20	T120A472__125AS	1.0	3					
0.0056	A	10,20	T120A562__125AS	1.0	3					
0.0068	A	10,20	T120A682__125AS	1.0	3					
0.0082	A	10,20	T120A822__125AS	1.0	3					
0.010	A	10,20	T120A103__125AS	1.0	3					
0.012	A	10,20	T120A123__125AS	1.0	3					
0.015	A	10,20	T120A153__125AS	1.0	3					
0.018	A	10,20	T120A183__125AS	1.0	3					
0.022	A	10,20	T120A223__125AS	1.0	3					
0.027	A	10,20	T120A273__125AS	1.0	3					
0.033	A	10,20	T120A333__125AS	1.0	3					
0.039	A	10,20	T120A393__125AS	1.0	3					
0.047	A	10,20	T120A473__125AS	1.0	3					
0.056	A	10,20	T120A563__125AS	1.0	3					
0.068	A	10,20	T120A683__125AS	1.0	3					
0.082	A	10,20	T120A823__125AS	1.0	3					
0.10	A	10,20	T120A104__125AS	1.0	3					
0.12	B	10,20	T120B124__125AS	2.5	3					
0.15	B	10,20	T120B154__125AS	2.5	3					
0.18	B	10,20	T120B184__125AS	2.5	3					
0.22	B	10,20	T120B224__125AS	2.5	3					
0.27	B	10,20	T120B274__125AS	2.5	3					
0.33	B	10,20	T120B334__125AS	2.5	3					
0.39	B	10,20	T120B394__125AS	2.5	3					
0.47	B	10,20	T120B474__125AS	2.5	3					
0.56	B	10,20	T120B564__125AS	2.5	3					
0.68	B	10,20	T120B684__125AS	2.5	3					

1/ To complete Catalog Number, insert Capacitance Tolerance Symbol in 9th Character. M = ±20%, K = ±10%, J = ±5%.
2/ To complete Catalog Number, insert Failure Rate Symbol in the 13th Character as shown on page 4.

KEMET

SOLID TANTALUM CAPACITORS

UNION CARBIDE

T140 SERIES — SUPER CAPACITANCE & T242 (CSR23), T252 (CSR33) CAPACITORS

Available to 1000 μF 6 VDC, 560 μF 10 VDC, 330 μF 15 VDC, these high capacitance to volume ratio, hermetically sealed solid tantalum capacitors are offered in standard MIL style A, B, C, and D cases. Available in a wide range of capacitances and working voltages, they effectively extend the CV range of the popular KEMET military type T110 Series. They meet or exceed the environmental and mechanical requirements of MIL-C-39003. Designed to operate from −55°C to +125°C, they exhibit exceptionally low DC leakage, dissipation factor and impedance characteristics. They are ideal for coupling, by-pass, filtering and timing circuits, and are excellent substitutes for wet tantalums in low voltage applications. They are also available in styles CSR23 (T242 Series) and CSR33 (T252 Series) per MIL-C-39003, and in a high reliability version per specification GR500/A (T240 Series).

CAPACITOR MARKINGS

MARKING: Unless otherwise specified by special order, standard marking of T140 Series capacitors consists of the following:

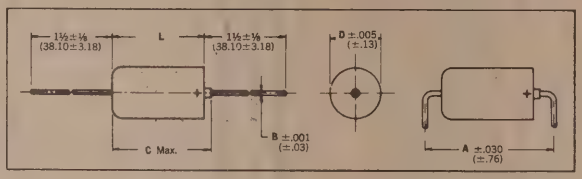
A CASE

Line 1. Polarity & Series +T140
Line 2. Manufacturer's Identification & Capacitance Tolerance ..... K 10%
Line 3. Nominal Capacitance — (μF) R denotes decimal point ..... R82 μF
Line 4. Voltage 60V
Line 5. Date Code (e.g.: 7012R, R7012, 012RX or RX012) 012RX

B, C, & D CASE

Line 1. Polarity & Series +T140
Line 2. Manufacturer's Identification .... KEMET
Line 3. Nominal Capacitance — (μF) R denotes decimal point ..... R82 μF
Line 4. Voltage & Capacitance Tolerance.. 35V 10%
Line 5. Date Code (e.g.: 7012R, R7012, 7012RX or RX7012) 7812RX

CAPACITOR OUTLINE DRAWINGS



DIMENSIONS — INCHES & (MILLIMETERS)

Case Size	Uninsulated D ±0.005 (±.13)	Uninsulated L ±0.031 (±.79)	Insulated D ±0.010 (±.25)	Insulated L ±0.031 (±.79)	A ±0.03 (±.76)	B ±0.001 (±.03)	C Max.
A	0.125 (3.18)	0.250 (6.35)	0.135 (3.43)	0.286 (7.26)	0.5 (12.70)	0.020 (.51)	0.422 (10.72)
B	0.175 (4.45)	0.438 (11.13)	0.185 (4.70)	0.474 (12.04)	0.7 (17.78)	0.020 (.51)	0.610 (15.49)
C	0.279 (7.09)	0.650 (16.51)	0.289 (7.34)	0.686 (17.42)	1.0 (25.40)	0.025 (.64)	0.822 (20.88)
D	0.341 (8.66)	0.750 (19.05)	0.351 (8.92)	0.786 (19.96)	1.1 (27.94)	0.025 (.64)	0.922 (23.42)

T140 SERIES — POLAR SOLID TANTALUM CAPACITORS

Cap μF	Case Size	Cap Tol ±%	KEMET T140 SERIES 1/ Kemet Catalog Number	Leakage Current μA 25° C Rated Voltage	Max D.F. %, 25° C 120 Hz	CSR23 CAPACITORS MIL-C-39003/3B M39003/03— Dash Number Reference M (1.0%)	P (0.1%)	R (0.01%)	S (0.001%)	CSR33 CAPACITORS MIL-C-39003/6 MIL—C—39003/06— Dash Number Reference M (1.0%)	P (0.1%)	R (0.01%)	S (0.001%)	2/Kemet Equivalent Catalog Number To CSR23 & CSR33 Capacitors
6 VOLT RATING AT 85° C														
8.2	A	10,20	T140A825__006AS	1.5	6									
10.0	A	10	T140A106K006AS	1.5	6	0101	0201	0301	0401	0001	0101	0201	0301	T2__2A106K006__S
10.0	A	20	T140A106M006AS	1.5	6	0102	0202	0302	0402	0002	0102	0202	0302	T2__2A106M006__S
12.0	A	10	T140A126K006AS	1.5	6	0103	0203	0303	0403	0003	0103	0203	0303	T2__2A126K006__S
12.0	A	20	T140A126M006AS	1.5	6									
68.0	B	10,20	T140B686__006AS	3.0	6									
82.0	B	10,20	T140B826__006AS	5.0	6									
100.0	B	10	T140B107K006AS	8.0	8	0104	0204	0304	0404	0004	0104	0204	0304	T2__2B107K006__S
100.0	B	20	T140B107M006AS	8.0	8	0105	0205	0305	0405	0005	0105	0205	0305	T2__2B107M006__S
220.0	C	10,20	T140C227__006AS	10.0	8									
270.0	C	10,20	T140C277__006AS	10.0	8									
330.0	C	10	T140C337K006AS	15.0	8	0106	0206	0306	0406	0006	0106	0206	0306	T2__2C337K006__S
330.0	C	20	T140C337M006AS	15.0	8	0107	0207	0307	0407	0007	0107	0207	0307	T2__2C337M006__S
390.0	C	10	T140C397K006AS	15.0	10	0108	0208	0308	0408	0008	0108	0208	0308	T2__2C397K006__S
390.0	C	20	T140C397M006AS	15.0	10									
470.0	C	10	T140C477K006AS	15.0	10	0109	0209	0309	0409	0009	0109	0209	0309	T2__2C477K006__S
470.0	C	20	T140C477M006AS	15.0	10	0110	0210	0310	0410	0010	0110	0210	0310	T2__2C477M006__S
560.0	D	10,20	T140D567__006AS	20.0	10									
680.0	D	10	T140D687K006AS	20.0	10	0111	0211	0311	0411	0011	0111	0211	0311	T2__2D687K006__S
680.0	D	20	T140D687M006AS	20.0	10	0112	0212	0312	0412	0012	0112	0212	0312	T2__2D687M006__S
820.0	D	10	T140D827K006AS	20.0	10	0113	0213	0313	0413	0013	0113	0213	0313	T2__2D827K006__S
820.0	D	20	T140D827M006AS	20.0	10									
1000.0	D	10	T140D108K006AS	30.0	10	0114	0214	0314	0414	0014	0114	0214	0314	T2__2D108K006__S
1000.0	D	20	T140D108M006AS	30.0	10	0115	0215	0315	0415	0015	0115	0215	0315	T2__2D108M006__S

1/ To complete Catalog Number, insert Capacitance Tolerance Symbol in the 9th Character as shown on page 4.
2/ To complete Catalog Number, insert Series Designator (4 = CSR23, 5 = CSR33) in the 2nd character, and Failure Rate Symbol in the 13th Character as shown on page 4.

KEMET SOLID TANTALUM CAPACITORS

UNION CARBIDE

T140 SERIES — POLAR SOLID TANTALUM CAPACITORS

Cap µF	Case Size	Cap Tol ±%	KEMET T140 SERIES 1/ Kemet Catalog Number	Leakage Current µA 25°C Rated Voltage	Max D.F. % 25°C 120 Hz	CSR23 CAPACITORS MIL-C-39003/3B M39003/03– Dash Number Reference M (1.0%)	P (0.1%)	R (0.01%)	S (0.001%)	CSR33 CAPACITORS MIL-C-39003/6 MIL–C–39003/06– Dash Number Reference M (1.0%)	P (0.1%)	R (0.01%)	S (0.001%)	2/Kemet Equivalent Catalog Number To CSR23 & CSR33 Capacitors
10 VOLT RATING AT 85° C														
5.6	A	10,20	T140A565__010AS	1.5	4									
6.8	A	10	T140A685K010AS	1.5	6	0116	0216	0316	0416	0016	0116	0216	0316	T2__2A685K010__S
6.8	A	20	T140A685M010AS	1.5	6	0117	0217	0317	0417	0017	0117	0217	0317	T2__2A685M010__S
8.2	A	10	T140A825K010AS	1.5	6	0118	0218	0318	0418	0018	0118	0218	0318	T2__2A825K010__S
8.2	A	20	T140A825M010AS	1.5	6									
47.0	B	10	T140B476K010AS	6.0	6	0119	0219	0319	0419	0019	0119	0219	0319	T2__2B476K010__S
47.0	B	20	T140B476M010AS	6.0	6	0120	0220	0320	0420	0020	0120	0220	0320	T2__2B476M010__S
56.0	B	10	T140B566K010AS	6.0	6	0121	0221	0321	0421	0021	0121	0221	0321	T2__2B566K010__S
56.0	B	20	T140B566M010AS	6.0	6									
68.0	B	10	T140B686K010AS	8.0	6	0122	0222	0322	0422	0022	0122	0222	0322	T2__2B686K010__S
68.0	B	20	T140B686M010AS	8.0	6	0123	0223	0323	0423	0023	0123	0223	0323	T2__2B686M010__S
82.0	B	10	T140B826K010AS	8.0	6	0124	0224	0324	0424	0024	0124	0224	0324	T2__2B826K010__S
82.0	B	20	T140B826M010AS	8.0	6									
150.0	C	10,20	T140C157__010AS	8.0	8									
180.0	C	10,20	T140C187__010AS	8.0	8									
220.0	C	10	T140C227K010AS	15.0	8	0125	0225	0325	0425	0025	0125	0225	0325	T2__2C227K010__S
220.0	C	20	T140C227M010AS	15.0	8	0126	0226	0326	0426	0026	0126	0226	0326	T2__2C227M010__S
270.0	C	10	T140C277K010AS	15.0	8	0127	0227	0327	0427	0027	0127	0227	0327	T2__2C277K010__S
270.0	C	20	T140C277M010AS	15.0	8									
330.0	D	10,20	T140D337__010AS	20.0	8									
390.0	D	10	T140D397K010AS	20.0	8	0128	0228	0328	0428	0028	0128	0228	0328	T2__2D397K010__S
390.0	D	20	T140D397M010AS	20.0	10									
470.0	D	10	T140D477K010AS	20.0	10	0129	0229	0329	0429	0029	0129	0229	0329	T2__2D477K010__S
470.0	D	20	T140D477M010AS	20.0	10	0130	0230	0330	0430	0030	0130	0230	0330	T2__2D477M010__S
560.0	D	10	T140D567K010AS	30.0	10	0131	0231	0331	0431	0031	0131	0231	0331	T2__2D567K010__S
560.0	D	20	T140D567M010AS	30.0	10									
15 VOLT RATING AT 85° C														
3.9	A	10,20	T140A395__015AS	1.5	4									
4.7	A	10	T140A475K015AS	1.5	4	0132	0232	0332	0432	0032	0132	0232	0332	T2__2A475K015__S
4.7	A	20	T140A475M015AS	1.5	4	0133	0233	0333	0433	0033	0133	0233	0333	T2__2A475M015__S
5.6	A	10	T140A565K015AS	1.5	4	0134	0234	0334	0434	0034	0134	0234	0334	T2__2A565K015__S
5.6	A	20	T140A565M015AS	1.5	4									
27.0	B	10,20	T140B276__015AS	6.0	6									
33.0	B	10	T140B336K015AS	6.0	6	0135	0235	0335	0435	0035	0135	0235	0335	T2__2B336K015__S
33.0	B	20	T140B336M015AS	6.0	6	0136	0236	0336	0436	0036	0136	0236	0336	T2__2B336M015__S
39.0	B	10	T140B396K015AS	6.0	6	0137	0237	0337	0437	0037	0137	0237	0337	T2__2B396K015__S
39.0	B	20	T140B396M015AS	6.0	6									
82.0	C	10,20	T140C826__015AS	8.0	6									
100.0	C	10,20	T140C107__015AS	10.0	8									
120.0	C	10,20	T140C127__015AS	10.0	8									
150.0	C	10	T140C157K015AS	15.0	8	0138	0238	0338	0438	0038	0138	0238	0338	T2__2C157K015__S
150.0	C	20	T140C157M015AS	15.0	8	0139	0239	0339	0439	0039	0139	0239	0339	T2__2C157M015__S
180.0	C	10	T140C187K015AS	15.0	8	0140	0240	0340	0440	0040	0140	0240	0340	T2__2C187K015__S
180.0	C	20	T140C187M015AS	15.0	8									
220.0	D	10	T140D227K015AS	20.0	8	0141	0241	0341	0441	0041	0141	0241	0341	T2__2D227K015__S
220.0	D	20	T140D227M015AS	20.0	8	0142	0242	0342	0442	0042	0142	0242	0342	T2__2D227M015__S
270.0	D	10	T140D277K015AS	20.0	8	0143	0243	0343	0443	0043	0143	0243	0343	T2__2D277K015__S
270.0	D	20	T140D277M015AS	20.0	8									
330.0	D	10	T140D337M015AS	20.0	8	0144	0244	0344	0444	0044	0144	0244	0344	T2__2D337K015__S
330.0	D	20	T140D337M015AS	20.0	8	0145	0245	0345	0445	0045	0145	0245	0345	T2__2D337M015__S
20 VOLT RATING AT 85° C														
2.7	A	10	T140A275K020AS	1.5	4	0146	0246	0346	0446	0046	0146	0246	0346	T2__2A275K020__S
2.7	A	20	T140A275M020AS	1.5	4									
3.3	A	10	T140A335K020AS	1.5	4	0147	0247	0347	0447	0047	0147	0247	0347	T2__2A335K020__S
3.3	A	20	T140A335M020AS	1.5	4	0148	0248	0348	0448	0048	0148	0248	0348	T2__2A335M020__S
3.9	A	10	T140A395K020AS	1.5	4	0149	0249	0349	0449	0049	0149	0249	0349	T2__2A395K020__S
3.9	A	20	T140A395M020AS	1.5	4									
18.0	B	10	T140B186K020AS	6.0	6	0150	0250	0350	0450	0050	0150	0250	0350	T2__2B186K020__S
18.0	B	20	T140B186M020AS	6.0	6									
22.0	B	10	T140B226K020AS	6.0	6	0151	0251	0351	0451	0051	0151	0251	0351	T2__2B226K020__S
22.0	B	20	T140B226M020AS	6.0	6	0152	0252	0352	0452	0052	0152	0252	0352	T2__2B226M020__S
27.0	B	10	T140B276K020AS	6.0	6	0153	0253	0353	0453	0053	0153	0253	0353	T2__2B276K020__S
27.0	B	20	T140B276M020AS	6.0	6									
56.0	C	10	T140C566K020AS	9.0	6	0154	0254	0354	0454	0054	0154	0254	0354	T2__2C566K020__S
56.0	C	20	T140C566M020AS	9.0	6									
68.0	C	10	T140C686K020AS	10.0	6	0155	0255	0355	0455	0055	0155	0255	0355	T2__2C686K020__S
68.0	C	20	T140C686M020AS	10.0	6	0156	0256	0356	0456	0056	0156	0256	0356	T2__2C686M020__S
82.0	C	10	T140C826K020AS	10.0	6	0157	0257	0357	0457	0057	0157	0257	0357	T2__2C826K020__S
82.0	C	20	T140C826M020AS	10.0	6									
100.0	C	10	T140C107K020AS	15.0	8	0158	0258	0358	0458	0058	0158	0258	0358	T2__2C107K020__S
100.0	C	20	T140C107M020AS	15.0	8	0159	0259	0359	0459	0059	0159	0259	0359	T2__2C107M020__S
120.0	C	10	T140C127K020AS	15.0	8	0160	0260	0360	0460	0060	0160	0260	0360	T2__2C127K020__S
120.0	C	20	T140C127M020AS	15.0	8									

1/ To complete Catalog Number, insert Capacitance Tolerance Symbol in the 9th Character as shown on page 4.

2/ To complete Catalog Number, insert Series Designator (4 = CSR23, 5 = CSR33) in the 2nd character, and Failure Rate Symbol in the 13th Character as shown on page 4.

KEMET SOLID TANTALUM CAPACITORS

UNION CARBIDE

T140 SERIES — POLAR SOLID TANTALUM CAPACITORS

Cap uF	Case Size	Cap Tol ±%	KEMET T140 SERIES 1/ Kemet Catalog Number	Leakage Current μA @ 25° C Rated Voltage	Max D.F. % 25° C 120 Hz	CSR23 CAPACITORS MIL-C-39003/3B M39003/03— Dash Number Reference M (1.0%)	P (0.1%)	R (0.01%)	S (0.001%)	CSR33 CAPACITORS MIL-C-39003/6 MIL—C—39003/06— Dash Number Reference M (1.0%)	P (0.1%)	R (0.01%)	S (0.001%)	2/Kemet Equivalent Catalog Number To CSR23 & CSR33 Capacitors
20 VOLT RATING AT 85° C														
150.0	D	10	T140D157K020AS	20.0	8	0161	0261	0361	0461	0061	0161	0261	0361	T2__2D157K020__S
150.0	D	20	T140D157M020AS	20.0	8	0162	0262	0362	0462	0062	0162	0262	0362	T2__2D157M020__S
180.0	D	10	T140D187K020AS	20.0	8	0163	0263	0363	0463	0063	0163	0263	0363	T2__2D187K020__S
180.0	D	20	T140D187M020AS	20.0	8									
30 VOLT RATING AT 85° C														
1.2	A	10,20	T140A125__030AS	1.5	4									
1.5	A	10,20	T140A155__030AS	1.5	4									
1.8	A	10,20	T140A185__030AS	1.5	4									
2.2	A	10,20	T140A225__030AS	1.5	4									
2.7	A	10,20	T140A275__030AS	1.5	4									
12.0	B	10,20	T140B126__030AS	6.0	6									
15.0	B	10,20	T140B156__030AS	6.0	6									
18.0	B	10,20	T140B186__030AS	6.0	6									
33.0	C	10,20	T140C336__030AS	8.0	6									
39.0	C	10,20	T140C396__030AS	8.0	6									
47.0	C	10,20	T140C476__030AS	10.0	6									
56.0	C	10,20	T140C566__030AS	10.0	6									
68.0	C	10,20	T140C686__030AS	10.0	6									
82.0	D	10,20	T140D826__030AS	15.0	6									
100.0	D	10,20	T140D107__030AS	20.0	8									
35 VOLT RATING AT 85° C														
1.2	A	10,20	T140A125__035AS	1.5	4									
1.5	A	10,20	T140A155__035AS	2.0	4									
1.8	A	10	T140A185K035AS	2.0	4	0164	0264	0364	0464	0064	0164	0264	0364	T2__2A185K035__S
1.8	A	20	T140A185M035AS	2.0	4									
8.2	B	10	T140B825K035AS	4.0	6	0165	0265	0365	0465	0065	0165	0265	0365	T2__2B825K035__S
8.2	B	20	T140B825M035AS	4.0	6									
10.0	B	10	T140B106K035AS	4.0	6	0166	0266	0366	0466	0066	0166	0266	0366	T2__2B106K035__S
10.0	B	20	T140B106M035AS	4.0	6	0167	0267	0367	0467	0067	0167	0267	0367	T2__2B106M035__S
27.0	C	10,20	T140C276__035AS	8.0	6									
33.0	C	10	T140C336K035AS	8.0	6	0168	0268	0368	0468	0068	0168	0268	0368	T2__2C336K035__S
33.0	C	20	T140C336M035AS	8.0	6	0169	0269	0369	0469	0069	0169	0269	0369	T2__2C336M035__S
39.0	C	10	T140C396K035AS	10.0	6	0170	0270	0370	0470	0070	0170	0270	0370	T2__2C396K035__S
39.0	C	20	T140C396M035AS	10.0	6									
47.0	C	10	T140C476K035AS	10.0	6	0171	0271	0371	0471	0071	0171	0271	0371	T2__2C476K035__S
47.0	C	20	T140C476M035AS	10.0	6	0172	0272	0372	0472	0072	0172	0272	0372	T2__2C476M035__S
56.0	D	10	T140D566K035AS	15.0	6	0173	0273	0373	0473	0073	0173	0273	0373	T2__2D566K035__S
56.0	D	20	T140D566M035AS	15.0	6									
68.0	D	10	T140D686K035AS	15.0	6	0174	0274	0374	0474	0074	0174	0274	0374	T2__2D686K035__S
68.0	D	20	T140D686M035AS	15.0	6	0175	0275	0375	0475	0075	0175	0275	0375	T2__2D686M035__S
50 VOLT RATING AT 85° C														
1.2	A	10	T140A125K050AS	1.5	4	0176	0276	0376	0476	0076	0176	0276	0376	T2__2A125K050__S
1.2	A	20	T140A125M050AS	1.5	4									
1.5	A	10	T140A155K050AS	1.5	4	0177	0277	0377	0477	0077	0177	0277	0377	T2__2A155K050__S
1.5	A	20	T140A155M050AS	1.5	4	0178	0278	0378	0478	0078	0178	0278	0378	T2__2A155M050__S
5.6	B	10	T140B565K050AS	4.5	4	0179	0279	0379	0479	0079	0179	0279	0379	T2__2B565K050__S
5.6	B	20	T140B565M050AS	4.5	4									
6.8	B	10	T140B685K050AS	6.0	6	0180	0280	0380	0480	0080	0180	0280	0380	T2__2B685K050__S
6.8	B	20	T140B685M050AS	6.0	6	0181	0281	0381	0481	0081	0181	0281	0381	T2__2B685M050__S
22.0	C	10	T140C226K050AS	10.0	6	0182	0282	0382	0482	0082	0182	0282	0382	T2__2C226K050__S
22.0	C	20	T140C226M050AS	10.0	6	0183	0283	0383	0483	0083	0183	0283	0383	T2__2C226M050__S
27.0	C	10	T140C276K050AS	10.0	6	0184	0284	0384	0484	0084	0184	0284	0384	T2__2C276K050__S
27.0	C	20	T140C276M050AS	10.0	6									
33.0	D	10	T140D336K050AS	10.0	6	0185	0285	0385	0485	0085	0185	0285	0385	T2__2D336K050__S
33.0	D	20	T140D336M050AS	10.0	6	0186	0286	0386	0486	0086	0186	0286	0386	T2__2D336M050__S
39.0	D	10	T140D396K050AS	10.0	6	0187	0287	0387	0487	0087	0187	0287	0387	T2__2D396K050__S
39.0	D	20	T140D396M050AS	10.0	6									
60 VOLT RATING AT 85° C														
0.82	A	10,20	T140A824__060AS	1.5	4									
1.0	A	10,20	T140A105__060AS	1.5	4									
4.7	B	10,20	T140B475__060AS	5.0	4									
5.6	B	10,20	T140B565__060AS	5.0	4									
12.0	C	10,20	T140C126__060AS	8.0	6									
15.0	C	10,20	T140C156__060AS	8.0	6									
18.0	C	10,20	T140C186__060AS	10.0	6									
22.0	C	10,20	T140C226__060AS	10.0	6									
27.0	D	10,20	T140D276__060AS	15.0	6									
33.0	D	10,20	T140D336__060AS	15.0	6									

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KEMET

SOLID TANTALUM CAPACITORS

UNION CARBIDE

KEMET T210, T211, T220, T240 GR500 GRADED RELIABILITY SOLID TANTALUM CAPACITORS

For the ultimate in high reliability design in KEMET's GR500 Capacitors with failure rates as low as .001% per 1,000 hours. These Capacitors are manufactured to KEMET's Specification GR500 and meet or exceed all requirements of MIL-C-39003.

GR500 Capacitors offer a demonstrated failure rate calculated from the most sophisticated and accurate reliability measurement method in the capacitor industry. Each production lot of these capacitors is subjected to accelerated life testing on a 100% basis under low impedance circuit conditions. The subsequent accumulated data is applied to Weibull Analysis (demonstrated below) for establishing the exact failure rate. These test results including the Weibull plot, and a summary of failure rate calculations are supplied with each shipment of capacitors.

In addition, all KEMET GR500 Capacitors are temperature cycled 5 times at −65°C to +125°C and receive seal test, leakage current, capacitance, dissipation factor, X-Ray, visual, and mechanical inspection on a 100% basis.

For a copy of Graded Reliability Specification GR500 and additional information on these capacitors, contact your KEMET Sales Representative.

T 210 A 125 K 020 M S

TANTALUM

***SERIES**
Solid electrolyte, graded high reliability, hermetically sealed.

CASE SIZE
A / B / C / D

CAPACITANCE PICOFARAD CODE
First two digits represent significant figures.
Third digit specifies number of zeros to follow.

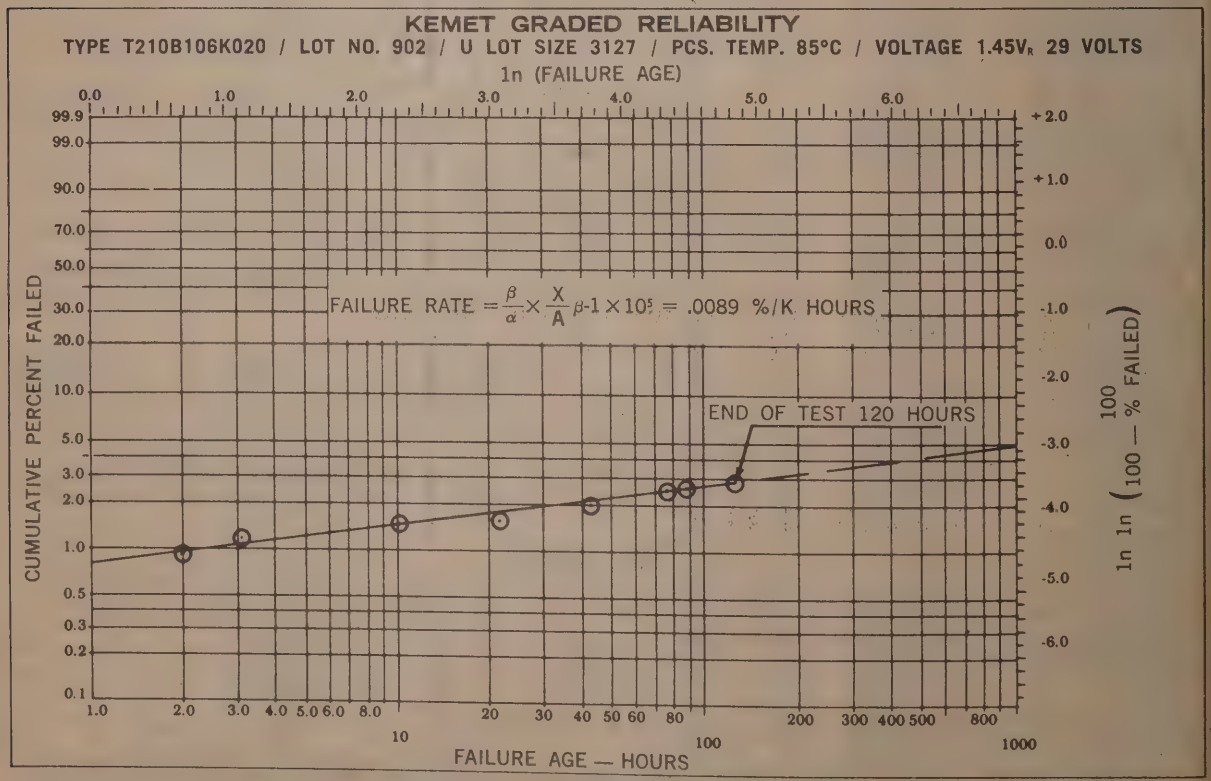
CAP TOLERANCE
M — 20% / K — 10% / J — 5%

GRADED FAILURE RATE
% Per 1000 Hrs.
L — 2 P — .1
M — 1 R — .01
S — .001

VOLTAGE
At 85°C

LEAD MATERIAL
S — Standard other lead materials are available on special order. Refer to page 4.

***SERIES**
210 — GR500/J — Axial lead, polar
211 — GR500/N — Axial lead, non-polar
220 — GR500/Z — Axial lead, subminiature, polar
240 — GR500/A — Axial lead, super capacitance, polar



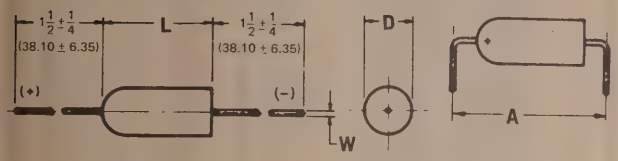
KEMET SOLID TANTALUM CAPACITORS

UNION CARBIDE

T310 POLAR MOLDED TANTALUM

Plastic molded, self insulating, using the same State-of-the-Art process techniques employed in the production of KEMET popular T110 capacitors. Designed for lead wire pre-forming and use in automatic insertion equipment. Exhibit low leakage current, good capacitance stability and low dissipation factor characteristics. C.V. range .10 to 330 μF, 6 to 50 VDC. Will operate continuously from −55°C to +85°C. Solderable and weldable, high purity solder coated lead wires. Ideal for application in commercial and industrial electronic equipment. For additional information refer to KEMET T310 Series Product Catalog.

CAPACITOR OUTLINE DRAWINGS



DIMENSIONS—INCHES & (MILLIMETERS)

Case Size	D ±.010 (±.25)	L ±.010 (±.25)	Lead Wire Diameter W ±.001 (±.03)	For PC Board Layout A
A	.138 (3.51)	.390 (9.91)	.025 (.64)	.6 (15.24)
B	.190 (4.83)	.562 (14.27)	.025 (.64)	.8 (20.32)
C	.300 (7.62)	.710 (18.03)	.025 (.64)	1.0 (25.40)
D	.365 (9.27)	.875 (22.23)	.025 (.64)	1.1 (27.94)

T310 SERIES — POLAR SOLID TANTALUM CAPACITORS

*Catalog Number	Capacitance μF 25° 120 Hz	Case Size	Max. Wt. Gram	Maximum Leakage Current μA, 25°C Rated Voltage	Maximum Dissipation Factor, % 25°C, 120 Hz
50 VOLT RATING AT 85°C					
T310A104 – 050AS	0.10	A	1.0	1.0	4
T310A124 – 050AS	0.12	A	1.0	1.0	4
T310A154 – 050AS	0.15	A	1.0	1.0	4
T310A184 – 050AS	0.18	A	1.0	1.0	4
T310A224 – 050AS	0.22	A	1.0	1.0	4
T310A274 – 050AS	0.27	A	1.0	1.0	4
T310A334 – 050AS	0.33	A	1.0	1.0	4
T310A394 – 050AS	0.39	A	1.0	1.0	4
T310A474 – 050AS	0.47	A	1.0	1.0	4
T310A564 – 050AS	0.56	A	1.0	1.0	4
T310A684 – 050AS	0.68	A	1.0	1.0	4
T310A824 – 050AS	0.82	A	1.0	1.0	4
T310A105 – 050AS	* 1.0	A	1.0	1.0	4
T310B125 – 050AS	1.2	B	2.0	1.0	6
T310B155 – 050AS	1.5	B	2.0	1.0	6
T310B185 – 050AS	1.8	B	2.0	1.0	6
T310B225 – 050AS	2.2	B	2.0	1.0	6
T310B275 – 050AS	2.7	B	2.0	1.0	6
T310B335 – 050AS	3.3	B	2.0	2.0	6
T310B395 – 050AS	3.9	B	4.0	5.0	6
T310B475 – 050AS	* 4.7	B	4.0	5.0	6
T310C565 – 050AS	5.6	C	4.0	5.0	6
T310C685 – 050AS	6.8	C	4.0	5.0	6
T310C825 – 050AS	8.2	C	4.0	5.0	6
T310C106 – 050AS	10.0	C	4.0	5.0	6
T310C126 – 050AS	12.0	C	4.0	5.0	6
T310C156 – 050AS	15.0	C	8.0	10.0	6
T310C186 – 050AS	*18.0	C	8.0	10.0	6
T310D226 – 050AS	*22.0	D	8.0	10.0	6
35 VOLT RATING AT 85°C					
T310A104 – 035AS	0.10	A	1.0	1.0	4
T310A124 – 035AS	0.12	A	1.0	1.0	4
T310A154 – 035AS	0.15	A	1.0	1.0	4
T310A184 – 035AS	0.18	A	1.0	1.0	4
T310A224 – 035AS	0.22	A	1.0	1.0	4
T310A274 – 035AS	0.27	A	1.0	1.0	4
T310A334 – 035AS	0.33	A	1.0	1.0	4
T310A394 – 035AS	0.39	A	1.0	1.0	4
T310A474 – 035AS	0.47	A	1.0	1.0	4
T310A564 – 035AS	0.56	A	1.0	1.0	4
T310A684 – 035AS	0.68	A	1.0	1.0	4
T310A824 – 035AS	0.82	A	1.0	1.0	4
T310A105 – 035AS	* 1.0	A	1.0	1.0	4
T310B125 – 035AS	1.2	B	2.0	1.0	6
T310B155 – 035AS	1.5	B	2.0	1.0	6
T310B185 – 035AS	1.8	B	2.0	1.0	6
T310B225 – 035AS	2.2	B	2.0	1.0	6
T310B275 – 035AS	2.7	B	2.0	1.0	6
T310B335 – 035AS	3.3	B	2.0	1.0	6
T310B395 – 035AS	3.9	B	2.0	1.0	6
T310B475 – 035AS	* 4.7	B	2.0	1.0	6
T310B565 – 035AS	5.6	B	2.0	1.0	6
T310B685 – 035AS	* 6.8	B	2.0	2.0	6
T310C825 – 035AS	8.2	C	4.0	5.0	6
T310C106 – 035AS	10.0	C	4.0	5.0	6
T310C126 – 035AS	12.0	C	4.0	5.0	6
T310C156 – 035AS	15.0	C	4.0	5.0	6
T310C186 – 035AS	18.0	C	8.0	10.0	6
T310C226 – 035AS	* 22.0	C	8.0	10.0	6
T310D276 – 035AS	27.0	D	8.0	10.0	6
T310D336 – 035AS	33.0	D	8.0	10.0	6
T310D396 – 035AS	39.0	D	8.0	10.0	6
T310D476 – 035AS	*47.0	D	8.0	10.0	6
20 VOLT RATING AT 85°C					
T310A104 – 020AS	0.10	A	1.0	1.0	4
T310A124 – 020AS	0.12	A	1.0	1.0	4
T310A154 – 020AS	0.15	A	1.0	1.0	4
T310A184 – 020AS	0.18	A	1.0	1.0	4
T310A224 – 020AS	0.22	A	1.0	1.0	4
T310A274 – 020AS	0.27	A	1.0	1.0	4
T310A334 – 020AS	0.33	A	1.0	1.0	4
T310A394 – 020AS	0.39	A	1.0	1.0	4
T310A474 – 020AS	0.47	A	1.0	1.0	4
T310A564 – 020AS	0.56	A	1.0	1.0	4
T310A684 – 020AS	0.68	A	1.0	1.0	4
T310A824 – 020AS	0.82	A	1.0	1.0	4
T310A105 – 020AS	1.0	A	1.0	1.0	4
T310A125 – 020AS	1.2	A	1.0	1.0	6
T310A155 – 020AS	1.5	A	1.0	1.0	6
T310A185 – 020AS	1.8	A	1.0	1.0	6
T310A225 – 020AS	* 2.2	A	1.0	1.0	6
T310B275 – 020AS	2.7	B	2.0	1.0	6
T310B335 – 020AS	3.3	B	2.0	1.0	6
T310B395 – 020AS	3.9	B	2.0	1.0	6
T310B475 – 020AS	4.7	B	2.0	1.0	6
T310B565 – 020AS	5.6	B	2.0	1.0	6
T310B685 – 020AS	6.8	B	2.0	1.0	6
T310B825 – 020AS	8.2	B	2.0	1.0	6
T310B106 – 020AS	10.0	B	2.0	1.0	6
T310B126 – 020AS	12.0	B	2.0	1.0	6
T310B156 – 020AS	*15.0	B	2.0	2.0	6
T310C186 – 020AS	18.0	C	4.0	5.0	6
T310C226 – 020AS	22.0	C	4.0	5.0	6
T310C276 – 020AS	27.0	C	4.0	5.0	6
T310C336 – 020AS	33.0	C	4.0	5.0	6
T310C396 – 020AS	39.0	C	8.0	10.0	6
T310C476 – 020AS	*47.0	C	8.0	10.0	6
T310D566 – 020AS	56.0	D	8.0	10.0	6
T310D686 – 020AS	68.0	D	8.0	10.0	6
T310D826 – 020AS	82.0	D	8.0	10.0	6
T310D107 – 020AS	*100.0	D	8.0	10.0	10
15 VOLT RATING AT 85°C					
T310A334 – 015AS	0.33	A	1.0	1.0	4
T310A394 – 015AS	0.39	A	1.0	1.0	4
T310A474 – 015AS	0.47	A	1.0	1.0	4
T310A564 – 015AS	0.56	A	1.0	1.0	4
T310A684 – 015AS	0.68	A	1.0	1.0	4
T310A824 – 015AS	0.82	A	1.0	1.0	4
T310A105 – 015AS	1.0	A	1.0	1.0	4

*Parent Values

KEMET SOLID TANTALUM CAPACITORS

UNION CARBIDE

T310 SERIES— POLAR SOLID TANTALUM CAPACITORS (CONTINUED)

†Catalog Number	Capacitance µF 25° 120 Hz	Case Size	Max. Wt. Gram	Maximum Leakage Current µA, 25°C Rated Voltage	Maximum Dissipation Factor, % 25°C, 120 Hz
15 VOLT RATING AT 85°C (CONT'D)					
T310A125—015AS	1.2	A	1.0	1.0	6
T310A155—015AS	1.5	A	1.0	1.0	6
T310A185—015AS	1.8	A	1.0	1.0	6
T310A225—015AS	2.2	A	1.0	1.0	6
T310A275—015AS	2.7	A	1.0	1.0	6
T310A335—015AS	* 3.3	A	1.0	1.0	6
T310B395—015AS	3.9	B	2.0	1.0	6
T310B475—015AS	4.7	B	2.0	1.0	6
T310B565—015AS	5.6	B	2.0	1.0	6
T310B685—015AS	6.8	B	2.0	1.0	6
T310B825—010AS	8.2	B	2.0	1.0	6
T310B106—015AS	10.0	B	2.0	1.0	6
T310B126—015AS	12.0	B	2.0	1.0	6
T310B156—015AS	15.0	B	2.0	2.0	6
T310B186—015AS	18.0	B	2.0	2.0	6
T310B226—015AS	* 22.0	B	2.0	3.0	6
T310C276—015AS	27.0	C	4.0	5.0	6
T310C336—015AS	33.0	C	4.0	5.0	6
T310C396—015AS	39.0	C	4.0	5.0	6
T310C476—015AS	47.0	C	4.0	5.0	6
T310C566—015AS	56.0	C	8.0	10.0	6
T310C686—015AS	▪ 68.0	C	8.0	10.0	6
T310D826—015AS	82.0	D	8.0	10.0	6
T310D107—015AS	100.0	D	8.0	10.0	10
T310D127—015AS	120.0	D	8.0	10.0	10
T310D157—015AS	▪150.0	D	8.0	10.0	10
10 VOLT RATING AT 85°C					
T310A105—010AS	1.0	A	1.0	1.0	4
T310A125—010AS	1.2	A	1.0	1.0	6
T310A155—010AS	1.5	A	1.0	1.0	6
T310A185—010AS	1.8	A	1.0	1.0	6
T310A225—010AS	2.2	A	1.0	1.0	6
T310A275—010AS	2.7	A	1.0	1.0	6
T310A335—010AS	3.3	A	1.0	1.0	6
T310A395—010AS	3.9	A	1.0	1.0	6
T310A475—010AS	* 4.7	A	1.0	1.0	6
T310B565—010AS	5.6	B	2.0	1.0	6
T310B685—010AS	6.8	B	2.0	1.0	6
T310B825—010AS	8.2	B	2.0	1.0	6
T310B106—010AS	10.0	B	2.0	1.0	6
T310B126—010AS	12.0	B	2.0	1.0	6
T310B156—010AS	15.0	B	2.0	1.0	6
T310B186—010AS	18.0	B	2.0	1.0	6
T310B226—010AS	22.0	B	2.0	2.0	6
T310B276—010AS	27.0	B	2.0	2.0	6
T310B336—010AS	33.0	B	2.0	2.0	6
T310B396—010AS	* 39.0	B	2.0	5.0	6
T310C476—010AS	47.0	C	4.0	5.0	6
T310C566—010AS	56.0	C	4.0	5.0	6
T310C686—010AS	68.0	C	4.0	5.0	6
T310C826—010AS	82.0	C	4.0	5.0	6
T310C107—010AS	*100.0	C	8.0	10.0	10
T310C127—010AS	120.0	C	8.0	10.0	10
T310D157—010AS	150.0	D	8.0	10.0	10
T310D187—010AS	180.0	D	8.0	10.0	10
T310D227—010AS	*220.0	D	8.0	10.0	10

†Catalog Number	Capacitance µF 25° 120 Hz	Case Size	Max. Wt. Gram	Maximum Leakage Current µA, 25°C Rated Voltage	Maximum Dissipation Factor, % 25°C, 120 Hz
6 VOLT RATING AT 85°C					
T310A225—006AS	2.2	A	1.0	1.0	6
T310A275—006AS	2.7	A	1.0	1.0	6
T310A335—006AS	3.3	A	1.0	1.0	6
T310A395—006AS	3.9	A	1.0	1.0	6
T310A475—006AS	4.7	A	1.0	1.0	6
T310A565—006AS	5.6	A	1.0	1.0	6
T310A685—006AS	* 6.8	A	1.0	1.0	6
T310B825—006AS	8.2	B	2.0	1.0	6
T310B106—006AS	10.0	B	2.0	1.0	6
T310A126—006AS	12.0	B	2.0	1.0	6
T310B156—006AS	15.0	B	2.0	1.0	6
T310B186—006AS	18.0	B	2.0	1.0	6
T310B226—006AS	22.0	B	2.0	1.0	6
T310B276—006AS	27.0	B	2.0	1.0	6
T310B336—006AS	33.0	B	2.0	1.0	6
T310B396—006AS	39.0	B	2.0	1.0	6
T310B476—006AS	47.0	B	2.0	2.0	6
T310B566—006AS	* 56.0	B	2.0	5.0	6
T310C686—006AS	68.0	C	4.0	5.0	6
T310C826—006AS	82.0	C	4.0	5.0	6
T310C107—006AS	100.0	C	4.0	5.0	10
T310C127—006AS	120.0	C	4.0	5.0	10
T310C157—006AS	150.0	C	4.0	5.0	10
T310C187—006AS	▪180.0	C	8.0	10.0	10
T310D227—006AS	220.0	D	8.0	10.0	10
T310D277—006AS	270.0	D	8.0	10.0	10
T310D337—006AS	▪330.0	D	8.0	10.0	10

‡ To complete Catalog Number insert capacitance tolerance in the 9th character of Catalog Number M = ±20%, K = ±10%.

Refer to page 4 for explanation of catalog numbering system.

* Parent values.

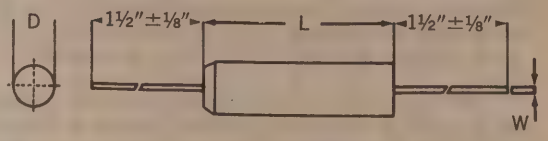
KEMET SOLID TANTALUM CAPACITORS

UNION CARBIDE

T322 SERIES — EXTENDED RANGE — PRECISION MOLDED

Extended range molded solid tantalum capacitors designed specifically for high speed automatic insertion applications. These capacitors offer an extremely high capacitance to volume ratio while still maintaining excellent performance characteristics. Supplied in four axial-lead tubular case sizes, these capacitors are ideally suited for use in printed wiring boards and all applications requiring a high degree of packaging density. The low impedance at high frequencies offered by this capacitor is especially suitable for decoupling required by high speed computers. T322 Series dimensions and tight lead wire-to-body concentricity permit installation by same automatic insertion equipment used for diodes and resistors. Available in working voltages of 2 (68 μF maximum), 4, 6, 10, 15, 20, 25, 35, and 50 (4.7 μF maximum) volts. Operating temperature range −55°C to +85°C with no voltage derating required. For additional information refer to KEMET T322 Product Catalog Form Number F-2875.

CAPACITOR OUTLINE DRAWINGS



DIMENSIONS—INCHES & (MILLIMETERS)

Case Size	D (Max)	L (Max)	W (Max)
A	.095 (2.41)	.260 (6.6)	.020 (.51)
B	.110 (2.79)	.290 (7.37)	.020 (.51)
C	.180 (4.57)	.345 (8.76)	.020 (.51)
D	.180 (4.57)	.420 (10.67)	.020 (.51)

T322 SERIES (MINIATURE) — STANDARD RATINGS & CATALOG NUMBERS

*CATALOG NUMBER	Capacitance μF 25° C 120 Hz	Case Size	Maximum Leakage Current μA 25° C Rated Voltage	Maximum Dissipation Factor, % 25° C 120 Hz
50 VOLT RATING AT 85°C — 33 VOLT RATING AT 125°C				
T322A154—050AS	0.15	A	.5	3
T322A184—050AS	0.18	A	.5	3
T322A224—050AS	0.22	A	.5	3
T322A274—050AS	0.27	A	.5	3
T322B334—050AS	0.33	B	.5	3
T322B394—050AS	0.39	B	.5	3
T322B474—050AS	0.47	B	.5	3
T322B684—050AS	0.68	B	.5	3
T322B105—050AS	1.0	B	.5	3
T322C155—050AS	1.5	C	.8	4
T322C225—050AS	2.2	C	1.1	4
T322D335—050AS	3.3	D	1.7	4
T322D475—050AS	4.7	D	2.4	4
35 VOLT RATING AT 85°C — 23 VOLT RATING AT 125°C				
T322A154—035AS	0.15	A	.5	3
T322A184—035AS	0.18	A	.5	3
T322A224—035AS	0.22	A	.5	3
T322A274—035AS	0.27	A	.5	3
T322A334—035AS	0.33	A	.5	3
T322A394—035AS	0.39	A	.5	3
T322A474—035AS	0.47	A	.5	3
T322B684—035AS	0.68	B	.5	3
T322B105—035AS	1.0	B	.5	3
T322B155—035AS	1.5	B	.6	3
T322C225—035AS	2.2	C	.8	3
T322C335—035AS	3.3	C	1.2	4
T322C475—035AS	4.7	C	1.7	4
T322C685—035AS	6.8	D	2.4	4
T322C106—035AS	10.0	D	3.5	4
25 VOLT RATING AT 85°C — 17 VOLT RATING AT 125°C				
T322A474—025AS	0.47	A	.5	3
T322A684—025AS	0.68	A	.5	3
T322A105—025AS	1.0	A	.5	3
T322B155—025AS	1.5	B	.5	3
T322B225—025AS	2.2	B	.6	3
T322B335—025AS	3.3	B	.9	3
T322C475—025AS	4.7	C	1.2	4
T322C685—025AS	6.8	C	1.7	4
T322C106—025AS	10.0	C	2.5	4
T322D156—025AS	15.0	D	3.8	4
20 VOLT RATING AT 85°C — 13 VOLT RATING AT 125°C				
T322A105—020AS	1.0	A	.5	4
T322A155—020AS	1.5	A	.5	4
T322B225—020AS	2.2	B	.5	4
T322B335—020AS	3.3	B	.7	4
T322B475—020AS	4.7	B	1.0	4
T322C685—020AS	6.8	C	1.4	6
T322C106—020AS	10.0	C	2.0	6
T322D156—020AS	15.0	D	3.0	6
T322D226—020AS	22.0	D	4.4	6

*CATALOG NUMBER	Capacitance μF 25° C 120 Hz	Case Size	Maximum Leakage Current μA 25° C Rated Voltage	Maximum Dissipation Factor, % 25° C 120 Hz
15 VOLT RATING AT 85°C — 10 VOLT RATING AT 125°C				
T322A155—015AS	1.5	A	.5	4
T322A225—015AS	2.2	A	.5	4
T322B335—015AS	3.3	B	.5	4
T322B475—015AS	4.7	B	.7	4
T322B685—015AS	6.8	B	1.1	6
T322C106—015AS	10.0	C	1.5	6
T322C156—015AS	15.0	C	2.3	6
T322D226—015AS	22.0	D	3.3	6
T322D336—015AS	33.0	D	5.0	6
10 VOLT RATING AT 85°C — 7 VOLT RATING AT 125°C				
T322A225—010AS	2.2	A	.5	4
T322A335—010AS	3.3	A	.5	4
T322B475—010AS	4.7	B	.5	4
T322B685—010AS	6.8	B	.7	6
T322B106—010AS	10.0	B	1.0	6
T322C156—010AS	15.0	C	1.5	6
T322C226—010AS	22.0	C	2.2	6
T322D336—010AS	33.0	D	3.3	6
T322D476—010AS	47.0	D	4.7	6
6 VOLT RATING AT 85°C — 4 VOLT RATING AT 125°C				
T322A335—006AS	3.3	A	.5	4
T322A475—006AS	4.7	A	.5	4
T322B685—006AS	6.8	B	.5	6
T322B106—006AS	10.0	B	.6	6
T322B156—006AS	15.0	B	.9	6
T322C226—006AS	22.0	C	1.4	6
T322C336—006AS	33.0	C	2.0	6
T322D476—006AS	47.0	D	2.8	6
T322D686—006AS	68.0	D	4.1	6
4 VOLT RATING AT 85°C — 2.7 VOLT RATING AT 125°C				
T322A475—004AS	4.7	A	.5	8
T322A685—004AS	6.8	A	.5	8
T322B106—004AS	10.0	B	.5	8
T322B156—004AS	15.0	B	.6	8
T322B226—004AS	22.0	B	.9	8
T322C336—004AS	33.0	C	1.4	8
T322C476—004AS	47.0	C	1.9	8
T322D686—004AS	68.0	D	2.8	8
2 VOLT RATING AT 85°C — 1.3 VOLT RATING AT 125°C				
T322A685—002AS	6.8	A	.5	10
T322A106—002AS	10.0	A	.5	10
T322B156—002AS	15.0	B	.5	10
T322B226—002AS	22.0	B	.5	10
T322B336—002AS	33.0	B	.7	10
T322C476—002AS	47.0	C	1.0	10
T322C686—002AS	68.0	C	1.4	10

*To complete Catalog Number, insert Capacitance Tolerance in the 9th Character of Catalog Number. M = ±20%, K = ±10%, J = ±5%.

KEMET SOLID TANTALUM CAPACITORS

UNION CARBIDE

T330 SERIES — PRECISION MOLDED — RADIAL LEAD

Kemet *T330 Series, polar-type, radial lead rectangular Precision Molded Tantalum (PMT) capacitors are primarily designed for applications that demand full use of the premium space available in printed circuitry and high density packaging. Compact, space saving T330 Series capacitors provide superior packing factor and space utilization compared with tubular units of the same microcoulomb (CV) rating.

T330 Series capacitors employ a rectangular sintered, dry tantalum anode transfer molded in precision dies with a high impact resistance plastic having excellent electrical, physical, and moisture resistant properties. The A Case is printed with polarity marking whereas B, C, and D Cases have the polarity symbol permanently molded on top of the plastic case. The radius on the two vertical edges at the positive end of B, C, and D Cases can also be used as a sensing dimension for automatic insertion processes. The location of the standoffs may serve a similar sensing function for the A Case. These standoffs, located in the base of all case sizes, provide vents for air circulation and also allow easy removal of flux residues from leadwire and circuit board solder joints.

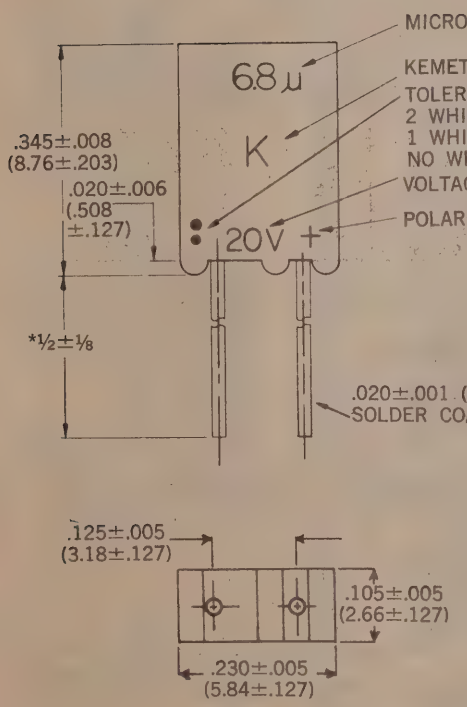
T330 Series capacitors are highly reliable and exhibit performance characteristics typical of military test standards. They are available in capacitance values ranging from 0.1 to 220 microfarads in ±20, ±10, and ±5% tolerance levels, and in working voltages from 6 to 50 volts. At 85°C the capacitors will operate continuously at full rated voltage. They are rated to 125°C when operated at 2/3 of nameplate voltage. In addition, they feature exceptionally low DC leakage and Dissipation Factor characteristics. These capacitors meet or exceed the environmental requirements (except hermeticity tests) of MIL-C-39003.

They are ideal for by-pass, coupling, and timing applications in computers, military ordinance, industrial, entertainment, and consumer electronic equipment.

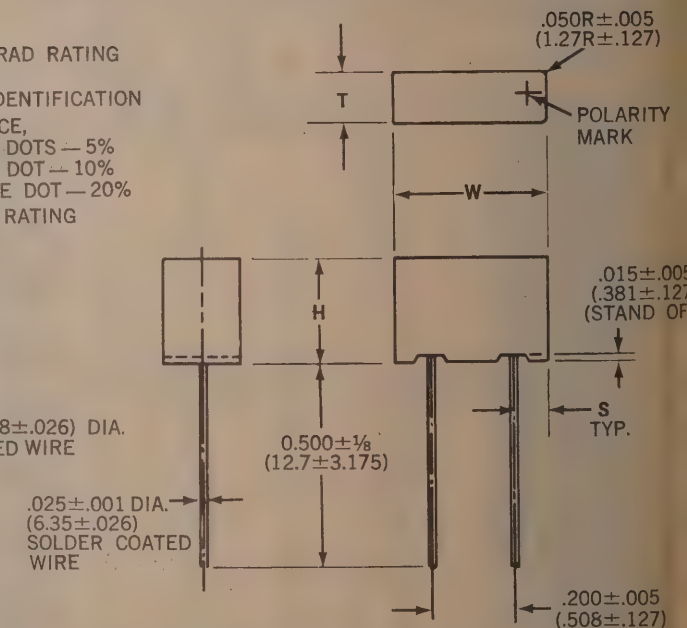
*Formerly P & W Series

CAPACITOR OUTLINE DRAWINGS

A CASE



B, C, & D CASE



NOTE:
ON THE B CASE SIZE THE STAND OFF APPEARS ONLY BETWEEN THE TWO LEADS

NOTE: ALL DIMENSIONS IN PARENTHESIS ARE IN MILLIMETERS AND ARE BASED UPON 1 INCH = 25.4mm

*Longer Lead Lengths Are Available on Special Order.

DIMENSIONS — INCHES & (MILLIMETERS)

Case Size	Case Height H	Case Width W	Case Thickness T	Case to Wire S
	±.015 (±0.38)	±.015 (±0.38)	±.015 (±0.38)	±.010 (±.026)
B	.225 (5.71)	.285 (7.24)	.170 (4.32)	.042 (1.07)
C	.325 (8.25)	.325 (8.25)	.170 (4.32)	.062 (1.57)
D	.375 (9.52)	.600 (15.24)	.195 (4.95)	.200 (5.08)

Standard Dimensions by Case Size

KEMET

SOLID TANTALUM CAPACITORS

UNION CARBIDE

KEMET T330 SERIES A — CASE RATINGS & PART NUMBER REFERENCE

*Catalog Number	Capacitance μF 25°C 120Hz	Voltage Rating	DC Leakage uA 25°C	Maximum Dissipation Factor % 25°C 120Hz
50 VOLT AT 85°C — 33 VOLT AT 125°C				
T330A104—050AS	.10	50	1	3
T330A124—050AS	.12	50	1	3
T330A154—050AS	.15	50	1	3
T330A184—050AS	.18	50	1	3
T330A224—050AS	.22	50	1	3
T330A274—050AS	.27	50	1	3
T330A334—050AS	.33	50	1	3
T330A394—050AS	.39	50	1	3
T330A474—050AS	.47	50	1	3
T330A564—050AS	.56	50	1	3
T330A684—050AS	.68	50	1	3
T330A824—050AS	.82	50	4	3
T330A105—050AS	1.0	50	4	4
T330A125—050AS	1.2	50	4	4
T330A155—050AS	1.5	50	4	4
35 VOLT AT 85°C — 23 VOLT AT 125°C				
T330A104—035AS	.10	35	4	3
T330A124—035AS	.12	35	4	3
T330A154—035AS	.15	35	4	3
T330A184—035AS	.18	35	4	3
T330A224—035AS	.22	35	4	3
T330A274—035AS	.27	35	4	3
T330A334—035AS	.33	35	4	3
T330A394—035AS	.39	35	4	3
T330A474—035AS	.47	35	4	3
T330A564—035AS	.56	35	4	3
T330A684—035AS	.68	35	4	3
T330A824—035AS	.82	35	4	3
T330A105—035AS	1.0	35	4	3
T330A125—035AS	1.2	35	4	4
T330A155—035AS	1.5	35	4	4
T330A185—035AS	1.8	35	4	4
T330A225—035AS	2.2	35	4	4
T330A275—035AS	2.7	35	4	4

*Catalog Number	Capacitance μF 25°C 120Hz	Voltage Rating	DC Leakage uA 25°C	Maximum Dissipation Factor % 25°C 120 Hz
25 VOLT AT 85°C — 17 VOLT AT 125°C				
T330A335—025AS	3.3	25	4	4
T330A395—025AS	3.9	25	4	4
T330A475—025AS	4.7	25	4	4
20 VOLT AT 85°C — 13 VOLT AT 125°C				
T330A565—020AS	5.6	20	4	6
T330A685—020AS	6.8	20	4	6
15 VOLT AT 85°C — 10 VOLT AT 125°C				
T330A825—015AS	8.2	15	4	6
10 VOLT AT 85°C — 7 VOLT AT 125°C				
T330A106—010AS	10	10	4	6
T330A126—010AS	12	10	4	6
T330A156—010AS	15	10	4	6
6 VOLT AT 85°C — 4 VOLT AT 125°C				
T330A186—006AS	18	6	4	6
T330A226—006AS	22	6	4	6

*To complete Catalog Number, insert Capacitance Tolerance in the 9th Character of Catalog Number. M = ±20%, K = ±10%, J = ±5%.

KEMET T330 SERIES B, C & D — CASE RATINGS & PART NUMBER REFERENCE

*CATALOG NUMBER	CAPACITANCE μF 25°C 120 Hz	CASE SIZE	WT. GRAM	LEAKAGE CURRENT uA 25°C RATED VOLTAGE	MAXIMUM DISSIPATION FACTOR, % 25°C, 120 Hz
50 VOLT RATING AT 85°C — 33 VOLT RATING AT 125°C					
T330B104—050AS	.10	B	0.9	0.5	3
T330B124—050AS	.12	B	0.9	0.5	3
T330B154—050AS	.15	B	0.9	0.5	3
T330B184—050AS	.18	B	0.9	0.5	3
T330B224—050AS	.22	B	0.9	0.5	3
T330B274—050AS	.27	B	0.9	0.5	3
T330B334—050AS	.33	B	0.9	0.5	3
T330B394—050AS	.39	B	0.9	0.5	3
T330B474—050AS	.47	B	0.9	0.5	3
T330B564—050AS	.56	B	0.9	0.5	3
T330B684—050AS	.68	B	0.9	0.5	3
T330B824—050AS	.82	B	0.9	0.5	3
T330B105—050AS	1.0	B	0.9	0.5	3
T330B125—050AS	1.2	B	0.9	0.5	4
T330B155—050AS	1.5	B	0.9	0.5	4
T330B185—050AS	1.8	B	0.9	0.5	4
T330B225—050AS	2.2	B	0.9	1	4
T330C275—050AS	2.7	C	1.3	1	4
T330C335—050AS	3.3	C	1.3	1	4
T330C395—050AS	3.9	C	1.3	1	4
T330C475—050AS	4.7	C	1.3	2	4
T330C565—050AS	5.6	C	1.3	2	4
T330D685—050AS	6.8	D	3.1	2	4
T330D825—050AS	8.2	D	3.1	2	4
T330D106—050AS	10	D	3.1	2	4
T330D126—050AS	12	D	3.1	2	4
T330D156—050AS	15	D	3.1	3	4
T330D186—050AS	18	D	3.1	3	4
35 VOLT RATING AT 85°C — 23 VOLT RATING AT 125°C					
T330B104—035AS	.10	B	0.9	0.5	3
T330B124—035AS	.12	B	0.9	0.5	3
T330B154—035AS	.15	B	0.9	0.5	3
T330B184—035AS	.18	B	0.9	0.5	3
T330B224—035AS	.22	B	0.9	0.5	3
T330B274—035AS	.27	B	0.9	0.5	3
T330B334—035AS	.33	B	0.9	0.5	3
T330B394—035AS	.39	B	0.9	0.5	3
T330B474—035AS	.47	B	0.9	0.5	3
T330B564—035AS	.56	B	0.9	0.5	3
T330B684—035AS	.68	B	0.9	0.5	3
T330B824—035AS	.82	B	0.9	0.5	3
T330B105—035AS	1.0	B	0.9	0.5	3
T330B125—035AS	1.2	B	0.9	0.5	4
T330B155—035AS	1.5	B	0.9	0.5	4
T330B185—035AS	1.8	B	0.9	0.5	4
T330B225—035AS	2.2	B	0.9	1	4
T330B275—035AS	2.7	B	0.9	1	4
T330B335—035AS	3.3	B	0.9	1	4
T330C395—035AS	3.9	C	1.3	1	6
T330C475—035AS	4.7	C	1.3	1	6
T330C565—035AS	5.6	C	1.3	1	6
T330C685—035AS	6.8	C	1.3	2	6
T330C825—035AS	8.2	C	1.3	2	6
T330C106—035AS	10	C	1.3	2	6
T330D126—035AS	12	D	3.1	2	6
T330D156—035AS	15	D	3.1	3	6
T330D186—035AS	18	D	3.1	3	6
T330D226—035AS	22	D	3.1	3	6
T330D276—035AS	27	D	3.1	3	6
T330D336—035AS	33	D	3.1	3	6
25 VOLT RATING AT 85°C — 17 VOLT RATING AT 125°C					
T330B275—025AS	2.7	B	0.9	0.5	4
T330B335—025AS	3.3	B	0.9	1	4
T330B395—025AS	3.9	B	0.9	1	4
T330B475—025AS	4.7	B	0.9	1	4
T330C685—025AS	6.8	C	1.3	1	6

*CATALOG NUMBER	CAPACITANCE μF 25°C 120 Hz	CASE SIZE	WT. GRAM	LEAKAGE CURRENT uA 25°C RATED VOLTAGE	MAXIMUM DISSIPATION FACTOR, % 25°C, 120 Hz
25 VOLT RATING AT 85°C (CONT'D)					
T330C825—025AS	8.2	C	1.3	1	6
T330C106—025AS	10.0	C	1.3	1	6
T330C126—025AS	12.0	C	1.3	1	6
T330C156—025AS	15.0	C	1.3	2	6
T330D226—025AS	22.0	D	3.1	3	6
T330D276—025AS	27.0	D	3.1	3	6
T330D336—025AS	33.0	D	3.1	3	6
T330D396—025AS	39.0	D	3.1	3	6
T330D476—025AS	47.0	D	3.1	3	6
15 VOLT RATING AT 85°C — 10 VOLT RATING AT 125°C					
T330B395—015AS	3.9	B	0.9	0.5	4
T330B475—015AS	4.7	B	0.9	0.5	4
T330B565—015AS	5.6	B	0.9	0.5	4
T330B685—015AS	6.8	B	0.9	0.5	6
T330B825—015AS	8.2	B	0.9	0.5	6
T330C126—015AS	12	C	1.3	1	6
T330C156—015AS	15	C	1.3	2	6
T330C186—015AS	18	C	1.3	2	6
T330C226—015AS	22	C	1.3	2	6
T330C276—015AS	27	C	1.3	2	6
T330D396—015AS	39	D	3.1	2	6
T330D476—015AS	47	D	3.1	3	6
T330D566—015AS	56	D	3.1	3	6
T330D686—015AS	68	D	3.1	3	6
T330D826—015AS	82	D	3.1	3	6
10 VOLT RATING AT 85°C — 7 VOLT RATING AT 125°C					
T330B565—010AS	5.6	B	0.9	0.5	4
T330B685—010AS	6.8	B	0.9	0.5	6
T330B825—010AS	8.2	B	0.9	0.5	6
T330B106—010AS	10	B	0.9	0.5	6
T330B126—010AS	12	B	0.9	0.5	6
T330B156—010AS	15	B	0.9	0.5	6
T330C186—010AS	18	C	1.3	0.5	6
T330C226—010AS	22	C	1.3	1	6
T330C276—010AS	27	C	1.3	1	6
T330C336—010AS	33	C	1.3	1	6
T330C396—010AS	39	C	1.3	2	6
T330D566—010AS	56	D	3.1	2	6
T330D686—010AS	68	D	3.1	2	6
T330D826—010AS	82	D	3.1	2	6
T330D107—010AS	100	D	3.1	3	6
T330D127—010AS	120	D	3.1	3	6
T330D157—010AS	150	D	3.1	6	6
6 VOLT RATING AT 85°C — 4 VOLT RATING AT 125°C					
T330B106—006AS	10	B	0.9	0.5	6
T330B126—006AS	12	B	0.9	0.5	6
T330B156—006AS	15	B	0.9	0.5	6
T330B186—006AS	18	B	0.9	0.5	6
T330B226—006AS	22	B	0.9	0.5	6
T330C336—006AS	33	C	1.3	0.5	6
T330C396—006AS	39	C	1.3	0.5	6
T330C476—006AS	47	C	1.3	1	6
T330C566—006AS	56	C	1.3	1	6
T330C686—006AS	68	C	1.3	2	6
T330D107—006AS	100	D	3.1	2	6
T330D127—006AS	120	D	3.1	2	6
T330D157—006AS	150	D	3.1	3	6
T330D187—006AS	180	D	3.1	3	6
T330D227—006AS	220	D	3.1	3	8

*To complete Catalog Number, insert Capacitance Tolerance Symbol in the 9th Character, i.e.: M = ±20%, K = ±10%, J = ±5%

KEMET SOLID TANTALUM CAPACITORS

UNION CARBIDE

T362 & T368 SERIES — PLASTIC DIPPED TANTALUM CAPACITORS

ECONOMICAL / .1-330 μF 6-50 VDC / LOW DC LEAKAGE

*T362 CAPACITOR OUTLINE DRAWINGS

A, B, C, & D CASE

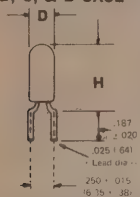


TABLE 1 — *STANDARD DIMEN. (MAX.)

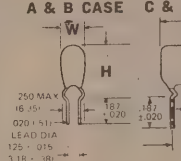
Case Size	D - Diameter	H - Height
A	0.175 (4.45)	0.350 (8.89)
B	0.250 (6.35)	0.500 (12.70)
C	0.350 (8.89)	0.650 (16.51)
D	0.400 (10.16)	0.750 (19.05)

NOTE: All dimensions in parenthesis are in millimeters and are based upon 1 inch = 25.4mm

**LONGER LEAD LENGTHS ARE AVAILABLE ON SPECIAL ORDER.

T368 CAPACITOR OUTLINE DRAWINGS

A & B CASE C & D CASE



*STANDARD DIMENSIONS (MAXIMUM)

Case Size	Thickness	W - Width	H - Height
A	.175 (4.45)	.175 (4.45)	.350 (8.89)
B	.250 (6.35)	.250 (6.35)	.500 (12.70)
C	.250 (6.35)	.450 (11.43)	.440 (11.18)
D	.275 (6.99)	.600 (15.24)	.660 (16.76)

NOTE: T368 C & D Case capacitors are also available with straight leads upon special order.

LONGER LEAD LENGTHS ARE AVAILABLE UPON SPECIAL ORDER.

ORDERING INFORMATION

T 36* B 155 M 050 A S

- TANTALUM
- SERIES *368 SEE BELOW *362 SEE BELOW
- CASE SIZE
- CAPACITANCE IN PICOFARADS — First two digits are significant figures. Third digit is the number of zeros following.
- CAPACITANCE TOLERANCE M ±20%, K ±10%, J ±5%
- VOLTAGE RATING
- FAILURE RATE LEVEL A — NOT APPLICABLE
- LEAD MATERIAL S — STANDARD

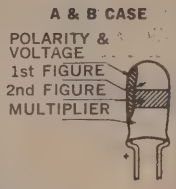
*SERIES

A & B CASE
T368 — .125 SPACING (CYLINDRICAL)
T362 — .250 SPACING (CYLINDRICAL)

C & D CASE
T368 — .250 SPACING (RECTANGULAR)
T362 — .250 SPACING (CYLINDRICAL)

CAPACITOR MARKING

A & B CASE



A & B CASE
Capacitance and Voltage Color Code

Rated Voltage VDC 25°C	Color	Code for Capacitance in Picofarads 1st Fig.	2nd Fig.	Multiplier -μμF
3-4	Black	0	0	None
3-6	Brown	1	1	x10
3-10	Red	2	2	x10²
3-15	Orange	3	3	x10³
3-20	Yellow	4	4	x10⁴
3-25	Green	5	5	x10⁵
3-35	Blue	6	6	x10⁶
3-50	Violet	7	7	x10⁷
	Gray	8	8	
3	White	9	9	

C & D CASE

1st LINE — KEMET BRAND AND CAPACITANCE

2nd LINE — POLARITY AND VOLTAGE

NOTE: Capacitors marked to higher voltages in the same case size may be shipped on orders requiring lower voltages.

T362 & T368 SERIES — STANDARD RATINGS

*Catalog Number	μF	Case Size	DC Leakage μA 25° C
50 Volt Rating at 85° C			
T36_A104_050AS	.1	A	1
T36_A154_050AS	.15	A	1
T36_A224_050AS	.22	A	1
T36_A334_050AS	.33	A	1
T36_A474_050AS	.47	A	1
T36_A684_050AS	.68	A	1
T36_A105_050AS	1.0	A	1
T36_B155_050AS	1.5	B	2
T36_B225_050AS	2.2	B	2
T36_B335_050AS	3.3	B	3
T36_B475_050AS	4.7	B	3
T36_C685_050AS	6.8	C	4
T36_C106_050AS	10.0	C	6
T36_C156_050AS	15.0	C	6
T36_D226_050AS	22.0	D	10
35 Volt Rating at 85° C			
T36_A104_035AS	.1	A	1
T36_A154_035AS	.15	A	1
T36_A224_035AS	.22	A	1
T36_A334_035AS	.33	A	1
T36_A474_035AS	.47	A	1
T36_A684_035AS	.68	A	1
T36_A105_035AS	1.0	A	1
T36_B155_035AS	1.5	B	1
T36_B225_035AS	2.2	B	1
T36_B335_035AS	3.3	B	2
T36_B475_035AS	4.7	B	2
T36_B685_035AS	6.8	B	3
T36_C106_035AS	10.0	C	5
T36_C156_035AS	15.0	C	5
T36_C226_035AS	22.0	C	10
T36_D336_035AS	33.0	D	10
T36_D476_035AS	47.0	D	10
25 Volt Rating at 85° C			
T36_A105_025AS	1.0	A	1
T36_A155_025AS	1.5	A	1
T36_B225_025AS	2.2	B	1
T36_B335_025AS	3.3	B	1
T36_B475_025AS	4.7	B	2
T36_B685_025AS	6.8	B	3
T36_B106_025AS	10.0	B	4
T36_C156_025AS	15.0	C	5
T36_C226_025AS	22.0	C	10
T36_C336_025AS	33.0	C	10
T36_D476_025AS	47.0	D	15
T36_D686_025AS	68.0	D	15
20 Volt Rating at 85° C			
T36_A105_020AS	1.0	A	1
T36_A155_020AS	1.5	A	1
T36_A225_020AS	2.2	A	1
T36_B335_020AS	3.3	B	1
T36_B475_020AS	4.7	B	2
T36_B685_020AS	6.8	B	2
T36_B106_020AS	10.0	B	3
T36_B156_020AS	15.0	B	4
T36_C226_020AS	22.0	C	5
T36_C336_020AS	33.0	C	10
T36_C476_020AS	47.0	C	15
T36_D686_020AS	68.0	D	15
T36_D107_020AS	100.0	D	20
15 Volt Rating at 85° C			
T36_A155_015AS	1.5	A	1
T36_A225_015AS	2.2	A	1
T36_A335_015AS	3.3	A	1
T36_B106_015AS	10.0	B	2
15 Volt Rating at 85° C			
T36_B156_015AS	15.0	B	3
T36_B226_015AS	22.0	B	5
T36_C336_015AS	33.0	C	5
T36_C476_015AS	47.0	C	10
T36_C686_015AS	68.0	C	15
T36_D107_015AS	100.0	D	20
T36_D157_015AS	150.0	D	20
10 Volt Rating at 85° C			
T36_A225_010AS	2.2	A	1
T36_A335_010AS	3.3	A	1
T36_A475_010AS	4.7	A	1
T36_B156_010AS	15.0	B	2
T36_B226_010AS	22.0	B	3
T36_B336_010AS	33.0	B	5
T36_C476_010AS	47.0	C	5
T36_C686_010AS	68.0	C	10
T36_C107_010AS	100.0	C	15
T36_D157_010AS	150.0	D	20
T36_D227_010AS	220.0	D	20
6 Volt Rating at 85° C			
T36_A335_006AS	3.3	A	1
T36_A475_006AS	4.7	A	1
T36_A685_006AS	6.8	A	1
T36_B226_006AS	22.0	B	2
T36_B336_006AS	33.0	B	3
T36_B476_006AS	47.0	B	5
T36_B686_006AS	68.0	B	5
T36_C107_006AS	100.0	C	10
T36_C157_006AS	150.0	C	15
T36_D227_006AS	220.0	D	20
T36_D337_006AS	330.0	D	20

*To complete Catalog Number insert series designation and capacitance tolerance symbols in the 4th and 9th characters, respectively as shown in the "ordering information" section above.

*C & D CASE PREFERRED STANDARD IS T362 SERIES

NOTE: Dissipation Factor does not exceed the following limits when measured at 120 Hz and 25°C: 0.1-1.0 μF — 4%, 1.2-6.8 μF — 6%, 8.2-68 μF — 8%, 82-330 μF — 10%

KEMET

SOLID TANTALUM CAPACITORS

UNION CARBIDE

T390 & T392 SERIES — PLASTIC DIPPED TANTALUM CAPACITORS

0.1 TO 680 μF — 3 TO 50 VDC / 6 CASE SIZES / −55°C TO 85°C / PRINTED POLARITY, CAPACITANCE & VOLTAGE IDENTIFICATION

KEMET T390/T392 Series offer the excellent performance and shelf life characteristics of solid tantalum capacitors in an economical dipped package making them ideal for use in industrial and consumer electronic circuit applications. Their small size and low profile save space while their .100" and .200" lead spacing fit 0.1" PC board grids. They are produced in our U.S. plants using the same high-grade materials and precision automated processes that are employed in the manufacture of KEMET military and industrial grade solid tantalum capacitors.

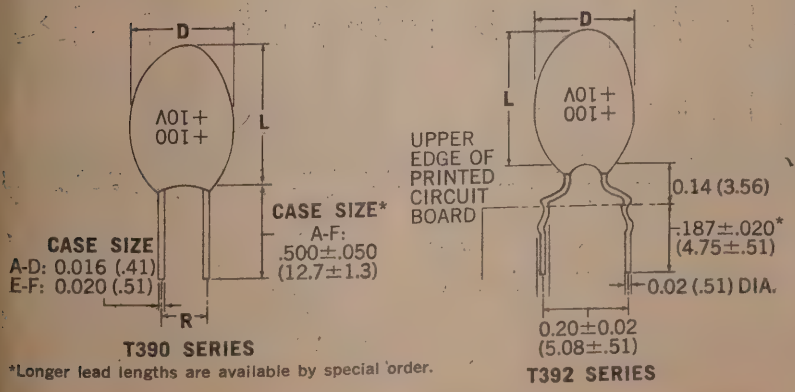
T390 & T392 SERIES — STANDARD RATINGS

μF	CASE SIZE	*CATALOG NUMBER	DC LEAKAGE μA 25°C
3 VOLT RATING AT 85° C			
4.7	A	T39_A475_003AS	1
6.8	A	T30_A685_003AS	1
10.0	B	T39_B106_003AS	1
15.0	B	T39_B156_003AS	1
22.0	B	T39_B226_003AS	2
33.0	C	T39_C336_003AS	2
47.0	C	T39_C476_003AS	3
68.0	D	T39_D686_003AS	4
100.0	D	T39_D107_003AS	6
150.0	D	T39_D157_003AS	9
220.0	E	T39_E227_003AS	14
330.0	E	T39_E337_003AS	20
470.0	F	T30_F477_003AS	20
680.0	F	T39_F687_003AS	20
6.3 VOLT RATING AT 85° C			
3.3	A	T39_A335_006AS	1
4.7	A	T39_A475_006AS	1
6.8	B	T39_B685_006AS	1
10.0	B	T39_B106_006AS	2
15.0	B	T39_B156_006AS	2
22.0	C	T39_C226_006AS	2
33.0	C	T39_C336_006AS	3
47.0	D	T39_D476_006AS	5
68.0	D	T39_D686_006AS	5
100.0	D	T39_D107_006AS	10
150.0	E	T39_E157_006AS	15
220.0	E	T39_E227_006AS	20
330.0	F	T39_F337_006AS	20
10 VOLT RATING AT 85°C			
2.2	A	T39_A225_010AS	1
3.3	A	T39_A335_010AS	1
4.7	B	T39_B475_010AS	1
6.8	B	T39_B685_010AS	2
10.0	B	T39_B106_010AS	2
15.0	C	T39_C156_010AS	2
22.0	C	T39_C226_010AS	3
33.0	D	T39_D336_010AS	5
47.0	D	T39_D476_010AS	5
68.0	D	T39_D686_010AS	10
100.0	E	T39_E107_010AS	15
150.0	E	T39_E157_010AS	20
220.0	F	T39_F227_010AS	20
16 VOLT RATING AT 85°C			
1.5	A	T39_A155_016AS	1
2.2	A	T39_A225_016AS	1
3.3	B	T39_B335_016AS	1
4.7	B	T39_B475_016AS	2
6.8	B	T39_B685_016AS	2
10.0	C	T39_C106_016AS	2
15.0	C	T39_C156_016AS	3
22.0	D	T39_D226_016AS	5
33.0	D	T39_D336_016AS	5
47.0	E	T39_E476_016AS	10
68.0	E	T39_E686_016AS	15
100.0	F	T39_F107_016AS	20
150.0	F	T39_F157_016AS	20
25 VOLT RATING AT 85°C			
1.0	A	T39_A105_025AS	1
1.5	A	T39_A155_025AS	1
2.2	B	T39_B225_025AS	1
3.3	B	T39_B335_025AS	1
4.7	C	T39_C475_025AS	2
6.8	C	T39_C685_025AS	3
10.0	C	T39_C106_025AS	4
15.0	D	T39_D156_025AS	5
22.0	D	T39_D226_025AS	10
33.0	E	T39_E336_025AS	10
47.0	E	T39_E476_025AS	15
68.0	F	T39_F686_025AS	15
35 VOLT RATING AT 85°C			
0.1	A	T39_A104_035AS	1
0.15	A	T39_A154_035AS	1
0.22	A	T39_A224_035AS	1
0.33	A	T39_A334_035AS	1
0.47	A	T39_A474_035AS	1
0.68	A	T39_A684_035AS	1
1.0	B	T39_B105_035AS	1
1.5	B	T39_B155_035AS	1
2.2	C	T39_C225_035AS	1
3.3	C	T39_C335_035AS	2
4.7	D	T39_D475_035AS	2
6.8	D	T39_D685_035AS	3
10.0	D	T39_D106_035AS	5
15.0	E	T39_E156_035AS	5
22.0	E	T39_E226_035AS	10
33.0	F	T39_F336_035AS	10
47.0	F	T39_F476_035AS	10
50 VOLT RATINGS AT 85°			
0.1	A	T39_A104_050AS	1
0.15	A	T39_A154_050AS	1
0.22	A	T39_A224_050AS	1
0.33	A	T39_A334_050AS	1
0.47	B	T39_B474_050AS	1
0.68	B	T39_B684_050AS	1
1.0	C	T39_C105_050AS	1
1.5	C	T39_C155_050AS	2
2.2	D	T39_D225_050AS	2
3.3	D	T39_D335_050AS	3
4.7	E	T39_E475_050AS	3
6.8	F	T39_F685_050AS	4
10.0	F	T39_F106_050AS	6

*To complete catalog number, insert series designation, and capacitance tolerance symbols in the 4th and 9th characters, respectively, as shown in the ordering information section on page 3.

DISSIPATION FACTOR: Does not exceed the following limits when measurements are made at 120 Hz and 25°C: .01-1.0 μF — 4%, 1.2-6.8 μF — 6%, 8.2-68 μF — 8%, 82-330 μF — 10%, 470-680 μF — 12%

CAPACITOR OUTLINE DRAWINGS



DIMENSIONS — INCHES & (MILLIMETERS)

Case Size	D Diameter Maximum	L Length Maximum	R (T390) Lead Space
A	0.18 (4.57)	0.28 (7.11)	0.10 (2.54)
B	0.20 (5.08)	0.30 (7.62)	0.10 (2.54)
C	0.26 (6.60)	0.36 (9.14)	0.10 (2.54)
D	0.34 (8.64)	0.40 (10.16)	0.10 (2.54)
E	0.40 (10.16)	0.56 (14.22)	0.20 (5.08)
F	0.44 (11.18)	0.68 (17.27)	0.20 (5.08)

1 inch = 25.4mm

KEMET SOLID TANTALUM CAPACITORS

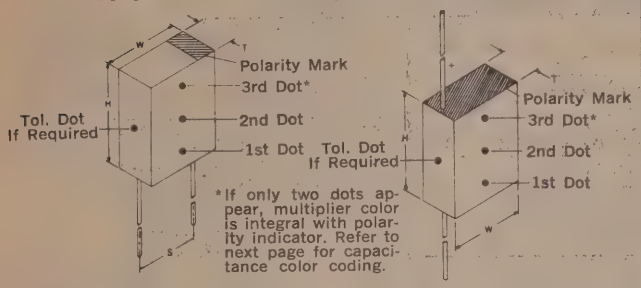
UNION CARBIDE

MICRON SERIES

The KEMET Micron Series is a complete line of microminiature solid tantalum capacitors designed to provide maximum electrical performance and capacitance-to-volume ratio for micro-miniaturized, high density, and integrated circuits. The capacitors consist of ultra-small anode assemblies encapsulated in plastic. The CV range is .0022-220 μF, 2-50 volts. Capacitance values are identified by color codes. For additional information, including non-polar styles, refer to KEMET Micron Series Product Catalog (Form F-2710).

CAPACITOR OUTLINE DRAWINGS

T370 RADIAL LEADS **T372 AXIAL LEADS**


Polarity Mark
3rd Dot*
2nd Dot
1st Dot
Tol. Dot If Required
Tol. Dot If Required
*If only two dots appear, multiplier color is integral with polarity indicator. Refer to next page for capacitance color coding.

DIMENSIONS—INCHES & (MILLIMETERS)

Case Size	H Max.	W Max.	T Max.	S Lead Spacing	Lead Dia. ±.001 (.03)
A	.125 (3.18)	.070 (1.78)	.040 (1.02)	.050±.015 (1.27±.38)	.010 (.25)
B	.165 (4.19)	.120 (3.05)	.070 (1.78)	.100±.020 (2.54±.51)	.010 (.25)
C	.225 (5.72)	.185 (4.70)	.075 (1.91)	.150±.020 (3.81±.51)	.010 (.25)
D	.290 (7.37)	.220 (5.59)	.110 (2.79)	.180±.025 (4.57±.64)	.016 (.41)
E	.310 (7.87)	.230 (5.84)	.130 (3.30)	.200±.025 (5.08±.64)	.016 (.41)
F	.475 (12.07)	.375 (9.53)	.150 (3.81)	.300±.025 (7.62±.64)	.016 (.41)

Lead Length: Pos. 1⅝±⅛ (41.3±3.18)
Neg. 1⅜±⅛ (34.9±3.18)

*Catalog Number	Capacitance μF 25°C 120 Hz	Voltage Rating 85°C	Max DCL μA 25°C	Max DF % 25°C 120 Hz
T 370 & T 372 A Case + 40% − 20% Tolerance Standard				
— A222L020AS	.0022	20	.5	10
— A332L020AS	.0033	20	.5	10
— A472L020AS	.0047	20	.5	10
— A682L020AS	.0068	20	.5	10
— A103L020AS	.010	20	.5	10
— A153L020AS	.015	20	.5	10
— A223L020AS	.022	20	.5	10
— A333L020AS	.033	20	.5	10
— A473L020AS	.047	20	.5	10
— A683L020AS	.068	20	.5	10
— A104L020AS	.10	20	.5	10
— A154L020AS	.15	20	.5	10
— A224L020AS	.22	20	.5	10
— A334L015AS	.33	15	.5	10
— A474L010AS	.47	10	.5	10
— A684L006AS	.68	6	.5	10
— A105L004AS	1.0	4	.5	10
— A155L003AS	1.5	3	.5	10
— A225L002AS	2.2	2	.5	15
T 370 & T 372 B Case ± 20% Tolerance Standard				
— B472M035AS	.0047	35	1.0	8
— B682M035AS	.0068	35	1.0	8
— B103M035AS	.010	35	1.0	8
— B153M035AS	.015	35	1.0	8
— B223M035AS	.022	35	1.0	8
— B333M035AS	.033	35	1.0	8
— B473M035AS	.047	35	1.0	8
— B683M035AS	.068	35	1.0	8
— B104M035AS	.10	35	1.0	8
— B154M035AS	.15	35	1.0	8
— B224M035AS	.22	35	1.0	8
— B334M035AS	.33	35	1.0	8
— B474M035AS	.47	35	1.0	8
— B684M025AS	.68	25	1.0	6
— B105M020AS	1.0	20	1.0	6
— B155M015AS	1.5	15	1.0	6
— B225M010AS	2.2	10	1.0	6
— B335M006AS	3.3	6	1.0	6
— B475M004AS	4.7	4	1.0	10
— B685M003AS	6.8	3	1.0	10
— B106M002AS	10	2	1.0	15

*Catalog Number	Capacitance μF 25°C 120 Hz	Voltage Rating 85°C	Max DCL μA 25°C	Max DF % 25°C 120 Hz
T 370 & T 372 C Case ± 20% Tolerance Standard				
— C684M035AS	.68	35	1.0	8
— C105M035AS	1.0	35	1.0	8
— C155M035AS	1.5	35	1.0	8
— C225M025AS	2.2	25	1.0	6
— C335M020AS	3.3	20	1.0	6
— C475M020AS	4.7	20	1.0	6
— C685M010AS	6.8	10	1.0	6
— C106M006AS	10	6	1.0	6
— C156M004AS	15	4	1.0	10
— C226M003AS	22	3	1.0	15
T 370 & T 372 D Case ± 20% Tolerance Standard				
— D225M035AS	2.2	35	2.0	8
— D335M035AS	3.3	35	2.0	8
— D475M035AS	4.7	35	2.0	8
— D685M025AS	6.8	25	2.0	6
— D106M020AS	10	20	2.0	6
— D156M015AS	15	15	2.0	6
— D226M010AS	22	10	2.0	6
— D336M006AS	33	6	2.0	10
— D476M004AS	47	4	2.0	10
T 370 & T 372 E Case ± 20% Tolerance Standard				
— E685M035AS	6.8	35	3.0	8
— E106M025AS	10	25	3.0	6
— E156M020AS	15	20	3.0	6
— E226M015AS	22	15	3.0	6
— E336M010AS	33	10	3.0	6
— E476M006AS	47	6	3.0	10
— E686M004AS	68	4	3.0	10
T 370 & T 372 F Case ± 20% Tolerance Standard				
— F106M035AS	10	35	9.0	8
— F156M035AS	15	35	9.0	8
— F226M035AS	22	35	9.0	8
— F336M025AS	33	25	9.0	8
— F476M020AS	47	20	9.0	8
— F686M015AS	68	15	9.0	8
— F107M010AS	100	10	9.0	8
— F157M006AS	150	6	9.0	10
— F227M003AS	220	3	9.0	15

*To complete Catalog Number add prefix to indicate Series, i.e., T370 Radial = T370A472L020S — T372 Axial = T372A472L020AS

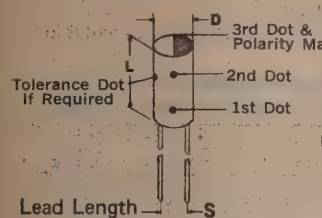
KEMET SOLID TANTALUM CAPACITORS

UNION CARBIDE

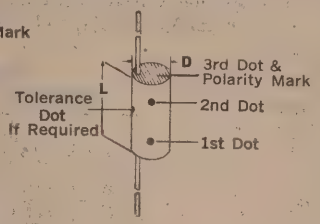
MICRON SERIES — POLAR-CYLINDRICAL CASE

CAPACITOR OUTLINE DRAWINGS

T 374 Radial Leads



T 376 Axial Leads



Lead Length — S
Pos. 1-5/8 ± 1/8 (41.3 ± 3.18)
Neg. 1-3/8 ± 1/8 (34.9 ± 3.18)

DIMENSIONS—INCHES & (MILLIMETERS)

Case Size	L Max.	D Max.	S Lead Spacing	Lead Diameter ±.001 (.03)
A	.125 (3.18)	.070 (1.78)	.050±.015 (1.27±.38)	.010 (.25)
B	.160 (4.06)	.070 (1.78)	.050±.015 (1.27±.38)	.010 (.25)
C	.200 (5.08)	.080 (2.03)	.050±.015 (1.27±.38)	.010 (.25)
D	.225 (5.72)	.100 (2.54)	.070±.020 (1.78±.51)	.010 (.25)
E	.250 (6.35)	.150 (3.81)	.120±.025 (3.05±.64)	.016 (.41)

*Catalog Number	Capacitance µF 25°C 120 Hz	Voltage Rating 85°C	Max DCL µA 25°C	Max DF % 25°C 120 Hz
T 374 & T 376 A Case + 40% − 20% Tolerance Standard				
— A222L020AS	.0022	20	.5	10
— A332L020AS	.0033	20	.5	10
— A472L020AS	.0047	20	.5	10
— A682L020AS	.0068	20	.5	10
— A103L020AS	.010	20	.5	10
— A153L020AS	.015	20	.5	10
— A223L020AS	.022	20	.5	10
— A333L020AS	.033	20	.5	10
— A473L020AS	.047	20	.5	10
— A683L020AS	.068	20	.5	10
— A104L020AS	.10	20	.5	10
— A154L020AS	.15	20	.5	10
— A224L020AS	.22	20	.5	6
— A334L015AS	.33	15	.5	6
— A474L010AS	.47	10	.5	6
— A684L006AS	.68	6	.5	6
— A105L004AS	1.0	4	.5	10
— A155L003AS	1.5	3	.5	10
— A225L002AS	2.2	2	.5	15
T 374 & 376 B Case + 40% − 20% Tolerance Standard				
— B222L050AS	.0022	50	1.0	8
— B332L050AS	.0033	50	1.0	8
— B472L050AS	.0047	50	1.0	8
— B682L050AS	.0068	50	1.0	8
— B103L050AS	.010	50	1.0	8
— B153L035AS	.015	35	1.0	8
— B223L035AS	.022	35	1.0	8
— B333L035AS	.033	35	1.0	8
— B473L035AS	.047	35	1.0	8
— B683L035AS	.068	35	1.0	8
— B104L035AS	.10	35	1.0	8
— B154L035AS	.15	35	1.0	8
— B224L035AS	.22	35	1.0	8
— B334L020AS	.33	20	1.0	6
— B474L020AS	.47	20	1.0	6
— B684L015AS	.68	15	1.0	6
— B105L010AS	1.0	10	1.0	6
— B155L006AS	1.5	6	1.0	6
— B225L004AS	2.2	4	1.0	10
— B335L003AS	3.3	3	1.0	10
— B475L002AS	4.7	2	1.0	15
T 374 & 376 C Case ± 20% Tolerance Standard				
— C334M035AS	.33	35	1.0	8
— C474M035AS	.47	35	1.0	8
— C684M020AS	.68	20	1.0	6
— C105M020AS	1.0	20	1.0	6
— C155M015AS	1.5	15	1.0	6
— C225M010AS	2.2	10	1.0	6
— C335M006AS	3.3	6	1.0	6
— C475M004AS	4.7	4	1.0	10
— C685M003AS	6.8	3	1.0	10
— C106M002AS	10.0	2	1.0	15
T 374 & 376 D Case ± 20% Tolerance Standard				
— D684M035AS	.68	35	1.0	8
— D105M035AS	1.0	35	1.0	8
— D155M020AS	1.5	20	1.0	6
— D225M020AS	2.2	20	1.0	6
— D335M015AS	3.3	15	1.0	6
— D475M010AS	4.7	10	1.0	6
— D685M006AS	6.8	6	1.0	6
— D106M004AS	10.0	4	1.0	10
— D156M003AS	15.0	3	1.0	10
— D226M002AS	22.0	2	1.0	15
T 374 & T 376 E Case ± 20% Tolerance Standard				
— E155M035AS	1.5	35	1.5	8
— E225M035AS	2.2	35	1.5	8
— E335M020AS	3.3	20	1.5	6
— E475M020AS	4.7	20	1.5	6
— E685M020AS	6.8	20	1.5	6
— E106M015AS	10.0	15	1.5	6
— E156M010AS	15.0	10	1.5	6
— E226M006AS	22.0	6	1.5	6
— E336M004AS	33.0	4	1.5	10
— E476M003AS	47.0	3	1.5	10

* To complete Catalog Number Add Prefix to Indicate Series, i.e., T374 Radial: T374A103L020AS
T376 Axial: T376A103L020AS

CAPACITANCE COLOR CODING

Color	Code for Capacitance in Picofarads: 1st & 2nd Dot	3rd Dot Decimal Multiplier
Black	0	1
Brown	1	10
Red	2	100
Orange	3	1,000
Yellow	4	10,000
Green	5	100,000
Blue	6	1,000,000
Violet	7	10,000,000
Grey	8	
White	9	

ORDERING INFORMATION

T 370 B 472 M 035 A S

- T — TANTALUM
- 370 — SERIES
- B — CASE SIZE
- 472 — CAPACITANCE IN PICOFARADS
  First two digits are significant figures. Third digit is the number of zeros following.
- M — CAPACITANCE TOLERANCE
  M ±20%, K ±10%, J ±5%, L +40%, −20%
- 035 — VOLTAGE RATING
- A — FAILURE RATE LEVEL
  A — NOT APPLICABLE
- S — LEAD MATERIAL
  S — STANDARD

KEMET SOLID TANTALUM CAPACITORS

UNION CARBIDE

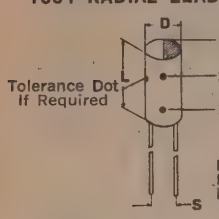
T384, T386

POLAR / EPOXY SEAL / HIGH EFFICIENCY / CYLINDRICAL SHAPE

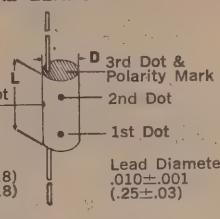
- .010-22 μF
- 2 to 20 VDC
- −55°C to +125°C
- Solder-Coated Nickel Leads
- High Charge (CV) Efficiency
- ±20%, ±10%, and ±5% Tolerances Also Available

CAPACITOR OUTLINE DRAWING

T384 RADIAL LEADS



T386 AXIAL LEADS



DIMENSIONS — INCHES & (MILLIMETERS)

Case Size	L Case Length Maximum	D Case Diameter Maximum	S Lead Spacing ±.015 (±.38)
A	.110 (2.79)	.067 (1.70)	.050 (1.27)
B	.125 (3.18)	.067 (1.70)	.050 (1.27)
C	.145 (3.68)	.067 (1.70)	.050 (1.27)
D	.160 (4.06)	.077 (1.96)	.050 (1.27)
E	.190 (4.83)	.077 (1.96)	.050 (1.27)
F	.200 (5.08)	.080 (2.03)	.050 (1.27)
G	.215 (5.46)	.098 (2.49)	.070 (1.78)

Refer to Previous Page on Capacitor Color Coding

ACTUAL SIZE — RADIAL

A CASE | B CASE | C CASE | D CASE | E CASE | F CASE | G CASE

*Catalog Number	Capacitance uF 25°C 120 Hz	Voltage Rating 85°C	Max DCL μA 25°C	Max DF % 25°C 120 Hz
T 384 & T 386 A Case + 40% − 20% Tolerance Standard				
_A102L020AS	.0010	20	0.5	10
_A152L020AS	.0015	20	0.5	10
_A222L020AS	.0022	20	0.5	10
_A332L020AS	.0033	20	0.5	10
_A472L020AS	.0047	20	0.5	10
_A682L020AS	.0068	20	0.5	10
_A103L020AS	.010	20	0.5	10
_A153L020AS	.015	20	0.5	10
_A223L020AS	.022	20	0.5	10
_A333L020AS	.033	20	0.5	10
_A473L020AS	.047	20	0.5	10
_A683L020AS	.068	20	0.5	10
_A104L020AS	.10	20	0.5	10
_A154L020AS	.15	20	0.5	6
_A224L015AS	.22	15	0.5	6
_A334L010AS	.33	10	0.5	6
_A474L006AS	.47	6	0.5	6
_A684L004AS	.68	4	0.5	10
_A105L003AS	1.0	3	0.5	10
_A155L002AS	1.5	2	0.5	15
T 384 & T 386 B Case + 40% − 20% Tolerance Standard				
_B102L020AS	.0010	20	0.5	10
_B152L020AS	.0015	20	0.5	10
_B222L020AS	.0022	20	0.5	10
_B332L020AS	.0033	20	0.5	10
_B472L020AS	.0047	20	0.5	10
_B682L020AS	.0068	20	0.5	10
_B103L020AS	.010	20	0.5	10
_B224L020AS	.22	20	0.5	6
_B334L015AS	.33	15	0.5	6
_B474L010AS	.47	10	0.5	6
_B684L006AS	.68	6	0.5	6
_B105L004AS	1.0	4	0.5	10
_B155L003AS	1.5	3	0.5	10
_B225L002AS	2.2	2	0.5	15
T 384 & T 386 C Case ± 20% Tolerance Standard				
_C334M020AS	.33	20	1.0	6
_C474M015AS	.47	15	1.0	6
_C684M010AS	.68	10	1.0	6
_C105M006AS	1.0	6	1.0	6
_C155M004AS	1.5	4	1.0	10
_C225M003AS	2.2	3	1.0	10
_C335M002AS	3.3	2	1.0	15

*Catalog Number	Capacitance uF 25°C 120 Hz	Voltage Rating 85°C	Max DCL μA 25°C	Max DF % 25°C 120 Hz
T 384 & T 386 D Case ± 20% Tolerance Standard				
_D684M020AS	.68	20	1.0	6
_D105M015AS	1.0	15	1.0	6
_D155M010AS	1.5	10	1.0	6
_D225M006AS	2.2	6	1.0	6
_D335M004AS	3.3	4	1.0	10
_D475M003AS	4.7	3	1.0	10
_D685M002AS	6.8	2	1.0	15
T 384 & T 386 E Case ± 20% Tolerance Standard				
_E105M020AS	1.0	20	1.0	6
_E155M015AS	1.5	15	1.0	6
_E225M010AS	2.2	10	1.0	6
_E335M006AS	3.3	6	1.0	6
_E475M004AS	4.7	4	1.0	10
_E685M003AS	6.8	3	1.0	10
_E106M002AS	10	2	1.0	15
T 384 & T 386 F Case ± 20% Tolerance Standard				
_F155M020AS	1.5	20	1.0	6
_F225M015AS	2.2	15	1.0	6
_F335M010AS	3.3	10	1.0	6
_F475M006AS	4.7	6	1.0	6
_F685M004AS	6.8	4	1.0	10
_F106M003AS	10	3	1.0	10
_F156M002AS	15	2	1.0	15
T 384 & T 386 G Case ± 20% Tolerance Standard				
_G225M020AS	2.2	20	1.0	6
_G335M015AS	3.3	15	1.0	6
_G475M010AS	4.7	10	1.0	6
_G685M006AS	6.8	6	1.0	6
_G106M004AS	10	4	1.0	10
_G156M003AS	15	3	1.0	10
_G226M002AS	22	2	1.0	15

*To complete Catalog Number add prefix to indicate Series, i.e., T384 Radial: T384A472L020AS
T386 Axial: T386A472L020AS

KEMET

SOLID TANTALUM CAPACITORS

UNION CARBIDE

THE FOLLOWING ADDITIONAL MICRON SERIES ARE ALSO AVAILABLE (REFER TO PRODUCT CATALOG — FORM F2710)

T371, T373

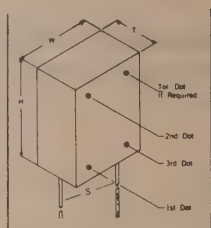
NON-POLAR
AXIAL OR RADIAL LEADS
RECTANGULAR SHAPE
EPOXY SEAL

- .001 to 33 μF
- 2 to 50 VDC
- −55°C to +125°C

Refer to page 41 for Capacitance Color Coding

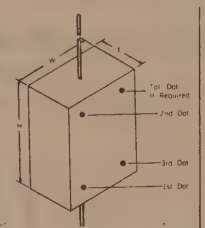
CAPACITOR OUTLINE DRAWINGS

T371 RADIAL LEADS



Lead Length: 1-5/8 ± 1/8 (41.3 ± 3.18)

T373 AXIAL LEADS



Lead Length: 1-5/8 ± 1/8 (41.3 ± 3.18)

DIMENSIONS — INCHES & (MILLIMETERS)

Case Size	H Case Height Max. Radial	H Case Height Max. Axial	W Case Width Max.	T Thick-ness Max.	S *Lead Spacing	Lead Diameter ±.001 (±.03)	Case Size	H Case Height Max. Radial	H Case Height Max. Axial	W Case Width Max.	T Thick-ness Max.	S *Lead Spacing	Lead Diameter ±.001 (±.03)
A	.135 (3.43)	.175 (4.32)	.120 (3.05)	.070 (1.78)	.100 (2.54)	.010 (.25)	F	.240 (6.10)	.280 (7.11)	.140 (3.56)	.180 (4.57)	.100 (2.54)	.010 (.25)
B	.160 (4.06)	.210 (5.33)	.120 (3.05)	.070 (1.78)	.100 (2.54)	.010 (.25)	G	.270 (6.86)	.310 (7.87)	.290 (7.37)	.155 (3.94)	.200 (5.08)	.016 (.41)
C	.200 (5.08)	.240 (6.10)	.140 (3.56)	.080 (2.03)	.100 (2.54)	.010 (.25)	H	.315 (8.00)	.370 (9.40)	.180 (4.57)	.220 (5.59)	.150 (3.81)	.016 (.41)
D	.180 (4.57)	.220 (5.59)	.125 (3.18)	.125 (3.18)	.100 (2.54)	.010 (.25)	J	.335 (8.51)	.390 (9.91)	.230 (5.84)	.230 (5.84)	.200 (5.08)	.016 (.41)
E	.235 (5.97)	.275 (6.99)	.190 (4.83)	.105 (2.67)	.125 (3.18)	.010 (.25)	*A, B, C, D, E, F Cases: ±.020 (±.51) G, H, J Cases: ±.025 (±.64)						

T380, T382

(SMALLEST LEADED ENCAPSULATED SOLID TANTALUM CAPACITORS AVAILABLE)

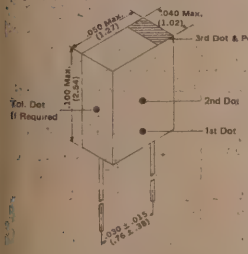
POLAR-EPOXY SEAL — RECTANGULAR SHAPE — RADIAL OR AXIAL LEADS

- .0047 to 0.47 μF
- 2 to 50 VDC
- −55°C to +125°C
- 130% Surge Voltage Rating
- +20%, +10%, and +5% Tolerances also Available

CAPACITOR OUTLINE DRAWINGS

ACTUAL SIZE — RADIAL

T380 RADIAL LEADS

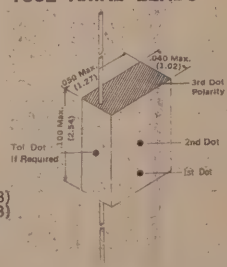


Lead Length:
Pos. 1⅜±⅛ (41.3±3.18)
Neg. 1⅜±⅛ (35.0±3.18)

Lead Diameter:
0.010±.001 (.25±.03)

ACTUAL SIZE — AXIAL

T382 AXIAL LEADS



RATINGS CHART

*Catalog Number	Capacitance μF 25°C 120 Hz	Voltage Rating 85°C	Max. DCL μA 25°C	Max. DF % 25°C 120 Hz
T380 & T382 A Case +40% −20% Tolerance Standard				
___A472L020AS	.0047	20	.5	10
___A682L020AS	.0068	20	.5	10
___A103L020AS	.010	20	.5	10
___A153L020AS	.015	20	.5	10
___A223L020AS	.022	20	.5	10
___A333L020AS	.033	20	.5	10
___A473L020AS	.047	20	.5	10
___A683L020AS	.068	20	.5	10
___A104L015AS	.10	15	.5	10
___A154L010AS	.15	10	.5	10
___A224L006AS	.22	6	.5	10
___A334L004AS	.33	4	.5	10
___A474L002AS	.47	2	.5	10

*To complete Catalog Number add prefix to indicate Series, i.e., T380 Radial: T380A472L020AS
T382 Axial: T382A472L020AS

Refer to page 41 for Capacitance Color Coding.

KEMET SOLID TANTALUM CAPACITORS

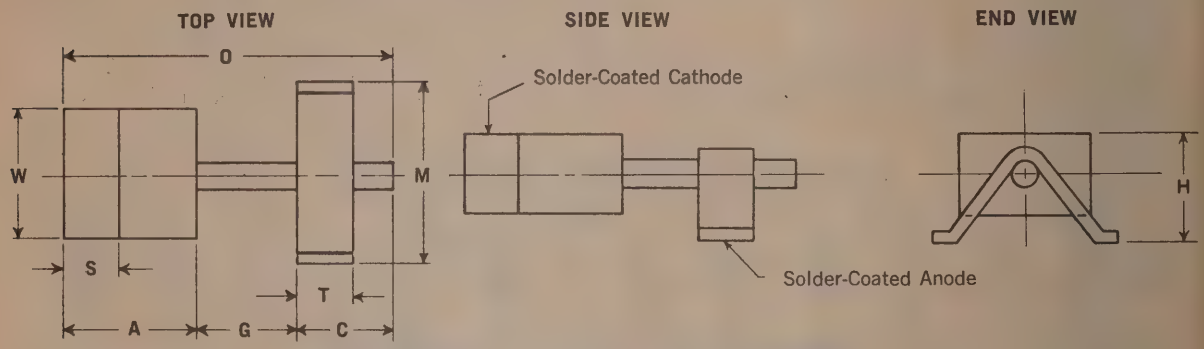
UNION CARBIDE

T411 & T421 SERIES — TANTALUM CHIP CAPACITORS

KEMET Tantalum Chip Capacitors present, at an economical price, maximum volumetric efficiency and high temperature capability. They are manufactured using a Union Carbide developed copper coating process that permits assembly temperatures up to 300°C for a short duration and continuous operating temperatures to 175°C when derated linearly to 25% of the 85°C voltage rating. They are specially designed for use in hybrid circuit and PC board applications using solder reflow bonding techniques. The anode connection consists of a solder coated nickel tab. Cathode connection is made to the solder coating surrounding the body of the chip. Standard capacitance values are from 0.1 to 100 μF with unlisted values available on special order. Voltage range is 4 to 50 VDC. For information on chips that are suitable for other bonding techniques (including epoxy), contact your KEMET representative.

T411 SERIES — STANDARD RECTANGULAR CHIP CAPACITORS

CAPACITOR OUTLINE DRAWINGS



DIMENSIONS — INCHES & (MILLIMETERS)

Case Size	O Max.	W Max.	A Max.	S Min.	G Min.	T Max.	C Max.	M Max.	H Max.	Wt. Max. Grams
A	.185 (4.70)	.100 (2.54)	.080 (2.03)	30%	.055 (1.40)	.045 (1.14)	.050 (1.27)	.100 (2.54)	.070 (1.78)	.06
B	.230 (5.84)	.130 (3.30)	.125 (3.18)	40%	.040 (1.02)	.055 (1.40)	.065 (1.65)	.150 (3.81)	.070 (1.78)	.11
C	.270 (6.86)	.160 (4.06)	.165 (4.19)	40%	.040 (1.02)	.055 (1.40)	.065 (1.65)	.150 (3.81)	.070 (1.78)	.18
D	.335 (8.51)	.170 (4.32)	.215 (5.46)	40%	.040 (1.02)	.065 (1.65)	.080 (2.03)	.150 (3.81)	.100 (2.54)	.28
E	.340 (8.64)	.180 (4.57)	.220 (5.59)	40%	.040 (1.02)	.065 (1.65)	.080 (2.03)	.150 (3.81)	.150 (3.81)	.35

T411 SERIES — STANDARD RATINGS AND CATALOG NUMBERS

*Catalog Number	Capacitance μF 25°C. 120 Hz	Rated Voltage 85° C	Maximum Leakage Current μA 25°C. Rated Voltage	Maximum D. F. % 120 Hz +25°C
A Case				
T411A104_050AS	.10	50	.5	4.0
T411A154_050AS	.15	50	.5	4.0
T411A224_035AS	.22	35	.5	4.0
T411A334_035AS	.33	35	.5	4.0
T411A474_025AS	.47	25	.5	4.0
T411A684_020AS	.68	20	.5	4.0
T411A105_015AS	1.0	15	.5	4.0
T411A155_010AS	1.5	10	.5	6.0
T411A225_006AS	2.2	6	.5	6.0
T411A335_004AS	3.3	4	.5	6.0
B Case				
T411B104_050AS	.10	50	1.0	4.0
T411B154_050AS	.15	50	1.0	4.0
T411B224_050AS	.22	50	1.0	4.0
T411B334_050AS	.33	50	1.0	4.0
T411B474_035AS	.47	35	1.0	4.0
T411B684_030AS	.68	30	1.0	4.0
T411B105_025AS	1.0	25	1.0	4.0
T411B155_020AS	1.5	20	1.0	6.0
T411B225_015AS	2.2	15	1.0	6.0
T411B335_010AS	3.3	10	1.0	6.0
T411B475_006AS	4.7	6	1.0	6.0
T411B685_004AS	6.8	4	1.0	6.0
C Case				
T411C474_050AS	.47	50	1.0	4.0
T411C684_050AS	.68	50	1.0	4.0
T411C105_035AS	1.0	35	1.0	4.0
T411C155_030AS	1.5	30	1.0	6.0
T411C225_025AS	2.2	25	1.0	6.0
T411C335_020AS	3.3	20	1.0	6.0
C Case continued				
T411C475_015AS	4.7	15	1.0	6.0
T411C685_010AS	6.8	10	1.0	6.0
T411C106_006AS	10.0	6	1.0	6.0
T411C156_004AS	15.0	4	1.0	6.0
D Case				
T411D105_050AS	1.0	50	2.0	4.0
T411D155_050AS	1.5	50	2.0	6.0
T411D225_035AS	2.2	35	2.0	6.0
T411D335_030AS	3.3	30	2.0	6.0
T411D475_025AS	4.7	25	2.0	6.0
T411D685_020AS	6.8	20	2.0	6.0
T411D106_015AS	10.0	15	2.0	6.0
T411D156_010AS	15.0	10	2.0	6.0
T411D226_006AS	22.0	6	2.0	6.0
T411D336_004AS	33.0	4	2.0	6.0
E Case				
T411E225_050AS	2.2	50	3.0	6.0
T411E335_050AS	3.3	50	3.0	6.0
T411E475_035AS	4.7	35	3.0	6.0
T411E685_030AS	6.8	30	3.0	6.0
T411E106_025AS	10.0	25	3.0	6.0
T411E156_020AS	15.0	20	3.0	6.0
T411E226_015AS	22.0	15	3.0	6.0
T411E336_010AS	33.0	10	3.0	6.0
T411E476_006AS	47.0	6	3.0	6.0
T411E686_004AS	68.0	4	3.0	6.0

*To complete Catalog Number insert Capacitance Symbol M ±20%, K ±10%, J ±5% in the 9th character.

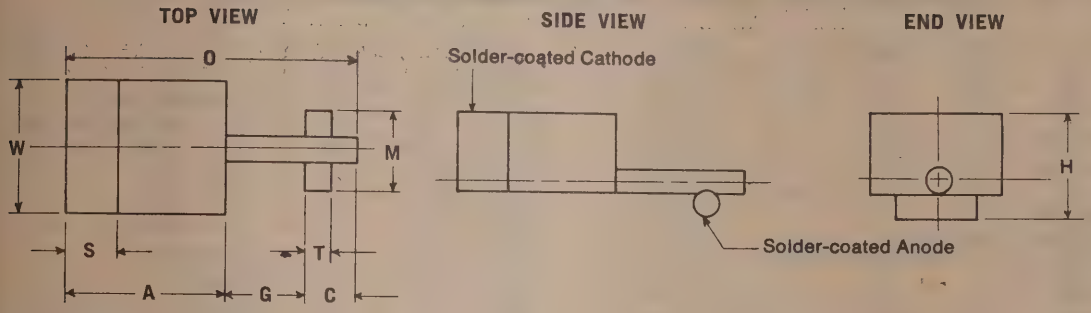
KEMET

SOLID TANTALUM CAPACITORS

UNION CARBIDE

T421 SERIES — MINIATURE RECTANGULAR CHIP CAPACITORS

CAPACITOR OUTLINE DRAWINGS



Case Size	O Max.	W Max.	A Max.	S Min.	G Min.	T Max.	C Max.	M Max.	H Max.	Wt. Max. Grams
A	.190 (4.83)	.070 (1.78)	.100 (2.54)	40%	.025 (.63)	.055 (1.40)	.065 (1.65)	.070 (1.78)	.060 (1.52)	.05
B	.205 (5.21)	.120 (3.05)	.120 (3.05)	40%	.025 (.63)	.050 (1.27)	.060 (1.52)	.070 (1.78)	.060 (1.52)	.09
C	.250 (6.35)	.160 (4.06)	.165 (4.19)	40%	.025 (.63)	.050 (1.27)	.060 (1.52)	.090 (2.29)	.080 (2.03)	.18
D	.305 (7.75)	.170 (4.32)	.215 (5.46)	40%	.025 (.63)	.055 (1.40)	.065 (1.65)	.090 (2.29)	.110 (2.79)	.35
E	.315 (8.00)	.175 (4.45)	.220 (5.59)	40%	.025 (.63)	.060 (1.52)	.070 (1.78)	.090 (2.29)	.150 (3.81)	.51

T421 SERIES — STANDARD RATINGS & CATALOG NUMBERS

DIMENSIONS — INCHES & (MILLIMETERS)

A-Case

*Catalog Number	Capacitance µF 25° C. 120 Hz	Rated Voltage 85° C	Maximum Leakage Current µA 25° C. Rated Voltage	Max. D. F. % 120 Hz +25° C
T421A104_050AS	.10	50	.5	4.0
T421A154_050AS	.15	50	.5	4.0
T421A224_050AS	.22	50	.5	4.0
T421A334_035AS	.33	35	.5	4.0
T421A474_025AS	.47	25	.5	4.0
T421A684_025AS	.68	25	.5	4.0
T421A105_020AS	1.0	20	.5	4.0
T421A155_015AS	1.5	15	.5	6.0
T421A225_010AS	2.2	10	.5	6.0
T421A335_006AS	3.3	6	.5	6.0
T421A475_004AS	4.7	4	.5	6.0

B-Case

*Catalog Number	Capacitance µF 25° C. 120 Hz	Rated Voltage 85° C	Maximum Leakage Current µA 25° C. Rated Voltage	Max. D. F. % 120 Hz +25° C
T421B334_050AS	.33	50	1.0	4.0
T421B474_050AS	.47	50	1.0	4.0
T421B684_035AS	.68	35	1.0	4.0
T421B105_025AS	1.0	25	1.0	4.0
T421B155_025AS	1.5	25	1.0	6.0
T421B225_020AS	2.2	20	1.0	6.0
T421B335_015AS	3.3	15	1.0	6.0
T421B475_010AS	4.7	10	1.0	6.0
T421B685_006AS	6.8	6	1.0	6.0
T421B106_004AS	10	4	1.0	6.0

*To complete Catalog Number insert Capacitance Symbol M ±20%, K ±10%, J ±5% in the 9th character.

C-Case

*Catalog Number	Capacitance µF 25° C. 120 Hz	Rated Voltage 85° C	Maximum Leakage Current µA 25° C. Rated Voltage	Max. D. F. % 120 Hz +25° C
T421C684_050AS	.68	50	2.0	4.0
T421C105_050AS	1.0	50	2.0	4.0
T421C155_050AS	1.5	50	2.0	6.0
T421C225_035AS	2.2	35	2.0	6.0
T421C335_025AS	3.3	25	2.0	6.0
T421C475_025AS	4.7	25	2.0	6.0
T421C685_020AS	6.8	20	2.0	6.0
T421C106_015AS	10	15	2.0	6.0
T421C156_010AS	15	10	2.0	6.0
T421C226_006AS	22	6	2.0	6.0
T421C336_004AS	33	4	2.0	6.0

D-Case

*Catalog Number	Capacitance µF 25° C. 120 Hz	Rated Voltage 85° C	Maximum Leakage Current µA 25° C. Rated Voltage	Max. D. F. % 120 Hz +25° C
T421D225_050AS	2.2	50	3.0	6.0
T421D335_050AS	3.3	50	3.0	6.0
T421D475_035AS	4.7	35	3.0	6.0
T421D685_025AS	6.8	25	3.0	6.0
T421D106_020AS	10	20	3.0	6.0
T421D156_020AS	15	20	3.0	6.0
T421D226_015AS	22	15	3.0	6.0
T421D336_010AS	33	10	3.0	6.0
T421D476_006AS	47	6	3.0	6.0
T421D686_004AS	68	4	3.0	6.0

E-Case

*Catalog Number	Capacitance µF 25° C. 120 Hz	Rated Voltage 85° C	Maximum Leakage Current µA 25° C. Rated Voltage	Max. D. F. % 120 Hz +25° C
T421E475_050AS	4.7	50	3.0	6.0
T421E685_035AS	6.8	35	3.0	6.0
T421E106_025AS	10	25	3.0	6.0
T421E226_020AS	22	20	3.0	6.0
T421E336_015AS	33	15	3.0	6.0
T421E476_010AS	47	10	3.0	6.0
T421E686_006AS	68	6	3.0	6.0
T421E107_004AS	100	4	3.0	6.0

KEMET CERAMIC CAPACITORS

UNION CARBIDE

KEMET CERAMIC CAPACITOR CATALOG NUMBERING SYSTEM
(MOLDED AND DIPPED (BLUE MAX) CAPACITORS ONLY)

C 052 K 102 K 2 X 1 C A

CERAMIC

CASE SIZE

SPECIFICATION
Current
C — Commercial
E — Kemet Established Reliability
T — MIL-C-39014C Slash Sheets 1C, 2E & 5C
K — MIL-C-11015D
G — MIL-C-20

CAPACITANCE
In picofarad code: First two digits are significant figures and third is number of zeros following (except 9 indicates division by 10). Examples: 0.1μF = 100,000pF = 104 and 0.1pF = 919.
See tables for Standard Values.

CAPACITANCE TOLERANCE

Standard	Others
M — ±20%	H — ±3%
K — ±10%	G — ±2%
J — ± 5%	F — ±1%
Z — +80% −20%	B — ±0.1pF
	C — ±0.25pF
P — GMV (Guar. Min. Value)	D — ±0.5pF
X — Other	

Standard tolerances for each Series are shown in the repetitive parts lists.

WORKING VOLTAGE
1 — 100 3 — 25
2 — 200 5 — 50 0 — Other

TEMPERATURE CHARACTERISTIC
(See Below)

INTERNAL CONSTRUCTION
1. High Temperature Solder. For Z5U Temperature Characteristic.
5. Ultra-High Temperature Solder. For all other Temperature Characteristics.

LEAD MATERIAL
C — Standard
Available on special order. Contact your sales representative.
D — Gold Dumet
G — Gold Plated Nickel
E — Copperweld (Solder Coated)
R — Copper (Solder Coated)

FAILURE RATE
A — Not Applicable (Std.)
L — 2.0%
M — 1.0%
P — .1%
R — .01%
S — .001%

STANDARD CAPACITANCE VALUES

10	22	47
12	27	56
15	33	68
18	39	82

These values are used with third-digit multipliers as noted above. Other, intermediate values may be used when tolerance is less than ±10% or on special order.

TEMPERATURE CHARACTERISTIC

Kemet Designator	Military Equivalent	EIA Equivalent	Capacitance Change With Temp.		
			Temp. Range, °C	Measured Without DC Bias Voltage	Measured With Bias (Rated Voltage)
G (Ultra Stable)	NPO, CG, BP	COG	−55 +125	±30 ppm/°C	±30 ppm/°C
X (Stable)	BX	X7R	−55 +125	±15%	+15% −25%
R (Stable)	BR	X7R	−55 +125	±15%	+15% −40%
U (General Purpose)	—	Z5U	+10 85	+22% −56%	N/A

INCHES TO MILLIMETERS CONVERSION TABLE

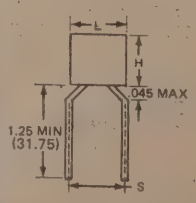
in.	mm	in.	mm	in.	mm	in.	mm
.001	.03	.045	1.14	.160	4.06	.290	7.37
.004	.10	.055	1.40	.170	4.32	.300	7.62
.005	.13	.060	1.52	.175	4.45	.350	8.89
.008	.20	.075	1.91	.180	4.57	.375	9.53
.010	.25	.090	2.29	.190	4.83	.390	9.91
.015	.38	.095	2.41	.200	5.08	.400	10.16
.016	.41	.100	2.54	.220	5.59	.495	12.57
.020	.51	.120	3.05	.240	6.10	.500	12.70
.025	.64	.140	3.56	.250	6.35	.690	17.53
.030	.76	.150	3.81	.260	6.60	1 in. = 25.4mm	

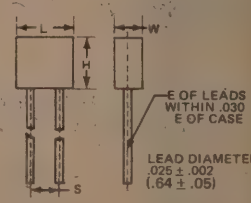
KEMET MONOLITHIC CERAMIC CAPACITORS
MOLDED CASES WITH RADIAL LEADS

OUTLINE DRAWINGS — DIMENSIONS IN INCHES (MILLIMETERS)

RADIAL LEAD DIMENSIONS. INCHES AND (MILLIMETERS)

KEMET CASE SIZE	MIL-C-20 EQUIVALENT	HEIGHT H	LENGTH L	WIDTH W	LEAD SPACING S
C052	CC05, CCR05	.190±.010 (4.83±.25)	.190±.010 (4.83±.25)	.090±.010 (2.29±.25)	.200±.015 (5.08±.38)
C062	CC06, CCR06	.290±.010 (7.37±.25)	.290±.010 (7.37±.25)	.090±.010 (2.29±.25)	.200+.015 (5.08±.38)
C512	CC07, CCR07	.480±.020 (12.19±.51)	.480±.020 (12.19±.51)	.140±.010 (3.56±.25)	.400±.020 (10.16±.51)
C522	CC08, CCR08	.480±.020 (12.19±.51)	.480±.002 (12.19±.51)	.240±.010 (6.10±.25)	.400±.020 (10.16±.51)





KEMET

MOLDED CERAMIC CAPACITORS

UNION CARBIDE

KEMET MONOLITHIC CERAMIC CAPACITORS

MOLDED CASES WITH RADIAL LEADS

STABLE TEMPERATURE CHARACTERISTIC: EIA X7R; MILITARY BX AND BR

Case Size	Cap., pF	Tol., %	Voltage	KEMET (1) (2)	MIL-C-11015	MIL-C-39014, for Failure Rate Levels (2)				
						L	M	P	R	S
	10	10	200	C052_100K2X5C_	CK05BX100K	1361	1201	1241	1281	1321
	10	20	200	C052_100M2X5C_	CK05BX100M	1362	1202	1242	1282	1322
	12	10	200	C052_120K2X5C_	CK05BX120K	1363	1203	1243	1283	1323
	15	10	200	C052_150K2X5C_	CK05BX150K	1364	1204	1244	1284	1324
	15	20	200	C052_150M2X5C_	CK05BX150M	1365	1205	1245	1285	1325
	18	10	200	C052_180K2X5C_	CK05BX180K	1366	1206	1246	1286	1326
	22	10	200	C052_220K2X5C_	CK05BX220K	1367	1207	1247	1287	1327
	22	20	200	C052_220M2X5C_	CK05BX220M	1368	1208	1248	1288	1328
	27	10	200	C052_270K2X5C_	CK05BX270K	1369	1209	1249	1289	1329
	33	10	200	C052_330K2X5C_	CK05BX330K	1370	1210	1250	1290	1330
	33	20	200	C052_330M2X5C_	CK05BX330M	1371	1211	1251	1291	1331
	39	10	200	C052_390K2X5C_	CK05BX390K	1372	1212	1252	1292	1332
	47	10	200	C052_470K2X5C_	CK05BX470K	1373	1213	1253	1293	1333
	47	20	200	C052_470M2X5C_	CK05BX470M	1374	1214	1254	1294	1334
	56	10	200	C052_560K2X5C_	CK05BX560K	1375	1215	1255	1295	1335
	68	10	200	C052_680K2X5C_	CK05BX680K	1376	1216	1256	1296	1336
	68	20	200	C052_680M2X5C_	CK05BX680M	1377	1217	1257	1297	1337
	82	10	200	C052_820K2X5C_	CK05BX820K	1378	1218	1258	1298	1338
	100	10	200	C052_101K2X5C_	CK05BX101K	1379	1219	1259	1299	1339
	100	20	200	C052_101M2X5C_	CK05BX101M	1380	1220	1260	1300	1340
	120	10	200	C052_121K2X5C_	CK05BX121K	1381	1221	1261	1301	1341
	150	10	200	C025_151K2X5C_	CK05BX151K	1382	1222	1262	1302	1342
	150	20	200	C052_151M2X5C_	CK05BX151M	1383	1223	1263	1303	1343
	180	10	200	C052_181K2X5C_	CK05BX181K	1384	1224	1264	1304	1344
	220	10	200	C052_221K2X5C_	CK05BX221K	1385	1225	1265	1305	1345
	220	20	200	C052_221M2X5C_	CK05BX221M	1386	1226	1266	1306	1346
	270	10	200	C052_271K2X5C_	CK05BX271K	1387	1227	1267	1307	1347
	330	10	200	C052_331K2X5C_	CK05BX331K	1388	1228	1268	1308	1348
	330	20	200	C052_331M2X5C_	CK05BX331M	1389	1229	1269	1309	1349
	390	10	200	C052_391K2X5C_	CK05BX391K	1390	1230	1270	1310	1350
	470	10	200	C052_471K2X5C_	CK05BX471K	1391	1231	1271	1311	1351
	470	20	200	C052_471M2X5C_	CK05BX471M	1392	1232	1272	1312	1352
	560	10	200	C052_561K2X5C_	CK05BX561K	1393	1233	1273	1313	1353
	680	10	200	C052_681K2X5C_	CK05BX681K	1394	1234	1274	1314	1354
	680	20	200	C052_681M2X5C_	CK05BX681M	1395	1235	1275	1315	1355
	820	10	200	C052_821K2X5C_	CK05BX821K	1396	1236	1276	1316	1356
C052	1,000	10	200	C052_102K2X5C_	CK05BX102K	1397	1237	1277	1317	1357
	1,000	20	200	C052_102M2X5C_	CK05BX102M	1398	1238	1278	1318	1358
	1,200	10	100	C052_122K1X5C_	CK05BX122K	1399	1239	1279	1319	1359
	1,500	10	100	C052_152K1X5C_	CK05BX152K	1400	1240	1280	1320	1360
	1,500	20	100	C052_152M1X5C_	CK05BX152M	1401	1441	1481	1521	1561
	1,800	10	100	C052_182K1X5C_	CK05BX182K	1402	1442	1482	1522	1562
	2,200	10	100	C052_222K1X5C_	CK05BX222K	1403	1443	1483	1523	1563
	2,200	20	100	C052_222M1X5C_	CK05BX222M	1404	1444	1484	1524	1564
	2,700	10	100	C052_272K1X5C_	CK05BX272K	1405	1445	1485	1525	1565
	3,300	10	100	C052_332K1X5C_	CK05BX332K	1406	1446	1486	1526	1566
	3,300	20	100	C052_332M1X5C_	CK05BX332M	1407	1447	1487	1527	1567
	3,900	10	100	C052_392K1X5C_	CK05BX392K	1408	1448	1488	1528	1568
	4,700	10	100	C052_472K1X5C_	CK05BX472K	1409	1449	1489	1529	1569
	4,700	20	100	C052_472M1X5C_	CK05BX472M	1410	1450	1490	1530	1570
	5,600	10	100	C052_562K1X5C_	CK05BX562K	1411	1451	1491	1531	1571
	6,800	10	100	C052_682K1X5C_	CK05BX682K	1412	1452	1492	1532	1572
	6,800	20	100	C052_682M1X5C_	CK05BX682M	1413	1453	1493	1533	1573
	8,200	10	100	C052_822K1X5C_	CK05BX822K	1414	1454	1494	1534	1574
	10,000	10	100	C052_103K1X5C_	CK05BX103K	1415	1455	1495	1535	1575
	10,000	20	100	C052_103M1X5C_	CK05BX103M	1416	1456	1496	1536	1576
	12,000	10	50	C052_123K5X5C_	CK05BX123K	1417	1457	1497	1537	1577
	15,000	10	50	C052_153K5X5C_	CK05BX153K	1418	1458	1498	1538	1578
	15,000	20	50	C052_153M5X5C_	CK05BX153M	1419	1459	1499	1539	1579
	18,000	10	50	C052_183K5X5C_	CK05BX183K	1420	1460	1500	1540	1580
	22,000	10	50	C052_223K5X5C_	CK05BX223K	1421	1461	1501	1541	1581
	22,000	20	50	C052_223M5X5C_	CK05BX223M	1422	1462	1502	1542	1582
	27,000	10	50	C052_273K5X5C_	CK05BX273K	1423	1463	1503	1543	1583
	33,000	10	50	C052_333K5X5C_	CK05BX333K	1424	1464	1504	1544	1584
	33,000	20	50	C052_333M5X5C_	CK05BX333M	1425	1465	1505	1545	1585
	39,000	10	50	C052_393K5X5C_	CK05BX393K	1426	1466	1506	1546	1586
	47,000	10	50	C052_473K5X5C_	CK05BX473K	1427	1467	1507	1547	1587
	47,000	20	50	C052_473M5X5C_	CK05BX473M	1428	1468	1508	1548	1588
	56,000	10	50	C052_563K5X5C_	CK05BX563K	1429	1469	1509	1549	1589
	68,000	10	50	C052_683K5X5C_	CK05BX683K	1430	1470	1510	1550	1590
	68,000	20	50	C052_683M5X5C_	CK05BX683M	1431	1471	1511	1551	1591
	82,000	10	50	C052_823K5X5C_	CK05BX823K	1432	1472	1512	1552	1592
	100,000	10	50	C052_104K5X5C_	CK05BX104K	1433	1433	1513	1553	1593
	100,000	20	50	C052_104M5X5C_	CK05BX104M	1434	1474	1514	1554	1594

Notes: (1) Insert proper symbol for specification: C — Kemet Standard, K — MIL-C-11015, T — MIL-C-39014.
(2) Failure rates are designated as follows: A — Not Applicable (applies to all but MIL-C-39014 parts), L — 2% per Khr (now inactive for new design), M — 1%/Khr, P — 0.1%/Khr, R — 0.01%/Khr, and S — 0.001%/Khr.

KEMET MOLDED CERAMIC CAPACITORS

UNION CARBIDE

KEMET MONOLITHIC CERAMIC CAPACITORS

MOLDED CASES WITH RADIAL LEADS

STABLE TEMPERATURE CHARACTERISTIC; EIA X7R; MILITARY BX AND BR

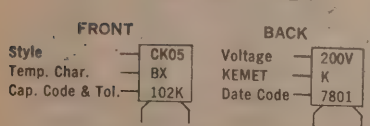
Case Size	Cap., pF	Tol., %	Voltage	KEMET (1) (2)	MIL-C-11015	MIL-C-39014, for Failure Rate Levels (2) L	M	P	R	S
C062	1,200	10	200	C062_122K2X5C_	CK06BX122K	1361	1201	1241	1281	1321
	1,500	10	200	C062_152K2X5C_	CK06BX152K	1362	1202	1242	1282	1322
	1,500	20	200	C062_152M2X5C_	CK06BX152M	1363	1203	1243	1283	1323
	1,800	10	200	C062_182K2X5C_	CK06BX182K	1364	1204	1244	1284	1324
	2,200	10	200	C062_222K2X5C_	CK06BX222K	1366	1206	1246	1286	1326
	2,200	20	200	C062_222M2X5C_	CK06BX222M	1367	1207	1247	1287	1327
	2,700	10	200	C062_272K2X5C_	CK06BX272K	1368	1208	1248	1288	1328
	3,300	10	200	C062_332K2X5C_	CK06BX332K	1369	1209	1249	1289	1329
	3,300	20	200	C062_332M2X5C_	CK06BX332M	1370	1210	1250	1290	1330
	3,900	10	200	C062_392K2X5C_	C60KBX392K	1371	1211	1251	1291	1331
	4,700	10	200	C062_472K2X5C_	CK06BX472K	1372	1212	1252	1292	1332
	4,700	20	200	C062_472M2X5C_	CK06BX472M	1373	1213	1253	1293	1333
	5,600	10	200	C062_562K2X5C_	CK06BX562K	1374	1214	1254	1294	1334
	6,800	10	200	C062_682K2X5C_	CK06BX682K	1375	1215	1255	1295	1335
	6,800	20	200	C062_682M2X5C_	CK06BX682M	1376	1216	1256	1296	1336
	8,200	10	200	C062_822K2X5C_	CK06BX822K	1377	1217	1257	1297	1337
	10,000	10	200	C062_103K2X5C_	CK06BX103K	1378	1218	1258	1298	1338
	10,000	20	200	C062_103M2X5C_	CK06BX103M	1379	1219	1259	1299	1339
	12,000	10	100	C062_123K1X5C_	CK06BX123K	1380	1231	1271	1311	1351
	15,000	10	100	C062_153K1X5C_	CK06BX153K	1381	1220	1260	1300	1340
	18,000	10	100	C062_183K1X5C_	CK06BX183K	1382	1221	1261	1301	1341
	22,000	10	100	C062_223K1X5C_	CK06BX223K	1383	1222	1262	1302	1342
	27,000	10	100	C062_273K1X5C_	CK06BX273K	1384	1232	1272	1312	1352
	33,000	10	100	C062_333K1X5C_	CK06BX333K	1385	1223	1263	1303	1343
	39,000	10	100	C062_393K1X5C_	CK06BX393K	1386	1224	1264	1304	1344
	47,000	10	100	C062_473K1X5C_	CK06BX473K	1387	1225	1265	1305	1345
	56,000	10	100	C062_563K1X5C_	CK06BX563K	1388	1226	1266	1306	1346
	68,000	10	100	C062_683K1X5C_	CK06BX683K	1389	1227	1267	1307	1347
	82,000	10	100	C062_823K1X5C_	CK06BX823K	1390	1229	1269	1309	1349
	100,000	10	100	C062_104K1X5C_	CK06BX104K	1391	1230	1270	1310	1350
	120,000	10	50	C062_124K5X5C_	CK06BX124K	1392	1233	1273	1313	1353
	150,000	10	50	C062_154K5X5C_	CK06BX154K	1393	1234	1274	1314	1354
	180,000	10	50	C062_184K5X5C_	CK06BX184K	1394	1235	1275	1315	1355
	220,000	10	50	C062_224K5X5C_	CK06BX224K	1395	1236	1276	1316	1356
	270,000	10	50	C062_274K5X5C_	CK06BX274K	1396	1237	1277	1317	1357
	330,000	10	50	C062_334K5X5C_	CK06BX334K	1397	1238	1278	1318	1358
	390,000	10	50	C062_394K5X5C_	CK06BX394K	1398	1239	1279	1319	1359
	470,000	10	50	C062_474K5X5C_	CK06BX474K	1399	1240	1280	1320	1360
	560,000	10	50	C062_564K5X5C_	CK06BX564K	1400	1404	1408	1412	1416
	680,000	10	50	C062_684K5X5C_	CK06BX684K	1401	1405	1409	1413	1417
	820,000	10	50	C062_824K5X5C_	CK06BX824K	1402	1406	1410	1414	1418
	1,000,000	10	50	C062_105K5X5C_	CK06BX105K	1403	1407	1411	1415	1419
				(3)						
(4) C512*	1.0	(3)	50	C512C105_5X5CA						
	1.5	(3)	50	C512C155_5X5CA						
	2.0	(3)	50	C512C205_5X5CA						
	2.2	(3)	50	C512C225_5X5CA						
				(3)						
(4) C522*	1.0	(3)	100	C522C105_1X5CA						
	2.0	(3)	50	C522C205_5X5CA						
	2.2	(3)	50	C522C225_5X5CA						
	2.7	(3)	50	C522C275_5X5CA						
	3.3	(3)	50	C522C335_5X5CA						

* Exceptionally high volumetric efficiency and packaging density with values available as high as 3.3 μF.

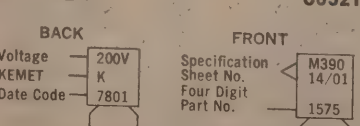
Notes: (1) See page 47. Insert proper symbol for specification: C — Kemet Standard, K — MIL-C-11015, T — MIL-C-39014.
(2) Failure rates are designated as follows: A — Not Applicable (applies to all but MIL-C-39014 parts), L — 2% per Khr (now inactive for new design), M — 1%/Khr, P — 0.1%/Khr, R — 0.01%/Khr, and S — 0.001%/Khr.
(3) Insert proper symbol for capacitance tolerance: K — ±10%, M — ±20%.
(4) Not available from military specification.

MARKING OUTLINE DRAWINGS

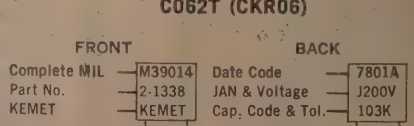
C052K and C062K



C052T (CKR05)



C062T (CKR06)

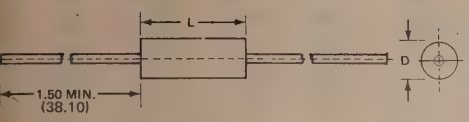


KEMET MOLDED CERAMIC CAPACITORS

UNION CARBIDE

MOLDED CASES WITH AXIAL LEADS

OUTLINE DRAWINGS — DIMENSIONS IN INCHES (MILLIMETERS)



Case Size	L	D	C	Military Styles	
				MIL-C-11015	MIL-C-39014
C114	.160±.010 (4.06±.25)	.090±.010 (2.29±.25)	.020, +.000, −.005 (.51, +.00, −.13)	CK12	CKR11
C124	.250±.010 (6.35±.25)	.090±.010 (2.29±.25)	.020, +.000, −.005 (.51, +.00, −.13)	CK13	CKR12
C192	.390±.010 (9.91±.25)	.140±.010 (3.56±.25)	.025, +.004, −.001 (.64, +.10, −.03)	CK14	CKR14
C202	.500±.020 (12.70±.51)	.250±.015 (6.35±.38)	.025, +.004, −.001 (.64, +.10, −.03)	CK15	CKR15
C222	.690±.030 (17.53±.76)	.350±.020 (8.89±.51)	.025, +.004, −.001 (.64, +.10, −.03)	CK16	CKR16

STABLE TEMPERATURE CHARACTERISTIC: EIA X7R, MILITARY BX AND BR

Case Size	Cap., pF	Tol., %	Voltage	KEMET (1) (2)	MIL-C-11015	MIL-C-39014/05, for Failure Rate Levels (2)				
						L	M	P	R	S
C114 (Military CK12 or CKR11)	10	10	100	C114_100K1X5C_	CK12BX100K	2401	2601	2801	2001	2201
	10	20	100	C114_100M1X5C_	CK12BX100M	2402	2602	2802	2002	2202
	12	10	100	C114_120K1X5C_	CK12BX120K	2403	2603	2803	2003	2203
	15	10	100	C114_150K1X5C_	CK12BX150K	2404	2604	2804	2004	2204
	15	20	100	C114_150M1X5C_	CK12BX150M	2405	2605	2805	2005	2205
	18	10	100	C114_180K1X5C_	CK12BX180K	2406	2606	2806	2006	2206
	22	10	100	C114_220K1X5C_	CK12BX220K	2407	2607	2807	2007	2207
	22	20	100	C114_220M1X5C_	CK12BX220M	2408	2608	2808	2008	2208
	27	10	100	C114_270K1X5C_	CK12BX270K	2409	2609	2809	2009	2209
	33	10	100	C114_330K1X5C_	CK12BX330K	2410	2610	2810	2010	2210
	33	20	100	C114_330M1X5C_	CK12BX330M	2411	2611	2811	2011	2211
	39	10	100	C114_390K1X5C_	CK12BX390K	2412	2612	2812	2012	2212
	47	10	100	C114_470K1X5C_	CK12BX470K	2413	2613	2813	2013	2213
	47	20	100	C114_470M1X5C_	CK12BX470M	2414	2614	2814	2014	2214
	56	10	100	C114_560K1X5C_	CK12BX560K	2415	2615	2815	2015	2215
	68	10	100	C114_680K1X5C_	CK12BX680K	2416	2616	2816	2016	2216
	68	20	100	C114_680M1X5C_	CK12BX680M	2417	2617	2817	2017	2217
	82	10	100	C114_820K1X5C_	CK12BX820K	2418	2618	2818	2018	2218
	100	10	100	C114_101K1X5C_	CK12BX101K	2419	2619	2819	2019	2219
	100	20	100	C114_101M1X5C_	CK12BX101M	2420	2620	2820	2020	2220
	120	10	100	C114_121K1X5C_	CK12BX121K	2421	2621	2821	2021	2221
	150	10	100	C114_151K1X5C_	CK12BX151K	2422	2622	2822	2022	2222
	150	20	100	C114_151M1X5C_	CK12BX151M	2423	2623	2823	2023	2223
	180	10	100	C114_181K1X5C_	CK12BX181K	2424	2624	2824	2024	2224
	220	10	100	C114_221K1X5C_	CK12BX221K	2425	2625	2825	2025	2225
	220	20	100	C114_221M1X5C_	CK12BX221M	2426	2626	2826	2026	2226
	270	10	100	C114_271K1X5C_	CK12BX271K	2427	2627	2827	2027	2227
	330	10	100	C114_331K1X5C_	CK12BX331K	2428	2628	2828	2028	2228
	330	20	100	C114_331M1X5C_	CK12BX331M	2429	2629	2829	2029	2229
	390	10	100	C114_391K1X5C_	CK12BX391K	2430	2630	2830	2030	2230
	470	10	100	C114_471K1X5C_	CK12BX471K	2431	2631	2831	2031	2231
	470	20	100	C114_471M1X5C_	CK12BX471M	2432	2632	2832	2032	2232
	560	10	100	C114_561K1X5C_	CK12BX561K	2433	2633	2833	2033	2233
	680	10	100	C114_681K1X5C_	CK12BX681K	2434	2634	2834	2034	2234
	680	20	100	C114_681M1X5C_	CK12BX681M	2435	2635	2835	2035	2235
	820	10	100	C114_821K1X5C_	CK12BX821K	2436	2636	2836	2036	2236
	1,000	10	100	C114_102K1X5C_	CK12BX102K	2437	2637	2837	2037	2237
	1,000	20	100	C114_102M1X5C_	CK12BX102M	2438	2638	2838	2038	2238
	1,200	10	100	C114_122K1X5C_	CK12BX122K	2439	2639	2839	2039	2239
	1,500	10	100	C114_152K1X5C_	CK12BX152K	2440	2640	2840	2040	2240
	1,500	20	100	C114_152M1X5C_	CK12BX152M	2441	2641	2841	2041	2241
	1,800	10	100	C114_182K1X5C_	CK12BX182K	2442	2642	2842	2042	2242
	2,200	10	100	C114_222K1X5C_	CK12BX222K	2443	2643	2843	2043	2243
	2,200	20	100	C114_222M1X5C_	CK12BX222M	2444	2644	2844	2044	2244
	2,700	10	100	C114_272K1X5C_	CK12BX272K	2445	2645	2845	2045	2245
	3,300	10	100	C114_332K1X5C_	CK12BX332K	2446	2646	2846	2046	2246
	3,300	20	100	C114_332M1X5C_	CK12BX332M	2447	2647	2847	2047	2247
	3,900	10	100	C114_392K1X5C_	CK12BX392K	2448	2648	2848	2048	2248
	4,700	10	100	C114_472K1X5C_	CK12BX472K	2449	2649	2849	2049	2249
	4,700	20	100	C114_472M1X5C_	CK12BX472M	2450	2650	2850	2050	2250
	5,600	10	50	C114_562K5X5C_	CK12BX562K	2451	2651	2851	2051	2251
	6,800	10	50	C114_682K5X5C_	CK12BX682K	2452	2652	2852	2052	2252
	6,800	20	50	C114_682M5X5C_	CK12BX682M	2453	2653	2853	2053	2253
	8,200	10	50	C114_822K5X5C_	CK12BX822K	2454	2654	2854	2054	2254
	10,000	10	50	C114_103K5X5C_	CK12BX103K	2455	2655	2855	2055	2255
	10,000	20	50	C114_103M5X5C_	CK12BX103M	2456	2656	2856	2056	2256

Notes: (1) Insert proper symbol for specification: C — Kemet standard, K — MIL-C-11015, T — MIL-C-39014.
(2) Failure rates are designated as follows: A — Not Applicable (applies to all but MIL-C-39014 parts), L — 2%/Khr (now inactive for new design), M — 1%/Khr, P — 0.1%/Khr, R — 0.01%/Khr, S — 0.001%/Khr.

KEMET MOLDED CERAMIC CAPACITORS

UNION CARBIDE

STABLE TEMPERATURE CHARACTERISTIC: EIA X7R, MILITARY BX AND BR

Case Size	Cap., pF	Tol., %	Voltage	KEMET (1) (2)	MIL-C-11015	MIL-C-39014/05, for Failure Rate Levels (2) L	M	P	R	S
C124 (Military CK13 or CKR12)	5,600	10	100	C124_562K1X5C_	CK13BX562K	2457	2657	2857	2057	2257
	6,800	10	100	C124_682K1X5C_	CK13BX682K	2458	2658	2858	2058	2258
	6,800	20	100	C124_682M1X5C_	CK13BX682M	2459	2659	2859	2059	2259
	8,200	10	100	C124_822K1X5C_	CK13BX822K	2460	2660	2860	2060	2260
	10,000	10	100	C124_103K1X5C_	CK13BX103K	2461	2661	2861	2061	2261
	10,000	20	100	C124_103M1X5C_	CK13BX103M	2462	2662	2862	2062	2262
	12,000	10	50	C124_123K5X5C_	CK13BR123K	2463	2663	2863	2063	2263
	15,000	10	50	C124_153K5X5C_	CK13BR153K	2464	2664	2864	2064	2264
	15,000	20	50	C124_153M5X5C_	CK13BR153M	2465	2665	2865	2065	2265
	18,000	10	50	C124_183K5X5C_	CK13BR183K	2466	2666	2866	2066	2266
	22,000	10	50	C124_223K5X5C_	CK13BR223K	2467	2667	2867	2067	2267
	22,000	20	50	C124_223M5X5C_	CK13BR223M	2468	2668	2868	2068	2268
	27,000	10	50	C124_273K5X5C_	CK13BR273K	2469	2669	2869	2069	2269
	33,000	10	50	C124_333K5X5C_	CK13BR333K	2470	2670	2870	2070	2270
	33,000	20	50	C124_333M5X5C_	CK13BR333M	2471	2671	2871	2071	2271
	39,000	10	50	C124_393K5X5C_	CK13BR393K	2472	2672	2872	2072	2272
	47,000	10	50	C124_473K5X5C_	CK13BR473K	2473	2673	2873	2073	2273
	47,000	20	50	C124_473M5X5C_	CK13BR473M	2474	2674	2874	2074	2274
C192 (Military CK14 or CKR14)	12,000	10	100	C192_123K1X5C_	CK14BX123K	2475	2675	2875	2075	2275
	15,000	10	100	C192_153K1X5C_	CK14BX153K	2476	2676	2876	2076	2276
	15,000	20	100	C192_153M1X5C_	CK14BX153M	2477	2677	2877	2077	2277
	18,000	10	100	C192_183K1X5C_	CK14BX183K	2478	2678	2878	2078	2278
	22,000	10	100	C192_223K1X5C_	CK14BX223K	2479	2679	2879	2079	2279
	22,000	20	100	C192_223M1X5C_	CK14BX223M	2480	2680	2880	2080	2280
	27,000	10	100	C192_273K1X5C_	CK14BX273K	2481	2681	2881	2081	2281
	33,000	10	100	C192_333K1X5C_	CK14BX333K	2482	2682	2882	2082	2282
	33,000	20	100	C192_333M1X5C_	CK14BX333M	2483	2683	2883	2083	2283
	39,000	10	100	C192_393K1X5C_	CK14BX393K	2484	2684	2884	2084	2284
	47,000	10	100	C192_473K1X5C_	CK14BX473K	2485	2685	2885	2085	2285
	47,000	20	100	C192_473M1X5C_	CK14BX473M	2486	2686	2886	2086	2286
	56,000	10	50	C192_563K5X5C_		2487	2687	2887	2087	2287
	68,000	10	50	C192_683K5X5C_		2488	2688	2888	2088	2288
	68,000	20	50	C192_683M5X5C_		2489	2689	2889	2089	2289
	82,000	10	50	C192_823K5X5C_		2490	2690	2890	2090	2290
	100,000	10	50	C192_104K5X5C_		2491	2691	2891	2091	2291
	100,000	20	50	C192_104M5X5C_		2492	2692	2892	2092	2292
	56,000	10	100	C192_563K1R5C_	CK14BX563K	2493	2693	2893	2093	2293
	68,000	10	100	C192_683K1R5C_	CK14BX683K	2494	2694	2894	2094	2294
	68,000	20	100	C192_683M1R5C_	CK14BX683M	2495	2695	2895	2095	2295
	82,000	10	100	C192_823K1R5C_	CK14BX823K	2496	2696	2896	2096	2296
	100,000	10	100	C192_104K1R5C_	CK14BX104K	2497	2697	2897	2097	2297
	100,000	20	100	C192_104M1R5C_	CK14BX104M	2498	2698	2898	2098	2298
	120,000	10	50	C192_124K5R5C_	CK14BR124K	2499	2699	2899	2099	2299
	150,000	10	50	C192_154K5R5C_	CK14BR154K	2500	2700	2900	2100	2300
	150,000	20	50	C192_154M5R5C_	CK14BR154M	2501	2701	2901	2101	2301
	180,000	10	50	C192_184K5R5C_	CK14BR184K	2502	2702	2902	2102	2302
	220,000	10	50	C192_224K5R5C_	CK14BR224K	2503	2703	2903	2103	2303
	220,000	20	50	C192_224M5R5C_	CK14BR224M	2504	2704	2904	2104	2304
	270,000	10	50	C192_274K5R5C_	CK14BR274K	2505	2705	2905	2105	2305
C202 (Military CK15 or CKR15)	56,000	10	100	C202_563K1X5C_		2506	2706	2906	2106	2306
	68,000	10	100	C202_683K1X5C_		2507	2707	2907	2107	2307
	68,000	20	100	C202_683M1X5C_		2508	2708	2908	2108	2308
	82,000	10	100	C202_823K1X5C_		2509	2709	2909	2109	2309
	100,000	10	100	C202_104K1X5C_	CK15BX104K	2510	2710	2910	2110	2310
	100,000	20	100	C202_104M1X5C_	CK15BX104M	2511	2711	2911	2111	2311
	120,000	10	100	C202_124K1R5C_	CK15BR124K	2512	2712	2912	2112	2312
	150,000	10	100	C202_154K1R5C_	CK15BR154K	2513	2713	2913	2113	2313
	150,000	20	100	C202_154M1R5C_	CK15BR154M	2514	2714	2914	2114	2314
	180,000	10	100	C202_184K1R5C_	CK15BR184K	2515	2715	2915	2115	2315
	220,000	10	100	C202_224K1R5C_	CK15BR224K	2516	2716	2916	2116	2316
	220,000	20	100	C202_224M1R5C_	CK15BR224M	2517	2717	2917	2117	2317
	270,000	10	100	C202_274K1R5C_	CK15BR274K	2518	2718	2918	2118	2318
	330,000	10	100	C202_334K1R5C_	CK15BR334K	2519	2719	2919	2119	2319
	330,000	20	100	C202_334M1R5C_	CK15BR334M	2520	2720	2920	2120	2320
	470,000	10	50	C202_474K5R5C_	CK15BR474K	2521	2721	2921	2121	2321
	470,000	20	50	C202_474M5R5C_	CK15BR474M	2522	2722	2922	2122	2322
	680,000	10	50	C202_684K5R5C_	CK15BR684K	2523	2733	2923	2123	2323
	680,000	20	50	C202_684M5R5C_	CK15BR684M	2524	2724	2924	2124	2324
	1,000,000	10	50	C202_105K5R5C_	CK15BR105K	2525	2725	2925	2125	2325
	1,000,000	20	50	C202_105M5R5C_	CK15BR105M	2526	2726	2926	2126	2326

Notes: (1) Insert proper symbol for specification: C — Kemet standard, K — MIL-C-11015, T — MIL-C-39014.
(2) Failure rates are designated as follows: A — Not Applicable (applies to all but MIL-C-39014 parts), L — 2%/Khr (now inactive for new design), M — 1%/Khr, P — 0.1%/Khr, R — 0.01%/Khr, S — 0.001%/Khr.

KEMET MOLDED CERAMIC CAPACITORS

UNION CARBIDE

STABLE TEMPERATURE CHARACTERISTIC: EIA X7R, MILITARY BX AND BR (CONT'D)

Case Size	Cap., pF	Tol., %	Voltage	KEMET (1) (2)	MIL-C-11015	MIL-C-39014/05, for Failure Rate Levels (2) L	M	P	R	S
C222 (Military CK16 or CKR16)	470,000	10	100	C222_474K1R5C_	CK16BR474K	2527	2727	2927	2127	2327
	470,000	20	100	C222_474M1R5C_	CK16BR474M	2528	2728	2928	2128	2328
	680,000	10	100	C222_684K1R5C_		2529	2729	2929	2129	2329
	680,000	20	100	C222_684M1R5C_		2530	2730	2930	2130	2330
	1,000,000	10	100	C222_105K1R5C_	CK16BR105K	2531	2731	2931	2131	2331
	1,000,000	20	100	C222_105M1R5C_	CK16BR105M	2532	2732	2932	2132	2332
	2,200,000	10	50	C222_225K5R5C_	CK16BR225K	2533	2733	2933	2133	2333
	2,200,000	20	50	C222_225M5R5C_	CK16BR225M	2534	2734	2934	2134	2334
	3,300,000	10	50	C222_335K5R5C_	CK16BR335K	2535	2735	2935	2135	2335
	3,300,000	20	50	C222_335M5R5C_	CK16BR335M	2536	2736	2936	2136	2336

Notes: (1) Insert proper symbol for specification: C — Kemet standard, K — MIL-C-11015, T — MIL-C-39014.
(2) Failure rates are designated as follows: A — Not Applicable (applies to all but MIL-C-39014 parts), L — 2%/Khr (now inactive for new design), M — 1%/Khr, P — 0.1%/Khr, R — 0.01%/Khr, S — 0.001%/Khr.

MARKING

C114 (CKR11)

JK — J for JAN, K for KEMET
100 — Capacitance Code
KP8 — Cap. Tol. FR Level & Date Code (Yr.)
31A — Lot Code Inspection Lot Code

C114 (CK12) C124 (CK13)

KCK — KEMET, CK
12BX — Style (12 or 13), Temp. Char. (BX or BR)
102K — Capacitance Code & Tolerance
7801 — Date Code

C192 (CK14) C202 (CK15) C222 (CK16)

M39014 5-2125 — Complete MIL Part No.
KEMET — KEMET
7801A — Lot Code
J50V — JAN & Voltage
105K — Capacitance Code & Tol.

C124 (CKR12)

JCK12 — J for JAN
103KP — Cap. Code, Cap. Tol. & FR Level
7801A — Date & Lot Code
K — KEMET

C192 (CKR14) C202 (CKR15) C222 (CKR16)

K100V — KEMET, Voltage
CK14BX — Style, Temp. Char.
123K — Capacitance Code & Tolerance
7801 — Date Code

ULTRA-STABLE TEMPERATURE CHARACTERISTIC: EIA COG, MILITARY CG, VERNACULAR NPO

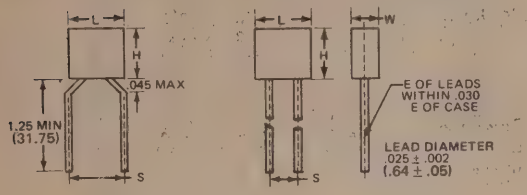
Case Size	Voltage	KEMET Cap. Range, pF	KEMET Part Number (5) (8) (6)	MIL-C-20 Specification Cap. Range, pF	Part Number (9) (6) (7)(6)	Slash No.
C114	200	1-330	C114_XXX_2G5C_	1-75	CC_75CGXXX_ _	27
	100	82-680	C114_XXX_1G5C_	82-240	do.	
	50	270-680	C114_XXX_5G5C_	270-680	do.	
C124	200	82-560	C124_XXX_2G5C_	82-120	CC_76CGXXX_ _	28
	100	270-1,000	C124_XXX_1G5C_	270-390	do.	
	50	820-1,000	C124_XXX_5G5C_	820-1,000	do.	
C192	200	150-5,600	C192_XXX_2G5C_	150-680	CG_77CGXXX_ _	29
	100	470-8,200	C192_XXX_1G5C_	470-2,200	do.	
	50	2,700-8,200	C192_XXX_5G5C_	2,700-5,600	do.	
C202	200	820-22,000	C202_XXX_2G5C_	820-3,300	CC_78CGXXX_ _	30
	100	3,900-33,000	C202_XXX_1G5C_	3,900-12,000	do.	
	50	15,000-33,000	C202_XXX_5G5C_	15,000-27,000	do.	
C222	200	3,900-56,000	C222_XXX_2G5C_	3,900-10,000	CC_79CGXXX_ _	31
	100	15,000-100,000	C222_XXX_1G5C_	15,000-39,000	do.	
	50	47,000-100,000	C222_XXX_5G5C_	47,000,82,000	do.	

Notes: (5) Insert proper symbol for specification: C — Kemet standard, G — MIL-C-20.
(6) Failure rates are designated as follows: A — Not Applicable (applies to all Kemet standard), R — Applicable (used only in 3rd position for MIL-C-20), M — 1%/Khr, P — 0.1%/Khr, R — 0.01%/Khr, S — 0.001%/Khr.
(7) Insert proper symbol for capacitance tolerance: F — ±1%, G — ±2%, J — ±5%, K — ±10% (K is not used for MIL-C-20), B — ±0.1pF, C — 0.25pF, D — ±0.5pF. (All these tolerances are not available for every part number.)
(8) XXX indicates picofarad code for capacitance standard values selected from the table on page 47.
(9) See Note 8 for 10pF and above. Below 10pF, MIL-C-20 uses a decimal point denoted by "R." For example, 9.1pF = 9R1.

KEMET MOLDED CERAMIC CAPACITORS

UNION CARBIDE

MOLDED CASES WITH RADIAL LEADS
ULTRA-STABLE TEMPERATURE CHARACTERISTIC: EIA COG, MILITARY CG, VERNACULAR NPO



CASE DIMENSIONS

KEMET Case Size	MIL-C-20 Equivalent	Height H	Length L	Width W	Lead Spacing S
C052	CC05, CCR05	.190±.010 (4.83±.25)	.190±.010 (4.83±.25)	.090±.010 (2.29±.25)	.200±.015 (5.08±.38)
C062	CC06, CCR06	.290±.010 (7.37±.25)	.290±.010 (7.37±.25)	.090±.010 (2.29±.25)	.200±.015 (5.08±.38)
C512	CC07, CCR07	.480±.020 (12.19±.51)	.480±.020 (12.19±.51)	.140±.010 (3.56±.25)	.400±.020 (10.16±.51)
C522	CC08, CCR08	.480±.020 (12.19±.51)	.480±.002 (12.19±.51)	.240±.010 (6.10±.25)	.400±.020 (10.16±.51)

Case Size	Voltage	KEMET Cap. Range, pF	KEMET Part Number (5) (8) (7) (6)	MIL-C-20 Specification Cap. Range, pF	MIL-C-20 Specification Part Number (6) (10) (9) (7)(6)	Slash No.
C052	200	1-3,300	C052_XXX_2G5C_	1-330	CC_05CGXXX _ _	
	100	360-4,700	C052_XXX_1G5C_	360-1,800	do.	35
	50	2,200-4,700	C052_XXX_1G5C_	2,000-3,300	do.	
C062	200	390-10,000	C062_XXX_2G5C_	360-1,800	CC_06CGXXX _ _	
	100	2,200-22,000	C062_XXX_1G5C_	2,000-4,700	do.	36
	50	5,100-22,000	C062_XXX_5G5C_	5,100-18,000	do.	
C512	200	2,200-68,000	C512_XXX_2G5C_	2,200-4,700	CC_07CG	
	100	5,600-120,000	C512_XXX_1G5C_	5,600-12,000	do.	37
	50	15,000-120,000	C512_XXX_5G5C_	15,000-100,000	do.	
C522	200	3,900-120,000	C522_XXX_2G5C_	3,900-4,700	CC_08CGXXX _ _	
	100	15,000-220,000	C522_XXX_2G5C_	15,000-18,000	do.	38
	50	56,000-220,000	C522_XXX_5G5C_	56,000-68,000	do.	

Notes: (5) Insert proper symbol for specification: C — Kemet standard, G — MIL-C-20.

(6) Failure rates are designated as follows: A — Not Applicable (applies to all Kemet standard), R — Applicable (used only in 3rd position for MIL-C-20), M — 1%/Khr, P — 0.1%/Khr, R — 0.01%/Khr, S — 0.001%/Khr.

(7) Insert proper symbol for capacitance tolerance: F — ±1%, G — ±2%, J — ±5%, K — ±10% (K is not used for MIL-C-20), B — ±0.1pF, C — 0.25pF, D — ±0.5pF. (All these tolerances are not available for every part number.)

(8) XXX indicates picofarad code for capacitance standard values selected from the table on page 47.

(9) See Note 8 for 10pF and above. Below 10pF, MIL-C-20 uses a decimal point denoted by "R." For example, 9.1pF =9R1.

(10) CH replaces CG below 10pF.

MARKING — RADIAL AND AXIAL STYLES

KEMET

FRONT

C052, C062

C052	Size (C052 or C062 as applicable)
NPO	Temperature Characteristic
101J	Capacitance Code, Tolerance

C512, C522

KEMET	KEMET
C512NPO	Size (C512 or C522 as applicable), Temperature Characteristic
104J100V	Capacitance Code, Tolerance, Voltage
7801	Lot Code

C114, C124, C192, C202, C222

KNPO	KEMET, Temperature Characteristic
101J	Capacitance Code, Tolerance
200V	Voltage
7801	Lot Code

BACK

200V	Voltage
K	KEMET
7801	Lot Code

MIL-C-20

CC and CCR05, 06, 75, 76, 77

JCG	JAN, CG or CH as applicable
101	Capacitance Code
JM8	Cap. Tol., Failure Rate (CCR only) Year Code
AAK	Lot Code, KEMET

Notes: 1. CC05/CCR05 utilizes two sides
2. R signifies decimal in cap. code

CC and CCR07, 08, 78, 79

CCR78CG	Military
821KM	Designation
JAN K	JAN, KEMET
821K200V	Cap., Cap. Tol., Voltage
7801A	Date Lot Code

KEMET CERAMIC HIGH RELIABILITY CAPACITORS

UNION CARBIDE

GR900 SERIES

INTRODUCTION

Using many of the same disciplines which have made Kemet the leader in the Graded High Reliability Tantalum capacitor field, a separate High Reliability Ceramic capacitor product line has been established. The GR900 molded axial, radial, and chip capacitors are made on this production line. From receipt of raw materials to final shipment, special raw materials, personnel, facilities, and test methods are used. These components are intended to meet the most critical requirements of demanding applications.

SCREENING TESTS

Although the GR900 Series encompasses a broad spectrum of voltages, capacitance values and case sizes, it is imperative that singular batch identity be maintained. Each batch receives 100% non-destructive testing in the order following:

1. **Thermal Shock** — Materials used in the construction of monolithic ceramic capacitors possess various thermal coefficients of expansion. To assure maximum uniformity, each part is temperature cycled 5 times between −55°C and +125°C. Capacitors failing to withstand this environmental stress are rejected.
2. **Voltage Conditioning** — One of the most strenuous environments for any capacitor is the high temperature/high voltage test. All units are subjected to a minimum of 100 hours at twice rated voltage at 125°C. This screening process is made additionally strenuous by the use of a low impedance (less than 3 ohms) voltage source.
3. **Electrical Test** — The following 100% electrical tests are performed.
   1. Dielectric strength at twice rated voltage and 25°C.
   2. Insulation resistance at 25°C.
   3. Insulation resistance at 125°C.
   4. Storage at 150°C for 2 hours minimum without voltage applied followed by a 24 hour stabilization period (temperature characteristic X only).
   5. Capacitance and dissipation factor at 25°C.
   6. Visual and mechanical examination.
   7. Radiographic examination.

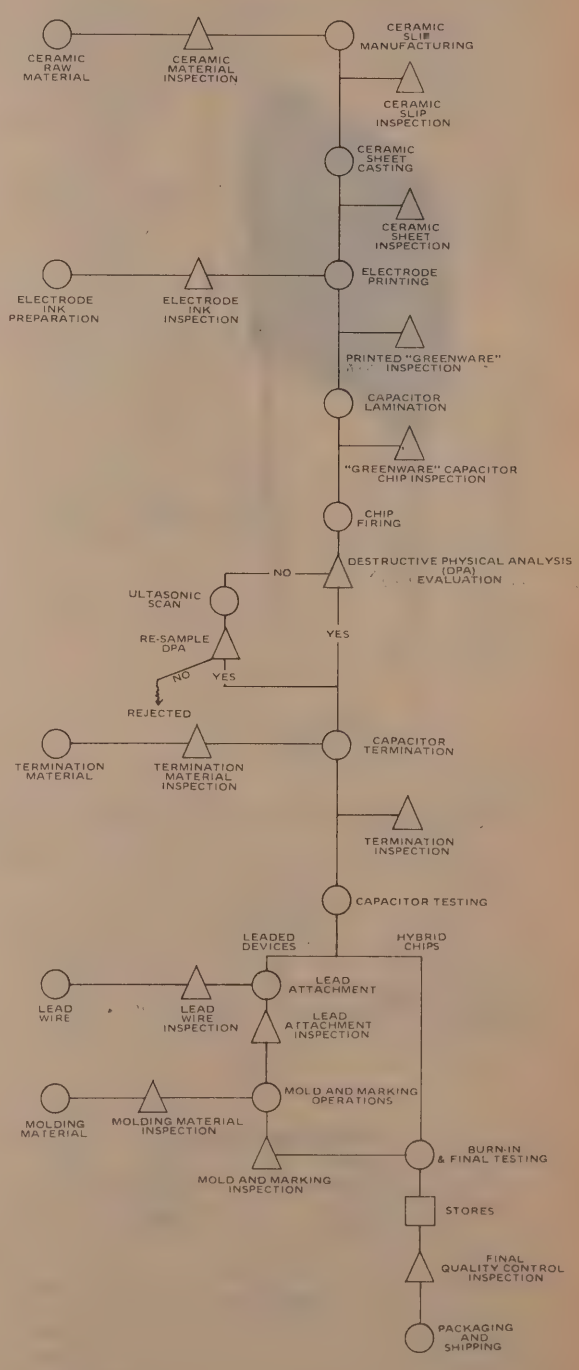
SAMPLE TESTS

In addition to these 100% tests, all production batches are subjected to a sample DPA and must meet strict internal void and delamination criteria. Batches failing to meet these criteria may be ultrasonic scanned for removal of marginal product (see general specification GR900 for details).

INTERNAL EXAMINATION

The internal quality of the sectioned capacitors will be examined under 30X or greater magnification. Both sub-samples will be examined for cracks in the ceramic, voids in the dielectric, delaminations, end metalization quality, electrode anomalies, and other pertinent features, including dielectric thickness and ceramic margin thicknesses.

MANUFACTURING FLOW CHART

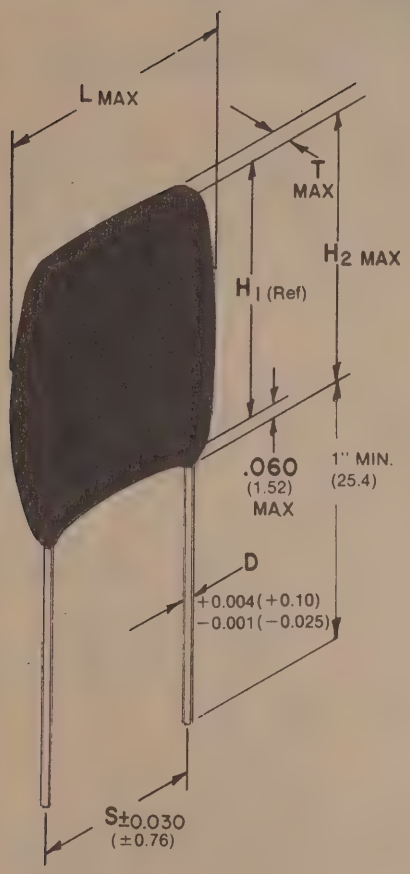


KEMET DIPPED CERAMIC CAPACITORS

UNION CARBIDE

BLUE MAX

DIPPED CASES WITH RADIAL LEADS



The Kemet "Blue Max" product line provides maximum range, conformally-coated capacitors in three dielectrics — COG Ultra-Stable; X7R Stable and Z5U General Purpose. The six case sizes include over 300 CV values in a capacitance range of 1.0pF to 6.8μF in 50, 100, and 200 volts. Their reliable performance is built-in through automated manufacture and precision process control techniques that assure uniform dielectric thickness, excellent electrode integrity, and electrode-to-termination continuity. Internal construction consists of the same superior monolithic body used in Kemet's molded capacitors. Encapsulation consists of a multi-layer moisture and shock resistant plastic coating that meets the flame test requirements of Underwriter's Laboratory Standard 492.

Additional CV values, sizes, and lead configurations are available on special order.

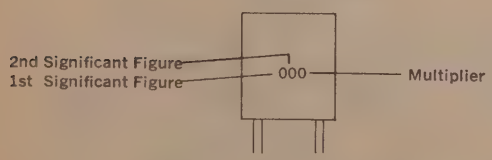
DIMENSIONS IN INCHES (MILLIMETERS)

Case Size	L	H_1	H_2	T	S	D & AWG #
312	.120 (3.05)	.100 (2.54)	.160 (4.06)	.100 (2.54)	.100 (2.54)	0.16 (.41) 26
315	.150 (3.81)	.150 (3.81)	.210 (5.33)	.100 (2.54)	.100 (2.54)	0.16 (.41) 26
320	.200 (5.08)	.200 (5.08)	.260 (6.60)	.125 (3.18)	.100 (2.54)	.020 (.51) 24
321	.200 (5.08)	.200 (5.08)	.260 (6.60)	.125 (3.18)	.250 (6.35)	.020 (.51) 24
330	.300 (7.62)	.300 (7.62)	.360 (9.14)	.150 (3.81)	.200 (5.08)	.020 (.51) 24
331	.300 (7.62)	.300 (7.62)	.360 (9.14)	.150 (3.81)	.250 (6.35)	.020 (.51) 24
340	.400 (10.16)	.400 (10.16)	.460 (11.68)	.150 (3.81)	.200 (5.08)	.020 (.51) 24
350	.500 (12.70)	.500 (12.70)	.560 (14.22)	.200 (5.08)	.400 (10.16)	.025 (.64) 22

Note: 1 inch = 25.4mm.

MARKING

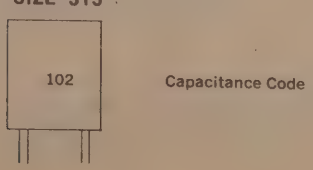
SIZE 312 COLOR CODED



CAPACITANCE COLOR CODE

0 — Black	5 — Green
1 — Brown	6 — Light Blue
2 — Red	7 — Violet
3 — Orange	8 — Grey
4 — Yellow	9 — White

SIZE 315



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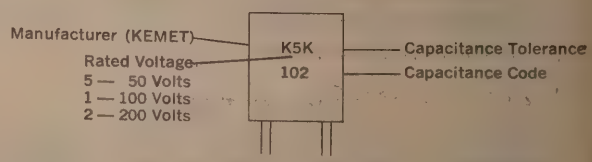

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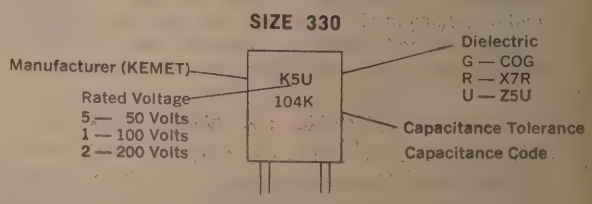

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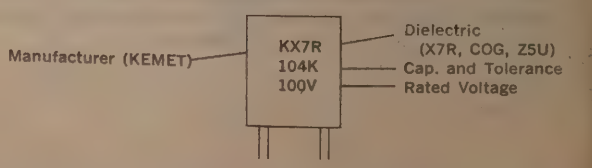


KEMET

DIPPED CERAMIC CAPACITORS

UNION CARBIDE

BLUE MAX

DIPPED CASES WITH RADIAL LEADS
STABLE TEMPERATURE CHARACTERISTIC: EIA X7R

Case Size	200 Volts		100 Volts		50 Volts	
	Capacitance	Part Number (11) (3)	Capacitance	Part Number (11) (3)	Capacitance	Part Number (11) (3)
C312	180pF	C312C181_2R5CA	820pF	C312C821_1R5CA	3,300pF	C312C332_5R5CA
	220	C312C221_2R5CA	1,000	C312C102_1R5CA	3,900	C312C392_5R5CA
	270	C312C271_2R5CA	1,200	C312C122_1R5CA	4,700	C312C472_5R5CA
	330	C312C331_2R5CA	1,500	C312C152_1R5CA	5,600	C312C562_5R5CA
	390	C312C391_2R5CA	1,800	C312C182_1R5CA	6,800	C312C682_5R5CA
	470	C312C471_2R5CA	2,200	C312C222_1R5CA	.01μF	C312C103_5R5CA
	560	C312C561_2R5CA	2,700	C312C272_1R5CA	.012	C312C123_5R5CA
	680	C312C681_2R5CA				
C315	270	C315C271_2R5CA	1,000	C315C102_1R5CA	5,600	C315C562_5R5CA
	330	C315C331_2R5CA	1,200	C315C122_1R5CA	6,800	C315C682_5R5CA
	390	C315C391_2R5CA	1,500	C315C152_1R5CA	.01μF	C315C103_5R5CA
	470	C315C471_2R5CA	1,800	C315C182_1R5CA	.012	C315C123_5R5CA
	560	C315C561_2R5CA	2,200	C315C222_1R5CA	.015	C315C153_5R5CA
	680	C315C681_2R5CA	2,700	C315C272_1R5CA	.018	C315C183_5R5CA
	820	C315C821_2R5CA	3,300	C315C332_1R5CA	.022	C315C223_5R5CA
	1,000	C315C102_2R5CA	3,900	C315C392_1R5CA		
	1,200	C315C122_2R5CA	4,700	C315C472_1R5CA		
C320 or C321 (11)	470	C32_C471_2R5CA	4,700	C32_C472_1R5CA	.012	C32_C123_5R5CA
	560	C32_C561_2R5CA	5,600	C32_C562_1R5CA	.015	C32_C153_5R5CA
	680	C32_C681_2R5CA	6,800	C32_C682_1R5CA	.018	C32_C183_5R5CA
	820	C32_C821_2R5CA	8,200	C32_C822_1R5CA	.022	C32_C223_5R5CA
	1,000	C32_C102_2R5CA	.01μF	C32_C103_1R5CA	.027	C32_C273_5R5CA
	1,200	C32_C122_2R5CA	.012	C32_C123_1R5CA	.033	C32_C333_5R5CA
	1,500	C32_C152_2R5CA	.015	C32_C153_1R5CA	.039	C32_C393_5R5CA
	1,800	C32_C182_2R5CA	.018	C32_C183_1R5CA	.047	C32_C473_5R5CA
	2,200	C32_C222_2R5CA	.022	C32_C223_1R5CA	.056	C32_C563_5R5CA
	2,700	C32_C272_2R5CA	.027	C32_C273_1R5CA	.068	C32_C683_5R5CA
	3,300	C32_C332_2R5CA	.033	C32_C333_1R5CA	.082	C32_C823_5R5CA
	3,900	C32_C392_2R5CA	.039	C32_C393_1R5CA	.1	C32_C104_5R5CA
	4,700	C32_C472_2R5CA	.047	C32_C473_1R5CA	.12	C32_C124_5R5CA
	5,600	C32_C562_2R5CA			.15	C32_C154_5R5CA
	6,800	C32_C682_2R5CA			.18	C32_C184_5R5CA
	8,200	C32_C822_2R5CA				
	.01μF	C32_C103_2R5CA				
	.012	C32_C123_2R5CA				
C330 or C331 (11)	4,700	C33_C472_2R5CA	.012	C33_C123_1R5CA	.1	C33_C104_5R5CA
	5,600	C33_C562_2R5CA	.015	C33_C153_1R5CA	.12	C33_C124_5R5CA
	6,800	C33_C682_2R5CA	.018	C33_C183_1R5CA	.15	C33_C154_5R5CA
	8,200	C33_C822_2R5CA	.022	C33_C223_1R5CA	.18	C33_C184_5R5CA
	.01μF	C33_C103_2R5CA	.027	C33_C273_1R5CA	.22	C33_C224_5R5CA
	.012	C33_C123_2R5CA	.033	C33_C333_1R5CA	.27	C33_C274_5R5CA
	.015	C33_C153_2R5CA	.039	C33_C393_1R5CA	.33	C33_C334_5R5CA
	.018	C33_C183_2R5CA	.047	C33_C473_1R5CA	.39	C33_C394_5R5CA
	.022	C33_C223_2R5CA	.056	C33_C563_1R5CA	.47	C33_C474_5R5CA
	.027	C33_C273_2R5CA	.068	C33_C683_1R5CA	.56	C33_C564_5R5CA
	.033	C33_C333_2R5CA	.082	C33_C823_1R5CA	.68	C33_C684_5R5CA
	.039	C33_C393_2R5CA	.1	C33_C104_1R5CA	.82	C33_C824_5R5CA
	.047	C33_C473_2R5CA	.12	C33_C124_1R5CA	1.0	C33_C105_5R5CA
	.056	C33_C563_2R5CA	.15	C33_C154_1R5CA	1.2	C33_C125_5R5CA
			.18	C33_C184_1R5CA	1.5	C33_C155_5R5CA
			.22	C33_C224_1R5CA		
			.27	C33_C274_1R5CA		
C340	.068	C340C683_2R5CA	.33	C340C334_1R5CA	1.8	C340C185_5R5CA
	.082	C340C823_2R5CA	.39	C340C394_1R5CA	2.0	C340C205_5R5CA
	.1	C340C104_2R5CA	.47	C340C474_1R5CA	2.2	C340C225_5R5CA
	.12	C340C124_2R5CA	.56	C340C564_1R5CA	2.7	C340C275_5R5CA
	.15	C340C154_2R5CA				
C350	.18	C350C184_2R5CA	.68	C350C684_1R5CA	2.2	C350C225_5R5CA
	.22	C350C224_2R5CA	.82	C350C824_1R5CA	2.7	C350C275_5R5CA
	.27	C350C274_2R5CA	1.0	C350C105_1R5CA	3.3	C350C335_5R5CA
	.33	C350C334_2R5CA	1.2	C350C125_1R5CA	3.9	C350C395_5R5CA
			1.5	C350C155_1R5CA	4.7	C350C475_5R5CA
					5.6	C350C565_5R5CA
					6.8	C350C685_5R5CA

Notes: (3) Insert proper symbol for capacitance tolerance: K — ±10%, M — ±20%.
(11) Case Sizes C320/C321, and C330/C331, are identical electrically but differ in lead spacing. See table of dimensions. Insert the appropriate symbol, "0" or "1" in the part number.

KEMET DIPPED CERAMIC CAPACITORS

UNION CARBIDE

BLUE MAX

DIPPED CASES WITH RADIAL LEADS

ULTRA-STABLE TEMPERATURE CHARACTERISTIC: EIA COG, VERNACULAR NPO

Case Size	200 Volts Capacitance	200 Volts Part Number (11) (7)	100 Volts Capacitance	100 Volts Part Number (11) (7)
C312	1.0pF	C312C109_2G5CA	120pF	C312C121_1G5CA
	1.5	C312C159_2G5CA	150	C312C151_1G5CA
	2.2	C312C229_2G5CA	180	C312C181_1G5CA
	2.7	C312C279_2G5CA	220	C312C221_1G5CA
	3.3	C312C339_2G5CA	270	C312C271_1G5CA
	4.7	C312C479_2G5CA		
	5.6	C312C569_2G5CA		
	6.8	C312C689_2G5CA		
	8.2	C312C829_2G5CA		
	10	C312C100_2G5CA		
	12	C312C120_2G5CA		
	15	C312C150_2G5CA		
	18	C312C180_2G5CA		
	22	C312C220_2G5CA		
	27	C312C270_2G5CA		
	33	C312C330_2G5CA		
	39	C312C390_2G5CA		
	47	C312C470_2G5CA		
	56	C312C560_2G5CA		
	68	C312C680_2G5CA		
	82	C312C820_2G5CA		
	100	C312C101_2G5CA		
	120	C312C121_2G5CA		
	150	C312C151_2G5CA		
C315	1.0	C315C109_2G5CA	390	C315C391_1G5CA
	1.5	C315C159_2G5CA	470	C315C471_1G5CA
	2.2	C315C229_2G5CA	560	C315C561_1G5CA
	2.7	C315C279_2G5CA	680	C315C681_1G5CA
	3.3	C315C339_2G5CA		
	4.7	C315C479_2G5CA		
	5.6	C315C569_2G5CA		
	6.8pF	C315C689_2G5CA		
	8.2	C315C829_2G5CA		
	10	C315C100_2G5CA		
	12	C315C120_2G5CA		
	15	C315C150_2G5CA		
	18	C315C180_2G5CA		
	22	C315C220_2G5CA		
	27	C315C270_2G5CA		
	33	C315C330_2G5CA		
	39	C315C390_2G5CA		
	47	C315C470_2G5CA		
	56	C315C560_2G5CA		
	68	C315C680_2G5CA		
	82	C315C820_2G5CA		
	100	C315C101_2G5CA		
	120	C315C121_2G5CA		
	150	C315C151_2G5CA		
	180	C315C181_2G5CA		
	220	C315C221_2G5CA		
	270	C315C271_2G5CA		
	330	C315C331_2G5CA		
C320 or C321	1.0	C32_C109_2G5CA	1,000	C32_C102_1G5CA
	1.5	C32_C159_2G5CA	1,200	C32_C122_1G5CA
	2.2	C32_C229_2G5CA	1,500	C32_C152_1G5CA
	2.7	C32_C279_2G5CA	1,800	C32_C182_1G5CA
	3.3	C32_C339_2G5CA	2,200	C32_C222_1G5CA
	4.7	C32_C479_2G5CA	2,700	C32_C272_1G5CA
	5.6	C32_C569_2G5CA	3,300	C32_C332_1G5CA
	6.8	C32_C689_2G5CA	3,900	C32_C392_1G5CA
	8.2	C32_C829_2G5CA	4,700	C32_C472_1G5CA
	10	C32_C100_2G5CA	5,600	C32_C562_1G5CA
	12	C32_C120_2G5CA		
	15	C32_C150_2G5CA		
	18	C32_C180_2G5CA		
C320 or C321 (Cont'd)	22	C32_C220_2G5CA		
	27	C32_C270_2G5CA		
	33	C32_C330_2G5CA		
	39	C32_C390_2G5CA		
	47	C32_C470_2G5CA		
	56	C32_C560_2G5CA		
	68	C32_C680_2G5CA		
	82	C32_C820_2G5CA		
	100	C32_C101_2G5CA		
	120	C32_C121_2G5CA		
	150	C32_C151_2G5CA		
	180	C32_C181_2G5CA		
	220	C32_C221_2G5CA		
	270	C32_C271_2G5CA		
	330	C32_C331_2G5CA		
	390	C32_C391_2G5CA		
	470	C32_C471_2G5CA		
	560	C32_C561_2G5CA		
	680	C32_C681_2G5CA		
	820	C32_C821_2G5CA		
	1,000	C32_C102_2G5CA		
	1,200	C32_C122_2G5CA		
	1,500	C32_C152_2G5CA		
	1,800	C32_C182_2G5CA		
	2,200	C32_C222_2G5CA		
	2,700	C32_C272_2G5CA		
	3,300	C32_C332_2G5CA		
C330 or C331	1,000	C33_C102_2G5CA	2,200	C33_C222_1G5CA
	1,200	C33_C122_2G5CA	2,700	C33_C272_1G5CA
	1,500	C33_C152_2G5CA	3,300	C33_C332_1G5CA
	1,800	C33_C182_2G5CA	3,900	C33_C392_1G5CA
	2,200	C33_C222_2G5CA	4,700	C33_C472_1G5CA
	2,700	C33_C272_2G5CA	5,600	C33_C562_1G5CA
	3,300	C33_C332_2G5CA	6,800	C33_C682_1G5CA
	3,900	C33_C392_2G5CA	8,200	C33_C822_1G5CA
	4,700	C33_C472_2G5CA	.01μF	C33_C103_1G5CA
	5,600	C33_C562_2G5CA	.015	C33_C153_1G5CA
	6,800	C33_C682_2G5CA	.018	C33_C183_1G5CA
	8,200	C33_C822_2G5CA	.022	C33_C223_1G5CA
	.01μF	C33_C103_2G5CA	.027	C33_C273_1G5CA
	.015	C33_C153_2G5CA	.033	C33_C333_1G5CA
C340	.018	C340C183_2G5CA	.039	C340C393_1G5CA
	.022	C340C223_2G5CA	.047	C340C473_1G5CA
	.027	C340C273_2G5CA	.056	C340C563_1G5CA
	.033	C340C333_2G5CA	.068	C340C683_1G5CA
C350	.022	C350C223_2G5CA	.082	C350C823_1G5CA
	.027	C350C273_2G5CA	.1	C350C104_1G5CA
	.033	C350C333_2G5CA	.12	C350C124_1G5CA
	.039	C350C393_2G5CA	.15	C350C154_1G5CA
	.047	C350C473_2G5CA	.18	C350C184_1G5CA
	.056	C350C563_2G5CA		
	.068	C350C683_2G5CA		
	.082	C350C823_2G5CA		
	.1	C350C104_2G5CA		

Notes: (7) Insert proper symbol for capacitance tolerance: K — ±10%, J — ±5%, G — ±2%, F — ±1%, D — ±0.5pF. Only D tolerance is available below 10pF.

(11) Case sizes C320/C321 and C330/C331 are identical electrically but differ in lead spacing. See table of dimensions. Insert the appropriate symbol, "0" or "1" in the part number.

GENERAL-PURPOSE TEMPERATURE CHARACTERISTIC: EIA Z5U

Case Size	100 Volts Capacitance	100 Volts Part Number (3)	50 Volts Capacitance	50 Volts Part Number (3)
C312	1,500pF	C312C152_1U1CA	3,300pF	C312C332_5U1CA
	2,200	C312C222_1U1CA	4,700	C312C472_5U1CA
			6,800	C312C682_5U1CA
			.01μF	C312C103_5U1CA
C315	1,500	C315C152_1U1CA	6,800pF	C315C682_5U1CA
	2,200	C315C222_1U1CA	.01μF	C315C103_5U1CA
	3,300	C315C332_1U1CA	.015	C315C153_5U1CA
	4,700	C315C472_1U1CA	.022	C315C223_5U1CA
C320 or C321	.01μF	C320C103_1U1CA	.022	C320C223_5U1CA
	.015	C320C153_1U1CA	.033	C320C333_5U1CA
	.022	C320C223_1U1CA	.047	C320C473_5U1CA
	.033	C320C333_1U1CA	.068	C320C683_5U1CA
	.047	C320C473_1U1CA	.1	C320C104_5U1CA
	.068	C320C683_1U1CA	.15	C320C154_5U1CA
			.22	C320C224_5U1CA
C330 or C331	.022	C330C223_1U1CA	.1	C330C104_5U1CA
	.033	C330C333_1U1CA	.15	C330C154_5U1CA
	.047	C330C473_1U1CA	.22	C330C224_5U1CA
	.068	C330C683_1U1CA	.33	C330C334_5U1CA
	.1	C330C104_1U1CA	.47	C330C474_5U1CA
	.15	C330C154_1U1CA	.68	C330C684_5U1CA
	.22	C330C224_1U1CA	1.0	C330C105_5U1CA
	.33	C330C334_1U1CA	1.5	C330C155_5U1CA
C340	.33	C340C334_1U1CA	1.5	C340C155_5U1CA
	.47	C340C474_1U1CA	2.2	C340C225_5U1CA
	.68	C340C684_1U1CA		
C350	1.0	C350C105_1U1CA	3.3	C350C335_5U1CA
	1.5	C350C155_1U1CA	4.7	C350C475_5U1CA
			6.8	C350C685_5U1CA

Notes: (3) Insert proper symbol for capacitance tolerance: M — ±20%, Z — +80%, −20%.

KEMET CERAMIC CHIP CAPACITORS

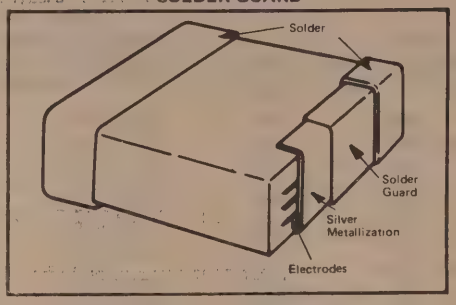
UNION CARBIDE

CHIP CAPACITORS FOR HYBRID CIRCUITS

Each standard chip features a unique barrier layer of copper in the end metallization that prevents silver leaching or scavenging and subsequent open-circuits during assembly. The "Solder Guard" chips will withstand solder reflow temperatures with little or no degradation of electrical continuity and performance. Other terminations available on special order include silver-palladium, gold, and gold-palladium.

Kemet chips are available in NPO, BX, and Z5U temperature characteristics in 50, 100, and 200 volt ratings. Military grade chips are screened per Group A of MIL-C-55681; in addition to the limited MIL-C-55681, all Kemet chips may be screened to Group A testing of that specification.

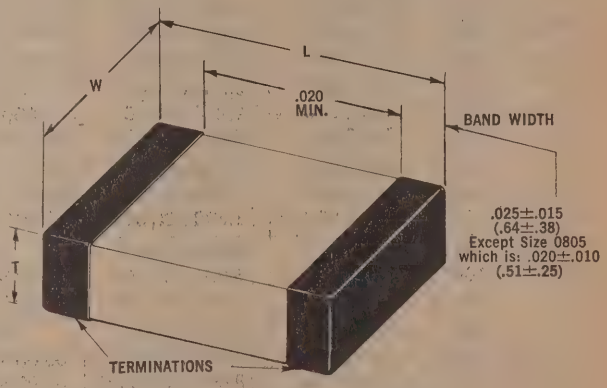
"SOLDER GUARD"



FOR SOLDER REFLOW ASSEMBLY

OUTLINE DRAWINGS — DIMENSIONS IN INCHES (MILLIMETERS)

Case Size	L	W	T
0805	.080±.015 (2.03±.38)	.050±.015 (1.27±.38)	.055 (1.40)
1005	.100±.015 (2.54±.38)	.055±.015 (1.40±.38)	.060 (1.52)
1210	.120±.015 (3.05±.38)	.100±.015 (2.54±.38)	.060 (1.52)
1805	.180±.015 (4.57±.38)	.050±.015 (1.27±.38)	.055 (1.40)
1808	.180±.015 (4.57±.38)	.080±.015 (2.03±.38)	.080 (2.03)
1813	.180±.015 (4.57±.38)	.125±.015 (3.18±.38)	.080 (2.03)
1825	.180 +.020 −.015 (4.57 +.51) (−.38)	.250 +.020 −.015 (6.35 +.51) (−.38)	.080 (2.03)
2225	.225 +.020 −.015 (5.72 +.51) (−.38)	.250 +.020 −.015 (6.35 +.51) (−.38)	.080 (2.03)



CATALOG NUMBERING SYSTEM — CHIP CAPACITORS

C 0805 C 103 K 5 X A H

CERAMIC

SIZE CODE
See table above

SPECIFICATION
C — Commercial
E — Kemet Established Reliability
P — MIL-C-55681A

CAPACITANCE CODE
Expressed in Picofarads (MMF)
First Two Digit-Significant Figures
Third Digit-Number of Zeros. (Use 9 for 1.0 thru 9.9pF. Example: 2.2pF - 229).

CAPACITANCE TOLERANCE

K — ±10%	C — ±0.25pF	G — ±2%	Z — +80%, −20%
M — ±20%	D — ±0.5pF	H — ±3%	X — Other
P — (GMV)	F — ±1%	J — ±5%	

VOLTAGE

1 — 100	5 — 50
2 — 200	0 — Other
3 — 25	

TEMPERATURE CHARACTERISTIC
Designated by Capacitance Change Over Temperature Range
G — NPO (±30 PPM/°C)
R — BR (±15%; +15%, −40% with bias)
U — Z5U (+22%, −56%)
X — BX (±15%; +15%, −25% with bias)

FAILURE RATE LEVEL (%/1,000 HOURS)
A — Standard for "C" and "E" specifications
M — 1.0
P — 0.1
R — 0.01
} M. P. & R Failure Rates Refer to MIL-C-55681 CHIPS only.

END METALLIZING
H — Solder Guard (Standard-Tinned)
T — Silver
G — Gold Plated
V — Palladium Silver (Standard-Untinned)
W — Palladium Gold
Y — Palladium Silver (Solder Coated)
Z — Other

KEMET CERAMIC CHIP CAPACITORS

UNION CARBIDE

CHIP CAPACITORS

ULTRA-STABLE, STABLE AND GENERAL PURPOSE TEMPERATURE CHARACTERISTICS

Size	Volt-age	KEMET Capacitance, pF			MIL-C-55681 Capacitance, pF		Part Number
		COG (NPO)	X7R (BX)	Z5U	BP (NPO)	BX	
0805	200	1-150	180-680	N/A	N/A	N/A	(12) (8) (3) (2)
	100	1-330	180-3,300	1,000-3,300	10-180	120-3,300	CDR01_XXXB_S_
	50	1-330	180-15,000	1,000-15,000	N/A	3,900-4,700	CDR01_XXXA_S_
1005	200	1-330	330-12,000	N/A			
	100	1-680	330-5,600	1,500-5,600	N/A	N/A	
	50	1-680	330-22,000	1,500-22,000			
1210	200	1-1,000	470-3,900	N/A			
	100	1-2,200	470-18,000	5,600-22,000	N/A	N/A	
	50	1-2,200	470-100,000	5,600-120,000			
1805	200	220-680	1,000-2,700	N/A	N/A	N/A	
	100	220-1,000	1,000-12,000	6,800-12,000	220-270	3,900-10,000	CDR02_XXXB_S_
	50	220-1,000	1,000-56,000	6,800-68,000	N/A	12,000-22,000	CDR02_XXXA_S_
1808	200	330-1,800	2,200-8,200	N/A	N/A	N/A	
	100	330-3,300	2,200-33,000	6,800-39,000	330-1,000	12,000-39,000	CDR03_XXXB_S_
	50	330-3,300	2,200-120,000	6,800-150,000	N/A	47,000-68,000	CDR03_XXXA_S_
1813	200	330-3,900	1,200-15,000	N/A			
	100	330-6,800	1,200-56,000	22,000-68,000	N/A	N/A	
	50	330-6,800	1,200-220,000	22,000-270,000			
1825	200	2,700-8,200	6,800-33,000	N/A	1,200-3,300	N/A	CDR04_XXXC_S_
	100	2,700-12,000	6,800-150,000	56,000-180,000	N/A	39,000-56,000	CDR04_XXXB_S_
	50	2,700-12,000	6,800-560,000	56,000-680,000	N/A	82,000-180,000	CDR04_XXXA_S_
2225	200	2,700-10,000	18,000-47,000	N/A			
	100	2,700-22,000	18,000-180,000	68,000-220,000	N/A	N/A	
	50	2,700-22,000	18,000-1,000,000	68,000-1,200,000			

Notes: For KEMET part number construction, see page 45. Insert Specification Symbol "P" for MIL-C-55681.
(2) Failure rates are designated as follows: M — 1%/Khr, P — 0.1%/Khr, R — 0.01%/Khr, and S — 0.001%/Khr.
(3) Insert proper symbol from MIL-C-55681/1 for capacitance tolerance.
(8) XXX indicates capacitance value in picofarads according to MIL-C-55681/1.
(12) Insert proper temperature characteristic symbol, "BP" or "BX."

KEMET

FILM CAPACITORS

UNION CARBIDE

FLAT KAP FILM CAPACITORS

Flat Kaps are small ultra stable film capacitors ideally suited for filters, A/D converters, integrators, multivibrator timing capacitors, and other applications where capacitance stability is essential. This stability is obtained by locking the capacitor body in place with a solid impregnant. Outstanding electrical characteristics and volumetric efficiencies, up to 20 times greater than mica, glass, and porcelain are derived from the unique vacuum deposited dielectric, parylene.

Available in three different temperature coefficient of capacitance characteristics: −200, ±30, 0 ±50, and 0 ±100 PPM /°C over the operating range −55°C to +125°C. Capacitors are tested in accordance with MIL-C-55514 and are stocked in all standard values down to ±1% tolerance. Tighter tolerances and non-standard values are available from .001μF to 1μF on special order. For additional information refer to Kemet Flat Kap Product Catalog.

FLAT KAP STANDARD RATINGS

Capacitance μF 25°C 1kHz	Case Size	Capacitance μF 25°C 1kHz	Case Size
.001	A	.027	B
.0012	A	.033	B
.0015	A	.039	B
.0018	A	.047	D*
.0022	A	.056	D*
.0027	A	.068	D*
.0033	A	.082	D*
.0039	A	.1	D*
.0047	A	.12	D
.0056	A	.15	D
.0068	A	.22	E
.0082	A	.33	F
.01	A	.47	F
.012	B	.56	G
.015	B	.68	G
.018	B	.82	H
.022	B	1.0	H

*These values available in C Case for 5% and 10% on special order only.

ORDERING INFORMATION

F 330 A 1201 G 050

FILM

*SERIES (Listed Below)

CASE SIZE

PICOFARAD CODE
First three digits represent significant figures.
Fourth digit specifies number of zeros to follow.

VOLTAGE

Cap. Tolerance
K — ±10%
J — ±5%
G — ±2%
F — ±1%
D — ±0.5%

***SERIES**

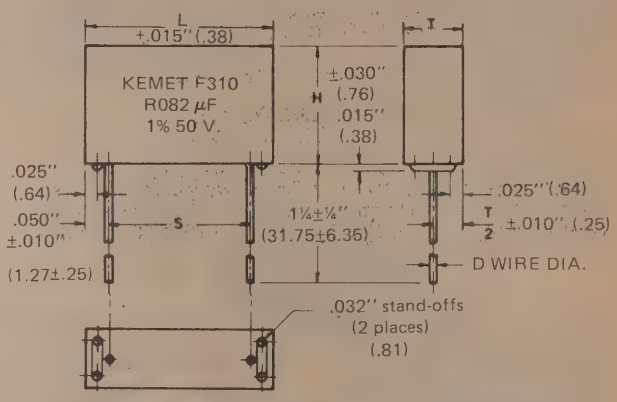
300 Plastic Encapsulation, Flat Kaps
310 A Temp. Coef., (−200 ±30 PPM) Molded, Radial Leads
311 A Temp. Coef., (−200 ±30 PPM) Molded, Axial Leads

320 †B Temp. Coef., (0 ±100 PPM) Molded, Radial Leads
321 †B Temp. Coef., (0 ±100 PPM) Molded, Axial Leads

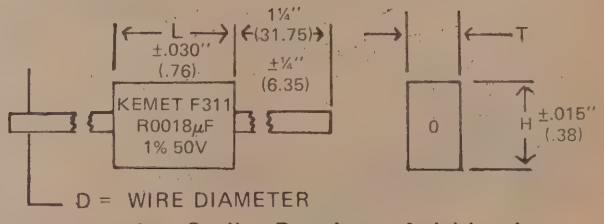
330 †C Temp. Coefficient, (0 ±50 PPM) Molded, Radial Leads
331 †C Temp. Coefficient, (0 ±50 PPM) Molded, Axial Leads

†A Temperature Coefficient available through all ratings. B & C temperature coefficient available all ratings to .1μF and to .22μF on special order.

Flat Kap film capacitors are also available in hermetic seal cases. For further information request Catalog F-2742.



Capacitor Outline Drawing — Radial Leads



Capacitor Outline Drawing — Axial Leads

STANDARD CASE DIMENSIONS IN INCHES (MILLIMETERS)

Case Size	H	L	T ±.015 (±.38)	S ±.005 (±.13)	D ±.001 (±.03)
A	.280 (7.11)	.500 (12.70)	.125 (3.18)	.400 (10.16)	.020 (.51)
B	.375 (9.53)	.500 (12.70)	.195 (4.95)	.400 (10.16)	.025 (.64)
C	.375 (9.53)	.600 (15.24)	.195 (4.95)	.500 (12.70)	.025 (.64)
D	.375 (9.53)	.600 (15.24)	.295 (7.49)	.500 (12.70)	.025 (.64)
E	.375 (9.53)	.750 (19.05)	.500 (12.70)	.650 (16.51)	.025 (.64)
F	.375 (9.53)	1.00 (25.40)	.600 (15.24)	.900 (22.86)	.032 (.81)
G	.375 (9.53)	1.50 (38.10)	.600 (15.24)	1.40 (35.56)	.032 (.81)
H	.550 (13.97)	1.50 (38.10)	.600 (15.24)	1.40 (35.56)	.032 (.81)

KEMET FILM CAPACITORS

UNION CARBIDE

CAPACITANCE CHANGE WITH TEMPERATURE

Three temperature coefficients of capacitance characteristics are available. The temperature coefficient shall be computed in accordance with MIL-C-19978.

CHARACTERISTIC A

The capacitance change between +25°C and −55°C shall not exceed +2% and between +25°C and +125°C shall not exceed −3%. The nominal linearized temperature coefficient of capacitance between −55°C and +125°C is −200 PPM /°C. The curve of Figure 1 shows the typical capacitance change versus temperature for A Characteristic Capacitors.

CHARACTERISTIC B

Capacitance change shall not exceed ±0.65% between 25°C and either −40°C or +90°C. Measurement error shall not exceed 0.1% of capacitance or 2.5pF, whichever is greater. The nominal linearized temperature coefficient of capacitance between −55°C and +125°C is 0 ±100 PPM/°C, as illustrated in Figure 2.

CHARACTERISTIC C

Capacitance change shall not exceed ±0.33% between 25°C and either −40°C or +90°C. Measurement error shall not exceed 0.1% of capacitance reading or 2.5pF, whichever is greater. The nominal linearized temperature coefficient of capacitance between −55°C and +125°C is 0 ±50 PPM/°C, as illustrated in Figure 3.

FIGURE 1

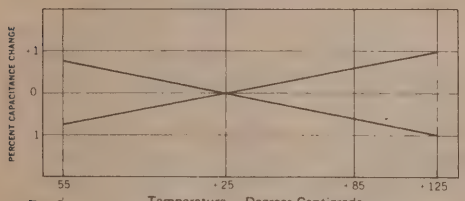


Fig. 2 Temperature – Degrees Centigrade
CAPACITANCE CHANGE VS. TEMPERATURE
MAXIMUM LIMITS FOR "B" CHARACTERISTIC

FIGURE 2

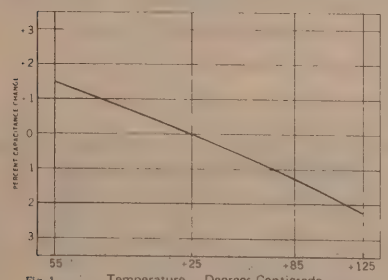


Fig. 1 Temperature – Degrees Centigrade
CAPACITANCE CHANGE VS. TEMPERATURE
TYPICAL CURVE FOR "A" CHARACTERISTIC

FIGURE 3

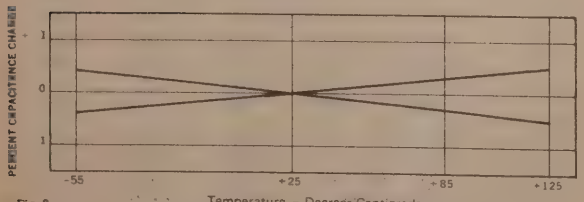
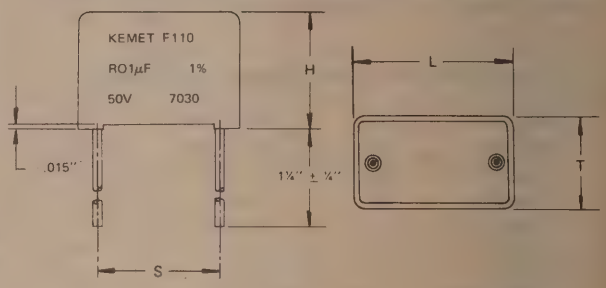


Fig. 3 Temperature – Degrees Centigrade
CAPACITANCE CHANGE VS. TEMPERATURE
MAXIMUM LIMITS FOR "C" CHARACTERISTIC

HERMETICALLY SEALED FLAT KAP

RADIAL LEAD



STANDARD CASE DIMENSIONS

Case Size	L ±.010	H +.005 −.015	T ±.010	S ±.005
A	.550	.375	.170	.400
B	.550	.470	.250	.400
C	.650	.470	.250	.500
D	.650	.470	.350	.500

STANDARD RATINGS

Capacitance μF 25°C 1kHz	Case Size 1, 5, 10%	Capacitance μF 25°C 1kHz	Case Size 5 & 10%	Case Size 1%
.001	A	.012	B	B
.0012	A	.015	B	B
.0015	A	.018	B	B
.0018	A	.022	B	B
.0022	A	.027	B	B
.0027	A	.033	B	B
.0033	A	.039	B	B
.0039	A	.047	C	D
.0047	A	.056	C	D
.0056	A	.068	C	D
.0068	A	.082	C	D
.0082	A	.1	C	D
.01	A	.15	D	D

ORDERING INFORMATION

F *110 A 1002 G 050

FILM

*SERIES (Listed on right)

CASE SIZE

PICOFARAD CODE
First three digits represent significant figures. Fourth digit specifies number of zeros to follow.

VOLTAGE

Cap.	Tolerance
K	±10%
J	±5%
G	±2%
F	±1%
D	±0.5%

*SERIES

110 — A Temp. Coefficient (−200 ±30 PPM) — Radial Lead

120 — B Temp. Coefficient (0 ±100 PPM) — Radial Lead

130 — C Temp. Coefficient (0 ±50 PPM) — Radial Lead

KEMET

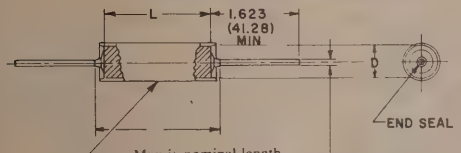
FILM CAPACITORS

UNION CARBIDE

FILM CAPACITORS
METALLIZED POLYCARBONATE FILM CAPACITORS
(MIL-C-83421/01 AND MIL-C-39022/9)

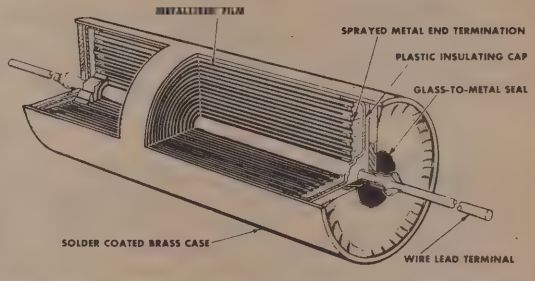
Kemet Metallized Polycarbonate Film Capacitors are designed for circuits requiring stable performance characteristics over a wide temperature range, small size, and operational reliability. They meet the same excellent quality standards associated with all other Union Carbide products. Electrical features include high insulation resistance, low dielectric absorption, low dissipation factor, and full voltage rating to 100°C. In addition, they are AC rated and have the self-healing properties that are inherent in a metallized dielectric. Typical applications include filtering, by-pass, timing, SCR commutating, and 400 cycle AC power circuits. Construction consists of high-purity metallized polycarbonate film with sprayed metal end terminations hermetically sealed in ultra-small solder-coated tubular metal cases. The capacitance range is .001 to 22μF with a DC voltage rating range of 30 to 400 volts. The 400 Hz AC voltage ratings range is 22 to 240 VRMS. The appropriate series are capable of meeting MIL-C-83421 CRH and MIL-C-39022 CHR requirements (see table below). For additional information refer to the Kemet Film Catalog Form F-2871.

F24— SERIES CAPACITOR OUTLINE DRAWING


L
1.623 (41.28) MIN
D
END SEAL
Max is nominal length (L) plus .200 (5.08)
LEAD DIA.
INSULATING SLEEVE
Shall extend beyond the capacitor body. Thickness shall not exceed .005 (.13) inch.
Case diameters .312 (7.92) and less: .025 (.64). 22 AWG
Case diameters .400 (10.16) and .500 (12.70): 032 (.81) 20 AWG
Case diameters .562 (14.27) and over: .040 (1.02). 18 AWG

Millimeters are in parentheses — 1 inch = 25.4mm

TYPICAL HERMETICALLY SEALED METALLIZED CAPACITOR



Marking — Capacitors are printed with Kemet Series designation, capacitance, tolerance, voltage, and date code.

ORDERING INFORMATION

F 241 A 1002 G 100 A

FILM CAPACITOR — F

SERIES — 241
Kemet Metallized Polycarbonate

KEMET REFERENCE NUMBER — A

PICOFARAD CODE — 1002
First three digits represent significant figures. Fourth digit specifies number zeros to follow.

CAPACITANCE TOLERANCE — G
K — ±10% F — ±1%
J — ±5% D — ±0.5%
G — ±2% C — ±0.25%

VOLTAGE — 100
Direct Reading

FAILURE RATE — A
A — Not Applicable
M — 1.0%/1,000 hr.
P — 0.1%/1,000 hr.
R — 0.01%/1,000 hr.
S — 0.001%/1,000 hr.

KEMET Series		*	30 VDC	50 VDC	100 VDC	200 VDC	400 VDC
F241	MIL-C-83421/01	1	CRH01	CRH02	CRH03	CRH04	CRH05
F242	MIL-C-83421/01	2	CRH06	CRH07	CRH08	CRH09	CRH00
F245	MIL-C-39022/9	1	CHR01A	CHR01D	CHR01G	CHR01K	CHR01N
F246	MIL-C-39022/9	2	CHR01B	CHR01E	CHR01H	CHR01L	CHR01P
F247	MIL-C-39022/9	3	CHR01C	CHR01F	CHR01J	CHR01M	CHR01R

*Quality Level

MIL-C-83421/01 MARKING INFORMATION

M83421/01
1 123 M

Single digit designating style (i.e., 1 — CRH01; 2 — CRH02; 3 — CRH03; 4 — CRH04; 5 — CRH05; 6 — CRH06; 7 — CRH07; 8 — CRH08; 9 — CRH09; and 0 — CRH00).

Nonsignificant dash number.

Single letter designating FR Level (M, P, R, and S).

Example of Kemet Part Number F241A2702F030M

MIL-C-39022/9 MARKING INFORMATION

M39022/9
A 001 M JAN

Single letter designating style (i.e., A — CHR01A; B — CHR01B; C — CHR01C; D — CHR01D; E — CHR01E; F — CHR01F; G — CHR01G; H — CHR01H; J — CHR01J; K — CHR01K; L — CHR01L; M — CHR01M; N — CHR01N; O — CHR01O; R — CHR01R).

Nonsignificant dash number.

Single letter designating FR Level (M, P, R, and S).

Jan Marking

Example of Kemet Part Number F245A100C030M

KEMET

FILM CAPACITORS

UNION CARBIDE

METALLIZED POLYCARBONATE FILM CAPACITORS
F140 AND F141 INDUSTRIAL INSTRUMENT CAPACITORS

1. **Capacitance and Tolerance** — Capacitance shall be within the specified tolerance limits of the nominal rating. Capacitors of 1μF or less in capacitance shall be measured at or referred to measurements made at 1,000 Hz. Capacitors greater than 1μF shall be measured at or referred to measurements made at 60 Hz.

2. **DC Voltage Rating** — 50V, 75V, 100V, 150V, 200V, 300V, and 400V.

3. **Operating and Storage Temperature** — −55°C to +125°C.

4. **Capacitance Change vs. Temperature** — The capacitance change vs. temperature shall not exceed ±2% of the +25°C value over the temperature range of −55°C to +125°C.

5. **Dissipation Factor** — At 25°C, the dissipation factor of all capacitors shall not exceed 0.30%. Capacitors of 1μF or less in capacitance shall be measured at or referred to measurements made at 1,000 Hz. Capacitors greater than 1μF shall be measured at or referred to measurements made at 60 Hz.

6. **Insulation Resistance** — At 25°C, the minimum product of insulation resistance and capacitance shall be 100,000 megohm-microfarads. Capacitance values of 0.5μF or less need not exceed 200,000 megohms. The insulation resistance between the case and either terminal, where the case is not a terminal, shall be greater than 50,000 megohms.

   At 85°C, the minimum product of insulation resistance and capacitance shall be 6,000 megohm-microfarads. Capacitance values of 0.5μF or less need not exceed 12,000 megohms.

   At 125°C, the minimum product of insulation resistance and capacitance shall be 1,000 megohm-microfarads. Capacitance values of 0.5μF or less need not exceed 2,000 megohms.

   Measurements shall be made after a two (2) minute charge at rated DC voltage.

7. **Dielectric Withstanding Voltage** — At 25°C, capacitors shall withstand 200% of rated DC voltage for two (2) minutes without permanent breakdown. When the case is not a terminal, the capacitors shall withstand 200% of rated DC voltage applied between the case and the terminals. Test voltage must be applied and discharged through a resistance of 1 ohm per volt, minimum.

8. **Life Test** — When tested at 125°C, the capacitors shall withstand 140% of rated DC voltage for a period of 250 hours. Only one failure in 18 tested shall be permitted. Subsequent to testing, the capacitors shall meet the following requirements:

   Insulation Resistance: At 25°C, no less than 60% of the initial value specified in **Insulation Resistance.**

   Capacitance Change: Not more than 5% of the initial value obtained when measured as specified in **Capacitance and Tolerance.**

   Dissipation Factor: Not greater than 0.60% when measured as specified in **Dissipation Factor.**

9. **AC Voltage Rating** — (−55°C to +105°C Ambient).

DC Voltage Rating	Equivalent VAC RMS Ratings at 400 Hz	800 Hz	1200 Hz	1600 Hz	2000 Hz
50 (0.33μF thru 5.6μF)	30	25	20	15	12
(5.8 μF thru 12.0μF)	25	20	15	12	10
(15.0μF thru 40.0μF)	20	15	12	10	8
(47.0μF thru 100.0μF)	10	8	6	5	4
75 (0.18μF thru 5.6μF)	50	35	30	25	20
(6.8 μF thru 12.0μF)	40	30	25	20	15
(15.0μF thru 39.0μF)	30	20	18	15	12
(47.0μF thru 100.0μF)	15	10	8	6	5
100 (0.15μF thru 5.6μF)	65	45	40	35	30
(6.0 μF thru 12.0μF)	45	35	30	25	20
(15.0μF thru 39.0μF)	35	25	20	15	12
(47.0μF thru 100.0μF)	18	12	8	6	5
150 (.10 μF thru 3.3μF)	90	65	55	45	40
(3.9 μF thru 5.6μF)	80	55	45	40	35
(6.8 μF thru 12.0μF)	55	40	35	30	25
(15.0μF thru 39.0μF)	45	30	20	15	12
(47.0μF thru 56.0μF)	25	18	12	10	8
200 (.10 μF thru 2.0μF)	120	95	80	70	60
(2.2 μF thru 5.6μF)	95	75	65	55	50
(6.0 μF thru 12.0μF)	65	45	35	30	25
(15.0μF thru 39.0μF)	50	30	20	15	12
300 (.10 μF thru 1.5μF)	200	140	115	100	90
(1.8 μF thru 3.9μF)	160	110	90	80	75
400 (.10 μF thru 1.0μF)	240	170	140	120	110
(1.2 μF thru 2.7μF)	190	135	110	95	90

ORDERING INFORMATION

GENERAL

F 14 X XXXX X XXX X

FILM
Dielectric

SERIES
Dielectric and Mechanical features three numbers.

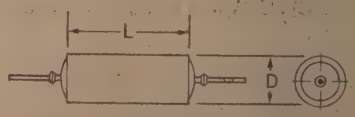
KEMET REF. NUMBER

PICOFARAD CODE
First three digits represent significant figures. Fourth digit specifies number of zeros to follow.

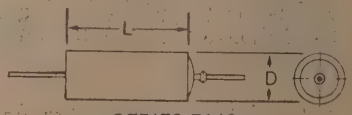
CAPACITANCE TOLERANCE
One Letter (All Series)
K — ±10%
J — ±5%
G — ±2%
F — ±1%

VOLTAGE
Read Directly

CASE FINISH:
S — Insulated
U — Not Insulated



SERIES F141

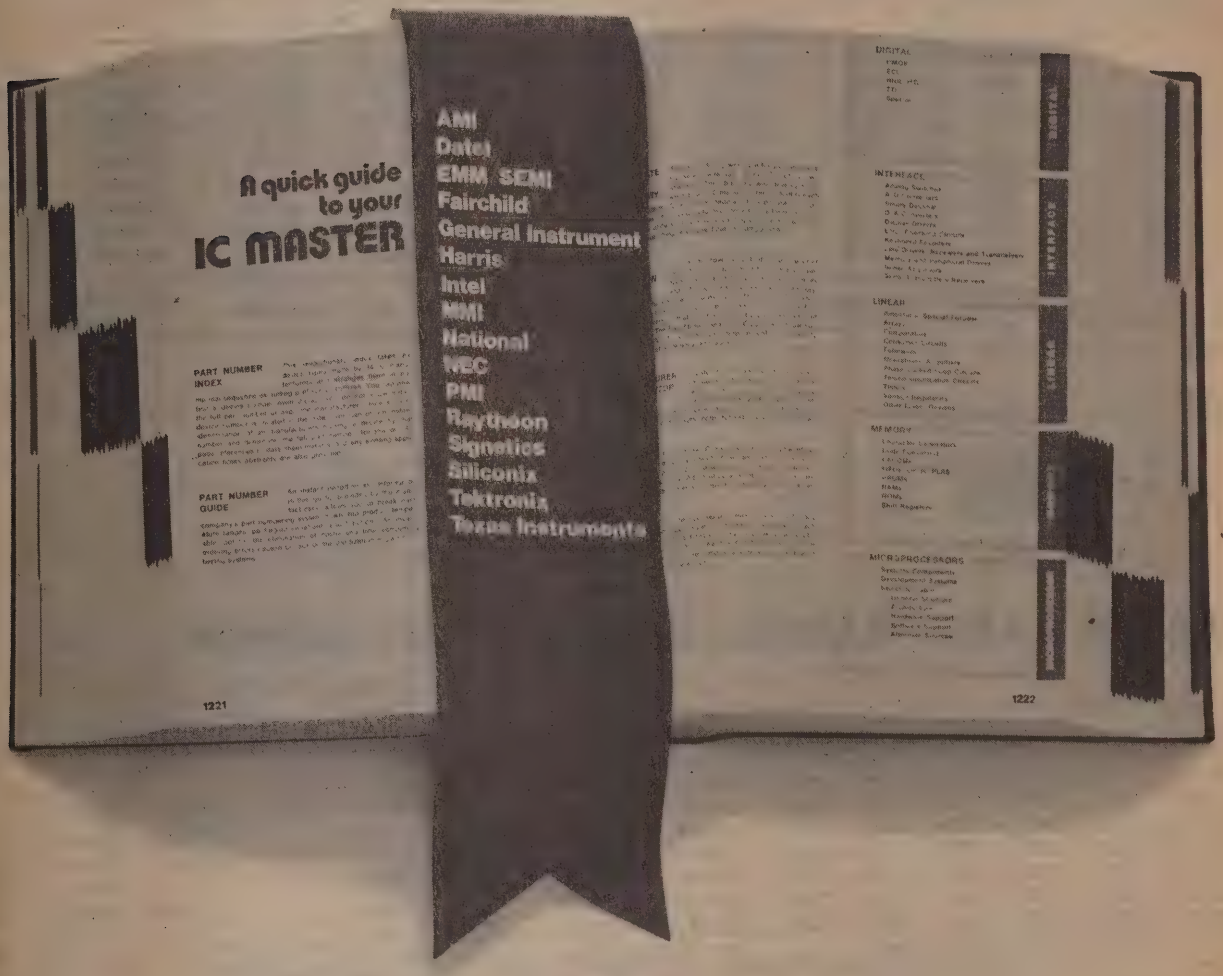


SERIES F140

For each rating the L Dimension is .061 shorter for the F140 Series.

Add Dept. EM to address to tell them you saw it in eem

A GOOD BOOK IS KNOWN BY THE COMPANIES IT KEEPS.



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Varadyne Varadyne Varadyne

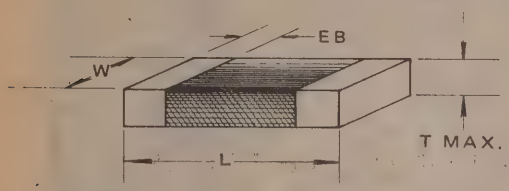
MONOLITHIC CERAMIC CAPACITORS

CHIP CAPACITORS

CAPACITANCE RANGE

SIZE	DIMENSIONS		DIELECTRIC TYPE (EIA CODE) See Dielectric Chart.		
	L x W x T	EB	BP (COG)	BR (X7R)	GU (Z5U)
1	.050 x .050 x .050	.005/.020	1pF - 390pF	120pF - .01mFd	1000pF - .022mFd
2	.080 x .050 x .050	.010/.030	1pF - 680pF	120pF - .015mFd	2200pF - .039mFd
3	.095 x .050 x .060	.010/.030	1pF - 1200pF	120pF - .027mFd	3900pF - .056mFd
4	.150 x .050 x .060	.010/.030	10pF - 2200pF	120pF - .047mFd	8200pF - .1mFd
5	.120 x .095 x .065	.010/.030	10pF - 4700pF	270pF - .1mFd	.015mFd - .22mFd
6	.170 x .070 x .070	.010/.035	12pF - 3300pF	220pF - .068mFd	.01mFd - .18mFd
18	.195 x .125 x .070	.020/.045	100pF - .01mFd	2200pF - .33mFd	.047mFd - .56mFd
10	.220 x .230 x .070	.020/.050	100pF - .027mFd	4700pF - .56mFd	.1mFd - 1.8mFd
14	.245 x .225 x .080	.020/.050	470pF - .039mFd	5600pF - 1.0mFd	.47mFd - 2.2mFd
AVAILABLE TOLERANCES			±5%; ±10%; ±20%	±5%; ±10%; ±20%	±20%; +80%, –20%; +100%, –0%

Meets or exceeds applicable requirements of MIL-C-55681.



HOW TO ORDER:

3	BP	050	S	101	J	D

SIZE
DIELECTRIC
DC WORKING VOLTAGE
CHIP CAPACITOR
CAPACITANCE CODE
TOLERANCE
TERMINATION (PALLADIUM-SILVER STD)

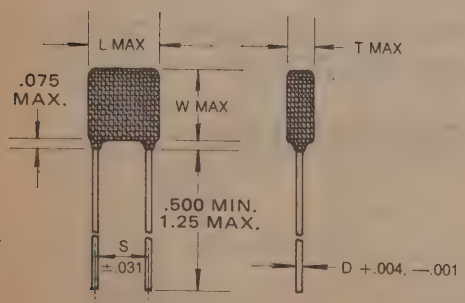
CLOVER CAPS RADIAL LEADED, EPOXY DIPPED

CAPACITANCE RANGE

SIZE	DIMENSIONS		DIELECTRIC TYPE (EIA CODE) See Dielectric Chart.		
	L x W x T	S x D	COG	X7R	Z5U
2112	.120 x .120 x .100	.100 x .016	5.6pF - 12pF	120pF - 330pF	2200pF - 6800pF
2115	.150 x .150 x .100	.100 x .016	15pF - 330pF	390pF - .015mFd	8200pF - .056mFd
2120	.200 x .200 x .125	100 x .020	390pF - 4700pF	.01mFd - .1mFd	.027mFd - .22mFd
2130	.300 x .300 x .150	.200 x .020	5600pF - .01mFd	.1mFd - .39mFd	.1mFd - 1mFd
2140	.400 x .400 x .150	.200 x .020	.01mFd - .022mFd	.47mFd - 1mFd	1mFd - 2.2mFd
2150	.500 x .500 x .200	.400 x .025	.027mFd - .047mFd	1mFd - 2.2mFd	2.7mFd - 4.7mFd
AVAILABLE TOLERANCES			±5%; ±10%; ±20%;	±5%; ±10%; ±20%	±20%; +80%; –20%; +100%, –0%

OPTIONAL LEAD DIAMETER AND LEAD SPACING

RADIAL STYLE	S	D	SUFFIX LETTER
2120	.200(5.08)	.020(.508)	A
2120	.250(6.35)	.020(.508)	B
2140	.375(9.52)	.020(.508)	C
2150	.375(9.52)	.020(.508)	C
2140	.375(9.52)	.025(.635)	D
2115	.100(2.54)	.020(.508)	E



HOW TO ORDER:

2120	X7R	050	R	103	K	A

SIZE
DIELECTRIC
DC WORKING VOLTAGE
RADIAL CAPACITOR
CAPACITANCE CODE
TOLERANCE
LEAD

Varadyne Industries, Inc. • 1520 Cloverfield Boulevard • Santa Monica, California 90404 • (213) 829-2984 • TWX (910) 343-6856

Add Dept. EM to address to tell them you saw it in eem

Varadyne Varadyne Varadyne

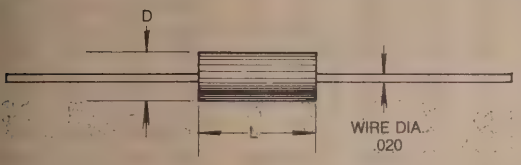
MONOLITHIC CERAMIC CAPACITORS

GREEN GODDESS AXIAL LEADED, GLASS ENCAPSULATED

CAPACITANCE RANGE

SIZE	DIMENSIONS L x D	DIELECTRIC TYPE (EIA CODE) See Dielectric Chart.		
		COG	X7R	Z5U
1801	.160 x .100	10pF - 680pF	120pF - .015mFd	2200pF - .047mFd
1802	.260 x .100	820pF - 2700pF	.018mFd - .056mFd	.056mFd - .12mFd
1803	.400 x .155	3300pF - .01mFd	.068mFd - .33mFd	.15mFd - 1.0mFd
AVAILABLE TOLERANCES		±5%; ±10%; ±20%	±10%; ±20%	±20%; +80%, –20%; +100%, –0%

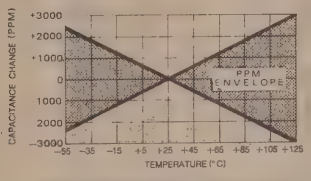
Meets or exceeds applicable requirements of MIL-C-11015 and MIL-C-39014.

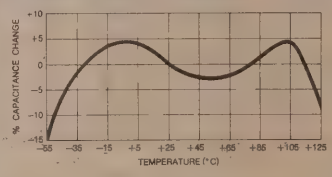


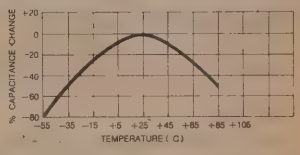
HOW TO ORDER:

1801	COG	050	A	681	J
SIZE	DIELECTRIC	DC WORKING VOLTAGE	AXIAL CAPACITOR	CAPACITANCE CODE	TOLERANCE

DIELECTRIC CHARACTERISTICS





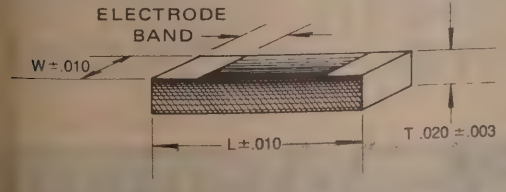


E.I.A. CODE	COG	X7R	Z5U
CAPACITANCE CHANGE:	0 ±30ppm/°C	±15%	+22, –56% (+10° to 85° C)
WORKING TEMPERATURE RANGE:	–55° C to +125° C	–55° C to +125° C	–55° C to +85° C
DF:	.15% max	2.5% max	3.5% max
IR @ 25° C:	100K megohms or 1000 megohms – mFd, whichever is less	100K megohms or 1000 megohms –mFd, whichever is less	10K megohms or 1000 megohms –mFd, whichever is less
DWV:	2.5 x Rated	2.5 x Rated	2.5 x Rated
TOLERANCE CODE	J(± 5%); K(± 10%); M(± 20%); Z(+80%, –20%); P(+100%, –0%)		

THICK FILM CHIP RESISTORS

STYLE	LENGTH (L)	WIDTH (W)	ELECTRODE BAND	POWER RATING	RESISTANCE RANGE
1	.050	.050	.005/.020	75 mw	10 ohm to 1 meg ohm
2	.075	.050	.015/.030	100 mw	40 ohm to 1 meg ohm
3	.100	.050	.015/.035	150 mw	60 ohm to 2 meg ohm
4	.150	.050	.015/.035	300 mw	100 ohm to 3 meg ohm
AVAILABLE TOLERANCES	±1%; ±2%; ±5%; ±10%; ±20%.				

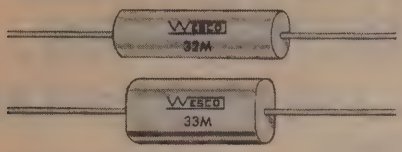
Meets or exceeds applicable requirements of MIL-R-55342. CONDUCTORS: Palladium silver standard – gold, palladium gold, solder coated available. One surface metalization available per MIL-R-55342 code 'S'. BONDING: Underside of the resistor may be metalized when specified per MIL-R-55342. PASSIVATION: Special glass passivation available.



HOW TO ORDER:

3	C	122	K
SIZE	CERMET CHIP	RESISTANCE VALUE IN OHMS	TOLERANCE

WESCO® MYLAR® FILM-FOIL CAPACITORS



SPECIFICATIONS

DIELECTRIC WITHSTANDING VOLTAGE

200% of rated voltage applied through a minimum limiting resistance of 100 Ohms/Volt. Duration of voltage stress shall be 15 seconds minimum and 1 minute maximum at 25°C.

TEMPERATURE RANGE

−55°C to +85°C with full rated voltage applied. To +125°C with 50% of rated voltage.

INSULATION RESISTANCE

At 25°C after 2 minutes of electrification at rated voltage or 500 VDC, whichever is less, the minimum product of Insulation Resistance and Capacitance shall be 100,000 megohms-microfarads, but need not exceed 100,000 megohms.

DISSIPATION FACTOR

Shall not exceed 0.75% when measured at 25°C and 1000 Hz, ±20 Hz. See characteristic curves for D.F. ratings at other temperatures.

CAPACITANCE AND TOLERANCE

Shall be measured within the tolerance limits specified. Measurements will be made at 25°C and 1000 Hz ±20 Hz.

LIFE TEST

Shall withstand 140% of rated voltage at 85°C for 250 hours. One failure in twelve shall be permitted.

CAPACITANCE STABILITY (DRIFT)

Less than 0.50% when measured in the following manner: three capacitance readings at 25°C, each made prior to and after temperature cycling from room to 80°C, and room to −55°C. The mathematical difference between the two extremes, divided by the intermediate value, and then multiplied by 100, yields the stability expressed in percent.

HUMIDITY RESISTANCE

Meets requirements of Mil-C-27287,, Para. 3.12 when tested in accordance with Mil-STD.-202C, Method 103 B, Condition B.

LEAD PULL AND BEND TEST

Steady pull of 5 pounds applied axially to leads for one minute. Bend test shall consist of one bend from the point of egress, first 90° in one direction, back to the original axial position, and then 90° in the opposite direction with no evidence of breakage.

FEATURES

Wrap and fill construction.

Tubular or oval configuration for optimum space savings.

Extended foil design.

Quality control procedures per Mil-Q-9858.

Will meet or exceed Mil-C-27287.

APPLICATIONS

Computers

Data Processing Equipment

Peripheral Equipment

Aircraft and Missile Systems

Industrial Instrumentation

Navigation and Distance Measuring Equipment

Communications Equipment

Filters

TYPE 32M RATINGS AND DIMENSIONS

Capacity in Mfds.	100 VOLTS D	L	Cat. No. 32M — K-1	200 VOLTS D	L	Cat. No. 32M — K-2	400 VOLTS D	L	Cat. No. 32M — K-4	600 VOLTS D	L	Cat. No. 32M — K-6
.001	.187	.40	1001	.187	.40	1001	.187	.53	1001	.187	.53	1001
.0012	.187	.40	1201	.187	.40	1201	.187	.53	1201	.187	.53	1201
.0015	.187	.40	1501	.187	.40	1501	.187	.53	1501	.187	.53	1501
.0018	.187	.40	1801	.187	.40	1801	.187	.53	1801	.187	.53	1801
.0022	.187	.40	2201	.187	.40	2201	.187	.53	2201	.187	.53	2201
.0027	.187	.40	2701	.187	.40	2701	.187	.53	2701	.203	.53	2701
.0033	.187	.40	3301	.187	.40	3301	.187	.53	3301	.218	.53	3301
.0039	.187	.40	3901	.187	.40	3901	.187	.53	3901	.218	.53	3901
.0047	.187	.40	4701	.187	.40	4701	.187	.53	4701	.187	.65	4701
.0056	.187	.40	5601	.187	.40	5601	.187	.53	5601	.203	.65	5601
.0068	.187	.40	6801	.187	.40	6801	.187	.53	6801	.203	.65	6801
.0082	.187	.40	8201	.187	.40	8201	.203	.53	8201	.218	.65	8201
.01	.187	.40	1002	.203	.40	1002	.218	.53	1002	.234	.65	1002
.012	.187	.40	1202	.234	.40	1202	.234	.53	1202	.265	.65	1202
.015	.203	.40	1502	.250	.40	1502	.265	.53	1502	.281	.65	1502
.018	.218	.40	1802	.203	.53	1802	.218	.65	1802	.265	.78	1802
.022	.234	.40	2202	.218	.53	2202	.250	.65	2202	.281	.78	2202
.027	.265	.40	2702	.234	.53	2702	.234	.78	2702	.312	.78	2702
.033	.218	.53	3302	.218	.65	3302	.265	.78	3302	.296	.90	3302
.039	.187	.65	3902	.234	.65	3902	.281	.78	3902	.328	.90	3902
.047	.203	.65	4702	.250	.65	4702	.312	.78	4702	.359	.90	4702
.056	.218	.65	5602	.281	.65	5602	.296	.90	5602	.375	.90	5602
.068	.250	.65	6802	.312	.65	6802	.328	.90	6802	.421	.90	6802
.082	.265	.65	8202	.296	.78	8202	.343	.90	8202	.375	1.18	8202
.1	.265	.78	1003	.328	.78	1003	.390	.90	1003	.421	1.18	1003
.12	.281	.78	1203	.328	.90	1203	.359	1.18	1203	.453	1.18	1203
.15	.312	.78	1503	.359	.90	1503	.390	1.18	1503	.500	1.18	1503
.18	.312	.90	1803	.359	1.03	1803	.437	1.32	1803	.515	1.32	1803
.22	.343	.90	2203	.390	1.03	2203	.484	1.32	2203	.562	1.32	2203
.27	.343	1.03	2703	.406	1.18	2703	.468	1.56	2703	.562	1.56	2703
.33	.375	1.03	3303	.437	1.18	3303	.515	1.56	3303	.578	1.70	3303
.39	.375	1.18	3903	.468	1.18	3903	.562	1.56	3903	.625	1.70	3903
.47	.406	1.18	4703	.515	1.18	4703	.609	1.56	4703	.687	1.70	4703
.56	.437	1.18	5603	.531	1.32	5603	.640	1.70	5603	.750	1.70	5603
.68	.484	1.18	6803	.515	1.56	6803	.703	1.70	6803	.796	1.82	6803
.82	.531	1.18	8203	.578	1.56	8203	.734	1.82	8203	.828	1.94	8203
1.0	.546	1.32	1004	.593	1.70	1004	.781	1.94	1004	.921	1.94	1004
1.25	.578	1.45	1254	.671	1.70	1254	—	—	—	—	—	—
1.50	.625	1.45	1504	.734	1.70	1504	—	—	—	—	—	—
2.0	.687	1.56	2004	.812	1.82	2004	—	—	—	—	—	—

TYPE 33M RATINGS AND DIMENSIONS

Capacity in Mfds.	100 VOLTS T	W	L	Cat. No. 33M — K1	200 VOLTS T	W	L	Cat. No. 33M — K2	400 VOLTS T	W	L	Cat. No. 33M — K4	600 VOLTS T	W	L	Cat. No. 33M — K6
.001	.125	.234	.40	1001	.125	.234	.40	1001	.109	.203	.53	1001	.109	.203	.53	1001
.0012	.125	.234	.40	1201	.125	.234	.40	1201	.109	.203	.53	1201	.109	.203	.53	1201
.0015	.125	.234	.40	1501	.125	.234	.40	1501	.125	.234	.53	1501	.125	.234	.53	1501
.0018	.125	.234	.40	1801	.125	.234	.40	1801	.125	.234	.53	1801	.125	.234	.53	1801
.0022	.125	.234	.40	2201	.125	.234	.40	2201	.125	.234	.53	2201	.125	.234	.53	2201
.0027	.125	.234	.40	2701	.125	.234	.40	2701	.125	.234	.53	2701	.125	.234	.53	2701
.0033	.125	.234	.40	3301	.125	.234	.40	3301	.125	.234	.53	3301	.140	.281	.53	3301
.0039	.125	.234	.40	3901	.125	.234	.40	3901	.125	.234	.53	3901	.140	.265	.53	3901
.0047	.125	.234	.40	4701	.125	.234	.40	4701	.125	.234	.53	4701	.125	.265	.65	4701
.0056	.125	.234	.40	5601	.125	.234	.40	5601	.125	.234	.53	5601	.125	.250	.65	5601
.0068	.125	.234	.40	6801	.125	.234	.40	6801	.125	.234	.53	6801	.125	.250	.65	6801
.0082	.125	.234	.40	8201	.125	.234	.40	8201	.140	.234	.53	8201	.140	.265	.65	8201
.01	.125	.234	.40	1002	.140	.250	.40	1002	.156	.250	.53	1002	.156	.281	.65	1002
.012	.125	.234	.40	1202	.171	.265	.40	1202	.171	.265	.53	1202	.171	.312	.65	1202
.015	.140	.234	.40	1502	.187	.281	.40	1502	.187	.312	.53	1502	.203	.328	.65	1502
.018	.156	.250	.40	1802	.140	.234	.53	1802	.140	.281	.65	1802	.171	.312	.78	1802
.022	.171	.281	.40	2202	.156	.250	.53	2202	.171	.296	.65	2202	.203	.343	.78	2202
.027	.203	.296	.40	2702	.171	281	.53	2702	.156	.281	.78	2702	.234	.359	.78	2702
.033	.140	.250	.53	3302	.156	.250	.65	3302	.171	.312	.78	3302	.218	.343	.90	3302
.039	.125	.234	.65	3902	.171	.265	.65	3902	.203	.328	.78	3902	.250	.375	.90	3902
.047	.140	.250	.65	4702	.171	.312	.65	4702	.203	.375	.78	4702	.281	.406	.90	4702
.056	.156	.265	.65	5602	.203	.328	.65	5602	.187	.359	.90	5602	.281	.453	.90	5602
.068	.187	.281	.65	6802	.218	.359	.65	6802	.218	.390	.90	6802	.312	.500	.90	6802
.082	.187	.312	.65	8202	.218	.343	.78	8202	.250	.421	.90	8202	.281	.453	1.18	8202
.1	.187	.312	.78	1003	.234	.375	.78	1003	.281	.453	.90	1003	.312	.500	1.18	1003
.12	.203	.328	.78	1203	.218	.390	.90	1203	.250	.421	1.18	1203	.343	.515	1.18	1203
.15	.234	.359	.78	1503	.250	.421	.90	1503	.281	.484	1.18	1503	.390	.578	1.18	1503
.18	.218	.328	.90	1803	.234	.437	1.03	1803	.312	.515	1.32	1803	.406	.578	1.32	1803
.22	.250	.359	.90	2203	.265	.468	1.03	2203	.359	.562	1.32	2203	.468	.640	1.32	2203
.27	.234	.406	1.03	2703	.281	.484	1.18	2703	.343	.546	1.56	2703	.437	.640	1.56	2703
.33	.265	.437	1.03	3303	.328	.515	1.18	3303	.390	.593	1.56	3303	.468	.671	1.70	3309
.39	.265	.453	1.18	3903	.359	.562	1.18	3903	.437	.640	1.56	3903	.500	.703	1.70	3903
.47	.296	.500	1.18	4703	.406	593	1.18	4703	.484	.687	1.56	4703	.562	.765	1.70	4703
.56	.328	.531	1.18	5603	.406	609	1.32	5603	.515	.718	1.70	5603	.625	.828	1.70	5603
.68	.375	.562	1.18	6803	.406	.609	1.56	6803	.578	.781	1.70	6803	.656	.875	1.82	6803
.82	.421	.609	1.18	8203	.453	.656	1.56	8203	.609	.812	1.82	8203	.703	.906	1.94	8203
1.0	.437	.625	1.32	1004	.484	.687	1.70	1004	.656	.859	1.94	1004	.781	.984	1.94	1004
1.25	.453	.656	1.45	1254	.453	.859	1.70	1254	—	—	—	—	—	—	—	—
1.50	.515	.718	1.45	1504	.515	.906	1.70	1504	—	—	—	—	—	—	—	—
2.0	.468	.875	1.56	2004	.578	.984	1.82	2004	—	—	—	—	—	—	—	—

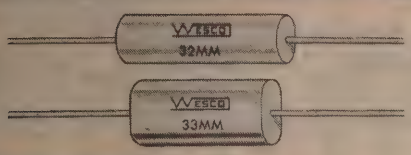
STANDARD LEAD SIZES: #24 AWG TCW: up to and including .203" Dia., #22 AWG TCW: from .204" thru .312" Dia., #20 AWG TCW: .313" Dia. and over. CAPACITY TOLERANCE: STANDARD . . . ±10% / OTHER . . . from ±20% to ±1%. Other values as well as voltage ratings are available on request.

*DuPONT REGISTERED TRADEMARK

WESCO® ELECTRICAL COMPANY
DEPT. EM, 201C MUNSON ST. • GREENFIELD, MASS. 01301 • PHONE: (413) 774-4358

WESCO®

WESCO® METALIZED MYLAR CAPACITORS



SPECIFICATIONS

DIELECTRIC WITHSTANDING VOLTAGE

200% of rated voltage applied through a minimum limiting resistance of 100 Ohms/Volt. Duration of voltage stress shall be 15 seconds minimum and 1 minute maximum at 25°C.

TEMPERATURE RANGE

−55°C to +85°C with full rated voltage applied. To +125°C with 50% of rated voltage.

INSULATION RESISTANCE

At 25°C after 2 minutes of electrification at rated voltage or 500 VDC, whichever is less, the minimum product of Insulation Resistance and Capacitance shall be 30,000 megohms-microfarads, but need not exceed 30,000 megohms.

DISSIPATION FACTOR

Shall not exceed 1.0% when measured at 25°C and 1000 Hz, ±20 Hz. See characteristic curves for D.F. ratings at other temperatures.

CAPACITANCE AND TOLERANCE

Shall be measured within the tolerance limits specified. Measurements will be made at 25°C and 1000 Hz, ±20 Hz.

LIFE TEST

Shall withstand 140% of rated voltage at 85°C for 250 hours. One failure in twelve shall be permitted.

CAPACITANCE STABILITY (DRIFT)

Less than 0.3% when measured in the following manner: three capacitance readings at 25°C, each made prior to and after temperature cycling from room to 85°C, and room to −55°C. The mathematical difference between the two extremes, divided by the intermediate value, and then multiplied by 100, yields the stability expressed in percent.

HUMIDITY RESISTANCE

Meets requirements of Mil-C-27287, Para. 3.12 when tested in accordance with Mil-STD.-202C, Method 103 B, Condition B.

LEAD PULL AND BEND TEST

Steady pull of 5 pounds applied axially to leads for one minute. Bend test shall consist of one bend from the point of egress, first 90° in one direction, back to the original axial position, and then 90° in the opposite direction with no evidence of breakage.

FEATURES

- Wrap and fill construction
- Tubular and oval configuration for optimum space savings
- Extended foil design
- Miniature size — lightweight
- Low dissipation factor
- Excellent stability
- Quality control procedures per Mil-Q-9858

APPLICATIONS

- Data Processing Equipment
- Aircraft and Missile Systems
- Industrial Instrumentation
- Navigation and Distance Measuring Equipment
- Communications Equipment
- Tachometers
- Filters
- Peripheral Equipment

TYPE 32MM RATINGS AND DIMENSIONS

Capacity in Mfds.	100 VOLTS D	L	Cat. No. 32MM — K-1	200 VOLTS D	L	Cat. No. 32MM — K-2	400 VOLTS D	L	Cat. No. 32MM — K-4	600 VOLTS D	L	Cat. No. 32MM — K-6
.0068	—	—	—	—	—	—	.218	.53	6801	.312	.53	6801
.0082	—	—	—	—	—	—	.234	.53	8201	.171	.65	8201
.01	—	—	—	—	—	—	.265	.53	1002	.250	.65	1002
.012	—	—	—	—	—	—	.203	.65	1202	.265	.65	1202
.015	—	—	—	—	—	—	.218	.65	1502	.296	.65	1502
.018	—	—	—	.203	.40	1802	.234	.65	1802	.328	.65	1802
.022	—	—	—	.218	.40	2202	.250	.65	2202	.375	.65	2202
.027	.171	.40	2702	.234	.40	2702	.265	.65	2702	.390	.65	2702
.033	.187	.40	3302	.265	.40	3302	.296	.65	3302	.437	.65	3302
.039	.187	.40	3902	.203	.53	3902	.234	.90	3902	.328	.90	3902
.047	.203	.40	4702	.218	.53	4702	.265	.90	4702	.375	.90	4702
.056	.218	.40	5602	.234	.53	5602	.265	.90	5602	.390	.90	5602
.068	.250	.40	6802	.250	.53	6802	.296	.90	6802	.437	.90	6802
.082	.187	.53	8202	.265	.53	8202	.328	.90	8202	.468	.90	8202
.1	.203	.53	1003	.281	.53	1003	.343	.90	1003	.515	.90	1003
.12	.218	.53	1203	.312	.53	1203	.328	1.18	1203	.453	1.18	1203
.15	.234	.53	1503	.343	.53	1503	.343	1.18	1503	.515	1.18	1503
.18	.250	.53	1803	.296	.65	1803	.375	1.18	1803	.562	1.18	1803
.22	.234	.65	2203	.328	.65	2203	.406	1.18	2203	.625	1.18	2203
.27	.250	.65	2703	.359	.65	2703	.453	1.18	2703	.687	1.18	2703
.33	.265	.65	3303	.406	.65	3303	.437	1.45	3303	.656	1.45	3303
.39	.281	.65	3903	.437	.65	3903	.468	1.45	3903	.703	1.45	3903
.47	.312	.65	4703	.468	.65	4703	.515	1.45	4703	.781	1.45	4703
.56	.343	.65	5603	.406	.90	5603	.546	1.45	5603	.843	1.45	5603
.68	.375	.65	6803	.437	.90	6803	.609	1.45	6803	.921	1.45	6803
.82	.359	.78	8203	.406	1.18	8203	.593	1.70	8203	.906	1.70	8203
1.0	.390	.78	1004	.437	1.18	1004	.656	1.70	1004	1.000	1.70	1004
1.25	.421	.78	1254	.500	1.18	1254	.734	1.70	1254	1.171	1.70	1254
1.50	.421	.90	1504	.531	1.18	1504	.796	1.70	1504	1.265	1.70	1504
1.80	.453	.90	1804	.593	1.18	1804	.875	1.70	1804	1.375	1.70	1804
2.0	.484	.90	2004	.625	1.18	2004	.921	1.70	2004	1.406	1.70	2004
3.0	.484	1.18	3004	.656	1.45	3004	—	—	—	—	—	—
4.0	.562	1.18	4004	.750	1.45	4004	—	—	—	—	—	—
5.0	.625	1.18	5004	.765	1 70	5004	—	—	—	—	—	—
8.0	.703	1.45	8004	.828	2.06	8004	—	—	—	—	—	—
10.0	.781	1.45	1005	.921	2.06	1005	—	—	—	—	—	—

TYPE 33MM RATINGS & DIMENSIONS

Capacity in Mfds.	100 VOLTS T	W	L	Cat. No. 33MM — K1	200 VOLTS T	W	L	Cat. No. 33MM — K2	400 VOLTS T	W	L	Cat. No. 33MM — K4	600 VOLTS T	W	L	Cat. No. 33MM — K6
.0068	—	—	—	—	—	—	—	—	.140	.281	.53	6801	.234	.359	.53	6801
.0082	—	—	—	—	—	—	—	—	.156	.296	.53	8201	.078	.218	.65	8201
.01	—	—	—	—	—	—	—	—	.187	.312	.53	1002	.171	.296	.65	1002
.012	—	—	—	—	—	—	—	—	.125	.250	.65	1202	.140	.281	.65	1202
.015	—	—	—	—	—	—	—	—	.140	.265	.65	1502	.203	.343	.65	1502
.018	—	—	—	—	—	—	—	—	.156	.281	.65	1802	.218	421	.65	1802
.022	—	—	—	—	.140	.281	.40	2202	.171	.312	.65	2202	.250	.437	.65	2202
.027	.109	.203	.40	2702	.156	.296	.40	2702	.203	.328	.65	2702	.281	.484	.65	2702
.033	.125	.218	.40	3302	.187	.312	.40	3302	.218	.359	.65	3302	.312	.531	.65	3302
.039	.125	.234	.40	3902	.125	.250	.53	3902	.156	.296	.90	3902	.218	.421	.90	3902
.047	.140	.250	.40	4702	.140	.265	.53	4702	.171	.312	.90	4702	.250	.437	.90	4702
.056	.156	.265	.40	5602	.156	.281	.53	5602	.187	.328	.90	5602	.265	.468	.90	5602
.068	.187	.281	.40	6802	.171	.296	.53	6802	.218	.343	.90	6802	.312	.515	.90	6802
.082	.109	.234	.53	8202	.187	.312	.53	8202	.218	.390	.90	8202	.343	.562	.90	8202
.1	.125	.250	.53	1003	.203	.343	.53	1003	.250	.421	.90	1003	.390	.593	.90	1003
.12	.140	.265	.53	1203	.234	.359	.53	1203	.218	.390	1.18	1203	.343	.546	1.18	1203
.15	.156	.281	.53	1503	.265	.390	.53	1503	.250	.421	1.18	1503	.390	.596	1.18	1503
.18	.187	.312	.53	1803	.234	.359	.65	1803	.281	.453	1.18	1803	.437	.640	1.18	1803
.22	.156	.281	.65	2203	.250	.390	.65	2203	.296	.500	1.18	2203	.500	.687	1.18	2203
.27	.171	.296	.65	2703	.281	.406	.65	2703	.343	.531	1.18	2703	.562	.765	1.18	2703
.33	.187	.312	.65	3303	.281	.484	.65	3303	.312	.515	1.45	3303	.531	.734	1.45	3303
.39	.218	.343	.65	3903	.312	.515	.65	3903	.343	.546	1.45	3903	.578	.781	1.45	3903
.47	.234	.359	.65	4703	.359	.562	.65	4703	.390	.578	1.45	4703	.640	.843	1.45	4703
.56	.250	.406	.65	5603	.281	.484	.90	5603	.437	.625	1.45	5603	.718	.921	1.45	5603
.68	.281	.437	.65	6803	.328	.515	.90	6803	.484	.687	1.45	6803	.796	1.000	1.45	6803
.82	.250	.421	.78	8203	.296	.484	1.18	8203	.468	.671	1.70	8203	.781	.984	1.70	8203
1.0	.281	.453	.78	1004	.328	.531	1.18	1004	.531	.734	1.70	1004	.857	1.078	1.70	1004
1.25	.312	.515	.78	1254	.375	.578	1.18	1254	.609	.812	1.70	1254	1.062	1.265	1.70	1254
1.50	.296	.500	.90	1504	.421	.625	1.18	1504	.671	.875	1.70	1504	1.156	1.359	1.70	1504
1.80	.328	.515	.90	1804	.406	.687	1.18	1804	.750	.953	1.70	1804	1.265	1.484	1.70	1804
2.0	.359	.562	.90	2004	.421	.718	1.18	2004	.796	1.000	1.70	2004	1.281	1.484	1.70	2004
3.0	.375	.578	1.18	3004	.406	.812	1.45	3004	—	—	—	—	—	—	—	—
4.0	.406	.703	1.18	4004	.625	.828	1.45	4004	—	—	—	—	—	—	—	—
5.0	.453	.750	1.18	5004	.640	.828	1.70	5004	—	—	—	—	—	—	—	—
8.0	.531	.828	1.45	8004	.656	.953	2.06	8004	—	—	—	—	—	—	—	—
10.0	.609	.906	1.45	1005	.750	1.046	2.06	1005	—	—	—	—	—	—	—	—

STANDARD LEAD SIZES: #24 AWG TCW: up to and including .203" Dia., #22 AWG TCW: from .204" thru .312" Dia., #20 AWG TCW: .313" Dia. and over. CAPACITY TOLERANCE: STANDARD . . . ±10% / OTHER . . . from ±20% to ±2%. Other values as well as voltage ratings are available on request.

*DuPONT REGISTERED TRADEMARK

WESCO® ELECTRICAL COMPANY
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WESCO®

WESCO® POLYSTYRENE CAPACITORS

SPECIFICATIONS

DIELECTRIC WITHSTANDING VOLTAGE
200% of rated voltage applied through a minimum limiting resistance of 100 Ohms/Volt. Duration of voltage stress shall be 15 seconds minimum and 1 minute maximum at 25°C.

INSULATION RESISTANCE
At 25°C after 2 minutes of electrification at rated voltage or 500 VDC, whichever is less, the minimum product of Insulation Resistance and Capacitance shall be 500,000 megohms-microfarads, but need not exceed 500,000 megohms.

DISSIPATION FACTOR
Shall not exceed .05% when measured at 25°C and 1000 Hz, ± Hz. See characteristic curves for D.F. ratings at other temperatures.

CAPACITANCE AND TOLERANCE
Shall be measured within the tolerance limits specified. Measurements will be made at 25°C and 1000 Hz, ±20 Hz.

LIFE TEST
Shall withstand 140% of rated voltage at 85°C for 250 hours. One failure in twelve shall be permitted.

TEMPERATURE COEFFICIENT
Capacitance shall change linearly over operating temperature range at rate of −105, ±30 parts per million/°C.

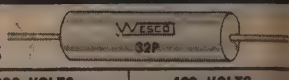
CAPACITANCE STABILITY (DRIFT)
Less than .05% when measured in the following manner: three capacitance readings at 25°C, each made prior to and after temperature cycling from room to 85°C, and room to −55°C. The mathematical difference between the two extremes, divided by the intermediate value, and then multiplied by 100, yields the stability expressed in percent.

HUMIDITY RESISTANCE
Meets requirements of Mil-C-27287, Para. 3.12 when tested in accordance with Mil-STD.-202C, Method 103 B, Condition B.

LEAD PULL AND BEND TEST
Steady pull of 5 pounds applied axially to leads for one minute. Bend test shall consist of one bend from the point of egress, first 90° in one direction, back to the original axial position, and then 90° in the opposite direction with no evidence of breakage.

TEMPERATURE RANGE
−55°C to +85°C with full rated voltage applied.

TYPE 32P RATINGS & DIMENSIONS



Capacity in Mfds.	100 VOLTS D	L	Cat. No. 32P — J-1	200 VOLTS D	L	32P Cat. No. — J-2	400 VOLTS D	L	Cat. No. 32P — J-4
.001	.187	.53	1001	.187	.53	1001	.187	.53	1001
.0012	.187	.53	1201	.187	.53	1201	.187	.53	1201
.0015	.187	.53	1501	.187	.53	1501	.187	.53	1501
.0018	.187	.65	1801	.187	.65	1801	.187	.65	1801
.0022	.187	.65	2201	.187	.65	2201	.187	.65	2201
.0027	.187	.65	2701	.187	.65	2701	.187	.65	2701
.0033	.187	.65	3301	.187	.65	3301	.187	.65	3301
.0039	.187	.65	3901	.187	.65	3901	.187	.65	3901
.0047	.187	.65	4701	.187	.65	4701	.234	.65	4701
.0056	.187	.65	5601	.187	.65	5601	.250	.65	5601
.0068	.187	.65	6801	.187	.65	6801	.234	.78	6801
.0082	.187	.65	8201	.203	.65	8201	.250	.78	8201
.01	.203	.65	1002	.234	.65	1002	.265	.78	1002
.012	.218	.65	1202	.218	.78	1202	.296	.78	1202
.015	.234	.65	1502	.250	.78	1502	.328	.78	1502
.018	.234	.78	1802	.265	.78	1802	.359	.78	1802
.022	.250	.78	2202	.281	.78	2202	.343	.90	2202
.027	.265	.78	2702	.312	.78	2702	.375	.90	2702
.033	.296	.78	3302	.343	.78	3302	.406	.90	3302
.039	.328	.78	3902	.375	.78	3902	.453	.90	3902
.047	.343	.78	4702	.359	.90	4702	.437	1.03	4702
.056	.375	.78	5602	.390	.90	5602	.484	1.03	5602
.068	.375	.90	6802	.421	.90	6802	.484	1.18	6802
.082	.406	.90	8202	.421	1.03	8202	.531	1.18	8202
.1	.453	.90	1003	.468	1.03	1003	.578	1.18	1003
.12	.484	.90	1203	.515	1.03	1203	.625	1.18	1203
.15	.500	1.03	1503	.531	1.18	1503	.656	1.32	1503
.18	.531	1.03	1803	.578	1.18	1803	.671	1.45	1803
.22	.546	1.18	2203	.640	1.18	2203	.671	1.70	2203
.27	.609	1.18	2703	.656	1.32	2703	.734	1.70	2703
.33	.625	1.32	3303	.687	1.45	3303	.812	1.70	3303
.39	.671	1.32	3903	.750	1.45	3903	—	—	—
.47	.703	1.45	4703	.734	1.70	4703	—	—	—

STANDARD LEAD SIZES: #24 AWG TCW: up to and including .203" Dia.
#22 AWG TCW: from .204" thru .312" Dia.
#20 AWG TCW: .313" Dia.and over

CAPACITY TOLERANCE: STANDARD . . . ±5% / OTHER . . . from ±20% to ±1%
Other values as well as voltage ratings are available upon request.

METALIZED POLYCARBONATE CAPACITORS

SPECIFICATIONS

DIELECTRIC WITHSTANDING VOLTAGE
200% of rated voltage applied through a minimum limiting resistance of 100 Ohms/Volt. Duration of voltage stress shall be 15 seconds minimum and 1 minute maximum at 25°C.

TEMPERATURE RANGE
−55°C to +85°C with full rated voltage applied. To +125°C with 50% of rated voltage.

INSULATION RESISTANCE
At 25°C after 2 minutes of electrification at rated voltage or 500 VDC, whichever is less, the minimum product of Insulation Resistance and Capacitance shall be 50,000 megohms-microfarads, but need not exceed 50,000 megohms.

DISSIPATION FACTOR
Shall not exceed 0.3% when measured at 25°C and 1000 Hz, ±20 Hz. See characteristic curves for D.F. ratings at other temperatures.

CAPACITANCE AND TOLERANCE
Shall be measured within the tolerance limits specified. Measurements will be made at 25°C and 1000 Hz, ±20 Hz.

LIFE TEST
Shall withstand 140% of rated voltage at 85°C for 250 hours. One failure in twelve shall be permitted.

CAPACITANCE STABILITY (DRIFT)
Less than 0.3% when measured in the following manner: three capacitance readings at 25°C, each made prior to and after temperature cycling from room to 85°C, and room to −55°C. The mathematical difference between the two extremes, divided by the intermediate value, and then multiplied by 100, yields the stability expressed in percent.

HUMIDITY RESISTANCE
Meets requirements of Mil-C-27287, Para. 3.12 when tested in accordance with Mil-STD.-202C, Method 103B, Condition B.

LEAD PULL AND BEND TEST
Steady pull of 5 pounds applied axially to leads for one minute. Bend test shall consist of one bend from the point of egress, first 90° in one direction, back to the original axial position, and then 90 ° in the opposite direction with no evidence of breakage.

TYPE 32MPC RATINGS & DIMENSIONS

Capacity in Mfds.	50 VOLTS D	L	Cat. No. 32MPC — K-05	100 VOLTS D	L	Cat. No. 32MPC — K-1	200 VOLTS D	L	Cat. No. 32MPC — K-2
.012	—	—	—	—	—	—	.171	.40	1202
.015	—	—	—	—	—	—	.187	.40	1502
.018	—	—	—	—	—	—	.203	.40	1802
.022	—	—	—	.156	.40	2202	.218	.40	2202
.027	—	—	—	.171	.40	2702	.234	.40	2702
.033	—	—	—	.171	.40	3302	.250	.40	3302
.039	—	—	—	.187	.40	3902	.187	.53	3902
.047	—	—	—	.203	.40	4702	.203	.53	4702
.056	—	—	—	.218	.40	5602	.218	.53	5602
.068	—	—	—	.234	.40	6802	.234	.53	6802
.082	.156	.40	8202	.187	.53	8202	.265	.53	8202
.1	.171	.40	1003	.203	.53	1003	.234	.65	1003
.12	.187	.40	1203	.218	.53	1203	.250	.65	1203
.15	.203	.40	1503	.234	.53	1503	.281	.65	1503
.18	.218	.40	1803	.250	.53	1803	.296	.65	1803
.22	.171	.53	2203	.265	.53	2203	.328	.65	2203
.27	.187	.53	2703	.250	.65	2703	.312	.78	2703
.33	.203	.53	3303	.265	.65	3303	.343	.78	3303
.39	.203	.53	3903	.281	.65	3903	.359	.78	3903
.47	.218	.53	4703	.312	.65	4703	.406	.78	4703
.56	.250	53	5603	.328	.65	5603	.390	.90	5603
.68	.218	.65	6803	.328	.78	6803	.421	.90	6803
.82	.234	.65	8203	.343	.78	8203	.468	.90	8203
1.0	.265	.65	1004	.375	.78	1004	.515	.90	1004
1.25	.296	.65	1254	.421	.78	1254	.484	1.18	1254
1.50	.312	.65	1504	.453	.78	1504	.531	1.18	1504
1.80	.328	.78	1804	.453	.90	1804	.578	1.18	1804
2.0	.343	.78	2004	.468	.90	2004	.609	1.18	2004
3.0	.390	.78	3004	.484	1.18	3004	.656	1.45	3004
4.0	.437	.78	4004	.546	1.18	4004	.750	1.45	4004
5.0	.437	.90	5004	.531	1.45	5004	.734	1.78	5004
8.0	.468	1.18	8004	.593	1.78	8004	.859	2.06	8004
10.0	.515	1.18	1005	.656	1.78	1005	.953	2.06	1005

STANDARD LEAD SIZES: #24 AWG TCW: up to and including .203" Dia.
#22 AWG TCW: from .204" thru .312" Dia.
#20 AWG TCW: .313" Dia.and over.

CAPACITY TOLERANCE: STANDARD . . . ±10% / OTHER . . . from ±20% to ±2%
Other values as well as voltage ratings are available upon request.

WESCO® ELECTRICAL COMPANY
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WESCO®

WESCO® POLYPROPYLENE CAPACITORS

SPECIFICATIONS

DIELECTRIC WITHSTANDING VOLTAGE
200% of rated voltage applied through a minimum limiting resistance of 100 Ohms/Volt. Duration of voltage stress shall be 15 seconds minimum and 1 minute maximum at 25°C.

INSULATION RESISTANCE
At 25°C after 2 minutes of electrification at rated voltage or 500 VDC, whichever is less, the minimum product of Insulation Resistance and Capacitance shall be 250,000 megohms-microfarads, but need not exceed 250,000 megohms.

DISSIPATION FACTOR
Shall not exceed .05% when measured at 25°C and 1000 Hz, ±20 Hz. See characteristic curves for D.F. ratings at other temperatures.

CAPACITANCE AND TOLERANCE
Shall be measured within the tolerance limits specified. Measurements will be made at 25°C and 1000 Hz, ±20 Hz.

LIFE TEST
Shall withstand 140% of rated voltage at 105°C for 250 hours. One failure in twelve shall be permitted.

TEMPERATURE COEFFICIENT
Capacitance shall change linearly over operating temperature range of −55°C to +85°C at rate of −290, ±75 parts per million/°C.

CAPACITANCE STABILITY (DRIFT)
Less than .2% when measured in the following manner: three capacitance readings at 25°C, each made prior to and after temperature cycling from room to 105°C, and room to −55°C. The mathematical difference between the two extremes, divided by the intermediate value, and then multiplied by 100, yields the stability expressed in percent.

HUMIDITY RESISTANCE
Meets requirements of Mil-C-27287, Para 3.12 when tested in accordance with Mil-STD.-202C, Method 103 B, Condition B.

LEAD PULL AND BEND TEST
Steady pull of 5 pounds applied axially to leads for one minute. Bend test shall consist of one bend from the point of egress, first 90° in one direction, back to the original axial position, and then 90° in the opposite direction with no evidence of breakage.

TEMPERATURE RANGE
−55°C to +105°C with full rated voltage applied.

TYPE 32PL RATINGS & DIMENSIONS

Capacity in Mfds.	100 VOLTS D	L	Cat.No. 32PL — K-1	200 VOLTS D	L	Cat.No. 32PL — K-2	400 VOLTS D	L	Cat.No. 32PL — K-4
.0010	.187	.406	1001	.187	.406	1001	.187	.406	1001
.0015	.187	.406	1501	.187	.406	1501	.203	.406	1501
.0022	.187	.406	2201	.187	.406	2201	.234	.406	2201
.0033	.187	.406	3301	.187	.406	3301	.187	.531	3301
.0039	.187	.406	3901	.203	.406	3901	.187	.531	3901
.0047	.187	.406	4701	.187	.531	4701	.203	.531	4701
.0056	.187	.406	5601	.187	.531	5601	.218	.531	5601
.0068	.187	.406	6801	.187	.531	6801	.234	.531	6801
.0082	.187	.406	8201	.187	.531	8201	.203	.656	8201
.0100	.203	.406	1002	.203	.531	1002	.218	.656	1002
.015	.219	.531	1502	.203	.656	1502	.265	.656	1502
.022	.250	.531	2202	.234	.656	2202	.312	.656	2202
.027	.265	.531	2702	.265	.656	2702	.328	.656	2702
.033	.234	.656	3302	.281	.656	3302	.328	.781	3302
.039	.250	.656	3902	.312	.656	3902	.359	.781	3902
.047	.281	.656	4702	.296	.781	4702	.390	.781	4702
.056	.281	.656	5602	.312	.781	5602	.421	.781	5602
.068	.296	.656	6802	.343	.781	6802	.406	.906	6802
.082	.312	.781	8202	.375	.781	8202	.437	.906	8202
.10	.344	.781	1003	.375	.906	1003	.484	.906	1003
.12	.375	.781	1203	.406	.906	1203	.453	1.156	1203
.15	.375	.906	1503	.453	.906	1503	.500	1.156	1503
.18	.406	.906	1803	.484	.906	1803	.546	1.156	1803
.22	.437	.906	2203	.484	1.031	2203	.687	1.156	2203
.27	.437	1.031	2703	.531	1.031	2703	.578	1.406	2703
.33	.500	1.031	3303	.593	1.031	3303	.640	1.406	3303
.39	.531	1.031	3903	.593	1.156	3903	.687	1.406	3903
.47	.531	1.156	4703	.656	1.156	4703	.750	1.406	4703
.56	.578	1.156	5603	.625	1.406	5603	.825	1.406	5603
.68	.625	1.156	6803	.687	1.406	6803	.825	1.656	6803
.82	.625	1.406	8203	.687	1.656	8203	.906	1.656	8203
1.0	.687	1.406	1004	.734	1.656	1004	1.000	1.656	1004

STANDARD LEAD SIZES: #24 AWG TCW: up to and including .203" Dia.
#22 AWG TCW: from .204" thru .312" Dia.
#20 AWG TCW: .313" Dia.and over

CAPACITY TOLERANCE: STANDARD . . . ±10% / OTHER . . . from 20% to ±1%
Other values as well as voltage ratings are available upon request.

FEATURES

32P
- Wrap and fill construction
- Excellent long-term stability
- Superior "Q" for tuned circuits
- High insulation resistance
- Linear temperature coefficient
- Quality control procedures per Mil-Q-9858
- Extended foil design

32MPC
- Wrap and fill construction
- Micro-miniature — lightweight
- Low dissipation factor
- Zero TC ±50 ppm/°C from +25°C to +55°C
- Extended foil design
- Excellent stability
- Quality control procedures per Mil-Q-9858

32PL
- Wrap and fill construction
- Excellent long-term stability
- Superior "Q" for tuned circuits
- High insulation resistance
- Linear temperature coefficient (−55°C to +85°C)
- Quality control procedures per Mil-Q-9858
- Extended foil design

APPLICATIONS

32P & 32PL
- Computers
- Data Processing Equipment
- Aircraft and Missile Systems
- Industrial Instrumentation
- Navigation and Distance Measuring Equipment
- Communications Equipment
- Timing and Retrace Circuits
- Integrating Networks
- High "Q" Low Loss Filters
- Peripheral Equipment

32MPC
- Data Processing Equipment
- Aircraft and Missile Systems
- Industrial Instrumentation
- Navigation and Distance Measuring Equipment
- Communications Equipment
- Tachometers
- Filters
- Peripheral Equipment

EXPLANATION OF CATALOG NUMBER

32 M 1002 K-1

32 — Round, Wrap and Fill, with epoxy seals.

M — Mylar-Foil, Axial Leads*

1002 — In Picofarads — first three digits are significant. Last digit specifies number of zeros, i.e., 1002 = 10,000 pfd. or 0.01 mfd.

K — Capacity Tolerance:
K = ±10% H = ±3% F = ±1%
M = ±20% J = ±5% G = ±2%

1 — DC Voltage Rating:
05 = 50 VDC 2 = 200 VDC 6 = 600 VDC
1 = 100 VDC 4 = 400 VDC etc.

***** — For Radial Leads, add letter "R" at end of part number.

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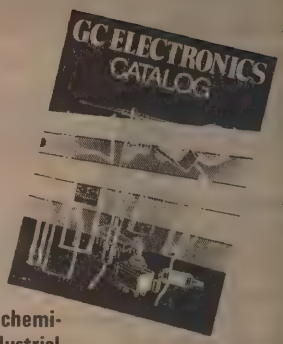

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Clean contacts, relays and other electronic devices. Leaves absolutely no deposits. Excellent degreaser for inks and gummy deposits on all electrical or mechanical apparatus. Non-flammable.
8669 16 oz. aerosol

RELAY KLEEN
Cleans relays, contacts and other electronic devices where no oily, residual deposits are desired. Excellent degreaser and general solvent for gummy deposits on all electrical or mechanical equipment. Non-flammable; contains no carbon terachloride.
8682 6 oz. aerosol
8682-16 16 oz. aerosol

SPRA KLEEN
Eliminates noise due to dust, dirt and corrosion on electrical contacts. Cleans and lubricates contacts, controls, relays, switches and other sliding contact devices in one fast operation.
8666 6 oz. aerosol
8666-16 16 oz. aerosol

NO–OX
Electronic contact cleaner dissolves corrosion quickly without harsh solvents. Lubricants and protects slide contacts long after application. Recommended for maintenance of volume and tone controls, attenuators, relay contacts, patchboard jacks and similar equipment.
100-02 2 oz. bottle
100-06 6 oz. aerosol

BIG BATH
Cleans and degreases tuners like no other product can. Lossens and blasts away all dust, grime and foreign matter. Safe for plastics and will not detune. Economical 24 oz. aerosol can.
10-903 24 oz. aerosol

JIF
Siliconized contact-control cleaner that cleans and lubricates, plus provides contacts and controls with the longest protection possible. Contains no solvents to harm plastics. Quick - easy to use. Non-flammable.
8670-3 3 oz. aerosol
8670-6 6 oz. aerosol

SILI-SPRA
High quality silicone lubricant! Handy aerosol features exclusive 3-way valve that applies a light lubricating film that lasts and won't leave a residue build-up. Ideal for home, office or workshop.
10-600 6 oz. aerosol

STRIP-X
Enamel stripping compound for the removal of enamel, Formar, Formex, and similar wire insulation coatings. Ideal for thin or stranded wires and wires that cannot be scraped or burned without damage to copper strands.
26-2 2 oz. bottle
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SOLDER FLUX REMOVER
Fast flux removal in a convenient aerosol spray. Excellent for spot flux removal or for removing all types of organic flux. Ideal for prototype work or for on the job use--limits down time. Avoids recontamination of bath method. Safe for use on most circuitry materials. Non-flammable. Low toxicity level.
22-270 16 oz. aerosol

CONDUCTIVE PAINT
Silver-nickel allow conductive paint in acrylic lacquer base. Provides an economical way to draw or repair printed circuits. Possesses good metallic lustre, high conductive and excellent stability in corrsive environments. Also adheres well to glass. Air dries to a hard film. Brush applicator cap.
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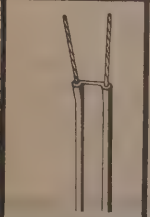
EXTRA DRY SUPER FREEZE MIST
Cools circuits 3 times faster! Locates bad capacitors, transistors and oxidized joints by instantly cooling components. Non-toxic, odor free, leaves no liquid residue on parts.
10-702 15 oz. aerosol

ZERO MIST CIRCUIT COOLER
Locates "intermittence" in electronic equipment caused by overheating of components. Cools components instantly pinpointing faulty capacitors, transsistors, oxidized junctions.
8667 16 oz. aerosol

	DESCRIPTION	Gauge	Stranding	Insulation Thickness	Nom. O.D.	Wt. lbs/gr per M ft
	SPT-1 Power Cord UL listed. Thermoplastic parallel - jacketed, 2 conductor, light duty cord. PVC insulated. One side ribbed for polarity identification. 300 V AC suggested working voltage. Temperature range - 55°C to 105°C. Brown & ivory	18	41/34	.030"	.110 x .210"	16 lbs/726.4 gr
	Speaker Wire Two conductor transmission cord for loudspeaker connection and other low voltage applications. Temperature range: -20°C to +60°C. 250 V AC suggested working voltage. Tinned one side for polarity identification. PVC insulation. Also available in 16 and 22 gauge. Clear, brown & silver.	24 20 18	7/32 10/30 16/30	.014" .020" .022"	.055 x .116" .078 x .162" .095 x .196"	5.8 lbs/2630 gr 12.3 lbs/5590 gr 15.53 lbs/7050 gr
	**Twin Lead Cable** Two conductor transmission line cable for 300 ohm antenna systems. Designed for use with color or black and white TV, and FM multiplex. Polyethelene insulation -60°C to +80°C. Stranded bare copper cond. material. 80% nom. velocity propagation. 4.4 nom. capacitance (pf/Ft). Nom. Attentuation per 100 Ft 100 MHz 1.1 dB 200 MHz 1.7 dB 300 MHz 2.2 dB 500 MHz 3.1 dB 900 MHz 4.5 dB	22 20	7/30 7/28	.025" .025"	.068 x .450" .068 x .450"	10.15 lbs/4610 gr 10.68 lbs/4850 gr

Minimum OEM quantities 100,000 ft per type. Smaller quantities in spools and flat packs available from your GC Distributor.

HARDMAN

The Hardman Selector Guide for Electrical/Electronic Epoxy Compounds

Product Number	ELECTRICAL PROPERTIES @ 25°C: Volume Resistivity ohms — cm	Dielectric Constant @ 100 kHz	Dissipation Factor @ 100 kHz	PHYSICAL PROPERTIES @ 25°C: Hardness Shore D	Linear Shrinkage in/in	7 Day Water Absorption %	THERMAL PROPERTIES: Heat Distortion Temperature °C	Thermal Conductivity cal x cm/sec x cm² x °C x 10^{-4}	Coefficient of Linear Expansion in/in/°C x 10^{-6}
TWO COMPONENT — ROOM TEMPERATURE CURING SYSTEMS									
EP 2220 TC	4×10^{13}	4.2	.020	95	.004	.20	86	8.2	43
EP 2225 MV	3×10^{15}	4.3	.020	96	.003	.12	116	N/A	44
EP 2230 TS	4×10^{15}	3.6	.021	88	.010	.84	51	5.1	152
EP 2305 LK	3×10^{15}	4.0	.001	88	.003	.75	67	6.9	44
EP 2306 LK	5×10^{15}	3.8	.018	90	.005	.74	85	5.2	107
EP 2400 TC	4×10^{14}	4.2	.030	96	.004	.19	78	10.3	78
EP 2404 GE	6×10^{14}	4.2	.027	97	.004	.10	84	7.2	68
EP 2405 FR	2×10^{15}	4.2	.010	95	.002	.17	77	12.0	62
EP 2408 TS	4×10^{15}	4.0	.050	53	.008	2.0	N/A	N/A	N/A
EP 2415 TC	1×10^{12}	5.2	.036	90	.001	.60	60	10.3	115
EP 2420 TC	2×10^{14}	5.4	.020	86	.002	.50	44	13.6	135
TWO COMPONENT — ELEVATED TEMPERATURE CURING SYSTEMS									
EP 2740 HT	7×10^{15}	3.8	.008	93	.011	.13	100	6.8	62
EP 2770 TC	1×10^{15}	3.7	.012	98	.012	.16	103	7.3	50
EP 2800 GU	3×10^{15}	3.5	.020	91	.026	.36	79	N/A	97
EP 2805 TC	6×10^{14}	3.8	.020	98	.004	.20	87	8.8	51
EP 2810 TS	9×10^{15}	2.9	.004	82	.008	.24	N/A	N/A	156
EP 2820 TS	6×10^{12}	4.4	.063	A85	.018	.11	N/A	4.0	N/A
EP 2825 TS	1×10^{11}	4.2	.054	26	.021	.82	N/A	3.8	N/A
EP 2840 TS	8×10^{14}	3.3	.029	67	.017	.50	N/A	3.8	N/A
DC 2900 HW	1×10^{15}	3.4	.010	90	.014	.16	N/A	8.9	147
ONE COMPONENT — ELEVATED TEMPERATURE CURING SYSTEMS									
EP 1760 LV	6×10^{15}	2.8	.006	88	.028	.2	N/A	N/A	140
EP 1765 TS	1×10^{15}	4.3	.026	90	.016	.2	64	7.8	105

N/A — NOT APPLICABLE

Epoxies

- Electrical/Electronic compounds
- High strength structural adhesives
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- Portable mixing heads
- Motionless mixers
- Dynamic mixers
- Automatic and hand portable extruders

Packaging

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Complete data available on these and other compounds

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HumiSeal Coatings

GENERAL CHART

Listed in this General Chart of Properties are ten of the most frequently used HumiSeal Protective Coatings and their principal properties. These have been tabulated in order to facilitate comparison of their characteristics and selection of the most suitable type for a specific application. In addition to these HumiSeal types we manufacture a variety of coatings for special purposes, including high temperature applications. Should none of the coatings listed in this chart fulfill your requirements, we suggest that you contact us for recommendations.

	PROPERTIES OF LIQUID HumiSeal											THERMAL PROPERTIES		
HumiSeal Type[1]	Specific Weight (lbs. per gallon)[2]	Solids Content (% by weight)[3]	Viscosity, with catalyst when applicable (centipoises)[4]	Flash Point (°F)[5]	Drying Time for Handling[6]	Recommended Curing Conditions	Time Required to Reach Optimum Properties	Pot Life, at Room Temperature	Shelf Life, at Room Temperature	Coverage per gallon (in sq. ft.) After One Dip	Mixing Ratio Part A to Part B (By Weight)	Continuous Use Temperature Range (°F)	Thermal Shock Test[7]	Solderability[8]
1B12	7.3	20	30	40	10 min.	24 hrs. at room temp. or 30 min. at 170°F	24 hrs.	1 year	1 year	550	one component	—75°F to +280°F	Passes	Good
1B15	7.6	35	470	30	10 min.	24 hrs. at room temp. or 30 min. at 170°F	24 hrs.	1 year	1 year	450	one component	—75°F to +270°F	Passes	Good
1B31	7.6	35	180	30	10 min.	24 hrs. at room temp. or 30 min. at 170°F	24 hrs.	6 mos.	6 mos.	450	one component	—75°F to +270°F	Passes	Good
1A20	8.5	50	120	80	60 min.	24 hrs. at room temp.	1 week	6 mos.	6 mos.	375	one component	—70°F to +250°F	Passes	Excellent
1A27	8.0	50	5000	80	15 min.	24 hrs. at room temp. or 4 hrs. at 170°F	1 week	1 year	1 year	450	one component	—90°F to +250°F	Passes	Excellent
1A33	7.7	44	180	30	15 min.	24 hrs. at room temp. or 4 hrs. at 170°F	1 week	6 mos.	6 mos.	300	one component	—90°F to +250°F	Passes	Excellent
2A64	8.9	55	80	85	4-5 hrs.	3 hrs. at 170°F	1 week	6 hrs.	6 mos.	470	1:1	—70°F to +270°F	Passes	Excellent
2B13	7.5	42	50	40	30 min.	90 min. at 200°F	1 week	24 hrs.	1 year	480	100:2	—70°F to +270°F	Passes	Poor
2A51	9.2	100	6000	non flammable	2 hrs.	24 hrs. at room temp. or 2 hrs. at 200°F	1 week	6 hrs.	6 mos.	200	1:1	—70°F to +250°F	Passes	Poor
2A53	7.8	54	300	70	30 min.	2 hrs. at 200°F	1 week	24 hrs.	6 mos.	400	1:1	—70°F to +250°F	Passes	Poor

HumiSeal TYPES LISTED IN BOLD PRINT COMPLY WITH THE REQUIREMENTS OF MIL-I-46058C

All technical data in this bulletin are based on test results using the stated standards and are believed to be correct. However, since the end use of HumiSeal materials (and the manner of storing and handling them) is beyond our control, we make no warranty — expressed or implied — as to the fitness of use, results to be obtained from or effects of use with respect to these materials. Their use shall be solely by the judgment of and at the risk of the end-user notwithstanding any statement contained in this bulletin.

1. The first digit in the type number specifies whether the product is a one- or a two-component system.
2. Fed-Std 141a, Method 4184.
3. Fed-Std 141a, Method 4044.
4. Fed-Std 141a, Method 4287.
5. Fed-Std 141a, Method 4291.
6. Fed-Std 141a, Method 4061.
7. Mil-I-46058C.
8. Visual evaluation for ease of soldering with an 85 watt iron through a 2 mil film.
9. Fluorescent dye may be added if required.
10. Fed-Std 141a, Method 2121.
11. Fed-Std 406, Method 7031, Procedure A.
12. Fed-Std 141a, Method 6303.
13. ASTM-D150-65T, at 1 MHz and 25°C.
14. Mil-I-46058C Insulation resistance during 10th cycle, at 65°C and 98% RH.

FOR ELECTRONICS

OF PROPERTIES

HumiSeal Protective Coatings are available in one-quart or one-gallon cans, five-gallon pails, or fifty-five gallon drums. HumiSeal types 1B15 and 1A27 are also available in 16-ounce aerosol containers. All HumiSeal types listed in this chart may be applied by dip, brush or spray. Literature on recommended techniques for the proper application of coatings and the preparation of the subtrates is available upon request.

PROPERTIES OF CURED HumiSeal COATING

PHYSICAL PROPERTIES						ELECTRICAL PROPERTIES					CHEMICAL PROPERTIES			
Clarity[9]	Average Build After One Dip (mils)[10]	Flammability[7]	Flexibility[7]	Adhesion[12]	Mar Resistance[12]	Dielectric Constant[13]	Dissipation Factor[13]	Dielectric Strength (volts)[7]	Insulation Resistance (teraohms)[7]	Moisture Resistance (gigaohms)[14]	Main Constituent	Fungus Resistance[7]	Resistance to Solvents	HumiSeal Type[1]
Transparent	0.5	Self-extinguishing	Very Good	Excellent	Very Good	2.8	.010	6000	250	30	Acrylic	Excellent	Very Good	1B12
Transparent	2	Self-extinguishing	Fair	Excellent	Fair	2.3	.010	8000	350	40	Acrylic	Excellent	Fair	1B15
Transparent	2	Self-extinguishing	Excellent	Excellent	Very Good	2.5	.010	7500	800	60	Acrylic	Excellent	Good	1B31
Transparent	2	Self-extinguishing	Excellent	Very Good	Excellent	3.5	.028	8000	300	48	Polyurethane	Excellent	Excellent	1A20
Transparent	5	Self-extinguishing	Excellent	Excellent	Fair	3.6	.020	7500	200	12	Polyurethane	Fair	Good	1A27
Transparent	2	Self-extinguishing	Excellent	Excellent	Fair	3.6	.030	7500	200	16	Polyurethane	Excellent	Good	1A33
Transparent	1	Self-extinguishing	Excellent	Excellent	Good	3.5	.024	3500	450	35	Polyurethane	Excellent	Excellent	2A64
Transparent	2	Self-extinguishing	Excellent	Excellent	Excellent	3.0	.030	8000	300	33	Epoxy	Excellent	Excellent	2B13
Transparent	15	Self-extinguishing	Fair	Good	Good	3.0	.030	6000	400	6	Epoxy	Excellent	Good	2A51
Transparent	1	Self-extinguishing	Excellent	Excellent	Excellent	3.0	.030	8000	200	28	Epoxy	Excellent	Excellent	2A53

HumiSeal Division
Columbia Chase Corporation
26-60 Brooklyn-Queens Expressway, W.
Woodside, New York 11377
Phone: (212) 932-0800 Please ask for Dept. 77

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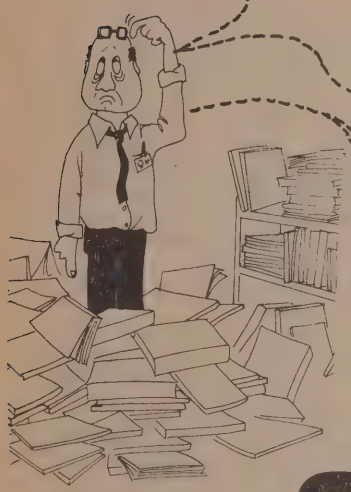

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EVERY PROJECT IS ANOTHER REASON

Design and test circuits as fast as you can think—with CSC Proto-Board® Solderless Breadboards.

As quick as pushing in or pulling out components, you can design, test, and modify all kinds of circuits, with CSC Proto-Boards. Sockets are *already mounted*, on sturdy metal ground/baseplates with non-marring feet. They're great for a wide variety of audio and digital projects, and you save money by using components over and over again.

PB-101—940 solderless tie points: ten 14-pin DIP capacity. 140 five-point terminals plus 8 bus lines of 30 tie-points each. 4.5"W x 5.8"L x 1.4"H (114 x 147 x 35mm); 9 oz. (.26 Kg). Price: $29.95

PB-102—1240 solderless tie points: twelve 14-pin DIP capacity. 188 five-point terminals plus 6 bus lines of 40 tie-points each and 2 bus lines of 30 points. 4.5"W x 7"L x 1.4"H (114 x 178 x 35mm); 10 oz. (.31 Kg). Price: $39.95

PB-6 Kit—630 solderless tie points: six 14-pin DIP capacity. Economical way to get Proto-Board speed and convenience. 94 five-point terminals plus 4 bus lines of 40 tie-points. Comes with pre-assembled sockets, four 5-way binding posts, base-plate, all hardware. 10 minute assembly with pliers and screwdriver. 6"L x 4"W x 1.4"H (152 x 102 x 34mm); 7 oz. (.20 Kg). Price: $15.95

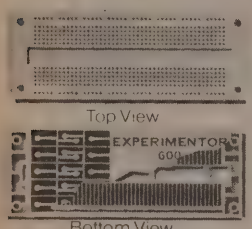
PB-100 Kit—760 solderless tie points: ten 14-pin DIP capacity. 140 five-point terminals plus 2 bus lines of 30 tie-points each. Comes with pre-assembled sockets, two 5-way binding posts, base-plate, all hardware. 4.5"W x 6"L x 1.4"H (114 x 152 x 35mm); 7.5 oz. (.21 Kg). Price: $19.95

EXTRA LARGE CAPACITY FOR MORE COMPLEX CIRCUITS!

PB-103—2250 solderless tie points: twenty-four 14-pin DIP capacity. 354 five-point terminals plus 14 bus lines of 50 tie-points each, plus 2 bus lines of 40 points. 6"W x 9"L x 1.4"H (152 x 229 x 35mm); 1.25 lb. (.57 Kg). Price: $59.95.

PB-104—3060 solderless tie points: thirty-two 14-pin DIP capacity. 472 five-point terminals plus 14 bus lines of 50 tie-points. 8"W x 9.8"L x 1.4"H (203 x 248 x 35mm); 1.75 lb. (.79 Kg). Price: $79.95.

Now, breadboard in any direction! With EXPERIMENTOR™ sockets, the breadboarding system that gives you more flexibility for less dollars!



Sockets lock together, snap apart, to handle any circuit

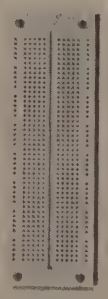
Arrange EXPERIMENTOR sockets to suit your circuit instead of rearranging your circuit to fit the breadboard.

Discover the ease and convenience of solderless breadboarding. CSC EXPERIMENTOR* sockets let you design, assemble and modify circuits as fast as you can push in or pull out components.

- **Large Capacity**—Large sockets have 550 solderless tie points (94 five-point terminals) plus two 40-point bus strips.
- **Full Fan-Out**—A CSC exclusive. The only solderless breadboard sockets with full fan-out capabilities for microprocessors and other larger (0.6") DIP's.
- **Snap-together in a domino pattern**—Arrange EXPERIMENTOR sockets to suit your circuit. Expand or contract at will.
- **Simple Mounting**—Vinyl insulated backing lets you mount EXPERIMENTOR sockets anywhere without shorting. Mount to any flat surface with 4-40 flat head screws or 6-32F self-tapping screws for behind-the-panel mounting.
- **Accepts All Standard Components**—Sockets conform to 0.1" grid and are DIP compatible. Accepts IC's, diodes, resistors, capacitors, transistors, etc.

Use #22-30 solid AWG wire interconnections.

U S Pat No D235 554



← EXPERIMENTOR™ 300
.3" centers, perfect for smaller DIP's. Ideal mate for peripheral microprocessor IC's. 6.0" x 2.1" overall
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EXPERIMENTOR™ 600 →
6" centers, perfect for microprocessors, clock chips, RAM's, ROM's, and PROM's. 6.0" x 2.4" overall
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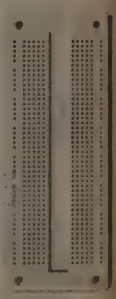


SPECIFICATIONS			TIE POINTS			
Model	Length	Width	Center Channel	5 Tie Points Terminals†	Bus Strips†	Price
300	6.0"	2.1"	.3"	94 (470)	2 (80)	$9.95
600	6.0"	2.4"	.6"	94 (470)	2 (80)	$10.95
350	3.5"	2.1"	.3"	46 (230)	2 (40)	$5.50
650	3.5"	2.4"	.6"	46 (230)	2 (40)	$6.25
Quad	6.0"	0.75"	—	—	4 (160)	$4.00

Both units are .375" deep
†Number in parentheses refers to total number of tie-points

CALL OR WRITE FOR FULL LINE CATALOG AND THE NAME OF YOUR CSC DEALER.

All Prices Shown are Manufacturer's Recommended List. Prices and Specifications Subject to Change Without Notice.

YOU WORK ON TO READ THIS AD.

Proto-Boards with Built-In Regulated Power Supplies!

For extra convenience and breadboarding speed!

PB-203—Same capacity and layout as PB-103, *plus* short-proof, fused 5VDC, 1A regulated power supply. Ripple and noise are a low 10mV at 0.5A. Has on-off toggle switch and pilot light plus four 5-way binding posts (2 for power). 9.75"L x 6.6"W x 3.25"H (248 x 168 x 83mm); weighs 5 lb. (2.27 Kg). For 117VAC, 50/60Hz (220VAC available at slightly higher cost). Price $80.00

PB-203A—All PB-203 features plus separate regulated +15VDC and −15VDC, 0.5A supplies, with internally and independently adjustable output voltage. Same size as PB-203; 5.5 lb. (2.5 Kg). For 117 VAC, 50/60 Hz (220 VAC, 50/60 Hz at slightly higher cost). Price: $129.95

All Prices Shown are Manufacturer's Recommended List.
Prices and Specifications Subject to Change Without Notice.

LOGIC PROBE LP-2

A breakthrough! Fast, safe and accurate digital testing that's very inexpensive.

LP-2 combines the functions of a pulse detector, pulse stretcher and level detector for circuit-powered testing of TTL, DTL, HTL and CMOS. Just set the logic switch to the proper family, connect the power lead clips to the test circuit and touch the probe to the node you want to test . . . for an instant picture of circuit conditions. Pulse LED indicates positive and negative pulse and level transitions, and stretches pulses as narrow as 300 nsec to a full 1/10th sec. HI/LO LEDs display logic "1" and logic "0." A 300K-plus input impedance insures minimum circuit loading. Interchangeable ground leads and probe tips provide ample flexibility to meet any application. LP-2 is the easiest and least expensive way to test, debug and service all types of digital circuits. Price: $24.95.

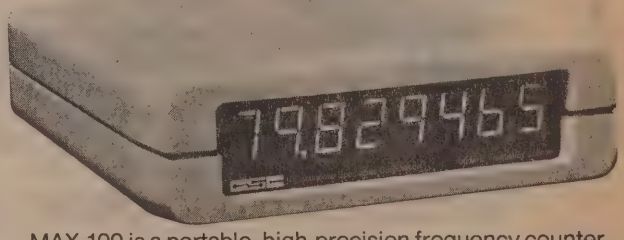
And don't forget our LP-1 and LP-3, for memory and high-speed circuit applications.

LP-1 does everything that LP-2 does, with the addition of MEMORY to store single-shot and low-rep-rate events, plus the ability to stretch pulses as narrow as 50 nsec. Price: $44.95. *LP-3* gives you the features of LP-1 and -2 plus super-speed capability to handle pulses as fast as 10 nsec. Price: $69.95.

MEET MAX-100

CSC's 100 MHz 8-digit Audio/CB/RF/Digital counter. At $134.95, nothing else does so much for so little.

- **MAXimum frequency range—20Hz-100MHz**
- **MAXimum CB performance—ideal for CB applications**
- **MAXimum visibility—big, bright, 0.6" 8-digit LED display**
- **MAXimum accuracy—crystal-controlled timebase**
- **MAXimum operating ease—automatic, no controls to set**
- **MAXimum range of applications—use for audio through ultrasonic through RF: AM, FM and digital**
- **MAXimum portability—completely self-contained**
- **MAXimum flexibility—choice of four power sources**
- **MAXimum versatility—use with clip-lead cable, in-line tap, mini-whip antenna, etc.**



MAX-100 is a portable, high-precision frequency counter that sets new standards in performance and value. In a compact, portable case, it gives you *continuous readings* from 20Hz to a *guaranteed 100MHz*, with 8-digit accuracy. Fast readings with 1/6-sec. update and 1-sec. sampling rate. Precise readings, derived from a crystal-controlled time base with 3ppm accuracy. High-sensitivity readings from signals as low as 30 mV, with diode overload protection up to 200V peaks.

Input signals over 100MHz automatically flash the most significant digit. And to indicate low-battery condition and extend remaining battery life, the *entire* display flashes at 1 Hz. Price: $134.95

SPECIFICATIONS

Range: 20 Hz to 100 MHz, guaranteed. **Gatetime:** 1 sec. **Resolution:** 1 Hz. **Accuracy:** ± 1 count + time base error. **Input Impedance:** 1 MΩ/56pF. **Coupling:** AC. **Sine Wave Sensitivity:** 30 mVRMS @ 50 MHz. **Internal Time Base Frequency:** 3.579545 MHz x tal osc. **Setability:** ± 3 ppm @ 25°C. **Temp-Stability:** Better than 0.2 ppm/°C, 0-50°C. **Max. Aging:** 10 ppm/year. **Display:** Eight .6" LED digits. **Lead-zero blanking:** decimal point appears between 6th and 7th digit when input exceeds 1 MHz. **Overflow:** with signals over 99,999,999 Hz, most significant (left hand) digit flashes, allowing readings in excess of 100 MHz. **Display update:** 1/6-second plus 1 sec. gate time. **Low Battery Indicator:** When power supply falls below 6.6 VDC, all digits flash @ 1 Hz. **Power:** 6 AA cells (internal); **External:** 110 or 220 VAC Eliminator/charger; Auto cigarette lighter adapter; 7.2-10VDC ext. supply; **Bat. Charging:** 12-14hr. **Size (HWD):** 1.75" x 5.63" x 7.75" (4.45 x 14.30 x 19.69cm.) **Weight:** Less than 1.5 lb. (0.68 Kg) w/batteries.

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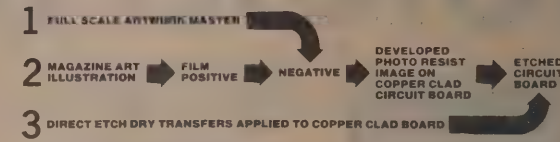
Duplicate industrial techniques to make one or hundreds of identical printed circuits. Remarkable **POS-NEG**™ (pat. pend.) system will photocopy 1:1 art directly from a magazine page. Make 1:1 artwork masters, negatives, positives. Sensitize ordinary copper clad circuit boards: use your negative to expose; then develop and etch the final circuit. **No camera. No darkroom.** No tracing, pasting or film cutting. All materials supplied except photoflood bulb available at any camera store.


1 FULL SCALE ARTWORK MASTER
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FILM POSITIVE
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DEVELOPED PHOTO RESIST IMAGE ON COPPER CLAD CIRCUIT BOARD
ETCHED CIRCUIT BOARD
3 DIRECT ETCH DRY TRANSFERS APPLIED TO COPPER CLAD BOARD

ER-4 COMPLETE PHOTO ETCH KIT **$27.95**

direct etch printed circuit kit

This one step kit uses a unique dry transfer resist that etches razor-sharp patterns. Lay out circuits directly on the copper board by rubbing down dry transfer patterns and lines. Connect with resist tape or leave unconnected for breadboards. Blow-up illustration shows 2 oz. copper circuit board **made only with materials in kit.** Black dry transfer resist is partly removed to show etched copper. Pattern is .015" squeeze-through wire transferred between 2 DIP pads. Pad edges are spaced .030" apart.

KIT CONTAINS: two 3"x4½" and two 2¼"x3" copper clad boards, 8 sheets direct etch PC patterns, 2 rolls PC resist tape (see ER-2 for description of patterns and tape), ¼ lb. anhydrous ferric chloride (makes 1 pint), combination storage box and etch tray, instructions.

ER-1 COMPLETE DIRECT ETCH KIT **$6.95**

photo etch and direct etch printed circuit refill kits

DRY TRANSFER ETCH RESIST SETS

8 sheets 3"x5" 1:1 patterns include lines, circles, jogs, squeeze-throughs, TO-3 & TO-18 transistors, TO-99, TO-100, DIP & flatpack ICs, donut pads, roll of 1/16" and 1/32" resist tape. Withstands ferric chloride, ammonium persulfate, peroxide and other etch systems.

ER-2 DRY TRANSFER ETCH RESIST ASST. **$3.95**

4 sheets assorted resist donuts 1/16" through 1/4" dia. All have .025" diameter center hole.

ER-13 RESIST DONUT PADS **$2.29**

4 sheets DIP and flatpack patterns. Continuous strips let you transfer 8, 14, 16 or any number of perfect pad patterns.

ER-14 RESIST DIP PATTERNS **$2.29**

24 sheets continuous DIP patterns with through traces. Use with or without traces for etch resist or 1:1 master art.

JD-174 RESIST DIP PATTERNS WITH TRACES **$7.49**

24 sheets continuous edge card connector patterns.

JD-122R 24 strips each of .156" & .125" FINGERS . **$7.49**
JD-168 24 strips of .100" SPACED FINGERS. **7.49**

ETCH RESIST PEN

"Write" your circuit down on copper. This felt pen has ink that is impervious to aqueous PC etch solutions.

ER-15 ETCH RESIST PEN **$1.49**

DRY CONCENTRATED ETCHANT

¼ lb. anhydrous ferric chloride in vapor tight package makes 1 pint etchant, enough for 200 sq. in. of copper board. Costs less than liquid etch solutions.

ER-3 DRY CONCENTRATED ETCHANT **$1.69**

POS-NEG™ PHOTOCOPY FILM

Polyester base film makes negatives or positives directly from opaque or translucent art in one step. Handle in subdued light. Expose with #2 photoflood.

ER-5 SIX SHEETS 5"x6" POS-NEG FILM **$4.29**
ER-9 TWO SHEETS 8"x11" POS-NEG FILM **4.29**

FILM PROCESS CHEMICALS

3 chemical packets make 1 pint litho film developer and 1 pint acid fixer. Handles 15 sheets copy film.

ER-6 FILM PROCESS CHEMICALS **$1.95**

PHOTO RESIST SPRAY

Photosensitive PC board coating. Unexposed coat is dissolved by resist developer. Exposed areas remain to act as an etch resist. Coats up to 400 sq. in.

ER-7 PHOTO RESIST SPRAY (2.5 oz. net wt.) **$2.95**

PHOTO RESIST DEVELOPER

Solvent blend develops exposed photoresist. Use with ER-7 spray resist.

ER-8 RESIST DEVELOPER (16 fl. oz.) **$2.95**

9"x12" CONTACT PRINT FRAME

Make negatives or film positives with patented Pos-Neg system. Steel frame assembly, yellow filter, instructions.

ER-10 PRINTING FRAME **$9.95**

POWER ETCH PUMP

Circulates etchant to speed etch rate. Contains air pump, coupling hose, perforated distributor tube, instructions.

ER-12 POWER ETCH PUMP **$6.95**

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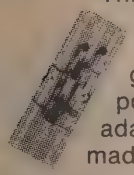
Solder is for sissies.

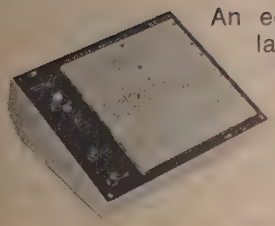
Are you still designing circuits the old fashioned way? Soldering and unsoldering? Burning up valuable IC's? If so, it's time you made a switch to solderless breadboarding. E&L Instruments offers a complete line of breadboarding products from sockets to the most complete systems for professional use. Here are five ways you can go solderless . . .

SK-10 Socket



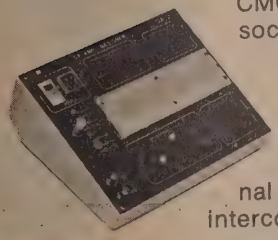
This precision solderless breadboarding socket will pay for itself in one afternoon. Integrated circuits and discrete components insert directly, without adapters. All interconnections are made with 20 to 26 gage solid conductor wire. $17.75.

Breadbox III



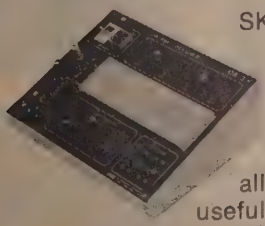
An economical approach to a large breadboarding area. Three SK-10 sockets, four 5-way binding posts, two BNC connectors, six BP-22 solderless breadboarding pins. $72.25

Op-Amp Designer #OA-2K



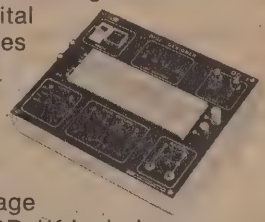
Powerful design tool for linear work and CMOS digital circuitry. SK-10 socket. Heavy current capacities on all three power supplies [+/– 15V & +5V DC]. Sensitive null detector and a full function generator with external frequency adjustment. All interconnections are solderless. $120.00 in kit form.

Op-Amp Designer #OA-3K



SK-10 socket. Plus and minus variable supplies (1 to 15V). This adjustable feature makes the unit exceptionally flexible, allowing it to be more useful for odd voltage requirements. The fixed 5 volt supply allows interfacing with TTL circuitry. $102.50 in kit form.

Digi-Designer #DD-1K



A must for every student, engineer or technician doing digital circuit design. Handles both IC and discrete components without soldering. Connections to the SK-10 socket are made using any solid 22 gage insulated wire. The DD-1K includes a clock, power supply, logic lights, pulsers, logic level switches and much more. All circuitry is now in one circuit board. $77.75 in kit form.

OEM and educational discounts available. All prices shown are suggested resale U.S.A.

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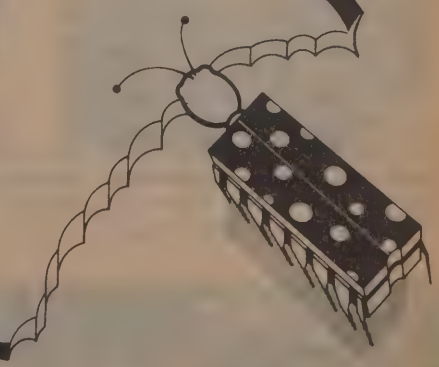


UNITED

SOLDER-WRAP® Packaging Technology

SOLDER-WRAP® is a high density interconnect system offering low front end cost, no artwork generation, fast engineering turn around, field changeability, and realistic production cost. With SOLDER-WRAP®, interconnect costs have been brought back in line with semiconductor costs. This unique electronics system forms interconnects at speeds two to three times faster than conventional wiring methods. Routing speed including soldering time, range from 350 to 1200 W.P.H. on the automatic equipment.

The SOLDER-WRAP® process consists of routing a fine insulated wire to the various protruding pins of components previously inserted into a specially patterned PC board. The individual wires and components leads are then soldered to the PC pads by a soldering probe, which simultaneously thermal strips away the wire insulation at the soldering area.

UNITED WIRING & MANUFACTURING CO. SOLDER-WRAP® INTERCONNECT PROCESS COMPARISON CHART

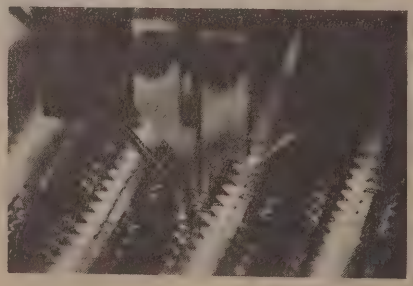
Process	Requires Artwork	Engineer Design	Engineer Changes	Density	Production Cost	Field Changeable	Prototype Process	Schottky Logic	ECL Logic
Two Sided Boards	Yes	6-10 Wks. Long	Artwork Changes	Low	Low	Poor	Very Poor	Poor	Poor
Multi-Layer Boards	Yes	10-12 Wks. Long	Artwork Changes	High	High	Very Poor	Very Poor	Good	Very Good
Wire-Wrap	No	2-4 Wks. Short	No Artwork	High	High	Good	Good	Fair	Fair
Stitch Weld	No	2-4 Wks. Short	No Artwork	High	Medium to High	Fair	Good	Fair	Fair
Two Sided SOLDER-WRAP®	No	2-4 Wks. Short	No Artwork	High	Low to Medium	Good	Very Good	Good	Fair
Multi-Layer SOLDER-WRAP®	No	2-4 Wks. Short	No Artwork	High	Medium	Good	Very Good	Very Good	Very Good

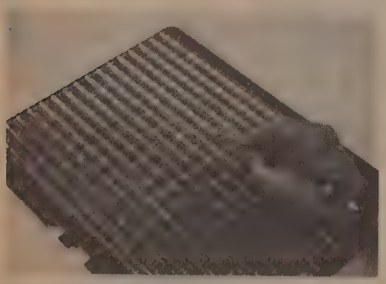
WHEN SHOULD SOLDER-WRAP® BE CONSIDERED FOR YOUR PACKAGING NEEDS?

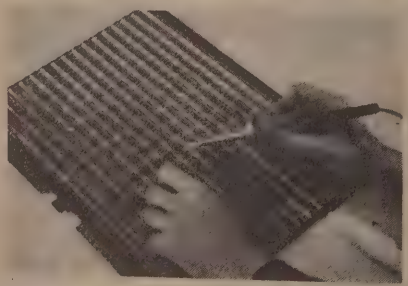
- **Front End Design (New Products)**
- **Replacement Wire-Wrap Boards**
- **Replacement Stitch-Weld Boards**
- **Replacement Multilayer Boards**
- **ECL Logic & TTL Schottky**
- **High Density Packaging Fan-Fold**

Advantages for SOLDER-WRAP® users include high surface and cubic density, fast engineering turn around, low front end tooling and testing costs and ease in changeability. As an example, the front end cost for a 40 position SOLDER-WRAP® board would run $308 including coding, keypunching and computer runs. Compare SOLDER-WRAP® with other processes in the chart in figure 1. SOLDER-WRAP® advantages can mean substantial savings for your operation in both time and money.

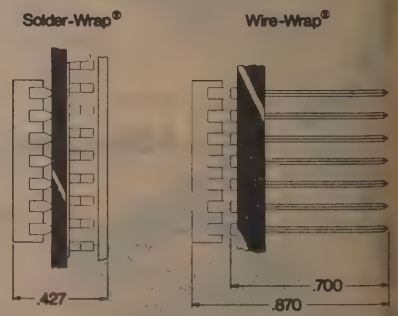
Some of the companies now using SOLDER-WRAP® are Texas Instruments, McDonnel Douglas, Collins Radio, Bell Labs, Westinghouse, L.T.V. Systems, E-Systems, Control Data, Univac, I.B.M., Bendix, Motorola, Cubic Western Data, Data West Corp., Jet Propulsion Laboratory, E.G.&G., Integrated Data Systems, Western Geophysical Div. Litton Resources, Teledyne Systems, Diebold, Schlumberger, Bell Helicopter, and Norand.







Manual or automatic — SOLDER-WRAP® offers fast, low cost, highly reliable interconnections and quick, easy changeability. Whether for prototyping or high volume production, SOLDER-WRAP® fills your high density interconnect needs.



SOLDER-WRAP®'s low profile increases cubic component densities — lowers packaging costs. Compare with Wire-Wrap profile.

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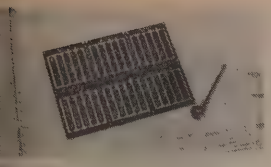
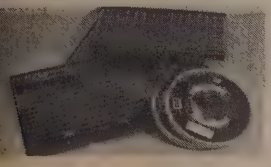
SOLDER-WRAP® Applications and Services

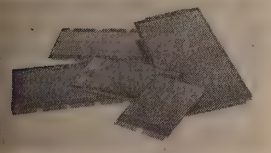
UNITED



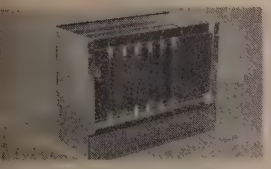
SOLDER-WRAP® Prototyping Kits and Tools — Extensive array of SOLDER-WRAP® boards and tools for breadboarding, building engineering prototypes, or making repairs to production SOLDER-WRAP® modules. See **eem** pages 1302 and 1303.



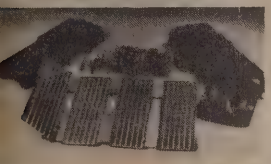
High Density Dual In-Line Packaging for T²L Logic using United's existing SOLDER-WRAP® circuit cards. Nearly any combination of IC capability, I/O configuration, and board size possible without front end artwork time delays. See **eem** page 1304.



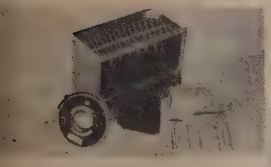
Mini and Microcomputer Interfacing through SOLDER-WRAP® I/O cards designed for accurate mechanical and electrical compatibility with most major systems. Implement your logic thru SOLDER-WRAP®. See **eem** page 1305.



SOLDER-WRAP® Backplane and Card Cage Systems, a new product line for 1978, offers high density packaging along with the high reliability and low connection costs of SOLDER-WRAP®. See **eem** page 1306.



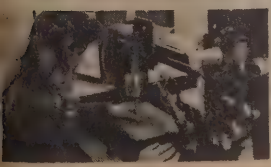
High Reliability in High Density Fan-Fold Packaging. Package up to 450 ICs with no connector interfacing. Integral power supply and forced air cooling make Fan-Fold the industry's newest packaging concept. See **eem** page 1307.



Total System Configuration with SOLDER-WRAP® Technology. Let United implement your logic design thru SOLDER-WRAP®. Given your specifications United's professional staff provides total system design from populating ICs on boards all the way to final testing of a completed functioning SOLDER-WRAP® system. See **eem** page 1308.

Production SOLDER-WRAP® wiring service for four boards or four thousand. United offers quick turn around, short front end design times and low connection costs. Artwork and software pricing in this section also. See **eem** page 1309.

Automatic SOLDER-WRAP® machinery will equip your facility for in-house SOLDER-WRAP® wiring. Reliable equipment, engineered and manufactured for precise positioning and low maintenance. Optional functions available also. See **eem** page 1310.



SOLDER-WRAP® Twisted Pair Wiring for ECL Circuitry. United now offers complete ECL capability with semi-automatic or manual twisted pair stringing, 3 layer boards with imbedded ground planes and twisted wire kits for prototyping. See **eem** page 1311.

National Sales Office
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UNITED WIRING & MFG. CO.

UNITED

SOLDER-WRAP® Prototyping Kits & Tools

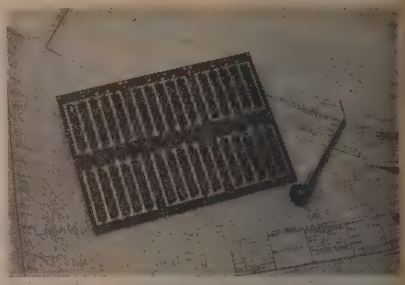
Prototype kits offered by United Wiring & Manufacturing Company are offered in a complete progression of sizes and are designed for use with all SOLDER-WRAP® boards as well as other manufacturers breadboards.

Each kit is designed around United's patented manual wire stringing tool which enables up to 300 connections to be made per hour, including soldering time. SOLDER-WRAP® prototype kits serve a triple purpose:

- **Breadboarding in your lab**
- **Making repairs in the field**
- **Complete functioning engineering prototypes**

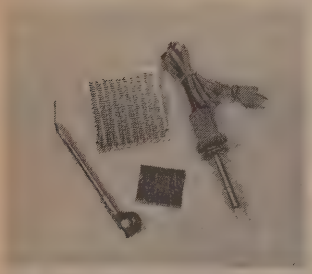
Using SOLDER-WRAP®, connections are made by stringing a continuous, unbroken wire from the beginning of a net to the end, connecting each common point along the way. With only one wire at each soldered connection, initial breadboarding, as well as subsequent changes, is effected quickly, neatly, and accurately. Using SOLDER-WRAP®, even breadboarding directly from logic diagrams becomes faster and greatly reduces wiring errors.

Whether used as introduction to the SOLDER-WRAP® method of interconnection or as a continuing design tool for your engineers and technicians, SOLDER-WRAP® prototyping capability can cut breadboarding time by 50% over



wire-wrapping and up to 75% over hard wire/soldering.

All kits and tools shown here are stocked for immediate delivery. Also refer to the following pages for United's wide assortment of off the shelf SOLDER-WRAP® boards.



SOLDER-WRAP® Starter Kit — Designed for initial experimentation with the SOLDER-WRAP® process.
Part Number 150-0100-001

SOLDER-WRAP® E.C.O. Kit — For making engineering changes on 2-sided boards and wiring on Vector and Vero breadboards.
Part Number 150-0105-001

SOLDER-WRAP® Special Tool Kit — Kit contains all special tools required for SOLDER-WRAP® prototyping.
Part Number 150-0110-001

Industrial SOLDER-WRAP® Prototype Kit — Our most complete prototype kit. The handsome attache case provides portability and contains an abundant supply of wire cartridges and other equipment for industrial applications.
Part Number 150-0115-001

Manual Stringer — Stainless steel, well balanced with adjustable wire tension.
Part Number 150-0120-001

Polyurethane/copper wire for stringer.
30 ga. P/N 150-0120-002 R(G)
34 ga. P/N 150-0120-003 R(G)
36 ga. P/N 150-0120-004 R(G)
38 ga. P/N 150-0120-005 R(G)
Specify red or green.

Soldering Unit — 42 Watt, 120 VAC 750°F.
P/N 150-0120-006 (2 wire)
P/N 150-0120-007 (3 wire)

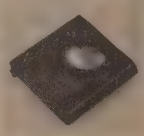
Solder Tips — Special shape allows ease of soldering.
P/N 150-0120-008

IC Insertion Tool — Guides and inserts IC's without damaging leads.
P/N 150-0120-009

IC Lead Bender — Properly bends IC leads for SOLDER-WRAP® wiring.
P/N 150-0120-010

Wire Cutter — For isolating networks on SOLDER-WRAP® boards.
P/N 150-0120-011

Continuity Tester — Audible signal — battery included.
P/N 150-0120-012



5X Magnifier — Lighted — excellent for inspection of connections.
P/N 150-0120-013

Twisted Pair Wire — For ECL and all high speed wiring using twisted pairs (red twisted with green).
P/N 150-0120-014 34 ga.
P/N 150-0120-015 36 ga.
P/N 150-0120-016 38 ga.

Manual Twisted Pair Stringer
P/N 150-0120-017

UNITED WIRING & MFG. CO.

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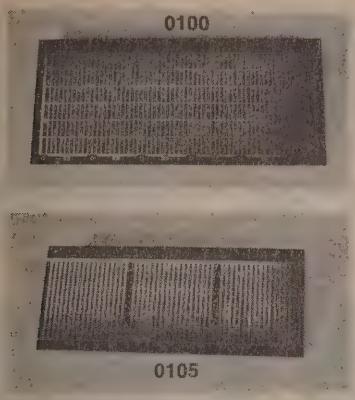
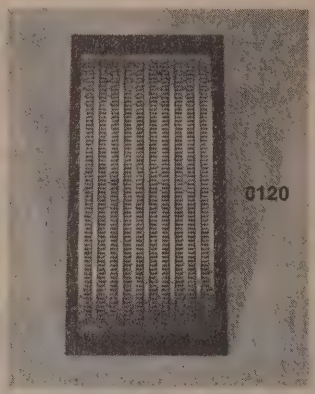
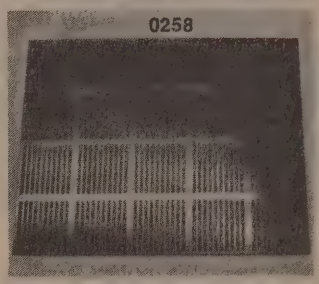
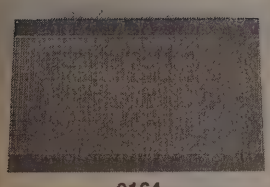
SOLDER-WRAP® Boards For Prototyping & Breadboarding

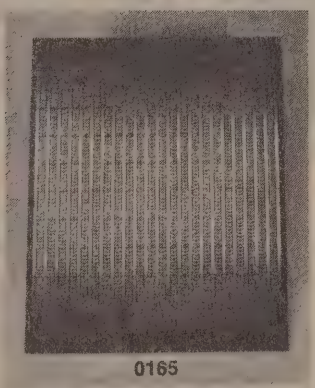
UNITED

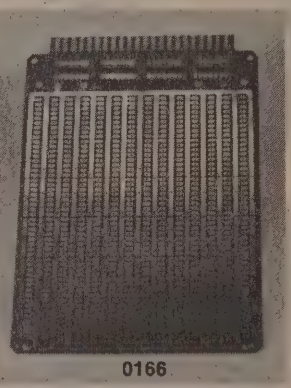


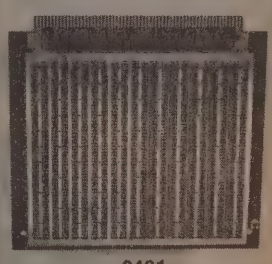












SOLDER-WRAP® PROTOTYPE BOARD SPECIFICATIONS

UWM Basic P/N	Accepts Total No. Pkgs. 16 Pin (.300)	or 22 Pin (.400)	or 40 Pin (.600)	Dimensions (Inches) L	W	Thk.	I/O Connector	Remarks
0100	180	0	0	16.18	7.48	.06	46 Pins (.1x.3) 6 Each	LP, NS, PB
0105	162	0	36	16.18	6.88	.06	46 Pins (.1x.3) 6 Each	LP, NS, PB
0120	35	0	9	8.00	3.70	.06	None	LP, NS
0164	176	0	45	9.00	14.00	.06	24 Pins (.1x.1) Ribbon Header (12 Each)	LP, NS
0165	88	0	21	7.00	7.00	.06	24 Pins (.1x.1) Ribbon Header (6 Each)	LP, NS
0166	42	0	8	6.50	4.50	.06	22x2x.156 Edge Card	LP, NS
0258	15	0	3	3.40	3.30	.06	None (Note 1.)	LP, NS
0421	66	25	14	7.50	7.70	.06	61x2x.100 Edge Card (Note 4.)	LP, NS

ORDERING INFORMATION SOLDER-WRAP® BOARDS

Part Number Construction Is As Follows

XX — XXXX — XX

A B C

A. First two digits define type of board
   LP = Low Profile Dip Socket commercial and Mil grade
   NS = SOLDER-WRAP® board without sockets
B. These four digits define basic board number
C. These two digits define SOLDER-WRAP® back covers
   -00 = No SOLDER-WRAP® back cover
   -01 = SOLDER-WRAP® back cover, styrene material
   -02 = SOLDER-WRAP® back cover, FR4 material

NOTES

1. Dimensions for 0258 board are for 1 section only (4 x 5 sections shown). Indicate number of patterns W by number of patterns H when ordering, max. = 5 wide (W) by 4 high (H).
2. All boards contain UWM wiring channels, installed.
3. Minimum board to board spacing for backplane insertion:
   NS .500 in C-C
   LP .600 in C-C
4. Mating card cage available.
5. All SOLDER-WRAP® boards meet the following specifications:

Laminate	MIL-P-13949
Plating	QQ-S-571, MIL-G-45204, QQ-N-290
Fabrication	Mil-Std-275 (MIL-P-55110 on request)
Artwork/Design	Mil-Std-100, MIL-D-1000

6. Complete price list available upon request.

National Sales Office
2608 Electronic Lane #509
Dallas, Texas 75220
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Manufacturing
P.O. Box 8369
Longview, Texas 75602
(214) 757-3045

UNITED WIRING & MFG. CO.

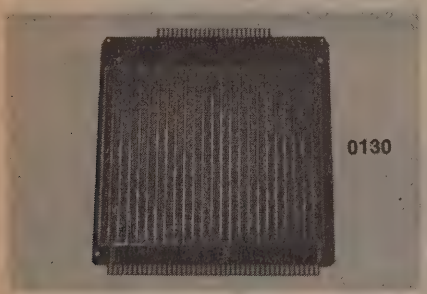
UNITED

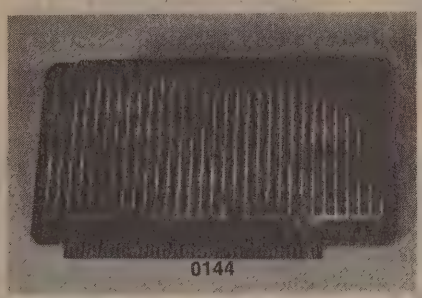
High Density IC Packaging For TTL Logic

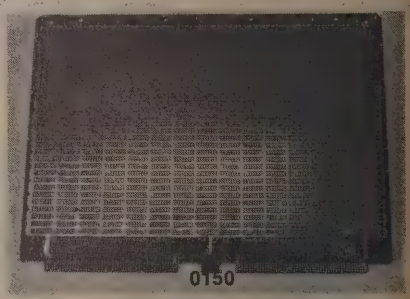
Commit your proven circuitry to production quickly by using one of United's high density SOLDER-WRAP® board designs. Save artwork generation lead time, costs and design errors. Existing designs offer packaging capacities from 25 to 225 16 pin ICs. Many variations in I/O configuration to interface with your existing system. Also, complete mating SOLDER-WRAP® backplane card cages for a wide range of plug-in boards.

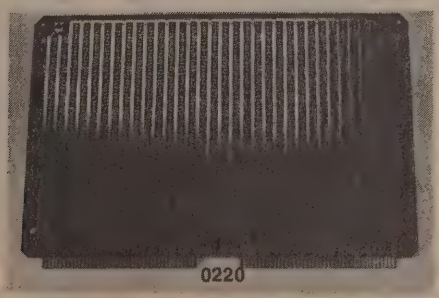
Table below shows specs on but a few of United's nearly 100 board designs available for your immediate SOLDER-WRAP® application.

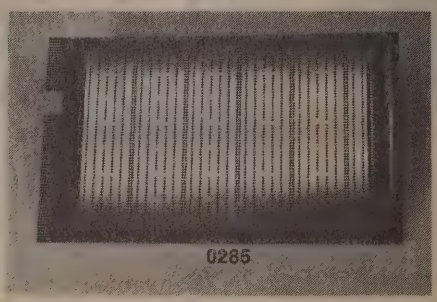
Contact United Wiring & Mfg. Co. for additional specifications and complete pricing information.

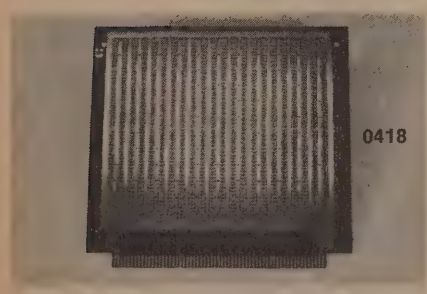


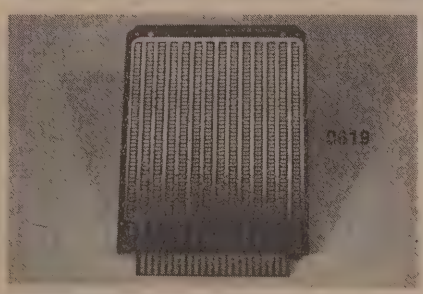


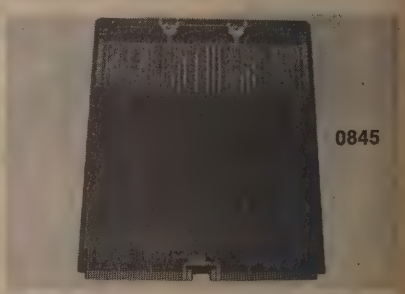












	SOLDER-WRAP® HIGH DENSITY BOARD SPECIFICATIONS						
	Accepts Total No. Pkgs. or or			Dimensions (inches)			
UWM Basic P/N	16 Pin (.300)	22 Pin (.400)	40 Pin (.600)	L	W	Thk.	I/O Connector
0130	84	0	16	8.69	7.75	.06	43x2x.156 / 50x2x.100 (HP 21XX Series)
0144	75	0	20	5.82	9.75	.06	43x2x.156
0150	225	0	12	11.00	14.23	.06	(2) 50x2x.1 (Mating card cage available)
0220	96	0	20	7.29	10.50	.06	(2) 20x2x.1 (Mating card cage available)
0285	119	25	30	12.00	7.24	.06	43x2x.1 / 18x2x.1 CAMAC
0418	66	0	14	7.50	7.70	.06	61x2x.1 (Mating card cage available)
0619	35	0	8	6.50	4.50	.06	22x2x.156
0845	216	80	20	15.40	11.75	.06	(2) 40x2x.125 / (3) 40 Pin Ribbon Cable Header

See prototyping section for ordering information.

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Manufacturing
P.O. Box 8368
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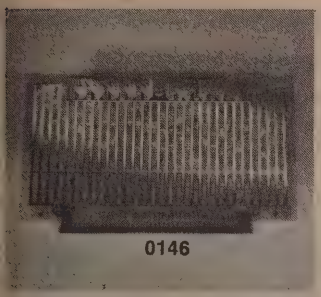
(214) 757-3045

Minicomputer & Microprocessor Interfacing Using SOLDER-WRAP®

UNITED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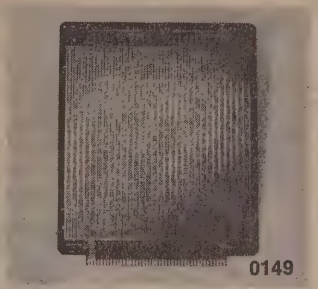
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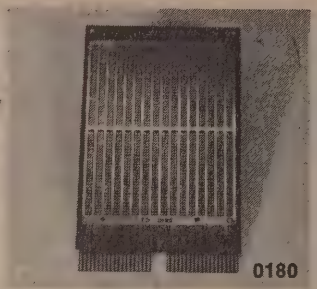
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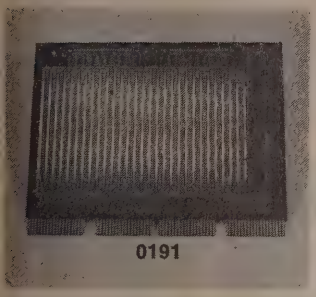
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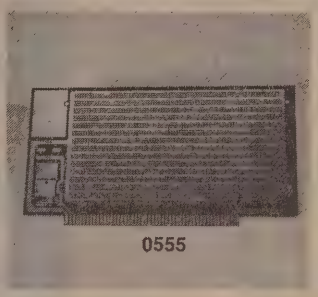
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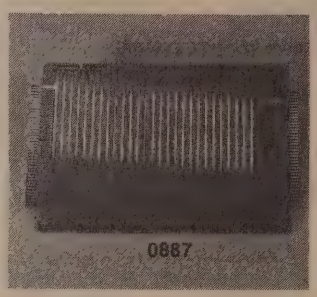
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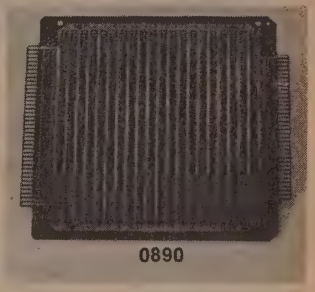
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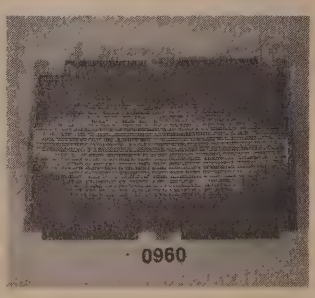
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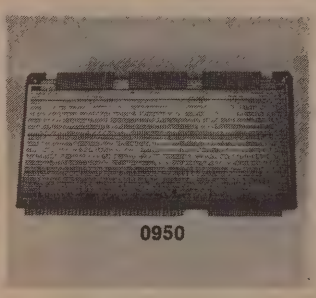
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	SOLDER-WRAP® MINI & MICRO BOARD SPECIFICATIONS							
	Accepts Total No. Pkgs.			Dimensions (Inches)				
UWM Basic P/N	16 Pin (.300)	or 22 Pin (.400)	or 40 Pin (.600)	L	W	Thk.	I/O Connector	Remarks
0146	49	0	10	6.000	9.750	.06	22x2x.156 / (2) 50 Pin .1x.1 Ribbon Cable Header	Motorola Exercisor
0149	150	0	16	11.800	9.750	.06	22x2x.156 / (2) 50 Pin .1x.1 Ribbon Cable Header	Motorola Exercisor
0180	48	0	10	8.430	5.187	.06	DEC Buss	DEC Dual
0189	96	0	20	8.430	10.457	.06	DEC Buss	DEC Quad
0191	84	0	18	8.430	10.457	.06	DEC Buss (4) 50 Pin .1x.1 Ribbon Cable Header	DEC Quad Auxiliary Ribbon Cable I/O
0555	56	0	12	10.000	5.380	.06	50x2x.125	S100 BUSS
0887	104	10	24	10.650	7.000	.06	40x2x.125 AND 36x2x.125	Texas Instruments 980
0890	70	0	18	7.000	7.910	.06	40x2x.125 AND 36x2x.125	Texas Instruments 980
0915	176	0	14	16.886	7.480	.06	50x2x.100 AND 43x2x.156	Computer Automation
0960	255	12	12	14.250	10.250	.06	(2) 40x2x.125 AND (2) 36x2x.125	Texas Instruments 990
0950	117	0	20	12.000	6.750	.06	43x2x.156 30x2x.100 DEC Buss	Intel 80 Series

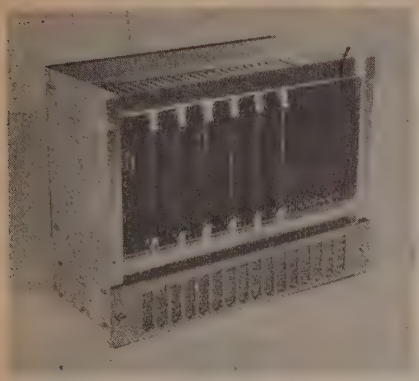
See United's section on prototyping and breadboards for complete PC board manufacturing specifications and ordering information.

National Sales Office
2608 Electronic Lane #509
Dallas, Texas 75220
(214) 350-4978

Manufacturing
P.O. Box 8368
Longview, Texas 75602
(214) 757-3045

UNITED WIRING & MFG. CO.

UNITED — SOLDER-WRAP® Backplane & Card Cage Systems

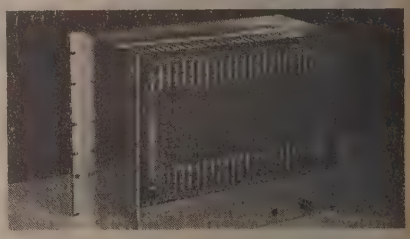


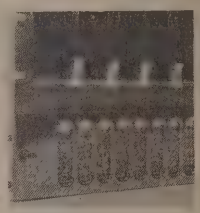
Total SOLDER-WRAP® system capability is now available by designing around United Wiring & Mfg. Co.'s new line of card cage and backplane systems. Offered in three basic sizes, with total chip capacities ranging from 1700 to 5800 chips, United's card cages accept 26 plug-in boards, each board having total IC capacity of from 66 Model (510-0105) to 225 (Model 510-0115) ICs per board.

Card cages are designed to fit standard 19" panel openings and are rigidly constructed for maintaining proper card positioning and connection integrity.

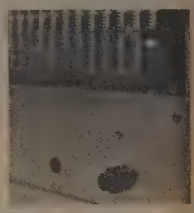
Each basic series comes optionally with a forced air cooling package pulling 180 cfm through a permanent washable filter.

SOLDER-WRAP® backplanes and plug-in boards may be wired automatically or manually and systems may be ordered with any available number of plug-in cards and external I/O connectors.

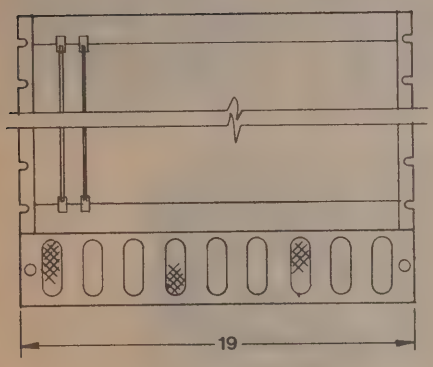


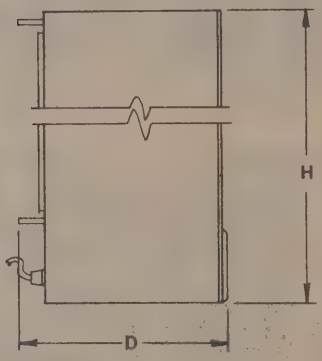


Removable Permanent Air Filter



Fused 110 VAC





ORDERING INFORMATION

XXX — XXXX — XXX — X

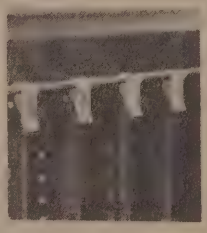
- XXX — Basic Cage P/N
- XXXX — 0 = IC Sockets in Plug-in Boards; 1 = No Sockets
- XXX — No. Plug-in Bds. (00 thru 26)
- X — No I/O Headers Installed (0-8)

SOLDER-WRAP® CARD CAGE SPECIFICATIONS

UWM Basic Part No.	Max. No. Boards	Max. No. ICs (16 Pin)	Dimensions (Inches) Height	Dimensions (Inches) Depth	Forced Air Cooling Pkg.	P/N Plug-In Board
510-0125	26	1716	10.5	9.0	No	700-0418-100
510-0126	26	1716	14.0	9.0	Yes	700-0418-100
510-0130	26	2444	14.0	9.0	No	700-0220-100
510-0131	26	2444	17.5	9.0	Yes	700-0220-100
510-0135	26	5850	17.5	13.5	No	700-0150-100
510-0136	26	5850	21.0	13.5	Yes	700-0150-100

NOTES

1. Backpanel boards are .125 thick, Plug-in boards are .062 thick. See prototype section for specs on all SOLDER-WRAP® boards.
2. Edge connectors — glass filled Diallyl Phthalate with Phosphor bronze contacts, nickel-gold plated. Contacts rated 5 ADC @ 25°C, 500 VDC Insertion force — less than 5 oz. (142 gm)
3. External I/O thru 50 pin flat ribbon header (maximum 8 per card cage)
4. Card cage material — steel and aluminum, anodized and bright cadmium plated for protection.
5. Center to center board spacing .600 in.



Custom position symbolization available on request.

Extractors provide easy, safe insertion and extraction of cards.

Reliable ribbon able I/O for cage to cage interconnection.

UNITED WIRING & MFG. CO.

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1801 Electronic Lane #509
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High Reliability DIP Packaging With SOLDER-WRAP® Fan-Fold

UNITED

SOLDER-WRAP® Fan-Fold — A New Interconnect Process Designed To Eliminate Backpanels And Cut Production Costs.

Fan-Fold offers several advantages over conventional backpanel and card cage systems. The main highlights of Fan-Fold packaging are **high density, improved reliability, reduced production cost, and no limitation of in and out connections** from board to board. Automatic SOLDER-WRAP® machinery handles up to five 4.5″x16″ Fan-Fold boards. The machine treats the five boards as one large board, 22.5″x16″.

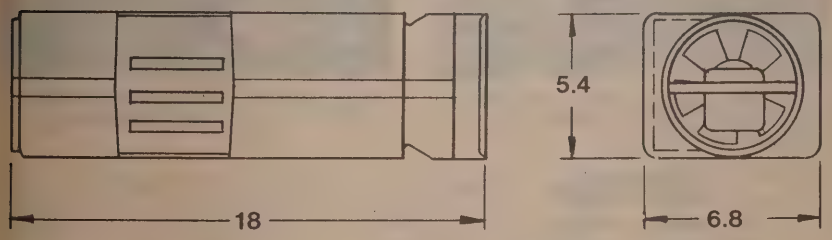
Flexible copper clad mylar is used to connect all the Fan-Fold boards into one continuous foldable assembly. This same copper clad mylar carries the ground plane from board to board.

The machine connects directly from one IC lead on one board to any other IC lead on any of the five boards. Once the SOLDER-WRAP® process has wired and soldered all five boards, a special 3M® tape is applied on wires crossing from board to board. This will adhere the wires to the copper clad mylar over the ground plane.

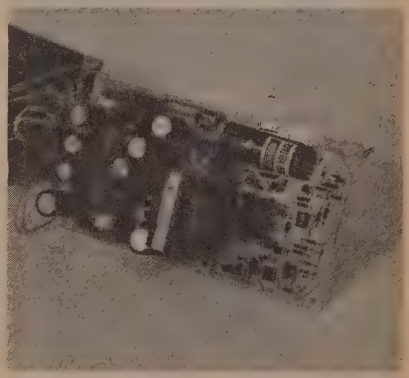
The design effort to package circuits on the Fan-Fold process is greatly reduced due to the elimination of partitioning of logic. **There is no limitation on the number of in and out signals from board to board.**

The production cost can be as much as 20% less than a conventional two sided printed circuit board system.

Fan-Fold also adapts well to TTL Schottky and ECL logic applications using SOLDER-WRAP® twisted pair wire. Interruptions of signal transmission due to card edge connectors can now be a problem of the past.

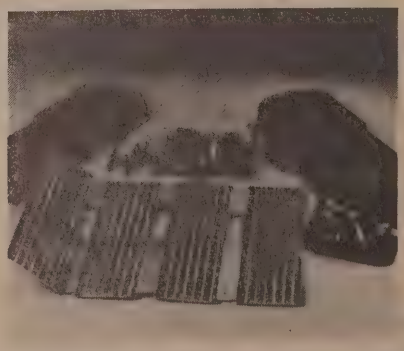


	Ordering Information	
UWM Part No.	No. Fan Fold Boards	With Power Supply
520-2100-200	2	ADD -PS
520-2100-300	3	ADD -PS
520-2100-400	4	ADD -PS
520-2100-500	5	ADD -PS



Fan-Fold Switching Power Supply — 110 VAC Input, 50 Watt Output; ±12 VDC, ±5 VDC.

SOLDER-WRAP® Fan-Fold Package Housed in Lower Half of Molded Enclosure.



SOLDER-WRAP® Fan-Fold Package Disassembled — Wiring Side of Board Shown.

SOLDER-WRAP® Fan-Fold Package Disassembled — Component Side of Board Shown.

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UNITED WIRING & MFG. CO.

UNITED — Total System Configuration With SOLDER-WRAP® Technology

United Wiring and Manufacturing Co. offers a complete system design and fabrication service using our broad line of SOLDER-WRAP® packaging schemes and products.

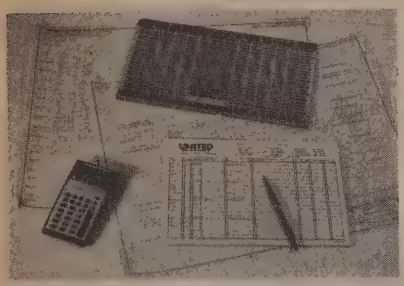
Professional experience, a well equipped facility and a thorough approach to engineering and production combine to provide your firm with the reliable product and turn around times required.

Whether using standard existing SOLDER-WRAP® cards, designing custom cards to your specs, building around a SOLDER-WRAP® solution to your design problem.

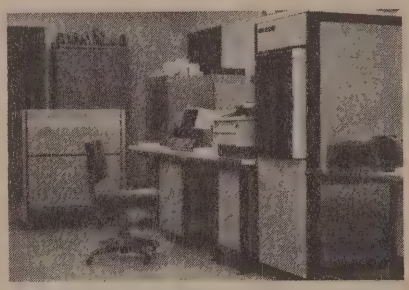
United's sophisticated software package analyzes your logic input, optimizes wire routing and points out design errors and conflicts in a thorough documentation package.

Necessary artwork to create special SOLDER-WRAP® boards can be created quickly and accurately using computer aided design techniques. Special power and ground layers, non-standard components, and custom board I/O are adapted where needed. And of course, low cost, highly reliable, self-testing, high speed SOLDER-WRAP® wiring keeps costs down and production up.

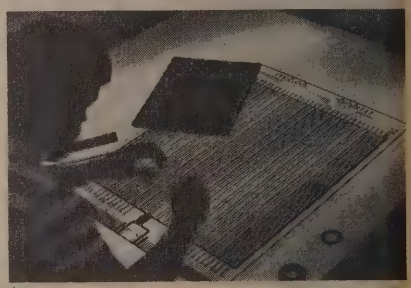
Whether it be an engineering prototype, low volume production, contract wiring services, or total systems delivery, put United Wiring and Mfg. Co. and SOLDER-WRAP® on your production team.



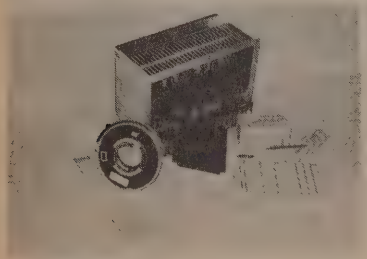
Logic is partitioned, pins assigned and signal data converted into input form for software operation.



In-house EDP capability provides documentation package and command data for automatic SOLDER-WRAP® machines.

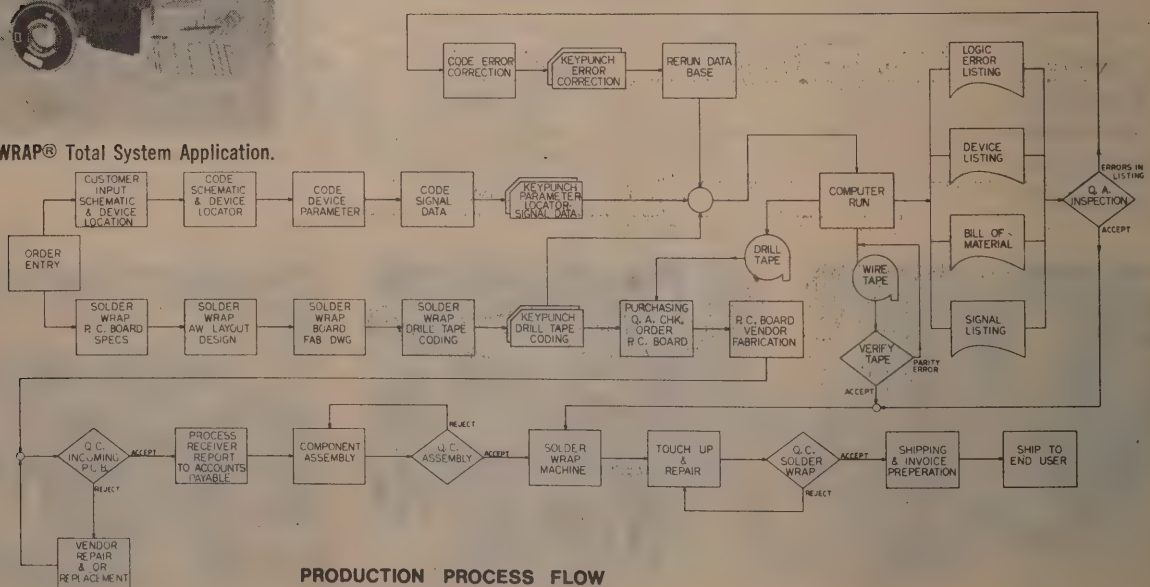


Existing boards or custom SOLDER-WRAP® artwork — accurate, professional design.



SOLDER-WRAP® Total System Application.

UNITED
WIRING & MFG
Solder-Wrap



PRODUCTION PROCESS FLOW

Contact a United Wiring & Mfg. Co. Sales Representative to discuss the SOLDER-WRAP® technology application suitable for your requirements.

UNITED WIRING & MFG. CO.

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2808 Electronic Lane #509
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(214) 350-4978

Manufacturing
P.O. Box 8368
Longview, Texas 75602
(214) 757-3045

Pricing Information— SOLDER-WRAP® Wiring Services

UNITED

SOLDER-WRAP® ARTWORK DESIGN & BOARD TOOLING

	1-50 ICs	51-100 ICs	101-300 ICs
Artwork Generation	$500.00	$770.00	$890.00
P.C. Tooling	270.00	395.00	495.00
Total	$770.00	$1095.00	$1385.00

*2 side A/W for TTL circuitry. A/W for Schottky or ECL applications quoted on request.

SOLDER-WRAP® SOFTWARE COSTS

1. Populating ICs for Board Layout incl. 2, 3, 4 below ..... $12.00 per IC
2. Coding Schematic, Keypunch, Computer Run, and Documentation Package* ..... $7.70 per IC
3. Keypunch, Computer Run, and Documentation Package ..... $4.50 per IC
4. Computer Run and Documentation Package .... $3.22 per IC
5. Conversion of existing SOLDER-WRAP* assembly to 2 sided or multilayer artwork ..... Prices on Request

*SOLDER-WRAP® documentation package includes listing of signal data by device pin and signal name. Also parts list and device location list.

SOLDER-WRAP® Wiring Services

Low Volume Wiring

One SOLDER-WRAP® Board	15 Cents per Wire
Two SOLDER-WRAP® Boards	14 Cents per Wire
Three SOLDER-WRAP® Boards	13 Cents per Wire
Four SOLDER-WRAP® Boards	12 Cents per Wire

SOLDER-WRAP® Contract Wiring Service — 12 Month Usage

100K to 200K Wires	10 Cents per Wire
200K to 300K Wires	9 Cents per Wire
300K to 500K Wires	8 Cents per Wire
500K to 1MM Wires	7 Cents per Wire
1MM to 2MM Wires	6 Cents per Wire
2MM to 5 MM Wires	5 Cents per Wire
5MM to 10MM Wires	4.5 Cents per Wire

Miscellaneous Components and Services

1. Burndy dual In-Line, low profile sockets available in 8, 14, 16, 18, 20, 22, 24, 28, and 40 pin configurations, either commercial or Mil grade.
2. Ceramic disc capacitors for decoupling; .01 MFD and 0.1 MDF. Order by description.
3. Insertion of components.
4. Snap-on protective covers for any SOLDER-WRAP® board.

Prices available on request.

United Wiring & Mfg. Co. Wire Wrap Prototyping Kit

Pre-stripped 30 AWG Kynar or MIL-ENE wire-wrap wire packaged in 9 different lengths. Available in 10 different insulation colors as shown and kits are stocked for immediate delivery. Lengths shown are insulation lengths; for total length of each wire add 2.0".

Wire Lengths and Quantities

Length	No. in Kit
1 in. (25.4 mm)	3000
2 in. (50.8 mm)	2000
3 in. (76.2 mm)	1000
4 in. (101.6 mm)	1000
5 in. (127.0 mm)	500
6 in. (152.4 mm)	350
7 in. (177.8 mm)	350
8 in. (203.2 mm)	350
9 in. (228.6 mm)	350

ORDERING INFORMATION

Basic Kit P/N 150-0250-XXX

Last Three Digits Indicate Wire Color

-000 Black	-005 Green
-001 Brown	-006 Blue
-002 Red	-007 Violet
-003 Orange	-008 Grey
-004 Yellow	-009 White

UWM Wire-Wrap Kit

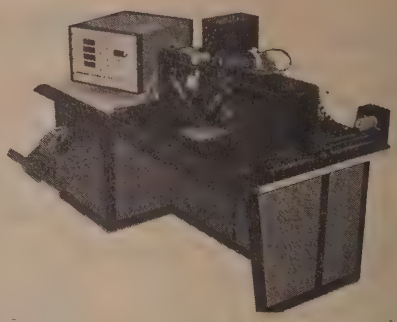
National Sales Office
2608 Electronic Lane #509
Dallas, Texas 75220
(214) 350-4978

Manufacturing
P.O. Box 8368
Longview, Texas 75602
(214) 757-3045

UNITED WIRING & MFG. CO.

UNITED

Automatic SOLDER-WRAP® Machinery



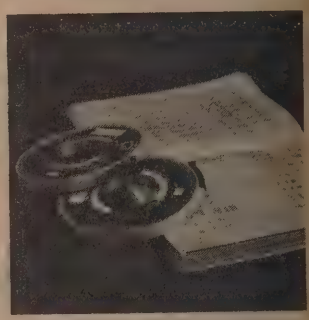
Automatic SOLDER-WRAP® interconnect equipment may be leased or purchased from United Wiring and Manufacturing Company, Inc. This equipment performs all wire routing, cutting and soldering functions and checks for errors.

The decision to lease, purchase or use United's in-house wiring capabilities should be based on your needs. If your volume is small, United can perform your wiring services for you at a savings of 20% to 30%. If your shop deals in medium to large volume, a 50% savings can be effected with leased or purchased equipment. For example, equipment wiring costs in a single shift operation would be approximately 3 cents per wire.

A computer system generates the engineering documentation package and a disc or paper tape to drive the automatic SOLDER-WRAP® equipment. An operator with two to three weeks training can effectively man the SOLDER-WRAP® equipment. Additional training is required to operate the engineering documentation package for the software system.

Either way, United's in-house service, or using SOLDER-WRAP® equipment in your own plant, means total reliability plus a 30% to 50% cost savings for you.

Equipment	Stringing — Conn. Per Hour	Soldering/Cutting — Conn. Per Hour	Avg. Wires — Per Hour	Cost Per Wire — One Shift
Model 100	1100	1000	350 W.P.H.	.03 Cents
Model 400	4200	4000	1000 W.P.H.	.025 Cents



Stringing, soldering, and cutting operations, performed automatically and accurately on SOLDER-WRAP® machinery.

SOLDER-WRAP® documentation package — special software available for most EDP systems.

Optional Functions Available

Optional functions are now available for the Model 100 SOLDER-WRAP® machine, making it a completely versatile production tool.

Wire-Wrap Option — 300 wires per hour and up can be wrapped using the 100 as a semi-automatic wire-wrap system. Digital displays indicate wire numbers and lengths, while the positioning mechanism guides the operator to the points to be wired.

SOLDER-WRAP® Twisted Pair Option — Equipped with the SOLDER-WRAP® twisted pair tool, the Model 100 can effect up to 200 twisted pair connections per hour. These transmission lines of 50-55 ohms impedance facilitate ECL circuitry without complex multi-layer circuit boards.

Component Insertion Option—A ten minute changeover from SOLDER-WRAP® to a light pointing mechanism and the Model 100 becomes an efficient component insertion tool. Component numbers or part bins are indicated on the displays providing quick component selection.

Wire-Wrap

Twisted Pair

Component Insertion

UNITED WIRING & MFG. CO.

National Sales Office
2608 Electronic Lane #509
Dallas, Texas 75220
(214) 350-4978

Manufacturing
P.O. Box 8368
Longview, Texas 75602
(214) 757-3045

SOLDER-WRAP® Twisted Pair Wiring For ECL Circuitry

UNITED

SOLDER-WRAP® TWISTED PAIR

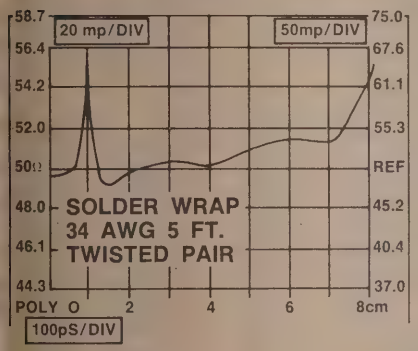
Twisted pair SOLDER-WRAP® will enable engineers to use ECL 10K/100K logic without laying out 8 to 10 layer PC boards for generation of transmission lines. The SOLDER-WRAP® twisted pair process utilizes a four-layer SOLDER-WRAP® board which will have imbedded power and ground planes in the two inner layers and the component and wiring surfaces on the outside layers. **The SOLDER-WRAP® twisted pair** will exhibit a 1.5 nano second propagational delay per foot of twisted pair wire. This holds true for 34, 36, and 38 gauge wire.

The characteristic impedance exhibited by 34, 36, and 38 gauge wire is 50, 53, and 56 ohms respectively. (Refer to TDR sampler readouts below). The SOLDER-WRAP® twisted pair tool is controlled by the Model 100 SOLDER-WRAP® machine and twists 8 to 10 turns per inch.

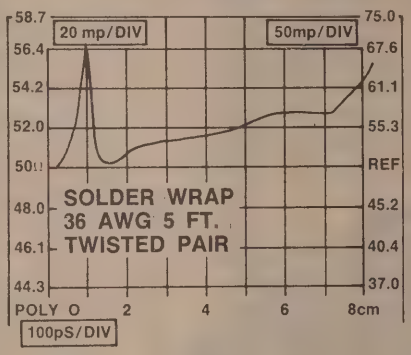
The light pointer on the Model 100 will indicate wire routing and also indicate whether a signal or ground wire should be connected to the IC patterns on the SOLDER-WRAP® ECL board. **The Model 100 machine** will automatically solder and cut the wires at an over all rate of approximately 200 wires per hour. The twisting operation on the twisted pair tool is controlled by a stepping motor which is in synchronization with the travel speed of the light pointing system.

SOLDER-WRAP® Twisted Pair Tool for manual operation. Speed control adapter comes with tool.

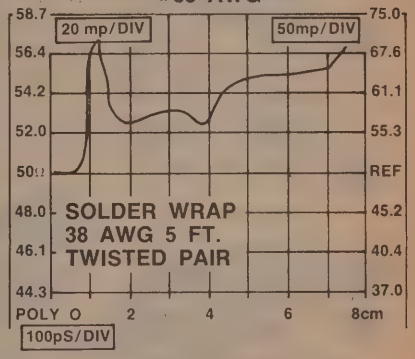
#34 AWG

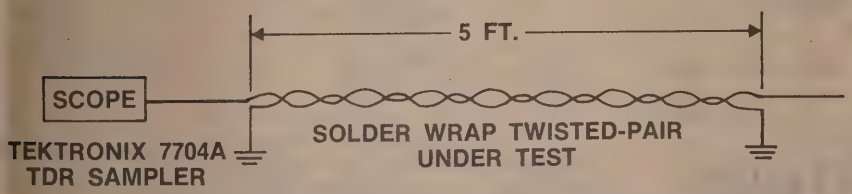


#36 AWG

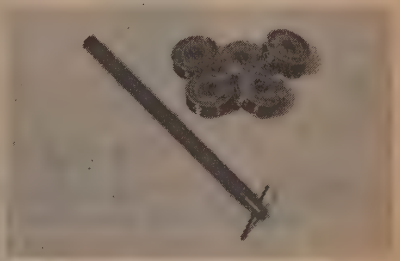


#38 AWG





TEST SET-UP FOR IMPEDENCE CHECK



Twisted Pair Wire Kit — Designed for ECOs in field or for small engineering modifications. See eem page 1302 for part numbers and ordering information.

SOLDER-WRAP® twisted pair is available through United's service center and will be offered both on Fan-Fold packaging and SOLDER-WRAP® backpanel/card cage systems. United will special design your ECL artwork to fit your special system configuration.

National Sales Office
2608 Electronic Lane #509
Dallas, Texas 75220
(214) 350-4978

Manufacturing
P.O. Box 8368
Longview, Texas 75602
(214) 757-3045

UNITED WIRING & MFG. CO.

VECTORBORD®, MICROVECTORBORD®

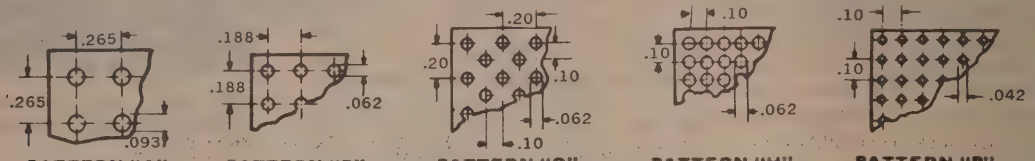
Vectorbord® and **Micro-Vectorbord®** prepunched terminal boards are time, work and money saving materials used throughout the electronic industry. Fire retardant material is precision punched in a wide variety of sizes, hole patterns, and thicknesses for later installation of terminals and components. Vector terminals in solder and wrapped wire models are available to fit all hole sizes. Pattern "A" or "AA" is good for experimental or other work where space is not critical. Pattern "B" is useful for work with small components such as resistors and capacitors. Pattern "G" is particularly useful for transistor usage. Pattern "H" and "P" are specially designed for use with integrated circuits and devices packaged with leads on 0.1 inch multiples.

Phenolic—MIL Spec PBE-P per MIL-P-3115 NEMA grade FR2. Copperclad phenolic meets NEMA FR2 and is one ounce.

Paper Epoxy—MIL Spec P-22324 type PEE NEMA grade FR3. Copperclad FL-PX per MIL-P-13949 NEMA grade FR3.

Epoxy Glass—For 'P' pattern boards with 'WE' in suffix-Unclad: MIL Spec MIL-P18177 type GEE NEMA FR4 and G-10. Copperclad: MIL Spec 13949 type FL-GF NEMA grade FR4 and G10. Color: Green. Best mechanical characteristics. **For all other glass epoxy boards** - FR-4 type, max. temp. 130°C (266°F); color, blue; best hole quality in epoxy glass; can plate through holes in clad material. Special sizes and hole layouts can be made to order, if one of the standard catalog items does not meet requirements. When ordering special size boards, the following MAXIMUM BOARD WIDTHS apply:

Pattern "A" in phenolic and epoxy paper or glass laminates; 20"
Pattern "B" all materials; 6"
Pattern "G" in phenolic and epoxy paper; 20". In epoxy glass; 16".
Pattern "H" in epoxy glass; 8.51". Pattern "P"; 10.00".



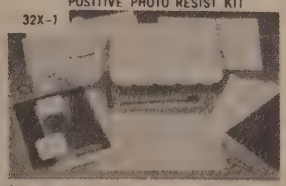
PATTERN "A" PATTERN "B" PATTERN "G" PATTERN "H" PATTERN "P"

pattern	material	catalog number	length inches	width inches	thick inches	copper clad
A	phenolic	18A18	4.80	4.80	1/16	none
		32A17	8.51	4.50	1/16	none
		32A18	8.51	4.80	1/16	none
		64A18	16.99	4.80	1/16	none
		72A32	19.11	8.51	1/16	none
		32AA9	8.51	2.41	3/32	none
		32AA18	8.51	4.80	3/32	none
		64AA18	16.99	4.80	3/32	none
		64AA32	16.99	8.51	3/32	none
		64AA132	35.01	16.99	3/32	none
	epoxy paper	64AA18EP	16.99	4.80	3/32	none
		64AA32EP	16.99	8.51	3/32	none
	epoxy glass	32A18WE	8.51	4.80	1/16	none
		64A18WE	16.99	4.80	1/16	none
B	phenolic	45B30	8.51	5.69	1/16	none
		90B30	16.97	5.69	1/16	none
G	phenolic	42G22	8.51	4.50	1/16	none
		42G24	8.51	4.80	1/16	none
		95G43	19.00	8.60	1/16	none
	epoxy paper	42G24EP	8.51	4.80	1/16	none
		85G24EP	16.99	4.80	1/16	none
		85G42EP	16.99	8.51	1/16	none
	epoxy glass	32G22WE	6.50	4.50	1/16	none
		42G22WE	8.51	4.50	1/16	none
		42G24WE	8.51	4.80	1/16	none
		42G42WE	8.51	8.51	1/16	none
		85G22WE	16.99	4.50	1/16	none
		85G24WE	16.99	4.80	1/16	none
		85G42WE	16.99	8.51	1/16	none
		175G22WE	35.00	4.50	1/16	none
		42G22WEC1	8.50	4.50	1/16	1 side
		42G22WEC2	8.50	4.50	1/16	2 sides
H	epoxy glass	85H48WE	8.50	4.80	1/16	none
		85H85WE	8.51	8.51	1/16	none
		170H48WE	16.99	4.80	1/16	none
		170H48 -032	16.99	4.80	1/32	none
		170H85WE	16.99	8.51	1/16	none

pattern	material	catalog number	length inches	width inches	thick inches	copper clad
P	epoxy glass	29P29	3.00	3.00	1/16	none
		44P29	4.50	3.00	1/16	none
		44P44	4.50	4.50	1/16	none
		59P19-032	6.00	2.00	1/32	none
		59P44-032	6.00	4.50	1/32	none
		64P44-032	6.50	4.50	1/32	none
		64P44	6.50	4.50	1/16	none
		64P44WE	6.50	4.50	1/16	none
		84P44	8.50	4.50	1/16	none
		84P44WE	8.50	4.50	1/16	none
		95P44	9.60	4.50	1/16	none
		169P44	17.00	4.50	1/16	none
		169P44WE	17.00	4.50	1/16	none
		169P59-016	17.00	6.00	1/64	none
		169P59-032	17.00	6.00	1/32	none
		169P59-047	17.00	6.00	3/64	none
		169P79	17.00	8.00	1/16	none
		169P84	17.00	8.50	1/16	none
		169P84WE	17.00	8.50	1/16	none
		349P44	36.00	4.50	1/16	none
		349P84	36.00	8.50	1/16	none
		169P44C1	17.00	4.50	1/16	1 side
		169P44C2	17.00	4.50	1/16	2 sides
		169P44WEC1	17.00	4.50	1/16	1 side
		169P59C1	17.00	6.00	1/32	1 side
		169P84C1	17.00	8.50	1/16	1 side
		169P84WEC1	17.00	8.50	1/16	1 side
	epoxy paper	64P44EP	6.50	4.50	1/16	none
		84P44EP	8.50	4.50	1/16	none
		138P42EP	13.90	4.50	1/16	none
		169P44EP	17.00	4.50	1/16	none
		169P47EP	17.00	4.80	1/16	none
		169P84EP	17.00	8.50	1/16	none
		64P44EPC1	6.50	4.50	1/16	1 side
		169P44EPC1	17.00	4.50	1/16	1 side
		64P44EPC2	6.50	4.50	1/16	2 sides
		169P44EPC2	17.00	4.50	1/16	2 sides
	phenolic	64P44XXXP	6.50	4.50	1/16	none
		169P44XXXP	17.00	4.50	1/16	none
		169P59XXXP	17.00	6.00	1/16	none

PHOTO SENSITIZED BOARD

+ POSITIVE ACTING PHOTO SENSITIZED COPPER CLAD BOARD FOR FASTER, EASIER ETCHED CIRCUITS



Vector positive acting coated photosensitized board speeds etched circuit manufacture because boards are coated with positive acting resist. Postive artwork is used for the circuit master pattern making use of readily available positive drafting aids. No reversing step required. A finished etched circuit can be made in less than an hour and boards etch in any common etchant. Vector positive acting developer must be used after exposure of the boards under U.V. light source such as a photo flood lamp or sunlight.

Kits 32X-1, 32XA-1 are recommended for trial evaluations of the system; later, purchase only boards and developer.

In the interest of improved design and performance, Vector reserves the right to make changes in its specifications without prior notice.

ORDERING INFORMATION

32X-1 Kit contains 1 bare and 1 sensitized 4½" x 6½" 1 ounce copperclad one side, 1/16 inch thick phenolic board, etching tray, ferric chloride etchant, developer, glass exposure plate, mask cutting film, tape, brush, razor knife, set of 4 sheets rub/transfer art work, layout paper, instruction sheets.

32XA-1 Kit has total of seven 1 ounce copperclad phenolic boards: 3 boards sensitized one side:1-4½" x 6½", 1-8.0" x 5.1", 1-4.5" x 2.73"; 2 boards sensitized 2 sides: 1-4½" x 6½", 1-4.5" x 2.73"; two bare boards: 1-4½" x 6½", 1-4.5" x 2.7" plus larger assortment of rub/transfer art work, etching chemical, developer, and other materials described in 32X-1 kit above.

1/16" THICK POSITIVE ACTING PHOTOSENSITIZED BOARDS

Catalog number	Description length	width	material	c.c. coating	pkg. quan.
CU90R80-1	9	7.98	phenolic	1 side	5
CU65R45-2	6.5	4.5	phenolic	2 sides	5
CU65R45-1	6.5	4.5	phenolic	1 side	5
CU45R27-1	4.5	2.73	phenolic	1 side	5
CU45R30W1	4.5	3.0	epoxy glass	1 side	3
CU65R27W1	6.5	2.73	epoxy glass	1 side	3
CU159R80W1	15.85	7.98	epoxy glass	1 side	2

Rub-Transfer Art Work Set R407 4 sheets. Includes lines, "donuts", I.C. and transistor pads

Positive Acting Developer 0088-21-15, 1.25 oz. bottle 0088-21-45, 6 oz. bottle

Etchant 2594A Ammonium Persulfate, 125 g. 2594E Ferric Chloride, 1 gallon

VECTOR ELECTRONIC COMPANY, Inc., 12460 Gladstone Av., Sylmar, CA 91342, phone (213) 365-9661, twx 910-496-1539

Vector WIRE WRAPPING TOOLS, TERMINALS, ACCESSORIES

WIRE WRAPPABLE TERMINALS & PINS — Vector "wrap-post" terminals are stamped from high grade copper alloy and have sharp corners (maximum radius .003") for gas-tight connections when properly wrapped with Vector or other wrapping equipment. Like many other Vector terminals, wrap-post terminals may be installed in Vectorbord® with inexpensive hand tools. New gang insertion tools permit installing some models at rates up to 1200 per hour — write factory. **As a result of their unique board holding design, when properly installed, terminals hold tightly to meet all production requirements.** Wrap-post terminals may be installed wherever required without high cost machines. They are ideal for building sub-assembly production boards for later incorporation in larger assemblies. Those with "stepped" shank designs may be used in plated-through holes.

T49 TRIFURCATED KLIP-WRAP Unique three-fingered clip on upper end makes this a time-saving terminal for production or experimental uses. The spring clip holds leads from 0.018" to 0.025", 0.032" or 0.040" until soldered. **Hand insertion tool P156** is adequate for installing a few at a time, but **spring impact tool P158 and D-8 die point** are recommended for larger quantity installation due to the speed and ease of use.

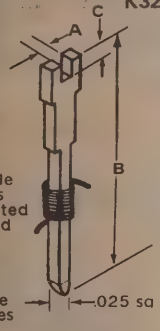
T49

T46 MINI-WRAP 0.028 inches square Sturdy double ended terminal fits .042" diameter holes. Has flanged mid-section.

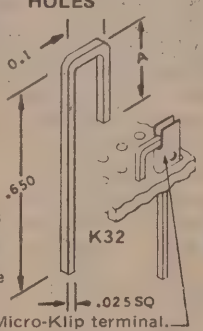
T46

part no. tin plating	part no. gold plating	tail length below 1/16" board	hand insertion tool	P158 tool w/die point	install in hole dia.
T49	T49A	.560	P156	D-8	.042
T49-1	T49A1	.388	P156	D-8	.042

T44/T68 MINI-WRAP for 0.042" HOLES Low profile wire wrappable terminals have slotted upper end for soldered wires. Ideal for miniature assemblies



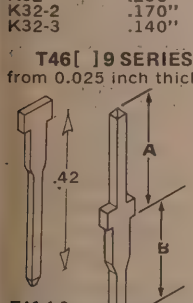
K32 "J" PIN for 0.042" HOLES Lowest cost wrappable terminal. May be used alone in circuit boards hole by inserting into two adjacent 0.028" to 0.042" diameter holes and bending shorter leg over for retention. Hooked end can also be embedded in encapsulated assemblies and wraps made on protruding tail. Illustration also shows terminal being used to provide wire wrappable extension tail to T42-1, a solderable Micro-Klip terminal.



CATALOG NUMBER tin	nickel/gold	DIMENSIONS A	B	C	hand install tool
T44	T44-1	.021	.690	.055	A13
T68	T68-1	.032	.800	.090	A13-1
T68A	T68A1	.032	.630	.090	A13-1

part no.	dimension A	insertion tool	for staking— P158 tool plus:	install in hole dia.
K32	.250"	not applicable		.028" min.
K32-2	.170"	not required	D-14 die; A-14 anvil	.028" min.
K32-3	.140"		D-14 die; A-14 anvil	.028" min.

T46[ ]9 SERIES WRAP POSTS, 0.025 inch square — Stamped from 0.025 inch thick stock, terminals hold without staking in 0.042 inch diameter holes.. Sharp corners (0.003 maximum radius) insure good wrapped wire connections. T46-5-9 accepts IDC cable headers.



T46-4-9

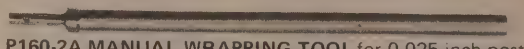
T46-2-9, T46-5-9
T46-3-9, T46-6-9

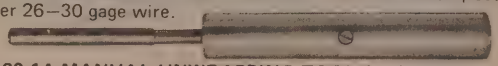
CATALOG NUMBER tin plated	nickel/gold	DIMENSION A	B
T46-2-9	T46-2A9	.36	.42
T46-3-9	T46-3A9	.46	.60
T46-5-9	T46-5A9	.28	.60
T46-6-9	T46-6A9	.36	.32
T46-4-9	T46-4A-9	—	.42

Hand insertion tool for above terminals is P133B or P205. P205 tool provides clearance (.020) between board and terminal cross bar. P133B tool inserts terminal cross bar flush with board.

ALIGNMENT BLOCKS — Drilled 0.62 inch thick blocks have holes on 0.1 inch centers to keep 0.025 inch square terminal tails straight during installation. **MB45-20** is two inches wide by four and one half inches long; **MB44-65** is four and one half inches wide by six and one half inches long.

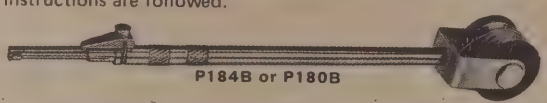
VECTOR WIRE WRAPPING TOOLS produce high quality wrapped connections which meet or exceed the requirements of MIL Spec 1130. Designed for laboratory and light production requirements, the tools are low priced but give excellent results. Vector's exclusive design on the P160-2A series eliminates the need for separate bits and shells for different wire sizes.


P160-2A MANUAL WRAPPING TOOL for 0.025 inch posts, number 26—30 gage wire.


P160-1A MANUAL UNWRAPPING TOOL for 0.025 inch square posts, number 26—30 gage wire.

P184B SERIES FOR 28 GAGE TEFZEL INSULATED WIRE

SLIT-N-WRAP™ WIRING TOOLS — Wire for 0.025" square posts. Revolutionary Slit-N-Wrap wiring is up to four times faster because wire-measuring, cutting and stripping are largely eliminated. The patented tool has a specially designed tip which slits the wire insulation just before it is wrapped on a post. Wire feeds from a spool on the tool making "daisy-chain" connections with single level wraps. Insulation is slit only during wrapping when instructions are followed.


P184B or P180B

P184B MANUAL SLIT-N-WRAP TOOL wraps heavy insulated (.005 inch thick) wire as tool is rotated by hand. Tool is shipped with two 50 foot spools of different colored Tefzel wire, instructions.

P160-4R3 driver unit for all Vector manual wire-wrapping tools. Portable field unit powered by self-contained rechargeable ni-cad batteries. High impact plastic housing, hand-fitting pistol grip design. Includes recharger.

P184-4T3B model is the same as P160-4R3 described above, but includes P184B tool installed, and accessories.

TEFZEL replacement wire for P184B tool. Available in 50 foot spools, two per package: red, W28-6B; green, W28-6A; white, W28-6E; yellow, W28-6F.

REPLACEMENT BIT for P184B series tools, or to convert P180 series tools to wrap Tefzel wire—P184-1B.

P180B SERIES TOOLS for 28 gage polyurethane nylon insulated wire — Smaller diameter polyurethane nylon insulated wire requires less room than other 28 gage insulated wire, resulting in more potential wraps per post and less crowded wire runs. If desired, polyurethane insulated wire may be soldered thru for making connections to round terminals, component leads, etc.

P180B MANUAL SLIT-N-WRAP TOOL wraps polyurethane nylon insulated wire as tool is rotated by hand. Tool is shipped with two 100 foot spools of different colored wire, instructions.

P160-4T2B DC model is same as P160-4R3 described above, but includes P180B tool installed and accessories.

P180-1B replacement bit for P180B series tools.

Polyurethane nylon coated replacement wire for P180 series tools. Available in 100 foot spools, three per package. Green; W28-2A; red, W28-2B; blue, W28-2D; clear, W28-2C.

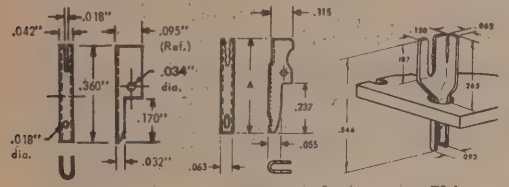
In the interest of improved design and performance, Vector reserves the right to make changes in its specifications without prior notice.

VECTOR ELECTRONIC COMPANY, INC., 12460 Gladstone Avenue, Sylmar CA 91342, phone (213) 365-9661, TWX (910) 496-1539

Vector SOLDERABLE & SOLDERLESS TERMINALS – PINS TOOLS FOR IDC CABLE

SOLDERABLE TERMINALS AND PINS

Suitable for PC board production, prototyping, experimenting.



Push-in terminals hold without staking, are inexpensive, faster to install, hold component leads until soldered. Popular hole sizes –0.042", 0.062", 0.093".

T42-1 MINIATURIZED COMPACT PUSH-IN – Fits 0.042" diameter holes such as in "P" pattern Micro-Vectorbord and can be mounted on 0.1 inch centers side-to-side. Tintillate plated. Ideal for IC work because leads can be laid in slots or pass through terminal vertically. By addition of soldered K32 "J" pin series terminal converts to wire wrappable type. Install with hand tool P149A.

T28 SERIES–Compact push-in fits 0.062" diameter holes in printed circuit boards and Vectorbord. Patterns B, F, G and H. Tintillate or silver plated, copper alloy material. Install with hand tool P91A.

T9.4 AND T9.6 SERIES – Push-in type fits 0.093 inch diameter holes in printed circuit boards or Vectorbord "A" and "AA" patterns. Serrated teeth (on all except T9.4A type) hold leads 0.032" to 0.040" in slots until soldered. Supplied with tintillate plating for easy soldering. T9.6 type has more "spring" action in slots and shank.

ORDERING INFORMATION

supplied in packages of 100 or 1000

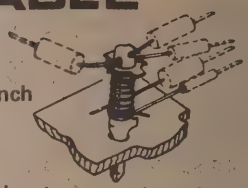
part no.	material	for hole diameter	overall length	ht. above board	lgth. below 1/16" bd.
T42-1	brite tin plated	0.042"	.360"	.190"	.107"

part no.	plating	tab end style	for hole diameter	overall length	ht. above board	lgth. below 1/16" bd.
T28	tin	hole	0.062"	.437"	.200"	.175"
T28S	silver	hole	0.062"	.437"	.200"	.175"
T28-1	tin	no hole	0.062"	.325"	.200"	.063"
T28S1	silver	no hole	0.062"	.325"	.200"	.063"

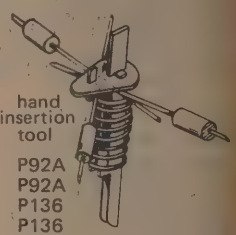
part no.	material	main slot style	for hole diameter	overall length	ht. above board	lgth. below 1/16" bd.
T9.4	copper alloy	serrated	0.093"	.562"	.203"	.296"
T9.4A		smooth	0.093"	.562"	.203"	.296"
T9.6		serrated	0.093"	.605"	.324"	.218"

P122B insertion tool installs both T9.4 and T9.6 types.

SPRING TERMINALS



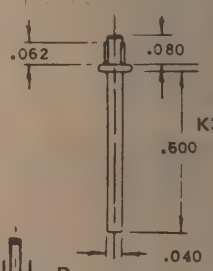
Patented springclip terminals push into 0.093 inch or 0.062 inch holes in Vectorbord® and hold without staking. Up to six leads may be connected without solder. Ideal for experimentation or "burn-in". Supplied in packages of 100 or 1000.

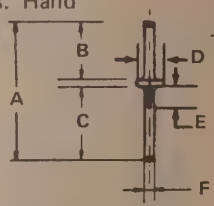


terminal no.	plating	fits hole	board thickness	hand insertion tool
T30-2	silver	.093	3/32	P92A
T30N2	nickel	.093	3/32	P92A
T32	silver	.093	3/32	P136
T32A	nickel	.093	3/32	P136
T32A1	nickel	.062	1/16	P136

INBORD PINS –

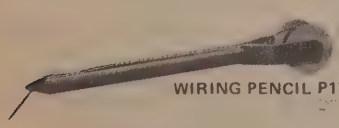
Phosphor bronze, tin or gold plated pins push into .042" or .025" diameter holes and hold without staking. Ideal for test points, compact wiring terminals. Supplied in packages of 50 or 1000. Order foam backup part number MP100-50 for installing terminals. Hand tool P133A will push in .040 dia. pins; P134A is for .025" diameter pins. Spring loaded and gang insertion tools available – write factory.





terminal/plating tin plated	nickel-gold	fits hole size	A	B	C	D	E	F
K24C*	K24A*	.042	.650	.255	.375	.085	.047	.040
K26C	K26A	.042	.375	.160	.195	.075	.080	.040
K27C	K27A	.025	.375	.160	.195	.050	.050	.024
K30C	K30A	.042	.550	.225	.305	.085	.060	.040
K31C	K31A	.042	.375	.160	.195	.075	.060	.040
K36C	K36A	.025	.705	.293	.400	.040	.050	.023
K38C	K38A	See illustration for dimensions.						

*Use in G-10 epoxy glass board only.



WIRING PENCIL P178-1

Pencil wiring tools & kit. Pencil wiring tool routes and guides spool fed 36 gage tinned, insulated wire around component or IC leads and terminals prior to soldering the joints with a 750°F (398°C) iron. Insulation "melts" when solder on iron is applied to joint. Fast and easy to use.

P178-1 wiring pencil is supplied with 400' spool 36 gage wire, complete instructions.

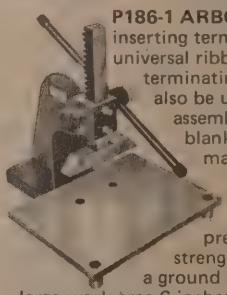
55X kit includes wiring pencil and wire plus 120' spool of bare tinned 30 gage wire, Vectorbord with tenth-inch spaced holes, wire spacers, 100 solder terminals and insertion tool, foam support block, chisel knife forming tool.

36 gage replacement wire is supplied in packages of two 400' spools: green, W36-4A; red, W36-4B; 32 gage wire in packages of two 200' spools: red, W32-4B.

P187 UNIVERSAL RIBBON CABLE IDC

(Insulation Displacement Connector terminating device)

This low-cost fixture terminates female IDC plugs made by Vector, Alpha, AMP, Ainsley, Berg, CW, JAE, 3M, SAE in seconds. (Excluding Alpha and CW strain relief cover type plugs); Berg "Female Quickie Connector" Type 65484 with strain relief requires P187-1 pressure bar which must be ordered separately. For best results, use in listed P186-1 press. Alternately, may be used with ordinary arbor press, vise, or "C" clamp.



P186-1 ARBOR PRESS for gang inserting terminals. Use with P187 universal ribbon cable plug terminating fixture. Can also be used generally for assembling, bending, blanking, forming, marking, piercing, punching, riveting and trimming. The press is die cast, high strength Zamak zinc with a ground steel mechanism. A large work area 6 inches by 8-3/8 inches (152.4 mm x 212.7 mm) and a 12 inch (304.8 mm) lever arm coupled with a 2.3 inch (58.4 mm) and 3.6 inch (91.4 mm) vertical capacity make this an ideal addition to any laboratory. Press includes removable pressure bar 4.4 inches by .75 inch (111.76 mm x 19.05 mm) installed on ram for use with terminal installation tools and ribbon cable terminating fixture.

In the interest of improved design and performance, Vector reserves the right to make changes in its specifications without prior notice.

VECTOR ELECTRONIC COMPANY, Inc., 12460 Gladstone Avenue, Sylmar, CA 91342; phone (213) 365-9661, twx (910) 496-1539

VECTOR DIP SOCKETS, SOCKET PINS & RECEPTACLES

SOCKETS FOR DUAL-IN-LINE DEVICES

DIP sockets available from Vector, accommodate most of the currently used DIP I.C. packages. Two key features are incorporated into these sockets:

- Tapered entry helps guide DIP leads into the socket receptacles.
- Gold inlay contact springs firmly hold the DIP leads and accommodate inconsistent DIP leads 0.010 inch (0.254 mm) x 0.020 inch (5.08 mm), and up to 0.024 inch (0.609 mm) diameter round pins.
- Individual contacts are accurately spaced 0.1 inch (2.54 mm) apart to ride for insertion into perforated circuit boards such as Vector "P" pattern.
- Polarizing notch or chamfer on body.

#157-1 DIP INSERTION TOOL

This is a "must" if one wishes to avoid lead loss in the insertion process, since it holds and aligns DIP leads for faster and more accurate assembly into sockets. #157-1 accommodates 14- and 16-pin DIPs.

P150 DIP EXTRACTION TOOL

Removal tool for DIPs assures easy removal of DIPs without damage. P150 extracts 8-, 14-, 16-, and 24-lead DIPs.

DUAL IN-LINE SOCKETS FOR ICS — ORDERING INFORMATION

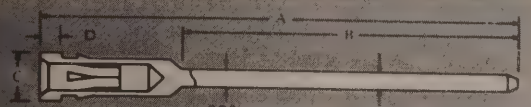
Catalog No.	CASTING DIMENSIONS Height	Length	Width	Spacing between rows	CONTACTS Max. term. length below casting	Type*
R708-2	0.150 (3.81)	0.400 (10.16)	0.400 (10.16)	0.300 (7.62)	0.150 (3.81)	ST
R714	0.280 (7.11)	0.765 (19.43)	0.400 (10.16)	0.300 (7.62)	0.690 (17.52)	WP
R714-1	0.280 (7.11)	0.765 (19.43)	0.400 (10.16)	0.300 (7.62)	0.144 (3.65)	ST
R714-2	0.150 (3.81)	0.700 (17.78)	0.400 (10.16)	0.300 (7.62)	0.150 (3.81)	ST
R716	0.280 (7.11)	0.865 (21.97)	0.400 (10.16)	0.300 (7.62)	0.690 (17.52)	WP
R716-1	0.280 (7.11)	0.865 (21.97)	0.400 (10.16)	0.300 (7.62)	0.144 (3.65)	ST
R716-2	0.150 (3.81)	0.800 (20.32)	0.400 (10.16)	0.300 (7.62)	0.150 (3.81)	ST
R724	0.280 (7.11)	1.280 (32.51)	0.700 (17.78)	0.600 (15.24)	0.690 (17.52)	WP
R724-2	0.150 (3.81)	1.200 (30.48)	0.700 (17.78)	0.600 (15.24)	0.150 (3.81)	ST
R740	0.280 (7.11)	2.080 (52.83)	0.700 (17.78)	0.600 (15.24)	0.690 (17.52)	WP
R740-2	0.280 (7.11)	2.080 (52.83)	0.700 (17.78)	0.600 (15.24)	0.144 (3.65)	ST

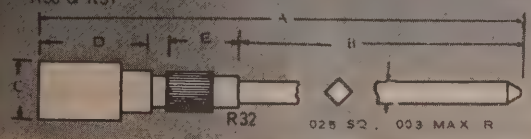
*ST = Solder Tail; WP = Wrap Post .025 inch (.64 mm sq.)

P150 is DIP Hand Extraction Tool; P157-1 is DIP Hand Insertion Tool—installs all 14- & 16-pin DIPs

R724

R716-1





SOCKET PINS

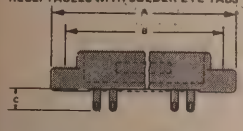
High quality copper alloy gold plated four-fingered contacts are housed inside gold plated brass screw machine terminals with solderable or 0.025" sq. wire wrappable tails for installing wherever required in 1/16" thick circuit boards. Models R30 and R31 have lower profile than low-profile DIP sockets, and press fit into 0.055" dia. holes. Model R32 fits 0.042" dia. holes in "P" Pattern Micro-Vectorbord® or DIP Plugbords.

Part No.	Tail Type	Dimensions A	B	C	D	E	Supplied in Pkg.:
R30	Solder	.29	.11	.072	.030	---	25, 100, or 1000
R31	WW	.703	.500	.072	.030	---	25, 100, or 1000
R32	WW	.745	.500	.072	.155	.075	25, 100, or 1000

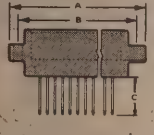
P158 Impact Insert. Tool w/D10 Die Point inserts R30, R31; w/D9 Die Point inserts R32. P158-1 Holder adapts Tool to drill or arbor press.

VECTOR RECEPTACLES FOR 0.062 THICK CIRCUIT CARDS

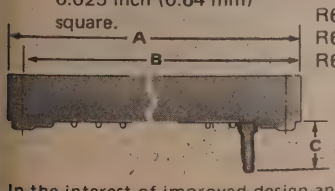
RECEPTACLES WITH SOLDER EYE TABS



RECEPTACLES WITH 0.025 SQ. WRAP POST TAILS



Vector receptacles are designed to accept printed circuit cards made by Vector or other manufacturers. Quality material and construction are used throughout to insure reliable performance. All wire wrappable contact tails (wrap post type) are 0.025 inch (0.64 mm) square.



Model No.	No. of Contacts	Spacing	Contact Tail Style	A	B	C	Accepts Vector Plugbord
R630	15/30	0.156	Solder Eyelet	3.27	2.94	.28	3796, 3797
R630-1	15/30	0.156	Wrap Post	3.27	2.94	.62	3796, 3797
R636-1	36/72	0.100	Wrap Post	4.44	4.175	.60	All 3719 Models All 4066 Series
R636-2	36/72	0.100	Solder Eyelet	4.48	4.175	.25	All 3719 Models All 4066 Series
R644	22/44	0.156	Solder Eyelet	4.36	4.03	.28	All 3677, 3682 All 4112, All 838 Models 3662, 3474, 4050-1
R644-1	22/44	0.156	Wrap Post	4.36	4.03	.60	All 3677, 3682 All 4112, All 838 Models 3662, 3474, 4050-1
R612-1*	12	0.2	Solder	3.15	2.88	.27	837 Series
R616-1*	16	0.2	Solder	3.95	3.68	.27	812 Series
R635*	35	0.1x0.2	Solder	4.21	3.93	.27	848 Series
R680	40/80	0.125	Wrap Post	5.81	5.545	.62	4350
R680-1	40/80	0.125	Wrap Post	5.81	5.545	.62	4350
R680-2	40/80	0.125	Solder Eyelet	5.81	5.545	.25	4350
R681***	50/100	0.125	Dip Solder	7.06	6.795	.25	8800 Series
R681-1	50/100	0.125	Wrap Post	7.06	6.795	.62	8801 Series
R681-2**	50/100	0.125	Wrap Post	7.06	6.795	.22	8804 Series

*Elco Varicon contacts

**Single level wrap tail with 0.250 spaced rows for wrapping, soldering, or IMSAI mother boards

***Dip solder tails with 0.140 (3.56 mm) spaced rows for Altair mother boards. Fits 0.042 inch diameter (1.07 mm) holes.

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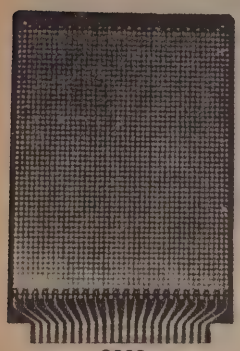
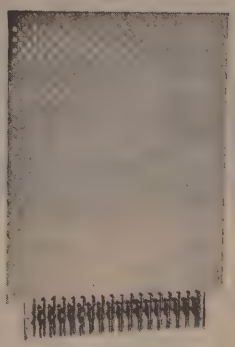
VECTOR ELECTRONIC COMPANY, INC. 12460 Gladstone Avenue, Sylmar CA 91342 Phone (213) 365-9661 TWX 910-496-1539

Vector PLUGBORDS SAVE TIME — MONEY

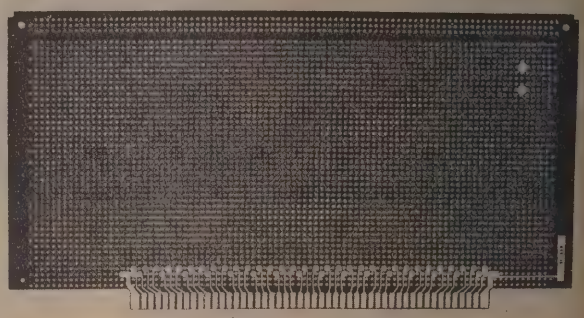
BARE BOARDS WITH ETCHED PLATED CONTACTS



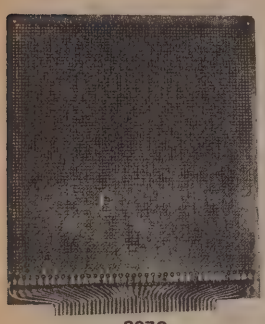
3662



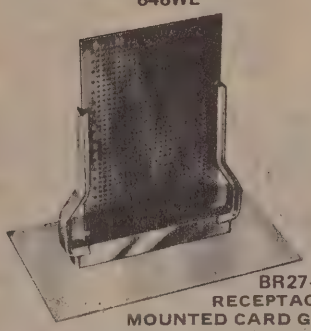
848WE



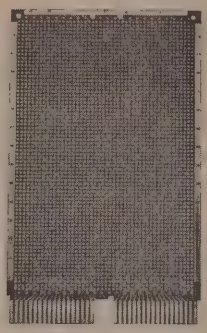
8801-1 (S-100 compatible)



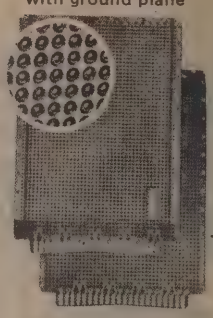
3673



BR27-3
RECEPTACLE
MOUNTED CARD GUIDE
(on R630 receptacle with 2.73" wide Plugbord)



4607 (DEC LSI-11 compatible)



3662A-6

PLUGBORDS FOR GENERAL USE WITH CONTACTS — But Without Matrix or Circuit Patterns

Use for building prototype, test and short run plug-in circuits because almost any component from DIPs to large resistors can be mounted anywhere on the boards. Boards have an overall grid of prepunched holes: 0.042 inch diameter on 0.1 inch centers (pattern "P"); 0.062 inch diameter on alternate 0.1 inch centers (pattern "G"). Boards are available with varied connector arrangements and mating connectors are listed. Back-to-back contacts on each etched side terminate in independent hole pads. Most boards have holes for attaching card ejectors.

ETCHED CONTACT SPECIFICATIONS — Epoxy glass Plugbords — 2 ounce copper .00005" nickel plate, gold flash. Quality flame-retardant 1/16" thick board materials are the same as those used for Vectorbord® and Micro-Vectorbord,® see preceding page. Terminals to fit.

RECOMMENDED CARD CAGES — For above Plugbords: 4.5" x 6.5" CCK-13 or CCK-13P; 4.5" x 4.5" CCK13A or CCK13AP: 7.98" x 9.6" CCK17 or CCK17P; 4.5" x 9.6" CCK4, CCK14 or CCK14P.

PATTERN	BOARD SIZE	EPOXY PAPER	EPOXY GLASS	ETCHED CONTACTS NO.	STYLE	SPACING	PLATING	MATING CONNECTORS SOLDER TAIL	WRAPPED TAIL
G	4.5" x 6.5"	812	812WE	16	ElcoVar	.2	gold	R616-1	—
G	3" x 4.5"	837	837WE	12	ElcoVar	.2	gold	R612-1	—
G	4.5" x 6.5"	838†	838WE†	44	etched	.156	tinned	R644	R644-3
G	4.5" x 6.5"	838-1	—	44	etched	.156	tinned	R644	R644-3
G	4.5" x 6.5"	838A†	838AWE†	22	etched	.156	tinned	R644	R644-3
G	4.5" x 6.5"	—	838WE1GN	44	etched	.156	NPGF	R644	R644-3
G	4.5" x 6.5"	—	848WE	35	ElcoVar	.10	gold	R635	—
P	3" x 4.5"	—	837PWE	12	ElcoVar	.2	gold	R612-1	—
P	2.73" x 4.5"	—	3795	44	etched	.1	NPGF	—	R644-2
P	2.73" x 4.5"	—	3797	30	etched	.156	NPGF	R630	—
P	4.5" x 6.5"	—	3719-1	72	etched	.1	NPGF	R636-2	R636-1
P	4.5" x 9.6"	—	3719-4	72	etched	.1	NPGF	R636-2	R636-1
P	4.5" x 6.5"	—	3662	44	etched	.156	NPGF	R644	R644-3
P	4.5" x 9.6"	—	3662-2	44	etched	.156	NPGF	R644	R644-3
P	4.5" x 4.5"	—	3662-4*	44	etched	.156	NPGF	R644	R644-3
P	4.5" x 4.5"	—	3662-5	44	etched	.156	NPGF	R644	R644-3
P	4.5" x 6.5"	—	3662A6*	44	etched	.156	NPGF	R644	R644-3
P	7.98" x 9.6"	—	3673	80	etched	.125	NPGF	—	R680
P	5.3" x 10.0"	—	8801-1	100	etched	.125	NPGF	R681-3	R681-1
P	5.2" x 8.43	—	4607	72	etched	.125	NPGF	—	—

*Has 2 ounce tinned copper ground plane on back side with etched clearance holes. ElcoVar = Elco Varicon NPGF=nickel plated gold flashed
†Boards keyed with .1 offset on plug-in portion.

RECEPTACLE MOUNTED CARD GUIDES — The BR27 series card guides provide rugged support for 1/16 inch freestanding circuit boards and sure guidance while engaging board and receptacle. This arrangement is commonly found on motherboards and in units where space is at a premium. Package quantity all catalog numbers: 2 guides; 2 screws — 4/40 pan head, ¾ inch long; 2 flat washers; 2 lock washers; 2 hex nuts, 4/40. In bulk quantities (more than 50 prs.) fasteners packaged separately from guides. Material is aluminum alloy, clear anodized except BR27D is die cast zinc.

ORDERING INFORMATION

guide no.	connector	for Plugbord types:
BR27D	R644, R644-3 (0.156")	4.5" wide Plugbords with centered contacts such as Vector 838-1, 3474, 3677, 3682 and 3662 series.
BR27-1	R636-1 (0.1")	4.5" wide Plugbords with centered contacts such as Vector 3719 series.
BR27-3	R630 (0.156")	2.73" wide Plugbords with centered contacts, such as Vector 3796 and 3797 series.
BR27-4	R644-2 (0.1")	2.73" wide Plugbords with centered contacts, such as Vector 3795.

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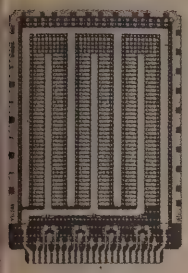
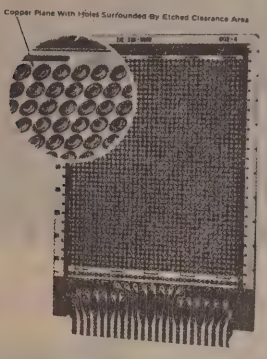
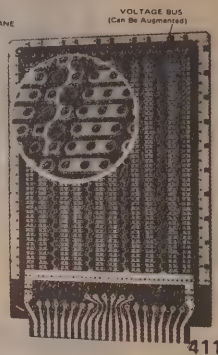
Vector PLUGBORDS FOR FLEXIBILITY



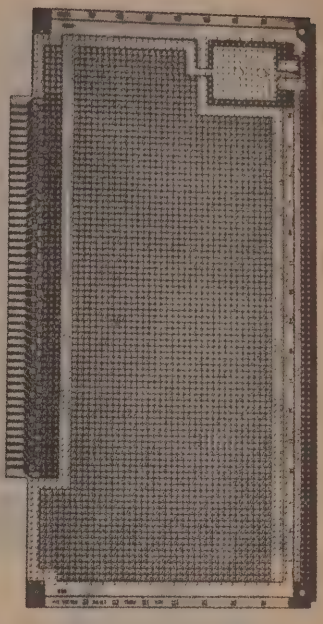
3677-2



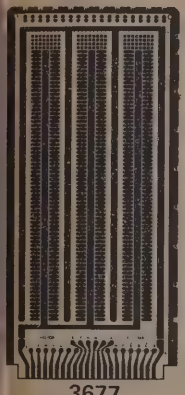
4112-4
(Component Side)



4112-4
(Wiring Side)



8801 (S-100 compatible)



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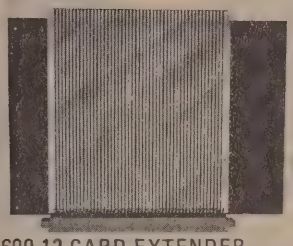
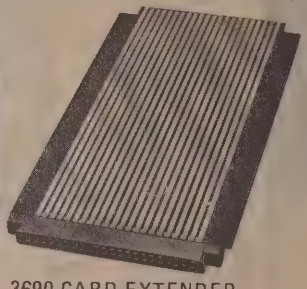


3690-12 CARD EXTENDER



3690 CARD EXTENDER

PLUGBORDS WITH ETCHED TINNED PADS AND BUSES

Use for prototype, test, and short run plug-in circuits. All boards ve an overall hole grid of 0.042 inch holes on 0.1 inch centers attern "P"). All etched circuitry above contact area is tinned for sy soldering. Boards are available with varied contact arrangements d mating connectors are listed. Back-to-back contacts on etched le terminate in independent hole pads. Terminals to fit.

3677 SERIES — These Plugbords have etched tinned buses, terleaved between pad areas. All models have tinned 3-hole pad oups for easy component mounting and interconnection. DIPs or mponents may be soldered directly to pads, or terminals installed pads. Socket tabs may also be attached to the pads to facilitate aking component changes. The heavy etched and tinned interleaved ound and voltage buses make complicated circuit construction lite easy, while providing great flexibility. The 3677 series has 96 dividual pads for mounting TO-5 and TO-18 transistors or round se integrated circuits.

4112 SERIES — These Plugbords have groups of 3-hole pads, terleaved "zig-zag" voltage bus, plus an overall etched ground ane on opposite side. The "zig-zag" design permits installed ns to connect or bypass the bus as desired. Reduced impedance d noise can be achieved with addition of Vector's double overhead trolley bus. DIPs or components may be soldered directly to pads, or terminals installed in pads. Socket tabs may also be attached to the pads.

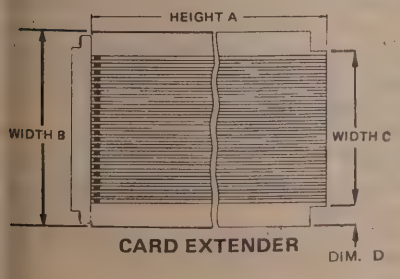
8801 — Overall grid of 0.042 inch holes on 0.1 inch grid with single tinned pads on most holes, except top rows.

RECOMMENDED CARD CAGES for above Plugbords: 4.5" x 6.5" CCK-13 or CCK-13P 4.5" x 4.5" — CCK13A or CCK13AP 7.98" x 9.6" — CCK17 or CCK17P 4.5" x 9.6" — CCK4, CCK14 or CCK14P

board size	part no.	no. DIPs accom. 14 pin	16 pin	no.	etched contacts spacing	plating	mating solder tail	connectors wrapped tail
2.73 x 4.5	3795-1	6	4	44	.1	NPGF	—	R644-2
2.73 x 4.5	3797-2	6	4	30	.156	NPGF	R630	R630-1
4.5 x 9.6	3677	24	21	44	.156	NPGF	R644	R644-3
4.5 x 6.5	3677-2	15	12	44	.156	NPGF	R644	R644-3
4.5 x 6.5	4112-4	25	25	44	.156	NPGF	R644	R644-3
4.5 x 4.5	4112-5	15	10	44	.156	NPGF	R644	R644-3
10.0 x 5.3	8801	94	94	100	.125	NPGF	R681	R681-2

NPGF = nickel plated gold flashed — Dimensions in inches.

ETCHED CONTACT SPECIFICATIONS — Epoxy glass Plugbords: two ounce copper .00005 inch nickel plate, gold flash. Quality flame-retardant 1/16 inch thick board materials are the same as those used for Vectorbord,® and Micro-Vectorbord,® see preceding page.



CARD EXTENDER

3690 SERIES CARD EXTENDERS — Card extenders allow extension of operating cards beyond cages for tests. Quality epoxy glass with nickel plated gold flashed plug tips and high quality top connector where indicated.

Extender catalog no.	A	B	C	D	Contact strip	Receptacle supplied	Plugbord series used with
3690	6.5	4.5	3.6	.46	22 each side, .156 ctrs.	R644	838,3474,3662
3690-1	6.5	4.5	3.6	.46	22 each side, .156 ctrs.	none	3677,3682,4050
3690-6	11.0	4.5	3.6	.46	22 each side, .156 ctrs.	R644	4112,4494
3690-2	11.0	4.5	3.7	.40	36 each side, .10 ctrs.	R636	4493, 3719
3690-3	11.0	4.5	3.7	.40	36 each side, .10 ctrs.	none	4066, 4312
3690-4	7.5	4.5	3.7	.40	36 each side, .10 ctrs.	R636	
3690-8	5.5	2.73	2.3	.22	22 each side, .156 ctrs.	R644-2	3795
3690-10	5.5	2.73	2.5	.12	15 each side, .156 ctrs.	R630	3797
3690-12	7.5	9.99	6.37	1.49	50 each side, .125 ctrs.	R681	8800
3690-13	7.5	9.99	6.37	1.49	50 each side, .125 ctrs.	none	
3690-14	11.0	6.99	5.11	.94	40 each side, .125 ctrs.	R680	3673, 4350
3690-15	11.0	6.99	5.11	.94	40 each side, .125 ctrs.	none	

Dimensions in inches.

In the interest of improved design and performance, Vector reserves the right to make changes in its specifications without prior notice.

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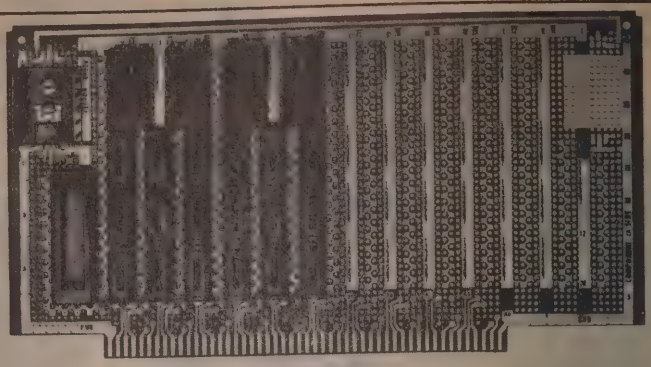
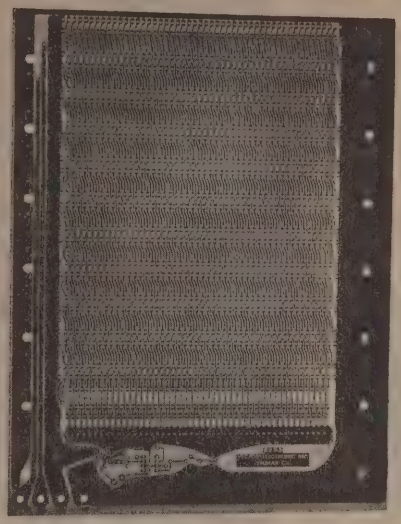
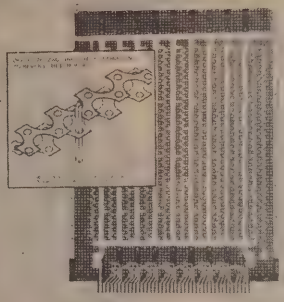
VECTOR MICROPROCESSOR PLUGBORDS



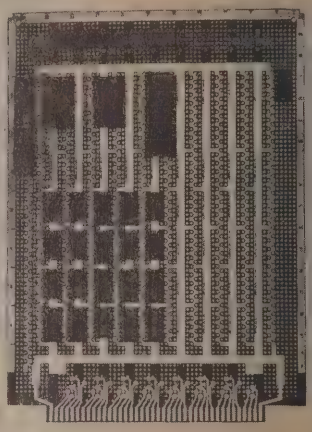
8800V
(Component side with added sockets. Available to order with sockets & terminals installed)



MODEL 8803
Motherboard for S-100 Bus Microcomputers



4350
(Wiring Side w/ Insert Showing Zig-Zag Bus)



4350
(Component Side w/ Added Sockets)

MICROPROCESSOR PLUGBORDS

With Vector Universal Microprocessor Plugbords, users can readily install any DIP device and quickly make the necessary interconnections to build peripheral interface equipment, expand memory capacity, or I.O. circuitry. Above FR-4 epoxy glass composite boards are furnished with an overall grid of 0.042 in. dia. holes on 0.1 in. grid, heavy tinned buses, plus nickel plated gold flashed contacts. Low in cost, the boards are planned for user installation and interconnection of wrap-post sockets wherever required. Copper-free areas are provided for installation of flat cable I.O. connectors or large bodied discrete devices.

8803 MOTHERBOARD FOR 8800V, 8801-1, 8804 AND OTHER S-100 BUS MICROCOMPUTER PLUGBORDS

This board has 11 connector mounting positions and etched tinned bus lines, solder mask, and etched circuitry for active or passive termination. Board measures 8½ in. x 11 in. and is FR-4 grade G-10 glass epoxy material. Twelve decoupling capacitors are furnished and user must supply own termination components and receptacles with tails spaced 0.125 in. by 0.250 in. such as Vector R681-2.

8800V - 10 in. wide by 5.313 in. high, has 100 (50 each side) contacts on 0.125 in. centers. Compatible with Altair 8800 and the IMSAI equivalent, the board can hold two 40-pin DIPs, eight 24-pin DIPs, and thirty-six 14- or 16-pin DIPs. Alternatively, it can hold fifty-two 14- or 16-pin DIPs, or ten 40-pin DIPs and eight 24-pin DIPs, or any combination in-between. Power is distributed to each DIP location by heavy copper tinned power and ground planes on opposite board sides for low impedance. Has two heat sink provisions, and one heat sink supplied with each board. For wiring ease, boards are identified by DIP zones as well as column and row hole designations.

Mating Connectors For 8800V

R681 — 50/100 contacts on 0.125 in. centers w/soldertails
R681-1 — Same as R681 except w/0.025 in. sq. wrap-post tails
R681-2 — 50/100 contacts on 0.125 in. centers w/0.25 in. long tails in two 0.250" spaced rows for mounting on Vector motherboard 8803

8800VA - 8800V with 98 wrap posts, T46-4-9, installed in contact pads, 3 in regulator pads, and 28 in power and ground planes for DIP wiring.

8800VB - Socketed model of 8800VA has the following complement of 3-level w.w. sockets installed and ready to wire: two 40-pin, eight 24-pin, thirty-six 16-pin.

4350 - 7 in. wide by 9.6 in. long, has 80 (40 each side) contacts on 0.125 in. centers. Compatible with TI 980 series computer, the board will hold sixty-three 14- or 16-pin DIPs over the power and ground buses, or six 24-pin DIPs plus forty-five 14- or 16-pin DIPs, or 40-pin microprocessor DIPs anywhere by cutting one etched jumper lead per location. Heavy, back-to-back tinned copper buses provide distributed decoupling capacitance. For user convenience, an extra plus or minus voltage zig-zag power bus is supplied on each side of the board.

Mating Connectors for 4350

R680-1 — 40/80 contacts on 0.125 in. centers; 0.025 in. sq. wrap post tails
R680 — Lower priced version of R680-1; numbering does not match 4350

Quality flame-retardant 1/16" thick board materials are the same as those used for Vectorbord® and Micro-Vectorbord.®

In the interest of improved design and performance, Vector reserves the right to make changes in its specifications without prior notice.

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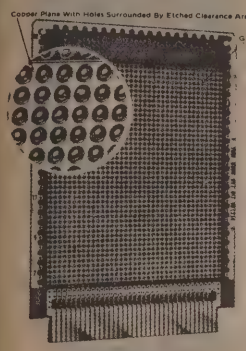
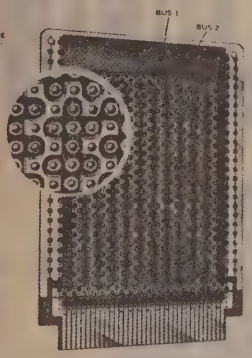
Vector

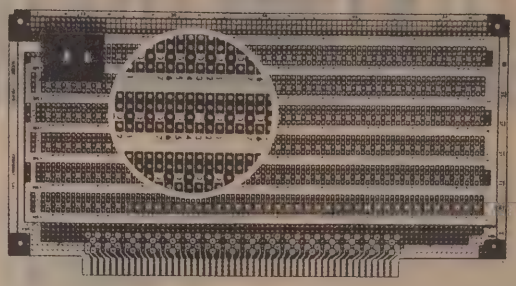
WIRE WRAPPABLE PLUGBORDS



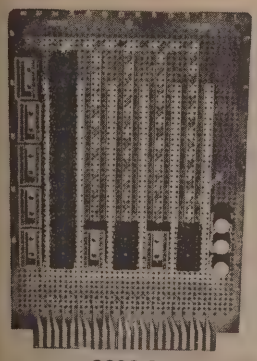
4066-4
(Component Side)



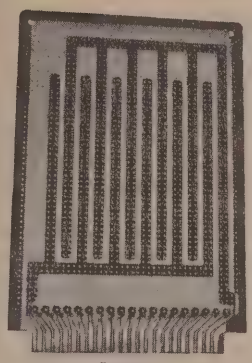
4066-4
(Wiring Side)



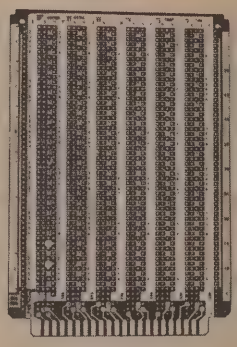
8804
(Component Side)



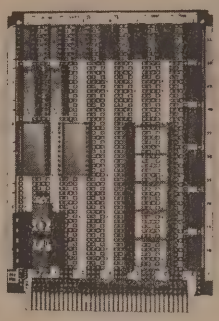
3682-2
(Component Side)



3682-2
(Wiring Side)



4494
(Component Side)



4493
(Component Side)

WIRE WRAPPABLE PLUGBORDS

Vector wire wrappable Plugbords are furnished with an overall grid of 0.042 in. holes on 0.1 in. centers, tinned interleaved buses, and ground planes on one side of some models. DIP sockets and wire wrappable terminals or socket pins may be installed wherever required and connected however required. "Free" board areas without buses are provided on all models for mounting discretes or other large components. All boards are flame-retardant epoxy glass and furnished with the most popular edge connectors, nickel plated and gold flashed. Ejector holes are provided on all models, and a full line of supporting compatible card and module cages is available from Vector. "Special" features on the 4066 series are:

GROUND PLANES -- A heavy overall 2 oz. tinned copper area on one board side can be used to reduce noise and transients, and to provide low impedance when used with buses on opposite side. A copper-free area surrounds each hole in the ground plane so installed terminals may be connected as required to one, or both, board side(s) as required.

ZIG-ZAG BUSES (on 4066 Series) -- Two uniquely configured independent bus paths accommodate terminal tails for connections as required. Use of high capacitance Vector double overhead trolley bus series with zig-zag bus lowers impedance for high frequency circuits, such as encountered in ECL 10,000 series logic.

CONTACT SPECIFICATIONS. Etched contacts:
-2 oz. copper .00005" nickel plate, gold flash.

Board Size	Part No.	No Cont.	Spacing	No. 14-pin DIPs Accom.	No. Independ. Buses		Mating Connectors	
					Wiring Side	Component Side	Solder Tail	Wrapped Tail
4.5"x9.6"	3682	44	.156	54	2	---	R644	R644-3
4.5"x6.5"	3682-2	44	.156	30	2	---	R644	R644-3
4.5"x6.5"	3682-4	44	.156	30	2	1	R644	R644-3
4.5"x6.5"	4066-4	72	.100	34	2	1	---	R636-1
4.5"x4.5"	4066-5	72	.100	18	2	1	----	R636-1

ANY-DIP T.M. PLUGBORDS

These plugbords have an overall pattern of .042 holes and accept all DIP sockets with lead spacings of 0.1 inch by 0.3, 0.4, 0.6 and 0.9, and with up to 64 pins. W.W. sockets and Vector's Slit-N-Wrap tool are ideal for fast hookup. A corner of the DIP area can be used for mounting a low profile heat sink (one heat sink and mounting hardware furnished), or two regulators in TO-220 packages. Leads on one regulator position are prewired to raw power input, ground input and plane, and regulated power plane. The other regulator position is uncommitted. Boards have a full ground plane network on the component side, and a similar but interdigitated power plane network is provided on the other side (for either raw or regulated power). These planes provide low impedance and high distributed capacity for power buses, versatility in DIP positioning, and place power supply sources less than one quarter inch away from any DIP lead. Board material is epoxy glass with 2 oz. tinned copper circuit patterns, and nickel plated gold flashed contacts.

DIP Mounting Capacity:
4½"x6½" models: forty-two 14- or 16-pin, or sixteen 22- or 24-pin, or eight 40-pin, or five 64-pin.
4½"x9.6" models: sixty-three 14- or 16-pin, twenty-four 22- or 24-pin, twelve 40-pin, six 64-pin.
10.0"x5.3" models: seventy 14- or 16-pin, or forty-nine 22-pin, or twenty-four 24-pin, or sixteen or twenty 40-pin, or six 64-pin.

Model No.	Size	No. Contacts	Spacing	Mating Connector Solder Tail	W.W. Tail-.025 sq.
4493	4½x6½	72	0.1	R636-2	R636-1
4493-1	4½x9.6	72	0.1	R636-2	R636-1
4494	4½x6½	44	0.1	R644	R644-3
4494-1	4½x9.6	44	0.1	R644	R644-3
8804	10.0x5.3	100	0.125	R681-3†	R681-1

†Solder Eyelet Tail

Quality flame-retardant 1/16" thick board materials are the same as those used for Vectorbord® and Micro-Vectorbord®, see preceding page.

RECOMMENDED CARD CAGES

For Plugbords: 4.5"x6.5", CCK3, CCK13 or CCK13P; 4.5"x4.5" - CCK13A or CCK13AP; 7.98"x9.6" - CCK17 or CCK17P; 4.5"x9.6" - CCK4, CCK14 or CCK14P.

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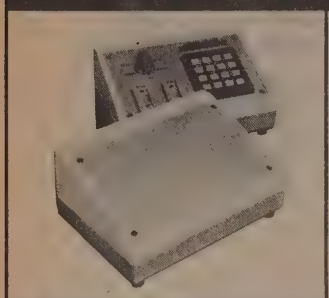
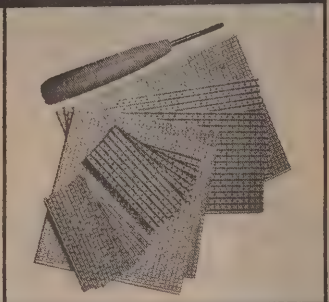
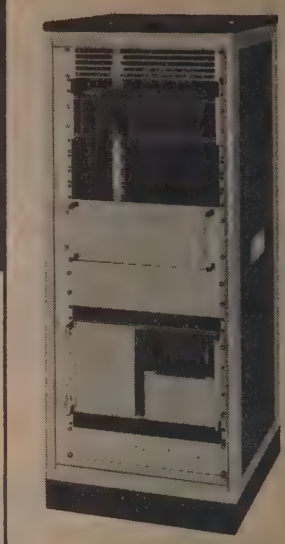
vero vero vero







Verobox®

High quality injection molded and vacuum formed plastic enclosures in a wide variety of sizes and styles. Over 40 variations are available to suit almost any packaging need. Features available on some styles include: integral hinged lids, externally accessible battery compartments, and aluminum panels. A wide variety of colors are available in production quantities.

Vero Card Racks

Five separate 19" racking systems result in over 2500 off-the-shelf combinations. All systems feature adjustable connector mounting and variable card spacing.

System 3A – An adjustable, economical kit for PCB's only. Card heights from 1" to 8" and of any depth up to 8" can be accepted in four standard E.I.A. heights up to 8.75". Optional accessories include hinged front panels.

System 3C – Designed to accept boards that are .75" less than frame height, this system is available in two depths (10" and 13"), and four E.I.A. heights up to 8.75". Optional accessories inlcude drop-in or hinged front panel.

System 3E – A rack system based on .5" spacing for PC boards and/or module units, all secured by a single action push-pull Verolock®. Modules are available in depths of 7.6" and 10.9", and widths of 1" to 8". 3E frames and modules are available in standard E.I.A. heights of 5.25", 7.0", and 8.75".

System KM4 – Designed as a EUROCARD housing to DIN41494, this system accepts both PC boards and modules. Among the board sizes this system will accept are 100 x 160 mm, 223.4 x 160 mm, and 4.5" x 6.5". Board spacing is variable from .4" minimum in increments of .2". Module widths of .6" to 16.8" are available in two depths. Rack heights of 5.25" and 10.5" are available.

System 1A – A heavy duty frame system for mounting a wide variety of modules in widths from 1" to 16". This versatile system offers over 200 off-the-shelf combinations plus thousands of non-standard combinations capable of satisfying most applications. Each module is retained by means of quick release quarter-turn fasteners. Frame heights up to 8.75" are available.

Send for Catalog showing the Complete Vero Line.

P.C. Boards

Several types of boards to suit most applications are available from stock including:

Veroboard® – Prototype PCB's incorporating a series of parallel copper tracks and pre-punched with a matrix of holes of various patterns (including 0.1" x 0.1" for IC's). Circuit assembly is accomplished by soldering components to boards and breaking copper tracks to shunt current as required.

D.I.P. Boards – Primarily designed to mount IC packages, the etched pattern on these boards provides convenient power and ground rails near all components. The universal pattern allows virtually any combination of IC packages to be mounted.

V.I.P.S. Boards – A variety of boards mounted with IC socket pins or IC sockets offering the user extremely high packaging densities.

Connectors

VERO offers a full line of edge connectors plus a wide range of high density, two piece PC board connectors. Contact spacings available include 0.1", 0.125", 0.156", and 0.200". DIP solder, solder eyelet, and solderless wrap terminations are also available. Send for our Connector Catalog.

Enclosures

A wide variety of metal enclosures are available including the following series':

Series 'D' Cases – Slim and attractively styled steel enclosures for mounting 19" equipment. Depths to 10.5".

Series 'A' Cases – Portable enclosures used to house 1A Series module units.

Verorack – Large enclosures for 19" equipment. Available in 47" and 68" heights initially. Features include lift-out side panels, left or right hinging doors, and lightweight aluminum extrusion construction.

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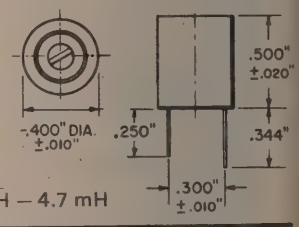
KEY FOR SAMPLER PAGE

\# : Form with core only is available for this series
items : Number of different coils in the series
Range : Minumum inductance of the lowest value coil thru maximum inductance of the highest value coil
A : Diameter of form
B : Height above chassis when mounted
C : Diameter or spacing at mount

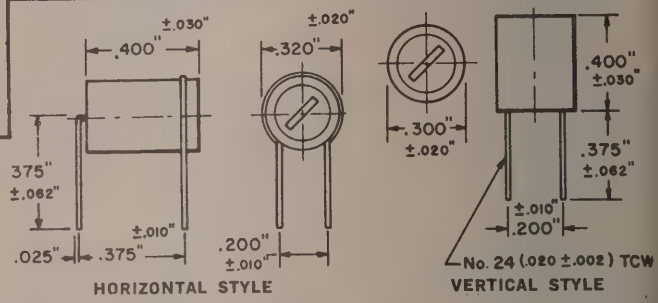
VL SERIES 29 items

Vertical Mount: Printed Circuit — Mil-C-15305
Tunable Range: .10 uH ±10%, .15-.22 uH ±15%, .33-4700 uH ±20%
Operating Temperature: −55°C to +125°C
Leads: No. 22 TCW
Nominal values: .10 uH — 4.7 mH



VLS SERIES (SHIELDED) 73 items

May be mounted either Vertically or Horizontally
Printed Circuit: Mil-C-15305
Tunable Range: .10 uH .12 uH ±5% — All others ±10%
Operating Temperature: −55°C to +125°C
Leads: No. 24 TCW
Nominal values: .10 uH — 100 mH

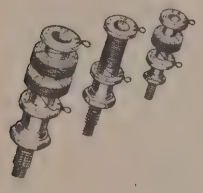


Nylon
4200 Series * 11 items
Range: .300 uH — 860 uH
A .285 B 1.175 C .312

Metal and Magnetic Shielding
9100 Series 17 items
Range: .099 uH — 11.12 mH
Size: .440" sq. X .550" high

Metal and Magnetic Shielding
9050 Series 15 items
Range: 1.5 uH — 60 mH
Size: .550 sq. X .685 high

Ceramic



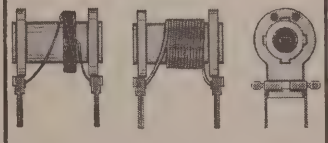
40A Series * 23 items
Range: .091 uH — 125 uH
A .205 B .685 C .166

41A Series * 23 items
Range: .690 uH — 1.25 mH
A .260 B .875 C .192

42A Series * 30 items
Range: .680 uH — 12.5 mH
A .375 B 1.060 C .252

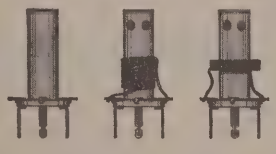
43A Series * 30 items
Range: 5.70 uH — 125 mH
A .500 B 1.500 C .252

Ceramic



47A Series * 50 items
Range: .095 uH — 1.10 mH
A .260 B .625 C .3 X .5

Ceramic

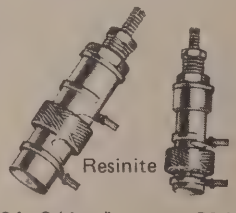


46A Series * 50 items
Range: .095 uH — 1.10 mH
A .260 B .625 C .386

Alpha—Cellulose

23A Series * 44 items
Range: .095 uH — 125 mH
A .281 B .750 C .343

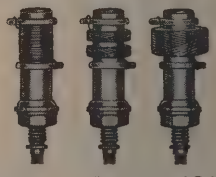
Resinite



20A Series * 30 items
Range: .088 uH — 1.20 uH
A .250 B .860 C .192

21A Series * 30 items
Range: .885 uH — 12 mH
A .375 B 1.125 C .252

Ceramic

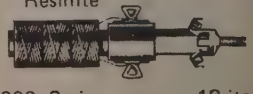


4300 Series * 16 items
Range: .190 uH — 285 uH
A .205 B .593 C .166

4500 Series * 15 items
Range: .440 uH — 760 uH
A .260 B .858 C .192

4400 Series * 13 items
Range: .990 uH — 2.00 mH
A .375 B 1.060 C .252

Resinite



9000 Series 18 items
With or Without Taps
Range: 40 uH — 750 mH
A .285 B 2.050 C .312

48A Series 9 items Range: .046 uH — .351 uH

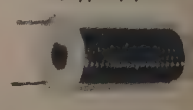
The 48A Series of coils may easily be tapped at ⅛, ¼, ⅜, ⅝, ¾, ⅞ turn if desired.
Frequency Range: 30 MHz to 250 MHz
Wire Size: 20 AWG tinned copper
Form Length: .73 inches
Coil OD: .310 inches
Lead Spacing: .408 inches
Core: 10-32 x ⅜" Carbonyl J

Polypropylene

49A Series 10 items Range: .060 uH — 1.530 uH

Frequency Range: 10 MHz to 250 MHz
Wire Size: 22 AWG single polyurethane coated with tinned leads
Form Length: .87 inches except 49A146MPC
Coil OD: .285 inches
Lead Spacing: .324 inches
Core: 10-32 x ⅜" Carbonyl J

Polypropylene



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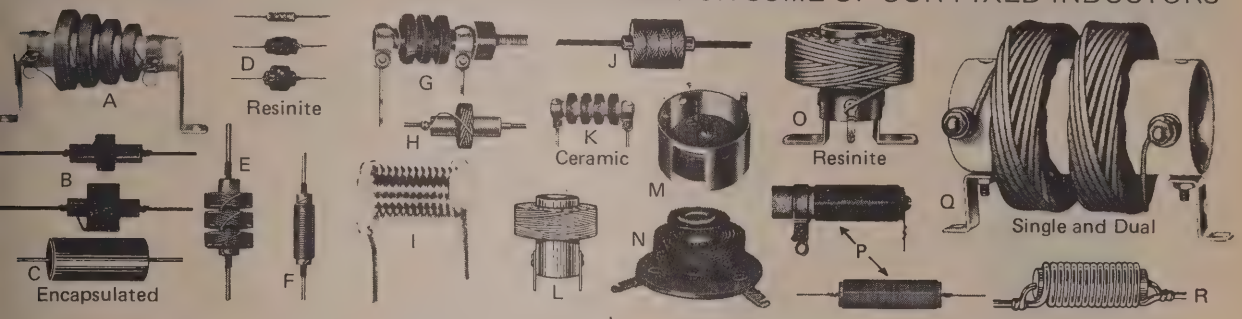
SAMPLER BELOW IS VERY ABBREVIATED SPECS ON SOME OF OUR FIXED INDUCTORS



A) Ceramic form .5x3.5 L= 1, 1.5, 2.5, 4 and 7 mH
A) Ceramic form .5x2.5 2 mH and 4 mH
B) Ferrite core .187x.625 25 items 100 uH — 10 mH
C) Resinite .312x1.000 16 items .10 uH — 10 uH
C) Iron .375x1.125 L= 10, 15, 24, 39, 55, 62, 82 & 100 uH
C) Resinite .500x1.000 L= .10, .15, .24 and .39 mH
C) Resinite .625x1.000 L= .55, .62, .75, and 1.0 mH
C) Iron .625x1.125 L= 1, 1.5, 2.4, 3.9, 5.5, 6.2, 8.2 & 10 mH
C) Ferrite .625x1.125 L= 2.5, 5, 10, and 50 mH
D) Core diameters .219 to .422 25 items 10 uH — 1,000 uH
E) Resi. core .187x.75 L=.10, .15, .24, .39, .55, .62, .75, 1 mH
E) Iron core .219x.875 L=1, 1.5, 2.4, 3.9, 5.5, 6.2, 8.2 & 10 mH
E) Ferrite core .250x.875 L= 2.5, 5, 10, 25 and 50 mH
F) Resinite core .187x.750 16 items .10 uH — 10 uH
F) Iron core .219x.875 L=10, 15, 24, 39, 55, 62, 82 & 100 uH
F) Resinite core .156x.500 16 items 1.0 uH — 18 uH
F) Iron core .156x.5 L=22,27,33,39,47,56,68,82 & 100 uH
G) Resinite form, Low capacity.625 o.d.x 1.25 1 mH & 2.5 mH
H) Resinite core .187x.375 23 items 20 uH — 950 uH
I) Polypropylene form .23x.38 9 items .023 uH — .590 uH

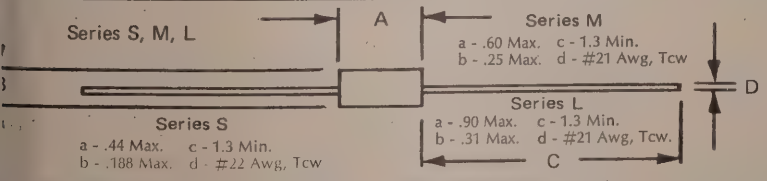
J) Phenolic core .107x.312 8 items .10 uH — .82 uH
J) Iron core .107x.250 53 items 1.0 uH — 2.2 mH
J) Iron core .107x3.75 11 items 2.5 mH — 10 mH
J) Iron core .125x.500 L= 12, 15, 18 and 22 mH
J) Ferrite core .187x.625 12 items 25 mH — 100 mH
K) Core .25x1.5 L= .25, .5, 1, 2.5, 5, 7.5, 10 and 25 mH
L) Resinite core .500x.875 25 items 1 mH — 100 mH
M) Ceramic dowel 1.25x1.125 L= .5, 1, 2.5, 5, 7.5, 10, 25mH
N) Ceramic dowel 1.125x.625 overall, 15 items .25 — 80 mH
N) Pwd. iron 1.125x.625 overall, 11 items .5 mH — 150 mH
O) 1.875x1.750 overall, light duty 50, 100, 250 and 600 uH
P) Frequency selective, for 1.8 MHz to 500 MHz 9 items
Q) Line Ch. 135uH 20A, 200uH 15A, 370uH 10A, 570 uH 5A
R) Powdered iron .531x1.312 3.35 uH 20 A
R) Pwd. iron .5x1.25 L=4.9, 8.8, 125,1000uH @15,10,3.5,1A
R) Powdered iron .312x.906 4 uH 8 A
R) Powdered iron .312x1.25 100 uH 2 A
R) Powdered iron .562x1.25 40 uH 3 A, 500 uH 2 A
R) Powdered iron .531x1.25 68 uH 5 A
R) Powdered iron .437x1.25 250 uH 2.5 A

Molded R.F. Chokes

Micro Mite Micro Miniature Shielded Miniature

eries	MS Type	Items	Inductance uH	Watts	Mold size
310	18130-1 to 26	28	.15—33	.25	.156X.375
320	75008-21 to 45	25	.15—27	.25	.188X.437
350	75052-1 to 7	7	47—150	.30	.250X.560
350	75053-1 to 5	5	180—390	.40	.310X.560
350	75054-1 to 5	5	470—1000	.45	.375X.625
350	75055-1 to 5	8	1500—10,000	.55	.468X.687
250	90537-1 to 73	73	.10—100,000	.25	.157X.395
210	90538-1 to 21	21	36—240	.22	.155X.375

Series	MS Type	Items	Inductance uH	Watts	Mold size
9220	90539-1 to 15	16	270—1000	.25	.190X.440
9220	90540-1 to 13	13	1100—3600	.40	.215X.560
9220	90541-1 to 11	11	3900—10,000	.45	.240X.740
9330	90542-1 to 24	24	.47—39	.33	.220X.560
9360	91189-1 to 13	13	1.1—120	.375	.281X.937
9340	91189-14 to 38	25	1.2—120	.375	.280X.940
9230	—	38	.10—120	.17	.095X.250
9230	—	11	150—1,000	.15	.095X.250


Series S, M, L
A
Series M
a - .60 Max. c - 1.3 Min.
b - .25 Max. d - #21 Awg, Tcw
D
Series L
a - .90 Max. c - 1.3 Min.
b - .31 Max. d - #21 Awg, Tcw.
C
Series S
a - .44 Max. c - 1.3 Min.
b - .188 Max. d - #22 Awg, Tcw

Series S 37 items .10 uH — 100 uH 1/3 watt
Series M 37 items 1.00 uH — 1 mH 1/3 watt
Series L 37 items 10 uH — 10 mH 1/2 watt
Operating temp. —55°C to +125°C
Terminal strength meets five pound pull test per MIL-C-15305D.
All series meet requirments of MIL-C-15305D. Grade 1, Class B.

ıcapsulated Subminiature and Miniature Toroidal Inductors

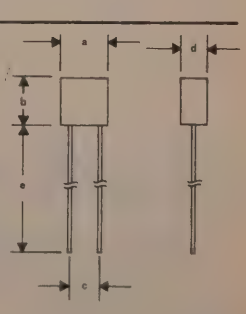
T1, T2, T3, T4 Series

Applications: printed circuits and modules
Environmental: designed to meet MIL-C-15305, Grade 1, Class B (−55°C to +125°C)
Moisture and shock resistant, immersion proof
Powdered iron toroidal core, low external magnetic field
Identification: part number and inductance value printed in contrasting color

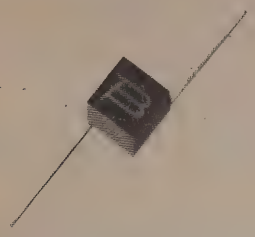
Maximum operating temperature: 125°C
Rated temperature rise (at 90°C): 35°C
Dielectric withstanding voltage: 700 v rms
Terminal pull: 5 pounds
Altitude rating: 70,000 feet
Overload current: 1.4 times the rated current

1	25 items	.01 uH — 1 uH	1/5 watt
2	25 items	.10 uH — 10 uH	1/5 watt
3	25 items	10 uH — 1 mH	1/3 watt
4	25 items	100 uH — 10 mH	1/2 watt

	T1 T2	T3	T4
a	.200 ±.010	.270 ±.010	.375 ±.015
b	.200 +.030 −.00	.270 +.030 −.00	.375 ±.015
c	.100 ±.010	.200 ±.010	.200 ±.010
d	.100 ±.010	.150 ±.010	.187 ±.010
e	1.0 Min.	1.0 Min.	1.0 Min.

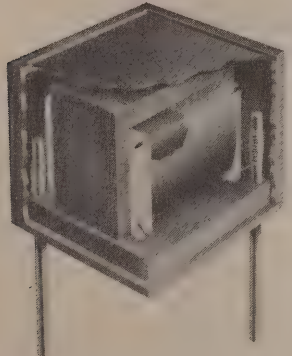


MICROMINIATURE INDUCTORS



MODEL 4221 MICROINDUCTOR

MODEL 4222 MICROINDUCTOR

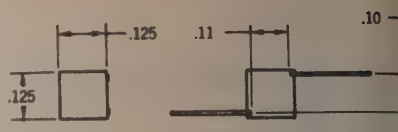


MODEL 4220 MICROINDUCTOR

MODEL 4221 MICROINDUCTOR/.125″ x .125″ x .125″

Standard Part Numbers — Stock Available

Inductor P/N	Inductance* Hy (min) @ 1 V, 1 KHz	DCR Ω
4221-0001	0.5h	230
4221-0002	3.5h	2000
4221-0003	0.1h	53
4221-0004	1.0h	525



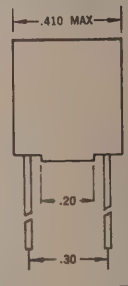
MODEL 4222 MICROINDUCTOR/.310″ x .410″ x .465″

Standard Part Numbers — Stock Available

Inductor P/N	Inductance Hy (min) @ 300 Hz	Q-Min @ 1 V, 1 KHz	DCR Ω	DC ma
4222-0001	6 at 15 V	5.0	1200	2.0
4222-0002	3.5 at 5 V	4.0	1200	2.0
4222-0003	1.25 at 3 V	3.5	180	2.0
4222-0004	0.3 at 3 V	3.0	40	4.0
4222-0005	0.1 at 3 V	2.0	15	5.0

Electrical

Inductance range ..... 100μ Hy to 6 Hy
Frequency ..... 50 Hz to 50 KHz
Voltage level ..... .1 to 20 V
DC current ..... 0 to 20 ma
DCR ..... 10 to 5,000 ohms
Q ..... .5 to 6.0
Power dissipation ..... 180 mw max for 40°C rise

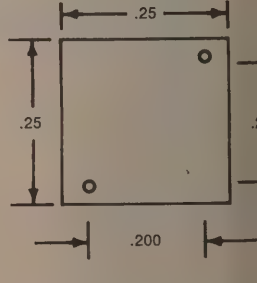


TOLERANCES: EXCEPT WHERE NOTE
DECIMALS .XX x ±.01

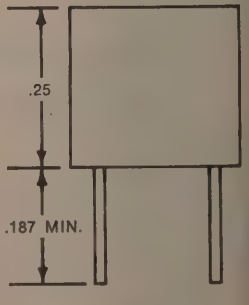
MODEL 4220 MICROINDUCTOR/.250″ x .250″ x .250″

Standard Part Numbers — Stock Available

Inductor P/N	Inductance Hy (min) @ 1 V, 1 KHz	Q-Min @ 1 V, 1 KHz	DCR Ω	DC ma*
4220-0001	66	.75	2100	0
4220-0006	2	4	1495	2.0
4220-0007	.08	5	25	4.0
4220-0008	3.5	3.5	1495	1.0
4220-0009	6.0	4.5	1495	.25
4220-0010	.1	6	54	4.0
4220-0011	1	4	364	.25
4220-0012	.5	5.5	223	.75
4220-0013	50	.75	1495	0
4220-0014	.7	5.0	364	1.5
4220-0015	.2	5.0	38	1.5
4220-0016	4.5	3.5	1495	.75



Inductor P/N	Inductance Hy ±10% @ 1 V, 1 KHz, ODC	Q-Min @ 1 V, 1 KHz	DCR Ω	DC ma*
4220-0030	.033	6.0	16	4.2
4220-0031	.047	6.0	24	3.4
4220-0032	.075	5.5	38	2.7
4220-0033	.120	5.5	64	2.1
4220-0034	.180	5.5	93	1.7
4220-0035	.300	5.0	155	1.3
4220-0036	.500	5.0	245	1.1
4220-0037	.750	5.0	385	.85
4220-0038	1.00	5.0	570	.75
4220-0039	2.00	4.5	980	.54
4220-0040	3.00	4.5	1550	.43
4220-0041	5.00	4.0	2480	.34
4220-0042	8.00	4.0	4010	.26



* With DC current applied — approximately — 10% drop in inductance occurs.

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N-9000 SERIES/POWER INDUCTORS

Standard Part Numbers — Stock Available

Part No.	Inductance MHY −10% +40%	Inductance Ma DC	DCR Ω	Dimensions
IN-9025	3	1000	0.25	Type 1
IN-9026	6	350	0.2	Type 1
IN-9027	11	1000	0.75	Type 1
IN-9028	400	135	31	Type 1
IN-9029	1500	20	85	Type 1
IN-9030	2000	65	180	Type 1
IN-9031	250	275	16	Type 2
IN-9032	700	135	40	Type 2
IN-9033	2500	50	150	Type 2
IN-9034	4500	50	325	Type 2
IN-9035	7000	50	550	Type 2
IN-9036	30	750	2	Type 3
IN-9037	50	750	3	Type 3
IN-9038	125	550	6	Type 3
IN-9039	400	275	22	Type 3

DIMENSIONS

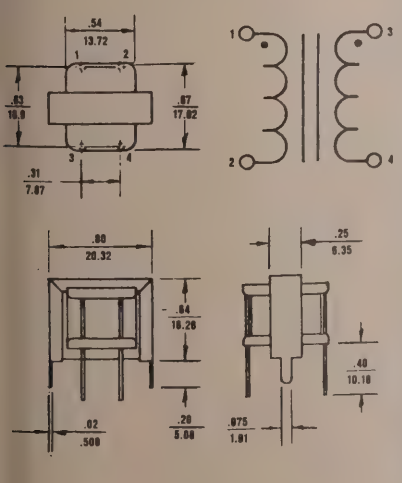
Type	L	W	H	Terminals	Mounting
1	1.47	.90	1.25	Pins	PC Tabs
2	1.74	1.10	1.39	Leads	Holes
3	1.98	1.48	1.65	Leads	Holes

N-9000 SERIES/DUAL MINIATURE INDUCTORS

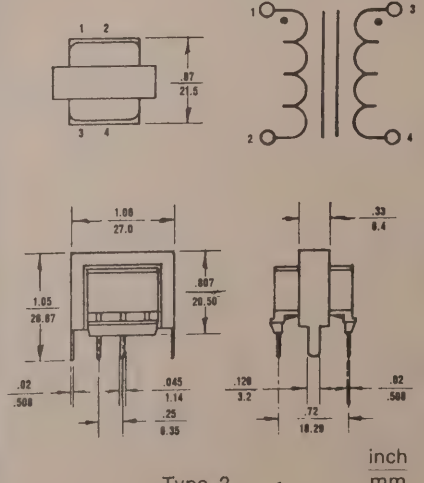
Special Order Modifications Available

- Can be Connected for Series or Parallel Operation
- Wide Inductance Range
- Miniature Size

Part No.	Inductance −10% +40% Series Connection HYS	Series Connection DCMA	Parallel Connection HYS	Parallel Connection DCMA	DCR Ω Typ. Series Connected	Dimensions
IN-9001	40	1	10	2	6700	Type 1
IN-9002	16	2	4	4	1100	Type 1
IN-9003	8	4	2	8	600	Type 1
IN-9004	3.6	4	.9	8	160	Type 1
IN-9005	1	20	.25	40	60	Type 2
IN-9006	.6	40	.15	80	36	Type 2
IN-9007	.4	60	.10	120	20	Type 2
IN-9008	.06	80	.015	160	4	Type 2



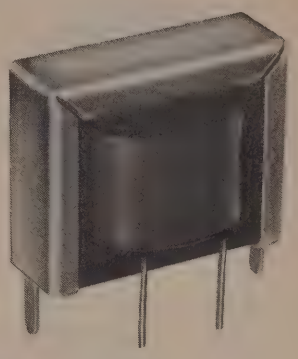
Type 1



Type 2

inch
mm

INDUSTRIAL/ COMMERCIAL INDUCTORS



IN-9000 SERIES
Dual Miniature Inductors

FEATURES

- Can be connected for series or parallel operation
- Wide inductance range
- Miniature size

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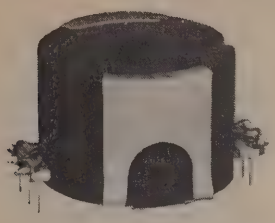
FERRITE CORE INDUCTORS



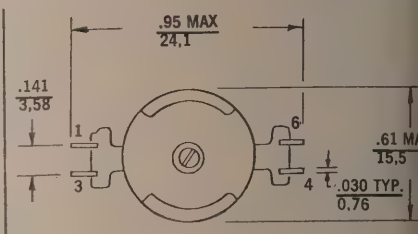
FEATURES

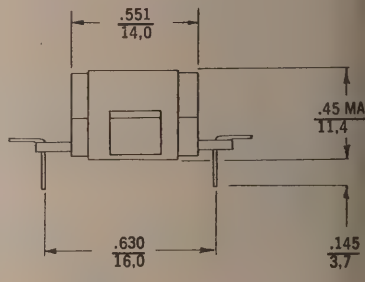
- International standard sizes
- Accurately adjustable inductance
- Printed circuit board mounting
- Predictable temperature coefficient
- High Q

SERIES 3000 FERRITE CORE INDUCTORS/14mm

BMP Part Number		L mH ±6%	Nom. DCR
4292	3103	1.00	0.70
	3203	2.00	1.40
	3503	5.00	3.50
	3104	10.00	7.90
	3204	20.00	14.00
	3504	50.00	35.50
	3105	100.00	81.20
	3205	200.00	140.00
	3305	300.00	216.00

Inductance measured @ 1000Hz NOM.
Units may be terminated on any combination of pins
Frequency Range 1.0-200 KHz
Inductance Range .5 mH to 1000 mH
Litz wire available on special order
$\triangle L = \pm 3\%$ STD Adjustment
$\triangle L = \pm 6\%$ Special





14mm

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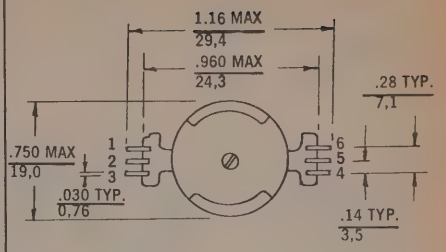
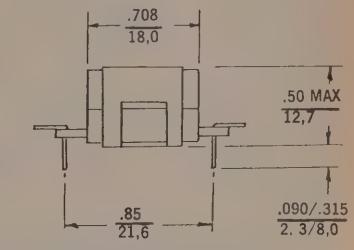
SERIES 4000 FERRITE CORE INDUCTORS/18mm

BMP Part Number		L mH ±6%	Nom. DCR
4292	4103	1.00	0.40
	4203	2.00	0.89
	4503	5.00	2.22
	4104	10.00	4.90
	4204	20.00	8.80
	4504	50.00	22.50
	4105	100.00	49.00
	4205	200.00	115.00
	4505	500.00	180.00

SERIES 7000 FERRITE CORE INDUCTORS/26mm

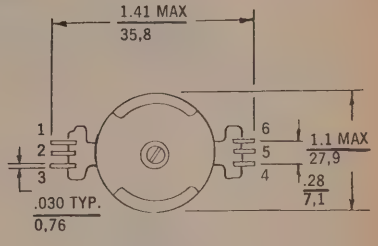
BMP Part Number		L mH ±6%	Nom. DCR
4292	7103	1.00	0.22
	7203	2.00	0.50
	7503	5.00	1.26
	7104	10.00	2.24
	7204	20.00	5.00
	7504	50.00	12.70
	7105	100.00	28.30
	7205	200.00	51.00
	7505	500.00	78.80

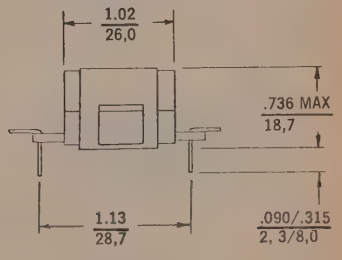




TOL. AT POINT OF EGRESS ±.01%
TOL. AT ENDS ±.06% ℄ TO ℄

18mm





26mm

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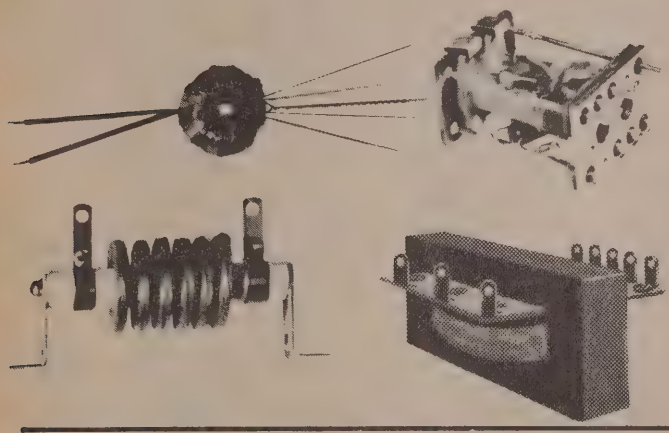

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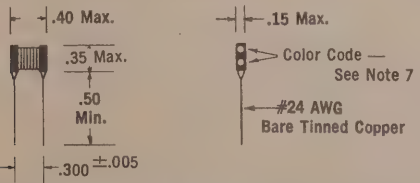
PRINTED CIRCUIT CHOKES

TYPE 6550 1.0μH-10mH 10% Tolerance



NOTES:
1. Effective inductance and Q measured on Boonton 260A Q-meter at frequencies specified, in accordance with MIL-C-15305.
2. Current rating (Rated IDC) is based on 0.2 watt power dissipation for approx. 20°C temperature rise. Depending on the application, these units may be operated at up to twice the rated current.
3. Incremental current (INCR I) is the minimum current at which the inductance will be decreased by 5% from its initial (zero — DC) value.
4. Dielectric Withstanding Voltage — 100 VRMS.
5. Operating Temperature Range — −55°C to +105°C.
6. Materials:
   Coil Form — Ferrite.
   Magnet Wire — Type B per MIL-W-583.
   Coating — Polyurethane per MIL-I-46058.
7. Marking — Color coded per dash number using standard EIA color code.

STANDARD VALUES: (Other values available on special order.)

Part No.	Nominal Inductance	Min. Q	Test Freq. MHz	Max. DCR Ohms	Min. SRF MHz	Rated IDC ma See Note 2	INCR I ma See Note 3
6550-1	1.0μH	90	7.9	.015	180	3600	7000
6550-2	2.5	85	7.9	.03	110	2500	4100
6550-3	5.0	90	7.9	.06	75	1800	2900
6550-4	7.5	95	7.9	.11	70	1300	2500
6550-5	10	90	7.9	.19	55	1020	2100
6550-6	25	80	2.5	.50	18	630	1300
6550-7	50	70	2.5	1.1	11	420	1000
6550-8	75	45	2.5	1.2	5.5	400	860
6550-9	100	85	.79	1.5	2.8	365	700
6550-10	250	55	.79	2.7	1.6	270	450
6550-11	500	35	.79	3.3	1.3	240	340
6550-12	750	30	.79	4.2	1.2	215	280
6550-13	1.0mH	80	.25	8.6	1.0	150	210
6550-14	2.5	75	.25	16	.53	110	140
6550-15	5.0	45	.25	31	.45	80	100
6550-16	7.5	25	.25	50	.32	63	80
6550-17	10	50	.079	70	.26	53	70

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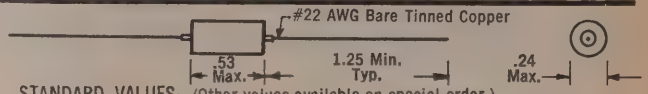
MINIATURE HIGH CURRENT CHOKES

TYPE 6470 4μH-10mH 10% Tolerance
Recommended mounting pitch — 1.00″



NOTES:

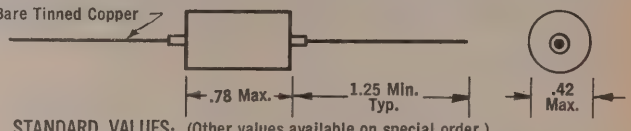
1. Effective inductance and Q measured on Boonton 260A Q-meter at frequencies specified in accordance with MIL-C-15305.
2. Current rating (Rated IDC) is based on .25 watt power dissipation for approx. 20°C temperature rise. Depending on the application, these units may be operated at up to twice the rated current.
3. Incremental current (INCRI I) is the minimum current at which the inductance will be decreased by 5% from its initial (zero — DC) value.
4. Dielectric Withstanding Voltage — 1000 VRMS.
5. Operating Temperature Range — −55°C to +105°C.
6. Materials:
   Coil Form — Ferrite.
   Magnet Wire — Type B per MIL-W-583.
   Cover — Polyester-alpha cellulose.
   Coating — Polyurethane per MIL-I-46058.

STANDARD VALUES: (Other values available on special order.)

Part No.	Nominal Inductance	Min. Q	Test Freq. MHz	Max. DCR Ohms	Min. SRF MHz	Rated I_{DC} ma	Incr I ma
6470-1	4μH	14	7.9	0.02	90	3500	2100
6470-2	6	12	7.9	0.03	80	2800	1800
6470-3	8	12	7.9	0.04	70	2500	1600
6470-4	10	40	2.5	0.05	52	2200	1400
6470-5	15	35	2.5	0.06	40	2000	1100
6470-6	20	35	2.5	0.07	11	1800	1000
6470-7	25	30	2.5	0.08	8.0	1700	900
6470-8	50	20	2.5	0.14	4.5	1300	600
6470-9	75	15	2.5	0.16	4.0	1200	500
6470-10	100	25	.79	0.22	3.0	1000	400
6470-11	250	25	.79	0.70	1.8	595	300
6470-12	500	20	.79	1.10	1.4	475	225
6470-13	750	15	.79	1.40	1.2	420	180
6470-14	1.0mH	70	.25	2.80	0.70	298	120
6470-15	2.5	40	.25	4.20	0.50	243	90
6470-16	5.0	30	.25	10.0	0.35	158	65
6470-17	7.5	12	.25	11.0	0.32	150	60
6470-18	10	15	.25	14.0	0.30	133	55

HIGH CURRENT CHOKES

TYPE 6310 6.8μH-1.0mH 10% Tolerance
Recommended mounting pitch — 1.25″



NOTES:

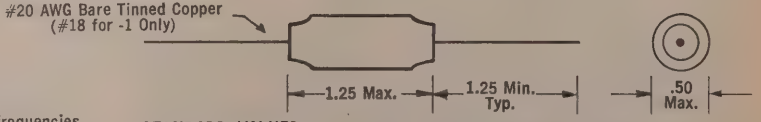
1. Effective inductance and Q measured on Boonton 260A Q-meter at frequencies specified, in accordance with MIL-C-15305.
2. Current rating (Rated IDC) is based on 0.5 watt power dissipation for approx. 20°C temperature rise.
3. Incremental current (INCR I) is the minimum current at which the inductance will be decreased by 5% from its initial (zero — DC) value.
4. Dielectric Withstanding Voltage — 1000 VRMS.
5. Operating Temperature Range: −55°C to +105°C.
6. Materials:
   Coil Form — Ferrite.
   Magnet Wire — Type B per MIL-W-583.
   Cover — Polyester-alpha cellulose.
   Coating — Polyurethane per MIL-I-46058.

STANDARD VALUES: (Other values available on special order.)

Part No.	Nominal Inductance	Min. Q	Test Freq. MHz	Max. DCR Ohms	Min. SRF MHz	Rated I_{DC} ma	Incr I ma
6310-1	6.8μH	18	7.9	.014	65	5900	5700
6310-2	10	55	2.5	.024	55	4500	4600
6310-3	15	50	2.5	.033	16	3900	3500
6310-4	22	50	2.5	.036	13	3700	3000
6310-5	33	35	2.5	.043	6.0	3400	2500
6310-6	50	30	2.5	.075	5.0	2500	2100
6310-7	75	18	2.5	.084	3.4	2400	1700
6310-8	100	52	.79	.12	2.5	2000	1300
6310-9	250	35	.79	.28	1.4	1300	900
6310-10	500	15	.79	.52	1.0	980	660
6310-11	750	18	.79	.62	0.9	890	570
6310-12	1000	45	.25	1.14	0.7	660	440

HIGH CURRENT CHOKES

TYPE 6150 10-100μH
Recommended mounting pitch — 1.50″



NOTES:

1. Effective inductance and Q measured on Boonton 260A Q-meter at frequencies specified, in accordance with MIL-C-15305.
2. Current rating (Rated IDC) is based on .75 watt power dissipation for approx. 20°C temperature rise. Depending on the application, these units may be operated at up to twice the rated current.
3. Incremental current (INCR I) is the minimum current at which the inductance will be decreased by 5% from its initial (zero — DC) value.
4. Dielectric Withstanding Voltage — 1000 VRMS.
5. Operating Temperature Range — −55°C to +85°C.
6. Materials:
   Coil Form — Ferrite.
   Magnet Wire — Type B per MIL-W-583.
   Jacket — PVC shrink tube.

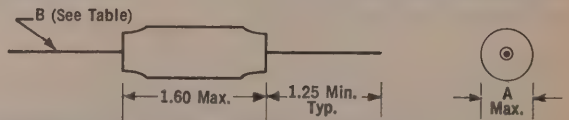
STANDARD VALUES: (Other values available on special order.)

Part No.	Nominal Inductance*	Min. Q	Test Freq. MHz	Max. DCR Ohms	Min. SRF MHz	Rated I_{DC} Amps	Incr I Amps
6150-1	10μH	30	2.5	.018	10	6.40	21
6150-2	20	18	2.5	.036	7.2	4.50	15
6150-3	30	12	2.5	.063	5.0	3.40	13
6150-4	40	12	2.5	.096	4.3	2.75	12
6150-5	50	10	2.5	.110	3.7	2.60	10
6150-6	75	8	2.5	.200	3.2	1.90	9
6150-7	100	26	.79	.400	2.2	1.30	7.8

*(−10, +20%)

HIGH CURRENT CHOKES

TYPE 6490 10μH-1.0mH 10% Tolerance
Recommended mounting pitch — 1.75″



NOTES:

1. Inductance measured on General Radio 1650B Impedance Bridge at 1 kHz.
2. Current rating (Rated IDC) is based on 1.0 watt power dissipation for approx. 20°C temperature rise. Depending on the application, these units may be operated at up to twice the rated current.
3. Incremental current (INCR I) is the minimum current at which the inductance will be decreased by 5% from its initial (zero — DC) value.
4. Dielectric Withstanding Voltage — 1000 VRMS.
5. Operating Temperature Range — −55°C to +85°C.
6. Materials:
   Coil Form — Ferrite.
   Magnet Wire — Type B per MIL-W-583.
   Jacket — PVC shrink tube.
   Lead Wires — Bared tinned copper.

STANDARD VALUES: (Other values available on special order.)

Part No.	Nominal Inductance	Max. DCR Ohms	Min. SRF MHz	Rated I_{DC} Amps	Incr I Amps	A Dia. In.	B Lead Size AWG
6490-1	10μH	.010	12.0	10.0	20	.65	14
6490-2	20	.017	9.0	7.7	16	.62	16
6490-3	30	.031	6.0	5.7	12	.61	18
6490-4	40	.050	5.0	4.5	11	.60	20
6490-5	50	.068	4.5	3.8	10	.59	20
6490-6	75	.13	3.4	2.8	9.0	.58	20
6490-7	100	.056	1.5	4.2	7.0	.79	20
6490-8	250	.14	0.90	2.7	4.5	.75	20
6490-9	500	.30	0.60	1.8	3.3	.72	20
6490-10	750	.56	0.45	1.3	2.6	.68	20
6490-11	1.0mH	.80	0.35	1.1	2.3	.66	20

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HIGH CURRENT/HIGH VOLTAGE CHOKES

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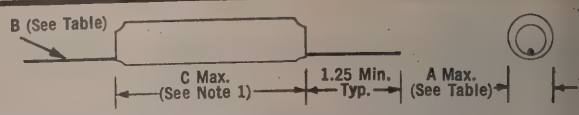
TYPE 6309 13-410μH 10% Tolerance
20-50KV minimum breakdown voltage



NOTES:
1. Minimum Breakdown Voltage ratings and dimensions are as follows:

	Min. Breakdown	C Max. Length In.	Rec. Mtg. Pitch In.
-1 thru -5	20KV	2.8	3.0
-6 thru -10	35KV	4.2	4.4
-11 thru -15	50KV	5.8	6.0

2. Inductance measured on General Radio 1650 Impedance Bridge at 1 KHz.
3. Current rating (Rated IDC) is based on power dissipation of 1.5 watt for -1 thru -5, 2.5 watt for -6 thru -10, and 3.5 watt for -11 thru -15; for approx. 20°C temperature rise. Depending on application, these units may be operated at up to twice the rated current.
4. Incremental current (INCR I) is the minimum current at which the inductance will be decreased by 5% from its initial (zero — DC) value.
5. Dielectric Withstanding Voltage — 1000 VRMS.
6. Materials:
   Coil Form — Ferrite. Jacket — PVC shrink tube.
   Magnet Wire — Type B per MIL-W-583.
   Lead Wires — Bare tinned copper.

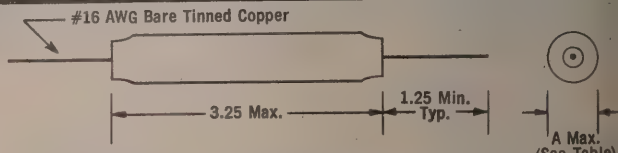
STANDARD VALUES: (Other values available on special order.)

Part No.	Nominal Inductance	Max. DCR Ohms	Min. SRF MHz	Rated I_{DC} Amps	INCR I Amps	A Dia. In.	B Lead Size AWG
6309-1	11μH	.005	40	18	11	.62	10
6309-2	18	.007	33	15	9.0	.59	12
6309-3	31	.013	27	11	7.0	.56	14
6309-4	46	.023	22	8.0	6.0	.52	16
6309-5	79	.042	15	6.0	4.5	.49	18
6309-6	32	.008	25	18	4.0	.62	10
6309-7	48	.012	20	15	3.2	.59	12
6309-8	80	.019	15	12	2.7	.56	14
6309-9	120	.036	13	8.3	2.2	.52	16
6309-10	190	.068	11	6.0	1.7	.49	18
6309-11	60	.010	15	19	2.2	.62	10
6309-12	90	.014	13	16	1.8	.59	12
6309-13	146	.025	10	12	1.4	.56	14
6309-14	225	.050	8	8.4	1.2	.52	16
6309-15	360	.100	7	6.0	.95	.49	18

HIGH CURRENT/HIGH VOLTAGE CHOKES

suitable for any high-current application — especially those requiring high-voltage transient suppression.

TYPE 6400 80μH-2.0mH 10% Tolerance
Recommended mounting pitch — 3.50″
25kV minimum breakdown voltage



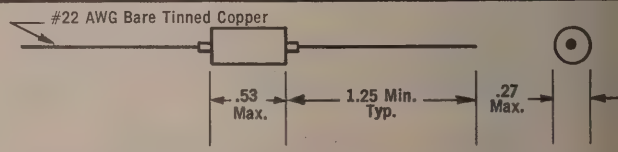
NOTES:
1. Inductance measured on General Radio 1650B Impedance Bridge at 1 KHz.
2. Current rating (Rated IDC) is based on 2.0 watt power dissipation for approx. 20°C temperature rise. Depending on application, these units may be operated at up to twice the rated current.
3. Incremental current (INCR I) is the minimum current at which the inductance will be decreased by 5% from its initial (zero — DC) value.
4. Dielectric Withstanding Voltage — 1000 VRMS.
5. Operating Temperature Range — −55°C to +85°C.
6. Materials:
   Coil Form — Ferrite.
   Magnet Wire — Type B per MIL-W-583.
   Jacket — PVC shrink tube.

STANDARD VALUES: (Other values available on special order.)

Part No.	Nominal Inductance	Max. DCR Ohms	Min. SRF MHz	Rated I_{DC} Amps	INCR I Amps	A Dia.
6400-1	80μH	.034	12	7.7	7.5	.70
6400-2	130	.065	11	5.5	5.6	.68
6400-3	220	.13	9.0	3.9	4.3	.67
6400-4	350	.25	7.0	2.8	3.6	.66
6400-5	560	.49	5.0	2.0	2.9	.65
6400-6	780	.87	4.5	1.5	2.5	.64
6400-7	1.4mH	1.9	3.2	1.0	1.8	.63
6400-8	2.0	3.6	2.6	.75	1.4	.62

SHIELDED CHOKES

TYPE 1670 250μH-100mH 10% or 25% Tolerance
Recommended mounting pitch — .80″



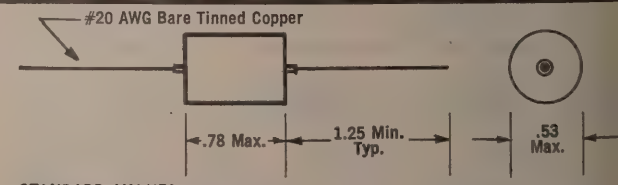
NOTES:
1. These units are especially suited for filtering applications where small size, low DC resistance and magnetic shielding are required. They are not recommended for applications requiring extremely high stability.
2. Inductance (LP) is measured at 1.0 KHz on a General Radio 1650-B impedance bridge. These units are available in either 10% or 25% inductance tolerance.
3. The test voltage specified in column 3 is the RMS voltage across the test unit during inductance measurement.
4. Current rating (Rated IDC) is based on 0.3 watt power dissipation for approx. 20°C temperature rise. Depending on the application, these units may be operated at up to twice the rated current.
5. Incremental current (INCR I) is the minimum current at which the inductance will be decreased by 5% from its initial (zero — DC) value.
6. Dielectric Withstanding Voltage — 100 VRMS.
7. Materials:
   Coil Form and Shield — Ferrite.
   Magnet Wire — Type B per MIL-W-583.
   Coating — Polyurethane per MIL-I-46058.

STANDARD VALUES: (Other values available on special order.)

Part No.	Nominal Inductance	Test Volts See Note 3	Max. DCR Ohms	Min. SRF MHz	Rated I_{DC} ma See Note 4	INCR I ma See Note
1670-1	250μH	.007	0.17	1.5	1330	60
1670-2	500	.014	0.39	1.1	880	44
1670-3	1.0mH	.028	0.80	0.90	610	30
1670-4	2.5	.07	1.8	0.40	400	20
1670-5	5.0	.14	3.1	0.30	310	13
1670-6	10	.15	6.3	0.20	220	9.4
1670-7	25	.30	13	0.14	150	6.0
1670-8	50	.40	28	0.10	100	4.3
1670-9	100	.24	54	0.70	75	3.0

SHIELDED CHOKES

TYPE 1662 5.0mH-1.0H 10% or 25% Tolerance
Recommended mounting pitch — 1.20″



NOTES:
1. These units are especially suited for filtering applications where small size, low DC resistance and magnetic shielding are required. They are not recommended for applications requiring extremely high stability.
2. Inductance (Lp) is measured at 1.0 KHz on a General Radio 1650-B impedance bridge. These units are available in either 10% or 25% inductance tolerance.
3. The test voltage specified in column 3 is the RMS voltage across the test unit during inductance measurement.
4. Current rating (Rated IDC) is based on 0.5 watt power dissipation for approx. 20°C temperature rise. Depending on the application, these units may be operated at up to twice the rated current.
5. Incremental current (INCR I) is the minimum current at which the inductance will be decreased by 5% from its initial (zero — DC) value.
6. Dielectric Withstanding Voltage — 100 VRMS.
7. Materials:
   Coil Form and Shield — Ferrite.
   Magnet Wire — Type B per MIL-W-583.
   Coating — Polyurethane per MIL-I-46058.

STANDARD VALUES: (Other values available on special order.)

Part No.	Nominal Inductance	Test Volts See Note 3	Max. DCR Ohms	Min. SRF MHz	Rated I_{DC} ma See Note 4	INCR I ma See Note
1662-1	5.0mH	.14	.83	.28	770	20
1662-2	10	.16	2.4	.20	450	13
1662-3	25	.32	5.2	.11	310	8.0
1662-4	50	.42	12	.080	200	5.0
1662-5	100	.24	30	.050	130	4.0
1662-6	250	.40	65	.035	88	2.3
1662-7	500	.46	130	.024	62	1.6
1662-8	1.0H	.25	200	.015	50	1.2

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QUALITY COILS SINCE 1946

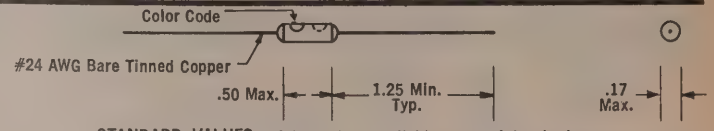
CADDELL-BURNS

40 East Second Street
Mineola, New York 11501

Area Code 516 746-2310

MINIATURE SHIELDED CHOKES

TYPES 6375/6376 1.0μH-5.0mH 10% Tolerance
Recommended mounting pitch — .70″



NOTES:
1. Effective inductance and Q measured on Boonton 260A Q-meter at frequencies specified, in accordance with MIL-C-15305.
2. Current rating (Rated IDC) is based on 0.25 watt power dissipation for approx. 20°C temperature rise. Depending on the application, these units may be operated at up to twice the rated current.
3. Incremental current (INCR I) is the minimum current at which the inductance will be decreased by 5% from its initial (zero — DC) value.
4. Dielectric Withstanding Voltage — 1000 VRMS.
5. Operating Temperature Range — −55°C to +105°C.
6. Materials:
   Coil Form and Shield — Ferrite.
   Magnet Wire — Type B per MIL-W-583.
   Construction — Epoxy encapsulated.
   Coating — Polyurethane per MIL-I-46058.

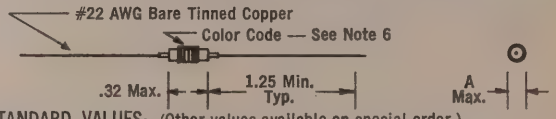
Marking — Color coded per dash number using standard EIA color as follows: 6375 — one color dot; 6376 — two color dots. e.g.: 6375-1 — one brown dot; 6376-1 — two brown dots, etc.

STANDARD VALUES: (Other values available on special order.)

Part No.	Nominal Inductance	Min. Q	Test Freq. MHz	Max. DCR Ohms	Min. SRF MHz	Rated I_{DC} ma See Note 2	Incr I ma See Note 3
6375-1	1.0μH	55	7.9	.05	200	2200	2700
6375-2	2.5	45	7.9	.08	115	1700	1600
6375-3	5.0	35	7.9	.12	90	1400	1000
6375-4	10	65	2.5	.42	55	770	750
6375-5	25	55	2.5	.80	35	560	450
6375-6	50	60	2.5	1.5	27	400	300
6375-7	100	70	2.5	3.1	20	280	200
6376-1	100	50	.79	.60	6.0	640	50
6376-2	250	55	.79	.92	2.6	520	32
6376-3	500	50	.79	2.0	1.9	350	22
6376-4	1.0mH	45	.25	4.7	0.8	230	15
6376-5	2.5	45	.25	7.5	0.5	180	10
6377-6	5.0	45	.25	17	0.4	120	7.0

MINIATURE CHOKES

TYPE 660 0.1-2.0μH 10% Tolerance
Recommended mounting pitch — .70″



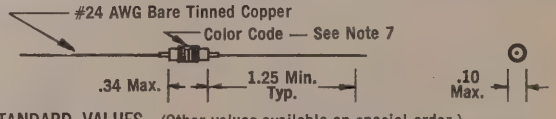
NOTES:
1. Effective inductance and Q measured on Boonton 260A Q-meter at frequencies specified, in accordance with MIL-C-15305.
2. Current rating (Rated IDC) is based on 0.2 watt power dissipation for approx. 20°C temperature rise. Depending on the application, these units may be operated at up to twice the rated current.
3. Dielectric Withstanding Voltage — 100 VRMS.
4. Operating Temperature Range — −55°C to +105°C.
5. Materials:
   Coil Form — Mineral filled phenolic.
   Magnet Wire — Type B per MIL-W-583.
   Coating — Polyurethane per MIL-I-46058.
6. Marking — Color coded per dash number using standard EIA color code.

STANDARD VALUES: (Other values available on special order.)

Part No.	Nominal Inductance	Min. Q	Test Freq. MHz	Max. DCR Ohms	Min. SRF MHz	Rated I_{DC} Amps See Note 2	A Dia.
660-1	0.1μH	60	25	.014	420	3.8	.15
660-2	0.2	60	25	.034	380	2.4	.14
660-3	0.3	55	25	.060	340	1.8	.13
660-4	0.4	55	25	.074	310	1.6	.13
660-5	0.5	55	25	.12	280	1.3	.13
660-6	0.75	45	25	.23	240	0.9	.13
660-7	1.0	50	25	.39	200	0.7	.13
660-8	1.5	30	7.9	.76	160	0.5	.12
660-9	2.0	30	7.9	.96	140	0.4	.12

MINIATURE CHOKES

TYPE 620 1.0-100μH 10% Tolerance
Recommended mounting pitch — .60″



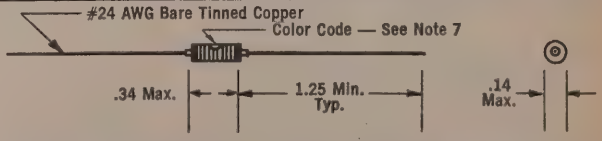
NOTES:
1. Effective inductance and Q measured on Boonton 260A Q-meter at frequencies specified, in accordance with MIL-C-15305.
2. Current rating (Rated IDC) is based on 0.2 watt power dissipation for approx. 20°C temperature rise. Depending on the application, these units may be operated at up to twice the rated current.
3. Incremental current (INCR I) is the minimum current at which the inductance will be decreased by 5% from its initial (zero — DC) value.
4. Dielectric Withstanding Voltage — 100 VRMS.
5. Operating Temperature Range — −55°C to +105°C.
6. Materials:
   Coil Form — Ferrite.
   Magnet Wire — Type B per MIL-W-583.
   Coating — Polyurethane per MIL-I-46058.
7. Marking — Color coded per dash number using standard EIA color code.

STANDARD VALUES: (Other values available on special order.)

Part No.	Nominal Inductance	Min. Q	Test Freq. MHz	Max. DCR Ohms	Min. SRF MHz	Rated I_{DC} ma See Note 2	Incr I ma See Note 3
620-1	1.0μH	50	7.9	.11	190	1300	4400
620-2	2.5	50	7.9	.18	120	1000	2600
620-3	5.0	45	7.9	.24	90	900	1800
620-4	7.5	40	7.9	.33	70	800	1350
620-5	10	40	2.5	.39	64	700	1100
620-6	15	60	2.5	.74	54	500	950
620-7	20	55	2.5	.96	46	450	780
620-8	25	60	2.5	1.2	40	400	680
620-9	50	85	2.5	3.6	28	270	490
620-10	75	90	2.5	6.3	22	170	410
620-11	100	80	2.5	8.6	20	150	320

MINIATURE CHOKES

TYPE 659 250μH-10.0mH 10% Tolerance
Recommended mounting pitch — .60″



NOTES:
1. Effective inductance and Q measured on Boonton 260A Q-meter at frequencies specified in accordance with MIL-C-15305.
2. Current rating (Rated IDC) is based on 0.2 watt power dissipation for approx. 20°C temperature rise. Depending on the application, these units may be operated at up to twice the rated current.
3. Incremental current (INCR I) is the minimum current at which the inductance will be decreased 5% from its initial (zero — DC) value.
4. Dielectric Withstanding Voltage — 100 VRMS.
5. Operating Temperature Range — −55°C to +105°C.
6. Materials:
   Coil Form — Ferrite.
   Magnet Wire — Type B per MIL-W-583.
   Coating — Polyurethane per MIL-I-46058.
7. Marking — Color coded per dash number using standard EIA color code.

STANDARD VALUES: (Other values available on special order.)

Part No.	Nominal Inductance	Min. Q	Test Freq. MHz	Max. DCR Ohms	Min. SRF MHz	Rated I_{DC} ma See Note 2	Incr I ma See Note 3
659-1	250μH	40	.79	2.0	3.2	315	165
659-2	500	35	.79	3.9	1.5	225	120
659-3	1.0mH	60	.25	9.5	1.1	145	78
659-4	2.5	55	.25	24	0.6	90	50
659-5	5.0	50	.25	50	0.5	63	37
659-6	10	40	.079	75	0.3	51	30

SEND YOUR REQUIREMENTS. PROMPT QUOTES.

QUALITY COILS SINCE 1946

CADDELL-BURNS

40 East Second Street
Mineola, New York 1150

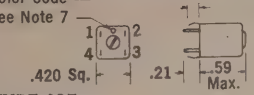
Area Code 516 746-231

MINIATURE SHIELDED VARIABLE INDUCTORS

TYPES 435/6344 .25-70μH

SCHEMATIC

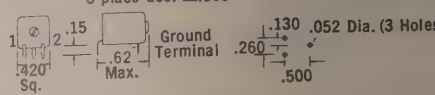
Color Code — See Note 7



TYPE 435
vertical mount

Recommended Mounting Layout

Tolerance 2 place dec. ±.020
3 place dec. ±.005



TYPE 6344
horizontal mount

Recommended Mounting Layo

NOTES:

1. For vertical mount, order as 435-1 . . . etc. For horizontal mount, order as 6344-1 . . . etc.
2. Effective inductance and Q measured on Boonton 260A Q-meter at frequencies specified, in accordance with MIL-C-15305.
3. Self-resonant frequencies are measured at maximum inductance.
4. Unit can be tuned from top or bottom with ⅛" insulated screwdriver (part no. C-B 2102). For type 435 only, provide .156 dia. hole if bottom access to tuning core is desired.
5. Current rating is based on .15 watt power dissipation for approx. 20°C temperature rise. Depending on the application, these units may be operated at up to twice the rated current.
6. Materials:
   Terminals — Tin-plated brass. Core — Ferrite.
   Coil Form and Base — Molded nylon. Shield Can — Cadmium-plated brass.
7. Marking — Marked with Caddell-Burns Part No. on side of can, and color-coded per dash number on bottom between two active terminals.

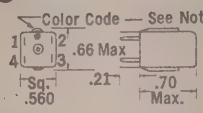
STANDARD VALUES: (Other values available on special order.)

Part No.	Minimum Range L Min.	L Max.	Minimum Q @ L Min.	@ L Max.	Test Freq. MHz	Min. SRF MHz Note 3	Max. DCR Ohms	Curre Ratin ma
435/6344-1	.25μH	.50μH	75	50	25	200	.03	220
435/6344-2	.48	1.0	70	45	25	150	.08	130
435/6344-3	.90	2.1	70	45	25/7.9	110	.17	93
435/6344-4	1.7	3.9	50	55	7.9	80	.60	50
435/6344-5	3.5	8.5	50	45	7.9	55	1.2	35
435/6344-6	7.5	17	60	40	7.9/2.5	40	2.3	25
435/6344-7	16.5	35	50	50	2.5	11	1.9	28
435/6344-8	33	70	45	45	2.5	8	2.9	22

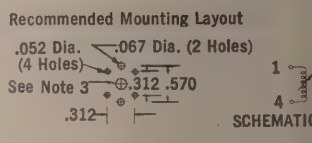
MINIATURE SHIELDED VARIABLE INDUCTORS

TYPE 6380 .08-370μH
Tol: 2 Place Dec. ±.020
3 Place Dec. ±.005

Color Code — See Note 6



Recommended Mounting Layout



NOTES:

1. Effective inductance and Q measured on Boonton 260A Q-meter at frequencies specified, in accordance with MIL-C-15305.
2. Self-resonant frequencies are measured at maximum inductance.
3. Provide .187 dia. hole if bottom access to tuning core is desired. Unit can be tuned from top or bottom with standard .060 square tuning tool (Part No: C-B2102).
4. Current rating is based on .2 watt power dissipation for approx. 20°C temperature rise. Depending on the application, these units may be operated at up to twice the rated current.
5. Materials:
   Terminals — Tin-plated brass.
   Coil Form and Base — Molded nylon.
   Core — Moisture-proofed powered iron or ferrite.
   Shield Can — Aluminum plain finish.
6. Marking — Marked with Caddell-Burns Part No. on side of can; and color-coded per dash number on bottom between two active terminals.

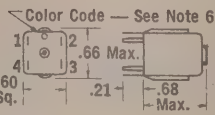
STANDARD VALUES: (Other values available on special order.)

Part No.	Minimum Range L Min.	L Max.	Minimum Q @ L Min.	@ L Max.	Test Freq. MHz	Min. SRF MHz Note 2	Max. DCR Ohms	Curre Ratin ma
6380-1	.08μH	.11μH	65	75	25	300	.012	400
6380-2	.10	.17	75	85	25	280	.014	370
6380-3	.13	.23	75	90	25	260	.015	360
6380-4	.17	.28	80	90	25	230	.016	350
6380-5	.25	.44	90	95	25	180	.024	280
6380-6	.29	.53	90	95	25	170	.026	270
6380-7	.48	.84	90	90	25	140	.058	180
6380-8	.71	2.5	90	85	25/7.9	80	.10	140
6380-9	1.8	5.7	70	110	7.9	50	.50	63
6380-10	4.5	14	55	120	7.9/2.5	18	.85	48
6380-11	12	40	60	115	2.5	10	1.6	35
6380-12	30	99	55	80	2.5	5.6	2.4	28
6380-13	73	190	55	115	2.5/.79	4.8	3.8	22
6380-14	148	370	75	120	.79	3.5	5.6	18

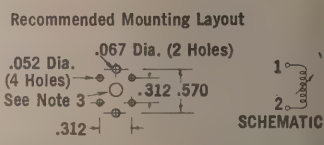
MINIATURE SHIELDED VARIABLE INDUCTORS

TYPE 434 .55-64μH
Tol: 2 Place Dec. ±.020
3 Place Dec. ±.005

Color Code — See Note 6



Recommended Mounting Layout



NOTES:

1. Effective inductance and Q measured on Boonton 260A Q-meter at frequencies specified, in accordance with MIL-C-15305.
2. Self-resonant frequencies are measured at maximum inductance.
3. Provide .187 dia. hole if bottom access to tuning core is desired. Unit can be tuned from top or bottom with standard .060 square tuning tool (Part No. C-B2102).
4. Current rating is based on .2 watt power dissipation for approx. 20°C temperature rise. Depending on the application, these units may be operated at up to twice the rated current.
5. Materials:
   Terminals — Tin-plated brass.
   Coil Form and Base — Molded nylon.
   Core — Moisture proofed powdered iron.
   Shield Can — Aluminum plain finish.
6. Marking — Marked with Caddell-Burns No. on side of can; and color-coded per dash number on bottom between two active terminals.

STANDARD VALUES: (Other values available on special order.)

Part No.	Minimum Range L Min.	L Max.	Minimum Q @ L Min.	@ L Max.	Test Freq. MHz	Min. SRF MHz Note 2	Max. DCR Ohms	Curre Ratin ma
434-1	.55μH	.90μH	90	85	25	160	.06	180
434-2	.90	1.4	90	70	25/7.9	130	.12	120
434-3	1.4	2.4	60	70	7.9	100	.25	89
434-4	2.2	4.1	60	80	7.9	80	.60	57
434-5	3.9	7.7	55	55	7.9	52	1.0	44
434-6	7.5	11	35	70	7.9/2.5	21	1.2	40
434-7	11	17	55	75	2.5	16	1.4	37
434-8	18	27	55	75	2.5	14	1.8	33
434-9	27	42	55	70	2.5	13	2.4	28
434-10	42	64	55	65	2.5	11	3.1	25

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QUALITY COILS SINCE 1946

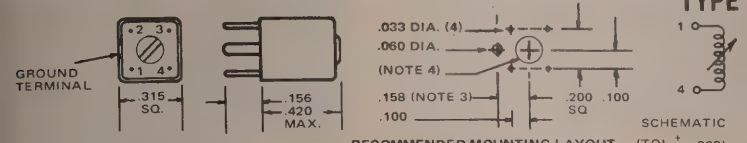
CADDELL-BURNS

40 East Second Street
Mineola, New York 11501

Area Code 516 746-2310

BMINIATURE SHIELDED VARIABLE INDUCTORS

TYPE 6740



S:

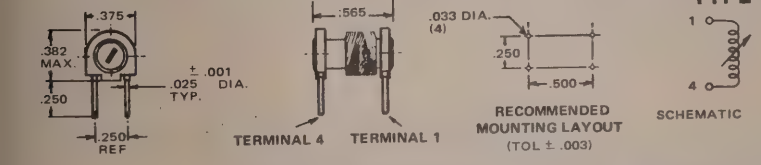
ffective inductance and Q
red on Boonton 260A Q-
in accordance with MIL-C-
.
lf-resonant frequencies are
red at nominal inductance.
ound terminal may be bent
uired to fit existing layouts.
Provide .156 DIA. hole if
n access to tuning core is
d. Tuning range on –38
–61 may be extended by
ng core to extend 1/16"
mounting surface (when
≈½Lnom).
urrent rating is based on ¼
ower dissipation.
ATERIALS–
minals: tin plated copper.
minal Base: molded phenolic.
Form: polyester fiberglass.
: moisture-proofed powder-
ron or ferrite.
ld Can: tin plated copper.
regnation: varnish per MIL-
73.

STANDARD VALUES (INTERMEDIATE AND SPECIAL VALUES AVAILABLE ON SPECIAL ORDER)

Dash No.	Nominal Inductance	Minimum Range LMIN	Minimum Range LMAX	Min Q @ LNOM	Test Freq. MHz	Max DCR OHMS	Min SRF MHz Note 2	Max IDC mA Note 5
–01	.10uH	.08uH	.12uH	80	25	.02	250	3500
–03	.15	.12	.18	85	25	.03	250	2800
–05	.22	.18	.27	85	25	.04	250	2500
–07	.33	.27	.39	90	25	.05	250	2200
–09	.47	.39	.56	90	25	.13	230	1350
–11	.68	.56	.82	90	25	.17	200	1200
–13	1.0	.82	1.2	90	25	.31	160	850
–15	1.5	1.0	1.8	60	7.9	.33	125	850
–17	2.2	1.5	2.7	65	7.9	.72	110	550
–19	3.3	2.2	3.9	65	7.9	1.3	95	425
–21	4.7	3.3	5.6	60	7.9	1.5	80	400
–23	6.8	4.7	8.2	60	7.9	1.8	62	350
–25	10	6.8	12.	60	7.9	2.2	45	325
–27	15	10	18	72	2.5	1.5	12	400
–29	22	15	27	67	2.5	1.8	9.5	350
–31	33	22	39	65	2.5	2.1	7.8	325
–33	47	33	56	57	2.5	2.8	6.6	300
–35	68	47	82	47	2.5	3.0	5.3	275
–37	100	68	120	45	2.5	3.5	5.0	250
–39	150	100	180	70	.79	3.8	3.4	250
–41	220	150	270	65	.79	6.0	2.8	200
–43	330	220	390	60	.79	7.9	2.3	150
–45	470	330	560	40	.79	11	1.9	125
–47	680	470	820	35	.79	13	1.7	125
–49	1.0mH	.68mH	1.2mH	32	.79	17	1.5	100
–51	1.5	1.0	1.8	37	.25	32	.86	85
–53	2.2	1.5	2.7	37	.25	41	.72	75
–55	3.3	2.2	3.9	40	.25	51	.69	65
–57	4.7	3.3	5.6	27	.25	80	.47	55
–59	6.8	4.7	8.2	25	.25	90	.39	50
–61	10	6.8	12	25	.25	110	.37	45

ORIZONTAL MOUNT VARIABLE INDUCTORS

TYPE 6750



ES:

Effective inductance and Q
ured on Boonton 260A Q-
r in accordance with MIL-C-
5.
Self-resonant frequencies are
ured at nominal inductances.
Current rating is based on ¼
power dissipation.
ATERIALS–
rminals: tin plated copper.
rminal Collars: epoxy-fiber-
ss per MIL-P-18177.
il Form: polyester-fiberglass.
re: moisture-proofed pow-
red iron.
pregnation: varnish per MIL-
173.

STANDARD VALUES (INTERMEDIATE AND SPECIAL VALUES AVAILABLE ON SPECIAL ORDER)

Dash No.	Nominal Inductance	Minimum Range LMIN	Minimum Range LMAX	Min. Q @LNOM	Test Freq. MHz	Max DCR OHMS	Min SRF MHz Note 2	Max IDC mA Note 3
–01	.10uH	.08uH	.12uH	100	25	.015	600	4000
–03	.15	.12	.18	110	25	.02	510	3500
–05	.22	.18	.27	115	25	.03	430	2800
–07	.33	.27	.39	115	25	.04	360	2500
–09	.47	.33	.56	110	25	.06	320	2000
–11	.68	.47	.82	110	25	.08	270	1750
–13	1.0	.68	1.2	115	25	.09	230	1650
–15	1.5	1.0	1.8	87	7.9	.18	180	1150
–17	2.2	1.5	2.7	83	7.9	.33	155	850
–19	3.3	2.2	3.9	85	7.9	.63	120	600
–21	4.7	3.3	5.6	85	7.9	1.2	105	450
–23	6.8	4.7	8.2	85	7.9	2.4	85	320
–25	10	6.8	12	85	7.9	3.0	74	280
–27	15	12	18	83	2.5	1.8	38	370
–29	22	18	27	85	2.5	2.2	31	330
–31	33	27	39	100	2.5	2.7	26	300
–33	47	39	56	100	2.5	3.2	21	270
–35	68	56	82	80	2.5	3.4	9.0	260
–37	100	82	120	77	2.5	4.3	7.6	240
–39	150	120	180	85	.79	6.2	4.2	200
–41	220	180	270	87	.79	8.0	3.4	175
–43	330	270	390	87	.79	9.6	3.0	160
–45	470	390	560	90	.79	12	2.7	140
–47	680	560	820	85	.79	15	2.2	125
–49	1.0mH	.82mH	1.2mH	75	.79	27	2.0	95
–51	1.5	1.0	1.8	70	25	25	1.6	100
–53	2.2	1.5	2.7	70	.25	32	1.4	85
–55	3.3	2.2	3.9	60	.25	66	1.0	60
–57	4.7	3.3	5.6	63	.25	80	.90	55
–59	6.8	4.7	8.2	65	.25	100	.75	50
–61	10	6.8	12	68	25	121	.67	45

LOW-COST PRINTED-CIRCUIT VARIABLE INDUCTORS

TYPE 6460

Variable R.F. Inductors
Four Printed Circuit Terminals, Mounting—.5" x .8" Centers
Size 5/8" x 5/8" x .985 Long
Polyester Cellulose Coil Form

Stock No.	Inductance Range Microhenries Min.	Inductance Range Microhenries Max.	Q'	Q''	Nom. D.C. Res. Ohms	Wire Size AWG
6460-1	06	09	80	105	008	22
6460-2	09	16	100	130	010	22
6460-3	15	29	120	140	011	22
6460-4	19	40	130	145	012	22
6460-5	32	68	80	105	08	20/44
6460-6	60	1 35	80	125	11	20/44
6460-7	1 14	2 5	90	135	15	20/44
6460-8	2 0	4 0	100	140	21	20/44
6460-9	3 1	5 6	110	120	26	20/44
6460-10	4 5	8 1	48	85	29	20/44
6460-11	7 0	11 4	43	150	37	20/44
6460-12	9 7	16 4	80	140	47	20/44
6460-13	15 6	26 2	90	155	61	20/44
6460-14	19 2	44	80	110	1 80	7/44
6460-15	41	95	80	90	2 56	7/44
6460-16	70	183	65	100	3 24	7/44
6460-17	180	525	90	98	5 76	7/44
6460-18	445	1040	94	105	9 32	7/44

Note: Inductance & Q at various frequencies can be altered by changing type of core used (see parts section for cores available). Dash No. 1 thru 15 uses Powdered Iron Core 302—250—6R. Dash No. 16 thru 18 uses Ferrite Core 303—250—6R

TYPE 6461

Variable R.F. Coil Series
Size 5/8" x 5/8" x .625 Long
0.5" P.C. Mounting

Stock No.	Inductance Range Microhenries Min.	Inductance Range Microhenries Max.	Q'	Q''	Nom. D.C. Res. Ohms	Wire Size AWG
6461-1	09	12	58	66	007	22
6461-2	1	14	102	128	009	22
6461-3	14	22	128	150	01	22
6461-4	18	33	134	155	011	22
6461-5	23	44	140	154	013	22
6461-6	37	68	87	105	102	7/41
6461-7	58	1 1	87	100	136	7/41
6461-8	1 1	2 2	72	115	2	7/41
6461-9	2	4 4	80	112	29	7/41
6461-10	3 3	8	96	140	77	7/44
6461-11	7	13 6	70	130	1 02	7/44
6461-12	12 4	25 5	85	134	1 42	7/44
6461-13	22 5	49	90	127	1 93	7/44
6461-14	47	100	86	97	2 8	7/44
6461-15	99	174	75	142	4 2	7/44
6461-16	170	332	95	146	6 0	7/44
6461-17	322	570	102	140	8 5	7/44
6461-18	525	910	97	125	10 4	7/44

TYPE 6462

Variable R.F. Coil with Powdered Iron Shield
Size 5/8" x 5/8" x .730 Long
0.5" P.C. Mounting

Stock No.	Inductance Range Microhenries Min.	Inductance Range Microhenries Max.	Q'	Q''	Nom. D.C. Res. Ohms	Wire Size AWG
6462 1	08	10	84	89	007	22
6462 2	4	8	82	100	11	7/41
6462 3	6	1 3	85	105	14	7/41
6462 4	1 1	2 6	71	115	20	7/41
6462 5	2 1	5 1	85	145	55	7/44
6462 6	3 4	8 6	96	145	75	7/44
6462 7	8 0	16 9	70	150	1 14	7/44
6462 8	16 2	39 5	94	142	1 52	7/44
6462 9	34	84	86	110	2 21	7/44
6462 10	57	124	80	145	2 74	7/44
6462 11	67	141	80	148	3 16	7/44

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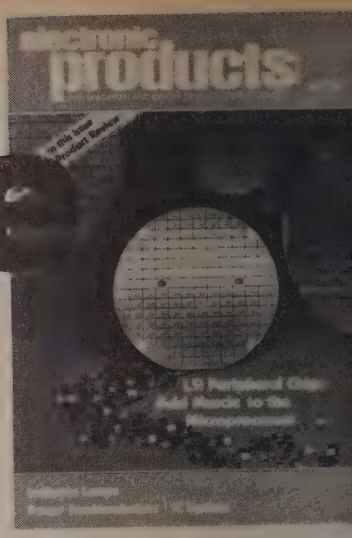

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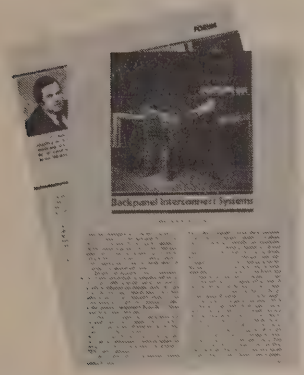

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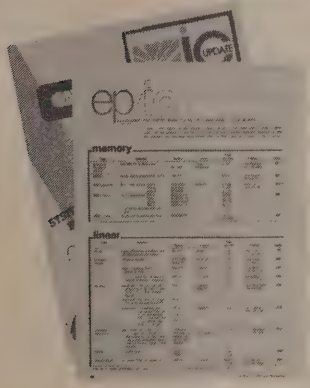

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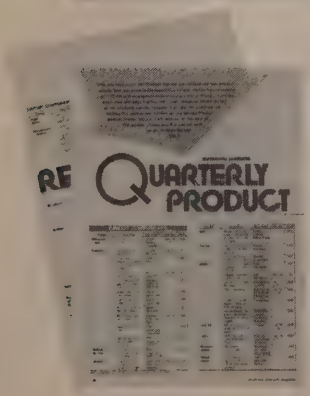

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CRAMER COIL DIV.

Division of Digital Magnetics, Inc.

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MINIATURE SOLENOID CHOKES ON .095" x ¼" LONG COIL FORM

Cramer Part No.	Inductance ±10%	Q	SRF MHz	DCR Ohms
CCM.68T	.68uh	47	308	.15
CCM.82T	.82uh	46	279	.20
CCM1.0T	1.0uh	30	253	.33
CCM1.2T	1.2uh	30	234	.42
CCM1.5T	1.5uh	31	208	.58
CCM1.8T	1.8uh	31	187	.68
CCM2.2T	2.2uh	32	169	1.17
CCM2.7T	2.7uh	32	153	1.4
CCM3.3T	3.3uh	32	137	2.6
CCM3.9T	3.9uh	33	126	2.9
CCM4.7T	4.7uh	34	114	3.4
CCM5.6T	5.6uh	33	106	3.9
CCM6.8T	6.8uh	43	54	.43
CCM8.2T	8.2uh	41	49	.56
CCM10T	10.0uh	39	48	.72
CCM12T	12.0uh	62	40	1.1
CCM15T	15.0uh	65	36	1.4
CCM22T	22.0uh	63	29	3.1
CCM27T	27.0uh	65	27	3.5
CCM33T	33.0uh	64	24	3.9

VELVETORK ADJUSTABLE COIL 368" PIN CIRCLE x ¾" LONG

Cramer Part No.	L Min.	Q Min.	L Max.	Q Min.	Test Freq.
CCA107	.095uh	77	.125uh	77	25MHz
CCA157	.130uh	68	.170uh	92	25MHz
CCA227	.185uh	88	.265uh	100	25MHz
CCA337	.285uh	88	.410uh	93	25MHz
CCA477	.420uh	100	.580uh	80	25MHz
CCA687	.540uh	101	.850uh	89	25MHz
CCA827	.640uh	101	1.00uh	78	25MHz
CCA106	.760uh	98	1.25uh	70	7.9MHz
CCA156	1.20uh	65	1.87uh	70	7.9MHz
CCA226	1.65uh	61	2.75uh	65	7.9MHz
CCA336	2.40uh	64	4.10uh	60	7.9MHz
CCA476	3.40uh	68	5.8uh	60	7.9MHz
CCA686	4.60uh	64	8.5uh	56	7.9MHz
CCA826	5.6uh	64	10uh	57	2.5MHz
CCA105	7.1uh	68	12.5uh	55	2.5MHz
CCA155	10uh	58	18.7uh	95	2.5MHz
CCA225	14.8uh	61	27.5uh	90	2.5MHz
CCA335	22uh	60	41uh	75	2.5MHz
CCA475	31uh	58	58uh	68	2.5MHz
CCA685	43.5uh	56	85uh	55	2.5MHz
CCA825	61uh	48	100uh	88	790KHz
CCA104	76uh	52	125uh	90	790KHz
CCA154	105uh	57	187uh	92	790KHz
CCA224	160uh	63	275uh	90	790KHz
CCA334	240uh	66	410uh	90	790KHz
CCA474	360uh	68	580uh	81	790KHz
CCA684	530uh	66	850uh	75	790KHz
CCA824	700uh	64	1mh	80	250KHz
CCA103	910uh	66	1.25mh	85	250KHz
CCA153	990uh	35	1.87mh	60	250KHz
CCA223	1.6mh	39	2.75mh	62	250KHz
CCA333	2.4mh	41	4.1mh	60	250KHz
CCA473	3.4mh	42	5.8mh	57	250KHz
CCA683	5.15mh	42	8.5mh	50	250KHz
CCA823	7.4mh	42	10.0mh	50	79KHz
CCA102	9.8mh	40	12.5mh	52	79KHz
CCA152	12mh	39	18.7mh	55	79KHz
CCA222	12.1mh	20	27.5mh	51	79KHz
CCA332	18.2mh	24	41mh	54	79KHz
CCA472	27.5mh	28	58mh	56	79KHz
CCA682	40mh	32	85mh	56	79KHz
CCA822	50mh	34	100mh	58	79KHz
CCA101	62mh	35	125mh	56	79KHz

BALUN COILS

PLUG-IN PRINTED CIRCUIT POWER TRANSFORMERS

Type No.	Secondary		Watts
	Parallel	Series	
CC6506	6.3V C.T. @ .20A (Single Secondary)		1.5
CC6512	12.6V @ 120A	25.2V C.T. @ .060A	1.5
CC6608	6.32V @ .70A	12.6V C.T. @ .35A	4.5
CC6616	28V @ .156A	56V C.T. @ .078A	4.5
CC6708	6.3V @ 1.2A	12.6V C.T. @ .60A	7.5
CC6712	12.6V @ .6A	25.2V C.T. @ .30A	7.5
CC6716	28V @ .27A	56V C.T. @ .135A	7.5

WR SERIES MOLDED MINIATURE R.F. CHOKES

Series	Inductance	Size
WR-2	.1 thru 1000uh	.1 x .250"
WR-4	.15 thru 240uh	.155 x .375"
WR-5	.1 thru 100,000uh	.162 x .450"
WR-6	270 thru 1000uh	.190 x .440"

CTC SERIES CONVERTER TRANSFORMERS

Input Voltage:	1.5 — 30V DC
Output Voltage:	up to 200V DC
Power:	up to 3 watts

CPT SERIES TRIGGER TRANSFORMERS

Primary L:	200uh to 5000uh
Turns Ratio:	1:1; 1:1:1; 2:1:1; 5:1

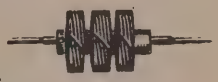
CN SERIES SHIELDED SUBMINIATURE ADJUSTABLE R.F. COILS

Cramer Part No.	Core Position: Inductance Maximum	Q Min.	Inductance Minimum	Q Min.
CN9050	1.5uh	40	3.0uh	41
CN9051	3.0uh	46	7.0uh	45
CN9052	7.0uh	40	14.0uh	62
CN9053	14.0uh	48	28.0uh	66
CN9054	28.0uh	48	60.0uh	45
CN9055	60.0uh	40	120.0uh	69
CN9056	120.0uh	52	280.0uh	68
CN9057	280.0uh	52	650.0uh	62
CN9058	650.0uh	36	1.3mh	68
CN9059	1.3mh	43	3.0mh	53
CN9060	3.0mh	32	10.0mh	32
CN9061	8.0mh	35	20.0mh	38
CN9062	15.0mh	25	40.0mh	40
CN9063	20.0mh	36	60.0mh	60

½", 7mm and 10mm

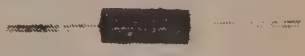
MINIATURE UNIVERSAL CHOKES WOUND ON .095" x ¼" LONG COIL FORMS

Cramer Part No.	Inductance ±10%	Q	SRF MHz	DCR Ohms
CMU39	39uh	20	11.2	5.8
CMU47	47uh	18	10.8	6.5
CMU56	56uh	17	10.6	7
CMU68	68uh	17	10.5	8
CMU82	82uh	16	10.4	8.5
CMU100	100uh	16	10.3	9.2
CMU120	120uh	22	9.6	10.7
CMU150	150uh	23	9.0	12
CMU180	180uh	23	7.5	13.7
CMU220	220uh	24	6.6	15
CMU270	270uh	24	5.6	16.8
CMU330	330uh	24	5.0	18.9
CMU390	390uh	24	4.8	20.6
CMU470	470uh	23	4.4	22.6
CMU560	560uh	54	3.2	11.5
CMU680	680uh	49	2.8	12.7
CMU820	820uh	46	2.2	13.9
CMU1000	1000uh	44	2.1	15.5
CMU1500	1500uh	57	1.8	23.9
CMU2200	2200uh	53	1.7	24.7



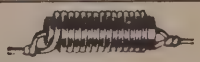
R.F. CHOKE MULTIPLE SECTION WINDING

Cramer Part No.	Inductance ±10%	Q	DCR Ohms
CBP1.0	1.0uh	55	.155
CBP10	10.0uh	28	.64
CBP50	50.0uh	18	3.0
CBP100	100.0uh	16	4.15
CBP500	500.0uh	27	15.
CBP1000	1000.0uh	40	34.
CBP500A	.5mh	17	6.9
CBP1000A	1.0mh	45	19.
CBP2500A	2.5mh	55	40.
CBP5000A	5.0mh	60	94.



FERRITE SHIELDED CHOKES

Cramer Part No.	Induct. 15%	Q	DCR Ohms	Size
CFS-500	500uh	62	1.7	.156x⅜L
CFS-1000	1.0mh	58	3.9	.156x⅜
CFS-2500	2.5mh	62	6.3	.156x⅜
CFS-5000	5.0mh	55	14.0	.156x⅜
CFS-10000	10.0mh	3.5	7.0	.250x½
CFS-25000	25.0mh	3.5	18.0	.250x½
CFS-50000	50.0mh	4.0	35.0	.250x½
CFS-100000	100.0mh	4.0	60.0	.250x½
CFS-250000	250.0mh	10.0	50.0	.500x1"
CFS-500000	500.0mh	10.0	150.0	.500x1"
CFS-1000000	1000.0mh	10.0	220.0	.500x1"
CFS-1.5H	1.5Hz	10.0	280.0	.500x1"
CFS-2H	2.0Hz	10.0	360.0	.500x1"



HASH FILTER CHOKES

Cramer Part No.	Inductance ±10%	Max. DCR Ohms
CMHF-3.35	3.35uh	.01
CMHF-8.8	8.8uh	.02
CMHF-40	40uh	.08
CMHF-68	68uh	.05
CMHF-100	100uh	.22

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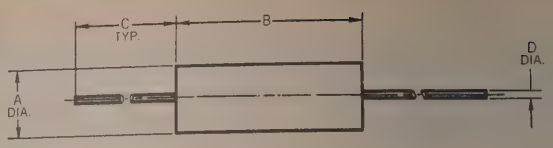


INDUCTANCE RANGE & MIL STANDARD

Model No.	INDUCTANCE RANGE From	To	CLASSIFICATION Grade	Class	Military Standard
IM-2	.10 μH	1.00 μH	1	B	MS-75083
	1.2 μH	27 μH	1	A	MS-75084
	33 μH	1000 μH	1	A	MS-75085
IM-4	.15 μH	4.7 μH	1	B	MS-18130
	5.6 μH	33 μH	1	A	MS-14046
	36 μH	240 μH	1	A	MS-90538
IM-6	270 μH	1000 μH	1	A	MS-90539
IMS-5	.1 μH	100,000 μH	1	A	—

DIMENSIONS

Model No.		A	B	C	D
IM-2	Max.	.105 [2.67]	.260 [6.60]	1.626 [41.30]	.0215 [.546]
	Min.	.085 [2.16]	.240 [6.10]	1.250 [31.75]	.0185 [.470]
IM-4	Max.	.165 [4.19]	.385 [9.78]	1.626 [41.30]	.027 [.686]
	Min.	.145 [3.68]	.365 [9.27]	1.250 [31.75]	.023 [.584]
IM-6	Max.	.200 [5.08]	.450 [11.43]	1.625 [41.28]	.027 [.686]
	Min.	.180 [4.57]	.430 [10.92]	1.250 [31.75]	.023 [.584]
IMS-5	Max.	.172 [4.37]	.430 [10.92]	1.625 [41.28]	.027 [.686]
	Min.	.152 [3.86]	.390 [9.91]	1.250 [31.75]	.023 [.584]

MODEL NO. IM-2

IND. (μh)	TOL.	Q MIN.	Test Freq. L & Q (Mhz)
.10	±10%	40	25.0
.12	±10%	40	25.0
.15	±10%	38	25.0
.18	±10%	35	25.0
.22	±10%	33	25.0
.27	±10%	33	25.0
.33	±10%	30	25.0
.39	±10%	30	25.0
.47	±10%	30	25.0
.56	±10%	30	25.0
.68	±10%	28	25.0
.82	±10%	28	25.0
1.00	±10%	25	25.0
1.20	±10%	25	7.9
1.50	±10%	28	7.9
1.80	±10%	30	7.9
2.20	±10%	30	7.9
2.70	±10%	37	7.9
3.30	±10%	45	7.9
3.90	±10%	45	7.9
4.70	±10%	45	7.9
5.60	±10%	50	7.9
6.80	±10%	50	7.9
8.20	±10%	55	7.9
10.0	±10%	55	7.9
12.0	±10%	45	2.5
15.0	±10%	40	2.5
18.0	±10%	50	2.5
22.0	±10%	50	2.5
27.0	±10%	50	2.5
33.0	±10%	45	2.5
39.0	±10%	45	2.5
47.0	±10%	45	2.5
56.0	±10%	45	2.5
68.0	±10%	50	2.5
82.0	±10%	50	2.5
100.	±10%	50	2.5
120.	±10%	30	.79
150.	±10%	30	.79
180.	±10%	30	.79
220.	±10%	30	.79
270.	±10%	30	.79
330.	±10%	30	.79
390.	±10%	30	.79
470.	±10%	30	.79
560.	±10%	30	.79
680.	±10%	30	.79
820.	±10%	30	.79
1000.	±10%	30	.79

MODEL NO. IM-4

IND. (μh)	TOL.	Q MIN.	Test Freq. L & Q (Mhz)
.15	±20%	50	25.0
.22	±20%	50	25.0
.33	±20%	45	25.0
.47	±20%	45	25.0
.56	±10%	50	25.0
.68	±10%	50	25.0
.82	±10%	50	25.0
1.00	±10%	50	25.0
1.20	±10%	33	7.9
1.50	±10%	33	7.9
1.80	±10%	33	7.9
2.20	±10%	33	7.9
2.70	±10%	33	7.9
3.30	±10%	33	7.9
3.90	±10%	33	7.9
4.70	±10%	33	7.9
5.60	±10%	45	7.9
6.80	±10%	50	7.9
8.20	±10%	50	7.9
10.0	±10%	55	7.9
12.0	±10%	65	2.5
15.0	±10%	65	2.5
18.0	±10%	75	2.5
22.0	±10%	75	2.5
27.0	±10%	60	2.5
33.0	±10%	65	2.5
36.0	± 5%	60	2.5
39.0	± 5%	60	2.5
43.0	± 5%	60	2.5
47.0	± 5%	55	2.5
51.0	± 5%	55	2.5
56.0	± 5%	55	2.5
62.0	± 5%	55	2.5
68.0	± 5%	55	2.5
75.0	± 5%	55	2.5
82.0	± 5%	50	2.5
91.0	± 5%	50	2.5
100.0	± 5%	50	2.5
110.0	± 5%	60	.79
120.0	± 5%	65	.79
130.0	± 5%	65	.79
150.0	± 5%	65	.79
160.0	± 5%	65	.79
180.0	± 5%	65	.79
200.0	± 5%	65	.79
220.0	± 5%	65	.79
240.0	± 5%	65	.79

MODEL NO. IM-6

IND. (μh)	TOL.	Q MIN.	Test Freq. L & Q (Mhz)
270.	± 5%	65	.79
300.	± 5%	65	.79
330.	± 5%	65	.79
360.	± 5%	65	.79
390.	± 5%	65	.79
430.	± 5%	65	.79
470.	± 5%	65	.79
510.	± 5%	65	.79
560.	± 5%	65	.79
620.	± 5%	60	.79
680.	± 5%	60	.79
750.	± 5%	60	.79
820.	± 5%	60	.79
910.	± 5%	60	.79
1000.	± 5%	60	.79

MODEL NO. IMS-5 Shielded Inductor

IND. ±10% (μH)	Q MIN.	TEST FREQ. (MHz)
.10	50	25
.12	51	25
.15	51	25
.18	50	25
.22	49	25
.27	47	25
.33	46	25
.39	44	25
.47	44	25
.56	43	25
.68	42	25
.82	40	25
1.00	44	25
1.20	44	7.9
1.50	44	7.9
1.80	44	7.9
2.20	44	7.9
2.70	44	7.9
3.30	44	7.9
3.90	44	7.9
4.70	44	7.9
5.60	44	7.9
6.80	50	7.9
8.20	50	7.9
10.0	50	7.9
12.0	55	2.5
15.0	45	2.5
18.0	45	2.5
22.0	45	2.5
27.0	45	2.5
33.0	45	2.5
39.0	50	2.5
47.0	50	2.5
56.0	50	2.5
68.0	50	2.5
82.0	50	2.5
100.0	50	2.5
120.0	55	.79
150.0	55	.79
180.0	55	.79
220.0	55	.79
270.0	55	.79
330.0	55	.79
390.0	60	.79
470.0	60	.79
560.0	60	.79
680.0	60	.79
820.0	60	.79
1,000.0	60	.79
1,200.0	45	.25
1,500.0	45	.25
1,800.0	45	.25
2,200.0	45	.25
2,700.0	45	.25
3,300.0	45	.25
3,900.0	45	.25
4,700.0	45	.25
5,600.0	44	.25
6,800.0	40	.25
8,200.0	40	.25
10,000.0	40	.25
12,000.0	30	.079
15,000.0	30	.079
18,000.0	30	.079
22,000.0	27	.079
27,000.0	27	.079
33,000.0	27	.079
39,000.0	27	.079
47,000.0	23	.079
56,000.0	23	.079
68,000.0	23	.079
82,000.0	21	.079
100,000.0	18	.079

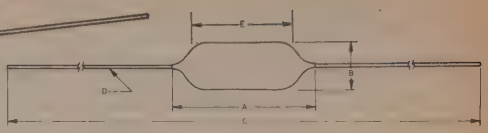
For complete information, write or phone

DALE ELECTRONICS, INC., East Highway 50, Yankton, South Dakota 57078. Phone 605-665-9301

DALE®

RF CHOKES

Epoxy—Uniform Coated



FEATURES

- Equivalent in quality to molded chokes—at a lower price.
- Excellent for automatic insertion.

Model No.		A	B	C	D	E	Inductance Range
IR-2	MAX.	.300 [7.62]	.120 [3.05]	—	.0215 [.546]	.240 [6.10]	.1 μh to 1000 μh
	MIN.	.270 [6.86]	.100 [2.54]	2.920 [74.17]	.0185 [.470]		
IR-4	MAX.	.440 [11.18]	.180 [4.57]	—	.027 [.686]	.370 [9.40]	.15 μh to 240 μh
	MIN.	.410 [10.41]	.150 [3.81]	2.985 [75.82]	.023 [.584]		

MODEL NO. IR-2

Ind. (μh)	Tol.	Q Min.	Test Freq. L&Q (Mhz)	Ind. (μh)	Tol.	Q Min.	Test Freq. L&Q (Mhz)
.10	±10%	40	25.0	12.0	±10%	45	2.5
.12	±10%	40	25.0	15.0	±10%	40	2.5
.15	±10%	38	25.0	18.0	±10%	50	2.5
.18	±10%	35	25.0	22.0	±10%	50	2.5
.22	±10%	33	25.0	27.0	±10%	50	2.5
.27	±10%	33	25.0	33.0	±10%	45	2.5
.33	±10%	30	25.0	39.0	±10%	45	2.5
.39	±10%	30	25.0	47.0	±10%	45	2.5
.47	±10%	30	25.0	56.0	±10%	45	2.5
.56	±10%	30	25.0	68.0	±10%	50	2.5
.68	±10%	28	25.0	82.0	±10%	50	2.5
.82	±10%	28	25.0	100.	±10%	50	2.5
1.00	±10%	25	25.0	120.	±10%	30	.79
1.20	±10%	25	7.9	150.	±10%	30	.79
1.50	±10%	28	7.9	180.	±10%	30	.79
1.80	±10%	30	7.9	220.	±10%	30	.79
2.20	±10%	30	7.9	270.	±10%	30	.79
2.70	±10%	37	7.9	330.	±10%	30	.79
3.30	±10%	45	7.9	390.	±10%	30	.79
3.90	±10%	45	7.9	470.	±10%	30	.79
4.70	±10%	45	7.9	560.	±10%	30	.79
5.60	±10%	50	7.9	680.	±10%	30	.79
6.80	±10%	50	7.9	820.	±10%	30	.79
8.20	±10%	55	7.9	1000.	±10%	30	.79
10.0	±10%	55	7.9				

MODEL NO. IR-4

Ind. (μh)	Tol.	Q Min.	Test Freq. L&Q (Mhz)	Ind. (μh)	Tol.	Q Min.	Test Freq. L&Q (Mhz)
.15	±20%	50	25.0	27.0	±10%	60	2.5
.22	±20%	50	25.0	33.0	±10%	65	2.5
.33	±20%	45	25.0	36.0	± 5%	60	2.5
.47	±20%	45	25.0	39.0	± 5%	60	2.5
.56	±10%	50	25.0	43.0	± 5%	60	2.5
.68	±10%	50	25.0	47.0	± 5%	55	2.5
.82	±10%	50	25.0	51.0	± 5%	55	2.5
1.00	±10%	50	25.0	56.0	± 5%	55	2.5
1.20	±10%	33	7.9	62.0	± 5%	55	2.5
1.50	±10%	33	7.9	68.0	± 5%	55	2.5
1.80	±10%	33	7.9	75.0	± 5%	55	2.5
2.20	±10%	33	7.9	82.0	± 5%	50	2.5
2.70	±10%	33	7.9	91.0	± 5%	50	2.5
3.30	±10%	33	7.9	100.0	± 5%	50	2.5
3.90	±10%	33	7.9	110.0	± 5%	60	.79
4.70	±10%	33	7.9	120.0	± 5%	65	.79
5.60	±10%	45	7.9	130.0	± 5%	65	.79
6.80	±10%	50	7.9	150.0	± 5%	65	.79
8.20	±10%	50	7.9	160.0	± 5%	65	.79
10.0	±10%	55	7.9	180.0	± 5%	65	.79
12.0	±10%	65	2.5	200.0	± 5%	65	.79
15.0	±10%	65	2.5	220.0	± 5%	65	.79
18.0	±10%	75	2.5	240.0	± 5%	65	.79
22.0	±10%	75	2.5				

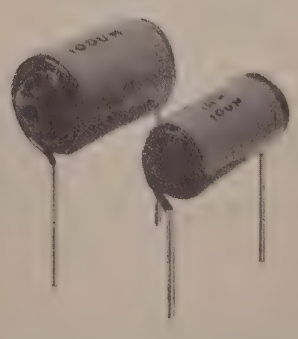
DALE®

TYPE IH SERIES

High Current Filter Chokes

FEATURES

- Flame retardant coating
- Printed circuit mounting
- Pre-tinned leads



Typical Applications
Noise filtering for switching regulators, power amplifiers, power supplies and SCR or Triac control circuits.

ELECTRICAL SPECIFICATIONS

Model	Ind. @ 1 KHz *±10%	Current (Max.)	DC Resistance (Max.)	Self-Resonant Frequency (Min.)
IH-3	5 μh	3 amps	.015 Ω	40 MHz
IH-3	10 μh	3 amps	.018 Ω	25 MHz
IH-3	27 μh	3 amps	.035 Ω	8 MHz
IH-3	50 μh	3 amps	.050 Ω	5 MHz
IH-3	100 μh	3 amps	.065 Ω	2.5 MHz
IH-3	150 μh	3 amps	.075 Ω	2.0 MHz
IH-3	250 μh	3 amps	.090 Ω	1.0 MHz
IH-5	5 μh	5 amps	.012 Ω	30 MHz
IH-5	10 μh	5 amps	.015 Ω	20 MHz
IH-5	27 μh	5 amps	.025 Ω	7 MHz
IH-5	50 μh	5 amps	.030 Ω	4 MHz
IH-5	68 μh	5 amps	.035 Ω	3.5 MHz
IH-5	100 μh	5 amps	.050 Ω	2.5 MHz
IH-5	150 μh	5 amps	.060 Ω	2.0 MHz
IH-10	5 μh	10 amps	.010 Ω	30 MHz
IH-10	10 μh	10 amps	.012 Ω	20 MHz
IH-10	27 μh	10 amps	.018 Ω	7 MHz
IH-10	50 μh	10 amps	.025 Ω	4 MHz
IH-10	68 μh	10 amps	.027 Ω	3.5 MHz
IH-10	100 μh	10 amps	.030 Ω	2.5 MHz
IH-15	5 μh	15 amps	.008 Ω	30 MHz
IH-15	10 μh	15 amps	.010 Ω	20 MHz
IH-15	27 μh	15 amps	.015 Ω	7 MHz
IH-15	50 μh	15 amps	.020 Ω	4 MHz

*Inductance measured with zero D.C. current.

For complete information, write or phone
DALE ELECTRONICS, INC., East Highway 50, Yankton, South Dakota 57078. Phone 605-665-9301

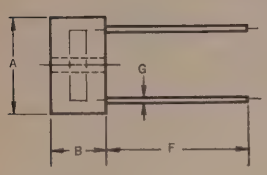
DALE®

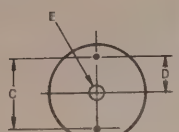
FILTER INDUCTORS, MIL-T-27

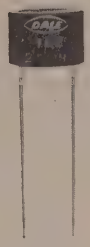
Toroidal, Encapsulated or Dipped

FEATURES

- Choice of encapsulated (TE) or dipped (TD) styles
- TE style designed to meet the requirements of MIL-T-27, Type TF5SX20ZZ. TD style combines low cost with excellent performance in commercial applications.

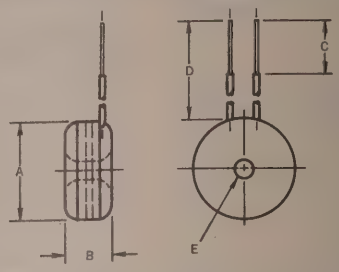






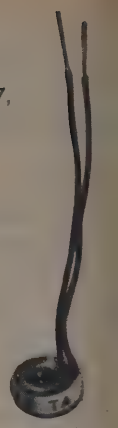
TE SERIES

Model No.	A Max.	B Max.	C	D	E	F Min.	G	Ind. Range
TE-2	.437 [11.10]	.270 [6.86]	.300 [7.62]	—	—	1.0 [25.40]	.020 [.51]	.050 MH to 250 MH
TE-3	.685 [17.40]	.385 [9.78]	.500 [12.70]	.250 [6.35]	.093 [2.36]	1.0 [25.40]	.025 [.64]	.05 MHy to 4.0 Hy
TE-4	1.062 [26.97]	.500 [12.70]	.900 [22.86]	.450 [11.43]	.120 [3.05]	1.0 [25.40]	.032 [.81]	.150 MHy to 7.5 Hy
TE-5	1.32 [33.53]	.725 [18.42]	1.00 [25.40]	.500 [12.70]	.144 [3.66]	1.0 [25.40]	.032 [.81]	1.0 MH to 20.0 Hy



TD SERIES

Model No.	A Max.	B Max.	C Min.	D Min.	E	Ind. Range
TD-2	.437 [11.10]	.25 [6.35]	—	2.0 [50.80]	3/8±1/8 [9.53±3.18]	.050 MH to 250 MH
TD-3	.685 [17.40]	.32 [8.13]	.125 [3.18]	3.0 [76.20]	3/8±1/8 [9.53±3.18]	.05 MHy to 4.0 Hy
TD-4	1.062 [26.97]	.437 [11.10]	.22 [5.59]	4.0 [101.60]	3/8±1/8 [9.53±3.18]	.15 MHy to 7.5 Hy
TD-5	1.32 [33.53]	.688 [17.48]	.22 [5.59]	6.0 [152.40]	3/8±1/8 [9.53±3.18]	1.0 MH to 20 Hy

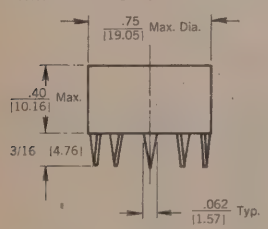


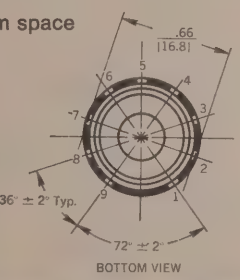
ITC-1052

Converter Transformers

FEATURES

- High conversion efficiency from DC input to filtered DC output
- Designed especially for low-power solid state circuits
- Designed for mounting on printed circuit boards
- Miniature size for minimum space





BOTTOM VIEW

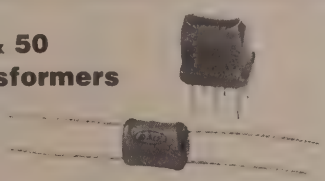
OPERATING CHARACTERISTICS*

Model No.	Input	Output	Frequency ± 20%	Efficiency Min.
1052-0	3.6 VDC	+7.2 ± .2 VDC at 150 mw −7.2 ± .2 VDC at 150 mw	7.5 KHz	50%
1052-6	5 VDC	200 ± 10 VDC at 500 mw	11 KHz	64%
1052-7	5 VDC	200 ± 10 VDC at 250 mw +15 ± .4 VDC at 125 mw −15 ± .4 VDC at 125 mw	11 KHz	60%
1052-9	5 VDC	+15 ± .4 VDC at 500 mw −15 ± .4 VDC at 500 mw	8 KHz	75%
1052-30	12 VDC	15 ± .4 VDC at 1 watt	7.5 KHz	72%

*Characteristics relate to transformer when operated in applicable test circuit and at specified load power.

PT-10, 20 & 50

Pulse Transformers



- TRIGGER TYPE PULSE TRANSFORMERS designed for low-cost trigger source isolation in half and full wave SCR power control circuits. P.C. and bobbin styles.
- PRIMARY INDUCTANCE RANGE: 200 μh to 5,000 μh.

CUSTOM COILS

- Dale offers wide custom capability in toroids, bobbins, RF transformers and inductors, power transformers, and audio transformers.

For complete information, write or phone

DALE ELECTRONICS, INC., East Highway 50, Yankton, South Dakota 57078. Phone 605-665-9301

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SERIES 0819

MILITARY SPECIFICATIONS:
MIL-C-15305 (LT4K & LT10K)

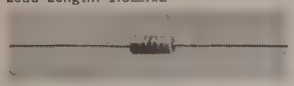
PHYSICAL PARAMETERS —
Length: .200±.010
Diameter: .078±.008
Lead Size: AWG #26 TCW.
Lead Length: 1.5±.12

Part Number	Inductance Microhenries	Q Min.
CORE MATERIAL: PHENOLIC		
0819-00	.10±10%	35
0819-02	.12±10%	35
0819-04	.15±10%	35
0819-06	.18±10%	35
0819-08	.22±10%	30
0819-10	.27±10%	30
0819-12	.33±10%	25
0819-14	.39±10%	25
0819-16	.47±10%	25
CORE MATERIAL: IRON		
0819-18	.56±10%	40
0819-20	.68±10%	40
0819-22	.82±10%	40
0819-24	1.0 ±10%	40
0819-26	1.2 ±10%	35
0819-28	1.5 ±10%	40
0819-30	1.8 ±10%	40
0819-32	2.2 ±10%	45
0819-34	2.7 ±10%	45
0819-36	3.3 ±10%	45
0819-38	3.9 ±10%	50
0819-40	4.7 ±10%	55
0819-42	5.6 ±10%	55
0819-44	6.8 ±10%	55
0819-46	8.2 ±10%	55
0819-48	10±10%	55
0819-50	12±10%	40
0819-52	15±10%	40
0819-54	18±10%	40
0819-56	22±10%	45
0819-58	27±10%	45
0819-60	33±10%	45
0819-62	39±10%	45
0819-64	47±10%	45
0819-66	56±10%	45
0819-68	68±10%	45
0819-70	82±10%	45
0819-72	100±10%	45
CORE MATERIAL: FERRITE		
0819-74	120±10%	35
0819-76	150±10%	35
0819-78	180±10%	35
0819-80	220±10%	35
0819-82	270 ±10%	35
0819-84	330±10%	35
0819-86	390±10%	35
0819-88	470±10%	35
0819-90	560±10%	35
0819-92	680±10%	35
0819-94	820±10%	35
0819-96	1000±10%	35

SERIES 1025

MILITARY SPECIFICATIONS:
MS-75083 (LT4K)
MS-75084 (LT10K)
MS-75085 (LT10K)

PHYSICAL PARAMETERS —
Length: .250±.010
Diameter: .095±.010
Lead Size: AWG #24 TCW.
Lead Length: 1.5±.12



Part Number	Inductance Microhenries	Q Min.
CORE MATERIAL: PHENOLIC		
1025-94	.10±10%	40
1025-96	.12±10%	40
1025-00	.15±10%	38
1025-02	.18±10%	35
1025-04	.22±10%	33
1025-06	.27±10%	33
1025-08	.33±10%	30
1025-10	.39±10%	30
1025-12	.47±10%	30
1025-14	.56±10%	30
1025-16	.68±10%	28
1025-18	.82±10%	28
1025-20	1.00±10%	25
CORE MATERIAL: IRON		
1025-22	1.20±10%	25
1025-24	1.50±10%	28
1025-26	1.80±10%	30
1025-28	2.20±10%	30
1025-30	2.70±10%	37
1025-32	3.30±10%	45
1025-34	3.90±10%	45
1025-36	4.70±10%	45
1025-38	5.60±10%	50
1025-40	6.80±10%	50
1025-42	8.20±10%	55
1025-44	10.0±10%	55
1025-46	12.0±10%	45
1025-48	15.0±10%	45
1025-50	18.0±10%	50
1025-52	22.0±10%	50
1025-54	27.0±10%	50
CORE MATERIAL: FERRITE		
1025-56	33.0±10%	45
1025-58	39.0±10%	45
1025-60	47.0±10%	45
1025-62	56.0±10%	45
1025-64	68.0±10%	50
1025-66	82.0±10%	50
1025-68	100.0±10%	50
1025-70	120.0±10%	30
1025-72	150.0±10%	30
1025-74	180.0±10%	30
1025-76	220.0±10%	30
1025-78	270.0±10%	30
1025-80	330.0±10%	30
1025-82	390.0±10%	30
1025-84	470.0±10%	30
1025-86	560.0±10%	30
1025-88	680.0±10%	30
1025-90	820.0±10%	30
1025-92	1000.0±10%	30

SERIES 1537

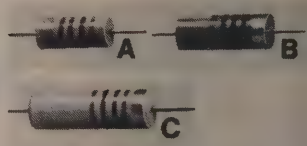
MILITARY SPECIFICATIONS:
MS-14046 (LT10K)
MS-18130 (LT4K)
MS-90538 (LT10K)

PHYSICAL PARAMETERS —
Length: .375±.010
Diameter: .155±.010
Lead Size: AWG #22 TCW.
Lead Length: 1.44±.12

Part Number	Inductance Microhenries	Q Min.
CORE MATERIAL: PHENOLIC		
1537-00	.15±20%	50
1537-02	.22±20%	50
1537-04	.33±20%	45
1537-06	.47±20%	45
1537-07	.56±10%	50
1537-08	.68±10%	50
1537-10	.82±10%	50
1537-12	1.00±10%	50
1537-14	1.20±10%	33
1537-16	1.50±10%	33
1537-18	1.80±10%	33
1537-20	2.20±10%	33
1537-22	2.70±10%	33
1537-24	3.30±10%	33
1537-26	3.90±10%	33
1537-28	4.70±10%	33
CORE MATERIAL: IRON		
1537-30	5.60±10%	45
1537-32	6.80±10%	50
1537-34	8.20±10%	50
1537-36	10.0±10%	55
1537-38	12.0±10%	65
1537-40	15.0±10%	65
1537-42	18.0±10%	75
1537-44	22.0±10%	75
1537-46	24.0± 5%	60
1537-47	27.0±10%	60
1537-48	27.0± 5%	60
1537-50	30.0± 5%	65
1537-51	33.0±10%	65
1537-52	33.0± 5%	65
1537-54	36.0± 5%	60
1537-56	39.0± 5%	60
1537-58	43.0± 5%	60
1537-60	47.0± 5%	55
1537-62	51.0± 5%	55
1537-64	56.0± 5%	55
1537-66	62.0± 5%	55
1537-68	68.0± 5%	55
1537-70	75.0± 5%	55
1537-72	82.0± 5%	50
1537-74	91.0± 5%	50
1537-76	100.0± 5%	50
1537-78	110.0± 5%	60
1537-80	120.0± 5%	65
1537-82	130.0± 5%	65
1537-84	150.0± 5%	65
1537-86	160.0± 5%	65
1537-88	180.0± 5%	65
1537-90	200.0± 5%	65
1537-92	220.0± 5%	65
1537-94	240.0± 5%	65

SERIES 2500

MILITARY SPECIFICATIONS:
MS-90539 (LT10K)
MS-90540 (LT10K)
MS-90541 (LT10K)



Part Number	Inductance Microhenries	Q Min.	Mold Size
CORE MATERIAL: IRON			
2500-00	270±5%	65	A
2500-02	300±5%	65	A
2500-04	330±5%	65	A
2500-06	360±5%	65	A
2500-08	390±5%	65	A
2500-10	430±5%	65	A
2500-12	470±5%	65	A
2500-14	500±5%	65	A
2500-15	510±5%	65	A
2500-16	560±5%	65	A
2500-18	620±5%	60	A
2500-20	680±5%	60	A
2500-22	750±5%	60	A
2500-24	820±5%	60	A
2500-26	910±5%	60	A
2500-28	1000±5%	60	A
2500-30	1100±5%	60	B
2500-32	1200±5%	60	B
2500-34	1300±5%	60	B
2500-36	1500±5%	65	B
2500-38	1600±5%	65	B
2500-40	1800±5%	65	B
2500-42	2000±5%	65	B
2500-44	2200±5%	70	B
2500-46	2400±5%	70	B
2500-48	2700±5%	70	B
2500-50	3000±5%	70	B
2500-52	3300±5%	70	B
2500-54	3600±5%	70	B
2500-56	3900±5%	80	C
2500-58	4300±5%	80	C
2500-60	4700±5%	80	C
2500-62	5000±5%	80	C
2500-63	5100±5%	80	C
2500-64	5600±5%	80	C
2500-66	6200±5%	80	C
2500-68	6800±5%	80	C
2500-70	7500±5%	80	C
2500-72	8200±5%	80	C
2500-74	9100±5%	80	C
2500-76	10000±5%	80	C

PHYSICAL PARAMETERS

Mold Size	Diameter	Length	Lead Size & Type
A	.190±.010	.440±.010	AWG #22 TCW
B	.215±.010	.560±.010	AWG #21 TCW
C	.240±.010	.740±.010	AWG #20 TCW

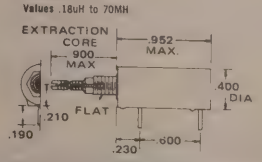
Mold Size	Lead Length	Power Dissipation in Watts 90°C	Max. Weight in Grams
A	1.44±.12	.166	.95
B	1.44±.12	.182	1.5
C	1.44±.12	.213	2.5

Delevan Products are manufactured and tested in accordance with MIL-C-15305 to meet the high levels of performance demanded by today's quality-minded manufacturers. A comprehensive program of Quality Assurance and Environmental Testing insure the reliability of **Delevan** components.

MOLDED VARIABLE RF

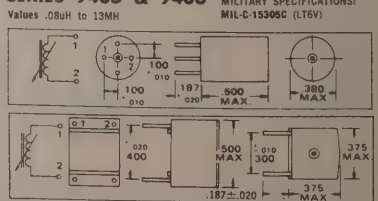
SERIES 4000 & 4100

MILITARY SPECIFICATIONS:
MS-90543 (LT12V)
MS-90546 (LT12V)
Values .18uH to 70MH



SERIES 9405 & 9406

MILITARY SPECIFICATIONS:
MIL-C-15305C (LT6V)
Values .08uH to 13MH



coils and inductive components

- Molded RF
- Shielded RF
- Micro-i coils & chip inductors
- Transformers
- Molded variable RF
- Potted coils
- Custom inductors

Delevan Division

AMERICAN PRECISION INDUSTRIES INC.

270 QUAKER RD./EAST AURORA, N.Y. 14052
TELEPHONE 716/652-3600 TELEX 91-293
OTHER DIVISIONS INCLUDE BASCO, DUSTEX, AMERICAN PRECISION INDUSTRIES (U.K.) LTD., DUSTEX OF CANADA INC.

SHIELDED RF

SERIES 1641

MILITARY SPECIFICATIONS:
MS-75087 (LT10K)
MS-75088 (LT10K)
MS-75089 (LT10K)

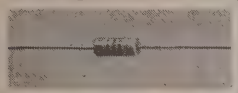
PHYSICAL PARAMETERS —
Length: .410±.020
Diameter: .162±.010
Lead Size: AWG #22 TCW.
Lead Length: 1.44±.12

Part Number	Inductance Microhenries	Q Min.
1641-101	.10±10%	50
1641-121	.12±10%	51
1641-151	.15±10%	51
1641-181	.18±10%	50
1641-221	.22±10%	49
1641-271	.27±10%	47
1641-331	.33±10%	46
1641-391	.39±10%	44
1641-471	.47±10%	44
1641-561	.56±10%	43
1641-681	.68±10%	42
1641-821	.82±10%	40
1641-102	1.0±10%	44
1641-122	1.2±10%	44
1641-152	1.5±10%	44
1641-182	1.8±10%	44
1641-222	2.2±10%	44
1641-272	2.7±10%	44
1641-332	3.3±10%	44
1641-392	3.9±10%	44
1641-472	4.7±10%	44
1641-562	5.6±10%	44
1641-682	6.8±10%	50
1641-822	8.2±10%	50
1641-103	10.0±10%	50
1641-123	12.0±10%	55
1641-153	15.0±10%	45
1641-183	18.0±10%	45
1641-223	22.0±10%	45
1641-273	27.0±10%	45
1641-333	33.0±10%	45
1641-393	39.0±10%	50
1641-473	47.0±10%	50
1641-563	56.0±10%	50
1641-683	68.0±10%	50
1641-823	82.0±10%	50
1641-104	100.0±10%	50
1641-124	120.0±10%	55
1641-154	150.0±10%	55
1641-184	180.0±10%	55
1641-224	220.0±10%	55
1641-274	270.0±10%	55
1641-334	330.0±10%	55
1641-394	390.0±10%	60
1641-474	470.0±10%	60
1641-564	560.0±10%	60
1641-684	680.0±10%	60
1641-824	820.0±10%	60
1641-105	1000.0±10%	60
1641-125	1200.0±10%	45
1641-155	1500.0±10%	45
1641-185	1800.0±10%	45
1641-225	2200.0±10%	45
1641-275	2700.0±10%	45
1641-335	3300.0±10%	45
1641-395	3900.0±10%	45
1641-475	4700.0±10%	45
1641-565	5600.0±10%	44
1641-685	6800.0±10%	40
1641-825	8200.0±10%	40
1641-106	10000.0±10%	40

SERIES 0925

NEW APPROVALS
MS-21426
MS-21427

PHYSICAL PARAMETERS —
Length: .250±.010
Diameter: .095±.010
Lead Size: AWG #26 TCW.
Lead Length: 1.5±.12



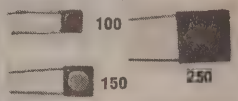
Part Number	Inductance Microhenries	Q Min.
0925-101	.10±10%	54
0925-121	.12±10%	52
0925-151	.15±10%	50
0925-181	.18±10%	49
0925-221	.22±10%	47
0925-271	.27±10%	46
0925-331	.33±10%	44
0925-391	.39±10%	42
0925-471	.47±10%	41
0925-561	.56±10%	41
0925-681	.68±10%	39
0925-821	.82±10%	38
0925-102	1.00±10%	37
0925-122	1.20±10%	40
0925-152	1.50±10%	41
0925-182	1.80±10%	43
0925-222	2.20±10%	45
0925-272	2.70±10%	48
0925-332	3.30±10%	49
0925-392	3.90±10%	50
0925-472	4.70±10%	53
0925-562	5.60±10%	54
0925-682	6.80±10%	55
0925-822	8.2±10%	55
0925-103	10.0±10%	57
0925-123	12.0±10%	36
0925-153	15.0±10%	38
0925-183	18.0±10%	40
0925-223	22.0±10%	40
0925-273	27.0±10%	40
0925-333	33.0±10%	41
0925-393	39.0±10%	42
0925-473	47.0±10%	44
0925-563	56.0±10%	44
0925-683	68.0±10%	45
0925-823	82.0±10%	45
0925-104	100.0±10%	40
0925-124	120.0±10%	31
0925-154	150.0±10%	33
0925-184	180.0±10%	33
0925-224	220.0±10%	35
0925-274	270.0±10%	37
0925-334	330.0±10%	40
0925-394	390.0±10%	38
0925-474	470.0±10%	36
0925-564	560.0±10%	36

MICRO-I® COILS

SERIES 100 150 & 250

MILITARY SPECIFICATIONS:
MS-21367 (LT10K) 100
MS-21368 (LT10K) 150
MS-21369 (LT10K) 250

PHYSICAL PARAMETERS (Max.):
100: .110" x .065"
150: .160" x .065"
250: .260" x .065"



Part Number	Inductance Microhenries	Q Min.
100-150	.015±30%	40
100-220	.022±30%	40
100-330	.033±30%	40
100-470	.047±30%	40
100-680	.068±30%	40
100-101	.100±30%	40
100-121	.12 ±20%	35
100-151	.15 ±20%	40
100-181	.18 ±20%	40
100-221	.22 ±20%	40
100-271	.27 ±20%	40
100-331	.33 ±20%	40
100-391	.39 ±20%	40
100-471	.47 ±20%	40
100-561	.56 ±20%	40
100-681	.68±20%	40
100-821	.82±20%	35
100-102	1.00±20%	35
100-122	1.20±10%	35
100-152	1.50±10%	32
100-182	1.80±10%	32
100-222	2.20±10%	35
100-272	2.70±10%	35
100-332	3.30±10%	37
100-392	3.90±10%	37
100-472	4.70±10%	40
100-562	5.60±10%	40
100-682	6.80±10%	40
100-822	8.20±10%	40
100-103	10.0 ±10%	40
150-123	12.0±10%	45
150-153	15.0±10%	45
150-183	18.0±10%	45
150-223	22.0±10%	45
150-273	27.0±10%	45
150-333	33.0±10%	45
150-393	39.0±10%	45
150-473	47.0±10%	45
150-563	56.0±10%	45
150-683	68.0±10%	45
150-823	82.0±10%	45
150-104	100 ±10%	45
250-124	120±10%	45
250-154	150±10%	45
250-184	180±10%	45
250-224	220±10%	45
250-274	270±10%	45
250-334	330±10%	45
250-394	390±10%	45
250-474	470±10%	40
250-564	560±10%	40
250-684	680±10%	40
250-824	820±10%	40
250-105	1000±10%	35

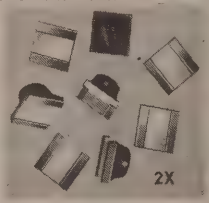
CHIP INDUCTORS

SERIES 103

MILITARY SPECIFICATIONS:
MIL-C-15305 (LT4K)

PHYSICAL PARAMETERS (Max.):
.110" sq. x .075" High.
Solder Rails both bottom and sides.

Illustration twice size for clarity.



Part Number	Inductance Microhenries	Q Min.
CORE MATERIAL: PHENOLIC		
103-100M	.010±20%	60
103-150M	.015±20%	55
103-220M	.022±20%	50
103-330M	.033±20%	48
103-470M	.047±20%	42
103-680M	.068±20%	36
103-101M	.100±20%	32
CORE MATERIAL: FERRITE		
103-121M	.12±20%	30
103-151M	.15±20%	25
103-181M	.18±20%	25
103-221K	.22±10%	25
103-271K	.27±10%	25
103-331K	.33±10%	25
103-391K	.39±10%	22
103-471K	.47±10%	22
103-561K	.56±10%	22
103-681K	.68±10%	22
103-821K	.82±10%	22
103-102K	1.0±10%	22
103-122K	1.2±10%	22
103-152K	1.5±10%	22
103-182K	1.8±10%	22
103-222K	2.2±10%	22
103-272K	2.7±10%	24
103-332K	3.3±10%	24
103-392K	3.9±10%	24
103-472K	4.7±10%	24
103-562K	5.6±10%	22
103-682K	6.8±10%	22
103-822K	8.2±10%	22
103-103K	10.0±10%	24
103-123K	12.0±10%	25
103-153K	15.0±10%	25
103-183K	18.0±10%	25
103-223K	22.0±10%	25
103-273K	27.0±10%	25

CUSTOM DESIGN

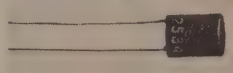
Delevan designs and manufactures specialized components for a wide variety of particular applications. Let us know your design parameters.

POTTED COILS

SERIES 2534

MILITARY SPECIFICATIONS:
MIL-C-15305 (LT6K)

PHYSICAL PARAMETERS —
Height: .345 Max.
Diameter: .25±.010
Lead Size: AWG. #24 TCW.
Lead Length: 1.62±.12
Lead Spacing: .200 +.010—.030

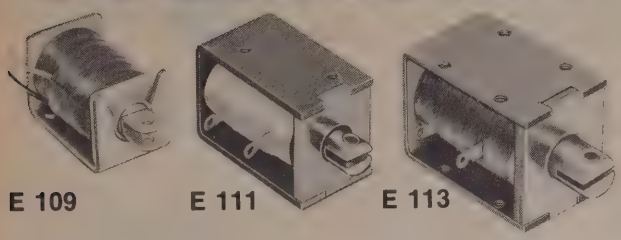


Part Number	Inductance Millihenries	Q Min.
2534-00	.10±10%	80
2534-02	.12±10%	80
2534-04	.15±10%	75
2534-06	.18±10%	70
2534-08	.22±10%	65
2534-10	.27±10%	80
2534-12	.33±10%	75
2534-14	.39±10%	70
2534-16	.47±10%	65
2534-18	.56±10%	65
2534-20	.68±10%	60
2534-22	.82±10%	50
2534-24	1.00±10%	45
2534-26	1.20±10%	70
2534-28	1.50±10%	70
2534-30	1.80±10%	70
2534-32	2.20±10%	70
2534-34	2.70±10%	65
2534-36	3.30±10%	65
2534-38	3.90±10%	65
2534-40	4.70±10%	60
2534-42	5.60±10%	60
2534-44	6.80±10%	55
2534-46	8.20±10%	50
2534-48	10.0 ±10%	45
2534-50	12.0 ±15%	35
2534-52	15.0 ±15%	35
2534-54	18.0 ±15%	35
2534-56	22.0 ±15%	35
2534-58	27.0 ±15%	35
2534-60	33.0 ±15%	30
2534-62	39.0 ±15%	30
2534-64	47.0 ±15%	30
2534-66	56.0 ±15%	25
2534-68	68.0 ±15%	20
2534-70	82.0 ±15%	18
2534-72	100.0 ±15%	15
2534-74	120.0 ±15%	10
2534-76	150.0 ±15%	10

This partial listing of Delevan Inductors is designed to give the Design Engineer a condensed overview of our product line. Our local representatives, distributors and factory sales engineers are available to serve your needs in the application of Delevan Products.

They will be happy to provide a complete catalog of all our coils and other inductive components. See the index for the complete listing of the Delevan sales organization.

SOLENOIDS



E 109 E 111 E 113

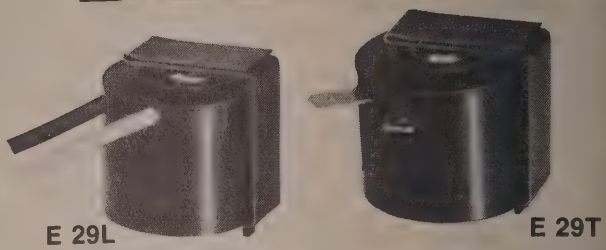
■ Voltages from 6 V to 230 V AC or DC ■ Custom lead lengths and terminal variations ■ Special plunger lengths and styles ■ Impregnated or encapsulated models

Specifications

	Power Requirement Intermittent/Continuous (25%)	Pull (Continuous Only)
E 109	18 W/4.5 W	8 oz. @ .05" gap
E 111	20 W/5.2 W	20 oz. @ .05" gap
E 113	30 W/8 W	35 oz. @ .05" gap

■ All metal parts are zinc plated. ■ Staked yoke standard. You may specify conical or flat plungers on production orders. ■ Life expectancy at rated load: 5×10^6.

BUZZERS



E 29L E 29T

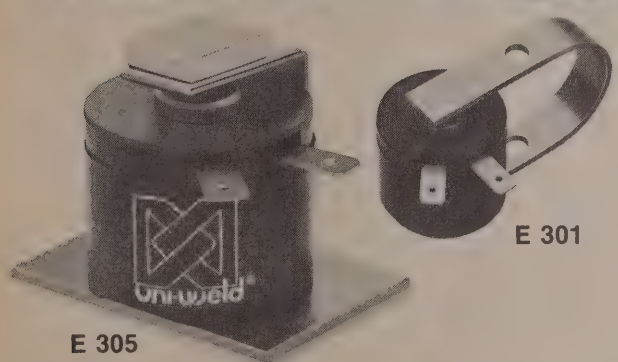
■ Produce loud, distinctive sound ■ Mount quickly easily with single screw ■ Manufactured with exclusive Uni-Weld® process

Specifications

Order by number code: E 29 or E 30	Terminals		Leads (5" Length Standard)	
	E 29	E 30	E 29	E 30
6 Volt, 60 Hz.	6E29T	6E30T	6E29L	6E30L
12 Volt, 60 Hz.	12E29T	12E30T	12E29L	12E30L
24 Volt, 60 Hz.	24E29T	24E30T	24E29L	24E30L
120 Volt, 60 Hz.	120E29T	120E30T	120E29L	120E30L

Ask about quantity prices.
Special voltages and terminals available.

VIBRATORS



E 301

E 305

■ Improve distribution and flow of solid or liquid materials ■ Long life ■ Noiseless ■ Adhesive mounting pad ■ Easy to install

Specifications
Model: Miniature Vibrator, E 305
Voltage: 115 V AC, continuous duty (other voltages to specification)
Input: 5 watts
Vibrating Frequency: 120 cps.
Force: 2.5 g's
Size: 1.50" (3.81 cm) x 1.00" (2.54 cm) x 1.25" (3.18 cm)
Weight: 1.8 oz. (50 gms.)

CLICKERS

E 8600

■ Creates distinctive signal in electronic keyboards ■ Reduces chance of error on "silent", "soft-touch" keyboards

Specifications
Duty Cycle: Approx. 15% max.
Coil: 20 ohm
Coil Insulation: 1500 V AC, 60 Hz. to frame. Other voltages to specification. Special windings available to suit other operating conditions.
Recommended Conditions: 20 volt pulse for 5 millisecond duration. (Signal may be varied by changing the duration of applied pulse.)
Termination: 8" leads standard. Terminals available.

Coil products to your specifications

Coils for any application: solenoids, power converters, relays, printers, reed switches, clocks, motors, clutches, tachometers, controls, transformers, vibrators, buzzers.

Check our capabilities: random wound bobbin coils, thread interweave coils, coil assemblies, transfer molding, encapsulation, impregnation, fluidized bedcoating, ultrasonic welding.

Endicott Coil Co., Inc.
P.O. Box 67 / 30 Charlotte Street
Binghamton, N.Y. 13905 / Phone: (607) 797-1263
TWX 510-252-0155

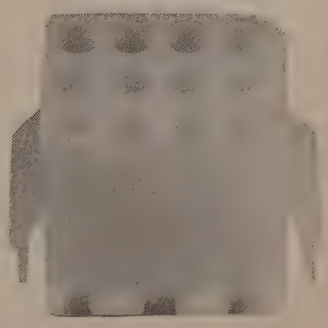
FROM DESIGN TO DELIVERY...

PRECISION INJECTION MOLDED COIL FORMS, BOBBINS, CONNECTOR HOUSINGS, AND COMMUNICATION PRODUCTS.

Harbison Industrial Products has complete in-plant facilities and services for injection molded products. Our in-house capability, in tool design, manufacture, part production and terminal insertion, assures the strictest quality for the components we provide. And our unique capability in either insert molding or post molding insertion can provide you with complete coil forms ready for winding.

The newest custom designed equipment and the ability to injection mold with modular family molding techniques — whereby a variety of different parts made from the same material can be produced in a single mold — affords attractive economies in tooling costs, without sacrificing the precision and quality of Harbison components.

We can meet or exceed the customary tolerances for injection molding your electrical and electronic components, and we mold in virtually any granular thermosetting plastic and most of the engineering thermoplastics, including nylon, Zytel 101*, Valox+, Delrin*, Noryl+, phenolics, and probably the material you're using now.



Write for the BR 16-2. It will give you an idea of how we may be able to help you.

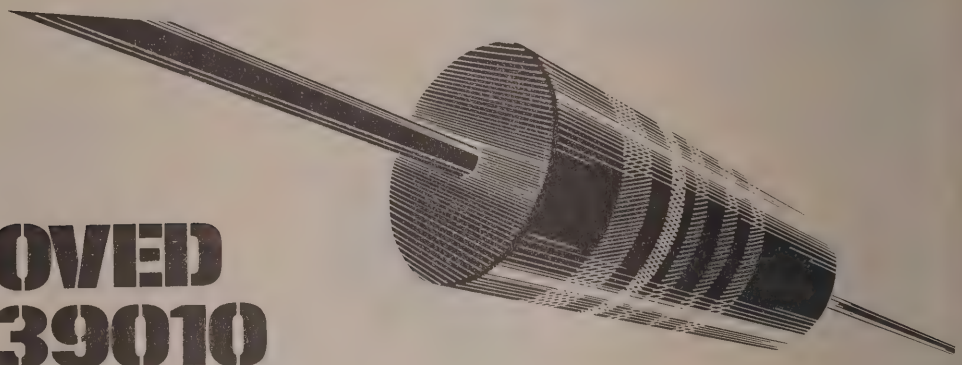
*Trademark of E. I. DuPont Company
+Trademark of General Electric Company

Harbison
INDUSTRIAL PRODUCTS INC.
A SUBSIDIARY OF THE POLYMER CORPORATION

PRECISION MOLDED PLASTICS
7205 HIBBS LANE, LEVITTOWN, PA 19057 · AC 215/943·9000

Nytronics Components Group, Inc.
ORANGE STREET, DARLINGTON, S. C. 29532
(803) 393-5421 — TWX 810-665-2182

Inductors



APPROVED MIL-C-39010

LATEST REVISION

MIL-C-39010/1A - /2A - /3A FAILURE RATE "R" .01%/1000 HRS.
MIL-C-39010/4A - /5A - /6A - /7A FAILURE "R" .01%/1000 HRS.
MIL-C-39010/8A - /9A - /10A FAILURE RATE "R" .01%/1000 HRS.

Nytronics' history of technical leadership in inductors has a new chapter. The first company to extend the standard line concept to variable inductors has remained ahead in every subsequent step of refinement and miniaturization.

Today, there's a new place for a familiar group of inductors under highest reliability military specifications—MIL-C-39010 (latest revision). The unique "T" lead construction eliminates fine wire consideration that has previously concerned design engineers on critical circuitry.

With sizes ranging from the world's smallest shielded inductor to the most complex variable inductor . . . shielded, unshielded and variable, in hundreds of off-the-shelf values . . . it makes good sense to check first with Nytronics or your local distributor.

Now tested and approved to highest reliability military specifications.

Nytronics Standard Inductor Part Number	Standard Military Series	New High Reliability Qualification
SWD	MS75087	MIL-C-39010-1
SWD	MS75088	MIL-C-39010-2
SWD	MS75089	MIL-C-39010-3
RFC-S	MS75008	MIL-C-39010-4
RFC-S	MS75101	MIL-C-39010-5
RFC-SS	MS18130	MIL-C-39010-6
RFC-SS	MS14046	MIL-C-39010-7
MD	MS75083	MIL-C-39010-8
MD	MS75084	MIL-C-39010-9
MD	MS75085	MIL-C-39010-10

Nytronics Components Group, Inc.
ORANGE STREET, DARLINGTON, S. C. 29532
(803) 393-5421 — TWX 810-665-2182

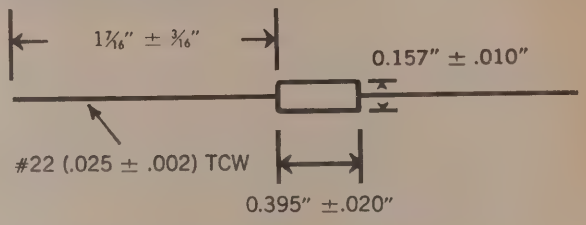
Inductors

MS-INDUCTOR SERIES 75087, 75088, 75089 MOLDED SHIELDED INDUCTOR

GRADE 1 CLASS A

Ultra-Reliable Molded Shielded Miniature Inductor. Inductance Range: 0.1uH to 100,000uH.

The **MS-INDUCTOR SERIES** are R.F. Inductors specifically designed to meet the demanding requirements of MIL-C-15305 (latest revision). The MS-INDUCTOR Series epoxy molded envelope and shielding offers the design engineer reliability, electrical performance, and minimum coupling in high density packaging.



ELECTRICAL CHARACTERISTICS

Inductance Tolerance: ±10% over the entire inductance range.
Dielectric Strength: 1000 volts RMS at sea level.
Self-Resonant Frequency: Measured per MIL-C-15305 (latest revision).
Q: Measured on a Q-Meter.
Maximum Current: Based on temperature rise not to exceed 15°C at 90°C ambient.

DENSITY CHARACTERISTICS

Volume: 0.0076 cubic inches **Weight:** 0.75 grams maximum
Shielding: At 1000 cycles two units assembled side by side exhibit less than 3% coupling.

PHYSICAL AND ENVIRONMENTAL CHARACTERISTICS

Operating Temperature: −55°C to +105°C.

Terminal Strength: Meets five pound pull test; five 360° rotations in alternate directions per MIL-C-15305 (latest revision).

Moisture, Vibration, and Shock Resistance: Meets requirements of MIL-C-15305 (latest revision), Grade 1, Class B. High frequency 10 cps to 2000 cps @ 20G ±10% maximum for 12 logarithmic swings each of 20 minute duration repeated for each of three mutually perpendicular planes. Shock: 100G, 6 MS.

Marking: Color coded per MIL-C-15305 (latest revision).

Material	MS No.	NCG P/N	L uH	Q min		Min. SRF MHz	Max. DCR Ω	Max. I mA	Incr.† I mA
					MHz				
PHENOLIC	MS75087-1	SWD	0.10	50	25	250	0.025	1790	>2900
	MS75087-2	SWD	0.12	51	25	250	0.034	1530	>2800
	MS75087-3	SWD	0.15	51	25	250	0.037	1470	>2750
	MS75087-4	SWD	0.18	50	25	250	0.047	1300	>2200
	MS75087-5	SWD	0.22	49	25	250	0.067	1100	>1700
	MS75087-6	SWD	0.27	47	25	250	0.11	855	>1500
	MS75087-7	SWD	0.33	46	25	250	0.13	780	>1300
	MS75087-8	SWD	0.39	44	25	250	0.18	670	>1100
	MS75087-9	SWD	0.47	44	25	235	0.25	565	>1000
	MS75087-10	SWD	0.56	43	25	210	0.33	490	> 900
	MS75087-11	SWD	0.68	42	25	190	0.45	420	> 750
	MS75087-12	SWD	0.82	40	25	180	0.59	370	> 600
IRON	MS75088-1	SWD	1.0	44	25	140	0.070	1070	>1900
	MS75088-2	SWD	1.2	44	7.9	130	0.093	895	>1600
	MS75088-3	SWD	1.5	44	7.9	115	0.12	815	>1300
	MS75088-4	SWD	1.8	44	7.9	105	0.14	775	>1200
	MS75088-5	SWD	2.2	44	7.9	100	0.19	650	>1100
	MS75088-6	SWD	2.7	44	7.9	92	0.28	535	> 950
	MS75088-7	SWD	3.3	44	7.9	85	0.35	480	> 800
	MS75088-8	SWD	3.9	44	7.9	75	0.40	450	> 750
	MS75088-9	SWD	4.7	44	7.9	70	0.55	380	> 650
	MS75088-10	SWD	5.6	44	7.9	65	0.72	335	> 550
	MS75088-11	SWD	6.8	50	7.9	55	1.02	280	> 500
	MS75088-12	SWD	8.2	50	7.9	50	1.32	250	> 475
	MS75088-13	SWD	10	50	7.9	46	1.62	220	> 450
	MS75088-14	SWD	12	55	2.5	44	2.00	200	> 400
FERRITE	MS75089-1	SWD	15	44	2.5	49	0.80	315	250
	MS75089-2	SWD	18	45	2.5	45	0.89	300	235
	MS75089-3	SWD	22	46	2.5	41	0.96	290	220
	MS75089-4	SWD	27	49	2.5	38	1.19	260	200
	MS75089-5	SWD	33	45	2.5	34	1.37	240	190
	MS75089-6	SWD	39	53	2.5	29	1.93	205	180
	MS75089-7	SWD	47	52	2.5	27	2.11	195	175
	MS75089-8	SWD	56	49	2.5	25	2.23	190	160
	MS75089-9	SWD	68	51	2.5	21	2.70	170	150
	MS75089-10	SWD	82	45	2.5	10.5	2.44	180	140

Material	MS No.	NCG P/N	L uH	Q min		Min. SRF MHz	Max. DCR Ω	Max. I mA	Incr.† I mA
					MHz				
FERRITE	MS75089-11	SWD	100	52	2.5	10.0	3.12	160	120
	MS75089-12	SWD	120	57	0.79	9.7	3.60	150	95
	MS75089-13	SWD	150	56	0.79	8.5	4.10	140	90
	MS75089-14	SWD	180	60	0.79	8.0	4.40	135	85
	MS75089-15	SWD	220	58	0.79	7.5	5.00	125	80
	MS75089-16	SWD	270	60	0.79	7.0	5.80	115	70
	MS75089-17	SWD	330	54	0.79	6.5	6.40	110	65
	MS75089-18	SWD	390	67	0.79	6.2	7.40	105	60
	MS75089-19	SWD	470	60	0.79	5.7	9.50	92	58
	MS75089-20	SWD	560	60	0.79	4.7	10.5	90	55
	MS75089-21	SWD	680	60	0.79	4.5	11.8	80	50
	MS75089-22	SWD	820	57	0.79	4.2	13.0	80	45
	MS75089-23	SWD	1000	60	0.79	3.8	17.5	70	40
	MS75089-24	SWD	1200	45	0.25	1.5	22.1	60	35
	MS75089-25	SWD	1500	49	0.25	1.2	26.5	55	33
	MS75089-26	SWD	1800	47	0.25	1.0	29.9	50	30
	MS75089-27	SWD	2200	50	0.25	0.97	33.8	50	27
	MS75089-28	SWD	2700	47	0.25	0.92	47.3	40	25
	MS75089-29	SWD	3300	43	0.25	0.84	53.0	40	22
	MS75089-30	SWD	3900	43	0.25	0.80	73.8	35	20
	MS75089-31	SWD	4700	44	0.25	0.74	81.6	31	19
	MS75089-32	SWD	5600	45	0.25	0.73	98.9	28	17
	MS75089-33	SWD	6800	43	0.25	0.66	111.0	27	16
	MS75089-34	SWD	8200	42	0.25	0.54	119.0	26	15
	MS75089-35	SWD	10,000	39	0.25	0.47	137.0	24	14
	MS75089-36	SWD	12,000	31	0.079	0.33	143.0	23	13
	MS75089-37	SWD	15,000	31	0.079	0.29	157.0	22	12
	MS75089-38	SWD	18,000	31	0.079	0.28	175.0	21	10
	MS75089-39	SWD	22,000	27	0.079	0.25	274.0	17	9
	MS75089-40	SWD	27,000	27	0.079	0.21	308.0	16	8
	MS75089-41	SWD	33,000	27	0.079	0.19	343.0	15	7.5
	MS75089-42	SWD	39,000	27	0.079	0.17	376.0	15	6.0
	MS75089-43	SWD	47,000	23	0.079	0.16	473.0	13	5.5
	MS75089-44	SWD	56,000	23	0.079	0.14	512.0	13	5.0
	MS75089-45	SWD	68,000	23	0.079	0.13	580.0	12	4.0
	MS75089-46	SWD	82,000	21	0.079	0.12	618.0	11	3.5
	MS75089-47	SWD	100,000	18	0.079	0.11	678.0	11	3.0

† INCREMENTAL CURRENT: The D.C. current required to cause a 5% reduction in the nominal inductance value.

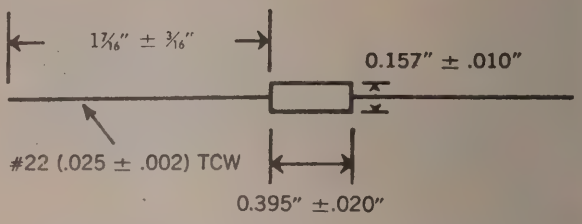
Nytronics Components Group, Inc.
ORANGE STREET, DARLINGTON, S. C. 29532
(803) 393-5421 — TWX 810-665-2182

Inductors

MS-INDUCTOR SERIES
90537
MOLDED SHIELDED INDUCTOR
(Manufactured per MS-90537)

Ultra-Reliable Molded Shielded Miniature Inductor.
Inductance Range: 0.1uH to 100,000uH.
Unique "T" design eliminates Fine Wire considerations.

The **MS-INDUCTOR SERIES** are R.F. Inductors specifically designed to meet the demanding requirements of MIL-C-15305 (latest revision). The MS-INDUCTOR Series epoxy molded envelope and shielding offers the design engineer reliability, electrical performance, and minimum coupling in high density packaging.



GRADE 1 CLASS B

ELECTRICAL CHARACTERISTICS

Inductance Tolerance: ±10% over the entire inductance range.
Dielectric Strength: 700 volts RMS at sea level.
Self-Resonant Frequency: Measured per MIL-C-15305 (latest revision).
Q: Measured on Q-Meter.
Maximum Current: Based on temperature rise not to exceed 35°C at 90°C ambient.

DENSITY CHARACTERISTICS

Volume: 0.0076 cubic inches **Weight:** 0.75 grams maximum
Shielding: At 1000 cycles two units assembled side by side exhibit less than 3% coupling.

PHYSICAL AND ENVIRONMENTAL CHARACTERISTICS

Operating Temperature: —55°C to +125°C.

Terminal Strength: Meets five pound pull test; five 360° rotations in alternate directions per MIL-C-15305 (latest revision).

Moisture, Vibration, and Shock Resistance: Meets requirements of MIL-C-15305D, Grade 1, Class B. High frequency 10 cps to 2000 cps @ 20G ±10% maximum for 12 logarithmic swings each of 20 minute duration repeated for each of three mutually perpendicular planes. Shock: 100G, 6 MS.

Marking: Color coded per MIL-C-15305 (latest revision).

Material	MS Catalog No.	NCG P/N	L µH	Q Min.	MHz	Min. SRF MHz	Max. DCR Ω	Max. I mA	Incr.** I mA
PHENOLIC	90537-1	SWD	0.10	50	25	250	0.025	2900	>2900
	90537-2	SWD	0.12	51	25	250	0.034	2800	>2800
	90537-3	SWD	0.15	51	25	250	0.037	2750	>2750
	90537-4	SWD	0.18	50	25	250	0.047	2200	>2200
	90537-5	SWD	0.22	49	25	250	0.067	1700	>1700
	90537-6	SWD	0.27	47	25	250	0.11	1500	>1500
	90537-7	SWD	0.33	46	25	250	0.13	1300	>1300
	90537-8	SWD	0.39	44	25	250	0.18	1100	>1100
	90537-9	SWD	0.47	44	25	235	0.25	1000	>1000
	90537-10	SWD	0.56	43	25	210	0.33	900	>900
	90537-11	SWD	0.68	42	25	190	0.45	750	>750
	90537-12	SWD	0.82	40	25	180	0.59	600	>600
IRON	90537-13	SWD	1.0	47	25	140	0.070	1900	>1900
	90537-14	SWD	1.2	46	7.9	130	0.093	1600	>1600
	90537-15	SWD	1.5	45	7.9	115	0.12	1300	>1300
	90537-16	SWD	1.8	43	7.9	105	0.14	1200	>1200
	90537-17	SWD	2.2	45	7.9	100	0.19	1100	>1100
	90537-18	SWD	2.7	46	7.9	92	0.28	950	>950
	90537-19	SWD	3.3	44	7.9	85	0.35	800	>800
	90537-20	SWD	3.9	44	7.9	75	0.40	750	>750
	90537-21	SWD	4.7	44	7.9	70	0.55	650	>650
	90537-22	SWD	5.6	47	7.9	65	0.72	550	>550
	90537-23	SWD	6.8	50	7.9	55	1.02	500	>500
	90537-24	SWD	8.2	50	7.9	50	1.32	475	>475
	90537-25	SWD	10	49	7.9	46	1.62	450	>450
	90537-26	SWD	12	55	2.5	44	2.00	400	>400
FERRITE	90537-27	SWD	15	44	2.5	49	0.80	620	250
	90537-28	SWD	18	45	2.5	45	0.89	610	235
	90537-29	SWD	22	46	2.5	41	0.96	600	220
	90537-30	SWD	27	49	2.5	38	1.19	500	200
	90537-31	SWD	33	45	2.5	34	1.37	490	190
	90537-32	SWD	39	53	2.5	29	1.93	410	180
	90537-33	SWD	47	52	2.5	27	2.11	400	175
	90537-34	SWD	56	49	2.5	25	2.23	380	160
	90537-35	SWD	68	51	2.5	21	2.70	370	150
	90537-36	SWD	82	45	2.5	10.5	2.44	360	140

Material	MS Catalog No.	NCG P/N	L µH	Q Min.	MHz	Min. SRF MHz	Max. DCR Ω	Max. I mA	Incr.** I mA
FERRITE	90537-37	SWD	100	52	2.5	10.0	3.12	325	120
	90537-38	SWD	120	57	.79	9.7	3.60	290	95
	90537-39	SWD	150	56	.79	8.5	4.10	275	90
	90537-40	SWD	180	60	.70	8.0	4.40	260	85
	90537-41	SWD	220	58	.79	7.5	5.00	250	80
	90537-42	SWD	270	60	.79	7.0	5.80	240	70
	90537-43	SWD	330	54	.79	6.5	6.40	225	65
	90537-44	SWD	390	67	.79	6.2	7.40	200	60
	90537-45	SWD	470	60	.79	5.7	9.50	180	58
	90537-46	SWD	560	60	.79	4.7	10.5	174	55
	90537-47	SWD	680	60	.79	4.5	11.8	168	50
	90537-48	SWD	820	57	.79	4.2	13.0	152	45
	90537-49	SWD	1000	65	.79	3.8	17.5	135	40
	90537-50	SWD	1200	45	.25	1.5	22.1	115	35
	90537-51	SWD	1500	49	.25	1.2	26.5	110	33
	90537-52	SWD	1800	47	.25	1.0	29.9	105	30
	90537-53	SWD	2200	50	.25	0.97	33.8	99	27
	90537-54	SWD	2700	47	.25	0.92	47.3	83	25
	90537-55	SWD	3300	43	.25	0.84	53.0	80	22
	90537-56	SWD	3900	43	.25	0.80	73.8	67	20
	90537-57	SWD	4700	44	.25	0.74	81.6	63	19
	90537-58	SWD	5600	45	.25	0.73	98.9	56	17
	90537-59	SWD	6800	43	.25	0.66	111.0	54	16
	90537-60	SWD	8200	42	.25	0.54	119.0	52	15
	90537-61	SWD	10,000	39	.25	0.47	137.0	49	14
	90537-62	SWD	12,000	31	.079	0.33	143.0	46	13
	90537-63	SWD	15,000	31	.079	0.29	157.0	45	12
	90537-64	SWD	18,000	31	.079	0.28	175.0	41	10
	90537-65	SWD	22,000	27	.079	0.25	274.0	33	9
	90537-66	SWD	27,000	27	.079	0.21	308.0	31	8
	90537-67	SWD	33,000	27	.079	0.19	343.0	30	7.5
	90537-68	SWD	39,000	27	.079	0.17	376.0	27	6.0
	90537-69	SWD	47,000	23	.079	0.16	473.0	26	5.5
	90537-70	SWD	56,000	23	.079	0.14	512.0	25	5.0
	90537-71	SWD	68,000	23	.079	0.13	580.0	24	4.0
	90537-72	SWD	82,000	21	.079	0.12	618.0	23	3.5
	90537-73	SWD	100,000	18	.079	0.11	678.0	22	3.0

**INCREMENTAL CURRENT — The D.C. current required to cause a 5% reduction in the nominal inductance value.

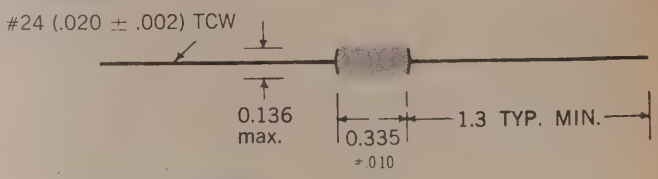
Nytronics Components Group, Inc.
ORANGE STREET, DARLINGTON, S. C. 29532
(803) 393-5421 — TWX 810-665-2182

Inductors

SUPER WEE-WEE-DUCTOR

An Ultra-Reliable molded shielded inductor. Subminiature size for high density circuits. Great Inductance-to-size ratio. .10 uH to 10,000 uH. 0.136" diameter x 0.335" length. 61 stock values.

The **SUPER WEE-WEE-DUCTOR,** a shielded miniaturized inductor, provides a greater inductance-to-size ratio in a molded epoxy envelope. Use of unique "T" lead construction on all values from 15 uH to 10,000 uH assures exceptional reliability in ranges where fine wire sizes are used. This MS inductor series is designed to meet the stringent requirements of MIL-C-15305 (latest revision). This provides the design engineer with utmost reliability, electrical performance, and minimum coupling in high density packaging.



GRADE 1 CLASS A

ELECTRICAL CHARACTERISTICS

Inductance Tolerance: ±10% (Q-Meter).
Dielectric Strength: 700 volts RMS at sea level.
Self-Resonant Frequency: Measured with full length leads on Q-Meter.
Q: Measured on Q-Meter.
Rating: I maximum based on 1/3 watt dissipation.

DENSITY CHARACTERISTICS

Volume: 0.0041 cubic inches.
Weight: 0.50 grams maximum.
Shielding: Less than 3% coupling with two units mounted side by side at 1000 cycles.

PHYSICAL AND ENVIRONMENTAL CHARACTERISTICS

Operating Temperature: −55°C to +105°C.
Terminal Strength: Meets five pounds pull test; five 360° rotations in alternate directions per MIL-C-15305 (latest revision).
Moisture, Vibration and Shock Resistance: Meets requirements of MIL-C-15305 (latest revision). High Frequency: 10 cps to 2000 cps @ 20G ±10% maximum for 12 logarithmic swings each of 20 minute duration repeated for each of three mutually perpendicular planes. Shock: 100G, 6 MS.
Marking: Color coded per MIL-C-15305 (latest revision).

SUPER WEE-WEE-DUCTOR STANDARD VALUES

Material	MS No.	NCG Part No.	L µH	Q min.	MHz	min. Fo MHz	approx. Cd Pf	Max. DCR Ω	Max. I mA	Incr.* I mA
PHENOLIC	MS21399-1	SW-W- 0.10	0.10	42	25	480	.70	.087	1650	>1650
	MS21399-2	SW-W- 0.12	0.12	42	25	460	.63	.090	1630	>1630
	MS21399-3	SW-W- 0.15	0.15	42	25	400	.66	.098	1550	>1550
	MS21399-4	SW-W- 0.18	0.18	42	25	360	.62	.117	1420	>1420
	MS21399-5	SW-W- 0.22	0.22	42	25	340	.63	.141	1330	>1330
	MS21399-6	SW-W- 0.27	0.27	42	25	320	.59	.157	1230	>1230
	MS21399-7	SW-W- 0.33	0.33	42	25	295	.55	.178	1140	>1140
	MS21399-8	SW-W- 0.39	0.39	42	25	275	.55	.208	1060	>1060
	MS21399-9	SW-W- 0.47	0.47	41	25	250	.56	.257	960	> 960
	MS21399-10	SW-W- 0.56	0.56	39	25	238	.52	.283	915	> 915
	MS21399-11	SW-W- 0.68	0.68	36	25	224	.50	.337	840	> 840
	MS21399-12	SW-W- 0.82	0.82	35	25	205	.50	.470	720	> 720
IRON	MS21400-1	SW-W- 1.0	1.0	38	25	135	.87	.170	1180	>1180
	MS21400-2	SW-W- 1.2	1.2	38	7.9	124	.87	.190	1150	>1150
	MS21400-3	SW-W- 1.5	1.5	38	7.9	114	.87	.212	1050	>1050
	MS21400-4	SW-W- 1.8	1.8	38	7.9	105	.89	.242	990	> 990
	MS21400-5	SW-W- 2.2	2.2	38	7.9	95	.88	.263	950	> 950
	MS21400-6	SW-W- 2.7	2.7	38	7.9	85	.83	.320	880	> 880
	MS21400-7	SW-W- 3.3	3.3	38	7.9	78	.81	.345	820	> 820
	MS21400-8	SW-W- 3.9	3.9	42	7.9	74	.76	.411	755	> 755
	MS21400-9	SW-W- 4.7	4.7	42	7.9	68	.75	.562	650	> 650
	MS21400-10	SW-W- 5.6	5.6	42	7.9	62	.77	.742	565	> 565
	MS21400-11	SW-W- 6.8	6.8	45	7.9	55	.80	1.00	485	> 485
	MS21400-12	SW-W- 8.2	8.2	47	7.9	51	.78	1.20	440	> 440
	MS21400-13	SW-W- 10	10	51	7.9	45	.78	1.84	355	> 335
	MS21400-14	SW-W- 12	12	51	2.5	41	.85	2.60	300	> 300
FERRITE "T" LEAD	MS21401-1	SW-W- 15	15	45	2.5	48	.55	.635	610	200
	MS21401-2	SW-W- 18	18	45	2.5	44	.55	.728	570	175
	MS21401-3	SW-W- 22	22	45	2.5	37	.60	.825	530	160
	MS21401-4	SW-W- 27	27	45	2.5	32	.65	.950	500	155
	MS21401-5	SW-W- 33	33	46	2.5	30	.65	1.26	430	150
	MS21401-6	SW-W- 39	39	46	2.5	27	.66	1.42	405	145
	MS21401-7	SW-W- 47	47	46	2.5	23	.66	1.72	370	140
	MS21401-8	SW-W- 56	56	48	2.5	21	.75	2.03	340	130
	MS21401-9	SW-W- 68	68	48	2.5	18.5	.75	2.29	320	120
	MS21401-10	SW-W- 82	82	46	2.5	17.0	.75	2.55	305	115
	MS21401-11	SW-W- 100	100	46	2.5	15.5	.78	2.92	280	100
	MS21401-12	SW-W- 120	120	53	0.79	14.5	.72	3.30	235	80
	MS21401-13	SW-W- 150	130	53	0.79	13.0	.70	4.30	215	68
	MS21401-14	SW-W- 180	180	53	0.79	11.5	.70	5.40	200	64
	MS21401-15	SW-W- 220	220	55	0.79	10.0	.84	6.65	150	60
	MS21401-16	SW-W- 270	270	57	0.79	9.50	.74	7.60	140	58
	MS21401-17	SW-W- 330	330	57	0.79	8.50	.75	8.50	130	56
	MS21401-18	SW-W- 390	390	57	0.79	8.00	.74	10.0	120	54
	MS21401-19	SW-W- 470	470	57	0.79	7.20	.70	13.5	100	52
	MS21401-20	SW-W- 560	560	61	0.79	6.40	.70	14.5	95	50
	MS21401-21	SW-W- 680	680	61	0.79	5.80	.78	16.0	90	48
	MS21401-22	SW-W- 820	820	58	0.79	5.30	.78	19.0	85	47
	MS21401-23	SW-W- 1000	1000	58	0.79	4.80	.78	21.5	80	45
	MS21401-24	SW-W- 1200	1200	55	0.25	2.90	1.9	23	100	40
	MS21401-25	SW-W- 1500	1500	55	0.25	2.80	1.6	30	90	35
	MS21401-26	SW-W- 1800	1800	55	0.25	2.60	1.5	33	86	32
	MS21401-27	SW-W- 2200	2200	55	0.25	2.55	1.3	40	78	30
	MS21401-28	SW-W- 2700	2700	55	0.25	2.40	1.2	43	74	28
	MS21401-29	SW-W- 3300	3300	55	0.25	2.00	1.1	58	65	26
	MS21401-30	SW-W- 3900	3900	55	0.25	1.95	1.1	76	56	23
	MS21401-31	SW-W- 4700	4700	55	0.25	1.85	1.1	85	53	20
	MS21401-32	SW-W- 5600	5600	55	0.25	1.75	1.0	100	48	18
	MS21401-33	SW-W- 6800	6800	50	0.25	1.58	1.0	127	43	15
	MS21401-34	SW-W- 8200	8200	50	0.25	1.55	1.0	150	40	12
	MS21401-35	SW-W- 10,000	10,000	50	0.25	1.45	1.0	190	37	10

*INCREMENTAL CURRENT — The D.C. current to cause a 5% reduction in the nominal inductance value.

Nytronics Components Group, Inc.
ORANGE STREET, DARLINGTON, S. C. 29532
(803) 393-5421 — TWX 810-665-2182

Inductors

WEE-DUCTOR

Miniature Shielded Inductor with high inductance-to-size ratio.
0.10uH to 180,000uH in 76 values
Designed to meet MIL-C-15305B.

The **WEE-DUCTOR** was the first miniature shielded inductor that Nytronics standardized for stock delivery. This encapsulated non-flammable shielded unit in a 0.164" diameter by 0.450" long envelope offers the design engineer extremely high inductance for density packaging. The WEE-DUCTOR is designed to meet the environmental requirements of MIL-C-15305 Rev. B. **GRADE 2 CLASS B**

ELECTRICAL CHARACTERISTICS

Inductance Tolerance: 0.1 to 22uH ±10% (Q-Meter); 27uH to 1,000 ±5% (1KC Bridge); 1,200uH to 56,000uH ±10% (1KC Bridge) 68,000uH to 180,000uH ±20% (1KC Bridge) measured at point on leads ½ inch from body.

Dielectric Strength: 700 volts RMS at sea level.

Self-Resonant Frequency: Minimum f_o to be not less than 80% of published data, and measured with full length leads on Q-Meter.

Q: Measured on Q-Meter.

Maximum Current: Based on temperature rise not to exceed 40°C at 85°C ambient.

DENSITY CHARACTERISTICS

Volume: 0.0087 cubic inches **Weight:** 0.75 grams maximum
Shielding: Less than 3% coupling with two units measured side by side at 1000 cycles.

PHYSICAL AND ENVIRONMENTAL CHARACTERISTICS

Operating Temperature: —55°C to +125°C.
Terminal Strength: Meets five pound pull test; five 360° rotations in alternate directions per MIL-C-15305B.
Marking: Printed with pertinent data.

MATERIAL	NCG PART NO.	L µH	Q min	MHz	Approx. SRF MHz	approx. Cd µµF	Max. DCR Ω	Max. I mA	Incr* I mA
PHENOLIC	WEE- 0.10	0.10	63	25	>500	0.67	0.020	4000	4000
	WEE- 0.12	0.12	61	25	>500	0.67	0.029	3350	3350
	WEE- 0.15	0.15	59	25	>500	0.67	0.032	3000	3000
	WEE- 0.18	0.18	57	25	458	0.67	0.040	2850	2850
	WEE- 0.22	0.22	56	25	414	0.67	0.045	2700	2700
	WEE- 0.27	0.27	50	25	373	0.67	0 08	2000	2000
	WEE- 0.33	0.33	48	25	337	0.67	0.09	1900	1900
	WEE- 0.39	0.39	48	25	310	0.67	0.16	1420	1420
	WEE- 0.47	0.47	48	25	283	0.67	0.17	1400	1400
	WEE- 0.56	0.56	45	25	258	0.67	0.36	960	960
	WEE- 0.68	0.68	45	25	235	0.67	0.37	940	940
	WEE- 0.82	0.82	41	25	214	0.67	0.46	870	870
IRON	WEE- 1.0	1.0	42	7.9	164	0.92	0.062	2300	2300
	WEE- 1.2	1.2	43	7.9	150	0.92	0.067	2200	2200
	WEE- 1.5	1.5	41	7 9	135	0.92	0.16	1420	1420
	WEE- 1.8	1.8	42	7.9	124	0.92	0.17	1370	1370
	WEE- 2.2	2.2	42	7.9	112	0.92	0.19	1300	1300
	WEE- 2 7	2.7	41	7.9	107	0.92	0.20	1270	1270
	WEE- 3 3	3.3	40	7 9	91.5	0.92	0.31	1030	1030
	WEE- 3 9	3.9	40	7 9	84.5	0.92	0.33	1000	1000
	WEE- 4.7	4 7	40	7.9	76.5	0.92	0.58	750	750
	WEE- 5 6	5 6	40	7 9	69.5	0.92	0.64	710	710
	WEE- 6 8	6 8	40	7.9	63.5	0 92	0.68	680	680
	WEE- 8 2	8 2	45	7 9	57.5	0.92	1.3	500	500
	WEE- 10	10	46	2.5	52.5	0.92	1.4	480	480
	WEE- 12	12	47	2.5	47.5	0.92	1.5	460	460
	WEE- 15	15	47	2.5	42.5	0.92	1.7	440	440
FERRITE	WEE- 18	18	45	2 5	53.5	0.49	0.88	610	235
	WEE- 22	22	47	2 5	47.0	0.50	0 95	590	220
	WEE- 27	27	42	2 5	44.0	0.48	1 15	530	200
	WEE- 33	33	43	2 5	40.0	0.48	1.2	520	193
	WEE- 39	39	45	2.5	36.5	0.48	1.6	450	183
	WEE- 47	47	46	2 5	33.0	0.49	1 8	420	177
	WEE- 56	56	40	2.5	30.0	0.49	2.2	390	170
	WEE- 68	68	40	2 5	27.0	0.50	2.3	375	165
	WEE- 82	82	42	2 5	17 5	1.0	2.4	360	160
	WEE- 100	100	63	79	15.0	1.0	2.6	345	157
	WEE- 120	120	62	.79	14.0	1 0	2.9	330	145

MATERIAL	NCG PART NO.	L µH	Q min	MHz	Approx SRF MHz	approx. Cd µµF	Max. DCR Ω	Max. I mA	Incr* I mA
FERRITE	WEE- 150	150	63	.79	12.5	1.0	3.3	315	126
	WEE- 180	180	60	.79	11.5	1.0	3.6	300	110
	WEE- 220	220	57	.79	11.0	0.94	4.1	280	105
	WEE- 270	270	52	.79	10.0	0.92	4.8	260	91
	WEE- 330	330	50	.79	9.0	0.92	5.6	240	87
	WEE- 390	390	43	.79	8.5	0.87	6.2	230	72
	WEE- 470	470	66	.79	8.0	0.83	10.0	180	67
	WEE- 560	560	64	.79	7.5	0.82	11.5	170	65
	WEE- 680	680	71	.79	6.5	0.87	12.0	160	60
	WEE- 820	820	67	.79	6.0	0.87	13.8	150	55
	WEE- 1000	1000	62	.79	5.6	0.87	16.0	140	52
	WEE- 1200	1200	52	.250	1.490	9 0	18.2	135	50
	WEE- 1500	1500	51	250	1.460	8.0	23.7	118	48
	WEE- 1800	1800	51	.250	1.420	6.5	30.2	105	42
	WEE- 2200	2200	50	.250	1.300	6.8	33.7	99	37
	WEE- 2700	2700	51	.250	1.180	6.8	43.1	87	33
	WEE- 3300	3300	52	250	1.050	7.0	48.7	82	30
	WEE- 3900	3900	48	.250	.960	7.0	62.7	72	29
	WEE- 4700	4700	48	.250	.840	7.4	70.5	68	28
	WEE- 5600	5600	48	.250	.810	6.8	104	56	24
	WEE- 6800	6800	45	250	.740	6.8	118	53	20
	WEE- 8200	8200	38	.250	.580	9.2	146	47	18
	WEE- 10,000	10,000	36	.079	.470	11.5	76 6	66	15
	WEE- 12,000	12,000	36	.079	.370	15.0	109	55	14
	WEE- 15,000	15,000	38	.079	.330	15.0	119	52	13
	WEE- 18,000	18,000	38	.079	305	15.0	138	49	13
	WEE- 22,000	22,000	32	.079	.295	13.0	219	39	12
	WEE- 27,000	27,000	32	079	.270	13.0	259	35	12
	WEE- 33,000	33,000	32	.079	.250	12.5	296	33	11
	WEE- 39,000	39,000	30	.079	.215	14.0	395	29	10
	WEE- 47,000	47,000	25	.079	.210	12.5	452	27	9
	WEE- 56,000	56,000	25	.079	.195	12.0	499	26	8
	WEE- 68,000	68,000	20	.079	.130	18.4	395	29	1 1
	WEE- 82,000	82,000	20	.079	.125	16.5	452	27	1.1
	WEE-100,000	100,000	20	.079	.115	16.2	499	26	1.1
	WEE-120,000	120,000	20	070	105	16.8	540	23	1.1
	WEE-150,000	150,000	20	.060	.098	13.4	750	20	1.0
	WEE-180,000	180,000	20	.050	.094	13.4	880	18	0.8

*INCREMENTAL CURRENT — The D.C. current to cause a 5% reduction in the nominal inductance value.

Nytronics Components Group, Inc.
ORANGE STREET, DARLINGTON, S. C. 29532
(803) 393-5421 — TWX 810-665-2182

Inductors

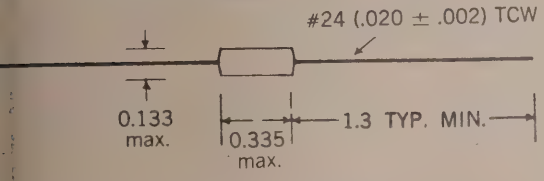
WEE-WEE-
DUCTOR SERIES

The smallest shielded inductor for high density circuits 0.10 to 1,000 uh 0.133" diameter x 0.335" length. We have 49 stock values.

GRADE 2 CLASS B

The **WEE-WEE-DUCTOR** offers the Design Engineer a subminiature shielded inductor to solve special problems in density circuit application. This shielded inductor has great inductance-to-size ratio and is designed to meet the stringent requirements of MIL-C-15305 Rev. B.

0.10 to 10,000uH
0.133" diameter x 0.335" length
49 stock values



ELECTRICAL CHARACTERISTICS

Inductance Tolerance:	±10% (Q-Meter).
Dielectric Strength:	700 volts RMS at sea level.
Self-Resonant Frequency:	Minimum f_o to be not less than 80% of published data, and measured with full length leads on Q-Meter.
Rating:	I maximum based on ⅓ watt dissipation.

DENSITY CHARACTERISTICS

Volume:	0.0041 cubic inches.
Weight:	0.50 grams maximum.
Shielding:	Less than 3% coupling with two units mounted side by side at 1000 cycles.

PHYSICAL AND ENVIRONMENTAL CHARACTERISTICS

Operating Temperature:	−55°C to +125°C.
Terminal Strength:	Meets five pound pull test; five 360° rotations in alternate directions per MIL-C-15305 (latest revision).
Marking:	Color coded per MIL-C-15305 (latest revision).

WEE-WEE-DUCTOR STANDARD VALUES

NCG PART NO.	L	Q min.		approx. SRF	Max. DCR	Max. I	Incr.* I
	uH		MHz	MHz	Ω	mA	mA
WEE-WEE- 0.10	0.10	42	25	500	.112	1720	>1720
WEE-WEE- 0.12	0.12	42	25	500	.126	1630	>1630
WEE-WEE- 0.15	0.15	42	25	500	.138	1550	>1550
WEE-WEE- 0.18	0.18	42	25	458	.165	1420	>1420
WEE-WEE- 0.22	0.22	42	25	414	.198	1330	>1330
WEE-WEE- 0.27	0.27	42	25	373	.220	1230	>1230
WEE-WEE- 0.33	0.33	42	25	360	.258	1140	>1140
WEE-WEE- 0.39	0.39	42	25	339	.292	1060	>1060
WEE-WEE- 0.47	0.47	41	25	309	.360	960	> 960
WEE-WEE- 0.56	0.56	39	25	295	.397	915	> 915
WEE-WEE- 0.68	0.68	36	25	270	.472	840	> 840
WEE-WEE- 0.82	0.82	35	25	250	.638	720	> 720
WEE-WEE 1.0	1.0	42	25	170	.208	1260	>1260
WEE-WEE- 1.2	1.2	38	7.9	150	.225	1210	>1210
WEE-WEE- 1.5	1.5	38	7.9	139	.265	1120	>1120
WEE-WEE- 1.8	1.8	38	7.9	129	.285	1080	>1080
WEE-WEE- 2.2	2.2	36	7.9	118	.330	1000	>1000
WEE-WEE- 2.7	2.7	38	7.9	106	.381	935	> 935
WEE-WEE- 3.3	3.3	38	7.9	98	.432	875	> 875
WEE-WEE- 3.9	3.9	40	7.9	91	.576	755	> 755
WEE-WEE- 4.7	4.7	42	7.9	83	.787	650	> 650
WEE-WEE- 5.6	5.6	42	7.9	77	1.04	565	> 565
WEE-WEE- 6.8	6.8	45	7.9	67	1.40	485	> 485
WEE-WEE- 8.2	8.2	47	7.9	62	1.68	440	> 440
WEE-WEE- 10	10	51	7.9	55	2.58	355	> 355
WEE-WEE- 12	12	51	2.5	49	3.65	300	> 300
WEE-WEE- 15	15	45	2.5	55	.862	620	200
WEE-WEE- 18	18	43	2.5	50	1.02	570	175
WEE-WEE- 22	22	42	2.5	45	1.12	545	160
WEE-WEE- 27	27	37	2.5	41	1.28	510	155
WEE-WEE- 33	33	46	2.5	37	1.70	440	150
WEE-WEE- 39	39	38	2.5	33	1.99	405	145
WEE-WEE- 47	47	42	2.5	29	2.41	370	140
WEE-WEE- 56	56	41	2.5	27	2.85	340	130
WEE-WEE- 68	68	46	2.5	23	3.21	320	120
WEE-WEE- 82	82	46	2.5	21	3.57	305	115
WEE-WEE- 100	100	43	2.5	19	4.10	280	100
WEE-WEE- 120	120	50	0.79	16	5.97	235	80
WEE-WEE- 150	150	49	0.79	15	7.05	215	68
WEE-WEE- 180	180	56	0.79	14	8.12	200	64
WEE-WEE- 220	220	53	0.79	12	14.8	150	60
WEE-WEE- 270	270	57	0.79	11.5	16.8	140	58
WEE-WEE- 330	330	57	0.79	10.5	18.6	130	56
WEE-WEE- 390	390	57	0.79	10.0	21.1	120	54
WEE-WEE- 470	470	50	0.79	8.5	32.2	100	52
WEE-WEE- 560	560	50	0.79	7.5	36.4	95	50
WEE-WEE- 680	680	56	0.79	7.0	41.1	90	48
WEE-WEE- 820	820	49	0.79	6.5	45.0	85	47
WEE-WEE-1000	1000	49	0.79	6.0	52.0	80	45

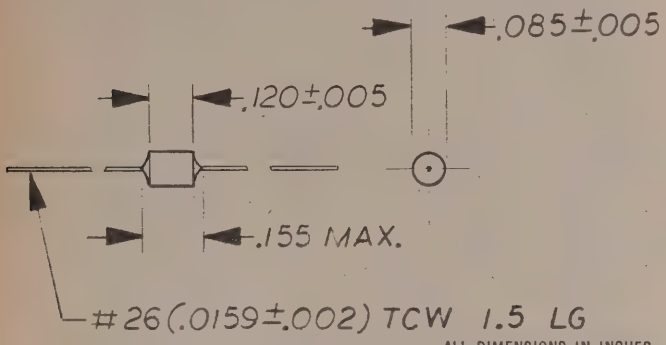
*INCREMENTAL CURRENT — The D.C. current to cause a 5% reduction in the nominal inductance value.

Nytronics Components Group, Inc.
ORANGE STREET, DARLINGTON, S. C. 29532
(803) 393-5421 — TWX 810-665-2182

Inductors

PEE-WEE SERIES

The amazing **PEE-WEE DUCTOR** represents a 66% size reduction from the smallest magnetically shielded axial leaded inductor series heretofore available anywhere. Furthermore, this size reduction was obtained with negligible loss of electrical performance by employing several unique concepts in RF coil design.



ALL DIMENSIONS IN INCHES

ELECTRICAL CHARACTERISTICS:

Inductance Tolerance: ± 10% (Std).

L,Q,F, values: Measurements per MIL-C-15305. (latest revision).

Incremental Current: Incremental current in table is for 5% reduction in inductance value.

Dielectric Strength: 300 Volts RMS @ Sea Level.

*SRF minimum not less than 80% of specified values.

DENSITY CHARACTERISTICS:

Volume: .0007 Cubic Inches

Weight: 0.12 Grams

Shielding: 5% maximum coupling for two units side by side.

Marking: EIA color coded

PHYSICAL AND ENVIRONMENTAL CHARACTERISTICS:

Terminal pull: 3 lbs. minimum.

Environmental: Grade 2 Class A

OPTIONS:

Inductance Values: Additional Inductance Values from .025 uH up to 10,000 uH available on special order.

PEE-WEE DUCTOR STANDARD VALUES

NCG PART NO.	L μH	Q min. @	MHz	*SRF MHz	Max. DCR Ω	Max. I mA	Incr. I mA
PW- 0.10	.10	40	25	500	.060	1500	*
PW- 0.12	.12	40	25	480	.070	1400	*
PW- 0.15	.15	40	25	450	.080	1300	*
PW- 0.18	.18	40	25	430	.090	1200	*
PW- 0.22	.22	40	25	390	.11	1100	*
PW- 0.27	.27	40	25	340	.12	1000	*
PW- 0.33	.33	40	25	310	.14	950	*
PW- 0.39	.39	40	25	280	.16	900	*
PW- 0.47	.47	40	25	250	.20	800	*
PW- 0.56	.56	40	25	220	.25	750	*
PW- 0.68	.68	35	25	200	.27	700	*
PW- 0.82	.82	35	25	180	.36	600	*
PW- 1.0	1.0	35	25	165	.40	525	*
PW- 1.2	1.2	35	7.9	150	.70	425	*
PW- 1.5	1.5	35	7.9	130	.80	400	*
PW- 1.8	1.8	35	7.9	120	.90	350	*
PW- 2.2	2.2	35	7.9	110	1.3	320	*
PW- 2.7	2.7	35	7.9	100	1.8	275	*
PW- 3.3	3.3	35	7.9	70	1.7	290	*
PW- 3.9	3.9	35	7.9	65	1.8	275	*
PW- 4.7	4.7	35	7.9	58	2.6	225	*
PW- 5.6	5.6	35	7.9	54	2.9	210	*
PW- 6.8	6.8	35	7.9	50	3.3	200	*
PW- 8.2	8.2	35	7.9	48	4.5	170	*
PW- 10	10	35	7.9	45	4.8	165	*
PW- 12	12	35	2.5	40	2.0	250	230
PW- 15	15	35	2.5	36	2.5	230	180
PW- 18	18	35	2.5	31	3.5	195	150
PW- 22	22	35	2.5	28	4.5	170	135
PW- 27	27	35	2.5	25	5.0	160	115
PW- 33	33	35	2.5	23	5.5	150	105
PW- 39	39	35	2.5	22	7.0	140	100
PW- 47	47	35	2.5	21	7.5	135	95
PW- 56	56	35	2.5	19	8.0	130	90
PW- 68	68	35	2.5	18	9.0	120	83
PW- 82	82	35	2.5	16	14	95	65
PW- 100	100	35	2.5	14	16	90	70
PW- 120	120	35	.79	9.5	10	115	40
PW- 150	150	35	.79	8.8	12	105	35
PW- 180	180	35	.79	8.1	15	90	32
PW- 220	220	35	.79	7.8	20	80	30
PW- 270	270	35	.79	7.3	23	75	27
PW- 330	330	35	.79	6.8	26	70	25
PW- 390	390	35	.79	6.0	35	65	23
PW- 470	470	35	.79	5.6	37	60	21
PW- 560	560	35	.79	5.0	40	58	20
PW- 680	680	35	.79	4.3	48	54	18
PW- 820	820	35	.79	3.8	54	47	17
PW-1000	1000	35	.79	3.5	65	43	15

* GREATER THAN MAX I

Nytronics Components Group, Inc.
ORANGE STREET, DARLINGTON, S. C. 29532
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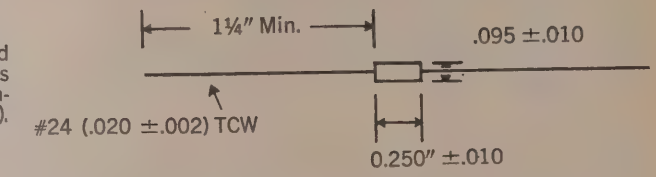
Inductors

DECI-DUCTOR

New Subminiature Inductor 0.10uH to 1000uH Range
0.100" diameter by 0.250" length 49 STANDARD VALUES

The **DECI-DUCTOR** offers the design engineer epoxy-molded reliability and uniformity in a subminiature R.F. Inductor. This Nytronics R.F. Inductor line is designed to meet all the environmental specifications of MIL-C-15305 (latest revision).



GRADE 2 CLASS B

ELECTRICAL CHARACTERISTICS

Inductance Tolerance: ±10% over entire range.
Dielectric Strength: 700 volts RMS at sea level.
Self-Resonant Frequency: Measured per MIL-C-15305 (latest revision).
Rating: Maximum Current based on 35°C rise in 90°C ambient.

DENSITY CHARACTERISTICS

Volume: 0.002 cubic inches **Weight:** 0.35 grams

PHYSICAL AND ENVIRONMENTAL CHARACTERISTICS

Operating Temperature: —55°C to +125°C

Terminal Strength: Meets three pound pull test; five 360° rotations in alternate directions per MIL-C-15305 (latest revision).

Moisture, Vibration, and Shock Resistance: Meets requirements of MIL-C-15305 (latest revision), 10 cps to 2000 cps @ 15 G ±10% maximum for 12 logarithmic swings each of 20 minute duration repeated for each of three mutually perpendicular planes. Shock: 50G, 11 MS (body mounted).

Marking: Color coded per MIL-C-15305 (latest revision).

	NCG Part No.	L uH	Q Min.	MHz	Min. SRF MHz	Max. DCR Ohms	Max I. mA
PHENOLIC	DD-0.10	0.10	40	25	690	0.07	2000
	DD-0.12	0.12	40	25	650	0.08	1900
	DD-0.15	0.15	38	25	600	0.09	1750
	DD-0.18	0.18	38	25	550	0.10	1600
	DD-0.22	0.22	35	25	510	0.11	1550
	DD-0.27	0.27	35	25	470	0.15	1350
	DD-0.33	0.33	32	25	410	0.21	1150
	DD-0.39	0.39	32	25	370	0.29	970
	DD-0.47	0.47	32	25	340	0.35	820
	DD-0.56	0.56	32	25	310	0.41	700
	DD-0.68	0.68	33	25	280	0.65	600
	DD-0.82	0.82	30	25	255	0.82	500
	DD-1.00	1.00	30	25	240	1.10	475
IRON	DD-1.20	1.20	30	7.9	155	0.16	1200
	DD-1.50	1.50	32	7.9	140	0.20	1100
	DD-1.80	1.80	35	7.9	130	0.32	900
	DD-2.20	2.20	35	7.9	120	0.37	760
	DD-2.70	2.70	37	7.9	105	0.49	700
	DD-3.30	3.30	45	7.9	95	0.67	575
	DD-3.90	3.90	45	7.9	87	0.95	500
	DD-4.70	4.70	45	7.9	80	1.10	475
	DD-5.60	5.60	52	7.9	75	1.60	380
	DD-6.80	6.80	52	7.9	65	1.80	350
	DD-8.20	8.20	60	7.9	62	2.40	300
	DD-10.0	10.0	60	7.9	52	3.40	265
	DD-12.0	12.0	45	2.5	42	2.40	300
	DD-15.0	15.0	47	2.5	36	2.70	275
	DD-18.0	18.0	50	2.5	32	3.00	260
	DD-22.0	22.0	50	2.5	28	3.30	250
	DD-27.0	27.0	50	2.5	25	3.80	240
	DD-33.0	33.0	50	2.5	30	3.80	260
FERRITE	DD-39.0	39.0	50	2.5	26	4.10	240
	DD-47.0	47.0	50	2.5	24	4.40	210
	DD-56.0	56.0	50	2.5	22	5.70	205
	DD-68.0	68.0	52	2.5	19	6.50	180
	DD-82.0	82.0	52	2.5	17	7.30	175
	DD-100	100	50	2.5	15	8.20	165
	DD-120	120	28	0.79	14	14	110
	DD-150	150	28	0.79	13	16	105
	DD-180	180	28	0.79	12	18	100
	DD-220	220	26	0.79	11	25	90
	DD-270	270	26	0.79	10	33	75
	DD-330	330	26	0.79	9.0	37	70
	DD-390	390	25	0.79	8.0	51	60
	DD-470	470	27	0.79	7.0	56	58
	DD-560	560	27	0.79	6.5	61	55
	DD-680	680	28	0.79	6.0	70	50
	DD-820	820	28	0.79	5.5	91	45
	DD-1000	1000	28	0.79	5.2	102	40

Nytronics Components Group, Inc.
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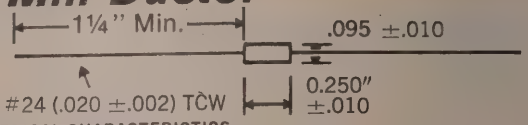
Inductors

Mili-Ductor



—MS INDUCTOR SERIES 75083, 75084, 75085 MOLDED INDUCTOR/0.100 uh to 1000 uh

Markings: Color coded per MIL-C-15305 (Latest Rev.)

The MS Inductor Series are RF Inductors specifically designed to meet the demanding requirements of MIL-C-15305 (latest revision). This MS Series is Epoxy Molded enveloped features reliability and uniformity in a Subminiature Inductor.

ELECTRICAL CHARACTERISTICS
Inductance Tolerance: ±10% over entire range.
Dielectric Strength: 1000 volts RMS at sea level.
Self-Resonant Frequency: Measured per MIL-C-15305 (latest revision).
Rating: Maximum current based on: 35°C rise in 90° ambient for phenolic, 15°C rise in 90° ambient for iron, 35°C rise in 70° ambient for ferrite core inductors.

DENSITY CHARACTERISTICS
Volume: 0.002 cubic inches; **Weight** .030 grams.

PHYSICAL AND ENVIRONMENTAL CHARACTERISTICS
Operating Temperature: —55°C to +125°C phenolic core, —55°C to +105°C iron and ferrite core.
Terminal Strength: Meets five pound pull test; five 360° rotations in alternate directions per MIL-C-15305 (latest revision).
Moisture, Vibration, and Shock Resistance: Meets requirements of MIL-C-15305 (latest revision), 10 cps to 2000 cps @ 20G ±10% maximum for 12 logarithmic swings each of 20 minute duration repeated for each of three mutually perpendicular planes. **Shock:** 100G, 6 MS (body mounted).

MS No.	NCG Part No.	±10% Inductance uh	Q Min.	Test Frequency (L & Q) MHz	Self-resonant Frequency, Min. MHz	DC Resistance Max. Ohms	Rated DC Current MA
MS75083-01	MD	.10	40	25.0	680	.08	1350
MS75083-02	MD	.12	40	25.0	640	.09	1270
MS75083-03	MD	.15	38	25.0	600	.10	1200
MS75083-04	MD	.18	35	25.0	550	.12	1105
MS75083-05	MD	.22	33	25.0	510	.14	1025
MS75083-06	MD	.27	33	25.0	430	.16	960
MS75083-07	MD	.33	30	25.0	410	.22	815
MS75083-08	MD	.39	30	25.0	365	.30	700
MS75083-09	MD	.47	30	25.0	330	.35	650
MS75083-10	MD	.56	30	25.0	300	.50	545
MS75083-11	MD	.68	28	25.0	275	.60	495
MS75083-12	MD	.82	28	25.0	250	.85	415
MS75083-13	MD	1.00	25	25.0	230	1.00	385
MS75084-01	MD	1.2	25	7.9	150	.18	590
MS75084-02	MD	1.5	28	7.9	140	.22	535
MS75084-03	MD	1.8	30	7.9	125	.30	455
MS75084-04	MD	2.2	30	7.9	115	.40	395
MS75084-05	MD	2.7	37	7.9	100	.55	355
MS75084-06	MD	3.3	45	7.9	90	.85	270
MS75084-07	MD	3.9	45	7.9	80	1.00	250
MS75084-08	MD	4.7	45	7.9	75	1.20	230
MS75084-09	MD	5.6	50	7.9	65	1.80	185
MS75084-10	MD	6.8	50	7.9	60	2.00	175
MS75084-11	MD	8.2	55	7.9	55	2.70	155
MS75084-12	MD	10	55	7.9	50	3.70	130
MS75084-13	MD	12	45	2.5	40	2.70	155
MS75084-14	MD	15	40	2.5	35	2.80	150
MS75084-15	MD	18	50	2.5	30	3.10	145
MS75084-16	MD	22	50	2.5	25	3.30	140
MS75084-17	MD	27	50	2.5	20	3.50	135
MS75085-01	MD	33	45	2.5	24	3.4	130
MS75085-02	MD	39	45	2.5	22	3.6	125
MS75085-03	MD	47	45	2.5	20	4.5	110
MS75085-04	MD	56	45	2.5	18	5.7	100
MS75085-05	MD	68	50	2.5	15	6.7	92
MS75085-06	MD	82	50	2.5	14	7.3	88
MS75085-07	MD	100	50	2.5	13	8	84
MS75085-08	MD	120	30	.79	12	13	66
MS75085-09	MD	150	30	.79	11	15	61
MS75085-10	MD	180	30	.79	10	17	57
MS75085-11	MD	220	30	.79	9	21	52
MS75085-12	MD	270	30	.79	8	25	47
MS75085-13	MD	330	30	.79	7	28	45
MS75085-14	MD	390	30	.79	6.5	35	40
MS75085-15	MD	470	30	.79	6	42	36
MS75085-16	MD	560	30	.79	5	46	35
MS75085-17	MD	680	30	.79	4	60	30
MS75085-18	MD	820	30	.79	3.8	65	29
MS75085-19	MD	1000	30	.79	3.4	72	28

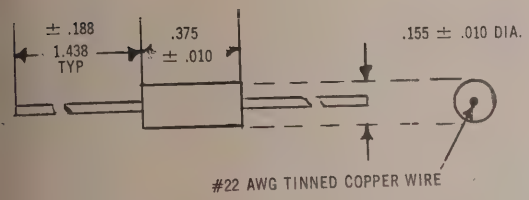
Nytronics Components Group, Inc.
ORANGE STREET, DARLINGTON, S. C. 29532
(803) 393-5421 — TWX 810-665-2182

Inductors

RFC-SS SERIES

Molded inductors specifically designed to meet MIL-C-15305 (latest revision). Inductance from 0.15 to 240uH.

GRADE 1 CLASS A (0.15-4.7)
CLASS B (5.6-240)



ELECTRICAL CHARACTERISTICS

Inductance Tolerance: 0.15 to 33 uH ±10%
36 to 240 uH ±5%
Measured on Q meter per MIL-C-15305 (latest revision).

Dielectric Strength: 1000 volts RMS @ sea level

Rated Current: Based on max. temp. rise of 35°C (ambient 90°C) for RFC-SS-0.15 to 4.7
15°C (ambient 90°C) for RFC-SS-5.6 to -240

PHYSICAL AND ENVIRONMENTAL CHARACTERISTICS

Operating Temperature: Max. 125°C for RFC-SS-0.15 to -4.7
Max. 105°C for RFC-SS-5.6 to -240

Terminal Strength: Meets five pound pull test per MIL-C-15305 (latest revision).

Moisture, Vibration, and Shock Resistance: Meets requirements of MIL-C-15305 (latest revision), high frequency 10 cps

Printing: Color banded.

MS NO.	NCG PART NO.	L	Q Min.	@	Min. SRF	Max. DCR	Rated DC Cur.
		uH		MHz	MHz	Ω	mA
MS18130-1	RFC-SS- .15	0.15	50	25	525	0.03	2450
MS18130-2	RFC-SS- .22	0.22	50	25	450	0.05	1900
MS18130-3	RFC-SS- .33	0.33	45	25	360	0.09	1400
MS18130-4	RFC-SS- .47	0.47	45	25	310	0.12	1225
MS18130-5	RFC-SS- .56	0.56	50	25	280	0.13	1220
MS18130-6	RFC-SS- .68	0.68	50	25	250	0.15	1100
MS18130-7	RFC-SS- .82	0.82	50	25	220	0.22	900
MS18130-8	RFC-SS- 1.00	1.00	50	25	200	0.29	830
MS18130-9	RFC-SS- 1.20	1.20	33	7.9	180	0.42	650
MS18130-10	RFC-SS- 1.50	1.5	33	7.9	160	0.50	600
MS18130-11	RFC-SS- 1.80	1.8	33	7.9	150	0.65	525
MS18130-12	RFC-SS- 2.2	2.2	33	7.9	135	0.95	435
MS18130-13	RFC-SS- 2.7	2.7	33	7.9	120	1.20	385
MS18130-14	RFC-SS- 3.3	3.3	33	7.9	110	2.00	300
MS18130-15	RFC-SS- 3.9	3.9	33	7.9	100	2.30	280
MS18130-16	RFC-SS- 4.7	4.7	33	7.9	90	2.60	260
MS14046-1	RFC-SS- 5.6	5.6	45	7.9	60	0.32	750
MS14046-2	RFC-SS- 6.8	6.8	50	7.9	55	0.50	600
MS14046-3	RFC-SS- 8.2	8.2	50	7.9	50	0.60	545
MS14046-4	RFC-SS- 10	10.0	55	7.9	45	0.90	445
MS14046-5	RFC-SS- 12	12	65	2.5	42	1.10	404
MS14046-6	RFC-SS- 15	15	65	2.5	40	1.40	370
MS14046-7	RFC-SS- 18	18	75	2.5	34	2.25	280
MS14046-8	RFC-SS- 22	22	75	2.5	30	2.50	265
MS14046-9	RFC-SS- 27	27	60	2.5	25	2.60	260
MS14046-10	RFC-SS- 33	33	65	2.5	19	3.00	250
MS90538-1	RFC-SS- 36	36	60	2.5	15.5	2.50	180
MS90538-2	RFC-SS- 39	39	60	2.5	14.5	2.60	176
MS90538-3	RFC-SS- 43	43	60	2.5	13.7	2.70	172
MS90538-4	RFC-SS- 47	47	55	2.5	13.0	2.75	170
MS90538-5	RFC-SS- 51	51	55	2.5	12.7	2.85	167
MS90538-6	RFC-SS- 56	56	55	2.5	12.0	3.00	164
MS90538-7	RFC-SS- 62	62	55	2.5	11.5	3.15	160
MS90538-8	RFC-SS- 68	68	55	2.5	11.0	3.30	156
MS90538-9	RFC-SS- 75	75	55	2.5	10.5	3.70	147
MS90538-10	RFC-SS- 82	82	50	2.5	10.3	3.9	143
MS90538-11	RFC-SS- 91	91	50	2.5	10.0	4.3	136
MS90538-12	RFC-SS-100	100	50	2.5	9.5	4.5	133
MS90538-13	RFC-SS-110	110	60	0.79	8.9	4.9	128
MS90538-14	RFC-SS-120	120	65	0.79	8.7	5.2	124
MS90538-15	RFC-SS-130	130	65	0.79	8.5	5.45	121
MS90538-16	RFC-SS-150	150	65	0.79	8.0	6.05	114
MS90538-17	RFS-SS-160	160	65	0.79	7.5	6.40	111
MS90538-18	RFC-SS-180	180	65	0.79	7.0	6.75	108
MS90538-19	RFC-SS-200	200	65	0.79	6.5	7.10	106
MS90538-20	RFC-SS-220	220	65	0.79	6.2	7.45	103
MS90538-21	RFC-SS-240	240	65	0.79	5.9	7.8	101

Nytronics Components Group, Inc.
ORANGE STREET, DARLINGTON, S. C. 29532
(803) 393-5421 — TWX 810-665-2182

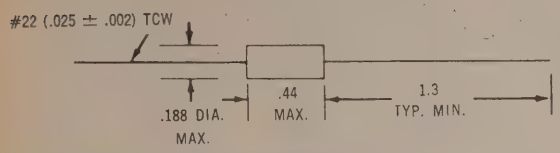
Inductors

RFC-S SERIES

Proven reliability molded inductors specifically designed to meet MIL-C-15305 (latest revision). Inductance 0.1 to 1000uH.

GRADE 1 CLASS B

ACTUAL SIZE



ELECTRICAL CHARACTERISTICS

Inductance Tolerance: 0.1 to 22uH ±10% on Q-Meter
27uH to 100 ±5%
1,000 cps bridge
120uH to 1000uH ±5% on Q-Meter

Dielectric Strength: 700 volts RMS at sea level.

Self-Resonant Frequency: Minimum f_o to be not less than 80% of published data and measured with full length leads on Grid-Dip Meter.

Q: Measured on Q-Meter.

Rating: ⅓ watt dissipation for series S

DENSITY CHARACTERISTICS

Volume: 0.012 cu. in.

Weight: 0.90 grams

PHYSICAL AND ENVIRONMENTAL CHARACTERISTICS

Operating Temperature: −55°C to +125°C.

Terminal Strength: Meets five pound pull test per MIL-C-15305 (latest revision).

Moisture, Vibration, and Shock Resistance: Meets requirements of MIL-C-15305 Grade 1, Class B. High frequency 10 cps to 2000 cps @ 30G ±10% maximum for 12 logarithmic swings, each of 20 minute duration repeated for each of three mutually perpendicular planes. (body mounted)

MS NO.	NCG PART NO.*	L	Q min		approx. SRF	Max. DCR	max. I	MATERIAL
		uH		MHz	MHz	Ω	mA	
MS21389-1	RFC-S- 0.10	0.10	85	50	500	.02	4000	PHENOLIC
MS21389-2	RFC-S- 0.12	0.12	85	50	500	0.25	3500	
MS21389-3	RFC-S- 0.15	0.15	85	50	500	.03	3000	
MS21389-4	RFC-S- 0.18	0.18	75	50	500	.03	3000	
MS21389-5	RFC-S- 0.22	0.22	75	50	500	.03	3000	
MS21389-6	RFC-S- 0.27	0.27	70	45	470	.04	2700	
MS21389-7	RFC-S- 0.33	0.33	70	40	440	.05	2500	
MS21389-8	RFC-S- 0.39	0.39	65	40	400	.08	2000	
MS21389-9	RFC-S- 0.47	0.47	60	25	360	.08	2000	
MS21389-10	RFC-S- 0.56	0.56	55	25	330	.10	1700	
MS21389-11	RFC-S- 0.68	0.68	55	25	300	.12	1500	
MS21389-12	RFC-S- 0.82	0.82	50	25	275	.18	1300	
MS21389-13	RFC-S- 1.0	1.0	50	20	250	.24	1100	
MS21389-14	RFC-S- 1.2	1.2	45	20	220	.35	1000	
MS21389-15	RFC-S- 1.5	1.5	45	15	200	.43	850	
MS21389-16	RFC-S- 1.8	1.8	45	15	180	.65	720	
MS21389-17	RFC-S- 2.2	2.2	45	15	165	.80	610	
MS21390-1	RFC-S- 2.7	2.7	55	10	110	.12	1600	IRON
MS21390-2	RFC-S- 3.3	3.3	55	10	100	.15	1400	
MS21390-3	RFC-S- 3.9	3.9	60	10	95	.23	1200	
MS21390-4	RFC-S- 4.7	4.7	70	7.9	90	.30	1000	
MS21390-5	RFC-S- 5.6	5.6	65	7.9	80	.45	900	
MS21390-6	RFC-S- 6.8	6.8	65	7.9	70	.55	800	
MS21390-7	RFC-S- 8.2	8.2	60	7.9	65	.65	720	
MS21390-8	RFC-S- 10	10	60	5	60	.73	650	
MS21390-9	RFC-S- 12	12	65	5	53	1.1	590	
MS21390-10	RFC-S- 15	15	80	2.5	47	1.4	500	
MS21390-11	RFC-S- 18	18	75	2.5	43	1.6	460	
MS21390-12	RFC-S- 22	22	75	2.5	40	1.8	430	
MS21390-13	RFC-S- 27	27	75	2.5	36	2.7	360	
MS21390-14	RFC-S- 33	33	85	2.5	32	3.5	300	
MS21390-15	RFC-S- 39	39	80	2.5	26	3.8	290	
MS21390-16	RFC-S- 47	47	80	2.5	22	4.0	275	
MS21390-17	RFC-S- 56	56	75	2.5	19	4.4	265	
MS21390-18	RFC-S- 68	68	75	2.5	16	4.7	250	
MS21390-19	RFC-S- 82	82	75	2.5	13	5.3	235	
MS21390-20	RFC-S- 100	100	75	1.5	10	6.0	220	
MS21390-21	RFC-S- 120	120	65	0.79	7.2	5.0	170	
MS21390-22	RFC-S- 150	150	65	0.79	6.7	5.8	164	
MS21390-23	RFC-S- 180	180	65	0.79	6.3	6.6	158	
MS21390-24	RFC-S- 220	220	65	0.79	5.9	7.4	155	
MS21390-25	RFC-S- 270	270	65	0.79	5.6	8.0	150	
MS21390-26	RFC-S- 300	300	65	0.79	5.3	8.6	145	
MS21390-27	RFC-S- 330	330	65	0.79	5.0	8.9	142	
MS21390-28	RFC-S- 360	360	65	0.79	4.7	9.6	137	
MS21390-29	RFC-S- 390	390	65	0.79	4 5	9.9	135	
MS21390-30	RFC-S- 430	430	65	0.79	4.3	10.4	131	
MS21390-31	RFC-S- 470	470	65	0.79	4.0	10.9	128	
MS21390-32	RFC-S- 510	510	65	0.79	3.8	11.6	124	
MS21390-33	RFC-S- 560	560	65	0.79	3.6	11.8	123	
MS21390-34	RFC-S- 620	620	60	0.79	3.5	12.5	120	
MS21390-35	RFC-S- 680	680	60	0.79	3.4	13.5	115	
MS21390-36	RFC-S- 750	750	60	0.79	3.3	14.0	113	
MS21390-37	RFC-S- 820	820	60	0.79	3.1	15.0	110	
MS21390-38	RFC-S- 910	910	60	0.79	3.0	15.5	107	
MS21390-39	RFC-S-1000	1000	60	0.79	2.8	16.5	104	

* NCG Part No. cannot be used as the MS Number.

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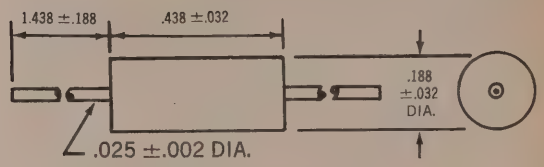
Inductors

MS-INDUCTOR SERIES 75008-75101-90539 MOLDED INDUCTOR



ALL DIMENSIONS IN INCHES

Proven reliability molded inductors designed to meet MS75008 and MIL-C-15305 (latest revision). Inductance 0.15 to 1000 uh.

ELECTRICAL CHARACTERISTICS

Inductance Tolerance: 0.15 to 0.47 uhy ±20%; 0.56 to 1000 uh ±10%
Dielectric Strength: 1000 Volts RMS at sea level
Max. Temp. Rise: 35°C

PHYSICAL AND ENVIRONMENTAL CHARACTERISTICS

Operating Temperature: —55°C to +125°C.
Terminal Strength: Meets five pound pull test per MIL-C-15305 (latest revision).
Moisture, Vibration, and Shock Resistance: Meets requirements of MIL-C-15305 (latest revision). High frequency 10 cps to 2000 cps @ 20G ±10% maximum for 12 logarithmic swings, each of 20 minute duration repeated for each of three mutually perpendicular planes. (body mounted)
Volume: S Type — 0.012 cu. in.
Weight: S Type — 0.90 grams
Marking: Color banded per MIL-C-15305 (latest revision).

	MS No.	NCG Part No.	Inductance ±5% uh	Q Min.	Test Frequency MHz	Self-Resonant Frequency, Min. MHz	DC Resistance Maximum Ohms	Rated DC Current mA	Material
GRADE 1, CLASS B	MS75008-21	RFC-S	0.15 ±20%	55	25.0	510	0.030	3,000	PHENOLIC
	MS75008-22	RFC-S	0.22 ±20%	50	25.0	415	0.035	2,800	
	MS75008-23	RFC-S	0.33 ±20%	50	25.0	350	0.065	2,000	
	MS75008-24	RFC-S	0.47 ±20%	50	25.0	300	0.085	1,700	
	MS75008-25	RFC-S	0.56 ±10%	50	25.0	270	0.125	1,450	
	MS75008-26	RFC-S	0.68 ±10%	45	25.0	250	0.150	1,300	
	MS75008-27	RFC-S	0.82 ±10%	40	25.0	210	0.205	1,100	
	MS75008-28	RFC-S	1.00 ±10%	40	25.0	200	0.290	930	
	MS75008-29	RFC-S	1.20 ±10%	30	7.9	180	0.400	785	
	MS75008-30	RFC-S	1.50 ±10%	30	7.9	170	0.485	700	
	MS75008-31	RFC-S	1.80 ±10%	30	7.9	150	0.740	580	
	MS75008-32	RFC-S	2.20 ±10%	30	7.9	140	0.970	505	
	MS75008-33	RFC-S	2.70 ±10%	30	7.9	120	1.20	460	IRON
	MS75101-1	RFC-S	3.30 ±10%	30	7.9	70	0.140	1,350	
	MS75101-2	RFC-S	3.90 ±10%	30	7.9	65	0.155	1,250	
	MS75101-3	RFC-S	4.70 ±10%	30	7.9	60	0.210	1,100	
	MS75101-4	RFC-S	5.60 ±10%	30	7.9	50	0.280	935	
	MS75101-5	RFC-S	6.80 ±10%	30	7.9	50	0.375	810	
	MS75101-6	RFC-S	8.20 ±10%	30	7.9	48	0.440	750	
	MS75101-7	RFC-S	10.00 ±10%	30	7.9	42	0.605	640	
	MS75101-8	RFC-S	12.00 ±10%	50	2.5	36	1.05	490	
	MS75101-9	RFC-S	15.00 ±10%	55	2.5	30	1.20	460	
	MS75101-10	RFC-S	18.00 ±10%	60	2.5	30	1.95	360	
	MS75101-11	RFC-S	22.00 ±10%	60	2.5	24	2.20	335	
	MS75101-12	RFC-S	27.00 ±10%	65	2.5	22	2.75	300	
GRADE 1, CLASS A	MS90539-01	RFC-S	270 ±10%	65	.79	5.6	8.2	110	
	MS90539-02	RFC-S	300 ±10%	65	.79	5.3	8.7	107	
	MS90539-03	RFC-S	330 ±10%	65	.79	5.0	9.1	105	
	MS90539-04	RFC-S	360 ±10%	65	.79	4.7	9.6	102	
	MS90539-05	RFC-S	390 ±10%	65	.79	4.5	10.0	100	
	MS90539-06	RFC-S	430 ±10%	65	.79	4.3	10.6	97	
	MS90539-07	RFC-S	470 ±10%	65	.79	4.0	11.1	95	
	MS90539-08	RFC-S	510 ±10%	65	.79	3.8	11.6	93	
	MS90539-09	RFC-S	560 ±10%	65	.79	3.6	12.3	91	
	MS90539-10	RFC-S	620 ±10%	60	.79	3.5	13.0	88	
	MS90539-11	RFC-S	680 ±10%	60	.79	3.4	13.7	85	
	MS90539-12	RFC-S	750 ±10%	60	.79	3.3	14.4	83	
	MS90539-13	RFC-S	820 ±10%	60	.79	3.1	15.1	81	
	MS90539-14	RFC-S	910 ±10%	60	.79	2.9	15.8	79	
	MS90539-15	RFC-S	1000 ±10%	60	.79	2.8	16.5	78	

* NCG Part No. cannot be used as the MS Number.

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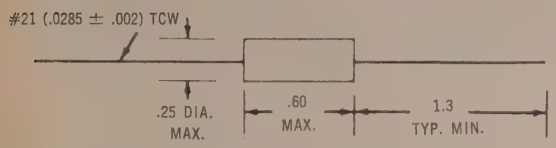
Inductors

RFC-M SERIES

Proven reliability molded inductors specifically designed to meet MIL-C-15305 (latest revision). Inductance 1.0 to 2200uH.

GRADE 1 CLASS B

ACTUAL SIZE



ELECTRICAL CHARACTERISTICS

Inductance Tolerance: 1.0 to 22uH ± 10% on Q-Meter
27uH to 2200 ± 5%
1,000 cps bridge

Dielectric Strength: 700 volts RMS at sea level.

Self-Resonant Frequency: Minimum f_0 to be not less than 80% of published data and measured with full length leads on Grid-Dip Meter.

Q: Measured on Q-Meter.

Rating: ⅓ watt dissipation for series M

DENSITY CHARACTERISTICS

Volume: 0.029 cu. in.

Weight: 2.00 grams

PHYSICAL AND ENVIRONMENTAL CHARACTERISTICS

Operating Temperature: −55°C to +125°C.

Terminal Strength: Meets five pound pull test per MIL-C-15305.

Moisture, Vibration, and Shock Resistance: Meets requirements of MIL-C-15305 (latest revision). High frequency 10 cps to 2000 cps @ 30G ±10% maximum for 12 logarithmic swings, each of 20 minute duration repeated for each of three mutually perpendicular planes. (body mounted)

MS NO.	NCG PART NO.*	L	Q Min.		approx. SRF	Max. DCR	Max. I	MATERIAL
		uH		MHz	MHz	Ω	mA	
MS21388-1	RFC-M- 1.0	1.0	100	15	170	.04	2700	IRON
MS21388-2	RFC-M- 1.2	1.2	100	15	155	.04	2700	
MS21388-3	RFC-M- 1.5	1.5	100	10	140	.04	2700	
MS21388-4	RFC-M- 1.8	1.8	95	10	125	.05	2500	
MS21388-5	RFC-M- 2.2	2.2	95	10	110	.05	2500	
MS21388-6	RFC-M- 2.7	2.7	68	7.9	95	.05	2500	
MS21388-7	RFC-M- 3.3	3.3	60	7.9	90	.05	2500	
MS21388-8	RFC-M- 3.9	3.9	60	7.9	87	.07	2100	
MS21388-9	RFC-M- 4.7	4.7	60	7.9	75	.09	1800	
MS21388-10	RFC-M- 5.6	5.6	65	7.9	70	.14	1550	
MS21388-11	RFC-M- 6.8	6.8	70	7.9	65	.17	1300	
MS21388-12	RFC-M- 8.2	8.2	65	7.9	57	.25	1150	
MS21388-13	RFC-M- 10	10	65	5	50	.32	1000	
MS21388-14	RFC-M- 12	12	65	5	45	.47	870	
MS21388-15	RFC-M- 15	15	75	4	40	.62	730	
MS21388-16	RFC-M- 18	18	65	4	37	.72	660	
MS21388-17	RFC-M- 22	22	65	2.5	35	.8	600	
MS21388-18	RFC-M- 27	27	65	2.5	31	1.2	520	
MS21388-19	RFC-M- 33	33	80	2.5	27	1.5	450	
MS21388-20	RFC-M- 39	39	80	2.5	25	2.3	380	
MS21388-21	RFC-M- 47	47	100	2.5	24	3.0	300	
MS21388-22	RFC-M- 56	56	100	2.5	22	4.2	270	
MS21388-23	RFC-M- 68	68	100	2.5	20	5.2	250	
MS21388-24	RFC-M- 82	82	100	2.5	18	6.2	220	
MS21388-25	RFC-M- 100	100	100	1.5	17	7	200	
MS21388-26	RFC-M- 120	120	95	1.5	14	7.5	200	
MS21388-27	RFC-M- 150	150	90	1.0	11	8	190	
MS21388-28	RFC-M- 180	180	85	1.0	9	9	185	
MS21388-29	RFC-M- 220	220	85	1.0	7	10	180	
MS21388-30	RFC-M- 270	270	80	1.0	5.5	11	172	
MS21388-31	RFC-M- 330	330	80	.8	4.5	12	165	
MS21388-32	RFC-M- 390	390	75	.8	4.0	13	157	
MS21388-33	RFC-M- 470	470	75	.8	3.5	14	150	
MS21388-34	RFC-M- 560	560	65	.8	3.1	16	145	
MS21388-35	RFC-M- 680	680	65	.8	2.7	17	140	
MS21388-36	RFC-M- 820	820	65	.8	2.5	19	132	
MS21388-37	RFC-M-1000	1000	70	.5	2.3	21	125	
MS21388-38	RFC-M-1200	1200	60	.25	2.7	22	120	
MS21388-39	RFC-M-2200	2200	70	.25	2.0	30	100	

* NCG Part No. cannot be used as the MS Number.

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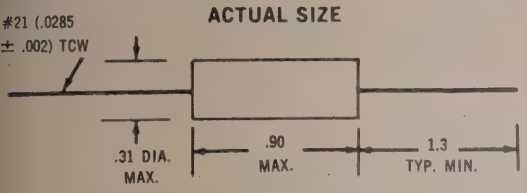
Inductors

RFC-L SERIES

Proven reliability molded inductors specifically designed to meet MIL-C-15305 (latest revision). Inductance 1.0 to 10,000uH.

GRADE 1 CLASS B

ACTUAL SIZE



ELECTRICAL CHARACTERISTICS

Inductance Tolerance: 0.1 to 22uH ±10% on Q-Meter
27uH to 10,000 ±5%
1,000 cps bridge

Dielectric Strength: 700 volts RMS at sea level.

Self-Resonant Frequency: Minimum f_0 to be not less than 80% of published data and measured with full length leads on Grid-Dip Meter.

Q: Measured on Q-Meter.

Rating: ½ watt dissipation for L series.

DENSITY CHARACTERISTICS

Volume: 0.068 cu. in.

Weight: 4.10 grams

PHYSICAL AND ENVIRONMENTAL CHARACTERISTICS

Operating Temperature: −55°C to +125°C.

Terminal Strength: Meets five pound pull test per MIL-C-15305 (latest revision).

Moisture, Vibration, and Shock Resistance: Meets requirements of MIL-C-15305 (latest revision). High frequency 10 cps to 2000 cps @ 30G ±10% maximum for 12 logarithmic swings, each of 20 minute duration repeated for each of three mutually perpendicular planes. (body mounted)

MS NO.	NCG PART NO.*	L µH	Q min		approx. SRF MHz	Max. DCR Ω	max. I mA	MAT.
				MHz				
MS21380-1	RFC-L- 1.0	1.0	130	15	170	.03	4000	IRON
MS21380-2	RFC-L- 1.2	1.2	130	15	155	.03	4000	
MS21380-3	RFC-L- 1.5	1.5	130	10	140	.03	4000	
MS21380-4	RFC-L- 1.8	1.8	130	10	125	.03	4000	
MS21380-5	RFC-L- 2.2	2.2	130	10	115	.04	3500	
MS21380-6	RFC-L- 2.7	2.7	100	10	102	.04	3500	
MS21380-7	RFC-L- 3.3	3.3	100	7.9	90	.04	3500	
MS21380-8	RFC-L- 3.9	3.9	80	7.9	85	.05	3100	
MS21380-9	RFC-L- 4.7	4.7	75	7.9	80	.05	3100	
MS21380-10	RFC-L- 5.6	5.6	65	7.9	72	.06	3000	
MS21380-11	RFC-L- 6.8	6.8	65	7.9	65	.06	3000	
MS21380-12	RFC-L- 8.2	8.2	65	7.9	57	.11	2400	
MS21380-13	RFC-L- 10	10	75	5	50	.15	1800	
MS21380-14	RFC-L- 12	12	75	5	45	.23	1600	
MS21380-15	RFC-L- 15	15	75	5	40	.3	1300	
MS21380-16	RFC-L- 18	18	75	5	36	.4	1150	
MS21380-17	RFC-L- 22	22	75	2.5	32	.5	1000	
MS21380-18	RFC-L- 27	27	70	2.5	30	.6	900	
MS21380-19	RFC-L- 33	33	70	2.5	28	.7	850	
MS21380-20	RFC-L- 39	39	70	2.5	26	1.1	720	
MS21380-21	RFC-L- 47	47	75	2.5	25	1.3	620	
MS21380-22	RFC-L- 56	56	80	2.5	22	1.8	540	
MS21380-23	RFC-L- 68	68	100	2.5	20	2.4	450	
MS21380-24	RFC-L- 82	82	100	2.5	18	2.8	425	
MS21380-25	RFC-L- 100	100	100	1.5	17	3.2	400	
MS21380-26	RFC-L- 120	120	100	1.5	15	4.8	360	
MS21380-27	RFC-L- 150	150	100	1.0	14	6.4	280	
MS21380-28	RFC-L- 180	180	95	1.0	12	9.5	240	
MS21380-29	RFC-L- 220	220	95	1.0	11	12	200	
MS21380-30	RFC-L- 270	270	70	1.0	9	13	195	
MS21380-31	RFC-L- 330	330	65	.79	7.5	14	190	
MS21380-32	RFC-L- 390	390	65	.79	6.5	15.5	180	
MS21380-33	RFC-L- 470	470	60	.79	5.5	17	170	
MS21380-34	RFC-L- 560	560	75	.5	4	18.5	165	
MS21380-35	RFC-L- 680	680	75	.5	3.2	20	155	
MS21380-36	RFC-L- 820	820	75	.5	2.8	22	150	
MS21380-37	RFC-L- 1000	1000	75	.5	2.4	24	145	
MS21380-38	RFC-L- 1200	1200	75	.5	2.1	27	137	
MS21380-39	RFC-L- 1500	1500	75	.4	1.9	29	130	
MS21380-40	RFC-L- 1800	1800	65	.4	1.7	32	125	
MS21380-41	RFC-L- 2200	2200	65	.25	1.5	35	120	
MS21380-42	RFC-L- 2700	2700	65	.25	1.3	40	112	
MS21380-43	RFC-L- 3300	3300	65	.25	1.2	45	105	
MS21380-44	RFC-L- 3900	3900	65	.25	1.05	49	100	
MS21380-45	RFC-L- 4700	4700	65	.25	.95	53	95	
MS21380-46	RFC-L- 5600	5600	65	.25	.85	60	90	
MS21380-47	RFC-L- 6800	6800	65	.25	.75	67	85	
MS21380-48	RFC-L- 8200	8200	65	.25	.65	75	82	
MS21380-49	RFC-L-10000	10000	65	.15	.58	80	80	

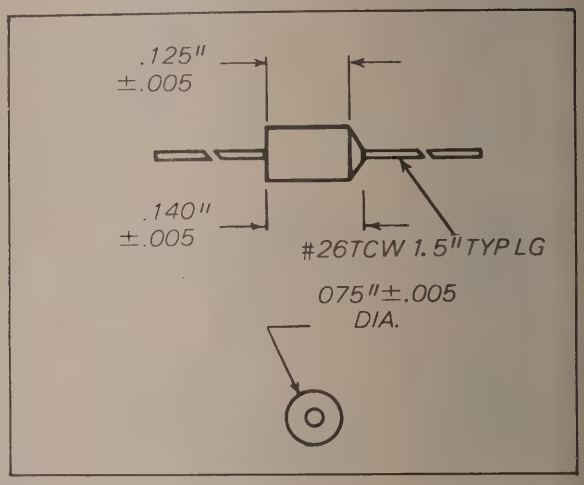
* NCG Part No. cannot be used as the MS Number.

Nytronics Components Group, Inc.
ORANGE STREET, DARLINGTON, S. C. 29532
(803) 393-5421 — TWX 810-665-2182

Inductors

Pee Dee Ductor Series

Marking: EIA color coded



The Pee Dee Ductor is a new, microminiature, axial-leaded RF inductor for hybrid circuit applications. It is significantly smaller than any unshielded inductor available anywhere. performance inductor has a standard inductance tolerance of ±10%. Values below 0.1 uh and above 1000 uh are available on special order.

GRADE 2 CLASS A

ELECTRICAL DATA

NCG Part No.	L uH	Q (Min.)	Test Freq. MHz	*F_o MHz	DCR Max. Ohms	Rated Current mA
PD-0.10	0.10	40	25	500	0.2	600
PD-0.12	0.12	40	25	450	0.2	600
PD-0.15	0.15	40	25	400	0.25	575
PD-0.18	0.18	40	25	380	0.25	575
PD-0.22	0.22	40	25	360	0.30	565
PD-0.27	0.27	40	25	300	0.30	565
PD-0.33	0.33	40	25	280	0.35	560
PD-0.39	0.39	40	25	260	0.37	550
PD-0.47	0.47	40	25	250	0.39	535
PD-0.56	0.56	40	25	240	0.40	525
PD-0.68	0.68	35	25	220	0.45	500
PD-0.82	0.82	35	25	180	0.50	480
PD-1.0	1.0	35	25	170	0.60	450
PD-1.2	1.2	35	7.9	150	0.70	425
PD-1.5	1.5	35	7.9	130	0.80	400
PD-1.8	1.8	35	7.9	120	0.90	350
PD-2.2	2.2	35	7.9	110	1.3	320
PD-2.7	2.7	35	7.9	105	1.8	275
PD-3.3	3.3	35	7.9	100	1.1	340
PD-3.9	3.9	35	7.9	90	1.4	310
PD-4.7	4.7	35	7.9	85	1.6	290
PD-5.6	5.6	35	7.9	70	1.8	275
PD-6.8	6.8	35	7.9	65	2.0	250
PD-8.2	8.2	35	7.9	62	2.2	245
PD-10	10	35	7.9	60	3.0	210
PD-12	12	35	2.5	35	2.0	250
PD-15	15	35	2.5	30	2.2	245
PD-18	18	35	2.5	25	2.5	230
PD-22	22	35	2.5	23	2.7	220
PD-27	27	35	2.5	21	3.8	195
PD-33	33	35	2.5	20	4.5	170
PD-39	39	35	2.5	16	6.0	150
PD-47	47	35	2.5	14	6.5	145
PD-56	56	35	2.5	12	7.8	135
PD-68	68	35	2.5	10	8.6	130
PD-82	82	35	2.5	9.0	9.8	120
PD-100	100	35	2.5	8.0	11.5	110
PD-120	120	28	.79	7.0	15.0	90
PD-150	150	28	.79	6.0	16.5	88
PD-180	180	25	.79	5.5	22	75
PD-220	220	24	.79	5.2	31	62
PD-270	270	24	.79	5.0	38	56
PD-330	330	24	.79	4.8	42	53
PD-390	390	24	.79	3.6	58	47
PD-470	470	24	.79	3.4	60	45
PD-560	560	24	.79	3.2	65	43
PD-680	680	22	.79	3.0	90	36
PD-820	820	23	.79	2.5	95	34
PD-1000	1000	21	.79	2.0	130	30

* F_o (self resonant frequency) minimum not less than 80% of specified value.

Nytronics Components Group, Inc.
ORANGE STREET, DARLINGTON, S. C. 29532
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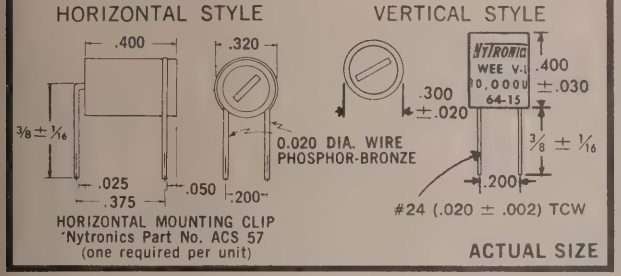
VARIABLE INDUCTORS

WEE V-L

NOW MIL APPROVED MIL-C-15305 (latest revision) — MS21381 & MS21402
Subminiature Shielded Adjustable Inductor
High Q Values
Vertical or Horizontal* Mounting
Unitized Epoxy-Molded Construction
0.400″ by 0.300″
0.10 to 100,000uH



The **WEE V-L** is designed to accommodate close inductance adjustments in high-density circuits that demand exceptional stability and high "Q" in the smallest size available. The **WEE V-L** is qualified MIL-C-15305 (latest revision). Printed board mounting is facilitated by 0.200 grid spacing and unit has shield construction to allow maximum density packaging. Standardized in 73 stock values.

ELECTRICAL CHARACTERISTICS

Adjustable Inductance Range:	±10%† over entire range as measured per MIL-C-15305 (latest revision).
Q and f_o Values:	Minimum not less than 80% of specified value at L nominal.
Dielectric Strength:	840 Volts R.M.S. at sea level.
Working Voltage:	300 Volts D.C.
Maximum Current:	Based on temperature rise not to exceed 15°C at 90°C ambient.
Incremental Current:	Defined as the DC current required to cause a five percent reduction in the nominal inductance value.

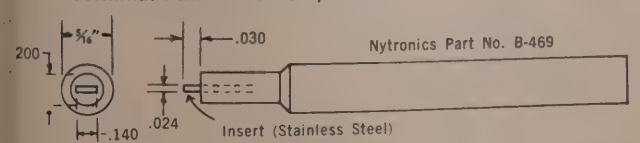
DENSITY CHARACTERISTICS

Weight:	1.5 grams maximum
Volume:	.0346 cubic inches
Shielding:	3% coupling maximum when two units are tested side by side.

PHYSICAL AND ENVIRONMENTAL CHARACTERISTICS

Use Nytronics Tuning Tool No. B-469 or equal.

Torque:	0.75 to 6.0 inch-oz.
Operating Temperature:	−55°C to +105°C.
Moisture, Vibration, and Shock Resistance:	Meet requirements of MIL-C-15305 (latest revision).
Marking:	Manufacturer data printed.
Terminal Pull:	Three pounds.



MS GRADE 1 CLASS A
WVL GRADE 3 CLASS A

MS No.	NCG Part No.	L nom. uH	f MHz	Q nom.	SRF Nom. MHz	Max. DCR ohms	Max. I m.a.	Incr. I m.a.
MS21381-1	WEE V-L† 0.10	.10	25	70	>250	0.030	2500	2500
MS21831-2	WEE V-L† 0.12	.12	25	70	>250	0.030	2500	2500
MS21381-3	WEE V-L 0.15	.15	25	70	>250	0.030	2500	2500
MS21381-4	WEE V-L 0.18	.18	25	70	>250	0.035	2400	2400
MS21381-5	WEE V-L 0.22	.22	25	70	>250	0.038	2300	2300
MS21381-6	WEE V-L 0.27	.27	25	80	>250	0.040	2200	2200
MS21381-7	WEE V-L 0.33	.33	25	80	>250	0.040	2200	2200
MS21381-8	WEE V-L 0.39	.39	25	80	250	0.045	2100	2100
MS21381-9	WEE V-L 0.47	.47	25	80	230	0.045	2100	2100
MS21381-10	WEE V-L 0.56	.56	25	80	220	0.050	2000	2000
MS21381-11	WEE V-L 0.68	.68	25	80	190	0.055	1900	1900
MS21381-12	WEE V-L 0.82	.82	25	85	180	0.060	1800	1800
MS21381-13	WEE V-L 1.00	1.00	25	85	160	0.070	1700	1700
MS21381-14	WEE V-L 1.2	1.2	7.9	90	170	0.085	1670	1670
MS21381-15	WEE V-L 1.5	1.5	7.9	100	155	0.100	1540	1540
MS21381-16	WEE V-L 1.8	1.8	7.9	115	135	0.110	1470	1470
MS21381-17	WEE V-L 2.2	2.2	7.9	110	120	0.120	1410	1410
MS21381-18	WEE V-L 2.7	2.7	7.9	110	104	0.125	1380	1380
MS21381-19	WEE V-L 3.3	3.3	7.9	90	93.0	0.165	1200	1200
MS21381-20	WEE V-L 3.9	3.9	7.9	90	87.0	0.180	1135	1135
MS21381-21	WEE V-L 4.7	4.7	7.9	95	79.0	0.245	985	985
MS21381-22	WEE V-L 5.6	5.6	7.9	95	72.0	0.265	950	950
MS21381-23	WEE V-L 6.8	6.8	7.9	85	63.0	0.330	853	853
MS21381-24	WEE V-L 8.2	8.2	7.9	95	60.0	0.460	720	720
MS21381-25	WEE V-L 10	10	7.9	90	54.0	0.640	620	620
MS21381-26	WEE V-L 12	12	2.5	120	37.0	0.800	545	545
MS21381-27	WEE V-L 15	15	2.5	120	28.8	0.865	520	520
MS21381-28	WEE V-L 18	18	2.5	115	23.8	0.940	504	504
MS21381-29	WEE V-L 22	22	2.5	125	21.3	1.03	460	460
MS21381-30	WEE V-L 27	27	2.5	115	20.6	1.18	413	418
MS21381-31	WEE V-L 33	33	2.5	120	18.6	1.30	398	398
MS21381-32	WEE V-L 39	39	2.5	120	17.7	1.41	385	385
MS21381-33	WEE V-L 47	47	2.5	110	14.9	1.61	350	350
MS21381-34	WEE V-L 56	56	2.5	115	13.9	2.08	330	330
MS21381-35	WEE V-L 68	68	2.5	105	12.9	2.20	320	320
MS21381-36	WEE V-L 82	82	2.5	105	11.7	2.42	300	300
MS21402-1	WEE V-L 100	100	2.5	95	10.5	2.15	333	333
MS21402-2	WEE V-L 120	120	0.790	95	5.60	2.38	316	190
MS21402-3	WEE V-L 150	150	0.790	90	5.20	2.52	306	175
MS21402-4	WEE V-L 180	180	0.790	95	4.90	2.88	288	150
MS21402-5	WEE V-L 220	220	0.790	95	4.60	3.18	273	125
MS21402-6	WEE V-L 270	270	0.790	100	4.20	3.50	260	120
MS21402-7	WEE V-L 330	330	0.790	100	3.55	4.80	222	110
MS21402-8	WEE V-L 390	390	0.790	100	3.45	5.44	209	105
MS21402-9	WEE V-L 470	470	0.790	100	3.20	5.90	201	100
MS21402-10	WEE V-L 560	560	0.790	95	2.90	6.30	194	90
MS21402-11	WEE V-L 680	680	0.790	100	2.70	7.20	181	80
MS21402-12	WEE V-L 820	820	0.790	90	2.50	8.00	172	70
MS21402-13	WEE V-L 1,000	1,000	0.790	100	2.35	12.0	141	65
MS21402-14	WEE V-L 1,200	1,200	0.250	95	2.20	13.5	132	60
MS21402-15	WEE V-L 1,500	1,500	0.250	90	1.90	16.5	119	55
MS21402-16	WEE V-L 1,800	1,800	0.250	100	1.80	18.0	114	47
MS21402-17	WEE V-L 2,200	2,200	0.250	100	1.70	20.5	107	43
MS21402-18	WEE V-L 2,700	2,700	0.250	95	1.50	22.5	102	39
MS21402-19	WEE V-L 3,300	3,300	0.250	90	1.40	42.0	76	36
MS21402-20	WEE V-L 3,900	3,900	0.250	85	1.27	47.5	71	35
MS21402-21	WEE V-L 4,700	4,700	0.250	85	1.24	53.0	67	34
MS21402-22	WEE V-L 5,600	5,600	0.250	85	0.93	62.5	65	31
MS21402-23	WEE V-L 6,800	6,800	0.250	75	0.79	69.5	58	27
MS21402-24	WEE V-L 8,200	8,200	0.250	80	0.75	75.0	56	26
MS21402-25	WEE V-L 10,000	10,000	0.250	70	0.70	100.0	49	24
MS21402-26	WEE V-L 12,000	12,000	0.079	70	0.50	64	60	40
MS21402-27	WEE V-L 15,000	15,000	0.079	70	0.38	84	52	34
MS21402-28	WEE V-L 18,000	18,000	0.079	70	0.36	93	50	30
MS21402-29	WEE V-L 22,000	22,000	0.079	70	0.32	104	45	28
MS21402-30	WEE V-L 27,000	27,000	0.079	70	0.30	173	35	26
MS21402-31	WEE V-L 33,000	33,000	0.079	70	0.27	187	32	24
MS21402-32	WEE V-L 39,000	39,000	0.079	70	0.26	220	30	22
MS21402-33	WEE V-L 47,000	47,000	0.079	70	0.25	253	28	20
MS21402-34	WEE V-L 56,000	56,000	0.079	70	0.24	285	26	19
MS21402-35	WEE V-L 68,000	68,000	0.079	60	0.20	311	24	18
MS21402-36	WEE V-L 82,000	82,000	0.079	60	0.19	385	22	16
MS21402-37	WEE V-L 100,000	100,000	0.079	60	0.17	420	20	15

*For horizontal mounting use Nytronics mounting clip No. ACS-57 or order with prefix H (i.e. H WEE V-L 0.10).
†Tunable range ±5.0% on 0.10uH & 0.12uH.

NOTE: Min. Q on MIL version not less than 80% of Q min. of commercial version.

Nytronics Components Group, Inc.
ORANGE STREET, DARLINGTON, S. C. 29532
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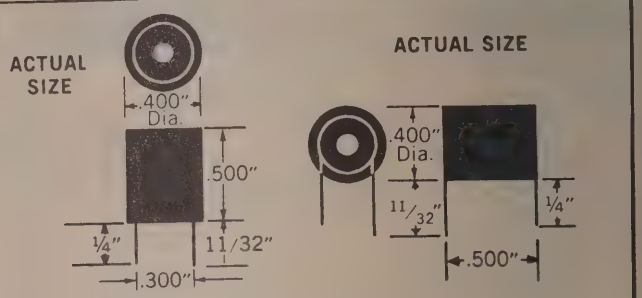
VARIABLE INDUCTORS

VIV-VIH

Miniature with inductance range of 0.10 to 4700uH in 29 values.
Encapsulated in epoxy resin for reliability.
Designed to meet MIL-C-15305 (latest revision).



Terminal Leads #22 (.025 ± .002) VCW

VERTICAL STYLE HORIZONTAL STYLE

The **VARIABLE INDUCTOR** offers high reliability and exceptional stability over extreme temperature variations. This small lightweight unit is furnished in vertical and horizontal styles to facilitate mounting on printed circuit boards. The unit is designed to meet the requirements of MIL-C-15305B.

NCG PART NOS.		L nom.	Q at L Nom.		Approx. SRF, L nom.	Max. DCR	Max. I
VIV	VIH	μH		MHz	MHz	Ω	mA
VIV-0.10	VIH-0.10	0.10	85	25.	>500.	0.02	3500
VIV-0.15	VIH-0.15	0.15	100	25.	>500.	0.035	2600
VIV-0.22	VIH-0.22	0.22	100	25.	>500.	0.04	2500
VIV-0.33	VIH-0.33	0.33	100	25.	334.	0.04	2500
VIV-0.47	VIH-0.47	0.47	100	25.	285.	0.05	2200
VIV-0.68	VIH-0.68	0.68	100	25.	237.	0.07	1850
VIV-1.00	VIH-1.00	1.00	90	25.	205.	0.13	1350
VIV-1.50	VIH-1.50	1.50	70	7.9	168.	0.24	1000
VIV-2.20	VIH-2.20	2.20	73	7.9	135.	0.30	890
VIV-3.30	VIH-3.30	3.30	80	7.9	112.	0.45	730
VIV-4.70	VIH-4.70	4.70	75	7.9	100.0	0.80	550
VIV-6.80	VIH-6.80	6.80	80	7.9	80.0	1.1	460
VIV-10.0	VIH-10.0	10.0	82	7.9	67.0	1.9	355
VIV-15.0	VIH-15.0	15.0	65	2.5	54.2	3.2	270
VIV-22.0	VIH-22.0	22.0	55	2.5	17.5	3.4	265
VIV-33.0	VIH-33.0	33.0	54	2.5	15.0	3.6	255
VIV-47.0	VIH-47.0	47.0	51	2.5	13.2	4.5	230
VIV-68.0	VIH-68.0	68.0	55	2.5	12.0	5.5	210
VIV-100	VIH-100	100.0	50	2.5	10.5	6.7	190
VIV-150	VIH-150	150.	50	.79	3.0	11.0	150
VIV-220	VIH-220	220.	50	.79	2.70	13.0	135
VIV-330	VIH-330	330.	48	.79	2.24	16.0	120
VIV-470	VIH-470	470.	45	.79	1.90	18.0	115
VIV-680	VIH-680	680.	42	.79	1.70	21.0	105
ViV-1000	VIH-1000	1000.	40	.79	1.40	38.0	80
VIV-1500	VIH-1500	1500.	40	.25	1.14	54.0	65
VIV-2200	VIH-2200	2200.	44	.25	0.96	66.0	60
VIV-3300	VIH-3300	3300.	46	.25	0.86	85.0	54
VIV-4700	VIH-4700	4700.	48	.25	0.76	99.0	49

GRADE 2 CLASS B
ELECTRICAL CHARACTERISTICS

Inductance Range: 0.33 to 4700uH Tunable Range ±20%
0.15 to 0.22uH Tunable Range ±15%
0.1 Tunable Range ±10%
All measurements at 25°C on Q-Meter using miniature alligator clips mounted 1/32" from body.
Q values min. not less than 80% of specified value.

Self-Resonant Frequency: Minimum f_o to be not less than 80% of published data as measured with Grid-Dip Meter.

DENSITY CHARACTERISTICS

Volume: 0.063 cubic inches

Weight: 2.6 grams

PHYSICAL AND ENVIRONMENTAL CHARACTERISTICS

Torque: 0.75 to 5.0 inch-ounces
Use Nytronics Tuning Tool No. B-305 or equal.

Operating Temperature: −55°C to +125°C

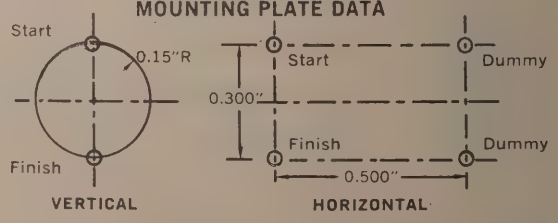
Terminal Strength: Meets five pound pull tests.

Moisture, Vibration, and Shock Resistance: Meets requirements of MIL-C-15305 (latest revision). Low frequency 10 cps to 55 cps @ .06" total excursion at rate of 1 linear sweep per minute for 2 hours repeated for each of 3 mutually perpendicular planes. Shock: 50G, 11ms.

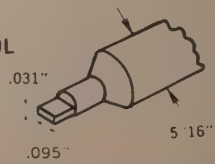
Core Material: Iron

Marking: Manufactured data printed.

MOUNTING PLATE DATA



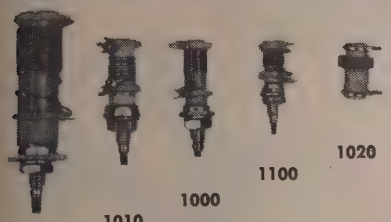
TYPICAL ALIGNING TOOL
B-305



NORTH HILLS • HIGH-PERFORMANCE COILS, ADJUSTABLE & FIXED

TO COVER ALL FREQUENCY RANGES FROM AUDIO TO 200 MHZ

COILS ON CERAMIC FORMS PER MIL-I-10



Series No.	Dimensions (Inches) Dia.	Length	Mtg. Hole Dia. (Inches)
1000	.50	.88	.196
1020	.50	.63	.050, .500 Apart
1100	.33	.63	.166
1300	.70	1.80	.252
1010	.43	.88	.196

Miniature 1000 Series

Part No.	Range Microhenries	Average Q
1000-A	1.0- 1.6	70 @ 7.9 MHz
1000-B	1.6- 2.7	80 @ 7.9 MHz
1000-C	2.7- 4.5	85 @ 7.9 MHz
1000-D	4.5- 8.5	85 @ 7.9 MHz
1000-E	8.5-14.5	75 @ 2.5 MHz
1000-F	14.5-22	65 @ 2.5 MHz
1000-G	22-29	65 @ 2.5 MHz
1000-H	29-55	85 @ 2.5 MHz
1000-I	55-110	80 @ 2.5 MHz
1000-J	110-185	85 @ .79 MHz
1000-K	185-305	85 @ .79 MHz
1000-L	305-515	85 @ .79 MHz
1000-M	515-820	85 @ .79 MHz
1000-N	820-1100	75 @ .79 MHz

RF Printed Circuit Coils

1020-A	0.41- 0.53	75 @ 25 MHz
1020-B	0.85- 1.15	65 @ 7.9 MHz
1020-C	1.87- 2.50	65 @ 7.9 MHz
1020-D	4.0 - 5.4	70 @ 7.9 MHz
1020-E	7.5 -12.5	70 @ 2.5 MHz
1020-F	20 -29	80 @ 2.5 MHz
1020-G	33 -61	80 @ 2.5 MHz
1020-H	80 -120	60 @ 0.79 MHz
1020-I	170 -260	70 @ 0.79 MHz

Subminiature 1100 Series

1100-A	0.9- 1.4	60 @ 7.9 MHz
1100-B	1.4- 1.9	70 @ 7.9 MHz
1100-C	1.9- 2.6	65 @ 7.9 MHz
1100-D	2.6- 3.7	65 @ 7.9 MHz
1100-E	3.7- 5.5	65 @ 7.9 MHz
1100-F	5.5- 7.4	60 @ 7.9 MHz
1100-G	7.4-12.5	70 @ 7.9 MHz
1100-H	12.5-18.0	65 @ 2.5 MHz
1100-I	18.0-28.0	70 @ 2.5 MHz
1100-J	28.0-38.0	70 @ 2.5 MHz
1100-K	38.0-55.0	70 @ 2.5 MHz

Transmitter 1300 Series

1300-A	For use from 90-200 MHz	
1300-B	For use from 40-90 MHz	
1300-C	For use from 20-40 MHz	
1300-D	0.7- 1.1	170 @ 25 MHz
1300-E	1.1- 1.7	130 @ 7.9 MHz
1300-F	1.7- 2.7	140 @ 7.9 MHz
1300-G	2.7- 4.5	140 @ 7.9 MHz
1300-H	4.5- 6.8	140 @ 7.9 MHz
1300-I	6.8-10.8	140 @ 7.9 MHz
1300-J	10.8-17.0	110 @ 2.5 MHz
1300-K	17.0-29.0	95 @ 2.5 MHz
1300-L	29.0-45.0	100 @ 2.5 MHz
1300-M	45.0-75.0	100 @ 2.5 MHz

HF Coils, Variable Approx. ±15%

1010-A	0.118	115 @ 50 MHz
1010-B	0.225	125 @ 25 MHz
1010-C	0.315	130 @ 25 MHz

WIDE ADJUSTMENT RANGE 120 SERIES

120 Series Mica-filled form .75" O.D. x 1.3" H. .196" dia. mtg. hole

PCS-120 Series Phenolic form .75" O.D. x 1.3" H. .196" dia. mtg. hole

PC-120 Series Phenolic form .5" O.D. x 1.25" L. .05" Pins, .70" Apart

Part No.	Range Microhenries	Average Q
120-A	2-3	70 @ 7.9 MHz
120-B	3-5	80 @ 7.9 MHz
120-C	5-9	85 @ 7.9 MHz
120-D	9-18	65 @ 2.5 MHz
120-E	18-36	70 @ 2.5 MHz
120-F	36-64	65 @ 2.5 MHz
120-G	64-105	85 @ 2.5 MHz
120-H	105-200	80 @ .79 MHz
120-I	200-500	75 @ .79 MHz
120-J	500-1000	85 @ .79 MHz
120-K	1000-2000	50 @ .25 MHz

Subminiature 600 Series

- Variable ±10%
- Shielded
- 0.3" O.D. x 0.4" H
- .020" Leads .20" Apart

Part No.	Nominal Microhenries	Average Q
600U1X0	1.0	120 @ 7.9 MHz
600U1X5	1.5	120 @ 7.9 MHz
600U2X2	2.2	120 @ 7.9 MHz
600U3X3	3.3	130 @ 7.9 MHz
600U4X7	4.7	125 @ 7.9 MHz
600U6X8	6.8	140 @ 7.9 MHz
600U10X	10	135 @ 7.9 MHz
600U15X	15	130 @ 2.5 MHz
600U22X	22	135 @ 2.5 MHz
600U33X	33	130 @ 2.5 MHz
600U47X	47	130 @ 2.5 MHz
600U68X	68	120 @ 2.5 MHz
600MX10	100	100 @ 2.5 MHz
600MX15	150	125 @ .79 MHz
600MX22	220	130 @ .79 MHz
600MX33	330	125 @ .79 MHz
600MX47	470	120 @ .79 MHz
600MX68	680	100 @ .79 MHz
600M1X0	1000	100 @ .79 MHz

High Q RF Coils, Fixed

- .75" O.D. x .63" H
- Hermetically sealed
- Complete shielding
- For printed circuitry
- For standard circuitry

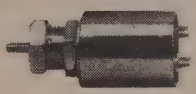
Part No.	Nominal Microhenries	Average Q
1219-A	0.47± 5%	90 @ 20 MHz
1219-B	1.0 ± 5%	100 @ 10 MHz
1219-C	2.2 ± 5%	130 @ 8 MHz
1219-D	4.7 ± 5%	130 @ 5 MHz
1219-E	10 ± 5%	130 @ 3 MHz
1219-F	22 ± 3%	185 @ 1.7 MHz
1219-G	47 ±3%	185 @ 1 MHz
1219-H	100 ±3%	200 @ 0.8 MHz
1219-I	220 ±3%	225 @ 0.7 MHz
1219-J	470 ±3%	250 @ 0.6 MHz
1219-K	1000 ±3%	300 @ 0.5 MHz
1219-L	2200 ±3%	300 @ 0.25 MHz

Hi Q 801, 802 Series, Adjustable ±10%

801, 802 Series
1.18" O.D. x .93" H

Part No.	Nominal Millihenries	Peak Q
801M1X0	1.0	100 @ 10 kHz
801M1X5	1.5	100 @ 10 kHz
801M2X2	2.2	100 @ 10 kHz
801M3X3	3.3	100 @ 10 kHz
801M4X7	4.7	100 @ 10 kHz
801M6X8	6.8	100 @ 10 kHz
801M10X	10	200 @ 20 kHz
801M15X	15	200 @ 20 kHz
801M22X	22	200 @ 20 kHz
801M33X	33	200 @ 20 kHz
801M47X	47	200 @ 20 kHz
801M68X	68	200 @ 20 kHz
801HX10	100	300 @ 30 kHz
801HX15	150	300 @ 30 kHz
801HX22	220	300 @ 30 kHz
801HX33	330	250 @ 20 kHz
801HX47	470	250 @ 20 kHz
801HX68	680	250 @ 20 kHz
801H1X0	1000	150 @ 15 kHz
802M1X0	1.0	400 @ 100 kHz
802M1X5	1.5	400 @ 100 kHz
802M2X2	2.2	400 @ 100 kHz
802M3X3	3.3	400 @ 100 kHz
802M4X7	4.7	400 @ 100 kHz
802M6X8	6.8	400 @ 100 kHz
802M10X	10	400 @ 70 kHz
802M15X	15	400 @ 70 kHz
802M22X	22	400 @ 70 kHz
802M33X	33	400 @ 70 kHz
802M47X	47	400 @ 40 kHz

SHIELDED COILS



- Shielded
- Encapsulated

- .44" Diameter **900 Series**

Part No.	Range Microhenries	Average Q
900-A	0.5- 0.8	80 @ 25 MHz
900-B	0.8- 1.3	70 @ 18 MHz
900-C	1.3- 2.0	60 @ 15 MHz
900-D	2.0- 4.0	70 @ 8 MHz
900-E	4.0- 7.0	70 @ 5 MHz
900-F	7.0-12.0	70 @ 4 MHz
900-G	12.0-20.0	70 @ 3 MHz
900-H	20.0-35.0	70 @ 2.5 MHz
900-I	35.0-60.0	70 @ 2.0 MHz
900-J	60.0-100.0	70 @ 1.0 MHz

- .63" Diameter **1500 Series**

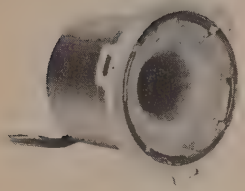
Part No.	Range Millihenries	Average Q
1500-A	.100- .175	80 @ 790 kHz
1500-B	.175- .300	80 @ 790 kHz
1500-C	.300- .500	80 @ 790 kHz
1500-D	.500- .800	75 @ 790 kHz
1500-E	.800-1.15	55 @ 500 kHz
1500-F	1.15-1.50	55 @ 250 kHz
1500-G	1.50-2.30	55 @ 250 kHz
1500-H	2.30-3.50	50 @ 250 kHz
1500-I	3.50-7.50	40 @ 250 kHz

For North Hills Wideband Transformers See Section 5600.

North Hills Electronics, INC. GLEN COVE, N.Y. 11542 • 516-671-5700

syntronic

SYNTRONIC INSTRUMENTS, INC.
100 Industrial Road, Addison, IL 60101



MILITARY/AIRBORNE/SHIPBOARD YOKES
Compact, lightweight, ruggedized yokes designed to withstand the rigors of environmental stresses. Typical applications include TV raster scans, HUD, HDD, alphanumeric, cockpit displays as well as military ground support and shipboard displays.

COMMERCIAL YOKES
Extensively tooled for volume production reflecting excellent cost effectiveness. Ideal for all variations of CRT terminals including alphanumeric computer output displays, medical waveform and video. Can be supplied with built-in geometry correction and beam centering provisions.

SPECIAL YOKES
Designed to solve unusual problems in unique displays such as phototypesetting, random graphics, vectors, line scan, monochrome or color projection simulators, and applications demanding accurate beam positioning, superior focus, and zero astigmatism.

YOKE APPLICATION CHECKLIST

This handy "Yoke Application Checklist" facilitates working out your exact requirements in designing a cathode ray tube (CRT) display.

CRT displays consist of three essentials:

The display format
The yoke/CRT unit
The deflection circuit

The display format incorporates the size, shape and general make-up of the data to be displayed. (See examples below.) Yoke design objectives are directed toward the display format requirements.

The yoke/CRT combination should be considered a unit and as such, essential to the achievement of display quality.

The deflection circuit to be chosen follows a tentative selection of the yoke/CRT combination. Use of existing electronics might at first appear to be good value engineering but this limits the choices available in yokes and CRTs, which can cause the total system to be less than optimum.

The necessary display information to be considered in specifying the yoke includes the data to be displayed, horizontal and vertical display dimensions, spot size and geometric correction requirements.

CRT DATA

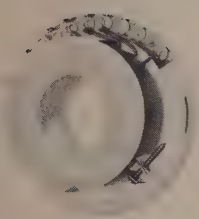
Manufacturer
Type Number
Size
Shape: round, rectangular, square
Max. diagonal deflection angle
Neck diameter
Anode voltage (KV)
Focus mode
  Low voltage electrostatic
  High voltage electrostatic
  Electromagnetic
  Dynamic
Line width
Center spot size
Jedec neck gauge number
Inside faceplate radius of curvature
YRL to gun distance
Is CRT shield used

YOKE

Max. inductance (μH): Horizontal (x), Vertical (y)
Max. resistance (Ohms): Horizontal (x), Vertical (y)
Single-ended or push-pull
PM Beam centering magnets
EM Beam centering coils
PM Pincushion correction magnets
Enclosed housing
Potted (Generally required for military)
General classification of display:
  Military
  Commercial
  Industrial/Special

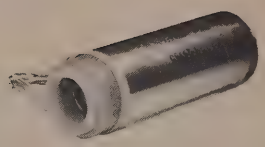
SCAN

Horizontal
Vertical
Resonant sweep
OP AMP/Driven sweep
Sweep rate or trace/Stroke time
Min. retrace time
Settling/recovery time
Max. voltage across coils
Max. current for deflection (ma)

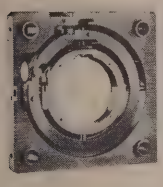


Y3802 YOKE
CHARACTER WRITING
Stator Ferrite Core. High frequency yoke provides effective way to produce display characters and symbols independent of main yoke. Mounts directly behind Y38 series of yokes. Low inductances as required.

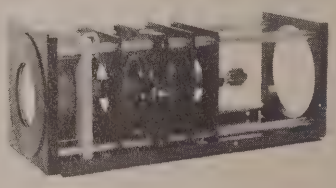
F50/55 FOCUS COILS
Static/Dynamic shielded units designed for electromagnetically focused precision displays where high resolution is required anywhere on the screen. Fits 38 mm (1½") neck diameter CRTs.



VIDICON
Complete package for ⅔" Vidicon -Plumbicon. Front or rear loading. Printed circuit deflection coils. Self-contained focus and alignment coils ...also full line of 1" Vidicon Yokes available.



MODEL D7450/7675
MICROPOSITIONER
COIL/LENS ALIGNER
For yokes and coils. Minimum backlash; fine adjustment of pitch, yaw, horizontal and vertical translation. Positive lock for each function without interaction.
D7450 for 3.5" O.D. Coils
D7675 for 4.0" O.D. Coils



CRT MOUNTS
Made for any size CRT. Fitted with micropositioner and magnetic shielding—rugged mount for bench or mobile applications.

It is impractical to attempt to catalog the variety of deflection yokes Syntronic Instruments, Inc., has designed and produced to satisfy thousands of unique specifications. Any yoke can be tailored to match specific objectives such as resolution, sensitivity, geometry, etc. and can be supplied in any inductance, single-ended or push-pull.

PM and EM accessories available for Beam Centering, Pincushion Correction, Astigmatism Correction to fit basic CRT neck diameters.

When the electronics industry needed high quality precision components for CRT display systems, Syntronic Instruments was able to provide the technology. As a manufacturer of precision yokes, coils and related components, Syntronic enjoys a substantial share of the deflection component market and has acquired an industry-wide reputation for its quality engineering and ability to manufacture these devices in any quantity.

Quality control with such components is imperative. Syntronic engineers have designed and built much of the test equipment for these precision instruments and consistently lead in the development of new test equipment.

Today's requirements for high resolution, solid-state driven, high-speed displays require continuing effort to advance the design of deflection components. Syntronic Instruments' experienced engineering group provides such present-day technology to every application.

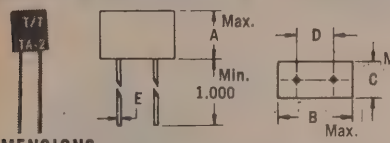
SYNTRONIC INSTRUMENTS, INC., 100 INDUSTRIAL ROAD, ADDISON, IL 60101
Phone (312) 543-6444
TWX: 910-651-2191

TOROTEL INC.

13402 SOUTH 71 HIGHWAY, GRANDVIEW, MO. 64030

PHONE: (816) 761-6314 TWX 910-777-7037

MINI-L ENCAPSULATED R.F. INDUCTORS — TA, TF, TB & TD SERIES



DIMENSIONS

Series	A	B	C	D	E	Max. Power
TA	.225	.210	.110	.100	.020	0.2 Watt
TB	.300	.280	.160	.200	.025	0.33 Watt
TD	.390	.390	.197	.200	.025	0.5 Watt
TF	.225	.210	.110	.100	.020	0.2 Watt

TA SERIES

- MIN. "Q": 60 to 70.
- INDUCTANCE RANGE: .1 uh to 10 uh.
- FREQUENCY RANGE: 1 to 50 MHz.
- INDUCTANCE TOLERANCES: Less than 1.0 uh, ±10%. Greater than or equal to 1.0 uh, ±5%. Closer tolerances available by special request.
- INDUCTANCE TC: +50 PPM/°C maximum.
- MAXIMUM POWER DISSIPATION: 0.2 watt.

TF SERIES

- MIN. "Q": 60 to 80.
- FREQUENCY RANGE: 20 to 300 MHz.
- INDUCTANCE RANGE: .01 to 1 uh.
- INDUCTANCE TOLERANCES: Less than 0.1 uh, ±20%. Greater than or equal to 0.1 uh, ±10%. Closer tolerances available by special request.
- INDUCTANCE TC: +200 PPM/°C maximum.
- MAXIMUM POWER DISSIPATION: 0.2 watt.

TD SERIES

- MIN. "Q": 40 to 80.
- INDUCTANCE RANGE: 100 to 10,000 uh.
- RECOMMENDED FREQUENCY RANGE: 50 kHz to 10 MHz.
- INDUCTANCE TOLERANCE: ±5%. Closer tolerances available by special request.
- INDUCTANCE TC: From +60 PPM/°C, maximum to +300 PPM/°C maximum, depending upon inductance value.
- MAXIMUM POWER DISSIPATION: .50 watt.

TB SERIES

- MIN. "Q": 50 to 80.
- RECOMMENDED FREQUENCY RANGE: 50 kHz to 35 MHz.
- INDUCTANCE RANGE: 10 to 1,000 uh.
- INDUCTANCE TOLERANCE: ±5%. Closer tolerances available by special request.
- INDUCTANCE TC: From +60 PPM/°C maximum to +300 PPM/°C maximum, depending upon inductance value.
- MAXIMUM POWER DISSIPATION: .33 watt.

- DESIGNED TO MEET THE REQUIREMENTS OF MIL-C-15305, GRADE 1, CLASS B (−55°C to +125°C). +125°C).
- DIELECTRIC WITHSTANDING VOLTAGE: 700 volts rms.
- RATED TEMPERATURE RISE: 35°C at an ambient temperature of 90°C.
- LEADS: Tinned Copper. Weldable leads available by special order.

TA SERIES

Part No.	Apparent Inductance (uh)	Min. "Q"	Test Freq. (MHz)	Min. SRF (MHz)	Max. DCR (ohms)	DC Curr. (ma)
TA- 1	0.10	60	25	450	0.04	2230
TA- 2	0.12	60	25	410	0.05	2000
TA- 3	0.15	65	25	350	0.06	1825
TA- 4	0.18	65	25	325	0.07	1675
TA- 5	0.22	65	25	300	0.08	1550
TA- 6	0.27	65	25	280	0.09	1475
TA- 7	0.33	65	25	260	0.10	1400
TA- 8	0.39	70	25	240	0.11	1325
TA- 9	0.47	70	25	220	0.15	1125
TA-10	0.56	70	25	200	0.20	1000
TA-11	0.68	70	25	180	0.25	900
TA-12	0.82	70	25	165	0.30	810
TA-13	1.0	70	25	150	0.35	750
TA-14	1.2	65	7.9	130	0.25	875
TA-15	1.5	65	7.9	120	0.30	800
TA-16	1.8	65	7.9	110	0.50	600
TA-17	2.2	65	7.9	100	0.75	500
TA-18	2.7	65	7.9	90	0.90	450
TA-19	3.3	65	7.9	70	1.0	425
TA-20	3.9	65	7.9	60	1.2	400
TA-21	4.7	60	7.9	50	1.5	350
TA-22	5.6	60	7.9	45	1.7	325
TA-23	6.8	60	7.9	40	2.0	300
TA-24	8.2	60	7.9	37	2.4	290
TA-25	10.0	60	7.9	35	2.6	280

TB SERIES

Part No.	Apparent Inductance (uh)	Min. "Q"	Test Freq. (MHz)	Min. SRF (MHz)	Max. DCR (ohms)	DC Curr. (ma)
TB- 1	10	75	2.5	35	1.1	550
TB- 2	12	75	2.5	31	1.3	500
TB- 3	15	75	2.5	27	1.5	460
TB- 4	18	80	2.5	25	1.9	410
TB- 5	22	80	2.5	22	2.2	380
TB- 6	27	80	2.5	20	2.6	350
TB- 7	33	80	2.5	18	3.3	320
TB- 8	39	80	2.5	16	3.8	290
TB- 9	47	80	2.5	14	4.6	260
TB-10	56	80	2.5	12	5.6	240
TB-11	68	80	2.5	11	6.7	220
TB-12	82	80	2.5	10	8.1	200
TB-13	100	80	2.5	9.1	9.6	180
TB-14	120	50	0.79	8.2	10.0	175
TB-15	150	50	0.79	7.5	11.0	160
TB-16	180	50	0.19	6.5	12.0	155
TB-17	220	50	0.79	5.6	13.0	150
TB-18	270	55	0.79	5.0	17.0	125
TB-19	330	55	0.79	4.5	19.0	130
TB-20	390	55	0.79	4.0	21.0	120
TB-21	470	55	0.79	3.5	22.0	115
TB-22	560	55	0.79	3.0	24.0	110
TB-23	680	55	0.79	2.8	19.0	130
TB-24	820	50	0.79	2.5	23.0	120
TB-25	1,000	50	0.79	2.5	26.0	110

All Items Available in Distributor Stock

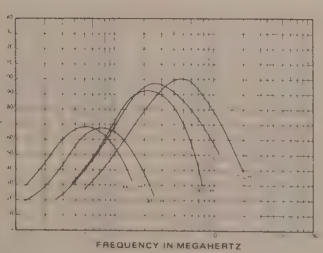
TF SERIES

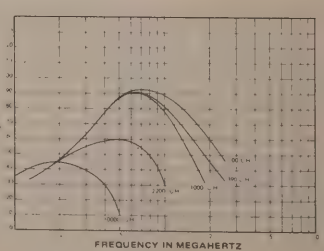
Part No.	Apparent Inductance (uh)	Min. "Q"	Test Freq. (MHz)	Min. SRF (MHz)	Max. DCR (ohms)	DC Curr. (ma)
TF- 1	0.01	60	150	1000	0.02	3100
TF- 2	0.012	60	150	1000	0.02	3100
TF- 3	0.015	60	150	1000	0.02	3100
TF- 4	0.018	60	150	1000	0.02	3100
TF- 5	0.022	60	100	900	0.02	3100
TF- 6	0.027	60	100	800	0.02	3100
TF- 7	0.033	60	100	750	0.02	3100
TF- 8	0.039	60	100	700	0.02	3100
TF- 9	0.047	60	100	650	0.02	3100
TF-10	0.056	60	100	600	0.02	3100
TF-11	0.068	60	100	550	0.03	2500
TF-12	0.082	60	100	500	0.03	2500
TF-13	0.10	80	50	450	0.04	2200
TF-14	0.12	80	50	400	0.05	2000
TF-15	0.15	80	50	350	0.06	1800
TF-16	0.18	80	50	320	0.07	1650
TF-17	0.22	80	50	300	0.08	1500
TF-18	0.27	80	50	280	0.10	1400
TF-19	0.33	80	50	260	0.12	1300
TF-20	0.39	80	50	240	0.15	1150
TF-21	0.47	80	50	220	0.20	1000
TF-22	0.56	70	50	200	0.25	900
TF-23	0.68	70	50	180	0.30	800
TF-24	0.82	70	50	160	0.35	750
TF-25	1.0	70	50	150	0.40	700

TD SERIES

Part No.	Apparent Inductance (uh)	Min. "Q"	Test Freq. (MHz)	Min. SRF (MHz)	Max. DCR (ohms)	DC Curr. (ma)
TD- 1	100	75	790	8.4	6	280
TD- 2	120	75	790	7.5	7	260
TD- 3	150	75	790	6.8	8	240
TD- 4	180	75	790	6.1	10	220
TD- 5	220	80	790	5.4	12	200
TD- 6	270	80	790	4.7	14	180
TD- 7	330	80	790	4.2	17	165
TD- 8	390	80	790	3.8	20	150
TD- 9	470	75	790	3.4	24	140
TD-10	560	75	790	3.1	28	130
TD-11	680	75	790	2.8	33	120
TD-12	820	75	790	2.5	40	110
TD-13	1,000	75	790	2.2	46	100
TD-14	1,200	45	250	1.9	30	120
TD-15	1,500	45	250	1.6	35	110
TD-16	1,800	50	250	1.4	40	105
TD-17	2,200	50	250	1.3	50	95
TD-18	2.700	50	250	1.2	60	85
TD-19	3,300	50	250	1.1	70	80
TD-20	3,900	50	250	1.0	80	75
TD-21	4,700	50	250	.9	90	70
TD-22	5,600	45	250	.8	100	65
TD-23	6,800	40	250	.7	140	60
TD-24	8,200	40	250	.6	160	55
TD-25	10,000	40	250	.6	175	50

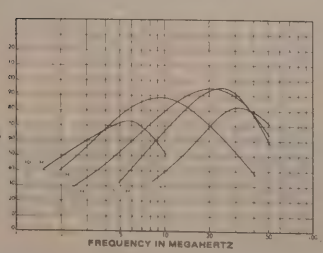
TB TYPICAL "Q" VS FREQUENCY

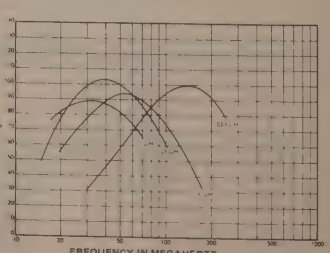




TD TYPICAL "Q" VS FREQUENCY

TA TYPICAL "Q" VS FREQUENCY





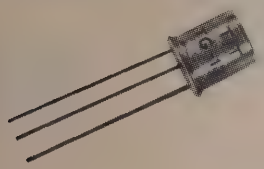
TF TYPICAL "Q" VS FREQUENCY

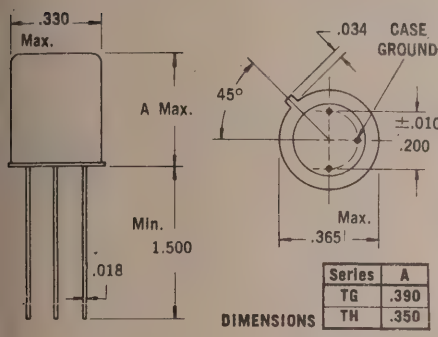
TOROTEL INC.

13402 SOUTH 71 HIGHWAY, GRANDVIEW, MO. 64030

PHONE: (816) 761-6314 TWX 910-777-7037

MINI-L HERMETICALLY SEALED R.F. INDUCTORS — TG, TH SERIES





Series	A
TG	.390
TH	.350

DIMENSIONS

TG SERIES

- DESIGNED TO MEET THE REQUIREMENTS OF MIL-T-27, GRADE 4, CLASS S.
- FREQUENCY RANGE: 10 to 500 kHz.
- INDUCTANCE RANGE: 1 to 500 mH.
- INDUCTANCE TOLERANCES: ±5%.
- INDUCTANCE STABILITY: ±2% (−20°C to +85°C.)

TH SERIES

- DESIGNED TO MEET THE REQUIREMENTS OF MIL-C-150305, GRADE 1, CLASS 0.
- FREQUENCY RANGE: 100 kHz to 10 MHz.
- INDUCTANCE RANGE: 10 uH to 1000 uH.
- INDUCTANCE TOLERANCES: 10 uH through 33 uH ±10%, 39 uH through 130 uH ±5%, greater than and including 150 uH ±3%.
- INDUCTANCE STABILITY: ±2% (−20°C to +85°C.)

TG SERIES

- HERMETICALLY SEALED, HIGH "Q" INDUCTOR IN A TO-5 TRANSISTOR CONFIGURATION.
- LOW EXTERNAL MAGNETIC AND ELECTROSTATIC FIELD.

Part No.	Inductance (mH)	Inductance Test Freq. (kHz)	"Q" Min.	"Q" Test Freq. (kHz)	DCR Max. (ohms)	Min. SRF (MHz)	DC Curr. (ma)
*TG- 1	1.0	10	120	200	3.3	1500	123
TG- 2	1.2	10	120	200	3.6	1300	118
*TG- 3	1.5	10	120	200	4.8	1160	102
TG- 4	1.75	10	120	200	5.2	1080	98
*TG- 5	2.0	10	120	200	5.7	1000	94
TG- 6	2.4	10	120	200	7.9	920	80
*TG- 7	3.0	10	120	150	8.9	820	75
TG- 8	3.6	10	120	150	9.8	730	71
TG- 9	4.3	10	120	150	13.7	660	60
*TG-10	5.0	10	120	150	14.7	600	58
TG-11	6.0	10	120	150	20.0	540	50
TG-12	7.2	10	120	100	21.8	480	48
*TG-13	8.6	10	100	100	24.0	430	45
*TG-14	10.0	10	100	100	32.4	400	39
TG-15	12.0	10	100	100	34.8	360	38
*TG-16	15.0	10	100	100	39.1	320	36
TG-17	17.5	10	85	70	55.0	300	30
*TG-18	20.0	10	85	70	60.0	280	29
TG-19	24.0	10	85	70	64.7	250	28
*TG-20	30.0	10	85	70	86.3	220	24
TG-21	36.0	10	85	70	95.8	195	23
*TG-22	43.0	10	85	70	132	185	19
*TG-23	50.0	10	85	70	143	165	18
*TG-24	60.0	10	75	50	155	145	18
TG-25	72.0	10	75	50	172	130	17
TG-26	86.0	10	75	50	233	125	15
*TG-27	100	10	75	50	252	115	14
TG-28	120	5	75	50	290	105	13
*TG-29	150	5	50	40	323	95	13
TG-30	175	5	50	40	350	85	12
*TG-31	200	5	50	40	477	80	10
TG-32	240	5	50	40	693	71	10
*TG-33	300	5	50	40	735	63	8
*TG-34	360	5	30	30	1005	57	7
TG-35	430	5	30	30	1100	51	6.5
*TG-36	500	5	30	20	1200	48	6.5

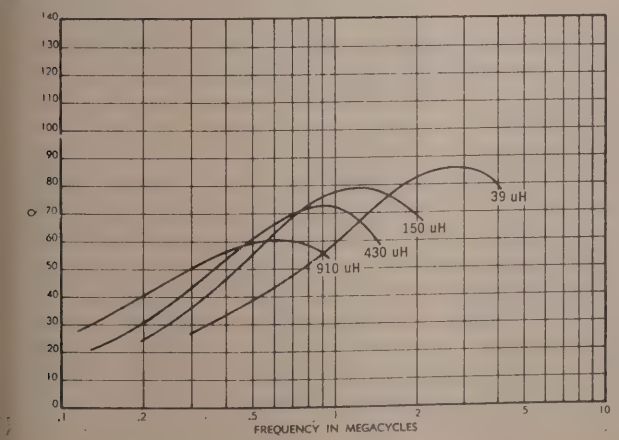
* Distributor Item

TH SERIES

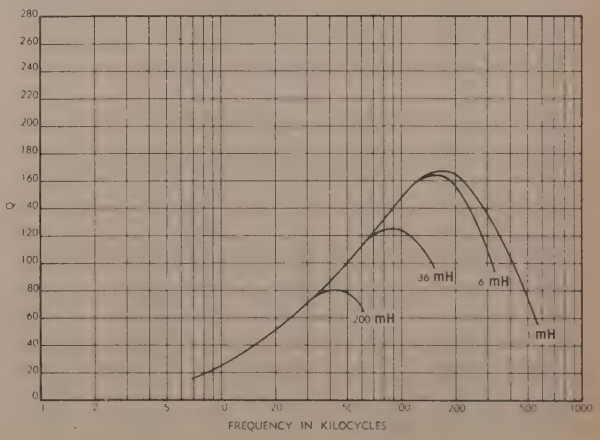
- AMBIENT TEMPERATURE RANGE: −55°C to +130°C.
- DIELECTRIC WITHSTANDING VOLTAGE: 100 volts rms.
- INSULATION RESISTANCE: 10,000 meg. ohms Min.

	Inductance (uH)	Inductance Test Freq. (kHz)	"Q" Min.	"Q" Test Freq. (kHz)	DCR Max. (ohms)	Min. SRF (MHz)	DC Curr. (ma)
TH- 7	10	1000	75	2500	2.4	35.0	102
TH- 8	12	1000	75	2500	2.5	30.0	100
TH- 9	15	1000	75	2500	2.6	25.0	98
TH-10	18	1000	75	2500	2.7	23.0	96
*TH-11	22	1000	75	2500	2.8	20.0	94
TH-12	27	1000	75	2500	2.9	17.0	93
TH-13	33	1000	75	2500	3.0	14.0	91
*TH-14	39	500	70	2500	3.1	11.0	90
TH-15	47	500	70	2500	3.2	10.0	88
*TH-16	56	500	70	2500	3.3	9.5	87
TH-17	68	500	70	2500	3.4	9.0	85
TH-18	82	500	70	2500	4.5	8.0	74
*TH-19	100	500	70	1500	5.1	7.5	70
TH-20	110	500	70	1500	6.0	7.0	64
*TH-21	120	500	70	1500	6.2	6.5	63
TH-22	130	500	70	1500	6.4	6.0	62
*TH-23	150	500	70	1500	6.6	5.5	61
TH-24	160	500	60	790	8.6	5.3	54
TH-25	180	500	60	790	9.0	5.0	52
*TH-26	200	500	60	790	9.5	4.5	51
TH-27	220	250	60	790	10.0	4.0	50
*TH-28	240	250	60	790	10.6	3.8	48
TH-29	270	250	60	790	11.2	3.6	48
*TH-30	300	250	60	790	14.2	3.4	42
TH-31	330	250	60	790	14.6	3.2	41
*TH-32	360	250	60	790	15.0	3.0	41
TH-33	390	250	60	790	15.6	2.9	40
TH-34	430	250	60	790	16.4	2.8	39
TH-35	470	250	60	790	20.4	2.7	35
*TH-36	510	250	60	790	21.8	2.6	34
TH-37	560	250	60	790	23.6	2.5	32
TH-38	620	250	60	790	24.6	2.3	32
*TH-39	680	250	50	790	25.8	2.1	31
TH-40	750	250	50	790	26.8	1.9	31
TH-41	820	250	50	790	38.4	1.7	25
TH-42	910	250	50	790	40.8	1.5	24
TH-43	1000	250	50	790	42.6	1.4	24

TH TYPICAL "Q" VS FREQUENCY



TG TYPICAL "Q" VS FREQUENCY



TOROTEL INC.

13402 SOUTH 71 HIGHWAY, GRANDVIEW, MO. 64030
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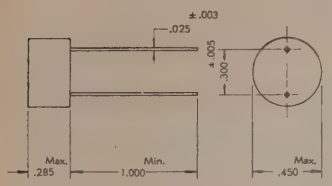
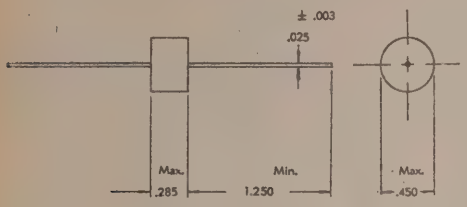
MINIATURE

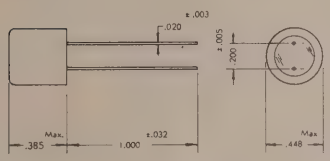
When ordering add the prefix **P, PA** or **M** to the part number for the case type desired.



TYPE P
Epoxy Encapsulated
MIL-T-27C, Grade 5, Class 5



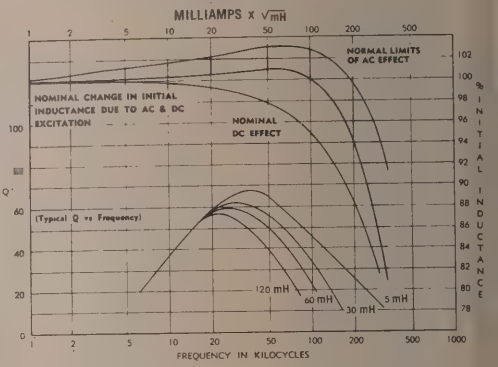
TYPE PA
Axial Leads
Epoxy Encapsulated



TYPE M
Metal Cased
MIL-T-27C, Grade 4, Class R

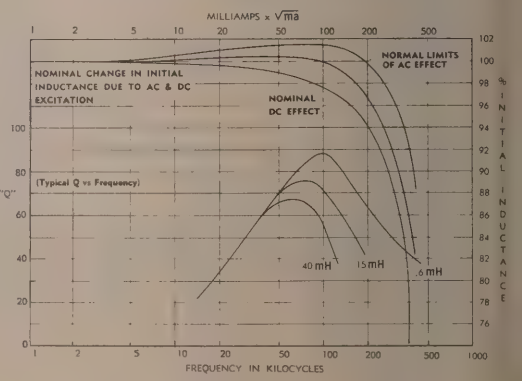
CORE NO. 03

- Recommended Frequency: Up to 50 kHz
- Maximum Inductance: 250 mH
- Tolerance: ±1.0%. Distributor Item ±2.0%
- Typical DCR: 1.5 ohms/mH



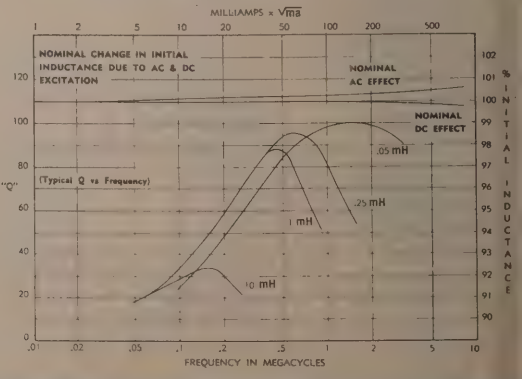
CORE NO. 13

- Recommended Frequency: 10 kHz to 200 kHz
- Maximum Inductance: 100 mH
- Tolerance: ±1.0%. Distributor Item ±2.0%
- Typical DCR: 3 ohms/mH



CORE NO. 29

- Recommended Frequency: 50 kHz to 5 MHz
- Maximum Inductance: 15 mH
- Tolerance: ±1.0%. Distributor Item ±2.0%
- Typical DCR: 20 ohms/mH



CORE NO. 03		CORE NO. 13		CORE NO. 29	
Inductance (mH)	Part Number	Inductance (mH)	Part Number	Inductance (mH)	Part Number
1.0	*03-1	.50	*13-1	.05	29-1
1.25	03-2	.60	13-2	.06	29-2
1.5	03-3	.72	13-3	.072	29-3
1.75	03-4	.86	13-4	.075	29-4
2.0	*03-5	1.0	*13-5	.086	29-5
2.4	*03-6	1.25	13-6	.100	*29-6
2.5	03-7	1.5	13-7	.120	29-7
3.0	*03-8	1.75	13-8	.125	29-8
3.6	03-9	2.0	*13-9	.150	29-9
4.3	03-10	2.4	13-10	.175	29-10
5.0	*03-11	2.5	13-11	.200	*29-11
6.0	03-12	3.0	*13-12	.240	29-12
7.2	03-13	3.6	13-13	.250	29-13
7.5	03-14	4.3	13-14	.300	*29-14
8.0	03-15	5.0	*13-15	.360	29-15
8.6	03-16	6.0	13-16	.400	29-16
10.0	*03-17	7.2	13-17	.430	29-17
12.0	03-18	8.6	13-18	.500	*29-18
12.5	03-19	10.0	*13-19	.600	29-19
15.0	03-20	12.0	13-20	.720	20-20
17.5	03-21	15.0	13-21	.750	29-21
20.0	*03-22	17.5	13-22	.860	29-22
24.0	03-23	20.0	*13-23	1.00	*29-23
30.0	03-24	24.0	13-24	1.20	29-24
36.0	03-25	25.0	13-25	1.25	29-25
43.0	03-26	30.0	13-26	1.50	29-26
50.0	*03-27	36.0	13-27	1.75	29-27
60.0	03-28	40.0	13-28	2.00	*29-28
72.0	03-29	43.0	13-29	2.40	29-29
75.0	03-30	50.0	*13-30	2.50	29-30
86.0	03-31	60.0	13-31	3.00	*29-31
100.0	*03-32	72.0	13-32	3.60	29-32
120.0	03-33	86.0	13-33	4.00	29-33
150.0	*03-34	100.0	13-34	4.30	29-34
175.0	03-35	—	—	5.00	*29-35
178.0	03-36	—	—	6.00	29-36
200.0	*03-37	—	—	7.20	29-37
250.0	03-38	—	—	7.50	29-38
—	—	—	—	8.60	29-39
—	—	—	—	10.0	29-40

* Distributor Item P Series Only

TOROTEL INC.

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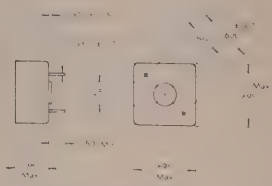
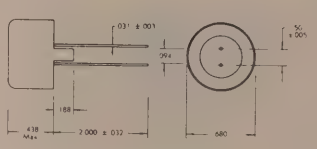
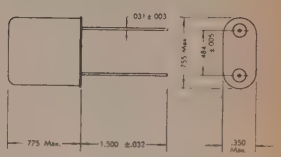
SUB-MINIATURE



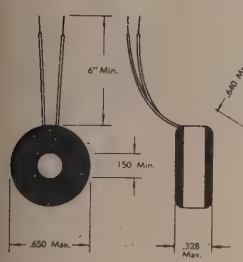
PRINTED CIRCUIT
TYPE S
Wt. .35 oz.



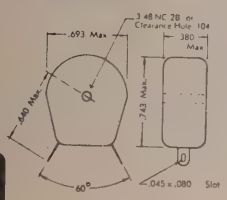
METAL CASED
TYPE M
Wt. .45 oz



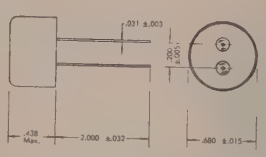
METAL CASED
TYPE MC
Wt. .45 oz



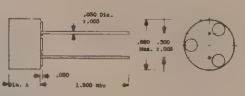
UNCASED
TYPE U
Wt. .25 oz.



COMPRESSION MOLDED
TYPE P
Wt. .35 oz.

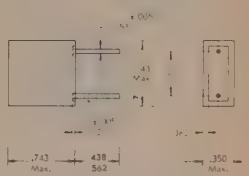


METAL CASED-GRID SPACING
TYPE MG
Wt. .45 oz



Style	Dim. A
PS	.435
PST	.390

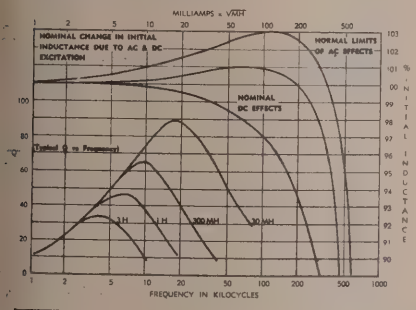
PRINTED CIRCUIT
TYPE PS & PST
Wt. .35 oz.



PRINTED CIRCUIT
TYPE PC
Wt. .35 oz.

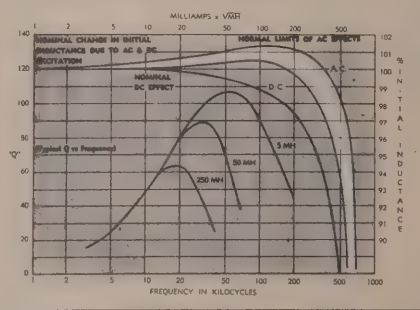
CORE NO. 50

- Recommended Frequency: Up to 20 kHz
- Maximum Inductance: 4.5 H
- Tolerance: ±1.0%. Distributor Item ±2.0%
- Special Core Stabilization Available: D, L, M, W
- Mechanical Tolerance: ±.015 (,38) unless otherwise indicated
- Typical DCR: 536 ohms/H



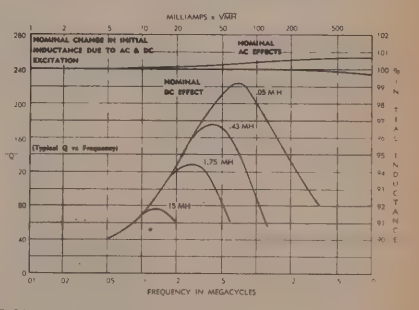
CORE NO. 51

- Recommended Frequency: 10 kHz to 100 kHz
- Maximum Inductance: 1 H
- Tolerance: ±1.0%. Distributor Item ±2.0%
- Special Core Stabilization Available: D, M, W
- Mechanical Tolerance: ±.015 (,38) unless otherwise indicated
- Typical DCR: 1.2 ohm/mH



CORE NO. 53

- Recommended Frequency: 50 kHz to 8 MHz
- Maximum Inductance: 20 mH
- Tolerance: ±1.0%. Distributor Item ±2.0%
- Only Core Stabilization Available: H
- Mechanical Tolerance: ±.015 (,38) unless otherwise indicated
- Typical DCR: 10.1 ohm/mH



STANDARD INDUCTANCE VALUES

CORE NO. 50

Inductance	Part Number	Inductance	Part Number
1.0 mH	50-1	125.0 mH	50-15
2.5 mH	50-2	150.0 mH	50-16
5.0 mH	*50-3	175.0 mH	50-53
6.0 mH	50-40	200.0 mH	*50-17
7.2 mH	50-41	240.0 mH	50-54
7.5 mH	50-4	250.0 mH	50-52
8.6 mH	50-42	300.0 mH	50-18
10.0 mH	*50-5	360.0 mH	50-55
12.0 mH	50-43	400.0 mH	50-19
12.5 mH	50-6	430.0 mH	50-56
15.0 mH	50-7	500.0 mH	*50-20
17.5 mH	50-44	600.0 mH	50-57
20.0 mH	*50-8	720.0 mH	50-58
24.0 mH	50-45	750.0 mH	50-21
25.0 mH	50-9	860.0 mH	50-59
30.0 mH	*50-10	1.0 H	*50-22
36.0 mH	50-46	1.2 H	50-60
40.0 mH	50-11	1.5 H	50-62
43.0 mH	50-47	1.25 H	50-61
50.0 mH	*50-12	1.75 H	50-63
60.0 mH	50-48	2.0 H	*50-64
72.0 mH	50-49	2.4 H	50-67
75.0 mH	50-13	2.5 H	50-66
86.0 mH	50-50	3.0 H	50-65
100.0 mH	*50-14	3.6 H	50-68
120.0 mH	50-51	4.0 H	50-69

† Add "C" to part number of molded inductor if clearance hole is desired.

U—Uncased
P—Compression Molded†
S—Printed Circuit
M—Metal Cased
MG—Metal Cased-Grid Spacing
MC—Metal Cased
PS, PST—Printed Circuit
PC—Printed Circuit

When ordering add case prefix to part number for package type desired. (Example MC-53-43)

CORE NO. 51

Inductance	Part Number	Inductance	Part Number
1.0 mH	51-1	24.0 mH	51-19
1.2 mH	51-2	30.0 mH	51-20
1.5 mH	51-3	36.0 mH	51-21
1.75 mH	51-4	43.0 mH	51-22
2.0 mH	*51-5	50.0 mH	*51-23
2.4 mH	51-6	60.0 mH	51-24
3.0 mH	51-7	72.0 mH	51-25
3.6 mH	51-8	86.0 mH	51-26
4.3 mH	51-9	100.0 mH	*51-27
5.0 mH	*51-10	120.0 mH	51-28
6.0 mH	51-11	150.0 mH	51-29
7.2 mH	51-12	175.0 mH	51-30
8.6 mH	51-13	200.0 mH	*51-31
10.0 mH	*51-14	240.0 mH	51-32
12.0 mH	51-15	300.0 mH	51-33
15.0 mH	51-16	360.0 mH	51-34
17.5 mH	51-17	430.0 mH	51-35
20.0 mH	*51-18	500.0 mH	*51-36

* Distributor Item P Series Only.

CORE NO. 53

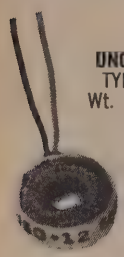
Inductance	Part Number	Inductance	Part Number
0.05 mH	53-1	1.0 mH	*53-23
0.06 mH	53-2	1.2 mH	53-24
0.072 mH	53-3	1.25 mH	53-25
0.075 mH	53-4	1.5 mH	53-26
0.086 mH	53-5	1.75 mH	53-27
0.10 mH	*53-6	2.0 mH	*53-28
0.12 mH	53-7	2.4 mH	53-29
0.125 mH	53-8	2.5 mH	53-30
0.15 mH	53-9	3.0 mH	*53-31
0.175 mH	53-10	3.6 mH	53-32
0.20 mH	53-11	4.0 mH	53-33
0.24 mH	53-12	4.3 mH	53-34
0.25 mH	53-13	5.0 mH	*53-35
0.30 mH	*53-14	6.0 mH	53-36
0.36 mH	53-15	7.2 mH	53-37
0.40 mH	53-16	7.5 mH	53-38
0.43 mH	53-17	8.6 mH	53-39
0.50 mH	*53-18	10.0 mH	*53-40
0.60 mH	53-19	12.0 mH	53-41
0.72 mH	53-20	12.5 mH	53-42
0.75 mH	53-21	15.0 mH	53-43
0.86 mH	53-22		

TOROTEL INC.

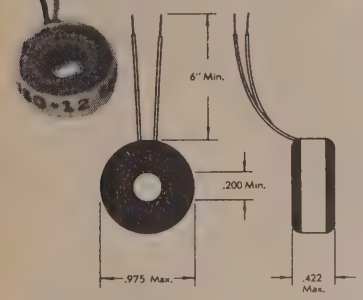
13402 SOUTH 71 HIGHWAY, GRANDVIEW, MO. 64030

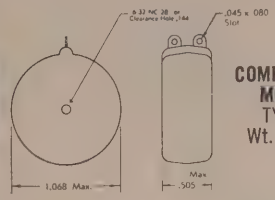
PHONE: (816) 761-6314 TWX 910-777-7037

TOROIDAL INDUCTORS



UNCASED
TYPE U
Wt. .55 oz.

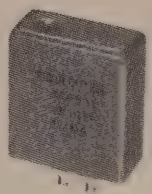


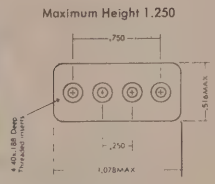


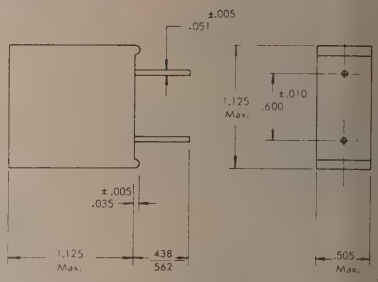
COMPRESSION MOLDED
TYPE P
Wt. 1.0 oz.

PRINTED CIRCUIT
TYPE PC

METAL CASED
TYPE M
Wt. 1.5 oz.

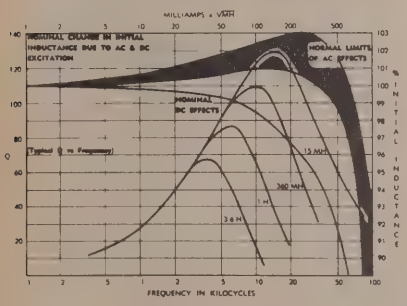






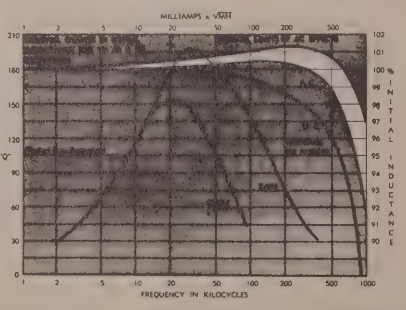
CORE NO. 06

- Recommended Frequency: Up to 20 kHz
- Maximum Inductance: 7.2H
- Tolerance: ±1.0%. Distributor Item ±2.0%
- Special Core Stabilization Available: B, D, E, G, L, M, W
- Studs are available on the "M" Series on special request
- Mechanical Tolerance: ±.015 (,38) unless otherwise indicated
- Typical DCR: 2.0 ohms/H



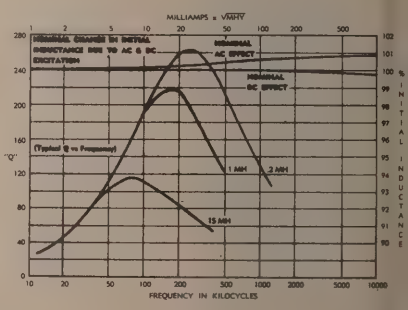
CORE NO. 48

- Recommended Frequency: Up to 100 kHz
- Maximum Inductance: 1 H
- Tolerance: ±1.0%. Distributor Item ±2.0%
- Special Core Stabilization Available: B, D, E, M, W
- Studs are available on the "M" Series on special request
- Mechanical Tolerance: ±.015 (,38) unless otherwise indicated
- Typical DCR: 420 ohms/H



CORE NO. 74

- Recommended Frequency: 50 kHz to 1 MHz
- Maximum Inductance: 30 mH
- Tolerance: ±1.0%. Distributor Item ±2.0%
- Only Core Stabilization Available: H
- Studs are available on the "M" Series on special request
- Mechanical Tolerance: ±.015 (,38) unless otherwise indicated
- Typical DCR: 3080 ohms/H



STANDARD INDUCTANCE VALUES

CORE NO. 06

Inductance	Part Number	Inductance	Part Number
5.0 mH	*06-1	200.0 mH	*06-15
6.0 mH	06-40	240.0 mH	06-54
7.2 mH	06-41	250.0 mH	06-52
7.5 mH	06-2	300.0 mH	06-16
8.6 mH	06-42	360.0 mH	06-55
10.0 mH	*06-3	400.0 mH	06-17
12.0 mH	06-43	430.0 mH	06-56
12.5 mH	06-4	500.0 mH	*06-18
15.0 mH	06-5	600.0 mH	06-57
17.5 mH	06-44	720.0 mH	06-58
20.0 mH	*06-6	750.0 mH	06-19
24.0 mH	06-45	860.0 mH	06-59
25.0 mH	06-7	1.0 H	*06-20
30.0 mH	*06-8	1.2 H	06-60
36.0 mH	06-46	1.25 H	06-21
40.0 mH	06-9	1.5 H	06-22
43.0 mH	06-47	1.75 H	06-61
50.0 mH	*06-10	2.0 H	*06-23
60.0 mH	06-48	2.4 H	06-62
72.0 mH	06-49	2.5 H	06-69
75.0 mH	06-11	3.0 H	*06-24
86.0 mH	06-50	3.6 H	06-70
100.0 mH	*06-12	4.3 H	06-71
120.0 mH	06-51	5.0 H *	06-72
125.0 mH	06-13	6.0 H	06-73
150.0 mH	06-14	7.2 H	06-74
175.0 mH	06-53		

† Add "C" to part number of molded inductor if clearance hole is desired.

U—Uncased
P—Compression Molded†
PC—Printed Circuit
M—Metal Cased

When ordering add case prefix to part number for package type desired. (Example P06-1)

CORE NO. 48

Inductance	Part Number	Inductance	Part Number
2.0 mH	48-1	43.0 mH	48-18
2.4 mH	48-2	50.0 mH	*48-19
3.0 mH	*48-3	60.0 mH	48-20
3.6 mH	48-4	72.0 mH	48-21
4.3 mH	48-5	86.0 mH	48-22
5.0 mH	*48-6	100.0 mH	*48-23
6.0 mH	48-7	120.0 mH	48-24
7.2 mH	48-8	150.0 mH	48-25
8.6 mH	48-9	175.0 mH	48-26
10.0 mH	*48-10	200.0 mH	*48-27
12.0 mH	48-11	240.0 mH	48-28
15.0 mH	48-12	300.0 mH	48-29
17.5 mH	48-13	360.0 mH	48-30
20.0 mH	48-14	430.0 mH	48-31
24.0 mH	48-15	500.0 mH	*48-32
30.0 mH	*48-16	600.0 mH	48-33
36.0 mH	48-17		

* Distributor Item P Series Only.

CORE NO. 74

Inductance	Part Number	Inductance	Part Number
0.1 mH	74-1	1.5 mH	73-21
0.12 mH	74-2	1.75 mH	73-22
0.125 mH	74-3	2.0 mH	73-23
0.15 mH	74-4	2.4 mH	73-24
0.175 mH	74-5	2.5 mH	73-25
0.20 mH	*74-6	3.0 mH	*73-26
0.24 mH	74-7	3.0 mH	73-27
0.25 mH	74-8	4.0 mH	73-28
0.3 mH	74-9	4.3 mH	73-29
0.36 mH	74-10	5.0 mH	*73-30
0.4 mH	74-11	6.0 mH	73-31
0.43 mH	74-12	7.2 mH	73-32
0.5 mH	*74-13	7.5 mH	73-33
0.6 mH	74-14	8.6 mH	73-34
0.72 mH	74-15	10.0 mH	*73-35
0.75 mH	74-16	12.0 mH	73-36
0.86 mH	74-17	12.25 mH	73-37
1.0 mH	*74-18	15.0 mH	*73-38
1.2 mH	74-19	17.5 mH	73-39
1.25 mH	74-20	20.0 mH	73-40

TOROTEL INC.

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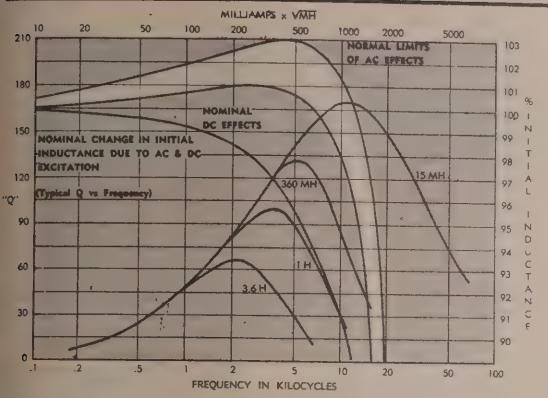
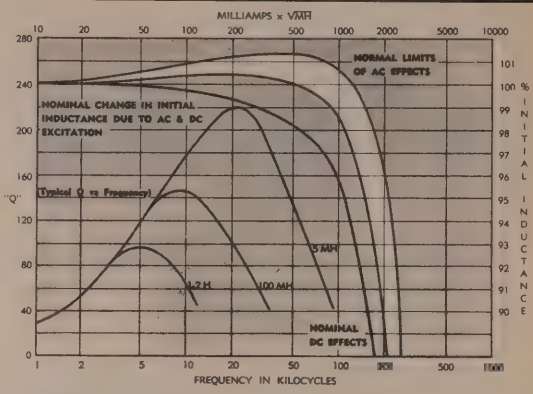
TOROIDAL INDUCTORS





CORE NO. 30

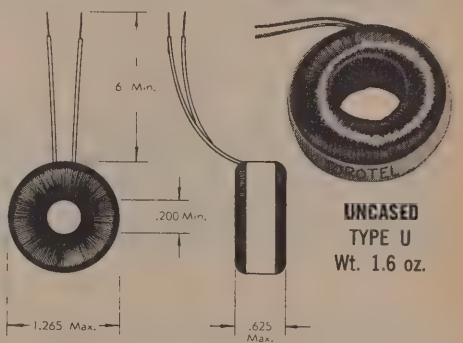
- Recommended Frequency: Up to 20 kHz
- Maximum Inductance: 17.5 H
- Tolerance: ±1.0%. Distributor Item ±2.0%
- Special Core Sabilization Available: B, D, E, G, L, M, W
- Studs are available on the "M" Series on special request
- Mechanical Tolerance: ±.015 (,38) unless otherwise indicated
- Typical DCR: 105 ohms/H

CORE NO. 94

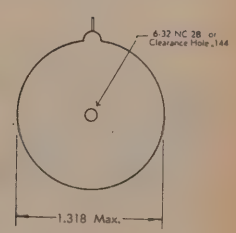
- Recommended Frequency: Up to 75 kHz
- Maximum Inductance: 1H
- Tolerance: ±1.0%. Distributor Item ±2.0%
- Special Core Sabilization Available: B, D, M, W
- Studs are available on the "M" Series on special request
- Mechanical Tolerance: ±.015 (,38) unless otherwise indicated
- Typical DCR: 210 ohms/H

CORE NO. 30

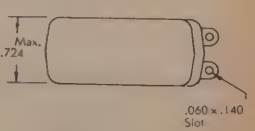
Inductance	Uncased Type	Compression Molded†	Metal Cased	Inductance	Uncased Type	Compression Molded†	Metal Cased
5.0 mH	U30-1	*P30-1	M30-1	360.0 mH	U30-55	P30-55	M30-55
6.0 mH	U30-40	P30-40	M30-40	400.0 mH	U30-17	P30-17	M30-17
7.2 mH	U30-41	P30-41	M30-41	430.0 mH	U30-56	P30-56	M30-56
7.5 mH	U30-2	P30-2	M30-2	500.0 mH	U30-18	*P30-18	M30-18
8.6 mH	U30-42	P30-42	M30-42	600.0 mH	U30-57	P30-57	M30-57
10.0 mH	U30-3	*P30-3	M30-3	720.0 mH	U30-58	P30-58	M30-58
12.0 mH	U30-43	P30-43	M30-43	750.0 mH	U30-19	P30-19	M30-19
12.5 mH	U30-4	P30-4	M30-4	860.0 mH	U30-59	P30-59	M30-59
15.0 mH	U30-5	P30-5	M30-5	1.0 H	U30-20	*P30-20	M30-20
17.5 mH	U30-44	P30-44	M30-44	1.2 H	U30-60	P30-60	M30-60
20.0 mH	U30-6	*P30-6	M30-6	1.25 H	U30-21	P30-21	M30-21
24.0 mH	U30-45	P30-45	M30-45	1.5 H	U30-22	P30-22	M30-22
25.0 mH	U30-7	P30-7	M30-7	1.75 H	U30-61	P30-61	M30-61
30.0 mH	U30-8	P30-8	M30-8	2.0 H	U30-23	P30-23	M30-23
36.0 mH	U30-46	P30-46	M30-46	2.4 H	U30-62	P30-62	M30-62
40.0 mH	U30-9	P30-9	M30-9	2.5 H	U30-69	P30-69	M30-69
43.0 mH	U30-47	P30-47	M30-47	3.0 H	U30-24	*P30-24	M30-24
50.0 mH	U30-10	*P30-10	M30-10	3.6 H	U30-63	P30-63	M30-63
60.0 mH	U30-48	P30-48	M30-48	4.0 H	U30-25	P30-25	M30-25
72.0 mH	U30-49	P30-49	M30-49	4.3 H	U30-64	P30-64	M30-64
75.0 mH	U30-11	P30-11	M30-11	5.0 H	U30-26	*P30-26	M30-26
86.0 mH	U30-50	P30-50	M30-50	6.0 H	U30-65	P30-65	M30-65
100.0 mH	U30-12	*P30-12	M30-12	7.2 H	U30-66	P30-66	M30-66
120.0 mH	U30-51	P30-51	M30-51	7.5 H	U30-27	P30-27	M30-27
125.0 mH	U30-13	P30-13	M30-13	8.6 H	U30-67	P30-67	M30-67
150.0 mH	U30-14	P30-14	M30-14	10.0 H	U30-28	*P30-28	M30-28
175.0 mH	U30-53	P30-53	M30-53	12.0 H	U30-68	P30-68	M30-68
200.0 mH	U30-15	*P30-15	M30-15	12.5 H	U30-29	P30-29	M30-29
240.0 mH	U30-54	P30-54	M30-54	15.0 H	U30-30	P30-30	M30-30
250.0 mH	U30-52	P30-52	M30-52	17.5 H	U30-31	P30-31	M30-31
300.0 mH	U30-16	P30-16	M30-16				



UNCASED
TYPE U
Wt. 1.6 oz.



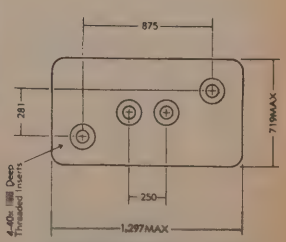
COMPRESSION MOLDED
TYPE P
Wt. 2.5 oz.



CORE NO. 94

Inductance	Uncased Type	Compression Molded†	Metal Cased	Inductance	Uncased Type	Compression Molded†	Metal Cased
5.0 mH	U94-1	P94-1	M94-1	75.0 mH	U94-21	P94-21	M94-21
6.0 mH	U94-2	P94-2	M94-2	86.0 mH	U94-22	P94-22	M94-22
7.2 mH	U94-3	P94-3	M94-3	100.0 mH	U94-23	*P94-23	M94-23
7.5 mH	U94-4	P94-4	M94.4	120.0 mH	U94-24	P94-24	M94-24
8.6 mH	U94-5	P94-5	M94-5	125.0 mH	U94-25	P94-25	M94-25
10.0 mH	U94-6	*P94-6	M94-6	150.0 mH	U94-26	P94-26	M94-26
12.0 mH	U94-7	P94-7	M94-7	175.0 mH	U94-27	P94-27	M94-27
12.5 mH	U94-8	P94-8	M94-8	200.0 mH	U94-28	*P94-28	M94-28
15.0 mH	U94-9	P94-9	M94-9	240.0 mH	U94-29	P94-29	M94-29
17.5 mH	U94-10	P94-10	M94-10	250.0 mH	U94-30	P94-30	M94-30
20.0 mH	U94-11	P94-11	M94-11	300.0 mH	U94-31	P94-31	M94-31
24.0 mH	U94-12	P94-12	M94-12	360.0 mH	U94-32	P94-32	M94-32
25.0 mH	U94-13	P94-13	M94-13	400.0 mH	U94-33	P94-33	M94-33
30.0 mH	U94-14	*P94-14	M94-14	430.0 mH	U94-34	P94-34	M94-34
36.0 mH	U94-15	P94-15	M94-15	500.0 mH	U94-35	*P94-35	M94-35
40.0 mH	U94-16	P94-16	M94-16	600.0 mH	U94-36	P94-36	M94-36
43.0 mH	U94-17	P94-17	M94-17	720.0 mH	U94-37	P94-37	M94-37
50.0 mH	U94-18	*P94-18	M94-18	750.0 mH	U94-38	P94-38	M94-38
60.0 mH	U94-19	P94-19	M94-19	860.0 mH	U94-39	P94-39	M94-39
72.0 mH	U94-20	P94-20	M94-20				

METAL CASED
TYPE M
Wt. 3.5 oz.



Maximum Height 1.750

† Add "C" to part number of molded inductor if clearance hole is desired. * Distributor Item P Series Only.

short form catalog

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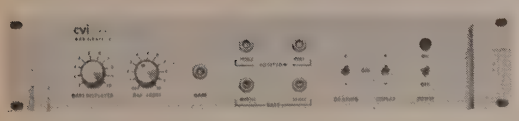
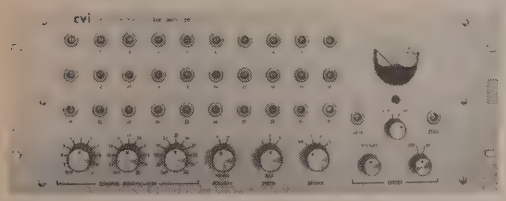
Bar Graph 101



Accepts 10 signal inputs and converts these into a vertical "Bar" pattern as seen on the screen of a standard TV monitor. Rack mount, 3½" h.

$1250.

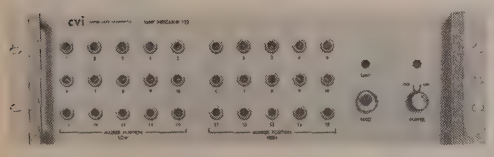
Bar Graph 120



Accepts 30 negative going input signals and produces a horizontal bar display with better than 1% accuracy. Has individual channel markers, zero suppression, decade expansion, and other features. Requires external sync. Rack mount, 7" h.

$4200.

Limit Indicator 122



Produces 15 separate "high" and 15 separate "low" vertical markers with automatic alarm when video falls outside of predetermined limits. Requires external sync. Rack mount, 5¼" h.

$3500.

Video Compressor 260B

Accepts standard composite video signals and performs sampling, digitizing, buffering, and slow scan TV conversion operations. Provides output for direct connection of slow scan signals to voice grade communications circuits. Rack mount, 5½" h. Also includes remote control unit.

$3000.

Video Compressor 262

Similar to the 260B but uses sampling only (8kHz) or sampling plus buffering (1kHz) to perform slow scan conversion. Compact table-top configuration.

$1250.	**262A**	8kHz bandwidth
1500.	**262B**	1kHz bandwidth

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Video Digitizer **270A**

Converts standard television signals into digital data for computer processing and control. Can also redisplay data on a standard television monitor for photographic production of hard copy by time exposure. Easily interfaced with modern minicomputers. Rack mount, 5¼" h.

$4000.

Video Expander **275**

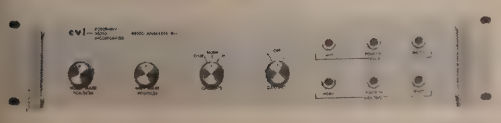
A solid state video memory capable of storing one frame of video information. Data may be fed into the 275 at a slow rate, stored, and displayed to present a continuously refreshed image on a standard television monitor screen. The image buildup process may be continuously observed, and there is no fadeout or image degradation with time in the resulting display. The 275 may be used as a computer display device or as a slow scan video communications receiver. For communications applications it is a companion unit for CVI Models 260B or 262 Video Compressors. Available in 256x256 or 256x512 element resolution, 6-bit grayscale. Rack mount, 10½" h.

$7000.	**275A**	1kHz	256x256
7000.	**275A-8**	8kHz	256x256
9000.	**275B**	1kHz	256x512
9000.	**275B-8**	8kHz	256x512
1000.	Computer I/O Option		
2000.	Frame Grab Option		

Video Transceiver **280**

Combines the functions of digital frame grabbing and slow scan transmission and reception in a single package. Contains 256x512x6 bit solid state video memory using 4K RAMs. Features remote control of functions and dual rate/resolution operation. Rack mount, 10½x10x15".

$12,500.



Video Analyzer **301**

Displays "vertically line-selected" TV waveforms directly on the screen of a normal TV monitor. 1/1 waveform/picture ratio simplifies identification of individual picture elements. Display also includes an electronic reference grating and H and V markers. Requires external sync. Rack mount, 3½" h.

$875.

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Sync Stripper 302-2

A utility unit producing sync, horizontal drive, vertical drive, and blanking signals derived from a standard composite video source. Allows interconnection and synchronization of video devices to camera or tape recorded signals. Size 9½x6¾x1¾".

$250.

Raster Generator 302-5

Generates very low speed rasters, up to one half hour in duration. Intended for use in recording sampled video information or other low frequency signals in conjunction with a conventional X-Y plotter. Produces pseudo topographical type displays with information vertically deflecting raster lines. Rack mount, 3½" h.

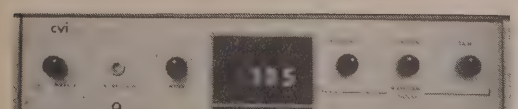
$950.

Motion Detector 304

Samples four independent points in a TV scene and produces an alarm when a change in brightness occurs at any of the sampling points. Operates with standard, composite, video signals. Rack mount, 3½" h.

$1000.

Video Micrometer 305



Designed for dimensional analysis of objects seen by TV camera. Incorporates image enhancement circuitry and a unique video waveform display superimposed on monitor screen for more objective determination of soft or fuzzy edges. Accepts standard video signals. Table top mounting 5¼" h.

$3150.

Video Integrator 310

Produces a D.C. voltage directly proportional to the integral of a video signal falling within a selectable "window" area. Requires external drives. Rack mount, 3½" h.

$1500.

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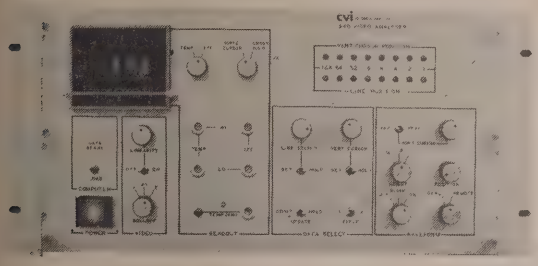
Video Analyzer 321

Laboratory version of the 301. Incorporates additional circuitry to allow chart recording of line selected video waveforms X-Y coordinate indication, noise analysis, computer data input, and other features. Rack mount, 3½" h.

$2500.



Video Analyzer 340

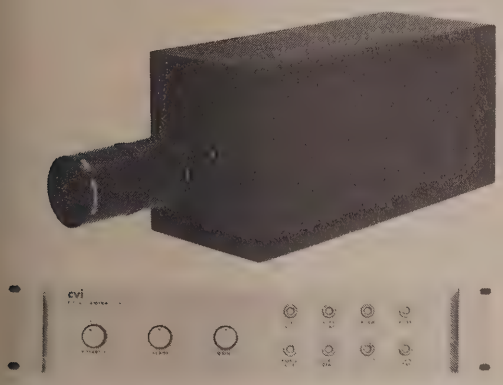
A sophisticated instrument intended to derive objective data from video signals. Functions include digitization of a selected TV line and processing of derived data. Several patterns are superimposed over input video for simplification of analysis. Rack mount, 8¾" h.

$14,500.

Video Analyzer 350

A low cost instrument for display of TV waveforms directly on a normal monitor screen, eliminating the need for a separate CRT display. Similar to the Model 301 but uses a fixed sampling position. Also features a peak video level detection mode. Rack mount, 1¾" h.

$400.



Data Camera 502

A TV camera intended particularly for research or industrial inspection uses. Accepts nearly any 1 inch tube and has various features such as externally controllable sweeps, beam blanking, dynamic gain control, plug-in low pass filters, and very wide range of operating rates. Options include video sampler and digital control of various functions. Camera is three chassis configuration: head, control unit, power supply. Requires external drives, blanking, or deflection voltages.

$4000.

Sync Generator 601-B

A unit intended for laboratory use when either standard or non-standard TV scan rates are required. Uses micrologic binary counters with adjustable feedback paths. Drive and blanking pulses are variable width, but sync is not EIA format. Incorporates dot/bar generator for test purposes. Rack mount, 3½" h.

$1025.

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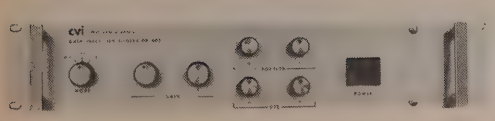
Data Insertion Generator **603**



Combines the functions of a 2 channel video mixer, special effects generator, and video pointer. A moveable oblong is positionable to any point in TV raster and is variable in size over a wide range. The oblong acts as the internal "key" in special effects mode, and also generates a white "box" outline or solid square for marking purposes. Requires external sync. Rack mount, 3½" h.

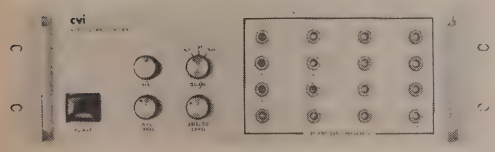
$1250.

Video Processor **604**

Modifies the grayscale of a video input signal by selecting and amplifying a variable width "slice." Also incorporates variable brightness control, sync adding, and external marker adding functions. Requires external sync. Rack mount, 3½" h.

$950.

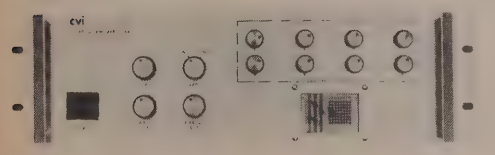
Video Quantizer **606**



Allows the processing of a video input signal into 16 separate amplitude levels. Operates with tape, camera, or disc inputs and allows radical grayscale alterations or the generation of complex synthetic color signals. Rack mount, 5¼" h.

$3500.

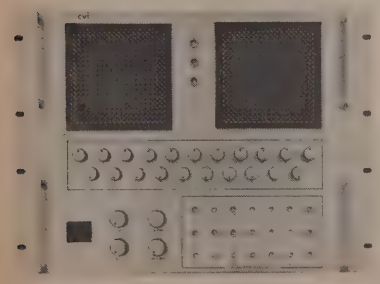
Video Quantizer **606A**



An eight-channel version of the 606, containing a built-in patch panel for the color coding and mixing functions. Produces R-G-B outputs and sync. Rack mount, 5¼" h.

$2500.

Video Quantizer **606C**



A 21-channel version of the 606, with integral patch panel for achieving a wide range of visual effects. Contains linear video amplifier for mixing input digital with quantized signals. Wide band operation. Rack mount, 14" h.

$5000.

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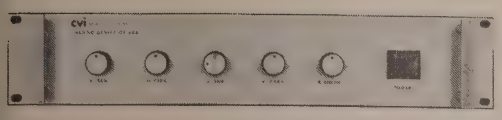
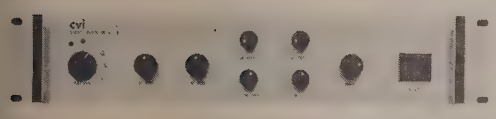
Shading Generator **608**



Generates H and V sawtooth and parabolic waveforms of variable amplitude and polarity to provide compensation of brightness errors in video input signals. May also be used to drive external dynamic correction circuitry. Requires external sync. Rack mount, 3½" h.

$950.

Video Pointer **610E**



Generates five different oblong and/or cross patterns which are positionable to any location on the TV screen. Oblongs can be changed in size over a range of 10 to 1. Unit may be used for marking purposes or for positional measurements. Rack mount, 3½" h.

$1950.

Diameter Analyzer **611**

Contains gating, slicing, and counting circuits to provide automatic measurement of the maximum vertical dimension of a target with moderate to high contrast. Both digital and analog output signals are available. Rack mount, 3½" h.

$1950.

Video Generator **615**

Generates grayscale, grating, dot, window, multiburst, and flat field signals. Multiburst is variable in position for monitor resolution checks, and multiburst frequencies to 20 MHz may be ordered. 615 requires external drives, blanking, and sync. 615A has internal sync generator and supplies video, sync, blanking, and drives. Rack mount, 5¼" h.

$2000. 615
2250. 615A

X-Y Indicator **620**

Generates white cross hairs superimposed over a video input signal. Allows rapid alignment of subject material with a predetermined location when used in conjunction with a standard TV camera and monitor. Accepts composite video on a terminated input and provides composite video out to a standard TV monitor. Size 11x8x 1.65". Mounting: Free standing or rack mount.

$400.

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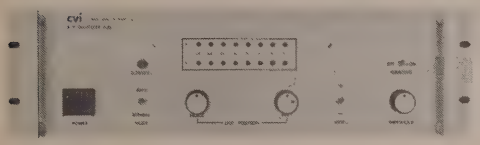
X-Y Indicator 621

Accepts either composite or non-composite video signals and superimposes either a small white dot or set of cross hairs on the video image. Marker may be manually positioned to any location on the raster and two directly proportional DC output signals are generated for analysis of spatial location of subjects. Also contains built-in grating generator for evaluation of input signal quality. Rack mount, 3½″ h.

$1500.

X-Y Digitizer 622



Provides 8 bit digital X-Y coordinates of a small white dot that may be manually located anywhere on a standard TV image. Also incorporates automatic tracking of high contrast targets, and stable grating test signal. Operates from composite video. Rack mount, 5¼″ h.

$4500.

Sync Delay 624

Accepts standard format vertical and horizontal drives and generates drives, blanking, and industrial sync signals which may be delayed by selectable amounts, both vertically and horizontally, from the original drive signals. Rack mount, 3½″ h.

$1250.

Video Detector 630

Provides gating functions combined with high and low video detection circuitry to provide automatic warning when video levels exceed preset limits. May also be operated in a differential mode to provide high sensitivity to small changes in contrast, such as might be produced by spots or hairline cracks. Operates from composite video signals. Standard rack mount, 3½″ h.

$1500.

Video Motion Analyzer 633

Accepts composite video signals and measures lateral motion of a high contrast video target in a selectable portion of the TV signal. Operates in two modes: one-line gate superimposed on target image, or variable gate to blank out all but target profile. Rack mount, 5¼″ h.

$4000.

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A few words about Colorado Video, Incorporated.

CVI specializes in the design and manufacture of instruments utilizing video technology. Particular areas of interest include research laboratory instrumentation, industrial inspection and control, computer input/output of television signals, video metrology, image alteration and synthesis, electronic art, scan conversion, and communications involving the transmission of TV pictures over audio grade circuits.

Colorado Video, Incorporated — 3245 Prairie Avenue, Boulder, Colorado USA

CVI instruments are used throughout the world and are available for operation from 50 to 400 Hertz power sources and at various scanning rates. For technical assistance, please contact any of the following:

CVI — Box 928 — Boulder, CO 80306 U.S.A.
(303) 444-3972 — TWX 910-940-3248 COLO VIDEO BDR

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Ciclovision S.R.L.
Marcelo T. de Alvear 849° "A"
Buenos Aires, Argentina
(32-2939)

Hae Nin Commerce Co., Inc.
Central P.O. Box 1201
Seoul, Korea
(22-2128)

Integrerad Electronik AB
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S-182 51 Djursholm, Sweden
(08/753 03 30)

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(30-69-06)

Protech, Inc.
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(383-1039)

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Littleton, Colorado 80121
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Perception Systems
13844 Peyton Drive
Dallas, Texas 75240
(214) 233-5497

Perspective Measurements
7370 Convoy Court
San Diego, California 92111
(714) 278-8931

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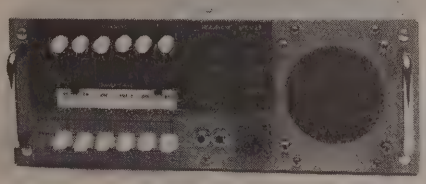
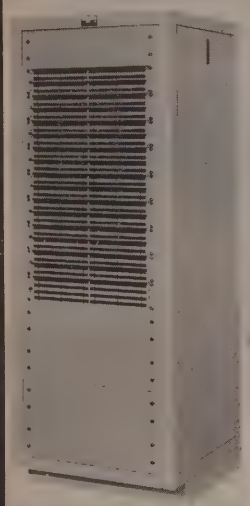
TRIANGLE INDUSTRIAL CENTER
MEDFORD, NEW JERSEY 08055
Phone: 609-267-7950

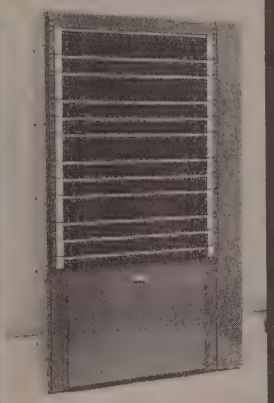
Loudspeaker-Amplifier Panels Single (SLP-4 shown) and dual units available with common or independent AC/DC Integral Power Supplies, or DC inputs. 5-1/4" H X 19" W X 6 " D



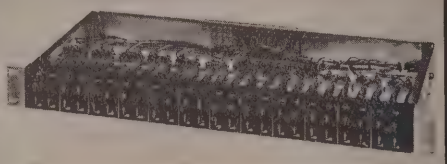
Air Traffic Control Tower Systems•Complete solid state Airport Tower units • FAA, Navy and Air Force approved • Models for 12 VDC, 24 VDC and 48 VDC power • Amplifiers for Tx and Rx circuits.

Mobile Air Traffic Control System AN/MRC-131 • Completely self contained • Provides 1 HF, 2 VHF, 2 UHF, 1 FM channels • Three operator positions • Power from motor alternator, 12 V DC battery, and 110/230 VAC rectifier charger • All frequencies in HF, VHF and UHF Air/Ground bands.



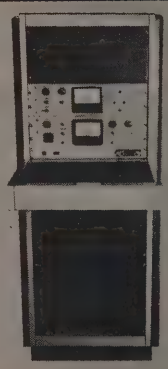


Patch and Test Bays Primary (cable), equal level Circuit and DC Patch Bays complete and ready for installation at site. Also, Patch, Test, Fuse and Distribution bays.

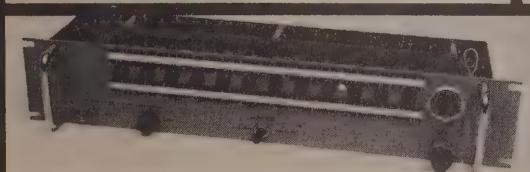


Variable Attenuator Panel - VAP-1230 Provides 12 channels of switchable attenuation from 0 to 30 DB in 2 DB steps, 600 OHMS input and output. 1-3/4" H X 19" W X 9" D. Other impedance and attenuation steps available.

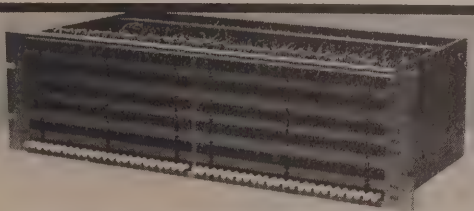
Voice Orderwire Unit TTP-12 • Provides selection 12 channels • Supplied with telephone handset • Adjustable Tx and Rx levels.



Magnet Charger Model 3 LV • High power for industrial users • 11000 watt seconds peak energy • Automatic 10 operations per minute • Available with Monitor Unit • Variable charging voltage 0-500 volts • Model 1 LV also available.



Local Alarm Panel LAP-12 • Model of 12, 24 and 36 points • Red lamp and audible alarm • 110 VAC, 48 VDC and 24 VDC optional power • Solid state construction.



Audio and Digital Patch Panels Miniature and standard telephone jacks in various configurations for telecommunications and computer patch and test facilities available in 2, 4 and 6 wire circuitry for audio; cut key and/or activity indicators for digital.

Supervisory Control, Alarm Systems • Custom designed to your requirements • Up to 256 points control and alarm • Excellent security Double scan with Parity • Computer control and logging available • Single master-multiple remotes • Fully solid state IC construction.

Relay Panel - RPY-20 20 Plug in relays in 1-3/4" of panel space for various applications in communications and control field. A wide variety of voltage and contact arrangements available.

Fuse and Alarm Panel 40 fuses in 1-3/4" H. Panel with visual alarm and contact outputs for remoting alarm. FP-40A for 6, 48, 60-80, 120-130 VDC. F P -40B for 6, 12, 24 and 48 VDC applications.

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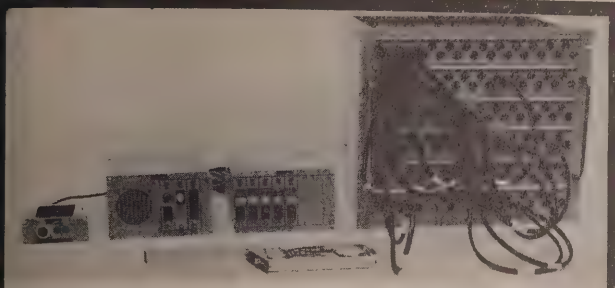
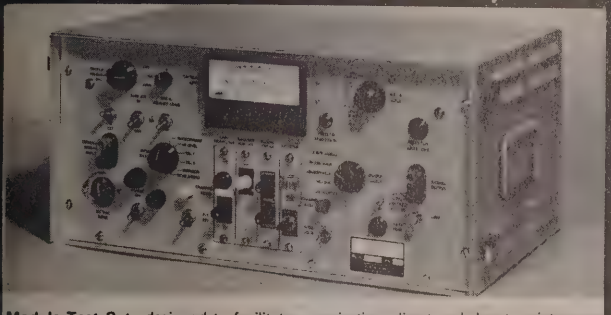
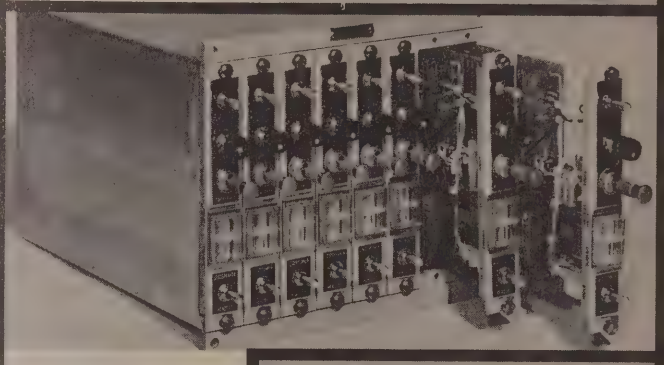


Air Traffic Radio Channel Control Systems 12 VDC, 24 VDC and 48 VDC,—12 and 24 VDC systems include (shown left to right): Jack Unit—audio unit; w/plug-in microphone amplifier/lamp brightner, recorder monitor, and speaker-headphone amplifier modules, — selector unit w/plug-in selector modules — multipin patch panel extender module (foreground). Flight service station selectors, power supply assemblies and supporting test set also shown on this page.

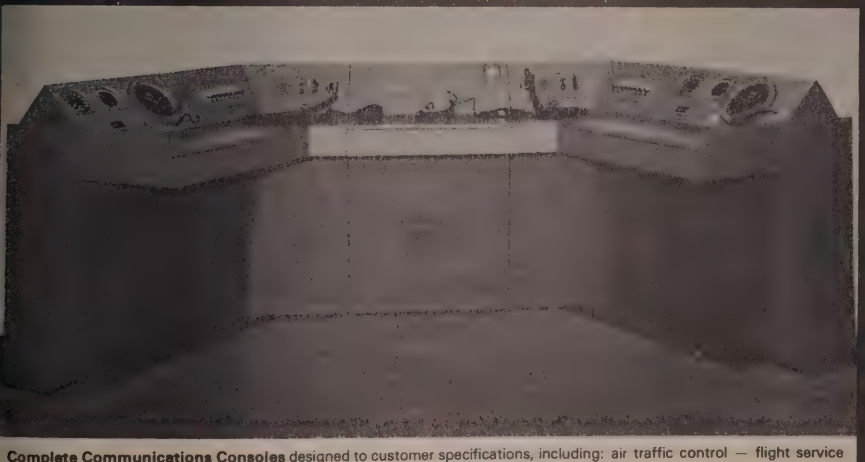
Power Supply Assemblies: Standard models include 12 VDC, 24 VDC and 48 VDC outputs with input @ 115 VAC 50-60 H_z single phase. (Other in/outputs available on request.)



Module Test Sets designed to facilitate organization, direct and depot maintenance levels. The test set provides in/output signals and measurements required to access module performance, used with 12 and 24V radio channel control equipment.

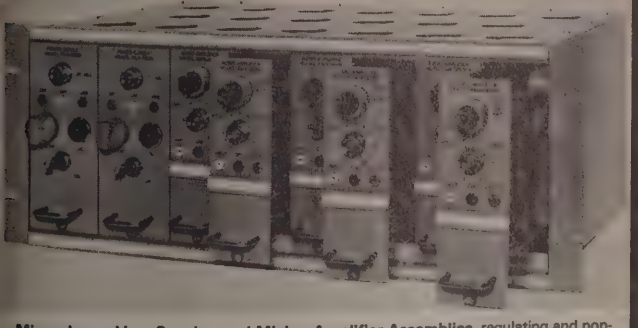


Flight Service Station Selectors provides standard radio channel control functions plus muting and individual volume control features with emergency and locking select and key switch.



Complete Communications Consoles designed to customer specifications, including: air traffic control — flight service stations — police, fire and maintenance dispatcher positions.

Four and Six Channel Main-Standby Transformer Control and Relay Panels — six channel control panel CP-600 shown. Other basic models include RP-600, SSP-400, and RTP-400. These units available in 12, 24 and 48 VDC.



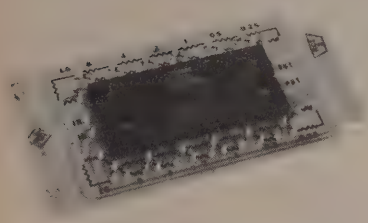
Microphone, Line, Speaker and Mixing Amplifier Assemblies, regulating and non-regulating (6 channel regulating amplifier — AA-6/600B shown)

Additional Systems and Equipment:

- Voice frequency signaling and control system (RCAG)
- Voice frequency signaling system (VOR/VORTAC)
- Receiver selector XFMR
- Receiver muting XFMR
- Receiver selector/mixing XFMR
- Radio headset panel
- Receiver selector, 4 channel
- Receiver volume control panel
- Receiver muting panel

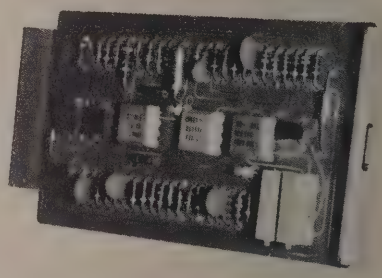
G.R.M. CORPORATION - COMPLETE MANUFACTURING SERVICES FOR OEM PROPRIETARY PRODUCTS

A COMPLETE LINE OF COMPONENTS FOR DATA COMMUNICATIONS SYSTEMS



LINE CONDITIONING & INTERFACE DEVICES

C-303 • Dual strappable 0 to 31.75 DB 600 ohm pads
C-311 • 600 ohm in/out 30 DB data grade line amplifier
C-312 • 2W, 600/10K input speaker amplifier
C-314-XX • Balanced and isolated summing amplifier up to 10 ports
C-315-XX • Balanced and isolated distribution amplifier up to 10 ports

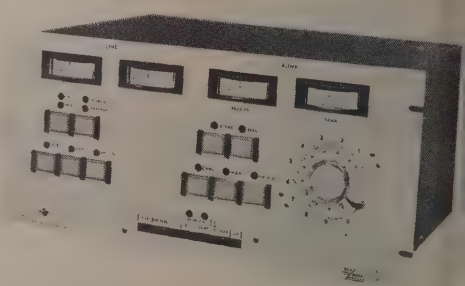


ALARMS—TELETYPE & CARRIER FAULT

C-351 • 45 to 200 Baud distortion/open line alarm
C-353 • Dual carrier detector/alarm
C-354 • Hi/Lo carrier alarm, detects out of tolerance data levels

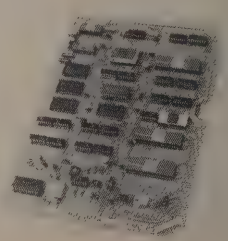
INTERFACE—TELETYPE

C-362 • EIA to TTY convertor 20 or 60 ma, two to four wire option
C-363 • EIA to polar convertor
C-368 • Automatic Loop current regulator adjustable 15 to 70 ma
C-435 • Digital Filter—Virtually eliminates errors on noisy TTY circuits using "UART" receivers
C-460 • Data Delay Motor Start provides up to 1 second of data storage for slow turn on printers such as T.I. Silent 700®... Saves power, extends life.
C-480 • Telex line and trunk test set—test either mechanical or computerized telex exchanges.



NEW! COMPLETE MICRO COMPUTER

CMC-68—Most advanced 6800 type single board computer on the market. Includes: 1K RAM, 32 I/O Ports, ACIA with Telco compatible loop interfaces, DMA Controller, 8 Level priority interrupt control, 4-1KX8 ROM sockets . . . and many more features.



CONTROLS AND SIGNALING

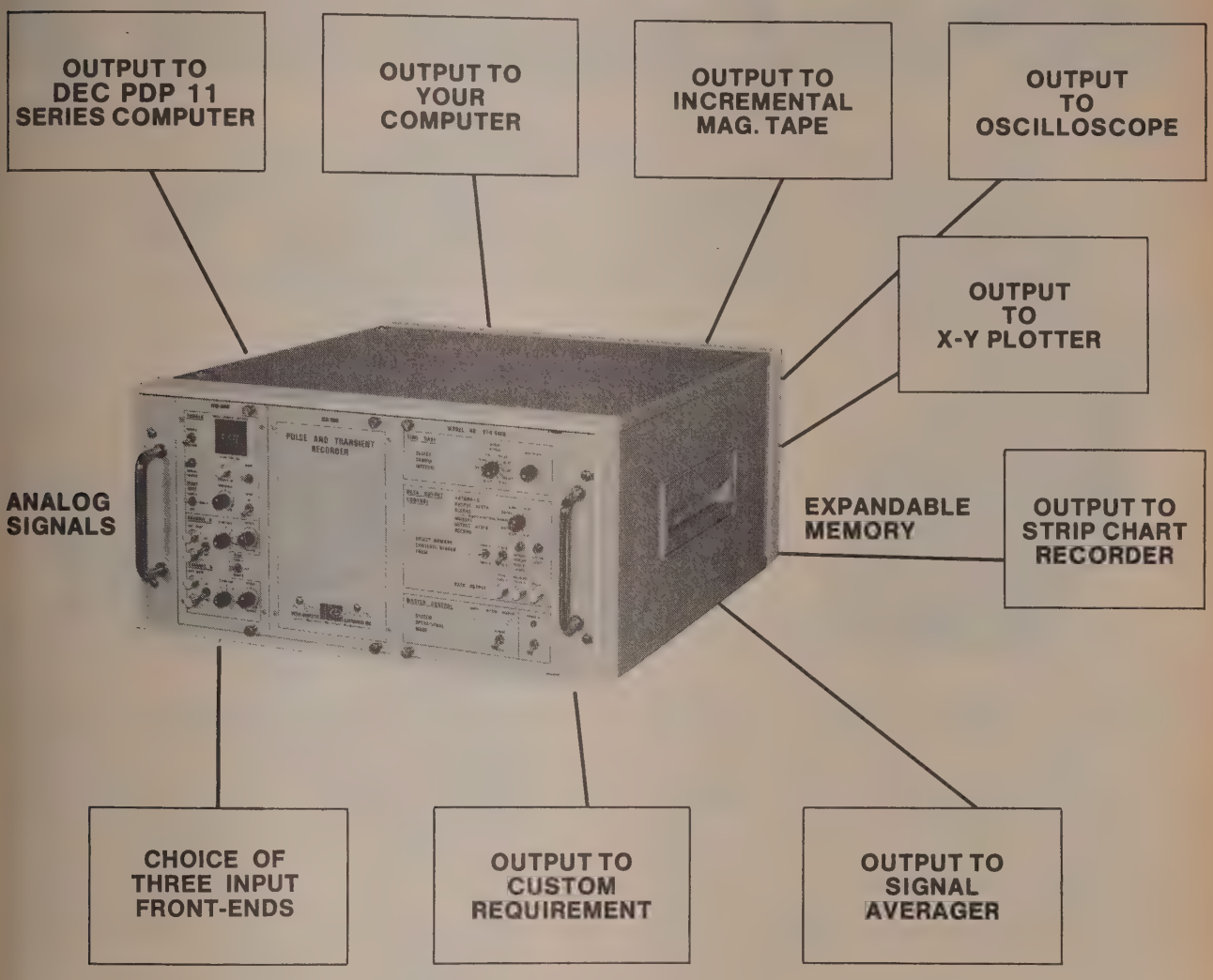
C-324A • Touch Tone® Receiver—Uses latest digital detector
C-325A • Touch Tone® to Dial Convertor—Single card
C-326 • Selective Call—Module for C324A responds to 2, 3 or 4 Digit addresses

NEW!

FP68 • Data Link Encrypter—Meets new FED STD FIBS PUB 46
MSC • Master Slave Clock System—Unlimited remote clocks

RE-EL CIRCUITS INC.
520 VICTOR STREET, SADDLE BROOK, NEW JERSEY / TELEPHONE (201) 843-3738
PRODUCTS FOR COMMUNICATION

HIGH SPEED
TRANSIENT ANALYZERS & SIGNAL PROCESSING SYSTEMS


OUTPUT TO DEC PDP 11 SERIES COMPUTER
OUTPUT TO YOUR COMPUTER
OUTPUT TO INCREMENTAL MAG. TAPE
OUTPUT TO OSCILLOSCOPE
OUTPUT TO X-Y PLOTTER
ANALOG SIGNALS
EXPANDABLE MEMORY
OUTPUT TO STRIP CHART RECORDER
CHOICE OF THREE INPUT FRONT-ENDS
OUTPUT TO CUSTOM REQUIREMENT
OUTPUT TO SIGNAL AVERAGER

FEATURES

- Sampling up to 100 MHz with 8-bit resolution
- Interfaces with I/O of all Computers
- Standard Memory — 2048 words
- Expandable Memory — 8k, 16k and 32k words
- Records transient waveforms and repetitive signals
- Easily interfaced to TTY, printer, or magnetic tapes
- Complete remote of front-panel controls
- Analog output for oscilloscope, plotter and strip chart recorder
- Sampling interval from 10 nanoseconds to 50 seconds
- Split timebase, records two rates per memory record
- X vs Y recording
- Variable pretrigger mode stores data up to total memory capacity for baseline and leading edge of signal analysis

APPLICATIONS

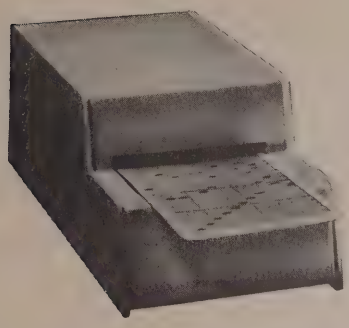
- Laser Processing
- Nuclear Applications
- Medical Applications
- Process Control
- Radar Systems
- Spectral Analysis
- Chemical Analysis
- Electronic and Electrical
- Accelerated Food Processing
- Pollution Monitoring
- X-ray and Gamma Ray Detection
- Alpha, Beta Particle Recording
- Acoustical Analysis

AMERICAN ELECTRONIC LABORATORIES, INC.

DEPT. EM, P.O. BOX 552, LANSDALE, PA. 19446 (215) 822-2929 TWX: 510-661-4976

We read your language. AMP card readers cover all

Whether you're going the punched, mark sense, or magnetic card route, there's an AMP product to read it. Or write on it. Or validate it. Or capture it. No other manufacturer offers so broad a line—with so many features and options to meet your needs. No matter how you buy them—as complete, ready-to-use units or as individual components—our wide range of card readers will give you the excellent performance and reliability for which AMP is noted. Use them anywhere—from automation and remote data collection to access control and military applications.

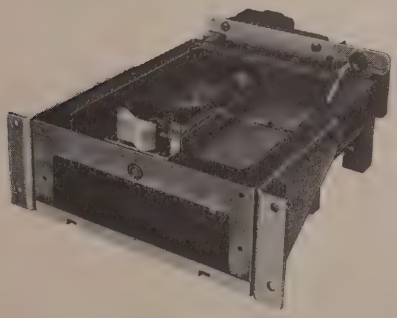


Serial card reader—Model 417.

- Reads punched hole or mark sense data on standard 80-column cards.
- Provides character serial, bit parallel data plus special interface options.
- Cards are automatically returned or captured and stacked at user's option.
- Available with stand-alone housing, or with convenient panel-mounting provisions.

Military static card reader—Model 2972.

- Approved for airborne equipment.
- Accepts standard 80-column paper or plastic punched cards.
- Reliable operation in extreme environments assured by extensive qualification program.
- Manual control eliminates need for external power.
- Great flexibility with a variety of electrical interface options. All input and output terminations are pluggable.
- Outputs compatible with TTL and DTL circuitry.



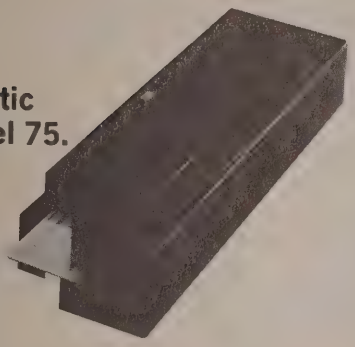
Static tab card reader—Model 2980/81.

- Reads standard 80-column punched tab cards.
- Compact design allows positioning in small panel space.
- Available with parallel outputs, matrix and diode-isolated specials.
- Wipe and back-wipe contact operation has high inherent reliability.
- Available in 80-column and 22-column versions —motorized and manually operated.

Combination static tab card/ badge card reader—Model 144.

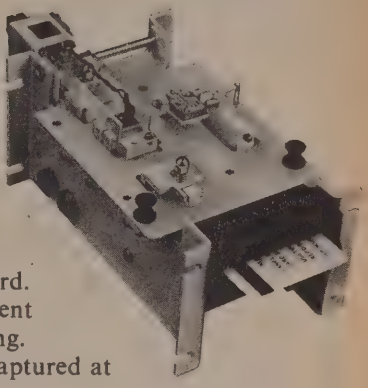
- Accepts standard punched paper 80-column cards and plastic badges.
- Reads numeric or alpha-numeric data up to 12 characters.
- Fully automatic read cycle. Requires no operator control.
- Remote switch design offers reliable operation and long life in industrial environments.
- Completely pluggable interface adapts to "state-of-the-art" wiring techniques.

three major technologies.



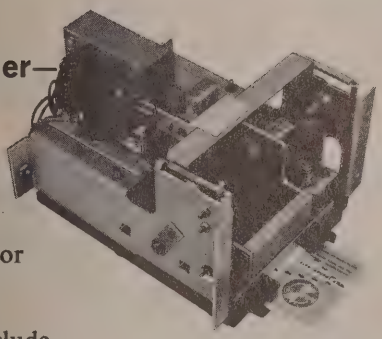
Low-profile magnetic card reader—Model 75.

- Reads IATA and ABA tracks.
- No motor required. Mechanical drive eliminates RF generation.
- Low profile. Suitable for use as a stand-alone accessory.
- TTL outputs are compatible with industry standards for design interface.



Magnetic card reader—Model 210/211.

- Slot design ensures proper orientation.
- Reads and writes at 210 bits per inch, providing as many as 650 bits across the card.
- Designed for convenient behind-panel mounting.
- Card is returned or captured at user's option.
- Adaptable to IATA, ABA and THRIFT track requirements.

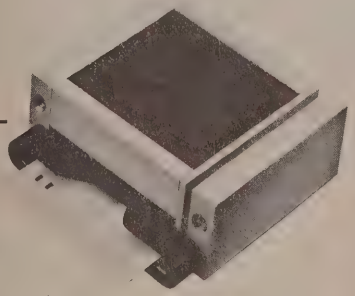


Badge card reader—Model 360/361.

- Reads 12, 20 or 22-column credit or badge cards.
- Solenoid powered or manually operated versions available.
- Output options include numeric, alpha-numeric, parallel and diode matrix.

Special-purpose magnetic readers also available with the following features:

- Read and write on multiple tracks at 300 bits per inch.
- Accept standard plastic credit type cards or a variety of paper stock from .007 to .040 inch in thickness, and 7.25 inches in length.
- Integrated decoding electronics available for TTL logic outputs.
- Fully automatic in operation with provisions to capture or return cards at user's option.
- Designed for behind-panel mounting.



Badge card reader—Model 130.

Maximum reliability, with proven switch design and a minimum of moving parts.
Compact, rugged construction.
Only two major assemblies for long life in severe environments.
Low-temperature operation. Suitable for outdoor use to −40°F.
No external power required. Reader operates with card insertion.
No maintenance required. Designed to operate throughout life without adjustment or preventive maintenance.

We read your language.
You name the card and the application,
AMP has the card reader to match.
For immediate information,
call (717) 367-1105. Or write:
AMP Incorporated, Capitron Division,
Elizabethtown, PA 17022.
TWX 510-657-4561.

AMP has a better way.

AMP
INCORPORATED

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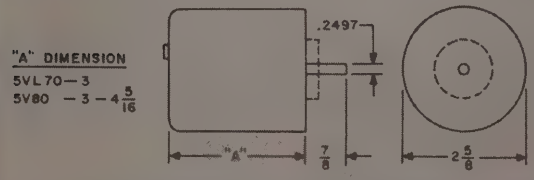
BALDWIN® ENCODERS

A COMPLETE LINE
OF LABORATORY TESTED AND FIELD PROVEN
OPTICAL ANALOG-TO-DIGITAL ENCODERS

5VL70 Series Incremental
5V80 Series Absolute



DOTTED PORTION – LOW TORQUE BEARING ASSEMBLY

Most economical encoders in the Baldwin line.

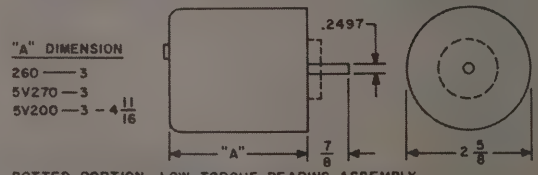
Incremental resolutions to 4096 counts per revolution with zero index available. Quadrature square wave or direction sensed pulsed outputs. Frequency response to 100 Khz. T^2 L compatible.

Absolute resolutions of 0-359, 2^8 , 2^9 , 10^3 and 2^{10} . Parallel outputs in cyclic binary, natural binary or BCD. Photocell or T^2 L compatible signal levels. Reverse count feature is standard. Gating option for sample and hold applications.

All feature single +5V operation, integrated electronics. 5V80 Series features field replaceable incandescent lamp. 5VL70 Series features long-life LED light source, (factory replaceable).

Options: low torque bearings, low inertia and metallized disks, thru shaft, side-exit cable and wide operating temperature range.

260 Series Tachometer
5V270 Series Incremental
5V200 Series Absolute



DOTTED PORTION – LOW TORQUE BEARING ASSEMBLY

These popular encoders offer high resolutions and a wide range of operating features in a small size.

Tachometer resolutions to 10,000 counts per revolution with zero index available. Frequency to 1 Mhz.

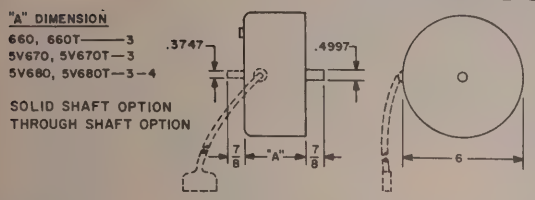
Incremental resolutions to 20,000 counts per revolution with zero index available. Photocell, quadrature square wave or direction sensed pulsed outputs. Frequency response to 100 Khz. T^2L compatible,

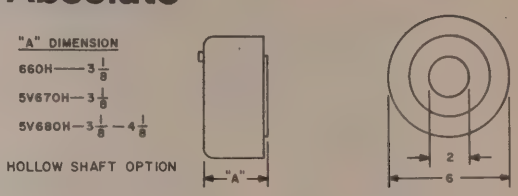
Absolute resolutions of 2^8 thru 2^{14}, 10^3, 0-3599, 10^4. Parallel outputs in cyclic binary, natural binary or BCD. Photocell or T^2L compatible signal levels. Reverse count feature is standard. Gating is optional.

Incremental and absolute encoders feature +5V operation. All have self-contained integrated electronics and easily accessible, single field replaceable lamp.

Options: Ruggedized and low torque bearings, low inertia and metallized disks, side exit cable, wide operating temperature range.

660 Series Tachometer 5V670 Series Incremental 5V680 Series Absolute





Unique in the field of direct reading optical encoders, this group offers a combination of high resolutions, great frequency response and a wide choice of mechanical configurations.

Tachometer resolutions to 24,000 counts per revolution index available. Frequency to 1 Mhz.

Incremental encoders offer resolutions up to 48,000 counts per revolution with or without zero index. Photocell, quadrature square wave or direction sensed pulsed outputs. Frequency response to 100 Khz. T^2L compatible.

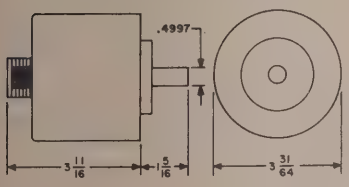
Absolute position encoders have standard resolutions of 2^{14} thru 2^{16}, 10^4 and 0-35999. Cyclic binary formats are offered in photocell or square wave output options. Natural binary or natural BCD outputs are other internal electronics options. Gating option is also available for customer sample and hold applications. Outputs are fully T^2L compatible.

Proprietary circuitry compensates for any changes in photocell levels due to temperature or supply voltage, thereby maintaining original accuracy. Electronic monitor output indicates marginal operation condition or power failure.

Incremental and absolute position encoders in these series feature single +5V operation. All employ integrated circuitry and a field replaceable lamp. Single, thru and hollow shaft designs are standard.

Options: Special bearing designs, serial outputs, wide operating temperature range.

3700 Series Incremental

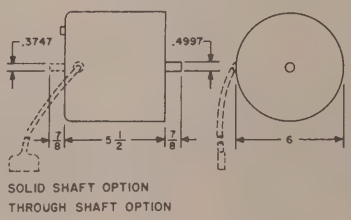


Rugged, high resolution incremental designed expressly for industrial applications.

Encoder is completely sealed against hostile environments. Heavy duty bearings, ½ inch shaft with contacting seal. Vibration immune, single LED light source. Internal integrated electronics with quadrature square wave or direction sensed pulsed outputs from noise rejecting differential line drivers.

Resolutions to 12,700 counts per revolution with zero reference option. Dual inch/metric resolution options have electrically selectable outputs.

690 Series Optical Resolver



This line of Baldwin absolute position encoders uses patented techniques to extend resolutions to 2^{17} thru 2^{20} per revolution while maintaining a 6 inch package diameter.

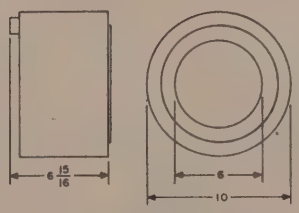
Internal electronics is integrated circuitry. Outputs are T^2L compatible.

Electronic compensation circuitry maintains accuracy for wide changes in temperature or power supply voltages. Dual detection stations cancel effects of bearing errors.

Solid and thru shafts are standard configurations. Lamps are field replaceable.

Options: Serial outputs, CW shaft rotation for increasing count, wide operating temperature range, hollow shaft.

1190 Series Optical Resolver



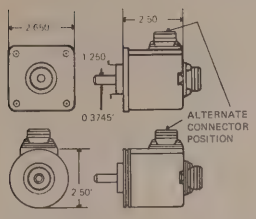
The 1190 Series with a hollow shaft feature complements the 690 Series optical resolvers. Resolutions of 2^{17} thru 2^{20} are standard.

All features of 690 Series are incorporated in this design. Six inch hollow shaft permits passage of large waveguides or slip ring assemblies.

Construction is all stainless steel for strength and integrity.

NEW FROM THE BEI INDUSTRIAL ENCODER DIVISION. A SERIES OF RUGGED HIGH QUALITY INDUSTRIAL OPTICAL ENCODERS WITH 30 DAY DELIVERY ON STANDARD MODELS!

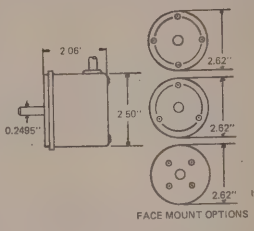
H25 SERIES
HEAVY DUTY INCREMENTAL



- HEAVY DIE CAST ALUMINUM
- RUGGED ABEC 7 BEARINGS
- END OR SIDE MOUNTED MIL-SPEC CONNECTOR

(Send for specification number 924-02002-001)

L25 SERIES
INSTRUMENT GRADE INCREMENTAL



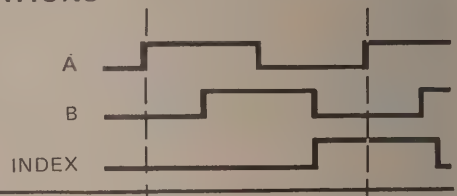
- LOW TORQUE
- ABEC 7 PRECISION BEARINGS
- MANY CABLE AND CONNECTOR OPTIONS
- AVAILABLE WITH DIE CAST COVER

(Send for specification number 924-02004-001)

ELECTRICAL SPECIFICATIONS

BASIC SQUARE WAVE

- Up to 2540 cycles per turn
- Line drivers
- CMOS
- Open collector
- Complementary outputs
- Lamp or LED



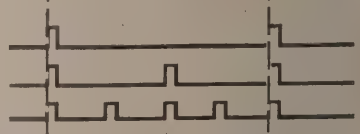
SINE WAVE

- Differential outputs
- Photovoltaic cells
- 100 MV amplitude typical

PULSED MULTIPLICATION
(DIRECTION SENSING)

- Choice of X1, X2, and X4 edge multiplication
- 2.5μ sec pulsewidth, typical
- Up to 10k pulses per shaft turn

(Send for specification number 924-02005-001)

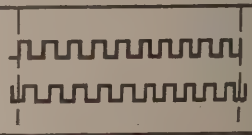


Note: Count pulses appear on one of two output lines, CW or CCW, depending on shaft rotation.

INTERPOLATION

- X2 or X5 count multiplication
- To 12,700 cycles per turn
- Complementary outputs

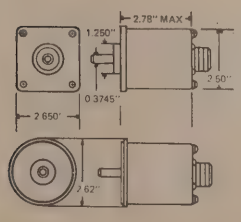
(Send for specification number 924-02007-001)



ENGLISH/METRIC, SELECT

- Provides two resolutions from one encoder; can be used with interpolation (Send for specification no. 924-02011-001)

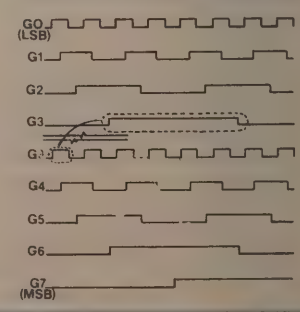
H25 SERIES – HEAVY DUTY 8-BIT ABSOLUTE POSITION



- 8 bit TTL Gray Code output
- Mil-spec connector
- Interrogation
- Open collector output
- Natural binary outputs
- CMOS, line drivers
- Memory (latch)

(Send for specification number 924-02014-001)

GRAY CODE (STANDARD)



CONTROL SYSTEMS FOR RATE AND POSITION

CONTROL UNIT

MOTOR-ENCODER

MICRO-LOC™ SYSTEM

The MICRO-LOC SYSTEM is a microprocessor based digital position servo with velocity control. The servo accepts binary position commands at a rate of 0-50 words per second and drives to the positions without further inputs. The servo follows a software programmed velocity curve depending on application requirements. An extensive line of motor-encoder resolutions is available in both absolute and incremental designs, single turn or multiturn, linear or nonlinear applications. One system controls up to four drive axes depending on application timing requirements. Additional systems are combined for simultaneous control of more than four axes.

ULTRA-LOC™ SYSTEM

The ULTRA-LOC SYSTEM is a new wide range, high accuracy, electronically programmable speed control system. It features high bandwidth at rates below sidereal and full torque at zero speed. The 10,000 to 1 rate range is remotely controllable by computer interface, 8421 BCD format. High performance over a wide speed range is achieved by a carrier-based error loop that is independent of rate. Even at very slow drive rates or zero speed, the error bit update rate of the servo loop is 30 kHz or higher. This eliminates bearing noise, jitter, and cogging associated with slow speed operation.

BEI Precision Optical Encoders with standard resolutions to 2^{20} absolute positions per turn insure basic system accuracy. Standard encoders with integral torque motor provide direct drive capability. Rate drive accuracies of 0.01% per turn are standard; 2^{24} resolution and higher rate accuracies are available on special order.

ULTRA-LOC Systems consist of control unit, motor-encoder, and power supply. Torque capability ranges from 1 lb.-ft. for the 6-inch diameter 690 Series; 40 lb.-ft. for the 1190 Series; and over 100 lb.-ft. for the 2000 Series. These systems are designed to be adapted to existing gimbals, pedestals, or rate tables as retrofit drive systems. **Rate and Position** are controlled by outputs from the position encoder using the customer's computer or by specifying the BEI position control option. A position display to 359.9999 degrees is optional (2^{20} encoder).

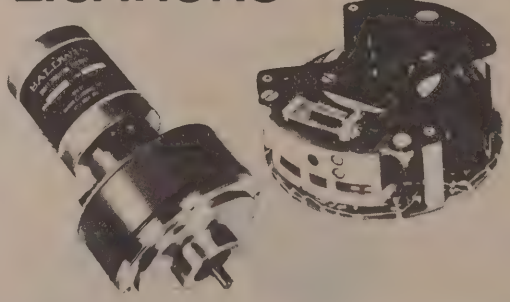
CUSTOM APPLICATIONS

BEI's technical personnel stand ready to assist in applying encoders in custom configurations.

Unusual linear or non-linear codes, special supply voltages, RFI shielding, output interface buffers and parallel/serial converters.

Direct mounting on torque motor drives or low inertia capstan motors.

Space and military applications requiring high reliability criteria.



BEI Electronics, Inc.

Controls and Instruments Division Little Rock, Arkansas

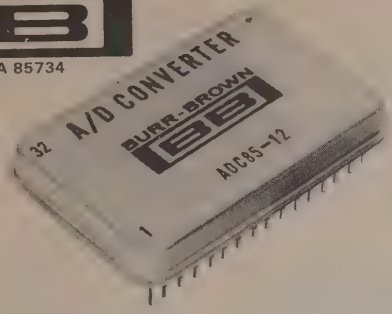
BEI

Industrial Encoder Division Goleta, California

Exclusive manufacturers of the BALDWIN® encoder
1101 McAlmont Street Little Rock, AR 72203
(501) 372-7351 TWX 910-722-7384

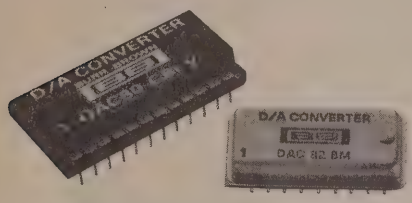
BURR-BROWN DATA CONVERSION

TUCSON, ARIZONA 85734



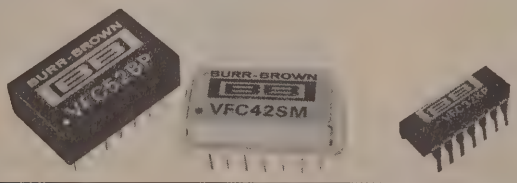
A/D CONVERTERS

	Model	Resolution (Bits)	RANGE OF SPECIFICATIONS: Linearity Error (% of FSR) max	Conversion Time (μsec)	Tempco Bipolar (ppm of FSR/°C)max	Input Range (V)	Package	Price (100's)
High Speed	ADC60	8 - 12	±0.0244 to ±0.195	.88 - 3.5	±15	±25 to +20	Module	$164.00 - $172.00
Low Cost	ADC80	10 - 12	±0.012 to 0.048	21 - 25	±23	±2.5 to ±10	DIP	$45.00 - $47.50
High Speed, Low Cost	ADC82	8	±0.2	2.8	±75	±2.5 to +20	DIP	$36.00 - $45.00
	ADC84	10 - 12	±0.012 to ±0.048	6 - 10	±33	±2.5 to ±10	DIP	$89.00 - $96.00
High Speed, Low Drift	ADC85	10 - 12	±0.012 to ±0.048	6 - 10	±18	±19 to ±53	DIP	$110.00 - $137.00



D/A CONVERTERS

	Model	Resolution	Linearity Error Over Temp (% of FSR) max	Tempco (ppm of FSR/°C) max	Output Range	Settling Time (FSR, ±1/2 LSB)	Package	Price (100's)
Very High Speed	DAC60	10 - 12 Bits	±0.012 to ±0.048	±15	-5 to ±2.5mA	40 - 150nsec	Module	$34.00 - $89.00
High Resolution	DAC70	16 Bits, 4 Digits	±0.003 to ±0.005	±9 to ±21	-2 to ±1mA	50μsec	DIP	$95.00 - $119.00
Low Cost	DAC80	12 Bits, 3 Digits	±0.012	±25	±2.5 to ±10V, -2 to ±1mA	300nsec - 5μsec	DIP	$19.50
Voltage Output	DAC82	8 Bits	±0.016	±50	±2.5 to ±10V, -1.6 to ±0.8mA	2.5μsec	DIP	$13.50 - $26.25
Low Drift	DAC85	12 Bits, 3 Digits	±0.012	±5 to ±20	±2.5 to ±10V, -2 to ±1mA	300nsec to 5μsec	DIP	$54.00 - $110.00
Monolithic	DAC90	8 Bits	±0.2	±75	-2, ±1mA	200nsec	DIP	$8.50 - $13.50



V/F CONVERTERS

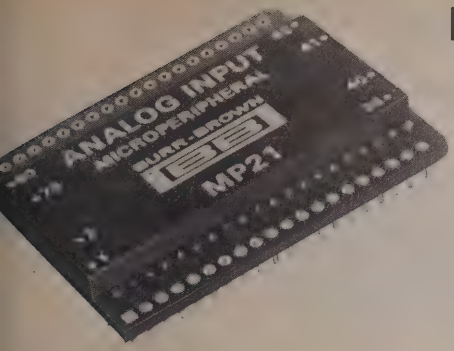
	Model	V_{IN} Range (V)	F_{OUT} Range (kHz)	Linearity (% of FSR) max	Tempco (ppm of FSR/°C) max	Package	Price (100's)
Low Cost, Monolithic	VFC32	User-selected	User-selected (500kHz, max)	±0.01, 10kHz ±0.05, 100kHz	±100 to ±150	DIP TO-100	$6.10 $8.00 - $11.00
Low Cost, Complete Hybrid	VFC42 VFC52	0 to +10 0 to +10	0 to 10 0 to 100	±0.01 ±0.05	±100 ±100	DIP DIP	$10.90 - $23.40
Low Drift, Complete	VFC12 VFC15	0 to +10 0 to +20	0 to 10 0 to 20	±0.01 ±0.01	50 50	Module Module	$26.00 $27.00
Very Low Drift, Complete	VFC12LD VFC15LD	0 to +10 0 to +20	0 to 10 0 to 20	±0.005 ±0.005	10 10	Module Module	$46.00 $47.00

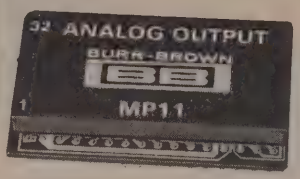
FOR ADDITIONAL DETAILS REFER TO THE BURR-BROWN GENERAL CATALOG OR CONTACT YOUR NEAREST BURR-BROWN REPRESENTATIVE

DATA CONVERSION

BURR-BROWN

TUCSON, ARIZONA 85734



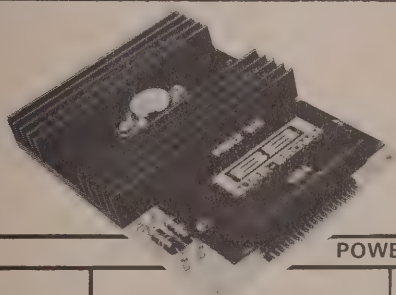


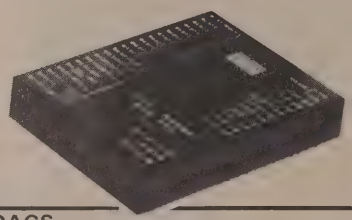
MICROPROCESSOR INTERFACED ANALOG INPUT SYSTEMS

	Model	RANGE OF SPECIFICATIONS: Channels	Resolution (Bits)	Accuracy (% of FSR) max	Accuracy Drift (ppm/°C) max	Package	Price (100's)
080, SC MP, Z-80,	MP20	8 Differential	8	±0.4	±40	Module	$140.00
084, 8085	MP22	16 Single-ended	12	±0.1	±25	Module	$180.00
800, 650X, F8	MP21	8 Differential 16 Single-ended	8	±0.4 ±0.4, Low	±40	Module	$140.00

MICROPROCESSOR INTERFACED ANALOG OUTPUT SYSTEMS

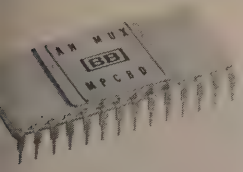
080, SC/MP, Z-80,	MP10	2	8	±0.4	±80	DIP	$69.00
084, 8085							
800, 650X, F8	MP11	2	8	±0.4	±80	DIP	$69.00

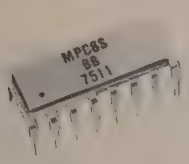


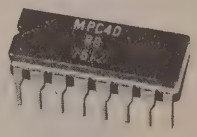


POWER DACS

	Model	Input Coding	Accuracy	Tempco (ppm of FSR/°C)	Output Voltage Range (V)	Output Current Range (mA)	Package	Price (1 - 9)
igitally Controlled,	4800	12 Bit Binary Plus Sign	±0.012% of FSR	22	±10, ±60	±200	Module	$490.00
oltage and Current imit	4801	3 Digit BCD Plus Sign	±0.012% of FSR	22	±10, ±60	±200	Module	$490.00
ow Cost, igh Current	4804	12 Bit Binary	±0.05% of Reading	50, max	User-selected to ±30	±1000	PC Card	$159.00







SAMPLE/HOLD CIRCUITS

	Model	Gain/Offset Error (%), (mV)	Charge Offset (mV)	Droop Rate (mV/msec)	Tempco (ppm of 20V/°C)	Acquisition Time (μsec)	Package	Price (100's)
ow Cost, Complete	SHC80	±0.01, ±2 max	±2 max	0.5 max	±2	10 max	DIP	$26.00 - $34.00
igh Speed, Complete	SHC85	±0.01, ±2 max	±2 max	0.5 max	±2	4.5 max	DIP	$51.00
ow Cost, Monolithic	SHC298AM	±0.01max,±7max	±25 max	10 max	±4	10 max	TO-99	$5.75
ery High Speed	SHM60	±0.01 max, ±1.5	±1.5	5	±2	1 max	Module	$75.00

MULTIPLEXERS

	Model	Channels	Input Range (V)	On Resistance (kΩ) max	Crosstalk (% of Off Channel Signal	Settling Time (to 0.01%) (μsec)	Package	Price (100's)
MOS	MPC8S	8 Single-ended	±10	1.8	0.005	5	DIP	$10.50
MOS	MPC4D	4 Differential	±10	1.8	0.005	5	DIP	$10.50
MOS	MPC16S	16 Single-ended	±10	1.8	0.005	7	DIP	$29.00
MOS	MPC8D	8 Differential	±10	1.8	0.005	7	DIP	$29.80

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BURR-BROWN MICROCOMPUTER I/O SYSTEMS

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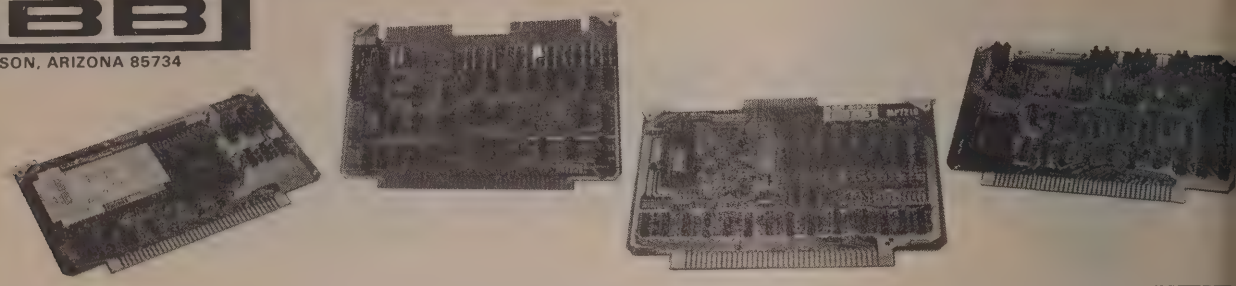


ANALOG INPUT/OUTPUT

Compatible With	Model	Analog Input	Analog Output	Inputs High Level	Inputs Low Level	Analog Resolution	Number Channels Input	Number Channels Output	Features	Price (1 - 9)
Intel[1] and National[2]	MP8418-AO	•	•	•	•	12	32 SE	2	PGA available	$575
	MP8418	•		•	•	12	32 SE		PGA available	$395
	MP8608	•	•	•	•	8	8 DIF	2	A1/A0 on one board	$244 - $409
	MP8616	•	•	•	•	8	16 SE	2	A1/A0 on one board	$244 - $409
	MP8632	•	•	•	•	8	64 SE	2	A1/A0 on one board	$344 - $509
	MP8408	•		•	•	12	8 DIF		General purpose	$419 - $544
	MP8416	•		•	•	12	16 SE		General purpose	$419 - $544
	MP8304		•			12		4	General purpose	$379 - $504
Motorola[3]	MP7218	•		•	•	12	16 SE		Low Cost	$395
	MP7408	•	•	•	•	8	16 SE	2	A1/A0 on one board	$244 - $409
	MP7432	•	•	•	•	8	64 SE	2	A1/A0 on one board	$344 - $509
	MP7608, MP7608-I	•		•	•	12	8 DIF		Industrial	$595
	MP7504		•			8		4	Isolated outputs	$695
	MP7208	•		•	•	12	8 DIF		General purpose	$575 - $725
	MP7216	•		•	•	12	16 SE		General purpose	$575 - $725
	MP7104		•			12		4	General purpose	$575 - $725
Zilog[4]	MP2216-AO	•	•	•	•	12	32 SE	2	A1/A0 on one board	$725
	MP2216	•		•	•	12	32 SE		General purpose	$595
Pro-Log[5]	MP4216	•		•	•	8	16 DIF		General purpose	$195
	MP4102		•			8		2	General purpose	$150

DIGITAL INPUT/OUTPUT

Compatible With	Model	Digital Input	Digital Output	Number Channels	Isolated	Features	Price (1 - 9)
Intel[1] and National[2]	MP801		•	16	Yes	Relay output	$295
	MP802		•	32	Yes	Relay output	$475
	MP810	•		24	Yes	Contact closure input	$355
	MP810-NS	•		24	Yes	Voltage input	$295
Motorola[3]	MP701		•	16	Yes	Relay output	$295
	MP702		•	32	Yes	Relay output	$475
	MP710	•		24	Yes	Contact closure input	$355
	MP710-NS	•		24	Yes	Voltage input	$295

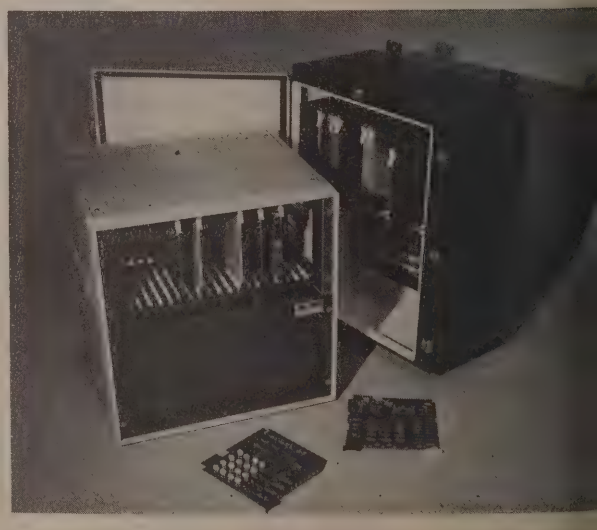
(1) SBC80 and Intellec 800 (2) BLC80 (3) Micromodule and EXORciser (4) Z-80MCB and Z-80MCS (5). All.

IOS 2000

DISTRIBUTED INTELLIGENCE I/O FOR MEASUREMENT/CONTROL

A uniquely flexible system serves clusters of remotely located sensors - makes distributed control practical for smaller applications. Serially linked to user programmable terminals, minis and μCs, IOS2000's factory preprogrammed MPU controls routine sensor signal conditioning (units conversion, linearization, excitation, auto zero and ranging, calibration, etc.) and monitoring functions.

IOS2000 offers dynamic configuration control: plug-in PCB modules let you add more I/O functions (contact closure, voltage, current), more memory, more power as needed. Internal self-diagnostic reporting programs cut downtime. Packaging-in racks or NEMA enclosures - fits field or control room use.



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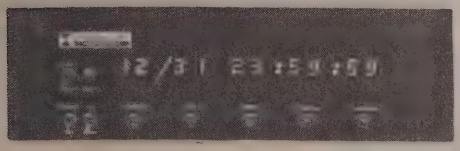
CHRONO-LOG CORPORATION

DIGITAL CLOCK/CALENDARS



SERIES 70,000 LED CLOCK/CALENDAR

CHRONO-LOG DIGITAL CLOCKS are used wherever a digital BCD output of real or elapsed time is required, such as in data logging, data transmission, data processing, telemetry and digital print-out systems. The outputs can also drive remote digital time displays.

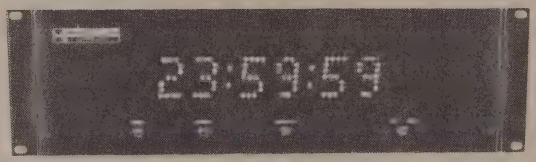
Buffered, gated parallel and/or digit serial (bit parallel) TTL compatible BCD outputs are provided. Options include a wide variety of time ranges; line frequency, external or internal crystal oscillator time bases; power sources, including standby batteries for operation during power failure; displays; and housing configurations. Provisions are available for interfacing to 8 bit or 16 bit input registers for minicomputers and microprocessors.

The Series 79,000 UP-DOWN Clock/Counter offers bi-directional features.

BIG TIME CLOCKS & REMOTE DISPLAYS

VISIBLE FROM 75 FEET

- 1½" LED dot shaped character
- 24 or 12 hour time
- 115/230 V., 50/60 Hz, or 12 V. DC
- standby battery option



REMOTE DISPLAYS accept parallel BCD inputs at TTL levels, display the data and provide retransmitting parallel BCD outputs to drive other displays.

TIME CODE INSTRUMENTS

CHRONO-LOG TIME CODE GENERATORS and READERS generate and read bit-serial modulated carrier time codes on analog tape recorders and transmission lines. DC level shift codes are also generated for oscillographic chart recorders.

The Series 9000 features low cost, low profile (1¾" panel height) units. Single IRIG code and multicode versions are offered as Generators, Readers or combination Generator/Readers. Semi-automatic synchronization to WWV is provided.

VIDEO GENERATORS

CHRONO-LOG VIDEO CHARACTER GENERATORS accept up to 16 BCD characters from Chrono-log instruments or other sources and generate a video signal for displaying the data on a video monitor or inserting the data into a video signal. Fixed alpha-numeric characters, stored in a PROM in the Character Generator, can be included as part of the display. Up to 31 characters can be displayed on one line, or 15 characters each on two lines.

DATA COUPLERS

CHRONO-LOG COMMUNICATIONS COUPLERS produce bit serial ASCII coded words at TTL levels, RS232C voltages or 20 ma current loops for interface to the communication ports of computers, teleprinters, video terminals, etc. The Communications Coupler is offered as an integral part of the Series 70,000 Digital Clock or as an independent instrument which can accept parallel BCD data at TTL levels.

ACCESSORY UNITS

STANDBY POWER PACKS are rechargeable battery units which provide +5 V. DC standby power for Chrono-log Digital Clocks and Time Code Generators. Three different capacities are offered: 2.5, 12.5 and 30 amp-hours.

OUTPUT BUFFERS accept a 21 bit TTL input word (normally hours, minutes, seconds and Power Failure bit) and produce up to ten (10) outputs to drive remote displays and data systems.

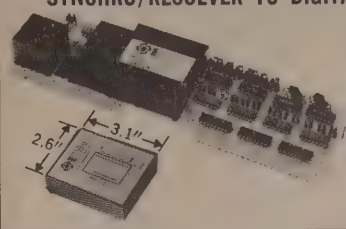
CHRONO-LOG CORPORATION

DEPT. EM, 2 WEST PARK ROAD • HAVERTOWN, PA 19083 • PHONE: (215) 853-1130

SYNCHRO CONVERTERS/DISPLAYS/ENCODERS

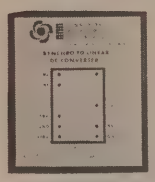
STANDARD LOW COST UNITS TO SATISFY ALMOST ANY SYNCHRO/RESOLVER OR SHAFT INTERFACING REQUIREMENT

SYNCHRO/RESOLVER TO DIGITAL Series SDC40/60



INPUT: 11.8/90 vrms L-L, 60 or 400 Hz. Ref: 26/115 vrms. **OUTPUT:** 16, 14, 12, or 10 Bits parallel binary or BCD. **ACCURACY:** ±2, ±4, ±6 or ±30 minutes of arc. **PACKAGE:** A) 2.6" x 3.1" x .82"h Module B) 2.6" x 9.25" x .9"h or 4½" x 6½" x .75"h repairable PC card.

SYNCHRO/RESOLVER TO LINEAR DC Series SLD200

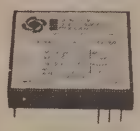


INPUT: 11.8/90vrms L-L, 60 or 400 Hz., Ref: 26/115vrms. **OUTPUT:** (A) −10 to +10 vdc linear with angles from −180° to +180° (standard) (B) 0 to +10V DC linear with angle from 0° to 360° (special) (C) −10 to +10 vdc linear with angles from −90° to +90°. **ACCURACY:** ±6 minutes of arc at input speeds up to 1440°/sec, or ±15, ±30, ±60 minutes of arc. **PACKAGE:** (A) 2.6" x 3.1" x .82" Module; (B) 3.06" x 2.6" x 3.18"H Can; (C) 4.5" x 6.5" x .75"H repairable PC card.

SYNCHRO/RESOLVER TO SINE-COSINE DC Series SD100

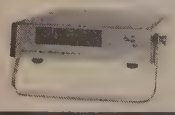
INPUT: 11.8/90 vrms L-L, 60 or 400 Hz. Ref: 26/115 vrms. **OUTPUT:** ±10 sin θ vdc; ±10 cos θ vdc. **ACCURACY:** ±2 or ±4 minutes of arc. **PACKAGE:** 1.75" x 1.75" x .6"h or 3" x 3" x .625"h Module.

INVARIANT SYNCHRO/RESOLVER TO SINE-COSINE Series SD100 I



INPUT: 11.8/90 vrms L-L, 60 or 400 Hz. Ref: 26/115 vrms. **OUTPUT:** ±10 sin θ vdc, ±10 cos θ vdc. **ACCURACY:** ±4 minutes of arc. **INVARIANCY:** A ±10% change in the input or reference voltage results in a ±.5% change in the individual DC outputs. **PACKAGE:** 3" x 3" x .625"h Module.

SYNCHRO ANGLE INDICATOR Series AI400

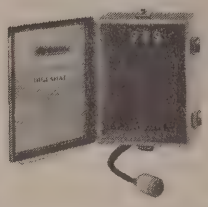


INPUT: 11.8/90 vrms L-L, 60 or 400 Hz. Ref: 26/115 vrms. **OUTPUT:** 5 Digit display and BCD data. **ACCURACY:** ±.03°, ±.05°, or ±.1°. **PACKAGE:** 9.5"w x 1.75"h x 12" Deep — Bench or Rack Mounting.

BINARY ANGLE INDICATOR (BINARY TO BCD) Series BAC100

INPUT: Up to 16 bits of parallel binary data, TTL compatable. **OUTPUT:** 5 digit display of angle (0° to 359.99°) OR ANY OTHER SCALE FACTOR DESIRED FROM 0 TO 99999 REPRESENTING ENCODER POSITION, RANGE, PRESSURE, WEIGHT, ETC. **ACCURACY:** ±.01° (±1 lsb). **PACKAGE:** A) 7.0"w x 1.75"h x 8.25" deep — Bench or Rack Mounting B) 4.5" x 6.5" x 1.8"h PC Board requiring +5 vdc at 1 amp C) 2.6" x 3.1" x .82h Module.

PROGRAMMABLE LIMIT SWITCHES Series DLS



INPUT: Shaft angle position.
LIMITS: (A) Dwell (From-to): 8 per unit
(B) Set Point — 16 per unit
(C) Closure — 16 per unit
OUTPUTS: (A) Logic Levels
(B) Power Transistor
(C) Relay
(D) Display (LED)
ACCURACY: Up to ±.1°
PICKOFF: Resolver (size 15 or 11)
PACKAGE: (A) 19" x 12" x 8.75"h
(B) NEMA 12 — 16" x 12" x 8"

DIGITAL TO SYNCHRO/RESOLVER Series DSC40/60

INPUT: 14, 12 or 10 bits parallel binary and 26/115 vrms reference. **OUTPUT:** 11.8/90 vrms. L-L, 60 or 400 Hz capable of driving 1VA, 2VA or 5VA LOADS: (up to 3 T.R.'s). **ACCURACY:** ±4, ±15 or ±30 minutes. **PACKAGE:** A) 2.6" x 3.1" x .82"h Module B) 4½" x 9¼" PC Card with edge connector (5VA units).

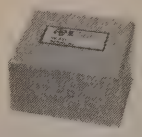
DC ANGLE TO SYNCHRO/RESOLVER Series LDS500

INPUT: ±10 vdc or ±100 vdc representing ±180° of angle. **OUTPUT:** 11.8/90 vrms L-L, 60 or 400 Hz capable of driving up to three size 11 T.R.'s (75 ohms L-L). **ACCURACY:** ±15 or ±30 minutes of arc. **PACKAGE:** (2) 4.5" x 9.25" x 2.0"h repairable PC Board with 22 pin edge connector.

DC SIN COS TO SYNCHRO DRIVERS Series DCS400

INPUT: ±10 vdc representing sin θ and cos θ. **OUTPUT:** 11.8/90 vrms L-L, 60 or 400 Hz capable of driving up to three size 11 T.R.'s (75 ohms L-L). **ACCURACY:** ±6, ±15, ±30 minutes of arc. **PACKAGE:** A) 4.5" x 6.5" x .8"h repairable PC Card. B) 4.5" x 9.25" x 1"h PC Card.

RECTANGULAR TO POLAR Series RP600



INPUT: R sin θ and R cos θ from 50 mv to 10 vdc. **OUTPUT:** R and θ. **ACCURACY:** θ: ±15 minutes at R = 10, R: ±.1% F.S. **PACKAGE:** 3.2" x 3.4" x 1.8"h Module.

ADDITIONAL PRODUCTS

- Hi Speed Multiplexed Syn to Digital
- Multiplexed Syn to Linear DC
- Digital Sin-Cos to Synchro
- Two Speed Digital to Synchro
- Selsyn to Digital/DC
- Azimuth Change Pulse Converters

ALL SYNCHRO INPUT/OUTPUT UNITS

- Available in 0°C to 70°C or −55°C to +85°C temperature range
- TTL compatable output and inputs or CMOS, or LP Shottky
- Operate from ±15 v, or ±15 and +5 vdc
- Transformer isolated inputs/outputs
- Solid State construction — 883 Level B Available
- CAN BE MADE FIELD OR FACTORY REPAIRABLE
- Available hermetically sealed and to MIL SPECS (E-5400)
- Delivery: Stock to 4 weeks (small quantity)

SPECIAL UNITS AND PACKAGES AVAILABLE ON REQUEST

Write or phone for detailed specifications, applications assistance and evaluation units.

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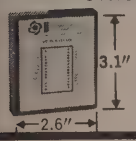
(516) 261-3300 TWX (510) 226-0448

SYNCHRO CONVERTERS/DISPLAYS/ENCODERS

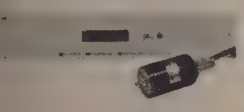
STANDARD LOW COST UNITS TO SATISFY ALMOST ANY SYNCHRO/RESOLVER OR SHAFT INTERFACING REQUIREMENT

SYNCHRO/RESOLVER TO BCD Series SBC



INPUT: 11.8/90vrms L-L, 60 or 400 Hz. Ref. 26/115vrms **OUTPUT:** 3 or 4 decade BCD — scaleable unipolar or bipolar. **ACCURACY:** ±30 or ±6 minutes of arc ±1 LSB. **PACKAGE:** 2.6" x 3.1" x .82" H Module. **OPTIONS:** Choice of Scale factors, Zero offset adjustments (±5%).

MULTITURN ABSOLUTE ENCODERS Series MDS90



INPUT: MULTI-TURN Shaft angle position. **OUTPUT:** 4, 5, or 6 Digit LED Display + BCD or Binary Data. **ACCURACY:** Up to ±1 pt. in 100,000. **PACKAGE:** Size 23 Pickoff with full or half rack electronics. **OPTIONS:** Zero Offset, NEMA 12 Housings, Presets, power supplies.

TYPICAL UNITS

Multiturn Encoders	Output Code	Resolution Counts/360°	Revolution for Full Count	Data Range
MDS90-DBC-16	Binary	2^{10}	64	2^{16}
MDS90-DBC-10	BCD	1000	10	10,000
MDS90-DBC-100	BCD	1000	100	100,000

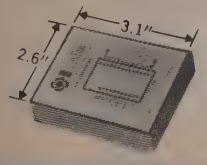
LOW COST ANGLE INDICATOR Series AI540

INPUT: 11.8/90vrms L-L, 60 or 400 Hz, Ref: 26/115vrms +115V 60 Hz power: **OUTPUT:** 4 digit or 3 digit, .5"H LED DISPLAY (unipolar or bipolar). **ACCURACY:** ±6 or ±30 minutes of arc ±1 LSB: **PACKAGE:** (A) 5.5"W x 7.5"L x 2.0"H PANEL MOUNT (DC supplies included): (B) 9½"W x 1¾"H, half rack mounting (DC supplies included. **OPTIONS:** Choice of scale factors, Zero offset adjustment (±5°).

MULTIPLEXED SYNCHRO TO DIGITAL Series MSH

INPUT: 11.8/90vrms L-L, 60 or 400 Hz., Ref: 26/115v rms, up to 128 channels; **OUTPUT:** 12 bit parallel binary or 4 decade BCD (unipolar or bipolar: **ACCURACY:** ±6 minutes of arc ±1 LSB: **PACKAGE:** (A) Central converter — 2.6" x 3.1" x .82"H module, (B) Input Module — 1.5" x 2.0" x .6"H, (C) Transformer Module — 1.5" x 1 3/16" x .6"H (Scott "T" — 400 Hz) +1" x 1" x .8"H (Ref.). **OPTIONS:** (A) choice of scale factor on BCD output, (B) Linear DC output, (C) Systems mounted on PC boards and/or racks.

MULTISPEED SYNCHRO TO DIGITAL Series TSD



INPUT: 11.8/90vrms L-L, 60 or 400 Hz., Ref: 26/115 vrms: **SPEEDS:** 8, 16, 32, 9, 18, and 36: **OUTPUTS:** 16 to 19 bits parallel binary: **ACCURACY:** ±.02, ±.01 or ±.005 degrees: **PACKAGE:** Two or Three 2.6" x 3.1" x .82"H modules. **OPTIONS:** (A) Systems packaged on PC Cards or in racks; (B) 5 digit display.

ABSOLUTE ENCODERS Series DS90

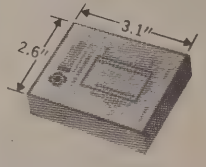
INPUT: Shaft angle position coupled to "DIGI-SHAFT" system: **OUTPUT:** four digit (.5"H) LED display (0 to 9999) +BCD or Parallel binary data (ANY SCALE FACTOR DESIRED): **ACCURACY:** ±1 part in 3600 (single turn) From shaft input to digital output: **PICKOFF:** Resolver (Size 8, 11, or 15): **PACKAGE:** (A) 5.44"W x 7.00" x 1.75"H: (B) Full or half rack: **OPTIONS:** Multichannels. Zero offset, Presets, DC output, Multiturn units with 5 digit (99999) output, NEMA 12 Housings.

TYPICAL UNITS (single Turn)

Pt. No.	Output	Counts/360°
DS90-DB-12	Binary Data	2^{12}
DSR90-36-BC	0-3599 display +BCD data	3600
DSR90-10	0-999 display	1000
DSR90L-25-BC	0 to ±2500 display +BCD data	±2500

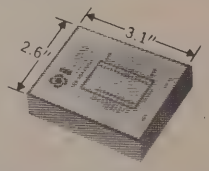
FULL SCALE OUTPUTS OF UP TO 9999 AVAILABLE
MULTITURN UNITS WITH UP TO 999999 FULL SCALE OUPUTS AVAILABLE

SOLID STATE CONTROL TRANSFORMER Series SCT



DIGITAL INPUT ANGLE (ϕ): 14, 12, or 10 bits parallel binary. **SYNCHRO/RESOLVER INPUT ANGLE (θ):** 11.8/90vrms L-L, 60 or 400 Hz. **OUTPUT:** E out=(V ref ±7%) sin (θ-ϕ) Sin wt: **GRADIENT:** .4 or 1vrms/degree. **RANGE:** ±7 or ±12.5 degrees: **ACCURACY:** ±4, ±15, or ±30 minutes of arc. **PACKAGE:** 2.6" x 3.1" x .82"H Module.

SOLID STATE CONTROL DIFFERENTIAL TRANSFORMER Series SCDX



DIGITAL INPUT ANGLE (ϕ): 14, 12, or 10 bits parallel binary. **SYNCHRO/RESOLVER INPUT ANGLE (θ):** 11.8/90vrms L-L, 60 or 400 Hz. **OUTPUT:** (1) 9.2K (ϕ) Sin (θ-ϕ) Sin wt. [7vrms.] (2) 9.2K (ϕ) Cos (θ-ϕ) Sin wt. [7vrms.] **ACCURACY:** ±4, ±15 or ±30 minutes of arc. **PACKAGE:** 2.6" x 3.1" x .82"H.

MODULATORS Series MOD500

INPUT: 0 to ±10 or ±100 VDC and 26V/115Vrms reference: **OUTPUT:** 0 to 7vrms (other voltages available. **ACCURACY:** ±.2% F.S.: **NULL:** ±.1% F.S. **PACKAGE:** 2.6" x 3.1" x .625" Module. **OPTIONS:** Gain+Zero Adjust, external output transformers.

DEMODULATORS Series D400

INPUT: 0 to 5, 10, 25 or 100vrms, 400 to 5000 Hz, 5/26vrms reference. **OUTPUT:** 0 to ±5 or ±10VDC. **ACCURACY:** ±.2, .3 or .5% F.S. **NULL:** ±.1% F.S. **PACKAGE:** (A) 1.75" x 1.75" x .6"H Module. (B) 2.75" x 1.4" x .75"H Module.

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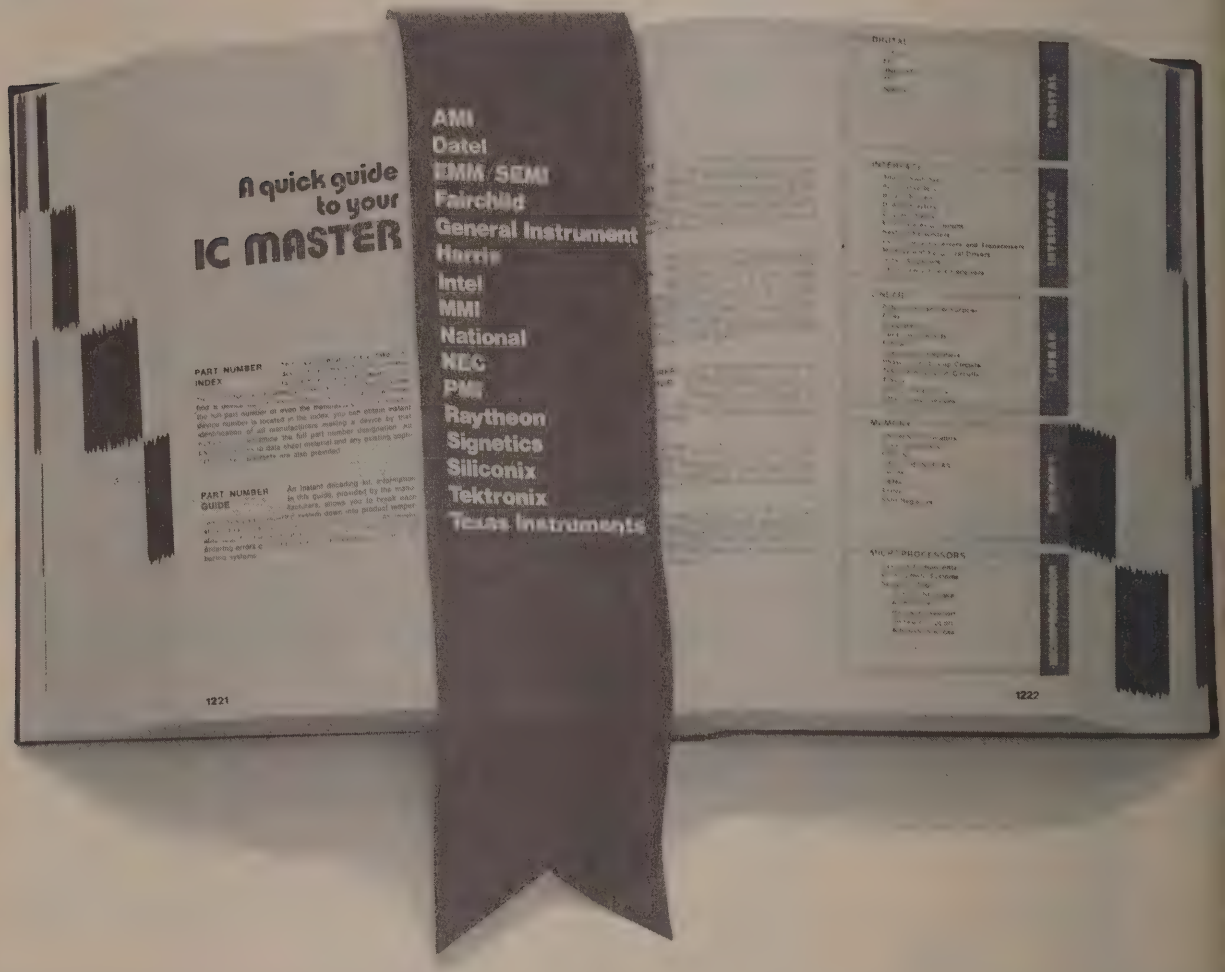
A GOOD BOOK IS KNOWN BY THE COMPANIES IT KEEPS



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S/D MODULES (LOW PROFILE)

The series 168F are a family of low profile, high performance, "tracking type" synchro/resolver to digital converters that function over the frequency range of 0 to 1,200Hz without need for external transformer modules. Series 168F are available with all popular logic forms (TTL, LPTTL, LSTTL or CMOS).

Series 168F100

14 bit (.022°) resolution with ± 4 minute ± .9LSB accuracy and 3600°/sec tracking rate. Single module: 3.12" x 2.62" x .4".

Series 168F300

12 bits (.088°) resolution with ± 8.5 minute accuracy and 11,000°/sec tracking rate. Single module: 3.12" x 2.62" x .4".

Series 168F200

10 bits (.351°) resolution with ± 30 minute accuracy and 25,000°/sec tracking rate. Single module: 3.12" x 2.62" x .4".

TWO SPEED S/D MODULES

Complete two speed, high performance synchro (and resolver) to digital converters for measuring two speed synchro systems and providing a single, unambiguous, parallel, binary angle output.

Series 168C300

1:8, 1:16, 1:32, or 1:64 two speed synchro/resolver input. Log_2N + 14 bits resolution, where N = speed ratio. Two modules: 3.12" x 2.62" x .8".

Series 168C500

1:36 (or 2:36) two speed synchro/resolver input. 16 bit (0.0055°) resolution with 0.41 minute accuracy and 720° tracking rate. Two modules: 3.12" x 2.62" x .8".

S/BCD MODULES

The Series 168C are a family of miniature, high performance synchro (and resolver) "tracking" converters which function over a frequency range of 50 to 2,200Hz without external modules. These units output either a 3 or 4 decade BCD code which is ideal for directly driving displays.

Series168C650

Either 0 to 359.9° or 0 to ±179.9° outputs with an accuracy of ±6 minutes ±.9LSB. Tracking rate is 5400°/sec. Single module 3.12" x 2.62" x .8".

Series 168C750

0 to 359° outputs with an accuracy of ±30 minutes ±.5LSB. Tracking rate is 5400°/sec. Single module 3.12" x 2.62" x .8".

D/S MODULES

The series 192B are a family of DTL/TTL/CMOS compatible digital to synchro/resolver converters. Fourteen bit natural binary angle data is continuously converted back to analog form . . . either as 3-wire synchro or 4-wire resolver signals capable of driving most control transformers.

Series 192B500

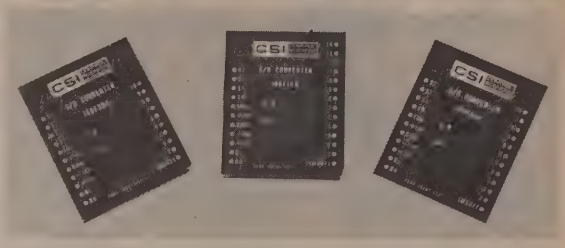
14 bit (.022°) resolution and 4 minute accuracy capable of driving 100 ohms L-L @ 11.8Vrms and 5K ohms L-L @ 90Vrms. Single module for 400 Hz: 2.62" x 3.12" x .8"; additional external transformer module required for 60 Hz: 4.40" x 1.90" x 1.50".

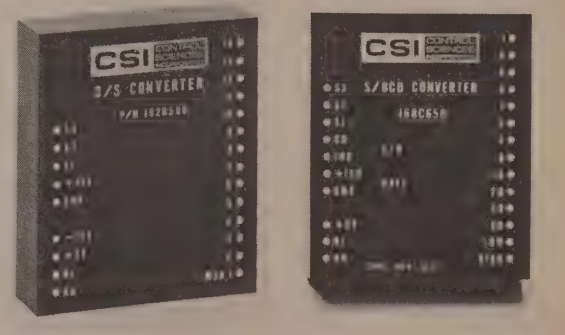
MULTIPLEXED S/D CONVERTER Series 160A

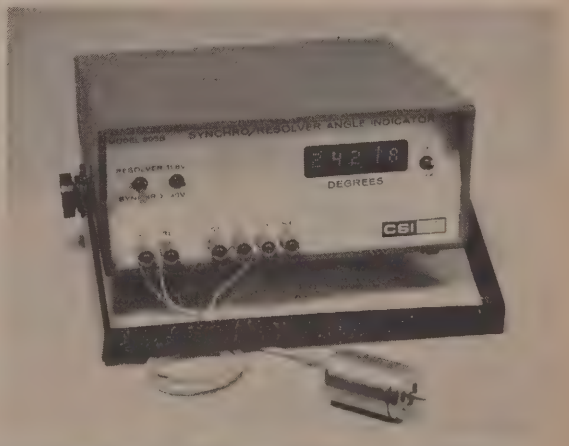
The series 160A multiplexed synchro/resolver to digital converter is a complete system capable of digitizing up to 24 synchro/resolver inputs with multiple voltage and frequency inputs. Each system consists of three types of modules: Central Processor 3.12" x 2.62" x .8"; Input Module 2.1" x 1.62" x .4"; and a Reference Processor 2.1" x 1.62" x .4". 13 bit (0.044°) resolution with 3.9 minute ± .5LSB accuracy. Sample rate 1/cycle, all channels simultaneously. Conversion time of 100 μsec/channel. DTL & TTL compatible.

SYNCHRO/RESOLVER ANGLE INDICATOR Model 805B

The model 805B Synchro/Resolver Angle Indicator is a lightweight instrument intended for use in measuring single synchro or resolver signals and displaying the angle in degrees on a 5 digit LED readout.







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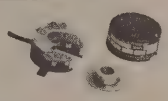
TRUMP-ROSS OPTICAL SHAFT ENCODERS AND PROGRAMMABLE LIMIT SWITCHES

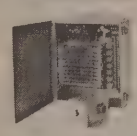
INCREMENTAL ENCODERS

	Pulses per Rev	Input Voltage (VDC)	Output Formats	Frequency Range (KHZ)	Shaft Dia. (Inches)	Outline Dimensions (Inches)	Features
Tru-Rota Instrumentation Encoder	10 to 1270 Single and dual channel 1271 to 2500 single channel only	5 to 15	TTL, HTL, CMOS, sine wave	0 to 50	1/4	2-5/16 DIA. x 1½ L	Compact, general purpose, instrument grade, incremental encoder. Low starting torque. Single or double-ended shaft. English/Metric combinations available.
Tru-Mite Industrial Encoder	200 to 5000	5 to 15	TTL, HTL CMOS, sine wave, line driver	0 to 100	3/8	2½ DIA. x2½ L	Rugged, industrial duty, incremental encoder with ⅜" diameter shaft and sealed bearings. Cast aluminum housing with flange or servo mount. Side or end-mounted MS connector. LED light source. English/Metric combinations available.
Tru-Tac Low-Cost Encoder	10 to 600	5 to 24	TTL, HTL, CMOS, line drivers	0 to 30	3/8	3L x 3⅛W x 3⅛H	Low cost, industrial duty, incremental encoder with double-ended ⅜" diameter shaft and sealed bearings. Foot or face mounting and MS connector. LED light source.
Trim-Step Modular Encoder	50 to 250	5	TTL, HTL, CMOS sine wave	0 to 25	N/A	2¼ DIA. x 1⅜ L	Rugged, modular, incremental encoder designed to be integrally mounted on a stepper or servo motor. Consists of a cylindrical slotted rotor and concentric stator. High shaft end play tolerance (.020"). Easy to install.
Kit-Coder Modular Encoder 	200 to 1000	5	TTL, sine wave	0 to 50	N/A	1½ DIA. x ¾ L	Low cost, modular, incremental encoder designed to be integrally mounted on a servo motor. Consists of an optically encoded disc on an aluminum hub and an LED light source/phototransistor/amplifier module. Small size and low inertia. Easy to install.
Heavy Duty Enclosure for Tru-Rotas used in severe environments such as machine tools conveyors, and mill drives.						For Tru-Rota and Tru-Mite encoders. Separate working shaft -⅜" or ⅝" diameter. NEMA 13 structure with sealed bearings and MS connector. Differential line driver can be incorporated.	

ABSOLUTE ENCODERS

	Resolution (Single Turn)	Input Voltage (VDC)	Output Codes	Output Formats	Frequency Range (KHZ)	Shaft Dia. (Inches)	Outline Dimensions (Inches)	Features
Model LR	9 Bit	5 to 24	BCD, gray, natural binary	TTL, HTL, CMOS	0 to 50	3/8 or 5/8	5L x 3½W 3⅝H	Industrial duty, absolute encoder. Heavy duty cast aluminum housing with ⅜" or ⅝" diameter shaft, and sealed bearings. Foot or face mounting and MS connector. LED light source. Non-ambiguous output.

PROGRAMMABLE LIMIT SWITCHES

	Number of "Cams"	Resolution (degrees)	Type of Output	Input Voltage	Shaft Dia (Inches)	Outline Dim. (Inches)	Features
Digi-Cam	1 to 12	1	TTL, HTL, CMOS	5 to 24 VDC	3/8 or 5/8	5L x 3½W x 3⅝H	Self-contained solid state, electronic cam switch. Internal semiconductor memory can be factory programmed for up to 12 individual cam on/off profiles with 1° minimum dwell for 360° of shaft rotation. Same rugged mechanical construction and I/O voltages as LR Absolute Encoder.
Electronic Cam System 	1 to 8 expandable to 24	1	Relay or Solid State	24, 115 or 230 VAC	Encoder 3/8 or 5/8 Programmer N/A	Encoder: 5L x 3½W x 3⅝H Programmer: 13W x 5½H x 6D	Replaces mechanical cam switches. Consists of LR Absolute Encoder and an electronic programmer. Never requires readjustment. Thumbwheels permit adjusting up to 8 on/off set points with 1° minimum dwell while shaft is rotating. Relay or solid-state outputs. Digital display indicates shaft position. Absolute encoder remembers shaft position even with power off.

Trump-Ross Encoders are manufactured by:

Datametrics Inc.
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DATA SPECIALTIES manufacturers a complete line of paper tape peripherals to suit a wide variety of applications. All the products shown are built around the revolutionary MODUPERF™ mechanism which features whisper quiet operation, MYLAR punching capability, long life die block (1,000,000 feet) and field replaceable modules.

The SRP-300 is a paper tape combo that connects, without modification, to any 300 baud teleprinter or CRT terminal thru the RS-232 connector and provides all the features of a conventional ASR.

The units are offered at various speeds with parallel or serial interfaces in table top or rack mounted configurations. In addition, the basic mechanism and interface/driver are available. Consult the chart below for details.

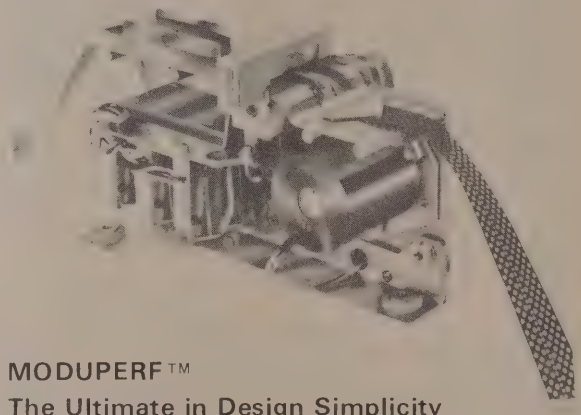
Combos

Add Paper Tape I/O to your Terminal or use as a stand alone Peripheral

Punch Systems

Table Top and Rack Panel Units

Mechanisms



MODUPERF™
The Ultimate in Design Simplicity

MODEL	DESCRIPTION	PUNCH SPEED	READER SPEED	INTERFACE	CONFIGURATION	DSI SPECIFICATION
SRP-300	READER/ PUNCH COMBO	300 BAUD	300 BAUD	SERIAL RS-232	TABLE TOP	3300
SRP-3075		75 c/s	300 c/s	PARALLEL DTL/TTL		3600
SRP-3075S		750 BAUD	3000 BAUD	SERIAL RS-232		3600
SP-75	PUNCH SYSTEM	75 c/s		PARALLEL DTL/TTL	TABLE TOP	3400
SP-75S		750 BAUD		SERIAL RS-232		
RP-75		75 c/s		PARALLEL DTL/TTL	19" RACK PANEL	3500
RP-75S		750 BAUD		SERIAL RS-232		
M-30	PUNCH MECHANISM	30 c s		PARALLEL* 24 VOLTS	MECHANISM B or C MOUNT	3100
M-75		75 c/s				

* INTERFACE/DRIVER CIRCUIT BOARD AVAILABLE - DTL/TTL INPUT

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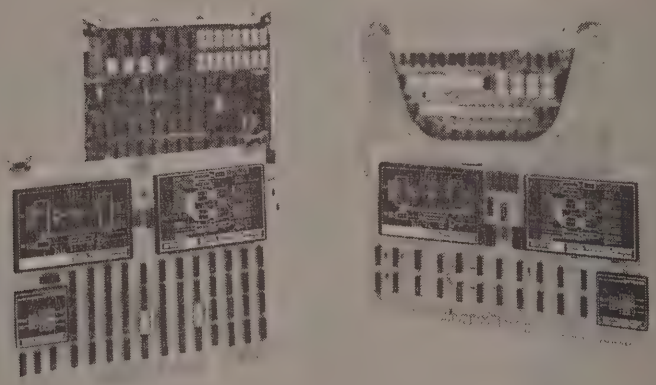
PRODUCT SUMMARY

5 DAY DELIVERY

Microcomputer Analog I/O Systems with extensive software diagnostics



For:

INTEL SBC-80 Series (8080A)
ZILOG MCB Series (Z-80)
DEC LSI-11 & LSI-11/2
Computer Automation LSI 2,3 & 4 Series
National Semi IMP/PACE & BLC-80 Series

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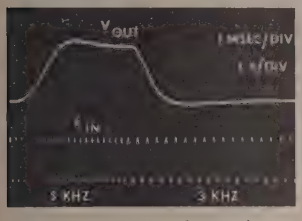
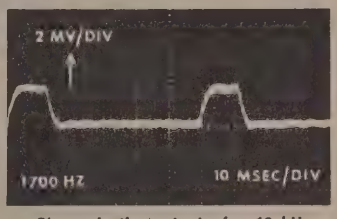
FREQUENCY-TO-ANALOG CONVERTERS
Fast and Ripple-Free

The New Model 22 Series F/A Converters (FAC) transform an input frequency to a proportional, ripple-free, output voltage with fast response. Because of their performance and utility, they will prove to be a basic building block for systems. They are superior to conventional charge-pump F/V converters, capable of being used directly with sampled analog data systems with no ripple uncertainties.



Output response of a 10 kHz FAC with a large step change of input frequency.

A New Basic Building Block for Data Conversion/Measurement Systems



Shown is the output of a 10 kHz FAC with a 20 period frequency change of +0.024% (of Full Scale), equivalent to 1 LSB change in 12 bits. Note the low ripple.

Not only can an analog data acquisition system (DAS) now measure frequency using these new FACs, but it can do it much faster than the digital counting methods. For some applications, several input frequencies can be multiplexed (or addressed) into a single precision 22B FAC for a low cost/channel system. The use of V/F converters for data transmission is now a very practical alternative. A 10 kHz V/F to FAC system can carry more data than a 1 MHz V/F to (12 bit) digital counter system, and also be easier to transmit.

Unlike gated counter methods, the output of the FAC continuously tracks the input frequency and provides the latest update when sampled by a DAS or other measuring system.

STANDARD MODULES — 1 kHz and 10 kHz Full Scale Input

INPUT
Dynamic Conversion Range — 10,000+/1
Configuration: Opto-isolated and direct level input.
— Any waveshape accepted which passes through the input trigger level.
Trip Level: Opto-isolated — +1 ma max., 40% hysteresis
Direct input — +2.0 volts, 0.8 volt hysteresis

OUTPUT
Output Voltage Range: 0 to +10 volts, +20% overrange.
Ripple: Less than ½ mv peak-peak at all input frequencies.

RESPONSE
For a 2/1 step change in frequency, the output will settle to within ±0.025% (of Full Scale) in less than 20 periods. Refer to scope photos for both large and small frequency step responses.

AVAILABLE OPTIONS
Other full scale frequencies are available from 100 kHz down to 100 Hz for Models 22A, B and down to 1 Hz for the 22AL.

INPUT OPTIONS
(-1) Uncommitted comparator input.
(-2) Input for magnetic reluctance pickup.

MODULES GENERAL SPECIFICATIONS: Operating Temperature Range — −25°C to +85°C.

Model Series[5]	Main Feature	Ripple Peak-Peak max	Linearity % of FS[1] max	Scale Tempco max	Power, max current	Scale Offset	Dimensions[1,4] (inches)	Price[1] (1-9)
22A	Single Supply	1 mv	±0.05%	±50 ppm/°C	+10 to +16 volts, 20 ma	±2 mv	2x1.5x.5	$59.00
22B	Precision	1 mv	±0.01%	±20 ppm/°C	±12, ±15 volts, 30 ma	±[2]1 mv	2x1.5x.5	74.00
22AL	Low Cost, 10/1 Range	1[3] mv	±0.1%	±50 ppm/°C	+10 to +30 volts, 10 ma	±2 mv	2x1.125x.5	39.00

NOTES: [1]For 10 kHz FAC [2]Trimmable to zero [3]Ripple increases below 1/10th full scale [4]Larger dimensions for low frequency units [5]F/A Converters are specified as in: 22B- (F S frequency) — (input options)

Complete Plug-in F/A Boards

D-B-Developments has an expanding line of Plug-in compatible FAC boards for most DAS and other data conversion systems. These plug-in cards use the precision 22B Series modules and can be specified for frequency range and input configuration. Power requirements are ±12 or ±15 volts. An optional +5 volt power converter is available for the larger DAS Boards. Consult factory for DAS compatible F/A converter cards.

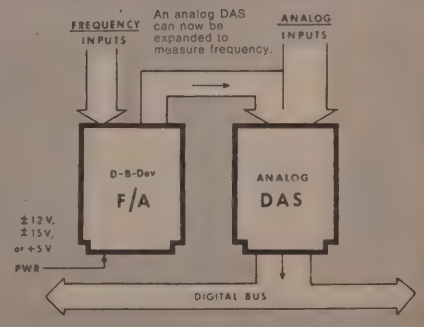
DAS-22 Series Boards: Standard 4.5" x 6.5", 22 pin boards (¾" spacing).

DAS-22S — Single channel FAC with 3½" analog meter.

DAS-22D — Dual channel FAC.

DAS-22M — 8 input multiplexed FAC.

Full scale frequencies available: 100 kHz down to 10 Hz.



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DATEL

DATA CONVERSION COMPONENTS AND SUBSYSTEMS

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Monolithic and Hybrid A/D Converters

	Model	Resolution	Accuracy (% FS)	Conversion Time	Output Coding	Input Ranges
Mono. Counting	ADC-MC8BC	8 Bits	0.2%	500 μsec.	Bin	0 to +5, +10V
Monolithic Integrating	ADC-EK8B	8 Bits	0.2%	1.8 msec.	Bin	0 to +10, ±5V
	ADC-EK10B	10 Bits	0.05%	6 msec.	Bin	
	ADC-EK12B	12 Bits	0.01%	24 msec.	Bin	
	ADC-EK12DC	3½ Digits	0.05%	12 msec.	BCD	0 to +10V
	ADC-EK12DR	3½ Digits	0.05%	12 msec.	BCD	0 to +10V
Hybrid Low Power CMOS Binary	ADC-HC12BGC	12 Bits	0.01%	300 μsec.	Bin, 2C	0 to +5, +10V ±2.5V, ±5V, ±10V
	ADC-HC12BMC					
	ADC-HC12BMR					
	ADC-HC12BMM					
Hybrid Ultra-Fast 12-Bit	ADC-HF12BGC	12 Bits	0.01%	2 μsec.	Bin, 2C	0 to +5, +10V ±2.5, ±5, ±10V
	ADC-HF12BMC					
	ADC-HF12BMR					
	ADC-HF12BMM					
Hybrid 12-Bit With Sample-Hold	ADC-HS12BGC	12 Bits	0.01%	8 μsec.	C Bin C 2C	0 to +5, +10V ±2.5V, ±5V, ±10V
	ADC-HS12BMC					
	ADC-HS12BMR					
	ADC-HS12BMM					
Hybrid Low Cost 12-Bit	ADC-HX12BGC	12 Bits	0.01%	20 μsec.	C Bin C 2C	0 to +5, +10V ±2.5, ±5, ±10V
	ADC-HX12BMC					
	ADC-HX12BMR					
	ADC-HX12BMM					
Hybrid Fast 12-Bit	ADC-HZ12BGC	12 Bits	0.01%	8μsec.	C Bin C 2C	0 to +5, +10V ±2.5, ±5, ±10V
	ADC-HZ12BMC					
	ADC-HZ12BMR					
	ADC-HZ12BMM					
Ultra-Fast 3-Bit Parallel Type	ADC-HU3BGC	3 Bit	12.5%	20 nsec.	Bin	±2.5V
	ADC-HU3BMC					
	ADC-HU2BMR					
	ADC-HU3BMM					

Notes: 1. Coding: BIN = Straight binary or offset binary
BCD = Binary coded decimal
2C = Two's complement
C Bin = Complementary binary
C 2C = Complementary two's complement

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ADC-MC8B: An 8 bit low cost counter type A/D which requires an external comparator.

ADC-EK SERIES: Series of low cost, monolithic CMOS A/D's using charge balancing conversion principle.

ADC-HC12B: 12 bit low power CMOS A/D's featuring single supply operation for portable instrumentation applications.

ADC-HF12B: State-of-the-art ultra-high speed 12 bit hybrid A/D converter featuring 2 μsec. conversion time.

ADC-HS12B: 12 bit, 8 μsec. A/D converter with sample-hold in miniature hybrid package.

ADC-HX12B: Industry standard, low cost 12 bit A/D converter with 20 μsec. conversion time and internal buffer.

ADC-HZ12B: High performance, 12 bit A/D converter with 8 μsec. conversion time and pin-programmable inputs.

ADC-HU3B: A 3 bit expandable, parallel type A/D featuring 20 nsec. conversion time. Decoded binary output.

Linearity	Temp. Range (°C)	Gain Tempco	Power Requirement	Case Size (Inches)	Price (1-24)
1/2 LSB	0 to 70	40 ppm/°C	+5V	16-Pin DIP	$ 9.50
1/2 LSB	0 to 70	40 ppm/°C	±5V	24-Pin DIP	$ 11.50
					$ 26.00
					$ 34.00
					$ 13.50
1/2 LSB	−25 to +85	40 ppm/°C	±5V	24 Pin DIP	$ 21.00
1/2 LSB	0 to 70	30 ppm/°C	+9 to +15V, ±9 to ±15V	32-Pin DIP	$129.00
	0 to 70				$139.00
	−25 to +85				$179.00
	−55 to +125				$219.00
1/2 LSB	0 to 70	25 ppm/°C	±15V, +5V	32-Pin DIP	$229.00
	0 to 70				$249.00
	−25 to +85				$299.00
	−55 to +100				$399.00
1/2 LSB	0 to 70	20 ppm/°C	±15V, +5V	32-Pin DIP	$149.00
	0 to 70				$159.00
	−25 to +85				$199.00
	−55 to +100				$239.00
1/2 LSB	0 to 70	20 ppm/°C	±15V, +5V	32-Pin	$ 85.00
	0 to 70				$ 95.00
	−25 to +85				$125.00
	−55 to +100				$155.00
1/2 LSB	0 to 70	20 ppm/°C	±15V, +5V	32-Pin DIP	$119.00
	0 to 70				$129.00
	−25 to +85				$169.00
	−55 to +100				$195.00
0.1%	0 to 70	25 ppm/°C	±5V	32-Pin DIP	$179.00
	0 to 70				$189.00
	−25 to +85				$239.00
	−55 to +100				$289.00

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***For additional specifications see "Microcircuits for Data Conversion" catalog.**

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General Purpose, High Performance Modular A/D Converters

	Model	Resolution	Accuracy (%FS)	Conversion Time	Output Coding (2)	Input Ranges
Lowest Cost	ADC-Econov.	6 Bits	0.8%	50 μsec.	Bin	+5, +10, ±2.5, +5V
	ADC-89A8B	8 Bits	0.2%	200 μsec.	Bin	0 to +10V, ±5V
	ADC-89A8D	2 Digits	0.5%	100 μsec.	BCD	0 to +10V
General Purpose Successive Approximation	ADC-MA10B2A	10 Bits	0.05%	40 μsec.	Bin, 2C	0 to +5V, +10V ±2.5V, ±5V, ±10V
	ADC-MA10B2B	10 Bits	0.05%	20 μsec.		
	ADC-MA12B2A(3)	12 Bits	0.01%	40 μsec.		
	ADC-MA12B2B	12 Bits	0.01%	20 μsec.		
High Resolution	ADC-149-14B	14 Bits	0.005%	50 μsec.	Bin, 2C	−10, −20, ±5, ±10V
High Performance Successive Approximation	ADC-M8B	8 Bits	0.2%	4.0 μsec.	Bin, 2C	+5, +10, ±5, ±10V
	ADC-M10B	10 Bits	0.05%	11.5 μsec.		
	ADC-M12B	12 Bits	0.01%	13.0 μsec.		
	ADC-M8D	2 Digits	0.5%	4.0 μsec.	BCD	0 to +5, +10V
	ADC-M12D	3 Digits	0.05%	13.0 μsec.		
High Performance Successive Approximation	ADC-L8B	8 Bits	0.2%	12 μsec.	Bin, 2C	+5, +10, ±5, ±10V
	ADC-L10B	10 Bits	0.05%	16 μsec.		
	ADC-L12B	12 Bits	0.01%	20 μsec.		
	ADC-L8D	2 Digits	0.5%	12 μsec.		
	ADC-L12D	3 Digits	0.05%	20 μsec.		
Fast Dual Slope	ADC-E8B	8 Bits	0.2%	312 μsec.	S.M. Bin	±1, ±5, ±10V
	ADC-E10B	10 Bits	0.05%	1.25 msec.		
	ADC-E12B	12 Bits	0.01%	5.0 msec.		
	ADC-E8D	2 Digits	0.5%	500 μsec.	S.M. BCD	±2, ±5, ±10V
	ADC-E12D	3 Digits	0.05%	5.0 msec.		

NOTES: 1. An optional high impedance buffer amplifier is available on special order to give 1000 megohms input impedance. Add $20.00 to price.

2. Coding: Bin = Straight binary of offset binary. S.M. Bin = Sign-magnitude binary
   BCD = Binary coded decimal S.M. BCD = Sign-magnitude BCD
   2C = Two's complement

3. Pin/Performance replacement for ADC-12QZ

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ADC-Econoverter: Lowest cost, 6 bit counting type A/D converter with 50 μsec. conversion time.

ADC-89A: Low cost, 8 bit binary or BCD A/D converter using counting method.

ADC-MA SERIES: Industry standard 10 and 12 bit successive approximation A/D converters with 40 or 20 μsec. conversion times. The ADC-MA12B2A is pin/performance replacement for the ADC-12QZ.

ADC-149-14B: A low cost, high resolution successive approximation A/D featuring 14 bit resolution and 50 μsec. conversion time.

ADC-M SERIES: These models are also fast, high performance successive approximation converters with less than 13 μsec. conversion time. Tempco is 10 ppm/°C and input voltage ranges must be ordered by model number.

ADC-L SERIES: Popular, high performance series of 8, 10, and 12 bit binary and 2 and 3 digit BCD models. Conversion times less than 20 μsec. with 10 ppm/°C tempco.

ADC-E SERIES: Series of fast dual slope A/D converters featuring 8, 10, and 12 bit binary and 2 or 3 digit BCD resolutions. Conversion times down to 312 μsec. for 8 bits.

Linearity	Input Impedance	Gain Tempco	Power Requirement	Case Size (inches)	Price (1-9)
1/2 LSB	4.2K	100 ppm/°C	±15V, +5V	2 x 2 x 0.375	$39.00
1/2 LSB	5K	50 ppm/°C	±15V, +5V	3 x 2 x 0.375	$73.00
					$73.00
					$119.00
1/2 LSB	2.5, 5, 10K (1)	30 ppm/°C	±15V, +5V	4 x 2 x 0.4	$131.00
					$129.00
					$175.00
1 LSB	5, 10K	15 ppm/°C	±15V, +5V	4 x 2 x 0.8	$239.00
				3 x 2 x 0.375	$241.00
					$310.00
1/2 LSB	10 K (1)	10 ppm/°C	±15V, +5V	4 x 2 x 0.4	$367.00
					$241.00
					$367.00
				3 x 2 x 0.375	$142.00
					$163.00
1/2 LSB	10K (1)	10 ppm/°C	±15V, +5V	4 x 2 x 0.4	$184.00
					$142.00
					$184.00
					$83.00
					$94.00
0.01%	100 Meg. 10K	50 ppm/°C	±15V, +5V	4 x 2 x 0.4	$104.00
					$83.00
					$104.00

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High Speed Modular A/D Converters

	Model	Resolution	Accuracy (% FS)	Conversion Time	Output Coding (2)	Input Ranges
Fast 8-Bit	ADC-EH8B1	8 Bits	0.2%	4.0 μsec	Bin, 2C	0 to +10V, ±5V
	ADC-EH8B2	8 Bits	0.2%	2.0 μsec.		
Fast 10-Bit	ADC-EH10B1	10 Bits	0.05%	4.0 μsec.	Bin, 2C	0 to +10V, ±5V
	ADC-EH10B2	10 Bits	0.05%	2.0 μsec.		
Fast 12-Bit	ADC-EH12B1	12 Bits	0.01%	8.0 μsec.	Bin, 2C	0 to +10V, ±5V
	ADC-EH12B2	12 Bits	0.01%	4.0 μsec.		
Ultra-Fast 12-Bit	ADC-EH12B3	12 Bits	0.01%	2.0 μsec.	Bin, 2C	0 to +10V, ±5V
100 nsec./Bit	ADC-G8B	8 Bits	0.2%	800 nsec.	Bin, 2C	−5, −10, ±5, ±10V
	ADC-GI0B	10 Bits	0.05%	1.0 μsec.		
Ultra-Fast Parallel Type	ADC-VH4B	4 Bits	3.0%	100 nsec.	Bin	0 to −2.56V (1)
	ADC-VH6B	6 Bits	0.8%	200 nsec.		
	ADC-VH8B	8 Bits	0.4%	200 nsec.		
Ultra-Fast Parallel Type	ADC-UH4B	4 Bits	3.0%	40 nsec.	Bin	0 to −2.56V (1)
	ADC-UH6B	6 Bits	0.8%	100 nsec.		
	ADC-UH8B	8 Bits	0.4%	100 nsec.		
8-Bit 20MHz	ADC-TV8B1	8 Bits	0.2%	50 nsec.	Bin (3)	±1, ±2, ±5V
	ADC-TV8B2	8 Bits	0.2%	50 nsec.	Bin (4)	0 to +1, +2, +5V
4-Bit with S/H	ADC-SH4B	4 Bits	3.0%	500 nsec.	Bin	0 to +1V

NOTES: 1. Bipolar versions are also available with ±1.28V input.
Add $50.00 to price.
2. Coding: Bin = Straight binary or offset binary
2C = Two's complement
3. ECL Logic Outputs
4. TTL Logic Outputs

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Add Dept. EM to address to tell them you saw it in eem

ADC-EH8B SERIES: Fast, 8 bit successive approximation A/D converters featuring 4 or 2 μsec. conversion times.

ADC-EH10B SERIES: Fast 10 bit successive approximation A/D converters featuring 4 or 2 μsec. conversion times.

ADC-EH12B SERIES: Fast 12 bit successive approximation models give 8 and 4 μsec. conversion times.

ADC-EH12B3: Industry's fastest 12 bit A/D converter with a 2 μsec. conversion time.

ADC-G SERIES: These high speed 8 and 10 bit A/D's feature 100nsec. per bit conversions, giving 800 nsec. for 8 bits and 1 μsec. for 10 bits.

ADC-SH4B: This model is a 4 bit A/D converter with a self-contained sample-hold circuit. Time for both acquisition and conversion is 500 nsec. This device is designed for optical scanning and fast pulse code modulation applications.

ADC-TV8B: New 8 bit, 20 MHz A/D converter containing internal sample-hold. Specially designed for video and radar digitizing.

ADC-UH SERIES: Ultra-fast parallel type converters with 40 nsec. conversion time for 4 bits and 100 nsec. for 6 or 8 bits.

ADC-VH SERIES: Ultra-fast parallel type converters with 100 nsec. conversion time for 4 bits and 200 nsec. for 6 or 8 bits.

Linearity	Input Impedance	Gain Tempco	Power Requirement	Case Size (Inches)	Price (1-9)
1/2 LSB	4.45K	50 ppm/°C	±15V, +5V	2 x 2 x 0.375	$ 89.00
					$136.00
1/2 LSB	2.3K	30 ppm/°C	±15V, +5V	3 x 2 x 0.375	$157.00
					$189.00
1/2 LSB	2.3K	30 ppm/°C	±15V, +5V	4 x 2 x 0.375	$179.00
					$219.00
1/2 LSB	1.15K	30 ppm/°C	±15V, +5V	4 x 2 x 0.4	$259.00
1/2 LSB	500, 1K, 2K	20 ppm/°C	±15V, +5V	4 x 2 x 0.4	$239.00
				4 x 2 x 0.8	$279.00
1/2 LSB					$695.00
1/2 LSB	100 ohms	50 ppm/°C	±15V, +5V	5 x 3 x 1.15	$745.00
1 LSB					$795.00
1/2 LSB					$795.00
1/2 LSB	100 ohms	50 ppm/°C	±15V, +5V	5 x 3 x 1.15	$845.00
1 LSB					$895.00
1/2 LSB	50, 75, 93 ohms	60 ppm/°C	±15V, ±5V	7.5 x 4.25 x 0.875	$1995.00
					$2095.00
1/3 LSB	50 ohms	200 ppm/°C	±15V, +5V	2×2×0.375	$ 99.00

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General Purpose Monolithic and Hybrid D/A Converters

	Model	Resolution	Accuracy (% FS)	Output	Settling Time	Linearity	Input Coding
8-Bit Monolithic	DAC-IC8BC	8 Bits	0.2%	Current	300 nsec.	½ LSB	Bin
	DAC-IC8BM	8 Bits	0.2%				
Fast 8-Bit Monolithic	DAC-08BC	8 Bits	0.2%	Current	85 nsec.	½ LSB	Bin
	DAC-O8BM	8 Bits	0.2%				
10-Bit Mono	DAC-IC10BC	10 Bits	0.05%	Current	250 nsec.	1 LSB	Bin
10-Bit Multiplying CMOS	DAC-HA10BC	10 Bits	0.05%	Current	500 nsec.	½ LSB	Bin
	DAC-HA10BR	10 Bits	0.05%				
	DAC-HA10BM	10 Bits	0.05%				
12-Bit Multiplying CMOS (Binary)	DAC-HA12BC	12 Bits	0.01%	Current	500 nsec.	½ LSB	Bin
	DAC-HA12BR	12 Bits	0.01%				
	DAC-HA12BM	12 Bits	0.01%				
12-Bit Multiplying CMOS (BCD)	DAC-HA12DC	3 Digits	0.05%	Current	500 nsec.	½ LSB	BCD
	DAC-HA12DR	3 Digits	0.05%				
	DAC-HA12DM	3 Digits	0.05%				
12-Bit Low Cost Hybrid (Binary)	DAC-HZ12BGC	12 Bits	0.01%	Voltage	3 μsec.	½ LSB	C Bin(1)
	DAC-HZ12BGR	12 Bits	0.01%				
	DAC-HZ12BMC	12 Bits	0.01%				
	DAC-HZ12BMR	12 Bits	0.01%				
	DAC-HZ12BMM	12 Bits	0.01%				
12-Bit Low Cost Hybrid (BCD)	DAC-HZ12DGC	3 Digits	0.05%	Voltage	3 μsec.	¼ LSB	CBCD
	DAC-HZ12DGR	3 Digits	0.05%				
	DAC-HZ12DMC	3 Digits	0.05%				
	DAC-HZ12DMR	3 Digits	0.05%				
	DAC-HZ12-DMM	3 Digits	0.05%				
12-Bit Low Drift	DAC-HZ12BMR-1	12 Bits	0.01%	Voltage	3 μsec.	½ LSB	C Bin(1)
	DAC-HZ12DMR-1	3 Digits	0.05%				CBCD

NOTES: 1. All models in this series are also available with 3 digit BCD coding. Prices are same as binary. For correct model designation, change "B" to "D" in model number.

2. Coding: Bin = Straight binary or offset binary
BCD = Binary coded decimal
C Bin = Complementary binary
C BCD = Complementary binary coded decimal
15 line = 8 bit input, no coding

DATEL SYSTEMS, INC.
1020 TURNPIKE STREET / CANTON, MASSACHUSETTS 02021
TELEPHONE: (617) 828-8000 TWX. 710-348-0135 . TELEX: 924461
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SANTA ANA, CALIFORNIA (714) 835-2751 / LA EXCHANGE (213) 933-7256 / SUNNYVALE, CALIFORNIA (408) 733-2424

DAC-IC8B: Low cost, monolithic 8 bit D/A converter with 300 nsec. current output.

DAC-08: Low cost, high speed monolithic 8 bit DAC featuring 85 nsec. settling time for output current.

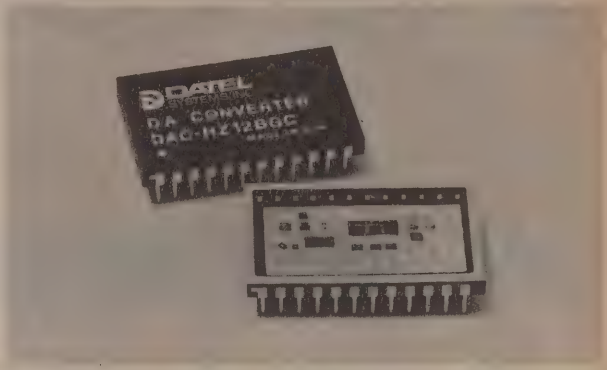
DAC-IC10B: A low cost monolithic 10 bit D/A converter with 0 to 4 mA current output.

DAC-HA10B: A multiplying 10 bit DAC using CMOS and thin film resistor fabrication.

DAC-HA12 SERIES: 12 bit binary and 3 digit BCD multiplying DAC's with CMOS and thin film resistor fabrication.

DAC-HZ12 SERIES: Industry standard, high performance 12 bit hybrid DAC's featuring fast voltage output and 20 ppm/°C tempco. Binary and BCD coding.

DAC-HZ12BMR-1 & DAC-HZ12DMR-1: Low drift, 10 ppm/°C 12 bit D/A converters with binary and BCD versions.



Output Ranges	Gain Tempco	Temp. Range (°C)	Power Requirement	Case	Price (1-24)
0 to −2 mA	20 ppm/°C	0 to 70	+5V, −15V	16-Pin DIP	$ 8.95
		−55 to +125			$ 12.45
0 to −2 mA	10 ppm/°C	0 to 70	±15V	16-Pin DIP	$ 8.00
		−55 to +125			$ 12.00
0 to −4 mA	20 ppm/°C	0 to 70	+5V, −15V	16-Pin DIP	$ 10.95
±1 mA	65 ppm/°C	0 to 70	+5V or +15V	16-Pin DIP	$ 29.00
		−25 to +85			$ 39.00
		−55 to +125			$ 69.00
±1 mA	10 ppm/°C	0 to 70	+5V or +15V	18-Pin DIP	$ 49.00
		−25 to +85			$ 69.00
		−55 to +125			$ 99.00
±1 mA	10 ppm/°C	0 to 70	+5V or +15V	18-Pin DIP	$ 49.00
		−25 to +85			$ 69.00
		−55 to +125			$ 99.00
±2.5, ±5, ±10V 0 to +5, +10V	20 ppm/°C	0 to 70	±15V	24-Pin DIP	$ 39.00
	20 ppm/°C	−25 to +85			$ 55.00
	20 ppm/°C	0 to 70			$ 49.00
	20 ppm/°C	−25 to +85			$ 69.00
	20 ppm/°C	−55 to +125			$119.00
0 to +2.5V 0 to +5V 0 to +10V	20 ppm/°C	0 to 70	±15V	24-Pin DIP	$ 39.00
	20 ppm/°C	−25 to +85			$ 55.00
	20 ppm/°C	0 to 70			$ 49.00
	20 ppm/°C	−25 to +85			$ 69.00
	20 ppm/°C	−55 to +125			$119.00
±2.5, ±5, ±10V 0 to +5, +10V	10 ppm/°C	−25 to +85	±15V	24-Pin DIP	$139.00
0 to +5, +10V					$139.00

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High Performance Hybrid D/A Converters

	Model	Resolution	Accuracy (% FS)	Output	Settling Time	Linearity
14-Bit Multiplying CMOS	DAC-HA14BC	14 Bits	0.006%	Current	500 nsec	1 LSB
	DAC-HA14BR	14 Bits	0.006%			
	DAC-HA14BM	14 Bits	0.006%			
Ultra-Fast 8-Bit Current Out	DAC-HF8BGC	8 Bits	0.2%	Current	25 nsec.	1/2 LSB
	DAC-HF8BMC	8 Bits	0.2%			
	DAC-HF8BMR	8 Bits	0.2%			
	DAC-HF8BMM	8 Bits	0.2%			
Ultra-Fast 10-Bit Current Out	DAC-HF10BGC	10 Bits	0.05%	Current	25 nsec.	1/2 LSB
	DAC-HF10BMC	10 Bits	0.05%			
	DAC-HF10BMR	10 Bits	0.05%			
	DAC-HF10BMM	10 Bits	0.05%			
Ultra-Fast 12-Bit Current Out	DAC-HF12BGC	12 Bits	0.01%	Current	50 nsec.	1/2 LSB
	DAC-HF12BMC	12 Bits	0.01%			
	DAC-HF12BMR	12 Bits	0.01%			
	DAC-HF12BMM	12 Bits	0.01%			
12-Bit with Input Register (Binary)	DAC-HK12BGC	12 Bits	0.01%	Voltage	3 μsec.	1/2 LSB
	DAC-HK12BMC	12 Bits	0.01%			
	DAC-HK12BMR	12 Bits	0.01%			
	DAC-HK12BMM	12 Bits	0.01%			
12-Bit with Input Register (BCD)	DAC-HK12DGC	3 Digits	0.05%	Voltage	3 μsec.	1/4 LSB
	DAC-HK12DMC	3 Digits	0.05%			
	DAC-HK12DMR	3 Digits	0.05%			
	DAC-HK12DMM	3 Digits	0.05%			
High Resolution 16-Bit Binary	DAC-HP16BMC	16 Bits	0.003%	Voltage	35 μsec.	4 LSB
	DAC-HP16BMR	16 Bits	0.003%			
	DAC-HP16BMM	16 Bits	0.003%			
High Resolution 4-Digit BCD	DAC-HP16DMC	4 Digits	0.005%	Voltage	15 μsec.	1/2 LSB
	DAC-HP16DMR	4 Digits	0.005%			
	DAC-HP16DMM	4 Digits	0.005%			
4-Bit Ultra-Fast Current Out	DAC-HU4BGC	4 Bits	3.0%	Current	25 nsec.	0.1%
	DAC-HU4BMC	4 Bits	3.0%			
	DAC-HU4BMR	4 Bits	3.0%			
	DAC-HU4BMM	4 Bits	3.0%			

NOTES: 1. Coding: Bin = Straight binary or offset binary
C Bin = Comp. binary or comp. offset binary
BCD = Binary coded decimal
C BCD = Comp. binary coded decimal
15 line = 8-bit input, no coding

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Input Coding	Output Ranges	Gain Tempco	Temp Range (°C)	Power Requirement	Case	Price (1-24)
Bin	±1 mA	10 ppm/°C	0 to 70	+5V or +15V	24-Pin DIP	$ 69.00
			−25 to +85			$ 99.00
			−55 to +125			$139.00
Bin	0 to +5 mA ±2.5 mA	20 ppm/°C	0 to 70	±15V	24-Pin DIP	$109.00
			0 to 70		24-Pin DIP (Hermetic)	$119.00
			−25 to +85			$159.00
			−55 to +100			$189.00
Bin	0 to +5 mA ±2.5 mA	20 ppm/°C	0 to 70	+15V	24-Pin DIP	$129.00
			0 to 70		24-Pin DIP (Hermetic)	$139.00
			−25 to +85			$179.00
			−55 to +100			$209.00
Bin	0 to +5 mA ±2.5 mA	20 ppm/°C	0 to 70	+15V	24-Pin DIP	$139.00
			0 to 70		24-Pin DIP (Hermetic)	$149.00
			−25 to +85			$189.00
			−55 to +100			$219.00
Bin	0 to +2.5V 0 to +5V 0 to +10V	20 ppm/°C	0 to 70	+5V, ±15V	24-Pin DIP	$ 59.00
			0 to 70		24-Pin DIP (Hermetic)	$ 69.00
			−25 to +85			$ 99.00
			−55 to +125			$139.00
BCD	0 to +5V 0 to +10V ±2.5, ±5, ±10V	20 ppm/°C	0 to 70	+5V, ±15V	24-Pin DIP	$ 59.00
			0 to 70		24-Pin DIP (Hermetic)	$ 69.00
			−25 to +85			$ 99.00
			−55 to +125			$139.00
C Bin	0 to +10V ±5V	15 ppm/°C	0 to 70	±15V	24-Pin DIP (Hermetic)	$119.00
			−25 to +85			$149.00
			−55 to +125			$199.00
C BCD	0 to +10V	15 ppm/°C	0 to 70	±15V	24-Pin DIP (Hermetic)	$119.00
			−25 to +85			$149.00
			−55 to +125			$199.00
15 Line	0 to −24 mA	15 ppm/°C	0 to 70	−5V	32-Pin DIP	$119.00
			0 to 70		32-Pin DIP (Hermetic)	$129.00
			−25 to +85			$169.00
			−55 to +100			$199.00

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SANTA ANA, CALIFORNIA (714) 835-2751 / LA EXCHANGE (213) 933-7256 / SUNNYVALE, CALIFORNIA (408) 733-2424

General Purpose Modular D/A Converters

	Model	Resolution	Accuracy (% FS)	Output	Settling Time	Linearity
Lowest Cost Current Output	DAC-98BI (1)	8 Bits	0.2%	Current	500 nsec.	1/2 LSB
	DAC-98DI (1)	2 Digits	0.5%			
	DAC-98BIR	8 Bits	0.2%			
	DAC-98DIR	2 Digits	0.5%			
8 Bit Voltage & Current Output	DAC-198B	8 Bits	0.2%	Voltage	20 μsec.	1/2 LSB
	DAC-198D	2 Digits	0.5%	Voltage	20 μsec.	
	DAC-198BI	8 Bits	0.2%	Current	300 nsec.	
	DAC-198DI	2 Digits	0.5%	Current	300 nsec.	
5 μsec. Voltage Output	DAC-298B	8 Bits	0.2%	Voltage	5 μsec.	1/2 LSB
	DAC-298D	2 Digits	0.5%			
10 Bit Voltage & Current Output	DAC-4910B	10 Bits	0.05%	Voltage	5 μsec.	1/2 LSB
	DAC-4910BI	10 Bits	0.05%	Current	300 nsec.	
	DAC-4912D	3 Digits	0.05%	Voltage	5 μsec.	
	DAC-4912DI	3 Digits	0.05%	Current	300 nsec.	
12 Bit Voltage & Current Output	DAC-6912B	12 Bits	0.01%	Voltage	20 μsec.	1/2 LSB
	DAC-6912BI	12 Bits	0.01%	Current	300 nsec.	
Current Output, 150 nsec. Settling	DAC-I8B	8 Bits	0.2%	Current	150 nsec.	1/2 LSB
	DAC-I10B	10 Bits	0.05%			
	DAC-I12B	12 Bits	0.01%			
	DAC-I8D	2 Digits	0.5%			
	DAC-I12D	3 Digits	0.05%			

NOTES: 1. These models derive their reference from the +15V supply.

2. Coding: Bin = Straight binary or offset binary
   BCD = Binary coded decimal
   2C = Two's complement
   C Bin = Complementary binary
   C BCD = Complementary BCD

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DAC-9 SERIES: This series includes DAC-9, DAC-19, DAC-29, DAC-49, and DAC-69 models, featuring low cost 8, 10, and 12 bit performance. Both current and voltage output types are offered along with both binary and BCD coding. Output settling times vary from 300 to 500 nsec. for current outputs and from 5 μsec. to 20 μsec. for voltage outputs.

DAC-I SERIES: This series features low drift (15 ppm/°C) current outputs with 150 nsec. settling time. Resolution is 8, 10, and 12 bits with binary and BCD coding.

Input Coding (2)	Output Ranges	Gain Tempco	Power Requirement	Case Size (inches)	Price (1-9)
Bin	0 to +2.6 mA	100 ppm/°C	+15V	2 x 1 x 0.375	$25.00
BCD	0 to +1.6 mA				$25.00
Bin	0 to +2.6 mA				$27.00
BCD	0 to +1.6 mA				$27.00
Bin, 2C	0 to +10V, ±5V	50 ppm/°C	±15V	2 x 2 x 0.375	$39.00
BCD	0 to +10V				$39.00
Bin	0 to +2.5 mA				$39.00
BCD	0 to +1.54 mA				$39.00
Bin, 2C	0 to +10V, ±5V	50 ppm/°C	±15V	2 x 2 x 0375	$45.00
BCD	0 to +10V				$45.00
Bin, 2C	0 to +10V, ±5V	50 ppm/°C	±15V	2 x 2 x 0.375	$59.00
Bin	0 to +2.5 mA				$59.00
BCD	0 to +10V				$59.00
BCD	0 to +1.54 mA				$59.00
Bin, 2C	0 to +10V, ±5V	50 ppm/°C	±15V	2 x 2 x 0.375	$69.00
Bin	0 to +2.5 mA				$69.00
Bin	0 to +2, ±1 mA	15 ppm/°C	±15V	2 x 1 x 0.375	$73.00
					$83.00
					$94.00
BCD	0 to +1.25 mA				$73.00
					$94.00

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High Speed, High Performance Modular D/A Converters

	Model	Resolution	Accuracy (% FS)	Output	Settling Time	Linearity
Low Cost 16 Bits	DAC-169-16B	16 Bits	0.005%	Voltage (1)	30 μsec.	4 LSB
	DAC-169-16D	4 Digits				1/2 LSB
Deglitched DAC	DAC-DG12B1	12 Bits	0.01%	Voltage (3)	600 nsec.	1/2 LSB
	DAC-DG12B2	12 Bits	0.01%			
25 & 50 nsec. Current Out	DAC-HI8B	8 Bits	0.2%	Current	25 nsec.	1/2 LSB
	DAC-HI10B	10 Bits	0.05%		25 nsec.	
	DAC-HI12B	12 Bits	0.01%		50 nsec.	
Ultra Low Drift, 1.5 ppm/°C	DAC-HR13B	13 Bits	0.006%	Current	1 μsec.	1/2 LSB
	DAC-HR14B	14 Bits	0.003%			1/2 LSB
	DAC-HR15B	15 Bits	0.0015%			1/2 LSB
	DAC-HR16B	16 Bits	0.0015%			1 LSB
Fast, Voltage Output 2 μsec. Settling	DAC-V8B	8 Bits	0.2%	Voltage	2 μsec.	1/2 LSB
	DAC-V10B	10 Bits	0.05%			
	DAC-V12B	12 Bits	0.01%			
	DAC-V8D	2 Digits	0.5%			
	DAC-V12D	3 Digits	0.05%			
Digital Input Register	DAC-VR8B	8 Bits	0.2%	Voltage	2 μsec.	1/2 LSB
	DAC-VR10B	10 Bits	0.05%			
	DAC-VR12B	12 Bits	0.01%			
	DAC-VR8D	2 Digits	0.5%			
	DAC-VR12D	3 Digits	0.05%			

NOTES: 1. Can also be connected for current output. Current output is 0 to +2mA or ±1 mA for binary version and 0 to + 1.25 mA for BCD version.

2. Coding: Bin = Straight binary or offset binary
   BCD = Binary coded decimal
   C Bin = Complementary binary
   C BCD = Complementary BCD
   2C = Two's complement

3. Glitch amplitude is ±2 LSB's maximum.

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DAC-169: Low cost, high resolution DAC's featuring 0.005% linearity and 10 ppm/°C tempco for 16 bit binary and 4 digit BCD models.

DAC-DG12B: 12 bit, ultra-fast voltage output DAC with deglitching circuitry. For use with CRT displays with up to 2.5 MHz update rate.

DAC-HI SERIES: 8, 10, and 12 bit resolution, current output DAC's featuring ultra-fast 25 & 50 nsec. output settling times.

DAC-HR SERIES: Ultra low drift (1.5 ppm/°C) D/A converters with resolutions from 13 to 16 bits.

DAC-V SERIES: These models are fast settling (2 μsec.) voltage output devices with 8, 10, and 12 bit resolutions.

DAC-VR SERIES: These 8, 10, and 12 bit models have a fast (2 μsec.) voltage output with a 20ppm/°C tempco. They feature a digital input storage register for maximum flexibility in transferring input data.

Input Coding (2)	Output Ranges	Gain Tempco	Power Requirement	Case Size (inches)	Price (1-9)
Bin	+10V, −10V ±5V	10 ppm/°C	±15V	2 x 2 x 0.375	$109.00
BCD	+10V, −10V				$109.00
Bin	−10V, ±5V, ±10V	35 ppm/°C	±15V, +5V	4 x 2 x 0.4	$262.00
2C	±5V, ±10V				$262.00
Bin	±2.5, +5 mA	15 ppm/°C	±15V	2 x 2 x 0.375	$104.00
		15 ppm/°C			$125.00
		20 ppm/°C			$136.00
C Bin	0 to +2mA, ±1mA	1.5 ppm/°C	±15V	4 x 2 x 0.4	$262.00
					$277.00
					$290.00
					$314.00
Bin	±5, ±10V 0 to +5, +10V	20 ppm/°C	±15V	2 x 2 x 0.375	$ 83.00
					$104.00
					$125.00
BCD	0 to +5, +10V				$ 83.00
					$125.00
Bin	±5V, ±10V 0 to +5, +10V	20 ppm/°C	±15V, +5V	2 x 2 x 0.375	$ 94.00
					$115.00
					$136.00
BCD	0 to +5, +10V				$ 94.00
					$136.00

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Analog Multiplexers

	Monolithic MXD-409	Monolithic MX-808
Number of Channels	4	8
Type Input	Differ.	Sing. End.
Input Voltage Range	±15V	±15V
Input Overvoltage, max.	±35V	±35V
Channel ON Resistance	1.5K	1.5K
Channel OFF Resistance	200 Meg.	200 Meg
Channel OFF Leakage	30 pA	30 pA
Channel Addressing	2 bit code	3 bit code
Address Logic Compatibility	DTL/TTL/CMOS	DTL/TTL/CMOS
Transfer Accuracy	.01%	.01%
Crosstalk	−86 dB	+86 dB
Common Mode Rejection	120 dB	—
Turn ON Time	500 nsec.	500 nsec.
Turn OFF Time	300 nsec.	300 nsec.
Power Requirement	±15V	±15V
Package Size, inches	16 Pin DIP	16 Pin DIP
Operating Temp. Range	0 to 70°C	0 to 70°C
Price (1-24)	**$17.00**	**$17.00**
MIL—Version(−55 to +125°C)	MXD-409M	MX-808M
MIL—Version Price	**$54.00**	**$54.00**
See Page	*	*

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This broad line of analog multiplexers offers 4 through 16-channel performance. The MX series multiplexers are monolothic devices which use dielectrically isolated CMOS fabrication. The analog and digital inputs are protected from loss of power and from overvoltages that exceed power supply voltages. They feature fast settling time, low capacitance, and low leakage currents. The MV series are lower cost monolithic CMOS devices which have lower channel ON resistance but do not have full input protection.

Monolithic	Monolithic	Monolithic	Monolithic
MXD-807	**MX-1606**	**MVD-807**	**MV-1606**
8	16	8	16
Differ.	Sing. End.	Differ.	Sing. End.
±15V	±15V	±15V	±15V
±35V	±35V	±17V	±17V
1.5K	1.5K	270Ω	270Ω
200 Meg.	200 Meg.	200 Meg.	200 Meg.
30 pA	30 pA	30 pA	30 pA
3 bit code	4 bit code	3 bit code	4 bit code
DTL/TTL/CMOS	DTL/TTL/CMOS	DTL/TTL/CMOS	DTL/TTL/CMOS
.01%	.01%	.01%	.01%
−86 dB	−86 dB	−86 dB	−86 dB
120 dB	—	120 dB	—
500 nsec.	500 nsec.	300 nsec.	300 nsec.
300 nsec.	300 nsec.	300 nsec.	300 nsec.
±15V	±15V	±15V	±15V
28 Pin Dip	28 Pin DIP	28 Pin Dip	28 Pin Dip
0 to 70°C	0 to 70°C	0 to 70°C	0 to 70°C
$40.00	**$40.00**	**$18.50**	**$18.50**
MXD-807M	MX-1606M	MVD-807M	MV-1606M
$96.00	**$96.00**	**$57.00**	**$57.00**
*	*	*	*

THESE MULTIPLEXERS ARE COVERED BY GSA CONTRACT

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Sample Holds

	Model	Accuracy	Acquisition Time (2)	Aperture Delay	Voltage Range	Gain	Bandwidth
Monolithic	SHM-IC-1	0.01%	5 μsec.	50 nsec.	±10V	±1.00(1)	2 MHz.
	SHM-IC-1M	0.01%	5 μsec.	50 nsec.	±10V	±1.00(1)	2 MHz.
	SHM-LM-2	0.01%	6 μsec.	100 nsec.	±10V	+1.00	1 MHz.
	SHM-LM-2M	0.01%	6 μsec.	100 nsec.	±10V	+1.00	1 MHz.
Hybrid	SHM-HUGC	0.1%	25 nsec.	6 nsec.	±2.5V	+0.975	50 MHz.
	SHM-HUMC	0.1%	25 nsec.	6 nsec.	±2.5V	+0.975	50 MHz.
	SHM-HUMR	0.1%	25 nsec.	6 nsec.	±2.5V	+0.975	50 MHz.
	SHM-HUMM	0.1%	25 nsec.	6 nsec.	±2.5V	+0.975	50 MHz.
	SHM-6GC	0.01%	1 μsec.	20 nsec.	±10V	±1 to ±10	5 MHz.
	SHM-6MC	0.01%	1 μsec.	20 nsec.	±10V	±1 to ±10	5 MHz.
	SHM-6MR	0.01%	1 μsec.	20 nsec.	±10V	±1 to ±10	5 MHz.
	SHM-6MM	0.01%	1 μsec.	20 nsec.	±10V	±1 to ±10	5 MHz.
Modular	SHM-1	0.025%	5 μsec.	50 nsec.	±10V	+1.00	650 kHz.
	SHM-2	0.1%	100 nsec.	10 nsec.	±10V	+1.00	10 MHz.
	SHM-2E	0.1%	100 nsec.	10 nsec.	±10V	+1.00	10 MHz.
	SHM-5	0.01%	350 nsec.	20 nsec.	±10V	−1.00	5 MHz.
	SHM-UH	0.25%	50 nsec.	10 nsec.	±5V	+0.95	35 MHz.
	SHM-UH3	0.1%	30 nsec.	5 nsec.	±5V	+0.975	35 MHz.

NOTES: 1. Can be configured for gains greater than ±1.
2. For 10V change.
3. Maximum offset voltage over operating temperature range.

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SHM-IC-1: Monolithic sample-hold featuring 5 μsec. acquisition time to 0.01%.

SHM-LM-2: Low cost monolithic unit with 6 μsec. acquisition time to 0.01%.

SHM-HU SERIES: Ultra-fast hybrid type sample-hold with 25 nsec. acquisition time over ± 2.5V range.

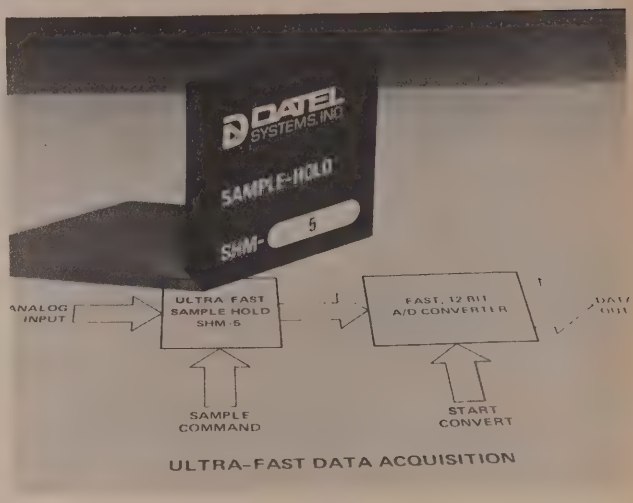
SHM-6 SERIES: High performance hybrid sample-hold featuring 1 μsec. acquisition time to 0.01%.

SHM-1: Modular, general purpose device with high accuracy and 5 μsec. acquisition time.

SHM-2, SHM-2E: Very high speed open loop circuit achieves acquisition times as fast as 100 nsec.

SHM-5: Ultra-fast modular sample-hold with 350 nsec. acquisition time to 0.01%.

SHM-UH, SHM-UH3: Ultra-fast modular sample-hold with 50 and 30 nsec. acquisition times for 8 bit applications.



ULTRA-FAST DATA ACQUISITION

Hold-Mode Droop	Tempco	Power Requirement	Temperature Range (°C)	Case Size (Inches)	Price (1-24)
50μV/msec.	20 μV/°C	±15V	0 to 70	14-Pin Cer. DIP	$ 19.00
50 μV/msec.	20 μV/°C	±15V	−55 to +125	14-Pin Cer. DIP	$ 53.00
200 μV/msec.	10 mV (3)	±15V	0 to 70	TO-99	$ 7.95
100 μV/msec.	5 mV (3)	±15V	−55 to +125	TO-99	$ 50.00
50 μV/μsec.	50 μV/°C	±15V, ±5V	0 to 70	24-Pin Cer. DIP	$129.00
50 μV/μsec.	50 μV/°C	±15V, ±5V	0 to 70	24-Pin Cer. DIP	$139.00
50 μV/μsec.	50 μV/°C	±15V, ±5V	−25 to +85	24-Pin Cer. DIP	$179.00
50 μV/μsec.	50 μV/°C	±15V, ±5V	−55 to +100	24-Pin Cer. DIP	$209.00
10 μV/μsec.	100 μV/°C	±15V, +5V	0 to 70	32-Pin Cer. DIP	$129.00
10μV/μsec.	100 μV/°C	±15V, +5V	0 to 70	32-Pin Cer. DIP	$139.00
10 μV/μsec.	100 μV/°C	±15V, +5V	−25 to +85	32-Pin Cer. DIP	$179.00
10 μV/μsec.	100 μV/°C	±15V, +5V	−55 to +100	32-Pin Cer. DIP	$209.00
1 μV/μsec.	20 ppm/°C	±15V, −20V	0 to 70	2×1×0.375	$ 73.00 **
50 μV/μsec.	30 ppm/°C	±15V	0 to 70	2×1×0.375	$ 94.00 **
330 μV/μsec.	30 ppm/°C	±15V	0 to 70	2×1×0.375	$ 99.00 **
20 μV/μsec.	15 ppm/°C	±15V	0 to 70	2×2×0.375	$198.00 **
50 μV/μsec.	50 μV/°C	±15V, +5V	0 to 70	2×2×0.375	$189.00 **
50 μV/μsec.	50 μV/°C	±15V, +5V	0 to 70	2×2×0.375	$199.00 **

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****Prices are for 1-9 quantity**

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Monolithic and Hybrid Operational Amplifiers

SPECIFICATIONS (Typical at 25°C, ±15V, unless otherwise noted)	MONOLITHIC MOD. SLEW RATE AM-450-2	MONOLITHIC FAST SETTLING AM-452-2	MONOLITHIC LOW COST AM-460-2	MONOLITHIC WIDEBAND AM-462-1/2
DC Open Loop Gain	25K	15K	150K	150K
Gain Bandwidth Product	12 MHz	20 MHz	12 MHz	100 MHz
Slew Rate	30V/μsec.	120V/μsec.	7V/μsec.	35V/μsec.
Settling Time, 10V to 0.1%	330 nsec.	200 nsec.	1.5 μsec.	1.0 μsec.
Output, min.	±10V @ 10mA	±10V @ 10mA	±10V @ 10mA	±10V @ 10mA
Common Mode Range, min.	±10V	±10V	±11V	±11V
Common Mode Rejection	90 dB	90 dB	100 dB	100 dB
Input Impedance	50 Meg.	100 Meg.	300 Meg.	300 Meg.
Input Bias Current, max.	250nA	250nA	25nA	25nA
Input Offset Current, max.	50nA	50nA	25nA	25nA
Input Offset Voltage, max., adj. to 0	±8mV	±10mV	±5mV	±5mV
Input Offset Voltage Drift	20μV/°C	30μV/°C	10μV/°C	15μV/°C
Power Requirement	±15V @ 4mA	±15V @ 4mA	±15V @ 3mA	±15V @ 3mA
Temperature Range	0°C to 70°C	0°C to 70°C	0°C to 70°C	0°C to 70°C
Package	TO-99	TO-99	TO-99	TO-116/TO-99
Price (1-24)	**$7.50**	**$10.50**	**$6.50**	**$9.00**
MIL-Version (−55°C to +125°C)	AM-450-2M	AM-452-2M	AM-460-2M	AM-462-1M/2M
MIL-Version Price	**$14.00**	**$25.00**	**$14.00**	**$17.00**

NOTES: 1. Max settling time for 10V to 0.01% is 200 nsec.
2. μV/°C maximum.
3. Model AM-500MC, 5μV/°C max. Input Offset Voltage Drift, 0 to 70°C, Metal Case, $85.00
Model AM-500MR, 7μV/°C max. Input Offset Voltage Drift, −25 to +85°C, Metal Case, $95.00
4. 10μV/°C max. Input Offset Voltage Drift
5. 0.6μV/°C max. Input Offset Voltage Drift

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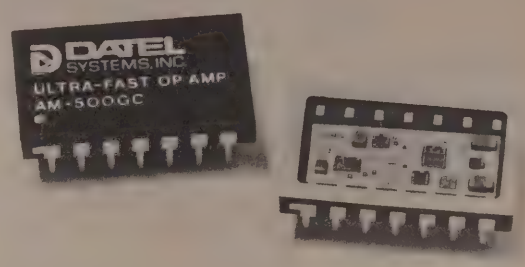
This broad line of monolithic and hybrid operational amplifiers is designed for data acquisition and conversion applications where high speed and small size are required. The devices shown in this table are wide bandwidth, high slew rate, fast settling amplifiers. In addition to high speed, they also have excellent DC characteristics making them good choices for high accuracy applications.

Four basic models of bipolar input amplifiers are offered along with two FET input models. The AM-464-2 is a new high voltage, fast settling amplifier with ±35V output swing. The AM-500 is a new hybrid, ultra-fast amplifier for inverting-only applications. It features 1000V/μsec. slew rate, 100 MHz gain bandwidth product, and 200 nsec settling time to .01% for a 10V step input. The AM-490-2 series are monolithic, chopper stabilized operational amplifiers with open loop gain of 5 x 10^8 and input offset drifts of 1.0, 0.3, and 0.1 μV/°C maximum.



MONOLITHIC	MONOLITHIC	MONOLITHIC	HYBRID	MONOLITHIC		
FAST SLEW FET AM-405-2	WIDEBAND FET AM-406-2	±35V SWING AM-464-2	ULTRA FAST AM-500GC[3]	CHOPPER STABILIZED AM-490-2		
				A	B	C
15K	150K	100K	1 x 10^6		5 x 10^8	
20 MHz	100 MHz	4 MHz	130 MHz		3 MHz	
120V/μsec.	35V/μsec	5V/μsec.	1000V/μsec.		2.5V/μsec.	
400 nsec.	—	—	100 nsec. (1)		—	
±10V @ 10mA	±10V @ 10mA	±35V @ 10mA	±10V @ 50mA		±10V @ 7mA	
±10V	±10V	±35V	—		±10V	
90 dB	90 dB	74 dB	—		120 dB	
10^{12} ohms	10^{12} ohms	200 Meg.	30 Meg.		100 Meg.	
20 pA	20 pA	30nA	4nA		150 pA	
20 pA	20 pA	30nA	0.5nA		50 pA	
±30mV	±15mV	±6mV	±3mV		±20μV	
50μV/°C	50μV/°C	15μV/°C	5μV/°C (2)	1.0 (2)	0.3 (2)	0.1 (2)
±15V @ 6mA	±15V @ 4mA	±10V to ±40V @ 3.2mA	±15V @ 22mA	±12V to ±20VDC @ 5mA		
0°C to 70°C	0°C to 70°C	0°C to 70°C	0°C to 70°C		0°C to 70°C	
TO-99	TO-99	TO-99	0.76 x 0.45 x 0.15"		TO-99	
$17.00	**$14.00**	**$6.75**	**$75.00**	**$34.00**	**$39.00**	**$44.00**
AM-405-2M	AM-406-2M	AM-464-2M	AM-500MM (4)		AM-490-2M (5)	
$37.00	**$29.00**	**$34.00**	**$135.00**		**$95.00**	

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Modular Operational Amplifiers

SPECIFICATIONS (Typical at 25°C, ±15V supplies unless otherwise noted)	FAST SETTLING AM-100			CAPACITIVE LOADS AM-101		FAST FOLLOWER AM-102		FAST SLEWING AM-103		140V FET AM-303	
	A	B	C	A	B	A	B	A	B	A	B
DC Open Loop Gain	300K			300K		130K		130K		10^6	
Gain Bandwidth Product	13.5 MHz			5.5 MHz		32 MHz		32 MHz		10 MHz	
Slew Rate	45V/μsec.			45V/μsec.		140V/μsec.		400V/μsec.		100V/μsec.	
Settling Time, 10V to .01%	550 nsec. (1)			1.0 μsec. (1)		550 nsec. (2)		350 nsec. (1)		2.5 μsec.	
Output, min.	±10V @ 20mA			±10V @ 20mA		±10V @ 20mA		±10V @ 20mA		±140V @ 20mA	
Common Mode Range, min.	±10V			±10V		±10V		±10V		±140V	
Common Mode Rejection	3,000			45,000		45,000		3,000		100,000	
Input Impedance	10^{12} ohms			10^{12} ohms		10^{12} ohms		10^{12} ohms		10^{12} ohms	
Input Bias Current, pA max.	100	50	20	50	20	50		50		100 pA	
Input Offset Current, max.	10 pA			10 pA		10 pA		10 pA		30 pA	
Input Offset Voltage	Adj. to 0			Adj. to 0		Adj. to 0		Adj. to 0		±1mV	
Input Off. Voltage Drift, μV/°C max.	50	25	10	40	20	40	20	40	20	50	20
Power Requirement	±15V @ 13mA			±15V @ 13mA		±15V @ 18mA		±15V @ 18mA		±15V to ±150V @ 12mA	
Temperature Range	0°C to 70°C			0°C to 70°C		0°C to 70°C		0°C to 70°C		0°C to 70°C	
Package	1.12 x 1.12 x 0.4"			1.12 x 1.12 x 0.4"		1.12 x 1.12 x 0.4"		1.12 x 1.12 x 0.4"		1.8 x 2.4 x .61"	
Socket	MS-6			MS-6		MS-6		MS-6		MS-11	
Price (1-9)	$52	$57	$62	$55	$59	$57	$65	$57	$65	$95	$126

Notes:
(1) Unity gain inverting
(2) Unity gain follower

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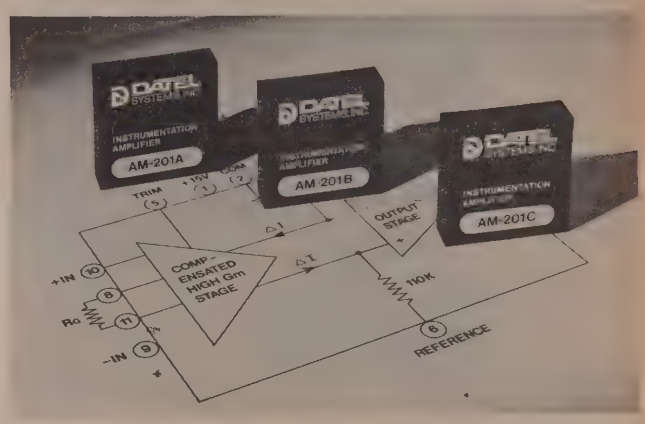
Instrumentation Amplifiers

These instrumentation amplifiers are designed for high performance data acquisition system front ends. They provide resistor-programmable gains with high input impedance and low drift. Gain can be programmed from 1 to 1000, and input offset drift is as low as 0.25 μV/°C at a gain of 1,000. The AM-201 series gives the highest performance for critical applications, including a bandwidth of 45 kHz at a gain of 1,000. For less critical applications, the low cost monolithic AM-435 provides excellent characteristics including FET inputs with very low bias currents.



SPECIFICATIONS (Typical at 25°C, ±15V supplies)	Modular AM-201 A	B	C	Monolithic AM-435 1C	1M
Gain Range	1 to 1000			1 to 1000	
Gain Nonlinearity, max.	0.01%			0.1%	0.05%
Gain Equation	200K/RG			RS/RG	
Gain Tempco.	±20ppm/°C max.			±3 ppm/°C typ.	
Gain Equation Accuracy	±0.5%			±0.05%	
Input Impedance	10^9 ohms			2×10^{12} ohms	
Input Bias Current, max.	50nA	25nA	25nA	40pA	20pA
Input Offset Current, max.	2.5nA	1nA	1nA	20pA	10pA
Input Offset Voltage, max.	Adj. to zero			±30mV	±15mV
Input Off. Volt. Drift, μV/°C max. for G=1000	±1.0	±0.5	±0.25	±10 (1)	
Output Off. Volt. Drift. μV/°C for G=1	±100μV/°C			±600μV/°C	
Input Voltage Range, min.	±10V			±10V	
Output Voltage, min.	±10V			±10V	
Output Current, min.	±5mA			±5mA	
Common Mode Rej., G=1000	100dB	106dB	114dB	105dB	115dB
Bandwidth, G=1000	45kHz.			7kHz.	
Bandwidth, G=100	180kHz.			30kHz.	
Slew Rate	1V/μsec.			1V/μsec.	
Power Requirement	±15VDC @ 5mA			±15VDC @ 1.5mA	
Temperature Range, oper.	0 to 70C			0 to 70C	−55 to +125C
Package	1.5×1.5×0.375 inches			16 Pin DIP	
Price (1-9)	**$73**	**$83**	**$94**	**$11.00***	**$25.00***

***Price (1-24)**

NOTE: 1. Typical

THESE INSTRUMENTATION AMPLIFIERS ARE COVERED BY GSA CONTRACT.

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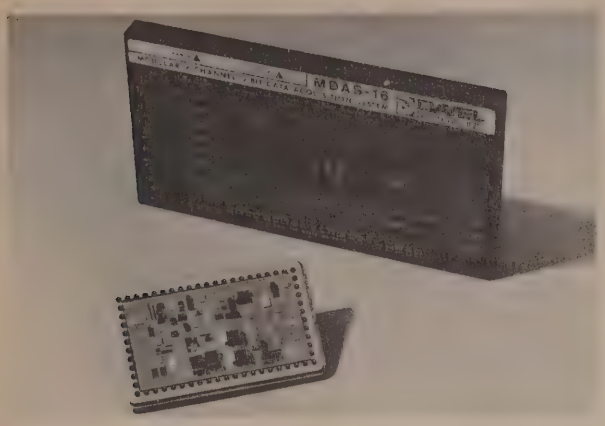
Data Acquisition Systems



	HDAS-16MC[1] Hybrid	HDAS-8MC[1] Hybrid	MDAS-16 Low Cost
No Channels	16	8	16
Input Type	Single Ended	Differential	Single Ended
Input Voltage Ranges, Unipolar	0 to +1V, to +10V	0 to +1V, to +10V	0 to +5, +10V
Input Voltage Ranges, Bipolar	±1 to ±10V	±1 to ±10V	±2.5, ±5, ±10V
Input Impedance	100 Meg.	100 Meg.	100 Meg.
Channel Addressing	4 Bit Code	3 Bit Code	4 Bit Code
Address Logic Compatibility	DTL/TTL	DTL/TTL	DTL/TTL
Resolution	12 Bits	12 Bits	12 Bits
Nonlinearity, max.	1/2 LSB	1/2 LSB	1/2 LSB
Differential Nonlinearity, max.	1/2 LSB	1/2 LSB	1/2 LSB
Max. Error at maximum throughput	.025%	.025%	.025%
Temp. Coefficient, max.	30 ppm/°C	30 ppm/°C	30 ppm/°C
No Missing Codes	0 to 70°C	0 to 70°C	0 to 70°C
Throughput Rate, max.	50 kHz	50 kHz	50 kHz
Acquisition Time	10 μsec	10 μsec	6 μsec.
Conversion Time	10 μsec.	10 μsec.	14 μsec.
Aperture Time	50 nsec.	50 nsec.	50 nsec.
Output Coding	Bin	Bin	Bin, 2C
Output Logic	Tri-State TTL	Tri-State TTL	Tri-State TTL
Power Requirement	±15V, +5V	±15V, +5V	±15V, +5V
Package Size, inches	2.3 x 1.4 x 0.24	2.3 x 1.4 x 0.24	4.6 x 2.5 x 0.375
Package Size, mm	58 x 36 x 6	58 x 36 x 6	117 x 64 x 10
Operating Temp. Range	0 to 70°C [2]	0 to 70°C [2]	0 to 70°C
Price (1-9)	**$295.00**	**$295.00**	**$295.00**

NOTES: 1. Includes programmable gain instrumentation amplifier
2. Models for other temperature ranges:
HDAS-16MR, HDAS-8MR, −25°C to +85°C, $395.00
HDAS-16MM, HDAS-8MM, −55°C to +125°C, $695.00
3. Coding: Bin = Straight Binary or Offset Binary
2C = Two's complement
4. Double Buffered
5. At a Gain of 1. For Gain of 1000, 0.1%
6. At a Gain of 1

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MDAS-8D Low Cost	DAS-250A,B High Speed
8	16
Differential	Single Ended
0 to +5, +10V	0 to −10V (A)
±2.5, ±5, ±10V	±5V (B)
100 Meg.	100 Meg.
3 Bit Code	4 Bit Code
DTL/TTL	DTL/TTL
12 Bits	12 Bits
1/2 LSB	1/2 LSB
1/2 LSB	1/2 LSB
.025%	.025%
30 ppm/°C	45 ppm/°C
0 to 70°C	0 to 70°C
50 kHz	250 kHz
6 μsec.	2 μsec.
14 μsec.	2 μsec.
50 nsec.	20 nsec.
Bin, 2C	Bin, 2C
Tri-State TTL	Tri-State TTL[4]
±15V, +5V	±15V, +5V
4.6 x 2.5 x 0.375	5.0 x 4.5 x 1.5
117 x 64 x 10	127 x 114 x 38
0 to 70°C	0 to 70°C
$295.00	**$595.00**

This comprehensive line of modern data acquisition systems gives the user a choice of units from a new low cost hybrid system up to a larger 250 kHz, 16 channel system. All models are complete, including automatic digital sequencing circuitry.

HDAS-16, HDAS-8: These devices are new miniature state-of-the-art hybrid systems featuring a programmable instrumentation amplifier, 16 channel single-ended or 8 channel differential operation, and 12 bits resolution at a 50 kHz rate.

MDAS-16, MDAS-8D: These popular miniature data acquisition systems are low cost and feature 5 programmed input ranges, 16 single-ended or 8 differential channels, 12 bit resolution, and a 50 kHz throughput rate. Size is only 4.6×2.5×0.375 inches.

MDAS-250A, MDAS-250B: These models offer 16 channel single-ended operation at 250 kHz throughput. Resolution is 12 bits and input options are 0 to −10V (MDAS-250A) or ±5V (MDAS-250B). Package size is 5.0×4.5×1.5 inches.

MDXP-32, MDXP-32-1: These modules are companion devices to the MDAS-16 and MDAS-8D. Both models contain 32 analog multiplexer channels, permitting expansion of the MDAS models up to 48 single ended or 24 differential channels using single level multiplexing. With double level multiplexing, up to 256 single ended or 128 differential channels can be realized using one MDXP-32 and seven MDXP-32-1's.

The MDXP-32-1 contains a 32 channel multiplexer and address decoder. The MDXP-32 contains, in addition, an address counter and address detector logic.

Prices (1-9): MDXP-32 $199.00
MDXP-32-1 $179.00

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TELEPHONE: (617) 828-8000 / TWX: 710-348-0135 / TELEX: 924461
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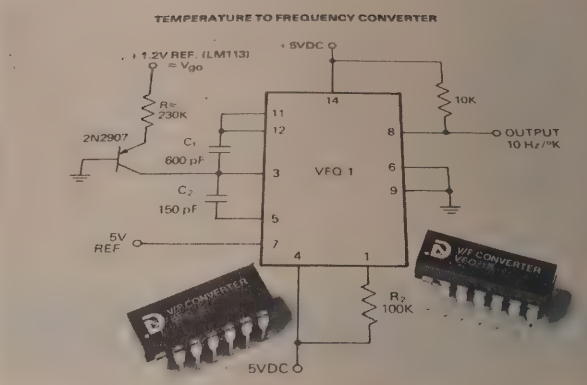
V/F Converters

This line of modular and monolithic V/F converters feature 10 kHz and 100 kHz models with excellent linearity and stability characteristics. The VFV series offers the highest performance with a universal design which can be used as a V/F or F/V converter by external pin connection. These devices have ±0.005% linearity for 10 kHz and ±0.05% linearity for 100 kHz; temperature stability is ±20 ppm/°C and ±100 ppm/°C maximum, respectively. For less critical applications the low cost, monolithic VFQ-1 is an excellent choice. It features a worst case linearity error of ±0.05% as a 10 kHz converter and can also be connected as an F/V converter. An external reference and several passive components are required with the VFQ-1.



	MODULAR		MONOLITHIC (2)	
Model	**VFV-10K**	**VFV-100K**	**VFQ-1C**	**VFQ-1R**
Voltage Range	0 to +10V	0 to +10V	—	—
Current Range	0 to +1mA	0 to +1mA	0 to +10μA	0 to +10μA
Input Overrange	10%	10%	500%	500%
Input Imped., V_{IN}	10K	10K	—	—
Output Frequency	0 to 10kHz	0 to 100kHz	0 to 10kHz (1)	0 to 10kHz (1)
Pulse Width	70μsec.	7μsec.	3μsec.	3μsec.
Output Drive	12 TTL Loads	12 TTL Loads	5 TTL Loads	5 TTL Loads
Nonlinearity, max.	±0.005%	±0.05%	±0.05%	±0.05%
Gain Tempco, max.	±20ppm/°C	±100ppm/°C	±40ppm/°C	±40ppm/°C
Zero Drift, max.	±30μV/°C	±30μV/°C	±50μV/°C	±50μV/°C
Power Supply	±15V @ 25mA	±15V @ 25mA	±5V @ 4mA	±5V @ 4mA
Oper. Temp. Range	0°C to 70°C	0°C to 70°C	0°C to 70°C	−25°C to +85°C
Package	2×2×0.375"	2×2×0.375"	14-Pin DIP	14 Pin DIP
Price (1-9)	**$59.00**	**$75.00**	**$7.50 (3)**	**$12.75 (3)**

NOTES: 1. Can also operate 0 to 100kHz, with ±0.25% max nonlinearity.
2. Requires external reference and several passive components.
3. 1-24 Price.

THESE V/F CONVERTERS ARE COVERED BY GSA CONTRACT.

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ADC-EK SERIES

MONOLITHIC INTEGRATING A/D CONVERTERS

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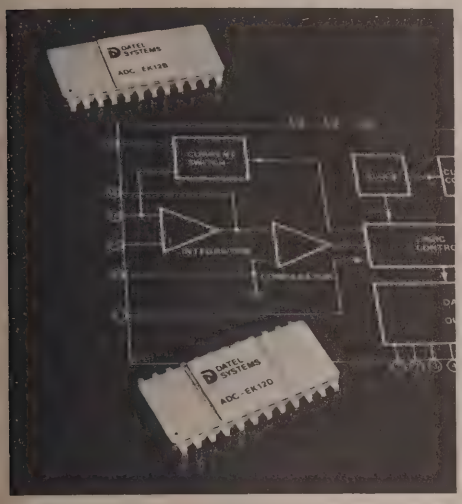

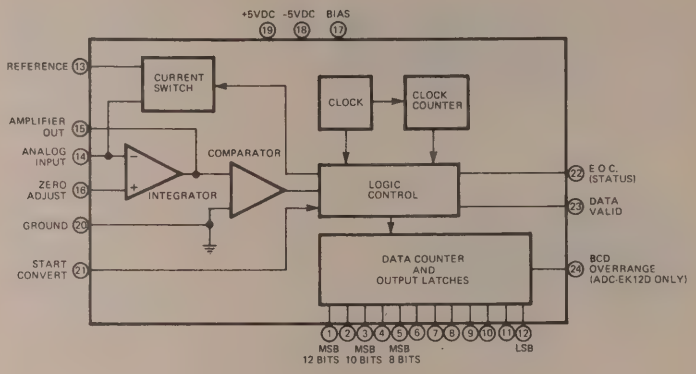

FEATURES

- **Charge Balancing Type**
- **Binary or BCD Models**
- **20 mW Power Consumption**
- **No Missing codes**
- **8, 10, 12 Bit Resolution**

The ADC-EK series are low power, integrating A/D converters fabricated on a single monolithic chip using CMOS technology. The circuit employs a charge balancing integrator, current switch, comparator, clock counter, data counter, and control logic circuitry to implement conversion. The charge balancing integration technique gives high linearity and noise immunity along with inherent monotonicity resulting in no missing codes. Output data appears in parallel form on latched outputs which are CMOS, low power TTL, or low power Schottky TTL compatible. The ADC-EK series consists of 5 different models with 8, 10, and 12 bit binary coding and 3½ digit BCD coding.

Conversion time is 1.8 to 24 milliseconds maximum depending on model. Nonlinearity is ±½ LSB max. while differential nonlinearity is ±¼ LSB typical.

SPECIFICATIONS, Typical at 25°C

	ADC-EK8B, 10B, 12B	ADC-EK12DC, DR
Resolution	8, 10, 12 Bits	3½ Digits
Conversion Time, 8 Bits	1.8 msec.	—
Conversion Time, 10 Bits	6.0 msec.	—
Conversion Time, 12 Bits	24 msec.	12 msec.
Gain Tempco, max.	40 ppm/°C	40 ppm/°C
Linearity Error, max.	½ LSB	¼ LSB
Differential Nonlinearity	¼ LSB	¼ LSB
Diff. Nonlinearity Tempco	1.7 ppm/°C	2.5 ppm/°C
No Missing Codes	Over Operating Temp. Range	
Power Supply Sensitivity	0.05%/%	0.05%/%
Analog Input Range	0 to +10μA	0 to +10 μA
Reference Input	−20 μA	−20 μA
Unipolar Coding	Straight Binary	BCD
Bipolar Coding	Offset Binary	—
Power Requirement	±5 VDC at 2 mA	±5 VDC at 2 mA
Package	24 Pin	24 Pin

ORDERING INFORMATION

Model	Oper. Temp. Range	Package	Price (1-24)
ADC-EK8B	0 to 70C	Plastic	$11.50
ADC-EK10B	0 to 70C	Ceramic	26.00
ADC-EK12B	0 to 70C	Ceramic	34.00
ADC-EK12DC	0 to 70C	Plastic	13.50
ADC-EK12DR	−25 to +85C	Ceramic	21.00

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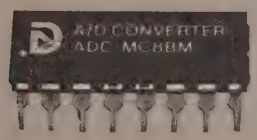
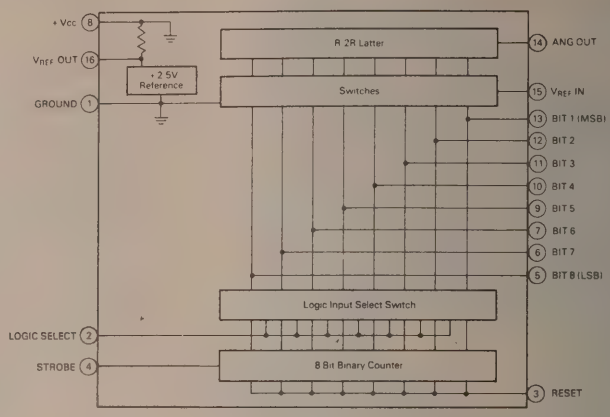
ADC-MC8B

LOW COST, 8 BIT MONOLITHIC A/D CONVERTER





FEATURES

- **8 Bit Resolution**
- **Internal 2.5 V Reference**
- **+5 V Supply Operation**
- **Operates as A/D or D/A**
- **Low Cost**

The ADC-MC8B is an 8 bit monolithic, multifunction converter which operates from a single +5 V supply. This device can be operated as either an A/D or D/A converter by means of external pin connections. As a D/A converter it is complete, including an internal 2.5 V reference; the output voltage is 0 to +2.55 V when using the internal reference. When operating as an A/D converter, two external IC's are required: a 311 type comparator, and a 74132 type quad NAND gate. An internal counter develops the output code word with 500 μsec. required for a full scale conversion.

The ADC-MC8B design consists of eight current switches, a diffused resistor R-2R ladder network, a 2.5 V band gap reference, an 8 bit binary counter, and eight logic select switches. The logic select switches have a control input which determines whether the switches provide TTL outputs or accept TTL inputs. This converter can also be used with an external reference.

SPECIFICATIONS, Typical at 25°C

	ADC-MC8B
Resolution	8 Bits
Conversion Time	500 μsec.
Gain Tempco	40 ppm/°C
Nonlinearity Error, max.	½ LSB
Differential Nonlinearity, max.	½ LSB
No Missing Codes	Over Op. Temp. Range
Analog Input Ranges*	0 to +2.5 V
	0 to +5 V
	0 to +10 V
Input Impedance	Set by resistor used
Reference Output	+2.55 V
Output Logic	DTL/TTL
Output Logic	DTL/TTL
Unipolar Coding	Straight Binary
Bipolar Coding	Offset Binary
Power Requirement	+5 VDC at 30 mA
Package	16 Pin DIP

*determined by external resistors

ORDERING INFORMATION

Model	Oper. Temp. Range	Package	Price (1-24)
ADC-MC8BC	0 to 70C	Plastic	$ 9.50
ADC-MC8BM	−55 to +125C	Ceramic	15.00

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Add Dept. EM to address to tell them you saw it in eem

ADC-HC12B

12 BIT, LOW POWER A/D CONVERTER

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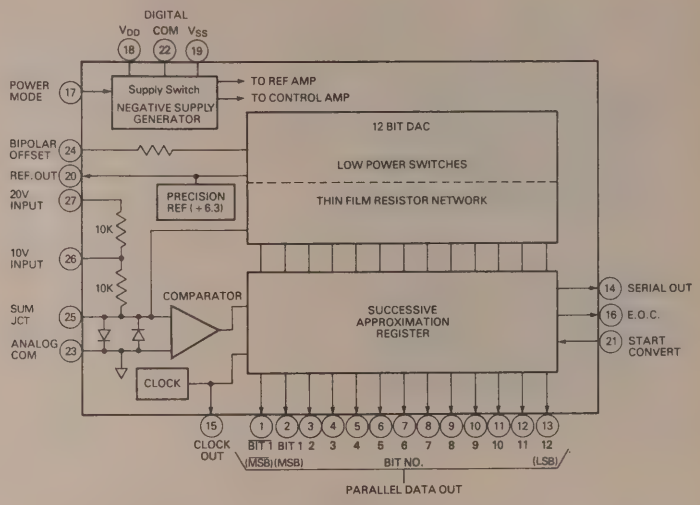

FEATURES

- **Single Supply Operation**
- **CMOS Circuitry**
- **12 Bit Resolution**
- **6 Input Voltage Ranges**
- **26 mW Consumption at 1000 Conversions/Sec.**

The ADC-HC12B is a complete, low power 12 bit A/D converter utilizing CMOS circuitry. It is specifically designed for portable and remote instrumentation applications where low power consumption is essential; this unit operates from either a single +9 VDC to +15 VDC power source (interrupt mode) or from a dual ±9 VDC to ±15 VDC source (continuous mode). In the interrupt mode of operation the converter is initially in standby mode, drawing only 10 μA of current from the supply until a start convert pulse is applied to it. With the pulse applied the converter turns on, stabilizes, and then performs a 12 bit conversion and returns to the standby mode while the 12 bit data word is held at the output.

Power consumption is 112 milliwatts in the continuous mode and 26 milliwatts in the interrupt mode at 1,000 conversions per second. There are six different analog input voltage ranges.

SPECIFICATIONS, Typical at 25°C

	ADC-HC12B
Resolution	12 Bits
Conversion Time, continuous mode	305 μsec. max.
Conversion Time, interrupt mode	350 μsec. max.
Gain Tempco, max.	30 ppm/°C
Nonlinearity Error, max.	½ LSB
Differential Nonlinearity, max.	½ LSB
Differential Nonlinearity Tempco	2 ppm/°C of FSR
No Missing Codes	Over Op. Temp. Range
Power Supply Sensitivity	0.003%/%
Analog Input Ranges	0 to +5 V, +10 V, +20 V ±2.5 V, ±5 V, ±10 V
Input Impedance	5K, 10K, or 20K
Output Logic	CMOS
Unipolar Coding	Straight Binary
Bipolar Coding	Offset Binary Two's Complement
Power Requirement, continuous	±9 V to ±15 V
Power Requirement, interrupt	+9 V to +15 V
Package	32 Pin

ORDERING INFORMATION

Model	Oper. Temp. Range	Seal	Price (1-24)
ADC-HC12BGC	0 to 70C	Epoxy	$129.00
ADC-HC12BMC	0 to 70C	Hermetic	139.00
ADC-HC12BMR	−25 to +85C	Hermetic	179.00
ADC-HC12BMM	−55 to +125C	Hermetic	219.00

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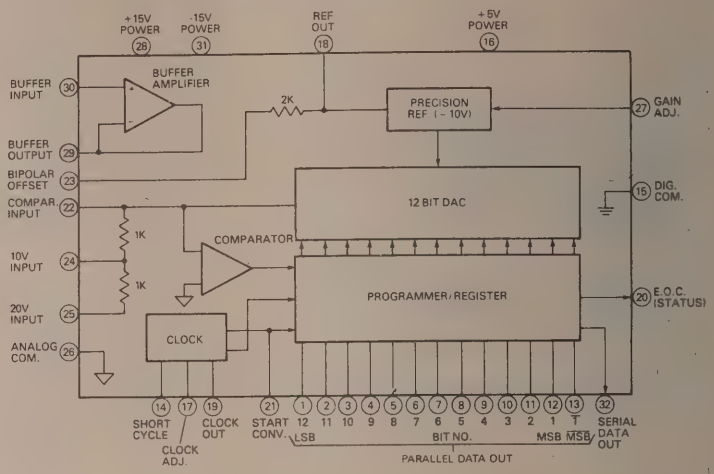
ADC-HF12B

12 BIT, ULTRA-FAST A/D CONVERTER



FEATURES

- **12 Bit Resolution**
- **2.0 μsec. Conversion Time**
- **5 Programmable Input Ranges**
- **100 Megohm Buffer Amplifier**
- **Short Cycling Capability**

The ADC-HF12B is an ultra-fast, 12 bit A/D converter manufactured with thin film hybrid technology. Using the successive approximation technique this converter completes a 12 bit conversion in just 2 microseconds. Five different input voltage ranges are available by simple external pin connection. An input buffer amplifier is also provided for applications where 100 megohm input impedance is required.

The ADC-HF12B circuit design uses an ultra-fast DAC with 12 matched current sources; it also contains a fast comparator, precision reference, clock, successive approximation register, and buffer amplifier. A thin film R-2R resistor ladder network is actively laser trimmed for optimum linearity.

Excellent tracking of the DAC current sources results in no missing codes over the operating temperature range.

SPECIFICATIONS, Typical at 25°C

	ADC-HF12B
Resolution	12 Bits
Conversion Time, max.	2 μsec.
Gain Tempco, max.	20 ppm/°C
Nonlinearity Error, max.	½ LSB
Differential Nonlinearity, max.	½ LSB
Diff. Nonlinearity Tempco	3 ppm/°C of FSR
No Missing Codes	Over Op. Temp. Range
Power Supply Sensitivity, max.	0.01%/%
Analog Input Ranges	0 to −5 V, 0 to −10 V ±2.5 V, ±5 V, ±10 V
Input Impedance	500 Ω, 1K, 2K
Buffer Input Impedance	100 Megohms
Buffer Bias Current	125 nA
Buffer Settling Time	1 μsec.
Output Logic	TTL
Unipolar Coding	Straight Binary
Bipolar Coding	Offset Binary Two's Complement
Power Requirement	+15 VDC at 70 mA −15 VDC at 30 mA +5 VDC at 200 mA
Package	32 Pin

ORDERING INFORMATION

Model	Oper. Temp. Range	Seal	Price (1-24)
ADC-HF12BGC	0 to 70C	Epoxy	$229.00
ADC-HF12BMC	0 to 70C	Hermetic	249.00
ADC-HF12BMR	−25 to +85C	Hermetic	299.00
ADC-HF12BMM	−55 to +100C	Hermetic	399.00

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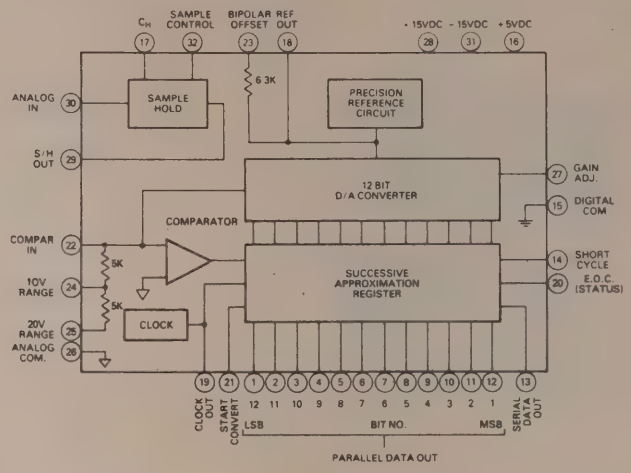
ADC-HS12B

12 BIT A/D CONVERTER WITH SAMPLE HOLD

DATEL SYSTEMS, INC.



FEATURES

- **Internal Sample-Hold**
- **6 μsec. Acquisition Time**
- **8 μsec. Conversion Time**
- **12-Bit Resolution**
- **Programmable Input Ranges**

The ADC-HS12B is a high performance 12 bit A/D converter combined with a sample-hold in a miniature 32 pin package. It is specifically designed for systems applications where the sample-hold is an integral part of the conversion process. The sample hold has a 6 μsec. acquisition time and the A/D converter has an 8 μsec. conversion time. Five input voltage ranges are programmable by external pin connection. The input impedance to the sample-hold is 100 megohms, permitting direct connection to an analog multiplexer.

This converter incorporates proven thin film hybrid technology used in high volume production. The thin film resistor network is fabricated of nichrome on glass and then actively laser trimmed for best linearity. Other features include 20 ppm/°C gain tempco, 2 ppm/°C differential nonlinearity tempco and no missing codes over the operating temperature range.

SPECIFICATIONS, Typical at 25°C

	ADC-HS12B
Resolution	12 Bits
Acquisition Time	6 μsec.
Conversion Time, max.	8 μsec.
Gain Tempco, max.	20 ppm/°C
Nonlinearity Error, max.	½ LSB
Differential Nonlinearity, max.	½ LSB
No Missing Codes	Over Op. Temp. Range
Power Supply Sensitivity	0.002%/% max.
Analog Output Ranges	0 to +5 V, 0 to +10 V ±2.5 V, ±5 V, ±10 V
Input Impedance	100 Megohms
Input Bias Current	50 nA
Aperture Delay Time	50 nsec.
Aperture Uncertainty Time	5 nsec.
Hold Mode Droop	50 nV/μsec. max.
Hold Mode Feedthrough	0.01% max.
Output Logic	TTL
Unipolar Coding	Comp. Binary
Bipolar Coding	Comp. Offset Binary
Power Requirement	+15 VDC at 60 mA −15 VDC at 50 mA +5 VDC at 100 mA
Package	32 Pin

ORDERING INFORMATION

Model	Oper. Temp. Range	Seal	Price (1-24)
ADC-HS12BGC	0 to 70C	Epoxy	$149.00
ADC-HS12BMC	0 to 70C	Hermetic	159.00
ADC-HS12BMR	−25 to +85C	Hermetic	199.00
ADC-HS12BMM	−55 to +100C	Hermetic	239.00

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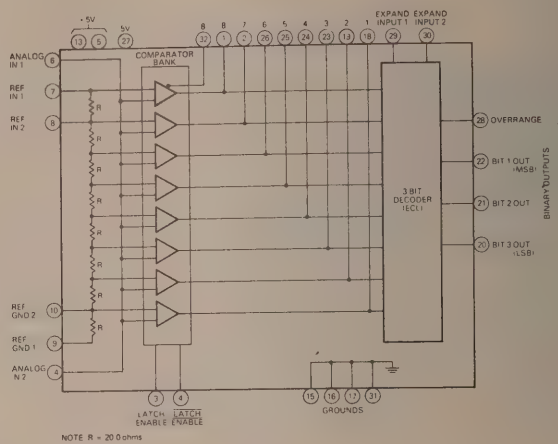
ADC-HU3B

3 BIT EXPANDABLE FLASH A/D CONVERTER



FEATURES

- **3 Bits Plus Overrange**
- **50 MHz Conversion Rate**
- **0.1% Linearity**
- **Expandable Building Block**
- **Parallel (Flash) Technique**

The ADC-HU3B is an ultra-fast, 3 bit A/D converter using the flash (or parallel) conversion technique. Using thin-film hybrid construction this device performs a conversion every 20 nanoseconds maximum, giving a 50 MHz conversion rate. It is a miniature building block circuit which can be used alone as a 3 bit A/D, with two units corrected together for a 4 bit A/D, or with four units connected together for a 5 bit A/D. There are two sets of digital outputs: one directly from the comparator outputs gives a "thermometer scale" output; the other is a 3 bit decoded binary output with an overrange bit.

The ADC-HU3B is fabricated using a bank of 8 ultra-fast monolithic analog comparators. A 160 ohm tapped thin-film resistor network biases the comparators and is connected to an external voltage reference: the network is actively laser trimmed to give 0.1% linearity.

SPECIFICATIONS, Typical at 25°C

	ADC-HU3B
Resolution	3 Bits
Conversion Time, 8 line output	16 nsec. max.
Conversion Time, binary output	20 nsec. max.
Conversion Rate, binary output	50 MHz min.
Gain Tempco, max.	±25 ppm/°C
Nonlinearity, max.	±0.1%
Analog Input Ranges	0 to +2.1 V 0 to −2.1 V ±2.1 V
Input Bias Current	50 μA
Reference Input	±2 V
Reference Input Impedance	120 to 160 Ohms
Output Logic	ECL
Unipolar Coding	8 line (thermometer scale) Straight Binary
Bipolar Coding	8 line (thermometer scale) Offset Binary
Power Requirement	+5 VDC at 160 mA −5 VDC at 330 mA
Package (see	32 Pin

ORDERING INFORMATION

Model	Oper. Temp. Range	Seal	Price (1-24)
ADC-HU3BGC	0 to 70C	Epoxy	$179.00
ADC-HU3BMC	0 to 70C	Hermetic	189.00
ADC-HU3BMR	−25 to +85C	Hermetic	239.00
ADC-HU3BMM	−55 to +100C	Hermetic	289.00

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ADC-HX12B

12 BIT, LOW COST A/D CONVERTER

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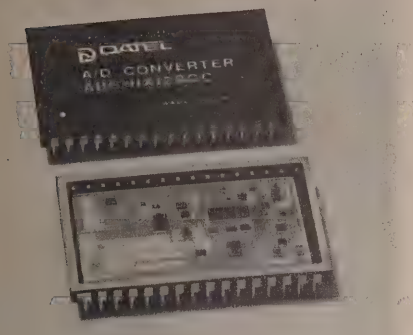

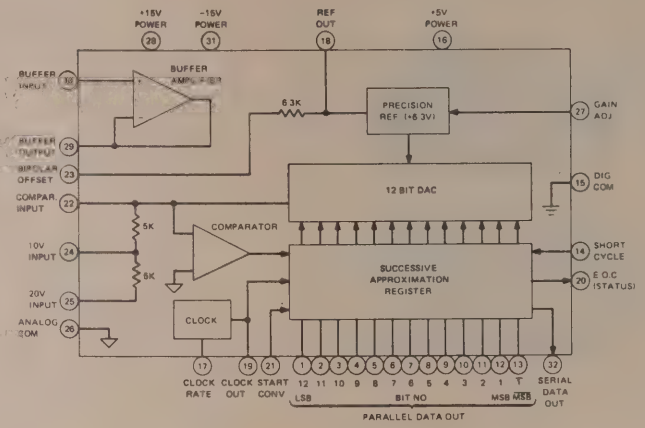

FEATURES

- **12 Bit Resolution**
- **20 μsec. Conversion Time**
- **5 Programmable Ranges**
- **100 Megohm Buffer**
- **Lowest Cost**

The ADC-HX12B is a very low cost, 12 bit A/D converter which is functionally complete. It is fabricated with thin film hybrid technology to perform a conversion in 20 μsec. By means of external pin connections it can be programmed for 5 different input voltage ranges. An internal 100 megohm buffer is provided for high input impedance applications.

The circuit consists of a 12 bit DAC which employs quad current switches, a precision zener reference, a fast comparator, clock, successive approximation register, and buffer amplifier. A nichrome thin film resistor network is actively laser trimmed to achieve optimum linearity.

Output data is available in both parallel and serial forms. This converter can also be short cycled to achieve faster conversions at lower resolutions.

SPECIFICATIONS, Typical at 25°C

	ADC-HX12B
Resolution	12 Bits
Conversion Time, max.	20 μsec.
Gain Tempco, max.	20 ppm/°C
Nonlinearity Error, max.	½ LSB
Differential Nonlinearity, max.	½ LSB
Diff. Nonlinearity Tempco	2 ppm/°C of FSR
No Missing Codes	Over Op. Temp. Range
Power Supply Rejection, max.	0.002%/%
Analog Input Ranges	0 to +5 V, 0 to +10V ±2.5 V, ±5 V, ±10 V
Input Impedance	2.5 K, 5 K or 10 K
Buffer Input Impedance	100 Megohms
Buffer Bias Current	125 nA
Buffer Settling Time	3 μsec.
Unipolar Coding	Complementary Binary
Bipolar Coding	Comp. Offset Binary Comp. 2's Complement
Power Requirement	+15 VDC at 55 mA −15 VDC at 45 mA +5 VDC at 100 mA
Package	32 Pin

ORDERING INFORMATION

Model	Oper. Temp. Range	Seal	Price (1-24)
ADC-HX12BGC	0 to 70C	Epoxy	$ 82.50
ADC-HX12BMC	0 to 70C	Hermetic	95.00
ADC-HX12BMR	−25 to +85C	Hermetic	125.00
ADC-HX12BMM	−55 to +100C	Hermetic	155.00

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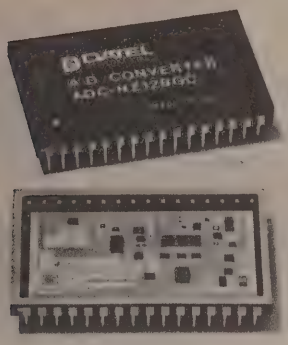
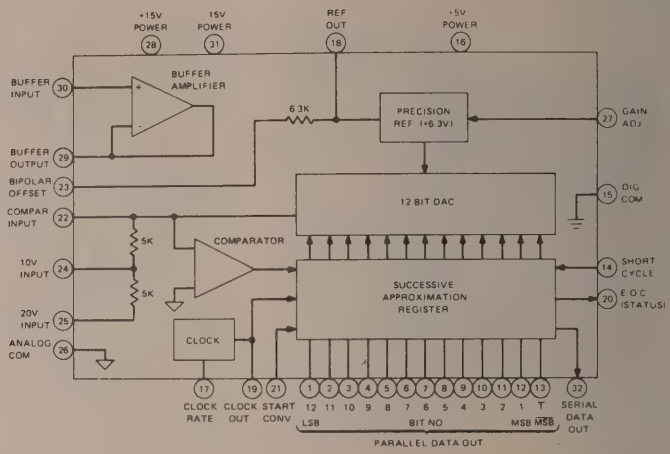
ADC-HZ12B

12 BIT, HIGH PERFORMANCE A/D CONVERTER





FEATURES

- **8 μsec. Conversion Time**
- **20 ppm/°C Tempco**
- **5 Programmable Ranges**
- **Short Cycle Capability**
- **100 Megohm Buffer**

The ADC-HZ12B features high conversion speed in a hybrid 12 bit A/D converter. By employing a low capacitance nichrome-on-glass thin film resistor network, a conversion time of only 8 μsec. is achieved. This converter also has 5 different input voltage ranges determined by external pin connection and a 100 megohm buffer which may be connected if desired.

This ADC-HZ12B is functionally complete, incorporating a 12 bit DAC, precision reference, fast comparator, successive approximation register, a clock, and buffer amplifier. The thin film resistor network has excellent tracking characteristics resulting in no missing codes over the operating temperature range. The network is functionally laser trimmed.

Output coding is complementary binary, complementary offset binary, or complementary two's complement. Provision is made for precise, external adjustment of offset and gain.

SPECIFICATIONS, Typical at 25°C

	ADC-HZ12B
Resolution	12 Bits
Conversion Time, max.	8 μsec.
Gain Tempco, max.	20 ppm/°C
Nonlinearity Error, max.	½ LSB
Differential Nonlinearity, max.	½ LSB
Diff. Nonlinearity Tempco	2 ppm/°C of FSR
No Missing Codes	Over Op. Temp. Range
Power Supply Sensitivity, max.	0.002%/%
Analog Input Ranges	0 to +5 V, 0 to +10V ±2.5 V, ±5 V, ±10 V
Input Impedance	2.5K, 5K or 10K
Buffer Input Impedance	100 Megohms
Buffer Bias Current	125 nA
Buffer Settling Time	3 μsec.
Output Logic	TTL
Unipolar Coding	Complementary Binary
Bipolar Coding	Comp. Offset Binary Comp. 2's Complement
Power Requirement	+15 VDC at 55 mA −15 VDC at 45 mA +5 VDC at 100 mA
Package	32 Pin

ORDERING INFORMATION

Model	Oper. Temp. Range	Seal	Price (1-24)
ADC-HZ12BGC	0 to 70C	Epoxy	$119.00
ADC-HZ12BMC	0 to 70C	Hermetic	129.00
ADC-HZ12BMR	−25 to +85C	Hermetic	169.00
ADC-HZ12BMM	−55 to +100C	Hermetic	195.00

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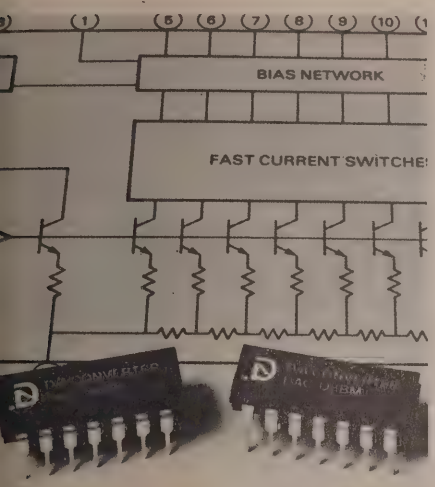
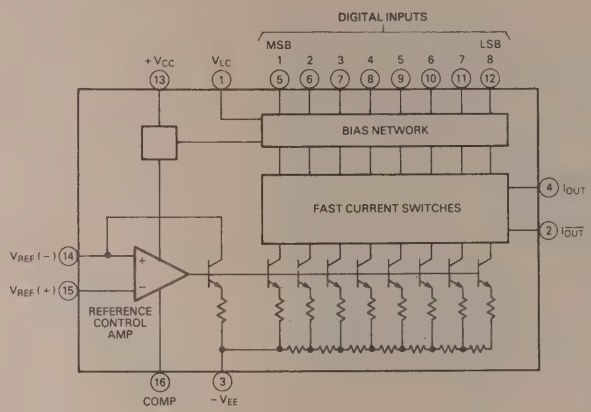
DAC-08B

HIGH SPEED, MONOLITHIC 8 BIT D/A CONVERTER

DATEL SYSTEMS, INC.





FEATURES

- 8 Bit Resolution
- 85 nsec. Settling Time
- High Output Compliance
- 1 or 2 Quadrant Multiplying
- Low Cost

The DAC-08BC and DAC-08BM provide very high speed performance coupled with low cost and application flexibility. These units have guaranteed full 8-bit monotonicity with non-linearity of 0.19% over the full operating temperature range. High speed current steering switches achieve 85 nanosecond settling time with a very low glitch for full scale changes. A large output voltage compliance range (−10 to +18 Volts) allows direct current to voltage conversion with just an output resistor, omitting the need for an op amp in many cases.

The DAC-08 consists of 8 fast-switching current sources, a diffused R-2R resistor ladder, a bias circuit, and a reference control amplifier. The diffused resistor ladder gives excellent temperature tracking resulting in a gain temperature coefficient of 10 ppm/°C. The monolithic fabrication results in excellent linearity and tempco, fast output settling and low cost.

SPECIFICATIONS, Typical at 25°C

	DAC-08BC/BM
Resolution	8 Bits
Settling Time, to ½ LSB	85 nsec.
Gain Tempco	10 ppm/°C
Nonlinearity, max	½ LSB
Diff. Nonlinearity, max.	½ LSB
Monotonicity	Over Op. Temp. Range
Power Supply Sensitivity	0.002%/%
Analog Output Ranges	0 to 2.1 mA 0 to 4.2 mA
Output Voltage Compliance	−10 V to +18 V
Input Logic	DTL, TTL, HTL CMOS, ECL, HNIL
Coding, unipolar	Straight Binary
Coding, bipolar	Offset Binary
Power Requirement	+4.5 to +18 V at 3.8 mA −4.5 to −18 V at 7.8 mA
Package	16 Pin DIP

ORDERING INFORMATION

Model	Oper. Temp. Range	Package	Price (1-24)
DAC-08BC	0 to 70C	Plastic	$ 8.00
DAC-08BM	−55 to +125C	Ceramic	12.00

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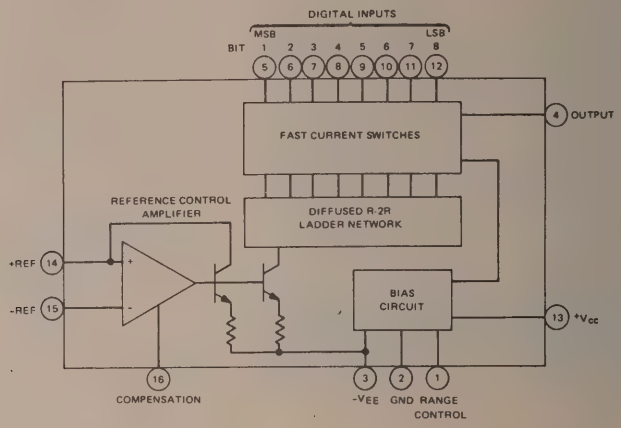
DAC-IC8B

LOW COST, MONOLITHIC 8 BIT D/A CONVERTER



FEATURES

- **8 Bit Resolution**
- **300 nsec. Settling Time**
- **½ LSB Linearity**
- **DTL/TTL Inputs**
- **Low Cost**

The DAC- IC8B is an 8 bit monolithic D/A converter designed for low cost and flexible application. It is packaged in a 16 pin DIP and requires only an external output amplifier and reference for operation. A full scale output change settles in 300 nanoseconds for a current output; this can be converted into a fast voltage output with a monolithic operational amplifier such as Datel System's AM-452. Digital input coding is straight binary for unipolar operation and offset binary for bipolar operation and is compatible with standard DTL/TTL logic.

The DAC-IC8B circuit consists of 8 fast switching current sources, a diffused resistor R-2R ladder network, a bias circuit, and a reference control amplifier. The diffused ladder network results in excellent linearity and temperature tracking. An external reference current of 2 mA must be supplied from the reference voltage source and the reference can be varied for one or two quadrant multiplying operations. Two models are available for the commercial and military temperature ranges.

SPECIFICATIONS, Typical at 25°C

	DAC-IC8B
Resolution	8 Bits
Settling Time, to ½ LSB	300 nsec.
Gain Tempco	20 ppm/°C
Nonlinearity, max.	½ LSB
Diff. Nonlinearity	½ LSB
Power Supply Sensitivity	0.01%/%
Analog Output Ranges	0 to 2.1 mA 0 to 4.2 mA
Output Voltage Compliance	−0.6 V to +0.5 V
Input Logic	DTL/TTL
Coding, unipolar	Straight Binary
Coding, bipolar	Offset Binary
Power Requirement	+5 VDC at 22 mA −4.5 to −16.5 V at 13 mA
Package	16 Pin DIP

ORDERING INFORMATION

Model	Oper. Temp. Range	Package	Price (1-24
DAC-IC8BC	0 to 70C	Ceramic	$ 8.95
DAC-IC8BM	−55 to +125C	Ceramic	12.75

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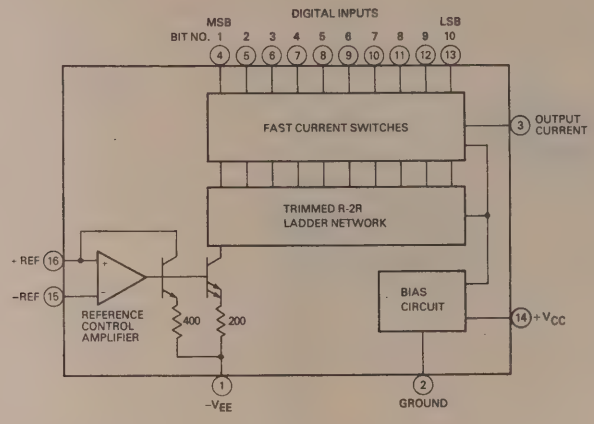
DAC-IC10BC

LOW COST, MONOLITHIC 10 BIT D/A CONVERTER

DATEL SYSTEMS, INC.



FEATURES

- **10 Bit Resolution**
- **Straight Binary Coding**
- **Current Output**
- **250 nsec. Settling Time**
- **TTL/CMOS Compatible**

The DAC-IC10BC is a low cost, 10 bit monolithic DAC with fast output current settling time. It is packaged in a 16 pin ceramic DIP and requires only an external reference and operational amplifier for voltage output operation. A full scale change in output current settles in 250 nanoseconds, and with a fast I.C. op amp (such as Datel System's AM-452) a 10V output change can settle within 1 microsecond. Digital input coding is straight binary for unipolar operation, and offset binary for bipolar operation; the logic inputs are compatible with TTL or CMOS.

This converter is manufactured with monolithic bipolar technology. The circuit incorporates 10 fast switching current sources which drive a diffused resistor R-2R network. The ladder network is laser trimmed by cutting aluminum links. The circuit also contains a reference control amplifier and a bias circuit. An external reference current of 2 mA is required at the + Reference input terminal.

The DAC-IC10BC has ±1 bit linearity with guaranteed monotonicity at room temperature and has a tempco of 20 ppm/°C.

SPECIFICATIONS, Typical at 25°C

	DAC-IC10BC
Resolution	10 Bits
Settling Time, to ½ LSB	250 nsec.
Gain Tempco	20 ppm/°C
Nonlinearity, max.	1 LSB
Diff. Nonlinearity, max.	1 LSB
Monotonicity	at 25°C
Power Supply Sensitivity	0.02%/%
Analog Output Range	0 to 5 mA
Output Voltage Compliance	−2.5 V to +0.2 V
Input Logic	DTL, TTL, HTL HNIL, CMOS
Coding, unipolar	Straight Binary
Coding, bipolar	Offset Binary
Power Requirement	+5 VDC at 18 mA −15 VDC at 20 mA
Package	16 Pin DIP

ORDERING INFORMATION

Model	Oper. Temp. Range	Package	Price (1-24)
DAC-IC10BC	0 to 70C	Ceramic	$10.95

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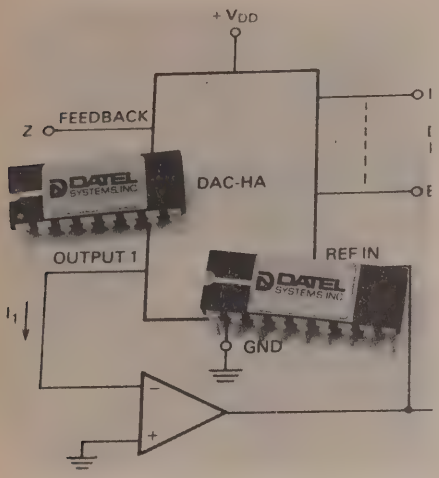
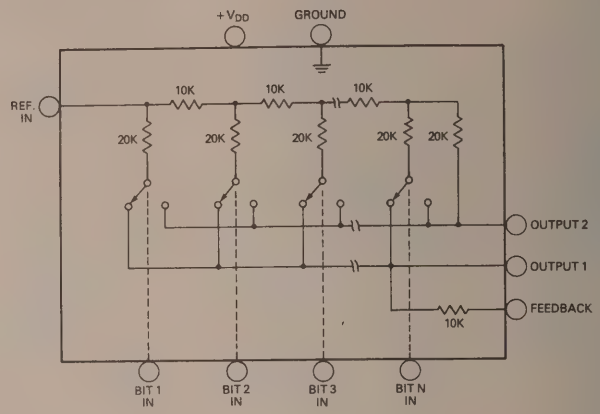
DAC-HA10B, DAC-HA12B

LOW POWER CMOS 10 & 12 BIT MULTIPLYING D/A CONVERTERS





FEATURES

- **10 & 12 Bit Resolution**
- **½ LSB Maximum Nonlinearity**
- **2 & 4 Quadrant Multiplying**
- **Low Power CMOS**
- **+5 V or +15 V Power Supply**

The DAC-HA series are high performance, multiplying digital to analog converters. They combine CMOS switches with laser trimmed nichrome thin film resistors to realize low power consumption with excellent linearity and drift characteristics. There are three models in this series: DAC-HA10B for 10 bit binary applications, DAC-HA12B for 12 bit binary applications and DAC-HA12D for 3 digit BCD applications. All units feature ±½ LSB maximum nonlinearity.

The thin film R-2R ladder network consists of 10K and 20K resistors with excellent tracking characteristics. The network provides a 10K input resistance to the required external reference, which can vary over ±10 V. The bandwidth for the reference input is 200 kHz. These devices are ideal for two and four quadrant multiplying applications and have output settling times of 500 nsec. Separate models are available for both +5 V and +15 V supply operation.

SPECIFICATIONS, Typical at 25°C

	DAC-HA10B	DAC-HA12B	DAC-HA12D
Resolution	10 Bits	12 Bits	3 Digits
Settling Time, to ½ LSB	500 nsec.	500 nsec.	500 nsec.
Gain Tempco, max.	65 ppm/°C	10 ppm/°C	10 ppm/°C
Nonlinearity, max.	½ LSB	½ LSB	½ LSB
Diff. Nonlinearity, max.	½ LSB	½ LSB	½ LSB
Monotonicity	Over Operating Temp. Range		
Feedthrough	0.05%	0.05%	0.05%
Power Supply Sensitivity	0.005%/%	0.005%/%	0.005%/%
Analog Output Current	±1 mA	±1 mA	±1 mA
Reference Input Range	±10 V	±10 V	±10 V
Reference Input Impedance	10K ±20%	10K ±20%	10K ±20%
Input Logic	TTL, CMOS	TTL, CMOS	TTL, CMOS
Coding, unipolar	Straight Bin.	Straight Bin.	BCD
Coding, bipolar	Offset Bin.	Offset Bin.	—
Power Requirement*	+5 VDC @ 5 μA +15 VDC @ 2 mA	+5 VDC @ 10 μA +15VDC @ 2 mA	+5 VDC @ 10 μA +15 VDC @ 2 mA
Package	16 Pin DIP	18 Pin DIP	18 Pin DIP

ORDERING INFORMATION

Model	Oper. Temp. Range	Supply Voltage*	Price (1-24)
DAC-HA10BC	0 to 70C	+5 V	$29.00
DAC-HA10BR	−25 to +85C	+5 V	39.00
DAC-HA10BM	−55 to +125C	+5 V	69.00
DAC-HA12BC	0 to 70C	+5 V	49.00
DAC-HA12BR	−25 to +85C	+5 V	69.00
DAC-HA12BM	−55 to +125C	+5 V	99.00
DAC-HA12DC	0 to 70C	+5 V	49.00
DAC-HA12DR	−25 to +85C	+5 V	69.00
DAC-HA12DM	−55 to +125C	+5 V	99.00

*For +15 V powered version, add suffix −1 to the model numbers shown.

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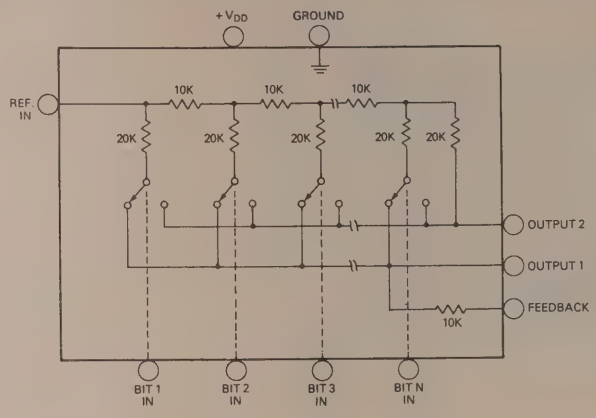
DAC-HA14B

HIGH RESOLUTION, MULTIPLYING CMOS D/A CONVERTER

DATEL SYSTEMS, INC.



FEATURES

- **14 Bit Resolution**
- **2 & 4 Quadrant Multiplying**
- **500 nsec. Settling Time**
- **10 ppm/°C Tempco**
- **+5 V or +15 V Power Supply**

The DAC-HA14B is a 14 bit, CMOS multiplying D/A converter. There are two versions, offering a choice of either +5 V or +15 V power supply operation. The +5 V model draws only 10 μA quiescent current while the +15 V model draws 2 mA. The device is packaged in a 20 pin ceramic DIP package.

The combination of low ON resistance CMOS switches and a laser-trimmed nichrome thin film resistor network result in a maximum nonlinearity of ±1 LSB with 14 bit monotonicity at 25°C. The gain temperature coefficient of the circuit is 10 ppm/°C maximum. The resistor network is an R-2R ladder with resistance values of 10K and 20K ohms.

The input resistance to the ladder is 10K ohms for the external reference source, which may be ±10 V. Bandwidth for the reference input is 200 kHz. The DAC-HA14B incorporates internal protection on the power supply and digital input terminals to prevent latch-up problems.

SPECIFICATIONS, Typical at 25°C

	DAC-HA14B
Resolution	14 Bits
Settling Time, to 1 LSB	500 nsec.
Gain Tempco, max.	10 ppm/°C
Nonlinearity, max.	1 LSB
Differential Nonlinearity, max.	1 LSB
Monotonicity	At 25°C
Power Supply Sensitivity	0.005%/%
Analog Output Current	±1 mA
Reference Input Range	±10 V
Reference Input Impedance	10K ±20%
Input Logic	TTL, CMOS
Coding, unipolar	Straight Binary
Coding, bipolar	Offset Binary
Power Requirement	+4 to +7 VDC at 10 μA +12 to +20 VDC at 2 mA*
Package	20 Pin DIP

*For models designated with −1 suffix

ORDERING INFORMATION

Model	Oper. Temp. Range	Supply Voltage	Price (1-24)
DAC-HA14BC	0 to 70C	+5 V	$ 69.00
DAC-HA14BR	−25 to +85C	+5 V	99.00
DAC-HA14BM	−55 to +125C	+5 V	139.00
DAC-HA14BC-1	0 to 70C	+15 V	69.00
DAC-HA14BR-1	−25 to +85C	+15 V	99.00
DAC-HA14BM-1	−55 to +125C	+15 V	139.00

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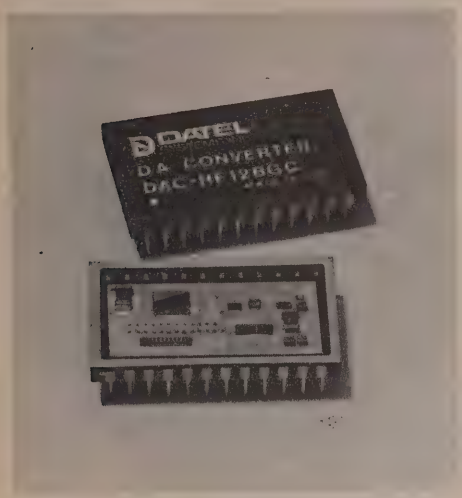
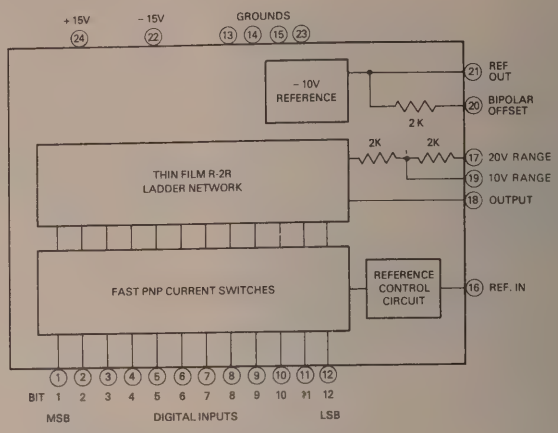
DAC-HF SERIES

ULTRA-FAST, CURRENT OUTPUT D/A CONVERTERS





NOTE: FOR DAC-HF10B PINS 11 & 12 ARE NO CONNECTION
FOR DAC-HF8B PINS 9, 10, 11 & 12 ARE NO CONNECTION

FEATURES

- **8, 10, or 12 Bit Resolution**
- **25 nsec. Settling (8 or 10 Bits)**
- **50 nsec. Settling (12 Bits)**
- **Unipolar or Bipolar Operation**
- **5 mA Output Current**

The DAC-HF series features ultra-fast current outputs for 8, 10, and 12 bit resolutions. These state-of-the-art digital to analog converters give output settling times of 25 nanoseconds maximum for 8 and 10 bits and 50 nanoseconds maximum for 12 bits. They can be used to drive a load resistor directly for up to ±1.2 V outputs or with a fast inverting operational amplifier (Datel System's AM-500) for up to ±10 V outputs at sub-microsecond settling times. The required feedback resistors are incorporated inside the unit and give a selection of five different output ranges by external pin connection.

The circuit uses high speed PNP current switches combined with a low impedance R-2R ladder network. The network is fabricated with nichrome thin-film resistors which are then laser trimmed for optimum linearity. The output current is 0 to +5 mA or ±2.5 mA with a 400 ohm output impedance.

SPECIFICATIONS, Typical at 25°C

	DAC-HF8B	DAC-HF10B	DAC-HF12B
Resolution	8 Bits	10 Bits	12 Bits
Settling Time max.*	25 nsec.	25 nsec.	50 nsec.
Gain Tempco, max.	20 ppm/°C	20 ppm/°C	20 ppm/°C
Nonlinearity, max.	½ LSB	½ LSB	½ LSB
Diff. Nonlinearity, max.	½ LSB	½ LSB	½ LSB
Monotonicity	Over Operating Temp. Range		
Power Supply Sensitivity	0.01%/%	0.01%/%	0.01%/%
Analog Output Ranges	0 to +5 mA ±2.5 mA	0 to +5 mA ±2.5 mA	0 to +5 mA ±2.5 mA
Output Voltage Compliance	±1.2 V	±1.2 V	±1.2 V
Input Logic	DTL/TTL	DTL/TTL	DTL/TTL
Coding, unipolar	Straight Bin.	Straight Bin.	Straight Bin.
Coding, bipolar	Offset Bin.	Offset Bin.	Offset Bin.
Power Requirement	+15 VDC @ 30 mA −15 VDC @ 12 mA	+15 VDC @ 35 mA −15 VDC @ 12 mA	+15 VDC @ 40 m −15 VDC @ 12
Package	24 Pin	24 Pin	24 Pin

*To 1 LSB

ORDERING INFORMATION

Model	Oper. Temp. Range	Seal	Price (1-24)
DAC-HF8BGC	0 to 70C	Epoxy	$109.00
DAC-HF8BMC	0 to 70C	Hermetic	119.00
DAC-HF8BMR	−25 to +85C	Hermetic	159.00
DAC-HF8BMM	−55 to +125C	Hermetic	189.00
DAC-HF10BGC	0 to 70C	Epoxy	129.00
DAC-HF10BMC	0 to 70C	Hermetic	139.00
DAC-HF10BMR	−25 to +85C	Hermetic	179.00
DAC-HF10BMM	−55 to +125C	Hermetic	209.00
DAC-HF12BGC	0 to 70C	Epoxy	139.00
DAC-HF12BMC	0 to 70C	Hermetic	149.00
DAC-HF12BMR	−25 to +85C	Hermetic	189.00
DAC-HF12BMM	−55 to +125C	Hermetic	219.00

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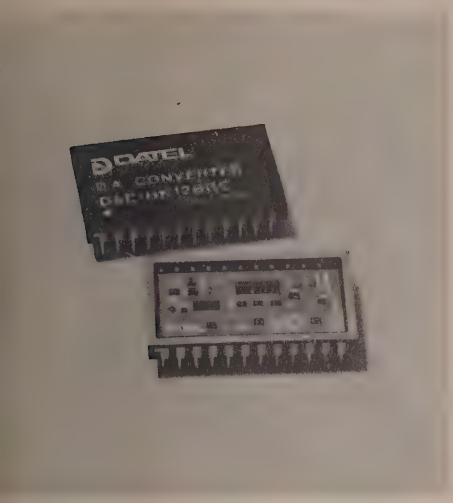
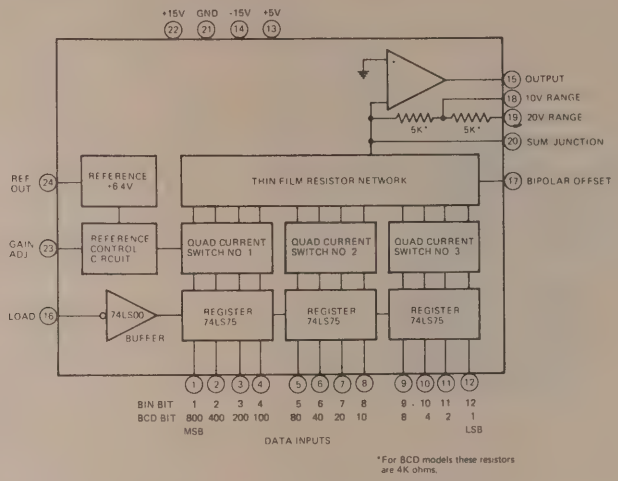
DAC-HK SERIES

HIGH PERFORMANCE 12 BIT DAC'S WITH INPUT REGISTER

DATEL SYSTEMS, INC.





FEATURES

- **12 Bit Resolution**
- **Input Register**
- **20 ppm/°C Tempco**
- **Binary, BCD, or 2's Comp. Coding**
- **3 μsec. Settling Time**

The DAC-HK series D/A converters are high performance 12-bit devices with a fast settling voltage output. They incorporate a level controlled input storage register and are specifically designed for systems applications such as data-bus interfacing with computers. When the "load" input is high data in the storage register is held, and when the load input is low data is transferred through to the DAC. There are three basic models available by coding option: binary, BCD, and two's complement. The output voltage ranges are externally pin-programmable and include: 0 to +2.5 V, 0 to +5 V, 0 to +10 V, ±2.5 V, ±5 V, and ±10 V.

Quad current switches are combined with a low T.C. thin film resistor network and a low T.C. Zener reference to achieve better than 20 ppm/°C gain tempco. Optimum linearity is attained by functional laser trimming of the thin film nichrome resistors.

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SPECIFICATIONS, Typical at 25°C

	DAC-HK12B	DAC-HK12D
Resolution	12 Bits	3 Digits
Settling Time, to ½ LSB	3 μsec.	3 μsec.
Gain Tempco, max.	20 ppm/°C	20 ppm/°C
Nonlinearity, max.	½ LSB	¼ LSB
Differential Nonlinearity, max.	½ LSB	¼ LSB
Monotonicity	Over Oper. Temp. Range	
Power Supply Sensitivity	0.002%/%	0.002%/%
Analog Output Voltages	0 to +5 V	0 to +2.5 V
	0 to +10 V	0 to +5 V
	±2.5 V	0 to +10 V
	±5 V	—
	±10 V	—
Output Current	±5 mA	+5 mA
Input Logic	DTL/TTL	DTL/TTL
Coding, unipolar	Straight Bin.	BCD
Coding, bipolar	Offset Bin.	—
	Two's Comp.	—
Power Requirement	+15 VDC at 15 mA −15 VDC at 30 mA +5 VDC at 45 mA	
Package	24 Pin	

ORDERING INFORMATION

Model	Oper. Temp. Range	Coding	Seal	Price (1-24)
DAC-HK12BGC	0 to 70C	Binary	Epoxy	$ 59.00
DAC-HK12BMC	0 to 70C	Binary	Hermetic	69.00
DAC-HK12BMR	−25 to +85C	Binary	Hermetic	99.00
DAC-HK12BMM	−55 to +125C	Binary	Hermetic	139.00
DAC-HK12BGC-2	0 to 70C	2's Comp.	Epoxy	59.00
DAC-HK12BMC-2	0 to 70C	2's Comp.	Hermetic	69.00
DAC-HK12BMR-2	−25 to +85C	2's Comp.	Hermetic	99.00
DAC-HK12BMM-2	−55 to +125C	2's Comp.	Hermetic	139.00
DAC-HK12DGC	0 to 70C	BCD	Epoxy	59.00
DAC-HK12DMC	0 to 70C	BCD	Hermetic	69.00
DAC-HK12DMR	−25 to +85C	BCD	Hermetic	99.00
DAC-HK12DMM	−55 to +125C	BCD	Hermetic	139.00

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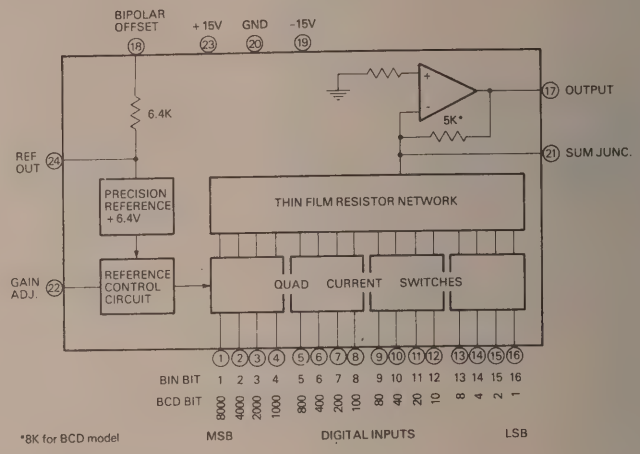
DAC-HP16B, DAC-HP16D

HIGH RESOLUTION D/A CONVERTERS



FEATURES

- **16 Bit Binary Model**
- **4 Digit BCD Model**
- **Linearity to 0.003%**
- **15 ppm/°C Tempco, Max.**
- **Voltage Output**

The DAC-HP series are high resolution D/A converters with voltage output. They are self-contained, including a low tempco zener reference circuit and output operational amplifier, all in a miniature 24 pin double spaced ceramic DIP package. There are two basic models in the series. The DAC-HP16B has 16 bit binary resolution with ±0.003% linearity while the DAC-HP16D has 4 digit BCD resolution with ±0.005% linearity. Input coding is complementary binary and complementary offset binary for the DAC-HP16B and complementary BCD for the DAC-HP16D. The binary version operates in both unipolar and bipolar modes with output voltages of 0 to +10 V and ±5 V; the BCD version operates in unipolar mode only with 0 to +10 V output.

The DAC-HP design incorporates thin film hybrid technology which has been in volume production. Selected low tempco nichrome on silicon thin film resistor networks are combined with tightly matched quad current switches to achieve 16 bit resolution.

SPECIFICATIONS, Typical at 25°C

	DAC-HP16B	DAC-HP16D
Resolution	16 Bits	4 Digits
Settling Time	35 μsec.	15 μsec.
Gain Tempco, max.	15 ppm/°C	15 ppm/°C
Nonlinearity, max.	0.003%	0.005%
Monotonicity, 10°C to 40°C	14 Bits	16 Bits
Power Supply, Sensitivity	0.002%/%	0.002%/%
Analog Output Ranges	0 to +10 V ±5 V	0 to +10 V —
Output Current	±5 mA	+5 mA
Input Logic	DTL/TTL	DTL/TTL
Coding, unipolar	Comp. Bin.	Comp. BCD
Coding, bipolar	Comp. Off. Bin.	—
Power Requirement	+15 VDC at 42 mA −15 VDC at 36 mA	
Package	24 Pin	

ORDERING INFORMATION

Model	Oper. Temp. Range	Seal	Price (1-24)
DAC-HP16BMC	0 to 70C	Hermetic	$119.00
DAC-HP16BMR	−25 to +85C	Hermetic	149.00
DAC-HP16BMM	−55 to +125C	Hermetic	199.00
DAC-HP16DMC	0 to 70C	Hermetic	119.00
DAC-HP16DMR	−25 to +85C	Hermetic	149.00
DAC-HP16DMM	−55 to +125C	Hermetic	199.00

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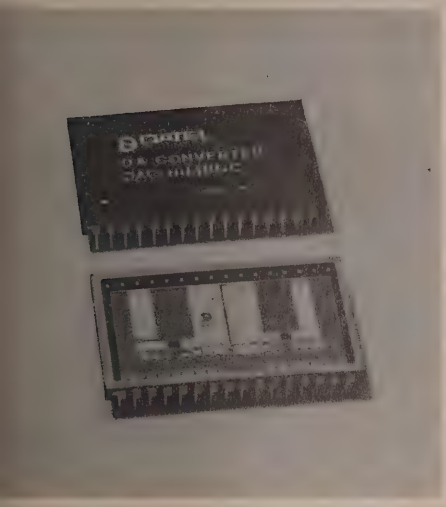
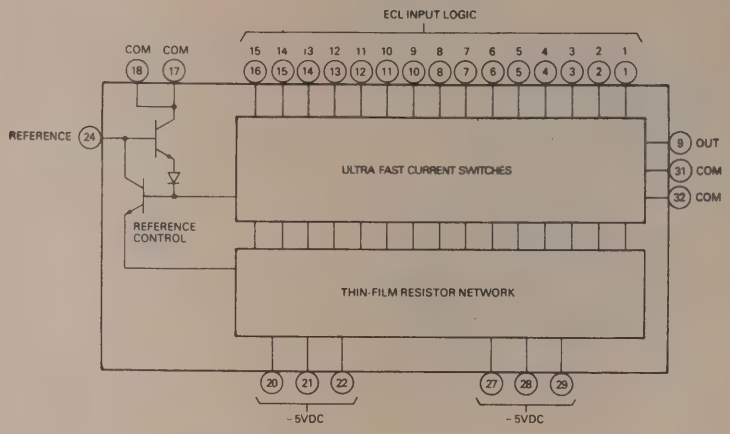
DAC-HU4B

ULTRA-FAST, 4 BIT D/A CONVERTER

DATEL SYSTEMS, INC.





FEATURES

- 4 Bit Resolution
- 25 nsec. Settling to 0.1%
- 24 mA Output Current
- 0.1% Linearity
- ECL 10,000 Input Logic

The DAC-HU4B is an ultra-fast 4 bit hybrid DAC which is specifically designed as a building block component for use with Datel System's ADC-HU3B A/D converters in ultra high speed two stage A/D converters. The DAC-HU4B has a 15 line ECL 10,000 complementary input designed to be driven from two ADC-HU3B's. The output current is 24 mA with all of the current switches on and settling time to 0.1% is only 25 nsec. By connecting the input logic lines together in groups of 8, 4, 2, and 1, complementary binary coding can be realized.

In order to be used in higher resolution A/D converters, this device has a linearity of 0.1%.

The gain temperature coefficient of this circuit is 15 ppm/°C without the external reference. The power to this device is supplied from an operational amplifier which operates from an external reference. The nominal supply voltage is −5 V at 25 mA.

SPECIFICATIONS, Typical at 25°C

	DAC-HU4B
Resolution	4 Bits
Settling Time, to 0.1% FS	25 nsec.
Gain Tempco	15 ppm/°C
Nonlinearity, max.	0.1% FS
Diff. Nonlinearity, max.	0.1% FS
Monotonicity	Over Op. Temp. Range
Analog Output	0 to 24 mA FS
Output Voltage Compliance	±0.6 V
Output Impedance, min.	50K ohms
Output Leakage Current	100 nA
Input Logic	ECL 10,000
Coding	Complementary 15 line Complementary Binary
Power Requirement	−5 VDC at 25 mA
Package	32 Pin

ORDERING INFORMATION

Model	Oper. Temp. Range	Seal	Price (1-24)
DAC-HU4BGC	0 to 70C	Epoxy	$119.00
DAC-HU4BMC	0 to 70C	Hermetic	129.00
DAC-HU4BMR	−25 to +85C	Hermetic	169.00
DAC-HU4BMM	−55 to +125C	Hermetic	199.00

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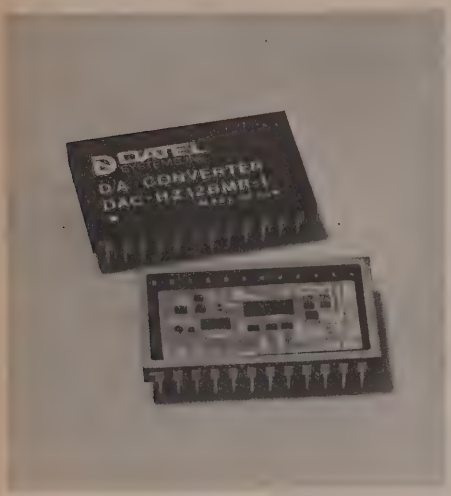
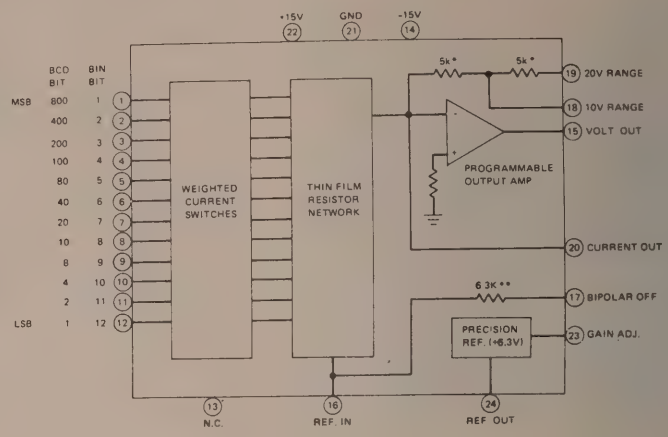
DAC-HZ12BMR-1, DAC-HZ12DMR-1

DATEL SYSTEMS, INC.

LOW DRIFT, HIGH PERFORMANCE 12 BIT D/A CONVERTERS





FEATURES

- **12 Bit Resolution**
- **10 ppm/°C Tempco**
- **Binary or BCD Coding**
- **3 μsec. Voltage Settling**
- **5 Output Ranges**

The DAC-HZ12BMR-1 and DAC-HZ12DMR-1 are low drift, hermetically sealed D/A converters which operate over the −25°C to +85°C temperature range. These models have 12 bit binary and 3 digit BCD coding respectively. With ±10 ppm/°C maximum tempco, they are specifically designed for demanding 12 bit applications where wider operating temperature range and low drift are essential. The analog output voltage is monotonic over the operating temperature range.

The DAC-HZ12BMR-1/DMR-1 utilizes quad current switches with a laser trimmed thin film resistor network, a precision zener reference circuit, a reference control circuit, and a fast output operational amplifier. Output voltage settling time is 3 μsec. and there are five pin selectable voltage ranges. The power supply requirement is ±15 VDC with no 5 volt logic supply necessary.

SPECIFICATIONS, Typical at 25°C

	DAC-HZ12BMR-1	DAC-HZ12DMR-1
Resolution	12 Bits	3 Digits
Settling time, to ½ LSB	3 μsec.	3 μsec.
Gain Tempco, max.	10 ppm/°C	10 ppm/°C
Nonlinearity, max.	½ LSB	¼ LSB
Differential Nonlinearity, max.	½ LSB	¼ LSB
Monotonicity	Over Oper. Temp. Range	
Power Supply Sensitivity	0.002%/%	0.002%/%
Analog Output Ranges	0 to +5 V	0 to +2.5 V
	0 to +10 V	0 to +5 V
	±2.5 V	0 to +10 V
	±5 V	—
	±10 V	—
Output Current	±5 mA	+5 mA
Input Logic	DTL/TTL	DTL/TTL
Coding, unipolar	Comp. Bin.	Comp. BCD
Coding, bipolar	Comp. Off. Bin.	—
Power Requirement	±15 VDC at 35 mA	
Package	24 Pin	

ORDERING INFORMATION

Model	Oper. Temp. Range	Coding	Seal	Price (1-24)
DAC-HZ12BMR-1	−25 to +85C	Binary	Hermetic	$139.00
DAC-HZ12DMR-1	−25 to +85C	BCD	Hermetic	139.00

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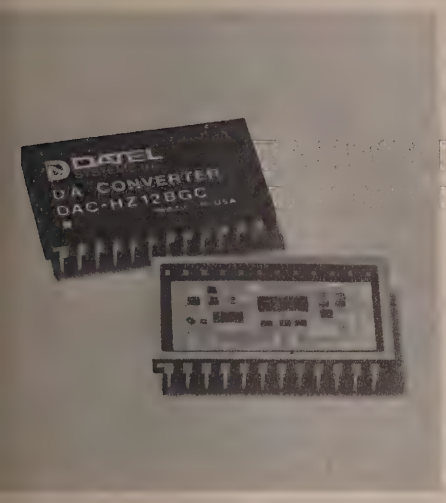
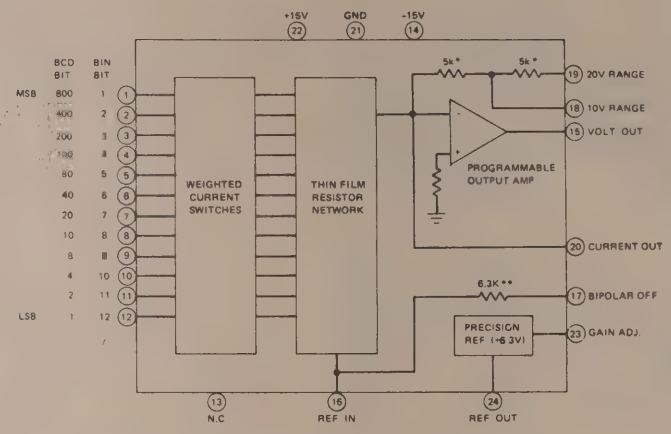
DAC-HZ12B SERIES

LOW COST, HIGH PERFORMANCE 12 BIT D/A CONVERTERS





FEATURES

- **12 Bits Binary**
- **3 Digits BCD**
- **5 Output Ranges**
- **3 μsec. Settling Time**
- **20 ppm/°C Tempco**

The DAC-HZ series are high performance, hybrid 12 bit binary and 3 digit BCD digital-to-analog converters. They are complete and self-contained with a precision internal reference and fast output operational amplifier. Pin programmable output voltage ranges are provided for a high degree of application flexibility; the output voltage ranges are 0 to +5 V, 0 to +10 V, ±2.5 V, ±5 V, and ±10 V with only unipolar ranges available on the BCD models.

The internal design utilizes three quad current switches, two thin film resistor networks, a precision zener reference circuit, reference control circuit and output amplifier. The thin film resistor networks are functionally trimmed with a laser to precisely set the binary weights of the current switches. The excellent tracking of the thin film resistors in conjunction with the tightly matched current switches results in a differential nonlinearity tempco of only 2 ppm/°C.

SPECIFICATIONS, Typical at 25°C

	DAC-HZ12B	DAC-HZ12D
Resolution	12 Bits	3 Digits
Settling Time, to ½ LSB	3 μsec.	3 μsec.
Gain Tempco, max.	20 ppm/°C	20 ppm/°C
Nonlinearity, max.	½ LSB	¼ LSB
Diff. Nonlinearity, max.	½ LSB	¼ LSB
Monotonicity	Over Op. Temp. Range	
Power Supply Sensitivity	0.002%/%	0.002%/%
Analog Output Ranges	0 to +5 V	0 to +2.5 V
	0 to +10 V	0 to +5 V
	±2.5 V	0 to +10 V
	±5 V	—
	±10 V	—
Output Current	±5 mA	+5 mA
Input Logic	DTL/TTL	DTL/TTL
Coding, unipolar	Comp. Bin.	Comp. BCD
Coding, bipolar	Comp. Off. Bin.	—
Power Requirement	±15 VDC at 35 mA	
Package	24 Pin	

ORDERING INFORMATION

Model	Oper. Temp. Range	Seal	Price (1-24)
DAC-HZ12BGC	0 to 70C	Epoxy	$ 39.00
DAC-HZ12BGR	−25 to +85C	Epoxy	55.00
DAC-HZ12BMC	0 to 70C	Hermetic	49.00
DAC-HZ12BMR	−25 to +85C	Hermetic	69.00
DAC-HZ12BMM	−55 to +125C	Hermetic	119.00
DAC-HZ12DGC	0 to 70C	Epoxy	39.00
DAC-HZ12DGR	−25 to +85C	Epoxy	55.00
DAC-HZ12DMC	0 to 70C	Hermetic	49.00
DAC-HZ12DMR	−25 to +85C	Hermetic	69.00
DAC-HZ12DMM	−55 to +125C	Hermetic	119.00

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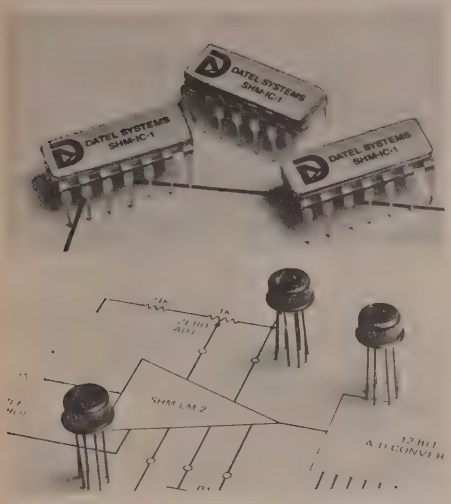
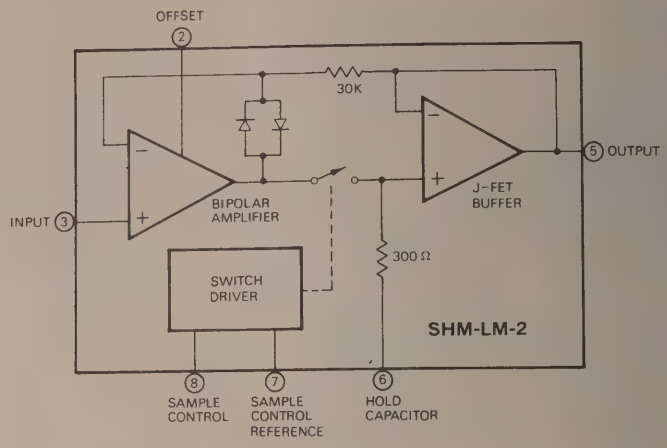
SHM-IC-1, SHM-LM-2

DATEL SYSTEMS, INC.

MONOLITHIC SAMPLE-HOLDS





FEATURES

- **Acquisition Time to 5 μsec.**
- **0.01% Accuracy**
- **Bandwidth to 2 MHz**
- **0.01% Feedthrough**
- **Low Cost**

These monolithic sample-hold devices feature excellent performance specifications at a low price. They are self-contained units requiring only an external hold capacitor for operation. The SHM-LM-2 operates in a fixed gain configuration of +1 while the SHM-IC-1 can be externally connected for gains of ±1 or for higher gains by means of two external resistors. Both models consist of a high impedance input amplifier, a fast electronic switch, and a high impedance output buffer amplifier. The circuit operates in a closed loop configuration for maximum accuracy.

Accuracy is 0.01% for both models making them useful in 12 bit A/D converter applications. For a 1000pF hold capacitor the acquisition time is 5 μsec. for the SHM-IC-1 and 6 μsec. for the SHM-LM-2. Better accuracy with lower feedthrough and hold mode droop can be achieved by using higher value hold capacitance such as .01 μF.

SPECIFICATIONS, Typical at 25°C, C_H = 1000pF

	SHM-IC-1	SHM-LM-2
Accuracy	0.01%	0.01%
Acquisition Time to 0.01%	5 μsec.	6 μsec.
Acquisition Time to 0.1%	4 μsec.	5 μsec.
Aperture Delay Time	50 nsec.	100 nsec.
Hold Mode Droop	50 μV/nsec.	200 μV/nsec.
Hold Mode Feedthrough, max.	0.01%	0.01%
Bandwidth	2 MHz	1 MHz
Sample-to-Hold Error, max.	20 mV	25 mV
Gain	±1	+1
Input Voltage Range, min.	±10 V	±11.5 V
Input Impedance	10^8 ohms	10^{10} ohms
Input Bias Current, max.	200 nA	50 nA
Input Offset Voltage Drift	20 μV/°C	10 mV*
Digital Control	DTL, TTL	DTL, TTL, CMOS
Output Voltage, min.	±10 V	±11.5 V
Output Current	±5 mA	±5 mA
Power Requirement	±15 V at 5 mA	±15 V at 6 mA
Package	14 Pin DIP	TO-99

*Over Oper. Temp. Range

ORDERING INFORMATION

Model	Oper. Temp. Range	Package	Price (1-24)
SHM-IC-1	0 to 70C	Ceramic	$19.00
SHM-IC-1M	−55 to +125C	Ceramic	53.00
SHM-LM-2	0 to 70C	Metal	7.95
SHM-LM-2M	−55 to +125C	Metal	50.00

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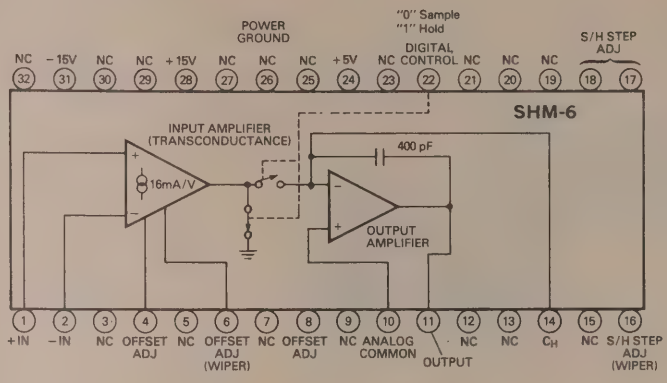
SHM-6, SHM-HU

FAST, HYBRID SAMPLE-HOLDS


POWER GROUND
"0" Sample
"1" Hold
DIGITAL CONTROL
S/H STEP ADJ
NC −15V NC NC +15V NC NC NC +5V NC NC NC NC NC NC
32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17
SHM-6
INPUT AMPLIFIER (TRANSCONDUCTANCE)
16mA/V
400 pF
OUTPUT AMPLIFIER
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
+IN −IN NC OFFSET ADJ NC OFFSET ADJ (WIPER) NC OFFSET ADJ NC ANALOG COMMON OUTPUT NC NC C_H NC S/H STEP ADJ (WIPER)

FEATURES

- **0.01% Accuracy (SHM-6)**
- **1.0 μsec. Acquisition Time (SHM-6)**
- **25 nsec. Acquisition Time (SHM-HU)**
- **50 MHz Bandwidth (SHM-HU)**
- **50 mA Output (SHM-6)**

These hybrid sample-hold circuits feature fast and ultra-fast acquisition times. The SHM-6 is designed for use with fast 12 bit A/D converters. Its accuracy is 0.01% and acquisition time is 1.0 μsec. maximum. Bandwidth is 5 MHz and aperture delay time is 20 nsec. In addition to its high accuracy and high speed this model also has a 50 mA output current. The input amplifier of the SHM-6 is an open loop transconductance amplifier which can be externally connected for closed loop gains of ±1 to ±10. The hold capacitor, of value 400pF, is included internally.

The SHM-HU is an ultra high speed sample-hold designed for video processing applications. It is specifically designed for use with Datel System's ADC-HU3B A/D converter and other ultra fast A/D's with resolutions up to 8 bits. It acquires a 5 V input change in just 25 nsec. and features a 10 psec. aperture uncertainty time. A 53 pF MOS hold capacitor is incorporated in the unit. The SHM-HU requires 4 external resistors and an external MH003 buffer amplifier.

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SPECIFICATIONS, Typical at 25°C

	SHM-6	SHM-HU
Accuracy	0.01%	0.1%
Acquisition time, to 0.01% max.	1.0 μsec.	—
Acquisition time, to 0.2%	—	25 nsec.
Aperture Delay Time	20 nsec.	6 nsec.
Aperture Uncertainty Time	2 nsec.	10 psec.
Hold Mode Droop	10 μV/μsec.	50 μV/μsec.
Hold Mode Feedthrough	0.01%	0.02%
Bandwidth	5 MHz	50 MHz
Sample-to-Hold Error	Adj. to zero	100 mV
Gain	±1 to 10	+0.975
Input Voltage Range, min.	±10 V	±2.5 V
Input Impedance	10^8 ohms	10^8 ohms
Input Bias Current, max.	10 nA	5 μA
Input Offset Voltage Drift	100 μV/°C	100 μV/°C
Digital Control	DTL, TTL	Diff. ECL
Output Voltage	±10 V	±2.5 V
Output Current	±50 mA	±10 mA
Power Requirement	+15 V at 55 mA −15 V at 60 mA +5 V at 30 mA	±15 V at 60 mA ±5 V at 70 mA
Package	32 Pin	24 Pin

ORDERING INFORMATION

Model	Oper. Temp. Range	Seal	Price (1-24)
SHM-6GC	0 to 70C	Epoxy	$129.00
SHM-6MC	0 to 70C	Hermetic	139.00
SHM-6MR	−25 to +85C	Hermetic	179.00
SHM-6MM	−55 to +125C	Hermetic	209.00
SHM-HUGC	0 to 70C	Epoxy	129.00
SHM-HUMC	0 to 70C	Hermetic	139.00
SHM-HUMR	−25 to +85C	Hermetic	179.00
SHM-HUMM	−55 to +125C	Hermetic	209.00

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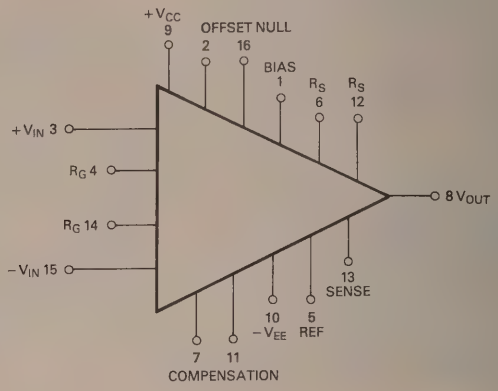
AM-435

DATEL SYSTEMS, INC.

MONOLITHIC, FET INPUT INSTRUMENTATION AMPLIFIER



FEATURES

- **2 x 10^{12} Ohms Input Z**
- **0.02% Gain Linearity**
- **105 dB min. CMRR**
- **Low Noise JFET Inputs**
- **Single Resistor Gain Adjust**

DESCRIPTION

The AM-435 is a low cost, high performance, monolithic instrumentation amplifier. Tightly matched JFET input devices give very high input impedance with very low bias currents and low input offset voltage drift. The AM-435 is ideal for applications where high differential source impedances are encountered.

This amplifier is programmed by means of two external resistors, R_S and R_G. With R_S at a set value the gain may be varied from 1 to 1000 by changing R_G. Provision is also made for an external offset adjustment by means of a trimming potentiometer. Input impedance is 2 x 10^{12} ohms with bias currents of 40 pA maximum. Common mode rejection is greater than 105 dB at a gain of 1000. Input noise current is only 0.01 pA RMS and gain nonlinearity is typically 0.02%. The input offset voltage drift is typically 10μV/°C and output offset voltage drift is 600μV/°C.

SPECIFICATIONS, Typical at 25°C, G=1000

	AM-435-1C	AM-435-1M
Gain Range	1 to 1000	1 to 1000
Gain Nonlinearity	0.1%	0.05%
Gain Equation	R_S/R_G	R_S/R_G
Gain Tempco	3ppm/°C	3ppm/°C
Gain Equation Accuracy	0.05%	0.05%
Input Impedance	2 x 10^{12} ohms	2 x 10^{12} ohms
Input Bias Current, max.	40 pA	20 pA
Input Offset Current, max.	20 pA	10 pA
Input Offset Voltage, max.	30 mV	15 mV
Input Off. Voltage Drift	10μV/°C	10μV/°C
Output Off. Voltage Drift, G=1	600μV/°C	600μV/°C
Input Voltage Range, min.	±10V	±10V
Output	±10V at 5mA	±10V at 5mA
Common Mode Rej, G=1000	105 dB	115 dB
Bandwidth, G=1000	7KHz	7KHz
Slew Rate	1V/μsec.	1V/μsec.
Power Requirement	±15VDC at 1.5 mA	
Package	16 Pin DIP	

ORDERING INFORMATION

Model	Oper. Temp. Range	Package	Price (1-24)
AM-435-1C	0 to 70C	Ceramic	$11.00
AM-435-1M	−55 to +125C	Ceramic	25.00

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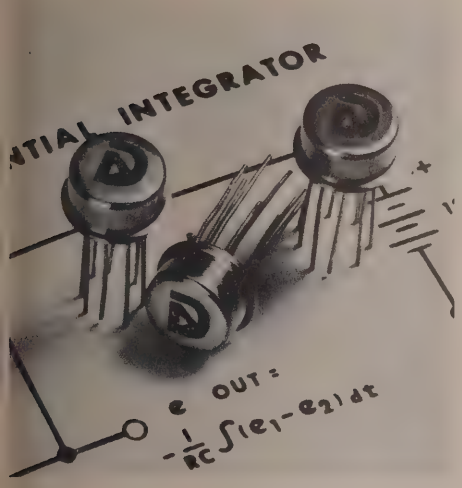
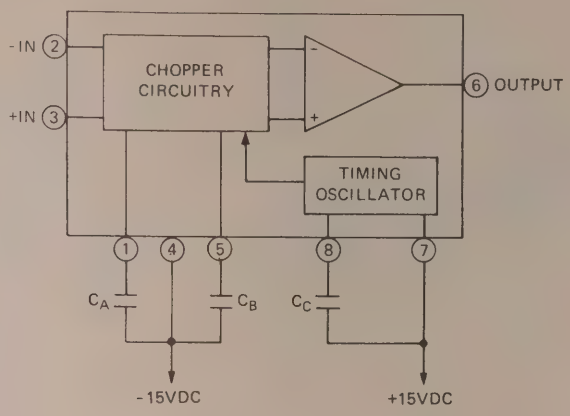
AM-490-2

MONOLITHIC, DIFFERENTIAL INPUT CHOPPER STABILIZED OP AMP





FEATURES

- **Differential Inputs**
- **120 dB CMR**
- **Chopper Stabilized**
- **Drift as Low as 0.1 μV/°C**
- **5 x 10^8 Open Loop Gain**

Model AM-490-2 is a monolithic, chopper stabilized operational amplifier with differential inputs; it is specifically designed for applications requiring ultra-stable DC characteristics together with good bandwidth. This device is available in three different grades of maximum input offset voltage drift: 1.0, 0.3, and 0.1μV/°C. The extremely low input offset voltage drift and initial input offset voltage of only 20μV eliminate the requirement for zero adjustment in most applications. Other important input characteristics include an input impedance of 100 megohms, input bias current of 150pA, and input offset current drift of 1pA/°C. This permits the AM-490-2 to operate accurately with source impedances over 100 kilohms. A common mode rejection of 120 dB minimum and open loop gain of 5 x 10^8 result in extremely low output errors. Long term stability is typically 5μV per year.

SPECIFICATIONS, Typical at 25°C

	AM-490-2			
	A	**B**	**C**	**M**
DC Open Loop Gain		5 x 10^8		
Gain Bandwidth Product		3 MHz		
Slew Rate		2.5 V/μsec.		
Full Power Frequency		40 kHz		
Overload Recovery Time		200 msec.		
Output		±10 V at 7 mA		
Output Resistance		200 ohms		
Common Mode Range		±10 V min.		
Common Mode Rejection, ± 5V		120 dB min.		
Input Impedance		100 megohms		
Input Bias Current		150 pA		
Input Offset Current		50 pA		
Input Offset Voltage		20 μV		
Input Off. Volt. Drift, μV/°C max.	1.0	0.3	0.1	0.6
Long Term Stability		5 μV/year		
Power Supply Rejection		120 dB min.		
Power Requirement		±15 VDC at 5 mA max.		
Package		TO-99		

ORDERING INFORMATION

Model	Oper. Temp. Range	Input Offset Voltage Drift	Price (1-24)
AM-490-2A	0 to 70C	1.0 μV/°C max.	$34.00
AM-490-2B	0 to 70C	0.3 μV/°C max.	39.00
AM-490-2C	0 to 70C	0.1 μV/°C max.	44.00
AM-490-2M	−55 to +125C	0.6 μV/°C max.	95.00

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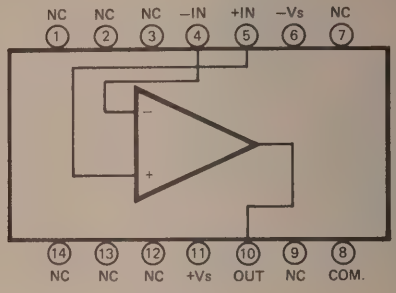
AM-500

ULTRA-FAST HYBRID OP AMP

DATEL SYSTEMS, INC



FEATURES

- **200 nsec. Settling to .01%**
- **1000V/μsec. Slew Rate**
- **100 MHz Gain Bandwidth**
- **10^6 Open Loop Gain**
- **50 mA Output Current**

The AM-500 series amplifiers are ultra-fast settling operational amplifiers for use in inverting applications. A unique feedforward amplifier design combines the characteristics of a low drift DC amplifier with those of a very fast AC amplifier. For optimum fast settling performance, this amplifier has an open loop gain roll-off of 6 dB per octave to beyond 100 MHz. Miniature thin-film hybrid construction permits an optimum combination of semiconductor devices and minimum lead lengths to realize the amplifier circuitry. Applications for the AM-500 series include fast integrators, sample-holds, fast waveform drivers, and fast D/A converter output amplifiers.

Output settling time is 200 nanoseconds max. to .01% for a 10 volt step change. Slew rate is 1000V/μsec. for positive output transitions and 1800V/μsec. for negative transitions. This high slew rate permits undistorted reproduction of a full load, 20V peak to peak sine-wave out to 16 MHz. Gain bandwidth product is 100 MHz minimum.

SPECIFICATIONS, Typical at 25°C

	AM-500
DC Open Loop Gain	10^5 V/V
Gain Bandwidth Product	100 MHz
Slew Rate, positive	1000 V/μsec.
Slew Rate, negative	1800 V/μsec.
Settling Time, 10 V to 1.0%	70 nsec.
Settling Time, 10 V to 0.1%	100 nsec.
Settling Time, 10 V to 0.01%	200 nsec. max.
Output	±10 V at 50 mA
Input Impedance	30 Meg.
Input Bias Current, max.	4 nA
Input Offset Current, max.	0.5 nA
Input Offset Voltage, max.	±3 mV
Input Offset Voltage Drift	5 μV/°C max.
Power Requirement	±15 VDC at 22 mA
Package	14 Pin DIP

ORDERING INFORMATION

Model	Oper. Temp. Range	Seal	Price (1-24)
AM-500GC	0 to 70C	Epoxy	$ 75.00
AM-500MC	0 to 70C	Hermetic	85.00
AM-500MR	–25 to +85C	Hermetic	95.00
AM-500MM	–55 to +125C	Hermetic	135.00

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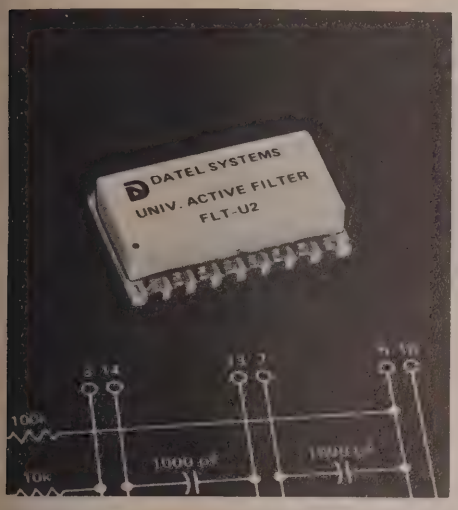
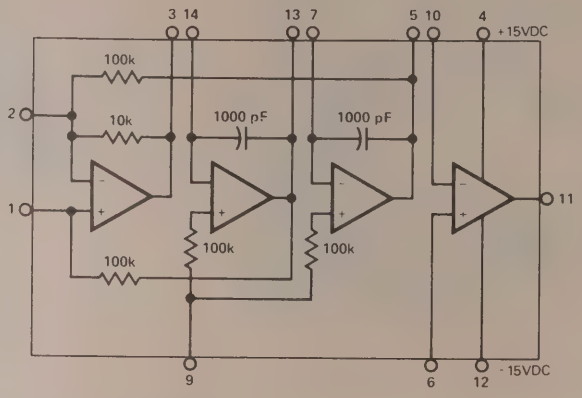
FLT-U2

UNIVERSAL HYBRID ACTIVE FILTER





FEATURES

- **State Variable Filter**
- **LP, BP, or HP Functions**
- **2 Pole Response**
- **Low Noise Amplifiers**
- **Low Cost**

The FLT-U2 is a universal active filter manufactured with thick film hybrid technology. It uses the state variable active filter principle to implement a second order transfer function. Three committed operational amplifiers are used for the second order function while a fourth uncommitted op amp can be used as a gain stage, summing amplifier, buffer amplifier, or to add another independent real pole.

Two-pole lowpass, bandpass, and highpass output functions are available simultaneously from three different outputs, and notch and allpass functions are available by combining these outputs in the uncommitted op amp. To realize higher order filters, several FLT-U2's can be cascaded. Q range is from 0.1 to 1,000 and resonant frequency range is 0.001 Hz to 200 kHz. Frequency stability is .01%/°C and resonant frequency accuracy is within ±5% of calculated values. Frequency tuning is done by two external resistors and Q tuning by a third external resistor.

SPECIFICATIONS, Typical at 25°C

	FLT-U2
Frequency Range	0.001 to 200 kHz
Q Range	0.1 to 1,000
f_0 Accuracy	±5%
f_0 Tempco	100 ppm/°C
Voltage Gain	0.1 to 1,000
Filter Output Functions	Lowpass Bandpass Highpass
Output Voltage	±10 V
Output Current	±10 mA
Amplifier Voltage Gain	300,000
Amp. Gain Bandwidth Prod.	3 MHz
Input Offset Voltage, max.	6 mV
Input Bias Current, max.	500 nA
Input Offset Current, max.	200 nA
Output Slew Rate	1 V/μsec.
Power Supply, rated	±15 VDC
Power Supply Range	±5 to ±18 VDC
Quiescent Current	9 mA
Package	14 Pin

ORDERING INFORMATION

Model	Oper. Temp. Range	Package	Price (1-24)
FLT-U2	0 to 70C	Ceramic	$19.00

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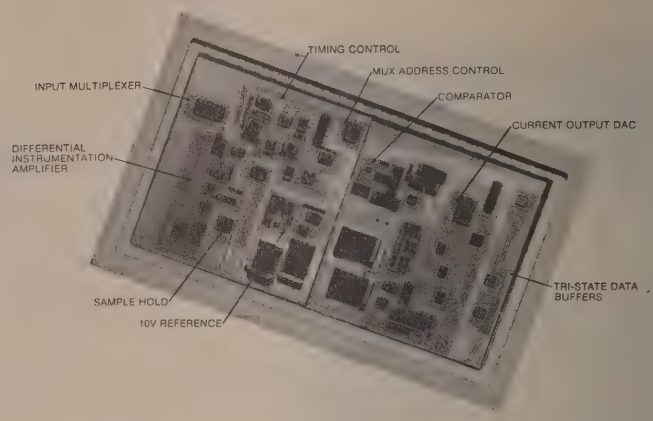
HDAS-8, HDAS-16

12 BIT HYBRID DATA ACQUISITION SYSTEMS

DATEL SYSTEMS, INC



FEATURES

- **12 Bit Resolution**
- **8 or 16 Channels**
- **Internal Instrumentation Amp**
- **50 kHz Throughput Rate**
- **Three State Outputs**

The HDAS-8, with 8 differential input channels, and the HDAS-16, with 16 single ended input channels, are industry's first complete 12 bit data acquisition systems in a single hybrid package. Acquisition and conversion times combined are 20μsec. maximum, giving a 50 kHz throughput rate. The 12 bit output data can be transferred out in three 4 bit bytes by means of three state data bus drivers. Output coding is straight binary for unipolar operation and offset binary for bipolar operation.

The HDAS circuitry includes an analog multiplexer, programmable gain instrumentation amplifier, sample-hold circuit with MOS hold capacitor, 10 volt buffered reference, 12 bit A/D converter, three state bus driver and digital control circuitry. The instrumentation amplifier can be programmed by a single external resistor for gains from 1 to 1000. This is an important feature for processing signals in the range of 10mV to 10 V full scale.

SPECIFICATIONS, Typical at 25°C

	HDAS-8	HDAS-16
No. Channels	8	16
Input Type	Differential	Single Ended
Input Range, unipolar FS	+10mV to +10 V	+10mV to +10 V
Input Range, bipolar FS	±10mV to ±10 V	±10mV to ±10 V
Common Mode Range	±11 V	—
Input Resistance	100 Meg.	100 Meg.
Input Bias Current, max.	200 pA	200 pA
Input Off. Voltage Drift	20μV/°C+(10μV/°C)G	
Input Gain Equation	G = 1+20K/R_G	
Channel Addressing	3-Bit Code	4-Bit Code
Address Input Logic	DTL, TTL	DTL, TTL
Resolution	12 Bits	12 Bits
Linearity Error, max.	½ LSB	½ LSB
Differential Nonlinearity, max.	½ LSB	½ LSB
Total Error, max.*	0.025%	0.025%
Gain Tempco, typ.	10 ppm/°C	10 ppm/°C
Gain Tempco, max.	30 ppm/°C	30 ppm/°C
No Missing Codes	Over Oper. Temp. Range	
Power Supply Sensitivity	0.01%/%	0.01%/%
Throughput Rate, max.	50 kHz	50 kHz
Acquisition Time	9 μsec.	9 μsec.
Conversion Time	9 μsec.	9 μsec.
Aperture Delay Time	100 nsec.	100 nsec.
Sample-Hold Droop	1 μV/μsec.	1 μV/μsec.
Feedthrough at 1 kHz, max.	0.01%	0.01%
Output Coding, unipolar	Straight Bin	Straight Bin
Output Coding, bipolar	Offset Bin.	Offset Bin.
Power Requirement	+15VDC at 67 mA max. −15 VDC at 71 mA max. +5VDC at 155 mA max.	
Package	Miniature 62 Pin	

*at maximum throughput rate

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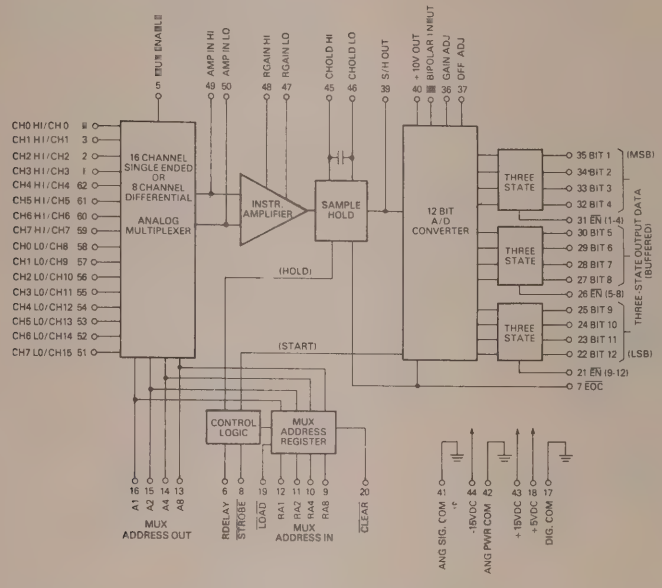

The internal sample-hold device has excellent characteristics and has its own self contained MOS hold capacitor. Aperture delay time is 100nsec. and hold mode droop is 1μV/μsec. Nonlinearity error is less than ½ LSB and total error is 1 LSB maximum at 50 kHz throughput rate.

The HDAS units are especially useful for microcomputer based measurement and control systems. The package is a miniature 2.3 × 1.4 × 0.24 inches (58 × 36 × 6 mm) with 62 pins.

OUTPUT CODING

UNIPOLAR

Scale	0 to +5V	0 to +10 V	Straight Binary
+FS-1 LSB	+4.9988	+9.9976	1111 1111 1111
+¾FS	+3.7500	+7.5000	1100 0000 0000
+½FS	+2.5000	+5.0000	1000 0000 0000
+¼FS	+1.2500	+2.5000	0100 0000 0000
+1 LSB	+0.0012	+0.0024	0000 0000 0001
ZERO	0.0000	0.0000	0000 0000 0000

BIPOLAR

Scale	±5V	±10 V	Offset Binary
+FS-1 LSB	+4.9976	+9.9951	1111 1111 1111
+½FS	+2.5000	+5.0000	1100 0000 0000
ZERO	0.0000	0.0000	1000 0000 0000
−½FS	−2.5000	−5.0000	0100 0000 0000
−FS+1 LSB	−4.9976	−9.9951	0000 0000 0001
−FS	−5.0000	−10.000	0000 0000 0000

ORDERING INFORMATION

Model	Oper. Temp. Range	Seal	Price (1-9)
HDAS-8MC	0 to 70C	Hermetic	$295.00
HDAS-8MR	−25 to +85C	Hermetic	395.00
HDAS-8MM	−55 to +125C	Hermetic	695.00
HDAS-16MC	0 to 70C	Hermetic	295.00
HDAS-16MR	−25 to +85C	Hermetic	395.00
HDAS-16MM	−55 to +125C	Hermetic	695.00

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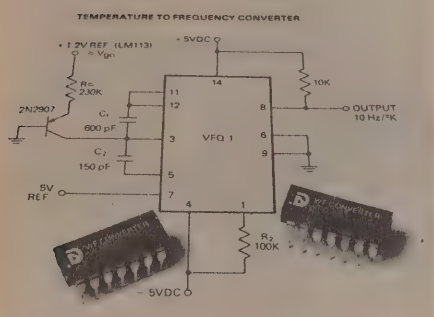
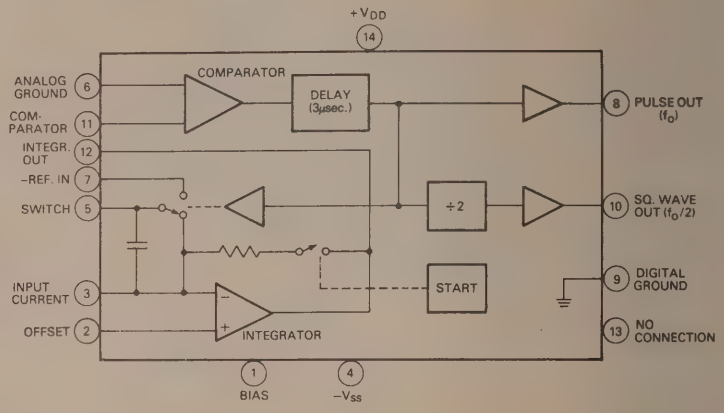
VFQ-1

MONOLITHIC VOLTAGE TO FREQUENCY CONVERTER





FEATURES

- **10 kHz to 100 kHz FS**
- **0.01% Typ. Linearity at 10 kHz**
- **25 ppm/°C Tempco**
- **Open Collector Output**
- **Pulse or Square Wave Output**

Model VFQ-1 is a new monolithic voltage to frequency converter using combined bipolar and CMOS technologies. This device accepts a positive analog input current and produces an output pulse train with a frequency linearly proportional to an input current. In addition to the pulse output, there is also a square wave output at half the pulse frequency. The full scale output pulse rate can be set from 10 kHz to 100 kHz by means of two external capacitors. Linearities are typically 0.01% for 10 kHz full scale and 0.1% for 100 kHz full scale; linearity holds all the way down to zero.

The VFQ-1 internal circuitry includes an operational integrator, a comparator, digital delay circuit, single-pole double-throw electronic switch, a start circuit, a divide by two circuit, and two output driver circuits. It operates on the well-known charge balancing integrator principle. The two outputs are open collector NPN which can sink up to 10 mA and give a logic HI output up to +18 volts.

SPECIFICATIONS Typical at 25°C

	VFQ-1
Output Frequency	0 to 10 kHz 0 to 100 kHz
Linearity 10 kHz FS	0.01%
Linearity, 100 kHz FS	0.1%
Gain Tempco	25 ppm/°C
Output	Open Collector TTL
Output Waveforms	Pulses at f_O Sq. Wave at $f_O/2$
Output Settling Time	2 pulses
Input Current Range	0 to +10 μA
Input Overrange	+50 μA
Input Offset Voltage	50 mV
Reference Input	−3.5 to −6.5 V
Zero Drift	50 μV/°C max.
Power Supply Sensitivity	0.025%/V
Power Requirement	±5 V at 4 mA
Package	16 Pin DIP

ORDERING INFORMATION

Model	Oper. Temp. Range	Package	Price (1-24)
VFQ-1C	0 to 70C	Plastic	$ 7.50
VFQ-1R	−25 to +85C	Ceramic	12.75

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DATEL SYSTEMS, INC.

SINETRAC SERIES

A/D-D/A PERIPHERAL BOARDS THAT SLIDE INTO YOUR COMPUTER

Datel's SineTrac Series is a family of slide-in A/D-D/A analog peripheral boards for popular mini- and microcomputers. Datel offers SineTrac models for DEC LSI-11 and PDP11 computers; Data General NOVA and microNOVA models; and for microprocessor-based computers from Intel (SBC and MDS series), Motorola (M6800 EXORciser) and National Semiconductor (BLC-80).

All models feature outstanding performance with A/D throughput periods of 20 microseconds per channel and D/A settling of 4 microseconds. Extraordinary channel density is achieved by using Datel's in-house-manufactured hybrid A/D's, D/A's, and subminiature power supply modules. Most SineTrac models include analog channel address registers and control logic for automatic sequential channel scanning. Depending on the computer type, most models accept interrupt and DMA programming with software control of system mode.

All SineTrac series include a comprehensive diagnostic assembly language program on paper tape. Full systems manuals supplied with each product include a full listing of this program plus much more.

The SineTrac series offers a user relief from typical A/D-D/A interfacing problems such as interface circuit design, digital I/O cabling (only analog signal cabling is required), and a strong head start toward handling problems.

Analog specifications are excellent including 12-bit binary A/D-D/A resolution and accuracy, 100 megohm A/D input impedance, and 50 milliohm D/A output impedance.

Contact Datel for complete individual brochures on the SineTrac Series.

SINETRAC SYSTEMS CHART

MODEL	NO. A/D CHANNELS	NO. D/A CHANNELS	COMPUTER	MFGR.	BUS SIZE	PRICE
ST-800	32S or 16D	—	MDS or SBC or BLC-80	Intel Nat'l Semi	8 Bits	from $ 595
ST-800DA	—	4 or 8	MDS or SBC or BLC-80	Intel Nat'l Semi	8 Bits	from $ 559
ST-PDP	64S or 32D	2	PDP-11	DEC	16 Bits	from $1235
ST-NOVA	64S or 32D	4	NOVA	Data General	16 Bits	$1795
ST-LSI	64S or 32D	2	LSI-11	DEC	16 Bits	from $ 625
ST-MNOVA	32S or 16D	2	microNOVA	Data General	16 Bits	from $ 630
ST-MNOVA-DA	—	4 or 8	microNOVA	Data General	16 Bits	from $ 630
ST-6800	32S or 16D	2	M6800 EXORciser	Motorola	8 Bits	from $ 419
ST-6800DA	—	4 or 8	M6800 EXORciser	Motorola	8 Bits	$475 $595

*Consult Factory

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DATEL SYSTEMS, INC.

SINETRAC SERIES

SPECIFICATIONS
COMMON TO ALL SINETRAC MODELS

DATA ACQUISITION SECTION (A/D ANALOG INPUTS)

SPECIFICATIONS
(Typical @ +25°C, dynamic conditions, unless otherwise specified)

ANALOG INPUTS

Number of Channels	Up to 64 channels, depends on model.
Channel Expansion	Up to 256 single-ended or differential channels.
Full Scale Input Voltage Ranges	0 to +5 volts 0 to +10 volts −5 to +5 volts −10 to +10 volts
Common Mode Range	±10 volts maximum
Input Overvoltage	±35 volts maximum sustained (no damage)
Input Impedance	100 megohms differential or to ground.
Input Bias Current	3nA typical, 10nA maximum
Input Capacitance	10pF, OFF channel, 100pF, ON channel to ground.

PERFORMANCE

Accuracy @ +25°C	Within ±0.025% of full scale range.
Resolution	12 Binary Bits (1 part in 4096)
Nonlinearity	±½ LSB maximum
Differential nonlinearity	±½ LSB maximum
Gain error	Adjustable to zero
Offset or Zero Error	Adjustable to zero
Gain Temperature Drift	Within ±30ppm of FSR/°C
Offset or Zero Temperature Drift	Within ±7ppm of FSR/°C
Common Mode Rejection	70dB min., DC to 1kHz, with 1 Kilohm unbalance
Power Supply Rejection	100dB to +5V Bus

DYNAMIC CHARACTERISTICS

Throughput Period	20 Microseconds max.
Acquisition Time	12 Microseconds
A/D Conversion Time	8 Microseconds
Aperture Time	50 nanoseconds
Sample/Hold Switch Feedthrough	0.01% Maximum
MUX Crosstalk from OFF Channels	0.01% @ 1KHz

DIGITAL OUTPUTS

Output Coding	Straight Binary (unipolar) Offset Binary (bipolar) 2's Complement (bipolar)	Jumper Selected

POWER CONSUMPTION
2.5 Amps or less typical @ +5VDC supplied from CPU bus connector. On-board DC/DC converter supplies ±15VDC to linear circuits.

PHYSICAL

Operating Temperature Range	0° to +70°C
Storage Temperature Range	−25°C to +85°C

DATA DISTRIBUTION SECTION (D/A ANALOG OUTPUTS)

ANALOG OUTPUTS

Number of Channels	Up to 8 single-ended or 4 single-ended per board.
Channel Expansion	256 Channels addressable
Full Scale Output Voltage Ranges	0 to +5 volts 0 to +10 volts −2.5 to +2.5 volts −5 to +5 volts −10 to +10 volts
Input Coding	Straight Binary (unipolar) Offset Binary (bipolar) 2's Complement (bipolar)
Output Impedance	50 milliohms
Output Current	±5mA min., short circuit proof to ground.

PERFORMANCE

Nonlinearity	±½ LSB, maximum
Differential nonlinearity	±½ LSB maximum
Gain Error	Adjustable to zero using pot for each channel.
Offset or Zero Error	Adjustable to zero using a pot for each channel.
Scan Period Adjust	1 to 10 milliseconds
Gain Temperature Drift	±30ppm of output/°C
Zero Temperature Drift	(Unipolar output) ±5ppm of FSR/°C
Offset Temperature Drift	(Bipolar output) ±15ppm of FSR/°C
Settling Time	4 microseconds to ±½ LSB
Power Supply Rejection	±0.02% of FSR per 1% variation.

HOT LINE PHONES

Datel has provided Hot Line Phones to give you the fastest, best customer service possible. Use these Hot Line phone numbers—for **your** convenience.

DATEL SYSTEMS, INC.
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SANTA ANA, CALIFORNIA (714) 835-2751 / LA EXCHANGE (213) 933-7256 / SUNNYVALE, CALIFORNIA (408) 733-2424

Add Dept. EM to address to tell them you saw it in eem

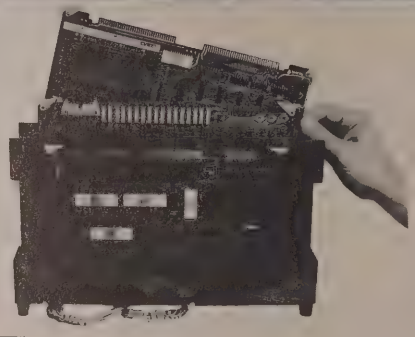
DATEL SYSTEMS, INC.

A/D-D/A COMPUTER PERIPHERALS FOR INTEL'S SBC & MDS COMPUTERS

SINETRAC ST-800

FEATURES

- ▶ 32 SE A/D Channels. per Board. 80 SE or 64 Diff. Channels on 2 Boards, Expandable to 256 Channels
- ▶ 50 KHz Throughput Period
- ▶ Automatic Sequential DMA
- ▶ Paper Tape Programs And Manuals Included
- ▶ D/A Expansion in 4 or 8 Channels/Board



ORDERING INFORMATION

SINETRAC 800 A/D SYSTEMS

ST—800—

NUMBER OF CHANNELS AND TYPE	FULL SCALE INPUT VOLTAGE RANGES	OUTPUT CODING	MODE JUMPER
32S- = 32 Single-ended 16D- = 16 Differential 16S- = 16 Single-ended	Unipolar Ranges A = 0 to +5V B = 0 to +10V Bipolar Ranges C = −5V to +5V D = −10V to +10V	1 = Straight binary, unipolar 2 = Offset binary, bipolar 3 = 2's Complement, bipolar	A = DMA* (Requires Intel's DMA Board) B = Program Control or Program Interrupt* *DMA Mode is installed in all units but is selected using a PC board jumper which can be quickly changed at any time. DMA Mode and Program Control/Program Interrupt cannot be mixed simultaneously but must be changed using the jumper.

SINETRAC 800 D/A SYSTEMS

ST—800—

MASTER OR SLAVE EXPANDER	NO. CHANNELS/CARD AND DC/DC CONVERTER	FULL SCALE OUTPUT VOTAGE RANGE	INPUT CODING
DA = Master DAX = Slave (Master req'd for control)	4 = 4 D/A channels DC/DC conv. included 8 = 8 D/A channels no DC/DC conv. (ext. ±15V pwr req'd)	Unipolar Ranges A = 0 to +5V B = 0 to +10V Bipolar Ranges C = −5V to +5V D = −10V to +10V E = −2.5V to +2.5V	1 = Straight binary, unipolar 2 = Offset binary, bipolar 3 = 2's complement, bipolar

When ordering, contact Datel to identify whether the scan clock will be used and what type of computer will be employed.

A/D SLAVE EXPANDER

ST-800-ADX

NUMBER OF ADDITIONAL* CHANNELS AND TYPE
32S = 32 Single-ended 32D = 32 Differential 48S = 48 Single-ended 48D = 48 Differential *Single-ended and differential channels cannot be mixed.

PRICES

A/D MASTER BOARDS

Model	Description	Price
ST-800-32S	32 Single-ended ..... A/D Channels	$ 650.
ST-800-16D	16 Differential ..... A/D Channels	$ 650.
ST-800-16S	16 Single-ended ..... A/D channels	$ 595.
ST-800-8D	8 Differential ..... A/D channels	$ 595.

A/D SLAVE EXPANDER BOARDS

ST-800-ADX32S	32 Chan. Single-ended ...	$ 395.
ST-800-ADX32D	32 Chan. Differential	$ 495.
ST-800-ADX48S	48 Chan. Single-ended ...	$ 449.
ST-800-ADX48D	48 Chan. Differential	$ 650.

D/A MASTER BOARDS

ST-800-DA8	8 D/A Channels, ... requires ext. ±15V @ .32A	$ 650.
ST-800-DA4	4D/A Channels, ... includes ±15V DC/DC Conv.	$ 559.

D/A SLAVE EXPANDER BOARDS

ST-800-DAX8	8 D/A Channels, ... requires ext. ±15V @ .32A	$ 619.
ST-800-DAX4	4 D/A Channels, ... includes ±15V DC/DC Conv.	$ 495.

4 AND 8 CHANNEL D/A CARDS CAN BE MIXED.

FOR A/D OR D/A EXPANSION AT A LATER DATE, CONTACT DATEL FOR ADDRESS JUMPER INFORMATION

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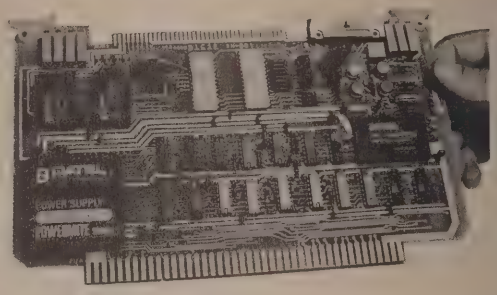
DATEL SYSTEMS, INC.

A/D-D/A COMPUTER PERIPHERALS FOR MOTOROLA'S M6800 EXORcisor

SINETRAC 6800 SERIES

FEATURES

- **32 A/D and 2 D/A Channels on a single board that slides directly into Motorola's M6800 EXORciser Microcomputer.**
- **Expandable up to 128 A/D and /or D/A channels.**
- **Directly compatible with EXBUG and 6800 assembly language programs.**
- **Comprehensive Systems Manual Paper Tape program included.**



A/D-D/A MASTER BOARDS

Model	Description	Price
ST-6800A1A	16 Single-ended A/D, DC/DC incl, no D/A	$495
ST-6800A1B	32 Single-ended A/D, DC/DC incl, no D/A	$550
ST-6800A1C	16 Differential A/D, DC/DC incl, no D/A	$550
ST-6800A2A	16 Single-ended A/D, no DC/DC, no D/A	$419
ST-6800A2B	32 Single-ended A/D, no DC/DC, no D/A	$475
ST-6800A2C	16 Differential A/D, no DC/DC, no D/A	$475
ST-6800B1A	16 Single-ended A/D, DC/DC incl, 2 D/A	$620
ST-6800B1B	32 Single-ended A/D, DC/DC incl, 2 D/A	$650
ST-6800B1C	16 Differential A/D, DC/DC incl, 2 D/A	$650
ST-6800B2A	16 Single-ended A/D, no DC/DC, 2 D/A	$545
ST-6800B2B	32 Single-ended A/D, no DC/DC, 2 D/A	$600
ST-6800B2C	16 Differential A/D, no DC/DC, 2 D/A	$600
ST-6800C1A	16 Single-ended A/D, DC/DC incl, 1 D/A	$555
ST-6800C1B	32 Single-ended A/D, DC/DC incl, 1 D/A	$610
ST-6800C1C	16 Differential A/D, DC/DC incl, 1 D/A	$610
ST-6800C2A	16 Single-ended A/D, no DC/DC, 1 D/A	$480
ST-6800C2B	32 Single-ended A/D, no DC/DC, 1 D/A	$540
ST-6800C2C	16 Differential A/D, no DC/DC, 1 D/A	$540

All systems include a systems manual and appropriate diagnostic program on paper tape.

D/A MASTER BOARDS

Model	Description	Price
ST-6800DA4A	4 D/A Channels DC/DC incl	$535
ST-6800DA4B	4 D/A Channels no DC/DC Conv.	$475
ST-6800DA8B	8 D/A Channels no DC/DC Conv.	$595

A/D EXPANDER BOARDS*

ST-6800ADX32S	32 Single-ended	$295
ST-6800ADX32D	32 Differential	$395
ST-6800ADX48S	48 Single-ended	$345
ST-6800ADX48D	48 Differential	$495

***A/D Channel Capacity**
128 Single-Ended Channels total max:
(1) 32-Chan. SE Master Board
(2) 48-Chan. SE Slave Expanders
(1) ST-800-11222B Cable
112 Differential Channels total max:
(1) 16-Chan. Diff. Master Board
(2) 48-Chan. Diff. Slave Expanders
(1) ST-800-11222B Cable

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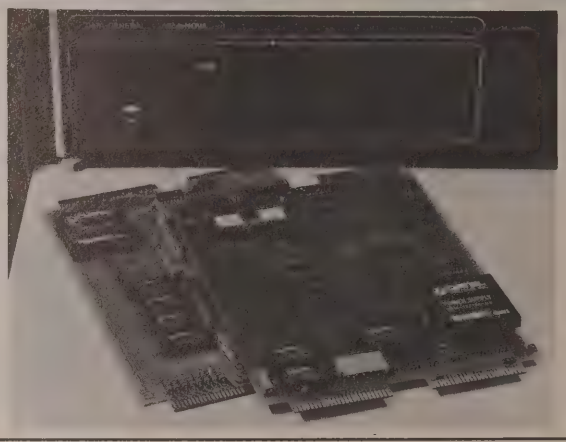
DATEL SYSTEMS, INC.

A/D-D/A COMPUTER PERIPHERALS FOR DATA GENERAL'S microNOVA

SINETRAC MNOVA SERIES

FEATURES

- 32 A/D and 2 D/A Channels on a single board that slides directly into Data General's micro NOVA Microcomputer.
- Expandable up to 256 A/D and/or D/A channels.
- Prices from $630 (16 A/D chans, no D/A, no DC/DC conv.).
- Speeds up to 45,000 A/D Samples per second.
- 12-Bit Digital output port available on D/A boards.
- Directly compatible with NOVA series assembly language programs, NOVA BASIC and other languages.
- Comprehensive Systems Manual and Paper Tape Diagnostic Program included for immediate teletypewriter printout.
- Choice of program control, Interrupt or DMA.



SineTrac microNOVA A/D - D/A MASTER BOARD

ST-MNOVA ____ ____ ____ ____

Number of A/D Channels	Number of D/A Channels	DC/DC Power Converter	A/D Gain*
16S = 16 Single-ended	1 = One D/A	D = Included	1 = Fixed Gain ±10V, 2's Complement coding (User may rewire to other ranges and coding)
32S = 32 Single-ended	2 = Two D/A's	X = Not Included (External ±15V @ 150 mA is required)	2 = Bit-Programmable Gain Differential Amplifier (PGA). ×1,2,4,8 Gains
16D = 16 Differential*	3 = No D/A's (A/D's Only)		3 = Differential Instrumentation Amplifier, user-selected fixed gain resistor, ×1 to ×1000

*For differential systems, the PGA or Differential Instrumentation Amplifier **must** be used.
All models do not include Data General MN603 and MN636 Controller Circuits.
All models will be ±10V, 2's complement coding
Users may rewire other ranges and coding.

PRICES

	Price, Single Quantity
Model ST-MNOVA32S3X1..... (16 Single-ended A/D channels, no D/A, no PS, fixed gain). Does not include Data General MN603 and 636 controller circuits.	$630
For 16 additional A/D channels (16D or 32S total).....	Add $40
For each D/A channel.....	Add $60
For the ±15V DC/DC Power Converter.....	Add $80
For programmable gain amplifier (X1, X2, X4, X8 Gains).....	Add $125
For differential instrumentation amplifier (User-selected fixed gain resistor, X1 to X1000).....	Add $90

STAND-ALONE D/A BOARDS

MODEL NUMBER	NOTES	PRICE (SINGLE QUANTITY)
ST-MNOVA-DA4A	DC/DC Power Converter is Included	$630
ST-MNOVA-DA4B	No DC/DC Converter (External ±15 Vdc Power @ 160 mA is required)	$550
ST-MNOVA-DA8B	No DC/DC Converter (External ±15 Vdc Power @ 320 mA is required)	$785

SLAVE A/D MULTIPLEXER CHANNEL EXPANDERS

(An A/D-D/A Master Board is required for control)

MODEL NUMBER	NOTES	PRICE (SINGLE QUANTITY)
ST-MNOVA-ADX64S	Adds 64 additional single-ended channels.	$345
ST-MNOVA-ADX32D	Adds 32 additional differential channels. The PGA or Diff. Inst. Ampl. on the master board is required.	$345

NOTE: Single-ended and differential inputs cannot be mixed.

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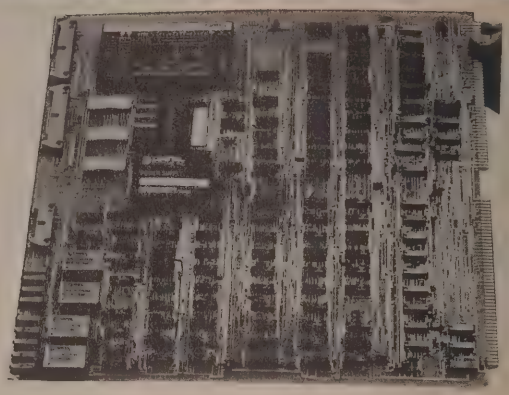
DATEL SYSTEMS, INC.

A/D-D/A COMPUTER PERIPHERAL FOR DATA GENERAL'S NOVA SERIES

SINETRAC NOVA SERIES

FEATURES

- **64 A/D and 4 D/A Channels on a single board that slides directly into Data General's NOVA series minicomputers.**
- **Expandable up to 256 A/D and/or D/A channels.**
- **Speeds up to 45,000 A/D Samples per Second**
- **Choice of Program Control, Interrupt, or DMA**
- **Comprehensive Systems Manual and Paper Tape Diagnostic Program Included**



ORDERING INFORMATION

ST-NOVA

A/D - D/A Location

A/D	D/A
1 = On-board	On-board
2 = None	On-board
3 = On-board	None
4 = On-board	Remote
5 = Remote	On-board
6 = Remote	Remote
7 = Remote	None
8 = None	Remote

Remote refers to A/D and/or D/A contained in the System 256 housing. System 256 must be ordered separately. Remote models delete certain analog signal components.

Configuration

S = Single-ended 64 A/D Channels*
D = Differential 32 A/D Channels*
X = Use for no on-board A/D Channels

* On-board A/D configurations are supplied with a capacity of 64 single-ended or 32 differential channels.

System Data Coding

1 = Straight Binary (unipolar) or Offset Binary (bipolar), with no sign extension
2 = 2's Complement (bipolar), with sign extension

Full Scale A/D Input Range

A = 0 to +5V
B = 0 to +10V
C = ±5V
D = ±10V
X = Use if on-brd A/D's are not included

A/D Resolution

1 = 8 Bits*
2 = 10 Bits*
3 = 12 Bits*
4 = 14 Bits*
5 = Use if A/D's are not included

*On-board A/D's must be 12 bits. This designator determines bit-positioning for both on-board and remote A/D's.

Full Scale D/A Output Range

A = 0 to +5V
B = 0 to +10V
C = ±5V
D = ±10V
X = Use if on-brd D/A's are not included

D/A Resolution

1 = 12 Bits*
2 = 14 Bits*
3 = Use if D/A's are not included

*On-board D/A's must be 12 bits. D/A's with 12 and 14 bit resolution will accept 8 and 10 bit inputs. Bits may be repositioned for desired voltage output swing. This designator determines bit-positioning for both on-board and remote D/A's.

SYSTEM 256 (REMOTE A/D-D/A) MUST BE ORDERED SEPARATELY IF USED

PRICES (Single Quantity)

MODEL	PRICE
ST-NOVA1	$1795.00
ST-NOVA2	$1345.00
ST-NOVA3	$1445.00
ST-NOVA6	$1070.00
ST-NOVA7	$1070.00
ST-NOVA8	$1070.00

System 256 On-Board/Remote Models

ST-NOVA4	$1445.00
ST-NOVA5	$1345.00

System 256/ST-NOVA I/O Cable Model

ST-NOVA-11128-1	$345.00

CONTACT DATEL FOR A FULL BROCHURE

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DATEL SYSTEMS, INC.

A/D-D/A COMPUTER PERIPHERALS FOR DEC'S LSI-11

SINETRAC LSI SERIES

FEATURES

- **64-channel analog input (A/D) and 2 output (D/A) channels fit directly inside DEC's LSI-11 series mini-computer.**
- **Data acquisition rates up to 25,000 samples per second.**
- **Two modes of programming.**
  - **Program-controlled mode**
  - **program-interrupt mode**
- **Expandable up to 256 A/D and/or 256 D/A channels.**
- **12-bit analog resolution with choice of coding and voltage ranges.**

A/D-D/A MASTER BOARD
Model Numbering

ST-LSI

Number of A/D Channels	Number of D/A Channels	Programmable Gain Amplifiers or Instrumentation Amplifiers	DC/DC Power Converter
32S = 32 Single-ended	Ø = No D/A's	P = PGA	1 = Included
16D = 16 Differential*	2 = 2 D/A Channels	D = Differential Instrumentation Amplifier (User-selected fixed gain)	2 = Not Included (Extra ±15V Power Required)
16S = 16 Single-ended		X = None (SE Only)	

Standard inputs are ±10V full scale and 2's complement coding. Users may rewire jumpers for other ranges and coding.

*For differential systems, the PGA or Differential Instrumentation Amplifier must be used.

PRICES — A/D-D/A MASTER BOARD

	Price, Single Quantity
MODEL ST-LSI16SØX2 (16 SE A/D Channels, no D/A, no PS)	$625
For 16 Additional A/D Channels (16D or 32S Total)	Add $ 40
For 2 D/A Channels (Includes current outputs)	Add $180
For Programmable Gain Amplifier (x1,x2,x4,x8 Gains)	Add $125
For Differential Instrumentation Amplifier (User-selected fixed gain resistor, x1 to x1000)	Add $ 90
For the ±15V DC/DC Power Converter	Add $ 80

Choose Only one

SLAVE A/D MULTIPLEXER CHANNEL EXPANDERS:
Model Numbering

(An A/D-D/A Master Board is Required for Control)

MODEL NUMBER	NOTES	PRICE (SINGLE QUANTITY)
ST-LSI-ADX32S	Adds 32 additional single-ended channels	$295
ST-LSI-ADX16D	Adds 16 additional differential channels. The PGA or Differential Instumentation Amplifier on the master board is required.	$295

NOTE: Single-ended and differential inputs cannot be mixed.

STAND-ALONE 4-CHANNEL D/A BOARDS:
Model Numbering

MODEL NUMBER	NOTES	PRICE (SINGLE QUANTITY)
ST-LSI-DA4A	DC/DC Power Converter is included	$535
ST-LSI-DA4B	No DC/DC Converter (External ±15 Vdc power @ 160 mA is required.	$475

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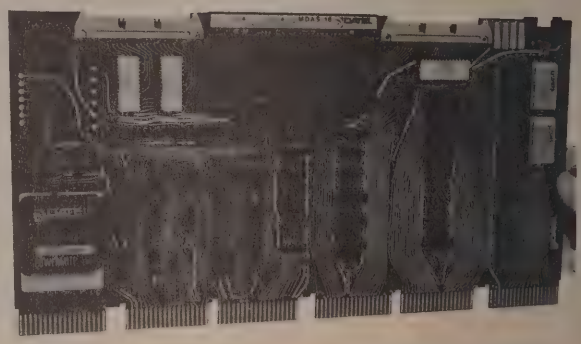
DATEL SYSTEMS, INC.

A/D-D/A PERIPHERALS FOR DEC'S PDP-11'S

SINETRAC PDP SERIES

FEATURES

- ▶ 64 A/D channels plus 2 D/A channels optional on one slide-in PDP 11 board
- ▶ A/D Throughput period 20 microseconds—provides data bursts in DMA mode up to 45,000 samples per second
- ▶ Three Scan Start Methods
  1. Program scan start (via interrupt or program instruction)
  2. DMA-board adjustable scan timer
  3. External start pulse
- ▶ Fast Automatic Sequential DMA Addressing, Lowest CPU Overhead. On-board channel address counters and start/final address logic
- ▶ Complete Systems manuals included.
- ▶ Paper Tape diagnostic programs included.
- ▶ Three Programming Methods
  1. Program Control Interface (PCI)
  2. Interrupt Service Interface (ISI)
  3. Direct Memory Access (DMA)



THREE SYSTEM LEVELS

The Sine Trac PDP is available in 3 versions:

1. A/D-D/A slide-in cards only. 64 single-ended A/D channels for only $1295 including manual and programs.
2. A/D-D/A card plus a wire-wrapped connector block, accessory cards and I/O cables.
3. As an interface to Datel's high performance System 256 remote A/D-D/A housing.

PRICE LIST

SineTrac Card Only ST-PDP1X Series

Model*	Description	Price (Singles)
ST-PDP1X1C5___	64 SE or 32 Diff. A/D Chan., no D/A Chans.	$1235.00
ST-PDP1X2E X__	No A/D, 2D/A Chan.	$ 935.00
ST-PDP1X3C____	64 SE or 32 Diff. A/D Chan., 2 D/A Chan	$1315.00

SineTrac Card plus Accessory Cards ST-PDP2 Series

Model*	Description	Price (Singles)
Program Control Interface		
ST-PDP2P1C5___	64 SE or 32 Diff. A/D Chan., no D/A Chans.	$2385.00
ST-PDP2P2E X__	No A/D Chan., 2 D/A Chan.	$2085.00
ST-PDP2P3C____	64 SE or 32 Diff. A/D Chan., 2 D/A Chan.	$2465.00
Interrupt Service Interface		
ST-PDP2S1C5___	64 SE or 32 Diff. A/D Chan., no D/A Chan.	$2385.00
ST-PDP2S3C____	64 SE or 32 Diff. A/D Chan., 2 D/A Chan.	$2465.00
Direct Memory Access		
ST-PDP2D1C5___	64 SE or 32 Diff. A/D Chan., no D/A Chan.	$2625.00
ST-PDP2D3C____	64 SE or 32 Diff A/D Chan., 2 D/A Chan.	$2700.00

SineTrac/System 256 Configuration with ST-PDP Card, and Accessory Cards ST-PDP3 Series

Model*	Description	Price (Singles)
Program Control Interface		
ST-PDP3P4C____	64 SE or 32 Diff. On-board A/D Chans., Remote D/A Chans.	$2700.00
ST-PDP3P5_____	Remote A/D Chans., 2 On-board D/A Chans.	$2430.00
ST-PDP3P6_____	Remote A/D Chans., Remote D/A Chans.	$2570.00
ST-PDP3P7	Remote A/D Chans., no D/A Chans.	$2570.00
ST-PDP3P8_____	No A/D Chans., Remote D/A Chans.	$2570.00
Interrupt Service Interface		
ST-PDP3S4C____	64 SE or 32 Diff. On-board A/D Chans., Remote D/A Chans.	$2730.00
ST-PDP3S5_____	Remote A/D Chans., 2 On-board D/A Chans.	$2430.00
ST-PDP3S6_____	Remote A/D Chans., Remote D/A Chans.	$2530.00
ST-PDP3S7_____	Remote A/D Chans., no D/A Chans.	$2530.00
Direct Memory Access		
ST-PDP3D4C____	64 SE or 32 Diff. On-board A/D Chans., Remote D/A Chans.	$2975.00
ST-PDP3D5_____	Remote A/D Chans. 2 On-board D/A Chans	$2675.00
ST-PDP3D6_____	Remote A/D Chans., Remote D/A Chans.	$2815.00
ST-PDP3D7_____	Remote A/D Chans., no D/A Chans.	$2815.00

*Note: These are not complete model numbers. Refer to the model number structure to fill in the spaces designating variations.

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DATEL SYSTEMS, INC.

SYSTEM 256

HIGH PERFORMANCE ANALOG I/O SYSTEM

FEATURES

- **Expansion to 512 single-ended A/D channels or 64 D/A channels**
- **A/D resolution up to 14 bits at 60 microseconds throughput period**
- **A/D throughput periods down to 4 microseconds for DMA I/O rates up to 200,000 samples/second**
- **Relay multiplexer option for 300V RMS common mode voltage with very high isolation**
- **Up to 32 Simultaneous Sample/Hold amplifiers for fast dynamic events**
- **Minicomputer-style, LED/Toggle Switch, binary front panel**
- **Datel SineTrac interfaces to PDP-11, NOVA, SBC-80, BLC-80**

System 256 is a complete high reliability computer input-output system for analog signals. It is capable of operating *on-line* or *off-line.* It has been designed to provide a versatile and permanent solution to the problem of interfacing analog signals to and from a digital computer. The modular principle used throughout enables the user to realize the most economic solution to any problem while maintaining maximum flexibility. Further expansion to an initial system is made by plug-in cards.

A wide range of options outlined elsewhere in this catalog allows a comprehensive system to be specified for applications to an instrumentation or control problem.

System 256 offers the flexibility, speed, economy and reliability necessary in today's world of real time applications.

It can function as an interface between an analog and digital computer in hybrid computer systems or as a peripheral device for general purpose digital computers.

It fills a growing need in industrial process control systems.

The ability to mix Analog Multiplexers, A/D's, Sample and Hold amplifiers and D/A's in virtually any configuration makes System 256 a valuable and dynamic systems tool.

GENERAL DESCRIPTION

The most unique feature of System 256 is its large analog input channel capacity while at the same time providing extremely low power consumption. The power consumed is a fraction of any system offered today while providing four times the channel capacity in the same package area. System 256 offers up to 256 analog channels and 32 Digital-to-Analog channels in a 19"Wx19"Dx3.5"H rack mounted enclosure, while competitors' systems offer 64 analog channels and 8 Digital-to-Analog channels in the same area, and still System 256 consumes less power. System 256 utilizes C/MOS (Complementary Metal Oxide Silicon) logic throughout.

C/MOS logic provides the necessary high-speed capability while at the same time drastically reduces power consumption. The quiescent power consumed by C/MOS logic is extremely low, or more precisely, the product of the supply voltage and the leakage current of the device (measured in pA). Its dynamic power consumption is somewhat more complex in that it is dependent on the supply voltage, operating speed and load capacitance. With a supply voltage

of +15V operating at IMHz into 15pF, the dynamic power consumption per logic function is approximately ImW. When this is compared with TTL logic at approximately 10.5mW per logic function, both quiescent and dynamic, it can be seen that a considerable reduction in power dissipation throughout the system will result by using C/MOS logic rather than TTL or DTL logic. The advantages of this low power dissipation in the system are obvious — less drift due to temperature rise, smaller power requirements, no cooling required, and more hardware per area.

SYSTEM DESCRIPTION

System 256 is designed to accept up to 256 single-ended or 128 differential analog signals plus 64 simultaneous sample & hold channels in the basic package. The analog inputs are multiplexed one at a time into a high impedance buffer amplifier then supplied to a sample & hold amplifier. The buffered analog signals are converted to digital data via a high speed successive approximation Analog to Digital Converter of up to 14 bits. The analog multiplexing process may be accomplished in either a sequential scan or a random address mode of operation. The digital output data is then fed to an LSB (least significant bit) positioning circuit which assures that regardless of the resolution of the converter, the LSB will always be on the extreme right hand position. This is in compliance with most minicomputer programming requirements.

THROUGHPUT TIME	A/D RESOLUTION			
	8 Bits	10 Bits	12 Bits	14 Bits
100 KHz	√	√ (opt)	√ (opt)	
70 KHz		√ (opt)		
50 KHz		√	√	
17 KHz				√

SYSTEM THROUGHPUT TIME VS RESOLUTION

250 KHz., 12 Bits Optional

Display and Control in both the Local and Remote mode of operation are provided on the front panel. This includes an LED display of digitized input data and A/D-D/A channel address. The Local Control features allow selection of input A/D channel address via an advance pushbutton switch, continuous conversion cycles on the same channel via a convert pushbutton switch, D/A channel address and manual insertion of D/A data via toggle switches.

Contained in the same package are provisions for supplying up to 32 Digital to Analog Converters. This conversion process again utilizes the LSB positioning circuit and is supplied with C/MOS storage registers. The Digital to Analog Converters accept up to 12 binary bits and generate an analog output corresponding to the selected channel. Four standard voltage range outputs are supplied to provide up to 10 milliamperes.

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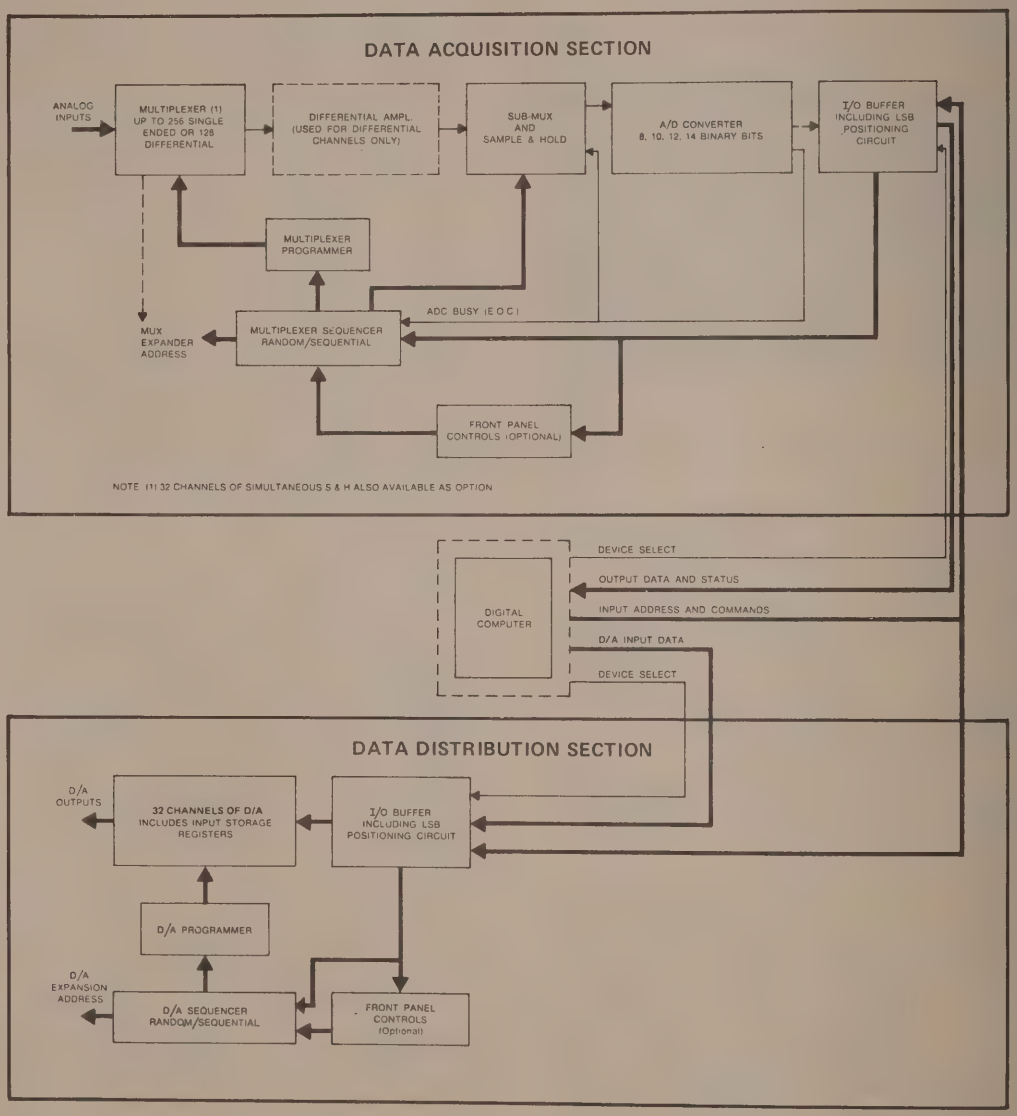
SYSTEM 256 BLOCK DIAGRAM


DATA ACQUISITION SECTION
ANALOG INPUTS
MULTIPLEXER (1) UP TO 256 SINGLE ENDED OR 128 DIFFERENTIAL
DIFFERENTIAL AMPL. (USED FOR DIFFERENTIAL CHANNELS ONLY)
SUB-MUX AND SAMPLE & HOLD
A/D CONVERTER 8, 10, 12, 14 BINARY BITS
I/O BUFFER INCLUDING LSB POSITIONING CIRCUIT
MULTIPLEXER PROGRAMMER
ADC BUSY (E.O.C.)
MUX EXPANDER ADDRESS
MULTIPLEXER SEQUENCER RANDOM/SEQUENTIAL
FRONT PANEL CONTROLS (OPTIONAL)
NOTE (1) 32 CHANNELS OF SIMULTANEOUS S & H ALSO AVAILABLE AS OPTION
DIGITAL COMPUTER
DEVICE SELECT
OUTPUT DATA AND STATUS
INPUT ADDRESS AND COMMANDS
D/A INPUT DATA
DEVICE SELECT
DATA DISTRIBUTION SECTION
D/A OUTPUTS
32 CHANNELS OF D/A INCLUDES INPUT STORAGE REGISTERS
I/O BUFFER INCLUDING LSB POSITIONING CIRCUIT
D/A PROGRAMMER
D/A EXPANSION ADDRESS
D/A SEQUENCER RANDOM/SEQUENTIAL
FRONT PANEL CONTROLS (Optional)

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SYSTEM 256 SPECIFICATIONS

PARAMETER	A/D SECTION
ANALOG INPUTS	
Number of Multiplexer Channels Single Ended Input	Expandable to 256 channels in 16 channel increments
Number of Multiplexer Channels Diff. Input (Optional)	Expandable to 128 channels in 8 channel increments
Number of Simultaneous Sample/Hold Channels	Expandable to 64 channels in 2 channel increments
Input Voltage Ranges	+5V FS, + 10V FS, ± 5V FS, ± 10V FS
Channel Input Acquisition Time	5usec to ± 0.025% of FS
Channel Input Impedance	100 Megohms—"on" or "off"
Input Configuration	Single ended or Differential
Maximum Input Overload	± 15V
Input Channel Time Skew Simultaneous S/H Section	50nsec
Maximum Common Mode Voltage — (3)	Any Combination of 20V P to P — Es + ECM
Common Mode Input Impedance — (3)	>100 Megohms
Common Mode Source Impedance — (3)	1 Kohms unbalanced
Common Mode Rejection Ratio — (3)	60db @ 1 KHz 80db @ 60 Hz
Crosstalk (Between inputs)	80db @ 100 Hz 45db @ 10MHz
SYSTEM PERFORMANCE	
Output Resolution	8, 10, 12, 14 binary bits
Output Data Coding (4)	Straight Binary — unipolar input Offset Binary — bipolar input 2's Complement — bipolar input
Throughput Rate	8 Binary Bits—100 KHz 10 Binary Bits—50 KHz 10 Binary Bits—70 KHz (opt.) 12 Binary Bits—50 KHz 14 Binary Bits—17 KHz
Aperture Time	50nsec
Accuracy	± 0.02% of FS ± ½ LSB
Temperature Coefficient	40ppm/°C
Throughput Rate	up to 100 KHz (250 KHz. Optional)
Linearity	± ½ LSB
DIGITAL CONTROL INPUTS	
Device Select	1 line, 1 TTL Load—Negative True
Random/Sequential	1 line, 1 TTL Load—Negative True (seq.)
Reset	1 line, 1 TTL Load—Negative True
Strobe	1 line, 1 TTL Load—Negative True
Convert Command Input	1 line, 1 TTL Load—Negative True
Random Address Inputs	9 lines, 1 TTL Load—Negative True
DIGITAL OUTPUTS	
A/D Converter Data	Up to 14 parallel lines—TTL Compatible (1)
Serial Output Train	1 line—TTL Compatible (1)
Busy (E.O.C.)	1 line—TTL Compatible (1)
Frame Sync	1 line—TTL Compatible (1)
A/D Clock	1 line—TTL Compatible (1)
Input Strobe Output	1 line—TTL Compatible (1)
Output Strobe Output	1 line—TTL Compatible (1)
Buffer Full Output	1 line—TTL Compatible (1)
FRONT PANEL CONTROLS	
Output Data Display	Up to 14 Bits of A/D Data Read Out
Channel Address Switches	Address Multiplexer in Random Mode
Channel Address Lamps	Display Multiplexer Position
A/D Mode Switch	Selects A/D Operation
A/D Convert Switch	Will Initiate an A/D Conversion
Reset Switch	Resets Multiplexer to Channel One
Random/Sequential Switch	Selects Multiplexer Mode of Operation
Advance Switch	Random Mode—Will Select Addressed Channel Sequential Mode—Will Advance to Next Higher Channel
Local/Remote Switch	Selects Source of System Control. Front Panel Controls or Computer
Last Channel Selector	Short Cycle Multiplexer in Sequential Mode
Power ON/OFF Switch	Applies AC power to System
MECHANICAL—ENVIRONMENTAL	
Operating Temperature Range	0°C to +70°C
Storage Temperature Range	-55°C to 85°C
Relative Humidity	10% to 90% Non-condensing
Physical Size	3½" H x 19"W x 19"D
Weight	12 LBS (Typ.)
I/O Mating Connectors	Up to Eleven Viking #3VH25/IJN5
Input Power	115 VAC ±10 VAC @ 47-63Hz., 100W max 225 VAC ±15 VAC @ 47-400Hz., (opt.)

(1) Open Collector. Will Sink 30 ma
(2) Optional
(3) Pertains only to Differential Input
(4) Contact Factory for Binary Coded Decimal

PARAMETER	D/A SECTION
DIGITAL INPUTS	
Number of Channels	Expandable to 32 channels in 1 channel increments
Resolution	8, 10, 12, 14 Binary Bits
Digital Coding (3)	Straight Binary Offset Binary Two's Complement
Data Inputs	DTL or TTL compatible Negative True Logic Loading: one TTL Load
Data Strobe	Information must be present at the register inputs of the DAC prior to strobing. Loading: one TTL Load
Update Rate	500 KHz
ANALOG OUTPUT	
Number of Analog Outputs	up to 32 channels
Accuracy	±0.01% of FS ±½ LSB
Output Voltage Range (2)	0V to + 10V FS 0V to + 5V FS ±10V FS ± 5V FS
Output Current	±5mA typ.
Output Loading	1 Kohms for + 10V Output 500 ohms for + 5V Output
Output Settling Time	2 usec to ±0.025% of FS
Resolution	±1 LSB
Linearity	±½ LSB
Temperature Coefficient	±20ppm/°C of FS
Long Term Stability	±0.01%/6 month period
Reference Source	Internal
DIGITAL CONTROL INPUTS	
Device Select	1 line, 1 TTL Load—Negative True
Random/Sequential	1 line, 1 TTL Load—Negative True (seq.)
Reset	1 line, 1 TTL Load—Negative True
Strobe	1 line, 1 TTL Load—Negative True
Convert Command Input	1 line, 1 TTL Load—Negative True
Random Address Inputs	9 lines, 1 TTL Load—Negative True
DIGITAL OUTPUTS	
Input Strobe Output	1 line, TTL Comp. (1)
FRONT PANEL CONTROLS	
Input Data Switches	Allows Manual Loading of Data Into Each D/A
Channel Address Switches	Address D/A's in Random Mode
Channel Address Lamps	Display D/A Channel Position
D/A Mode Switch	Selects D/A Operation
D/A Strobe Switch	Will Initiate a D/A Conversion
Reset Switch	Resets D/A's to Channel One
Random/Sequential Switch	Selects Mode of Operation
Advance Switch	Random Mode—Will Select Addressed Channel Sequential Mode—Will Advance to Next Higher Channel.
Local/Remote Switch	Selects Source of System Control. Front Panel Controls or Computer.
Last Channel Selector	Short Cycle D/A Channels in Sequential Mode
Power On/Off Switch	Applies AC Power to System
MECHANICAL—ENVIRONMENTAL	
Operating Temperature Range	0°C to + 70°C
Storage Temperature Range	-55°C to + 85°C
Relative Humidity	10% to 90% Non-condensing
Physical Size	3½"Hx19"Wx19"D
Weight	12 LBS (Typ.)
I/O Mating Connectors	Viking #3VH25/IJN5
Input Power	115VAC±10VAC @ 47- 63Hz 225VAC±15VAC @ 47-63Hz (opt.)

(1) Open Collector. Will Sink 30ma
(2) Fast Settling Current Output Available on Special Order
(3) Contact Factory for Binary Coded Decimal

FOR IMMEDIATE APPLICATION ASSISTANCE —

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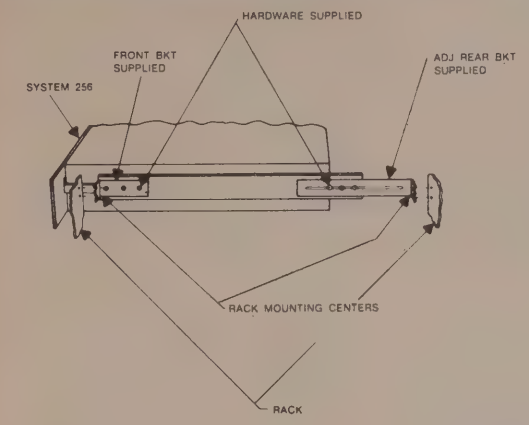
STANDARD INPUT AND OUTPUT PULLUP RESISTORS ARE 1 KILOHM. OTHER TERMINATION AVAILABLE ON SPECIAL ORDER.

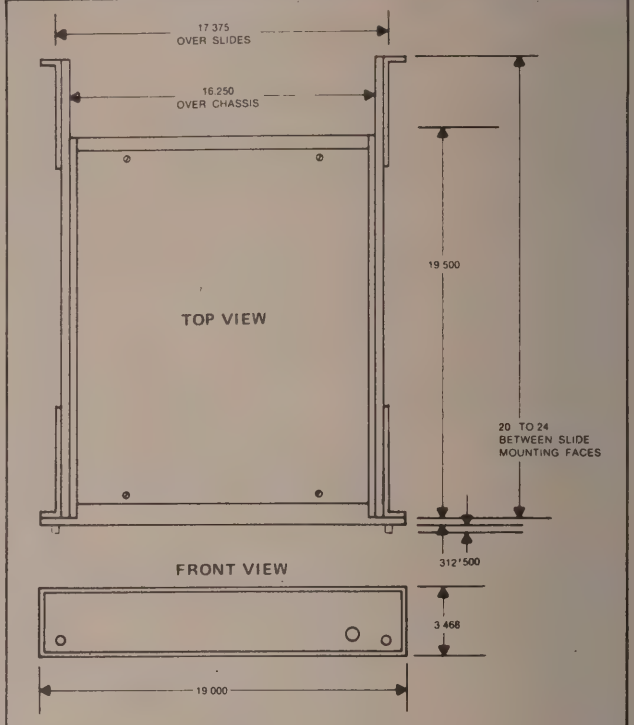
MECHANICAL DIMENSIONS

SYSTEM 256 IS AVAILABLE UNDER
GSA CONTRACT NO. GS-00S-29002



SIDE VIEW

MOUNTING SYSTEM 256



SPECIFYING SYSTEM 256 TO MEET YOUR PARTICULAR NEEDS

DAS–256–

NUMBER OF ANALOG MULTIPLEXER CHANNELS (3)
( ) = SINGLE ENDED INPUT – FROM 32 TO 256 INCREMENTS OF 32 CHANNELS
( ) = DIFFERENTIAL INPUT – FROM 16 TO 128 INCREMENTS OF 16 CHANNELS

NUMBER OF SIMULTANEOUS SAMPLE/HOLD CHANNELS (1)
1 = ZERO CHANNELS
( ) = NUMBER OF CHANNELS FROM 2 TO 64 INCREMENTS OF 2 CHANNELS SINGLE ENDED INPUT ONLY

A/D RESOLUTION, OUTPUT CODING AND SYSTEM THROUGHPUT RATE
88 = 8 BINARY BITS-100KHz THROUGHPUT RATE
108 = 10 BINARY BITS– 50KHz THROUGHPUT RATE
128 = 12 BINARY BITS– 50KHz THROUGHPUT RATE
148 = 14 BINARY BITS– 17KHz THROUGHPUT RATE
8D = 2 BCD DIGITS
12D = 3 BCD DIGITS

MULTIPLEXER INPUT CONFIGURATION
S = SINGLE ENDED–256 CHANNELS MAX.
D = DIFFERENTIAL–128 CHANNELS MAX.

FULL SCALE ANALOG INPUT
A = 0V TO +5V
B = 0V TO +10V
C = ±5V
D = ±10V
E = OTHER

SYSTEM OUTPUT DATA FORMAT
1 = STRAIGHT BINARY (UNIPOLAR INPUT)
2 = OFFSET BINARY (BIPOLAR INPUT)
3 = 2's COMPLEMENT (BIPOLAR INPUT)
4 = BINARY CODED DECIMAL (UNIPOLAR INPUT)

DDS–32– – – – –

NUMBER OF D/A CHANNELS (1)
( ) FROM 1 TO 32 INCREMENTS OF 1 CHANNEL

D/A RESOLUTION
8B = 8 BINARY BITS
10B = 10 BINARY BITS
12B = 12 BINARY BITS
14B = 14 BINARY BITS

INPUT DATA FORMAT
A = STRAIGHT BINARY (UNIPOLAR OUTPUT)
B = OFFSET BINARY (BIPOLAR OUTPUT)
C = 2's COMPLEMENT (BIPOLAR OUTPUT)
D = BINARY CODED DECIMAL (UNIPOLAR OUTPUT)

FULL SCALE OUTPUT VOLTAGE RANGE
1 = 0V TO +5V
2 = 0V TO +10V
3 = ±5V
4 = ±10V

NOTE: (1) D/A Channels are Limited to 16 when any number of Simultaneous SAMPLE/HOLD Channels are ordered. Otherwise up to 32 D/A Channels may be ordered.

(2) When Both A/D and D/A Sections Are Required, Make the Appropriate Selection Using Both Ordering Numbers.
Example A/D Section: DAS-256-32-S-A-88-1
Example D/A Section: DDS-32-16-8B-A-4
Also specify one or two device select lines.

(3) Single Ended Inputs and Differential Inputs Cannot be Combined.

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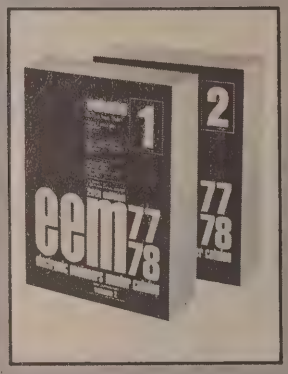

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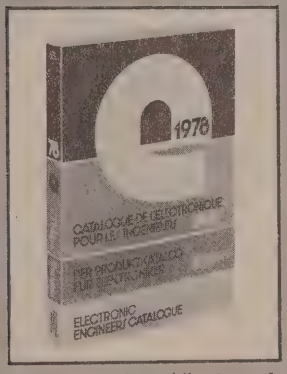

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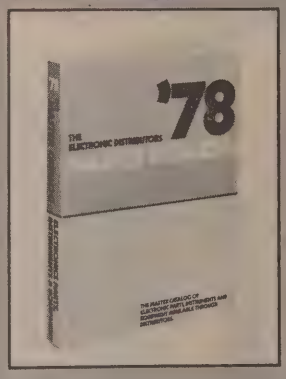

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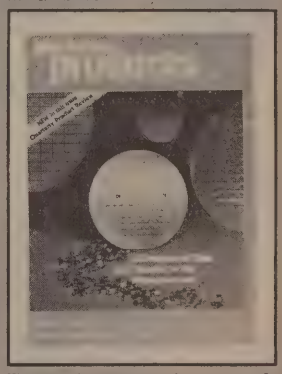

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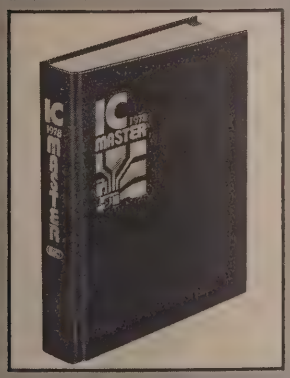

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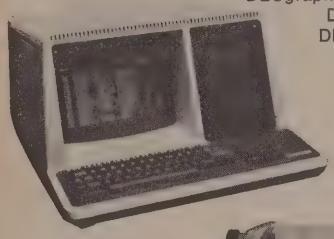

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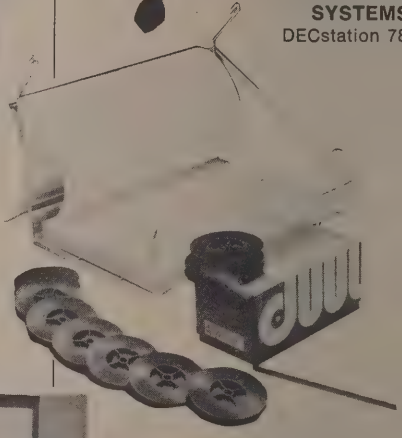

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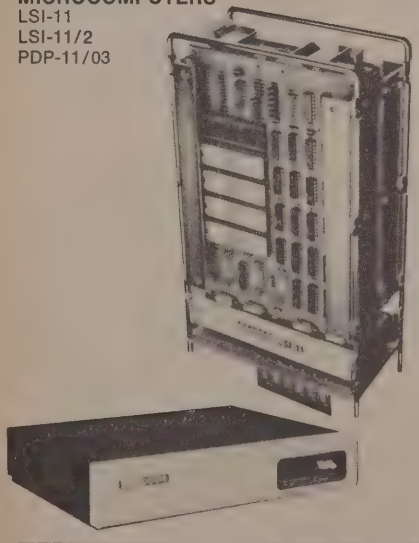

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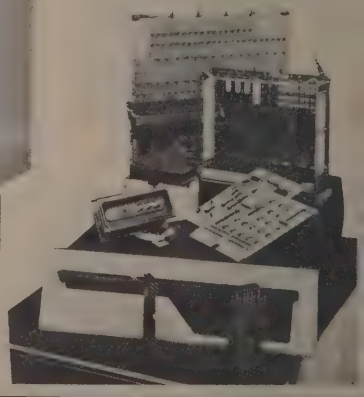

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Welcome

to the fourth edition of DIGITAL's Direct Sales Catalog. This new edition continues our tradition of offering you the latest technology products in computer hardware, supplies, and accessories.

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We believe that once you try purchasing the Direct Sales Catalog way, these catalog shopping advantages will prove themselves to you.

For details on how to place your orders, check the How to Order section beginning on page 154.

NEW in this edition

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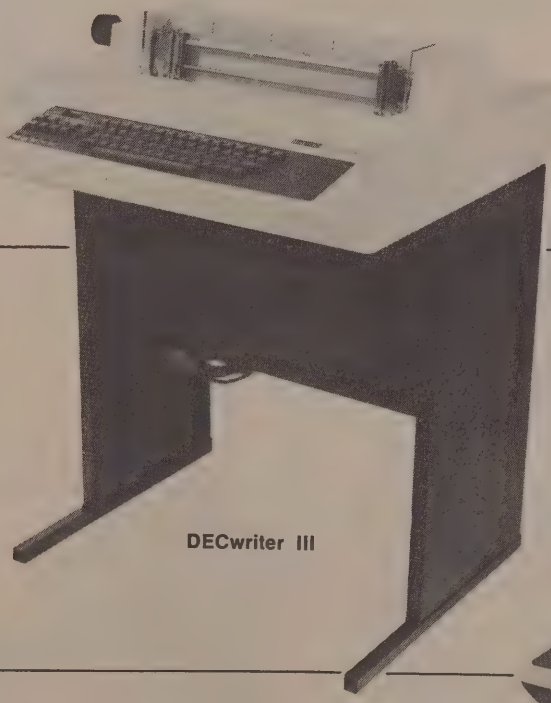
DECprinter I

DECwriter II



DECwriter III

DECscopes
DECgraphic Scopes

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The Direct Sales Catalog is: TERMINALS

Sophisticated computer systems demand reliable terminals. That's why DIGITAL manufactures its own. In fact DIGITAL manufacturing facilities are dedicated solely to the production of interactive terminals. What does this mean to you? Ultra reliable products with MTBF's (Mean Time Between Failure) measured in thousands of hours and millions of trouble-free data transactions. Video terminals, graphic terminals, hardcopy terminals, high speed printer terminals are all made to the same exacting quality standards — quality standards that the industry equates with the name DIGITAL.

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LA35 & LA36 DECWRITER II

PRINTER TERMINALS 30 CPS

Priced from $1520

LA35

LA36

Priced from $1595

- *Office-environment quietness.*
- *True 30-character-per-second printing throughput.*
- *Full 132-character line length.*
- *10 characters per inch standard. 16.5 optional. 6 lines per inch vertically.*
- *Upper and lower case printing plus numerics and symbols.*
- *ANSI typewriter keyboard on LA36. APL characters optional.*
- *Multipart forms up to 6 high.*
- *Form width variable from 3 to 14⅞".*
- *ASCII 128 character set (and keyboard on LA36).*
- *Numeric keypad, LA36 only.*
- *Asynchronous data transmission at switch selectable baud rates of 300, 150, and 110.*
- *20 mA current loop interface or EIA RS-232C.*
- *Full-duplex or half-duplex with local copy option.*
- *Buffer memory option for dynamic editing with store and forward capability on LA36.*

DECwriter II is a fast, small, quiet 300-baud interactive hard copy terminal. It functions as an economical, remote or local hard copy input/output device to a host computer. Priced competitively with comparable printer terminals, DECwriter II features improved throughput, reliability, print quality, and forms handling versatility. It is a true 30 characters per second printer — yet is so quiet that it can readily be used in an office environment. Measured exterior noise level is no more than 65 dB at 30 feet.

Two types of terminals are offered here: The LA36 Series which is a full send-receive terminal, and the LA35 Series which is a receive-only printer. Both terminals can accept multipart forms from 3 to 14⅞" wide.

An exciting new option that provides Buffered Send-Receive capabilities for LA36 is now available, see box on page 11. It provides the user local storage of data for editing before transmission, batching for highest-speed (300 baud) "burst" transmission, and storage for later transmission when line charges are lowest. This option can be added to all existing LA36 terminals.

DECwriter II achieves its 30 cps throughput by having a 16-character buffer storage receiving incoming data. This buffer stores characters during printing, carriage return, and line feed. When there is more than one character in the buffer, the terminal automatically switches to a 60 cps catch-up printing operation until all characters are printed. Thus DECwriter II makes full use of a 300-baud communications line.

The full ASCII complement of 96 upper and lower case letters, numbers, and symbol characters are printed by DECwriter II. However, the reduced 64-character ASCII subset can be accommodated by setting the CAPS LOCK key. This reduced set maps the lower case keyboard characters into their upper case equivalents so that only upper case characters are transmitted. The printout format is a full 132 character positions with 6-lines-per-inch vertical spacing. Horizontal character spacing is 10 per inch standard with option of having closer spacing of 16.5 per inch.

LA35 & LA36 DECWRITER II

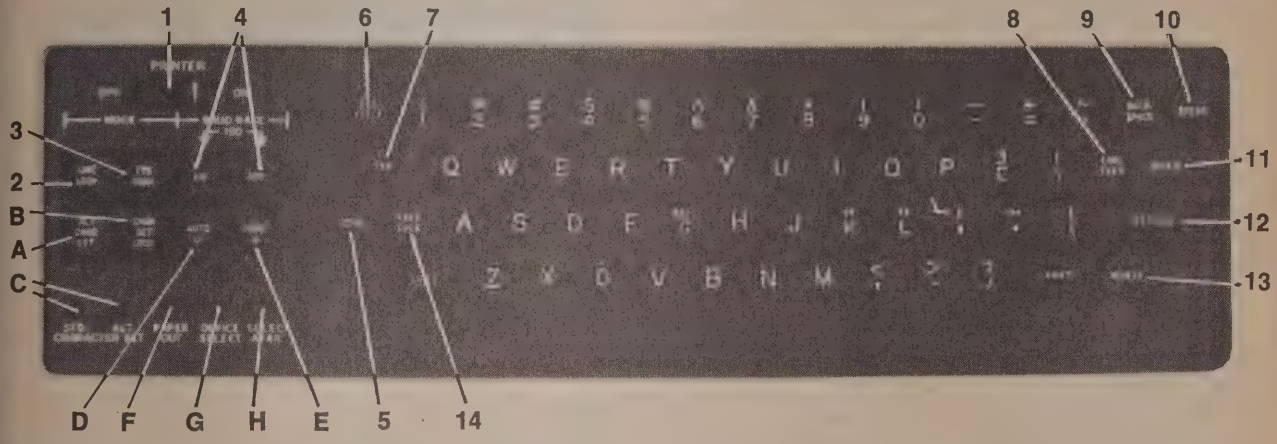
TYPEWRITER KEYBOARD — LA36

The keyboard of the LA36 Series is built to a universally accepted standard — the office typewriter (ANSI standard). The key layout, stroke, and touch are familiar to any typist. This means that training and familiarization time can be kept to a minimum, and maximum throughput can be achieved quickly. DECwriter II's keyboard is user-proven, having undergone vigorous testing since the fall of 1973.

Three-key rollover protection is incorporated in the design to eliminate multiple-keying errors. Up to three keys can be depressed at one time but the input will be correct if one of the first two keys struck is released before the third.

Switches adjacent to the keyboard allow the operator to power-up, select transmission rate, choose on-line or local operation, half- or full-duplex operation, and to activate optional features. In the local mode DECwriter II functions as a typewriting device allowing operators to add information to the printout.

An optional 14-key numeric keypad is available for those applications that require extensive numeric data entry. The keypad fits in the keyboard bezel to the right of the main keys.



STANDARD FEATURES — LA36 KEYBOARD

1. POWER-ON/OFF — Turns power on or off.
2. LINE/LOC — Connects the LA36 to the host computer (LINE) or, when depressed in the locked position, to itself (LOCAL).
3. FDX/HDX — Selects either full-duplex or half-duplex (when depressed, in the locked position) with local copy operation.
4. BAUD RATE — Selects clock frequency for transmission/reception at one of the following rates:
   300 (normal) 30 characters/second at 10 bits/character
   150 15 characters/second at 10 bits/character
   110 10 characters/second at 11 bits/character
   For 300 BAUD operation:
   Depress and lock only the key labeled 300
   For 110 BAUD operation:
   Depress and lock only the key labeled 110
   For 150 BAUD operation:
   Depress and lock both keys
5. CTRL — In combination with other keys, causes some "control" (nonprinting) action to take place at the host computer. See Table I.
6. ESC(SEL) — Directs the host computer to treat the next received character as a command.
7. TAB — Directs the host computer to advance the print head the programmed number of spaces.
8. LINE FEED — Sends a line feed command in the data sent to the host computer.
9. BACK SPACE — Sends a BS code to the host computer. Moves the printed head one space to left in half-duplex mode.
10. BREAK — Causes reception of data from the host computer to be interrupted (in half-duplex operation).
11. DELETE — Transmits a DELETE code to host computer.
12. RETURN — Sends a carriage return command in the data sent to the host computer.
13. REPEAT — Repeats to the host computer any character being pressed simultaneously.
14. CAPS LOCK — Generates all upper-case characters plus numerals and eliminates lower-case alphas.

OPTIONAL FEATURES — LA36 KEYBOARD

A. ALT CHAR SET — When depressed and in the locked position selects the Alternate Character Set to be printed.

B. CHAR SET LOCK — When depressed in the locked position determines whether the operator or a remote device controls changes between ASCII and APL or other alternate character sets.

C. STD/ALT CHARACTER SET — These Light Emitting Diodes light to signify which character set has been selected. Either the one above STD or ALT will be illuminated.

D. AUTO LF — When depressed in the locked position AUTO LF inserts a local line feed after each carriage return whether typed locally or received from the host.

E. HERE IS — When depressed will send up to a 20 character message down the communication line.

F. PAPER OUT — Will light when the terminal is out of paper.

G. DEVICE SELECT — Will light when the terminal has been remotely selected to transmit. SELECT AVAIL will then be extinguished.

H. SELECT AVAIL — Will light when the terminal is available for remote selection.

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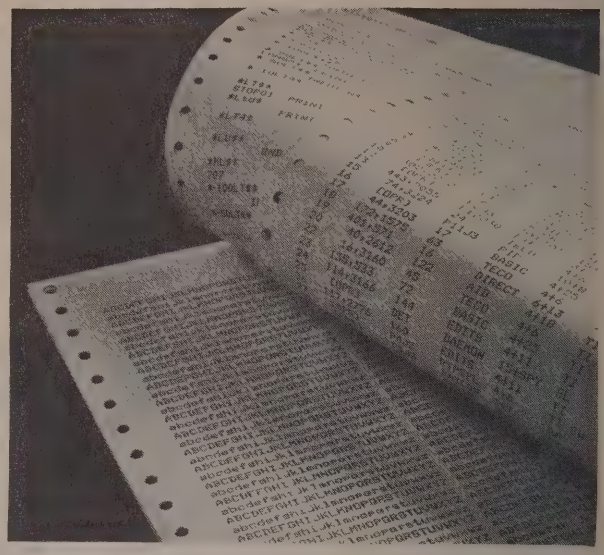
LA35 & LA36 DECWRITER II

Print Quality

The secret of DECwriter II's print quality is the design of the printhead. It comprises a 7 by 7 dot matrix which produces a far more legible image than the more conventional 5 by 5 matrix. The printhead wires are permanently lubricated and their curvature and support mechanism has been developed by computer simulation. The mechanism is protected by a massive heat sink. The results? Long life with minimal wear.

To ensure uniform density of the character impressions the motion of the printhead wires is controlled from a constant-current source. For absolute accuracy in both horizontal and vertical dot placement the printhead has a ruby sapphire bearing guide at its tip. This jewel bearing is highly resistant to wear ensuring that each wire always strikes the ribbon and paper at the proper location.

Dye-based ribbons per a DEC specification are used instead of carbon-based. These latter ribbons tend to unduly wear printhead wires which leads to poor character legibility. The ribbon feed system is also designed to eliminate smudging of the impressions. The ribbon is advanced only during carriage motion and is in fact directly driven by this motion. This eliminates a separate ribbon advance circuit and associated actuators. DECwriter II's mechanical ribbon rewind mechanism is also particularly trouble free.



DECwriter II prints easily read upper and lower case characters formed in a 7 by 7 dot matrix positioned precisely by a proprietary new carriage system.

Paper Handling

Because DECwriter II has a full 132-column printing capability and can accept form widths all the way from 3 to 14⅞″ — including 9½″ teleprinter forms — the same forms can be used on both line printers and keyboard printers, reducing inventory costs and headaches.

To accept different forms widths the right tractor moves horizontally. The left tractor can be adjusted to permit precise horizontal alignment on preprinted forms.

Six-part forms can easily be handled because of the tractor system for forms feeding. This system is the same as that found on high speed computer output line printers. Because a stepping motor drives the two pin-feed tractors the tractors reliably initialize on an integral forms line. There are always six pins engaging the paper, thus multiple forms are pulled with uniform tension without interleaf slippage and misregistration.

As an aid to the terminal operator the top of DECwriter II is beveled and the ribbon is positioned away from the paper. The printed characters are therefore easily visible. The printhead, too, moves four spaces to the right whenever there is a pause in printing lasting over 1,300 millisecs. The printhead returns to its operating position within 100 millisecs once printing commences. Other operator aids are detailed in the Options section.

Interface: Software

The DECwriter II will function with software handlers written for teletypewriters and other hard-copy terminals — in general. But it is important to review the exact interactive relationships in matching DECwriter II to the particular application. The following considerations are key to successful utilization:

1. **Transmission Mode** — Full-duplex or Half-duplex operation is possible. In the full-duplex mode the keyboard is logically separated from the printer. In half-duplex mode, the printer will copy all printable characters typed on the keyboard.
2. **Word Length** — 7-bit data words plus even or no parity. All outgoing characters are transmitted using even-parity protocol (a word is judged correct if it contains an even number of ones). Jumpers can be moved to provide no parity with parity bit marking, or parity bit spacing, and, alternately, odd parity protocol.
3. **Variable Baud Rates** — By switch selection on the terminal 110, 150, or 300 baud transmission rates are possible. Word length varies with the baud rate. At 110 baud, word length is 11 bits while at 150, and 300 it is 10 bits.
4. **Print Format** — Both upper case and lower case printout is possible. The CAPS LOCK feature also allows upper case only printout. Where forms fill-in is frequently called for options such as tab control and forms feed-length selection should be specified. Also if the terminal will be used in programming applications where APL is used, the optional dual ANSI/APL character set option should be specified. Further consideration should be given to the benefits of the compressed font option. This changes the horizontal spacing of the characters from 10 per inch to 16.5 characters per inch allowing the full 132 characters to be printed in only 8″ of space. Thus the printout can be on 8½″ wide paper for easy filing in standard cabinets.

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LA35 & LA36 DECWRITER II

Interface: Software (Cont'd)

5. **Command Responses** — How DECwriter II reacts to commands from the host computer is an important consideration. Instructions such as line feed or carriage return cause movement of the printhead. Table II spells out the standard and optional codes in use. The host computer, too, must be programmed to respond to control commands from the keyboard. These are generated by striking the CTRL key followed by another key, see Table I.

6. **Optional Operational Controls** — Other interactive controls are optionally available. For example, a selective addressing option allows a transmitting device such as the host computer or another master terminal to select a single terminal, or a group of terminals, or all terminals on the same communications line to receive the transmitted data. A terminal, too, may identify itself to the network by application of the answerback option. Here on receipt of an ENQ or enquiry code the terminal transmits a 20 character identity. This same message is transmitted by the operator pressing the HERE IS key. An automatic line feed option allows the terminal to transmit both a carriage return signal and a line feed signal each time the carriage return button is depressed. And an automatic paper-out signal can be optionally generated.

7. **Buffered Send Receive** — A 4K, 8K, 12K, or 16K local memory and control option has recently been introduced for LA36. This buffer allows data to be stored prior to transmission.

TABLE I — CONTROL SIGNALS FROM KEYBOARD

(CTRL) (C)	Signifies that the end of text has been reached.
(CTRL) (B)	Signifies that all characters to follow are to be treated as text.
(CTRL) (BEL)	Signifies an alarm condition.
(CTRL) (Space, Y, Z, X, P, Q, S, F, U, V)	Special commands associated with Buffered Send-Receive Option.

TABLE II — COMMAND CODES FROM HOST COMPUTER

Character(s) and Octal Code(s)	Action Taken
BEL (007)	Sounds alarm bell.
BS (010)	Moves printhead back one space to left.
SI (017) and SO (016)	Part of ANSI/APL selection option. When code SI is received, character set to be printed shifts from ANSI to optional APL standard. SO code restores operation to normal.
LF (012)	Advances the paper upwards one line.
CR (015)	Moves printhead to left margin. Can also trigger an automatic LF command as an option.
SP (040)	Space Bar. Moves printhead one position to the right.
(041 to 176)	Prints all printable characters including numerics, punctuation symbols, upper case, and lower case alphas. Moves printhead one space to the right.
NUL (000) and DEL (177)	The terminal does not respond to these characters which are often used with slower electro-mechanical devices as fill or pad characters.
ESC 1 (033 061)	Part of the forms control option. This code sets a horizontal tab in any or all of the 132 character columns. Fill characters, or a time delay, required from host computer.
ESC 2 (033 062)	This code clears all horizontal tabs.
ESC 3 (033 063)	Part of forms control option. This code sets up to 84 vertical tabs. Host computer must provide time delay or fill characters.
ESC 4 (033 064)	This code clears all vertical tabs.
ENQ (005)	Activates answerback option resulting in transmission from terminal of up to 20 character terminal identity.
FF (014)	Part of form feed option. This code causes form to be advanced to top of next form.

Interface: Hardware

The keyboard version LA36 is normally configured for full-duplex operation. It can either be passive with the host computer providing the current source or, by a local wiring change, become an active device. In the half-duplex mode, transmission can take place only in one direction at a time. In this mode DECwriter II can also be either active or passive.

An optional 20 mA current loop or EIA Standard RS232C interface is available. Physically the EIA interface is a customer installed cable and module. The EIA interface can be provided with modem control which includes auto answer, timed disconnect, and half/full duplex logic to provide both the LA35 and LA36 with half-duplex capability.

An optional modem is also available. This modem is comparable to a BELL 103J modem. It provides full duplex, asynchronous communication at rates up to 300 baud. It has originate and auto-answer capability. It includes an FCC-approved DAA. And it incorporates a self-test switch, mounted inside the cabinet, for local or remote diagnosis.

An integral acoustic coupler kit is an option. Two muffs are mounted on the rear of the terminal and accept a standard telephone handset.

Included are a carrier detector light and a new terminal cover to contain the muffs. The coupler can transmit full- or half-duplex serial, binary, asynchronous data at rates from 0 to 303 bits per second.

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LA35 & LA36 DECWRITER II

OPTIONS DESCRIPTION

The options described here must be installed by the user if ordered by individual option catalog number. Note that Models LA35-CE, -CJ and LA36-CE, -CJ are equipped with certain pre-installed options. See p. 11 for details.

Basic Mounting Kit for Options

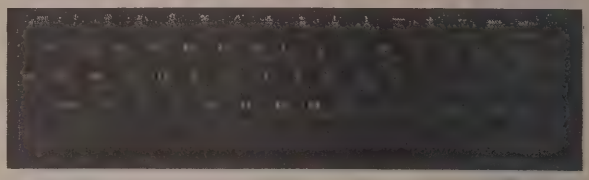
LAXX-LB

This option provides the expansion logic and 6 mounting spaces to mount the DECwriter II communications and forms-handling options. This option also contains logic to automatically sense and activate new options as they are added to the DECwriter II.

Character Set Options

LAXX-PK

This dual character option allows DECwriter II to be used as an ANSI/APL terminal. With this option installed, the DECwriter II has two character sets and selection of the desired set is possible via the receipt of Shift In (SI) and Shift Out (SO) ASCII control codes or via the ALT character set switch on the operator's control panel. The Character Set Lock switch is used to lock-out either manual control or host computer control of character set selection.



Optional APL keyboard.

Paper Handling and Printout Options

LAXX-KV — Forms Feed Option

This option consists of a single-width, double-height module, a cable and a forms-control switch unit. The forms-length switch unit mounts inside the top cover on the printer mechanism side plate. It contains an 11-position switch to select the desired forms length and a reset button which, when depressed, defines the present paper position as top-of-form. The receipt of an FF character (can also be generated from the console panel in half-duplex or local mode) causes the form to be advanced to the next top-of-form.

NOTE: The host computer software must send fill characters or provide time delay to use this option.

LAXX-KY — Form Control Option

This option provides all of the features of the LAXX-KV, plus it provides horizontal and vertical tab capability. The horizontal tab uses ESC 1 to set a tab in any column (132 tabs maximum) and an ESC 2 to clear all horizontal tabs. The vertical tab uses ESC 3 to set up to 84 vertical tabs per form and ESC 4 to clear all vertical tabs.

NOTE: The host computer software must send fill characters or provide time delay to use this option.

LAXX-LZ — Paper Out Sensor

This option alerts the operator to a paper-out or paper-jam condition. An LED on the console panel will illuminate when a paper out has occurred. When using a 20mA interface, printing will stop and data will be discarded. When using the LAXX-KG EIA, interface, the ready line will be dropped and a forced disconnect will occur. Use of EIA with modem control allows the user a choice of actions on paper out. (See LAXX-LG)

LAXX-KJ — Compressed Font Option

This option changes the horizontal spacing from 10 characters per inch to 16.5 characters per inch. This allows 132 columns to be printed in 8″ space. A 40% reduction in paper usage is achieved allowing 132 column reports to be filed in standard file cabinets.

Operator Assist Options

LAXX-KK — 14 Key Numeric Pad Option

Comes with new keyboard bezel and cable.

LAXX-LA — Auto Line-Feed Option

This option allows the operator to depress the auto LF push-button on the operator's control panel and in this state cause the DECwriter II to transmit a carriage return and line-feed character each time the carriage return button is depressed on the main keyboard. With the auto LF button up, the DECwriter II reverts back to normal mode of operation. The option also features, as an installer option, the ability to generate an LF automatically upon receipt of a carriage return code from the host computer.

LAXX-KX — Answerback & Auto Line Feed Option

This option provides all of the features of the LAXX-LA, plus a manual and automatic answerback capability. The answerback option allows transmission of a user-determined terminal identification message of up to 20 characters. This feature is activated upon receipt of an inquiry (ENQ) code or by the operator depressing the HERE IS button on the console. Message generation is accomplished by means of 20 7-bit DIP switches on the option board. These switches are easily changeable to alter the Answerback message.

LAXX-NE — Print Window

The Print Window is a clear plastic cover that mounts over the entire carriage system to provide both noise-free operation and protection of the print head and paper from foreign objects.

LAXX-RG — Column Scale and Pointer

This option is virtually the same as LAXX-LN but does not include the Print Window.

LAXX-LN — Print Window, Scale, Pointer

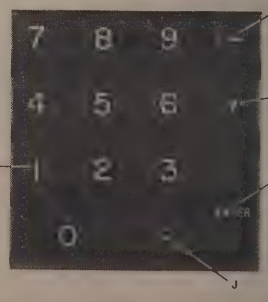
This option consists of the Print Window and three indicators: Column Scale, Line Indicator, and Column Pointer. The Column Scale is a 17.25″ long strip that is marked off in 132 divisions representing the possible column locations. The scale adheres to the bottom lip on the print window. The Line Indicator mounts on the print head and is used to establish two printing locations. One part indicates the baseline of the characters in a particular line. When setting up a form or rolling back to a previously printed line, this indicator is used to exactly align where the next character will print on the line. The other part of this indicator shows where the next character will print with respect to the column position. The Column Pointer is used in conjunction with the Column Scale to indicate the number of the column where the next character will be printed.

Optional Keypad Features for LA36

I 0 thru 9
Numerical keys aid in data input.

J ./ ,/ —
Point, comma and minus sign are essential symbols for numerical data.

K ENTER
This instruction functions like CR and other "input data" signals.



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LA35 & LA36 DECWRITER II

OPTIONS DESCRIPTION (Cont'd)

Communications Options

Cat. No. LAXX-KG — EIA Interface

This option provides an EIA RS232-C interface. A 9-foot cable with 25-pin data-set-type connector is also supplied.

LAXX-LG — EIA Interface & Modem Control

This option provides an EIA RS232-C interface for the DECwriter II. The option includes auto answer, timed disconnect and half/full duplex logic to provide earlier model DECwriters with half-duplex. A 9-foot cable with 25 pin data-set type connector is also supplied with this option. Straps are available on this option to send timed break (230 ms), 3000 ms long space, forced disconnect, or do nothing (stops printing, discards data) on a paper-out condition. Modem controls are also provided on this option for use with the Selective Address option.

LAXX-KW — Selective Address Option

This option allows the capability of operating in a selection control environment when connected to a multipoint Common Carrier Leased Private Line facility or an equivalent customer-provided communication network. It allows a transmitting device (CPU or controlling terminal) to act as a master and select a single terminal, a group of terminals, or all terminals on the same communications line to receive the transmitted data.

Each terminal connected to the line has the capacity of selecting itself as master once the previous master has relinquished the multi-party line.

LAXX-LM — Integral Acoustic Coupler Kit

The option provides coupling to phone lines with hardware mounted completely within the DECwriter. It comprises two muffs which are mounted to the rear of the terminal cover and are capable of accepting standard telephone handsets. Included with the option are a carrier detector light and a new terminal cover to contain the muffs. The coupler can transmit full- or half-duplex serial, binary, asynchronous data at rates from 0 to 303 bits per second. The coupler may also be set to transmit or ignore BREAK. Signals: Serial, binary, asynchronous 0 to 303 baud maximum transmission rate.

Transmit Frequencies:	Mark 1270 ±10Hz
	Space 1070 ±10Hz
Receive Frequencies:	Mark 2225 ±10Hz
	Space 2025 ±10Hz

LAXX-RE — Modem

This option, which is comparable to the BELL 103J modem, consists of modem, cover with switch assembly, test switch, carrier light, interface cabling, and an FCC-approved DAA.

Both the modem and the Data Access Arrangement mount completely inside the LA36 cabinet. In addition, a plug is provided which connects the DAA to a standard telephone jack, so the terminal can be easily moved to any phone location.

LAXX-LH 20 mA Interface

This option adds 20 mA current loop capability to DECwriter II models not so equipped.

BUFFERED SEND RECEIVE

LAXX-NS, -NT, -NU, -NV

The LA36 DECwriter II can be equipped with a solid state buffer option which provides the user local storage of data for batch transmission at rates up to 300 baud. The electronic store and forward capability is an alternative to electromechanical automatic send and receive (ASR) devices using either magnetic or paper tape media. In addition, the electronic buffer's easy-to-use editing capability can minimize communication line charges.

In normal use, savings in line charges will pay for the buffer within four months.

The option consists of one microprocessor-based printed circuit board with an integral power supply and a mounting bracket. The entire assembly is mounted inside the LA36. This option is user installed. The terminal must have an EIA interface for this option.

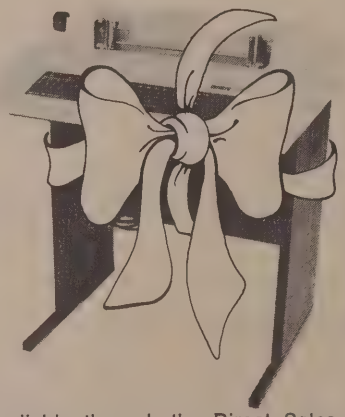
Other features are:

- *Field installable in any DECwriter II.*
- *110, 150, or 300 baud rate transmission.*
- *Available with 4K, 8K, 12K, or 16K memory.*
- *Parity check on each character and parity selection.*
- *Stand-alone power supply.*
- *CONTROL code operation, see Table I.*
- *Line search capability.*
- *Margins selectable for 72, 80 or 132 characters.*
- *X ON, X OFF and restraint control.*

Electrical power for the buffer is provided by its own power supply which is included with the option. The option mounts conveniently within the LA36. Logically the buffer is in series between the LA36 Logic Module and the EIA interface (must be ordered if not present on existing installation).

DECwriter II

WITH THE TRIMMINGS



LA36 Priced from $1825

Now available through the Direct Sales Catalog is a DECwriter II configuration with factory installed options:

- *A 14-Key Numeric Keypad (LA36 only)*
- *Print Window, Column Scale, and Pointer*
- *Paper-out Sensor*
- *Ribbon*
- *Sample Paper*
- *20 mA Current Loop Interface*
- *Includes On-Site Warranty (90 days)*
- *Extra Ribbon*
- *Sample Paper Sheets*

Order LA36-CE or -CJ for keyboard DECwriter II's and LA35-CE or -CJ for Receive-Only Models.

CALL: 800-258-1710 (N.H. Residents 603 - 884-6660) 8:30 am to 5 pm EST.

digital DIRECT SALES CATALOG

LA35 & LA36 DECWRITER II

OPERATIONAL SPECIFICATIONS

Printout

Printing Speed: 30 char/sec throughput, serial asynchronous.

Number of Columns: 132.

Printing Characters: 96 or 64 switch selectable ASCII Character set. APL optional.

Control Characters: 32 ASCII Character set.

Keyboard Characters: 128 or 96 switch selectable. APL optional.

Paper Handling

Tractor feed, 6 engaging pins, movable tractors for 3 to 14⅞″ forms, manual print gap adjustment for 1-6 part forms, vernier vertical and horizontal adjustment for custom preprinted forms.

COMMUNICATIONS

Rates

110 baud 11 bit, 150 and 300 baud 10 bit; switch selectable at keyboard panel.

Modes of Operation

Local or full duplex on-line, switch selectable at keyboard panel.

MECHANICAL SPECIFICATIONS

Color: Off-white top with flat-black base.

Mounting: 1 free-standing unit.

Height: 33.2″ **Depth:** 24.0″

Width: 27.5″ **Weight:** 102 lbs.

Environment

Temperature: 10°C to 40°C (50°F to 104°F) operating. −40°C to 66°C (−40°F to 151°F) non operating.

Humidity: 10% to 90% (relative, noncondensing) operating. 5% to 95% (relative, noncondensing) nonoperating.

Noise: 65 db at 3 feet.

ELECTRICAL SPECIFICATIONS

Input Current: 115V ac (2A) 60 Hz or 230V ac 50 Hz. Power cord included with grounded plug for wall outlets. LA36 and LA35 are UL listed.

Heat Dissipation: 300 W printing; 160 W nonprinting.

SUPPLIES SPECIFICATIONS

Paper

Single-Part: 15-lb. paper minimum; 0.010″ card stock max.

Multi-Part: 2-6 part (no cards except last copy). Max. Thickness: 0.020″. All parts of multi-part forms must be identical in width.

Note: NCR or 3M paper, up to 6-part. Must use ribbon on top copy. First surface impact paper not recommended.

Continuous-feed, fan-fold business forms with 3- or 4-prong margin crimps on both margins (multi-part). Stapled forms are not recommended and may damage tractors and other areas of the machine. Dot or line glue margins acceptable.

Caution: Do not line glue both margins as air will not be able to escape and poor impressions will result.

Type: Impact 7 by 7 dot matrix.

Character Size: 0.70 by 0.100″.

Vertical Spacing: 6 lines/inch.

Horizontal Spacing: 10 char/inch or 16.5 optional.

Carriage Return: 500 msec maximum.

Line Feed: 33 msec.

Slew Speed: 5 inches/second (30 lines/second).

Keyboard (LA36)

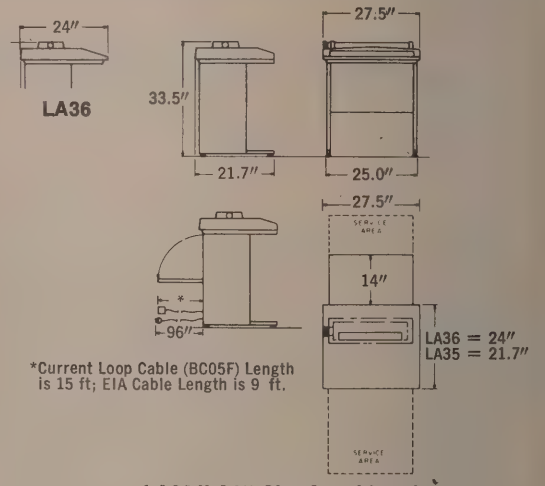
Standard ANSI typewriter-like layout, mechanical contact with four parallel switches of inlaid rolled gold. APL character designations optional.

Parity

No parity, eighth bit marking on transmit; odd or even parity, with or without parity error printout, jumper-selectable.

Interface

Full-duplex passive or active operation (jumper selectable). Optional 20 mA current loop or EIA RS232C.



LA36/LA35 Site Considerations

Ribbon

Digital-specified nylon fabric, spool assembly 0.5″ wide by 40 yards.

LA36 MAINTENANCE MANUAL

A comprehensive manual for the do-it-yourselfer; provides installation, operation, theory, electrical and mechanical servicing information, engineering drawings, and parts breakdown.

Cat. No.	Price
B-EK-1LA36-MM	$74

?GOT A QUESTION?

Give us a call, toll free, at 800-258-1710 (N.H. residents 603 - 884-6660) between 8:30 am and 5 pm EST. Catalog Sales saves you time and money.

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LA35 & LA36 DECWRITER II

ORDERING INFORMATION

Basic Models

Cat. No.	Description*	List	Cat.	Cash	Shipping Weight
B-LA36-DK	DECwriter II with keyboard. 120V, 60 Hz operation.	$1870	$1660	$1595	145 lbs.
B-LA36-DN	Same as -DK but 230V, 50 Hz version.	1895	1680	1615	145 lbs.
B-LA36-CE	Same as -DK but with 20 mA Current Loop, 14-Key Numeric Keypad, Print Window, Column Scale & Pointer, Paper Out Sensor and on-site warranty.	2100	1890	1825	150 lbs.
B-LA36-CJ	Same as -CE but 230V, 50 Hz version.	2100	1890	1825	150 lbs.
B-LA35-DK	Receive-Only DECwriter II. 120V, 60 Hz operation.	1780	1525	1525	145 lbs.
B-LA35-DN	Same as -DK but 230V, 50 Hz version.	1805	1600	1540	145 lbs.
B-LA35-CE	Same as -DK but with 20 mA Current Loop, Print Window, Column Scale and Pointer, Paper Out Sensor and on-site warranty.	1900	1710	1652	145 lbs.
B-LA35-CJ	Same as -CE but 230V, 50 Hz version.	1900	1710	1652	145 lbs.

* Includes 7′ power cord, and users manual.

Options

Cat. No.	Description	Terminal Must Also Have This Option	Includes This Feature	Applicable to LA35	Applicable to LA36	List	Cat.	Cash	Shipping Weight
B-LAXX-LB	Option Mounting Kit	—	—	X	X	$110	$105	$100	16 lbs.
B-LAXX-PK	ANSI/APL Character Set	LB	—	—	X	720	684	655	5 lbs.
B-LAXX-KY	Forms Control	LB	KV	X	X	315	299	287	5 lbs.
B-LAXX-KV	Forms Feed	LB	—	X	X	165	157	150	5 lbs.
B-LAXX-LZ	Paper Out Sensor	—	—	X	X	25	24	23	4 lbs.
B-LAXX-KJ	Compressed Font	—	—	X	X	55	52	50	2 lbs.
B-LAXX-KG	EIA Interface	—	—	X	X	65	62	59	4 lbs.
B-LAXX-LG	EIA Interface with Modem Control	—	KG	X	X	110	105	100	4 lbs.
B-LAXX-KW	Selective Addressing	LB, LG	—	X	X	130	124	118	5 lbs.
B-LAXX-KK	Numeric Keypad	—	—	—	X	105	100	96	10 lbs.
B-LAXX-LA	Auto Line Feed	LB	—	X	X	85	81	77	4 lbs.
B-LAXX-KX	Auto Line Feed plus Answerback	LB	LA	X	X	210	200	191	3 lbs.
B-LAXX-LM	Acoustic Coupler	—	—	X	X	475	451	432	10 lbs.
B-LAXX-NE	Print Window	—	—	X	X	15	14	14	3 lbs.
B-LAXX-LN	Window, Scale, Pointer	—	NE	X	X	30	29	27	5 lbs.
B-LAXX-NS	BSR 4K	KG or LG	—	—	X	865	822	787	10 lbs.
B-LAXX-NT	BSR 8K	KG or LG	—	—	X	1165	1107	1060	10 lbs.
B-LAXX-NU	BSR 12K	KG or LG	—	—	X	1460	1387	1329	10 lbs.
B-LAXX-NV	BSR 16K	KG or LG	—	—	X	1745	1658	1588	10 lbs.
B-LAXX-RG	Column Scale, Pointer	NE	—	X	X	10	10	9	1 lb.
B-LAXX-RE	103 Modem/DAA	LG	—	X	X	430	409	391	4 lbs.
B-LAXX-LH	20 mA Interface	—	—	X	X	15	14	14	2 lbs.

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DIRECT SALES CATALOG

LA35 & LA36 DECWRITER II

SUPPLIES AND ACCESSORIES

Accessories

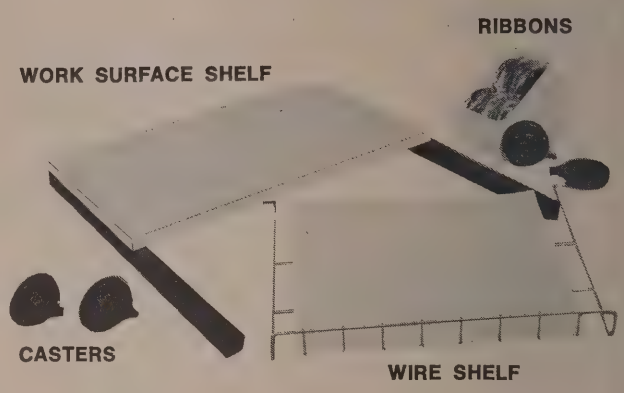
To complement DECwriter installations, a range of custom-tailored accessories is available either individually or in combination kits as follows:

Work Surface Shelf, LAXX-KC — Attaches to either left or right side of terminal. Dimensions: 24L by 15″W.

Wire Shelf, LAXX-KD — Attaches to back of terminal to collect printer paper. Dimensions: 10½L by 18W by 2″H.

Basket, LAXX-NC — Attaches to back of terminal to collect printer paper. It is deeper than the LAXX-KD wire shelf and holds up to one complete box of single or multipart forms. Dimensions: 12L by 16W by 13″H.

Casters, LAXX-KB — Attaches to back legs of terminals so they can easily be moved.



Cat. No.	Description	Cat.	Cash	Shipping Weight
B-**LAXX-KC**	Surface Shelf	**$42.75**	**$40.95**	14 lbs.
B-**LAXX-KD**	Wire Shelf	**23.75**	**22.75**	1 lb.
B-**LAXX-NC**	Basket	**23.75**	**22.75**	1 lb.
B-**LAXX-KB**	Casters	**14.25**	**13.65**	1 lb.

Supplies

Ribbon

½″ by 40 yds., nylon, 12 ribbons per box.
Shipping Weight: 3 lbs. per box.

Cat. No.	Cat.	Cash
B-**36-10558-01**	**$47.50 box**	**$45.50 box**

Paper

14⅞ by 11″ white, fanfold, lined, single-sheet.

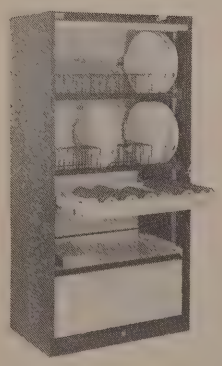
Cat. No.	No. of Parts	Sheets Per Box	Cat.	Cash	Shipping Weight
B-**36-09141-00**	1	2400	**$30.40**	**$29.12**	40 lbs.

Accessories Kit, LAXX-KA

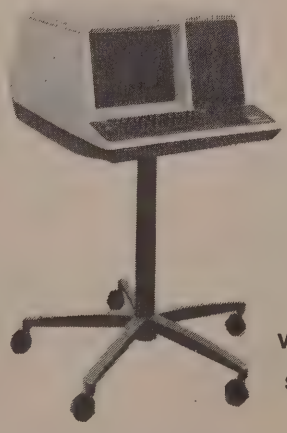
Kit includes: 1 #LAXX-KB Caster Set
1 #LAXX-KC Surface Shelf
1 #LAXX-KD Wire Shelf

Cat. No.	Description	Cat.	Cash	Shipping Weight
B-**LAXX-KA**	Accessory Kit	**$76 ea**	**$72.80 ea**	16 lbs.

SEE OUR COMPUTER ROOM FURNISHINGS



Media Storage Cabinet
See page 148



Video Terminal Stands
See page 147

Tables
See page 147

DIGITAL offers an attractive line of media storage cabinets, video terminal stands and tables. Enhance your computer room's appearance and improve operating efficiency.

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DIRECT SALES CATALOG

LS120 DECWRITER III

PRINTER TERMINALS, HIGH SPEED 180 CPS

Standard Features

- *180 cps printing.*
- *110, 300 or 1200 baud operation plus additional, operator-selectable rates of up to 4800 baud.*
- *Full- or half-duplex operation.*
- *X-ON, X-OFF (DC1, DC3) FDX protocol.*
- *ETX/EOT or reverse channel HDX protocol.*
- *RS232C interface.*
- *Paper-out switch.*
- *Switch-selectable automatic line feed.*
- *Selectable automatic new line.*
- *Auto-answer with time out protection.*
- *132-column printing; 10 characters per inch horizontal; 6 lines per inch vertical spacing.*
- *Fine vertical adjustment for forms alignment.*
- *128-character ASCII upper/lower case set.*
- *ANSI keyboard with multi-key rollover.*
- *Prints 6-part forms.*
- *Handles variable width forms (3 through 14⅞"W).*
- *Self-test mode.*
- *Print window.*
- *Adjustable left and right tractors.*
- *Switchable parity selection and parity error detection.*
- *7 by 7 dot matrix printing.*

NEW LOWER PRICE

LS120

Priced from $3072

Optional Features

- *Forms package, including length of form, top and bottom of form, horizontal and vertical tab (relative and absolute), left hand and right hand margin setting and direct positioning.*
- *User programmable 20 character Answerback option, which includes additional space for storage of user defined machine set-up parameters.*
- *APL alternate character set.*
- *Compressed font (16.5 characters per inch).*
- *14-key numeric pad.*
- *300 baud integral acoustic coupler.*
- *Compatibility with DECwriter II standard accessories and supplies.*

The LS120 DECwriter III is a low cost, interactive hard copy serial data communications terminal designed for operation at 1200 baud.

DECwriter III draws upon field-proven sub-assemblies used in other DIGITAL terminals. DECwriter III meets high standards of reliability, ease of maintenance and accuracy of DECwriter II and DECprinter.

A microprocessor-based options controller module provides flexibility in the DECwriter III, making it suitable for a wide range of applications. For example, the terminal can utilize half- and full-duplex as well as echoplex protocols. In addition to the terminal's basic 1200 baud rate, other rates from 110 to 4800 baud can be selected.

Further, DIGITAL offers a number of standard options for the machine, allowing the user to tailor terminals to each specific application.

The DECwriter III is equally at home in both communications and interactive computer console applications. Its 180 cps print speed, combined with its integral 1K character buffer provides highly efficient machine throughput. In addition, the DECwriter III incorporates a "smart" look ahead print capability which automatically returns the print head to the first *printing* position of each successive line. Its quiet operation makes it a suitable addition to any office environment.

Field-proven subassemblies used in both the LA36 DECwriter II and the LA180 DECprinter are incorporated in the DECwriter III. These include a 7 by 7 dot matrix print head, ANSI keyboard, logic circuitry and power circuitry. In addition, the DECwriter III contains a microprocessor-based options controller module for additional forms handling and communications capabilities. This module has been designed to allow for future buffered send/receive capabilities and editing features. The LS120 uses a 128-character upper- and lower-case ASCII character set. Optional character set ROMs enable the user to print non-standard characters.

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DIRECT SALES CATALOG

LS120 DECWRITER III

Incoming Buffer Storage

The LS120 incorporates a 1K character FIFO buffer for temporary storage of incoming data. If data is received at a rate faster than DECwriter III can process and print it, the buffer will protect the data stream, against loss. If the buffer becomes full, the terminal can be switched to automatically issue an XOFF (DC3) command to the sending device to stop transmitting data. When the buffer has been emptied, the terminal will issue an XON (DC1) command for resumption of transmission.

Keyboard

The keyboard layout is an ANSI standard typewriter styled keyboard. An optional APL character set option can also be ordered. DECwriter III features a multi-key rollover keyboard, which prevents the operator out-typing the keyboard even at low baud rates. Each key activates a gold-inlaid multi-contact switch capable of generating more than 100 million characters without an error. The keyboard's "CAPS LOCK" key permits the operator to lock the alpha keys in upper case while leaving numerals and special symbols in lower case. Any operator hesitation longer than two seconds moves the print head four spaces to the right. This provides a clear view of the last character printed. Last character visibility can be overridden by the operator. An optional 14-key numeric pad is also available. See LA36, p. 10.

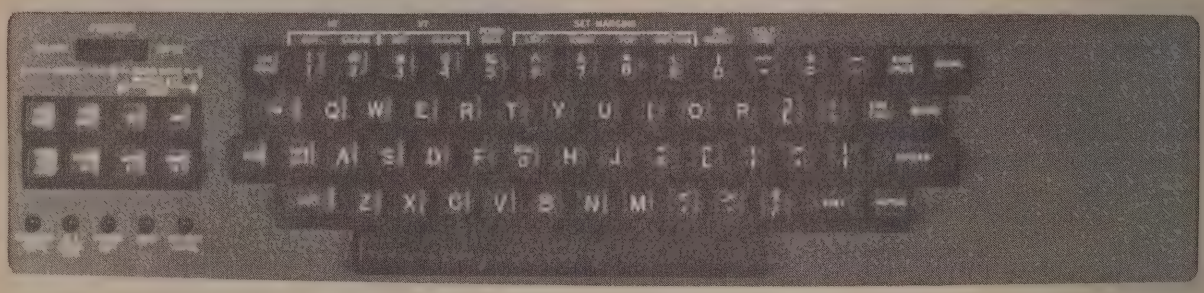

TABLE I — CONTROLS AND INDICATORS

PRINTER ON/OFF	This rocker switch applies or removes ac power to the machine electronics.
LINE/LOC	Connects the terminal to the host computer (LINE). When depressed, a disconnect is issued and the terminal can be used in off-line operations.
HDX/FDX	Selects either full-duplex or half-duplex (when depressed and locked) with local copy operation. (The echoplex feature can be defeated by the user.)
BAUD RATE	The two pushbuttons labeled 110 and 300 determine the line speed at which the DECwriter III sends or receives data. Depressing both buttons selects 1200 baud operation. When both buttons are in the up position, a user pre-determined rate of 2400, 4800 or a split rate of either 75/1200 or 150/1200, can be used.
AUTO LINE FEED	When this pushbutton is in the down position, carriage return and line feed are transmitted whenever the carriage return on the main keyboard is struck. When a carriage return is received from the communications line, a line feed can also be generated.
PRINTER ON INDICATOR	Indicates that ac power is being applied to machine electronics. This light will blink when power is ON, but the terminal is in a NOT READY condition.
ALT CHAR SET INDICATOR	Indicates that the alternate character set is being used, when installed.
PAPER OUT INDICATOR	Indicates that the terminal has run out of paper. This indicator will also come on when the LS120 cover is open.
XMIT INDICATOR	When ON, indicates that the terminal is transmit enabled.
SELECT AVAIL INDICATOR	Reserved for future use.
CHAR SET LOCK	Depression of this button locks the terminal into the selected standard or alternate character set.
STANDBY	Allows keyboard operation in LOCAL mode while holding the communication line.
HERE IS	This button functions only when the answerback option is installed. When pushed, it causes transmission of a user-determined identification message of up to 20 characters.

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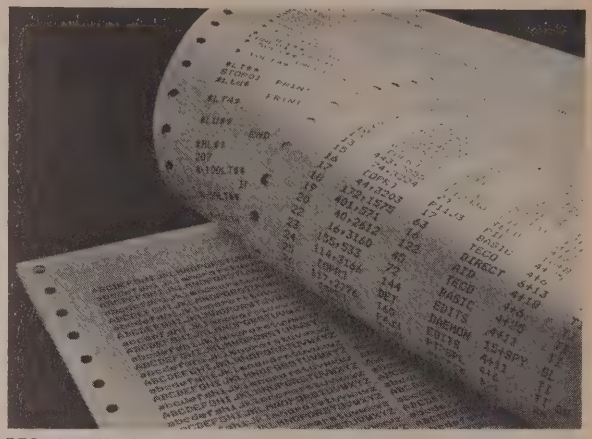
LS120 DECWRITER III

Print Head

DECwriter III's print head is based on the technology used in DIGITAL's DECprinter and DECwriter II. The wires are permanently lubricated for long life and resistance to wear by paper and ribbon. Wire curvature and support mechanism are designed by computer simulation for minimal wear and fatigue. The use of constant current solenoids and a ruby jewel head bearing insures precise character formation and uniform density of character impression. Field experience with over 100,000 units has proved this 7 by 7 dot matrix design to be extremely reliable.

Carriage System

The carriage system smoothly and quietly transports the print head along the horizontal axis, providing accurate character positioning. A precisely adjustable print gap assures clean, clear impressions on a variety of forms sizes of up to six parts. The carriage is controlled by a servo system which assures accurate dot placement. The dc motor operates in the forward direction at up to 18″ per second, and has a maximum carriage return time of 275 milliseconds.



DECwriter III prints easily read upper and lower case characters formed in a 7 by 7 dot matrix positioned precisely by a proprietary new carriage system.

COMMUNICATIONS

The terminal supports half-duplex transmission with both coded character turnaround protocol and reserve channel protocol. For the character turnaround command, the operator may select between ETX or EOT. In addition, the LS120 provides operator-switchable local copy (echoplex) capability for systems where neither the processor nor the modem provides this function.

Many 300 and 1200 baud half- and full-duplex modems are compatible with the LS120. These include the Bell 103 and 202 Series, the Vadic 3400 and the Bell 212A.

The LS120 allows the user a choice of alternatives in the event of a paper out. One condition issues a short break, signaling the host to take appropriate action while holding the communication line. The other condition, for use in unattended operation, issues a DTR disconnect signal.

Parity selection is handled through switches on the options controller module.

If a problem occurs on the system, the operator can utilize a self-test feature in local mode. This initiates a constant ripple pattern, which tells the operator whether the problem is in the terminal or in some other part of the system.

OPTIONS

LAXX-RF — Programmable Answerback Package

The optional answerback package for the DECwriter III features a user programmable 20 character answerback message. The answerback option utilizes a PROM that can be programmed by the user directly from the terminal's keyboard. In addition, separate PROM space is provided for the user to store machine set-up parameters.

LAXX-RB — Read Only Answerback Package

This option performs the same functions as the programmable option except it does not have the capability of blasting PROMS. Therefore, any PROM being used on this option must have been previously blasted on the programmable version.

LAXX-RA — Optional Forms Handling Package

A comprehensive option package for quick and easy handling of single- or multi-part forms can be added to the DECwriter III. Through simple keyboard commands, the operator can set all forms handling parameters. Also, by a direct positioning feature, the print head can be ordered to any horizontal or vertical print position with a single command. Tabbing can be accomplished through either absolute or relative addressing — providing a high degree of flexibility for the user.

LAXX-RC — APL Alternate Character Set

This dual character option allows DECwriter III to be used as an ANSI/APL terminal. With this option installed, the DECwriter III has two character sets and selection of the desired set is possible via receipt of Shift In (SI) and Shift Out (SO) ASCII control codes. Character Set Lock switch, located on the LS120 console panel, is used to either lock-out manual control or host computer control of character set selection.

LAXX-RM — 14 Key Numeric Pad Option

14 Key Numeric Pad Option comes with new keyboard bezel and cable.

LAXX-KJ — Compressed Font Option

This option changes the horizontal spacing from 10 characters per inch to 16.5 characters per inch. This allows 132 columns to be printed in 8″ space. A 40% reduction in paper usage is achieved allowing 132 column reports to be filed in standard file cabinets.

LAXX-LM — Integral Acoustic Coupler Kit

The 300 baud option provides coupling to phone lines with hardware mounted completely within the DECwriter. It comprises two muffs which are mounted to the rear of the terminal cover and are capable of accepting standard telephone handsets. Included with the option are a carrier detector light and a new terminal cover to contain the muffs. The coupler can transmit full- or half-duplex serial, binary, asynchronous data at rates from 0 to 303 bits per second. The coupler may also be set to transmit or ignore BREAK. Signals: Serial, binary, asynchronous 0 to 303 baud maximum transmission rate.

Transmit Freq: Mark 1270 ±10 Hz Space 1070 ±10 Hz

Receive Freq: Mark 2225 ±10 Hz Space 2025 ±10 Hz

LAXX-RN — 20 mA Current Loop Interface

This option provides a 20 mA interface. A 15′ cable is also supplied.

LAXX-RG Column Scale and Pointer

This option consists of three indicators: Column Scale, Line Indicator, and Column Pointer. The Column Scale is a 17.25″ long strip that is marked off in 132 divisions representing the possible column locations. The scale adheres to the bottom lip of the print window. The Line Indicator mounts on the print head and is used to establish two printing locations. One part indicates the baseline of the characters in a particular line. When setting up a form or rolling back to a previously printed line, this indicator is used to exactly align where the next character will print with respect to the column position. The Column Pointer is used in conjunction with the Column Scale to indicate the number of the column where the next character will be printed.

digital DIRECT SALES CATALOG

LS120 DECWRITER III

OPERATIONAL SPECIFICATIONS

Printout

Printing Speed: 180 char/sec, serial asynchronous.

Number of Columns: 132

Printing Characters: 96 or 64, switch selectable ASCII Character set. APL optional.

Control Characters: 32 ASCII Character set.

Keyboard Characters: 128 or 96 switch selectable. APL optional.

Paper Handling

Tractor feed, 6 engaging pins, movable tractors for 3 to 14⅞″ forms, manual print gap adjustment for 1-6 part forms, vernier vertical and horizontal adjustment for custom preprinted forms.

Type: Impact 7 by 7 dot matrix.

Character Size: 0.75 by 0.100″

Vertical Spacing: 6 lines/inch.

Horizontal Spacing: 10 char/inch or 16.5 char/inch optional.

Carriage Return: 275 msec maximum.

Slew Speed: 7½ inches/second (45 lines/second).

Keyboard

Standard ANSI typewriter-like layout, mechanical contact with four parallel switches of inlaid rolled gold. APL character designations optional.

COMMUNICATIONS

Rates

110 baud, 11 bit; 300 baud and higher, 10 bits. Four switch selectable rates from console panel: 110, 300, and 1200 are standard user-determined. Fourth rate of 2400, 4800, or a split rate of either 75/1200 or 150/1200, can be used.

Interface

EIA RS232C. Supplied with 9 foot cable and terminated in a standard 25 pin EIA connector. An optional 20 mA current loop interface is also available.

Modes of Operation

Full-duplex, half-duplex, and echoplex modes on-line; or LOCAL switch selectable at keyboard panel. SWITCH SELECTABLE STANDBY MODE places LS120 keyboard into a LOCAL mode while the printer remains ON-LINE.

Parity: Input and output parity ODD, EVEN, and NO parity, bit 8 marking, or NO parity with bit 8 spacing are switchable choices. An output character with improper parity will force a substitute character to be printed.

MECHANICAL SPECIFICATIONS

Color: Off-white top with flat-black base.

Mounting: 1 free-standing unit.

Height: 33.5″

Width: 27.5″

Depth: 24″

Weight: 107 lbs.

Environment

Temp: 10°C to 40°C (50°F to 104°F) operating.
−40°C to 66°C (−40°F to 151°F) nonoperating.

Humidity: 10% to 90% (relative, noncondensing) operating.
5% to 95% (relative, noncondensing) nonoperat.

Noise: 65 dB printing at 3 feet.

ELECTRICAL SPECIFICATIONS

90-132V ac or 180-264V ac, user-selectable; 50 or 60 Hz ±1 Hz. Included w/grounded plug for wall outlets. UL listed.

Heat Dissipation:
400W printing; 100W nonprinting.

SUPPLIES SPECIFICATIONS

Paper

Single-Part: 15 lb. paper min; 0.010″ card stock max.

Multi-Part: 2-6 part (no cards except last copy). Max. thickness 0.020″.

All parts of multi-part forms must be identical in width.

Note

NCR or 3M paper, up to 6-part. Must use ribbon on top copy. First surface impact paper not recommended.

Continuous-feed, fan-fold business forms with 3- or 4-prong margin crimps on both margins (multi-part). Stapled forms are not recommended and may damage tractors and other areas of the machine. Dot or line glue margins acceptable.

Caution

Do not line glue both margins as air will not be able to escape and poor impressions will result.

Ribbon

Digital-specified nylon fabric, spool assembly 0.5″W by 60 yards. Supply Item #36-12153-01

?GOT A QUESTION?

Give us a call, toll free, at 800-258-1710 (N.H. residents 603 - 884-6660) between 8:30 am and 5 pm EST. Catalog Sales saves you time and money.

DEALING DIRECT SAVES YOU $$$

The **Cat** prices are lower than **List** price. Pay **Cash** price and save even more. To qualify for these discounts follow the rules for dealing direct with **DIGITAL's** Catalog Sales Desk — See page 154 for details.

digital DIRECT SALES CATALOG

LS120 DECWRITER III

ORDERING INFORMATION

Basic Models

Cat. No.	Description	List	Cat.	Cash	Shipping Weight
B-LS120-HE	DECwriter III EIA Interface 120V ac 60 Hz	$3900	$3200	$3072	145 lbs.
B-LS120-HJ	230V ac 50 Hz Version of -HE	3990	3200	3072	145 lbs.

NOTE: Includes 7′ Power Cord, 9′ EIA Interface Cable, and Operations Manual.

Options

Cat. No.	Description	List	Cat.	Cash	Shipping Weight
B-LAXX-RA	Forms Package	$85	$81	$77	1 lb.
B-LAXX-RF	Communications Package (Programmable)	165	157	150	1 lb.
B-LAXX-RB	Communications Package (Non-Programmable)	120	114	109	1 lb.
B-LAXX-RN	20 mA Current Loop Interface	100	95	91	1 lb.
B-LAXX-RC	APL Character Set	120	114	109	1 lb.
B-LAXX-KJ	Compressed Font	55	52	50	1 lb.
B-LAXX-RM	Numeric Keypad	105	100	96	1 lb.
B-LAXX-LM	300 Baud Acoustic Coupler	475	451	432	1 lb.
B-LAXX-RG	Column Scale, Pointer	10	10	9	1 lb.

SUPPLIES AND ACCESSORIES

Accessories

To complement DECwriter III installations, a range of custom tailored accessories are available either individually or in combination kits as follows:

Work Surface Shelf, LAXX-KC — Attaches to either left or right side of terminal. Dimensions: 24L by 15″W.

Wire Shelf, LAXX-KD — Attaches to back of terminal to collect printer paper. Dimensions: 10½L by 10W by 2″H.

Basket, LAXX-NC — Attaches to back of terminal to collect printer paper. It is deeper than the LAXX-KD wire shelf and holds up to one complete box of single or multi-part forms. Dimensions: 12L by 16W by 13″H.

Casters, LAXX-KB — Attaches to back legs of terminals so they can easily be moved.

Cat. No.	Description	Cat.	Cash	Shipping Weight
B-LAXX-KC	Surface Shelf	$42.75	$40.95	14 lbs.
B-LAXX-KD	Wire Shelf	23.75	22.75	1 lb.
B-LAXX-NC	Basket	23.75	22.75	1 lb.
B-LAXX-KB	Casters	14.25	13.65	1 lb.

Supply and Accessory Kits for LS120

ACCESSORIES KIT LAXX-KA	Cat. No.	Cat.	Cash	Shipping Weight
Kit Includes 1 #LAXX-KB Caster Set 1 #LAXX-KC Surface Shelf 1 #LAXX-KD Wire Shelf	B-LAXX-KA	$76	$72.80	16 lbs.

Supplies

Ribbon

½″ by 60 yards nylon. 12 ribbons per box.
Shipping Weight: 3 lbs. per box.

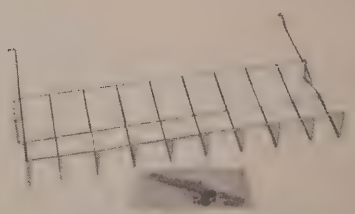
Cat. No.	Cat.	Cash
B-36-12153-01	$61.75	$59.15

Paper

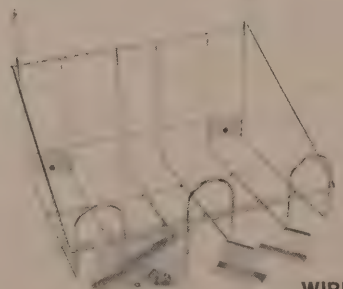
14⅞″ by 11″ white, fan-fold lined single-sheet.

Cat. No.	No. of Parts	Sheets Per Box	Cat.	Cash	Shipping Weight
B-36-09141-00	1	2400	$30.40	$29.12	40 lbs.

SURFACE SHELF



WIRE SHELF



WIRE BASKET

CALL: 800-258-1710 (N.H. Residents 603 - 884-6660) 8:30 am to 5 pm EST.

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LA180 DECPRINTER I

HIGH SPEED PRINTER 180 CPS

Lowest Price EVER

Features:

- *180 characters per second.*
- *Parallel interface.*
- *Accommodates 6-part form (0.20 max. thickness).*
- *Handles variable-width forms, 3 through 14⅞"W.*
- *132-column print; 10-characters-per-inch horizontal spacing, 16.5-per-inch optional.*
- *6-lines-per-inch vertical spacing.*
- *128-character ASCII upper/lower case set with control codes and symbols.*
- *7 by 7 dot matrix.*
- *Backspace capability.*
- *Quiet operation.*
- *Excellent character readability.*
- *Fine vertical adjustment for accurate forms placement.*
- *Paper-out switch.*
- *Paper-out override.*
- *Switch-selectable forms length (11 lengths).*
- *Drives 100' cable.*
- *Self test capability.*

Priced from $2688

DECprinter

High-speed line printer **LA180** has a handsome styling to blend in with office or computer room decor.

The LA180 DECprinter I is a 180-character-per-second, 132-column hard-copy printer. Utilizing a 7 by 7 dot matrix printing technique and a field-proven printhead, the LA180 provides highly legible and reliable printing of the full 128-character ASCII upper and lower case set. Each LA180 is equipped with a standard parallel interface; however, the unit may also be utilized as a serial device by the addition of one of the optional serial line interface kits.

Forms flexibility is provided by the LA180's ability to accommodate up to six-part forms and handles variable width forms from 3 to 14⅞" wide. Forms length is switch settable, see figure, in eleven lengths, from one line to 14", with fine vertical tractor release adjustment for precise location of printing.

Paper feed is tractor-driven by a stepping motor. The tractor design provides four pin paper engagement of the form on a flat bed, ensuring control and positive feeding of multi-part forms. A paper-out sensor and switch is provided as a standard feature.

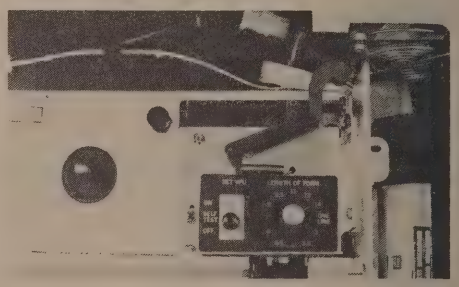


TABLE I — OPERATOR CONTROLS

POWER ON-OFF	Applies and removes ac power to entire machine.
ON-LINE/OFF-LINE	Enables or disables communications.
HEAD OF FORM	Feeds form to the next top-of-form or single-line, if forms switch is set in single-line position and ON-LINE/OFF-LINE switch is in OFF-LINE position. If the paper-out indicator is set, printing can be continued to the next top-of-form by pressing the Head-of-Form button for each line or holding button in until Head-of-Form is reached.
LENGTH OF FORM (ROTARY SWITCH)	Selects any of 11 form lengths.
SET VFU	Used in conjunction with the Length-of-Form switch to reset forms length.
SELF TEST	Will run a ripple test pattern locally if set in test position with machine in on-line mode.
FORMS THICKNESS ADJUSTMENT	Located on right side of printhead carriage; selects proper gap for 1-through-6-part form. Approximately 1 click for each part.
RIGHT AND LEFT TRACTOR ADJUSTMENT	Thumb screw may be loosened to allow tractor movement for various form widths.
FINE VERTICAL TRACTOR RELEASE	Line-feed knob may be depressed inward and rotated in the appropriate direction for precise location of printing with respect to vertical zones.

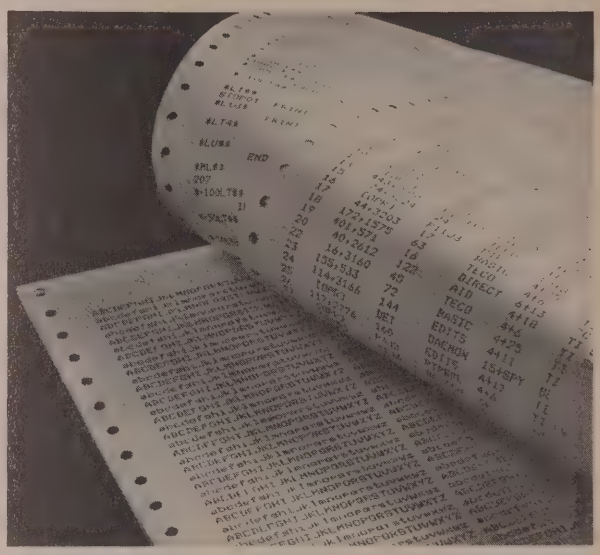
LA180 DECPRINTER I

Print Quality

The secret of LA180's print quality, see figure, is the design of the printhead. It comprises a 7 by 7 dot matrix which produces a far more legible image than the more conventional 5 by 5 matrix. The printhead wires are permanently lubricated and their curvature and support mechanism has been developed by computer simulation. The mechanism is protected by a massive heat sink. The results? Long life and minimal wear by paper or ribbon.

To ensure uniform density of the character impressions, the motion of the printhead wires is controlled from a constant-current source. For absolute accuracy in both horizontal and vertical dot placement, the printhead has a ruby sapphire bearing guide at its tip. This jewel bearing is highly resistant to wear, ensuring that each wire always strikes the ribbon and paper at the proper location. LA180's printhead has a rated life of 100 million characters.

Dye-based ribbons per a DIGITAL specification are used instead of carbon-based. These latter ribbons tend to unduly wear printhead wires which leads to poor character legibility. The ribbon feed system is also designed to eliminate smudging the impressions. The ribbon is advanced only during carriage motion and is in fact directly driven by this motion. This eliminates a separate ribbon advance circuit and associated actuators.



DECprinter I prints easily read upper and lower case characters formed in a 7 by 7 dot matrix positioned precisely by a proprietary new carriage system.

Paper Handling

Because DECprinter I has a full 132-column printing capability and can accept form widths all the way from 3 to 14⅞" — even 9½" teleprinter forms — the same forms can be used on both line printers and keyboard printers.

Six-part forms can easily be handled because of the tractor system for forms feeding. A stepping motor drives two pin-feed tractors. Thus the tractors reliably initialize on an integral forms line. There are always six pins engaging the paper; therefore, multiple forms are pulled with uniform tension without interleaf slippage and misregistration.

To accept different forms widths, the right tractor moves horizontally. The left tractor can be adjusted to permit precise horizontal alignment on pre-printed forms.

Character Set and Code

The full, 96-character, upper- and lower-case set is standard with the LA180. Data is interpreted in a read-only memory (ROM). Changing the ROM enables the user to print non-standard characters. The standard ASCII set, shown in Table II, consists of 10 numerics, 26 upper-case alphas, 26 lower-case alphas, and 34 special characters, including DELETE, a nonprinting, nonspacing control code. The total character and control code count is 128.

As an aid to the terminal operator, the top of LA180 is beveled and the ribbon is positioned away from the paper. The printed characters are therefore easily visible. The printhead, too, moves four spaces to the right whenever there is a pause in printing lasting over 1300 milliseconds. The printhead returns to its operating position within 100 milliseconds.

A compressed font option is available. This option changes the horizontal spacing from 10 characters per inch to 16.5 characters per inch. This allows 132 columns to be printed in 8" space. A 40% reduction in paper usage is achieved allowing 132-column reports to be filed in standard file cabinets. This option, once installed, must be removed if 132-column printing is again required.

TABLE II — COMMAND CODES FROM HOST COMPUTER

Character(s) and Octal Code(s)	Action
BEL (007)	Sounds audible tone. A separate tone is sounded for each of up to eight BEL codes in succession.
BS (010)	Moves printhead one space to left.
LF (012)	Prints content of line buffer, returns printhead to left margin, and advances paper one line.
FF (014)	Advances paper to top of next form (FORM FEED).
CR (015)	Moves printhead to left margin.
SP (040)	Stores "space character" in memory.
(041 to 177)	All printable characters. Received and stored in memory prior to printing.
DEL (177)	Clears memory.

?GOT A QUESTION?

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LA180 DECPRINTER I

Microprogram Control

Functions once performed by printers under hardware control are handled in the LA180 under the control of a 512-instruction microprogram. These instructions are divided into routines, each dedicated to a specific machine function. Microprogram control (MPC) initiates a machine function, senses performance of the function, and, based on that performance, determines which routine is to be performed next. Because the LA180 allows the user to monitor machine functions and operator controls, he can design his software to modify specific routines and to change the printer's responses as desired to meet changing operational requirements.

Control Logic

Eight-bit characters reach the LA180 from the user's interface and are processed through the single-character buffer under MPC, loading the character-buffer RAM with a line of data. From the RAM, characters are presented on a FIFO basis to the character-generator ROM, which generates the firing matrix through which the print head forms the printable characters. The ROM also contains decoding information for the nonprintable command characters.

The carriage servo and printhead subsystems are activated under MPC to move the printhead through the character cell and print the commanded dots in each of the seven rows. A CR (carriage return) character causes the MPC to move the printhead to the left margin. A BS (back space) character causes the MPC to move the printhead one column to the left. An LF (line feed) character causes the MPC to activate the stepper motor drive and advance the paper one line. An FF (form feed) character advances the paper to the top of the next form.

DECprinter is shipped with no parity. The user can select even parity or odd parity, with parity error printout, by changing jumpers.

Interfacing

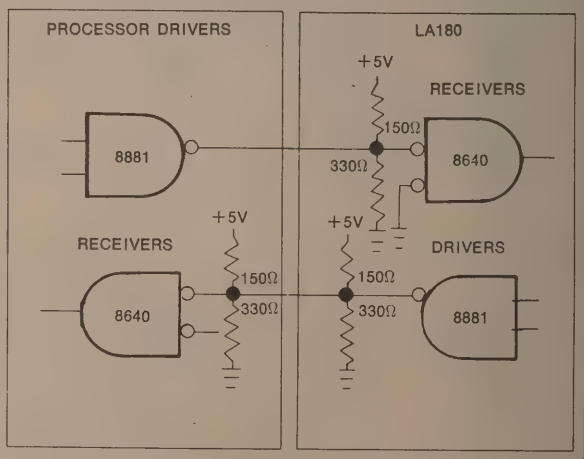
LA180 is generally connected via a local parallel interface to the host computer. Buffered serial interfaces (LAXX-NW for EIA RS232C and LAXX-NX for 20 mA current loop interconnection) are optionally available. They mount directly into LA180 and come complete with interface cabling. The standard parallel interface requires a BC11S-XX cable that plugs into a 40-pin Berg connector on the LA180 logic module. (Interface cable not supplied with terminal.) The cable can be any length up to 100 feet. The interface pin assignments for the host computer are shown in Table III. The diagram associated with Table III shows the recommended drivers and receivers for maximum noise rejection.

TABLE III — INTERFACE CONNECTOR PIN ASSIGNMENTS

Pin No.	Signal	Pin No.	Signal
A	Data Strobe	KK	+5V dc*
M	Data 1	B	Data Strobe Ret
K	Data 2	N	Data 1 Ret
U	Data 3	L	Data 2 Ret
P	Data 4	V	Data 3 Ret
C	Data 5	R	Data 4 Ret
E	Data 6	D	Data 5 Ret
S	Data 7	F	Data 6 Ret
SS	Parity*	T	Data 7 Ret
Y	Demand	TT	Parity Ret
PP	Busy*	Z	Demand Ret
EE	Paper Fault	RR	Busy Ret
HH	On Line	FF	Paper Fault Return
MM	+12V dc*	JJ	On Line Ret
LL	1200 baud*	W	+5V dc*
	DC Ground	UU	−12V dc*
	Chassis Ground		

*Optional signal at interface (jumper must be added).

LA180 Interface Diagram



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LA180 DECPRINTER I

ORDERING INFORMATION

Basic Models

Cat. No.	Description	List	Cat.	Cash	Shipping Weight
B-**LA180-PA**	180 cps, 132-column printer Parallel input/output 115V ac 60 Hz operation	**$3240**	**$2800**	**$2688**	145 lbs.
B-**LA180-PD**	Same as -PA except 230V ac 50 Hz operation	**3240**	**2800**	**2688**	145 lbs.

Options — User Installed

Cat. No.	Description	List	Cat.	Cash	Shipping Weight
B-**LAXX-NW**	EIA RS232C buffered serial interface	**$525**	**$499**	**$478**	5 lbs.
B-**LAXX-NX**	20 mA current loop buffered serial interface	**525**	**499**	**478**	5 lbs.
B-**LAXX-KJ**	Compressed font option	**55**	**52**	**50**	2 lbs.

OPERATIONAL SPECIFICATIONS

Printing Speed: 180 characters/second.
Number of Columns: 132
Printing Characters: 96-character ASCII set.
Control Characters: 32

Printing

Type: Impact, 7 by 7 dot matrix.
Vertical Spacing: 6 lines/inch.
Horizontal Spacing: 10 characters/inch; 16.5 per inch opt.
Single Line Skip: 32 ms
Slew Speed: 7.5″/second; 45 lines/second.
Carriage Return Time: 275 ms max.

Communications

Parallel transfer standard. Optional serial buffered EIA RS232C or 20 mA current loop.

MECHANICAL SPECIFICATIONS

Mounting: 1 free-standing unit.
Size: 33.2H by 27.5W by 20.0″D
Weight: 102 lbs. approximate.
Color: Off-white top with flat black base.

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature: 10°C to 40°C (50°F to 104°F)
Relative Humidity: 10% to 90% noncondensing; maximum wet bulb 29°C.
Noise: 65 dB at 3 feet.

ELECTRICAL SPECIFICATIONS

Input Voltage and Frequency:
LA180-PA — 115V ac 60 Hz
LA180-PD — 230V ac 50 Hz
Heat Dissipation: 400W printing, 100W nonprinting.

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LA180 DECPRINTER I

SUPPLIES SPECIFICATIONS

Paper

Single-Part: 15-lb. paper min.; 0.010″ card stock max.

Multi-Part:
2-6 part (no cards except last copy). Max. thick. 0.020″.
All parts of multi-part must be identical in width.

Note
NCR or 3M paper, up to 6-part, must use ribbon on top copy. First surface impact paper not recommended.

Ribbon

Digital-specified nylon fabric, spool assembly 0.5″ wide by 60 yards.

Continuous-feed, fan-fold business forms with 3- or 4-prong margin crimps on both margins (multi-part). Stapled forms are not recommended and may damage tractors and other areas of the machine. Dot or line glue margins acceptable.

Caution
Do not line glue both margins as air will not be able to escape and poor impressions will result.

SUPPLIES AND ACCESSORIES

Paper: White, Fan-fold, Lined 14⅞ by 11″

Cat. No.	No. of Parts	Sheets Per Box	Cat.	Cash	Shipping Weight
B-36-09141-00	1	2400	$30.40 per box	$29.12 per box	40 lbs.

Ribbon

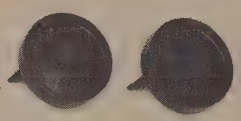
Cat. No.	Description	Cat.	Cash	Shipping Weight
B-36-12153-01	½″ by 60 yards nylon. 12 ribbons per box.	$61.75 per box	$59.15 per box	3 lbs.

Accessories

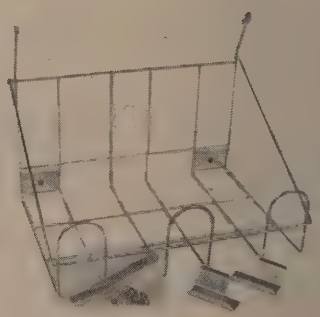
Casters: LAXX-KB
Set of casters for back legs of LA180 Terminals.

Paper Basket: LAXX-NC
Easily attaches to back of LA180 to collect printer paper. Measures 16W by 13H by 12″L.

Cat. No.	Cat.	Cash	Shipping Weight
B-LAXX-KB	$14.25 each	$13.65 each	1 lb.
B-LAXX-NC	23.75 each	22.75 each	1 lb.



CASTERS



PAPER BASKET

LA180 MAINTENANCE MANUAL

A comprehensive manual for the do-it-your selfer; provides installation, operation, theory, electrical and mechanical servicing information, engineering drawings, and an illustrated parts breakdown.

Catalog No.	Price
B-EK-LA180-MM	$19

CATALOG NUMBERS VS MODEL NUMBERS

The Catalog Numbers published in this catalog relate only to purchases made through the Direct Sales Catalog. The **Bold Face** portion of each Catalog Number is the official DIGITAL Model Number. All invoices and packing slips will reference only the Model Number.

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PAPER TAPE READER ACOUSTIC COUPLER

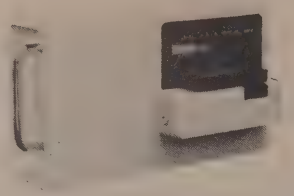
SERIAL PAPER TAPE READER — PRS01

The PRS01 is a small, portable paper tape reader that connects into the serial line of a system console or terminal. The reader provides a convenient and inexpensive method of loading paper tapes using the keyboard device codes of the terminal. It is designed primarily for loading maintenance and diagnostic programs. Because the reader produces a 20 mA serial asynchronous signal, it can be interconnected to a console device or terminal, or to any 20 mA current loop input if no console device is available.

A switch on the reader permits selection of either the console keyboard or the PRS01 as the computer input device. This lets the user switch back and forth between devices without having to disconnect the reader once it is installed. Operation is continuous with start and stop functions controlled by a front panel switch. Outside of this, the reader is similar in operation to the low-speed reader on an ASR teleprinter.

The PRS01 reads 8-level tapes with in-line feed hole. Two versions of the reader are available so that transfer rates of 300 baud or 2400 baud can be used. 115V ac or 230V ac models can be ordered, see table.

The entire reader, including a self-contained power supply, is housed in a small 2-piece plastic case. The back cover is removable for easy access to all sub-assemblies which are mounted inside the front cover.



PRS01

OPERATIONAL SPECIFICATIONS

Feed Hole: In-line.

Tape Level: 8-level.

Transmission Rates: PRS01-AA, PRS01-AB — 2400 baud (approx. 120 char/sec.).

PRS01-BA, PRS01-BB — 300 baud (approx. 22 char/sec.).

Interface: 20 mA current loop, passive, with Mate-N-Lok connector (12-09378-01).

Data: Data is in the form of a serial pulse string. Each character time consists of one "start" bit, eight "data" bits, and one "stop" bit. The "stop" bit (or "1") is current flowing.

System Connections

The PRS01 reader can easily be connected to computer systems with or without terminals. If the computer does not have a terminal, an adapter cable is normally used to connect the reader cables to the computer's terminal interface. Because the type of adapter cable needed depends on which computer terminal interface is used, it may have to be purchased separately.

If the computer has a terminal, then the standard interface cable supplied with the reader is used to interconnect the components. This interface cable uses a "Y" connection so that it can be inserted between the terminal and its interface.

ELECTRICAL SPECIFICATIONS

Power Requirements: PRS01-AA, PRS01-BA — 1.0A @ 117V ac (±10%), 50/60 Hz

PRS01-AB, PRS01-BB — 0.5A @ 230V ac (±10%), 50 Hz

MECHANICAL SPECIFICATIONS

Operating Temperature: 15°C to 32°C (59°F to 90°F).

Humidity: 20% to 80% (noncondensing).

Dimensions: 12W by 7½H by 5¼"D.

Weight: 6½ lbs.

Cat. No.	Baud Rate	Power Input	List	Cat.	Cash	Shipping Weight
B-**PRS01-AA***	2400	115V ac 60 Hz	**$750**	**$713**	**$683**	9 lbs.
B-**PRS01-AB***	2400	230V ac 50 Hz	**750**	**713**	**683**	9 lbs.
B-**PRS01-BA***	300	115V ac 60 Hz	**750**	**713**	**683**	9 lbs.
B-**PRS01-BB***	300	230V ac 50 Hz	**750**	**713**	**683**	9 lbs.

*Includes "Y" cable 10' long, male and female loose Mate-N-Lok connectors for computer and terminal.

ACOUSTIC COUPLER — DF01-A

DF01-A Acoustic Coupler can be used to connect DIGITAL and other terminals to remote computing systems via ordinary telephone sets and public switched telephone network.

Both 20 mA current loop and EIA RS232C interfaces are standard in the DF01-A.

Through slide switches, the user may choose either full- or half-duplex operation.

"Sound-seal" cushions on the DF01-A hold the telephone handset firmly in position and provide excellent acoustic shielding. Good durability is provided by an injection-molded case made of special impact-resistant material. All electronic circuitry, switches and connectors are mounted on a single printed circuit board.

Operating Modes: Originate only, in half- or full-duplex.

Data Rate: Up to 300 baud.

Receiver Sensitivity: −35 dBM in acoustic mode.

Frequencies:

	Send	Receive
Mark	1270 Hz	2225 Hz
Space	1070 Hz	2025 Hz
Frequency Stability	0.3%	0.4%

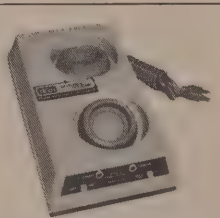
Modulation Technique: Audio Freq. — Shift Keyed (AFSK).

Transmit Power Level: −21 dBM ±3 dBM.

Line Coupling: Acoustic coupling to telephone line.

Interface: 20 mA teletype levels or EIA RS232C (both available on the same unit; both outputs can be used simultaneously if desired).

Compatibility: Used with remote terminals (teleprinter, typewriter, CRT display, plotter, card reader) to provide information transfer to/from a Bell 103A2 (or equivalent) dataset. Cannot be used with 230V 50 Hz, nor is it compatible with European modems.



Controls and Indicators: Power ON/OFF. Full-duplex/half-duplex (slide switch). Carrier ON indicator light.

Cables: Supplied w/8' cable equipped with Mate-N-Lok connector at terminal end for connection to terminals equipped with DEC compatible 20 mA interfaces. A cable should be ordered (DEC No. BC05D-25) to connect the DF01-A to terminals already equipped with EIA interface and cable.

MECHANICAL SPECIFICATIONS

Operating Temperature: 0°C to 60°C (32°F to 140°F).

Size: 7.5W by 3H by 12"L. **Wt:** 6 lbs. **Mounting:** Table case.

ELECTRICAL SPECIFICATIONS

Power Requirement: 115V 60 Hz (less than 10W).

Cat. No.	List	Cat.	Cash	Shipping Weight
B-**DF01-A***	**$760**	**$722**	**$692**	8 lbs.

*Operators manual supplied with each unit.

CALL: 800-258-1710 (N.H. Residents 603 - 884-6660) 8:30 am to 5 pm EST.

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VT52 DECSCOPE

VIDEO TERMINALS

Priced from $1729

VT52 DECscope
has a typewriter layout keyboard, keypad, upper and lower case alphabet, and advanced cursor control. Screen display capacity is 1920 characters (24 lines of 80 characters).

Features:

- *Price-competitive with teletypewriters.*
- *1920-character screen with twenty-four lines of 80 characters.*
- *Highly reliable keyboard featuring typewriter layout.*
- *Numeric function keyboard.*
- *Asynchronous data communication at individually switch-selected transmit and receive baud rates from 75 to 9600 baud.*
- *ASCII code utilized, plus additional commands through escape sequences.*
- *Extensive cursor controls.*
- *Horizontal tabs.*
- *Exclusive hold-screen mode prevents data loss regardless of host computer transmitting speed.*
- *Easy interfacing with 20-mA current loop or RS232C levels.*
- *Keystroke click for rhythmic typing.*
- *Three-key rollover protection.*
- *Full-duplex and full-duplex-with-local-copy modes.*
- *Printer interface option.*

DECscope is a character-oriented video terminal designed to replace electromechanical devices. Intended for asynchronous data communication systems. DECscope is compatible with most popular computers. DECscope is simple for operators to master, and noiseless for locations requiring silence. DECscope can reduce the high costs, both obvious and subtle, of teletypewriters and other video data terminals. The savings in operating costs are most meaningful. DECscope has a high throughput compared to teletypewriter devices. High reliability is the key to improved throughput. Electromechanical maintenance is eliminated, and electronic maintenance is minimal. DECscope costs less to keep running, and it keeps running longer.

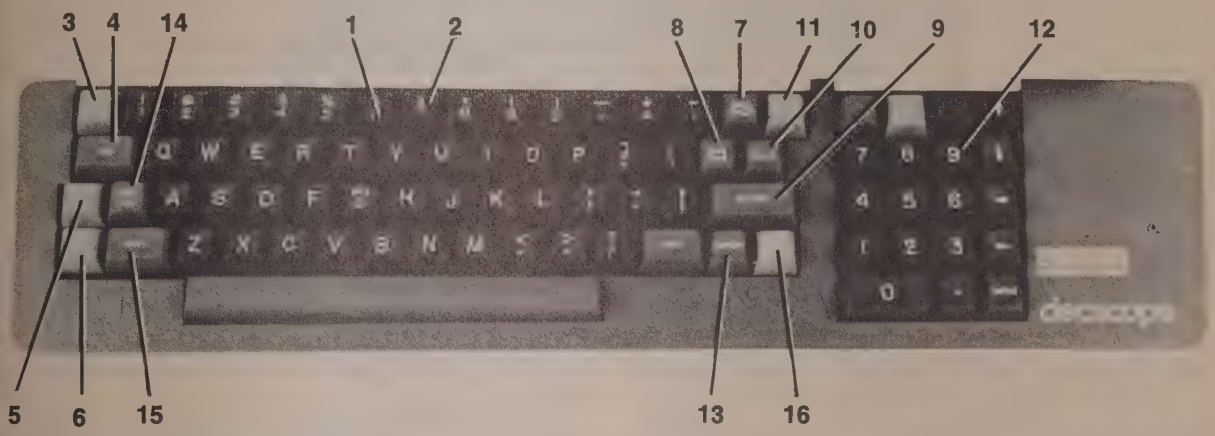
VT52 DECSCOPE

TYPEWRITER KEYBOARD

The keyboard is built to a universally accepted standard, the office typewriter (ANSI standard). DECscope's key layout, stroke, and touch are familiar to any typist. See keyboard close-up illustration. Training and familiarization time can be kept to a minimum without sacrificing operating accuracy and speed.

In hospitals and other sensitive locations, DECscope can operate in absolute silence. When silence is not required, operator can turn on an audible-response switch to produce a key-stroke click that encourages rhythmic, high-throughput keying, without the annoying noise of a teletypewriter.

DECscope also increases the operator's speed with three-key rollover protection to eliminate multiple-keying errors. Up to three keys can be depressed yet transmission will be correct if one of the first two keys typed is released before the third.



KEY AND CONTROL LOCATIONS AND FUNCTIONS

1. Labels can be placed here to identify 10 user-defined escape sequences called up by individual keys.
2. Ribbed lines cast in cabinet associate displayed escape sequence names with keys selecting them.
3. ESC (SEL) — Transmits the character ESC (escape) which, when received by the terminal from the host, introduces an escape sequence. If the terminal is in the local-copy mode or the host software echoes ESC back to the terminal, the ESC key initiates escape mode, indicating that the next character received is to be interpreted as a command rather than a character. Many software systems also assign a special meaning to the ESC character.
4. TAB — Moves cursor to the next tab stop; stops are positioned every eight spaces through 72nd space, then every space to 80th. No effect when cursor is at 80th.*
5. CTRL — Allows special characters to be transmitted. When control key is held down, the bit two of any character transmitted by the DECscope is sent as zero. These special characters are frequently used by system software, and some have special meanings to the DECscope when the host echoes them back or transmits them.
6. SCROLL — Functions only when DECscope is in hold-screen mode. Allows one new line to be displayed. With SHIFT key down, allows 24 new lines to be displayed, filling screen with new data.
7. BACK SPACE — Moves cursor one space left.*
8. LINE FEED — Moves cursor down one line. Also scrolls display after 24th line.*
9. RETURN — Moves cursor to left margin on same line.*
10. DELETE — Transmits a character which the host computer can use to institute a last-character erase sequence.
11. BREAK — Forces an interrupt of incoming messages when used with half-duplex system. Holds transmission line low as long as key is pressed. Included for compatibility with half-duplex systems.
12. NUMERIC KEYPAD — In alternate-keypad mode, numeral, decimal point, and ENTER keys transmit unique escape sequences, distinguishing them from alphanumeric keys.
13. REPEAT — Repeats, at rates up to 30 characters a second, any key held down simultaneously.
14. CAPS LOCK — Generates all upper-case characters, plus numerals.
15. SHIFT — Generates all upper-case characters, plus upper symbols on key caps.
16. COPY or PRINT — Functions when external hard copy option installed. Controls printout operation.

*These special functions occur only when character is echoed or transmitted from host computer to DECscope.

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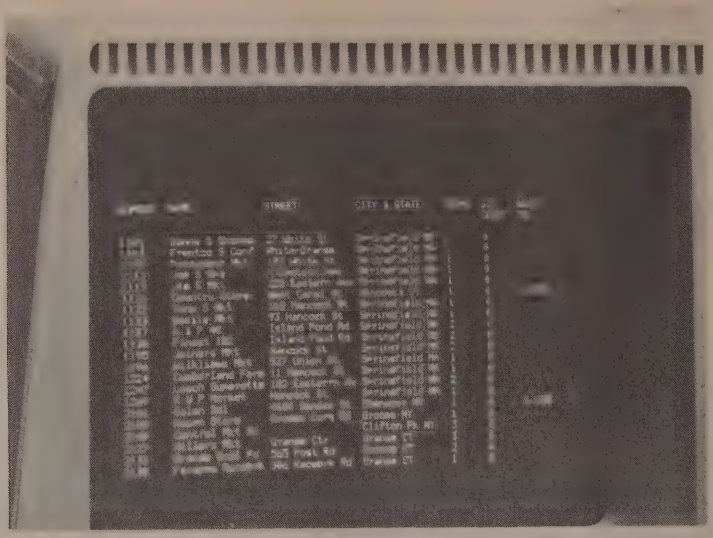
VT52 DECSCOPE



Very Readable Screen

P4 phosphor is used for optimum character definition, giving the DECscope display better character resolution than a consumer-grade television set. Character brightness is operator-adjustable. The screen is recessed and tilted to avoid glare from overhead lighting. Because no filter covers the screen, it can be easily cleaned by the operator. However, for users with special applications, DECscope will accept colored filters.

Screen size is 24 lines by 80 characters (full 96 ASCII character set) on the VT52 Series. The VT52 has a 7 by 7 dot matrix for character shapes. Excellent upper and lower case definition is achieved, see illustration.

The screen's 80 character per line format allows the exact display of FORTRAN or COBOL full-card images; thus the DECscope can take the place of a key punch and card reader for program entry.

A wide range of cursor controls is provided, including both incremental and extended-movement commands utilizing escape sequences. Up, down, right, and left movements, see Table I, plus 8-space tabbing are available. Individual characters, lines, or the full screen can be erased using simple commands (ESC J and ESC K).

Use of the extended-movement commands can greatly increase an operator's throughput in form-filling tasks, for example, because the host computer software can interactively position the cursor at the next answer required, based on previous answers.

Two Operating Modes

DECscope operates in two modes: full-duplex, and full-duplex-with-local-copy.

The full-duplex-with-local-copy mode allows the operator to display and verify each character as it is being keyed for transmission. This feature makes DECscope compatible with software written for half-duplex terminals. In the conventional full-duplex mode, the character is keyed to the host computer and can be echoed back for display.

Switch-selectable transmit and receive speeds are set individually to the same or different speeds.

Transmission and reception speeds can be 75, 110, 150, 300, 600, 1200, 2400, 4800, or 9600 baud.

TABLE I
MANUAL CURSOR CONTROL COMMANDS

Cursor Direction	From VT52 Keypad	From Keyboard	Other Action
Up one line	↑	ESC A	No Scroll
Up one line		ESC I	Scrolls down
Down one line	↓	ESC B	No Scroll
Down one line		LF	Scrolls up
Right one column	→	ESC C	No erase
Right one column		Space	Erases
Left one column	←	ESC D	No erase
Left one column		BS	No erase
Home		ESC H	To start of top line

SCREENFILTERS — FOR VIDEO TERMINAL

Acrylic filters are available for use with DIGITAL's VT52 and VT50 Video Terminals. Filters serve to reduce excessive glare from overhead lighting. Shipping Weight: .5 lbs.

Cat. No.	Color	Cat.	Cash
B-12-13195-00	Gray	$14.25 each	$13.65 each

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VT52 DECSCOPE

Interface: Software

Basically DECscope will operate with software handlers written for teletypewriters or other video terminals. But as with any interactive device the unique operational features of DECscope must be carefully considered for the intended application. The following aspects are key:

1. *Transmission Mode* — Full-duplex or full-duplex with local copy operation. Asynchronous transmission.
2. *Word Length* — 7-bit data words, plus even or no parity. All outgoing characters are generated using even-parity protocol (a word is judged correct if it contains an even number of ones). A slide switch on the bottom of the DECscope enables the operator to select no parity where the usual parity bit is always in a mark condition. Odd parity, and space, can be obtained by moving a jumper wire.
3. *Variable Baud Rates* — By switch selection from 75 to 9600 baud operation is possible. However, word length varies depending on baud rate. At 75, 150 and higher, the word length is 10 bits while at 110 baud the word length is 11 bits.
4. *Character Display Format* — Upper and lower case display. 12 lines of characters. Display width of 80 characters.
5. *Command Responses* — How DECscope reacts to commands generated by the host computer is a fundamental consideration. For example, commands such as control codes, escape sequences, cursor position control, automatic screen erasing, and hold-screen modes are all received from the host computer in ASCII format. Table II and Table III document the respective codes and their actions.

Interface: Hardware

Two interfaces are available for DECscope, the 20 mA current loop and the EIA RS232C standard. The VT52 can be ordered with either a 20 mA or EIA interface. For later conversion, optional, user-installed interfaces are available to provide both EIA capability for 20 mA-equipped units and 20 mA capability for EIA-equipped units. Refer to DECscope option listings on page 32.

The 20 mA loop is optically coupled and provides sufficient gain for systems requiring more than 20 mA switching capacity. The current loop can be operated off-line to insure that it is functioning properly before system installation. DECscope is passive with this interface in that the host computer supplies the driving current. Generally the DECscope with this interface is used for data input applications where the terminal is located no more than one thousand feet from the host computer. The actual reliable working distance depends on the cable used, the electrical noise present at the installation, and the host computer circuitry. Typical assignments: inventory control, job status, computer console, nursing station, and educational systems.

DECscopes equipped with the EIA interface are commonly used for remote order-entry or order processing from any location that has access to a dial telephone network or leased line. Typical assignments: time-share terminals, credit checking, order entry, reservations, and program development.

TABLE II — COMMANDS FROM HOST COMPUTER

Character(s) and Octal Code(s)	Action Taken
BEL (007)	Sounds the audible alarm.
BS (010)	Moves the cursor left one position, unless it was at the start of a line to begin with.
TAB (011)	Moves the cursor rightward to the next TAB stop, unless the cursor was at the end of a line to begin with. (TAB stops are fixed in columns 9, 17, 25, 33, 41, 49, 57, 65, 73, 74, 75, 76, 77, 78, 79, and 80.)
LF (012)	Moves the cursor down one line — performs an upward scroll if the cursor was on the bottom line.
CR (015)	Moves the cursor to the start of the same line it was on.
ESC (033)	Serves as a signal that the following character is to be interpreted rather than displayed; ESC introduces multicharacter commands called "Escape Sequences."
Displayable Characters (041 to 176)	The character is displayed at the cursor position; then the cursor is moved right one column, unless it was at the end of a line to begin with.
Space (040)	Space (040) blanks the character at the cursor position and moves the cursor right.
NUL (000) and DEL (177)	The terminal does not respond to NUL or DEL, in order to be compatible with slower electromechanical devices that use these characters as filler.

TABLE III — ESCAPE SEQUENCE COMMANDS FROM HOST COMPUTER

Escape Sequences	Effect
ESC = (033 075)	Enters alternate-keypad mode. In Alternate-keypad mode, keys on the numeric pad transmit unique Escape Sequences to distinguish them from similar keys on the main keyboard, and to invoke user-defined functions.
ESC (033 076)	Exits alternate-keypad mode and returns to Numeric-keypad mode. (Alternate-keypad mode remains in effect until this command disables it.)
ESC A (033 101)	Moves the cursor up one line, unless it was already on the top line — does not perform a scroll.
ESC B (033 102)	Moves the cursor down one line, unless it was already on the bottom line — does not perform a scroll.
ESC C (033 103)	Moves the cursor HOME: to the start of the it was already at the end of a line — does not erase the character at the old cursor position.
ESC D (033 104)	Moves the cursor left one column, unless it was already at the start of a line — same as BS (010).
ESC H (033 110)	Moves the cursor HOME: to the start of the top line.
ESC I (033 111)	Moves the cursor up one line — performs a downward scroll if the cursor was on top line.
ESC J (033 112)	Erases all data from the cursor position to the end of the screen.
ESC K (033 113)	Erases all data from the cursor position rightward on the same line.
ESC Y (033 131)	Direct Cursor Addressing feature — moves the cursor to any specified position on the screen, regardless of where it was before. Format is: ESC Y Line Number Column Number Line Number is one character; octal code 040 to refer to the top line, 041 to refer to the second line, . . . 067 to refer to the bottom line. Column Number can legally range from 040 (left-most column) to 157 (right-most column). The cursor is moved to the specified column of the specified line.
ESC Z (033 132)	Requests terminal to identify itself. Terminal will respond with a three-character Escape Sequence unique to its own configuration.
ESC [(033 133)	Enters Hold-screen mode. In Hold-screen mode, data will not be scrolled off screen until operator requests it by striking Scroll key.
ESC (033 134)	Exits Hold-screen mode. (Hold-screen mode remains in effect until this command disables it.)

Printer Option — The first three Escape Sequences perform the exact same functions as the COPY key:

ESC]	(033 135)	Print the Screen
ESC ^	(033 136)	Enter Auto-Print Mode
ESC _	(033 137)	Exit Auto-Print Mode
ESC V	(033 126)	Print Cursor Line
ESC W	(033 127)	Enter Printer-Controller Mode
ESC X	(033 130)	Exit Printer-Controller Mode

CALL: 800-258-1710 (N.H. Residents 603 - 884-6660) 8:30 am to 5 pm EST.

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VT52 DECSCOPE

Controlled Scrolling

To allow time for reading long messages coming in at high speeds, the operator or host computer can put DECscope into a hold-transmission mode by initiating ESC [(033 133). Cancellation of this mode is achieved by ESC / (033 134).

When the terminal enters the hold-screen mode, the current line or any subsequent line selected by the operator is displayed until a line feed occurs or the 80th character position is reached. When an LF (line feed) is received, it is not immediately processed but stored in the housekeeping portion of the terminal's memory. Receipt of any subsequent character will cause the terminal to transmit X-OFF (023). That character, and any others which may be received between that time and the time at which X-OFF (023) is interpreted by the host and transmission is stopped, will be stored in a 13-position overflow portion of memory.

If the operator, by pressing the SCROLL key, allows another line to be displayed, the line feed is processed, then the overflow characters are processed (displayed) until the next LF is encountered. If the overflow is exhausted without encountering an LF, the terminal transmits X-ON (021).

If the host fails to stop sending and the overflow area fills, the terminal will process the line feed and the characters in the overflow area regardless of hold-screen mode.

The Auxiliary Keypad

An advanced feature of the VT52 is the auxiliary keypad that operates in one of two modes. Software can place the terminal in a mode in which the keypad as well as the main keyboard's numeral keys can be used for data entry. If it is desired to distinguish between the typing of keys on the keypad and keys on the main keyboard, software can select a mode — Alternate Keypad Mode — in which each key on the keypad transmits a unique Escape Sequence. See Table IV.

Easier manual control of the cursor is facilitated by "arrow keys." If the codes transmitted by the "arrow keys" are echoed back to the terminal, they will cause the cursor to move one position in the direction the arrow points in. The CONTROL, SHIFT, and CAPS LOCK keys do not affect the codes transmitted by the keys on the auxiliary keypad, in either keypad mode.

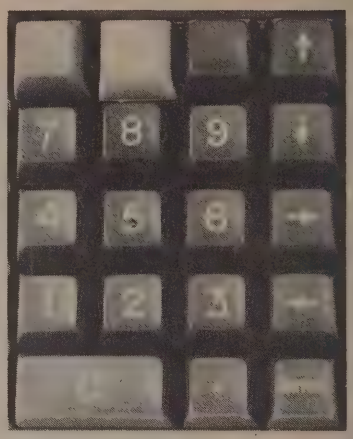

TABLE IV
KEYPAD COMMANDS

Typing the Key Labeled . . .	In Numeric-Keypad Mode, Transmits the Following Code(s)	In Alternate-Keypad Mode, Transmits the Following Code(s)
0	0	ESC ? p
1	1	ESC ? q
2	2	ESC ? r
3	3	ESC ? s
4	4	ESC ? t
5	5	ESC ? u
6	6	ESC ? v
7	7	ESC ? w
8	8	ESC ? x
9	9	ESC ? y
		ESC ? n
ENTER	CR	ESC ? M
(up arrow)	ESC A	ESC A
(down arrow)	ESC B	ESC B
(right arrow)	ESC C	ESC C
(left arrow)	ESC D	ESC D
(left blank key)	ESC P	ESC P
(center blank key)	ESC Q	ESC Q
(right blank key)	ESC R	ESC R

Printer Interface

The VT52 Printer Interface Module, VTXX-KA, is a field-installable option available on all new VT52s and certain units already in the field. It provides a data path between the VT52 Video Terminal and a serial or parallel printer such as the LA35 or LA180.

When this option is incorporated, there is a COPY (or PRINT) key at the lower right corner of the main keyboard. Using this key, the operator can make the terminal output text to the printer in one of two ways. The two variations depend on whether the operator holds down the SHIFT key when the COPY key is typed. If the COPY key is pressed without the SHIFT key down, then the terminal will output the entire contents of the screen to the printer. If the COPY key is pressed while the SHIFT key is held down, then the terminal enters Auto-Print Mode. Auto-Print Mode allows a variable number of lines of text to be the output to the printer. Whenever the terminal gets a Line Feed command to move the cursor down one line, the line the cursor was on at the time will be the output to the printer. This will be true for as long as the terminal remains in Auto-Print Mode. To take the terminal out of Auto-Print Mode, the operator types the shifted COPY key a second time. None of these three uses of the COPY key cause any codes to be sent to the host computer.

The three commands which the operator can issue by using the COPY key can also be issued from the computer. To command the terminal to send text to the printer, the host sends the VT52 Escape Sequences ESC], ESC Λ and ESC ___ (see Table III). There are two additional ways in which the host computer can operate the printer:

- By specifying individual lines to be printed, ESC V.
- By placing the terminal in a mode in which it sends the characters it receives to the printer instead of to the screen (Printer-Controller Mode ESC W, enter mode and ESC X, exit mode).

When the terminal receives ESC V from the host, it will output the entire contents of the line which the cursor is on to the printer.

If the printer has more than 80 columns, the columns to the right of the 80th column will never be used by the line-at-a-time PRINT commands, since it is impossible to construct a line on the screen of the VT52 with more than 80 columns. Many programs, however, will want to control the actions of the printer in more detail, without the "interpretive" activity of the VT52 (trimming blanks and inserting line delimiters). For example, the program may want to be able to print in all 132 columns of the printer, overprint lines, or send control codes to the printer. A program does this by placing the VT52 in Printer-Controller Mode. In Printer-Controller Mode, every character the VT52 receives will be passed directly to the printer without being converted or otherwise acted upon by the VT52. The VT52 becomes essentially a remote printer controller.

VT52 DECSCOPE

Printer Interface (Cont'd)

The characters ESC W, which the host sent to the VT52 to cause it to enter Printer-Controller Mode, are not passed to the printer. When the VT52 receives ESC X, which causes it to exit Printer-Controller Mode, the ESC will already have been sent to the printer. Instead of sending the X to the printer, the VT52 sends the character CAN (whose code is 030) to cancel the effect of the ESC. The action of the printer is not instantaneous and may lag behind data transmission from the host to the terminal. But in situations where information which has been requested to be printed might be destroyed or altered before it can be printed, the terminal will cease processing incoming characters. The terminal begins putting incoming characters in its Silo buffer, and transmits X-OFF to the host. When the necessary printing has been finished, the terminal will begin to process the characters in the Silo. When it has processed all the characters in the Silo, the terminal will send X-ON to the host to indicate that it is ready for more characters.

When the terminal is in Printer-Controller Mode, so that data flows through the terminal and out to the printer as it is received from the host, the terminal will use the Silo, and X-OFF and X-ON signals, to limit the data rate on the transmission line to a rate the printer can keep up with. Therefore, the maximum data rate for output to the printer via Printer-Controller Mode is the minimum of the baud rate between the terminal and the printer, and the baud rate between the terminal and host.

On the interface module itself, there is an 8-position rotary switch. The switch selects which of the interfaces (serial or parallel) will be used and, if the serial interface is selected, which baud rate will be used. Selectable serial baud rates are: 150, 300, 600, 1200, 2400, 4800, and 9600 baud.

The host cannot determine if the terminal operator has pressed the COPY key. Host software MUST support synchronization with X-OFF/X-ON (must suspend its transmission promptly upon receiving X-OFF and resume upon receiving X-ON), or else the Silo may overflow, interfering with the accuracy of the output.

Status Reporting

When VT52s and other terminals such as the VT50 are used in the same computer system, software can send each terminal a command (ESC Z) to identify itself. The VT52 will automatically transmit a three-character Escape Sequence which identifies it as a VT52. The host thus determines which features can be used with the terminal presently attached.

The significance of the status reporting feature is that VT50s, VT52s and future VT models can be freely interchanged within a system, with the software responding correctly to each different type of terminal.

OPERATIONAL SPECIFICATIONS

Display	VT52
Format	24 lines by 80 characters
Character matrix	7 by 7
Character size	.08 by .16″
Screen size	8.3 by 4.1″
Character set	ASCII 96-characters (upper/lower case, numeric, punctuation)

Alphanumeric Keyboard	
Character	ASCII 96-characters plus 32 control codes
Key layout	ANSI typewriter
CAPS LOCK key	Yes
Numeric Keypad	10 decimal digits, decimal point, ENTER (CR) key, four cursor controls, three user-defined (blank) keys

Communications	
Interface	20 mA current loop, or EIA RS232C
Code	USASCII extended by Escape Sequences
Speed — Full-duplex (switch-selectable)	75, 110, 150, 300, 600, 1200, 2400, 4800, and 9600 baud
Speed — Full-duplex with local copy (switch-selectable)	75, 110, 150, 300, 600, 1200, 2400, 4800, and 9600 baud
Speed — Full-duplex split speeds (switch-selectable)	Transmission at 75, 150, 300 baud with reception at 600, 1200, 2400, 9600 baud

Cursor	
Type	Blinking underline
Control	Up or down 1 line, right 1 character, left 1 character, home, tab, erase to line end, erase to screen end, move to host computer commanded position

DECSCOPE MAINTENANCE MANUALS

Comprehensive documentation that provides installation, operation, theory, electrical and mechanical servicing, and engineering drawings.

Cat. No.	For Model	Price	Shipping Weight
B-EK-OVT52-MM	VT52	$50.00	3 lbs.

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VT52 DECSCOPE

OPERATIONAL SPECIFICATIONS (Cont'd)

Audible Signals

Key Click: Switch-controlled.

Bell: Sounds (a) upon receipt of control character BEL.
(b) when keyboard input approaches right margin.

Operator Controls

Power On/Off, Intensity Control, Baud Rate Switch, Terminal Mode Switch, Key-Click On/Off, Even/No Parity.

Hold-Screen Mode

Allows operator to halt transmission from host, preserving data on display. Enabled/disabled by Escape Sequences.

Parity

Even or mark (no parity) switch-selectable. Odd or space possible with rewiring (jumper).

Page Overflow

Upward scroll.

ELECTRICAL SPECIFICATIONS

Line Voltage

100-126V or 191-238V, or 209-260V

Line Frequency

60 ±1 Hz or 50 ±1 Hz

Power Consumption

110 watts

Power Line Hash Filter

Low Leakage Balun Type

Overload Protection

Circuit Breaker

MECHANICAL SPECIFICATIONS

Dimensions

Height: 14.1″

Width: 20.9″

Depth: 27.2″

Minimum Table Depth: 17.7″

Weight: 44 lbs.

Operating Environment

DEC-STD-102
Class B Environment
10°C to 40°C (50°F to 104°F)
Relative Humidity 10% to 90%
Maximum Wet Bulb 28°C (82°F)
Minimum Dew Point 2°C (36°F)

Case Material

Injection-molded Noryl Thermoplastic Screen Phosphor is P4

ORDERING INFORMATION

Cat. No.	Description*	List	Cat.	Cash	Shipping Weight
B-**VT52-AA**	VT52 DECscope with 20 mA interface 115V ac 60 Hz operation	**$1900**	**$1805**	**$1729**	56 lbs.
B-**VT52-AB**	VT52 DECscope with 20 mA interface 230V ac 50 Hz operation	**1900**	**1805**	**1729**	56 lbs.
B-**VT52-AE**	VT52 DECscope with EIA interface 115V ac 60 Hz operation	**1900**	**1805**	**1729**	56 lbs.
B-**VT52-AF**	VT52 DECscope with EIA interface 230V ac 50 Hz operation	**1900**	**1805**	**1729**	56 lbs.

* Power cord and operator's manual provided with basic models.

OPTIONS

Cat. No.	For	Description	List	Cat.	Cash	Shipping Weight
B-**VTXX-KA**	VT52	Printer interface	**$240**	**$228**	**$218**	5 lbs.
B-**BN52A-7F**	VT52	EIA interface, 25′ cable	**66**	**63**	**60**	4 lbs.
B-**BN52B-7F**	VT52	20 mA interface, 25′ cable	**66**	**63**	**60**	4 lbs.

CATALOG NUMBERS VS MODEL NUMBERS

The Catalog Numbers published in this catalog relate only to purchases made through the Direct Sales Catalog. The **Bold Face** portion of each Catalog Number is the official DIGITAL Model Number. All invoices and packing slips will reference only the Model Number.

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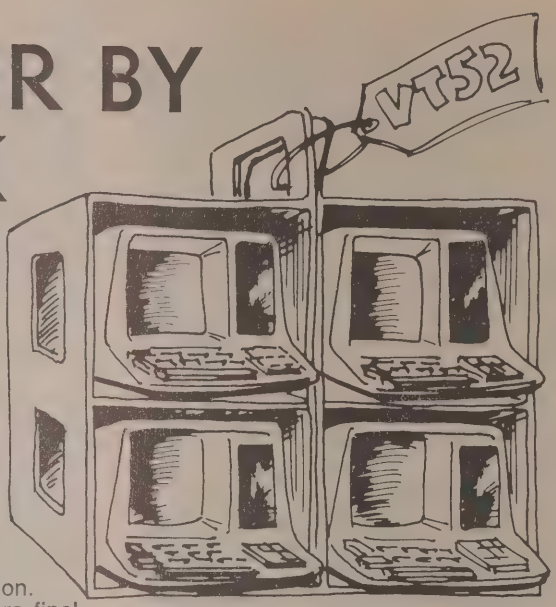
VT52 DECSCOPE 4-PACK

IT'S CHEAPER BY THE 4-PACK



A special 4-pack of VT52 DECscopes is available through the Direct Sales Catalog. Buying by the 4-pack saves you money. $1600 off the list price. That's $400 a terminal.

You must agree to some special terms and conditions when you purchase a 4-pack. For instance, all four DECscopes must be of exactly the same model. And all four must be released for shipment simultaneously to a single destination. Further, all sales on the 4-pack DECscope are final once shipped from DIGITAL. Last but not least, the 4-pack price is the lowest possible. No other discounts can apply. But all that isn't too bad when you consider the absolute dollar savings. It's almost like getting *one* DECscope for free. Here's how to order your 4-pack:

Cat. No.	Description	Qty.	4-Unit List Price	Special 4-Pack Price	Catalog 4-Pack Cash Price	Combined Shipping Weight
B-**VT52F-AA**	DECscope, 20 mA interface. 115V ac, 60 Hz operation.	4	**$7600**	**$6000**	**$5760**	224 lbs.
B-**VT52F-AB**	DECscope, 20 mA interface. 230V ac, 50 Hz operation.	4	**7600**	**6000**	**5760**	224 lbs.
B-**VT52F-AE**	DECscope, EIA interface. 115V ac, 60 Hz operation.	4	**7600**	**6000**	**5760**	224 lbs.
B-**VT52F-AF**	DECscope, EIA interface. 230V ac, 50 Hz operation.	4	**7600**	**6000**	**5760**	224 lbs.

DECSCOPE

The Video Terminal for Prepackaged Computer Systems

DECscope is the recommended video terminal for expanding the DECstation 78 and PDP-11V03 Microcomputer Systems offered through the Direct Sales Catalog. Flexibility and readability means useability. When you add a DECscope to a DIGITAL system you know your interface will work.
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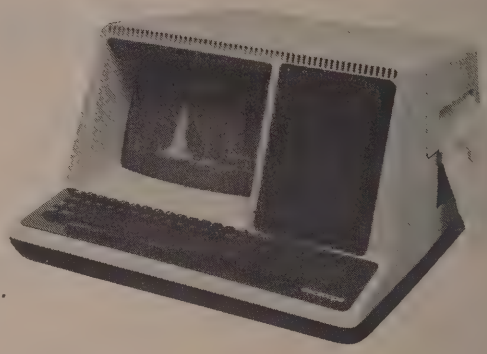
GRAPHIC TERMINAL WITH COPIER OPTION

- *Upper and Lower Case Text.*
- *Switch Selectable Transmission Rate (75 to 9600 baud).*
- *Can Interface to any CPU; Serial ASCII Transmission.*
- *A 19 Button Keypad for Directing Cursor Movement and Numerical Entry Applications.*
- *Upward and Downward Scrolling.*
- *Electrolytic Copier Option.*
- *Hardcopy Output of both Alphanumerics and Graphics.*
- *Universally Accepted Standard Typewriter Keyboard.*
- *Choice of Interface and Cable to Host Device; 20 mA Current Loop, or EIA RS232-C.*
- *Direct Cursor Addressing Capability in Alphanumeric Mode.*
- *Generation of User Defined Codes from the Keyboard.*
- *A Repeat Key on the Keyboard.*
- *25 Seconds per Copy.*
- *Hardcopy can be by Keyboard Button Selection or Under Program Control.*



The VT55 is an on-line interactive CRT terminal that offers waveform graphics — a new and significant capability which meets the needs of a variety of applications. Two graphs of 512 data points each can be displayed with a screen resolution of 512x by 236y. These graphs can be in point-plot or histogram (shaded) format. Graph markers (20-point vertical lines) are available (one per data point) to facilitate data editing and graph generation. In addition, the VT55 allows simultaneous display of any combination of text and graphics. It can hold up to 1920 characters in 24 lines of an 80 characters-per-line matrix. The 24th line of text is positioned below any graphs to facilitate labeling the x axis.

To complete the picture, a user can take a permanent record of a display image with the VT55's optional hard-copy unit. By simply pressing a specified key, the VT55 supplies a hard copy reproduction of the display screen for both characters and graphs.

The display of alphanumeric and graphic data is performed by the raster scan method. Raster scan infers that the beam of the cathode ray tube is swept completely across the phosphor surface of the tube 50 or 60 times (depending on the power line frequency) in a second. Information, generated via the memory, turns the beam on and off, intensifying dots on the phosphor at the proper time to produce characters and graphics on the video screen. This is basically the same method used by consumer television sets.

For most applications, the VT55 will be interfaced to a host computer and operated in the full-duplex communication mode. Data transmitted by the VT55 is received by the host computer. Data received by the VT55 is determined solely by the host computer. ASCII 96-character set plus 32 control codes can be transmitted.

The VT55 is capable of sending and receiving at baud rates from 75 to 9600 bits per second. Data is sent in serial digital format for the 20 mA current loop interface models. The EIA interface models allow the use of the VT55 with RS232-C signals.

Alphanumeric Mode

In the Alphanumeric mode, data received via the serial line input is stored in the alphanumeric memory and printed as characters, numerals, and symbols on the screen if the code represents a printable character.

Received printable symbols are displayed on the video screen in a 24-horizontal line by 80-vertical column format. Each character is displayed as a 7 by 7 dot matrix; the matrix size is approximately 4.0mm by 4.0mm. Character placement on the screen is controlled by the alphanumeric cursor. The cursor is a blinking, underlining line that indicates the screen position in which the next received character is to be placed. When receiving a new character, the cursor automatically increments to the right. The cursor may also be shifted around the screen by receipt of alphanumeric cursor control commands or the auxiliary keypad.

Graphics Mode

Graphics mode performs in essentially the same way as Alphanumeric mode with regard to character font, control codes, etc. The only difference is that the subset of 32 lowercase characters is replaced by a set of 30 special characters to extend the capability of the terminal in printing equations and fractions and plotting line graphs.

When the VT55 is in the Graph Drawing mode, incoming digital data, aside from the control codes, is treated as graph plotting information. This data represents Graph Drawing mode instructions and data points. The VT55 can plot two 512-point graphs, graph 0 and graph 1, each represented as a line graph or histogram. Vertical and horizontal lines that span the viewable screen area may be displayed anywhere in the viewable area of the screen. These lines can be combined to form grids to aid in labeling values on the graphs. The VT55 has graph markers as an additional graph feature. These are short vertical markers useful in defining important features on the graph. All graph features of the VT55 are individually controllable by the programmer. All data is stored in a separate graph memory. Keeping graph information separate from the alphanumeric information storage allows superposition of the alphanumeric and graph information and allows the removal of one type of information without affecting the other. For example, a label could be printed over a graph and then removed without affecting the graph. See figures on p. 35 for some typical graph capabilities.

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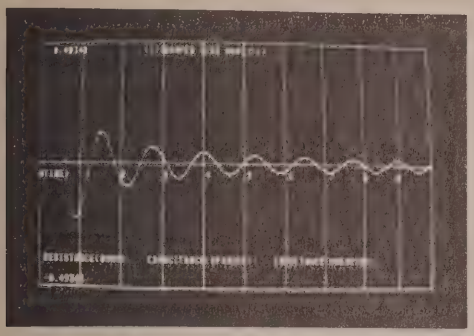
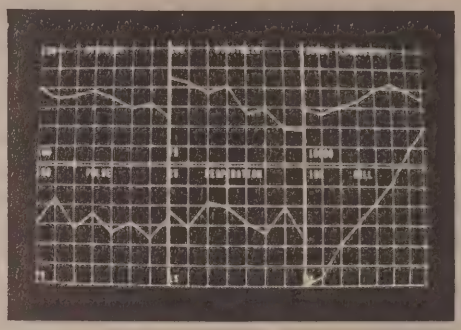
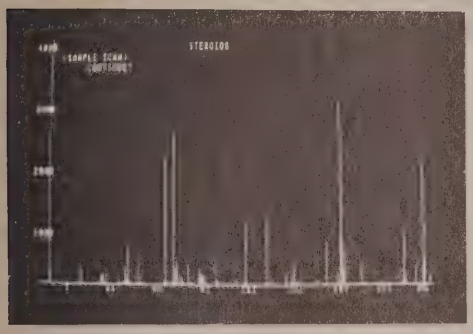
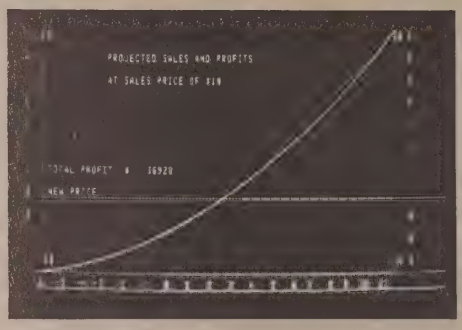
VT55 DECGRAPHIC SCOPE

SAMPLE DISPLAY GRAPHS*









*Apparent distortion of close-up photo of CRT is due to curved surface of screen.

Graphics Mode (Cont'd)

The VT55 has an ensemble of nine graph commands which permit loading of individual points on the two graphs and loading and clearing of individual markers, vertical lines, and horizontal lines. The user may choose to blank this data from the screen, but hold the data in the internal graph memory for later viewing. All graph memory may be cleared with one instruction when desired.

Copier

The optional copier allows the user to make a hard copy duplicate of the video screen. The paper copy includes the displayed graphs as well as the alphanumeric characters. The copier is contained within the VT55 cabinet and the paper output emerges from the right side of the terminal. Upon command, the VT55 generates a hard copy of the display on the screen. Using a scanning technique, the terminal generates the image of the display in about 25 seconds. The display image is approximately 3H by 7″W. As the copier uses rolled paper, many lines of text and graphs may be formatted on a standard letter-size sheet of paper. The roll is 8½″W by 100′L. The copier's scanning technique consists of scanning an electrode across a surface of special recording paper in exactly the same pattern as the raster scan on the VT55 screen. An electrode on the opposite face of the paper receives a voltage from the VT55 microprocessor in conjunction with the image to be recorded. The potential across the two electrodes causes a current to pass through the recording paper and actually plates metal from one of these electrodes onto the paper to form a dark point.

Keyboard

The VT55 keyboard is compatible with ANSI standard typewriter keyboard. This keyboard layout is similar to the layout found on an office typewriter, rather than on a keypunch machine. It contains the keys that generate the 96-character set of ASCII and a control key for the generation of the 32 control codes. Unique VT55 function keys are on the keyboard as well. See Operational Specifications for details of other keyboard features.

?GOT A QUESTION?

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VT55 DECGRAPHIC SCOPE

Software

The following high level software facilities are currently available under the following PDP-11 operating systems and languages.

- *RT-11, a high performance, real-time operating system designed for dedicated single-user or foreground/background applications.*
- *VT55 support under RT-11 is available as follows — RT-11/FORTRAN Extensions*

  RT-11 BASIC
  FOCAL/RT-11
- *RSX-11M, a multi-processing real-time system designed for a wide range of applications where many tasks must be monitored and controlled concurrently.*
- *The VT55 is supported by FORTRAN using the same subroutine calls and functions as the RT-11 version.*

OPERATIONAL SPECIFICATIONS

ALPHANUMERICS

Character Lines: 24

Character Columns: 80

Control: Blinking alpha cursor.

Character Set: 96-character upper and lower case ASCII subset plus 32 control characters and special graphic characters.

Special Features: Upward and downward scroll, bell, erase, erase, tabulate, cursor control, character on a line.

Character Format: 7 by 7 dot matrix.

GRAPHICS

Resolution: 512 horizontal by 236 vertical points.

Graphs or Histograms: Two single-valued functions of x, each individually controlled.

Grid: 512 vertical lines and 236 horizontal lines, each individually controlled.

Graphic Marker: 512/graph, total of 1024. Each graphic marker is individually controlled.

Special Features: Individual blanking and unblanking of all graphic features, clear all graphics.

Linearity: ±½ point.

USER CONTROLS

Intensity: Variable to adjust screen brightness.

Parity: Even, odd or non parity switch selectable.

Power/Logic Reset: Turns line voltage on and off and resets unit to Alphanumeric mode.

KEYBOARD

Format: ANSI x 4.14-1971 standard typewriter keyboard.

Keyclick: Audible feedback on each keystroke.

Error Correction: Three-key rollover to reduce errors caused by fast typing.

Special Keys: Extra control keys for special and commonly used control functions include ESC, TAB, SCROLL, BACKSPACE, BREAK, LINE FEED, RETURN, COPY, REPEAT.

Keypad: 19 button keypad efficiently designed for entry of numeric data plus special user defined codes may be generated with special Terminal mode.

COPIER

Image Copied: Display on screen less the alphanumeric cursor.

Time/Print: Approximately 25 seconds/copy.

Copy Size: Approximately 3H by 7″W.

Paper Roll Size: 100′L by 8½″W.

Character Format: 7 by 7 dot matrix.

Graph Field: 512 points horizontal by 236 points vertical.

User Controls: Variable character width adjustment.

Baud Rate/Interface Mode: Allows choice of baud rate, full-duplex, full-duplex with local copy and local mode with rotary switches.

Hold Screen Mode: Allows interruption of data transmission for extended display viewing.

Terminal Identifier: Terminal will respond with ESC/E when receiving ESC/Z.

COMMUNICATIONS SPECIFICATIONS

INTERFACE

Type: 20 mA current loop or EIA RS2326 interface.

SPEED

Full-Duplex: 75, 110, 150, 300, 600, 1200, 2400, 4800, and 9600 baud.

Full-Duplex with Local Copy: 110, 150, 300, 600, 1200, 2400, 4800, and 9600 baud.

Full-Duplex, Split Speeds: Transmission at 75, 150, 300, or 4800 baud with reception at 110, 600, 1200, 2400, 4800, or 9600 baud.

TRANSMISSION

10-Bit Length: 75, 150, 300, 600, 1200, 2400, 4800, and 9600 baud.

11-Bit Length Parity: 110 baud only. Generated on transmission as even parity or a mark. (No parity is switch-selectable.) Parity is not checked on reception.

SUPPLIED CABLE LENGTH

20 mA Model: 25′ (max. length 1000′).

EIA Model: 25′ (max. length 50′).

SCREENFILTERS — FOR VIDEO TERMINAL

Acrylic filters are available for use with DIGITAL's VT55 Graphic Terminal. Filters serve to reduce excessive glare from overhead lighting.
Shipping Weight: .5 lbs.

Cat. No.	Color	Cat.	Cash
B-12-13195-00	Gray	$14.25	$13.65

CALL: 800-258-1710 (N.H. Residents 603 - 884-6660) 8:30 am to 5 pm EST.

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VT55 DECGRAPHIC SCOPE

MECHANICAL SPECIFICATIONS

SYSTEM WEIGHT
With Copier: 57 lbs.
Without Copier: 49 lbs.

CABINET DIMENSIONS
Height: 14.1″
Width: 20.9″
Depth: 27.2″
Minimum Table Depth: 17.7″

VIDEO DISPLAY
Size: 12″ diagonal
Active Screen Size: 8 by 5.0″
Method: Raster scan, roll-free
Phosphor: P4

ELECTRICAL SPECIFICATIONS

POWER REQUIREMENTS
Noncopier Unit: 185W of power max.
Copier Unit: 300W of power max.
Input: 115V ac 60 Hz or 230V ac 50 Hz

ENVIRONMENTAL SPECIFICATIONS

TEMPERATURE
Operating
With Copier 15°C to 32°C (59°F to 90°F)
Without Copier 10°C to 40°C (50°F to 104°F)
Nonoperating −40°C to 66°C (−40°F to 151°F)

HUMIDITY (NONCONDENSING)
Operating
With Copier 20 to 80%
Without Copier 10 to 90%
Nonoperating 0 to 95%

VT55 USERS MANUAL

Cat. No.	Description	Price	Shipping Weight
B-**EK-VT55E-TM**	VT55 Users Manual	**$9**	1 lb.

ORDERING INFORMATION

Cat. No.	Description	List	Cat.	Cash	Shipping Weight
Basic Model (without Copier)					
B-**VT55-EA**	Graphic terminal. 20 mA current loop interface. 115V ac 60 Hz	**$2750**	**$2613**	**$2499**	61 lbs.
B-**VT55-EB**	Same as -EA but for 230V ac 50 Hz operation.	**2750**	**2613**	**2499**	61 lbs.
B-**VT55-EE**	Graphic terminal. EIA RS232-C interface. 115V ac 60 Hz	**2750**	**2613**	**2499**	61 lbs.
B-**VT55-EF**	Same as -EE but for 230V ac 50 Hz operation	**2750**	**2613**	**2499**	61 lbs.
Models with Copier					
B-**VT55-FA***	Graphic terminal with copier. 20 mA current loop interface. 115V ac 60 Hz	**3995**	**3795**	**3635**	70 lbs.
B-**VT55-FB***	Same as -FA but for 230V ac 50 Hz operation	**3995**	**3795**	**3635**	70 lbs.
B-**VT55-FE***	Graphic terminal with copier. EIA RS232-C interface. 115V ac 60 Hz	**3995**	**3795**	**3635**	70 lbs.
B-**VT55-FF***	Same as -FE but for 230V ac 50 Hz operation	**3995**	**3795**	**3635**	70 lbs.

* A VT50 Series Copier User's Manual (EK-VT50-0P-001) is supplied with these models.

VT55 COPIER PAPER

Sensitized paper for use with DIGITAL's electrolytic copier. Each roll of white paper is 8½″W by 100′L. A new anode is supplied with each roll of paper. Paper is supplied by the box. Note that the shelf life of the paper is six months. Copier paper remains usable for one month once it is in the copier unit.

Cat. No.	Description	Cat.	Cash	Shipping Weight
B-**VT50K-3**	3 rolls paper 3 anodes	**$22.80 box**	**$21.84 box**	4 lbs.
B-**VT50K-12**	12 rolls paper 12 anodes	**$91.20 box**	**$87.36 box**	16 lbs.

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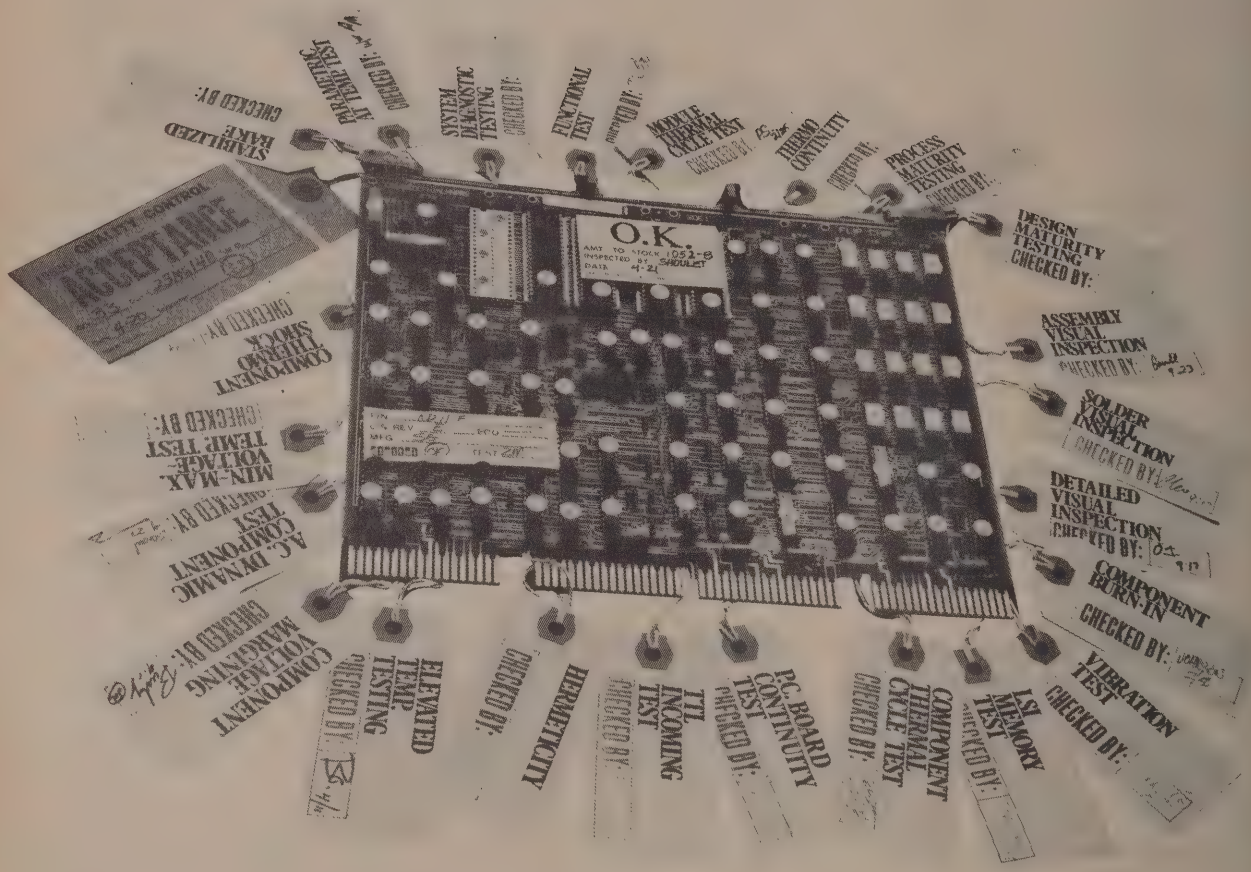
O.K.
QUALITY CONTROL
ACCEPTANCE
STABILIZED BAKE
CHECKED BY:
BURN-IN
CHECKED BY:
SYSTEM DIAGNOSTIC TESTING
CHECKED BY:
FUNCTIONAL TEST
CHECKED BY:
MANUFACTURING QUALITY CONTROL
CHECKED BY:
MANUFACTURING QUALITY CONTROL
CHECKED BY:
MANUFACTURING QUALITY CONTROL

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The Direct Sales Catalog is: MICROCOMPUTERS

You may be able to design a microcomputer. But do you really want to manufacture one? Designing a microcomputer is just the first step. You need expensive people and equipment to build it, and complex quality controls to make sure it's right. It has to be right, because your company's reputation is on the line.

DIGITAL's LSI-11 family of microcomputers — LSI-11, LSI-11/2 and PDP-11/03 — not only supports the widest range of software and peripherals of any microcomputer, it's built to the most exacting quality control standards in the industry.

This level of quality control would strain your budget, but DIGITAL can support it because of the large number of LSI-11s that come off our production line.

DIGITAL tests everything: processor chips, p.c. board, memory, modules, packaging, the finished assembly. And DIGITAL's technicians aren't afraid to throw out any product that doesn't measure up.

DIGITAL finishes up its LSI-11 testing program with a detailed visual inspection, because in spite of everything that the LSI-11 board has been through, we still want it to look nice for you.

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LSI-11, LSI-11/2 AND PDP-11/03

THREE FORM FACTORS FOR FLEXIBILITY

Powerful microcomputers packaged to suit your every application. All based on the Large Scale Integration version of the worldwide standard PDP-11. Offered for the first time in the Direct Sales Catalog is the new LSI-11/2 downsized version of the board type LSI-11. It adds another dimension to microcomputers. In the following pages you will find a wide selection of interfacing modules to choose from. No matter which packaging style you select you are well supported. In fact you can even move directly to a complete system. Check out the PDP-11V03 Computer System also offered for the first time in this catalog. See p. 62.

At the heart of all versions of the LSI-11 "family" is the Central Processing Unit. The functions of this unit are implemented using MOS LSI. A technical description of this key unit is on the opposite page.

THE PDP-11/03 BOXED MICROCOMPUTER

The PDP-11/03 comprises quad size modules mounted in an attractive enclosure and equipped with a power supply. Double size optional modules can, of course, be added to the system by mounting them in the enclosure. This version of the LSI-11 family is recommended for applications requiring fewer than 10 units because it requires very little "hardware engineering" to adapt it to an application. The external dimensions of the enclosure, which can be mounted on a standard 19″ rack, are 3½″ high by 19″ wide by 13″ deep. The enclosure can contain a CPU and 16K RAM and still have room inside for up to four double size boards.

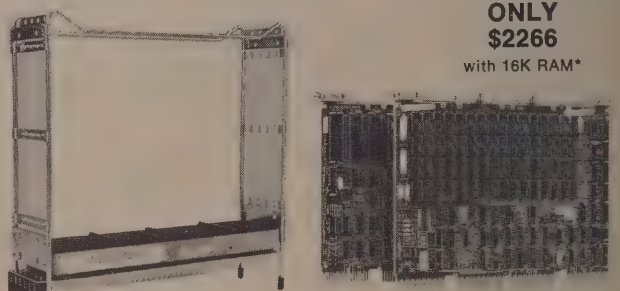
ONLY $3170
with 16K RAM*

*Price includes enclosure and power supply.

THE LSI-11 QUAD SIZE FAMILY

The LSI-11 comprises modules that are quad size with dimensions 10½″ x 8½″. The CPU module board can have 4K RAM on board with additional RAM being added in increments of 4K or 16K. All the options that are being developed for the new LSI-11/2 form factor will function with the LSI-11. As shown the backplane and card cage assembly is approximately 11″ high by 11″ wide by 3″ deep. It will hold four quad-size boards or the CPU with 4K RAM and up to 6 double-size boards.

ONLY $2266
with 16K RAM*



*Price for module boards only.

THE LSI-11/2 DOUBLE SIZE FAMILY

The LSI-11/2 comprises modules that are double size with dimensions 5″ x 8½″. By separating the CPU functions from memory functions this new downsize family was created. The backplane and card guide assembly shown is only 10.8″ high by 5.75″ wide by 3″ deep yet can hold four modules which could be typically the CPU, 32K RAM, a 4-line Serial Line Unit and an IEEE Instrument Bus Interface.

ONLY $1538
with 16K RAM*

*Price for module boards only.

CENTRAL PROCESSING UNIT

The 16-bit central processor functions are contained in four silicon gate, N-channel, metal oxide semiconductor (MOS), large-scale integration (LSI), integrated circuit chips. These chips provide all instructions, decoding, bus control, and arithmetic/logic unit functions of the processor. The central processor contains eight general registers which can serve as accumulators, index registers, autoincrement/autodecrement registers, or stack pointers.

The LSI-11 bus *is a high-speed, 38-line parallel bus containing data, address, control and synchronization lines. Sixteen lines are used for time multiplexing of data and addresses. All data and control lines are bidirectional, asynchronous, open-collector lines capable of providing a maximum parallel data transfer rate of 833K words per second under direct memory access operation.*

The basic instruction set *has more than 400 powerful PDP-11/40 instructions. There are no separate memory, I/O, or accumulator instructions. Thus the user can manipulate data in peripheral device registers as flexibly as in memory registers.*

Extended instruction and floating-point instruction *options provide fixed-point multiplication, division, and multiple shifting in single-precision arithmetic as well as floating-point addition, subtraction, multiplication and division. Order option KEV11, a plug-in chip.*

Single-level, vectored, automatic priority interrupt *provides for user-implementation of a priority-structured I/O interrupt system. Devices electrically closest to the microcomputer module receive highest priority, for either DMA or programmed I/O transfers. (DMA devices have a higher priority than programmed I/O devices). This structure allows nesting of interrupts to as many levels as there are devices connected to the LSI-11 bus. Upon receipt of an interrupt grant, the device directs the processor to an interrupt vector location which contains the starting address of the device interrupt service routine and the new processor status word.*

Real-time clock input signal line *functions as an external interrupt line. When connected to a frequency source, it can serve as a real-time processor. interrupt. A jumper on the microcomputer module enables or disables this highest priority interrupt function.*

Asynchronous operation *of all system modules permits each to function at its highest possible speed.*

Power fail/autostart *provides jumper-selective restart through a power-up vector, a defined location, or an octal debugging technique (ODT) microcode.*

ODT/ASCII console routine/bootstrap *all are resident in microcode to provide automatic entry into the debugging mode, replacement of conventional programmers' panel lights and switches with any terminal device generating standard ASCII codes, and the ability to automatically commence operation through resident bootstrap routines.*

Word or byte processing *provides very efficient handling of 8-bit characters without the need to rotate, swap, or mask.*

digital LSI-11
DIRECT SALES CATALOG

AVAILABLE IN 7 PROCESSOR-MEMORY BASIC CONFIGURATIONS

DIGITAL's highly successful LSI-11 Microcomputer now can be bought in three NEW basic processor-memory configurations. This means that there are currently seven basic configurations available through the Direct Sales Catalog. By adding the three new ones, DIGITAL has been able to provide system designers with basic LSI-11 configurations in 4K, 8K, 12K, 16K, and 20K RAM versions. For a system that requires 8K, 12K, or 20K, the new configurations are considerably less expensive (more than 30% for a 20K system) than a system configured with extension memory modules. Note that the new configurations apply ONLY to the "individual pc board" LSI-11 style and not to the "packaged" PDP-11/03 which is currently available only in 4K and 16K basic configurations.

All of the features that have made LSI-11 the microcomputer industry standard of excellence are incorporated in the new configurations. Features such as:

- *16-bit MOS, LSI central processor.*
- *Parallel I/O bus port.*
- *PDP-11/40 instruction set.*
- *DMA transfer rate of 833K words per sec.*
- *Power-fail/auto restart.*
- *Vectored interrupt*
- *Real-time clock input.*
- *Octal debugging routine in microcode.*
- *ASCII console routines in microcode.*
- *Microcode bootstrap routine.*
- *Expandable arithmetic capabilities.*
- *Word or byte processing.*

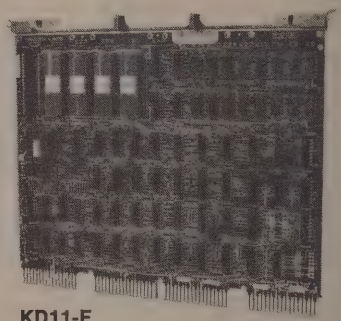
The new configurations are the result of "bundling" various processor and memory options and offering them at attractive prices. Following are the details of each basic configuration.

KD11-F Basic Processor with 4K RAM

The KD11-F is contained entirely on one 8.5 by 10" (Quad-height) pc board. The 4K RAM is 4096 words by 16 bits implemented by dynamic MOS LSI. A memory register addresses all onboard memory plus expansion memory up to 32K words or 64K bytes.

Memory refresh is executed by microcode. However, where interrupt latency, due to the microcode refresh functions, cannot be tolerated, refresh option REV11-A, or -C should be ordered.

Power requirements for KD11-F are +5V dc ±5% at 1.8A (2.4A max.) and +12V dc ±3% at 0.8A (1.1A max.). The H780-H supply described in this catalog can provide the necessary power and control functions. Note if H780-H is **not** used, a KPV11 Power Failure/Line Time Clock module (or equivalent) must be used for correct power control for the KD11-F. Temperature Range: 5°C to 60°C (41°F to 140°F). Relative Humidity: 10% to 95% (no condensation). Maximum Air Temperature Rise Across Module: 7°C (12.5°F).



KD11-F

Cat. No.	List	Cat.	Cash	Shipping Weight
B-KD11-F*	$990	$941	$901	15 lbs.

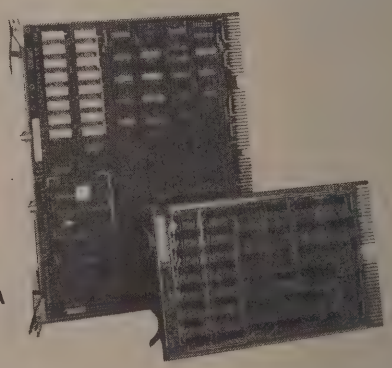
*Prices shown include a ZJV01-RB literature and diagnostic package.

KD11-FA Basic Processor with 8K RAM

The KD11-FA is contained on one 8.5 by 10" quad height and one 8.5 by 5" double height pc boards. The 8K RAM is 8192 words by 16 bits implemented by dynamic MOS LSI. A memory register addresses all 8K words with expansion capability up to 32K words or 64K bytes. Memory select circuitry allows for operation on 4K address boundaries.

Dynamic memory refresh is performed automatically every 1.67 milliseconds by microcode on the basic microcomputer module. However, where interrupt latency, due to the microcode refresh functions, cannot be tolerated, refresh option REV11-A or -C should be ordered.

Power requirements for the KD11-FA are +5V dc ±5% at 2.36A (3.52A max.) and +12V dc ±3% at 1.06A (1.68A max.). The H780-H power supply described in this catalog can provide the necessary power and control functions. Note if H780-H is not used, a KPV11 Power Fail/Line Time Clock module (or equivalent) must be used for correct power control for the KD11-FA. Temp. Range: 5°C to 60°C (41°F to 140°F). Relative Humidity: 10% to 95% (no condensation). Max. Air Temp. Rise Across Module: 7°C (12.5°F).



KD11-FA

Cat. No.	List	Cat.	Cash	Shipping Weight
B-KD11-FA*	$1240	$1178	$1128	18 lbs.

*Prices shown include a ZJV01-RB literature and diagnostic package.

BASIC CONFIGURATIONS (Cont'd)

KD11-FB Basic Processor with 12K RAM

The KD11-FB is contained on one 8.5 by 10″ quad height pc board and two 8.5 by 5″ double height pc boards. Each board contains 4K of RAM for a total of 12,288 words by 16 bits implemented by dynamic MOS LSI components. A memory register addresses all 12K words with expansion capability up to 32K words or 64K bytes. Memory select circuitry allows for operation on 4K address boundaries. Dynamic memory refresh is performed automatically every 1.67 milliseconds by microcode on the basic microcomputer module. However, where interrupt latency, due to the microcode refresh functions, cannot be tolerated, refresh option REV11-A or -C should be ordered.

Power requirements are +5V dc ±5% at 2.92A (4.64A max.) and +12V dc ±3% at 1.32A (2.26A max.). The H780-H power supply described in this catalog can provide the necessary power and control functions. Note if H780-H is not used, a KPV11 Power Fail/Line Time Clock module (or equivalent) must be used for correct power control for the KD11-FB. Temperature Range: 5°C to 60°C (41°F to 140°F). Relative Humidity: 10% to 95% (no condensation). Maximum Air Temperature Rise Across Module: 7°C (12.5°F).

KD11-FB

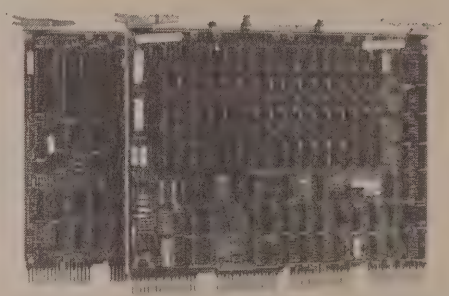
Cat. No.	List	Cat.	Cash	Shipping Weight
B-KD11-FB*	$1490	$1416	$1356	20 lbs.

*Prices shown include a ZJV01-RB literature and diagnostic package.

KD11-R Basic Processor with 16K RAM

The KDR11-R has two 8.5 by 10″ (quad-height) pc boards to contain the central processor functions and the MOS LSI dynamic memory chips. Memory size is 16K words by 16-bits. A memory register addresses the KD11-R's internal memory plus expansion memory up to 32K words or 64K bytes. The memory refresh function is not by microcode from the central processor but is an independent function. Thus the refresh capability of Option REV11-A or -C is not applicable to this configuration. Note illustration shows the two boards of this configuration with optional arithmetic expansion IC package KEV11 installed (lower left corner of right-hand board).

Power requirements are +5V dc ±5% at 2.7A (4.1A max.) and +12V dc ±3% at 0.8A (1.2A max.). The H780-H power supply described in this catalog can provide the necessary power and control functions. Note if H780-H is **not** used, a KPV11 Power Fail/Line Time Clock Module (or equivalent) must be used for correct power control for the KD11-R. Temperature Range: 5°C to 60°C (41°F to 140°F). Relative Humidity: 10% to 95% (no condensation). Max. Air Temperature Rise Across Module: 7°C (12.5°F).



KD11-R

Cat. No.	List	Cat.	Cash	Shipping Weight
B-KD11-R*	$2490	$2366	$2266	20 lbs.

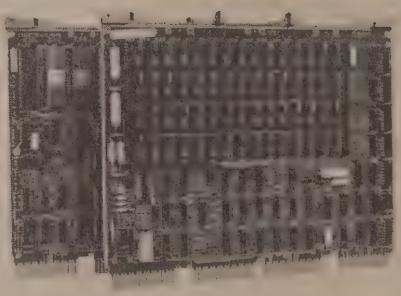
*Prices shown include a ZJV01-RB literature and diagnostic package.

KD11-FC Basic Processor with 20K RAM

The KD11-FC is contained on two 8.5 by 10″ quad height pc boards. 4K of dynamic RAM memory is located on the processor board and the remaining 16K on the second board. The 20K RAM is 20,480 words by 16 bits implemented by dynamic MOS LSI. A memory register addresses all 20K words with expansion capability up to 32K words or 64K bytes. Memory select circuitry allows for operation on 4K address boundaries.

Memory refresh of the KD11-FC system may be handled by one of several means. Dynamic memory refresh of the entire system can be performed automatically every 1.67 milliseconds by the microcode on the basic microcomputer module. Also, the 16K memory board has the capability of providing its own on-board memory refresh. Additionally, if interrupt latency, due to the microcode functions, cannot be tolerated, refresh option REV11-A or -C should be ordered. With this option installed in the system, the automatic refresh functions of the processor and 16K memory boards must be disabled.

Power requirements are +5V dc ±5% at 2.8A (4.4A max.) and +12V dc ±3% at 1.34A (1.66A max.). The H780-H power supply described in this catalog can provide the necessary power and control functions. Note if H780-H is not used, a KPV11 Power Fail/Line Time Clock module (or equivalent) must be used for correct power control for the KD11-FC. Temperature Range: 5°C to 60°C (41°F to 140°F). Relative Humidity: 10% to 95% (no condensation). Maximum Air Temperature Rise Across Modules: 7°C (12.5°F).



KD11-FC

Cat. No.	List	Cat.	Cash	Shipping Weight
B-KD11-FC*	$1990	$1891	$1811	20 lbs.

*Prices shown include a ZJV01-RB literature and diagnostic package.

digital DIRECT SALES CATALOG

LSI-11 AND PDP-11/03

PDP-11/03 PACKAGED MICROCOMPUTER

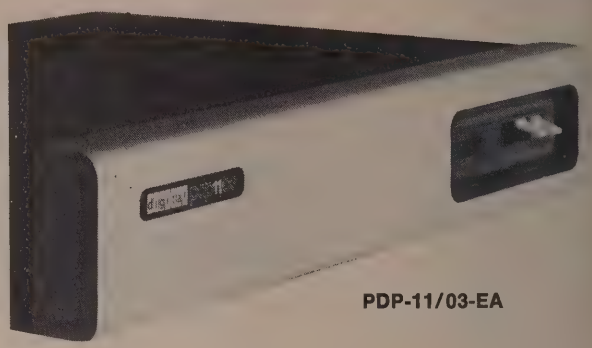
- *PDP-11/03-EA with 4K RAM Memory*
- *PDP-11/03-KA with 16K RAM Memory*

The PDP-11/03 is an enclosed combination of the LSI-11 modules and accessories. It comprises a 19″-rack mountable enclosure measuring 3½ by 19 by 13″, an H9270 backplane and card-guide assembly, plus a central processor and RAM memory. An H780-H power supply, which includes indicators, switches and a dual-fan assembly, is incorporated in the enclosure. Input voltage required is 90-132V ac (47-63 Hz). Max. Power Consumption: 210 watts at full load.

The enclosure has a removable front panel (pop panel). It can be easily removed to allow front access to the modules. The power supply indicator/switch panel (at right) does not detach with the front panel so remains functional during servicing. Temperature Range: 5°C to 50°C (41°F to 122°F). Humidity: 10% to 90% (no condensation).

Two basic congurations of PDP-11/03 can be ordered: **PDP-11/03-EA** which has a 4K RAM memory and the central processor function on one quad-height board. This leaves room in the enclosure for up to six double-height modules. Where interrupt latency cannot be tolerated, an external refresh option REV11-A or -C should be specified (one double-height board).

PDP-11/03-KA which has a 16K RAM memory. The central processor and memory are on two quad-height boards. The enclosure can, therefore, contain up to four more double-height modules. No external refresh option is required with this configuration unless other optional memory requires refresh.



PDP-11/03-EA

FEATURING:

- 16-bit MOS, LSI central processor
- Parallel I/O bus port
- PDP 11/40 instruction set
- DMA transfer rate of 833K words per sec.
- Power-fail/auto restart
- Vectored interrupt
- Real-time clock input
- Octal debugging routine in microcode
- ASCII console routines in microde
- Microcode bootstrap routine
- Expandable arithmetic capabilities
- Word or byte processing

Cat. No.	RAM	List	Cat.	Cash	Shipping Weight
B-**PDP-11/03-EA***	4K	**$1995**	**$1895**	**$1815**	42 lbs.
B-**PDP-11/03-KA***	16K	**3495**	**3320**	**3180**	45 lbs.

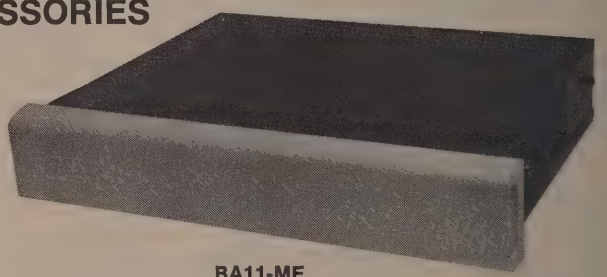
* Prices shown include a ZJV01-RB literature and diagnostic package.

MOUNTING HARDWARE AND ACCESSORIES

Expansion Boxes — BA11-ME

BA11-ME expansion box provides a most convenient means for expanding existing LSI-11, PDP-11/03, and PDP-11V/03* systems. Each expansion box includes an H9270 backplane, an H780 power supply (which is capable of supplying sufficient power to all modules contained within the expansion box), and a rack-mountable enclosure. The enclosure is identical in size and design to that of the PDP-11/03. However, the switch/indicator control panel is not included (part of the H780 power supply in PDP-11/03 systems). The BA11-ME requires 115V rms, 50 or 60 Hz input power. Note the power supply is a "slave" unit. The system must have a master supply such as H780-H included. These expansion boxes are, therefore, only to be used to expand a system and not as a primary enclosure.

* See page xx in catalog.



BA11-ME

Cat. No.	Description	List	Cat.	Cash	Shipping Weight
B-**BA11-ME**	115V ac	**$1000**	**$950**	**$910**	40 lbs.

Jumper Cable Assemblies and Terminator Module (TEV11)

When assembling a two-backplane LSI-11 or PDP-11/03 system, a BCV1B jumper cable assembly and a 120 ohm terminator module TEV11 are necessary. BCV1B comprises two BC05L cables, one M9400-YE, and an M9401 backplane connector. To expand to a third backplane, one BCV1A jumper cable assembly must also be ordered. BCV1A comprises two BC05L cables and two backplane connectors M9400-YD and M9401. At least a 4-foot length difference must be maintained between the BCV1A-XX and BCV1B-XX. Jumper cables are equipped at each end with Berg 40-conductor connectors. Note: If Option REV11-A is part of the system, terminator module TEV11 is not needed.

Cat. No.	Description	List	Cat.	Cash	Shipping Weight
B-**BCV1A-XX***	Cable Assembly — 2′, 4′, 6′, or 10′	**$210**	**$200**	**$191**	2 lbs. (2′ only) 3 lbs. (4′-10′)
B-**BCV1B-XX***	Cable Assembly/Terminator Assembly — 2′, 4′, 6′, or 10′	**290**	**276**	**264**	2 lbs. (2′ only) 3 lbs. (4′-10′)
B-**TEV11**	Terminator Module 120-ohm — Double-height (8.5 by 5″)	**110**	**105**	**100**	2 lbs.

* Add Suffix 02, 04, 06, or 10 to specify cable length.

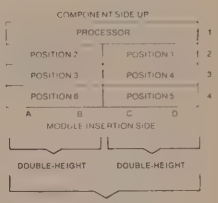
MOUNTING HARDWARE AND ACCESSORIES

Backplane/Card Guide Assembly — H9270

The H9270 backplane/card guide assembly is a prewired LSI-11 structured backplane based on a standard DIGITAL four by four slot configuration. It is designed to be integrated into customer-packaged equipment. For LSI-11 systems that are to be rack mounted, a DDV11-B unit in an H909-C enclosure should be specified — or consider using a PDP-11/03 complete.

Features:

- *Designed to accept one KD11-F Series and up to six I/O or memory modules or one KD11-R and up to four I/O or memory modules.*
- *All LSI-11 bus data, control, and power connectors are pre-wired on the printed circuit backplane to each module location.*
- *Easily implemented, priority-structured I/O bus system based upon electrical position along the LSI-11 bus. Device priority levels established by a daisy-chained grant signal arrangement for interrupt and DMA requests. Placement of modules into the backplane automatically passes the bus grant signal to the next lower-priority device.*
- *Backplane integral with card guide assembly.*
- *Mounting capability in all planes for convenient "bolt-in" installation in a variety of customer designed equipment packages.*
- *Backplane size 11.15 by 2.8 by 11.0".*
- *Can be mounted adjacent to H780-H power supply.*



Module placement in H9270 backplane

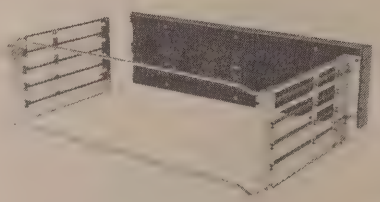
Cat. No.	List	Cat.	Cash	Shipping Weight
B-H9270	$190	$181	$173	6 lbs

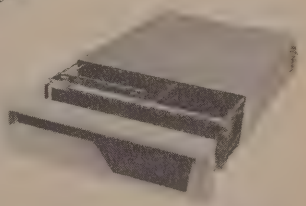
Nine by Six Slot Unit — DDV11-B

The DDV11-B is an expanded version of the standard LSI-11 backplane for use when either more dedicated LSI-11 compatible logic space or non-LSI-11 compatible space for various other special purpose logic modules or both is required. A nine by four slot section (36 individual module slots) of this system unit is pre-bused specifically for LSI-11 bus signal, power and ground connections. The remaining nine by two slot section (18 slots) is provided with +5V dc, −12V dc and ground power connections only; this leaves the remaining pins free for use with any special logic modules to be used in conjunction with the LSI-11 family of modules and bus requirements.

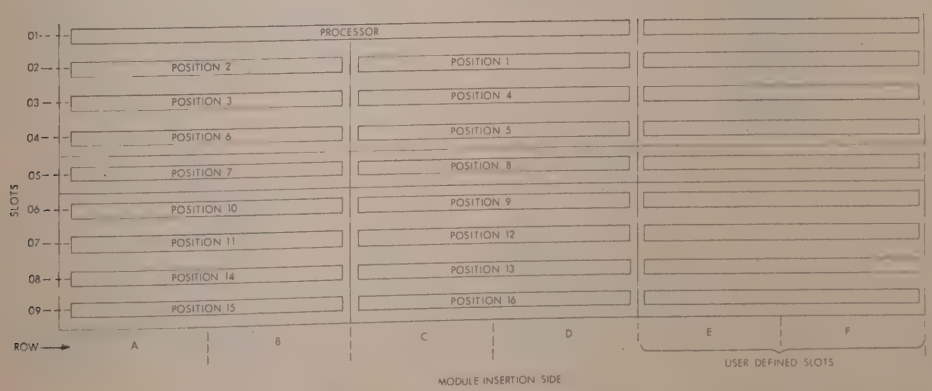
An optional card cage, Type H0341, is also available to provide protection against physical damage to modules and to serve as a logic card guide. This card cage completely surrounds the slot side of the system unit and is shown in the photograph.

The DDV11-B without the card cage will fit into an H909-C module enclosure, see photo. H0341 is provided with H909-C. Details of this enclosure are covered elsewhere in this catalog.


DDV11-B backplane shown with optional H0341 card cage.


H909-C general purpose enclosure holds one DDV11-B backplane. For details see p. 132 in this catalog.

Cat. No.	Description	List	Cat.	Cash	Shipping Weight
B-DDV11-B	Backplane	$400	$380	$364	10 lbs
B-H0341	Card Cage	50	48	46	3 lbs.



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DIRECT SALES CATALOG

LSI-11, LSI-11/2 AND PDP-11/03

INTRODUCING THE LSI-11/2

FIRST TIME IN DIRECT SALES CATALOG

The LSI-11/2 has the power of the LSI-11 and the PDP-11 family of minicomputers. The same versatile instruction set. The same powerful software. The same interrupt and floating point arithmetic powers. Only its form factor has changed. We've divided our LSI-11 board down the middle, so that CPU and memory are on separate, half-sized boards. What this gives you is a greatly improved form factor, for a new range of design flexibility.

We've taken the LSI-11 CPU and put it on a 5″ by 8½″ board. Now the LSI-11/2 processor and a 32K RAM module together are no bigger than the original LSI-11 with only 4K of memory.

The LSI-11/2 family will open up some new dimensions in microcomputer applications. Especially where space or cost is important.

But size is just the start. Your cost savings can be up to 40%, depending on configuration. Power consumption has been lowered, too. And most systems designed with LSI-11/2 components will run faster.

We're also extending our half-size format to a whole new family of microcomputer options, including memories and interfaces. Imagine: With just two 5″ by 8½″ boards in our new microbackplane, you can have a 16-bit system with up to 32K words RAM, and room left over for your own electronics. That's a 77% reduction in space. And all for only $2266.*

Naturally, our entire half-size family is compatible with our previous products, to expand your options even further.

The LSI-11/2 microcomputer is truly a minicomputer in performance. In fact, no other microcomputer of its size in the world has so much power.

*Cash price for KD11-HD Processor-Memory System.

TECHNICAL DESCRIPTION

CENTRAL PROCESSING UNIT

The KD11-HA is an LSI-11 central processor on a double-size module. The KD11-HA has no on-board RAM. The heart of the KD11-HA is the microcomputer chip set. This chip set includes a control chip, a data chip and two micro-instruction ROM chips. In addition, an optional KEV11 MICROM (see p. 56) that contains EIS/FIS microcode can be installed on the module. Additional logic on the KD11-HA interconnects the chip set with the LSI-11 bus. The KD11-HA is normally the bus master in an LSI-11 system; however, provision has been made for direct memory access operations by another module on the LSI-11 bus. The KD11-HA may be interrupted by requests from external devices using the bus interrupt request.

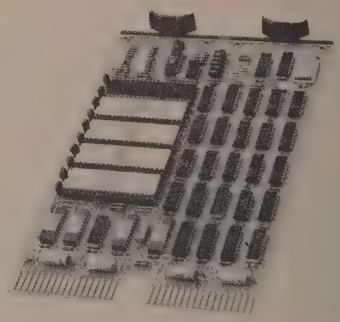
The KD11-HA responds to several control signals on the LSI-11 bus. These control signals initiate power/fail restart microcode sequences, halt mode and EVENT line interrupts.

The KD11-HA does not have microcode refresh for dynamic MOS RAM. Memory must be self-refreshing or DMA refresh (REV11, p. 56) must be used.

The KD11-HA combined with an MSV11-D memory module provides the LSI-11 microcomputer and all the RAM memory needed for a system in two double-size card locations. Note that KD11-HA is not available through this catalog as a "stand alone" item but is available in any one of four memory/CPU configurations.

The KD11-HA, a double-size (5″ by 8.5″) module, should be mounted in the first slot of the first backplane of an LSI-11/2 system. All connections to and from the KD11-HA are via the card edge connectors to the LSI-11 backplane. The KD11-HA must be mounted in the first slot for proper handling of DMA requests and interrupt requests.

The KD11-HA microcode executes all of the PDP-11/40 instruction set. The KEV11 option extends the microcode to respond to all EIS/FIS instructions. The LSI-11 chip set controls fetching of instructions and decoding instructions to determine which operations are to be performed. Both word and byte instructions can be executed. The internal architecture of the chip set makes the KD11-HA particularly well-suited for execution of byte-oriented instructions.



LSI-11 vs LSI-11/2

KD11-HA
Dual Size Module
Double Sided Etch
No On Board Memory
No External Memory Refresh Capability
On Board Power Up Sequencing
Crystal Controlled Clock (not adjustable)

KD11-F
Quad Size Module
Multi Layer Etch
4K On Board Memory
External Memory Refresh Capability
Requires External Sequencing
One Shot Clock (adjustable)

Both have
Same Chip Set
LSI-11 Bus Compatibility
Software Compatibility
Machine Cycle Time (380 ns)

MEMORY MODULES

The MSV11-D is a memory module that can be configured to provide all the random access memory necessary for an LSI-11/2 microcomputer system. The MSV11-D is available with three different capacities: 8K, 16K or 32K, all with 16-bit words. The 8K version is made with 4K x 1 bit MOS RAMs. The 16K and 32K versions are constructed with new 16K x 1 bit RAM chips.

LSI-11/2 systems are normally limited to 28K words of memory. The MSV11-D has a strap that enables the lower 2K of RAM Bank 7. This means that the memory system can be expanded to 30K if no I/O devices are using the address range of 160000 to 170000 (software operating systems do not support system development in this additional 2K range).

The MSV11-D is self refreshing. No bus time is required for the refresh operation. This means that neither microcode nor DMA refresh is necessary. If a bus access occurs while the refresh operation is taking place, the reply signal will be delayed up to 750 ns while the refresh operation takes place. Systems with on-board memory refresh have a throughput of between 4% and 6% higher than systems with conventional bus refresh.

The MSV11-D, coupled together with the KD11-HA processor module, provides both the processor and up to 32K of RAM in two double-sized card locations.

The MSV11-D MOS RAM double-sized (5″ x 8.5″) module can be mounted in any LSI-11 backplane position. Power distribution on the MSV11-D has been partitioned to allow separate power supplied (+5V and +12V) for memory and refresh logic. When desired, a second power supply can be connected to these extra power leads to provide power for the memory during power fail conditions. See p. 51 for specifications on the MSV11-D Series of memory modules.

One configuration of processor-memory KD11-HU includes 256 x 16-bit RAM and sockets for up to 4K x 16-bit UV PROM memory chips. This configuration is intended for application in dedicated controllers where memory volatility cannot be tolerated.

OPTIONAL INTERFACES

There is a variety of various optional modules that can be added to the LSI-11/2 systems. These include IBV11-A IEEE Instrument Bus Interface, MRV11-BA 4K UV PROM board, MRV11-AA 4K PROM board, DRV11 16-bit parallel interface, DCK11-AC CHIPKIT foundation module, REV11-A module (memory refresh and termination functions are not required for LSI-11/2 systems contained on one microbackplane), KPV11-A power sequencer/line clock module (see below under Power Considerations), and the DLV11 single-line serial interface. These optional modules are described in detail later in this section.

RXV11 DUAL FLOPPY DISK SYSTEM

The RXV11 Dual Floppy Disk System is a low cost, random access, mass memory device that stores data in fixed-length blocks on preformatted flexible diskettes. Each drive is capable of storing up to 256K 8-bit bytes of data. Each floppy disk system includes an RX01 floppy disk drive, a 15-foot interface cable, and an RXV11 interface that plugs into the LSI-11/2, LSI-11 or PDP-11/03 system backplane.

NEW FOUR-LINE SERIAL LINE INTERFACE

The DLV11-J is a dual height module that implements four independent asynchronous serial interfaces to the LSI-11 bus. Besides EIA RS-422 and RS-423 (backward compatible with RS-232C) drive levels for receive and transmit data, the DLV11-J also has 20 mA capability with reader run using an externally mounted option DLV11-KA. The module is intended to allow system configurations to mix asynchronous serial terminals with other peripherals, all connected to the same DLV11-J module. For further details on DLV11-J and DLV11-KA see p. 53.

POWER SUPPLY CONSIDERATIONS

Power requirements for the LSI-11/2 depend on the number of memory boards used in the configuration. The central processor requires +5V ±5% at 1A (typ) and +12V ±3% at .22A (typ.) Each memory module requires +5 ±5% at 1.7A (typ) and +12V ±3% at .4A (typ). Any commercially available power supply which meets these requirements can be used. Note that a KPV11 Power Sequence module is not required for power-up (as it is with the LSI-11 family) but if an orderly system shutdown is necessary on power failure then the KPV11 module is required.

digital

DIRECT SALES CATALOG

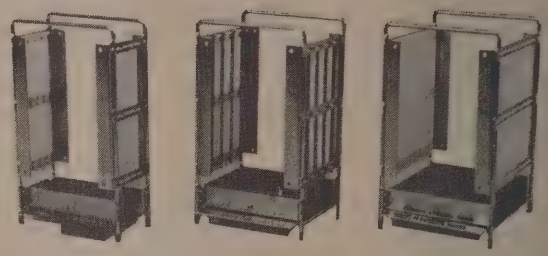
LSI-11, LSI-11/2 AND PDP-11/03

A NEW, COMPACT BACKPLANE ASSEMBLY — H9281

- *Configurations of 2 x 4, 2 x 8, and 2 x 12*
- *Bus lines prewired to each module location*
- *Easily implemented priority structure*
- *Built-in terminator in backplane*
- *Integral card guide assembly, rugged and lightweight*
- *Fast-on tabs for power connection*
- *Supports battery back-up*

The key to the LSI-11/2 family is the LSI-11 bus, completely contained in the backplane. This new backplane reflects the form factor of the LSI-11/2 family, and can help make system configuration fast and easy.

The LSI-11 bus provides a vectored interrupt I/O system with priority based on device position along the bus. Since each module connected to the bus receives the same set of interface signal lines, you simply plug memory and interface modules into any desired location in the backplane.



Three sizes of backplane with card cage assemblies are available. The outside dimensions of the three styles are as follows: 2 x 4 size, 10.8″ high by 5.75″ wide by 3″ deep; 2 x 8 size, 10.8″ high by 5.75″ wide by 6″ deep; and 2 x 12 size, 10.8″ high by 5.75″ wide by 8″ deep.

The new backplane comes in three sizes to accommodate four, eight, or twelve modules, see illustrations.

ORDERING INFORMATION

Cat. No.	Description	List	Cat.	Cash	Shipping Weight
BASIC PROCESSOR-MEMORY CONFIGURATIONS					
B-**KD11-HB**†	LSI-11/2 Central Processor Unit as KD11-HA plus 8K x 16-bit-Random Access Memory (RAM) — two boards, size: 8.5 x 5″.	**$1290**	**$1226**	**$1174**	10 lbs.
B-**KD11-HC**†	LSI-11/2 Central Processor Unit as KD11-HA plus 16K x 16-bit Random Access Memory (RAM) — two boards, size: 8.5 x 5″.	**1690**	**1606**	**1538**	10 lbs.
B-**KD11-HD**†	LSI-11/2 Central Processor Unit as KD11-HA plus 32K x 16-bit Random Access Memory (RAM) — two boards, size: 8.5 x 5″.	**2490**	**2366**	**2266**	10 lbs.
B-**KD11-HU***†	LSI-11/2 Central Processor Unit as KD11-HA plus UV PROM/RAM memory board. Included are 256 x 16-bit RAM and sockets for up to 4K x 16-bit UV PROM memory chips.	**990**	**941**	**901**	10 lbs.
ACCESSORIES AND OPTIONS					
B-**H9281-AA**	LSI-11/2 backplane assembly prewired to accept four 8.5 x 5″ modules and power connections.	**75**	**71**	**68**	4 lbs.
B-**H9281-AB**	LSI-11/2 backplane assembly prewired to accept eight 8.5 x 5″ modules and power connections.	**110**	**105**	**100**	5 lbs.
B-**H9281-AC**	LSI-11/2 backplane assembly prewired to accept twelve 8.5 x 5″ modules and power connections.	**145**	**138**	**132**	6 lbs.
B-**H9281-BA**	Housing assembly for four LSI-11/2 modules including card guides, retainers and H9281-AA backplane.	**105**	**100**	**96**	5 lbs.
B-**H9281-BB**	Housing assembly for eight LSI-11/2 modules including card guides, retainers and H9281-AB backplane.	**155**	**147**	**141**	6 lbs.
B-**H9281-BC**	Housing assembly for twelve LSI-11/2 modules including card guides, retainers and H9281-AC backplane.	**205**	**195**	**187**	7 lbs.
B-**RXV11-BA**	Dual Floppy Disk Drive, 115V ac 50 Hz.	**4300**	**4085**	**3913**	75 lbs.

KD11-HA

LSI-11/2 Central Processor Unit with power fail/auto restart, 16-bit, I/O DMA port, real-time clock input & vector interrupt handling — single board, size: 8.5 in. x 5 in.

*To execute diagnostics external 4K x 16-bit RAM is required. Minimum external RAM available through Direct Sales Catalog is 8K.
† Prices shown include a ZJV01-RB literature and diagnostic package.

SPECIFICATIONS

KD11-HA Central Processor

Power consumption: +5V @ 1.0 amps (typ.)
+12V @ .22 amps (typ.)
Bus loading: 1.7 AC loads, 1.0 DC loads
Temperature range: 5°C to 60°C
Relative humidity: 10% to 95%, no condensation

MSV11-D Memory Module

Power consumption: Operating: +5V @ 1.7 amps (typ.)
+12V @ .4 amps (typ.)
Battery Backup: +5V @ .7 amps (typ.)
+12V @ .4 amps (typ.)
Temperature: 5°C to 60°C
Humidity: 10% to 95%, no condensation
Bus loading: AC loads, 1 DC load

OTHER OPTIONS

DLV11-J	Four-line serial interface	see p. 53
IBV11-A	IEEE instrument bus interface	see p. 54
MRV11-BA	4K UV PROM board	see p. 51
MRV11-AA	4K PROM board	see p. 50
DRV11	16-bit parallel interface	see p. 52
DCK11-AC	CHIPKIT Foundation Module	see p. 58
REV11-A	Refresh/bootstrap/diagnostic/terminator	see p. 56
KPV11-A	Power sequencer/Line clock	see p. 49
DLV11	Single-line serial interface	see p. 52
MSV11-DB	8K RAM	see p. 51
MSV11-DC	16K RAM	see p. 51
MSV11-DD	32K RAM	see p. 51

Power Supply — H780-H

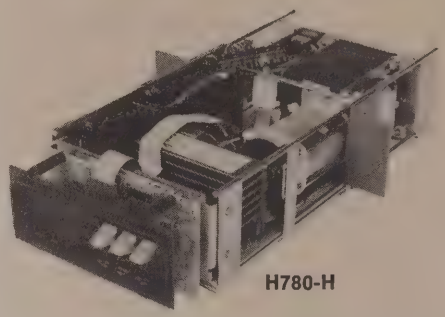
The H-780-H power supply provides the voltage levels (+5 and +12V dc) required by LSI-11 and LSI-11/2 microcomputer modules. Additionally, control functions such as power fail/restart sequences and line-time clock (LTC) generation are included. These latter functions are essential for the LSI-11 and LSI-11/2 system and if the H780-H power supply is not used then Option KPV11 or equivalent must be incorporated in the system, see below.

The power output of the H780-H is adequate to handle a fully implemented H9270 backplane, H9281, (or the equivalent). The individual power requirements of each LSI-11 or LSI-11/2 module option included in the system should be totalled to ensure proper operation.

The H780-H includes a 12″ power cable, terminated with a 6-lug connector strip that mates with the backplane's power terminal block and a 10″ bus signal cable that mates with the backplane's connector pins. A connector block on the rear of the H780-H is provided for connection to a primary power source. A line fuse and On/Off switch on the rear of the option provide overload protection and primary power control, respectively.

Features:

- *+5V ±4%, 18A (max.) and +12V ±3%, 3.5A (max.); combined dc power must not exceed 120W.*
- *Overcurrent/Short Circuit Protection — Output voltages return to normal after removal of overload or short. Current limited to approximately 1.2 times the required max. rating.*
- *Overvoltage Protection — +5V limited to +6.3V (approximately); +12V limited to +15V (approximately).*
- *Dual Primary Power Configuration — Can be connected for nominal 115V, 60 Hz or 230V, 50 Hz input power.*
- *Line Time Clock — A bus-compatible signal is generated by the power supply for the event (line time clock) interrupt input to the processor. This signal is either 50 or 60 Hz, depending upon primary power line frequency input to the power supply.*



H780-H

- *Fans — Built-in fans provide cooling for the power supply and LSI-11 modules contained in an adjacent H9270 backplane.*
- *Power Fail/Automatic Restart — Fault detection and status circuits monitor ac and dc voltages and generate bus-compatible BPOK H and BDCOK H signals (respectively) to inform the LSI-11 or LSI-11/2 system modules of power supply status. Automatic power signal sequencing is provided.*
- *Master Console — Console includes three switches (dc ON-OFF, HALT/ENABLE, and LTC ON-OFF) and three indicators (RUN, dc ON, spare).*
- *Backplane signals: BPOK H, BDCOK H, BEVNT L, BHALT L, SRUN L.*
- *Slave Power Supply Control — H780-H can control a slave power supply.*

The H780-H measures 5½″ wide by 3½″ high by 14⅝″ long. It can be mounted adjacent to the H9270 backplane card cage assembly, but not to the H9281 housings.

Cat. No.	List	Cat.	Cash	Shipping Weight
B-**H780-H**	**$700**	**$665**	**$637**	15 lbs.

Power Controller/Sequencer — KPV11

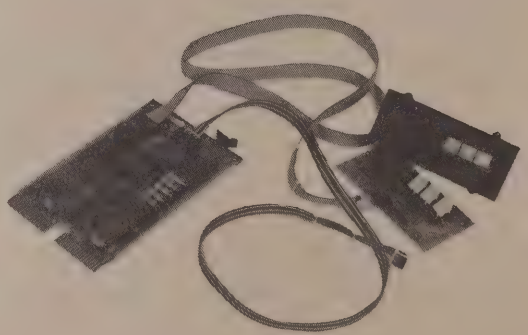
Unless an H780-H power supply is used, the KPV11 option (or equivalent) must be incorporated in an LSI-11 or LSI-11/2 system for power fail/restart sequencing and to provide a Line Time Clock (LTC) generator for the system. There are two cataloged models: KPV11-A, and KPV11-B. They differ in that -A has no termination resistors so cannot be used as an LSI-11 or LSI-11/2 bus terminator. -B provides 120-ohm termination. Note that the -B module must be mounted in the backplane immediately following the last option module for the termination function to work.

The KPV11-A module can be mounted remote from the backplane and interconnected by an optional 70-12754 cable that plugs into the module and the backplane. No program control of the LTC function is possible with a remote installation, however.

An optional console can be added to the KPV11 to provide indicators and switches. The switches are dc ON/OFF, HALT/ENABLE, LTC ON/OFF. The indicators are RUN, dc ON, and a spare. The console is ordered by three catalog numbers: 54-11808 pc board assembly (includes switches and LED indicators), 70-11656 bezel, and 70-08612-4A console signal/power cable. Order by all three numbers.

AC power to this option must be provided via a center-tapped transformer, 24V ac user supplied. This ac input provides the dc power for the option, the 50 Hz or 60 Hz reference for the LTC function and is the power fail monitor signal for the power signal sequence circuit. An external clock frequency can be used as the LTC reference if need be. Note that the KPV11 is **not** a power supply. Suitable dc power (+5V and +12V) for the LSI-11 or LSI-11/2 system must be provided by the system user.

The KPV11 module is a double-height (8.5 by 5″) pc board.



Cat. No.	Description	List	Cat.	Cash	Shipping Weight
B-**KPV11-A**	Controller without Termination Resistors	**$290**	**$276**	**$264**	5 lbs.
B-**KPV11-B**	Controller E/W 120-ohm Terminations	**315**	**299**	**287**	5 lbs.
B-**70-12754**	Remote Signal Cable	**13**	**12**	**12**	.5 lbs.
B-**54-11808**	Console pc Panel	**50**	**48**	**46**	.5 lbs.
B-**70-11656**	Console Bezel	**9**	**9**	**8**	.5 lbs.
B-**70-08612-4A**	Console Signal/Power Cable	**10**	**10**	**9**	.5 lbs.

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DIRECT SALES CATALOG

LSI-11, LSI-11/2 AND PDP-11/03

EXTENSION MEMORY MODULES*

4K RAM MOS MEMORY MODULE — MSV11-B [11] [—] [11/03] **

A double-height (8.5 by 5″) read/write memory module utilizing dynamic MOS semiconductor memory devices, the module capacity is 4096 words of 16-bits, with memory-select circuitry for operation on 4K address boundaries. Dynamic memory refresh must be performed by microcode on the basic microcomputer module (hence, not easily compatible with LSI-11/2). If the interrupt latency associated with CPU microcode refresh cycling is undesirable an external refresh option (REV11-A or -C) implemented on an 8.5 by 5″ (double-height) board can be ordered. The LSI-11 CPU KD11-F or the PDP-11/03-EA microcomputer can handle up to seven of these MSV11-B memory modules (32K words). Power requirements for MSV11-B are +5V ±5% at 0.56A (1.12A max.) and +12V ±3% at 0.26A (0.58A max.). Voltage levels are identical to those for the basic microcomputer modules.

★ ★ PRICES SLASHED ★ ★

Cat. No.	List	Cat.	Cash	Shipping Weight
B-MSV11-B	$625	$257	$246	2 lbs.

16K RAM MOS MEMORY MODULE — MSV11-CD [11] [—] [11/03]

A quad-height (8.5 by 10″) read/write memory module utilizing dynamic MOS semiconductor memory devices, the module capacity is 16K words of 16 bits with memory-select circuitry for operation on 4K address boundaries. Dynamic memory refresh is performed automatically every 25 microseconds (approximately) by circuitry on the memory module. If the memory is accessed during this refresh cycle, the cycle continues and a delay of 750 nanoseconds (max.) may be encountered before the I/O transaction is completed. Power requirements are +5V ±5% at 1A (2A max.) and +12V ±5% at 0.54A (0.56A max.). Voltage levels are the same as those required by the basic microcomputer modules.

Cat. No.	List	Cat.	Cash	Shipping Weight
B-MSV11-CD	$1375	$1306	$1251	5 lbs.

4K PROM MEMORY — MRV11-AA [11] [11/2] [11/03]

Having a double-height (8.5 by 5″) module size, this user programmable, read-only memory utilizes either 256 by 4-bit or 512 by 4-bit fusible link-semiconductor devices (which must be ordered separately). The module's maximum capacity is 2048 or 4096 words of 16-bits (depending upon which device is used), and is expandable in 256 or 512 16-bit word increments (requires 4 chips per increment). This module is configured with 32 sockets for mounting memory IC devices of the user's choice. PROM chips (MRV11-AC, see right) can be supplied as an option. Board-mounted jumpers enable selection of the module's address. Power requirements are +5, ±5% at either 0.2A (0.4A max.) with no memory devices installed or 2.8A (4.1A max.) with 4K implemented.

Cat. No.	List	Cat.	Cash	Shipping Weight
B-MRV11-AA	$175	$166	$159	2 lbs.

PROM CHIP FOR MRV11-AA MEMORY

Fusible Link Unprogrammed PROM Chip. 512 by 4-bit array.

Cat. No.	List	Cat.	Cash	Shipping Weight
B-MRV11-AC	$40	$38	$36	.25 lbs.

4K CORE MEMORY MODULE — MMV11-A [11] [—] [11/03]

Included in this catalog to expand existing core-based systems (MOS memories are recommended for new systems), the MMV11-A is a quad-size (8.5 by 10″) double width read/write memory module containing 4096 words of 16-bits, with memory address selection circuitry for starting operation on any 4K boundary. Core memory provides non-volatile read/write storage for applications requiring protection against power losses.

Power requirements are +5V ±5% at 3A (7A max.) and +12V ±3% at 0.2A (0.6A max.). Voltage levels are identical to those required by the basic microcomputer modules.

Cat. No.	List	Cat.	Cash	Shipping Weight
B-MMV11-A	$990	$941	$901	10 lbs.

* A comprehensive user's manual is provided with each memory option ordered.

[11] [11/02] [11/03] **

**Because some modules are quad height boards, they will not fit into the LSI-11/2 double height backplane. Additionally some memory modules do not have onboard memory refresh.

The bar next to each heading indicates which module applies to which microcomputer family.

EXTENSION MEMORY MODULES (Cont'd)

PROM-RAM MEMORY — MRV11-BA [11] [11/2] [11/03]

This option is packaged as a double-height (8.5 by 5″) pc board. MRV11-BA comprises a 256-word by 16-bit MOS random access memory (RAM) and a 4K by 16-bit PROM memory implemented via eight sockets designated to hold up to eight 1K by 8-bit PROM chips. The PROM chips can either be industry-standard such as Intel 8708, or DIGITAL MRV11-BC chips (see below) can be ordered. The MRV11-BC chips are erasable by exposure to high intensity ultraviolet light and therefore can be reprogrammed.

The RAM can be used as scratch pad or stack memory by system software. This memory is volatile and is lost when power is removed. The RAM memory is refreshed by local circuitry on the MRV11-BA module. The PROM memory is non-volatile. Both PROM and RAM address space can be independently configured by customer placed jumpers. Power requirements are +5V dc, ±5% at 0.58A (0.67A max.) and +12V dc ±5% at .34A (0.41A max.) without any PROMs installed. The current values increase to .62A (0.744A max.) and 0.5A (0.6A max.) respectively with eight MRV11-BC PROMs installed. The voltage levels are compatible with the other microcomputer modules. The −5V dc required for the PROMs is derived via a "charge-pump" circuit on the MRV11-BA module.

Software is available to convert absolute loader format programs into listing and paper tapes in PROM content format (see elsewhere in this section).

Cat. No.	List	Cat.	Cash	Shipping Weight
B-**MRV11-BA**	**$325**	**$309**	**$296**	3 lbs.

UV PROM CHIPS — MRV11-BC

These PROM chips plug into sockets on the MRV11-BA memory module. Each MRV11-BC PROM is one IC chip that provides 1024 (1K) words by 8-bits of memory. UV PROM chips are erased by high intensity ultra-violet light focussed through a clear quartz window on each chip. Two chips are required to provide 1K of 16-bit memory, thus eight chips implement a full 4K by 16-bit memory.

Cat. No.	List	Cat.	Cash	Shipping Weight
B-**MRV11-BC**	**$100**	**$95**	**$91**	1 lb.

8K-32K RAM MOS MEMORY MODULE MSV11-D — DESIGNED FOR LSI-11/2

The MSV11-D is a memory module that can be configured to provide all the random access memory necessary for an LSI-11 microcomputer system. The MSV11-D is available with three different capacities: 8K, 16K or 32K, all with 16-bit words. The 8K version made with 4K x 1 bit MOS RAMs. The 16K and 32K versions are constructed with new 16K x 1 bit RAM chips.

LSI-11 systems are normally limited to 28K words of memory. The MSV11-D has a strap that enables the lower 2K of RAM Bank 7. This means that the memory system can be expanded to 30K if no I/O devices are using the address range of 160000 to 170000 (software operating systems do not support system development in this additional 2K range).

The MSV11-D is self refreshing. No bus time is required for the refresh operation. This means that neither microcode nor DMA refresh is necessary. If a bus access occurs while the refresh operation is taking place, the reply signal will be delayed up to 750 ns while the refresh operation takes place. Systems with on-board memory refresh have a throughput of between 4% and 6% higher than systems with conventional bus refresh.

The MSV11-D is a double size module.

SPECIFICATIONS

Power Requirements

Model	Supply Voltage	Operating Power Typical	Maximum	Standby Power Typical	Maximum
MSV11-DC (16K)	+5V System Power	1.7A, 8.5W	1.9A, 9.5W	1.7A, 8.5W	1.9A, 9.5W
	+5V Battery Backup	0.7A, 3.5W	0.8A, 4.0W	0.7A, 3.5W	0.8A, 4.0W
	+12V System Power or Battery Backup	0.34A, 4.0W	0.38A, 4.6W	0.6A, 0.7W	.07A, 0.9W
MSV11-DB, -DD (8K or 32K)	+5V System Power	1.7A, 8.5W	1.9A, 9.5W	1.7A, 8.5W	1.9A, 9.5W
	+5V Battery Backup	0.7A, 3.5W	0.8A, 4.0W	0.7A, 3.5W	0.8A, 4.0W
	+12V System Power or Battery Backup	0.37A, 4.5W	0.41A, 4.9W	.08A, 1.0W	0.1A, 1.2W

Environmental Operating: 5° to 60°C (41° to 140°F) with a relative humidity of 10% to 95% (no condensation), with adequate airflow across the module. When operating at the maximum temperature (60°C or 140°F), airflow must maintain the inlet to outlet air temperature rise across the modules to 7°C (12.5°F), maximum. During battery backup operation, the temperature must be maintained within the normal operating temperature range. **Storage:** −40° to 66°C (−40° to 151°F) with a relative humidity of 10% to 90% (no condensation).

Cat. No.	Description	List	Cat.	Cash	Shipping Weight
B-**MSV11-DB**	8K x 16-bit Random Access Memory (RAM) including on-board refresh — single board, size: 8.5″ x 5″.	**$850**	**$808**	**$874**	3 lbs.
B-**MSV11-DC**	16K x 16-bit Random Access Memory (RAM) including on-board refresh — single board, size: 8.5″ x 5″.	**1375**	**1306**	**1251**	3 lbs.
B-**MSV11-DD**	32K x 16-bit Random Access Memory (RAM) including on-board refresh — single board, size: 8.5″ x 5″.	**2400**	**2280**	**2184**	3 lbs.

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DIRECT SALES CATALOG

LSI-11, LSI-11/2 AND PDP-11/03

INPUT/OUTPUT INTERFACES

LSI-11, LSI-11/2 and PDP-11/03 interface options permit interfacing most peripheral devices to the bus with ease. Not all interface options apply to all systems. The coded boxes [11] [11/2] [11/03] beside each option title shows those systems to which the option can be applied.

PARALLEL LINE UNIT — DRV11 [11] [11/2] [11/03]

This unit is a general-purpose, 16-bit parallel interface between the LSI-11 or LSI-11/2 bus and the user's peripheral device.

Features:

- *16 diode-clamped data input lines.*
- *16 latched output lines.*
- *16-bit word or 8-bit byte data transfers.*
- *Complete device address decoding user-assigned.*
- *Bus interface and control logic for interrupt processing and vectored addressing of interrupt service routines.*
- *Interrupt priority determined by electrical position along the bus.*
- *Control/status registers (CSR) compatible with PDP-11 software routines. CSR and receiver data buffer registers directly accessed via processor instructions.*
- *Plug, signal, and program compatible with PDP-11 DR11-C.*
- *Four control lines available to the peripheral device for output data ready, output data accepted, input data ready, and input data accepted logic operations.*
- *Can be used with TTL or DTL logic-compatible devices.*
- *Maximum data transfer rate of 90K words per second under program control.*
- *Maximum drive capability of 25 feet of cable.*
- *Two 40-pin H854 I/O connectors mounted on module.*
- *Board size is double-height (8.5 by 5″).*
- *Power requirements are +5V dc ±5% at 0.85A (1.3A max.).*
- *Recommended interface cables are two BC08R ,or two BC04Z, or two BC07D. Longest cable permitted is 25 feet.*

Cat. No.	List	Cat.	Cash	Shipping Weight
B-**DRV11**	**$210**	**$200**	**$191**	2 lbs.

SERIAL LINE UNITS — DLV11, DLV11-E, DLV11-F [11] [11/2] [11/03]

The DLV11, DLV11-E and DLV11-F are asynchronous line interface modules that interface the LSI-11 bus to any of several standard types of serial communications lines. The modules receive serial data from peripheral devices, assemble it into parallel data, and transfer it to the LSI-11 bus. They accept data from the LSI-11 bus, convert it into serial data, and transmit it to the peripheral devices. The modules differ in that DLV11-E offers full modem control, whereas DLV11 and DLV11-F support either 20 mA current loop or EIA-standard lines, but do not include modem control. The table summarizes the similarities and differences of each unit. All units have the following features:

- *Jumper- or program-selectable crystal-controlled baud rates: 50, 75, 110, 134.5, 150, 300, 600, 1200, 1800, 2000, 3600, 4800, 7200 and 9600. (No program select on DLV11.)*
- *Provisions for user-supplied external clock inputs for baud rate control.*
- *Jumper-selectable parity and data bit formats.*
- *LSI-11 bus interface and control logic for interrupt processing and vectored addressing of interrupt service routines.*
- *Control, status, and data buffer registers directly accessible via processor instructions.*
- *Program and peripheral connector plug compatible with the PDP-11 DL11 series of asynchronous line interface modules.*
- *All units are double size modules.*

SPECIFICATIONS

Power Requirements

+ 5V ±5% 1A (nominal)
+12V ±5% 150 mA (nominal)

Environmental

Operating temperature: 5°C to 60°C
Non-operating temperature: −40°C to 66°C
Humidity (operating and non-operating):
10% to 95% max. wet bulb 32°C

Feature Comparison

Features	DLV11	DLV11-F	DLV11-E
Programmable Baud Rates (Write Only Bits)		X	X
Modem Control			X
EIA "Data Leads Only"	X	X	X
20 mA Current Loop	X	X	
Jumper Selectable Active or Passive 20 mA Current Loop	X	X	
Error Flags		X	X
BREAK Generation Bit	X	X	X
Receiver Active Bit		X	X
Maintenance Bit		X	X
On-board Clocks for Split Speed Operation		X	X
Halt on Framing Error	X	X	X
Boot on Framing Error		X	X
UART Cleared by INIT		X	X
UART Cleared by DCOK	X		
No Trap on Write to RBUF		X	X
Modem Status Bit	X		

NOTE: X indicates feature available.

Cat. No.	Description	List	Cat.	Cash	Shipping Weight
B-**DLV11**	Serial Line Unit	**$250**	**$238**	**$228**	3 lbs.
B-**DLV11-E**	Serial Line Unit with Modem Control	**300**	**285**	**273**	3 lbs.
B-**DLV11-F**	Serial Line Unit	**250**	**238**	**228**	3 lbs.

INPUT/OUTPUT INTERFACES (Cont'd)

INTERFACE FOUNDATION MODULE — DRV11-P [11] [—] [11/03]

The DRV11-P is a versatile wire wrap module that contains the bus interface logic for operation with the LSI-11 or PDP-11/03 system and provides adequate board area for mounting and connecting integrated circuits (IC's) or discrete components. Because the bus interface logic is included, the module can be efficiently configured by the user to satisfy a variety of device interface logic applications.

A 40-pin connector, H854, conveniently mounted at the board edge, facilitates the connection to a device through several cable assembly types available from DIGITAL. See p. 56. Except for the bus interface connections, all signals and voltages are terminated to wire wrap pins for user connections. The bus control logic is provided with wire wrap test points for monitoring the internal signals. The test points are spaced at 0.1 in. between pins to allow a 40-pin connector to be inserted over the wire wrap pins for automated test functions.

Approximately ⅔ of the surface area on the module consists of plated-through holes, each connected to a wire wrap pin. The user can mount three different types of dual-in-line IC's or a variety of discrete components into the holes and connect the proper voltages and signals by wire wrapping leads on the board. The DRV11-P module can be inserted into any one of the available interface option locations of the LSI-11, PDP-11/03 backplane, or PDP-11/03 backplane extender unit. The module is quad-height (8.5 by 10″). Refer to the LSI-11 User's Manual supplied free with each order that calls for a basic processor-memory configuration for detailed installation information.

Recommended cables to be used with this module are BC07D, BC08R, and BC04Z. See p. 56.

Power requirements are +5V dc ±5% at 1A (not including user logic).

See Chip Kit Section for alternative Interface Foundation Modules, p. 58.

Cata. No.	List	Cat.	Cash	Shipping Weight
B-**DRV11-P**	**$275**	**$261**	**$250**	3 lbs.

SERIAL LINE UNIT — DLV11-J [11] [11/2] [11/03]

The DLV11-J is a dual height module that implements four independent asynchronous serial interfaces to the LSI-11 bus. Besides EIA RS-422 and RS-423 (backward compatible with RS-232C) drive levels for receive and transmit data, the DLV11-J also has 20 mA capability with reader run using an externally mounted option DLV11-KA. The module is intended to allow system configurations to mix asynchronous serial terminals with other peripherals.

Each of the four serial channels has four registers which are defined like those of the DL11. The 4 banks of registers of the 4 channels are consecutive and can be positioned in the I/O page using wire-wrap jumpers. Exception: The last channel may be separately configured as the console device.

The DLV11-KA EIA to 20 mA in-line converter includes a 3 foot cable to connect to the DLV11-J. The standard DEC 20 mA cable or Teletype® cable connects to one side of the DVL11-KA which is housed in a 1½″ high by 3″ wide by 4″ deep mounting box. DLV11-KA also provides support for a 110 baud data rate thus adding this capability to DLV11-J.

Note that a BC21B-05 Interface Cable has to be ordered for each I/O channel that will be utilized.

SPECIFICATIONS

Baud rates: 38400, 19200, 9600, 4800, 2400, 1200, 600, 300, 150, 110, external clock

Level code: 7 or 8 bits

Stop bits: 1 or 2 bits

Specifications (Cont'd)

Parity checking: None, Odd, Even

Split speed: No

Connectors: 10-pin Berg

Each channel can be set up independently using wire-wrap jumpers. Output drive levels can be individually selected as RS-422 or RS-423.

NOTE: RS-423 is backward compatible with RS-232C.

RS-422 AND RS-423

Electronic Industries Association (EIA) standards RS-422 and RS-423 have been accepted as new international standards for transmission lines between electronic equipment. These new standards offer a considerable performance improvement over traditional EIA RS-232C and current loops.

With RS-232C, the maximum reliable cable length is 50 feet and the maximum frequency is 20K baud. RS-422, on the other hand, has the capability of going all the way up to 4000 feet and a maximum baud rate of 10 megabaud (although not simultaneouly).

The new RS-422 and RS-423 specifications define the characteristics of the transmitters and receivers used to drive the transmission line as well as the characteristics of the transmission line itself. The receivers and cables used for both standards are identical, but the transmitters are different. RS-422 is a differential (balanced) line system which is capable of transmitting data at high baud rates over long distances with the high noise immunity associated with balanced line systems. RS-423 is a single-ended line system which inherently does not have the capability of a differential line.

RS-423 transmitters and receivers are backward compatible with RS-232C transmitters and receivers. This means that an RS-232C transmitter can send data to an RS-423 receiver and vice versa. Since the receivers used for RS-423 are identical to the receivers used for RS-422, it is possible to design systems which will work with existing RS-232C equipment and can then be upgraded (usually via a strapping change) to RS-422. The system performance is, however, that of RS-232C until the upgrade takes place.

Cat. No.	Description	List	Cat.	Cash	Shipping Weight
B-**DLV11-J**	Four-Line Serial Line Unit	**$465**	**$442**	**$423**	2 lbs.
B-**DLV11-KA**	EIA to 20 mA Converter with 3′ Cable	**110**	**105**	**100**	3 lbs.
B-**BC21B-05**	Interface Cable (1 required per channel) 5′	**40**	**38**	**36**	2 lbs.

MICROCOMPUTERS

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DIRECT SALES CATALOG

LSI-11, LSI-11/2 AND PDP-11/03

DIRECT MEMORY ACCESS — DRV11-B [11 | — | 11/03]

The DRV11-B is a general purpose Direct Memory Access (DMA) interface used to transfer data directly between the LSI-11 or PDP-11/03 system memory and an I/O device. The interface is programmed by the processor to move variable length blocks of 16-bit data words to or from specified locations in memory by means of the LSI-11 bus. Once programmed, no processor intervention is required. The DRV11-B can transfer up to 250K, 16-bit words per second and is capable of operating in burst modes, with byte addressing. The control structure also allows read-modify-restore operations.

The interface consists of five registers: Word Count Register (WCR), Bus Address Register (BAR), Control Status Register (CSR), Input Data Buffer Register (IDBR), and Output Data Buffer Register (ODBR). The module also includes bus transceivers and logic for interrupt requests, address control and protocol, and DMA requests.

The DRV11-B contains one switch bank used to assign an appropriate device address to the DMA interface and one switch bank to select an interrupt vector address in the LSI-11 memory where the DMA routine is stored. Two 40-pin connectors, H854, mounted near the edge of the module, facilitate the connection of the I/O device with the DMA, using any two of several cable assemblies available from DIGITAL. The quad-height (8.5 by 10″) module may be inserted into any available slot of the LSI-11 backplane or backplane extenders according to the rules and restrictions as described in the LSI-11 User's Manual supplied free with each order that calls for a basic processor memory configuration.

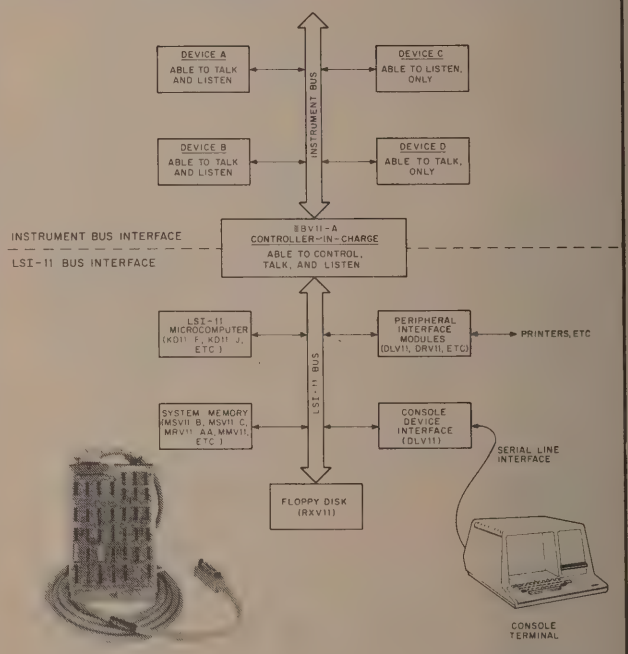
Recommended cables to be used with this module are BC07D, BC08R, or BC04Z. For details of these cables see p. 56.

Power requirements are +5V dc ±5% at 1.9A (nominal).

Cat. No.	List	Cat.	Cash	Shipping Weight
B-**DRV11-B**	**$580**	**$551**	**$528**	5 lbs.

INSTRUMENT BUS — IBV11-A [11 | 11/2 | 11/03]

The instrument bus is contained on a double-height (8.5 by 5″) pc board, and conforms to the IEEE Standard 488-1975 "Digital Interface for Pragrammable Instrumentation."
IEEE 488 standardizes three primary characteristics associated with interfacing instruments such as DVMs, Programmable Power Supplies, Frequency Generators, etc. to computers. These areas are mechanical (connectors and cables), electrical (driver and receiver circuit parameters), and functional (complete definition of each signal line, exact protocol and timing relationship for message transfer, etc.). The bus may have TALKERS (instruments that transmit data) and LISTENERS (instruments that receive data). The IBV11-A can function as a TALKER or LISTENER and as a CONTROLLER initiating a test system by setting ranges, functions or parameters of instruments. Thus, instruments now conforming to IEEE standards may be purchased "off-the-shelf" and integrated into systems with the IBV11-A. See diagram.



Features:

- *PDP-11 software compatible. RT-11, FORTRAN, and BASIC programming.*
- *Bus interface.*
- *Instrument bus compatible with the IEEE 488-1975 standard.*
- *Supports instrument bus cable lengths up to 65.6 feet total.*
- *Fifteen devices (max.) can connect to the instrument bus.*
- *System functions such as: System CONTROLLER, LISTENER (receives data from instruments) and TALKER (transmits data to instruments).*

A 12-foot long interface cable is supplied with each IBV11-A ordered. This cable, BN11A-04, connects the instrument bus option to the first user instrument on the bus. When more than one instrument is to be added to the bus, cable BN01A-04 (12 feet) must be ordered for each additional instrument.

For further details on the instrument bus option request a free copy of the Instrument Bus User's Manual by contacting the Direct Catalog Sales Desk.

Cat. No.	Description	List	Cat.	Cash	Shipping Weight
B-**IBV11-A**	Instrument Bus*	**$750**	**$713**	**$683**	10 lbs.
B-**BN11A-04**	12-ft. Cables to Connect Bus to First Instrument	**125**	**119**	**114**	7 lbs.
B-**BN01A-04**	12-ft. Cable to Interconnect Subsequent Instruments on bus	**125**	**119**	**114**	7 lbs.

* Includes one BN11A-04 cable.

ANALOG-TO-DIGITAL CONVERTER — ADV11-A [11 — 11/03]

The ADV11-A is a 12-bit analog-to-digital converter with built-in multiplexer. A sample-and-hold feature makes available 16 channels of A/D single-ended or 8 quasi-differential inputs that will convert an analog voltage from ±5.12V full-scale bipolar. The ADV11-A features a buffer register that allows data from one conversion to be transferred to the processor after a subsequent conversion begins. This buffering optimizes the throughput rate of the converter, permitting the ADV11-A to run at 25 kHz throughput to memory using an LSI-11 system operating under optimum programming with DMA refresh. The auto-zeroing technique — another feature — uses a patented design that measures the sampled signal with respect to the offset of its own internal circuitry and thus effectively cancels out its own offset error contributions to the measurement. There are also three-built-in signals for self-testing. They may be connected through a BC08R-01 maintenance cable (not included) to any channel. A maintenance self-test plug is provided with the option for diagnostic verification. The test signals are two dc levels, and one bipolar triangular waveform. The bipolar triangular wave can be used with diagnostic software to produce a data base for extremely thorough and precise analog linearity testing.

Features:

- *16 single-ended or 8 quasi-differential channels.*
- *Input voltage range is ±5.12V bipolar full scale.*
- *Output resolution is 12-bits (1 part in 4096).*
- *Input impedance is 100 Megohms min.*
- *Input bias current is 40 nA max.*
- *Temperature stability is 5 ppm per °C for gain coefficient and 2 ppm per °C of full scale for offset coefficient.*
- *Power requirements are +5V dc ±5% at 1.75A and +12V dc ±5% at 350 mA.*
- *Quad-height (8.5 by 10") module.*
- *The recommended interface cables are BC04Z, BC08R or BC07D, see p. 56.*

Cat. No.	List	Cat.	Cash	Shipping Weight
B-**ADV11-A**	**$1000**	**$950**	**$910**	5 lbs.

DIGITAL-TO-ANALOG CONVERTER — AAV11-A [11 — 11/03]

The AAV11-A is a four-channel digit-to-analog converter that allows the user a wide variety of output voltage ranges that are jumper selectable. Each 12-bit D/A converter has its own holding register which can be separately addressed and can be written and read in either word or byte format.

Features:

- *Four mutually exclusive D/A converters.*
- *12-bit digital input per converter.*
- *Input binary-coded for unipolar mode, offset binary for bipolar mode.*
- *Single-buffered, word or byte operable, read/write digital storage.*
- *Bipolar output voltage range is ±2.56V ±5.12V or ±10.24V jumper selectable. Factory set for ±5.12V.*
- *Unipolar output voltage is either 0 to +5.12V or 0 to +10.24V jumper selectable.*
- *Resolution is 12-bits (1 part in 4096).*
- *Temperature stability is 10 ppm per °C max. for gain coefficient and 20 ppm per °C max. of full scale for offset coefficient.*
- *Gain accuracy is adjustable.*
- *Linearity is ±½ LSB.*
- *Output impedance is 1 ohm max.*
- *6 mA per converter drive capability.*
- *5 volts per microsec. slew rate.*
- *Power requirements are +5V dc ±5% at 1.5A and +12V dc ±5% at 0.4A.*
- *Quad-height (8.5 by 10") module.*
- *Recommended interface cables are BC04Z, BC08R or BC07D, see p. 56.*

Cat. No.	List	Cat.	Cash	Shipping Weight
B-**AAV11-A**	**$900**	**$855**	**$819**	5 lbs.

REAL TIME CLOCK — KWV11-A [11 — 11/03]

The KWV11-A is a programmable real-time clock that offers the user several methods of measuring and counting intervals or events from 1 microsecond to 650 seconds. It can also be used to synchronize external equipment. The KWV11-A is a 16-bit clock that will operate in one of four programmable modes and can be selected to operate at one of five crystal-controlled frequencies.

Features:

- *Programmable function modes are: single interval, repeated interval, external event timing, and external event timing from a zero base.*
- *Crystal controlled frequency of 1 MHz, 100 KHz, 10 KHz, 1 KHz, or 100 Hz.*
- *Timing accuracy is .01%.*
- *Power requirements are +5V dc ±5% at 1.75A.*
- *Quad-height (8.5 by 10") module.*

Cat. No.	List	Cat.	Cash	Shipping Weight
B-**KWV11-A**	**$600**	**$570**	**$546**	5 lbs.

digital
DIRECT SALES CATALOG

LSI-11, LSI-11/2 AND PDP-11/03

OPERATIONAL OPTIONS — REV11-A, REV11-C [11] [—] [11/03]

- *Memory Refresh*
- *Diagnostic*
- *Bus Termination*

This external refresh module is used when the dynamic RAM memory refresh implemented in the KD11-F basic microcomputer module or PDP-11/03-KA microcomputer microcode is disabled. This option eliminates an interrupt latency which can exist when operating with the microcode refresh functions. Also included are bootstraps for the resident paper tape absolute loader, and CPU and memory diagnostics. A 120-ohm bus termination is included with Option REV11-A only. REV11-A must not be used in systems where other DMA devices are on the I/O bus. Use REV11-C with TEV11 120-ohm terminator module in these applications. See p. 44 for TEV11 information.
Option is a double-height (8.5 by 5″) pc board.

Cat. No.	Description	List	Cat.	Cash	Shipping Weight
B-**REV11-A**	120-ohm Termination	**$320**	**$304**	**$291**	2 lbs.
B-**REV11-C**	No Termination	**320**	**304**	**291**	2 lbs.

ARITHMETIC FUNCTION PACKAGE — KEV11 [11] [11/2] [11/03]

Extended instruction and floating point instruction. Option KEV11 provides fixed-point multiplication, division, and multiple shifting in single-precision arithmetic, as well as floating-point addition, subtraction, multiplication, and division. Furnished as an IC package, it plugs into a socket in the basic microcomputer modules and PDP-11/03 microcomputers.

Cat. No.	List	Cat.	Cash	Shipping Weight
B-**KEV11**	**$190**	**$181**	**$173**	1 lb.

I/O INTERFACE CABLES [11] [11/2] [11/03]

Cat. No.	Description	Length	List	Cat.	Cash	Shipping Weight
B-**BC04Z-10**	40-conductor cable with 40-pin H856 and open end.	10′	**$53**	**$50**	**$48**	2 lbs.
B-**BC07D-10**	Two 20-conductor flat mylar ribbon cables with 40-pin H856 and open end.	10′	**75**	**71**	**68**	5 lbs.
B-**BC07D-15**		15′	**90**	**86**	**82**	6 lbs.
B-**BC07D-25**		25′	**105**	**100**	**96**	10 lbs.
B-**BC08R-01**	Maintenance cable. Connects input to output ports.	1′	**50**	**48**	**46**	1 lb.
B-**BC08R-xx**	H856 to H856 connectors. Flat mylar 40-conductor.	For available lengths see cable section (Hardware and Accessories) in this catalog.				
B-**BC05M-04**	20 mA loop cable. H856 and 12-09340-00 connectors. Three 2-conductor, round shielded leads.	2′	**46**	**44**	**42**	2 lbs.
B-**BC05C-25**	EIA interface. H856 and Cinch #DP25P connectors.	25′	**112**	**106**	**102**	3 lbs.
B-**BC01V-25**	EIA interface cable for DLV11-E	25′	**88**	**84**	**80**	3 lbs.
B-**BC21B-05**	EIA interface cable for DLV11-J	5′	**40**	**38**	**36**	2 lbs.

CATALOG NUMBERS VS MODEL NUMBERS

The Catalog Numbers published in this catalog relate only to purchases made through the Direct Sales Catalog. The **Bold Face** portion of each Catalog Number is the official DIGITAL Model Number. All invoices and packing slips will reference only the Model Number.

digital
DIRECT SALES CATALOG

MICROCOMPUTER

LSI-11, LSI-11/2 AND PDP-11/03

SOFTWARE

PAPER TAPE SOFTWARE PACKAGE — QJV10-CB [11] [11/2] [11/03]

This package of utility software consists of an Editor, which allows the user to create and modify ASCII source files to be used as input to other system programs; an Assembler, which allows the user to translate assembly language programs into executable machine-coded programs; a Loader, which allows the user to input programs and data from various media into the machine; an On-line Debugging Technique (ODT) Package, which allows the user to debug assembled and linked programs; an Input/Output Executive, which allows the user to control the flow of data to and from devices under program control.

This software package requires 8K of memory and may be loaded using any DIGITAL paper tape reading device by interfacing it to the LSI-11. If you choose to load paper tape using a Teletype®, purchase the LT33-DC from DIGITAL. The LT33-DC is a specially modified ASR-33 which is compatible with DIGITAL specifications, and is plug-compatible with the DLV11 serial interface.

Cat. No.	List	Cat.	Cash	Shipping Weight
B-**QJV10-CB**	**$110**	**$105**	**$100**	10 lbs.

® Teletype is registered trademark of Teletype Corp., Skokie, Ill.

PROM FORMATTER PROGRAM — QJV11-CB [11] [11/2] [11/03]

This paper tape software program is used to facilitate the programming of both fusible link (MRV11-AA) and UV-erasable (MRV11-BA) PROM memory options. Before programming these memory options, a thorough understanding of the descriptions contained within the Microcomputer Handbook is advised. The reference manuals accompanying these options should also be studied.

Free copies of the handbook are available for the asking by calling the Catalog Sales Desk.

Cat. No.	List	Cat.	Cash	Shipping Weight
B-**QJV11-CB**	**$30**	**$29**	**$27**	2 lbs.

LSI-11 DOCUMENTATION / DIAGNOSTICS — ZJV01-RB [11] [11/2] [11/03]

One extensive literature package is included (no charge) with each LSI-11 or LSI-11/2 purchase order that includes a processor. This package includes a user's manual, a processor handbook, a configuration and installation guide, a complete set of module schematics, and a set of diagnostics (tapes and program listings).

Additional LSI-11 or LSI-11/2 documentation packages may be purchased if required.

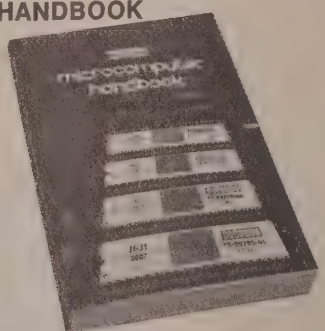
Cat. No.	List	Cat.	Cash	Shipping Weight
B-**ZJV01-RB**	**$120**	**$114**	**0109**	10 lbs.

LOGIC HANDBOOK

The Logic Handbook, known as the computer industry's "Bible" on logic design, gives you the technical story on general purpose computer interfacing, various cable configurations, system boxes and enclosures, special purpose interfaces and a host of other compatible equipment.

For almost twenty years, the Logic Handbook has been regarded as the one reference book for customers for the world of interfacing and DEC products. Have your own resident DEC sales and technical consultant — the Logic Handbook!

MICROCOMPUTER HANDBOOK



The Microcomputer Handbook is our answer to the question, "Where can I find the answers to everything I've always wanted to know about the LSI-11 and LSI-11/2 but didn't know where to look." Included are detailed chapters on the processor, options, installation, software, operating systems, peripheral devices, programming, maintenance and much more. The text covers the full range of LSI-11 systems from the LSI-11 and LSI-11/2 board sets to the PDP-11/03 microcomputer to the PDP-11V/03 disk based microcomputer system. Truly, everything you want and need to know of the LSI-11 microcomputer is found between the two covers of this handbook!

DIRECT SALES CATALOG APPLICATION NOTES AND PRODUCT BULLETINS

For the user who requires more complex and technical information on specific products or application ideas, the D.S.C. has a complete line of detailed product bulletins and application notes. These publications will tell you everything you should need to know about the particular product involved.

Dozens of different application notes and product bulletins are available for the asking.

CALL: 800-258-1710 (N.H. Residents 603 - 884-6660) 8:30 am to 5 pm EST.

CHIPKIT — DESIGNERS KITS FOR CUSTOM INTERFACES [11] [11/2] [11/03]

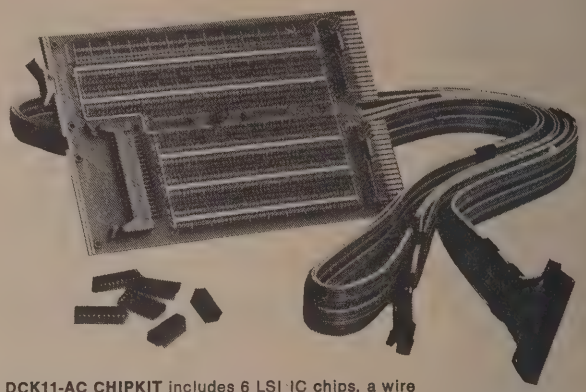
What's a CHIPKIT? DIGITAL has developed proprietary large scale integration IC's for its own use. Certain of these IC's are being offered to LSI-11 and LSI-11/2 users for custom interfacing to the Q-bus. Prior to the introduction of these IC's, a designer of custom input/output or direct memory access (DMA) interfaces had two alternatives: modify standard DIGITAL product or design from scratch. Now, however, a circuit designer can buy, through the Direct Sales Catalog, a third cost effective choice — the CHIPKIT. The kits contain in LSI IC chip form the circuitry necessary for interfacing to the LSI-11 Q-bus. Some CHIPKITS also include a PC wire wrap board and an interface cable.

These LSI IC chips reduce the circuit board area for the bus circuitry. This reduction enables a designer to implement the Q-bus I/O and DMA circuitry on the double height wire wrap board provided with the kit with ample room remaining to incorporate the designer's required special circuitry. This results in backplane space savings, increased system reliability through reduced component count, lowering of system costs and, most importantly, a greater opportunity for customer value — added to the finished product.

Four CHIPKITs are currently available through the Direct Sales Catalog.

DCK11-AC is titled Program Control Bus Interface. It comprises four DC005 Transceiver Chips, one DC004 Protocol Chip, one DC003 Interrupt Chip, a W9512 double height, extended length, single width wire wrap module, a BC07D-10 40-conductor, 10-foot flat ribbon cable having an H856 connector on one end with the other end open ended, and a CHIPKIT Designers Manual. The DCK-11-AC is functionally similar to and a complementary product to the DRV11-P Q-bus Foundation Module described on p. 53. DRV11-P is not LSI -11/2 compatible.

DCK11-AD is titled Direct Memory Access Bus Interface. It comprises all the components listed for the DCK11-AC plus two DC006 Word Count/Bus Address Chips and one DC010 Bus Master Chip. The DCK11-AD is functionally similar to and a complementary product to the DRV11-B Q-bus General Purpose DMA Interface.



DCK11-AC CHIPKIT includes 6 LSI IC chips, a wire wrappable board, and an interface cable.

DCK11-AA is a CHIPKIT that comprises Program Control chips alone. One DCK11-AA contains one DC003 Interrupt Chip, one DC004 Protocol Chip and four DC005 Transceiver Chips.

DCK11-AB is a CHIPKIT that comprises Direct Memory Access chips. A DCK11-AB contains two DC006 Word Count/Bus Address Chips and one DC010 Bus Master Chip as well as the six chips included in DCK11-AA.

Remember that these CHIPKITS provide the basic I/O and DMA circuitry but are not assembled ready-to-plug-in options such as DRV11-P or DRV11-B.

For a description of each chip and the wire wrap board, see below. Ordering information is on p. 60. A detailed application Note is also available. Contact the Direct Sales Catalog Desk for a copy.

Wire Wrappable Module W9512

The W9512 module will accept a variety of IC package types and discrete components. The printed circuit on each board connects the appropriate edge connector pins to the Vcc plane on Side 2 of the board and the ground plane (GND) on Side 1. The remaining edge connector pins terminate to a double row of wire wrap pins for user designated functions. Each module also includes a premounted 40-pin male cable connector to allow an interface cable to be attached to the module logic. The pins of the cable connector are also terminated to a double row of wire wrap pins. Each board contains insulated standoffs to maintain the required clearance between adjacent modules and prevent shorting of wire wrap pins. The wire wrap pins and components are mounted on Side 2 of each module. The majority of the rows of predrilled holes accept IC packages with pin spacings of 0.3″. However, a universal area on the W9512 module is the area which accepts IC packages with standard pin spacings of 0.3″, 0.4″ and 0.6″.

Total IC capacity on the wire wrap module is as follows:
32 14-pin IC's or 27 16-pin IC's, 5 24-pin IC's, 3 40-pin IC's.

These capacities allow one pair of holes between each DIP for mounting additional decoupling capacitors. The W9512 module is supplied without IC sockets. See p. 60 for IC sockets available through the Direct Sales Catalog.

W9512 wire wrappable board is equipped with 40-pin male interface connector.

CHIP DESCRIPTIONS

DC003 INTERRUPT LOGIC

The interrupt chip is an 18-pin, 0.3″ center DIP device that provides the circuits to perform an interrupt transaction on the LSI-11 Q-bus. The device is used in peripheral interfaces and provides two interrupt channels labeled "A" and "B," with the A section at a higher priority than the B section. Bus signals use high impedance input circuits or high drive open collector outputs, which allow the device to directly attach to the LSI-11's bus. The maximum current required from the Vcc supply is 140 mA.

DC004 PROTOCOL LOGIC

The protocol chip is a 20-pin, 0.3″ center DIP device that functions as a register selector, providing the signals necessary to control data flow into and out of up to four word registers (8 bytes). Bus signals can directly attach to the device because receivers and drivers are provided on the chip. An RC delay circuit is provided to slow the response of the peripheral interface to data transfer requests. The circuit is designed such that if tight tolerance is not required, then only an external 1K ±20% resistor is necessary. External RC's can be added to vary the delay. Maximum current required from the Vcc supply is 120 mA.

DC005 TRANSCEIVER LOGIC

The 4-bit transceiver is a 20-pin, 0.3″ center, low-power Schottky device; its primary use is in peripheral device interfaces, functioning as a bidirectional buffer between a data bus and peripheral device logic. In addition to the isolation function, the device also provides a comparison circuit for address selection and a constant generator, useful for interrupt vector addresses. The bus I/O port provides high impedance inputs and high drive (70 mA) open collector outputs to allow direct connection to the LSI-11 data bus structure. On the peripheral device side, a bidirectional port is also provided, with standard TTL inputs and 20 mA three-state drivers. Data on this port is the logical inversion of the data on the bus side. Maximum current required from the Vcc supply is 120 mA.

DC006 WORD COUNT/BUS ADDRESS LOGIC

Designed primarily for use with DMA interfaces, the DC006 chip is a 20-pin, 0.3″ center, low-power Schottky device that consists of two 8-bit binary upcounters, one for word count and another for bus address. Two chips are cascaded for full 16-bit implementation. The Word Count function is a 16-bit read/write register that controls the number of transfers to be made at a time. The Bus Address counter is a 16-bit read/write register used to generate the bus address which specifies the location to or from which the data is to be transferred. Maximum current required from the Vcc supply is 160 mA.

DC010 BUS MASTER LOGIC

The DC010 chip is a 20-pin, 0.3″ center, low-power Schottky device for primary use in DMA peripheral device interfaces using the LSI-11 bus.

This device provides the logic circuitry to perform the hand-shaking operations required to request and to gain control of the system bus. Once bus mastership has been established, this device then generates the required signals to perform a DIN, DOUT or DATIO transfer as specified by control lines to the chip.

The chip uses an external free-running clock and generates the enable and disable clock controls internally.

The chip also has a control line that will allow multiple transfers or only four transfers to take place before giving up bus mastership. Maximum current required from the Vcc supply is 160 mA.

SPECIFICATIONS

Absolute Maximum Ratings:

Supply Voltage (Vcc)	+7V
Operating Temp. (Ta)	+32°F to +158°F (0°C to +70°C)
Storage Temp. (Ts)	−75°F to +257°F (−60°C to +125°C)

Recommended Operating Conditions:

Supply Voltage (Vcc)	4.75V (Min), 5.0V (Norm), 5.25V (Max.)
Supply Current (Vcc)	DC003: 140 mA (Max) DC004, DC005: 120 mA (Max) DC006: 160 mA (Max) DC010: 160 mA (Max)
Free Air Temperature	+32°F to +158°F (0°C to +70°C)
Relative Humidity	10% to 95%, noncondensing

Physical Dimensions:

DC003, 18-pin	0.3″ center
DC004, 20-pin	0.3″ center
DC005, 20-pin	0.3″ center
DC006, 20-pin	0.3″ center
DC010, 20-pin	0.3″ center
W9512 Wire Wrappable Module	Double height, extended length, single width.
BC07D-10 Cable	10′ 40-conductor ribbon cable, with 40-pin (female) mating connector (H856) installed on one end only; prestripped on other end.

See Page 60 for Ordering Information.

CHIPKITS (Cont.)

ORDERING INFORMATION

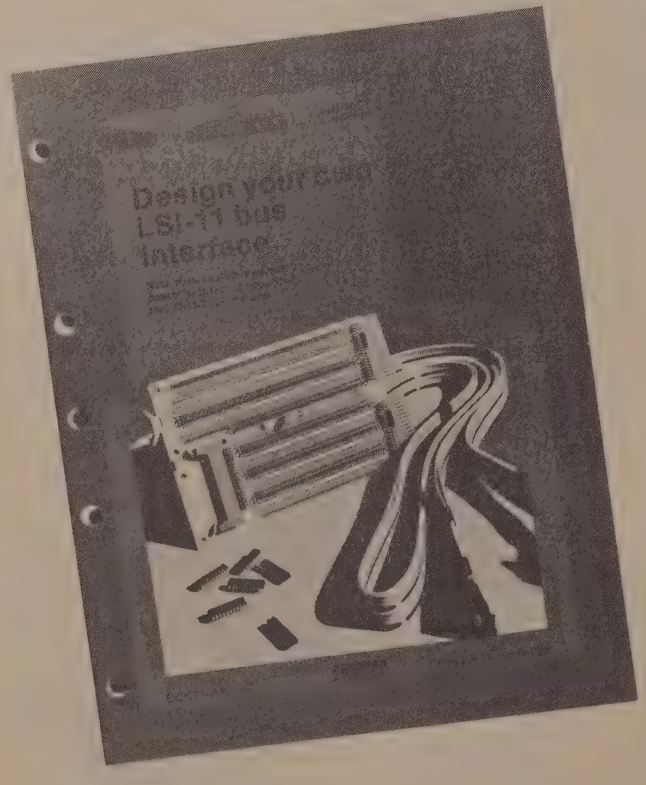
Cat. No.	Description	Cat.	Cash	Shipping Weight
B-**DCK11-AC**	Designer's CHIPKIT Program Control	**$175**	**$168**	5 lbs.
B-**DCK11-AD**	Designer's CHIPKIT DMA Control	**275**	**264**	5 lbs.
B-**DCK11-AA**	Program Control CHIPKIT	**46***	**44***	2 lbs. / 10 kits
B-**DCK11-AB**	DMA CHIPKIT	**150***	**144***	2 lbs. / 10 kits

* Price per CHIPKIT. Minimum order 10 CHIPKITS. For high volume quantities contact Direct Sales Catalog Desk.

IC Sockets — 954, 961, 962

These integrated circuit (IC) sockets provide low-cost, reliable production packaging of 14- or 16-, 24-, and 40-pin dual-in-line package (DIP) integrated circuits (ICs). These low-profile IC sockets are especially useful for limited-production runs of special, user-designed circuitry using blank or wire wrappable module boards (available through the Direct Sales Catalog) which are available without factory-installed IC sockets. The 954 accepts 14- or 16-pin ICs; 10 sockets/package. The 961 accepts 24-pin ICs; 5 sockets/package. The 962 accepts 40-pin ICs; 5 sockets/package.

Cat. No.	Description	List	Cat.	Cash	Shipping Weight (per pkg.)
B-**954**	Package of 10 Sockets 14- or 16-pin IC's	**$8**	**$8**	**$7**	¼ lb.
B-**961**	Package of 5 Sockets for 24-pin IC's	**8**	**8**	**7**	¼ lb.
B-**962**	Package of 5 Sockets for 40-pin IC's	**25**	**24**	**23**	¼ lb.



Design your own LSI-11 bus interface

Contact the Direct Sales Catalog Desk for your copy of CHIPKIT Users Guide. Included in this free, applications-oriented publication (16 pages) are:

- *Logic Diagrams*
- *Bus Interface Diagrams*
- *Wiring Diagrams*
- *Timing Diagrams*
- *Pin/Signal Descriptions*
- *Truth Tables*

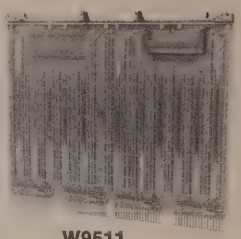
Plus more details on each CHIPKIT chip.

WIRE WRAPPABLE MODULES FOR Q-BUS [-11] [-11/2] [-11/03]

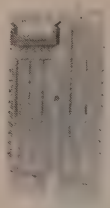
DIGITAL's family of Q-bus compatible wire wrappable modules consists of two double height (8.5 by 5″) and two quad height (8.5 by 10″) circuit cards. Note that the quad height boards do not fit LSI-11/2 backplane. One card of each size is equipped with premounted Dual-In-Line (DIP) package low profile sockets. See p. 60 for sockets available through the Direct Sales Catalog. Each board will accept various combinations of DIP assemblies including the more common 14-, 16-, 24-, and 40-pin packages. Various other size DIP assemblies as well as discrete components are easily accommodated. These modules are ideal for design prototyping, limited quantity production runs or design instructional use.

The printed circuit on each board connects the appropriate edge connector pins to the Vcc plane on Side 2 (Component side) of the board and the ground plane (GND) on Side 1. The remaining edge connector pins terminate to a double row of wire wrap pins for user designated functions. Each of the modules also includes a 40-pin male cable connector to allow an interface cable to be attached to the module logic. The pins of the cable connector are also terminated to a double row of wire wrap pins. The quad height module is provided with a space where a second 40-pin cable connector (P/N H854, labeled J2, see below for suitable connector) can be inserted by the user. When this second cable connector is not required, additional IC packages can be installed. Each board contains insulated standoffs to maintain the required clearance between adjacent modules to prevent shorting of wire wrap pins.

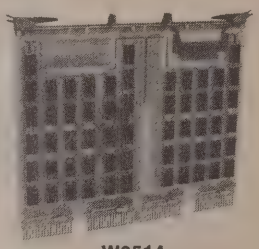
The wire wrap pins and components are mounted on Side 2 of each module. The majority of the rows of predrilled holes accept IC packages with pin spacings of 0.3″. However, a universal area on each of the four modules accepts IC packages with standard pins spacings of 0.3″, 0.4″, and 0.6″. See diagram of each board.



W9511



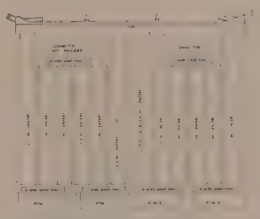
W9512



W9514

W9515

W9512 and W9515 IC Locations



W9511 and W9514 IC Locations

Power & Ground Connections

	Power and Ground Connections
W9511	Vcc — AA2, BA2, CA2, DA2 GND — AT1, BT1, CT1, DT1, AC2, BC2, CC2, DC2
W9514	Same as W9511
W9512	Vcc — AA2, BA2 GND — AT1, BT1, AC2, BC2
W9515	Same as W9512

ORDERING INFORMATION

Cat. No.	Description	Size	Total* IC Capacity No. of Pins 14 or 16	24	40	Sockets Supplied 16-Pin	List	Cat.	Cash	Shipping Weight
B-W9511	Quad height, extended length, single width module with extractor handle. No DIP sockets included. One 40-pin male cable connector premounted on board and space for additional 40-pin connector provided.	EQS	72 or 61	5	3	None	$125	$119	$114	4 lbs.
B-W9514	Same as W9511 except with premounted DIP sockets. See photo for socket placement.	EQS	— 58	—	—	58	220	209	200	4 lbs.
B-W9512	Dual height, extended length, single width module with flip clip handle. No DIP sockets included. One 40-pin male cable connector premounted on board.	EDS	32 or 27	5	3	None	70	67	64	2 lbs.
B-W9515	Same as W9512 except with premounted DIP sockets. See photo for socket placement.	EDS	— 25	—	—	25	120	114	109	2 lbs.

*Note that the capacities listed allow one pair of holes between each DIP for mounting additional decoupling capacitors.

Connector and Crimping Tool for Wire Wrappable Boards See p. 107 for wire wrap tools ad wire.

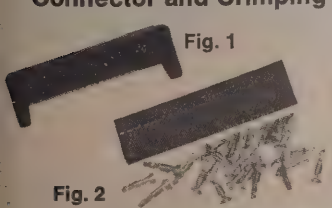


Fig. 1

Fig. 2

Cat. No.	Description	Contact Positions	Fig.	List	Cat.	Cash	Qty. (per pkg.)	Shipping Weight
B-H854*	Connector Male (Board Mount)	40	1	$6	$6	$5	1	.5 lb.
B-H856*	Connector Female (Cable Mount)	40	2	10	10	9	1	.5 lb.
B-HT95	Crimping Tool for H856 Contacts	N/A	—	195	185	177	1	8 lbs.

* Price includes 40 contact pins or sockets.

CALL: 800-258-1710 (N.H. Residents 603 - 884-6660) 8:30 am to 5 pm EST.

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The Direct Sales Catalog is:

MICROCOMPUTER SYSTEMS

PDP-11V03

AS LOW AS $8472

The ultimate number cruncher. The 16 bit, 400+ instruction set PDP-11V03 Microcomputer System. Word or byte processing. PDP-11 software compatibility. A wide choice of software, memory and I/O interface options. A most flexible, adaptable computer system that is currently widely used in a host of laboratory applications — and is making significant inroads into commercial and industrial areas.

The PDP-11V03 is born of the same advanced technology that has made the LSI-11 family the designer's choice for reliability and useability. The PDP-11V03 is software compatible with all other members of the PDP-11 family.

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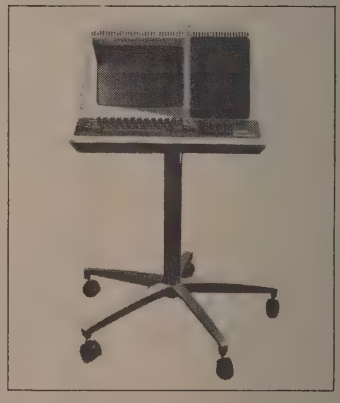
LSI-11 BASED MICROCOMPUTER SYSTEM

PDP-11V03 with LA36 DECwriter II hard copy terminal. The PDP-11/03 microcomputer and an RXV11 dual floppy disk drive are incorporated in an H984 cabinet.

PDP-11V03 with VT52 DECscope Video Terminal. DECscope can be mounted on VTXX-ST Terminal Stand (insert) as described on page 147.



The PDP-11V03 Microcomputer Systems is a complete, fully integrated, assembled and tested computer system. The system is built around the highly successful LSI-11/PDP-11/03 microcomputer of which more than 25,000 have been installed worldwide.

Two basic systems are offered in this catalog. One has an LA36 DECwriter II hard copy terminal, the other a VT52 DECscope video terminal as its interactive operator's terminal. Each basic system includes a PDP-11/03 16-bit microcomputer, 16K of dynamic MOS RAM, a 128K 16-bit RXV11 dual floppy disk drive, and the powerful Real Time operating system software RT-11. The microcomputer and the disk drive are mounted in a roll-about H984 Cabinet (for details of cabinet see p. 130). An optional expansion box (BA11-ME, see p. 44) can be mounted within the cabinet for additional memory and interface options. Complete system documentation and diagnostics are provided. Optional software packages round out the system.

The PDP-11V03 System was developed primarily to bring "full service" computing and data manipulating power to engineering, scientific, medical, and laboratory applications where the wide choice of interface hardware options can best be used. For example, a D/A converter, an IEEE Instrument Bus interface, and a "16 line in, 16 line out" parallel interface are only a few of the options available.

The optional software which includes, among others, BASIC/RT-11, FORTRAN IV/RT-11, and APL-11/RT-11 allows the system to be adapted to many unique applications.

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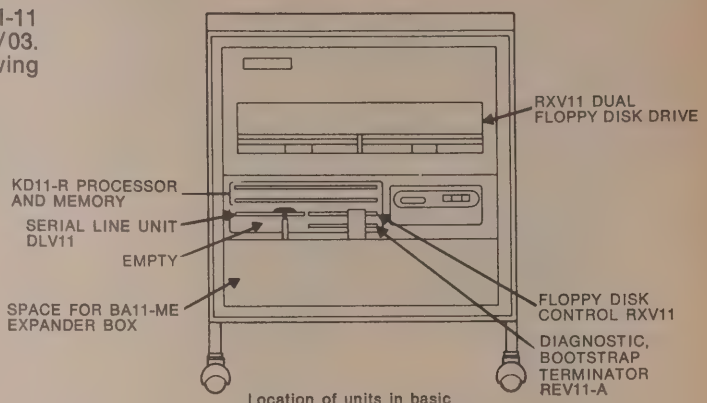
MICROCOMPUTER SYSTEMS

PDP-11/03 MICROCOMPUTER

At the heart of the PDP-11V03 System is the LSI-11 based "packaged" microcomputer called PDP-11/03. Each PDP-11/03 microcomputer has the following features standard:

- 16-bit MOS, LSI central processor
- Paralled I/O bus port
- PDP-11/40 instruction set
- DMA transfer rate of 833K words per sec.
- Power fail/auto restart
- Vectored interrupt
- Real Time clock input
- Octal debugging routine in microcode
- ASCII console rountines in microcode
- Microcode bootstrap routine
- Expandable arithmetic capabilities
- 16-bit word or 8-bit byte processing



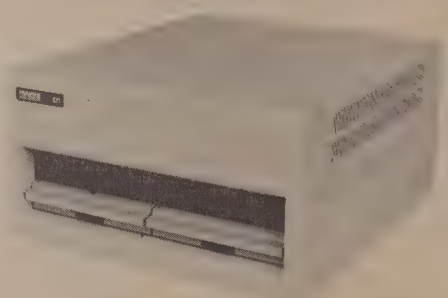
Location of units in basic PDP-11V03 basic configuration

The basic configurations of the system include 16,384 16-bit words (32K 8-bit bytes) of dynamic MOS RAM. The RAM memory can be increased to a maximum of 32K 16-bit words (64K 8-bit bytes) in 4K increments by using Expansion Memory Modules MSV11-B. Or by specifying Expansion Memory Module MSV11-CD (16K RAM) an immediate increase to full 32K capacity is obtained. See System Expansion Diagram page 66. Note that the maximum RAM configuration does not mandate an expansion box.

MASS MEMORY

The system's mass memory is the RXV11 dual floppy disk drive. Each drive of the RXV11 is capable of storing 256, 256 8-bit bytes or 128, 128 16-bit words. The RXV11 is completely integrated into the PDP-11V03 system, having gone through a rigorous system level test procedure to ensure trouble-free operation. The RXV11 has a mean-time-between-failure (MTBF) rating in excess of 3100 hours.

A second RXV11 dual floppy disk drive can be added to the system to expand the mass memory to 1,025,024 8-bit bytes (512, 512 16-bit words). The RXV11 unit can be ordered through this catalog. Note, however, that the drive, which is totally enclosed, cannot mount in the supplied PDP-11V03 cabinet so must be placed either on top of the cabinet or on a stand close by.



RXV11 dual floppy disk drive system comprises the RX01 dual floppy disk drive plus interfacing for the PDP-11V03 system

STANDARD INTERACTIVE TERMINALS

The basic system can be ordered with either the 30-cps hard copy LA36 DECwriter II terminal, or a 1920-character screen VT52 DECscope Video Terminal. In either configuration the terminals interface with a serial line unit (supplied) via a 20 mA current loop. A 15-foot interface cable and a 9-foot power cord are provided for site flexibility. Both the LA36 and VT52 are explained in detail in the Terminals Section of this catalog.

SUPPLIED SOFTWARE

The software operating system which comes standard with all models of the PDP-11V03 offered through the Direct Sales Catalog is DIGITAL's powerful RT-11 disk operating system designed for interactive program development and on-line, real-time applications. In a foreground/background environment, the user can run a real-time application in the foreground while interactively developing a program or running a batch stream in the background. RT-11 includes two compatible monitors and a variety of program development and system utilities. As options, RT-11 supports FOCAL, FORTRAN IV and BASIC languages. BASIC is offered in a single-user or multi-user version. RT-11 has provision for an operator's console (interactive terminal) and the RXV11 disk system. RT-11 also supports a highspeed printer, LAV11, available through this catalog. Other software options listed under Optional Software.

RT-11 is a particularly easy-to-use system and yet it provides a sophisticated set of programming tools, particularly for the lab application environment. The system is completely device-independent and configuration independent. Programs can be directed to use a specific peripheral at run-time. The system can run unmodified on a variety of memory configurations.

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SYSTEM EXPANSION

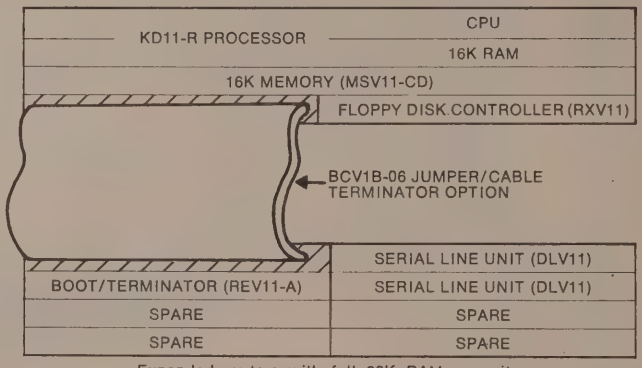
Device priority is determined by the position of the module in the computer backplane. A signal passes through each module in turn forming a "daisy chain" through them. The closer a module is to the processor, the higher its hardware priority in the daisy chain. The priority chaining scheme requires that there be no empty slots between modules, as this would break the chain.

The REV11-A bootstrap and terminator module must be the last module (lowest priority) after all options are installed. When installing optional modules the user must remove the REV11-A module, install the options in consecutive order of slot positions, and then install the REV11-A module in the next slot position available.

The REV11-A is a direct memory access (DMA) module. The use of other DMA devices that are installed on the I/O bus between the REV11-A and the processor module will likely result in ineffective DMA refresh and loss of memory data. When DMA devices are to be used in addition to the REV11 option, use the REV11-C (no termination resistors) and the TEV11; install the REV11-C as the highest priority DMA device and the TEV11 as the 120 Ω bus termination in the last option location. See LSI-11 section.

KD11-R PROCESSOR	CPU
	16K RAM
SERIAL LINE UNIT (DLV11)	FLOPPY DISK CONTROLLER (RXV11)
SPARE	BOOT/TERMINATOR (REV11-A)

Basic PDP-11/03 configuration for PDP-11V03 system.



Expanded system with full 32K RAM capacity and one optional Serial Line Unit.

EXPANDING THE SYSTEM

The basic PDP-11V03 system can be expanded in 9 ways. An expander box may be required. Not listed in order of importance they are:

1) Add more RAM
2) Add PROM/ROM
3) Add a second mass memory (RXV11)
4) Add a high speed (180 cps) printer
5) Add hard copy terminals
6) Add video terminals
7) Add optional interface hardware such as A/D and D/A converters
8) Add optional software
9) Add capability to processor

1 **Add More RAM:** By ordering MSV11-B modules 4K by 16-bit MOS read/write memory can be incrementally added. Or by specifying MSV11-CD a full 16K by 16-bit MOS memory is ordered. MSV11-B should not be used as a "bank" zero if it is desired to "power up" to an active program. Note that once a 4K unit is ordered the user is committed to expanding in 4K increments to the maximum expansion of 32K. If the system will ultimately in the short term be expanded to full memory capacity it is recommended that the MSV11-CD module be ordered. See LSI-11 Section for a full description of MSV11-B and -CD.

2 **Add PROM/ROM:** By ordering MRV11-AA PROM memory with up to 16 MRV11-AC PROM 512 by 4-bit chips, PROM memory can total up to 4096 words of 16-bits. See LSI-11 Section for other combinations.

3 **Add an RXV11 disk drive:** The RT-11 software can support a second RXV11 dual floppy disk drive thus enabling the system to have a mass memory of 1 million 8-bit bytes. The additional drive can be purchased through this catalog and comes complete with all cables and LSI-11 bus interface. Physically the second drive must be mounted externally to the system cabinet.

4 **Add a high-speed printer:** An on-site parallel-interfacing printer can be added by ordering the LAV11 DECprinter I. This is an LA180 DECprinter that is supplied with a controller module and an interface cable.

An LA180 can be used in a serial mode if a serial interface (DLV11 family or the equivalent) is available. Note that in the serial mode LA180 must be equipped with the optional EIA interface (LAXX-NW) or the 20 mA current loop interface (LAXX-NX) respectively. If the LA180 is EIA equipped and is located within 34 feet of the PDP-11V03, then Null Modem cable BC03M-25 is required. This distance can be extended by requesting special length BC03M cables. For cables longer than 25 ft. there will be an additional charge. Contact Catalog Sales Desk for details. If the printer is remote and is interfaced via a modem, then a BC05D-10 EIA cable must be ordered.

If the LA180 is 20 mA interface equipped the same rules as the EIA equipped LA180 apply except that cable BC03L-25 should be ordered in place of the BC03M-25 and cable BC05C-10 should be ordered instead of BC05D-10.

DECprinter I
High-speed line printer **LAV11** has a handsome styling to blend in with office or computer room decor.

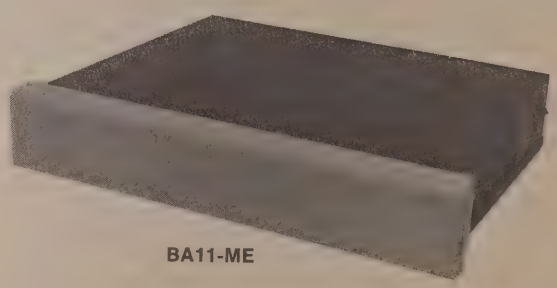
5 **Add hard copy terminals:** The PDP-11V03 system can support a total of four printers or interactive terminals simultaneously. The recommended hard copy terminal for the system is the LA36 DECwriter II or the LS120 DECwriter III both of which are available through this catalog.

Either terminal provides keyboard input and impact printing interfacing via standard serial interfaces (DLV11 family or equivalent). The serial interfaces are available through the Direct Sales Catalog. The LA36 must be equipped with either a 20 mA interface or an EIA interface. The LS120 comes equipped with an EIA interface although a 20 mA interface (LAXX-RN) is available.

LS120 prints at up to 180 cps, LA36 has a throughput of 30 cps. If a Receive-Only terminal is required then the LA35 DECwriter II 30-cps hard copy terminal can be specified. See the Terminal Section for details on all these terminals. Note that interface cabling as described above (Item 4) for the LA180 must also be ordered for LS120 or LA35/36.

EXPANDER BOX

The basic system has two slot positions available for adding options. By adding an expander box the user has six additional slot positions available for a total of eight. The BA11-ME is used with 115 Vac systems. In addition to the expander box, a BCV1B-06 jumper cable/terminator assembly is required to connect the existing backplane to the backplane in the expander box. See LSI-11 section for details of BA11-ME.



BA11-ME

Cat. No.	Description	Cash Price
B-**BA11-ME**	An expansion box that includes a backplane and a power supply for use in a 115 Vac system.	**$910**
B-**BCV1B-06**	The jumper cable/terminator assembly consists of two modules interconnected by a 6-foot, 40 conductor (H865-to-H856) connector cable.	**264**

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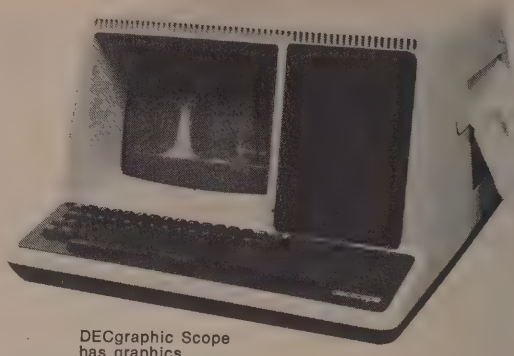
6 Add video terminals: Any VT52 DECscope or VT55 DECgraphic Scope can be used to expand the interactive capabilities of the system (upper limit is four in combination with other terminal/printers). Both VT52 and VT55 require serial line interfaces (DLV11 or equivalent) and cabling as outlined for the LA180 in Item 4 above.

VT52 and VT55 each display 1920 characters (24 lines by 80 characters) of the full ASCII character set. A numeric and function keypad aids data entry and cursor control. VT55 has a graphics mode that allows the user to display data as bar graphs or curves either in point plot or histogram (shaded) format. Two graphs, each of up to 512 data points, can be displayed simultaneously. The VT55 can also be ordered with an integral copier to give a permanent record of the displayed data. For details on the VT52 and VT55 see the Terminals Section in this catalog.

7 Add interface hardware: Serial line units, parallel line units, Bus foundation modules, CHIP-KITS, IEEE Instrument Bus interface modules, A/D converters, and D/A converters can all be added to the basic system. These options are briefly described in the Interface Hardware box in this section and fully described in the LSI-11 section of this catalog.

8 Add Optional Software: A long list of optional software is available to complement the operating software RT-11. Details of the software can be obtained by contacting the Direct Sales Catalog Desk. See "Optional Software" box for program descriptions and costs. Note all software brought through the Direct Sales Catalog is supplied "As Is" so does not have full maintenance support.



DECgraphic Scope has graphics capability and an optional hard copy output

9 Add capability to processor: The processor has a prewired 40-pin socket mounted on its printed circuit board that is reserved for the KEV11 option. This option increases the processor's capability to handle the Extended Instruction Set (EIS) and the Floating Point Instruction Set (FIS). The option is a 40-pin integrated circuit chip which is installed on the processor board and does not require any option position slots space on the backplane. See the LSI-11 Section for details. Cash price for the KEV11 is $173.

OPTIONAL SOFTWARE

Cat. No.	Description	List	Cat.	Cash	Shipping Weight
B-**QJ813-CY**	RT-11/FORTRAN IV V2, Binary, Floppy	$ 610	$ 580	$ 555	4 lbs.
B-**QJ907-CY**	RT-11/APL Software, Floppy	825	784	751	4 lbs.
B-**QJ913-CY**	RT-11/BASIC-11 V2, Binary, Floppy	550	523	501	4 lbs.
B-**QJ921-CY**	RT-11/Multi-User BASIC, Binary, Floppy	550	523	501	4 lbs.
B-**QJ922-CY**	RT-11/FOCAL, Floppy	185	176	168	4 lbs.
B-**QJ945-CY**	RT-11/REMOTE-11, Floppy	550	523	501	4 lbs.
B-**QJ960-CY**	RT-11/Scientific Sub Routine FORTRAN IV Floppy	185	176	168	4 lbs.

INTERFACE HARDWARE

Serial Line Unit

Each additional device that has serial data requires a DLV11 Serial Interface module and either a BC05M-04 cable or a BC03L-05 cable. The cable is connected from the module and mounted in a slot on the connector panel located on the back of the cabinet.

INTERFACE HARDWARE OPTIONS

For Details see LSI-11 Section.

Cat. No.	Description	Cash Price
B-**DLV11**	An interface module for a 20 mA current loop service or an EIA-compatible device. The DLV11 contains selectable baud rates from 50 to 9600 Baud.	$228
B-**BC05M-04**	An interface cable to connect the DLV11 module through a Mate-N-Lok connector requiring a 20 mA current loop.	42
B-**BC03L-05**	An interface cable to connect the DLV11 module through an RS232-C male connector to a device requiring an EIA interface.	59

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INTERFACE HARDWARE (Cont'd)

Parallel Line Units

Each additional device that has parallel data requires a DRV11 Parallel Interface module and two BC08R-XX (XX = 1, 3, 6, 10, 20, or 25 feet) cable assemblies.

Cat. No.	Description	Cash Price
B-**DRV11**	An interface with 16 input lines and 16 output lines for transferring 16-bit word or 8-bit byte programmed data transfers.	**$191**
B-**BC08R-XX**	An interface cable with two 20-conductor ribbon cables and an H856 connector on each end. The cable connects between the DRV11 and the user device.	**93***

* Cash price for BC08R-25

User-designed Expansion

A versatile wire wrap module is available for user-designed circuits. The module includes bus interface logic for operation with the LSI-11 processor and also provides adequate board area for custom circuitry. CHIPKITS are also available.

Cat. No.	Description	Cash Price
B-**DRV11-P**	LSI-11 bus foundation module	**$250**
CHIPKIT	See Page 58	—

IEEE Instrument Bus Interface

This option interfaces the computer to instruments designed to IEEE Standard 488-1975 for Digital Interface for Programmable Instrumentation.

Cat. No.	Description	Cash Price
B-**IBV11-A**	An LSI-11 processor/IEEE Instrument Bus interface module.	**$683**

Digital-to-Analog Converter

This D/A converter features a holding register for user control applications.

Cat. No.	Description	Cash Price
B-**AAV11-A**	A four-channel 12-bit digital-to-analog converter.	**$819**

Analog-to-Digital Converter

This option can accommodate 16 single-ended or 8 quasi-differential inputs. Conversion is initiated by program control.

Cat. No.	Description	Cash Price
B-**ADV11-A**	A 12-bit successive approximation analog-to-digital converter.	**$910**

MECHANICAL SPECIFICATIONS

Component	Height	Length	Width	Weight
H984-BA Computer Cabinet (including casters)	25.5″	28.1″	21.5″	180 lbs.*
LA36 DECwriter II	33.5″	24.0″	27.5″	102 lbs.
VT52 DECscope	14.1″	27.2″	20.9″	44 lbs.

* With expander box fully loaded.

ELECTRICAL SPECIFICATIONS

Voltage: 104 - 126 Vac

Frequency: 60 Hz ±1 Hz

Power Consumption:	Typical (or idle)	Maximum
Computer Cabinet	1100 W	1240 W
VT52 DECscope	110 W	110 W
LA36 DECwriter II	160 W	300 W

ENVIRONMENTAL SPECIFICATIONS

Temperature
Operating: 15° to 32°C (59° to 90°F) ambient
Maximum Temperature Gradient: 20°F/hr (11.1°C/hr)
Nonoperating: −35° to 52°C (−30° to +125°F)

IMPORTANT NOTE
Diskette temperature must be within operating temperature range before use.

Relative Humidity
Operating: 25°C (77°F) maximum wet bulb
2°C (36°F) minimum dew point
20% to 80% relative humidity (no condensation)
Nonoperating: 5% to 98% relative humidity (no condensation)
Diskettes, Nonoperating: 10% to 80% relative humidity (no condensation)

Magnetic Field
Diskettes exposed to a magnetic field strength of 50 Oersteds or greater may lose data.

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RELATED DOCUMENTATION

Hardware Documentation

Cat. No.	Description	Price
B-EK-RXV11-OP	RXV11 User's Manual	$5.50
B-EK-RX01-MM	RX01/RX8/RX11 Floppy Disk System Maintenance Manual	14.00
B-EK-MSV11-OP	MSV11-C User's Manual	9.00
B-EK-LA365-OP	LA36/35 DECwriter II User's Manual	9.00
B-EK-1LA36-MM	LA36 DECwriter II Maintenance Manual	74.00
B-EK-VT5X-OP	DECscope User's Manual	9.00
B-EK-OVT52-MM	VT52 DECscope Maintenance Manual	50.00
B-EH-07043-76	LSI-11 Programmer's Reference Card/10 ea.	5.50

Operating System Documentation

Cat. No.	Description	Price
RT-11 Version 3		
B-AA-5281A-TC	Introduction to RT-11	$14.00
B-AA-5284A-TC	RT-11 System Message Manual	11.00
B-AA-5285A-TC	RT-11 Documentation Directory	N/C
B-AA-5283A-TC	RT-11 System Generation Manual	11.00
B-AV-5287A-TC	RT-11 System Reference Card	1.00
B-AA-5279A-TC	RT-11 System User's Guide	19.00
B-AA-5280A-TC	RT-11 Advanced Programmer's Guide	19.00

Optional Software Documentation

Cat. No.	Description	Price
B-AA-1588E-TC	BASIC/RT-11 Language Reference Manual	$11.00
B-AA-1707B-TC	BASIC/RT-11 Release Notes	N/C
B-AA-1855C-TC	PDP-11 FORTRAN Language Reference Manual	11.00
B-AA-5749A-TC	RT-11/RSTS/E FORTRAN IV User's Guide	9.00
B-AA-1886A-TC	RT-11 FORTRAN Release Notes	N/C
B-AA-1863F-TC	FOCAL-11 User's Manual	11.00
B-AA-1907B-TC	BASIC Language Reference Manual	11.00
B-AA-1915A-TC	MULTI-USER BASIC User's Manual	9.00
B-AA-1913A-TC	MULTI-USER BASIC/ RT-11 System Installation Guide	N/C
B-AA-5076A-TC	APL-11 Programmer's Reference Manual	11.00
B-AA-5197A-TC	APL-11 Release Notes	N/C

The software distributed with the PDP-11V03 is the RT-11 operating system. This operating system is contained on two diskettes. Shown here is a diskette being carefully loaded into drive unit.

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PDP-11V03

ORDERING INFORMATION

Cat. No.	Description	List	Cat.	Cash	Shipping Weight
B-SR-VXRRA-LE†	PDP-11V03 Computer System for 115 Vac 60 Hz operation. Includes Parts List A and LA36-CE DECwriter II. Software supplied "As Is".	$9310	$8845	$8472	300 lbs.
B-SR-VXRRA-VE†	Same as -LE but includes VT52-AA Video Terminal instead of LA36-CE DECwriter II.	9310	8845	8472	250 lbs.
B-LAV11-PA	LA180-PA w/LSI-11 Interface, 115 Vac	3770	3582	3431	145 lbs.
B-RXV11-BA	Dual Floppy Disk System for 115 Vac 60 Hz operation.	4300	4085	3913	75 lbs.
B-QJ013-CY*	RT-11 operating Software, License, Floppies.	1380	1311	1256	4 lbs.
B-ZJ215-RY	PDP-11V03 Literature/Diagnostic Package	330	314	300	4 lbs.

* Supplied with each PDP-11V03 System at no extra charge.
† One ZJ215-RY literature and diagnostic package supplied with each PDP-11V03 ordered.

PARTS LIST A

The PDP-11V03 Computer System offered in this catalog includes the following items:

1 — H984-BA Cabinet
1 — RXV11-BA Dual Floppy Disk Drive System
1 — PDP-11/03-KA 16K RAM Microcomputer
1 — DLV11 Serial Line Unit
1 — REV11-A Bootstrap Loader/Terminator
1 — RT-11 Operating System Software

Your New V03
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See Pages 138 to 149

CALL: 800-258-1710 (N.H. Residents 603 - 884-6660) 8:30 am to 5 pm EST.

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DIRECT SALES CATALOG

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The following literature is available FREE to holders of DIGITAL's Direct Sales Catalog (limit 1 each per customer). Included are Manuals and Handbooks giving in depth information on various Direct Sales Catalog products and product families, Product Bulletins and Sales Brochures detailing specifications and characteristics of specific catalog-available products and Application Notes describing the actual usage and application of those products.

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To obtain copies of this literature call the Catalog Order Desk at 800-258-1710 (N.H. 603 - 884-6660) and ask for the publication by name.

Manuals/Handbooks

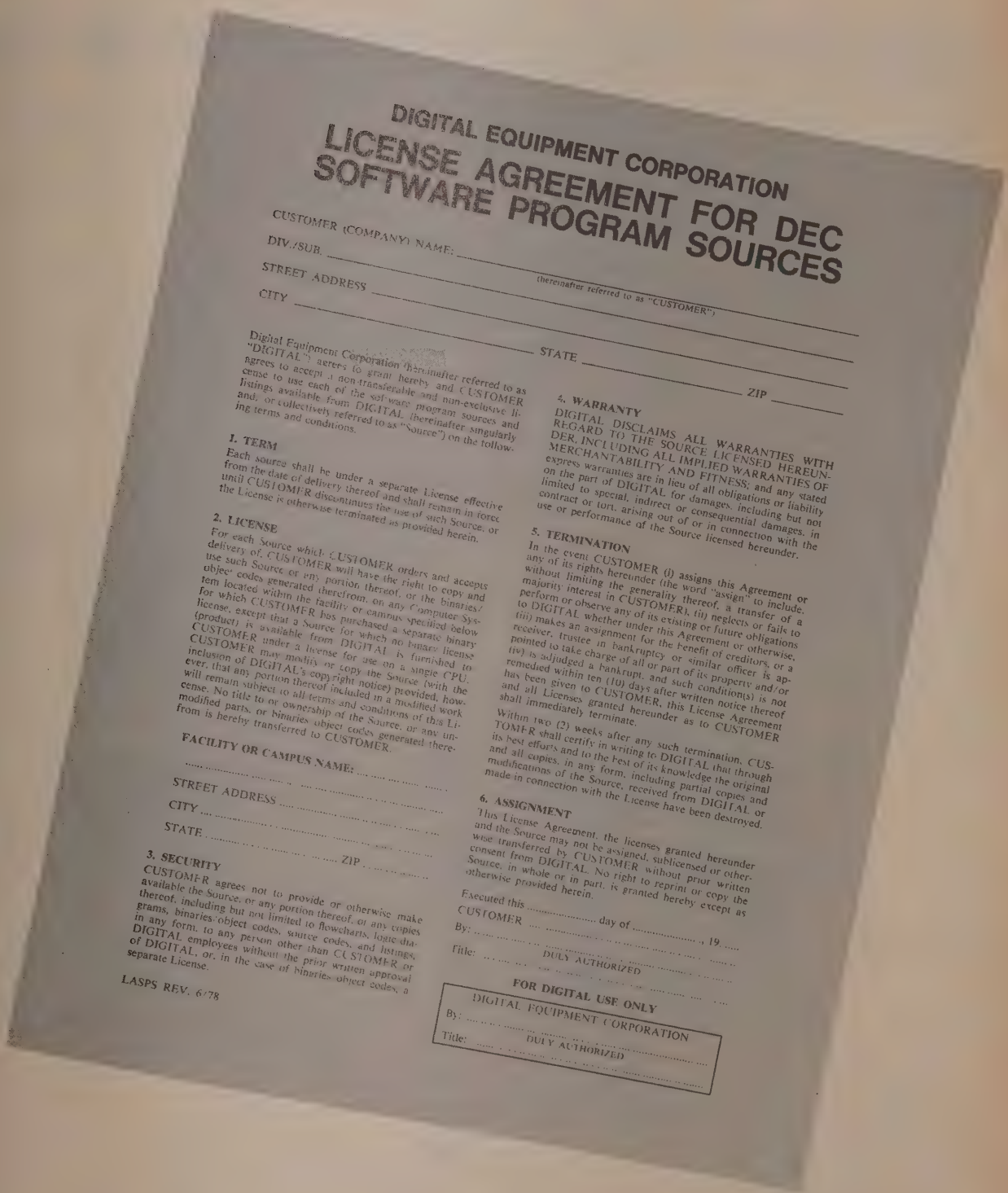
PDP-11V03 System Manual
DECstation User's Guide
CHIPKIT User's Guide
1978-1979 Logic Handbook
Hardware/Accessories Handbook
Microcomputer Handbook
Supplies Brochure
Technical Documentation Brochure
DRV11-B General Purpose DMA Interface User's Guide
DRV11-P LSI-11 Interface Foundation Module User's Guide
DR11-L/DR11-M UNIBUS Input/Output Interface User's Guide

Product Bulletins/Sales Brochures

PRS01 Serial Paper Tape Reader
KPV11 Power Fail/Line Time Clock Generator Module
DR8-ED OMNIBUS Two-Word Input Interface
M1705 OMNIBUS Two-Word Output Interface
DR11-L UNIBUS Two-Word Input Interface
DR11-M UNIBUS Two-Word Output Interface
A866 A/D Converter Module (12-Bit)
DRV11-P LSI-11 Interface Foundation Module
M1709 OMNIBUS Interface Foundation Module
M1710 UNIBUS Interface Foundation Module
High-Density Wire Wrappable Modules, W95XX Series
IBV11-A Instrument Bus Interface
M5864 Optic Isolator Input Module
M6865 Optic Isolator Output Module
LA35/LA36 Printer Terminal Brochure
LA180 Line Printer Terminal Brochure
LS120 Printer Terminal Brochure
VT52 Display Terminal Brochure
VT55 Graphics Display Terminal Brochure

Application Notes

KEV11 Extended Arithmetic Chip Installation Procedure
LSI-11 Based Distributed Control System Improves Plastic Sheet and Film Extrusion Operation
LSI-11 Based SORC/800 Makes Remittance Processing Easy
LSI-11 Broadens Range of Applications for Voice Input Data Terminals
LSI-11 in Ultrasonic Scanner Improves Sensitivity and Reproducability
LSI-11 Microcomputer Lets Three OEM Firms Offer More Display System Power
Using the LSI-11 as a Remote Node in a Computer Network
LSI-11 Facilitates New Product Development at GenRad
You may be able to Design a Microcomputer on a Board but do you want to Manufacture One?
Assembling an LSI-11 Component System with a DDV11-B
Battery Backup for LSI-11 Microcomputer Systems



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THE EVOLUTIONARY DECSTATION 78

$7091* buys you a basic 78/40 DECstation 78. For this you get an LSI (large scale integration) PDP-8 minicomputer, a video terminal 16K RAM, 256,256 12-bit words of floppy disk mass storage, multiple parallel/serial I/O ports, and powerful operating system software that includes FORTRAN IV and BASIC. In fact a complete stand alone plug-it-in-and-let's-go computer system. If you are using, or considering using a timesharing service, you must look *twice* at DECstation 78.

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DECSTATION 78

THE AFFORDABLE APPROACHABLE MINICOMPUTER SYSTEM

Priced from $7091

DECstation 78 in its basic configuration 78/40 comprises a VT78 Video Data Processor, an RX78 Dual Floppy Disk Drive, and a mini table. A second RX78 Disk Drive when added to the system mounts below the first, creating the configuration designated 78/60.

DECstation 78 is a "packaged" computer system that in its basic configurations comprise an LSI version of the 16K PDP-8 minicomputer, a video display terminal, one or two RX78 Dual Floppy Disk drive(s), an easy-to-use interface system, and a versatile operating software system OS/78. A compact system stand completes the package, see photo. Unlike other systems which must be configured from individually selected system components, DECstation 78's components are carefully matched and tested as a system by DIGITAL to ensure hassle-free startup.

The heart of DECstation 78 is in the VT78 Video Data Processor in which minicomputer and display are totally integrated. The VT78 minicomputer is an LSI version of the PDP-8 containing 16,384 words (32K bytes) of Random Access Memory. The display system shares the features of the DECscope terminal family, including alphabetic and numeric keypads, a 24-line by 80-character screen format, the complete ASCII upper and lower case character set, 33 special symbols, and nineteen user-defined special function keys. The special symbols set allows the terminal to have basic graphics capability.

The purpose of DECstation 78 is to bring **full capability** computer power within the reach of individuals, small businesses, and large organizations alike. DECstation 78 was designed to cut cost, operating complexity, and size, but to perform with all the efficiency and flexibility of much larger, more complicated computer systems.

DECstation 78 can be easily programmed to perform in a wide range of data processing environments — everything from personal computing and fixed-function applications to real-time, multitasking operations and networking. The Operating System OS/78 supports the popular high-level programming languages BASIC and FORTRAN IV and is an excellent tool for general purpose program development in the single user environment.

Configuring the DECstation 78 system to meet specific needs is a simple matter of choosing the right hardware and software components from the DECstation family. Features that are optional on other, more expensive systems are standard, integral parts of DECstation 78. Features like asynchronous communications, built-in disk and high-speed data interfaces, and a real-time clock.

Installation is simple. There is only one cable between the processor and each peripheral. Fewer complicated electronic and mechanical parts and interconnection cables mean fewer maintenance problems and easier installation. In fact, system interconnection has been so streamlined and simplified that DECstation 78 can be installed by the user in something less than an hour — without special tools. The interconnections are through external plug-in ports which allow the user to adapt or reconfigure DECstation 78 to handle new processing needs as they occur. The I/O connection panel on the back of the processor contains five ports. Two serial EIA RS232C asynchronous interface ports are suitable for interfacing with terminals and other devices that operate with speeds from 50 to 19,200 baud. One port is equipped for modem control, the other is not. A parallel I/O port for printers and custom interfacing provides bi-directional 12-bit transfers at rates up to 15K words per second. A disk interface port allows connection to RX78 Floppy Disks.

The system can be interfaced easily to a number of instrumentation devices in scientific, engineering, medical analysis and other research and development environments. It can be used to collect, process and store data from test equipment, for example, to perform electronic troubleshooting procedures or to monitor and control experiments.

All hardware and software offerings are the same proven DIGITAL components widely used with larger PDP-8 systems.

Floppy Disk Mass Memory

Mass memory for DECstation 78 is provided by the RX78 Dual Floppy Disk Drive. The RX78 is a highly reliable, low-cost mass storage subsystem that accepts two industry standard diskettes each capable of storing 256,256 8-bit bytes or 128,128 12-bit words per drive. Thus total storage capacity is approximately equivalent to two hundred pages of typewritten text. The RX78 diskettes provide a compact data interchange and software distribution medium in addition to functioning as a random-access file device. The simple mechanical construction of the RX78 reduces hardware and operating complexity and makes it as easy to load software as it is to insert a cassette into a tape recorder.

DECstation 78's basic configuration 78/40-DA has one RX78 dual drive which accommodates two floppy diskettes. The other basic configuration 78/60-DA has two RX78 dual drives so it can handle four floppy diskettes.

digital DECSTATION 78

DIRECT SALES CATALOG

Expanding the System

A selection of peripherals and software is available for easy system expansion. The dual drive mass memory of the 78/40 system can be expanded to the equivalent of a 78/60 system by adding an RX78 dual drive to the system. DECstation 78 can support additional video display terminals and hard copy terminals. Two output printers are offered. Modems allow the transmission and receipt of data by DECstation 78 over telephone lines. DECstation 78 can be linked to other DECstation 78's or to a larger host computer in a distributed data processing network. The full complement of powerful software available for DECstation 78 guarantees an applications flexibility previously impossible with such a reasonably priced computer system. The expansion options available through the Direct Sales Catalog are discussed below.

Accessory item such as paper supplies, forms and computer installation furnishings can all be found in the Supplies/Furniture Section of the Direct Sales Catalog.

Disk Drive

The addition of a second RX78 Dual Floppy Disk Drive to the basic DECstation 78 configuration 78/40 increases the mass storage capacity to 1,025,024 8-bit bytes or 512,512 12-bit words. The second RX78 fits into the system stand below the first one. An interface cable is provided. System integration is a simple plug-in operation. No further mass memory expansion of DECstation 78 is possible once two RX78 are in the system. Additional diskettes can be ordered through this catalog. See p. 85 for ordering information.

Printers

Both serial- and parallel-interfacing hard copy printers are available. For local on-site output, the LA78 DECprinter I 180-cps line printer is recommended. This printer interfaces via a parallel port on DECstation 78.

For outputting via a serial port, the LA180 DECprinter I 180-cps line printer can be supplied. When an LA180 is ordered, be sure to specify the optional EIA buffered serial interface option (LAXX-NW). If the LA180 is located locally (within 34 feet of DECstation 78), then Null Modem Cable BC03M-25 is required. However, if the printer is remote and is interfaced via a modem then a BC05D-10 EIA cable must be ordered to connect DECstation 78 to the modem.

Hard Copy Terminals

Either the LA36 DECwriter II or the LS120 DECwriter III can be specified as serial hard copy terminals for DECstation 78. Each provides keyboard input, impact printing, and interfaces via a serial port on DECstation 78. LS120 prints at 180-cps, LA36 at a slower 30-cps.

LA78-PA PARALLEL PRINTER

Featuring

- *180 characters per second.*
- *Parallel interface.*
- *128-character ASCII upper/lower case set with control codes and symbols.*
- *7 x 7 dot matrix.*
- *132-column print, 10 characters per inch horizontal.*
- *6 lines per inch vertical spacing.*

For Details see p. 82.

Priced from $2838

LA180 SERIAL PRINTER

Featuring

- *180 characters per second.*
- *Serial interface (with option LAXX-NW).*
- *Accepts 300, 1200, 2400, 4800, or 9600 baud serial transmission.*
- *128-character ASCII upper/lower case set with control codes and symbols.*
- *7 x 7 dot matrix.*
- *132-column print, 10 characters per inch horizontal spacing.*
- *6 lines per inch vertical spacing.*

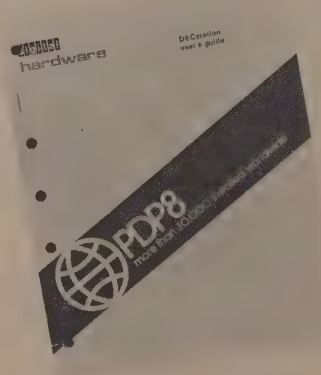
For Details see Terminal Section

Priced from $2688

Important: To interface, through a serial port, with DECstation 78, Option LAXX-NW (EIA Buffered Serial Interface) must be specified and either a BC05D-10 or a BC03M-25 cable ordered. BC05D-10 is used to connect via a modem to LA180. BC03M-25 is used where LA180 is within 34 feet of DECstation 78.

DECSTATION 78 USER'S GUIDE

Need more information on DECstation 78? Complete information on the installation and operation of DECstation is yours for the asking. Simply call the Catalog Order Desk at 800-258-1710 (N.H. 603-884-6660) and ask for a DECstation 78 User's Guide. We'll be happy to send you a FREE copy.



What About Applications Support?

Continuing support in the use of DIGITAL computers is also available through DECUS, the DIGITAL Equipment Computer Users Society. With a membership of more than 25,000 from some 40 countries, DECUS is the largest and most active society of its kind in the world.

Contact your nearest sales office listed on page 174 for further information.

digital DECSTATION 78

DIRECT SALES CATALOG

MINICOMPUTER SYSTEMS

Hard Copy Terminals

LA36 must be ordered with LAXX-LG EIA Interface Option to work with DECstation 78. (LS120 in its basic configuration is EIA Interface compatible.) In either case, interface cable BC05D-10 or BC03M-25 must be specified. BC05D-10 is for interfacing via a modem, BC03M-25 is for local (within 34 feet) connection to DECstation 78.

If a receive-only hard copy terminal is required, the LA35 DECwriter II 30-cps Printing Terminal is available. Order with LAXX-LG Option and cable BC03M-25 or BC05D-10.

Video Display Terminals

DECscope Video Terminals can be added to the DECstation 78 system. VT52 DECscope has a 24-line by 80-character screen. Model VT52-AE interfaces via a serial port on DECstation 78. As explained above for hard copy terminals, either a BC05D-10 or BC03M-25 cable is required.

When terminal graphics capability such as bar charts and curves in point plot or histogram (shaded) format is required, a VT55 DECgraphic Scope should be specified. Screen capacity is 24-lines by 80 characters of text or two graphs of 512 data points each. VT55 interfaces via a serial port on DECstation 78 when cable BC05D-10 or BC03M-25 is used.

Software

The OS/78 operating system is a complete software development operating system designed to run on DECstation 78. OS/78 is supplied as part of the basic system. In addition to OS/78, a multitasking real-time operating system RTS/8 is optionally available. RTS/8, assembly language based, allows multiple tasks to run concurrently while competing for resources on a fixed priority basis. A communications software package DECNET/8 can be added to run under RTS/8. DECNET/8 enables a user to write programs which will allow two or more VT78 Video Data Processors or PDP-8's to communicate via standard DIGITAL interfaces. It is based on DIGITAL's standard network protocols.

LA35/LA36 SERIAL TERMINALS (30 CPS)

Featuring

- *30-character-per-second*
- *ANSI typewriter keyboard on LA36.*
- *ASCII 128-character set. (and keyboard on LA36).*
- *Optional numeric keypad, LA 36 only.*
- *Switch selectable baud rates of 300, 150 and 110.*
- *EIA RS232C interface (with option LAXX-LG).*
- *Full-duplex or half-duplex operation.*

Priced from $1595

To interface, through a serial port, with DECstation 78, LA35/LA36 must be equipped with option LAXX-LG (EIA Interface with Modem Control). Also, a BC05D-10 or BC03M-25 cable must be ordered as discussed under the LA180 description. An optional keypad can be specified for LA36 as option LAXX-KK. LA35 without keyboard is at rear in photo.

For Details see Terminal Section
Don't Miss LA35/LA36's "with the trimmings" in that Section.

LS120 SERIAL TERMINAL (180 CPS)

Featuring

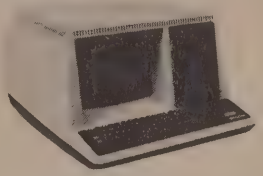
- *180 cps printing.*
- *110, 300 or 1200 baud operation plus additional, operator-selectable rates of up to 4800 baud.*
- *Full- or half-duplex operation.*
- *EIA RS232C interface*
- *7 x 7 dot matrix.*
- *132-column printing; 10 characters per inch horizontal; 6 lines per inch vertical spacing.*
- *128-character ASCII upper/lower case set.*
- *ANSI keyboard with multi-key rollover.*

Priced from $3072

Model LS120-HE is equipped with an EIA interface so it can connect through a serial port on DECstation 78. Cables BC03M-25 or BC05D-10, however, are required as explained under the LA180 description.

For Details see Terminal Section

VT52 DECSCOPE



Featuring

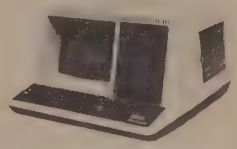
- *1920-character screen with twenty-four lines of 80 characters.*
- *Highly reliable keyboard featuring typewriter layout.*
- *Numeric function keyboard.*
- *Asynchronous data communication at individually switch-selected transmit and receive baud rates from 75 to 9600 baud.*
- *ACSII code utilized, plus additional commands through escape sequences.*
- *EIA RS232C interface (Model VT52-AE).*
- *Full-duplex operation.*

Priced from $1729

Either a BCO$D-10 or a BC03M-25 cable is required as explained under the LA180 description.

For Details see Terminal Section

VT55 DECGRAPHIC SCOPE



Featuring

- *Upper and lower case text.*
- *Switch selectable transmission rate (75 to 9600 baud).*
- *19-button keypad for directing cursor movement and numerical entry.*
- *Hard copy output of both alphanumeric and graphics (VT55-FE only).*
- *Standard typewriter keyboard.*
- *EIA RS232C interface.*

Priced from $2499

Either a BC03M-25 or BC05D-10 cables are required as explained under the LA180 description.

For Details see Terminal Section

CALL: 800-258-1710 (N.H. Residents 603 - 884-6660) 8:30 am to 5 pm EST.

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DIRECT SALES CATALOG

TECHNICAL DESCRIPTION

Display and Keyboard Features

- *Easy to use typewriter-like keyboard.*
- *19-key auxiliary numeric keypad (11 numerics, 4 cursor keys, 3 user-definable function keys, ENTER key), plus auto repeat key.*
- *Direct cursor addressing.*
- *Fixed horizontal tabs.*
- *Quiet operation.*
- *Adjustable character brightness.*
- *24-line x 80-character screen format.*
- *7 x 7 dot matrix*
- *Full 128 ASCII upper and lower case character set plus 33 special graphic characters.*
- *Communications to imbedded CPU at 9600 baud.*
- *Other features including upward scroll, erase to end of line, erase to end of screen and hold screen mode.*

VIDEO DISPLAY AND KEYBOARD

In DECstation 78 the computer and terminal are a single compact unit, designated as a VT78 Video Data Processor. The processor and display are interconnected over a high-speed serial line with the processor physically located inside the video display's case. A single START switch activates the entire system. At system power-up, the display and keyboard are automatically tested.

The keyboard/video display is basically a DECscope in origin but has some added features to tailor it to DECstation 78. The same clarity of displayed characters, adjustability of screen intensity, and glare-free screen popular in DECscope products are carried over in DECstation 78.

The keyboard is standard typewriter (ANSI) and produces a key-stroke click for audible feedback of key operation (click can be eliminated for silent operation). Three-key rollover protection eliminates fast typing errors. Should three keys be depressed simultaneously, transmission will still be correct if one of the first two keys typed is released before the third. The figure shows the layout of the keyboard and describes the functions of the various keys. Note that striking a key does not directly cause a display result. All instructions are fed to the processor which then controls the displayed characters or cursor movements. This is equivalent to a DECscope-Host computer configuration where the instructions are echoed back from the host.

The use of two or three code escape sequences greatly expands the range of commands to which DECstation 78 responds. Basically these commands fall into four categories: Cursor Control, Screen Erase, Hold Screen, and Keypad/Keyboard Mode Change. See Table IV for details.

An auxiliary keypad extends the keyboard's capabilities. The keypad has 19 keys. The function of each key is shown in Table II. There are two modes in which the keypad can operate, Normal and Alternate. The Alternate Mode is established by an escape sequence (ESC =) to enter the mode and (ESC >) to exit the mode. When in the Alternate Mode, the ten numeral keys, the decimal point key, and the ENTER key transmit unique escape codes, Table II, for custom assignment by the user. In either mode, there are also three blank unassigned keypad keys for user definition. Cursor control keys complete the keypad's functions.

TABLE I

FULL ASCII CHARACTER SET AND CODESHIFT CAUSED BY CONTROL KEY

CTRL Key* Down		Codes Transmitted When CTRL Key Is Not Down					
Octal Code	Char.	Octal Code	Char.	Octal Code	Char.	Octal Code	Char.
000	NUL	040	Space	100	@	140	\
001	SOH	041	!	101	A	141	a
002	STX	042	"	102	B	142	b
003	ETX	043	#	103	C	143	c
004	EOT	044	$	104	D	144	d
005	ENQ	045	%	105	E	145	e
006	ACK	046	&	106	F	146	f
007	BELL	047	'	107	G	147	g
010	BS	050	(	110	H	150	h
011	HT	051	)	111	I	151	i
012	LF	052	*	112	J	152	j
013	VT	053	+	113	K	153	k
014	FF	054	,	114	L	154	l
015	CR	055	-	115	M	155	m
016	SO	056	.	116	N	156	n
017	SI	057	/	117	O	157	o
020	DLE	060	0	120	P	160	p
021	DC1 (XON)	061	1	121	Q	161	q
022	DC2	062	2	122	R	162	r
023	DC3 (XOFF)	063	3	123	S	163	s
024	DC4	064	4	124	T	164	t
025	NAK	065	5	125	U	165	u
026	SYN	066	6	126	V	166	v
027	ETB	067	7	127	W	167	w
030	CAN	070	8	130	X	170	x
031	EM	071	9	131	Y	171	y
032	SUB	072	:	132	Z	172	z
033	ESC	073	;	133	[	173	{
034	FS	074	<	134	\	174	|
035	GS	075	=	135	]	175	}
036	FS	076	>	136	^	176	~
037	US	077	?	137	_	177	Delete

*With CTRL Key down striking **any** key in the three rightward columns of the table cause the code in the CTRL Key down column to be transmitted. For example with CTRL Key down, keys Space, @ and / all transmit Octal Code 000 which is NUL.

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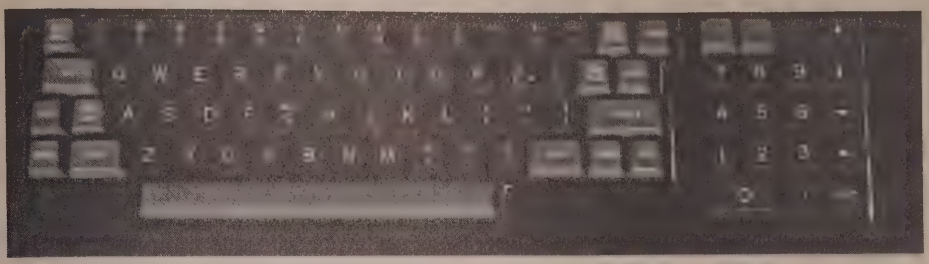
MINICOMPUTER SYSTEMS

DECSTATION 78



KEYBOARD FUNCTIONS

Key	Function
A thru Z	Selects upper case or lower case characters (depending on SHIFT key) for entry into processor.
1 through 0 and symbol keys (!, #, @, etc.)	Selects corresponding numeral or symbol (depending on SHIFT key) for entry into processor.
ESC (Select)	Transmits ESC (033) code to processor. This alerts processor that next character or sequence of characters is a command.
TAB	Moves cursor rightwards to the next TAB stop. TAB stops are fixed in columns 9, 17, 25, 33, 41, 49, 57, 65, and 73.
CTRL	When held down, CTRL key changes the code transmitted by other keys to initiate control functions. See Table I.
SCROLL	When pressed SCROLL key will add one line of characters to display when in the Hold Screen Mode. Typing SHIFT SCROLL will add a screenful of characters. See description in text.
CAPS LOCK	Cause letters A through Z to always be upper case. Has no effect on numerals or symbols.
SHIFT	Selects upper case or lower case alphabetic characters and numeral or symbol characters to be entered into processor.
BACK SPACE	Moves cursor one space to the left.
LINE FEED	Drops the cursor one line in same column.
DELETE	Eliminates character above cursor.
RETURN	Moves cursor to extreme left margin. Carriage Return function.
REPEAT	With REPEAT key pressed, any other code-transmitting key will continuously transmit its code to the processor.
COPY	Not used.
BREAK	Not often used but included for compatibility with half-duplex serial data lines. When pressed, holds data line in zero state.
SPACE BAR	Erases character at the cursor position and moves cursor one column to right.

Graphics Capability

DECstation 78 has a built-in graphics capability which, by means of special symbols, enables the user to display bar graph data, for example, more accurately than with only the ASCII character set, Table I. The keyboard/video display enters the Graphics Mode by escape sequence (ESC F) and exits by escape sequence (ESC G). When in the Graphics Mode, octal codes 136-176, which normally stand for lower case alphabetics and certain symbols, are interpreted as 33 special symbols. Table III depicts the symbols and describes their functions.

Controlled Scrolling

Often the data coming from the processor arrives too fast for the display to handle. In this case software, through the transmittal of octal codes (021) XON and (023) XOF, establishes an optimum speed for the display by halting transmission as required. The operator can override the software controlled scrolling by putting the display in the Hold Screen Mode (enters mode via escape sequence (ESC [), exits via (ESC/)). In this mode, new data is displayed only when the operator presses the SCROLL key or the combination SHIFT SCROLL. In the former case, one line of new data is displayed; in the latter an entire screenful.

TABLE II
AUXILIARY KEYPAD FUNCTIONS

Key	Normal Code	Alternate Keypad Code
0-9	Numeral	ESC ? p) thru (ESC ? y)
•	Decimal Point	(ESC ? n)
ENTER	Same as RETURN	(ESC ? M)
↑	Up Cursor (ESC A)	Up Cursor
↓	Down Cursor (ESC B)	Down Cursor
→	Right Cursor (ESC C)	Right Cursor
←	Left Cursor (ESC D)	Left Cursor
Left Blank	User Defined (ESC P)	(ESC P)
Center Blank	User Defined (ESC Q)	(ESC Q)
Right Blank	User Defined (ESC R)	(ESC R)

Note: None of the keys on the auxiliary keypad are affected by pressing the SHIFT, CAPS LOCK, or CTRL keys.

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TECHNICAL DESCRIPTION (Cont'd)

TABLE III
GRAPHICS MODE TRANSLATION

Octal Code	Character/Symbol Displayed: Graphics Mode	Character/Symbol Displayed: Normal Mode
136	blank	^
137	blank	_
140	reserved	`
141	solid rectangle	a
142	1/	b
143	3/	c
144	5/	d
145	7/	e
146	degrees	f
147	plus or minus	g
150	right arrow	h
151	ellipsis	i
152	divide by	j
153	down arrow	k
154	bar at scan 0	l
155	bar at scan 1	m
156	bar at scan 2	n
157	bar at scan 3	o
160	bar at scan 4	p
161	bar at scan 5	q
162	bar at scan 6	r
163	bar at scan 7	s
164	subscript 0	t
165	subscript 1	u
166	subscript 2	v
167	subscript 3	w
170	subscript 4	x
171	subscript 5	y
172	subscript 6	z
173	subscript 7	{
174	subscript 8	¦
175	subscript 9	}
176	paragraph	~

Codes 154-163 These codes cause eight horizontal lines at various scans within the character position to be displayed. These bars can be used to print a bar-graph on the screen with more accuracy than would be possible using only minus signs and underlines.

Codes 142-145 (1/, 3/, 5/, and 7/) are used preceding the subscripts to form fractions. In particular, the fractions ⅛, ¼, ⅜, ½, ⅝, ¾, and ⅞ can be formed using these four symbols and the subscripts.

Code 151 The ellipsis appears as three dots in the character position (. . .). The spacing of these three dots is such that several of these symbols placed adjacent to one another in the screen will produce a smooth line of dots.

Codes 136-140 These codes are reserved for future use.

TABLE IV
ESCAPE SEQUENCE COMMANDS

Escape Sequence	Action
CURSOR CONTROL COMMANDS	
ESC A	Moves cursor up one character position in same column. No scrolling.
ESC B	Moves cursor down one character position in same column. Same function as LINE FEED. No scrolling.
ESC C	Moves cursor one column to right.
ESC D	Same as Backspace (BS). Moves cursor one column to left.
ESC H	Cursor Home command. Moves cursor to upper left character position on screen.
ESC Y	This sequence followed by a line designate (octal 040 to 067) followed by a column designate (040 to 157) directs cursor to a specific coordinate character location on screen. Most useful for forms work.
ERASE SCREEN COMMANDS	
ESC K	**Erase to End of Line** command. Erases all information at the cursor position and rightward to end of line.
ESC J	**Erase to End of Screen** command. Erases all information from cursor position to end of screen.
ESC ⊏	**Enter Hold Screen Mode** command. In this mode data cannot scroll off screen except by pressing SCROLL key. See text for details.
ESC /	**Exit Hold Screen Mode** command. See ESC ⊏ above.
KEYBOARD/KEYPAD MODE CHANGE COMMANDS	
ESC =	**Enter Alternate Keypad Mode** command. Converts certain keypad keys to transmit unique escape sequences. See Table II.
ESC >	**Exit Alternate Keypad Mode** command.
ESC F	**Enter Graphics Mode** command. Converts octal codes 136 thru 176 to special graphic symbols for display. See Table III.
ESC G	**Exit Graphics Mode** command. See ESC F above.

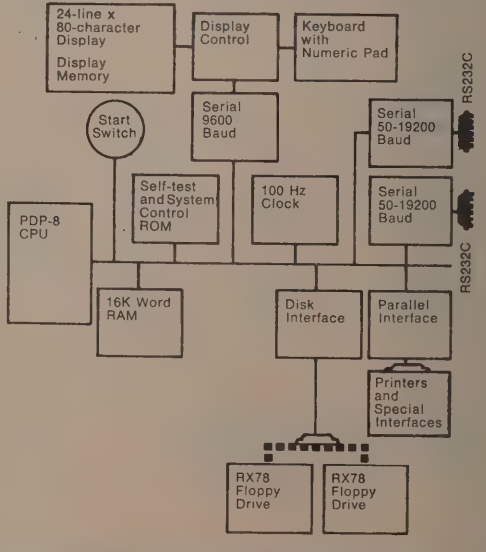
Processor

The overall organization of DECstation 78 is shown in the figure. An LSI (large scale integration) version of the powerful PDP-8 minicomputer contained on a 15¾" x 11⅞" printed circuit board is mounted inside of DECstation 78's video display unit. This is the processor for the system. It includes a 12-bit CPU with memory extension control, 16,384 words (32K bytes) of Random Access Memory, complete peripheral interfacing, internal bootstrap facilities, and a 100 Hz real-time clock. The CPU has the same powerful instruction set as the PDP-8A. Cycle time is approximately 3.6 μs.

Three general purpose processor registers are provided:

- PC. The 12-bit program counter points to the location from which the next instruction will be fetched.
- AC, L. The 12-bit accumulator and its 1-bit carry extension, the Link, form the register where all arithmetic calculations take place.
- MQ. The 12-bit Multiplier Quotient register serves as a temporary storage register.

Main memory is 12-bits by 16K words of Random Access NMOS Memory organized as 4 fields of 4K words each. Each field consists of 32 pages of 128 words.



TECHNICAL DESCRIPTION (Cont'd)

Processor (Cont'd)

An on-board ROM permits several important features to be included. These are:

- Automatic self-test procedure.
- Processor status display.
- Terminal emulation mode, which allows DECstation 78 to be used as a stand alone computer terminal without independent processing capability.
- Internal disk bootstrap.
- Preselection of baud rates on primary communications port, Table V.

There are two basic groups of instructions: memory reference and microinstructions. Memory reference instructions require an operand; microinstructions do not. The DECstation 78 processor features indirect addressing capability up to 4K and 8 auto-index registers. Three groups of operate microinstructions perform a variety of program operations without any need for reference to memory location. Groups 1 and 2 allow the programmer to manipulate and/or test the data that is located in the accumulator or link. Group 3 operate instructions allow the programmer to manipulate the MQ register. Many of these operate microinstructions may be combined by the experienced programmer in order to use the DECstation 78 processor more efficiently.

Input/Output (IOT) instructions are used to control the operation of the computer's interrupt system and clock and to make all exchanges of data to the system display, keyboard, and externally connected peripherals.

There are four interface ports for DECstation 78: a parallel port, a disk interface port, and two asynchronous serial ports. The parallel I/O port is for printers and custom interfacing. It provides bidirectional 12-bit transfers at rates up to 15K words per second.

The two asynchronous serial EIA RS232C interface ports are suitable for primary and secondary communications applications, terminals, and the attachment of a variety of devices. These ports (SLU 2 and SLU 3) feature 16 program selectable baud rates ranging from 50 to 19,200 baud and programmable loopback for maintenance, Table V. One port, SLU 3, provides programmable parity generation and overrun detection, variable width stop-bit selection and programmable character length. The other port, SLU 2, is equipped for full modem control.

The disk interface port allows connection between the DECstation 78 processor and two independent dual drive disk units (RX78). It provides both 8- and 12-bit data formats for maximum flexibility.

TABLE V

BAUD RATE TABLE

Programmable baud rate selection is provided with DECstation 78 as a standard feature. It makes adaption to a particular communication environment very simple and eliminates error prone setting of internal switches and jumper wires.

Baud Rates Selectable

50	150	1800	4800
75	300	2000	7200
110	600	2400	9600
134.5	1200	3600	19200

RX78 Floppy Disk Drive

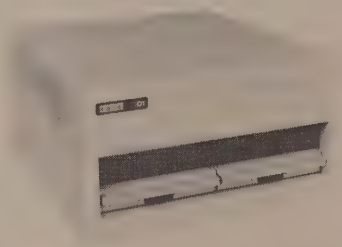
The RX78 Floppy Disk System is an inexpensive mass storage subsystem, I/O and random access file device characterized by speed and reliability. Either one or two compact, self-contained units may be interfaced with the processor via a high-speed data port on the external connector panel. Each RX78 includes **two drives,** a microprogrammed controller module and a read/write electronics module. The system is capable of storing either 256,256 8-bit bytes or 128,128 12-bit words **per drive** in industry standard format.

Given an absolute sector address, the RX78 locates that sector and performs the desired function. The RX78 performs all necessary parity checks and provides error indications. Head position is automatically verified, and each sector has a cyclic redundancy check (CRC) character as part of the header field and another CRC character as part of the data field. The RX78 generates and verifies the CRC characters and provides error checks.

Track-to-track moves require ten milliseconds for the move plus twenty milliseconds for settling time if the head is loaded for a read or write. The rotational speed of the diskette is 360 rpm, with an average latency time of 83 milliseconds. The total average access time is only 483 milliseconds. During a sequential access, the whole diskette can be read in about thirty seconds.

The RX78 Floppy Disk System uses IBM-standard diskettes — thin, flexible oxide-coated disks about the size of a 45-rpm phonograph record. The disk is recorded only on one side and is permanently contained in an 8-inch square flexible protective evelope. The envelope has a large center hole for the drive spindle, a small hole for track index sensing, and a large slit for the read/write head. A solenoid contact load pad is located on the opposite side of the envelope. The inside of the envelope is covered with a soft material designed to wipe the disk surface clean just before reading.

The diskette contains 77 tracks with 26 sectors per track. Each sector can store 128 8-bit bytes or 64 12-bit words for a total formatted capacity of 256,256 bytes or 128,128 words.



The diskette is a portable, convenient storage, interchange and software distribution medium which allows DECstation 78 users to store large amounts of data in a small space. Additional diskettes are available through the Direct Sales Catalog. See p. 85.

Once a diskette is loaded into the drive and the door closed, the diskette is engaged on the registration hub. When the diskette drive is at operating speed, the software takes over. Unloading is as simple a process. Elimination of any other operator controls simplifies operation.

RX78 SPECIFICATIONS

Storage Medium: Preformatted industry-compatible diskette.
Capacity per Diskette: 256,256 8-bit bytes or 128,128 12-bit words.
Data Transfer Speed: 10K bytes/second in byte mode; 5K words/second in 12-bit mode.
Time for Half Revolution: 83 msec.
Diskette Rotation Speed: 360 rpm.
Drives per Control: 2 (maximum).
Track Positioning Time:
One track move: 10 msec. Average access time: 483 msec.
Average track seek: 380 msec. Maximum track seek: 760 msec.
Head setting: 20 msec.
Data Organization:
Tracks: 77
Sectors: 26 per track
Capacity per sector: 128 8-bit bytes or 64 12-bit words
Recording Method: Double frequency.

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DIRECT SALES CATALOG

TECHNICAL DESCRIPTION (Cont'd)

PRINTER OPTIONS

LA78-PA DECprinter I Parallel Printer

Standard Features

- *180 characters per second.*
- *Parallel interface.*
- *Accommodates 6-part form (0.20" max. thickness).*
- *Handles variable-width forms, 3 through 14⅞"W.*
- *132-column print, 10 characters per inch horizontal.*
- *6 lines per inch vertical spacing.*
- *128-character ASCII upper/lower case set with control codes and symbols.*
- *7 x 7 dot matrix.*
- *Backspace capability.*
- *Fine vertical adjustment for accurate forms placement.*
- *Paper-out switch.*
- *Paper-out override.*
- *Switch-settable forms length (11 lengths).*

The LA78 DECprinter is a 180-cps hard-copy printer with a full complement of standard features which make it one of the most affordable and easy-to-use matrix printers available.

The LA78 accommodates any of eleven common-length forms. The LA78 also features quiet operation, a durable field-proven print head, the accommodation of multipart forms of varying width, and adjustable vertical positioning for accurate form placement.

The LA78 interfaces through DECstation 78's parallel port. In its mechanical details, LA78 is identical to DECprinter I's LA180 which is described in the Terminal Section of the Direct Sales Catalog. Note LA78 comes equipped with a 25-foot cable to connect it to DECstation 78.

LA78 SPECIFICATIONS

Power: 115 Vac, 60 Hz.

Heat Dissipation: 400 w printing; 100 w nonprinting.

Environment:
Operating temperature: 10°C to 40°C (50°F to 104°F).
Relative humidity: 10% to 90% noncondensing.
Maximum wet bulb: 28°C.

Dimensions: 32.2"H x 27.5"W x 20.0"D.

Mounting: Freestanding.

Weight: 120 lbs. approx.

Color: Off-white top with flat black base.

COMMERCIAL BASIC NOW INCLUDED WITH DECSTATION 78

Users tell us that adding Commercial BASIC to the OS/78 operating system gives DECstation 78 features not available on ANY OTHER "under $10K" computer system.

BASIC consists of an editor, compiler, and a runtime system, all three supporting BASIC's dual functions as an interactive program development tool and a system for interactive and batch execution.

BASIC includes features oriented to the Commercial user:

- *Three types of data format: floating point numeric, alphanumeric string, and commercial decimal (number string) data.*
- *Commercial decimal arithmetic to 15-digit precision, including automatic data format conversion as required.*
- *PRINT USING statement for formatted printing of numeric strings; especially useful for columns and tables.*
- *Full uppercase/lowercase capability.*
- *Cursor control function to facilitate data entry.*
- *Faster run-time performance.*
- *Random-access record-oriented I/O for rapid storage or retrieval of individual records.*
- *Smaller memory-space needed.*
- *OEM's can protect their source code by distributing programs as saved files.*
- *Existing assembly language programs can be mixed with new Commercial BASIC programs.*
- *Because BASIC programs can be run under the OS/78 BATCH processing facility DECstation can be used interactively or jobs can be queued to run over extended periods — such as overnight.*
- *Concurrent operations — like simultaneous data entry and communications — are possible.*
- *A line printer spooler Symbiont guides users in writing their own Symbionts.*

By adding Commercial BASIC to the DECstation 78 we have increased its capabilities for the user in the Commercial environment. And all this increased capability is brought to you at NO EXTRA CHARGE.

TECHNICAL DESCRIPTION (Cont'd)

SOFTWARE

Three major software packages are available for DECstation 78. These are: an Operating System OS/78 that is included in the price of the basic DECstation 78 package; an optional real-time multitasking facility RTS/8; and an optional communications software package DECNET/8. Note RTS/8 must be installed before DECNET/8 can be used. In addition to these basic software support packages, the DECstation 78 user has access to the extensive library of PDP-8 programs. Consult the Direct Sales Catalog Desk for further information. OS/78, RTS/8 and DECNET/8 are discussed below.

IMPORTANT

Certain Software is provided by DIGITAL only under a non-transferable and non-exclusive license to use. See p. 72 for details.

Multilanguage Operating System OS/78

OS/78 provides DECstation 78 users with power and flexibility in both interactive and batch programming environments. OS/78 is based on DIGITAL's proven OS/8 and offers many features previously available only on larger computer systems. OS/78 maximizes utilization of DECstation 78 main memory because the resident portion of the operating system requires only 256 words of memory. Non-resident portions of the system are swapped into memory from the RX78 floppy disk automatically as required.

OS/78 is easy to use and provides the development programmer with a complete, logical interface to program and file structures. All data files and executable programs are stored on one or more floppy disks where they may be accessed for loading, modification or execution by simple keyboard commands.

OS/78 incorporates Commercial BASIC and FORTRAN IV and provides a comprehensive set of software tools and utility programs that help make DECstation 78 an excellent program development and calculations tool in the single-user environment. These include EDIT, PAL8, CREF, ODT and BATCH PROCESSING, among others.

EDIT is a line-oriented text editor that allows the user to enter and modify ASCII files. It supports commands to list, insert, delete, change and move text as well as to search for character strings.

PAL8 is a two-pass language assembler that provides the programmer with the capability of coding directly in machine-oriented symbolic instructions. Its features include: 1) conditional assembly which enables a single source file to produce different binaries for different purposes; 2) paginated listings, page headings and page numbering to improve program documentation; and 3) a symbol table which lists all program labels and their memory location or value.

CREF (Cross-Reference Utility Program) aids the programmer in writing, debugging and maintaining assembly language programs by providing the ability to pinpoint all references to a particular symbol. CREF provides an alphabetical cross-reference table for PAL8 assembly listings and numbers each line in the listing. Program symbols and literals are printed alphabetically along with the numbers of the lines that reference to them. Optional two-pass operation doubles the number of symbols that can be accommodated in a program.

ODT (Octal Debugging Technique) is invisibly co-resident with the user program so that there is no need to allocate more than 3 words in each 4K field for a debugging package during development. Breakpoints can be set anywhere in a program to allow the programmer to trace the execution of his program. Whenever program execution is suspended, ODT provides the capability to examine and optionally modify memory locations or registers. Specified areas of memory may be searched by means of ODT's binary memory search mechanism.

OS/78's BATCH PROCESSING utility allows lengthy sequences of commands or frequently used programs to be run automatically on DECstation 78.

Real-time Multitasking RTS/8

RTS/8 is DIGITAL's real-time, multitasking software facility for use with the PDP-8 family of minicomputers.

RTS/8 allows DECstation 78 to handle many tasks simultaneously by making use of the otherwise idle processor cycles that occur periodically during a program's execution. A user-defined priority list allows the most important jobs to be processed first. As a result, programs in execution can, if necessary, be temporarily suspended and removed from memory (swapped out) to make room for a higher priority job.

RTS/8 includes comprehensive resource management capabilities. It maintains the current status of system resources to determine the combination of peripherals, input files, and run-time options to be used during the current execution of a program.

By using RTS/8, the programmer is able to take advantage of a set of software modules (see box) that will interface with his hardware, thereby freeing him to concentrate on his own programs and greatly reduce development time.

Note:
RTS/8 must have OS/78 software as the operating system.

RTS/8 MODULES

RTS/8 EXECUTIVE controls the overall execution and interaction of task schedules, startup and suspension as well as the passing of information between tasks.

MONITOR CONSOLE ROUTINE (MCR) MODULE provides the programmer functions, which he can request from the console terminal, to control, inspect and debug an experimental system.

RX78 FLOPPY DISK MODULE enables interrupts from the floppy disk and accepts and processes messages sent to it.

OS/8 FILES MODULE enables the user to look up, create and delete files in OS/78 directories from a task. When used in conjunction with other mass storage modules, it gives programmers the capability to read or write OS/78 files on the floppy disk.

CLOCK MODULE accepts requests to perform actions after a specified time has elapsed or at regular intervals.

CONSOLE AND NON-CONSOLE TERMINAL MODULES each handle a single terminal in either line or character mode. Input in line mode is terminated by a carriage return or an ALTMODE character, and may be edited with a RUBOUT or CTRL/U character. In character mode, input is not echoed and is terminated by overflow of a specified character count.

LINE PRINTER MODULE supports an LA78 line printer. Its structure is also identical to line mode in the terminal module.

SWAP MODULE swaps other tasks into or out of memory. It determines if a task is already in memory or whether it must first be written onto mass storage before another task may reside in its partition area of memory, or whether a new task can be swapped into memory without regard to what was in the partition previously.

Communications Networking DECNET/8

DECNET is a set of software tools which may be used to extend RTS/8 so that a DECstation 78 may be connected with other computer systems to form a data network. The DECNET user can configure a variety of networks utilizing DECstation 78's or DECstation 78's and other members of the PDP-8 family. These may include communications networks, resource-sharing networks, manufacturing or computational networks.

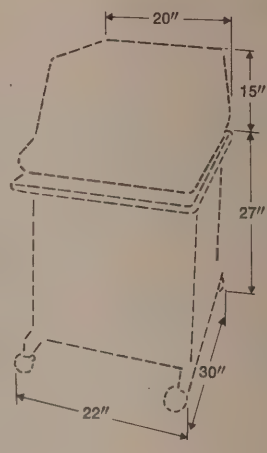
The DECNET/8 package includes the following software components: Digital Data Communications Message Protocol (DDCMP); Network Information Program (NIP); Terminal Communication Facility (TLK); and Interrupt Service Routines (ISR).

digital DECSTATION 78

DIRECT SALES CATALOG

SITE CONSIDERATIONS

All the components described in this section will interface together in terms of matching logic levels and operating functions. Note that all specified models in the ordering information are selected for operation from a 115V 60 Hz AC supply. Should you consider adding components other than those specified here to your system, be sure to order compatible models. The power requirements for each component are given in the table below. Plan your installation accordingly. Environmental specifications for each component are also summarized below. Design your installation for the "worst case" component. The printers, hard copy terminals, and DECstation 78 are free-standing. DECscopes have to be placed on a desk or a table or a terminal stand (see Supplies/Furniture Section for suitable furniture). The overall size of each component is summarized in the table. The overall dimensions of DECstation 78 are shown pictorially. Unit weights (not shipping weights) are also summarized in the table. The color scheme for each unit is off-white and flat black.



OVERALL DIMENSIONS OF DECstation 78

Site Consideration Specifications

Component	Model No.	Operating Environment				Electrical Specs			Dimensions WxDxH″	Weight	Recommended Floor Space	Max. Noise Level
		Temp.	Relative Humidity	Max. Wet Bulb	Min. Dew Point	Line Vac Voltage	Freq.	Max. Power				
DECstation 78	78/40-DA	15-32°C 59-90°F	20-80%	25°C 77°F	2°C 36°F	95-127	60 ±1 Hz	685W	22x30x20	160 lbs.	22″Wx30″D Allow 6″D Rear Access	NA
DECstation 78	78/60-DA	15-32°C 59-90°F	20-80%	25°C 77°F	2°C 36°F	95-127	60 ±1 Hz	1260W	22x30x20	225 lbs.	22″Wx30″D Allow 6″D Rear Access	NA
Dual Floppy Disk Drive	RX78-AA*	15-32°C 59-90°F	20-80%	25°C 77°F	2°C 36°F	90-132	60 ±1 Hz	575W	19x23.5x10.5	65 lbs.	Mounts Beneath DECstation 78	NA
DECprinter I	LA78-PA	10-40°C 50-104°F	10-90%	28°C 82°F	2°C 36°F	95-127	60 ±1 Hz	400W	27.5x20x33.2	102 lbs.	27.5″Wx20″D Allow 14″D Rear Access	65 dB @ 3′
DECprinter I	LA180	10-40°C 50-104°F	10-90%	28°C 82°F	2°C 36°F	95-127	60 ±1 Hz	400W	27.5x20x33.2	102 lbs.	27.5″Wx20″D Allow 14″D Rear Access	65 dB @ 3′
DECwriter II	LA35	10-40°C 50-104°F	10-90%	28°C 82°F	2°C 36°F	95-127	60 ±1 Hz	300W	27.5x21.7x33.5	102 lbs.	27.5″Wx21.7″D Allow 14″D Rear Access	65 dB @ 3′
DECwriter II	LA36	10-40°C 50-104°F	10-90%	28°C 82°F	2°C 36°F	95-127	60 ±1 Hz	300W	27.5x24x33.5	102 lbs.	27.5″Wx24″D Allow 14″D Rear Access	65 dB @ 3′
DECwriter III	LS120	10-40°C 50-104°F	10-90%	28°C 82°F	2°C 36°F	90-132	60 ±1 Hz	400W	27.5x24x33.5	107 lbs.	27.5″Wx24″D Allow 14″D Rear Access	65 dB @ 3′
DECscope	VT52	10-40°C 50-104°F	10-90%	28°C 82°F	2°C 36°F	100-126	60 ±1 Hz	110W	20.9x27.2x14.1	44 lbs.	17.7″ (table depth)	NA
DECgraphic Scope	VT55-FE	15-32°C 59-90°F	20-80%	25°C 77°F	2°C 36°F	100-126	60 ±1 Hz	300W	20.9x27.2x14.1	57 lbs.	17.7″ (table depth)	NA
DECgraphic Scope	VT55-EE	10-40°C 50-104°F	10-90%	28°C 82°F	2°C 36°F	100-126	60 ±1 Hz	185W	20.9x27.2x14.1	49 lbs.	17.7″ (table depth)	NA

*RX78-AA Media must meet the same environmental specifications as the Disk Drive itself.

ORDERING INFORMATION

Basic DECstation 78's

Cat. No.	Description	List	Cat.	Cash	Shipping Weight
B-78/40-DA	VT78 Video Processor, RX78 Dual Floppy Disk Drive, Systems Stand, OS/78 Operating System Software, Documentation.	$8245	$7421	$7091	190 lbs.
B-78/60-DA	Same as 78/40-DA but includes two RX78 Dual Floppy Disk Drives.	$12,545	$11,291	$10,789	265 lbs.

RX78 Dual Disk Drive

Cat. No.	Description	List	Cat.	Cash	Shipping Weight
B-RX78-AA	RX78 Dual Floppy Disk Drive, I/O Cable to VT78.	$4300	$3870	$3698	75 lbs.

Printer Options (See Terminal Section for other options)

Cat. No.	Description	Must Also Order*	List	Cat.	Cash	Shipping Weight
B-LA78-PA	DECprinter I. 180-cps, 132-column, parallel I/O printer.	—	$3300	$2970	$2838	145 lbs.
B-LA180-PA	DECprinter I. 180-cps, 132-column, serial I/O printer when equipped with option LAXX-NW.	LAXX-NW, and BC05D-10 or BC03M-25 cable.	$3240	$2800	$2688	145 lbs.
B-LAXX-NW	EIA Buffered Serial Interface for LA180-PA.	LA180-PA	$525	$499	$478	5 lbs.

*Or have available. Options are user installed.

digital DECSTATION 78

DIRECT SALES CATALOG

ORDERING INFORMATION (Cont'd)

Hard Copy Terminal Options (See Terminal Section for Other Options)

Cat. No.	Description	Must Also Order*	List	Cat.	Cash	Shipping Weight
B-LA36-DK	DECwriter II, 30-cps hard copy printing terminal. 96-character ASCII keyboard. Can be equipped with LAXX-KK numeric keypad.	LAXX-LG EIA Interface. And BC05D-10 or BC03M-25 cable	$1870	$1660	$1595	145 lbs.
B-LA35-DK	DECwriter II. 30-cps hard copy printing terminal. Receive-only version of LA36-DK.	LAXX-LG EIA Interface And BC05D-10 or BC03M-25 cable.	1780	1580	1520	145 lbs.
B-LS120-HE	DECwriter III. 180-cps hard copy printing terminal. 96-character ASCII keyboard. EIA serial interface. Can be equipped with LAXX-RM numeric keypad.	BC05D-10 or BC03M-25 cable.	3990	3200	3072	145 lbs.
B-LAXX-LG	EIA Interface with Modem Control. For LA35-DK and LA36-DK.	LA35-DK or LA36-DK DECwriter II.	110	105	100	4 lbs.
B-LAXX-KK	14-Key Numeric Keypad for LA36-DK.	LA36-DK DECwriter II.	105	100	96	10 lbs.
B-LAXX-RM	14-Key Numeric Keypad for LS120-HE.	LS120-HE DECwriter III.	105	100	96	10 lbs.

* Or have available. Options are user installed.

★ ★ How about an LA35 or LA36 "with the trimmings"? See Terminal Section. ★ ★

Video Terminal Options (See Terminal Section for Other Options)

Cat. No.	Description	Must Also Order*	List	Cat.	Cash	Shipping Weight
B-VT52-AE	DECscope. 24-line by 80-character video terminal. Upper/lower case display. 96-character ASCII keyboard. 19-key keypad. EIA serial interface.	BC05D-10 or BC03M-25 cable.	$1900	$1805	$1729	56 lbs.
B-VT55-EE	DECgraphic Scope. 24-line by 80-character video terminal. Graphics display capability. 96-character ASCII keyboard. 19-key keypad. EIA serial interface.	BC05D-10 or BC03M-25 cable.	2750	2613	2499	61 lbs.
B-VT55-FE**	DECgraphic Scope. Same as VT55-EE but includes integral thermal printer for hard copy output.	BC05D-10 or BC03M-25 cable.	3995	3795	3635	70 lbs.

* Or have available. Options are user installed.

** A VT50 Series Copier User's Manual (EK-VT50-OP-001) is supplied with this model. See also Terminal Section of this catalog for ordering instructions for Copier Paper.

Interface Cable Options

Cat. No.	Description	List	Cat.	Cash	Shipping Weight
B-BC03M-25	Null Modem Cable, 25'. Connects all local serial options to DECstation 78.	$60	$57	$55	5 lbs.
B-BC05D-10	EIA Cable, 10'. Connects modems to DECstation 78 serial ports.	94	89	86	3 lbs.

Software Options

Cat. No.	Description	List	Cat.	Cash	Shipping Weight
B-QF022-AY*	OS/78 VI Binaries on two Diskettes .Documentation.	$1400	$1260	$1204	3 lbs.
B-QF020-XY†	RTS/8 Sources on one Diskette. Documentation. Needs OS/78 to function.	550	495	473	2 lbs.
B-QF680-XY†	DECNET/8 Sources on one Diskette. Documentation. Needs RTS/8 to function.	900	810	774	2 lbs.

* OS/78 package is included with each DECstation 78 ordered. † User must sign software license agreement. See p. 72 for details.

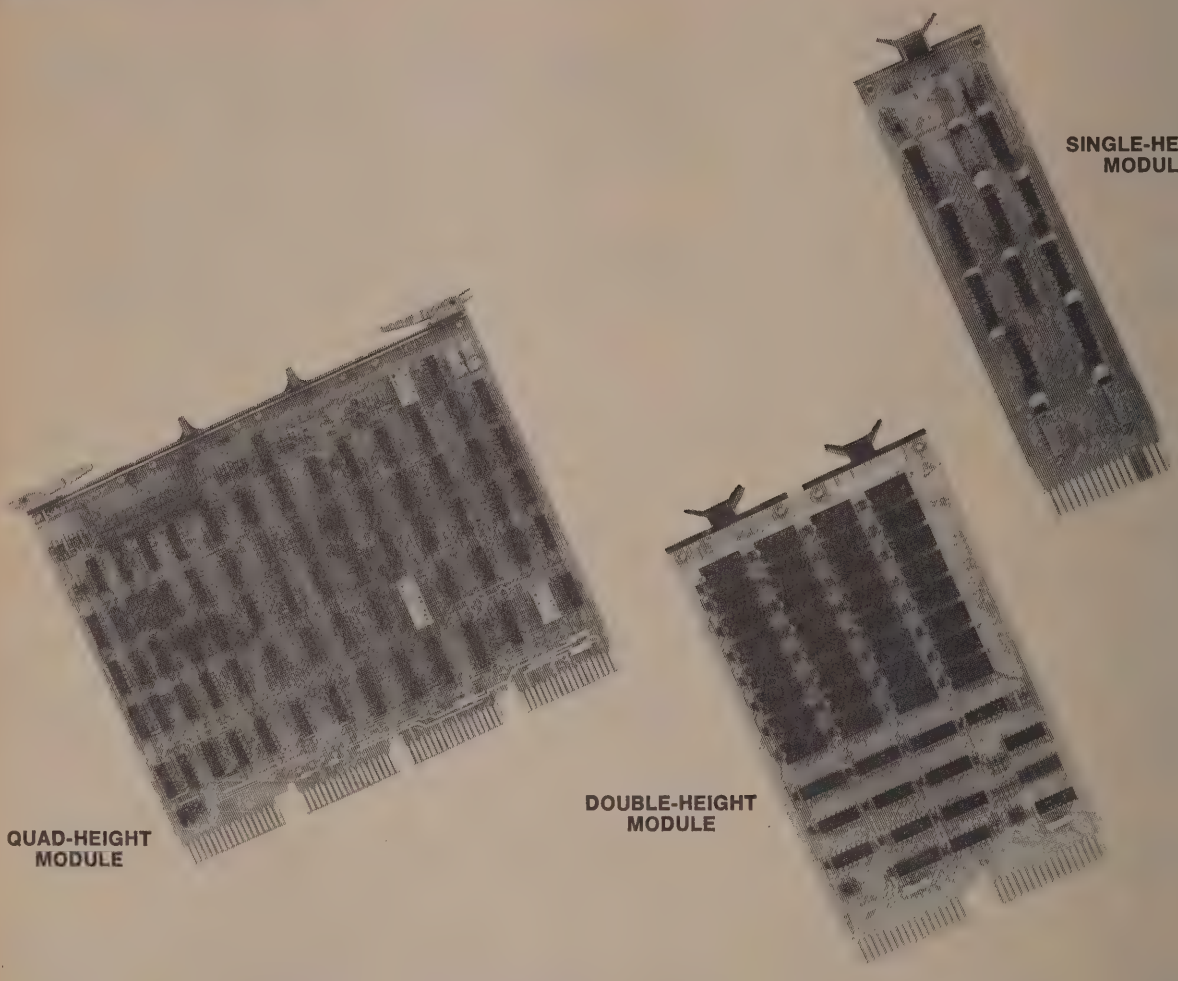
Miscellaneous Accessories

Cat. No.	Description	Cat.	Cash	Shipping Weight
B-RX01K-10	Diskettes for RV78 Floppy Disk Drive. Qty. 10 per box.	$71.25	$68.25	1 lb.

CALL: 800-258-1710 (N.H. Residents 603 - 884-6660) 8:30 am to 5 pm EST.

digital MODULES

DIRECT SALES CATALOG



See page 107 for physical description.

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DIRECT SALES CATALOG

The Direct Sales Catalog is:
LOGIC MODULES

These are the same modules used in DIGITAL's products and by hundreds of OEM's for computer interfacing, instrumentation, data gathering, and control. If you're in the business of designing, assembling, or testing logic subsystems, then purchasing the components through this catalog makes sense. You probably know what you need, the specification criteria required, and how to implement the design. In other words, you don't need a sales presentation by DIGITAL. We can pass that cost savings directly to you when you order through this catalog.

Featured are DIGITAL's M Series TTL-integrated circuit modules. The M Series line consists of modules ranging from basic and fundamental logic modules to self-contained computer interfacing modules. The impact of advancing technology can be seen in M Series evolution. From the beginning, M Series was TTL-integrated circuit-oriented; the current trend is toward MSI and LSI. The result is more complexity (and more built-in design solutions) per module. Many of the modules in this catalog amount to full-scale digital subsystems. The microcomputer is the latest result of the continuing technological advancements. As the leading supplier of logic modules, DIGITAL applied this micro concept to a family of modules designated LSI-11 and LSI-11/2. See details starting on p. 38 in this catalog.

Also offered through the Direct Sales Catalog are A-Series analog modules and computer interface modules (for both the PDP-8 and PDP-11), computer systems, mounting hardware, power supplies, and cabling. All these support functions provide a total capability for designing, implementing, and assembling a modular system, small or large, at the lowest cost per function in the industry. P. 107 in this catalog explains the physical aspects of DIGITAL's modules.

digital DIGITAL MODULES—M SERIES

DIRECT SALES CATALOG

M SERIES MONOLITHIC MODULES

M Series high-speed monolithic integrated circuit logic modules employ TTL (transistor-transistor logic) circuits which provide high speed, high fanout, large capacitance drive capability, and excellent noise margins.

The M Series include a full digital system complement of basic modules which are designed with sufficient margin for reliable system operation at frequencies up to 6 MHz. Specific modules may be operated at frequencies up to 10 MHz. The integrated circuits are dual-in-line packages.

GATES AND INVERTERS

Cat. No.	Description	Typical Symbol§	Load per Input	Output Drive Capability	Qty. per Module	Inputs	Size	List	Cat.	Cash	Shipping Weight (oz.)
B-M113	NAND	Fig. 1	1	10	10	2	SSS	$20	$19	$18	
B-M115	NAND	Fig. 1	1	10	8	3	SSS	21	20	19	
B-M117	NAND	Fig. 1	1	10	6	4	SSS	21	20	19	
B-M119	NAND	Fig. 1	1	10	3	8	SSS	21	20	19	
B-M617	Power — NAND	Fig. 1	1	30	6	4	SSS	28	27	25	
B-M133	High-Speed NAND	Fig. 1	1.3	12	10	2	SSS	26	25	24	
B-M135	High-Speed NAND	Fig. 1	1.3	12	8	3	SSS	24	23	22	
B-M137	High-Speed NAND	Fig. 1	1.3	10	6	4	SSS	24	23	22	
B-M139	High-Speed NAND	Fig. 1	1.3	12	3	8	SSS	26	25	24	
B-M627	Power, High-Speed NAND	Fig. 1	2.5	30	6	4	SSS	30	29	27	
B-M1131	Open Collector NAND*	Fig. 1	1	10	10	2	SSS	30	29	27	See
B-M1103	AND	Fig. 2	1	10	10	2	SSS	23	22	21	p. 161
B-M1307	AND	Fig. 2	1.3	12	6	4	SSS	28	27	25	
B-M112	NOR	Fig. 3	1	10	10	2	SSS	22	21	20	
B-M116	NOR	Fig. 3	1	10	6	4	SSS	23	22	21	
B-M141	NAND/OR	Fig. 4	1	7†	2 1	8 6	SSS	33	31	30	
B-M121	AND/NOR	Fig. 5	1	10	6	4	SSS	26	25	24	
B-M1125	EXCLUSIVE OR	Fig. 6	1	10	5	2	SSS	22	21	20	
B-M111	INVERTER	Fig. 7	1	10	16	1	SSS	26	25	24	
B-M611	Power, High-Speed INVERTER	Fig. 7	1.25	37	14	1	SSS	37	35	34	
B-M165	BUFFER	Fig. 8	4	10/10‡	8	1	SSS	33	31	30	

* Use M165 Buffer to convert open-collector output to standard configuration. See below.

† The output of each gate presents 2 unit loads when connected to another output. Thus when the outputs of all the gates on this module are connected together (to form a 16-input gate), the 3 gates present a load of 3 x 2 units to the fourth, totaling 6 units. This leaves 1 unit load capability.

‡ BUFFER converts open-collector outputs (see M1131) to inverting and non-inverting standard outputs (10 of each).

§ Symbol shown represents typical configuration.

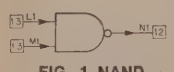


FIG. 1 NAND

FIG. 2 AND

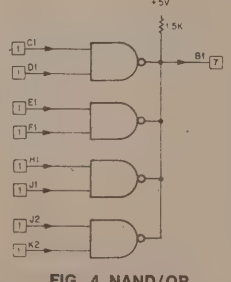


FIG. 4 NAND/OR

FIG. 3 NOR

FIG. 5 AND/NOR

FIG. 6 EXCLUSIVE OR

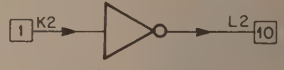


FIG. 7 INVERTER

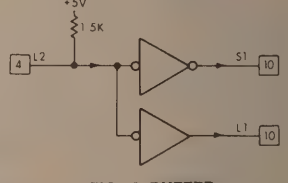


FIG. 8 BUFFER

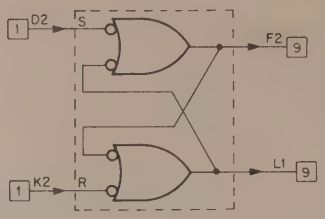
General Characteristics

Power Supply Voltage	+5V dc ±5%
Logic Levels	Input / Output Logical LOW (0): 0.0 to 0.8V / 0.0 to 0.4V Logical HIGH (1): 2.0 to 3.6V / 2.4 to 3.6V Noise Margin — Worst Case: 400 millivolts
Input and Output Loading	The input loading and output drive capability of M Series modules are specified in terms of a specific number of unit loads. Typically, the input loading is one unit; however, certain modules may contain inputs which will present greater than one unit load. The typical M Series module output will supply 10 unit loads of input loading. However, certain module outputs will deviate from a 10-unit-load capability and provide more or less drive. Always refer to the individual module specifications to ascertain actual loading figures.
Unit Load	In the logic 0 state, one unit load requires that the driver be able to sink 1.6 milliamps (maximum) from the load's input circuit while maintaining an output voltage of equal to or less than +0.4V. In the logic 1 state, one unit load requires that the driver supply a leakage current of 40 microamps (maximum) while maintaining an output voltage of equal to or greater than +2.4V.
Timing	M Series pulse sources provide sufficient pulse duration to trigger any M Series flip-flop operating within maximum propagation delay specifications. Detailed timing information appears in the **Logic Handbook.**

DIGITAL MODULES—M SERIES

R/S FLIP-FLOPS

Module M203 is made up of 8 Reset/Set flip-flops. Each flip-flop, see diagram, comprises two 2-input NAND gates with cross-coupled outputs. The load/drive capability is indicated on the diagram.



Cat. No.	Flip-flops per Module	Size	List	Cat.	Cash	Shipping Weight
B-M203	8	SSS	$27	$26	$25	See p. 161

D-TYPE FLIP-FLOPS

A D-type flip-flop functions to transfer each input (HIGH or LOW) on the D-line to the output when the threshold is reached on the leading (positive-going voltage) edge of the clock pulse (or a level change). Each flip-flop has independently gated data, clock, and dc set inputs. All, except M206, have independent dc resets. M206 has six flip-flops. One group of three has a common jumper-removable dc reset line. The other group has a permanent common dc reset. The load/drive capability is indicated on the diagrams, Fig. 1 or Fig. 2.

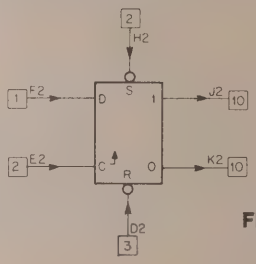
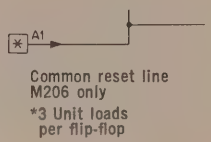


FIG. 1



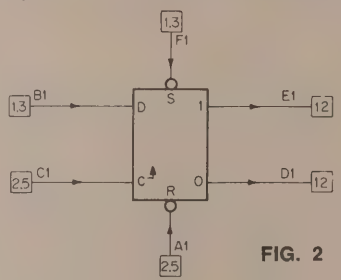


FIG. 2

Cat. No.	Description	Flip-Flops per Module	Fig.	List	Cat.	Cash	Shipping Weight
B-M205	General Purpose	5	1	$24	$23	$22	See p. 161
B-M206	General Purpose	6	1	33	31	30	
B-M246	High Speed	5	2	24	23	22	

NOTE: All Sizes are SSS

J-K FLIP-FLOPS

When both J and K inputs are HIGH, the J-K flip-flop, Fig. 1, complements (outputs change state) on the negative-going threshold of the clock pulse. A common reset (CLEAR) line is present on both M207 and M204, although three of the six flip-flops on M207 can be disconnected from the common line by removable jumpers. M202, see Fig. 3, has a 3-input AND gate on each of the J and K inputs. M204 has 2-input AND gates on both J and K inputs on one of the four flip-flops, Fig. 4, 3-input AND gates on both J and K inputs on another of the flip-flops, Fig. 2, and a 2-input AND gate on the J input of a third flip-flop, Fig. 3. One flip-flop does not have input gates, Fig. 1. The arrangement of these flip-flops permits counters to be formed (up to 16 per module) with simple connector wiring.

Load/drive capabilities are indicated on the diagrams, Fig. 1, 2 and 3.

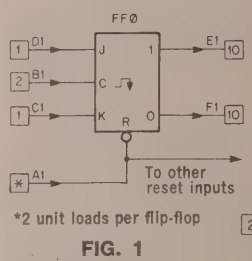


FIG. 1

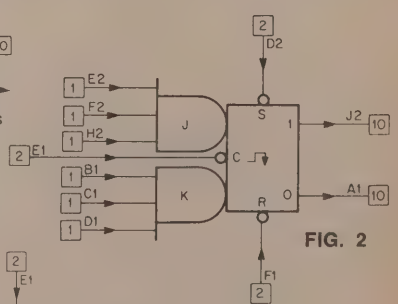


FIG. 2

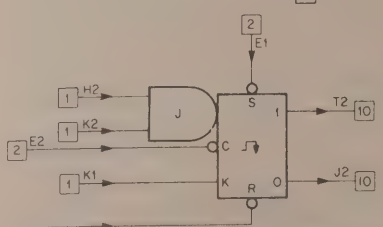


FIG. 3

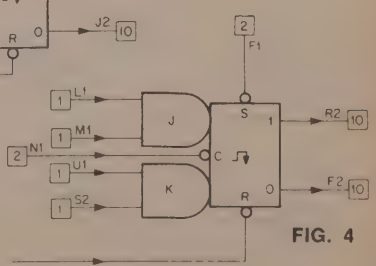


FIG. 4

Cat. No.	Description	Flip-Flops per Module	Fig.	List	Cat.	Cash	Shipping Weight
B-M207	General Purpose	6	1	$36	$34	$33	See p. 161
B-M202	ANDed Inputs	3	2	22	21	20	
B-M204	Buffer/ Counter	4	1, 2, 3, 4	28	27	25	

NOTE: All Sizes are SSS

digital DIGITAL MODULES—M SERIES

DIRECT SALES CATALOG

LOGIC AMPLIFIERS

Solenoid Drivers — M040, M060

These modules are designed to drive inductive loads such as relays and solenoids. (Use M050 for incandescent lamp loads.)

The M040, Fig. 1, contains two identical negative high-voltage driver circuits. Each consists of a 4-input positive NAND gate that controls a PNP transistor switch. The switch is capable of sinking up to 600 mA of current to ground from an external power supply of up to —70 volts. One terminal of the load device (relay, etc.) must be connected to the external voltage, the other to the drive output. The positive terminal of the external supply connects to the module ground.

The M060 module, Fig. 2, consists of four identical positive high-current driver circuits. Each circuit contains an inverting gate that controls an NPN transistor switch. A low level, at any input, will turn on the switch which is capable of driving loads up to 1.2 amps to ground with external power supply voltages of up to +75 volts dc.

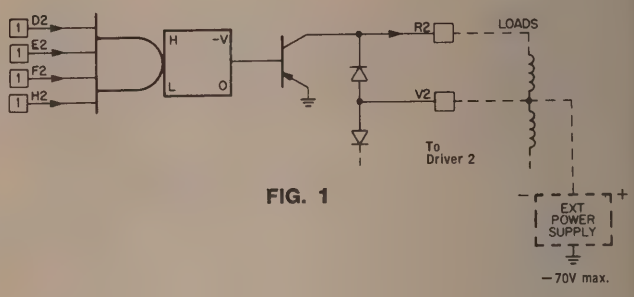


FIG. 1

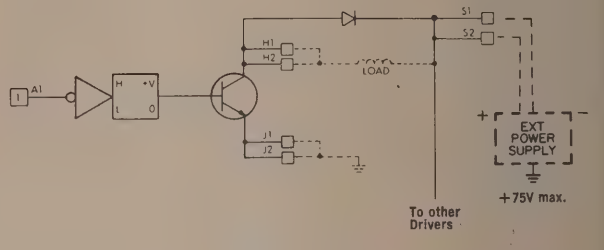
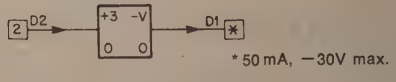


FIG. 2

Cat. No.	Size	Drivers per Module	List	Cat.	Cash	Shipping Weight
B-M040	SSS	2	$43	$41	$39	See p. 161
B-M060	SSS	4	60	57	55	

Incandescent Lamp Driver — M050

The M050 contains twelve transistor inverters that can drive miniature incandescent bulbs such as those on an indicator panel. A LOW level on the input of the driver causes current to flow in the output. Do not use to drive inductive loads (relays, solenoids). Each output is able to drive 50 mA into an external load connected to any voltage up to —30 volts.



Cat. No.	Size	Drivers per Module	List	Cat.	Cash	Shipping Weight
B-M050	SSS	12	$36	$34	$33	See p. 161

Cable Driver, Positive Level — M660

The M660 Cable Driver consists of three NAND gate circuits each of which will drive a 100-ohm terminated cable with M Series levels or pulses of duration greater than 100 ns. The output is not open-collector. It is a discrete transistor totem pole configuration similar to an IC gate providing high current drive in both the high and low directions. Outputs can sink 50 mA at a logic LOW, and can source 50 mA at a logic HIGH.

Cat. No.	Size	Drivers per Module	List	Cat.	Cash	Shipping Weight
B-M660	SSS	3	$29	$28	$26	See p. 161

? NEED SOME QUICK ANSWERS ?

Ask our Direct Sales Catalog Staff. They are all knowledgeable and can answer most of your questions rightaway — or send you back-up literature — or connect you with an applications expert — or, do just about anything that can possibly be done to make it easy for you to buy the Direct Sales Catalog Way. Put them through their paces. Call 800-258-1710 (N.H. residents 603 - 884-6660) between 8:30 am and 5 pm EST.

DIGITAL MODULES — M SERIES

CLOCK MODULES

Crystal Controlled Clock — M4050

The M4050 is a crystal controlled clock module that provides both positive- or negative-going 80 ns pulses at a frequency range from 5 kHz to 5 MHz. The module has a series of jumper leads mounted between split lugs on the board which can be removed to select four frequency ranges. Once the proper range has been selected, the output clock frequency is determined by a plug-in crystal. The module can be effectively used in applications requiring accurate pulses at stable frequencies. Driving capability is 10 unit loads for the positive going and 9 for the negative going output pulses.

The frequency must be specified by the user and the appropriate jumpers will be removed at DIGITAL for the frequency ranges required.

The M4050 is available in several standard frequencies listed below. Be sure to list the frequency range desired when ordering. Standard frequency ranges available: 1.333 MHz; 2.0 MHz; 5.0 MHz.

Crystal Clock — M405

The M405 employs a crystal oscillator to provide a highly stable, precisely known frequency between 5 kHz and 10 MHz. The frequency within this range may be specified by the user.

Outputs at the two output pins are respectively positive and negative going 50 ns pulses. Pulses are time shifted by one gate delay with the negative pulse leading the positive pulse by a maximum of 20 ns. The output pulse width can be modified by the addition of an external capacitor to increase the output pulse width by approximately 1 ns per 2.5 pF of additional capacitance. Frequency stability is 0.01% of specified value between 0°C and +55°C. Standard stock frequencies are 1.333 MHz, 2 MHz, 5 MHz. Driving capability in unit loads is 10 for the positive going and 9 for the negative going pulses.

Multivibrator Clock — M403

The M403 is an RC Multivibrator Clock which produces standard 10-microsecond timing pulses, positive-going and negative-going, at repetition rates adjustable from 1 kHz to 50 kHz in three ranges. Internal capacitors, selected by jumper pin connection, provide coarse frequency control, while an internal potentiometer provides continuously variable adjustment within each range.

The clock circuit is enabled by a HIGH level at the ENABLE input. If a LOW level is applied, the clock output will time out.

Lower frequencies and wider pulse widths can be derived by adding external capacitance. Driving capability is 10 unit loads and 9 unit loads on positive-going and negative-going, respectively. ENABLE input is one unit load.

Multifrequency Crystal Clock — M404

The M404 clock contains a 2 MHz crystal oscillator and frequency dividers.

A HIGH on the CLEAR input (one unit load) clears the frequency divider and all outputs go LOW except the 2 MHz output, which is not affected. Maximum error from specified output frequency is 0.01% between 0°C and +55°C.

Output frequencies from the divider are 5, 10, 12.5, 50, 100, 125, 250, 500 kHz and 1 and 2 MHz.

Variable Multivibrator Clock — M401

The M401 Variable Clock is a stable RC-coupled multivibrator which produces standard 50 ns (positive or negative going) timing pulses at adjustable repetition rates.

Repetition rate is adjustable from 175 Hz to 10 MHz in five ranges. Internal capacitors, selected by jumper pin connections, provide coarse frequency control. An internal potentiometer provides continuously variable adjustment within each range.

A 0 to 10 volt control voltage will vary the frequency over about 30% of each frequency range.

A two-input OR gating input (each input is one unit load) is provided for start-stop control of the pulse train. A level change from HIGH to LOW with fall time less than 400 ns is required to enable the clock.

Output driving capability is 10 and 9 unit loads for the positive-going and negative-going pulses.

Cat. No.	Size	Description	Circuits per Module	List	Cat.	Cash	Shipping Weight
B-**M405**	SSS	Crystal Clock	1	$120	$114	$109	
B-**M403**	SSS	Multivibrator Clock	1	50	48	46	
B-**M404**	SSS	Multifrequency Crystal Clock	1	89	85	81	See p. 161
B-**M401**	SSS	Variable Multivibrator Clock	1	60	57	55	
B-**M4050**	ESS	Crystal Clock	1	120	114	109	

CATALOG NUMBERS VS MODEL NUMBERS

The Catalog Numbers published in this catalog relate only to purchases made through the Direct Sales Catalog. The **Bold Face** portion of each Catalog Number is the official DIGITAL Model Number. All invoices and packing slips will reference only the Model Number.

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DIGITAL MODULES—M SERIES

PULSE-SHAPING, DELAYING MODULES

Delay and Stretch — M3020

The M3020 Module contains two independent monostable multivibrators, each of which is activated by the output of its own integral Schmitt Trigger circuit. A low input transition on any one of the three inputs to the Schmitt Trigger circuit produces a positive output pulse after a preset adjustable delay and triggers the multivibrator. Minimum duration of a low pulse is 50 ns. The Schmitt Trigger input provides hysteresis which prevents the multivibrator from being triggered erroneously by noise signals at the input. Each trigger input is three unit loads.

When activated, the multivibrator produces a positive pulse at the output. The width of the pulse is variable from 50 ns to 50 sec and is selected by the external connections to capacitors mounted on the M3020 and by the variable Vcc available.

The delay time is adjustable from 50 ns to 7.5 ms using the internal capacitors and can be extended by adding an external capacitor.

Output drive capability is 10 unit loads.

Pulse Amplifier/Generator — M602

The M602 contains two pulse amplifiers which provide power amplification and transform level changes into pulses. A negative pulse output is produced when the input is triggered by a transition from HIGH to LOW on any one of three (per circuit) inputs to an integral OR gate. Each input is three unit loads. An internal capacitor is brought out to pin connections to permit the standard 50 ns output pulse to be increased to 110 ns (nominal). Drive capability is 30 unit loads per amplifier.

Schmitt Trigger — M501

The M501 is a Schmitt Trigger with variable thresholds and complementary positive logic outputs. Its applications are varied and include use as a: switch filter, pulse shaper, threshold detector.

The input voltage (not to exceed ±20 volts) is compared with the thresholds set on pins UPPER and LOWER, respectively. Output goes to LOW when the input rises above the UPPER THRESHOLD, having been below the LOWER THRESHOLD. Output rises to +3 volts when the input falls below the LOWER THRESHOLD, having been above the UPPER THRESHOLD. A second output is the complement of the first.

An integrator is provided on the input, allowing switches to be connected to the Schmitt Trigger with contact bounce effects eliminated. Two switch time constants are provided: a 7 ms time constant and a 3.5 ms time constant.

Integrating One-shot — M306

The M306 is a zero-recovery-time integrating monostable multivibrator with complementary outputs. The M306 has the ability to respond to an input even while in the active state, so that successive inputs above a preset frequency can postpone the return to the inactive state indefinitely.

An input pulse (2 unit loads) of 30 ns will trigger the M306. The output pulse width is a minimum of 225 ns with maximum width limited only by capacitor leakage (40 sec is typical max.). Timing is adjusted by externally added capacitors and a multiturn potentiometer as the module. Drive capability is 11, and 12 unit loads on the positive-going and negative-going outputs, respectively.

Delay Line — M310

The M310 consists of a tapped delay line with associated circuitry and two pulse amplifiers. The total delay is 500 ns with taps available at 50 ns intervals. Applications are in timing pulse trains and pulse spacing.

The pulse amplifiers standardize the outputs of the delay line. The output of the pulse amplifier is a positive pulse whose duration is typically 50 to 200 ns. These amplifiers are not intended to be driven by TTL IC logic. Input to the delay line is three unit loads.

Outputs from the delay line must be connected to the input of the pulse amplifiers. Each pulse amplifier can drive 30 unit loads.

Cat. No.	Size	Description	Circuits per Module	List	Cat.	Cash	Shipping Weight
B-**M3020**	SSS	Delay/Stretch	2	**$44**	**$42**	**$40**	
B-**M602**	SSS	Amplifier/Generator	2	**33**	**31**	**30**	
B-**M501**	SSS	Schmitt Trigger	1	**29**	**28**	**26**	See p. 161
B-**M306**	SSS	Integrating One-Shot	1	**42**	**40**	**38**	
B-**M310**	SSS	Delay Line	1	**60**	**57**	**55**	

MISCELLANEOUS

Logic HIGH Source — M002

To hold unused M Series TTL gate inputs HIGH, the M002 provides 15 outputs at +3 volts (logic HIGH). Up to 10 unused M Series gate inputs may be connected to any one output.

The M002 can also be used as pull-ups for open-collector outputs in a wired-OR situation. If an M002 circuit is driven by a gate, it appears as two TTL unit loads or 3.2 mA at ground.

Cat. No.	Size	List	Cat.	Cash	Shipping Weight
B-**M002**	SSS	**$15**	**$14**	**$14**	See p. 161

DIGITAL MODULES—M SERIES

MISCELLANEOUS (Cont'd)

Parity Circuit — M162

The M162 contains two parity detector circuits. Each circuit indicates whether the binary data presented to it contains an ODD or EVEN number of ONES by a HIGH level on specific output pins. Each input data line represents 4 unit loads. The ODD parity HIGH output can drive 6 unit loads. The ODD parity LOW output can drive 10 unit loads.

Cat. No.	Size	Circuits per Module	List	Cat.	Cash	Shipping Weight
B-M162	SSS	2	$38	$36	$35	See p. 161

MSI Module Board — W960

The W960 MSI Module Board is a single-height, standard length module board that can accommodate either two 14- or 16-pin dual-in-line package (DIP) integrated circuits (ICs) or one 24-pin DIP IC, either with or without sockets. All IC pin plated-through hole locations are identified with their associated board contact finger and are all brought out to the board contact fingers via printed circuit etching.

Cat. No.	List	Cat.	Cash	Shipping Weight
B-W960	$9	$9	$8	See p. 161

Universal Terminator Board — W964

The W964 Universal Terminator Board is a single-height, standard length module. It is an etched and drilled module that can be used for mounting user-selected and user-supplied discrete components to provide a variety of termination or voltage source circuits for up to 28 signal pins. Each signal pin can have two components connected to ground and one component connected to +5 volts. Any discrete component can be mounted on the W964 if the physical size is approximately the size of a ¼-W resistor or disk capacitor.

Cat. No.	List	Cat.	Cash	Weight Shipping
B-W964	$11	$10	$10	See p. 161

DECODERS AND MULTIPLEXERS

Decoders — M155, M161, M163, M230

The M155 Module decodes the binary value on the four input lines into one of sixteen mutually exclusive outputs when both STROBE inputs are LOW. The de-multiplexing function is performed by using the four input lines to address the output line. When either STROBE input is HIGH, all outputs are HIGH. Any output can drive 10 unit loads. All inputs present one unit load each.

The M163 Module consists of two binary-to-decimal decoder circuits, each of which accepts four inputs and provides 10 mutually exclusive outputs. The most significant 2^3 input can be used as an enable function to allow the circuits to be used as a binary-to-octal decoder. Outputs 0 through 7 will remain HIGH as long as input 2^3 is HIGH. Any output can drive 10 unit loads. Each input presents one unit load.

The M161 is a functional decoding module which can be used as a binary-to-octal or binary-coded decimal (8421 or 2421 codes) to decimal decoder. Three ENABLE inputs are provided for selective enabling of modules in decoders of more than one octal or decimal digit. In the octal mode, the bit 2* input should be connected to ground, which automatically inhibits the 8 and 9 outputs. A HIGH and a LOW version of each output is provided. All outputs can drive 10 unit loads each. Code inputs present one unit load each; ENABLE inputs 2 each.

The M230 converts a binary number to its binary coded decimal equivalent or a binary coded decimal number to its binary equivalent.

The maximum number that can be applied to the BCD input is 4095 which will result in all ones at the binary output. The maximum value of all ones applied to the binary input will result in the value 4095 at the BCD output. This converter utilizes a counting technique where the count frequency is typically 5 MHz. Therefore, the conversion time for the maximum number is typically 0.82 millisecond. The M230 is fully cascadable. All outputs can drive 10 unit loads. Each input presents 1 unit load.

Cat. No.	Size	Decoders per Module	List	Cat.	Cash	Shipping Weight
B-M155	SSS	1	$31	$29	$28	
B-M163	SSS	2	30	29	27	See
B-M161	SSS	1	38	36	35	p. 161
B-M230	SSS	1	77	73	70	

Multiplexers — M1713, M1701

The M1713 Module is a 1-of-16 data selector/multiplexer. A 4-bit binary code defines which of the 16 data inputs will be connected to the output when STROBE is LOW. All inputs present one unit load. The output can drive 10 unit loads.

The M1701 Data Selector contains two independent dual 4-line to 1-line multiplexers on a single-height module. Each dual multiplexer has two groups of DATA INPUTS, two STROBES, two OUTPUTS and common SELECT inputs (2-bits). An OUTPUT becomes active for a DATA INPUT when the DATA INPUT is addressed by the SELECT lines and the corresponding STROBE brought LOW. All inputs present one unit load each. Outputs can drive 10 unit loads each.

Cat. No.	Size	Description	Muxes per Module	List	Cat.	Cash	Shipping Weight
B-M1713	SSS	16-to-1	1	$21	$20	$19	See
B-M1701	SSS	4-to-1	4	26	25	24	p. 161

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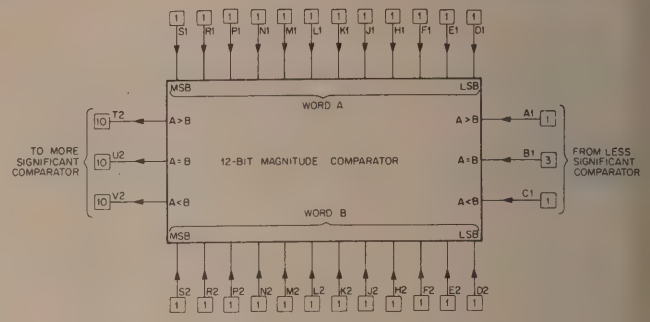
DIGITAL MODULES—M SERIES

COUNTERS AND ARITHMETIC MODULES

Magnitude Comparator, 12-bit — M168

The M168 12-bit Magnitude Comparator performs magnitude comparison of two 12-bit words. One of the three outputs, A > B, A = B or A < B will be high to indicate the relative magnitude of the two binary input words.

The M168 Comparator may be cascaded to compare longer words. The outputs T2, U2 and V2 should be connected to the corresponding inputs of the next comparator which are A1, B1 and C1 respectively. The inputs of the first comparator must all be made a logical "1."



Cat. No.	Size	List	Cat.	Cash	Shipping Weight
B-M168	SSS	$50	$48	$46	See p. 161

Up/Down Counters — M236, M237, M238

These three up/down counters are fully programmable; that is, the outputs may be preset to any state by entering the desired data at the DATA inputs while the LOAD input is LOW. The output will change to agree with the DATA inputs independently of the COUNT pulses, This feature allows the counters to be used as modulo-N dividers by simply modifying the count length with the preset inputs. These counters were designed to be cascaded without the need for any external circuitry.

The M238 Module consists of two identical 4-bit binary counters. Synchronous operation is provided by having all flip-flops clocked simultaneously so that the outputs change coincidentally with each other.

The outputs are triggered by a LOW to HIGH level transition of either COUNT input. The direction of the counting is determined by which COUNT input is pulsed while the other COUNT input is HIGH. All outputs can drive 10 unit loads. All inputs present one unit load each.

The M236 is a 12-bit synchronous binary up/down counter. It has a single control input that can switch the counting mode from up to down without disturbing the contents of the counter. Counting occurs on a positive transition of the COUNT IN line. This input must remain LOW for at least 50 ns before the count. Time between pulses can be no less than 50 ns. There is no maximum for pulse width or time between pulses. The maximum count frequency is 10 MHz. The ENABLE input permits counting while it is HIGH, and disables counting while it is LOW. All outputs can drive 10 unit loads. ENABLE and COUNT inputs present one unit load. LOAD and UP/DOWN control present three unit loads each. Data inputs present one load each.

The M237 is a 3-digit synchronous BCD up/down counter. It has a single control input that can switch the counting mode from up to down without disturbing the contents of the counter. Counting and ENABLE action is the same as described above for the M236. So, too, are load/drive capabilities.

Cat. No.	Size	Description	Counters per Module	List	Cat.	Cash	Shipping Weight
B-M238	SSS	4-bit binary	2	$44	$42	$40	See p. 161
B-M236	SSS	12-bit bin.	1	58	55	53	
B-M237	SSS	3-digit BCD	1	58	55	53	

Counter/Register, 4-bit — M239

The M239 Module consists of three high-speed, four flip-flop stage elements. It provides 12-bit data storage or a serial counter with 12-BCD outputs. All inputs and outputs are TTL or DTL compatible with a drive capability of 10 unit loads (TTL). All inputs present one unit load each. Each of the 12 flip-flops has a data line input, and data information is entered by a COUNT/LOAD signal associated with each 4-bit stage. The output of the flip-flops assumes the logic state of the data inputs when the COUNT/LOAD input signal is HIGH. When the COUNT/LOAD signal is LOW, the data inputs are disabled, provided the clock inputs are inactive.

The Q_A output of each latch within a 4-stage element is connected to the toggle (T) input of the following latch. This allows the module to be used as a high-speed counter or serial-to-BCD converter.

The counters will accept frequencies of 0-50 MHz at the CLOCK 1 input, and the transfer of information to the outputs occurs at the positive-going edge of this clock pulse.

Cat. No.	Size	Registers per Module	List	Cat.	Cash	Shipping Weight
B-M239	SSS	3	$44	$42	$40	See p. 161

LOGIC HANDBOOK

The Logic Handbook, known as the computer industry's "bible" on logic design, gives you the technical story on general purpose computer interfacing, various cable configurations, system boxes and enclosures, special purpose interfaces and a host of other compatible equipment.

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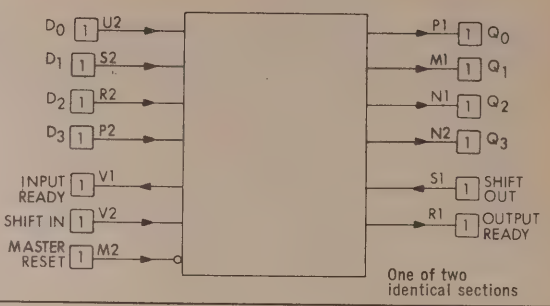
DIGITAL MODULES—M SERIES

MEMORY AND REGISTERS MODULES

Serial FIFO Memory — M2500 / 64 4-bit Words (Dual)

The M2500 Module provides storage for 64 4-bit words in each of two memory elements. The words are stored and read asynchronously on a first-word-in, first-word-out basis. By series coupling the two memory elements, the total storage capacity can be increased to 128 4-bit words. The two memory elements can also be paralleled, using external logic, to form storage for 64 8-bit words.

Cat. No.	Size	Elements per Module	List	Cat.	Cash	Shipping Weight
B-M2500	SSS	2	$83	$79	$76	See p. 161



Shift Register, 4-bit (Dual) — M245

The M245 Module consists of two 4-bit shift registers with both serial and parallel data entry capability. They are shift-right only registers; that is, the output data is shifted from A toward D.

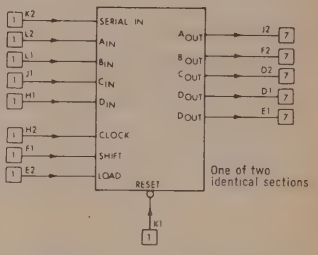
Three control modes are possible: serial shift right, parallel enter mode, and no change or hold mode. These control modes are chosen by inputs at the SHIFT and LOAD lines.

In the serial mode of operation, data present at the SERIAL INput, when the SHIFT input is High, is loaded on the Low-going edge of the CLOCK pulse.

In the parallel entry mode, data present at the data inputs A IN through D IN, when the LOAD line is High, is loaded on the Low-going edge of the CLOCK pulse.

The hold mode is created by holding both the LOAD and SHIFT lines Low. By doing this, the CLOCK pulse will have no effect on the output, regardless of data present at the SERIAL INputs or DATA INputs.

A RESET line has been provided for the registers which will clear the internal flip-flop circuitry.



Cat. No.	Size	Registers per Module	List	Cat.	Cash	Shipping Weight
B-M245	SSS	2	$31	$29	$28	See p. 161

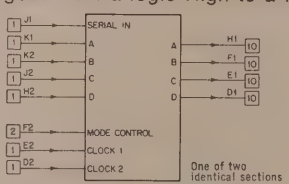
Shift Register, Multipurpose 4-bit (Dual) — M248

The M248 Module consists of two 4-bit Shift registers — multipurpose in the fact that they are capable of either serial or parallel entry, shifting right, or with simple external connections, shifting left.

When a logic LOW is applied to the MODE CONTROL input, a shift right operation is performed by clocking at the CLOCK 1 input. In this mode, serial data is entered at the SERIAL INput. CLOCK 2 and parallel inputs A through D are inhibited.

When a logic HIGH is applied to the MODE CONTROL input, it allows entry of parallel data through inputs A through D and CLOCK 2. This mode permits parallel loading of the register or, with external interconnection, shift left operation. In this mode, shift left can be accomplished by connecting the output of each flip-flop to the parallel input of the previous flip-flop; that is, D output to C input, etc., and serial data is entered at input D.

Two clock inputs are available which permit separate clock sources to be used for the shift right and shift left modes. If both modes can be clocked from the same source, the clock input may be applied to both CLOCK 1 and CLOCK 2. The transfer of information to the output pins occurs when the clock input goes from a logic High to a logic Low.



Cat. No.	Size	Registers per Module	List	Cat.	Cash	Shipping Weight
B-M248	SSS	2	$28	$27	$25	See p. 161

Tri-state Register, 4-bit (Dual) — M2001

The M2001 is a dual, 4-bit register module consisting of D-type flip-flops and input and output gating. It provides a total of eight bits of data storage and outputs to interface directly to system bus. All input and output signals are through edge board connector. Each of the module output contains a tri-state circuit capable of driving low-impedance, high-capacitance loads without the use of pull-up or interface components. The third state of the output is a high-impedance state and is selectable by logic levels to the input of the module. This state effectively disconnects the register outputs from the bus when no information transfer is required. Up to 128 of these outputs can be connected together in a wired-OR configuration. All inputs present one unit load. All outputs can drive 10 unit loads each.

Cat. No.	Size	Registers per Module	List	Cat.	Cash	Shipping Weight
B-M2001	SSS	2	$44	$42	$40	See p. 161

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COMMUNICATIONS

Asynchronous Transceiver — M7390

The M7390 Asynchronous Transceiver Module is a complete serial-line interface for use with data communications equipment. Full-duplex operation, selectable baud rates, parity selection, and programmable word length features provide this module with considerable flexibility. It contains input/output level converters (for 20 mA current loop or EIA RS-232-C signals), parallel-to-serial and serial-to-parallel converters (for transmitting and receiving asynchronous serial data), and a crystal-controlled clock (for frequency stability) and frequency-divider circuitry (for variable transmission and reception rates) on a single module.

The transmitter section of the module accepts parallel data from either a terminal device or a computer, serializes it, formats it by appending selected control and error-detecting bits, and transmits this word serially.

The receiver section accepts serial data, converts it to parallel information, checks the received word for the correct control and error-detecting bits, and presents the parallel word at the output terminals of the module.

Cat. No.	Size	List	Cat.	Cash	Shipping Weight
B-M7390	EDS	$218	$207	$198	See p.161

EIA Level Converter — M594

The M594 Module is used to convert the signal voltage levels between DIGITAL data processing terminal equipment such as the DF11 Modem and data communications equipment such as a Bell data set. The M594 provides circuits to convert a maximum of eight EIA or CCITT signal levels to eight DTL or TTL signals that are compatible with DIGITAL logic, and circuits to convert a maximum of seven DIGITAL, TTL, or DTL logic signal outputs to seven signals compatible with EIA or CCITT signal devices. Refer to EIA Standard RS-232-C for description of the selected signals.

Cat. No.	Size	List	Cat.	Cash	Shipping Weight
B-M594	SSS	$94	$89	$86	See p. 161

Optic-coupled 20 mA Loop Interface — M598

The M598 module contains a single-channel transmit and a single-channel receive circuit capable of converting the data signals between a Teletype® or similar current loop device and TTL or DTL compatible logic circuits. The data signals transferred through each of the module circuits are optically-coupled to provide a maximum of 1500V isolation between the current loop and the TTL logic. The transmitter receives serial TTL or DTL compatible levels and controls an output current loop with a maximum current of up to 80 mA.

The M598 module is supplied with jumper leads installed to operate as a passive element providing no current to the current loop device. By rewiring the jumper leads on the transmitter and receiver circuits, the module can be an active element and supply current from a +5V dc or −15V dc source.

Cat. No.	Size	List	Cat.	Cash	Shipping Weight
B-M598	ESS	$77	$73	$70	See p. 161

Teletype® Transmitter — M707 / Teletype® Receiver — M706

The M707 Teletype® Transmitter is a parallel-to-serial teletype code converter self-contained on a double height module. This module includes all of the parallel-to-serial conversion, buffering, gating and timing (excluding only an external clock) necessary to transfer information in an asynchronous manner between a parallel binary device and a serial data line or teletype device.

The M706 Teletype® Receiver is a serial-to-parallel teletype code converter self-contained on a double height module. This module includes all of the serial-to-parallel conversion, buffering, gating, and timing (excluding only an external clock) necessary to transfer information in an asynchronous manner between a serial data line or Teletype® device and a parallel binary device.

The M707 and M706 Module include the necessary gating so that they can be used in a half-duplex system with each other. Device selector gating is also provided so that these modules can be used on the positive bus of either the PDP8/I or the PDP8/L.

Cat. No.	Size	Description	List	Cat.	Cash	Shipping Weight
B-M707	SDS	Transmitter	$110	$105	$100	See p. 161
B-M706	SDS	Receiver	82	78	75	

Optic Isolators Input/Output — M5864/M6865

The M5864 Optic Isolator Input Module and the M6865 Optic Isolator Output Module are used to electrically isolate and/or convert signal levels between peripheral devices and a TTL-compatible interface of a processor or controller system. The M5864 interconnects with the DR11-L Two-Word Input UNIBUS Interface. M6865 interconnects with the DR11-M Two-Word Output UNIBUS Interface.

Each module contains 20 optically-coupled circuits, each of which provides signal isolation between the input and output of the module. The data signals are optically-coupled to provide a maximum of 1500V isolation between the current loop and the TTL logic. The M5864 Input Module has 18 input circuits that accept levels from current-producing devices and convert these signals to TTL-compatible levels. Each TTL can drive 10 unit loads.

Two **output** circuits accept TTL-compatible levels from the interface and control the conduction of two floating transistor outputs whose outputs are capable of switching 8 mA current each.

Conversely, the M6865 Output Module has 18 output circuits that accept TTL-compatible levels from the interface to control the conduction of the 18 floating transistors in the optic couplers. Each TTL input is 10 unit loads while each of the transistor outputs is capable of switching 1.6 mA of current. As with the M5864, the data signals are optically-coupled to provide a maximum of 1500V isolation between the current loop and the TTL logic. Two **input** circuits receive controlling signals from current-producing devices and convert these signals to TTL-compatible levels.

Cat. No.	Size	Description	List	Cat.	Cash	Shipping Weight
B-M5864	EDD	Input	$132	$125	$120	See p. 161
B-M6865	EDS	Output	116	110	106	

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ANALOG MODULES—A SERIES

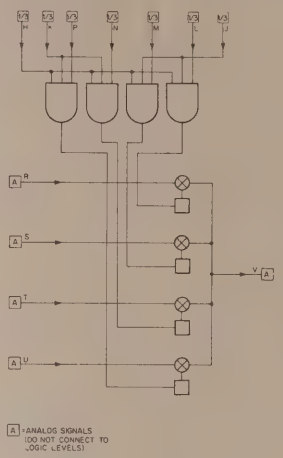
A Series analog modules support the M Series by providing a two-way translation between continually varying real-world voltage measurements and the digital realm of control and computation. The A Series emphasizes 10- and 12-bit performance in a family of mutually compatible functions — multiplexers, operational amplifiers, and A/D converters.

Analog Multiplexer — A123

The A123 Multiplexer provides 4 gated analog switches that are controlled by logic levels of 0V and +3V. The module is equivalent to a single-pole, 4-position switch, since the output terminals of each MOS FET switch are tied together. If all three digital inputs of a gating circuit are at +3V (or not connected), MOS FET switch is "closed." If any digital input is a 0V, the related switch is "open." Two switches should not be on at the same time. The analog switch can handle signals between +10V and −10V, with currents up to 1 mA.

The positive power supply must be between +5V and +15V, and at least equal to or greater than the most positive excursion of the analog signal. The negative power supply must be between −5V and −20V, and at least 10V more negative than the most negative excursion of the analog signal. The voltage difference between the two supplies must not be more than 30V.

Cat. No.	Size	List	Cat.	Cash	Shipping Weight
B-A123	SSS	$75	$71	$68	See p. 161

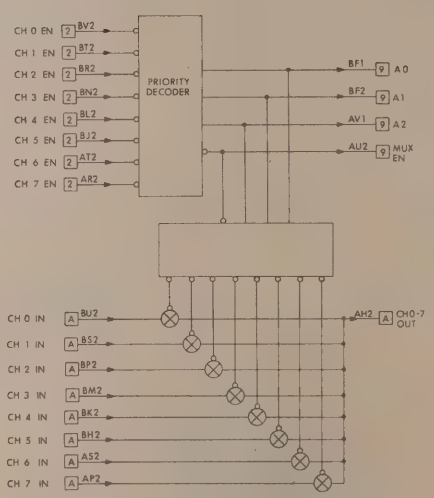


Analog Multiplexer, 8-channel — A126

The A126 is an eight-channel, high-impedance multiplexer module with each channel controlled by an associated enable input. The conduction or non-conduction of each channel is controlled by FETs and the channel outputs are connected together to a common terminal. Each channel is capable of switching bipolar (±12V) analog signals and is protected against random switching in the event of overvoltage and power down or loss of power conditions.

The enable inputs, associated with each channel, are priority encoded to ensure that only one channel is connected to the output at a time. Therefore, more than one channel enable input can be asserted at one time. Channel 0 is the highest priority and Channel 7, the lowest priority. The enable signals required are TTL or DTL compatible levels. Three TTL outputs are provided for identifying the selected channel, and one TTL multiplexer enable output indicates that one of the eight channels has been selected. The selected channel number is specified by an octal code on lines A0-A2.

Cat. No.	Size	List	Cat.	Cash	Shipping Weight
B-A126	SDS	$83	$79	$76	See p. 161

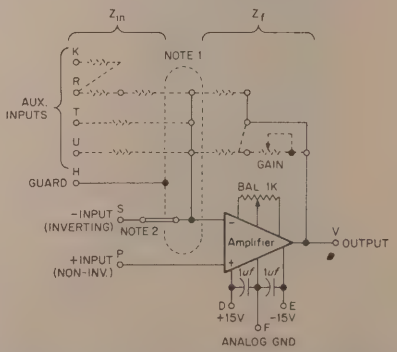


Operational Amplifier — A207

The A207 is an economical Operational Amplifier featuring fast settling time (5 μs to within 10 mV), making it especially suited for use with Analog-to-Digital Converters. The A207 can be used for buffering, scale-changing, offsetting, and other data-conditioning functions required with A/D Converters. All other normal operational amplifier configurations can be achieved with the A207.

The A207 is supplied with a zero balance potentiometer. Provisions are made on the board for the mounting of input and feedback components, including a gain trim potentiometer. The A207 is pin-compatible with the A200 Operational Amplifier. DC open loop gain, 670 ohm load is 15,000 min. and slewing rate is 3.5V μs min. Max. output is ±10V dc at 15 mA. Input voltage range is ±10V dc. Input impedance is 100K ohms min. with an input offset drift vs. temperature of 60 μV/°C. Temperature range is 0°C to 60°C.

Cat. No.	Size	List	Cat.	Cash	Shipping Weight
B-A207	SSS	$57	$54	$52	See p. 161



NOTE 1. Mounting holes are provided on the module so that input and feedback components can be added. Components shown with dashed lines are not included with the module.

NOTE 2. This jumper comes with the module. It may be removed to suit circuit requirements.

CALL: 800-258-1710 (N.H. Residents 603 - 884-6660) 8:30 am to 5 pm EST.

digital
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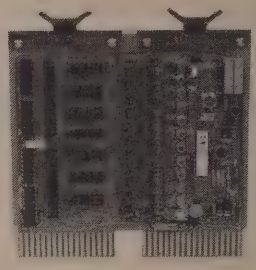
ANALOG MODULES—A SERIES

A/D Converter, High Speed, 12-bit Bipolar — A866



The A866 is a 12-bit general purpose analog-to-digital converter module which uses the successive approximation technique. The A866 is designed to accept unipolar or bipolar single-ended analog voltage as input and convert it to a 12-bit TTL-compatible, coded digital output. The coded digital output is parallel data and is available for application to a computer, terminal, display, or other logic device.

the selection of unipolar or bipolar and voltage range of the analog input is determined by jumper leads mounted on the module circuit board. he module has factory-installed jumpers that permit its use with bipolar, 10V full-scale extended-range inputs. By changing the jumper configuration, the user can select bipolar or unipolar, 5V or 10V full scale extended or non-extended input ranges.

The A866 can be used wherever fast, accurate analog-to-digital conversions are required.

The high input impedance (100 megohms) at the analog inputs minimizes the signal source loading, and the fast conversion time permits an encoding rate at the output of 16,000 coversions per second.

The digital output data, the output control and status signals, and the input control signals are all TTL-compatible.

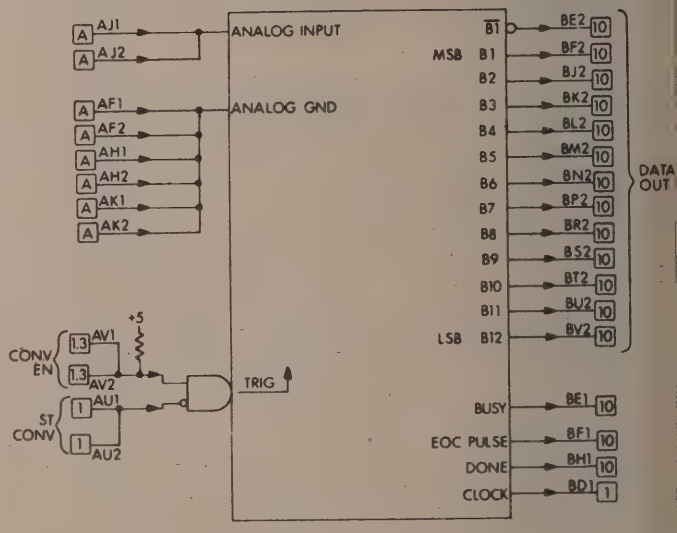
Three outputs are provided to indicate the status of the conversion process. The BUSY output becomes high and remains high while the conversion process is active. The BUSY output becomes low 50 ns after the data is available at the output and remains low until the next command to start the conversion.

The DONE output is the complement of the BUSY level.

The EOC PULSE output becomes a high level for 450 ±50 ns after the DONE output level goes high.

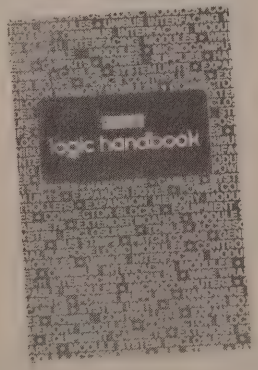
The CLOCK output is a series of 50 ns pulses (min.) generated when the A866 Module is performing an analog-to-digital conversion.

Detailed information on the module is available on the A866 A/D Converter Module (12-bit, 15-microsecond) data sheet. Contact Catalog Sales Desk for a free copy.



Cat. No.	Size	List	Cat.	Cash	Shipping Weight
B-A866	SDS	$400	$380	$364	See p. 161

LOGIC HANDBOOK



The Logic Handbook, known as the computer industry's "Bible" on logic design, gives you the technical story on general purpose computer interfacing, various cable configurations, system boxes and enclosures, special purpose interfaces and a host of other compatible equipment.
For almost twenty years, the Logic Handbook has been regarded as the one reference book for customers for the world of interfacing and DEC products. Have your own resident DEC sales and technical consultant — the Logic Handbook!

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PDP-8 AND PDP-11 INTERFACE MODULES

PDP-8 AND PDP-11 COMPUTER INTERFACE MODULES

Included in this section are some of the many modular interfaces designed to operate with DIGITAL's PDP-8 and PDP-11 computers. Like the other modules in this catalog, these interface modules are fully described in the Logic Handbook which is available to you free of charge. Consult Catalog Sales Desk.

PDP-8/A, 8/E, 8/F, 8/M (OMNIBUS) INPUT/OUTPUT MODULES

One-word Input, 12-bits — M1703

The M1703 provides, on a single quad-height module, a complete, self-contained interface that will input 12 bits of parallel TTL-level data to the PDP-8/A, 8/F, 8/E or 8/M OMNIBUS, under interrupt or programmed I/O control. The M1703 plugs directly into the OMNIBUS connector assembly, and the external device plugs into a 40-pin flat cable connector on the module itself. The module includes a device selector, an operation decoder, flags, and all control logic needed to request interrupt and respond to programmed I/O commands on the OMNIBUS.

Two-word Input, 24-bits — DR8-ED

The DR8-ED is a complete, general purpose input interface used to transfer two independent 12-bit, parallel data words from a user's peripheral device to a PDP-8 computer system. It is directly compatible with the OMNIBUS of a PDP-8/A, 8/E, 8/F or 8/M and is designed for installation in any available OMNIBUS slot except 1, 2 and 3 of a PDP-8/A. See diagram below.

The DR8-ED consists of a device selector and IOT decoder logic, interrupt request and skip control, and two 12-bit Data Buffer Registers (DBRs) — one for each data word, and two independent Control and Status Registers (CSRs). One CSR is assigned to each input data word and provides status and control information during word transfers.

The DR8-ED is designed for user application and requires a minimum of external hardware to implement into a PDP-8 system. Two 40-pin connectors are conveniently mounted near the edge of the board to permit either one or two devices to be easily connected using BC08R, BC07D, or BC04Z flat cable assemblies available from DIGITAL. These cables have mating connectors pre-mounted and can be supplied in any required length.

The interface module occupies one slot in the OMNIBUS or expander and is quad-height, extended-length, single-width board.

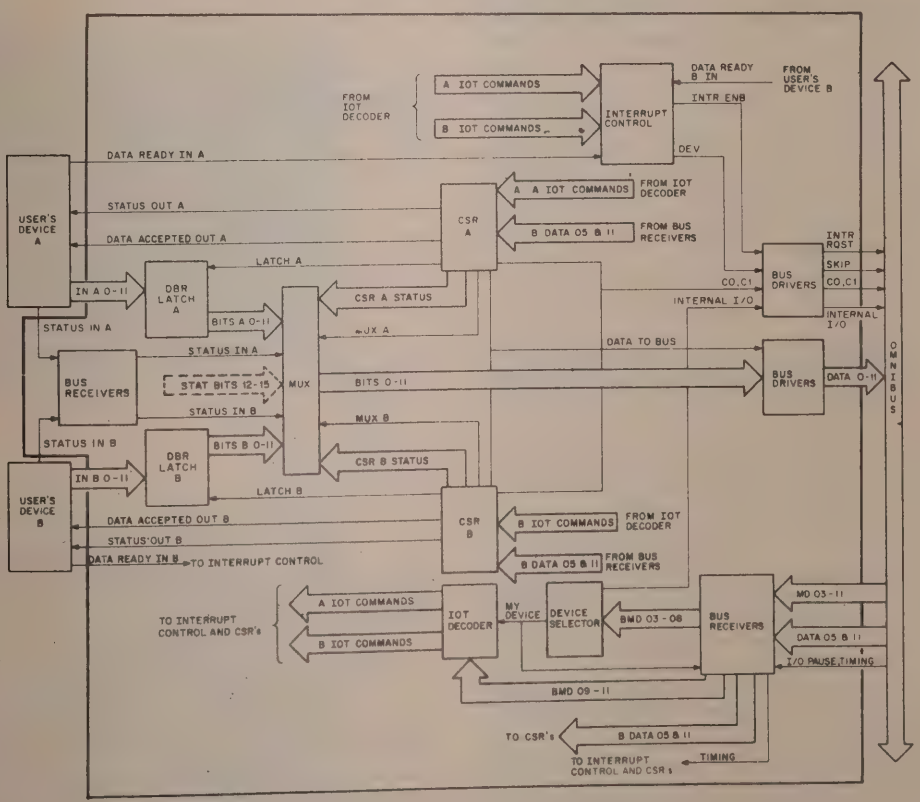

Figure 2 DR8-ED Functional Block Diagram

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PDP-8 COMPUTER INTERFACE MODULES

INPUT/OUTPUT MODULES (Cont'd)

Two-word Output, 24-bits — M1705

The M1705 is an output interface module that allows the PDP-8 computer to transfer data to, and control the operation of, remotely programmable instruments of similar digital devices. The function is to perform parallel transfers, under program or interrupt control, of 12-bit data words from the computer to peripheral devices.

The M1705 consists of duplicate logic sections. Each section includes device selection logic to address an external device, an operations decoder to determine the type of interface operation, a 12-bit storage register to buffer the output data, interrupt control logic, and bus drivers/receivers to allow operation on the OMNIBUS. Connection to the device(s) is made via standard cables that plug into a pair of connectors on the M1705 module board.

M1705 is quad-height, extended length and single width.

Cat. No.	Description	Size	List	Cat.	Cash	Shipping Weight
B-**M1703**	12-bit Input	EQS	**$99**	**$94**	**$90**	See p. 161
B-**M1705**	13-bit Output	EQS	**200**	**190**	**182**	See p. 161
B-**DR8-ED**	24-bit Input	EQS	**325**	**309**	**296**	3 lbs.

Interface Foundation Module — M1709

The M1709 OMNIBUS Interface Foundation module is a generalized OMNIBUS interface card that is constructed to allow the user to build a custom design using integrated circuits (ICs). All required OMNIBUS interface logic, i.e., bus drivers/receivers, device selectors, and interrupt/skip circuitry is provided. IC mounting pads with wire wrappable pins are made available for custom circuitry. Pads accommodate all common types of Dual-In-Line Pack (DIP) ICs with up to 40 pins.

Connection to user-equipment is made via standard cables (BC08R, BC07D, or BC04Z) that plug directly into the M1709 module board. The module cable connector allows several M1709 modules or W966/W967 wire wrappable modules to be strapped together to accommodate more extensive designs.

Cat. No.	Size	List	Cat.	Cash	Shipping Weight
B-**M1709**	EQS	**$142**	**$135**	**$129**	See p. 161

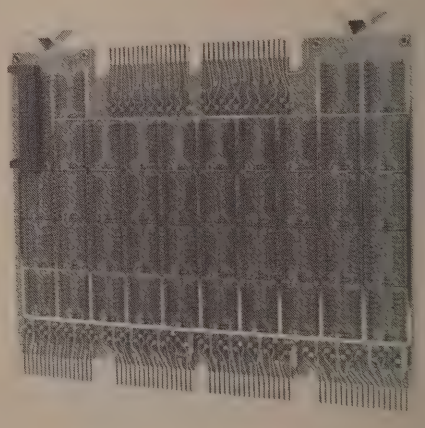
Wire Wrappable Boards — W966 and W967

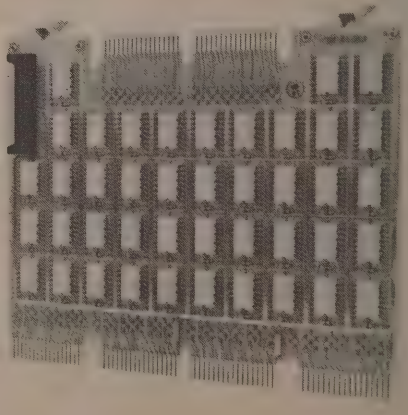
The W966 Wire Wrappable Module is a PDP-8/A, 8/E, 8/F, 8/M general-purpose module that provides for construction of custom interface designs using integrated circuits (ICs) and wire wrapped interconnections. Up to 42 of 14- and/or 16-pin ICs can be easily mounted (with or without 16-pin sockets) onto the etched IC pads. Sockets are not supplied with W966 but are with W967, see below. Each wire wrap pin can accommodate two separate leads of 30-gauge wire. Discrete components may also be directly soldered onto the IC pads. Position E39 features a pad that can be used for mounting a potentiometer.

The W967 Wire Wrappable Module is identical to the W966 except that featured on the board are 42 low-profile IC sockets which easily accommodate 14- and/or 16-pin ICs. Each wire wrap pin can accommodate two separate leads of 30-gauge wire. Discrete components may also be directly inserted into the sockets. Position E39 features a pad that can be used for mounting a potentiometer by removing the socket.

Both modules have 72 etched contact fingers at the handle end, with a wire wrap pin connected to each finger. When a W966 or W967 is located adjacent to another W966 or W967, signals can be bused from one module to the other via these contact fingers by using an H851 edge connector. One H851 can bus 36 signals; therefore, two H851s are required to bus all 72 signals. In addition, the standard 144 contact fingers at the connector end of the module are also connected to wire wrap pins.

An H854 40-pin I/O connector (male) is contained on the module to provide access to the "outside world;" it can accept any cable equipped with an H856 connector. Eighteen of these connector pins are connected to wire wrap pins.





Cat. No.	Description	Size	List	Cat.	Cash	Shipping Weight
B-**W966**	w/o Sockets	EQS	**$121**	**$115**	**$110**	See
B-**W967**	w Sockets	EQS	**215**	**204**	**196**	p. 161

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PDP-11 INTERFACE MODULES

MODULE SELECTION GUIDE

For detailed description see following pages.

Interface Controls, p. 101, 102

Description	Cat. No.	Size	List	Cat.	Cash
Address Selector	B-M105	ESS	$95	$90	$86
Bidirectional Bus Interfacing Gates	B-M1500	ESS	22	21	20
Bus Input Interface	B-M1501	ESS	38	36	35
Bus Output Interface	B-M1502	EDS	66	63	60
Interrupt Control	B-M7821	ESS	121	115	110
Word Count and Bus Address	B-M795	EDS	238	226	217
UNIBUS Master Control Module	B-M796	ESS	119	113	108

UNIBUS Drivers/Receivers, p. 102, p. 103

Drivers	B-M783	ESS	$44	$42	$40
Drivers (non-inverting)	B-M798	SSS	44	42	40
Receivers	B-M784	ESS	44	42	40
Transceivers	B-M785	ESS	55	52	50
IC Drivers	B-957	†	26	25	26
IC Receivers	B-956	†	19	18	17

Memory Interface, p. 103, p. 104

Direct Memory Access	B-DR11-B	*	$1620	$1539	$1474
DECkit Direct Memory Access	B-KIT11-D	*	850	808	774

*Shipping Weight is 13 lbs. **Shipping Weight is 3 lbs.
†Shipping Weight is .25 lbs. #Shipping Weight is 4 lbs.

Parallel I/O Interfaces, p. 104

Description	Cat. No.	Size	List	Cat.	Cash
Remote Instrument Control DVM's and programmable power supplies)	B-M1623	EQS	$165	$157	$150
DVM Data Input	B-M1621	EQS	138	131	126
Interface Foundation Module	B-M1710	EQS	275	261	250
Relay Output (16-bit)	B-M1801	EQS	390	371	355

UNIBUS Interfaces, p. 105

1-Word In, 1-Word Out	B-DR11-C	EQS#	$540	$513	$491
2-Word Input	B-DR11-L	EQS#	380	361	346
2-Word Output	B-DR11-M	EQS#	380	361	346

Serial I/O Interfaces, p. 105

20 mA Current Loop Asynchronous Interface	B-DL11-WA	EQS**	$770	$732	$701
EIA RS232C Interface	B-DL11-WB	EQS**	770	732	701
EIA RS232C Interface with Modem Control	B-DL11-WC	EQS**	770	732	701

Analog Interfaces, p. 105

D/A and A/D Converter, 16-channel Multiplexer, Sample/Hold Amplifier, Clock, and Scope Control	B-AR11	EHS	$1815	$1724	$1652

INTERFACE CONTROLS

Bus Output Interface — M1502

$60

The M1502 is a versatile buffered output interface for up to 16 data bits, arranged in two 8-bit bytes. The module accepts data from the UNIBUS Data lines and stores it in a 16-bit register. Outputs are supplied both to a 40-pin flat ribbon connector and to the backplane. Open-collector output drivers with pull-up resistors are included on the module. Three flip-flops with Type D as well as Type RS inputs are provided as flags or synchronizing devices.

Although intended for parallel data output, this module may be used to drive indicators or small relays provided the voltage and current limits are not exceeded.

Up to four M1502 modules (64-bits) can be controlled by one M105 Address Selector Module, one M7821 Interrupt Control Module, and one M1500 Bus Gates Module.

Interrupt Control Module — M7821

$110

The M7821 Interrupt Control Module is used with the interface logic of a device in the PDP-11 systems. The M7821 allows one or two devices that request an interrupt to gain access to the UNIBUS and become bus master for one or more data transfers. It also provides a vector control circuit to enable the selection of an address in memory at which the device subroutine is stored.

The module consists of an A Master Control, B Master Control, and Vector Control logic. Either of the two master control circuits can be used to generate a Non-Processor Request (NPR) for direct data transfers to memory (DMA) or a Bus Request (BR) which interrupts the current processor program. The A Master Control, however, is normally used for generating the NPR and the B Master Control for the BR. When used as a DMA Control, the A Master Control has the ability to perform a burst mode block transfer which allows more than one data cycle to be performed each time the device becomes bus master.

The B Master Control contains logic which can be implemented to allow the monitoring of the bus NPR line. This capability permits an NPR initiated by a device to be honored under certain conditions and the device to gain access to the bus even though a BR from another device has occurred prior to the NPR. A jumper lead can be removed from the module to disable this feature if the B half is used for NPR transfers.

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PDP-11 INTERFACE MODULES

INTERFACE CONTROLS (Cont'd)

Address Selector — M105

$86

The M105 is used in PDP-11 device interfaces to decode the UNIBUS Address and Control lines. It provides gating signals for up to four device registers that indicate a register is being referenced and three control signals that indicate the direction for data flow.

Bidirectional Bus Interfacing Gates — M1500

$20

This module provides gating arrangements useful for interfacing to the PDP-11 computer. It is designed specifically to provide additional gating and output drive when using the M1501-M1502 Input/Out modules. Applications are:

General-Purpose Use:

1. Providing general-purpose high fan-out drivers.
2. Providing a stage of inversion with high fan-out capability.

PDP-11 Interfacing:

1. ANDing SELECT signals with direction signals (OUT HIGH, OUT LOW) to load registers.
2. ANDing SELECT signals with direction signals (OUT HIGH, OUT LOW) to form set or reset pulses.
3. Receiving the INIT (initialize) signal from the UNIBUS and distributing it via high-power drivers.

Bus Input Interface — M1501

$35

The M1501 contains 16 bus drivers for interfacing parallel input data to the PDP-11 UNIBUS. The module includes two control flags that can be used for interrupt request and enable. Data inputs from an external device enter a 40-pin flat cable connector mounted on the module itself. All inputs are diode-clamped to ground and +5V. Up to four M1501 Modules (64-bits) can be controlled by one M105 Address Selector Module, one M7821 Interrupt Control Module, and one M1500 Bus Gates Module.

Word Count and Bus Address Module — M795

$217

The M795 Word Count and Bus Address Module can be used to provide two of the essential elements of an interface which connects Direct Memory Access (DMA) devices to the UNIBUS. This module contains two 16-bit counters. One counter is used to count the number of data transfers that occur. The other counter is used to specify sequential bus addresses for the sources and/or destinations of the data to be transferred. This module is used to interface direct memory access (DMA) devices to the UNIBUS.

UNIBUS Master Control — M796

$108

The M796 UNIBUS Master Control Module provides the necessary logic to enable a peripheral device to perform a bus cycle on the UNIBUS to transfer data. In addition to controlling the four transfer operations (DATI, DATIP, DATA, and DATOB), the M796 module generates strobe and gating signals which transfer both address and data to and from the bus; handles de-skewing of data received from the bus; protects against data transfers to nonexistent devices by the use of time-out circuits; and provides a flip-flop and integrating one-shot that can be used by the customer for special control functions.

Any device in the PDP-11 system may have the capability of gaining control of the bus and, as bus master, of transferring data to and from other slave devices on the bus. This operation is performed independently of processor control and is usually referred to as Direct Memory Access (DMA). The logic necessary to gain control of the UNIBUS is provided by the M7821 Interrupt Control Module.

UNIBUS DRIVERS/RECEIVERS

UNIBUS Drivers — M783

$40

The M783 consists of 12 low-leakage bus drivers to be used as an input interface to the UNIBUS of the PDP-11. Each driver is open-collector and is capable of sinking 50 mA with a collector voltage of less than 0.8V. The output high leakage current is 25 microamperes maximum. Pin D2 is a TTL output that allows additional drivers to be controlled by the single enabling gate (inputs H1 and F1). Pin U1 provides +3V as a source of logic HIGH for 10 TTL loads.

UNIBUS Drivers — M798

$40

This module consists of 16 non-inverting UNIBUS drivers with pull-up resistors on the inputs. The module is used in device interfaces to minimize the loading effect caused by attaching several drivers to the same UNIBUS signal line, as in the case of a device containing multiple registers. Loading of signal lines on the UNIBUS is restricted to the equivalent of one UNIBUS receiver input and two UNIBUS driver outputs per device.

In addition, the M798 Module allows the UNIBUS to be driven by standard open-collector TTL gates. The inputs to each M798 driver circuit are pulled up to +5V through a 1-kilohm resistor.

UNIBUS Receivers — M784

$40

The M784 consists of 16 high-impedance inverting bus receivers that are used as an output interface from the UNIBUS of the PDP-11. All inputs present one UNIBUS receiver load. Each output has a fan-out capability of seven standard TTL loads.

PDP-11 INTERFACE MODULES

UNIBUS DRIVERS/RECEIVERS (Cont'd)

UNIBUS Transceiver — M785

$50

The M785 consists of eight drivers and eight receivers for use as a device interface with the PDP-11 UNIBUS. Pin U1 provides +3V and has an output capability of 10 TTL loads. Driver gates have open collectors and are capable of sinking 50 mA with a collector voltage of less than 0.8V. The output high leakage current is 2.5 μA maximum.

UNIBUS IC Receiver — 956

$17

The 956 is a package of ten 14-pin, dual-in-line package (DIP) DEC8640 integrated circuits (ICs). Each IC comprises four 2-input NOR gates. The DEC8640 gates are especially suitable as UNIBUS receivers because of their high impedance characteristics and, hence, minimal loading on the bus.

UNIBUS IC Drivers — 957

$26

The 957 is a package of ten 14-pin, dual-in-line package (DIP) DEC8881-1 integrated circuits (ICs). Each IC comprises four 2-input NAND gates. The DEC8881-1 ICs are especially suitable by UNIBUS drivers because of their capability to sink 70 mA with a collector voltage of less than 0.8V.

MEMORY INTERFACES

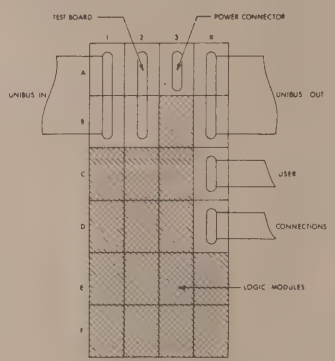
Direct Memory Access Interface — DR11-B

$1474

The DR11-B is a general purpose direct memory access (DMA) interface to the UNIBUS. The DR11-B, rather than using program controlled data transfers, operates directly to or from memory, moving data between the UNIBUS and the user device.

The interface consists of four registers: command and status, word count, bus address, and data. Operation is initialized under program control by loading word count with the 2's complement of the number of transfers, specifying the initial memory or bus address where the block transfer is to begin, and by loading the command/status register with function bits. The user device recognizes these function bits and responds by setting up the control inputs. If the user device requests data from memory or a UNIBUS device, the DR11-B performs a UNIBUS Data In transfer (DATI) and loads its data register with the information held at the referenced bus address. The outputs of this register are available to the user device. (This output data is buffered.) If the user device requests data to be written into memory, the DR11-B performs a UNIBUS Data Out transfer (DATO), moving data from the user device to the referenced bus address. (This input data from the user is not buffered.) Transfers normally continue at a user defined rate until the specified number of words are transferred.

The user is given a number of control lines allowing for flexible operation. Burst modes, read-modify-restore operations, and byte addressing are possible with the control structure.



DR11-B SYSTEM UNIT

The DR11-B is packaged in one standard System Unit allowing convenient incorporation into a PDP-11 system. A UNIBUS jumper module (M920) is supplied with the unit.

Connections to the user device are made through two M957 split lug cable boards or one M9760 cable connector board. The two M957's are supplied with the unit. Alternatively, an M920 can be used to jumper all user signals to an adjacent BB11 blank mounting panel, which can be used to hold some or all of the device logic. (Neither the additional M920 nor the BB11 is supplied with the unit.)

DECkit — Direct Memory Access — KIT11-D

$774

A kit is basically a collection of logic modules assembled by the user to a prewired system unit, capable of performing a highly complex computer interface at low cost to the user.

The kits are defined in full or maximum configuration; i.e., the system unit wiring and the recommended complement of modules define the maximum I/O capability. If the user wishes, a lesser capability may be achieved by removing the appropriate modules.

The KIT11-D kit is designed specifically for the PDP-11 owner who requires high I/O data transfer rates. Full 16-bit data words can be transferred between the PDP-11 memory and an external device at UNIBUS speeds. The KIT11-D interface kit is physically and electronically compatible with all PDP-11 Family computers.

Parallel digital data is cabled directly to and from the interface kit; no additional logic or hardware is required to handle TTL-compatible data. External devices, such as lab instruments, mass storage units, display, pre-processors, and other CPUs can communicate conveniently with the PDP-11 memory.

The prewired backplane includes five unused module slots that can be used for custom logic such as level shifters and counters. Even modules for simple processing logic can be utilized in these unused slots.

KIT11-D is valuable to the OEM and the end-user. The predesigned interface concept frees the system designer from the complex problems usually associated with UNIBUS interfacing and the end-user has available the flexibility and speed of the UNIBUS for data transfers.

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PDP-11 INTERFACE MODULES

DIRECT SALES CATALOG

DECkit — Direct Memory Access — KIT11-D (Cont'd)

Hardware/Accessories for DECkit11 Series

If mounting space is available in the existing PDP-11 processor mounting box, the DECkit can be installed there and jumpered to the existing panels by a UNIBUS Connector Module, M920*. Power is supplied from the processor power supply, or from an additional H720-E* Power Supply.

If the Interface Kit is installed in a separate mounting rack, the UNIBUS is extended to that rack with a BC11A cable. This cable is available in various standard lengths from 2 ft. to 35 ft.; see elsewhere in this catalog.

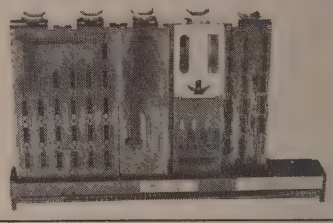
Input/Output Cables

Type	Connectors
BC08R-XX[1]	H856 to H856[2]
BC04Z-XX[1]	H856 to open-ended[2]
BC07A-XX[1]	H856 to open-ended[2]
BC07D-XX[1]	H856 to open-ended[2]

Notes: [1]XX is length in feet.
[2]H856 is a female connector.

*Not supplied with option.

Slot	Row A	B	C	D	E	F
04	UNIBUS OUT		SPARE			
03	G772 POWER	M796	M7219			
02		M7821	M205	M116	M113	M112
01	UNIBUS IN		M660	M9100	M1502	



PARALLEL I/O INTERFACES

Instrument Remote Control Interface — M1623 $150

The M1623 is a PDP-11 Interface Module containing the bus receivers and control logic needed to remotely program several types of digital voltmeters and programmable power supplies. All outputs to the instrument are through a 40-pin cable connector mounted on the module.

Some of the digital voltmeters and power supplies that can be interfaced by the M1623 are:

Digital Voltmeters

Fluke	Models 8200A, 8400A
Hewlett-Packard	Models 3450A, 3480A
Data Precision	Series 2000
Systron-Donner	Model 7110
Dana	Model 4800

Programmable Power Supplies

Fluke	Models 4210A, 4216A, 4250A, 4265A
Hewlett-Packard	Models 6130B, 6129B, 6131B

The user should first compare the interfacing requirements of his particular instrument with the capabilities of this module. Many instrument manufacturers have various control options which should be chosen carefully for compatibility with the M1623.

DVM Data Input Interface — M1621 $126

The M1621 is a PDP-11 Interface Module containing all the bus drivers and control logic needed to input TTL-level information from several types of digital voltmeters and multimeters. All inputs from the instruments enter a 40-pin cable connector mounted on the module.

Some of the digital voltmeters and multimeters that can be interfaced by the M1621 are:

Fluke	Models 8200A, 8400A
Hewlett-Packard	Models 3450A, 3480A
Data Precision	Series 2000
Systron-Donner	Model 7110
Dana	Model 4800

The user should first compare the interfacing requirements of his particular instrument with the capabilities of this module. Many instrument manufacturers have various control options which should be chosen carefully for compatibility with the M1621.

UNIBUS Interface Foundation Module — M1710 $250

The M1710 UNIBUS Interface Foundation Module is a general-purpose board that provides for the construction of custom interface designs using integrated circuits (ICs). The M1710 lets users build their own interfaces between a wide variety of peripheral equipment and any PDP-11 processor. All essential UNIBUS logic, such as device address selection, interrupt circuitry, and bus receivers and drivers, is provided on the lower portion of the module. The remainder of the board contains IC mounting pads with wire wrappable pins for custom logic designs. These pads accommodate combinations of all common type of DIP (dual-in-line-package) integrated circuits with up to 40 pins.

The M1710 is a versatile module, ideal for any type of application. The end user, such as a university laboratory familiar with ICs, will appreciate both the capabilities and cost-effectiveness of the module; no additional mounting panel or power supply is required. These features, coupled with the fact that the M1710 is capable of automatic wire wrapping, also should prove valuable to the Original Equipment Manufacturer (OEM) who requires many custom interfaces. And, in all cases, the module is easily a adaptable to accommodate any changes in interface design.

The M1710 plugs into any Small Peripheral Controller (SPC) slot, or DD11 Peripheral Mounting Panel. Additionally, it may be used in a system unit such as the BB11. Connection to user equipment is made via a cable connector mounted on the M1710 Module.

16-Bit Relay Output Interface — M1801 $355

The M1801 is a PDP-11 Interface Module containing the bus receivers, relay drivers and control logic needed to program 16 isolated single-pole relay contacts. The relay contact outputs are available at two 40-pin cable connectors mounted on the module.

PDP-11 INTERFACE MODULES

PARALLEL I/O INTERFACES (Cont'd)

UNIBUS INTERFACES MULTIWORD

One-word Input / One-word Output — DR11-C

$491

The DR11-C is a general-purpose interface between the PDP-11 UNIBUS and a user's peripheral. The DR11-C provides the logic and buffer register necessary for program-controlled parallel transfers of 16-bit data between a PDP-11 System and an external device.

It is directly compatible with the PDP-11 UNIBUS and is designed for installation into any one of the available Small Peripheral Controller slots (SPC) of a DD11 System Interfacing Unit and PDP-11 processor unit.

The DR11-C interface consists of three functional sections: address selection logic, interrupt control logic and device interface logic.

The DR11-C is designed for user applications and requires a minimum of external hardware to implement into the PDP-11 system. Two 40-pin connectors are conveniently mounted near the edge of the board. These connectors permit the external device to be easily connected using BC07D, BC08R or BC04Z flat cables available from DIGITAL. These cables have the mating connectors premounted and are supplied in any specified length. See elsewhere in catalog.

Two-word Input — DR11-L

$346

Similar in function to DR11-C except DR11-L transfers two independent 16-bit parallel data words from a user's peripheral device into the PDP-11 computer system.

Two-word Output — DR11-M

$346

Similar to DR11-C except DR11-M transfers two independent 16-bit parallel data words from the PDP-11 computer system to a user's peripheral device.

SERIAL I/O INTERFACES

Asynchronous Serial Line Units

DL11-WA, DL11-WB, DL11-WC

$701

DL11-WA, -WB and -WC serial line units are character-buffered interfaces that perform two basic operations. First, receiving and transmitting asynchronous serial data. Second, providing a line frequency clock that is used to measure time. DL11-WA is desiged to interface with a 20 mA current loop, -WB is compatible with EIA RS232C, -WC is EIA compatible and has modem control.

As a receiver of serial data, the interface converts an asynchronous serial character from an external device into the parallel character required for transfer to the UNIBUS. This parallel character can then be gated through the bus to memory, a processor register, or some other device.

As a transmitter, a parallel character from the bus is converted to a serial character for transmission to an external device. Because the two data transfer units (receiver and transmitter) are independent, they are capable of simultaneous two-way communication. The receiver and transmitter each operates through two related registers; a control and status register for command and monitoring functions, and a data buffer register for storing data prior to transfer to the bus or external device. The line frequency clock uses a signal derived from an ac input voltage by the power supply to generate timed interrupts. The clock portion utilizes a register for command and monitoring functions.

Switch selections on the interface provide the flexibility needed to handle a variety of terminals. The user can, for example, set up switches such that DL11-WA can interface to a teletype or, by resetting switches, to a high speed CRT terminal. The user has a choice of speeds, character size, stop-code length, parity and error checking.

The SLU/RTC option is packaged on a quad height integrated circuit module which can be inserted into either a small peripheral controller slot in a processor or one of the SPC slots in a DD11-A peripheral mounting panel. All users input and output signals are connected to the interface by Berg Connector D. Power of +5V at 2.0A and −15V at 150 mA (EIA level between +9V and +15V at 50 mA) is required. A 70-8360-1 20 mA current loop cable is provided with the DL11-WA whereas a BC05C-25 EIA interface cable is supplied with DL11-WB and -WC.

For Programming and Operating Characteristics refer to PDP11 Peripherals Handbook.

ANALOG INTERFACES — AR11

$1652

The AR11 is a compact analog real-time module for use with the PDP-11 family of computers. Included on the module are a 10-bit A/D converter, two 10-bit D/A converters, a crystal controlled clock, scope control, a 16-channel multiplexer, and a sample and hold amplifier. Operation and selection of functions is under software control.

The complete AR11 subsystem electronics are contained on one single hex module that can mount in either of the two center slots of a DD11-B, C, or D system unit, or within the CPU mainframe assembly. All external connections are made via a Berg connector (supplied with mating plug) which is mounted on an outside corner of the module.

No external analog supply voltages are required. A unique dc to dc converter without transformer uses the +5V logic power to generate the high-quality positive and negative voltages needed by the AR11.

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PDP-11 WIRE WRAPPABLE MODULE BOARDS

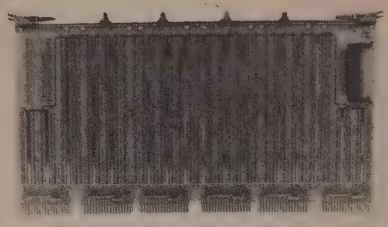
SPC/PDP-11 COMPATIBLE

DIGITAL offers a family of Small Peripheral Controller (SPC) compatible wire wrappable modules. These modules are ideal for PDP-11 design prototyping, limited quantity production runs, or design instructional use.

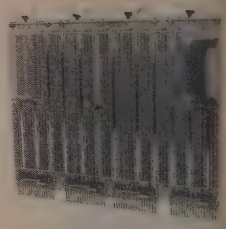
The family of modules consists of six boards: two double height, two quad height, and two hex height. One card of each size is equipped with premounted Dual-In-Line (DIP) package low-profile sockets. The other one is without sockets. Each board will accept various combinations of DIP assemblies including the more common 14-, 16-, 24-, and 40-pin packages. Various other size DIP assemblies as well as discrete components are easily accommodated.

The printed circuit on each board connects the appropriate edge connector pins to the Vcc plane on Side 2 of the board (component side) and the ground plane (GND) on Side 1. The remaining edge connector pins terminate to a double row of wire wrap pins for user designated function. Each of the modules also includes a 40-pin male cable connector to allow an interface cable to be attached to the module logic. The pins of the cable connector are also terminated to a double row of wire wrap pins. The quad and hex height modules have a space where a second 40-pin cable connector (P/N H854 labeled J2, see p. 21, or suitable connector) can be inserted by the user. When this second cable connector is not required, additional IC packages can be installed. Each board contains insulated standoffs to maintain the required clearance between adjacent modules to prevent shorting of wire wrap pins.

The wire wrap pins and components are mounted on Side 2 of each module. The majority of the rows of predrilled holes accept IC packages with pin spacings of 0.3″. However, universal areas on the six modules accept IC packages with standard pin spacings of 0.3″, 0.4″, and 0.6″. See diagram of each board.

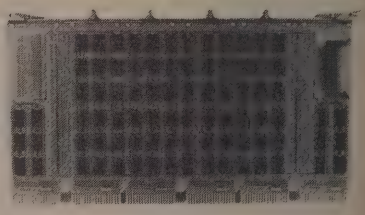


W9500

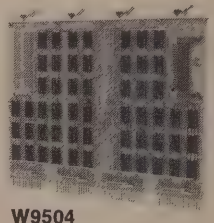


W9501

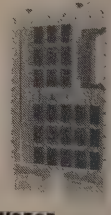
W9502



W9503



W9504



W9505

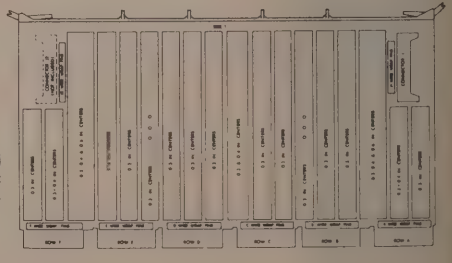
ORDERING INFORMATION

	Description	Size	Total* IC Capacity No. of Pins 14 or 16	24	40	Sockets Supplied 16-Pin	List	Cat.	Cash	Shipping Weight
B-W9500	Module with extractor bracket. No DIP sockets included. One 40-pin male cable connector mounted on board and space for additional 40-pin connector provided.	EHS	128 or 114	10	6	None	$185	$176	$168	5 lbs.
B-W9503	Same as W9500 except with premounted DIP sockets. See photo for socket placement.	EHS	— 84	—	—	84	325	309	296	5 lbs.
B-W9501	Module with flip clip handles. No DIP sockets included. One 40-pin male cable connector premounted on board and space for additional 40-pin connector provided.	EQS	72 or 61	5	3	None	115	109	105	3 lbs.
B-W9504	Same as W9501 except with premounted DIP sockets. See photo for socket placement.	EQS	— 54	—	—	54	210	200	191	3 lbs.
B-W9502	Module with flip clip handles. No DIP sockets included. One 40-pin male cable connector premounted on board.	EDS	40 or 38	5	3	None	60	57	55	2 lbs.
B-W9505	Same as W9502 except with premounted DIP sockets. See photo for socket placement.	EDS	— 24	—	—	24	110	105	100	2 lbs.

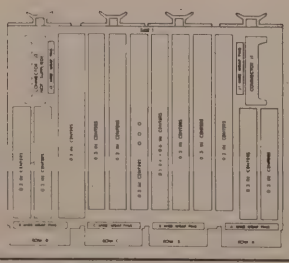
*Note that the capacities listed allow one pair of holes between each DIP for mounting additional decoupling capacitors.

Power and Ground Connections

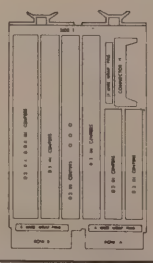
	Power and Ground Connections
W9500	Vcc - AA2, BA2, CA2, DA2, EA2, FA2
	GND - AT1, BT1, CT1, DT1, ET1, FT1, AC2, BC2, CC2, DC2, EC2, FC2
W9503	Same as W9500
W9501	Vcc - AA2, BA2, CA2, DA2
	GND - AT1, BT1, CT1, DT1, AC2, BC2, CC2, DC2
W9504	Same as W9501
W9502	Vcc - AA2, BA2
	GND - AT1, BT1, AC2, BC2
W9505	Same as W9502



W9500 AND W9503 IC LOCATIONS



W9501 AND W9504 IC LOCATIONS



W9502 AND W9505 IC LOCATIONS

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DIGITAL'S MODULAR SYSTEMS

DIGITAL Modules are single-height, double-height, or quad-height; standard length or extended length; and single-width or double-width. Each DIGITAL Module is a specific, fixed size; the size of each module is stated in the module description. DIGITAL single-height and double-height modules are standard length or extended length. DIGITAL quad-height modules are always extended length. Any DIGITAL Module can be single-width or double-width; most, however, are single-width.

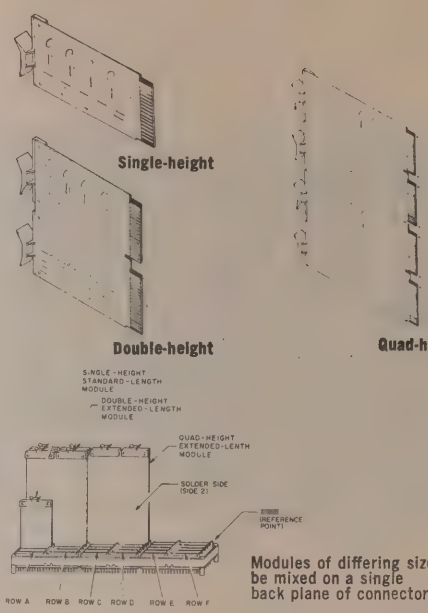
The height and length requirement is determined by the quantity and size of discrete components and integrated circuits located on side 1 of the module, and to some extent, by the amount of etched printed circuitry on sides 1 and 2. The width requirement is determined by the distance the largest component extends from its mounting surface on the module.

All DIGITAL Module connector blocks accommodate any height (standard or double) module. The length of the modules to be used in a logic system must, however, be considered when connector block mounting drawers, system unit mounting drawers, or cabinets are being selected; enough space must be provided to accommodate the longest module. DIGITAL's standard length modules are 5.40/5.60 in. long and extended length modules are 8.84/9.04 in. long from the bottom of the contact fingers to the top of the attached handle(s).

All DIGITAL Module connector blocks accommodate any width (single or double) module. The width of the module must be considered, however, when any connector block module slot is occupied by a double-width module; this is because no module can be inserted into the module slot on the immediate right on the same connector block unless that connector block provides sufficient space between module slots for the mounted components, i.e., an H808 Module Connector Block. Normal module spacing is on half-inch centers.

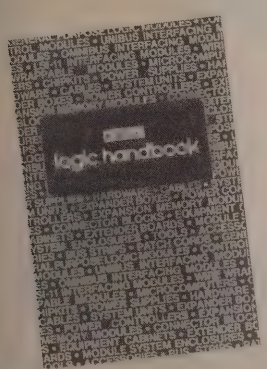
Some DIGITAL Module connector blocks accommodate only single-height modules and others accept either single-height or double-height modules. No single connector block can accommodate quad-height modules; quad-height modules must be mounted in mounting frames, system units, or module drawers comprising module connector blocks with slotted ends so that four module slots are arranged end to end (i.e., at least two H863 or H8030 Module Connector Blocks mounted end to end). Single-height modules are 2.417/2.452 in. high, Double-height modules are 5.167/5.202 in. high, and quad-height modules are 10.437/10.472 in. high.

See Hardware Section of this catalog for descriptions of the connector blocks and mounting frames/enclosures available from the Direct Sales Catalog.



Modules of differing sizes can be mixed on a single back plane of connector blocks.

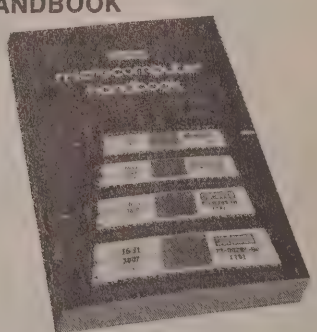
LOGIC HANDBOOK



The Logic Handbook, known as the computer industry's "Bible" on logic design, gives you the technical story on general purpose computer interfacing, various cable configurations, system boxes and enclosures, special purpose interfaces and a host of other compatible equipment.

For almost twenty years, the Logic Handbook has been regarded as the one reference book for customers for the world of interfacing and DEC products. Have your own resident DEC sales and technical consultant — the Logic Handbook!

MICROCOMPUTER HANDBOOK



The Microcomputer Handbook is our answer to the question, "Where can I find the answers to everything I've always wanted to know about the LSI-11, but didn't know where to look." Included are detailed chapters on the processor, options, installation, software, operating systems, peripheral devices, programming, maintenance and much more. The text covers the full range of LSI-11 systems from the LSI-11 board set to the PDP-11/03 microcomputer to the PDP-11V/03 disk based microcomputer system. Truly, everything you want and need to know of the LSI-11 microcomputer is found between the two covers of this handbook!

DIRECT SALES CATALOG APPLICATION NOTES AND PRODUCT BULLETINS

For the user who requires more complex and technical information on specific products or application ideas, the D.S.C. has a complete line of detailed product bulletins and application notes. These publications will tell you everything you should need to know about the particular product involved.

Dozens of different application notes and product bulletins are available for the asking.

CALL: 800-258-1710 (N.H. Residents 603 - 884-6660) 8:30 am to 5 pm EST.

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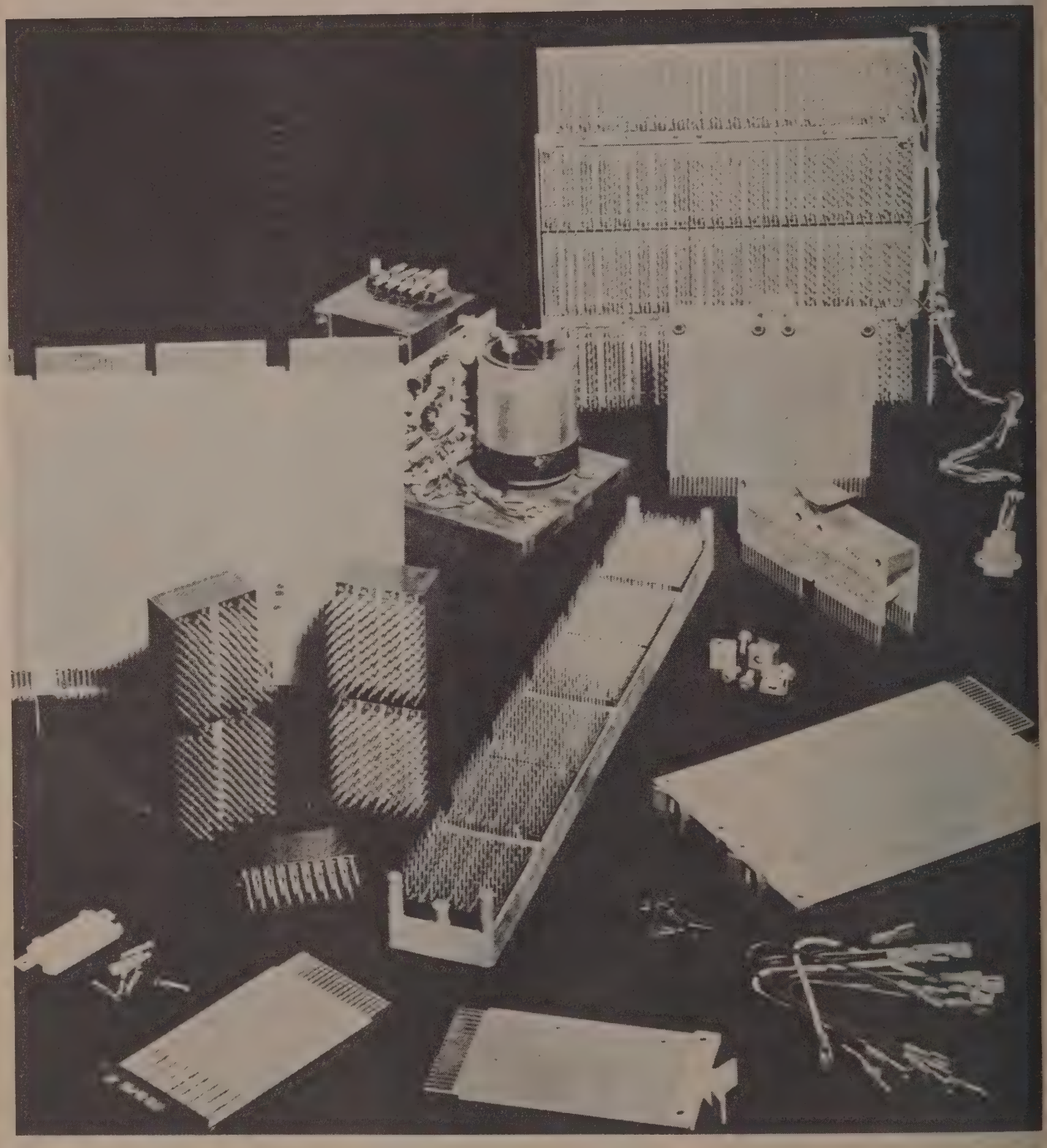

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DIRECT SALES CATALOG

The Direct Sales Catalog is:
YOUR HARDWARE STORE

This section describes DIGITAL's line of mounting hardware, cabinets, connectors, power supplies, wire wrapping accessories, and other accessory-type interface products available through the Direct Sales Catalog. These items are the unique and essential products that provide efficient and orderly system construction. This section is especially useful for logic and system designers faced with the problem of translating a paper design into working hardware. The products described will aid the logic designer immeasurably in choosing suitable hardware and accessories.

INDEX

- ☐ Connector Blocks ..... p. 110
- ☐ Mounting Panels and System Units ..... p. 111
- ☐ Connectors and Adapters ..... p. 115
- ☐ Cable Assemblies ..... p. 119
- ☐ Wire Wrapping Tools ..... p. 121
- ☐ Wire Wrappable Boards ..... p. 122
- ☐ Extender Boards ..... p. 123
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CONNECTORS AND MOUNTING HARDWARE

CONNECTOR BLOCKS

At the heart of DIGITAL's mounting systems are these Connector Blocks. Designed to make reliable connection with contact fingers on either one or both sides of pc modules, they can be classified as one-slot, two-slot or four-slot wide. The smallest block accepts one single-height module. The largest accepts eight single- or four double-height modules. Blocks can be mounted end-to-end for quad- or hex-height modules but blocks with slotted ends must be specified. Each slot has 36 contact positions though some blocks have contacts on only one side (for single-sided pc modules). Solder fork and wire wrap terminals are available. See table for details of each block.

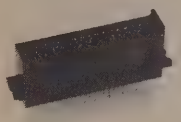

FIG. 1
Single height. Single slot. Wire wrap terminals. Shown is H807. H802 is physically similar.

FIG. 2
Double height. Two slots. Wire wrap terminals. Slotted ends. Shown is H8030.

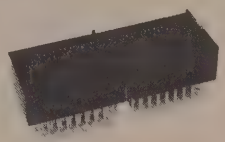

FIG. 3
Double height. Four slots. Wire wrap terminals. Shown is H808.

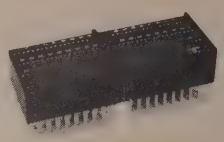

FIG. 4
Double height. Eight slots. Wire wrap or solder fork terminals. Shown is H800-W. H800-F and H803 are similar.

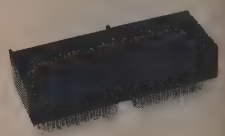

FIG. 5
Double height. Eight slots. Slotted ends. Shown is H863.

Selection Guide — Connector Blocks

Catalog Number	B-H802	B-H807	B-H8030	B-H808	B-H800-F	B-H800-W	B-H803	B-H863
Illustration	Fig. 1	Fig. 1	Fig. 2	Fig. 3	Fig. 4	Fig. 4	Fig. 4	Fig. 5
Number of Slots	1	1	2	4	8	8	8	8
Boards Accepted								
Single-Height	1	1	2	4	8	8	8	8
Double-Height	—	—	1	2	4	4	4	4
No. of Sides	Single	Double*	Double*	Double*	Single	Single	Double*	Double*
Contacts per Slot	18	36	36	36	18	18	36	36
Total Contacts	18	36	72	144	144	144	288	288
Replacement Contact	—	H805	H805	H809	—	—	H805	H805
Terminal Style	WW	WW	WW	WW	SF	WW	WW	WW
Wire Size, AWG	24	30	30	24	24	24	30	30
End Style	US	US	S†	US	US	US	US	S†
Use Bus Strip No.	932	933	933	939	932	932	933	933
Price, List	**$10**	**$6**	**$7**	**$17**	**$14**	**$16**	**$16**	**$16**
Price, Cat.	**10**	**6**	**7**	**16**	**13**	**15**	**15**	**15**
Price, Cash	**9**	**5**	**6**	**15**	**13**	**15**	**15**	**15**
Shipping Weight, lbs.	.5	.5	1	2	2	2	2	2

*Although a single-sided board can be used in a slot that accepts double-sided boards, only one half of the contact capability of the double-sided slot is used.

†Must have this feature if quad height boards are to be used with these connectors.

N/A — Not applicable
SF — Solder Fork
WW — Wire Wrap®

PC — Pins for PC boards
US — Unslotted
S — Slotted

®Wire Wrap is registered trademark of Gardner-Denver Co.

Additional Ordering Information

	List	Cat.	Cash	Shipping Weight
Cat. No. B-**H805** 36 Replacement Contacts	**$9**	**$9**	**$8**	.25 lb.
Cat. No. B-**H809** 18 Replacement Contacts	**5**	**5**	**4**	.25 lb.

BUS STRIPS

When a bus strip is placed over the connector block pins, and soldered to each, it interconnects all pins for a common assignment, e.g., Ground, Signal, etc. Order Bus Strip appropriate to Blocks used according to table. Shown is Bus Strip 932.

Use With Connector Blocks	Cat. No.	Strips per Pkg.	Length	Price per Pkg. List	Cat.	Cash
H800, H802	B-**932**	5	13.5"	**$4**	**$4**	**$3**
H803, H8030, H863, H807	B-**933**	1	21.5"	**1**	**1**	**0.9**
H808	B-**939**	6	21.5"	**10**	**10**	**9**

Note: Shipping Weight for all items is 1 lb.

CATALOG NUMBERS VS MODEL NUMBERS

The Catalog Numbers published in this catalog relate only to purchases made through the Direct Sales Catalog. The **Bold Face** portion of each Catalog Number is the official DIGITAL Model Number. All invoices and packing slips will reference only the Model Number.

CONNECTORS AND MOUNTING HARDWARE

19-INCH RACK MOUNTING PANELS

These 19-inch mounting panels mount on racks drilled or punched to standard EIA spacings. Each mounting panel comprises module connector blocks held together in mounting frames. The mounting frames are equipped with endplates to protect the mounted modules that plug into the connector blocks. Various configurations are available as detailed in the table.

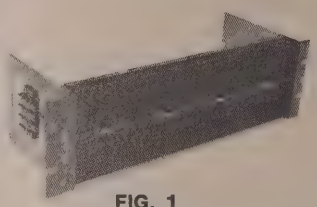

FIG. 1
H911-J
(was H911-B)

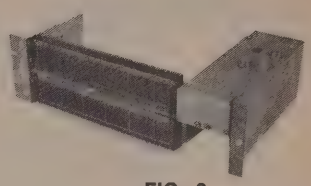

FIG. 2
H916

Selection Guide

Catalog Number	B-H911-J†	B-H911-K‡	B-H911-S	B-H914	B-H916	B-H917
Illustration	Fig. 1	Fig. 1	Fig. 1	Fig. 1	Fig. 2	Fig. 2
Connector Blocks						
Style	H803	H803	H803	H808	H803	H808
Quantity	8	8	8	8	6	6
Slots per Block	8	8	8	4	8	4
Contacts per Slot	36	36	36	36	36	36
Module Capacity						
Single-Height	64	64	64	32	48	24
Double-Height	32	32	32	16	24	12
Quad-Height	—	—	—	—	—	—
Length	Std.	Std.	Ext.	Std.	Std.	Std.
Terminal Block (+5V dc, −15V dc, and Grd.)	Yes	Yes	Yes	No	Yes	Yes
Busing						
Power	+5V dc	+5V dc	+5V dc	No	+5V dc, −15V dc	+5V dc, −15V dc
Ground	No	Yes	Yes	No	Yes	Yes
Pre-wired						
Power	No	+5V dc	+5V dc	No	+5V dc, −15V dc	+5V dc, −15V dc
Ground	No	Yes	Yes	No	Yes	Yes
Mounting Space L x W x D	19″ x 5.25″ x 6″	19″ x 5.25″ x 6″	19″ x 5.25″ x 9.5″	19″ x 5.25″ x 6″	19″ x 5.25″ x 13.25″	19″ x 5.25″ x 13.25″
Power Supply (equipped with)	—	—	—	—	H716*	H716*
Price, List	**$200**	**$200**	**$230**	**$160**	**$400**	**$320**
Price, Cat.	**190**	**190**	**219**	**152**	**380**	**304**
Price, Cash	**182**	**182**	**209**	**146**	**364**	**291**
Shipping Weight, lbs.	10	11	10	9	13	13

*H716 Power Supply provides +5V dc at 5.5 Amp and −15V dc at 1.5 Amp
Input is 105-130V ac or 210-260V ac, 47-63 Hz

†Formerly designated H911-B
‡Formerly designated H911-BP

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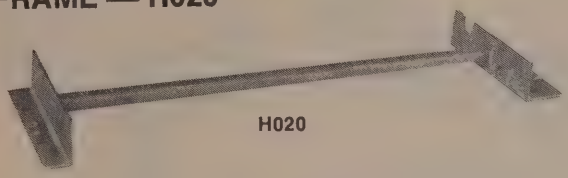
CONNECTORS AND MOUNTING HARDWARE

CONNECTOR BLOCK MOUNTING FRAME — H020

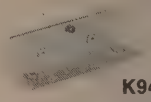

H020

Designed to accommodate a variety of module connector blocks, power supplies, and other components. Up to eight, H863, H800, H803 or H808 blocks can be mounted. Grounding lugs can be attached also. Fits 19″ racks.

Cat. No.	List	Cat.	Cash	Shipping Weight
B-**H020**	**$17**	**$16**	**$15**	1 lb.

MOUNTING BRACKET — K941 SUPPORT — K940

K941

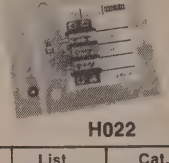

K940

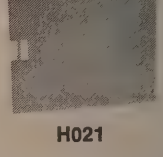
Up to four module connector blocks (H800, H803, H8030, H863, H808) can be mounted to any convenient surface with the K941 Mounting Bracket. K940 is a support that attaches to an enclosure to facilitate mounting K941.

Cat. No.	List	Cat.	Cash	Shipping Weight
B-**K940**	**$11**	**$10**	**$10**	1 lb.
B-**K941**	**15**	**14**	**14**	.5 lb.

STANDOFF END-PLATES (H021, H022) (H024, H025)

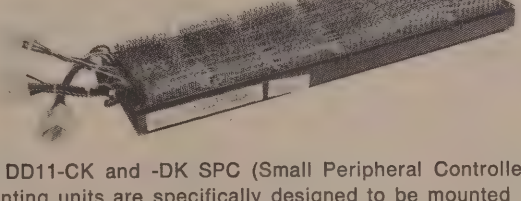
These end-plates attach to the ends of the H020 connector block mounting frame to provide strength to the frame, to protect the modules, and to provide a terminal block for dc power connections. Each end-plate occupies 5.25-inch of vertical mounting space. The H021 and H022 comprise a right and a left pair for standard length modules. Conversely H024 and H025 are for extended length module applications. The terminal block is three-section for +5V dc, −15V dc, and ground. It accepts spade and quick-connect terminals. Filtering capacitors (68 μF) are installed on H022 and H025.


H022


H021

Cat. No.	List	Cat.	Cash	Shipping Weight
B-**H021**	**$8**	**$8**	**$7**	1 lb.
B-**H022**	**22**	**21**	**20**	1 lb.
B-**H024**	**8**	**8**	**7**	1 lb.
B-**H025**	**22**	**21**	**20**	1 lb.

HEX-SIZE SPC MOUNTING UNITS



The DD11-CK and -DK SPC (Small Peripheral Controller) mounting units are specifically designed to be mounted in BA11-L and BA11-K system expansion boxes. These mounting units differ from the DD11-A and -B models in that the -CK and -DK models will accept hex-size SPC interface modules unique to certain computer systems. Both come prewired with power cable harnesses compatible with the BA11-L and -K boxes.

Before ordering a DD11-CK or -DK, the user should be thoroughly familiar with the requirements of both the system unit and the computer system involved. Consult with the particular processor handbook for further information, or call the Catalog Sales Desk.

Cat. No.	Description	List	Cat.	Cash	Shipping Weight
B-**DD11-CK**	4-slot System Unit	**$330**	**$314**	**$300**	6 lbs.
B-**DD11-DK**	9-slot System Unit	**660**	**627**	**601**	10 lbs.

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HARDWARE AND ACCESSORIES

CONNECTORS AND MOUNTING HARDWARE

FOUR-SLOT MOUNTING SYSTEMS

Four-slot Mounting Systems are designed to mount in the various Module System Enclosures available from DIGITAL. These systems comprise a mounting frame and up to three four-slot Module Connector Blocks mounted end-to-end. A fully complemented four-slot system unit provides mounting facilities for 24 single-height, 12 double-height or four quad-height plus eight single- or four double-height modules. See table for details of available units. An H014 Mounting Panel, see below, can be ordered to mount the four-slot units in a 19-inch rack.

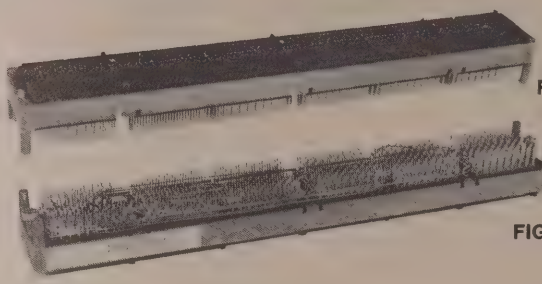


FIG. 1

FIG. 2

Selection Guide — Four-Slot System Units †

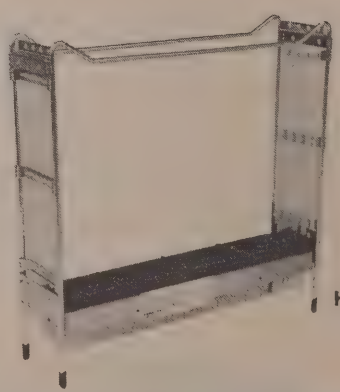
Catalog Number	B-H933-C	B-H933-CA	B-H933-CB	B-BB11	B-BB11-A	B-DD11-A	B-DD11-B
Illustration	Fig. 1	Fig. 1	Fig. 1	Fig. 2	Fig. 2	Fig. 2	Fig. 2
Connector Blocks†				These mounting systems are pre-wired and are associated with the UNIBUS System and so are dedicated units.			
Type	H803	H803/H863	H863				
Quantity	3	1-H803 2-H863	3				
Slots per Block	8	8	8				
Contacts per Slot	36	36	36				
Module Capacity							
Single-Height	24	24	24				
Double-Height	12	12	12				
Quad-Height	—	4*	4*				
Terminals	Wire Wrap	Wire Wrap	Wire Wrap				
Price, List	**$79**	**$79**	**$79**	**$187**	**$187**	**$350**	**$350**
Price, Cat.	**75**	**75**	**75**	**178**	**178**	**333**	**333**
Price, Cash	**72**	**72**	**72**	**170**	**170**	**319**	**319**
Shipping Weight, lbs.	4	4	4	4	4	4	4

*Plus either an additional 8 singles or 4 doubles.
†Each System Unit is 16½″ long by 2¼′ wide by 1.59″ high (not counting terminals).

FOUR-BY-FOUR SLOT SYSTEM UNIT — H9271

The H9271 is a general purpose, four-wide by quad-height system unit mounted within an integral card cage assembly. The H9271 can be used as a general purpose system unit for virtually any application requiring a compact, easily mountable logic rack. The system unit is manufactured and machined in such a way as to facilitate mounting in any plane or axes.

The H9271 consists of two H863 slotted connector blocks placed end to end for the mounting of four quad-height, eight double-height, or sixteen single-height modules or any combination of the above totaling sixteen single slots. The blocks are mounted within a rectangular steel frame allowing easy access to the pin side of the blocks for wire wrapping, and the card cage surrounds the module insertion side of the logic rack.

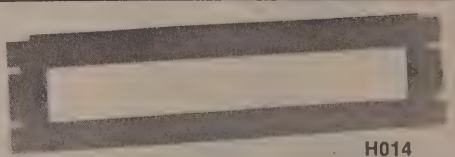


H9271

Cat. No.	List	Cat.	Cash	Shipping Weight
B-H9271	$94	$89	$86	5 lbs.

MOUNTING PANEL — H014

Shown is the H014 panel on to which a four-slot system unit can be mounted. H014 is a flat panel with raised edges and a rectangular central hole to allow the System Unit terminals to be accessed. Mounts in a 19″ rack and occupies 5¼″ vertically. An H726-B power supply (see p. 98) may be used in a rack mountable configuration by using the H014.



H014

Cat. No.	List	Cat.	Cash	Shipping Weight
B-H014	$23	$22	$21	2 lbs.

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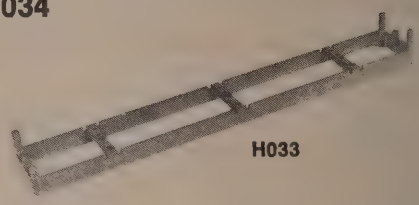
CONNECTORS AND MOUNTING HARDWARE

SYSTEM UNIT MOUNTING FRAMES — H033, H034

These are blank mounting frame predrilled to be equipped with Module Connector Blocks (H800-F, H800-W, H803, H808 or H863). Unit H033 can hold up to three blocks. H034 can hold six 4-slot blocks and three 1-slot blocks (H8030). The H034 is designed specifically to fit in a PDP-11 Processor Cabinet or a BA-11 Expansion Box. It provides module mounting space equivalent to two system units (e.g. two BB-11's). Shown is the H033. This unit can be mounted on a H014 Mounting Panel for installation in 19″ rack systems — or it can be mounted in other enclosures. H033 is 2¼″ wide by 16½″ long by 1.59″ high. H034 is 4.77″ wide by 16.52″ long by ¾″ high.

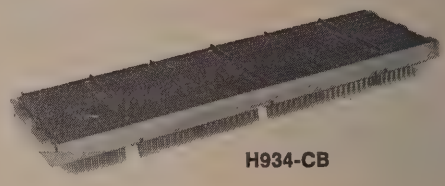


H033

Cat. No.	List	Cat.	Cash	Shipping Weight
B-**H033**	**$11**	**$10**	**$10**	2 lbs.
B-**H034**	**17**	**16**	**15**	3 lbs.

NINE-SLOT SYSTEM UNITS — H934-CB, BB11-B

A nine-slot system unit comprises up to six four-slot wide Module Connector Blocks plus three one-slot wide blocks such as H8030. The blocks are mounted in groups of three: one four-slot wide, one one-slot wide, then one four-slot wide. A fully complemented system unit can hold 54 single-height or 27 double-height, or 9 quad-height plus 16 single-height (or 8 double-height) modules. H934-CB is an unwired unit for general use comprising six H863 eight-slot blocks and three two-slot blocks H8030. Each block has 36 contacts per slot and wire wrap pins. The BB11-B unit is dedicated to general PDP-11 interfacing and is prewired for UNIBUS power only. Both units have dimensions of 4.77″ wide by 16.52″ long by .75″ high (not counting terminals).



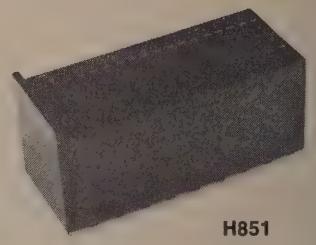
H934-CB

Cat. No.	List	Cat.	Cash	Shipping Weight
B-**H934-CB**	**$150**	**$143**	**$137**	8 lbs.
B-**BB11-B**	**285**	**271**	**259**	8 lbs.

EDGE CONNECTOR — H851

H851 is used to interconnect 36 top (Handle) contact fingers to 36 top (Handle) contact fingers on an adjacent module board. Interconnection between slots is by an in-place PC board. H851 connectors are particularly useful for the interconnection of PDP-8 Omnibus modules equipped with edge type connector fingers.

Cat. No.	List	Cat.	Cash	Shipping Weight
B-**H851**	**$19**	**$18**	**$17**	.25 lbs.



H851

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CONNECTORS AND MOUNTING HARDWARE

BUS INTERCONNECTIONS/TERMINATIONS

These specially developed connectors are dedicated to UNIBUS or OMNIBUS applications. Check table for details.

FIG. 1

FIG. 2

FIG. 3

Bus Interconnection/Termination

Cat. No.	Description	Illus.	Height	Length	Width	Comments	List	Cat.	Cash	Shipping Weight
B-M920	UNIBUS Jumper Module	Fig. 1	Double	Short	Double	Connects UNIBUS from one system unit to adjacent unit.	$65	$62	$59	.25 lbs.
B-M930	UNIBUS Terminator Module	Fig. 3	Double	Short	Single	Terminates last device on UNIBUS.	60	57	55	.25 lbs.
B-M981	UNIBUS Internal Terminator Module	Fig. 2	Double	Std.	Double	Terminates KD11-A internal UNIBUS and connects KD11-A processor to next device.	98	93	89	.25 lbs.
B-M976	UNIBUS Cable Connector	Fig. 3	Double	Short	Single	Accepts 60-cond. Flat Mylar. Solder to PC Board.* Cable Clamp 12-09764 supplied.	20	19	18	.25 lbs.
B-M935	OMNIBUS Connector Module	Fig. 1	Double	Short	Double	Connects PDP-8/e OMNIBUS from one system unit to adjacent unit.	54	51	49	.25 lbs.

*Via split lugs.

ADAPTERS

Adapters are similar to Cable Connectors. They feature, however, a plugable connector for connecting to a terminated cable. The five adapters are shown pictorially and their specifications are detailed in the table.

FIG. 1
M971 Adapter

FIG. 3
M975 Adapter

FIG. 2
M973 Adapter

FIG. 4
M9100 Adapter

FIG. 5
M9970 Adapter

Adapters — PC to Connectors

Catalog Number	B-M971	B-M973	B-M975	B-M9100	B-M9970
Illustration	Fig. 1	Fig. 2	Fig. 3	Fig. 4	Fig. 5
Contact Fingers					
Side 1	18	4	24	18	36
Side 2	18	—	24	18	36
Connector Type	H854	12-09340-00	H854	H854	H854
Quantity	1	1	2	2	1
Contacts	40 Male	4 Female*	80 Male	80 Male	40 Male
Height	Single	Single	Double	Single	Double
Length	Ext.	Ext.	Special Short†	Ext.	Ext.
Contact Finger Assignment					
Ground	—	—	6	4	—
Signal	32	4	36	32	40
Unused	—	—	4	—	32
Resistors	4‡	—	—	—	—
Cable Clamp Supplied	12-09764	—	—	—	—
E/W Handle	Yes	Yes	No	Yes	Yes
Comments	Current Limiting Resistors	TTY Cable Connector	Extra Short Length	T-junction	Connector to Contact Fingers
Price, List	$33	$33	$37	$33	$40
Price, Cat.	31	31	35	31	38
Price, Cash	30	30	34	30	36
Shipping Weight, lbs.	.25	.25	.25	.25	.25

*Mating connector must have male contacts in positions 2, 3, 5 and 7.
†Special length on M975 allows it to protrude only 1.5″ from logic panel.
‡10Ω .25W resistors in series with 4 lines.

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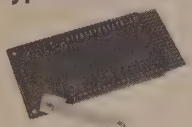
CONNECTORS AND MOUNTING HARDWARE

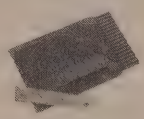
CABLE CONNECTORS

Each of these connectors comprise a unique printed wiring pattern on a PC board and means for connecting a cable to the PC board. The PC board is in fact the male half of a connector. It plugs into the slot of a standard Connector Block. Different cable types including Flat Ribbon, Flat Mylar, Flat Coaxial, Round Twisted Wire Pair, Round Coaxial and Multiconductor Round can be accommodated by specific connectors. Cables are connected by split-lug solder terminals, solderless clamp-type connector housings, or by PC soldering techniques to pads on the boards. Although certain of these connectors have been developed for specific applications, they are applicable to many other systems. Details of each connector are covered in the table. Typical connector configurations are shown pictorially to highlight the features that are available.

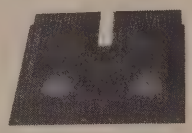
Typical Connector Configurations



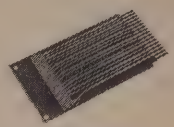
Standard length. Single height. Current limiting resistors. Split-lug terminals. **M908**



Short length. Single height. Split-lug cabling terminals. Side entry cable. **M927**



Standard length. Double height. Top entry cabling. **M912**



Standard length. Solderless connector for flat shielded cable. **M953**

Extended length. Single height. E/W handle. Side cable entry. PC pads for cable connection. **M972**

Flat Ribbon 20-Conductor

Catalog Number	B-M908	B-M957	B-M933	B-W011	B-W018	B-W021	B-W023	B-W027
Cables								
Quantity	2	2	1	1	1	1	1	1
Total Conductors	40	40	20	20	20	20	20	20
Height	Single	Single	Single	Single	Single	Single	Single	Single
Length	Std.	Ext.	Std.	Short	Short	Std.	Std.	Std.
Contact Fingers								
Qty. — Side 1 / Side 2	18/18	18/18	8/18	18/0	18/0	18/0	18/0	18/0
Contact Assignments								
Ground	—	—	—	7	—	7	—	—
Signal	32	32	—	9	18	9	16	—
Resistors	4*	4*	40**	—	—	—	—	18§
Jumpers	—	—	—	—	—	—	2	—
Unused	—	—	—	2	—	2	—	—
Cable Connections								
Quantity	36	36	20	19	18	19	18	18
Method	S.L.	S.L.	S.L.	S.L.	S.L.	S.L.	S.L.	S.L.
Cable Assignments								
Ground	—	—	—	10	—	10	—	—
Common	—	—	—	—	—	—	—	—
Signal	36	36	20	9	18	9	18	18
Entry Direction	Top	Side	Top	Top	Top	Top	Top	Top
Cable Clamp (supplied)	943	943	943	943	943	943	943	943
E/W Handle	No	Yes	No	No	No	No	No	No
Price, List	**$16**	**$24**	**$22**	**$9**	**$9**	**$8**	**$7**	**$14**
Price, Cat.	**15**	**23**	**21**	**9**	**9**	**8**	**7**	**13**
Price, Cash	**15**	**22**	**20**	**8**	**8**	**7**	**6**	**13**
Shipping Weight, lbs.	.25	.25	.25	.25	.25	.25	.25	.25

Flat Mylar 19-Conductor

Catalog Number	B-M901	B-M903	B-M918	B-M922	B-M943	B-M972	B-W031	B-W033
Cables								
Quantity	2	2	2	2	2	2	1	1
Total Conductors	38	38	38	38	38	38	19	19
Height	Single	Single	Single	Single	Single	Single	Single	Single
Length	Std.	Std.	Std.	Std.	Std.	Ext.	Short	Std.
Contact Fingers								
Qty. — Side 1 / Side 2	18/18	17/17	18/18	18/18	17/17	18/18	16/0	18/0
Contact Assignments								
Ground	—	14	—	—	14	—	7	—
Signal	32	18	—	32	18	34	9	16
Resistors	4*	—	—	—	—	2*	—	—
Jumpers	—	—	4	4	—	—	—	2
Unused	—	2	—	—	2	—	—	—
Cable Connections								
Quantity	36	38	36	36	32	36	19	18
Method	S.L.	S.L.	S.L.	S.L.	S.L.	S.L.	S.L.	S.L.
Cable Assignments								
Ground	—	20	—	—	14	—	10	—
Common	—	—	—	—	—	—	—	—
Signal	36	18	36	36	18	36	9	18
Entry Direction	Top	Top	Side	Top	Side	Side	Top	Side
Cable Clamp (supplied)	940	940	940	940	940	940	940	940
E/W Handle	No	No	Yes	No	Yes	Yes	No	Yes
Price, List	**$17**	**$11**	**$12**	**$9**	**$8**	**$30**	**$6**	**$6**
Price, Cat.	**16**	**10**	**11**	**9**	**8**	**29**	**6**	**6**
Price, Cash	**15**	**10**	**11**	**8**	**7**	**27**	**5**	**5**
Shipping Weight, lbs.	.25	.25	.25	.25	.25	.25	.25	.25

Note: See following page for footnotes.

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IRECT SALES CATALOG

HARDWARE AND ACCESSORIES

CONNECTORS AND MOUNTING HARDWARE

CABLE CONNECTORS (Cont'd)

Flat Coaxial 9-conductor

Flat Shielded 40-conductor

Catalog Number	B-M904	B-M917	B-W028	B-M954	B-M953	B-M955
Cables						
Quantity	2	2	1	2	1	1
Total Conductors	36	36	18	80	40	40
Height	Single	Single	Single	Single	Single	Single
Length	Std.	Std.	Std.	Std.	Std.	Std.
Contact Fingers						
Qty. — Side 1 / Side 2	18/18	17/17	18/0	18/18	18/18	18/0
Contact Assignments						
Ground	14	14	7	—	14	—
Signal	18	18	—	32	18	16
Resistors	—	—	—	4*	—	2*
Jumpers	—	—	9	—	—	—
Unused	4	2	2	—	4	—
Cable Connections						
Quantity	26	30	19	80	40	40
Method	S.L.	S.L.	S.L.	Con	Con	Con
Cable Assignments						
Ground	8	12	10	—	22	—
Common	—	—	—	44	—	22
Signal	18	18	9	36	18	18
Entry Direction	Top	Side	Top	Top	Top	Top
Cable Clamp (supplied)	944	940	940	Suppl.	Suppl.	Suppl.
E/W Handle	No	Yes	No	No	No	No
Price, List	**$12**	**$13**	**$7**	**$30**	**$28**	**$30**
Price, Cat.	**11**	**12**	**7**	**29**	**27**	**29**
Price, Cash	**11**	**12**	**6**	**27**	**25**	**27**
Shipping Weight, lbs.	.25	.25	.25	.25	.25	.25

Round TWP 9-pair — Round TWP 18-pair — Round TWP 19-pair — Round Coaxial 9-conductor — Round Cable 24-conductor

Catalog Number	B-M927	B-M912	B-W024	B-M904	B-M908	B-M904	B-M959
Cables							
Quantity	1	2	1	2	2	2	1
Total Conductors	18	72	36	38	38	18‡‡	24
Height	Single	Double	Single	Single	Single	Single	Single
Length	Short	Std.	Short	Std.	Std.	Std.	Short
Contact Fingers							
Qty. — Side 1 / Side 2	18/18	36/36	18/0	18/18	18/18	18/18	18/18
Contact Assignment							
Ground	16	28	2	14	—	14	—
Signal	16	36	14	18	32	18	24
Resistors	—	—	2*	—	4*	—	—
Jumpers	—	—	—	—	—	—	—
Unused	4	8	—	4	—	4	12
Cable Connections							
Quantity	27	72	33	26	36	26	24
Method	S.L.	S.L.	S.L.	S.L.	S.L.	S.L.	S.L.
Cable Assignments							
Ground	9	—	—	8	—	8	—
Common	—	35/35††	17	—	—	—	—
Signal	18	2	16	18	36	18	24
Entry Direction	Side	Top	Top	Top	Top	Top	Side
Cable Clamp (Supplied)	941	941	941	941	941	941	941
E/W Handle	No	No	No	No	No	No	No
Price, List	**$10**	**$26**	**$11**	**$12**	**$16**	**$12**	**$13**
Price, Cat.	**10**	**25**	**10**	**11**	**15**	**11**	**12**
Price, Cash	**9**	**24**	**10**	**11**	**15**	**11**	**12**
Shipping Weight, lbs.	.25	.25	.25	.25	.25	.25	.25

NOTES FOR CONNECTORS

*10 ohm ¼ series resistors.

§3000 ohm ¼W ±5% series resistors.

¶Each signal line has a D664 diode in series.

**M933 is a power distribution board that can contain 20 resistor divider networks plus ground and voltage-in terminals. Space is allowed for 2 dc filter capacitors. All components are supplied by customer.

††35/35 means that there are two mutually exclusive circuits each of which has 35 common paths.

‡‡Including drain wires.

SL — Solder lug (split lug) mounted on board.

SId — Cable conductors soldered directly to PC board.

Con — Solderless terminals in a connector housing.

TWP — Twisted wire pair. e.g. 36 TWP is 18 individually twisted pairs.

CATALOG NUMBERS VS MODEL NUMBERS

The Catalog Numbers published in this catalog relate only to purchases made through the Direct Sales Catalog. The **Bold Face** portion of each Catalog Number is the official DIGITAL Model Number. All invoices and packing slips will reference only the Model Number.

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CONNECTORS AND MOUNTING HARDWARE

RECTANGULAR CONNECTORS

Three sets of connectors are offered each of which has a male and female half. The Board-to-Cable connectors, Fig. 1 and Fig. 2 have one half affixed to a PC board while the other terminates a flat cable. The Panel-to-Cable Connectors have one half, generally, mounted on a panel; the other half terminates a round cable. See table for details.

FIG. 1

FIG. 2

FIG. 7

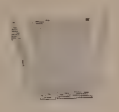
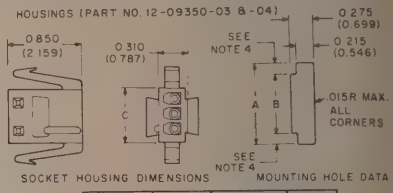


FIG. 5



Part No.	"A" Dim. ±0.005	"B" Dim.	"C" Dim.
12-09350-03	0.920	0.645/0.635	0.630
12-09350-04	1.120	0.845/0.835	0.830
12-09350-06	0.850	0.575/0.570	0.565
12-09350-09	1.085	0.815/0.810	0.805
12-09350-12	1.320	1.050/1.045	1.045
12-09350-15	1.555	1.290/1.285	1.280

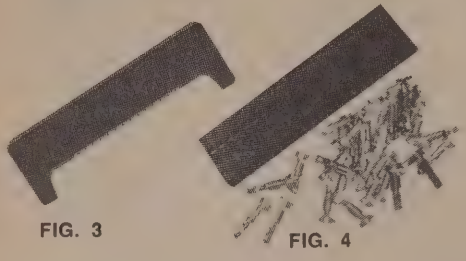


FIG. 3 FIG. 4

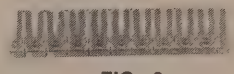
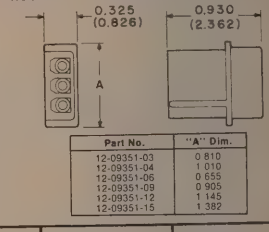


FIG. 8

FIG. 6



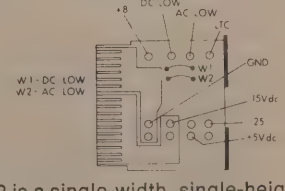
Part No.	"A" Dim.
12-09351-03	0.810
12-09351-04	1.010
12-09351-06	0.655
12-09351-09	0.905
12-09351-12	1.145
12-09351-15	1.382

Selection Guide

Catalog Number	Description	Contact Positions	Fig.	List	Cat.	Cash	Qty. (per pkg.)
Board-to-Cable Connectors							
B-12-09340-00‡	Housing Female (Board)	8	1	$1	$1	$0.90	2
B-12-09340-01‡	Housing Male (Cable)	8	2	1	1	0.90	2
B-H854	Connector Male (Board)	40	3	6	6	5	1
B-H856*	Connector Female (Cable)	40	4	10	10	9	1
Panel-to-Cable Connectors‡							
B-12-09350-03	Housing Female (Panel)	3	5	$1	$1	$0.90	5
B-12-09350-04	Housing Female (Panel)	4	5	1	1	0.90	5
B-12-09350-06	Housing Female (Panel)	6	5	1	1	0.90	5
B-12-09350-09	Housing Female (Panel)	9	5	1	1	0.90	3
B-12-09350-12	Housing Female (Panel)	12	5	1	1	0.90	3
B-12-09350-15	Housing Female (Panel)	15	5	1	1	0.90	2
B-12-09351-03	Housing Male (Cable	3	6	1	1	0.90	5
B-12-09351-04	Housing Male (Cable)	4	6	1	1	0.90	5
B-12-09351-06	Housing Male (Cable)	6	6	1	1	0.90	5
B-12-09351-09	Housing Male (Cable)	9	6	1	1	0.90	5
B-12-09351-12	Housing Male (Cable)	12	6	1	1	0.90	3
B-12-09351-15	Housing Male (Cable)	15	6	1	1	0.90	3
Contacts†							
B-12-09379-01	Female	8	7	$1	$1	$0.90	10
B-12-09378-01	Male	8	8	1	1	0.90	10

*Contacts supplied with connector. Use tool HT95 for crimping. See page 121.
†Contacts fit all connector housings in table. Female version accommodate one 22, 24 or 26 AWG wire, or two 26 or 28 AWG wire.
‡No contacts supplied. Order separately. See Contacts heading.

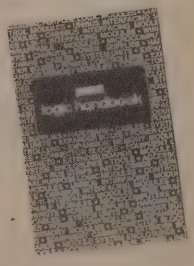
POWER CONNECTOR — G772



The G772 is a single-width, single-height, short-length board used to connect power to a backplane assembly such as a BB11 or DD11.

Cat. No.	List	Cat.	Cash	Shipping Weight
B-G772	$10	$10	$9	.25 lbs.

LOGIC HANDBOOK



The Logic Handbook, known as the computor industry's "bible" on logic design, gives you the technical story on general purpose computer interfacing, various cable configurations, system boxes and enclosures, special purpose interfaces and a host of other compatible equipment.

For almost twenty years, the Logic Handbook has been regarded as the one reference book for customers for the world of interfacing and DEC products. Have your own resident DEC sales and technical consultant — the Logic Handbook!

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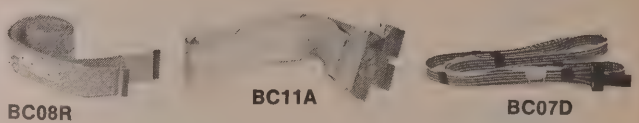
DIRECT SALES CATALOG

HARDWARE AND ACCESSORIES

CONNECTORS AND MOUNTING HARDWARE

CABLE ASSEMBLIES

Preassembled cables are available from DIGITAL. A variety of lengths, cable types and terminations can be bought from this catalog. Some have a dedicated application, others are general purpose. The connectors referred to in the table are described in detail elsewhere in this catalog.



Typical examples of cable assemblies.

Selection Guide

Cat. No.	Cable Length (feet)	Used On	Connector	Cable Material	Connector	List	Cat.	Cash	Shipping Weight (lbs.)
B-BC04Z-06	6	General Purpose	H856	Flat, 40-cond., Mylar	Open	$44	$42	$40	1
B-BC04Z-10	10	General Purpose	H856	Flat, 40-cond., Mylar	Open	53	50	48	2
B-BC04Z-15	15	General Purpose	H856	Flat, 40-cond., Mylar	Open	63	60	57	2
B-BC04Z-25	25	General Purpose	H856	Flat, 40-cond., Mylar	Open	89	85	81	3
B-BC05C-25	25	Multi-use	H856	Round 25-cond.	RS232 (Male)	112	106	102	3
B-BC05C-50	50	Multi-use	H856	Round 25-cond.	RS232 (Male)	143	136	130	5
B-BC05D-10	10	Multi-use	RS232 (Male)	Round 25-cond.	RS232 (Female)	94	89	86	3
B-BC05D-25	25	Multi-use	RS232 (Male)	Round 25-cond.	RS232 (Female)	132	125	120	5
B-BC06R-06	6	Mass-Bus	H855	Flat 40-cond.	H855	37	35	34	4
B-BC06R-10	10	Mass-Bus	H855	Flat 40-cond.	H855	45	43	41	5
B-BC06R-25	25	Mass-Bus	H855	Flat 40-cond.	H855	75	71	68	8
B-BC06R-50	50	Mass-Bus	H855	Flat 40-cond.	H855	125	119	114	12
B-BC07A-10	10	General Purpose	H856	Round 20-TWP	Open	77	73	70	2
B-BC07A-15	15	General Purpose	H856	Round 20-TWP	Open	88	84	80	3
B-BC07A-25	25	General Purpose	H856	Round 20-TWP	Open	99	94	90	5
B-BC07D-10	10	General Purpose	H856	Ribbon, 20-cond.	Open	75	71	68	2
B-BC07D-15	15	General Purpose	H856	Ribbon, 20-cond.	Open	90	86	82	3
B-BC07D-25	25	General Purpose	H856	Ribbon, 20-cond.	Open	105	100	96	5
B-BC08J-06	6	PDP-8 Series	H856	Flat, 40-cond.	M953	83	79	76	1
B-BC08J-10	10	PDP-8 Series	H856	Flat, 40-cond.	M953	94	89	86	1
B-BC08J-15	15	PDP-8 Series	H856	Flat, 40-cond.	M953	107	102	97	2
B-BC08J-25	25	PDP-8 Series	H856	Flat, 40-cond.	M953	127	121	116	3
B-BC08J-50	50	PDP-8 Series	H856	Flat, 40-cond.	M953	187	178	170	6
B-BC08R-01	1	General Purpose	H856	Flat, 40-cond.	H856	50	48	46	1
B-BC08R-03	3	General Purpose	H856	Flat, 40-cond.	H856	54	51	49	1
B-BC08R-06	6	General Purpose	H856	Flat, 40-cond.	H856	61	58	56	2
B-BC08R-08	8	General Purpose	H856	Flat, 40-cond.	H856	65	62	59	2
B-BC08R-10	10	General Purpose	H856	Flat, 40-cond.	H856	69	66	63	3
B-BC08R-12	12	General Purpose	H856	Flat, 40-cond.	H856	74	70	67	3
B-BC08R-20	20	General Purpose	H856	Flat, 40-cond.	H856	91	86	83	5
B-BC08R-25	25	General Purpose	H856	Flat, 40-cond.	H856	102	97	93	5
B-BC08R-50	50	General Purpose	H856	Flat, 40-cond.	H856	187	178	170	8
B-BC11A-02	2	UNIBUS	M919	Dual 60-cond.	M929	127	121	116	1
B-BC11A-05	5	UNIBUS	M919	Dual 60-cond.	M929	143	136	130	1
B-BC11A-08F	8.5	UNIBUS	M919	Dual 60-cond.	M929	160	152	146	2
B-BC11A-10	10	UNIBUS	M919	Dual 60-cond.	M929	176	167	160	2
B-BC11A-15	15	UNIBUS	M919	Dual 60-cond.	M929	193	183	176	3
B-BC11A-25	25	UNIBUS	M919	Dual 60-cond.	M929	220	209	200	4
B-BC11K-25	25	DR11-C	H856	Round 20-TWP	Open	140	133	127	4
B-BC11S-25	25	General Purpose	H856	Round	H856	100	95	91	6
B-BC11S-50	50	General Purpose	H856	Round	H856	150	143	137	8
B-BC11S-AO	100	General Purpose	H856	Round	H856	260	247	237	10

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DIRECT SALES CATALOG

CONNECTORS AND MOUNTING HARDWARE

CABLING

The following cabling can be ordered directly from catalog. Specify part number, length desired (avail. in increments of 1 ft.)

Cat. No.	Description	List*	Cat.*	Cash*	Shipping Weight (lbs./foot)
B-17-00001-00	Flat Coaxial, 9 cond.	$1.00	$1.00	$ .90	.25
B-17-00002-00	Flat Coaxial, 19-cond.	1.00	1.00	.90	.25
B-17-00002-01	Flat Coaxial, 60-cond.	2.00	2.00	1.80	.25
B-17-00003-00	Round, Coaxial	1.00	1.00	.90	.25
B-17-00004-00	Flat Coaxial, 40-cond.	2.00	2.00	1.80	.25
B-17-00018-00	Cable, Round, 20 TWP	2.00	2.00	1.80	.25
B-91-07575	Cable, Ribbon, 20-cond.	.60	.60	.50	.25
B-91-07706	Cable, Round, 6-cond.	.50	.50	.40	.25
B-91-07736	Cable, Round, 25-cond.	1.20	1.20	1.10	.25

*Price per foot.

Wire Wrapping Wire

Cat. No.	Description	List†	Cat.†	Cash†	Shipping Weight (lbs./spool)
B-91-05740	Wire Wrapping Wire, 30 AWG, 1000 ft./spool	$66	$63	$60	2
B-91-07688	Wire Wrapping Wire, 24 AWG, 1000 ft./spool	55	52	50	3

†Price per spool.

Cable Clamps

Cat. No.	Application	Pieces per Pkg.	Price per Pkg. List	Cat.	Cash	Shipping Weight (lbs./pkg.)
B-12-09764‡	Flat Cable to 4.562″ Wide	5	$3	$3	$2.70	.25
B-12-09925	Round Cable from .29″ to .39″ Dia. Attachable to H807 Block	4	1	1	0.90	.25
B-940‡	Flat Cable to 1.75″ Wide	25	8	8	7	.25
B-941‡	Round Cable .281″ to .438″ Dia.	25	9	9	8	.25

‡Eyelets to mount cable clamps supplied with each package.

GRIP CLIPS — H820, H821 — Make Your Own Patch Cords

Designed to slip easily on to wire wrap pins, these grip-clip connectors are sold in 1,000 lot quantities. H820 fits wire wrap pins that accept 24 AWG; H821 for 30 AWG-designed pins. Tools H825 and H826 can be used to crimp these connectors to 24 or 30 AWG stranded wire. See tools elsewhere in this hardware section.

Cat. No.	Price per 1000 List	Cat.	Cash	Shipping Weight
B-H820	$53	$50	$48	1 lb.
B-H821	125	119	114	1 lb.

CATALOG NUMBERS VS MODEL NUMBERS

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? NEED SOME QUICK ANSWERS ?

Ask our Direct Sales Catalog Staff. They are all knowledgeable and can answer most of your questions rightaway — or send you back-up literature — or connect you with an applications expert — or, do just about anything that can possibly be done to make it easy for you to buy the Direct Sales Catalog Way. Put them through their paces. Call 800-258-1710 (N.H. residents 603 - 884-6660) between 8:30 am and 5 pm EST.

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digital DIRECT SALES CATALOG

HARDWARE AND ACCESSORIES

CONNECTORS AND MOUNTING HARDWARE

PATCH CORDS — FOR WIRE WRAP TERMINALS — 913, 915

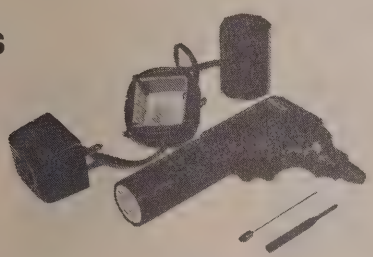
Equipped with H820 or H821 grip-clip connectors to provide slip-on connections to wire wrap pins, these patch cords are available in assorted lengths and insulation colors. 913 fits wire wrap pins sized for 24 AWG; 915 for 30 AWG-designed pins. IPVC insulated stranded wire (24 AWG for 913, 26 AWG for 915) forms the patch cord.

Ordering Information

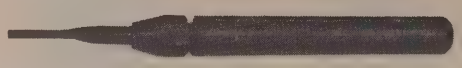
Add appropriate dash number for color/length required according to the following: 2-in Brown (-2); 3-in Brown/White (-3); 4-in Red (-4); 6-in Red/White (-6); 8-in Orange (-8); 12-in Orange/White (-12); 16-in Yellow (-16); 24-in Yellow/White (-24); 32-in Green (-32); 48-in Green/White (-48); 64-in Blue (-64); order dash number (-AF) for a 100 assortment as follows: 30(-3), 25(-6), 25(-8), 10(-24), 5(-32), 5(-64).

Cat. No.	Qty. per Pkg.	List	Cat.	Cash	Shipping Weight
B-913(-XX)	100	$28	$27	$25	1 lb.
B-915(-XX)	100	36	34	33	1 lb.

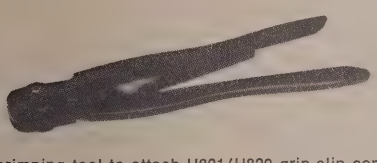
TOOLS



Battery operated wire wrap guns have rechargeable nickel-cadmium batteries. Supplied w/bit and sleeve set, and recharger.



Hand wrap tool is essential for service and repair work. Use for limited production applications, too.



Hand crimping tool to attach H821/H820 grip-clip connectors to 24/30 AWG stranded wire.

Hand unwrapping tool quickly removes wrapped wires.

Ordering Information

Description	Wire Size AWG	Cat. No.	List	Cat.	Cash	Shipping Weight
Wire Wrap Gun E/W Bit/Sleeve	24	B-H810-C	$298	$283	$271	2 lbs.
Wire Wrap Gun E/W Bit/Sleeve	30	B-H810-D	165	157	150	2 lbs.
Wire Wrap Hand Wrap Tool	24	B-H811	48	46	44	1 lb.
Wire Wrap Hand Wrap Tool	30	B-H811-A	65	62	59	1 lb.
Wire Wrap Hand Unwrap Tool	24	B-H812	13	12	12	1 lb.
Wire Wrap Hand Unwrap Tool	30	B-H812-A	19	18	17	1 lb.
Wire Wrap Gun, Bit (Replacement)	30	B-H813-A	39	37	35	1 lb.
Wire Wrap Gun Sleeve (Replacement)	30	B-H814-A	23	22	21	2 lbs.
Crimping Tool for H820 Grip-Clips	24	B-H825	161	153	147	2 lbs.
Crimping Tool for H821 Grip-Clips	30	B-H826	250	238	228	2 lbs.
Crimping Tool for H856 Contacts	*	B-HT-95	195	185	177	8 lbs.

*See contacts description on p. 118.

DEALING DIRECT SAVES YOU $$$

The **Cat** prices are lower than **List** price. Pay **Cash** price and save even more. To qualify for these discounts follow the rules for dealing direct with DIGITAL's Catalog Sales Desk — see page 154 for details.

CALL: 800-258-1710 (N.H. Residents 603 - 884-6660) 8:30 am to 5 pm EST.

digital
DIRECT SALES CATALOG

WIRE WRAPPABLE BOARDS

Wire wrappable modules provide a convenient, low-cost method of producing prototype or limited runs of production modules with special circuitry that utilizes, mainly, dual-in-line package (DIP) integrated circuits (IC's). They are completely compatible with the standard module mounting blocks summarized elsewhere in this publication. There are two styles of board offered in this Section of the catalog:

- *Series W940 and W950 — General purpose.*
- *Series W9300 — High density, socket pins.*

Series W900 can be obtained with or without premounted sockets. Series W9300 has special "socket pins" that allow IC's (or other component leads) to be plugged in without soldering.

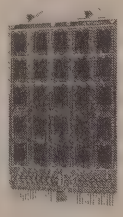
See LSI-11 Section and PDP-11 Modules for other Wire Wrappable Boards.

GENERAL PURPOSE — SERIES W940 AND W950

These glass epoxy, wire wrappable modules have +5V dc power and ground bused (printed circuit etch tracks) to wire wrap pins at each IC location to facilitate connection of Vcc and ground to the appropriate IC wire wrap pin. The wire wrap pins each accommodate two 30 AWG wire wraps. All of these modules have etched and gold-plated contact fingers and all have handles attached.

25 DIP Capacity, 14- or 16-pin

W941



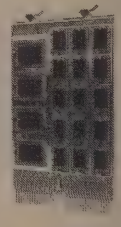
W943

Cat. No.	Size	DIP Capacity 14-Pin	DIP Capacity 16-Pin	Sockets Supplied	List	Cat.	Cash
B-W941	EDS	25 or	25	None	$64	$61	$58
B-W943	EDS	—	25	25	88	84	80

Shipping Weight: 2 lbs.

19 DIP Capacity — 15, 14- or 16-pin 4, 24-pin*

W951

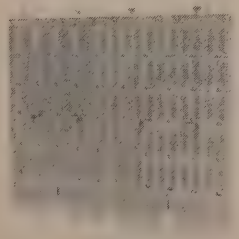


W953

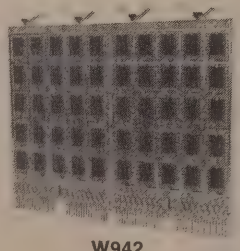
Cat. No.	Size	DIP Capacity 14-Pin	DIP Capacity 16-Pin	DIP Capacity 24-Pin	Sockets Supplied	List	Cat.	Cash
B-W951	EDS	15 or	15 and	4*	None	$55	$52	$50
B-W953	EDS	—	15 and	4*	15, 16-Pin 4, 24-Pin	95	90	86

Shipping Weight: 2 lbs.
*4, 14-pin or 16-pin DIP's can be used instead of 4, 24-pin.

50 DIP Capacity, 14- or 16-pin



W940

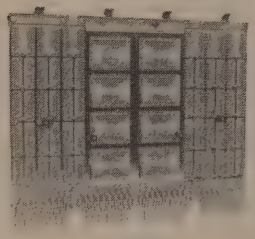


W942

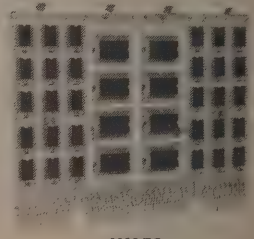
Cat. No.	Size	DIP Capacity 14-Pin	DIP Capacity 16-Pin	Sockets Supplied	List	Cat.	Cash
B-W940	EQS	50 or	50	None	$130	$124	$118
B-W942	EQS	—	50	50	175	166	159

Shipping Weight: 3 lbs.

38 DIP Capacity — 30, 14- or 16 pin 8, 24-pin



W950



W952

Cat. No.	Size	DIP Capacity 14-Pin	DIP Capacity 16-Pin	DIP Capacity 24-Pin	Sockets Supplied	List	Cat.	Cash
B-W950	EQS	30 or	30 and	8	None	$95	$90	$86
B-W952	EQS	—	30 and	8	30, 16 Pin 8, 24-Pin	210	200	191

Shipping Weight: 3 lbs.

WIRE WRAPPABLE & EXTENDER

HIGH DENSITY, SERIES W9300

The W9301 and W9302 are wire wrappable modules suitable for user designed logic interface applications. The module accepts a variety of dual-in-line (DIP) integrated circuits (IC's) or discrete components which can be mounted to the module without the use of solder. The component or IC leads insert into specially designed socket terminals which have a wire wrap pin on the opposite end. The electrical interconnection of the wire wrap pins can be performed manually or by using automated wire wrapping techniques.

The W9301 board has four rows of 36 gold-plated contacts (18 contacts on each side of each row). Each contact is connected to a wire wrap pin by the board etch. A ground plane is etched on side 1 of the module and power (Vcc) plane is etched on side 2. Contact pin A2 of each of the four rows directly connects to the power plane, and contact pins C2 and T1 directly connect to the ground plane. The module is quad-height, extended length. A total of 68 decoupling capacitors are provided premounted between Vcc and GND at each main IC location. The module occupies 2 slots of a standard DIGITAL system unit. A 40-pin connector is mounted at the edge of the module to facilitate the attachment of a device cable assembly.

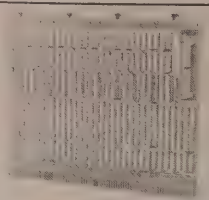
The W9302 board has six rows of 36 gold-plated contacts (18 contacts on each side of each row). Each contact is connected to a wire wrap pin by the board etch. A ground plane is etched on side 1 of the module and power (Vcc) plane is etched on side 2. Contact pin A2 of each of the six rows directly connects to the power plane, and contact pins C2 and T1 directly connect to the ground plane. The module is hex height, extended length. A total of 97 decoupling capacitors are provided premounted between Vcc and GND at each main IC location. The module occupies two slots in a standard DIGITAL system unit. Two 40-pin connectors are mounted at the edge of the module to facilitate the attachment of device cable assemblies.

Wire Wrap Terminals

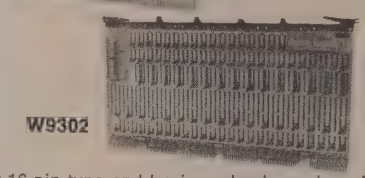
All wire wrap terminals on side 2 of the modules are located on a grid of 0.1″ spacing to facilitate automatic point-to-point wire wrapping equipment. The connections to the pins are made using #30 gauge solid conductor insulated wire.

Total IC Complement

The W9301 module has three pin configuration areas assigned to 16-pin, 24- and 40-pin IC's. The 16-pin area consists of three rows of socket terminals and will accept a total of 47 IC's of the 8-, 14-, or 16-pin type and having a lead spacing of 0.3″. The 24-pin area will accept a total of 10 IC's with up to 24 pins per IC, and having a lead spacing of 0.3, 0.4, or 0.6″. The 40-pin area will accept a total of 11 IC's with up to 40 leads per IC having a lead spacing of 0.6″ or a total of 22 IC's with up to 16 leads per IC and having a lead spacing of 0.3″. Thus up to 79 IC equivalents (14- or 16-pin DIP) can be mounted on the module. Areas are provided on the board for mounting DIP's with a center spacing of 0.3, 0.4, or 0.6″. Table I lists the acceptable IC types and pin spacing.



W9301



W9302

TABLE I IC TYPES

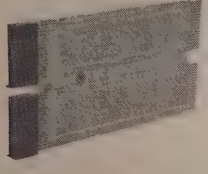
IC, Total Pins	Center Spacing (Inch.)
8	0.3
14	0.3
16	0.3
18	0.3
20	0.3
22	0.4
24	0.6
28	0.6
40	0.6

The W9302 module has three pin configuration areas assigned to 16-, 24-, and 40-pin IC's. The 16-pin area consists of three rows of socket terminals and will accept a total of 65 IC's of the 8-, 14-, or 16-pin type and having lead spacing of 0.3″. The 24-pin area will accept a total of 15 IC's with up to 24-pins per IC, and having a lead spacing of 0.3, 0.4, or 0.6″. The 40-pin area will accept a total of 17 IC's with up to 40 leads per IC and having a lead spacing of 0.6″ or a total of 34 IC's with up to 16 leads per IC and having a lead spacing of 0.3″. Thus up to 114 IC equivalents (14- or 16-pin DIP's) can be mounted on the module. Areas are provided on the board for mounting DIP's with a center spacing of 0.3, 0.4 or 0.6″. Table I lists acceptable IC types and pin spacing.

Cat. No.	Size	DIP Capacity 8-, 14- or 16-Pin	DIP Capacity 24-Pin	DIP Capacity 40-Pin	Prices	Shipping Weight
B-W9301	EQD	47	10	11*	CALL FOR CURRENT PRICING	3 lbs.
B-W9302	EHD	65	15	17†		4 lbs.

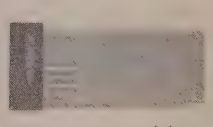
*Or 22 additional 16-Pin DIP's with 0.3″ lead spacing.
†Or 34 additional 16-Pin DIP's with 0.3″ lead spacing.

MODULE EXTENDER BOARDS



W900

Used in systems comprising extended length modules to extend a double-height, 72-pin module with +5V dc power at contact fingers AA2 and BA2 and with ground at contact fingers AC2, BC2, AT1, and BT1, i.e., most double-height M-Series modules. This is a multilayer module: layer 2 is the ground plane and layer 3 is the +5V dc power plane.

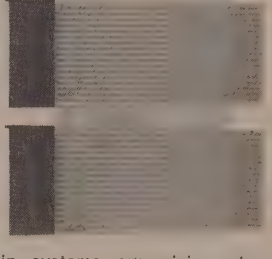


W980

Used in systems comprising standard length modules to extend a single-height, 18-pin (one side only) module, i.e., most A-, K-, and W-Series modules. None of the contact fingers are interconnected.

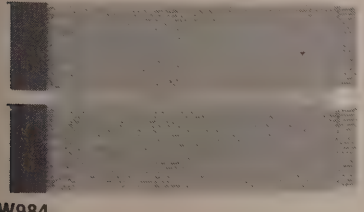
W982

Used in systems comprising standard length modules to extend a single-height, 36-pin module, i.e., single-height M-Series modules. None of the contact fingers are interconnected.



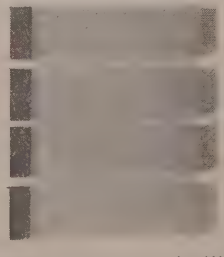
W983

Used in systems comprising standard length modules to extend a double-height, 72-pin module, i.e., double-height M-Series modules. None of the contact fingers are interconnected.



W984

The same as W983 except the W984 is an extended length module extender board and should be used to extend a system module located beside one, or between two, extended length modules.



W987

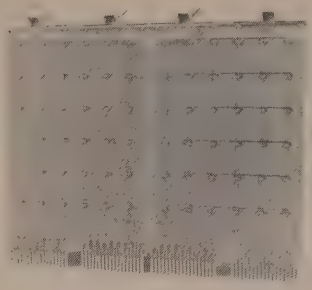
The same as W984 except the W987 is a quad-height module extender board and should be used to extend quad-height (144-pin) modules.

Cat. No.	List	Cat.	Cash	Shipping Weight
B-W900	$130	$124	$118	2 lbs.
B-W980	17	16	15	½ lb.
B-W982	21	20	19	½ lb.
B-W983	32	30	29	½ lb.
B-W984	37	35	34	1 lb.
B-W987	59	56	54	2 lbs.

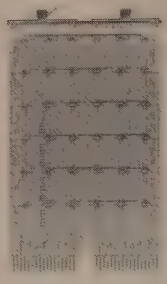
CALL: 800-258-1710 (N.H. Residents 603 - 884-6660) 8:30 am to 5 pm EST.

EXTENDER, COLLAGE AND BLANK BOARDS

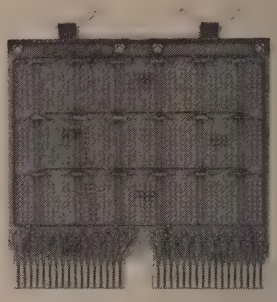
COLLAGE MODULE BOARDS



W968



W969



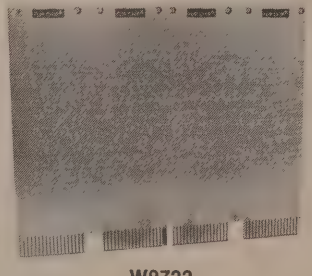
W979

Collage module boards provide a convenient, low-cost method of producing prototype or limited runs of production modules with special circuitry that uses 14- or 16-pin dual-in-line package (DIP) integrated circuits (IC's) with or without wire wrap sockets and/or solder sockets. These different configurations are described in the table that follows. Collage module boards are completely compatible with the standard module mounting blocks. These glass epoxy modules have +5V dc power and ground bused (printed circuit etch tracks) to plated-through holes at each IC location to facilitate connection of Vcc and ground to the appropriate IC pin.

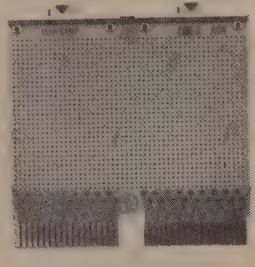
Cat. No.	Description	List	Cat.	Cash	Shipping Weight
B-W968	Accommodates up to seventy-two 14- or 16-pin DIP IC's with or without wire wrap sockets and/or solder sockets.	$74	$70	$67	3 lbs.
B-W969	Same as W968 except accommodates 36 IC's.	37	35	34	1 lb.
B-W979	Same as W968 except accommodates 18 IC's.	29	28	26	½ lb.

BLANK MODULE BOARDS

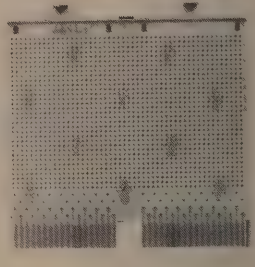
W930



W9722



W975



W999

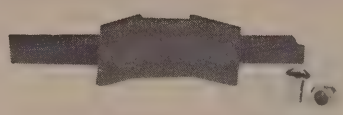
Blank module boards provide a convenient method of breadboarding (mounting) experimental or prototype circuits, and they provide a low-cost method of producing limited runs of production modules with special circuitry. They are completely compatible with the standard module mounting blocks. These glass epoxy, blank module boards have etched and gold-plated contact fingers and all have handles supplied.

Cat. No.	Description	List	Cat.	Cash	Shipping Weight
B-W930	Bare board wih 36 feed-through eyelets. PC etching from the eyelets to the contact fingers.	$11	$10	$10	¼ lb.
B-W970	Bare board with 36 plated-through holes in the printed circuit etching to the contact fingers.	11	10	10	¼ lb.
B-W971	Same as W970 except double-height and has 72 plated-through holes and two handles.	17	16	15	¼ lb.
B-W972	Copper-clad on both sides.	15	14	14	¼ lb.
B-W9720	Same as W972 except extended length.	9	9	8	½ lb.
B-W9721	Same as W9720 except double-height and has two handles.	17	16	15	½ lb.
B-W9722	Same as W9720 except quad-height and has four handles.	31	29	28	1 lb.
B-W973	Same as W972 except double-height.	28	27	25	½ lb.
B-W974	Perforated board with 36 plated-through holes in the printed circuit etching to the contact fingers.	10	10	9	¼ lb.
B-W975	Same as W974 except double-height and has 72 plated-through holes and two handles.	21	20	19	¼ lb.
B-W990	Bare board with 18 split-lug terminals. Printed circuit etching from the split-lugs to the contact fingers. This board has contact fingers on one side only.	8	8	7	¼ lb.
B-W991	Same as W990 except double-height and has 36 split-lug terminals and two handles.	15	14	14	½ lb.
B-W992	Same as W972 except copper-clad on one side only and has contact fingers on one side only.	7	7	6	¼ lb.
B-W993	Same as W973 except copper-clad on one side only and has contact fingers on one side only.	12	11	11	½ lb.
B-W998	Same as W974 except has 18 plated-through holes and has contact fingers on one side only.	9	9	8	¼ lb.
B-W999	Same as W975 except has 36 plated-through holes and has contact fingers on one side only.	14	13	13	¼ lb.

MISCELLANEOUS

MODULE HANDLE — 937

The 937 (90-08337-08) is a package containing 25 blank, gray module handles and the eyelets to attach them to modules. These blank handles are generally user-attached to prototype or limited-production run modules that utilize blank copper-clad or wire wrappable modules. The handles are compatible with the handles of all DIGITAL's standard A-, K-, M-, and W-Series modules. They have two 0.128″ diameter mounting holes spaced 2.00″ center-to-center.

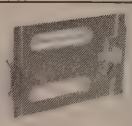


Cat. No.	Description	List	Cat.	Cash	Shipping Weight (per pkg.)
B-**937**	Package of 25 Blank Module Handles	$8	$8	$7	¼ lb.

MODULE HANDLE EXTENDER — H850

The H850 Module Handle Extender mounts over the handle of a single-height, single-length module and physically extends the length to make a single-length module congruous with extended length modules.

The H850 is manufactured from durable, U.L. Standard No. 94 recognized material and is sized to fit over DIGITAL's standard module handle. It is sold in lots of ten.

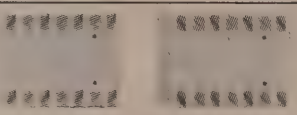


Cat. No.	Description	List	Cat.	Cash	Shipping Weight (per pkg.)
B-**H850**	Package of 10 Module Handle Extenders	$15	$14	$14	¼ lb.

MODULE HOLDER CLIPS — H852, M853 •

The H852 and H853 Module Holder Clips are used to maintain rigidity of the modules in a system. Each module holder clip fits over the top (handle end) of modules of the same length in adjacent slots of a system unit. The H852, a ribbed type, fits between handles of modules in the same connector block; the H853, a nonribbed type, fits between handles of modules in adjacent (end-to-end) connector blocks.

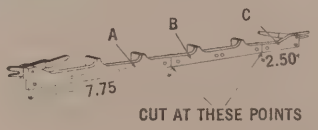
The H852 and H853 are manufactured from durable, plastic material that is nonconductive. Sold in lots of 25 each.



Cat. No.	Description	List	Cat.	Cash	Shipping Weight (per 25 lot)
B-**H852**	Package of 25 Module Holder Clips (ribbed type)	$9	$9	$8	¼ lb.
B-**H853**	Package of 25 Module Holder Clips (nonribbed type)	9	9	8	¼ lb.

HOLD-DOWN BRACKET — 12-10711-02

The 12-10711-02 module hold-down bracket serves as a mechanical combination handle and hold-down bracket for Hex-size modules when used with appropriate card guides such as an H0341. This bracket can also be used as a hold-down bracket for LSI-11 compatible modules (quad-size) but must be modified as shown in the accompanying drawing.



CUT AT THESE POINTS

Cat. No.	List	Cat.	Cash	Shipping Weight
B-**12-10711-02**	$4	$4	$3	1 lb.

IC SOCKETS — 954, 961, 962

These integrated circuit (IC) sockets provide low-cost, reliable production packaging of 14- or 16-, 24-, and 40-pin dual-in-line package (DIP) integrated circuits (ICs). These low-profile IC sockets are especially useful for limited-production runs of special, user-designed circuitry using blank or wire wrappable module boards (described in this section), which are available without factory-installed IC sockets.

The 954 accepts 14- or 16-pin ICs; 10 sockets/package.

The 961 accepts 24-pin ICs; 5 sockets/package.

The 962 accepts 40-pin ICs; 5 sockets/package.

Cat. No.	Description	List	Cat.	Cash	Shipping Weight (per pkg.)
B-**954**	Package of 10 Sockets 14- or 16-pin IC's	$8	$8	$7	¼ lb.
B-**961**	Package of 5 Sockets for 24-pin IC's	8	8	7	¼ lb.
B-**962**	Package of 5 Sockets for 40-pin IC's	25	24	23	¼ lb.

DAISY CHAIN — 917-2.5

The 917 Daisy Chain is a continuous length of stranded insulated wire on a reel with 250 gold-plated and insulated terminals crimped at 2.5″ intervals. A prototype system is easily and quickly hand patched when the 917 Daisy Chain is used.

The terminals are designed to fit on module connector blocks that have wire wrap pins sized for wrapping with 30 AWG wire (0.025/0.026″ square) e.g., module connector blocks H803, H8030, H807, and H863.

The 917-2.5 Daisy Chain has 250 terminals at 2.5″ intervals.

Cat. No.	List	Cat.	Cash	Shipping Weight
B-**917-2.5**	$61	$58	$56	2 lbs.

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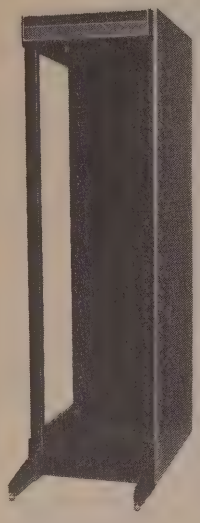
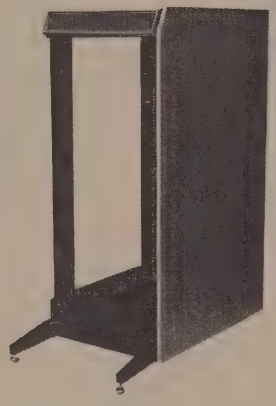
DIRECT SALES CATALOG

CABINETS AND ENCLOSURES

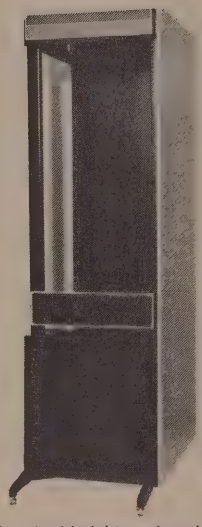
CABINETS — STANDARD AND SHORT



Standard height cabinet has 63″ of vertical mounting space



Short height cabinet has 42″ of vertical mounting space



Standard height equipped with short door and 5¼″ Bezel Cover Panel

Rear view of standard cabinet showing mounting panel door frame and full door

This cabinet style has two frames: standard size and short size; plus a complete line of cabinet accessories and hardware. Both sizes accept panels or equipment designed to mount in standard 19″ electronics cabinets or racks. The cabinet frames are rigidly constructed of 12 and 13 gauge steel, either riveted or welded together.

Basic color of the cabinet is black. Gray is used for end panels and the bezel of the cover panels.

These cabinet frames offer complete flexibility and expandability to present and future DIGITAL systems for end users, and original equipment manufacturers. The enclosure area in these cabinets is adaptable to customer-designed hardware, logic module racks, power supplies, computer systems and peripherals.

All cabinets are configured around the basic H950-AA or H957-AA Cabinet Frame. These cabinet frames are drilled with 0.25″ diameter holes at standard EIA spacings to accommodate equipment, panels, or devices which are designed to mount in standard 19″ electronics cabinets or racks. Some cabinets contain a Power Controller for distribution and control of the main power to the equipment installed. The five basic configurations shown later include a rear mounting panel door frame, which is also drilled with 0.25″ diameter holes at standard EIA spacings; this mounting panel door frame allows the equipment and devices mounted on it to be swung out for maintenance or adjustment. Optional accessories as specified by the customer can be added to any of the basic configurations. The parts and accessories included with each of the basic cabinet configurations are listed on page 89. The optional accessories that are available for use with these cabinets are listed opposite. All cabinets are completely assembled before shipment.

The cabinets can be placed individually or attached to form a multi bay configuration. The accessories and hardware available include front and rear doors, panel mounting door frames and door skins, end panels, bezel and logo panels, blower fans, and power controllers.

Standard Size Cabinets

Four basic cabinet configurations (H960-BC, H960-CA, H961-A, H961-AA) are available in the standard size cabinet series. The H961-A, -AA are intended primarily for add-on configurations. The standard size cabinet is 71.5″ high and provides 63.0″ of vertical mounting space at the front; an additional 63.0″ of mounting space is available at the rear of the cabinet. These cabinets are configured to meet the requirements of most customer applications.

Short Size Cabinet

The short size cabinet (H967-BA) is 50.0″ tall and provides 42.0″ of vertical mounting space at the front; an additional 42.0″ of mounting space is available at the rear of the cabinet.

How to Order A Basic Cabinet Assembly

Determine if one of the basic cabinet assembly configurations will fulfill your requirements by referring to page 89. and comparing the items that comprise each configuration.

If one of these basic configurations will satisfy your requirements, you can order the completely assembled cabinet by specifying that cabinet assembly number; e.g. H960-BC. In addition to the accessories included in the five configurations, optional accessories are available, e.g. short doors, a cabinet table, and drawer mounting slides.

If one of the basic configurations will not fulfill your requirements, you can "build up" and order a cabinet that will suit your specific requirements by ordering an H950-AA standard size frame or an H957-AA short frame and the accessories (by specific part numbers) that you require. The frame and the accessories that you select will be shipped completely assembled.

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CABINETS AND ENCLOSURES

BASIC CONFIGURATIONS

STANDARD HEIGHT

H960-CA and H960-BC — Both Models are E/W:

Cabinet frame 19W by 25D by 69″H
Mounting panel door frame. Rear mtg. RH
Logo frame panel (plastic)*
5 Bezel cover panels 10½″
2 End panels
Stabilizer feet (pair)
Kickplate
Fan assembly. Top mounted, 115V ac
Filter for fan
Power controller. 90-135V ac, Single phase

H960-CA only
Full door. Rear mounted. RH

H960-BC only
Mounting panel door skin

Cat. No.	List	Cat.	Cash	Shipping Weight
B-H960-CA	$1210	$1150	$1101	321 lbs.
B-H-960-BC	1210	1150	1101	331 lbs.

STANDARD HEIGHT

H961-AA

Cabinet frame 19W by 25D by 69″H
Mounting panel door frame. Rear mtg. RH
Mounting panel door skin
Logo frame panel (plastic)*
Filler strip (front and rear for 1 side only)
Kickplate
Fan assembly. Top mounted, 115V ac
Filter for fan
Power controller. 90-135V ac, Single phase

NOTE: End panels not supplied. Order separately if required.

Cat. No.	List	Cat.	Cash	Shipping Weight
B-H961-AA	$935	$888	$851	245 lbs.

STANDARD HEIGHT

H961-A

Cabinet frame 19W by 25D by 69″H
Mounting panel door frame. Rear mtg. LH
Mounting panel door skin
Logo frame panel (plastic)*
Kickplate
Filler strip set (front and rear for 1 side only)
Fan assembly. Top mounted, 115V ac
Filter for fan
6 Bezel cover panels 10½″

NOTE: Front bezel cover panels are not supplied nor is a power controller. End panels if required must be ordered separately.

Cat. No.	List	Cat.	Cash	Shipping Weight
B-H961-A	$935	$888	$851	236 lbs.

*Inlay strip included. Specify color — terra cotta amber or magenta rose.

SHORT HEIGHT

H967-BA

Cabinet frame 19W by 25D by 47½″H
Mounting panel door frame. Rear mtg. RH
Full door. Rear mtg. RH
Logo frame panel*
End panel, right
End panel, left
Fan assembly. Rear mtg. 115V ac
Filter for fan
Kickplate
Stabilizer feet (pair)
Power controller. 90-135V ac, Single phase

NOTE: Bezel cover panels are not supplied.

Cat. No.	List	Cat.	Cash	Shipping Weight
B-H967-BA	$1399	$1329	$1273	276 lbs.

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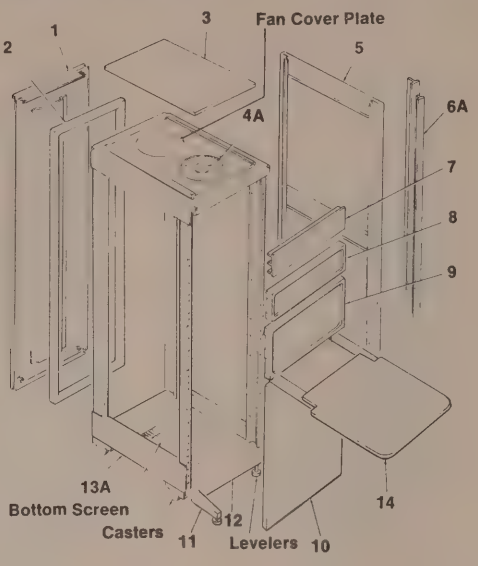
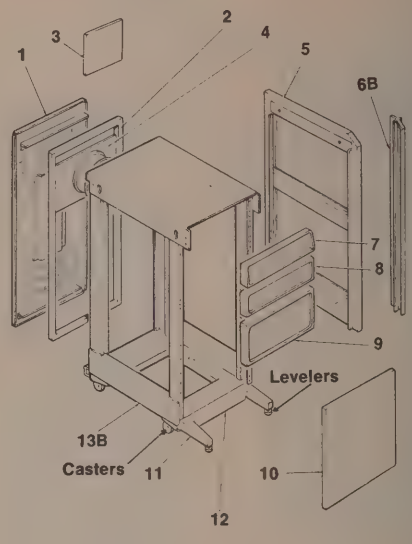
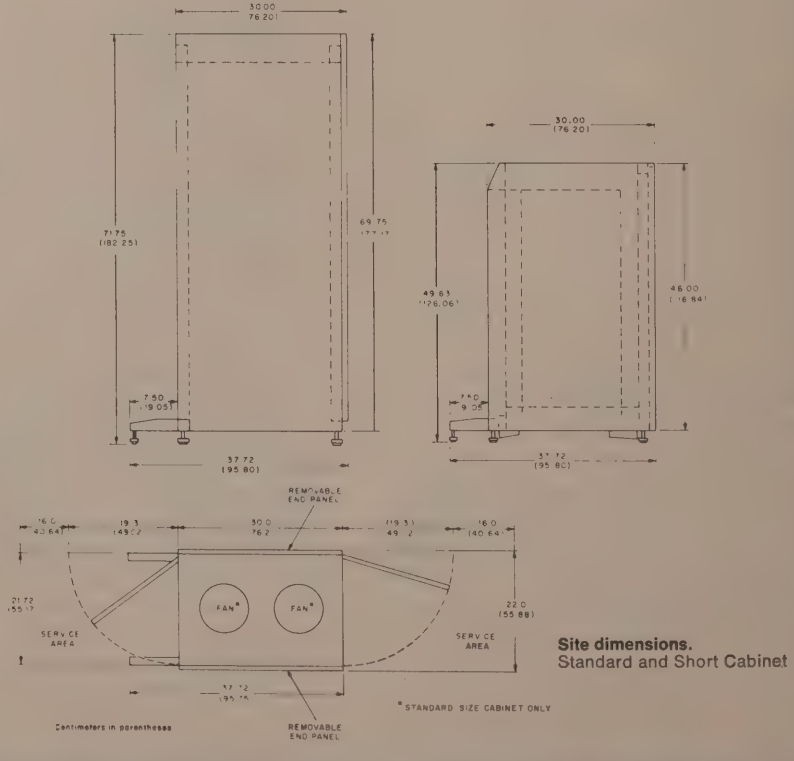
CABINETS AND ENCLOSURES





1 *Full rear door*
2 *Mounting panel door frame*
3 *Air filter*
4 *Fan assembly, short cabinet*
4A *Fan assembly, standard cabinet*
5 *End panel*
6A *Filler strip set (front and rear — standard cabinet)*
6B *Filler strip set (top, front, and rear — short cabinet)*
7 *Logo frame panel*
8 *Bezel cover panel (covers 5.25" of mounting height)*
9 *Bezel cover panel (covers 10.5" of mounting height)*
10 *Short door*
11 *Stabilizer feet*
12 *Kickplate*
13A *Frame 19W by 69H by 25"D (standard cabinet only)*
13B *Frame 19W by 47.5H by 25"D (short cabinet only)*
41 *Cabinet-mounted table*



Site dimensions.
Standard and Short Cabinet

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DIRECT SALES CATALOG

HARDWARE AND ACCESSORIES

CABINETS AND ENCLOSURES

CUSTOMIZING OPTIONS

Standard or Short Cabinet	Description	Catalog Number Standard	Catalog Number Short	List	Cat.	Cash	Shipping Weight (lbs.)	Illustration Key
	Cabinet frames (includes casters and levelers)							
Std.	19W by 25D by 69″H	B-H950-AA§	—	$295	$280	$268	173	13A
Short	19W by 25D by 47½″ H	—	B-H957-AA¶	275	261	250	146	13B
	Full Doors							
Std.	RH Front/Rear Mtg.	B-H950-BA*	—	75	71	68	38	1
Std.	LH Front/Rear Mtg.	B-H950-CA*	—	80	76	73	38	1
Short	RH Rear Mtg. only	—	B-H957-BA	92	87	84	22	1
	Short Doors							
Both	21″	B-H950-HA†	B-H950-HA†	68	65	62	12	10
Both	31.5″	B-H950-HD	B-H950-HD	120	114	109	18	10
Both	42″	B-H950-HF	B-H950-HF	88	84	80	24	10
Std.	63″	B-H950-HK‡	—	120	114	109	33	10
	Mounting Panel Door Frames							
Std.	RH Rear Mtg.	B-H950-DA	—	60	57	55	19	2
Std.	LH Rear Mtg.	B-H950-EA	—	70	67	64	19	2
Short	RH Rear Mtg.	—	B-H957-DA	59	56	54	23	2
Short	LH Rear Mtg.	—	B-H957-EA	60	57	55	23	2
	Mounting Panel Door Skins							
Std.	Fits Door Frames	B-H950-FA	—	35	33	32	28	—
	End Panels							
Std.	Left and Right	B-H952-AA	—	78	74	71	72	5
Short	Right	—	B-H957-FA	115	109	105	61	5
Short	Left	—	B-H957-FB	115	109	105	61	—
	Logo Frame Panels							
Std.	Aluminum**	B-H950-LA	—	42	40	38	3	—
Std.	Plastic**	B-H950-LB	—	13	12	12	3	7
Short	Aluminum**	—	B-H957-LA	55	52	50	3	7
	Bezel Cover Panels							
Both	5¼″ Deep	B-H950-PA	B-H950-PA	12	11	11	2	8
Both	10½″ Deep	B-H950-QA	B-H950-QA	17	16	15	3	9
	Stabilizer Feet							
Both	Pair	B-H952-BA	B-H952-BA	50	48	46	7	11
	Cabinet Mounted Table							
Both	Mounts on Cabinet	B-H950-G	B-H950-G	170	162	155	25	15
	Kickplates							
Both	E/W Stabilizers	B-74-06782	B-74-06782	7	7	6	3	12
Both	W/O Stabilizers	B-74-06793	B-74-06793	13	12	12	3	—
	Drawer Mounting Slides							
Both	Straight Out	B-12-09154	B-12-09154	36	34	33	7	—
Both	Tiltable	B-12-09703	B-12-09703	75	71	68	10	—
	Bottom Cover Plate							
Short	Encloses Bottom	—	B-H957-JA	17	16	15	4	—
	Fan Assembly							
Std.	Top Mtg. 115V ac	B-H952-CA[1]	—	80	76	73	8	4A
Short	Front/Rear Mtg. 115V ac	—	B-H957-HA[2]	98	93	89	9	4
	Filters (air)							
Std.	For H952-CA Fan	B-H950-SA	—	4	4	4	1	3
Short	For H957-HA Fan	—	B-H957-SA	7	7	6	1	3
	Power Controllers							
Both	90-130V ac Two Phase	B-861-A	B-861-A	330	314	300	18	—
Both	90-135V ac One Phase	B-861-C	B-861-C	415	394	378	17	—
	Filler Strips (Join two cabinets)							
Std.	Front/Rear	B-H952-GA	—	60	57	55	9	6A
Short	Top/Front/Rear	—	B-H957-GA	94	89	86	8	6B

*Full doors can only be used on front if no kickplate or stabilizer feet are installed.
†Order H950-JA instead of H950-HA if 21″ door is to be used on a cabinet with stabilizer feet.
‡Order H950-JE instead of H950-HK if 63″ door is to be used on cabinet with stabilizer feet.
§Has 63″ each of mounting space both front and rear.
¶Has 42″ each of mounting space both front and rear.
**Inlay strip included. Specify color: terra cotta amber, or magenta rose.
[1] H950-SA filter not included.
[2] H957-SA filter included.

CALL: 800-258-1710 (N.H. Residents 603 - 884-6660) 8:30 am to 5 pm EST.

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CABINETS AND ENCLOSURES

CABINETS: GENERAL PURPOSE, LOW PROFILE

H984 SERIES

The H984-BA (115V ac) and the H984-BB (230V ac) are low profile cabinets equipped with a walnut-grained, plastic laminate top surface, and four ball-type casters mounted on a supporting frame. The cabinets are a beige steel enclosure trimmed in flat black.

Each H984 provides mounting space for standard 19″ panels or racks at both the front and rear of the unit. Two vertical angles at the front and rear opening of the enclosure contain pre-drilled holes at EIA spacing. The angles can be laterally positioned within the cabinet to adjust for mounting units with varying depths. Both sides of the steel enclosure contain ventilation ports.

A 115V ac or 230V ac power control panel is supplied with the cabinet.

OPTIONAL EQUIPMENT

Fan Panel Assembly

A fan panel assembly with two enclosed rotary fans is available as an option and provides additional cooling for the electrical components in the cabinet. The assembly is pre-wired with a cord and male connector which can be inserted into one of the outlets on the power connector panel. The fan assembly is available for 115V ac or 230V ac. The panel is supplied with hardware for mounting.

Black Plastic Front Cover

A flat black, plastic louvered cover panel 1.75″ in height can be used to complete the covering at the front of the H984. The panel slots allow increased air flow through cabinet.

Blank Connector Panel

The blank connector panel is designed to completely enclose the rear opening of the H984 when the blower fan assembly option is included. This provides a surface for mounting interface cable connectors or cable openings. The panel is supplied with hardware for mounting.

Blank Metal Panel

A light gray blank metal cover panel, 3.5″ in height can be ordered to complete the covering at the front of the cabinet. The color is the same as PDP-11/03 front panel and H984 cabinet.

SPECIFICATIONS

Dimensions
Width: 23.50″
Depth: 28.06″
Height: 21.50″

Mounting Space
Width: Standard 19″ EIA
Depth: 24.28″
Height: 17.56″

Color
Walnut grained top surface, beige side panels, chrome trim

Description	Cat. No.	List	Cat.	Cash	Shipping Weight
Low Profile Cabinet (115V ac)	B-H984-BA	$390	$371	$355	70 lbs.
Low Profile Cabinet (230V ac)	B-H984-BB	390	371	355	70 lbs.
Optional Hardware					
Blower Fan (115V ac)	B-70-12438-0	90	86	82	8 lbs.
Blower Fan (230V ac)	B-70-12438-1	90	86	82	8 lbs.
Blank Connector Panel (back)	B-74-17440	15	14	14	5 lbs.
Louvered Cover Panel (front)	B-12-11474	5	5	5	1 lb.
Blank Metal Cover (front)	B-H950-NC	15	14	14	4 lbs.

GENERAL PURPOSE SYSTEMS DESK — H9800-A

REDUCED IN PRICE

The H9800-A is a low-profile system desk equipped with a walnut grained plastic laminate top and color coordinated to fit into the modern office decor. The unit is equipped with six ball casters as standard equipment for easy positioning on carpeted surfaces. Included also is a 115V ac power distribution panel.

The H9800-A is constructed of quality materials including a top constructed of 55 lb. particle board with a dark-walnut plastic laminate. The "module" itself is constructed of 11 and 18 gauge steel with a maximum loading capacity of 400 lbs.

The H9800-A consists of a left-mounted rack enclosure offering 21″ of usable height and 29″ of usable depth in a standard 19″ EIA mount format. The right side offers knee space, a modesty panel, and a convenient work surface ideal for using terminals or typewriters.

Cat. No.	List	Cat.	Cash	Shipping Weight
B-H9800-A	$650	$618	$592	100 lbs.

SPECIFICATIONS

Dimensions (overall)
Width: 48″
Depth: 32″
Height: 27.6″

Module Enclosure Mounting Space
Standard 19″ EIA width
21″ Usable height
29″ Usable depth (adjustable)

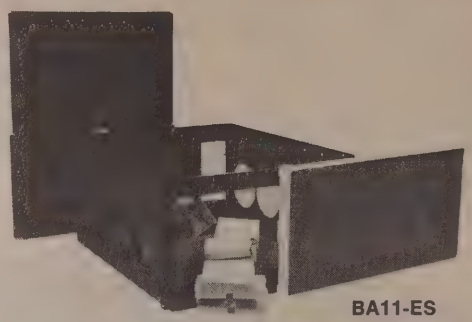
Color
Walnut grained top surface, beige side panels, chrome trim

CABINETS AND ENCLOSURES

EXPANSION MOUNTING BOX — BA11-ES

The BA11-ES Expansion Mounting Box is a steel enclosure that is designed to house up to six four-slot or three nine-slot system units and an H720-E Power Supply. The BA11-ES enclosure consists of a chassis with brackets for mounting the system units and power supply; four side-mounted fans for forced air cooling; a removable top cover; two 12-09703 Tilting Chassis Slides; and an H950-QA Cover Panel. Included with the mounting box is an 8.5-ft. external I/O UNIBUS flat cable (BC11A-8F) used with PDP-11 Systems. An internal power cable is contained within the box; the power cable distributes dc power and power signals from the power supply to each of the BB11 System Units installed. An access hole at the rear of the box provides clearance for the receptacles and controls on the H720-E Power Supply. The BA11-ES is 16.75W by 23.25D by 10.50″H, excluding the cover panel and slides.

The BA11-ES can be installed in any electronics cabinet or rack equipped with 19″ mounting rails (front and rear) drilled at standard EIA spacings. The BA11-ES attaches



BA11-ES

to the cabinet frame by the two tilt slides mounted on each side of the unit. The tilt slides enable the unit to be pulled from the cabinet and tilted to facilitate servicing the system units or power supply.

Cat. No.	List	Cat.	Cash	Shipping Weight
B-**BA11-ES**	**$1050**	**$998**	**$956**	55 lbs.

EXPANSION MOUNTING CHASSIS — BA11-KE

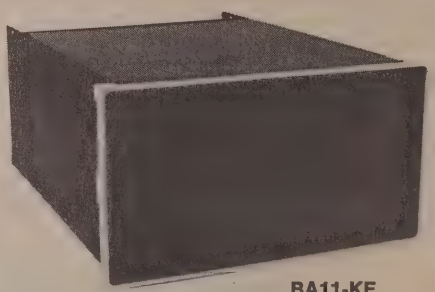
Description

BA11-KE is a general purpose PDP-11 expansion mounting chassis (10½H by 17W by 25″D) and mounts in standard cabinets. It includes the H765 power system for 115V operation and it supplies multiple voltages which deliver 660 watts of dc power. The expansion mounting chassis also includes mounting hardware, UNIBUS cable and a pop panel. BA11-KE is Underwriter Laboratories (UL) listed.

It accommodates any mix of modules including both quad and hex modules and has mounting space for up to 22 hex size modules. For example 2 nine by six slot system unit and 1 four by six slot system unit. A tilting chassis slide allows three positions: horizontal, 45° and 90°. Multiple dc voltages are available within BA11-KE as follows:

Multiple Voltages

(2) H744 Regulators	+ 5V @ 25A (each)
(1) H745 Regulator	−15V @ 10A
(1) 54-11-086 Regulator	+20V @ 8A
	− 5V @ 1.1A*
(1) 54-11086 Regulator	+15V @ 4A



BA11-KE

*Maximum −5V current is dependent upon +20V current. It is equal to 1A plus the current of the +20V supply, up to a total of 8A.

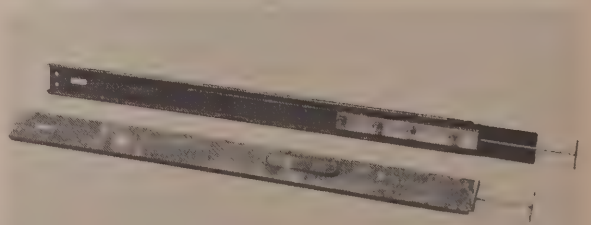
Input power required is 90-132V ac (47-63 Hz) single phase at 12A.

Cat. No.	List	Cat.	Cash	Shipping Weight
B-**BA11-KE**	**$2420**	**$2299**	**$2202**	100 lbs. unloaded

CHASSIS SLIDES

Three types of chassis slide are offered. Shown is a tilting version of 12-09703. A chassis mounted on this slide can be extended out of a cabinet 22.28″ and tilted 90° either up or down. The 12-09154 extends the chassis 22″ but is not tiltable. The 12-10945 extends the chassis 19″. It features a two-part construction whereby part of the left member can be removed to allow the left side cover plate of the H909-A or H909-BA drawer to be removed to access the enclosed modules. All slides mount in cabinets with front and rear rails drilled or punched to standard EIA spacings.

Cat. No.	List	Cat.	Cash	Shipping Weight
B-**12-09154**	**$36**	**$34**	**$33**	7 lbs.
B-**12-09703**	**75**	**71**	**68**	10 lbs.
B-**12-10945**	**33**	**31**	**30**	6 lbs.

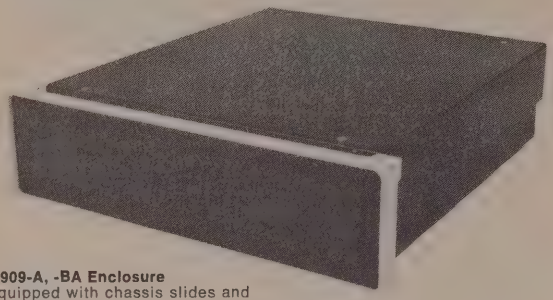


12-09703

MODULE ENCLOSURES — H909 SERIES

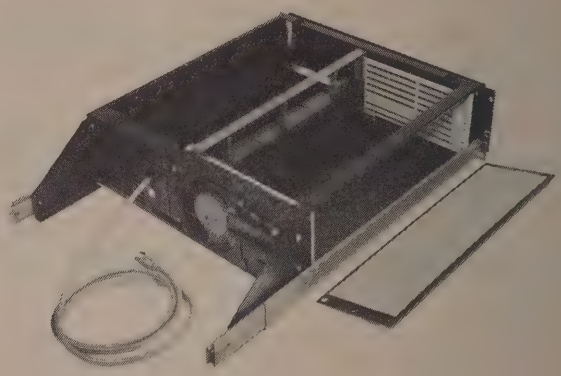
For Four-Slot or Nine-Slot System Units

The H909 Series of Module Enclosures—Logic Boxes—are designed to provide compact attractive enclosures for DIGITAL's single-height through hex-height module boards. Maximum capacity is the equivalent of nine hex-height boards (i.e. 54 single-height). Both standard length and extended length boards can be accommodated. Room is available to incorporate a power supply in H909-A and H909-C while H909-BA comes equipped with an H755 power supply. The H755 Power Supply provides ±15V dc at 2A and +5V dc at 13A. A line cord and circuit breaker are also included.



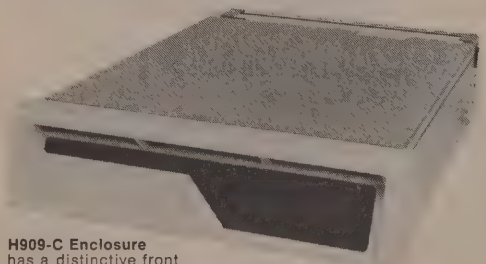
H909-A, -BA Enclosure
equipped with chassis slides and bracket for mounting in 19″ rack. Note front Bezel Panel matches 5¼″ Cover Panels on DIGITAL's Cabinets.

H909-A Enclosure is primarily designed to accommodate nine-slot System Mounting Units and can optionally be equipped with either an H034 nine-slot mounting frame, or H934-CB System Mounting Unit that itself is equipped with six H863 and three H8030 Connector Blocks, or the UNIBUS nine-slot unit BB11-B. Note the LSI-11 System Unit DDV11-B *does not* fit into this enclosure. A +5V dc at 7A power supply H726-B can also be ordered. This supply mounts on an H034 mounting frame which must be ordered separately specifically for the power supply.



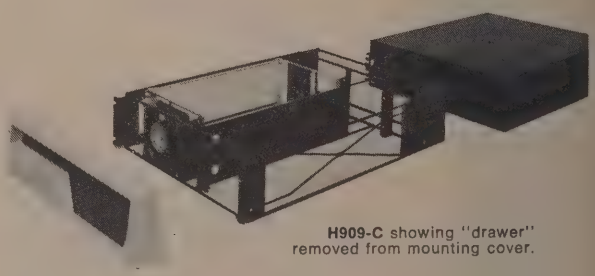
H909-A showing optional equipment installed.

H909-BA Enclosure is the same as the H909-A with the exception that the H755 Power Supply is included. All other options must be ordered separately.



H909-C Enclosure
has a distinctive front panel that can be drilled to install lights or switches. Table top or 19″ rack mounting.

H909-C Enclosure is more versatile than the H909-A or H909-BA units. It can accommodate both four-slot and nine-slot System Mounting Units. Or it can house other non-standard mounting arrangements if compatible mounting frames (H033 and H034) with Connector Blocks (such as H803) are employed. One or two four-slot System Mounting Units or one nine-slot unit can be accommodated. Additionally the LSI-11 System Unit DDV11-B *does* fit in this enclosure. The front panel can be drilled for customer installed lights and switches. This enclosure can directly mount without additional hardware the following system units and mounting frames: DDV11-B, H934, H933 Series, BB11 Series, DD11 Series, any DECkit 11, and mounting frames H033 and H034.



H909-C showing "drawer" removed from mounting cover.

All the H909 Series can be mounted on 19″ racks or can be used as stand-alone table-top enclosures. H909-C mounts directly on the 19″ rack by attaching the ears on the enclosure cover to the rack. The inside "drawer" then can be pulled out to a "stop" position for servicing. H909-A and -BA require optional chassis slides and brackets. Included with all enclosures are a cooling fan, card guides (card cage), cable restraints, and a front bezel. H909-A and -BA have a top cover and removable side cover.

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CABINETS AND ENCLOSURES

ORDERING INFORMATION

Basic Enclosures

Cat. No.	Description	List	Cat.	Cash	Shipping Weight
B-H909-A	Enclosure	$310	$295	$282	40 lbs.
B-H909-BA	Enclosure Equipped With H755 Power Supply and BC05H Line Cord and Circuit Breaker	740	703	673	59 lbs.
B-H909-C	Enclosure	350	333	319	60 lbs.

Options for H909-A and H909-BA

Cat. No.	Description	List	Cat.	Cash	Shipping Weight
B-H034	Nine-slot Mounting Frame	$17	$16	$15	3 lbs.
B-H934-CB	Nine-slot System Mounting Unit Equipped With Six H863 and Three H8030 Connector Blocks	150	143	137	8 lbs.
B-BB11-B	Nine-slot UNIBUS System Unit	285	271	259	5 lbs.
B-H726-B	Power Supply +5V at 7A. **Must Order** H034 Mounting Frame to Mount.	260	247	237	10 lbs.
B-12-10945	Chassis Slides	33	31	30	6 lbs.
B-74-09459	Required Bracket for Above Chassis Slides (left)	5	5	5	1 lb.
B-74-09449	Required Bracket for Above Chassis Slides (right)	5	5	5	1 lb.

Options for H909-C

Cat. No.	Description	List	Cat.	Cash	Shipping Weight
B-12-10331-0	5″ Blower Fan (optional for power bay)	$43	$41	$39	4 lbs.
B-H984-CA*	Bracket Set for H909-C and PDP-11/04, /34 Enclosures	4	4	4	1 lb.

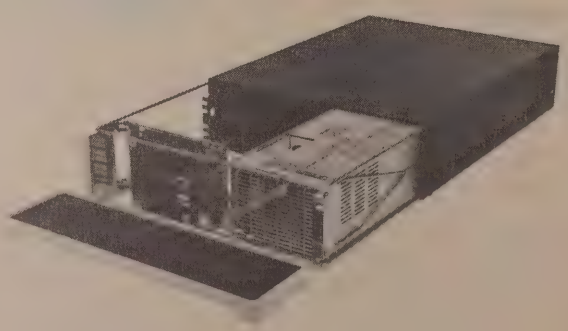
*Required for mounting H909-C or PDP-11/04 or /34 enclosures in H984 cabinet. Attaches to rear.
This part no. formerly 74-16975

EXPANSION MOUNTING CHASSIS — BA11-LE

BA11-LE is a general purpose PDP-11 expansion mounting chassis (5¼ by 19W by 25″D) equipped with power supply, front mounted cover panel, and two fans for cooling the power supply and logic bays. A surrounding chassis envelope similar in construction to that of the H909-C facilitates mounting the BA11-LE in cabinets pre-drilled at standard EIA spacings. The 115 Vac input H777-CA power unit supplies 32A of output power at +5 Vac with regulators to support either MOS or core expansion memory.

The chassis can optionally be equipped with up to two DD11-CK or one DD11-DK SPC (Small Peripheral Controller) system units thus enabling the BA11-LE to support the expansion requirements of a wide variety of PDP-11/04 and PDP-11/34 based systems. UNIBUS access to the BA11-LE chassis is gained by means of the appropriate length BC11A UNIBUS cable which must be ordered separately.

When equipped with the DD11-DK nine by six slot system unit, the BA11-LE can accommodate up to nine hex size modules.



The BA11-LE is supplied with an internal power cable harness which mates directly to the DD11-CK and -DK system units.

Cat. No.	List	Cat.	Cash	Shipping Weight
B-BA11-LE	$1600	$1520	$1456	60 lbs.

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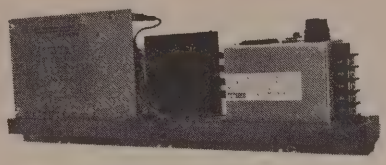
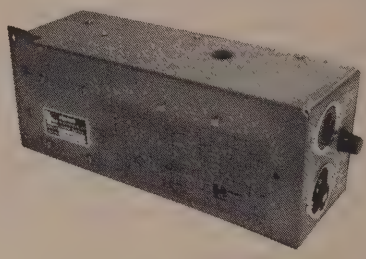
POWER SUPPLIES

POWER SUPPLIES +5V DC



H726-B



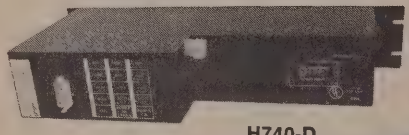
H716

Featuring:

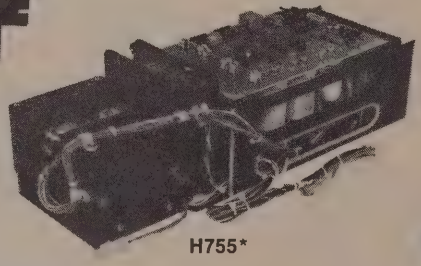
- *Short circuit protection.*
- *Floating output(s).*
- *Over voltage protection on +5V dc output*
- *Mount in 19″ rack using H020 Mounting Bar (H716) or using H014 Mounting Panel (H726-B).*

Cat. No.	Input	Output	Size	List	Cat.	Cash	Shipping Weight
B-**H716**	120-240V ac 47-63 Hz	+5V dc at 4A, 3% Reg. −15V dc at 1.5A, 5% Reg.	5¼″L 12″D 4⅛″H	**$360**	**$342**	**$328**	8 lbs.
B-**H726-B**	120-240V ac 47-63 Hz	+5V dc at 7A, 1% Reg.	16½″L 6¼″D 2¼″H	**260**	**247**	**237**	10 lbs.

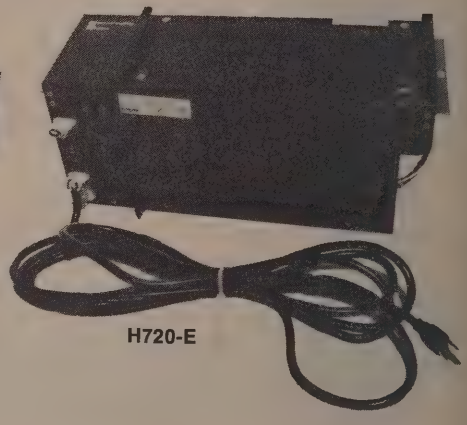
SYSTEMS POWER SUPPLIES



H740-D



H755*



H720-E

Featuring:

- *19″ rack mounting (H740-D).*
- *Input frequency monitor and ac and dc low voltage detection (H720-E, H740-D).*
- *Overvoltage and overcurrent protection.*
- *Model H720-E mounts in BA11-ES Expansion Box, see page 131*

Cat. No.	Input	Output	Size	List	Cat.	Cash	Shipping Weight
B-**H720-E**	120V ac 47-63 Hz	+ 5V dc at 22A −15V dc at 10A + 8V dc at 1.5A −22V dc at 1.5A	5½″L 16½″D 8½″H	**$850**	**$808**	**$774**	30 lbs.
B-**H740-D***	115-230 47-63 Hz	+ 5V dc at 17A −15V dc at 5A +15V dc at 1A	19″L 8″D 3½″H	**555**	**527**	**505**	25 lbs.
B-**H755***	115V ac 47-63 Hz	+ 5V dc at 13A ±15V dc at 2A	16¾″L 4⅞″D 5¼″H	**680**	**646**	**619**	25 lbs.

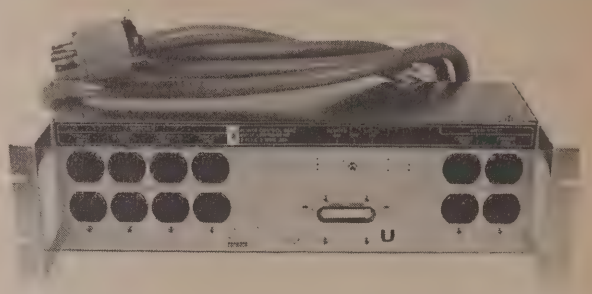
*Requires BC05H-6 line set for 115V ac or BC05J-6 line set for 230V ac operation. Order separately as follows:

Cat. No.	List	Cat.	Cash	Shipping Weight
B-**BC05J-6**	**$88**	**$84**	**$80**	10 lbs.
B-**BC05H-6**	**88**	**84**	**80**	10 lbs.

POWER SUPPLIES

POWER CONTROLLERS AC VOLTAGE

These power controllers control and distribute ac voltage to power supplies, fans and other ac-operated devices in a system. Ac receptacles on the front panel are used to connect to system points requiring ac power. Four switched dual receptacles and two unswitched duals are provided. The switched receptacles are activated either remotely or locally by panel switch selection. Power to the controller inputs is via a line cord. Controllers mount in a 19″ rack. 861-A requires an input of 90-130V ac, 2 phase, 16A per pole to output 90-130V ac at 12A for each ac outlet. 861-C is a single-phase input device (24A per pole) with a 12A output at each outlet. Input/output voltage is 90-130V ac. The 861-D requires an input of 90-130V ac, 3-phase, 24A per pole to output 90-130V ac at 12A for each outlet.

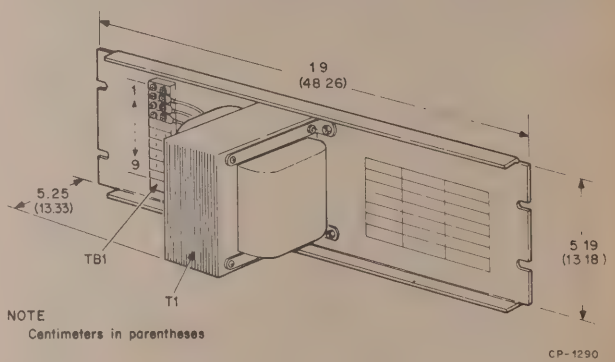


Cat. No.	List	Cat.	Cash	Shipping Weight
B-**861-A**	**$330**	**$314**	**$300**	18 lbs.
B-**861-C**	**415**	**394**	**378**	18 lbs.
B-**861-D**	**795**	**755**	**723**	20 lbs.

STEP-DOWN TRANSFORMER EQUIPPED WITH MOUNTING PANEL

Accepts 115, 189, 200, 217, 230, and 245V ac and steps it down to 115V ac at 4A. Mounts on panel on 19″ rack. Panel height 5.19″. Depth of installation 5¼″.

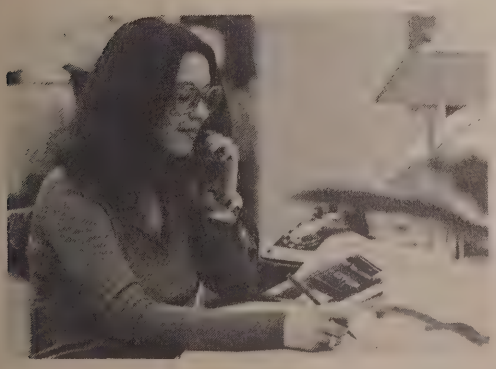
Cat. No.	List	Cat.	Cash	Shipping Weight
B-**H722**	**$110**	**$105**	**$100**	19 lbs.



DISTRIBUTION PANEL — H322

This general purpose signal distribution panel has two 40-pin H854 connectors, two 9-pin 12-09350-09 connectors and nine 10-screw terminal strips mounted on it. From these connectors signals, power, and ground can be distributed to various devices. H854 mates with cable connector H856 while 12-09350-09 mates with cable connector 12-09351-09. H322 mounts via brackets to a 19″ rack.

Cat. No.	List	Cat.	Cash	Shipping Weight
B-**H322**	**$185**	**$176**	**$168**	12 lbs.



?Need Some Quick Answers?

Ask our Direct Sales Catalog Staff. They are all knowledgeable and can answer most of your questions rightaway — or send you back-up literature — or connect you with an applications expert — or, do just about anything that can possibly be done to make it easy for you to buy the Direct Sales Catalog Way. Put them through their paces. Call 800-258-1710 (N.H. residents 603 - 884-6660) between 8:30 am and 5 pm EST.

CALL: 800-258-1710 (N.H. Residents 603 - 884-6660) 8:30 am to 5 pm EST.

digital DISK DRIVES

DIRECT SALES CATALOG

ADD-ON RK05 DISK DRIVES

DIGITAL'S DIRECT SALES CATALOG now offers catalog ordering of Add-On RK05 disk drives. DIGITAL's rugged and field proven RK05 is one of the most successful disk products in the mini-computer industry. Worldwide, Digital has over 35,000 RK05 disk drives presently installed. DEC computer system customers, who currently use DIGITAL disk drive subsystems incorporating RK05 disk drives (RK11 for PDP-11's and RK8 for PDP-8 configurations), can now increase the disk storage capacity of their systems EASILY and QUICKLY by ordering Add-On RK05 disk drives through this catalog. And at the same time receive the benefit of the catalog's discount policy.

Two basic models are offered: the RK05J which has removable cartridges, and the RK05F with non-removable storage media. Since RK05 disk controllers support multiple disk configurations, it is not necessary to purchase additional interfaces for a system. For example, up to four RK05J's or two RK05F drives can be interfaced to a PDP-8 system with one controller. On PDP-11 systems, up to eight RK05J or four RK05F drives can be utilized via a single controller.

Total system compatibility and full DEC field service maintenance features are guaranteed. To insure proper disk installation and warranty verification, the field service installation charge is included as part of the RK05 purchase price. Simply call the nearest DEC field service office when the RK05 arrives and be assured of fast and trouble-free system installation. The RK05 disk drives have the following features:

Capacity
- RK05J has removable on-line storage of 2.5 million bytes per drive with PDP-11 format or 3.2 million bytes per drive with PDP-8 format.
- RK05F has non-removale on-line storage of 5 million bytes per drive with PDP-11 format or 6.64 million bytes with PDP-8 format.

Ease of Use
- Convenient system operation.
- Simple disk-to-disk copying procedure.
- Easy handling with front loading cartridge.
- Rack mounted drives for flexible configurations.
- Disk capacity easily expanded.

Speed
- Fast access (10 msec track to track).
- Fast data transfer (1.44 megabits per sec.).
- Overlapped seeks for improved throughput.

Reliability
- Transfer verification.
- Accurate positioning.
- Dust protection.
- Wide operating environment from 50°F to 104°F.

Software Compatibility
- PDP-11 support by RT-11, RSK-11M, RSX-11D, RSTS/E, IAS and MUMPS-11.
- PDP-8 support by OS/8 and RTS/8.

Hardware Compatibility
- Mounts in standard DIGITAL cabinetry.
- RK05J uses DECpack compatible cartridges.

OPERATIONAL SPECIFICATIONS

	RK05J	RK05F
CAPACITIES		
Formatted Capacity		
PDP-11	2.5 Megabytes	5.0 Megabytes
PDP-8	3.32 Megabytes (6-bit bytes)	6.64 Megabytes (6-bit bytes)
System Capacity		
PDP-11	20 Megabytes	20 Megabytes
PDP-8	13.28 Megabytes (6-bit bytes)	13.28 Megabytes (6-bit bytes)
Storage Medium	Removable Cartridge	Non-Removable
Disk/Drive	1	1
Surfaces/Disk	2	2
Heads/Drive	2	2
Bit Density	2040 BPI	2040 BPI
Track Density	100 TPI	200 TPI
Cylinders	200 +3	400 +6
Tracks	400 +6	800 +12
Sectors/Track		
PDP-11	12	12
PDP-8	16	16
Bytes/Sector	512	512
TRANSFER RATES		
Minimum Transfer	1 word	1 word
Data Transfer Rate	1.44 Mbits/Sec	1.44 Mbits/Sec
ACCESS TIME		
Disk Rotational Speed	1500 RPM	1500 RPM
Average Latency		
Access Times:	20 msec	20 msec
Track to Track	10 msec avg	8.5 msec avg
Average Random Seek	50 msec	56 msec
Maximum Seek	85 msec	105 msec

ELECTRICAL SPECIFICATIONS

Voltage/Frequency	95-130 VAC, 60 Hz
Operating Power	160 W/2.1 AMPS
Idle Power	85 W/0.74 AMPS
Starting Current	
Power only	1.8 AMPS
Spindle	10 AMPS for 2 secs

ENVIRONMENTAL SPECIFICATIONS

Ambient Temperature	50°F - 104°F
Temperature Change Rate	10°F per hour
Relative Humidity No Condensation	8% - 80%
Altitude	10,000 ft.

DIMENSIONS & WEIGHT

Width	19 inches
Depth	26.5 inches
Height	10.5 inches
Weight	110 lbs.

FITS CABINETS
H960, H967, H950, H957, H9800, H9500, H9600.

digital DISK DRIVES

DIRECT SALES CATALOG

SYSTEM OPERATION

Multiple drive configurations have independent positioners for each drive which offer the user convenient system operation. Information is easily copied from one disk to another; in mixed drive configurations, the operating system and user programs can be readily transferred onto the RK05F or backed up for off-line storage on RK05J cartridges. When disk cartridges need to be removed, only the drive involved is placed off-line. This allows the computer system to remain operational while removable cartridges are being changed, an important feature in multi-user and multi-task environments.

The RK05F has been designed to appear to a controller as if there were two logical RK05J drives connected to it. This design feature permits RK05J and RK05F drives to be easily mixed on all PDP-11 and PDP-8 computer systems. More importantly, the RK05J and RK05F drives are fully compatible in terms of software, allowing for easy expansion of disk capacity with no need for time consuming and extremely expensive program conversions.

The RK05F starts at an even numbered position on the controller and utilizes two drive positions instead of the single position utilized by the RK05J. On PDP-11 systems the RK05F can assume logical positions of (0,1), (2,3), (4,5), or (6,7) on the controller. Since the first RK05J drive is included with the controller, the maximum system configurations for a PDP-11 are: eight RK05J drives: six RK05J drives plus one RK05F; four RK05J's plus two RK05F's; or two RK05J's plus 3 RK05F's.

On the PDP-8, the RK05F can assume logical positions of (0,1) or (2,3). Maximum system configurations for the PDP-8 are four RK05J's, or two RK05J's plus one RK05F.

Both subsystems offer fast access and fast data transfer for maximum system throughput. In addition, the sophisticated controller can overlap seeks on multi-drive systems: while one drive is performing a read or write operation, other drives can be seeking new data tracks. Overlapped seeks are currently supported by RSX-11D, RSTS/E and IAS on all RK05J systems but not on mixed RK05J/RK05F systems.

In order to assure accurate storage and transfer, RK05 subsystems employ hardware features which verify the correct track selection, provide a checksum, and perform a write check function. Also, the voice coil positioner and an optical position transducer provide fast access time and accurate positioning.

An emergency retract power supply automatically forces the heads to their home position if line power fails, thus protecting the disk from damage.

ORDERING PROCEDURE/REQUIREMENTS

The installation and warrantly verification charge must be added to the price of the RK05(s) ordered. The cost involved includes two elements:

a) RK05 Disk Drives ordered from this catalog are installable only on systems supported by current DIGITAL Field Service Maintenance Contracts. A copy of this contract must accompany all orders. Orders will be accepted and processed after the system configuration has been reviewed by DIGITAL with the local Sales/Field Service Office.

A fixed fee covering installation and 90-day on-site warranty has been included in the price of each RK05 drive.

b) A mileage charge computed from the Mileage Charge Table must be added to the order. List the mileage and amount separately on your order. The mileage used should be measured by a straight line from the nearest DIGITAL Field Service Office. All Field Sales Offices have associated Field Service Offices. Consult listing on page 174 for closest office. The mileage charge applies once for each group of RK05's installed at one time.

MILEAGE CHARGE TABLE

Miles	Charge
0-100	**No Charge**
101-200	**$150**
Over 200	**$250**

Model Number	Description	Cat.†	Cash†	Shipping Weight
B-**RK05J-AA***	RK05J Disk Drive. For PDP-8 or -11. 115 Vac, 60 Hz.	**$5400**	**$5184**	140 lbs.
B-**RK05F-AA***	RK05F Disk Drive. For PDP-8. 115 Vac, 60 Hz.	**5505**	**5285**	140 lbs.
B-**RK05F-FA***	RK05F Disk Drive. For PDP-11. 115 Vac, 60 Hz.	**5505**	**5285**	140 lbs.

* Includes all cabling and documentation

† Plus mileage charge

IMPORTANT NOTE!

Disk Drives are sold without software support. Compatibility with operating system software is the responsibility of the purchaser.

CALL: 800-258-1710 (N.H. Residents 603 - 884-6660) 8:30 am to 5 pm EST.

digital SUPPLIES/FURNITURE

DIRECT SALES CATALOG

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DIGITAL EQUIPMENT CORP. / Mail Station MK1-2/E13 / Merrimack, NH 03054

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DIGITAL
Your One-Stop SUPPLIES Solution

DIGITAL's Direct Sales Catalog maintains a complete line of computer supplies specifically designed for use with your DIGITAL computer system(s). These products enable you to operate your equipment reliably and efficiently. DIGITAL supplies offer the following features:

- Guaranteed compatibility with DIGITAL equipment. This means fewer errors, and less down time.
- Protection against hardware damage and data loss.
- Continued effectiveness of DIGITAL warranties and service agreements.
- Off-the-shelf availability ensuring quick delivery and lower inventory needs.

The following supply items enhance the performance and reliability of DIGITAL's systems:

- Magnetic disk media including disk packs, disk cartridges and floppy diskettes. The same Quality Assurance inherent in DIGITAL's computers is also built into its magnetic media.
- Self-contained disk cartridge cleaners designed to accomplish fast and efficient cleaning of front and top loading magnetic disk cartridges.
- Ribbons for DIGITAL's DECwriter and DECprinter terminals. A unique non-abrasive ink is matched to print heads to produce excellent print quality and lengthen the print head operating life.
- Word processing supplies including nylon and mylar ribbons, a choice of eleven print wheels, and a filter screen for video terminals.

The Direct Sales Catalog offers cabinetry to maintain supplies and protect your magnetic media when not in use. Cabinet interiors can be custom-configured with various options to meet individual needs. Options can be conveniently re-arranged or changed at any time to adapt to future requirements. In addition, there are paper baskets, work shelves, term tables, tape racks, paper tape trays, and multipurpose binders.

All supply items are guaranteed free of defects in material and workmanship. To avoid damage during material handling and storage, supply products are prepackaged in DIGITAL designed containers.

CALL: 800-258-1710 (N.H. Residents 603 - 884-6660) 8:30 am to 5 pm EST.

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MAGNETIC MEDIA

DISK CARTRIDGES

RK06 AND RK07 DISK CARTRIDGES

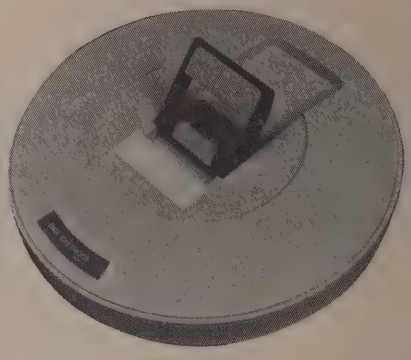
The RK07 and RK06 disk drives are high performance, medium capacity storage devices. Using technology similar to the RP05 and RP06 drives, the RK07 and RK06 provide the reliability and features of a high capacity drive in a medium capacity, subsystem.

The storage media, designed for and matched to the RK07 and RK06 drives are cartridges manufactured by DIGITAL under strict quality control. The RK07 is a double density version of the popular RK06 disk cartridge. The disk cartridges have two platters and four recording surfaces: three for data and one for servo control and tracking information. The platters and drive interfacing hub are enclosed in an impact-resistant mounting cartridge which provides maximum protection from dust and other contaminants.

The cartridges load easily onto the drives from the top. Handling is simplified by a built-in, 3 function handle that a) releases the protective cover from the cartridge; b) releases the cartridge from the drive; and c) is used to carry the cartridge.

The disk cartridges have been designed for both high reliability and convenience. When a pack is stored, the impact-resistant plastic cartridge completely encloses and seals the recording surfaces against dirt and contamination and protects the hub against damage. Disk cartridges are light-weight, easy to carry, and may be stacked for easy storage. Because they are top loading, and magnetically secured and aligned to the drive, they can be mounted simply and securely.

All disk cartridges are delivered pre-formatted for PDP-11 and VAX-11/780 systems with 22 sectors per track. Bad blocks are pre-initialized during manufacturing to insure that all sectors marked as good can be read by any drive. This saves valuable system time and increases data integrity. Cartridges can also be reinitialized on-site without destroying the original bad block marking. If desired, packs may be reformatted on-site. RK07 and RK06 cartridges are labelled and color-coded for easy identification. Interlocks are built into the drive so that RK07 cartridges cannot be mistakenly mounted in an RK06 disk drive and vice versa.

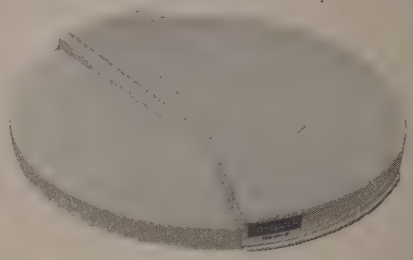


RK07 AND RK06 Disk Cartridge

Type	RK07 Cartridge	RK06 Cartridge
Formatted capacity per cartridge	28 Million bytes	14 Million bytes
Surfaces per cartridge	3 data +1 servo	3 data +1 servo
Sectors per track	22	22

RK05 DISK CARTRIDGES

Your best assurance of performance compatibility with DIGITAL disk drives is to use DIGITAL disk cartridges exclusively. The disk cartridge for RK05 series drives is a high precision magnetic coated recording disk and hub assembly for use with DIGITAL's PDP-11 and PDP-8 computers. The DIGITAL disk cartridge is designed with special internal clearances at four key points. This eliminates friction caused by the disk hub rubbing against the inside of the cartridge — a problem that could create computer errors when non-DIGITAL disk cartridges are used with DIGITAL drives. This special feature results in smooth, problem-free operation.



RK05 Disk Cartridge

RK05K-8
For use with RK05/RK8E Disk Drives on a PDP-8. Cartridge has a storage capacity of 1.6 million words with 16 sectors per track and 2200 bits per inch.

RK05K-11
For use with an RK05 Disk Drive on a PDP-11. Cartridge has a storage capacity of 1.2 million words with 12 sectors per track and 2200 bits per inch.

RL01 DISK CARTRIDGES

The RL01K-DC is outstanding in its simplicity and reliability. It's the next step for the interactive user who wants more than a floppy disk for use on low end PDP-11 UNIBUS systems, 11/03 LSI-11 bus systems and PDP-8A OMNIBUS systems. The media, designed for and matched to the RL01 Disk Drive, is assembled and formatted by DIGITAL under strict quality control, and is a top loading, 5.2 megabyte disk cartridge. The cartridge has one platter with two recording surfaces. All disk cartridges are delivered pre-formatted. Bad blocks are pre-initialized and factory recorded on the last track to insure that the limited number of sectors containing media defects are not used for data recording. The media features a new embedded servo track-following system for accurate disk head positioning and increased data integrity. The pre-recorded servo information is therefore interspersed with the data and is read with the same head that reads and writes data. This means that no cartridge surface is reserved for servo information — both surfaces of the cartridge are used for data recording. Data integrity and reliability are virtually assured, since the servo information is continually sampled by the same heads that are used to read and write the data. This technique protects the user's data more effectively than conventional servo technologies.

DISK CARTRIDGES (Cont'd)

ORDERING INFORMATION

Cat. No.	For Computer	For Drive	Cat.	Cash	Shipping Weight
B-RK07K-DC	PDP-11/VAX	RK07	$308.75	$295.75	14 lbs.
B-RK07K-EF	PDP-11/VAX	RK07	403.75	386.75	14 lbs.
B-RK06K-DC	PDP-11	RK06	236.55	226.59	14 lbs.
B-RK06K-EF	PDP-11	RK06	331.55	317.59	14 lbs.
B-RK05K-8	PDP-8	RK05/RK8E	94.05	90.09	8 lbs.
B-RK05K-11	PDP-11	RK05	94.05	90.09	8 lbs.
B-RL01K-DC	PDP-11 - PDP-8A	RL01	141.55	135.59	5 lbs.
B-30-09794	PDP-8	RK01	94.05	90.09	8 lbs.
B-30-10350-01	PDP-11	RK02	94.05	90.09	8 lbs.

CARTRIDGE STORAGE UNITS

These durable storage units provide a convenient method for storing five RK05, or two RK06, style cartridges horizontally. They are designed to mount into DIGITAL's standard system cabinetry so that cartridges are in close proximity to the drive and are well protected from environmental hazards. Brackets, bezel and hardware for secure mounting are included.

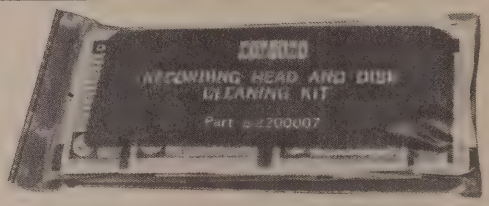
Cat. No.	For Cartridge	Capacity (Cartridges)	Cat.	Cash	Shipping Weight
B-RKR01-AC	RK05	5	$66.50	$63.70	18 lbs.
B-RKR01-AD	RK06	2	66.50	63.70	18 lbs.

RKR01-AC
Disk Cartridge storage unit.

DISK CARTRIDGE HEAD CLEANING KIT

Kit contains alcohol-soaked pads and wand for cleaning the read/write heads. Shipping Weight: 1 lb.

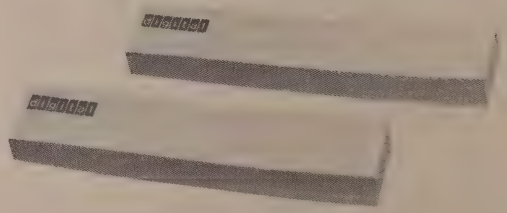
Cat. No.	Cat.	Cash
B-22-00007	$2.85	$2.73



DISK CARTRIDGE LABELS

DECpack labels are designed to fit into the molded frame at the front edge of all disk cartridges. No adhesive is necessary. 100 labels per package. Shipping Weight: 1 lb.

Cat. No.	Cat.	Cash
B-36-11715	$1.90	$1.82



DISK CARTRIDGE STORAGE CASE

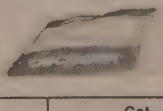
Sturdy disk attaché case enables one to conveniently and safely transport disk cartridges and disk packs. The rugged, high-impact resistant shell combined with foam inserts protect against shock and vibration.

The storage case is desgned to keep disks and packs contamination free. The case holds two RK06 or three RK05 (type 2315) style disk cartridges; or, alternatively, one each of the RP02, RP03, RP04, RP06, or RM03 disk packs. Black attaché case measures 18″ L x 17″ W x 9″ H. Shipping Weight: 9.5 lbs.

Cat. No.	Cat.	Cash
B-RKR02	$71.25	$68.25

RK05 DISK CARTRIDGE STORAGE BAG

The square, zip-lock bag is designed to store and protect RK05 disk cartridges when not in use. The polyethylene bag safeguards cartridges from contaminants such as smoke, dust, oil particles, and hair. Package of 10 bags. Shipping Weight: 4 lbs.



Cat. No.	Cat.	Cash
B-RK05K-MT	$9.50	$9.10

CALL: 800-258-1710 (N.H. Residents 603 - 884-6660) 8:30 am to 5 pm EST.

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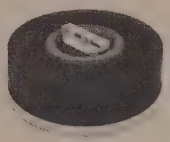
MAGNETIC MEDIA

DIRECT SALES CATALOG

DISK PACKS — For Disk Drives



Disk Pack

These packs are for use with DIGITAL's high-performance Disk Drives. The removable disk pack offers the flexibility of virtually unlimited off-line storage capacity. Each pack is enclosed in a strong plastic cover to protect the entire pack from damage and to prevent particles from entering the pack assembly while in storage. Flag free disk packs are available for the RP03 Disk Drive (P/N RP03-PX), RP04 Disk Drive (P/N RP04-PX), and the RP06 Disk Drive (P/N RP06-PX).

ORDERING INFORMATION

Cat. No.	For Disk Drive	Cat.	Cash
B-**RP02-P**	RP02, RPR02	**$280.25**	**$268.45**
B-**RP03-P**	RP03	**308.75**	**295.75**
B-**RP03-PX**	RP03	**332.50**	**318.50**
B-**RP04-P**	RP04, RP05	**570.00**	**546.00**
B-**RP04-PX**	RP04, RP05	**641.25**	**614.25**
B-**RP06-P**	RP06	**712.50**	**682.50**
B-**RP06-PX**	RP06	**783.75**	**750.75**
B-**RM03-P**	RM03	**565.25**	**541.45**

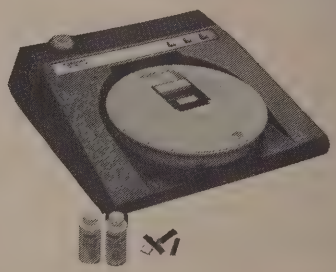
Specifications	RP02-P	RP03-P	RP03-PX	RP04-P	RP04-PX	RP06-P	RP06-PX	RM03-P
Number of recording surfaces	20	20	20	20	20	20	20	6
Data surfaces/pack	20	20	20	19	19	19	19	5
Tracks/surface	203	406	406	411	411	815	815	—
Tracks/inch	100	200	200	200	200	400	400	384
Sectors/track (16 bit)	20	20	20	22	22	22	22	32
Sectors/track (36 bit)				22	22	20	20	32
Words/sector (16 bit)	—	—	—	256	256	256	256	256
Words/sectors (36 bit)	—	—	—	256	256	128	128	256
Bits/inch	2200	2200	2200	4040	4040	4040	4040	6038
Formatted capacity megabytes	29	58	58	100	100	200	200	67
Dimensions	6″ H x 15″ Dia.			7″ H x 15″ Dia.				4″ H x 15″ Dia.
Shipping Weight	20 lbs.	20 lbs.	20 lbs.	29 lbs.	29 lbs.	29 lbs.	29 lbs.	20 lbs.

DISK CARTRIDGE CLEANERS

DIGITAL'S Disk Cartridge Cleaners are self-contained cleaning systems that are safe, efficient, and extremely easy to operate. They are designed to clean front loading (Type 2315) magnetic disk cartridges, including DIGITAL's RK05, RK06 and RK07 series. The cleaning unit requires no special operator training and can significantly minimize disk problems and extend the useful life of the disk cartridge.

DIGITAL Disk Cartridge Cleaners are U.L. listed. They are designed to remove all undesirable contaminants that can cause serious head crashes (oxide redeposits, dust, smoke, oil particles, paper bits, and fingerprint smudges). Cartridges containing valid data can be cleaned with complete confidence because only soft cleaning pads containing special solvent cleaning fluid come in contact with the disk surface. A microscopic filter system keeps contaminants out of the cleaning system.

The cleaner features a self-seating device which allows a cartridge to be easily loaded without damaging the magnetic recording surfaces. A unique interlock system further prevents damage to cartridges and insures correct installation. Three panel indicators assist the operator through the cleaning procedure. The entire cleaning cycle requires only three minutes. Each cleaner is shipped with one supplies kit.



Complete installation and operating instructions are also included with each unit.

Specification:
Size: 23″ L x 23″ W x 9″H
Weight: 23 lbs.
Operation: Cycle time three minutes

Cat. No.	Description	Cat.	Cash	Shipping Weight
B-**RK05K-AA**	Disk Cartridge Cleaner for RK05 series. 115 Vac, 50/60 Hz	**$1040.25**	**$996.75**	23 lbs.
B-**RK05K-AB**	Disk Cartridge Cleaner for RK05 series. 230 Vac, 50 Hz	**1040.25**	**996.75**	23 lbs.
B-**RK07K-AA**	Disk Cartridge Cleaner for RK06 & RK07 series. 115 Vac, 50/60 Hz	**1325.25**	**1269.45**	23 lbs.
B-**RK07K-AB**	Disk Cartridge Cleaner for RK06 & RK07 series. 230 Vac, 50 Hz	**1325.25**	**1269.45**	23 lbs.

DISK CARTRIDGE CLEANER SUPPLIES KIT

Kit contains 3 bottles of cleaning fluid and 50 pairs of pads.
Shipping Weight: 2 lbs.

Cat. No.	Cat.	Cash
B-**RCP03**	**$47.50**	**$45.50**

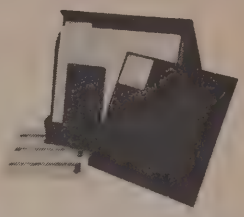
digital DIRECT SALES CATALOG

MAGNETIC MEDIA

DISKETTES — For RX01 Floppy Disk Drive

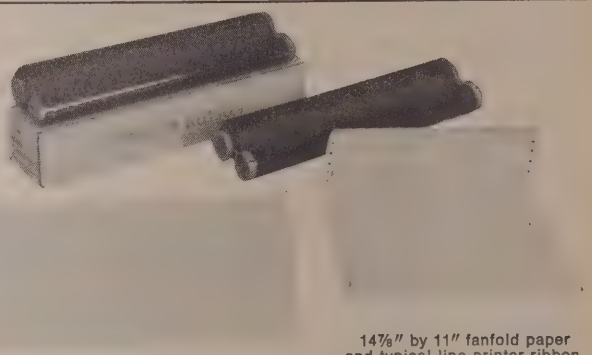
The floppy disk is a removable storage medium used with DIGITAL's Floppy Drives. The flexible oxide-coated disks are initialized and provide random-access data storage capability. The diskette contains 77 tracks and 26 sectors per track. Each sector can store 128 8-bit bytes for a total formatted capacity of 256,256 8-bit bytes (approximately 3,000 80-column cards). Floppy diskettes come packaged in the DIGITAL Floppy Case made of strong polypropylene to withstand rugged handling, storage, and shipping. The floppy case safeguards against environmental contaminants such as dust and debris which may affect the reliability of recorded data. The case holds floppies vertically within a blue polystyrene insert to allow convenient diskette selection and replacement. Bookshaped case is suitable for desk-top, bookshelf, or library and can be used while sitting at a desk, terminal, or minicomputer system. Empty diskette boxes are also available.

An alternative method of storing floppies is in the floppy binder. Blue, 3-ring binder contains clear vinyl inserts to keep floppies well protected, organized, and easily accessible. Binder minimizes diskette loss or damage that can result from continual retrieval and replacement. Binder comes with five inserts and fits conveniently on a desk, bookshelf, or inside a drawer. Each insert holds two floppy diskettes. Total binder capacity is ten inserts and twenty floppies. Additional clear vinyl inserts are optionally available in packages of five.



Cat. No.	Description	Cat.	Cash	Shipping Weight
B-**RX01K-10**	Box of 10 Diskettes	**$71.25/ box**	**$68.25/ box**	2 lbs.
B-**RX01K-MT**	Empty Diskette Box	**4.75/ each**	**4.55/ each**	1 lb.
B-**RX01K-AE**	Diskette Binder	**11.40/ each**	**10.92/ each**	2 lbs.
B-**RX01K-AH**	Binder Inserts	**6.65/ pkg. 5**	**6.37/ pkg. 5**	10 oz.

8½″ by 11″ fanfold paper and 1″ ribbon.



14⅞″ by 11″ fanfold paper and typical line printer ribbon.

PAPER† — For Line Printers and DECwriters

Size	Used On	Number of Parts	Sheets Per Box	Cat. No.	Cat.	Cash	Shipping Weight
14⅞″ by 11″	All 132-column	1	2400	B-**36-09141-00**	**$30.40**	**$29.12**	44 lbs.
9⅞″ by 11″	80-column and LA30 DECwriter	1	3200	B-**36-09829-00**	**28.50**	**27.30**	32 lbs.
8½″ by 11″	72-column*	1	3200	B-**36-05361**	**28.50**	**27.30**	27 lbs.

COPIER PAPER

Size	Used On	Package Style	Quantity Per Box	Cat. No.	Cat.	Cash	Shipping Weight
8½″ by 100′	Electrolytic Copier	Roll	Box - 3 rolls	B-**VT50K-3**	**$22.80**	**$21.84**	4 lbs.
8½″ by 100′	Electrolytic Copier	Roll	Case - 12 rolls	B-**VT50K-12**	**91.20**	**87.36**	16 lbs.

* Use on DECwriter II, III, and DECprinter with compressed font option. † White, fanfold, lined.

RIBBONS — For Line Printers, DECwriters and DECprinter

Size	Used On	Cat. No.	Cat.	Cash	Shipping Weight
15″ by 20 yds.	V-, W-Series* (132-column)	B-**36-11688**	**$28.50**	**$27.30**	2 lbs.
9″ by 27 yds.	LP08, 09, 10, 11, 12, 15 and LE8 (80-column)	B-**36-09828**	**28.50**	**27.30**	2 lbs.
1″ by 36 yds.	Centronics LS8, LS08 and LS11 (132-column)	B-**36-10998**	**7.60**	**7.28**	1 lb.
14½″ by 25 yds	132-column†	B-**18-10156-00**	**33.25**	**31.85**	2 lbs.
14½″ by 25 yds	132-column‡	B-**18-10156-01**	**33.25**	**31.85**	2 lbs.
1″ by 40 yds. (nylon)	DECwriter I, II 12 ribbons/box	B-**36-10558-01**	**47.50**	**45.50**	3 lbs.
1″ by 60 yds. (nylon)	DECwriter III, DECprinter 12 ribbons/box	B-**36-12153-01**	**61.75**	**59.15**	3 lbs.

* With aluminum foil reversing strips. † Has reversing bar. ‡ No reversing bar.

CALL: 800-258-1710 (N.H. Residents 603 - 884-6660) 8:30 am to 5 pm EST.

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MAGNETIC MEDIA

SCREENFILTERS — For Video Terminal

Acrylic filters are available for use with DIGITAL's VT61, VT61/t, VT55, VT52, VT50 Video Terminals. Filters serve to reduce excessive glare from overhead lighting. Shipping Weight: .5 lbs.

Cat. No.	Color	Cat.	Cash
B-12-13195-00	Gray	$14.25	$13.65

ACCESSORIES FOR LA36, LS120 AND LA180

See Terminal Section for description of these items.
Copy holder attaches to work surface shelf.

Cat. No.	Used On	Description	Cat.	Cash	Shipping Weight
B-LAXX-KB	LS120, LA180, LA36	Caster Set	$14.25	$13.65	1 lb.
B-LAXX-NC	LS120, LA180, LA36	Paper Basket	23.75	22.75	4 lbs.
B-LAXX-KD	LA36	Wire Shelf	23.75	22.75	1 lb.
B-LAXX-KC	LS120, LA36	Work Surface Shelf	42.75	40.95	13 lbs.
B-H981-A	LS120, LA36	Copy Holder	42.75	40.95	3 lbs.
B-LAXX-KA	LS120, LA36	Accessory Kit	76.00	72.80	15 lbs.

WORD PROCESSING

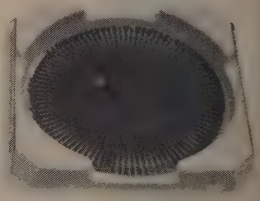
FILM RIBBONS: Film (mylar) ribbons are enclosed within a a black cartridge and remain good for one complete cycle.

NYLON RIBBONS: Ribbons are enclosed within a continuous loop cartridge. May be used until desired print quality is no longer obtainable.

PAPER: Single-part, white, unlined, fanfold, 8½ by 11 inches, 2400 sheets per box.

PRINT WHEELS: Interchangeable print wheels allow different type fonts in "letter quality" printers.

Cat. No.	Description	Qty. Per Box	Cat.	Cash	Shipping Weight
B-LQP01-KA	Mylar Ribbon Cartridge	4	$22.80	$21.84	1 lb.
B-LQP01-KB	Nylon Ribbon Cartridge	6	30.40	27.12	1 lb.
B-36-13202	**Paper** 9½" by 11" white, fanfold, unlined	2400 sheets	28.50	27.30	40 lbs.
	Print Wheels				
B-LQP01-PA	Courier 10	6			
B-LQP01-PB	Pica 10	6			
B-LQP01-PC	Elite 12	6	45.60	43.68	1 lb.
B-LQP01-PD	Courier 72	6			
B-LQP01-PE	French Prestige Cubic	6	61.75	59.15	1 lb.
B-LQP01-PF	General Scientific	6	61.75	59.15	1 lb.
B-LQP01-PH	OCR-B	6	61.75	59.15	1 lb.
B-LQP01-PJ	Courier Legal 10A	6	61.75	59.15	1 lb.
B-LQP01-PK	Letter Gothic	6	61.75	59.15	1 lb.
B-LQP01-PL	Theme	6	61.75	59.15	1 lb.
B-LQP01-PM	Orator 90%	6	61.75	59.15	1 lb.

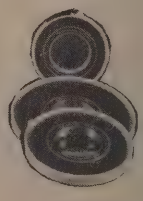


PRINT WHEELS

½" MAGNETIC TAPE

Magnetic tape is available in three lengths for use with DIGITAL's magtape units: 600', 1200', or 2400' magnetic tapes are certified for use at 1600 bpi on industry standard transports. Storage canisters or tape seals are provided with tape.

CANISTER



TAPE SEAL

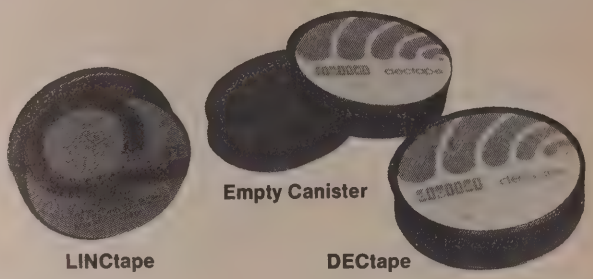
Length	Quantity	Cat. No.		Cat.	Cash	Shipping Weight	
		Canister	Seal			Canister	Seal
600'	10 tapes	B-TUM06-CN	B-TUM06-SL	$142.50	$136.50	16 lbs.	10 lbs.
1200'	10 tapes	B-TUM12-CN	B-TUM12-SL	190.00	182.00	20 lbs.	18 lbs.
2400'	10 tapes	B-TUM24-CN	B-TUM24-SL	237.50	227.50	34 lbs.	26 lbs.

digital DIRECT SALES CATALOG

MAGNETIC MEDIA

DECtape AND LINCtape

The mylar tape has a specially formulated plastic sheath overcoating which serves as a protector for the heads. DECtape is offered certified (formatted) and uncertified (unformatted). LINCtape is uncertified. DIGITAL guarantees that uncertified tape is certifiable. DECtapes come in blue translucent plastic canisters. LINCtapes are in green canisters.



Cat No.	Type	Length	Certified?	Use With	Cat.	Cash	Shipping Weight
B-74-03860-00	DECtape (blue canister)	260′	No	555, 55 or 56 transports	$9.50	$9.10	.5 lb.
B-74-05996-00	DECtape (blue canister)	260′	Yes	PDP-8	13.30	12.74	.5 lb.
B-74-05996-01	DECtape (blue canister)	260′	Yes	PDP-1, 4, 6, 7, 9, 10, 11,15, 20	13.30	12.74	.5 lb.
B-74-03860-01	LINCtape (green canister)	260′	No	LINC, LINC-8, PDP-12	9.50	9.10	.5 lb.

EMPTY CANNISTER, REELS AND VINYL TABS

Vinyl tabs secure tape on reel. Empty canisters store DECtape or LINCtape. Reels are replacement items.

Cat. No.	For	Description	Quantity	Color	Cat.	Cash	Shipping Weight
B-TU56K-DT	DECtape	Empty Canisters	10/pkg.	Blue	$4.75	$4.55	10 oz.
B-TU56K-LT	LINCtape	Empty Canisters	10/pkg.	Green	4.75	4.55	10 oz.
B-TU56K-MT	DECtape & LINCtape	Empty Reels	10/pkg.	—	19.00	18.20	2 oz.
B-18-09537	DECtape & LINCtape	Vinyl Tabs	50 tabs/pkg.	—	3.80	3.64	2 oz.

DECtape LABELS

Pressure sensitive labels available by the roll for easy DECtape identification. Labels are available in four colors. 250 labels per roll. Shipping Weight: 2 oz. per roll.

Cat. No.	Color	Cat.	Cash
B-90-07912-01	Red	$4.75/Roll	$4.55/Roll
B-90-07912-02	Blue	4.75/Roll	4.55/Roll
B-90-07912-03	Green	4.75/Roll	4.55/Roll
B-90-07912-04	Yellow	4.75/Roll	4.55/Roll

MAGNETIC HEAD CLEANING KIT

Materials contained in this kit are to be used to clean tape heads, guides, and reels or any part of the drive where a dirty residue could ultimately come in contact with tape. Shipping weight: 1 lb.

Cat. No.	Cat.	Cash
B-TUC01	$9.50	$9.10

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MAGNETIC MEDIA

TAPE CASSETTES For TU60 Drives

DIGITAL's Cassette unit houses a plastic coated mylar tape. The heavy-duty tape provides long tape life (typically 2000 end-to-end passes). DIGITAL's Cassette units do not use pinch rollers, capstan drive, brakes, clutches, belts, or pulleys. The tape path is simple; only the head touches the tape. DECassette has a storage capacity of 92,000 bytes and measures 150 feet in length. A TU60-LH binder is available. Standard size blue binder holds up to 12 cassettes.

Cat. No.	Description	Cat.	Cash	Shipping Weight
B-**TU60-K**	DECassette	**$7.60**	**$7.28**	2 oz.
B-**TU60-LH**	Binder for 12 cassettes	**5.70**	**5.46**	1 lb.

TELEPRINTER SUPPLIES

Teleprinter Paper, 8½ by 11″

White, fanfold, lined; for use with Sprocket Feed model 35 teleprinters. 3200 sheets per box. Shipping Weight: 24 lbs.

Cat. No.	Cat.	Cash
B-**36-05361**	**$28.50**	**$27.30**

Teleprinter Paper, Non-Perforated

Rolled teleprinter paper non-perforated, white, unlined. For use on all ASR/KSR-33 Friction Feed Teleprinters. One case contains 12 rolls. Shipping Weight: 35 lbs.

Cat. No.	Cat.	Cash
B-**36-05365-01**	**$34.20**	**$32.76**

Teletype Paper-Tape, Oil Rolled

One inch by 950 ft., gray. For use with I/O Teletype Readers/Punches. Models ASR-33, 35, and 37. One case contains 28 rolls. Shipping Weight: 46 lbs.

Cat. No.	Cat.	Cash
B-**36-05360-01**	**$42.75**	**$40.95**

Teletype Ribbon

For use with Models 28, 33, 35, and 37. One box contains 12 ribbons. Shipping Weight: 1 lb.

Cat. No.	Cat.	Cash
B-**18-09137-01**	**$19.00**	**$18.20**

PAPER-TAPE

High Speed Fanfold Paper-Tape

For use on all DIGITAL's high speed paper-tape readers and punches. Sold by the case. One case contains 18 tapes (1″ by 1000 ft.). Shipping Weight: 28 lbs.

Cat. No.	Cat.	Cash
B-**36-05363-01**	**$71.25**	**$68.25**

Paper-Tape Trays (Blue Color)

Stores eight fanfold paper-tapes. Can be equipped with clear vinyl cover to prevent spilling. Shipping Weight: 1 lb.

Cat. No.	Description	Cat.	Cash
B-**36-05364-00**	Tray	**$2.85**	**$2.73**
B-**36-05364-01**	Cover	**.95**	**.91**
B-**12-11528**	Tray with Snap-on Cover	**4.75**	**4.55**

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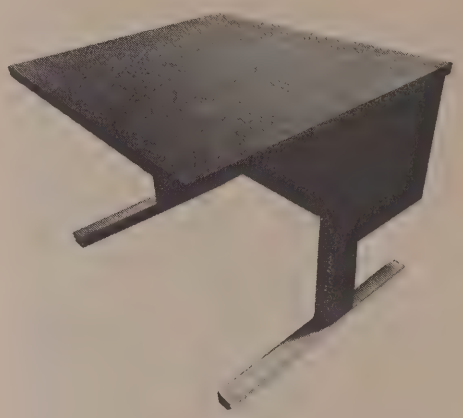
DIRECT SALES CATALOG

Tables



This table provides a convenient work surface. The surface is walnut finish. The table is wide enough so that terminals such as DECscope, as well as papers, print-outs, etc., may be placed on the surface. The shroud in the rear is ideal for holding a data set, or other items. The two sides have cable openings so that a complete unit appears neat and attractive. Shipping Weight: 50 lbs.

The H970-EB measures 27H by 36W by 30″D (keyboard height). A set of casters, 12-11526, can be ordered for the table. Installed, they increase table height by 2″.

Cat. No.	Description	Cat.	Cash	Shipping Weight
B-**H970-EB**	Small Table	**$228 each**	**$218 each**	50 lbs.
B-**12-11526**	Caster Set	**19 each**	**18 each**	1 lb.

Free Standing Table — H970-HB

The H970-HB serves as a support table for peripheral devices such as the VT52 DECscope in office environments. The table consists of a walnut wood-grained, scratch-resistant top, medium grey side rails, and an off-white modesty panel. The leading edge of the top is beveled for additional comfort. The H970-HB includes four adjustable leveling feet for firm positioning. Dimensions are 27H by 24W by 30″D.

Cat. No.	Cat.	Cash	Shipping Weight
B-**H970-HB**	**$162**	**$155**	40 lbs.

Terminal Stand

DIGITAL's unique Terminal Stand features a rounded black steel center pole that attaches to five pedestal legs. Casters attach to each leg to facilitate unit mobility. The following terminals are supported on a base plate that is securely mounted to the center pole: VT50, VT52, VT55, VT61, VT61/t, VT71, and VT71/t. Terminal Stand combines functional design with contemporary elegance. It measures 26″ in height and requires minimal floor space when fully assembled. Each stand is shipped unassembled for ease of storage and to reduce shipping costs. Instructions and necessary tools for easy and quick unit assembly are included. Please use Part No. VT71-ST for Terminal Stand to be used with the VT71 and VT71/t terminals.

Cat. No.	Description	Cat.	Cash	Shipping Weight
B-**VTXX-ST**	Terminal Stand (VT50, 52, 55, 61, 61/t)	**$71.25**	**$68.25**	25 lbs.
B-**VT71-ST**	Terminal Stand (VT71, 71/t)	**71.25**	**68.25**	25 lbs.

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digital DIRECT SALES CATALOG

MEDIA STORAGE CABINET

DIGITAL's cabinets add complete organization, durability, and security for your operating supplies and accessories. The cabinets provide convenient and easy access storage facilities for cartridges, disk packs, DECtapes, MAGtapes, ribbons, paper tape, and accessories. Each cabinet is of all-welded steel construction and has a high impact plastic rollaway tambour door in off-white with a blue accent strip.

Cabinets require only 18½ inches outside depth. The centrally located handle facilitates easy opening and closing. A single door lock resists tampering to insure security.

Cabinets are available empty and in two different sizes. Cabinets can then be custom configured to meet individual storage needs.

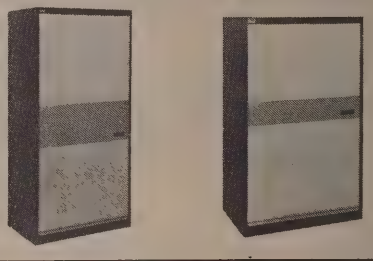
BASIC CABINETS

Large Cabinet — H980-BA

The large empty cabinet measures 73″H x 38″ W x 18½″ D. The unit provides 65″ of inside mounting space for the options which are described on the following pages.

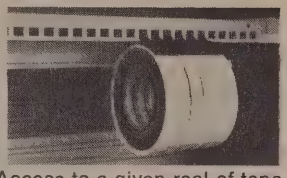
Small Cabinet — H980-BB

The small empty cabinet measures 61″ H x 38″ W x 18½″ D. The unit provides 52″ of inside mounting space for the options which are described on the following pages.



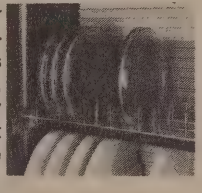
CABINET OPTIONS

MAGtape Hanger Bar — H980-CA



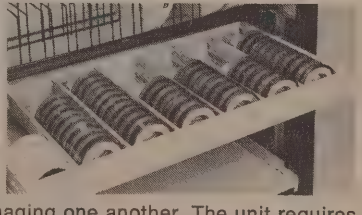
The tape hanger bar is designed to accommodate one-half inch industry-compatible magnetic tape in tape seal only. Up to 35 of either 600-foot, 1,200-foot or 2,400-foot reels of tape may be stored in any combination. Access to a given reel of tape is accomplished by pressing the reel inward allowing the spring loaded stabilizer to gently swing the reel outward where it can be grasped. The unit requires 14¾″ of inside mounting space for 2400-foot reels.

MAGtape Storage Rack — H980-CB



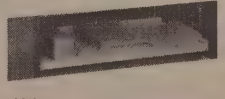
The tape storage rack provides slots for storing reels of one-half inch industry-compatible magnetic tape in canisters only. Up to 20 of either the 600-foot, 1,200-foot or 2,400-foot reels of tape may be stored in any combination. The unit requires 13″ of inside mounting space for 2400-foot reels.

Disk Storage Rack — H980-CC



The storage rack provides slots for securely storing up to 14 RK05K style disk cartridges. Slots are adequately spaced to allow easy cartridge replacement and retrieval and to prevent cartridges from scraping and damaging one another. The unit requires 17″ of inside mounting space.

Fixed Shelf — H980-CG



The fixed shelf (does not roll) provides storage space for miscellaneous items such as cards, forms, and printer paper. The shelf is secured so that heavy items may be stored.

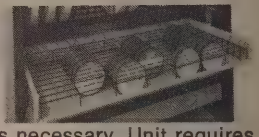
Roll-out Shelf — H980-CD

The roll-out shelf either functions as a work surface shelf for disk packs or, combined with the divider kit (H980-CH) creates a DECtape Storage Drawer for up to 72 tapes in canisters. The unit requires 7″ of inside mounting space for RP02-P, RP03-P, RP04-P, RP06-P and RM03-P disk packs or 4¾″ of inside mounting space for DECtapes and RK06 cartridges.

Divider Kit — H980-CH

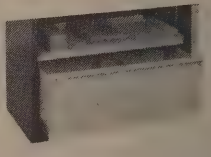
The H980-CH divider kit provides partitions within the H980-CD roll-out drawer, so that DECtape, cassettes, or any other small items may be divided into logical units, and stored economically.

DECtape Wire Frame — H980-CK



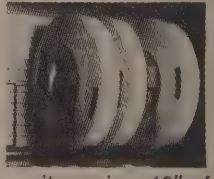
The H980-CK DECtape wire frame provides slots so that up to 77 reels of DECtape in canisters may be stored conveniently and systematically. The wire frame fits easily within the H980-CD roll-out drawer. No screws or attachments necessary. Unit requires 4¾″ inside vertical mounting space for DECtapes.

Storage Drawer — H980-CF



The storage drawer is ideal for storing a variety of items such as maintenance manuals, paper tape trays, binders, and many other "hard-to-find-a-place-for" items. Roll-out drawer measures 12″ H x 31½″ W x 12″ D. The unit requires 13″ of inside mounting space.

RK06 Storage Rack — H980-CL

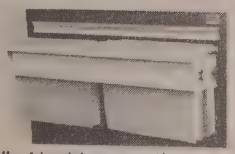


The rack provides slots for securely storing up to 9 RK06 style cartridges. Slots are adequately spaced to allow easy cartridge replacement and retrieval and to prevent cartridges from scraping and damaging one another. The unit requires 16″ of inside mounting space.

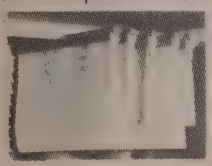
MEDIA STORAGE CABINET

CABINET OPTIONS (Cont'd)

Hanger Binder Frame — H980-CE



The hanger frame is designed with two sections for storing printout binders and legal documents. Hanger frames accommodate printout binders with tabs or "ears" that hook onto the frame. Frame rolls out for rapid access. The unit requires 13" of inside mounting space.



Hanger Bar — H980-CM

The documentation hanger bar is designed for use with both the Data Binder (H980-CN) and Paper (H980-CP) Hangers. It provides a unique method for storing computer printouts and makes frequent retrieval of data convenient. Accommodates attachments for 14½ x 11" data binders and 8½ x 11" paper. Sturdy metal bar has end brackets that mount into supplies cabinets (H980-BA and H980-BB). Unit requires 2" inside mounting space.

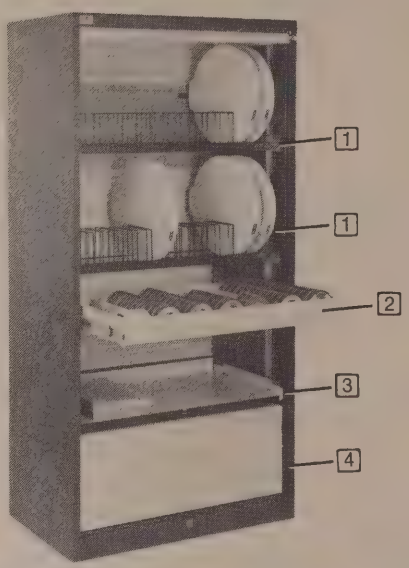
Data Binder Hanger — H980-CN

Sturdy plastic hanger attaches to documentation hanger bar (H980-CM) to store 14⅞ x 11" data binders containing computer printouts. Hanger comes with front and back flaps to enclose computer printouts. Can mix and match the two size hangers. Available 10 hangers per package. Unit requires 14½" of inside mounting space.

Paper Hanger — H980-CP

Sturdy plastic hanger attaches to documentation hanger bar (H980-CM) to store 8½ x 11" paper. Hanger comes with front and back flaps to enclose computer printouts. Can mix and match the two size hangers. Available 10 hangers per package. Unit requires 12" of inside mounting space.

TYPICAL LARGE CABINET



As shown the cabinet is equipped with the following options:

1. Two H980-CC Disk Cartridge storage unit handling 28 RK05K Disk Cartridges.
2. One H980-CD roll-out-drawer with one H980-CH divider set for storing 72 DECtapes.
3. One H980-CG fixed shelf for storage of forms, punched cards, etc.
4. One H980-CF storage drawer for utility purposes.

ORDERING INFORMATION

Cat. No.	Description	Cat.	Cash	Shipping Weight
B-H980-BA	Large Cabinet — Empty	$379.05	$363.09	145 lbs.
B-H980-BB	Small Cabinet — Empty	331.55	317.59	135 lbs.
B-H980-CA	MAGtape Hanger Bar	33.25	31.85	6 lbs.
B-H980-CB	Magtape Storage Rack	33.25	31.85	5 lbs.
B-H980-CC	Disk Storage Rack	33.25	31.85	7 lbs.
B-H980-CD	Roll Out Shelf	61.75	59.15	18 lbs.
B-H980-CE	Hanger Binder Frame	66.50	63.70	18 lbs.
B-H980-CF	Storage Drawer	76.00	72.80	33 lbs.
B-H980-CG	Fixed Shelf	33.25	31.85	12 lbs.
B-H980-CH	Divider Kit	61.75	59.15	15 lbs.
B-H980-CK	DECtape Wire Frame	33.25	31.85	5 lbs.
B-H980-CL	RK06 Storage Rack	33.25	31.85	7 lbs.
B-H980-CM	Hanger Bar (documentation)	33.25	31.85	5 lbs.
B-H980-CN	Data Binder Hanger	36.10	34.58	1 lb.
B-H980-CP	Paper Hanger	36.10	34.58	1 lb.

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DIRECT SALES CATALOG

TECHNICAL DOCUMENTATION

New to this Direct Sales Catalog edition is the Technical Documentation Section. Here you will find a selection of our most commonly requested technical reference manuals. For your convenience, the listings have been assembled on the basis of operating system software. For instance, all of the RT-11 (Real Time - 11) manuals are listed in the RT-11 section.

SPECIAL TERMS AND CONDITIONS

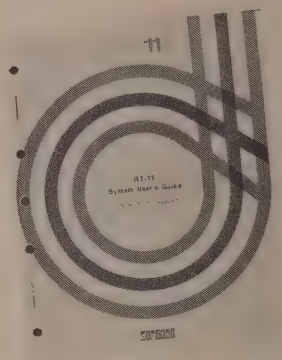
Any discrepancies on received manuals must be reported within 30 days. Goods ordered and shipped may not be returned for credit.

All prepaid Technical Documentation orders will be shipped postage paid. Orders not prepaid will be shipped F.O.B. point of origin and shipping charges will be added to the invoice. Be sure to add appropriate sales tax amounts to your order.

RT-11 (Real Time Foreground/Background System) REFERENCE MANUALS

RT-11 is a single-user disk operating system designed for interactive program development and on-line applications. In a foreground/background environment, the user can run a real-time application in the foreground while interactively developing a program or running a batch stream in the background. RT-11 includes two compatible monitors and a variety of program development and system utilities. As options, RT-11 supports FOCAL, FORTRAN IV and BASIC languages. BASIC is offered in a single-user or multi-user version.

RT-11 runs on a PDP-11 with between 8K and 30K words of memory. In addition, RT-11 requires a console terminal and one of the following random-access devices: TC11 dual DECtape drive, RK11 disk cartridge drive, RX11 floppy disk drive, RF11 fixed-head disk with floppy disk, RK11 disk, DECtape or paper tape reader/punch, RP02 disk drive with floppy disk, RK11 disk or DECtape drive, or RS03 or RS04 disk drive with RK05 disk drive. RT-11 also supports a line printer, magnetic tape drives, a card reader and cassette drives. In addition, the high-level languages provide access to a variety of graphics and lab display peripherals.



Catalog Number	Title	Price
B-**AA-2866C-TC**	RT-11 System Reference Manual	**$24.00**
B-**AA-5283A-TC**	RT-11 System Generation Manual	**11.00**
B-**AA-2667A-TC**	RT-11 System Manual	**11.00**
B-**AA-5279A-TC**	RT-11 System User's Guide	**19.00**
B-**AA-5284A-TC**	RT-11 System Message Manual	**11.00**
B-**AV-5287A-TC**	RT-11 System Pocket Guide	**1.00**
B-**AA-5280A-TC**	RT-11 Advanced Programmer's Guide	**19.00**
B-**AA-5749A-TC**	FORTRAN IV User's Guide (RT-11, RSTS/E)	**9.00**
B-**AA-5281A-TC**	Introduction to RT-11	**14.00**
B-**AA-1855C-TC**	PDP-11 FORTRAN IV Language Reference Guide	**11.00**
B-**AA-1863F-TC**	FOCAL-11 User's Manual	**11.00**
B-**AA-1588E-TC**	BASIC-11 Language Reference Manual	**11.00**
B-**AA-5071A-TC**	BASIC-11 User's Manual	**9.00**
B-**AA-1915A-TC**	Multi-User BASIC User's Manual	**9.00**

CATALOG NUMBERS VS MODEL NUMBERS

The Catalog Numbers published in this catalog relate only to purchases made through the Direct Sales Catalog. The **Bold Face** portion of each Catalog Number is the official DIGITAL Model Number. All invoices and packing slips will reference only the Model Number.

All software manuals reflect current version of the operating system and system software.

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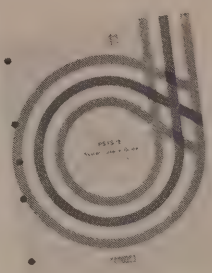
DIRECT SALES CATALOG

TECHNICAL DOCUMENTATION

RSTS/E (Resource Time Sharing System) REFERENCE MANUALS

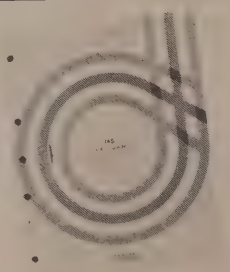


RSTS/E is a timesharing system that allows up to 63 simultaneous users to process data in interactive mode using the BASIC-PLUS language processor. As options, the system supports a COBOL language processor and PDP-11 SORT file sort utility and a FORTRAN IV compiler system. BASIC-PLUS jobs can range from small desk calculator jobs to large 16K word programs and can use chaining and interjob communication features to execute even larger programs. COBOL programs can have a maximum size of 28K words. RSTS/E also includes a comprehensive set of easy-to-use system utilities for the system manager and timesharing users.

As a general rule, RSTS/E can support up to 63 jobs on a PDP-11/70, up to 32 jobs on a PDP-11/45 and up to 24 jobs on a PDP-11/40 central processor. The actual number of jobs a configuration can support depends on the application's characteristics and the amount of memory available. RSTS/E requires at least 32K words of parity memory to run BASIC-PLUS jobs only or at least 64K words to run both BASIC-PLUS and COBOL or FORTRAN IV jobs. A minimum peripheral complement includes a console terminal and a disk system. The system device can be any single RP series disk system or a dual drive RK11 disk system. A TU16 or TM11 magnetic tape or TC11 DECtape system is required for system generation and back-up unless the disk system is a dual drive RK11 system.

Catalog Number	Title	Price
B-AA-2623B-TC	BASIC-PLUS Language Manual	$11.00
B-AA-0153A-TK	BASIC-PLUS-2 Language Reference Manual	11.00
B-AA-0154A-TC	BASIC-PLUS-2 User's Guide	11.00
B-AA-5133A-TC	RSTS/E System User's Guide	14.00
B-AA-2726B-TC	RSTS/E Programmer's Manual	14.00
B-AA-2762B-TC	RSTS/E System Manager's Guide	11.00
B-AA-3346A-TC	RSTS/E Text Editor Manual	11.00
B-AA-3337B-TC	RSTS/E Runoff User's Guide	9.00
B-AA-5704A-TC	RSTS/E User Environment Test Package Manual	9.00
B-AA-0003B-TC	RSTS/E RMS-11 Utilities User's Guide	9.00
B-AA-5072A-TC	RSTS/E Task Builder Reference Manual	11.00
B-AA-2616B-TC	RPG II User's Guide (CTS-500, RSTS/E)	11.00
B-AA-2649B-TC	DMS-500 User's Guide (CTS-500)	11.00
B-AA-5749A-TC	FORTRAN IV User's Guide	9.00
B-AA-1757C-TC	COBOL-11 (RSTS/E) User's Guide	19.00
B-AA-1949D-TC	COBOL-11 (RSTS/E) Language Reference Manual	14.00

IAS (Interactive Application System) REFERENCE MANUALS



IAS is a large, general-purpose operating system that runs on a PDP-11/70 or PDP-11/45 Processor. It is a multi-user time-sharing system that supports concurrent interactive, batch and real-time applications. It includes the MACRO assembler. As options FORTRAN IV, FORTRAN IV-PLUS, COBOL and BASIC language processors can be added. IAS features:

- Multiple programming languages: FORTRAN, BASIC, COBOL and MACRO
- A single, easy to learn and use interactive command language
- Priority scheduling for real-time tasks
- Submission of batch jobs from interactive terminals
- Timesharing services for development of interactive application programs
- A simple internal software interface for the development and use of special-purpose, multi-user interactive applications
- A sophisticated file system providing device independence, file protection, sequential and random file access
- Dynamic allocation of system resources
- Use of shared, reentrant code to minimize memory requirements
- System management facilities for system configuration, generation and control
- Facilities to account for and restrict the use of system resources

Catalog Number	Title	Price
B-AA-2535E-TC	IAS User's Guide	$14.00
B-AA-2520C-TC	IAS System Management Guide	14.00
B-AA-2504B-TC	IAS Executive Reference Manual, Volume I	9.00
B-AA-2506B-TC	IAS Executive Reference Manual, Volume II	11.00
B-AA-2519C-TC	IAS System Generation Guide	11.00
B-AA-2515B-TC	IAS/RSX-11 I/O Operation Reference Manual	14.00
B-AA-2508A-TC	IAS Editing Utilities Reference Manual	11.00
B-AA-2501B-TC	IAS Guide to Writing Device Handlers Task Document	9.00
B-AA-2510C-TC	IAS Device Handlers Reference Manual	11.00

PDP-11 SOFTWARE GENERAL

Catalog Number	Title	Price
B-AA-5530A-TC	PDP-11 TECO User's Guide	$ 9.00
B-AA-2711B-TC	PDP-11 ROLLIN Utility Program Document	9.00
B-AB-3196A-TC	PDP-11 Absolute Loader (VA07) Listing	11.00
B-AA-3457B-TC	PDP-11 Papertape Software Handbook	9.00
B-AA-3341C-TC	PDP-11 Sort Reference Handbook	9.00

CALL: 800-258-1710 (N.H. Residents 603 - 884-6660) 8:30 am to 5 pm EST.

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DIRECT SALES CATALOG

TECHNICAL DOCUMENTATION

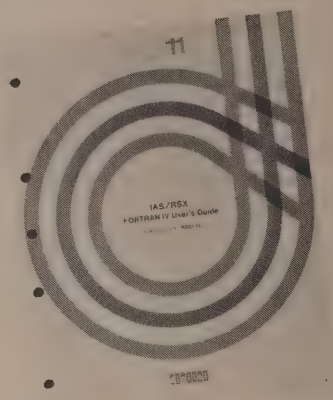
RSX-11 (Real Time Multiprogramming Family) REFERENCE MANUALS

RSX-11 is a unique family of compatible real-time multiprogramming operating systems for the PDP-11 computers. The RSX-11 family includes: RSX-11D, a large, multi-purpose operating system for dynamic environments; RSX-11M, a compact, efficient operating system for relatively stable environments; and RSX-11S, a small, execute-only operating system for dedicated application environments.

The RSX-11 operating systems comprise a compatible hierarchy. The program interface to RSX-11M is a proper subset of RSX-11D. Programs written to run under RSX-11M will run under RSX-11D following a re-link of the object form of the program on an RSX-11D system. RSX-11S is a memory-based proper subset of RSX-11M fully compatible internally. A program written to execute as a task under RSX-11S will execute under RSX-11M without change. It will also execute under RSX-11D following a re-link of the object form of the program.

RSX-11D includes an Executive to monitor and control system operation, a set of Monitor Console Routines (MCR) to enable the user to communicate with the system, a set of File Control Services (FCS), I/O device handler tasks, and a variety of system utility programs. Programs can be written in MACRO, FORTRAN IV, FORTRAN IV-PLUS and COBOL.

RSX-11M includes an Executive, MCR services, FCS file system, and system utility programs. Under RSX-11M, programs can be written in a subset MACRO, in a fully-compatible RSX-11D MACRO, or in FORTRAN IV or FORTRAN IV-PLUS. RSX-11M's MCR services and FCS file system are compatible to RSX-11D's. Device handlers under RSX-11D are loadable tasks to provide system flexibility, while device drivers in RSX-11M are built into the Executive during system generation to provide faster response.



Both RSX-11D and RSX-11M are multi-user systems. More than one terminal user can interface with MCR services simultaneously. An MCR facility allows users to create a file containing executable commands to control common sequences of operations. The MCR facility in RSX-11M systems allow the user to create indirect command files using a procedure control language to effect a multi-stream batch capability. RSX-11D provides a patch processor to handle single-stream batch operations.

Catalog Number	Title	Price
RSX-11M		
B-AA-5245A-TC	RSX-11M Beginner's Guide	$ 9.00
B-AA-2599A-TC	RSX-11 Utilities Procedure Manual	14.00
B-AA-5134C-TC	RSX-11M System Generation Manual	14.00
B-AA-2512B-TC	RSX-11M Executive Reference Manual	11.00
B-AA-2588C-TC	RSX-11M Task Builder Reference Manual	11.00
B-AA-5568A-TC	RSX-11M User Mode Diagnostics Reference Manual	11.00
B-AA-2600C-TC	RSX-11M Guide to Writing I/O Drivers	11.00
B-AA-1936C-TC	FORTRAN IV User's Guide	11.00
B-AA-2512B-TC	MACRO-11 Reference Manual (IAS/RSX-11)	11.00
B-AA-2514B-TC	ODT Reference Manual (IAS/RSX-11)	11.00
B-AA-2515B-TC	I/O Operations Reference Manual (IAS/RSX-11)	14.00
B-AA-5569A-TC	Disk Save & Compress User's Guide (IAS/RSX-11)	11.00
B-AA-2533B-TC	RSX-11M I/O Drivers Reference Manual	14.00
B-AA-2542B-TC	RSX-11M Error Logging Reference Manual	11.00
B-AA-2543C-TC	RSX-11M Executive Reference Manual	11.00
B-AA-4954A-TC	RMS-11 Utilities User's Guide	9.00
B-AA-0001A-TC	Introduction to RMS-11	11.00
B-AA-0002A-TC	RMS-11 MACRO Programmer's Reference Manual	11.00
B-AA-0157A-TC	BASIC-PLUS-2 User's Guide	11.00
B-AA-5075A-TC	PDP-11 MACRO Language Reference Manual	11.00
B-AA-3330B-TC	PDP-11 PRESRV Utility User's Guide	11.00
B-AA-1749D-TC	COBOL-11 Language Reference Manual	11.00
B-AA-1757C-TC	COBOL-11 User's Guide	19.00
B-AA-1874A-TC	FORTRAN IV - PLUS OTS Reference Manual	11.00
B-AA-1884B-TC	FORTRAN IV - PLUS User's Guide	11.00
RSX-11D		
B-AA-3019E-TC	RSX-11D System Generation Reference Manual	$11.00
B-AA-3021D-TC	RSX-11D Task Builder Reference Manual	11.00
B-AA-3030B-TC	RSX-11D User's Guide	14.00
B-AA-3037B-TC	RSX-11D Executive Reference Manual	9.00
B-AA-3098C-TC	RSX-11D System Manager's Guide	11.00

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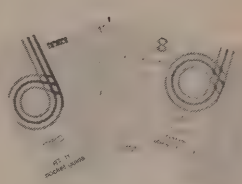
DIRECT SALES CATALOG

TECHNICAL DOCUMENTATION

HANDBOOKS

Listed below is a selection of DIGITAL's hardware, software and programming reference handbooks. These handbooks give excellent insight, both general and specific, into each respective topic. Both novice and experienced computer operators will find these books useful. Many have been selected by educational institutions as the basis for computer science and programming classes.

Also listed are DIGITAL's Programmer's Pocket Reference Cards. For many years these cards have been the working tools of computer programmers around the world. Each gives complete tables of the appropriate instruction sets and other useful information for the programmer.



Catalog Number	Title	Price
B-AA-0614A-TA	4K Assemblers Pal III/MACRO-8 Document	$ 9.00
B-AA-0622A-TA	8K Basic Document	11.00
B-16P210	Designing Computers Systems Handbook	3.50
B-AA-0627A-TA	FOCAL-8 Document	11.00
B-AA-0632A-TA	FORTRAN/SABR Document	9.00
B-EB-05300-75	Introduction to Minicomputer Networks	4.50
B-AA-0839A-TA	Introduction to Programming Document	3.50
B-EK-LA356-J1	LA35/36 Mini Maintenance Hardware	11.00
B-AA-4637A-TA	OS/8 Handbook	9.00
B-AA-0615A-TA	PAL 8 Assembled Document	9.00
B-EB-05961-76	PDP-11 Peripheral Handbook	9.00
B-AA-1359A-TC	PDP-11 Programming Fundamentals Handbook	5.50
B-EB-08127-20	PDP-11 Software Handbook	5.50
B-EB-05138-76	PDP-11/04, 05, 10, 35, 40, 45 Processor Handbook	5.50
B-EB-06707-20	PDP-11/04,/34/45/55 Processor Handbook	5.50
B-EB-06498-20	PDP-11/60 Handbook	5.50
B-EB-05962-76	PDP-11/70 Processor Handbook	5.50
B-AA-4338A-TA	PDP-8 Family Commonly Used Utility Routines	8.00
B-AA-0586A-TA	PDP-8 Programming Manual	5.50
B-EB-06219-76	PDP-8/A Minicomputer Handbook	5.50
B-AA-0155A-TK	Introduction to BASIC	5.50
B-EB-02546-76	Small Computer Handbook (8E, 8M, 8F)	5.50
B-EB-07466-20	VAX 11/780 Architecture Handbook	9.00
B-EB-08126-20	VAX 11/780 Software Handbook	9.00

PROGRAMMER'S POCKET REFERENCE CARDS

B-EH-03606-76	COBOL-11 Reference Card	10 @ $5.50
B-EH-02784-73	DECGraphic-11 GT Series Reference Card	10 @ 5.50
B-AV-2183B-TC	GAMMA-11 F/B Reference Card	10 @ 5.50
B-AV-1051C-TC	LAB-Applications-11 Program Reference Card	10 @ 5.50
B-EH-07043-76	LSI-11/PDP-11/03 Programming Reference Card	10 @ 5.50
B-AV-2201D-TC	MUMPS-11 Reference Cards	10 @ 5.50
B-EH-04786-75	PDP-11 Pocket Reference Card	10 @ 5.50
B-EH-S1046-76	PDP-11 Programming Reference Card	10 @ 5.50
B-EH-01805-77	PDP-8 Pocket Reference Card	10 @ 5.50
B-AV-5126A-TC	RSTS/E Pocket Guide	10 @ 5.50
B-AV-5570A-TC	RSX-11M Pocket Reference Card	10 @ 5.50
B-AV-2740-TC	RT-11 System Reference Card	1.00
B-AV-5287A-TC	RT-11 V3 System Pocket Guide	

CALL: 800-258-1710 (N.H. Residents 603 - 884-6660) 8:30 am to 5 pm EST.

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HOW TO ORDER

Catalog Sales Desk
800-258-1710
(N.H. residents 603 - 884-6660).
From 8:30 am to 5 pm EST.

To ensure prompt delivery and accurate charges you must use one of the four methods outlined below. Choose whichever best suits your company's internal operations.

1. **Preprinted Order Form (Note A)**
A sample of this form — and detailed instructions for filling it in — are shown on page 155. We prefer you use this form. DIGITAL's Terms and Conditions for Catalog 1-78 (Note B) are printed on the reverse side. The submittal of your order on this form acknowledges your acceptance of these Terms and Conditions. For your review, the Terms and Conditions pertaining to Catalog 1-78 (Note B) are reproduced on page 159.

2. **Purchase Order and Preprinted Form**
If you submit your own Purchase Order you can simply attach a **signed** copy of DIGITAL's Preprinted Order Form (Note A) to signify your acceptance of the Terms and Conditions pertaining to Catalog 1-78 (Note B) as documented on page 159. Be sure to provide us with all the required information as detailed under **Ordering Information.**

3. **Purchase Order Only**
If you submit a Purchase Order and do not include DIGITAL's Preprinted Order Form you must incorporate this statement "Terms and Conditions of DIGITAL's Direct Sales Catalog 1-78 govern this order." These Terms and Conditions (Note B) are documented on page 159. Be sure to provide us with all the required information as detailed under **Ordering Information.**

4. **Phone Orders**
If you have a current approved Catalog Open Account (see definition page 156) call the Catalog Sales Desk to enter your order. Your order will be processed and scheduled but not shipped until we receive a confirming, acceptable written catalog order as described in 1 through 3 above. We can handle your call more quickly if you have the following information ready: catalog part number, quantity, description, billing address, and shipping address.

ORDERING INFORMATION

We must have the following information to process your order:

(a) Company Name, and Complete Address including ZIP Code.

(b) A Ship To address, if different from the company address.

(c) Name, Title, and Phone Number of Equipment Specifier (not purchasing contact, unless same).

(d) Tax Exemption Number if applicable. A copy of your Exemption Certificate is also required if not submitted with a previous catalog order. See **Sales Tax Information,** page 156.

(e) Purchase Order Number (for billing purposes only and for Catalog Open Accounts).

(f) State if you are subject to the Renegotiation Act.

(g) State if Transportation Insurance is required. See **Transportation Insurance,** page 156.

(h) Indicate which shipping method you require. Note that size and weight considerations sometimes limit your choice. See **Shipping and Delivery Information,** page 156.

(i) Give Quantity, Catalog Part Number, Description and Appropriate Price (Catalog or Cash) for each item. You can refer to the Product Index for a summary of all items and their prices. Include any special specifications (color, style, etc.) with the item description.

(j) Give the Shipping Weight for each item. For Modules you must check the Module Weight Chart on page 161 to compute the combined shipping weight of the Modules.

(k) Compute all taxes, shipping charges, and insurance costs in accordance with the instructions under **Sales Tax Information, Shipping and Delivery Information, Transportation Insurance.**

(l) Add costs in Items i and k. This is the Total Order Cost.

(m) When paying cash, remit the amount computed in (l) above. Pay by check or postal money order. Do NOT send currency or stamps. If the actual charges are less than you computed, DIGITAL will refund the difference provided it exceeds $2.

(n) **If your order is less than $35.00 you must pay cash.**

ADDRESS AND MAIL ORDERS TO:
Digital Equipment Corporation
Direct Sales Catalog, Dept. EM
P.O. Box 4202, Boston, MA 02107

Note A: Call Catalog Sales Desk for copies of the Order Forms.

Note B: Expiration date of Catalog 1-78 is June 30, 1979. If you are using this catalog after this date you must check with the Catalog Sales Desk for any changes affecting Terms, Conditions, Products or Prices. Although we expect most prices to remain unchanged for the life of Catalog 1-78, some may change. You will be informed of any change when we process your order.

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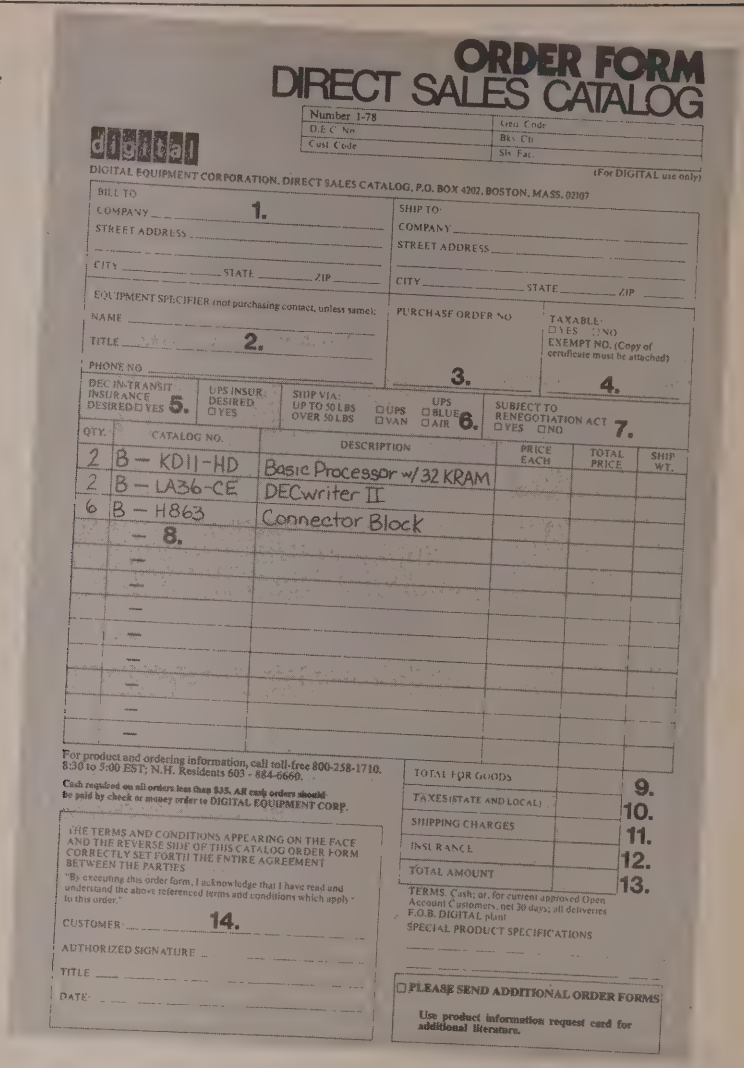
DIRECT SALES CATALOG

PREPRINTED ORDER FORM*

Follow these 14 steps to fill in the form.



ORDER FORM
DIRECT SALES CATALOG

digital

Number 1-78 | Cust Code | D.E.C. No | Cust Code | Bk. Cl. | Sls. Fac.

(For DIGITAL use only)

DIGITAL EQUIPMENT CORPORATION, DIRECT SALES CATALOG, P.O. BOX 4202, BOSTON, MASS. 02107

BILL TO
COMPANY 1.
STREET ADDRESS
CITY STATE ZIP

SHIP TO
COMPANY
STREET ADDRESS
CITY STATE ZIP

EQUIPMENT SPECIFIER (not purchasing contact, unless same):
NAME
TITLE 2.
PHONE NO

PURCHASE ORDER NO 3.

TAXABLE: ☐YES ☐NO
EXEMPT NO. (Copy of certificate must be attached) 4.

DEC IN-TRANSIT INSURANCE DESIRED ☐YES 5.
UPS INSUR. DESIRED ☐YES
SHIP VIA: UP TO 50 LBS ☐UPS ☐VAN OVER 50 LBS ☐UPS ☐BLUE ☐AIR 6.
SUBJECT TO RENEGOTIATION ACT ☐YES ☐NO 7.

QTY.	CATALOG NO.	DESCRIPTION	PRICE EACH	TOTAL PRICE	SHIP WT.
2	B – KD11-HD	Basic Processor w/32 KRAM			
2	B – LA36-CE	DECwriter II			
6	B – H863	Connector Block			
	– 8.				
	–				
	–				
	–				
	–				
	–				
	–				
	–				
	–				

For product and ordering information, call toll-free 800-258-1710. 8:30 to 5:00 EST; N.H. Residents 603 - 884-6660.

Cash required on all orders less than $35. All cash orders should be paid by check or money order to DIGITAL EQUIPMENT CORP.

THE TERMS AND CONDITIONS APPEARING ON THE FACE AND THE REVERSE SIDE OF THIS CATALOG ORDER FORM CORRECTLY SET FORTH THE ENTIRE AGREEMENT BETWEEN THE PARTIES

"By executing this order form, I acknowledge that I have read and understand the above referenced terms and conditions which apply to this order."

CUSTOMER 14.
AUTHORIZED SIGNATURE
TITLE
DATE

TOTAL FOR GOODS		9.
TAXES (STATE AND LOCAL)		10.
SHIPPING CHARGES		11.
INSURANCE		12.
TOTAL AMOUNT		13.

TERMS: Cash; or, for current approved Open Account Customers, net 30 days; all deliveries F.O.B. DIGITAL plant

SPECIAL PRODUCT SPECIFICATIONS

☐ PLEASE SEND ADDITIONAL ORDER FORMS

Use product information request card for additional literature.

IMPORTANT!

CATALOG NUMBERS VS MODEL NUMBERS

The Catalog Numbers published in this catalog relate only to purchases made through the Direct Sales Catalog. The **Bold Face** portion of each Catalog Number is the official DIGITAL Model Number. All invoices and packing slips will reference only the Model Number.

1. Put your company name and complete address, including Zip Code for **Bill To** information. If you want your order shipped to a different address, write this in the **Ship To** space.
2. Name, title, and phone number of **Equipment Specifier** (not purchasing contact, unless same).
3. Purchase order number (for Catalog Open Accounts and for invoicing purposes only).
4. Check off whether this order is taxable and include tax exemption number, if applicable (see notes under **Sales Tax Information). A copy of the exemption certificate must be attached if not submitted with a previous Catalog Order.**
5. Check if transportation insurance is desired. UPS or DIGITAL.
6. Check method of shipment (UPS, air, van). Verify that method selected will accept your shipment based on size and/or weight restrictions.
7. Check if you are subject to the Renegotiation Act.
8. Give the quantity, catalog number, description, appropriate price (depending on the discount taken), total price, and shipping weight for each part ordered, plus any special product specifications required, in the description. Compute Module weight as shown on page 161.
9. Add up amounts in the **Total Price** column and enter total in the **Total for Goods** block.
10. Add state and local taxes, if applicable (see notes under **Sales Tax Information).**
11. Add shipping charges only if paying cash and shipping via UPS. All other shipping methods will be prepaid by DIGITAL and added to the customer's invoice or billed by the carrier. (See instructions under **Shipping and Delivery Information.)**
12. Add insurance charges only if paying cash. (See instructions under **Transportation Insurance** to calculate UPS or DIGITAL insurance charges.) All Open Account customers requesting DIGITAL insurance will be billed these charges.
13. Total all of the above items. Cash customers should remit this total with their order, including shipping charges, insurance, and taxes. All cash orders should be paid by check or postal money order. Do NOT send currency or stamps. If the charge for equipment and transportation is less than the amount you send us, we will refund the difference provided it exceeds $2. **Cash is required on all orders totaling less than $35.**
14. Be sure and sign the order form. Orders cannot be processed without an authorized signature.

Address and mail orders to:
Digital Equipment Corporation
Direct Sales Catalog, Dept. EM
P.O. Box 4202, Boston, MA 02107

* Preprinted Order Forms are available. Request them from the Catalog Sales Desk.

CALL: 800-258-1710 (N.H. Residents 603 - 884-6660) 8:30 am to 5 pm EST.

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DIRECT SALES CATALOG

HOW TO ORDER

SHIPPING AND DELIVERY INFORMATION

DIGITAL will utilize the fastest service to your area by surface transportation unless indicated otherwise. Cash customers requesting UPS delivery and meeting weight and size limits of UPS may use the following charts to figure shipping and handling charges. Customers on the West Coast should indicate UPS Blue Label Service over regular UPS for faster delivery.

Use the Zip Code Chart for the continental U.S. and find the *first* three digits of your Zip Code to determine your zone. Then refer to the shipping rate chart for the charges appropriate to your zone according to the shipping weight of each item ordered. Figure UPS charges for each catalog item separately using the indicated shipping weight times the quantity. Then total the individual charges figured and remit the total amount. Unless otherwise stated, shipping weights are calculated to the nearest pound. Excess payments of transportation charges over two dollars will be refunded by check.

To calculate shipping charges for a module(s), first refer to the physical descriptions included with each module description. Modules are either standard-length or extended-length; single-height, double-height, or quad-height; and single-width, double-width, or triple-width. Then check the Logic Module Weight Chart on page 161 to determine shipping weight for each module size.

Some catalog products may exceed weight and/or size limitations (either individually or collectively) for shipment via UPS. These items will be shipped with freight charges collect (you will be billed by carrier), as will all cash orders when requesting shipment by air (except Blue Label Service).

All approved current Catalog Open Account customers should only indicate appropriate (by weight) and desired (surface or air) transportation mode. All shipping charges for open accounts will be prepaid by DIGITAL and added to the customer's invoice.

SALES TAX INFORMATION

Unless an *exemption certificate* which is valid for the state into which your order is being shipped has been submitted with this, or a previous catalog order DIGITAL must by law collect state sales tax for the following states at the rates shown below.

We are also required by law to collect any city, county, parish, or rapid transit taxes within these states. If your order is being shipped to an area which has a local tax of this type, please include such additional tax with your payment.

CATALOG OPEN ACCOUNTS

Catalog Open Accounts (net 30 days) will be granted to customers approved by the Catalog Sales Credit Department. To apply for Open Account Payment terms (net 30 days), call toll free 800-258-1710 (N.H. residents 603 - 884-6660) and ask for the credit desk.

10-DAY FREE TRIAL RETURNS

Before sending material back to DIGITAL for credit, call our Catalog Order Desk and ask for a Return Authorization Number and shipping instructions. Material shipped to us without an Authorization Number will NOT be credited to you.

TRANSPORTATION INSURANCE

UPS charges include a $100 value for insurance. Insurance rates for UPS orders over $100 can be calculated by adding 25¢ for each additional $100 value or fraction thereof.

All cash customers requiring non-UPS delivery and approved current Catalog Open Account customers clearly indicating "yes, in-transit insurance is desired" will be provided insurance on their orders while in-transit, and a charge of 50¢ per $100 of catalog price, or fraction thereof, will be made. Cash customers should include these charges in their payment.

CURRENT STATE SALES TAX TABLE

Taxes subject to adjustment without notice in event of Legislative change.

State	Percent	State	Percent	State	Percent	State	Percent	State	Percent
Alabama*	4	Hawaii	4	Maryland	5	New Jersey	5	South Carolina	4
Arkansas*	3	Illinois	4	Massachusetts	5	New Mexico*	4	Tennessee*	4.5
Arizona*	4	Indiana	4	Michigan	4	New York*	4	Texas*	4
California*	6	Iowa	3	Minnesota*	4	North Carolina*	3	Utah*	4
Colorado*	3	Kansas*	3	Mississippi	5	Ohio*	4	Vermont	3
Connecticut	7	Kentucky	5	Missouri*	3.12	Oklahoma*	2	Virginia*	3
Florida	4	Louisiana*	3	Nebraska	3	Pennsylvania	6	Washington*	4.6
Georgia*	3	Maine	5	Nevada	3	Rhode Island	6	West Virginia	3
								Wisconsin	4

*Certain localities within these states require additional local taxes. After determining the exact amount from your local tax office, please include it on your order.

ZIP CODE TABLE

Zip Code Prefixes	Zone	Zip Code Prefixes	Zone	Zip Code Prefixes	Zone	Zip Code Prefixes	Zone	Zip Code Prefixes	Zone	Zip Code Prefixes	Zone	Zip Code Prefixes	Zone
010-043	2	140-147	4	258-279	4	382	5	541-546	5	690-693	7	812	7
044	3	148-149	3	280-284	5	383	6	547-548	6	700-704	6	813-816	8
045	2	150-168	4	285	4	384-385	5	549	5	705-706	7	820	7
046	3	169-171	3	286-299	5	386-397	6	550-574	6	707-729	6	821	8
047	4	172-174	4	300-315	5	400-436	5	575-577	7	730-739	7	822	7
048-049	3	175-176	3	316	6	437-449	4	580-584	6	740-745	6	823-825	8
050-053	2	177	4	317-322	5	450-456	5	585-588	7	746-748	7	826-828	7
054	3	178-199	3	323-355	6	457	4	590-591	8	749	6	829-880	8
056-069	2	200-218	4	356-359	5	458-479	5	592-593	7	750-754	7	881	7
070-089	3	219	3	360-361	6	480-482	4	594-599	8	755	6	882-883	8
100-108	2	220-241	4	362	5	484-499	5	600-619	5	756-784	7	884	7
109	3	242	5	363-367	6	500-516	6	620-623	6	785	8	890-898	8
110-126	2	243-245	4	368	5	520	5	624-629	5	786-796	7	900-961	8
127	3	246-248	5	369	6	521-526	6	630-675	6	797-799	8	970-986	8
128	2	249-254	4	370-379	5	527-539	5	676-679	7	800-810	7	988-994	8
129-139	3	255-257	5	380-381	6	540	6	680-689	6	811	8		

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DIRECT SALES CATALOG

United Parcel Service — Effective May 1, 1978

COMMON CARRIER RATE CHART

ANY FRACTION OF A POUND OVER THE WEIGHT SHOWN TAKES THE NEXT HIGHER RATE

WEIGHT NOT TO EXCEED	RATES TO ZONE 2	ZONE 3	ZONE 4	ZONE 5	ZONE 6	ZONE 7	ZONE 8	WEIGHT NOT TO EXCEED	RATES TO ZONE 2	ZONE 3	ZONE 4	ZONE 5	ZONE 6	ZONE 7	ZONE 8
1lb.	$.82	$.84	$.87	$.90	$.94	$.99	$1.04	26lb.	$2.67	$3.14	$3.89	$4.70	$5.87	$7.06	$8.49
2"	.89	.93	.99	1.05	1.14	1.23	1.34	27"	2.74	3.23	4.01	4.85	6.06	7.31	8.79
3"	.97	1.02	1.11	1.20	1.34	1.47	1.64	28"	2.82	3.32	4.13	5.00	6.26	7.55	9.09
4"	1.04	1.11	1.23	1.35	1.53	1.72	1.94	29"	2.89	3.41	4.25	5.15	6.46	7.79	9.39
5"	1.11	1.20	1.35	1.50	1.73	1.96	2.23	30"	2.96	3.50	4.37	5.30	6.65	8.03	9.68
6"	1.19	1.30	1.47	1.66	1.93	2.20	2.53	31"	3.04	3.60	4.50	5.46	6.85	8.28	9.98
7"	1.26	1.39	1.59	1.81	2.12	2.45	2.83	32"	3.11	3.69	4.62	5.61	7.05	8.52	10.28
8"	1.34	1.48	1.71	1.96	2.32	2.69	3.13	33"	3.19	3.78	4.74	5.76	7.25	8.76	10.58
9"	1.41	1.57	1.83	2.11	2.52	2.93	3.43	34"	3.26	3.87	4.86	5.91	7.44	9.01	10.88
10"	1.48	1.66	1.95	2.26	2.71	3.17	3.72	35"	3.33	3.96	4.98	6.06	7.64	9.25	11.17
11"	1.56	1.76	2.08	2.42	2.91	3.42	4.02	36"	3.41	4.06	5.10	6.22	7.84	9.49	11.47
12"	1.63	1.85	2.20	2.57	3.11	3.66	4.32	37"	3.48	4.15	5.22	6.37	8.03	9.74	11.77
13"	1.71	1.94	2.32	2.72	3.31	3.90	4.62	38"	3.56	4.24	5.34	6.52	8.23	9.98	12.07
14"	1.78	2.03	2.44	2.87	3.50	4.15	4.92	39"	3.63	4.33	5.46	6.67	8.43	10.22	12.37
15"	1.85	2.12	2.56	3.02	3.70	4.39	5.21	40"	3.70	4.42	5.58	6.82	8.62	10.46	12.66
16"	1.93	2.22	2.68	3.18	3.90	4.63	5.51	41"	3.78	4.52	5.71	6.98	8.82	10.71	12.96
17"	2.00	2.31	2.80	3.33	4.09	4.88	5.81	42"	3.85	4.61	5.83	7.13	9.02	10.95	13.26
18"	2.08	2.40	2.92	3.48	4.29	5.12	6.11	43"	3.93	4.70	5.95	7.28	9.22	11.19	13.56
19"	2.15	2.49	3.04	3.63	4.49	5.36	6.41	44"	4.00	4.79	6.07	7.43	9.41	11.44	13.86
20"	2.22	2.58	3.16	3.78	4.68	5.60	6.70	45"	4.07	4.88	6.19	7.58	9.61	11.68	14.15
21"	2.30	2.68	3.29	3.94	4.88	5.85	7.00	46"	4.15	4.98	6.31	7.74	9.81	11.92	14.45
22"	2.37	2.77	3.41	4.09	5.08	6.09	7.30	47"	4.22	5.07	6.43	7.89	10.00	12.17	14.75
23"	2.45	2.86	3.53	4.24	5.28	6.33	7.60	48"	4.30	5.16	6.55	8.04	10.20	12.41	15.05
24"	2.52	2.95	3.65	4.39	5.47	6.58	7.90	49"	4.37	5.25	6.67	8.19	10.40	12.65	15.35
25"	2.59	3.04	3.77	4.54	5.67	6.82	8.19	50"	4.44	5.34	6.79	8.34	10.59	12.89	15.64

ADDITIONAL CHARGES:
For each COD received for collection — 85 cents.
For each Address Correction — 85 cents.
For each Acknowledgment of Delivery (AOD) — 20 cents.
For each package with a declared value over $100 — 25 cents for each additional $100 or fraction thereof.

WEIGHT AND SIZE LIMITS:
Maximum Weight per package — 50 POUNDS.
Maximum Weight of all packages from one shipper to one consignee in one day — 100 pounds.
Maximum Size per package — 108 INCHES IN LENGTH AND GIRTH COMBINED.
Minimum charge for a package measuring over 84 inches in length and girth combined will be equal to charge for a package weighing 25 pounds.

See separate rate chart for BLUE LABEL AIR

Carrier rates published in this catalog are per UPS rates effective May 1, 1978. These rates are subject to change. DIGITAL will use the rates in effect at the time of order placement.

digital HOW TO ORDER

DIRECT SALES CATALOG

MAY 1978

SERVICE: Entire State / Partial State	RATE CHART COLUMN	TERRITORY SERVED
ALABAMA	A	Entire State
ALASKA	E	See Points Served
ARIZONA	C	Entire State
CALIFORNIA	C	Entire State
COLORADO	B	See Points Served
FLORIDA	B	Entire State
GEORGIA	A	Entire State
HAWAII	D	See Points Served
IDAHO	C	Entire State
ILLINOIS	A	Entire State
INDIANA	A	Entire State
IOWA	A	Entire State
KANSAS	A	See Points Served
KENTUCKY	A	Entire State
MICHIGAN	A	Entire State
MINNESOTA	A	Entire State
MISSOURI	A	Entire State
MONTANA	C	Entire State
NEBRASKA	A	See Points Served
NEVADA	C	Entire State
NEW MEXICO	B	Entire State
NORTH CAROLINA	A	Entire State
NORTH DAKOTA	A	See Points Served
OHIO	A	See Zip Codes Served
OREGON	C	Entire State
SOUTH CAROLINA	A	Entire State
TENNESSEE	A	Entire State
TEXAS	B	See Points Served
UTAH	C	Entire State
WASHINGTON	C	Entire State
WISCONSIN	A	Entire State
WYOMING	C	Entire State

RATE CHART

WEIGHT NOT TO EXCEED	A	B	C	D	E
1 lb.	$1.24	$1.28	$1.41	$2.09	$2.31
2 "	1.72	1.81	2.07	2.68	2.93
3 "	2.21	2.34	2.72	3.27	3.55
4 "	2.69	2.87	3.38	3.86	4.17
5 "	3.18	3.39	4.03	4.45	4.79
6 "	3.66	3.92	4.69	5.04	5.41
7 "	4.15	4.45	5.35	5.63	6.03
8 "	4.63	4.98	6.00	6.22	6.65
9 "	5.12	5.51	6.66	6.81	7.27
10 "	5.60	6.03	7.31	7.39	7.89
11 "	6.09	6.56	7.97	7.98	8.52
12 "	6.57	7.09	8.63	8.57	9.14
13 "	7.06	7.62	9.28	9.16	9.76
14 "	7.54	8.15	9.94	9.75	10.38
15 "	8.03	8.67	10.59	10.34	11.00
16 "	8.51	9.20	11.25	10.93	11.62
17 "	9.00	9.73	11.91	11.52	12.24
18 "	9.48	10.26	12.56	12.11	12.86
19 "	9.97	10.79	13.22	12.70	13.48
20 "	10.45	11.31	13.87	13.28	14.10
21 "	10.94	11.84	14.53	13.87	14.73
22 "	11.42	12.37	15.19	14.46	15.35
23 "	11.91	12.90	15.84	15.05	15.97
24 "	12.39	13.43	16.50	15.64	16.59
25 "	12.88	13.95	17.15	16.23	17.21
26 "	13.36	14.48	17.81	16.82	17.83
27 "	13.85	15.01	18.47	17.41	18.45
28 "	14.33	15.54	19.12	18.00	19.07
29 "	14.82	16.07	19.78	18.59	19.69
30 "	15.30	16.59	20.43	19.17	20.31
31 "	15.79	17.12	21.09	19.76	20.94
32 "	16.27	17.65	21.75	20.35	21.56
33 "	16.76	18.18	22.40	20.94	22.18
34 "	17.24	18.71	23.06	21.53	22.80
35 "	17.73	19.23	23.71	22.12	23.42
36 "	18.21	19.76	24.37	22.71	24.04
37 "	18.70	20.29	25.03	23.30	24.66
38 "	19.18	20.82	25.68	23.89	25.28
39 "	19.67	21.35	26.34	24.48	25.90
40 "	20.15	21.87	26.99	25.06	26.52
41 "	20.64	22.40	27.65	25.65	27.15
42 "	21.12	22.93	28.31	26.24	27.77
43 "	21.61	23.46	28.96	26.83	28.39
44 "	22.09	23.99	29.62	27.42	29.01
45 "	22.58	24.51	30.27	28.01	29.63
46 "	23.06	25.04	30.93	28.60	30.25
47 "	23.55	25.57	31.59	29.19	30.87
48 "	24.03	26.10	32.24	29.78	31.49
49 "	24.52	26.63	32.90	30.37	32.11
50 "	25.00	27.15	33.55	30.95	32.73

PARTIAL STATES — POINTS SERVED

(Air Service for the following States is provided ONLY to the Towns or Zip Codes listed below)

Zip Code	Town
ALASKA	
995-01	**Anchorage**
995-02	**Anchorage**
995-03	**Anchorage**
995-04	**Anchorage**
995-05	**Anchorage**
995-06	**Anchorage**
995-07	**Anchorage**
995-01	Eastchester
995-06	Elmendorf AFB
995-05	Fort Richardson
995-04	Mountain View
995-03	Spenard
COLORADO	
800-22	Adams City
804-01	Applewood
804-01	Applewood Mesa
800	**Arvada**
800	Aurora
803	Boulder
806-01	Brighton
800-20	Broomfield
801-10	Cherry Hills Village
800-22	Commerce City
802	**Denver**
802-25	Denver Fed. Center
802-03	Denver Tech Center
800-22	Derby
800-24	Dupont
804-01	Edgemont
802-14	Edgewater
801-10	Englewood
802-40	Fitz Army Hospital
802-36	Fort Logan
802-22	Glendale
804-01	Golden
801-10	Greenwood Village
800-22	Irondale
800-26	Lafayette
802-12	Lakeside
802-15	Lakewood
801	Littleton
802-36	Loretto Heights
800-27	Louisville
802-30	Lowry AFB
800-22	Mapleton
802-12	Mountain View
805-44	Niwot
802-01	Rocky Flats
802-40	Rocky Mtn. Arsenal
800-22	Rose
801-10	Sheridan
802-07	Stapleton Field
802-29	Thornton
802-29	Welby
800-30	Westminster
800-33	Wheat Ridge
HAWAII (Oahu)	
967-01	Aiea
968-21	Aina Haina
968-62	Barber's Point
967-95	Bellows AFB
968-61	Camp H. M. Smith
967-06	Campbell Industrial Park
966-15	Capehart Village
967-06	Ewa
967-06	Ewa Beach
966-18	Ford Island
968-58	Fort Shafter
967-12	Haleiwa
967-17	Hauula
967-25	Hawaii Kai
967-86	Helemanu
968-53	Hickam AFB
968	**Honolulu**
968-19	Honolulu Inter. Airport
967-30	Kaaawa
968-16	Kahala
967-31	Kahuku
967-34	Kailua
968-13	Kakaako
967-44	Kaneohe
968-63	Kaneohe Marine C. Air Sta.
967-34	Kanikai
968-16	Kapahula
967-59	Kunia
967-62	Laie
967-92	Lualualei N.A.D.
967-92	Maili
967-92	Makaha
968-18	Makalapa
968-25	Makapuu
968-25	Makapuu Point
967-92	Makua
968-22	Makiki
968-22	Manoa
967-89	Mililani Town
967-91	Mokuleia
967-92	Nanakuli
967-86	Naval Comm. Sta., Wahiawa
967-12	Paumalu
967-82	Pearl City
968-60	Pearl Harbor
967-17	Punaluu
967-12	Pupukea
968-57	Schofield Barracks
967-12	Sunset Beach
968-59	Tripler Army Medical Center
967-86	Wahiawa N.C.S.
967-91	Waialua
967-92	Waianae
967-92	Waianae Nankuli
967-82	Waiau
968-15	Waikiki
967-95	Waimanalo
967-12	Waimea
967-97	Waipahu
968-54	Wheeler AFB
967-86	Whitmore Village
KANSAS	
660-85	Aubry
660-07	Basehor
661-09	Bethel
661-04	Beverly Hills
660-61	Bonita
660-12	Bonner Springs
661-02	Brenner Heights
660-18	Cedar (Johnson Co.)
660-61	Clare
662-22	Countryside
662-15	Craig
661-06	Crestline Gardens
660-18	De Soto
661-13	Edwardsville
661-04	Fairdale
661-15	Fairfax
660-48	Fairmount
662-05	Fairway
660-27	Ft. Leavenworth
661-06	Highland Crest
660-37	Holliday
661-06	Kanview
661	**Kansas City**
662-23	Kenneth
660-48	Kickapoo
661-06	Lake Quivira
660-43	Lansing
660-48	Leavenworth
662-06	Leawood
660-52	Lenape
662-14	Lenexa
660-12	Loring
662-03	Merriam
662-22	Mission
662-05	Mission Hills
662-05	Mission Woods
660-61	Morse
661-11	Muncie
660-61	Olathe
662-04	Overland Park
661-09	Piper
662-08	Prairie Village
661-06	Quivira Lake
660-85	Redel
661-02	Reidy Manor
660-86	Reno
662-03	Roeland Park
662-03	Shawnee
662-21	South Park
662-23	Stanley
660-85	Stilwell
660-19	Sunflower
661-06	Turner
660-48	Wadsworth
661-04	Welborn
662-05	Westwood
662-05	Westwood Hills
660-18	Wilder
660-51	Zarah
NEBRASKA	
680-05	Bellevue
680-07	Bennington
680-46	Chalco
680-22	Elkhorn
680-23	Fort Calhoun
680-28	Gretna
681-22	Irvington
681-28	La Vista
681-13	Offutt AFB
681	**Omaha**
680-46	Papillion
681-27	Ralston
680-54	Richfield
680-59	Springfield
680-64	Valley
680-69	Waterloo
NORTH DAKOTA	
581-02	**Fargo**
582-01	**Grand Forks**
580-42	Harwood
580-78	West Fargo
580-47	Wild Rice
OHIO (Only Zip Codes)	
430-00	thru 432-99
437-00	thru 439-99
450-00	thru 457-99
TEXAS	
750-01	Addison
782-09	Alamo Heights
770-45	Almeda
760	Arlington
760-20	Azle
751-49	Balch Springs
770-58	Bayport
775-20	Baytown
760-21	Bedford
774-01	Bellaire
761-26	Benbrook
799-18	Biggs AFB
782-35	Brooks AFB
770-24	Bunker Hill Village
760-28	Burleson
782-36	Camp Bullis
750-06	Carrollton
761-27	Carswell AFB
780-09	Castroville
751-04	Cedar Hill
775-30	Channelview
770-58	Clear Lake City
752-11	Cockrell Hill
760-34	Colleyville
750-19	Coppell
760-36	Crowley
752	**Dallas**
775-36	Deer Park
751-15	De Soto
751-16	Duncanville
770-30	Ellington AFB
799	**El Paso**
760-39	Euless
761-40	Everman
752-34	Farmers Branch
761-19	Forest Hill
799-06	Fort Bliss
782-34	Fort Sam Houston
761	**Fort Worth**
775-46	Friendswood
775-47	Galena Park
750	Garland
750-50	Grand Prairie
760-51	Grapevine
761-17	Haltom City
782-14	Harlandale
770-24	Hedwig Village
752-05	Highland Park
775-62	Highlands
770-55	Hilshire Village
770	**Houston**
773-38	Humble
770-24	Hunters Creek Village
760-53	Hurst
751-41	Hutchins
750	Irving
770-29	Jacinto City
770-40	Jersey Village
782-41	Kelly AFB
760-60	Kennedale
751-45	Kleberg
782-36	Lackland AFB
751-46	Lancaster
775-71	La Porte
775-73	League City
750-67	Lewisville
775-71	Lomax
782-01	Los Angeles Heights
760-63	Mansfield
775-20	McNair
751-49	Mesquite
774-59	Missouri City
770-58	NASA (LB) Space Center)
770-58	Nassau Bay
775	Pasadena
775-81	Pearland
770-24	Piney Point Village
750-74	Plano
781-48	Randolph AFB
750-79	Renner
750-80	Richardson
761-18	Richland Hills
750-88	Rowlett
761-79	Saginaw
782	**San Antonio**
782-14	San Antonio AFS
775-86	Seabrook
751-59	Seagoville
775-71	Shoreacres
799-22	Smeltertown
775-87	South Houston
782-11	South San Antonio
770-05	Southside Place
770-24	Spring Valley
774-77	Stafford
782-14	Stinson Field
774-78	Sugar Land
751-49	Sunnyvale
775-86	Taylor Lake Village
752-05	University Park
775-58	Webster
770-05	West University Place
761-08	White Settlement
799-07	Ysleta

digital
DIRECT SALES CATALOG

HOW TO ORDER

Catalog Sales Desk
800-258-1710
(N.H. residents 603 - 884-6660).
From 8:30 am to 5 pm EST.

TERMS AND CONDITIONS OF SALE FOR CATALOG 1-78

1. PRICE/PAYMENT:

A. All orders submitted on DIGITAL's Catalog Order Form and accompanied by a check in the amount of the catalog price plus transportation (if shipped UPS), insurance, charge, and sales tax shall be accepted and processed unless Customer is otherwise notified by DIGITAL within ten (10) days of receipt of order. If Customer has an approved current Catalog Open Account, a check need not accompany the Order Form, but rather, at Customer's option, full payment shall be due within thirty (30) days from date of delivery. Notwithstanding the above, cash **is required for all orders of less than $35.**

B. All catalog prices are exclusive of transportation charges and sales, use, and other similar tax. All such charges and taxes shall be added to the Catalog price and paid by Customer to DIGITAL. To qualify for tax exemption, Customer must submit a copy of a valid Tax Exemption **Certificate with each order. Purchases are in accordance to current catalog prices only.**

2. DELIVERY:

All deliveries shall be F.O.B. DIGITAL's Factory. Risk of loss shall pass to Customer upon delivery by DIGITAL to carrier. For all shipments, except via UPS, insurance will be provided on the products while in transit and a charge of $.50 per $100 of Catalog price will be made if Customer clearly indicates in the block marked "YES, IN-TRANSIT INSURANCE IS DESIRED" on the Catalog Order Form. UPS shipping charges include insurance of $100. Additional UPS insurance coverage can be obtained by Customer at the rates specified in the *How to Order* Section. DIGITAL shall not be liable for any damages or penalty for delivery delays when due to causes beyond its reasonable control.

3. ACCEPTANCE:

Should the Customer, upon receipt of the Product, find it unsatisfactory for any reason, DIGITAL will refund Customer the Catalog price, provided Customer returns the Product to DIGITAL, transportation prepaid and insured, in the same condition as delivered and in the same DIGITAL or equally suitable shipping container within ten (10) days of receipt. Before returning the product, Customer must call DIGITAL for a return authorization number.

4. WARRANTY:

A. All Products (except Software) purchased from this Catalog are warranted as stated below for a period of ninety (90) days from date of initial delivery, except that the warranty period for W, M, and A Series modules is one (1) year.

B. All Products (except Software) are warranted against defects in material and workmanship under normal and proper use and in their original unmodified condition for the period set forth in Clause 4A above. If found defective by DIGITAL within the terms of this warranty, DIGITAL's sole obligation shall be to repair or replace (at its option) the defective Product. If DIGITAL determines that the Product is not defective within the terms of this warranty, Customer shall pay all costs of handling and return transportation. All replaced Products become the property of DIGITAL. As a condition of this warranty, Customer must obtain a DIGITAL Return Authorization Number, and must return all Products, transportation prepaid and insured, to the appropriate location, as specified in the *Service* Section of this Catalog.

C. Transportation charges for the return to Customer shall be paid by DIGITAL within the contiguous United States only. These warranties outside the contiguous United States are limited to repair or replacement only and exclude all costs of shipping, Customs clearance, and other related charges.

D. All Software Products with a DIGITAL Support Category of A or B are warranted to conform to the DIGITAL Software Product Description (SPD) applicable at the time of order. DIGITAL's sole obligation hereunder shall be to remedy any nonconformance of the software to the SPD. Such remedy shall be provided as specified in the Software Support Categories Addendum to the SPD for nonconformances reported to DIGITAL during the one (1) year period following delivery. Software with a designated Support Category of C is furnished on an "as is" basis.

E. EXCEPT FOR THE EXPRESS WARRANTIES STATED ABOVE, DIGITAL DISCLAIMS ALL WARRANTIES ON PRODUCTS, INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS; and the stated express warranties are in lieu of all obligations or liabilities on the part of DIGITAL for damages, including but not limited to special, indirect, or consequential damages arising out of or in connection with the use or performance of the Products.

5. SOFTWARE PRODUCT LICENSE:

Licensed software provided hereunder, including any subsequent improvements or updates, is furnished to Customer under a license for use on a single Unit and may only be copied in whole or in part (with the proper inclusion of copyright notice on the software) for use on such Unit. Customer shall not provide or otherwise make available the software, or any part thereof or any copies thereof, in any form to any third party. However, Customer may provide the software to a third party who agrees with Customer or DIGITAL to limit the use of the software to a single Unit transferred by Customer to the third party, to only copy the software, in whole or in part (with the proper inclusion of copyright notice on the software) for use on such Unit and not to provide or otherwise make available the software to any other party. For each copy of the software made by Customer and so provided to a third party, Customer shall pay DIGITAL its then current license fee for such software within thirty (30) days after transfer of the software to such third party. No title to or ownership of the software or any of its parts is hereby transferred to Customer. Notwithstanding the above, use of source software requires execution of a separate Source License Agreement.

6. PATENTS:

If notified promptly in writing of any action (and all prior claims relating to such action) brought against the customer, based on a claim that the customer's use or sale of the product(s) (including software) infringes a United States patent or copyright, DIGITAL will defend such action at its expense and will pay the costs and damages awarded in any such action, provided that DIGITAL shall have sole control of the defense of any such action and all negotiations for its settlement or compromise. In the event that a final injunction shall be obtained against the customer's use of the product(s) by reason of infringement of a United States patent or copyright, or if in DIGITAL's opinion the product(s) is likely to become the subject of a claim or infringement of a United States patent or copyright, DIGITAL will, at its option and at its expense, either procure for the customer the right to continue using the product(s), replace or modify the same so that it becomes noninfringing, or grant the customer a credit for such product(s) as depreciated and accept its return. The depreciation shall be an equal amount per year over the lifetime of the product(s) as established by DIGITAL. DIGITAL shall not have any liability to the customer under any provision of this clause if the infringement, or claim thereof, is based upon (i) the use or sale of the product(s) in combination with other products or devices which are not made by DIGITAL, or (ii) the use of the product(s) in practicing any process, or (iii) the furnishing to the customer of any information, service, or applications assistance. The customer shall hold DIGITAL harmless against any expense, judgement, or loss for infringement of any patents, copyrights, or trademarks which results from DIGITAL's compliance with the customer's designs, specifications, or instructions. No costs or expenses shall be incurred for the account of DIGITAL without the written consent of DIGITAL. In no event shall DIGITAL's total liability to the customer under or as a result of compliance with the provisions of this clause exceed the aggregate sum paid to DIGITAL by the customer for the allegedly infringing product(s).
The foregoing states the entire liability of DIGITAL with respect to infringement of patents and copyrights by the product(s) or any part thereof or by its operation.

7. SUBSTITUTION AND MODIFICATIONS OF SPECIFICATION:

DIGITAL reserves the right, without prior approval from or notice to customer, to make changes to the products (i) which do not effect physical or functional interchangeability or performance at a higher level of assembly or (ii) when required for purposes of safety or (iii) to meet product specifications.

8. GENERAL:

A valid contract binding upon the parties will come into being only as of the time a properly completed and executed Catalog Order Form or written customer acceptance of the catalog Terms and Conditions (such as "Terms and Conditions of Digital's **1-78** Direct Sales Catalog govern this order," written or typed on the purchase order) together with full payment (except for approved current Catalog Open Account Customers), is received by DIGITAL, unless Customer is otherwise notified by DIGITAL within ten (10) days of receipt. The laws of the Commonwealth of Massachusetts shall apply and govern all Catalog Orders. The terms and conditions set forth in Clause 1 through 8 hereof and those set forth on the face of the Catalog Order Form shall apply to all Catalog Orders, notwithstanding any deviations and/or additions by Customer. In no event will DIGITAL be liable for special, indirect, or consequential damages.

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digital SUPPORT SERVICES

DIRECT SALES CATALOG

A wide range of maintenance and customer services are available from DIGITAL to support your DIGITAL hardware. Depending on the type of equipment ordered, you can select an alternative which meets your service needs; from complete DIGITAL maintenance to complete self-maintenance.

There are six service groups which are dedicated to satisfying the post sales service needs of DIGITAL customers. Consult your local yellow pages or call Catalog Sales Desk for nearest location. Support services available through these organizations are:

FIELD SERVICE
This organization provides DIGITAL customers with both on-site and off-site maintenance service through a variety of service products. There are over 300 service locations worldwide with over 5000 service personnel dedicated to servicing DIGITAL equipment.

EDUCATIONAL SERVICES
Through the Educational Services Group, DIGITAL customers can be trained from computer novice to advanced proficiency in software, hardware, and system management. Courses are offered at worldwide locations and at the customer's site.

SOFTWARE SERVICES
Software Services is an organization dedicated to supporting DIGITAL Software by providing software consulting, software maintenance, and software components to DIGITAL customers. Presently there are over 700 Software Specialists located worldwide to assist the customer with his software needs.

CUSTOMER SPARES
Customer Spares is in the business of selling spare parts to customers who wish to perform any level of self-maintenance. Customers in remote locations or with high uptime requirements who use the Field Service organization also benefit from the services offered by this organization. Services offered by Customer Spares, plus educational courses (see above), make it possible for the customer to be successful at self-maintenance.

ON-SITE SERVICE
There are a variety of contractual on-site service programs for terminals and computer systems. Per call service is also provided in which maintenance is provided on a non-contractual time and material basis.

OFF-SITE SERVICE
For the customer not desiring or qualified to receive on-site service, various programs are available for securing factory level repair off-site.

PRODUCT REPAIR CENTERS (PRC)

Centers are established through which a customer may receive fast, low-cost repairs for many off-site service needs. The PRC's offer factory equivalent repairs on a growing list of CPU's, peripherals, and module boards. There are presently 17 PRC's located worldwide. Services presently offered by the Product Repair Centers are:

1. **Major Repair Work** on electro-mechanical devices and CPU's. Customer sends his equipment to a PRC and DIGITAL will repair.
2. **Fixed Quote Repair** — Upon receipt, DIGITAL will inspect equipment, then contact customer with a fixed price for repair. Customer has the option to cancel order for a $60 fee.
3. **Repair of Modules** — Customer can send his modules to the PRC for repair. (This service is available in domestic U.S. via Customer Returns Area (617) 933-8710 x 2280.)

For further information, the customer should contact his local Field Service office for information concerning the repair charges and capabilities of the PRC in his area. See page 161 for locations.

DIGITAL EQUIPMENT CORP. / Mail Station MK1-2/E13 / Merrimack, NH 03054

Add Dept. EM to address to tell them you saw it in eem

digital
IRECT SALES CATALOG

SUPPORT SERVICES/ MODULE WEIGHT CHART

SERVICE

If your catalog product malfunctions for any reason, simply check the appropriate description below for your servicing needs.

Catalog Product	Under 90-Day Warranty	Over 90-Day Warranty
LA Series VT Series LS Series DECstation 78 PRS01	Return to nearest Product Repair Center (listed below) for no-charge repair.	A variety of procedures for obtaining service is available including complete repair at a regional Product Repair Center, and/or a contract with DIGITAL's Field Service Group. Refer to description opposite, then contact your local Field Service office for complete details.
LSI-11, PDP-11/03, PDP-11/V03 Microcomputer	LSI-11, PDP-11/03 and PDP-11/V03 modules are to be returned for no-charge repair to the following address: Digital Equipment Corp. Customer Returns Area 36 Cabot Rd. Woburn, MA 01801 Before mailing, call (617) 933-8710, ext. 2280 for return procedures.	Fixed rate module repair. For quote and procedure, call (617) 933-8710, ext. 2280.
All other catalog items	Call 800-258-1710 (N.H. residents 603 - 884-6660) for warranty and post-warranty information.	

AUTHORIZED FACTORY RETURN WARRANTY PRODUCT REPAIR CENTERS (NORTH AMERICA)

SANTA ANA
Digital Equipment Corporation
2110 South Anne Street
P.O. Box 4257
Santa Ana, California 92704
Tel. No.: (714) 979-1660

KANATA
Digital Equipment Corporation
Product Repair Center
100 Herzberg Road
Kanata, Ontario, Canada
Tel. No.: (613) 592-5111

PRINCETON
Digital Equipment Corporation
Product Repair Center
U.S. Route 1
Princeton, New Jersey 08540
Tel. No.: (609) 452-2940

SANTA CLARA
Digital Equipment Corporation
Product Repair Center
2525 Augustine Drive
Santa Clara, California 95051
Tel. No.: (408) 984-0200

CHICAGO
Digital Equipment Corporation
Product Repair Center
5600 Apollo Drive
Rolling Meadows, Illinois 60008
Tel. No.: (312) 640-5500

WOBURN
Digital Equipment Corporation
Customer Returns Area
36 Cabot Road
Woburn, Massachusetts 01801
Tel. No.: (617) 933-8710, ext. 2280

LOGIC MODULE WEIGHT CHART

	MODULE SIZE CODE									
	SSS	SDS	SDD	ESD	EDD	EQS	EQD	ESS	SDT	EDS
Net Weight	3 oz.	6 oz.	4 oz.	8 oz.	8 oz.	12 oz.	16 oz.	6 oz.	20 oz.	9 oz.

Size Code Description (L by H by W)
Length: Standard (S), Extended (E)
Height: Single (S), Double (D), Quad (Q), Hex (H)
Width: Single (S), Double (D), Triple (T)

To calculate the gross shipping weight of your logic module order, locate the module size in the Logic Modules section of this catalog for each of the modules required. Using the Logic Module Weight Chart above, determine the total net weight of the modules. Add 25% (of total net weight) to the net weight to determine the gross weight and round off to the next whole pound. All shipping charges are based on the calculated gross weight. See the following example.

EXAMPLE:

No. Ordered	Cat. No.	Module Size	Net Weight
2	M3020	SSS	6 oz. (3 oz. ea.)
1	M1500	ESS	6 oz.
4	A866	SDS	24 oz. (6 oz. ea.)
			36 oz. (total net weight)

Calculate 25% of total net weight	36 oz. by .25 = 9 oz.
Add to net weight	36 oz. + 9 oz. = 45 oz. (gross weight)
Convert to lbs., 16 oz. = 1 lb.	45 oz. ÷ 16 = 2.81 lbs.
Next whole lb.	2.81 lbs. = 3.0 lbs. shipping weight

CALL: 800-258-1710 (N.H. Residents 603 - 884-6660) 8:30 am to 5 pm EST.

digital
DIRECT SALES CATALOG

DIGITAL'S OTHER PRODUCTS AND SERVICES

Only a portion of DIGITAL's products and services are sold through this Direct Sales Catalog. Your local sales office can provide you with information on our complete product line, which is built around five computer series: The PDP-8, the DECsystem-10 and -20, the PDP-11 and the PDP-15. See listing of sales offices in the United States on page 174.

If you're looking for anything from a small dedicated controller to a large-scale, general-purpose computer, you will find the right system among them.

The PDP-8, introduced in 1965, was first used as a laboratory tool. Today it handles a wide variety of real-time monitoring and control applications. Six central processor models, three minicomputer and four microcomputers, make up the PDP-8 family.

All PDP-8's have as their central element a patented, synchronous data path, the Omnibus, to handle bidirectional communication between system elements. Since each element plugs into the bus through an electrically identical connector, the customer can upgrade the system by simply plugging new devices in. No wiring changes are needed. Many popular interface modules are available through the Direct Sales Catalog.

The PDP-8 customer can choose from more than 600 software programs. These include powerful program development systems like OS/8 and the real-time operating system RTS-8.

The DECsystem-10, introduced in 1967, is a family of large-scale computer systems designed for interactive timesharing, real-time processing, and multiprogramming tasks. A DECsystem-10 can serve multiple users simultaneously under one operating system, with a common user and operating command language.

Any DECsystem-10 can be made more powerful simply by adding more processors, memories, communications systems, and input/output devices. No user software changes are required to expand from the smallest DECsystem-10 to the largest.

All DECsystem-10 central processors can run under the same TOPS-10 operating system, execute the same programs, and utilize most of the same peripherals.

More than 600 DECsystem-10's are now handling a wide range of user applications, including accounting, communications, design and development, education, inventory management, management information, payroll, production control, research, simulation, transaction processing, and typesetting. More service bureaus use DECsystem-10's for timesharing than any other system.

The DECsystem-20 is the bridge machine between the DECsystem-10 and the PDP-8, -11, and -15 Series. Like the DECsystem-10, the DECsystem-20 offers highly reliable virtual memory, a multi-mode operating system (TOPS-20) and a complete range of programming languages and supporting utilities. The end result is an easy-to-learn, easy-to-use interactive system that can still offer all the throughput needed for traditional batch applications.

The PDP-11, introduced in 1970, has brought new technological advances to small, 16-bit computers. The innovations included the UNIBUS, a single, high-speed, bidirectional data bus through which all system elements communicate asynchronously; a hardware stacking capability for rapid processing of structured data; a vectored priority interrupt system for fast, real-time response; and a completely modular organization.

The PDP-11 family shares a common architecture, range of peripherals, and software. The family extends from the LSI-11 microcomputer on the low end to the high-end PDP-11/70, which offers data base management, COBOL programming, and up to four million bytes of main memory.

PDP-11 processors, memories, and peripherals are all designed as plug-in building blocks, simplifying expansion and access for maintenance. New options plug in, without the need for new interfaces. Many popular interface modules are available through the Direct Sales Catalog.

The PDP-15, introduced in 1972, is a family of 18-bit medium-scale computers used in computer-aided design, land use planning, architecture, cartography, stress analysis, construction, medical data bases, shipping, data acquisition and production control.

Hardware features include asynchronous processor operation, a memory processor, single and dual processor configurations and use of programs as large as 128K words.

PDP-15 software includes three operating systems: XVM/DOS for high volume interactive computation, including graphics and dedicated real time applications; XVM/RSX, combining graphics, batch and interactive processing and output spooling with many simultaneous users; and XVM/MUMPS, for timeshared data base management systems with up to 48 on-line users.

DIGITAL supports PDP-15 hardware, software and applications through the Traditional Products organization as detailed below. Refer to local sales office for further details.

The principal marketing groups are listed below, with summaries of their primary interests.

Business Products — Multiuser/multitask interactive systems that can stand alone or serve as parts of a distributed processing network.

Data Communication — Products for message switching, front-end processing, transaction processing, networks, intercomputer communication, reservation file processing, and data concentrating.

Education Systems — CLASSIC and other interactive student systems, computer-assisted and computer-managed teaching, data reduction, business education, and computer science education.

Industrial Products — Systems for programmable control, power management, process control, equipment monitoring, order picking, and inventory control and billing.

Original Equipment Manufacturing — Special packaging and design of computer elements and systems for system builders who resell to end users.

Telephone Data Management — Systems for traffic administration and planning, call addressing analysis, traffic pattern analysis, automatic interception, service order entry, directory assistance, extended testing, revenue collection, maintenance monitoring, billing, message unit recording, and time reporting.

Typesetting — Systems that aid in newswriting, composition, electronic editing and proofreading, automatic justification and hyphenation, classified advertising, accounting, payroll, and circulation.

Laboratory Data Products — Equipment for scientific research, clinical research, pollution monitoring, hospital information systems, radio-isotope study, data acquisition, apparatus control, and data analysis.

Traditional Products — Add-on equipment for current users of DIGITAL products no longer being actively manufactured, and recycled used equipment manufactured by DIGITAL.

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PRODUCT INDEX & PRICE GUIDE

DIRECT SALES CATALOG

The following pages list the more than 800 products available from the Direct Sales Catalog. The Technical Documentation products are listed separately within that catalog section. For your convenience, list, price, catalog price, and cash price has been provided as well as page number next to each item in the index. Products are listed in alpha-numeric sequence according to DIGITAL part number. A general catalog table of contents is given on Page 3 and at the beginning of each catalog section.

PRICING

LIST PRICE — The list price column gives DIGITAL's current corporate list price on each item.

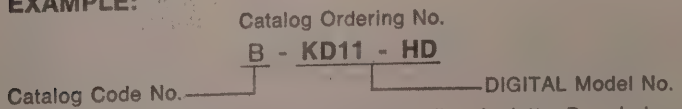
CATALOG PRICE — This price is the price you pay when you order through the Direct Sales Catalog and have DIGITAL invoice you for the requested material. The savings over list price amounts can be quite significant.

CASH PRICE — The cash price is the price you pay for your order when you enclose a check with the order covering full payment. The result is even greater savings.

CATALOG NUMBERS VS MODEL NUMBERS

The Catalog Number of each item listed is structured in the following manner. The BOLD FACE portion of each Catalog Number reflects the official DIGITAL model number for that particular item. The letter preceding the model number is a catalog ordering code and is used as part of the ordering Catalog Number for all catalog purchases. Please use the **entire** Catalog Number for all your purchases. Invoices and packing lists will reflect DIGITAL's model numbers only.

EXAMPLE:



Please use the entire Catalog Number, including the letter B, ordering code to order any item from this catalog.

DIGITAL Equipment Corporation assumes no responsibility for any errors which may appear in this catalog.

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DIRECT SALES CATALOG

Catalog No.	Description	Page No.	List Price	Cat. Price	Cash Price
B-861-A	Power Controller, Two-Phase	129, 135	$330.00	$314.00	$300.00
B-861-C	Power Controller, Single-Phase	129, 135	415.00	394.00	378.00
B-861-D	Power Controller, Three-Phase	135	795.00	755.00	723.00
B-913- (all dash items)	24 AWG Patch Cords	121	28.00	27.00	25.00
B-915- (all dash items)	26 AWG Patch Cords	121	36.00	34.00	33.00
B-917-2.5	Daisy Chain	125	61.00	58.00	56.00
B-932	Bus Strip	110	4.00	4.00	4.00
B-933	Bus Strip	110	1.00	1.00	.90
B-937	Blank Module Handle	125	8.00	8.00	7.00
B-939	Bus Strip	110	10.00	10.00	9.00
B-940	Cable Clamp	120	8.00	8.00	7.00
B-941	Cable Clamp	120	9.00	9.00	8.00
B-954	Solder IC Sockets	60, 125	8.00	8.00	7.00
B-956	UNIBUS Receiver IC's	101	26.00	25.00	24.00
B-957	UNIBUS Driver IC's	101	19.00	18.00	17.00
B-961	24-Pin IC Sockets	60, 125	8.00	8.00	7.00
B-962	40-Pin IC Sockets	60, 125	25.00	24.00	23.00
B-12-09154	Mounting Slides	129, 131	36.00	34.00	33.00
B-12-09340-00	8-Pin Cable Conn. Housing (Female)	118	1.00	1.00	.90
B-12-09340-01	8-Pin Cable Conn. Housing (Male)	118	1.00	1.00	.90
B-12-09350- (all dash items)	Cable Conn. Housing (Female)	118	1.00	1.00	.90
B-12-09351- (all dash items)	Cable Conn. Housing (Male)	118	1.00	1.00	.90
B-12-09378-01-	Male Conn. Pins	118	1.00	1.00	.90
B-12-09379-01	Female Conn. Pins	118	1.00	1.00	.90
B-12-09703	Mounting Slides, Tilt	129, 131	75.00	71.00	68.00
B-12-09764	Cable Clamp	120	3.00	3.00	2.70
B-12-09925	Cable Clamp	120	1.00	1.00	.90
B-12-10331-0	Blower Fan for H909-C	133	43.00	41.00	39.00
B-12-10711-02	Hex Module Handle/Extractor	125	4.00	4.00	3.00
B-12-10945	Chassis Slides	131, 133	33.00	31.00	30.00
B-12-11474-0	Cover Panel for H984	130	5.00	5.00	5.00
B-12-11526	Caster Set	147	20.00	19.00	18.00
B-12-11528	Tray w/Snap-on Cover	146	5.00	4.75	4.55
B-12-13195-00	Screen Filter, Gray	28, 144	15.00	14.25	13.65
B-17-00001-00	Cable, 19-Cond. Flat Coax	120	1.00	1.00	.90
B-17-00002-00	Cable, 19-Cond. Flat Mylar	120	1.00	1.00	.90
B-17-00002-01	Cable 60-Cond. Flat Mylar	120	2.00	2.00	1.80
B-17-00003-00	Cable, Round Coax	120	1.00	1.00	.90
B-17-00004-00	Cable, 40-Cond. Flat Mylar	120	2.00	2.00	1.80
B-17-00018	Cable, 20 TWP	120	2.00	2.00	1.80
B-18-09137-01	Teletype Ribbon	146	20.00	19.00	18.20
B-18-09537	DECtape & LINCtape Vinyl Tabs	145	4.00	3.80	3.64
B-18-10156-00	Ribbon, 132 Column Line Printer and Terminal	143	35.00	33.25	31.85
B-18-10156-01	Ribbon, 132 Column Line Printer and Terminal	143	35.00	33.25	31.85
B-22-00007	Disk Head Cleaning Kit	141	3.00	2.85	2.73
B-30-09794	Disk Cartridge for RK01 Drive	141	99.00	94.05	90.09
B-30-10350-01	Disk Cartridge for RK02 Drive	141	99.00	94.05	90.09
B-36-05360-01	Teletype Paper Tape, Oil Rolled	146	45.00	42.75	40.95
B-36-05361	Fanfold Paper 72 Column	143, 146	30.00	28.50	27.30
B-36-05363-01	High Speed Paper Tape	146	75.00	71.25	68.25
B-36-05364-00	Paper Tape Tray	146	3.00	2.85	2.73
B-36-05364-01	Paper Tape Tray Cover	146	1.00	.95	.91
B-36-05365-01	Teleprinter Paper, non perforated 12 rolls/case	146	36.00	34.20	32.76
B-36-09141-00	Fanfold Paper 1 Part, 132 Column	14, 143	32.00	30.40	29.12
B-36-09828	Ribbon, 80 Column, for Line Printer and Terminal	143	30.00	28.50	27.30
B-36-09829-00	Fanfold Paper, LA30	143	30.00	28.50	27.30
B-36-10558-01	Ribbon, DECwriter I, II	14, 143	50.00	47.50	45.50
B-36-10998	Ribbon, 132 Column, for Line Printer and Terminal	143	8.00	7.60	7.28
B-36-11688	Ribbon, 132 Column, for Line Printer and Terminal	143	30.00	28.50	27.30
B-36-11715	Disk Cartridge Labels	141	2.00	1.90	1.82
B-36-12153-01	Ribbon, DECwriter III DECprinter I	19, 143	65.00	61.75	59.15
B-36-13202	Fanfold Paper, Unlined	144	30.00	28.50	27.30
B-54-11808	Console PC Panel	49	50.00	48.00	46.00
B-70-08612-4A	Console Cable	49	10.00	10.00	9.00
B-70-11656	Console Bezel	49	9.00	9.00	8.00
B-70-12438-0	Fan Assembly for H984 (115 Vac)	130	90.00	86.00	82.00

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Catalog No.	Description	Page No.	List Price	Cat. Price	Cash Price
B-70-12438-1	Fan Assembly for H984 (230 Vac)	130	$ 90.00	$ 86.00	$ 82.00
B-70-12754	Remote Signal Cable	49	13.00	12.00	12.00
B-74-03860-00	DECtape used with 555/55/56 Transports	145	10.00	9.50	9.10
B-74-03860-01	LINCtape used w/LINC/LINC-8 and PDP-12	145	10.00	9.50	9.10
B-74-05996-00	DECtape used with PDP-8	145	14.00	13.30	12.74
B-74-05996-01	DECtape used with PDP-1/4/6/7/9/10/15 and 20	145	14.00	13.30	12.74
B-74-06782	Kickplate	129	7.00	7.00	6.00
B-74-06793	Kickplate	129	13.00	12.00	12.00
B-74-09449	Bracket for Chassis Slides (right)	133	5.00	5.00	5.00
B-74-09459	Bracket for Chassis Slides (left)	133	5.00	5.00	5.00
B-74-17440	Blank Panel for H984	130	15.00	14.00	14.00
B-78/40-DA	DECstation 78 w/RX78, OS78, VT78, Stand	84	8245.00	7421.00	7091.00
B-78/60-DA	DECstation 78 w/2-RX78, OS78, VT78, stand	84	12,545.00	11,291.00	10,789.00
B-90-07912-01	DECtape Labels 250/roll red	145	5.00	4.75	4.55
B-90-07912-02	DECtape Labels 250/roll blue	145	5.00	4.75	4.55
B-90-07912-03	DECtape Labels 250/roll green	145	5.00	4.75	4.55
B-90-07912-04	DECtape Labels 250/roll yellow	145	5.00	4.75	4.55
B-91-05740	Wire Wrapping Wire, 30 AWG	120	66.00	63.00	60.00
B-91-07575	Cable Ribbon 20-Cond.	120	.60	.60	.50
B-91-07688	Wire Wrapping Wire, 24 AWG	120	55.00	52.00	50.00
B-91-07706	Cable, Round 6-Cond.	120	.50	.50	.40
B-91-07736	Cable, Round 25-Cond.	120	1.20	1.20	1.10
B-A123	Analog Multiplexer	97	75.00	71.00	68.00
B-A126	Analog Multiplexer	97	83.00	79.00	76.00
B-A207	Operational Amplifier	97	57.00	54.00	52.00
B-A866	A/D Converter, Hi-Speed 12-bit	98	400.00	380.00	364.00
B-AAV11-A	Digital-to-Analog Converter	55	900.00	855.00	819.00
B-ADV11-A	Analog-to-Digital Converter	55	1000.00	950.00	910.00
B-AR11	Analog Real Time Module	101	1815.00	1724.00	1652.00
B-BA11-ES	Expansion Mounting Box	131	1050.00	998.00	956.00
B-BA11-KE	Expansion Mounting Box	130	2420.00	2299.00	2202.00
B-BA11-LE	Expansion Mounting Box	133	1600.00	1520.00	1456.00
B-BA11-ME	Expansion Mounting Box	44	1000.00	950.00	910.00
B-BB11	Pre-Wired System Unit	113	187.00	178.00	170.00
B-BB11-A	Pre-Wired System Unit	113	187.00	178.00	170.00
B-BB11-B	Pre-Wired System Unit	114, 133	285.00	271.00	259.00
B-BC01V-25	EIA Interface Cable for DLV11-E	56	88.00	84.00	80.00
B-BC03L-05	EIA Cable H856-RS232 (male)	68	65.00	62.00	59.00
B-BC03M-25	25' Null Modem Cable	85	60.00	57.00	55.00
B-BC04Z-06	6' 40-Cond. Cable	119	44.00	42.00	40.00
B-BC04Z-10	10' 40-Cond. Cable	56, 119	53.00	50.00	48.00
B-BC04Z-15	15' 40-Cond. Cable	119	63.00	60.00	57.00
B-BC04Z-25	25' 40-Cond. Cable	119	89.00	85.00	81.00
B-BC05C-25	25' EIA Interface Cable	56, 119	112.00	106.00	102.00
B-BC05C-50	50' EIA Interface Cable	119	143.00	136.00	130.00
B-BC05D-10	10' EIA Extension Cable	85, 119	94.00	89.00	86.00
B-BC05D-25	25' EIA Extension Cable	119	132.00	125.00	120.00
B-BC05H-06	Line Set, 115 Vac	134	88.00	84.00	80.00
B-BC05J-06	Line Set, 230 Vac	134	88.00	84.00	80.00
B-BC05M-04	4' 20 mA Current Loop Cable	56	46.00	44.00	42.00
B-BC06R-06	6' Cable, Flat, 40-Cond.	119	37.00	35.00	34.00
B-BC06R-10	10' Cable, Flat, 40-Cond.	119	45.00	43.00	41.00
B-BC06R-25	25' Cable, Flat, 40-Cond.	119	75.00	71.00	68.00
B-BC06R-50	50' Cable, Flat, 40-Cond.	119	125.00	119.00	114.00
B-BC07A-10	10' Cable, Round 20-TWP	119	77.00	73.00	70.00
B-BC07A-15	15' Cable, Round 20-TWP	119	88.00	84.00	80.00
B-BC07A-25	25' Cable, Round 20-TWP	119	99.00	94.00	90.00
B-BC07D-10	10' Cable, Two 20-Cond. Flat, Mylar Ribbon	56, 119	75.00	71.00	68.00
B-BC07D-15	15' Cable, Two 20-Cond. Flat, Mylar Ribbon	56, 119	90.00	86.00	82.00
B-BC07D-25	25' Cable, Two 20-Cond. Flat, Mylar Ribbon	56, 119	105.00	100.00	96.00
B-BC08J-06	6' Cable, 40-Cond. Flat Coax.	119	83.00	79.00	76.00
B-BC08J-10	10' Cable, 40-Cond. Flat Coax.	119	94.00	89.00	86.00
B-BC08J-15	15' Cable, 40 Cond. Flat Coax.	119	107.00	102.00	97.00
B-BC08J-25	25' Cable, 40-Cond. Flat Coax.	119	127.00	121.00	116.00
B-BC08J-50	25' Cable, 40-Cond. Flat Coax.	119	187.00	178.00	170.00
B-BC08R-01	Test and Maintenance Cable	56, 119	50.00	48.00	46.00
B-BC08R-03	3' Cable, 40-Cond. Mylar	119	54.00	51.00	49.00
B-BC08R-06	6' Cable, 40-Cond. Mylar	119	61.00	58.00	56.00
B-BC08R-08	8' Cable, 40-Cond. Mylar	119	65.00	62.00	59.00

CALL: 800-258-1710 (N.H. Residents 603 - 884-6660) 8:30 am to 5 pm EST.

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Catalog No.	Description	Page No.	List Price	Cat. Price	Cash Price
B-BC08R-10	10′ Cable, 40-Cond. Mylar	119	$ 69.00	$ 66.00	$ 63.00
B-BC08R-12	12′ Cable, 40-Cond. Mylar	119	74.00	70.00	67.00
B-BC08R-20	20′ Cable, 40-Cond. Mylar	119	91.00	86.00	83.00
B-BC08R-25	25′ Cable, 40-Cond. Mylar	119	102.00	97.00	93.00
B-BC08R-50	50′ Cable, 40-Cond. Mylar	119	187.00	178.00	170.00
B-BC11A-02	2′ UNIBUS Cable, Dual 60-Cond.	119	127.00	121.00	116.00
B-BC11A-05	5′ UNIBUS Cable, Dual 60-Cond.	119	143.00	136.00	130.00
B-BC11A-8F	8′6″ UNIBUS Cable, Dual 60-Cond.	119	160.00	152.00	146.00
B-BC11A-10	10′ UNIBUS Cable, Dual 60-Cond.	119	176.00	167.00	160.00
B-BC11A-15	15′ UNIBUS Cable, Dual 60-Cond.	119	193.00	183.00	176.00
B-BC11A-25	25′ UNIBUS Cable, Dual 60-Cond.	119	220.00	209.00	200.00
B-BC11K-25	25′ Cable, Round 20-TWP (DR11-C I/O Cable)	119	140.00	133.00	127.00
B-BC11S-25	25′ Cable, 36-Cond. Round	119	100.00	95.00	91.00
B-BC11S-50	50′ Cable, 36-Cond. Round	119	150.00	143.00	137.00
B-BC11S-AO	100′ Cable, 36-Cond. Round	119	260.00	247.00	237.00
B-BC21B-05	5′ Cable, DLV11-J	53, 56	40.00	38.00	36.00
B-BCV1A-02	2′ Cable, LSI-11 BUS	44	210.00	200.00	191.00
B-BCV1A-04	4′ Cable, LSI-11 BUS	44	210.00	200.00	191.00
B-BCV1A-06	6′ Cable, LSI-11 BUS	44	210.00	200.00	191.00
B-BCV1A-10	10′ Cable LSI-11 BUS	44	210.00	200.00	191.00
B-BCV1B-02	2′ Cable, LSI-11 BUS	44	290.00	276.00	264.00
B-BCV1B-04	4′ Cable, LSI-11 BUS	44	290.00	276.00	264.00
B-BCV1B-06	6′ Cable, LSI-11 BUS	44	290.00	276.00	264.00
B-BCV1B-10	10′ Cable, LSI-11 BUS	44	290.00	276.00	264.00
B-BN01A-04	IBV11-A Cable	54	125.00	119.00	114.00
B-BN11A-04	IBV11-A Cable	54	125.00	119.00	114.00
B-BN52A-7F	VT52 EIA Interface & Cable, 25′	32	66.00	63.00	60.00
B-BN52B-7F	VT52 20 mA Interface & Cable, 25′	32	66.00	63.00	60.00
B-DCK11-AA	Program Control I/O CHIPKIT	60	46.00	46.00	44.00
B-DCK11-AB	DMA Control CHIPKIT	60	150.00	150.00	144.00
B-DKK11-AC	Program Control I/O Designer's CHIPKIT	60	175.00	175.00	168.00
B-DCK11-AD	DMA Control Designer's CHIPKIT	60	275.00	275.00	264.00
B-DD11-A	Pre-Wired SPC System Unit	113	350.00	333.00	319.00
B-DD11-B	Pre-Wired SPC System Unit	113	350.00	333.00	319.00
B-DD11-CK	Pre-Wired SPC System Unit	112	330.00	314.00	300.00
B-DD11-DK	Pre-Wired SPC System Unit	112	660.00	627.00	601.00
B-DDV11-B	LSI-11 Backplane, 9-Slot	45	400.00	380.00	364.00
B-DF01-A	Acoustic Telephone Coupler	25	760.00	722.00	692.00
B-DL11-WA	20 mA Asynchronous Interface	101	770.00	732.00	701.00
B-DL11-WB	EIA Asynchronous Interface	101	770.00	732.00	701.00
B-DL11-WC	EIA Asynchronous Interface w/Model Control	101	770.00	732.00	701.00
B-DLV11	Serial Line Unit	52	250.00	238.00	228.00
B-DLV11-E	Serial Line Unit	52	300.00	285.00	273.00
B-DLV11-F	Serial Line Unit	52	250.00	238.00	228.00
B-DLV11-J	Serial Line Unit-4-line	53	465.00	442.00	423.00
B-DLV11-KA	EIA to 20 mA Converter for DLV11-J	53	110.00	105.00	100.00
B-DR8-ED	Two Word Input, PDP-8	100	325.00	309.00	296.00
B-DR11-B	PDP-11 DMA Interface	101	1620.00	1539.00	1474.00
B-DR11-C	PDP-11 General Purpose Interface	101	540.00	513.00	491.00
B-DR11-L	Two Word Input, PDP-11	101	380.00	361.00	346.00
B-DR11-M	Two Word Output, PDP-11	101	380.00	361.00	346.00
B-DRV11	Parallel Line Unit	52	210.00	200.00	191.00
B-DRV11-B	LSI-11 DMA Interface	54	580.00	551.00	528.00
B-DRV11-P	Interface Foundation Module	53	275.00	261.00	250.00
B-EKOVT52-MM	VT52 Maintenance Manual	31	50.00	50.00	50.00
B-EKOVT55-TM	VT55 User's Manual	37	9.00	9.00	9.00
B-EK-1LA36-MM	LA36 Maintenance Manual	12	74.00	74.00	74.00
B-EK-LA180-MM	LA180 Maintenance Manual	24	19.00	19.00	19.00
B-G772	Power Connector	118	10.00	10.00	9.00
B-H014	Mounting Plate	113	23.00	22.00	21.00
B-H020	Connector Block Mounting Frame	112	17.00	16.00	15.00
B-H021	Standoff End-Plates	112	8.00	8.00	7.00
B-H022	Standoff End-Plates	112	22.00	21.00	20.00
B-H024	Standoff End-Plates	112	8.00	8.00	7.00
B-H025	Standoff End-Plates	112	22.00	21.00	20.00
B-H033	System Unit Casting	114	11.00	10.00	10.00

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Catalog No.	Description	Page No.	List Price	Cat. Price	Cash Price
B-H034	Nine-Slot Mounting Frame	114, 133	$ 17.00	$ 16.00	$ 15.00
B-H0341	Card Cage	45	50.00	48.00	46.00
B-H322	Distribution Panel	135	185.00	176.00	168.00
B-H716	Power Supply	134	360.00	342.00	328.00
B-H720-E	System Power Supply	134	850.00	808.00	774.00
B-H722	Step-Down Transformer E/W Mounting Plate	135	110.00	105.00	100.00
B-H726-B	Power Supply	133, 134	260.00	247.00	237.00
B-H740-D	System Power Supply	134	555.00	527.00	505.00
B-H755	System Power Supply	134	680.00	646.00	619.00
B-H780-H	Power Supply	49	700.00	665.00	637.00
B-H800-F	Connector Block	110	14.00	13.00	13.00
B-H800-W	Connector Block	110	16.00	15.00	15.00
B-H802	Connector Block	110	10.00	10.00	9.00
B-H803	Connector Block	110	16.00	15.00	15.00
B-H8030	Connector Block	110	7.00	7.00	6.00
B-H805	Replacement Contacts	110	9.00	9.00	8.00
B-H807	Connector Block	110	6.00	6.00	5.00
B-H808	Connector Block	110	17.00	16.00	15.00
B-H809	Replacement Contacts	110	5.00	5.00	4.00
B-H810-C	Wire Wrapping Gun, 24-AWG	121	298.00	283.00	271.00
B-H810-D	Wire Wrapping Gun, 30-AWG	121	165.00	157.00	150.00
B-H811	Wire Wrapping Tool, 24-AWG	121	48.00	46.00	44.00
B-H811-A	Wire Wrapping Tool, 30-AWG	121	65.00	62.00	59.00
B-H812	W/W Unwrap Tool 24-AWG	121	13.00	12.00	12.00
B-H812-A	W/W Unwrap Tool, 30-AWG	121	19.00	18.00	17.00
B-H813-A	W/W Gun Bit (replacement) 30-AWG	121	39.00	37.00	35.00
B-H814-A	W/W Gun Sleeve (replacement) 30-AWG	121	23.00	22.00	21.00
B-H820	Grip Clip	120	53.00	50.00	48.00
B-H821	Grip Clip	120	125.00	119.00	114.00
B-H825	Crimping Tool, 24-AWG	121	161.00	153.00	147.00
B-H826	Crimping Tool, 30-AWG	121	250.00	238.00	228.00
B-H850	Handle Extender	125	15.00	14.00	14.00
B-H851	Edge Connector	114	19.00	18.00	17.00
B-H852	Module Holder	125	9.00	9.00	8.00
B-H853	Module Holder	125	9.00	9.00	8.00
B-H854	40-Pin Connector (Male)	61, 118	6.00	6.00	5.00
B-H856	40-Pin Connector (Female)	61, 118	10.00	10.00	9.00
B-H863	Connector Block	110	16.00	15.00	15.00
B-H909-A	Logic Enclosure	133	310.00	295.00	282.00
B-H909-BA	Logic Enclosure E/W Power Supply	133	740.00	703.00	673.00
B-H909-C	Logic Enclosure	133	350.00	333.00	319.00
B-H911-J	Mounting Panel	111	200.00	190.00	182.00
B-H911-K	Mounting Panel	111	200.00	190.00	182.00
B-H911-S	Mounting Panel	111	230.00	219.00	209.00
B-H914	Mounting Panel	111	160.00	152.00	146.00
B-H916	Mounting Panel	111	400.00	380.00	364.00
B-H917	Mounting Panel	111	320.00	304.00	291.00
B-H9270	LSI-11 Backplane/Card Guide Assembly	45	190.00	181.00	173.00
B-H9271	General Purpose 4-Slot Backplane	113	94.00	89.00	86.00
B-H9281-AA	LSI-11/2 Backplane	48	75.00	71.00	68.00
B-H9281-AB	LSI-11/2 Backplane	48	110.00	105.00	100.00
B-H9281-AC	LSI-11/2 Backplane	48	145.00	138.00	132.00
B-H9281-BA	LSI-11/2 Backplane/Card Guide Assembly	48	105.00	100.00	96.00
B-H9281-BB	LSI-11/2 Backplane/Card Guide Assembly	48	155.00	147.00	141.00
B-H9281-BC	LSI-11/2 Backplane/Card Guide Assembly	48	205.00	195.00	187.00
B-H933-C	4-Slot System Unit	113	79.00	75.00	72.00
B-H933-CA	4-Slot System Unit	113	79.00	75.00	72.00
B-H933-CB	4-Slot System Unit	113	79.00	75.00	72.00
B-H934-CB	9-Slot System Unit	114, 133	150.00	143.00	137.00
B-H950-AA	Cabinet Frame	129	295.00	280.00	268.00
B-H950-BA	Mounting Door, Front and Rear, RH	129	75.00	71.00	68.00
B-H950-CA	Mounting Door, Front and Rear, LH	129	80.00	76.00	73.00
B-H950-DA	Door Frame, Rear Mounting, RH	129	60.00	57.00	55.00
B-H950-EA	Door Frame, Rear Mounting, LH	129	70.00	67.00	64.00
B-H950-FA	Mounting Panel Door Skins	129	35.00	33.00	32.00
B-H950-G	Cabinet Mounted Table	129	170.00	162.00	155.00
B-H950-HA	Short Door 21″	129	68.00	65.00	62.00
B-H950-HD	Short Door 31.5″	129	120.00	114.00	109.00

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Catalog No.	Description	Page No.	List Price	Cat. Price	Cash Price
B-H950-HF	Short Door 42″	129	$ 88.00	$ 84.00	$ 80.00
B-H950-HK	Short Door 63″	129	120.00	114.00	109.00
B-H950-LA	Logo Frame Panel, Aluminum	129	42.00	40.00	38.00
B-H950-LB	Logo Frame Panel, Plastic	129	13.00	12.00	12.00
B-H950-NC	Blank Cover Panel	130	15.00	14.00	14.00
B-H950-PA	Bezel Cover Panel	129	12.00	11.00	11.00
B-H950-QA	Bezel Cover Panel	129	17.00	16.00	15.00
B-H950-SA	Air Filter for H952-CA	129	4.00	4.00	4.00
B-H952-AA	End Panel, Left or Right	129	78.00	74.00	71.00
B-H952-BA	Stabilizer Feet	129	50.00	48.00	46.00
B-H952-CA	Top Mounting Fan Assembly, 115 Vac	129	80.00	76.00	73.00
B-H952-GA	Filler Strips, Front & Rear	129	60.00	57.00	55.00
B-H957-AA	Cabinet Frame	129	275.00	261.00	250.00
B-H957-BA	Mounting Door, Rear Mounting, RH	129	92.00	87.00	84.00
B-H957-DA	Door Frame, Rear Mounting, RH	129	59.00	56.00	54.00
B-H957-EA	Door Frame, Rear Mounting, LH	129	60.00	57.00	55.00
B-H957-FA	End Panel-Right	129	115.00	109.00	105.00
B-H957-FB	End Panel-Left	129	115.00	109.00	105.00
B-H957-GA	Filler Strips, Top Front Rear	129	94.00	89.00	86.00
B-H957-HA	Front & Rear Mounting Fan Assembly	129	98.00	93.00	89.00
B-H957-JA	Bottom Cover Plate	129	17.00	16.00	15.00
B-H957-LA	Logo Frame Panel	129	55.00	52.00	50.00
B-H957-SA	Filter for H957-HA Fan	129	7.00	7.00	6.00
B-H960-BC	Cabinet	127	1210.00	1150.00	1101.00
B-H960-CA	Cabinet	127	1210.00	1150.00	1101.00
B-H961-A	Cabinet	127	935.00	888.00	851.00
B-H961-AA	Cabinet	127	935.00	888.00	851.00
B-H967-BA	Cabinet	127	1399.00	1329.00	1273.00
B-H970-EB	Table	147	240.00	228.00	218.00
B-H970-HB	Table	147	170.00	162.00	155.00
B-H980-BA	Supplies Cabinet, Large	149	399.00	379.05	363.09
B-H980-BB	Supplies Cabinet, Small	149	349.00	331.55	317.59
B-H980-CA	Magtape Hanger Bar	149	35.00	33.25	31.85
B-H980-CB	Magtape Storage Rack	149	35.00	33.25	31.85
B-H980-CC	Disk Storage Rack	149	35.00	33.25	31.85
B-H980-CD	Roll-Out Shelf	149	65.00	61.75	59.15
B-H980-CE	Hanger Binder Frame	149	70.00	66.50	63.70
B-H980-CF	Storage Drawer	149	80.00	76.00	72.80
B-H980-CG	Fixed Shelf	149	35.00	33.25	31.85
B-H980-CH	Divider Kit	149	65.00	61.75	59.15
B-H980-CK	DECtape Wire Frame	149	35.00	33.25	31.85
B-H980-CL	RK06 Storage Rack	149	35.00	33.25	31.85
B-H980-CM	Hanger Bar, Documentation	149	35.00	33.25	31.85
B-H980-CN	Data Binder Hanger	149	38.00	36.10	34.58
B-H980-CP	Paper Hanger	149	38.00	36.10	34.58
B-H9800-A	General Purpose Systems Desk	130	650.00	618.00	592.00
B-H981-A	Copy Holder	144	45.00	42.75	40.95
B-H984-BA	Low Profile System Cab	130	390.00	371.00	355.00
B-H984-BB	Low Profile System Cab	130	390.00	371.00	355.00
B-H984-CA	Bracket Set for H909-C	133	4.00	4.00	4.00
B-HT-95	Crimping Tool-H856 Contacts	61, 121	195.00	185.00	177.00
B-IBV11-A	Instrument Bus Interface	54	750.00	713.00	683.00
B-K940	Mounting Bracket	112	11.00	10.00	10.00
B-K941	Mounting Bracket Support	112	15.00	14.00	14.00
B-KD11-F	LSI-11 Processor w/4K RAM	42	990.00	941.00	901.00
B-KD11-FA	LSI-11 Processor w/8K RAM	42	1240.00	1178.00	1128.00
B-KD11-FB	LSI-11 Processor w/12K RAM	42	1490.00	1416.00	1356.00
B-KD11-FC	LSI-11 Processor w/20K RAM	42	1990.00	1891.00	1811.00
B-KD11-HB	LSI-11/2 Processor w/8K RAM	48	1290.00	1226.00	1174.00
B-KD11-HC	LSI-11/2 Processor w/16K RAM	48	1690.00	1606.00	1538.00
B-KD11-HD	LSI-11/2 Processor w/32K RAM	48	2490.00	2366.00	2266.00
B-KD11-HU	LSI-11/2 Processor w/4K UV PROM	48	990.00	941.00	901.00
B-KD11-R	LSI-11 Processor w/16K RAM	42	2490.00	2366.00	2266.00
B-KEV11	Extended Arithmetic Function Package	56	190.00	181.00	173.00
B-KIT11-D	PDP-11 I/O DMA Kit	101	850.00	808.00	774.00
B-KPV11-A	Power Sequence Module w/o BUS Termination	49	290.00	276.00	264.00
B-KPV11-B	Power Sequence Module w/120 OHM BUS Termination	49	315.00	299.00	287.00
B-KWV11-A	Real Time Clock	55	600.00	570.00	546.00

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Catalog No.	Description	Page No.	List Price	Cat. Price	Cash Price
B-LA35-CE	DECwriter II w/o Keyboard, 115 Vac	13	$1900.00	$1710.00	$1652.00
B-LA35-CJ	DECwriter II w/o Keyboard, 230 Vac	13	1900.00	1710.00	1652.00
B-LA35-DK	DECwriter II w/o Keyboard Ribbon, Cable, Paper, 115 Vac	13, 85	1780.00	1580.00	1520.00
B-LA35-DN	DECwriter II w/o Keyboard Ribbon, Cable, Paper, 230 Vac	13	1805.00	1600.00	1540.00
B-LA36-CE	DECwriter II w/Keyboard, 115 Vac	13	2100.00	1890.00	1825.00
B-LA36-CJ	DECwriter II w/Keyboard, 230 Vac	13	2100.00	1890.00	1825.00
B-LA36-DK	DECwriter II w/Keyboard, w/o Ribbon, Cable, Paper, 115 Vac	13, 85	1870.00	1660.00	1595.00
B-LA36-DN	DECwriter II w/Keyboard, w/o Ribbon, Cable, Paper, 230 Vac	13	1895.00	1680.00	1615.00
B-LA180-PA	180CPS, 132 Column Printer, 115 Vac	23, 84	3240.00	2800.00	2688.00
B-LA180-PD	180CPS, 132 Column Printer, 230 Vac	23	3240.00	2800.00	2688.00
B-LA78-PA	DECstation LA180 Printer	84	3300.00	2970.00	2838.00
B-LAV11-PA	LA180-PA w/LSI-11 Interface, 115 Vac	71	3770.00	3582.00	3431.00
B-LAXX-KA	Accessory Kit	14, 144	80.00	76.00	72.80
B-LAXX-KB	Caster Set	14, 144	15.00	14.25	13.65
B-LAXX-KC	Surface Shelf	14, 144	45.00	42.75	40.95
B-LAXX-KD	Wire Shelf	14, 144	25.00	23.75	22.75
B-LAXX-KG	EIA Interface	13	65.00	62.00	59.00
B-LAXX-KJ	Compressed Font	13, 23	55.00	52.00	50.00
B-LAXX-KK	Numeric Keyboard	13, 85	105.00	100.00	96.00
B-LAXX-KV	Forms Feed	13	165.00	157.00	150.00
B-LAXX-KW	Selective Addressing	13	130.00	124.00	118.00
B-LAXX-KX	Auto Line Feed Plus Answerback	13	210.00	200.00	191.00
B-LAXX-KY	Form Control	13	315.00	299.00	287.00
B-LAXX-LA	Auto Line Feed	13	85.00	81.00	77.00
B-LAXX-LB	Option Mounting Kit	13	110.00	105.00	100.00
B-LAXX-LG	EIA Interface w/Modem Control	13, 85	110.00	105.00	100.00
B-LAXX-LH	20 mA Interface Cable	13	15.00	14.00	14.00
B-LAXX-LM	Acoustic Coupler	13, 19	475.00	451.00	432.00
B-LAXX-LN	Window, Scale, Pointer	13	30.00	29.00	27.00
B-LAXX-LZ	Paper-Out Sensor	13	25.00	24.00	23.00
B-LAXX-NC	Wire Basket	24, 144	25.00	23.75	22.75
B-LAXX-NE	Print Window	13	15.00	14.00	14.00
B-LAXX-NS	BSR Option, 4K	13	865.00	822.00	787.00
B-LAXX-NT	BSR Option, 8K	13	1165.00	1107.00	1060.00
B-LAXX-NU	BSR Option, 12K	13	1460.00	1387.00	1329.00
B-LAXX-NV	BSR Option, 16K	13	1745.00	1658.00	1588.00
B-LAXX-NW	EIA RS232C Buffered Serial Interface	23, 84	525.00	499.00	478.00
B-LAXX-NX	20 mA Current Loop Buffered Serial Interface	23	525.00	499.00	478.00
B-LAXX-PK	ANSI/APL Character Set	13	720.00	684.00	655.00
B-LAXX-RA	Forms Handling Package	19	85.00	81.00	77.00
B-LAXX-RB	Non-Programmable Communication Package	19	120.00	114.00	109.00
B-LAXX-RC	APL Character Set	19	120.00	114.00	109.00
B-LAXX-RG	Column Scale, Pointer	13, 19	10.00	10.00	9.00
B-LAXX-RE	Modem with DAA	13	430.00	409.00	391.00
B-LAXX-RF	Programmable Communications Package	19	165.00	157.00	150.00
B-LAXX-RM	Numeric Keypad	19, 85	105.00	100.00	96.00
B-LAXX-RN	20 mA Current Loop Interface	19	100.00	95.00	91.00
B-LQP01-KA	Mylar Ribbon Cartridge	144	24.00	22.80	21.84
B-LQP01-KB	Nylon Ribbon Cartridge	144	32.00	30.40	27.12
B-LQP01-PA	Print Wheel, Courier 10	144	48.00	45.60	43.68
B-LQP01-PB	Print Wheel, Pica 10	144	48.00	45.60	43.68
B-LQP01-PC	Print Wheel, Elite 12	144	48.00	45.60	43.68
B-LQP01-PD	Print Wheel, Courier 72	144	48.00	45.60	43.68
B-LQP01-PE	Print Wheel, French Prestige	144	65.00	61.75	59.15
B-LQP01-PF	Print Wheel, General Scientific	144	65.00	61.75	59.15
B-LQP01-PH	Print Wheel OCR-B	144	65.00	61.75	59.15
B-LQP01-PJ	Print Wheel, Courier Legal 10A	144	65.00	61.75	59.15
B-LQP01-PK	Print Wheel, Letter Gothic	144	65.00	61.75	59.15
B-LQP01-PL	Print Wheel, Theme	144	65.00	61.75	59.15
B-LQP01-PM	Print Wheel, Orator 90%	144	65.00	61.75	59.15
B-LS120-HE	DECwriter III, EIA Interface 115 Vac 60 Hz	19, 85	3990.00	3200.00	3072.00
B-LS120-HJ	DECwriter III, EIA Interface 230 Vac 50 Hz	19	3990.00	3200.00	3072.00
B-M002	Logic High Source	92	15.00	14.00	14.00
B-M040	Solenoid Driver	90	43.00	41.00	39.00

CALL: 800-258-1710 (N.H. Residents 603 - 884-6660) 8:30 am to 5 pm EST.

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Catalog No.	Description	Page No.	List Price	Cat. Price	Cash Price
B-M050	Incandescent Lamp Driver	90	$ 36.00	$ 34.00	$ 33.00
B-M060	Solenoid Driver	90	60.00	57.00	55.00
B-M105	Address Selector	101	95.00	90.00	86.00
B-M1103	2-Input AND Gates	88	23.00	22.00	21.00
B-M111	Inverter	88	26.00	25.00	24.00
B-M112	NOR Gates	88	22.00	21.00	20.00
B-M1125	Exclusive OR	88	22.00	21.00	20.00
B-M113	NAND Gates	88	20.00	19.00	18.00
B-M1131	Open Collector NAND	88	30.00	29.00	27.00
B-M115	NAND Gates	88	21.00	20.00	19.00
B-M116	NOR Gates	88	23.00	22.00	21.00
B-M117	NAND Gates	88	21.00	20.00	19.00
B-M119	NAND Gates	88	21.00	20.00	19.00
B-M121	AND/NOR Gates	88	26.00	25.00	24.00
B-M1307	AND Gates	88	28.00	27.00	25.00
B-M133	High Speed NAND Gates	88	26.00	25.00	24.00
B-M135	High Speed NAND Gates	88	24.00	23.00	22.00
B-M137	High Speed NAND Gates	88	24.00	23.00	22.00
B-M139	High Speed NAND Gates	88	26.00	25.00	24.00
B-M141	NAND/OR Gates	88	33.00	31.00	30.00
B-M1500	Bidirectional BUS Interface	101	22.00	21.00	20.00
B-M1501	BUS Input Interface	101	38.00	36.00	35.00
B-M1502	BUS Output Interface	101	66.00	63.00	60.00
B-M155	4-Bit Binary to 16 Outputs	93	31.00	29.00	28.00
B-M161	Binary to Octal/Decimal	93	38.00	36.00	35.00
B-M162	Parity Circuit	93	38.00	36.00	35.00
B-M1621	DVM Data Input Interface	101	138.00	131.00	126.00
B-M1623	Instrument Remote Control Interface	101	165.00	157.00	150.00
B-M163	4-Bit Binary to Decimal	93	30.00	29.00	27.00
B-M165	Buffers	88	33.00	31.00	30.00
B-M168	Magnitude Comparator	94	50.00	48.00	46.00
B-M1701	Data Selector, 4 to 1	93	26.00	25.00	24.00
B-M1703	One Word Input, 12-Bits	100	99.00	94.00	90.00
B-M1705	Two Word Output, 24-Bits	100	200.00	190.00	182.00
B-M1709	OMNIBUS Interface Foundation Module	100	142.00	135.00	129.00
B-M1710	UNIBUS Interface Foundation Module	101	275.00	261.00	250.00
B-M1713	Data Selector, 16 to 1	93	21.00	20.00	19.00
B-M1801	16-Bit Relay Output Interface	101	390.00	371.00	355.00
B-M2001	Tri-State Register, 4-Bit (Dual)	95	44.00	42.00	40.00
B-M202	ANDed Inputs	89	22.00	21.00	20.00
B-M203	Reset/Set Flip Flop	89	27.00	26.00	25.00
B-M204	Buffer Counter	89	28.00	27.00	25.00
B-M205	General Purpose Flip Flop	89	24.00	23.00	22.00
B-M206	General Purpose Flip Flop	89	33.00	31.00	30.00
B-M207	General Purpose Flip Flop	89	36.00	34.00	33.00
B-M230	BCD to Binary/Binary to BCD	93	77.00	73.00	70.00
B-M236	Up/Down Counter 12-Bit Binary	94	58.00	55.00	53.00
B-M237	Up/Down Counter 3-Digit BCD	94	58.00	55.00	53.00
B-M238	Up/Down Counter 4-Bit Binary	94	44.00	42.00	40.00
B-M239	Counter/Register 4-Bit	94	44.00	42.00	40.00
B-M245	Shift Register 4-Bit (Dual)	95	31.00	29.00	28.00
B-M246	High Speed Flip Flop	89	24.00	23.00	22.00
B-M248	Shift Register Multi-Purpose 4-Bit (Dual)	95	28.00	27.00	25.00
B-M2500	Serial FIFO Memory	95	83.00	79.00	76.00
B-M3020	Delay/Stretch	92	44.00	42.00	40.00
B-M306	Integrating One Shot	92	42.00	40.00	38.00
B-M310	Delay Line	92	60.00	57.00	55.00
B-M401	Variable Multivibrator Clock	91	60.00	57.00	55.00
B-M403	Multivibrator Clock	91	50.00	48.00	46.00
B-M404	Multifrequency Crystal Clock	91	89.00	85.00	81.00
B-M405	Crystal Clock	91	120.00	114.00	109.00
B-M4050	Crystal Clock	91	120.00	114.00	109.00
B-M501	Schmitt Trigger	92	29.00	28.00	26.00
B-M5864	Opto-Isolators-Input	96	132.00	125.00	120.00
B-M594	EIA Level Converter	96	94.00	89.00	86.00
B-M598	Opto-Coupled 20 mA Loop Interface	96	77.00	73.00	70.00
B-M602	Amplifier/Generator	92	33.00	31.00	30.00
B-M611	Power, High Speed Inverter	88	37.00	35.00	34.00

CALL: 800-258-1710 (N.H. Residents 603 - 884-6660) 8:30 am to 5 pm EST.

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B-M617	Power/NAND Gate	88	$ 28.00	$ 27.00	$ 25.00
B-M627	Power, High Speed NAND Gate	88	30.00	29.00	27.00
B-M660	Cable Drive, Positive Level	90	29.00	28.00	26.00
B-M6865	Opto-Isolators-Output	96	116.00	110.00	106.00
B-M706	Teletype Receiver	96	82.00	78.00	75.00
B-M707	Teletype Transmitter	96	110.00	105.00	100.00
B-M7390	Asynchronous Transceiver	96	218.00	207.00	198.00
B-M7821	Interrupt Control Module	101	121.00	115.00	110.00
B-M783	UNIBUS Drivers	101	44.00	42.00	40.00
B-M784	UNIBUS Receivers	101	44.00	42.00	40.00
B-M785	UNIBUS Transceivers	101	55.00	52.00	50.00
B-M795	Word Count Module	101	238.00	226.00	217.00
B-M796	UNIBUS Master Control	101	119.00	113.00	108.00
B-M798	UNIBUS Drivers	101	44.00	42.00	40.00
B-M901	Flat Mylar Cable Conn.	116	17.00	16.00	15.00
B-M903	Flat Mylar Cable Conn.	116	11.00	10.00	10.00
B-M904	Cable Connector	117	12.00	11.00	11.00
B-M908	Cable Connector	116, 117	16.00	15.00	15.00
B-M9100	Cable Adapter	115	33.00	31.00	30.00
B-M912	Cable Connector	117	26.00	25.00	24.00
B-M917	Flat Coaxial Cable Conn.	117	13.00	12.00	12.00
B-M918	Flat Mylar Cable Conn.	116	12.00	11.00	11.00
B-M920	UNIBUS Jumper Module	115	65.00	62.00	59.00
B-M922	Flat Mylar Cable Conn.	116	9.00	9.00	8.00
B-M927	Cable Connector	117	10.00	10.00	9.00
B-M930	UNIBUS Terminator	115	60.00	57.00	55.00
B-M933	Flat Ribbon Cable Conn.	116	22.00	21.00	20.00
B-M935	OMNIBUS Conn. Module	115	54.00	51.00	49.00
B-M943	Flat Mylar Cable Conn.	116	8.00	8.00	7.00
B-M953	Flat Coaxial Cable Conn.	117	28.00	27.00	25.00
B-M954	Flat Coaxial Cable Conn.	117	30.00	29.00	27.00
B-M955	Flat Coaxial Cable Conn.	117	30.00	29.00	27.00
B-M957	Flat Ribbon Cable Conn.	116	24.00	23.00	22.00
B-M959	Cable Connector Module	117	13.00	12.00	12.00
B-M971	Cable Adapter	115	33.00	31.00	30.00
B-M972	Flat Mylar Cable Conn.	116	30.00	29.00	27.00
B-M973	Cable Adapter	115	33.00	31.00	30.00
B-M975	Cable Adapter	115	37.00	35.00	34.00
B-M976	UNIBUS Cable Conn.	115	20.00	19.00	18.00
B-M981	UNIBUS Internal Term. Module	115	98.00	93.00	89.00
B-M9970	Cable Adapter	115	40.00	38.00	36.00
B-MMV11-A	4K Core Memory Module	50	990.00	941.00	901.00
B-MRV11-AA	4K PROM Memory Module	50	175.00	166.00	159.00
B-MRV11-AC	PROM Chip for MRV11-AA	50	40.00	38.00	36.00
B-MRV11-BA	PROM/RAM Memory Module	51	325.00	309.00	296.00
B-MRV11-BC	UV PROM Chip for MRV11-BA	51	100.00	95.00	91.00
B-MSV11-B	4K RAM MOS Memory	50	265.00	257.00	246.00
B-MSV11-CD	16K RAM MOS Memory	50	1375.00	1306.00	1251.00
B-MSV11-DB	8K RAM MOS Memory	51	850.00	808.00	774.00
B-MSV11-DC	16K RAM MOS Memory	51	1375.00	1306.00	1251.00
B-MSV11-DD	32K RAM MOS Memory	51	2400.00	2280.00	2184.00
B-PDP-11/03-EA	Pkg. Microcomputer w/4K RAM Memory	44	1995.00	1895.00	1815.00
B-PDP-11/03-KA	Pkg. Microcomputer w/16K RAM Memory	44	3495.00	3320.00	3170.00
B-PRS01-AA	Serial PaperTape Reader 2400 Baud 115 Vac	25	750.00	713.00	683.00
B-PRS01-AB	Serial PaperTape Reader 2400 Baud 230 Vac	25	750.00	713.00	683.00
B-PRS01-BA	Serial PaperTape Reader 300 Baud 115 Vac	25	750.00	713.00	683.00
B-PRS01-BB	Serial PaperTape Reader 300 Baud 230 Vac	25	750.00	713.00	683.00
B-QF020-XY	RTS/8 Software Package	85	550.00	495.00	413.00
B-QF022-AY	OS/78 Software Package	85	1400.00	1260.00	1204.00
B-QF680-XY	DECnet/8 Software Package	85	900.00	810.00	774.00
B-QJ013-CY	RT11 Software, License, Floppy	68	1380.00	1311.00	1256.00
B-QJ813-CY	RT11/Fortran IV V2, Binary, Floppy	68	610.00	580.00	555.00
B-QJ907-CY	RT11/APL Software, Floppy	68	825.00	784.00	751.00
B-QJ913-CY	RT11/BASIC-11 V2, Binary, Floppy	68	550.00	523.00	501.00
B-QJ921-CY	RT11/Multi-User Basic, Binary, Floppy	68	550.00	523.00	501.00
B-QJ922-CY	RT11/Focal, Floppy	68	185.00	176.00	168.00
B-QJ945-CY	RT11/Remote-11, Floppy	68	550.00	523.00	501.00
B-QJ960-CY	RT11/Scientific Sub Routine FORTRAN IV, Floppy	68	185.00	176.00	168.00
B-QJV10-CB	Papertape Software Package	57	110.00	105.00	100.00

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B-QJV11-CB	PROM Formatter Program	57	$ 30.00	$ 29.00	$ 27.00
B-RCP03	Disk Cleaning Kit	142	50.00	47.50	45.50
B-REV11-A	LSI-11 Refresh/Terminator Module	56	320.00	304.00	291.00
B-REV11-C	LSI-11 Refresh Module	56	320.00	304.00	291.00
B-RK05F-AA	RK05 Disk Drive for PDP-8, 115 Vac	137	5505.00	5505.00	5285.00
B-RK05F-FA	RK05 Disk Drive for PDP-11, 115 Vac	137	5505.00	5505.00	5285.00
B-RK05J-AA	1.2M 16-Bit Word RK05 Disk Drive, 115 Vac	137	5400.00	5400.00	5184.00
B-RK05K-AA	Disk Cartridge Cleaner for RK05 Series, 115 Vac	142	1095.00	1040.25	996.75
B-RK05K-AB	Disk Cartridge Cleaner for RK05 Series, 230 Vac	142	1095.00	1040.25	996.75
B-RK05K-8	Disk Cartridge for RK05/RK8E Drive	141	99.00	94.05	90.09
B-RK05K-11	Disk Cartridge for RK05/RK11 Drive	141	99.00	94.05	90.09
B-RK05K-MT	Disk Cartridge Storage Bag	141	10.00	9.50	9.10
B-RK06K-DC	Disk Cartridge for RK06	141	249.00	236.55	226.59
B-RK06K-EF	RK06 Disk Cartridge Error Free	141	349.00	331.55	317.59
B-RK07K-AA	Disk Cartridge Cleaner for RK06 and RK07, 115 Vac	142	1395.00	1325.25	1269.45
B-RK07K-AB	Disk Cartridge Cleaner for RK06 and RK07, 230 Vac	142	1395.00	1325.25	1269.45
B-RK07K-DC	Disk Cartridge for RK07	141	325.00	308.75	295.75
B-RK07K-EF	RK07 Disk Cartridge, Error Free	141	425.00	403.75	386.75
B-RKR01-AC	Storage Rack for Disk Cartridge	141	70.00	66.50	63.70
B-RKR01-AD	Storage Rack for Disk Cartridge	141	70.00	66.50	63.70
B-RKR02	Disk Cartridge Storage Case	141	75.00	71.25	68.25
B-RL01K-DC	Disk Cartridge for RL01	141	149.00	141.55	131.95
B-RM03-P	Disk Pack, 67 Megabytes	142	595.00	565.25	541.45
B-RP02-P	Disk Pack, 20 Megabytes	142	295.00	280.25	268.25
B-RP03-P	Disk Pack, 40 Megabytes	142	325.00	308.75	295.75
B-RP03-PX	Error Free RP03-P Disk Pack	142	350.00	332.50	318.50
B-RP04-P	Disk Pack 88 Megabytes	142	600.00	570.00	546.00
B-RP04-PX	Error Free RP04-P Disk Pack	142	675.00	641.25	614.25
B-RP06-P	Disk Pack, 176 Megabytes	142	750.00	712.50	682.50
B-RP06-PX	Error Free RP06-P Disk Pack	142	825.00	783.75	750.75
B-RX01K-10	Diskettes for RX01 Drive Box of 10	85, 143	75.00	71.25	68.25
B-RX01K-MT	Empty Diskette Box	143	5.00	4.75	4.55
B-RX01K-AE	Diskette Binder	143	12.00	11.40	10.92
B-RX01K-AH	Binder Inserts	143	7.00	6.65	6.37
B-RX78-AA	Dual Drive Floppy Disk for DECstation	84	4300.00	3870.00	3698.00
B-RXV11-BA	Dual Drive Floppy Disk w/LSI-11 BUS Interface	48, 71	4300.00	4085.00	3913.00
B-SR-VXRRA-LE	PDP-11V03 System, Inc., PDP-11/03-KA, RXV11-BA, RT11, Cabinet, DECwriter II (LA36-CE), REV11-A	71	9310.00	8845.00	8472.00
B-SR-VXRRA-VE	PDP-11V03 System, Inc., PDP-11/03-KA, RXV11-BA, RT11, Cabinet, DECscope (VT52-AA), REV11-A	71	9310.00	8845.00	8472.00
B-TEV11	Terminator Module 120 Ohm	44	110.00	105.00	100.00
B-TU56K-DT	Empty, Blue, DECtape Canisters	145	5.00	4.75	4.55
B-TU56K-LT	Empty, Green, LINCtape Canisters	145	5.00	4.75	4.55
B-TU56-MT	Replacement Reels for DECtapes or LINCtapes	145	20.00	19.00	18.00
B-TU60-K	DECassettes for TU60 Drive	146	8.00	7.60	7.28
B-TU60-LH	Binder for 12 TU60-K Cassettes	146	6.00	5.46	5.70
B-TUC01	Magnetic Head Cleaning Kit	145	10.00	9.50	9.10
B-TUM06-CN	½" Mag Tape 600' w/Canister, Pkg. 10	144	150.00	142.50	136.50
B-TUM06-SL	½" Mag Tape 600' w/Seal, Pkg. 10	144	150.00	142.50	136.50
B-TUM12-CN	½" Mag Tape 1200' w/Canister, Pkg. 10	144	200.00	190.00	182.00
B-TUM12-SL	½" Mag Tape 1200' w/Seal, Pkg. 10	144	200.00	190.00	182.00
B-TUM24-CN	½" Mag Tape 2400' w/Canister, Pkg. 10	144	250.00	237.50	227.50
B-TUM24-SL	½" Mag Tape 2400' w/Seal, Pkg. 10	144	250.00	237.50	227.50
B-VT50K-03	VT55 Copier Supply Kit	37, 143	24.00	22.80	21.84
B-VT50K-12	VT55 Copier Supply Kit	37, 143	96.00	91.20	87.36
B-VT52-AA	VT52 DECscope w/20 mA Interface, 115 Vac	32	1900.00	1805.00	1729.00
B-VT52-AB	VT52 DECscope w/20 mA Interface, 230 Vac	32	1900.00	1805.00	1729.00
B-VT52-AE	VT52 DECscope w/EIA Interface, 115 Vac	32, 85	1900.00	1805.00	1729.00
B-VT52-AF	VT52 DECscope w/EIA Interface, 230 Vac	32	1900.00	1805.00	1729.00
B-VT52F-AA	Four (4) VT52-AA	33	7600.00	6000.00	5760.00
B-VT52F-AB	Four (4) VT52-AB	33	7600.00	6000.00	5760.00
B-VT52F-AE	Four (4) VT52-AE	33	7600.00	6000.00	5760.00
B-VT52F-AF	Four (4) VT52-AF	33	7600.00	6000.00	5760.00
B-VT55-EA	Graphics Display Terminal w/20 mA Interface 115 Vac	37	2750.00	2613.00	2499.00
B-VT55-EB	Graphics Display Terminal w/20 mA Interface 230 Vac	37	2750.00	2613.00	2499.00
B-VT55-EE	Graphics Display Terminal w/EIA Interface 115 Vac	37, 85	2750.00	2613.00	2499.00
B-VT55-EF	Graphics Display Terminal w/EIA Interface 230 Vac	37	2750.00	2613.00	2499.00
B-VT55-FA	Graphics Display Terminal w/Copier Option, 20 mA Interface, 115 Vac	37	3995.00	3795.00	3635.00

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B-VT55-FB	Graphics Display Terminal w/Copier Option, 20 mA Interface, 230 Vac	37	$3995.00	$3795.00	$3635.00
B-VT55-FE	Graphics Display Terminal w/Copier Option, EIA Interface, 115 Vac	37, 85	3995.00	3795.00	3635.00
B-VT55-FF	Graphics Display Terminal w/Copier Option, EIA Interface, 230 Vac	37	3995.00	3795.00	3635.00
B-VT71-ST	Terminal Stand w/Casters for VT50, 52, 55, 61, 61t	147	75.00	71.25	68.25
B-VTXX-KA	VT52 Printer Interface	32	240.00	228.00	218.00
B-VTXX-ST	Terminal Stand w/Casters for VT71, VT71t	147	75.00	71.25	68.25
B-W011	Flat Ribbon Cable Conn.	116	9.00	9.00	8.00
B-W018	Flat Ribbon Cable Conn.	116	9.00	9.00	8.00
B-W021	Flat Ribbon Cable Conn.	116	8.00	8.00	7.00
B-W023	Flat Ribbon Cable Conn.	116	7.00	7.00	6.00
B-W024	Cable Connector	117	11.00	10.00	10.00
B-W027	Flat Ribbon Cable Conn.	116	14.00	13.00	13.00
B-W028	Flat Coaxial Cable Conn.	117	12.00	11.00	11.00
B-W031	Flat Mylar Cable Conn.	116	6.00	6.00	5.00
B-W033	Flat Mylar Cable Conn.	116	6.00	6.00	5.00
B-W900	Module Extender Board	123	130.00	124.00	117.00
B-W930	Blank Module	124	12.00	11.00	11.00
B-W9301	Wire Wrappable Module	123	Call For Current Pricing		
B-W9302	Wire Wrappable Module	123	Call For Current Pricing		
B-W940	Wire Wrappable Module	122	130.00	124.00	118.00
B-W941	Wire Wrappable Module	122	64.00	61.00	58.00
B-W942	Wire Wrappable Module	122	175.00	166.00	159.00
B-W943	Wire Wrappable Module	122	88.00	84.00	80.00
B-W950	Wire Wrappable Module	122	95.00	90.00	86.00
B-W9500	Wire Wrappable Module	106	185.00	176.00	168.00
B-W9501	Wire Wrappable Module	106	115.00	109.00	105.00
B-W9502	Wire Wrappable Module	106	60.00	57.00	55.00
B-W9503	Wire Wrappable Module	106	325.00	309.00	296.00
B-W9504	Wire Wrappable Module	106	210.00	200.00	191.00
B-W9505	Wire Wrappable Module	106	110.00	105.00	100.00
B-W951	Wire Wrappable Module	122	55.00	52.00	50.00
B-W9511	Wire Wrappable Module	61	125.00	119.00	114.00
B-W9512	Wire Wrappable Module	61	70.00	67.00	64.00
B-W9514	Wire Wrappable Module	61	220.00	209.00	200.00
B-W9515	Wire Wrappable Module	61	120.00	114.00	109.00
B-W952	Wire Wrappable Module	122	210.00	200.00	191.00
B-W953	Wire Wrappable Module	122	95.00	90.00	86.00
B-W960	MSI Module Board	93	9.00	9.00	8.00
B-W964	Universal Terminator Board	93	11.00	10.00	10.00
B-W966	Wire Wrappable Module	100	121.00	115.00	110.00
B-W967	Wire Wrappable Module	100	215.00	204.00	196.00
B-W968	Collage Module Board	124	74.00	70.00	67.00
B-W969	Collage Module Board	124	37.00	35.00	34.00
B-W970	Blank Module Board	124	11.00	10.00	10.00
B-W971	Blank Module Board	124	17.00	16.00	15.00
B-W972	Copper-Clad Blank Module	124	15.00	14.00	14.00
B-W9720	Copper-Clad Blank Module	124	9.00	9.00	8.00
B-W9721	Copper-Clad Blank Module	124	17.00	16.00	15.00
B-W9722	Copper-Clad Blank Module	124	31.00	29.00	28.00
B-W973	Copper-Clad Blank Module	124	28.00	27.00	25.00
B-W974	Perforated Module Board	124	10.00	10.00	9.00
B-W975	Perforated Module Board	124	21.00	20.00	19.00
B-W979	Collage Module Board	124	29.00	28.00	26.00
B-W980	Module Extender Board	123	17.00	16.00	15.00
B-W982	Module Extender Board	123	21.00	20.00	19.00
B-W983	Module Extender Board	123	32.00	30.00	29.00
B-W984	Module Extender Board	123	37.00	35.00	34.00
B-W987	Module Extender Board	123	59.00	56.00	54.00
B-W990	Blank Module Board	124	8.00	8.00	7.00
B-W991	Blank Module Board	124	15.00	14.00	14.00
B-W992	Copper-Clad Module	124	7.00	7.00	6.00
B-W993	Copper-Clad Module	124	12.00	11.00	11.00
B-W998	Perforated Module Board	124	9.00	9.00	8.00
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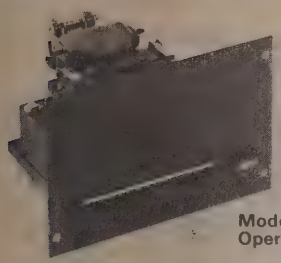

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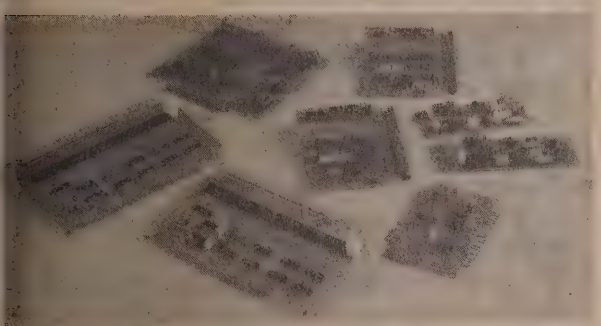

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ADVANTAGES

Static Operation • All contacts are made simultaneously — card or badge can be re-read without operator action. Multiple columns can be outputed in parallel.

Captive Action • Card or badge is held in reader until released by system.

Reliable Brush Design • Nominally 5- minimum of 3- contacts per hole assures reliable read time after time in spite of contaminants and card misalignment.
• Brushes protected against warped and mutilated cards.

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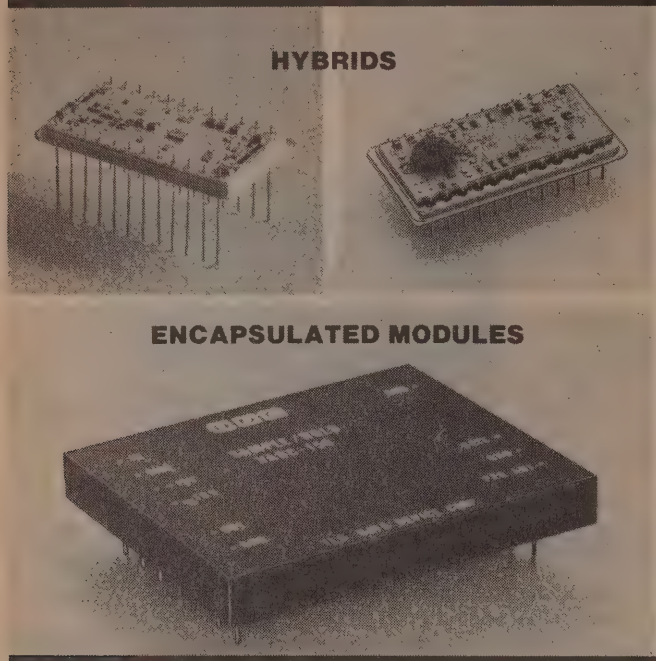

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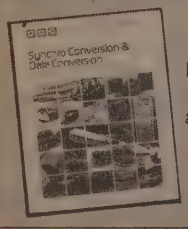

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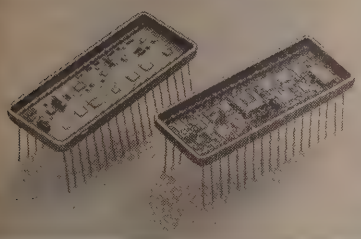
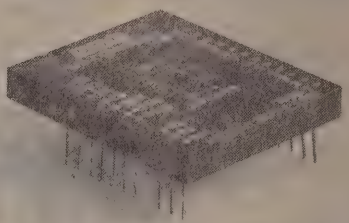
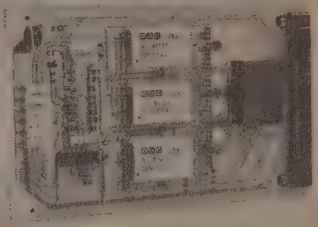


ENCAPSULATED MODULES



CARD MOUNTED



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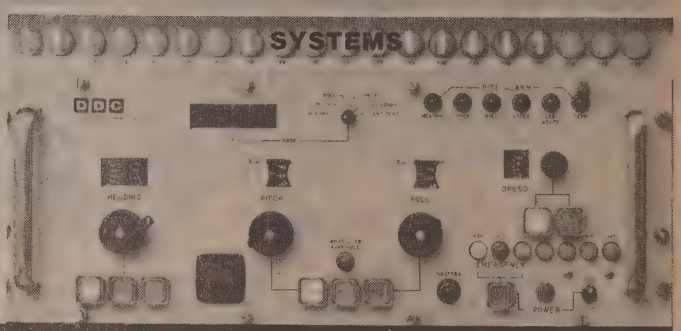
SYSTEMS



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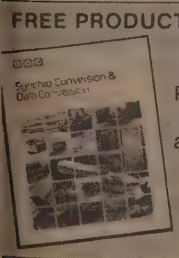

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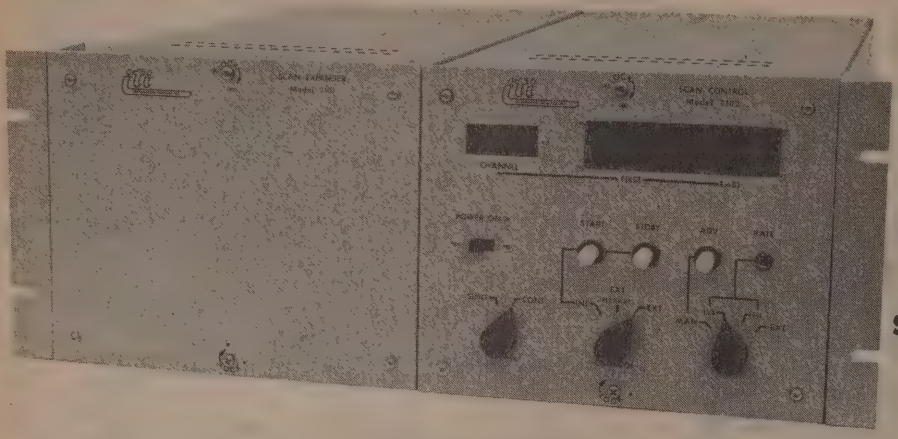

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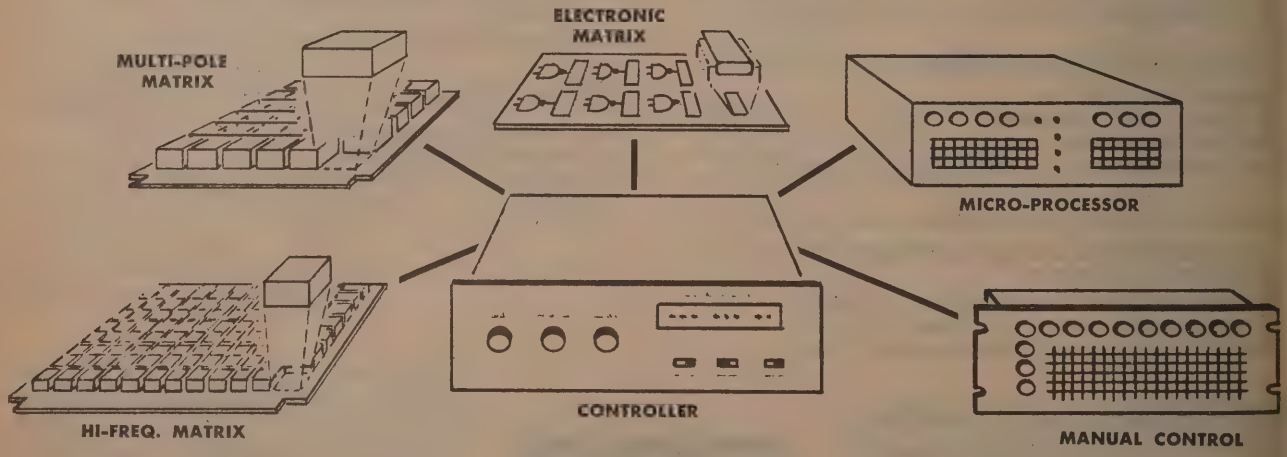

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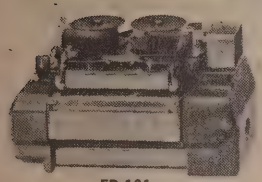
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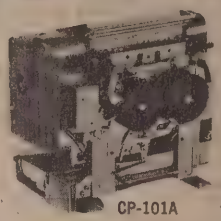
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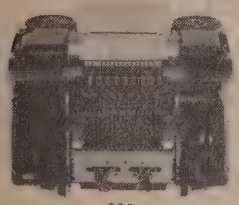
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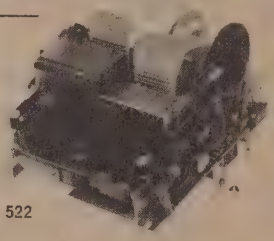
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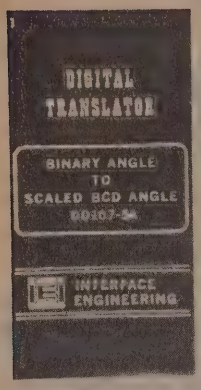
ANGLE TRANSLATORS (617) 344-7383



UNITS CONVERSION

CODE CONVERSION

ANGLE COMBINERS COMPARATORS

TRIG FUNCTIONS

DIGITAL SERVOS

SYNCHRO TO DIGITAL

SYNCHRO TO DC

DIGITAL TO SYNCHRO

COORDINATE CONVERSION

SERIAL-OPTICAL DATA LINKS

FAST MATH OPERATORS

ANGLE DISPLAYS

Function	Model	Input	Output	FS/Rate	Accuracy	Size	Bulletin
Binary Angle to BCD Degrees	DD107-4 to -7	12,16,20,21 bits	4 to 7 digits	359.9° to 359.9995°	±0.6 LSD	C A	570115 370226
Binary Angle to BCD Radar Mils	DD124-4 to -7	12,16,20,21 bits	4 to 7 digits	6399 to 6399.997	±0.6 LSD	A	370630
BCD Degree to Arcmin. + Sec.	DD132	999° BCD	4 digit BCD	59′57″	±1 arcsec	A	371204
Binary Angle to Bipolar Angle	DD117-16-21	17 or 21 bits	±17 or 21 bits	±180° — .3 μs	±0	C	370607
Binary Angle Combiner	DD118	16 bit θ & 16 bit φ	16 bit θ + φ or θ — φ	.35 μs	±0	C	470221
Binary Angle Comparator	DD119	16 bit θ & 16 bit θ ± φ	±16 bit φ shortest path	.4 μs	±0	A	370815
BCD Degrees to Binary Angle	DD127-4-5	4, 5 digit BCD	13 or 16 bits	359.9° or 359.99°	±.6 LSD	A	370915
BCD Degrees to Binary Angle	DD107-6 & DD141	6 digit BCD	19 bit angle	359.999°	±1 LSB	A A	670820 670820
BCD Degrees, Min, Sec. to Binary Angle	DD132, DD141 & DD107-6	7 digit BCD	19 bit angle	359° 59′57″	±1 LSB	AA C	670820 670820
Dual Speed Combiner	DD115A	X1 — 7 bits X36 — 14 bits	19 bit angle	0.25 μs	±.0013°	E	471120
Dual Speed Expanders	DD113-12-16	12 or 16 bits	X36-14 bits	0.2 μs	±1 LSB—X36	D	471215
TRIG FUNCTIONS							
Binary Angle to Binary Sine	DD108A,B,C	10, 13, 16 bits	16 bit sine	90°, .7 to .9 μs	±.005° to .001°	A BX	270928 570812
Angle to 4 Quad. Sine + Cos Cntrl.	DD109-209	12, 15, 18 bits	±16 bit sine or cosine	360° .9 to 1.5 μs	±.005° to .001°	C E	271007 570512
Binary Tan to Angle	DD130A,B	10 or 13 bits	16 bit angle	45°, 1.2 μs	±.0025°	A BX	371105 371105
Arcsin or Arccos	DD108/137	16 bits S or C	16 bit angle	90°, 20 μs	±.001°	A/BX	670915
Binary Angle to Tan.	DD130/137	16 bit angle	16 bit tan.	45°, 20 μs	±.0025°	A/BX	670915
DC Angle to Sin & Cos	SA840A,B,C	+10 v = 360°	10 sinθ, 10 cosθ	500/sec	±.3° to ±.1°	A	371214
DC Sin + Cos to Angle	SA880A,B,C	10 sinθ, 10 cosθ	+10 v = 360°	500/sec	±.3° to ±.1°	A	770320
Inverse Function	DD137	16 bit X	16 bit f (X)	16 X slave	tol. of slave	A	470303
Inverse Function	DD141-20-28	20 or 28 bit X	16 or 24 bit f (X)	.3 μs/count	tol. of slave	C	570210
SYNCHRO-DIGITAL							
Synchro to Digital	SD550	synchro	10 bit angle	720 RPM	±1 bit	F	770522
Synchro to Digital	SD540	synchro	14 bit angle	240 RPM	±4′ ±½ LSB	F	770415
S-D Multichannel	SD532	to 64 channels	13 bit angle	100 μs access	±4′ ±½ LSB	D/F	770318
S-D 4 Channel	SD528	4 ch. synchro	13 bit angle	0.2 μs access	±4′ ±½ LSB	D/BX	671120
S-D Dual Speed	SD560	X1, X36 synchro	16 bit angle	X1 — 20 RPM	±.01° ±½ LSB	F	770715
Synchro to BCD Angle	SD570	synchro	3 or 4 digit	359.9 or ±179.9	to ±0.1° ±1 LSD	F	770608
DIGITAL-SYNCHRO							
Digital to Synchro	DS340	14 bit angle	1-2 vA	360°	±4′	F	761215
Digital to Resolver	DR350	14 bit angle	7 v resolver	360°	±4′	F	770212
Digital to Resolver	DR320-A,B	10, 12, 14 bits	7 v resolver	360°	±3′ to ±12′	C	760815
Resolver to Synchro	AA750	7V resolver	3 to 30 vA	360°	±1′ to ±20′	H	770120
Solid State CT	DS360	synchro vs 14 bit angle	null/error .4 to 1 vac/°	±7 vac	±4′	F	770324
SYNCHRO-ANALOG							
Synchro to Linear DC	SA810A,B,C	synchro	+10 or ±5 vdc	0-360°, ±180°	±.25° to ±.1°	A	370612
Synchro to DC Sin & Cos-ABS	SA820A,B,C	synchro	10 sin θ 10 cos θ	60 or 400/sec	±.35° to ±.15°	B	371114
Synchro to DC Sin & Cos-Ref. scaled	SA830	synchro	10 sin θ 10 cos θ	60 or 400/sec	±.1°	C	371123

INTERFACE ENGINEERING

Function	Model	Input	Output	FS/Rate	Accuracy	Size	Bulletin
Binary Add/Subtract	DD129	16 bit A & B	16 bit A ± B	.4 μs	±0	C	370726
Binary Multiply	DD123	16 bit A & B	18 bit AB	10 μs	±0	A	470515
Multiply Double Prec.	DD123-DP	16 bit A & B	32 bit AB	10 μs	±0	BX	470515
Binary Divide	DD163	16 bit A & B	18 bit A/B	10 μs	±0	A	570719
Divide Double Prec.	DD163-DP	32A & 16B	32 bit A/B	10 μs	±0	BX	570719
Square Root	DD123/137	16 bit A	16 bit $\sqrt{A}$	160 μs	±0	A/A	670915
Floating Point	DD154	16A + 4 bit X	8 modes	.3 μs/shift	±0	A	570622
Complements	DD112	12-20 bit A	ones, two's, direct-thru	.25 μs	±0	C	370918
COORDINATE CONVERTERS							
DC Polar to Rectangular	SA850A,B,C	.1 to 10 v R 0 to 10 v θ	Rsin θ Rcos θ	500/sec	.125 to .5° .1 to .4%	A	371222
DC Rectangular to Polar	SA860A,B,C	.1 to 10 Rsin θ & Rcos θ	+10 v=360° abs. .1 to 10 R	500/sec	.125 to .5° .1 to .4%	A	371224
Polar to Analog Rectangular	DR320-10, -12 and -14	10 to 14 bit θ ±10 v R	Rsin θ Rcos θ	2 μs	.05° & .2° .1 and .3%	C	571022
Optically Isolated Serial Data Link	DD128T & DD128R	Accepts and delivers 24 bit parallel data at up to 20K words/sec. Serial transmission via low cost twisted pair up to 1 mile.				C C	371115 371115
Panel Display Kits	DD120-4 to -6	4 to 6 digit, .55" numerals, complete with bezels, decoders, etc.				PI	371019

Notes: 1) Synchro translators interface 90 v/60 Hz (-96), 90 v/400 Hz (-94), and 11.8 v/400 Hz (-114) synchros. Contact IEI for resolver interfaces.

2) Cases: A) 3"x4"x.4" B) 3"x4"x.8" Bx) 3"x4"x.675" C) 2"x4"x.4" D) 2"x3"x.4" E) 2"x4"x.8" F) 2.625"x3.125"x.8"

FAST 16 BIT MATH

- Add
- Subtract
- Multiply
- Divide
- Square Root
- Sine
- Arc Sine
- Cosine
- Arc Cosine
- Tangent
- Arctan
- Inverse Functions
- Floating Point
- Complements

COORDINATE CONVERSION

SERIAL DATA LINKS

PANEL DISPLAYS

MAINFRAME SUBSYSTEMS

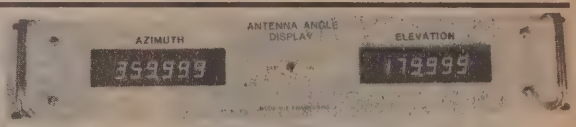
MAINFRAMES are integrated modular subsystems optimized by the selection of functions, resolutions, and speeds for the specifics of each application. Typical groups are outlined below. Contact IEI for additional information.

ANGLE DISPLAYS: The DD135 series accepts, converts, displays, and delivers angles in a variety of forms including binary, BCD, synchro resolver, dual speed, mils, degrees, arc-minutes and seconds and distance in any unit of linear measure at resolutions to 21 bits and accuracies to ±.0003°. Options include bipolar operation and programmable offsets and scaling factors.

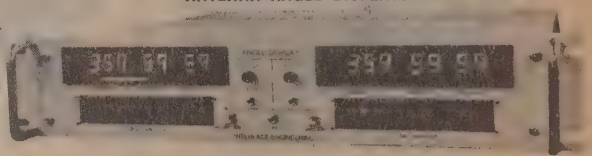
SYNCHRO INTERFACES: Multichannel synchro to digital and digital to synchro interfaces accommodating mix of channels, synchro levels, references, and speed ratios, various display and BITE options.

PRECISION COORDINATE CONVERTERS: Polar, spherical, and rectangular coordinate conversion and translation units employing non-volatile hardware math and trig and providing angle and vector resolutions to 18 bits.

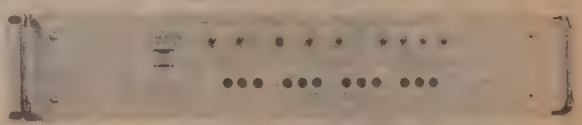
STABILIZATION COMPUTERS: ROM programmed microcomputer controllers which accept vehicle, object, and inertial position data, compute true pointing angle, and generate the command signals required to maintain true pointing. Units feature signed 16 bit floating point precision, computing speed, and dynamic accuracy.



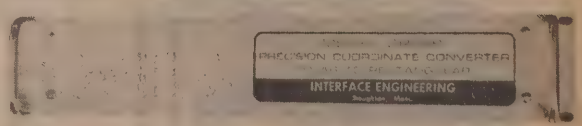
ANTENNA ANGLE DISPLAYS



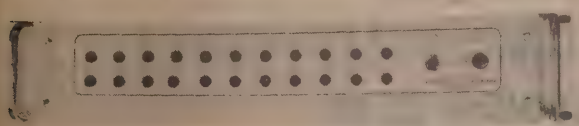
ROTARY TABLE DISPLAYS



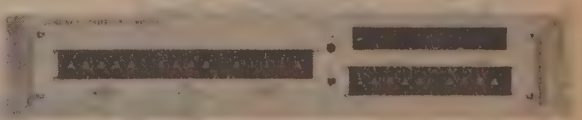
SYNCHRO INTERFACES



COORDINATE CONVERTERS



RADAR REMOTER — SEPARATOR UNIT



STABILIZATION COMPUTERS

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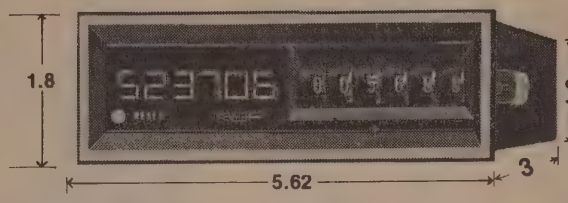
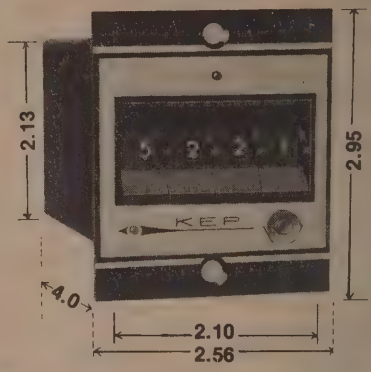


SCP-16



EL-4

With or without visual display. Up to 6 digits of preset. Built in 110 VAC power supply. Counts up to preset number or down from the preset number. Multiple presets available. Crystal time bases. Paralell BCD output. Current available to power all KEP input devices. In stock.

TACHOMETERS, TOTALIZERS, TIMERS ADD/SUBTRACT COUNTERS

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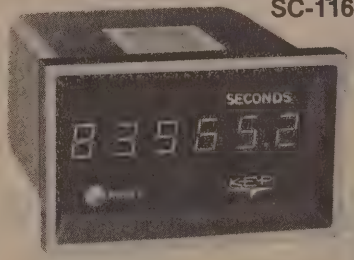
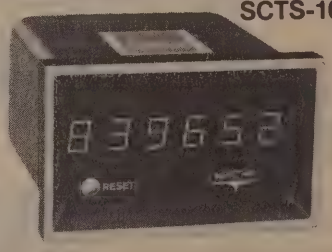
SC-116



TOTALIZER /ADD SUBTRACT

BCD • 10 megahertz • c/MOS • 110 VAC Supply • Phase Discrimination • Small Handsome Aluminum Case • High Noise Immunity • Low Price • In stock

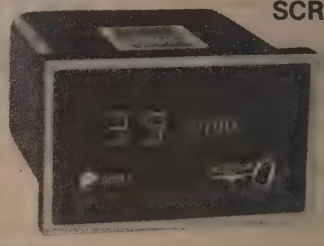
SCTS-16



TIMERS

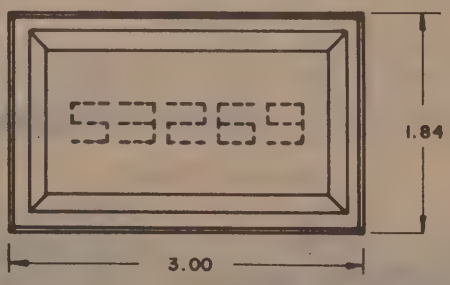
Line Controlled • Crystal Controlled • Any Resolution to milliseconds • BCD • Splits • Taylor • Built in 110 VAC Power Supply • C/MOS • 4 Digits • Low Cost • In Stock

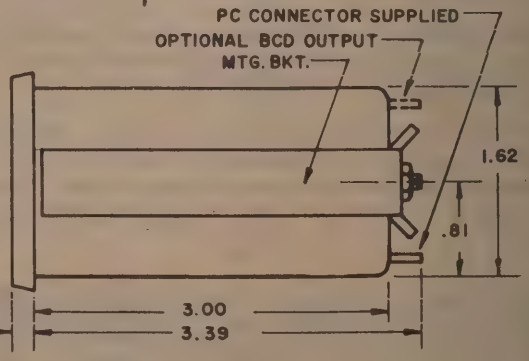
SCR-12



RATE METER/TACHOMETER

4 Digits or fewer • Pulsed by KEP Inputs • Updates once per second • No display change without rate change • 110 VAC Supply Built In • Various Mounting Styles • BCD Output





See Product Section 2200

MINIATURE ELECTRONIC TOTALIZERS/ADD SUBTRACT COUNTERS/ELECTRO-MECHANICAL PRESET COUNTERS/TOTALIZERS/ELASPED TIME INDICATORS/PNEUMATIC COUNTERS

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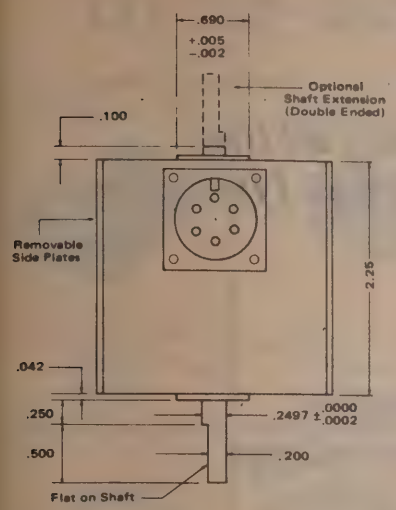

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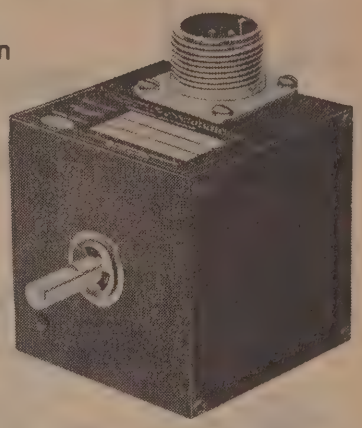

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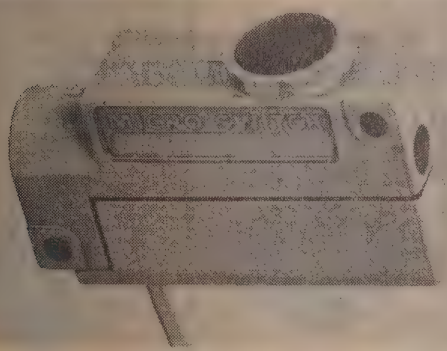

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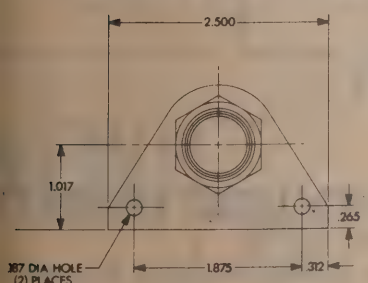
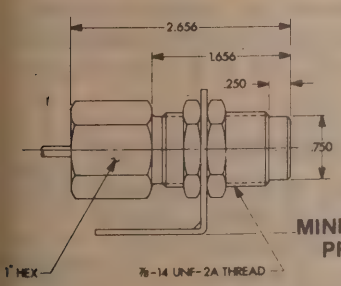
These photo electric eyes use a solid state infra red LED light source to eliminate interference from ambient light and provide virtually unlimited light source life. The LED (light emitting diode) replaces the usual incandescent bulb which is fragile and of limited life.

The light beam is aimed across the path of the item to be counted to a reflector which directs the beam back to a sensor built into the photo head. The count is triggered when the beam is broken. Many variations are available.

These photo heads may be directly connected to any KEP counter.

TOTALLY SOLID STATE PROXIMITY SENSOR





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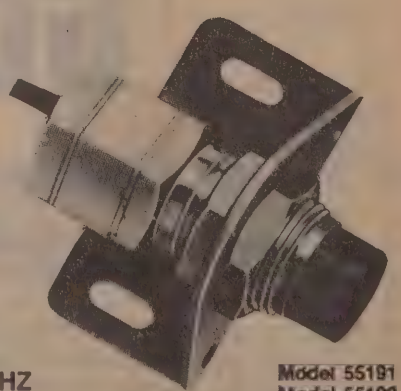

Model 55191
Model 55192

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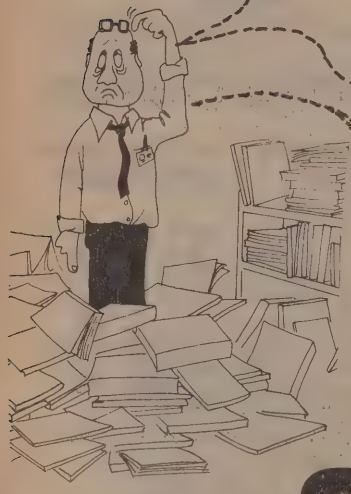

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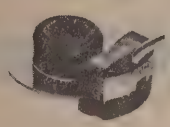
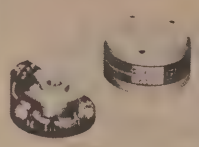
INDUSTRIAL
INCREMENTAL

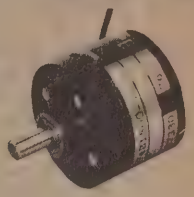


MODEL 71
OPTICAL
MODULAR
INCREMENTAL

MODEL 72
OPTICAL
SIZE 25,
LOW COST, INCREMENTAL



MODEL 73
OPTICAL
INCREMENTAL FOR
MOUNTING TO MOTORS



MODEL 74
OPTICAL
SIZE 15,
LOW COST, INCREMENTAL

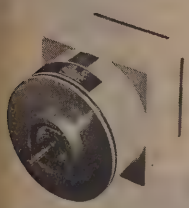
MODEL 76
LOW COST
OPTICAL
ABSOLUTE

HOLLOW SHAFT
OPTICAL
INCREMENTAL
& ABSOLUTE

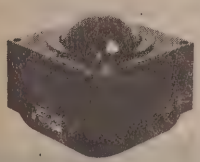
SIZE 25 & 35
ABSOLUTE
OPTICAL COMMERCIAL
& MILITARY

SIZE 25 & 35
INCREMENTAL
OPTICAL COMMERCIAL
& MILITARY

SIZE 11
PIN CONTACTS
ABSOLUTE
& INCREMENTAL



HEAVY DUTY
ABSOLUTE



TRACKBALL

OPTICAL
MODULAR
ABSOLUTE

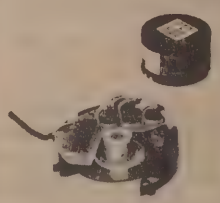
MILITARY
SPECIALS

OUTER SPACE
APPLICATIONS

NEW!

MODEL 75
SIZE 8
LOW COST,
INCREMENTAL

MODEL 715
OPTICAL
INCREMENTAL FOR
MOUNTING TO MOTORS



MODEL 720
OPTICAL
INCREMENTAL FOR
MOUNTING TO MOTORS

MOTOR/ENCODER
PACKAGE

Being the world leader in our field, we have designed encoders to meet the full spectrum of user applications ranging from the simplest, low cost modular encoders to the most sophisticated encoders for military and NASA requirements.

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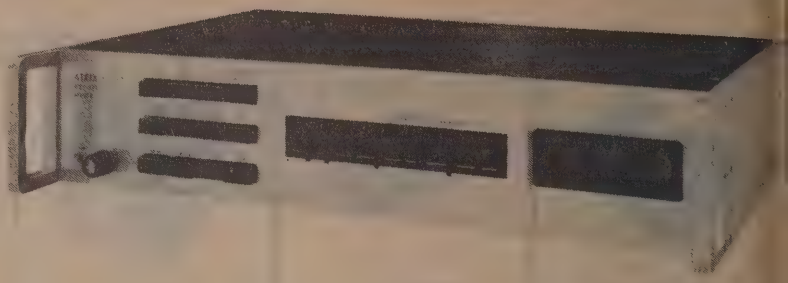
Thermocouple and General Instrumentation Scanners

General Instrumentation
MODEL 1701 SCANNER

- **Random access. Channels controlled by a BCD input to allow programming by external source such as computer.**
- **Sequential scanning with end point selection by front panel digital switches.**



GENERAL: The BCD input is compatible with standard TTL logic. The unit contains BCD output for use on auxiliary equipment. Switches are available in multiples of 10 up to 100 channels in a 3½" cabinet.

CAPACITY: 10 to 100 channels are available in the 3½" master. Slave units with 10 to 200 channels in 3½" cabinets allow expansion to 1000 channels.

SCAN RATE: The scan rate may be as fast as 5 msecs.

INPUT: 1. Level — Standard BCD TTL logic. True equals +5 volts and false equals 0 to +0.5 volts. Unused inputs must have a false level or be terminated in 500 ohms max. 2. BCD enable — A false signal must be applied to enable the input data.

CHANNEL READOUT: Neon numerical indicator lights are provided for a visual indication of the channel selected.

CONTACT RATINGS: 500 volts maximum between conductor and chassis, 350 volts maximum between conductors. Current should not exceed 100 ma for maximum life.

OPTIONS:

A. Manual Digital Switch — The switch can manually select any desired channel from the front panel.

B. Sequential Scan — 1. Advance: Application of a true level will cause the scanner to advance one channel. 2. Reset: Application of a true level will hold the scanner in reset (000) position until true level is removed. Short or open circuit is "false." Positive 5V is true. Input impedance is 10K ohms. 3. Stop or Ctr. Disable: Application of a true level will disenable the advance input or stop any external clock inputs. A false level is required to allow sequential scanning.

C. Sequential Scan with End Point Selection — Two digital switches are provided on the front panel to manually select the start and the stop channel for sequential scanning.

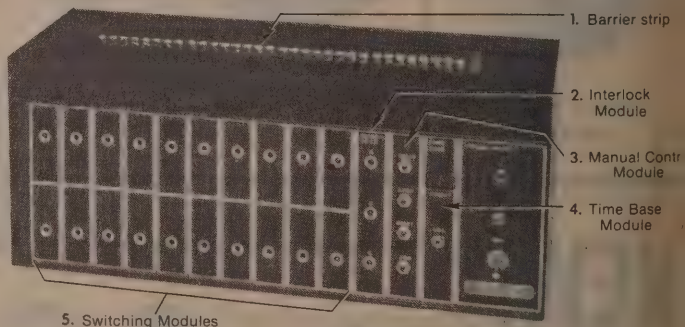
D. Int. Clock — 1. Rate: Continuously variable from .01 to 10 seconds per channel. 2. Single/Recycle: A front panel switch allows a single scan of all switches or continuous scanning of all switches. 3. Internal/External: Front panel switch selects the internal clock or an external clock input. 4. Start Input: Application of true level at the start input will initiate a scan of all switches only when the scanner is in the 000 condition.

DIMENSIONS: 3½" high x 17" wide x 10" deep.

LITERATURE: Write for Bulletin RS-71.

Quantachron V Timer-Programmer

A solid state "cam" timer-programmer with plug-in modules for easier maintenance and less down time.



Field proven • All solid state high level logic • Triac output switching • Up to 20 channels per unit • Programmed by digital switches • Easy to maintain • Plug-in modules • Select only the number of channels and functions needed • Rack mounted, bench mount or enclosure mount • Digital display of count • Manual or remote control • Dimensions 16" wide x 6¾" high x 6" deep.

1. Barrier Strip: All input, output and control functions connect to easily accessible barrier strip. All connections electrically isolated from digital logic.

2. Interlock Module: This module is optional. It allows four independent external contacts normally open to interrupt the count sequence and prevent an actuation of four ouput channels until the interlock is re-established.

3. Manual Control Module: Start, stop, reset and jog.

4. Time Base Module: Generates 100 counts for the time base selected. Time base can be adjusted from 0.5 to 1000 seconds.

5. Switching Modules: From two to 20 channels. Two channels per module. This module receives the count code generated by the time base module and compares it to the "Activate" and "Release" code programmed by the digital switches. Each module has two independent channels. Programming is done by setting the digital switches (by thumb or screwdriver) to the desired actuate and release times.

MATRIX CORPORATION

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NEED A *MEDIUM* OR *HIGH RESOLUTION* ENCODER? OR A *MILITARY* ENCODER OF *ANY* RESOLUTION?

Itek can deliver! Check out the *Absolute* and *Incremental* shaft-angle encoders listed in the table below. They're designed and manufactured to *exacting* quality assurance standards to ensure very long and very dependable performance! Stock and custom displays are available to operate with any Itek encoder. ■ Individual data sheets of any Itek encoder or display are immediately available on request. ■ Modifications to your specific encoder requirements can be accommodated.

Absolute Digisec RA series

Rotary Absolute Optical Shaft Angle Encoders

Model	O.D.	Shaft	Resolution: Binary (2^n)	Resolution: (BCD)
SOLID SHAFT				
15	1.5	.187		
23	2.3	.25	C 11, C 12, C 13, T 16, T 17, T 18, T 19, T 20	
35	3.5	.375	C 12, C 13, C,S 14, C,S 15, C,S 16, S 17	C 3.6K, S 36K
THRU-HOLE	O.D.	I.D.		
55	5.5	.75	S 16, S 17, S 18, S 19, S 20	
60	6.0	2.25	S 16, S 17, S 18, S 19, S 20	
100	10.0	2.75	S 16, S 17, S 18, S 19, S 20, S 21	S 36K, S 360K
106	10.0	6.0	S 16, S 17, S 18, S 19, S 20, S 21	S 36K, S 360K
117	11.0	7.0	S 19, S 20, S 21	
158	15.0	8.0	S 20, S 21, S 22	

OD—Outside Diameter ID—Inside Diameter C—Self-contained Electronics
S—Separate electronic enclosure T—2 speed geared paired configurations

Incremental Digisec RI series

Rotary Incremental Optical Shaft Angle Encoders

Model	O.D.	Shaft	Resolution: Binary (2^n)	Resolution: Decimal
SOLID SHAFT				
15	1.5	.187	C 8, C 9, C 10, C 11, C 12, C 13	C 0.1K, C 0.5K, C 1.0K, C 1.8K, C 2.0K, C 3.6K, C 4.0K, C 5.0K, C 8.0K
23	2.3	.25		
35	3.5	.375	C 13, C 14, C 15, C 16, C 17	C 20K, C 32K, C 36K, C 40K, C 50K, C 64K, C 72K, C 80K, C 100K
THRU-HOLE	O.D.	I.D.		
55	5.5	.75	C 16, C 17, C 18, C 19	
60	6.0	2.25		
100	10.0	2.75	C 17, C 18, C 19, C 20	C 360K
106	10.0	6.0	C 17, C 18, C 19, C 20	C 360K
117	11.0	7.0		
158	15.0	8.0	C 20, C 21, S 22	

Absolute Digisec RA series

Features: • Parallel whole word unambiguous out • TTL/DTL compatible • Resolution to 0.31 arc-seconds (22 bits) • Highest accuracies available anywhere • Operating temperature −40° to +71°C • Military Specification rated • Instant on-the-fly readout • LED light sources • Separate Electronics—no electronics in optical unit (thru-hole systems)

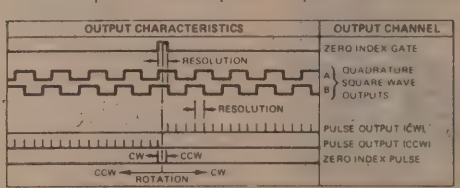
Available Options: • Serial readout • Line driver output • Redundancy • Chrome slit and disc (standard on size 23 and size 158) • Binary lamp display • Subtractor card for electronic zeroing

Detailed Data Sheets are available on request Specifications subject to change without notice

Incremental Digisec RI series

Features: • Quadrature square wave or pulse output, zero index • TTL/DTL compatible • Resolution to 0.31 arc-second (22 bits) • Self-contained electronics • Operating temperature −40° to +71°C • Military Specification rated • LED light sources

Available Options: • Line driver output • Pigtail cable • Square wave or pulse output



Environmental Ratings. All DIGISEC® encoders are designed to meet rigid military specifications. The following environmental specifications are typical.

Temperature: −40° to +71°C	Vibration: 10g
Humidity: 0 to 95%	Shock: 50g, 11 milliseconds

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Measurement Systems
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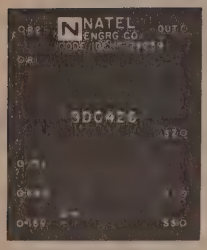
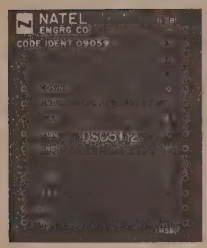
Tel: (617) 969-7300 TWX: 710 335 6783

SYNCHRO CONVERSION BY NATEL



SYNCHRO/RESOLVER-TO-DIGITAL

Function	Model	Input (VRMS)	Output Resolution (Bits)	Output Format	Accuracy (arc-min)	Tracking (°/sec)	Size (see code)
S/R-to-Digital	SD402	11.8/26/90	10, 12	CMOS, TTL or LPTTL	±15, ±7.5	14,400	D
S/R-to-Digital	SD552	11.8/26/90	14, 16		± 4, ±2	3,600	B
S/R-to-Digital	SD602	11.8/26/90	10, 12		±15, ±7.5	14,400	C
S/R-to-Digital	SD632	11.8/26/90	12		± 7.5	7,200	C
S/R-to-Digital	SD634	11.8/26/90	14		± 4	3,600	A
S/R-to-Digital	SD636	11.8/26/90	16		± 2	1,800	A
S/R-to-Digital	SD532	11.8/26/90	14		± 4	3,600	A
S/R-to-Digital	SD2019	11.8/26/90	20		± .06	360	E
S/R Dual Speed	2SD402	11.8/26/90	16		± .6	1,440	A
S/R Dual Speed	2SD412	11.8/26/90	20		± .06	360	F



SYNCHRO/RESOLVER-TO-BCD

Function	Model	Input (VRMS)	Output Resolution	Output Format	Accuracy (°)	Range	Size
S/R-to-BCD	SD330	11.8/26/90	3 Digit	CMOS, TTL or LPTTL	±1°	±179°	A
S/R-to-BCD	SD340	11.8/26/90	3 Digit		±1°	0 to 359°	A
S/R-to-BCD	SD340	11.8/26/90	4 Digit		± .1°	±179.9°	A
S/R-to-BCD	SD341	11.8/26/90	4 Digit		± .1°	0 to 359.9°	A

DIGITAL-TO-SYNCHRO/RESOLVER

Function	Model	Input	Output		Accuracy (arc-min)	Transformation Ratio	Size
			V (L-L)	VA			
D-to-S/R	DSC5012	14 Bits	11.8/26/90	2	±4	±1%	A
D-to-S/R	DSC5112	14 Bits	11.8/26/90	2	±4	± .1%	A
D-to-R	DR5025	10,12 or 14 Bits	7.2	.05	±4	±1%	D
D-to-sin & cos	DSC2028	14 Bits	10sin θ 10cos θ	.05	±10	±7.5%	D
SSCT	SSCT450	Synchro vs. 14 Bit angle	7.2	.05	±4	Null Error 0.4 to 1 VRMS/°	A
SCDX	SCDX460	Synchro vs. 14 Bit angle	7.2	.05	±4	Null Error 0.4 to 1 VRMS/°	A

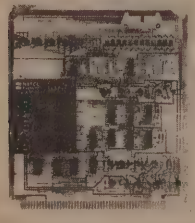
SPECIAL PRODUCTS AND SYSTEMS

- 2-Speed Combiners
- Synchro Drivers
- Multiplex Systems
- Angle Position Indicators

SYNCHRO-TO-ANALOG

Function	Model	Input (VRMS)	Output	Accuracy (min)	Tracking	Size
S/R-to-sin & cos	431	11.8/26/90	10sin θ 10cos θ	±6	±.0015°/RPM	A or G
S/R-to-linear	416/426	11.8/26/90	±10 V-dc	±6	±.007°/RPM	H or A

Reference frequencies can be selected from 47 Hz to 5 kHz.



Size Codes (inches):

Code	L	W	H
A	2.6	3.1	0.82
B	2.6	3.1	0.42
C	2.6	2.6	0.82
D	2.6	2.6	0.42
E	3.5	5.5	0.42
F	2.6	3.6	0.82
G	1.5	2.0	3.5
H	1.4	3.0	4.5

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Instrument Corporation

- DATA ACQUISITION SYSTEMS
- COMPUTER INTERFACES
- SYSTEM 620/H-P CALCULATOR TURN-KEY SYSTEM
- INSTRUMENTATION AMPLIFIERS

DATA ACQUISITION SYSTEMS

System 620 is a complete line of field-proven computer controlled data acquisition products — providing all functions from signal conditioning to computer interface. Each product reflects Neff's high standards of accuracy, versatility and reliability...

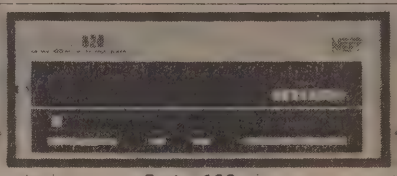
SERIES 100 AMPLIFIER PER CHANNEL SYSTEM. The top of the System 620 family of data acquisition products, the amplifier-per-channel Series 100 offers performance unmatched by any other data acquisition technique. High signal source isolation plus a differential amplifier with guard shield, high-level active filter and FET multiplexer switches **for each channel** provide low noise, 50 kHz throughput rate, 0.01% accuracy and 120dB common mode rejection.

Series 100 offers a choice of four types of differential input amplifiers with plug-in modules for gain and bandwidth selection on each channel. A programmable gain amplifier with gain of 1 through 40 increases the dynamic range of the system under program control. The system is available with a 12-, 14- or 15-bit ADC. Up to 64 channels mount in a single 7 x 19-inch (H x W) enclosure; it is expandable up to 256 channels.

SERIES 200 AMPLIFIER PER CHANNEL SYSTEM. Series 200 is identical to the Series 100 system, but is expandable to 2048 channels.

SERIES 300 SIGNAL CONDITIONER. A subsystem that conditions the output of signal transducers to be compatible with analog measuring systems, the System 300 contains an excitation power supply for each channel providing either constant voltage or constant current excitation. It also has bridge completion circuits and calibration for up to 64 channels per enclosure. Plug-in mode cards configure each channel for operation with a particular type of transducer.

SERIES 400 DIFFERENTIAL MULTIPLEXER. The Series 400, by virtue of its fully guarded differential inputs, provides performance unmatched by systems of its type. An input guard shield, surrounding sensitive input circuits, is driven by the common mode component of the input signal. This achieves 120dB rejection without switching individual guard shields and allows the system to operate from either grounded or floating inputs without degradation.



Series 100

An input filter on each channel rejects superimposed noise and unwanted signal frequencies. CMOS/FET multiplexer switches provide high isolation and allow throughput rates to 10kHz. The system's programmable gain amplifier provides program-controlled input sensitivity from 5mv to 10 volts. Accuracy is enhanced by an automatic zero circuit that compensates for internal drift. Series 400 is available with a 12- or 14-bit ADC. Up to 256 channels are accommodated in one enclosure; the system is expandable to 2048 channels.

COMPUTER INTERFACE. Standard interfaces to most commonly used minicomputers are available. Both Programmed I/O and DMA data transfer are offered.

SERIAL DATA LINK. The Serial Data Link provides asynchronous serial transmission over two coaxial cables between the controlling computer and up to eight System 620's located at remote test sites. It permits data acquisition and encoding at the individual test sites — reducing analog cabling requirements.

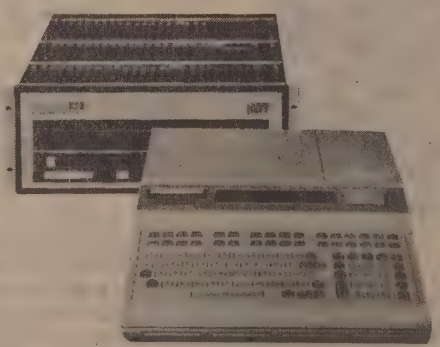
A serial data transmitter accepts 16-bit parallel computer words and converts them to serial form. Transmissions to and from the remote sites are in the form of a 20-bit pulse train. All transmitted and received data is checked for parity and pulse count — both on a per-word and data block basis. An error flag is set if errors are detected. Separate 16-bit parallel data output and status words are returned to the computer.

SYSTEM 620S "TURN-KEY" SYSTEM

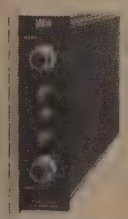
The "Turn-Key" System 620S consists of either the Series 100 or Series 400 system interfaced to the Hewlett-Packard Model 9825A Desk Top Calculator, used for system control, data storage and processing. The 9825A's speed, computational capability and fast semiconductor memory provide the system control and data processing power of a minicomputer while retaining the operating convenience of a calculator.

The system is supplied with standard data acquisition programs. A built-in, two-track tape cassette drive is used to load programs and record data. Its easy-to-learn high-level programming language was designed especially for technical personnel having little or no programming experience.

A variety of high-speed I/O techniques including DMA, buffered I/O and fast read/write with vectored interrupt capability can be utilized. A 16-bit parallel hardware interface provides data transfer rates to 43,000 samples per second in DMA mode with the Series 100 system and up to 9800 samples per second with Series 400.



INSTRUMENTATION AMPLIFIERS



Neff offers a complete line of differential instrumentation amplifiers for laboratory, industrial and aerospace applications. Neff amplifiers feature gains of 1 to 2500, accuracy of 0.01%, 120dB CMR, switch selectable filter, simultaneous narrowband and wideband outputs, integral power supplies and separate input and output zero controls.

Models are available with 300V common mode, programmable gain, galvanometer output and fullscale zero offset capability. A single-channel case is available as well as 8-channel or 16-channel rack mounting enclosures.

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If you're into AC Instrumentation or ATE, then you've probably worked with our high-accuracy, high-reliability instrumentation . . . or wanted to! We are the innovators of equipment and modules based on an industry-first usage of LSI that resulted in performance parameters unmatched by competitive products.

All North Atlantic equipment reflects the highest state-of-the-art technology. Each product we produce goes through extensive testing including burn-in at a 100% level.

Now! LSI in Synchro Converter modules!

Founded on our leadership in AC Instrumentation is our innovative line of data conversion modules. Making use of advanced LSI technology, all receive the same, intensive quality-control tests as our instruments including burn-in. If you're into data conversion, your logical next step should be to learn about our LSI-enhanced modules.

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- LSI/85 Single Speed S/D
- LSI/36 2 Speed S/D
- 785 1.25VA D/S

ANGLE POSITION INDICATORS
- 8300 0.01 Resolution
- 8800 0.001 Resolution

SYNCHRO SIMULATOR
- 530 0.0001 Resolution
- 532 DPM Style
- 538 Digital Interface

SYNCHRO BRIDGES
- 540/10 0.0001° Resolution
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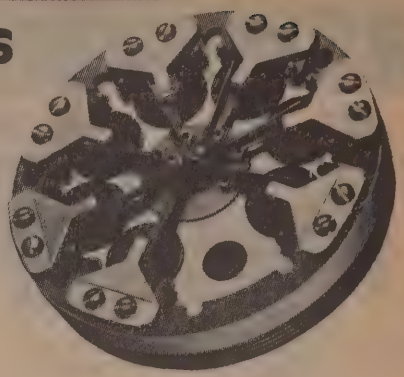
Today's Most Advanced Printers Aren't Just Different At Heart...

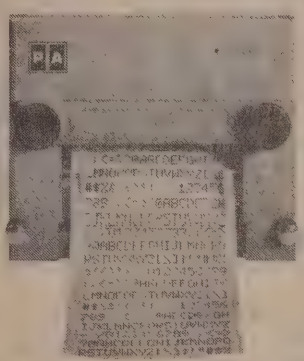


All Matri-Dot printers start with this difference: a unique dot matrix print head that outperforms all others . . . smaller in size, high (150cps) speed, longer needle stroke for crisper multiple copy printing, and lower power consumption. 7 x 5 dot matrix characters provide full alphanumerics with a complete ASCII 63-character set — perfect head start for a full capability family!

They're Far Ranging In Capabilities

DMTP-3
Smallest Data/Text Printing Mini

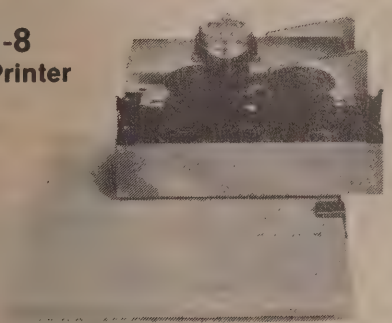
Smallest 20-column alphanumeric impact printer available, it's just 3"H x 3½"W x 7"D for single copy printing, 9" deep for multiples. Prints both "first line up" text or "first line down" data print formats . . . even prints enhanced letters. Drop-in ink platen prints 75,000 lines without messy ribbons, ink reservoirs or costly special papers. Request Bulletin 904.



DMTP-6
Microprocessor-Compatible Printer

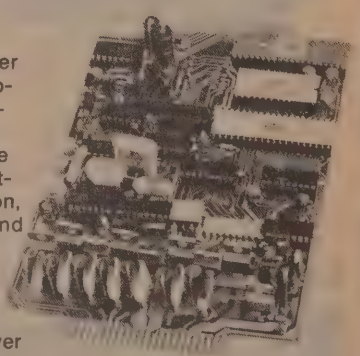
Available in 80-96 column widths, this uniquely versatile tape printer turns out both text and data at 110 cps. It prints from 1-4 copies without adjustment, using ordinary adding machine paper, impact-sensitive paper, even fan-fold forms and labels. Easily replaceable ink rollers combine with self-reversing ribbon for 10-million-character life. Request Bulletin 911.

DMTP-8
Forms Printer



Three open sides allow easy insertion of receiving forms, invoice forms, virtually any size documents. Prints up to 48 characters and any number of lines; accepts form sets form 3 to 15 mils thick — typically an original and four copies. Adapts for varying applications with choice of straight-through feed, or bidirectional feed and ejection. Request Bulletin 914.

uP 7-2
Microprocessor Controller



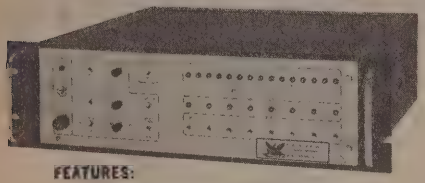
Control any DMTP Series Matri-Dot printer with this internally programmable option. Interfaced between the printer and the outside world, it provides built-in character generation, diagnostic routines, and a choice of such logic functions as ASCII, RS-232C/I-Loop and selectable baud rates from 110 to 1200. Power supply and mating harness also available. Request Bulletin 921.

PA **PRACTICAL AUTOMATION, INC.**

Trap Falls Road, Shelton, Conn. 06484
Tel 203-929-5381 Telex 96-4217

PDI® Analog Data Acquisition Subsystems

6000 SERIES High Level Analog Data Acquisition Systems



Units in the 6000 Series are highly flexible instruments, with many options, that can be matched exactly to the capabilities and characteristics of the control unit or data storage device. Within the 6000 Series there are three subgroups. The subgroups feature high speed, high temperature stability, and low cost. All three groups offer resolution from 8 to 15 binary bits and will accommodate up to 256 single ended or 128 differential inputs in a single chassis. These features combined with single channel, random and sequential address capabilities make the 6000 Series easily adaptable to your system requirements without the need for costly custom engineering. The system comes complete with all necessary power supplies for its operation and requires only 110V AC line power.

FEATURES:

- Multiplexed Thruput Rates to 1MHz
- Temperature Compensation to 10 ppm
- Versatile optional Manual Controls and Indicators
- Choice of Standard Input Voltage Range Options
- Field Expandable to 256 Channels (S.E.)
- Differential or Single Ended Input
- Resolution to 15 Bits
- Input Overvoltage Protection to ±30 Volts
- System Accuracies to 0.01%

3 SUB-SERIES

6900 - Highest Speed

The 6900 group provides the highest thruput rate in the 6000 Series. Resolution of 8 to 15 binary bits is available with multiplexing rates to 1 MHz for an 8 bit model, 400 KHz for a 12 bit model and 220 KHz for a 15 bit model. The 6900 system was designed primarily for applications where the analog input bandwidths are high. Base price: $3,344.00.

Model No.	6908	6910	6912	6913	6914	6915	Notes
No. of Bits (Binary)	8	10	12	13	14	15	
Resolution (1 Part in)	255	1,023	4,095	8,191	16,383	32,767	
Thruput Rate (KHz)	1000	800	400	250	220	220	(1)
Thruput Error (% FSR @ 25°C)	0.4	0.15	0.05	0.03	0.02	0.01	(2)
Input Ranges (STD)	A,B	A,B	A,B,C,D,E	A,B,C,D,E	B,C,D,E	B,C,D,E	(3)

General 6900 Specifications
System T.C.: 0.003% FSR/°C
Aperture Delay: 10 nanoseconds
Aperture Uncertainty: 1 nanosecond

Notes:
(1) Thruput rate for sequential mode or random mode when address is supplied one channel ahead.
(2) Accuracy specification includes all error sources and the quantizing error of ±½ LSB.
(3) Input ranges: A=0 to +5V; B=±5V; C=0 to 10V; D=±10V; E=±10.24V

6700 - Highest Stability

The 6700 group provides the highest thermal stability of the 6000 Series. The overall system temperature coefficient is less than 0.001% FSR/°C or 10PPM. This system was designed specifically for applications where wide temperature variations might be encountered and high accuracy must be maintained. Base price: $2,542.00.

Model No.	6708	6710	6712	6713	6714	6715	Notes
No. of Bits (Binary)	8	10	12	13	14	15	
Resolution (1 part in)	255	1,023	4,095	8,191	16,383	32,767	
Thruput Rate (KHz)	110	90	65	60	20	20	(1)
Thruput Error (% FSR @ 25°C)	0.4	0.1	0.025	0.015	0.01	0.01	(2)
Input Ranges (STD)			A,B,C,D,E			B,C,D,E	(3)

General 6700 Specifications
System T.C.: 0.001% FSR/°C
Aperture Delay: 10 nanoseconds
Aperture Uncertainty: 1 nanosecond

Notes:
(1) Thruput rate for sequential or random mode
(2) Accuracy specification includes all error sources and the quantizing error of ±½ LSB
(3) Input ranges: A=0 to +5V; B=±5V; C=0 to 10V; D=±10V; E=±10.24V

6400 - Lowest Cost

The 6400 offers an attractive compromise between thruput rate, temperature stability, and cost. While the lowest priced group in the 6000 Series, it offers moderate thruput rates and thermal stability. The 6400 group was designed for applications where low cost is a major consideration along with reasonably high performance. Base price: $2,091.00.

Model No.	6408	6410	6412	6413	6414	6415	Notes
Number of Bits (Binary)	8	10	12	13	14	15	
Resolution (1 part in)	255	1,023	4,095	8,191	16,383	32,767	
Thruput rate (KHz)	70	65	50	25	10	4	(1)
Thruput Error (% FSR @ 25°C)	0.4	0.1	0.025	0.015	0.01	0.01	(2)
Input Ranges (STD)			A,B,C,D,E			B,C,D,E	(3)

General 6400 Specifications
System T.C.: 0.002% FSR/°C
Aperture Delay: 50 nanoseconds
Aperture Uncertainty: 10 nanoseconds

Notes:
(1) Thruput rate for sequential or random mode
(2) Accuracy specification includes all error sources and the quantizing error of ±½ LSB
(3) Input Ranges: A=0 to +5V; B=±5V; C=0 to 10V; D=±10V; E=±10.24V

7000 SERIES • Automatic/Programmable Gain Ranging

The 7000 Series offers a unique solution to high speed analog to digital conversion where the input amplitude cannot be predicted in advance of the conversion. Utilizing a high speed, fast settling multi-range amplifier the 7000 Series can switch channels, determine the gain range, and perform a 14 bit A to D conversion in less than 20 microseconds. Five models with thruput rates from 10 KHz to 50 KHz are available. In the Autoranging mode a 14 bit data word is combined with 2 bits of range data for a 16 bit output word. A single chassis will accommodate from 8 to 128 differential channels. Base price: $6,367.00.

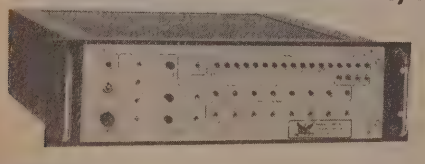
Model No.		7115	7215	7315	7415	7515	Notes
Thruput Rate (KHz)		10	20	30	40	50	
Thruput Error (% FSR @ 25°C)							(1)
Full Scale	±10.0	0.01	0.01	0.01	0.01	0.01	
Input	±1.0	0.015	0.02	0.025	0.03	0.035	
Range (Volts)	±0.1	0.02	0.025	0.03	0.04	0.05	

Features:
- Resolution to 15 bits
- Thruput Accuracy to .01%
- Auto or Programmable Gain Ranging
- Four Customer Selected Gain Ranges from 0.1 to 10.0 Volts
- Multiplexed Thruput Rates to 50 KHz

General 7000 Specifications
Input Ranges (Customer Selectable): Any four from ±0.1 to ±10.0 Volts
Input Impedance: 100 megohms (ON or OFF)
CMRR (DC to 60 Hz with 350 ohms source unbalance)
Gain Level: 1 = 80 db; 10 = 100 db; 100 = 120 db
Common Mode and Normal Mode Voltage: ±11 Volts.
Cross Talk Rejection (DC to 1 KHz with 350 ohms source unbalance)
Thruput Rate (KHz): 10 = 110 db; 20 = 104 db; 30 = 98 db; 40 = 92 db; 50 = 86 db
Gain Range Change: 90% of full scale
Thruput T.C.: 0.002% FSR±3 μ volts RTI/°C

Notes:
(1) Thruput error includes all error sources and ±½ LSB in automatic mode. Error is slightly less in programmed mode.

8000 SERIES • Automatic/Programmable Gains to 1024



The 8000 Series features adaptability to almost any input signal currently in use. The system offers automatic or programmed gain selection with 11 binary ranges from ±10 millivolts to ±10.24 volts full scale. In the automatic ranging mode the gain ranges effectively provide the system with a binary floating point capability. The data word (12 binary bits) is combined with the range data (4 binary bits) for a 16 bit output word. The 8000 System will resolve input changes at 5 microvolts on the ±10 millivolt range for an overall analog dynamic range of 132 db. Base price: $4,438.00.

Gain Ranges: 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024
Input Ranges: ±10.24, 5.12, 2.56, 1.28, 0.64, 0.32, 0.16, 0.08, 0.04, 0.02, 0.01 Volts
Thruput Error: Less than .05% of the reading on any input over 5 millivolts @ 25°C
Differential CMRR (DC to 60 Hz): 80 db at unity gain and increasing to 120 db at a gain of 1024 with 350 ohms source unbalance
Common Mode and Normal Mode Voltage: ±11 Volts.
Prices subject to change without notice.

Aperture Time: 50 nanoseconds
System T.C.: 0.001% FSR±1 μ volt RTI/°C
Crosstalk Rejection: Minimum of 100 db, DC to 60 Hz
Input Impedance: 100 megohms (ON or OFF)
Thruput Rates:
Automatic Gain Ranging Mode
Single Channel ..... 2.5 KHz
Multiplexed Input ..... 1.0 KHz
Programmed Gain Mode
Fixed Gain, Single Channel ..... 20 KHz
Gain and Channel Switching ..... 1.8 KHz

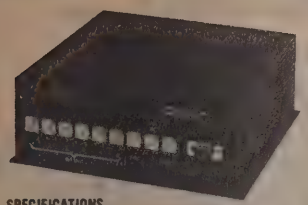
Features
- Resolution of 12 Bits
- 11 Binary Gain Ranges
- ±10 mv to ±10.24V Input Ranges
- Thruput Rates to 20 KHz
- Auto or Programmable Gains
- System Accuracy of 0.05% of Reading

Subsystem computer interfaces available. Contact factory for quotation.

PHOENIX DATA, INC.

3384 W. OSBORN RD. PHOENIX, AZ 85017
Ph. (602) 278-8528, TWX 910-951-1364

PDI High Speed Analog to Digital Converters



MODEL ADC1106-100
A/D CONVERTER COMBINES
High Speed with
(100 million conversions per second)
Exceptional Accuracy
(±0.75%±½LSB)

SPEEDS to 100 MHz

Phoenix Data's new very-high-speed (100 million conversions per second) analog to digital converter is designed to digitize ultra-high-speed analog input signals — including high-speed display and radar signal digitized input — with accuracy of ±0.75%±½LSB.

The new ADC1106-100 also has a resolution of 6-bit binary or 2's complement with a ±2 volt input range. A "system-ready" module only 8"x 8"x 3", it is totally self-contained and incorporates all of the functions necessary to perform 6-bit binary conversions at 100 million per second except for power supply. Model ADC1106-60 is identical with Model ADC1106-100 except that conversions are performed at a rate of 60 million per second.

SPECIFICATIONS

ANALOG INPUT SIGNAL	
Accuracy	±0.75%±½LSB
Full Range	±2 volts
Connection	Coaxial, Single Ended
Input Impedance	50 Ohms
Bandwidth, 1dB	50 MHz
CTC (Command to Convert) STROBE	
Logic Type	ECL
Input Impedance	50 Ohms
Conversion	Initiated on negative going transition
Pulse Repetition Rate (PRR)	100,000,000/Second
Pulse Duration	Square wave
END OF CONVERSION (EOC)	
Pulse	ECL level, rising edge signifies EOC
Delay	Occurs approx. 30 nanoseconds after CTC Strobe
DATA OUTPUTS	
Code	6-bit Binary and 2's complement with monotonicity
Logic Type	ECL compatible
Drive	50 Ohm lines
Parallel Data Out	Sustained 1 cycle
Output Skew	±1.0 nanosecond (typical)
POWER REQUIREMENT	
+5.2Vdc ± 5% @ 2.0 ampere	
—5.2Vdc ± 5% @ 4.0 ampere	
PACKAGE	Approx. 8.0"x8.0"x3"
ENVIRONMENTAL	
Temperature	
Operating	0°C to +50°C
Storage	—55°C to +125°C
Humidity	0 to 99% relative, no condensation

Base price: 1106-60: $6,847.; 1106-100: $13,721.

HIGH SPEED BUFFER MEMORY for A/D converter, high speed data buffering

GENERAL DESCRIPTION

The Model MEM 1108-100/2560 Buffer Memory has been specifically designed for use with Phoenix Data's Ultra High Speed D/A Converters — Models 1105-60/100 1106-60/100, where standard analog conversion rates range as high as 100 MHz for high speed communication and other data acquisition applications. The MEM 1108-100/2560 is also ideally suited for use with other A/D converter systems employing up to 8-bit resolution and ECL interface logic. When used with Phoenix Data A/D Converters, the buffer memory accepts the 6-bit converter output, and in addition, two external CPU supplied control or identifier bits as a part of each 8-bit data word. All memory write operations are synchronized (strobed) by the converter End-Of-Conversion (EOC) pulse.

Phoenix Data's Model MEM 1108-100/2560 High Speed Buffer Memory represents the latest in memory design technology and data acquisition modules — allowing the user to buffer ultra-high speed analog data conversions for greater efficiency and more effective use of computer interfacing. Data blocks of 2560 A/D converted data words can be accumulated and stored in memory at rates of up to 100 megawords per second, while memory read-out is accomplished at a 4 megaword rate when using the internal buffer clock, or at any other selected rate up to 4 megawords per second when using an externally supplied clock.

FEATURES

- 2560 Word Storage Capacity
- 8-bit Word, Parallel Input/Output
- Up to 100 MHz Word Input Rate
- Up to 4 MHz Word Output Rate
- Load Synchronized With End-Of-Conversion Pulse (EOC)
- Internal/External Buffer Read Clock Selection
- ECL Logic (Converter Interface)
- TTL Logic (CPU Interface)
- Output & Recirculate Mode
- Output & Clear Mode
- Fill & Continue Mode
- Fill & Stop Mode

SPECIFICATIONS

- General

Memory Capacity	2560 words
Word Length	8 bits
Input Word Rate	Up to 100 megawords per second
Output Word Rate	4 Megawords per second with internal clock — 0 to 4 Megawords per second with external clock

- Input Data Format — Bit parallel, word serial

Output Data Format	Bit parallel, word serial (sequential . . . first in, first out)

- Input Control Signals

Write Clock (EOC Pulse)	Falling edge of ADC End of Conversion (EOC) pulse (ECL logic)
External Read Clock	0 to 4 MHz buffer read clock from CPU
Output And Recirculate	Output and Recirculate enable from CPU (TTL logic)
Output And Clear	Output and Clear enable from CPU (TTL logic)
Fill And Continue	Continuous Fill enable from CPU (TTL logic)
Fill And Stop	Fill and Stop enable from CPU (TTL logic)
External Stop	External Stop signal from CPU (TTL logic)

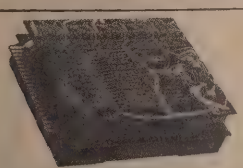
- Output Control Signals

Buffer Full	Logic level from memory (TTL logic). Occurs on first occurrence of location 2560 write (load), in Fill And Stop mode only.
Buffer Empty	Logic level from memory (TTL logic). Occurs on location 2560 read (empty), in Output And Stop mode only.
Output Strobe	One data word outputted for each strobe (TTL logic)

- Operating Modes

Write Memory	1. Fill and Stop — normal sequencial write and terminate on Buffer Full signal (2560 words stored) 2. Fill and Continue — sequential over-write until terminated by External Stop signal from CPU
Read Memory	1. Output and Clear — normal sequential read and clear, terminating on Buffer Empty signal (2560 words outputted) 2. Output and Recirculate — sequential read and circulate until terminated by External Stop signal from CPU

Base price: MEM 1108-100/2560: $10,577.



NEW AND EXCLUSIVE A/D CONVERTER features:
High Speed: 4 μsec. High Resolution: 15 Bits. High Accuracy: ±0.0065% of FSR

Phoenix Data's new Model ADC1215F A/D converter is a high-performance design with a total conversion time of 4 microseconds (250,000 conversions per second), a resolution of 15 binary bits (1 part in 32,767), and guaranteed accuracy of ±0.0065% of FSR in addition to complete monotonicity. Analog dynamic range is in excess of 86 db. Model ADC1215F is available in two basic models: single-ended and differential. The ADC1215F utilizes a single fold-back technique in conjunction with successive approximation conversions to achieve an equivalent conversion rate of 267 nanoseconds per bit.

Model ADC1215 is identical with the ADC1215F except that conversion time is 10 microseconds.

ADC1215F SPECIFICATIONS

ENCODING (Digital Quantizing)	
Number of Bits	15 binary bits
Accuracy (% of Full Range)	0.0065%
Temperature Coefficient	±10 PPM/°C
Resolution	1 part in 32,767
Conversion Time (Total)	4.0 microseconds
ANALOG INPUT SIGNAL	
Standard Full Range	±10V
Connection	Single Ended or Diff. Opt.
Input Impedance	100 Megohm
Overvoltage	±15V, Maximum
CONTROLS, INPUTS AND OUTPUTS	
Output Codes	2's Complement and Offset Binary
Logic Levels	TTL/DTL
Data Output Drive	Full TTL capability
Output Data	Stored until updated at end of conversion
Command to Convert	Conversion is initiated on leading edge of positive going pulse.
Busy Output	Goes true at CTC and False at End of Conversion
End of Conversion	Pulse goes true at End of Conversion 100 nanoseconds duration
Overrange	Output goes full scale and overrange bit goes true
ENVIRONMENTAL	
Temperature/Operating	0°C to +70°C
Temperature/Storage	—55°C to +100°C
Humidity	0 to 99% Relative, non-condensing
POWER REQUIREMENTS	
+15V, ±5% @ 150 MA • —15V, ±5% @ 75 MA • +5V, ±5% @ 900 MA	

Base price: ADC1215: $1,280.; ADC1215F: $1,922.; ADC1215L: $2,190.

Prices subject to change without notice.

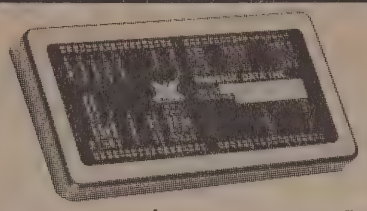
For additional information, contact your local Phoenix Data, Inc. representative.

Prices subject to change without notice.

PHOENIX DATA, INC.

3384 W. OSBORN RD. PHOENIX, AZ 85017
Ph. (602) 278-8528, TWX 910 951-1364

PDI® Analog to Digital Converters



ENCASED A/D CONVERTERS

All 42 units in Phoenix Data's new series of encased, modular A/D converters — ADC1300 thru ADC1800 — employ the highly reliable and stable voltage switching successive approximation conversion technique. Note these features:

1300 SERIES / Model No.	1308	1309	1310	1311	1312	1313	1314
Conv. Time (μsec.)*	15	20	25	30	40	50	100
Error (%FSR)**	0.4	0.2	0.1	0.05	0.025	0.015	0.01
Input Z (Kohms)	20	20	20	20	20	20	20
TC (PPM/°C, 0 to 70°C)***	15	15	15	15	15	10	10
Price 1 to 9	$199.00	$212.00	$197.	$239.00	$251.00	$381.00	$444.00

1400 SERIES / Model No.	1408	1409	1410	1411	1412	1413	1414
Conv. Time (μsec.)*	12	14	17	20	24	35	70
Error (%FSR)**	0.4	0.2	0.1	0.05	0.025	0.015	0.01
Input Z (Kohms)	20	20	20	20	20	20	20
TC (PPM/°C, 0 to 70°C)***	15	15	15	15	15	10	10
Price 1 to 9	$207.	$232.	$251.00	$264.00	$290.00	$398.00	$483.00

1500 SERIES / Model No.	1508	1509	1510	1511	1512	1513	1514
Conv. Time (μsec.)*	8	9	10	12	15	25	35
Error (%FSR)**	0.4	0.2	0.1	0.05	0.025	0.015	0.01
Input Z (Kohms)	20	20	20	20	20	4	4
TC (PPM/°C, 0 to 70°C)***	10	10	10	10	10	5	5
Price 1 to 9	$212.00	$251.00	$278.00	$303.00	$337.00	$420.00	$612.00

1600 SERIES / Model No.	1608	1609	1610	1611	1612	1613	1614
Conv. Time (μsec.)*	6	7	8	9	10	15	20
Error (%FSR)**	0.4	0.2	0.1	0.05	0.025	0.015	0.01
Input Z (Kohms)	20	20	20	20	20	4	4
TC (PPM/°C, 0 to 70°C)***	10	10	10	10	10	5	5
Price 1 to 9	$251.00	$290.00	$317.00	$348.00	$381.00	$410.	$702.00

1700 SERIES / Model No.	1708	1709	1710	1711	1712	1713	1714
Conv. Time (μsec.)*	3.5	4.0	4.5	5.0	6.5	10	15
Error (%FSR)**	0.4	0.2	0.1	0.05	0.025	0.015	0.01
Input Z (Kohms)	20	20	20	20	20	4	4
TC (PPM/°C, 0 to 70°C)***	10	10	10	10	10	5	5
Price 1 to 9	$317.00	$341.00	$381.00	$444.00	$483.00	$624.00	$806.00

1800 SERIES / Model No.	1808	1809	1810	1811	1812	1813	1814
Conv. Time (μsec.)*	2	2.5	3	3.5	4	8	12
Error (%FSR)**	0.4	0.2	0.1	0.05	0.025	0.015	0.01
Input Z (Kohms)	4	4	4	4	4	4	4
TC (PPM/°C, 0 to 70°C)***	10	10	10	10	10	5	5
Price 1 to 9	$381.00	$444.00	$509.00	$572.00	$637.00	$766.00	$895.00

2100 SERIES / Model No.	2114	2115	2116
Conv. Time (μsec.)	40	50	80
Error (%FSR)	±0.004	±0.002	±0.002
Input Z (Mohms)	100	100	100
TC (PPM/°C, 0 to 70°C)	±5	±5	±5
Price 1 to 9	$825.	$895.	$1,045.

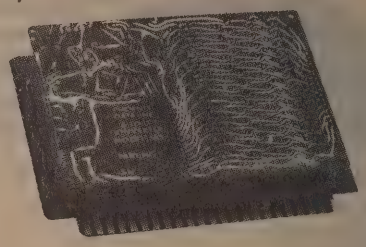
NOTE: All characteristics are available in open-constructed modules. Write for details.

*Total conversion time from trailing edge of TTL/DTL Logic level.

**The conversion error includes all error sources, ±½ LSB and all temperature related errors over the temperature range of 10° to 40°C up to 12 bits and 15° to 35°C for 13 and 14 bit resolution with no adjustments. If an input range other than that specified at time of purchase is selected, the gain and offset may have to be adjusted.

***The temperature coefficient includes all gain, offset, reference, and differential linearity related temperature effects over 0 to 70°C. For extended operating temperature ranges the T.C. degrades by a factor of 2 from +70°C to +125°C and from 0°C to —55°C.

A/D CONVERTERS (PC CARD)



400 SERIES / Model No.	408	409	410	411	412	413	414
Conv. Time (μsec.)	8.0	9.0	10.0	11.0	15.0	35.0	80.0
Error (%FSR)	0.4	0.2	0.1	0.05	0.025	0.015	0.01
Input Z (Kohms)	20	20	20	20	20	20	20
TC (PPM/°C, 0 to 70°)	12 PPM/°C FSR						
Price 1 to 9	$212.	$237.	$261.	$291.	$317.	$375.	$419.

700 SERIES / Model No.	708	709	710	711	712
Conv. Time (μsec.)	3.5	4.0	4.5	5.0	6.5
Error (%FSR)	Up to ±0.025% of Full Range				
Input Z (Kohms)	20	20	20	20	20
TC (PPM/°C, 0 to 70°C)	±10 PPM/°C of Full Range				
Price 1 to 9	$303.	$322.	$355.	$411.	$388.

70 SERIES / Model No.	1270	1370	1470	1570	1670
Conv. Time (μsec.)	13.0	14.0	45.0	250.0	500.0
Error (%FSR)	±0.025	±0.015	±0.01	±0.005	±0.0025
Input Z (Kohms)	20	20	20	20	20
TC (PPM/°C, 0 to 70°C)	±5 PPM/°C				
Price 1 to 9	$381.	$506.	$631.	$756.	$881.

800 SERIES / Model No.	808	809	810	811	812	813	814	815
Conv. Time (μsec.)	2	2.5	3	3.5	4	8	12	35
Error (%FSR)	0.4	0.2	0.1	0.05	0.025	0.015	0.01	0.005
Input Z (Kohms)	4	4	4	4	4	4	4	20
TC (PPM/°C, 0 to 70°C)	15	15	15	15	15	10	10	10
Price 1 to 9	$331.	$381.	$431.	$481.	$581.	$681.	$781.	$881.

900 SERIES / Model No.	908	909	910	911	912
Conv. Time (μsec.)	0.8	0.9	1.	1.5	2.
Error (%FSR)	±0.4	±0.2	±0.1	±0.05	±0.025
Input Z (Kohms)	4	4	4	4	4
TC (PPM/°C, 0 to 70°C)	±20	±20	±20	±20	±20
Price 1 to 9	$548.	$598.	$648.	$698.	$748.

1100 SERIES / Model No.	1105-60	1105-100	1106-60	1106-100
Conv. Time (μsec.)	0.016	0.010	0.016	0.010
Error (%FSR)	±1.5% ±½LSB	±1.5% ±½LSB	±0.75% ±½LSB	±0.75% ±½LSB
Input Z (ohms)	50	50	50	50
Temp. Range (operating)	0°C to 50°C	0°C to 50°C	0°C to 50°C	0°C to 50°C
Price 1 to 9	$3527.00	$7007.00	$6847.00	$13,721.00

Military versions available. Contact factory for specifications and quotations.

1200 SERIES / Model No.	1215	1215F	1215L
Conv. Time (μsec.)	10	4	5.5
Error (%FSR)	0.005	0.0065	±0.004
Input Z (Mohms)	100	100	100
TC (PPM/°C, 0 to 70°C)	10	10	5
Price 1 to 9	$1,280.	$1,922.	$2,190.

2000 SERIES / Model No.	2014	2015	2016
Conv. Time (μsec.)	40	50	80
Error (%FSR)	±0.004	±0.002	±0.002
Input Z (Mohms)	100	100	100
TC (PPM/°C, 0 to 70°C)	±5	±5	±5
Price 1 to 9	$725.	$795.	$945.

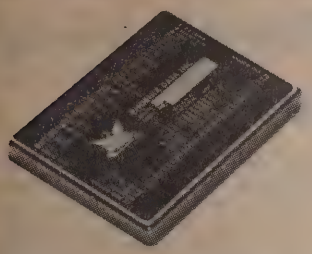
Prices subject to change without notice.

PHOENIX DATA, INC.

3384 W. OSBORN RD. PHOENIX, AZ 85017
Ph. (602) 278-8528. TWX 910-951-1364

PDI Encased Digital to Analog Converters – 3000 Series

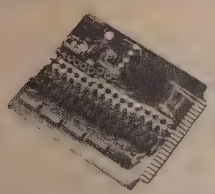
SPECIFICATIONS EDAC Series 3000 — Encased Digital to Analog Converters



Model	Input Resolution (Note 1)	Full Range Slew & Settling Time (Note 2) (usec.)	Accuracy of FSR (Note 3)	Linearity of FSR	Temperature Coefficient (0°C to 70°C) (Note 4)	Performance	Price 1-9
3012	12 Bits	15	±0.02%	±0.010%	10 ppm/°C	Standard	$206.
3112	12 Bits	15	±0.01%	±0.006%	5 ppm/°C	Precision	251.
3212	12 Bits	1	±0.02%	±0.010%	10 ppm/°C	High Speed	275.
3312	12 Bits	1	±0.01%	±0.008%	5 ppm/°C	Precision & High Speed	329.
3413	13 Bits	15	±0.015%	±0.008%	10 ppm/°C	Standard	262.
3414	14 Bits	17	±0.0125%	±0.007%	10 ppm/°C	Standard	319.
3415	15 Bits	20	±0.010%	±0.006%	10 ppm/°C	Standard	422.
3416	16 Bits	20	±0.007%	±0.004%	10 ppm/°C	Standard	570.
3513	13 Bits	15	±0.010%	±0.006%	5 ppm/°C	Precision	320.
3514	14 Bits	17	±0.007%	±0.004%	5 ppm/°C	Precision	389.
3515	15 Bits	20	±0.005%	±0.003%	5 ppm/°C	Precision	514.
3516	16 Bits	20	±0.003%	±0.0015%	5 ppm/°C	Precision	686.
3613	13 Bits	1.0	±0.015%	±0.008%	10 ppm/°C	High Speed	342.
3614	14 Bits	1.5	±0.0125%	±0.007%	10 ppm/°C	High Speed	411.
3615	15 Bits	2.0	±0.010%	±0.006%	10 ppm/°C	High Speed	549.
3616	16 Bits	3.0	±0.007%	±0.004%	10 ppm/°C	High Speed	732.
3713	13 Bits	2.0	±0.010%	±0.006%	5 ppm/°C	Precision & High Speed	400.
3714	14 Bits	2.5	±0.007%	±0.005%	5 ppm/°C	Precision & High Speed	480.
3715	15 Bits	3.5	±0.006%	±0.004%	5 ppm/°C	Precision & High Speed	640.
3716	16 Bits	4.5	±0.004%	±0.002%	5 ppm/°C	Precision & High Speed	858.

NOTES:
1. Lower resolution units available on request.
2. Conversion time includes settling time to rated accuracy for a full-range step (worse case). See Conversion Timing Diagram.
3. Accuracy figures include all error parameters.
4. Standard operating temperature range is 0°C to 70°C. Extended temperature ranges are available. Also, on special order, units available to 2.5 ppm/°C.
5. For Model Number Coding, see Ordering information.
6. For special configurations or applications, contact your local Phoenix Data, Inc. representative or the factory.
7. The temperature coefficient includes all gain, offset, reference and differential linearity related temperature effects over 0 to 70°C. For extended operating temperature ranges the T.C. degrades by a factor of 2 from +70°C to +90°C and from 0°C to —55°C.

DIGITAL TO ANALOG CONVERTERS — PC Card — including Military and Industrial Types



Model	Input Resolution (Bits)	Full Range Slew & Settling Time (Note 1) (usec.)	Accuracy of FSR (Note 6)	Linearity of FSR	Temperature Coefficient (0°C to 70°C) (Note 7)	Price
PDAC1270A(2)	12	10	±0.01%	±0.006%	±5 PPM/°C	$226.
PDAC1370A	13	10	±0.01%	±0.006%	±5 PPM/°C	290.
PDAC1470A	14	10	±0.01%	±0.006%	±5 PPM/°C	355.
PDAC1570A	15	15	±0.005%	±0.003%	±5 PPM/°C	585.
PDAC1670A	16	15	±0.005%	±0.0015%	±5 PPM/°C	741.
PDAC1270R(3)	12	10	±0.01%	±0.006%	±5 PPM/°C	251.
PDAC1370R	13	10	±0.01%	±0.006%	±5 PPM/°C	317.
PDAC1470R	14	10	±0.01%	±0.006%	±5 PPM/°C	381.
PDAC1570R	15	15	±0.005%	±0.003%	±5 PPM/°C	612.
PDAC1670R	16	15	±0.005%	±0.0015%	±5 PPM/°C	766.
DAC1570G(4)	15	20	±0.005%	±0.002%	±5 PPM/°C	947.
DAC1670G	16	20	±0.005%	±0.002%	±5 PPM/°C	1092.
DAC1670G-4D(5)	16	20	±0.005%	±0.002%	±5 PPM/°C	1152.
DAC1590G Mil.	15	20	±0.005%	±0.002%	±5 PPM/°C	2052.

NOTES: (1) Faster Settling Times Available. Settling time is to rated accuracy. (2) "A": Without Input Holding Register. (3) "R": With Input Holding Register. (4) "G": Put "Glitch" less than 1 LSB. (5) "4D": Four Decade BCD Code. (6) Accuracy at 25°C including all error sources. (7) Includes all temperature-related errors.

SAMPLE & HOLD 7000 SERIES SPECIFICATIONS

Model No.	Description	Standard Modules 4.5x3"	4.5x5"	Double Ended Module 3.75x 4.625"	Input Connection Differential	Single Ended	Acquisition Time (usec.) Full range step slew & settle to accuracy	Accuracy % FS @ 25°C	TC (PPM/°C) Thruput	Aperture Time Typical (ns)	Short Term Aperture Jitter (ns)	Track To Hold Settle Time (ns)	Input Characteristics (Typical) Impedance @ DC @ 25°C	Bias Current @ 25°C	Output Characteristics Impedance @ 25°C	Current (Max.)	Price 1 to 9 (Single) Sample & Hold	Price 1 to 9 (Dual) Sample & Hold
7012	Moderate speed.	X				X	13	±0.0125	±2½	30	10	500					$104.	$161.
7112			X			X	13	±0.0125	±2½	30	10	500	1000 Mohms	50 na	0.8 ohm @ DC	5 ma	109.	166.
7212	Suitable for ADC's		X		X		15	±0.015	±3½	30	10	500					138.	195.
7312	thru 13 bits.			X		X	13	±0.0125	±2½	30	10	500					114.	181.
7412				X	X		15	±0.015	±3½	30	10	500					143.	237.
7014	Moderate speed.	X				X	15	±0.007	±2½	30	10	600					161.	269.
7114			X			X	15	±0.007	±2½	30	10	600	1000 Mohms	50 na	0.8 ohm @ DC	5 ma	166.	281.
7214	Suitable for ADC's		X		X		17	±0.009	±3½	30	10	600					195.	336.
7314	thru 15 bits			X		X	15	±0.007	±2½	30	10	600					172.	293.
7414				X	X		17	±0.009	±3½	30	10	600					200.	348.

8000 SERIES SPECIFICATIONS

8012	Higher speed.	X				X	4	±0.0125	±3.5	30	10	300					$136.	$222.
8112			X			X	4	±0.0125	±3.5	30	10	300					141.	233.
8212	Suitable for ADC's		X		X		5	±0.015	±4.5	30	10	300	1000 Mohms	250 na	0.2 ohm @ DC	5 ma	213.	371.
8312	thru 13 bits.			X		X	4	±0.0125	±3.5	30	10	300					150.	248.
8412				X	X		5	±0.015	±4.5	30	10	300					219.	382.
8014	Higher speed.	X				X	5	±0.008	±3.5	30	10	400					209.	363.
8114			X			X	5	±0.008	±3.5	30	10	400					214.	374.
8214	Suitable for ADC's		X		X		6	±0.01	±4.5	30	10	400					281.	500.
8314	thru 15 bits.			X		X	5	±0.008	±3.5	30	10	400	1000 Mohms	250 na	0.2 ohm @ DC	5 ma	223.	389.
8414				X	X		6	±0.01	±4.5	30	10	400					286.	512.

9000 SERIES SPECIFICATIONS

9010	High speed	X				X	1	±0.025	±10.	20	3	200					$211.	$367.
9110	Suitable for ADC's		X			X	1	±0.025	±10.	20	3	200	500 Mohms	250 na	0.2 ohm @ DC	10 ma	217.	377.
9210	thru 11 bits		X		X		1.5	±0.035	±12.	20	3	200					286.	512.
9310				X		X	1	±0.025	±10.	20	3	200					223.	389.
9410				X	X		1.5	±0.035	±12.	20	3	200					293.	523.
9012	High speed.	X				X	2	±0.015	±10.	20	3	250					247.	435.
9112	Suitable for ADC's		X			X	2	±0.015	±10.	20	3	250					252.	446.
9212	thru 13 bits.		X		X		2.5	±0.02	±12.	20	3	250	500 Mohms	250 na	0.2 ohm @ DC	10 ma	331.	595.
9312				X		X	2	±0.015	±10.	20	3	250					258.	457.
9412				X	X		2.5	±0.02	±12.	20	3	250					336.	606.
9014	High speed.	X				X	3	±0.01	±7.5	20	3	300					322.	580.
9114	Suitable for ADC's		X			X	3	±0.01	±7.5	20	3	300	500 Mohms	250 na	0.2 ohm @ DC	10 ma	328.	591.
9214	thru 15 bits.		X		X		3.5	±0.0125	±10.	20	3	300					398.	725.
9314				X		X	3	±0.01	±7.5	20	3	300					334.	542.
9414				X	X		3.5	±0.0125	±10.	20	3	300					404.	736.

NOTE 1: 15 bit SAH's require tuning to the individual ADC.
NOTE 2: All SAH's are designed to have a full scale range of ±10V output. That is: a voltage range of +5V input will have a gain of 2.

ENCASED SAMPLE AND HOLD

(2" long x 2" wide x 0.39" high, hot-tin-dipped steel covered module.) Shielded on six sides against RFI and on five sides against EMI. Completely repairable. One SAH per card.

Model	Connection	INPUT Range	Impedance	Aperture	Accuracy	Settling Time	Output Current	Hold Mode Droop	Price 1 to 9
SAH1	Single ended	+10V to —10V	100 Mohm	50 ns	±0.01% of FS	10us to ±0.01%	±2 ma	2uv/us	$149.
SAH3	Single ended	+10V to —10V	100 Mohm	10 ns	±0.025% of FS	1us to ±0.025%	±5 ma	50uV/us	234.

MULTIPLEXERS. Open or encased modules; Standard 44-pin or double-ended card for back rack insertion. Input ranges to ±10V standard, others optional. Overvoltage protection optional. Single ended or Differential Inputs, Output submultiplexing.

MODEL	DESCRIPTION	PRICE
870S	8 channel Differential or	$322.
1670S	16 channel Single Ended Standard card.	322.
1670D	16 channel Singled Ended; double ended card.	$322.
870D	8 channel Differential; double ended card.	322.
MUX08	8 channel Single Ended; 2"L x 2"W x 0.39"H encased module.	168.

Prices subject to change without notice.

PHOENIX DATA, INC. 3364 W. OSBORN RD. PHOENIX, AZ 85017 Ph. (602) 278-8528, TWX 910-951-1364

PRESTON

ANALOG-TO-DIGITAL
For the Highest Accuracy

GMAD Series Analog-to-Digital Converters

Here are the world's most reliable Analog-to-Digital Conversion Systems with speed and resolution to meet the needs of every instrumentation and data conversion system.

From the 'world's fastest high resolution ADC'—the GMAD-01 — to the new 'low cost' GMAD-4 that can be easily expanded to over 1000 analog input channels at less than $25 per channel, Preston's GM Series of ADCs are delivered with exactly the right amplifiers, multiplexers, controls, indicators and interface features to give your system the ultimate in accuracy, flexibility and efficiency!

And every model in the GM Series comes complete with integral power supplies and interface connectors — ready to install in a standard 19 inch wide rack.

With the GM Series of ADCs, you have a complete selection of low-level and high-level analog amplifiers and multiplexers. This versatile input system is further complemented by a choice of several Sample-and-Hold Amplifiers and special gain scaling buffer amplifiers whose configurations include manual or remote programmed address and automatic gain control capability.

For complete information including detailed specifications, block diagrams, timing charts and examples of overall system performance, call or write Preston Scientific. We'll send you our "Specifying Guide" and include price and delivery information, too!

Preston's ADCs interface with all types of analog input signals —

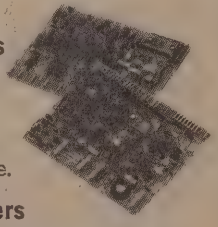
Model GMM Multiplexers

Available with both single-ended and differential inputs, GMM Multiplexers provide a common output line isolated from all other signals by 2000 Megohms.

Expandable to over 1000 channels as system requirements grow, Model GMM Multiplexers specifications include —

Input Impedance	Greater than 50 Megohms
Switching Time	Less than 1 microsecond
Input Offset Current	Less than 10 nanoamps
Input Voltage	Up to ±10 volts
Crosstalk	Less than ±0.01% for 100 channels
Linearity	±0.01% of Full Scale
Zero Drift	Less than ±0.01% of F.S.

Model GMD-PG and GMD-ADC Programmable Gain Amplifiers

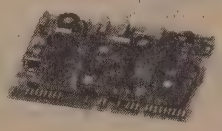


These gain scaling amplifiers are specifically designed for Analog-to-Digital Conversion applications where the full scale amplitude of the input signals vary over a wide range.

Model 8300 XWB Series Amplifiers

For the ultimate in accuracy, reliability and system flexibility, the exclusive "Balanced Precision" performance of the 8300 XWB Series Amplifier is unsurpassed. Models are available with both manual and remotely programmed gain and filter selection on a per-channel basis for use in ADC systems.

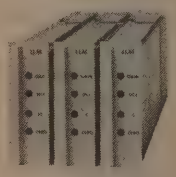
Model GMD Amplifier-Multiplexers



This card-mounted amplifier-multiplexer provides a low-cost amplifier-per-channel input signal system for full scale analog signals in the range from 10 millivolts to 100 volts. Optional output filters cover frequencies from 1 Hz to 60 kHz.

Model LLM Series Low Level Multiplexers

Preston's newest multi-channel analog input system provides the high accuracy of "amplifier-per-channel" performance with transformer isolated low-level multiplexing at channel rates up to 50 kHz.

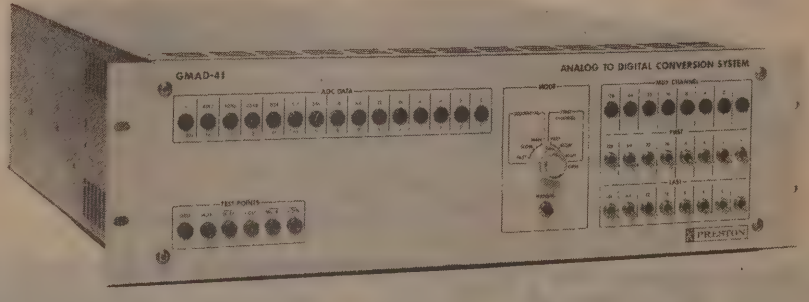


Gain accuracy, stability and linearity are all within ±0.01% of full scale, and the input impedance is 100 Megohms.

As many as 2048 data channels can be combined in a single system. Performance includes accuracy that is compatible with a 14 bit resolution ADC and provides a CMR of 130 db at 60 Hz with a 350 volt CMV. Stability specifications include a Zero TC of less than 0.1 uV/°C RTI and 0.1 MV/°C RTO, resulting in the same "Balanced Precision" specifications that are the hallmark of Preston's famous instrumentation amplifiers.

Outstanding features of the LLM System include INPUT DATA FILTERS from 10 Hz to 30 kHz, PROGRAMMABLE GAIN from 1X to 1000X on a per-channel basis (gain memory optional), and DIGITAL AVERAGING using the ADC as a digital filter (programmable on a per-channel basis with optional memory).

There's a lot more to tell about how Preston's LLM Systems provide the ultimate in low-level A-D conversion with sophisticated performance and operating features at moderate cost, so please request our comprehensive 12-page brochure for the complete LLM System story.



CONVERSION SYSTEMS
in Data Acquisition Systems

PRESTON

Five Models Are Included In the GMAD Series To Provide An Exceptionally Wide Range of Speeds and Resolutions.

Resolution	Accuracy (% of F.S. ±½ L.S.B.)	Conversion Time GMAD-01	GMAD-1	GMAD-2	GMAD-3	GMAD-4
14 binary bits + sign	0.010%	*	1.5 μsec	5.0 μsec	10 μsec	20 μsec
13 binary bits + sign	0.015%	*	1.4 μsec	4.5 μsec	9 μsec	19 μsec
12 binary bits + sign	0.025%	0.5 μsec	1.2 μsec	4.0 μsec	8 μsec	18 μsec
11 binary bits + sign	0.05%	0.4 μsec	1.0 μsec	3.5 μsec	7 μsec	17 μsec
10 binary bits + sign	0.1%	0.3 μsec	0.3 μsec	3.0 μsec	*	16 μsec
9 binary bits + sign	0.2%	0.2 μsec	0.2 μsec	2.5 μsec	*	*
8 binary bits + sign	0.4%	0.1 μsec	0.1 μsec	2.0 μsec	*	*
7 binary bits + sign	0.8%	*	0.1 μsec	1.5 μsec	*	*
4-digit BCD and sign	0.01%	*	*	10 μsec	40 μsec	*
3-digit BCD and sign	0.1%	*	*	8 μsec	32 μsec	*

*These configurations not available

and all types of digital output, control and computer signals, too.

Model GMDAC-2 Digital-to-Analog Converters

Module-mounted digital-to-analog converters are also available in the GM Series Systems to make the generation of analog data simulation as accurate and reliable as the basic A-D converter.

Specifications include 15 bit resolution and accuracy, update rates to 500 kHz and outputs of 10 volts or 100 volts full scale.

Model GMCAM and GMSDM Memory (New for '78)

Channel Address (CAM) Random Access Memories are now available for most GM Series ADC Systems. The Channel Address Memory allows the user to enter a list of channels to be converted. The GM System control logic then sequentially scans the memory locations and digitizes the data on the listed channels.

System Data (SDM) Output Memories provide built-in storage capability for the digitized data. The SDM Memory is available for either Random Access or FI-FO (First-In — First Out) type operations. These output data memories provide the user with a limited on-line storage system to reduce the data servicing overhead usually allocated to the user's computer system.

Memory Systems are available in 256, 512 and 1024 word blocks with 8 to 16 bit word length.

Model GMDSRC Digitally Programmable Clock

This optional crystal-based scan rate clock permits selection of a wide range of multiplexing rates so that the ADC system's speed can be optimized on a per-channel basis.

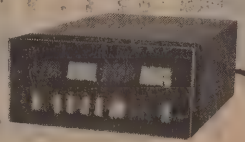
The GMAD-1 ADC System shown here is equipped with the clock address control, controls for multiplexer first- and last-channel limits (GMC Logic System) and address switches to enter gain address for GMD-PG/AGC Gain Scaling Amplifiers.

Front panel indicators also provide ADC Data and Currently Addressed Channel as a LED binary display.

Logic Interface To Your Computer

Direct interfacing with your computer or controller can now be made an integral part of every GMAD Series A/D Conversion System. Preston can include plug-in logic and control modules that provide the right sequencing and logic levels to match your particular computer system.

Just let us know the type of computer you plan to interface with our ADC, and we'll provide all the 'hand-shaking' signals you need.

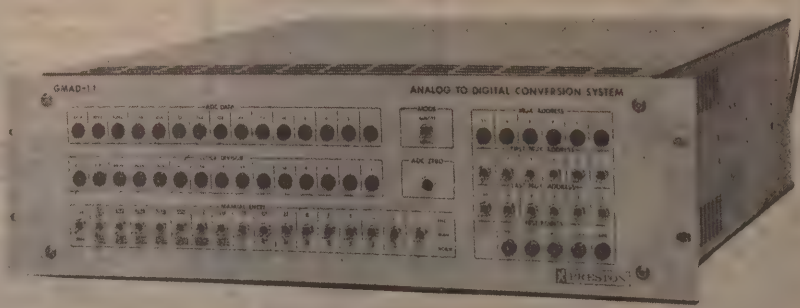


If you're using a DEC PDP-11, HP 2100, Varian V-73, Data General NOVA or other similar computers, we already have the interface system ready to install, and we'll even provide the interconnecting cables!

Save yourself time, trouble and expense. Call or write Preston Scientific for details. We'll make certain you get a complete GMAD ADC System — ready to operate the first day it arrives!

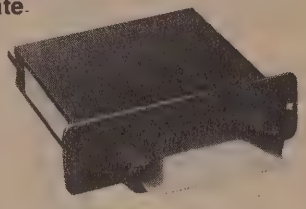
PRESTON SCIENTIFIC INCORPORATED
805 East Cerritos Avenue,
Anaheim, California 92805
Telephone: (714) 776-6400
TELEX 65-5321

PRESTON



CARD AND BADGE READERS

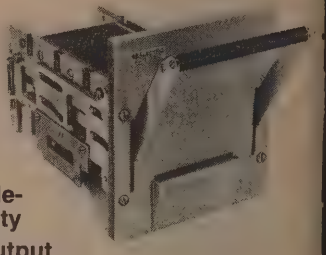
SOLID STATE BADGE READERS



- Completely solid state. One moving part
- Reads up to 22 Columns, 12 rows, Alpha-Numeric
- Absolute validation of readings
- Compact, low-cost

An ultra-reliable badge reader for time-clock, production floor data collection, security systems and other data station requirements. Reads complete Hollerith information. Provides column strobe for every column regardless of punched data. Cannot be "teased," misoriented, or otherwise fooled. Serial data output.

STATIC CARD READERS

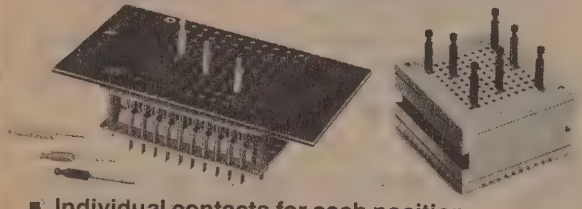


- 80 or 51 column x 12 row models
- Static. Data remains in "read" mode until card is removed
- Redundant contact designs assure reliability
- Discreet input and output at every data position

The best for heavy industrial use. Single transaction readers, manually operated with heavy duty mechanisms for long life. Buss bars available for rows or columns or both. Complete interlock systems to eliminate misinformation from incorrectly positioned documents.

PROGRAMMING DEVICES

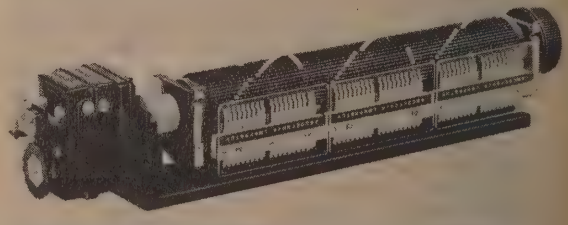
PROGRAM BOARDS



- Individual contacts for each position. No interaction
- Complete range of accessories for every type of programming
- Available in .250", 4mm, or .100" c-c spacing, in any number of holes

The economical, simple way to program, switch, or test any signals. Simple electrical matrix that can be interconnected by shorting or diode pins. Ideal for process control, machine control, sequential testing and dozens of other applications. Direct readout or program at all times.

PROGRAM SWITCHES



- 60 programs on drum. Up to 60 circuit control
- Manual, time based, or stepper drives
- 1 Amp, 7 Amp or 15 Amp carrying capacity

Extra compact programming capability at reasonable cost with high reliability. Simply set programs with inserts on each line of 60 position drum. Programs will run sequentially either on real time base, manually, or upon command from process feedback.

PROGRAMMING DEVICES DIVISION

SEALECTRO CORPORATION

MAMARONECK, NY 10543 PHONE: 914 698-5600 TWX: 710-566-1110

Sealectro West, 14011 Ventura Blvd., Suite 215, Sherman Oaks, CA 91423, (213) 990-8131
1901 Old Middlefield Way, Suite 19, Mountain View, CA 94043 (415) 965-1212

Sealectro Ltd., Portsmouth, Hants, England

Sealectro S.A., Zone Industrielle Toulon Est, 83087 Toulon Cedex, France

CIRCUIT COMPONENTS ▪ R. F. COMPONENTS ▪ PROGRAMMING DEVICES

TAURUS punched card readers

STATIC/PARALLEL... SERIAL...SERIAL/PARALLEL

A complete line of readers for OEM and system applications

FOR INDUSTRIAL, COMMERCIAL, INSTITUTIONAL USES

BADGE/CARD READERS

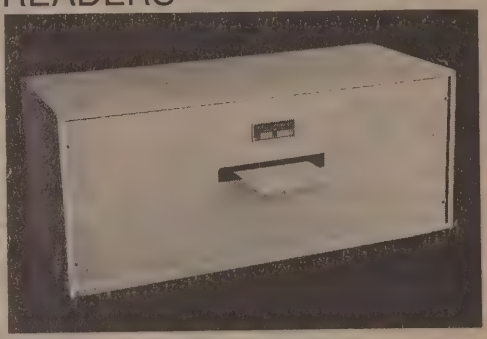
New Series H . . .
4 standard models

Read cards/badges of up to 12 rows and 10, 20, 30, or 68 columns. Optical reading with no moving parts, ensuring error-free readout, long life, minimum maintenance. Completely self-contained. To operate, merely insert badge or card fully and withdraw. Readout is character (column) serial, bit (row) parallel.

Particularly suitable for security and access-control applications. Can easily replace less satisfactory readers in existing installations. Designed for OEM and system applications. Custom-feature models can be supplied.

The 10-column Model H-10 is pictured. For complete details on our complete badge/card reader line, request Series H Catalog.

SERIAL READERS



Read cards one column at a time. Photo-electric hole sensing. Solid-state logic or relay output. With or without hopper feed. Free-standing or panel-mount. Various output formatting . . . bit parallel, ASCII, teletype, etc. In use since 1967.

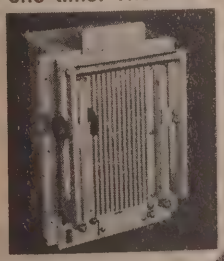
- 168 standard options. Custom options also available.
- 6 Card-Handling Modes
- 7 Readout Modes
- 3 Data-Valid Features

These card readers are specifically designed for OEM and systems applications in the warehousing, data-handling, industrial and process control, manufacturing and other fields where conditions are not especially favorable for card readers.

STATIC OR PARALLEL READERS . . . 3 MODELS

Read all or part of an IBM card in parallel. Put card in, push handle. HOLE . . . closed switch. NO HOLE . . . open switch. (Opposite can also be provided.) Contacts not through the card. Reliable indirect switching. All switching at one time. Thousands in use since 1956.

MODEL M-4A
up to 80 columns



MODEL JM-4A
up to 40 columns

MODEL CM-20
specifically designed for stacker cranes

For complete details on our lines of serial and static/parallel readers, request Punched Card Readers Catalog.

We also supply . . .
Teflon-Insulated Terminals . . .
Circuitrak PCB Guides.

TAURUS
CORPORATION
Lambertville, New Jersey 08530
Telephone: (609) 397-2390

All Taurus readers are of heavy-duty design for highest reliability and long life.

TIMING EQUIPMENT

8363
Time Code Translator/Generator

SPECIFICATIONS

TIME BASE
EXTERNAL FREQUENCY STANDARD: 1 MHz (5 MHz Optional). **OPTIONAL INTERNAL FREQUENCY STANDARD: Frequency:** 1 MHz. **Temperature Stability:** $\pm 3 \times 10^{-9}$/°C. **Aging Rate:** $\pm 5 \times 10^{-9}$/day. **Retrace:** $\pm 1 \times 10^{-8}$ after 24 hours off.

Model 8363
Specify Model 8362 if days are desired

SYNCHRONIZATION
Automatic WWV Synchronization: WWV tick. **External Start:** Pulse. **Slew:** 1 μs/s through 100 ms/s in decade steps. **Propagation Delay:** Compensates for delays of 0 to 99.9 ms (18.6K miles) in 0.1 ms increments. **Translate Mode Synchronization:** Unit locks onto and remains fully synchronized to incoming code. Thumbwheel switches may be used to compensate for transmission delays of 0 to 99.9 ms.

TIME DISPLAY
Six 0.6-inch planar indicators display time-of-day.

CODE INPUT
Format: Available formats include IRIG A, IRIG B, IRIG G, NASA 36 Bit, XR3, and 2137. **Level:** 0.5 to 8 volts peak-to-peak (wide range options available).

CODE OUTPUTS
Formats: IRIG, NASA, XR3, and 2137 in modulated and DC level-shift forms. **Level-Shift Codes:** Standard TTL; adjustable outputs (0 to 10V peak into 300 ohms) optionally available. **Modulated Codes:** Mark/space ratio 3.3:1; coherence to "on-time" less than $\pm 1°$ of the carrier cycle; crossover discontinuities less than 1 percent; amplitude adjustable from 0 to 7 volts peak-to-peak; IRIG A, B, G, NASA 36 Bit, and 2137 will drive 50 ohms; others will drive 500 ohms.

OUTPUT OPTIONS
Parallel: BCD time-of-day plus 1 pps strobe, straight-binary time-of-day plus 1 pps strobe, or group-binary time-of-day plus 1 pps strobe. **Sinewave:** Consult factory for available frequencies and levels. **Millisecond and Rate:** BCD milliseconds plus 1 ppm through 10K pps, phase-coherent to within 10 ns.

OPTIONAL COMPUTER INTERFACE
Addressable storage of output formats and remote control of generator functions.

POWER
95 to 135 VAC, 48 to 440 Hz, RFI filtered. **Battery Backup Provision:** 11 to 14 VDC (display not on).

PHYSICAL
Weight: 12 pounds. **Mounting:** Standard 19-inch rack (slides optional). **Size:** 19 inches wide x 3.47 inches high x 15 inches deep. **Temperature:** 0°C to +60°C.

8365
Universal IRIG Time Code Generator

SPECIFICATIONS

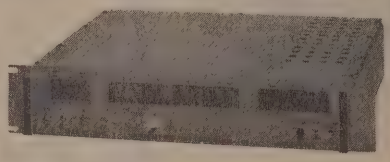
TIME BASE
EXTERNAL FREQUENCY STANDARD: 1 MHz (5 MHz optional). **OPTIONAL INTERNAL FREQUENCY STANDARD: Frequency:** 1 MHz. **Temperature Stability:** $\pm 3 \times 10^{-9}$/°C. **Aging Rate:** $\pm 5 \times 10^{-9}$/day. **Retrace:** $\pm 1 \times 10^{-8}$ after 24 hours off.

SYNCHRONIZATION
Automatic WWV Synchronization: WWV tick. **External Start:** Pulse. **Slew:** 1 μs/s through 100 ms/s in decade steps. **Propagation Delay:** Compensates for delays of 0 to 99.9 ms (18.6K miles) in 0.1 ms increments.

LEAP YEAR RESET
Day 001 after day 365 or 366.

TIME DISPLAY
Nine 0.6-inch planar indicators display time-of-year.

CODE OUTPUTS
Formats: IRIG A, IRIG B, IRIG D, IRIG E, IRIG G, and IRIG H in DC level-shift form. **Level:** Standard TTL; adjustable outputs (0 to 10V peak into 300 ohms) optionally available. **Optional Modulated Codes:** Mark/space ratio 3.3:1; coherence to "on-time" less than $\pm 1°$ of the carrier cycle; crossover discontinuities less than 1 percent; amplitude adjustable from zero to 7V peak-to-peak; IRIG A, B, G will drive 50 ohms, others will drive 500 ohms.



OUTPUT OPTIONS
Parallel: BCD time-of-year plus 1 pps strobe, straight-binary time-of-day plus 1 pps strobe, and group-binary time-of-day plus 1 pps strobe. **Sinewave:** Consult factory for selection of frequencies and levels. **Millisecond and Rate:** BCD milliseconds plus 1 ppm through 10K pps, phase-coherent to within 100 ns.

OPTIONAL COMPUTER INTERFACE
Addressable storage of output formats and remote control of generator functions.

POWER
95 to 135 VAC, 48 to 440 Hz, RFI filtered. **Battery Backup Provision:** 11 to 14 VDC (display not on).

PHYSICAL
Weight: 12 pounds. **Mounting:** Standard 19-inch rack (slides optional). **Size:** 19 inches wide x 3.47 inches high x 15 inches deep. **Temperature:** 0°C to +60°C.

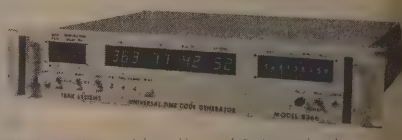
8366
Time Code Generator

SPECIFICATIONS

TIME BASE
EXTERNAL FREQUENCY STANDARD: 1 MHz (5 MHz optional). **OPTIONAL INTERNAL FREQUENCY STANDARD: Frequency:** 1 MHz. **Temperature Stability:** $\pm 3 \times 10^{-9}$/°C. **Aging Rate:** $\pm 5 \times 10^{-9}$/day. **Retrace:** $\pm 1 \times 10^{-8}$ after 24 hours off.

SYNCHRONIZATION
Automatic WWV Synchronization: WWV tick. **External Start:** Pulse. **Slew:** 1 μs/s through 100 ms/s in decade steps. **Propagation Delay:** Compensates for delays of 0 to 99.9 ms (18.6K miles) in 0.1 ms increments.

LEAP YEAR RESET
Day 001 after day 365 or 366.



Model 8366
Specify Model 8361 if days not desired

TIME DISPLAY
Nine 0.6-inch planar indicators display time-of-year.

CODE OUTPUTS
Formats: IRIG, NASA, XR3, and 2137 in modulated and DC level-shift forms. **Level-Shift Codes:** Standard TTL; adjustable outputs (0 to 10V peak into 300 ohms) optionally available. **Optional Modulated Codes:** Mark/space ratio 3.3:1; coherence to "on-time" less than $\pm 1°$ of the carrier cycle; crossover discontinuities less than 1 percent; amplitude adjustable from zero to 7 volts peak-to-peak; IRIG A, B, G, NASA 36 Bit, and 2137 will drive 50 ohms; others will drive 500 ohms.

OUTPUT OPTIONS
Parallel: BCD time-of-year plus 1 pps strobe, straight-binary time-of-day plus 1 pps strobe, and group-binary time-of-day plus 1 pps strobe. **Sinewave:** Consult factory for selection of frequencies and levels. **Millisecond and Rate:** BCD milliseconds plus 1 ppm through 10K pps, phase-coherent to within 100 ns.

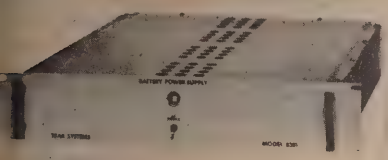
OPTIONAL COMPUTER INTERFACE
Addressable storage of output formats and remote control of generator functions.

POWER
95 to 135 VAC, 48 to 440 Hz, RFI filtered. **Battery Backup Provision:** 11 to 14 VDC (display not on).

PHYSICAL
Weight: 12 pounds. **Mounting:** Standard 19-inch rack (slides optional). **Size:** 19 inches wide x 3.47 inches high x 15 inches deep. **Temperature:** 0°C to +60°C.

8381 & 8317
Battery Power Supply

MODEL 8381
esigned to smoothly and instantaneously upply all of the necessary DC voltages to RAK Timing Equipment in the event of loss of rimary AC power. The unit has the capacity to ower the Timing Equipment for up to 36 ours, depending on the number of options in he equipment being operated.



SPECIFICATIONS

SWITCHES/INDICATORS
ON/OFF toggle switch; charging lamp indicator; analog voltmeter.

PHYSICAL
Weight: 55 pounds. **Mounting:** Standard 19-inch rack. **Size:** 19 inches wide x 3.47 inches high x 22 inches deep. **Panel Finish:** Light Gray. **Temperature:** 0°C to +60°C.

RECHARGE TIME
20 hours to recharge after a complete discharge cycle.

MODEL 8317

SPECIFICATION
Same as 8381 except:

POWER CAPACITY
Six to eight hours.

PHYSICAL
Weight: 23 pounds. **Size:** 19 inches wide x 3.47 inches high x 12 inches deep.

RECHARGE TIME
8 hours to recharge after a complete discharge cycle.

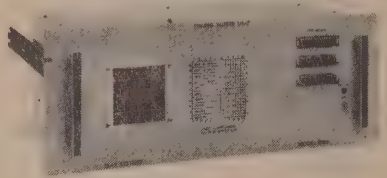
8383
Timing Buffer Unit

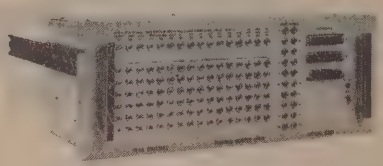
SPECIFICATIONS
INPUT
Input levels: up to ± 10 Volts.
Frequency response: DC to 5 MHz. **Input impedance:** greater than 180 K ohms per channel. DC to 100 KHz, 1 K ohm at 5 MHz.

OUTPUT
Output level: 95% of input (minimum). **Output Impedance:** 10 ohms max. at 1 KHz. Wide range of applications include buffering time codes, pulse rates, parallel time data, and sine wave rates for distribution to other equipment. Some of the many options available: (1) Front panel patch fields allow patching of any input time code or rate into any output. (2) Front panel test points. (3) Precision rate and time codes input up to 20 channels and provide six isolated outputs per channel. **Example:** Input a single ended NASA PB-2 parallel code at TT logic levels and provide two separate outputs at RS422 differential balanced output levels. Will accept 49 dynamic bits of the PB-2 code.

INPUT POWER
115 VAC ±10%, 50 to 440 Hz.

PHYSICAL
3½" or 5¼" deep x 19" standard rack mount.



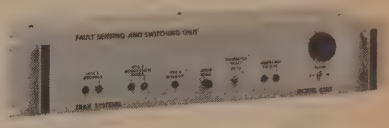


8385
Fault Sensing and Switching Unit

SPECIFICATIONS
INPUT
Modulated codes: Formats, IRIG "A" (10 KHz), IRIG "B" (1 KHz), IRIG "D" (1 KHz), IRIG "E" (1 KHz), IRIG "H" (1 KHz). Level, 1 to 7 V_{pp}. Mark/space ratio, 2:1 to 6:1. Loading, IRIG "B": 4K ohms; others: none. **Level-shift codes:** Formats, IRIG "A", "B", "D", "E", "G", "H". Rates, 1 pps, 10 pps, 100 pps, 1 K pps. Baseline, 0.2 ±0.2 Vdc. Amplitude, 3.4 ±0.1 Vdc. Loading, IRIG "B": 2 TTL LS loads; others: one TTL LS load.

PERFORMANCE
(1) Monitors the IRIG "B" outputs from two time code generators. (2) Provides automatic and manual switch-over. (3) Monitors IRIG "B" dropouts and modulation irregularities. (4) Compares phase difference of greater than 10 μ sec or bit dropout. (5) Each type of error lights a front panel indicator and sounds an audible alarm.

PHYSICAL
Weight: 5 lbs. **Height:** 3½". **Depth:** 6¼" excluding projections. Standard 19" rack mount.



TRAK SYSTEMS
DIVISION OF TRAK MICROWAVE CORP
Mail Station E-8
4726 Eisenhower Boulevard
Tampa, Florida 33614
Phone (813) 884-1411
Telex 52-827

TIMING EQUIPMENT

8371 & 8395
Time Code Readers

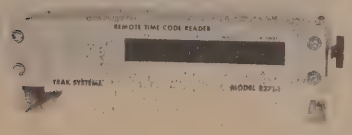
SPECIFICATIONS
INPUTS
Code input: IRIG B, IRIG E, NASA 36 BIT, XR3, 2137. **Impedance:** 150K ohms level: 0.5 to 10.0Vpp without adjustments. **Modulation Ratio:** 2:1 to 6:1. **Carrier Frequency:** 100Hz (IRIG E), 250Hz (XR3) 1000Hz (others)

SYNCHRONIZATION
Display updates within ±5ms of "on-time" (once per second)

DISPLAY
Seven-segment red LED's. Numeral height is 0.5 inches with reading distance of 30 feet.

INPUT POWER
110 or 220 VAC ±10%, 50 to 400 Hz, 15 watts nominal.

PHYSICAL
Weight: 4 pounds. **Height:** 3 inches. **Width:** 14 inches. **Depth:** 5 inches (excluding ¾" heat sink), mounting bracket supplied.

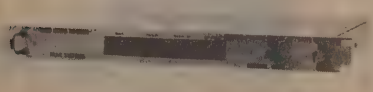


MODEL 8395
SPECIFICATIONS
INPUTS
Code input: IRIG A or B, NASA 36 BIT, XR3, 2137. **Impedance:** 4 ohms. **Level:** 50 mv to 10 Vpp (wider range option available). **Modulation ratio:** 2:1 to 6:1. **Carrier Frequency:** 100Hz to 25K Hz. **Input filtering:** Optionally available.

DISPLAY
Red LED's. Numeral height is 0.5 inches. Display test optional.

INPUT POWER
115 VAC 10%, 60 to 400Hz.

OUPUTS
Serial code: Buffered input code capable of driving a minimum of 200 feet of unterminated coaxial cable or twisted pair (optional). **Parallel:** BCD days, hours, minutes and seconds, DTL and TTL compatible (optional). **Isolation:** All outputs separately buffered and short-circuit proof.



PHYSICAL
Weight: 8 pounds. **Height:** 1.72 inches. **Width:** 19 inches. **Depth:** 13.25 inches. **Mounting:** Standard 19 inch rack. **Temperature:** 0°C to +60°C.

8386
Time Code Generator/ Reader

SPECIFICATIONS
TIME BASE
Internal frequency standard: 1 MHz. **Temperature stability:** $\pm 1 \times 10^{-9}$/°C. **Aging rate:** $\pm 5 \times 10^{-9}$, 1 day. **Retrace:** $\pm 1 \times 10^{-8}$ after 24 hours off.

Automatic direction detection: will read forward and reverse. **Automatic error by-pass:** will read distorted codes.

CODE INPUT
Format: IRIG "B" standard. Others optionally available. **Level:** .1 V_{pp} to 14 V_{pp}. **Modulation ratio:** 2:1 to 6:1.

CODE OUTPUT
Format: IRIG "B" standard. Others optionally available.

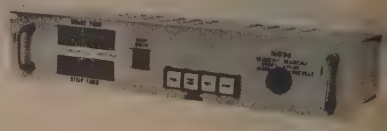
OPTIONS
In both Generator and Read Modes: BCD millisecond (12 bits) and 1 pps through 1000 pps rate outputs. **Parallel outputs:** BCD time of year; straight binary time of day; group binary time of day. **Slow code outputs:** (1) Time of year in BCD amplitude- and width-modulated format. (2) Frame rates of 1, 5 and 10 seconds or 1 and 10 minutes. (3) Output level from 1 to 10 V_{pp} into 300 ohms.

INPUT POWER
95 to 135 VAC, 48 to 400 Hz, 25 W nominal.

PHYSICAL
Weight: 15 lbs. **Chassis:** standard 19" rack mount. **Height:** 3½" and **Depth:** 15", exclusive of projections.

8384
Time Code Generator/Tap Search Unit

SPECIFICATIONS
INPUT
Amplitude: .2 to 14 V_{pp}. **Impedance:** 50 K ohms. **Format:** IRIG "B". Others optionally available. **Mark/space ratio:** 3:1 to 6:1. **Direction:** Forward or reverse. **Frequency:** 200 Hz to 100 KHz, with filter supplied; to 250 KHz with optional filters.



OUTPUT
DC level-shift code: Baseline, 0.2 ±0.2 Vdc. Amplitude, 3.4 ±1.0 Vdc. Rise time, 20 ns max. 1 to 90% amplitude. Fall time, 20 ns max. 90 to 10% amplitude. Loading, will drive 5 standard TTL load **Adjustable dc level-shift code (optional):** Baseline, 0.2 ±0.2 Vdc. Amplitude, 0 to 10 Volts peak. Rise time, 50 ns max. 10 to 90% amplitude. Fall time, ns max. 90 to 10% amplitude. Loading — will dr 300 ohms. **Modulated code:** Format, IRIG "B". Leve to 7 V_{pp},adjustable. Mark/space ratio, 2:1 to 6:1, adjustable. Output loading, 50 ohms min. (500 oh for 100 Hz codes). Coherence to "on-time" less tha ±1° of one carrier cycle; crossover discontinuities less than 1%. **Start coincidence pulse:** Baseline, 3. ±1.0 Vdc. Pulse level, 0.2 ±0.2 Vdc. Rise and fal times, 20 ns max. 10 to 90% amplitude. Duration, second nominal. Description, pulse is generated a selected START TIME when unit is in FWD (Playbac mode. **Stop coincidence pulse:** Same as start coincidence pulse except that pulse appears at selected STOP TIME. **Recorder "Stop" control:** All three connections of form-C relay. Contacts rated 3A, 130 Vac. Closure time for command is one second nominal. **Recorder "Fwd" (play) control:** Same as "Stop" control. **Recorder "Fast Fwd" control:** Same as "Stop" control. **Recorder "Rev" control:** Same as "Stop" control. **Recorder "Command" control:** Relay closure coincident with each of the four commands described above.

PHYSICAL
Height: 3½". **Depth:** 15" exclusive of projections. Standard 19" rack mount.

INPUT POWER
95 to 135 Vac, 48 to 400 Hz, 35 W nominal.

TIME BASE
Built-in frequency standard: Aging rate, ±5 to 10^{-9}/day or better.

8368
Time Code Generator

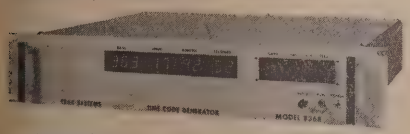
SPECIFICATIONS

TIME BASE
OPTIONAL EXTERNAL FREQUENCY STANDARD: 1 or 5 MHz.
INTERNAL FREQUENCY STANDARD: Frequency: 1 MHz. **Temperature Stability:** $\pm 3 \times 10^{-9}$/°C. **Aging Rate:** $\pm 5 \times 10^{-9}$/day. **Retrace:** $\pm 1 \times 10^{-8}$ after 24 hours off.

LEAP YEAR RESET
Day 001 after day 365 or 366.

TIME DISPLAY
Nine 0.6-inch planar indicators display time-of-year.

CODE OUTPUTS
Formats: IRIG, NASA, XR3, and 2137 in modulated and DC level-shift forms. **Level-Shift Codes:** Standard TTL; adjustable outputs (0 to 10V peak into 300 ohms) optionally available. **Modulated Codes:** Mark/space ratio 3.3:1; coherence to "on-time" less than $\pm 1°$ of the carrier cycle; crossover discontinuities less than 1 percent; amplitude adjustable from 0 to 7 volts peak-to-peak; IRIG A, B, G, NASA 36 Bit, and 2137 will drive 50 ohms; others will drive 500 ohms.



Model 8368
Specify Model 8367 if days not desired

OUTPUT OPTIONS
Parallel: BCD time-of-year plus 1 pps strobe, straight-binary time-of-day plus 1 pps strobe, and group-binary time-of-day plus 1 pps strobe. **Sinewave:** Consult factory for selection of frequencies and levels. **Millisecond and Rate:** BCD milliseconds plus 1 ppm through 10K pps, phase-coherent to within 100 ns.

OPTIONAL COMPUTER INTERFACE
Addressable storage of output formats and remote control of generator functions.

POWER
95 to 135 VAC, 48 to 440 Hz, RFI filtered.
Battery Backup Provision (optional): 11 to 14 VDC (display not on).

PHYSICAL
Weight: 12 pounds. **Mounting:** Standard 19-inch rack (slides optional). **Size:** 19 inches wide x 3.47 inches high x 15 inches deep. **Temperature:** 0°C to +60°C.

8370
Time Code Translator/Generator

SPECIFICATIONS

TIME BASE
OPTIONAL EXTERNAL FREQUENCY STANDARD: 1 or 5 MHz.
INTERNAL FREQUENCY STANDARD: Frequency: 1 MHz. **Temperature Stability:** $\pm 3 \times 10^{-9}$/°C. **Aging Rate:** $\pm 5 \times 10^{-9}$/day. **Retrace:** $\pm 1 \times 10^{-8}$ after 24 hours off.

TRANSLATE MODE SYNCHRONIZATION
Automatically locks onto and remains synchronized to incoming time code.

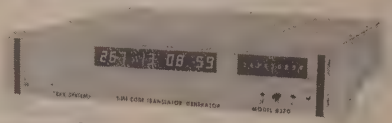
LEAP YEAR RESET
Day 001 after day 365 or 366.

TIME DISPLAY
Nine 0.6-inch planar indicators display time-of-year.

CODE INPUT
Format: Available formats include IRIG A, IRIG B, IRIG G, NASA 36 Bit, XR3, and 2137. **Level:** 0.5 to 8 volts peak-to-peak (wide range options available).

CODE OUTPUTS
Formats: IRIG, NASA, XR3, and 2137 in modulated and DC level-shift forms. **Level-Shift Codes:** Standard TTL; adjustable outputs (0 to 10V peak into 300 ohms) optionally available. **Modulated Codes:** Mark/space ratio 3.3:1; coherence to "on-time" less than $\pm 1°$ of the carrier cycle; crossover discontinuities less than 1 percent; amplitude adjustable from 0 to 7 volts peak-to-peak; IRIG A, B, G, NASA 36 Bit, and 2137 will drive 50 ohms; others will drive 500 ohms.

OUTPUT OPTIONS
Parallel: BCD time-of-year plus 1 pps strobe, straight-binary time-of-day plus 1 pps strobe, and group-binary time-of-day plus 1 pps strobe. **Sinewave:** Consult factory for selection of frequencies and levels. **Millisecond and Rate:** BCD milliseconds plus 1 ppm through 10K pps, phase-coherent to within 100 ns.



Model 8370
Specify Model 8369 if days not desired

OPTIONAL COMPUTER INTERFACE
Addressable storage of output formats and remote control of generator functions.

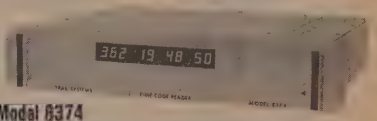
POWER
95 to 135 VAC, 48 to 440 Hz, RFI filtered.
Battery Backup Provision (optional): 11 to 14 VDC (display not on).

PHYSICAL
Weight: 12 pounds. **Mounting:** Standard 19-inch rack (slides optional). **Size:** 19 inches wide x 3.47 inches high x 15 inches deep. **Temperature:** 0°C to +60°C.

8374
Time Code Reader

SPECIFICATIONS

INPUTS
Code Options: IRIG A, IRIG B, NASA 36 Bit (and XR3 and 2137 in Model 8373). **Impedance:** 100K ohms. **Level:** 30 mVpp space to 25 Vpp mark. **Modulation Ratio:** 2:1 to 6:1. **Frequency:** 100 Hz to 40 kHz with filter supplied; to 150 kHz with optional plug-in filter. **Filter:** 40 kHz, 12 dB/octave low pass filter supplied; other frequencies from 250 Hz through 150 kHz optionally available. **Optional Switchable Filter:** 250 Hz, 1000 Hz, 20 kHz, 60 kHz, 80 kHz.



Model 8374
Specify Model 8373 if days not desired

SYNCHRONIZATION
Major scaler is updated when two consecutive frames agree to within one second and continue to count at 1 pps rate derived from incoming code. All code errors are bypassed. Error bypass is active in reverse mode on IRIG and NASA code readers having reverse code reading options.

TIME DISPLAY
Nine 0.6-inch planar indicators display time-of-year.

OUTPUTS
Serial Code: Buffered input code capable of driving a minimum of 200 feet of unterminated coaxial cable or twisted pair. **Parallel (Optional):** BCD hours, minutes, and seconds, DTL and TTL compatible. **Isolation:** All outputs separately buffered and short-circuit proof.

INPUT POWER
95 to 135 VAC, 48 to 440 Hz, RFI filtered, 25 watts (nominal).

PHYSICAL
Weight: 12 pounds. **Mounting:** Standard 19-inch rack (slides optional). **Size:** 19 inches wide x 3.47 inches high x 15 inches deep. **Temperature:** 0°C to +60°C.

For further information, contact TRAK Systems, Division of TRAK Microwave Corporation, 4722 E Eisenhower Boulevard, Tampa, Florida 33614. Telephone 813-884-1411. Telex 52-827.

CATALOGUE DE L'ELECTRONIQUE POUR LES INGENIEURS
DER PRODUKTKATALOG FÜR ELEKTRONIKER
ELECTRONIC ENGINEERS CATALOGUE

The 1978 edition is out...and the response is in...
IMMEDIATE AND OVERWHELMING

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The ELECTRONIC ENGINEERS CATALOGUE is the only comprehensive, trilingual catalogue/source-directory of electronic products available to—and from—Western Europe.

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SYNCHRO CONVERTERS — MUX SYSTEMS

	Input Availability	Output	Static Accuracy	Size
TRACKING SYNCHRO/RESOLVER TO DIGITAL Full transformer isolated units with jitter free output.	Freq.: 50 to 1600Hz L-L V_{RMS}: 5 to 90 Ref. V_{RMS}: 10 to 115	Model 1661: 16 bits 1651: 14 bits 1651-B: 12 bits 1651-C: 10 bits	±1′ ±4′ ±8.5′ ±22′	3.1″ x 3.4″ x .82″ 3.1″ x 2.6″ x 0.82″ 3.1″ x 2.6″ x 0.82″ 3.1″ x 2.6″ x 0.42″
AUTORANGING TRACKING S/D. Model 1653 Transformer isolated. Reference and L-L voltages may vary independently of each other.	Ref.: 44-1500Hz Ref. V_{RMS}: 5-125 L-L V_{RMS}: 5-115	12 bits	±6′	3.1″ x 2.6″ x 0.82″
TRACKING S/D WITH BCD OUTPUT. Model 1662 Transformer isolated units with jitter free output.	Ref.: 50-1500Hz Ref. V_{RMS}: 10-115 L-L V_{RMS}: 5-90	4 Decade BCD	±4′	3.1″ x 2.6″ x 0.82″
14 BIT SYNCHRO OR SIN/COS TO DIGITAL. Series 1623F: Includes ±5° offset capability. Can accept FLUX VALVE inputs.	Freq.: 50Hz to 10KHz L-L V_{RMS}: 5 to 90 Ref. V_{RMS}: 10 to 115	14 bit parallel binary or 4 decade BCD. TTL, DTL compatible.	±4′	3.125″ x 2.625″ x 0.82″
TWO SPEED SYNCHRO-TO-DIGITAL. Series 1512 Combines either binary or nonbinary gear ratios from a two speed system. Only one module required per complete system.	36:1, 18:1, 9:1, 16:1	Up to 19 bits binary parallel.	±0.08′	3.125″ x 2.625″ x 0.82″
MULTIPLEXED SYNCHRO-TO-DIGITAL. Series MUX: Simple, noise immune, small and inexpensive Modular system, up to to 128 channels.	Any combination of Synchros and Resolvers.	14 bits binary parallel 75 μs conversion.	±5′	3.125″ x 2.65″ x 0.82″ + 1.85″ x 0.85″ x 0.82″ per channel
ANGLE POSITION INDICATOR, SOLID STATE. Series 2623: Includes ±5° offset capability. Rugged, compact, accurate and economical. With or without built-in power supplies. Internal reference available.	Freq.: 50Hz to 10KHz L-L V_{RMS}: 5 to 90 Ref. V_{RMS}: 10 to 115	Readout: 3599, ±179.9 or 9999. Others available.	±0.1°	5.5″ x 1.75″ x 5.5″ deep
SYNCHRO OR SIN/COS TO LINEAR DC. Series K678-1637: Converts synchro or resolver inputs to linear DC output proportional to the angle. Connector termination available. Output voltage may be offset.	Freq.: 50Hz to 10KHz L-L V_{RMS}: 5 to 90 Ref. V_{RMS}: 10 to 115	±10VDC for angles −180° to +180°.	6′,15′, 30′ or 1°	**K678:** 3.1″ x 2.6″ 0.82″ **1637:** 2.5″ x 3.2 x 0.78″
SYNCHRO/RESOLVER TO SINE-COSINE DC. Series 655/697: Generates sine and cosine DC outputs proportional to the angle.	Freq.: 60 or 400Hz L-L V_{RMS}: 11.8 or 90 Ref. V_{RMS}: 26 or 115	−10 volts to +10VDC, representing the sine and cosine of the input angle.	±6′	400Hz: 1.85″ x .85″ x .82″
SYNCHRO TO SINE-COSINE DC (non-variant). Series 655NV: Generates sine and cosine DC outputs proportional to the input angle. Insensitive to synchro reference and line voltage. Ideal for displays.	Freq.: 60 or 400Hz L-L V_{RMS}: 11.8 or 90 Ref. V_{RMS}: 26 or 115	−10 volts to +10VDC representing the sine and cosine of the input angle.	±6′	3.44″ x 3.19″ x 0.82″
DIGITAL TO SYNCHRO/RESOLVER, Series 1667:	16 bits LPTTL, levels binary coded angle.	Freq.: 50Hz to 10KHz L-L V_{RMS}: 5 to 90	±1′	3.125″ x 3.625″ x 1″
DIGITAL-TO-SYNCHRO/RESOLVER. Series 1673: Miniaturized, 1.5 VA, short circuit proof. 0.1% Max. amplitude variation.	14 bits, LPTTL levels binary coded angle.	Freq.: 50Hz to 10KHz L-L V_{RMS}: 5 to 90	±4′ ±12′	3.125″ x 2.625″ x 0.82″
DIGITAL-TO-SYNCHRO/RESOLVER, Series A1670: Drives 3 TR's High power, solid state device converts a 14 bit input into either a 3 wire synchro or 4 wire resolver output. Overload and short circuit protected.	14 lines representing angles 0 to 360°	L-L V_{RMS}: 11.8 or 90 Ref. V_{RMS}: 26 or 115 Freq.: 60Hz or 400Hz	±4′	PC: 4.5″ x 8″ x 0.875″
ACP TO SINE/COSINE DC (non-variant). Series 1502: Model 1502-1 is ACP to Synchro.	4096 ACP & 1 ARP	±10VDC, as the sine and cosine.	±5′	3.1″ x 3.5″ x .82″
DIGITAL TO SINE COSINE DIGITAL. Series 1500: Model 1500-1 has tristate outputs and MUX sine and cosine over 12 lines.	14 lines representing angles 0 to 360°.	12 bits sine and cosine, also quadrant signs.	±2′	3.0″ x 4″ x 0.4″
DIGITAL TO SINE COSINE DC (non-variant). Series 1501: 0.05% max. amplitude variation.	14 lines representing angles 0 to 360°.	±10VDC, as the sine and cosine.	±4′ or ±15′	3.125″ x 2.625″ x 0.82″
DIGITAL-TO-RESOLVER. Series 1503: 0.035% max. amplitude variation.	14 lines representing angles 0 to 360°.	2 AC voltages, 20V P-P, as the sine and cosine.	±4′	3.125″ x 2.625″ x 0.82″
CONTROL TRANSFORMER, SOLID STATE. Series 1682: Fully transformer isolated unit. 0.035% max. amplitude variation.	Synchro and 14 bits Natural parallel binary.	±5 V_{RMS} representing ±12.5°.	±4′	3.125″ x 2.626″ x 0.82″
CONTROL DIFFERENTIAL TRANSMITTER, SOLID STATE. Series 1681: 0.035% max. amplitude variation.	Synchro and 14 bit Natural parallel binary.	6.5 V_{RMS}, sine/cosine.	±4′	3.125″ x 2.625″ x 0.82″
SINE-COSINE TO SYNCHRO DRIVERS. Series B676: Solid state device designed to handle large current surges of TR's. Will drive three 11TR4s to a low null. Overload and short circuit protected.	±10VDC, representing the sine and cosine of the required angle.	L-L V_{RMS}: 11.8 or 90 Ref. V_{RMS}: 26 or 115 Freq.: 60Hz or 400Hz	±10′	PC: 4.5″ x 8.0″ x 1″
LINEAR DC TO SINE-COSINE DC. Series C670: Converts a D.C. voltage, representing an angle, into two output voltages that are proportional to the sine and cosine of that angle.	±10VDC representing angles from −180° to +180°	K sin θ and K cos θ K = 10VDC	±10′	3.44″ x 3.19″ x 0.82″
COORDINATE ROTATOR. Series A689: Rotates (X-Y) coordinates proportional to a linear DC input.	X = R cos θ Y = R sin θ R = ±10VDC	R sin (θ + β) R cos (θ + β)	±10′	3.19″ x 3.44″ x 0.82″
POLAR TO RECTANGULAR. Series A1618: Converts polar coordinates (R, θ) into rectangular (X, Y).	R: ±10VDC θ: ±10VDC	X = R cos θ, Y = R sin θ R = ±20MV to ±10VDC	±10′	3.19″ x 3.44″ x 0.82″
RECTANGULAR TO POLAR. Series 695: Converts rectangular coordinates (X, Y) into polar (R, θ).	X = R cos θ Y = R sin θ	R = $\sqrt{X2 + Y2}$ θ = $\tan^{-1}$ Y/X	±10′	3.19″ x 3.44″ x 1.78″
COMPUTING DEMODULATORS. Series 840, 854: Fully isolated. Proportional phase sensitive bipolar output.	840: 0 to 5 V_{RMS} 854: 0 to 20 V_{RMS}	0 to ±4.3VDC 0 to ±10VDC	0.1% 0.1%	1.63″ x 1.0″ x 1.0″
DUAL CHANNEL PHASE SENSITIVE DEMODS. Series 9318 Ideal for resolver demodulation.	0-115V_{RMS}, 400 Hz, 60Hz available	±10VDC	0.1%	3.1″ x 1.9″ x 0.5″

Other frequencies and voltages available. Units available for either 0 to +70°C or −55°C to +105°C operation. Most units are hermetically sealed for extra protection.

VERNITECH
Division of VERNITRON CORPORATION

Synchro Conversion Modules & Systems

Synchro/Resolver-to-Digital Converters

Model	Hz	Synchro Input (V)	Reference Voltage	Output	Resolution (Arc-Minutes)	Accuracy (Arc-Minutes)	Tracking Speed (°/Sec-Min)
VSD-401-SM	400	11.8	26	14 Bit	1.32	4′ ±0.5 LSB	1440
VSD-409-SM	400	90	115	14 Bit	1.32	4′ ±0.5 LSB	1440
VSD-609-SM	50-60	90	115	14 Bit	1.32	4′ ±0.5 LSB	720

1. Available in 10 or 12 bit modules and PC board configurations
2. 2 speed and multiplexed designs available
3. Module size: 2.625 x 3.125 x .82

FEATURES
- ±4 minutes or ±0.5 LSB accuracy
- 14 Bit or 1.32 minutes resolution
- Standard DC power requirements +5V & ±15V
- PC board compatible
- No field adjustments required
- Inhibit and converter busy signals

Digital-to-Synchro/Resolver Converters

Model	Hz	Synchro Input (V)	Reference Voltage	Load Capability	Accuracy
VDS-401-SB-2	400	11.8	26	2VA	±6 minutes
VDS-409-SB-2	400	90	115	2VA	±6 minutes
VDS-609-SB-2	60	90	115	2VA	±6 minutes
VDS-401-SM	400	11.8	26	100 ohms L-L Balanced	±4 minutes
VDS-409-SM	400	90	115	5kohms L-L Balanced	±4 minutes
VDS-609-SM	60	90	115	4kohms L-L Balanced	±4 minutes

1. D/S output drive capability to 20 V.A. available

FEATURES
- PC board compatible
- High reliability
- Low cost
- Operating temperature: 0°C to +70°C

Angle Position Indicator

Model Number	Input	Hz
VNS-104-401	11.8V Synchro	400
VNS-104-409	90V L-L Synchro	400
VNS-104-609	90V L-L Synchro	60

The VNS-104 Angle Position Indicator is a Synchro-to-Digital Converter with a DTL/TTL compatible BCD ouput. These units are self contained including an integral power supply and a high intensity digital display. The VNS Series units are economically priced and feature variable range scale settings to allow for the display of physical units of measurement such as temperature, weight, and distance. The readout displays either zero to full scale or ± full scale.
Package size: 3¾ x 2$\frac{5}{32}$ x 6$\frac{1}{16}$.

FEATURES
- DTL/TTL compatible BCD output
- High reliability
- Settable range scales
- Built-in Power Supply
- Low cost
- CMOS circuitry

Special Converters

Synchro-to-BCD and Resolver-to-BCD Converters

Sampling Type

Model	Hz	Synchro Input (V)	Reference Voltage	BCD Output	4-Digit Accuracy	3-Digit Accuracy	Sample Rate
VSD-401-SM-D-002	400	11.8	26	359.9 (4)	±6′ ±1 LSB	±30′ ±1 LSB	40/sec
VSD-409-SM-D-002	400	90	115	359.9 (4)	±6′ ±1 LSB	±30′ ±1 LSB	40/sec
VSD-609-SM-D-002	50-60	90	115	359.9 (4)	±6′ ±1 LSB	±30′ ±1 LSB	40/sec
VRD-401-SM-D-002	400	11.8	26	359 (3)	±6′ ±1 LSB	±30′ ±1 LSB	40/sec
VRD-409-SM-D-002	400	90	115	359 (3)	±6′ ±1 LSB	±30′ ±1 LSB	40/sec
VRD-609-SM-D-002	50-60	90	115	359 (3)	±6′ ±1 LSB	±30′ ±1 LSB	40/sec

FEATURES
- ±6 minutes of arc accuracy
- 4 decade BCD or 6 minute resolution
- Standard DC power requirements +5V & ±15V
- Variable scale converter
- PC board compatible
- No field adjustments required

Tracking Type

Model	Hz	Synchro Input (V)	Reference Voltage	Output	Resolution (Arc-Minutes)	Accuracy (Arc-Minutes)	Tracking Speed (°/Sec-Min)
VSD-609-SM-D	50-60	90	115	0-359.9 BCD	6 (.1°)	±6′	180
VSD-401-SM-D	400	11.8	26	0-359.9 BCD	6 (.1°)	±6′	360
VSD-409-SM-D	400	90	115	0-359.9 BCD	6 (.1°)	±6′	360

Synchro-to-Linear DC

Model	Hz	Synchro Input (V)	Balanced Load	Input Rates
VSDC-401-SM	400	11.8	15k	720°/sec
VSDC-409-SM	400	90	750k	720°/sec
VSDC-609-SM	60	90	200k	100°/sec

FEATURES
- ±6 minutes accuracy
- Infinite resolution
- High stability - minimum drift
- PC board compatible
- Low cost
- CMOS circuitry

Synchro-to-Sin-Cosine DC

Model	Hz	Synchro Input (V)	Balanced Load	Reference Input	Input Rates
VSSC-401-SM	400	11.8	10k	26V @ 5mA	360°/sec
VSSC-409-SM	400	90	100k	115V @ 3mA	360°/sec
VSSC-609-SM	60	90	100k	115V @ 3mA	60°/sec

FEATURES
- Non-variant output
- Very low drift
- Output filtered and smoothed
- No field adjustments required
- CMOS circuitry

14 Bit Miniature Control Differential Transmitter

Model	Hz	Synchro Input (V)	Balanced Load
VDCDX-401-SM	400	11.8	10k
VDCDX-409-SM	400	90	600k

FEATURES
- ±4.5 minutes accuracy
- 14 Bit resolution
- PC board compatible
- Low cost
- Short circuit proof output
- Synchro & Digital angle inputs

14 Bit Miniature Control Transformer

Model	Hz	Synchro Input (V)	Balanced Load	Output Signal	Output Range
VDCT-401-SB	400	11.8	10k	0.4V RMS/0	±7° Off Null
VDCT-409-SB	400	90	600k	1.0V RMS/0	±7° Off Null

FEATURES
- ±4 minutes accuracy
- 14 Bit resolution
- PC board compatible
- Low cost

VERNITECH
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DEPT. EM, 300 MARCUS BOULEVARD
DEER PARK, LONG ISLAND, NY 11729
PHONE (516) 586-5100 TWX 510-227-6079

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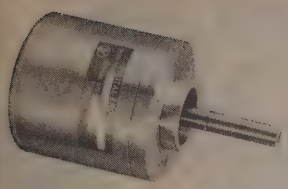

SHAFT ENCODERS
CONTACTING AND OPTICAL
INCREMENTAL — ABSOLUTE

OPTICAL INCREMENTAL

Size	Resolution	Diameter	Length	Features (Optical)	Options
11	To 1024 Pulses	1.062	1.500	All Solid State Light Source High Reliability Industrially Designed Construction	• Sealed • Index Marker • Quadrature Output • 1X-2X-4X Multiplier • Extended Temperature Range • Non-Std. Supply Voltage • Line Drivers • Connectors • Direction Sensing
23	To 2048 Pulses	2.250	1.875		
25	To 2540 Pulses	2.500	2.500		
35	To 2500 Pulses	3.500	2.250		

OPTICAL ABSOLUTE

Size	Output Code	Counts/Turn	Least Count Angle	Features	Options
23	BCD	Up to 1000	.18°	Quadrature Output on LSB Available	• Serial Output Available • Size 30 Available With Parity Bit • Multiturn Available
30	Any	Up to 1024	.18°		

CONTACTING ABSOLUTE

Size	Code	Counts/Turn	Revolutions for Full Count	Full Count	Features	Options
11	Gray/Binary	To 256	1 to 64	To 2^{14}	Operating Speed: To 200 RPM DTL/TTL Compatable 5,000,000 Rev. — Life Slew Speed: 1000 RPM Output: Parallel Non-Ambiguous All Units Contain Self-Selecting Logic	• Operating Temp.: —55°C to 125°C • Various Output Voltage Ratings • 18 and 19 Bit Total Count • Connectors • Increasing Count — CCW Rotation
	BCD	To 100	1 to 100	To 9999		
18	Gray/Binary	To 512	1 to 2048	To 2^{19}		
23	Binary	To 256	1 to 2048	To 2^{19}		
	BCD	To 400	1 to 100	1 x 10^6 BCD		
31	Gray/Binary	1024	Single Turn	To 2^{10}		

OPTICAL KIT — INCREMENTAL — INDUSTRIAL USE

Size	Resolution	Light Source	Construction	Features	Options	
Un-Housed 15 or 2.3	To 1024 Pulses	LED	Modular	Low Cost	2 Channel Output Index Channels	Squared Output Operating Voltages: 5 to 15 V.D.C.

Housed versions also available.

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DEPT. EM, 300 MARCUS BOULEVARD
DEER PARK, LONG ISLAND, NY 11729
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AirBorn connectors

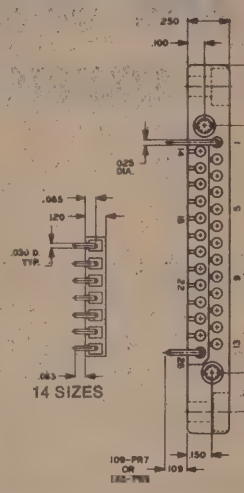
AirBorn Connectors for PC Card to Chassis or Mother Board Connections

Two series of subminiature, right-angle .030″ dia. BeCu pin to socket connectors.

Series WT: Single-row connectors on .100″ centers.

Series WTB: Double-row connectors on .100″ centers, offset .050″. Three or six 50-ohm Coax available with 20-contact connectors.

Terminations: Soldercup, wave solder, Wire-Wrap*.



Contacts	Length Overall
10	1.350
14	1.550
20	1.850
24	2.050
26	2.150
30	2.350
36	2.650
40	2.850
44	3.050
50	3.350
54	3.550
56	3.650
60	3.850
66	4.150
70	4.350
90	5.650
100	6.150
120	7.150
20+3	2.850
20+6	4.050

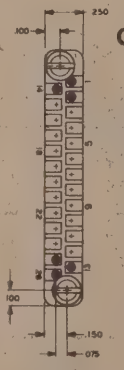
AirBorn Connectors for PC Board Input-Output, Cable to Panel and Cable to Chassis Connections

Series WTA: Subminiature, rectangular plug and receptacle, .100″ centers, two rows offset .050″, .030″ dia. BeCu contacts.

Terminations: Soldercup, wave solder, and Wire-Wrap*.

Series WTD: Subminiature, rectangular plug and receptacle, .100″ centers, two rows offset .050″, .030″ dia. BeCu contacts.

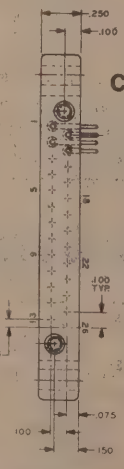
Terminations: Crimp Removal Socket.



Contacts	Overall Length
10	.850
14	1.050
20	1.350
24	1.550
26	1.650
30	1.850
36	2.150
40	2.350
44	2.550
50	2.850
54	3.050
56	3.150
60	3.350
66	3.650
70	3.850

AirBorn Connectors for Extender Board and Test Applications

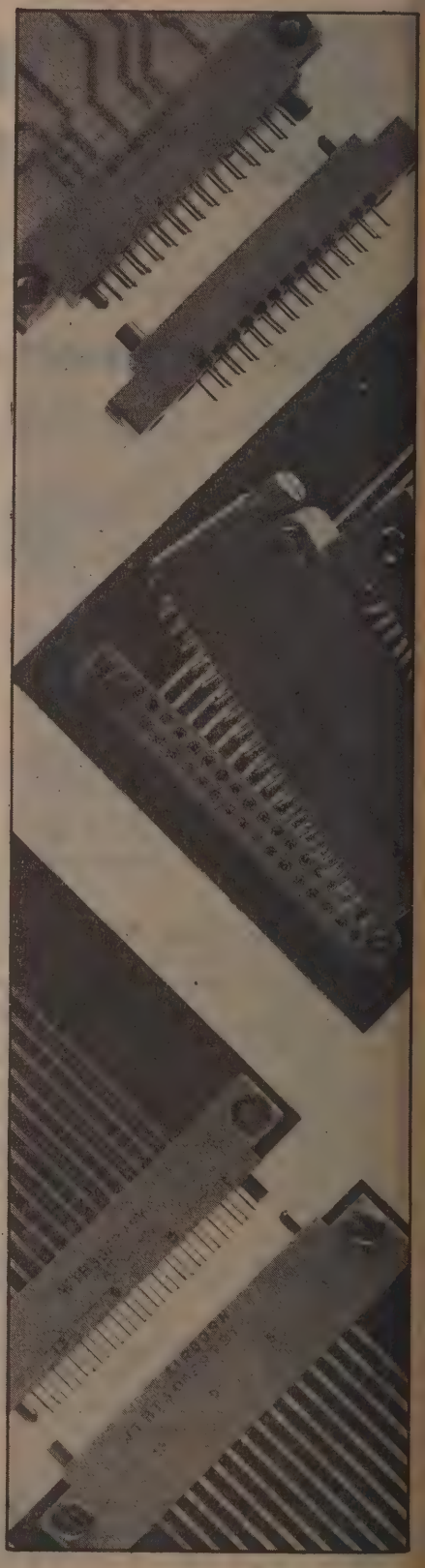
Series WTBT: Right angle receptacles combine with right angle plugs for extender board applications. Available in combinations from 10 to 70 contacts. Choice of .109″ or .140″ termination lengths. Also provides a test vehicle using conventional plugs with guiding or jackscrew locking devices.



Contacts	Length Overall
10	1.350
14	1.550
20	1.850
24	2.050
26	2.150
30	2.350
36	2.650
40	2.850
44	3.050
50	3.350
54	3.550
56	3.650
60	3.850
66	4.150
70	4.350

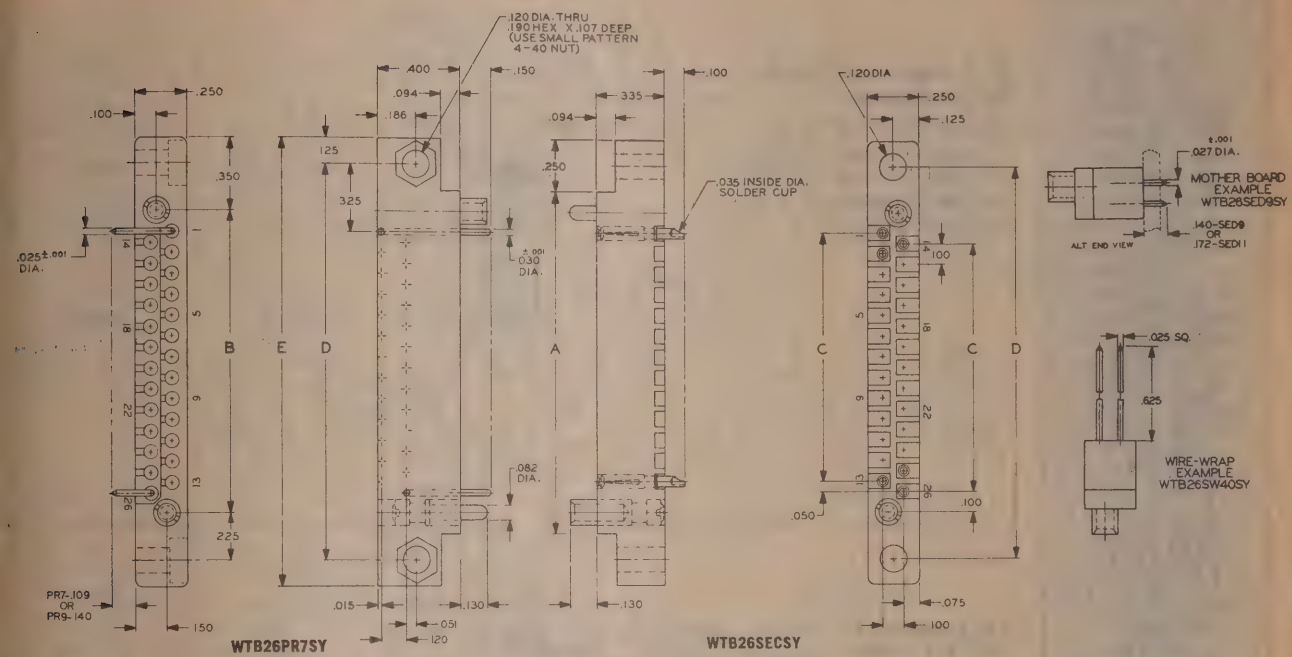
Check with us on status of parts to: MIL-C-55302/55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66.

*Registered TM of Gardner-Denver Company.



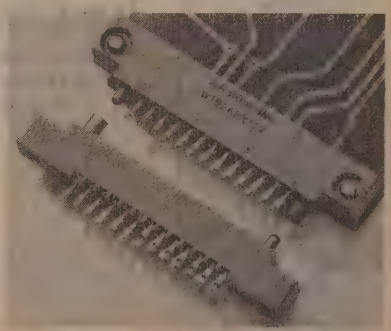
AirBorn connectors

PC CONNECTORS / APPLICATIONS

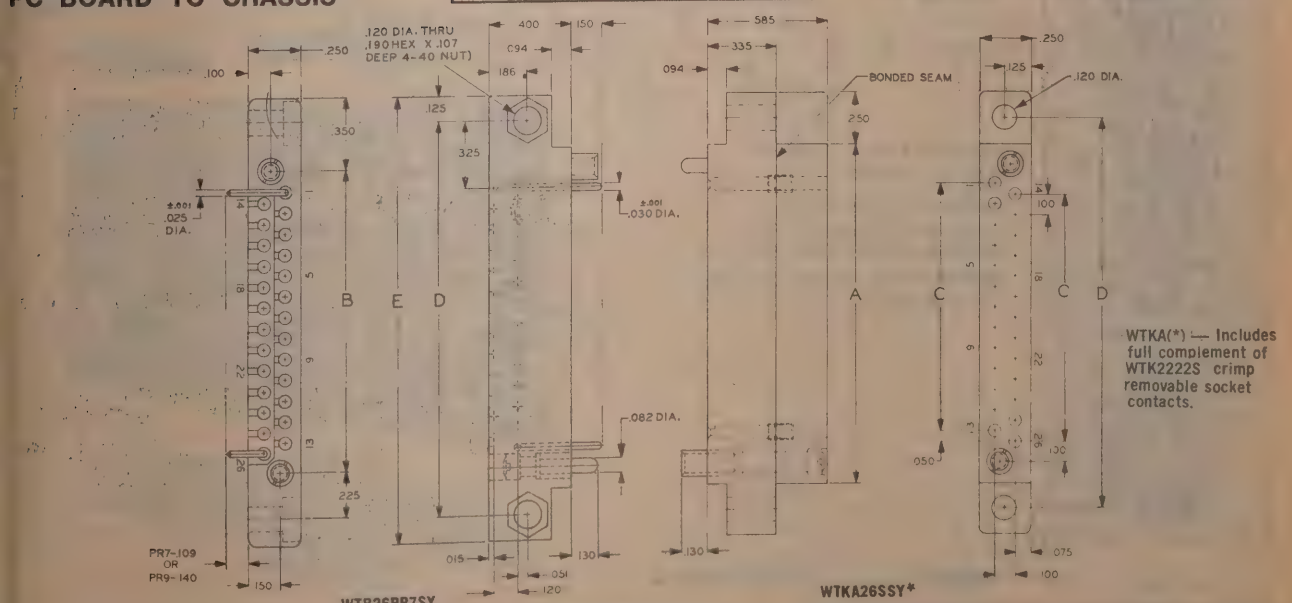


PC BOARD TO MOTHER BOARD TO CHASSIS

Size	Dimensions				
	A	B	C	D	E
10	.850	.650	.400	1.100	1.350
14	1.050	.850	.600	1.300	1.550
20	1.350	1.150	.900	1.600	1.850
24	1.550	1.350	1.100	1.800	2.050
26	1.650	1.450	1.200	1.900	2.150
30	1.850	1.650	1.400	2.100	2.350
36	2.150	1.950	1.700	2.400	2.650
40	2.350	2.150	1.900	2.600	2.850
44	2.550	2.350	2.100	2.800	3.050
50	2.850	2.650	2.400	3.100	3.350
54	3.050	2.850	2.600	3.300	3.550
56	3.150	2.950	2.700	3.400	3.650
60	3.350	3.150	2.900	3.600	3.850
66	3.650	3.450	3.200	3.900	4.150
70	3.850	3.650	3.400	4.100	4.350

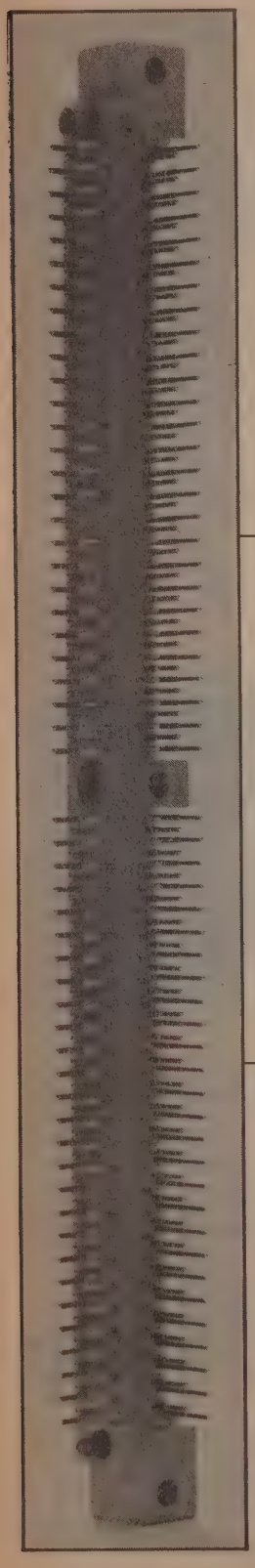


PC BOARD TO CHASSIS

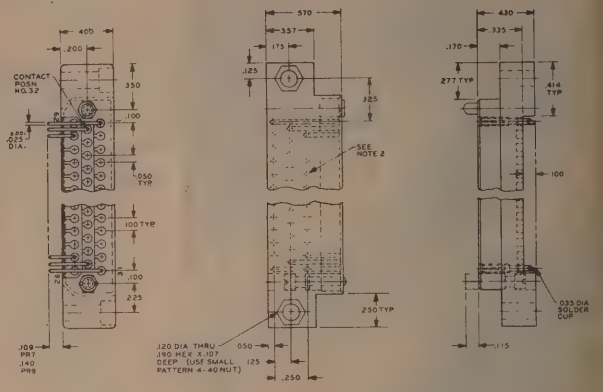


AirBorn connectors

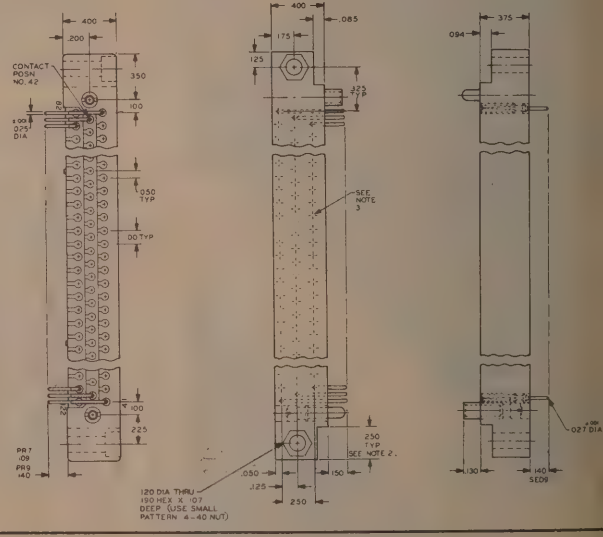
PC CONNECTORS/3-ROW HIGH DENSITY



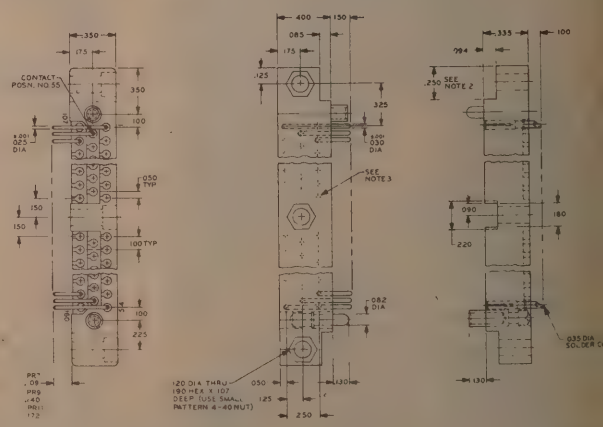
92 Contacts PCB to MB
PCB to Chassis
Series WGE: 3.9″ long
Three rows staggered with contacts centered on .100″.
Terminations: solder cup, dip pin, or Wire-Wrap*.



122 Contacts PCB to MB
PCB to Chassis
Series WGA: 4.9″ long
Three rows staggered with contacts centered on .100″
Terminations: solder cup, dip pin, or Wire-Wrap*.



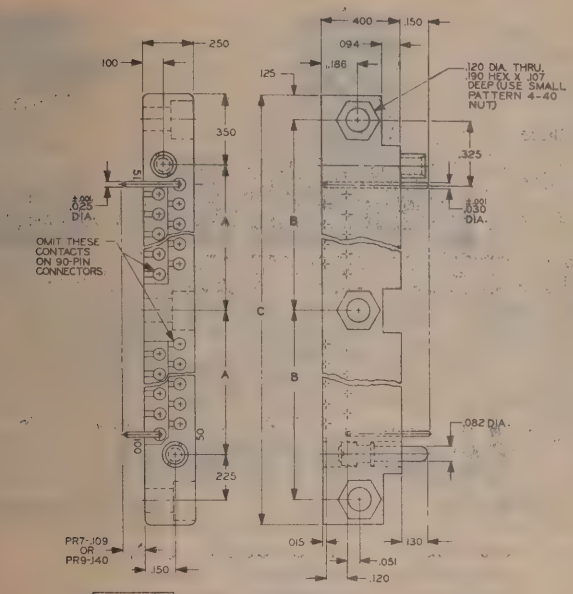
160 Contacts PCB to MB
PCB to Chassis
Series WG: 6.4″ long
Three rows staggered with contacts centered on .100″
Terminations: solder cup, dip pin, or Wire-Wrap*.



*Registered TM of Gardner-Denver Company.

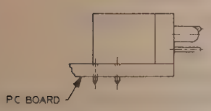
AirBorn connectors

PC & COAX CONNECTORS / APPLICATIONS



WTB100PR7SY

WTB100SECSY



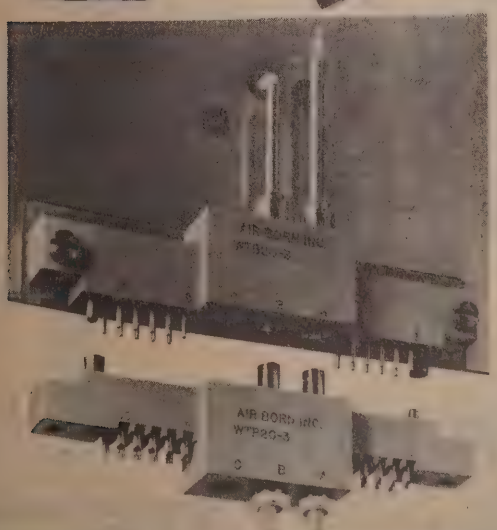
PC BOARD TO CHASSIS
PC BOARD TO MOTHER BOARD

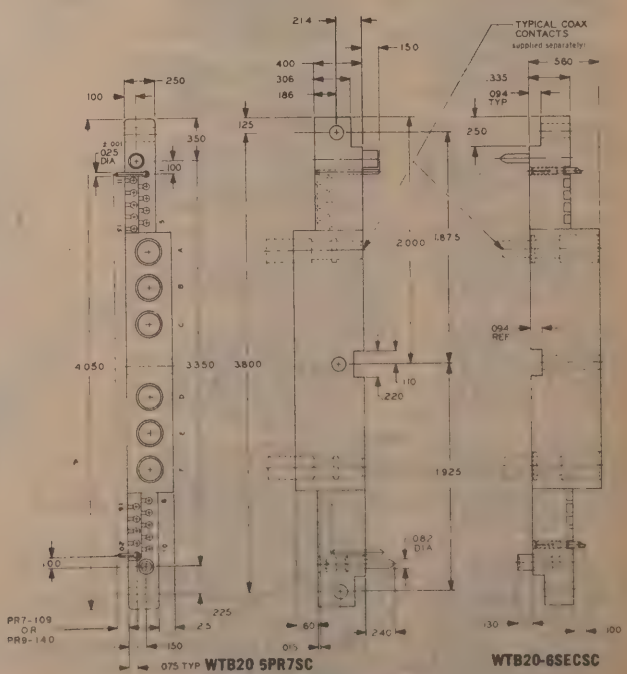
Size	Dimensions					
	A	B	C	D	E	F
90	2.475	2.700	5.650	5.150	2.200	2.100
100	2.725	2.950	6.150	5.650	2.400	2.400
120	3.225	3.450	7.150	6.650	2.900	2.900

COAX PLUS 20 . . .

This combination connector offers even more versatility by combining either 3 or 6 removable coaxial contacts with 20 standard signal contacts in one compact unit. Designed for semi-rigid or flexible cable, AirBorn's Series WTB-Coax right-angle PC board connector features .100" spacing in 2 staggered rows.

Tools Available





WTB20 5PR7SC

WTB20-6SECSC

AirBorn connectors

PC AND POWER CONNECTORS / APPLICATIONS

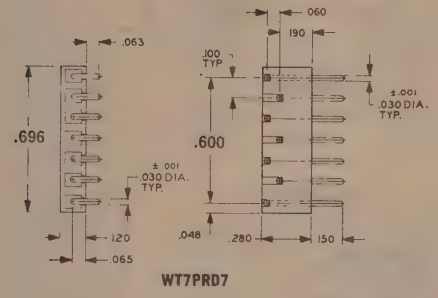
WT SERIES

Right Angle Plug, In-Line Receptacle With .100" Centers.

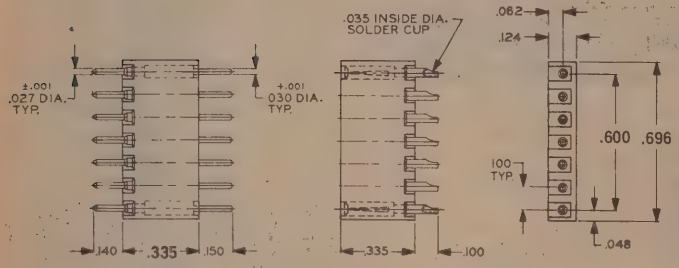
Material — Glass-Filled Phenolic Per MIL-M-14G

Applications

PC Card to Mother Board or Cable.
PC Board to Cable, Cable to Cable.
Sizes 3 thru 16 (Contacts).

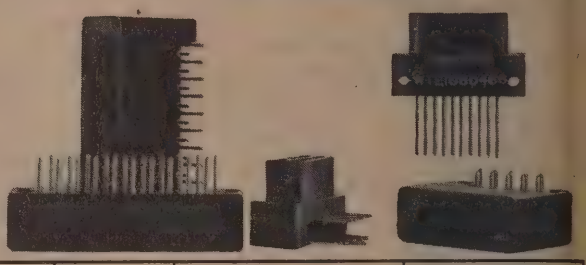


WT7PRD7



WT7PD9 WT7SEC

WTE SERIES

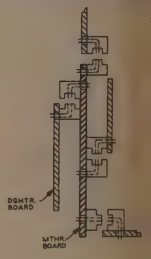


No. of Contacts	Female Shell	Male Shell	Dimensions OAL	Dimensions OAW
10	WTE10PR5	WTE10SER13 (rt. ∠ sockets) WTE10SED9 - WTE10SED23	.750	.300
20	WTE20PR5 PR5 = .081 extension	Same terminations as above but with 20 contacts	1.250	.300

Innovate!

with ⊾ to ⊾, ⊥, or ∥ connectors.

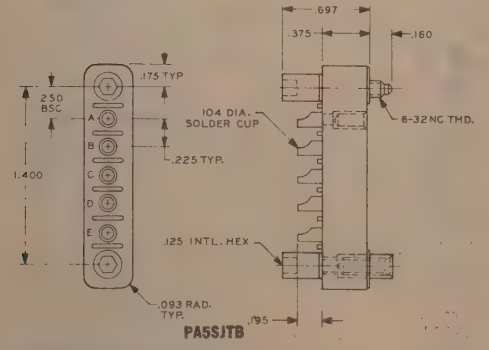
New flexibility in electronic design is possible with AirBorn's new WTE series of right angle connectors. Use any combination — right angle to right angle, perpendicular, parallel, or extended boards. Two sizes: 10 and 20 contacts. Spacing: .100"; 2 rows; offset .050.



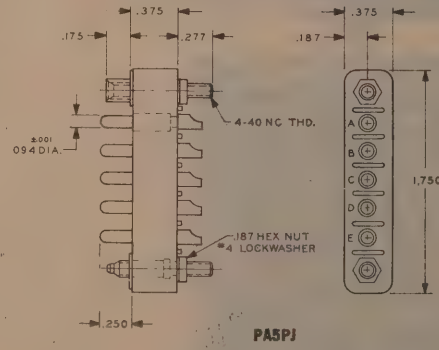
NOTES:
1. Molded bodies: glass filled nylon per Fed Spec. LP-395
2. Contacts: beryllium copper per QQ-C-530, gold plate per MIL-G-45204

PA POWER SERIES

Series	No. of Contacts	For Contact Type	Hardware Code
PA	5 (#12)	P — Pin Contact Solder Cup	J — Fixed Jackscrew Set
	(4-5) (4 #12) (5 #16)	S — Socket Contact Open Entry Solder Cup	JT — Turning Jackscrew Set
			JTB — Turning Jackscrew Set Short Knob
			SY — Guide Set



PA5SJTB



PA5PJ

PA SERIES MATERIAL:

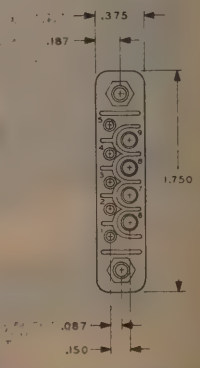
Molded Bodies — Diallyl Phthalate Per MIL-M-14 (GDI-30F OR SDG-F).

Pin Contacts — Brass, Gold Plated.

Socket Contacts — Phosphor Bronze, Gold Plated.

Guides & Jacks & JTB Knob — Stainless Steel, Type 303, Passivated Per QQ-P-35.

JT KNOB — Aluminum, Type 2024-T4 or 2017-T4, Anodized Per MIL-A-8625, Type II.

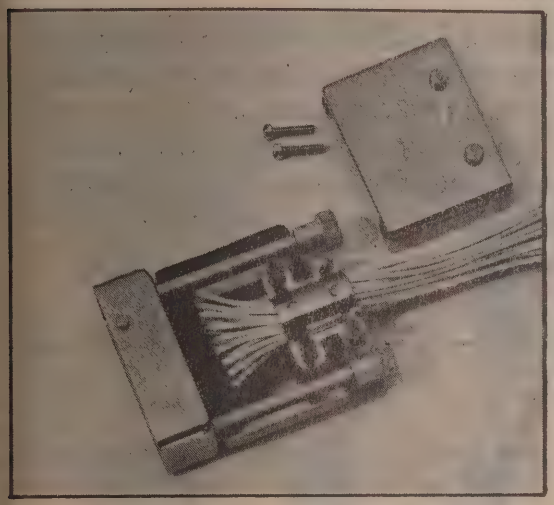


RECEPTACLE EXAMPLE OF PA4-5PJ

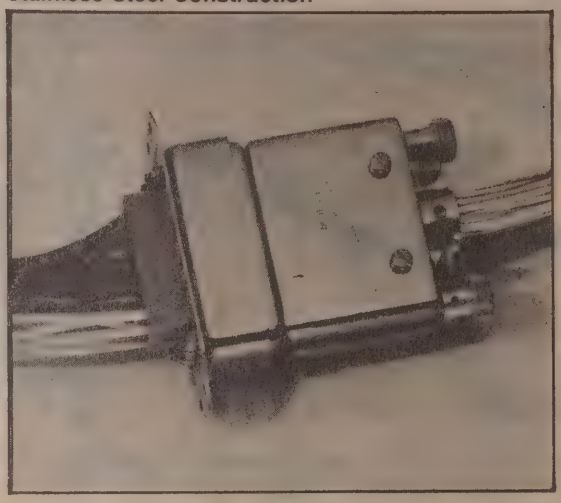
AirBorn connectors

CABLE TO PANEL CONNECTORS

Removable Hood



Stainless Steel Construction



Crimp, Removable Contacts 50 lb. minimum resistance to push out. Stainless steel shells, mounting plates, and split hoods optional. Sizes: 18,34,42,50, 66,75,104.

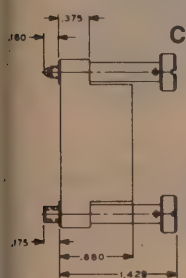
Soldercup Contacts retained in molding. Rugged .0625 dia pins. Stainless steel shells, mounting plates, and split hoods optional. Sizes: 14,20,34,42, 50,50-8,66,75,104.

AirBorn Connectors for Inter-equipment Connections — Cable to Panel, Cable to Cable, and Drawer to Cabinet

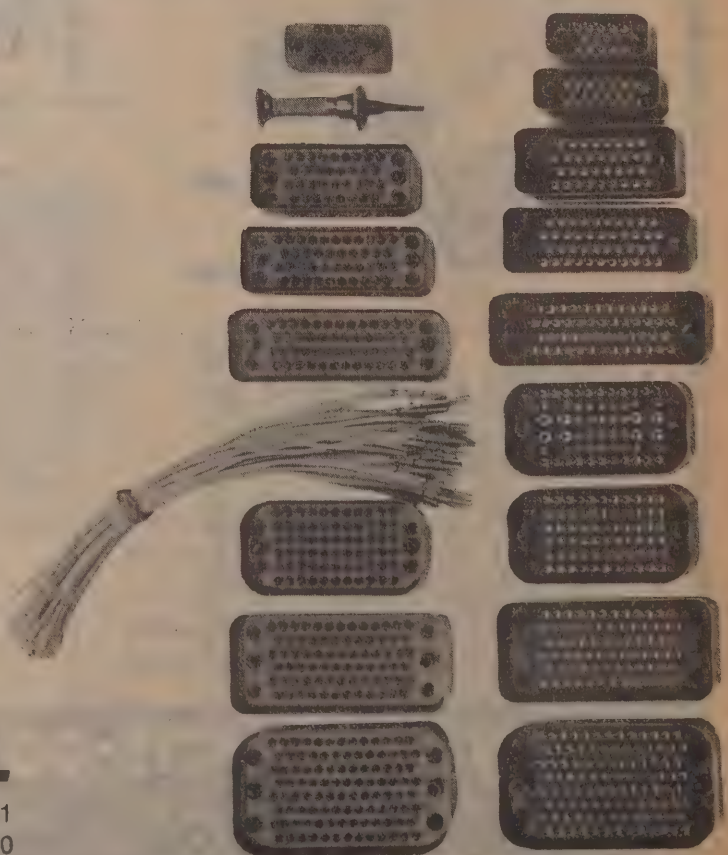
Two series of miniature, rectangular connectors with rugged .0625″ dia. contacts. Both available with stainless steel shells, mounting plates, split hoods, and environment-proof features.

Series K, EK: Features crimp, removable contacts with 50 lb. minimum resistance to push-out.

Series P, EP: Features soldercup contacts retained in molding.



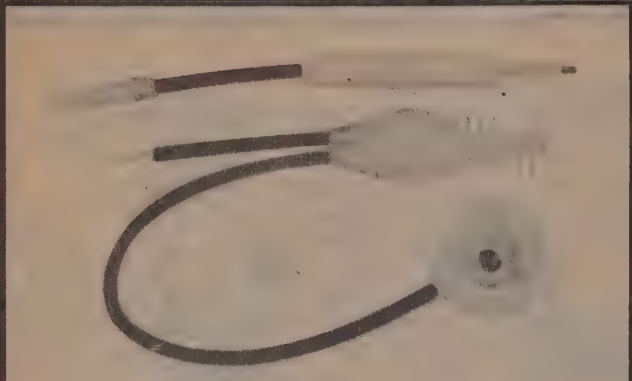
Contacts	Series	Overall Length
14	P	1.250
18	K	1.312
20	P	1.562
34	K&P	2.000
42	K&P	2.312
50	K&P	2.700
50-8	P	2.281
66	K&P	2.281
75	K&P	2.700
104	K&P	2.760



AirBorn, Inc.

Dept. EM, 4321 AirBorn Dr., Addison, TX 75001
(214) 233-2000

ALDEN PRODUCTS COMPANY
117 NORTH MAIN STREET
BROCKTON, MASSACHUSETTS 02403
TELEX:
924451
TELEPHONE:
(617) 583-0160



HIGH VOLTAGE

ALDEN, the pioneer in "IMI" integral molding techniques, provides high-reliability, high-quality disconnects at low cost for HV applications up to 50 KVDC. Select from an extensive range of connectors for virtually every HV requirement.

WE SPECIALIZE IN CUSTOM MOLDED CONNECTORS

TUBE CAP

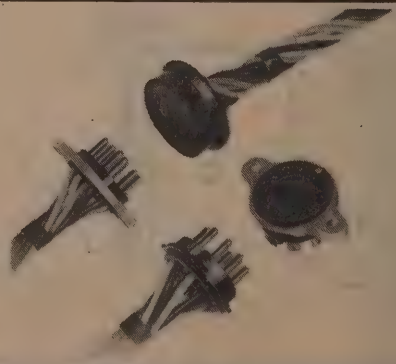
Corona, high voltage and temperature problems associated with power and flash tubes are reliably solved with **ALDEN's** broad range of tube cap/flash tube connectors. A wide variety of styles and material options are available.

CRT CONNECTORS

High-reliability sockets for most popular CRT's. Exclusive floating contacts assure perfect mating every time, self-lock when plugged. Both pre-wired and solder-lug contacts available.

ASSEMBLED PLUGS AND CONNECTORS

Low-cost solutions to your interconnect requirements. A large variety of plugs, connectors, and sockets are available for your selection, including panel mounts, solder-tabs, pre-wired, miniature and shielded.



ALDEN PRODUCTS COMPANY
117 NORTH MAIN STREET
BROCKTON, MASSACHUSETTS 02403
CONNECTOR SYSTEMS

ALLIED SYSTEMS CORPORATION

Patchboard Programming Systems

Allied Systems now offers two complete lines of patchcord programming systems, with more than twenty-one sizes available. Allied also supplies associated patch cords and hardware for both lines.

Catalog 567 covers IBM style systems which normally have a contact spacing of .250 X .281 or .281 X .281. These systems use larger taper pins for rear panel wiring.

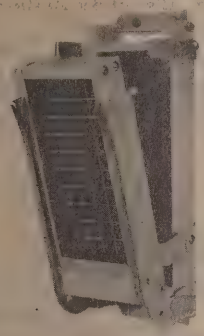
Catalog 667 covers hook type systems which have a contact spacing of .250 X .250. These systems are available for taper pin, wire wrap or locking latch type rear panel wiring.

Patch cords are available in a variety of types: single conductor, coax, two conductor shielded, etc., to fit any programming requirement.

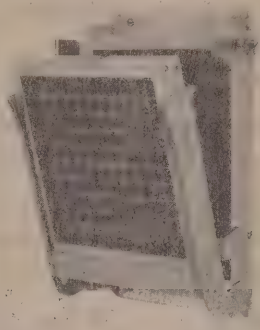
Thirteen sizes of *fixed* programming systems are available in both types of systems, ranging in size from 200 to 3264 contacts.

The extremely competitive pricing of the Allied Systems lines, plus the unexcelled quality of their products, gives you, the user, a competitive edge in the design and pricing of your system.

Call your nearest Allied Rep. or Home Office for application help in using Allied Systems patch panels and programming systems, or for prices.



MODEL 902 200 POSITIONS



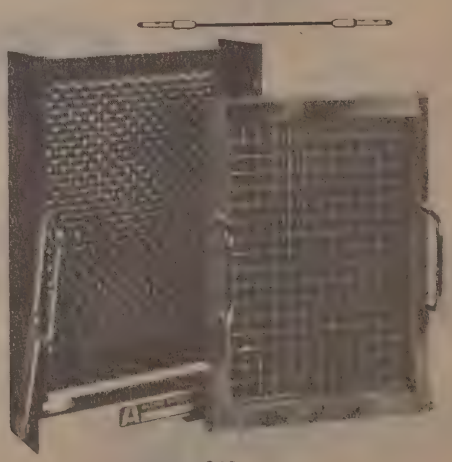
MODEL 904 440 POSITIONS

MODEL 901 680 POSITIONS

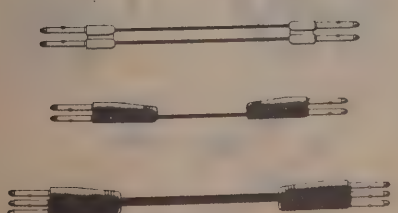
MODEL 922 1280 POSITIONS

MODEL 921 1600 POSITIONS

MODEL 910 5120 POSITIONS



MODEL 816



4 Tri-Port Circle Phone (919) 299-2294 P. O. Box 11005 Greensboro, N. C. 27409

High-voltage connections

Military interconnections

- Hermetically sealed and corona-resistant
- Space saving — maximum performance from the minimum size and weight
- Wide temperature range: −55°C to +125°C (−67°F to −257°F)
- Voltage ratings: to 150,000 volts DC
- High altitude operation — up to 70,000 feet without voltage derating
- Insulation: extruded silicone rubber
- Lead wire remains flexible from −62°C to +250°C
- Receptacles: glass epoxy
- High reliability — operate under extreme environmental conditions
- Color coded for easy identification
- Excellent mechanical strength — resistant to vibration and shock
- High dielectric strength
- Fungus, moisture, oil and chemical resistant
- Radiation resistant
- Positive mating of lead into receptacle
- RFI shielding — optional
- Preassembled — no tools required
- Versatile — top access, splice or bulkhead application
- Meet applicable military specifications

No exposed high voltage, the contacts are deeply recessed. And we've designed corona right out. With our LGH interconnection devices, in fact, it's safety all the way.

Safety — with many pluses. Such as compactness, light weight, quick connect/disconnect, great reliability.

Which is exactly what you'd expect from the people with the broadest line of high-voltage connectors, lead assemblies and receptacles. The specialists in custom design to a system. The company with the most experience — the

–safe and sure, from AMP.

only one that covers both military and commercial markets with specialized designs for each.

Take a good look at these key product features. They add up to a lot of reasons why a lot of people rely on AMP for their interconnection needs. And why you should, too.

For all the reasons,
call 717-367-1105.
Or write AMP Incorporated,
Capitron Division,
Elizabethtown, Pa. 17022.
TWX 510-657-4561.

Commercial interconnections

- The right balance of characteristics to solve high-voltage carrying problems at lowest applied cost
- Designed specifically for commercial application in industrial environments, and to meet large-volume production requirements
- Voltage ratings: to 8 KVAC, rms, 60 Hz; to 20 KVDC
- Temperature range: rated for operation within −15°C to +85°C
- Altitude operation — rated from sea level to 10,000 feet
- Safety construction — UL recognized, 94V-0 rated plastic material
- Exceed minimum creepage and clearance for specified voltages per applicable International Specifications
- Available with or without leads
- Crimp, snap-in contacts rated at 7.5 amperes
- Pins and sockets accept #22-20 AWG and #18-16 AWG wire
- Machine applied terminations assure lowest applied cost

AMP has a better way.

AMP
INCORPORATED

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AMPHENOL CONNECTORS

BUNKER RAMO

AMPHENOL NORTH AMERICA
Bunker Ramo Corporation

A few of our many quality connectors for your interconnection needs

RACK-AND-PANEL CONNECTORS

Amphenol Min Rac 17® Series Connectors

- Fixed or removable contacts
- 9 to 50 contacts, choice of arrangements and dielectrics
- Intermates with all "D"-shaped subminiatures

Poke Home | Encapsulated & Rear Release | Fixed Contact | Power & Coax | Solderless Wrap

Amphenol 32 Series Connectors

- Drop in for fast, soldered P.C. headers
- Standoffs for easy flux cleaning
- 32 Series Fire-Plug™ connectors for flame-hazard applications (classified UL 94V-0)
- 32 Series Econo-Plug™ connectors for less critical applications
- 2, 3, 6, 9, 12, or 15 contacts
- Panel mount with fingertip latching and cable-to-cable mounts also available

CABLE ASSEMBLIES

- Multi-conductor cables made to rigid quality control standards, automatically inspected
- Harness assemblies made as engineering prototypes or high-volume complex systems. Satisfy optimum reliability requirements and stringent environmental specs

Amphenol Micro Rac® 220 Series Connectors

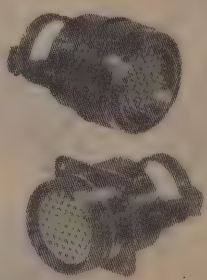
- Low-cost, high contact density
- Mono-block construction, polarized mating
- 52 and 104 contacts, float-mounted

Amphenol Micro-Pierce® 157 Series Connectors

- Float-mounted for easy mounting above or below panel
- 24 and 26 AWG solid conductors
- Gold-plated contacts, fiberglass-filled polyester dielectric
- Polarized mating, 14 to 64 contacts

POWER CONNECTORS

Amphenol 48 Series Miniature Connectors



- Qualified to MIL-C-26500, Rev. "E"
- Lightweight, easy-to-assemble with crimp-removable contacts
- Bayonet or threaded couplings, power and shielded contacts
- 30 insert arrangements, size 8 through 24

Amphenol 44 Series Waterproof Connectors

- Resilient, one-piece body resists abrasion; impervious to water, lubricants, fuel, ozone, or road salts
- Environmentally sealed to prevent liquid entry
- Low first cost, low maintenance costs
- Simple, positive push-pull connect/disconnect

BUNKER RAMO

AMPHENOL NORTH AMERICA
Bunker Ramo Corporation

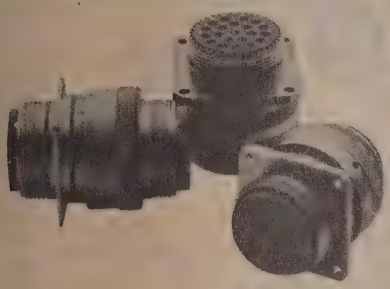
AMPHENOL CONNECTORS

POWER CONNECTORS

Amphenol 97 Series Circular Connectors

- Factory-aligned, non-rotating contacts for easy soldering
- Diallyl-phthalate inserts give high insulating resistance and dimensional stability
- Molded barrier between each contact for increased voltage rating

Amphenol Miniature Environmental Connectors



- 118 Series qualified to MIL-C-26482/Series 2
- 418 Series qualified to MIL-C-38999/Series I and II
- 518 Series qualified to MIL-C-83723/Series III
- All three series preferred under MIL-STD-1353A
- All with molded polymer retention discs to eliminate troublesome metal clips
- Wide range of shell sizes, insert arrangements, and termination tooling

Amphenol 229 Series Power-Distribution Connectors

- Qualified to MIL-C-22992, Class L
- Preferred under MIL-STD-1353A
- Rugged high-impact aluminum ratings: 40, 60, 100, and 200 amps
- Waterproof, mated or unmated, capped or uncapped
- Recessed socket contact for arc quenching

PRINTED CIRCUIT CONNECTORS

Amphenol 225 Series Printed Circuit Commercial Connectors

- Slotted bellows, wire-wrappable terminations or solder terminations
- Low contact resistance, low-friction mating for repeated insertions
- Wide choice of contact grid positions and terminal configurations

For complete information, technical data dimensions and prices, contact the nearest Amphenol North America sales office or distributor listed in this catalog.

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AMPHENOL CONNECTORS

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ADAPTERS BETWEEN SERIES

Many different combinations of between series adapters are available. They are of non-constant impedance, but designed so that inherent electrical discontinuities are minimal. We describe an adapter by referring to its own construction. We indicate the specific series involved and the mating configuration of each end of the adapter . . . BNC jack to N plug, for instance. One end of the adapter is a BNC jack. The other end is an N plug. The fact that it joins a BNC plug and N jack is understood.

ADAPTERS / WEATHERPROOF • 50 OHM IMPEDANCE • TFE INSULATION

Construction	Adapter Ends		Description	Dimensions inches(millimeters) a	Dimensions inches(millimeters) b	Mtg. Hole	Military Number	Amphenol Number
ALC-5 to BNC	ALC-Plug	BNC-Jack	Straight	.920(23.4)	.390(9.9)	—	—	904-10011
	ALC-Jack	BNC-Jack	Straight	.960(24.4)	.390(9.9)	—	—	904-10012
	ALC-Jack	BNC-Jack	Bulkhead, .125(3.2) Max. Panel Thickness	.950(24.1)	.620(15.8)	Z	—	904-10003
ALC-5 to SMA	ALC-Jack	SMA-Jack	Straight	.570(14.5)	.250(6.4)	—	—	904-10013
APC-7 to SMA	APC-7	SMA-Jack	Straight	1 11/32(34.1)	13/16(20.6)	—	—	131-1028
	APC-7	SMA-Plug	Straight	1 3/8(34.9)	13/16(20.6)	—	—	131-1038
APC-N to SMA	APC-Jack	SMA-Jack	Straight	1 19/32(40.5)	5/8(15.9)	—	—	131-1077
	APC-Jack	SMA-Plug	Straight	1 23/64(34.5)	5/8(15.9)	—	—	131-1076
	APC-Plug	SMA-Plug	Straight	1 3/4(44.5)	13/16(20.6)	—	—	131-1074
	APC-Plug	SMA-Jack	Straight	1 5/8(41.2)	13/16(20.6)	—	—	131-1075
BNC to C	BNC-Plug	C-Jack	Straight	1 9/32(32.5)	19/32(15.1)	—	UG-635	83175
	BNC-Jack	C-Plug	Straight	1 15/64(31.3)	3/4(19.1)	—	UG-635A	83200
BNC to HN	BNC-Jack	HN-Plug	Straight	1 1/2(38.1)	27/32(21.4)	—	UG-309	8900
	BNC-Plug	HN-Jack	Angle, Rexolite Insulation	1 1/2(38.1)	19/32(15.1)	—	UG-559	17750
	BNC-Plug	HN-Jack	Rexolite/TFE Insulation/Non-Constant Impedance	1 21/32(42.1)	3/4(19.1)	—	—	32750
	BNC-Jack	HN-Jack	Panel, Front or Rear Mounting	1 3/8(34.9)	3/4(19.1)	Y	—	35050
BNC to MB	BNC-Jack	MB-Jack	Panel, Front or Rear Mounting/Kel-F/TFE Insulation	1 5/32(29.4)	.377(9.6)	X	—	33200
	BNC-Jack	MB-Jack	Bulkhead Mounted, Rear, Hermetic Seal, Glass-TFE Ins.	1 1/8(28.6)	.595(15.1)	W	—	47200
	BNC-Jack	MB-Plug	Kel-F/TFE Insulation	15/16(23.8)	9/16(14.3)	—	—	47250
	BNC-Plug	MB-Jack	Kel-F/TFE Insulation	1(25.4)	9/16(14.3)	—	—	47275
BNC to N	BNC-Jack	N-Jack	Angle, Panel, Rear Mounting	1 7/16(36.5)	1(25.4)sq.	V	—	2800
	BNC-Jack	N-Jack	Bulkhead Mounted, Front, Rexolite-TFE Ins., Pressurized	1 27/32(46.8)	13/16(20.6)	T	—	5850
	BNC-Jack	N-Jack	Panel, Rear Mounting, Rexolite Insulation	1 1/2(38.1)	1(25.4)sq.	V	—	21850
	BNC-Jack	N-Jack	Bulkhead Mounted, Front, Hermetic Seal/Non-Const. Imp.	1 11/16(42.9)	13/16(20.6)	T	—	93075
	BNC-Jack	N-Plug	Straight/Non-Constant Impedance	1 5/16(33.3)	13/16(20.6)	—	UG-201A	31-216
	BNC-Jack	N-Plug	Straight/Non-Constant Impedance	1 15/32(37.3)	13/16(20.6)	—	UG-201	31-830
	BNC-Jack	N-Plug	Straight, 70 Ohm Impedance	1 9/16(39.7)	3/4(19.1)	—	—	4250
	BNC-Plug	N-Plug	Straight	1 1/2(38.1)	13/16(20.6)	—	—	4900
	BNC-Plug	N-Plug	Straight	1 1/2(38.1)	13/16(20.6)	—	UG-1034	5225
	BNC-Plug	N-Jack	Straight/Non-Constant Impedance	1 9/16(39.7)	39/64(15.5)	—	UG-349A	31-217
	BNC-Plug	N-Jack	Rexolite-TFE Insulation	1 3/4(44.5)	5/8(15.9)	—	UG-349	2975
	BNC-Plug	N-Jack	Panel, Rear Mounting, Rexolite-TFE Insulation	1 3/4(44.5)	1(25.4)sq.	V	UG-335	3025
BNC to SM	BNC-Jack	SM-Jack	Bulkhead Mounted, Rear, Hermetic Seal/Non-Const. Imp.	1 1/8(28.6)	19/32(15.1)	W	UG-691	89250
BNC to SMA	BNC-Jack	SMA-Jack	Straight	1 1/8(28.6)	9/16(14.3)	—	—	901-167
	BNC-Jack	SMA-Plug	Straight	1 5/32(29.4)	9/16(14.3)	—	—	901-166
	BNC-Plug	SMA-Plug	Straight	1 3/32(27.8)	9/16(14.3)	—	—	901-164
	BNC-Plug	SMA-Jack	Straight	1 1/16(27.0)	9/16(14.3)	—	—	901-165
BNC to TNC	BNC-Jack	TNC-Jack	Straight	1 19/32(32.5)	7/16(11.1)	—	—	76400
	BNC-Jack	TNC-Plug	Straight	1 1/4(31.8)	5/8(15.9)	—	—	79675
	BNC-Plug	TNC-Jack	Straight	1 1/4(31.8)	5/8(15.9)	—	—	79025
BNC to UHF	BNC-Jack	UHF-Plug	Straight, Rexolite Insulation/Non-Constant Impedance	1 3/16(30.2)	23/32(18.3)	—	UG-273	31-028
	BNC-Jack	UHF-Plug	Straight	1 9/32(32.5)	3/4(19.1)	—	—	12025
	BNC-Plug	UHF-Jack	Straight, Rexolite Insulation	1 5/16(33.3)	5/8(15.9)	—	UG-255	2900
	BNC-Plug	UHF-Jack	Straight	1 5/16(33.3)	5/8(15.9)	—	—	2925
C to HN	C-Jack	HN-Plug	Straight/Non-Weatherproof/Non-Constant Impedance	1 1/2(38.1)	27/32(21.4)	—	UG-702	83350
	C-Plug	HN-Jack	Straight/Non-Weatherproof/Non-Constant Impedance	1 1/2(38.1)	3/4(19.1)	—	UG-703A	83400
C to LC	C-Jack	LC-Jack	Straight/Non-Constant Impedance	3 29/64(87.7)	1 1/4(31.8)	—	—	82350
C to MB	C-Jack	MB-Jack	Straight/Non-Constant Impedance/Glass-TFE Insulation/Hermetically Sealed	1 9/32(31.0)	3/4(19.1)	U	—	83950
C to N	C-Jack	N-Plug	Straight	1 3/8(34.9)	13/16(20.6)	—	UG-564	82-508
	C-Plug	N-Jack	Straight	1 17/32(38.9)	3/4(19.1)	—	UG-565A	82-540
	C-Jack	N-Plug	Angle	1 9/32(32.5)	1 9/32(32.5)	—	—	83875
C to UHF	C-Jack	UHF-Plug	Straight/Non-Weatherproof/Non-Constant Impedance	1 3/8(34.9)	13/16(20.6)	—	UG-637	83225
HN to LC	HN-Jack	LC-Jack	Panel/Non-Constant Impedance	2 13/64(56.0)	1 1/4(31.8)	S	UG-259A	2500
	HN-Jack	LC-Plug	Straight/Non-Constant Impedance/Polyethylene Insulation	2 9/32(57.9)	1 5/8(41.3)	—	UG-252	2625
HN to MHV	HN-Plug	MHV-Jack	Straight	1 1/2(38.1)	27/32(21.4)	—	—	20625
HN to N	HN-Plug	N-Jack	Straight	1 9/16(39.7)	7/8(22.2)	—	—	16050
	HN-Jack	N-Plug	Straight	1 9/16(39.7)	13/16(20.6)	—	—	16075
	HN-Jack	N-Jack	Straight/Copolymer of Styrene-TFE Insulation	1 49/64(44.8)	3/4(19.1)	—	—	16100
MB to N	MB-Jack	N-Jack	Straight	1 1/4(31.8)	5/8(15.9)	—	—	47375
MB to UHF	MB-Jack	UHF-Plug	Straight/Non-Constant Impedance/Non-Weatherproof Male Contacts	1 11/32(34.1)	3/4(19.1)	—	—	47400
MHV to UHF	MHV-Jack	UHF-Plug	Straight/Non-Constant Impedance	1 9/32(32.5)	3/4(19.1)	—	—	28050
	MHV-Plug	UHF-Jack	Straight/Non-Constant Impedance	1 3/8(34.9)	5/8(15.9)	—	—	28075
N to LC	N-Jack	LC-Jack	Panel/Polyethylene Insulation	2 13/64(56.0)	1 9/16(39.7)	R	UG-271A	55000

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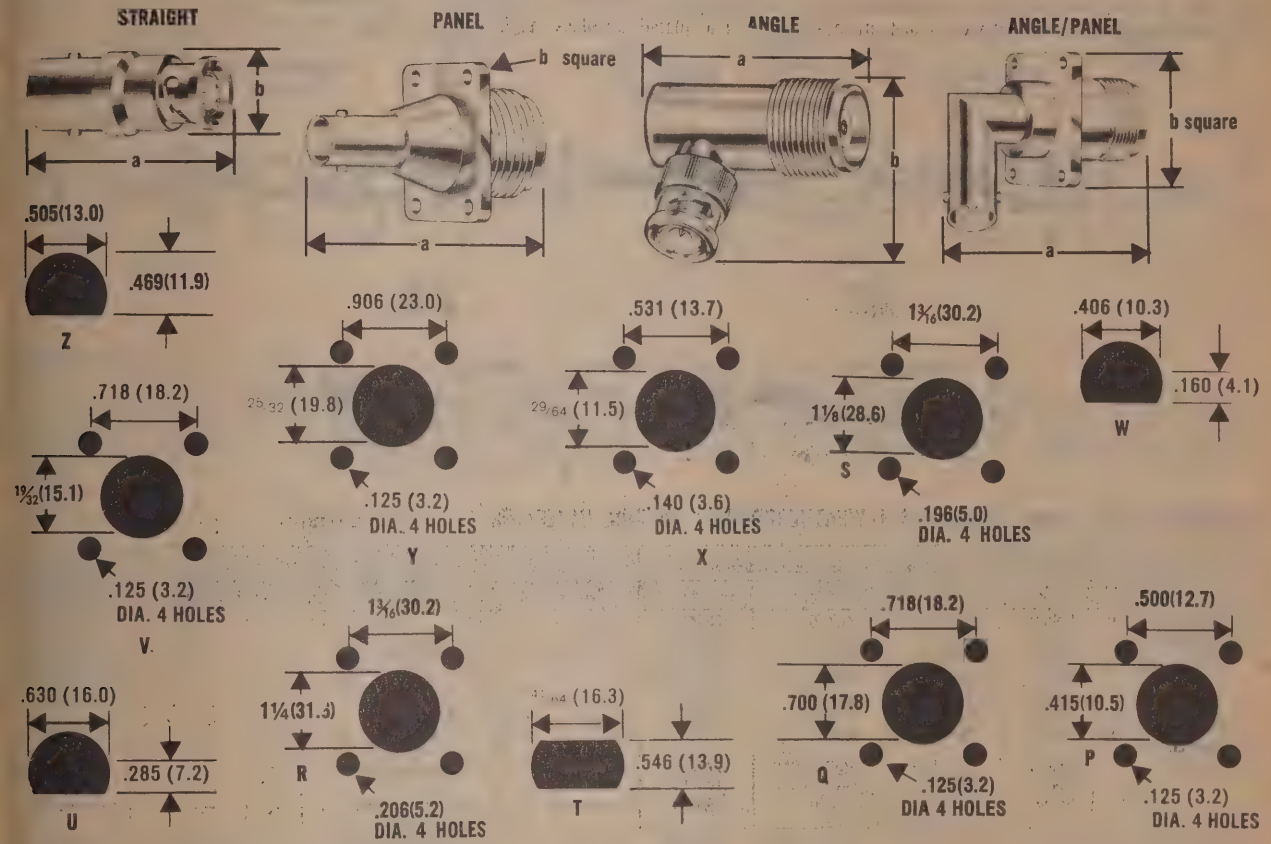
AMPHENOL CONNECTORS

ADAPTERS BETWEEN SERIES



ADAPTERS (Cont'd)

Construction	Adapter Ends		Description	Dimensions inches(millimeters) a	b	Mtg. Hole	Military Number	Amphenol Number
N to SMA	N-Plug	SMA-Jack	Straight	1.659(42.1)	13/16(20.6)	—	—	901-294
	N-Jack	SMA-Plug	Straight	1.7(43.2)	5/8(15.9)	—	—	901-293
	N-Plug	SMA-Plug	Straight	1.7(43.2)	13/16(20.6)	—	—	901-292
	N-Jack	SMA-Jack	Straight	1.657(42.1)	5/8(15.9)	—	—	901-295
	N-Jack	SMA-Plug	Panel	1.657(42.1)	1(25.4)sq.	Q	—	901-278
	N-Jack	SMA-Jack	Panel	1.657(42.1)	1(25.4)sq.	Q	—	901-268
N to TNC	N-Plug	TNC-Jack	Straight	1 5/16(33.3)	13/16(20.6)	—	—	78800
	N-Jack	TNC-Jack	Straight	1 23/64(35.3)	5/8(15.9)	—	—	78825
	N-Plug	TNC-Plug	Straight	1 13/16(35.7)	13/16(20.6)	—	—	78875
	N-Jack	TNC-Plug	Straight	1 21/32(42.1)	5/8(15.9)	—	—	79825
	N-Plug	TNC-Plug	Straight	1 9/16(39.7)	13/16(20.6)	—	—	79850
N to UHF	N-Plug	UHF-Jack	Straight/Copolymer of Styrene Insulation/ Non-Weatherproof/Non-Constant Impedance	1 13/32(35.7)	13/16(20.6)	—	UG-146	4400
	N-Jack	UHF-Plug	Straight/Copolymer of Styrene-TFE Insulation Non-Constant Impedance	1 9/16(39.7)	3/4(19.1)	—	UG-83	14000
	N-Plug	UHF-Jack	Straight/Non-Weatherproof/Non-Constant Impedance	1 13/32(35.7)	13/16(20.6)	—	—	14650
	N-Plug	UHF-Plug	Straight/Copolymer of Styrene Insulation/ Non-Constant Impedance	1 47/64(44.1)	3/4(19.1)	—	UG-318	26700
	N-Jack	UHF-Plug	Straight/Non-Constant Impedance	1 13/16(46.0)	13/16(20.6)	—	UG-83B	34125
SMA to TNC	SMA-Jack	TNC-Jack	Straight	1 1/8(28.6)	3/8(14.3)	—	—	901-171
	SMA-Jack	TNC-Jack	Straight/Long	1 27/64(36.1)	3/8(14.3)	—	—	901-328
	SMA-Jack	TNC-Jack	Panel/Mounting	1 27/64(36.1)	11/16(17.5)	P	—	901-280
	SMA-Jack	TNC-Plug	Straight	1 3/32(27.8)	19/32(15.1)	—	—	901-169
	SMA-Jack	TNC-Plug	Straight/Long	1 17/32(38.9)	19/32(15.1)	—	—	901-329
	SMA-Plug	TNC-Plug	Straight	1 1/8(28.6)	19/32(15.1)	—	—	901-168
	SMA-Plug	TNC-Plug	Straight/Long	1 37/64(40.1)	19/32(15.1)	—	—	901-331
	SMA-Plug	TNC-Jack	Straight	1 5/32(29.4)	3/8(14.3)	—	—	901-170
	SMA-Plug	TNC-Jack	Straight/Long	1 13/32(37.3)	3/8(14.3)	—	—	901-330
	SMA-Plug	TNC-Jack	Panel/Mounting	1 13/32(37.3)	11/16(17.5)	P	—	901-279

AMPHENOL CONNECTORS

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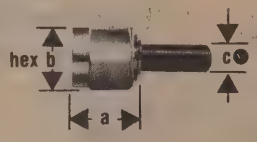
SMA SERIES COAXIAL CONNECTORS

SMA's are 50 ohm semi-precision sub-miniature (3mm), high-frequency (0-18 GHz) connectors with ¼-36 threaded coupling. They meet all MIL-C-39012 requirements for SMA connectors and are available in gold plated stainless steel, beryllium copper or stainless finish where indicated.

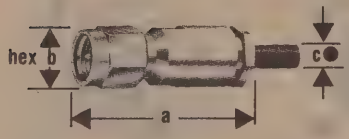
SOLDER TYPE 901-113

SOLDER TYPE 901-183

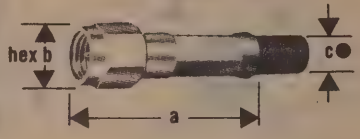


SOLDER TYPE 901-105

CLAMP 901-107



CRIMP 901-101



STRAIGHT PLUGS / MALE CONTACTS • WEATHERPROOF • 50 OHM IMPEDANCE • TFE INSULATION

Cable RG-/U	Cable Termination	Dimensions, inches(millimeters) a	b	c	Tool Data▲ Die Set P/N	Construction Notes	Military Number	Amphenol Number
.085" Dia. Semi-Rigid with Contact and Insulator	Solder	43/64(17.1)	5/16(7.9)	.088(2.24)	—	—	—	901-126
	Solder	.438(11.1)	5/16(7.9)	.091(2.3)	—	Stainless Steel	—	901-9201-2A□
	Solder	.385(9.8)	5/16(7.9)	.088(2.24)	—	—	—	901-390-1△
	Solder	17/32(13.5)	5/16(7.9)	.088(2.24)	—	—	—	901-390-2△
.141" Dia. Semi-Rigid Less Contact and Insulator	Solder	1/2(12.7)	5/16(7.9)	.144(3.7)	—	—	—	901-113
	Solder	21/64(8.3)	5/16(7.9)	.144(3.7)	—	Short Skirt	—	901-183△
	Solder	43/64(17.1)	5/16(7.9)	.144(3.7)	—	With Contact and Insulator	—	901-105
	Solder	.445(11.3)	5/16(7.9) Dia.	.142(3.6)	—	Stainless Steel	—	901-9201-1A□
	Clamp	63/64(25.0)	11/32(8.7) Dia.	.144(3.7)	—	—	—	901-107
	Solder	.330(8.4)	5/16(7.9)	.146(3.7)	—	Stainless Steel/ Short Skirt	—	901-9183-1△
55, 58, 141, 142, 223	Clamp	31/32(24.6)	11/32(8.7) Dia.	.219(5.6)	—	Captivated Contact	—	901-103
	Clamp	31/32(24.6)	11/32(8.7) Dia.	.219(5.6)	—	Captivated Contact	M39012/55-4009	901-103-11
	Clamp	31/32(24.6)	11/32(8.7) Dia.	.219(5.6)	—	Captivated Contact	M39012/55-4004	901-103-12
55, 142, 223, 400	Crimp	1 1/32(26.2)	5/16(7.9)	.220(5.6)	227-1221-11	Captivated Contact	—	901-101
	Crimp	1 1/32(26.2)	5/16(7.9)	.220(5.6)	227-1221-11	Captivated Contact	M39012/55-4022	901-101-11
	Crimp	1 1/32(26.2)	5/16(7.9)	.220(5.6)	227-1221-11	Captivated Contact	M39012/55-4015	901-101-12
	Crimp	1 1/32(26.2)	5/16(7.9)	.220(5.6)	227-1221-11	Captivated Contact	M39012/55-4023	901-101-13
	Crimp	1 1/32(26.2)	5/16(7.9)	.220(5.6)	227-1221-11	Captivated Contact	M39012/55-4016	901-101-14
	Crimp	1.187(30.1)■	5/16(7.9)	.220(5.6)	227-1221-11	Noncaptivated Contact S/S	M39012/55-4502	901-9511-1□
58, 141, 303	Crimp	29/32(23.0)	5/16(7.9)	.206(5.2)	227-1221-11	Captivated Contact	—	901-109
	Crimp	29/32(23.0)	5/16(7.9)	.206(5.2)	227-1221-11	Captivated Contact	M39012/55-4021	901-109-11
	Crimp	29/32(23.0)	5/16(7.9)	.206(5.2)	227-1221-11	Captivated Contact	M39012/55-4014	901-109-12
	Crimp	29/32(23.0)	5/16(7.9)	.206(5.2)	227-1221-11	Captivated Contact	M39012/55-4024	901-109-13
	Solder	1.187(30.1)■	5/16(7.9)	.206(5.2)	227-1221-11	Noncaptivated Contact S/S		901-9501-□
122	Crimp	1.250(31.7)	5/16(7.9)	.175(4.4)	227-1221-09	Noncaptivated Contact S/S	M39012/55-3013	901-3302
	Clamp	63/64(25.0)	11/32(8.7) Dia.	.114(2.9)	—	Captivated Contact	M39012/55-4008	901-243-11
	Clamp	63/64(25.0)	11/32(8.7) Dia.	.114(2.9)	—	Captivated Contact	M39012/55-4003	901-243-12
122, 180, 195	Crimp	1 1/32(26.2)	5/16(7.9)	.175(4.4)	227-1221-09	Captivated Contact	—	901-246
	Crimp	1 1/32(26.2)	5/16(7.9)	.175(4.4)	227-1221-09	Captivated Contact	M39012/55-4020	901-246-11
	Crimp	1 1/32(26.2)	5/16(7.9)	.175(4.4)	227-1221-09	Captivated Contact	M39012/55-4013	901-246-12
174, 188, 316	Clamp	63/64(25.0)	11/32(8.7) Dia.	.114(2.9)	—	Captivated Contact	—	901-128
	Clamp	63/64(25.0)	11/32(8.7) Dia.	.114(2.9)	—	Captivated Contact	M39012/55-4007	901-128-11
	Clamp	63/64(25.0)	11/32(8.7) Dia.	.114(2.9)	—	Captivated Contact	M39012/55-4002	901-128-12
	Crimp	1.109(28.7)	5/16(7.9)	.128(3.3)	227-1221-09	Captivated Contact	—	901-155
	Crimp	1.109(28.7)	5/16(7.9)	.128(3.3)	227-1221-09	Captivated Contact	M39012/55-4019	901-155-11
	Crimp	1.109(28.7)	5/16(7.9)	.128(3.3)	227-1221-09	Captivated Contact	M39012/55-4012	901-155-12
174, 179, 187, 188, 316	Solder	.690(17.5)	5/16(7.9)	.128(3.3)	—	Stainless Steel	—	901-9501-3
	Crimp	.690(17.5)	5/16(7.9)	.128(3.3)	227-1221-03	Stainless Steel	—	901-9511-3
	Crimp	.705(17.9)	5/16(7.9)	.128(3.3)	227-1221-03	Stainless Steel/ Captivated Contact	—	901-9601-3
178	Crimp	1.250(31.7)	5/8(7.9)	.075(1.9)	227-1221-03	Captivated Contact S/S	M39012/55-3011	901-3300
178, 196	Clamp	1 1/32(26.2)	11/32(8.7)	.078(2.0)	—	Captivated Contact	—	901-242
	Clamp	1 1/32(26.2)	11/32(8.7)	.078(2.0)	—	Captivated Contact	M39012/55-4006	901-242-11
	Clamp	1 1/32(26.2)	11/32(8.7)	.078(2.0)	—	Captivated Contact	M39012/55-4001	901-242-12
178	Crimp	1 1/4(31.8)	.360(9.1) Dia.	.075(1.9)	227-1221-03	Captivated Contact	M39012/55-4018	901-245-11
180, 195	Clamp	63/64(25.0)	11/32(8.8) Dia.	.158(4.0)	—	—	—	901-139
	Crimp	3/4(19.1)	5/16(7.9)	.175(4.4)	227-1221-09	—	—	901-192
303	Crimp	1.375(34.9)	5/16(7.9)	.178(4.5)	227-1221-11	Captivated Contact S/S	MS39012/55-3024	901-3313

● Accommodates Cable Diameter
▲ Use with Tool Handle 227-944, Cavity A
□ For Stainless Finish Ad SF to Amphenol Number Suffix
△ Preferred Dismountable Coupling Nut Design Allows Precise Trimming After Soldering
■ Overall Length Includes Heat Shrink Tubing Supplied.

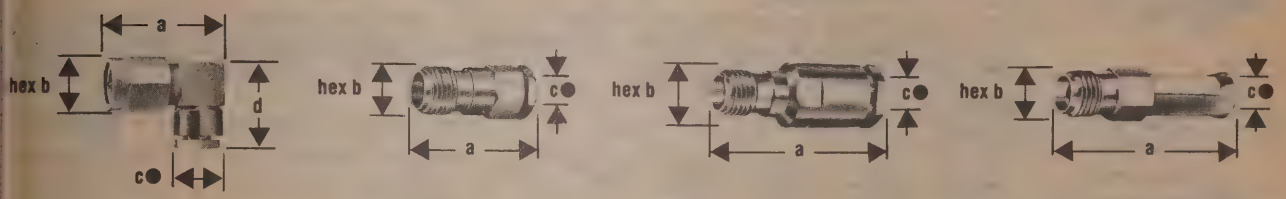
BUNKER RAMO

AMPHENOL NORTH AMERICA
Bunker Ramo Corporation

AMPHENOL CONNECTORS

SMA SERIES COAXIAL CONNECTORS (Continued)

SOLDER TYPE 901-136 | SOLDER TYPE 901-106 | CLAMP 901-108 | CRIMP 901-102



ANGLE PLUGS / MALE CONTACTS • WEATHERPROOF • 50 OHM IMPEDANCE • TFE INSULATION

Cable RG-/U	Cable Termination	Dimensions, inches(millimeters) a	b	■	d	Tool Data▲ Die Set P/N	Construction Notes	Military Number	Amphenol Number
.085" Dia. Semi-Rigid	Solder	1/16(17.5)	5/16(7.9)	.088(2.2)	35/64(13.9)	—	—	—	901-136
.141" Dia. Semi-Rigid	Solder	21/32(16.7)	5/16(7.9)	.144(3.7)	35/64(13.9)	—	—	—	901-142
	Solder	.675(17.1)	5/16(7.9)	.144(3.7)	.430(10.9)	—	S/S Captivated Contact	—	901-9221-1A□
55, 58, 141, 142, 223	Clamp	1/16(17.5)	5/16(7.9)	.220(5.6)	7/8(22.2)	—	—	—	901-130
	Clamp	1/16(17.5)	5/16(7.9)	.220(5.6)	7/8(22.2)	—	—	M39012/56-4009	901-130-11
	Solder	.675(17.1)	5/16(7.9)	.220(5.6)	1.125(28.6)■	—	S/S Captivated Contact	—	901-9521-1□
55, 142, 223	Crimp	.675(17.1)	5/16(7.9)	.220(5.6)	1.187(30.2)■	227-1221-11	S/S Captivated Contact	—	901-9531-1□
58, 141	Crimp	21/32(16.7)	5/16(7.9)	.206(5.2)	57/64(22.6)	227-1221-11	—	—	901-149
142, 400	Crimp	21/32(16.7)	5/16(7.9)	.220(5.6)	57/64(22.6)	227-1221-11	—	M39012/56-4502	901-148-15
161, 174, 179, 187, 188, 316	Solder	1/16(17.5)	5/16(7.9)	.125(3.2)	3/4(19.1)	—	—	—	901-361
174, 188, 316	Clamp	1/16(17.5)	5/16(7.9)	.144(2.9)	51/64(20.2)	—	—	—	901-140
	Clamp	1/16(17.5)	5/16(7.9)	.114(2.9)	49/64(19.6)	—	—	—	901-368
	Clamp	1/16(17.5)	5/16(7.9)	.114(2.9)	49/64(19.6)	—	—	M39012/56-4002	901-368-11
	Clamp	1/16(17.5)	5/16(7.9)	.114(2.9)	47/64(19.6)	—	—	M39012/56-4007	901-368-12
174, 179, 187, 188, 316	Solder	.675(17.1)	5/16(7.9)	.128(3.3)	.565(14.4)	—	Stainless Steel/ Captivated Contact	—	901-9521-3
	Crimp	.675(17.1)	5/16(7.9)	.128(3.3)	.600(15.2)	227-1221-03	Stainless Steel/ Captivated Contact	—	901-9531-3
178	Clamp	1/16(17.5)	5/16(7.9)	.078(2.0)	51/64(20.2)	—	—	—	901-287
	Clamp	1/16(17.5)	5/16(7.9)	.078(2.0)	49/64(19.6)	—	—	—	901-367
	Clamp	1/16(17.5)	5/16(7.9)	.078(2.0)	49/64(19.6)	—	—	M39012/56-4006	901-367-11
	Clamp	1/16(17.5)	5/16(7.9)	.078(2.0)	47/64(19.6)	—	—	M39012/56-4001	901-367-12
180, 195	Clamp	1/16(17.5)	5/16(7.9)	.158(4.0)	51/64(20.2)	—	—	—	901-270
303	Clamp	1/16(17.5)	5/16(7.9)	.178(4.5)	7/8(22.2)	—	—	—	901-288

STRAIGHT JACKS / FEMALE CONTACTS • WEATHERPROOF • 50 OHM IMPEDANCE • TFE INSULATION

Cable RG-/U	Cable Termination	Dimensions, inches(millimeters) a	b	c	Tool Data▲ Die Set P/N	Construction Notes	Military Number	Amphenol Number
.085" Dia. Semi-Rigid	Solder	.500(12.7)	1/4(6.4)	.088(2.2)	—	Stainless Steel	—	901-9202-2A
.141" Dia. Semi-Rigid	Solder	.500(12.7)	1/4(6.4)	.144(3.7)	—	Stainless Steel	—	901-9202-1A□
	Clamp	55/64(23.4)	11/32(8.7) Dia.	.144(3.7)	—	—	—	901-108
	Solder	1/2(12.7)	1/4(6.4)	.143(3.7)	—	—	—	901-408
55, 58, 141, 142, 223	Clamp	15/16(23.8)	11/32(8.7) Dia.	.219(5.6)	—	Captivated Contact	—	901-104
	Clamp	15/16(23.8)	11/32(8.7) Dia.	.219(5.6)	—	Captivated Contact	M39012/57-4009	901-104-11
	Clamp	15/16(23.8)	11/32(8.7) Dia.	.219(5.6)	—	Captivated Contact	M39012/57-4004	901-104-12
55, 142, 223	Crimp	1(25.4)	1/4(6.4)	.220(5.6)	227-1221-11	Captivated Contact	—	901-102
	Crimp	1(25.4)	1/4(6.4)	.220(5.6)	227-1221-11	Captivated Contact	M39012/57-4022	901-102-11
	Crimp	1(25.4)	1/4(6.4)	.220(5.6)	227-1221-11	Captivated Contact	M39012/57-4015	901-102-12
	Crimp	1(25.4)	1/4(6.4)	.220(5.6)	227-1221-11	Captivated Contact	M39012/57-4023	901-102-13
	Crimp	1.43(36.4)	1/4(6.4) ■	.220(5.6)	227-1221-11	Noncaptivated Contact S/S	—	901-9602-1□
58, 141, 303	Crimp	7/8(22.2)	1/4(6.4)	.206(5.2)	227-1221-11	Captivated Contact	—	901-110
	Crimp	1(25.4)	1/4(6.4)	.206(5.2)	227-1221-11	Captivated Contact	M39012/57-4021	901-110-11
	Crimp	1(25.4)	1/4(6.4)	.206(5.2)	227-1221-11	Captivated Contact	M39012/57-4014	901-110-12
	Crimp	1(25.4)	1/4(6.4)	.206(5.2)	227-1221-11	Captivated Contact	M39012/57-4024	901-110-13
	Crimp	1(25.4)	1/4(6.4)	.206(5.2)	227-1221-11	Captivated Contact	M39012/57-4017	901-110-14
59	Crimp	1(25.4)	1/4(6.4)	.261(6.6)	227-1221-13	—	—	901-200
142, 400	Crimp	1(25.4)	1/4(6.4)	.220(5.6)	227-1221-11	Captivated Contact	M39012/57-4502	901-102-15
161, 174, 179, 187, 188, 316	Crimp	31/32(24.6)	5/16(7.9)	.128(3.3)	227-1221-09	Captivated Contact	—	901-156
	Crimp	31/32(24.6)	5/16(7.9)	.128(3.3)	227-1221-09	Captivated Contact	M39012/57-4019	901-156-11
	Crimp	31/32(24.6)	5/16(7.9)	.128(3.3)	227-1221-09	Captivated Contact	M39012/57-4012	901-156-12
174, 179, 187, 188, 316	Crimp	.900(22.9)	5/16(7.9)	.128(3.3)	227-1221-03	Stainless Steel/ Captivated Contact	—	901-9602-3
174, 188, 316	Clamp	15/16(23.8)	11/32(8.7) Dia.	.114(2.9)	—	Captivated Contact	—	901-129
	Clamp	15/16(23.8)	11/32(8.7) Dia.	.114(2.9)	—	Captivated Contact	M39012/57-4007	901-129-11
	Solder	1.125(28.6)	1/4(6.4)	.114(2.9)	—	Noncaptivated Contact S/S	—	901-9502-3□

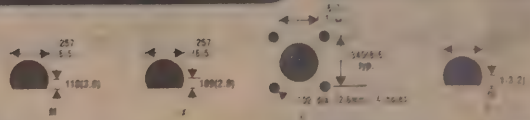
● Accommodates Cable Diameter
▲ Use with Tool Handle 227-944, Cavity A
□ For Stainless Finish Ad SF to Amphenol Number Suffix
■ Overall Length Includes Heat Shrink Tubing Supplied.

AMPHENOL CONNECTORS

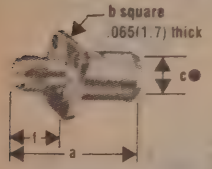
BUNKER RAMO

AMPHENOL NORTH AMERICA
Bunker Ramo Corporation

SMA SERIES (Continued)

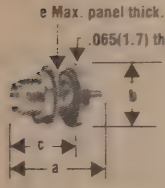


PANEL JACK
901-121



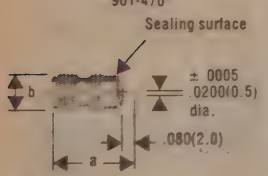
BULKHEAD JACK
901-122

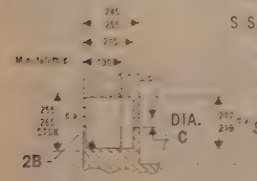
REAR MOUNT
RECEPTACLE 901-116

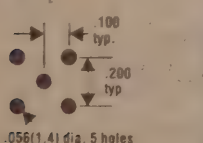


FRONT MOUNT
RECEPTACLE 901-117

SPARK PLUG
901-470







JACKS / FEMALE CONTACTS • REAR MOUNTED • WEATHERPROOF • 50 OHM IMPEDANCE • TFE INSULATION

Cable RG-/U	Termination	Dimensions, inches(millimeters) a	b	c	e	f	Mtg. Hole	Stainless Steel or Tool Data▲ Use Set P/N	M39012/ Number	Amphenol Number
PANEL										
.085" Dia. Semi-Rigid	Solder	.560(14.2)	1/2(12.7)	.0875(2.2)	—	.310(7.9)	Y		—	901-9206-2
.141" Dia. Semi-Rigid	Solder	4 1/64(16.3)	1/2(12.7)	.144(3.7)	—	.325(8.3)	Y		—	901-141
	Solder	.560(14.4)	1/2(12.7)	.142(3.6)	—	.310(7.9)	Y		—	901-9206-1
55, 58, 141, 142, 223	Clamp	15/16(23.8)	1/2(12.7)	.219(5.6)	—	.325(8.3)	Y	—	—	901-121
	Clamp	15/16 23.8	1/2(12.7)	.219(5.6)	—	.325(8.3)	Y		58-4009	901-121-11
	Clamp	15/16(23.8)	1/2(12.7)	.219(5.6)	—	.325(8.3)	Y	—	58-4004	901-121-12
55, 142, 223, 400	Crimp	1(25.4)	1/2(12.7)	.220(5.6)	—	.325(8.3)	Y		—	901-152
	Crimp	1(25.4)	1/2(12.7)	.220(5.6)	—	.325(8.3)	Y		58-4502	901-152-15
58, 141, 303	Crimp	1(25.4)	1/2(12.7)	.206(5.2)	—	.325(8.3)	Y		—	901-153
174, 188, 316	Clamp	15/16(23.8)	1/2(12.7)	.114(2.9)	—	.325(8.3)	Y	—	—	901-150
	Clamp	15/16(23.8)	1/2(12.7)	.114(2.9)	—	.325(8.3)	Y		58-4007	901-150-11
	Clamp	15/16(23.8)	1/2(12.7)	.114(2.9)	—	.325(8.3)	Y		58-4002	901-150-12
180, 195	Clamp	15/16(23.8)	1/2(12.7)	.158(4.0)	—	.325(8.3)	Y		—	901-220
BULKHEAD										
.085" Dia. Semi-Rigid	Solder	4 1/64(16.3)	7/16(11.1)	.088(2.24)	.103(2.6)	.407(10.3)	Z		—	901-158
	Solder	.750(19.0)	.437 Hex	.0875(2.2)	.093(2.4)	.415(10.5)	X	Sinless Steel	—	901-9210-2
.141" Dia. Semi-Rigid	Solder	4 1/64(16.3)	7/16(11.1)	.144(3.7)	.103(2.6)	.407(10.3)	Z	—	—	901-157
	Solder	.750(19.0)	.437 Hex	.142(3.6)	.093(2.4)	.415(10.5)	X		—	901-9210-1
	Solder	3/4(19.1)	7/16(11.1)	.143(3.6)	.093(2.4)	.415(10.5)	M		—	901-380
	Solder	35/64(13.9)	7/16(11.1)	.143(3.6)	.093(2.4)	.415(10.5)	M		—	901-381
	Clamp	59/64(23.4)	7/16(11.1)	.144(3.7)	.103(2.6)	.407(10.3)	Z		—	901-159
	Clamp	31/32(24.6)	7/16(11.1)	.144(3.7)	.103(2.6)	.407(10.3)	Z		—	901-286
55, 58, 141 142, 223	Clamp	15/16(23.8)	7/16(11.1)	.219(5.6)	.103(2.6)	.407(10.3)	Z	—	—	901-122
	Clamp	15/16(23.8)	.430(11.0)	.219(5.6)	.103(2.6)	.407(10.3)	Z	—	59-4009	901-122-11
	Clamp	15/16(23.8)	.430(11.0)	.219(5.6)	.103(2.6)	.407(10.3)	Z		59-4004	901-122-12
55, 142, 223, 400	Crimp	1(25.4)	.437(11.1)	.220(5.6)	.103(2.6)	.407(10.3)	Z	227-122	—	901-291
	Crimp	1(25.4)	.437(11.1)	.220(5.6)	.103(2.6)	.407(10.3)	Z		59-4502	901-291-15
122	Clamp	15/16(23.8)	.430(11.0)	.168(4.3)	.103(2.6)	.407(10.3)	Z	—	—	901-257
	Clamp	15/16(23.8)	.430(11.0)	.168(4.3)	.103(2.6)	.407(10.3)	Z	—	59-4008	901-257-11
	Clamp	15/16 23.8	.430(11.0)	.168(4.3)	.103(2.6)	.407(10.3)	Z		59-4003	901-275-12
174, 188, 316	Clamp	15/16(23.8)	7/16(11.1)	.114(2.9)	.103(2.6)	.407(10.3)	Z	—	—	901-256
	Clamp	15/16 23.8	7/16(11.1)	.114(2.9)	.103(2.6)	.407(10.3)	Z		59-4007	901-256-11
	Clamp	15/16(23.8)	7/16(11.1)	.114(2.9)	.103(2.6)	.407(10.3)	Z	—	59-4002	901-256-12
178	Clamp	.96(24.6)	.430(11.0)	.078(2.0)	.103(2.6)	.407(10.3)	Z		—	901-255
	Clamp	.96(24.6)	.430(11.0)	.078(2.0)	.103(2.6)	.407(10.3)	Z	—	59-4006	901-255-11
	Clamp	.96(24.6)	.430(11.0)	.078(2.0)	.103(2.6)	.407(10.3)	Z	—	59-4001	901-255-12
	Clamp	.96(24.6)	.430(11.0)	.078(2.0)	.103(2.6)	.407(10.3)	Z		—	901-283
180, 195	Clamp	21/32(16.7)	7/16(11.1)	.158(4.0)	.103(2.6)	.407(10.3)	Z		—	901-284
303	Clamp	15/16(23.8)	7/16(11.1)	178(4.5)	.103 2.6	.407(10.3)	Z		—	901-285

RECEPTACLES / FEMALE CONTACTS • 50 OHM IMPEDANCE • TFE INSULATION

Description	Terminal Style	Dimensions, inches(millimeters) a	b	c	e	Mtg. Hole	Military Number	Amphenol Number
BULKHEAD								
Rear Mounted/Gasket	Solder Cup	21/32(16.8)	7/16(11.1) Dia.	.409(10.4)	.103(2.6)	Z	M39012/61-4001	901-116
S S Rear Mounted Captivated Contact	Solder Cup	.668(17.0)	7/16(11.1) Dia.	.450(11.4)	.125(3.2)	X		901-9211-□
Rear Mounted	Solder Cup	43/64(17.0)	5/16(7.9) Hex	.429(10.9)	.125(3.2)	X	—	901-190
Rear Mtd./Hermetic Sealed	Spade	21/32(16.8)	7/16(11.1) Dia.	.407(10.4)	.103(2.6)	Z	M39012/62-4001	901-161
Front Mtd./Hermetic Sealed	Spade	11/16(17.5)	7/16(11.1) Dia.	.290(7.4)	.103(2.6)	Z	M39012/62-4002	901-162
Front Mtd./Gasket	Solder Cup	11/16(17.5)	7/16(11.1) Dia.	.290(7.4)	.103(2.6)	Z	M39012/61-4002	901-117
S, S Front or Rear/.050" Dia.x.084" Long (1.3x2.1mm) Terminal	Blunt	.600(16.7)	5/16(7.9) Hex	—	—	5/16-24 UNEF-2A	—	901-9220-□
Front or Rear/Hermetic Sealed/.020" Dia.x.115" Long (0.5x2.9mm) Terminal	Blunt	5/8(16.0)	5/16(7.9) Hex	—	—	5/16-24 UNEF-2A	—	901-233
PRINTED CIRCUIT								
Straight/.050"(1.3mm) Dia. Term/.040"(1.0mm) Sq. 4 Legs	P.C. Pins	17/32(13.5)	1/4 Sq.(6.4)	3/8(9.5)	5/32(4.0) long	T	—	901-144
Angle/.050"(1.3mm) Dia. Term/.040"(1.0mm) Sq. 4 Legs	P.C. Pins	.585(14.9)	.530(13.5) long inc. legs	3/8(9.5)	5/32(4.0) long	T	—	901-143
STRIPLINE LAUNCHERS								
Jack for .031"(0.8mm) Thick Board	Turret	.416(10.6)	13/32(10.4)Dia.	.375(9.5)	—	V	—	901-182-1
Jack/Microstrip/1"x.370" (25.4x9.4mm) Flange	Blunt W/.064Dia. x.040 Long TFE	.541(13.7)	1/4-36 Thd.	.066±.001	—	T	—	901-570
Spark Plug for Mic Pkg./ Hermetic Sealed/Use With Torque Tool 901-2450	Blunt	.541(13.7)	1/4-36 Thd.	.047±.001	—	L	—	901-470

● Accommodates Cable Diameter □ For Stainless Finish Ad SF to Amphenol Numer Suffix
▲ Use with Tool Handle 227-944, Cavity A

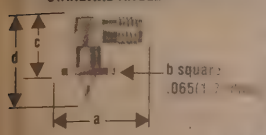
BUNKER RAMO

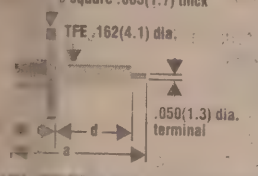
AMPHENOL NORTH AMERICA
Bunker Ramo Corporation

AMPHENOL CONNECTORS

SMA SERIES (Continued)

STANDARD ANGLE



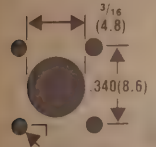


STANDARD TYPE FOR USE WITH WIRE OR CABLE
b square .065(1.7) thick

TRIM-LINE FLANGE JACK MATING
flange .220(5.6) wide by .065(1.7) thick

ADAPTER 901-120
.065(1.7) thick

ANGLE ADAPTER 901-274



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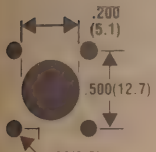
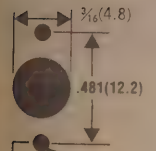
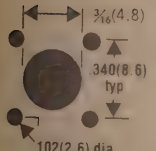


J



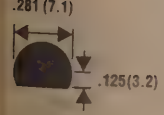
W



Y

INSTALLATION TOOL 901-2450

S



Z

PANEL RECEPTACLES / 50 OHM IMPEDANCE • TFE INSULATION

Description	Terminal Style	Dimensions, inches(millimeters) a	b	c	d	Mtg. Hole	Number Amphenol
JACK MATING / CAPTIVATED FEMALE CONTACT • SQUARE FLANGE							
ide x.050"Deep(.50 x 1.3mm)Slot S/S	Slotted	.440(11.2)	1/2(12.7)	.375(9.5)	—	Y	901-9204-2☐
td. Type/II No. 39012/60-4001	Solder Cup	.562(14.3)	1/2(12.7)	.390(9.9)	—	Y	901-112
Stainless Steel Body/Epoxy Captivation	Solder Cup	.575(14.6)	1/2(12.7)	.375(9.5)	—	Y	901-9215
ge Flange	Blunt	.620(15.8)	11/16(17.5)	.390(9.9)	.110(2.8) TFE	J	901-349-2
ge Flange	Blunt	.765(19.4)	11/16(17.5)	.390(9.9)	.175(4.4) TFE	J	901-349-1
pe/.15 Wide X .100" Deep (.89x2.54mm) Slot	Slotted	.781(19.8)	1/2(12.7)	.390(9.9)	—	Y	901-299
ss Steel	Blunt	1.080(27.4)	1/2(12.7)	.375(9.5)	.590(15.0) TFE	Y	901-9204☐
pe/Stainless Steel Body/Epoxy Captivation	Blunt	1.080(27.4)	1/2(12.7)	.375(9.5)	.590(15.0) TFE	Y	901-9204CC☐
inless Steel Body/Epoxy Captivation	Blunt	1.093(27.8)	1/2(12.7)	.390(9.9)	.590(15.0) TFE	Y	901-176-2
as 901-176-2 Except d Contact	Blunt	1.093(27.8)	1/2(12.7)	.390(9.9)	.590(15.0) TFE	Y	901-176-1
PLUG MATING / CAPTIVATED MALE CONTACT • SQUARE FLANGE							
	Tab	.607(15.4)	1/2(12.7)	.507(12.9	—	Y	901-357
ge Flange	Blunt	.537(13.6)	11/16(17.5)	.507(12.9)	.110(2.8) TFE	J	901-378-2
No Epoxy Captivation	Blunt	.995(25.3)	1/2(12.7)	.507(12.9)	.330(8.4) TFE	Y	901-9214☐
Stainless Steel Nut & Body/Epoxy Captivation	Blunt	.995(25.3)	1/2(12.7)	.507(12.9)	.330(8.4) TFE	Y	901-9214CC
s Steel Nut & Body/Epoxy Captivation	Blunt	1.573(39.9)	1/2(12.7)	.507(12.9)	.150(3.8) TFE	Y	901-414
FLANGE ANGLES / JACK MATING • SQUARE FLANGE							
tainless Steel	Solder Cup	.583(14.8)	1/2(12.7)	.505(12.9)	.685(17.4)	Y	901-9224-☐
a.x.275" Long (2.36x .015" (38mm) Thick Tab	Tab	.708(18.0)	1/2(12.7)	.503(12.8)	.953(24.2)	Y	901-417
TRIM-LINE FLANGE / JACK MATING • CAPTIVATED FEMALE CONTACT							
Typ Non-Captivated Contact	Solder Hole	.375(9.5)	5/8(16.0)	.375(9.5)	—	W	901-371
inless Steel Epoxy Captication	Solder Cup	.575(14.6)	5/8(16.0)	.375(9.5)	.025(.6)	W	901-9244-2☐
ssSteel.005"x.050"x.100"(.13x1.27x.225)	Tab	.375(9.5)	5/8(16.0)	.275(7.0)	—	W	901-9244-3☐
ide X.100" Deep(.64x2.54mm)Slot S/S	Slotted	.630(16.4)	5/8(16.0)	.375(9.5)	.025(.6) TFE	W	901-9244-1☐
s 901-353-2 Except Contact	Blunt	1.093(27.8)	5/8(16.0)	.390(9.9)	.590(15.0) TFE	W	901-353-1
.3" (Deep) (.41x.64mm) Slot ntact (Plug Mating)/	Slotted	.890(22.6)	5/8(16.0)	.550(14.0)	.620(15.8)	W	901-326

ADAPTERS, CAP & CHAIN, TOOLS, CABLE ASSEMBLIES

tion	Dimensions, inches(millimeters) a	b	c	d	e	Mtg. Hole	Amphenol Number
ADAPTERS 50 OHM IMPEDANCE • TFE INSULATION							
g (Long)	57/64(22.6)	5/16(7.9) Hex	—	—	—	—	901-118
ug Epoxy Captivation S/S	7/8(22.2)	5/16(7.9) Hex	—	—	—	—	901-9218☐
a Jack (Long)	19/32(15.1)	1/4(6.4) Dia.	—	—	—	—	901-119
Jack Epoxy Captivation S/S	1/2(12.7)	1/4(6.4) Dia.	—	—	—	—	901-9217☐
ck Epoxy Captivation S/S	.720(18.2)	5/16(7.9) Hex	—	—	—	—	901-9216☐
	21/32(16.7)	—	—	21/32(16.7)	—	—	901-274
	35/64(13.9)	—	—	35/64(13.9)	—	—	901-275
Stainless Steel	5/8(15.9)	—	—	.585(14.9)	—	—	901-9219-A☐
	5/8(15.9)	—	—	9/16(14.3)	—	—	901-125
k	13/16(20.6)	3/8(9.5) Dia.	.335(8.5)	—	.103(2.6)	Z	901-120
Bulkhead/Ja Jack (Long)	7/8(22.2)	3/8(9.5) Hex	.303(7.7)	—	.250(6.4)	Z	901-191
Bulkhead/Ja Jack/ with Gasket Hermetic Seal Stainless Steel	7/8(22.2)	.500(12.7) Dia.	.550(14.0)	—	.187(4.8)	S	901-9208-A☐
/Jack-Jack	1(25.4)	—	—	11/16(17.5)	—	—	901-178
Plug-Jack-Plug	1 1/8(28.6)	—	—	11/16(17.5)	—	—	901-229
Tee/Jack-Plug-Jack	1(25.4)	—	—	3/4(19.1)	—	—	901-305
Tee/Plug-Plug-Jack	1.08(27.4)	—	—	.754(19.1)	—	—	901-382
CAP AND CHAIN							
Non-Shorting Plug/2 (50.8mm) Chain/.130 (3.3mm) Dia. Eyelet	29/64(11.5)	5/16(7.9) Hex	—	—	—	—	901-163

☐ For Stainless Finish Ad SF to Amphenol Number Suffix

SMA TOOLS

Tool Kit contas recommended jacket and dielectric trim tools for precise cable preparation required to ob... cal performance specified. Com... structions are included.

Tool Kit with jacket and dielectric trim tools (less Taper Tool).	901-2500
Taper Tool for .141(3.5mm) semi-rigid center conductor	901-2400
Torque Tool for 901-470 and 901-570 Stripline Launcher	901-2450

CABLE ASSEMBLIES

Custom semi-precision cable assemblies are available with .141(3.5mm) and .085(2.2mm) dia. semi-rigid cable fitted with SMA connectors;contact factory with your specifications.

☐ For Stainless ...nish Ad SF to Amphenol Number Suffix

AMPHENOL CONNECTORS

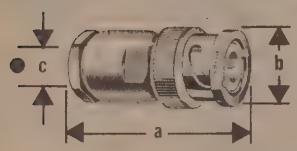
BUNKER RAMO

AMPHENOL NORTH AMERICA
Bunker Ramo Corporation

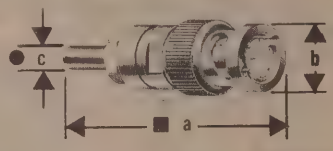
BNC SERIES COAXIAL CONNECTORS

Miniature in size and light in weight, the BNC is characterized by its two-stud quick disconnect bayonet lock coupling arrangement. They function well to 11 GHz and are available in a wide selection of configurations for all popular cables.

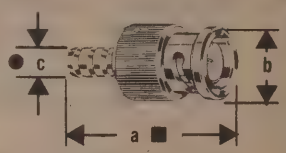
TYPICAL CLAMP & SOLDER TYPE



ORIGINAL-CRIMP



QUICK-CRIMP, MIL-CRIMP & CRIMP-CRIMP



STRAIGHT PLUGS / MALE CONTACTS • 50 OHM IMPEDANCE • WEATHERPROOF • TFE INSULATION

Cable RG-/U	Cannot be Used With	Cable Termination	Dimensions, inches(millimeters) a	b	c	Tool Data▲ Die Set P/N	Construction Notes	Military Number	Amphenol Number
8, 9	—	Std. Clamp	1 21/32(42.1)	1 1/16(17.5)	.437(11.1)	—	"b" dim. is body O.D.	UG-959	6775
6	—	Std. Clamp	1 1/4(31.8)	3/8(14.3)	.348(8.8)	—	Rexolite Insulation	—	9350
59, 62, 71, 140, 210, 302	71	Mil-Crimp II	1 3/32(27.8)	3/8(14.3)	.259(6.6)	227-1221-13	—	M39012/16-0015	31-4321
	71	Quick-Crimp	1 17/64(32.1)	3/8(14.3)	.259(6.6)	227-1221-13	—	—	68175
	71	Orig.-Crimp	1 15/32(37.3)	3/8(14.3)	.259(6.6)	227-1221-13	—	—	31-359
	—	Std.-Clamp	1 1/16(27.0)	3/8(14.3)	.259(6.6)	—	Rexolite Insulation	UG-260	31-012
	—	Std.-Clamp	1 1/16(27.0)	3/8(14.3)	.259(6.6)	—	Non-Weatherproof/Rex. Ins.	UG-260A	31-021
	—	Mil-Clamp I	1 3/32(27.8)	3/8(14.3)	.259(6.6)	—	—	UG-260B	31-212
	—	C.C. Clamp II	1 5/32(29.4)	3/8(14.3)	.259(6.6)	—	Captivated Cont.	—	31-304
	—	Mil-Clamp I	1 3/32(27.8)	3/8(14.3)	.259(6.6)	—	Beryl. Outer Cont.	UG-260C	31-2212
	—	Mil-Clamp I	1 3/32(27.8)	3/8(14.3)	.259(6.6)	—	Beryl. Outer Cont.	UG-260D	31-3212
	—	Mil-Clamp I	1 1/16(27.0)	3/8(14.3)	.259(6.6)	—	75 Ohm	—	86475
	—	Mil-Clamp II	1 3/32(27.8)	3/8(14.3)	.259(6.6)	—	—	M39012/16-0102	31-3302
55, 58, 141, 142, 223, 400	58, 141	Quick-Crimp	1 17/64(32.1)	3/8(14.3)	.220(5.6)	227-1221-11	—	—	36875
	58, 141	Crimp-Crimp	1 1/32(31.0)	3/8(14.3)	.220(5.6)	227-1221-11	—	M39012/16-0503	31-4427
	55A, 223	Std.-Clamp	31/32(24.6)	3/8(14.3)	.214(5.5)	—	—	UG-88	31-002
	55A, 223	Std.-Clamp	31/32(24.6)	3/8(14.3)	.214(5.5)	—	—	UG-88A	14525
	55A, 223	Std.-Clamp	1(25.4)	3/8(14.3)	.214(5.5)	—	Female Contact/Polarized	—	14625
	55A, 223	Std.-Clamp	31/32(24.6)	3/8(14.3)	.214(5.5)	—	Non-Weatherproof	UG-88B	31-018
	—	Mil-Clamp I	1 1/16(27.0)	3/8(14.3)	.214(5.5)	—	—	UG-88C	31-202
	—	C.C Clamp	1 5/32(29.4)	3/8(14.3)	.214(5.5)	—	Capt. Contact	—	31-301
	—	Mil-Clamp I	1 1/16(27.0)	3/8(14.3)	.214(5.5)	—	Beryl. Outer Cont.	UG-88D	31-2202
	—	Mil-Clamp I	1 1/16(27.0)	3/8(14.3)	.214(5.5)	—	Beryl. Outer Cont.	UG-88E	31-3202
	—	Mil-Clamp II	1 1/16(27.0)	3/8(14.3)	.214(5.5)	—	—	M39012/16-0101	31-3301
58, 141	—	Mil-Crimp II	1 3/32(27.8)	3/8(14.3)	.206(5.2)	227-1221-11	—	M39012/16-0013	31-4320
	—	Quick-Crimp	1 17/64(32.1)	3/8(14.3)	.206(5.2)	227-1221-11	—	—	36775
	—	Orig.-Crimp	1 15/32(37.3)	3/8(14.3)	.206(5.2)	227-1221-11	—	—	31-351
122, 180, 195	180, 195	Crimp-Crimp	1 1/32(31.0)	3/8(14.3)	.175(4.4)	227-1221-09	—	M39012/16-0501	31-4425
	180, 195	Quick-Crimp	1 17/64(32.1)	3/8(14.3)	.175(4.4)	227-1221-09	—	—	99575
	122	Crimp-Crimp	1 1/32(31.0)	3/8(14.3)	.175(4.4)	227-1221-09	—	M39012/16-0502	31-4426
	122	Quick-Crimp	1 17/64(32.1)	3/8(14.3)	.175(4.4)	227-1221-09	—	—	36650
	180	Mil-Clamp I	1 1/16(27.0)	3/8(14.3)	.175(4.4)	—	—	UG-1033	84975
	—	Mil-Clamp II	1 5/32(29.4)	3/8(14.3)	.175(4.4)	—	—	M39012/16-0103	31-3303
	122, 195	Std. Clamp	1(25.4)	3/8(14.3)	.150(3.8)	—	—	—	16300
.141" Dia. Semi-Rigid	—	Solder Type	1 1/16(27.0)	3/8(14,3)	.144(3.7)	—	—	—	31-4214
174, 179, 187, 188	174, 188	Mil-Crimp I	1 13/64(30.6)	3/8(14.3)	.115(2.9)	227-1221-09	—	—	31-242
	179, 187	Mil-Crimp I	1 13/64(30.6)	3/8(14.3)	.115(2.9)	227-1221-09	—	—	31-315
	—	Orig.-Crimp	1 11/32(34.1)	3/8(14.3	.128(3.3)	227-1221-03	—	—	31-371
	—	Mil-Clamp I	1 1/16(27.0)	3/8(14.3)	.115(2.9)	—	—	—	69475
178, 196	—	Std.-Clamp	1(25.4)	3/8(14.3)	.094(2.4)	—	—	—	15875
Beldon 8281	—	Quick-Crimp	1 5/16(33.3)	3/8(14.3)	.342(8.7)	—	—	—	31-321-1000
Essex 21-597 or Equiv.	—	Mil-Crimp I	1 13/64(30.6)	3/8(14.3)	.175(4.4)	227-1221-09	—	—	31-325
	—	Quick-Crimp	1 17/64(32.1)	3/8(14.3)	.175(4.4)	227-1221-09	—	—	99600
WE724A	—	Std. Clamp	1 1/4(31.8)	3/8(14.3)	.328(8.3)	—	—	—	9325
No. 18, 20, 22 H.V. Wire shld. & unshld.	—	Std. Clamp	1(25.4)	3/8(14.3)	.123(3.1)	—	—	—	13925

● Accommodates Cable Diameter
■ Includes Outer Ferrule not Shown on Illustration
▲ Use with Tool Handle 227-944

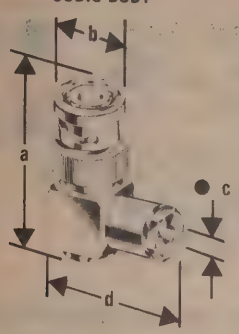
BUNKER RAMO

AMPHENOL NORTH AMERICA
Bunker Ramo Corporation

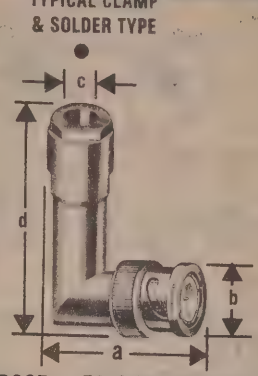
AMPHENOL CONNECTORS

BNC SERIES (Continued)

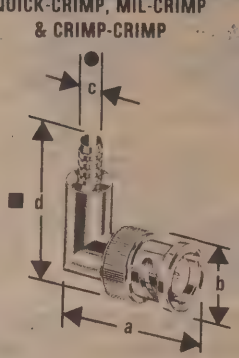
CUBIC BODY



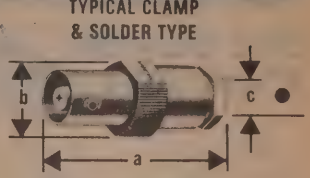
TYPICAL CLAMP & SOLDER TYPE



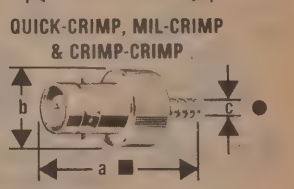
QUICK-CRIMP, MIL-CRIMP & CRIMP-CRIMP



TYPICAL CLAMP & SOLDER TYPE



QUICK-CRIMP, MIL-CRIMP & CRIMP-CRIMP



ANGLE PLUGS / MALE CONTACTS • WEATHERPROOF • 50 OHM IMPEDANCE • TFE INSULATION • MITRE BODY

Cable RG-/U	Cannot be Used With	Cable Termination	Dimensions, inches(millimeters) a	b	c	d	Tool Data▲ Die Set P/N	Construction Notes	Military Number	Amphenol Number
122	—	Crimp-Crimp	1 1/8(28.6)	3/16(14.3)	.175(4.4)	1 9/16(39.7)	227-1221-09	—	M39012/20-0501	31-4444
	71	Mil-Crimp I	1 3/16(30.2)	3/16(14.3)	.259(6.6)	1 13/32(40.5)	227-1221-13	—	—	31-336
	71	Quick-Crimp	1 1/8(28.6)	3/16(14.3)	.259(6.6)	1 9/16(39.7)	227-1221-13	—	—	95625
59, 62, 71, 140, 210	—	Std.-Clamp	1 1/4(31.6)	3/16(14.3)	.259(6.6)	1 1/32(26.2)	—	Rexolite Ins./Cubic	—	31-850
	—	Std.-Clamp	1 1/4(31.6)	3/16(14.3)	.259(6.6)	1(25.4)	—	Cubic Body	—	8575
	—	Std.-Clamp	2 3/32(23.0)	3/16(14.3)	.259(6.6)	1 3/32(29.4)	—	Cubic Body	—	33750
	—	Mil-Clamp I	1 1/16(27.0)	3/16(14.3)	.259(6.5)	1 5/16(39.7)	—	—	—	86225
	58, 141	Mil-Crimp I	1 3/16(30.2)	3/16(14.3)	.220(5.6)	1 13/32(40.5)	227-1221-11	—	—	31-334
	58, 141	Quick-Crimp	1 1/8(28.6)	3/16(14.3)	.220(5.6)	1 9/16(39.7)	227-1221-11	—	—	95575
	58, 141	Mil-Crimp II	1 3/32(27.8)	3/16(14.3)	.220(5.6)	1 21/32(42.1)	227-1221-11	—	M39012/20-0003	31-3365
55, 58, 141, 142, 223, 400	58, 141	Crimp-Crimp	1 1/8(28.6)	3/16(14.3)	.220(5.6)	1 21/32(42.1)	227-1221-11	—	M39012/20-0503	31-4446
	—	Mil-Clamp I	1 3/32(28.8)	3/16(14.3)	.214(5.5)	.214(5.5)	—	—	UG-913	31-204
		Mil-Clamp I	1 3/32(27.8)	3/16(14.3)	.214(5.5)	1 5/8(41.3)	—	Beryl. Outer Cont.	UG-913A	31-2204
	55A, 223	Std. Clamp	1 1/4(31.6)	3/16(14.3)	.214(5.5)	1(25.4)	—	Cubic Body	—	8525
	55A, 223	Std. Clamp	2 3/32(23.0)	3/16(14.3)	.214(5.5)	1 3/32(29.4)	—	Cubic Body	—	38250
	—	Mil-Clamp II	1 3/32(27.8)	3/16(14.3)	.214(5.5)	1 5/8(41.3)	—	—	M39012/20-0101	31-3361
58, 141	—	Mil-Crimp I	1 3/16(30.2)	3/16(14.3)	.206(5.2)	1 13/32(40.5)	227-1221-11	—	—	31-335
	—	Quick-Crimp	1 1/8(28.6)	3/16(14.3)	.206(5.2)	1 9/16(39.7)	227-1221-11	—	—	95600
	—	Mil-Crimp II	1 1/8(28.6)	3/16(14.3)	.206(5.2)	1 21/32(42.1)	227-1221-11	—	M39012/20-0002	31-3364
	180, 195	Mil-Crimp I	1 3/16(30.2)	3/16(14.3)	.175(4.4)	1 13/32(40.5)	227-1221-09	—	—	31-339
	122	Mil-Crimp I	1 3/16(30.2)	3/16(14.3)	.175(4.4)	1 13/32(40.5)	227-1221-09	—	—	31-338
122, 180, 195	122	Crimp-Crimp	1 1/8(28.6)	3/16(14.3)	.175(4.4)	1 21/32(42.1)	227-1221-09	—	M39012/20-0502	31-4445
	180	Std. Clamp	1 1/4(31.6)	3/16(14.3)	.175(4.5)	1(25.4)	—	Cubic Body	—	33775
	122, 195	Std. Clamp	1 1/4(31.6)	3/16(14.3)	.150(3.8)	1(25.4)	—	Cubic Body	—	16975
.141" Dia. Semi-Rigid	—	Solder Type	1 1/16(27.0)	3/16(14.3)	.144(3.7)	1 3/16(39.7)	—	—	—	31-4216
174, 179, 187, 188	174, 188	Mil-Crimp I	1 3/16(30.2)	3/16(14.3)	.115(2.9)	1 13/32(40.5)	227-1221-09	—	—	31-243
	179, 187	Mil-Crimp I	1 3/16(30.2)	3/16(14.3)	.115(2.9)	1 13/32(40.5)	227-1221-09	—	—	31-316
178, 196	—	Std. Clamp	1 1/4(31.6)	3/16(14.3)	.096(2.4)	1(25.4)	—	Cubic Body	—	21975
Essex 21-597 or Equiv.	—	Mil-Crimp I	1 3/16(30.2)	3/16(14.3)	.175(4.4)	1 13/32(40.5)	227-1221-09	—	—	31-340
	—	Quick-Crimp	1 1/8(28.6)	3/16(14.3)	.175(4.4)	1 9/16(39.7)	227-1221-09	—	—	99650

STRAIGHT JACKS / FEMALE CONTACTS • WEATHERPROOF • 50 OHM IMPEDANCE • TFE INSULATION

Cable RG-/U	Cannot be Used With	Cable Termination	Dimensions, inches(millimeters) a	b	c	Tool Data▲ Die Set P/N	Construction Notes	Military Number	Amphenol Number
	71	Mil-Crimp II	1 11/64(29.8)	3/16(14.3)	.259(6.6)	227-1221-13	—	M39012/17-0015	31-4328
	71	Quick-Crimp	1 11/32(34.1)	3/16(14.3)	.259(6.6)	227-1221-13	—	—	68150
	—	Std. Clamp	1 3/4(29.0)	3/16(14.3)	.259(6.6)	—	—	UG-261	31-015
59, 62, 71, 140, 210	—	Std. Clamp	1 3/4(29.0)	3/16(14.3)	.259(6.6)	—	Non-Weatherproof	UG-261A	31-022
	—	Mil-Clamp I	1 3/4(29.0)	3/16(14.3)	.259(6.6)	—	—	UG-261B	31-215
	—	C.C. Clamp II	1 13/64(31.4)	3/16(14.3)	.259(6.6)	—	Captivated Contact	—	31-305
	—	Mil-Clamp I	1 3/4(29.0)	3/16(14.3)	.259(6.6)	—	—	UG-261C	31-2215
	—	Mil-Clamp II	1 3/4(29.0)	3/16(14.3)	.259(6.6)	—	—	M39012/17-0102	31-3320
	55A	Std.-Clamp	1 3/4(29.0)	3/16(14.3)	.214(5.5)	—	—	UG-89	31-005
	55A	Std.-Clamp	1 3/4(29.0)	3/16(14.3)	.214(5.5)	—	Non-Weatherproof	UG-89A	31-019
	—	Mil-Clamp I	1 3/4(29.0)	3/16(14.3)	.214(5.5)	—	—	UG-89B	31-205
55, 58, 141, 142	—	C.C. Clamp I	1 13/64(31.4)	3/16(14.3)	.214(5.5)	—	Captivated Contact	—	31-302
223, 400	—	Mil-Clamp I	1 3/4(29.0)	3/16(14.3)	.214(5.5)	—	—	UG-89C	31-2205
	—	Mil-Clamp II	1 3/4(29.0)	3/16(14.3)	.214(5.5)	—	—	M39012/17-0101	31-3319
	58, 141	Crimp-Crimp	1(25.4)	1/16(11.1)	.220(5.6)	227-1221-09	—	M39012 17-0503	31-4431
	58, 141	Quick-Crimp	1 11/32(34.1)	3/16(14.3)	.220(5.6)	227-1221-11	—	—	36900
58, 141	—	Quick-Crimp	1 11/32(34.1)	3/16(14.3)	.206(5.2)	227-1221-11	—	—	36800
	—	Mil-Crimp II	1 11/64(29.8)	3/16(14.3)	.206(5.2)	227-1221-11	—	M39012 17-0013	31-4327
	180, 195	Crimp-Crimp	1(25.4)	1/16(11.1)	.175(4.4)	227-1221-09	—	M39012/17-0501	31-4429
	180, 195	Quick-Crimp	1 11/32(34.1)	3/16(14.3)	.175(4.4)	227-1221-09	—	—	99675
122, 180, 195	122	Quick-Crimp	1 11/32(34.1)	3/16(14.3)	.175(4.4)	227-1221-09	—	—	36675
	—	Mil-Clamp II	1 3/4(29.0)	3/16(14.3)	.175(4.4)	—	—	M39012/16-0103	31-3321
	122, 195	Std.-Clamp	1 3/4(27.4)	3/16(14.3)	.150(3.8)	—	—	—	16925
	122	Crimp-Crimp	1(25.4)	1/16(11.1)	.175(4.4)	227-1221-09	—	M39012/17-0502	31-4430
.141" Dia. Semi-Rigid	—	Solder Type	1 3/64(29.0)	3/16(14.3)	.144(3.7)	—	—	—	31-4218
174, 179, 187, 188	174, 188	Mil-Crimp I	1 25/64(35.3)	3/16(14.3)	.115(2.9)	227-1221-09	—	—	31244
	179, 187	Mil-Crimp I	1 25/64(35.3)	3/16(14.3)	.115(2.9)	227-1221-09	—	—	31-317
Essex 21-597 or Equiv.	—	Mil-Crimp I	1 25/64(35.3)	3/16(14.3)	.175(4.4)	227-1221-09	—	—	31-332
	—	Quick-Crimp	1 11/32(34.1)	3/16(14.3)	.175(4.4)	227-1221-09	—	—	99700

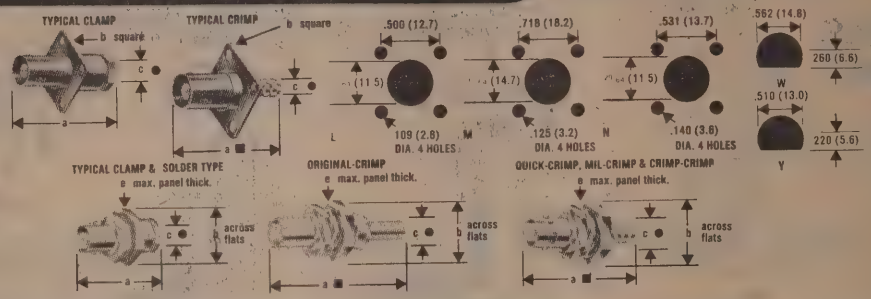
Accommodates Cable Diameter ■ Includes Outer Ferrule Not Shown on Illustration ▲ Use with Tool Handle 227-944

AMPHENOL CONNECTORS

BUNKER RAMO

AMPHENOL NORTH AMERICA
Bunker Ramo Corporation

BNC SERIES (Continued)



PANEL JACKS / FEMALE CONTACTS • WEATHERPROOF • 50 OHM IMPEDANCE • NO. 3-56 TAPPED FLANGE HOLES • FRONT OR REAR MOUNTED • TFE INSULATION

Cable RG-/U	Cannot be Used With	Cable Termination	Dimensions, inches(millimeters) a	b	c	Mtg. Hole	Tool Data▲ Die Set P/N	Construction Notes	Military Number	Amphenol Number
8	—	Std. -Clamp	1 15/32(37.3)	1(25.4)	.438(11.1)	M	—	.125 Dia. Flange Holes /Rear Mounted Only	—	6750
	71	Mil-Crimp II	1(25.4)	1 1/16(17.5)	.259(6.6)	L	227-1221-13	—	M39012/18-0015	31-4244
	—	Std. Clamp	1 1/8(28.6)	1 1/16(17.5)	.259(6.6)	L	—	Rexolite Insulation	UG-262	31-011
	—	Std. Clamp	1 3/64(27.4)	1 1/16(17.5)	.259(6.6)	L	—	Non-Weatherproof/ Rexolite Insulation	UG-262A	31-023
59, 62, 71, 140, 210	—	Mil-Clamp I	1 3/64(29.0)	1 1/16(17.5)	.259(6.6)	L	—	—	UG-262B	31-211
	—	C.C. Clamp II	1 15/64(31.4)	1 1/16(17.5)	.259(6.6)	L	—	Captivated Contact	—	31-303
	—	Mil-Clamp I	1 3/64(29.0)	1 1/16(17.5)	.259(6.6)	L	—	—	UG-262C	31-2211
	—	Mil-Clamp II	1 3/64(29.0)	1 1/16(17.5)	.259(6.6)	L	—	—	M39012/18-0101	31-3334
	55A, 223	Std. Clamp	1 1/8(28.6)	1 1/16(17.5)	.214(5.4)	L	—	—	UG-291	31-001
	55A, 223	Std. Clamp	1 3/64(27.4)	1 1/16(17.5)	.214(5.4)	L	—	Non-Weatherproof	UG-291A	31-020
	55A, 223	Mil-Clamp I	1 3/64(29.0)	1 1/16(17.5)	.214(5.4)	L	—	—	UG-291B	31-201
	—	C.C. Clamp I	1 15/64(31.4)	1 1/16(17.5)	.214(5.4)	L	—	Captivated Contact	—	31-300
55, 58, 141, 142, 223, 400	—	Mil-Clamp I	1 3/64(29.0)	1 1/16(17.5)	.214(5.4)	L	—	—	UG-291C	31-2201
	55A, 223	Std. Clamp	1 3/64(27.4)	3/4(19.1)	.214(5.4)	N	—	.136 Dia. Flange Holes /Rear Mounted Only	UG-90	1300
	—	Mil-Clamp II	1 3/64(29.0)	1 1/16(17.5)	.214(5.4)	L	—	—	M39012/18-0102	31-3333
	58, 141	Mil-Crimp II	1 11/64(29.8)	1 1/16(17.5)	.220(5.6)	L	227-1221-11	—	M39012/18-0014	31-4243
	58, 141	Crimp-Crimp	1 11/64(29.8)	1 1/16(17.5)	.220(5.6)	L	227-1221-11	—	M39012/18-0503	31-4435
58, 141	—	Mil-Crimp II	1 11/64(29.8)	1 1/16(17.5)	.206(5.2)	L	227-1221-11	—	M39012/18-0013	31-4242
	—	Std. -Clamp	1 3/64(27.4)	1 3/64(17.5)	.175(4.4)	L	—	Rexolite Insulation	—	164-75
122, 180, 195	180, 195	Crimp-Crimp	1 11/64(29.8)	1 1/16(17.5)	.175(4.4)	L	227-1221-09	—	M39012/18-0501	31-4433
	122	Crimp-Crimp	1 11/64(29.8)	1 1/16(17.5)	.175(4.4)	L	227-1221-09	—	M39012/18-0502	31-4434
	—	Mil-Clamp II	1 3/64(29.0)	1 1/16(17.5)	.175(4.4)	L	—	—	M39012/18-0103	31-3335
174, 179, 187, 188	—	Mil-Clamp I	1 3/64(29.0)	1 1/16(17.5)	.117(3.0)	L	—	—	—	86425

BULKHEAD JACKS / FEMALE CONTACTS • WEATHERPROOF • 50 OHM IMPEDANCE • REAR MOUNTED • TFE INSULATION

Cable RG-/U	Cannot be Used With	Cable Termination	Dimensions, inches(millimeters) a	b	c	e	Mtg. Hole	Tool Data▲ Die Set P/N	Construction Notes	Military Number	Amphenol Number
	71	Mil-Crimp II	1 13/32(35.7)	1 1/16(17.5)	.259(6.6)	.125(3.2)	Y	227-1221-13	—	M39012/19-0015	31-4343
	71	Quick-Crimp	1 5/16(33.3)	1 1/16(17.5)	.259(6.6)	.125(3.2)	Y	227-1221-13	—	—	95750
	71	Orig.-Crimp	1 1/32(40.5)	1 1/16(17.5)	.259(6.6)	.125(3.2)	Y	227-1221-13	—	—	31-365
59, 62, 71, 140, 210	—	Mil-Clamp I	1 1/8(28.6)	1 1/16(17.5)	.259(6.6)	.218(5.5)	Y	—	—	UG-910	31-207
	—	Mil-Clamp I	1 3/64(29.0)	1 1/16(17.5)	.259(6.6)	.218(5.5)	Y	—	—	UG-910A	31-2207
	—	Mil-Clamp	1 3/64(29.0)	1 1/16(17.5)	.259(6.6)	.218(5.5)	Y	—	—	UG-910B	31-3207
	—	Mil-Clamp II	1 11/64(29.8)	1 1/16(17.5)	.259(6.6)	.218(5.5)	Y	—	—	M39012/19-0102	31-3348
	—	Std.-Clamp	1 1/4(27.0)	5/8(15.9)	.259(6.6)	.125(3.2)	W	—	Front Mtg./Rex. Ins.	UG-624	2075
	—	Std.-Clamp	1 3/64(27.4)	5/8(15.9)	.259(6.6)	.125(3.2)	W	—	Rexolite Insulation	—	2675
	55A, 223	Mil-Clamp I	1 1/8(28.6)	1 1/16(17.5)	.214(5.4)	.218(5.5)	Y	—	—	UG-909	31-206
	55A, 223	Std. Clamp	1 1/16(27.0)	5/8(15.9)	.214(5.4)	.125(3.2)	W	—	Front Mounting	—	2475
55, 58, 141, 142, 223, 400	55A, 223	Std. Clamp	1 3/64(27.4)	5/8(15.9)	.214(5.4)	.125(3.2)	W	—	—	—	2575
	—	Mil-Clamp I	1 3/64(29.0)	1 1/16(17.5)	.214(5.4)	.218(5.5)	Y	—	—	UG-909A	31-2206
	—	Mil-Clamp I	1 3/64(29.0)	3/4(19.1)	.214(5.4)	.218(5.5)	Y	—	—	UG-909B	31-3206
	—	Mil-Clamp I	1 49/64(44.8)	5/8(15.9)	.214(5.4)	.156(4.0)	Y	—	Herm. Sealed	—	17725
	—	Mil-Clamp II	1 11/64(29.8)	1 1/16(17.5)	.214(5.4)	.218(5.5)	Y	—	—	M39012/19-0101	31-3347
55, 142, 223 400	—	Crimp-Crimp	1 13/32(35.7)	1 1/16(17.5)	.220(5.6)	.218(5.5)	Y	227-1221-11	—	M39012/19-0503	31-4439
	—	Quick-Crimp	1 5/16(33.3)	1 1/16(17.5)	.220(5.6)	.125(3.2)	Y	227-1221-11	—	—	95700
	—	Orig.-Crimp	1 1/32(40.5)	1 1/16(17.5)	.220(5.6)	.125(3.2)	Y	227-1221-11	—	—	31-357
	—	Mil-Crimp II	1 13/32(35.7)	1 1/16(17.5)	.206(5.2)	.218(5.5)	Y	227-1221-11	—	M39012/19-0013	31-4342
58, 141	—	Quick-Crimp	1 5/16(33.3)	1 1/16(17.5)	.206(5.2)	.125(3.2)	Y	227-1221-11	—	—	95725
	—	Orig. Crimp	1 1/32(40.5)	1 1/16(17.5)	.206(5.2)	.125(3.2)	Y	227-1221-11	—	—	31-358
	122	Crimp-Crimp	1 13/32(35.7)	1 1/16(17.5)	.175(4.4)	.218(5.5)	Y	227-1221-09	—	M39012/19-0502	31-4438
122, 180, 195	122	Quick-Crimp	1 5/16(33.3)	1 1/16(17.5)	.175(4.4)	.125(3.2)	Y	227-1221-09	—	—	95800
	180, 195	Crimp-Crimp	1 13/32(35.7)	1 1/16(17.5)	.175(4.4)	.218(5.5)	Y	227-1221-09	—	M39012/19-0501	31-4437
	—	Orig. Crimp	1 1/32(40.5)	1 1/16(17.5)	.175(4.4)	.125(3.2)	Y	227-1221-09	—	—	31-372
.141" Dia. Semi-Rigid	—	Solder-Type	1 1/8(28.6)	1 1/16(17.5)	.144(3.7)	.125(3.2)	Y	—	—	—	31-4220
	174, 188	Mil-Crimp I	1 3/8(34.9)	1 1/16(17.5)	.115(2.9)	.125(3.2)	Y	227-1221-09	—	—	31-245
174, 179, 187, 188	179, 187	Mil-Crimp I	1 3/8(34.9)	1 1/16(17.5)	.115(2.9)	.125(3.2)	Y	227-1221-09	—	—	31-318
	—	Orig. Crimp	1 13/32(37.3)	1 1/16(17.5)	.128(3.3)	.125(3.2)	Y	227-1221-03	—	—	31-369
	—	Std. Clamp	1 3/64(29.0)	1 1/16(17.5)	.115(2.9)	.250(6.4)	Y	—	—	—	86350
179	179A, B	Std. Clamp	1 3/64(27.4)	5/8(15.9)	.094(2.4)	.125(3.2)	W	—	Front Mounting	—	17825
178, 196	—	Mil-Clamp I	1 3/64(29.0)	1 1/16(17.5)	.098(2.5)	.250(6.4)	Y	—	—	—	86850
Essex 21-597 or Equiv.	—	Mil-Crimp I	1 3/8(34.9)	1 1/16(17.5)	.175(4.4)	.125(3.2)	Y	227-1221-09	—	—	31-347
	—	Quick-Crimp	1 5/16(33.3)	1 1/16(17.5)	.175(4.4)	.125(3.2)	Y	227-1221-09	—	—	99750

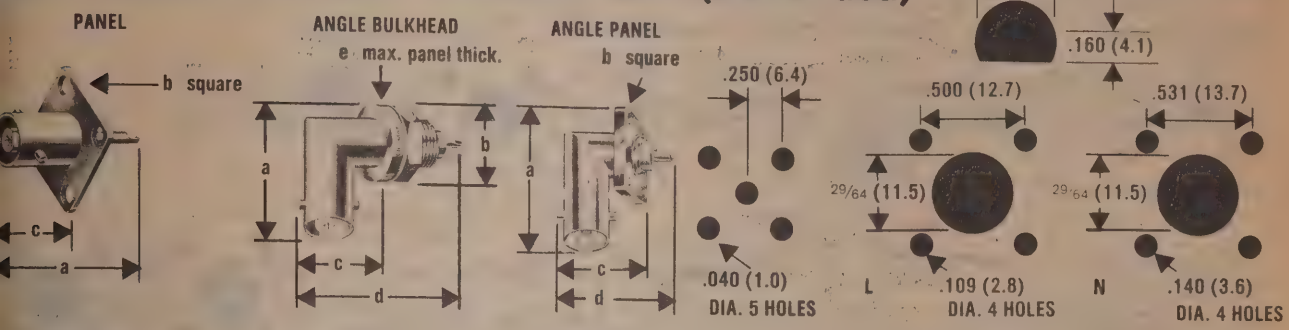
● Accommodates Cable Diameter ■ Includes Outer Ferrule Not Shown on Illustration ▲ Use with Tool Handle 227-944

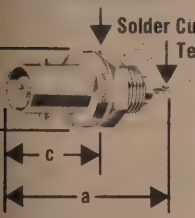
BUNKER RAMO

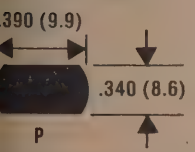
AMPHENOL NORTH AMERICA
Bunker Ramo Corporation

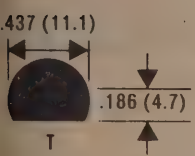
AMPHENOL CONNECTORS

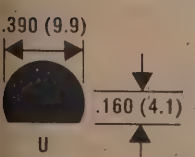
BNC SERIES COAXIAL CONNECTORS (Continued)

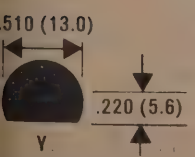












RECEPTACLES / FEMALE CONTACTS • 50 OHM IMPEDANCE • TFE INSULATION

Description	Terminal Style	Dimensions, inches(millimeters) a	b	c	d	e	Mtg. Hole	Military Number	Amphenol Number
PANEL									
Printed Circuit Pins, .040" Dia. by 1/8" Long	P.C. Pins	49/64(19.4)	11/16(17.5)	41/64(16.3)	—	—	I	—	18225
No. 3-56 Tapped Flange Holes	Solder Cup	1 1/16(27.0)	11/16(17.5)	23/32(18.3)	—	—	L	M39012/ 22-0001	31-3377
No. 3-56 Tapped Flange Holes	Solder Cup	1 1/16(27.0)	11/16(17.5)	23/32(18.3)	—	—	L	UG-290A	31-203
No. 3-56 Tapped Flange Holes	Solder Cup	1 1/16(27.0)	11/16(17.5)	23/32(18.3)	—	—	L	UG-290	31-003
No. 3-56 Tapped Flange Holes	Solder Cup	1 1/32(26.2)	11/16(17.5)	23/32(18.3)	—	—	L	—	31-842
.109" Dia. Flange Holes, Rexolite Insulation	Solder Cup	1 1/32(26.2)	11/16(17.5)	23/32(18.3)	—	—	L	UG-447	31-817
.120" Dia. Flange Holes, Rexolite Insulation	Solder Cup	1 1/32(26.2)	11/16(17.5)	23/32(18.3)	—	—	L	—	31-105
.136" Dia. Flange Holes Rexolite Insulation	Turret	1 3/64(27.4)	3/4(19.1)	39/64(15.5)	—	—	N	UG-185	4500
.136" Dia. Flange Holes Rexolite Insulation	Spade	27/32(21.4)	3/4(19.1)	19/32(14.2)	—	—	N	UG-928	1100
.140" Dia. Flange Holes, Polystyrene Insulation	Turret	1 5/32(37.3)	3/4(19.1)	43/64(17.1)	—	—	N	—	31-104
Plug Mating Face (Male Contact), .136" Dia. Flange Holes	Solder Cup	1 1/4(31.8)	3/4(19.1)	55/64(21.8)	—	—	N	—	3150
ANGLE									
No. 3-56 Tapped Flange Holes	Solder Cup	1 1/16(27.0)	11/16(17.5)	3/4(19.1)	15/16(23.8)	—	L	—	5075
.136" Dia. Flange Holes	Solder Cup	1 3/32(27.8)	3/4(19.1)	3/4(19.1)	15/16(23.8)	—	N	UG-535	5675
Front Mount Bulkhead, External Toothed Lockwasher	Solder Cup	29/32(23.0)	19/32(15.1)	3/4(19.1)	1 9/32(32.5)	.156(4.0)	V	UG-1098	31-222☐
Front Mount Bulkhead, Thick Panel, External Toothed Lockwasher	Solder Cup	29/32(23.0)	19/32(15.1)	3/4(19.1)	1 3/8(34.9)	.312(7.9)	V	UG-1098A	31-2222☐
BULKHEAD / FRONT MOUNT • INTERNAL TOOTH LOCKWASHER									
Isolated from Panel, White Molded Thermo Plastic Insulation	Solder Cup	1 3/16(30.2)	1/2(12.7)	31/64(12.3)	—	.187(4.8)	U	—	31-010
Gold Plated Contact	Solder Cup	1 3/16(30.2)	1/2(12.7)	31/64(12.3)	—	.250(6.4)	U	M39012/ 21-0002	31-3376☐
Standard Type	Solder Cup	1 3/16(30.2)	1/2(12.7)	31/64(12.3)	—	.250(6.4)	U	UG-1094A	31-2221☐
Thin Panel	Solder Cup	1 1/16(27.0)	1/2(12.7)	31/64(12.3)	—	.125(3.2)	U	UG-1094	31-221☐
Gold Plated Contact	Solder Cup	1 1/16(27.0)	1/2(12.7)	15/32(11.9)	—	.156(4.0)	T	M39012/ 21-0001	31-3375☐
Standard Type	Solder Cup	1 1/16(27.0)	1/2(12.7)	15/32(11.9)	—	.156(4.0)	T	UG-625B	31-236☐
Standard Type	Solder Cup	1 1/16(27.0)	1/2(12.7)	15/32(11.9)	—	.156(4.0)	T	UG-625	5575☐
Standard Type	Solder Cup	1 1/32(26.2)	1/2(12.7)	1/2(12.7)	—	.156(4.0)	T	—	11300☐
Polarized, Male Contact	Solder Cup	1 1/32(26.2)	1/2(12.7)	1/2(12.7)	—	.156(4.0)	T	—	11325☐
Pressurized	Solder Cup	1 13/64(32.9)	3/64(14.7)	19/32(15.1)	—	.250(6.4)	P	UG-657A	31-239☐
Pressurized	Solder Cup	1 13/64(32.9)	3/64(14.7)	19/32(15.1)	—	.250(6.4)	P	UG-657	31-102☐
Hermetic Sealed, Gold Plated Contact	Spade	1 3/4(30.6)	15/32(14.2)	33/64(13.1)	—	.250(6.4)	U	M39012/ 24-0002	31-4238☐
Hermetic Sealed, External Tooth Lockwasher	Spade	1 3/4(30.6)	15/32(14.2)	33/64(13.1)	—	.250(6.4)	U	UG-912	31-238☐
Hermetic Sealed	Spade	1 13/32(35.7)	3/4(19.1)	5/8(15.9)	—	.312(7.9)	P	—	87225☐
Plug Mating Face, Male Contact Hermetic Sealed	Spade	1 13/32(35.7)	9/16(14.3)	7/8(22.2)	—	.156(4.0)	U	—	86250☐
Hermetic Sealed, Gold Plated Contact, Rear Mt.	Spade	1 11/32(34.1)	11/16(17.5)	53/64(21.0)	—	.250(6.4)	Y	M39012/ 24-0001	31-4237
Pressurized, External Tooth Lockwasher, Rear Mt.	Solder Cup	1 15/32(37.3)	13/16(20.6)	53/64(21.0)	—	.250(6.4)	.516 Dia.	UG-254A	31-016

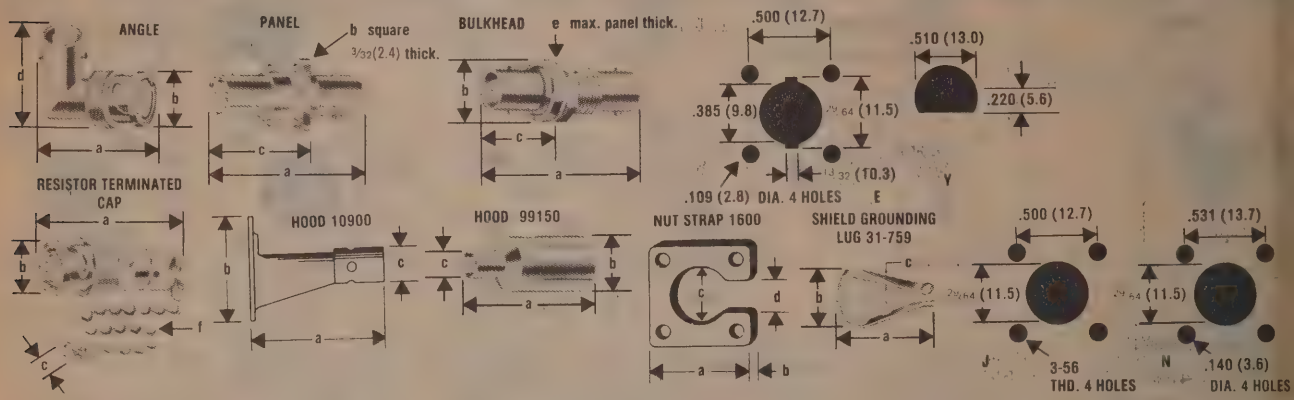
☐ To Ground Cable Shield Use Lug P/N 31-759

AMPHENOL CONNECTORS

BUNKER RAMO

AMPHENOL NORTH AMERICA
Bunker Ramo Corporation

BNC SERIES COAXIAL CONNECTORS (Continued)



ADAPTERS / 50 OHM IMPEDANCE • TFE INSULATION

Construction	Adapter Ends	Dimensions, inches(millimeters) a	b	c	d	e	Mtg. Hole	Construction Notes	Military Number	Amphenol Number
STRAIGHT	Plug-Plug	1¼(31.8)	5/16(14.3)	—	—	—	—	—	UG-491A	31-218
	Plug-Plug	1¼(31.8)	5/16(14.3)	—	—	—	—	Beryl. Outer Contact	UG-491B	31-2218
	Jack-Jack	1 9/32(32.5)	7/16(11.1)	—	—	—	—	—	UG-914	31-219
	Plug-Plug	1¼(31.8)	5/16(14.3)	—	—	—	—	—	UG-491	8425
	Jack-Jack	1 17/32(38.9)	5/16(14.3)	—	—	—	—	—	—	21925
ANGLE	Jack-Plug	1(25.4)	5/16(14.3)	—	31/32(24.6)	—	—	—	UG-306	31-009
	Jack-Plug	1 1/16(27.0)	5/16(14.3)	—	57/64(22.6)	—	—	Beryl. Outer Contact	UG-306A	31-209
	Jack-Plug	1 1/16(27.0)	5/16(14.3)	—	57/64(22.6)	—	—	Beryl. Outer Contact	UG-306B	31-2209
PANEL	Jack-Jack	1 9/32(32.5)	1 1/16(17.5)	19/32(15.1)	—	.250(6.4)	E	3-56 Tapped Flange Holes	UG-414	47000
	Jack-Jack	1 9/32(32.5)	1 1/16(17.5)	1 1/16(17.5)	—	.187(4.8)	E	3-56 Tapped Flange Holes	UG-414A	47025
BULKHEAD	Jack-Jack	1 13/32(35.7)	1 1/16(17.5)	43/64(17.0)	—	.187(4.8)	Y	Herm. Sealed/Glass-TFE Insul./ Internal Lockwasher Teeth	UG-492A	31-220
	Jack-Jack	1 25/64(35.3)	1 1/16(17.5)	43/64(17.0)	—	.156(4.0)	Y	Herm. Sealed/Glass-TFE Insul./ External Lockwasher Teeth	UG-492B	31-2220
	Jack-Jack	1 17/32(38.9)	1 1/16(17.5)	43/64(17.0)	—	.281(7.1)	Y	Herm. Sealed/Glass-TFE Insul./ External Lockwasher Teeth/ Thick Panel	UG-492D	31-3220
	Jack-Jack	1 13/32(35.7)	1 1/16(17.5)	43/64(17.0)	—	.187(4.8)	Y	Standard Type/Internal Lockwasher Teeth	—	4525
TEE	Jack-Plug-Jack	1 9/32(32.5)	5/16(14.3)	—	1 9/32(27.8)	—	—	—	UG-274	31-008
	Jack-Plug-Jack	1 9/32(32.5)	5/16(14.3)	—	1 1/16(27.0)	—	—	Beryl. Outer Contact	UG-274A	31-208
	Jack-Plug-Jack	1 9/32(32.5)	5/16(14.3)	—	1 1/16(27.0)	—	—	Beryl. Outer Contact	UG-274B	31-2208
	Plug-Plug-Plug	1 13/16(46.0)	5/16(14.3)	—	1 17/32(31.0)	—	—	—	—	4725
	Jack-Jack-Jack	1 9/32(32.5)	1 1/16(17.5)	1 1/16(17.5)	1 7/16(36.5)	.281(7.1)	E	Panel Mount/3-56 Tapped Flange Holes/Rexolite Insul.	—	17450
	Plug-Jack-Jack	1 17/32(38.9)	3/8(9.6)	—	1(25.4)	—	—	—	—	21900
	Plug-Jack-Plug	1 13/16(46.0)	7/16(11.1)	—	1 13/16(30.2)	—	—	—	—	27750
	Cable-Plug-Cable	1¾(44.5)	5/16(14.3)	—	29/32(23.0)	—	—	RG-58/U Cable/Standard Clamp	—	33725

CAPS AND ACCESSORIES

Construction	Description	Dimensions, inches(millimeters) a	b	c	d	f	Mtg. Hole	Military Number	Amphenol Number
Resistor Terminated Caps	Rexolite Insulation/100 Ohm	1¼(31.8)	5/16(14.3)	.144(3.7)	—	3½(88.9)	—	MX-554	4700☐
° Male Contacts	100 Ohm	1¼(31.8)	5/16(14.3)	.144(3.7)	—	3½(88.9)	—	MX-554A	39575
° Weatherproof	—	1¼(31.8)	5/16(14.3)	.144(3.7)	—	3½(88.9)	—	—	35650☐
° Tfe Insulation	—	1 13/64(30.6)	5/16(14.3)	—	—	—	—	—	35725☐
	Rexolite Insulation	1 9/64(29.0)	5/16(14.3)	—	—	—	—	—	40750☐
	51 or 75 Ohm 1 Watt Resistor	1½(38.1)	5/16(14.3)	—	—	—	—	—	46650☐
Male Caps ° Weatherproof	Shorting Male Contact	1 1/16(17.5)	5/16(14.3)	.144(3.7)	—	2¼(57.2)	—	CW-159	31-017
	Shorting Male Contact	1 1/16(17.5)	5/16(14.3)	.144(3.7)	—	2½(63.5)	—	M39012/25-0016	31-3017
	Shorting Male Contact	1 9/32(15.1)	5/16(14.3)	—	—	—	—	—	5275
	Solder Lug	23/32(18.3)	5/16(14.3)	.510(13.0)	—	2½(63.5)	—	—	87300
	—	23/32(18.3)	5/16(14.3)	.375(9.5)	—	3½(88.9)	—	—	900
	—	1 1/16(17.5)	5/16(14.3)	.142(3.6)	—	2¼(57.2)	—	CW-123	31-006
	—	45/64(17.9)	5/16(14.3)	.130(3.3)	—	2¼(57.2)	—	M39012/25-0006	31-026
	—	37/64(14.7)	5/16(14.3)	—	—	—	—	CW-155	31-007
	—	37/64(14.7)	5/16(14.3)	—	—	—	—	CW-155A	31-027
	—	37/64(14.7)	5/16(14.3)	—	—	—	—	M39012/25-0015	31-3207
Female Caps ° Weatherproof	—	1 1/16(17.5)	½(12.7)	.281(7.1)	—	3¼(82.6)	—	M39012/25-0008	31-3210
	—	25/32(19.8)	5/16(14.3)	—	—	—	—	—	1750
Accessories ° Non-Weatherproof	Hood with Square Flange for use with RG-55, 58/U Cable	7/8(22.2)	1 1/4(17.5)	7/32(5.6)	—	—	J	MX-195	10900
	Hood for use with RG-55, 58, 59, 62, 71, 223/U Cable	1 3/16(20.6)	1 11/32(8.7)	3/16(4.7)	—	—	—	M39012/25-0010	99150
	Nut Strap, 4 Holes with 4-40 NC-23 Threads	¾sq.(19.1)	.081(2.1)	7/16(11.1)	.200(5.1)	—	N	MT-412	1600
	Shield Grounding Lug Used on Front Mount Receptacles as Shown	29/32(23.0)	37/64(14.7)	1/8(3.2)	—	—	—	—	31-759

☐ To order without resistor, add -1 to part number; to order with resistor, add resistor value to part number. ½Watt 5% resistor values (ohms) stocked: 47, 51, 68, 75, 82, 91, 100, 120, 130, 150, 180, 240, 270, 300, 470, 510, 560, 680, 750, 820, 1000, 1500, 3900, 4700, 10000, 100000, 150000.

BUNKER RAMO

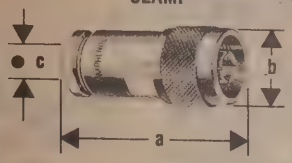
AMPHENOL NORTH AMERICA
Bunker Ramo Corporation

AMPHENOL CONNECTORS

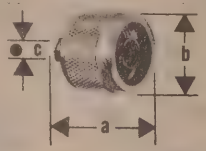
N SERIES COAXIAL CONNECTORS

Series N connectors are medium size weatherproof, threaded coupling units with a frequency limit of 11 GHz. They have a peak voltage rating of 1500 volts and are impedance matched to either 50 or 70 ohm cables as listed. Cable affixment methods include crimp, clamp and solder-type.

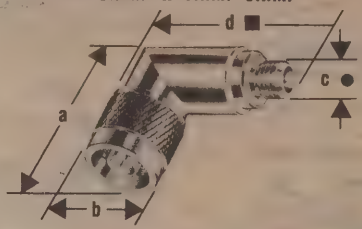
STANDARD CLAMP



SOLDER-TYPE



MIL-CRIMP & CRIMP-CRIMP



STRAIGHT PLUGS / MALE CONTACTS • WEATHERPROOF • 50 OHM IMPEDANCE • TFE INSULATION

Cable RG-/U△	Cable Termination	Dimensions, inches(millimeters) a	b	c	d	Tool Data▲ Die Set P/N	Construction Notes	Military Number	Amphenol Number
5, 21, 143, 212, 222	Mil-Crimp II	1 29/64(36.9)	13/16(20.6)	.342(8.7)	—	227-1221-29	—	M39012/01-0016	82-4341
	Std. -Clamp	2(50.8)	3/4(19.1)	.357(9.1)	—	—	Non-Weatherproof/ Copolymer of Styrene Insulation	UG-18	3400
	Mil-Clamp I	1 1/2(38.1)	13/16(20.6)	.357(9.1)	—	—	—	UG-18B	82-86
	Mil-Clamp I	1 1/2(38.1)	25/32(19.8)	.347(8.8)	—	—	—	UG-18C	82-203
	Mil-Clamp I	1 1/2(38.1)	13/16(20.6)	.347(8.8)	—	—	Safety Wiring	UG-18D	82-3202
6	Std. -Clamp	1 3/4(44.5)	13/16(20.6)	.357(9.1)	—	—	70 Ohm Impedance	UG-91A	7200
8, 9, 213, 214	Std. -Clamp	2(50.8)	3/4(19.1)	.444(11.3)	—	—	Copolymer of Styrene Insulation	UG-21	3900
8, 9, 213, 214, 225	Mil-Clamp I	1 1/2(38.1)	13/16(20.6)	.444(11.3)	—	—	—	UG-21B	82-61
	Mil-Clamp I	1 1/2(38.1)	13/16(20.6)	.444(11.3)	—	—	—	UG-21C	82-96
	Mil-Clamp I	1 1/2(38.1)	25/32(19.8)	.444(11.3)	—	—	Safety Wiring	UG-21D	82-202
	Mil-Clamp I	1 1/2(38.1)	13/16(20.6)	.444(11.3)	—	—	Safety Wiring	UG-21E	82-3202
	C.C. Clamp	1 1/2(38.1)	25/32(19.8)	.444(11.3)	—	—	Captivated Contact	UG-1185	82-312
	C.C. Clamp	1 1/2(38.1)	25/32(19.8)	.444(11.3)	—	—	Captivated Contact	UG-1185A	82-3312
	Mil-Clamp II	1 35/64(39.3)	13/16(20.6)	.444(11.3)	—	—	Captivated Contact	M39012/01-0005	82-4352
	Mil-Clamp II	1 35/64(39.3)	13/16(20.6)	.444(11.3)	—	—	—	M39012/01-0002	82-4352-1
10, 12, 116, 215, 227	Mil-Clamp I	2 1/8(54.0)	13/16(20.6)	.511(13.0)	—	—	Armor Clamp	UG-941A	82-204
	Mil-Clamp I	2 1/8(54.0)	13/16(20.6)	.511(13.0)	—	—	Armor Clamp	UG-941B	82-3204
11, 149	Mil-Crimp II	1 31/64(37.7)	13/16(20.6)	.418(10.6)	—	227-1221-25	Safety Wiring/Captivated Contact	M39012/01-0013	82-342
11, 13, 149, 216	Std. -Clamp	1 7/8(47.6)	13/16(20.6)	.444(11.3)	—	—	70 Ohm Impedance	UG-94A	82-84
	Mil-Clamp I	1 1/2(38.1)	13/16(20.6)	.444(11.3)	—	—	70 Ohm Impedance	—	91150
14, 217	Mil-Clamp I	1 21/32(42.1)	7/8(22.2)	.557(14.1)	—	—	—	UG-204A	82-105
	Mil-Clamp I	1 21/32(42.1)	7/8(22.2)	.557(14.1)	—	—	—	UG-204C	82-214
	Mil-Clamp II	1 23/32(43.7)	13/16(20.6)	.557(14.1)	—	—	Safety Wiring	M39012/01-0003	82-4365
	Mil-Clamp II	1 23/32(43.7)	13/16(20.6)	.557(14.1)	—	—	Safety Wiring/Captivated Contact	M39012/01-0015	82-4368
17, 218	Mil-Clamp I	2 1/8(54.0)	1 5/16(33.3)	.900(22.9)	—	—	—	UG-167A	82-104
	Mil-Clamp I	2 1/8(54.0)	1 5/16(33.3)	.900(22.9)	—	—	Safety Wiring	UG-167D	82-215
	Mil-Clamp I	2 1/8(54.0)	1 5/16(33.3)	.900(22.9)	—	—	Safety Wiring	UG-167F	82-3215
18, 219	Mil-Clamp I	3(76.2)	1 5/16(33.3)	.963(24.5)	—	—	Armor Clamp	UG-982	92125
35	Std.-Clamp	2 3/8(60.3)	1 5/16(33.3)	.900(22.9)	—	—	70 Ohm Imp./Armor Clamp	—	82-113
55, 142, 223	Mil-Crimp I	1 31/64(37.7)	13/16(20.6)	.220(5.6)	—	227-1221-57	—	—	82-5370
58, 141	Mil-Crimp I	1 31/64(37.7)	13/16(20.6)	.206(5.2)	—	227-1221-57	—	—	82-5375
58, 141, 142	Std.-Clamp	1 25/32(45.2)	13/16(20.6)	.214(5.4)	—	—	Copolymer of Styrene Insulation	UG-536	34000
	Mil-Clamp I	1 3/8(34.9)	13/16(20.6)	.214(5.4)	—	—	—	UG-536B	34025
59, 62, 71, 140, 210	Mil-Crimp I	1 31/64(37.7)	13/16(20.6)	.261(6.6)	—	227-1221-59	—	—	82-5380
	Std.-Clamp	1 25/32(45.2)	13/16(20.6)	.257(6.5)	—	—	Copolymer of Styrene Insulation	UG-603	34500
	Mil-Clamp I	1 3/8(34.9)	13/16(20.6)	.257(6.5)	—	—	—	UG-603A	34525
	Std.-Clamp	1 5/8(41.3)	13/16(20.6)	.257(6.5)	—	—	70 Ohm Impedance	—	34750
	Mil-Clamp I	1 3/8(34.9)	13/16(20.6)	.257(6.5)	—	—	70 Ohm Impedance	—	91300
63, 114	Std.-Clamp	1 3/4(44.5)	13/16(20.6)	.435(11.0)	—	—	—	UG-1003	12400
142, 400	Crimp-Crimp	1 29/64(36.9)	13/16(20.6)	.220(5.6)	—	227-1221-57	Safety Wiring/Captivated Contact	M39012/01-0503	82-4427
213	Crimp-Crimp	1 29/64(36.9)	13/16(20.6)	.418(10.6)	—	227-1221-25	Safety Wiring/Captivated Contact	M39012/01-0502	82-4426
214, 225, 393	Crimp-Crimp	1 29/64(36.9)	13/16(20.6)	.438(11.1)	—	227-1221-25	Safety Wiring/Captivated Contact	M39012/01-0501	82-4425
.141" Dia. Semi-Rigid	Solder Type	63/64(25.0)	13/16(20.6)	.143(3.6)	—	—	Gold Plated	—	82-28

SINGLE PLUGS / MALE CONTACTS • WEATHERPROOF • 50 OHM IMPEDANCE • TFE INSULATION

5, 21, 143, 212, 222	Mil-Crimp I	1 9/64(39.7)	13/16(20.6)	.342(8.7)	2 1/64(51.2)	227-1221-29	—	—	82-5350
	Mil-Clamp I	1 3/8(34.9)	13/16(20.6)	.343(8.7)	1 5/8(41.3)	—	—	—	15950
8, 9, 87, 213, 214, 223	C.C. Clamp	1 13/64(32.9)	13/16(20.6)	.444(11.3)	1 13/16(49.2)	—	Captivated Contact	—	82-326
	Std.-Clamp	1 7/16(36.5)	13/16(20.6)	.437(11.1)	1 7/8(47.6)	—	—	—	82-835
	Mil-Clamp II	1 15/32(37.3)	13/16(20.6)	.437(11.1)	1 59/64(48.8)	—	—	M39012/05-0001	82-4357
	Std.-Clamp	1 5/8(41.3)	13/16(20.6)	.437(11.1)	1 11/16(42.9)	—	—	—	6875
	Mil-Clamp I	1 9/32(32.5)	13/16(20.6)	.444(11.3)	1 5/8(41.3)	—	—	—	15975
	Std.-Clamp	1 7/16(36.5)	13/16(20.6)	.437(11.1)	2 1/32(51.6)	—	—	UG-594A	15425
11, 49	Mil-Crimp I	1 1/16(39.7)	13/16(20.6)	.418(10.6)	2 1/64(51.2)	227-1221-25	—	—	82-5351
11, 13, 149, 216	Std.-Clamp	1 5/8(41.3)	13/16(20.6)	.437(11.1)	1 11/16(42.9)	—	70 Ohm Impedance	—	17025
55, 142, 223	Mil-Crimp I	1 9/16(39.7)	13/16(20.6)	.220(5.6)	2 1/64(51.2)	227-1221-57	—	—	82-5374
58, 141	Mil-Crimp I	1 9/16(39.7)	13/16(20.6)	.206(5.2)	2 1/64(51.2)	227-1221-57	—	—	82-5379
58, 141, 142	Std. Clamp	1 5/8(41.3)	13/16(20.6)	.210(5.3)	1 7/32(31.0)	—	—	—	18750
	Std. Clamp	1 9/16(39.7)	13/16(20.6)	.214(5.4)	1 7/32(31.0)	—	Less Cap	—	25850
59, 62, 71, 140, 210	Std. Clamp	1 5/8(41.3)	13/16(20.6)	.257(6.5)	1 7/32(31.0)	—	—	—	19250
142, 400	Crimp-Crimp	1 17/32(38.9)	53/64(21.0)	.220(5.6)	2 3/8(60.3)	227-1221-57	Safety Wiring/Captivated Contact	M39012/05-0503	82-4442
213	Crimp-Crimp	1 17/32(38.9)	53/64(21.0)	.418(10.6)	2 3/8(60.3)	227-1221-25	Safety Wiring/Captivated Contact	M39012/05-0502	82-4441
214, 225, 393	Crimp-Crimp	1 9/16(39.7)	13/16(20.6)	.438(11.1)	2 1/64(51.2)	227-1221-25	Safety Wiring/Captivated Contact	M39012/05-0501	82-4440
RG-8A & 87A Semi-Rigid	—	1 15/32(37.3)	13/16(20.6)	.333(8.5)	2(50.8)	—	Incl. 82-887 Kit Clamp/ Safety Wiring	—	82-177

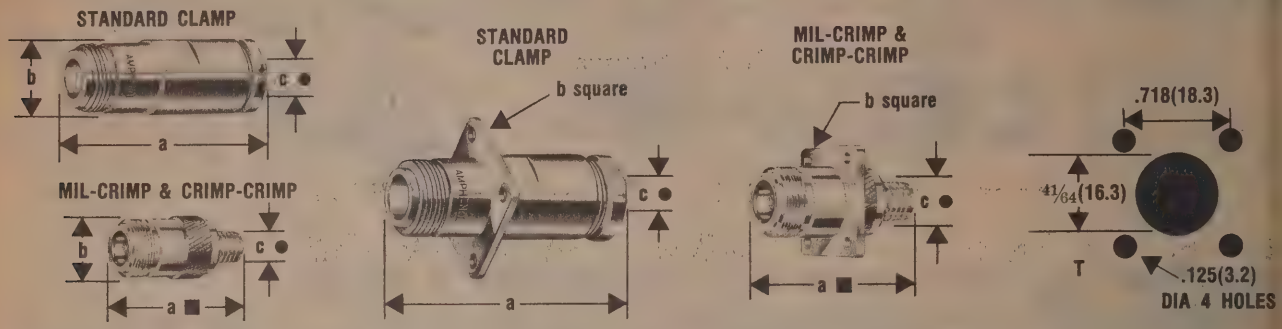
Accommodates Cable Diameter ▲ Use with Tool Handle 227-944 ■ Includes Outer Ferrule Not Shown on Illustration △ For Armored Cables, See Armor Clamps

AMPHENOL CONNECTORS

BUNKER RAMO

AMPHENOL NORTH AMERICA
Bunker Ramo Corporation

N SERIES COAXIAL CONNECTORS (Continued)



STRAIGHT JACKS / FEMALE CONTACTS • WEATHERPROOF • 50 OHM IMPEDANCE • TFE INSULATION

Cable RG-/U△	Cable Termination	Dimensions, inches(millimeters) a	b	c	Tool Data▲ Die Set P/N	Construction Notes	Military Number	Amphenol Number
5, 21, 143, 212, 222	Mil-Crimp II	1 5/16(39.7)	1 1/16(17.5)	.342(8.7)	227-1221-29	—	M39012/02-0007	82-338
	Mil-Clamp II	1 7/8(47.6)	1 1/16(17.5)	.346(8.8)	—	—	M39012/02-0001	82-358
	Mil-Clamp I	1 5/16(39.7)	3/4(19.1)	.357(9.1)	—	—	UG-20	42000
	Mil-Clamp I	1 5/16(39.7)	3/4(19.1)	.357(9.1)	—	—	UG-20B	82-88
	Mil-Clamp I	1 5/16(39.7)	3/4(19.1)	.347(8.8)	—	—	UG-20C	82-210
	Mil-Clamp I	1 5/16(39.7)	3/4(19.1)	.347(8.8)	—	Modified Cable Clamp	UG-20D	82-3210
6	Std.-Clamp	1 7/8(47.6)	1 1/16(17.5)	.357(9.1)	—	70 Ohm Impedance	UG92A	7700
	Mil-Clamp I	1 5/16(39.7)	3/4(19.1)	.347(8.8)	—	75 Ohm Impedance	—	91225
8, 9, 213, 214	Mil-Clamp I	1 5/16(39.7)	3/4(19.1)	.444(11.3)	—	—	UG-23	48000
8, 9, 87, 213, 214, 225	Mil-Clamp I	1 5/16(39.7)	3/4(19.1)	.440(11.2)	—	—	UG-23A	7600
	Mil-Clamp I	1 5/16(39.7)	3/4(19.1)	.440(11.2)	—	—	UG-23B	82-63
	Mil-Clamp I	1 13/16(46.0)	1 1/16(17.5)	.437(11.1)	—	—	UG-23C	82-94
	Mil-Clamp I	1 5/16(39.7)	3/4(19.1)	.444(11.3)	—	Modified Cable Clamp	UG-23D	82-209
	Mil-Clamp I	1 5/16(39.7)	3/4(19.1)	.444(11.3)	—	Modified Cable Clamp	UG-23E	82-3209
	Mil Clamp II	1 3/4(40.9)	1 1/16(17.5)	.443(11.3)	—	—	M39012/02-0002	82-4356-1
	C.C. Clamp	1 5/16(39.7)	3/4(19.1)	.444(11.3)	—	Captivated Contact	UG-1186	82-313
	Mil-Clamp II	1 3/4(40.9)	1 1/16(17.5)	.443(11.3)	—	Captivated Contact	M39012/02-0003	82-4356
10, 12, 116, 215, 227	Mil-Clamp I	2 1/4(57.2)	3/4(19.1)	.444(11.3)	—	Armor Clamp	UG-940A	82-212
	Mil-Clamp I	2 1/4(57.2)	3/4(19.1)	.444(11.3)	—	Armor Clamp	UG-940B	82-3212
11, 149	Mil-Crimp II	1 5/16(39.7)	1 1/16(17.5)	.418(10.6)	227-1221-25	—	M39012/02-0014	82-339
11, 13, 149, 216	Std.-Clamp	1 15/16(49.2)	1 1/16(17.5)	.437(11.1)	—	70 Ohm Impedance	UG-95A	82-89
17	Std.-Clamp	2 3/16(55.6)	1 5/16(33.3)	.900(22.9)	—	—	—	14850
55, 142, 223	Mil-Crimp I	1 5/16(39.7)	1 1/16(17.5)	.220(5.6)	227-1221-57	—	—	82-5371
58, 141	Mil-Crimp I	1 5/16(39.7)	1 1/16(17.5)	.206(5.2)	227-1221-57	—	—	82-5376
58, 141, 142	Std.-Clamp	1 13/16(46.0)	1 1/16(17.5)	.214(5.4)	—	Copolymer of Styrene Insulation	—	35000
	Mil-Clamp I	1 1/2(38.1)	5/8(15.9)	.214(5.4)	—	—	—	35025
59, 62, 71, 140, 210	Std.-Clamp	1 5/8(41.3)	1 1/16(17.5)	.257(6.5)	—	Copolymer of Styrene Insulation	UG-602	36500
142, 400	Crimp-Crimp	1 17/32(38.9)	5/8(15.9)	.220(5.6)	227-1221-57	Captivated Contacts	M39012/02-0503	82-4431
213	Crimp-Grimp	1 17/32(38.9)	5/8(15.9)	.418(10.6)	227-1221-25	Captivated Contacts	M39012/02-0502	82-4430
214, 225, 393	Crimp-Crimp	1 17/32(38.9)	5/8(15.9)	.438(11.1)	227-1221-25	Captivated Contacts	M39012/02-0501	82-4429

PANEL JACKS / FEMALE CONTACTS • WEATHERPROOF • 50 OHM IMPEDANCE • .125" (3.2) DIA. FLANGE HOLES • MOUNTING HOLE T • REAR MOUNTED • TFE INSULATION

5, 21, 143, 212, 222	Mil-Crimp II	1 5/16(39.7)	1(25.4)	.342(8.7)	227-1221-29	—	M39012/02-0015	82-344
	Std.-Clamp	2(50.8)	1(25.4)	.355(9.0)	—	Copolymer of Styrene Insulation	UG-19	3500
	Mil-Clamp I	1 5/16(39.7)	1(25.4)	.343(8.7)	—	—	UG-19B	82-87
	Mil-Clamp I	1 5/16(39.7)	1(25.4)	.343(8.7)	—	—	UG-19C	82-207
	Mil-Clamp I	1 5/16(39.7)	1(25.4)	.347(8.8)	—	Modified Cable Clamp	UG-19D	82-3207
6	Std.-Clamp	1 7/8(47.6)	1(25.4)	.357(9.1)	—	70 Ohm Impedance	UG-93A	7800
8, 9, 87, 213, 214, 225	Mil-Clamp II	1 3/4(40.9)	1(25.4)	.444(11.3)	—	—	M39012/02-0005	82-4360-1
	Mil-Clamp II	1 3/4(40.9)	1(25.4)	.444(11.3)	—	Captivated Contacts	M39012/02-0006	82-4360
	Mil-Clamp I	1 13/16(46.0)	1(25.4)	.437(11.1)	—	—	UG-22B	82-62
	Mil-Clamp I	1 13/16(46.0)	1(25.4)	.437(11.1)	—	Modified Cable Clamp	UG-22C	82-95
	Mil-Clamp I	1 5/16(39.7)	1(25.4)	.444(11.3)	—	—	UG-22D	82-208
	Mil-Clamp I	1 5/16(39.7)	1(25.4)	.444(11.3)	—	Modified Cable Clamp	UG-22E	82-3208
	C.C. Clamp	1 5/16(39.7)	1(25.4)	.444(11.3)	—	Captivated Contact	UG-1187	82-314
10, 12, 116, 215, 227	Mil-Clamp I	2 1/4(57.2)	1(25.4)	.444(11.3)	—	Armor Clamp	UG-935A	82-211
	Mil-Clamp I	2 1/4(57.2)	1(25.4)	.444(11.3)	—	Armor Clamp	UG-935B	82-3211
11, 149	Mil-Crimp I	1 5/16(39.7)	1(25.4)	.418(10.6)	227-1221-25	—	—	82-5345
11, 13, 149, 216	Std.-Clamp	1 13/16(46.0)	1(25.4)	.437(11.1)	—	70 Ohm Impedance	UG-96A	82-90
55, 58, 141, 142, 223	Mil-Clamp I	1 1/2(38.1)	1(25.4)	.224(5.7)	—	—	UG-1095A	36250
55, 141, 142	Mil-Crimp I	1 5/16(39.7)	1(25.4)	.220(5.6)	227-1221-57	—	—	82-5372
58, 141,	Mil-Crimp I	1 5/16(39.7)	1(25.4)	—	227-1221-57	—	—	82-5377
58, 141, 142	Std.-Clamp	1 13/16(46.0)	1(25.4)	.214(6.4)	—	Copolymer of Styrene Insulation	UG-1052	36000
59, 62, 71, 140 210	Std.-Clamp	1 13/16(46.0)	1(25.4)	.257(6.5)	—	Copolymer of Styrene Insulation	UG-593	35500
	Mil-Clamp I	1 13/16(46.0)	1(25.4)	.257(6.5)	—	70 Ohm Impedance	—	35550
	Mil-Clamp I	1 1/2(38.1)	1(25.4)	.257(6.5)	—	70 Ohm Impedance	—	91250
142, 400	Crimp-Crimp	1 17/32(38.9)	1(25.4)	.220(5.6)	227-1221-57	Captivated Contact	M39012/02-0513	82-4434
213	Crimp-Crimp	1 17/32(38.9)	1(25.4)	.418(10.6)	227-1221-25	Captivated Contact	M39012/02-0512	82-4433
214, 225, 393	Crimp-Crimp	1 17/32(38.9)	1(25.4)	.438(11.1)	227-1221-25	Captivated Contact	M39012/02-0511	82-4432

● Accommodates Cable Diameter
■ Includes Outer Ferrule Not Shown on Illustration
▲ Use with Tool Handle 227-944
△ For Armored Cables, See Armor Clamps

Add Dept. EM to address to tell them you saw it in eem

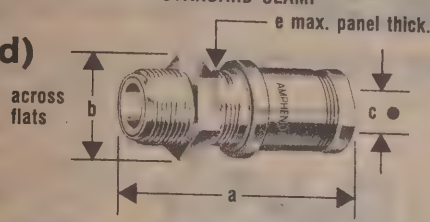
BUNKER RAMO

AMPHENOL NORTH AMERICA
Bunker Ramo Corporation

AMPHENOL CONNECTORS

N SERIES (Continued)

STANDARD CLAMP



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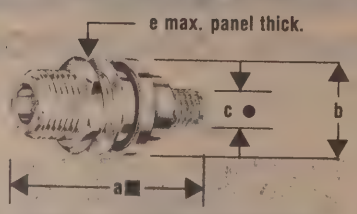
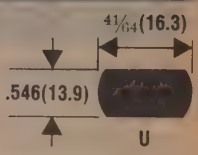
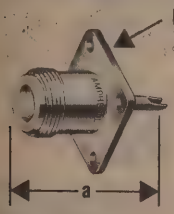
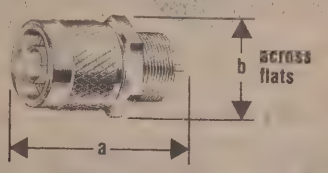




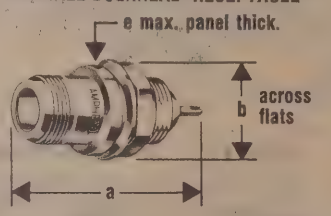
FEMALE PANEL RECEPTACLE



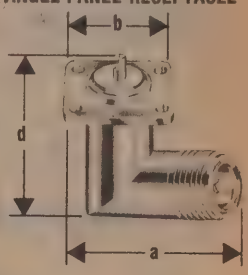
MALE BULKHEAD RECEPTACLE

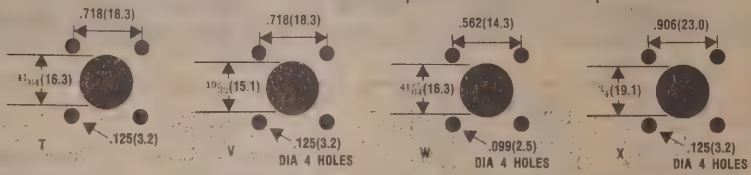


FEMALE BULKHEAD RECEPTACLE



ANGLE PANEL RECEPTACLE





BULKHEAD JACKS / FEMALE CONTACTS • WEATHERPROOF • 50 OHM IMPEDANCE • MOUNTING HOLE U • REAR MOUNTED

Cable RG-/U△	Cable Termination	Dimensions, inches(millimeters) a	b	c	e	Tool Data▲ Die Set P/N	Construction Notes	Military Number	Amphenol Number
5, 21, 143, 212, 222	Mil-Crimp II Mil-Clamp I	1 27/32(46.8) 1 3/4(44.5)	7/8(22.2) 7/8(22.2)	.342(8.7) .343(8.7)	.250(6.4) .334(8.5)	227-1221-29 —	— —	M39012/03-0003 UG-159B	82-347 15550
8, 9, 213, 214	Mil-Clamp I	2 5/32(54.8)	7/8(22.2)	.444(11.3)	.334(8.5)	—	Herm. Sealed/Glass TFE Insul.	—	23025
8, 9, 87, 213, 214, 225	Mil-Clamp II Mil-Clamp I Mil-Clamp I Mil-Clamp I	1 53/64(46.4) 1 3/4(44.5) 1 3/4(44.5) 1 3/4(44.5)	7/8(22.2) 3/4(19.1) 3/4(19.1) 7/8(22.2)	.334(8.5) .437(11.1) .437(11.1) .444(11.3)	.250(6.4) .703(17.9) .703(17.9) .334(8.5)	— — — —	— — Modified Cable Clamp —	M39012/03-0002 UG-160A UG-160B UG-160D	82-4364 82-67 82-93 91025
11, 149	Mil-Crimp II	1 27/32(46.8)	7/8(22.2)	.418(10.6)	.250(6.4)	227-1221-25	—	M39012/03-0010	82-348
11, 144, 165, 213, 214, 216, 225	Mil-Clamp II	1 23/32(48.4)	23/32(22.3)	.443(11.3)	.250(6.4)	—	Captivated Contact	M39012/03-0012	82-4369
55, 58, 141, 142, 223	Mil-Clamp I	1 43/64(42.5)	13/16(20.6)	.224(5.7)	.317(8.1)	—	—	UG-556B	35275
55, 142, 223	Mil-Crimp I	1 27/32(46.8)	7/8(22.2)	.220(5.6)	.250(6.4)	227-1221-57	—	—	82-5373
58, 141	Mil-Crimp I	1 27/32(46.8)	7/8(22.2)	.206(5.2)	.250(6.4)	227-1221-57	—	—	82-5378
58, 141, 142	Mil-Clamp I	1 13/16(46.0)	13/16(20.6)	.214(5.4)	.294(7.5)	—	—	UG-556	35250
59, 62, 71, 140, 210	Std.-Clamp	1 27/32(46.8)	13/16(20.6)	.257(8.5)	.294(7.5)	—	Copolymer of Styrene Insul.	—	18250
142, 400	Crimp-Crimp	1 15/64(31.3)	7/8(22.2)	.220(5.6)	.250(6.4)	227-1221-57	Captivated Contact	M39012/03-0503	82-4438
165	Mil-Crimp II	2.031(51.6)	.9(22.9)	.418(10.6)	.250(6.4)	227-1221-25	—	M39012/03-0008	82-397
213	Crimp-Crimp	1 15/64(31.3)	7/8(22.2)	.418(10.6)	.250(6.4)	227-1221-25	Captivated Contact	M39012/03-0502	82-4437
214, 225, 393	Crimp-Crimp	1 15/64(31.3)	7/8(22.2)	.438(11.1)	.250(6.4)	227-1221-25	Captivated Contact	M39012/03-0501	82-4436
225	Mil-Crimp II	2 1/32(51.6)	29/32(22.9)	.438(11.1)	.250(6.4)	227-1221-25	—	M39012/03-0009	82-398
.141" Dia. Semi-Rigid	Solder Type	1 43/64(42.5)	3/4(19.1)	.143(3.6)	.343(8.7)	—	Contact Factory for Assembly Instructions	—	82-118

RECEPTACLES / 50 OHM IMPEDANCE • FEMALE CONTACTS

Description	Dimensions, inches(millimeters) a	b	d	e	Mtg. Hole	Military Number	Amphenol Number
PANEL / WEATHERPROOF • .125" (3.2mm) • FLANGE HOLES • TFE INSULATION							
Plug Mating Face (Male Contact), Front Mount Only, Copolymer of Styrene Insulation	1 3/32(27.8)	1(25.4)	—	—	V	—	49000
Standard Female	1 7/64(28.2)	1(25.4)	—	—	T	M39012/04-0002	82-368
Standard Female	1 7/64(28.2)	1(25.4)	—	—	T	UG-58	82-24
Standard Female	1 7/64(28.2)	1(25.4)	—	—	T	UG-58A	82-97
Standard Female	1 17/32(38.9)	1 3/16(30.1)	—	—	X	UG-496	82-92
Standard Female	1 3/4(44.5)	1(25.4)	—	—	T	UG-231	2750
#4-40 Flange Holes With Hood for RG-58/U, Copolymer of Styrene Insulation	1 1/8(28.6)	1(25.4)	—	—	T	—	82-112
70 Ohm Impedance .100" (2.5mm) Flange Holes	1 7/64(28.2)	3/4(19.1)	—	—	W	—	9575
Angle Female, 1 1/16"(27mm) Clearance Above Panel	1 7/64(28.2)	1(25.4)	1 29/64(36.9)	—	V	UG-997A	8975
Angle Female, 3/4" (19.1mm) Clearance Above Panel	1 7/64(28.2)	1(25.4)	1 29/64(36.9)	—	V	—	23775
BULKHEAD / FRONT MOUNTED • HERMETICALLY SEALED • GLASS-TFE INSULATION							
Plug Mating Face (Male Contact), Less Mounting Hardware	1 7/64(28.2)	13/16(20.6)	—	—	U	—	19550
Standard Female	1 37/64(40.1)	13/16(20.6)	—	.250(6.4)	U	M39012/04-0001	82-369
Standard Female	1 37/64(40.1)	13/16(20.6)	—	.209(5.3)	U	UG-680	82-811
Weatherproof with Hood, TFE Insulation Standard Female	1 3/8(34.9)	13/16(20.6)	—	.364(9.2)	U	—	13275
	1 15/32(37.3)	1(25.4)	—	.331(8.4)	U	—	31150

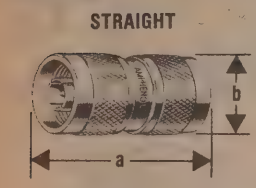
● Accommodates Cable Diameter ▲ Use with Tool Handle 227-944 ■ Includes Outer Ferrule Not Shown on Illustration △ For Armored Cables, See Armor Clamps

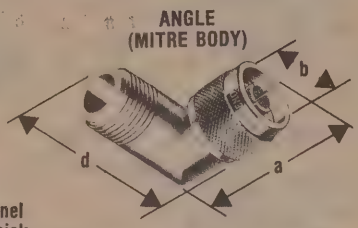
AMPHENOL CONNECTORS

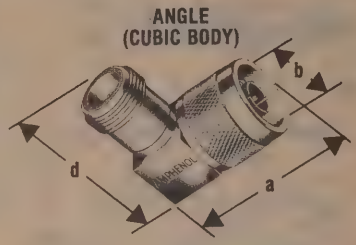
BUNKER RAMO

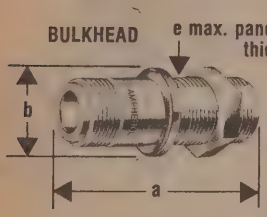
AMPHENOL NORTH AMERICA
Bunker Ramo Corporation

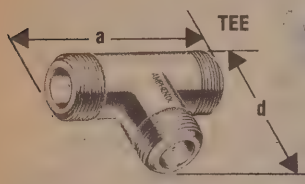
N SERIES COAXIAL CONNECTORS (CONTINUED)

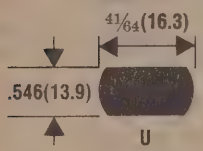




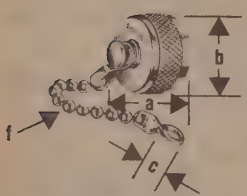




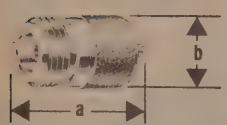




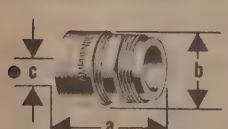
MALE CAP & CHAIN



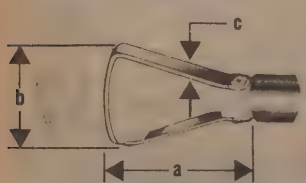
FEMALE CAP



ARMOR CLAMP



SHIELD GROUNDING LUG



ADAPTERS / 50 OHM IMPEDANCE • TFE INSULATION

Adapter Ends	Dimensions, inches(millimeters) a	b	d	e	Mtg. Hole	Construction Notes	Military Number	Amphenol Number
STRAIGHT								
Jack-Jack	1¾(44.5)	21/32(16.7)	—	—	—	—	UG-29A	82-65
Plug-Plug	1 15/32(40.5)	13/16(20.6)	—	—	—	—	UG-57B	82-100
Jack-Jack	1¾(44.5)	21/32(16.7)	—	—	—	—	UG-29B	82-101
Jack-Jack	1¾(44.5)	21/32(16.7)	—	—	—	—	UG-29	15000
Plug-Plug	1 15/32(40.5)	13/16(20.6)	—	—	—	70 Ohm Impedance	—	17075
Jack-Jack	1¾(44.5)	21/32(16.7)	—	—	—	—	—	21650
Plug-Plug	1 15/32(40.5)	13/16(20.6)	—	—	—	—	UG-57A	45250
ANGLE								
Jack-Plug	1 7/16(36.5)	13/16(20.6)	1.37(34.9)	—	—	Mitre Body	UG-27A	82-64
Jack-Plug	1 13/16(46.0)	13/16(20.6)	1.31(33.3)	—	—	Mitre Body	UG-27B	82-98
Plug-Jack	1 5/16(33.3)	13/16(20.6)	1.40(35.7)	—	—	Cubic Body	UG-27C	82-213
Jack-Plug	1 17/32(38.9)	⅞(22.2)	1.46(37.3)	—	—	Mitre Body	UG-212A	82-91
BULKHEAD								
Jack-Jack	1⅝(41.3)	13/16(20.6)	—	.312(7.9)	U	Copolymer of Styrene Insul./Pressurized	UG-30	82-66
Jack-Jack	1¾(44.5)	13/16(20.6)	—	.343(8.7)	U	Glass Insulation/Hermetically Sealed	UG-30C	82-201
Jack-Jack	1⅝(41.3)	13/16(20.6)	—	.312(7.9)	U	Pressurized	—	82-849
Jack-Jack	1 5/16(49.2)	⅞(22.2)	—	.625(15.9)	U	Glass Insul./"O" Ring/Hermetically Sealed	—	90950
Jack-Jack	1 17/32(38.9)	⅞(22.)	—	.339(8.6)	U	Glass Insul./"O" Ring/Hermetically Sealed	UG-30D	91100
TEE								
Jack-Plug-Jack	1¾(44.5)	—	1 31/64(37.7)	—	—	—	UG-107A	82-36
Jack-Jack-Jack	1¾(44.5)	—	1 7/32(31.0)	—	—	—	UG-28A	82-99
Jack-Plug-Jack	1¾(44.5)	—	1 31/64(37.7)	—	—	—	UG-107B	82-102
Jack-Plug-Jack	1¾(44.5)	—	1 31/64(37.7)	—	—	—	UG-107	4800
Plug-Plug-Plug	2 11/32(59.5)	—	1 31/64)37.7)	—	—	—	—	4850
CROSS								
Jack-Jack-Jack-Jack	2¼(57.2)	—	2¼(57.2)	—	—	—	—	17125

ACCESSORIES

Description	Dimensions, inches(millimeters) a	b	c	f	Military Number	Amphenol Number
CAPS / WEATHERPROOF						
Male Cap & Chain	9/16(14.3)	¾(19.1)	.144(3.7)	1¾(44.5)	M39012/25-0011	82-3106
Male Cap & Chain	9/16(14.3)	¾(19.1)	.144(3.7)	1¾(44.5)	MX-913	82-106
Male Cap	7/16(11.1)	¾(19.1)	—	—	—	9225
Male Cap & Chain, Shorting Male Contact	27/32(21.4)	13/16(20.6)	.144(3.7)	2½(63.5)	—	13700
Male Cap & Chain	9/16(14.3)	¾(19.1)	.144(3.7)	3(76.3)	—	18575
Female Cap & Chain	31/32(24.6)	⅝(15.9)	.188(4.8)	2¼(57.2)	—	6950
Female Cap, Shorting Female Contact	1(25.4)	⅝(15.9)	—	—	—	13675
RESISTOR TERMINATED CAP						
Male Cap & Chain	1⅜(34.9)	13/16(20.6)	.144(3.7)	3½(88.9)	—	82-3200▲
ARMOR CLAMPS / ASSEMBLE TO CONNECTORS DESIGNED FOR IDENTICAL CABLE WITHOUT ARMOR						
Use with Std.-Clamp on RG-10, 12, 79, 116, 215/U Cable	⅞(22.2)	11/16(17.5)	.470(11.9)	—	MX-564	82-48
Use with Std.-Clamp on RG-10, 12, 79, 116, 215, 227/U Cable	1 1/16(27.0)	11/16(17.5)	.511(13.0)	—	M-564A	82-109
Use with Mil-Clamp I on RG-10, 12, 79, 116, 215, 227/U Cable	1⅛(28.6)	¾(19.1)	.511(13.0)	—	M39012/25-0013	82-3517
Use with Mil-Clamp I on RG-18, 219/U Cable	1⅜(34.9)	1 5/16(33.3)	.963(24.5)	—	M39012/25-0014	99175
SHIELD GROUNDING LUG / NON-WEATHERPROOF						
Used on Font Mount Receptacles as Shown	1(25.4)	37/64(14.7)	⅛(3.2)	—	—	82-1275

● Accommodates Cable Diameter

▲ To Order Without Resistor, Add -1 to Part Number; To Order With Resistor, Add Resistor Value to Part Number. ½ Watt 5% Resisto Values (Ohms) Stocked: 47, 51, 75, 82, 91, 100, 120, 130, 150, 180, 240, 270, 300, 470, 510, 560, 680, 750, 820, 1000, 1500, 3900 4700. 10K. 50K

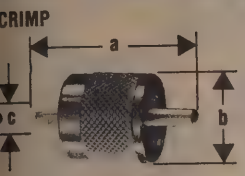
Add Dept. EM to address to tell them you saw it in eem

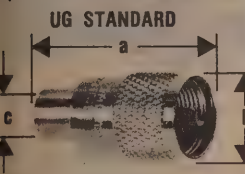
BUNKER RAMO

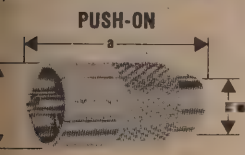
AMPHENOL NORTH AMERICA
Bunker Ramo Corporation

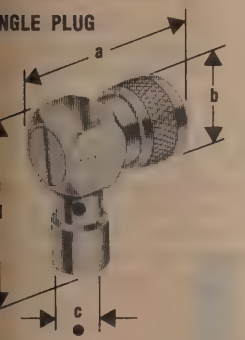
AMPHENOL CONNECTORS

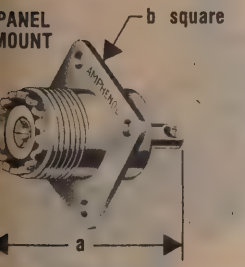
UHF SERIES COAXIAL CONNECTORS

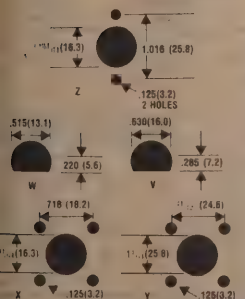












Threaded coupling UHF series are low-cost, general purpose connectors for lower frequency applications up to 500 MHz. Both threaded and push-on mating are available with Braid-solder, solderless clamp, hex crimp and the new FCP style cable affixment which requires no special tools.

PLUGS / NON-CONSTANT IMPEDANCE• MALE CONTACTS • NON-WEATHERPROOF • MICA-FILLED PHENOLIC, PBT POLYESTER, OR EQUAL INSULATION

Cable RG-/U	Termination Cable	Dimensions, inches(millimeters) a	b	c	d	Tool Data Die Set P/N	Construction Notes	Military Number	Amphenol Number
STRAIGHT									
8, 11, 149, 213	Braid Crimp	1 5/16(33.3)	3/4(19.1)	.418(10.4)	—	227-1221-23▲	Solder Contact	—	83-8SP
8, 9, 11, 13, 63, 87, 149, 213, 214, 216, 225	UG Standard	1 1/2(38.1)	3/4(19.1)	.444(11.2)	—	—	—	PL-259	83-1SP
	UG Standard	1 1/2(38.1)	1 1/16(17.5)	.437(11.1)	—	—	TFE Insulation	PL-259	83-822
	Clamp Set Screw	1 5/16(39.7)	23/32(18.3)	.444(11.2)	—	—	—	PL-259A	83-1SPN
	Clamp Set Screw	1 5/16(39.7)	1 3/16(20.6)	.450(11.4)	—	—	TFE Insulation	PL-259A	83-756
	Solderless Clamp	1 43/64(42.5)	3/4(19.1)	.444(11.2)	—	—	—	—	83-851
	UG Standard	1 1/2(38.1)	23/32(18.3)	.444(11.2)	—	—	Push-On Mating	—	83-5SP
11, 149	Solderless Clamp	1 43/64(42.5)	3/4(19.1)	.437(11.1)	—	—	Solderless Contact	—	83-850
17, 218	UG Standard	2 1/8(54.0)	1 5/16(33.3)	.625(15.9)	—	—	TFE Ins., Contact RF for Assy. Inst.	—	83-86
34	UG Standard	1 13/16(30.2)	1 1/8(28.6)	.625(15.9)	—	—	Large Body, Weatherproof	UG-358	83-21SP
55, 142, 223	Braid Crimp	1 5/16(33.3)	3/4(19.1)	.220(5.7)	—	227-1221-11/ Cav. A▲	Solder Contact	—	83-55SP
58	FCP Clamp	1 1/16(27.0)	3/4(19.1)	—	—	No Tools Req.	Slotted Ferrule/ Short Cplg. Nut	—	83-58FCP□
	Crimp-Crimp	1 9/16(39.7)	3/4(19.1)	.205(5.2)	—	227-951△ 227-1350▲	Economy Formed Metal Body/ Short Cplg. Nut	—	83-58DCP-4
59	Crimp-Crimp	1 13/32(35.7)	3/4(19.1)	.253(6.4)	RG-58/U RG-59/U	227-1358▲ 227-948△	Economy Formed Metal Body/ Short Cplg. Nut	—	83-59DCP-1
58, 141	Braid Crimp	1 5/16(33.3)	3/4(19.1)	.206(5.3)	—	227-1221-11/ Cav. A▲	Solder Contact	—	83-58SP
	Clamp Set Screw	1 9/16(39.7)	23/32(18.3)	.214(5.5)	—	—	—	UG-203	83-776
59, 62, 140, 210	Braid Crimp	1 5/16(33.3)	3/4(19.1)	.251(6.4)	—	227-1221-13/ Cav. A▲	Solder Contact	—	83-59SP
59, 62, 71, 140, 210	UG Standard	1 11/16(42.9)	23/32(19.8)	.257(6.6)	—	—	—	UG-111	83-750
ANGLE									
8, 9, 11, 13, 63, 87, 149, 213, 214, 216, 225	UG Standard	1 3/8(34.9)	3/4(19.1)	.444(11.2)	1 35/64(39.3)	—	TFE Insulation	—	83-67
	UG Standard	1 3/8(34.9)	3/4(19.1)	.444(11.2)	1 35/64(39.3)	—	Polystyrene Ins.	—	83-59

RECEPTACLES AND ADAPTERS / NON-CONSTANT IMPEDANCE • NON-WEATHERPROOF

Description	Dimensions, inches(millimeters) a	b	d	e	Mounting Hole	Military Number	Amphenol Number
PANEL RECEPTACLES / .125"(3.2mm) DIA. FLANGE HOLES • FEMALE CONTACTS • MICA FILLED PHENOLIC INSULATION							
Standard Type	1 1/16(27.0)	1(25.4)	—	—	X	SO-239	83-1R
Polystyrene Insulation	1 1/16(27.0)	1(25.4)	—	—	X	SO-239	83-1RTY
TFE Insulation	1 1/16(27.0)	1(25.4)	—	—	X	SO-239A	83-798
Large Body	1 5/8(27.4)	1 9/32(32.5)	—	—	Y	UG-357	83-21R
Pressurized/Ceramic Ins.	1 3/16(30.2)	1(25.4)	—	—	X	—	83-716
Special/Oval Flange	1 1/16(27.0)	1 19/64(32.9)	—	—	Z	—	83-876
BULKHEAD RECEPTACLES / FEMALE CONTACTS							
Front Mount/Copolymer of Styrene and TFE Ins.	1 3/32(27.8)	9/16(14.3)	—	.156(4.0)	W	—	83-875
Front Mount/Mica-Filled Phenolic Ins.	1 3/32(27.8)	9/16(14.3)	—	.156(4.0)	W	—	83-875-1002
Rear Mount/Mica-Filled Phenolic Ins.	1 1/16(27.0)	3/4(19.1)	—	.093(2.4)	V	—	83-878
Rear Mount/Pressurized/ Copolymer of Styrene Ins.	1 13/32(35.7)	7/8(22.2)	—	.515(13.1)	41/64(16.3) Dia.	UG-266	4575
Rear Mount/Hermetic Sealed/Glass-TFE Ins.	1 13/32(35.7)	7/8(22.2)	—	.515(13.1)	41/64(16.3) Dia.	—	74525
ADAPTERS / POLYSTYRENE INSULATION							
Straight/Jack-Jack	1 1/8(28.6)	5/8(15.9)	—	—	—	PL-258	83-1J
Straight/Jack-Jack/ Large Body	1 1/8(28.6)	1(25.4)	—	—	—	UG-360	83-21J
Straight/Jack-Jack TFE Ins.	1 1/8(28.6)	5/8(15.9)	—	—	—	—	11850
Straight/Plug-Plug	1 5/16(33.3)	25/32(19.8)	—	—	—	—	83-877
Bulkhead/Jack-Jack	2(50.8)	5/8(15.9)	—	.890(22.6)	41/64(16.3) Dia.	UG-363	83-1F
Bulkhead/Jack-Jack/ Copolymer of Styrene Ins.	1 3/8(34.9)	5/8(15.9)	—	.281(7.1)	41/64(16.3) Dia.	UG-224	29500
Angle/Jack-Plug	1 9/32(32.5)	3/4(19.1)	1 3/16(30.2)	—	—	UG-646	83-1AP
Angle/Plug-Jack	1 7/32(31.0)	3/4(19.1)	1 1/16(27.0)	—	—	M-359A	83-58
Tee/Jack-Plug-Jack	1 5/8(41.3)	3/4(19.1)	1 19/64(30.6)	—	—	M-358	83-1T

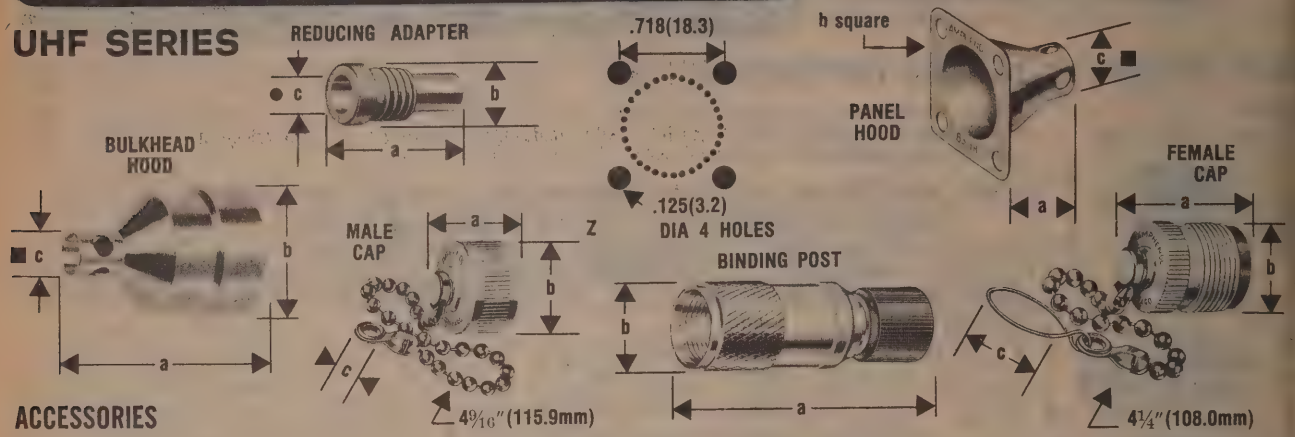
● Accommodates Cable Diameter
▲ Use with tool handle 227-944
△ Use with Semi-Automatic Pneumatic Bench Tool 227-945
□ U.S. Patent 4,053,200

AMPHENOL CONNECTORS

BUNKER RAMO

AMPHENOL NORTH AMERICA
Bunker Ramo Corporation

UHF SERIES



ACCESSORIES

Construction	Description	Dimensions, inches(millimeters) a	b	c	Mtg. Hole	Military Number	Amphenol Number
REDUCING ADAPTERS For P/N 83-ISP, 83-59, 83-67, 83-750, 83-822, 83-850, 83-851 Non-Weatherproof	RG-55, 58, 141, 142 Cable (Except 55A)	1(25.4)	7/16(11.1)	.209(5.3)	—	UG-175	83-185
	RG, 59, 62, 71, 140, 210 Cable	1(25.4)	7/16(11.1)	.257(6.5)	—	UG-176	83-168
HOODS Non-Weatherproof For Use with Cables Indicated and Panel Receptacles P/N 83-IR, 83-IRTY, 83-716, 83-798	RG-8, 10, 11, 12, 63, 79, 115, 149, 213, 215 Cable	3/4(19.1)	1(25.4)	.345(8.8)	Z	UG-106	83-1H
	RG-8, 9, 10, 11, 12, 63, 79, 87, 115, 149, 213, 215 Cable	7/8(22.2)	1(25.4)	.360(9.1)	Z	UG-372	83-1HP
	RG-58, 141 Cable	3/4(19.1)	1(25.4)	.155(3.9)	Z	UG-177	83-765
	RG-58, 141 Cable	3/4(19.1)	1(25.4)	.155(3.9)	Z	—	83-765-1001
	Cadmium Plating RG-58, 141 Cable	7/8(22.2)	1(25.4)	.156(4.0)	Z	—	83-786
HOOD Threaded for Mounting on Bulkhead Receptacles P/N 4575 & 74525	RG-55, 59, 140, 142, 223 Cable 5/8-24 Mounting Threads	1(25.4)	11/16(17.5)	.201(5.1)	—	MX-539	5375
CAPS Weatherproof	Male	15/32(11.9)	3/4(19.1)	.130(3.3)	—	—	83-1AC
	Female	11/16(17.5)	5/8(15.9)	.562(14.3)	—	—	83-1BC
BINDING POST Non-Weatherproof	Male Contact/Copolymer of Styrene Insulation	1 7/8(47.6)	23/32(18.3)	—	—	UG-332	58000

TOOLS

TWIN-HEX CRIMP TOOL SYSTEM

APPLICATION NOTES

Amphenol has introduced a new concept in cable-connector assembly tools, consisting of a universal tool frame with interchangeable crimping dies selected according to the cable and connector being assembled. A single Twin-Hex tool and one set of dies will crimp the outer ferrule to the cable braid and the center contact to the center conductor of the cable. With a few additional die sets, a wide variety of diameters can be crimped.

Die sets are easily interchanged. They are designed so there is no confusion regarding proper orientation. For permanent installation, a set of roll pins is included with each die set. Complete instructions are supplied.

HOW TO ORDER

Twin-Hex tool frame 227-944 is purchased separately. Select the die set required for your application from the table below and order by Amphenol Die Set number. (Hex size dimensions are listed for reference only.) Die sets are stamped with the Military number on one side and the Cavity designation on the reverse side. (Cavity A crimps outer conductor and Cavity B crimps inner conductor.)

RG-/ Cable Group	Connector Series	Cavity	Amphenol Die Set Number	Military Die Set Number	Hex Size Across Flats Cavity A (Outer)	Cavity B (Inner)
5, 6, 21, 143, 212, 222, 304	N	A & B	227-1221-29	M22520/5-29	.324	.100
8, 9, 11, 149, 213	UHF	A only	227-1221-23	M22520/5-23	.384	—
8, 9, 11, 87A, 149, 165, 213, 214, 216, 225, 393	N & SC	A & B	227-1221-25	M22520/5-25	.429	.100
55, 58, 141, 142, 223, 303, 400	BNC/TNC	A & B	227-1221-11	M22520/5-11	.213	.068
	UHF/SMA	A only				
	N & SC	A & B	227-1221-57	M22520/5-57	.213	.100
59, 62, 140, 210	BNC/TNC	A & B	227-1221-13	M22520/5-13	.255	.068
	UHF	A only				
	N	A & B	227-1221-59	M22520/5-59	.255	.100
71	BNC/TNC	A & B	227-1221-15	M22520/5-15	.263	.068
122, 174, 179, 180, 187, 188, 195, Essex 21-597	BNC/TNC SMA	A & B A only	227-1221-09	M22520/5-09	.178	.068
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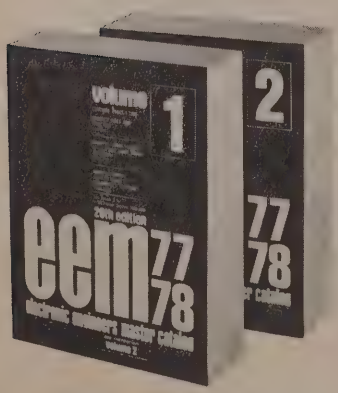

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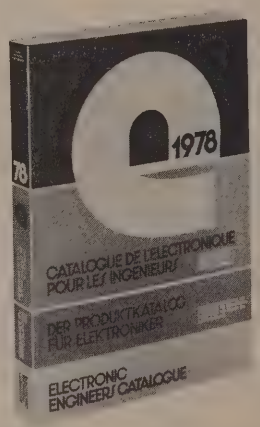

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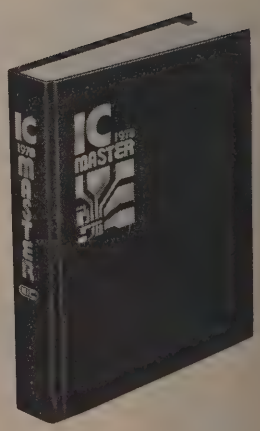

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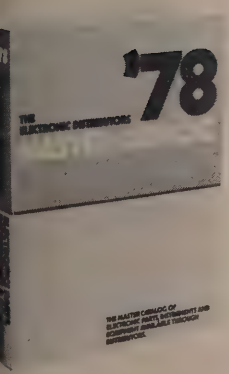

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TERMINAL JUNCTION SYSTEM MODULES (MIL-T-81714)

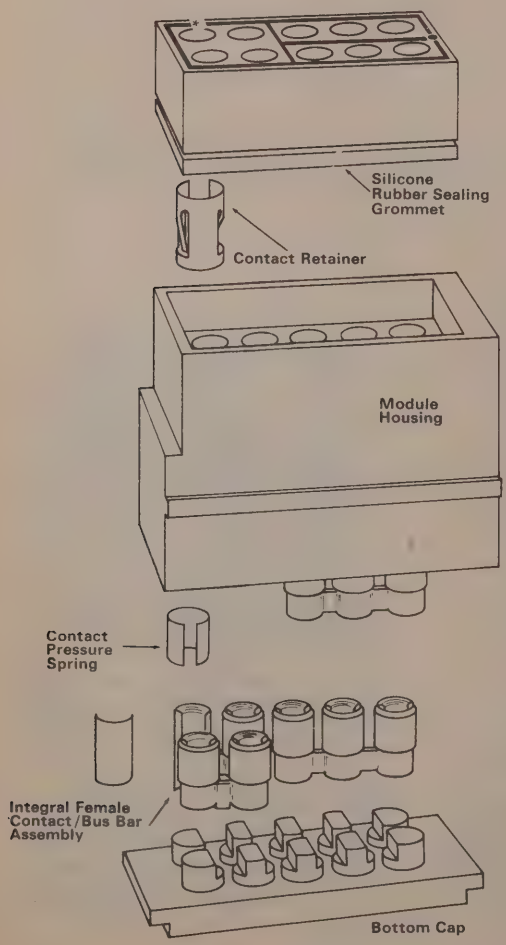
Appleton electronics division
ELECTRIC COMPANY
DEPT. EM / 2205 12th AVENUE / SOUTH MILWAUKEE, WISCONSIN 53172 / (414) 764-7200

Terminal Junction System Modules — QPL Approved in accordance with MIL-T-81714 Contacts are approved to MIL-C-39029. Appleton terminal junction system modules are available in feedback and feedthru types, sizes 16, 20, and 22, with a full selection of bussing arrangements. Several mounting track variations are also available. An Appleton exclusive, total peripheral pin-to-socket surface contact and one-piece contact/bus design, provides superior electrical characteristics.

INSIDE THE APPLETON TERMINAL JUNCTION MODULE

The most important element in a terminal junction system is the **terminal junction module.** It is here that environmental conditions are overcome, margins for error are reduced, versatility is the highest, and the most important, reliability is, above all, achieved.

To attain these goals, the Appleton terminal junction module embodies several outstanding advantages. The exploded view below shows you how these advantages work.



SPECIFICATIONS FOR APPLETON TERMINAL JUNCTION SYSTEMS

Insulators: Glass-filled, flame-retardant thermoset plastic. **Contacts:** Copper alloy, plated with gold per MIL-G-45204. **Wire-Sealing Grommets:** Silicone rubber. **Tracks:** Aluminum alloy, anodized per MIL-A-8625. **Hardware:** Non-magnetic stainless steel passivated. **Sealing Plugs:** Teflon®. **Applicable Specifications:** Appleton Terminal Junction Modules, Splices, and Track Assemblies meet or exceed the electrical, mechanical, and environmental requirements of MIL-T-81714. **Contact Resistance:** Appleton's unique peripheral surface contacts exhibit millivolt-drop readings consistently BELOW the range specified in MIL-T-81714. **Reproducibility:** Appleton contacts are made from uniform half-cylinders, gold-plated after forming, and joined by a pressure spring, they are remarkably free of performance variations. From contact to contact, and from module to module, critical performance characteristics are highly reproducible.

WIRE RANGE ACCOMMODATIONS

Module Size	Conductor Size, AWG	Module Size	Conductor Size, AWG
22	26 24 22	16	20 18 16
20	24 22 20	12	14 12

CLASSIFICATION

Class A 150°C max. Environmental type, limited fluid resistance.
Class B 175°C max. Environmental type, extended fluid resistance.
Class C 200°C max. Environmental type, limited fluid resistance.

ORDERING INFORMATION

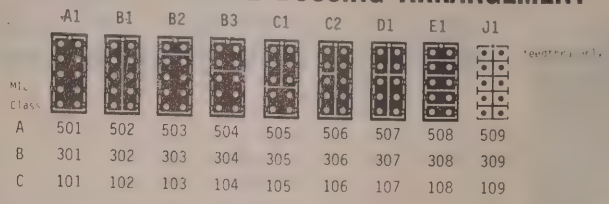
To order an Appleton Terminal Junction System:

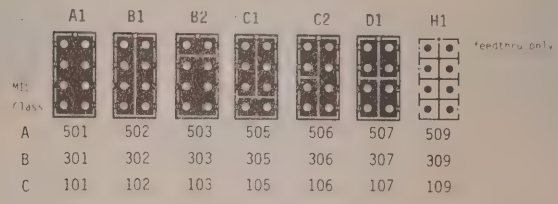
1. Choose the basic size: 20, 22, etc.
2. Choose the class: A, B, C.
3. Choose the bussing arrangement in relationship to the class designation.
4. For example: Size 20 module, Class C, all common bus order, 420120-101 (reference M81714/2-CA1).

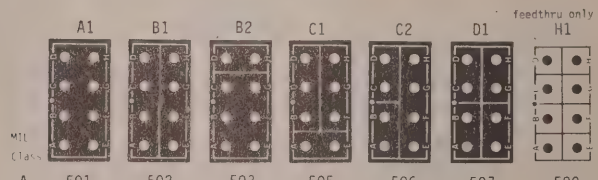
Appleton electronics division
ELECTRIC COMPANY
EPT. EM / 2205 12th AVENUE / SOUTH MILWAUKEE, WISCONSIN 53172 / (414) 764-7200

TERMINAL JUNCTION SYSTEM MODULES (MIL-T-81714)

TERMINAL JUNCTION SYSTEM MODULE MILITARY MODULE BUSSING ARRANGEMENT

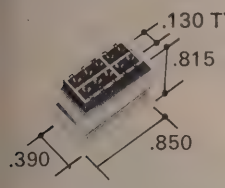




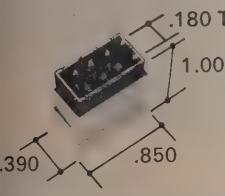


* Size 22 & 20 are same physical size.

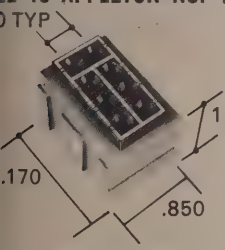
ZE 22 *MIL NO. M81714/1
ZE 22 *APPLETON NO. 420122-



ZE 20 *MIL NO. M81714/2
ZE 20 *APPLETON NO. 420120-

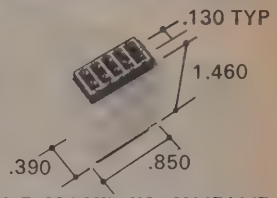


ZE 16 MIL NO. M81714/3
ZE 16 APPLETON NO. 420116-

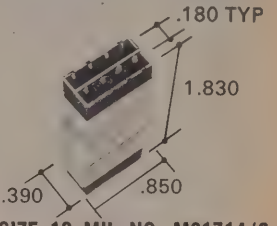


ZE 12 MIL NO. M81714/4
ZE 12 APPLETON NO. 420112-

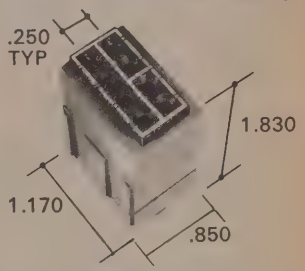
SIZE 22 *MIL NO. M81714/6
SIZE 22 *APPLETON NO. 420222-



SIZE 20 *MIL NO. M81714/7
SIZE 20 *APPLETON NO. 420220-



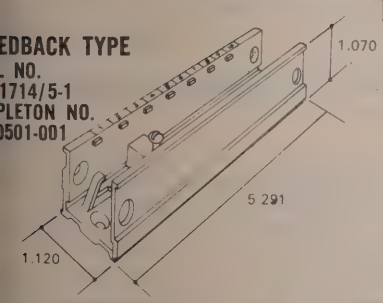
SIZE 16 MIL NO. M81714/8
SIZE 16 APPLETON NO. 420216-



SIZE 12 MIL NO. M81714/9
SIZE 12 APPLETON NO. 420212-

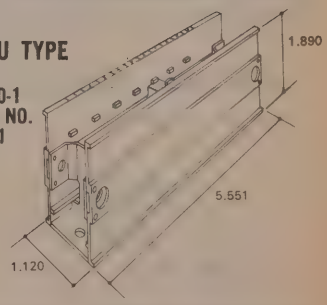
TERMINAL JUNCTION SYSTEM TRACK

EDBACK TYPE
. NO.
1714/5-1
PLETON NO.
0501-001

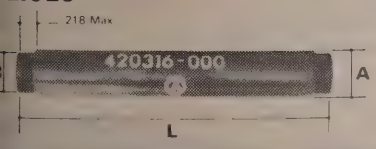


This track assembly will accommodate up to ten size 22, 20, or 16 modules, or any combination thereof. Three size 12 modules may be installed in this track assembly. Additional lengths are available. Call or write Appleton.

FEEDTHRU TYPE
MIL NO.
M81714/10-1
APPLETON NO.
420502-001



RMINAL JUNCTION SYSTEM PLICES



MIL No.	Appleton No.	Size	"A" Dia. +.025	"B" Dia. Max.	"L" +.032
1714/11-22A	420322-000	22	.250	.225	1.460
1714/11-20A	420320-000	20	.250	.225	1.460
1714/11-16A	420316-000	16	.281	.256	1.830
1714/11-12A	420312-000	12	.344	.319	1.830

PIN CONTACTS

Pin contacts are available to accommodate their respective module block sizes.

MIL No.	Appleton No.	Contact Size	Wire Barrel Size	Conductor Size	O.D. Range of Finished Wires (Inch)
M39029/01-16-22	422068-000	22	22	26 24 22	0.034-0.066
M39029/01-16-20	422006-000	20	20	24 22 20	0.038-0.083
M39029/01-14-16	422037-000	16	16	20 18 16	0.060-0.101
M39029/01-12-12	422072-000	12	12	14 12	0.087-0.147

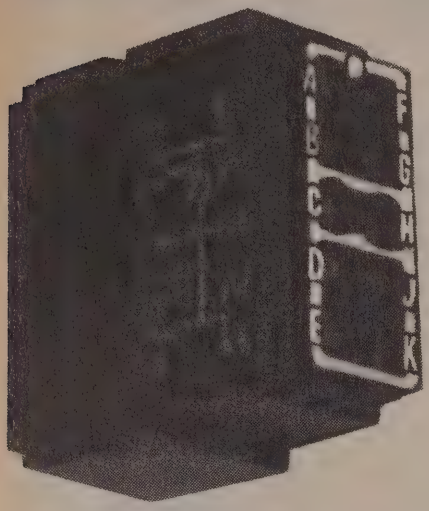
INSERTION/REMOVAL TOOLS

NAS1664 standard insertion/removal tools for the various size pins are available from Appleton.

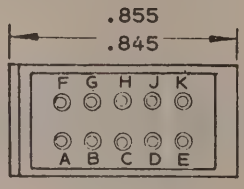
MIL No.	Size	Appleton No.
M83723-31-20	20	422078-001
M83723-31-16	16	422078-002
M83723-31-12	12	422078-003

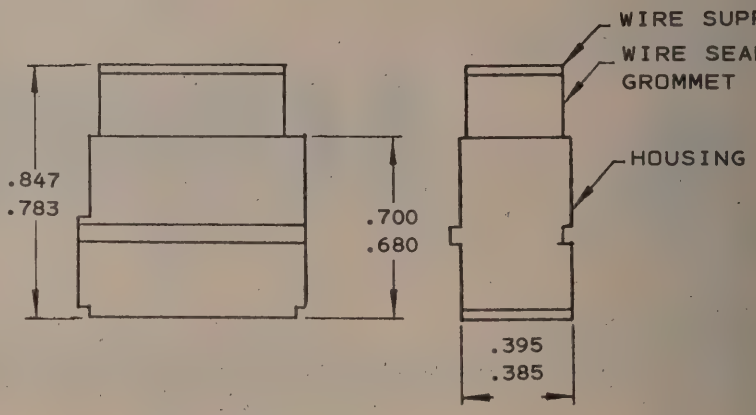
IMPEDANCE MATCHING TERMINAL JUNCTION MODULES

Appleton ELECTRIC COMPANY electronics division
DEPT. EM / 2205 12th AVENUE / SOUTH MILWAUKEE, WISCONSIN 53172 / (414) 764-720



MODULES ACCOMMODATE UP TO THREE RCR07 ¼ WATT RESISTORS, 1N2071 DIODES, OR ONE CAPACITOR



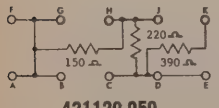


This new series of terminal junction modules feature internal resistors, diodes, and capacitors with no increase in size over standard MIL-T-81714 terminal junctions. The specific modules are used for balancing unmatched impedance values incurred when using various electronic components.

These terminal junction modules also feature a rigid wire support which allows severe bending of wires without opening wire seals of the silicone rubber grommet. All components are welded to the field-proven socket contact design developed for the MIL approved modules.

These modules can be mounted in the standard feedback track (see Appleton Terminal Junction Module page). Listed below are several available schematic diagrams and their respective value designations.

SCHEMATIC DIAGRAMS



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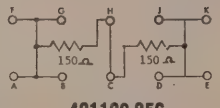

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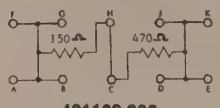

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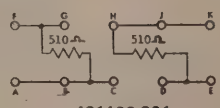

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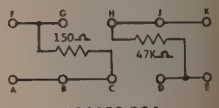

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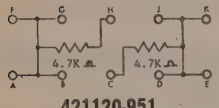

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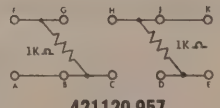

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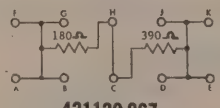

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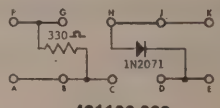

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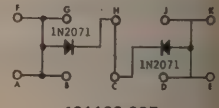

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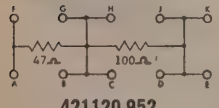

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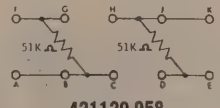
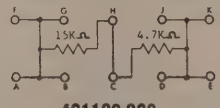
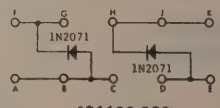


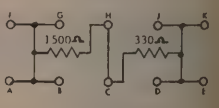
421120-958



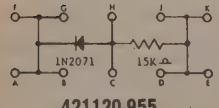
421120-968



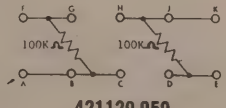
421120-963



421120-969



421120-955



421120-959

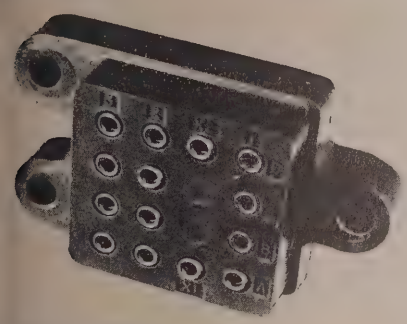
If you so desire, Appleton will custom make any value changes to suit your particular application. Feel free to request any such assistance from Appleton's quality engineering staff. Just call or write for details.

Appleton electronics division
ELECTRIC COMPANY

DEPT. EM / 2205 12th AVENUE / SOUTH MILWAUKEE, WISCONSIN 53172 / (414) 764-7200

RELAY SOCKETS (MIL-R-6106)

Appleton relay sockets for MIL-R-6106 relays are available in many configurations with a full range of standard styles with fixed and removable closed-entry socket contacts. The low profile designs can be mounted from the top or bottom of the panel. Appleton relay sockets provide numerous variations of polarization; and possible terminal styles include: crimp removable, solder pot, pierced tab, turret lug, dip solder, and wire wrap.



APPLICATION

Appleton relay sockets can be used in conjunction with airbourne and shipboard equipment, plus any and all industrial electronic equipment utilizing MIL-R-6106 electro-mechanical relays and commercial relays having the same interface design.

APPLETON FEATURES

- Low Profile Design
- Closed Entry Socket Contacts
- Bottom and Top Mounting Versatility
- Positive Polarization
- Unique .200 Grid Pattern
- Plus a wide variety of contact termination possibilities: solder pot, pierced tab, turret lug, dip solder, wire wrap.

PERFORMANCE

Appleton connector assemblies meet the requirements of NAVORD 3020237.

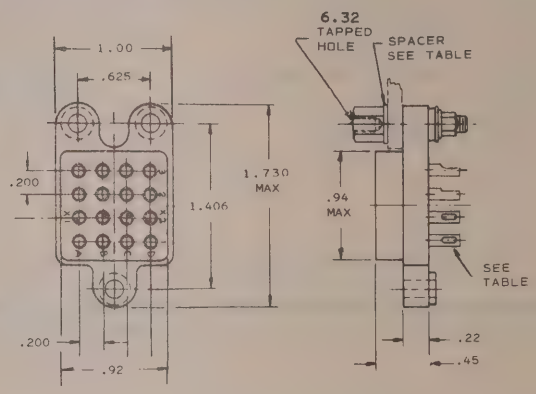
MATERIALS

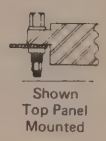
Insulators: Dialyl Phthalate Type SDG-F Per MIL-M-14 color Green.
Contacts: Copper Alloy — Gold Plated Per MIL-G-45204
Contact Hood: Stainless Steel 300 Series
"C" Ring — Contact Retainer: Stainless Steel Per MIL-S-7720

Mounting Hardware:
Stud: Stainless Steel per MIL-S-7720
Spacer: Stainless Steel per MIL-S-7720
Washer: Stainless Steel Per MIL-S-7720
Hex Nut: MS 21043-06

NON-ENVIRONMENTAL TYPE

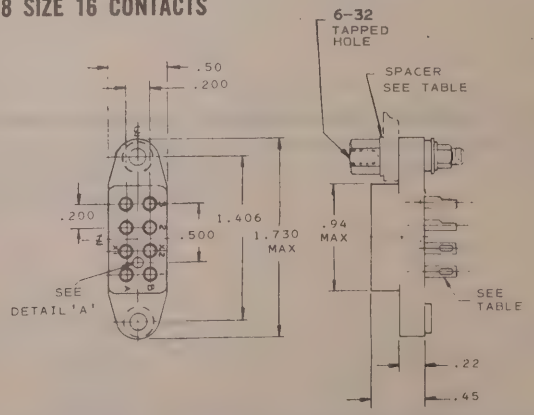
APPLETON RELAY SOCKET NO. 451116-030
14 SIZE 16 CONTACTS

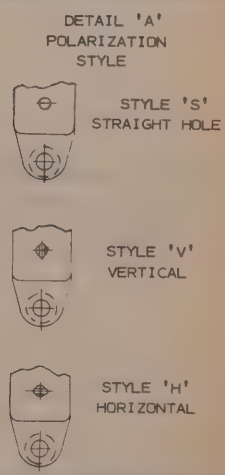




Appleton No.	Navord P/N	Mating Relay	Contact Style	Omit Contacts	Panel	Spacer
451116-042	3020237-011	MS 24700-4	Solder Cup	X1, A; X2, D	.090	3
451116-041	3020237-004	MS 24700-4	Pierced Tab	X1, A; X2, D	.090	3
451116-040	3020237-003	MS 24700-4	Pierced Tab	X1, A; X2, D	.125	None
451116-032	3020237-012	MS 27400-2	Solder Cup	X1, B; X2, C	.090	3
451116-031	3020237-002	MS 27400-2	Pierced Tab	X1, B; X2, C	.090	3
451116-030	3020237-001	MS 27400-2	Pierced Tab	X1, B; X2, C	.125	None

APPLETON RELAY SOCKET NO. 451116-050
8 SIZE 16 CONTACTS





Appleton No.	Navord P/N	Mating Relay	Contact Style	Polarization	Panel	Spacer
451116-071	3020237-010	30203-8-003	Pierced Tab	Style H	.090	2
451116-070	3020237-009	30203-8-003	Pierced Tab	Style H	.125	None
451116-061	3020237-008	MS 27401-4	Pierced Tab	Style V	.090	2
451116-060	3020237-007	MS 27401-4	Pierced Tab	Style V	.125	None
451116-052	3020237-003	MS 27401-2	Solder Cup	Style S	.090	2
451116-051	3020237-006	MS 27401-2	Pierced Tab	Style S	.090	2
451116-050	3020237-005	MS 27401-2	Pierced Tab	Style S	.125	None

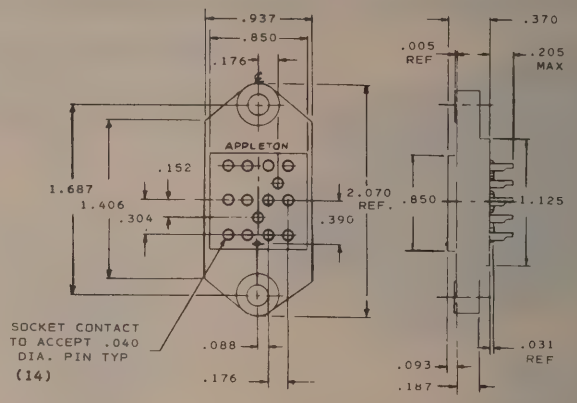
RELAY SOCKETS (MIL-R-6106)

Appleton electronics division
ELECTRIC COMPANY
DEPT. EM / 2205 12th AVENUE / SOUTH MILWAUKEE, WISCONSIN 53172 / (414) 764-7200

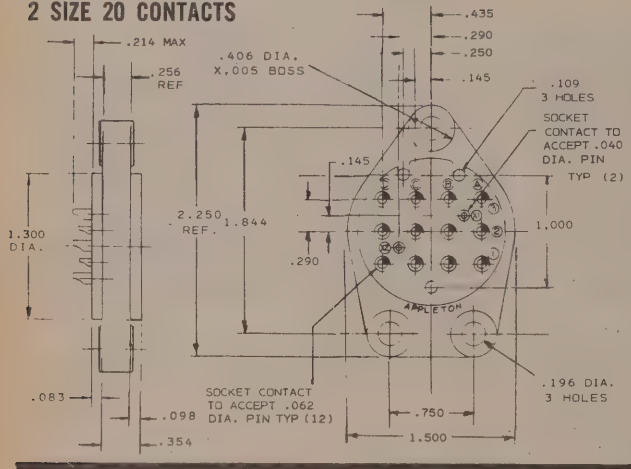
MATERIALS

- Attractive tan housing is thermoset material in accordance with MIL-M-14, Type SDG-F.
- Fixed, closed-entry type socket contacts are made of copper alloy and gold plated per MIL-G-45204.
- Mounting hardware is available; to order, change first digit after dash to "8." For example, without hardware, 451116-080; with hardware, 451116-880.

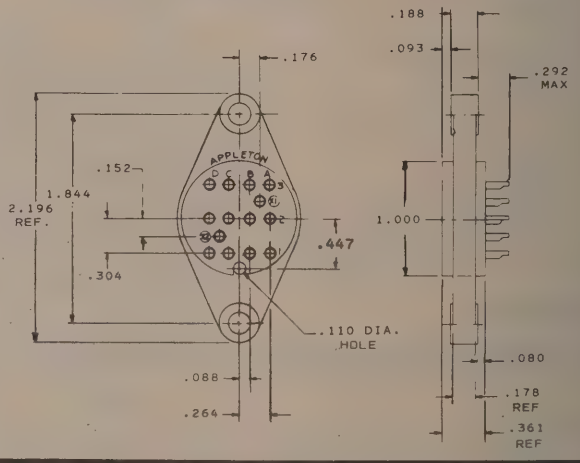
APPLETON RELAY SOCKET NO. 451116-080
14 SIZE 20 CONTACTS



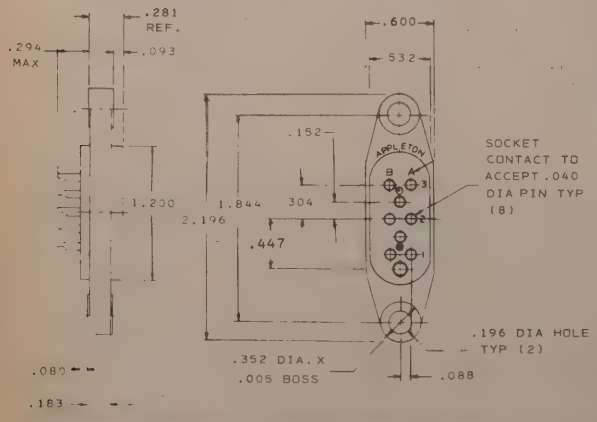
APPLETON RELAY SOCKET NO. 451116-090
12 SIZE 16 CONTACTS
2 SIZE 20 CONTACTS



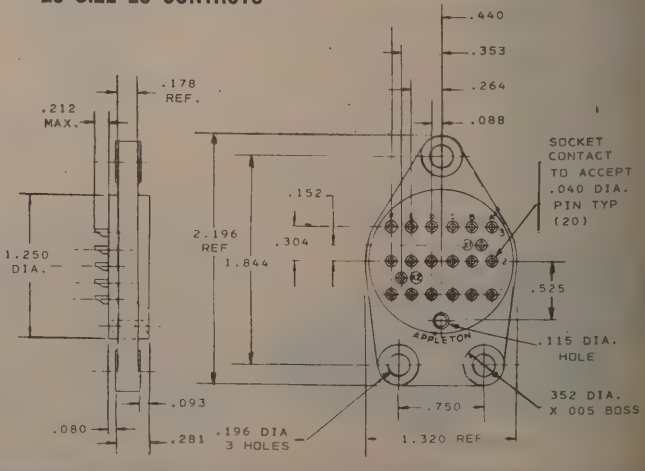
APPLETON RELAY SOCKET NO. 451116-100
14 SIZE 20 CONTACTS



APPLETON RELAY SOCKET NO. 451116-110
8 SIZE 20 CONTACTS



APPLETON RELAY SOCKET NO. 451116-120
20 SIZE 20 CONTACTS



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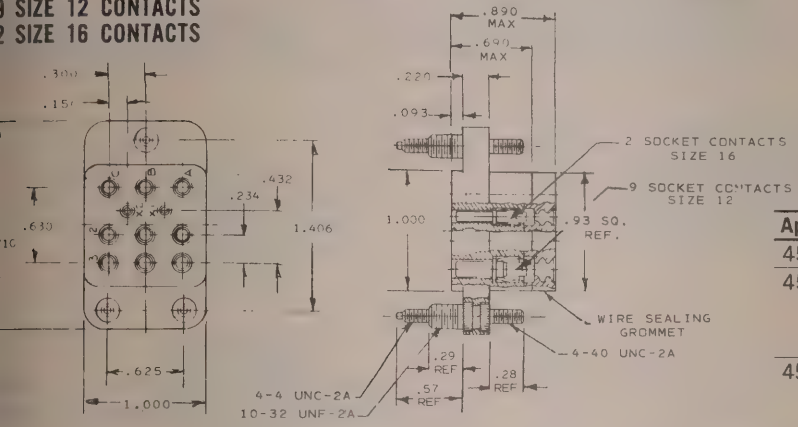
DEPT. EM / 2205 12th AVENUE / SOUTH MILWAUKEE, WISCONSIN 53172 / (414) 764-7200

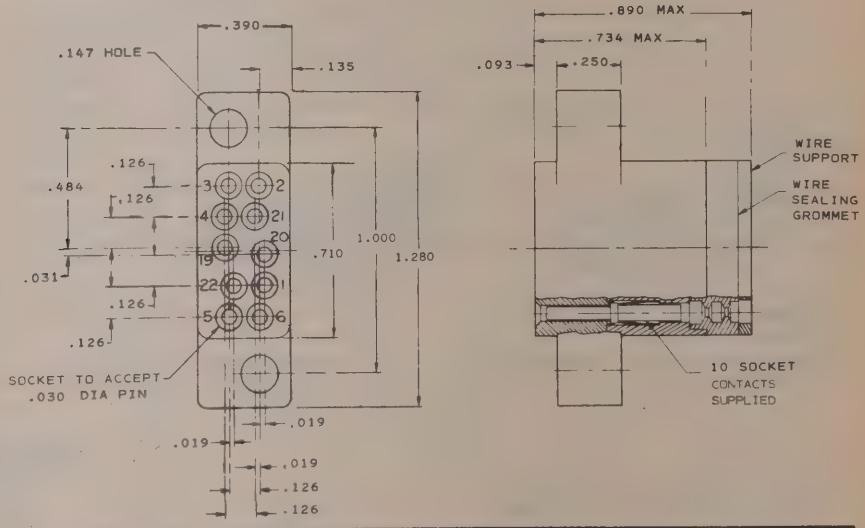
RELAY SOCKETS (MIL-R-6106)

APPLETON RELAY SOCKET NO. 41116-160, 161, 162
9 SIZE 12 CONTACTS
2 SIZE 16 CONTACTS

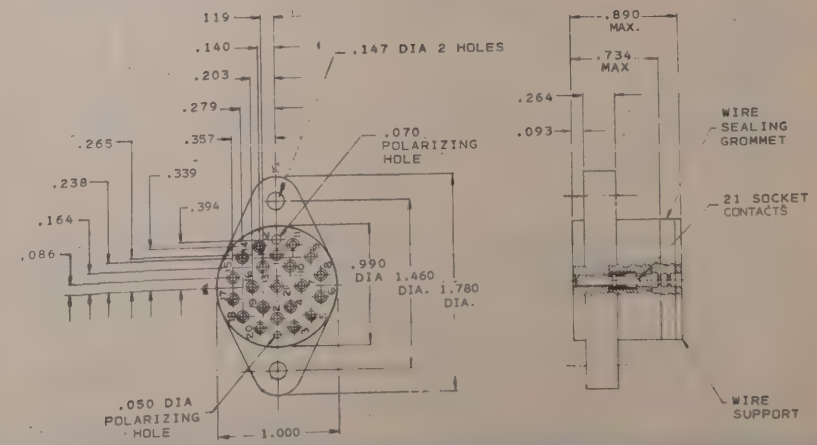


Appleton No.	Contacts Supplied	Contact No.
451116-160	None	—
451116-161	9 Socket Contacts, Size 12	422053-900
	2 Socket Contacts, Size 16	422054-900
451116-162	9 Socket Contacts, Size 12, #16 Crimp	422089-900
	2 Socket Contacts, Size 16	422054-900

APPLETON RELAY SOCKET NO. 451116-431
22 SIZE 10 CONTACTS



APPLETON RELAY SOCKETS NO. 451116-441
20 SIZE 21 CONTACTS



MATERIALS

Attractive green housing and wire support is thermoset molded material in accordance with MIL-M-14, Type SDG-F.

Appleton socket contacts are copper alloy and gold plated per MIL-G-45204.

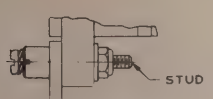
The stud material and mounting hardware are corrosion resistant passivated steel.

Socket contacts are of the closed entry type.

All hardware and contacts are supplied.

With Appleton No. 451116-431, crimp tool M22520/2-01 should be used to terminate socket contacts to their respective wire sizes. Furthermore, for the above Appleton No., MS27534-22 tool should be used for inserting and removing wired mating socket contacts.

With Appleton No. 451116-441, crimp tool M22520/1-01 should be used to terminate socket contacts to their respective wire sizes. Furthermore, for the above Appleton No., MS27534-20 tool should be used for inserting and removing wired mating socket contacts.



Hardware Supplied

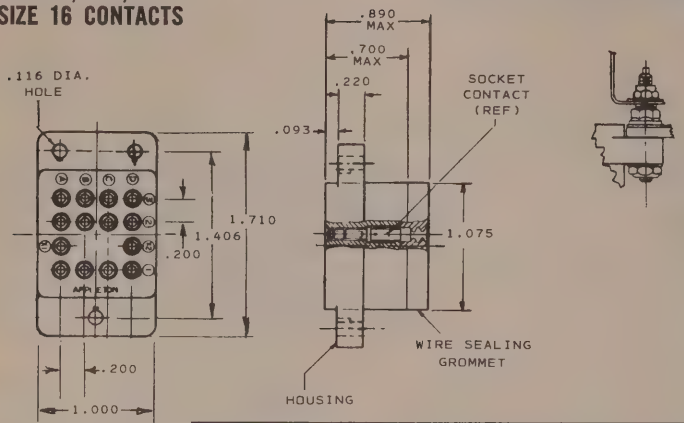
RELAY SOCKETS (MIL-R-6106)

Appleton ELECTRIC COMPANY electronics divisio

DEPT. EM / 2205 12th AVENUE / SOUTH MILWAUKEE, WISCONSIN 53172 / (414) 764-7200

APPLETON RELAY SOCKET NO. 451116-130, 131, 132 14 SIZE 16 CONTACTS

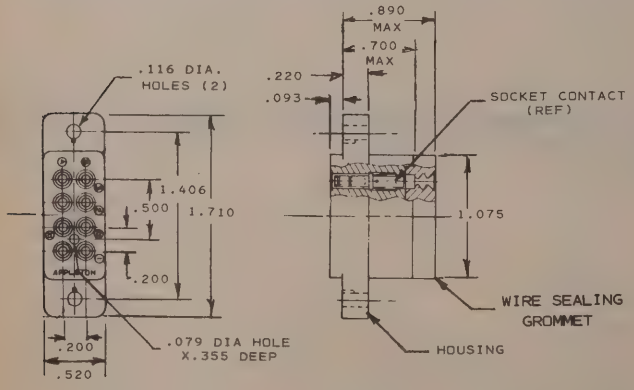
ENVIRONMENTAL TYPE
REAR ENTRY REAR RELEASE



Appleton No.	Contacts Supplied	Contact No.
451116-130	None	—
451116-131	Size 16 Contact, Mating End, Crimp End to Accommodate 16-18-20 AWG	422046-900
451116-132	Size 16 Contact, Mating End, Crimp End to Accommodate 20-22-24 AWG	422047-900

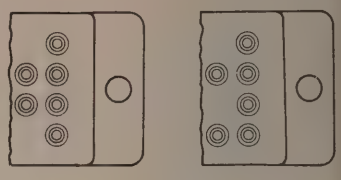
MATERIALS

- Attractive light green housing is thermoset molded material in accordance with MIL-M-14, Type SDG-F.
- Red sealing grommet is made of silicone rubber.
- Closed entry, crimp type sockets are copper alloy gold plated per MIL-G-45204.
- Stud material and mounting hardware are made of corrosion resistant steel.
- All hardware is supplied in separate bag within socket package.
- A MS3191 crimp tool should be used to terminate pin contacts to their respective wire sizes.
- NAS1664-16 and -12 tools should be used for inserting and removing wired contacts.
- Contacts are supplied in separate bag within socket package (see table).

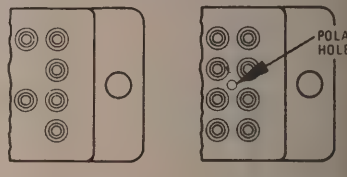


Appleton No.	Contacts Supplied	Contact No.
451116-140	None	—
451116-141	Size 16 Contact, Mating End, Crimp End to Accept 16-18-20 AWG	422046-900
451116-142	Size 16 Contact, Mating End, Crimp End to Accept 20-22-24 AWG	422047-900

POLARIZATION STYLES
14 & 16 CONTACT POSITIONS



14 CONTACTS		14 CONTACTS	
Without Contacts	With Contacts	Without Contacts	Witl Contact
580	581	590	591

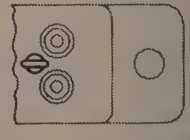


14 CONTACTS		16 CONTACTS	
600	601	610	611

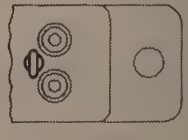
APPLETON RELAY SOCKET NO. 451116-

POLARIZATION STYLES
8 CONTACT POSITIONS

Without Contacts	With Contacts
550	551



560	551



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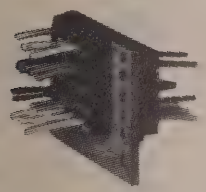
PROGRAMMING TERMINAL BLOCKS

ppleton programming terminal blocks offer a complete selec-ion of bussed or individual circuits. Choose from feedback or eedthru types in sizes 16 and 20 (color coded). The unique ne-piece socket contact design provides uninterrupted circuit through all bussed positions. Appleton individual terminal blocks meet your needs for interconnection, bussing, and signal distribution.

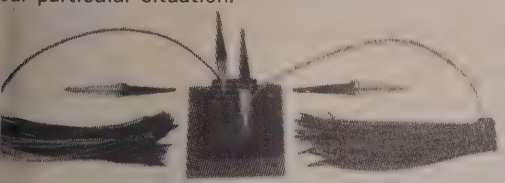
FEEDBACK TYPE



FEEDTHRU TYPE

TERMINAL BLOCKS

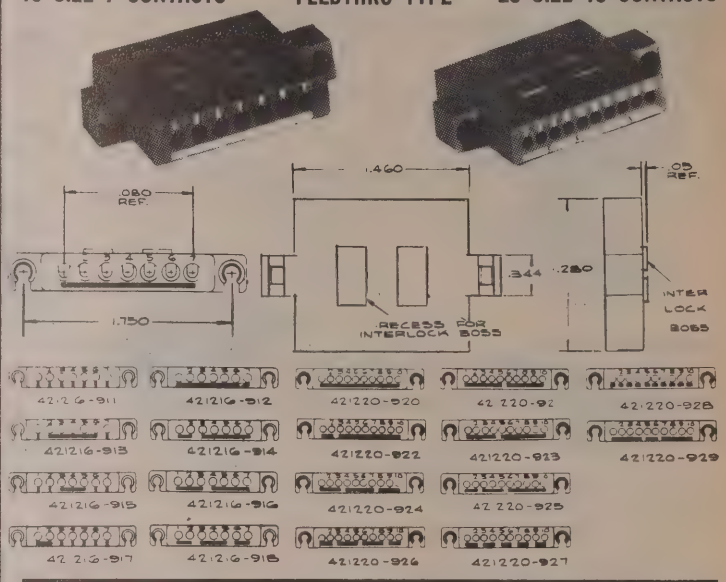
ppleton Programming Terminal Blocks are offered n Feedthru and Feedback types to provide electrical ontinuity program bussing for input/output as re-uired for your application. Size 16 blocks (color oded blue and rated at 13 amps) accept 16, 18, and 0 AWG stranded wire, and provide up to 15 contacts er square inch. Size 20 blocks (color coded red, ated at 7.5 amps) accept 20, 22, and 24 AWG tranded wire, and provide up to 21 contacts per quare inch. Appleton Programming Terminal Blocks re available for plate mounting; call or write Apple-on's quality engineering staff for assistance in order o meet your various application problems. They will ollow your designs or develop mounting plates for our particular situation.



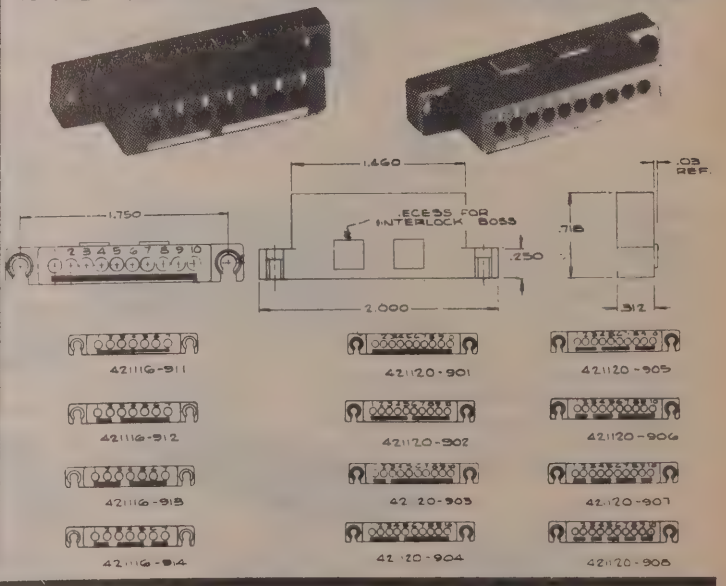
EASY INSERTION/REMOVAL OF PIN CONTACTS

tandard plastic tool permits simple insertion or emoval of pin contacts for disassembly or program-ing circuit changes without disturbing other pro-ram functions. Highly reliable crimp wire termina-on pin contacts are used. Crimping is accomplished ith standard industry-accepted manual or semi-utomatic tools.

16 SIZE 7 CONTACTS FEEDTHRU TYPE 20 SIZE 10 CONTACTS



16 SIZE 7 CONTACTS FEEDBACK TYPE 20 SIZE 10 CONTACTS



FEATURING

1. CRIMP SCREW MACHINE CONTACTS

) Accepts MIL-C-39029/1 Pin Contacts
) Rear Release Removable
) MIL-C-83723/31 Contact Insertion/ Extraction Tool

. INTERNAL BUSSING

) One Piece, Contact and Buss Insures Low, Constant Millivolt Drop
) Bussing Combinations to Suit Your Needs

3. CONNECTOR SIZES

A) 16 Size Color Coded Blue Available in Feedback and Feedthru Design, Includes 7 Contacts
B) 20 Size Color Coded Red Feedback and Feedthru Design Includes 10 Contacts
C) 12 Size Color Coded Yellow Feedback and Feedthru Design Includes 5 Contacts

4. MOUNTING

A) Two 4-40 Screws are Required for Mounting
B) Snap-on Mounting Feature
C) Interlocking Bosses and Recess for Polarizing and Stacking

5. APPLICATION STANDARDIZATION

The Low-cost Terminal Blocks are Designed to Use the Same MS-39029/1 Pin Contact, MIL-T-22520 Crimping System and MIL-83723/31 Insertion Removal Tools used in the Sophisticated Military MIL-T-81714 Terminal Junction System. Appleton is also a Major Supplier of MIL-T-81714 T.J.S.

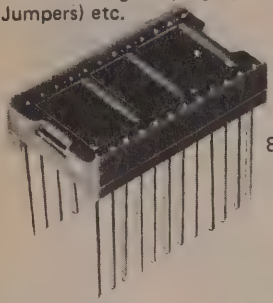
ARIES T.M.
ELECTRONICS, INC.
P.O. Box 231, Frenchtown, N.J. 08825
Telephone (201) 996-4096, TWX 510-235-3391

DIP Sockets,

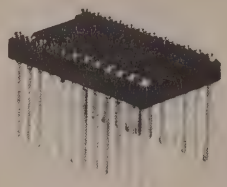
DIP SOCKETS—6 STYLES

DIP SOCKETS

For mounting IC's, logic jumpers (see DIP-R-LOGIC Jumpers) etc.

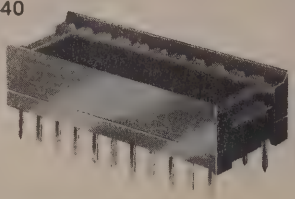


SERIES 501
Wire Wrap* Type Pins with Aries bifurcated contacts.
Available:
8-10-14-16-18-20-22-24-28-32-36-40 Pins on .200, .300, .400 and .600 centers.



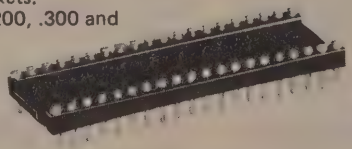
SERIES 503
Lo-Profile Sockets—Wire Wrap Pins with collet style contacts.
Available: 2 to 40 pins in increments of 2 on .300 or .600 centers.
64 pins on .900 centers.

SERIES 511
Solder Type Pins with Aries bifurcated contacts.
Available:
8-10-14-16-18-20-22-24-28-32-36-40 Pins on .200, .300, .400 and .600 centers.



SERIES 512
Lo-Profile Sockets with Aries bifurcated solder type pins.
Available: 8-14-16-24 Pins on .300 and .600 centers.

SERIES 513
Lo-Profile Collet Style Sockets.
Available 6 to 40 pins on .200, .300 and .600 centers.
64 pins on .900 centers.



SPECIALS: POLARIZED HEADER & SOCKET
For perfect mating of Header & Socket

SERIES 5118 Polarized Socket 14 & 16 pin (Aries bifurcated pins)
SERIES 6008 Polarized Header.

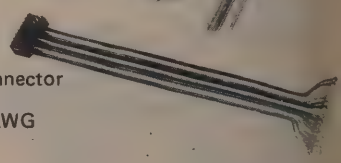
*TM—Gardner-Denver

Complete Information in Catalog 5000.

DIP JUMPERS 10 STANDARD STYLES and SPECIALS

DIP JUMPERS

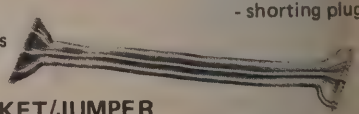
SERIES 100—DIP board to DIP board.
Available: 8-14-16-24 pins.
Any length cable.
Any connector orientation available, 12 standard configurations.



SERIES 112—DIP Extenders
Available: 8-14-16-24 pins.
Any length cable. Various connector orientations (see catalog).
Cable—EIA color coded, 26 AWG (7 strands 34 AWG).
Type B—600 V 105°C.

DECI-CENTER™ JUMPERS

SERIES 150-151 –Available: 8-14-16-24 pins, socket one end—Deci-center other end.
Any length cable. Cable—EIA color coded, 26 AWG (7 strands 34 AWG).
Type B-600 V 105°C. Two wiring sequences available as standard.

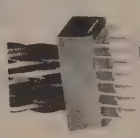


DIP-ER LOGIC™ SOCKET/JUMPER

SERIES 206-207-208

Dip-er Logic Socket Jumpers saves the space on the board for a plug in position and can be used to impose two devices into one position.
Pluggable into standard 8-14-16 and 24 position logic panels.
Any length cable. Cable—EIA color coded, 26 AWG (7 strands 34 AWG).
Type B—600 V 105°C.

TWISTED PAIR JUMPER



Twisted pair jumpers are available with one les number of pairs than the connector number. Example 14 pin jumper is available with either 13 twisted pair all grounds connected to 14 pin, or 7 twisted pairs, a grounds connected to the opposite signal pins 8-14

FLAT CABLE JUMPER

Flat cable jumpers provided as 14 and 16 pin a standards, also available in 8 and 24 pin with flat wi bonded together. Excellent for high flex applicatio or where space is a major consideration. Mo connector orientations available as standar

D TO DIP JUMPERS

SERIES 225
Cable assemblies using "D" Series subminiature connectors (9, 15, 25, 37 and 50 pin) on one end and Aries DIP Headers on other ends. Other end can be furnished stripped and tinned also. Cable is EIA color coded 26 AWG. Other sizes and types of cable can be accommodated.

SPECIALS Aries will promptly respond to your special jumper requirements.

Complete information, Catalog No. 1200-2.

Jumpers, Headers

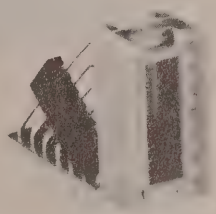
The product listings shown here are abbreviated. Complete data, dimensions and material specifications are available in various Aries catalogs, which have been noted with each listing. Our line of DIP packaging accessories is extremely broad and we urge you to contact the factory or our sales representative in your area. Your inquiries will receive our prompt attention.

VERTISOCKETS
22 STYLES and SPECIALS

ERTISOCKETS™

or mounting LED Displays, Switches, est Points. A complete line—from 2 pin r decimal to 40 pins for multiple splays.

vailable for vertical, horizontal or edge rd displays with optional mounting ngles of 30°, 45°, 60° or 90°. Device ounting centers .200, .300 and .600.

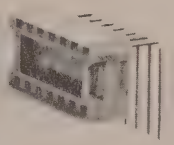


VERTICAL MOUNTING

ERIES 2810—Available: 8-10 Pin Aries bifurcated pins) on .200 centers.
ERIES 810—Available: 8-14-16 Pin Aries bifurcated pins) on .300 centers.
ERIES 6810—Available: 8-10-14 Pin Aries bifurcated pins) on .600 centers.

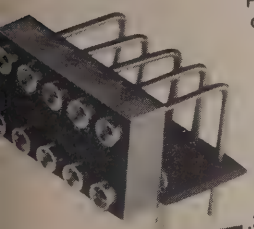
HORIZONTAL MOUNTING

ERIES 2820, 2822 and 823—Available: 8-10 Pins (Aries ifurcated pins) on .200 centers.
ERIES 820, 822, 823—Available: -14-16-18 Pins (Aries bifurcated pins) n .300 centers.
ERIES 6823—Available: 8 to 40 Pins Aries bifurcated pins) on .600 centers.
ERIES 822E (Economy Model)—Available: 8-14-16-18 Pins Aries bifurcated pins) on .300 centers. Note: one row of pins .025 x .006 with ther row .025 sq.



COLLET STYLE VERTISOCKET

For displays using round pins (Solder or Wire Wrap). Excellent for military applications. Can be provided with FR4 base material.



Horizontal

SERIES 2820C, 2822C, 2823C—Available: 8 and 10 pins on .200 centers.
SERIES 820C, 822C and 823C—Available: 8 to 20 pins on .300 centers in increments of two (2).

Vertical

SERIES 2810C—Available 8-10 pins.
SERIES 0810C—Available: 2 pin (for decimal) on .150 center.

EDGE CARD MOUNTING

Mounts on 1/16" p.c. board.
SERIES 2830: 8-10 pin on .200 centers.
SERIES 830: 8-14-16-18 pins on .300 centers.
SERIES 6830: 8-10-14-16-18-24 to 40 pins on .600 centers.

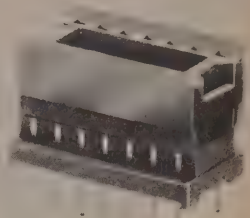
PECIAL COLLET STYLE ERTISOCKETS

o specification are also available.

omplete information in Catalog 8000A

ELEVATOR SOCKETS

Useful to bring device to level required. Available from ¼" to 1¼" high. Standard heights in stock; specials 3 weeks.

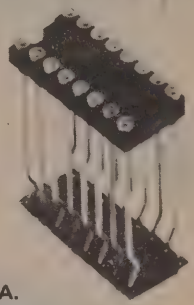


SERIES 8XXX (XXX=height)

Available: 14 pin (Aries bifurcated pins) on .300 centers.

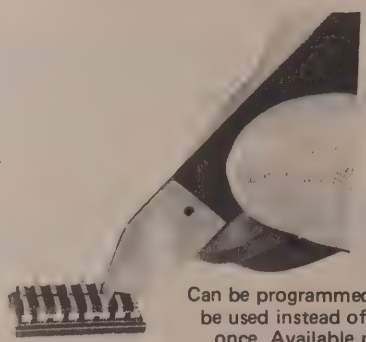
COLLET STYLE CONTACTS

Any height up to 1.150"
2 thru 20 pin on .300 centers
2 thru 40 pin on .600 centers
Specials to any height with no tooling charge. Can be supplied in single pin line to accommodate large LCD, alpha numeric displays and displays that include electronics.



Complete information in Catalog 8000A.

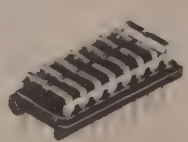
DIP PROGRAM HEADERS AND COVERS



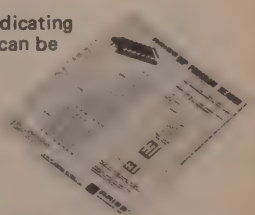
DIP PROGRAM HEADERS AND COVERS

SERIES 675—Available: 2-4-6-8-10-12-14-16-18-20 Pin on .300 centers.

Can be programmed within header itself. Can be used instead of DIP Switches that are set once. Available pre-programmed or can be programmed by customer with needle nose pliers or Aries Program Header tool.



Spec. Sheet 6700 also available for indicating program desired so Program Headers can be furnished pre-programmed.

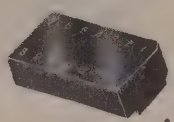


Complete information on Spec. Sheet 6750.

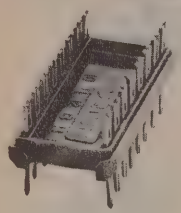
ARIES T.M.
ELECTRONICS, INC.
P.O. Box 231, Frenchtown, N.J. 08825
Telephone (201) 996-4096, TWX 510-235-3391

The product listings shown here are abbreviated. Complete data, dimensions and material specifications are available in various Aries catalogs, which have been noted with each listing. Our line of DIP packaging accessories is extremely broad and we urge you to contact the factory or our sales representative in your area. Your inquiries will receive our prompt attention.

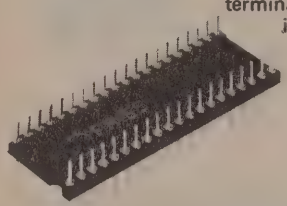
DIP HEADERS and COVERS 5 STYLES and SPECIALS



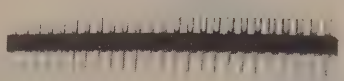
DIP HEADERS & COVERS for mounting components.
SERIES 600 with coined contacts. 2 Styles of Terminals: Post and Fork. Available: 2-8-14-16-24 pins on .300 & .600 centers. Contact styles shown below.



SERIES 625 with screw machine terminals. 5 Styles of Terminals. Available in 23 to 40 pins—each available on .200, .300, .400 and .600 centers.
SERIES 8625 with screw machine terminals. Available in 14-16-18-32 pins in single and double rows on .800 centers. Terminal styles shown below.

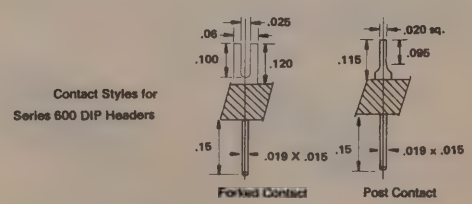


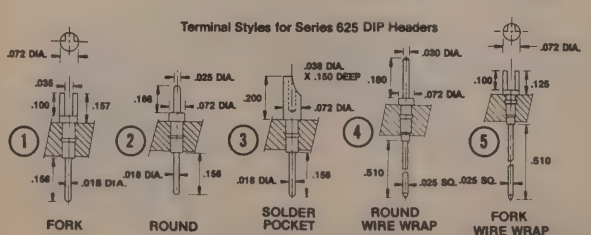
SERIES 650 COVERS: FOR HEADERS
Available for 8-14-16-24-40 pin sizes to accept components of 1/8", 3/8", 1/2" or 3/4" high.



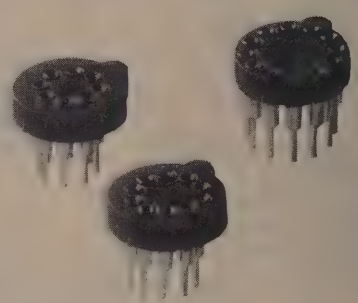
SERIES 0600 and 0625 Pin Line Headers
A single header strip both end and side stackable on .100 centers. (0600 with coined contacts) (0625 with screw machine terminals). Available: 1 to 25 pins on .100 centers.

Complete information:
Catalog 6000-2.

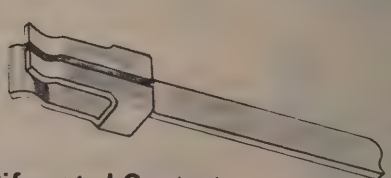




TO SOCKETS



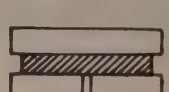
D Series 514 T O SOCKETS
Available 3, 4, 8 (.200 dia.), 8 (.230 dia.), 10, 12 Pin



Aries Bifurcated Contacts

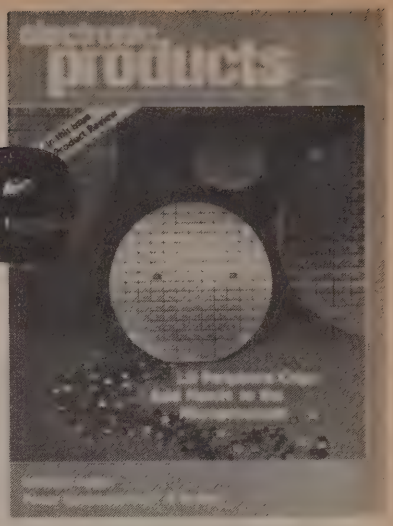
A superior electrical contact as well as firm, physical spring grip. The Aries bifurcated contact has more metal than any other . . . one good reason for its superiority and secure mating.

For round leads
Up to .020 Dia.
Redundant 3 point contact



For flat leads
Up to .025 wide
Grips thickness for maximum electrical contact.

stay up to date



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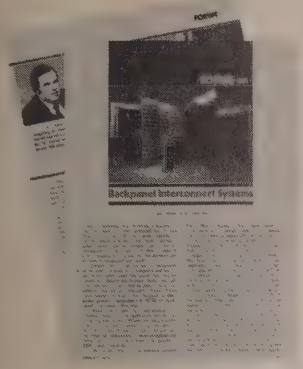

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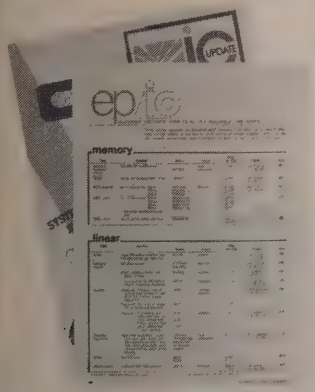

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QUARTERLY PRODUCT PLANNING DIRECTORY—A compilation of the latest catalogs of a wide variety of electronic products and systems.

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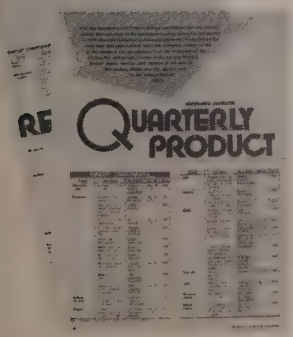

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AUGAT® Boards/Accessories

SOCKET/TERMINAL VARIATIONS

Two piece tapered entry socket terminal — four leaf machined closed entry inner contact and machined outer sleeve.

All catalogued boards are supplied with 3 level socket terminals, gold over nickel plated sleeves and contacts.

Any board may be purchased with 2 level socket terminals and optional plating combinations, by adding the proper suffix to the part number, as indicated in the example box below.

SOCKET TERMINAL OPTIONS: For wrap length, plating and replacement parts, see table below.

Example Part Number	Suffix Added to Number	Contact Plating	Sleeve Plating	Socket Terminal Length	Replacement Part Number
8136-PG1-30	None	Gold	Gold	12,95/.510 (3 level)	LSG-1FG1-1
8136-PG1-30-TG	-TG	Gold	Tin		LSG-1FG1-14
8136-PG1-30-2	-2	Gold	Gold	9,40/.370 (2 level)	LSG-1FG6-1
8136-PG1-30-2TG	-2TG	Gold	Tin		LSG-1FG6-14

MATERIALS

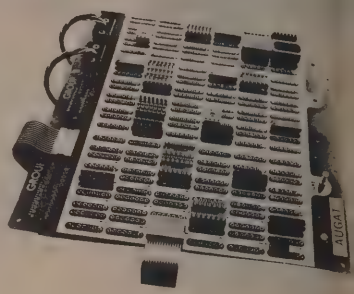
Two-piece, Machined Socket Terminal:
Inner Contact — beryllium copper, gold over nickel plated.
Outer Sleeve — brass, gold over nickel plated or tin over copper plated.

Board: Glass epoxy, 2 oz. copper circuitry, tin plated both sides.

Pins: phosphor bronze, gold over nickel plated.

PATTERNED BOARDS — CLASS 005

P-SERIES

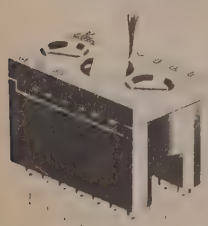


- ⅛" thick board accepts 14 and 16 lead dip I.C.'s.
- Modular Construction — boards may be purchased in multiples of 30 patterns (up to 180 patterns) indicated by suffix number. EXAMPLE: 8136-PG1-90 90 patterns.

See specs. for socket terminal variations.

Part Number	Socket/ Terminals Per Pattern	Voltage & Ground Connections	I.O. Area (for Every 30-Pattern Section)
8136-PG1	14	7 & 14	Socket Terminals (2 Rows of 23)
8136-PG18			Feed Thru Pins (2 Sets: 2 Rows of 13) Total-52 Pins
8136-PG3	14 + 2 (V & G)	V & G Sleeves	Socket Terminals (2 Rows of 23)
8136-PG189			Socket Terminals, High Density (4 Rows of 7)
8136-PG19			Feed Thru Pins (2 Sets: 2 Rows of 13) Total-52 Pins
8136-PG5	16	8 & 16	Socket Terminals (2 Rows of 23)
8136-PG190			Socket Terminals, High Density (4 Rows of 7)
8136-PG20			Feed Thru Pins (2 Sets: 2 Rows of 13) Total-52 Pins
8136-PG13	16 + 2 (V & G)	V & G Sleeves	Socket Terminals (2 Rows of 23)
8136-PG191			Socket Terminals, High Density (4 Rows of 7)
8136-PG21			Feed Thru Pins (2 Sets: 2 Rows of 13) Total-52 Pins

PLUGS/MALE — CLASS 130



A

Styles A & B plugs available unassembled.

C

.300" x .100" Spacing

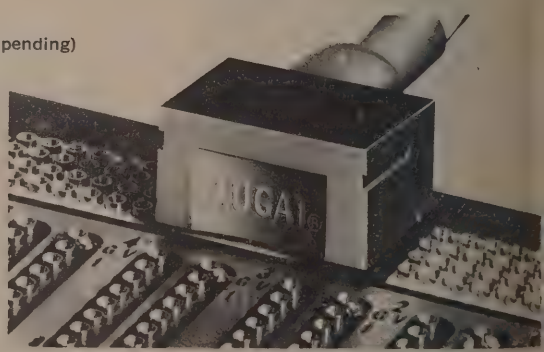
B

Part Number	Style	No. of Pins	Description
1P14-3T12-1	A	14	Inter-facing Plugs
2P14-1R12-1	B	14	Flat Cable Plugs
7P14-2T12-1	C	14	Ribbon Cable (twisted pair)
7P14-3T12-1	C	14	Ribbon Cable (flat cable)

NOTE: Standard 12", 24" and 36" lengths available. EXAMPLE: 1P14-3T12"-1. NOTE: For 16 pin assemblies, replace 14 with 16. EXAMPLE: 1P16. NOTE: For double ended plug assemblies, replace -1 suffix with -2. EXAMPLE: 1P14-3T12-2.

PLUGS/HIGH DENSITY — CLASS 130

(patent pending)



28 PINS
.100" x .100"
Grid Spacing

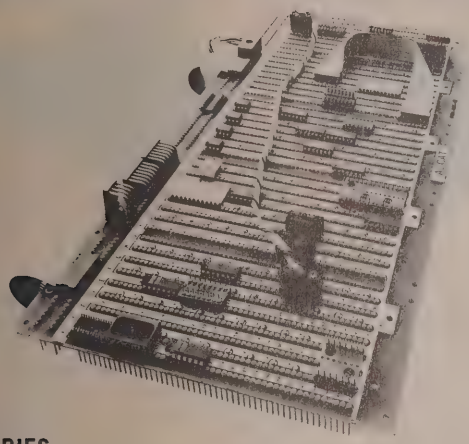
Part Number	Description
9P28-2S12-1	Assembly
8136-742P1	Hood
9P28-2G1	Base (with pins)

NOTE: Standard 12", 24" and 36" lengths available. EXAMPLE: 9P28-2S12"-1. NOTE: For double ended plug assemblies, replace -1 suffix with -2. EXAMPLE: 9P28-2S12-2.

MATING SOCKETS AVAILABLE
Part No. 528-AG28D (P.C.)
Part No. 528-AG24F (Wire wrap)

Boards/Accessories

UNIVERSAL BOARDS — CLASS 005



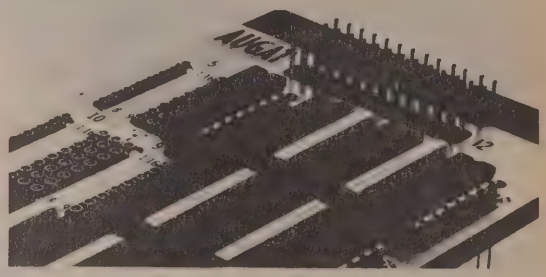
U-SERIES

• ⅛" thick board accepts any combination of 6 through 40 lead dip I.C.'s. • Modular Construction — boards may be purchased in multiples of 9 rows (up to 54 rows) indicated by suffix number. EXAMPLE: 8136-UG1-27 27 rows on .300" centers. See specs. for socket terminal variations.

Part Number	Voltage & Ground Connections	I.O. Area (for every 9-Row Section
8136-UG1	V & G Sleeves	Socket Terminals (2 Rows of 23)
8136-UG119		Socket Terminals, High Density (3 Sets: 4 Rows of 7) Total-84-Pins
8136-UG56	V & G Socket/Terminals	Socket Terminals (2 Rows of 23)
8136-UG6	V & G Sleeves	Feed-Thru Pins (2 Sets: 2 Rows of 13) Total - 52 Pins
8136-UG61	V & G Socket/Terminals	

ECL BOARDS — CLASS 020

(3 PLANES)



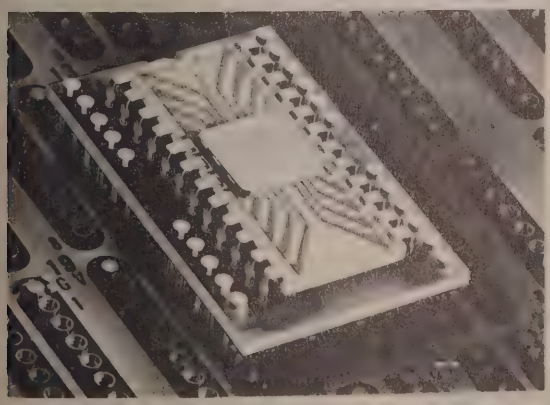
ECL/SIP SERIES (patent pending)

• ⅛" thick, 3 voltage plane boards include — 2.0V plane to terminate pull down resistors. Accommodates pluggable sip resistor networks without loss of density. Board available for ECL/TTL translators. 24-pin ALV and standard 16 pin gates.

• Modular construction available in multiple I.C. positions. See specs. for socket terminal variations.

Part Number	Function	Socket/ Terminals Per Pattern	Voltage & Ground Connections	I.O. Terminations
8136-ECL21	Standard	16	Vcc Pin 1 + 16 (ALU) 1 + 24 (Translator) 16 Vee Pin 8 (ALU) 12 + Vcc (Translator) 9 Vtt (All sip networks Pin 1)	Feed Thru
8136-ECL23	Translator			
8136-ECL26				
8136-ECL24	Array Multiplier	16 and 24		
8136-ECL25	ALU			

LSI ADAPTORS — CLASS 105



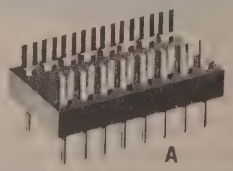
• Accept up to 40 lead LSI dip's. • Interposing LSI circuits on 14 and 16 pin patterns. • Adaptor pins located to prevent improper position on panel. •Dip's soldered into adaptor which plugs into panel. • Adaptor plugs also available for TO-5 conversion.

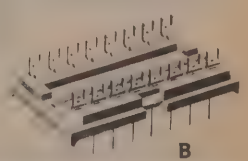
Part Number	Application
628-HG16	Up to 28 Pins .600" x .100" Spacing
640-HG16	Up to 40 Pins .600" x .100" Spacing

ADAPTORS — CLASS 100

• 3 Pin styles.
• Single, double patterns.

• Slotted pin only.
• Low profile.
• Low cost.
• Cover available.


A

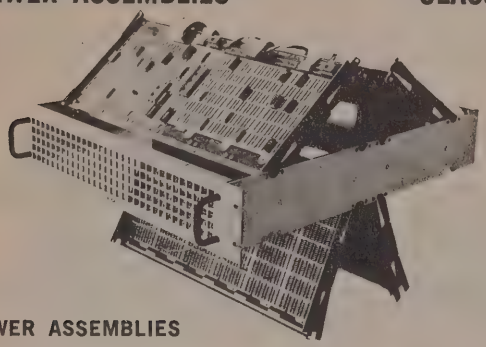

B

Part Number	Style	No. of Pins	Pin Spacing	Description
614-CG1	A	14	.300" x .100"	Slotted Pin
616-CG1	A	16		
614-DG5	B	14		
616-DG5	B	16		
614-CG3	A	14	.600" x .100"	Slotted Pin
616-CG3	A	16		
624-CG1	A	24		
628-CG2	A	28		
636-CG1	A	36		
640-CG1	A	40		

NOTE: Plugs available in 3 pin styles: round, solder pocket and slotted — single and double patterns. (Style A only.)
Cover — 14 pin, 614-2P1: 16 pin, 616-2P1. (Style B only.)

AUGAT® Drawers Boards/Racks Kits

DRAWER ASSEMBLIES — CLASS 200



DRAWER ASSEMBLIES

• Accepts up to four plane mount boards, up to 720 dip I.C.'s. • Frames are hinged either side for accessibility and easy removal. • Dust covers furnished. • Designed for 19″ rack mounting. • Optional perforated or solid end plates.

FULL DRAWER DEPTH: 20.425 ±.030

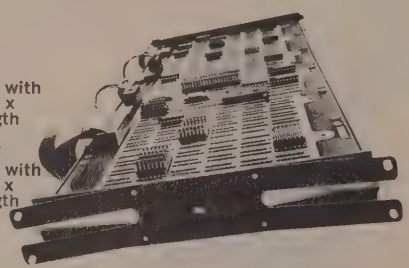
Part Number	Description
8170-DG1	Drawer assembly with fan cutout rear plate and perforated front plate. (Accepts 4 board frames.)
8170-DG2	Drawer assembly with rear blank plate and front blank plate. (Accepts 4 board frames.)

HALF DRAWER DEPTH: 12.325 ±.030

Part Number	Description
8170-DG4	Drawer assembly with fan cutout rear plate and perforated front plate. (Accepts 2 board frames.)
8170-DG5	Drawer assembly with rear blank plate and front blank plate. (Accepts 2 board frames.)

NOTE: Order board frames separately.

MATERIALS: (Full drawer and half drawer)
All frame members are aluminum, gold iridite. Front plate is painted blue.



Part Number 8170-14G1
Accepts any board series with 175,26/6.900 Max. Width x 411,48/16.200 Max. Length

Part Number 8170-14G2
Accepts any board series with 190,50/7.500 Max. Width x 411,48/16.200 Max. Length

BOARD FRAMES

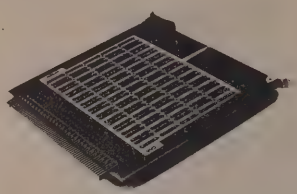
Frames are hinged at both ends with spring latch, permitting accessibility to either component side or wire wrapped side of board. Frame may also be removed by depressing both ends of spring latch. Mounts full 180 pattern board or a combination of board styles up to 180 patterns.

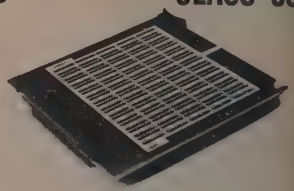
KITS

HOLTITE™ SOLDERLESS, PLUGGABLE INTERCONNECTION PACKAGING SYSTEM converts plated-thru holes to plug-in sockets without soldering. Offers the low profile of direct soldering and the benefits of a totally pluggable system. Precision machined contact is press fitted into a printed circuit board plated-thru hole. Conversion to Holtite system is accomplished by simply changing drilled hole diameter prior to plating.

FIBEROPTIC ENGINEERING KIT enables low cost engineering evaluation of fiberoptics. Complete kit contains 5-meter cable assembly, IRED emitter assembly temperature-referenced photodetector assembly, TTL-compatible preamplifier and TTL-compatible emitter driver. Kit operates from DC to 5 MBPS.

PLUG IN TYPE BOARDS — CLASS 005





W-SERIES for pin and socket type connections.

R-SERIES FOR EDGE BOARD CONNECTIONS

Part Number	Socket/Terminals Per Pattern	Board Thickness	Voltage & Ground Connections
8136-RG1	14 .300″ x .100″ Spacing	1/8″	7 + 14
8136-RG2			V + G Terminals
8136-RG7		1/16″	7 + 14
8136-RG8			V + G Terminals
8136-RG3	16 .300″ x .100″ Spacing	1/8″	8 + 16
8136-RG4			V + G Terminals
8136-RG9		1/16″	8 + 16
8136-RG10			V + G Terminals
8136-RG58	Blank Card	1/8″	
8136-RG85		1/16″	
8136-138G1	Extender Card	1/8″	
8136-RG86		1/16″	

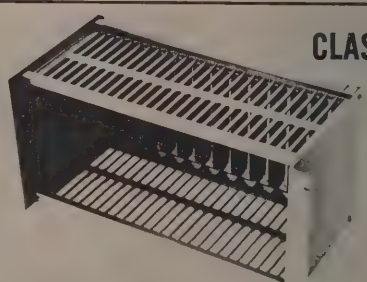
NOTE: Connector only — Part No. 14005-1P1 (1/8″) 14005-19P1 (1/16″) (120 contact — 60 dual row).

UNIVERSAL TYPE

Part Number	No. of Rows	Board Thickness	Voltage & Ground Connection
8136-URG1	20 Rows of 50 Contacts on.300″ Centers	1/8″	V + G Terminals
8138-URG14		1/16″	

Also available . . . A universal style I.C. packaging board for station access in the "CAMAC" crate.

RACKS — CLASS 205



R-SERIES RACKS FOR R SERIES BOARDS

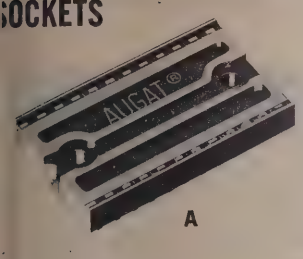
Part Number	Accepts Panel Thickness	Description
8160-EG10	1/8″	Back Panel Only (with 13 connectors)
8160-EG21	1/16″	
8170-RG1	1/8″	Rack with Back Panel for 19″ Rack Mounting
8170-RG14	1/16″	
8170-RG3	1/8″	Same as RG1 or RG14, Except without Back Panel
8170-RG16	1/16″	

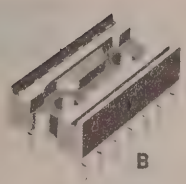
NOTE: The above part numbers are for 13 connector positions. For 3,6 or 9 connector position racks and back panels, simply add proper suffix to the end of part number.
EXAMPLE: 8160-EG10-3 (3 connector position).

AUGAT INC. 33 Perry Avenue, P.O. Box 779, Attleboro, Massachusetts 02703 / (617) 222-2202 / TWX 710-391-0644

Sockets

SOCKETS — CLASS 410





Low Profile — Printed Circuit)

Low Cost. • Low Profile — **.163 above P.C. board** (I.C. Seating Plane). • Two termination styles available: APPLICATION: Style A — any hole size down to .025 dia., Style B — recommended mounting hole .035 ±.002 dia. for good retention in P.C. board during wave soldering. • Beryllium copper contacts insures greater and more uniform normal force.

Part Number	No. of Contacts	Insulator Length	Insulator Width	Contact Plating	Termination
308-AG39D	8 .300″ x .100″	.400″ Max.	.405″ Max.	Tin	A
308-AG40D				Gold	
308-AG37D				Tin	B
308-AG38D				Gold	
314-AG39D	14 .300″ x .100″	.700″ Max.	.405″ Max.	Tin	A
314-AG40D				Gold	
314-AG37D				Tin	B
314-AG38D				Gold	
316-AG39D	16 .300″ x .100″	.800″ Max.	.405″ Max.	Tin	A
316-AG40D				Gold	
316-AG37D				Tin	B
316-AG38D				Gold	
318-AG39D	18 .300″ x .100″	.900″ Max.	.405″ Max.	Tin	A
318-AG40D				Gold	
318-AG37D				Tin	B
318-AG38D				Gold	
324-AG39D	24 .600″ x .100″	1.200″ Max.	.705″ Max.	Tin	A
324-AG40D				Gold	
324-AG37D				Tin	B
324-AG38D				Gold	
340-AG39D	40 .600″ x .100″	2.000″ Max.	.705″ Max.	Tin	A
340-AG40D				Gold	
340-AG37D				Tin	B
340-AG38D				Gold	

NOTE: Request information on 22 and 28 contact sizes.

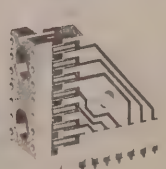
MATERIALS

Insulator: Thermoplastic polyester, UL rated 94V-O.
Contacts: Beryllium copper, gold over nickel or tin plated.
Wafer: .005 Tk. Nomex.

SOCKETS (L.E.D.) — CLASS 425

45°, 60°, and 90°
L.E.D. NUMERIC DISPLAY SOCKET

• Two piece machined contact assembly — inner contact and outer sleeve. • Design will permit gang mounting on P.C. board — .400 centers or greater.

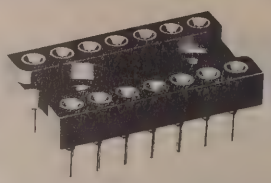


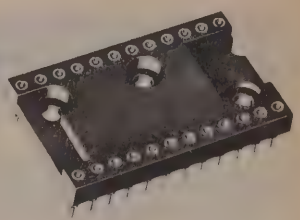
(patent pending)

Part Number	No. of Pins	Socket Angle	Termination
514-AG21D	14 .300″ x .100″	90°	Printed Circuit
514-AG25D		45°	
514-AG26D		60°	

NOTE: For 16 pin, replace 14 with 16. EXAMPLE: 516-AG21D.

SOCKETS — CLASS 415

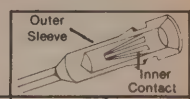




(Machined Contact)

• Meets most severe environmental conditions including military requirements of high shock and vibration. • Two piece tapered entry socket terminal — four leaf machined closed entry inner contact and machined outer sleeve. • Wire Wrap* (2 or 3 level) or P.C. termination. Gold plated contacts, gold or tin plated outer sleeves.

All sockets listed are with printed circuit termination. See note below for ordering sockets with wire wrap termination.



Part Number	No. of Contacts	Insulator Length	Insulator Width	Insulator Height	Contact Plating	Sleeve Plating
508-AG10D	8 .3″ x .1″	.400″ Max.	.450″	.180″ Max.	Gold	Gold
508-AG11D					Gold	Tin
514-AG10D	14 .3″ x .1″	.750″	.450″	.135″ Max.	Gold	Gold
514-AG11D					Gold	Tin
516-AG10D	16 .3″ x .1″	.850″	.450″	.135″ Max.	Gold	Gold
516-AG11D					Gold	Tin
518-AG10D	18 .3″ x .1″	.900″ Max.	.450″	.135″ Max.	Gold	Gold
518-AG11D					Gold	Tin
522-AG10D	22 .4″ x .1″	1.150″	.550″	.135″ Max.	Gold	Gold
522-AG11D					Gold	Tin
524-AG10D	24 .6″ x .1″	.1200″ Max.	.750″	.135″ Max.	Gold	Gold
524-AG11D					Gold	Tin
528-AG10D	28 .6″ x .1″	1.400″ Max.	.750″	.135″ Max.	Gold	Gold
528-AG11D					Gold	Tin
532-AG10D	32 .6″ x .1″	1.600″ Max.	.750″	.135″ Max.	Gold	Gold
532-AG11D					Gold	Tin
536-AG10D	36 .6″ x .1″	1.800″ Max.	.750″	.135″ Max.	Gold	Gold
536-AG11D					Gold	Tin
540-AG10D	40 .6″ x .1″	2.000″ Max.	.750″	.135″ Max.	Gold	Gold
540-AG11D					Gold	Tin

NOTE: The above sockets are also standard with wire wrap termination, simply replace "D" suffix with "F" suffix for three level and "F"-2 for two level. EXAMPLE:

	Gold/Gold	Gold/Tin
2 Level	516-AG10F-2	516-AG11F-2
3 Level	516-AG10F	516-AG11F

MATERIALS

Insulator: Thermoplastic polyester, UL Rated 94V-O.

SOCKET/TERMINALS:

Terminal: Brass, gold over nickel or tin plated.
Female Contact: Beryllium copper, gold over nickel or tin plated.

SOCKETS — CLASS 510

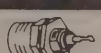
(Trans. & I.C., Low Profile)

• Low cost. • Molded insulator and automated contact assembly — save you money. • Ultra low profile — precision machined contact assembly.

AVA ELECTRONICS CORP.
4000 BRIDGE STREET
DREXEL HILL, PA 19026
(215) 284-2500

F COAXIAL CONNECTORS & BNC CONNECTORS

FEMALE CHASSIS CONNECTOR



AF61 AHC
F Female Spring Contact chassis connector — 3/32" thread length
Net. $.45

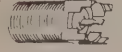
AF61 SI
F Female Spring Contact chassis connector — 11/32" thread length
Net. $.49

AF61 ANFP
F Female Pressurized Spring contact chassis connector, No Flats
Net $.68

AF61 AP
F Female Pressurized Spring contact chassis connector with Flats
Net $.49

AF61 APO
F Female Spring Contact Push-On chassis connector Net $.65

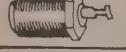
AF61 APSO
F Female Push-On chassis connector, Stake-On to chassis
Net $.49



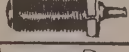
AF61 PC
F Female Spring Contact chassis connector for Printed Circuit Board
Net $.74

AFS61A
F Female Back Mount chassis connector Spring Contact .06 Flange .50 thread length
Net. $.47

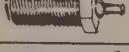
AF61 ABMH
F Female Back Mount chassis connector Spring Contact .10 Flange .64 thread length
Net $.47



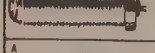
AF61 ABMH DF
AF61 ABMH with Double Flat
Net $.49



AF61 LBM-050
F Female Back Mount chassis connector Spring Contact .05 Flange .80 thread length
Net $.55



AF61 LBM-100
F Female Back Mount chassis connector Spring Contact .10 Flange .75 thread length
Net $.55

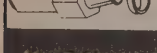


AF61 XL
F Female Back Mount chassis connector Spring Contact .10 Flange 1.28 thread length
Net $.59

AF81 B
F Female Splice Spring Contact almost 1" long
Net $.45

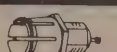
AF93 POP
F Female Push-On Spring Contact Female, mates with F Male connectors
Net $.85

AF94-55
F Female Crimp Connector for RG-55/U, can be used as a chassis connector
Net $1.55



AF94-59
F Female Crimp Connector for RG-59/U, also used as chassis connector with Flats
Net $1.55

MALE CHASSIS CONNECTORS



AF67
F Male Push-On chassis connector, mates with all Female connectors
Net $.69

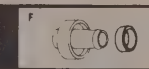
AF69
F Male chassis connector, mates with all F Female connectors
Net $.69

AF62 PIF
F Male Push-On Flush Mount chassis connector
Net $.99

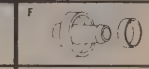
AF62 PIFSC
F Male Push-On Flush Mount chassis connector with spring clip attached to male end
Net $1.15

AF63 PIRSI
F Male Push-In Raised Mount chassis connector
Net $.59

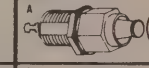
CABLE TO CHASSIS CONNECTORS



AF56
Stake-On chassis connector for RG-56/U cable
Net $.30



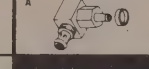
SO59
Stake-On chassis connector for RG-59/U cable
Net $.30



AF65
F Female crimp type cable connector to chassis — Hex body — for RG-59/U cable
Net $.65

AF94-55
F Female Crimp Connector for RG-55/U — can be used as a chassis connector
Net $.89

AF94-59
F Female Crimp Connector for RG-59/U — also used as chassis connector—with Flats
Net $.89

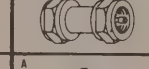


PM61 PO59
Right Angle F Female Push-On to F Crimp-On for RG-59/U cable
Net/$2.60

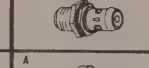
F ADAPTORS

AF81B
F Female Splice Spring Contact almost 1" long
Net $.45

RA 59-375
Right Angle Adaptor — F Male to F Female — spring contact
Net $.85

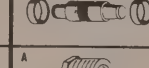


AF71
Double Male Adaptor Splice — 1.5" long
Net $.85



AF93 POP
F Female Push-On spring contact Female, mates with F Male connectors
Net $.85

APF 59
F Male Push-On connector to F Female, mates with all F Male connectors
Net $.95



AF95
Permanent dual Female connector crimp splice for RG-59/U
Net $.79

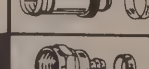
AF81
F to C adaptor, outer threads 3/8-32 of F connector, screws to 1/4-32 C
Net $.19

MALE CABLE CONNECTORS

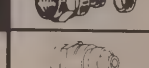
AF56H
F Male connector for RG-6/U cable
Net $.37

AF11H
F Male connector for RG-11/U cable
Net $.58

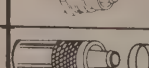
AF201 A/U
F Male crimp type connector for RG-11/U cable
Net $2.80



AF59H
F Male connector for RG-59/U cable
Net $.21



AF59A
F Male RG-59/U connector with crimp ferrule built on
Net $.22

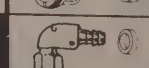


AG59
F Male Push-On connector for RG-59/U cable
Net $.60

APG 59
F Male Push-On with .040 Pin for RG-59/U cable
Net $1.15

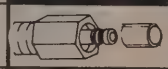
AB59 PO
Push-On to F-61 Female, screw on to RG-59/U cable
Net $.79

AF59 PO
F Male Push-On to F-61, crimps onto RG-59/U cable
Net $.49



RA59
F Male Right Angle connector for RG-59/U cable — 0.77 Max. Height
Net $.69

FEMALE CABLE CONNECTORS



AF94-55
F Female Crimp connector for RG-55/U, can be used as a chassis connector
Net $.89

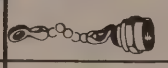
AF94-59
F Female Crimp connector for RG-59/U, also used as chassis connector—with Flats
Net $.89

PM61 PO 59
Right angle F Female Push-On to F Crimp-On for RG-59/U cable
Net $2.60

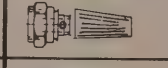
TERMINATORS/DUST COVER/ BINDING POSTS

TM59
F Female — 75 OHM Terminating Connector
Net $.75

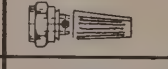
AF61 APOT
F Female Push-On spring contact, 75 OHM Terminating Connector
Net $1.75



CN59
Dust Cap and Chain used with all F Female connectors
Net $.79

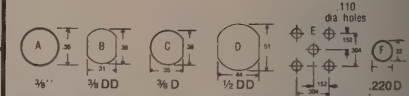


BP 356
F Male to Red Binding Post
Net $2.75



BP 316
F Male to Black Binding Post
Net $2.75

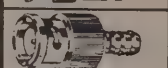
F CHASSIS CUTOUT OUTLINES



BNC CABLE CONNECTORS

No. 340
BNC Male for RG58-RG55 cable (UG88/U type)
Net $1.45

No. 341
BNC Male for RG58-RG55 cable (UG88E/U type)
Net $1.55



No. 342
BNC Male for RG58 — crimp ring on cable
Net $1.25

No. 343
BNC Male for RG59-RG62 cable (UG260/U type)
Net $1.55

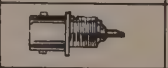
No. 344
BNC Male for RG59-RG62 cable (UG260D/U type)
Net $1.65

No. 345
BNC Male for RG59 — crimp ring on cable
Net $1.35

BNC CHASSIS CONNECTORS

No. 240
BNC Female (UG625B/U type) A mount
Net $1.25

No. 241
BNC Female pressurized (UG-657/U type) B mount
Net $1.95

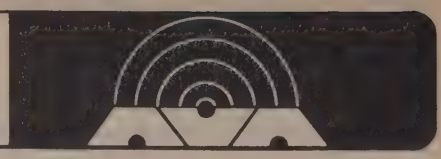


No. 242
BNC Female (UG1094/U type) C mount
Net $1.10

No. 243
BNC Female (UG1094A/U type) C mount
Net $1.25

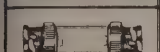
BNC ADAPTORS
UHF CONNECTORS
UHF ADAPTORS

AVA ELECTRONICS CORP.
4000 BRIDGE STREET
DREXEL HILL, PA 19026
(215)284-2500



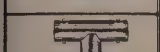
BNC ADAPTORS

No 1034-24
BNC Male to BNC Female
Net $2.95



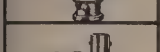
No. 1034-34
BNC Male to BNC Male (UG-491A/U type)
Net $3.45

No. 1024-24
BNC Female to BNC Female
Net $1.95



No. 1024-24-24
BNC Tee (3) Females Net $5.95

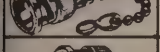
No.1024-34-24
BNC Tee (2) Females (1) Male (UG274/U type)
Net $4.75



No. 1034R24
BNC Right Angle Male to Female (UG306/U type)
Net $4.85

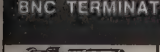
BNC CAPS

No. 3401
BNC Weatherproof Male Cap & Chain (CW123 type)
Net $.98

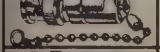


No. 3402
BNC Weatherproof Male Cap without Chain (CW155 type)
Net $.85

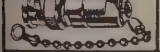
BNC TERMINATORS
1% RESISTORS
VSWR 1.1 MAX
DC TO 300 MHz



No. 3403
BNC Male Terminator w/chain 50 ohm 1%
Net $4.50



No. 3404
BNC Male Terminator w/chain 75 ohm 1%
Net $4.50



No. 3405
BNC Male Terminator without chain 50 ohm 1%
Net $4.25

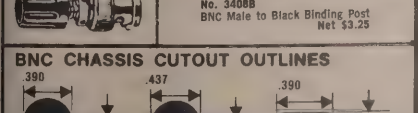
No. 3406
BNC Male Terminator without Chain 75 ohm 1%
Net $4.25

BNC — MALE TO BINDING POSTS

No. 3407R
BNC Male to Red Binding Post
Net $3.25

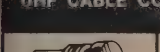
No. 3408B
BNC Male to Black Binding Post
Net $3.25

BNC CHASSIS CUTOUT OUTLINES

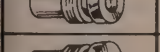


UHF CABLE CONNECTORS

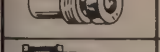
UG 175/U
UHF Adaptor for PL259 to fit on RG58/U cable
Net $.19



UG 176/U
UHF Adaptor for PL259 to fit on RG59/U cable
Net $.19

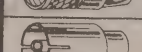


CH 259
Double Crimp UHF Male Connector for RG58/U cable
Net $.59



PL 259
UHF Male Connector, RG58/U and RG59/U cable
Net $.59

PL 259-A
UHF Male Connector, RG58/U and RG59/U cable
Net $1.75



PL 259 PO
UHF push-on Connector, RG58/U Push-On Connector, RG57/U and RG59/U cable
Net $1.25

PL 259 TEF
UHF Male Connector for RG58/U and RG59/U cable, Teflon insulator
Net $.79

PL 259A TEF
UHF Male Connector for RG58/U and RG59/U cable, Teflon insulator
Net $1.85

PL 259-6
UHF Male Connector, crimps to RG-6/U
Net $.75

PL 259-8
UHF Male Connector, crimps to RG-8/U
Net $.85

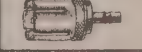
PL 259 SL
UHF Male Solderless, for RG58/U cable
Net $.65

PL 259-58
UHF Male Connector, crimps to RG58/U
Net $.75

PL 259-59
UHF Male Connector, crimps to RG59/U
Net $.75

PO 259-58
Push-on UHF Male Connector for RG58/U and RG59/U cable
Net $.85

PO 259-59
Push-on UHF Male Connector for RG58/U and RG59/U cable
Net $.85



[illegible]
UHF Female Connector crimps to RG58/U
Net $1.20

UHF CHASSIS CONNECTORS

BM 239
UHF Female Connectors "D" hole, Back or front mount
Net $.69

BM 239 TEF
UHF Female Connectors "D" hole, Back or front mount, Teflon insulator
Net $.79

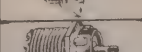
CH 239
UHF Female Connector "D" hole
Net $.75

CH 239 TEF
UHF Female Connector "D" hole, Teflon insulator
Net $.85

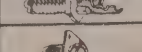
HL239
UHF Chassis Connector with Solder Lug. Mounts with nut
Net $.69

SL 239
UHF 4 hole Chassis Connector with Solder Lug
Net $.69

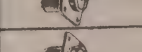
SPHL 239
UHF Chassis Connector with Solder Lug. Mounts with nut or staked on to chassis.
Net $.69



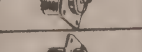
SO 239
UHF Female Chassis Connector, 4 hole mount
Net $.65



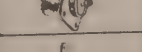
SO 239A
UHF Female Chassis Connector, 4 hole mount, Teflon Insulator
Net $.79



SO 239 silver
UHF Female Chassis Connector, 4 hole mount
Net $.75



SO 239 N2H
UHF Female Chassis Connector, 2 hole mount
Net $.69

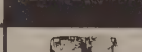


SO 239 N2H TEF
UHF Female Chassis Connector, 2 hole mount, Teflon insulator
Net $.85

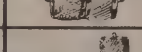
CM 259
Chassis Mount UHF Male Connector, 3/8" "DD" hole or 3/8-32 threaded hole mount
Net $1.25

SO4
UHF Female Chassis Connector ½" mounting
Net $1.25

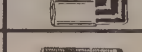
UHF ADAPTORS



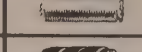
DM
UHF Double Male Connector
Net $1.85



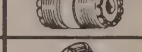
ICB 76
Portable Antenna Adaptor, solderless
Net $1.45



UG 224/U
UHF Panel Mount Adaptor, female each end 1⅜" long
Net $2.95



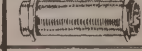
PL 258
UHF Female Adaptor Splice
Net $1.25



M 358
UHF T Connector, 2 line female
Net $2.95

M 359
UHF 90° angle connector male to female
Net $1.85

UG 363/U
UHF Panel Mount Adaptor female each end 2" long
Net $3.25



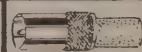
1033-49
Adaptor for PL259 UHF Female to Quick Connect/Disconnect
Net $1.45

UHF TERMINATORS / DUST COVERS / DUMMY LOADS / BINDING POSTS

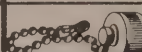
PL 259T 50
50 ohms, 1%
Net $1.95

PL 259T 75
75 ohms terminator — male 1%
Net $1.95

DL 776
Dummy Load with Modulation Light. Quick Connect/Disconnect
Net $2.75



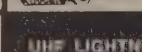
MX 913
Dust cap and Chain to cap end of Female UHF Connector
Net $1.50



BP 259R
UHF Male to Red Binding Post
Net $2.95

BP 259B
UHF Male to Black Binding Post
Net $2.95

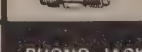
UHF LIGHTNING ARRESTORS



LA 76
Indoor Lightning Arrestor for CB, Color and B/W TV
Net $2.75

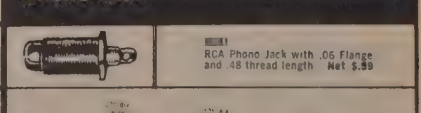
LAO 76
Outdoor Lightning Arrestor
Net $2.50

PHONO JACK



[illegible]
RCA Phono Jack with .06 Flange and .48 thread length
Net $.59

UHF CHASSIS CUTOUT OUTLINES



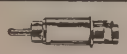
AVA ELECTRONICS CORP.
4000 BRIDGE STREET
DREXEL HILL, PA 19026
(215) 284-2500

RF ADAPTORS

RF — PHONO ADAPTORS — MALE

1021-20 SP
Phono Male to UHF Female
Net $1.30

1051-58 SP
Phono Male to UHF Male
Net $2.95



1051-24 SP
Phono Male to BNC Female
Net $2.95

1051-34 SP
Phono Male to BNC Male
Net $2.95

1051-27 SP
Phono Male to F Female
Net $2.20

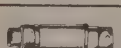
1051-59 SP
Phono Male to F Male Net $2.20

1051-51 SP
Phono Male to Phono Male
Net $2.20

RF — PHONO ADAPTORS — FEMALE

1030-53 SP
Phono Female to UHF Female
Net $2.95

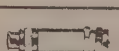
1030-58 SP
Phono Female to UHF Male
Net $2.95



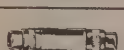
1030-24 SP
Phono Female to BNC Female
Net $2.95

1030-34 SP
Phono Female to BNC Male
Net $2.95

1030-27 SP
Phono Female to F Female
Net $2.20

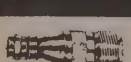


1030-59 SP
Phono Female to F Male
Net $2.20

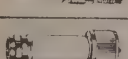


1030-30 SP
Phono Female to Phono Female
Net $2.20

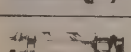
F ADAPTORS — MALE



1013-21 SP
F Male to UHF Female Net $2.95

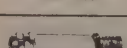


1013-58 SP
F Male to UHF Male Net $3.50

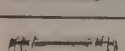


1013-24 SP
F Male to BNC Female Net $2.95

1013-34 SP
F Male to BNC Male Net. $2.95

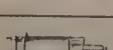


1013-27 SP
F Male to F Female Net $2.95



1013-13 SP
F Male to F Male Net $2.25

1030-59 SP
F Male to Phono Female
Net $2.25



1051-59 SP
F Male to Phono Male Net $2.25

RA 59-375 SP
F Male to F Female Net $.95

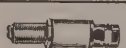
RA 59 SP
F Male to RG59 Cable Net $.75

1027-36 SP
F Male Push-On to F Female
Net $3.25

F ADAPTORS — FEMALE

1027-53 SP
F Female to UHF Female
Net $3.45

1027-01 SP
F Female to UHF Male Net $2.65

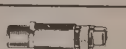


1027-24 SP
F Female to BNC Female
Net $3.45

1027-34 SP
F Female to BNC Male
Net $2.95

1027-27 SP
F Female to F Female
Net $.75

1013-27 SP
F Female to F Male Net $2.95



1030-27 SP
F Female to Phono Female
Net $2.25

1051-27 SP
F Female to Phono Male
Net $2.25

AF 93 POP SP
F Female to F Female Push-On
Net $.85

1027-36 SP
F Female to F Male Push-On
Net $3.25

UHF ADAPTORS — MALE

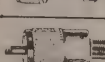
1058-53 SP
UHF Male to UHF Female
Net $3.45

1033-49 SP
UHF Male Push-On to UHF Female
Net $1.45

1001-01 SP
UHF Male to UHF Male
Net $1.85

1001-24 SP
UHF Male to BNC Female
Net $2.25

1058-34 SP
UHF Male to BNC Male
Net $3.45

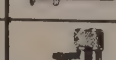


1027-01 SP
UHF Male to F Female
Net $2.65

1013-58 SP
UHF Male to F Male Net $3.45

1030-58 SP
UHF Male to Phono Female
Net $2.95

1051-58 SP
UHF Male to Phono Male
Net $2.95



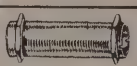
1001-55 SP
UHF Male to UHF Female
Net $1.85

1001-55-55 SP
UHF Male to 2 UHF Females
Net $2.95

UHF ADAPTORS — FEMALE

1055-55 SP
UHF Female to UHF Female
Net $1.25

1055-55-2 SP
UHF Female to UHF Female — 1⅜" long
Net $2.95



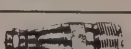
1055-55-3 SP
UHF Female to UHF Female — 2" long
Net $3.25

1058-53 SP
UHF Female to UHF Male
Net $3.45

1024-53 SP
UHF Female to BNC Female
Net $3.45

1034-53 SP
UHF Female to BNC Male
Net $3.45

1027-53 SP
UHF Female to F Female
Net $3.45



1013-21 SP
UHF Female to F Male
Net $2.95

1030-53 SP
UHF Female to Phono Female
Net $2.95

1021-20 SP
UHF Female to Phono Male or Motorola Male
Net $1.30

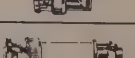
1021-52 SP
UHF Female 3.5mm Phone Plug
Net $1.75

BNC ADAPTORS — MALE

1034-53 SP
BNC Male to UHF Female
Net $3.45

1058-34 SP
BNC Male to UHF Male
Net $3.45

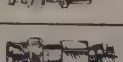
1034-R24 SP
BNC Male to BNC Female
Net $4.85



1034-24 SP
BNC Male to BNC Female
Net $2.95

1034-34 SP
BNC Male to BNC Male
Net $3.45

1027-34 SP
BNC Male to F Female
Net $2.95



1013-34 SP
BNC Male to F Male Net $2.95

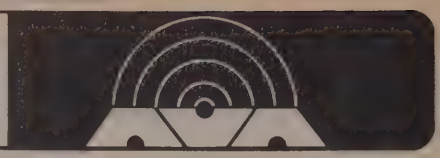
1030-34 SP
BNC Male to Phono Jack
Net $2.95

1024-34-24 SP
BNC Male to 2 BNC Females
Net $4.75

1051-34 SP
BNC Male to Phono Plug
Net $2.95

ATTENUATORS BNC-F-UHF TERMINATORS CABLE ASSEMBLIES

AVA ELECTRONICS CORP.
4000 BRIDGE STREET
DREXEL HILL, PA 19026
(215) 284-2500



BNC ADAPTORS — FEMALE

1024-53 SP
BNC Female to UHF Female
Net $3.45

1001-24 SP
BNC Female to UHF Male
Net $2.45

1024-24 SP
BNC Female to BNC Female
Net $1.95

1034-24 SP
BNC Female to BNC Male
Net $2.95

1027-24 SP
BNC Female to F Female
Net $3.45

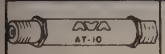
1013-24 SP
BNC Female to F Male Net $2.95

1030-24 SP
BNC Female to Phono Female
Net $2.95

1051-24 SP
BNC Female to Phono Male
Net $2.95

1024-24-24 SP
BNC Tee — 3 females Net $5.95

F ATTENUATORS 75 OHM RESISTOR FEED THRU TERMINATION

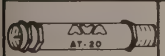


No. AT10-3
F Female to F Female 3 dB
Net $3.95

No. AT10-6
F Female to F Female 6 dB
Net $3.95

No. AT10-10
F Female to F Female 10 dB
Net $3.95

No. AT10-20
F Female to F Female 20 dB
Net $3.95



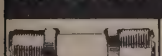
No. AT20-3
F Male to F Female 3 dB
Net $4.25

No. AT20-6
F Male to F Female 6 dB
Net $4.25

No. AT20-10
F Male to F Female 10 dB
Net $4.25

No. AT20-20
F Male to F Female 20 dB
Net $4.25

UHF ATTENUATORS 50 OHM



No. AT30-3
UHF Female to UHF Female 3 dB
Net $24.50

No. AT30-6
UHF Female to UHF Female 6 dB
Net $24.50

No. AT30-10
UHF Female to UHF Female 10 dB
Net $24.50

No. AT30-20
UHF Female to UHF Female 20 dB
Net $24.50

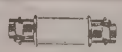
No. AT40-3
UHF Male to UHF Female 3dB
Net $24.50

No. AT40-6
UHF Male to UHF Female 6 dB
Net $24.50

No. AT40-10
UHF Male to UHF Female 10 dB
Net $24.50

No. AT40-20
UHF Male to UHF Female 20 dB
Net $24.50

BNC ATTENUATORS 50 OHM



No. AT50-3
BNC Female to BNC Female 3 dB
Net $22.50

No. AT50-6
BNC Female to BNC Female 6 dB
Net $22.50

No. AT50-10
BNC Female to BNC Female 10 dB
Net $22.50

No. AT50-20
BNC Female to BNC Female 20 dB
Net $22.50

No. AT60-3
BNC Male to BNC Female 3 dB
Net $22.50

No. AT60-6
BNC Male to BNC Female 6 dB
Net $22.50

No. AT60-10
BNC Male to BNC Female 10 dB
Net $22.50

No. AT60-20
BNC Male to BNC Female 20 dB
Net $22.50

BNC FEED THROUGH TERMINATION — 1% Resistors

No. FTT120-50
BNC Male to BNC Female 50 Ohm to Ground
Net $15.80

No. FTT120-75
BNC Male to BNC Female 75 Ohm to Ground
Net $15.80

No. FFT120-93
BNC Male to BNC Female 93 Ohm to Ground
Net $15.80

No. FTT-120-300
BNC Male to BNC Female 300 Ohm to Ground
Net $15.80

No. FTT120-600
BNC Male to BNC Female 600 Ohm to Ground
Net $15.80

No. FTT120-1
BNC Male to BNC Female 1 Meg to Ground
Net $15.80

BNC FEED THROUGH SERIES RESISTOR — 5% Resistors

No. FTR110-50
BNC Male to BNC Female 50 Ohm in series
Net $6.95

No. FTR110-75
BNC Male to BNC Female 75 Ohm in series
Net $6.95

No. FTT100-93
BNC Male to BNC Female 93 Ohm in series
Net $6.95

No. FTR100-600
BNC Male to BNC Female 600 Ohm in series
Net $6.95

RF PATCH CORDS

PHONO MALE TO PHONO MALE

SP 5951-51-6
6 ft. Net $2.30

SP5951-51-12
12 ft. Net $2.80

SP 5951-51-20
20 ft. Net $3.25

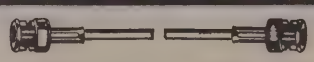
F MALE TO F MALE

SP 5913-13-6
6 ft. Net $2.49

SP 5913-13-10
10 ft. Net $2.80

SP 5913-13-25
25 ft. Net $3.75

BNC MALE TO BNC MALE

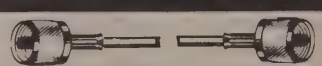


SP 5934-34-6
6 ft. $4.90

SP 5934-34-10
10 ft. Net $5.40

SP 5934-34-25
25 ft. Net $6.55

UHF MALE TO UHF MALE

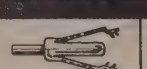


SP 5901-1-6
6 ft. Net $3.15

SP 5901-1-10
10 ft. Net $3.25

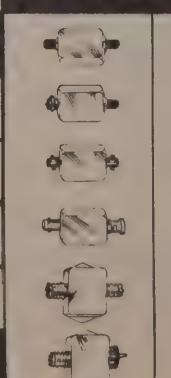
SP 5901-1-25
25 ft. Net $4.60

MOTOROLA CABLE CONNECTOR



M20 SP(22)
Motorola Connector for RG58 and RG59 cables — 2 pair card
Net $.54

SHIELDED BLACK BOXES



SB 6000
Shielded Steel Box with Cover, 2 F Female Connectors w/Solder Lugs, size: 1¾" x 1¼" x ¾"
Net $3.95

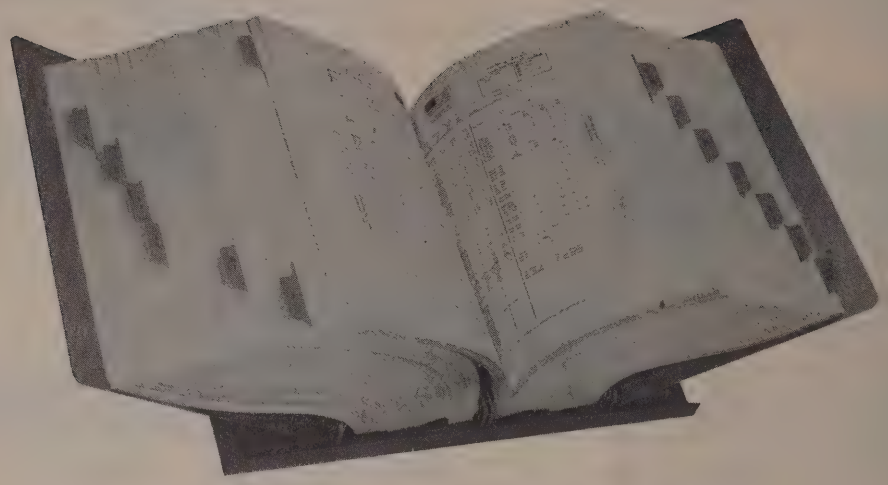
SB 6001
Shielded Steel Box with Cover, one F Female and one Male Connector w/Solder Lugs, same size as SP 6000
Net $4.50

SB 6002
Shielded Steel Box with Cover, 2 BNC Female Connectors, w/ Solder Lugs, size: 1¾" x 1¼" x ¾"
Net $4.95

SB 6003
Shielded Steel Box with Cover, one BNC Male and one BNC Female Connector w/Solder Lugs, same size as SB 6002
Net $5.50

SB 6004
Shielded Steel Box with Cover, 2 UHF Female Connectors w/ Solder Lugs, size: 2½" x 2" x 1¼"
Net $4.95

SB 6005
Shielded Steel Box with Cover, one UHF Male and one UHF Female w/Solder Lugs, same size as SB 6004
Net $5.50



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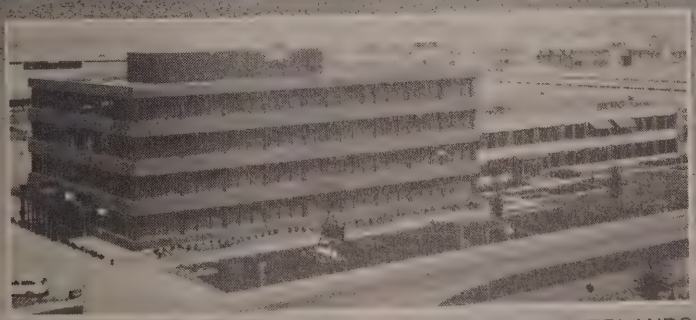
Berg Electronics

Division E. I. du Pont de Nemours & Co. (Inc.)

A Concise Review of Berg Connectors, Terminals and Application Machines

Modular Interconnection Systems for the data processing, instrumentation and communications industries.

Divisional Headquarters: New Cumberland, Pa. U.S.A.



European Headquarters: 's-HERTOGENBOSCH, NETHERLANDS

BERG ELECTRONICS
Division, E. I. du Pont de Nemours & Co. (Inc.)

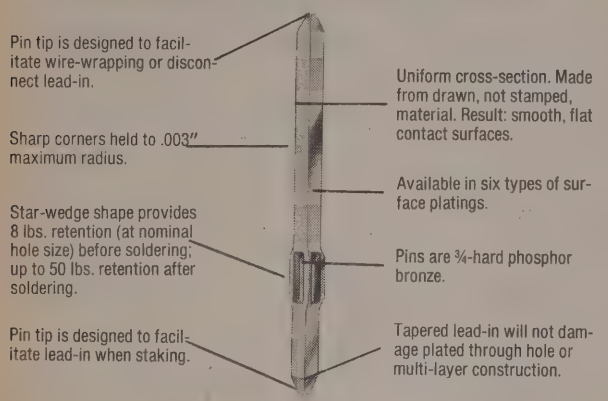
NEW CUMBERLAND, PENNSYLVANIA 17070 • TELEPHONE (717) 938-6711 / IN EUROPE: 's-HERTOGENBOSCH, NETHERLANDS • TELEPHONE 073-123432

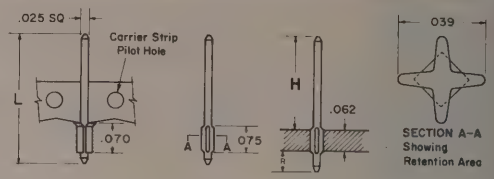
BergCon™ .025" square modular interconnection system . . .

offering high density .100" grid stacking . . . end-to-end or side-to-side . . . across a wide range of connector types.

BergPin™ male terminals for disconnect and wire-wrapping

System provides a fast, reliable method for staking pins in circuitboard. Here are the features that distinguish BergPin terminals from ordinary wire-wrapping pins:


Pin tip is designed to facilitate wire-wrapping or disconnect lead-in.
Sharp corners held to .003" maximum radius.
Star-wedge shape provides 8 lbs. retention (at nominal hole size) before soldering; up to 50 lbs. retention after soldering.
Pin tip is designed to facilitate lead-in when staking.
Uniform cross-section. Made from drawn, not stamped, material. Result: smooth, flat contact surfaces.
Available in six types of surface platings.
Pins are ¾-hard phosphor bronze.
Tapered lead-in will not damage plated through hole or multi-layer construction.



Part Number	Plating	Underplating	Material
75401-	30 mill min. gold*	50 mill min. nickel	Phosphor-bronze (¾ hard) ASTM B159-66
75402-	50 mill min. gold**	10 mill copper flash	Phosphor-bronze (¾ hard) ASTM B159-66
75403-	50 mill min. gold**	50 mill min. nickel	Phosphor-bronze (¾ hard) ASTM B159-66
75404-	150 min. acid tin***	none	Phosphor-bronze (¾ hard) ASTM B159-66
75405-	100 mill min. gold	50 mill min. nickel	Phosphor-bronze (¾ hard) ASTM B159-66
75406-	100 min. gold	100 min. copper	Phosphor-bronze (¾ hard) ASTM B159-66
75407-	PLAIN	none	Phosphor-bronze (¾ hard) ASTM B159-66
75408-	PLAIN	none	Cupro-Nickel C.D.A. No 725

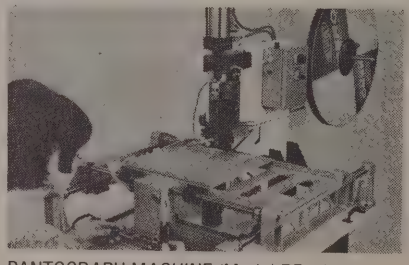
*MIL-G-45204 Type 2 **MIL-G-45204 Type 1 Class 1 ***MIL-T-10727A Type 1

This listing gives the material, plating and underplating; it does not show the pin length or height above board. For these dimensions, we refer you to Berg Bulletin 105 which is available upon request.

BergPin staking machines cut costs, control quality

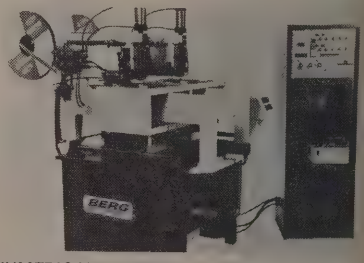
PRODUCTION MACHINE (Model BP-161)

For staking boards with limited number of pins or boards with varying pin configurations. Operator manually locates hole position and initiates staking cycle for up to 2000 insertions per hour.



PANTOGRAPH MACHINE (Model BP-151)

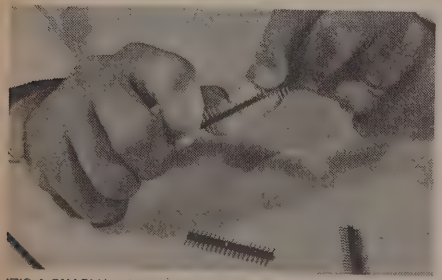
Ideal for straight-line insertion in boards or for high quantities of identical boards. Stakes up to 3500 pins per hour.



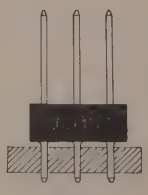
NUMERICALLY-CONTROLLED MACHINE (Model NC)

For high-speed automatic staking. Features a numerically-controlled, X-Y positioning system for programming pin-to-pin spacing and row patterns. Twin insertion heads simultaneously stake two identical boards at rates up to 12,000 per hour.

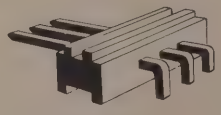
BergStik™ straight and right angle headers on .100", .125" and .150" centers



IT'S A SNAP! Headers can be broken to desired length by hand.



Straight Header



Right Angle Header

An inexpensive new method for inserting .025" sq. pins in boards for wire-wrapping or input/output usage. Suitable for high-volume production as well as prototyping. Supplied in many lengths and in choice of platings. Stackable to grid pattern on their respective pin centers. BergStik Headers are notched to allow user to break to any desired number of positions.

See Bulletin 140 for complete details.

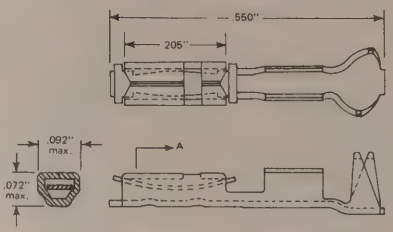
BergCon™ .025" square modular interconnection system

Dual-metal PV receptacles provide superior electrical and mechanical properties

(Beryllium copper spring; ¼-hard brass body)

PV Receptacles . . . mate with .025" square pins on .125" grid or greater

The Berg "PV" connector is the most reliable .025" post receptacle in use today. This unique terminal provides a virtually constant retention force even after repeated cycles on a male pin. The spring of the PV is available in a choice of thicknesses enabling you to "design in" a retention force that is tailored to the application.



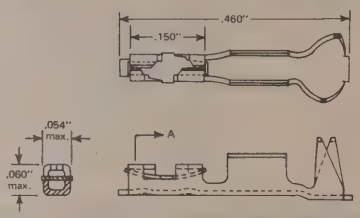
PV RECEPTACLE PART NUMBERS (CONTINUOUS STRIP)

Wire Gage, AWG	#18, #20, or two #22, two #24			#22, #24, #26, or two #26			#28, #30, #32		
Spring thickness	.005"	.006"	.008"	.005"	.006"	.008"	.005"	.006"	.008"
Finish:									
Gold, 40 μ-in. over Ni	46226	46221	46223	46236	46231	46233	46246	46241	46243
*Gold, 75 μ-in. over Ni	46228	46220	46222	46238	46230	46232	46248	46240	46242
BERGflo solder coat	47736	47388	46580	47737	47389	46590	47738	47390	46600
SPOT O' GOLD	75694	75694	75694	75694	75694	75694	75694	75694	75694
	-001	-002	-003	-004	-005	-006	-007	-008	-009

*Minimum order required

Mini-PV Receptables . . . mate with .025" square pins on .100" grid spacing

The smaller version of the PV is of similar two-piece design for lasting retention after repeated disconnects. The Mini-PV is available in 4 varieties of platings including SPOT O' GOLD. (The latter gives you the electrical and mechanical properties of gold where you need it—in the contact area and in the spring.) Install the Mini-PV in a latch housing for 1 through 72 simultaneous connections. See application machines below.



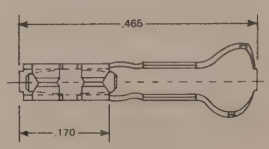
MINI-PV RECEPTACLE PART NUMBERS (CONTINUOUS STRIP)

Wire Gage, AWG	#20, or two #22, two #24		#22, #24, #26, or two #26, two #28			#28, #30, #32, two #30, two #32		
Spring thickness	.005"	.0065"	.0035"	.005"	.0065"	.0035"	.005"	.0065"
Finish:								
Gold, 40 μ-in. over Ni	47441	47566	47457	47439	47565	47456	47437	47564
*Gold, 75 μ-in. over Ni	47220	—	47784	47216	—	47883	47212	—
BERGflo solder coat	47221	47648	47445	47217	47649	47446	47213	47650
SPOT O' GOLD	75691-002	75691-003	75691-004	75691-005	75691-006	75691-007	75691-008	75691-009

*Minimum order required

Jumbo-PV Receptacles

This female disconnect is designed for use with .040" (1MM) or .045" square or round pins. Maximum contact resistance: 1.5 milliohms. Current rating: 7 amperes minimum. Standard spring thickness—.0065".



Sizes shown are representative of line. See Bulletin 101B for additional listings.

JUMBO-PV RECEPTACLE PART NUMBERS (CONTINUOUS STRIP)

	MATES WITH .040" (1mm) PIN			MATES WITH .045" PIN			
Wire Gage, AWG	#18, #20, #22	#22, #24, #26	#28, #30, #32	Wire Gage, AWG	#18, #20, #22	#22, #24, #26	#28, #30, #32
Spring Thickness	.0065"	.0065"	.0065"	Spring Thickness	.0065"	.0065"	.0065"
Finish:				Finish:			
Gold, 40 μ-in.	75369-003	75369-002	75369-001	Gold, 40 u-in.	75375-003	75375-002	75375-001
Tin Lead, 20 μ-in.	75369-006	75369-005	75369-004	Tin Lead, 20 u-in.	75375-006	75375-005	75375-004

Insertion Force*—Series 75369—750 grams max. Series 75375—700 grams max.
Withdrawal force*—Series 75369—200 grams max. Series 75375—300 grams max.

*Gold Contacts Only

For complete details, contact your local Berg Sales Engineer.

Applying PV Receptacles

MODEL 200 PV CRIMPER

This electrically-operated bench press provides 1500 or more quality crimps per hour. Machine has 2½ ton capacity and features a short press stroke and direct clutch linkage. Size: 29" high x 26" long x 16" wide. Weight: 150 lbs. Power Requirements: 80-100 psi air; 120 V electrical.

(See Bulletin 101B for additional information)

MODEL 250 PV CRIMPER

Air-powered unit is compact, delivers approximately 1000 terminals per hour (depending on operator dexterity.) Operates on 80 psi air. Uses 110 V for light source. Size: 26½" high x 18" long x 10" wide. Weight 50 lbs.

HAND TOOL (not shown)

Sturdy. Duplicates the quality of crimping machines. Features a positive ratchet that does not release until full crimping pressure is applied to a terminal.

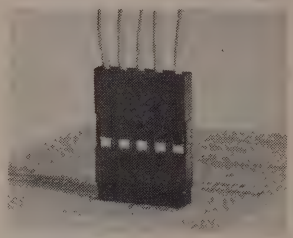
BergCon™ .025" square modular interconnection system

Housing (Latch or Rod Type)

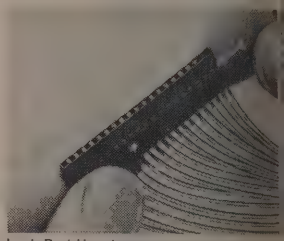
Berg Mini-Latch Housings allow simultaneous connection of as many as 72 Mini-PV terminated conductors; are available in many standard sizes.

Berg Lock-Rod Housings employ a lock rod to retain the terminal; ideal for applications requiring frequent wiring changes or for prototyping. Lock-Rod Housings connect as many as 31 Mini-PV terminated conductors in a single row—up to 62 in twin rows on .100" grid. Supplied 31 single row for .150" centers.

(See Bulletin 101B for complete details.)



Latch Housing



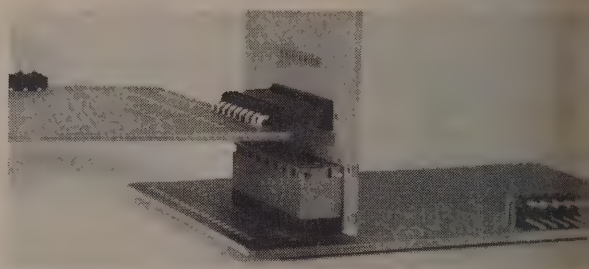
Lock-Rod Housing

PV Card Connectors–Vertical-Horizontal

These PV Card Connectors are available in single and double row configurations to mate with .025" square pins on .100" or .150" grids. Applications: Programmable or functional board-to-board mounting at right angle, parallel or the same plane.

		Number of Positions	
		Horizontal	Vertical
.100" GRID	Single Row	5–52	2–50
	Double Row	10–130	4–100
.150" GRID	Single Row	5–30	2–72
	Double Row	10–86	12,16,20&24

(See Bulletin 112C or your Berg Sales Engineer for additional information)



BergPin .025" square post and ferrule assemblies mate with Berg PV card connectors.

Vertical Stake-to-Board PV Receptacle

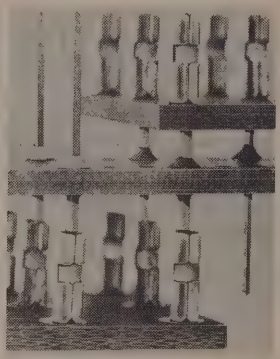
Receptacle stakes to PC board allowing dense packaging configuration by parallel mounting 1/16" glass-epoxy circuit boards. Features top or bottom entry which gives greater flexibility in placement on circuit board. Two-piece design provides lasting retention even after repeated cycling. Reliable application machines substantially reduce applied cost.

(See Bulletin 118 for additional information.)

Horizontal Stake-to-Board PV Receptacle

This version of the Berg PV receptacle is staked to the PC board, then wave soldered. Its design allows for dense packaging configurations in vertical mounting 1/16" glass-epoxy circuit boards. Horizontal PV receptacles can be employed with BergPin terminals to provide quick pluggability. Receptacles are supplied in strip form for high-speed machine staking.

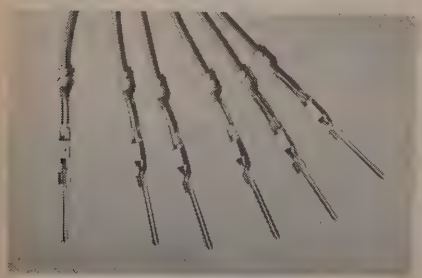
(See Bulletin 333 for additional information)



Vertical PV Receptacle

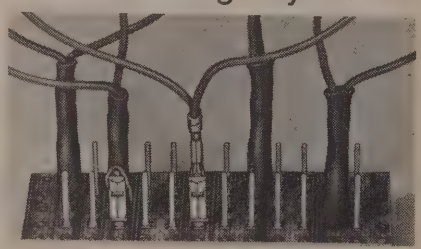
Horizontal PV Receptacle

Crimp-to-Wire Male Pin



Compatible with BergCon .025" square interconnection system. Makes flying-type connector when mated with Berg Mini-PV receptacle and used with Mini-latch housing. Maximum current rating: 5 amperes. 5.0 milliohms maximum contact resistance when mated with a Mini PV contact. *(See Bulletin 101B for additional information)*

Daisy Chain for Pre-testing Layouts



Here's a back-panel wiring system in easy-to-handle reel form. Consists of a continuous length of #28 gauge stranded wire with 250 insulated PV's crimped at constant intervals (2½" to 5" center-to-center spacing). Eliminates wire measuring, stripping, soldering, or expensive hand-tool terminating in your plant. *(See Bulletin 101B.)*

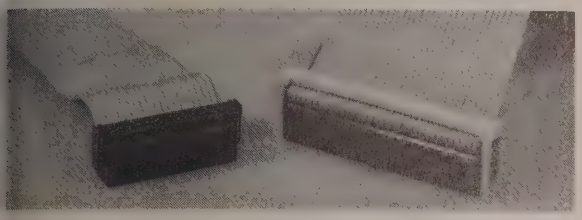
Mini-Jump Connector

MINI-JUMP, provides flexibility in circuit programming of mini-computers, card readers, printers, modems, and POS equipment. It allows for high density packaging; is stackable in both directions on .100" centers and up. Low-profile design permits tight packaging in the vertical plane. Mates with industry standard .025" square pins or .028" round pins. MINI-JUMP, which features Berg dual-metal receptacles, is supplied in a variety of package sizes. *(See Bulletin 144 for additional information)*

ositive-Latch Quickie™ Connectors terminate multi-lead cable in about 10 seconds

Berg QUICKIE series of connectors is designed to interface with flat, flexible round nductor cable on .050" centers. Connectors in this series eliminate the time, problems l expense of pre-stripping.

tandard Female Connector *



is form is used to interface flat flexible round conductor cable on .050" centers to 25 square wire-wrapping pins on .100" square grid. (It also mates with .025" round ns.) The standard QUICKIE Connector consists of two basic parts—the housing and cover. A third part—the strain relief—is not essential in all uses.

uickie assemblies supplied with strain reliefs

Type	Part Number	Cover Style
2 X 5	65484-001	A
2 X 5	65484-003	B
2 X 7	65484-025	A
2 X 7	65484-027	B
2 X 8	65484-029	A
2 X 8	65484-031	B
2 X 10	65484-005	A
2 X 10	65484-007	B
2 X 13	65484-009	A
2 X 13	65484-011	B
2 X 17	65484-013	A
2 X 17	65484-015	B
2 X 20	65484-017	A
2 X 20	65484-019	B
2 X 15	65484-021	A
2 X 15	65484-023	B

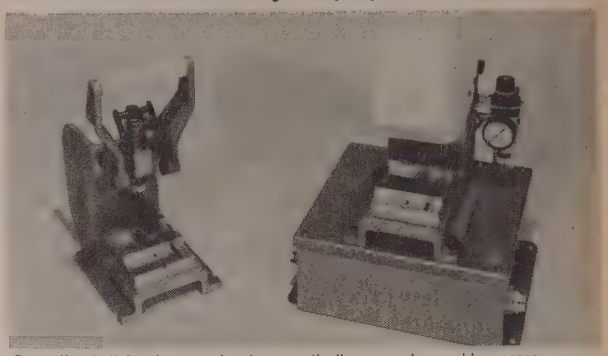
uickie assemblies supplied without strain relief

Type	Part Number	Cover Style
2 X 5	65485-001	A
2 X 5	65485-003	B
2 X 7	65485-025	A
2 X 7	65485-027	B
2 X 8	65485-029	A
2 X 8	65485-031	B
2 X 10	65485-005	A
2 X 10	65485-007	B
2 X 13	65485-009	A
2 X 13	65485-011	B
2 X 17	65485-013	A
2 X 17	65485-015	B
2 X 20	65485-017	A
2 X 20	65485-019	B
2 X 25	65485-021	A
2 X 25	65485-023	B

otes: A—Closed end cover style B—Thru end cover style

ote: A polarized version of the standard female is also available. Polarization is accomplished without loss of a pin position.

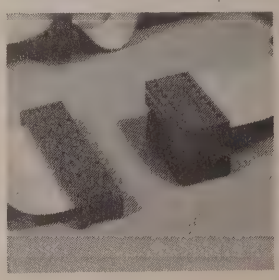
Quickie Assembly Equipment



Berg offers both hand-powered and pneumatically powered assembly presses.

Quickie Cable

Cable is supplied in PVC insulation including a choice of 28 AWG stranded or 30 AWG solid wire. Cable is available in 8 sizes.



Quickie Male Dip and PCB Connectors

The Male DIP Connector is available in 2 X 7 and 2 X 8 configurations . . . may be plugged into standard IC sockets.

The PCB Connector is available in 6 sizes for solder application directly to the printed circuit board.

Quickie Shielded Right-Angle Headers and Straight Headers

Berg QUICKIE Right-Angle Headers are fully compatible with the standard female connector. Available with plastic latches which give assurance that connector remains mated during vibration. The Straight Header also is fully compatible with the standard female connector; it is shielded on three sides.

See Bulletin 1200 for a comprehensive listing of the various forms of the QUICKIE Connector.

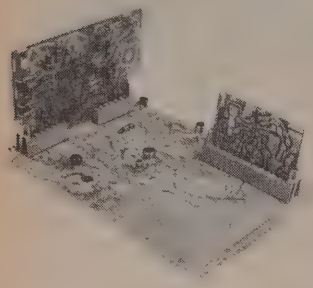
Shielded Right Angle Headers for .100", .125" or .150" Grid

Headers consist of glass-reinforced Nylon housings having .025" square pins on .100 grid which are molded in position for maximum strength. The configuration provides an integral top shield that serves to protect the pins from damage, plus side shields that prevent pin bending when female housings are removed. *See Bulletin 150*

BergLok™ Modular Interconnection Blocks . . . a simple, reliable way to mount replaceable daughter-board modules in electronic assemblies

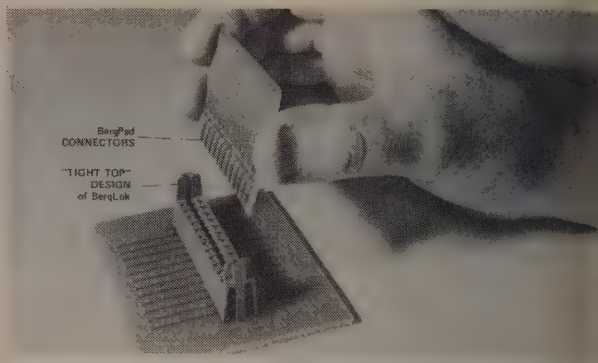
BergLok Connector Blocks provide a vertical mounting system for logic cards, ceramic substrates, and printed circuit cards, single or double sided. These blocks afford complete pluggability of modules into any conventional PC mother board, 1/16" thick. Standard center-to-center spacing is .200".

These connector blocks can be mounted in any position on the mother board and, thus, permit complete flexibility in packaging design and assembly. In most applications, BergLok Interconnection Blocks resist impact, shock and vibration without **supplementary support devices.**



Blocks have snap-lock base to anchor connectors firmly in mother board prior to wave soldering. No tools or fixtures needed. End-block latches lock daughter-boards firmly in place during handling and shipping. Yet boards can be easily removed for servicing or replacement.

(See Bulletin 116 for complete details)

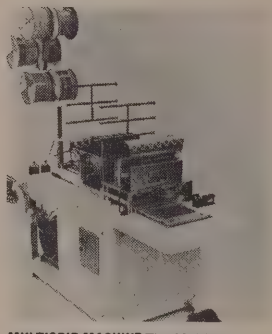


The tightly-controlled card guide that guarantees the stabilization of .062" daughter board in BergLok blocks is known as **"Tight-Top."**

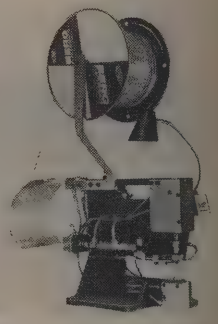
"BergPad," a terminal which is applied to the edge of P.C. board to replace copper-clad fingers, eliminates the problems of peel strength and wave solder thickness control. BergPad terminals can be applied to one side of the standard .062" board or to both sides of .031" to .045" board. (Write for details or see your local Berg Electronics Sales Engineer.)

Griplet® Lead-Holding Connector for PC Boards . . . machine-insertable at rates up to 100,000 per hour

The Griplet connector is inserted into holes in a PC board in order to hold component leads or wires at a desired depth. It protects the pads, firmly retains the inserted conductor and promotes a more reliable solder joint . . . while providing faster circuit assembly. Griplets are also used as a mechanical means of obtaining an electrical connection between two sides of a PC board.



MULTIGRIP MACHINE The Multigrip is designed for multiple inserting and staking of Griplet connectors in large quantities of identical boards. Rate: approximately eight boards per minute; inserts up to 70,000 Griplet connectors per hour. Berg also has several other Griplet model machines.



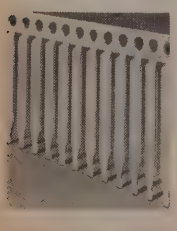
MODEL K Semi-Automatic Machine. Designed for economy and reliability. Inserts and stakes one connector per cycle. Rate: approximately 1,800 per operator-hour.

(See Bulletin 301 for complete listing.)

BergLance™ Low-Cost Wire-Wrapping Posts . . . for rapid, reliable staking in circuit board

BergLance posts and application machines provide high-speed staking of termination points in circuit boards for radio, TV, electronic organ, and similar consumer electronic products. Available in 2 basic cross-sections (.025" x .061" and .025" square) and with choice of lengths. Terminals, which are supplied in strip form for automatic insertion, have solder pre-coat and high-quality 60–40 tin lead finish.

(See Bulletin 107 for additional information.)



Berg "Shotgun" Machine has staking potential of up to 150,000 pins/day. Board area—11" x 12". Many other machines available to meet production needs.

Minisert™ Low Profile, Miniature PC Socket . . . provides repeated pluggability

e Berg MINISERT is a superior pluggable socket that assures positive retention in e circuit board prior to soldering, and spring-to-board electrical contact after sol- ring. The unique design of the MINISERT cup and spring extension allows solder to drawn to the top surface of a two-sided board, producing a solder fillet on the top d without overflow into the socket.

n elastomeric seal keeps foreign matter out of the socket before and after the com- nent lead has been inserted. This seal remains in place throughout the life of the cket.

e MINISERT accepts round leads ranging from .012" to .022" diameter, or flat leads 08" to .015" thick by .015" to .023" wide. Sockets will fit a hole size ranging from 50" to .058" and are furnished on a metal carrier strip for insertion by the Berg S-105 Machine. This machine provides substantial savings in time and in total plied cost.

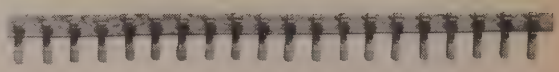
e MINISERT socket is also supplied in Kapton tape; it can be clipped to length for anual insertion in dual-in-line pattern or for terminating flat cable PC board jumpers. ose sockets are on .100" centers. Supplied on reels of 25,000 or 5,000 socket antities.

Features

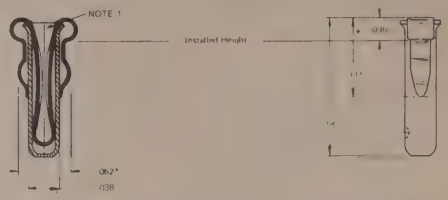
- Low-Profile—Extends only .030" above and .088" below a 1/16" board.
- Fits wide range of hole sizes; accepts many sizes of round or flat leads.
- Provides repeated pluggability for dual-in-line packages, LED's, lamps, transis- tors, etc.

Part Number	Standard Packaging	Recommended Applicator
75060-007	25M per reel	MS-105
75060-008	5M per reel	MS-100
75315-001	Loose piece	Tool
75540-001	25M reel (KAPTON)	Hand Inserted
75540-002	5M reel (KAPTON)	Hand Inserted

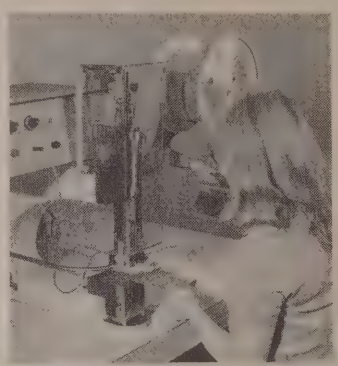
See Bulletin 120 for complete details.)



Minisert Sockets are now supplied in Kapton® Tape. Just clip to length for manual insertion.



NOTE 1. Elastomeric Seal keeps foreign matter out of the socket before and after component lead has been inserted. This seal remains in place throughout the life of the socket.

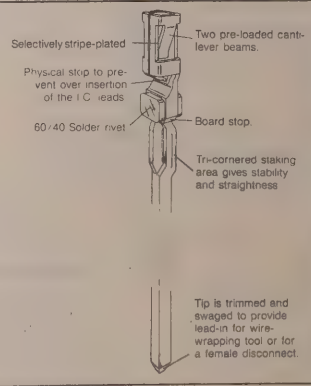


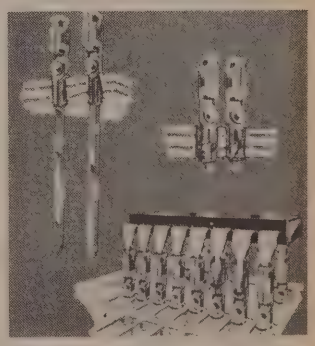
Berg pneumatically operated MS-105 machine inserts approximately 2,000 sockets per hour. A hand-operated (MS-100) insertion device is available for small runs; rate 800–1,000 per hour. A handtool kit can be purchased for prototyping purposes.

Berg Tri-Socket™. . . a .025" square wire-wrapping or solder-tab socket for 1/16" through 1/8" thick boards.

erg's Tri-Socket is a one-piece, free-standing design which will accommodate a ariety of lead sizes. It has tri-cornered fins in the staking area which extend beyond ne suggested hole diameter of the PC board. When inserted, the fins retract allowing entle entry into the board. The 3-point contact gives the Tri-Socket stability and traightness without causing damage to the thru plating. (The Tri-Socket does not ntroduce the great stresses to the PC board that are created with interference-fit ype pins).

unique feature is a 60/40 solder rivet which is precisely positioned above the tri- ornered area. This rivet is already for reflow. After reflow, retention force exceeds 60 ounds. *(See Bulletin 390 for complete listing.)*


Selectively stripe-plated
Two pre-loaded cantilever beams.
Physical stop to prevent over insertion of the I.C. leads
60/40 Solder rivet
Board stop
Tri-cornered staking area gives stability and straightness
Tip is trimmed and swaged to provide lead-in for wire-wrapping tool or for a female disconnect.



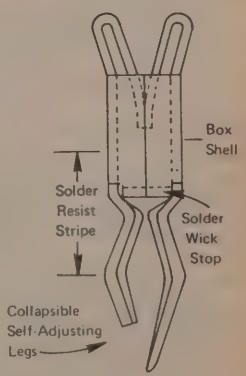
Low-Profile, Dual-Beam IC Socket Package

Berg's Dual-Beam I.C. Socket is a highly reliable low-profile DIP Package which will not allow solder wicking. The target area is .020" X .040"; socket design has a press-fit leg so the package will not fall out of the P.C. board after insertion. Ventilated molding and stand-offs allow for easy cleaning of the complete P.C. board assembly. This package consists of tin or gold plated phosphor bronze sockets which are inserted into a precision molded one-piece glass-filled polyester thermoplastic housing.

The Berg Dual-Beam DIP Package will accept leads ranging from .009" to .012". Face-wipe design provides maximum wiping action with mating package leads. Beams serve to track a bent or biased lead.

Plastic housing has a height of .175" maximum; its width allows for side-by-side mounting and measures .430" maximum. Housing material is rated UL 94V-0.

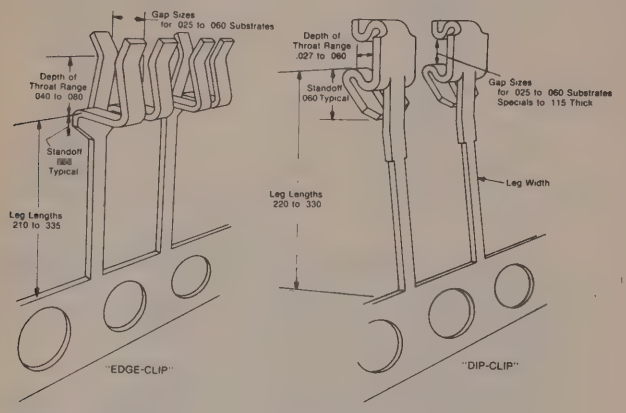
(See Bulletin 147 for complete listing)



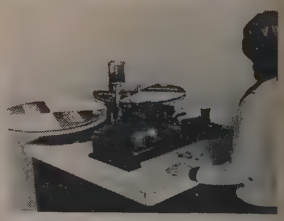
Solok* Terminations for Ceramic Hybrid Microcircuits

Solok* Terminations clip onto substrate rather than into holes drilled through it. They mechanically hold their position until soldered for a permanent connection. Berg offers a complete terminal application machine system. Its broad standard line is backed by an unusual custom design capability. *DuPont Trademark

Two basic types . . . many configurations


Gap Sizes for .025 to .060 Substrates
Depth of Throat Range .040 to .080
Standoff .060 Typical
Leg Lengths .210 to .335
"EDGE-CLIP"
Depth of Throat Range .027 to .060
Standoff .060 Typical
Gap Sizes for .025 to .060 Substrates Specials to .115 Thick
Leg Width
Leg Lengths .220 to .330
"DIP-CLIP"

Edge-Clip Machine
This machine is used for single edge-mounted terminals. It can be programmed to install terminals at any given pad location or to skip terminals in an area where there is no pad. Rate: Up to 1500 packages per hour.



Dip-Clip Machine
This semi-automatic machine is used for DIP type terminations; it, too, operates at rates up to 1500 substrates per hour. (Terminals must be ordered "left" and "right" handed for this machine.)

Definition of Terms

1. **Depth of Throat**—Distance from edge of substrate to point where terminal contacts pad.
2. **Standoff**—Distance that terminal will hold substrate away from mouting board.
3. **Leg Length**—Distance from substrate to end of leg **with carrier strip removed.**
4. **Gap Size**—Opening in clip area of terminal designed to assure a mechanical hold on the substrate.

For complete details and specifications, contact your local Berg Sales Engineer or request Bulletin 124.

Berg Serpent Terminals

. . . mate with input/output connectors of IBM 360 and 370 Systems

The Berg "Serpent" is a 48-position connector which provides a reliable I/O connection within your system . . . or plug compatibility to IBM.

Its crimp-type contact, is made of phosphor bronze, and plated gold-over-nickel for excellent conductivity. Contacts have insulation-support ears which provide termination strength for conventional wires in 18-20 AWG, 22-26 AWG, and 28-32 AWG ranges as well as coaxial and shielded wires. These contacts self lock in the connector housing and provide firm wiping action.

Connector housings, made of polycarbonate, have an alphanumeric coding on front and rear for easy cavity identification. Other features include: a spring-loaded jackscrew which assures positive locking, a strain-relief cover, and mounting slots for panel mounting.

(See Bulletin 250 for additional information)

Lugs and Tie Points

for Bobbins, Coil Forms, Shield Cans

THRU-LUG TERMINALS—are precision stamped with sections that, when staked, clinch the terminal securely to both sides of the board. Catalog Section #406.

EXTRUDED COLUMN LUGS—designed for high-strength retention in circuit and terminal boards. Job-matched machines rapidly stake as many as six lugs simultaneously. Catalog Section #407.

COIL FORM AND BUTTERFLY TERMINALS—feature specially designed tips for rapid insertion and immediate retention in circuit boards. Provide wrapping and soldering points for coil winding wire. Catalog Section #202.

CAN LUGGING SYSTEMS—Berg offers a complete line of lugs for mounting shield cans to circuit boards. Designs include flat-sided or cylindrical can types for flush or elevated mounting and four styles to automatically key cans. Catalog Section #203.

BOBBIN TERMINATIONS—Berg's system for inserting lugs into molded bobbins eliminates costly insert molding and provides secure connection points. Available in thru-lug and blind-pocket types. Catalog Section #204

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cable concepts corporation

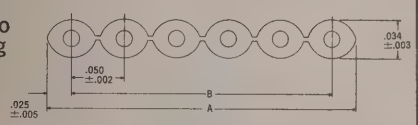
FLAT CABLE AND ASSEMBLIES FOR THE ELECTRONICS INDUSTRY

About Cable Concepts Corporation

CCC supplies flat ribbon cable to major connector manufacturers for use in their own cable and harness assemblies. They come to us because our specially designed, high precision machinery, coupled with a rigid quality control system, has made us a leader in the volume production of standard and special flat cable. CCC products include cable up to 5 in. wide, using solid or stranded round conductors or flat conductors, jumper cable, prestripped jumpers, and connector-cable assemblies.

ROUND CONDUCTOR FLAT CABLE

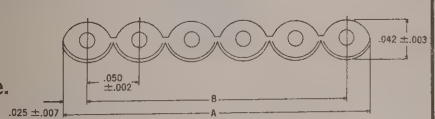
Available in symmetrical cross-section to allow mounting connector in either orientation.



UL Style No.	2651 or 2828
Color	Gray (custom colors available)
Marking	Edge marked red on gray
Wire Gauge	28 AWG stranded (7-#36 AWG), tinned 30 AWG solid, bare
Conductor Spacing	0.050 in. center-to-center
Insulation Resistance	$>10^4$ MΩ (10 ft. sample)
Cable Concepts Part No.	CC-XX-7361VS (stranded) CC-XX-300VS (solid)

ROUND CONDUCTOR COLOR CODED FLAT CABLE

Laminated pre-insulated stranded wire.



UL Style No.	2697
Color	Brown, red, orange, yellow, green, blue, violet, gray, white, black, and repeat
Wire Gauge	28 AWG stranded (7-#36 AWG), tinned
Conductor Spacing	0.050 in. center-to-center
Backing Material	Clear PVC film
Insulation Resistance	$>10^3$ MΩ (10 ft. sample)
Cable Concepts Part No.	CC-XX-7361VCS

HOW TO ORDER CABLE

CC 10 7361 V C S X

- **CC** — CCC
- **10** — No. of conductors
- **7361** — 2-digit number is solid conductor; 3- or 4-digit number is stranded; 6-digit number is rectangular conductor
- **V** — 0: Bare copper; 1: Tin-plated copper; 2: Silver-plated copper
- **C** — V: Polyvinyl chloride; F: FEP Teflon; M: Mylar; K: Kapton
- **S** — Color coded
- **X** — Symmetrical cable
- Special construction

CABLE-CONNECTOR ASSEMBLIES

CCC has extensive experience in terminating, assembling, and carefully testing flat cable-connector assemblies and harnesses. CCC cable can be terminated with any commercially available insulation-displacement connector. These can be to customer specification, or will be selected by Cable Concepts on the basis of price, technical requirements, or availability. Call for quotation on assemblies engineered to your specifications.

STANDARD SPECIFICATIONS

Insulation Material	Polyvinylchloride (PVC)
Flammability Rating	UL rated FR1
Tensile Strength	30,000 psi (min.)
Voltage Rating	300V rms
Dielectric Withstand Voltage	>1500V rms
Propagation Delay	1.4 ns/ft. (nom.)
Temperature Rating	−20°C to +105°C (color coded to +80°C)
Elongation	20% (min.)
Length	100 ft. reels

CONDUCTOR ELECTRICAL SPECIFICATIONS

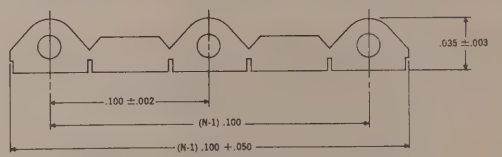
Wire gauge (AWG)	Characteristic impedance (Ω)		Capacitance (pf/ft)		Inductance (μH/ft)		Propagation delay (ns/ft)	
	GS*	GSG*	GS*	GSG*	GS*	GSG*	GS*	GSG*
#28 Stranded	150	105	7.7	15.0	.29	.20	1.38	1.40
#30 Solid	175	125	6.5	12.0	.33	.23	1.41	1.42

*Cable configuration tested: GS = Ground-Signal
GSG = Ground-Signal-Ground

DIMENSIONS

No. of Cond.	DIMENSION A	DIMENSION B
10	.500 ±.010	.450 ±.007
14	.700 ±.010	.650 ±.007
16	.800 ±.010	.750 ±.009
20	1.000 ±.015	.950 ±.009
24	1.200 ±.015	1.150 ±.009
26	1.300 ±.015	1.250 ±.009
34	1.700 ±.015	1.650 ±.009
40	2.000 ±.015	1.950 ±.011
50	2.500 ±.015	2.450 ±.011
60	3.000 ±.015	2.950 ±.011
64	3.200 ±.015	3.100 ±.011

ROUND CONDUCTOR JUMPER CABLE



UL Style No.	2651
Color	Gray (custom colors available)
Wire Gauge	26 AWG solid, tinned
Conductor Spacing	0.100 in. center-to-center
Insulation Resistance	$>10^4$ MΩ (10 ft. sample)
Cable Concepts Part No.	CC-100-261V

PRESTRIPPED JUMPERS

Precut to the lengths you specify and stripped ready for installation, these become the most economical of termination systems. Premade jumpers can have from 3 to 36 solid conductors, lengths can be anything from a minimum of 1 in.

Also available: Mylar- and Kapton-insulated flat conductor cable.

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Dept. EM, 1610D Manning Blvd., Levittown, PA 19057
(215) 547-5273 • TWX 510-660-2144

CC-100

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FIELD INSTALLABLE/CRIMP BNC CONNECTORS SOLVE CABLE TERMINATION PROBLEMS

REPRINTED FROM ELECTRONIC PRODUCTS MAGAZINE/JANUARY 1978

Conventional fast-assembly, non-crimp BNC connectors now on the market often involve time consuming assembly procedures, including a contact soldering operation. The modern crimp BNC's are a major improvement, but they also involve either crimping or soldering the center contact, require relatively expensive crimp tools and the handling of three or more components.

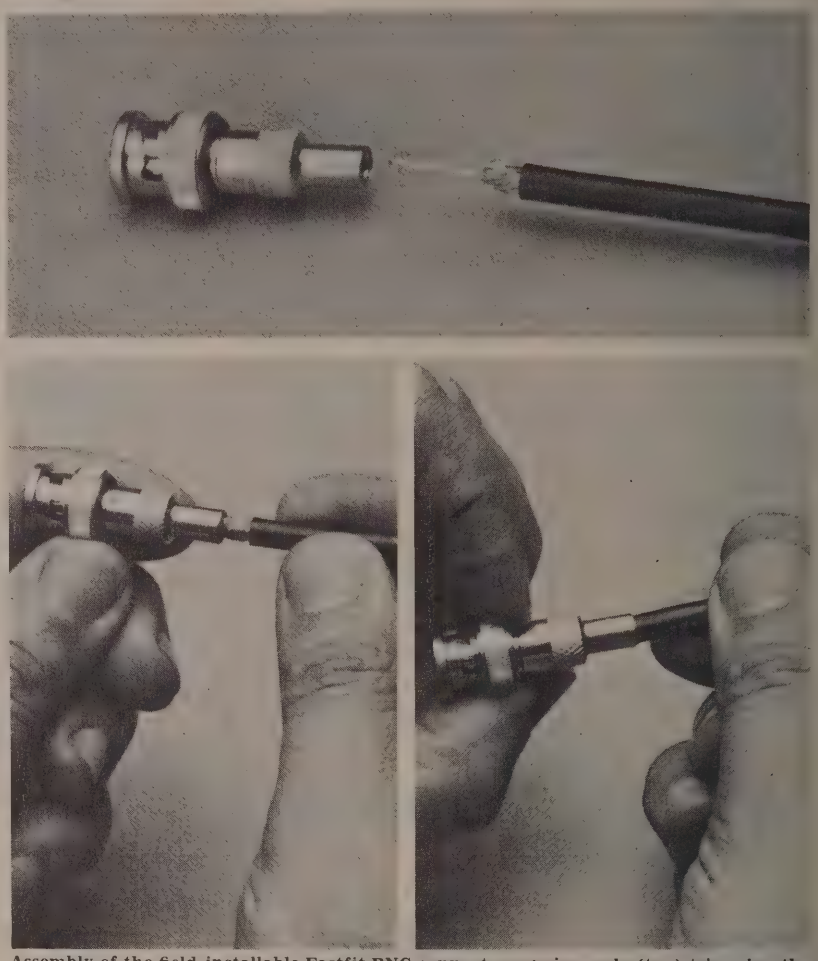
A new kind of BNC connector, called Fastfit, is significantly easier to terminate than conventional BNC connectors and consequently permits significant assembly cost savings. The field-installable version is a one-piece connector with no loose parts, and the crimp version has only a body assembly and a braid crimp ferrule. Initially, both versions are being produced for RG-58 and RG-59 type cables.

Self energizing contact

The "heart" of the connectors is a self energizing contact that is preassembled into the body between two polyethylene insulators. A U-shaped tine on the contact captures the cable center conductor on assembly, forming a secure connection. The preassembled contact insures precise positioning of the contact and therefore, proper mating face dimensions. The connector is designed to be used with solid center conductor cable.

The one-piece, field-installable version requires no contact soldering, has no loose clamp nuts or contacts to handle. It requires no wrenches, little manual dexterity, and represents a significant savings in labor, and therefore, costs. The connector is assembled by simply trimming the cable, inserting the center conductor into the rear of the connector body, thereby energizing the self-contained center contact, and twisting the connector onto the cable. A novel tapered and threaded back-end opening in the body enables it to be easily screwed onto the cable braid and jacket, forming a secure consistent termination. The connector will withstand up to 50 pounds of axial pull.

The two-piece crimp version requires only crimping of the braid, making assembly easier, consistent, and obviously saving production assembly time. Similarly, the assembly instructions are to trim the cable and simply insert the center conductor into the rear of the connector body. The crimp ferrule is then moved over the back end of the body, capturing the braid in the standard manner. An inexpensive vice-grip type of hand tool is used for crimping, with a bench and power tool also available.



Assembly of the field-installable Fastfit BNC connector requires only (top) trimming the cable, (bottom left) inserting the cable into the connector until the solid center conductor mates with self energizing contact, and (bottom right) simply twisting the connector.

The connectors have a nominal impedance of 50 or 75 ohms, a peak voltage rating of 500 V, and a dielectric withstanding voltage of 1500 V rms. Insertion loss is 0.1 dB at 2 GHz, with a VSWR of 1.05 at 1 GHz, 1.2 at 2 GHz. The connectors are brass bright nickel plated, with high density polyethylene insulators.

The crimp type, CP88 Series of BNC plugs have an OD of 0.570" with a terminated length of 1.300". Cable entry diameters are 0.213" and 2.60" for RG58 and RG59 cables, respectively. The field installable CPF188 Series of plugs have an OD of 0.570" and a length of 1.470". Cable entry diameters are 0.250" and 0.300" for RG58 and RG59 cables, respectively. Modifications or special versions of the connectors are available on request.

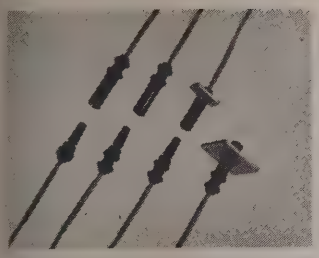
The BNC plugs are packaged in individual polyethylene bags with imprinted termination instructions.

WE WILL GLADLY ENTERTAIN CUSTOM REQUIREMENTS UTILIZING THIS PATENTED CONCEPT.
ASK ABOUT OUR LINE OF **UHF** CONNECTORS.

244 Woodland Avenue
Bloomfield, Connecticut 06002
Tel: (203) 243-1761
TWX: 710-420-0592

CAMBRIDGE PRODUCTS CORP
A Hi-G Company

Caton offers the best in Corona free connectors because we've been making them for over 35 years

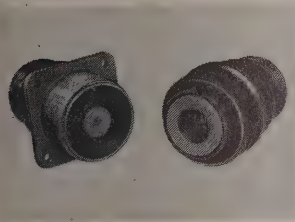


SILICONE IN-LINE CONNECTORS

PM 200 and PM 300 SERIES

These all silicone positive end pieces snap together forming a watertight connection that can easily be disassembled or changed. The units are fully molded and offer high reliability and long life. The units are corona free and leak proof.

The PM 200 series is for 30 KVDC and the PM 300 series is for 50 KVDC. Both series are available with optional grommet type ends for panel mounting.



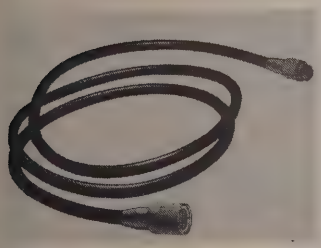
MODIFIED MS CONNECTORS

CCM SERIES

Positive contact screw-on connectors feature self-centering tapered contacts of molded resilient silicone inserts. They afford high dependability with their positive peripheral seal. The dielectric inserts are uneffected by temperatures in the range of −70°F to +480°F. They are ozone and corona resistant.

In addition to the single contact version, the CCM series come in 2, 3, 4 and 8 contact versions and have shell sizes ranging from 10 to 24. They carry voltage rates from 20 to 50 KVDC.

A line of accessories including protective caps and cable clamps are available throughout the ranges offered.



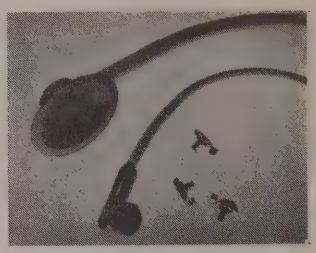
RADAR, PULSE AND HIGH VOLTAGE CABLE ASSEMBLIES

CA SERIES

These high voltage cable assemblies feature factory molded ends that assure the highest possible corona free construction. Corona extinction is measured in accordance with MIL-C-17.

These cable assemblies are the industry standard and are used in virtually all radar installations world-wide. Their corona free capabilities range from 10-30 KVAC and the Hi-Pot series from 25-75 KVDC.

The CA series comes in numerous configurations to interface with most any high-voltage/pulsed voltage requirements.



CRT ANODE LEADS SILICONE WITH BERRYLLIUM/ COPPER CONTACTS

CCR SERIES

These CRT anode leads are both leak proof and corona free. The lead assemblies are molded silicone with heat treated contacts. They offer excellent fire and heat resistance with ambient temperatures over 150°C.

The built-in stress relieving contours eliminate electrical discharges in the corona-prone areas. The connectors come with three basic types of contacts. The contacts are both riveted and heat fused for strength and reliability. The contacts themselves are available separately for OEM applications.

The connectors adapt perfectly to JI-22 or JI-25 anode ball contacts. Capabilities range from 5 KV to 30 KV.

NEW FROM CATON

PRINTED CIRCUIT BOARD CONNECTORS

EC SERIES

Caton manufactures hundreds of connectors in the EC series. They presently hold license to produce this line of Burndy connectors.

The models shown are typical. They are availabie in mineral filled diallyl phthalate per MIL-M-14F, type MDG. The contacts are phosphor bronze with hard gold plating in accordance with applicable military specification. These come in 10, 15, 18, 22 contacts.

Caton now manufactures many styles, sizes and custom applications. Contact us for your requirements.

CATON

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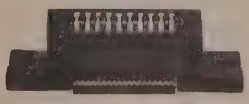
Cordage Park Plymouth MA 02360
Telephone 617-746-6817
DEPT. EM
CORONA FREE CONNECTIONS

GeeWee* ROUND WIRE FLAT CABLE CONNECTORS

CF006 PCB CONNECTORS Permanently connects cable to printed circuit board.	• For connecting cable with up to 50 conductors • Connections can be inspected before cover is applied • No cable stripping necessary • Utilizes patented CW contacts	Sizes are available for terminating flat cable having 10, 20, 26, 34, 40 or 50 round conductors. Cover with integral strain relief and lip for protection of bare ends of wires is standard; cover without lip that permits wire to pass freely through connector (daisy chaining) without interference from protective lip is also available.
CF008 SOCKET CONNECTORS Connects to cable and provides female socket nose to mate with headers CN711 and CN712, or to properly oriented pins permanently fastened to a PC board.	• For connecting cable with up to 50 conductors • Connections can be inspected before cover is applied • "T" Bars on cover simplify assembly and disassembly • Utilizes patented CW contacts	For terminating cable with 10, 20, 26, 34, 40, and 50 conductors. Designed for rapid connect/disconnect of cable to two rows of .025" square or round posts on .100" x .100" centers. Cover variations include a self-locking cover with built-in strain relief for termination of conductor ends (standard); also available is a cover for intermediate connections that permits conductor cable to pass through connector (daisy chaining).
CN711 & CN712 HEADERS For quickly connecting cable that is terminated with female socket CF008. Has posts for soldering to PC board or wire wrap.	• Accepts connectors with up to 50 contacts • Side guides assure correct alignment of mating connectors • Posts can be soldered to PC boards or wire wrapped	Headers available to mate with CF008 sockets terminating 10, 20, 26, 34, 40, or 50 conductor cable. Each has two rows of .025" contacts that are straight through or bent at 90°. End of contacts opposite to socket mating end are .025" x .025" square pins for wire wrap termination, or .025" diameter round pins usually wave soldered permanently to PC board. Protective lip prevents damage to contacts when not in use. Available with latches that lock headers to mating CF008 sockets.
CP200 DIP CONNECTORS Permanently connects flat cable to printed circuit board having holes on standard DIP spacing, or with connect/disconnect provision to I.C. socket.	• Cover ridges assure proper cable alignment • Cover preassembled to connector base at factory to simplify handling • Numbered positions simplify solder post identification • Utilizes patented CW contacts	DIP (Dual in-line package) connector for terminating 14, 16 or 24 conductor cable. Provision for connect/disconnect into I.C. socket or permanent wave solder termination to mating PC board. Preassembled cover permits rapid termination with simple hand tool.
CF100 CARD EDGE CONNECTORS  Connects/disconnects flat cable with etched conductive lines on edge of 1/16" thick PC board.	• Accepts cable with up to 50 conductors • Contacts are bifurcated for maximum integrity of connection • Cantilever contact will operate with up to .075" PC board thickness • Utilizes patented CW contacts	Sizes available for termination of 10, 20, 26, 34, 40, and 50 conductor strip cable. Standard connector includes integral strain relief. Available with or without mounting ears.

CW Industries has extensive experience in wire cutting, terminating, assembly and testing of flat/cable connector assemblies. Send us your inquiry for special harness requirements. We will also quote on any other flat cable/connector requirements that you may have.

For additional information send for Technical Bulletin 2101.

*Registered Trademark

CW INDUSTRIES
550 DAVISVILLE ROAD, WARMINSTER PENNSYLVANIA 18974
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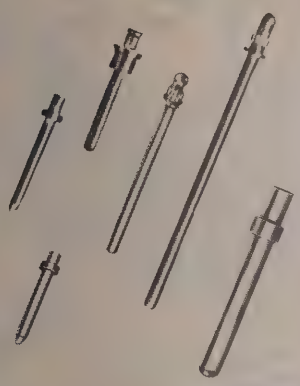
Quality products through creative engineering

DIRECT FROM THE MANUFACTURER'S MANUFACTURER WITH ZILLIONS OF CONFIGURATIONS IN STOCK

MODULE, CONNECTOR AND PRINTED CIRCUIT

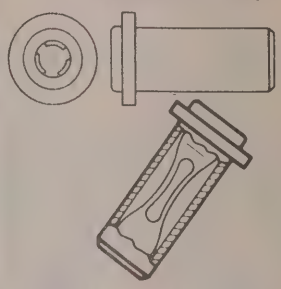
PINS & SQUARE-WRAPS®



PRINTED CIRCUIT

JACKS

& CONNECTORS



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TEFLON* INSULATED

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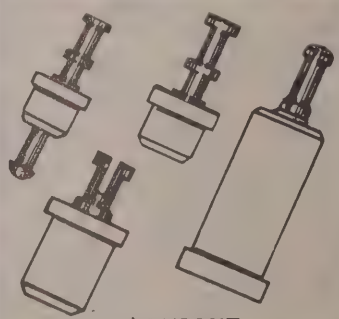

*TM DUPONT

SOLDER

TERMINALS

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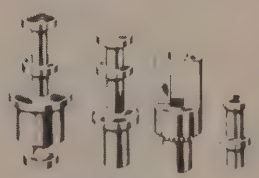

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YOU PROBABLY WON'T SEE WHAT YOU NEED ON THIS PAGE

We're just showing some of Connector Corp.'s capabilities

Our 2nd Quarter Century: Providing design solutions to help packaging engineers achieve max. unit performance.
5 Plants: Complete in-house mfg./QC from basic raw materials to finished product.
Highly Efficient Cost-Saving Mfg. Techniques: Already tooled on many thousands of items, one of which can be adapted for you or a new one made to your individual requirement.
Production: High volume high speed production to close tolerances.
Market Reputation: A typical long time customer rates C/C: 1) Tops in quality 2) Excellent in service and performance. 3) Equitable in price. 4) Overall rating 98.5%. Other customers give C/C similar ratings.
Innovative designs . . . engineering service . . . production quality have built C/C's reputation.
Talk to our engineers or our closest representative. They'll work with your engineers to design, develop and/or make the product or innovation you need to meet your changing packaging assembly requirements.

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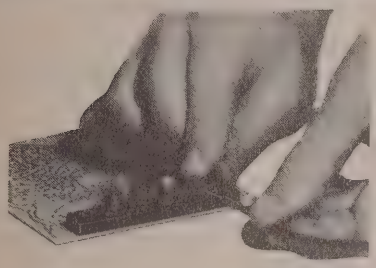
SPECIALISTS IN INNOVATIVE AMERICAN MADE CONNECTIONS

WE WANT YOUR PROBLEMS!!!

Your connection problems, that is

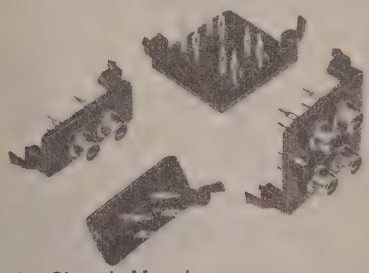
Here are just 4 cost-saving design solutions Connector Corporation came up with to meet customer's packaging needs. (Sorry there's not enough space to show you the other 5,000+ answers C/C has created).

DESIGN ANSWER NO. 1



Series 950 Wyrlok Receptors. Note quick, easy, simple connect/disconnect. To connect, press, insert, release.
To disconnect, just press, remove wire, release.
No crimping, soldering, wire wrap, welding, wire attachments, screwing down, tools or bonding materials required to obtain a firm electrical or mechanical connection. Long, useful life because wear is almost non-existent.
Save space, energy, labor, material & time on your production line.
Quick, easy serviceability. For disconnecting, there is no destructive heat or unsoldering, no destructive detaching of crimped, welded or riveted joints, no loosening of screwed down joints with screwdrivers. Just press, remove wire, release.
1, 2, 3, 4, 5 or 6 Wyrlok Receptors offered on a single strip of UL approved (94VO) flame retardant thermo-plastic material.
Innumerable applications. Replaces many less efficient methods currently used in accomplishing electrical, electromechanical or mechanical connections in instrumentation, computer software, electronic & TV games, pinball games, TV, stereo, telecommunications, switching equipment, ground support equipment, speakers, prototype breadboards, appliances, CB, fibre optics, batteries, automotive, medical electronics and many others including yours.

DESIGN ANSWER NO. 2

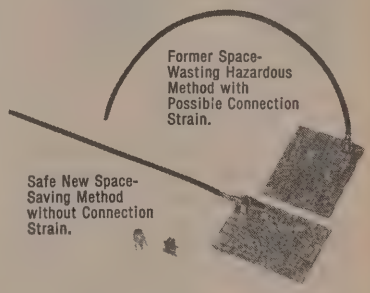


Up to *tenfold* more connects / disconnects with Types 1070-01 (quad) & 1070-02 (dual) Precision Audio Connector Sub-Assemblies for PC Boards and/or Chassis Mount.
Your assembly line costs are reduced because these connector sub-assemblies mount directly to the pc board. In contrast, conventional audio jacks must 1) first be mounted to the chassis, then 2) individually wired to the pc board.
Eliminated entirely are costs for wire, solder and labor for mounting pc board to chassis, rather than interconnecting each and every socket and pc board with soldered wire jumpers.
Minor "last minute" circuit design modifications on your assembly lines are now practical and easily done. Solder holes in tails permit soldering "after thought" resistors, condensers and other electrical components to the tails.

DESIGN ANSWER NO. 3

Eliminate CRT Damage with Miniature Type 546 7-Pin Socket with Special Spark Discharge Device.
Prevents costly damage to CRTs from voltage surges and circuitry breakdown.
Mates with JEDEC E7-91 tube base having .040 dia. pins on a .375 pin circle. Socket also available without spark gap.
Applications in computer & computer related industries, TV, automotive analytical industry, and other information displays.

DESIGN ANSWER NO. 4


Former Space-Wasting Hazardous Method with Possible Connection Strain.
Safe New Space-Saving Method without Connection Strain.

Space-Saving Type 107E65-4 Right Angle RF/Audio Connector with Quick Connect/Disconnect for Coaxial Cables & Twin Leads.
Gives packaging designer CHOICE of vertical OR horizontal pc board placement in limited spaces without bulky wide loop cable, making possible a more compact packaging design.
No connection strain as in wide looped cable to open up plug skirt and cause poor or failing electrical connection.
Applications in electronic games, CBs, stereos, monitoring equipment, communication equipment, etc. where conventional design sockets cause bulky cable looping, wasting packaging space.

USE OUR HIGH VOLUME METAL STAMPING & MOLDING DEPARTMENTS FOR YOUR PRODUCTION REQUIREMENTS

- Close tolerances are routine.
- All dies & molds completely designed & made in our own fully equipped tool & mold facilities by skilled craftsmen.
- Time-saving, flexible — even if changes occur during a high production run. Faster, more efficient because everything handled in-house.
- Available independently or as part of your connector order.
- Proficiency in a wide variety of metal alloys & molding compounds.

Would you like the next cost-saving answer for *your* problem? Our Engineering Department, in readiness to help, awaits your call.

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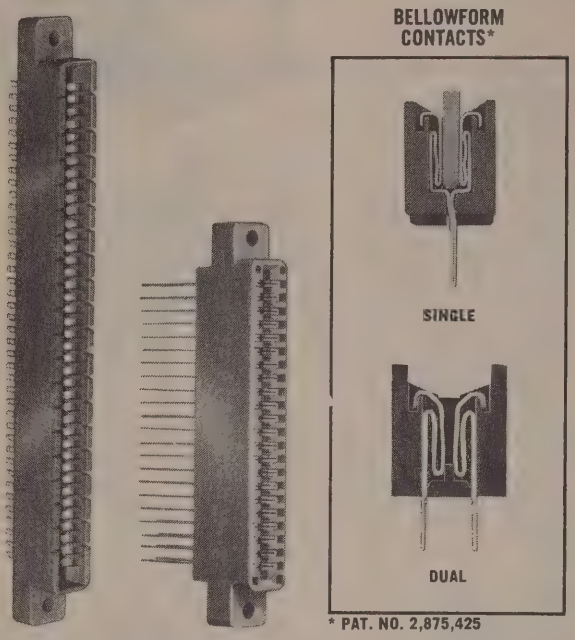
CONTINENTAL CONNECTORS

Precision Electronic Connectors For Commercial & Military Applications

SERIES 600 CARD-EDGE CONNECTORS FOR PRINTED CIRCUITRY



* PAT. NO. 2,875,425

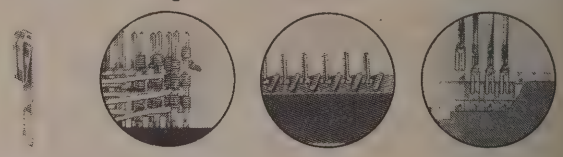
Connector body molding material is made of a variety of compounds such as Diallyl Phthalate, for commercial and military applications. Contacts are gold plated phosphor bronze or beryllium copper with optional plating in accordance with all MIL SPECS or special customer requirements. These contacts, with "bellowform" construction, are durable and capable of withstanding thousands of insertions and withdrawals without failure; they are virtually indestructible.

Series 600 printed circuit connectors represent one of the most extensive lines of receptacle or card-edge types. A wide variety of single readout and double readout construction, with sizes from three to 210 contacts are available.

CONTACT CENTERS:
.050", .075", .100", .125", .140", .150", .156" and .200"

BOARD THICKNESS:
1/32", 3/64", 1/16", 3/32" and 1/8"

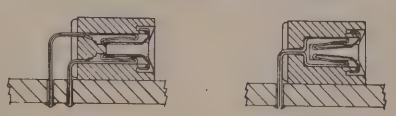
WIRING STYLES:
Eyelet lug for soldering, solderless-wrap terminations for wire-wrapping technique, contacts for dip or flow soldering and taper tab solderless wiring



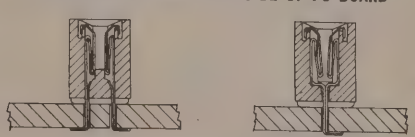
MIL SPECS:
Continental Printed Circuit Connectors meet or exceed applicable MIL-C-21097 specifications. They withstand a 50-hour salt spray test and ambient temperature range of −55°C to +125°C.

SELECTIVE PLATING — Continental's continuous process selective plating deposits an equal amount of gold on each contact. The contacts pass through various cleaning and plating baths, resulting in a controlled amount of gold uniformly deposited on the critical contact area. By plating gold on the contact surface only, selective plating automatically brings down your connector cost enormously.

PRINTED CIRCUIT APPLICATIONS

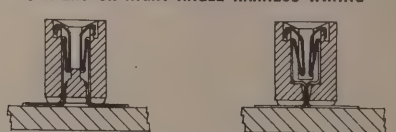


RIGHT ANGLE MOUNTING WITH CONTACTS FOR DIP SOLDERING TO UNDERSIDE OF PC BOARD



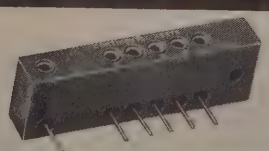
VERTICAL MOUNTING WITH CONTACTS FOR DIP SOLDERING TO UNDERSIDE OF PC BOARD

VERTICAL MOUNTING WITH CONTACTS FOR SRAIGHT OR RIGHT ANGLE HARNESS WIRING



VERTICAL MOUNTING WITH CONTACTS SOLDERED TO TOP SIDE OF PRINTED CIRCUIT BOARD

PC TEST POINT



SERIES 672. Provide conveniently located test points to check printed circuitry. Available with 4, 5, 6, 8, 10, 11, 20, 21, 28, 30, 42 and 63 contacts which grip and hold securely a standard .080" test probe. Connectors have recessed and floating pin terminals mounted at right angle to the test socket. Pins dip solder to printed circuit board.

FOR COMPLETE CATALOG ON ANY SERIES WRITE OR PHONE:
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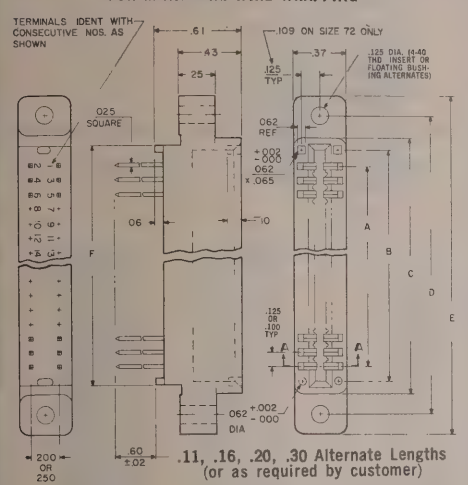
CONTINENTAL CONNECTORS

Precision Electronic Connectors For Commercial & Military Applications

PRINTED CIRCUIT CONNECTORS FOR MINIATURE WIRE WRAPPING



Full Bellowform Contacts on Connector with .100 Contact Centers (Series 6100-200)

Semi Bellowform Contacts on Connectors with .125 Contact Centers (Series 6125-250)

No. of Contact	SERIES 6100-200 .100 CONTACT CENTERS						SERIES 6125-250 .125 CONTACT CENTERS					
	A	B	C	D	E	F	A	B	C	D	E	F
6/6	.500	.700	.860	1.175	1.435	.750	.625	.875	1.035	1.295	1.555	.875
10/10	.900	1.100	1.260	1.575	1.835	1.150	1.125	1.375	1.535	1.795	2.055	1.375
15/15	1.400	1.600	1.760	2.075	2.335	1.650	1.750	2.000	2.160	2.420	2.680	2.000
17/17	1.600	1.820	1.972	2.240	2.500	1.840	—	—	—	—	—	—
18/18	1.700	1.900	2.060	2.375	2.635	1.950	2.125	2.375	2.535	2.795	3.055	2.375
20/20	1.900	2.100	2.260	2.575	2.835	2.150	2.375	2.625	2.785	3.045	3.305	2.625
22/22	2.100	2.300	2.460	2.775	3.035	2.350	2.625	2.875	3.035	3.295	3.555	2.875
24/24	2.300	2.500	2.660	2.975	3.235	2.550	—	—	—	—	—	—
25/25	2.400	2.600	2.760	3.075	3.335	2.650	3.000	3.250	3.410	3.670	3.930	3.250
26/26	2.500	2.700	2.900	3.200	3.500	2.775	—	—	—	—	—	—
28/28	2.700	2.900	3.060	3.375	3.635	2.950	3.375	3.625	3.785	4.045	4.305	3.625
30/30	2.900	3.100	3.260	3.575	3.835	3.150	3.625	3.875	4.035	4.295	4.555	3.875
31/31	—	—	—	—	—	—	3.750	4.000	4.160	4.420	4.680	4.000
35/35	3.400	3.600	3.760	4.075	4.335	3.650	4.250	4.500	4.660	4.920	5.180	4.500
36/36	3.500	3.700	3.860	4.175	4.435	3.750	4.375	4.625	4.785	5.045	5.305	4.625
40/40	3.900	4.100	4.260	4.575	4.835	4.150	4.875	5.125	5.285	5.545	5.805	5.125
43/43	4.200	4.400	4.560	4.875	5.135	4.450	5.250	5.500	5.660	5.920	6.180	5.500
44/44	4.300	4.500	4.660	4.975	5.235	4.550	—	—	—	—	—	—
48/48	4.700	4.900	5.150	5.450	5.710	5.130	—	—	—	—	—	—
49/49	—	—	—	—	—	—	6.000	6.250	6.410	6.670	6.930	6.250
50/50	4.900	5.100	5.260	5.575	5.835	5.150	6.125	6.375	6.535	6.795	7.055	6.375
60/60	5.900	6.100	6.260	6.575	6.835	6.150	7.375	7.625	7.785	8.045	8.305	7.625
65/65	6.400	6.600	6.760	7.075	7.335	6.650	8.000	8.250	8.410	8.670	8.930	8.250
75/75	7.400	7.600	7.760	8.075	8.335	7.650	9.250	9.500	9.650	9.920	10.180	9.500
100/100	9.900	10.100	10.260	10.575	10.835	10.150	12.375	12.625	7.785	13.045	13.305	12.625

SERIES 6100-200 and 6125-250. The most extensive line of printed circuit connectors for miniature wire wrapping in the industry. All densities from 2 to 200 contacts can be supplied . . . the most popular sizes being tabulated above. Available in two grid patterns — .100 x .200 (Series 6100-200) and .125 x .250 (Series 6125-250) with .025 square terminals true positioned to make these particularly suitable for automatic wiring techniques. Terminal lengths to exact customer needs for one, two or three wraps; or for flow soldering to boards of any thickness. Choice of mounting styles — thru hole, thd. inserts, floating bushing, flat bottom and without mounting "ears." Connector body molding material may be any of a variety of compounds for commercial and military applications. Contacts are gold plated phosphor bronze with optional plating in accordance with all MIL specs or special customer requirements.

Voltage Rating (sea level) — 1800 V. RMS (.100 spacing); 2100 V. RMS (.125 spacing) Current Rating — 3 amps continuous.

CONTINENTAL CONNECTORS CORPORATION CATALOGS

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Continental Connectors Corp.

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354 Maynard Road / Sudbury, MA 01776 / (617) 443-3760
Wayzata Blvd. at County Road 18 / Minneapolis, MN 55426 / (612) 546-0095
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Solid State Electronics Co. / Dallas, TX / (214) 352-2601
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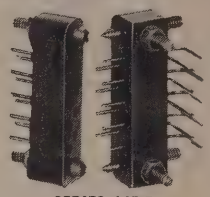
CONTINENTAL CONNECTORS

Precision Electronic Connectors For Commercial & Military Applications

RIGHT ANGLE SERIES PLUG & SOCKET TYPES FOR PRINTED CIRCUITRY

IN ACCORDANCE WITH MIL-C-55302, MIL-E-5400, MIL-C-28748 SPECIFICATIONS

.050", .100", .156", .200" CONTACT CENTERS



SERIES 145-5

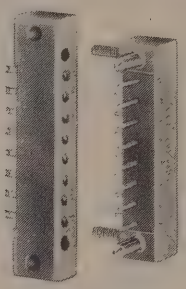
SERIES 145-5. 7, 9, 11, 15, 19, 23, 37 contacts. Solder cup on socket, dip solder pin for plug. For use in airborne electronic equipment in accordance with MIL-C-55302 specs.

SERIES 600-1-45. 17, 23, 25, 33, 41, 45 & 77 contacts on .050" center spacing. Right angle configuration of two and three rows of dip solder contacts.

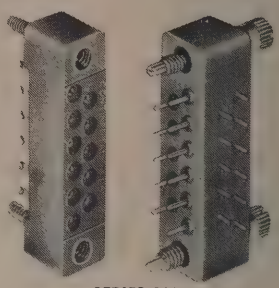
SERIES 600-1-50. 50 contacts on .100" center spacing.

SERIES 670. 4, 8, 10, 12, 13, 22, 28 single row contacts on .156" center spacing. Guide pins in plug and guide bushings in socket provide polarized mating of parts.

SERIES 683. 11,12,18, 19, 23, 32, 33, with polarizing screwlocks or guide-pins and guide sockets. Meet aircraft requirements for vibration and high altitude.



SERIES 670



SERIES 683

SERIES J RIGHT ANGLE OR STRAIGHT THRU WIRING — .050"/.100" CONTACT CENTERS

9, 11, 15, 21, 25, 31, 37, 51 CONTACTS

These plug and socket connectors are widely used in all electronic systems. Their size and rugged construction make them particularly adaptable to aircraft applications. They can be used for mounting on single or dual sided printed circuit boards of varying thickness. The contact configuration is excellent for flat cable use. Plug contacts are integrally molded into the rugged body material and are protected by a high strength, single piece molded shell of glass fiber reinforced phenolic. Molding configuration prevents mismatching of plug and socket.

Socket contacts are wire crimp removable and free floating. They feature a self-wiping action that eliminates the need for precious metal plating such as gold. Excellent conductivity and a low millivolt drop. Hoods are available.

ELECTRICAL AND MECHANICAL RATINGS:

Voltages	Breakdown	Recommended Test
At Sea Level	2000V. RMS	1325V. RMS
At 70,000 Ft.	400V. RMS	300V. RMS

Current Rating: 3 Amps Continuous ..... 5 Amps Max.
Minimum Creepage Between Contacts ..... .047"
Minimum Air Space Between Contacts ..... .047"
Male Contact Pin Diameter ..... .030"
Crimp Barrel for Socket Contact: Accommodates #22, #24, #26 AWG Wire

NOTES:

1. Body Material: Glass fiber reinforced phenolic Type MFH per MIL-M-14.
2. Contact Material: Copper alloy, gold plated.
3. Socket contact 2500-S2A22-39 must be ordered separately.
4. For electroplated tin contact add suffix "SN" to connector part number (J21P90-15-SN).

J51S RECEPTACLE USES REMOVABLE SOCKET CONTACTS

J51P90-15 PLUG RIGHT ANGLE WIRING & MOUNTING

ENLARGED VIEW OF REMOVABLE SOCKET CONTACT SHOWS DETAIL OF CLOSED ENTRY CONSTRUCTION

FOR COMPLETE CATALOG ON ANY SERIES WRITE OR PHONE:
CONTINENTAL CONNECTOR CORPORATION / DEPT. EM / 34-63 56th STREET, WOODSIDE, NEW YORK 11377 / PHONE SALES: (212) 899-4422

CONTINENTAL CONNECTORS

Precision Electronic Connectors For Commercial & Military Applications

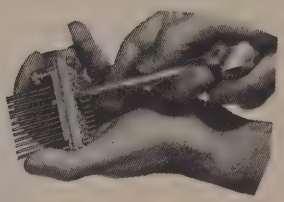
RACK AND PANEL CONNECTORS FOR VARIOUS EQUIPMENT

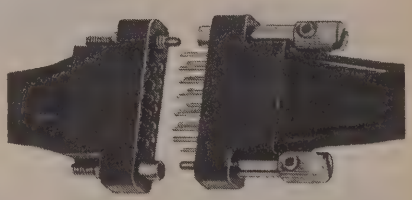
A complete line of high-reliability connectors for computers, missile, aircraft, communications and other critical electronic applications. In addition to standard specifications, these connectors can be supplied with such optional accessories as aluminum hoods, protective shells, polarizing screwlocks* and solder filled contacts. Various molding compounds are also available.

* PATENT NO. 2,746,022

MICROMINIATURE AND MINIATURE WITH CRIMP REMOVABLE CONTACTS

AVAILABLE WITH 7, 9, 14, 18, 20, 26, 34, 42, 50, 66, 75, 104 & 152 CONTACTS CONFORM TO MIL-C-28748 SPECIFICATIONS





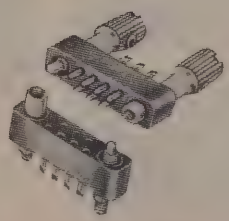
Continental Connector's removable contacts and wire crimp terminations eliminate all connector soldering operations. Contacts are supplied separately and wired independently of connector body, and can be readily replaced with simple, low cost hand tools. Connectors are available with guide pins and sockets or screwlock hardware.

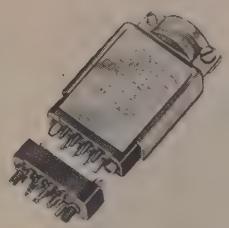
SERIES 25. Removable contact connectors are interchangeable with our Series 20 fixed contact types. .025″ and .045″ square solderless-wrap terminations with .062″ or .040″ pin diameters are also available. Optional aluminum hoods, protective shells and mounting plates can be supplied. Shielded crimp removable contacts for RG-178B/U and RG-196A/U coaxial cable can be intermixed in any combination with the standard type contacts. Select guide pins and sockets or polarizing screwlocks for mating hardware.

SERIES MMM. Five thru 75 contact sizes. Interchangeable with Series MM-22 fixed contact types. Can be supplied with guide pins and guide sockets, polarizing screwlocks and aluminum hoods.

SERIES 25MM. Center screwlock locking device. Available with 50, 76, 100 and 200 contact sizes. Contacts are on .100″ centers.

FIXED CONTACT MICROMINIATURE, SUBMINIATURE, MINIATURE





SERIES MM-22 MICROMINIATURE. Five to 104 contacts. Ruggedized to withstand shock and vibration extremes. Meet MIL-C-28748 specs or commercial type. Available with guide pins and guide sockets, polarizing screwlocks, cable brackets and aluminum hoods.

Breakdown Voltage (sea level), 2000V. RMS • Current Rating, 3A • Minimum Creepage Between Contacts, .070″ • Minimum Air Space Between Contacts, .040″ • Contact Center Spacing, .093″ • Pin Diameter, .030″ • Solder Cup, #22 AWG wire.

SERIES SM-20 SUBMINIATURE. Five to 104 contacts. Meet MIL-C-28748 specs or commercial type. Optional features include guide pins and guide sockets, polarizing screwlocks, protective shells and aluminum hoods.

Breakdown Voltage (sea level), 2000V. RMS • Current Rating, 5A Continuous, 7.5A Maximum • Minimum Creepage Between Contacts, .078″ • Minimum Air Space Between Contacts, .045″ • Contact Center Spacing, .125″ • Pin Diameter, .040″ • Solder Cup, #20 AWG wire.

SERIES 20 MINIATURE. Five to 104 contacts. Similar to above except larger size. Meet MIL-C-28748 specs or commercial type. Hexagonal configuration with 1, 4, 5, 7, 9 and 10 contacts is also available.

Breakdown Voltage (sea level), 3000V. RMS • Current Rating, 5A Continuous, 7.5A Maximum • Minimum Creepage Between Contacts, .125″ • Minimum Air Space Between Contacts, .070″ • Contact Center Spacing, .150″ • Pin Diameter, .040″ • Solder Cup, #20 AWG wire.

CENTER SCREWLOCK

SERIES 1900. 10, 22, 34, 50, 78, 104 and 152 contacts. Double lead thread action screwlock, stainless steel side channels and closed entry contacts for maximum reliability. Series 2500 available with 152 removable contacts.

Breakdown Voltage (sea level), 3000V. RMS • Current Rating, 10A Continuous, 13A Maximum • Pin Diameter, .062″ • Minimum Creepage Between Contacts, .110″ • Minimum Air Space Between Contacts, .050″ • Contact Center Spacing, .150″ • Solder Cup (also solderless-wrap and taper pin) #16 AWG wire.

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BUCHANAN® I/O CONNECTORS

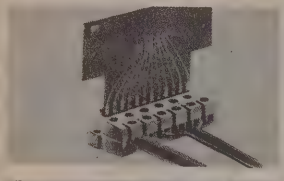
Input to Output...using only a screwdriver! Save up to $30.00 per PC card (materials and labor) with the BUCHANAN I/O System.

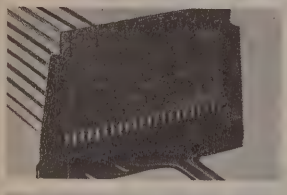
PC BOARD CONNECTORS

6 Standard Designs for *direct* connection of system wiring to system PC Boards.

- replace conventional edge connectors — eliminate up to 5 connections per circuit . . . no "mongrel" interfacing
- no soldering, crimping, wirewrapping, wire terminations — only a screwdriver needed.

Same basic design features as PCB1, 2, 3, but accepts 36-circuit double-sided PC boards . . . unique temperature-stabilization option . . . bifurcated, cantilever contact design . . . 0.156" CL spacing.



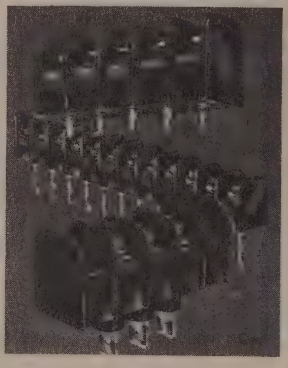


Combines barrier strip convenience with PC board plug-in efficiency . . . tri-barrier design for safety . . . accepts #22–#12 AWG wire sizes, unterminated or with ring or spade lugs . . . 45°-angle contact screws, with or without captive clamps, facilitate wiring . . . 300 V, 10 A/circuit . . . 8 circuits/connector standard . . . 0.375" CL spacing . . . provision for 2 mounting planes.

UL Component Recognition for field wiring . . . funneled wire entry . . . captive contact screws . . tubular-clamp wire contacts . . . high-pressure tuning fork contacts . . . 0.156" and 0.200" CL spacing . . . up to 44 circuits per connector, #12–#30 AWG wire sizes.

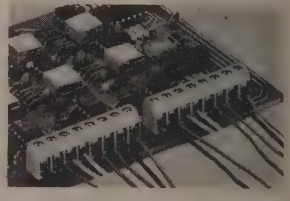
SINGLE-SCREW BARRIER BLOCKS

for PC board and panel applications.



- UL Component Recognized for field wiring; CSA Certified
- 2 standard contact spacings:
  SSB6 — 3/8" CL, 300 V, 20 A/circuit, up to 32 circuits
  SSB7 — 7/16" CL, 600 V, 20 A/circuit, up to 27 circuits
- wire sizes: one #12–#30 AWG or two #16–#30 AWG
- 3 base options (closed, flat, turret)
- 7 bottom terminal options (non-feed-through, circuit board, extended circuit board, wire wrap, right-angle wire-wrap, quick-connect, solder tail)
- screw, quick-connect, and solder-tab top-terminals
- 6 circuit identification options
- complete accessories selection

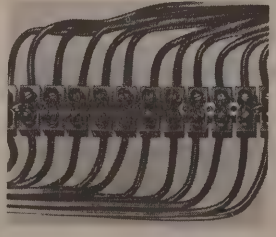
- vertical and right-angle-mounting configurations for installation flexibility
- tri-barrier wire enclosures for safety
- #12–#30 AWG wire sizes; 300 V, 15 A/circuit
- up to 36 circuits per block; .375" CL
- 7 bottom-terminal options (non-feed-through, 3 vertical, and 3 right-angle)
- screw, quick-connect, and solder-tab top-terminals
- 8 circuit identification options
- complete accessories selection



Miniature, high-density, box-contact terminal strips for PC boards with severe space limitations.

- height only 0.4" (10 mm) above mounting surface
- 0.197" (5 mm) pin spacing
- 100 V, 13 A/circuit; accepts #14–#22 AWG wires
- strips for 2, 3, 4, 5, 6, 8, 10, 12 circuits

DOUBLE-SCREW BARRIER STRIPS



- high circuit density
- 5 twelve-circuit models for #4 to #20 AWG wire
- 380 V, 20 A/circuit up to 500 V, 70 A/circuit ratings available
- mounting holes between each two circuits
- contact screws and wire contacts recessed for "dead-front" safety
- non-breakable, flexible polyethylene easily cut into fewer-circuit strips
- tubular contacts accept stripped solid and stranded unterminated wire

*For a complete Engineering Management Report on how the BUCHANAN I/O System achieves two major objectives — substantial cost reduction and significant product enhancement — plus complete data on these BUCHANAN I/O Connectors, call our nearest Regional Information Center (listed below).

amerace

CONTROL PRODUCTS DIVISION

Amerace Corporation, Control Products Division, Union, NJ 07083 U.S.A.
BUCHANAN® Terminal Blocks, Barrier Strips, & I/O Connectors.
AGASTAT® Time-Delay Relays, Control Relays, & Programmable Switches.
Regional Information Centers: Santa Fe Springs, CA, (213) 863-5753;
Elk Grove Village, IL, (312) 437-8354; Manhasset, NY, (516) 627-8809;
Atlanta, GA, (404) 261-1224.

BUCHANAN® TERMINAL BLOCKS

More kinds than any other source — from the smallest to the largest — the right type for every application — every one with famous BUCHANAN quality built in.

Designing to metric or DIN standards? BUCHANAN also has a complete line of *metric* blocks with features found only in European-style designs. For complete data, request BUCHANAN Catalog MB-100.

MOUNTING	AWG WIRE RANGE(1)	CONTACT TYPES(2)	AGENCY RECOGNITION	AMPACITY(3)	VOLTAGE(4)	NO. OF TERMINALS	HOUSING MAT'L(6)	CIRCUITS PER FOOT
	#30–#12	1, 2	UR CSA	30A	a–300V b–600V	Snap-fit sections enable user to assemble blocks with any number of terminals, or can be factory-assembled to order.		48
SURFACE AND CHANNEL	#22–#8	1, 2, 3	UL UR CSA (5)	50A	a–300V b–600V		N, P	32
		2, 3			c–600V d–750V		PPS	
		1, 2, 3, 5			c–300V d–750V		Ph	26
	#18–#4	1, 2, 3, 4, 6		90A	c–600V d–750V		N, P, Ph	20–24
	#12–#1/0	2, 4	UL UR CSA	155A			N	16
	#12–250MCM			270A			Ph	9
CHANNEL	#12 and smaller	6		30A			N	19
SURFACE & CHANNEL	#8 and smaller	1, 2, 3					N, P, Ph	16
			UR CSA(8)	15A				
SURFACE	#6 and smaller		UL UR CSA(5)	70A		2, 4, 6, 8, 12	Ph	19
	#4–600MCM	4	UL UR CSA	455A	c–600V d–2000V	1		5

(1) Depending on contact type.
(2) Contact types: 1—Tubular Clamp; 2—Tubular Screw; 3—Strap Screw; 4—A1/Cu Tubular Screw; 5— Quick-Connect; 6— Strap Clamp.
(3) Depending on wire size and contact type.
(4) a — NEMA Gen'l. Ind'l. Control Devices
b — NEMA Limited Power Ind'l. Circuits
c — UL, CSA, NEMA Ind'l. Control Stds. for . . .
d — Withstand voltages in excess of IEEE switchgear standards for . . .
(5) Strap screw, strap clamp, quick-connect contacts not UL Listed.
(6) N— Nylon; P — Polypropylene; Ph — Phenolic; PPS — Polyphenylene Sulfide.
(7) ERT Terminal Blocks are highly resistant to heat, radiation, and corrosion.
(8) Some models.

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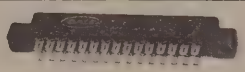
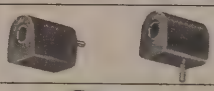
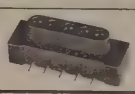
Elk Grove Village, IL, (312) 437-8354; Manhasset, NY, (516) 627-8809;
Atlanta, GA, (404) 261-1224.

DALE®

QUICK REFERENCE
CONNECTORS

For complete information, write or phone
DALE ELECTRONICS, INC., East Highway 50, Yankton, South Dakota 57078. Phone 605-665-9301

PRINTED CIRCUIT

DALE TYPE		BASIC DESCRIPTION
EBT 156 Edgeboard		Single readout modified tuning fork contacts with .156" spacing. For 1/16" boards. 6 to 22 contacts.
EB 7 Edgeboard		Choice of single or dual readout models with .156" x .140" grid spacing. Accepts card thicknesses from .054" to .071". 6 to 22 contacts.
EB 8 Edgeboard		Dual readout with .156" x .200" grid spacing. Accepts .054" to .071" card thicknesses. Choice of body materials. 6 to 25 contacts.
ES 1 & ES 5 Digital Display Connector		Single readout digital display connectors. Permit custom variations in substrate length, width, and number of contacts without tooling charge. Substrate lengths from 1.000" to 6.000".
ED 1 & ED 5 Edgeboard		Dual readout edgeboard connectors. Permit custom variations in substrate length, width and number of contacts without tooling charge. Substrate lengths from 1.200" to 4.500".
300 Dip Solder		Right angle or straight through terminals. 7 to 25 staggered contacts with .250" spacing (.125" grid). Meets applicable paragraphs of MIL-C-28748.
303 Dip Solder		45 contacts in compact 3-row design. Meets applicable paragraphs of MIL-C-8384.
315 Dip Solder		50 contacts with .200" spacing. Staggered rows provide a .100" grid.
PJ Test Point		Right angle or straight through types with dip solder pin for permanent mounting.
500SR5 Test Point		One-piece molding with 5 dip solder contacts for permanent mounting.

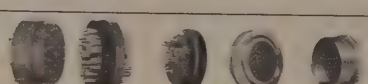
RANK AND PANEL

MM22, MM24 Microminiature		Choice of solder cup or dip solder contacts. 5 to 44 contacts with .09" spacing. Meets MIL-C-8384. Available with or without hardware.
SM20 Subminiature		Compact, lightweight. Fixed or turnable screwlocks. 5 to 75 contacts on .12" spacing. Meets MIL-C-8384.
S20 Housed		Lightweight. Protective housing and hood. For RF and power interconnect applications.

SIDE MOUNT

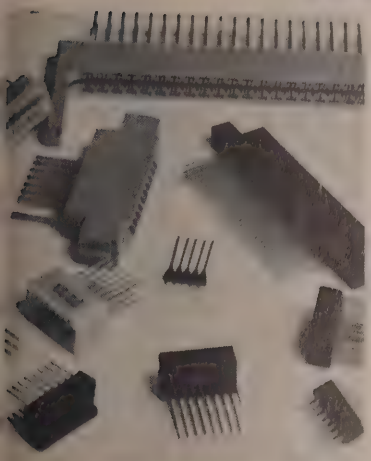
A20		Body components available with any desired pin and socket combination. Floating contacts. Hole through body permits flat or building block type mounting. Meets applicable paragraphs of MIL-C-8384. Special locking device on G16.
G20		
G16		

SPECIALS

QX32 QX72 & MX72 400 & 401		Umbilical and round keyed shell types.

ELECTRONIC CONNECTORS AND INTRACONNECTION SYSTEMS

ELECTRONIC CONNECTOR PRODUCTS



CONNECTORS & SOCKETS,
Standard or Custom

Dynatech proprietary fabrication and high volume assembly techniques offer low cost production of precision P.C. card edge connectors with 0.100", 0.125", 0.156" or 0.200" contact spacing and 14 or 16 pin DIP sockets. Custom designs to customer specifications.

EXCLUSIVE "ZIP" GOLD PLATING

Dynatech exclusive contact plating process reduces gold use up to 90% compared to conventional techniques. "ZIP" puts high density 23K gold on the contact surface where it's needed in thicknesses of 10 to 100 millionths. Nickel underplate available, but not required.

Exclusive Dynatech "ZIP" plating process puts gold on contact surface where it's needed, thus eliminating wasteful plating of non-contact surfaces.

INTRACON BACKPANEL INTRACONNECTION SYSTEMS

ALUMINUM BACKPANELS

Dynatech aluminum backpanels reduce external wiring using standard connectors and insulated layers for various voltage or grounding intraconnections. They also offer the versatility of mixing several connector types.

PRINTED CIRCUIT BACKPANELS

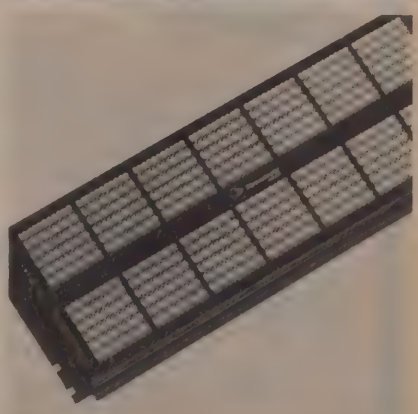
Dynatech two-sided and multilayer backpanels will intraconnect several random voltages and reduce external wiring. They use friction fit contacts that can simultaneously connect several plated-thru holes. Minimum thickness for the P.C. board backpanel is 0.125".

MICROPROCESSOR BACKPANELS

Dynatech backpanels simplify use of microprocessors such as Intel's, Motorola's and National's. Many standard configurations are available, but custom designs can be created from either aluminum or printed circuit backpanels.

TELEPHONE CROSS CONNECT BACKPANELS

Dynatech Cross Connect systems save cable, cut space 50% or more and reduce craftsman wiring time. Systems are directly interchangeable with accepted telecommunication systems.



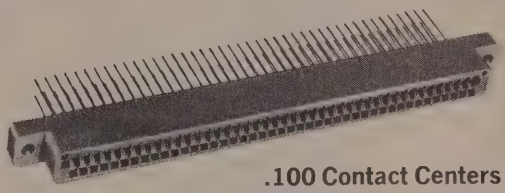
Dynatech CORP.
1225 East Wakeham, P.O. Box 1019
Santa Ana, California 92702
Phone: (714) 558-8755

eby™

CONNECTORS
CARD-EDGE
BOX EDGEBOARD
MOLDED MALE HEADERS

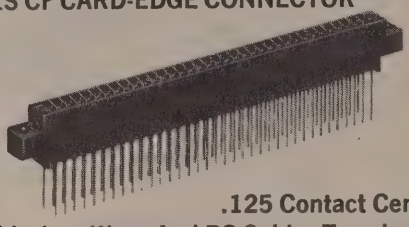
SOCKETS
INTEGRATED CIRCUIT
DIP PLUGS
INTERCONNECT JUMPERS

SERIES CM CARD-EDGE CONNECTOR



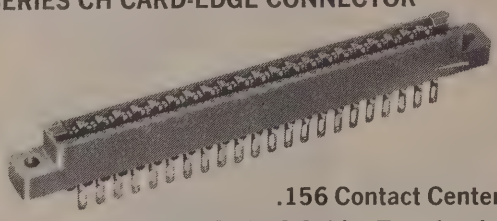
.100 Contact Centers
Solderless Wrap And PC Solder Termination

SERIES CF CARD-EDGE CONNECTOR



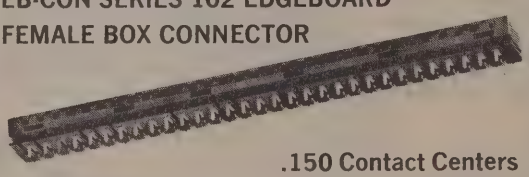
.125 Contact Centers
Solderless Wrap And PC Solder Termination

SERIES CH CARD-EDGE CONNECTOR



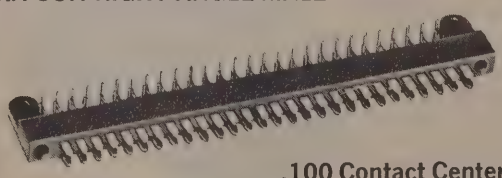
.156 Contact Centers
Solder Hole And PC Solder Termination

EB-CON SERIES 102 EDGEBOARD
FEMALE BOX CONNECTOR

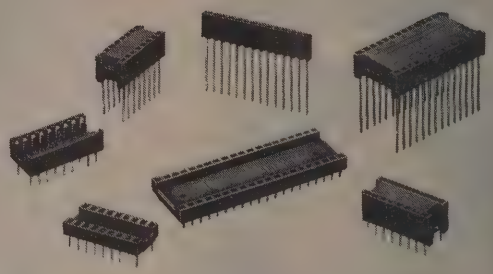


.150 Contact Centers
Closed Entry Female Receptacle Designed
To Mate With .025 Sq. Or Round Contacts

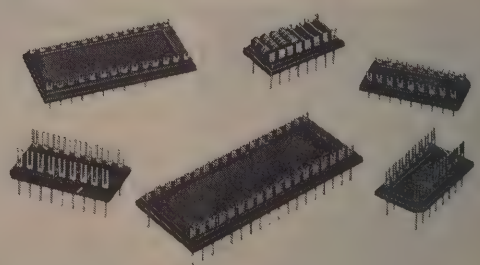
RA-CON RIGHT ANGLE MALE HEADERS



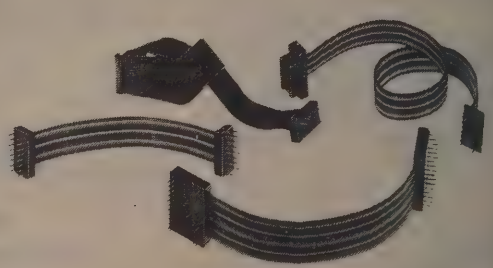
.100 Contact Centers
Right Angle Male Headers For Use With
Printed Circuit Boards



I.C. SOCKETS
STANDARD & LOW PROFILE



STANDARD DIP PLUGS

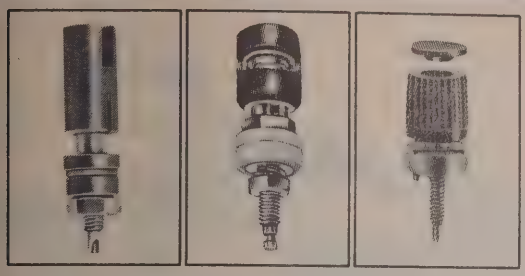


INTERCONNECT JUMPER CABLES

eby™

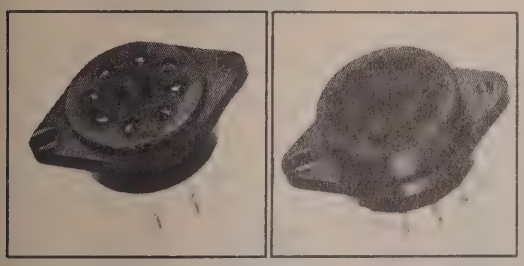
subsidiary of REDM CORPORATION, 4701 GERMANTOWN AVE., PHILA. PA. 19144
(215) 842-3000 TWX: 710-670-0452

BINDING POSTS . . . TEST POINTS . . . SOCKETS



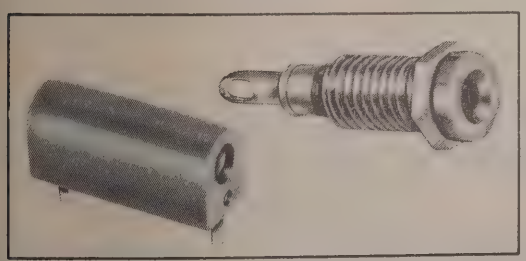
MILITARY BINDING POSTS, WATERPROOF BINDING POSTS, PANEL MOUNT BINDING POSTS

Eby produces more waterproof and panel mount binding posts per MIL-P-55149 than any other supplier. Binding posts are also available for commercial and industrial applications. They are supplied in panel mount, screw, and spring-activated.



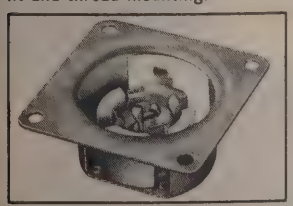
RELAY SOCKETS, ROUND, 8 CONTACT AND 11 CONTACT

8 and 11 contact relay sockets; molded integral saddles; rugged proven reliability; commercial prices.



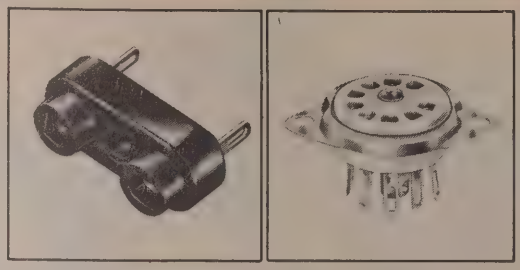
TIP JACKS

Tip jacks and test points per MIL-C-39024; plastic bodies; metal sleeves; screw machine and sheet metal contacts; press fit and thread mounting.



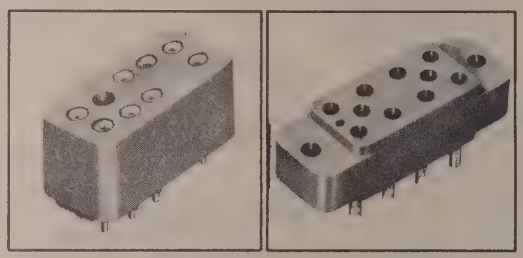
SPECIAL SOCKETS, POWER TUBE SOCKETS

Special and custom designed sockets and plugs, built to your specifications.



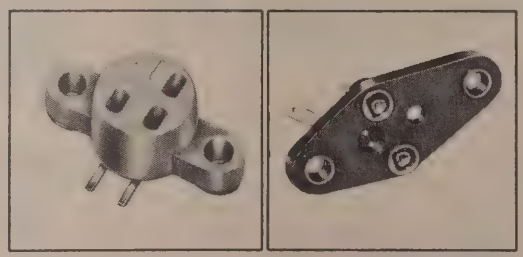
CRYSTAL SOCKETS, TUBE SOCKETS

Crystal and tube sockets; ceramic and plastic; Eby supplies more Q.P.L. listed sockets per MIL-S-12883 than any other manufacturer — the only listed supplier! 7 to 9 pin tube adaptors available.



RELAY SOCKETS, RECTANGULAR, 8 CONTACT AND 10 CONTACT

Military approved rectangular relay sockets, printed circuit and panel mounted.



TRANSISTOR SOCKETS

A broad line of transistor sockets, TO-66, TO-3, TO-5, etc., low cost commercial and industrial applications.

CONSIDER YOUR CONNECTION

eby™

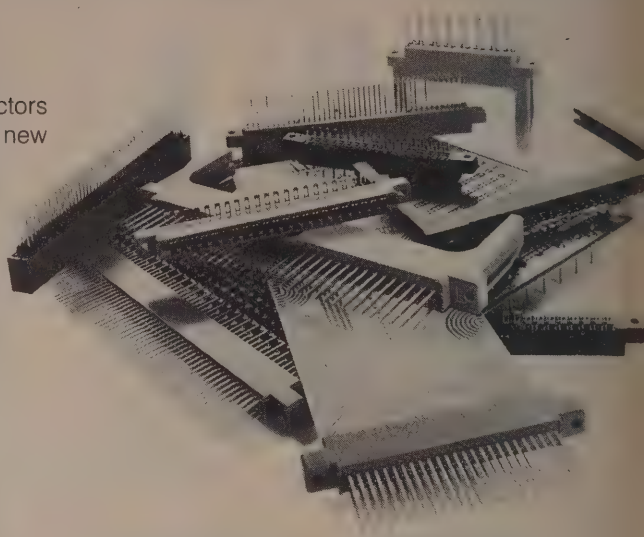
This is just a small sampling of our standard products — send for a catalog — consult us for special custom devices. Small and large volume.

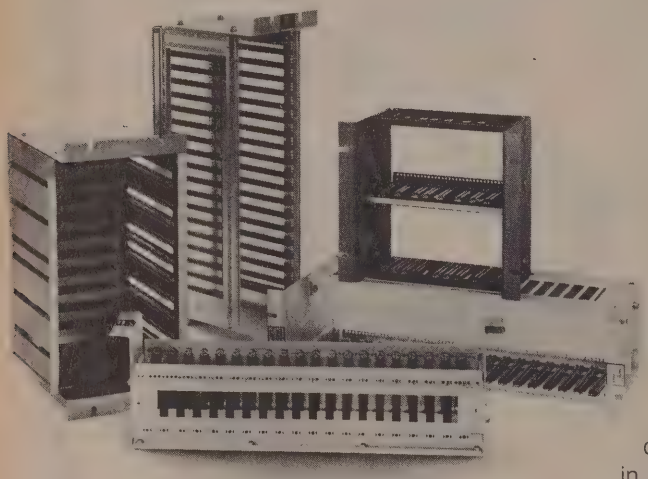
eby™ subsidiary of REDM CORPORATION, 4701 GERMANTOWN AVE., PHILA. PA. 19144
(215) 842-3000 TWX: 710-670-0452

Proven problem

CARD EDGE CONNECTORS

Elco has been the supplier of reliable card edge connectors for years. Now additional sizes in the standard line and a new line of wire-wrappable connectors with .156″ centers are offered. All standard contact spacings from .100″ to .156″ for all termination techniques are available including QPL, military qualifications to MIL-C-21097/21 and UL recognition. And they're immediately available from your local distributor.





PC CARD ENCLOSURES

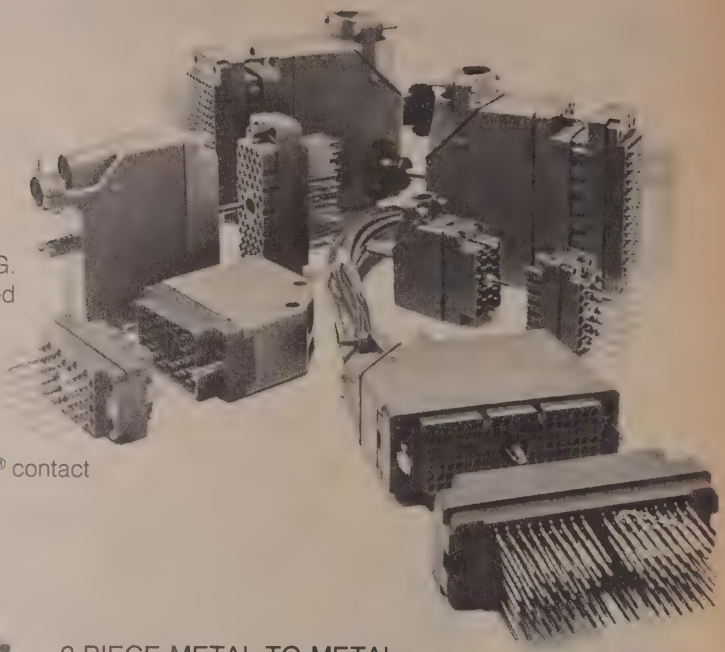
The versatile Varipak® II card enclosures are constructe from standard components and will accommodate any number of cards and card sizes to meet your custom re quirements. They come complete with guide plates, car guides, and connector mounting panels. Your local distributor offers immediate delivery on 64 standard models in 19″ and 24″ widths.

BACKPANEL SYSTEMS

Are you looking for compact, ready-made backpanel interconnects for your daughter cards to reduce costs? Elco offers metal plate backpanels with pc connectors for automatic and hand wire wrapping which provide built-in ground and voltage interconnections. To further simplify your task and eliminate wire wrapping, Elco offers pc backpanels in two sided and multilayer configurations providing all ground, power and signal interconnections for mounted card edge or metal-to-metal connectors with contact spacings from .100″ to .156″. All backpanels are custom engineered to fit your exact needs in sizes accommodating as many as 20,000 contacts.

Elco Connects!

solvers from Elco



/O AND RACK AND PANEL CONNECTORS

Meets every i/o wire size requirement from 18 to 30 AWG. They feature easy mating/unmating and locking of mated connectors with a single jack screw operation. High-density contact spacings range from .100" to .150" grids, with 20 to 165 contacts with solder, crimp, wire wrap and other terminations. Lightweight aluminum covers are available for cosmetic appeal, wire clamping and strain relief. They utilize the Varicon™ contact which has a 25 year record of reliable service.

2-PIECE METAL-TO-METAL PC CONNECTORS

For the user, who needs the most reliable card-to-card connection, end-to-end, at right angles or stacking connections, we offer the greatest variety of metal-to-metal contacts and connectors available anywhere. Expect off-the-shelf delivery from our distributors on most configurations that include .050" staggered, .100" to .200" spacing, 1 to 96 contacts, various termination styles, with or without card guides and hardware for most any application. Most are mil spec, QPL and UL recognized. Connections are made by our Varicon™ contact providing hermaphroditic, gas-tight joints with millions of operating hours proving their reliability.

LCO CORPORATION'S catalogs are available upon request r any of these products. In most cases, these products are mediately available from distributor stock. For custom products engineering assistance, we'll be glad to help you. Just call us, co connects . . . worldwide!

National Sales Office
Willow Grove, PA 19090
TWX 510-665-5573/215-659-7000

Elco Corporation
2250 Park Place
El Segundo, Ca 90245
TWX 910-325-6602/213 675-3311

GW Elco Corporation
a Gulf + Western manufacturing company

ational Sales Office, Willow Grove, PA 19090, 215-659-7000/TWX 510-665-5573
onnector Division, Huntingdon Industrial Park, Huntingdon, PA 16652, 814-643-0700/TWX 510-691-3117
terconnect Systems Division, 2200 Park Place, El Segundo, CA 90245, 213-675-3311/TWX 910-325-6602
perations in USA, Australia, Denmark, England, France, Germany, Israel and Japan.
ales offices throughout the world.

Bendix Electrical Components Division
Sidney, New York 13838
(607) 563-5325

Heavy Duty Cylindrical

MIL-C-22992

CUSTOM CABLING

DESIGN CHARACTERISTICS

- **Heavy duty, largest size** cylindrical
- **Current ratings to 200 amps**
- **Environmental resistant**
- **Quick mating, vibration resistant** threaded coupling incorporating
- **Easily maintainable** double stub thread

CUSTOMER OPTIONS

- **Nine mounting styles** to accommodate power and control circuitry
- **Eighteen shell sizes** from 10 through 52
- **Wide assortment of contact arrangements** - accommodating from 1 through a maximum of 104 circuits
- **Solder or crimp contacts**
- **Sizes 20 to 4/0 contacts** accepting wire sizes 20 through 4/0 AWG
- **Designed for use with jacketed cable**
- **Alternate positioning**

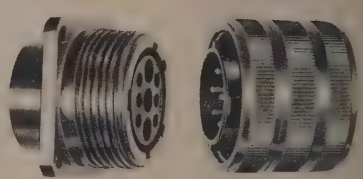
1

CLASS "L"

1. Highly suitable for industrial or military applications and is designed to meet demands of heavy power interconnections in current ranges of 40 to 200 amps. As safety is an all important factor, the connectors are designed with a programmed coupling sequence to provide making of grounded or neutral circuits prior to mating of power circuits. At unmating, the power circuits are broken before the ground or neutral. A unique arc quencing capability also provides a positive safety feature if the connectors are inadvertently disconnected under load. A 5 key polarizing system is used to assure that circuits with incompatible power characteristics (voltage, phase and frequency) cannot be mated. Cable lay patterns have been taken into account in the design of contact arrangements to facilitate termination of large conductors. Meets requirements of MIL-C-22992, Class L.

Catalog 12-052

2



QWLD

2. Heavy duty waterproof series with 5 key polarization for power and control circuits. Meets requirements of MIL-C-22992.

Catalog 12-052

QWL

An additional waterproof series, but with single key polarization. A more compact heavy duty connector, meeting the performance requirements of MIL-C-22992.

Brochure L-1080

3

CUSTOM CABLING

3. The Electrical Components Division maintains a custom cabling department to design and manufacture high quality cabling for industrial, aerospace, oceanic and military applications. Careful consideration is given to all aspects of a particular installation, with major emphasis given to environmental, reliability and cost requirements. Experienced engineering, model shop, and production personnel; complete molding, braiding, and fabrication capabilities, and a wide variety of tooling, are available to assist you with your cabling needs. If desired, cabling mockup service can be furnished. For further information, contact the Cabling and Special Products Group at the Sidney, N. Y. Plant.

Contact Sidney Plant for Referenced Catalogs.

Bendix **Electrical Components Division**

Sidney, New York 13838

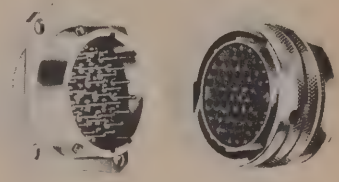
(607) 563-5325

MIL-C-38999, MIL-C-27599

DESIGN CHARACTERISTICS

1

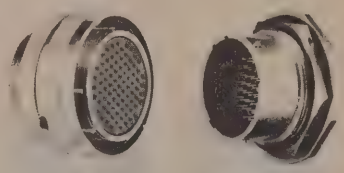
- **Lightweight, compact, hi-contact density** cylindrical
- **Operating voltage to 900 VAC (RMS)** at sea level
- **Environmental resistant**
- **Quick positive coupling** assured by three point bayonet coupling system
- **Visual confirmation** of complete coupling
- **Eliminates mismating** by the use of five key/keyway guide design
- **Error proof alternate positioning** insured by rotation of master keyway location during machining of shell



CUSTOMER OPTIONS

2

- **Five mounting styles** provide maximum flexibility in product design
- **Nine shell sizes** - 8 through 24
- **Fifty-six different contact arrangements** - to accommodate minimum of three circuits to a maximum of one hundred and twenty-eight circuits
- **Solder or crimp** rear release contacts
- **Size 22D to 12 contacts** accepting wire sizes 26 through 12 AWG
- **Eight finishes** provide protection in a wide variety of corrosive and mechanical environments
- **Coaxial (shielded) contacts** optional
- **Hermetic seal (glass fusion) receptacles**



JT, MS-JT

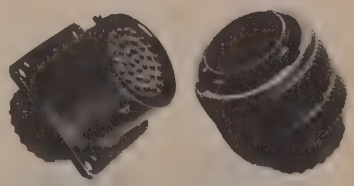
3

1. For applications requiring maximum weight/space savings and reliability. Also available in designs approved to MIL-C-38999 Series II (crimp termination) and MIL-C-27599 Series II (solder termination).

Catalog 12-090

LJT

2. Popular 100% "scoop-proof" (recessed pins) version of the JT family. Shell design is such that contacts cannot be bent or damaged by improper mating. The LJT offers maximum contact protection against bending and user aggressiveness. Also available in designs approved to MIL-C-38999 Series I (crimp termination) and MIL-C-27599 Series I (solder termination).



Catalog 12-090

SJT

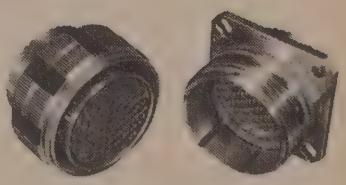
4

3. A further expansion of the basic JT family, incorporating the LJT 100% scoop-proof feature and standard mounting dimensions of JT and Pygmy types.

Catalog 12-091

TRI-START*

4. Designed for severe vibration, temperature and moisture environments the Tri-Start completely mates in one full turn. Lockwiring is eliminated in this self locking, quick coupling connector. Superior EMI shielding is achieved through the combination of grounding fingers and solid metal to metal mating. Universal mounting holes for front or rear mounting, and locksmith metal keying for alternate positions come with the Tri-Start. Potential contact damage is minimized in this 100% "scoop proof" MIL-C-38999 Series III type connector. Threaded Coupling.



*U.S. Pat. Pending

Brochure SL-306

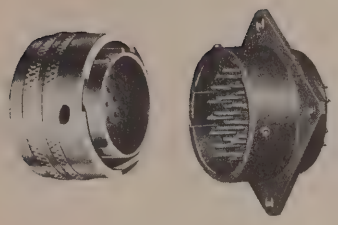
Contact Sidney Plant for Referenced Catalogs.

Bendix Electrical Components Division
Sidney, New York 13838
(607) 563-5325

Miniature Cylindrical (Pygmy)

MIL-C-26482, MIL-C-83723

1



DESIGN CHARACTERISTICS

- **Medium size,** widely used cylindrical
- **Operating voltage to 900 VAC (RMS)** at sea level
- **Environmental resistant**
- **Quick positive coupling** assured by three point bayonet coupling system
- **Visual confirmation** of complete coupling
- **Eliminates mismating** by the use of five key/keyway design

CUSTOMER OPTIONS

- **Seven mounting styles** provide optimum flexibility in product design
- **Ten shell sizes** - 6 through 24
- **Solder or crimp** front and rear release contacts
- **Sizes 20 through 12 contacts** accept wire sizes 20 through 12 AWG
- **Six finishes** provide protection in a wide variety of corrosive and mechanical environments
- **Coaxial (shielded) and thermocouple contact** options
- **Hermetic seal (glass fusion) receptacles**
- **Threaded coupling series** available
- **Alternate positioning**

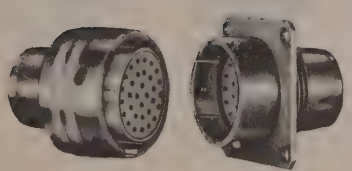
2

PT, MS-PT

1. Basis of popular "Pygmy" line, incorporating bayonet coupling and **solder** contacts. Also available in MS approved designs to MIL-C-26482, Service Classes E, F and P.

Catalog 12-070

3



PT-SE, MS-PT-SE

2. A derivative of the Pygmy line incorporating **crimp,** front release removable contacts with a metal clip retention system. The MS version is approved to MIL-C-26482 with MIL-C-23216 geometry contacts.

Catalog 12-070

PT-CE

3. Lowest cost Pygmy type connector, featuring **crimp,** front release removable contacts and a voidless one piece insert and grommet assembly offering continuous dielectric separation between contacts.

Catalog 12-070

Contact Sidney Plant for Referenced Catalogs.

Bendix Electrical Components Division

Sidney, New York 13838

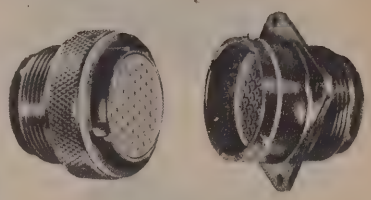
(607) 563-5325

PTS-DR, MS-PTS-DR

4. A series featuring the latest innovations in miniature cylindrical connector technology including **crimp** rear-release removable contacts, dielectric retention, electroless nickel plate, poly (amide-imide) inserts with "hard faced" closed entry socket design, and temperature capabilities to 392°F. Also obtainable as MS versions in accordance with MIL-C-26482 and MIL-C-83723.

Catalog 12-076

4



SP

5. **Solder** contacts and corrosion resistant hard anodic alumilite finish. Receptacles have been designed with enlarged flanges and mounting holes, providing for optimum back panel mounting.

Catalog 12-070

SP-SE, SP-CE

Features of the SP, SE and CE type connectors are merged to offer **crimp**, front release removable contacts with either metal or non-metal contact retention, in a corrosion resistant bayonet coupling design.

Catalog 12-070

5

PC

6. An additional derivative of the Pygmy line with double stub thread coupling, **solder** contacts and single key polarization. The series will meet the performance requirements of MIL-C-26482 and MIL-C-83723.

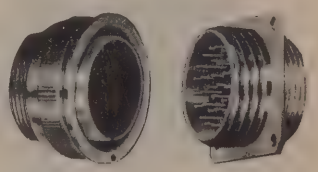
Catalog 12-070

PC-SE, PC-CE

Threaded coupling and **crimp**, front release removable contacts. Engineered for applications requiring a threaded coupling and the convenience of crimp contacts.

Consult Sales Office

6



Contact Sidney Plant for Referenced Catalogs.

Bendix Electrical Components Division
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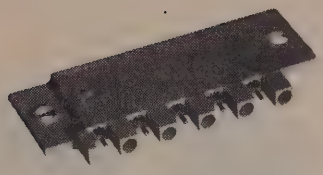
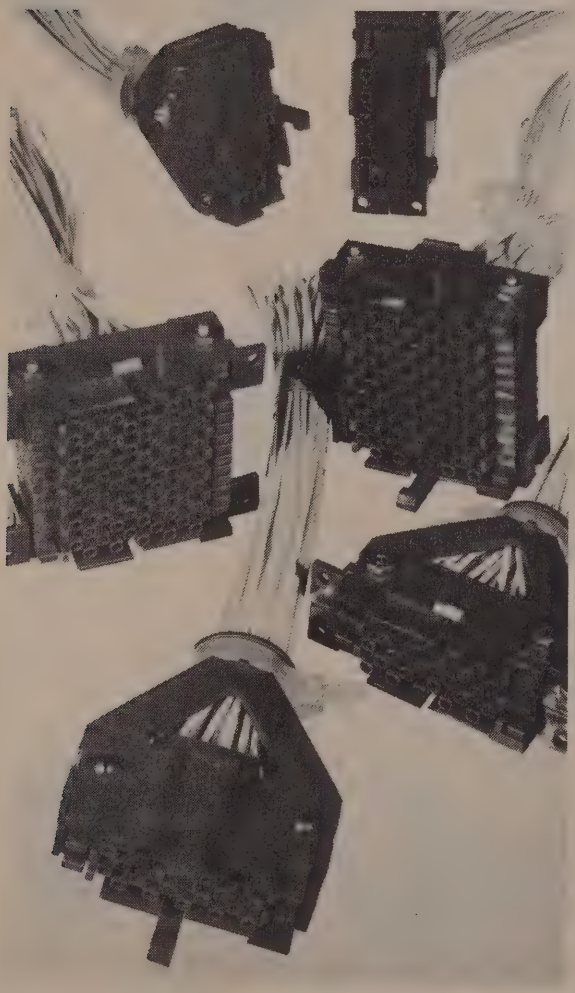
(607) 563-5301

Printed Circuit Board

B^3 modular "building block" low mating force





- FUNCTIONAL PROTOTYPE/LABORATORY TOOL
  the B^3 module is intended for long term work table or lab use
  rear release, rear removable, replaceable, low mating force contacts, using standard application tools
  removable, replaceable components

- REAL FLEXIBLITY FOR THE DESIGNER/PROTOTYPER
  build your own low mating force modular connectors
  virtually unlimited combinations of X - Y axis growth, polarization, wire bundle strain relief
  assemble "as you need" modular buildups in Two Piece, Rack and Panel, Latchable Plug and Receptacle, or PCB Input/Output Connector configurations
  low mating force interconnection innovation at a fraction of prototype cost
  prototype or breadboard interconnections can be changed with a minimum of expense and lost time
  crimp or PC stud termination
  contacts on .100 inch center to center spacing, square grid

- AVAILABLE IN A HANDY KIT
  to provide an inexpensive introduction to LOW MATING FORCE INTERCONNECTIONS.

Brochure SL-311

Contact Sidney Plant for Referenced Catalogs.

Bendix Electrical Components Division
Sidney, New York 13838
(607) 563-5301

Printed Circuit Board

B^3 bristle brush bunch low mating force

DESIGN CHARACTERISTICS

- 70 to 90% reduction in mating force. Only 1/2 ounce typical contact engaging and separating forces
- High circuit count interconnections to 400 contacts per connector
- Two, three and four row patterns, 10 to 100 contacts per row, in one contact per row increments
- Over 20,000 mating cycles with Bendix B^3 Bristle Brush Bunch contacts*
- 0.100 in. center to center contact spacing, square grid
- Superior electrical characteristics - redundant current paths, low constrictive resistance, stable time/life contact resistance, uniform current densities
- Serviceability - removable crimp contacts, repairable PC stud and solderless wrap contacts
- Board support structure reinforcing reduced
- High performance polyester dielectric moldings

CUSTOMER OPTIONS

- Variety of contact terminations and platings
- Accessories to suit latching, piloting and polarization variations
- Up to 256 keyed mating polarizations

MOTHER BOARD, DAUGHTER BOARD

1., 2. Two piece PCB Connector featuring crimp removable, PCB Stud or solderless wrap contacts in the MB Series and field repairable 90° PCB Stud contacts in the DB Series.

INPUT/OUTPUT

3. Rear release, rear removable crimp contacts for discrete wire cabling. I/O Connector Series mates with standard MB and PC Receptacle Series to provide external inputs/outputs.

PC

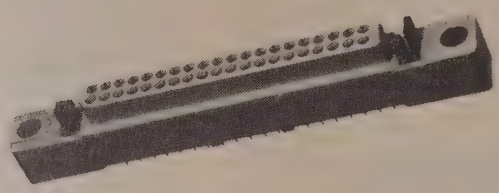
4. 90° PCB Stud contacts for side mounting on board. Mates with DB and I/O Series.

Brochure SL-305

*U.S. Pat. No. 3,725,844

Contact Sidney Plant for Referenced Catalogs.

1



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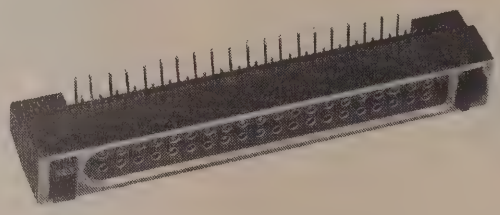

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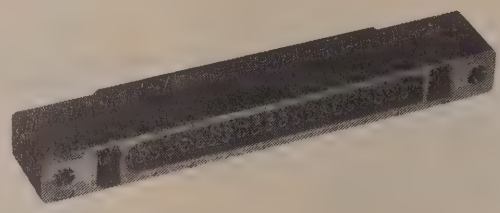

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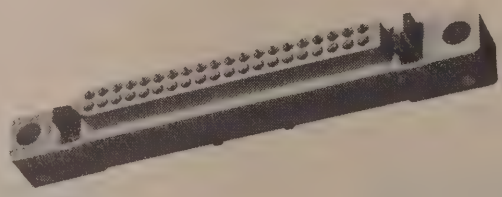


Bendix Electrical Components Division
Sidney, New York 13838
(607) 563-5384

RF Connectors

MIL-C-39012, MIL-C-3655, MIL-A-55339

1

BNC, TNC SERIES MIL-C-39012

1. Small, lightweight and environmental characterize connectors in this series. In bayonet-lock or threaded coupling versions, the choice is yours, you get optional positive contact captivation and the new 30 second SQUARE-CUT assembly. Excellent electrical performance is available to 11 GHz at temperatures to 250°C with a rated 500 volts.

Square-Cut Brochure, SL-283

N SERIES MIL-C-39012

2. Designed for general purpose medium size RF Cable such as RG-8/U, this weatherproof, threaded coupling connector has a 1500 volt rating and an 11 GHz frequency limit.

TWINAX SERIES MIL-C-3655

3. Offered with bayonet-lock or threaded couplings and clamping or crimp-on hardware for twinax cable. Twinax is described as an insulated twisted pair contained in an outer shield which is limited to very low frequency signal applications because of high transmission losses above 10 MGz.

Polarized BNC Connector Brochure, SL-289

2

TRIAX SERIES

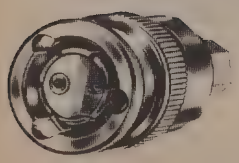
4. Offered with bayonet-lock or threaded couplings and clamping or crimp-on hardware for triax cable. Triax is described as an insulated center conductor contained in two concentric outer shields, insulated from each other, providing three separate cable conductor paths.

ADAPTERS MIL-A-55339

5. Between series and within series adapters are available for BNC, N and C Series connectors.

Ask for the RF Connector Catalog 1069

3

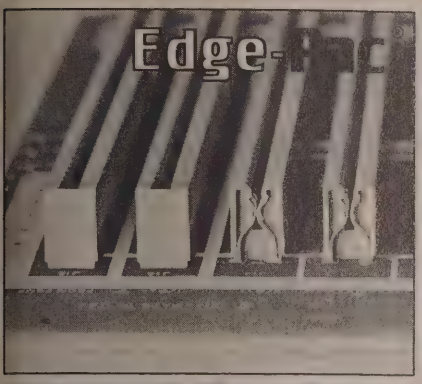


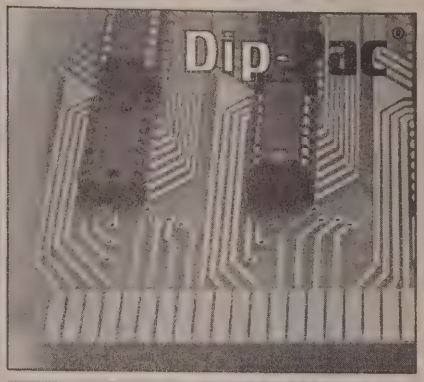
4

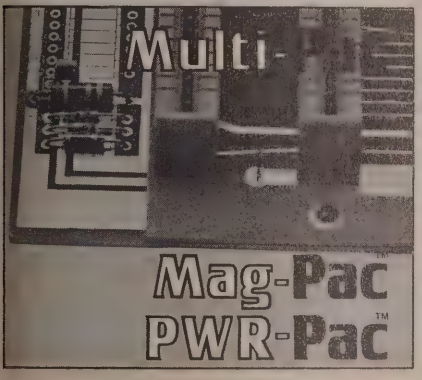
5

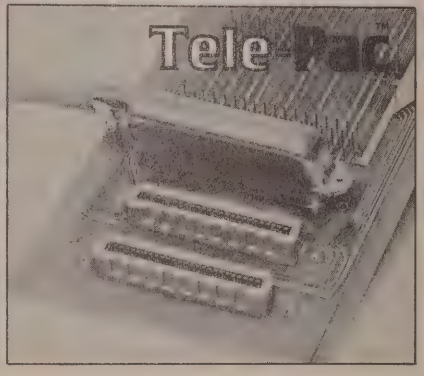
Contact Sidney Plant for Referenced Catalogs.

The leader in press-fit backpanels...









Patented backpanel concepts, plus complete in-house capabilities, give you low-cost reliability that's become the standard for the rest of the industry to shoot for.

Edge-Pac®
Patented card-edge backpanel is the springboard for the complete ELFAB line. Each system is custom designed for your special application.

Multi-Pac®
- External wiring eliminated or reduced cuts cost.
- Up to eight planes of circuitry.

PWR-Pac™
- Pure copper planes for low voltage / high current applications.
- Outputs standard to your specifications.
- Circuit boards and planes in backpanel.

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Dip-Pac®
- Dip socket receptacles with Edge-Pac or Multi-Pac design.

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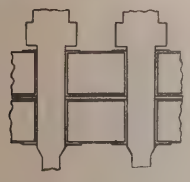
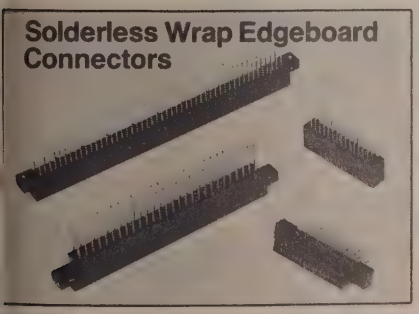
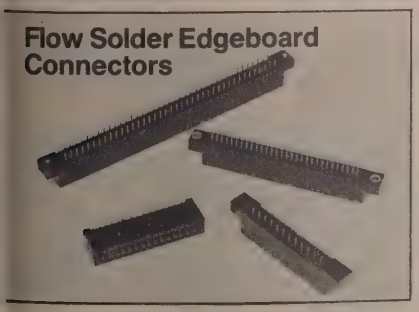


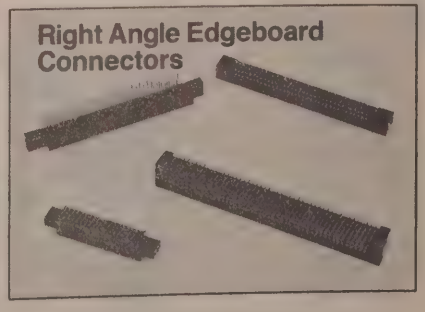
...and your best source for connectors.



Solderless Wrap Edgeboard Connectors
- .025" square termination.
- Bifurcated modified bellows type contact.
- Positive contact for low current loss, yet light touch for insertion / removal durability.

Flow Solder Edgeboard Connectors
- .100", .125", .150", & .156" spacing.
- For .062 PC board.





Right Angle Edgeboard Connectors
- .100", .125", .150" & .156" spacing.
- For .062 PC board.

Elfab — a dependable supplier
When you deal with Elfab, you can be sure that products will conform exactly to your specifications. Discuss your needs in existing or planned applications with us. Call or write your Elfab representative or distributor (connectors only) for complete information on the Elfab product line.

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EMC Interconnection Specialists

ELECTRONIC MOLDING CORPORATION
96 MILL STREET/WOONSOCKET, R. I. 02895 U.S.A.
PHONE (401) 769-3800 TWX 710-387-1350

This ready-reference lists the most widely applied components from the catalog. For convenience in selection, each popular item is both pictorially shown and tabulated according to its specific plating, material and color combinations available for immediate delivery from stock.

For detailed specifications on components consult the catalog

Contact the factory for details and catalog.

STANDOFF TERMINALS

TYPE NO.	PART NO.
1	2772-4-1 2772-14-1 4632-14-1
12	2938-14-1 2938-17-1 2939-14-1 2940-14-1
105	5144-5-1

FEED THRUS

TYPE NO.	PART NO.
119	5446-4-1

FEED THRU-THRU HOLE

TYPE NO.	PART NO.
2	2497-4-1,-9 2598-4-1
10	2894-14-1 2925-4-1 2927-4-1 3097-4-1 4479-16-1 4487-4-1

FEED THRUS

TYPE NO.	PART NO.
3	4639-4-1
7	4616-4-1 4616-16-1 5129-4-1
13	5979-4-1
9	2819-5-1
135	5141-5-1

ULTRA MINIATURE

TYPE NO.	PART NO.
10	4547-4-1 4547-14-1
12	3337-4-1
117	5428-17-1

FEED THRU END HOLE

TYPE NO.	PART NO.
6	2803-14-1
8	5128-4-1
51	4338-67-0,-1

TEST JACKS

TYPE NO.	PART NO.
158	6220-217-2 Also -3,-4,-5,-6
85	6304-247-0 Also -3,-4,-5,-6,-8 & -9
76	4836-165-0 Also -2,-4,-6
78	4928-113-9
77	4879-125-0 Also -2,-3,-4,-5,-6 & -9
104	5173-125-0 Also -2,-5 & -9 5173-143-2
88	5075-139-1 & -5

INSULATED SPACERS

TYPE NO.	PART NO.
83	3329-53-5
84	3328-53-5

MIL-T-55155 TERMINALS

TYPE NO.	PART NO.
91M	2989-52-0 Also -1,-5,-6 & -9 2990-52-5

THREADED NURL-LOC FEED THRUS

TYPE NO.	PART NO.
37	4179-148-1
70	4806-165-1

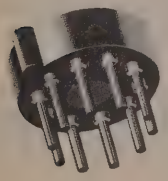
MOLDED STANDOFF TERMINALS

TYPE NO.	PART NO.
89 Single turret	2014-5-1 2014-67-1 2020-5-1 2503-5-1 2310-67-1 2333-5 -1 2013-5 -1 & -5 2019-5 -1 & -5 5684-52-6 & -9 5684-5-1 5685-52-6 2321-5 -5 2037-5 -1
91 Double turret	2385-5 -5 2376-14-1 2055-14-1 4024-5 -1 2522-5 -1 2162-5-1
93	5627-14-1 5629-52-6 4077-5-1 2723-14-1
94	
95	5702-52-6
98 Straight pin	2003-5 -1 2762-14-1 6051-52-6 4602-14-1 4604-14-1
101 Bifurcated	2304-14-1 Also -4,-5 2840-5 -1 & -5 2308-5 -1 Also -4 & -5 3340-5 -1 3340-52-1 4999-5 -1 2871-5 -5
100	5324-5-1

THREADED FEED THRUS

TYPE NO.	PART NO.
32	4363-5 -1
33	4007-14-1

TO-5 OP AMP SOCKETS



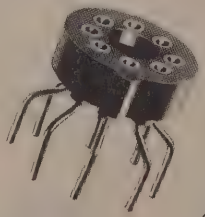
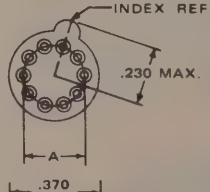
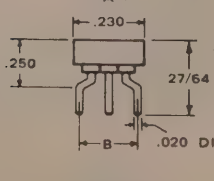


FIG. 3





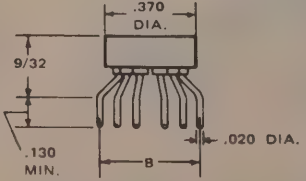


FIG. 4

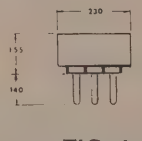


FIG. 1

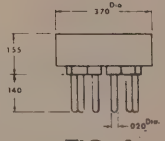


FIG. 2

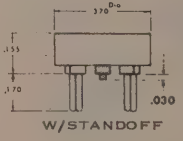


FIG. 2A

FIG. 5

FIG. 6

PART NO.	FIG. NO.	NO. OF PINS	A DEVICE LEAD CIRCLE DIA.	B TERMINAL CIRCLE DIA.	DESCRIPTION
7017-362-5	1	3	.100	.100	STRAIGHT LEAD TERMINAL
7019-362-5	1	4	.100	.100	
7003-362-5	2	3	.200	.200	
7004-362-5	2	4	.200	.200	
7006-362-5	2	6	.200	.200	
7008-362-5	2	8	.200	.200	
7009-362-5	2	8	.230	.230	
7070-362-5	2A	8	.230	.230	
7010-362-5	2	10	.230	.230	
7012-362-5	2	12	.275	.275	
7073-362-5	3	3	.100	.200	BENT LEAD IN CIRCULAR PATTERN FOR EXPANDED CIRCUITRY
7074-362-5	3	4	.100	.200	
7075-362-5	3	3	.100	.150	
7076-362-5	3	4	.100	.150	
7058-362-5	4	8	.200	.400	
7059-362-5	4	8	.230	.400	
7064-362-5	4	10	.230	.400	
7069-362-5	4	12	.275	.400	
7061-362-5	4	10	.230	SEE FIG.5	BENT LEAD GRID PATTERN
7068-362-5	4	8	.200	SEE FIG.6	

CUSTOMIZED WIRE-WRAP® PANELS
for any application...

Superior design and superb construction result in EMC's unsurpassed performance in pin-in-board packaging panels. The EMC line includes a wide selection of hi-density Wire-Wrap® panels, with input/output sections for male/female cable assemblies or plug-in edge connectors. EMC panels are available in 2 or 3 levels of wrap, with 12 to 180 or more positions. Five patterns are standard (14 or 16 pin, with V and G committed or uncommitted, plus universal). Board thicknesses of 1/8" or 1/16", as well as a variety of terminal plating styles, are available.

Custom panels are designed to reduce wrapping costs to an absolute minimum, to conform to special I/O requirements, and in layouts and shapes to complement existing systems. All EMC panels utilize patented* Nurl-Loc® Funnel-Entry terminals, recognized throughout the industry for superior holding power and ease of assembly. The Nurl-Loc design prevents twising during wrapping, and greatly simplifies terminal replacement, if needed. Most important, Nurl-Loc spreads stress evenly thoughout the board, resulting in flatter non-warping panels with more accurate true positions of terminals. The Funnel-Entry feature vastly simplifies manual or automatic I.C. lead insertion.

*U.S. Pat. No. D-223,109 Nurl-Loc® Electronic Molding Corp. Wire-Wrap® Gardner-Denver Co.

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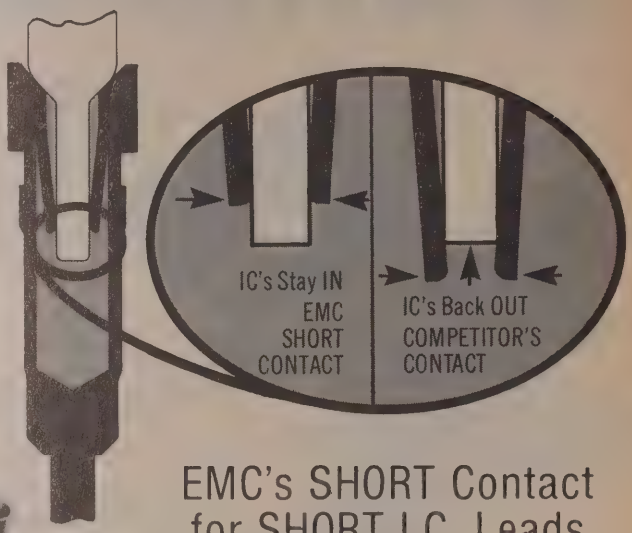
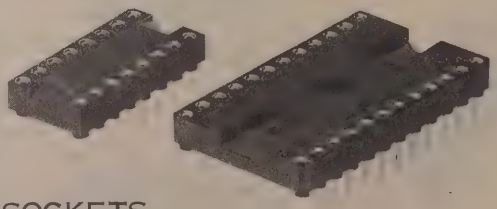
Interconnection Specialists



EMC's SHORT Contact for SHORT I.C. Leads

Many newer IC's have shorter or highly tapered leads. If plugged into longer standard contacts, lateral pressure caused by the angle of the contacts vector into a constant potential ejection force. Add a little vibration from nearby equipment, and out they come. EMC's new four-finger Short Contacts move the lateral pressure well up onto the body of the lead... grab and hold leads even .095 inches long. Specify Short Contacts in EMC's full line of sockets and packaging panels...field-proven for over a full year in actual usage.



LOW PROFILE SOCKETS

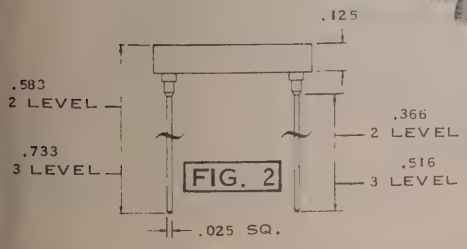


FIG. 2

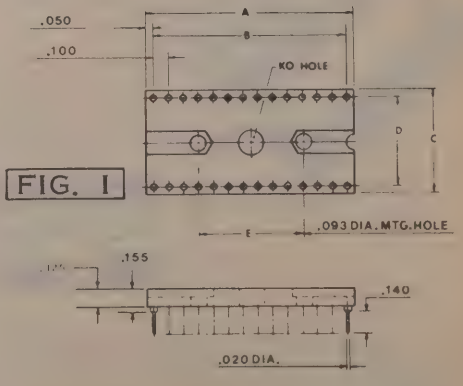
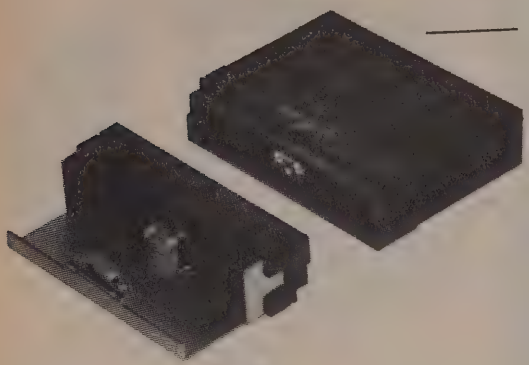


FIG. 1

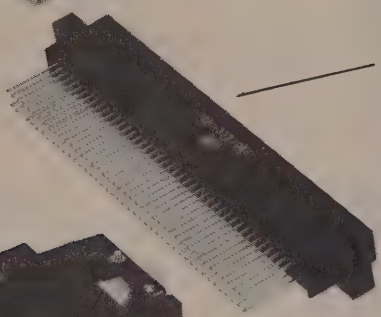
FIG. 1 SOLDER TAIL PART NO.	FIG. 2 2 LEVEL WRAP PART NO.	FIG. 2 3 LEVEL WRAP PART NO.	NO. OF PINS	A	B	DIP SPACING C	D	E
7086-362-5	7144-362-5	7143-362-5	6	.295	.200	.395	.300	*
7048-362-5	7121-362-5	7049-362-5	8	.395	.300	.395	.300	*
7087-362-5	7146-362-5	7145-362-5	10	.495	.400	.395	.300	*
7014-362-5	7027-362-5	7023-362-5	14	.695	.600	.395	.300	*
7016-362-5	7026-362-5	7025-362-5	16	.795	.700	.395	.300	*
7197-362-5	7853-362-5	7854-362-5	16	.795	.700	.495	.400	*
7018-362-5	7117-362-5	7034-362-5	18	.895	.800	.395	.300	*
7198-362-5	7855-362-5	7856-362-5	20	.995	.900	.395	.300	*
7022-362-5	7119-362-5	7037-362-5	22	1.095	1.000	.495	.400	.800
8540-362-5	8541-362-5	8542-362-5	24	1.200	1.100	.495	.400	.700
7024-362-5	7031-362-5	7038-362-5	24	1.200	1.100	.700	.600	.700
7028-362-5	7032-362-5	7039-362-5	28	1.400	1.300	.700	.600	.700
7036-362-5	7120-362-5	7041-362-5	36	1.800	1.700	.700	.600	.700
7040-362-5	7122-362-5	7042-362-5	40	2.000	1.900	.700	.600	.800

FUJITSU: CONNECTORS



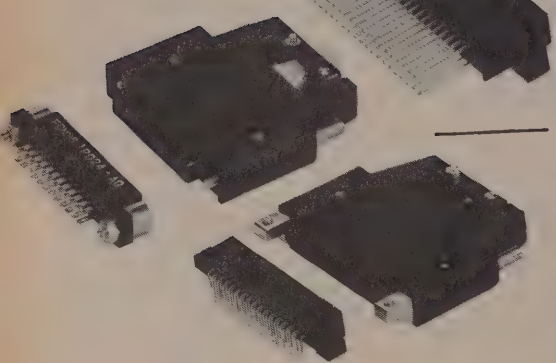
MULTI CABLE CONNECTORS
FCN120

High quality 48-position multi-cable connector matches pin for pin with IBM's Serpent Connectors and AMP's Amplimate Connectors. Gold-over-nickel finished contacts are positively locked into the housings. UL recognized glass-filled polycarbonate construction makes the Multi-Cable Connector heat stable, fire resistant and self-extinguishing. Current rating: 6A maximum. Accommodates wire sizes AWG #24 to #32.



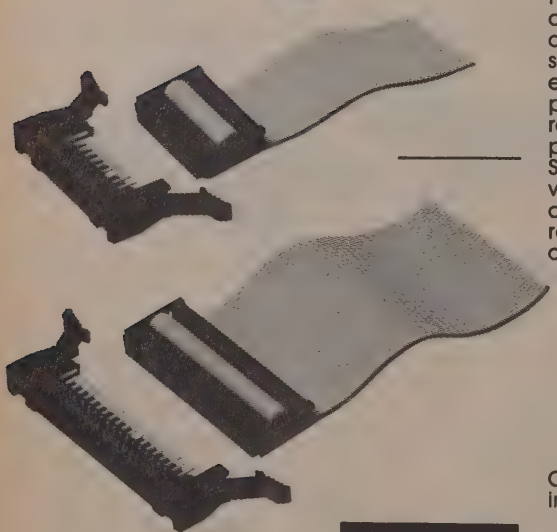
CARD EDGE PC BOARD CONNECTORS
FCN330

Twin gold plated contacts have .1 inch spacing and .2 inch row spacing. Solder plated terminals are suitable for either direct soldering or wire-wrapped connections. 3A at 300 Vdc. Comes in choice of 22, 30, 36, 43, 44 or 50 x 2 pins.



2-PIECE PC BOARD CONNECTORS
FCN-360

Designed specifically to be mounted on PC boards. The terminals have .1 inch spacing to accommodate the popular printed circuit grid. 3A at 250 Vac. Accommodates wire sizes AWG #23 to #28, depending on type. Receptacles are made with slightly larger openings to help guide the contact pins to instant connection. Available with eyelet terminals, wire-wrap, crimp, straight and right angle. Any combination of plug and receptacle is possible.



FLAT CABLE CONNECTORS
FCN-700

Faster installation, greater dependability and reduced labor costs. .05 center-spaced flat cables of 20 to 60 conductors connected in seconds. 1A at 250 Vac. Accommodates wire sizes AWG #28 stranded or #30 solid. A special locator plate ensures positive cable to cable contact alignment and field proven gold-over-nickel-plated U-contacts provide corrosion resistant, gas tight connections. Unique locking mechanism prevents accidental disconnection from vibration and shock. Snap-action release. The FCN-700 Series comes in choice of vertical, right angle and wire-wrap headers; open or closed covers for both end and through cable applications. Prices range from $1.00 for 10,000 pieces. Slightly higher, depending on model and quantity ordered.

Call or write Fujitsu America, Inc. for literature or more information on any of these products.

FUJITSU

FUJITSU AMERICA, INC.

COMPONENT SALES DIVISION
910 SHERWOOD DRIVE LAKE BLUFF, ILLINOIS 60044 TEL. (312) 295-2610 TWX: 910-651-2259

AND CAPACITORS AND RELAYS AND

DEPT. EM, EXCEL PRODUCTS COMPANY INC.
401 Joyce Kilmer Ave., New Brunswick, N.J. 08903
(201) 249-6600 • TWX 710-480-6255

PLEASE WRITE FOR FREE CATALOGUE

Excel manufactures in-house every standard panel made by Augat and others. They are completely interchangeable in every manner.
Excel manufactures complete ranges of newest versions of ECL and Shottky panels.

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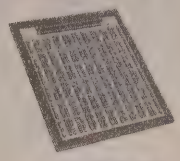
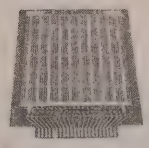
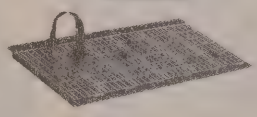
ALL UL APPROVED



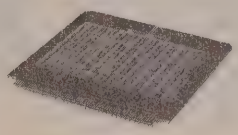
EXCEL SERIES 1000
14+V&G or 16+V&G pin patterns in 30 or 60 positions.



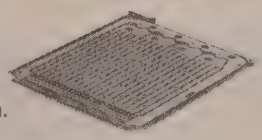
EXCEL SERIES 2000
14+V&G or 16+V&G pin patterns 30 or 60 position.
Gold finger edge connector take off.



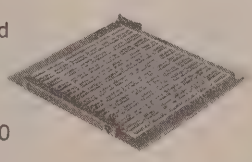
EXCEL SERIES 3000
30 position to 240 position.
Available in all pin patterns including 24 pin. Also universal 50 pin rows. Sockets or feed thrus in I/O areas.



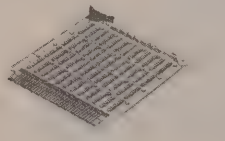
EXCEL SERIES 4000
60 position available in all pin patterns including universal 50 pin rows and also combination 14 and 16 pin patterns.



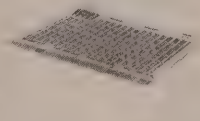
EXCEL SERIES 5000
Edge board connections-provision and hardware for mounting voltage regulators. 20 rows of 62 contacts each.



EXCEL SERIES 6000
Complete range of high density DIP packaging panels in all patterns—60 and 72 positions including 20 rows of universal 50 or 58 contacts. 1/16" or 1/8" thick. Can accommodate IC's with legs centered at .300, .400 and .600.
All panels supplied with high density 120 pin 3 row male .100" centers connector affixed. Female connectors available separately.

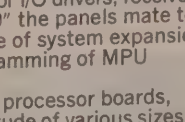


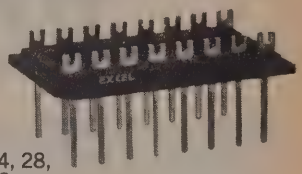
EXCEL SERIES 7000
Series edgeboard 24 position—special sockets and slotted pins for variable voltage and ground and mounting components. 14-16 patterns.



EXCEL SERIES 8000
8430 and 8460 are Mini Panels to interface with Data General's Nova® computers. Series 84A1 and 8532 are Mini Panels to interface with DEC PDP8® and PDP11® computers.

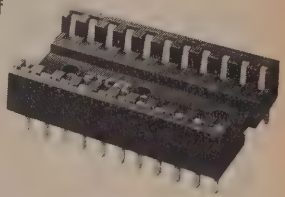
MPU PANEL EXCLUSIVE—
EXCEL SERIES 9000
This is a new family of pluggable panels for Microprocessor kits. Panel #9045-3BD-60 accommodates nearly all MPU kits currently available. Memory panel #9042-3BD-60 accepts any 16 - 18 - 22 or 28 pin LSI, RAM, ROM or PROM in 4K byte increments. Both panels have all necessary provisions for I/O drivers, receivers, buffers and control lines. Measuring 6" x 10" the panels mate to standard 44 pin edge connectors for ease of system expansion during prototyping, evaluating and programming of MPU devices.
For the first time, most requirements for processor boards, memory boards, I/O boards and the multitude of various sizes of panels used for MPU devices, and in the various MPU kits can be condensed into and handled by the two new **Excel** panels.



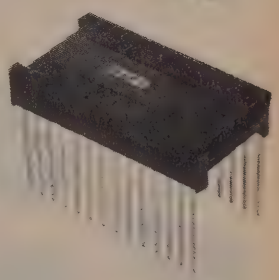


EXCEL SERIES 400
Component leaders 14, 16, 17, 24, 28, 36, 40- glass filled polyester SE-O, Phosphor Bronze, Gold over nickel or bright tin covers available.

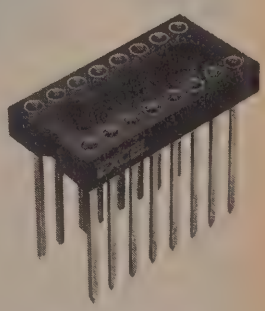
EXCEL SERIES 500
Low Profile. 8-40 pin solder tails, gold over nickel or bright tin plated. Glass filled Polyester SE-O. Beryllium copper holds the edge of IC leg for better contact.



EXCEL SERIES 600
Low Profile. Low cost 8-40 pin solder tail. Gold over nickel or bright tin. Glass filled Polyester SE-O. Beryllium copper holds the flat of the IC leg. End stackable.



EXCEL SERIES 700
Standard Profile. 8-40 pin wire wrap or solder tails. Contact is gold over nickel or bright tin plated Phosphor Bronze. Body is SE-O rated glass filled Polyester. Tapered entry holds the edge of IC leg for best contact.



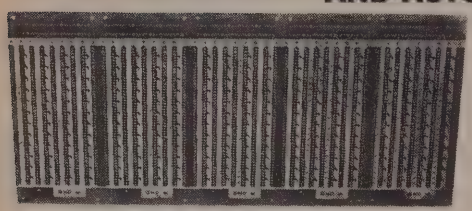
EXCEL SERIES 800
8-14-16-22-24-28-36-40-42-64
Highest quality available. Precision Swiss screw machine contacts. Wire wrap 1, 2 or 3 levels. Solder tails or component headers. Terminal contact is beryllium copper over nickel, terminal body is brass, gold over nickel or tin plated. Body for 8-14-16 contact is 94V-O rated Polyester for 18-64 body is 94V-O rated FR-4 Glass Epoxy. Very low profile.
Any size custom DIP — available.

EXCEL MANUFACTURES IN HOUSE
WIRE WRAPPING — FULLY AUTOMATIC OR SEMI-AUTOMATIC
CUSTOM I. C. PLUGGABLE PANELS
WIRE WRAP PINS AND SOCKETS
CUSTOM SWISS SCREW MACHINE PARTS
DIP SOCKETS
CARD CAGES AND RACKS
BACKPANELS

One Source Responsibility for your Packaging Needs

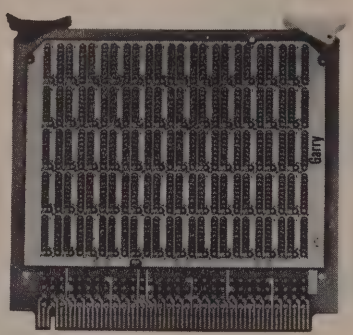
GARRY'S "TOTAL PACKAGING" CONCEPT PUTS IT ALL TOGETHER FOR YOU!

WITH I.C. PLUGGABLE PANELS, LOW PROFILE SOCKETS AND AUTOMATIC WIRE WRAP* MACHINES



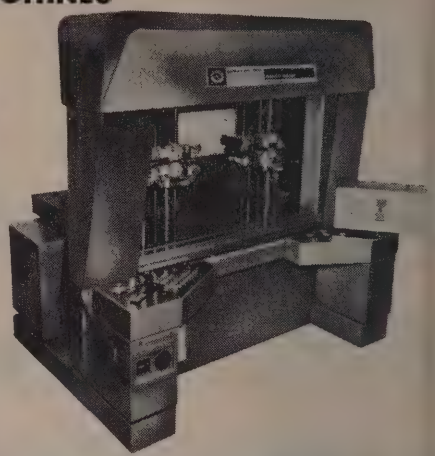
I.C. PLUGGABLE PANELS

Modular series features your choice of 4 I.C. position configurations or universal I.C. position configuration in one section of 30 I.C. positions through 8 sections (240 I.C.'s)



I.C. PLUGGABLE PANELS

Card Edge series offers 12, 16, 24, 30, 60 or 72 positions in your choice of 4 I.C. configuration, plus universal I.C. position configuration and 72 to 120 I-O pins.

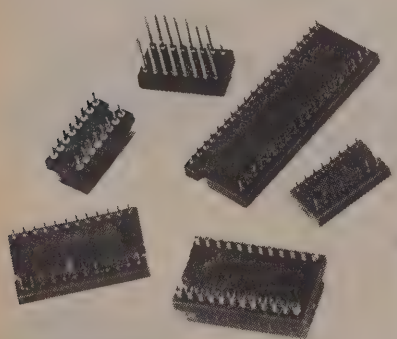


GARRY'S AUTOMATIC WIRE WRAP* MACHINES

Never a Bum Wrap! Think of it. No more scrapped PC boards. (You can actually fix a faulty wire wrap!) No more high inventory costs. No more complicated "doctoring" in the field. No more expensive tooling start-ups. No more headaches because you're "locked into" a PC design.

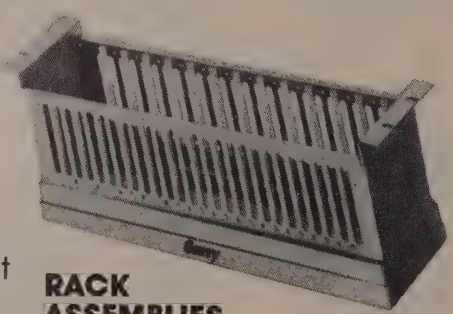
A complete in-house wire-wrap service is also available to give you quick turnaround.

It Never Varies. Our precision beryllium spring clip has the most consistent I.C. insertion-withdrawal ratio in the industry. All this because our facilities are among the world's best.



LOW PROFILE SOCKETS ADAPTORS

Low profile sockets accept standard DIP packages. Machined contact features closed end construction, eliminating solder or flux wicking problem.



RACK ASSEMBLIES

Card racks accept up to 13 boards on 1 .200 centers, or up to 25 boards on .600 centers.

Send for Garry's new free catalog!

Find out why the leading electronics companies use thousands of our wire-wrapped panels each week...

We won't pin a bum wrap on you!

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New Brunswick, N.J. 08902
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N.Y. (212) 267-6844

TERMINATION HARDWARE SERIES 2, 22, 29

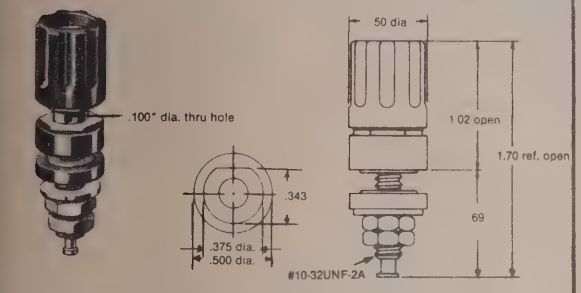
BINDING POSTS

RATING:

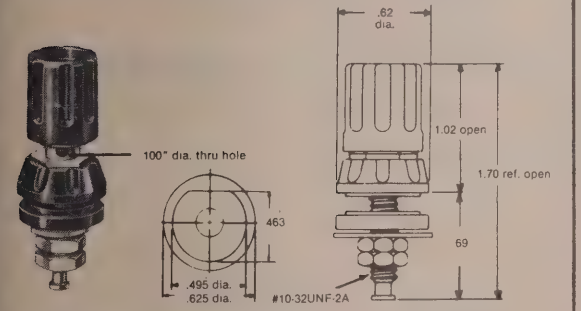
Rating at 120 VDC: 15 amps continuously with a max. temperature rise of 20°C.

Insulation Resistance: Between stud and mounting panel.
No. 29-1: 120,000 megohms. **No. 29-3:** 200,000 megohms.

Voltage Breakdown: Between studs and mounting panel.
No. 29-1: 1500 VAC. **No. 29-3:** 3000 VAC.



29-1 Standard Screw Type Binding Post with Straight Skirt. Fits 3/8" Diameter Mounting Hole Allowing Close Spacing.



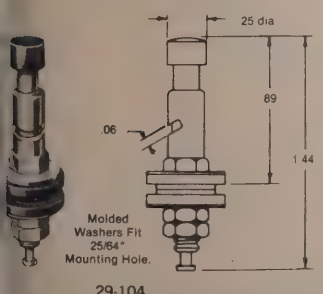
29-3 Standard Screw Type Binding Post with Flared Skirt Fits ½" Diameter Mounting Hole Allowing Wider Spacing.

Dual mounting base for use with 29-1 binding post to assemble two posts on ¼" centers is available. See GRAYHILL Hardware catalog.

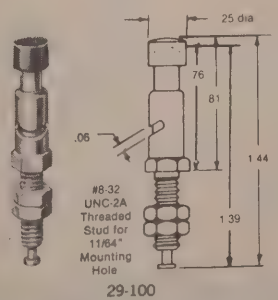
PUSH POST™

New plunger type binding post for positive connections. To operate, button is depressed, lead is placed in slot, and button is released. Spring pressure assures firm positive contact. Extends only 7/8" above mounting board.

Rating at 120 VDC: 20 amps continuously with a max. temperature use of 70°C.



29-104

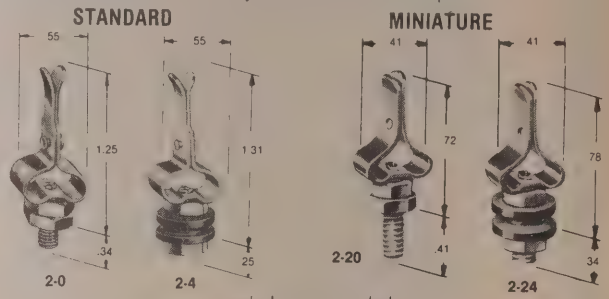


29-100

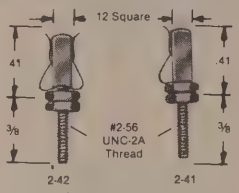
Also available with banana plug. See GRAYHILL Hardware catalog.

TEST CLIPS

Designed for panel mounting on test equipment or for breadboarding to allow rapid connections without manual opening and closing of jaws. Hex nut under clip allows for tension adjustment of individual clip.



ULTRA MINIATURE
PAT. NO. 3,116,101

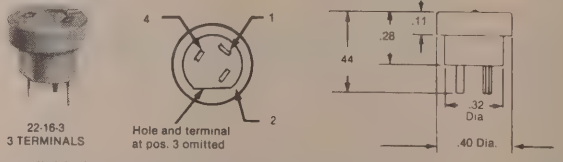


Also available in studless and banana plug versions. See GRAYHILL Hardware catalog.

SOCKETS

TRANSISTOR TYPE

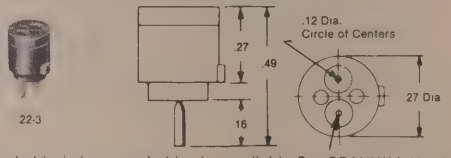
Designed to accept the standard outline (TO-5, 9, 11, 16, 26, 29, 31 & 39). Leads fit on standard 100 mil grid for PC mount or fit a "D" hole to be held by a ring fastener. Wrap around terminals and molded-in indicator line for can tab orientation.



Also available in 4 terminal, different pin to flat orientation and 4 pin, screw or rivet mount. See GRAYHILL Hardware catalog.

BI-PIN LAMP

Accepts standard T-1¼ and T-1¾ outline lamps when leads are trimmed to 0.215". PC mount terminals fit .032" diameter hole.



Right angle bi-pin lamp socket is also available. See GRAYHILL Hardware catalog.

ORDERING INFORMATION

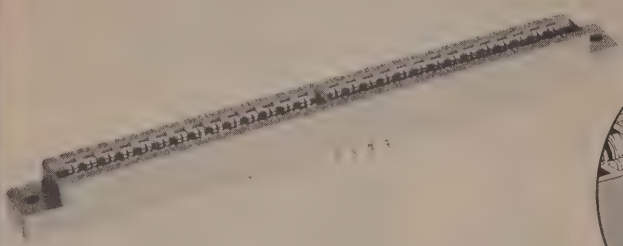
Part Number	Unit Price	2000-4999 Pieces	Part Number	Unit Price	2000-4999 Pieces	Part Number	Unit Price	500-900 Pieces
2-0	$0.50	$0.43	2-20	$0.50	$0.43	22-3	$0.75	$0.60
2-1	0.85	0.72	2-21	0.85	0.72	22-16-3	0.75	0.60
2-4	0.75	0.64	2-41	0.50	0.43			
			2-42	0.55	0.47			

Part Number	Button Cap Color	Unit Price	100-999 Pieces
29-1 RED	Red	$1.15	$0.86
29-1 BLK	Black	1.15	0.86
29-3 RED	Red	1.15	0.86
29-3 BLK	Black	1.15	0.86
29-100 RED	Red	0.80	0.60
29-100 BLK	Black	0.80	0.60
29-104 RED	Red	1.15	0.86
29-104 BLK	Black	1.15	0.86

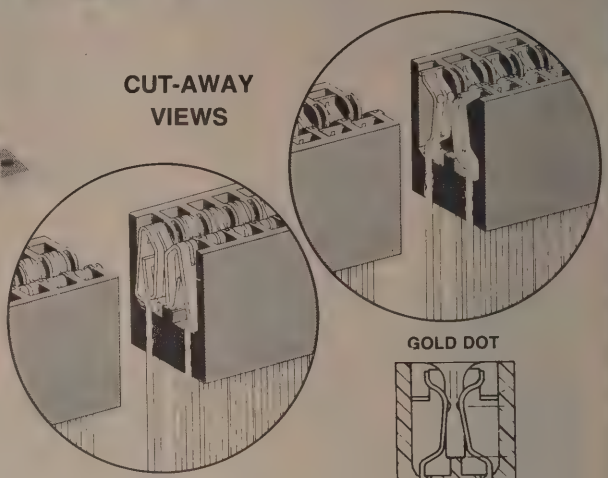
PRICES AND DISCOUNTS SUBJECT TO CHANGE WITHOUT NOTICE

GTE SYLVANIA INCORPORATED

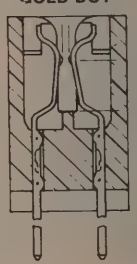
CARD EDGE CONNECTORS



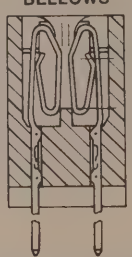
CUT-AWAY VIEWS



GOLD DOT



BELLOWS



FEATURES OF THE GOLD DOT CONTACT

- Bifurcated Gold Dot (contact point) is a coined gold/silver alloy assuring maximum conductivity at the exact point of contact.
- Designed for easy card insertion.
- Discrete contact identification.
- Designed to meet the applicable performance requirements of MIL-C-21097.
- Between-position and on-position polarizing available.
- Economy connector with maximum reliability.
- Multiple mounting styles available, including: thru hole, threaded bushing, and no mounting ear.

FEATURES OF THE BELLOWS CONTACT

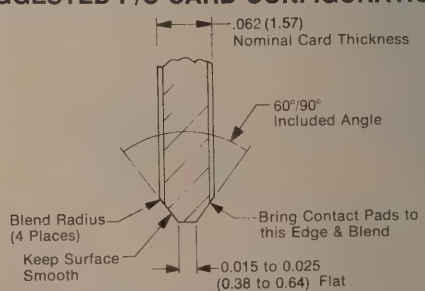
- Bifurcated bellows-shaped contact springs provide constant pressure and maximum protection against vibration, corrosion, and repeated card insertion.
- 24 karat gold-plated mating surface assures maximum conductivity and reliability.
- Designed for easy card insertion.
- Discrete contact identification.
- Designed to meet the applicable performance requirements of MIL-C-21097.
- Between-position and on-position polarizing available.
- Multiple mounting styles available, including: thru hole, threaded bushing, and no mounting ear.

GOLD DOT AND BELLOWS CONTACT CONNECTOR SPECIFICATIONS:

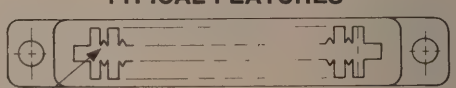
- Operating voltage (sea level). . .600v dc.
- Current. . .3 amps.
- Designed to mate with circuit boards from .054(1.372) to .071(1.803) thick.
- Temperature range. . .–85°F(–65°C) to 257°F(125°C).
- Voltage drop not to exceed 30 mv @ rated current.
- Diallyl Phthalate or Phenolic housing materials.
- Phosphor bronze contact material.
- Specifications subject to change. Consult GTE Sylvania Product Specifications for additional technical information.

This is only a sample of the GTE Sylvania connector product line. For additional information or complete catalogue, please write to GTE Sylvania.

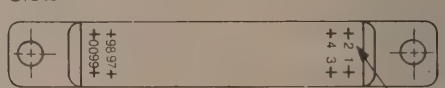
SUGGESTED P/C CARD CONFIGURATION



TYPICAL FEATURES



Polarizing Key Slots



Typical Contact Identification

POLARIZING KEYS

ORDER SEPARATELY

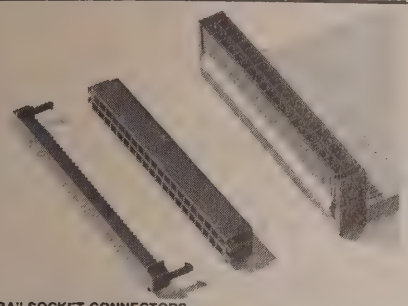
On Position
P/N 7192-0558
Matl/G.R. Polyester Thermoplastic
Color/Natural

Between Position
P/N 7192-0370
Matl/G.R.Nylon
Color/Natural

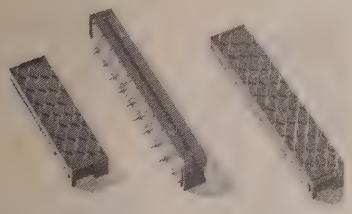
GTE SYLVANIA INCORPORATED, PRECISION MATERIALS PRODUCTS BUSINESS, CONNECTOR PRODUCTS OPERATION OF THE PARTS DIVISION. TITUSVILLE, PENNSYLVANIA 16354. PHONE: (814) 589-7071. TWX 510-692-6763.

GTE SYLVANIA INCORPORATED

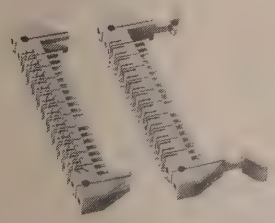
FLAT CABLE CONNECTOR SYSTEMS



"BA" SOCKET CONNECTORS
- Designed to terminate to cable on .050 (1.270) conductor centers.
- Mass insulation displacing concept offers good gas-tight termination.
- Accepts 28-30 AWG solid or stranded conductors
- Designed to mate to .025 (.635) sq. posts or .025 dia. pins
- Positive locking assembly.



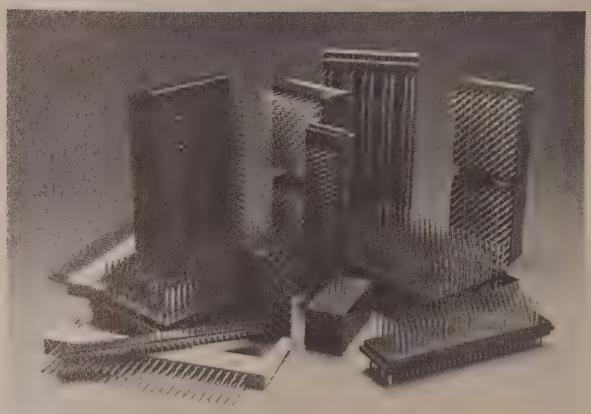
"BC" PCB FLAT CABLE CONNECTORS
- Positive locking assembly.
- Low profile design .255 (6.477) max. height.
- Open or closed cover designs for end-wire or thru-wire applications.
- Optional contact lengths for PC boards up to .125(3.175) thick
- Connector design and termination tooling guarantee uniform reliable interconnections.



"BB" HEADER CONNECTORS
- Low Profile Design - max. height for vertical application is .700 (17.780) not including latch option.
- Designed for solder or wire-wrappable applications.
- Positive latch option.
- Shielded design to protect contacts when disconnected.
- Vertical or right angle applications.

"BD" STACKABLE SOCKET CONNECTORS
- Mass insulation displacing concept, offering good gas-tight seal
- Positive locking assembly.
- Low profile package with maximum height of .275(6.985) permits stacking of two connectors on a typical wire-wrappable post
- Latest concept in interconnect packaging.
- Lowest total applied cost than other I/O (input/output) connector types.

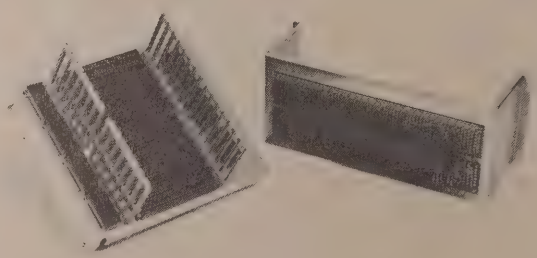
CUSTOM CONNECTORS



Have GTE Sylvania combine its expertise with yours to design a custom connector to your exact specifications.

- Designed to specific customer applications.
- Provide reliable connectors to major industries for over two decades.
- Feature complete material and process control from product concept to customer shipment via total vertical integration.
- Provide highest reliability contact in the industry including the GTE Sylvania proven gold dot.
- Designed to provide the highest possible packaging density.
- Available with both solder tab and wrap-post contact tails.
- Available in wide range of sizes and mounting styles.
- Choice of housing materials.

BACK PANEL ASSEMBLIES



- Backpanel assemblies available complete or in sub-assembly form.
- Made to your exact specifications.
- Over two decades of engineering know-how in backpanel design and manufacture.
- Complete testing capabilities including zero-defect electrical checking for finished assemblies.
- Complete in-house production facilities.
- Panels designed with a wide range of connectors available on .100, .125, .156, or .200 inch centerline spacing.
- Stringent quality control throughout assembly procedure from several in-process stations.

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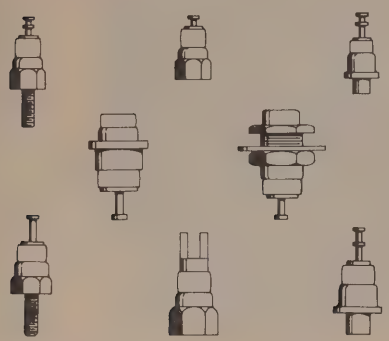
HIRAM JONES

manufacture and design of circuit component

Teflon† Insulated * One-Piece * Terminals and Test Jacks



*** DELIVERY** Immediate — from stock on catalog items.

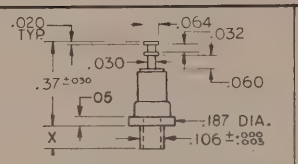
*** QUALITY** QPL facility, insuring highest product reliability. Complete traceability on all raw material and processes.

*** PRODUCTION** Precision Swiss automatic machines — long or short runs to customer design and specifications.

* ONE-PIECE *

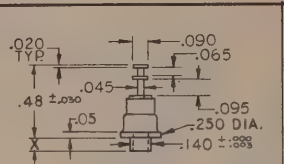
Teflon† Insulated Terminals

Male-Female Threads and Swage Types and Test Jacks



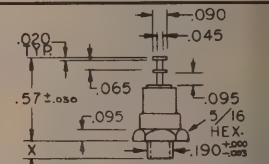
Single Turret also available
O/A Height above Board: .30 ±.030
P/N TS-111-A/-4

Part No.	X	Board Thickness
TS-112-A	.055	1/64
TS-112-0	.075	1/32
TS-112-1	.095	.050
TS-112-2	.105	1/16
TS-112-3	.135	3/32
TS-112-4	.165	1/8



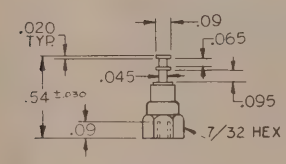
Single Turret also available
O/A Height above Board: .39 ±.030
P/N TS-231-0/-4

Part No.	X	Board Thickness
TS-232-0	.075	1.32
TS-232-1	.095	.050
TS-232-2	.105	1/16
TS-232-3	.135	3/32
TS-232-4	.175	1/8



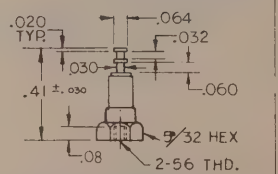
Single Turret also available
O/A Height above Board: .50 ±.030
P/N TS-351-0/-4

Part No.	X	Board Thickness
TS-352-0	.075	1/32
TS-352-1	.095	.050
TS-352-2	.105	1/16
TS-352-3	.135	3/32
TS-352-4	.165	1/8



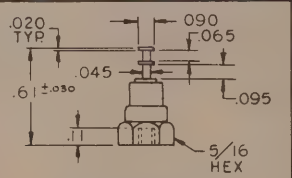
Part No.	Thread
TS-232-8F	4-40
TS-232-9F	6-32

Single Turret also available
O/A Length: .47 ±.030
P/N TS-231-8F/-9F



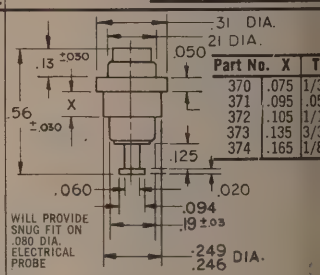
Part No.	Thread
TS-112-6F	2-56

Single Turret also available
O/A Length: .35 ±.030
P/N TS-111-8F



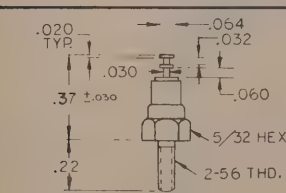
Part No.	Thread
TS-352-8F	4-40
TS-352-9F	6-32

Single Turret also available
O/A Length: .54 ±.030
P/N TS-351-8F/-9F



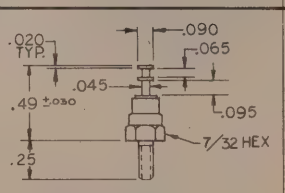
Part No.	X	T
370	.075	1/
371	.095	.0
372	.105	1/
373	.135	3/
374	.165	1/

SWAGE TEST JACK
Available in 10 Standard E.I.A. colors



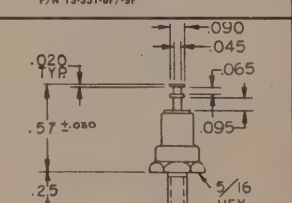
Part No.	Thread
TS-112-6M	2-56

Single Turret also available
O/A Height above Board: .34 ±.030
P/N TS-111-6M



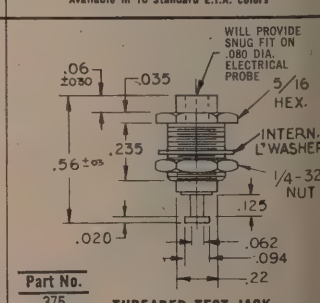
Part No.	Thread
TS-232-8M	4-40
TS-232-9M	6-32

Single Turret also available
O/A Height above Board: .42 ±.030
P/N TS-231-8M/-9M



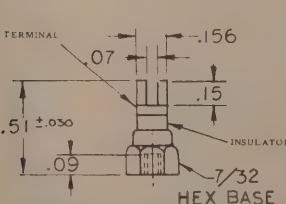
Part No.	Thread
TS-352-8M	4-40
TS-352-9M	6-32

Single Turret also available
O/A Height above Board: .50 ±.030
P/N TS-351-8M/9M

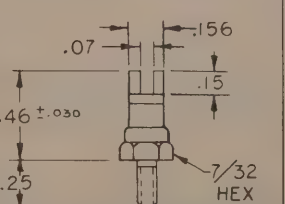


Part No.
375

THREADED TEST JACK



Part No.	Thread
TS-233-8F	4-40
TS-233-9F	6-32



Part No.	Thread
TS-233-8M	4-40
TS-233-9M	6-32

Other Hiram Jones Products:

Non-Insulated Terminals, Test Jacks and Contacts
Printed Circuit, MS and MIL-T-55155 Terminals

†Reg. Trademark, E.I. DuPont de Nemours and Co.

DEPT. EM
607 VANOWEN STREET, NORTH HOLLYWOOD CALIF 91605
(213) 875-0213

HIRAM JONES

Teflon† Insulated * Press-Type * Terminals and Test Jacks

TEFLON†

TFE-FLUOROCARBON) per MIL-P-19468 has outstanding mechani al and electrical properties over a wide range of frequencies and emperatures (−100°C to +250°C), extreme chemical inertness, igh heat resistance, zero water absorption and complete anti-hesive- ess which make it a superior insulation.

TERMINALS

MATERIAL: Half-hard Brass per QQ-B-626, CDA360.
FINISH: Standard plating is Gold per MIL-G-45204. Other finishes supplied on request.

INSTALLATION TOOLS

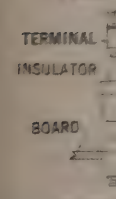
ools are available for all HIRAM JONES components. Specify Part lumber and prefix "S." Example: S-602 Assembly Tool.

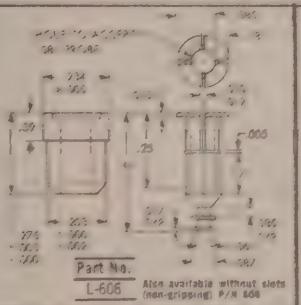
*** PRESS-TYPE ***

For simple, fast economical installation

*** PRESS-TYPE ***

Teflon† Insulated Test Jacks



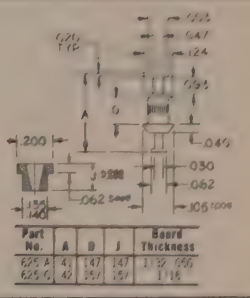


Part No. L-606 — Also available without slots (non-gripping) P/N 606

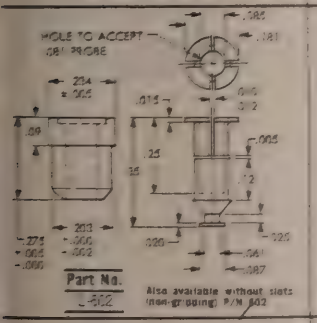
*** PRESS-TYPE ***

Teflon† Insulated Feed-Thrus and Standoffs

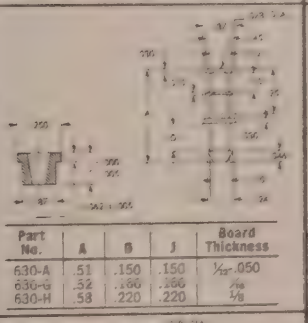
Available in Ten Standard E.I.A. Colors



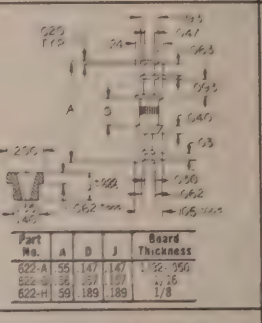
Part No.	A	D	J	Board Thickness
625-A	.41	.147	.147	1/32-.050
625-G	.42	.157	.157	1/16



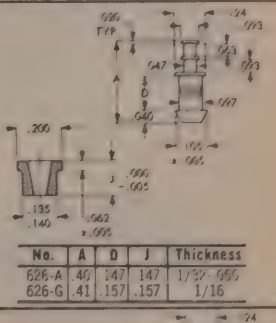
Part No. S-602 — Also available without slots (non-gripping) P/N 602



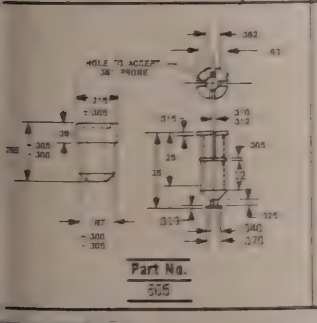
Part No.	A	B	J	Board Thickness
630-A	.51	.150	.150	1/32-.050
630-G	.52	.160	.160	1/16
630-H	.58	.220	.220	1/8



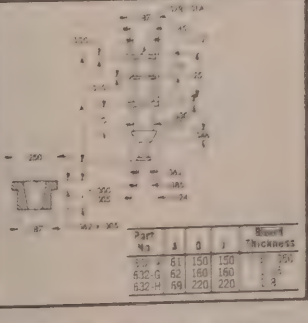
Part No.	A	D	J	Board Thickness
622-A	.55	.147	.147	1/32-.050
622-G	.56	.157	.157	1/16
622-H	.59	.189	.189	1/8



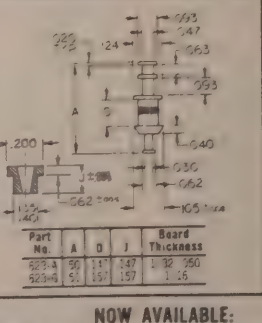
No.	A	D	J	Thickness
626-A	.40	.147	.147	1/32-.050
626-G	.41	.157	.157	1/16



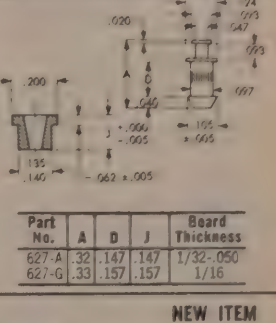
Part No. 605



Part No.	A	D	J	Board Thickness
632-A	.61	.150	.150	1/32-.050
632-G	.62	.160	.160	1/16
632-H	.69	.220	.220	1/8



Part No.	A	D	J	Board Thickness
623-A	.56	.147	.147	1/32-.050
623-G	.57	.157	.157	1/16



Part No.	A	D	J	Board Thickness
627-A	.32	.147	.147	1/32-.050
627-G	.33	.157	.157	1/16

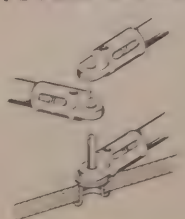
9W WIRE TERMINATION SYSTEM COMPONENTS

NOW AVAILABLE: P/N 9W-208 CRIMP TERMINAL FOR AWG WIRE SIZES NO. 28 & 30

NEW ITEM

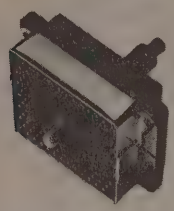
FOR BUILT-IN RELIABILITY:
Provides a solder-wicking barrier to minimize wire fatigue failures.

SERVICEABILITY:
Utilizing fast, simple wire connection and disconnection.



9W Crimp Terminal Part No.	O.D.	Lgth.	AWG Wire Sizes	Mating Terminal Post	Board Thickness
9W-206	.078	.265	20 & 22	9W-507-1 Standoff	3/32"
				9W-507-5 Standoff	1/16"
9W-207	.062	.226	24 & 26	9W-510-1 Feed-thru	3/32"
				9W-510-3 Feed-thru	1/16"
9W-230	.094	.282	16 & 18	9W-507-3 Standoff	3/32"
				9W-507-7 Standoff	1/16"
				9W-510-2 Feed-thru	3/32"
				9W-510-4 Feed-thru	1/16"

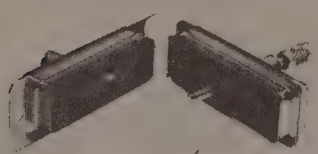
CALL ON HUGHES HIGH TECHNOLOGY CONNECTORS FOR THE TOUGHEST JOBS.



C-21 Tightest Sealing Environmental Connector—to 250 psi.

New HAC-PAK™ Round-to-Flat Cable Connector

Highest density Circular Connector



Highest density Subminiature Connector

We specialize in connector problems nobody else can crack. If it's simple and easy, anybody can do it, including us. But the tough nut is our specialty.

When you need high density connectors with positive polarization, high contact retention and unmatched reliability, call us. (714) 549-5701. Or write: 17150 Von Karman Avenue, Irvine, CA 92714.

HUGHES
HUGHES AIRCRAFT COMPANY
CONNECTING DEVICES DIV.

We crack the tough ones.

HUGHES
HUGHES AIRCRAFT COMPANY
CONNECTING DEVICES DIV.

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(617) 232-6687
L-K Harman Associates—Lee Office
17 Maritta Avenue, Lee, Massachusetts 01238
(413)243-1158

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(312) 696-2828

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(913) 381-7557

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Pompton Plains, New Jersey 07444
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(919) 292-3201
L & D Inc.—Greenville Office
15 Drexel Avenue, Greenville, South Carolina 29607
L & D Inc.—Richmond, Virginia Office
P.O. Box 25608, Richmond, Virginia 23260
L & D Inc.—Huntsville Office
333 Ardenmore Highway, P.O. Box 5005,
Huntsville, Alabama 35805
(205) 859-1690

Ohio, Michigan, Indiana, Pennsylvania (Western), **Kentucky** (Eastern), **Virginia** (Western)
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2649 Erie Avenue, Cincinnati, Ohio 45208
(513) 871-4211
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Luebbe Sales Company—Detroit Office
20905 Greenfield Road, Southfield, Michigan 48075
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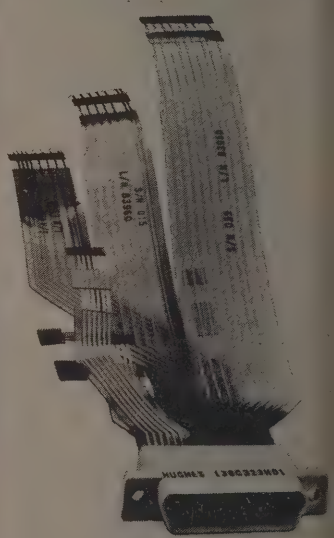

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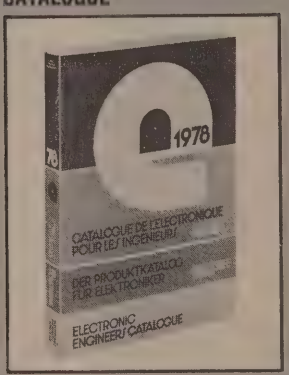

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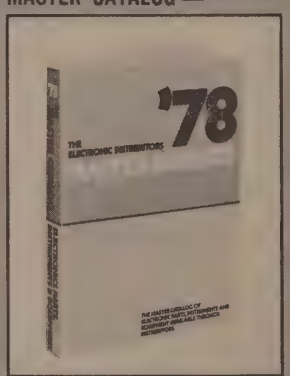

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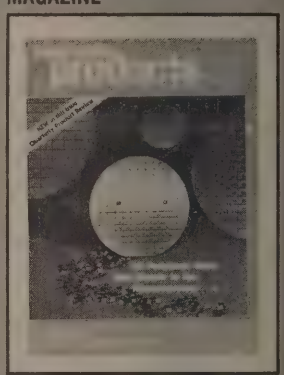

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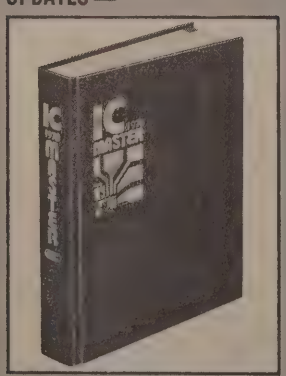

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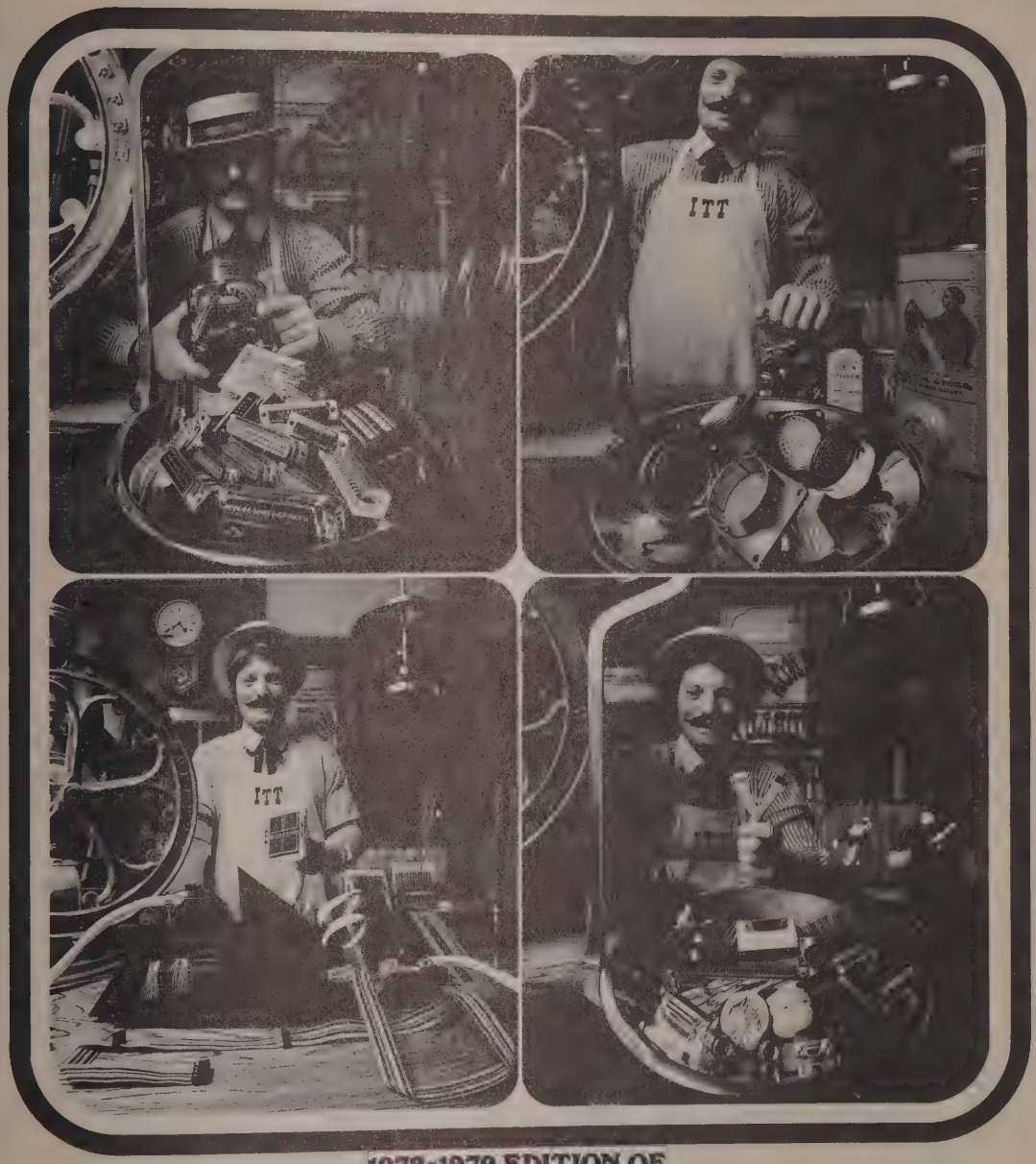

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K Connectors — lightweight, rugged, circular connectors with quick connect/disconnect Acme threads 1810

KPT/KPTM/KPSE Miniature Circular MIL-C-26482 Connectors — general purpose, solder and crimp removable contacts, bayonet coupling 1818

MS-A/MS-B/MS-E/MS-F/ER MIL-C-5015 Standard Circular Connectors — general purpose, threaded coupling, solder and crimp removable contacts 1828

PV Miniature Circular Connectors — designed to M83723 (Series I) and M26482 (Series II), bayonet coupling 1848

SURE-SEAL™ Connectors — low cost, UL/CSA recognized, sealed connectors for automotive/industrial applications 1857

VE Standard Circular Connectors — sealed connectors that meet all the needs of the heavy duty transportation industry 1860

D Subminiature Rectangular Connectors — for commercial/industrial and general military/aerospace MIL-C-24308 applications 1863

DPK Rack/Panel Connectors — high performance, environment-resistant, thermal protection connectors qualified to MIL-C-83723 (USAF) 1899

DPXNA/DPXNE Rack/Panel Connectors — Single, 2-, 3-, 4-gang non-environmental/environmental versions, designed to meet MIL-C-81659 Rev. B 1910

SMA Connectors — for RF and coaxial requirements for commercial and military applications 1917

ADAPTA-CON Connectors — low force receptacle and post interconnections for PC and I/O applications 1921

Mas/Ter - IDC Insulation Displacement Connectors — insulation displacement connector packaging system for telecommunications, computer, industrial control and other applications requiring low cost with high performance, high speed mass termination of contacts . 1929

DL "ZIF" Connectors — designed for commercial/industrial, computer and peripheral equipment; zero mating force via cam actuated contacts 1933

MICROMINIATURE Connectors — rectangular, circular, strip configurations, with MICRO (3 amp), Centi (5 amp) and NANO (1 amp) Twist Pin Contacts* 1941

*Licensed by New Twist

INTRODUCTION

It's almost impossible to find electrical or electronic equipment anywhere in the world that doesn't involve the use of one or more ITT Cannon Electric products. Our interconnection devices are currently solving problems in equipment and systems ranging from computers to cable TV, telecommunications to transportation, vending machines to nuclear reactors, deep space to deep submergence, braking systems for trucks to applications on every commercial aircraft now flying. The result of this is a truly unequalled depth of engineering experience in all phases of interconnection technology.

Through our CAPS® distributors (Cannon Authorized Plug Specialists), we offer customers the world's largest organization of stocking and assembling distributors — with representation in every major electronics center. Having passed the same quality standards we impose on our own assembly operations, these distributors buy component parts and sub-assemblies from our factories, then assemble them to your requirements at their facilities. Thus, they can customize your connectors and save you the cost of inventory. More specialized orders are passed on to our factories where they are expedited by one of the finest computerized production control systems in the world. It all adds up to getting you the right product at the right time. And at the right price.

For more information, please contact your local ITT Cannon representative or distributor. If you have an interconnect problem, we can help you.

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Six decades on the leading edge of interconnect technology.

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MINIATURE CIRCULAR CONNECTORS
KJL/KJ CONNECTORS

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

KJL-SERIES I SCOOP-PROOF AND KJ-SERIES II LOW PROFILE CONNECTORS... DESIGNED TO MIL-C-38999

- **High contact density**
- **Lightweight/low-profile/scoop proof**
- **Environment-resistant**
- **Operating temperature range from −29°C to +200°C (−85°F to +392°F)**
- **Crimp snap-in contacts in the NEW SUPER CAESAR™ rear release contact retention assembly**

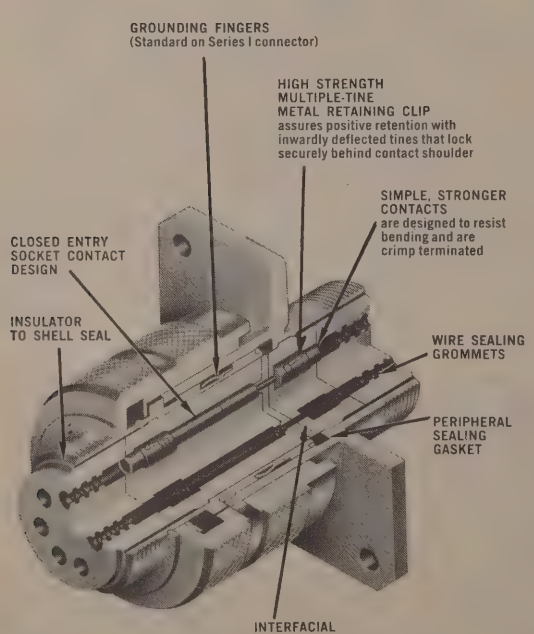
ITT Cannon's KJL and KJ miniature circular connectors are environment-resistant and designed to meet the critical performance and design requirements of MIL-C-38999. Engineered for high density circuitry capabilities, these connectors are designed to operate at temperatures ranging from −29°C to +200°C (−85°F to +392°F). They are readily adaptable to both commercial and space age requirements where size, weight, low-profile/scoop proof design and high reliability are key factors. KJL/KJ connectors are offered in nine shell sizes. A total of 59 contact arrangements are available that will accommodate from 3 to 128 contacts using AWG wire sizes 16 through 28. Contacts are of high conductivity copper alloy with gold plated finish.

The KJL-Series of connectors are designed with a "scoop-proof" feature which provides a safety factor in blind mating applications.

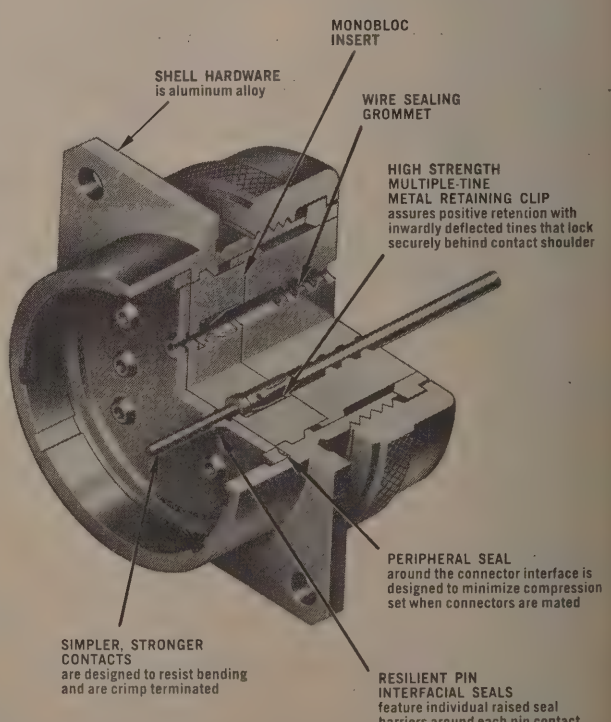
Contact retention is provided by the newly developed SUPER CAESAR™ rear release contact assembly. SUPER CAESAR more than meets the MIL Specs, for contact retention. The assembly features a multiple-tine **metal** retaining clip housed in a monobloc plastic insert. Contacts are inserted, released, and extracted from the rear of the connector, offering lower installation and maintenance costs to the user.

Monobloc (one-piece) inserts are made of strong, durable plastic. Pin contact cavities in the insert are constructed with a closed-down effect. This feature offers superior pin stability and positive axial alignment of the contacts. Lead-in chamfers in the socket front insert face provide for positive contact mating. The shells feature five-keyway shell polarization to assure alignment during engagement. A three-point bayonet lock coupling provides fast connect and disconnect. Complete environmental sealing is accomplished by an interfacial seal, with individual raised tapered sealing barriers around each pin contact; a peripheral seal, and a multiple-ripple wire sealing grommet. Hermetic shell styles are also available.

KJL-SERIES 1


GROUNDING FINGERS
(Standard on Series I connector)
HIGH STRENGTH MULTIPLE-TINE METAL RETAINING CLIP
assures positive retention with inwardly deflected tines that lock securely behind contact shoulder
SIMPLE, STRONGER CONTACTS
are designed to resist bending and are crimp terminated
CLOSED ENTRY SOCKET CONTACT DESIGN
INSULATOR TO SHELL SEAL
WIRE SEALING GROMMETS
PERIPHERAL SEALING GASKET
INTERFACIAL SEAL

KJ-SERIES 2


MONOBLOC INSERT
SHELL HARDWARE
is aluminum alloy
WIRE SEALING GROMMET
HIGH STRENGTH MULTIPLE-TINE METAL RETAINING CLIP
assures positive retention with inwardly deflected tines that lock securely behind contact shoulder
PERIPHERAL SEAL
around the connector interface is designed to minimize compression set when connectors are mated
SIMPLER, STRONGER CONTACTS
are designed to resist bending and are crimp terminated
RESILIENT PIN INTERFACIAL SEALS
feature individual raised seal barriers around each pin contact

For a quick response to your application needs call one of the following District Offices:
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Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

MINIATURE CIRCULAR CONNECTORS
KJL/KJ CONNECTORS

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

GENERAL INFORMATION—HOW TO ORDER

ITT CANNON VERSION

NOTE: KJL/KJ supplied with exact complement of contacts.

KJL	0	E	21	A	61	S	N
KJ	6	E	18	A	35	S	N

Series Prefix
Shell Style
Class
Shell Size
Hardware Finish
Contact Arrangement
Contact Type
Shell Position

SERIES PREFIX
KJL Series I — Scoop proof
KJ Series II — Low profile

SHELL STYLE
0* — Wall mounting receptacle
2 — Box mounting receptacle (available as hermetic)
3* — Wall mounting receptacle (back panel mounting)
5 — Box mounting receptacle (back panel mounting)
6* — Straight plug
G6 — Straight plug, grounded
7* — Jam nut receptacle (available as hermetic)

CLASS
E* — Environment-resistant with rear accessory (without strain relief)
F — Environment-resistant with strain relief accessory
P — Environment-resistant with straight potting cup accessory
R — Environment-resistant with full grommet seal **without rear accessory; shell styles 2 and 5 only**
T* — Environment-resistant (without rear accessory). Class T not applicable to KJ2E, KJ2R, KJ5E, KJ5R, MS27499, MS27513, and MS27508.

SHELL SIZE
KJL: 9, 11, 13, 15, 17, 19, 21, 23, 25
KJ: 10, 12, 14, 16, 18, 20, 22, and 24

HARDWARE FINISH STANDARD
A — Bright cadmium over electroless nickel plate (—85°F to +302°F) (—29°C to +150°C)
B — Olive drab cadmium over electroless nickel plate (—85°F to +302°F) (—29°C to +150°C)
C — Anodic (non-conductive) (—85°F to +392°F) (—29°C to +200°C), (not applicable to KJL series. Applicable to KJ series except KJG6).
N — Electroless nickel (—85°F to +392°F) (—29°C to +200°C)

CONTACT ARRANGEMENT
See following pages

CONTACT STYLE
P — Pin
S — Socket

ALTERNATE SHELL POSITION
N (normal), A, B, C, D

*Available in KJL

MS VERSION

NOTE: MS supplied with specified complement of contacts and wire sealing plugs.

MS27473	E	*	A	66	P	A

MS Number Shell Style
Class
Shell Size
Hardware Finish
Contact Arrangement
Contact Style
Alternate Shell Position

MS NUMBER SHELL STYLE

KJL	KJ
MS27466	MS27472 — Wall Mounting Receptacle
—	MS27473 — Straight Plug
MS27468	MS27474 — Jam Nut Receptacle
MS27467	MS27484 — Grounded Plug
MS27656	MS27497 — Wall Mounting Receptacle (back panel mounting)
—	MS27513 — Box Mounting Receptacle
—	MS27479 — Wall Mounting Receptacle (C Finish)
—	MS27480 — Straight Plug (C Finish)
—	MS27481 — Jam Nut Receptacle (C Finish)
—	MS27499 — Box Mounting Receptacle (Class E)
—	MS27508 — Box Mounting (Back Panel Mounting)

CLASS
E — Environment-resistant
P — Environment-resistant with straight potting cup accessories
R — Environment-resistant with full grommet seal without rear accessory; shell styles 2 and 5 only
T — Environment-resistant (without rear accessory). Class T not applicable to KJ2E, KJ2R, KJ5E, KJ5R, MS27499, MS27513, and MS27508.

SHELL SIZES
KJL: 9, 11, 13, 15, 17, 19, 21, 23, 25
KJ: 10, 12, 14, 18, 20, 22, 24

HARDWARE FINISH STANDARD
A — Bright cadmium over electroless nickel plate (—85°F to +302°F) (—29°C to +150°C)
B — Olive drab cadmium over electroless nickel plate (—85°F to +302°F) (—29°C to +150°C)
C — Anodic (non-conductive) (—85°F to +392°F) (—29°C to +200°C), (not applicable to series I. Applicable to series II except MS27484)
F — Electroless nickel (—85°F to +392°F) (—29°C to +200°C)

CONTACT ARRANGEMENT
See following pages

CONTACT STYLE
P — Pin; S — Socket

ALTERNATE SHELL POSITION
A, B, C, and D (not required for normal)

STANDARD DATA

MATERIALS AND FINISHES

	MIL-C-38999 and KJ	Grounded Plug
Shell	Aluminum alloy	Aluminum alloy, cad. plate
Insulator	Thermosetting plastic	Thermosetting plastic
Contacts	Copper alloy, gold plate	Copper alloy, gold plate
Grommet and Seal	Silicone base elastomer	Silicone base elastomer
Jam Nut	Aluminum alloy	—
Grounding Spring	—	Beryllium copper, cad. plate

MECHANICAL FEATURES

Shell Styles	0 — Wall mounting receptable
	2 — Box mounting receptacle*
	3 — Wall mounting receptacle (back panel)
	5 — Box mounting receptacle (back panel)*
	6 — Straight plug
	7 — Jam nut receptacle
Shell Sizes	KJL: 9 thru 25; KJ: 10 thru 24
Coupling	3 point bayonet, quick-release
Polarization Shell	5 keys and keyways

*Applicable to KJ only.

ELECTRICAL DATA

Contact Size 22D, 20 and 16

Contact Rating and Wire Size Accommodation

Wire Size	Contact size and test amps 22D	20	16
28	1.5	—	—
26	2.0	—	—
24	3.0	3.0	—
22	5.0	5.0	—
20	—	7.5	7.5
18	—	—	10.0
16	—	—	13.0
14	—	—	—
12	—	—	—

Service Rating	Test Voltages	Service Rating M	Service Rating I	Service Rating II
(unmated condition)	Sea Level	1300	1800	2300
	110,000 ft.	200	200	200

Contact Termination Crimp (classes E, F, P, R, T)

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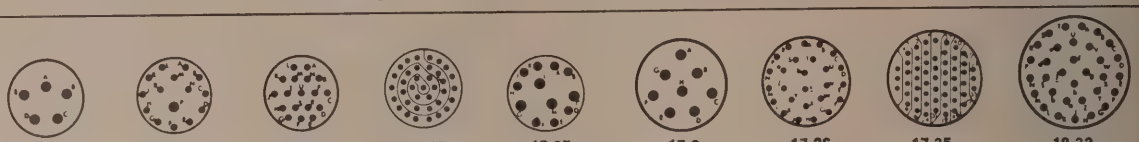
ITT CANNON ELECTRIC

MINIATURE CIRCULAR CONNECTORS
KJL/KJ CONNECTORS

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

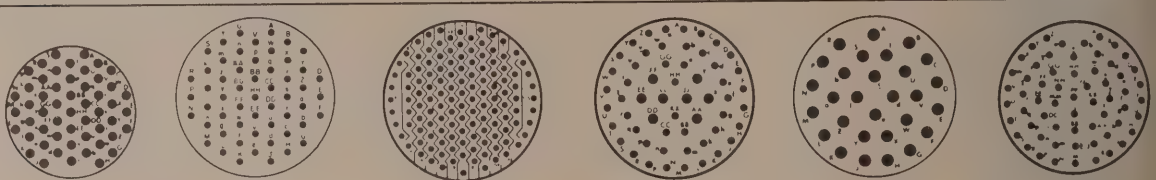
CONTACT ARRANGEMENTS
KJL-SERIES I
(ENGAGING VIEW PIN INSERT)

Shell Size	9-35	9-98	11-5	11-35	11-98	13-8	13-35	13-98
No. of Contacts	6 #22D	3 #20	5 #20	13 #22D	6 #20	8 #20	22 #22D	10 #20
Service Rating	M	I	I	M	I	I	M	I



Shell Size	15-5	15-15	15-18	15-35	15-97	17-8	17-26	17-35	19-32
No. of Contacts	5 #16	14 #20, 1 #16	18 #20	37 #22D	8 #20, 4 #16	8 #16	26 #20	55 #22D	32 #20
Service Rating	I	I	I	M	I	II	I	M	I

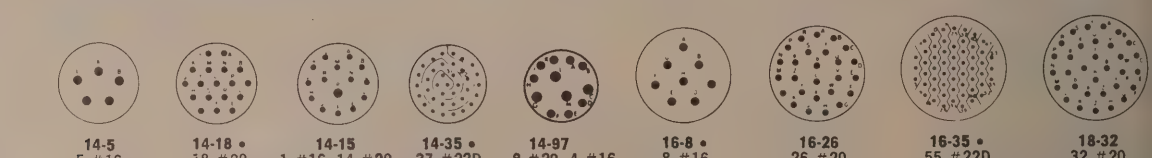
Shell Size	19-35	21-35	21-16	21-39	21-41	23-35	23-21
No. of Contacts	66 #22D	79 #22D	16 #16	37 #20, 2 #16	41 #20	100 #22D	21 #16
Service Rating	M	M	II	I	I	M	II



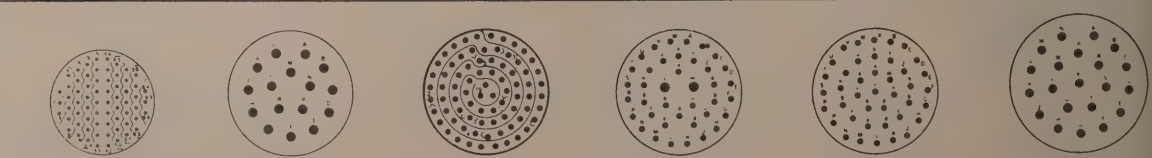
Shell Size	23-53	23-55	25-35	25-4	25-29	25-61
No. of Contacts	53 #20	55 #20	128 #22D	48 #20, 8 #16	29 #16	61 #20
Service Rating	I	I	M	I	I	I

CONTACT ARRANGEMENTS
KJ SERIES II
(ENGAGING VIEW PIN INSERT)

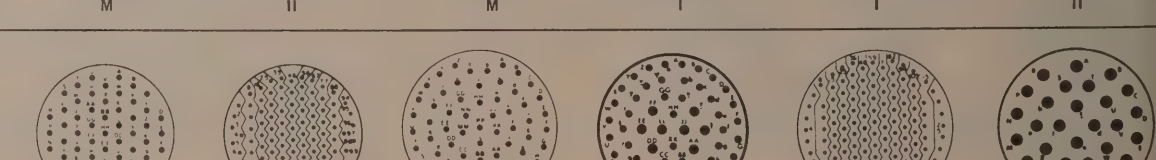
Shell Size	8-35	8-98	10-5	10-98 •	10-35 •	12-8	12-98 •	12-35 •
No. of Contacts	6 #22D	3 #20	5 #20	6 #20	13 #22D	8 #20	10 #20	22 #22D
Service Rating	I	I	I	I	M	I	I	M



Shell Size	14-5	14-18 •	14-15	14-35 •	14-97	16-8 •	16-26	16-35 •	18-32
No. of Contacts	5 #16	18 #20	1 #16, 14 #20	37 #22D	8 #20, 4 #16	8 #16	26 #20	55 #22D	32 #20
Service Rating	II	I	I	M	I	II	I	M	I



Shell Size	18-35 •	20-16	20-35 •	20-39	20-41	22-21
No. of Contacts	66 #22D	16 #16	79 #22D	37 #20, 2 #16	41 #20	21 #16
Service Rating	M	II	M	I	I	II



Shell Size	22-55	22-35	24-61	24-4	24-35 •	24-29
No. of Contacts	55 #20	100 #22D	61 #20	48 #20, 8 #16	128 #22D	29 #16
Service Rating	I	M	I	I	M	I

• Layouts are available in all shell sizes including MS27499, MS27508, KJ2E and KJ5E.

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

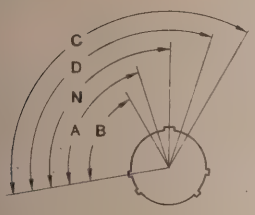
ITT CANNON ELECTRIC

MINIATURE CIRCULAR CONNECTORS
KJL/KJ CONNECTORS

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

ALTERNATE POLARIZING POSITIONS

Front face of receptacle. Insert arrangement does not rotate with main key.



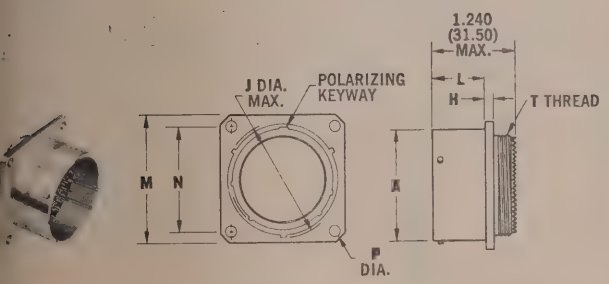
KJL

Shell Size	AB ANGLE OF ROTATION (Degrees) Normal	A	B	C	D
9	95°	77°	—	—	113°
11	95°	81°	67°	123°	109°
13	95°	75°	63°	127°	115°
15	95°	74°	61°	129°	116°
17	95°	77°	65°	125°	113°
19	95°	77°	65°	125°	113°
21	95°	77°	65°	125°	113°
23	95°	80°	69°	121°	110°
25	95°	80°	69°	121°	110°

KJ

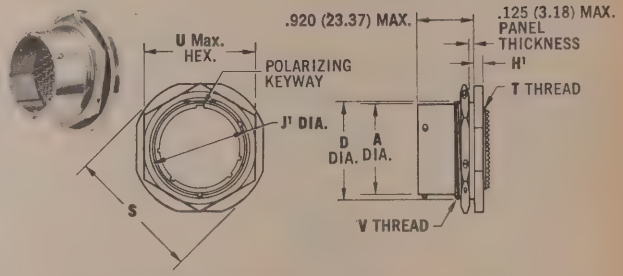
Shell Size	AB ANGLE OF ROTATION (Degrees) Normal	A	B	C	D
8	100°	82°	—	—	118°
10	100°	86°	72	128°	114°
12	100°	80°	68°	132°	120°
14	100°	79°	66°	134°	121°
16	100°	82°	70°	130°	118°
18	100°	82°	70°	130°	118°
20	100°	82°	70°	130°	118°
22	100°	85°	74°	126°	115°
24	100°	85°	74°	126°	115°

WALL MOUNTING RECEPTACLE
KJL0 (ITT Cannon designation)
MS27466 (MS designation)



NOTE: For backshell dimensions and configurations, see page 13.

JAM NUT RECEPTACLE
KJL7 (ITT Cannon designation)
MS27468 (MS designation)



NOTE: For backshell dimensions and configurations, see page 13.

INCHES

Shell Size	A Dia. Max.	D Dia. Max.	H Max.	H¹ Max.	J Dia. Max.	L Max.	M Max.	N Max.	P Dia. Max.	S Dia. Max.	T Thread	U Max. Hex.	V Thread Class 2A	Overall Length With Backshells E Straight	F Cable Clamp	P Potting Max.
9	.573	.655	.100	.120	.662	.632	.958	.719	.138	1.204	7/16-28UNEF-2A	.892	11/16-24UNEF	1.365	1.846	1.451
11	.701	.755	.100	.120	.810	.632	1.051	.812	.138	1.391	9/16-24UNEF-2A	1.017	13/16-20UNEF	1.365	1.846	1.451
13	.851	.942	.100	.120	.960	.632	1.145	.906	.138	1.516	11/16-24UNEF-2A	1.205	1-20UNEF	1.365	1.846	1.451
15	.976	1.066	.100	.120	1.085	.632	1.239	.969	.138	1.641	13/16-20UNEF-2A	1.329	1 1/8-28UNEF	1.365	1.846	1.451
17	1.101	1.191	.100	.120	1.210	.632	1.332	1.062	.138	1.766	15/16-20UNEF-2A	1.455	1 1/4-28UNEF	1.365	1.966	1.451
19	1.208	1.316	.100	.151	1.317	.632	1.458	1.156	.138	1.954	1 1/16-18UNEF-2A	1.579	1 3/8-28UNEF	1.365	1.996	1.451
21	1.333	1.441	.130	.151	1.442	.602	1.582	1.250	.138	2.078	1 3/16-18UNEF-2A	1.705	1 1/2-28UNEF	1.365	1.996	1.451
23	1.458	1.566	.130	.151	1.567	.602	1.708	1.375	.157	2.204	1 5/16-18UNEF-2A	1.829	1 5/8-18UNEF	1.365	1.996	1.451
25	1.583	1.691	.130	.151	1.692	.602	1.832	1.500	.157	2.328	1 7/16-18UNEF-2A	2.017	1 3/4-18UNEF	1.309	1.996	1.451

MILLIMETERS

Shell Size	A Dia. Max.	D Dia. Max.	H Max.	H¹ Max.	J Dia. Max.	L Max.	M Max.	N Max.	P Dia. Max.	S Dia. Max.	T Thread	U Max. Hex.	V Thread Class 2A	Overall Length With Backshells E Straight	F Cable Clamp	P Potting Max.
9	14.55	16.64	2.54	3.05	16.81	16.05	24.33	18.26	3.51	30.58	7/16-28UNEF-2A	22.66	11/16-24UNEF	34.67	46.89	36.86
11	17.81	19.18	2.54	3.05	20.57	16.05	26.70	20.62	3.51	35.33	9/16-24UNEF-2A	25.83	13/16-20UNEF	34.67	46.89	36.86
13	21.62	23.93	2.54	3.05	24.38	16.05	29.08	23.01	3.51	38.51	11/16-24UNEF-2A	30.61	1-20UNEF	34.67	46.89	36.86
15	24.79	27.08	2.54	3.05	27.56	16.05	31.47	24.61	3.51	41.68	13/16-20UNEF-2A	33.76	1 1/8-28UNEF	34.67	46.89	36.86
17	27.97	30.25	2.54	3.05	30.73	16.05	33.83	26.97	3.51	44.86	15/16-20UNEF-2A	36.96	1 1/4-28UNEF	34.67	49.94	36.86
19	30.68	33.43	2.54	3.84	33.45	16.05	37.03	29.36	3.51	49.63	1 1/16-18UNEF-2A	40.11	1 3/8-28UNEF	34.67	50.70	36.86
21	33.86	36.60	3.30	3.84	36.63	15.29	40.18	31.75	3.51	52.78	1 3/16-18UNEF-2A	43.31	1 1/2-28UNEF	34.67	50.70	36.86
23	37.03	39.78	3.30	3.84	39.80	15.29	43.38	34.93	3.99	55.98	1 5/16-18UNEF-2A	46.46	1 5/8-18UNEF	34.67	50.70	36.86
25	40.21	42.95	3.30	3.84	42.98	15.29	46.53	38.10	3.99	59.13	1 7/16-18UNEF-2A	51.23	1 3/4-18UNEF	33.25	50.70	36.86

ITT CANNON ELECTRIC

MINIATURE CIRCULAR CONNECTORS
KJL/KJ CONNECTORS

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

TOOLING ACCESSORIES

CONTACTS

Series	Cannon Contact	Size	Description	MS Contact*
KJL	021-1251-001	16	Socket	MS27490-16
KJL	031-1250-001	20	Socket	MS27490-20
KJL	031-1147-007	22D	Socket	MS27490-22D
KJ	031-1123-016	16	Socket	MS27491-16
KJ	031-1124-020	20	Socket	MS27491-20
KJ	031-1147-000	22D	Socket	MS27491-22D
KJL/KJ	030-1995-016	16	Pin	MS27493-16
KJL/KJ	030-1997-020	20	Pin	MS27493-20
KJL/KJ	030-2042-000	22D	Pin	MS27493-22D

* MIL-C-39029/56/57/58 specification.

WIRE SEALING PLUGS

Size	ITT Cannon Part Number	MS Part Number	Color Code
22D	225-1013-000	MS27488-22	Black
20	225-1014-000	MS27488-20	Red
16	225-1015-000	MS27488-16	Blue

CRIMP TOOLS

Contact Size	Crimp Tool Part Number	Locator or Turret Part Number
22D	M22520/2-01	Pin: M22520/2-09; Socket: M22520/2-06
20	M22520/1-01	TH187
16	M22520/1-01	TH187

INSERTION AND EXTRACTION TOOLS

Contact Size	ITT Cannon Part Number	MS Number	Color Code	
			Insertion	Extraction
20	CIET-20	MS27534-20	Red	White
16	CIET-16	MS27534-16	Blue	White
22D	CIET-22D	MS27534-22D	Green	White

MS INSERTION TOOLS

Contact Size	MS Part Number	ITT Cannon Part Number	Color Band†
16	MS27495A16	995-0001-732	Blue
20	MS27495A20	995-0001-716	Red
22*	MS27495A22	995-0001-720	Brown
22D or 22M*	MS27495A22M	995-0001-718	Black

† Color band indicates tool size

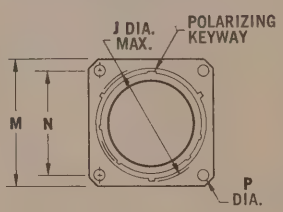
MS EXTRACTION TOOLS

Contact Size	MS Part Number	ITT Cannon Part Number	Color Band‡	
			No. 1	No. 2
16	MS27495R16	995-0001-731	Blue	White
20	MS27495R20	995-0001-717	Red	White
22*	MS27495R22	995-0001-721	Brown	White
22D or 22M*	MS27495R22M	995-0001-719	Black	White

‡ Band No. 1 indicates tool size; Band No. 2 indictaes removal tool
* Inactive, not recommended for new design, replacement only

WALL MOUNTING RECEPTACLE (BACK PANEL)

KJL3 (ITT Cannon designation)
MS27656 (MS designation)



NOTE: For backshell dimensions and configurations, see page 13.

INCHES

Shell Size	A Dia. Max.	H Max.	J Dia. Max.	L Max.	M Max.	N Max.	P Dia. Max.	T Thread	Overall Length With Backshells		
									E Straight	F Cable Clamp	P Potting Max.
9	.573	.100	.662	.820	.958	.719	.138	7/16-28UNEF-2A	1.324	1.805	1.410
11	.701	.100	.810	.820	1.051	.812	.138	9/16-24UNEF-2A	1.324	1.805	1.410
13	.851	.100	.960	.820	1.145	.906	.138	11/16-24UNEF-2A	1.324	1.805	1.410
15	.976	.100	1.085	.820	1.239	.969	.138	13/16-20UNEF-2A	1.324	1.805	1.410
17	1.101	.100	1.210	.820	1.332	1.062	.138	15/16-20UNEF-2A	1.324	1.935	1.410
19	1.208	.100	1.317	.820	1.458	1.156	.138	1 1/16-18UNEF-2A	1.324	1.955	1.410
21	1.333	.130	1.442	.790	1.582	1.250	.138	1 3/16-18UNEF-2A	1.324	1.955	1.410
23	1.458	.130	1.567	.790	1.708	1.375	.157	1 5/16-18UNEF-2A	1.324	1.955	1.410
25	1.583	.130	1.692	.790	1.832	1.500	.157	1 7/16-18UNEF-2A	1.268	1.955	1.410

MILLIMETERS

Shell Size	A Dia. Max.	H Max.	J Dia. Max.	L Max.	M Max.	N Max.	P Dia. Max.	T Thread	Overall Length With Backshells		
									E Straight	F Cable Clamp	P Potting Max.
9	14.55	2.54	16.81	20.83	24.33	18.26	3.51	7/16-28UNEF-2A	33.63	45.85	35.81
11	17.81	2.54	20.57	20.83	26.70	20.62	3.51	9/16-24UNEF-2A	33.63	45.85	35.81
13	21.62	2.54	24.38	20.83	29.08	23.01	3.51	11/16-24UNEF-2A	33.63	45.85	35.81
15	24.79	2.54	27.56	20.83	31.47	24.61	3.51	13/16-20UNEF-2A	33.63	45.85	35.81
17	27.97	2.54	30.73	20.83	33.83	26.97	3.51	15/16-20UNEF-2A	33.63	48.90	35.81
19	30.68	2.54	33.45	20.83	37.03	29.36	3.51	1 1/16-18UNEF-2A	33.63	49.66	35.81
21	33.86	3.30	36.63	20.07	40.18	31.75	3.51	1 3/16-18UNEF-2A	33.63	49.66	35.81
23	37.03	3.30	39.80	20.07	43.38	34.93	3.99	1 5/16-18UNEF-2A	33.63	49.66	35.81
25	40.21	3.30	42.98	20.07	46.53	38.10	3.99	1 7/16-18UNEF-2A	32.21	49.66	35.81

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

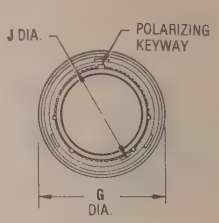
ITT CANNON ELECTRIC

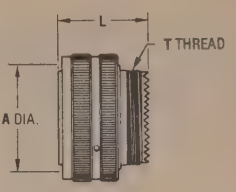
MINIATURE CIRCULAR CONNECTORS
KJL/KJ CONNECTORS

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

STRAIGHT PLUG GROUNDED

KJL6 (ITT Cannon designation)
MS27467 (MS designation)





INCHES

NOTE: For backshell dimensions and configurations, see page 13.

Shell Size	A Max.	J Dia. Max.	L Max.	G Dia.	T Thread	Overall Length With Backshells E	F Cable Clamp	P Potting Max.
9	.585	.483	1.234	.859	7/16-28UNEF-2A	1.312	1.793	1.398
11	.717	.611	1.234	.984	9/16-24UNEF-2A	1.312	1.793	1.398
13	.866	.760	1.234	1.156	11/16-24UNEF-2A	1.312	1.793	1.398
15	.990	.885	1.234	1.281	13/16-20UNEF-2A	1.312	1.793	1.398
17	1.115	1.010	1.234	1.406	15/16-20UNEF-2A	1.312	1.913	1.398
19	1.222	1.115	1.234	1.516	1 1/16-18UNEF-2A	1.312	1.943	1.398
21	1.347	1.240	1.234	1.641	1 3/16-18UNEF-2A	1.312	1.943	1.398
23	1.472	1.365	1.234	1.766	1 5/16-18UNEF-2A	1.312	1.943	1.398
25	1.597	1.490	1.234	1.891	1 7/16-18UNEF-2A	1.256	1.943	1.398

MILLIMETERS

Shell Size	A Max.	J Dia. Max.	L Max.	G Dia.	T Thread	Overall Length With Backshells E	F Cable Clamp	P Potting Max.
9	14.86	12.27	31.34	21.81	7/16-28UNEF-2A	33.32	45.54	35.51
11	18.21	15.52	31.34	24.99	9/16-24UNEF-2A	33.32	45.54	35.51
13	22.00	19.30	31.34	29.36	11/16-24UNEF-2A	33.32	45.54	35.51
15	25.15	22.48	31.34	32.53	13/16-20UNEF-2A	33.32	45.54	35.51
17	28.32	25.65	31.34	35.71	15/16-20UNEF-2A	33.32	48.59	35.51
19	31.04	28.32	31.34	38.50	1 1/16-18UNEF-2A	33.32	49.35	35.51
21	34.21	31.50	31.34	41.68	1 3/16-18UNEF-2A	33.32	49.35	35.51
23	37.39	34.67	31.34	44.85	1 5/16-18UNEF-2A	33.32	49.35	35.51
25	40.56	37.85	31.34	48.03	1 7/16-18UNEF-2A	31.90	49.35	35.51

KJL PANEL CUTOUTS

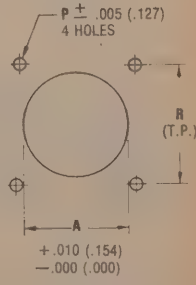
FLANGE MOUNTED RECEPTACLES

INCHES

Shell Size	A Dia.	P Dia.	R	Mtg. Screw
9	.610	.125	.719	#4
11	.734	.125	.812	#4
13	.860	.125	.906	#4
15	.985	.125	.969	#4
17	1.110	.125	1.062	#4
19	1.234	.125	1.156	#4
21	1.360	.125	1.250	#4
23	1.484	.125	1.375	#4
25	1.611	.152	1.500	#6

MILLIMETERS

A Dia.	P Dia.	R	Mtg. Screw
15.49	3.18	18.26	#4
18.64	3.18	20.62	#4
21.84	3.18	23.01	#4
25.02	3.18	24.61	#4
28.19	3.18	26.97	#4
31.34	3.18	29.36	#4
34.54	3.18	31.75	#4
37.69	3.18	34.92	#4
40.92	3.86	38.10	#6



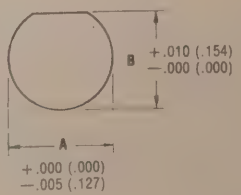
JAM NUT RECEPTACLES

INCHES

Shell Size	A Dia.	B Dia.
9	.697	.665
11	.822	.765
13	1.010	.952
15	1.135	1.076
17	1.260	1.201
19	1.385	1.326
21	1.510	1.451
23	1.635	1.576
25	1.760	1.701

MILLIMETERS

A Dia.	B Dia.
17.70	16.90
20.88	18.44
25.65	24.18
28.82	27.33
32.00	30.51
35.18	33.69
38.35	36.86
41.53	40.03
44.70	43.21



Dimensions subject to change. (millimeters are in parenthesis)

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

MINIATURE CIRCULAR CONNECTORS
KJL/KJ CONNECTORS

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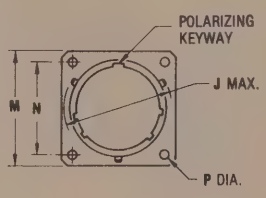
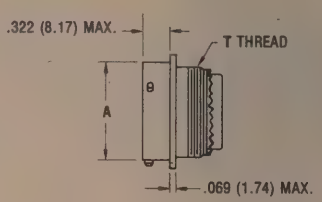
WALL MOUNTING RECEPTACLE
KJO (ITT Cannon designation)
MS27472 (MS designation)





INCHES

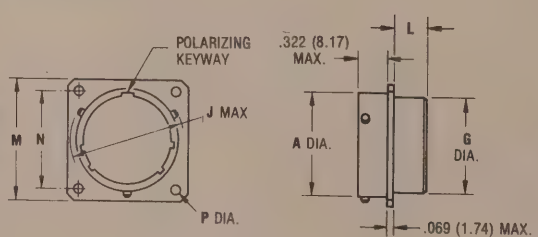
NOTE: For backshell dimensions and configurations, see page 13.

Shell Size	A Dia. Max.	J Dia. Max.	M Max.	N T.P.	P +.005 −.010	T Thread	Overall Length With Backshells E	F Cable Clamp	P Potting Max.
8	.474	.563	.828	.594	.125	7/16-28UNEF-2A	850	1.555	1.020
10	.591	.680	.954	.719	.125	9/16-24UNEF-2A	.850	1.555	1.020
12	.751	.859	1.047	.812	.125	11/16-24UNEF-2A	.850	1.555	1.020
14	.876	.984	1.141	.906	.125	13/16-20UNEF-2A	.850	1.790	1.020
16	1.001	1.108	1.234	.969	.125	15/16-20UNEF-2A	.850	1.790	1.020
18	1.126	1.233	1.328	1.062	.125	1 1/16-18UNEF-2A	.850	1.790	1.020
20	1.251	1.358	1.453	1.156	.125	1 3/16-18UNEF-2A	.850	1.790	1.020
22	1.376	1.483	1.578	1.250	.125	1 5/16-18UNEF-2A	.850	1.930	1.020
24	1.501	1.610	1.703	1.375	.152	1 7/16-18UNEF-2A	.850	1.900	1.080

MILLIMETERS

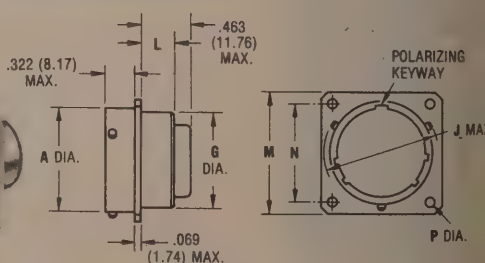
Shell Size	A Dia. Max.	J Dia. Max.	M Max.	N T.P.	P Dia. Max.	T Thread	Overall Length With Backshells E	F Cable Clamp	P Potting Max.
8	12.04	14.30	21.03	15.09	3.17	7/16-28UNEF-2A	21.59	39.50	25.90
10	15.01	17.27	24.33	18.26	3.17	9/16-24UNEF-2A	21.59	39.50	25.90
12	19.07	21.82	26.59	20.62	3.17	11/16-24UNEF-2A	21.59	39.50	25.90
14	22.25	25.09	28.98	23.01	3.17	13/16-20UNEF-2A	21.59	45.47	25.90
16	25.42	28.14	31.34	24.61	3.17	15/16-20UNEF-2A	21.59	45.47	25.90
18	28.60	31.32	33.73	26.97	3.17	1 1/16-18UNEF-2A	21.59	45.47	25.90
20	31.77	34.49	36.81	27.36	3.17	1 3/16-18UNEF-2A	21.59	45.47	25.90
22	33.95	37.47	39.08	31.76	3.17	1 5/16-18UNEF-2A	21.59	49.02	25.90
24	38.12	40.89	43.26	34.92	3.17	1 7/16-18UNEF-2A	21.59	48.26	27.43

BOX MOUNTING RECEPTACLE
KJ2E (ITT Cannon designation)
MS27499 (MS designation)



NOTE: This connector does not accommodate backshells.

KJ2R (ITT Cannon designation)
MS27513 (MS designation)



NOTE: This connector does not accommodate backshells.

INCHES

Shell Size	A Dia. Max.	G Dia. Max.	J Dia. Max.	L Max.	M Max.	N T.P.	P +.005 −.010
8	.474	.421	.563	.312	.828	.594	.125
10	.591	.542	.680	.312	.954	.719	.125
12	.751	.667	.859	.312	1.047	.812	.125
14	.876	.791	.984	.312	1.141	.906	.125
16	1.001	.916	1.108	.312	1.234	.969	.125
18	1.126	1.034	1.233	.312	1.328	1.062	.125
20	1.251	1.158	1.358	.312	1.453	1.156	.125
22	1.376	1.283	1.483	.312	1.578	1.250	.125
24	1.501	1.408	1.610	.312	1.703	1.375	.152

(millimeters are in parenthesis)

MILLIMETERS

A Dia. Max.	G Dia. Max.	J Dia. Max.	L Max.	M Max.	N T.P.	P +0.13 −0.25
12.04	10.69	14.30	7.92	21.03	15.09	3.17
15.01	13.77	17.27	7.92	24.23	18.26	3.17
19.07	16.94	21.82	7.92	26.59	20.62	3.17
22.25	20.09	24.99	7.92	28.98	23.01	3.17
25.42	23.27	28.14	7.92	31.34	24.61	3.17
28.60	26.26	31.32	7.92	33.73	26.97	3.17
31.77	29.41	34.49	7.92	36.81	27.36	3.17
33.95	32.59	37.67	7.92	39.08	31.76	3.17
38.12	35.76	40.89	7.92	43.26	34.92	3.17

Dimensions subject to change.

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

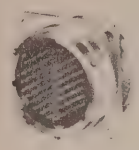
ITT CANNON ELECTRIC

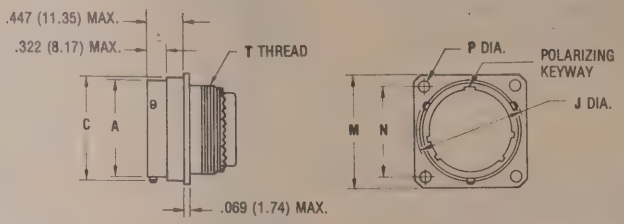
MINIATURE CIRCULAR CONNECTORS
KJL/KJ CONNECTORS

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

WALL MOUNTING RECEPTACLE (BACK PANEL)

KJ3 (ITT Cannon designation)
MS27497 (MS designation)





INCHES

Shell Size	A Dia. Max.	C Dia. Max.	J Dia. Max.	M Max.	N T.P.	P +.005 −.010	T Thread	Overall Length With Backshells E Straight	F Cable Clamp	P Potting Max.
8	.474	.522	.563	.828	.594	.125	7/16-28UNEF-2A	.855	1.570	1.020
10	.591	.639	.680	.954	.719	.125	9/16-24UNEF-2A	.855	1.570	1.020
12	.751	.808	.859	1.047	.812	.125	11/16-24UNEF-2A	.855	1.570	1.020
14	.876	.935	.984	1.141	.906	.125	13/16-20UNEF-2A	.855	1.780	1.020
16	1.001	1.058	1.108	1.234	.969	.125	15/16-20UNEF-2A	.855	1.780	1.020
18	1.126	1.183	1.233	1.328	1.062	.125	1 1/16-18UNEF-2A	.855	1.780	1.020
20	1.251	1.308	1.358	1.453	1.156	.125	1 3/16-18UNEF-2A	.855	1.780	1.020
22	1.376	1.433	1.483	1.578	1.250	.125	1 5/16-18UNEF-2A	.855	1.960	1.020
24	1.501	1.568	1.610	1.703	1.375	.152	1 7/16-18UNEF-2A	.855	1.960	1.080

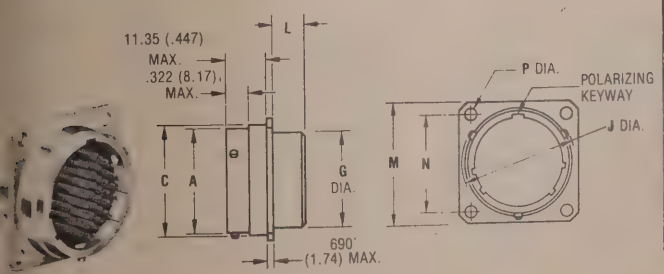
NOTE: For backshell dimensions and configurations, see page 14.

MILLIMETERS

Shell Size	A Dia. Max.	C Dia. Max.	J Dia. Max.	M Max.	N T.P.	P +0.13 −0.25	T Thread	Overall Length With Backshells E Straight	F Cable Clamp	P Potting Max.
8	12.04	13.26	14.30	21.03	15.09	3.17	7/16-28UNEF-2A	21.80	39.88	25.90
10	15.01	16.21	17.27	24.23	18.26	3.17	9/16-24UNEF-2A	21.80	39.88	25.90
12	19.07	20.50	21.82	26.59	20.62	3.17	11/16-24UNEF-2A	21.80	39.88	25.90
14	22.25	23.72	24.99	28.98	23.01	3.17	13/16-20UNEF-2A	21.80	45.21	25.90
16	25.42	26.85	28.14	31.24	24.61	3.17	15/16-20UNEF-2A	21.80	45.21	25.90
18	28.60	30.02	31.32	33.73	26.97	3.17	1 1/16-18UNEF-2A	21.80	45.21	25.90
20	31.77	33.20	34.49	36.91	29.36	3.17	1 3/16-18UNEF-2A	21.80	45.21	25.90
22	34.95	36.37	37.67	40.08	31.75	3.17	1 5/16-18UNEF-2A	21.80	49.78	25.90
24	38.12	40.80	40.89	43.66	34.92	3.86	1 7/16-18UNEF-2A	21.80	49.78	27.43

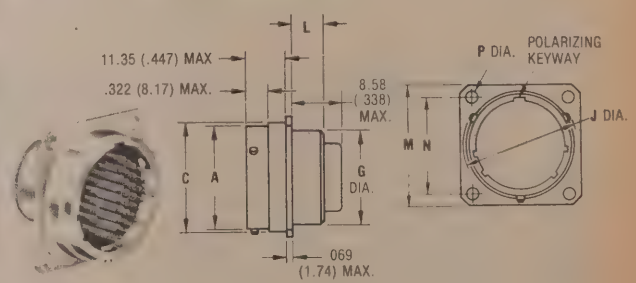
BOX MOUNTING RECEPTACLE (BACK PANEL)

KJ5E (ITT Cannon designation)
MS27508 (MS designation)



NOTE: This connector does not accommodate backshells.

KJ5R (ITT Cannon designation)



NOTE: This connector does not accommodate backshells.

INCHES

Shell Size	A Dia. Max.	C Dia. Max.	G Dia. Max.	J Dia. Max.	L Max.	M Max.	N T.P.	P +.005 −.010
8	.474	.522	.421	.563	.185	.828	.594	.125
10	.591	.639	.542	.680	.185	.954	.719	.125
12	.751	.808	.667	.859	.185	1.047	.812	.125
14	.876	.935	.791	.984	.185	1.141	.906	.125
16	1.001	1.058	.916	1.108	.185	1.234	.969	.125
18	1.126	1.183	1.034	1.233	.185	1.328	1.062	.125
20	1.251	1.308	1.158	1.358	.185	1.453	1.156	.125
22	1.376	1.433	1.283	1.483	.185	1.578	1.250	.125
24	1.501	1.568	1.408	1.610	.185	1.703	1.375	.152

MILLIMETERS

A Dia. Max.	C Dia. Max.	G Dia. Max.	J Dia. Max.	L Max.	M Max.	N T.P.	P +0.13 −0.25
12.04	13.26	10.69	12.78	4.75	21.03	15.09	3.17
15.01	16.21	18.64	17.27	4.75	24.23	18.26	3.17
19.07	20.50	21.82	21.82	4.75	26.59	20.62	3.17
22.25	23.72	24.99	24.99	4.75	28.98	23.01	3.17
25.42	26.85	28.57	28.14	4.75	31.24	24.61	3.17
28.60	30.02	31.34	31.32	4.75	33.73	26.97	3.17
31.77	33.20	34.52	34.49	4.75	36.91	29.36	3.17
34.95	36.37	37.69	37.67	4.75	40.08	31.75	3.17
38.12	40.80	40.87	40.89	4.75	43.66	34.92	3.86

(millimeters are in parenthesis)

Dimensions subject to change.

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

MINIATURE CIRCULAR CONNECTORS
KJL/KJ CONNECTORS

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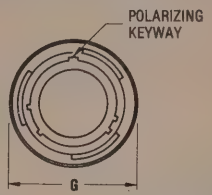
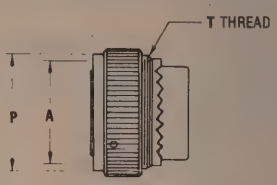
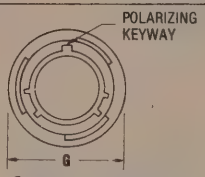
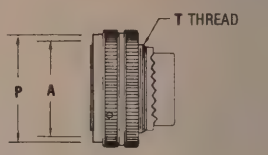
STRAIGHT PLUG
KJ6 (ITT Cannon designation)
MS27473 (MS designation)





STRAIGHT PLUG GROUNDED
KJG6 (ITT Cannon designation)
MS27484 (MS designation)





INCHES

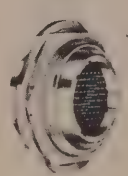
Shell Size	A Dia. Max.	G Dia. Max.	P Dia. Max.	T Thread	Overall Length With Backshells: E Straight	F Cable Clamp	P Potting Max.
8	.485	.749	.615	7/16-28UNEF-2A	.840	1.555	1.020
10	.606	.858	.737	9/16-24UNEF-2A	.840	1.555	1.020
12	.765	1.030	.910	11/16-24UNEF-2A	.840	1.555	1.020
14	.890	1.155	1.035	13/16-20UNEF-2A	.840	1.790	1.020
16	1.014	1.280	1.157	15/16-20UNEF-2A	.840	1.790	1.020
18	1.140	1.405	1.289	1 1/16-18UNEF-2A	.840	1.790	1.020
20	1.264	1.530	1.410	1 3/16-18UNEF-2A	.840	1.790	1.020
22	1.389	1.640	1.535	1 5/16-18UNEF-2A	.840	1.930	1.020
24	1.514	1.765	1.663	1 7/16-18UNEF-2A	.840	1.900	1.080

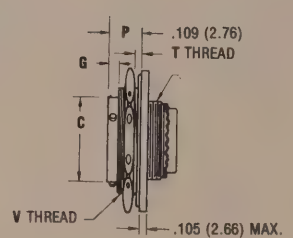
MILLIMETERS

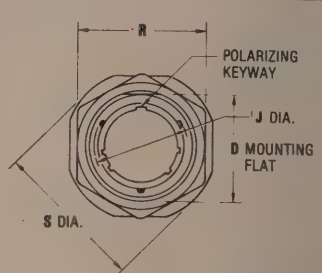
Shell Size	A Dia. Max.	G Dia. Max.	P Dia. Max.	T Thread	Overall Length With Backshells: E Straight	F Cable Clamp	P Potting Max.
8	12.32	19.02	15.62	7/16-28UNEF-2A	21.34	39.50	25.90
10	15.39	21.79	18.72	9/16-24UNEF-2A	21.34	39.50	25.90
12	19.33	26.16	23.11	11/16-24UNEF-2A	21.34	39.50	25.90
14	22.61	29.34	26.29	13/16-20UNEF-2A	21.34	45.47	25.90
16	25.75	32.51	29.39	15/16-20UNEF-2A	21.34	45.47	25.90
18	28.96	35.69	32.74	1 1/16-18UNEF-2A	21.34	45.47	25.90
20	27.00	38.86	35.81	1 3/16-18UNEF-2A	21.34	45.47	25.90
22	35.28	40.66	38.99	1 5/16-18UNEF-2A	21.34	49.02	25.90
24	38.45	44.83	42.24	1 7/16-18UNEF-2A	21.34	48.26	27.43

NOTE: For backshell dimensions and configurations, see page 14.

JAM NUT RECEPTACLE
KJ7 (ITT Cannon designation)
MS27474 (MS designation)







INCHES

Shell Size	C Dia. Max.	D Max.	G Max.	J Max.	P Max.	R Max. Hex.	S Dia. Max.	T Thread	V Thread	Overall Length With Backshells: E Straight	F Cable Clamp	P Potting Max.
8	.474	.818	.145	.563	.443	1.079	1.381	7/16-28UNEF-2A	7/8-20UNEF-2A	.840	1.555	1.020
10	.591	.942	.145	.680	.443	1.205	1.506	9/16-24UNEF-2A	1 -20UNEF-2A	.840	1.555	1.020
12	.751	1.066	.145	.859	.443	1.329	1.631	11/16-24UNEF-2A	1 1/8-18UNEF-2A	.840	1.555	1.020
14	.876	1.191	.145	.984	.443	1.455	1.756	13/16-20UNEF-2A	1 1/4-18UNEF-2A	.840	1.790	1.020
16	1.001	1.321	.145	1.108	.443	1.579	1.944	15/16-20UNEF-2A	1 3/8-18UNEF-2A	.840	1.790	1.020
18	1.126	1.441	.145	1.233	.443	1.705	2.022	1 1/16-18UNEF-2A	1 1/2-18UNEF-2A	.840	1.790	1.020
20	1.251	1.566	.171	1.358	.469	1.829	2.147	1 3/16-18UNEF-2A	1 5/8-18UNEF-2A	.840	1.790	1.020
22	1.376	1.691	.171	1.483	.469	2.017	2.271	1 5/16-18UNEF-2A	1 3/4-18UNS -2A	.840	1.930	1.020
24	1.501	1.816	.171	1.610	.469	2.142	2.396	1 7/16-18UNEF-2A	1 7/8-16UN -2A	.860	1.900	1.080

NOTE: For backshell dimensions and configurations, see page 14.

MILLIMETERS

Shell Size	C Dia. Max.	D Max.	G Max.	J Max.	P Max.	R Max. Hex.	S Dia. Max.	T Thread	V Thread	Overall Length With Backshells: E Straight	F Cable Clamp	P Potting Max.
8	12.04	20.78	3.68	14.30	11.00	27.41	35.08	7/16-28UNEF-2A	7/8-20UNEF-2A	21.34	39.50	25.90
10	15.11	23.93	3.68	17.27	11.00	30.61	38.25	9/16-24UNEF-2A	1 -20UNEF-2A	21.34	39.50	25.90
12	19.07	27.08	3.68	21.81	11.00	33.76	41.43	11/16-24UNEF-2A	1 1/8-18UNEF-2A	21.34	39.50	25.90
14	22.25	30.25	3.68	24.99	11.00	36.96	44.60	13/16-20UNEF-2A	1 1/4-18UNEF-2A	21.34	45.47	25.90
16	25.42	33.55	3.68	28.14	11.00	40.11	49.38	15/16-20UNEF-2A	1 3/8-18UNEF-2A	21.34	45.47	25.90
18	28.60	36.60	3.68	31.32	11.00	43.31	51.36	1 1/16-18UNEF-2A	1 1/2-18UNEF-2A	21.34	45.47	25.90
20	31.77	39.78	4.34	34.49	11.91	46.46	54.63	1 3/16-18UNEF-2A	1 5/8-18UNEF-2A	21.34	45.47	25.90
22	33.95	42.95	4.34	37.67	11.91	51.23	57.68	1 5/16-18UNEF-2A	1 3/4-18UNS -2A	21.34	49.02	25.90
24	38.12	46.13	4.34	40.89	11.91	54.41	59.86	1 7/16-18UNEF-2A	1 7/8-16UN -2A	21.84	48.26	27.43

Dimensions subject to change.

(millimeters are in parenthesis)

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

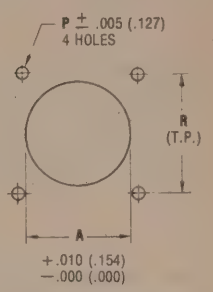
ITT CANNON ELECTRIC

MINIATURE CIRCULAR CONNECTORS
KJL/KJ CONNECTORS

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

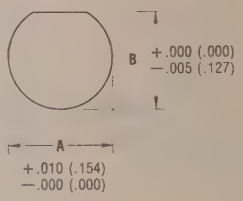
KJ PANEL CUTOUTS
FLANGE MOUNTED RECEPTACLES

INCHES					MILLIMETERS			
Shell Size	A Dia.	P Dia.	R	Mtg. Screw	A Dia.	P Dia.	R	Mtg. Screw
8	.610	.125	.594	#4	15.49	3.18	15.08	#4
10	.734	.125	.719	#4	18.64	3.18	18.26	#4
12	.860	.125	.812	#4	21.84	3.18	20.62	#4
14	.985	.125	.906	#4	25.02	3.18	23.01	#4
16	1.110	.125	.969	#4	28.19	3.18	24.61	#4
18	1.234	.125	1.062	#4	31.34	3.18	26.97	#4
20	1.360	.125	1.156	#4	34.54	3.18	29.36	#4
22	1.484	.125	1.250	#4	37.69	3.18	31.75	#4
24	1.611	.152	1.375	#6	40.92	3.86	34.92	#6

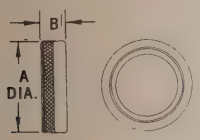


JAM NUT RECEPTACLES

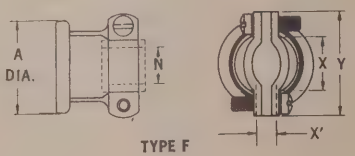
INCHES			MILLIMETERS	
Shell Size	A Dia.	B Dia.	A Dia.	B Dia.
8	.885	.828	22.48	21.03
10	1.010	.952	25.65	24.18
12	1.135	1.076	28.82	27.33
14	1.260	1.201	32.00	30.51
16	1.385	1.331	35.18	33.81
18	1.510	1.451	38.35	36.86
20	1.635	1.576	41.53	40.03
22	1.760	1.701	44.70	43.21
24	1.885	1.826	47.88	46.38



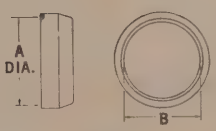
KJL/KJ BACKSHELL ACCESSORIES
(For overall length of connectors with backshells see pages 8, 9, 10, 11 and 12.)



TYPE E



TYPE F



TYPE P

INCHES										
Shell Size		Type E			Type F				Type P	
KJL	KJ	A Dia. Max.	B Max.	A Max.	N Dia. Max.	X Dia. Min.	X' Dia. Min.	Y Max.	A Dia. Max.	B Dia. Max.
9	8	.580	.328	.580	.135	.234	.187	.829	.598	.434
11	10	.705	.328	.705	.198	.297	.187	.891	.723	.548
13	12	.830	.328	.830	.322	.422	.281	1.016	.847	.673
15	14	.955	.328	.955	.385	.547	.325	1.141	.969	.798
17	16	1.080	.328	1.080	.510	.609	.356	1.203	1.087	.899
19	18	1.205	.328	1.205	.635	.734	.456	1.469	1.211	1.024
21	20	1.330	.328	1.330	.635	.734	.519	1.469	1.336	1.141
23	22	1.455	.328	1.455	.760	.922	.519	1.656	1.461	1.274
25	24	1.555	.270	1.555	.810	.984	.657	1.750	1.586	1.399

MILLIMETERS										
Shell Size		Type E			Type F				Type P	
KJL	KJ	A Dia. Max.	B Max.	A Max.	N Dia. Max.	X Dia. Min.	X' Dia. Min.	Y Max.	A Dia. Max.	B Dia. Max.
9	8	14.73	8.33	14.73	3.43	5.94	4.75	21.06	15.19	11.02
11	10	17.91	8.33	17.91	5.03	7.54	4.75	22.63	18.36	13.92
13	12	21.08	8.33	21.08	7.18	10.72	7.14	25.81	21.51	17.09
15	14	24.26	8.33	24.26	9.78	12.89	8.26	28.98	24.61	20.27
17	16	27.32	8.33	27.43	12.95	15.47	9.04	30.56	27.61	22.83
19	18	30.61	8.33	30.61	16.13	18.64	11.58	37.31	30.76	26.01
21	20	33.78	8.33	33.78	16.13	18.64	13.18	37.31	33.93	29.98
23	22	36.96	8.33	36.96	19.30	23.42	13.18	42.06	37.11	32.36
25	24	39.50	6.86	39.50	20.57	24.99	16.69	44.45	40.28	35.53

(millimeters are in parenthesis)

Dimensions subject to change.

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

MINIATURE CIRCULAR CONNECTORS
KJL/KJ CONNECTORS

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

BACKSHELL CROSS REFERENCE PART NUMBERS

KJ TYPE E (STRAIGHT)

Shell Size	Finishes A Cadmium/Nickel-Clear Part Number	B Cadmium/Nickel-O.D. Part Number	C Anodic Non-Cond. Part Number	N Electroless Nickel Part Number
8	057-0776-000	057-0862-000	057-0819-000	057-0776-002
10	057-0777-000	057-0863-000	057-0820-000	057-0777-002
12	057-0778-000	057-0864-000	057-0821-000	057-0778-002
14	057-0779-000	057-0846-000	057-0822-000	057-0779-002
16	057-0780-000	057-0847-000	057-0823-000	057-0780-002
18	057-0781-000	057-0848-000	057-0824-000	057-0781-002
20	057-0782-000	057-0849-000	057-0825-000	057-0782-002
22	057-0783-000	057-0850-000	057-0826-000	057-0783-002
24	057-0784-000	057-0851-000	057-0827-000	057-0784-002

MS/KJL TYPE F (CABLE CLAMP)

Shell Size	MS Part Number	Cannon Part Number	Finishes A Cadmium/Nickel-Clear Cannon	A MS	B Cadmium/Nickel-O.D. Cannon	B MS	N Electroless Nickel Cannon	F MS
9	27506-*9-1	057-3005-***	-020	A	-019	B	-018	F
11	27506-*11-1	057-3006-***	-019	A	-018	B	-017	F
13	27506-*13-1	057-3007-***	-020	A	-019	B	-018	F
15	27506-*15-1	057-3008-***	-018	A	-017	B	-016	F
17	27506-*17-1	057-3009-***	-019	A	-018	B	-017	F
19	27506-*19-1	057-3010-***	-020	A	-019	B	-018	F
21	27506-*21-1	057-3011-***	-021	A	-020	B	-019	F
23	27506-*23-1	057-3012-***	-023	A	-022	B	-021	F
25	27506-*25-1	057-3013-***	-021	A	-020	B	-019	F

* MS Finish
*** Cannon Finish

MS/KJ TYPE F (CABLE CLAMP)

Shell Size	MS Part Number	Cannon Part Number	Finishes A Cadmium/Nickel-Clear Cannon	A MS	B Cadmium/Nickel-O.D. Cannon	B MS	N Electroless Nickel Cannon	F MS
8	27506-*8-2	057-3005-***	-012	A	-013	B	-015	F
10	27506-*10-2	057-3006-***	-011	A	-012	B	-014	F
12	27506-*12-2	057-3007-***	-012	A	-013	B	-015	F
14	27506-*14-2	057-3008-***	-010	A	-011	B	-013	F
16	27506-*16-2	057-3009-***	-012	A	-013	B	-015	F
18	27506-*18-2	057-3010-***	-013	A	-014	B	-016	F
20	27506-*20-2	057-3011-***	-011	A	-013	B	-015	F
22	27506-*22-2	057-3012-***	-015	A	-016	B	-018	F
24	27506-*24-2	057-3013-***	-013	A	-014	B	-017	F

* MS Finish
*** Cannon Finish

MS/KJL/KJ TYPE P (POTTING) BOOT

Shell Size KJL	Shell Size KJ	MS Part Number	Cannon Part Number	Shell Size KJL	Shell Size KJ	MS Part Number	Cannon Part Number
9	8	27486-*-**	040-0169-000	19	18	27486-*-**	040-0174-000
11	10	27486-*-**	040-0170-000	21	20	27486-*-**	040-0175-000
13	12	27486-*-**	040-0171-000	23	22	27486-*-**	040-0176-000
15	14	27486-*-**	040-0172-000	25	24	27486-*-**	040-0176-000
17	16	27486-*-**	040-0173-000				

* MS Finish
** Specify applicable KJL or KJ shell size

ADAPTER RING

Shell Size		MS Part Number	Cannon Part Number	Finishes A Cadmium/Nickel-Clear Cannon	A MS	B Cadmium/Nickel-O.D. Cannon	B MS	N Electroless Nickel Cannon	F MS
9	8	27485-*-**	237-0874-***	-000	A	-001	B	-002	F
11	10	27485-*-**	237-0875-***	-000	A	-001	B	-002	F
13	12	27485-*-**	237-0876-***	-000	A	-001	B	-002	F
15	14	27485-*-**	237-0877-***	-000	A	-001	B	-002	F
17	16	27485-*-**	237-0878-***	-000	A	-001	B	-002	F
19	18	27485-*-**	237-0879-***	-000	A	-001	B	-002	F
21	20	27485-*-**	237-0880-***	-000	A	-001	B	-002	F
23	22	27485-*-**	237-0880-***	-000	A	-001	B	-002	F
25	24	27485-*-**	237-0881-***	-000	A	-001	B	-002	F

* MS Finish
** Specify applicable KJL or KJ shell size
*** Cannon Finish

Dimensions subject to change.

(millimeters are in parenthesis)

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

AUDIO CONNECTORS

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

XLRA/XLR SERIES

XLRA

Newest Audio connector series, available with dual purpose insertable contacts that can be terminated by crimp or solder. Contacts can be supplied in reel or bulk form.

XLR

Similar to XLRA except for factory installed solder termination contacts only. Socket insulator is resilient.

ANNON® Audio connectors are designed for use in audio/video nd other low level circuit applications where reliability, quiet peration, and the elimination of mechanical interference are ecessary. In addition to audio applications, these plugs have ound wide usage in the industrial/electronic field. Common uses nclude microphones, tape recorders, amplifiers, test instruentation, computers, medical instruments, cameras, control evices, and high fidelity systems.

In this catalog the XLRA and XLR Series connectors are shown. Of these two series, the XLRA is the newest, most economical audio connector. The XLRA is available with dual purpose contact terminations that can be **soldered or crimped** at the option of the user (socket side only for the present), while the XLR connector is available in standard solder contact termination.

XLRA FEATURES

- **Most economical advanced design audio connector.**
- **Popular high strength glass-filled nylon insulator provides exceptional dielectric properties.**
- **Latch-lock coupler molded of reinforced plastic.**
- **Contact termination by high speed automatic crimp, hand crimp or solder.**
- **High strength drawn shell with grounding tab.**
- **Polarization accomplished through contact arrangement and polarizing boss and groove.**

LRA/XLR Audio Connectors developed by ITT Cannon Electric eature the most innovative design characteristics: Strong, compact, and streamlined shells with a protective satin finish. Cross ibbing sections increase the inherent shell strength for rugged pplications. Glass-filled nylon insulators provide outstanding ielectric properties and improved shock construction. The XLRA s available in a three-contact arrangement, which accommolates three 10-amp contacts, and also features a shell grounding ab housed in any one of five shell styles. Crimp/solder type ontacts offer the option of high speed automatic crimp, hand rimp, or standard solder termination. For high speed automatic rimp termination contacts are available in reel form. For small uantity usage the same contacts may be terminated by either older or a hand crimp tool. The integral cable clamp used for oth XLRA and XLR provides two clamping positions for a positive rip on cable sizes ranging from 7/32" to 5/16" diameter. Neoprene ushings provide strong cable relief with an internal design to ermit easy cable insertion.

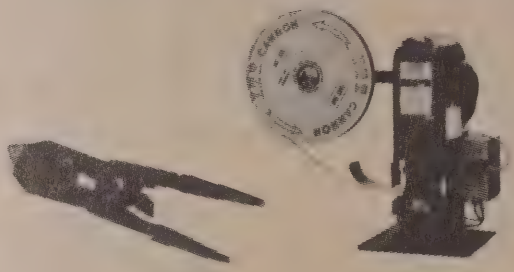
HOW TO ORDER

XLRA - 3 - 11C
XLR - 4 - 12C

Prefix
Contact Arrangement
Shell Style

Prefix
XLRA, XLR — ITT Cannon prefix
Contact Arrangement
Number of contacts
Shell Style
See following pages

ASSEMBLY & TERMINATION TOOLING DATA



The new XLRA crimp contact is available in reel form for high speed, large volume, automatic termination. ITT Cannon's ABT-606 automatic termination tool is factory equipped with the XLRA die set to insure quality contact terminations. XLRA crimp contacts are also available in individual packaging for hand termination with the CCT-XLRA, for smaller quantity contact terminations.

STANDARD DATA

		XLRA	XLR*
SHELL, ENDBELL, ENDBELL CAP, CABLE CLAMP	Material	Aluminum Alloy	
	Finish	Satin Nickel	
BARREL	Material	Nickel Silver Alloy	Steel
	Finish	—	Satin Nickel
CONTACTS	Material	Nickel Silver Alloy	Copper Alloy
	Finish	—	Silver Plate
CONTACT TERMINATION		Crimp and Solder	Solder
CONTACT ARRANGEMENTS		3-10 amp contacts #16 B&S wire	3-15 amp contacts #14 B&S wire 4-10 amp contacts #16 B&S wire 5-7½ amp contacts #18 B&S wire
PIN INSULATOR	Material	Reinforced Thermoplastic	
SOCKET INSULATOR	Material	Reinforced Thermoplastic	Resilient
CABLE RELIEF	Material	Resilient	
MOUNTING BRACKET	Material	Steel	
	Finish	Cadmium Plate	

*Available in steel in 11S and 12S style plugs only.

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

AUDIO CONNECTORS

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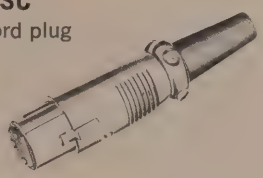
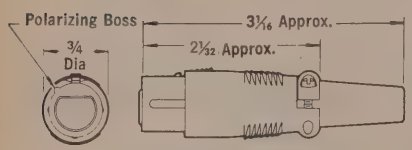
XLRA/XLR SERIES (Socket Contacts)

*Add contact arrangement number.

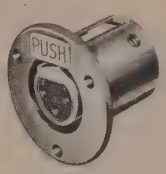
XLR-*-11C
XLRA-*-11C
XLR-*-11SC
Straight cord plug

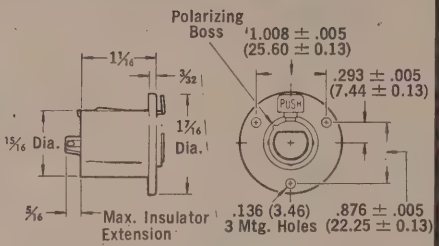




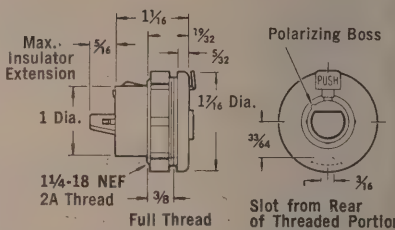
In the XLR series the 11SC is the same as the 11C model except that the shell material is steel, and finger grips extend completely around the shell.

XLR-*-13
XLRA-*-13
Wall mounting receptacle



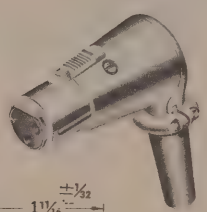


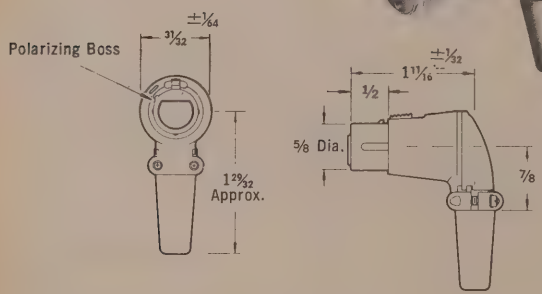
XLR-*-13N
XLRA-*-13N
Panel mounting receptacle



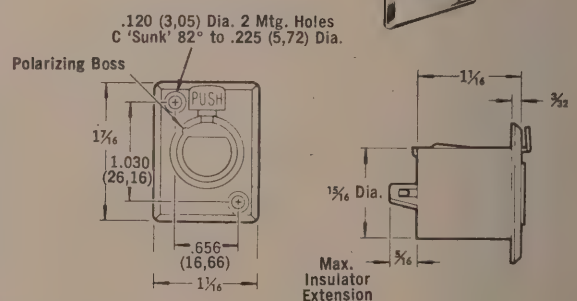
The mounting nut can accommodate a ½" panel. By reversing the nut, panels to ⅝" can be used.

XLR-*-15
90° cord plugs





XLR-*-31
XLRA-*-31
Wall mounting receptacle



AVAILABLE IN XLRA/XLR

CROSS REFERENCE MATING GUIDE

(millimeters are in parentheses)
Dimensions subject to change

XLRA / XLR	ITT CANNON ELECTRIC									SWITCHCRAFT**						AMPHENOL** 3 contact type			AMPHENOL** 4 contact type		
	XLR(*)-11C	XLR(*)-12C	XLR(*)-13	XLR(*)-13N	XLR(*)-14	XLR(*)-14N	XLR(*)-15	XLR(*)-31	XLR(*)-32	A(*)F (XLR-*-11C)	A(*)M (XLR-*-12C)	B(*)M (XLR-*-14N)	C(*)F (XLR-*-13)	C(*)M (XLR-*-14)	D(*)F (XLR-*-31)	D(*)M (XLR-*-32)	91-853 (XLR-3-12C)	91-855 (XLR-3-14)	91-856 (XLR-3-13)	91-857 (XLR-4-12C)	91-859 (XLR-4-14)	91-860 (XLR-4-13)
XLR(*)-11C		•			•	•			•		•	•		•		•	•	•		•	•	
XLR(*)-12C	•		•	•			•	•		•			•		•				•			
XLR(*)-13		•									•						•			•		
XLR(*)-13N		•									•											
XLR(*)-14	•						•			•												
XLR(*)-14N	•						•			•												
XLR(*)-15		•			•	•			•		•	•		•		•	•	•	•	•	•	•
XLR(*)-31		•									•						•			•		
XLR(*)-32	•						•			•												

*Number of insert contacts or pins must be specified (3, 4 or 5) on ITT Cannon Electric and Switchcraft connectors to complete number and to insure proper selection of mating connectors.

**XLR numbers shown in parentheses are ITT Cannon equivalents to Switchcraft and Amphenol part numbers shown.

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

AUDIO CONNECTORS

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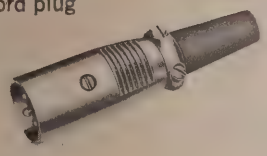
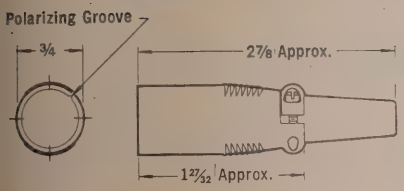
XLR SERIES (Pin Contacts)

*Add contact arrangement number.

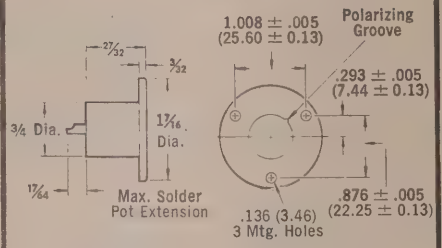
XLR-*-12C
XLR-*-12SC
Straight cord plug



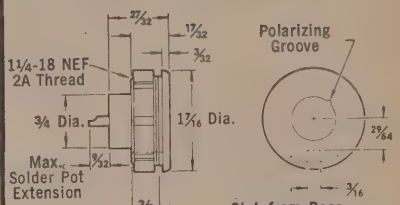


In the XLR series the 12SC is the same as the 12C model except that the shell material is steel, and finger grips extend completely around the shell.

XLR-*-14
Wall mounting receptacle

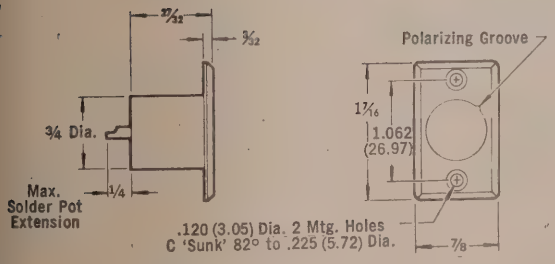


XLR-*-14N
Panel mounting receptacle

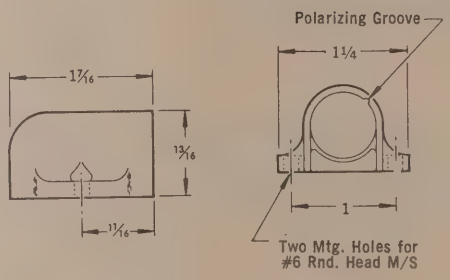


The mounting nut can accommodate a 1/32" panel. By reversing the nut, panels to 5/16" can be used.

XLR-*-32
Wall mounting receptacle



XLR-(*)-42
90° wall or microphone mounting receptacle



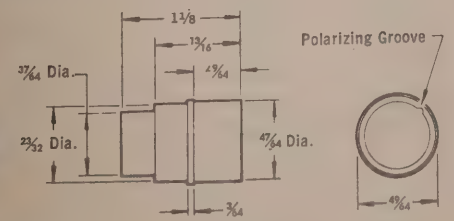
Not available with contact arrangement having 5 contacts.

AVAILABLE IN XLR ONLY

Dimensions subject to change.
(millimeters are in parentheses)

ADAPTER RECEPTACLES

XLR-*-50
Plain shell



Adapter receptacles are for mounting in or onto microphones or other units where they can be adequately supported. They are aluminum with satin nickel finish. Type 50 is a plain shell; type 50N includes a coupling nut to mate with the threaded portion of a microphone unit; and type 50T has a threaded barrel to mate into the equipment. All socket plugs (type 11C, 11SC, and 15) mate with these adapter receptacles.

CONTACT ARRANGEMENTS

XLRA

3
3-10 amp contacts
#16 B&S wire

Face view of pin insert not to full scale

XLR

3
3-15 amp contacts
#14 B&S wire

4
4-10 amp contacts
#16 B&S wire

5
5-7½ amp contacts
#18 B&S wire

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AUDIO CONNECTORS

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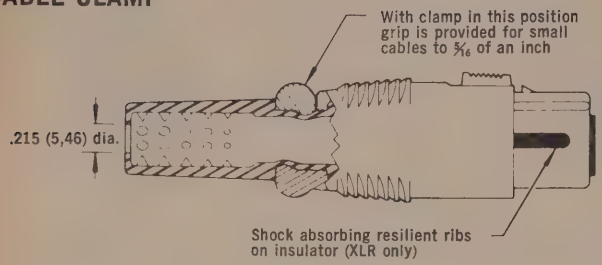
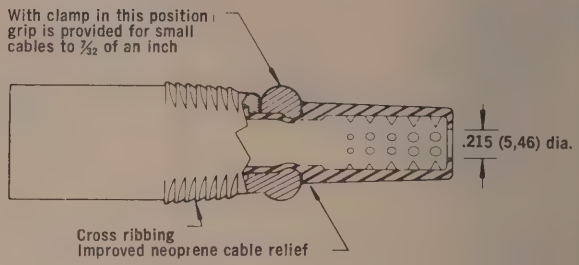
XLRA/XLR SERIES AUDIO CONNECTORS

CABLE CLAMP


With clamp in this position grip is provided for small cables to 5/16 of an inch
.215 (5,46) dia.
Shock absorbing resilient ribs on insulator (XLR only)


With clamp in this position grip is provided for small cables to 7/32 of an inch
.215 (5,46) dia.
Cross ribbing Improved neoprene cable relief

ACCESSORIES

REPLACEMENT PARTS

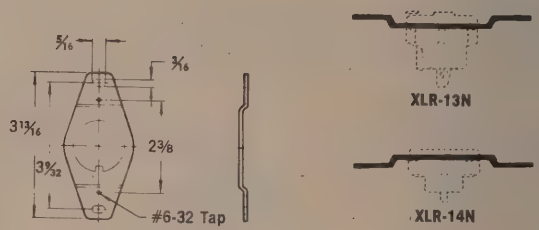
Replacement parts are available for the XLR and XLRA connectors. Contact your local ITT Cannon sales office or distributor for price availability.

FLOOR MOUNTING BRACKETS

XLR series receptacles can be installed in the floor by using a bracket for mounting in a Russell and Stoll floor box number 2503.
The bracket permits the floor mounting of the following receptacles:

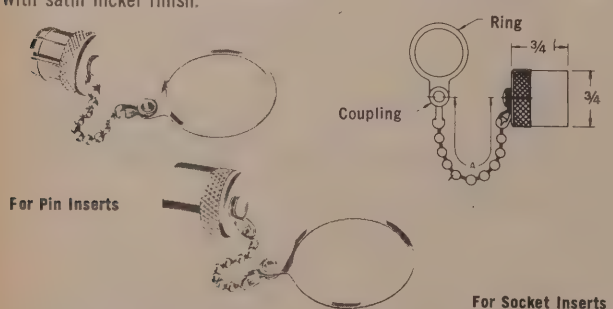
XLR-13N and XLR-14N. (These receptacles are mounted by using different sides of the same bracket. See illustration.)

Part number for this bracket is 015-0094-000.



DUST CAPS

XLR dust caps are furnished with a chain and coupling. The coupling has clearance for a #6 screw for use on wall mounted receptacles. When the plug is a straight cord type, a ring is attached for mounting on the cable relief bushing. When the receptacle is a panel type, a ring is attached for mounting on the shell. Dust caps are brass with satin nickel finish.



Part Number	Used on XLRA/XLR	Type of Mounting	Chain Length A
XLR-11RC	XLR-11C (11SC) -15	Mounted to cable relief bushing .630 +.010 −.002 (16.00 +0.25 −0.05) dia. ring	3 1/4
XLR-12PC	-12C (12SC)		2 15/16
XLR-13RC	-13 -31	Screw mounted coupling has clearance hole for #6 screw	1 13/16
XLR-14PC	-14 -32 -42		1 13/16
XLR-11SRC	-11C (11SC) -13 -15 -31		3 1/4
XLR-12SPC	-12C (12SC) -14 -32 -42		2 15/16
XLR-13N-RC	-13N -35 -35-2G	Shell mounted 1 17/64 dia. ring	2 1/8
XLR-14N-PC	-14N -36 XLR-36-2G		2 1/8 ±3/32

CONTACT DATA

Series	Number of Contacts	Voltages Test	Voltages Service	Current Rating (amps)	Wire Size B & S
XLRA	3	1400	133	10	16
XLR	3	1400	133	15	14
	4	1400	133	10	16
	5	1400	133	7.5	18

(millimeters are in parentheses)
Dimensions subject to change.

VOLTAGE RATINGS

TEST CONDITIONS: 25°C ambient temperature, 40% relative humidity, 29.7 in. Hg barometric pressure.

METHOD: Sixty-cycle AC sine-wave potential was applied between adjacent contacts and shell in steps of 100 volts, maintaining each step at approximately 80% of the initial flashover value. All values are rms meter readings.

SELECTED VALUES: The safe test potential sustained for one minute on the lowest capacity circuit encountered was selected as the governing value of all circuits in all connectors of similar construction and spacing.

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

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HIGH ENVIRONMENTAL CONNECTORS DESIGNED TO MIL-C-5015G

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STANDARD CIRCULAR HIGH ENVIRONMENTAL CONNECTORS Designed to MIL-C-5015G

The United States Navy Specification MIL-C-5015G (Navy) provides specifications for the connector series covered by this catalog. These connectors are available for many applications, from commercial/industrial and mass transportation systems to the most stringent high reliability military and space requirements.

The MS/CV345* connector manufactured by ITT Cannon Electric to MIL-C-5015G (Navy) is a threaded coupling, removable rear release crimp contact type. Fully intermateable with existing MIL-C-5015 and threaded MIL-C-83723 (USAF) type connectors, they provide for minimum effort and high economy upgrades for existing applications. In addition, they offer simplified design for new and interphase equipment.

MS/CV connectors covered under MIL-C-5015G (Navy) utilize fluid resistant elastomers to provide maximum protection against degrading fuels, oils, coolants and cleansers.

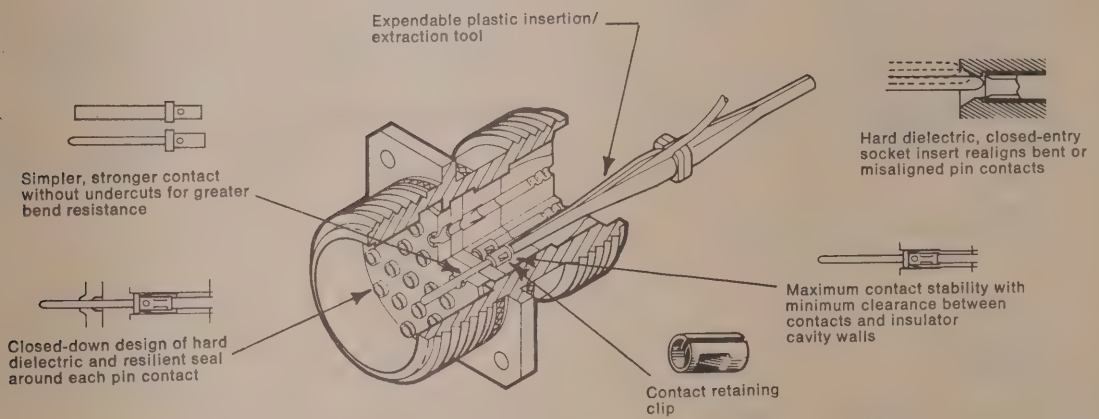
Temperature withstanding capabilities range from −55°C to +200°C depending upon the class. The use of electroless nickel and cadmium plating for hardware finishes gives the connectors maximum protection from the above factors. High quality manufacturing processes and materials combine to insure the optimum in performance and reliability under an extreme range of environmental conditions.

The MS/CV connector manufactured by ITT Cannon Electric is available in four shell styles and 58 contact arrangements accommodating from 1 to 48 contacts (sizes 0, 4, 8, 12 and 16).

This connector series is manufactured to accommodate the following backshells: MS3414, MS3415, MS3416, MS3417, MS-3418 and MS3419.

Shell polarization is effected by a single keyway and key, and standard MS polarization positions are available to prevent mismating.

FEATURES


Expendable plastic insertion/ extraction tool
Hard dielectric, closed-entry socket insert realigns bent or misaligned pin contacts
Simpler, stronger contact without undercuts for greater bend resistance
Maximum contact stability with minimum clearance between contacts and insulator cavity walls
Closed-down design of hard dielectric and resilient seal around each pin contact
Contact retaining clip

1. **Universal Insertion/Extraction Tool Style**—A single, expendable plastic tool is used for insertion and extraction of both pins and sockets. Tool never touches engaging ends of contacts, cannot damage insert.
2. **Simple, Strong Contact Design**—One basic configuration eliminates undercuts, maximizes bend resistance for positive contact mating.
3. **Interfacial Pin Insert Seal**—Universal Interconnect permits design of raised moisture barriers around each pin which mate into lead-in chamfers of hard face socket insert for individual contact sealing. Interfacial seal is never touched by service tools.
4. **Superior Contact Stability**—"Closed-down" design of each contact cavity in the insulator supports each contact, minimizes contact splaying.
5. **Closed Entry Socket Insert**—Hard dielectric socket face of mating connector has lead-in chamfers for positive alignment of pins and sockets.
6. **Simplified Assembly Operations**—One standard procedure for assembling connectors and contacts . . . standard MS crimp tools . . . all servicing of contacts accomplished from the rear of the connector.

CONNECTOR GENERAL CAPABILITIES

Class	Moisture Resistance	Fluid & Fuel Resistance	Operating Temperature	
			Maximum	Minimum
MS345*KT	Yes	Complete	+175°C	−55°C
MS345*L	Yes	Complete	+200°C	−55°C
MS345*W	Yes	Partial	+125°C	−55°C

NOTES: Fluid and fuel resistance definitions are as follows:

Limited: Resistant to hydraulic fluid per MIL-H-5606 and lubricating oil per MIL-L-7808.

Partial: Resistant to hydraulic fluid per MIL-H-5606, lubricating oil per MIL-L-7808, Aerosafe 2300, and Skydrol (LD).

Complete: Resistant to hydraulic fluid per MIL-H-5606 or Skydrol (LD), lubricating oils per MIL-L-7808 and MIL-L-23699, cleaners CeeBee A694 or Aerosafe 2300, jet engine fuel per MIL-J-5624 Grade JP-5, Ethylene Glycol, and Coolanol 25.

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

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HIGH ENVIRONMENTAL CONNECTORS DESIGNED TO MIL-C-5015G

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GENERAL INFORMATION

HOW TO ORDER

CV	345	6	L	18 —	9	P	W	
MS	345	6	L	18 —	9	P	W	

Prefix
Series
Shell Style
Connector Class
Shell Size
Contact Arrangement
Contact Sex
Polarization

PREFIX
MS — Complies with MIL-C-5015G
CV — ITT Cannon Prefix

SHELL STYLES
MS3450 — Wall Mounting Receptacle
MS3451 — Cable Connecting Receptacle
MS3452 — Box Mounting Receptacle
MS3456 — Cable Connecting Plug
CV3450 — Wall Mounting Receptacle
CV3451 — Cable Connecting Receptacle
CV3452 — Box Mounting Receptacle
CV3456 — Cable Connecting Plug

CONNECTOR CLASSES
Class KT — Firewall
Class L — High Temperature, Fluid Resistant
Class W — General Purpose

SHELL SIZE
See following pages

CONTACT ARRANGEMENTS
See the following pages.

CONTACT SEX: P — Pin S — Socket
A — Less Pin Contact
B — Less Socket Contact
*D — #1622 for #1616 Pin
#1216 for #1212 Pin
*E — #1622 for #1616 Socket
#1216 for #1212 Socket

*Used on Class "L" only

TEST DATA

HIGH POTENTIAL TEST VOLTAGE

MS/CV connectors show no evidence of breakdown when the test voltage given below is applied between the two closest contacts and between the shell and the contacts closest to the shell for a period of one minute.

TEST VOLTAGE

Service Rating	Test Voltage (rms) 60 cps	Suggested Operating Voltages* DC	AC (rms)
Inst.	1000	250	200
A	2000	700	500
D	2800	1250	900
E	3500	1750	1250
B	4500	2450	1750
C	7000	4200	3000

*As indicated in previous MS Specification and to be used by the designer only as a guide.

TEST CURRENT

Maximum current ratings of contacts and maximum allowable voltage drop under test conditions when assembled as in service are shown below. Maximum total current to be carried per connector is the same as that allowable in wire bundles as specified in MIL-W-5088.

CURRENT RATING (MIL-C-5015G test method)

Contact Size	Max. Current Rating (amps)	Test Current (amps)	Potential Drop (millivolts)
16	22	13	50
12	41	23	50
8	73	46	25
4	135	80	14
0	245	150	12

WIRE RANGE ACCOMMODATIONS

Contact Size	Wire Size	OD of Finished Wire (inch)[1] Minimum	Maximum
16-16	20	.053 (1,35)	.103 (2,62)
	18		
	16		
12-12	14	.085 (2,16)	.158 (4,01)
	12		

Contact Size	Wire Size	OD of Finished Wire (inch)[1] Minimum	Maximum
8-8	10	.132 (3,35)	.255 (6,48)
	8		
4-4	6	.237 (6,02)	.370 (9,40)
	4		
0-0	2	.360 (9,14)	.550 (13,97)
	0		

[1]Wire Reference — MIL-W-16878, MIL-W-22759, MIL-W-81381, MIL-C-915, MIL-C-24145 and MIL-C-2194.

(millimeters are in parentheses)
Dimensions subject to change.

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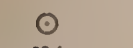
CONTACT ARRANGEMENTS (FACE VIEW PIN INSERT)

1 CONTACT



	8S-1	10S-2	12-5	20-2
Shell Size	8S-1	10S-2	12-5	20-2
No. of Contacts	1 #16	1 #16	1 #12	1 #0
Service Rating	A	A	D	D

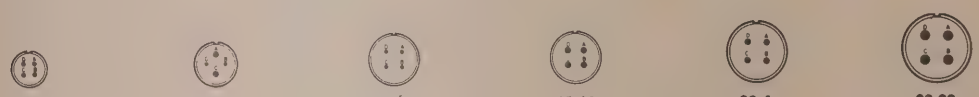
2 CONTACTS

	10SL-4	12S-3	14S-9
Shell Size	10SL-4	12S-3	14S-9
No. of Contacts	2 #16	2 #16	2 #16
Service Rating	A	A	A

3 CONTACTS

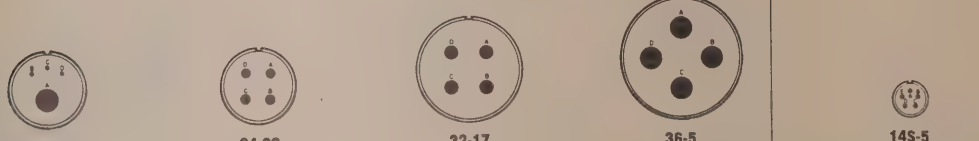
	16S-4	16-11	10SL-3	14S-7	16-7	16-10	22-2
Shell Size	16S-4	16-11	10SL-3	14S-7	16-7	16-10	22-2
No. of Contacts	2 #16	2 #12	3 #16	3 #16	2 16 (A, B) 1 #8 (C)	3 #12	3 #8
Service Rating	D	A	A	A	A	A	D

4 CONTACTS



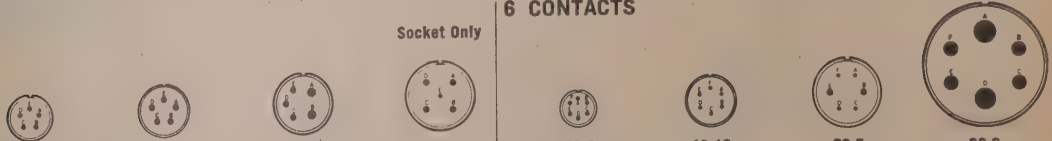
	14S-2	16-9	18-4	18-10	20-4	22-22
Shell Size	14S-2	16-9	18-4	18-10	20-4	22-22
No. of Contacts	4 #16	2 #16 (B, D) 2 #12 (A, C)	4 #16	4 #12	4 #12	4 #8
Service Rating	Inst.	A	D	A For new MIL equip. design, use 18-11	D	A

5 CONTACTS



	24-4	24-22	32-17	36-5	14S-5
Shell Size	24-4	24-22	32-17	36-5	14S-5
No. of Contacts	3 #16 (B, C, D) 1 #0 (A)	4 #8	4 #4	4 #0	5 #16
Service Rating	D	D	D	A	Inst.

6 CONTACTS

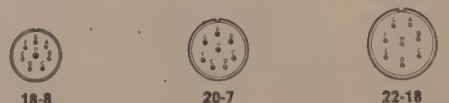


	16S-8	18-11	20-14	22-13 (Socket Only)	14S-6	18-12	22-5	36-6
Shell Size	16S-8	18-11	20-14	22-13	14S-6	18-12	22-5	36-6
No. of Contacts	5 #16	5 #12	3 #12 (C, D, E) 2 #8 (A, B)	1 #16 (E) 4 #12 (A-D)	6 #16	6 #16	4 #16 (A, C, D, F) 2 #12 (B, E)	4 #4 (B, C, E, F) 2 #0 (A, D)
Service Rating	A	A	A	A (A-D), D (E)	Inst.	A For new MIL equip. design, use 16S-1	D	A

7 CONTACTS

	16S-1	18-9	20-15	24-10
Shell Size	16S-1	18-9	20-15	24-10
No. of Contacts	7 #16	5 #16 (B, C, E-G) 2 #12 (A, D)	7 #12	7 #8
Service Rating	A	Inst.	A	A

8 CONTACTS



	18-8	20-7	22-18 (Pin Only)
Shell Size	18-8	20-7	22-18
No. of Contacts	7 #16 (A-G) 1 #12 (H)	8 #16	8 #16
Service Rating	A	A (C-F) D (A, B, G, H)	A (C-E) D (all others)

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CONTACT ARRANGEMENTS (FACE VIEW PIN INSERT)

9 CONTACTS

Shell Size	20-16
No. of Contacts	7 #16 (A-G) 2 #12 (H, I)
Service Rating	A

Shell Size	20-18
No. of Contacts	6 #16 (A, C-E, G, H) 3 #12 (B, F, I)
Service Rating	A

Shell Size	22-16
No. of Contacts	6 #16 3 #12
Service Rating	A

Shell Size	24-11
No. of Contacts	6 #12 (A-C, G-I) 3 #8 (D-F)
Service Rating	A

10 CONTACTS

Shell Size	18-1
No. of Contacts	10 #16
Service Rating	A (B, C, F, G) Inst. (all others)

11 CONTACTS

Shell Size	24-20
No. of Contacts	9 #16 (A-D, G-L) 2 #12 (E, F)
Service Rating	D

12 CONTACTS

Shell Size	28-9
No. of Contacts	6 #16 (A, H-M) 6 #12 (B-G)
Service Rating	D

Socket Only

Shell Size	28-18
No. of Contacts	12 #16
Service Rating	A (A, B) C (M) D (G-L) Inst. (C-F)

14 CONTACTS

Shell Size	20-27
No. of Contacts	14 #16
Service Rating	A

Shell Size	28-2
No. of Contacts	12 #16 (A-L, N) 2 #12 (M, P)
Service Rating	D

Shell Size	32-9
No. of Contacts	12 #16 (C-N) 2 #4 (A, B)
Service Rating	D

15 CONTACTS

Shell Size	28-17
No. of Contacts	15 #16
Service Rating	A (A-L), B (R), D (M-P)

Shell Size	32-12
No. of Contacts	10 #16 (A-D, F, G, L, N-P) 5 #12 (E, H, J, K, M)
Service Rating	A (C-G,) D (all others)

16 CONTACTS

Shell Size	24-7
No. of Contacts	14 #16 (A-M, 0) 2 #12 (P, N)
Service Rating	A

17 CONTACTS

Shell Size	20-29
No. of Contacts	17 #16
Service Rating	A

19 CONTACTS

Shell Size	22-14
No. of Contacts	19 #16
Service Rating	A

22 CONTACTS

Shell Size	28-11
No. of Contacts	18 #16 (A-I, N-X) 4 #12 (J-M)
Service Rating	A

23 CONTACTS

Shell Size	32-6
No. of Contacts	16 #16 (A-0, S) 2 #12 (U, V) 3 #8 (P-T) 2 #4 (W, X)
Service Rating	A

Shell Size	32-13
No. of Contacts	18 #16 (A-D, K-Z) 5 #12 (E-J)
Service Rating	D

24 CONTACTS

Shell Size	24-28
No. of Contacts	24 #16
Service Rating	Inst.

26 CONTACTS

Shell Size	28-12
No. of Contacts	26 #16
Service Rating	A

30 CONTACTS

Shell Size	40-1
No. of Contacts	24 #16 (A-L, T-e) 6 #12 (M-S)
Service Rating	D

35 CONTACTS

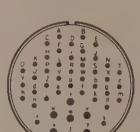
Shell Size	28-15
No. of Contacts	35 #16
Service Rating	A For new equip. design, use 28-21

Shell Size	32-7
No. of Contacts	28 #16 (A-N, W-Z, a-k) 7 #12 (O-V)
Service Rating	Inst. (A, B, H, J) A (all others)

37 CONTACTS

Shell Size	28-21
No. of Contacts	37 #16
Service Rating	A

47 CONTACTS



Shell Size	36-7
No. of Contacts	40 #16 (A-Z, a-s) 7 #12 (T-Z)
Service Rating	A

48 CONTACTS

Shell Size	36-10
No. of Contacts	48 #16
Service Rating	A

52 CONTACTS

Shell Size	36-52
No. of Contacts	52 #16
Service Rating	A

For a quick response to your application needs call one of the following District Offices:

WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

HIGH ENVIRONMENTAL CONNECTORS DESIGNED TO MIL-C-5015G

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

MS DESIGNATED ALTERNATE INSERT POSITIONS

Dimensions subject to change.

All views are looking into front of pin insert or rear of socket insert.

NORMAL POSITION

POSITION W

POSITION X

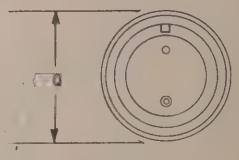
POSITION Y

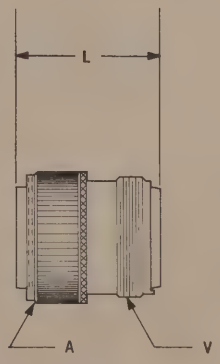
POSITION Z

ALTERNATE POSITIONS

No. of Contacts	Contact Arrangement	Degrees W	X	Y	Z
2	12S-3	70	145	215	290
	14.5-9	—	—	—	—
	16S-4	35	110	250	325
	16-11	35	110	250	325
3	14S-7	90	180	270	—
	16-7	80	110	250	280
	16-10	—	—	—	—
	22-2	70	145	215	290
4	14S-2	—	120	240	—
	16-9	35	110	250	325
	18-4	35	110	250	325
	18-10	—	120	240	—
	20-4	45	110	250	—
	22-22	—	110	250	—
	24-4	80	110	250	280
	24-22	45	110	250	—
	32-17	45	110	250	—
	36-5	—	120	240	—
5	14S-5	—	110	—	—
	16S-8	—	170	265	—
	18-11	—	—	—	—
	22-13	35	110	250	325
	20-14	—	—	—	—
6	18-12	80	—	—	280
	22-5	35	110	250	325
	36-6	—	—	—	—
7	16S-1	80	—	—	280
	18-9	80	110	250	280
	20-15	80	—	—	280
	24-10	80	—	—	280
8	18-8	70	—	—	290
	20-7	80	110	250	280
	22-18	80	110	250	280
9	20-16	80	110	250	280
	20-18	—	—	—	—
	22-16	80	110	250	280
	24-11	—	—	—	—
10	18-1	70	145	215	290
11	24-20	—	—	—	—
12	28-9	80	110	250	280
	28-18	70	145	215	290
14	20-27	35	110	250	325
	32-9	—	—	—	—
15	28-17	80	110	250	280
	32-12	80	110	250	280
16	24-7	80	110	250	280
17	20-29	80	—	—	280
19	22-14	80	—	—	280
22	28-11	80	110	250	280
23	32-6	80	110	250	280
	32-12	80	110	250	280
24	24-28	80	110	250	280
26	28-12	90	180	270	—
30	40-1	65	130	235	300
35	28-15	80	110	250	280
	32-7	80	125	235	280
37	28-21	80	110	250	280
47	36-7	80	110	250	280
48	36-10	80	125	235	280
52	36-52	—	—	—	—

MS 3456 / CV3456 CABLE CONNECTING PLUG





INCHES

Shell Size	L Max. Contact #16-4	L Max. Contact #0	Q Dia. Max.	A Thread Class 2B	V Thread Class 2A
8S	1.750	—	.844	½-28 UNEF	½-20 UNEF
10S	1.750	—	.969	⅝-24 UNEF	⅝-24 UNEF
10SL	1.750	—	.969	⅝-24 UNEF	⅝-24 UNEF
12S	1.750	—	1.062	¾-20 UNEF	¾-20 UNEF
12	2.100	—	1.062	¾-20 UNEF	¾-20 UNEF
14S	1.750	—	1.156	⅞-20 UNEF	⅞-20 UNEF
14	2.100	—	1.156	⅞-20 UNEF	⅞-20 UNEF
16S	1.750	—	1.250	1-20 UNEF	1-20 UNEF
16	2.100	—	1.250	1-20 UNEF	1-20 UNEF
18	2.100	—	1.344	1⅛-18 UNEF	1⅛-18 UNEF
20	2.100	2.250	1.469	1¼-18 UNEF	1⅜-18 UNEF
22	2.100	2.250	1.594	1⅜-18 UNEF	1⅝-18 UNEF
24	2.100	2.250	1.719	1½-18 UNEF	1⅞-18 UNEF
28	2.100	2.250	1.969	1¾-18 UNS	1¾-18 UNS
32	2.100	2.250	2.219	2-18 UNS	2-18 UNS
36	2.100	2.250	2.469	2¼-16 UN	2¼-16 UN
40	2.100	2.250	2.719	2½-16 UN	2½-16 UN
44	2.100	2.250	2.969	2¾-16 UN	2¾-16 UN
48	2.100	2.250	3.219	3-16 UN	3-16 UN

MILLIMETERS

L Max. Contact #16-4	L Max. Contact #0	Q Dia. Max.
44,45	—	21,44
44,45	—	24,61
44,45	—	24,61
44,45	—	26,97
44,45	—	26,97
53,34	—	29,36
44,45	—	29,36
53,34	—	31,75
44,45	—	31,75
53,34	—	34,14
53,34	57,15	37,31
53,34	57,15	40,49
53,34	57,15	43,66
53,34	57,15	50,01
53,34	57,15	56,36
53,34	57,15	62,71
53,34	57,15	69,06
53,34	57,15	75,41
53,34	57,15	81,76

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ITT CANNON ELECTRIC

HIGH ENVIRONMENTAL CONNECTORS DESIGNED TO MIL-C-5015G

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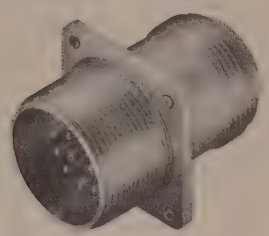
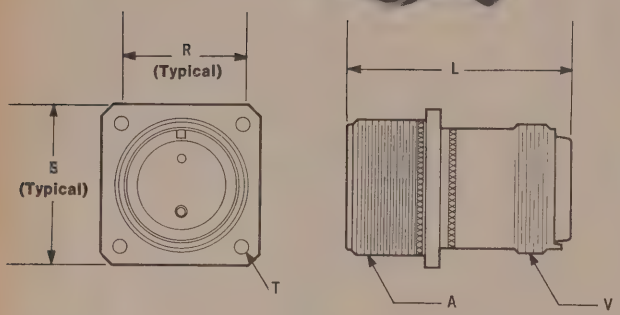
MS3450 / CV3450
WALL MOUNTING RECEPTACLE





INCHES

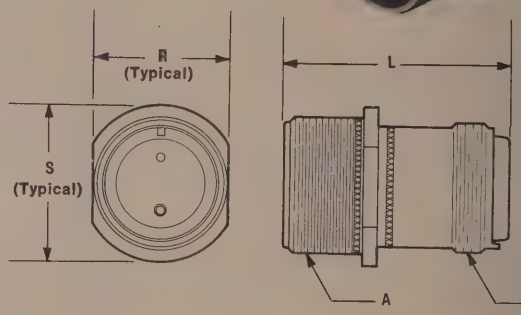
Size Shell	L Max. Contact #16-4	L Max. Contact #0	R ±.005	S ±.031	T Dia. +.015 −.000 Class L,W	T Dia. +.015 −.000 Class K	A Thread Class 2A	V Thread Class 2A
8S	1.750	—	.594	.875	.115	.145	½-28 UNEF	½-20 UNEF
10S	1.750	—	.719	1.000	.115	.145	⅝-24 UNEF	⅝-24 UNEF
10SL	1.750	—	.719	1.000	.115	.145	⅝-24 UNEF	⅝-24 UNEF
12S	1.750	—	.812	1.094	.115	.145	¾-20 UNEF	¾-20 UNEF
12	2.100	—	.812	1.094	.115	.145	¾-20 UNEF	¾-20 UNEF
14S	1.750	—	.906	1.188	.115	.145	⅞-20 UNEF	⅞-20 UNEF
14	2.100	—	.906	1.188	.115	.145	⅞-20 UNEF	⅞-20 UNEF
16S	1.750	—	.969	1.281	.115	.145	1-20 UNEF	1-20 UNEF
16	2.100	—	.969	1.281	.115	.145	1-20 UNEF	1-20 UNEF
18	2.100	—	1.062	1.375	.115	.172	1⅛-18 UNEF	1$\frac{1}{16}$-18 UNEF
20	2.100	2.250	1.156	1.500	.115	.172	1¼-18 UNEF	1$\frac{3}{16}$-18 UNEF
22	2.100	2.250	1.250	1.625	.115	.172	1⅜-18 UNEF	1$\frac{5}{16}$-18 UNEF
24	2.100	2.250	1.375	1.750	.142	.172	1½-18 UNEF	1$\frac{7}{16}$-18 UNEF
28	2.100	2.250	1.562	2.000	.142	.172	1¾-18 UNS	1¾-18 UNS
32	2.100	2.250	1.750	2.250	.168	.204	2-18 UNS	2-18 UNS
36	2.100	2.250	1.938	2.500	.168	.204	2¼-16 UN	2¼-16 UN
40	2.100	2.250	2.188	2.750	.168	.204	2½-16 UN	2½-16 UN
44	2.100	2.250	2.375	3.000	.168	.204	2¾-16 UN	2¾-16 UN
48	2.100	2.250	2.625	3.250	.168	.204	3-16 UN	3-16 UN

MILLIMETERS

Shell Size	L Max. Contact #16-4	L Max. Contact #0	R ±.13	S ±7.87	T Dia. +0,38 −0,00 Class L,W	T Dia. +0,38 −0,00 Class K	A Thread Class 2A	V Thread Class 2A
8S	44,45	—	15,09	22,22	2,92	3,68	½-28 UNEF	½-20 UNEF
10S	44,45	—	18,26	25,40	2,92	3,68	⅝-24 UNEF	⅝-24 UNEF
10SL	44,45	—	18,26	25,40	2,92	3,68	⅝-24 UNEF	⅝-24 UNEF
12S	44,45	—	20,62	27,79	2,92	3,68	¾-20 UNEF	¾-20 UNEF
12	53,34	—	20,62	27,79	2,92	3,68	¾-20 UNEF	¾-20 UNEF
14S	44,45	—	23,01	30,18	2,92	3,68	⅞-20 UNEF	⅞-20 UNEF
14	53,34	—	23,01	30,18	2,92	3,68	⅞-20 UNEF	⅞-20 UNEF
16S	44,45	—	24,61	32,54	2,92	3,68	1-20 UNEF	1-20 UNEF
16	53,34	—	24,61	32,54	2,92	3,68	1-20 UNEF	1-20 UNEF
18	53,34	—	26,97	34,92	2,92	4,37	1⅛-18 UNEF	1$\frac{1}{16}$-18 UNEF
20	53,34	57,15	29,36	38,10	2,92	4,37	1¼-18 UNEF	1$\frac{3}{16}$-18 UNEF
22	53,34	57,15	31,75	41,28	2,92	4,37	1⅜-18 UNEF	1$\frac{5}{16}$-18 UNEF
24	53,34	57,15	34,92	44,45	3,61	4,37	1½-18 UNEF	1$\frac{7}{16}$-18 UNEF
28	53,34	57,15	39,67	50,80	3,61	4,37	1¾-18 UNS	1¾-18 UNS
32	53,34	57,15	44,45	57,15	4,27	5,18	2-18 UNS	2-18 UNS
36	53,34	57,15	49,23	63,50	4,27	5,18	2¼-16 UN	2¼-16 UN
40	53,34	57,15	55,58	69,85	4,27	5,18	2½-16 UN	2½-16 UN
44	53,34	57,15	60,32	76,20	4,27	5,18	2¾-16 UN	2¾-16 UN
48	53,34	57,15	66,68	82,55	4,27	5,18	3-16 UN	3-16 UN

MS3451 / CV3451
CABLE CONNECTING RECEPTACLE (CLASS L AND W ONLY)

Dimensions subject to change.



INCHES

Shell Size	L Max. Contact #18-4	L Max. Contact #0	R Max.	S ±.031	A Thread Class 2A	V Thread Class 2A
8S	1.750	—	.504	.729	½-28 UNEF	½-20 UNEF
10S	1.750	—	.629	.854	⅝-24 UNEF	⅝-24 UNEF
10SL	1.750	—	.629	.854	⅝-24 UNEF	⅝-24 UNEF
12S	1.750	—	.754	.974	¾-20 UNEF	¾-20 UNEF
12	2.100	—	.754	.974	¾-20 UNEF	¾-20 UNEF
14S	1.750	—	.879	1.099	⅞-20 UNEF	⅞-20 UNEF
14	2.100	—	.879	1.099	⅞-20 UNEF	⅞-20 UNEF
16S	1.750	—	1.005	1.224	1-20 UNEF	1-20 UNEF
16	2.100	—	1.005	1.224	1-20 UNEF	1-20 UNEF
18	2.100	—	1.131	1.349	1⅛-18 UNEF	1$\frac{1}{16}$-18 UNEF
20	2.100	2.250	1.256	1.474	1¼-18 UNEF	1$\frac{3}{16}$-18 UNEF
22	2.100	2.250	1.381	1.599	1⅜-18 UNEF	1$\frac{5}{16}$-18 UNEF
24	2.100	2.250	1.506	1.715	1½-18 UNEF	1$\frac{7}{16}$-18 UNEF
28	2.100	2.250	1.756	1.974	1¾-18 UNS	1¾-18 UNS
32	2.100	2.250	2.007	2.224	2-18 UNS	2-18 UNS
36	2.100	2.250	2.257	2.474	2¼-16 UN	2¼-16 UN
40	2.100	2.250	2.511	2.724	2½-18 UN	2½-18 UN
44	2.100	2.250	2.761	2.974	2¾-16 UN	2¾-16 UN
48	2.100	2.250	3.011	3.224	3-16 UN	3-16 UN

MILLIMETERS

Shell Size	L Max. Contact #18-4	L Max. Contact #0	R Max.	S ±0,79	A Thread Class 2A	V Thread Class 2A
8S	44,45	—	12,80	18,52	½-28 UNEF	½-20 UNEF
10S	44,45	—	15,98	21,69	⅝-24 UNEF	⅝-24 UNEF
10SL	44,45	—	15,98	21,69	⅝-24 UNEF	⅝-24 UNEF
12S	44,45	—	19,15	24,74	¾-20 UNEF	¾-20 UNEF
12	53,34	—	19,15	24,74	¾-20 UNEF	¾-20 UNEF
14S	44,45	—	22,33	27,91	⅞-20 UNEF	⅞-20 UNEF
14	53,34	—	22,33	27,91	⅞-20 UNEF	⅞-20 UNEF
16S	44,45	—	25,53	31,09	1-20 UNEF	1-20 UNEF
16	53,34	—	25,53	31,09	1-20 UNEF	1-20 UNEF
18	53,34	—	28,73	34,26	1⅛-18 UNEF	1$\frac{1}{16}$-18 UNEF
20	53,34	57,15	31,90	37,44	1¼-18 UNEF	1$\frac{3}{16}$-18 UNEF
22	53,34	57,15	35,08	40,61	1⅜-18 UNEF	1$\frac{5}{16}$-18 UNEF
24	53,34	57,15	38,25	43,56	1½-18 UNEF	1$\frac{7}{16}$-18 UNEF
28	53,34	57,15	44,60	50,14	1¾-18 UNS	1¾-18 UNS
32	53,34	57,15	50,98	56,49	2-18 UNS	2-18 UNS
36	53,34	57,15	57,33	62,84	2¼-16 UN	2¼-16 UN
40	53,34	57,15	63,78	69,19	2½-18 UN	2½-18 UN
44	53,34	57,15	70,13	75,54	2¾-16 UN	2¾-16 UN
48	53,34	57,15	76,48	81,89	3-16 UN	3-16 UN

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Add Dept. EM to address to tell them you saw it in eem

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HIGH ENVIRONMENTAL CONNECTORS DESIGNED TO MIL-C-5015G

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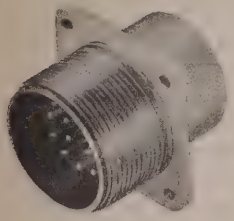
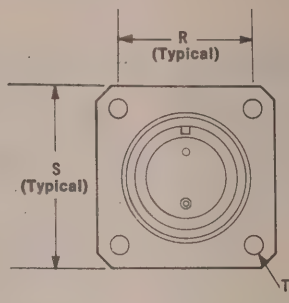
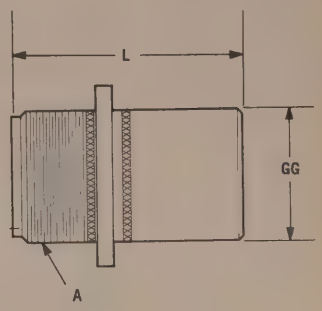
Dimensions subject to change.

MS3452 / CV3452

BOX MOUNTING RECEPTACLE (CLASS L AND W ONLY)







INCHES

Shell Size	G Dia. ±.016	L Max. Contact #16 & 12	L Max. Contact #8, 4, & 0	R ±.005	S ±.031	T Dia. +.015 −.000 Class L, W	A Thread Class 2A
8S	.500	1.662	—	.594	.875	.115	½-28-UNEF
10S	.625	1.662	—	.719	1.000	.115	⅝-24 UNEF
10SL	.625	1.662	—	.719	1.000	.115	⅝-24 UNEF
12S	.750	1.662	—	.812	1.094	.115	¾-20 UNEF
12	.750	1.662	—	.812	1.094	.115	¾-20 UNEF
14S	.875	1.662	—	.906	1.188	.115	⅞-20 UNEF
14	.875	1.662	—	.906	1.188	.115	⅞-20 UNEF
16S	1.000	1.662	—	.969	1.281	.115	1-20 UNEF
16	1.000	1.662	1.937	.969	1.281	.115	1-20 UNEF
18	1.062	1.662	1.937	1.062	1.375	.115	1⅛-18 UNEF
20	1.187	1.662	1.937	1.156	1.500	.115	1¼-18 UNEF
22	1.312	1.662	1.937	1.250	1.625	.115	1⅜-18 UNEF
24	1.437	1.662	1.937	1.375	1.750	.142	1½-18 UNEF
28	1.750	1.662	1.937	1.562	2.000	.142	1¾-18 UNS
32	2.000	1.662	1.937	1.750	2.250	.168	2-18 UNS
36	2.250	1.662	1.937	1.938	2.500	.168	2¼-16 UN
40	2.500	1.662	1.937	2.188	2.750	.168	2½-16 UN
44	2.750	1.662	1.937	2.375	3.000	.168	2¾-16 UN
48	3.000	1.662	1.937	2.625	3.250	.168	3-16 UN

MILLIMETERS

Shell Size	G Dia. ±0,41	L Max. Contact #16 & 12	L Max. Contact #8, 4, & 0	R ±0,13	S ±0,79	T Dia. +0,38 −0,00 Class L, W
8S	12,70	42,21	—	15,09	22,22	2,92
10S	15,88	42,21	—	18,26	25,40	2,92
10SL	15,88	42,21	—	18,26	25,40	2,92
12S	19,05	42,21	—	20,62	27,79	2,92
12	19,05	42,21	—	20,62	27,79	2,92
14S	22,22	42,21	—	23,01	30,18	2,92
14	22,22	42,21	—	23,01	30,18	2,92
16S	25,40	42,21	—	24,61	32,54	2,92
16	25,40	42,21	49,20	24,61	32,54	2,92
18	26,97	42,21	49,20	26,97	34,92	2,92
20	30,15	42,21	49,20	39,36	38,10	2,92
22	33,32	42,21	49,20	31,75	41,28	2,92
24	36,50	42,21	49,20	34,92	44,45	3,61
28	44,45	42,21	49,20	39,67	50,80	3,61
32	50,80	42,21	49,20	44,45	57,15	4,27
36	57,15	42,21	49,20	49,23	63,50	4,27
40	63,50	42,21	49,20	55,58	69,85	4,27
44	69,85	42,21	49,20	60,32	76,20	4,27
48	76,20	42,21	49,20	66,68	82,55	4,27

ACCESSORIES

CONTACTS

Contact Size	THERMOCOUPLE ALUMEL PIN	ALUMEL SOCKET	CHROMEL PIN	CHROMEL SOCKET
16S	—	031-3113-011	—	031-3113-012
16	030-3196-015	031-3114-014	030-3196-016	031-3114-015
12	030-3197-011	031-3115-009	030-3197-012	031-3115-010

PIN, MS3162 (Navy)

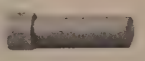
Dash No.	Mating End Size	Mating End Color	Wire Barrel Size	Wire Barrel Color	Part Number	Finish
16-16	16	Blue	16	Blue	030-3196-008	Gold
12-12	12	Yellow	12	Yellow	030-3197-007	Gold
8-8	8	Red	8	Red	030-3198-003	Silver
4-4	4	Blue	4	Blue	030-3199-004	Silver
0-0	0	Yellow	0	Yellow	030-3200-003	Silver

SOCKET, MS3163 (Navy)

Dash No.	Mating End Size	Mating End Color	Wire Barrel Size	Wire Barrel Color	Part Number	Finish
*16S-16	16S	Blue	16	Blue	031-3113-005	Gold
16-16	16	Blue	16	Blue	031-3114-008	Gold
12-12	12	Yellow	12	Yellow	031-3115-006	Gold
8-8	8	Red	8	Red	031-3116-003	Silver
4-4	4	Blue	4	Blue	031-3117-003	Silver
0-0	0	Yellow	0	Yellow	031-3118-003	Silver

*16S type socket contacts are for use in 8S, 10S, 10SL, 12S, 14S and 16S Shell Size Connectors.

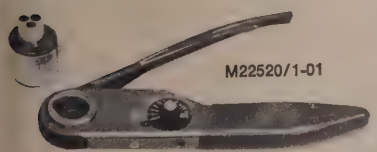
WIRE HOLE FILLERS



Contact Size	Part Number	Color Code
16	225-0071-000	Blue
12	225-0072-000	Yellow
*8	225-1009-000	Red
*4	225-1008-000	Blue
*0	225-1007-000	Yellow

*Consult factory for availability.

TOOLS



A complete line of crimp, insertion and extraction tools is provided for MIL-C-5015G connectors. Crimp tools are made from high quality metal and are designed for long life and trouble-free service. Insertion and extraction tools are made of a durable plastic and are inexpensive and expendable.

Contact Size	INSERTION/EXTRACTION TOOLS PLASTIC MS No.	PLASTIC ITT Cannon No.	METAL MS No.	METAL ITT Cannon No.	Crimp Tool	Unwired Contact
16	MS3447-16	CIET-16	—	—	M22520/1-01 with	274-7008-000
12	MS3447-12	CIET-12	—	—	M22520/1-02 Turret	274-7009-000
8	MS3165-8	CET 8-2	MS3483-1	CET-CVR-8	CBT 600B Power Unit CCH-8-1 Crimp Head CCHP-8-6 Locator	— — —
4	MS3165-4	CET 4-8	MS3483-2	CET-CVR-4	CBT 600B Power Unit CCH-4-1 Crimp Head CCHP-4-8 Locator	— — —
0	MS3165-0	CET 0-1	MS3483-3	CET-00-CV	CBT 600B Power Unit CCH-0-1 Crimp Head CCHP-0-8 Locator	— — —

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

STANDARD CIRCULAR CONNECTORS CVA/M83723 (SERIES II)

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

CVA/M83723 (SERIES II)
INTERMATEABLE / INTERMOUNTABLE WITH ALL MIL-C-5015

The United States Air Force specification, MIL-C-83723, USAF Series II, reflects a vastly upgraded, hi-rel version of the MIL-C-5015 type connectors. These connectors are suited for a variety of applications from commercial/industrial to the most stringent, high performance, high reliability military and space applications.

The M83723/CVA connector, manufactured by ITT Cannon Electric, is a threaded coupling, removable rear release crimp contact type which is fully qualified and QPL approved under MIL-C-83723 (USAF). They are fully intermateable/intermountable with all existing MIL-C-5015 connectors.

The removable rear release crimp contact concept utilized by this connector has become the standard design in the military/aerospace and commercial industries. Features such as faster and easier wire termination, use of common termination tooling and minimizing field repair during maintenance are combined to provide a maximum savings in termination and training time.

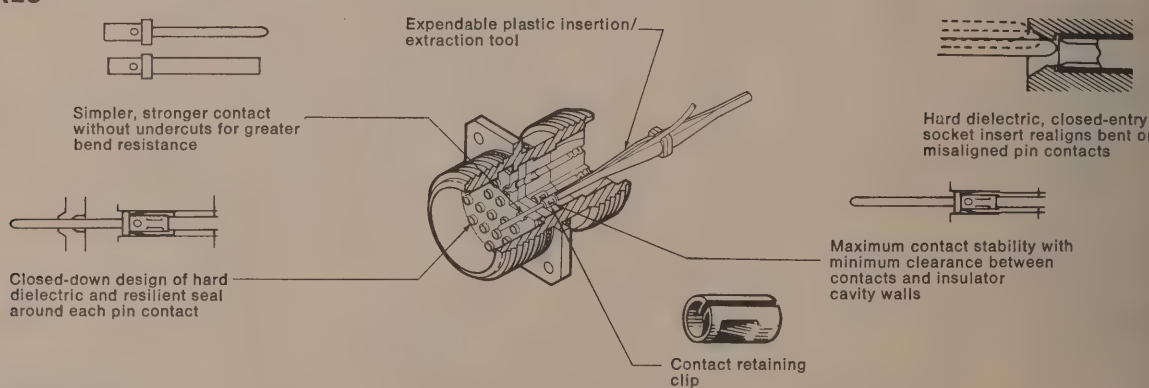
CVA connectors covered under MIL-C-83723 (USAF) utilize fluid resistant elastomers to provide the greatest protection against degradation from a wide variety of fuels, oils, coolants, and cleaning agents. The hardware is finished in electroless nickel to provide for operating temperatures from −55° to +200°C. All materials, finishes and processes used in the manufacture of ITT Cannon's CVA connectors assure the best performance and reliability in the industry for the widest possible range of environmental conditions.

The M83723/CVA connector manufactured by ITT Cannon is available in 4 shell styles and 75 contact arrangements accommodating from 1 to 48 contacts (sizes 0, 4, 8, 12 and 16).

Backshells are available in three configurations for the CVA connector series: straight with strain relief, 90° with strain relief, and straight, short without strain relief. All are fully qualified and QPL-listed under MIL-C-83723 (USAF). **Backshells are not included with the connector and must be ordered separately.**

Shell polarization is effected by a single key and keyway with alternate insert positions available to prevent mismating.

FEATURES


Expendable plastic insertion/ extraction tool
Simpler, stronger contact without undercuts for greater bend resistance
Hard dielectric, closed-entry socket insert realigns bent or misaligned pin contacts
Closed-down design of hard dielectric and resilient seal around each pin contact
Maximum contact stability with minimum clearance between contacts and insulator cavity walls
Contact retaining clip

1. **Universal Insertion/Extraction Tool Style** — A single, expendable plastic tool is used for insertion and extraction of both pins and sockets. Tool never touches engaging ends of contacts, cannot damage insert.
2. **Simple, Strong Contact Design** — One basic configuration eliminates undercuts, maximizes bend resistance for positive contact mating.
3. **Interfacial Pin Insert Seal** — Universal Interconnect permits design of raised moisture barriers around each pin which mate into lead-in chamfers of hard face socket insert for individual contact sealing. Interfacial seal is never touched by service tools.
4. **Superior Contact Stability** — "Closed-down" design of each contact cavity in the insulator supports each contact, minimizes contact splaying.
5. **Closed Entry Socket Insert** — Hard dielectric socket face of mating connector has lead-in chamfers for positive alignment of pins and sockets.
6. **Simplified Assembly Operations** — One standard procedure for assembling connectors and contacts . . . standard MS crimp tools . . . all servicing of contacts accomplished from the rear of the connector.

MILITARY SPECIFICATION CROSS REFERENCE CHART
MIL-C-83723/MIL-C-5015

Shown here are the corresponding MIL-C-83723 slash sheet numbers of those connectors that are equivalent to the MIL-C-5015 connectors.

Replacements For MIL-C-5015	MIL-C-83723 "Slash" Sheet Numbers*		ITT Cannon Equivalent Prefix Designation for MIL-C-83723	Description
	Sockets	Pin		
MS3100/3400/3450	-19	-20	CVA0	Wall Mounting Receptacle
MS3101/3401/3451	-17	-18	CVA1	Cable Mounting Receptacle
MS3102/3402/3452	-21	-22	CVA2	Box Mounting Receptacle
MS3106/3406/3456	-23	-24	CVA6	Straight Plug
MS3108/3406/3456	-23**	-24**	CVA6**	90° Angle Plug

* If parts per MIL-C-83723 are desired, order per applicable M83723 number only.
** Requires 90° Backshell (must be purchased separately).

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Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

STANDARD CIRCULAR CONNECTORS CVA/M83723 (SERIES II)

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GENERAL INFORMATION

Use the Military part number (M83723) when ordering connectors for military use. These M part number connectors have the required acceptance testing for each part lot per Mil Spec requirements. If a military type connector is needed but without the added acceptance testing for each part, yet having "in process" checking, specify the ITT Cannon equivalent part number on the drawing or purchase order.

HOW TO ORDER

MS DESIGNATION

M83723 - 19 R 11 04 *

MILITARY DESIGNATION

SHELL STYLE AND CONTACT TYPE
See Shell Style chart at right

CONNECTOR CLASS
R — Conductive Finish:
Operating Temp. −55°C to +200°C; fluid-resistant

SHELL SIZE*
8(8S), 10(10S), 11(10SL), 12, 13(12S), 15(14S), 16, 17(16S), 18, 20, 22, 24, 28, 32, 36, and 40

CONTACT ARRANGEMENTS
1-48 contacts (sizes 16, 12, 8, 4, and 0)

INSULATOR POSITION
N, W, X, Y, and Z

*Shell sizes shown in parentheses—i.e. 8 (8S)—are the MIL-C-5015 quivalent shell sizes.

ITT CANNON EQUIVALENT

CVA 0 R 10SL 4 S *

ITT CANNON DESIGNATION

SHELL STYLE
See Shell Style chart at right

CONNECTOR CLASS
R — Conductive Finish:
Operating Temp. −55°C to +200°C; fluid-resistant

SHELL SIZE (In 1/16ths inch)
8S, 10S, 10SL, 12S, 14S, 16S, 16, 18, 20, 22, 24, 28, 32, 36, and 40

CONTACT ARRANGEMENTS
1-48 contacts (sizes 16, 12, 8, 4, and 0)

CONTACT TYPE
P for Pin; S for Socket

INSULATOR POSITION
N, W, X, Y, and Z

CONDENSED DATA

STANDARD MATERIALS AND FINISHES	
Shell MATERIAL FINISH	 Aluminum alloy Conductive (electroless nickel)
Insulator	Silicone elastomers (−55°C to +200°C) Hard dielectric is glass filled epoxy
Contacts MATERIAL FINISH	 Copper alloy Gold plated
MECHANICAL FEATURES	
Shell Size	8S, 10S, 10SL, 12S, 14S, 16S, 16, 18, 20, 22, 24, 28, 32, 36, and 40
Service Classes	R — Conductive finish; operating temp. −55°C to +200°C
Coupling	Threaded
Polarization	1 key and keyway
Shell Styles	Wall mounting receptacle Cable connecting receptacle Box mounting receptacle Straight plug
Number of Contacts	1 to 48 (Sizes 16, 12, 8, 4, 0)
Contact Termination	Crimp removable Rear release

SHELL STYLE AND CONTACT TYPE CHART

Shell Style	Contact Type	MS Designation	ITT Cannon Designation
Cable Connecting Receptacle	Socket	M83723-17	CVA1R
	Pin	M83723-18	
Wall Mounting Receptacle	Socket	M83723-19	CVA0R
	Pin	M83723-20	
Box Mounting Receptacle	Socket	M83723-21	CVA2R
	Pin	M83723-22	
Straight Plug	Socket	M83723-23	CVA6R
	Pin	M83723-24	

ELECTRICAL DATA

TEST CURRENT

Maximum current ratings of contacts and maximum allowable voltage drop under test conditions when assembled as in service are shown below. Maximum total current to be carried per connector is the same as that allowable in wire bundles as specified in MIL-W-5088.

HIGH POTENTIAL TEST VOLTAGE

CV connectors show no evidence of breakdown when the test voltage given below is applied between the two closed conacts and between the shell and the contacts closest to the shell for a period of one minute.

Number of Contacts — 1 through 48
WIRE SIZE

Contact Size	Wire Size (MIL-W-16878)	Insul. O.D. Minimum	Limit (inch.) Maximum
16	16 thru 22	.068 (1,73)	.103 (2,62)
12	12 thru 14	.097 (2,46)	.158 (4,01)
8	8 thru 10	.164 (4,17)	.255 (6,48)
4	4 thru 6	.288 (7,32)	.370 (9,40)
0	0 thru 2	.415 (10,54)	.550 (13,97)

CURRENT RATING (MIL-C-5015 Test Method)

Contact Size	Max. Current Rating (amps)	Test Current (amps)	Potential Drop (millivolts)
16	22	20	21
12	41	35	22
8	73	60	46
4	135	110	38
0	245	200	36

(millimeters are in parentheses)

TEST VOLTAGE

Service Rating	Test Voltage (rms) 60 cps	Suggested* Operating Voltages DC	AC (rms)
Inst.	1000	250	200
A	2000	700	500
D	2800	1250	900
E	3500	1750	1250
B	4500	2450	1750
C	7000	4200	3000

*As indicated in previous MS Specification and to be used by the designer only as a guide.

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CONTACT ARRANGEMENTS

ALTERNATE INSERT ARRANGEMENT POSITIONS

LEGEND:
All arrangements are available in pin and socket side unless otherwise noted:

All views are looking into front of pin insert or rear of socket insert.

NORMAL POSITION

POSITION W

POSITION X

POSITION Y

POSITION Z

Shell Size	M83723 Arrangement	MIL-C-5015 Equiv Arrangement	Wire Size	Service Rating	Alternate Positions Degrees W	X	Y	Z
8S	8001	8S-1	1 #16	A	—	—	—	—
10S	1002	10S-2	1 #16	A	—	—	—	—
10SL	1103	10SL-3	3 #16	A	—	—	—	—
	1104	10SL-4	2 #16	A	—	—	—	—
12	1205	12-5	1 #12	D	—	—	—	—
12S	1303	12S-3	2 #16	A	70	145	215	290
	1304	12S-4	1 #16	D	—	—	—	—
14S	1502	14S-2	4 #16	Inst.	—	120	240	—
	1505	14S-5	5 #16	Inst.	—	110	—	—
	1506	14S-6	6 #16	Inst.	—	—	—	—
	1507	14S-7	3 #16	A	90	180	270	—
	1509	14S-9	2 #16	A	70	145	215	290
16	1609	16-9	2 #12 2 #16	A	35	110	250	315
	1610	16-10	3 #12	A	90	180	270	—
	1611	16-11	2 #12	A	25	110	250	325
16S	1701	16S-1	7 #16	A	80	—	—	280
	1708	16S-8	5 #16	A	—	170	265	—
18	1801	18-1	10 #16	A (B, C, F & G) Inst. (others)	70	145	215	290
	1804	18-4	4 #16	A	35	110	250	325
	1805	18-5	2 #12 1 #16	D	80	110	250	280
	1808	18-8	1 #12 7 #16	A	70	—	—	290
	1809	18-9	2 #12 5 #16	Inst.	80	110	250	280
	1810	18-10	4 #12	A	—	120	240	—
	1811	18-11	5 #12	A	—	170	265	—
20	2004	20-4	4 #12	D	45	110	250	—
	2007	20-7	8 #16	A (C, D, E & F) D (A, B, H & G)	80	110	250	280
	2014	20-14	2 #8 3 #12	A	80	110	250	280
	2015	20-15	7 #12	A	80	—	—	280
	2016	20-16	2 #12 7 #16	A	80	110	250	280
	2018	20-18	3 #12 6 #16	A	35	110	250	325
	2024	20-24	2 #8 2 #16	A	35	110	250	325
	2027	20-27	14 #16	A	35	110	250	325
	2029	20-29	17 #16	A	80	—	—	280
	2033	20-33	11 #16	A	—	—	—	—
22	2202	22-2	3 #8	D	70	145	215	290
	2205	22-5	2 #12 4 #16	D	35	110	250	325
	2206	22-6	2 #8 1 #16	D	80	110	250	280
	2214	22-14	19 #16	A	80	—	—	280
	2219	22-19	14 #16	A	80	110	250	280
	2222	22-22	4 #8	A	—	110	250	—
	2223	22-23	8 #12	D (A) D (all others)	35	—	250	—
24	2402	24-2	7 #12	D	80	—	—	280
	2405	24-5	16 #16	A	80	110	250	280
	2407	24-7	2 #12 14 #16	A	80	110	250	280
	2409	24-9	2 #4	A	35	110	250	325
	2410	24-10	7 #8	A	80	—	—	280
	2411	24-11	3 #8 6 #12	A	35	110	250	325
	2412	24-12	2 #4 3 #12	A	80	110	250	280
	2420	24-20	2 #12 9 #16	D	80	110	250	280
	2428	24-28	24 #16	Inst.	80	110	250	280
28	2802	28-2	2 #12 12 #16	D	35	110	250	325
	2809	28-9	6 #12 6 #16	D	80	110	250	280
	2811	28-11	4 #12 18 #16	A	80	110	250	280
	2812	28-12	26 #16	A	90	180	270	—
	2815	28-15	35 #16	A	80	110	250	280
	2817	28-17	15 #16	A (A to L) D (M, N, P) B (R)	80	110	250	280
	2820	28-20	4 #16 10 #12	A	80	110	250	280
	2821	28-21	37 #16	A	80	110	250	280
32	3205	32-5	2 #0	D	35	110	250	325
	3207	32-7	7 #12 28 #16	Inst. (A, B, h, j) A (all others)	80	125	235	280
	3209	32-9	2 #4 12 #16	D	80	110	250	280
	3213	32-13	5 #12 18 #16	D	80	110	250	280
	3217	32-17	4 #4	D	45	110	250	—
36	3605	36-5	4 #0	A	—	120	240	—
	3606	36-6	2 #0 4 #4	A	35	110	250	325
	3607	36-7	7 #12 40 #16	A	80	110	250	280
	3608	36-8	1 #12 46 #16	A	80	110	250	280
	3609	36-9	1 #4 2 #8 14 #12 14 #16	A	80	125	235	280
	3610	36-10	48 #16	A	80	125	235	280
	3615	36-15	35 #16	D (m) A (all others)	60	125	245	305
40	4001	40-1	6 #12 24 #16	D	65	130	235	300
	4009	40-9	1 #8 22 #12 24 #16	A	65	125	225	310
	4010	40-10	4 #4 9 #8 16 #16	D	65	125	225	310

Numbers shown in parentheses are the M83723 shell size/insert arrangement equivalent for the MIL-C-5015 insert arrangement shown in bold type, i.e. 10SL-4. (1104)

1 CONTACT

2 CONTACTS

Shell Size	12-5 (1205)	8S-1 (8001)	10S-2 (1002)	12S-4 (1304)	10SL-4 (1104)	12S-3 (1303)	14S-9 (1509)	16-11 (1611)	24-9 (2409)	32-5 (3205)
No. of Contacts	1 #12	1 #16	1 #16	1 #16	2 #16	2 #16	2 #16	2 #12	2 #4	2 #0
Service Rating	D	A	A	D	A	A	A	A	A	D
									for new MIL. equip. design use 24-12	

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CONTACT ARRANGEMENTS (FACE VIEW, PIN INSERT)

3 CONTACTS

	10SL-3 (1103)	14S-7 (1507)	16-10 (1610)	22-2 (2202)	18-5 (1805)	22-6 (2206)
Shell Size / No. of Contacts	3 #16	3 #16	3 #12	3 #8	2 #12 (B, C) 1 #16 (A)	1 #16 (B) 2 #8 (A, C)
Service Rating	A	A	A	D	D	D

Available Socket only

Available Socket only

4 CONTACTS

	14S-2 (1502)	16-9 (1609)	18-4 (1804)	18-10 (1810)	20-4 (2004)	22-22 (2222)	20-24 (2024)	32-17 (3217)	36-5 (3605)
Shell Size / No. of Contacts	4 #16	2 #16 (B, D) 2 #12 (A, C)	4 #16	4 #12	4 #12	4 #8	2 #16 (A, C) 2 #8 (B, D)	4 #4	4 #0
Service Rating	Inst.	A	D	A	D	A	A	D4	A

5 CONTACTS

	14S-5 (1505)	16S-8 (1708)	18-11 (1811)	20-14 (2014)	24-12 (2412)
Shell Size / No. of Contacts	5 #16	5 #16	5 #12	3 #12 (C, D, E) 2 #8 (A, B)	3 #12 (B, D, E) 2 #4 (A, C)
Service Rating	Inst.	A	A	A	A

6 CONTACTS

	14S-6 (1506)	22-5 (2205)	36-6 (3606)
Shell Size / No. of Contacts	6 #6	4 #16 (A, C, D, F) 2 #12 (B, E)	4 #4 (B, C, E, F) 2 #0 (A, D)
Service Rating	Inst.	D	A

7 CONTACTS

	16S-1 (1701)	18-9 (1809)	20-15 (2015)	24-10 (2410)	24-2 (2402)
Shell Size / No. of Contacts	7 #16	5 #16 (B, C, E, F, G) 2 #12 (A, D)	7 #12	7 #8	7 #12
Service Rating	A	Inst.	A	A	D

Available Pin only

8 CONTACTS

	18-8 (1808)	20-7 (2007)	22-23 (2223)
Shell Size / No. of Contacts	7 #16 (A-G) 1 #12 (H)	8 #16	8 #12
Service Rating	A	A (C-F) D (A, B, G, H)	D (H) A (all others)

9 CONTACTS

	20-16 (2016)	20-18 (2018)	24-11 (2411)
Shell Size / No. of Contacts	7 #16 (A-G) 2 #12 (H, I)	6 #16 (A, C-E, G, H) 3 #12 (B, F, I)	6 #12 (A-C, G-I) 3 #8 (D-F)
Service Rating	A	A	A

10 CONTACTS

	18-1 (1801)
Shell Size / No. of Contacts	10 #16
Service Rating	A (B, C, F, G) Inst. (all others)

11 CONTACTS

	20-33 (2033)	24-20 (2420)
Shell Size / No. of Contacts	11 #16	9 #16 (A-D, G-L) 2 #12 (E, F)
Service Rating	A	D

12 CONTACTS

	28-9 (2809)
Shell Size / No. of Contacts	6 #16 (A, H-M) 6 #12 (B-G)
Service Rating	D

14 CONTACTS

Available Socket only

	20-27 (2027)	22-19 (2219)
Shell Size / No. of Contacts	14 #16	14 #16
Service Rating	A	A

14 CONTACTS

	28-2 (2802)	28-20 (2820)	32-9 (3209)
Shell Size / No. of Contacts	12 #16 (A-L, N) 2 #12 (M, P)	4 #16 (K-N) 10 #12 (A-J, P)	12 #16 (C-N) 2 #4 (A, B)
Service Rating	D	A	D

15 CONTACTS

	28-17 (2817)
Shell Size / No. of Contacts	15 #16
Service Rating	A (A-L), B (R) D (M-P)

16 CONTACTS

Available Socket only

	24-5 (2405)	24-7 (2407)
Shell Size / No. of Contacts	16 #16	14 #15 (A-M, O) 2 #12 (P, N)
Service Rating	A	A

17 CONTACTS

	20-29 (2029)
Shell Size / No. of Contacts	17 #16
Service Rating	A

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WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

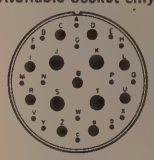
ITT CANNON ELECTRIC

STANDARD CIRCULAR CONNECTORS CVA/M83723 (SERIES II)

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

Dimensions subject to change.
(millimeters are in parentheses)

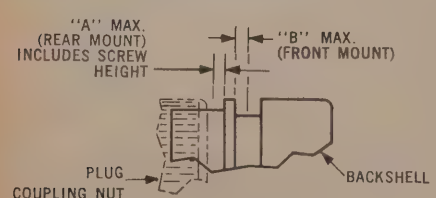
CONTACT ARRANGEMENTS (FACE VIEW, PIN INSERT)

	19 CONTACTS	22 CONTACTS	23 CONTACTS	24 CONTACTS	26 CONTACTS	29 CONTACTS
						Available Socket only
						
Shell Size	22-14 (2214)	28-11 (2811)	32-13 (3213)	24-28 (2428)	28-12 (2812)	40-10 (4010)
No. of Contacts	19 #16	18 #16 (A-I, N-X) 4 #12 (J-M)	18 #16 (A-D, K-Z) 5 #12 (E-J)	24 #16	26 #16	16 #16 (A, B, E-H, M, N, P, Q, V-Y, b, c) 9 #8 (C, D, I, L, O, R, U, Z, a) 4 #4 (J, K, S, T)
Service Rating	A	A	D	Inst.	A	A

	30 CONTACTS	31 CONTACTS	35 CONTACTS			37 CONTACTS
		Available Pin only		Available Socket only		
Shell Size	40-1 (4001)	36-9 (3609)	32-7 (3207)	36-15 (3615)	28-15 (2815)	28-21 (2821)
No. of Contacts	24 #16 (A-L, T-e) 6 #12 (M-S)	14 #16 (A-G, Z-f) 14 #12 (H-N, S-Y) 2 #8 (O, R), 1 #4 (P)	28 #16 (A-N, W-Z, a-k) 7 #12 (O, V)	35 #16	35 #16	37 #16
Service Rating	D	A	Inst. (A, B, h, J) A (all others)	D (m) A (all others)	A For new MIL equip. design, use 28-21	A

	47 CONTACTS		48 CONTACTS
	Available Socket only		
Shell Size	36-7 (3607)	36-8 (3608)	40-9 (4009)	36-10 (3610)
No. of Contacts	40 #16 (A-Z, a-s) 7 #12 (t-z)	46 #16 (A-X, Z-z) 1 #12 (Y)	24 #16 (A, B, D, E, G, I, J, L, M, P, Q, T, b, e, f, i, j, l, m, o, p, q, t, u) 22 #12 (C, F, H, K, N, O, R, S, U-W, Y, Z, a, c, d, g, h, k, n, r, s) 1 #8 (X)	48 #16
Service Rating	A	A	A	A

PANEL CLEARANCE



RECEPTACLE

Shown here are the maximum dimensions allowable to ensure complete connector operation.

Panel Thickness	SHELL SIZE																
	8S	10S	10SL	12S	14S	16S	12	14	16	18	20	22	24	28	32	36	40
A (Max.)	.187 (4,75)						.125 (3,18)						.187 (4,75)		.250 (6,35)		
B (Max.)	.125 (3,18)																

MINIMUM I. D. BUSHING DIMS.

	Single Bushing						Two Bushings			
Shell Size	8S, 10S	10SL, 12S, 12	14S, 14	16S, 16	18	20, 22	24, 28	32	36	40
Bushing I.D. ±.015 (0,38mm)	.130 (3,30)	.220 (5,59)	.312 (7,92)	.437 (11,10)	.562 (14,27)	.625 (15,88)	.625 (15,88)	.750 (19,05)	.937 (23,80)	1.250 (31,75)

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

STANDARD CIRCULAR CONNECTORS CVA/M83723 (SERIES II)

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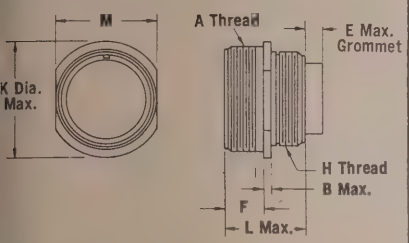
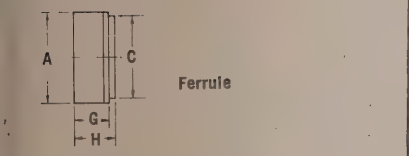
Dimensions subject to change.

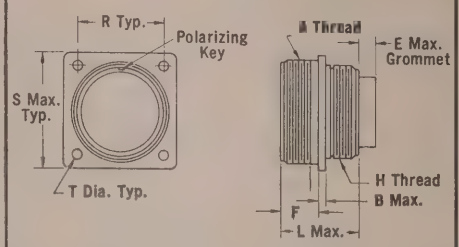
SHELL STYLES

CABLE CONNECTING RECEPTACLE
MIL-C-83723-17 SOCKET
MIL-C-83723-18 PIN
CVA1

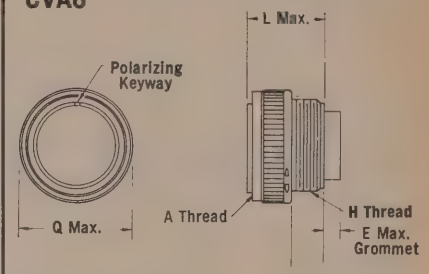


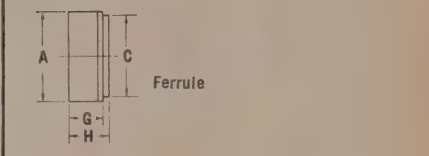


WALL MOUNTING RECEPTACLE
MIL-C-83723-19 SOCKET
MIL-C-83723-20 PIN
CVA0



STRAIGHT PLUG
MIL-C-83723-23 SOCKET
MIL-C-83723-24 PIN
CVA6





RECEPTACLE WITHOUT BACKSHELL

NOTE: Backshells and Bushings are ordered separately see page 33 for part numbers. See page 30 for minimum I.D. bushing dimensions and page 32 for backshell dimensions.

INCHES

When contact arr. size 18 thru 40 contain one or more size 0 contacts E dim. will increase .150(3,81mm).

M83723 Shell Size	M5015 Shell Size	B Max.	E Max.	F +.015 −.000	K Max.	L Max.	M ±.004	Q Max.	R ±.005	S Max.	T +.015 −.000	A Thread Class 2A	H Thread Class 2A	FERRULE OVERALL DIMENSIONS A Max.	C Max.	G Max.	H Max.
8	8S	.110	.378	.562	.729	1.135	.500	.760	.594	.906	.115	½-28UNEF	7/16-28UNEF	.280	.245	.342	.427
10	10S	.110	.378	.562	.854	1.135	.625	.880	.719	1.031	.115	5/8-24UNEF	½-28UNEF	.340	.298	.335	.420
11	10SL	.110	.378	.562	.849	1.135	.625	.880	.719	1.031	.115	5/8-24UNEF	9/16-24UNEF	.409	.378	.335	.430
13	12S	.130	.378	.562	.974	1.135	.750	1.010	.812	1.125	.115	¾-20UNEF	5/8-24UNEF	.460	.403	.340	.419
12	12	.130	.317	.750	.974	1.495	.750	1.010	.812	1.125	.115	¾-20UNEF	5/8-24UNEF	.460	.403	.340	.419
15	14S	.130	.378	.562	1.099	1.135	.875	1.130	.906	1.219	.115	7/8-20UNEF	¾-20UNEF	.563	.485	.339	.414
14	14	.130	.317	.750	1.099	1.495	.875	1.130	.906	1.219	.115	7/8-20UNEF	¾-20UNEF	.563	.485	.339	.414
17	16S	.130	.378	.562	1.224	1.135	1.000	1.250	.969	1.312	.115	1-20UNEF	7/8-20UNEF	.689	.605	.339	.424
16	16	.130	.317	.750	1.224	1.495	1.000	1.250	.969	1.312	.115	1-20UNEF	7/8-20UNEF	.689	.605	.339	.424
18	18	.160	.367	.750	1.349	1.495	1.125	1.340	1.062	1.406	.115	1⅛-18UNEF	1-20UNEF	.806	.725	.449	.574
20	20	.160	.367	.750	1.474	1.495	1.250	1.469	1.156	1.531	.115	1¼-18UNEF	1⅛-18UNEF	.941	.863	.458	.573
22	22	.160	.367	.750	1.599	1.495	1.375	1.590	1.250	1.656	.115	1⅜-18UNEF	1¼-18UNEF	1.059	.973	.456	.551
24	24	.160	.305	.812	1.715	1.556	1.500	1.719	1.375	1.781	.142	1½-18UNEF	1⅜-18UNEF	1.170	1.085	.457	.547
28	28	.160	.305	.812	1.974	1.556	1.750	1.969	1.562	2.031	.142	1¾-18UNS	1⅝-18UNEF	1.401	1.245	.458	.573
32	32	.160	.244	.875	2.224	1.620	2.000	2.219	1.750	2.281	.168	2-18UNS	1⅞-16UN	1.652	1.515	.459	.544
36	36	.160	.244	.875	2.474	1.620	2.250	2.469	1.938	2.521	.168	2¼-16UN	2⅛-16UN	1.860	1.751	.463	.573
40	40	.160	.244	.875	2.724	1.620	2.505	2.728	2.188	2.781	.168	2½-16UN	2⅜-16UN	2.105	—	—	.823

MILLIMETERS

M83723 Shell Size	M5015 Shell Size	B Max.	E Max.	F +0,38 −0,00	K Max.	L Max.	M ±0,10	Q Max.	R ±0,13	S Max.	T +0,38 −0,00	A Thread Class 2A	H Thread Class 2A	FERRULE OVERALL DIMENSIONS A Max.	C Max.	G Max.	H Max.
8	8S	2,79	9,60	14,27	18,52	28,83	12,70	19,30	15,09	23,01	2,92	½-28UNEF	7/16-28UNEF	7,11	6,22	8,69	10,85
10	10S	2,79	9,60	14,27	21,69	28,83	15,87	22,35	18,26	26,19	2,92	5/8-24UNEF	½-28UNEF	8,64	7,57	8,51	10,67
11	10SL	2,79	9,60	14,27	21,56	28,83	15,87	22,35	18,26	26,19	2,92	5/8-24UNEF	9/16-24UNEF	10,39	9,60	8,51	10,92
13	12S	3,30	9,60	14,27	24,74	28,83	19,05	25,65	20,62	28,58	2,92	¾-20UNEF	5/8-24UNEF	11,68	10,24	8,64	10,64
12	12	3,30	8,05	19,05	24,74	37,97	19,05	25,65	20,62	28,58	2,92	¾-20UNEF	5/8-24UNEF	11,68	10,24	8,64	10,64
15	14S	3,30	9,60	14,27	27,91	28,83	22,22	28,70	23,01	30,96	2,92	7/8-20UNEF	¾-20UNEF	14,30	12,32	8,61	10,52
14	14	3,30	8,05	19,05	21,91	37,97	22,22	28,70	23,01	30,96	2,92	7/8-20UNEF	¾-20UNEF	14,30	12,32	8,61	10,52
17	16S	3,30	9,60	14,27	31,09	28,83	25,40	31,75	24,61	33,32	2,92	1-20UNEF	7/8-20UNEF	17,50	15,37	8,61	10,77
16	16	3,30	8,05	19,05	31,09	37,97	25,40	31,75	24,61	33,32	2,92	1-20UNEF	7/8-20UNEF	17,50	15,37	8,61	10,77
18	18	4,06	9,32	19,05	34,26	37,97	28,57	34,04	26,97	35,71	2,92	1⅛-18UNEF	1-20UNEF	20,47	18,42	11,41	14,58
20	20	4,06	9,32	19,05	37,44	37,97	31,75	37,31	29,36	38,89	2,92	1¼-18UNEF	1⅛-18UNEF	23,90	21,92	11,63	14,55
22	22	4,06	9,32	19,05	40,61	37,97	34,92	40,39	31,75	42,06	2,92	1⅜-18UNEF	1¼-18UNEF	26,90	24,71	11,58	13,99
24	24	4,06	7,75	20,62	43,56	39,52	38,10	43,54	34,92	45,24	3,61	1½-18UNEF	1⅜-18UNEF	29,72	27,46	11,61	13,89
28	28	4,06	7,75	20,62	50,14	39,52	44,45	49,89	39,67	51,59	3,61	1¾-18UNS	1⅝-18UNEF	35,58	31,62	11,63	14,55
32	32	4,06	6,20	25,22	56,49	41,15	50,80	56,23	44,45	57,94	4,27	2-18UNS	1⅞-16UN	41,96	38,48	11,66	13,84
36	36	4,06	6,20	22,22	62,84	41,15	57,15	62,59	49,22	64,29	4,27	2¼-16UN	2⅛-16UN	47,24	44,48	11,76	14,55
40	40	4,06	6,20	22,22	69,19	41,15	63,62	69,16	55,57	70,64	4,27	2½-16UN	2⅜-16UN	53,47	—	—	20,90

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ITT CANNON ELECTRIC

STANDARD CIRCULAR CONNECTORS CVA/M83723 (SERIES II)

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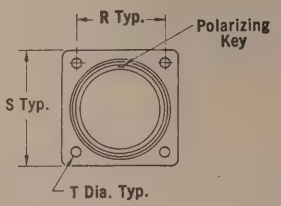
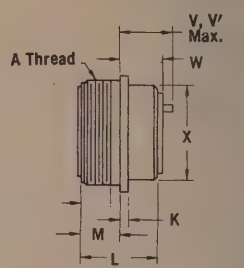
Dimensions subject to change.

SHELL STYLES

BOX MOUNTING RECEPTACLE

MIL-C-83723-21 SOCKET
MIL-C-83723-22 PIN
CVA2





RECEPTACLE WITHOUT BACKSHELL ASSEMBLY

NOTE: Backshells and Bushings are ordered separately see page 33 for part numbers. See page 30 for minimum I.D. bushing dimensions.

INCHES

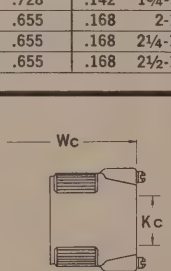
M83723 Shell Size	M5015 Shell Size	K Max.	L Max.	M +.016 −.000	X Max.	R ±.005	W Max.	S Max.	Max. Contact Ext. V Size 0	Max. Contact Ext. V' Sizes 8, 4	T +.015 −.000	A Thread Class 2A
8	8S	.100	.943	.562	.449	.594	.557	.906	—	—	.115	½-28UNEF
10	10S	.100	.943	.562	.509	.719	.521	1.031	—	—	.115	⅝-24UNEF
11	10SL	.115	1.065	.562	.625	.719	.521	1.031	—	—	.115	⅝-24UNEF
13	12S	.100	.960	.562	.625	.812	.557	1.125	—	—	.115	¾-20UNEF
12	12	.100	1.150	.750	.625	.812	.625	1.125	—	—	.115	¾-20UNEF
15	14S	.100	.960	.562	.750	.906	.557	1.218	—	—	.115	⅞-20UNEF
14	14	.100	1.150	.750	.750	.906	.625	1.218	—	—	.115	⅞-20UNEF
17	16S	.100	.960	.562	.875	.969	.557	1.312	—	—	.115	1-20UNEF
16	16	.100	1.150	.750	.875	.969	.625	1.312	—	.790	.115	1-20UNEF
18	18	.140	1.130	.750	.984	1.062	.640	1.406	.915	.790	.115	1⅛-18UNEF
20	20	.140	1.161	.750	1.171	1.156	.640	1.531	.915	.790	.115	1¼-18UNEF
22	22	.140	1.161	.750	1.265	1.250	.640	1.656	.915	.790	.115	1⅜-18UNEF
24	24	.140	1.317	.812	1.390	1.375	.578	1.781	.853	.728	.142	1½-18UNEF
28	28	.140	1.317	.812	1.640	1.562	.578	2.031	.853	.728	.142	1¾-18UNS
32	32	.170	1.317	.875	1.890	1.750	.515	2.281	.790	.655	.168	2-18UNS
36	36	.170	1.317	.875	2.140	1.938	.515	2.531	.790	.655	.168	2¼-16UN
40	40	.170	1.348	.875	2.359	2.188	.515	2.781	.790	.655	.168	2½-16UN

MILLIMETERS

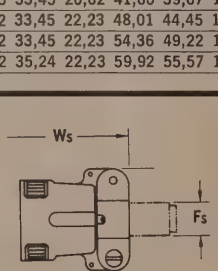
M83723 Shell Size	M5015 Shell Size	K Max.	L Max.	M +0,41 −0,00	X Max.	R ±0,13	W Max.	S Max.	Max. Contact Ext. V Size 0	Max. Contact Ext. V' Sizes 8, 4	T +0,38 −0,00	A Thread Class 2A
8	8S	2,54	23,95	14,27	11,40	15,09	14,15	23,01	—	—	2,92	½-28UNEF
10	10S	2,54	23,95	14,27	12,93	18,26	14,15	26,19	—	—	3,05	⅝-24UNEF
11	10SL	2,92	27,05	14,27	15,87	18,26	13,23	26,19	—	—	3,05	⅝-24UNEF
13	12S	2,54	24,38	14,27	15,87	20,62	14,15	28,57	—	—	3,05	¾-20UNEF
12	12	2,54	29,21	19,05	15,87	20,62	15,87	28,57	—	—	3,05	¾-20UNEF
15	14S	2,54	24,38	14,27	19,05	23,01	14,15	30,94	—	—	3,05	⅞-20UNEF
14	14	2,54	29,21	19,05	19,05	23,01	15,87	30,94	—	—	3,05	⅞-20UNEF
17	16S	2,54	24,38	14,27	22,22	24,61	14,15	33,32	—	—	3,05	1-20UNEF
16	16	2,54	29,21	19,05	22,22	24,61	15,87	33,32	—	17,14	3,05	1-20UNEF
18	18	3,05	28,70	19,05	24,99	26,97	16,26	35,71	23,24	20,07	3,05	1⅛-18UNEF
20	20	3,05	29,49	19,05	29,74	29,36	16,26	38,89	23,24	20,07	3,05	1¼-18UNEF
22	22	3,05	29,49	19,05	32,13	31,75	16,26	42,06	23,24	20,07	2,92	1⅜-18UNEF
24	24	3,05	33,45	20,62	35,31	34,92	14,68	45,24	21,67	18,49	3,61	1½-18UNEF
28	28	3,05	33,45	20,62	41,66	39,67	14,68	51,59	21,67	18,49	3,61	1¾-18UNS
32	32	4,32	33,45	22,23	48,01	44,45	13,08	57,94	20,07	16,64	4,27	2-18UNS
36	36	4,32	33,45	22,23	54,36	49,22	13,08	64,29	20,07	16,64	4,27	2¼-16UN
40	40	4,32	35,24	22,23	59,92	55,57	13,08	70,64	20,07	16,64	4,27	2½-16UN

BACKSHELL ASSEMBLIES

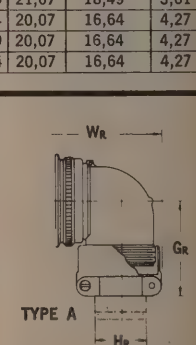
CVA1, CVA0, CVA6



TYPE N



TYPE S



TYPE A

RECEPTACLE WITH BACKSHELL ASSEMBLY

INCHES

M83723 Shell Size	Type N (Straight) †Kc Max.	Type N (Straight) Wc Max.	Type S (Cable Clamp) †Fs Max.	Type S (Cable Clamp) Ws Max.	Type A (90° Clamp) GR Max.	Type A (90° Clamp) †HR Max.	Type A (90° Clamp) WR Max.
8S	.245	1.535	.235	2.065	1.220	.235	2.177
10S	.300	1.550	.235	2.065	1.250	.235	2.177
10SL	.380	1.540	.297	2.065	1.280	.297	2.272
12S	.403	1.562	.297	2.065	1.280	.297	2.272
12	.403	1.921	.297	2.425	1.280	.297	2.632
14S	.485	1.538	.422	2.155	1.405	.422	2.427
14	.485	1.897	.422	2.505	1.405	.422	2.787
16S	.604	1.530	.547	2.205	1.529	.547	2.505
16	.604	1.907	.547	2.560	1.529	.547	2.865
18	.725	2.017	.610	2.680	1.593	.610	2.944
20	.865	2.036	.735	2.680	1.655	.735	3.170
22	.973	2.003	.735	2.680	1.718	.735	3.170
24	1.085	2.016	.922	2.975	1.894	.922	3.505
28	1.245	2.016	.922	2.975	1.973	.922	3.505
32	1.515	2.024	1.235	2.975	2.187	1.235	3.389
36	1.750	2.023	1.360	2.975	2.405	1.360	4.139
40	1.865	2.449	1.630	3.950	5.100	1.630	7.151

MILLIMETERS

M83723 Shell Size	Type N (Straight) †Kc Max.	Type N (Straight) Wc Max.	Type S (Cable Clamp) †Fs Max.	Type S (Cable Clamp) Ws Max.	Type A (90° Clamp) GR Max.	Type A (90° Clamp) †HR Max.	Type A (90° Clamp) WR Max.
8S	6,22	38,99	5,97	52,45	30,99	6,10	49,91
10S	7,62	39,37	5,97	52,45	31,75	6,10	49,91
10SL	9,65	39,12	7,54	52,45	32,51	7,75	53,09
12S	10,32	39,67	7,54	52,45	32,51	7,75	53,09
12	10,32	48,79	7,54	61,60	32,51	7,75	62,20
14S	12,31	39,06	10,72	54,74	35,69	10,95	56,26
14	12,31	48,18	10,72	63,63	35,69	10,95	65,38
16S	15,34	38,86	13,89	56,01	38,84	14,10	58,67
16	15,34	48,44	13,89	65,02	38,84	14,10	67,67
18	18,41	51,23	15,49	68,07	40,46	15,70	70,08
20	21,97	51,71	18,67	68,07	42,04	18,87	75,79
22	24,71	50,88	18,67	68,07	43,64	18,87	75,79
24	27,55	51,21	23,42	75,56	48,11	23,67	84,40
28	31,62	51,21	23,42	75,56	50,11	23,67	84,40
32	38,48	51,41	31,37	75,56	55,55	31,57	94,01
36	44,45	51,38	34,54	75,56	61,09	34,75	100,36
40	47,37	62,20	41,99	100,33	129,54	41,10	175,11

† Maximum entry into end bell excluding bushings. See page 30 for minimum I.D. bushing dimensions.

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

STANDARD CIRCULAR CONNECTORS CVA/M83723 (SERIES II)

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

ACCESSORIES

BACKSHELL BUSHINGS

Shell Size	Part Number
8S & 10S	012-0215-007
10SL, 12S & 12	012-0216-016
14S & 14	012-0217-019
16S & 16	012-0218-017
18	012-0219 009
20 & 22	012 0220-012

Shell Size	Part Number
24 & 28	012-0220-012 & 012 0221-014
32	012-0221-014 & 012 0222-010
36	012-0220-010 & 012-0223-008
40	012-0223-008 & 012-0224-007

BACKSHELLS
(MIL-C-83723 cross reference to ITT Cannon part numbers with and without bushings and ground screws)

Shell Size	Military Part No.	ITT Cannon Part Number					
		Type "A" (90°)		Type "N" (Str. No Clamp)		Type "S" (Str. w/Clamp)	
		With Bushing	Without Bushing	With Ground Scr.	Without Ground Scr.	With Bushing	W/O Ground Screw/Bushing
8S	M83723-35*-08**	057-3365-000	057-3365-001	057-3143-003	058-0602-002	057-0438-011	057-0438-012
10S	M83723-35*-10**	—	—	—	—	057-0439-012	057-0439-014
10SL	M83723-35*-11**	057-3366-000	057-3366-001	057-3086-005	058-0604-009	057-0440-033	057-0440-037
12	M83723-35*-12**	—	—	—	—	—	—
12S	M83723-35*-13**	057-3367-000	057-3367-001	057-0612-002	058-0605-006	057-0441-016	057-0441-025
14	M83723-35*-14**	—	—	—	—	—	—
14S	M83723-35*-15**	057-3355-000	057-0355-001	057-0618-005	058-0607-009	057-0443-031	057-0443-035
16	M83723-35*-16**	057-3357-000	057-3357-001	057-3255-002	058-0610-004	057-0446-015	057-0446-017
16S	M83723-35*-17**	057-3356-000	057-3356-001	057-3085-002	058-0609-005	057-0445-021	057-0445-023
18	M83723-35*-18**	057-3358-000	057-3358-001	057-0553-007	058-0611-007	057-0447-025	057-0447-028
20	M83723-35*-20**	057-3359-000	057-3359-001	057-0500-007	058-0612-007	057-0448-030	057-0448-031
22	M83723-35*-22**	057-3360-000	057-3360-001	057-0536-007	058-0613-007	057-0449-024	057-0449-026
24	M83723-35*-24**	057-3361-000	057-3361-001	057-3068-008	058-0614-008	057-0450-026	057-0450-028
28	M83723-35*-28**	057-3362-000	057-3362-001	057-0613-008	058-0615-009	057-0451-026	057-0451-027
32	M83723-35*-32**	057-3363-000	057-3363-001	057-0537-005	058-0616-005	057-0452-022	057-0452-023
36	M83723-35*-36**	057-3364-000	057-3364-001	057-3126-003	058-0617-003	057-0453-023	057-0453-024
40	M83723-35*-40**	—	—	057-3161-002	058-3237-002	057-3368-000	057-3368-004

* = Add Type, "A", "N", or "S"
** = Add Class; R = Conductive Finish (Electroless Nickel)
A = Non-Conductive Finish (Hard Anodize). Consult Factory on availability and part numbers.

NOTE: Unless specifically requested, all backshells ordered by the M83723 part number will be supplied without bushings and ground screws.

CONTACTS

MS Number		Mating End		Wire Barrel		ITT Cannon Part Number		
Pin	Socket	Size	Color	Size	Color	Pin	Socket	Finish
—	MS3163-16S-16	16S	Blue	16	Blue	—	031-3113-005	Gold
MS3162-16-16	MS3163-16-16	16	Blue	16	Blue	030-3196-008	031-3114-008	Gold
MS3162-12-12	MS3163-12-12	12	Yellow	12	Yellow	030-3197-007	031-3115-006	Gold
MS3162-8-8	MS3163-8-8	8	Red	8	Red	030-3198-003	031-3116-003	Silver
MS3162-4-4	MS3163-4-4	4	Blue	4	Blue	030-3199-004	031-3117-003	Silver
MS3162-0-0	MS3163-0-0	0	Yellow	0	Yellow	030-3200-003	031-3118-003	Silver

THERMOCOUPLE

Contact Size	Alumel		Chromel	
	Pin	Skt	Pin	Skt
16S	—	031-3113-011	—	031-3113-012
16	030-3196-015	031-3114-014	030-3196-016	031-3114-015
12	030-3197-011	031-3115-009	030-3197-012	031-3115-010

SEALING PLUGS

Contact Size	MS Part No.	ITT Cannon Part No.	Contact Size	MS Part No.	ITT Cannon Part No.	Contact Size	MS Part No.	ITT Cannon Part No.
0	M83723-28-0	225-1007-000	8	M83723-28-8	225-1009-000	16	M83723-28-16	225-0071-000
4	M83723-28-4	225-1008-000	12	M83723-28-12	225-0072-000			

TERMINATION TOOLS

A complete line of crimp, insertion and extraction tools is provided for MIL-C-83723 connectors. Crimp tools are made from high quality metal and are designed for long life and trouble-free service. Insertion and extraction tools are made of a durable plastic and are inexpensive and expandable.

Contact Size	INSERTION/EXTRACTION TOOLS				Crimp Tool	Tool Handle	Tool for Unwired Contact
	Plastic		Metal				
	MS No.	ITT Cannon No.	MS No.	ITT Cannon No.			
16	M83723-31-16	CIET-16	—	—	M22520/1-01 with M22520/1-02 Turret	084-0068-000	274-7008-000
12	M83723-31-12	CIET-12	—	—		084-0069-000	274-7009-000
8	M83723-32-8	CET 8-2	MS3483-1	CET-CVR-8	CBT 600B Power Unit CCH-8-1 Crimp Head CCHP-8-6 Locator	—	—
4	M83723-32-4	CET 4-8	MS3483-2	CET-CVR-4	CBT 600B Power Unit CCH-4-1-Crimp Head CCHP-4-8 Locator	—	—
0	M83723-32-0	CET 0-1	MS3483-3	CET-00-CV	CBT 600B Power Unit CCH-0-1 Crimp Head CCHP-0-8 Locator	—	—

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ITT CANNON ELECTRIC

STANDARD CIRCULAR CONNECTORS K SERIES

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

K CONNECTORS

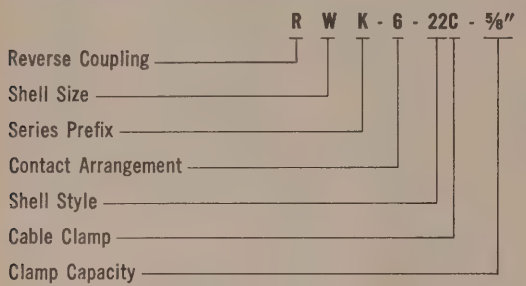
RUGGED CIRCULAR CONNECTORS WITH QUICK CONNECT/DISCONNECT ACME THREADS

K standard circular connectors with special Acme thread coupling are rugged, lightweight and economical. These connectors are extremely versatile, with eight shell types and insert diameters, totaling more than 350 contact arrangements, in a variety of amperage and voltage capacities. K connectors have made the quick disconnect concept a standard in the industry, saving time and money in servicing, assembly, testing and inspection. K connectors are used on aircraft, transmitters, instrument panels, Geiger counters, television cameras, potentiometers, cathode ray recorders and other equipment.

The general basic K series connectors are shown as follows:

- **K/RK** Standard circular connector with special Acme thread couplings for quick connect and disconnect. Used in color and monochrome TV cameras, transmitters, telephone circuits, etc.
- **SK** "BEEP" telephone connectors — special telephone, television applications, and for use on general ground support equipment.

PART NUMBER EXPLANATION



REVERSE COUPLING

R — All female (socket contact) connectors have a stationary coupling nut and the male (pin contact) connectors have rotating coupling threads.

SHELL SIZE

W — 7/8" threaded coupling dia.
N — 1 1/16" threaded coupling dia.
L — 2 1/2" threaded coupling dia.
G — 1 3/16" threaded coupling dia.
F — 1 13/16" threaded coupling dia.
S — 1 5/16" threaded coupling dia.
I — 2 1/4" threaded coupling dia.

SERIES PREFIX

K — ITT Cannon Prefix

CONTACT ARRANGEMENT

See following pages

SHELL STYLE

21 — Straight plug, socket insert
22 — Straight plug, pin insert
23 — 90° plug, socket insert
24 — 90° plug, pin insert
31S — Small flange receptacle, socket insert
31SL — Large flange receptacle, socket insert
32S — Small flange receptacle, pin insert
32SL — Large flange receptacle, pin insert

CABLE CLAMP

C — Cable clamp

CLAMP CAPACITY

See K-21C, K-22C, RK-22C, K-23, K-24 and RK-24C

CONDENSED DATA

STANDARD MATERIALS AND FINISHES

Shell — Aluminum alloy, cadmium plate (clear)

Insulator — Thermosetting plastic or fabricated phenolic

Contacts — Copper alloy, silver plate (gold plate for size 20 contact only)

ELECTRICAL DATA

Number of Contacts — 1 thru 110

Wire Size / Amps — #20 — 7.5 amps
#16 — 10 amps
#14 — 15 amps
#10 — 30 amps
#8 — 40 amps
#6 — 60 amps
#4 — 80 amps
#2 — 115 amps
#0 — 200 amps

Other Contacts Available — Coax. min. coax.

Termination — Solder pot

MECHANICAL FEATURES

Coupling — K — Special Acme thread coupling nut
RK — Reverse coupling nut

Cable Entry — Cable clamp

MATING GUIDE

	K-21	K-22	K-23	K-24	K-31	K-32
K-21		●		●		●
K-22	●		●		●	
K-23		●		●		●
K-24	●		●		●	
K-31		●		●		●
K-32	●		●		●	

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ITT CANNON ELECTRIC

STANDARD CIRCULAR CONNECTORS
K SERIES

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

CONTACT ARRANGEMENTS

FRONT VIEW, PIN INSERTS

*See page 41 for contact spacing/voltage rating.

SHELL SIZE WK

	WK-M2	WK-3	WK-C3	WK-4	WK-S4	WK-5	WK-S5
Contacts	2	3	3	4	4	5	5
Wires	2-#16	3-#14	1-#16 (3) 2-#10 (1 & 2)	4-#16	2-#16 (1 & 3) 2-#10 (2 & 4)	5-#16	4-#16 (1-4) 1-#10 (5)
Contact Spacing*	3/32	1/16	3/64	3/64	3/64	3/64	3/64

	WK-M6	WK-6	WK-A7	WK-8
Contacts	6	6	7	8
Wires	6-#16	6-#16	7-#16	8-#20
Contact Spacing*	1/32	3/64	3/64	5/64

SHELL SIZE GK

	GK-V2	GK-C3	GK-E3
Contacts	2	3	3
Wires	2-#14	1-#14 (1) 2-#6 (2 & 3)	3-#8
Contact Spacing*	11/64	3/64	3/64

	GK-S3	GK-4	GK-C4	GK-G5	GK-M5	GK-R7
Contacts	3	4	4	5	5	7
Wires	3-#10	4-#10	2-#14 (1 & 2) 2-#8 (3 & 4)	1-#16 (5) 4-#10 (1-4)	3-#16 (1, 3 & 5) 2-#10 (2 & 4)	5-#16 (1, 2, 5, 6 & 7) 2-#14 (3 & 4)
Contact Spacing*	5/64	3/64	5/64	3/64	5/64	3/64 (7) 3/64 (1-6)

	GK-8	GK-C8	GK-S8	GK-9	GK-12
Contacts	8	8	8	9	12
Wires	8-#14	5-#16 (2, 3, 5, 6 & 8) 3-#10 (1, 4 & 7)	4-#16 (2, 3, 5 & 6) 4-#10 (1, 4, 7 & 8)	9-#16	12-#16
Contact Spacing*	3/64	3/64	3/64	1/16	3/64

SHELL SIZE SK

	SK-S2	SK-L3	SK-U4
Contacts	2	3	4
Wires	2-#4	skt. contacts 1-2 (#10) grd. to skt. contact G (#10) when pin insert is removed for RG-7/U cable	3-#16 (1-3) 1-#16 coax. (4)
Contact Spacing*	5/64	3/64	3/64

	SK-5	SK-6	SK-M7	SK-8	SK-A8	SK-C9
Contacts	5	5	7	8	8	9
Wires	5-#10	6-#10	3-#16 (2, 6 & 7) 4-#10 (1, 3, 4 & 5)	8-#16	7-#14 (1-7) 1-#6 (8)	5-#16 (3-5, 8, 9) 2-#10 (1 & 2) 2-#6 (6 & 7)
Contact Spacing*	5/64	1/16	5/64	5/64	3/64	3/64

	SK-M10	SK-W11	SK-D12	SK-C16	SK-19	SK-24
Contacts	10	11	12	16	19	24
Wires	8-#16 (2, 4-10) 2-#10 (1 & 3)	11-#16	8-#16 (1, 3, 5, 7, 9-12) 4-#10 (2, 4, 6 & 8)	14-#16 (1-12, 14, 16) 2-#10 (13 & 15)	19-#16	24-#20
Contact Spacing*	5/64	3/64	3/64	3/64	3/64	1/16

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ITT CANNON ELECTRIC

STANDARD CIRCULAR CONNECTORS
K SERIES

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

CONTACT ARRANGEMENTS

FRONT VIEW, PIN INSERTS

*See page 41 for contact spacing/voltage rating.

SHELL SIZE NK

	NK-E3	NK-P4	NK-D8	NK-L8	NK-M8	NK-P9
Contacts	3	4	8	8	8	9
Wires	3-#4	4-#6	8-#14	4-#14 (1, 3, 6, 8) 4-#8 (2, 4, 5, 7)	8-#10	9-#16
Contact Spacing*	3/32	5/64	7/64	5/64	5/64	13/64 (4), 11/64 (9) 7/64 (1-3, 5-7), 5/64 (8)

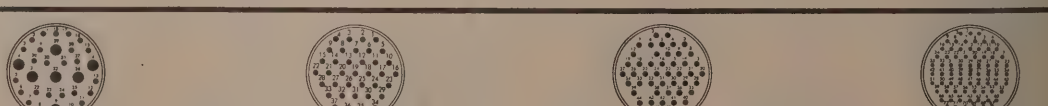
	NK-L11	NK-12	NK-L12	NK-N14	NK-L15	NK-V17
Contacts	11	12	12	14	15	17
Wires	1-#16 (1), 8-#14 (2-9) 2-#10 (10 & 11)	12-#14	8-#16 (1-8) 4-#6 (9-12)	9-#16 (1-3, 5, 6, 9, 10, 12, 14) 5-#10 (4, 7, 8, 11, 13)	15-#14	11-#16 (1-11) 6-#10 (12-17)
Contact Spacing*	5/64		3/64 (1-8) 5/64 (9-12)	5/64	1/16	3/64

SHELL SIZE FK

	NK-L20	NK-L21	NK-L23	NK-27	FK-G5C	FK-12	FK-B14
Contacts	20	21	23	27	5	12	14
Wires	7-#14 (2, 11, 14, 17-20) 13-#16 (1, 3-10, 12, 13, 15, 16)	17-#16 (5-21) 4-#10 (1-4)	19-#16 (5-23) 2-#14 (3, 4), 2-#10 (1, 2)	27-#16	5-#16 coax. alum. insulator grd. to shell for RG-7/U cable	12-#10	14-#14
Contact Spacing*	3/64 (1-13, 15, 16) 5/64 (14, 17-20)	3/64	3/64	3/64	3/64	7/64	3/32 (1-13) 25/64 (14)

	FK-R14	FK-L17	FK-19	FK-L20	FK-W20
Contacts	14	17	19	20	20
Wires	14-#16	15-#14 (1-14 & 17) 2-#10 (15 & 16)	19-#14	13-#16 (1-13) 7-#10 (14-20)	20 min. coax.
Contact Spacing*	5/64 (1-10) 15/64 (11-14)	3/8 (17) 3/64 (1-16)	5/64	5/64	1/32

	FK-21	FK-24	FK-V24	FK-32	FK-C32
Contacts	21	24	24	32	32
Wires	17-#16 (1, 2, 5-7, 10-21) 2-#8 (3, 4) 2-#4 (8, 9)	23-#16 (1-23) 1-#16 coax. for RG-58/U cable 1/32 (1-11) 5/64 (12-23), 1/8 (24)	21-#16 (1-21) 2-#10 (22 & 23), 1-#4 (24)	32-#16	32-#16
Contact Spacing*	1/16		3/64	1/8 (1-2) 1/16 (3-32)	3/64



	FK-L32	FK-37	FK-46	FK-75
Contacts	32	37	46	75
Wires	25-#16 (1-3, 5-8, 10-13,15-20, 22-25, 27, 28, 30, 31) 7-#10 (4, 9, 14, 21, 26, 29, 32)	37-#16	46-#16	75-#20
Contact Spacing*	3/64	3/64	3/64	3/64

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ITT CANNON ELECTRIC

STANDARD CIRCULAR CONNECTORS K SERIES

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CONTACT ARRANGEMENTS

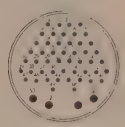
FRONT VIEW, PIN INSERT

SHELL SIZE IK

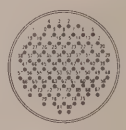
*See page 41 for contact spacing/voltage rating.

	IK-26	IK-A36
Contacts	26	36
Wires	26-#14	21-#16 (1-17, 19-22) 5-#14 (18, 23-26), 10-#10 (27-36)
Contact Spacing*	5/64	3/64 (1-26) 1/16 (29-36)

SHELL SIZE LK



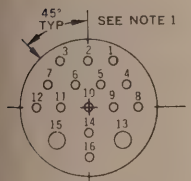
	LK-R24C	LK-37	LK-A50	LK-A53
Contacts	24	37	50	53
Wires	21-#14 (1-21), 3-#16 coax. (22-24) for RG-7/U cable	37-#14	46-#16 (1-46) 4-#10 (47-50)	49-#16 (1-49) 4-#10 (50-53)
Contact Spacing*	3/64 (1-3, 5-8, 13, 15, 20, 22-24) 7/64 (4, 9-12, 14, 16-19, 21)	5/64	3/64 (1-46) 5/64 (47-50)	3/64 (1-49) 7/64 (50-53)



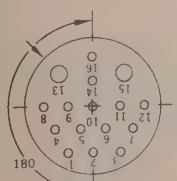
	LK-68	LK-81	LK-110
Contacts	68	81	110
Wires	68-#16	81-#16	110-#20
Contact Spacing*	1/16	3/64	1/16

POLARIZATION POSITIONS

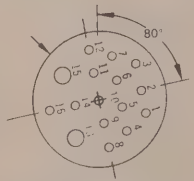
Face View — Pin Insert. (As viewed from engaging end.)



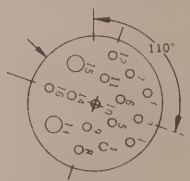
Position N



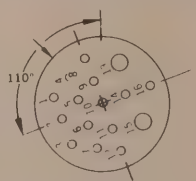
Position V



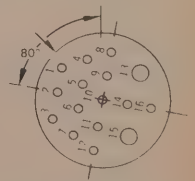
Position W



Position X



Position Y



Position Z

NOTES:

1. Shell polarizing means is indicated by arrow at 45° and will remain constant regardless of insert rotation.
2. Insert to be rotated within the shell to the required position as viewed from engaging end.
3. For alternate positions not shown consult factory.

CROSS REFERENCE LIST BY NUMBER OF CONTACTS

No. of Contacts	No. of Contacts	No. of Contacts	No. of Contacts
2 Contacts — WK-M2, GK-V2, SK-S2	**8 Contacts** — WK-8, GK-8, GK-C8, GK-S8, SK-8, SK-A8, NK-D8, NK-M8	**16 Contacts** — SK-C16	**32 Contacts** — FK-32, FK-C32, FK-L32
3 Contacts — WK-3, WK-C3, GK-C3, GK-E3, GK-S3, SK-L3, NK-E3	**9 Contacts** — GK-9, SK-C9, NK-P9	**17 Contacts** — NK-V17, FK-L17	**36 Contacts** — IK-A36
4 Contacts — WK-4, WK-S4, GK-4, GK-C4, SK-U4, NK-P4	**10 Contacts** — SK-M10	**19 Contacts** — SK-10, FK-19	**37 Contacts** — FK-37, LK-37
5 Contacts — WK-5, WK-S5, GK-G5, GK-M5, SK-5, FK-G5C	**11 Contacts** — SK-W11, NK-L11	**20 Contacts** — NK-L20, FK-L20, FK-W20	**46 Contacts** — FK-46
6 Contacts — WK-6, WK-M6, SK-6	**12 Contacts** — GK-12, SK-D12, NK-12, NK-L12, FK-12	**21 Contacts** — NK-L21, FK-21	**50 Contacts** — LK-A50
7 Contacts — WK-A7, GK-R7, SK-M7	**14 Contacts** — NK-N14, FK-B14, FK-R14	**23 Contacts** — NK-L23	**53 Contacts** — LK-A53
	15 Contacts — NK-L15	**24 Contacts** — SK-24, FK-24, FK-V24, LK-R24C	**68 Contacts** — LK-68
		26 Contacts — IK-26	**75 Contacts** — FK-75
		27 Contacts — NK-27	**81 Contacts** — LK-81
			110 Contacts — LK-110

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

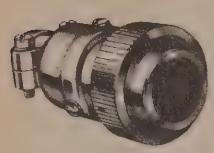
STANDARD CIRCULAR CONNECTORS
K SERIES

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

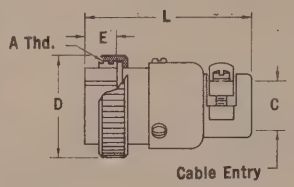
Dimensions subject to change.

K AND RK SERIES

K-21C
STRAIGHT PLUG
SOCKET INSERTS



K-21C

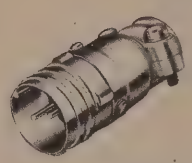


K-21C (Cable Clamp)

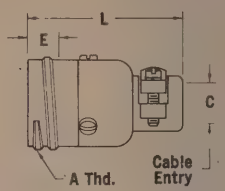
Part Number	C ±1/64	D ±1/64	E ±1/64	L ±3/64	A Thd.
WK-(*)-21C-1/4"	15/64	1 3/64	7/16	2 3/32	7/8-6
WK-(*)-21C-5/16"	11/32	1 3/64	7/16	2 3/32	7/8-6
WK-(*)-21C-3/8"	13/32	1 3/64	7/16	2 3/32	7/8-6
WK-(*)-21C-1/2"	17/32	1 3/64	7/16	2 3/32	7/8-6
WK-(*)-21C-5/8"	21/32	1 3/64	7/16	2 3/32	7/8-6
GK-(*)-21C-1/2"	17/32	1 23/64	7/16	2 3/16	1 3/16-6
GK-(*)-21C-5/8"	21/32	1 23/64	7/16	2 3/16	1 3/16-6
SK-(*)-21C-1/2"	17/32	1 15/32	7/16	2 3/16	1 5/16-6
SK-(*)-21C-5/8"	21/32	1 15/32	7/16	2 3/16	1 5/16-6
SK-(*)-21C-3/4"	25/32	1 15/32	7/16	2 3/16	1 5/16-6
NK-(*)-21C-1/2"	17/32	1 47/64	7/16	2 5/32	1 5/16-6
NK-(*)-21C-5/8"	21/32	1 47/64	7/16	2 5/32	1 5/16-6
NK-(*)-21C-3/4"	25/32	1 47/64	7/16	2 5/32	1 5/16-6
NK-(*)-21C-7/8"	29/32	1 47/64	7/16	2 5/32	1 5/16-6
FK-(*)-21C-3/4"	19/32	2 1/64	7/16	2 5/16	1 13/16-6
FK-(*)-21C-5/8"	21/32	2 1/64	7/16	2 5/16	1 13/16-6
FK-(*)-21C-7/8"	29/32	2 1/64	7/16	2 5/16	1 13/16-6
FK-(*)-21C-1"	1 1/16	2 1/64	7/16	2 15/32	1 13/16-6
IK-(*)-21C-7/8"	29/32	2 1/2	1/2	3	2 1/4-6
IK-(*)21C-1"	1 1/16	2 1/2	1/2	3 5/32	2 1/4-6
IK-(*)-21C-1 1/8"	1 3/16	2 1/2	1/2	3	2 1/4-6
LK-(*)-21C-1"	1 1/16	2 7/8	1/2	3 5/64	2 1/2-6
LK-(*)-21C-1 1/2"	1 1/16	2 7/8	1/2	3 1/8	2 1/2-6

*Add contact arrangement.

K-22C
STRAIGHT PLUG
PIN INSERTS



K-22C



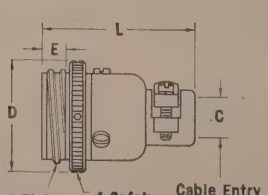
K-22C (Cable Clamp)

Part Number	C ±1/64	E ±1/64	L ±3/64	A Thd.
WK-(*)-22C-1/4"	15/64	7/16	1 29/32	7/8-6
WK-(*)-22C-5/16"	11/32	7/16	1 29/32	7/8-6
WK-(*)-22C-3/8"	13/32	7/16	1 29/32	7/8-6
WK-(*)-22C-1/2"	17/32	7/16	1 29/32	7/8-6
WK-(*)-22C-5/8"	21/32	7/16	1 29/32	7/8-6
GK-(*)-22C-1/2"	17/32	7/16	2	1 3/16-6
GK-(*)-22C-5/8"	21/32	7/16	2	1 3/16-6
SK-(*)-22C-1/2"	17/32	7/16	2	1 5/16-6
SK-(*)-22C-5/8"	21/32	7/16	2	1 5/16-6
SK-(*)-22C-3/4"	25/32	7/16	2	1 5/16-6
NK-(*)-22C-1/2"	17/32	7/16	1 31/32	1 5/16-6
NK-(*)-22C-5/8"	21/32	7/16	1 31/32	1 5/16-6
NK-(*)-22C-3/4"	25/32	7/16	1 31/32	1 5/16-6
NK-(*)-22C-7/8"	29/32	7/16	1 31/32	1 5/16-6
FK-(*)-22C-3/4"	19/32	7/16	2 5/32	1 13/16-6
FK-(*)-22C-5/8"	21/32	7/16	2 5/32	1 13/16-6
FK-(*)-22C-7/8"	29/32	7/16	2 5/32	1 13/16-6
FK-(*)-22C-1"	1 1/16	7/16	2 5/16	1 13/16-6
IK-(*)-22C-7/8"	29/32	1/2	2 13/16	2 1/4-6
IK-(*)-22C-1"	1 1/16	1/2	2 31/32	2 1/4-6
IK-(*)-22C-1 1/8"	1 3/16	1/2	2 13/16	2 1/4-6
LK-(*)-22C-1"	1 1/16	1/2	2 57/64	2 1/2-6
LK-(*)-22C-1 1/2"	1 1/16	1/2	2 15/16	2 1/2-6

*Add contact arrangement.

RK-22C
STRAIGHT PLUG
REVERSE COUPLING PIN INSERTS

RK-22C



RK-22C (Cable Clamp)

Part Number	C ±1/64	D ±1/64	E ±1/64	L ±3/64	A Thd.
RWK-(*)-22C-1/4"	15/64	1 3/64	7/16	1 29/32	1 5/16-6
RWK-(*)-22C-5/16"	11/32	1 3/64	7/16	1 29/32	1 5/16-6
RWK-(*)-22C-3/8"	13/32	1 3/64	7/16	1 29/32	1 5/16-6
RWK-(*)-22C-1/2"	17/32	1 3/64	7/16	1 29/32	1 5/16-6
RWK-(*)-22C-5/8"	21/32	1 3/64	7/16	1 29/32	1 5/16-6
RGK-(*)-22C-1/2"	17/32	1 7/16	7/16	2	1 1/4-6
RGK-(*)-22C-5/8"	21/32	1 7/16	7/16	2	1 1/4-6
RSK-(*)-22C-1/2"	17/32	1 9/16	7/16	2	1 3/8-6
RSK-(*)-22C-5/8"	21/32	1 9/16	7/16	2	1 3/8-6
RSK-(*)-22C-3/4"	25/32	1 9/16	7/16	2	1 3/8-6
RNK-(*)-22C-1/2"	17/32	1 9/16	7/16	1 31/32	1 5/8-6
RNK-(*)-22C-5/8"	21/32	1 13/16	7/16	1 31/32	1 5/8-6
RNK-(*)-22C-3/4"	25/32	1 13/16	7/16	1 31/32	1 5/8-6
RNK-(*)-22C-7/8"	29/32	1 13/16	7/16	1 31/32	1 5/8-6
RFK-(*)-22C-3/4"	19/32	2 1/8	7/16	2 5/32	1 13/16-6
RFK-(*)-22C-5/8"	21/32	2 1/8	7/16	2 5/32	1 13/16-6
RFK-(*)-22C-7/8"	29/32	2 1/8	7/16	2 5/32	1 13/16-6
RFK-(*)-22C-1"	1 1/16	2 1/8	7/16	2 5/16	1 13/16-6
RIK-(*)-22C-7/8"	29/32	2 5/16	1/2	2 13/16	2 5/16-6
RIK-(*)-22C-1"	1 1/16	2 5/16	1/2	2 31/32	2 5/16-6
RIK-(*)-22C-1 1/8"	1 3/16	2 5/16	1/2	2 13/16	2 5/16-6
RLK-(*)-22C-1"	1 1/16	2 13/16	1/2	2 57/64	2 5/16-6
RLK-(*)-22C-1 1/2"	1 1/16	2 13/16	1/2	2 15/16	2 5/16-6

*Add contact arrangement.

For a quick response to your application needs call one of the following District Offices:
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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

STANDARD CIRCULAR CONNECTORS
K SERIES

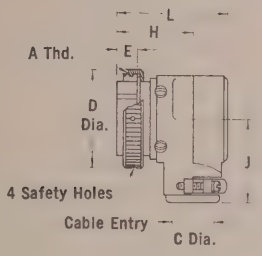
For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

Dimensions subject to change.

K AND RK SERIES

K-23
90° ANGLE PLUG
SOCKET INSERTS

K23C

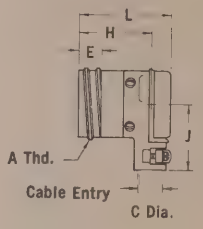


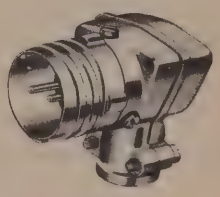
K-23C (Cable Clamp)

Part Number	C ±1/64	D ±1/64	E ±1/64	H ±3/64	J ±1/64	L ±1/16	A Thd.
WK-(*)-23C-3/8"	13/32	1 3/64	7/16	1 23/64	1	1 3/4	7/8-6
WK-(*)-23C-1/2"	17/32	1 3/64	7/16	1 31/64	1	2	7/8-6
GK-(*)-23C-3/8"	25/64	1 23/64	7/16	1 7/16	1 3/32	1 15/16	1 3/16-6
GK-(*)-23C-1/2"	17/32	1 23/64	7/16	1 7/16	1 3/32	1 15/16	1 3/16-6
GK-(*)-23C-5/8"	21/32	1 23/64	7/16	1 3/16	1 3/32	2 5/32	1 3/16-6
SK-(*)-23C-1/2"	17/32	1 15/32	7/16	1 23/64	1 7/16	1 15/16	1 5/16-6
SK-(*)-23C-5/8"	21/32	1 15/32	7/16	1 17/32	1 7/16	2 3/32	1 5/16-6
SK-(*)-23C-3/4"	25/32	1 15/32	7/16	1 15/32	1 7/16	2 7/32	1 5/16-6
NK-(*)-23C-9/16"	19/32	1 47/64	7/16	1 35/64	1 5/16	2 1/8	1 5/16-6
NK-(*)-23C-5/8"	21/32	1 47/64	7/16	1 35/64	1 5/16	2 1/8	1 5/16-6
NK-(*)-23C-1 1/16"	23/32	1 47/64	7/16	1 35/64	1 5/16	2 1/8	1 5/16-6
FK-(*)-23C-9/16"	19/32	2 1/64	7/16	1 33/64	1 23/32	2 1/32	1 13/16-6
FK-(*)-23C-5/8"	21/32	2 1/64	7/16	1 33/64	1 23/32	2 1/16	1 13/16-6
IK-(*)-23C-1 1/8"	1 3/16	2 1/2	1/2	2 1/32	2 5/32	2 25/64	2 1/4-6
LK-(*)-23C-1"	1 1/16	2 13/16	1/2	1 31/32	2 1/8	2 25/32	2 1/2-6

*Add contact arrangement.

K-24
90° ANGLE PLUG
PIN INSERTS





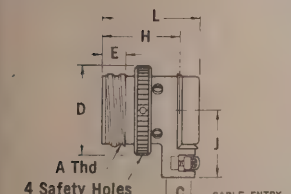
K-24C

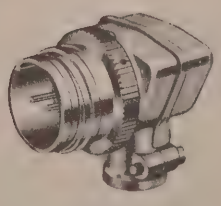
K-24C (Cable Clamp)

Part Number	C ±1/64	E ±1/64	H ±3/64	J ±1/64	L ±1/16	A Thd.
WK-(*)-24C-3/8"	13/32	7/16	1 11/64	1	1 3/16	7/8-6
WK-(*)-24C-1/2"	17/32	7/16	1 19/64	1	1 13/16	7/8-6
GK-(*)-24C-1/2"	17/32	7/16	1 1/4	1 3/32	1 3/4	1 3/16-6
GK-(*)-24C-3/8"	25/64	7/16	1 1/4	1 3/32	1 3/4	1 3/16-6
GK-(*)-24C-5/8"	21/32	7/16	1 3/8	1 3/32	1 31/32	1 3/16-6
SK-(*)-24C-1/2"	17/32	7/16	1 17/64	1 7/16	1 3/4	1 5/16-6
SK-(*)-24C-5/8"	21/32	7/16	1 11/32	1 7/16	1 29/32	1 5/16-6
SK-(*)-24C-3/4"	23/32	7/16	1 13/32	1 7/16	2 1/32	1 5/16-6
NK-(*)-24C-9/16"	19/32	7/16	1 23/64	1 5/16	1 15/16	1 3/16-6
NK-(*)-24C-5/8"	21/32	7/16	1 23/64	1 5/16	1 15/16	1 3/16-6
NK-(*)-24C-1 1/16"	23/32	7/16	1 23/64	1 5/16	1 15/16	1 3/16-6
FK-(*)-24C-9/16"	19/32	7/16	1 23/64	1 23/32	1 7/8	1 13/16-6
FK-(*)-24C-5/8"	21/32	7/16	1 23/64	1 23/32	1 7/8	1 13/16-6
IK-(*)-24C-1 1/8"	1 3/16	1/2	1 27/32	2 5/32	2 43/64	2 1/4-6

*Add contact arrangement.

RK-24C
90° ANGLE PLUG
REVERSE COUPLING PIN INSERTS





RK24C

RK-24C (Cable Clamp)

Part Number	C ±1/64	D ±1/64	E ±1/64	H ±3/64	J ±1/64	L ±1/16	A Thd.
RWK-(*)-24C-3/8"	13/32	1 3/64	7/16	1 11/64	1	1 3/16	15/16-6
RWK-(*)-24C-1/2"	17/32	1 3/64	7/16	1 19/64	1	1 13/16	15/16-6
RGK-(*)-24C-1/2"	17/32	1 7/16	7/16	1 1/4	1 3/32	1 3/4	1 1/4-6
RGK-(*)-24C-5/8"	21/32	1 7/16	7/16	1 3/8	1 3/32	1 31/32	1 1/4-6
RSK-(*)-24C-1/2"	17/32	1 7/16	7/16	1 17/64	1 7/16	1 3/4	1 3/8-6
RSK-(*)-24C-5/8"	21/32	1 7/16	7/16	1 11/32	1 7/16	1 29/32	1 3/8-6
RSK-(*)-24C-3/4"	25/32	1 7/16	7/16	1 13/32	1 7/16	2 1/32	1 3/8-6
RNK-(*)-24C-9/16"	19/32	1 13/16	7/16	1 23/64	1 7/16	1 15/16	1 5/8-6
RNK-(*)-24C-5/8"	21/32	1 13/16	7/16	1 23/64	1 7/16	1 15/16	1 5/8-6
RNK-(*)-24C-1 1/16"	23/32	1 13/16	7/16	1 23/64	1 7/16	1 15/16	1 5/8-6
RFK-(*)-24C-9/16"	19/32	2 1/8	7/16	1 23/64	1 23/32	1 7/8	1 15/16-6
RFK-(*)-24C-5/8"	21/32	2 1/8	7/16	1 23/64	1 23/32	1 7/8	1 15/16-6
RIK-(*)-24C-1 1/8"	1 3/16	2 5/16	1/2	1 27/32	2 5/32	2 43/64	2 5/16-6
RLK-(*)-24C-1"	1 1/16	2 13/16	1/2	1 25/32	2 1/8	2 13/32	2 5/16-6

*Add contact arrangement.

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

STANDARD CIRCULAR CONNECTORS
K SERIES

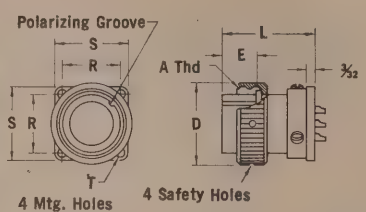
For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

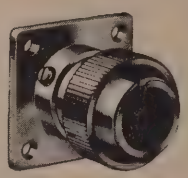
K AND RK SERIES

Dimensions subject to change.
(millimeters are in parentheses)

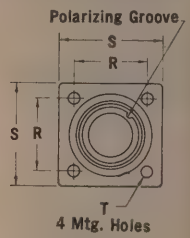
K-31S, K-31SL WALL MOUNTING RECEPTACLE
PIN INSERTS

K-31S





K-31SL

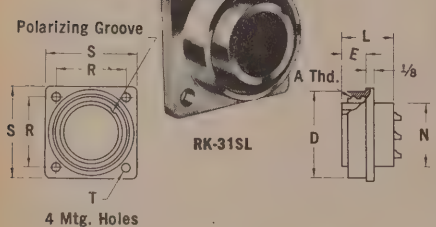


K-31S (Small Flange) and K-31SL (Large Flange)

Part Number	For K-31S and K-31SL D ±1/64	E ±1/64	L ±3/64	A Thd.	For K-31S R ±.005	S ±1/64	T ±.005	For K-31SL R ±.005	S ±1/64	T ±.005
WK-(*)-31S	1 3/64	7/16	1 3/16	7/8-6	.730 (18,54)	1 5/16	.120 (3,05)	.972 (24,69)	1 5/16	.144 (3,65)
GK-(*)-31S	1 23/64	7/16	1 7/32	1 3/16-6	.972 (24,69)	1 1/4	.120 (3,05)	1.192 (30,28)	1 3/16	.169 (4,29)
SK-(*)-31S	1 15/32	7/16	1 7/32	1 5/16-6	1.038 (26,37)	1 3/8	.120 (3,05)	1.282 (32,56)	1 11/16	.169 (4,29)
NK-(*)-31S	1 47/64	7/16	1 7/32	1 7/16-6	1.259 (31,98)	1 5/8	.169 (4,29)	1.500 (38,1)	1 15/16	.169 (4,29)
FK-(*)-31S	2 1/64	7/16	1 1/4	1 13/16-6	1.502 (38,15)	1 7/8	.169 (4,29)	1.678 (42-62)	2 1/16	.169 (4,29)
IK-(*)-31S	2 1/2	1/2	1 13/32	2 1/4-6	1.944 (49,38)	2 5/16	.169 (4,29)	2.031 (51,59)	2 3/16	.169 (4,29)
LK-(*)-31S	2 7/8	1/2	1 13/32	2 1/2-6	2.077 (52,76)	2 7/16	.169 (4,29)	2.210 (56,13)	2 7/16	.169 (4,29)

For K31SL (Large Flange), add "L" to nomenclature. e.g., WK-(*)-31S becomes WK-(*)-31SL.
*Add contact arrangement.

RK-31SL WALL MOUNTING RECEPTACLE
REVERSE COUPLING PIN INSERTS

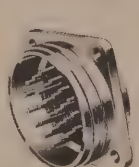


RK-31SL (Large Flange)

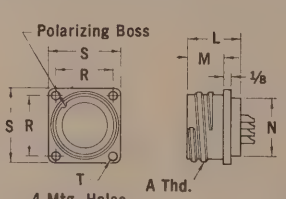
Part Number	L ±3/64	N ±.005	E ±1/64	A Thd.	D ±1/64	R ±.005	S ±1/64	T ±.005
RWK-(*)-31SL	1 5/16	3/4	7/16	1 5/16-6	1 1/16	.972 (24,69)	1 5/16	.144 (3,65)
RGK-(*)-31SL	1 5/16	1	7/16	1 1/4-6	1 3/8	1.192 (30,28)	1 3/16	.169 (4,29)
RSK-(*)-31SL	1 5/16	1 1/8	7/16	1 3/8-6	1 1/2	1.282 (32,56)	1 11/16	.169 (4,29)
RNK-(*)-31SL	1 5/16	1 3/8	7/16	1 5/8-6	1 3/4	1.502 (38,15)	1 15/16	.169 (4,29)
RFK-(*)-31SL	1 5/16	1 5/8	7/16	1 13/16-6	2 1/16	1.680 (42,67)	2 1/8	.169 (4,29)
RIK-(*)-31SL	1 5/16	1 15/16	1/2	2 5/16-6	2 1/2	2.032 (51,61)	2 3/16	.169 (4,29)
RLK-(*)-31SL	1 5/16	2 1/4	1/2	2 5/16-6	2 3/4	2.210 (56,13)	2 7/8	.169 (4,29)

*Add contact arrangement.

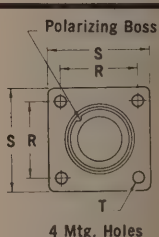
K-32S, K-32SL WALL MOUNTING RECEPTACLE
PIN INSERTS



K-32S



K-32SL



K-32S (Small Flange) and K-32SL (Large Flange)

Part Number	For K-32S and K-32SL L ±3/64	N ±.005	M ±1/64	A Thd.	For K-32S R ±.005	S ±1/64	T ±.005	For K-32SL R ±.005	S ±1/64	T ±.005
WK-(*)-32S	3/4	3/4	7/16	7/8-6	.730 (18,54)	1 5/16	.120 (3,05)	.972 (24,69)	1 5/16	.144 (3,65)
GK-(*)-32S	3/4	1	7/16	1 3/16-6	.972 (24,69)	1 1/4	.120 ((3,05)	1.192 (30,28)	1 3/16	.169 (4,29)
SK-(*)-32S	3/4	1 1/8	7/16	1 5/16-6	1.038 (26,37)	1 3/8	.120 (3,05)	1.282 (32,56)	1 11/16	.169 (4,29)
NK-(*)-32S	3/4	1 3/8	7/16	1 7/16-6	1.259 (31,98)	1 5/8	.144 (3,66)	1.503 (38,18)	1 15/16	.169 (4,29)
FK-(*)-32S	3/4	1 5/8	7/16	1 13/16-6	1.502 (38,15)	1 7/8	.144 (3,66)	1.679 (42,65)	2 1/8	.169 (4,29)
IK-(*)-32S	27/32	1 15/16	1/2	2 1/4-6	1.944 (49,38)	2 5/16	.169 (4,29)	2.031 (51,59)	2 3/16	.169 (4,29)
LK-(*)-32S	27/32	2 1/4	1/2	2 1/2-6	2.077 (52,76)	2 7/16	.169 (4,29)	2.210 (56,13)	2 7/8	.169 (4,29)

For K-32L (Large Flange), add "L" to nomenclature. e.g., WK-(*)-32S becomes WK-(*)-32SL.
*Add contact arrangement.

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

STANDARD CIRCULAR CONNECTORS
K SERIES

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Dimensions subject to change.

K AND RK SERIES ACCESSORIES

K & RK-59A DUST CAPS

K-59A (for K-21, K-23 Plugs, K-31SL Receptacle)

Shell Size	Chain	Shell Size	Chain
WK-59A-1	No chain	FK-59A-1	No chain
WK-59A-2	#6	FK-59A-2	#6
GK-59A-1	No chain	IK-59A-1	No chain
GK-59A-2	#6	IK-59A-1	#10
SK-59A-1	No chain	LK-59A-1	No chain
SK-59A-2	#6	LK-59A-2	#10
NK-59A-1	No chain		
NK-59A-2	#6		

RK-59A (for RK-31SL Receptacle)

Shell Size	Chain	Shell Size	Chain
RWK-59A-1	No chain	RNK-59A-2	#6
RWK-59A-2	#6	RFK-59A-1	No chain
RGK-59A-1	No chain	RFK-59A-2	#6
RGK-59A-2	#6	RIK-59A-1	No chain
RSK-59A-1	No chain	RIK-59A-2	#10
RSK-59A-2	#6	RLK-59A-1	No chain
RNK-59A-1	No chain	RLK-59A-2	#10

K & RK-60A DUST CAPS

K-60A (for K-22 Plug and K-32S, K-32SL Receptacles)

Shell Size	Chain	Shell Size	Chain
WK-60A-1	No chain	FK-60A-1	No chain
WK-60A-2	#6	FK-60A-2	#6
GK-60A-1	No chain	IK-60A-1	No chain
GK-60A-2	#6	IK-60A-2	#10
SK-60A-1	No chain	LK-60A-1	No chain
SK-60A-2	#6	LK-60A-2	#10
NK-60A-1	No chain		
NK-60A-2	#6		

RK-60A (for RK-22 and RK-24 Plugs)

Shell Size	Chain	Shell Size	Chain
RWK-60A-1	No chain	RNK-60A-2	#6
RWK-60A-2	#6	RFK-60A-1	No chain
RGK-60A-1	No chain	RFK-60A-2	#6
RGK-60A-2	#6	RIK-69A-1	No chain
RSK-60A-1	No chain	RIK-69A-2	#10
RSK-60A-2	#6	RLK-60A-1	No chain
RNK-60A-1	No chain	RLK-60A-2	#10

BARREL EXTENSIONS

Shell Size	Length	Part Number
WK	1/2"	019961-0017
	1"	019961-0009
GK	1/2"	019961-0023
	1"	019961-0011
IK	1/2"	019961-0018
	3/4"	019961-0019

Shell Size	Length	Part Number
NK	1/2"	019961-0014
	3/4"	019961-0021
	1 1/8"	019961-0006
FK	17/32"	019961-0003
	1"	019961-0016
	1 17/32"	019961-0004
SK	1/2"	019961-0010
	3/4"	019961-0020
	1 17/32"	019961-0001

CONTACT ARRANGEMENTS by number of contacts

Code	Contact Spacing	Test Voltage 60 cps. (ac rms)	Code	Contact Spacing	Test Voltage 60 cps. (ac rms)	Code	Contact Spacing	Test Voltage 60 cps. (ac rms)
A	1/64	540 volts	J	9/64	3050 volts	S	19/64	4940 volts
B	1/32	1000 volts	K	5/32	3250 volts	T	5/16	5100 volts
C	3/64	1300 volts	L	11/64	3450 volts	U	23/64	5580 volts
D	1/16	1700 volts	M	3/16	3650 volts	V	3/8	5750 volts
E	5/64	2050 volts	N	13/64	3850 volts	W	25/64	5890 volts
F	3/32	2350 volts	O	7/32	4050 volts	X	13/32	6020 volts
G	7/64	2600 volts	P	15/64	4240 volts	Y	7/16	6300 volts
H	1/8	2900 volts	Q	1/4	4420 volts	Z	1/2	6800 volts
			R	9/32	4780 volts			

SPACING/VOLTAGE CODE

There shall be no evidence of breakdown when the test voltages indicated below are applied, for a period of one minute, between the contacts and between the shell and the contacts with spacings as noted below:

Laboratory Conditions

Ambient Temperature	20°C to 27°C
Relative Humidity	69% to 73%
Barometric Pressure	29.70" to 29.75"
Insert Material	Phenolic XXX-P or molded melamine

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ITT CANNON ELECTRIC

MINIATURE CIRCULAR CONNECTORS KPT/KPTM/KPSE SERIES

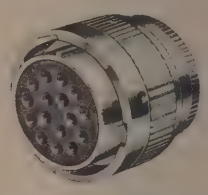
For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

MINIATURE CIRCULAR CONNECTORS

DESIGNED TO MIL-C-26482 SERIES I, SOLDER AND CRIMP CONTACTS

KPT/KPTM/KPSE

This catalog describes CANNON® connectors using MIL-C-26482 Series I type hardware with three-point bayonet coupling and five-key polarization. These miniature circular connectors are grouped into three series ranging from general purpose solder pot connectors . . . to high performance, crimp connectors . . . to connectors with high contact density. This broad range provides the most complete family of 26482 connectors available today. The versatility of these connectors is proven by the fulfillment of requirements ranging from general purpose to space environmental.



In addition to the three basic series, connectors for special applications ar also available. They include RFI filtering versions (with low pass internal filte pin contacts), hermetic connectors for high pressure watertight requirements and twist-on pull-off couplers for MIL-C-26482 plugs.

STANDARD DATA

Standard Materials and Finishes	KPT	KPTM	KPSE
SHELL	aluminum alloy, conductive olive drab chromate over cadmium finish per QQ-P-416		
INSULATOR	polychloroprene	polychloroprene	polychloroprene
GROMMET AND SEAL	polychloroprene	polychloroprene	polychloroprene
CONTACTS	Copper alloy, gold over copper plate per MIL-G-45204 type II, Class I		

Mechanical Data

SHELL SIZES	00—wall mounting receptacle 01—cable connecting plug 02—box mounting receptacle 06—straight plug	07—jam nut receptacle 08—90° angle plug B—thru-bulkhead receptacle (KPT only)
SHELL SIZES	KPT/KPTM 8 thru 24	KPSE 10 thru 24
POLARIZATION/COUPLING	fine keyway/three point bayonet	
SERVICE CLASSES	A—general duty B—general duty with strain relief E—grommet seal F—grommet seal with strain relief	J—gland nut with strain relief for jacketed cable P—potted

Electrical Data

NUMBER OF CONTACTS	KPT/KPTM 2 thru 61	KPSE 3 thru 61
WIRE SIZE, AWG	KPT/KPTM 12 thru 24	KPSE 16 thru 24

WIRE RANGE ACCOMMODATIONS

CONTACT SIZE	AW6 WIRE SIZE	MIN. KPT	MIN. KPTM/ KPSE	MAX. KPT/ KPTM/KPSE
20	24, 22, and 20	.060	.047	.083
16	20, 18 and 16	.066	.066	.109
12	14 and 12	.097		.142

CONTACT TERMINATION	solder	crimp snap-in

Contact Rating	CONTACT SIZE	RATED AMPS	TEST CURRENT	MILLIVOLT DROP
	20	7.5	7.5	less than 55
	16	22.0	13.0	less than 50

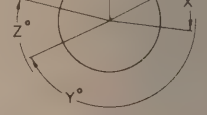
Service Rating	TEST VOLT.	SERVICE	AC (rms)	DC	MAXIMUM OPERATING VOLTAGE	SERVICE	AC (rms)	DC
	Sea Level	1	1500	2100	Sea Level	1	600	850
		2	2300	3200		2	1000	1275
	70,000 ft.	1	375	535				
		2	550	770				

Coaxial Contacts	—	RG-55/U, RG-59/U, RG-62/U, and RG-223/U	—

ALTERNATE INSERT POSITIONS

The diagram at the left indicates alternate insert positions. The five positions (W, X, Y, Z and Normal) differ in degree of rotation fo various sizes and arrangements. For the exact degree of rotation, and for the list of contact arrangements and alternate positions available refer to the tabulation below.

INSERT POSITION
(Face view of pin insert)



NO. OF CONTACTS	SHELL SIZE	ARR. NO.	Degrees of Rotation W	X	Y	Z
2	8	8-2	58	122	—	—
3	8	8-3	60	210	—	—
	8	8-33	90	—	—	—
	12	12-3	—	—	180	—
4	8	8-4	45	—	—	—
5	14	14-5	40	92	184	273
6	10	10-6	90	—	—	—
	10	10-98	90	180	240	270
8	12	12-8	90	112	203	292
	16	16-8	54	152	180	331
	24	24A8	—	—	—	—
	24	24A8	—	—	—	—
	24	24A9	—	—	—	—
10	12	12-10	60	155	270	295
11	18	18-11	62	119	241	340
12	14	14-12	43	90	—	—
15	14	14-15	17	110	155	234
16	20	20-16	238	318	333	347
18	14	14-18	15	90	180	270
19	14	14-19	30	165	315	—
21	22	22-21	16	135	175	349
23	16	16-23	158	270	—	—
	16	**16A99**	**66**	**156**	**223**	**340**
24	20	20-24	70	145	215	290
26	16	16-26	60	—	275	338
28	18	18A28	—	—	—	—
30	18	18-30	180	193	285	350
31	24	24A31	90	225	—	—
32	18	18-32	85	138	222	265
	22	22-32	72	145	215	288
34	22	22-34	62	142	218	298
36	22	22-36	72	144	216	288
39	20	20-39	63	144	252	333
41	20	20-41	45	126	225	—
	22	22-41	39	135	264	—
55	22	22-55	30	142	226	314
57	24	24A57	90	180	270	324
61	24	24-61	90	180	270	324

Numbers in bold face indicate contact arrangements are not to MIL-C-26482.

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Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

MINIATURE CIRCULAR CONNECTORS
KPT/KPTM/KPSE SERIES

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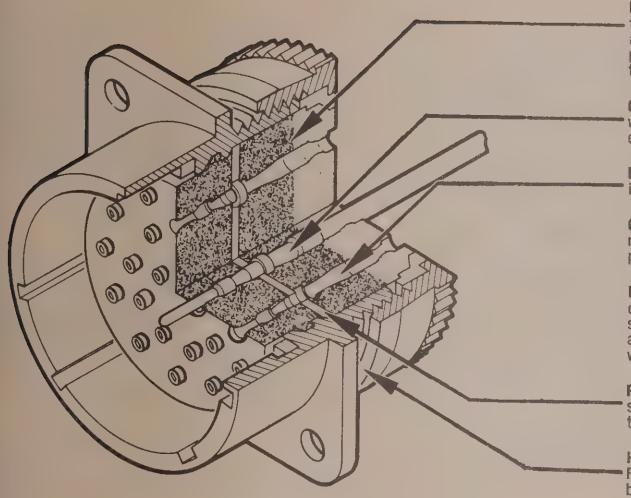
GENERAL PURPOSE, CRIMP CONTACT CONNECTORS
KPTM SERIES



DUAL-SHORE® INSULATOR is integrally molded polychloroprene with a firm front section and a soft resilient rear section that provides a moistureproof seal around each wire. A hard plastic web is molded within the firm front section to prevent over-insertion of the contacts. This construction eliminates the moisture traps characteristic of other types of insulators.

CRIMP, SNAP-IN CONTACTS are to MIL-C-23216 specification and can be crimped with the standard M22520/1 crimp tool. They are especially suited to quick and easy field service by unskilled personnel.

BOW SPRING SOCKET CONTACTS increase socket contact area, provide smooth insertion and prolong connector life.

CLOSED-ENTRY SOCKETS eliminate damage from abuse by test probes and automatically correct misaligned pins. Lead-in chamfers around the socket assures proper mating even with up to .060" misalignment or splay of mating pins.

INTERFACIAL SEALING is assured by raised barriers around each pin contact that compress into the lead-in chamfers at each socket contact. This method provides such a positive seal around each pair of mated contacts that, if several contacts are removed from the insert, there will be no leakage to the remaining contacts when the connector is immersed in water.

POSITIVE STOP, a tough thermoplastic web molded into the DUAL-SHORE insulator, prevents over-insertion of contacts by providing a close-fitting seat for the shoulder of each pin or socket.

HARDWARE is aluminum alloy, finished to QQ-P-416, and conforms to MIL-C-26482. Five key polarization assures correct hardware engagement, and three-point bayonet lock provides quick connect/disconnect. To aid further in sealing, a peripheral neoprene ring is mounted in the receptacle and is compressed by the plug barrel while engaged.

FEATURES

- **unique DUAL-SHORE insulator**
- **crimp snap-in contacts**
- **closed-entry bow spring socket contacts**
- **interfacial sealing**
- **positive stop to prevent over-insertion of contacts**

KPTM connectors are recommended for applications which require an extremely reliable, environment-resistant connector designed for economy, efficiency and simplicity, but not requiring MIL-SPEC qualifications. The KPTM is a version of the KPT with a DUAL-SHORE insulator and MS-3192/3193 crimp snap-in contacts. The DUAL-SHORE insulator is a simple, compact unit with no retaining clips or rings to move or obstruct, and no glued joints to loosen or serve as moisture entry paths.

Interfacial sealing is assured by raised barriers around each pin contact cavity that compress into the lead-in chamfers at each socket contact cavity when mated, providing such a positive seal there will be no leakage when the connector is immersed in water even if several contacts are removed.

KPTM connectors are intermateable, intermountable and interchangeable with all MIL-C-26482 connectors. In fact, they utilize the same crimp, removable (MIL-C-23216) contacts as used in the MIL-qualified KPSE series, thus allowing the user to standardize on one contact for use in both the qualified MS (KPSE) series and the KPTM series.

HOW TO ORDER

KPTM	00	E	18 - 32	P	X	**

Series Prefix
Shell Style
Service Type
Shell Size
Contact Arrangement
Contact Type
Alternate Insert Position
Modification Code

SERIES PREFIX
KPTM — ITT Cannon prefix

SHELL STYLE
00 — wall mounting receptacle
01 — cable connecting plug
02 — box mounting receptacle
06 — straight plug
07 — jam nut receptacle
08 — 90° angle plug

SERVICE TYPE
A — general duty
B — general duty with strain relief
E — grommet seal
F — grommet seal with strain relief
J — watertight gland seal with strain relief for jacketed cable
P — potted

SHELL SIZE
8, 10, 12, 14, 16, 18, 20, 22 and 24.

CONTACT ARRANGEMENT
See contact arrangement page.

CONTACT TYPE
P — pin
S — socket

ALTERNATE INSERTION POSITION
W, X, Y, and Z. (Omit for normal.)

MODIFICATION CODE
Consult factory. Omit first digit (0) of shell style indication when using modification code, except for code F0. F0 designates connector less contacts. See COMPONENTS/ACCESSORIES page for contact part numbers.

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

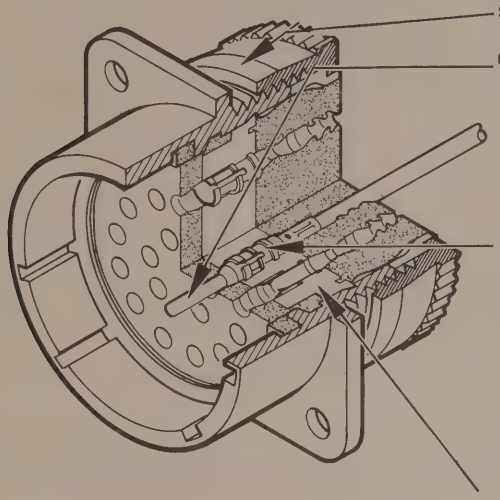
ITT CANNON ELECTRIC

MINIATURE CIRCULAR CONNECTORS
KPT/KPTM/KPSE SERIES

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

HIGH PERFORMANCE, MIL-C-26842 SERIES I CRIMP CONTACT CONNECTORS

KPSE SERIES



STANDARD MIL-C-26482 HARDWARE mates with any connector designed to MIL-C-26482.

CRIMP, SNAP-IN CONTACTS are designed to MIL-C-23216 and can be crimped with the standard M22520/1 crimp tool.

CLOSED-ENTRY SOCKET CONTACTS eliminate damage from abuse by test probes and help to correct any misaligned pins during engagement.

CONTACT INSERTION is accomplished from the rear of the connector. When the contact is fully inserted, the clip tines snap securely behind the contact shoulder.

CONTACT EXTRACTION is accomplished with a front-inserted extraction tool. Pressing the tool plunger pushes the contact out thru the rear of the connector.

CONTACT RETAINING CLIP is completely encased in a tough plastic wafer to protect the clip from damage.

COMPLETE MOISTURE SEALING is achieved by combining four seals: shell, peripheral, interfacial and wire seals.

SHELL SEAL is effected when the plug shell pushes against the sealing ring in the receptacle when the connectors are mated.

PERIPHERAL SEAL around the edge of the pin insulator is designed so that mating the connector puts tension on the seal and greatly reduces compression set.

INTERFACIAL SEAL is achieved by the insulator faces meeting when the plug and receptacle are mated.

WIRE SEAL is accomplished by a multiple ripple design, exceeding the wire sealing requirements of MIL-C-26482.

POSITIVE INSERT-TO-SHELL MECHANICAL RETENTION with hard plastic wafer firmly locked into a groove in the shell, in addition to a strong adhesive bond between the insert and shell.

FEATURES

- environment-resistant
- voidless integrally molded insulator
- front-release, crimp snap-in contacts
- closed entry socket contacts
- 4 moisture seals for complete sealing
- contact clip protected in hard dielectric
- positive insert-to-shell mechanical retention

KPSE environment-resistant, miniature circular, quick disconnect connectors, qualified to MIL-C-26482, are designed for the exacting requirements of today's electronic industry. The KPSE features an insulator which is mechanically retained in the shell by a positive, hard plastic-to-metal lock retention augmented by a reliable adhesive bond. Complete moisture sealing is achieved by four seals; shell, peripheral, interfacial and wire seals.

Crimp snap-in contacts are retained in clips that are completely encased in a tough hard dielectric wafer, thus protecing the clip tines from damage. Closed-entry socket contacts facilitate positive mating.

The KPSE series is intermateable, intermountable and interchangeable with all MIL-C-26482 connectors, whether crimp or solder type, and is available with many materials, finishes and configurations.

HOW TO ORDER

MS	3120	E	18-32	P	X		
KPSE	00	E	18-32	P	X	**	

Series Prefix
Shell Style
Class
Shell Size
Contact Arrangement
Contact Type
Alternate Insert Position
Modification Code

SERIES PREFIX
KPSE — ITT Cannon prefix
MS — MIL-C-26482 prefix

SHELL STYLE
ITT Cannon Number:
00 — wall mounting receptacle
01 — cable connecting plug
02 — box mounting receptacle (without wire seals)
06 — straight plug
07 — jam nut receptacle
08 — 90° angle plug

MS Designation:
3120 — wall mounting receptacle
3121 — cable connecting plug
3122 — box mounting receptacle
3124 — jam nut receptacle
3126 — straight plug

CLASS
A — general duty (not MS approved)
B — general duty with strain relief without grommet & ferrule, (may be used for potting when strain relief is desired) (not MS approved)
E — grommet seal (MS specification)
F — grommet seal with strain relief (MS specification)
J — gland seal with strain relief for jacketed cable (not MS approved)
P — potted (MS specification)

SHELL SIZE
10, 12, 14, 16, 18, 20, 22, and 24

CONTACT ARRANGEMENT
See contact arrangement page

CONTACT TYPE
P — pin
S — socket

ALTERNATE INSERT POSITION
W, X, Y, and Z. (Omit for normal.)

MODIFICATION CODE
Consult factory. Omit first digit (0) of shell style indication when using modification code, except for code F0. F0 designates connector less contacts. See COMPONENTS/ACCESSORIES page for contact part numbers.

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

MINIATURE CIRCULAR CONNECTORS
KPT/KPTM/KPSE SERIES

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

GENERAL PURPOSE, MIL-C-26482 SOLDER CONTACT CONNECTORS

KPT SERIES

FEATURES

- general purpose
- closed-entry socket contacts
- solder termination

KPT connectors are a series of general-purpose, environment-resistant, miniature circular connectors, qualified for use in military applications. These connectors are also widely used in industrial applications calling for quick-disconnect connectors with fixed contacts for solder termination.

The KPT series is intermateable and intermountable with all MIL-C-26482 connectors, whether solder or crimp type and is available with many materials, finishes and configurations.

HOW TO ORDER

MS	3110	E	22-36	P	Y		
KPT	00	E	22-36	P	Y	**	

Series Prefix
Shell Style
Class
Shell Size
Contact Arrangement
Contact Type
Alternate Insert Position
Modification Code

SERIES PREFIX
KPT — ITT Cannon prefix
MS — MIL-C-26482 prefix

SHELL STYLE
ITT Cannon number:
00 — wall mounting receptacle
01 — cable connecting plug
02 — box mounting receptacle (Class E only)
06 — straight plug
07 — jam nut receptacle (available in hermetic version also)
08 — 90° angle plug
B — thru-bulkhead receptacle (Class E only)

MS Designation:
3110 — wall mounting receptacle
3111 — cable connecting plug
3112 — box mounting receptacle (Class E only)
3114 — jam nut receptacle
3116 — straight plug
3119 — thru-bulkhead receptacle (Class E only)

CLASS
A — general duty (not MS approved)
B — general duty with strain relief without grommet & ferrules (may be used for potting when strain relief is desired) (not MS approved)
E — grommet seal except on 02 and 3112 (MS specification)
F — grommet seal with strain relief (MS specification)
J — water tight gland seal with strain relief for jacketed cable (MS specification)
P — potted (MS specification)

SHELL SIZE
8, 10, 12, 14, 16, 18, 20, 22, and 24

CONTACT ARRANGEMENT
See contact arrangements page.

CONTACT TYPE
P — pin; S — socket

ALTERNATE INSERT POSITION
W X, Y and Z. (Omit for normal.)

MODIFICATION CODE
Consult factory. Omit first (0) of shell style indication when using modification code.

KPTB CONNECTORS

- general purpose
- double ended pin and socket contacts
- contains KPT socket insert
- nonremovable contacts

KPTB connectors are a series of general purpose, miniature circular connectors, qualified for use in military applications. They are also widely used in industrial applications. The KPTB in a thru-bulkhead version with double faced pin and socket insert construction allowing mating from both ends. They contain KPT socket inserts with feedthru (pin/socket) nonremovable contacts.

The thru-bulkhead receptacle is provided for applications requiring the disconnection of a power source from either side of a panel. A typical connector to be used if air leakage requirements are critical.

HOW TO ORDER

Thru-Bulkhead Receptacle Connectors:

KPTB	22	55	PS	Y	

Series Prefix
Shell Size
Contact Arrangement
Contact Style (pin & socket)
Alternate Insert Position

MS3119	E	22	55	Y	

MIL-C-26482 Prefix
Class
Shell Size
Contact Arrangement
Alternate Insert Position

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

MINIATURE CIRCULAR CONNECTORS
KPT/KPTM/KPSE SERIES

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

CONTACT ARRANGEMENTS (See page 40 for Alternate Insert Positions)

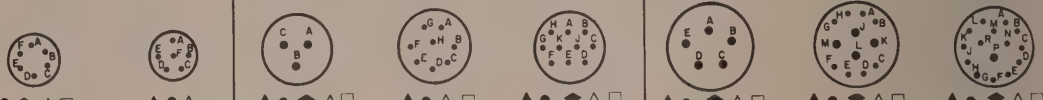
Drawing not to scale; face view of pin insert shown (socket view is opposite)

LEGEND
▲ KPT
● KPTM
◆ KPSE
△ Authorized per MIL-C-26482 (NAVY)
□ Authorized per SCL-6019 (SIGNAL CORPS)

SHELL SIZE 8

SHELL SIZE	8-2	8-3	8-4	8-33
NO. OF CONTACTS	2-#20	3-#20	4-#20	3-#20
SERVICE RATING	1	1	1	1

SHELL SIZE 10 / SHELL SIZE 12 / SHELL SIZE 14

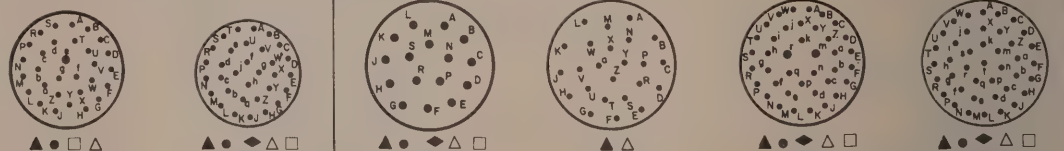


SHELL SIZE	10-6	10-98	12-3	12-8	12-10	14-5	14-12	14-15
NO. OF CONTACTS	6-#20	6-#20	3-#16	8-#20	10-#20	5-#16	8-#20 4-#16	14-#20 1-#16
SERVICE RATING	1	1	2	1	1	2	1	1

SHELL SIZE 16 / SHELL SIZE 18

SHELL SIZE	14-18	14-19	16-8	16-23	16-26	16A99	18-11	18A28
NO. OF CONTACTS	18-#20	19-#20	8-#16	22-#20 1-#16	26-#20	21-#20 2-#16	11-#16	26-#20 2-#16
SERVICE RATING	1	1	2	1	1	1	2	1

SHELL SIZE 20



SHELL SIZE	18-30	18-32	20-16	20-24	20-39	20-41
NO. OF CONTACTS	29-#20 1-#16	32-#20	16-#16	24-#20	37-#20 2-#16	41-#20
SERVICE RATING	1	1	2	1	1	1

SHELL SIZE 22

PIN INSERT ONLY KPTM

SHELL SIZE	22-21	22-32	22-34	22-36	22-41	22-55
NO. OF CONTACTS	21-#16	32-#20	34-#20	36-#20	27-#20 14-#16	55-#20
SERVICE RATING	2	1	1	1	(#20's); 2 (#16's)	1

SHELL SIZE 24

SHELL SIZE	24A4	24A8	24A9	24A31	24A57	24-61
NO. OF CONTACTS	1-#20 2-RG-55/U	1-#20	1-#20	31-#16	55-#20 2-#12	61-#20
SERVICE RATING	5-RG-59/U	7-RG-59/U or 62/U	7-RG-223/U	1	1	1

For a quick response to your application needs call one of the following District Offices:
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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

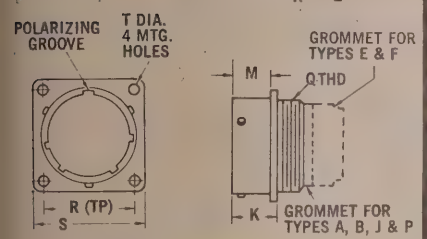
ITT CANNON ELECTRIC

MINIATURE CIRCULAR CONNECTORS
KPT/KPTM/KPSE SERIES

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

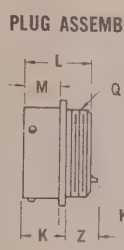
Dimensions subject to change.

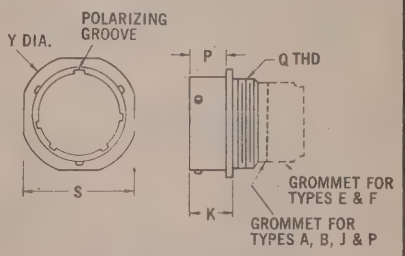
WALL MOUNTING RECEPTACLES
KPT00/MS3110
(MS service class E, F, J, P)
KPSE00/MS3120
(MS service class E, F, J, P)
KPTM00



CRIMP: KPTM00/KPSE00/MS3120

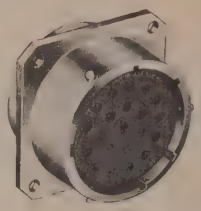
CABLE CONNECTING PLUGS
KPT01/MS3111
(MS service class E, F, J, P)
KPSE01/MS3121
(MS service class E, F, P)
KPTM01

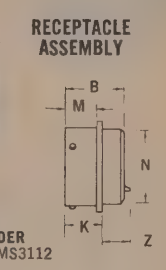


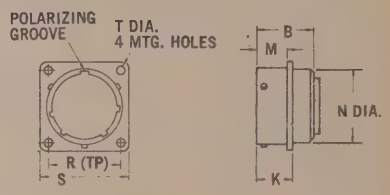


CRIMP: KPTM01/KPSE01/MS3121

BOX MOUNTING RECEPTACLES
KPT02/MS3112
(MS service class E)
KPSE02/MS3122
(MS service class E)
KPTM02







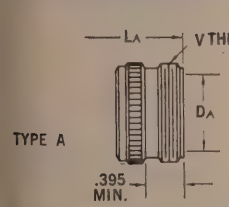
CRIMP: KPTM02/KPSE02

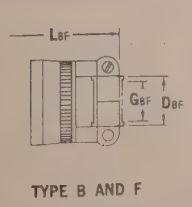
WITHOUT TERMINATION ASSEMBLIES

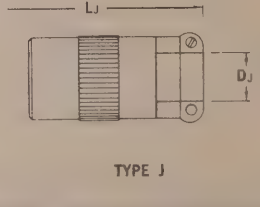
Shell Size	B Max.	K ±.010(±0,25)	L Max.	M ±.005(±0,13)	KPT/KPTM/KPSE N Dia. Max.	P ±.005(±0,13)	R• (TP)	S Max.	T ±.005(±0,13)	Y Max.	KPT Z Max.	U Thread UNEF Class 2A
‡8	.832 (21,13)	.530 (13,46)	.848 (21,54)	.457 (11,61)	.436 (11,07)	.425 (10,79)	.594 (15,09)	.828 (21,03)	.120 (3,05)	.958 (24,33)	.483 (12,27)	3/16-28
10	.832 (21,13)	.530 (13,46)	.848 (21,54)	.457 (11,61)	.526 (14,27)	.425 (10,79)	.719 (18,26)	.954 (24,23)	.120 (3,05)	1.082 (27,48)	.483 (12,27)	5/16-24
12	.832 (21,13)	.530 (13,46)	.848 (21,54)	.457 (11,61)	.687 (17,45)	.425 (10,79)	.812 (20,62)	1.047 (26,59)	.120 (3,05)	1.176 (29,87)	.483 (12,27)	1/16-24
14	.832 (21,13)	.530 (13,46)	.848 (21,54)	.457 (11,61)	.812 (20,62)	.425 (10,79)	.906 (23,01)	1.141 (28,98)	.120 (3,05)	1.270 (32,26)	.483 (12,27)	3/16-20
16	.832 (21,13)	.530 (13,46)	.848 (21,54)	.457 (11,61)	.936 (23,77)	.425 (10,79)	.969 (24,61)	1.234 (31,34)	.120 (3,05)	1.364 (34,65)	.483 (12,27)	5/16-20
18	.832 (21,13)	.530 (13,46)	.848 (21,54)	.457 (11,61)	1.061 (26,95)	.425 (10,79)	1.062 (26,97)	1.328 (33,73)	.120 (3,05)	1.458 (37,03)	.483 (12,27)	1 1/16-18
20	.895 (22,73)	.650 (16,51)	1.055 (26 80)	.561 (14,25)	1.186 (30,12)	.540 (13,72)	1.156 (29,36)	1,453 (36,91)	.120 (3,05)	1.582 (40,18)	.427 (10,85)	1 3/16-18
22	.895 (22,73)	.650 (16,51)	1.055 (26,80)	.561 (14,25)	1.311 (33,30)	.540 (13,72)	1.250 (31,75)	1.578 (40,08)	.120 (3,05)	1.708 (43,38)	.427 (10,85)	1 3/16-18
24	.895 (22,73)	.683 (17,35)	1.055 (26,80)	.594 (15,09)	1.436 (36,47)	.573 (14,55)	1.375 (34,92)	1.703 (43,26)	.147 (3,73)	1.832 (46,53)	.393 (9,98)	1 1/16-18

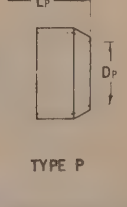
‡ Not available in KPSE. • (TP) located within .010 T.P. with respect to diameter A and master keyway.

WITH TERMINATION ASSEMBLIES









Shell Size	TYPE A DA Min.	TYPE A LA Max.	TYPE B and F DBF Min.	TYPE B and F GBF Min.	TYPE B and F LBF Max.	TYPE E LE Max.	TYPE J DJ Min.	TYPE J DJ Max.	TYPE J LJ Max.	TYPE P DP Min.	TYPE P LP Max.	V Thread UNEF Class 2A
‡8	.335(8,51)	1.444(36,68)	.234(5,94)	.115(2,92)	1.776(45,11)	1.328(33,73)	.168(4,27)	.230(5,84)	2.270(57,66)	.327(8,31)	1.450(36,83	1/2-28
10	.466(11,84)	1.444(36,68)	.297(7,54)	.178(4,52)	1.776(45,11)	1.328(33,73)	.205(5,21)	.312(7,92)	2.270(57,66)	.444(11,28)	1.450(36,83)	5/8-24
12	.591(15,01)	1.444(36,68)	.422(10,72)	.302(7,67)	1.176(45,11)	1.328(33,73)	.338(8,59)	.442(11,23)	2.410(61,21)	.558(14,17)	1.450(36,83)	3/4-20
14	.705(19,05)	1.444(36,68)	.547(13,89)	.365(9,27)	1.776(45,11)	1.328(33,73)	.416(10,57)	.539(13,56)	2.600(66,04)	.683(17,35)	1.450(36,83)	7/8-20
16	.830(21,08)	1.444(36,68)	.609(15,47)	.490(12,45)	1.896(48,16)	1.328(33,73)	.550(13,97)	.616(15,65)	2.880(73,15)	.808(20,52)	1.450(36,83)	1-20
18	.948(24,08)	1.444(36,68)	.740(18,80)	.615(15,62)	1.896(48,16)	1.328(33,73)	.660(15,24)	.672(17,07)	3.170(80,52)	.909(23,09)	1.450(36,83)	1 3/16-18
20	1.043(26.49)	1.728(43,89)	.740(18,80)	.615(15,62)	1.970(50,04)	1.360(34,54)	.635(16,13)	.747(18,97)	3.610(91,69)	1.034(26.26)	1.660(42,16)	1 3/16-18
22	1.198(30,43)	1.728(43,89)	.928(23,57)	.740(18,80)	1.970(50,04)	1.360(34,54)	.670(17,02)	.846(21,49)	3.760(95,50)	1.159(29,44)	1.660(42,16)	1 3/16-18
24	1.293(32,84)	1.738(43,89)	.984(24,99)	.790(20,07)	1.970(50,04)	1.360(34,54)	.740(18,80)	.894(22,71)	3.900(99,06)	1.284(32,61)	1.730(43,94)	1 3/16-18

‡ Not available in KPSE.

(millimeters are in parentheses)

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

MINIATURE CIRCULAR CONNECTORS
KPT/KPTM/KPSE SERIES

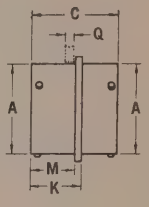
For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

Dimensions subject to change.

BOX MOUNTING RECEPTACLES

KPTB/MS3119
(MS service class E)

THRU-BULKHEAD RECEPTACLE



Shell Size	A Dia. ±.003	K ±.020	C Max.	M ±.010	Q Max.	R* (TP)	S Max.	T ±.00
8	.471 (11,96)	.634 (16,10)	1.125 (28,58)	.572 (14,53)	.188 (4,78)	.594 (15,09)	.828 (21,03)	.120 (3,05)
10	.588 (14,94)	.634 (16,10)	1.125 (28,58)	.572 (14,53)	.188 (4,78)	.719 (18,26)	.954 (24,23)	.120 (3,05)
12	.748 (18,00)	.634 (16,10)	1.125 (28,58)	.572 (14,53)	.188 (4,78)	.812 (20,62)	1.047 (26,59)	.120 (3,05)
14	.873 (22,17)	.634 (16,10)	1.125 (28,58)	.572 (14,53)	.188 (4,78)	.906 (23,01)	1.141 (28,98)	.120 (3,05)
16	.998 (25,35)	.634 (16,10)	1.125 (28,58)	.572 (14,53)	.188 (4,78)	.969 (24,61)	1.234 (31,34)	.120 (3,05)
18	1.123 (28,52)	.634 (16,10)	1.125 (28,58)	.572 (14,53)	.188 (4,78)	1.062 (26,97)	1.328 (33,73)	.120 (3,05)
20	1.248 (31,70)	.792 (20,12)	1.255 (31,88)	.698 (17,73)	.312 (7,92)	1.156 (29,36)	1.453 (36,91)	.120 (3,05)
22	1.373 (34,87)	.792 (20,12)	1.255 (31,88)	.698 (17,73)	.312 (7,92)	1.250 (31,75)	1.578 (40,08)	.120 (3,05)
24	1.498 (38,05)	.792 (20,12)	1.255 (31,88)	.698 (17,73)	.312 (7,92)	1.375 (34,92)	1.703 (43,26)	.147 (3,73)

*(T.P.) located within .010 T.P. with respect to diameter A and master keyway.

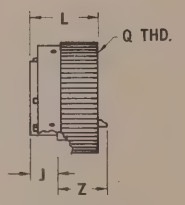
STRAIGHT PLUGS

KPT06/MS3116
(MS service class E, F, J, P)

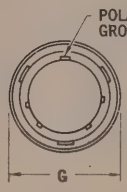
KPSE06/MS3126
(MS service class E, F, P)

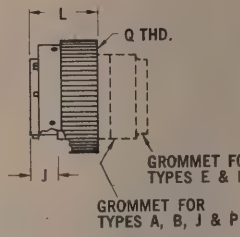
KPTM06

PLUG ASSEMBLY

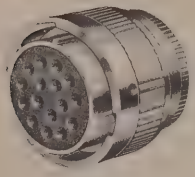


SOLDER: KPT06/MS3116



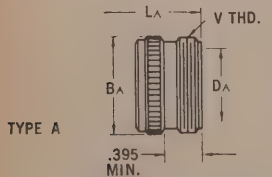


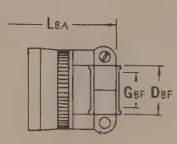
CRIMP: KPTM06/KPSE06/MS3126



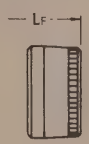
WITHOUT TERMINATION ASSEMBLIES

Shell Size	KPT/KPTM/KPSE G Max.	KPT/KPTM/KPSE J ±.005 (±0,13)	KPT/KPTM/KPSE L Max.	KPT Z Max.	Q Thread UNEF Class 2A
‡8	.782 (19,86)	.358 (9,09)	.844 (21,44)	.641 (16,28)	7/16-28
10	.926 (23,52)	.358 (9,09)	.844 (21,44)	.641 (16,28)	9/16-24
12	1.043 (26,49)	.358 (9,09)	.844 (21,44)	.641 (16,28)	11/16-24
14	1.183 (30,05)	.358 (9,09)	.844 (21,44)	.641 (16,28)	13/16-20
16	1.305 (33,15)	.358 (9,09)	.844 (21,44)	.641 (16,28)	15/16-20
18	1.391 (35,33)	.368 (9,09)	.844 (21,44)	.641 (16,28)	1 1/16-18
20	1.631 (41,43)	.420 (10,67)	.989 (25,12)	.584 (14,83)	1 3/16-18
22	1.656 (42,06)	.420 (10,67)	.989 (25,12)	.584 (14,83)	1 5/16-18
24	1.777 (45,14)	.420 (10,67)	.989 (25,12)	.584 (14,83)	1 7/16-18

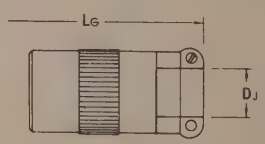




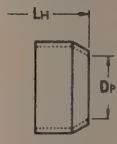
TYPE B AND F



TYPE E



TYPE J



TYPE P

WITH TERMINATION ASSEMBLIES

(millimeters are in parentheses)

‡ Not available in KPSE.

Shell Size	TYPE A LA Max.	TYPE A DA Min.	TYPE B and F LBA Max.	TYPE B and F DBF Min.	TYPE B and F GBF Min.	TYPE E LF Max.	TYPE J LG Max.	TYPE J DJ Min.	TYPE J DJ Max.	TYPE P LH Max.	TYPE P DP Min.	V Thread UNEF Class 2A
‡ 8	1.440(36,58)	.335(8,51)	1.812(46,02)	.234(5,94)	.115(2,92)	1.328(33,73)	2.270(57,66)	.168(4,27)	.230(5,84)	1.450(36,83)	.327(8,31)	1/2-28
10	1.440(36,58)	.466(11,84)	1.812(46,02)	.297(7,54)	.178(4,52)	1.328(33,73)	2.270(57,66)	.205(5,21)	.312(7,92)	1.450(36,83)	.444(11,28)	5/8-24
12	1.440(36,58)	.591(15,01)	1.812(46,02)	.422(10,72)	.322(7,67)	1.328(33,73)	2.410(61,21)	.338(8,59)	.442(11,23)	1.450(36,83)	.558(14,17)	3/4-20
14	1.440(36,58)	.705(19,05)	1.812(46,02)	.547(13,89)	.365(9,27)	1.328(33,73)	2.600(66,04)	.416(10,57)	.539(13,56)	1.450(36,83)	.683(17,35)	7/8-20
16	1.440(36,58)	.830(21,08)	1.938(49,23)	.609(15,47)	.490(12,45)	1.328(33,73)	2.880(73,15)	.550(13,97)	.616(15,65)	1.450(36,83)	.808(20,52)	1-20
18	1.440(36,58)	.948(24,08)	1.938(49,23)	.740(18,80)	.615(15,62)	1.328(33,73)	3.170(80,52)	.600(15,24)	.672(17,07)	1.450(36,83)	.909(23,09)	1 1/16-18
20	1.662(42,21)	1.043(26,49)	1.953(49,61)	.740(18,80)	.615(15,62)	1.294(34,54)	3.510(89,15)	.635(16,13)	.747(18,97)	1.600(42,16)	1.034(26,26)	1 3/16-18
22	1.662(42,21)	1.198(30,43)	1.953(49,61)	.928(23,57)	.740(18,80)	1.294(34,54)	3,670(93,22)	.670(17,02)	.846(21,49)	1.600(42,16)	1.159(29,44)	1 5/16-18
24	1.672(42,21)	1.293(32,84)	1.953(49,61)	.984(24,99)	.790(20,07)	1.294(34,54)	3.800(96,52)	.740(18,80)	.894(22,71)	1.690(43,94)	1.284(32,61)	1 7/16-18

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

MINIATURE CIRCULAR CONNECTORS
KPT/KPTM/KPSE SERIES

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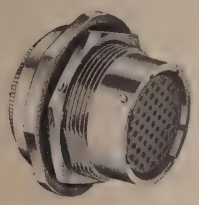
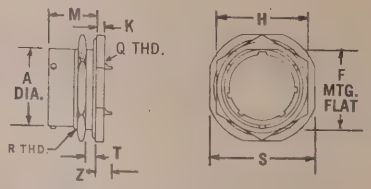
Dimensions subject to change.

JAM NUT RECEPTACLES

KPT07/MS3114
(MS service class E, F, P)
KPSE07/MS3124
(MS service class E, F, P)
KPTM07



RECEPTACLE ASSEMBLY



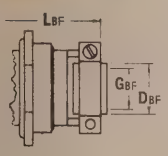
SOLDER: KPT07/MS3114

(Type A—Without Term. Access.)

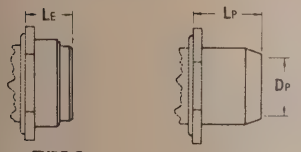
CRIMP: KPTM07/KPSE07/MS3124

(Type A—Without Term. Access.)

TERMINATION ASSEMBLIES



TYPE B & F



TYPE E TYPE P

WITHOUT TERMINATION ASSEMBLIES

Shell Size	KPT/KPTM/KPSE A ±.003	F ±.005	H ±.005	K ±.010	M ±.005	S ±.010	T Panel Thick. Min.	T Panel Thick. Max.	KPT Z Max.	R Thread Class 2A UNEF
‡8	.471	.525	.750	.125	.696	.938	.062	.125	.312	5/16-24
10	.588	.650	.875	.125	.696	1.062	.062	.125	.312	11/16-24
12	.748	.813	1.062	.125	.696	1.250	.062	.125	.312	7/8-20
14	.873	.937	1.188	.125	.696	1.375	.062	.125	.312	1-20
16	.998	1.061	1.312	.125	.696	1.500	.062	.125	.312	1 1/8-18
18	1.123	1.186	1.438	.125	.696	1.625	.062	.125	.312	1 1/4-18
20	1.248	1.311	1.562	.156	.884	1.812	.062	.250	.187	1 3/8-18
22	1.373	1.436	1.688	.156	.884	1.938	.062	.250	.187	1 1/2-18
24	1.498	1.561	1.812	.156	.917	2.062	.062	.250	.150	1 5/8-18

WITH TERMINATION ASSEMBLIES

Shell Size	TYPE B and F DBF Min.	TYPE B and F GBF Min.	TYPE B and F LBF Max.	TYPE E LE Max.	TYPE P DP Min.	TYPE P LP Max.
‡8	.234	.115	1.812	.672	.327	.625
10	.297	.178	1.812	.672	.444	.625
12	.422	.302	1.812	.672	.558	.625
14	.547	.365	1.812	.672	.683	.625
16	.609	.490	1.938	.672	.808	.625
18	.740	.615	1.938	.672	.909	.625
20	.740	.615	2.016	.692	1.034	.746
22	.928	.740	2.016	.692	1.159	.746
24	.984	.790	2.016	.658	1.284	.716

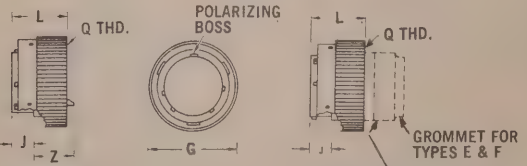
‡ Not available in KPSE.

RIGHT ANGLE PLUGS

KPT08/KPSE08/KPTM08

PLUG ASSEMBLY

RECEPTACLE ASSEMBLY

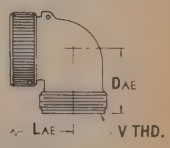


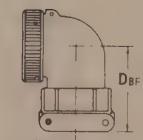
SOLDER KPT08

CRIMP KPTM08 KPSE08

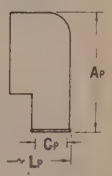
TERMINATION ASSEMBLIES

TYPE A and E





TYPE B and F



TYPE P

WITHOUT TERMINATION ASSEMBLIES

Shell Size	KPT/KPTM/KPSE G Max.	J ±.005	L Max.	KPT Z Max.	Q Thread UNEF Class 2A
‡8	.782	.358	.844	.641	5/16-28
10	.926	.358	.844	.641	3/8-24
12	1.043	.358	.844	.641	11/16-24
14	1.183	.358	.844	.641	13/16-20
16	1.305	.358	.844	.641	15/16-20
18	1.391	.358	.844	.641	1 1/16-18
20	1.631	.420	.989	.584	1 3/16-18
22	1.656	.420	.989	.584	1 5/16-18
24	1.777	.420	.989	.584	1 7/16-18

WITH TERMINATION ASSEMBLIES

Shell Size	TYPE A and E LAE Max.	TYPE A and E DAE Max.	V Thread UNEF Class 2A	TYPE B and F DBF Max.	TYPE B and F LBF Max.	TYPE P AP Max.	TYPE P LP Max.	TYPE P CP Max.
‡8	1.421	.822	1/2-28	1.238	1.421	—	—	—
10	—	—	—	—	—	1.030	1.320	.252
12	1.546	.916	3/4-20	1.395	1.546	1.030	1.507	.252
14	1.577	.978	7/8-20	1.519	1.577	1.030	1.507	.283
16	1.609	1.041	1-20	1.582	1.609	1.280	1.507	.355
18	1.734	1.103	1 1/16-18	1.644	1.734	1.280	1.695	.530
20	1.879	1.166	1 3/16-18	1.707	1.879	1.530	1.752	.562
22	2.035	1.245	1 5/16-18	1.884	2.035	1.530	1.752	.562
24	—	—	—	—	—	1.780	2.027	.610

‡ Not available in KPSE. NOTE: For size 10 and 24 consult factory for availability in Type A, B, E, and F. For size 8 consult factory for availability in Type P.

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WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

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MINIATURE CIRCULAR CONNECTORS
KPT/KPTM/KPSE SERIES

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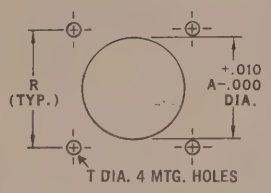
Dimensions subject to change.

MOUNTING DATA

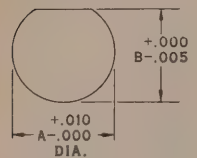
PANEL CUTOUTS BOX AND WALL MOUNTING RECEPTACLE



Shell Size	FLANGE (FRONT MOUNTING) KPT/KPTM/KPSE A	A•	R	MOUNTING HOLE DIA. KPT/KPTM/KPSE T ±.005	SCREW
‡8	.449	.563	.594	.125	#4
10	.573	.680	.719	.125	#4
12	.699	.859	.812	.125	#4
14	.823	.984	.906	.125	#4
16	.949	1.108	.969	.125	#4
18	1.073	1.233	1.062	.125	#4
20	1.199	1.358	1.156	.125	#4
22	1.323	1.483	1.250	.125	#4
24	1.449	1.610	1.375	.155	#6

‡ Not available in KPSE connectors.
• For back panel mounting.

JAM NUT RECEPTACLE



Shell Size	KPT/KPTM/KPSE A	B
‡8	.578	.542
10	.703	.669
12	.890	.830
14	1.015	.955
16	1.140	1.084
18	1.265	1.208
20	1.390	1.333
22	1.515	1.459
24	1.640	1.584

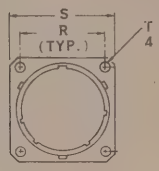
‡ Not available in KPSE connectors.

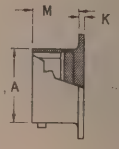
DUMMY RECEPTACLES

HOW TO ORDER

KPT 15 8 A
MS 3115 10 A

- Prefix
- Dummy Receptacle
- Shell Size
- Flange: A — standard



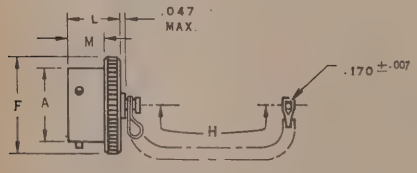


Shell Size	A ±.003	K ±.016	M +.015 −.016	R• (TP)	S Max.	T Dia.
*- 8A	.471	.062	.478	.594	.828	.120
*-10A	.588	.062	.478	.719	.954	.120
*-12A	.748	.062	.478	.812	1.047	.120
*-14A	.873	.062	.478	.906	1.141	.120
*-16A	.998	.062	.478	.969	1.234	.120
*-18A	1.123	.062	.478	1.062	1.328	.120
*-20A	1.248	.094	.572	1.156	1.453	.120
*-22A	1.373	.094	.572	1.250	1.578	.120
*-24A	1.498	.094	.605	1.375	1.703	.147

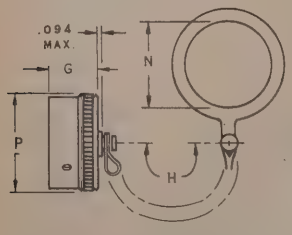
* Add prefix KPT15 or MS3115.
• (T.P.) located within .010 T.P. with respect to diameter A and master keyway.

PROTECTIVE CAPS

80 — cap for plugs



81 — cap for receptacles



* Add prefix: KPT or MS and add type: 80 for plug cap, 81 for receptacle cap; 3180 for MS plug cap, 3181 for MS receptacle cap.

** Add termination style; see part number explanation above.

HOW TO ORDER

KPT 81 - 12 C •
MS 3180 - 10

- **Modification:** Consult factory.
- **Termination Style:** no letter—without chain; C — sash chain; N — sash chain with ring (MIL SPEC) (81 or 3181 only)
- **Size:** 8 thru 24
- **Type:** 80 or 3180 — plug cap 81 or 3181 — receptacle cap
- **Prefix:** KPT, MS use KPT for KPSE/KPTM

STANDARD MATERIALS AND FINISHES

	KPT/KPSE/MS
Protective Cap	aluminum alloy, olive drab finish, per QQ-P-416
Sash Chain	stainless steel
Ring/Rivet	stainless steel
Gasket	polychloroprene

Shell Size	A ±.003	F Max.	G Max.	H ±.250	L Max.	M +.015 −.016	N Min.	P Max.
*- 8**	.471	.719	.562	3.000	.562	.384	.578	.719
*-10**	.588	.844	.562	3.000	.562	.384	.703	.812
*-12**	.748	1.000	.562	3.500	.562	.384	.891	1.000
*-14**	.873	1.125	.562	3.500	.562	.384	1.016	1.125
*-16**	.998	1.250	.562	3.500	.562	.384	1.141	1.250
*-18**	1.123	1.375	.562	3.500	.562	.384	1.266	1.375
*-20**	1.248	1.500	.562	4.000	.625	.446	1.391	1.500
*-22**	1.373	1.625	.562	4.000	.625	.446	1.516	1.625
*-24**	1.498	1.750	.602	4.000	.658	.479	1.641	1.750

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

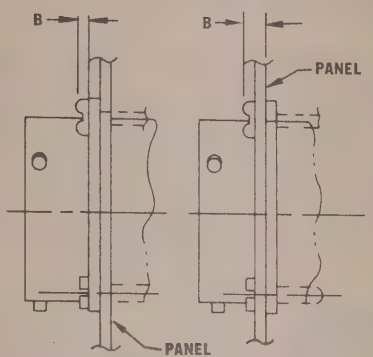
MINIATURE CIRCULAR CONNECTORS
KPT/KPTM/KPSE SERIES

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

PANEL THICKNESS

Shown here are the maximum panel thickness dimensions allowable to ensure complete connector operation for the Wall Mounting Receptacle, Box Mounting Receptacle, and Thru-Bulkhead Receptacle.

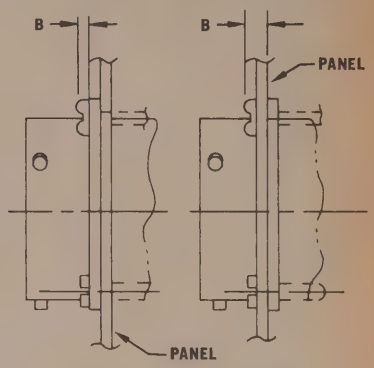
Size	B Max
8	.087
10	
12	
14	
16	
18	
20	.212
22	
24	



FRONT PANEL MTG REF — REAR PANEL MTG REF

WALL MOUNTING BOX MOUNTING RECEPTACLE

Size	B Max panel and screw head
8	.218
10	
12	
14	
16	
18	
20	.344
22	
24	.311



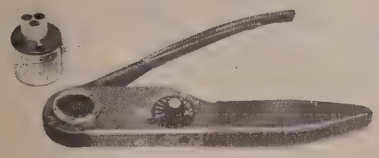
FRONT PANEL MTG REF — REAR PANEL MTG REF

THRU-BULKHEAD RECEPTACLE

COMPONENTS/ACCESSORIES

TOOLING

Crimp



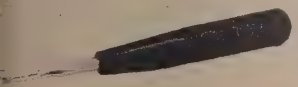
M22520/1-01 CRIMP TOOL

Connector Series	MS
KPTM/KPSE	M22520/1-01 Crimp Tool with M22520/1-02 Turret

Insertion/Extraction

KPTM Insertion

KPTM Extraction



KPSE Insertion

KPSE Extraction

KPTM

Contact Size	Insertion	Extraction
20 without insulation support	CIT-20-18	CET-20-4
20 with insulation support	CIT-20-5A	CET-20-4
16	CIT-16-1	CET-16-3A

KPSE

Contact Size	Insertion MS	Extraction MS
20	MS24256A20	MS24256R20
16	MS24256A16	MS24256R16

CONTACTS

#20 KPTM/KPSE #16

KPTM/KPSE

Size/Type	MS	ITT CANNON
20 socket	MS3193A20-20A	031-9074-002
20 pin	MS3192A20-20A	030-9036-000
16 socket	MS3193-16-16A	031-9095-003
16 pin	MS3192-16-16A	030-9032-003

WIRE HOLE FILLERS/GROMMET SEALING PLUGS

KPTM/KPSE

Contact Size	Color Code	MS	ITT Cannon
20	Red	MS3187A20	225-1012-000
16	Blue	MS3187-16A	225-1011-000

ITT CANNON ELECTRIC

MS STANDARD CIRCULAR CONNECTORS DESIGNED TO MIL-C-5015

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

MSA / MSB / MSE / MSF / MSR / ER SERIES DESIGNED TO MIL-C-5015

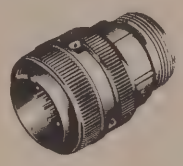
• Uniform high quality • Shell sizes and types for every application • Widest range of contact arrangements

This catalog describes ITT Cannon connectors designed and manufactured to MIL-C-5015, the military specification covering "MS" electrical connectors. These circular connectors were originally designed for aircraft, but are now widely used in many other fields. They are particularly suitable for commercial applications requiring low cost and high reliability.

ITT Cannon is the foremost manufacturer of MS and MS type connectors with the widest range of connector styles, sizes and variations in the industry. These connectors utilize the finest materials, which, along with precision manufacturing and rigid quality control, assure ITT Cannon customers of the finest quality connectors.

GENERAL PURPOSE MS-A, MS-B

Designed to MIL-C-5015, MS-A and MS-B connectors are widely used in aircraft, commercial and industrial applications. MS-A connectors have solid endbells; MS-B connectors have split endbells; MS-C connectors are pressurized. Standard insulation is diayll phthalate. Shells are aluminum alloy. Contacts are silver plated copper alloy.

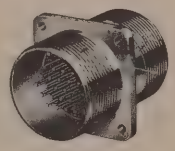


QUICK DISCONNECT CA-AQ AND CA-BQ

CA-AQ and CA-BQ are MS-A and MS-B plugs incorporating a quick-disconnect accessory. The accessory consists of a coupler and an adapter. CA-AQ and CA-BQ connectors are used in quick disconnect applications, such as between breakaway assemblies or where disconnect by a straight-away pull is required.

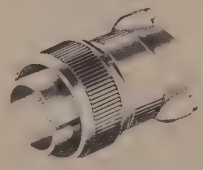
PRESSURIZED BULKHEAD BFR AND TBF

The BFR is a pressurized bulkhead connector that will mate with standard MS plugs. The TBF is a thru-bulkhead version with double faced construction allowing mating from both ends. Both connectors use resilient insulators. Contacts are silver plated copper alloy. Shells are aluminum alloy.



ENVIRONMENTAL RESISTANT MS-E, MS-F, MS-R and F-80 (Solder/Crimp Termination)

MS-E, MS-F and MS-R are similar to MS-A and MS-B connectors but have resilient insulators and wire sealing grommets for extreme environmental conditions and high altitude sealing. MS-E's and MS-F's have a mechanical cable clamp; the MS-R has a shorter, lighter weight endbell without the cable clamp. Both the MS-F and MS-R have O rings to supplement the interfacial seal. Shells are aluminum alloy. Contacts are silver plated copper alloy. The F-80 modification (crimp contact termination) is available in E, R, F and BFR styles with resilient insulators.



POTTING ER CONNECTORS (Solder Contact Termination)

These lightweight potting connectors provide resistance to salt water, fuels, etc., and will withstand the effects of high vibration. 3100 and 3106 connectors with plastic potting cups and resilient inserts meet the requirements of MS3103 and MS25183. Contacts are silver plated copper or brass. ER insulators are resilient; shells are aluminum alloy. A 90° plug (3108ER) is also available.

ACCESSORIES

Accessories to fit MS connectors include junction shells, protective caps, dummy or stowage receptacles, cable clamps, telescoping bushings.

GENERAL INFORMATION

CONTACTS

Pin and socket contacts are designed to resist severe vibration and repeated connection and disconnection. The average force to either engage or separate pin and socket contacts will not exceed the average values given in the latest revision of MIL-C-5015.

Force in Lbs.	Contact Sizes 16	12	8	4	0
Maximum	3.00	5.00	10.00	15.00	20.00
Average	2.10	3.50	7.00	10.50	14.00
Minimum	.25	.50	.75	1.00	2.00

THERMOCOUPLE CONTACTS

Size 12 and 16 contacts, machined from matching thermocouple lead wire alloys, can be supplied in ITT Cannon connectors. These thermocouple contacts maintain continuity from thermal-sensor leads thru a bulkhead or other closures in temperature measuring applications.
These contacts for matching lead wires are detailed by the standards of the Instrument Society of America (I.S.A.):

I.S.A. Standards	Material
J and Y	Iron and constantan
K	Chromel and alumel
T	Copper and constantan

Since the thermocouple connector application determines the soldering methods and materials to be used, thermocouple contacts, identified by permanent markings, are normally supplied with untinned solder pots. Thermocouple contacts are supplied only in connectors having resilient insulators.

WIRING

For class E, R and F connectors, satisfactory moisture sealing will be obtained if AWG and MS wire sizes and insulation outside diameters are governed by this table.

Contact Size	Wire Size (MIL-W-5086)	Insulation OD Limit (inches)
16	16 thru 22	.064 min. to .130 max.
12	12 thru 14	.114 min. to .170 max.
8	8 thru 10	.164 min. to .255 max.
4	4 thru 6	.275 min. to .370 max.
0	0 thru 2	.415 min. to .550 max.

ELECTRICAL SERVICE DATA

Maximum current ratings of contacts and maximum allowable voltage drop under test conditions when assembled as in service are shown below. Maximum total current to be carried per connector is the same as that allowable in wire bundles as specified in MIL-W-5088.

Contact Size	Max. Current Rating (amps)	Test Current (amps)	Potential Drop (millivolts)
16	22	20	21
12	41	35	20
8	73	60	12
4	135	110	10
0	245	200	10

HIGH POTENTIAL TEST VOLTAGE

MS connectors show no evidence of breakdown when the test voltage given below is applied between the two closest contacts and between the shell and the contacts closest to the shell for a period of one minute.

MS Service Rating	Test Voltage (RMS) 60 cps	Suggested* Operating Voltages DC	AC (rms)	Air Spacing Nom. (inches)	Creepage Distance Nom. (inches)
Inst.	1000	250	200		1/16
A	2000	700	500	1/16	1/8
D	2800	1250	900	1/8	3/16
E	3500	1750	1250	3/16	1/4
B	4500	2450	1750	1/4	5/16
C	7000	4200	3000	5/16	1

*As indicated in previous MS Specification and to be used by the designer only as a guide.

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

MS STANDARD CIRCULAR CONNECTORS DESIGNED TO MIL-C-5015

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

CONTACT ARRANGEMENTS (FACE VIEW, PIN INSERT)

LEGEND
• Resilient only
▲ Resilient & Plastic
■ Plastic only
¢ Cannon Cost Cutter — readily available from Cannon Distributors

1 CONTACT

Shell Size	8S-1	10S-2	12S-4	12-5	14-3	16-12	18-7	20-2	10SL-4	12S-3
No. of Contacts	1 #16	1 #16	1 #16	1 #12	1 #8	1 #4	1 #8	1 #0	2 #16	2 #16
Service Rating	A	A	D	D	A	A	B	D	A	A

HIGH VOLTAGE

Shell Size	14S-9	16-11	16S-4
No. of Contacts	2 #16	2 #12	2 #16
Service Rating	A	A	D

2 CONTACTS

Shell Size	16-13	18-3	20-23	22-11	24-9	28-7
No. of Contacts	2 #12 (A-Iron B-Constantan)	2 #12	2 #8	2 #16	2 #4	2 #4
Service Rating	A	D	A	B	A	D

3 CONTACTS

Shell Size	10SL-3	14S-1	14S-7	16S-5	16S-6	16-10	18-5	18-22
No. of Contacts	3 #16	3 #16	3 #16	3 #16	3 #16	3 #12	1 #16 (A) 2 #12 (B, C)	3 #16
Service Rating	A	A	A	A	A	A	D	D

4 CONTACTS

Shell Size	20-3	20-19	22-2	22-6	22-9	36-4	12SA10	14S-2
No. of Contacts	3 #12	3 #8	3 #8	1 #16 (B) 2 #8 (A, C)	3 #12	3 #0	4 #16	4 #16
Service Rating	D	A	D	D	E	A (B, C), D (A)	A	Inst.

Shell Size	16-9	18-4	18-10	18-13	18-15	20-4	20-24	20A37
No. of Contacts	2 #16 (B, D) 2 #12 (A, C)	4 #16	4 #12	3 #12 (B, C) 1 #8 (A)	4 #12 (A, C-Iron; B, D-Constantan)	4 #12	2 #16 (A, C) 2 #8 (B, D)	ITT Cannon pos. #8 of 20-4
Service Rating	A	D	A	A	A	D	A	

5 CONTACTS

Shell Size	22-4	22-10	22-22	24-22	32-17	36-5	10SLA4	14S-5
No. of Contacts	2 #12 (A, C) 2 #8 (B, D)	4 #16	4 #8	4 #8	4 #4	4 #0	5 #20	5 #16
Service Rating	A	E	A	D	D	A	A	Inst.

Shell Size	16S-8	18-11	20-14	22-12	22-13	24-12	32-1
No. of Contacts	5 #16	5 #12	3 #12 (C, D, E) 2 #8 (A, B)	3 #16 (A, C, D) 2 #8 (B, E)	1 #16 (E) 4 #12 (A-D)	3 #12 (B, D, E) 2 #4 (A, C)	3 #12 (A, C, D) 2 #0 (B, E)
Service Rating	A	A	A	D	A (A-D), D (E)	A	E (A), D (all others)

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ITT CANNON ELECTRIC

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CONTACT ARRANGEMENTS (FACE VIEW, PIN INSERT)

LEGEND
• Resilient only
▲ Resilient & Plastic
■ Plastic only

¢ Cannon Cost Cutter — readily available from Cannon Distributors

6 CONTACTS

Shell Size / No. of Contacts	14S-6 6 #16	18-12 6 #16	20-8 4 #16 (B, C, E, F) 2 #8 (A, D)	20-17 1 #16 (F) 5 #12 (A-E)	20-22 3 #16 (B, D, F) 3 #8 (A, C, E)	22-5 4 #16 (A, C, D, F) 2 #12 (B, E)	22-15 1 #16 (D) 5 #12 (A-C, E, F)	22-24 4 #16 (A, C-E) 2 #12 (B, F)	28-22 3 #16 (D-F) 3 #4 (A-C)
Service Rating	Inst.	A	Inst.	A	A	D	A (E-C, E, F), E (D)	A (A, B, F), D (C-E)	D

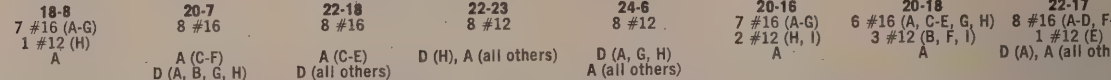
7 CONTACTS

Shell Size / No. of Contacts	16S-1 7 #16	18-9 5 #16 (B, C, E-G) 2 #12 (A, D)	20-15 7 #12	22-28 7 #12	24-2 7 #12	24-10 7 #8	24-27 7 #16	28-10 3 #12 (A, F, G) 2 #8 (B, E) 2 #4 (C, D)
Service Rating	A	Inst.	A	A	D	A	E	D (G), A (all others)

8 CONTACTS

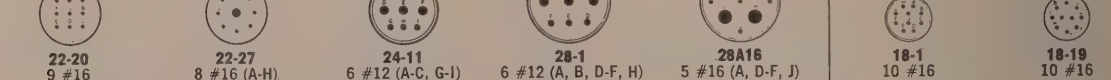
Shell Size / No. of Contacts	18-8 7 #16 (A-G) 1 #12 (H)	20-7 8 #16	22-18 8 #16	22-23 8 #12	24-6 8 #12	20-16 7 #16 (A-G) 2 #12 (H, I)	20-18 6 #16 (A, C-E, G, H) 3 #12 (B, F, I)	22-17 8 #16 (A-D, F-J) 1 #12 (E)
Service Rating	A	A (C-F) D (A, B, G, H)	A (C-E) D (all others)	D (H), A (all others)	D (A, G, H) A (all others)	A	A	D (A), A (all others)

9 CONTACTS



Shell Size / No. of Contacts	22-20 9 #16	22-27 8 #16 (A-H) 1 #8 (J)	24-11 6 #12 (A-C, G-I) 3 #8 (D-F)	28-1 6 #12 (A, B, D-F, H) 3 #8 (C, J, G)	28A16 5 #16 (A, D-F, J) 4 #4 (B, C, G, H)
Service Rating	A	D (J), A (all others)	A	D (A, E, J) A (all others)	A

10 CONTACTS



Shell Size / No. of Contacts	18-1 10 #16	18-19 10 #16
Service Rating	A (B, C, F, G) Inst. (all others)	A

10 CONTACTS

Shell Size / No. of Contacts	28-19 6 #16 (A-C, H, L, M) 4 #12 (E, G, J, K)
Service Rating	A (C, E, G, J, K, L) B (H, M), D (A, B)

11 CONTACTS

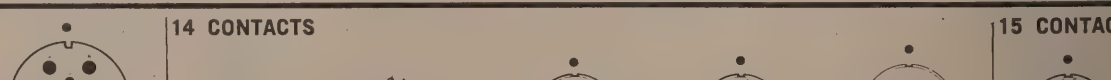
Shell Size / No. of Contacts	20-33 11 #16	24-20 9 #16 (A-D, G-L) 2 #12 (E, F)
Service Rating	A	D

12 CONTACTS

Shell Size / No. of Contacts	28-9 6 #16 (A, H-M) 6 #12 (B-G)	24-19 12 #16	24A24 12 #12
Service Rating	D	A	A

13 CONTACTS

Shell Size / No. of Contacts	20-11 13 #16
Service Rating	Inst.



14 CONTACTS

Shell Size / No. of Contacts	40A33 7 #8 (G-N) 6 #4 (A-F)	20-27 14 #16	22-19 14 #16	28-2 12 #16 (A, L, N) 2 #12 (M, P)	28-20 4 #16 (K-N) 10 #12 (A-J, P)	32-9 12 #16 (C-N) 2 #4 (A, B)
Service Rating	A	A	A	D	A	D

15 CONTACTS

Shell Size / No. of Contacts	28-17 15 #16
Service Rating	A (A-L), B (R) D (M-P)

16 CONTACTS

Shell Size / No. of Contacts	24-5 16 #16	24-7 14 #16 (A-M, O) 2 #12 (P, N)
Service Rating	A	A

17 CONTACTS

Shell Size / No. of Contacts	20-29 17 #16
Service Rating	A

18 CONTACTS

Shell Size / No. of Contacts	36A16 (B, C, G, J, K, M, N, R, T-Iron; A, D-F, H, L, P, S, U-Constantan)
Service Rating	A

19 CONTACTS

Shell Size / No. of Contacts	22-14 19 #16
Service Rating	A

20 CONTACTS

Shell Size / No. of Contacts	28-16 20 #16
Service Rating	A

22 CONTACTS

Shell Size / No. of Contacts	28-11 18 #16 (A-I, N-X) 4 #12 (J-M)
Service Rating	A

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

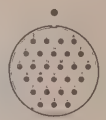
ITT CANNON ELECTRIC

MS STANDARD CIRCULAR CONNECTORS DESIGNED TO MIL-C-5015

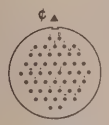
For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

CONTACT ARRANGEMENTS (FACE VIEW, PIN INSERT)

LEGEND
• Resilient only
▲ Resilient & Plastic
■ Plastic only
¢ Cannon Cost Cutter — readily available from Cannon Distributors

	23 CONTACTS	24 CONTACTS	26 CONTACTS	27 CONTACTS	30 CONTACTS	31 CONTACTS	
							
Shell Size No. of Contacts	32-6 16 #16 (A-O, S) 2 #12 (U, V) 3 #8 (P-T) 2 #4 (W, X)	24-28 24 #16	28-12 26 #16	36A46 27 #12	32-8 24 #16 (A-L, T-Z, a-e) 6 #12 (M-S)	36-9 14 #16 (A-G, Z-f) 14 #12 (H-N, S-Y) 2 #8 (O, R) 1 #4 (P)	28-15 35 #16
Service Rating	A	Inst.	A	A	A For new MIL equip. design, use 32-7	A	A For new MIL equip. design, use 28-21

	37 CONTACTS	42 CONTACTS	43 CONTACTS	47 CONTACTS	
Shell Size No. of Contacts	32-7 28 #16 (A-N, W-Z, a-k) 7 #12 (O-V)	36-15 35 #16	28-21 37 #16	44-1 36 #16 (A-S, Z-t) 6 #12 (T-Y)	28A51 43 #16	32A47 47 #16	36-7 40 #16 (A-Z, a-s) 7 #12 (t-z)
Service Rating	Inst. (A, B, h, j) A (all others)	D (m), A (all others)	A	D	A	A	A

	47 CONTACTS	48 CONTACTS	52 CONTACTS	54 CONTACTS	56 CONTACTS		85 CONTACTS	100 CONTACTS
								
Shell Size No. of Contacts	36-8 46 #16 (A-X, Z-z) 1 #12 (Y)	36-10 48 #16	36A34 52 #16	32A10 54 #16	36A66 52 #16 (A-c, h-AH) 4 #12 (d, e, f, g)	40A27 60 #16	40-56 85 #16	48-5 90 #16 (A-BL, BN-BT, BW, BV) 1 #8 (CD) 9 #12 (BM, BU, BV, BY-CC, CE)
Service Rating	A	A	A	A	A	A	A	A

MS ALTERNATE INSERT POSITIONS

All views are looking into front of pin insert or rear of socket insert.

NORMAL POSITION

POSITION W

POSITION X

POSITION Y

POSITION Z

No. of Contacts	Contact Arrangement	Degrees W	X	Y	Z
2	12S-3	70	145	215	290
	14S-9	70	145	215	290
	16S-4	35	110	250	325
	16-11	35	110	250	325
	16-13	35	110	250	325
	18-3	35	110	250	325
	20-23	35	110	250	325
	22-11	35	110	250	325
	24-9	35	110	250	325
	28-7	35	110	250	325
3	14S-7	90	180	270	—
	16S-5	70	145	215	290
	16S-6	90	180	270	—
	16-10	90	180	270	—
3	18-5	80	110	250	280
	18-22	70	145	215	290
	20-3	70	145	215	290
	20-19	90	180	270	—
	22-2	70	145	215	290
	22-6	80	110	250	280
	22-9	70	145	215	290
	36-4	70	145	215	290
4	14S-2	—	120	240	—
	16-9	35	110	250	325
	18-4	35	110	250	325
	18-10	—	120	240	—
	18-13	80	110	250	280
	18-15	—	120	240	—
	20-4	45	110	250	—
	20-24	35	110	250	325
	22-4	35	110	250	325
	22-10	35	110	250	325
4	22-22	—	110	250	—
	24-22	45	110	250	—
	32-17	45	110	250	—
	36-5	—	120	240	—
5	14S-5	—	110	—	—
	16S-8	—	170	265	—
	18-11	—	170	265	—
	20-14	80	110	250	280
	22-12	80	110	250	280
	22-13	35	110	250	325
	24-12	80	110	250	280
	32-1	80	110	250	280
6	18-12	80	—	—	280
	20-8	80	110	250	280
	20-17	90	180	270	—
	20-22	80	110	250	280

(Continued next page)

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

MS STANDARD CIRCULAR CONNECTORS DESIGNED TO MIL-C-5015

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory)

MS ALTERNATE INSERT POSITIONS (Continued)

No. of Contacts	Contact Arrangement	Degrees W	X	Y	Z
6	22-5	35	110	250	325
	22-15	80	110	250	280
	22-24	80	110	250	280
	28-22	70	145	215	290
7	16S-1	80	—	—	280
	18-9	80	110	250	280
	20-15	80	—	—	280
	22-28	80	—	—	280
	24-2	80	—	—	280
	24-10	80	—	—	280
	24-27	80	—	—	280
	28-10	80	110	250	280
8	18-8	70	—	—	290
	20-7	80	110	250	280
	22-18	80	110	250	280
	22-23	35	—	250	—
	24-6	80	110	250	280
9	20-16	80	110	250	280
	20-18	35	110	250	325
	22-17	80	110	250	280
	22-20	35	110	250	325
	22-27	80	—	250	280
	24-11	35	110	250	325
	28-1	80	110	250	280
10	18-1	70	145	215	290
	28-19	80	110	250	280
11	24-20	80	110	250	280
12	28-9	80	110	250	280
14	20-27	35	110	250	325
	22-19	80	110	250	280
	28-2	35	110	250	325
	28-20	80	110	250	280
	32-9	80	110	250	280

No. of Contacts	Contact Arrangement	Degrees W	X	Y	Z
15	28-17	80	110	250	280
16	24-5	80	110	250	280
	24-7	80	110	250	280
17	20-29	80	—	—	280
19	22-14	80	—	—	280
20	28-16	80	110	250	280
22	28-11	80	110	250	280
23	32-6	80	110	250	280
24	24-28	80	110	250	280
26	28-12	90	180	270	—
30	32-8	80	125	235	280
31	36-9	80	125	235	280
35	28-15	80	110	250	280
	32-7	80	125	235	280
	36-15	60	125	245	305
37	28-21	80	110	250	280
42	44-1	65	125	225	310
47	36-7	80	110	250	280
	36-8	80	110	250	280
48	36-10	80	125	235	280
85	40-56	72	144	216	288
100	48-5	65	125	225	310

All views are looking into front of pin insert or rear of socket insert.

NORMAL POSITION

POSITION W

POSITION X

POSITION Y

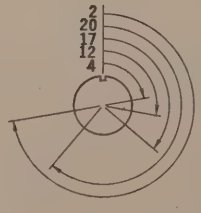
POSITION Z

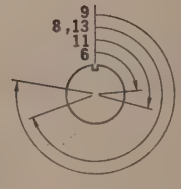
ITT CANNON DESIGNATED ALTERNATE INSERT POSITIONS

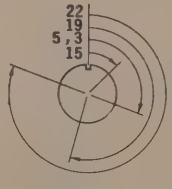
NOT MS APPROVED

Shell Size	Contact Arrangement	Available Position								
10SL	A4	2	3	5	8	12	13			
12S	A10	3	5	8	13					
24	A24	2	4	9	12					
28	A16	2	3	8	9					
	A51	3	4	8	9	12				
32	A10	2	3	4	5		9	12	13	
	A47	2	3	4	5	8	9	12	13	
36	A16	2	3	4	5	8	9	12	13	15
	A34	2	3	4	5	8	9	12	13	20
	A46	2	3	4	5	6	7	12	13	15
	A66	2	3	5	8	9	13	17	18	
40	A27	4	14	17	20	22				
	A33	2	3	5	8	13				

NOTE: For ITT Cannon contact arrangements not listed above, consult factory.







NOTE: Front view of pin insulator rotated as shown.

Position	Angle (degrees)
Normal	0
2	260
3	110
4	80
5	use pos. 3
6	85
8	250
9	280
11	105
12	100
13	use pos. 8
14	30
15	45
16	120
17	130
18	150
19	195
20	220
21	255
22	290
23	165
24	330
25	235
26	125

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

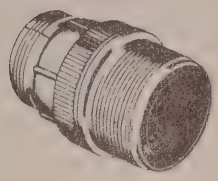
Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

MS STANDARD CIRCULAR CONNECTORS DESIGNED TO MIL-C-5015

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

GENERAL PURPOSE MS-A/MS-B



MS-A and MS-B connectors were originally designed and approved under Military Specifications for use in military aircraft. Since then, commercial and industrial demand for these connectors has grown because of their uniform quality, dependability, low cost and interchangeability as prescribed in MIL-C-5015. These MS connectors are available in two classes:

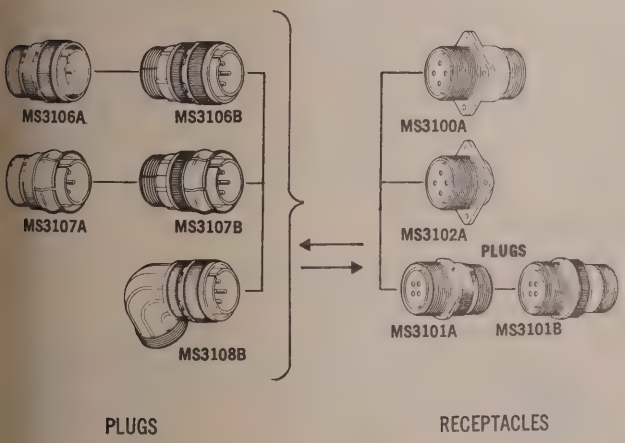
A — Solid endbell with plastic or resilient insulators.

B — Split endbell with plastic insulators for greater accessibility to solder connections.

The MS-A and MS-B are available as plugs or receptacles. The term plug applies to any assembly fixed to the end of a cable. The term receptacle applies to any assembly mounted to a wall or box. MS shells will accept either pin or socket insert assemblies. Socket contacts are the closed-entry type.

Standard MS connectors are available with from 1 to 100 contacts in 15 different insert diameters ranging from .250 to 2.550 inches. Each contact arrangement is available with pin or socket contacts and will mate with all MS type connectors having the same size and contact arrangement.

TYPICAL MATING GUIDE



PLUGS RECEPTACLES

STANDARD DATA

Shell	Material	Aluminum alloy
	Finish	Olive drab chromate coating over cadmium plating
Insulator	Material	(Plastic) diayll phthalate
Contacts	Material	Brass or copper alloy
	Finish	Silver plate
	Termination	Tinned solder pot

HOW TO ORDER

MS	3102	A	18-8	P	X	(RES)*
CA	3106	B	18-8	P	X	

Prefix
Shell Style
Class
Shell Size
Contact Arrangement**
Contact Type
Alternate Insert Position

PREFIX
MS — Complies with Military Specification MIL-C-5015
CA — ITT Cannon prefix indicating special application or variation of MS. See modification codes.

SHELL STYLE
3100 — Wall mounting receptacle
3101 — Cord connecting plug
3102 — Box mounting receptacle
3106 — Straight plug
3107 — Quick disconnecting plug
3108 — 90° angle plug

CLASS
A — Solid or one-piece endbell
B — Split or two-piece endbell

SHELL SIZE
Coupling thread diameter in sixteenths of an inch

CONTACT ARRANGEMENTS
See pages 49-51

CONTACT TYPE
P for Pin; S for Socket

ALTERNATE INSERT POSITIONS
See pages 55-56

*When resilient insulators are desired, see pages 53-55 for availability.

When ordering (EG) a 10SLA4 contact arrangement it will be the same as a 10SL-20-4 which is stamped on the shell.

ITT CANNON ELECTRIC

MS STANDARD CIRCULAR CONNECTORS DESIGNED TO MIL-C-5015

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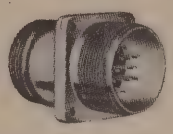
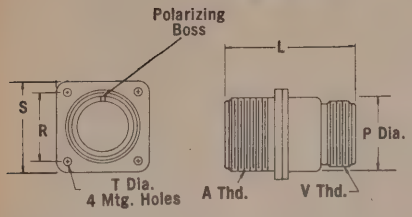
Dimensions subject to change.

GENERAL PURPOSE MS-A/MS-B

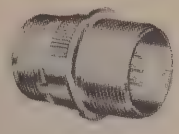
WALL MOUNTING RECEPTACLE
SOLID SHELL
MS3100A

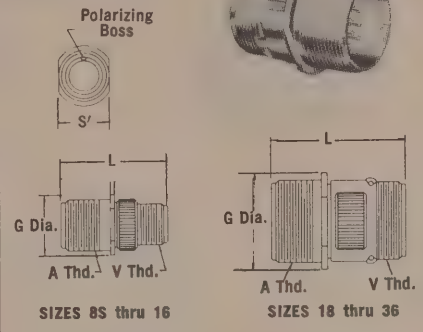




MS3100A wall mounting receptacles are used with the MS3057 cable clamp or with conduit to eliminate need for the conduit box in applications where wires are carried thru walls or bulkheads.

CABLE CONNECTING PLUG
SOLID ENDBELL
MS3101A

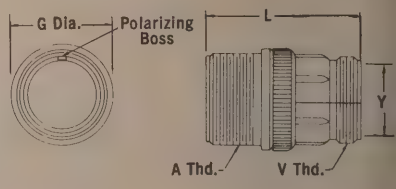




MS3101A solid endbell cable connecting plugs are used for cable extension requirements where mounting provisions are unnecessary.

CABLE CONNECTING PLUG
SPLIT ENDBELL
MS3101B

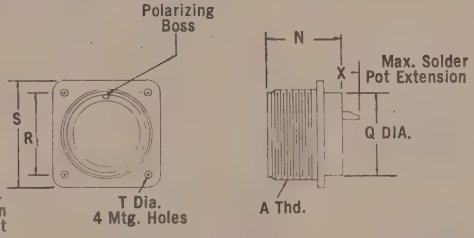
(Available with plastic insulators only)



MS3101B split endbell cable connecting plugs are used for cable extension requirements where mounting provisions are unnecessary.

BOX MOUNTING RECEPTACLE
MS3102A

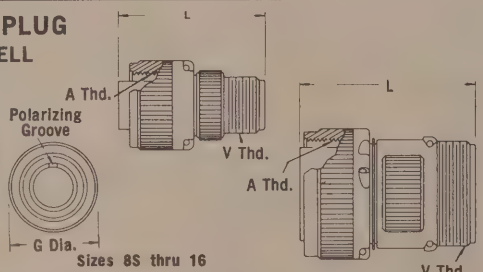
(Available with plastic or resilient insulators)



The MS3102A box mounting receptacles are used on boxes and equipment cases where no cable support is required.

Shell Size	X DIMENSION Max. Solder Pot Ext. — Pin or Socket Contact Size 16	12	8	4	0
8S-16S	.50	—	—	—	—
12	—	.59	—	—	—
14	—	—	.73	—	—
16	.50	.59	.73	.86	—
18-22	.50	.59	.72	.86	.86
24-28	.59	.65	.76	.90	.90
32-48	.47	.53	.66	.78	.78

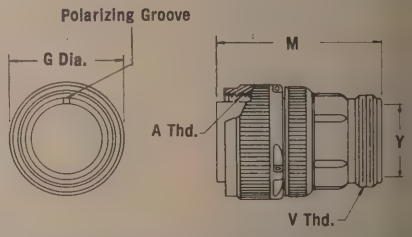
STRAIGHT PLUG
SOLID ENDBELL
MS3106A



MS3106A straight plugs are used with 3100 and 3102 receptacles and 3101 plugs.

STRAIGHT PLUG
SPLIT ENDBELL
MS3106B

(Available with plastic insulators only)



MS3106B straight plugs with split endbell are used to connect circuits with 3100 and 3102 receptacles and 3101 plugs.

Shell Size	G Max.	L Max.	M Max.	N Max.	P Max.	Q Max.	R ±.005	S Max.	S' Max.	T +.010 −.005	Y Max.	A Thread	V Thread
8S	.844	1.469	1.469	1.000	.532	.454	.594	.906	.530	.120	.312	1/2-28NUEF-2B	1/2-28UNEF-2A
10S	.969	1.531	1.531	1.000	.656	.514	.719	1.031	.656	.120	.311	5/8-24NEF-2B	1/2-28UNEF-2A
•10SL	.969	1.531	1.531	1.000	.782	.630	.719	1.031	.781	.120	.410	5/8-24NEF-2B	5/8-24NEF-2A
12S	1.062	1.688	1.688	1.000	.782	.630	.812	1.125	.781	.120	.358	3/4-20UNEF-2B	5/8-24NEF-2A
14S	1.156	1.688	1.688	1.000	.906	.755	.906	1.219	.908	.120	.471	7/8-20UNEF-2B	3/4-20UNEF-2A
16S	1.250	1.688	1.688	1.000	1.032	.880	.969	1.312	1.031	.120	.596	1-20UNEF-2B	7/8-20UNEF-2A
12	1.062	2.062	2.062	1.205	.782	.630	.812	1.125	.781	.120	.358	3/4-20UNEF-2B	5/8-24NEF-2A
14	1.156	2.062	2.062	1.205	.906	.755	.906	1.219	.905	.120	.471	7/8-20UNEF-2B	3/4-20UNEF-2A
16	1.250	2.062	2.062	1.205	1.032	.880	.969	1.312	1.031	.120	.596	1-20UNEF-2B	7/8-20UNEF-2A
18	1.344	2.062	2.062	1.205	1.156	.989	1.062	1.406	1.155	.120	.774	1 1/8-18NEF-2B	1-20UNEF-2A
20	1.469	2.188	2.188	1.205	1.282	1.176	1.156	1.531	1.280	.120	.886	1 1/4-18NEF-2B	1 3/16-18NEF-2A
22	1.594	2.188	2.188	1.205	1.406	1.270	1.250	1.656	1.405	.120	.894	1 3/8-18NEF-2B	1 3/16-18NEF-2A
24	1.719	2.312	2.312	1.375	1.532	1.395	1.375	1.781	1.530	.147	1.143	1 1/2-18NEF-2B	1 7/16-18NEF-2A
28	1.969	2.312	2.312	1.375	1.782	1.645	1.562	2.031	1.778	.147	1.152	1 3/4-18NS-2B	1 7/16-18NEF-2A
32	2.219	2.438	2.438	1.375	2.032	1.895	1.750	2.281	2.030	.173	1.455	2-18NS-2B	1 3/4-18NS-2A
36	2.469	2.438	2.438	1.375	2.282	2.145	1.938	2.531	2.280	.173	1.704	2 1/4-16UN-2B	2-18NS-2A
40	2.719	2.438	2.438	1.375	2.532	2.364	2.188	2.781	—	.173	1.946	2 1/2-16UN-2B	2 1/4-16UN-2A
44	2.969	2.562	2.600	1.375	2.782	2.645	2.375	3.031	—	.173	2.196	2 3/4-16UN-2B	2 1/2-16UN-2A
48	3.219	2.562	2.600	1.375	3.032	2.895	2.625	3.281	—	.173	2.699	3-16UN-2B	3-16UN-2A

• Socket contact connectors in 10SL size must be ordered with CA prefix in part number.

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

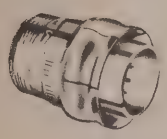
MS STANDARD CIRCULAR CONNECTORS DESIGNED TO MIL-C-5015

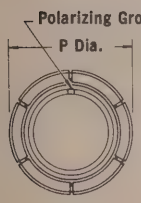
or immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

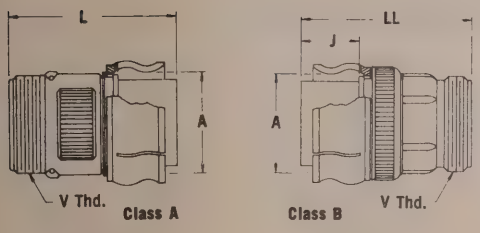
Dimensions subject to change.

ENERAL PURPOSE MS-A/MS-B

UICK DISCONNECT PLUG
OLID ENDBELL
IS3107A
PLIT ENDBELL
IS3107B



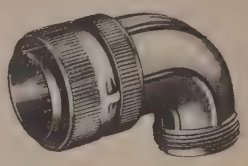


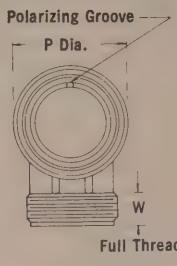


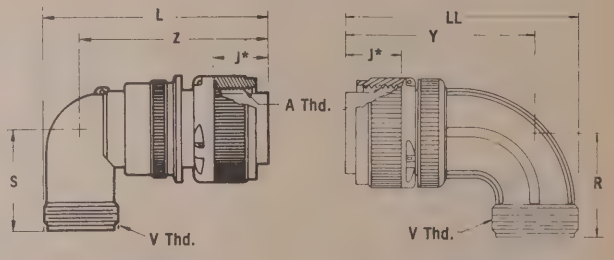
Sizes 8S thru 28
(Available with plastic insulators only)

The MS3107A (solid endbell) and the MS3107B (split endbell) quick disconnect plugs are used at the end of a cable on equipment demanding rapid disconnection. MS3107 plugs are not adaptable to severe vibration conditions.

90° ANGLE PLUG
SOLID ENDBELL
SPLIT ENDBELL
MS3108A
MS3108B







Sizes 8S thru 48

MS3108B 90° angle plugs, have a split endbell and are used where wires must be brought at an abrupt angle. Where a solid endbell is required, MS-3108A is available in sizes 8S thru 36 only. Either the split or solid endbells on the 3108 are capable of being rotated and locked.

MS3107

Shell Size	A Max.	Class A L Max.	Class B LL Max.	P Max.	V Thread
8S	.500	1.469	1.469	.720	1/2-28UNEF-2A
10S	.625	1.531	1.531	.845	1/2-28UNEF-2A
•10SL	.625	1.531	1.531	.845	5/8-24NEF-2A
12S	.750	1.688	1.688	1.000	5/8-24NEF-2A
14S	.875	1.688	1.688	1.125	3/4-20UNEF-2A
16S	1.000	1.688	1.688	1.250	7/8-20UNEF-2A
12	.750	2.062	2.062	1.000	5/8-24NEF-2A
14	.875	2.062	2.062	1.125	3/4-20UNEF-2A
16	1.000	2.062	2.062	1.250	7/8-20UNEF-2A
18	1.125	2.062	2.062	1.375	1-20UNEF-2A
20	1.250	2.188	2.188	1.500	1 3/16-18NEF-2A
22	1.375	2.188	2.188	1.625	1 3/16-18NEF-2A
24	1.500	2.312	2.312	1.750	1 3/16-18NEF-2A
28	1.750	2.312	2.312	2.000	1 3/16-18NEF-2A

•Pin contact connectors in 10SL size must be ordered with CA prefix in part number.

MS3108

Shell Size	Class A L Max.	Class B LL Max.	P Max.	R Max.	S Max.	Y Max.	Z Max.	A Thread	V Thread
8S	1.93	1.750	.844	.938	.801	1.500	1.640	1/2-28UNEF-2B	1/2-28UNEF-2A
10S	1.93	1.750	.969	1.000	.832	1.500	1.640	5/8-24NEF-2B	1/2-28UNEF-2A
•10SL	2.05	1.812	.969	1.000	.863	1.500	1.703	5/8-24NEF-2B	5/8-24NEF-2A
12S	2.05	2.000	1.062	1.062	.863	1.688	1.703	3/4-20UNEF-2B	5/8-24NEF-2A
14S	2.41	2.125	1.156	1.125	.926	1.750	1.765	7/8-20UNEF-2B	3/4-20UNEF-2A
16S	2.37	2.375	1.250	1.188	.988	1.938	1.796	1-20UNEF-2B	7/8-20UNEF-2A
12	2.55	2.250	1.062	1.062	.863	1.938	2.062	3/4-20UNEF-2B	5/8-24NEF-2A
14	2.63	2.312	1.156	1.125	.926	1.938	2.125	7/8-20UNEF-2B	3/4-20UNEF-2A
16	2.73	2.562	1.250	1.188	.988	2.125	2.156	1-20UNEF-2B	7/8-20UNEF-2A
18	2.79	2.688	1.344	1.312	1.051	2.188	2.250	1 1/8-18NEF-2B	1-20UNEF-2A
20	2.94	3.031	1.469	1.375	1.113	2.438	2.312	1 1/4-18NEF-2B	1 3/16-18NEF-2A
22	2.94	3.031	1.594	1.375	1.176	2.438	2.312	1 3/8-18NEF-2B	1 3/16-18NEF-2A
24	3.29	3.406	1.719	1.562	1.253	2.688	2.531	1 1/2-18NEF-2B	1 7/16-18NEF-2A
28	3.29	3.406	1.969	1.562	1.332	2.688	2.531	1 3/4-18NS-2B	1 7/16-18NEF-2A
32	3.75	3.750	2.219	1.875	1.551	2.875	2.750	2-18NS-2B	1 3/4-18NS-2A
36	3.91	3.938	2.409	2.062	1.770	2.938	2.875	2 1/4-16UN-2B	2-18NS-2A
40	7.21††	4.750	2.723††	2.125	3.885††	3.625	5.690	2 1/2-16UN-2B	2 1/4-16UN-2A
44	—	4.750	2.969	2.250	—	3.275	—	2 3/4-16UN-2B	2 1/2-16UN-2A
48	—	5.031	3.219	2.375	—	3.531	—	3-16UN-2B	3-16UN-2A

†† Not to MS specifications. • Pin connectors in 10SL size must be ordered with CA prefix in part number

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

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MS STANDARD CIRCULAR CONNECTORS DESIGNED TO MIL-C-5015

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QUICK DISCONNECT AQ/BQ

CA-AQ and CA-BQ connectors are used in quick disconnect applications, such as between break-away assemblies or where disconnect by a straight-away pull is required.

Quick disconnect accessories (adapters and couplers) fit standard plastic insert MS and CA connectors. The manual coupler replaces the coupling nut on the plug; the adapter screws onto the coupling thread on the receptacle. These accessories are available thru size 28 and may be purchased separately or as part of a standard plastic insert MS or CA connector assembly.

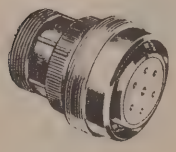
HOW TO ORDER

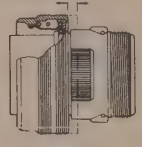
CA	00	AQ	22 - 28	P	W	
CA	06	BQ	22 - 28	P	W	-A95

Prefix
Shell Style
Class
Shell Size
Contact Arrangement
Contact Type
Alternate Insert Position
Modification Code

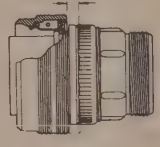
PREFIX
CA — ITT Cannon prefix
SHELL STYLE
00 — Wall mounting receptacle
01 — Cable connecting plug
02 — Box mounting receptacle
06 — Straight plug
08 — 90° angle plug
CLASS
AQ — Quick disconnect, solid endbell
BQ — Quick disconnect, split endbell
SHELL SIZE
Coupling thread diameter in sixteenths of an inch
CONTACT ARRANGEMENTS
See pages 53-55
CONTACT TYPE
P for Pin; S for Socket
ALTERNATE INSERT POSITION
See pages 55-56
MODIFICATION CODE
Consult factory for modification codes

RECEPTACLES AND PLUGS

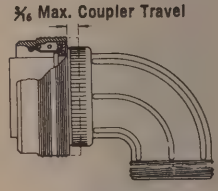




CA06AQ
SOLID ENDBELL

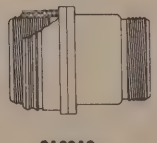


CA06BQ
SPLIT ENDBELL

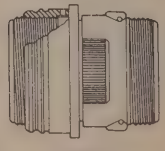


CA08BQ
90° ANGLE ENDBELL

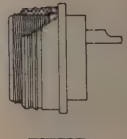
Plug with Coupler



CA00AQ



CA01AQ



CA02AQ

Receptacle with Adapter

To order complete AQ/BQ connector assemblies (plug with coupler or receptacle with adapter), see tabulation. For complete assembly dimentions, use coupler or adapter dimensions (page 61) with the standard plastic insulator MS or CA connector dimensions on pages 58-59.

	RECEPTACLE WITH ADAPTER				PLUG WITH COUPLER		
Shell Size	Part Number for MS3100A with Quick Disconnect Adapter, Pin Insert*	Part Number for MS3101A with Quick Disconnect Adapter, Pin Insert*	Part Number for MS3101B with Quick Disconnect Adapter, Pin Insert*	Part Number for MS3102A with Quick Disconnect Adapter, Pin Insert*	Part Number for MS3109A with Quick Disconnect Coupler, Pin Insert**	Part Number for MS3106B with Quick Disconnect Coupler, Pin Insert**	Part Number for MS3108B with Quick Disconnect Coupler, Pin Insert**
8S	CA00AQ8S-**P	CA01AQ8S-**P	CA01BQ8S-**P	CA02AQ8S-**P	CA06AQ8S-**P	CA06BQ8S-**P	CA08BQ8S-**P
•10SL	CA00AQ10SL-**P	CA01AQ10SL-**P	CA01BQ10SL-**P	CA02AQ10SL-**P	▲CA06AQ10SL-**S	CA06BQ10SL-**S	CA08BQ10SL-**S
12S	CA00AQ12S-**P	CA01AQ12S-**P	CA01BQ12S1**P	CA02AQ12S-**P	CA06AQ12S-**P	CA06BQ12S-**P	CA08BQ12S-**P
14S	CA00AQ14S-**P	CA01AQ14S-**P	CA01BQ14S-**P	CA02AQ14S-**P	CA06AQ14S-**P	CA06BQ14S-**P	CA08BQ14S-**P
16S	CA00AQ16S-**P	CA01AQ16S-**P	CA01BQ16S-**P	CA02AQ16S-**P	CA06AQ16S-**P	CA06BQ16S-**P	CA08BQ16S-**P
12	CA00AQ12-**P	CA01AQ12-**P	CA01BQ12-**P	CA02AQ12-**P	CA06AQ12-**P	CA06BQ12-**P	CA08BQ12-**P
14	CA00AQ14-**P	CA01AQ14-**P	CA01BQ14-**P	CA02AQ14-**P	CA06AQ14-**P	CA06BQ14-**P	CA08BQ14-**P
16	CA00AQ16-**P	CA01AQ16-**P	CA01BQ16-**P	CA02AQ16-**P	CA06AQ16-**P	CA06BQ16-**P	CA08BQ16-**P
18	CA00AQ18-**P	CA01AQ18-**P	CA01BQ18-**P	CA02AQ18-**P	CA06AQ18-**P	CA06BQ18-**P	CA08BQ18-**P
20	CA00AQ20-**P	CA01AQ20-**P	CA01BQ20-**P	CA02AQ20-**P	CA06AQ20-**P	CA06BQ20-**P	CA08BQ20-**P
22	CA00AQ22-**P	CA01AQ22-**P	CA01BQ22-**P	CA02AQ22-**P	CA06AQ22-**P	CA06BQ22-**P	CA08BQ22-**P
24	CA00AQ24-**P	CA01AQ24-**P	CA01BQ24-**P	CA02AQ24-**P	CA06AQ24-**P	CA06BQ24-**P	CA08BQ24-**P
28	CA00AQ28-**P	CA01AQ28-**P	CA01BQ28-**P	CA02AQ28-**P	CA06AQ28-**P	CA06BQ28-**P	CA08BQ28-**P

*For socket inserts, substitute S for P following the contact arrangement number.
**Add contact arrangement number. See pages 53-55.

• 10SL available only in 10SL-3P or 10SL-4P, pin inserts only
▲ 10SL available only in 10SL-3S or 10SL-4S socket inserts only

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

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MS STANDARD CIRCULAR CONNECTORS DESIGNED TO MIL-C-5015

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

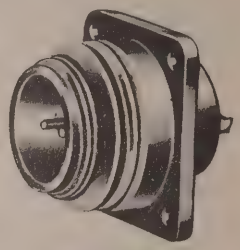
Dimensions subject to change.

QUICK DISCONNECT AQ/BQ

CA22181 ADAPTERS
FOR STANDARD PLASTIC INSULATOR MS AND CA RECEPTACLES

The CA22181 adapter is designed to screw over the coupling threads of a standard MS or CA receptacle with plastic insulator. It has a locking groove, which receives the formed end of the coupler latch when fully engaged.

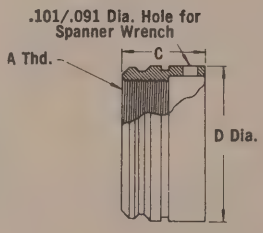
Adapters may be ordered as part of a standard plastic insulator MS or CA receptacle, or they may be ordered separately. To order adapters separately, a listing is given in the table below. To order complete assemblies (standard plastic insulator MS or CA receptacles with adapters), see page 60.



MS3101 RECEPTACLE WITH ADAPTER

ADAPTER

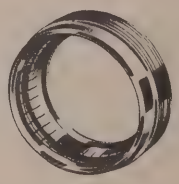
Adapter Part Number	For Shell Size	C Max.	D Max.	A Thread
CA22181-8	8S	.480	.615	½-28UNEF-2B
CA22181-10	10S & 10SL	.480	.740	⅝-24UNEF-2B
CA22181-12	12S	.480	.915	¾-20UNEF-2B
CA22181-14	14S	.480	1.045	⅞-20UNEF-2B
CA22181-16	16S	.480	1.170	1-20UNEF-2B
CA22181-13	12	.665	.915	¾-20UNEF-2B
CA22181-15	14	.665	1.045	⅞-20UNEF-2B
CA22181-17	16	.665	1.170	1-20UNEF-2B
CA22181-18	18	.540	1.305	1⅛-18NEF-2B
CA22181-20	20	.540	1.405	1¼-18NEF-2B
CA22181-22	22	.540	1.530	1⅜-18NEF-2B
CA22181-24	24	.575	1.655	1½-18NEF-2B
CA22181-28	28	.575	1.905	1¾-18NS-2B

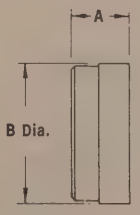


CA22182 COUPLERS
FOR STANDARD PLASTIC INSULATOR MS AND CA PLUGS

CA22182 couplers are designed to replace the coupling nut on standard ITT Cannon plastic insulator MS or CA connectors. A standard manual coupler (AQ and BQ) is available.

Couplers may be ordered separately or as part of a standard plastic insulator MS or CA connector assembly (see page 60).





MANUAL TYPE COUPLER

Part Number	Type Disconnect	For Shell Size	A Max.	B Max.
CA22182-7	AQ	8S	.740	1.040
CA22182-8	BQ			
CA22182-9	AQ	10S & 10SL	.740	1.165
CA22182-10	BQ			
CA22182-11	AQ	12 & 12S	.740	1.240
CA22182-12	BQ			
CA22182-14	AQ BQ	14 & 14S	.740	1.415
CA22182-16	AQ BQ	16 & 16S	.740	1.540
CA22182-18	AQ	18	.880	1.665
CA22182-20	AQ & BQ	20	.880	1.780
CA22182-21	AQ	22	.880	1.910
CA22182-22	BQ			
CA22182-23	AQ	24	.950	1.995
CA22182-24	BQ			
CA22182-27	AQ	28	.950	2.240
CA22182-28	BQ			

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MS STANDARD CIRCULAR CONNECTORS DESIGNED TO MIL-C-5015

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MS-E/MS-R/MS-F
SOLDER/F80 CRIMP ENVIRONMENTAL

In the latest revision of MIL-C-5015, a new class of environment-resistant connectors was added. This new class F connector supersedes the previous class E connector. The MS-3106F is identical to the MS-3106E except that the MS-3106F has an "O" ring under the coupling nut. The class E will still be available upon request for existing programs, and upon ordering will also bear the E nomenclature on the shell.

ITT Cannon MS-F and MS-R connectors are designed to operate in the extreme environmental conditions of high altitude flight. These connectors must be completely sealed to withstand moisture, condensation, vibration, corona and flashover caused by high altitude environments.

MS-F and MS-R connectors have a resilient grommet with internal restrictions in the wire cavities which act as O rings around the wires. This allows the wires to slide thru the grommet with a minimum of friction, yet when the ferrule is seated and the endbell tightened it provides a perfect wire seal thru a wide variety of wire diameters. This seal at the rear, plus the interfacial seal at the front, effects a completely environment-resistant assembly when the plug is mated to an F or R receptacle. Sockets are of the closed-entry type.

The F-80 modification (crimp contact termination) is available in resilient insulators in the E, R, F, and BFR styles, creating a large selection of insert assemblies and hardware. Components are identical to the MS–5015 except that the contacts are modified for crimp termination providing an inexpensive crimp contact connector with the proven reliability of and complete intermateability with the MS-5015 series. See page 65 for assembly instructions.

Cable clamps have been integrally designed with the endbell on MS-E and MS-F connectors. Class R is without the cable clamp.

HOW TO ORDER

CA MS	3106 3106	R R	20-27 20-27	P P	W W	*	

Prefix
Shell Style
Class
Shell Size
Contact Arrangement
Contact Type
Alternate Insert Position
Modification Code

PREFIX
MS — Conforms to latest MIL-C-5015 revision
CA — Cannon designation (for F80 modification)

SHELL STYLE
3100 — Wall mounting receptacle
3102 — Box mounting receptacle
3106 — Straight plug
3108 — 90° angle plug

CLASS
E/F — Environmental with resilient insulators and integral cable clamp.
R — Environmental with resilient insulators and shortened lightweight end-bell; also additional sealing with O ring seal under coupling nut in styles 3106 and 3108

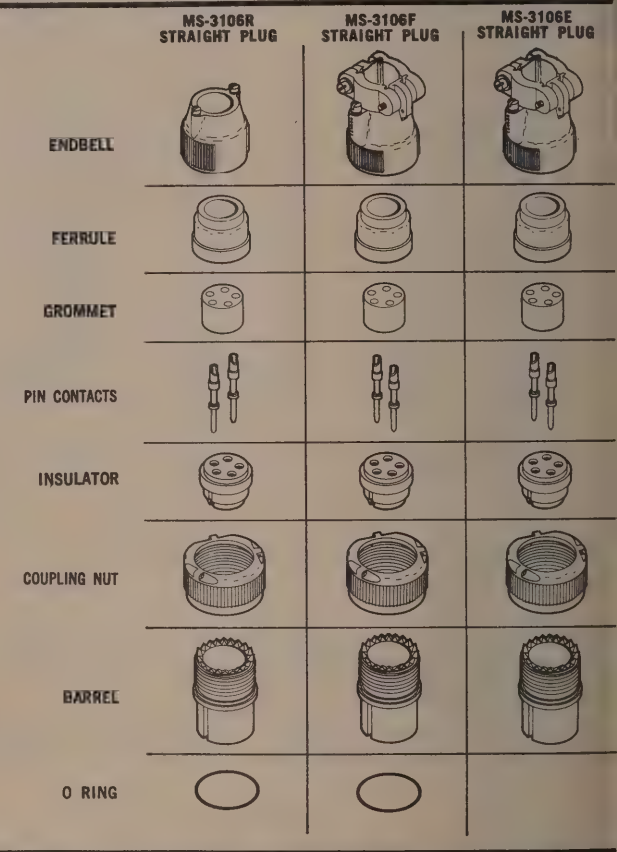
SHELL SIZE
Coupling thread diameter in sixteenths of an inch

CONTACT ARRANGEMENTS — See pages 53-55

CONTACT TYPE — P for Pin; S for Socket

ALTERNATE INSERT POSITION — See pages 55-56

MODIFICATION CODE
F80 — Crimp type contacts. See page 65 for assembly instructions.



STANDARD DATA

Shell	Material	Aluminum alloy
	Finish	Chromate coating over cadmium plating
Insulator	Material	Polychloroprene (resilient)
Contacts	Material	Brass or copper alloy
	Finish	Silver plate
	Termination	Tinned solder pot

HIGH VOLTAGE CARTRIDGES FOR MS-E AND MS-R

- **Standard contact arrangements are adaptable to high voltage applications.**
- **Eliminates need for a separate high voltage connector.**
- **Assembly time is reduced.**

High voltage conductors as well as power and/or control signal conductors can now be connected simultaneously in standard MS connectors. Previously, MS connectors involved in high voltage circuitry required individual design considerations and could only be ordered as a "special." The new high voltage cartridge allows conversion of a standard connector to one capable of handling up to 15,000 volts DC (Test Voltage — mated), operating voltage — sea level 5,000 VDC or 3,500 VAC. These cartridges are molded of nylon and provide a high degree of arc-over protection between adjacent contacts or between a contact and the connector shell. Unmated, each cartridge provides a nylon isolating barrier capable of withstanding up to 10,000 volts DC (or peak).

The contact within the cartridge is a 7.5 amp, size 20, crimp snap-in type with dielectric rear release clip retention. This contact is removable with the plastic CIET20 insertion/extraction tool provided the insulation is .084" or less. The contact may be crimped with the standard MS-3191 tool and hand inserted into the nylon cartridge. The cartridge body is installed in the connector at the factory.

High voltage cartridges now available fit in the space normally occupied by a #4 or #8 size contact in an MS-E, MS-R or MS-F type connector.

Over forty-nine contact arrangements are currently available in which these high voltage cartridges may be used. Consult factory for ordering information.

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

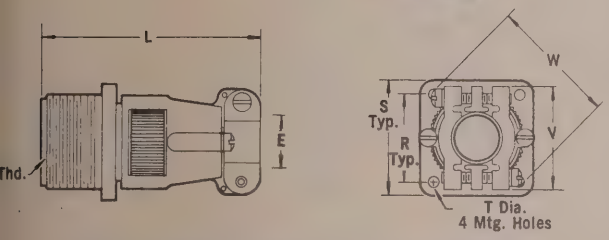
MS STANDARD CIRCULAR CONNECTORS DESIGNED TO MIL-C-5015

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

Dimensions subject to change.

MS-E/MS-R/MS-F
SOLDER/F80 CRIMP ENVIRONMENTAL

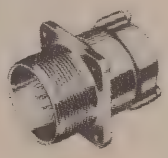
WALL MOUNTING RECEPTACLE
INTEGRAL CABLE CLAMP
MS3100E / MS3100F

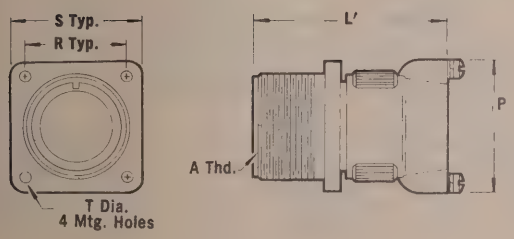


MS3100E is identical to MS3100F and is available upon request. For new equipment, customer should specify MS3100F.

MS3100F wall mounting receptacles are used to carry wires thru walls or bulkheads, or to provide a means of disconnection at a bulkhead. MS3100F receptacles mate with 3106 and 3108 plugs.

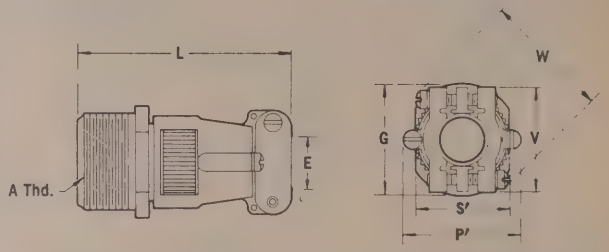
WALL MOUNTING RECEPTACLE
MS3100R





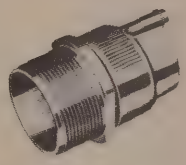
The MS3100R receptacle is identical in purpose to the MS3100F. The MS3100R features a shorter lightweight endbell and mates with 3106 and 3108 plugs.

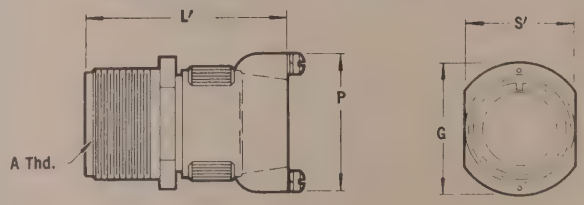
CABLE CONNECTING PLUG
INTEGRAL CABLE CLAMP
MS3101E / MS3101F



MS3101E cable connecting plugs are used for cable extension requirements, where mounting provisions are unnecessary. MS3101E plugs mate with 3106, 3107 and 3108 plugs. Note: The D revision of MIL-C-5015 has changed the nomenclature of the 3101 from receptacle to plug.

CABLE CONNECTING PLUG
MS3101R





MS3101R cable connecting plug is identical in purpose to the MS3101E. The MS3101R features a shorter lightweight endbell and mates with 3106, 3107 and 3108 plugs. Note: The D revision of the MIL-C-5015 specification has changed the nomenclature of the 3101 from receptacle to plug.

Shell Size	E Max.	E Min.	G Max.	L Max.	L' Max.	P Max.	P' Max.	R ±.005	S ±.031	S' Max.	T +.010 −.005	V Max.	W Max.	A Thread
8S	.235	.102	.844	2.250	1.838	.890	.890	.594	.875	.515	.120	.840	1.046	½-28UNEF-2A
10S	.235	.102	.969	2.250	1.838	.890	.890	.719	1.000	.640	.120	.840	1.046	⅝-24UNEF-2A
10SL	.297	.140	1.062	2.250	1.838	.970	.970	.719	1.000	.640	.120	.900	1.125	⅝-24UNEF-2A
12S	.297	.140	1.062	2.250	1.838	.970	.970	.812	1.094	.765	.120	.900	1.125	¾-20UNEF-2A
14S	.422	.195	1.156	2.250	1.838	1.150	1.150	.906	1.188	.890	.120	1.100	1.343	⅞-20UNEF-2A
16S	.547	.255	1.281	2.250	1.838	1.250	1.250	.968	1.281	1.015	.120	1.200	1.484	1-20UNEF-2A
12	.297	.140	1.062	2.625	2.181	.970	.970	.812	1.094	.765	.120	.900	1.125	¾-20UNEF-2A
14	.422	.195	1.156	2.625	2.181	1.150	1.150	.906	1.188	.890	.120	1.100	1.343	⅞-20UNEF-2A
16	.547	.255	1.281	2.625	2.181	1.250	1.250	.969	1.281	1.015	.120	1.200	1.484	1-20UNEF-2A
18	.610	.285	1.344	2.688	2.281	1.450	1.450	1.062	1.375	1.140	.120	1.300	1.609	1⅛-18UNEF-2A
20	.735	.350	1.500	2.750	2.281	1.570	1.570	1.156	1.500	1.265	.120	1.500	1.890	1¼-18UNEF-2A
22	.735	.350	1.625	2.750	2.281	1.570	1.570	1.250	1.625	1.390	.120	1.500	1.890	1⅜-18UNEF-2A
24	.922	.468	1.750	2.969	2.281	1.880	1.880	1.375	1.750	1.515	.147	1.740	2.170	1½-18UNEF-2A
28	.922	.468	2.000	3.031	2.281	1.880	1.880	1.562	2.000	1.765	.147	1.740	2.170	1¾-18UNS-2A
32	1.235	.664	2.250	3.031	2.322	2.205	2.205	1.750	2.250	2.015	.173	2.075	2.656	2-18UNS-2A
36	1.360	.694	2.500	3.281	2.322	2.400	2.400	1.938	2.500	2.270	.173	2.300	2.922	2¼-16UN-2A
*40	1.630	.911	—	3.530†	2.427†	2.840	—	2.188	2.750	—	.173	—	—	2½-16UN-2A

† Not to MS specification

* Not available in MS3101E and MS3101R.

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

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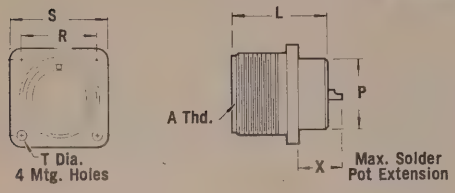
Dimensions subject to change.

MS-E/MS-R/MS-F
SOLDER/F80 CRIMP ENVIRONMENTAL

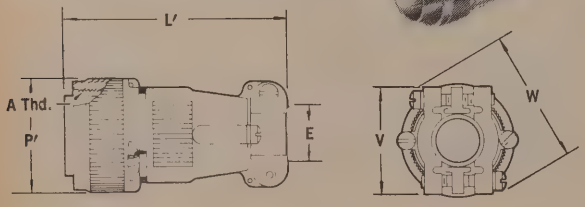
BOX MOUNTING RECEPTACLE
MS3102E / MS3102R



MS3102E and MS3102R box mounting receptacles are used in junction boxes or as an integral part of equipment. These connectors are identical in construction and will mate with 3106, 3107 and 3108 plugs. For new equipment, customer should specify MS3102R.

	X DIMENSION Max. Solder Pot Ext. — Pin or Socket Contact Size				
Shell Size	16	12	8	4	0
8S, 10S, 10SL	.534	—	—	—	—
12S, 14S, 16S	.518	—	—	—	—
12	.705	.705	—	—	—
14	.705	.705	.767	—	—
16	.705	.705	.767	.767	—
18	.674	.674	.736	.736	—
20, 22	.674	.674	.736	.736	.971
24, 28	.612	.612	.674	.674	.909
32, 36	.549	.549	.611	.611	.846

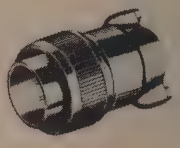
STRAIGHT PLUG
INTEGRAL CABLE CLAMP
MS3106E / MS3106F

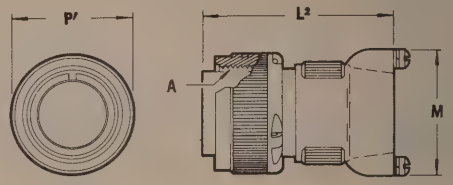


MS3106E is identical to MS3106F except for O ring under the coupling nut, and is available upon request. For new equipment, customer should specify MS3106F.

MS3106F straight plugs mate with 3100 and 3102 receptacles and 3101 plugs.

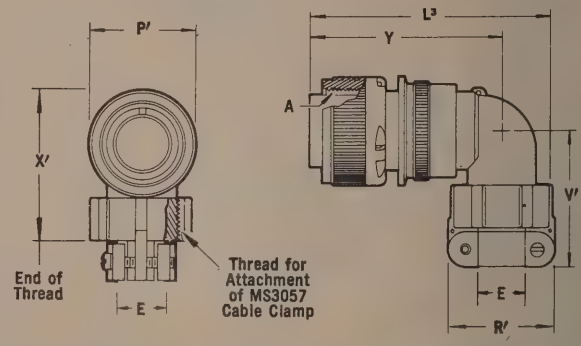
STRAIGHT PLUG
MS3106R





The MS3106R straight plug is identical in purpose to the MS3106F. The MS3106R has the shorter endbell. This plug will mate with 3100 and 3102 receptacles and 3101 plugs.

90° ANGLE PLUG
MS3108E / MS3108R



MS3108R 90° angle plugs (with O ring seal less cable clamp) and the MS3108E 90° angle plugs (less O ring seal with cable clamp) are used where there is limited space and where wires must be brought at abrupt angles. This plug will mate with 3100 and 3102 receptacles and 3101 plugs.

Shell Size	E Min.	E Max.	L Max.	L¹ Max.	L² Max.	L³ Max.	M Max.	P Max.	P¹ Max.	R ±.005	R¹ Max.	S +.031	T +.010 −.005	V Max.	V¹ Max.	W Max.	X¹ Max.	Y Max.	A Thread
8S	.102	.235	1.040	2.250	1.838	2.156	.890	.426	.844	.594	.835	.875	.120	.840	1.218	1.046	1.546	1.640	½-28UNEF-2A
10S	.102	.235	1.040	2.250	1.838	2.156	.890	.520	.969	.719	.835	1.000	.120	.840	1.250	1.046	1.697	1.640	⅝-24UNEF-2A
10SL	.140	.297	1.040	2.250	1.838	2.188	.970	.614	.969	.719	.895	1.000	.120	.900	1.281	1.125	1.728	1.703	⅝-24UNEF-2A
12S	.140	.297	1.040	2.250	1.838	2.188	.970	.614	1.062	.812	.895	1.094	.120	.900	1.281	1.125	1.858	1.703	¾-20UNEF-2A
14S	.195	.422	1.040	2.250	1.838	2.312	1.150	.739	1.156	.906	1.085	1.188	.120	1.100	1.406	1.343	2.041	1.765	⅞-20UNEF-2A
16S	.255	.547	1.040	2.250	1.838	2.406	1.250	.854	1.250	.969	1.180	1.281	.120	1.200	1.531	1.484	2.223	1.796	1-20UNEF-2A
12	.140	.297	1.400	2.625	2.181	2.531	.970	.614	1.062	.812	.895	1.094	.120	.900	1.281	1.125	1.858	2.062	¾-20UNEF-2A
14	.195	.422	1.400	2.625	2.181	2.688	1.150	.739	1.156	.906	1.085	1.188	.120	1.100	1.406	1.343	2.041	2.125	⅞-20UNEF-2A
16	.255	.547	1.400	2.625	2.181	2.781	1.250	.864	1.250	.969	1.180	1.281	.120	1.200	1.531	1.484	2.223	2.156	1-20UNEF-2A
18	.285	.610	1.400	2.688	2.281	2.844	1.450	.989	1.344	1.062	1.275	1.375	.120	1.300	1.593	1.609	2.376	2.250	1⅛-18UNEF-2A
20	.350	.735	1.400	2.750	2.281	3.250	1.570	1.145	1.469	1.156	1.475	1.500	.120	1.500	1.656	1.890	2.567	2.312	1¼-18UNEF-2A
22	.350	.735	1.400	2.750	2.281	3.250	1.570	1.270	1.594	1.250	1.475	1.625	.120	1.500	1.718	1.890	2.751	2.312	1⅜-18UNEF-2A
24	.468	.922	1.400	2.969	2.281	3.719	1.880	1.395	1.719	1.375	1.715	1.750	.147	1.740	1.890	2.170	2.957	2.531	1½-18UNEF-2A
28	.468	.922	1.400	3.031	2.281	3.719	1.880	1.614	1.969	1.562	1.715	2.000	.147	1.740	1.968	2.170	3.272	2.531	1¾-18UNS-2A
32	.664	1.235	1.400	3.031	2.322	4.188	2.205	1.864	2.219	1.750	2.040	2.250	.173	2.075	2.187	2.656	3.755	2.750	2-18UNS-2A
36	.694	1.360	1.400	3.281	2.322	4.297	2.400	2.051	2.469	1.938	2.285	2.500	.173	2.300	2.406	2.922	4.078	2.875	2¼-16UN-2A
40	.911	1.630	1.400	3.577†	2.430	7.211†	2.840	2.390	2.723†	2.188	2.948	2.750	.173	—	5.875	—	6.152	5.690	2½-16UN-2A

† Not to MS specification

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ITT CANNON ELECTRIC

MS STANDARD CIRCULAR CONNECTORS DESIGNED TO MIL-C-5015

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F80 ASSEMBLY INSTRUCTIONS

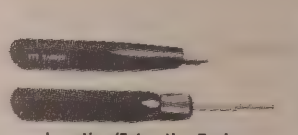
TOOLS

ITT Cannon provides a complete line of crimp insertion and extraction tooling to be used with CA-F80 contacts as follows:

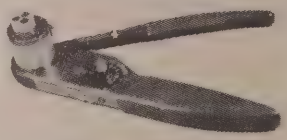
Contact Size	Hand Crimp Tool*	Locator	Power Crimp Tool**	Crimp Head	Locator	Gauge
16	M-22520/1-01	TH-70 -1				
12	M-22520/1-01	TP567	CBT-600/600B	CCN-12-2	CCHP-12-2	—
8	—	—	CBT-600/600B	CCN-8-1	CCHP-8-1	CCN-8-1
4	—	—	CBT-600/600B	CCN-4-1	CCHP-4-1	CCN-4
0	—	—	CBT-600B	CCH-0-1	CCHP-0-9	CCN-0

*The M-22520/1-01 is the MIL standard crimp tool for #12 thru #20 contacts and when used with crimp #12, 16, and 20 contacts for the CA-F80.

**The CBT-600- is recommended for crimping of #4 thru #12 contacts. The 6BT-600B for #0 thru #8. The appropriate locators and crimp heads are available as shown above.



Insertion/Extraction Tools



M-22520/1-01

CBT-600

Although obsoleted by MIL-T-22520, MS3191-1 tool is commonly used in non-military commercial applications. The chart below specifies contact size and corresponding locator used with the MS3191-1 tool.

Shell Styles	Contact Size	Locator
8S thru 16S	16 Pin	L-16-3191-7
	16 Socket	L-16-3191-46
12 thru 36	16 Pin	L-16-3191-10
	16 Socket	L-16-3191-52
	12 Pin	L-16-3191-16
	12 Socket	L-16-3191-20

Insertion and extraction tools used for these connectors are available for contact sizes 16 thru 0 as shown.

Contact Size	Insertion Tools	Extraction Tools	Handle Color
16	CIT-16	CET-16-4	Blue
12	CIT-12	CET-12-2	Yellow
8	CIT-8	CET-8	Red
4	CIT-4	CET-4	Blue
0	CIT-0	CET-0	Yellow

GUIDE PINS

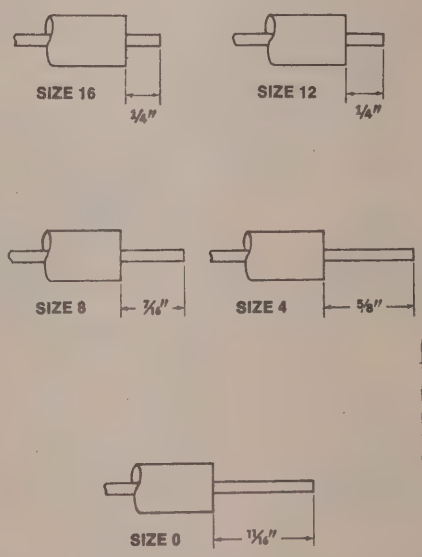
Guide pins are used to assist insertion of socket contact Sizes #16 and #12. Larger sizes do not require guide pins.

Contact	Guide Pin
#16	226-1017-000
#12	226-1018-000

CRIMPING CONTACTS

1. Check the crimp tool to be sure that the proper crimp head locator is used.
2. Cycle the tool to be sure the indentors are open.
3. Place the contact, mating end first, into the tool.
4. Insert the stripped wire into the hollow end of the contact. Be sure the wire is inserted as far as it will go.
5. Close the tool completely to crimp. Unless the tool is closed completely, the tool will not release the contact.
6. Remove the crimped contact from the tool. Check the inspection hole to verify that the wire is fully inserted.

RECOMMENDED WIRE STRIPPING



INSERTION OF CONTACTS

1. Before inserting the contacts, remove the endbell, grommets, and ferrule from the receptacle. Remove the endbell, grommet, ferrule, and coupling nut from the plug. Slide the hardware over the wire bundle in the proper order for reassembly after all the contacts are inserted.
2. To assist insertion of contacts, lubricate insert cavities with isopropyl alcohol. Alcohol will evaporate and will not leave a conductive film. **Caution: Never use any lubricant other than isopropyl alcohol.** Hold the plug or receptacle body firmly and insert the wired contacts as far as possible by hand. Starting at one side of the insulator, work progressively from contact to contact across the layout. When inserting socket contacts, be sure to provide fixture space below the front face to permit length of guide pins for #16 and #12 contacts to clear insulator face.
3. Place the correct insertion tool on the contact so that the wire runs along the groove in the tool. (Tool tip will butt against the shoulder.)
4. Beginning with a cavity on the outer edge of the plug, apply a slow, even pressure perpendicular to the insulator face until the contact snaps into position. If contacts are not inserted all the way prior to removing insertion tool, do not try to reinsert the insertion tool. Instead, using the extraction tool, push the contact back to position it was in when the insertion tool was originally placed over the contact for push-in; otherwise the inside of contact cavity may be damaged by reinserting the insertion tool.
5. Inspect the front end of the insulator to assure that the contacts are inserted to the proper depth.

PIN CONTACT PART NUMBERS

Contact Size	F80
16S	330-0345-016
16	330-0351-016
12	330-0351-012
8	330-0351-008
4	330-0351-004
0	330-0351-000

SOCKET CONTACT PART NUMBERS

Contact Size	F80
16S	031-0554-161
16	031-0560-161
12	031-0560-121
8	031-0560-081
4	031-0560-041
0	031-0560-001

COMPLETION

After all the cavities have been filled, slide the hardware back into position on the barrel. Tighten the endbell until the ferrule and endbell are flush. Compression of the grommet in this manner results in maximum sealing characteristics of the plug.

EXTRACTION OF CONTACTS

1. Select the appropriate tool. (Tool tips are reversible for either pin or socket.) Place the extraction tool over the pin or into the socket.
2. Apply a slow, even pressure to push the contact out of the rear of the insulator.

ITT CANNON ELECTRIC

MS STANDARD CIRCULAR CONNECTORS DESIGNED TO MIL-C-5015

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

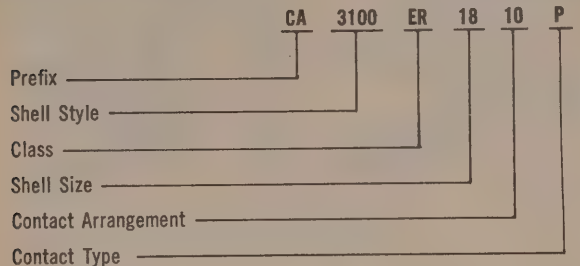
Dimensions subject to change.

ER POTTING CONNECTORS

MS type potting connectors are available with nylon cups. 00 and 06 shell styles with plastic cups and resilient insulators meet the requirements of MS3103 and MS25183. Also available is the 08 plug with resilient insulator and 90° angle nylon potting cup.

ITT Cannon provides for a ¼" clearance for potting on all contact sizes.

HOW TO ORDER



PREFIX
CA — ITT Cannon prefix indicating special application or variation of MS

SHELL STYLE
3100 — Wall mounting receptacle
3106 — Straight plug
3108 — 90° angle plug

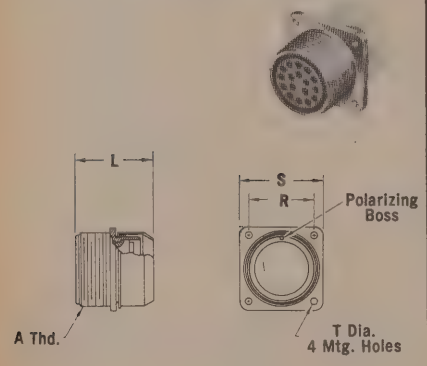
CLASS
ER — Resilient insulator, nylon potting cup and thread attachment ring

SHELL SIZE
Coupling thread diameter figured in sixteenths of an inch

CONTACT ARRANGEMENTS
See pages 53-55

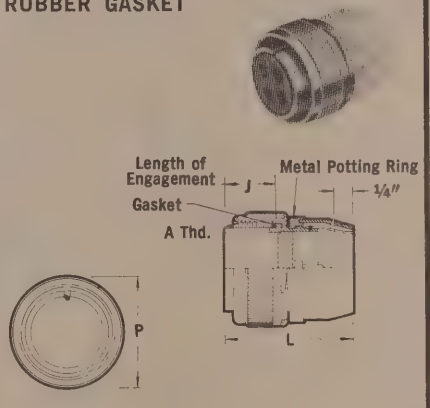
CONTACT TYPE
P for Pin; S for Socket

WALL MOUNTING RECEPTACLE
CA3100ER
MS3103 TYPE
NYLON POTTING CUP
THREADED ATTACHMENT RING



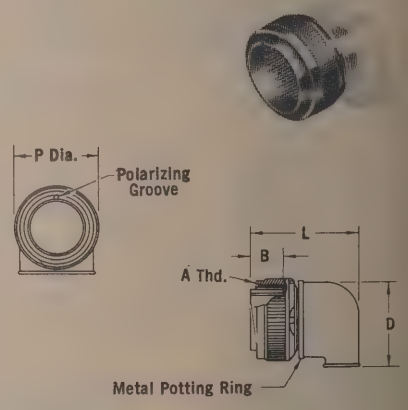
The CA3100ER receptacle (MS3103 type) is supplied with a resilient insulator and a nylon potting cup with a threaded attachment ring. This receptacle mates with 3106, 3107 and 3108 plugs.

STRAIGHT PLUG
CA3106ER
MS25183 TYPES
NYLON POTTING CUP
RUBBER GASKET



The CA3106ER plug is supplied with resilient insulators, nylon potting cups with threaded attachment rings, and a rubber gasket under the coupling nut. This plug mates with 3100 and 3102 receptacles and 3101 plugs.

90° ANGLE PLUG
CA3108ER
NYLON POTTING CUP
RUBBER GASKET



The CA3108ER is supplied with resilient insulator, 90° nylon potting cup and threaded attachment ring with a rubber gasket under the coupling nut. This plug mates with 3100 and 3102 receptacles and 3101 plugs.

CA3100ER

Shell Size	L Max.	R ±.005	S Max.	T +.010 −.005	R Thread
8S	1.531	.594	.906	.120	½-28UNEF-2A
10S	1.531	.719	1.031	.120	⅝-24NEF-2A
10SL	1.531	.719	1.031	.120	⅝-24NEF-2A
12S	1.531	.812	1.125	.120	¾-20UNEF-2A
14S	1.531	.906	1.219	.120	⅞-20UNEF-2A
16S	1.531	.969	1.312	.120	1-20UNEF-2A
12	1.968	.812	1.125	.120	¾-20UNEF-2A
14	1.968	.906	1.219	.120	¾-20UNEF-2A
16	1.968	.968	1.312	.120	1-20UNEF-2A
18	1.968	1.062	1.406	.120	1⅛-18NEF-2A
20	2.188	1.156	1.531	.120	1¼-18NEF-2A
22	2.188	1.250	1.656	.120	1⅜-18NEF-2A
24	2.188	1.375	1.781	.147	1½-18NEF-2A
28	2.188	1.562	2.031	.147	1¾-18NS-2A
32	2.188	1.750	2.281	.173	2-18NS-2A
36	2.188	1.938	2.531	.173	2¼-16UN-2A

CA3106ER

Shell Size	J Max.	L Max.	P Max.	A Thread
8S	.536	1.562	.844	½-28UNEF-2B
10S	.536	1.562	.969	⅝-24UNEF-2B
10SL	.536	1.562	.969	⅝-24UNEF-2B
12S	.536	1.562	1.062	¾-24UNEF-2B
14S	.536	1.562	1.156	⅞-20UNEF-2B
16S	.536	1.562	1.250	1-20UNEF-2B
12	.724	2.000	1.062	¾-20UNEF-2B
14	.724	2.000	1.156	⅞-20UNEF-2B
16	.724	2.000	1.250	1-20UNEF-2B
18	.724	2.000	1.344	1⅛-18UNEF-2B
20	.724	2.125	1.469	1¼-18UNEF-2B
22	.724	2.125	1.594	1⅜-18UNEF-2B
24	.724	2.125	1.719	1½-18UNEF-2B
28	.724	2.125	1.969	1¾-18UNS-2B
32	.724	2.180	1.219	2-18UNS-2B
36	.724	2.180	2.469	2¼-16UN-2B
40	.724	2.180	2.723	2½-16UN-2B

CA3108ER

Shell Size	D Max.	L Max. For Arr. w/#16 & #12 Contacts	L Max. For Arr. w/#8 & #4 Contacts	P Max.	A Thread
8S	—	—	—	—	—
10S	—	—	—	—	—
10SL	1.040	1.463	—	.969	⅝-24UNEF-2B
12S	1.040	1.600	—	1.062	¾-20UNEF-2B
14S	1.040	1.600	2.300	1.156	⅞-20UNEF-2B
16S	1.290	1.600	2.550	1.250	1-20UNEF-2B
12	1.040	1.910	—	1.062	¾-20UNEF-2B
14	1.040	1.910	2.610	1.156	⅞-20UNEF-2B
16	1.290	1.910	2.850	1.250	1-20UNEF-2B
18	1.290	2.100	2.850	1.344	1⅛-18UNEF-2B
20	1.540	2.100	2.850	1.469	1¼-18UNEF-2B
22	1.540	2.100	2.850	1.594	1⅜-18UNEF-2B
24	1.790	2.281	2.985	1.719	1½-18UNEF-2B
28	2.040	2.485	2.985	1.969	1¾-18UNS-2B
32	2.290	2.485	2.985	1.219	2-18UNS-2B
36	2.540	2.485	2.985	2.469	2¼-16UN-2B

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

MS STANDARD CIRCULAR CONNECTORS DESIGNED TO MIL-C-5015

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

Dimensions subject to change.

BULKHEAD CONNECTORS BFR / TBF

TBF and BFR pressurized bulkhead receptacles mate with standard MS type plugs (3106, 3107 and 3108) if contact arrangements correspond. Both the BFR and TBF have resilient insulators. The TBF (thru-bulkhead fitting) version has a double-faced construction allowing mating from both ends. An O ring is supplied as standard on both the BFR and the TBF. Contacts are silver plated copper or brass alloy. Shells are aluminum alloy.

HOW TO ORDER

	BF / TBF	R	14S -	5	P -	1
			20 -	15	PS	
Prefix						
Class						
Shell Size						
Contact Arrangement						
Contact Type						
Mounting (BFR only)						

PREFIX
BF — Bulkhead fittings
TBF — Thru bulkhead fittings

CLASS
R — Resilient insulators
H — Hermetic; see Hermetic catalog

SHELL SIZE
Coupling thread diameter figured in sixteenths of an inch

CONTACT ARRANGEMENTS — See pages 53-55

CONTACT TYPE
P for Pin; S for Socket; PS for Pin and Socket (TBF only)

MOUNTING — BFR only; see chart on right

BFR MOUNTING DIMENSIONS

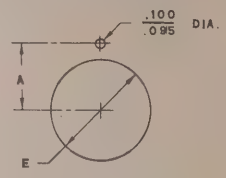


Figure 1

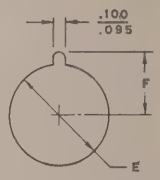
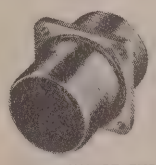
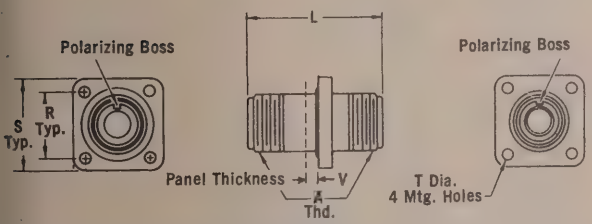


Figure 2

Shell Size	A ±.005	E +.015 −.000	F ±.005
8S	.323	.500	.373
10S, 10SL	.385	.625	.435
12S, 12	.448	.750	.498
14S, 14	.510	.875	.560
16S, 16	.573	1.000	.623
18	.635	1.125	.685
20	.698	1.250	.748
22	.760	1.375	.810
24	.823	1.500	.873
28	.948	1.750	.998
32	1.073	2.000	1.123
36	1.198	2.250	1.248

THRU-BULKHEAD RECEPTACLE TBF — RESILIENT INSULATOR





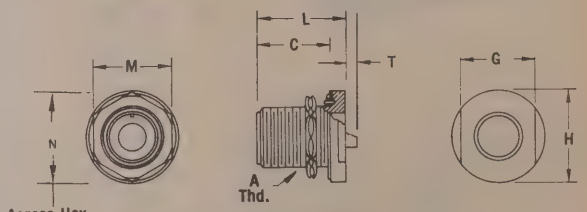
TBF thru-bulkhead fittings have pressurized resilient insulators. Special double-face pin and socket contact construction permits cable components to be wired and tested in the shop and then to be plugged into the mounted TBF plug to complete the installation. The TBF mates with 3106, 3107 and 3108 plugs.

PRESSURIZED BULKHEAD RECEPTACLE BFR

TYPE 1

Shell	Standard
Insulator	Polychloroprene
Lock Nut	Hex with 6 wire holes
O Ring	Neoprene
Position Pin	Standard
Mounting	Figure 1 or 2

PART NO. EXAMPLE: BFR14S-5P-1



Standard Position Pin is 3/32" Dia.

BFR pressurized bulkhead receptacles withstand the air leakage requirements of MIL-C-5015 not to exceed 1 cu. in. of air per hour when subjected to a pressure differential of 30 psi at −55°C. Insulators are resilient material bonded to the aluminum shell. Both pin and socket assemblies are available. The BFR will mate with standard MS type 3106, 3107, 3108 plugs.

TBF

Shell Size	R ±.005	S ±.031	T +.010 −.005	V Max.
8S	.594	.875	.120	.325
10S	.719	1.000	.120	.325
10SL	.719	1.000	.120	.325
12S	.812	1.094	.120	.325
14S	.906	1.188	.120	.325
16S	.968	1.281	.120	.325
12	.812	1.094	.120	.445
14	.906	1.188	.120	.445
16	.968	1.281	.120	.445
18	1.062	1.375	.120	.445
20	1.156	1.500	.120	.445
22	1.250	1.625	.120	.445
24	1.375	1.750	.147	.383
28	1.562	2.000	.147	.383
32	1.750	2.250	.173	.320
36	1.938	2.500	.173	.383
40	2.188	2.750	.173	.383

BFR

Shell Size	C Max.	G Max.	H Max.	L Max.	M Max.	N Max.	T Max. Solder Pot Ext. #16	#12	#8	#4	#0	TBF/BFR A Thread
8S	.853	.895	1.077	1.087	.697	.820	.140	—	—	—	—	1/2-28UNEF-2A
10S	.853	1.015	1.203	1.087	.822	.960	.140	—	—	—	—	5/8-24NEF-2A
10SL	.853	1.015	1.203	1.087	.822	.960	.140	—	—	—	—	5/8-24NEF-2A
12S	.853	1.077	1.327	1.087	.955	1.110	.140	—	—	—	—	3/4-20UNEF-2A
14S	.853	1.203	1.453	1.087	1.072	1.250	.140	—	—	—	—	7/8-20UNEF-2A
16S	.853	1.327	1.577	1.087	1.265	1.460	.140	—	—	—	—	1-20UNEF-2A
12	1.244	1.077	1.327	1.525	.947	1.110	.062	.062	—	—	—	3/4-20UNEF-2A
14	1.244	1.203	1.453	1.525	1.072	1.250	.062	.062	.125	—	—	7/8-20UNEF-2A
16	1.244	1.327	1.577	1.525	1.265	1.460	.062	.062	.125	.125	—	1-20UNEF-2A
18	1.244	1.453	1.703	1.525	1.395	1.610	.062	.062	.125	.125	—	1 1/8-18NEF-2A
20	1.244	1.577	1.827	1.525	1.515	1.750	.062	.062	.125	.125	.359	1 1/4-18NEF-2A
22	1.244	1.577	1.953	1.525	1.635	1.900	.062	.062	.125	.125	.359	1 3/8-18NEF-2A
24	1.244	1.827	2.077	1.525	1.765	2.030	.062	.062	.125	.125	.359	1 1/2-18NEF-2A
28	1.244	1.953	2.327	1.525	2.015	2.330	.062	.062	.125	.125	.359	1 3/4-18NS-2A
32	1.244	2.203	2.577	1.525	2.205	2.550	.062	.062	.125	.125	.359	2-18NS-2A
36	1.244	2.577	2.827	1.525	2.455	2.840	.062	.062	.125	.125	.359	2 1/4-16UN-2A

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

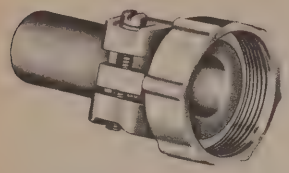
MS STANDARD CIRCULAR CONNECTORS DESIGNED TO MIL-C-5015

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory)

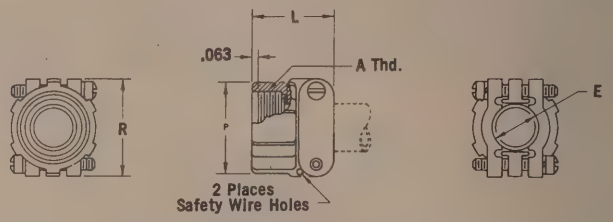
ACCESSORIES

Dimensions subject to change.

CABLE CLAMP
WITH OR WITHOUT BUSHING
MS3057A



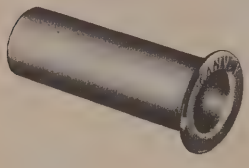
The MS3057A cable clamp is made for plugs and receptacles that have an endbell with external conduit threads. The double clamping action provides a balanced, positive hold on the wires and greatly reduces moisture transmission. Provision is made for safety wiring. This clamp is supplied without bushing; to order bushing, add "with bushing" after part number.



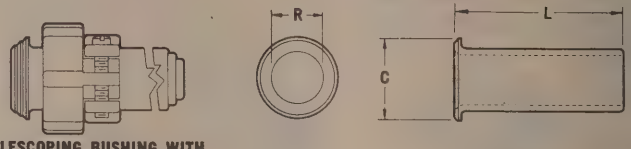
Part Number*	Fits Shell Size	Accommodates MS Bushings†	E Min.	E Max.	L ±.031	P ±.031	R ±.031	A Thread
MS3057-3A	8S-10S	MS3420-3	.102	.250	.812	.688	.812	1/2-28UNEF-2B
MS3057-4A	10SL, 12S, 12	MS3420-4	.140	.312	.812	.812	.875	5/8-24UNEF-2B
MS3057-6A	14S, 14	MS3420-6	.195	.438	.875	.969	1.062	3/4-20UNEF-2B
MS3057-8A	16S, 16	MS3420-8	.255	.562	.938	1.094	1.156	7/8-20UNEF-2B
MS3057-10A	18	MS3420-10	.285	.625	.938	1.188	1.250	1-20UNEF-2B
MS3057-12A	20, 22	MS3420-12	.350	.750	.938	1.375	1.469	1 1/16-18UNEF-2B
MS3057-16A	24, 28	MS3420-16, 12	.468	.938	1.031	1.656	1.688	1 7/16-18UNEF-2B
MS3057-20A	32	MS3420-20, 16	.664	1.250	1.094	2.031	2.031	1 3/4-18UNS-2B
MS3057-24A	36	MS3420-24, -20	.694	1.375	1.156	2.219	2.281	2-18UNS-2B
MS3057-28A	40	MS3420, -24, -20	.911	1.625	1.688	2.500	2.688	2 1/4-16UN-2B
MS3057-32A	44	MS3420-32, -28, -24	—	1.875	1.750	2.781	2.938	2 1/2-16UN-2B
MS3057-40A	48	MS3420-40, -32, -28	—	2.375	1.750	3.281	3.500	3-16UN-2B

*To order cable clamp with bushing, add "with bushing" after part number, i.e., MS3057-10A with bushing.
†MS bushings are polychloroprene.

TELESCOPING BUSHING
MS3420 / MS39056 (REF.)



Telescoping gland bushings (used with MS3057A cable clamp) keep dirt, oil and moisture out of endbell. Taping or wrapping wires is eliminated since bushing protects wires going thru clamp. Combinations of bushings may be used to decrease cable entry diameter to improve sealing. Material is polychloroprene (MS).

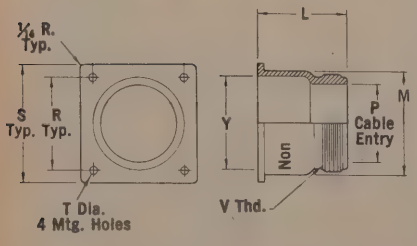


TELESCOPING BUSHING WITH MS3057A CABLE CLAMP

MS Part Number	POLYCHLOROPRENE MS Part Number	ITT Cannon Part Number	Fits Shell Size	C ±.016	L ±.031	R ±.016
MS3420-3	MS39056-1	CA18220-3	8S, 10S	.379	2.875	.130
MS3420-4	MS39056-2	CA18220-4	10SL, 12, 12S	.505	2.750	.220
MS3420-6	MS39056-3	CA18220-6	14,14S	.619	2.625	.312
MS3420-8	MS39056-4	CA18220-8	16, 16S	.744	2.500	.437
MS3420-10	MS39056-5	CA18220-10	18	.869	2.375	.562
MS3420-12	MS39056-6	CA18220-12	20, 22	1.064	2.250	.625
MS3420-16	MS39056-7	CA18220-16	24, 28	1.314	2.125	.750
MS3420-20	MS39056-8	CA18220-20	32	1.596	2.000	.937
MS3420-24	MS39056-9	CA18220-24	36	1.847	1.875	1.250
MS3420-28	MS39056-10	CA18220-28	40	2.085	1.750	1.375
MS3420-32	MS39056-11	CA18220-32	44	2.335	1.625	1.624
MS3420-40	MS39056-12	CA18220-40	48	2.835	1.500	1.874

JUNCTION SHELL
CA2120

The CA2120 straight junction shell is used with MS3102 box mounting receptacle to protect and enclose the wires behind a panel or bulkhead and to connect flexible or rigid conduit. Material is aluminum alloy; finish is olive drab chromate over cadmium plate.



Part Number	Fits Shell Size	L Max.	M Max.	P Max.	R ±.005	S Max.	T +.010 −.005	Y Max.	V Thread
CA2120-1	8S	.789	.532	.350	.594	.906	.120	.472	1/2-28UNEF-2A
CA2120-2	10S	.789	.056	.350	.719	1.031	.120	.530	1/2-28UNEF-2A
CA2120-2A	10SL	.749	.782	.430	.719	1.031	.120	.655	5/8-24UNEF-2A
CA2120-3	12S & 12	.811	.782	.430	.812	1.125	.120	.655	5/8-24UNEF-2A
CA2120-4	14S & 14	.812	.906	.550	.906	1.219	.120	.772	3/4-20UNEF-2A
CA2120-5	16S & 16	.890	1.032	.679	.969	1.312	.120	.896	7/8-20UNEF-2A
CA2120-9	18	1.119	1.156	.780	1.062	1.406	.120	1.004	1-20UNEF-2A
CA2120-10	20	1.276	1.282	.890	1.156	1.531	.120	1.192	1 1/16-18UNEF-2A
CA2120-11	22	1.244	1.406	.900	1.250	1.656	.120	1.285	1 1/16-18UNEF-2A
CA2120-12	24	1.354	1.532	1.150	1.375	1.781	.147	1.411	1 7/16-18UNEF-2A
CA2120-13	28	1.338	1.782	1.159	1.562	2.031	.147	1.660	1 7/16-18UNEF-2A
CA2120-14	32	1.385	2.032	1.460	1.750	2.281	.173	1.910	1 3/4-18UNS-2A
CA2120-15	36	1.385	2.282	1.710	1.938	2.531	.173	2.160	2-18UNS-2A
CA2120-16	40	1.385	2.532	1.960	2.188	2.781	.173	2.379	2 1/4-16UN-2A
CA2120-17	44	1.510	2.782	2.210	2.375	3.031	.173	2.661	2 1/2-16UN-2A
CA2120-18	48	1.510	3.032	2.704	2.625	3.281	.173	2.910	3-16UN-2A

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

MS STANDARD CIRCULAR CONNECTORS DESIGNED TO MIL-C-5015

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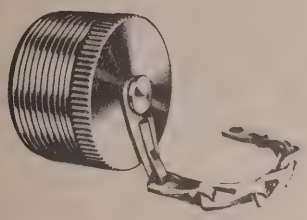
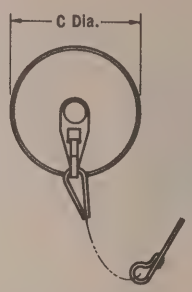
ACCESSORIES

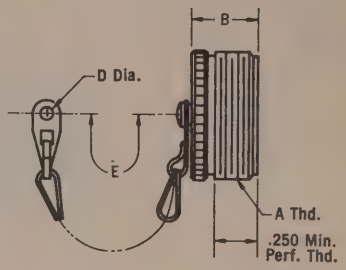
Dimensions subject to change.

PROTECTIVE METAL CAPS

MS25042
CA17530
CA19741





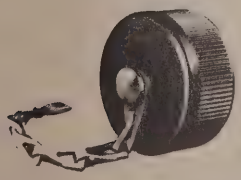


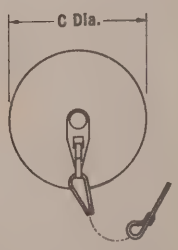
FOR 06 AND 08 STYLE PLUGS

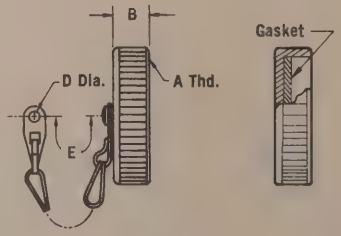
These externally threaded metal dust caps are used to protect the MS3106 and MS3108 plugs. Material is aluminum alloy. They are furnished with sash chain or less sash chain.

Part Number with Sash Chain MS (Ref.)	ITT Cannon	Less Sash Chain ITT Cannon	Fits Shell Size	B Max.	C Dia. Max.	E Max.	D Dia. Max.	A Thread
MS25042-8D	CA17530-5100	CA19741-8	8S	.656	.562	4.500	.166	½-28UNEF-2A
MS25042-10D	CA17530-5101	CA19741-10	10S, 10SL	.656	.687	4.500	.166	⅝-24UNEF-2A
MS25042-12D	CA17530-5102	CA19741-12	12, 12S	.844	.812	5.000	.166	¾-20UNEF-2A
MS25042-14D	CA17530-5103	CA19741-14	14S & 14	.844	.937	5.000	.166	⅞-20UNEF-2A
MS25042-16D	CA17530-5104	CA19741-16	16S & 16	.844	1.062	5.000	.166	1-20UNEF-2A
MS25042-18D	CA17530-5105	CA19741-18	18	.844	1.187	5.000	.166	1⅛-18UNEF-2A
MS25042-20D	CA17530-5106	CA19741-20	20	.844	1.312	5.500	.197	1¼-18UNEF-2A
MS25042-22D	CA17530-5107	CA19741-22	22	.844	1.437	5.500	.197	1⅜-18UNEF-2A
MS25042-24D	CA17530-5108	CA19741-24	24	.844	1.562	6.000	.197	1½-18UNEF-2A
MS25042-28D	CA17530-5109	CA19741-28	28	.844	1.812	8.250	.197	1¾-18UNEF-2A
MS25042-32D	CA17530-5110	CA19741-32	32	.844	2.062	8.250	.228	2-18UNEF-2A
MS25042-36D	CA17530-5111	CA19741-36	36	.844	2.312	8.250	.228	2¼-16UN-2A
MS25042-40D	CA17530-5112	CA19741-40	40	.844	2.562	8.250	.228	2½-16UN-2A
MS25042-44D	CA17530-5113	CA19741-44	44	.844	2.812	8.250	.228	2¾-16UN-2A
MS25042-48D	CA17530-5114	CA19741-48	48	.844	3.062	8.250	.228	3-16UN-2A

MS25043
CA2209
CA2322







FOR 00, 01 AND 02 STYLE RECEPTACLES

These internally threaded metal dust caps are used to protect MS3100, MS3101 and MS3102 receptacles. Material is aluminum alloy. They are furnished with sash chain or less sash chain.

Part Number with Sash Chain MS (Ref.)	ITT Cannon	Less Sash Chain ITT Cannon	Fits Shell Size	B Max.	C Dia. Max.	E Max.	D Dia. Max.	A Thread
MS25043-8D	CA2209-5100	CA2322-1	8S	.469	.688	4.500	.150	½-28UNEF-2B
MS25043-10D	CA2209-5101	CA2322-2	10S, 10SL	.469	.815	4.500	.150	⅝-24UNEF-2B
MS25043-12D	CA2209-5102	CA2322-3	12S, 12S	.469	1.000	5.000	.150	¾-20UNEF-2B
MS25043-14D	CA2209-5103	CA2322-4	14, 14S	.469	1.125	5.000	.150	⅞-20UNEF-2B
MS25043-16D	CA2209-5104	CA2322-5	16, 16S	.469	1.188	5.000	.150	1-20UNEF-2B
MS25043-18D	CA2209-5105	CA2322-6	18	.469	1.344	5.000	.150	1⅛-18UNEF-2B
MS25043-20D	CA2209-5106	CA2322-7	20	.469	1.469	5.500	.150	1¼-18UNEF-2B
MS25043-22D	CA2209-5107	CA2322-8	22	.469	1.594	5.500	.150	1⅜-18UNEF-2B
MS25043-24D	CA2209-5108	CA2322-9	24	.469	1.719	6.000	.181	1½-18UNEF-2B
MS25043-28D	CA2209-5109	CA2322-10	28	.531	1.969	8.250	.181	1¾-18UNS-2B
MS25043-32D	CA2209-5110	CA2322-11	32	.531	2.219	8.250	.197	2-18UNS-2B
MS25043-36D	CA2209-5111	CA2322-12	36	.531	2.469	8.250	.197	2¼-16UN-2B
MS25043-40D	CA2209-5112	CA2322-13	40	.531	2.719	8.250	.197	2½-16UN-2B
MS25043-44D	CA2209-5113	CA2322-14	44	.531	2.969	8.250	.197	2¾-16UN-2B
MS25043-48D	CA2209-5114	CA2322-15	48	.531	3.188	8.250	.197	3-16UN-2B

ITT CANNON ELECTRIC

MS STANDARD CIRCULAR CONNECTORS DESIGNED TO MIL-C-5015

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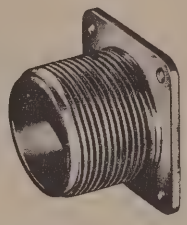
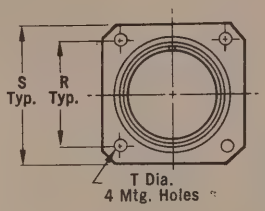
Dimensions subject to change.

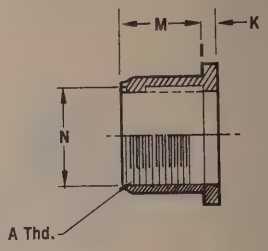
ACCESSORIES

DUMMY RECEPTACLE

CA2182
MS3105





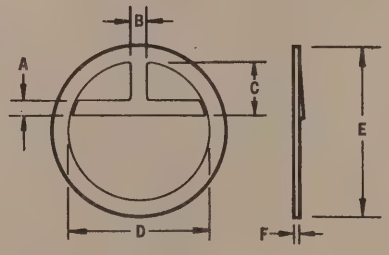


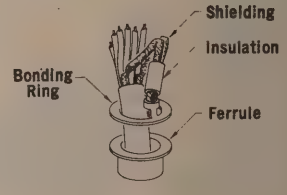
The CA2182 dummy receptacle holds MS3106 or MS3108 plugs when not in use. Material is aluminum alloy; finish is olive drab chromate over cadmium plate. These receptacles meet the requirements of MS3105.

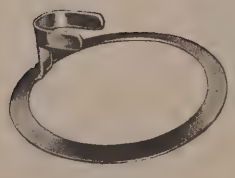
ITT Cannon Part No.	MS Part No.	Fits Shell Size	K Max.	M Max.	N Max.	R ±.005	S Max.	T +.010 −.005	A Thread
CA2182-2	MS3105-10S	10S & 10SL	.156	.593	.463	.719	1.031	.120	5/8-24UNEF-2A
CA2182-16	MS3105-12S	12S	.156	.593	.572	.812	1.125	.120	3/4-20UNEF-2A
CA2182-17	MS3105-14S	14S	.156	.593	.697	.906	1.219	.120	7/8-20UNEF-2A
CA2182-18	MS3105-16S	16S	.156	.593	.822	.969	1.312	.120	1-20UNEF-2A
CA2182-3	MS3105-12	12	.156	.781	.572	.812	1.125	.120	3/4-20UNEF-2A
CA2182-4	MS3105-14	14	.156	.781	.697	.906	1.219	.120	7/8-20UNEF-2A
CA2182-5	MS3105-16	16	.156	.781	.822	.969	1.312	.120	1-20UNEF-2A
CA2182-6	MS3105-18	18	.203	.781	.947	1.062	1.406	.120	1 1/8-18UNEF-2A
CA2182-7	MS3105-20	20	.203	.781	1.073	1.156	1.531	.120	1 1/4-18UNEF-2A
CA2182-8	MS3105-22	22	.203	.781	1.197	1.250	1.656	.120	1 3/8-18UNEF-2A
CA2182-9	MS3105-24	24	.203	.843	1.322	1.375	1.781	.147	1 1/2-18UNEF-2A
CA2182-10	MS3105-28	28	.203	.843	1.541	1.562	2.031	.147	1 3/4-18UNS-2A
CA2182-11	MS3105-32	32	.359	.906	1.791	1.750	2.281	.173	2-18UNS-2A
CA2182-12	MS3105-36	36	.359	.906	2.010	1.938	2.531	.173	2 1/4-16UN-2A
CA2182-13	—	40	.359	.906	2.260	2.188	2.781	.173	2 1/2-16UN-2A
CA2182-14	—	44	.359	.906	2.510	2.375	3.031	.173	2 3/4-16UN-2A
CA2182-15	—	48	.359	.906	2.760	2.625	3.281	.173	3-16UN-2A

BONDING RING

CA2250
AN3111







Bonding rings are used for bonding between endbell and wire shielding, and may be used with either a cable clamp or a flexible conduit coupling nut. Material is soft copper. All excess lengths of tongue may be cut away.

APPLICATION

The wire shield is separated from wire by drawing wire thru a pierced hole in the shielding. The bonding ring tongues are formed around the shielding pigtail and soldered. The soldered connection is protected by insulation such as plastic tubing or friction tape to prevent stray wires of the shielding braid from rupturing the insulation of other wires, thereby causing a short circuit. When the flexible conduit nut or cable clamp is tightened to the endbell of the plug, a satisfactory bond between the wire shielding and plug endbell is ensured.

Part Number	Fits Shell Size	A Min.	B Min.	C Max.	D Min.	E Max.	F Max.
AN3111-1	8S, 10S	.052	.052	.166	.318	.453	.025
AN3111-2	10SL, 12, 12S	.052	.052	.198	.436	.571	.025
AN3111-3	14 & 14S	.052	.052	.198	.552	.687	.025
AN3111-4	16 & 16S	.084	.084	.416	.615	.812	.025
AN3111-5	18	.115	.115	.322	.677	.937	.025
AN3111-6	20 & 22	.115	.115	.510	.909	1.110	.025
AN3111-7	24 & 28	.115	.115	.448	1.100	1.360	.025
AN3111-8	32	.115	.115	.572	1.413	1.673	.037
AN3111-9	36	.115	.115	.572	1.663	1.923	.037
AN3111-10	40	.115	.115	.572	1.905	2.165	.037
AN3111-11	44	.115	.115	.698	2.155	2.415	.037
AN3111-12	48	.115	.115	.698	2.655	2.915	.037

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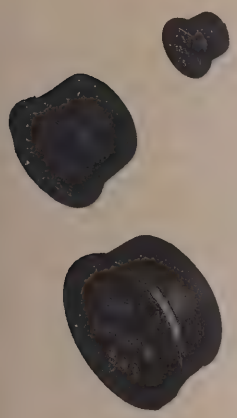
ACCESSORIES

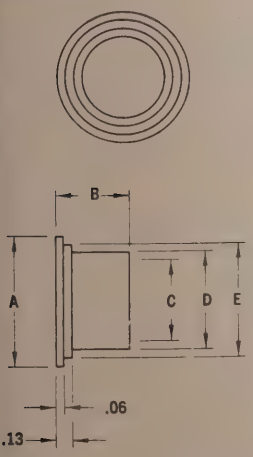
PLASTIC PROTECTIVE CAPS



Protective dust caps are designed to cover the coupling and conduit ends of MS connectors where there is a possibility of foreign matter accumulating on the interior of the connector or of damage to the threaded parts. Material is red polyethylene. Plastic dust caps can be reused, but are not intended to replace the standard aluminum dust caps shown on preceding pages.

Part Number	MS3100F, R Coupling End	MS3100F, R Solder Pot End	MS3102F, R Coupling End	MS3102F, R Solder Pot End	MS-F (only) Solder Pot End	MS3106/MS3108 F, R Coupling End	MS3106/MS3108 F, R Solder Pot End
025-0458-000				8S		8S	
025-0459-000	8S	8S, 10S	8S	8S, 10S	10S		8S, 10S
025-0460-000	10S, 10SL	10SL, 12S, 12	10S, 10SL	10SL, 12S, 12		10SL, 12S, 12	10SL, 12S, 12
025-0462-000	12S, 12	14S, 14	12S, 12	14S, 14			14S, 14
025-0463-000	14S, 14	16S, 16	14S, 14	16S, 16			16S, 16
025-0466-000				18	18		
025-0467-000				20		20	
025-0468-000	20		20	22	22		
025-0469-000	22			24	24		
025-0470-000				28			
025-0471-000				32			
025-0472-000				36			
025-0473-000				40			
025-0474-000				44			
025-0475-000				48			
025-0477-000						10S, 10SL	
025-0478-000						12S, 12	
025-0479-000						14S, 14	
025-0480-000						16S, 16	
025-0484-000						18	
025-0486-000						22	
025-0487-000						24	
025-0488-000						28	
025-0489-000						32	
025-0490-000						36	
025-0491-000						40	
025-0492-000						44	
025-0493-000						48	
025-0498-000	16S, 16	18	16S, 16	48			18
025-0499-000		20, 22		36		22	20, 22
025-0500-000		24, 28		40			24, 28
025-0501-000	28	32	28	44			32
025-0502-000	32	36	32	32			36
025-0503-000	36	40	36	24, 28			40
025-0504-000	40	44	40	20, 22			44
025-0505-000	48		48	18			48
025-0507-000	18		18		20		
025-0510-000	24		24				
025-0511-000	44	48	44				
025-0608-000					8S		
025-0609-000					10SL, 12S, 12		
025-0610-000					14S, 14		
025-0611-000					16S, 16		
025-0612-000					28		
025-0613-000					32		
025-0614-000					36		

DIMENSIONS



Part Number	A Max.	B Max.	C Max.	D Max.	E Max.	Wt. Lb.
025-0458-000	.673	.440	.430	.486	.583	.0012
025-0459-000	.734	.440	.490	.546	.644	.0014
025-0460-000	.848	.700	.600	.656	.758	.0022
025-0462-000	.973	.700	.730	.786	.883	.0028
025-0463-000	1.098	.700	.850	.908	1.008	.0033
025-0466-000	1.209	.700	.950	1.016	1.119	.0042
025-0467-000	1.396	.700	1.150	1.216	1.308	.0054
025-0468-000	1.500	.700	1.240	1.306	1.405	.0060
025-0469-000	1.625	.700	1.360	1.426	1.530	.0067
025-0470-000	1.870	.700	1.610	1.676	1.775	.0087
025-0471-000	2.120	.700	1.860	1.926	2.025	.0103
025-0472-000	2.370	.700	2.110	2.176	2.275	.0141
025-0473-000	2.501	.700	2.310	2.380	2.491	.0164
025-0474-000	2.872	.700	2.590	2.660	2.772	.0186
025-0475-000	3.122	.700	2.840	2.910	3.022	.0222
025-0477-000	.802	.491	.550	.616	.712	.0017
025-0478-000	.911	.571	.669	.725	.821	.0022
025-0479-000	1.036	.571	.794	.850	.946	.0027
025-0480-000	1.161	.571	.919	.975	1.071	.0033
025-0484-000	1.290	.576	1.028	1.094	1.195	.0044
025-0486-000	1.540	.576	1.278	1.344	1.445	.0058
025-0487-000	1.665	.576	1.403	1.469	1.570	.0066
025-0488-000	1.907	.576	1.645	1.711	1.812	.0084

Part Number	A Max.	B Max.	C Max.	D Max.	E Max.	Wt. Lb.
025-0489-000	2.157	.576	1.895	1.961	2.062	.0102
025-0490-000	2.412	.576	2.140	2.216	2.317	.0132
025-0491-000	2.672	.576	2.390	2.466	2.572	.0163
025-0492-000	2.922	.576	2.640	2.716	2.822	.0186
025-0493-000	3.172	.576	2.890	2.966	3.072	.0213
025-0498-000	1.240	.700	.990	1.056	1.150	.0044
025-0499-000	1.427	.700	1.117	1.183	1.337	.0055
025-0500-000	1.677	.700	1.420	1.486	1.587	.0072
025-0501-000	1.985	.700	1.730	1.796	1.895	.0095
025-0502-000	2.245	.700	1.980	2.046	2.155	.0114
025-0503-000	2.495	.700	2.230	2.296	2.400	.0134
025-0504-000	2.742	.700	2.480	2.546	2.652	.0186
025-0505-000	3.257	.700	2.980	3.046	3.157	.0233
025-0507-000	1.365	.700	1.110	1.176	1.275	.0050
025-0510-000	1.740	.700	1.490	1.556	1.650	.0077
025-0511-000	3.007	.700	2.730	2.796	2.907	.0220
025-0608-000	.643	.440	.400	.456	.553	.0011
025-0609-000	.829	.700	.580	.636	.739	.0021
025-0610-000	.954	.700	.710	.766	.864	.0028
025-0611-000	1.079	.700	.830	.886	.989	.0032
025-0612-000	1.839	.700	1.570	1.626	1.744	.0083
025-0613-000	2.089	.700	1.820	1.876	1.994	.0100
025-0614-000	2.376	.700	2.010	2.066	2.231	.0132

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ITT CANNON ELECTRIC

MINIATURE CIRCULAR CONNECTORS
PV/M83723/M26482

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

PVA/MIL-C-83723 (SERIES I)
PV7*/MIL-C-26482 (SERIES II)

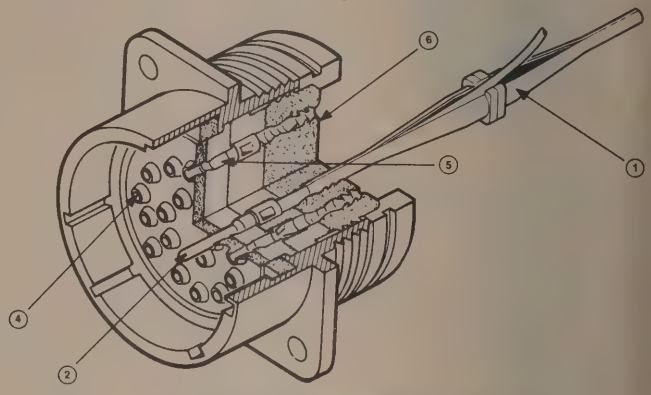
- **Intermateable with MIL-C-26482 Series I and NAS1599**
- **Operating temperature —55°C to +200°C**

The PV connector series is designed to meet the rugged requirements of NAS1599, the specification which delineates the critical requirements of space-age applications. PV connectors have been used extensively on major aerospace programs requiring general-purpose, miniature cylindrical bayonet coupling connectors such as Apollo, ATM, OWS, Minuteman, Skylab, Space Shuttle, Thor-Delta, Titan IIIC, and Viking.

PVA/PV7* connectors are available under numerous industrial specifications, some of which are listed below:

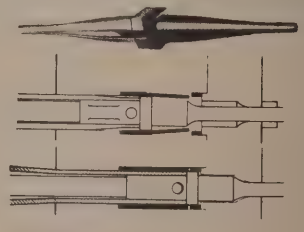
- MIL-C-83723 (Series I) USAF
- 40M39569 NASA, George C. Marshall Sprace Flight Center
- 81D52 Martin Marietta, Denver Division
- MC414-0365 Rockwell International Space Division
- AC414-0013 Rockwell International Autonetics Division
- STS0003 McDonnell Douglas Astronautics
- SV81 NAS1599 Martin Marietta/NASA Langley
- MIL-C-26482 (Series II) Navy

The PV series is an important member of the Universal Interconnect System (UIS) — the only system that can perform all interconnection missions. This system is adaptable for use with connectors of all shapes and sizes, including circular and rectangular configurations, standard, miniature and subminiature sizes. UIS is a rear servicing system that evolved from the LITTLE CAESAR® rear release contact retention assembly, pioneered and developed by ITT Cannon. Since this time, ITT Cannon, and its licensees, have supplied to industry over 250 million interconnections utilizing this system.



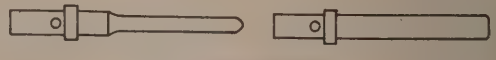
Universal Insertion/Extraction Tool Style — A single, expendable plastic tool is used for insertion and extraction of both pins and sockets. The tool never touches the engaging ends of contacts, and cannot damage the insert. **Contact Insertion** is accomplished with the colored insertion tip of the tool that butts against the contact shoulder. When the contact is fully inserted, the tines snap behind the contact shoulder. **Contact extraction** is equally simple. Using the white ends of the tool, insert the tool tip into the rear of the plug (or receptacle), expanding the tines beyond the contact shoulder and releasing the contact.

1.



Simple, Strong Contact Design — One basic configuration eliminates undercuts and maximizes bend resistance for positive contact mating.

2.



Closed-Entry Socket Insert — Hard dielectric socket face of mating connector has lead-in chamfers for positive alignment of pins and sockets.

3.

Interfacial Pin Insert Seal — Universal interconnect permits design of raised moisture barriers around each pin which mate into lead-in chambers of hard face socket insert for individual contact sealing. Interfacial sealing is never touched by service tools.

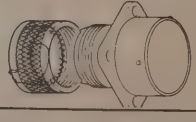
4.

Superior Contact Stability — Rear Contact Release System (LITTLE CAESAR contact assembly) features a stamped metal retaining clip captivated by molded-in shoulders of each contact cavity in the insulator. A rear-inserted plastic tool expands the tines beyond the contact shoulder, releasing the contact.

5.

Polarized Backshells — Interlocking teeth on the front of the backshell and rear portion of the shell allow endbells to be positioned as desired, eliminating chafing of wire during assembly.

6.



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MINIATURE CIRCULAR CONNECTORS
PV/M83723/M26482

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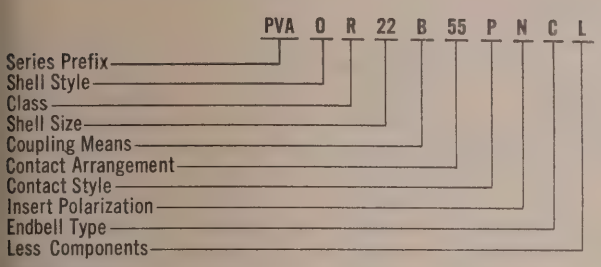
HOW TO ORDER

SERIES I — MIL-C-83723

ITT CANNON DESIGNATION



SERIES PREFIX
PVA — Interchangeable with MIL-C-83723, Series I

SHELL STYLE
0 — Narrow flange mounting receptacle
1 — Cable connecting receptacle
4 — Wide flange mounting receptacle
6 — Straight plug
7 — Single hole mounting receptacle

CLASS
R — Conductive finish (nickel), operating temp. −55°C to 200°C, fluid resistant
G — Conductive finish (nickel), operating temp. −55°C to 200°C, fluid resistant, RFI grounding (plug only)
A — Non-conductive finish (black anodize), operating temp. −55°C to 200°C, fluid resistant

SHELL SIZE
10, 12, 14, 16, 18, 20, 22 and 24

COUPLING MEANS
B — Bayonet

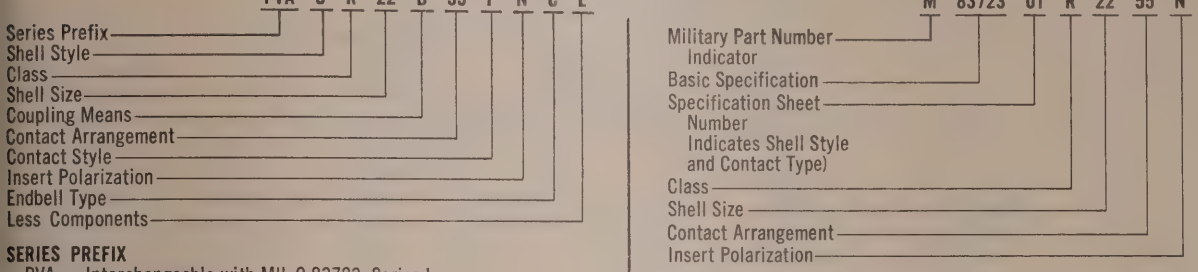
CONTACT ARRANGEMENTS
See following page.

INSERT POLARIZATION
N (normal), W, X, Y and Z

ENDBELL TYPE
C — Short (without strain relief)
R — 90° (with strain relief)
S — Straight (with strain relief)

LESS COMPONENTS
Use letter "L" if connectors are to be supplied less contacts, grommet sealing plugs, and insertion/extraction tools. ("L" is not marked on connectors)

MS DESIGNATION



MILITARY PART NO. INDICATOR
M

BASIC SPECIFICATION
MIL-C-83723

SPECIFICATION SHEET NUMBER (shell style and contact type)
01 — Narrow flange mounting receptacle with socket contacts
02 — Narrow flange mounting receptacle with pin contacts
03 — Wide flange mounting receptacle with socket contacts
04 — Wide flange mounting receptacle with pin contacts
05 — Single hole mounting receptacle with socket contacts
06 — Single hole mounting receptacle with pin contacts
07 — Cable connecting receptacle with socket contacts
08 — Cable connecting receptacle with pin contacts
13 — Straight plug with socket contacts
14 — Straight plug with pin contacts
42 — Straight plug, RFI grounding with pin contacts
43 — Straight plug, RFI grounding with socket contacts

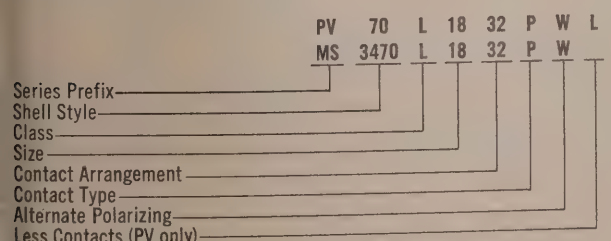
CLASS
R — Conductive finish (nickel), operating temp. −55°C to 200°C, fluid resistant
A — Non-conductive finish (black anodize), operating temp. −55°C to 200°C, fluid resistant

SHELL SIZE
10, 12, 14, 16, 18, 20, 22 and 24

CONTACT ARRANGEMENTS
See following page.

INSERT POLARIZATION
N (normal), W, X, Y and Z

SERIES II — MIL-C-26482



SERIES PREFIX
MS — Complies with MIL-C-26482
PV — ITT Cannon Interchangeable with MIL-C-26482 Series II

SHELL STYLE

Cannon Part No.	Military No.	Description
PV70	MS3470	— Narrow flange receptacle
PV71	MS3471	— Cable connecting receptacle
PV72	MS3472	— Wide flange receptacle
PV74	MS3474	— Jam nut receptacle
PV75	MS3475	— Straight plug, RFI grounding
PV76	MS3476	— Straight plug

CLASS
PV Series
L
MS Series
A — Fluid resistant, 200°C, non-conductive
L — Fluid resistant, 200°C, conductive finish (nickel)
W — Corrosive and fluid resistant, 175°C
(NOTE: ITTCE's PV, class "L" connectors meet the qualification requirements for both class "E" and "L" of MIL-C-26482.)

SHELL SIZE
10, 12, 14, 16, 18, 20, 22 and 24

CONTACT ARRANGEMENTS
See following page.

CONTACT TYPE
P — Pin contact
S — Socket contact
A — Less pin contact* (MS only)
B — Less socket contacts* (MS only)
*The "A" and "B" designators are used only when **other** than power contacts are to be installed (i.e. shielded, coaxial and thermocouple contacts).

ALTERNATE POLARIZING
No designation required for normal position.
Standard MS alternate positions available.

LESS CONTACTS
Use "L" if PV connectors are ordered less contacts, grommet sealing plugs and insertion/extraction tool ("L" is not stamped on connectors). To order MS connectors less contacts, purchase order must state less contacts.

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MINIATURE CIRCULAR CONNECTORS
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Dimensions subject to change

MILITARY SPECIFICATION CROSS REFERENCE CHART

PVA/PV7*, MIL-C-83723 (Series I) and MIL-C-26482 (Series II) Replacement for	MS Standards	ITT Cannon Prefix Commercial Design	MIL-C-83723 "Slash Sheet" Socket	MIL-C-83723 "Slash Sheet" Pin	ITT Cannon Prefix Commercial Design	Description
MIL-C-26482		**MIL-C-26482**			**MIL-C-83723**	
MS3110, MS3120	MS3470	PV70	/1	/2	PVA0	Narrow Flange Receptacle
MS3111, MS3121	MS3471	PV71	/7	/8	PVA1	Cable Connecting Receptacle
MS3112, MS3122	MS3470	PV70	/1	/2	PVA0	Narrow Flange Receptacle
MS3114, MS3124	MS3474	PV74	/5	/6	PVA7	Single Hole Mount Receptacle
MS3116, MS3126	MS3476	PV76	/13	/14	PVA6	Straight Plug
KSP/KSPM/KSSE	MS3472	PV72	/3	/4	PVA4	Wide Flange Receptacle
PV75	MS3475	PV75	/42	/43	PVA6G	Straight Plug, RFI Grounding
NAS1599						
NAS1650, NAS1699	MS3470	PV70	/1	/2	PVA0	Narrow Flange Receptacle
NAS1651, NAS1700	MS3472	PV72	/3	/4	PVA4	Wide Flange Receptacle
NAS1652, NAS1701	MS3474	PV74	/5	/6	PVA7	Single Hole Mount Receptacle
NAS1653, NAS1702	MS3476	PV76	/13	/14	PVA6	Straight Plug

ELECTRICAL DATA

Contact Size	Wire Size	Insulation O.D. Limits inch (mm) min.	Insulation O.D. Limits inch (mm) max.	Max. Current For Tests (amps) (MIL-C-83723)	Potential Drop (Millivolts at 25°C)
12	12	.097 (2,46)	.158 (4,01)	23	50
	14			17	45
16	16	.053 (1,35)	.103 (2,62)	13	50
	20			7.5	45
20	20	.040 (1,02)	.083 (2,11)	7.5	55
	24			3.0	45

Service Rating	Dielectric Withstanding Voltage sea level	Dielectric Withstanding Voltage 70,000 ft. altitude	Insulation Resistance (25°C)
1	1500 Vac rms	375 Vac rms	5000 megohms minimum
2	2300 Vac rms	500 Vac rms	5000 megohms minimum

STANDARD DATA

MATERIALS AND FINISHES

Description	Material	Finish
SHELL	Aluminum alloy per QQ-A-367	Electroless nickel plating per MIL-C-26074 or black anodize
INSULATORS	Mineral glass-filled epoxy	None
ELASTOMERS (grommets, interfacial and O ring seals)	Silicone rubber (ITT Cannon blend) Fluorosilicone rubber (ITT Cannon blend)	None None
CONTACTS	Copper alloy	Gold plate per MIL-G-45204
COUPLING NUT	Aluminum alloy per QQ-A-591	Electroless nickel plating per MIL-C-26074 or black anodize
JAM NUT (on PV74, PVA7)	Aluminum alloy per QQ-A-282	Electroless nickel plating per MIL-C-26074 or black anodize

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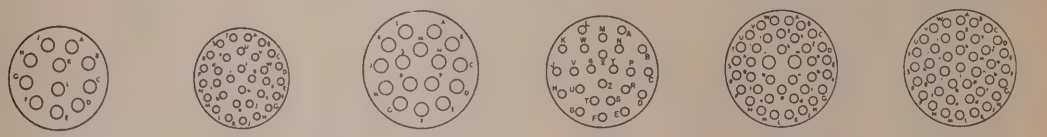
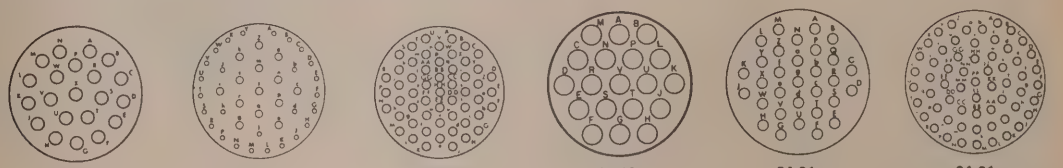
CONTACT ARRANGEMENTS (FACE VIEW, PIN INSERT)

SHELL SIZE	10-6	12-3	12-8	12-10	14-4	14-5	14-12	14-15
NO. OF CONTACTS	6-#20	3-#16	8-#20	10-#20	4-#12	5-#16	4-#16, 8-#20	1-#16, 14-#20
SERVICE RATING	1	2	1	1	1	2	1	1

SHELL SIZE	14-18	14-19	16-8	16-23	16-26	18-8
NO. OF CONTACTS	18-#20	19-#20	8-#16	1-#16, 22-#20	26-#20	8-#12
SERVICE RATING	1	1	2	1	1	1



SHELL SIZE	18-11	18-32	20-16	20-24	20-39	20-41
NO. OF CONTACTS	11-#16	32-#20	16-#16	24-#20	2-#16, 37-#20	41-#20
SERVICE RATING	2	1	2	1	1	1

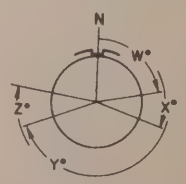


SHELL SIZE	22-21	22-41	22-55	24-19	24-31	24-61
NO. OF CONTACTS	21-#16	27-#20, 14-#16	55-#20	19-#12	31-#16	61-#20
SERVICE RATING	2	1 2	1	2	1	1

ALTERNATE POSITIONS

SHELL SIZE	ARRANGEMENT	N	W	POS CODE X	Y	Z
10	6	0°	90°	—	—	—
12	3	0°	—	—	180°	—
	8	0°	90°	112°	203°	292°
	10	0°	60°	155°	270°	295°
14	4	0°	45°	—	—	—
	5	0°	40°	92°	184°	273°
	12	0°	43°	90°	—	—
	15	0°	17°	110°	155°	234°
	18	0°	15°	90°	180°	270°
	19	0°	30°	165°	315°	—
16	8	0°	54°	152°	180°	331°
	23	0°	158°	270°	—	—
	26	0°	60°	—	275°	338°
18	8	0°	180°	—	—	—
	11	0°	62°	119°	241°	340°
	32	0°	85°	138°	222°	265°
20	16	0°	238°	318°	333°	347°
	24	0°	70°	145°	215°	290°
	39	0°	63°	144°	252°	333°
	41	0°	45°	126°	225°	—
22	21	0°	16°	135°	175°	349°
	36	0°	72°	144°	216°	288°
	41	0°	39°	135°	264°	—
	55	0°	30°	142°	226°	314°
24	19	0°	30°	165°	315°	—
	31	0°	90°	225°	255°	—
	61	0°	90°	180°	270°	324°

INSERT POSITION



(Face view of pin insert)

Contact arrangements requiring reduced diameter for lead-in chamfer on outer row of contact cavities as indicated below.

Shell	Contact Arrangements	Contact Cavities
12	10	C, G
14	12	A, B, C, D, E, F, G, and H
14	19	B, D, F, H, K, and M
16	26	A, B, C, D, E, F, G, H, J, K, L, M, N, P, and R
18	32	A, B, C, D, E, F, G, H, J, K, L, M, N, P, R, S, and T
22	41	A, B, C, D, E, F, G, H, J, K, L, M, N, P, R, S, T, U, V, W, X, and Y

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PV/M83723/M26482

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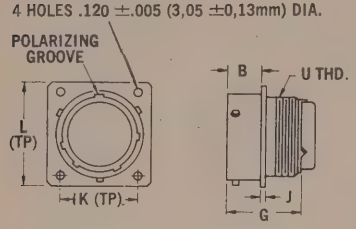
Dimensions subject to change.

NARROW FLANGE RECEPTACLE

MS3470/PV70
M83723-01 (socket)
M83723-02 (pin) / **PVA0**

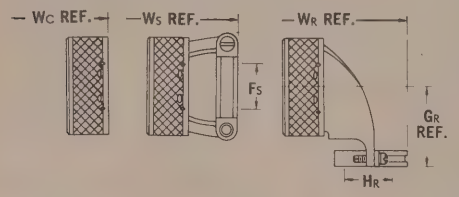
RECEPTACLE ASSEMBLY



RECEPTACLE ASSEMBLY WITHOUT BACKSHELL

SHELL SIZE*	INCHES B Max.	G Max.	J Max.	K	L	U Thread UNEF Class 2A	MILLIMETERS B Max.	F Max.	G Max.	J Max.	K	L
10	.462	1.215	.078	.719	.954	5/8-24	11,73	15,01	30,85	1,98	18,26	24,23
12	.462	1.215	.078	.812	1.047	3/4-20	11,73	19,08	30,85	1,98	20,62	26,59
14	.462	1.215	.078	.906	1.141	7/8-20	11,73	22,25	30,85	1,98	23,01	28,98
16	.462	1.215	.078	.969	1.234	1-20	11,73	25,43	30,85	1,98	24,61	31,34
18	.462	1.215	.078	1.062	1.328	1 1/16-18	11,73	28,60	30,85	1,98	26,97	33,73
20	.587	1.275	.110	1.156	1.453	1 3/16-18	14,91	31,78	32,40	2,79	29,36	36,91
22	.587	1.275	.110	1.250	1.578	1 5/16-18	14,91	34,95	32,40	2,79	31,75	40,08
24	.620	1.275	.110	1.375	1.703	1 7/16-18	15,75	38,13	32,40	2,79	34,93	43,26

BACKSHELL ASSEMBLIES
(Not supplied with MS connectors)



M83723	TYPE N	TYPE S	TYPE A
PVA0	TYPE C	TYPE S	TYPE R

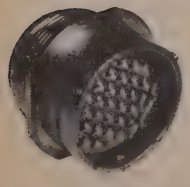
RECEPTACLE ASSEMBLIES WITH BACKSHELL†

SHELL SIZE*	INCHES TYPE C WC Max.	TYPE S FS Max.	TYPE S WS Max.	TYPE R GR Max.	TYPE R HR Max.	TYPE R WR Max.	MILLIMETERS TYPE C WC Max.	TYPE S FS Max.	TYPE S WS Max.	TYPE R GR Max.	TYPE R HR Max.	TYPE R WR Max.
10	1.492	.286	1.842	.880	.286	2.115	37,90	7,26	46,79	23,35	7,26	53,72
12	1.492	.416	1.842	.950	.416	2.250	37,90	10,57	46,79	24,13	10,57	57,15
14	1.492	.476	2.077	1.010	.476	2.340	37,90	12,09	52,76	25,65	12,09	59,44
16	1.492	.626	2.077	1.070	.626	2.475	37,90	15,90	52,76	27,18	15,90	62,87
18	1.492	.706	2.077	1.130	.706	2.574	37,90	17,93	52,76	28,70	17,93	65,38
20	1.552	.831	2.137	1.190	.831	2.767	39,42	21,11	54,28	30,23	21,11	70,28
22	1.552	.956	2.137	1.260	.956	2.890	39,42	24,28	54,28	32,00	24,28	73,41
24	1.552	1.081	2.137	1.320	1.081	3.012	39,42	27,46	54,28	33,53	27,46	76,50

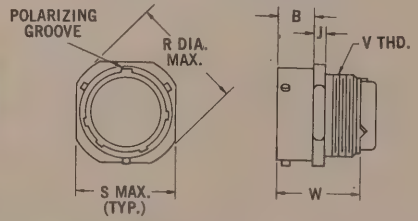
* See page 73 for part numbers.
† To order backshell assemblies separately, see page 80.

CABLE MOUNTING RECEPTACLE

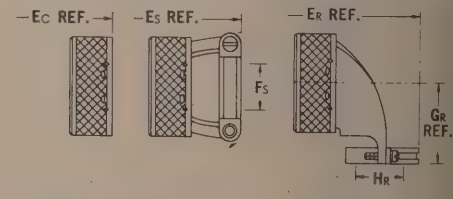
MS3471/PV71
M83723-07 (socket)
M83723-08 (pin) / **PVA1**



RECEPTACLE ASSEMBLY



BACKSHELL ASSEMBLIES
(Not supplied with MS connectors)



M83723	TYPE N	TYPE S	TYPE A
PVA1	TYPE C	TYPE S	TYPE R

RECEPTACLE ASSEMBLIES WITHOUT BACKSHELL

SHELL SIZE*	INCHES B Max.	J Max.	R Dia. Max.	S Max.	W Max.	V-Thread UNEF Class 2A	MILLIMETERS B Max.	J Max.	R Dia. Max.	S Max.	W Max.
10	.462	.078	1.082	.954	1.215	5/8-24	11,73	1,98	27,48	24,23	30,86
12	.462	.078	1.176	1.047	1.215	3/4-20	11,73	1,98	29,87	26,59	30,86
14	.462	.078	1.270	1.141	1.215	7/8-20	11,73	1,98	32,26	28,98	30,86
16	.462	.078	1.364	1.234	1.215	1-20	11,73	1,98	34,64	31,34	30,86
18	.462	.078	1.458	1.328	1.215	1 1/16-18	11,73	1,98	37,03	33,73	30,86
20	.587	.110	1.582	1.453	1.275	1 3/16-18	14,91	2,79	40,18	36,91	32,38
22	.587	.110	1.708	1.578	1.275	1 5/16-18	14,91	2,79	43,38	40,08	32,38
24	.620	.110	1.832	1.703	1.275	1 7/16-18	15,75	2,79	46,53	43,26	32,38

* See page 73 for part numbers.

RECEPTACLE ASSEMBLIES WITH BACKSHELL†

SHELL SIZE*	INCHES TYPE C EC Max.	TYPE S FS Max.	TYPE S ES Max.	TYPE R GR Max.	TYPE R HR Max.	TYPE R ER Max.	MILLIMETERS TYPE C EC Max.	TYPE S FS Max.	TYPE S ES Max.	TYPE R GR Max.	TYPE R HR Max.	TYPE R ER Max.
10	1.492	.286	1.842	.880	.286	2.115	37,90	7,26	46,79	23,35	7,26	53,72
12	1.492	.416	1.842	.950	.416	2.250	37,90	10,57	46,79	24,13	10,57	57,15
14	1.492	.476	2.077	1.010	.476	2.340	37,90	12,09	52,76	25,65	12,09	59,44
16	1.492	.626	2.077	1.070	.626	2.475	37,90	15,90	52,76	27,18	15,90	62,87
18	1.492	.706	2.077	1.130	.706	2.574	37,90	17,93	52,76	28,70	17,93	65,38
20	1.552	.831	2.137	1.190	.831	2.767	39,42	21,11	54,28	30,23	21,11	70,28
22	1.552	.956	2.137	1.260	.956	2.890	39,42	24,28	54,28	32,00	24,28	73,41
24	1.552	1.081	2.137	1.320	1.081	3.012	39,42	27,46	54,28	33,53	27,46	76,50

† To order backshell assemblies separately, see page 80.

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

MINIATURE CIRCULAR CONNECTORS
PV/M83723/M26482

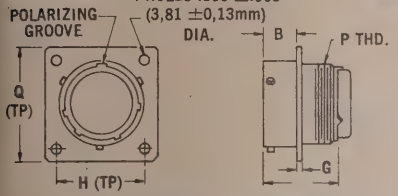
For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

Dimensions subject to change.

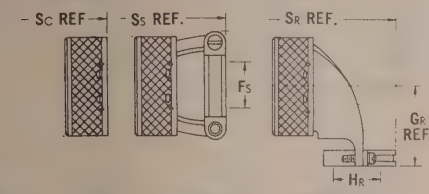
WIDE FLANGE RECEPTACLE

MS3472/PV72
M83723-03 (socket)
M83723-04 (pin) / **PVA4**

RECEPTACLE ASSEMBLY



BACKSHELL ASSEMBLIES
(Not supplied with MS connectors)



M83723	TYPE N	TYPE S	TYPE A
PVA4	TYPE C	TYPE S	TYPE R

RECEPTACLE ASSEMBLIES WITHOUT BACKSHELL

SHELL SIZE*	INCHES B Max.	F Max.	G Max.	H Max.	Q Max.	P Thread UNEF Class 2A	MILLIMETERS B Max.	F Max.	G Max.	H Max.	Q Max.
10	.493	1.215	.078	.812	1.141	5/8-24	12,52	30,85	1,98	20,62	28,98
12	.493	1.215	.078	.938	1.266	3/4-20	12,52	30,85	1,98	23,83	32,16
14	.493	1.215	.078	1.031	1.360	7/8-20	12,52	30,85	1,98	26,19	34,54
16	.493	1.215	.078	1.125	1.453	1-20	12,52	30,85	1,98	28,58	36,91
18	.493	1.215	.078	1.203	1.532	1 1/16-18	12,52	30,38	1,98	30,56	38,91
20	.587	1.275	.110	1.297	1.688	1 3/16-18	14,91	32,40	1,98	32,94	42,88
22	.587	1.275	.110	1.375	1.766	1 5/16-18	14,91	32,40	1,98	34,93	44,86
24	.620	1.275	.110	1.500	1.891	1 7/16-18	15,75	32,40	1,98	38,10	48,03

RECEPTACLE ASSEMBLIES WITH BACKSHELL†

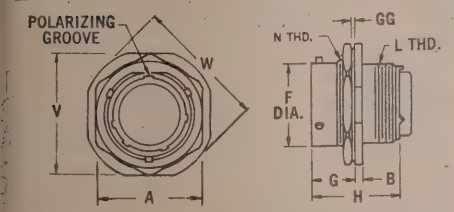
SHELL SIZE*	INCHES TYPE C Sc Max.	TYPE S Fs Max.	TYPE S Ss Max.	TYPE R GR Max.	TYPE R HR Max.	TYPE R SR Max.	MILLIMETERS TYPE C Sc Max.	TYPE S Fs Max.	TYPE S Ss Max.	TYPE R GR Max.	TYPE R HR Max.	TYPE R SR Max.
10	1.492	.286	1.842	.880	.286	2.115	37,90	7,26	46,79	22,35	7,26	53,72
12	1.492	.416	1.842	.950	.416	2.250	37,90	10,57	46,79	24,13	10,57	57,15
14	1.492	.476	2.077	1.010	.476	2.340	37,90	12,09	52,76	25,65	12,09	59,44
16	1.492	.626	2.077	1.070	.626	2.475	37,90	15,90	52,76	27,18	15,90	62,87
18	1.492	.706	2.077	1.130	.706	2.574	37,90	17,93	52,76	28,70	17,93	65,38
20	1.552	.831	2.137	1.190	.831	2.767	39,42	21,11	54,28	30,23	21,11	70,28
22	1.552	.956	2.137	1.260	.956	2.890	39,42	24,28	54,28	32,00	24,28	73,41
24	1.552	1.081	2.137	1.320	1.081	3.012	39,42	27,46	54,28	33,53	27,46	76,50

* See page 73 for part numbers.
† To order backshell assemblies separately, see page 80.

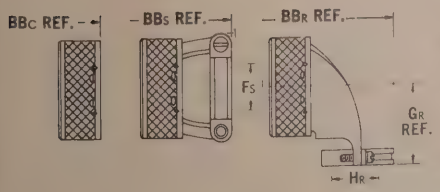
JAM NUT

MS3474/PV74
M83723-05 (socket)
M83723-06 (pin) / **PVA7**

RECEPTACLE ASSEMBLY



BACKSHELL ASSEMBLIES
(Not supplied with MS connectors)



M83723	TYPE N	TYPE S	TYPE A
PVA7	TYPE C	TYPE S	TYPE R

RECEPTACLE ASSEMBLIES WITHOUT BACKSHELL

SHELL SIZE*	INCHES V Max.	A Max.	B Max.	F Max.	G	GG Panel Thickness	H Max.	W Dia.	L Thread UNEF Class 2A
10	1.078	.892	.113	.591	.707	.187	1.215	1.203	5/8-24
12	1.266	1.079	.113	.751	.707	.187	1.215	1.391	3/4-20
14	1.391	1.205	.113	.876	.707	.187	1.215	1.516	7/8-20
16	1.516	1.329	.113	1.001	.707	.187	1.215	1.641	1 -20
18	1.641	1.455	.113	1.126	.707	.187	1.215	1.766	1 1/16-18
20	1.828	1.579	.148	1.251	.772	.250	1.275	1.954	1 3/16-18
22	1.954	1.705	.148	1.376	.772	.250	1.275	2.078	1 3/16-18
24	2.078	1.829	.148	1.501	.772	.219	1.275	2.203	1 1/16-18

SHELL SIZE*	MILLIMETERS V Max.	A Max.	B Max.	F Max.	G	GG Panel Thickness	H Max.	W Dia.
10	27,38	22,66	2,87	15,01	17,96	4,75	30,85	30,56
12	32,16	27,41	2,87	19,08	17,96	4,75	30,85	35,33
14	35,33	30,61	2,87	22,25	17,96	4,75	30,85	38,51
16	38,51	33,76	2,87	25,43	17,96	4,75	30,85	41,68
18	41,68	36,96	2,87	28,60	17,96	4,75	30,85	44,86
20	46,43	40,11	3,76	31,78	19,61	6,35	32,40	49,63
22	49,63	43,31	3,76	34,95	19,61	6,35	32,40	52,78
24	52,78	46,46	3,76	38,13	19,61	5,56	32,40	55,96

RECEPTACLE ASSEMBLIES WITH BACKSHELL†

SHELL SIZE*	INCHES TYPE C BBC Max.	TYPE S BBS Max.	TYPE S FS Max.	TYPE R BBR Max.	TYPE R GR Max.	TYPE R HR Max.	MILLIMETERS TYPE C BBC Max.	TYPE S BBS Max.	TYPE S FS Max.	TYPE R BBR Max.	TYPE R GR Max.	TYPE R HR Max.
10	1.492	1.842	.286	2.115	.880	.286	37,90	46,79	7,26	53,72	22,35	7,26
12	1.492	1.842	.416	2.250	.950	.416	37,90	46,79	10,57	57,15	24,13	10,57
14	1.492	2.077	.476	2.340	1.010	.476	37,90	52,76	12,09	59,44	25,65	12,09
16	1.492	2.077	.626	2.475	1.070	.626	37,90	52,76	15,90	62,87	27,18	15,90
18	1.492	2.077	.706	2.574	1.130	.706	37,90	52,76	17,93	65,38	28,70	17,93
20	1.552	2.137	.831	2.767	1.190	.831	39,42	54,28	21,11	70,28	30,23	21,11
22	1.552	2.137	.956	2.890	1.260	.956	39,42	54,28	24,28	73,41	32,00	24,28
24	1.552	2.137	1.081	3.012	1.320	1.081	39,42	54,28	27,46	76,50	33,53	27,46

* See page 73 for part numbers.
†To order backshell assemblies separately, see page 80.

ITT CANNON ELECTRIC

MINIATURE CIRCULAR CONNECTORS
PV/M83723/M26482

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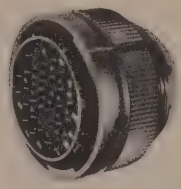
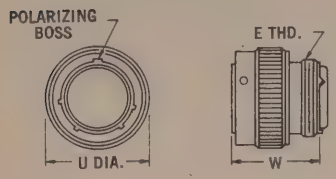
Dimensions subject to change.

STRAIGHT PLUG

MS3476/PV76
M83723-13 (socket)
M83723-14 (pin) / **PVA6**



PLUG ASSEMBLY

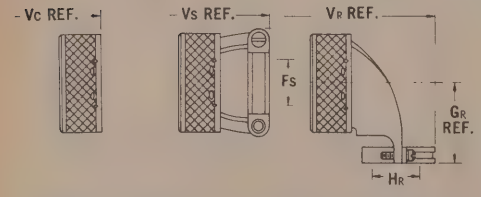


PLUG ASSEMBLIES WITHOUT BACKSHELL

INCHES

SHELL SIZE*	U Max.	W Max.	E Thread UNEF Class 2A	U Max.	W Max.
10	.926	1.230	5/8-24	21,72	31,24
12	1.048	1.230	3/4-20	26,42	31,24
14	1.183	1.230	7/8-20	29,97	31,24
16	1.305	1.230	1 -20	33,15	31,24
18	1.391	1.230	1 1/16-18	35,33	31,24
20	1.531	1.230	1 3/16-18	38,89	31,24
22	1.656	1.230	1 5/16-18	42,06	31,24
24	1.777	1.230	1 7/16-18	45,14	31,24

BACKSHELL ASSEMBLIES
(Not supplied with MS connectors)



M83723	TYPE N	TYPE S	TYPE A
PVA6	TYPE C	TYPE S	TYPE R

PLUG ASSEMBLIES WITH BACKSHELL†

INCHES | **MILLIMETERS**

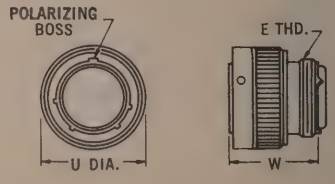
SHELL SIZE*	TYPE C Vc Max.	TYPE S Fs Max.	TYPE S Vs Max.	TYPE R GR Max.	TYPE R HR Max.	TYPE R VR Max.	TYPE C Vc Max.	TYPE S Fs Max.	TYPE S Vs Max.	TYPE R GR Max.	TYPE R HR Max.	TYPE R VR Max.
10	1.507	.286	1.857	.880	.286	2.130	38,28	7,26	47,17	22,35	7,26	54,10
12	1.507	.416	1.857	.950	.416	2.265	38,28	10,57	47,17	24,13	10,57	57,53
14	1.507	.476	2.092	1.010	.476	2.355	38,28	12,09	53,14	25,65	12,09	59,82
16	1.507	.626	2.092	1.070	.626	2.490	38,28	15,90	53,14	27,18	15,90	63,25
18	1.507	.706	2.092	1.130	.706	2.589	38,28	17,93	53,14	28,70	17,93	65,76
20	1.507	.831	2.092	1.190	.831	2.722	38,28	21,11	53,14	30,23	21,11	69,14
22	1.507	.956	2.092	1.260	.956	2.845	38,28	24,28	53,14	32,00	24,28	72,26
24	1.507	1.081	2.092	1.320	1.081	2.967	38,28	27,46	53,14	33,53	27,46	75,36

* See page 71 for part numbers.
† To order backshell assemblies separately, see page 78.

STRAIGHT PLUG R. F. I. SHIELDED

MS3475/PV75
M83723-42 (pin)
M83723-43 (socket) / **PVA6G**

PLUG ASSEMBLY



INCHES | **MILLIMETERS**

SHELL SIZE*	E Thread UNEF Class 2A	U Max.	W Max.	SHELL SIZE*	E Thread UNEF Class 2A	U Max.	W Max.
10	5/8-24	.926	1.230	10	5/8-24	21,72	31,24
12	3/4-20	1.048	1.230	12	3/4-20	26,42	31,24
14	7/8-20	1.183	1.230	14	7/8-20	29,97	31,24
16	1 -20	1.305	1.230	16	1 -20	33,15	31,24
18	1 1/16-18	1.391	1.230	18	1 1/16-18	35,33	31,24
20	1 3/16-18	1.531	1.230	20	1 3/16-18	38,89	31,24
22	1 5/16-18	1.656	1.230	22	1 5/16-18	42,06	31,24
24	1 7/16-18	1.777	1.230	24	1 7/16-18	45,14	31,24

* See page 71 for part numbers.

For a quick response to your application needs call one of the following District Offices:
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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

MINIATURE CIRCULAR CONNECTORS
PV/M83723/M26482

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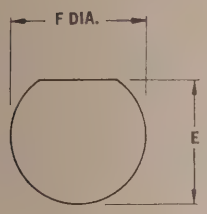
Dimensions subject to change.

PANEL CUTOUTS

JAM NUT RECEPTACLE

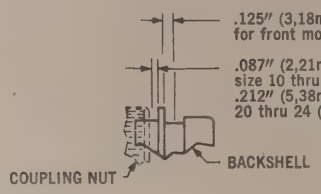


Shell Size	INCHES E	INCHES F DIA.	MILLIMETERS E	MILLIMETERS F DIA.
8				
10	.661	.697	16,79	17,70
12	.824	.895	20,93	22,73
14	.948	1.010	24.08	25,65
16	1.072	1.135	27,23	28,33
18	1.197	1.260	30,40	32,00
20	1.322	1.385	33,58	35,18
22	1.447	1.510	36,75	38,35
24	1.572	1.635	39,93	41,53

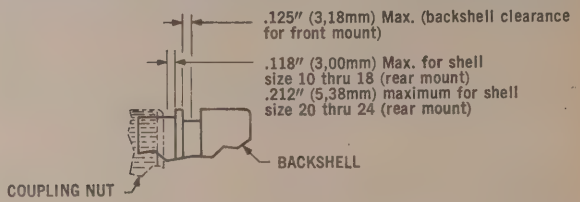
PANEL THICKNESS

Shown here are the maximum panel thickness dimensions allowable to ensure complete connector operation.

NARROW FLANGE RECEPTACLE

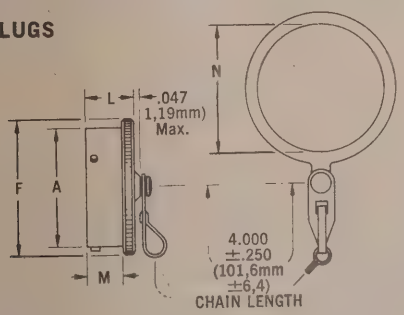

.125" (3,18mm) Max. (backshell clearance for front mount)
.087" (2,21mm) Max. for shell size 10 thru 18 (rear mount)
.212" (5,38mm) Max. for shell size 20 thru 24 (rear mount)
BACKSHELL
COUPLING NUT

WIDE FLANGE RECEPTACLE

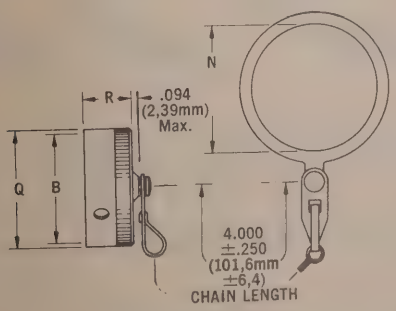

.125" (3,18mm) Max. (backshell clearance for front mount)
.118" (3,00mm) Max. for shell size 10 thru 18 (rear mount)
.212" (5,38mm) maximum for shell size 20 thru 24 (rear mount)
BACKSHELL
COUPLING NUT

PROTECTIVE METAL CAPS

CAP FOR PLUGS



CAP FOR RECEPTACLES



Shell Size	A Max.	B Max.	F Max.	L Max.	M Max.	N Min.	Q Max.	R Max.
8	.474	.486	.719	.562	.399	.578	.734	.562
10	.591	.607	.844	.562	.399	.703	.859	.562
12	.751	.766	1.000	.562	.399	.891	1.000	.562
14	.876	.890	1.125	.562	.399	1.016	1.125	.562
16	1.001	1.015	1.250	.562	.399	1.141	1.250	.562
18	1.126	1.141	1.375	.562	.399	1.266	1.375	.562
20	1.251	1.265	1.500	.625	.461	1.391	1.500	.562
22	1.376	1.390	1.625	.625	.461	1.516	1.625	.562
24	1.501	1.515	1.750	.658	.494	1.641	1.750	.602

INCHES

MILLIMETERS

A Max.	B Max.	F Max.	L Max.	M Max.	N Max.	Q Max.	R Max.
12,04	12,34	18,26	14,27	10,13	14,68	18,64	14,27
15,01	15,42	21,44	14,27	10,13	17,86	21,82	14,27
19,08	19,46	25,40	14,27	10,13	22,63	25,40	14,27
22,25	22,60	28,58	14,27	10,13	25,81	28,58	14,27
25,43	25,78	31,75	14,27	10,13	28,98	31,75	14,27
28,60	28,98	34,93	14,27	10,13	32,16	34,93	14,27
31,78	32,13	38,10	15,88	11,71	35,33	38,10	14,27
34,96	35,31	41,26	15,88	11,71	38,51	41,26	14,27
38,13	38,48	44,45	16,71	12,55	41,68	44,45	15,29

HOW TO ORDER

PV DESCRIPTION

PVS G 80 -22 C

Series Prefix
PVS—ITT Cannon prefix

Class
G—Conductive, nickel finish, fluid resistant
A—Nonconductive anodize finish

Type
80—Plug cap
81—Receptacle cap

Shell Size
8 through 24

Termination Style
No letter—without chain
C—Sash chain without ring
N—Sash chain with ring

MS DESCRIPTION

M83723 -44 -22 C

M Number Prefix

Slash Sheet
44—Receptacle cap
46—Plug cap

Shell Size

Termination Style
No letter—without chain
C—Sash chain without ring
N—Sash chain with ring

For a quick response to your application needs call one of the following District Offices:
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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

MINIATURE CIRCULAR CONNECTORS PV/M83723/M26482

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory)

Dimensions subject to change.

COMPONENTS/ACCESSORIES

DUMMY RECEPTACLES

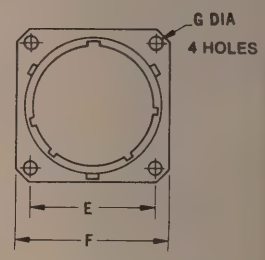
HOW TO ORDER

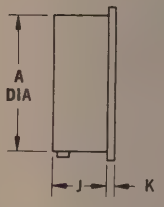
PVS -15 G 12

- Series Prefix
- Dummy Receptacle Indicator: -15 — PV
- Class: G — conductive finish (nickel); A — nonconductive finish (anodized)
- Shell Size: 10 thru 24

M83723 -45 -22

- M Number Prefix
- Slash Sheet
- Shell Size





Shell Size	Inches A Max.	E Basic	F Max.	G Max.	J Max.	K Max.	Millimeters A Max.	E Basic	F Max.	G Max.	J Max.	K Max.
8	.474	.594	.828	.125	.493	.078	12,04	15,09	21,03	3,18	12,52	1,98
10	.591	.719	.954	.125	.493	.078	15,01	18,26	24,23	3,18	12,52	1,98
12	.751	.812	1.047	.125	.493	.078	19,06	20,62	26,60	3,18	12,52	1,98
14	.876	.906	1.141	.125	.493	.078	22,25	23,01	28,98	3,18	12,52	1,98
16	1.001	.969	1.234	.125	.493	.078	25,43	24,61	31,34	3,18	12,52	1,98
18	1.126	1.062	1.328	.125	.493	.078	28,60	26,97	33,73	3,18	12,52	1,98
20	1.251	1.156	1.453	.125	.587	.110	31,76	29,36	36,91	3,18	14,91	2,79
22	1.376	1.250	1.578	.125	.587	.110	34,95	31,75	40,08	3,18	14,91	2,79
24	1.501	1.375	1.703	.152	.620	.110	38,13	34,93	43,26	3,86	15,75	2,79

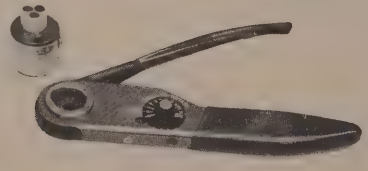
CONTACTS

Contact Size	Type	Part Numbers (MS26482) M39029-	M83723-	ITT Cannon
20	Socket	5-20-20	34B20	031-9174-004
20	Pin	4-20-20	33B20	030-9173-006
16	Socket	5-16-16	34B16	031-9206-006
16	Pin	4-16-16	33B16	030-9205-007
12	Socket	5-12-12	34B12	031-9186-003
12	Pin	4-12-12	33B12	030-9185-003

WIRE HOLE FILLERS

Contact Size	Part Numbers (MS26482) MS3187-	M83723-	ITT Cannon	Color Code
20	20-2	28-20	225-0070-000	Red
16	16-2	28-16	225-0071-000	Blue
12	12-2	28-12	225-0072-000	Yellow

CRIMP TOOL



M22520/1-01 Crimp Tool with M22520/1-02 Turret

INSERTION/EXTRACTION TOOLS

Size Contact	Part Number MS3447-	M83723-	ITT Cannon	Tool Handle	Tool for Unwired Contacts
20	20	31-20	CIET-20	084-0067-000	274-7007-000
16	16	31-16	CIET-16	084-0068-000	274-7008-000
12	12	31-12	CIET-12	084-0069-000	274-7009-000

BACKSHELLS (Not supplied with MS Connectors)

Shell Size	TYPE C (SHORT) M83723 Conductive (Nickel finish)	ITT CANNON Non-conductive (Anodized finish)	ITT CANNON Conductive (Nickel finish)	TYPE S (STRAIGHT) M83723 Conductive (Nickel finish)	ITT CANNON Non-conductive (Anodized finish)	ITT CANNON Conductive (Nickel finish)	TYPE R (90°) M83723 Conductive (Nickel finish)	ITT CANNON Non-conductive (Anodized finish)	ITT CANNON Conductive (Nickel finish)
10	15N-10	057-0716-000	057-0716-002	15S-10	057-0683-000	057-0683-002	15A-10	057-0704-000	057-0704-001
12	15N-12	057-0717-000	057-0717-002	15S-12	057-0684-000	057-0684-002	15A-12	057-0705-000	057-0705-001
14	15N-14	057-0718-000	057-0718-002	15S-14	057-0685-000	057-0685-002	15A-14	057-0706-000	057-0706-001
16	15N-16	057-0719-000	057-0719-002	15S-16	057-0686-000	057-0686-002	15A-16	057-0707-000	057-0707-001
18	15N-18	057-0720-000	057-0720-002	15S-18	057-0687-000	057-0687-002	15A-18	057-0708-000	057-0708-001
20	15N-20	057-0721-000	057-0721-002	15S-20	057-0688-000	057-0688-002	15A-20	057-0709-000	057-0709-001
22	15N-22	057-0722-000	057-0722-002	15S-22	057-0689-000	057-0689-002	15A-22	057-0710-000	057-0710-001
24	15N-24	057-0723-000	057-0723-002	15S-24	057-0713-000	057-0713-002	15A-24	057-0711-000	057-0711-001

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

CIRCULAR CONNECTORS SURE-SEAL™

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

Dimensions subject to change.
(millimeters are in parenthesis)

RELIABILITY. LOW COST. PERFORMANCE. DELIVERY!

ITT Cannon Electric provides them all with SURE-SEAL™ — a new series of low cost, UL and CSA recognized, environmental connectors.

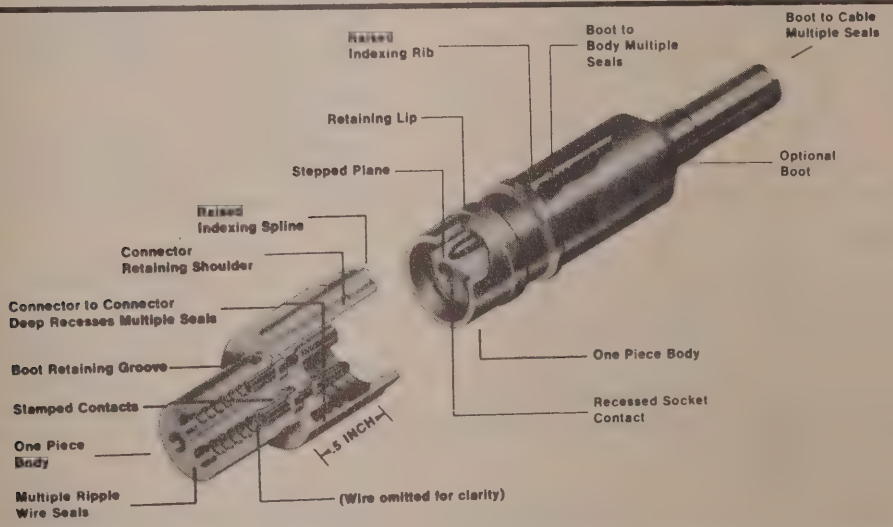
The one-piece molded body and rugged multiple moisture seals make the SURE-SEAL connector a natural for applications whose outside contaminants must be excluded.

One of the many features of the SURE-SEAL connector is its simplicity. In addition to the contacts, only two other parts — the connector bodies — are required to complete the interconnect.

ITT Cannon developed SURE-SEAL connectors to meet the increased requirements for safety and reliability in the automotive field brought about by Department of Transportation regulations. These sealed connectors satisfy all of the parameters defined by automotive/industrial standards including vibration, shock, temperature cycling, salt water spray and immersion, petroleum derivatives, industrial gas, and most important low millivolt drop and low contact resistance.

Along with the SURE-SEAL connector Cannon has developed another automotive/industrial connect series called the VE connector. For more information on this heavy duty transportation equipment connector please turn to page 84.

FEATURES



Low Installed Cost
ITT Cannon's Sure-Seal connectors are designed to be terminated by the O.E.M. The O.E.M. being the termination facility gives complete in-house capability! The total installed cost is what counts.

Field Serviceable
When necessary, Sure Seal connectors can be change, modified, or re-wired in the field.

One-Piece Molded Bodies
The Sure-Seal connector incorporates a very simple one-piece molded body. No other parts — other than contacts — are needed to assemble a complete connector.

Low Cost Stamped Contacts
Without sacrificing quality, the cost of Sure-Seal connectors is kept low by using stamped contacts available on reels in a continuous strip for use on the industry accepted ABT-500 or ABT-606 semi automatic crimp press. All contacts utilize a "B" type crimp.

Wide Wire Gage Accommodations
Ideally suited to be terminated on SAE-J878A or SAE-J558A wires of size 14, 16 and 18 AWG, wire sizes with insulation in the range of .100 to .147 inches, termination to multi-conductor jacketed cables in the range of .208 to .380 inches diameter, and can be terminated to three different wire ranges with total environmental sealing still assured.

Polarized Against Mis-Mates
Sure-Seal Connector mating faces are constructed with two stepped planes; the plug and receptacle must be properly oriented in order for the contacts to engage. For "blind" mating a raised indexing rib and matching raised indexing spline has been added to the plug and receptacle.

Water Submersible
Not just splash proof, but truly submersible for short periods of time. The Sure-Seal connector has been successfully tested in up to three feet of 5% water saline solution. Note: Although Sure-Seal can withstand submersion, it is not designed to be used as an underwater connector.

Resistant to Automotive/Commercial Environments
Sure-Seal connectors are designed to meet temperatures from −40°C to 105°C under conditions of high humidity severe vibration, ice and mud. Sealing integrity is still maintained with exposure to brake fluid, gasoline, diesel fuel, anti-freeze, ultra violet, ozone, steam cleaning under normal operating conditions.

ITT CANNON ELECTRIC

CIRCULAR CONNECTORS
SURE-SEAL™

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Dimensions subject to change.
(millimeters are in parenthesis

GENERAL INFORMATION — HOW TO ORDER

To order connector, specify component parts as listed below:

Insert Arrangement	Receptacle Housing	Plug Housing	Boot	Clip/Clamp	Color
SS1*	120-1833-000	120-1832-000	N/A	026-0452-000	Black
SS2*	120-1804-000	120-1807-000	317-1398-000	029-0263-000	Red
SS3*	120-1805-000	120-1808-000	317-1397-000	029-0262-000	Yellow
SS4*	120-1806-000	120-1809-000	317-1399-000		
SS5*	120-1839-000	120-1841-000	N/A	026-0450-000	Natural
SS6*	120-1840-000	120-1842-000	N/A		
SS7*	120-1874-000	120-1873-000	N/A		
SS8*	120-1866-000	120-1865-000	N/A	026-0451-000	Black
SS9*	120-1868-000	120-1867-000	N/A		
SS10*	120-1870-000	120-1869-000	N/A		

* Add R for Receptacle and P for Plug.

ORDERING EXAMPLE FOR COMPLETE SS2R:

120-1804-000	Receptacle Body	1 ea.
317-1398-000	Boot	1 ea. (optional)
030-2196-000	Contact Pin	1 ea.
031-1267-000	Contact Socket	1 ea.

		Contact Part Numbers	
		Pin	Socket
Standard	Individual	030-2196-000	031-1267-000
	Reels of 5000	110238-0040	110238-0085
Insulation Support	Individual	030-2196-001	031-1267-001
	Reels of 5000	110238-0195	110238-0194

STANDARD DATA

MATERIALS AND FINISHES

Plug	Elastomeric material
Receptacle	Elastomeric material
Contacts	Copper alloy, tin-lead plate

MECHANICAL DATA

Crimp Contacts	Semi-automatic or hand crimpable
Contact Positions	1 thru 10
Polarization	Stepped plane positive polarization and visual polarization
Contact Retention	7.5 lbs. dead weight minimum
Contact Insertion	From rear with simple hand tool, or simultaneous insertion of multiple crimped contacts

* Consult factory for other diameters.

ELECTRICAL DATA

Contact Resistance	10 Milliohms maximum
Current Rating	15 amps continuous at 85°C 8 amps continuous at 105°C
Insulation Resistance	100 Megohms minimum
Dielectric Withstanding Voltage	1,200 VAC at sea level
Wire Range	14 AWG to 18 AWG
Wire Insulation Sealing Range*	.100" minimum; .147" maximum

ACCESSORIES

Protective Seal Boot	Seals cabled wire jackets to connector housing
Mechanical Clips/Clamps	Increases connector-to-connector pull apart values plus indicator for proper assembly

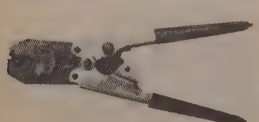
TEST CRITERIA

Sealing Capability	3 foot depth immersion in 5% salt solution, room ambient
Weather, Ozone and Ultra Violet Resistance	In accordance with ASTM D-1149 (100 pphm) and ASTM D-1171 (outdoor exposure)
Industrial Gas	Equivalent to MIL-C-23216, para. 4.6.13.
Durability	50 cycles mating and unmating
Salt Spray	In accordance with MIL-STD-202D, Method 101D
Humidity	95% at 95°C/1000 hours
Dry Heat	105°C for 1000 hours
Vibration	10 to 55 Hz, .06" DA, 1 hour, X and Y planes
Shock	50g, 11ms, 30 cycles, X and Y planes

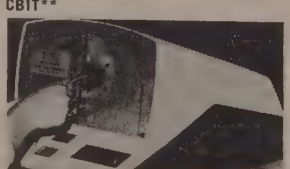
TOOLING

ITT Cannon's Sure-Seal connectors are supported by a complete line of customer tooling. Whether your needs are for small to moderate quantity requirements or for high production in-house capability, ITT Cannon has the customer tooling for the job.

HAND CRIMP TOOL
CCT-SS
(Standard Contact)



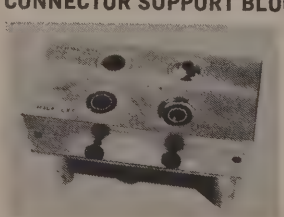
MULTIPLE INSERTION TOOL
CBIT**



STANDARD CONTACT INSERTION TOOL
CIT-SS-14

SEMI-AUTOMATIC STRIP/CRIMP TOOL
ABT-500-CCS-SS

CONNECTOR SUPPORT BLOCK



ABT-606

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Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

CIRCULAR CONNECTORS
SURE-SEAL™

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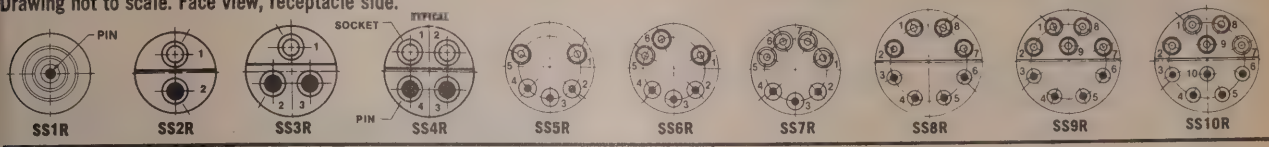
CONTACT ARRANGEMENTS

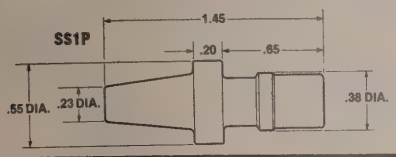
Dimensions subject to change.
(millimeters are in parenthesis)

Drawing not to scale. Face view, receptacle side.

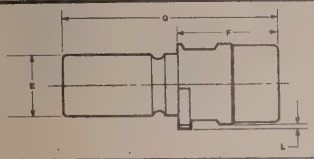


PLUG

SINGLE CONTACT

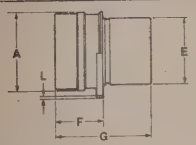


2, 3, AND 4 CONTACTS



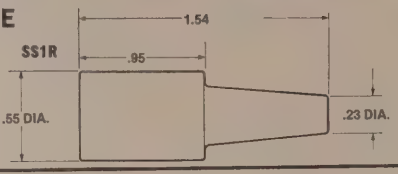
Body Identifier	Part Number	E Dia. Max.	F Max.	G Max.	L Max.	A Dia. Max.
SS2P	120-1807-000	.430 (10.92)	.690 (17.53)	1.410 (35.81)	.050 (1.27)	.550 (13.97)
SS3P	120-1808-000	.500 (12.70)	.690 (17.53)	1.410 (35.81)	.050 (1.27)	.600 (15.24)
SS4P	120-1809-000	.500 (12.70)	.690 (17.53)	1.410 (35.81)	.050 (1.27)	.600 (15.24)

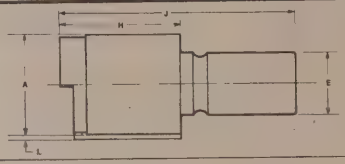
5, 6, 7, 8, 9, AND 10 CONTACTS



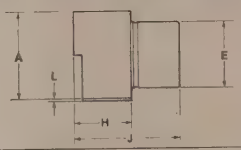
Body Identifier	Part Number	E Dia. Max.	F Max.	G Max.	L Max.	A Dia. Max.
SS5P	120-1841-000	.810 (20.57)	.700 (17.78)	1.470 (37.34)	.050 (1.27)	1.110 (28.19)
SS6P	120-1842-000	.810 (20.57)	.700 (17.78)	1.470 (37.34)	.050 (1.27)	1.110 (28.19)
SS7P	120-1873-000	.810 (20.57)	.700 (17.78)	1.470 (37.34)	.050 (1.27)	1.110 (28.19)
SS8P	120-1865-000	.935 (23.75)	.700 (17.78)	1.470 (37.34)	.050) (1.27)	1.135 (28.83)
SS9P	120-1867-000	.935 (23.75)	.700 (17.78)	1.470 (37.34)	.050) (1.27)	1.135 (28.83)
SS10P	120-1869-000	.935 (23.75)	.700 (17.78)	1.470 (37.34)	.050) (1.27)	1.135 (28.83)

RECEPTACLE





Body Identifier	Part Number	A Dia. Max.	E Max.	H Max.	J Max.	L Max.
SS2R	120-1804-000	.710 (18.03)	.430 (10.92)	.820 (20.83)	1.550 (39.37)	.050 (1.27)
SS3R	120-1805-000	.760 (19.30)	.500 (12.70)	.820 (20.83)	1.550 (39.37)	.050 (1.27)
SS4R	120-1806-000	.760 (19.30)	.500 (12.70)	.820 (20.83)	1.550 (39.37)	.050 (1.27)



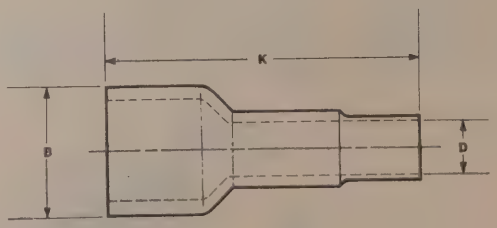
Body Identifier	Part Number	A Dia. Max.	E Max.	H Max.	J Max.	L Max.
SS5R	120-1839-000	1.110 (28.19)	.810 (20.57)	.835 (21.21)	1.610 (40.89)	.050 (1.27)
SS6R	120-1840-000	1.110 (28.19)	.810 (20.57)	.835 (21.21)	1.610 (40.89)	.050 (1.27)
SS7R	120-1874-000	1.110 (28.19)	.810 (20.57)	.835 (21.21)	1.610 (40.89)	.050 (1.27)
SS8R	120-1866-000	1.285 (32.64)	.935 (23.75)	.835 (21.21)	1.610 (40.89)	.050 (1.27)
SS9R	120-1868-000	1.285 (32.64)	.935 (23.75)	.835 (21.21)	1.610 (40.89)	.050 (1.27)
SS10R	120-1870-000	1.285 (32.64)	.935 (23.75)	.835 (21.21)	1.610 (40.89)	.050 (1.27)

ACCESSORIES

Clip/Clamps are available for all SureSeal connectors, please consult factory for ordering information.

BOOT

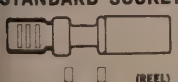
Used With (Body Identifier)	Part Number	B Dia. Max.	D Sealing Dim.	K Max. Ref.
SS2	317-1398-000	.550 (13.97)	.208-.228 (5.28-5.79)	2.05 (52.07)
SS3	317-1397-000	.618 (15.69)	.220-.240 (5.59-6.10)	2.05 (52.07)
SS4	317-1399-000	.750 (19.05)	.345-.380 (8.76-9.65)	2.05 (52.07)



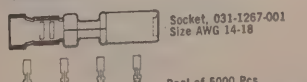
* Consult Factory

CONTACTS

STANDARD SOCKET

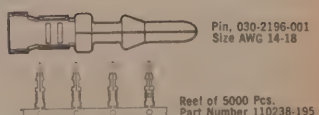


INSULATION SUPPORT SOCKET



STANDARD PIN

INSULATION SUPPORT PIN



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ITT CANNON ELECTRIC

STANDARD CIRCULAR CONNECTORS VE SERIES

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

Dimensions subject to change.
(millimeters are in parenthesis)

INTRODUCING THE ITT CANNON VE SERIES

The use of electronics is revolutionizing the design of heavy duty transportation equipment.

As trucks, off-road equipment and farm machinery become more complex and more expensive, traditional electromechanical functions are being augmented by electronics. New control and monitoring functions are being added that could not be implemented in any other way. And even more electronic complexity is being introduced by the need to meet ever more stringent government-mandated safety, emission control and fuel conservation regulations.

It is a design revolution, but as in any revolution, there have been some casualties.

Instead of trying to force ready-made solutions onto the problems, at ITT Cannon Electric we took advantage of our experience as the oldest connector manufacturer and our resources as one of the largest connector companies in the world.

Working with design, manufacturing and test personnel at the leading companies in the heavy duty transportation industry, we helped define the problems and developed the right solutions.

The result is the ITT Cannon VE Series of connectors. VE Series connectors meet all the needs of the heavy duty transportation industry. They cost less to buy, and less to use. They eliminate the drawbacks of other designs, and work better and longer in your applications.

They are designed for faster termination into harnesses, easier assembly on the production line, and much quicker field rework, should it ever be required. They are available in a range of sizes and contact layouts to provide the optimum solution to your interconnect problems, whether on the engine, under the hood, on the chassis or in the cab.

VE Series connectors consist of three basic elements: a rugged metal shell; a single-piece, monobloc insulator; and a low cost, high volume crimp contact.

Metal shell halves mate and lock with a quick-turn bayonet coupling and feature a visual indicator of proper mating. They are polarized with five keyways and are jam-proof even in blind mating conditions. Connectors are environmentally-sealed with a gasket sealing the shell and barrel when mated, and an individual wire sealing grommet. Integral diaphragms in the wire cavities of the grommet prevent the entry of contamination

and moisture through unwired cavities, yet are easily punctured when contacts are inserted.

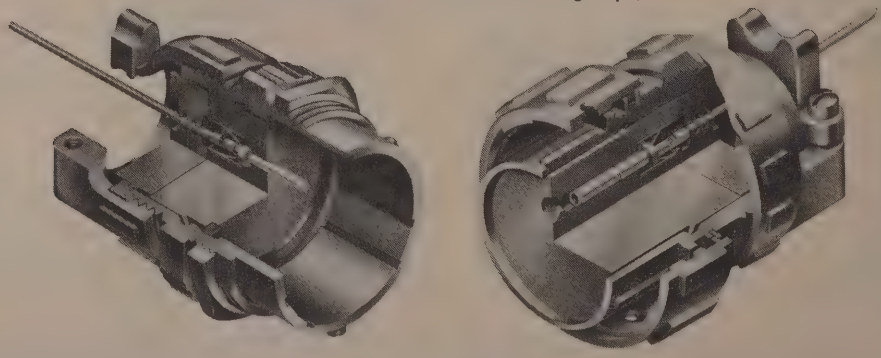
The insulator is a single thermoplastic block, with our SUPER CAESAR™ contact retaining clip permanently installed in the contact cavities. This concept eliminates two-piece construction, molded-in bushings and costly cone retention tooling, yet results in pull-out forces far higher than with other contact retention methods. Contacts are quickly and easily inserted, released and extracted from the rear of the connector for lower installation and maintenance costs.

The socket insulator engaging face features closed entry socket cavities with a lead-in chamfer. The lead-in chamfer guides bent or misaligned pins and ensures positive, accurate axial alignment of all contacts during mating.

Contacts are stamped and formed, with high-performance alloy plating to maintain low contact resistance over the entire life of the connector. They are available as loose pieces or on reels. Termination may be accomplished on Artos and Eubanks automatic luggers for high speed production, with ITT Cannon semi-automatic crimp machines for moderate usage, or with simple hand tools for field modification or repair.

Exhaustive testing and performance proof, both in the lab and under real-world field conditions, show that VE Series connectors are today's best available answer to the interconnect problems of the heavy duty transportation industry.

SUPER CAESAR® contact retaining clip



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ITT CANNON ELECTRIC

STANDARD CIRCULAR CONNECTORS VE SERIES

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(millimeters are in parenthesis)

PERFORMANCE CHARACTERISTICS

VE Series connectors are guaranteed to operate over the temperature range from −40°C to +105°C. They readily withstand the same severe shock and vibration, high humidity, ice and mud that your equipment must cope with day after day. And they continue to maintain their performance and sealing integrity even when exposed to brake fluid, transmission fluids, gasoline and diesel fuel, or anti-freeze, ozone and steam.

Following are some of the performance characteristics.

Test	Requirements	Criteria	Results
Water Immersion	Total immersion, 2 hours	Insulation resistance one megohm min.	Insulation resistance 100 gigaohms min.
Vibration	18-500-18 Hz, 10 G's peak, 3 hours in 3 planes.	No cracking, breaking or loosening of parts, and no electrical discontinuity >10 μsec.	Passed
Shock	50 G, half-sine, 3-axis.		Passed
Fluid Splash	25 splash/drip dry cycles using: gasoline, diesel fuel, brake fluid, transmission fluid, ethylene glycol, SAE 30 oil.	Connectors shall mate and unmate and meet insulation resistance of one megohm min.	40 gigaohms min.
Steam Exposure	121°-149°C at 100 psig.	No damage and meet insulation resistance of one megohm min.	20 gigaohms min.

For complete details please request our test report #C-78-77.

TOOLING

VE Series connectors achieve further cost reductions in manufacturing, assembly and maintenance. Connectors, contacts and tooling have been designed to achieve the maximum productivity possible.

For high volume production, contacts are available on reels for use on the ITT Cannon ABT-500-CCD-VE semi-automatic crimper in conjunction with Artos and Eubanks wire measuring/cutting/stripping machines. The entire operation is performed at a single work station, and production rates as high as 3600 terminations per hour have been achieved with high reliability.

For jacketed multi-conductor cable that cannot be processed on the Artos and Eubanks luggers, Cannon's ABT-500-CCS-VE semi-automatic stripper/crimper unit may be used alone. It both strips and crimps in a single operation and is capable of up to 1000 reliable terminations per hour.

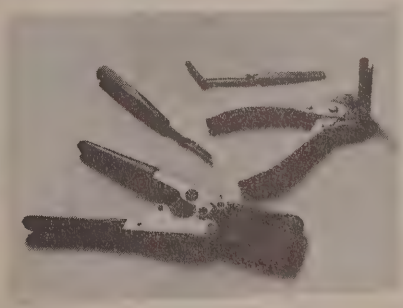
For application of reeled contacts to prestripped wire, we offer the ABT-606-VE, an air-operated semi-automatic crimp machine.

Hand tools include a ratchet-cycle crimper for close quarter terminations and an even less expensive hand crimper for field modification and maintenance. A simple hand tool inserts and removes terminated wires from the rear of the connector.

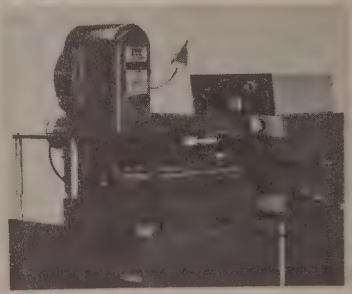
The entire range of tooling has been designed to maintain the price and performance advantages of ITT Cannon VE Series connectors, and does so very successfully. Users can select equipment that is exactly appropriate to their needs, with the result that VE Series connectors provide lower total installed costs than competitive connectors.

We wouldn' have it any other way. For complete information, contact your nearest ITT Cannon Electric field office.

ABT-606-VE pneumatic bench-top crimper.



Inexpensive hand tools.



ABT-500-CCD-VE and Eubanks or Artos high-speed termination tooling.

ABT-600-CCS-VE semi-automatic stripper/crimper.

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ITT CANNON ELECTRIC

STANDARD CIRCULAR CONNECTORS
VE SERIES

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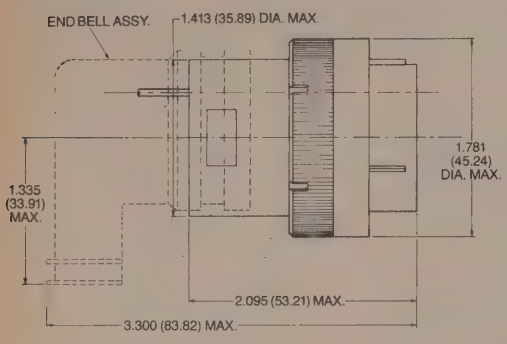
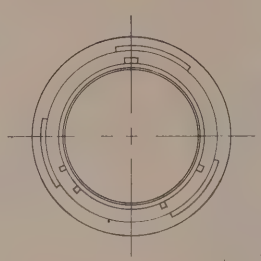
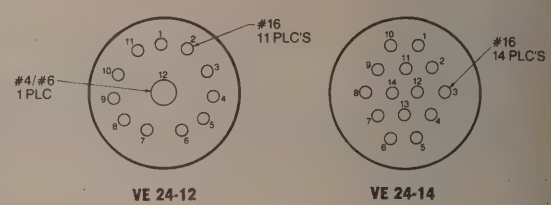
Dimensions subject to change.
(millimeters are in parenthesis)

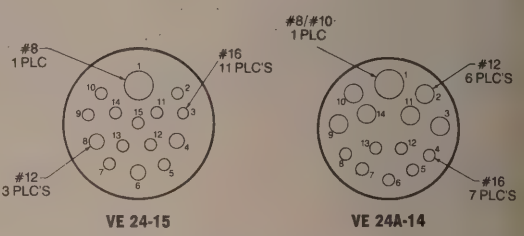
SERIES 24



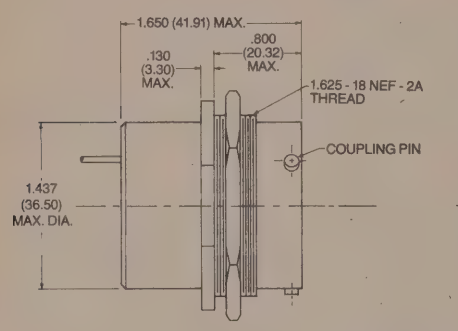
PLUG

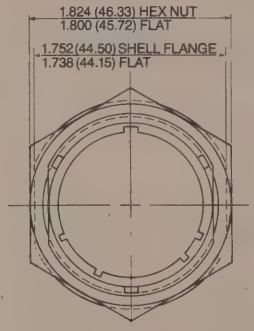




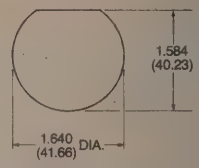


CONTACT LAYOUTS



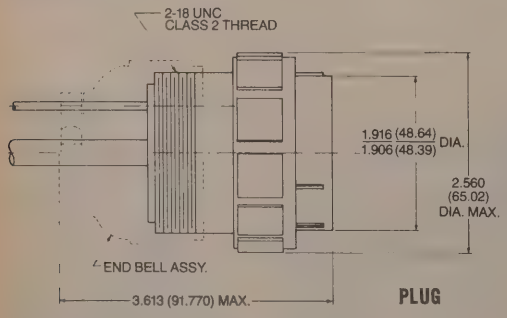


RECEPTACLE

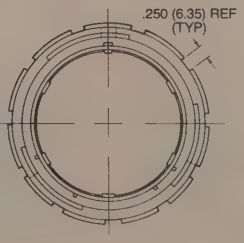


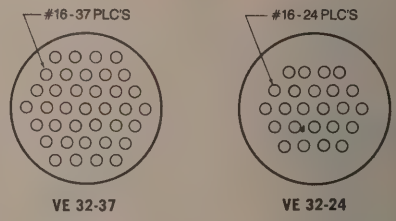
PANEL CUTOUTS

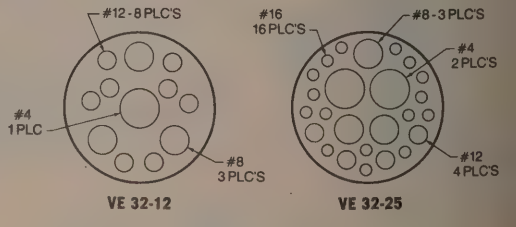
SERIES 32



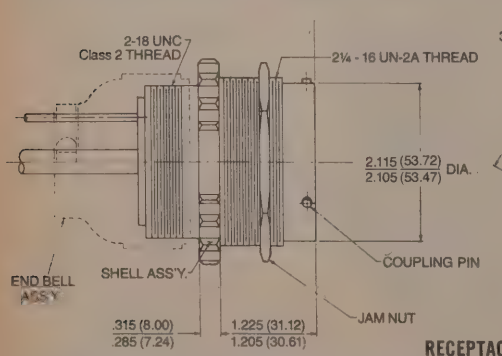
PLUG







CONTACT LAYOUTS



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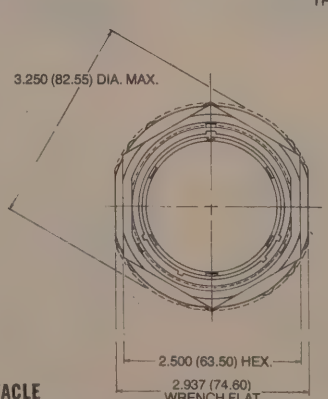

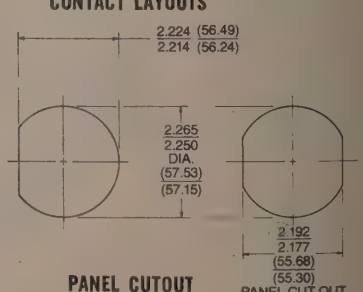

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Add Dept. EM to address to tell them you saw it in eem

Who can meet your greatest needs in D Subminiatures?

Cannon can!

Six decades on the leading edge of interconnect technology.

CANNON ITT

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D SUBMINIATURE RECTANGULAR CONNECTORS

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

GENERAL INFORMATION

D Subminiature rectangular connectors are designed for applications where space and weight are prime considerations. They accommodate a great number of circuits in relation to their size and weight and are especially suited for aircraft, missile, and ground support systems. Although designed essentially for rack/panel applications, D series connectors may be adapted for cable attachments by accessory junction shells (shields) with integral clamps.

- ORIGINAL D with solder pot contacts in a two-piece insulator.
- BURGUN-D Mark IV connector with crimp snap-in contacts in a rear release dielectric retention assembly for economical, commercial applications.
- D*U: Flame-retardant BURGUN-D low cost non-environmental subminiature connectors with rear release crimp, snap-in contacts.
- D*P: Flame retardent 90° all plastic PCB connectors ideal for low cost high performance commercial applications.
- D*SP: Mas/Ter interconnect system connectors providing reliable high speed mass termination; flame retardant.
- D*M: GOLDEN-D Mark I connector with solder pot contacts in a monobloc insulator for improved moisture resistance.
- D*M: ROYAL D Mark III connectors have crimp snap-in contacts in the LITTLE CAESAR® rear release contacts retention assembly for high performance, high reliability applications.

These intermateable connectors will accommodate up to 50 contacts that are rated at 5-amps per contact for #20 gauge wire. A high density arrangement with 78 size 22 contacts is also available, as are combination arrangements with provisions for coaxial, power, and/or high voltage contacts and printed circuit terminations. Polarization is by the keystone shape of the shell; coupling is by friction.

The versatility of the D Subminiature line is enhanced by the variety of finishes, as well as by a complete line of accessories. Many of these D Subminiature connector series and accessories are U.L. recognized. Inquiries regarding modifications and custom harnessing of connectors are invited.

SUMMARY

Series	Description	Designation	Insulator	Contacts Termination
D*	D Subminiature connector, low cost	ORIGINAL-D	Two pieces, white Nylon	Solder, Wire-Wrap† and printed circuit
D*C	D Subminiature connector, low cost for commercial applications	BURGUN-D (Mark IV)	Two pieces, burgundy, glass-filled Nylon	Crimp snap-in rear release, and printed circuit Plastic retention clip
D*U	Flame-retardant BURGUN-D D Subminiature	BURGUN-D (Mark IV)	Two pieces, black, glass-filled thermoplastic	Crimp snap-in, rear release, and printed circuit Plastic cone retention
D*P	D Subminiature 90° all plastic PCB connector, low cost, high performance, flame retardant	—	Housing / Retainer: glass-filled thermoplastic, UL rated 94V-0, black	Solder and printed circuit
D*SP	D Subminiature, connectors with high speed mass termination for lower cost, flame retardant	Mas/Ter-D	Glass-filled thermoplastic, UL rated 94V-0, black	Insulation displacement technique
D*M	D Subminiature connector for more critical applications conforms to MIL-C-24308	GOLDEN-D (Mark I)	Monobloc, Diallyphthalate glass-filled, dark green	Solder and printed circuit Coaxial, high power and high voltage
D*MA	D Subminiature with LITTLE CAESAR contact retention system conforms to MIL-C-24308	ROYAL-D (Mark III)	Monobloc, Diallylphthalate glass-filled, dark green	Crimp snap-in, rear release coaxial and/or high voltage

† Wire-Wrap is a registered trademark of Gardner-Denver

ORIGINAL D* Solder Type, Non-Removable Contacts

The Original D connector utilizes a two-piece nylon insulator in five basic shell sizes: E, A, B, C, and D. These nylon insulators operate in temperatures ranging from —65°F to +250°F (—55°C to +120°C). Contact arrangements accommodate 9, 15, 25, 37, and 50 size 20 solder pot, Wire-Wrap or printed circuit contacts respectively. Standard contact terminations accommodate up to #20 AWG stranded wire. Current rating is 5 amps. Polarization is by keystone shape of the shell. Locking accessories and shells with float mounts are also available.

HOW TO ORDER

D B E 25 P A

Series Prefix
Shell Size
Mounting Type
Contact Arrangements
Contact Type
Printed Circuit Terminal/Wire-Wrap Modifier

SERIES PREFIX
D — ITT Cannon designation

SHELL SIZE
E, A, B, C and D

MOUNTING TYPE
No designation: standard .120 (3,05) diameter mounting hole
E — 4-40 clinch nut for rear panel mounting
F — Float mount for rear panel mounting
G — 2-56 clinch nut for rear panel mounting
K — .154 (3,91) diameter mounting holes
R — Reverse float mount for front panel mounting

CONTACT ARRANGEMENTS
9, 15, 25, 37 and 50 contacts

CONTACT TYPE
P — Pin; S — Socket

PRINTED CIRCUIT TERMINAL/WIRE-WRAP MODIFIER

A — Right-angle printed circuit connector with .040 (1,02) diameter terminals, with bracket; accommodates printed circuit boards up to 1/16" (1,57) maximum thickness.

C — Right angle printer circuit connector with .040 (1,02) diameter terminals, without bracket; accommodates printed circuit boards up to 1/16" (1,57) maximum thickness.

U — Straight printed circuit connector with .024 (0,61) diameter terminals; accommodates printed circuit boards up to .093 (2,36) maximum thickness.

V — Straight printed circuit connector with .040 (1,02) diameter terminals; accommodates printed circuit boards up to 1/16" (1.57) maximum thickness.

Wire-Wrap Termination: F179 — 2 wraps per termination
F179A — 3 wraps per termination
F179B — 1 wrap per termination

(millimeters are in parentheses)

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D SUBMINIATURE RECTANGULAR CONNECTORS

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ORIGINAL D D* Solder Type, Non-Removable Contacts

Dimensions are subject to change.

CONDENSED DATA

STANDARD MATERIALS AND FINISHES

Shell	Steel, yellow chromate over cadmium plate
Insulator	Two piece white Nylon
Contacts	Copper alloy, gold over nickel plate
Rivets and Washers (float mounting)	Stainless steel

MECHANICAL FEATURES

Coupling	Friction and lock accessories
Polarization	Keystone-shaped shells
Contact Type	Captivated
Termination	Solder pot, Wire-Wrap or printed circuit

ELECTRICAL DATA

Wire Size	Size 20
Current Rating	Size 20 Contacts: 5 amps

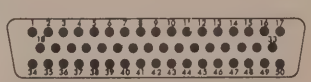
VOLTAGE RATING see page 109.

CONTACT ARRANGEMENTS

FACE VIEW PIN INSERT

Shell Size	E	A	B
No. of Contacts	9	15	25
Contact Size	#20	#20	#20

Shell Size	C
No. of Contacts	37
Contact Size	#20



Shell Size	D
No. of Contacts	50
Contact Size	#20

† Wire-Wrap is a registered trademark of Gardner-Denver

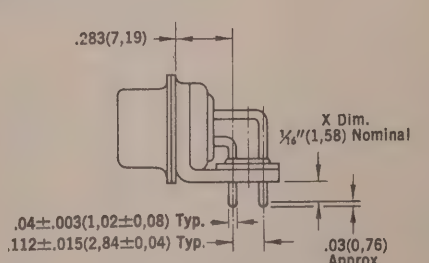
PRINTED CIRCUIT APPLICATIONS

RIGHT ANGLE 90° TERMINAL

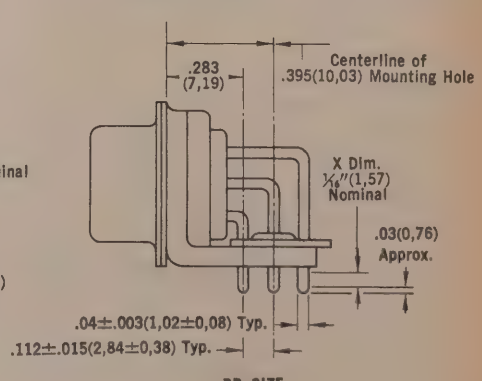
Connectors are furnished with or without a bracket. Spacer assemblies not supplied.

Part Number Printed Circuit Terminal Modifier	90° Bracket Included
A	Yes
C	No

Example: DE-9PA, see page 88 for ordering nomenclature.



DE, DA, DB, DC SIZES



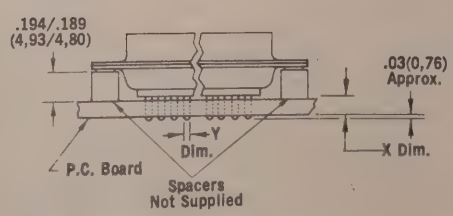
DD SIZE

STRAIGHT TERMINAL

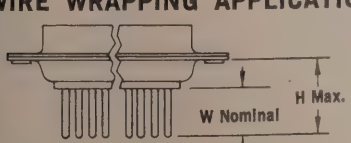
For printed circuit boards up to 1/16"(1,58mm) maximum thickness the straight terminals extend 3/32"(2,38mm) beyond the rear of the insert.

Part Number Printed Circuit Terminal Modifier	X Nominal	Y ±.003 (±0,08)
U	3/32 (2,38)	.024 (0,61)
V	1/16 (1,58)	.04 (1,02)

Example: DE-9PA, see page 88 for ordering nomenclature.



WIRE WRAPPING APPLICATIONS



Modification Code	H	W	Wrap Accommodations
F179	.587 (14,91)	.375 (9,52)	2
F179A	.713 (18,11)	.500 (12,7)	3
F179B	.465 (11,8)	.250 (6,35)	1

.024" square (0,61) contact tails will accommodate #28 or #30 AWG rigid wire (diagonal of square is .034/.031" (0,86/0,79mm)).

(millimeters are in parentheses)

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

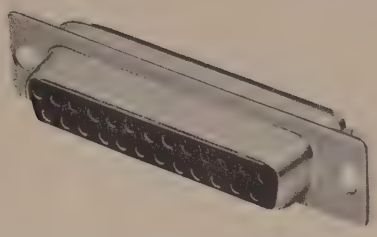
D SUBMINIATURE RECTANGULAR CONNECTORS

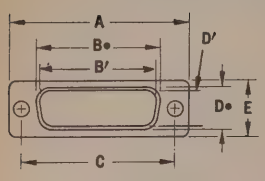
For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

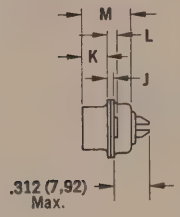
Dimensions subject to change.

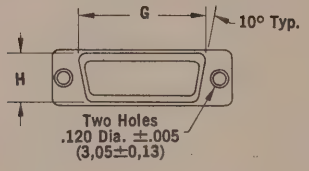
ORIGINAL D* Solder Type, Non-Removable Contacts

STANDARD SHELL

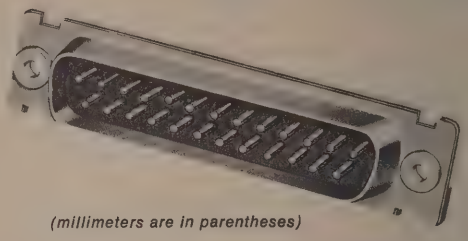




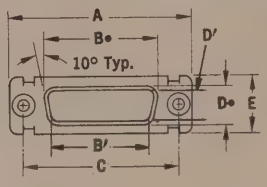


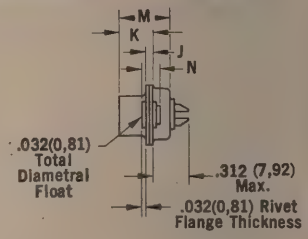


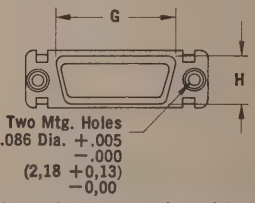
SHELL WITH FLOAT MOUNTS



(millimeters are in parentheses)







It is recommended that only one assembly, either pin or socket, be float mounted. For front panel mounting use reverse float mount; see page 118.

INCHES

Part Number by Shell Size	A ±.015	B• ±.010	B′ ±.010	C ±.005	D• ±.010	D′ ±.010	E ±.015	G• ±.010	H• ±.010	J ±.010	K ±.010	L ±.010	M ±.015	N ±.010
DE-9P	1.213	—	.666	.984	—	.329	.494	.759	.422	.030	.236	.045	.422	.120
DE-9S	1.213	.640	—	.984	.308	—	.494	.759	.422	.030	.243	.045	.429	.120
DA-15P	1.541	—	.994	1.312	—	.329	.494	1.083	.422	.030	.236	.045	.422	.120
DA-15S	1.541	.968	—	1.312	.308	—	.494	1.083	.422	.030	.243	.045	.429	.120
DB-25P	2.088	—	1.534	1.852	—	.329	.494	1.625	.422	.039	.231	.060	.426	.129
DB-25S	2.088	1.508	—	1.852	.308	—	.494	1.625	.422	.030	.243	.045	.429	.120
DC-37P	2.729	—	2.182	2.500	—	.329	.494	2.272	.422	.039	.231	.060	.426	.129
DC-37S	2.729	2.156	—	2.500	.308	—	.494	2.272	.422	.030	.243	.045	.429	.120
DD-50P	2.635	—	2.079	2.406	—	.436	.605	2.178	.534	.039	.231	.060	.426	.129
DD-50S	2.635	2.062	—	2.406	.420	—	.605	2.178	.534	.030	.243	.045	.429	.120

MILLIMETERS

Part Number by Shell Size	A ±0,38	B• ±0,25	B′ ±0,25	C ±0,12	D• ±0,25	D′ ±0,25	E ±0,38	G• ±0,25	H• ±0,25	J ±0,25	K ±0,25	L ±0,25	M ±0,38	N ±0,25
DE-9P	30,81	—	16,91	24,99	—	8,36	12,55	19,28	10,72	0,76	5,99	1,14	10,72	3,05
DE-9S	30,81	16,25	—	24,99	7,82	—	12,55	19,28	10,72	0,76	6,17	1,14	10,90	3,05
DA-15P	39,14	—	25,24	33,32	—	8,36	12,55	27,51	10,72	0.76	5,99	1,14	10,72	3,05
DA-15S	39,14	24,58	—	33,32	7,82	—	12,55	27,51	10,72	0,76	6,17	1,14	10,90	3,05
DB-25P	53,03	—	38,96	47,04	—	8,36	12,55	41,27	10,72	0,99	5,87	1,52	10,82	3,28
DB-25S	53,03	38,30	—	47,04	7,82	—	12,55	41,27	10,72	0,76	6,17	1,14	10,90	3,05
DC-37P	69,31	—	55,42	63,50	—	8,36	12,55	57,71	10,72	0,99	5,87	1,52	10,82	3,28
DC-37S	69,31	54,76	—	63,50	7,82	—	12,55	57,71	10,72	0,76	6,17	1,14	10,90	3,05
DD-50P	66,92	—	52,81	61,11	—	11,07	15,37	55,32	13,56	0,99	5,87	1,52	10,82	3,28
DD-50S	66,92	52,37	—	61,11	10,67	—	15,37	55,32	13,56	0,76	6,17	1,14	10,90	3,05

• Dimensions B, D, G, and H are measured as outside dimensions at the bottom of draw. For shell with float mounts, add letter F after letter C, e.g., DEF-9P.

(millimeters are in parentheses)

NOTE: B • and D • are the O.D. dims. for socket side, B′ and D′ are the I.D. dims. for pin side.

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

D SUBMINIATURE RECTANGULAR CONNECTORS

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

BURGUN-D (Mark IV) D*C/D*U Crimp Type, Removable Contacts

BURGUN-D CONNECTORS
CRIMP SNAP-IN CONTACTS

BURGUN-D Mark IV connectors are non-environmental, subminiature rectangular connectors with rear release, crimp snap-in contacts. They are intermateable and intermountable with existing types. BURGUN-D connectors operate in temperatures from −65°F to +250°F (−55°C to +120°C) and are used for plug-in module applications, cable-to-cable and cable-to-panel installations, computers, business machines, and many other commercial applications. Available in both glass-filled Nylon (D*C) and flame-retardant glass reinforced thermoplastic UL rated 94V-0 (D*U).

These connectors feature size 20 crimp contacts, accommodating wire size #18 thru #30 AWG stranded wire, the socket contact is a highly reliable, sleeveless, spring finger contact. These contacts are inserted and extracted from the rear of the insulator with an expendable, plastic insertion/extraction tool CIET20HDB, or consult the factory for a metal tweezer type device for high volume users. Closed entry socket insulators correct misaligned pins during engagement. Connectors may be ordered with or without contacts. When ordering connectors less contacts, the suffix "FO" must be added to the part number, and the contacts ordered separately. All assembly tools are ordered separately.

There is a variety of contacts available for termination to printed circuit boards and flex circuits. Semi-automatic crimp machines are also available for volume crimping requirements. For additional cost savings, purchase these connectors without contacts (Code FO), then purchase the contacts in bulk and use them in the connectors as required. With the vast amount of contact combinations in the standard BURGUND-D connector this connector has proven to be one of the most versatile, low cost, rugged connectors available.

The five shell sizes accommodate from 9 to 50 contacts. Polarization and coupling are accomplished through shell configuration and friction, respectively.

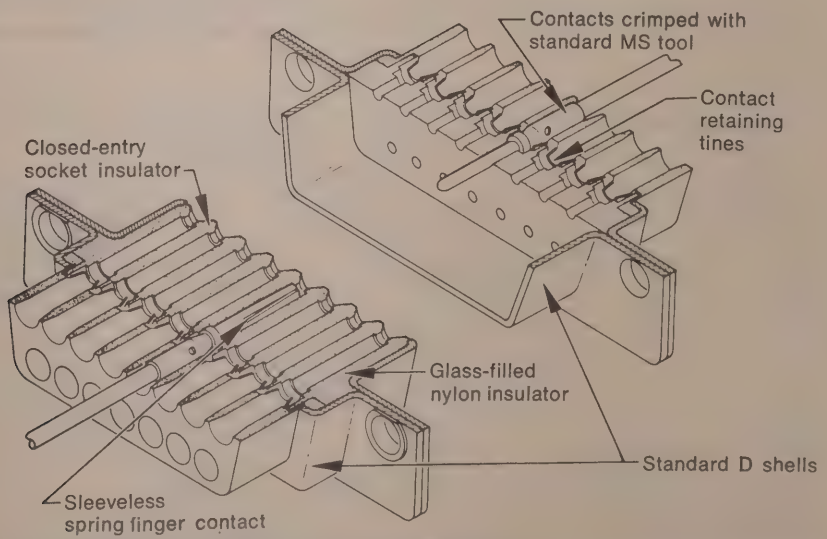
REAR RELEASE CONTACT RETENTION SYSTEM UTILIZING DIELECTRIC BIFURCATED CONES

The D*C and D*U connectors feature a rear insulator with integral, molded contact retaining tines. These plastic tines permit the insertion and extraction of contacts from the rear of the connector with a simple, expendable plastic insertion/extraction tool.

During contact insertion, the retaining tines expand as the contact passes thru. These rugged tines snap into place behind the contact shoulder when the contact is fully inserted. The tool is inserted to expand the tines, allowing easy extraction of the wired contact.

The retention system and the integral contact retaining tines guarantee functional reliability in many environments.

- **Mates with existing D types**
- **Operates in temperatures to +250°F**
- **Crimp snap-in contacts**
- **Highly reliable socket contacts**
- **Insertion/extraction with expendable tool**
- **Corrects misaligned contacts**



For a quick response to your application needs call one of the following District Offices:
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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

D SUBMINIATURE RECTANGULAR CONNECTORS

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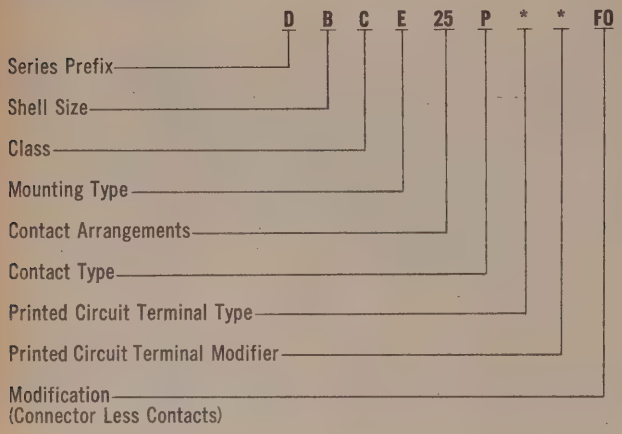
BURGUN-D (Mark IV) D*C/D*U Crimp Type, Removable Contacts

HOW TO ORDER



SERIES PREFIX
D — ITT Cannon designation

SHELL SIZE
E, A, B, C and D

CLASS
C — Contact retention cone, rear release contacts
U — Flame retardant, contact retention cone, rear release contacts

MOUNTING TYPE
No designator: standard .120" (3,05) diameter mounting holes
E — 4-40 clinch nut for rear panel mounting
F — Float mount for rear panel mounting
G — 2-56 clinch nuts for rear panel mounting
K — .154 (3,91) diameter mounting hole
R — Reverse float mount for front panel mounting

CONTACT ARRANGEMENTS
9, 15, 25, 37 and 50 (basic arrangements); 13W3 coaxial

CONTACT TYPE
P — Pin; S — Socket

PRINTED CIRCUIT TERMINAL TYPE
A — 90° contacts
B — Straight

PRINTED CIRCUIT TERMINAL MODIFIER
A — .030/.026 (0,76/0,66) dia. with .164/.149 (4,16/3,78) extension from bracket (stamped contacts with bracket).
B — .030/.026 (0,76/0,66) dia. with .159/.129 (4,04/3,28) extension from rear of insulator (stamped contacts).
D — .030/.026 (0,76/0.66) dia. with .164/.149 (4,16/3,78) extension from bracket. Machine contacts to be supplied.
F — .030/.026 (0,76/0,66) dia. with .159/.129 (4,04/3,28) extension from rear of insulator. Machine contacts to be supplied.
K — .030/.026 (0,76/0,66) dia. with .164/.149 (4,16/3,78) extension from flange, less bracket (machined contacts).
L — .030/.026 (0,76/0,66) dia. with .125/.095 (3,18/2,41) extension from bracket (stamped contacts with bracket).

MODIFICATION
FO — Connector less contacts (not stamped on connector)

CONDENSED DATA

STANDARD MATERIALS AND FINISHES

Shell	Steel, yellow chromate over cadmium plate
Insulator	Glass-filled burgundy nylon (D*C) Glass reinforced thermoplastic, UL rated, 94V-0, black (D*U)
Contacts	Machined: Copper alloy, gold over nickel plate Stamped: Copper alloy, selectively plated gold over nickel
Rivets and Washers (float mounting)	Stainless steel

MECHANICAL FEATURES

Coupling	Friction and lock accessories
Polarization	Keystone-shaped shells
Contact Type	Crimp snap-in

ELECTRICAL DATA

Contact Termination	Crimp
Wire Size	Size 20 Contacts: #20, #22 and #24 AWG stranded wire; size 20-18 contacts: one #18 or two #22 AWG stranded wire; size 20-26 contacts: #26, #28 and #30 AWG stranded wire
Current Rating	Size 20 Contacts: 5 amps

VOLTAGE RATING (See Page 109 for Data)

Dimensions subject to change.
(millimeters are in parentheses)

For a quick response to your application needs call one of the following District Offices:
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Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

D SUBMINIATURE RECTANGULAR CONNECTORS

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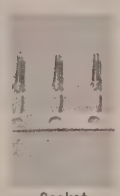
Dimensions subject to change.

BURGUN-D (Mark IV) D*C/D*U Crimp Type, Removable Contacts

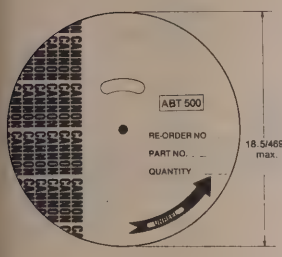
STAMPED CONTACTS

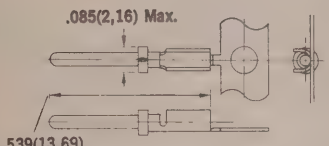
Stamped contacts are furnished on reels for use with the semi-automatic ABT-500 crimp and strip/crimp machines. These contacts will accommodate wire sizes #18 thru #28 AWG solid and stranded wire.

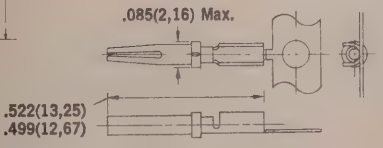
Pin



Socket



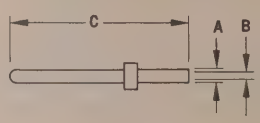


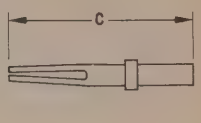


Wire Accommodation	Contact Part Number Pin	Contact Part Number Socket	Contacts Per Reel
AWG #18 thru 22 (For AWG #24 consult factory)	D110238-165	D110238-166	7,500
AWG #20 thru 28 (For AWG #30 consult factory)	D110238-34	D110238-35	10,000

***Note:** Insulation support (crimp) is available on D110238-34 and -35 contacts by modifying the ABT-500 or the Stripper Crimper (recommended wire sizes: 24, 26, 28 AWG).

MACHINED CONTACTS





For low volume usage and field repair. These contacts are available for use with the CBT-460 semi-automatic crimp tool.

NOTE for Size 20-18 contacts only: Shrink sleeving is suggested on the crimp pot to prevent contacts from touching.

Description	Part Number	Wire Accommodation	A ±.002 (±0,05)	B ±.002 (±0,05)	C Max.
Pin 20	030-1952-000	20, 22, 24	.067(1,70)	.045(1,14)	.537(13,64)
Pin 20-18	030-1954-000	(1) 18 or (2) #22	.086(2,18)	.066(1,68)	.874(22,20)
Pin 20-26	030-1952-002	26, 28, 30	.067(1,70)	.025(0,63)	.537(13,64)
Socket 20	030-1953-000	20, 22, 24	.067(1,70)	.045(1,14)	.523(13,28)
Socket 20-18	030-1955-000	(1) 18 or (2) #22	.086(2,18)	.066(1,68)	.852(21,64)
Socket 20-26	030-1953-002	26, 28, 30	.067(1,70)	.025(0,63)	.523(13,28)

(millimeters are in parentheses)

BASIC AND COMBINED CONTACT ARRANGEMENTS

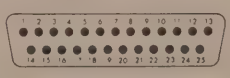
Note: Color Code — Pin Connector: Red, Socket Connector: Blue

#20 CONTACTS WITH COAX, POWER AND/OR HIGH VOLTAGE CONTACTS

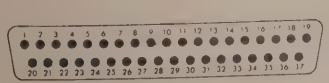
FACE VIEW PIN INSERT

	E
Shell Size	
No. of Contacts	9
Contact Size	#20

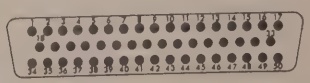
	A
Shell Size	
No. of Contacts	15
Contact Size	#20



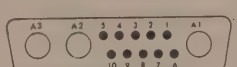
	B
Shell Size	
No. of Contacts	25
Contact Size	#20



	C
Shell Size	
No. of Contacts	37
Contact Size	#20



	D
Shell Size	
No. of Contacts	50
Contact Size	#20



	B
Shell Size	
Arrangement	13W3
No. of Contacts	10
Contact Size	#20
Coax or HV Cavities	3

Note: Consult factory for flame retardant D*U.

D*MA coaxials and high voltage contacts are used for 13W3 layout. See page 112.

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

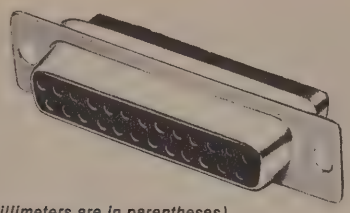
D SUBMINIATURE RECTANGULAR CONNECTORS

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

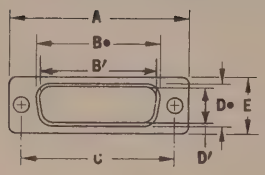
BURGUN-D (Mark IV) D*C/D*U Crimp Type, Removable Contacts

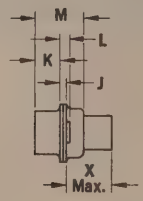
Dimensions subject to change.

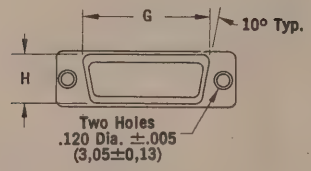
STANDARD SHELL



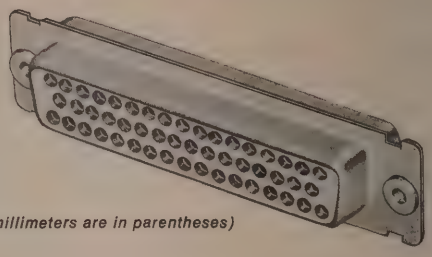
(millimeters are in parentheses)



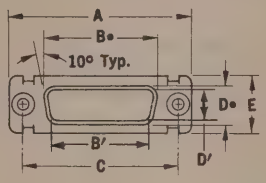


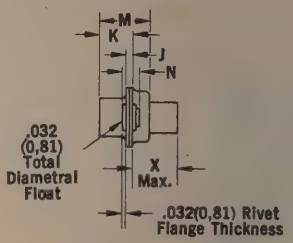


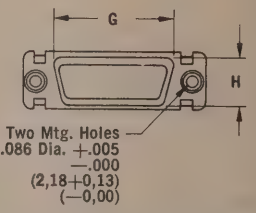
SHELL WITH FLOAT MOUNTS



(millimeters are in parentheses)







It is recommended that only one assembly, either pin or socket, be float mounted. For front panel mounting use reverse float mount; see page 118.

INCHES

Part Number by Shell Size	A ±.015	B• ±.010	B′ ±.010	C ±.005	D• ±.010	D′ ±.010	E ±.015	G• ±.010	H• ±.010	J ±.010	K ±.010	L ±.010	M ±.015	N ±.010	X Max.
DEC-9P	1.213	—	.666	.984	—	.329	.494	.759	.422	.030	.236	.045	.422	.120	.375
DEC-9S	1.213	.640	—	.984	.308	—	.494	.759	.422	.030	.243	.045	.429	.120	.375
DAC-15P	1.541	—	.994	1.312	—	.329	.494	1.083	.422	.030	.236	.045	.422	.120	.375
DAC-15S	1.541	.968	—	1.312	.308	—	.494	1.083	.422	.030	.243	.045	.429	.120	.375
DBC-25P	2.088	—	1.534	1.852	—	.329	.494	1.625	.422	.039	.231	.060	.426	.129	.375
DBC-25S	2.088	1.508	—	1.852	.308	—	.494	1.625	.422	.030	.243	.045	.429	.120	.375
DCC-37P	2.729	—	2.182	2.500	—	.329	.494	2.272	.422	.039	.231	.060	.426	.129	.375
DCC-37S	2.729	2.156	—	2.500	.308	—	.494	2.272	.422	.030	.243	.045	.429	.120	.375
DDC-50P	2.635	—	2.079	2.406	—	.436	.605	2.178	.534	.039	.231	.060	.426	.129	.375
DDC-50S	2.635	2.062	—	2.406	.420	—	.605	2.178	.534	.030	.243	.045	.429	.120	.375

MILLIMETERS

Part Number by Shell Size	A ±.0,38	B′ ±0,25	B• ±0,25	C ±0,12	D• ±0,25	D′ ±0,25	E ±0,38	G• ±0,25	H• ±0,25	J ±0,25	K ±0,25	L ±0,25	M ±0,38	N ±0,25	X Max.
DEC-9P	30,81	—	16,91	24,99	—	8,36	12,55	19,28	10,72	0,76	5,99	1,14	10,72	3,05	9,52
DEC-9S	30,81	16,25	—	24,99	7,82	—	12,55	19,28	10,72	0,76	6,17	1,14	10,90	3,05	9,52
DAC-15P	39,14	—	25,24	33,32	—	8,36	12,55	27,51	10,72	0,76	5,99	1,14	10,72	3,05	9,52
DAC-15S	39,14	24,58	—	33,32	7,82	—	12,55	27,51	10,72	0,76	6,17	1,14	10,90	3,05	9,52
DBC-25P	53,03	—	38,96	47,04	—	8,36	12,55	41,27	10,72	0.99	5,87	1,52	10,82	3,28	9,52
DBC-25S	53,03	38,30	—	47,04	7,82	—	12,55	41,27	10,72	0,76	6,17	1,14	10,90	3,05	9,52
DCC-37P	69,31	—	55,42	63,50	—	8,36	12,55	57,71	10,72	0,99	5,87	1,52	10,82	3,28	9,52
DCC-37S	69,31	54,76	—	63,50	7,82	—	12,55	57,71	10,72	0,76	6,17	1,14	10,90	3,05	9,52
DDC-50P	66,92	—	52,81	61,11	—	11,07	15,37	55,32	13,56	0,99	5,87	1,52	10,82	3,28	9,52
DDC-50S	66,92	52,37	—	61,11	10,67	—	15,37	55,32	13,56	0,76	6,17	1,14	10,90	3,05	9,52

•Dimensions B, D, G, and H are measured as outside dimensions at the bottom of draw. For shell with float mounts, add letter F after letter C, e.g., DECF-9P.

*Add number of contacts for basic arrangements, OR add contact arrangement number for coaxial and/or HV comb. arrangements.

NOTE: B• and D• are the O.D. dims. for socket side, B′ and D′ are the I.D. dims. for pin side.

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

D SUBMINIATURE RECTANGULAR CONNECTORS

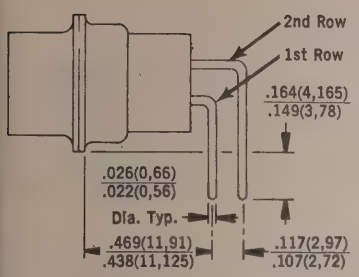
For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

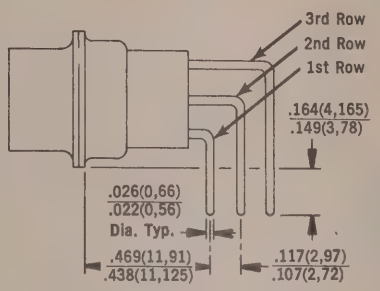
BURGUN-D (Mark II) D*C/D*U Crimp Type, Removable Contacts

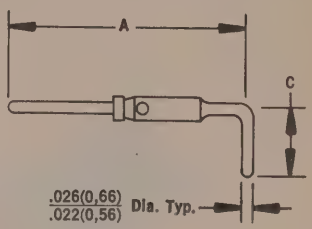
Dimensions subject to change.

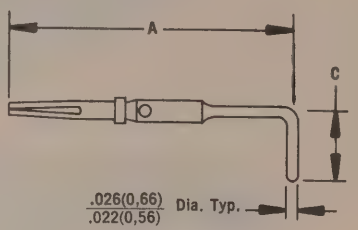
PRINTED CIRCUIT APPLICATIONS

90° PRINTED CIRCUIT CONTACTS (ordered as components)









CONNECTORS COMPLETELY ASSEMBLED WITH 90° FRAME RETARDANT PLASTIC BRACKETS

PART NUMBER EXAMPLES

Machined Contacts

With Bracket: **AD** designation (Ex.: DBC-25P-AD)
Without Bracket: **AK** designation (Ex.: DBU-25P-AK)

Stamped Contacts

With Bracket: **AA** designation (Ex.: DBC-25P-AA)
Without Bracket: Not available

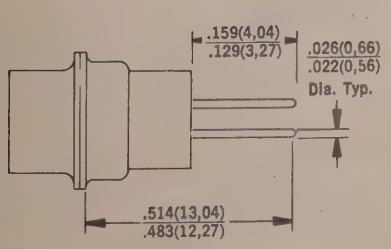
Note: See page 116 for part numbers and dimensions of 90° Plastic Bracket for use with right angle printed circuit connectors.

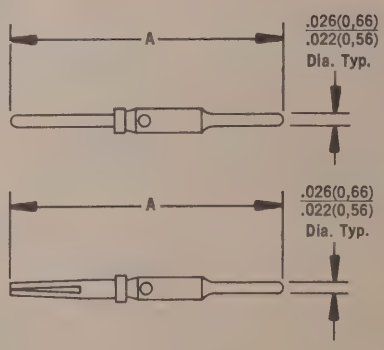
90° MACHINED CONTACTS

	Row	Contact Part Number	A	C
Pin	1st	030-2086-000	.684(17,37)	.345(8,76)
*Pin	2nd	030-2087-000	.796(20,21)	.457(11,61)
**Pin	3rd	030-2088-000	.908(23,06)	.569(14,45)
Socket	1st	030-2089-000	.666(16,92)	.345(8,76)
*Socket	2nd	030-2090-000	.778(19,76)	.457(11,61)
**Socket	3rd	030-2091-000	.890(22,61)	.569(14,45)

*2nd row for shell sizes E, A, B and C starting from cavity 1.
**3rd row for shell size D only, starting from cavity 1.

STRAIGHT PRINTED CIRCUIT CONTACTS (ordered as components)





PART NUMBER EXAMPLES

Connectors Supplied With Contacts In Vials
Machined Contacts
-BF

Example: DBC-25P-BF
Example: DBU-25P-BF

Connectors Completely Assembled With Contacts Installed
Stamped Contacts
-BB

Example: DBC-25P-BB
Example: DBU-25P-BB

STRAIGHT MACHINED CONTACTS

	Contact Order No.	A±.010
Pin	030-1989-000	0.729(18,5)
Socket	030-1990-000	0.711(18,0)

(millimeters are in parentheses)

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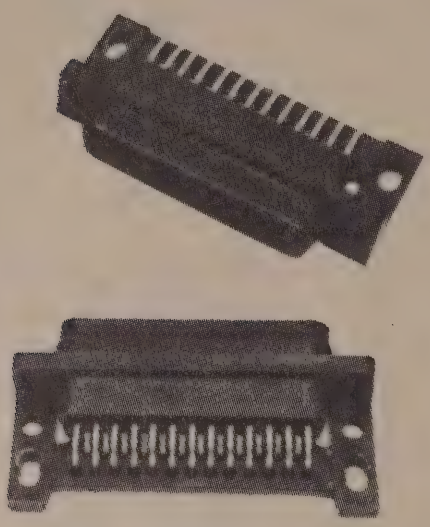
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

D SUBMINIATURE RECTANGULAR CONNECTORS

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

ALL PLASTIC 90° D*P A UNIVERSAL LOW COST RIGHT-ANGLE CONNECTOR FOR PRINTED CIRCUIT BOARDS.



The new Cannon D*P all plastic 90° PCB connector is ideal for telecommunications, computer, industrial control and other applications where low cost and high performance are required.

These printed circuit board connectors are available in the 15, 25, 37 and 50-contact versions, with other contact arrangements planned.

Plugs and receptacles are fully intermateable with all D Subminiature connectors whether solder, crimp or the new insulation displacement types. Mating is complete even when junction shells are used, as in telephone industry applications.

Contacts are held in place by a special snap-in retainer plate that prevents contact pushout and holds the pins precisely aligned for easier assembly to the printed circuit board. Two configurations are available, one for printed circuit boards drilled for any Cannon 90° D Subminiature-type PCB connector, and one for boards drilled for other 90° PCB connectors, metal or plastic. The D*P is fully intermountable in both applications with no redrilling, no extra hardware.

The D*P connector is flame retardant (UL listed 94V-0) glass filled thermoplastic, while contacts are those used in the low-cost Cannon Burgun-D Series.

STANDARD DATA

Housing/Retainer	Glass reinforced thermoplastic, UL rated 94V-0, black.
Contacts	Gold over nickel electroplate on copper alloy.
Coupling	Friction.
Polarization	Keystone shape.
Contact Type	Captivated.
Contact Termination	Solder.
Current Rating	Size 20 contacts: 5 amperes.
Dielectric Withstanding Voltage	1000 VAC sea level to 20,000 feet (6096 meters)
Insulation Resistance	1000 megohms
Temperature Range	−55°C to +125°C (−67°F to +257°F)

HOW TO ORDER

D B P - 25 P A A

- Series
- Shell Size
- Class
- Contact Arrangement
- Contact Type
- PC Termination Type
- PC Termination Modification

SERIES	D Subminiature
SHELL SIZES	E*, A, B, C, D**
CLASS	P — UL listed flame retardant thermoplastic
CONTACT ARRANGEMENTS	9*, 15, 25, 37, 50*
CONTACT TYPE	P — Pin (Receptacle) S — Socket (Plug)
PC TERMINATION TYPE	A — 90°, .478 (12,14) length C — 90°, .590 (14,99) length
PC TERMINATION MODIFICATION	A — Standard Cannon extension

*Consult factory for availability. ** Standard Cannon extension only.

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

D SUBMINIATURE RECTANGULAR CONNECTORS

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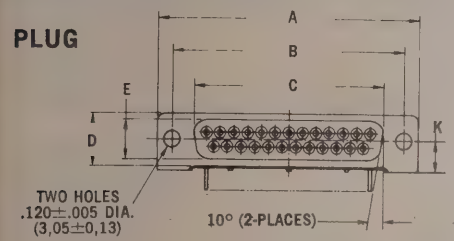
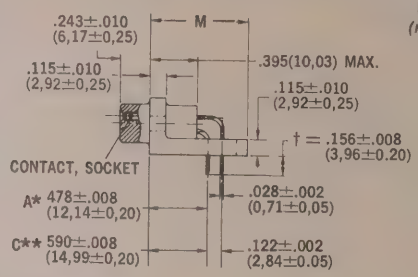
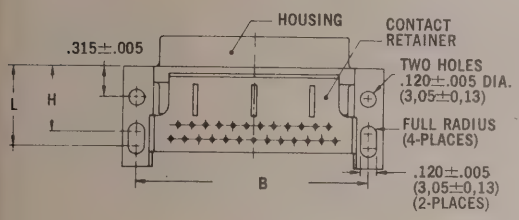
ALL PLASTIC 90° D*P DIMENSIONAL DATA

Dimensions subject to change.
(millimeters are in parentheses)

PLUG





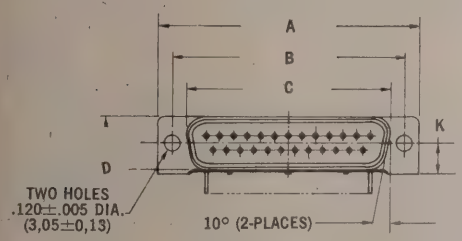


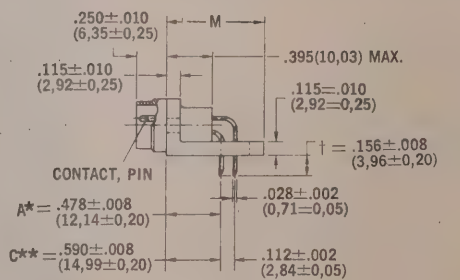
PLUG DIMENSIONS

Part No. by Shell Size	A ±.015 (0,38)	B ±.005 (0,13)	C ±.005 (0,13)	D ±.015 (0,38)	E ±.005 (0,13)	H ±.005 (0,13)	K ±.010 (0,25)	L ±.005 (0,13)	M ±.010 (0,25)
DEP-9S*	1.213 (30,80)	0.984 (24,99)	0.643 (16,33)	0.419 (10,64)	0.311 (7,80)	0.523 (13,28)	0.245 (6,22)	0.635 (16,13)	0.796 (20,22)
DAP-15S*	1.543 (39,19)	1.312 (33,32)	0.971 (24,66)	0.419 (10,64)	0.311 (7,80)	0.523 (13,28)	0.245 (6,22)	0.635 (16,13)	0.796 (20,22)
DBP-25S	2.088 (53,03)	1.852 (47,04)	1.511 (38,38)	0.419 (10,64)	0.311 (7,80)	0.523 (13,28)	0.245 (6,22)	0.635 (16,13)	0.796 (20,22)
DCP-37S*	2.729 (69,32)	2.500 (63,50)	2.159 (54,84)	0.419 (10,64)	0.311 (7,80)	0.523 (13,28)	0.245 (6,22)	0.635 (16,13)	0.796 (20,22)
DDP-50S*	2.635 (66,93)	2.406 (61,11)	2.064 (52,43)	0.525 (13,33)	0.423 (10,74)	0.558 (14,17)	0.300 (7,62)	0.670 (17,02)	0.908 (23,06)

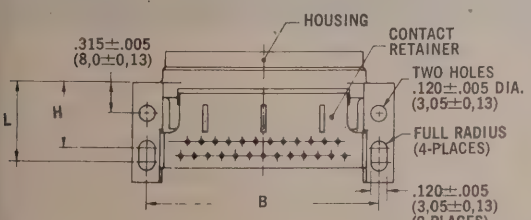
*Consult factory for availability.

RECEPTACLE





A* For replacing Cannon 90° D Subminiature-type connectors.
C** For replacing other 90° PCB connectors.
†For other contact extensions, consult factory.

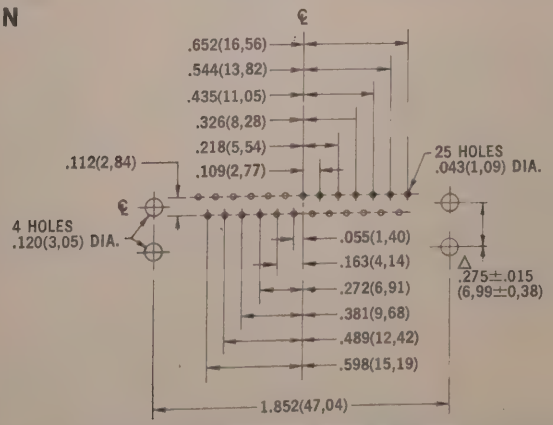


RECEPTACLE DIMENSIONS

Part No. by Shell Size	A ±.015 (0,38)	B ±.005 (0,13)	C ±.010 (0,25)	D ±.015 (0,38)	H ±.005 (0,13)	K ±.010 (0,25)	L ±.005 (0,13)	M ±.010 (0,25)
DEP-9P*	1.213 (30,81)	0.984 (24.99)	0.752 (19,10)	(10,64) 0.419	(13,28) 0.523	0.245 (6,22)	0.635 (16,13)	0.796 (20,22)
DAP-15P	1.543 (39,19)	1.312 (33,32)	1.080 (27,43)	0.419 (10,64)	0.523 (13,28)	0.245 (6,22)	0.635 (16,13)	0.796 (20,22)
DBP-25P	2.088 (53,03)	1.852 (47,04)	1.620 (41,15)	0.419 (10,64)	0.523 (13,28)	0.245 (6,22)	0.635 (16,13)	0.796 (20,22)
DCP-37P	2.729 (69,32)	2.500 (63,50)	2.268 (57,61)	0.419 (10,64)	0.523 (13,28)	0.245 (6,22)	0.635 (16,13)	0.796 (20,22)
DDP-50P*	2.635 (66,93)	2.406 (61,11)	2.168 (55,07)	0.525 (13,33)	0.558 (14,17)	0.300 (7,62)	0.670 (17,02)	0.908 (23,06)

*Consult factory for availability.

P.C. BOARD HOLE PATTERN



△ Location of Connector Mounting Holes Optional As Shown

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WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

D SUBMINIATURE RECTANGULAR CONNECTORS

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

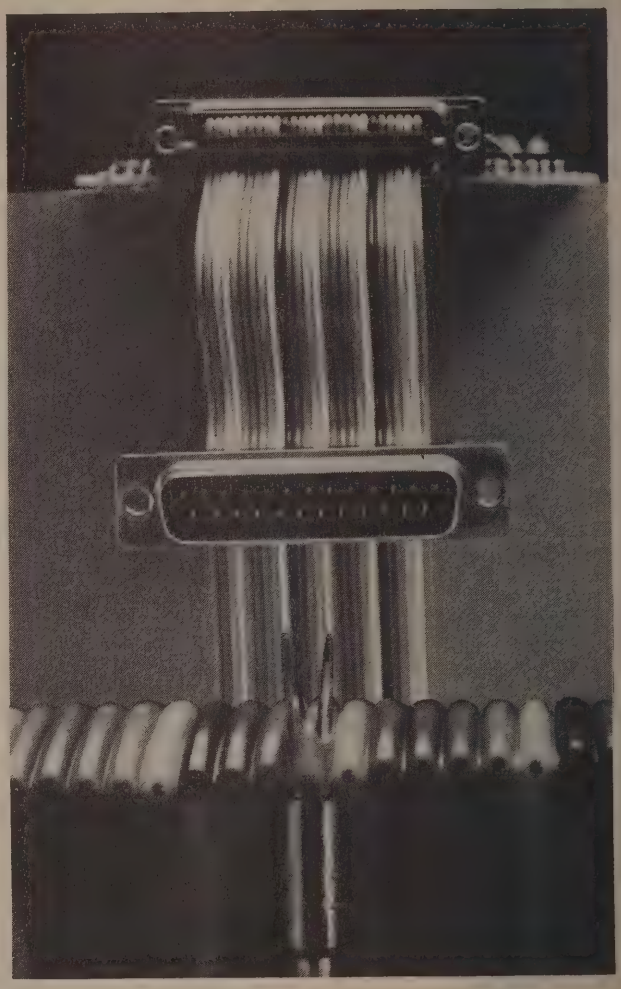
MAS/TER-D D*SP

The new Cannon® Mas/Ter-D (Mass Terminated, D Subminiature) pin-and-socket connectors provide reliable high-speed mass termination at a lower total installed cost than conventional mass termination techniques.

Fully intermateable and intermountable with the Cannon D Subminiature Series, Mas/Ter-D connectors are part of the new Cannon Mas/Ter Interconnect System. The Mas/Ter Interconnect System eliminates the drawbacks of conventional mass termination systems while providing several benefits all its own.

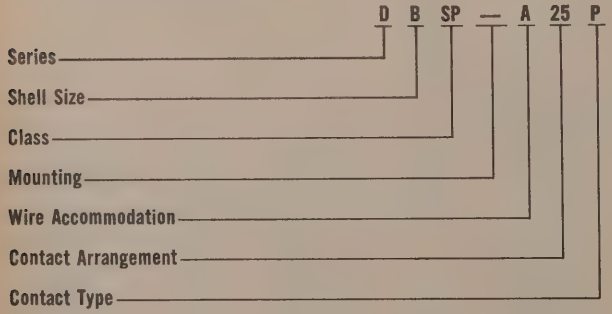
- Fully intermateable and intermountable with and accepts locking device accessories from the Cannon D Subminiature Series.
- Entire connector is terminated at once with no insulation stripping, no complex tooling.
- Terminates cables or may be used in a daisy chain configuration with no break in the cable.
- Each contact size terminates two wire gages, solid or stranded, utilizing both variable spaced .054/.050 (1,37/1,27) and .050/.050 (1,27/1,27) spaced round conductor flat cable or individual wires, with most standard insulation materials.
- Plastic materials used are flame retardant, U.L. listed.

For more information on the full capabilities of the Cannon Mas/Ter Interconnect System, contact your nearest ITT Cannon Sales Office.



HOW TO ORDER

Example: To order a D Subminiature connector with 25 contacts using the Mas/Ter termination technique, standard .120" (3,05) diameter mounting holes, for solid or stranded wire from #22 thru #24 AWG and pin contacts, order as follows:



SERIES	D Subminiature Series with keystone-shaped insulator
SHELL SIZES	E*, A, B, C, D*
CLASS	SP — Insulation displacement
MOUNTING	No designation — Standard .120 (3,05) dia. mounting holes E — #4-40 clinch nuts for rear panel mounting F — Float mount for rear panel mounting G — #2-56 clinch nuts K — .154 (3,91) mounting holes R — Float mount for front panel mounting Consult factory for mounting details
WIRE ACCOMMODATION	A — #22 thru #24 AWG, solid and stranded B — #26 thru #28 AWG, solid and stranded
CONTACT ARRANGEMENT	9*, 15, 25, 37, 50*
CONTACT TYPE	P — Pin S — Socket

*Consult factory for availability *(millimeters are in parentheses)*

STANDARD DATA

Insulator	Glass reinforced thermoplastic, U.L. rated 94V-0 (flame retardant), black
Contacts	Gold over nickel electroplate on copper alloy
Shell	Yellow chromate over cadmium plate on steel
Termination technique	Insulation displacement
Coupling	Friction
Polarization	Keystone shape
Contact size	20
Wire accommodation	Contact A: #22 thru #24 AWG solid and stranded, .053 (1,35) max. insulation dia., non-irradiated PVC insulation preferable. Contact B: #26 thru #28 AWG solid and stranded, .041 (1,04) max. insulation dia., non-irradiated PVC insulation preferable.
Current rating	3 amperes continuous, contact A 1 ampere continuous, contact B
Dielectric withstanding voltage	650 VAC
Insulation resistance	1000 megohms
Contact resistance	15 milliohms
Temperature range	—55°C to +105°C (—67°F to +221°F)

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

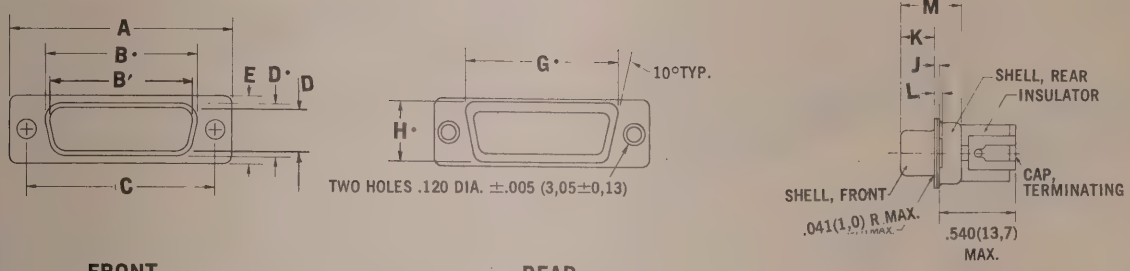
ITT CANNON ELECTRIC

D SUBMINIATURE RECTANGULAR CONNECTORS

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

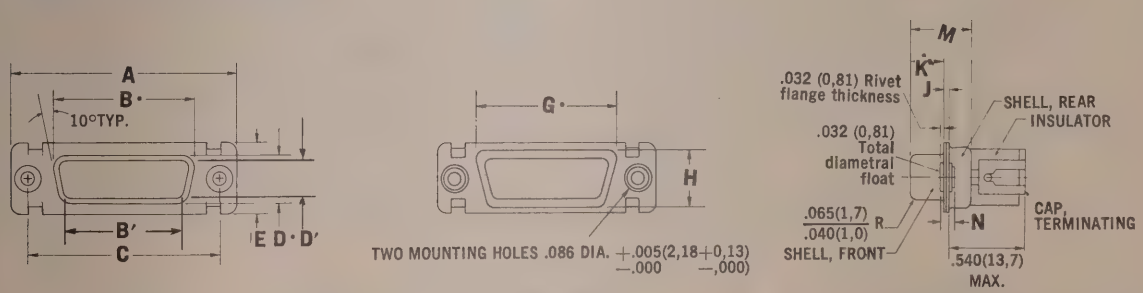
Dimensions subject to change.

STANDARD SHELL



FRONT REAR

SHELL WITH FLOAT MOUNTS



FRONT REAR

INCHES

Part Number by Shell Size	A ±.015	B• ±.010	B′ ±.010	C ±.005	D• ±.010	D′ ±.010	E ±.015	G• ±.010	H• ±.010	J ±.010	K ±.010	L ±.010	M ±.015	N ±.010
DE-9P	1.213	—	.666	.984	—	.329	.494	.759	.422	.030	.236	.045	.422	.120
DE-9S	1.213	.640	—	.984	.308	—	.494	.759	.422	.030	.243	.045	.429	.120
DA-15P	1.541	—	.994	1.312	—	.329	.494	1.083	.422	.030	.236	.045	.422	.120
DA-15S	1.541	.968	—	1.312	.308	—	.494	1.083	.422	.030	.243	.045	.429	.120
DB-25P	2.088	—	1.534	1.852	—	.329	.494	1.625	.422	.039	.231	.060	.426	.129
DB-25S	2.088	1.508	—	1.852	.308	—	.494	1.625	.422	.030	.243	.045	.429	.120
DC-37P	2.729	—	2.182	2.500	—	.329	.494	2.272	.422	.039	.231	.060	.426	.129
DC-37S	2.729	2.156	—	2.500	.308	—	.494	2.272	.422	.030	.243	.045	.429	.120

MILLIMETERS

Part Number by Shell Size	A ±0,38	B• ±0,25	B′ ±0,25	C ±0,12	D• ±0,25	D′ ±0,25	E ±0,38	G• ±0,25	H• ±0,25	J ±0,25	K ±0,25	L ±0,25	M ±0,38	N ±0,25
DE-9P	30,81	—	16,91	24,99	—	8,36	12,55	19,28	10,72	0,76	5,99	1,14	10,72	3,05
DE-9S	30,81	16,25	—	24,99	7,82	—	12,55	19,28	10,72	0,76	6,17	1,14	10,90	3,05
DA-15P	39,14	—	25,24	33,32	—	8,36	12,55	27,51	10,72	0,76	5,99	1,14	10,72	3,05
DA-15S	39,14	24,58	—	33,32	7,82	—	12,55	27,51	10,72	0,76	6,17	1,14	10,90	3,05
DB-25P	53,03	—	38,96	47,04	—	8,36	12,55	41,27	10,72	0,99	5,87	1,52	10,82	3,28
DB-25S	53,03	38,30	—	47,04	7,82	—	12,55	41,27	10,72	0,76	6,17	1,14	10,90	3,05
DC-37P	69,31	—	55,42	63,50	—	8,36	12,55	57,71	10,72	0,99	5,87	1,52	10,82	3,28
DC-37S	69,31	54,76	—	63,50	7,82	—	12,55	57,71	10,72	0,76	6,17	1,14	10,90	3,05

• Dimensions B, D, G, and H are measured as outside dimensions at the bottom of draw.
For shell with float mounts, add letter F after letter C, e.g., DEF-9P.

NOTE: B• and D• are the O.D. dims. for socket side, B′ and D′ are the I.D. dims. for pin side.

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

D SUBMINIATURE RECTANGULAR CONNECTORS

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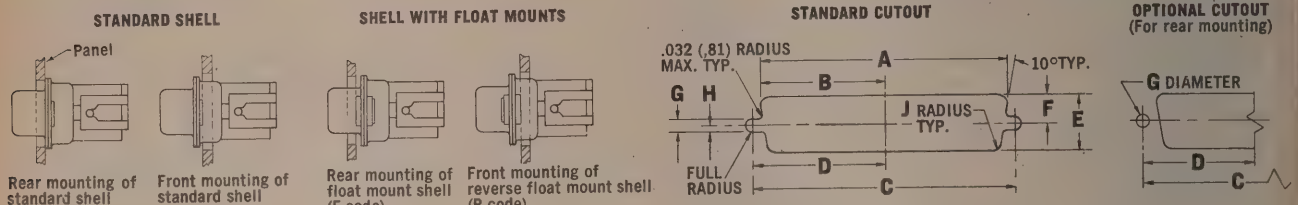
(millimeters are in parentheses)

MOUNTING VIEWS AND PANEL CUTOUTS

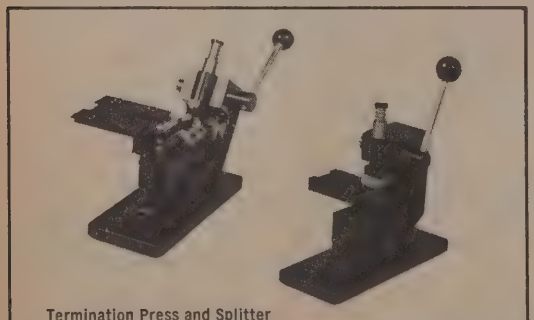


Connector size	Mounting Method	A ± .005 (0,13)	B ± .005 (0,13)	C ± .005 (0,13)	D ± .005 (0,13)	E ± .005 (0,13)	F ± .005 (0,13)	G ± .002 (0,05)	H ± .002 (0,05)	J ± .002 (0,05)
E Standard	Front Mounting	.874 (22,19)	.437 (11,09)	.984 (24,99)	.492 (12,49)	.513 (13,03)	.257 (6,52)	.120 (3,04)	.060 (1,52)	.083 (2,10)
	Rear Mounting	.806 (20,47)	.403 (10,23)	.984 (24,99)	.492 (12,49)	.499 (11,40)	.225 (5,71)	.120 (3,04)	.060 (1,52)	.132 (3,35)
E Float	Front Mounting	.906 (23,01)	.453 (11,50)	.984 (24,99)	.492 (12,49)	.545 (13,84)	.273 (6,93)	.088 (2,23)	.044 (1,11)	.083 (2,10)
	Rear Mounting	.838 (21,28)	.419 (10,64)	.984 (24,99)	.492 (12,49)	.481 (12,21)	.241 (6,12)	.088 (2,23)	.044 (1,11)	.132 (3,35)
A Standard	Front Mounting	1.202 (30,53)	.601 (15,26)	1.312 (33,32)	.656 (16,66)	.513 (13,03)	.257 (6,52)	.120 (3,04)	.060 (1,52)	.083 (2,10)
	Rear Mounting	1.134 (28,80)	.567 (14,40)	1.312 (33,32)	.656 (16,66)	.449 (11,40)	.225 (5,71)	.120 (3,04)	.060 (1,52)	.132 (3,35)
A Float	Front Mounting	1.234 (31,34)	.617 (15,67)	1.312 (33,32)	.656 (16,66)	.545 (13,84)	.273 (6,93)	.088 (2,23)	.044 (1,11)	.083 (2,10)
	Rear Mounting	1.166 (29,61)	.583 (14,80)	1.312 (33,32)	.656 (16,60)	.481 (12,21)	.241 (6,12)	.088 (2,23)	.044 (1,11)	.132 (3,35)
B Standard	Front Mounting	1.743 (44,27)	.872 (22,14)	1.852 (47,04)	.926 (23,52)	.513 (13,03)	.257 (6,52)	.120 (3,04)	.060 (1,52)	.083 (2,10)
	Rear Mounting	1.674 (42,51)	.837 (21,25)	1.852 (47,04)	.926 (23,52)	.449 (11,40)	.225 (5,71)	.120 (3,04)	.060 (1,52)	.132 (3,35)
B Float	Front Mounting	1.775 (45,08)	.888 (22,55)	1.852 (47,04)	.926 (23,52)	.545 (13,84)	.273 (6,93)	.088 (2,23)	.044 (1,11)	.083 (2,10)
	Rear Mounting	1.706 (43,33)	.853 (21,66)	1,852 (47,04)	.926 (23,52)	.481 (12,21)	.241 (6,12)	.088 (2,23)	.044 (1,11)	.132 (3,35)
C Standard	Front Mounting	2.391 (60,73)	1.196 (30,37)	2.500 (63,50)	1.250 (31,75)	.513 (13,03)	.257 (6,52)	.120 (3,04)	.060 (1,52)	.083 (2,10)
	Rear Mounting	2.326 (59,08)	1.163 (29,54)	2.500 (63,50)	1.250 (31,75)	.449 (11,40)	.225 (5,71)	.120 (3,04)	.060 (1,52)	.132 (3,35)
C Float	Front Mounting	2.423 (61,54)	1.212 (30,78)	2.500 (63,50)	1.250 (31,75)	.545 (13,84)	.273 (6,93)	.088 (2,23)	.044 (1,11)	.083 (2,10)
	Rear Mounting	2.354 (59,79)	1.177 (29,89)	2.500 (63,50)	1.250 (31,75)	.481 (12,21)	.241 (6,12)	.088 (2,23)	.044 (1,11)	.132 (3,35)

ASSEMBLY PROCEDURE

The lower total installed cost of the Mas/Ter Interconnect System is achieved through a quick, simple termination procedure. The entire operation is performed at a single work station with a single stroke of the press, with no stripping of insulation and no complex tooling.

Either .054/.050 (1,37/1,27) variable-spaced or .050/.050 (1,27/1,27) fixed-spacing round conductor flat cable may be mass terminated with the Mas/Ter interconnect system. .050/.050 (1,27/1,27) wires are first separated on a splitting press. For assembly, the .054 (1,37) portion of the variable-spaced or the separated portion of the fixed-spacing flat cable is positioned over the connector body, the cap is placed over it, and a single stroke of the press terminates all wires. After termination, a strain-relief clamp may be snapped into place quickly and easily.



Termination Press and Splitter

MAS/TER-D Tooling Ordering Information:

Select appropriate components and equipment press to terminate various cable configurations and connector sizes from locator and comb kit listing below.

LOCATOR KITS		COMB KITS	
Connector Layout	P/N Locator	Wire Type	P/N
37 Contacts Pin and Socket	320-7004-005	.050" (1,27) Split Cable*	320-7004-009
25 Contacts Pin and Socket	320-7004-006	.050" (1,27) Split Cable*	320-7004-010
		.050"/.054" (1,37/1,27) Variable Pitch	320-7004-014
15 Contacts Pin and Socket	320-7004-007	.050" (1,27) Split Cable*	320-7004-011

Termination Press P/N 317-1489-000

*Splitter (P/N 070296-0001) is required to pre split .050" cable prior to termination. Splitter will split **all** widths (15 to 37 conductors) with adjustment of wire guide.

EXAMPLE: Required to terminate 25 conductor .050" (1,27) flat cable to 25 contact connector (pin or socket).

SELECT — Locator Kit 320-7004-006
— Comb Kit 320-7004-010
— Termination Press 317-1489-000
— Splitter 070296-0001

For other connector layout and wire configuration not shown consult factory for appropriate kit numbers.

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

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(millimeters are in parentheses)

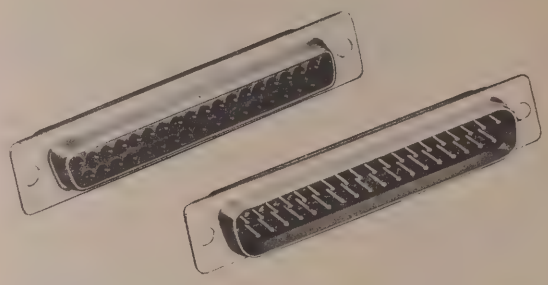
GOLDEN-D (Mark I) D*M Solder Type, Non-Removable Contacts

GENERAL INFORMATION

The D*M connector features solder pot contacts in a monobloc insulator for improved temperature characteristics and increased moisture resistance. Two insulator types are available: combination arrangements with accommodations for coax, power and/or high voltage contacts, plus standard AWG wire contacts; and arrangements with standard AWG wire contacts only. The five amp* solder pot contacts accommodate wire sizes up to #20 AWG standard wire. Socket contacts are of the closed entry type. Operating temperatures of insulators range from −65°F to +300°F (−55°C to +148°C).

Combination arrangements are supplied with unfilled coax, power and/or high voltage contact cavities. Coax, power, high voltage contacts must be ordered separately, and may be used interchangeably in any of the arrangements listed. High voltage contacts accommodate up to #20 wire sizes. Coax contacts (with crimp or solder braid type terminations) and high voltage contacts are snap-in and removable. Coax and high voltage contacts have captivated solder type center contacts.

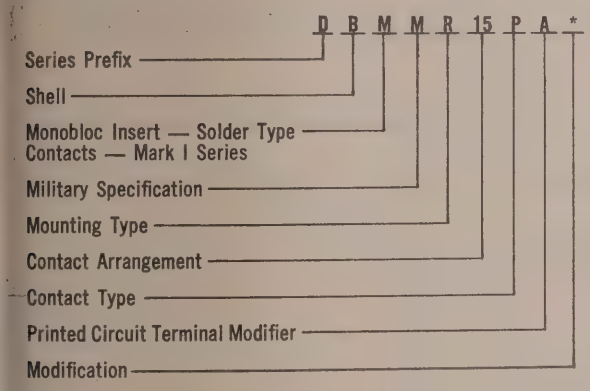
Standard coax and high voltage plugs contain female center contacts; receptacles contain male center contacts. Combination arrangement pin connector assemblies accommodate coax, power, and high voltage plugs only; socket assemblies accommodate receptacles. Connector assemblies



and contact inserts are matched and color coded to ease assembly. No insertion tool is required for coax, power, and high voltage contacts; they may be extracted with ITT Cannon Tool CET-C6B.

Connectors for non-magnetic applications are available. Standard NMB non-magnetic connectors have magnetic flux densities less than 200 gamma after magnetization with a 5000 gauss magnet.

HOW TO ORDER



SERIES PREFIX
D — ITT Cannon designation

SHELL
A, B, C, D, and E

MARK I SERIES DESIGNATION

MILITARY SPECIFICATION
M — For connectors to MIL-C-24308 specification — omit for standard

MOUNTING TYPE
No Designator — Standard .120 (3,05) diameter hole
E — 4-40 clinch nut for rear panel mounting
F — Float mounts for rear panel mounting
G — 2-56 clinch nut for rear panel mounting
K — .154 (3,91) diameter mounting hole
R — Reverse float mount for front panel mounting

CONTACT ARRANGEMENT
See page 92

CONTACT TYPE
P — Pin; S — Socket

MODIFICATION
Please consult factory

PRINTED CIRCUIT TERMINAL MODIFIER CODES (See Chart Below)

Dimensions subject to change.

Code	Straight	Right Angle	Bracket: With	Bracket: Without	Below Board	Commercial: Contact Extension ±.020(0,51)	Commercial: Max. Board Thickness	Military: Contact Extension	Military: Max. Board Thickness	Terminal Diameter
*A	—	•	•	—	—	③.093(2,36)	.062(1,57)	②④.099/.154(2,54/39,12)	.062(1,57)	.040(1,02)
B	•	—	—	—	—	①.125(3,18)	.062(1,57)	—	—	.040(1,02)
C	—	•	—	•	—	③.093(2,36)	.062(1,57)	—	—	.040(1,02)
*D	—	•	•	—	—	③.093(2,36)	.062(1,57)	②④.099/.154(2,54/39,12)	.062(1,57)	.030(0,76)
E	•	—	—	—	—	①.125(3,18)	.062(1,57)	—	—	.030(0,76)
F	—	•	—	•	—	③.093(2,36)	.062(1,57)	—	—	.030(0,76)
*G	—	•	•	—	—	③.125(3,18)	.093(2,36)	②④.130/.185(33,02/46,99)	.094(2,39)	.040(1,02)
H	•	—	—	—	—	①.156(3,96)	.094(2,39)	①.130/.185(33,02/46,99)	.094(2,39)	.040(1,02)
K	—	•	—	•	—	③.125(3,18)	.093(2,36)	—	—	.040(1,02)
*L	—	•	•	—	—	③.156(3,96)	.125(3,18)	②④.130/.185(33,02/46,99)	.094(2,39)	.030(0,76)
M	•	—	—	—	—	①.156(3,96)	.094(2,39)	①.130/.185(33,02/46,99)	.094(2,39)	.030(0,76)
P	—	•	—	•	—	③.156(3,96)	.125(3,18)	—	—	.030(0,76)
R	—	•	—	•	—	③.184(4,67)	.156(3,96)	—	—	.030(0,76)
*S	—	•	•	—	—	③.184(4,67)	.156(3,96)	②④.155/.210(39,37/53,34)	.125(3,18)	.030(0,76)
T	—	•	—	•	•	③.125(3,18)	.093(2,36)	—	—	.040(1,02)
*W	—	•	•	—	—	③.156(3,96)	.125(3,18)	②④.155/.210(39,37/53,34)	.125(3,18)	.040(1,02)
*X	•	—	—	—	—	①.184(4,67)	.156(3,96)	①.155/.210(39,37/53,34)	.125(3,18)	.040(1,02)
Y	—	•	—	—	•	③.093(2,36)	.062(1,57)	—	—	.030(0,76)
*Z	•	—	—	—	—	①.184(4,67)	.156(3,96)	①.155/.210(39,37/53,34)	.125(3,18)	.030(0,76)

*When suffix "M" is used on Commercial designators, Military contact extension applies. ①From Insulator ②From Bracket ③From Flange ④Available, Pin Side Only

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ITT CANNON ELECTRIC

D SUBMINIATURE RECTANGULAR CONNECTORS

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GOLDEN-D (Mark I) D*M Solder Type, Non-Removable Contacts

STANDARD DATA

Shell	Steel, cadmium plated with yellow chromate supplementary coating
Insulator	Diallylphthalate, glass-filled per MIL-M-14, Type GDI-30F or Type SD6-F, dark green color, monobloc construction
#20 Contacts (Standard)	Pin and Socket: Brass, gold plate over nickel plate
#20 Contacts (Military)	Pin and Socket: Brass, gold plate over copper
Ref. MIL-C-24308	ITT Finish Code A156
Rivets and Washers (Float Mounting)	Stainless steel
High Voltage Contacts	*Pin: Brass, gold plate over nickel plate *Socket: Copper alloy, gold plate over nickel plate
Coaxial Contacts	Outer Contact: *Plug: Brass, gold plate over nickel plate; *Receptacle: Beryllium copper, gold plate over nickel plate *Center Female Contact: Copper alloy, gold plate over nickel plate *Center Male Contact: Brass, gold plate over nickel plate Insulator: Teflon
High Power Contacts	*Pin: Brass, gold plate over nickel plate *Socket: Beryllium copper, gold plate over nickel plate
Voltage Rating	See page 109

***NOTE:** Also available in Military Finish: Gold over copper plate (ITT Cannon Finish Code A156).

BASIC CONTACT ARRANGEMENTS

FACE VIEW PIN INSERT

Shell Size	E	A	B	C	D
No. of Contacts	9	15	25	37	50
Contact Size	#20	#20	#20	#20	#20

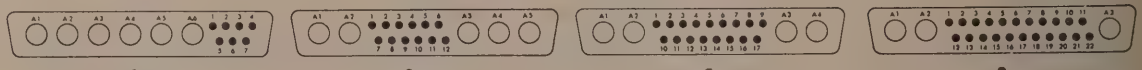
COMBINATION ARRANGEMENTS

#20 CONTACTS WITH COAX, POWER AND/OR HIGH VOLTAGE CONTACTS

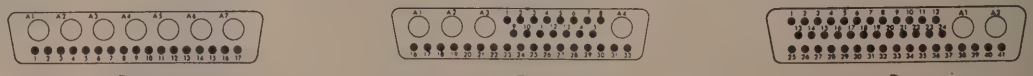
Note: Color Code — Pin Connector: Red, Socket Connector: Blue

Shell Size	E	A	A	A	B	B
Arrangement	5W1	3W3	7W2	11W1	5W5	9W4
No. of Contacts	4	0	5	10	0	5
Contact Size	#20	—	#20	#20	—	#20
Coax or HV Cavities	1	3	2	1	5	4

Shell Size	B	B	B	C
Arrangement	13W3	17W2	21W1	8W8
No. of Contacts	10	15	20	0
Contact Size	#20	#20	#20	—
Coax or HV Cavities	3	2	1	8



Shell Size	C	C	C	C
Arrangement	13W6	17W5	21WA4	25W3
No. of Contacts	7	12	17	22
Contact Size	#20	#20	#20	#20
Coax or HV Cavities	6	5	4	3



Shell Size	D	D	D
Arrangement	24W7	36W4	43W2
No. of Contacts	17	32	41
Contact Size	#20	±20	#20
Coax or HV Cavities	7	4	2

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

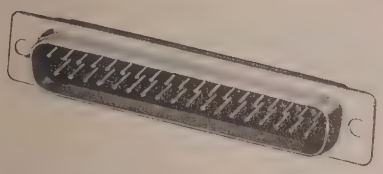
D SUBMINIATURE RECTANGULAR CONNECTORS

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

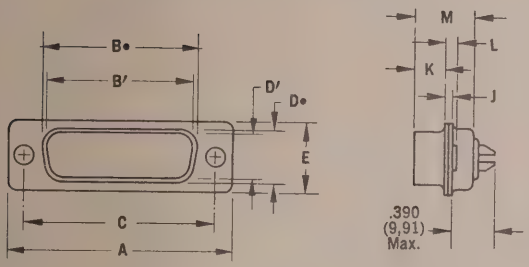
Dimensions subject to change.

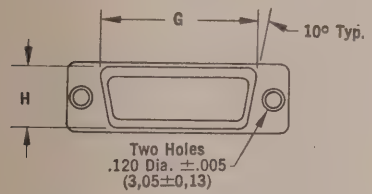
GOLDEN-D (Mark I) D*M Solder Type, Non-Removable Contacts

STANDARD SHELL



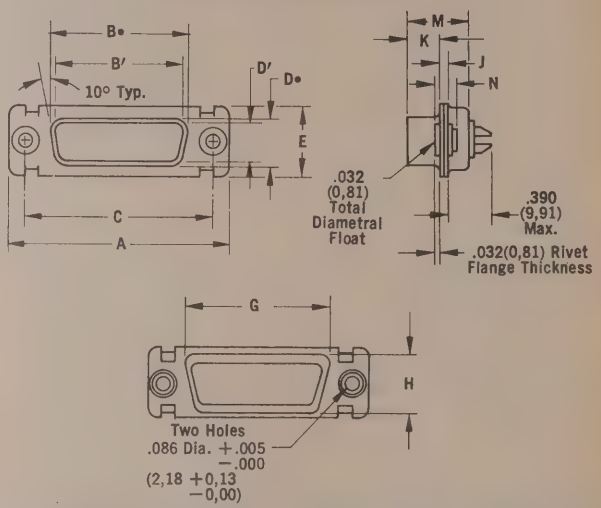
(millimeters are in parentheses)





SHELL WITH FLOAT MOUNTS

(millimeters are in parentheses)



It is recommended that only one assembly, either pin or socket, be float mounted. For front panel mounting use reverse float mount; see page 118.

INCHES

Part Number by Shell Size	A ±.015	B• ±.010	B′ ±.010	C ±.005	D• ±.010	D′ ±.010	E ±.015	G• ±.010	H• ±.010	J ±.010	K ±.010	L ±.010	M ±.015	N ±.010
DEM-*P	1.213	—	.666	.984	—	.329	.494	.759	.422	.030	.236	.045	.422	.120
DEM-*S	1.213	.640	—	.984	.308	—	.494	.759	.422	.030	.243	.045	.429	.120
DAM-*P	1.541	—	.994	1.312	—	.329	.494	1.083	.422	.030	.236	.045	.422	.120
DAM-*S	1.541	.968	—	1.312	.308	—	.494	1.083	.422	.030	.243	.045	.429	.120
DBM-*P	2.088	—	1.534	1.852	—	.329	.494	1.625	.422	.039	.231	.060	.426	.129
DBM-*S	2.088	1.508	—	1.852	.308	—	.494	1.625	.422	.030	.243	.045	.429	.120
DCM-*P	2.729	—	2,182	2.500	—	.329	.494	2.272	.422	.039	.231	.060	.426	.129
DCM-*S	2.729	2.156	—	2.500	.308	—	.494	2.272	.422	.030	.243	.045	.429	.120
DDM-*P	2.635	—	2.079	2.406	—	.436	.605	2.178	.534	.039	.231	.060	.426	.129
DDM-*S	2.635	2.062	—	2.406	.420	—	.605	2.178	.534	.030	.243	.045	.429	.120

MILLIMETERS

Part Number by Shell Size	A ±0,38	B• ±0,25	B′ ±0,25	C ±0,12	D• ±0,25	D′ ±0,25	E ±0,38	G• ±0,25	H• ±0,25	J ±0,25	K ±0,25	L ±0,25	M ±0,38	N ±0,25
DE-9P	30,81	—	16,91	24,99	—	8,36	12,55	19,28	10,72	0,76	5,99	1,14	10,72	3,05
DE-9S	30,81	16,25	—	24,99	7,82	—	12,55	19,28	10,72	0,76	6,17	1,14	10,90	3,05
DA-15P	39,14	—	25,24	33,32	—	8,36	12,55	27,51	10,72	0,76	5,99	1,14	10,72	3,05
DA-15S	39,14	24,58	—	33,32	7,82	—	12,55	27,51	10,72	0.76	6,17	1,14	10,90	3,05
DB-25P	53,03	—	38,96	47,04	—	8,36	12,55	41,27	10,72	0,99	5,87	1,52	10,82	3,28
DB-25S	53,03	38,30	—	47,04	7,82	—	12,55	41,27	10,72	0,76	6,17	1,14	10,90	3,05
DC-37P	69,31	—	55,42	63,50	—	8,36	12,55	57,71	10,72	0,99	5,87	1,52	10,82	3,28
DC-37S	69,31	54,76	—	63,50	7,82	—	12,55	57,71	10,72	0,76	6,17	1,14	10,90	3,05
DD-50P	66,92	—	52,81	61,11	—	11,07	15,37	55,32	13,56	0.99	5,87	1,52	10,82	3,28
DD-50S	66,92	52,37	—	61,11	10,67	—	15,37	55,32	13,56	0,76	6,17	1,14	10,90	3,05

Add number of contacts for basic arrangements, OR add the contact arrangement number for coaxial and/or HV combination arrangements.

•Dimensions B, D, G, and H are measured as outside dimensions at the bottom of draw.
For shell with float mounts, add letter F after letter M, e.g., DEMF-*P.

NOTE: B• and D• are the O.D. dims. for socket side, B′ and D′ are the I.D. dims. for pin side.

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WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

D SUBMINIATURE RECTANGULAR CONNECTORS

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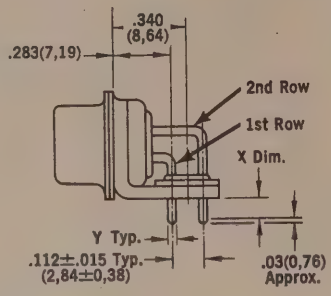
Dimensions subject to change.

GOLDEN-D (Mark I) D*M Solder Type, Non-Removable Contacts

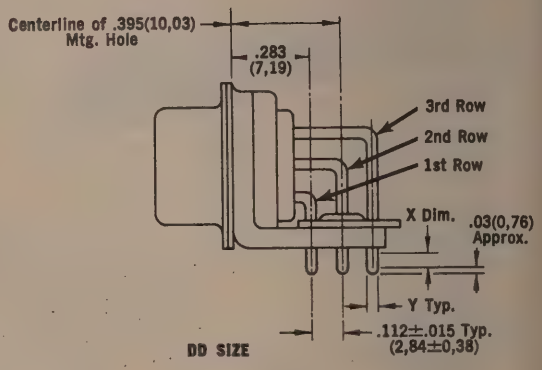
PRINTED CIRCUIT APPLICATIONS

RIGHT ANGLE 90° TERMINAL

Connectors are furnished with or without bracket. Spacer assemblies not supplied.



DE, DA, DB, DC SIZES

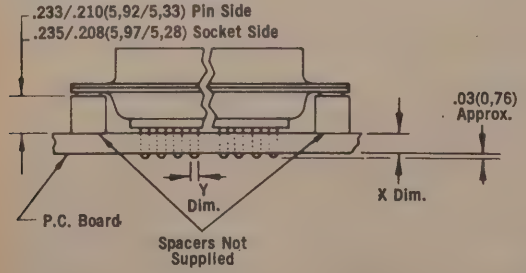


DD SIZE

Code	Straight	Right Angle	Bracket		Below Board	Commercial		Military		Terminal Diameter
			With	Without		Contact Extension ±.020(0,51)	Max. Board Thickness	Contact Extension	Max. Board Thickness	
*A	—	•	•	—	—	[2].093(2,36)	.062(1,57)	[2][4].099/.154(2,54/39,12)	.062(1,57)	.040(1,02)
B	•	—	—	—	—	[1].125(3,18)	.062(1,57)	—	—	.040(1,02)
C	—	•	—	•	—	[3].093(2,36)	.062(1,57)	—	—	.040(1,02)
*D	—	•	•	—	—	[2].093(2,36)	.062(1,57)	[2][4].099/.154(2,54/39,12)	.062(1,57)	.030(0,76)
E	•	—	—	—	—	[1].125(3,18)	.062(1,57)	—	—	.030(0,76)
F	—	•	—	•	—	[3].093(2,36)	.062(1,57)	—	—	.030(0,76)
*G	—	•	•	—	—	[2].125(3,18)	.093(2,36)	[2][4].130/.185(33,02/46,99)	.094(2,39)	.040(1,02)
H	•	—	—	—	—	[1].156(3,96)	.094(2,39)	[1].130/.185(33,02/46,99)	.094(2,39)	.040(1,02)
K	—	•	—	•	—	[3].125(3,18)	.093(2,36)	—	—	.040(1,02)
*L	—	•	•	—	—	[2].156(3,96)	.125(3,18)	[2][4].130/.185(33,02/46,99)	.094(2,39)	.030(0,76)
M	•	—	—	—	—	[1].156(3,96)	.094(2,39)	[1].130/.185(33,02/46,99)	.094(2,39)	.030(0,76)
P	—	•	—	•	—	[3].156(3,96)	.125(3,18)	—	—	.030(0,76)
R	—	•	—	•	—	[3].184(4,67)	.156(3,96)	—	—	.030(0,76)
*S	—	•	•	—	—	[2].184(4,67)	.156(3,96)	[2][4].155/.210(39,37/53,34)	.125(3,18)	.030(0,76)
T	—	•	—	•	•	[3].125(3,18)	.093(2,36)	—	—	.040(1,02)
*W	—	•	•	—	—	[2].156(3,96)	.125(3,18)	[2][4].155/.210(39,37/53,34)	.125(3,18)	.040(1,02)
*X	•	—	—	—	—	[1].184(4,67)	.156(3,96)	[1].155/.210(39,37/53,34)	.125(3,18)	.040(1,02)
Y	—	•	—	—	•	[3].093(2,36)	.062(1,57)	—	—	.030(0,76)
*Z	•	—	—	—	—	[1].184(4,67)	.156(3,96)	[1].155/.210(39,37/53,34)	.125(3,18)	.030(0,76)

*When suffix "M" is used on Commercial designators, Military contact extension applies. [1]From Insulator [2]From Bracket [3]From Flange [4]Available, Pin Side Only

STRAIGHT TERMINAL



Part Number Printed Circuit Terminal Modifier	X	Y ±.003(±0,08)
B	3/32(2,38)	.04(1,02)
E	3/32(2,38)	.03(0,76)
H	1/8(3,17)	.04(1,02)
M	1/8(3,17)	.03(0,76)

Example: DAM-15PB, see page 101 for ordering nomenclature. *(millimeters are in parentheses)*

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

D SUBMINIATURE RECTANGULAR CONNECTORS

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GOLDEN-D (Mark I) D*M Solder Type, Non-Removable Contacts

CROSS REFERENCE LIST

MARK I MILITARY SOLDER POT CONNECTORS

MIL-C-24308 Part No.	Cannon Part No.
M24308/1-1	DEMM9S
M24308/1-2	DAMM15S
M24308/1-3	DBMM25S
M24308/1-4	DCMM37S
M24308/1-5	DDMM50S

MIL-C-24308 Part No.	Cannon Part No.
M24308/3-1	DEMM9P
M24308/3-2	DAMM15P
M24308/3-3	DBMM25P
M24308/3-4	DCMM37P
M24308/3-5	DDMM50P

MARK I PRINTED CIRCUIT CONNECTORS

MIL-C-24308 Part No.	Cannon Part No.
M24308/23-1	DEMM9SM
M24308/23-2	DAMM15SM
M24308/23-3	DBMM25SM
M24308/23-4	DCMM37SM
M24308/23-5	DDMM50SM
M24308/23-7	DEMM9SZ
M24308/23-8	DAMM15SZ
M24308/23-9	DBMM25SZ
M24308/23-10	DCMM37SZ
M24308/23-11	DDMM50SZ
M24308/23-13	DEMM9SH
M24308/23-14	DAMM15SH
M24308/23-15	DBMM25SH
M24308/23-16	DCMM37SH
M24308/23-17	DDMM50SH
M24308/23-19	DEMM9SX
M24308/23-20	DAMM15SX
M24308/23-21	DBMM25SX
M24308/23-22	DCMM37SX
M24308/23-23	DDMM50SX
M24308/24-1	DEMM9PM
M24308/24-2	DAMM15PM
M24308/24-3	DBMM25PM
M24308/24-4	DCMM37PM
M24308/24-5	DDMM50PM
M24308/24-7	DEMM9PZ
M24308/24-8	DAMM15PZ
M24308/24-9	DBMM25PZ
M24308/24-10	DCMM37PZ
M24308/24-11	DDMM50PZ
M24308/24-13	DEMM9PH
M24308/24-14	DAMM15PH
M24308/24-15	DBMM25PH
M24308/24-16	DCMM37PH
M24308/24-17	DDMM50PH

MIL-C-24308 Part No.	Cannon Part No.
M24308/24-19	DEMM9PX
M24308/24-20	DAMM15PX
M24308/24-21	DBMM25PX
M24308/24-22	DCMM37PX
M24308/24-23	DDMM50PX
M24308/24-25	DEMM9PD
M24308/24-26	DAMM15PD
M24308/24-27	DBMM25PD
M24308/24-28	DCMM37PD
M24308/24-29	DDMM50PD
M24308/24-31	DEMM9PL
M24308/24-32	DAMM15PL
M24308/24-33	DBMM25PL
M24308/24-34	DCMM37PL
M24308/24-35	DDMM50PL
M24308/24-37	DEMM9PA
M24308/24-38	DAMM15PA
M24308/24-39	DBMM25PA
M24308/24-40	DCMM37PA
M24308/24-41	DDMM50PA
M24308/24-43	DEMM9PG
M24308/24-44	DAMM15PG
M24308/24-45	DBMM25PG
M24308/24-46	DCMM37PG
M24308/24-47	DDMM50PG
M24308/24-49	DEMM9PS
M24308/24-50	DAMM15PS
M24308/24-51	DBMM25PS
M24308/24-52	DCMM37PS
M24308/24-53	DDMM50PS
M24308/24-55	DEMM9PW
M24308/24-56	DAMM15PW
M24308/24-57	DBMM25PW
M24308/24-58	DCMM37PW
M24308/24-59	DDMM50PW

ITT CANNON ELECTRIC

D SUBMINIATURE RECTANGULAR CONNECTORS

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GOLDEN-D (Mark I) D*M Solder Type, Non-Removable Contacts

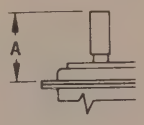
REMOVABLE COAXIAL, HIGH VOLTAGE, AND HIGH POWER CONTACTS

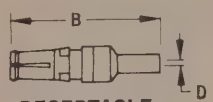
Dimensions subject to change.

Color Code: Receptacle - Blue; Plug - Red

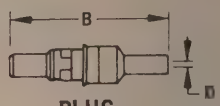
For recommended stripping dimensions and termination data see pages 121 and 122. All coaxial and high voltage contacts have solder center contact. For coax, high voltage, and power contact material, see page 102.

STRAIGHT CRIMP BRAID COAXIAL CONTACTS





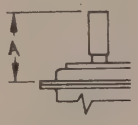
RECEPTACLE

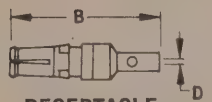


PLUG

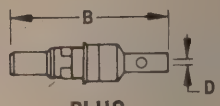
	Part Number Standard Finish	Part Number Military Finish*	A Max.	B Ref.	D ±.005(±0,13)	RG Cable No. Old	RG Cable No. New
Plug	DM53740	DM53740-17	.739(18,8)	.929(23,6)	.055(1,4)	196/U	178B/U
Plug	DM53740-1	DM53740-15	.739(18,8)	.929(23,6)	.081(2,06)	187/U 188/U	179B/U 316B/U
Plug	DM53740-3	DM53740-16	.847(21,5)	1.037(26,3)	.140(3,56)	195/U	180B/U
Plug	DM53740-5	DM53740-18	.847(21,5)	1.037(26,3)	.140(3,56)	58/U	58B/U
Receptacle	DM53742	DM53742-18	.739(18;8)	.929(23,6)	.055(1,4)	196/U	178B/U
Receptacle	DM53742-1	DM53742-16	.739(18,8)	.929(23,6)	.081(2,06)	187/U 188/U	179B/U 316B/U
Receptacle	DM53742-3	DM53742-17	.847(21,5)	1.037(26,3)	.140(3,56)	195/U	180B/U
Receptacle	DM53742-5	DM53742-19	.847(21,5)	1.037(26,3)	.140(3,56)	58/U	58B/U

STRAIGHT SOLDER BRAID COAXIAL CONTACTS





RECEPTACLE



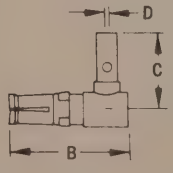
PLUG

	Part Number Standard Finish	Part Number Military Finish*	A Max.	B Ref.	D ±.005(±0,13)	Old RG Cable No.	New RG Cable No.
Plug	DM53740-5008	DM53740-5105	.739(18,8)	.929(23,6)	.055(1,4)	196/U	178B/U
Plug	DM53740-5001	DM53740-5099	.739(18,8)	.929(23,6)	.081(2,06)	187/U 188/U	179B/U 316B/U
Plug	DM53740-5002	DM53740-5104	.847(21,5)	1.037(26,3)	.140(3,56)	195/U	180B/U
Plug	DM53740-5005	DM53740-5101	.847(21,5)	1.037(26,3)	.140(3,56)	58/U	58B/U
Receptacle	DM53742-5006	DM53742-5092	.739(18,8)	.929(23,6)	.055(1,4)	196/U	178B/U
Receptacle	DM53742-5001	DM53742-5089	.739(18,8)	.929(23,6)	.081(2,06)	187/U 188/U	179B/U 316B/U
Receptacle	DM53742-5002	DM53742-5091	.847(21,5)	1.037(26,3)	.140(3,56)	195/U	180B/U
Receptacle	DM53742-5004	DM53742-5086	.847(21,5)	1.037(26,3)	.140(3,56)	58/U	58B/U
Plug (Short Type)	DM53740-5000	DM53740-5100	.670(17,0)	.860(21,8)	.040(1,0)	196/U	178B/U
Receptacle (Short Type)	DM53742-5000	DM53742-5085	.670(17,0)	.860(21,8)	.040(1,0)	196/U	178B/U

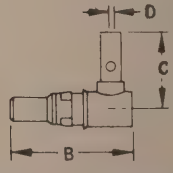
(millimeters are in parentheses)

RIGHT ANGLE SOLDER BRAID COAXIAL CONTACTS

RECEPTACLE



PLUG



	Part Number Standard Finish	Part Number Military Finish*	A Max.	B Ref.	C	D ±.005(±0,13)	RG Cable No. Old	RG Cable No. New
Plug	DM53741-5000	DM53741-5059	.530(13,46)	.734(18,64)	.492(12,50)	.055(1,4)	196/U	178B/U
Plug	DM53741-5001	DM53741-5062	.530(13,46)	.734(18,64)	.492(12,50)	.081(2,06)	187/U 188/U	179B/U 316B/U
Plug	DM53741-5003	DM53741-5063	.530(13,46)	.734(18,64)	.601(15,27)	.110(2,79)	195/U	180B/U
Plug	DM53741-5004	DM53741-5060	.530(13,46)	.734(18,64)	.601(15,27)	.125(3,18)	58/U	58B/U
Receptacle	DM53743-5000	DM53743-5073	.530(13,46)	.734(18,64)	.492(12,50)	.055(1,4)	196/U	178B/U
Receptacle	DM53743-5001	DM53743-5076	.530(13,46)	.734(18,64)	.492(12,50)	.081(2,06)	187/U 188/U	179B/U 316B/U
Receptacle	DM53743-5003	DM53743-5077	.530(13,46)	.734(18,64)	.601(15,27)	.110(2,79)	195/U	180B/U
Receptacle	DM53743-5004	DM53743-5074	.530(13,46)	.734(18,64)	.601(15,27)	.125(3,18)	58/U	58B/U

*MIL-C-24308 Finish: 0.00005(0,00127) minimum gold plate over copper plate (ITT Cannon code A 156).

For a quick response to your application needs call one of the following District Offices:

WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

D SUBMINIATURE RECTANGULAR CONNECTORS

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

GOLDEN-D (Mark I) D*M Solder Type, Non-Removable Contacts

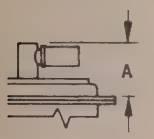
REMOVABLE COAXIAL, HIGH VOLTAGE, AND HIGH POWER CONTACTS

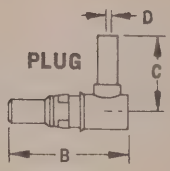
Dimensions subject to change.

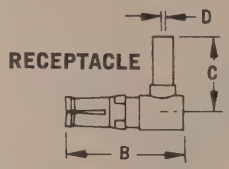
For recommended stripping dimensions and termination data see pages 121 and 122. All coaxial and high voltage contacts have solder center contact. For coax, high voltage, and power contact material, see page 102.

Color Code: Receptacle - Blue; Plug - Red

RIGHT ANGLE CRIMP BRAID COAXIAL CONTACTS

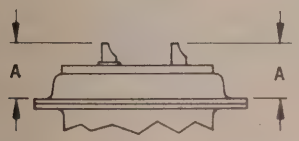


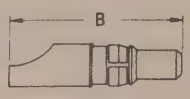




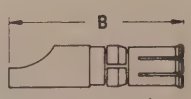
	Part Number Standard Finish	Part Number Military Finish*	A Max.	B Ref.	C	D ±.005(±0,13)	RG Cable No. Old	RG Cable No. New
Plug	DM53741	DM53741-12	.530(13,46)	.734(18,64)	.492(12,50)	.055(1,4)	196/U	178B/U
Plug	DM53741-1	DM53741-11	.530(13,46)	.734(18,64)	.492(12,50)	.081(2,06)	187/U 188/U	179B/U 316B/U
Plug	DM53741-3	DM53741-10	.530(13,46)	.734(18,64)	.601(15,27)	.110(2,79)	195/U	180B/U
Plug	DM53741-4	DM53741-13	.530(13,46)	.734(18,64)	.601(15,27)	.125(3,18)	58/U	58B/U
Receptacle	DM53743-2	DM53743-18	.530(13,46)	.734(18,64)	.492(12,50)	.055(1,4)	196/U	178B/U
Receptacle	DM53743-3	DM53743-16	.530(13,46)	.734(18,64)	.492(12,50)	.081(2,06)	187/U 188/U	179B/U 316B/U
Receptacle	DM53743-5	DM53743-17	.530(13,46)	.734(18,64)	.601(15,27)	.110(2,79)	195/U	180B/U
Receptacle	DM53743-6	DM53743-19	.530(13,46)	.734(18,64)	.601(15,27)	.125(3,18)	58/U	58B/U

HIGH POWER SOLDER TYPE CONTACTS





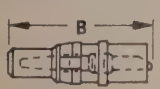
PLUG



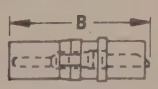
RECEPTACLE

	Part Number Standard Finish	Part Number Military Finish*	A Max.	B Ref.	Current Rating (Amps)	Wire Size
Plug	DM53745-1	DM53745-28	.666(16,92)	.866(22,00)	40	#8
Plug	DM53745-7	DM53745-27	.666(16,92)	.866(22,00)	20	#12
Plug	DM53745-8	DM53745-25	.666(16,92)	.866(22,00)	10	#16
Receptacle	DM53744-1	DM53744-21	.666(16,92)	.856(21,74)	40	#8
Receptacle	DM53744-6	DM53744-25	.666(16,92)	.856(21,74)	20	#12
Receptacle	DM53744-7	DM53744-24	.666(16,92)	.856(21,74)	10	#16

STRAIGHT HIGH VOLTAGE CONTACTS



PLUG

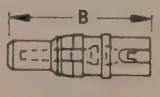


RECEPTACLE

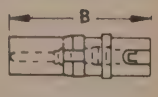
	Part Number Std. Finish	Part Number Mil. Finish*	A Max.	B Ref.	Wire Size
Plug	DM51157	DM51157-8	.539(13,69)	.734(18,64)	#20
Receptacle	DM51155	DM51155-7	.539(13,69)	.734(18,64)	#20

MIL-C-24308 Finish: 0.00005(0,00127) minimum gold plate over copper plate (ITT Cannon code A 156).

RIGHT ANGLE HIGH VOLTAGE CONTACTS



PLUG



RECEPTACLE

	Part Number Standard Finish	Part Number Military Finish*	A Max.	B Ref.	Wire Size
Plug	DM51157-5000	DM51157-5005	.491(12,47)	.697(17,70)	#20
Receptacle	DM51155-5000	DM51155-5004	.491(12,47)	.697(17,70)	#20

(millimeters are in parentheses)

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

D SUBMINIATURE RECTANGULAR CONNECTORS

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ROYAL-D (Mark III) D*MA Crimp Type, Removable Contacts

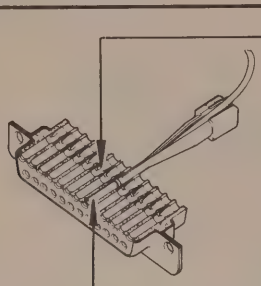
LITTLE CAESAR® REAR RELEASE CONTACT ASSEMBLY

The D*MA connector is a D Subminiature connector that utilizes the LITTLE CAESAR rear release contact assembly. This contact assembly allows rear insertion, release and extraction of crimp snap-in contacts. The simplified contact design with no undercuts offers greater bend resistance and a hard closed entry socket insulator insures positive contact alignment. Consult the factory for availability of rear release coaxial, power and/or high voltage contacts. Crimp terminations accommodate #18, #20, #22, #24, #26 and #30 AWG stranded wire and are rated for 5 amps.†

Extra contacts may be ordered for replacement purposes; for part numbers of contacts, see page 110.

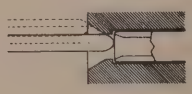
Connectors for non-magnetic applications are available. Standard NMB non-magnetic connectors have magnetic flux densities less than 200 gamma after magnetization with a 5000 gauss magnet.

†Military rating of 20 contacts or wires is 1.5 amps average, and 7.5 amps maximum. See Current Ratings shown on page 109.

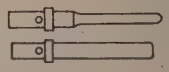


'Contact retaining clip'

Hard dielectric, closed-entry socket insert realigns bent or misaligned pin contacts.



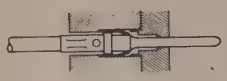
Simple stronger contact without undercuts for greater bend resistance.



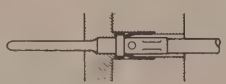
CONTACT INSERTION

Size 20 Contacts

Contact partially inserted.

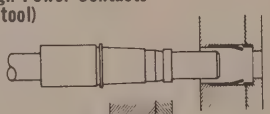


Tines snap behind contact shoulder when contact is fully inserted.

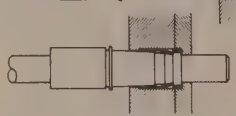


Coaxial Contact and Size 8 High Power Contacts (with built-in metal extraction tool)

Contact partially inserted.

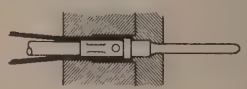


Tines snap behind contact should when contact is fully inserted.

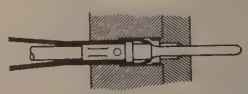


CONTACT EXTRACTION

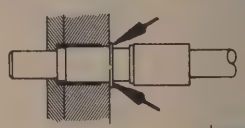
Tines expanded beyond contact shoulder with extraction tool, ready for release.



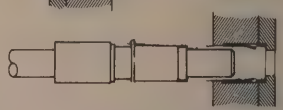
Contact partially removed.



Depress flange of built-in extraction tool until flush with rear of insulator.



Contact being pulled from connector.



HOW TO ORDER

(millimeters are in parentheses)

D	B	MA	M	R	25	P	*	FO

Series Prefix
Shell Size
Class
Military Specification
Mounting Type
Contact Arrangements
Contact Type
Modification
FO

SERIES PREFIX
D — ITT Cannon designation

SHELL SIZE
E, A, B, C and D

CLASS
MA — Monobloc with LITTLE CAESAR rear release contact retention systems.

MILITARY SPECIFICATION
M — For connectors to MIL-C-243008 specification — omit for standard

MOUNTING TYPE
No designator: standard .120 (3,05) diameter mounting hole
E — 4-40 clinch nut for rear panel mounting
F — Float mount for rear panel mounting
G — #2-56 clinch nut for rear panel mounting
K — .154 (3,91) diameter mounting hole
R — Reverse float mount for front panel mounting

CONTACT ARRANGEMENTS See page 110

CONTACT TYPE
P — Pin; S — Socket

MODIFICATION
Please consult factory

FO
Connector without contacts (FO will not be printed on the connector)

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT ELECTRIC CANNON

D SUBMINIATURE RECTANGULAR CONNECTORS

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ROYAL-D (Mark III) D*MA Crimp Type, Removable Contacts

STANDARD DATA

Shell	Steel with yellow chromate over cadmium plate
Insulator	(Monobloc-type) Dially phthalate, glass-filled per MIL-M-14 Type GDI-30F or Type SD6F, dark green color
#20 Contacts (Standard)	Pin: Leaded copper, gold plate over nickel plate Socket: Copper alloy, gold plate over nickel plate with stainless steel sleeves
#20 Contacts (Military) Ref: MIL-C-24308	Pin and Socket: Gold over copper (ITT Cannon finish code A156)
Rivets and Washers (Float Mounting)	Stainless steel
High Voltage Contacts	*Pin: Brass, gold plate over nickel plate *Socket: Copper alloy, gold plate over nickel plate Insulator: Nylon (Temperature Range: —65°F to +250°F (—55°C to +120°C)
Coaxial Contacts	Outer Contact: *Plug: Brass, gold plate over nickel plate *Receptacle: Beryllium copper, gold plate over nickel plate Center Contact: *Female: Copper alloy, gold plate over nickel plate *Male: Brass, gold plate over nickel plate Insulator: Teflon
High Power Contacts	*Pin: Brass, gold plate over nickel plate *Socket: Beryllium copper, gold plate over nickel plate
Contact Retention	9 lbs. min (40 N) after 10 insertions
(#20 Contacts)	5 lbs. min. (22 N) after 100 insertions
Voltage Ratings	See below

*NOTE: Also available in Military Finish: Gold over copper plate (ITT Cannon Finish Code A156).

VOLTAGE AND CURRENT RATING

CONNECTORS WITH BASIC ARRANGEMENTS

AWG #20 wire contacts only

All voltages are measured from contact to contact and from contact to shell in unmated condition.

Connector Type		Altitude (feet/m)			
		Sea Level	20,000/6096	50,000/15240	70,000/21336
D*MA, D*C, D*U	Average Flashover	1500	1000	500	500
	Test	1000	650	325	325
D*M, D*	Average Flashover	1700	1000	650	500
	Test	1250	750	475	375

All voltage figures are AC 60 rms cps, measured at approximately 77°F, 50% rh.

CONNECTORS WITH COMBINATION ARRANGEMENTS

AWG #20 wire contacts with coaxial, high power, and/or high voltage contacts

All voltages are for plugs and receptacles in both mated and unmated conditions.

Type of Contact		Altitude (feet/m)							
		Sea Level		20,000/6096		50,000/15240		70,000/21336	
		90°	Straight	90°	Straight	90°	Straight	90°	Straight
Center Conductor to Coaxial Shell	Average Flashover	1200	1500	900	1000	600	700	400	500
	Test	800	1000	600	650	400	475	275	325
High Power Contact and/or Coaxial Shell to Plug Shell	Average Flashover	1500	1500	1000	1000	500	500	500	500
	Test	1000	1000	650	650	325	325	325	325
Coaxial Shell to Nearest Standard Solder Pot Contact	Average Flashover	•	1500	•	1500	•	900	•	650
	Test	•	1000	•	1000	•	600	•	425
HV Contact to Nearest Contact or to Shell	Average Flashover	3800	3800	2300	2300	900	900	650	650
	Test	2800	2800	1700	1700	675	675	475	475

• Not applicable due to variable rotation.

TEST CURRENT

Maximum current ratings of contacts are as shown at right. For the maximum total current per connector refer to MIL-W-5088 (the maximum recommended total current per connector is the same as the continuous duty current for wires in conduit or bundles).

Contact Size	Max. Current Rating (rms)
20	7.5
22D	5

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

D SUBMINIATURE RECTANGULAR CONNECTORS

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory)

ROYAL-D (Mark III) D*MA Crimp Type, Removable Contacts

CRIMP TYPE CONTACTS

Contact Size	Wire Size Accom.	Standard Finish Male	Standard Finish Female	Finish A 156 Male	Finish A 156 Female
20	20, 22, 24	330-5291-000	031-1007-000	330-5291-037	031-1007-042
20-18	1 #18, 2 #22	330-5291-001	031-1007-001	330-5291-055	031-1007-054
20-26	26, 28, 30	330-5291-004	031-1007-004	330-5291-050	031-1007-048
22D*	24, 26, 28	——	——	030-2042-002	031-1147-002

NOTE: ROYAL-D connectors meet the requirements of ITT Cannon Electric Specification CS-141.
*Max. insulation O.D. is .050 (1,27) max.

MIL-C-24308

D*MA connectors are also available to MIL-C-24308. To order add another M to part number. For example: DAMAM-15P. See cross reference list.

CROSS REFERENCE LIST

STANDARD MARK III LAYOUTS		SIZE 22 CONTACT LAYOUTS ONLY	
MIL-C-24308 Part No.	Cannon Part No.	MIL-C-24308 Part No.	Cannon Part No.
M24308/2-1	DEMAM-9S	M24308/2-15	DDMAM-78S
M24308/2-2	DAMAM-15S	M24308/2-32	DDMAMF-78S
M24308/2-3	DBMAM-25S	M24308/2-301	DDMAMF-78S-FO
M24308/2-4	DCMAM-37S	M24308/2-290	DDMAM-78S-FO
M24308/2-5	DDMAM-50S	M24308/4-15	DDMAM-78P
M24308/4-1	DEMAM-9P	M24308/4-268	DDMAM-78P-FO
M24308/4-2	DAMAM-15P	M24308/4-311	DDMAMF-78P
M24308/4-3	DBMAM 25P	M24308/4-333	DDMAMF-78P-FO
M24308/4-4	DCMAM-37P	M24308/6-15	DDMAM-78S-NM
M24308/4-5	DDMAM-50P	M24308/6-268	DDMAMF-78S-NM
M24308/10-1	031-1007-042	M24308/6-290	DDMAM-78S-NM-FO
M24308/11-1	330-5291-037	M24308/6-333	DDMAMF-78S-NM-FO
		M24308/8-15	DDMAM-78P-NM
		M24308/8-269	DDMAM-78P-NM-FO
		M24308/8-311	DDMAMF-78P-NM
		M24308/8-333	DDMAMF-78P-NM-FO
		M24308/12-1	031-1147-002
		M24308/13-1	030-2042-002

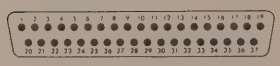
BASIC CONTACT ARRANGEMENTS

FACE VIEW PIN INSERT

Shell Size	E
No. of Contacts	9
Contact Size	#20

Shell Size	A
No. of Contacts	15
Contact Size	#20

Shell Size	B
No. of Contacts	25
Contact Size	#20



Shell Size	C
No. of Contacts	37
Contact Size	#20

Shell Size	D
No. of Contacts	50
Contact Size	#20

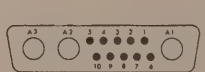
Shell Size	D
No. of Contacts	78
Contact Size	#22D Contacts only

COMBINATION ARRANGEMENTS

NOTE: Color Code — Pin Connector, Red; Socket Connector, Blue

#20 CONTACTS WITH COAX, POWER AND/OR HIGH VOLTAGE CONTACTS

NOTE: This arrangement for DMA110335 and DMA110336 Shielded Contacts only. See page 112.



Shell Size	A	A	B	B	D
Arrangement	7W2	11W1	13W3	17W2	30WS7
No. of Contacts	5	10	10	15	23
Contact Size	#20	#20	#20	#20	#20
Coax or HV Cavities	2	1	3	2	7 shielded contacts only

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

D SUBMINIATURE RECTANGULAR CONNECTORS

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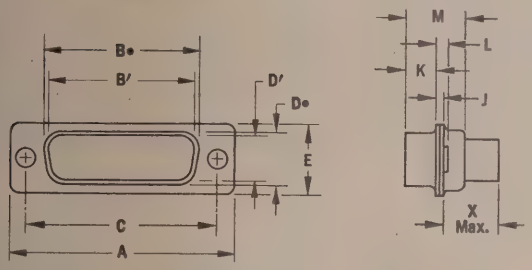
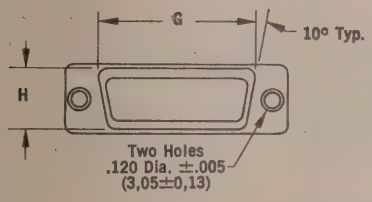
Dimensions subject to change.

ROYAL-D (Mark III) D*MA Crimp Type, Removable Contacts

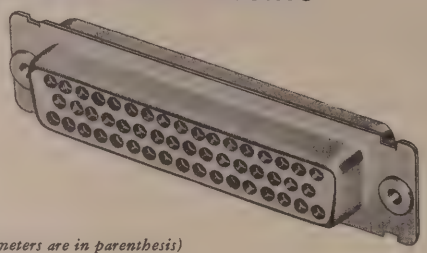
STANDARD SHELL

(millimeters are in parenthesis)

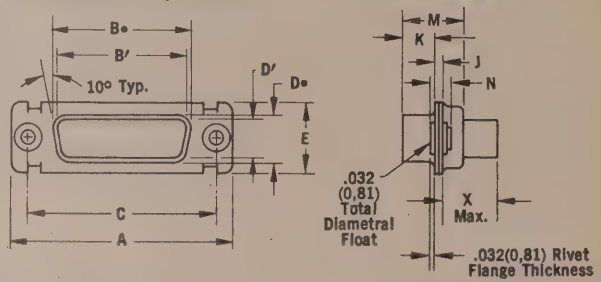


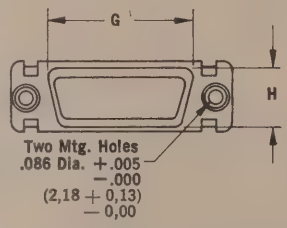


SHELL WITH FLOAT MOUNTS



(millimeters are in parenthesis)





It is recommended that only one assembly, either pin or socket, be float mounted. For front panel mounting use reverse float mount; see page 118.

INCHES

Part Number by Shell Size	A ±.015	B• ±.010	B′ ±.010	C ±.005	D• ±.010	D′ ±.010	E ±.015	G• ±.010	H• ±.010	J ±.010	K ±.010	L ±.010	M ±.015	N ±.010	X Max.
DEMA-*P	1.213	—	.666	.984	—	.329	.494	.759	.422	.030	.236	.045	.422	.120	.375
DEMA-*S	1.213	.640	—	.984	.308	—	.494	.759	.422	.030	.243	.045	.429	.120	.375
DAMA-*P	1.541	—	.994	1.312	—	.329	.494	1.083	.422	.030	.236	.045	.422	.120	.375
DAMA-*S	1.541	.968	—	1.312	.308	—	.494	1.083	.422	.030	.243	.045	.429	.120	.375
DBMA-*P	2.088	—	1.534	1.852	—	.329	.494	1.625	.422	.039	.231	.060	.426	.129	.375
DBMA-*S	2.088	1.508	—	1.852	.308	—	.494	1.625	.422	.030	.243	.045	.429	.120	.375
DCMA-*P	2.729	—	2.182	2.500	—	.329	.494	2.272	.422	.039	.231	.060	.426	.129	.375
DCMA-*S	2.729	2.156	—	2.500	.308	—	.494	2.272	.422	.030	.236	.045	.429	.120	.375
DDMA-*P	2.635	—	2.079	2.406	—	.436	.605	2.178	.534	.039	.231	.060	.426	.129	.375
DDMA-*S	2.635	2.062	—	2.406	.420	—	.605	2.178	.534	.030	.243	.045	.429	.120	.375

MILLIMETERS

Part Number by Shell Size	A ±0,38	B′ ±0,25	B• ±0,25	C ±0,12	D• ±0,25	D′ ±0,25	E ±0,38	G• ±0.25	H• ±0,25	J ±0,25	K ±0,25	L ±0,25	M ±0,38	N ±0,25	X Max.
DEC-9P	30,81	—	16,91	24,99	—	8,36	12,55	19.28	10,72	0,76	5,99	1,14	10,72	3,05	9,52
DEC-9S	30,81	16,25	—	24,99	7,82	—	12,55	19,28	10,72	0,76	6,17	1,14	10,90	3,05	9,52
DAC-15P	39,14	—	25.24	33,32	—	8,36	12,55	27,51	10,72	0,76	5,99	1,14	10,72	3,05	9,52
DAC-15S	39.14	24,58	—	33,32	7,82	—	12,55	27,51	10,72	0,76	6,17	1,14	10,90	3,05	9,52
DBC-*P	53,03	—	38,96	47,04	—	8,36	12,55	41,27	10,72	0,99	5,87	1,52	10,82	3,28	9,52
DBC-*S	53,03	38,30	—	47,04	7,82	—	12 55	41.27	10,72	0,76	6,17	1,14	10,90	3.05	9,52
DCC-37P	69,31	—	55,42	63,50	—	8,36	12.55	57,71	10,72	0,99	5,87	1,52	10,82	3.28	9,52
DCC-37S	69,31	54.76	—	63,50	7.82	—	12 55	57.71	10,72	0.76	6.17	1,14	10,90	3.05	9,52
DDC-50P	66.92	—	52,81	61,11	—	11,07	15.37	55.32	13,56	0,99	5,87	1,52	10,82	3.28	9,52
DDC-50S	66.92	52,37	—	61.11	10,67	—	15.37	55.32	13,56	0.76	6,17	1,14	10,90	3,05	9,52

Dimensions B, D, G, and H are measured as outside dimensions at the bottom of draw.
For shell with float mounts, add letter F after letter C, e.g., DECF-9P.

*Add number of contacts for basic arrangements, OR add contact arrangement number for coaxial and/or HV comb. arrangements.

NOTE: B• and D• are the O.D. dims. for socket side, B′ and D′ are the I.D. dims. for pin side.

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

D SUBMINIATURE RECTANGULAR CONNECTORS

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ROYAL-D (Mark III) D*MA Crimp Type, Removable Contacts

Dimensions subject to change.
(millimeters are in parentheses)

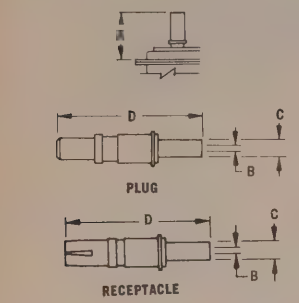
REMOVABLE COAXIAL, HIGH VOLTAGE, AND HIGH POWER CONTACTS

All coaxial and high voltage contacts have solder center contact. For coax, high voltage, and power contact material see page 102. For recommended stripping dimensions and termination data see page 122.

* MIL-C-24308 Finish: 0.00005 (0,00127) minimum gold plate over copper plate (ITT Cannon code A 156)

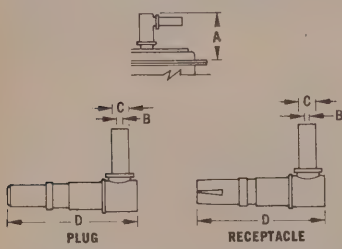
STRAIGHT CRIMP BRAID COAXIAL CONTACTS

Color Code: Receptacle - Blue; Plug - Red



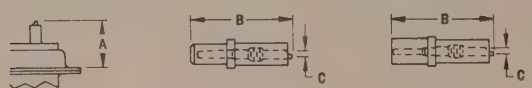
	Part Number Std. Finish	Part Number Mil. Finish*	A Max.	B ±.005 (0,12)	C ±.005 (0,12)	D Ref.	RG Cable No. Old	RG Cable No. New
Plug	DMA43717	DMA43717-4	.805(20,44)	.040(1,02)	.125(3,18)	1.019(25,88)	196/U	178B/U
Plug	DMA43717-1	DMA43717-5	.805(20,44)	.067(1,70)	.156(3,96)	1.019(25,88)	187/U 188/U	316B/U 179B/U
Plug	DMA43717-2	DMA43717-6	.805(20,44)	.110(2,79)	.235(5,97)	1.019(25,88)	195/U	180B/U
Plug	DMA43717-3	DMA43717-7	.805(20,44)	.125(3,18)	.235(5,97)	1.019(25,88)	58/U	58B/U
Receptacle	DMA43717	DMA43716-4	.805(20,44)	.040(1,02)	.125(3,18)	1.006(25,55)	196/U	178B/U
Receptacle	DMA43716-1	DMA43716-5	.805(20,44)	.067(1,70)	.156(3,96)	1.006(25,55)	187/U 188/U	316B/U 179B/U
Receptacle	DMA43716-2	DMA43716-6	.805(20,44)	.110(2,79)	.235(5,97)	1.006(25,55)	195/U	180B/U
Receptacle	DMA43716-3	DMA43716-7	.805(20,44)	.125(3,18)	.235(5,97)	1.006(25,55)	58/U	58B/U

RIGHT ANGLE CRIMP BRAID COAXIAL CONTACTS



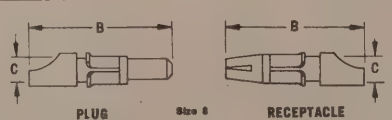
	Part Number Std. Finish	Part Number Mil. Finish*	A Max.	B ±.005 (0,12)	C ±.005 (0,12)	D Ref.	RG Cable No. Old	RG Cable No. New
Plug	DMA43719	DMA43719-4	.703(17,85)	.040(1,02)	.125(3,18)	.922(23,42)	196/U	178B/U
Plug	DMA43719-1	DMA43719-5	.703((17,85)	.067(1,70)	.156(3,96)	.922(23,42)	187/U 188/U	316B/U 179B/U
Plug	DMA43719-2	DMA43719-6	.703(17,85)	.110(2,79)	.235(5,97)	.922(23,42)	195/U	180B/U
Plug	DMA43719-3	DMA43719-7	.703(17,85)	.125(3,18)	.235(5,97)	.922(23,42)	58/U	58B/U
Receptacle	DMA43718	DMA43718-4	.703(17,85)	.040(1,02)	.125(3,18)	.910(23,11)	196/U	178B/U
Receptacle	DMA43718-1	DMA43718-5	.703(17,85)	.067(1,70)	.156(3,96)	.910(23,11)	187/U 188/U	316B/U 179B/U
Receptacle	DMA43718-2	DMA43718-6	.703(17,85)	.110(2,79)	.235(5,97)	.910(23,11)	195/U	180B/U
Receptacle	DMA43718-3	DMA43718-7	.703(17,85)	.125(3,18)	.235(5,97)	.910(23,11)	58/U	58B/U

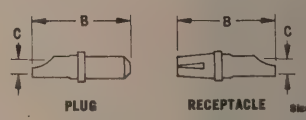
STRAIGHT HIGH VOLTAGE CONTACTS

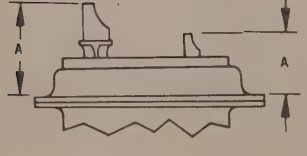


	Part Number Std. Finish	Part Number Mil. Finish*	A Max.	B Ref.	C ±.005 (0,12)	Wire Size
Plug	DMA44157	DMA44157-1	.539(13,7)	.734(18,6)	.045(1,1)	20
Receptacle	DMA44159	DMA44159-1	.539(13,7)	.734(18,6)	.045(1,1)	20

POWER CONTACTS



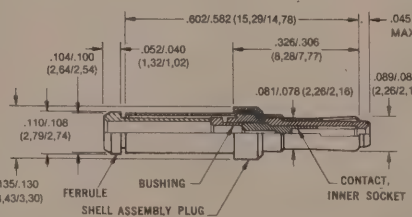


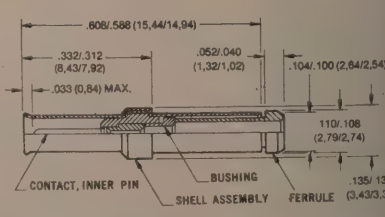


	Part Number Standard Finish	Part Number Military Finish*	A Max.	B Ref.	C +.005(0,13) −.004(0,10)	Wire Size	Current Rating (Amps)
Plug	DMA44348	DMA44348-1	.800(20,32)	1.000(25,40)	.188(4,78)	#8	40
Plug	DMA44349	DMA44349-1	.500(12,7)	.697(17,70)	.112(2,84)	#12	20
Plug	DMA44350	DMA44350-1	.500(12,7)	.697(17,70)	.069(1,75)	#16	10
Receptacle	DMA44351	DMA44351-1	.800(20,32)	.993(25,22)	.188(4,78)	#8	40
Receptacle	DMA44352	DMA44352-1	.500(12,7)	.690(17,53)	.112(2,84)	#12	20
Receptacle	DMA44353	DMA44353-1	.500(12,7)	.690(17,53)	.069(1,75)	#16	10

SHIELDED #16 CONTACTS

Crimp Inner Contact and Outer Shell





PLUG: DDMA110335 — RG196A/U and RG178B/U cable RECEPTACLE: DDMA110336 — RG196A/U and RG178B/U cab

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

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ACCESSORIES

CONVERSION CHART FOR DIMS. TOL.						
	Inches	.005	.010	.015	.020	.025	.030
	Millimeter	0,13	0,25	0,38	0,51	0,64	0,76

ACCESSORY DESCRIPTION	CONNECTOR APPLICATION D*C/D*U	D*MA	D*MA Combination	D*M	D*M Combination	D*	D* Combination	Pages
Junction Shells — Straight clamp	•	•		•		•		103
Straight with latching mechanism	•	•	•	•	•	•	•	103
Round clamp	•	•	★	•	★	•	★	103
Deep straight clamp	•	•	★	•	★	•	★	104
Right angle	•	•	★	•	★	•	★	104
Straight and right angle plastic	•	•	★	•	★	•	★	104
Universal	•	•		•		•		107
Data phone				•		•		107
Potting Shells — Less grips	★	★	★	•	★	•	★	104
Nylon	★	★	★	•	★	•	★	105
Switching Shells — Less handle				•		•		105
Sliding Lock Assemblies	•	•	•	•	•	•	•	105
Screw Lock Assemblies — Male and female	•	•	•	•	•	•	•	105
Jackscrew Assemblies	•	•	•	•	•	•	•	106
D Spring Latch Assembly	•	•	•	•	•	•	•	106
Guide Pin Plates — Male and female	•	•	•	•	•	•	•	106
Modular Plates	•	•	★	•	★	•	•	107
Right Angle Connector Mounting Bracket	•	•	•	•	•	•	★	106
Dust Caps — Polyethylene	•	•	•	•	•	•	•	107
Sealing Gaskets	•	•		•		•	•	107
Wire Hole Fillers		•			★	•		107
Alignment Tool	•							107

•Connector type with which accessory may be used.

†Consult factory.

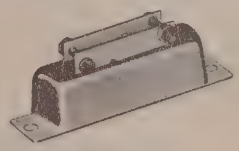
For non-magnetic or non-magnetic gold plated junction shells consult factory.

NOTE: Accessories are shown assembled for reference only, components are shipped loose.

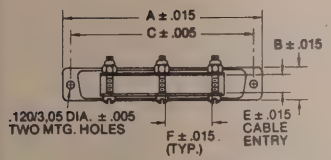
All tolerances are ±.010(0,3) unless noted otherwise.

JUNCTION SHELLS

STRAIGHT CLAMP



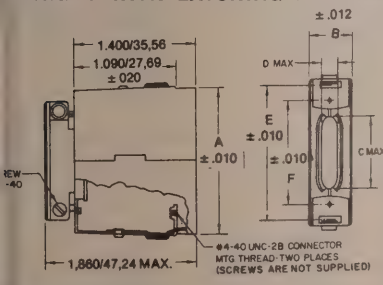
Material: Low carbon steel.
Finish: Cadmium plate, yellow chromate.
Corrosion Resistance: Passes 50-hour exposure to salt spray in accordance with MIL-STD-202A, Method 101A, Condition B.

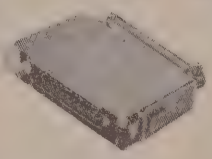


Part Number by Shell Size

Cannon	Mil. Spec.	No. of Cable Locking Screws Reqd.	A	B	C	E	F	G
DA 19678-1	M24308/22-2	2	1.531(38,9)	.500(12,7)	1.312(33,3)	.296(7,5)	.312(7,9)	.640(16,2)
DB 19678-2	M24308/22-3	2	2.078(52,8)	.500(12,7)	1.852(47,0)	.296(7,5)	.796(20,2)	.640(16,2)
DC 19678-3	M24308/22-4	3	2.718(69,0)	.500(12,7)	2.500(63,5)	.296(7,5)	.687(17,4)	.640(16,2)
DD 19678-4	M24308/22-5	3	2.625(66,7)	.609(12,7)	2.406(61,1)	.390(9,9)	.687(17,4)	.703(17,8)

STRAIGHT WITH LATCHING MECHANISM





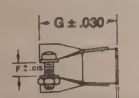
Material: Low carbon steel.
Finish: Cadmium plate, yellow chromate.
Corrosion Resistance: Passes 50-hour exposure to salt spray in accordance with MIL-STD-202A, Method 101A, Condition B.

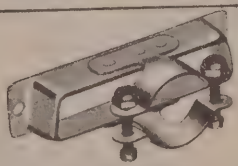
Part Number by Shell Size

Cannon	A	B	C	D	E	F
DA 44546	1.880(47,8)	.542(13,8)	.943(24,0)	.322(8.	1.723(43,8)	1.317(33,5)
DB 44547	2.419(61,4)	.542(13,8)	1.490(37,8)	.322(8	2.263(57,5)	1.857(47,2)
DC 44548	3.067(77,9)	.542(13,8)	2.140(54,4)	.322(8,..)	2.911(73,9)	2.505(63,6)
DD 44549	2.973(75,5)	.653(16,6)	1.879(47,7)	.427(10,8)	2.817(71,6)	2.411(61,2)
DE 44550	1.551(39,4)	.542(13,8)	.625(15,9)	.322(8,2)	1.395(35,4)	.989(25,1)

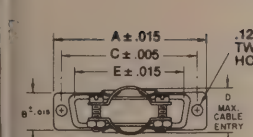
ROUND CLAMP

(millimeters are in parentheses)
Dimensions subject to change.





Material: Low carbon steel.
Finish: Cadmium plate, yellow chromate.
Corrosion Resistance: Passes 50-hour exposure to salt spray in accordance with MIL-STD-202A, Method 101A, Condition B.



Part Number by Shell Size

Cannon	Mil. Spec	A	B	C	D	E	F	G
DE 44994	M24308/21-1	1.208(30,7)	.500(12,7)	.984(25,0)	.406(10,3)	.661(16,8)	.125(3,2)	1.031(26,2)
DA 20961	M24308/21-2	1.531(38,9)	.500(12,7)	1.312(33,3)	.406(10,3)	.984(25,0)	.125(3,2)	1.031(26,2)
DB 20962	M24308/21-3	2.078(52,8)	.500(12,7)	1.852(47,0)	.593(15,1)	1.515(38,5)	.187(4,7)	1.062(27,0)
DC 20963	M24308/21-4	2.718(69,0)	.500(12,7)	2.500(63,5)	.718(18,2)	2.171(55,1)	.250(6,3)	1.062(27,0)
DD 20964	M24308/21-5	2.625(66,7)	.609(15,5)	2.406(61,1)	.812(20,6)	2.093(53,2)	.312(7,9)	1.062(27,0)

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

D SUBMINIATURE RECTANGULAR CONNECTORS

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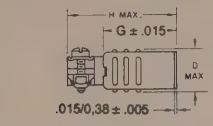
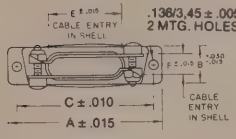
Dimensions subject to change.
(millimeters are in parentheses)

ACCESSORIES (Cont'd)

DEEP STRAIGHT CLAMP



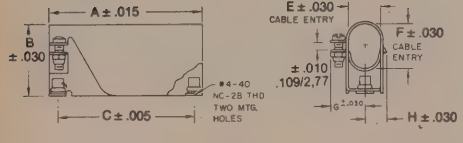
Material: Low carbon steel
Finish: Cadmium plate, yellow chromate.
Corrosion Resistance: Passes 50-hour exposure to salt spray in accordance with MIL-STD-202A, Method 101A, Condition B.

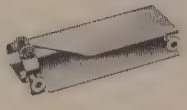


Part Number by Shell Size

Cannon	Mil. Spec.	A	B	C	D	E	F	G	H
DE 24657	M24308/20-1	1.203(30,6)	.484(12,3)	.984(25,0)	.578(14,7)	.375(9,5)	.375(9,5)	.750(19,0)	1.250(31,7)
DA 24658	M24308/20-2	1.531(38,9)	.484(12,3)	1.312(33,3)	.578(14,7)	.713(18,1)	.312(7,9)	.750(19,0)	1.250(31,7)
DB 24659	M24308/20-3	2.078(52,8)	.484(12,3)	1,852(47,0)	.578(14,7)	1.000(25,4)	.312(7,9)	1.000(25,4)	1.563(39,7)
DC 24660	M24308/20-4	2.718(69,0)	.484(12,3)	2.500(63,5)	.578(14,7)	1.375(34,9)	.312(7,9)	1.000(25,4)	1.563(39,7)
DD 24661	M24308/20-5	2.625(66,7)	.593(15,1)	2.406(61,1)	.687(17,4)	1.406(35,7)	.406(10,3)	1.125(28,6)	1.688(42,9)

RIGHT ANGLE



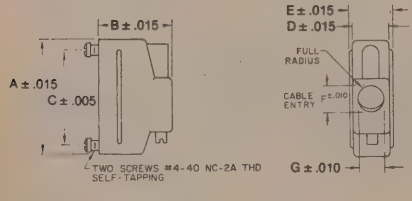


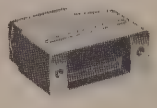
Material: Low carbon steel
Finish: Cadmium plate, yellow chromate.
Corrosion Resistance: Passes 50-hour exposure to salt spray in accordance with MIL-STD-202A, Method 101A, Condition B.

Part Number by Shell Size

Cannon	Mil. Spec.	A	B	C	E	F	G	H
DE 19977-5	M24308/19-1	1.203(30,6)	.718(18,2)	.984(25,0)	.437(11,1)	.437(11,1)	.468(11,9)	.281(7,1)
DA 19977-1	M24308/19-2	1.531(38,9)	.718(18,2)	1.312(33,3)	.437(11,1)	.437(11,1)	.468(11,9)	.281(7,1)
DB 19977-2	M24308/19-3	2.078(52,8)	.968(24,6)	1.852(47,0)	.437(11,1)	.625(15,9)	.468(11,9)	.281(7,1)
DC 19977-3	M24308/19-4	2.718(69,0)	1.187(30,1)	2.500(63,5)	.437(11,1)	.812(20,6)	.468(11,9)	.281(7,1)
DD 19977-4	M24308/19-5	2.625(66,7)	1.250(31,7)	2.406(61,1)	.562(14,3)	.906(23,1)	.531(13,5)	.343(8,7)

PLASTIC STRAIGHT



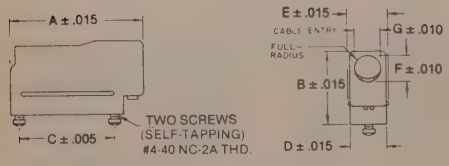


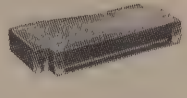
Material: Nylon.
Finish: None.
Corrosion Resistance: Hardware passes 50-hour exposure to salt spray in accordance with MIL-STD-202A, Method 101A, Condition B.

Part Number by Shell Size

Cannon	A	B	C	D	E	F	G
DE 51218-1	1.218(30,9)	1.000(25,4)	.984(25,0)	.500(12,7)	.562(14,3)	.281(7,1)	.281(7,1)
DA 51210-1	1.546(39,3)	1.000(25,4)	1.312(33,3)	.500(12,7)	.562(14,3)	.360(9,1)	.360(9,1)
DB 51212-1	2.093(53,2)	1.250(31,7)	1.852(47,0)	.500(12,1)	.562(14,3)	.493(12,5)	.360(9,1)
DC 51214-1	2.734(69,4)	1.500(38,1)	2.500(63,5)	.500(12,7)	.562(14,3)	.694(17,6)	.360(9,1)
DD 51216-1	2.640(67,1)	1.500(38,1)	2.406(61,1)	.609(15,5)	.671(17,0)	.734(18,6)	.468(11,9)

PLASTIC RIGHT ANGLE





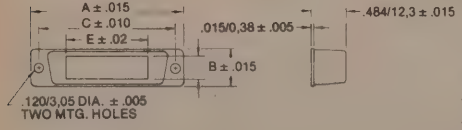
Material: Nylon.
Finish: None.
Corrosion Resistance: Hardware passes 50-hour exposure to salt spray in accordance with MIL-STD-202A, Method 101A, Condition B.

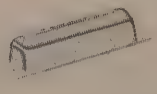
Part Number by Shell Size

Cannon	A	B	C	D	E	F	G
DA 51211-1	1.822(46,3)	1.000(25,4)	1.312(33,3)	.500(12,7)	.562(14,3)	.360(9,1)	.360(9,1)
DB 51213-1	2.368(60,1)	1.250(31,7)	1.852(47,0)	.500(12,7)	.562(14,3)	.493(12,5)	.360(9,1)
DC 51215-1	3.009(76,4)	1.500(38,1)	2.500(63,5)	.500(12,7)	.562(14,3)	.694(17,6)	.360(9,1)
DD 51217-1	2.915(74,0)	1.500(38,1)	2.406/61,1)	.609(15,5)	.671(17,0)	.734(18,6)	.468(11,9)

POTTING SHELLS

LESS GRIPS





Material: Low carbon steel
Finish: Cadmium plate, yellow chromate.
Corrosion Resistance: Passes 50-hour exposure to salt spray in accordance with MIL-STD-202A, Method 101A, Condition B.

Part Number by Shell Size

Cannon	A	B	C	D	E
DA 19678-10	1.531(38,887)	.500(12,700)	1.312(33,324)	.300(7,620)	.588(14,935)
DB 19678-11	2.078(52,781)	.500(12,700)	1.852(47,040)	.300(7,620)	1.125(28,575)
DC 19678-12	2.718(69,037)	.500(12,700)	2.500(63,500)	.300(7,620)	1.750(44,450)
DD 19678-13	2.625(66,675)	.609(15,468)	2.406(61,112)	.390(9,906)	1.750(44,450)

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

D SUBMINIATURE RECTANGULAR CONNECTORS

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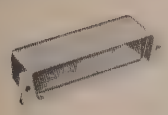
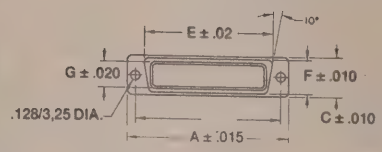
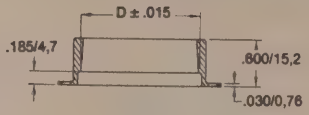
ACCESSORIES (Cont'd)

Dimensions subject to change.
(millimeters are in parentheses)

POTTING SHELLS CONT'D
NYLON POTTING SHELLS





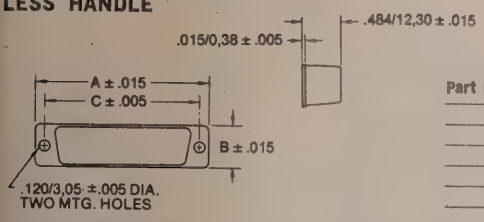


Note: Nylon potting shells are molded with a thin flange .030(0,76) to permit the use of D Subminiature locking devices.

Part Number by Shell Size

Cannon	A	B	C	D	E	F	G
DE 50904-1	1.208(30,683)	.984(24,993)	.495(12,573)	.641(16,281)	.769(19,532)	.430(10,992)	.345(8,763)
DA 50905-1	1.536(39,014)	1.312(33,324)	.495(12,573)	.973(24,714)	1.104(28,041)	.430(10,992)	.345(8,763)
DB 50906-1	2.083(52,908)	1.852(47,040)	.495(12,573)	1.516(38,506)	1.639(41,630)	.430(10,992)	.345(8,763)
DC 50907-1	2.723(69,164)	2.500(63,500)	.495(12,573)	2.154(54,711)	2.289(58,140)	.430(10,992)	.345(8,763)
DD 50908-1	2.630(66,802)	2.406(61,112)	.606(15,392)	1.938(49,225)	2.189(55,600)	.545(13,843)	.445(11,303)

SWITCHING SHELLS
LESS HANDLE

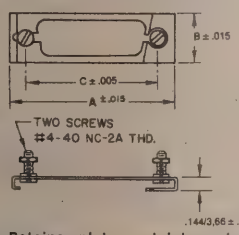


Material: Low carbon steel.
Finish: Cadmium plate, yellow chromate.
Corrosion Resistance: Passes 48-hour exposure to salt spray in accordance with MIL-STD-202A, Method 101A, Condition B.

Part Number by Shell Size

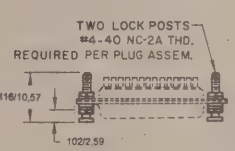
Cannon	A	B	C
DA 19678-6	1.531(38,887)	.500(12,700)	1.312(33,324)
DB 19678-7	2.078(52,781)	.500(12,700)	1.852(47,040)
DC 19678-8	2.718(69,037)	.500(12,700)	2.500(63,500)
DD 19678-9	2.625(66,675)	.609(15,468)	2.406(61,112)

SLIDING LOCK ASSEMBLIES
SLIDING LOCK RETAINER



Material: Retainer plate — stainless steel; hardware — cold rolled steel.
Finish: Retainer plate — passivated; hardware — Cadmium plate, yellow chromate.
Corrosion Resistance: Passes 48-hour exposure to salt spray in accordance with MIL-STD-202A. Method 101A, Condition B.

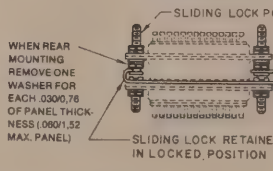
SLIDING LOCK POST



	Part Number
Steel	D53018
Non-Magnetic	D53018-5

NOTE: Two sliding lock post assemblies are required per connector.

LOCKED POSITION

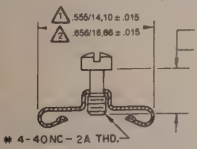

SLIDING LOCK POST
WHEN REAR MOUNTING REMOVE ONE WASHER FOR EACH .030/0,76 OF PANEL THICKNESS (.060/1,52 MAX. PANEL)
TO UNLOCK, SLIDE IN OPPOSITE DIRECTION
SLIDING LOCK RETAINER IN LOCKED POSITION

SLIDING LOCK RETAINER
Part Number by Shell Size

Cannon	A	B	C
DE 51224-1	1.392(35,36)	.500(12,70)	.984(25,00)
DA 51220-1	1.720(43,70)	.500(12,70)	1.312(33,32)
DB 51221-1	2.260(57,40)	.500(12,70)	1.852(47,07)
DC 51222-1	2.908(73,86)	.500(12,70)	2.500(63,50)
DD 51223-1	2.814(71,47)	.609(15,47)	2.406(61,10)

SCREW LOCK ASSEMBLIES
NOTE: Two screw lock assemblies are required per connector.

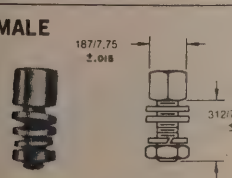
MALE



△ FOR SHELL SIZES DE, DA, DB
△ FOR SHELL SIZE DD

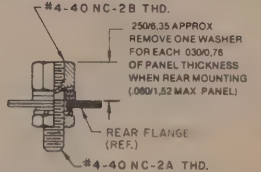
Material: Clip — sheet steel; hardware — cold rolled steel.
Finish: Cadmium plate, yellow chromate.
Corrosion Resistance: Passes 48-hour exposure to salt spray in accordance with MIL-STD-202A, Method 101A, Condition B.

FEMALE



Material: Cold rolled steel.
Finish: Cadmium plate, yellow chromate.
Corrosion Resistance: Passes 48-hour exposure to salt spray in accordance with MIL-STD-202A, Method 101A, Condition B.
NOTE: An 8 inch/pound (female) and 4 inch/pound (male) maximum torque during assembly is recommended on steel screw lock assemblies.

MOUNTED POSITION


#4-40 NC-2B THD.
.250/6,35 APPROX
REMOVE ONE WASHER FOR EACH .030/0,76 OF PANEL THICKNESS WHEN REAR MOUNTING (.060/1,52 MAX PANEL)
REAR FLANGE (REF.)
#4-40 NC-2A THD.

Part Number by Shell Size

Cannon	Mil. Spec.	Type	Usage
*D20419		Male	DA, DE pin or socket; DB, DC socket
**D20419-16		Male	DA, DE pin or socket; DB, DC socket both with junction shell
*D20419-18	M24308/25-1,2,3,4	Male	DB, DC pin
**D20419-21		Male	DB, DC pin with junction shell
*D20420		Male	DD socket
**D20420-12		Male	DD socket with junction shell
*D20420-13	M24308/25-5	Male	DD pin
**D20420-15		Male	DD pin with junction shell
D20418-2	M24308/26-1	Female	DE, DA, DB, DC, DD pin or socket with or without junction shell

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

D SUBMINIATURE RECTANGULAR CONNECTORS

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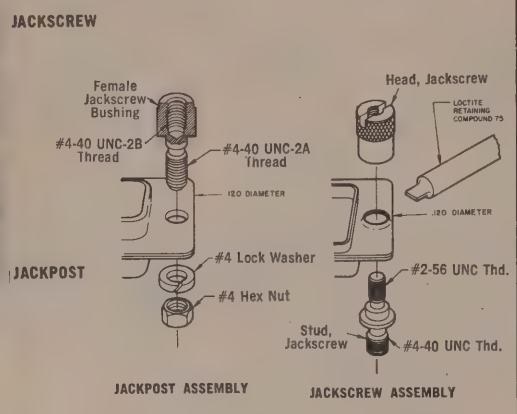
ACCESSORIES (Cont'd)

Dimensions subject to change.
(millimeters are in parentheses)

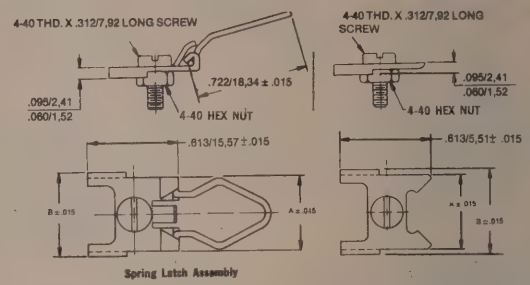
JACKSCREW ASSEMBLY
(not recommended for use with metal junction shells)



	Part Number	Material	Finish
Jackscrew	D110550*	Stainless steel	None
Jackpost	D110551*	Stainless steel	Passivate

*Part number consists of two assemblies each as required per connector. Fits all standard D Series with .120 diameter mounting holes.
5½ inch/pounds maximum torque during assembly is recommended.

D SPRING LATCH ASSEMBLY



Material: Stainless steel.
Finish: Passivated.

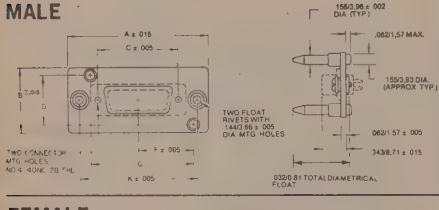
END DISC LATCH ASSEMBLY

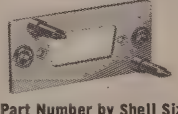
End Disc Latch Assembly Part Number	A	B
D110278 (Sizes DE, DA, DB, DC)	.484(12,3)	.556(14,1)
D110280 (Size DD)	.609(15,5)	.673(17,1)
Spring Latch Assembly Part Number	**A**	**B**
D110277 (Sizes DE, DA, DB, DC)	.484(12,3)	.556(14,1)
D110279 (Size DD)	.609(15,5)	.673(17,1)

NOTE: Two end disk latch assemblies and two spring latch assemblies are required per mated connector.

GUIDE PIN PLATES

MALE



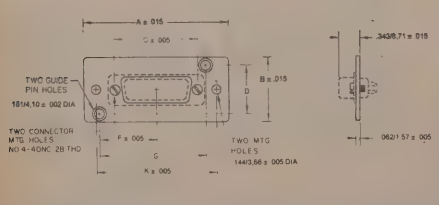


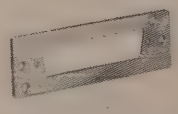
Material: Plates and float hardware are cold rolled steel; guidepins are stainless steel.
Plate Finish: Cadmium plate, yellow chromate.
Corrosion Resistance: Passes 48-hour exposure to salt spray in accordance with MIL-STD-202A, Method 101A, Condition B.

Part Number by Shell Size

Cannon	A	B	C	D	F	G	K
DA 22213	2.281(57,937)	1.000(25,400)	1.312(33,324)	.750(19,050)	.898(22,809)	1.663(47,240)	1.906(48,412)
DB 22255	2.820(71,628)	1.000(25,400)	1.852(47,040)	.750(19,050)	1.168(29,667)	2.203(55,956)	2.446(62,128)
DC 22070	3.468(88,087)	1.000(25,400)	2.500(63,500)	.750(19,050)	1.492(37,896)	2.851(72,415)	3.094(78,587)
DD 21962	3.375(85,725)	1.125(28,575)	2.406(61,112)	.874(22,1996)	1.437(36,499)	2.749(69,824)	3.000(76,200)

FEMALE





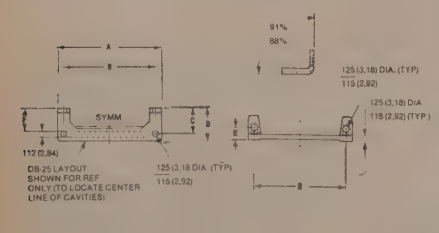
Material: Cold rolled steel.
Plate Finish: Cadmium plate, yellow chromate.
Corrosion Resistance: Passes 48-hour exposure to salt spray in accordance with MIL-STD-202A, Method 101A, Condition B.

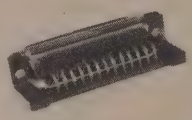
Part Number by Shell Size

Cannon	A	B	C	D	F	G	K
DA 22214	2.281(57,937)	1.000(25,400)	1.312(33,324)	.750(19,050)	.898(22,809)	1.663(47,240)	1.906(48,412)
DB 22254	2.820(71,628)	1.000(25,400)	1.852(47,040)	.750(19,050)	1.168(29,667)	2.203(55,956)	2.446(62,128)
DC 22071	3.468(88,087)	1.000(25,400)	2.500(63,500)	.750(19,050)	1.492(37,896)	2.851(72,415)	3.094(78,587)
DD 21961	3.375(85,725)	1.125(28,575)	2.406(61,112)	.874(22,1996)	1.437(36,499)	2.749(69,824)	3.000(76,200)

RIGHT ANGLE BRACKETS (used with 90° printed circuit connector D*M, D*, D*C/D*U)

NOTE: For applicable contact extension see pages 101 and 104.





Material:
Nylon 6/6 heat stabilized 30% glass fiber, UL-SE-0.
Color: Black.

D*/D*M

Shell Size	Part Number	A ±.015	B ±.005	C ±.005	D ±.010	E ±.010	F ±.010
DE	015-0338-000	1.224(31,1)	.984(24,0)	.340(8,63)	.484(12,3)	.247(6,27)	.283(7,2)
DA	015-0339-000	1.552(39,4)	1.312(33,3)	.340(8,63)	.484(12,3)	.247(6,27)	.283(7,2)
DB	015-0340-000	2.092(53,1)	1.852(47,0)	.340(8,63)	.484(12,3)	.247(6,27)	.283(7,2)
DC	015-0341-000	2.740(69,0)	2.500(63,5)	.340(8,63)	.484(12,3)	.247(6,27)	.283(7,2)
DD	015-0342-000	2.646(67,2)	2.406(61,1)	.395(10,0)	.594(15,1)	.302(7,67)	.283(7,2)

D*C/D*U

Shell Size	Part Number	A ±.015	B ±.005	C ±.005	D ±.010	E ±.010	F ±.010
DE	015-0348-000	1.224(31,1)	.984(24,0)	.502(12,8)	.647(16,4)	.247(6,27)	.445(11,3)
DA	015-0349-000	1.552(39,4)	1.312(33,3)	.502(12,8)	.647(16,4)	.247(6,27)	.445(11,3)
DB	015-0350-000	2.092(53,1)	1.852(47,0)	.502(12,8)	.647(16,4)	.247(6,27)	.445(11,3)
DC	015-0351-000	2.740(69,0)	2.500(63,5)	.502(12,8)	.647(16,4)	.247(6,27)	.445(11,3)
DD	015-0352-000	2.646(67,2)	2.406(61,1)	.558(14,2)	.756(19,2)	.302(7,67)	.445(11,3)

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

D SUBMINIATURE RECTANGULAR CONNECTORS

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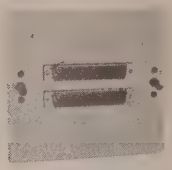
ACCESSORIES (Cont'd)

Dimensions subject to change.

MODULAR PLATES



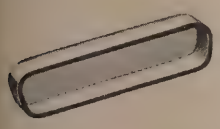
MALE

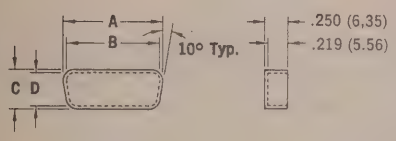
Consists of from 1 to 3 D Subminiature pin connectors float mounted to retaining plate and protected by connector housing at front face of assembly. Available in 36 fixed polarizing positions. Consult factory for part number and additional information.

FEMALE

Consists of from 1 to 3 D Subminiature socket connectors with terminal sealing kits assembled to spring mounted retaining plate. Available in 36 fixed polarizing positions, and a 32- or 48-pound total spring force. Consult factory for part number and additional information.

DUST CAPS

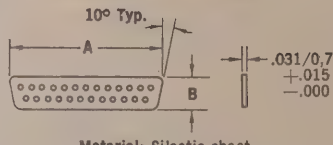




Material: Polyethylene (red).

Part Number by Shell Size	Use with	A	B	C	D
DE 59-20	DE 9S	.694(17,6)	.627(15,9)	.362(9,2)	.295(7,5)
DE 60-20	DE 9P	.749(19,0)	.682(17,3)	.412(10,5)	.345(8,8)
DA 59-20	DA 15S	1.022(26,0)	.955(24,3)	.362(9,2)	.295(7,5)
DA 60-20	DA 15P	1.077(27,4)	1.010(25,7)	.412(10,5)	.345(8,8)
DB 59-20	DB 25S	1.562(39,7)	1.495(38,0)	.362(9,2)	.295(7,5)
DB 60-20	DB 25P	1.635(41,5)	1.568(39,8)	.430(10,9)	.363(9,2)
DC 59-20	DC 37S	2.210(56,1)	2.143(54,4)	.362(9,2)	.295(7,5)
DC 60-20	DC 37P	2.283(57,9)	2.216(56,3)	.430(10,9)	.363(9,2)
DD 59-20	DD 50S	2.116(53,7)	2.049(52,0)	.474(12,0)	.407(10,3)
DD 60-20	DD 50P	2.179(55,3)	2.112(53,6)	.536(13,6)	.469(11,9)

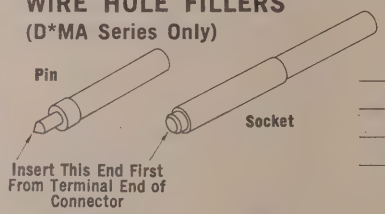
SEALING GASKETS



Material: Silastic sheet

Part Number by Shell Size	A	B
DE 53750	.656(16,7)	.328(8,3)
DA 53750-1	.984(25,0)	.328(8,3)
DB 53750-2	1.531(38,9)	.328(8,3)
DC 53750-3	2.171(55,1)	.328(8,3)
DD 53750-4	2.078(52,8)	.437(11,1)

WIRE HOLE FILLERS
(D*MA Series Only)

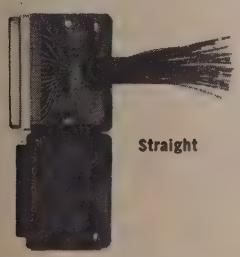


Material: Nylon.

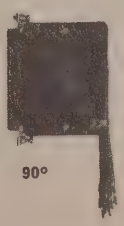
Part Number	Insert Type
DMA 51236-1	Socket
DMA 51235-1	Pin

(millimeters are in parentheses)

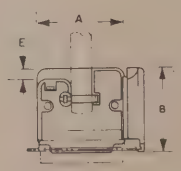
UNIVERSAL JUNCTION SHELL



Straight



90°



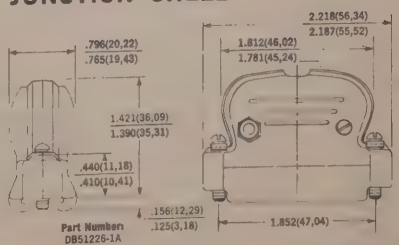
Material: Junction shell — polypropylene; hardware — steel; ty-rap — nylon.
Finish: Hardware — cadmium plate, yellow chromate.
Color: Black (junction shell).
U.L. rated 94V-2 (flame retardant)

Part Number by Shell Size	A ±.015(±,381)	B ±.020(±,508)	C ±.020(±,508)	D ±.020(±,508)	E ±.010(±,254)
DE 110963-1	.765(19,431)	1.400(35,560)	.600(15,240)	.250(6,350)	.125(3,175)
DA 110963-2	1.097(27,863)	1.569(39,852)	.600(15,240)	.375(9,525)	.161(4,089)
DB 110963-3	1.641(41,681)	1.651(41,935)	.600(15,240)	.410(10,414)	.205(5,207)
DC 110963-4	2.279(57,886)	1.899(48,234)	.600(15,240)	.593(15,062)	.250(6,350)
DD 110963-5	2.063(52,400)	1.925(48,895)	.710(18,034)	.670(17,018)	.285(7,239)

ALIGNMENT TOOL
(For D*C/D*U BURGUN-D 90° Connectors with Machined Contacts Only)

Part Number: 317-1389-000

JUNCTION SHELL



Max. Cable Entry .312 (7,92)

Part Number: DB51226-1A

Material: Junction shell — melamine; hardware — steel.
Finish: Hardware — cadmium plate, clear chromate.
Color: Black (junction shell).

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

D SUBMINIATURE RECTANGULAR CONNECTORS

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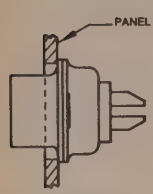
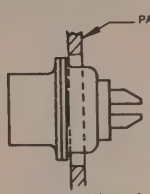
Dimensions subject to change.

D*, D*C, D*U, D*M, D*MA

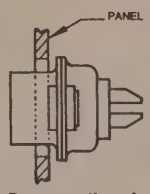
PANEL CUTOUTS



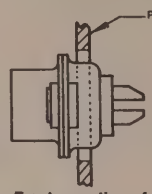
Rear mounting of standard shell



Front mounting of standard shell

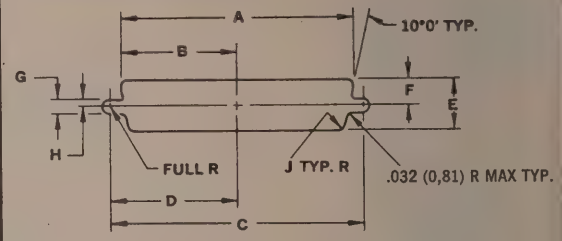


Rear mounting of float mount shell (F code)

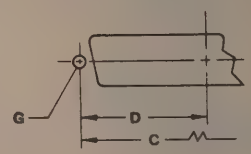


Front mounting of reverse float mount shell (R code)

STANDARD CUTOUT



OPTION CUTOUT (For Rear Mounting)

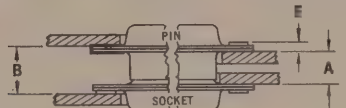


Connector Size	Mounting Method	A ±.005(0,13)	B ±.005(0,13)	C ±.005(0,13)	D ±.005(0,13)	E ±.005(0,13)	F ±.005(0,13)	G ±.002(0,05)	H ±.002(0,05)	J ±.002(0,05)
A Standard	Front Mounting	1.202(30,53)	.601(15,26)	1.312(33,32)	.656(16,66)	.513(13,03)	.257(6,52)	.120(3,04)	.060(1,52)	.083(2,10)
	Rear Mounting	1.134(28,80)	.567(14,40)	1.312(33,32)	.656(16,66)	.449(11,40)	.225(5,71)	.120(3,04)	.060(1,52)	.132(3,35)
A Float	Front Mounting	1.234(31,34)	.617(15,67)	1.312(33,32)	.656(16,66)	.545(13,84)	.273(6,93)	.088(2,23)	.044(1,11)	.083(2,10)
	Rear Mounting	1.166(29,61)	.583(14,80)	1.312(33,32)	.656(16,66)	.481(12,21)	.241(6,12)	.088(2,23)	.044(1,11)	.132(3,35)
B Standard	Front Mounting	1.743(44,27)	.872(22,14)	1.852(47,04)	.926(23,52)	.513(13,03)	.257(6,52)	.120(3,04)	.060(1,52)	.083(2,10)
	Rear Mounting	1.674(42,51)	.837(21,25)	1.852(47,04)	.926(23,52)	.449(11,40)	.225(5,71)	.120(3,04)	.060(1,52)	.132(3,35)
B Float	Front Mounting	1.775(45,08)	.888(22,55)	1.852(47,04)	.926(23,52)	.545(13,84)	.273(6,93)	.088(2,23)	.044(1,11)	.083(2,10)
	Rear Mounting	1.706(43,33)	.853(21,66)	1.852(47,04)	.926(23,52)	.481(12,21)	.241(6,12)	.088(2,23)	.044(1,11)	.132(3,35)
C Standard	Front Mounting	2.391(60,73)	1.196(30,37)	2.500(63,50)	1.250(31,75)	.513(13,03)	.257(6,52)	.120(3,04)	.060(1,52)	.083(2,10)
	Rear Mounting	2.326(59,08)	1.163(29,54)	2.500(63,50)	1.250(31,75)	.449(11,40)	.225(5,71)	.120(3,04)	.060(1,52)	.132(3,35)
C Float	Front Mounting	2.423(61,54)	1.212(30,78)	2.500(63,50)	1.250(31,75)	.545(13,84)	.273(6,93)	.088(2,23)	.044(1,11)	.083(2,10)
	Rear Mounting	2.354(59,79)	1.177(29,89)	2.500(63,50)	1.250(31,75)	.481(12,21)	.241(6,12)	.088(2,23)	.044(1,11)	.132(3,35)
D Standard	Front Mounting	2.297(58,34)	1.149(29,18)	2.406(61,11)	1.203(30,55)	.623(15,82)	.312(7,92)	.120(3,04)	.060(1,52)	.083(2,10)
	Rear Mounting	2.218(56,33)	1.109(28,16)	2.406(61,11)	1.203(30,55)	.555(14,09)	.278(7,06)	.120(3,04)	.060(1,52)	.132(3,35)
D Float	Front Mounting	2.239(59,15)	1.165(29,59)	2.406(61,11)	1.203(30,55)	.655(16,63)	.328(8,33)	.088(2,23)	.044(1,11)	.083(2,10)
	Rear Mounting	2.250(57,15)	1.125(28,57)	2.406(61,11)	1.203(30,55)	.587(14,90)	.294(7,46)	.088(2,23)	.044(1,11)	.132(3,35)
E Standard	Front Mounting	.874(22,19)	.437(11,09)	.984(24,99)	.492(12,49)	.513(13,03)	.257(6,52)	.120(3,04)	.060(1,52)	.083(2,10)
	Rear Mounting	.806(20,47)	.403(10,23)	.984(24,99)	.492(12,49)	.449(11,40)	.225(5,71)	.120(3,04)	.060(1,52)	.132(3,35)
E Float	Front Mounting	.906(23,01)	.453(11,50)	.984(24,99)	.492(12,49)	.545(13,84)	.273(6.93)	.088(2,23)	.044(1,11)	.083(2,10)
	Rear Mounting	.838(21,28)	.419(10,64)	.984(24,99)	.492(12,49)	.481(12,21)	.241(6,12)	.088(2,23)	.044(1,11)	.132(3,35)

(millimeters are in parentheses)

PANEL MOUNTING

PIN FRONT MOUNTING — PIN REAR MOUNTING

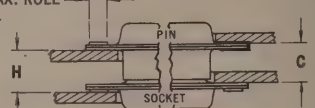


SOCKET FRONT MOUNTING — SOCKET REAR MOUNTING

FIGURE 1A

PIN REAR MOUNTING — PIN FRONT MOUNTING

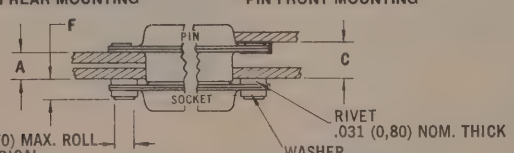
.187 (4,75) MAX. ROLL OVER TYPICAL



SOCKET FRONT MOUNTING — SOCKET REAR MOUNTING

FIGURE 1B

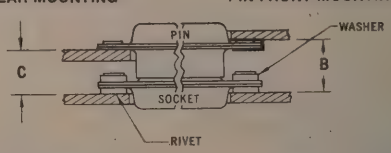
PIN REAR MOUNTING — PIN FRONT MOUNTING



SOCKET FLOAT MOUNTING — SOCKET FLOAT MOUNTING

FIGURE 2

PIN REAR MOUNTING — PIN FRONT MOUNTING



SOCKET REVERSE FLOAT MOUNTING — SOCKET REVERSE FLOAT MOUNTING

FIGURE 3

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

D SUBMINIATURE RECTANGULAR CONNECTORS

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

D*, D*C, D*U, D*M, D*MA

Dimensions subject to change.
(millimeters are in parentheses)

PANEL MOUNTING CONT'D

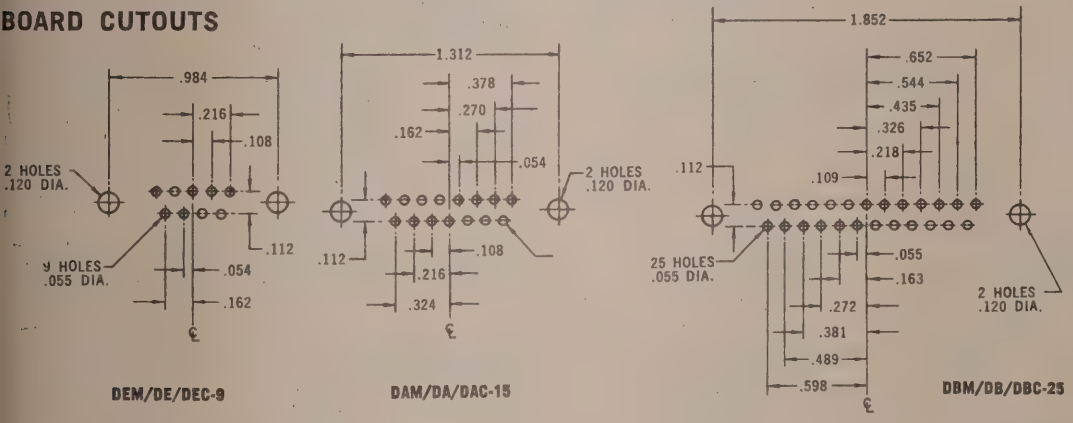
NOTE: A, B, C, and H are dimensions between panels and represent the recommended limit to be used in the design of the connector mounting method.

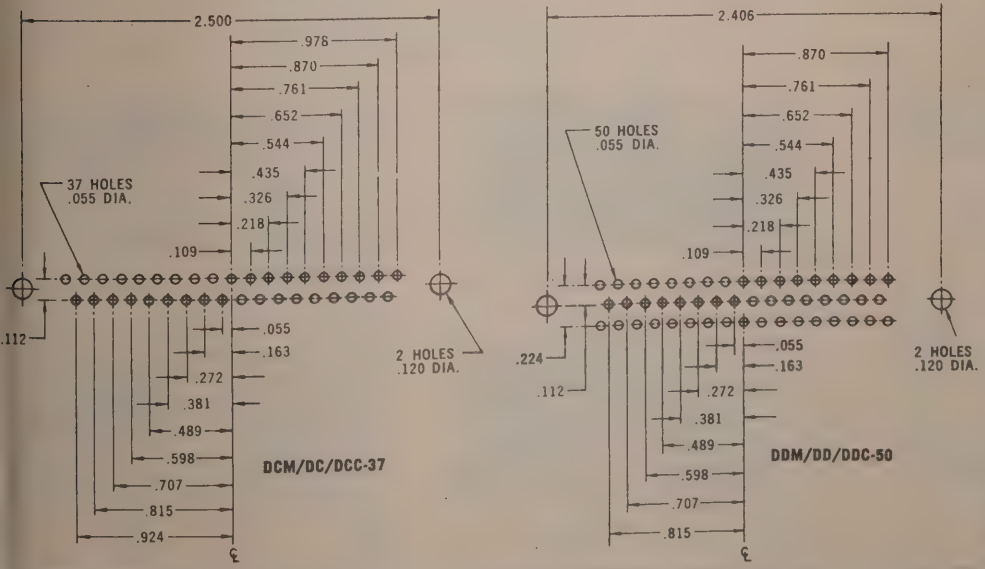
Fig. No.	Combination of Mated Connectors: Size	Pin (See Note below)	Socket	A +.030(+0,76) −.000(−0)	B +.030(+0,76) −.000(−0)	C +.030(+0,76) −.000(−0)	F ±.010(±0,25)	H +.030(+0,76) −.000(−0)
1	A, E	Standard	Standard	.250(6,35)	.340(8,63)	.295(7,49)	—	.295(7,49)
1	B, C, D	Standard	Standard	.238(6,04)	.343(8,71)	.298(7,56)	—	.283(7,18)
2	A, E	Standard	Float Mount	.218(5,53)	—	.263(6,68)	.120(3,04)	—
2	B, C, D	Standard	Float Mount	.206(5,23)	—	.266(6,75)	.120(3,04)	—
2	A, E	Float Mount	Standard	.218(5,53)	—	.263(6,68)	.120(3,04)	—
2	B, C, D	Float Mount	Standard	.206(5,23)	—	.251(6,37)	.130(3,30)	—
3	A, E	Standard	Rev. Float Mount	—	.358(9,09)	.313(7,95)	.120(3,04)	—
3	B, C, D	Standard	Rev. Float Mount	—	.361(9,16)	.301(7,64)	.120(3,04)	—
3	A, E	Rev. Float Mount	Standard	—	.358(9,09)	.313(7,95)	.120(3,04)	—
3	B, C, D	Rev. Float Mount	Standard	—	.355(9,01)	.310(7,87)	.130(3,30)	—

NOTE: Standard pin assemblies contain .015(3,81) inch thick front shells on E and A sizes; .024(6,09) inch thick front shells on B, C, and D sizes.

D*, D*C, D*U, D*M PRINTED CIRCUIT BOARD SERIES

BOARD CUTOUTS





Conversion Chart — Inches to Millimeters

Inches	mm
.054	1,37
.055	1,40
.108	2,74
.109	2,77
.112	2,84
.120	3,05
.162	4,11
.163	4,14
.216	5,49
.218	5,54
.224	5,69
.270	6,86
.272	6,91
.324	8,23
.326	8,28
.378	9,60
.381	9,68
.435	11,05
.489	12,42
.544	13,82
.598	15,19
.652	16,56
.707	17,96
.761	19,33
.816	20,73
.870	22,10
.924	23,47
.978	24,84
.984	24,99
1.312	33,32
1.852	47,04
2.406	61,11
2.500	63,50

Dia. P/C Tail	Recommended P/C Board Hole Dia.
.028(0,71)	.045(1,14)
.030(0,76)	.045(1,14)
.040(1,02)	.055(1,40)

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D SUBMINIATURE RECTANGULAR CONNECTORS

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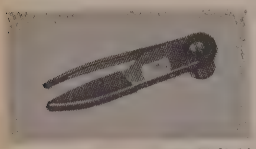
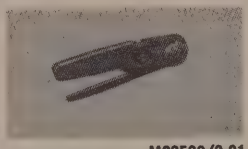
ASSEMBLY INSTRUCTIONS

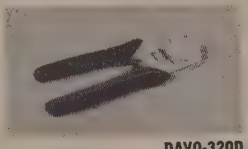
CRIMP AND ASSEMBLY TOOLS D*C, D*U, D*MA



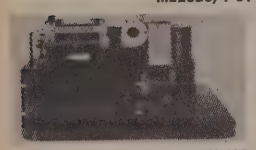
M22520/1-01



M22520/2-01

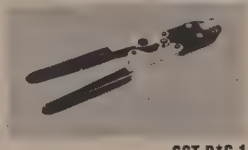


DAVO-320D



CBT-460

ABT-500



CCT-D*C-1

CIET-20-HDB

EXTRACTION D*MA

Figure 2

Figure 3

The CET-20-11 tool extracts size 20 pin and socket contacts from the D*MA Series.

Operating Instructions:

A. Place the tool slot over the wire (Figure 2) with the tool tip approximately ¼ inch behind the insulator. Then slide the tool back along the wire until the tool slit opens and surrounds the wire.

B. Slide the tool forward along the wire (Figure 3) and push the tool firmly into the insulator until it bottoms, releasing the contact. Press the wire against the tool and remove wire, tool, and contact from the connector.

D*C/D*U

Contact	Wire Accom.	Hand Crimp Tool	Semi-Automatic Tool	Insertion	Extraction
20 (Machined)	24, 22, 20	M22520/1-01 with Locator TH185		CIET-20HDB (White Tip)	(Colored Tip)
		M22520/2-01 with Locator L3198-20HDL	CBT-460 (Vibra-feed)		
		Davo 320D			
20-18 (Machined)	1 #18 or 2 #22	M22520/1-01 with Locator TH185	None	CIET-2018HDB (White Tip)	(Colored Tip)
20-26 (Machined)	30, 28, 26	M22520/2-01 with Locator L3198-20HDL	CBT-460 (Vibra-feed)	CIET-20HDB (White Tip)	(Colored Tip)
20 (Stamped)	20 thru 30	CCT—D*C-1	ABT-500 Die Set D*C	CIET-20HDB (White Tip)	Colored Tip)
20-18 (Stamped)	18, 20, 22 or 2 #22	CCT-D*C-4	ABT-500 Die Set D*C	CIET-20HDB (White Tip)	(Colored Tip)

NOTE: To extract a contact with a #18 wire the wire will have to be clipped off the contact first.

D*MA

Connector	Contact	Crimp	Insertion	Extraction
D*MM	Coaxial	CCT-DM (braid only)	None Required	CET-C6B
	Size 8, 12 & 16 High Power and High Voltage	None (solder type)	None Required	CET-C6B
	Size 20	M22520/2-01 with M225202-08 locator or K-13-1 locator MS3191-1 with locator P-20-3191-1 DAVO-300D CBT-460	None Required	CET-20-11 or military insertion/extraction tool, *MS18278-1 same as CIET-20HD
	20-18	M22520/1-01 with locator TH25 MS3191-1 with locator P20-3191-17	None Required	CET 20-15
	Size 22D	M22520/2-01 with M22520/2-06 locator	None Required	CIET-22M KJ
D*MAM	Coaxial	CCT-DM (braid only)	None Required	Integral Part of Coaxial
	Size 8 High Power	None (solder type)	None Required	Integral Part of Coaxial
	Size 12 and 16 High Power and High Voltage	None (solder type)	None Required	CET-12-14
	Shielded Contacts	Inner contact: M22520/2-01 with locator M22520/2-12 Outer Shell: M22520/1-01 with locator M22520/1-02	None Required	CIET-16

*Combination insertion/extraction tool.

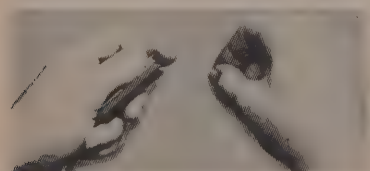
ASSEMBLY OF D*C, D*U, D*MA

	Min.	Max.
D*C/D*U	.156 (3,96)	.187 (4,75)
D*MA	.188 (4,78)	.208 (5,28)

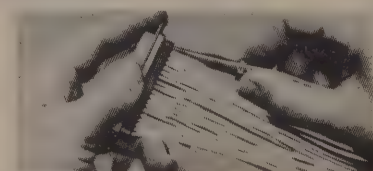
WIRE STRIPPING
1. Cut wires to length. Strip insulation per above illustration. Check for broken or frayed wires.

CONTACT CRIMPING
2. Insert contact and wire into proper crimp tool (and locator, if required). Crimp contact to wire. Inspect crimp.

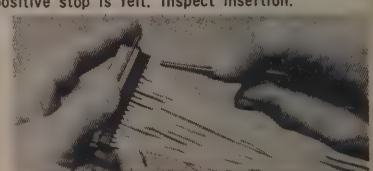
CONTACT INSERTION
3. Center wired contact in groove of insertion tool (for size 22D also, D*MA) with tool tip butting contact shoulder. Insert contact into cavity until a positive stop is felt. Inspect insertion.



4. To be sure contact is locked securely, pull back lightly on wire. Repeat for balance of contacts, working row by row across the insulator.



CONTACT EXTRACTION
5. Place wire into extraction tool tip. (See above for D*MA extraction.)



6. Insert tool tip into contact cavity until tip bottoms against contact shoulder, releasing tines. Hold wire against tool with finger and remove tool and contact. Repeat for balance of contacts.

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WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

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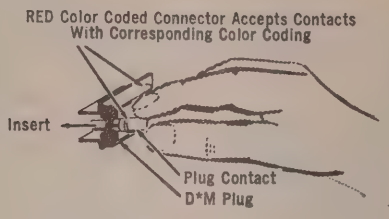
r immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

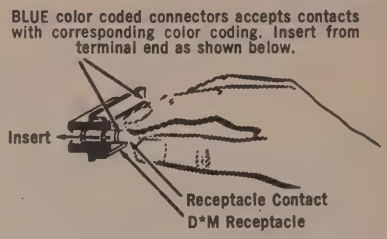
OOLS (D*MA, D*C, D*U COAXIALS)

Dimensions subject to change.

SERTION D*M COAX, POWER, ND HV CONTACTS

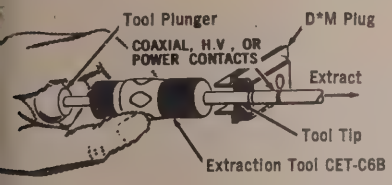
insertion tool is required. Color coded coax, wer, and high voltage contacts are accepted by responding color coded D*M assemblies.




BLUE color coded connectors accepts contacts with corresponding color coding. Insert from terminal end as shown below.
Insert
Receptacle Contact
D*M Receptacle

XTRACTION D*M COAXIAL, H.V., AND OWER CONTACTS CET-C6B

ormerly CET-C6A)

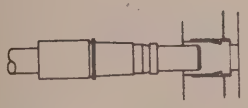


The CET-C6B tool extracts coax, power and high voltage contacts (plug and receptacle) from the D*M Series.

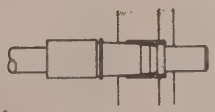
Operating Instructions:
To extract the D*M coax contact, hold the tool by the body and insert the tip into the front of the contact cavity until it booms and closes the coax retaining ring. Holding the body in this position securely enough to keep coax retaining ring closed, push the plunger; contact will be pushed out of the rear of the assembly.

SERTION D*MA COAXIALS AND GH POWER CONTACTS

Contact partially inserted.



Tines snap behind contact shoulder when contact is fully inserted.

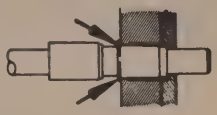


insertion tools are required for the coaxial contact, size 8 high power contacts, and sizes 12 and 16 high power and high voltage contacts.

sertion Procedure:
sh the contact into the rear of the connector. Tines will snap behind the ct shoulder when the contact is fully inserted.

EXTRACTION D*MA COAXIALS AND HIGH POWER CONTACTS

Depress flange of built-in extraction tool until flush with rear of insulator.



Contact being pulled from connector.

A separate extraction tool is not required for the coaxial contact or the size 8 high power contacts. The tool is an integral part of the contact.

Insertion Procedure:
Depress flange of built-in extraction tool until it is flush with the rear of the insulator. Contact can then be pulled from the connector. For extraction of sizes 12 and 16 high power and high voltage contacts the CET-12-16 is recommended.

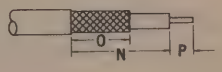
(millimeters are in parentheses)

COAX CABLE ASSEMBLY

D*M SERIES

TRIM DIMENSIONS

CRIMP TYPE					SOLDER TYPE			
Part Number	N	O	P	Crimp Tool	Part Number	N	O	P
DM 53740	5/16(7,92)	1/4(6,35)	5/64(1,98)	A	DM 53740-5000	5/16(7,92)	1/4(6,35)	5/64(1,98)
DM 53740-1	5/16(7,92)	1/4(6,35)	5/64(1,98)	B	DM 53740-5001	5/16(7,92)	1/4(6,35)	5/64(1,98)
DM 53740-3	3/8(9,52)	5/16(7,92)	5/64(1,98)	C	DM 53740-5002	3/8(9,52)	5/16(7,92)	5/64(1,98)
DM 53740-5	3/8(9,52)	5/16(7,92)	5/64(1,98)	C	DM 53740-5005	3/8(9,52)	5/16(7,92)	5/64(1,98)
DM 53741	3/8(9,52)	15/64(5,94)	1/16(1,57)	A	DM 53740-5008	5/16(7,92)	1/4(6,35)	5/64(1,98)
DM 53741-1	3/8(9,52)	15/64(5,94)	1/16(1,57)	B	DM 53741-5000	3/8(9,52)	15/64(5,94)	1/16(1,57)
DM 53741-3	27/64(10,69)	5/16(7,92)	3/32(2,39)	C	DM 53741-5001	3/8(9,52)	15/64(5,94)	1/16(1,57)
DM 53741-4	27/64(10,69)	5/16(7,92)	3/32(2,39)	C	DM 53741-5003	27/64(10,69)	5/16(7,92)	3/32(2,39)
DM 53742	5/16(7,92)	1/4(6,35)	5/64(1,98)	A	DM 53741-5004	27/64(10,69)	5/16(7,92)	3/32(2,39)
DM 53742-1	5/16(7,92)	1/4(6,35)	5/64(1,98)	B	DM 53742-5000	5/16(7,92)	1/4(6,35)	5/64(1,98)
DM 53742-3	3/8(9,52)	5/16(7,92)	5/64(1,98)	C	DM 53742-5001	5/16(7,92)	1/4(6,35)	5/64(1,98)
DM 53742-5	3/8(9,52)	5/16(7,92)	5/64(1,98)	C	DM 53742-5002	3/8(9,52)	5/16(7,92)	5/64(1,98)
DM 53743-2	3/8(9,52)	15/64(5,94)	1/16(1,57)	A	DM 53742-5004	3/8(9,52)	5/16(7,92)	5/64(1,98)
DM 53743-3	3/8(9,52)	15/64(5,94)	1/16(1,57)	B	DM 53742-5006	5/16(7,92)	1/4(6,35)	5/64(1,98)
DM 53743-5	27/64(10,69)	5/16(7,92)	3/32(2,39)	C	DM 53743-5000	3/8(9,52)	15/64(5,94)	1/16(1,57)
DM 53743-6	27/64(10,69)	5/16(7,92)	3/32(2,39)	C	DM 53743-5001	3/8(9,52)	15/64(5,94)	1/16(1,57)
					DM 53743-5003	27/64(10,69)	5/16(7,92)	3/32(2,39)
					DM 53743-5004	27/64(10,69)	5/16(7,92)	3/32(2,39)



Trim coaxial cable to these dimensions for installation to D*M coaxial contacts.

CRIMP TOOL
A. CCT-DM (small die)
B. CCT-DM (intermediate die)
C. CCT-DM (large die)

tolerances are ±.010 (0.25)

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

D SUBMINIATURE RECTANGULAR CONNECTORS

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

Dimensions subject to change.

D*M SERIES (Cont'd)

ASSEMBLY

STEP 1: Straight and 90° Coaxials

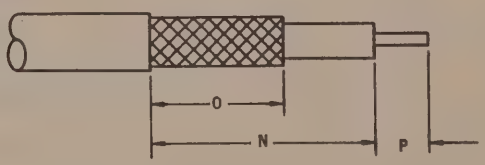
1. Slide the outer ring over the cable jacket. Trim the cable as specified in the table of Coax Cable Trim Dimensions. Insert the cable dielectric and center conductor into the inside diameter of the inner sleeve. Then solder the center conductor to the coax center contact.

STEP 2: Straight and 90° Coaxials

2. Slide the outer ring forward until it is flush with the coax shell containing the braid between the outer ring and the inner sleeve. For solder type coaxes, soft solder the outer ring to the assembly thru the cross-drilled solder hold. For crimp type coaxes, crimp with the appropriate tool in the area defined.

D*MA SERIES

TRIM DIMENSIONS



CRIMP TOOL

CCT-DM (small die)

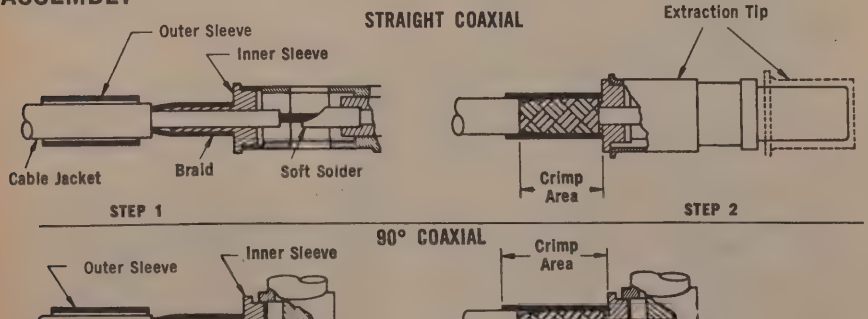
Trim coaxial cable to these dimensions for installation to D*MA coaxial contacts.

CRIMP TYPE

Part Number	N	O	P	Crimp Tool
DMA 43717	.354(8,99)	.190(4,83)	.090(2,29)	A
DMA 43717-1	.354(8,99)	.190(4,83)	.090(2,29)	B
DMA 43717-2	.354(8,99)	.190(4,83)	.090(2,29)	C
DMA 43717-3	.354(8,99)	.190(4,83)	.090(2,29)	C
DMA 43716	.354(8,99)	.190(4,83)	.090(2,29)	A
DMA 43716-1	.354(8,99)	.190(4,83)	.090(2,29)	B
DMA 43716-2	.354(8,99)	.190(4,83)	.090(2,29)	C
DMA 43716-3	.354(8,99)	.190(4,83)	.090(2,99)	C
DMA 43719	.316(8,03)	.190(4,83)	.062(1,57)	A
DMA 43719-1	.316(8,03)	.190(4,83)	.062(1,57)	B
DMA 43719-2	.316(8,03)	.190(4,83)	.062(1,57)	C
DMA 43719-3	.316(8,03)	.190(4,83)	.062(1,57)	C
DMA 43718	.316(8,03)	.190(4,83)	.062(1,57)	A
DMA 43718-1	.316(8,03)	.190(4,83)	.062(1,57)	B
DMA 43718-2	.316(8,03)	.190(4,83)	.062(1,57)	C
DMA 43718-3	.316(8,03)	.190(4,83)	.062(1,57)	C

(millimeters are in parentheses)

ASSEMBLY



STEP 1: Straight Type

Slide outer sleeve over cable jacket and trim cable. Insert cable dielectric and center conductor into inside dimension of inner sleeve. Solder center conductor to coaxial center contact.

Slide outer sleeve forward until flush with inner sleeve to confine braid. Crimp outer sleeve, using crimp tool CCT-DM. Crimp as close as possible to the inner sleeve shoulder. Push extraction tip over the coaxial (as shown) until it rests against the inner sleeve shoulder.

STEP 2: 90° Angle Type

Slide outer sleeve over cable jacket and trim cable. Insert cable dielectric and center conductor into inside dimension of inner sleeve. Solder center conductor to coaxial center contact.

Slide outer sleeve forward until flush with coaxial shell, confining braid between outer and inner sleeves. Crimp in area shown. Soft solder cap in place.

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WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

DPK SERIES RACK/PANEL CONNECTORS

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Dimensions subject to change.
(millimeters are in parenthesis)

RECTANGULAR DPK CONNECTORS HIGH-PERFORMANCE MIL-C-83733 QUALIFIED TEMPERATURE RANGES OF −65°C TO +200°C ENVIRONMENT-RESISTANT

TT Cannon's DPK series are high performance, environment-esistant, rectangular connectors qualified to MIL-C-83733 (USAF). hey feature crimp snap-in contacts in the dependable LITTLE AESAR® rear release contact retention assembly. Developed y Cannon, this unique, field-proven assembly permits contacts o be inserted and extracted at the rear of the connector. ontacts are qualified to military specifications and are crimped ith MIL-C-22520 crimp tools, using standard locators.

he versatile DPK Connector is suitable for many applications, articularly where environment or thermal protection is man-atory and high reliability is a design requirement.

hese high performance connectors are available in two shell izes with a variety of mounting configurations. There are 3 contact arrangements available accommodating from 18 to 85 standard, shielded and coaxial contacts. The standard ontacts are available in sizes 12, 16, 20 and 22D. Shells are a ie-cast aluminum alloy with electroless nickel finish. Insulators re a high grade, glass reinforced, epoxy-based resin. Silicone ubber is used for wire sealing grommets, interfacial and eripheral seals.

HOW TO ORDER

TT CANNON NOMENCLATURE

DPK A — G 131 P * G — 7 F0

DPK B — G 185 S * K — 7 F0

eries Prefix —
TT Cannon Designation
hell Size
ontact Modification
ontact Arrangement
ontact Type
olarization (applicable to mounting style A)
onnector Mounting Style
onnector Materials Per MIL-C-83733
urnished Less Contacts
vill not be stamped on connector).

MIL-C-83733 (USAF) NOMENCLATURE

M 83733-04 R B 101

ilitary Part Number Indicator
asic Specification
ecification Sheet Number
lass: R-environment resistant
ell Size
ntact Arrangement

DESCRIPTIONS

Shell Size
A — Small shell
B — Large shell

Contact Modification
G — MIL-C-38999 contacts. Size 22D for DPKA-131 and DPKB-185 contact arrangements only.
W — MIL-C-38999 type contacts. Size 22D Wire-Wrap* posts for DPKA-131 and DPKB-185 layouts. .025″ square posts for .340; extension from grommet face.

Contact Arrangement
Shell Size A: 18, 32, 51 and 131 (MIL-STD-1531).
Shell Size B: 48, 64, 78, 101, 59W7, 71, 71C15, 161 and 185 (MIL-STD-1532).

Contact Type
P: Pin (Receptacle Connectors)
S: Socket (Plug Connectors)

Polarization
Six-position shell polarization accomplished with polarizing pins mounted on each end of shell flange. Available on mounting styles A and B only.

Mounting Styles
A: Two mounting holes .197″ diameter (for either nuts or jackscrews ordered separately) and two polarizing posts. (Replaces Mounting Style B.)
C: Four MS24700-2 bushings, included for the receptacle (M83733/5).
F: Four (4) clinch nuts (No. 6-32 thread) (M83733/6).
G: Four .281″ diameter holes (for MS24700-2 bushings or 231-0019-000 spring mounts) (M83733/1).
H: Two mounting hole flange. Two (231-0019-000) spring mounts on the plug and two MS24700-2 bushing mounts on the receptacle (M83733/10; /12).
K: Four captivated, non-rotaing spring mounts on the plug (M83733/4).
M: Two mounting hole flange. Two mounting holes .281″ diameter (for MS24700-2 bushings or 231-0019-000 spring mounts) (M83733/9).
X: Two guide pins with two (231-0019-000) spring mounts on the plug and two guide sockets with two .197″ diameter holes on the receptacle (M83733/2; /3).
Y: Two guide sockets with two (231-0019-000) spring mounts on the plug and two guide pins with .197″ diameter holes on the receptacle (M83733/7; /8).
Z: Two staggered clinch nuts on the receptacle (No. 6-32 thread) (M83733/11).

Material Modification
-7 standard product line, environment resistant per MIL-C-83733(USAF). QPL M83733.

* Trade Mark of Gardner-Denver

For a quick response to your application needs call one of the following District Offices:
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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

DPK SERIES RACK/PANEL CONNECTORS

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Dimensions subject to chang
(millimeters are in parenthes

STANDARD DATA

MATERIALS

Shell	Diecast aluminum alloy A-380 per QQ-A-591
Insulator	High grade thermosetting plastic
Contacts	Copper alloy per QQ-C-533
Grommets and Seals	Silicone base elastomer
Mounting Hardware	Stainless steel

FINISHES

Shell	Electroless nickel plate per MIL-C-26074, Class 1
Contacts	Gold over copper plate per MIL-G-45204
Hardware	Passivate

MECHANICAL FEATURES

Shell Sizes	A, B
Coupling	Friction, spring mount or jackscrew-coupling nut
Contact Arrangements	A — 18, 32, 51, G131 B — 48, 64, 78, 101, 59W7 71, 71C15, 161, G185

ELECTRICAL DATA

Number of contacts: 18 thru 185		Sealing Range Wire Diameter	
Contact Sizes	Wire Accommodation (AWG)	Min.	Max.
22D	22, 24, 26	.030	.060
20	20, 22, 24	.040	.083
16	16, 18	.063	.103
12	12, 14	.081	.158
12 Shielded	RG-179/U	.106	.158

Max. current carrying capacity of contacts

Contact Size:	#12	#16	#20	#22
Amperage:	23	13	7.5	5.0

Test Voltages (AC-RMS)

Altitude (feet)	Equivalent Pressure (Torr)	Service Ratings (M & I)				Unmated 161 Arrangemen
		Mated		Unmated		
		M	I	M	I	
Sea level	....	1300	1800	1300	1800	1000
50,000	87.5	800	1000	550	600	350
70,000	35.5	800	1000	350	400	250
110,000	5.74	800	1000	200	200	150

CROSS REFERENCE FROM MILITARY TO CANNON PART NUMBERS

MIL-SPEC P/N	ITTCE P/N
M83733-01RA018	DPKA-18PG-7
M83733-01RA032	DPKA-32PG-7
M83733-01RA051	DPKA-51PG-7
M83733-01RA131	DPKA-G131PG-7
M83733-01RB048	DPKB-48PG-7
M83733-01RB064	DPKB-64PG-7
M83733-01RB071	DPKB-71PG-7
M83733-01RB71C	DPKB-71C15PG-7
M83733-01RB078	DPKB-78PG-7
M83733-01RB101	DPKB-101PG-7
M83733-01RB185	DPKB-G185PG-7
M83733-04RA018	DPKA-18SK-7
M83733-04RA032	DPKA-32SK-7
M83733-04RA051	DPKA-51SK-7
M83733-04RA131	DPKA-G131SK-7
M83733-04RB048	DPKB-48SK-7
M83733-04RB064	DPKB-64SK-7
M83733-04RB071	DPKB-71SK-7
M83733-04RB71C	DPKB-71C15SK-7
M83733-04RB078	DPKB-78SK-7
M83733-04RB101	DPKB-101SK-7
M83733-04RB185	DPKB-G185SK-7
M83733-07RA018	DPKA-18SY-7
M83733-07RA032	DPKA-32SY-7
M83733-07RA051	DPKA-51SY-7
M83733-07RA131	DPKA-G131SY-7
M83733-07RB048	DPKB-48SY-7
M83733-07RB064	DPKB-64SY-7
M83733-07RB071	DPKB-71SY-7
M83733-07RB71C	DPKB-71C15SY-7
M83733-07RB078	DPKB-78SY-7
M83733-07RB101	DPKB-101SY-7
M83733-10RA018	DPKA-18PH-7
M83733-10RA032	DPKA-32PH-7
M83733-10RA051	DPKA-51PH-7
M83733-10RB048	DPKB-48PH-7
M83733-10RB064	DPKB-64PH-7
M83733-10RB071	DPKB-71PH-7
M83733-10RB71C	DPKB-71C15PH-7
M83733-10RB078	DPKB-78PH-7
M83733-10RB101	DPKB-101PH-7

MIL-SPEC P/N	ITTCE P/N
M83733-02RA018	DPKA-18SX-7
M83733-02RA032	DPKA-32SX-7
M83733-02RA051	DPKA-51SX-7
M83733-02RA131	DPKA-G131SX-7
M83733-02RB048	DPKB-48SX-7
M83733-02RB064	DPKB-64SX-7
M83733-02RB071	DPKB-71SX-7
M83733-02RB71C	DPKB-71C15SX-7
M83733-02RB078	DPKB-78SX-7
M83733-02RB101	DPKB-101SX-7
M83733-02RB185	DPKB-G185SX-7
M83733-05RA018	DPKA-18PC-7
M83733-05RA032	DPKA-32PC-7
M83733-05RA051	DPKA-51PC-7
M83733-05RA131	DPKA-G131PC-7
M83733-05RB048	DPKB-48PC-7
M83733-05RB064	DPKB-64PC-7
M83733-05RB71C	DPKB-71C15PC-7
M83733-05RB078	DPKB-78PC-7
M83733-05RB101	DPKB-101PC-7
M83733-05RB185	DPKB-G185PC-7
M83733-05RB071	DPKB-71PC-7
M83733-08RA018	DPKA-18PY-7
M83733-08RA032	DPKA-32PY-7
M83733-08RA051	DPKA-51PY-7
M83733-08RB048	DPKB-48PY-7
M83733-08RB064	DPKB-64PY-7
M83733-08RB071	DPKB-71PY-7
M83733-08RB71C	DPKB-71C15PY-7
M83733-08RB078	DPKB-78PY-7
M83733-08RB101	DPKB-101PY-7
M83733-11RA018	DPKA-18PZ-7
M83733-11RA032	DPKA-32PZ-7
M83733-11RA051	DPKA-51PZ-7
M83733-11RB048	DPKB-48PZ-7
M83733-11RB064	DPKB-64PZ-7
M83733-11RB071	DPKB-71PZ-7
M83733-11RB71C	DPKB-71C15PZ-7
M83733-11RB078	DPKB-78PZ-7
M83733-11RB101	DPKB-101PZ-7

MIL-SPEC P/N	ITTCE P/N
M83733-03RA018	DPKA-18PX-7
M83733-03RA032	DPKA-32PX-7
M83733-03RA051	DPKA-51PX-7
M83733-03RA131	DPKA-G131PX-7
M83733-03RB048	DPKB-48PX-7
M83733-03RB064	DPKB-64PX-7
M83733-03RB071	DPKB-71PX-7
M83733-03RB71C	DPKB-71C15PX-7
M83733-03RB078	DPKB-78PX-7
M83733-03RB101	DPK-101PX-7
M83733-03RB185	DPKB-G185PX-7
M83733-06RA018	DPKA-18PF-7
M83733-06RA032	DPKA-32PF-7
M83733-06RA051	DPKA-51PF-7
M83733-06RA131	DPKA-G131PF-7
M83733-06RB048	DPKB-48PF-7
M83733-06RB064	DPKB-64PF-7
M83733-06RB071	DPKB-71PF-7
M83733-06RB71C	DPKB-71C15PF-7
M83733-06RB078	DPKB-78PF-7
M83733-06RB101	DPKB-101PF-7
M83733-06RB185	DPKB-G185PF-7
M83733-09RA018	DPKA-18PM-7
M83733-09RA032	DPKA-32PM-7
M83733-09RA051	DPKA-51PM-7
M83733-09RB048	DPKB-48PM-7
M83733-09RB064	DPKB-64PM-7
M83733-09RB071	DPKB-71PM-7
M83733-09RB71C	DPKB-71C15PM-7
M83733-09RB078	DPKB-78PM-7
M83733-09RB101	DPKB-101PM-7
M83733-12RA018	DPKA-18SH-7
M83733-12RA032	DPKA-32SH-7
M83733-12RA051	DPKA-51SH-7
M83733-12RB048	DPKB-48SH-7
M83733-12RB064	DPKB-64SH-7
M83733-12RB071	DPKB-71SH-7
M83733-12RB71C	DPKB-71C15SH-7
M83733-12RB078	DPKB-78SH-7
M83733-12RB101	DPKB-101SH-7

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ITT CANNON ELECTRIC

DPK SERIES RACK/PANEL CONNECTORS

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Dimensions subject to change.
(millimeters are in parenthesis)

MOUNTING STYLES/APPLICATIONS

DPK connectors for rectangular or staggered mounting are available in both two- and four-spring mount assemblies, or the same shell style may be ordered to accommodate bushing assemblies. In the spring mount version the spring-loaded mechanism will compensate for a panel space variation of up to .070" while insuring electrical and environmental integrity.

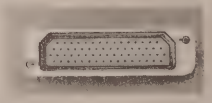
DPK connectors are also available with polarizing posts, accommodations for jackscrews, and coupling nuts for cord-to-cord and cord-to-panel applications. Another shell style has two or four mounting holes fitted with captive clinch nuts.

For mounting dimensions of the various mounting styles shown here please refer to pages 129-130.

MOUNTING STYLE A

Mounting style A is designed for cord-to-panel and cord-to-cord applications. Connectors are supplied with two polarizing posts installed and provisions for installation of two jackscrew assemblies or two coupling nut assemblies. (Replaces Mounting Style B.)

33 Shell
Plug
Socket Contacts



34 Shell
Receptacle
Pin Contacts

Jackscrew Assembly
305-0007-000

Coupling Nut Assembly
335-0002-000

Ordered Separately

MOUNTING STYLE C

Mounting style C is designed for cord-to-panel or rack-to-panel applications. Connectors are supplied with (4) MS24700-2 bushings.

M83733-05

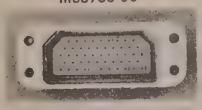
34 Shell
Receptacle
Pin Contacts

Bushing MS24700-2
(Self-Locking)
012-0515-000

MOUNTING STYLE F

Mounting style F is designed for rack-to-panel or cord-to-panel applications. Connectors are supplied with four captive clinch nuts installed.

M83733-06



34 Shell
Receptacle
Pin Contacts

MOUNTING STYLE G

Mounting style G is designed for rack-to-panel applications. Connectors are supplied with four .281 diameter holes which will accommodate either four MS24700-2 bushings or four 231-0019-000 spring mounts.

33 Shell
Plug
Socket Contacts

M83733-01

34 Shell
Receptacle
Pin Contacts

Bushing MS24700-2
(Self-Locking)
012-0515-000

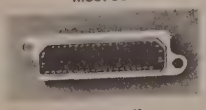
Spring Mount Assembly
MIL-STD-1533
213-0019-000

Ordered Separately

MOUNTING STYLE H

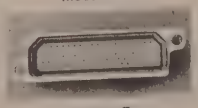
Mounting style H is designed for rack-to-panel applications. Connectors are supplied with two .281 diameter holes which are staggered. Two spring mounts are on the plug end two MS24700-2 bushings are on the receptacle.

M83733-12



33 Shell
Plug
Socket Contacts

M83733-10



34 Shell
Receptacle
Pin Contacts

Bushing MS24700-2
(Self-Locking)
012-0515-000

Spring Mount Assembly
MIL-STD-1533
231-0019-000

ITT CANNON ELECTRIC

DPK SERIES RACK/PANEL CONNECTORS

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Dimensions subject to change.
(millimeters are in parenthesis)

MOUNTING STYLES/APPLICATIONS

MOUNTING STYLE K

Mounting style K is designed for rack-to-panel applications. Connectors are supplied with four captivated, non-rotating spring mounts on the plug.

M83733-04

33 Shell
Plug
Socket Contacts

MOUNTING STYLE M

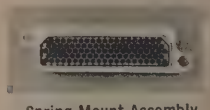
Mounting style M is designed for rack-to-panel applications. Connectors are supplied with two .281 diameter holes which are staggered and will accommodate either two MS24700-2 bushings or two 231-0019-000 spring mounts.

33 Shell
Plug
Socket Contacts

34 Shell
Receptacle
Pin Contacts

M83733-09

Bushing MS24700-2
(Self-Locking)
012-0515-000



Spring Mount Assembly
MIL-STD-1533
231-0019-000

Ordered Separately

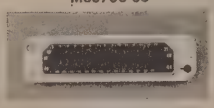
MOUNTING STYLE X

Mounting style X is designed for rack-to-panel applications where positive alignment is required before connectors are mated. Plug has two guide pins and two spring mounts; receptacle has two guide sockets and two .197 dia. holes.

M83733-02

33 Shell
Plug
Socket Contacts

M83733-03



34 Shell
Receptacle
Pin Contacts

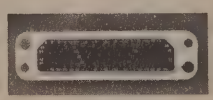
MOUNTING STYLE Y

Mounting style Y is identical to mounting style X, except the guide sockets are on the plug and the guide pin and springs are on the receptacle.

M83733-07

33 Shell
Plug
Socket Contacts

M83733-08



34 Shell
Receptacle
Pin Contacts

MOUNTING STYLE Z

Mounting style Z is designed for use in rack-to-panel applications. Connectors are supplied with two captive clinch nuts which are staggered.

M83733-11

34 Shell
Receptacle
Pin Contacts

MIL-C-83733/DPK MOUNTING STYLES

MIL-C-83733 Connector Type	DPK Mtg. Style	Mating MIL-C-83733 Connector	DPK Mtg. Style
M83733-01 RECEPTACLE	G	M83733-04	K
M83733-02 PLUG	X	M83733-03	X
M83733-03 RECEPTACLE	X	M83733-02	X
M83733-04 PLUG	K	M83733-01	G
		M83733-05	C
		M83733-06	F
M83733-05 RECEPTACLE	C	M83733-04	K
M83733-06 RECEPTACLE	F	M83733-04	K

MIL-C-83733 Connector Type	DPK Mtg. Style	Mating MIL-C-83733 Connector	DPK Mtg. Style
M83733-07 PLUG	Y	M83733-08	Y
M83733-08 RECEPTACLE	Y	M83733-07	Y
M83733-09 RECEPTACLE	M	M83733-12	H
M83733-10 RECEPTACLE	H	M83733-12	H
M83733-11 RECEPTACLE	Z	M83733-12	H
M83733-12 PLUG	H	M83733-09	M
		M83733-10	H
		M83733-11	Z

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

DPK SERIES
RACK/PANEL CONNECTORS

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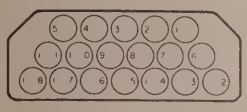
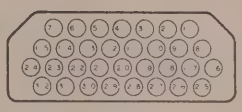
Dimensions subject to change.
(millimeters are in parenthesis)

CONTACT ARRANGEMENTS

DPKA

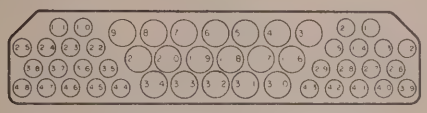
FACE VIEW PIN INSERT SHOWN

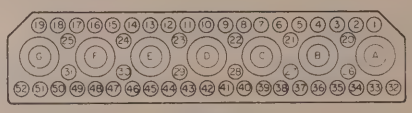




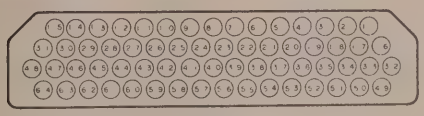
LAYOUT NO. OF CONTACTS AND WIRE SIZE SERVICE RATING	18 18 #12 I	32 32 #16 I	51 51 #20 I	G131 131 #22D M

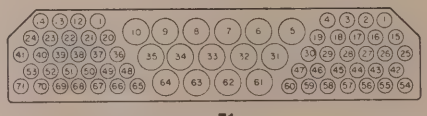
DPKB



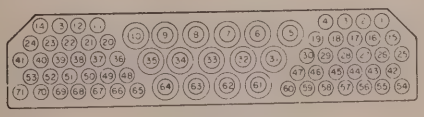


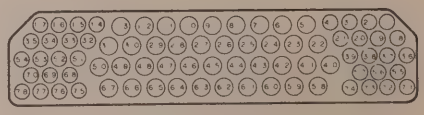
LAYOUT NO. OF CONTACTS AND WIRE SIZE SERVICE RATING	48 30 #16 (1, 2, 10-15, 22-29, 35-48), 18 #12 (3-9, 16-21, 30-34)	59W7 52 #20 (1-52) 7 Coax. (A-G) #20: 1500 Coax: 1000 I & 500 VDC (Coax) The 59W7 layout is sold less coaxial contacts.



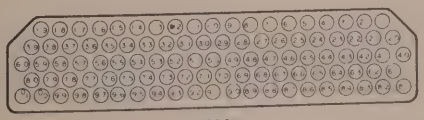


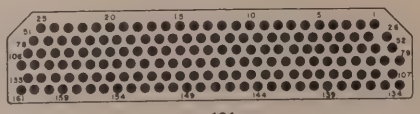
LAYOUT NO. OF CONTACTS AND WIRE SIZE SERVICE RATING	64 64 #16 I	71 56 #20 (1-4, 11-30, 36-60, 65-71) 15 #12 (5-10, 31-35, 61-64) I



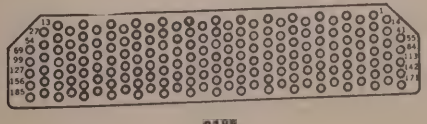


LAYOUT NO. OF CONTACTS AND WIRE SIZE SERVICE RATING	71C15 56 #20 (1-4, 11-30, 36-60, 65-71) 15 Shielded #12 (5-10, 31-35, 61-64) #20: 1500; #12 Shielded: 500 I & 500 VDC (Coax)	78 38 #20 (1-4, 14-21, 32-39, 51-57, 68-78), 40 #16 (5-13, 22-31, 40-50, 58-67) I





LAYOUT NO. OF CONTACTS AND WIRE SIZE SERVICE RATING	101 101 #20 I	161 161 #22 1000 VDC



LAYOUT NO. OF CONTACTS AND WIRE SIZE SERVICE RATING	G185 185 #22D M

In the -161 contact arrangement, the entire pin contact is recessed in an individual cavity in the plug insulator. The socket contact is exposed and extends from the connector receptacle face.

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

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DPK SERIES RACK/PANEL CONNECTORS

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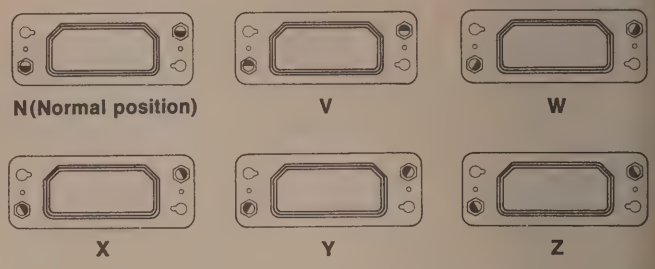
Dimensions subject to change.
(millimeters are in parenthesis)

POLARIZATION
(MOUNTING STYLE A ONLY)

POLARIZING POST ALTERNATE POSITIONS

Pin insert polarizing positions are 180° opposite socket insert polarizing positions. Shaded areas indicate extended portion of the polarizng posts. Cord to panel DPK connectors are available in 35 alternate polarizing positions by changing indexing of the polarizing posts. Keystone corners and hexagonal posts provide this wide range of alternate positions.

Face view of socket insert plug connector engaging end.



CONTACT DATA
STANDARD CONTACTS

Contact Size	Type	ITTCE Part Number	MS Part Number	Tooling		Grommet Sealing Plugs	
				Crimp	Insertion/Extraction	Color	Part Number
12	PIN SOCKET	030-9185-003 031-9186-003	M83723-33B12 M83723-34B12	M22520/1-01 WITH M22520/1-02 TURRET	CIET-12	Yellow	225-0072-000
16	PIN SOCKET	030-9205-007 031-9206-006	M83723-33B16 M83723-34B16	M22520/1-01 WITH M22520/1-02 TURRET	CIET-16	Blue	225-0071-000
20	PIN SOCKET	030-9173-006 031-9174-004	M83723-33B20 M83723-34B20	M22520/2-01 WITH M22520-12 TURRET	CIET-20	Red	225-0070-000
22	PIN SOCKET	030-1975-001 031-1113-001	N/A	M22520/2-01 /2-012222	CIET-22KJ	Black	225-1013-000
22D	PIN SOCKET	030-2042-000 031-1147-000	MS27494-22D MS27492-22D	M22520-209 PIN TURRET AND M22520-206 SOCKET TURRET	CCT-DPKB-22 CIT-DPX2MA-22	Black	225-1013-000

COAXIAL/SHIELDED CONTACTS

Coaxial		Part Number	Cable Accom.	DWV Voltage	Min./Max. O.D. Wire Accom.	Crimp Tools	Locator	Insertion/ Extraction Tool	Grommet Sealing Plugs	
									Color	Part Number
Coaxial Contacts* (59W7 Arrangement Only)	Plug: Receptacle:	249-5500-012 249-5500-013	RG188/U	500 VDC	.122/.250	CCTC8 Outer M22520/2-01	——— M22520/2-30	———	White	225-0085-000
	Plug: Receptacle:	249-5500-008 249-5500-009	RG195/U	500 VDC	.122/.250	CCTC9 Outer M22520/2-01	——— M22520/2-30	———	White	225-0085-000
	Plug: Receptacle:	249-5500-010 249-5500-011	RG180/U	500 VDC	.122/.250	CCTC9 Outer M22520/2-01	——— M22520/2-30	———	White	225-0085-000

* Plug Coaxials go into 33 Shells with Socket Contacts.
Receptacle Coaxials go into 34 Shells with Pin Contacts.

Shielded	Type‡	ITTCE P/N†	MIL P/N†	Cable Accom.	Min./Max. Cable Dia.	Crimp Tools	Locator	Insertion/ Extraction Tool	Grommet Sealing Plugs
Size 12 Contact 71C15 Layout Only	PIN	249-1825-001	M83733-13	RG179/U	.106/.158	M22520/5-01 Outer M22520/2-01 Inner	M22520/5-08 Outer M22520/2-30 Inner	CIET-12	225-0072-000 Yellow
	SOCKET	249-1826-000	M83733-14						

† Consult Factory for Configuration and Assembly Instructions.
‡ Pin and Socket Shielded Contacts are used in 34 Receptacle and 33 Plug connectors respectively.

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DPK SERIES
RACK/PANEL CONNECTORS

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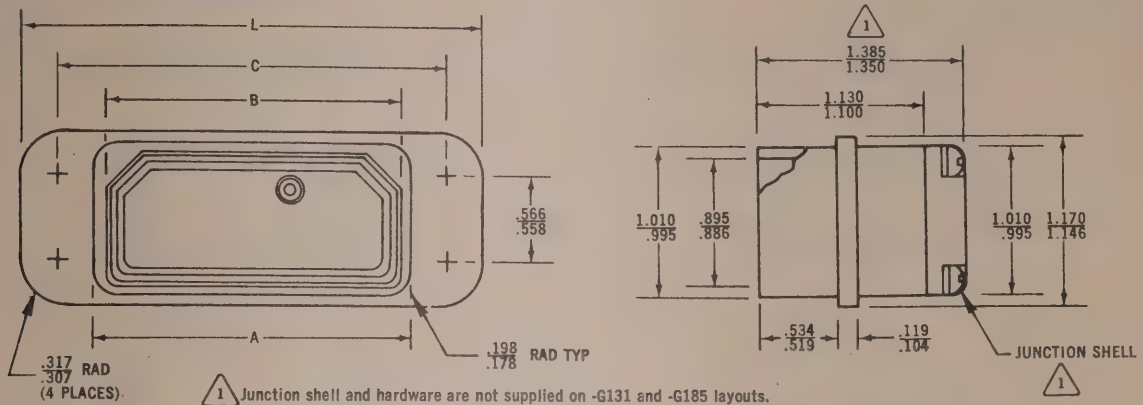
RECEPTACLE/CONFIGURATIONS
(PIN CONTACTS)

Dimensions subject to change.
(millimeters are in parenthesis)

BASIC 34 SHELL DIMENSIONS



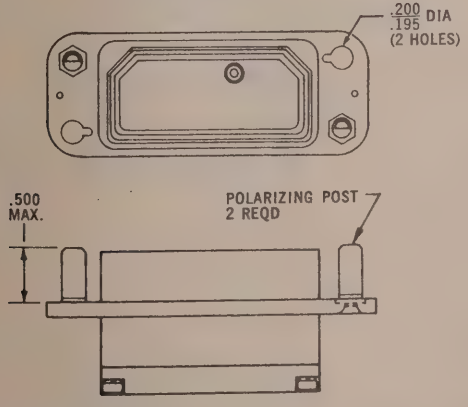
1 Junction shell and hardware are not supplied on -G131 and -G185 layouts.

SHELL SIZE	A	B	C	L	N STAGGERED†
DPKA-*P*-*	2.083 2.075	1.971 1.962	2.582 2.574	3.028 3.000	2.148 2.134
DPKB-*P*-*	3.380 3.372	3.271 3.262	3.879 3.871	4.325 4.297	3.445 3.431

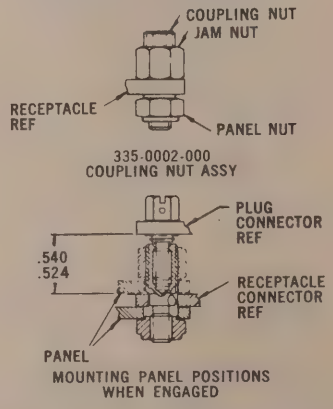
† See page 132 Style SM

DPK TYPES

MOUNTING STYLE A

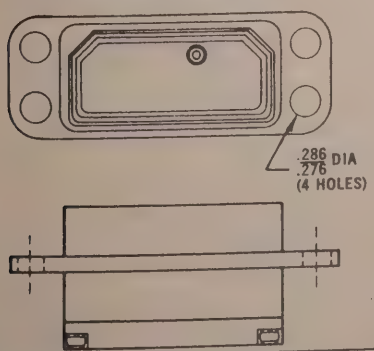


MOUNTING DIMENSIONS FOR COUPLING NUT ASSEMBLIES

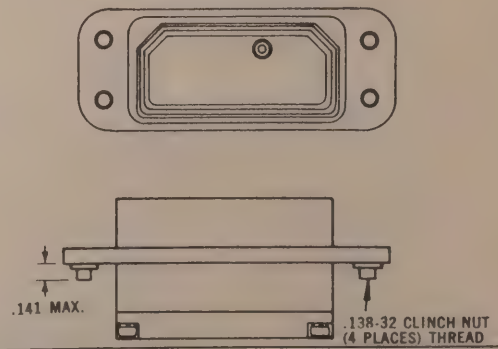


DPK/MIL-C-83733 TYPES

MOUTING STYLE G
STANDARD HOLE MOUNTING
MIL-C-83733/1(USAF)



MOUNTING STYLE F
CLINCH NUT MOUNTING
MIL-C-83733/6(USAF)



ITT CANNON ELECTRIC

DPK SERIES RACK/PANEL CONNECTORS

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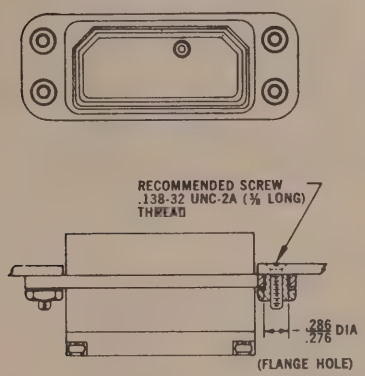
Dimensions subject to change.
(millimeters are in parenthesis)

RECEPTACLE/CONFIGURATIONS

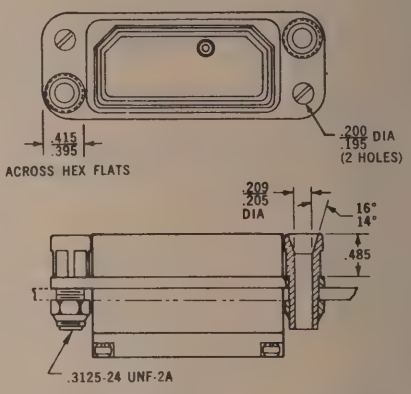
(PIN CONTACTS)

DPK/MIL-C-83733 TYPES

MOUNTING STYLE C
BUSHING MOUNTING
MIL-C-83733/5(USAF)

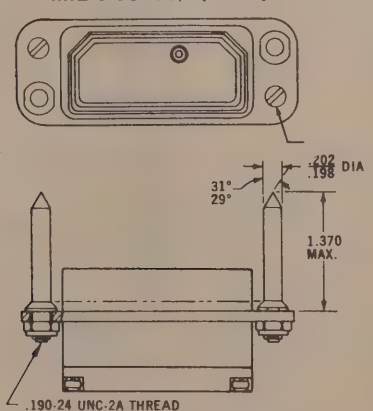


MOUNTING STYLE X
WITH GUIDE SOCKETS
MIL-C-83733/3(USAF)

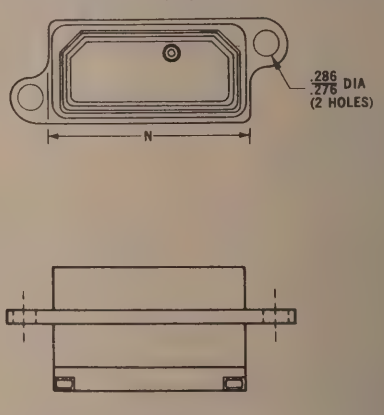


DPK/MIL-C-83733 TYPES

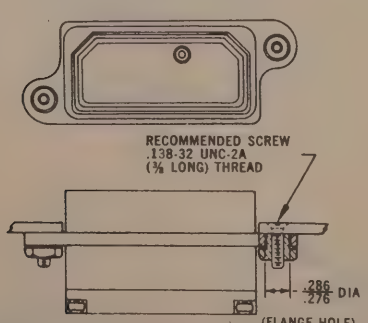
MOUNTING STYLE Y
WITH GUIDE PINS
MIL-C-83733/8(USAF)



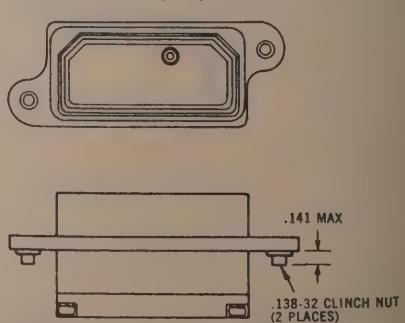
MOUNTING STYLE M
STAGGERED STANDARD HOLE MOUNTING
MIL-C-83733/9(USAF)



MOUNTING STYLE H
STAGGERED BUSHING MOUNTING
MIL-C-83733/10(USAF)



MOUNTING STYLE Z
STAGGERED CLINCH NUT MOUNTING
MIL-C-83733/11(USAF)



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DPK SERIES RACK/PANEL CONNECTORS

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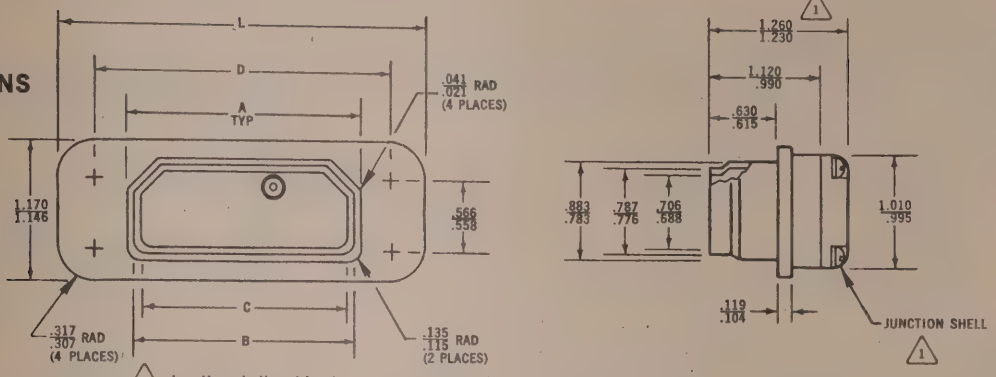
PLUG/CONFIGURATIONS (SOCKET CONTACTS)

Dimensions subject to change.
(millimeters are in parenthesis)

BASIC 33 SHELL DIMENSIONS



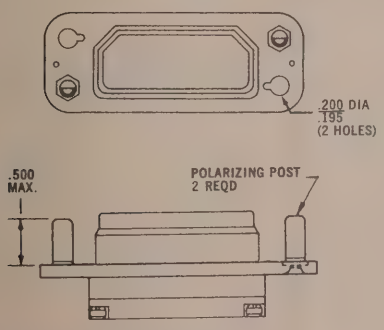
1 Junction shell and hardware are not supplied on -G131 and -G185 layouts.

SHELL SIZE	A	B	C	D	L	N STAGGERED†
DPKA-*S*-*	1.959 1.949	1.864 1.853	1.773 1.764	2.582 2.574	3.028 3.000	2.148 2.134
DPKB-*S*-*	3.256 3.246	3.161 3.150	3.080 3.071	3.879 3.871	4.325 4.297	3.445 3.431

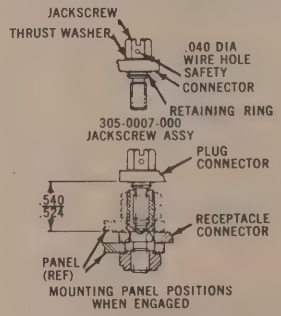
† See page 132 Style PM

DPK STYLES

MOUNTING STYLE A

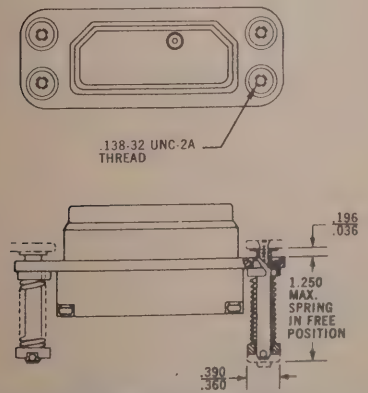


MOUNTING SPACING DIMENSIONS FOR JACKSCREW ASSEMBLIES



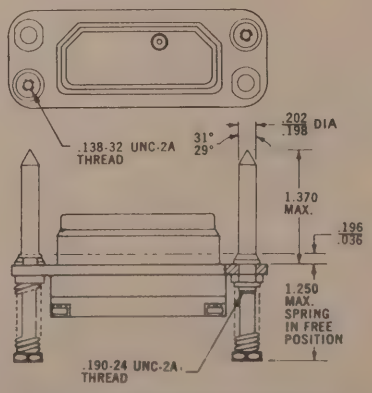
DPK/MIL-C-83733 TYPES

MOUNTING STYLE K
WITH CAPTIVE SPRINGS
MIL-C-83733/4(USAF)



NOTES:
1. Springs are pre-loaded to 25 pounds each in free position.
2. Spring forces will be 118 pounds minimum at .500 panel spacing, and 150 lbs. nominal at .390 panel spacing.

MOUNTING STYLE X
WITH GUIDE PINS AND SPRING MOUNTING
MIL-C-83733/2(USAF)



NOTES:
1. Springs are pre-loaded to 25 pounds each in free position.
2. Spring forces will be 118 pounds minimum at .500 panel spacing, and 150 lbs. nominal at .390 panel spacing.
3. This configuration must not be used on the 185 contact layout.

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

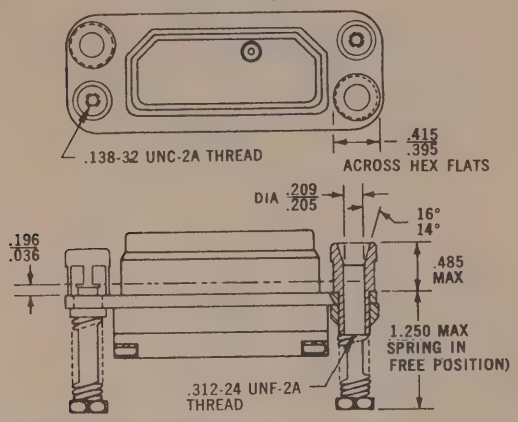
DPK SERIES RACK/PANEL CONNECTORS

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

Dimensions subject to change.
(millimeters are in parenthesis)

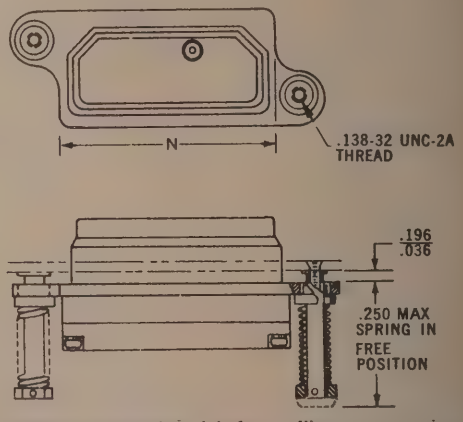
PLUG/CONFIGURATIONS
(SOCKET CONTACTS)
DPK/MIL-C-83733 TYPES

MOUNTING STYLE Y
WITH GUIDE SOCKETS AND SPRING MOUNTING
MIL-C-83733/7(USAF)



NOTES:
1. Springs are pre-loaded to 25 pounds each in free position.
2. Spring forces will be 118 pounds minimum at .500 panel spacing, and 150 lbs. nominal at .390 panel spacing.

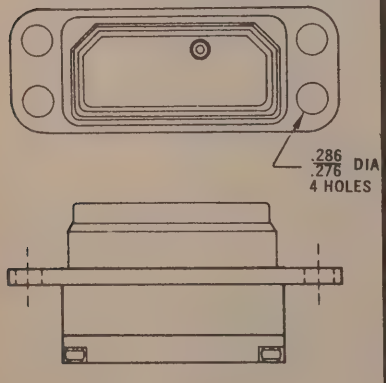
MOUNTING STYLE H
STAGGERED SPRING MOUNTING
MIL-C-83733/12(USAF)



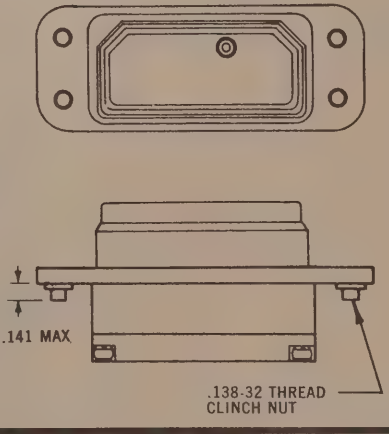
NOTES:
1. Springs are pre-loaded to 25 pounds each in free position.
2. Spring forces will be 118 pounds minimum at .500 panel spacing, and 150 lbs. nominal at .390 panel spacing.
3. This configuration must not be used on the 131 or 185 contact layouts.

DPK COMMERCIAL TYPES

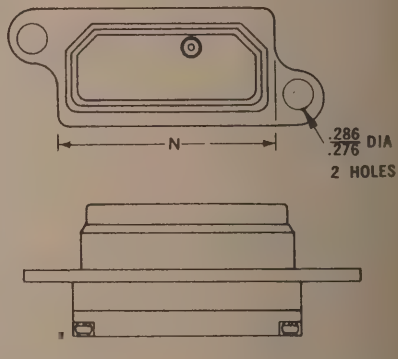
MOUNTING STYLE G
STANDARD HOLE MOUNTING



MOUNTING STYLE F
CLINCH NUT MOUNTING



MOUNTING STYLE M
STAGGERED STANDARD HOLE MOUNTING



PANEL CUTOUTS
MOUNTING STYLES

PG, SG
PC, PF, SF
SX, PX, SK

SY, PY
S*A, S*B
P*A, P*B

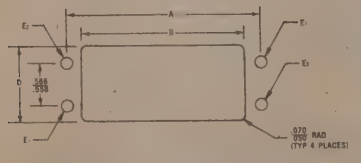


Figure 1. Panel cutout dimensions.

PM, PH, PZ

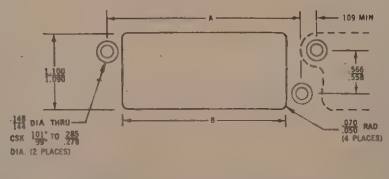


Figure 2. Panel cutout dimensions.

SH, SM

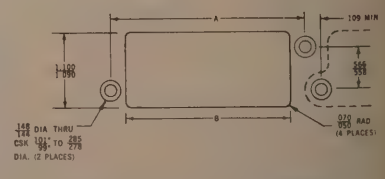


Figure 3. Panel cutout dimensions.

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

DPK SERIES RACK/PANEL CONNECTORS

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Dimensions subject to change.
(millimeters are in parenthesis)

PANEL CUTOUT DIMENSIONS

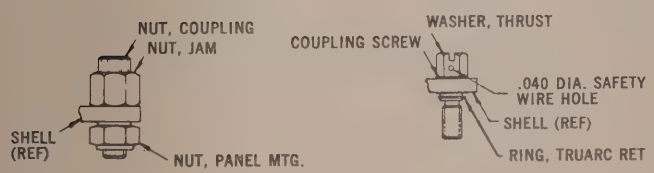
MIL-C-83733 Part No./ Mounting Style	DPK Mounting Styles	Figure Ref.	Dimensions (in inches)									
			A ±.004		B ±.005		D ±.005		E_1		E_2	
			Shell Size A	Shell Size B	Shell Size A	Shell Size B	Shell Size A	Shell Size B	Shell Size A	Shell Size B	Shell Size A	Shell Size B
M83733-01, -05, -06	PG, SG, PC, PF, SF	1	2.578	3.875	2.103	3.400	1.022	1.022	.148 / .144	.148 / .144	.148 / .144	.148 / .144
M83733-02	SX	1	2.578	3.875	2.103	3.465	1.022	1.095	.148 / .144	.148 / .144	.260 / .250	.260 / .250
M83733-03	PX	1	2.578	3.875	2.103	3.465	1.022	1.095	.320 / .315	.320 / .315	.148 / .144	.148 / .144
M83733-04	SK	1	2.578	3.875	2.167	3.465	1.095	1.095	.148 / .144	.148 / .144	.148 / .144	.148 / .144
M83733-07	SY	1	2.578	3.875	2.167	3.465	1.095	1.095	.148 / .144	.148 / .144	.430 / .420	.430 / .420
M83733-08	PY	1	2.578	3.875	2.167	3.465	1.095	1.095	.380 / .370	.380 / .370	.148 / .144	.148 / .144
M83733-09, -10, -11	PM, PH, PZ	2	2.578	3.875	2.167	3.465	1.095	1.022	—	—	—	—
M83733-12	SH, SM	3	2.578	3.875	2.095	3.400	1.095	1.095	—	—	—	—
N/A	S*A, S*B P*A, P*B	1	2.578	3.875	2.103	3.465	1.022	1.095	.301 / .294	.301 / .294	.301 / .294	.301 / .294

MOUNTING ASSEMBLY

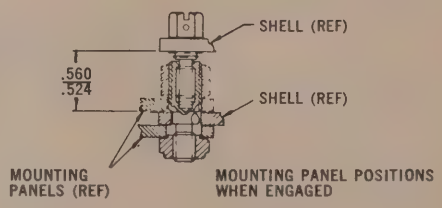
JACKSCREW/COUPLING NUT

Installation of jackscrew and coupling nuts in mounting style A and B.

CORD-TO-CORD INSTALLATION



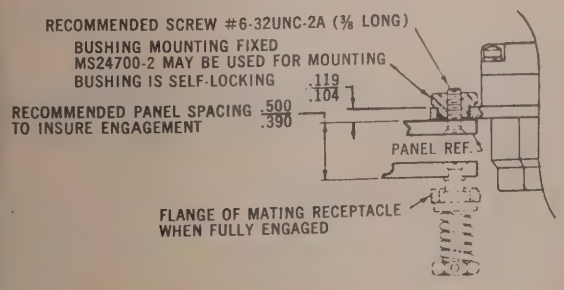
PANEL MOUNTING

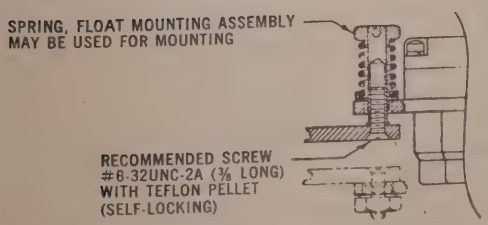


BUSHING/SPRING MOUNT

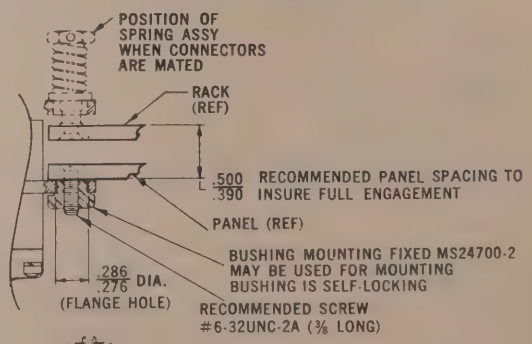
Installation of mounting styles utilizing bushing and spring mount assemblies.

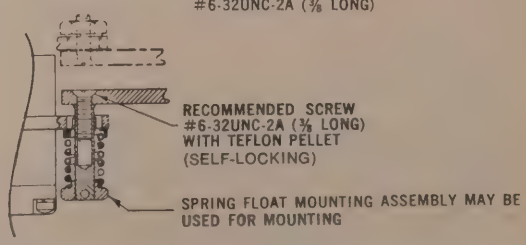
PLUGS




SPRING, FLOAT MOUNTING ASSEMBLY MAY BE USED FOR MOUNTING
RECOMMENDED SCREW #6-32UNC-2A (⅜ LONG) WITH TEFLON PELLET (SELF-LOCKING)

RECEPTACLES




RECOMMENDED SCREW #6-32UNC-2A (⅜ LONG) WITH TEFLON PELLET (SELF-LOCKING)
SPRING FLOAT MOUNTING ASSEMBLY MAY BE USED FOR MOUNTING

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

DPXNA/DPXNE RACK/PANEL CONNECTORS

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

Dimensions subject to change

ITT Cannon Electric's DPXNA (non-environmental, Type IV) and DPXNE (environmental, Types II and III) rack and panel connectors are designed to meet or exceed the requirements of MIL-C-81659, Revision B. They are used in military and aerospace applications and computer periphery equipment requirements, and are designed to operate in temperatures ranging from —65°C to 125°C. DPXNA/NE connectors are available in single, 2, 3, and 4 gang configurations, with a total of 12 contact arrangements accommodating contact sizes 12, 16, 20 and 22, and combination standard and coaxial contacts. Contact retention of these crimp snap-in contacts is provided by the LITTLE CAESAR® rear release contact retention assembly. Environmental sealing is accomplished by wire sealing grommets and interfacial seals.

HOW TO ORDER

A. SINGLE GANG

DPX B NE — A106 — 33 P — 00

- Series Prefix
- Shell Style
- Class
- Contact Arrangement
- Shell Type
- Contact Type
- Modification

B. TWO (2) GANG

DPX 2 NE — 67M P AW8 P 34 B — 00

- Series Prefix
- Two (2) Gang Shell
- Class
- Contact Arrangement (Side A)
- Contact Type
- Contact Arrangement (Side B)
- Contact Type
- Shell Type
- Shell Style
- Modification

C. THREE (3) GANG

DPX 3 NE — 104M — 33 PS — 00

- Series Prefix
- Three (3) Gang Shell
- Class
- Insert Designator
- Shell Type
- Contact Type [1]
- Modification

D. FOUR (4) GANG

DPX 4 NE — 78M — 34 P — 00

- Series Prefix
- Four (4) Gang Shell
- Class
- Insert Designator
- Shell Type
- Contact Type [1]
- Modification

1 NOTE: On 3 & 4 gang assemblies, combination layouts, the contact type designator of the A106 layout, if applicable, preceeds the designator for standard contact sex layouts. See 3 gang nomenclature breakdown for 240M example (67MS, 67MS, A106P).

E. DEFINITION

Series Prefix
DPX - ITT Cannon Designation

Class (MIL-C-81659B, Class 1)....
NA - Non-Environmental (MIL-C-81659B, Type IV)
NE - Environmental (MIL-C-81659B, Types II and III)

Shell Style
B - Arinc 'B' Shell

Contact Arrangement
See page 137

Insert Designator
In the 3 and 4 gang assemblies, the insert designation number represents cumulative (Total) contacts. The charts on Page 133 denote shell cavity location by layout. (If desired arrangement location is not defined, please consult our local sales engineering office.)

Contact Type
'P' for Pin (Standard on '34' receptacle except A106 layout which has reversed contact sex)
'S' for Socket (Standard on '33' plug except A106 layout which has reversed contact sex)

SHELL TYPE
'33' for Plug; '34' for Receptacle

MODIFICATION CODES
-00 Standard.
-01 Standard with clinch nuts in the mounting holes (34 only).
-02 Standard with brackets for attaching junction shells.
-03 Standard with mounting holes .120 dia. countersunk 100° to .230 dia. (33 only)
-17 Combination of 01** and 02** (clinch nuts in mounting holes - 34 only and brackets for attaching junction shells).
-22 Standard with clinch nuts (33 only).
-23 Standard with standard floating eyelets.
-29 Standard except less grommet (NE, pin only)
-30 Same as -29** except with brackets for attaching junction shells.
-33 Same as -29** except with clinch nuts.
-37 same as -29** except with clinch nuts and brackets for attaching junction shells.
-39 Standard with standard floating eyelets and brackets for attaching junction shells.

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

DPXNA/DPXNE RACK/PANEL CONNECTORS

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Dimensions subject to change.
(millimeters are in parenthesis)

DPX3NA/DPX3NE INSERT DESIGNATOR NUMBER

MS3157	ITTCE	Side A	Side B	Side C
0005	78M	26MP	26MP	26MP
0006	78M	26MS	26MS	26MS
0013	120M	40MP	40MP	40MP
0014	120M	40MS	40MS	40MS
0021	135M	45MP	45MP	45MP
0022	135M	45MS	45MS	45MS
0029	171M	57MP	57MP	57MP
0030	171M	57MS	57MS	57MS
0037	201M	67MP	67MP	67MP
0038	201M	67MS	67MS	67MS
0045	A318	A106P	A106P	A106P
0046	A318	A106S	A106S	A106S
0065	24M	W8MP	W8MP	W8MP
0066	24M	W8MS	W8MS	W8MS
0067	122M	W8MP	W8MP	A106S
0068	122M	W8MS	W8MS	A106P
0073	146M	67MP	67MP	W8MP
0074	146M	67MS	67MS	W8MS
0075	240M	67MP	67MP	A106S
0076	240M	67MS	67MS	A106P
0079	A240M	67MP	A106S	67MP
0080	A240M	67MS	A106P	67MS
0091	279M	A106S	A106S	67MP
0092	279M	A106P	A106P	67MS
0157	244M	A106S	A106S	32W4MP
0158	244M	A106P	A106P	32W4MS

DPX4NA/DPX4NE INSERT DESIGNATOR NUMBER

MS3157	ITTCE	Side A	Side B	Side C	Side D
0007	104M	26MP	26MP	26MP	26MP
0008	104M	26MS	26MS	26MS	26MS
0015	160M	40MP	40MP	40MP	40MP
0016	160M	40MS	40MS	40MS	40MS
0023	180M	45MP	45MP	45MP	45MP
0024	180M	45MS	45MS	45MS	45MS
0031	228M	57MP	57MP	57MP	57MP
0032	228M	57MS	57MS	57MS	57MS
0039	268M	67MP	67MP	67MP	67MP
0040	268M	67MS	67MS	67MS	67MS
0047	A424	A106P	A106P	A106P	A106P
0048	A424	A106S	A106S	A106S	A106S
0063	95M	10W3MP	10W3MP	W8MP	67MP
0064	95M	10W3MS	10W3MS	W8MS	67MS
0085	150M	W8MP	W8MP	67MP	67MP
0086	150M	W8MS	W8MS	67MS	67MS
0095	326M	A106S	W8MP	A106S	A106S
0096	326M	A106P	W8MS	A106P	A106P
0097	287M	A106S	67MP	A106S	W8MP
0098	287M	A106P	67MS	A106P	W8MS
0099	189M	A106S	67MP	W8MP	W8MP
0100	189M	A106P	67MS	W8MS	W8MS
0101	346M	A106S	A106S	67MP	67MP
0102	346M	A106P	A106P	67MS	67MS

ELECTRICAL DATA

Contact Size	Wire Size	Insulation O.D. Limits (Inch) Min.	Insulation O.D. Limits (Inch) Max.	Max. Current Ratings, Amps Singlewire Free Air	Max. Current Ratings, Amps Bundled MIL-W-5688	Max. Current for Tests (Amps) (MIL-C-35029)	Max. Potential Drop (Millivolts) at 25°C
4	6	.222	.310	101	60.0	60.0	22
8	8	.181	.250	73	46.0	46.0	26
12	12, 14	.097	.135	41	23.0	23.0	42
				32	17.0	17.0	40
16	16, 18 20	.068	.103	22	13.0	13.0	49
				16	10.0	10.0	47
				11	7.5	7.5	55
20	20, 22 24	.040	.071	11	7.5	7.5	55
				5	5.0	5.0	50
				3	3.0	3.0	45
22	22, 24 26	.030	.054	5	5.0	5.0	73
				3	3.0	3.0	63
				2	2.0	2.0	53

Note — The maximum contact resistance listed above is with silver plated wire.

STANDARD DATA

Description	Material	Finish
Shell	Aluminum alloy	Cadmium plating, Type II, Class 3/ QQ-P-416 with yellow chromate finish
Insulators	Thermosetting plastic	None
Elastomers	Silicone rubber (ITT Cannon Blend)	None
Contacts	Copper alloy	Gold plate per MIL-G-45204, Type 1, Grade C, Class 1 with suitable underplating (silver not used)
Insulator Retaining Plate	Aluminum alloy	Anodize, blue color
Junction Shell Brackets	Aluminum alloy	Same as shell
Junction Shells (Not available for four gang)	Aluminum alloy	Same as shell
Clinch Nuts	Stainless steel	None
Float Mounts	Stainless steel	None
Polarizing Posts	Stainless steel	None
Polarizing Keys & Retaining Plate	Nickel silver	None
Screws	Brass	Cadmium plating
Lockwashers	Phosphor Bronze	Cadmium plating

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ITT CANNON ELECTRIC

DPXNA/DPXNE RACK/PANEL CONNECTORS

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Dimensions subject to change.

POLARIZATION POSITIONS

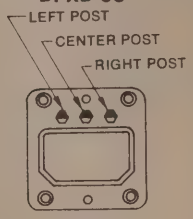
MIL-C-81659B requires that polarizing posts be shipped unassembled with the connector. The user then assembles the posts in the preferred position and marks the position number on the connector. All DPXNA and DPXNE connectors shall be sold this way. The position number will not be marked.

POSITIONS 1 2 3 4 5 6

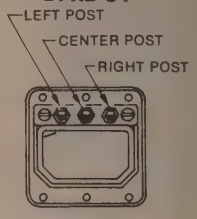
Dark area represents post

FACE VIEW OF ENGAGING END

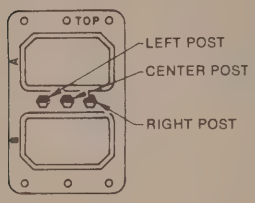
DPXB-33



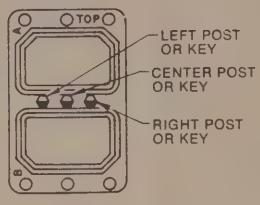
DPXB-34



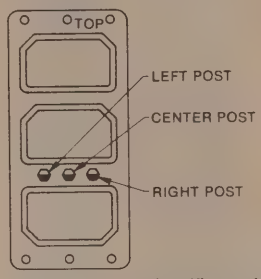
DPX2-33B



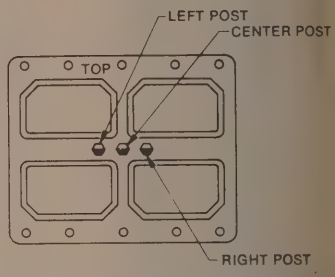
DPX2-34B



DPX3-33



DPX4-33



POLARIZING POSITION

The last two digits in the four-digit dash number refer to the polarizing post position. The polarizing posts will be shipped unassembled with the connector assembly. The position number is not stamped on the connector. This allows the customer to position the posts themselves and then stamp the appropriate number on the shell.

(millimeters are in parenthesis)

33 PLUG MALE SHELL

Position	Left Post	Center Post	Right Post	Position	Left Post	Center Post	Right Post
01	1	1	1	51	3	2	5
02	2	1	1	52	4	2	5
03	3	1	1	53	5	2	5
04	4	1	1	54	6	2	5
05	5	1	1	55	1	2	4
06	6	1	1	56	2	2	4
07	1	1	6	57	3	2	4
08	2	1	6	58	4	2	4
09	3	1	6	59	5	2	4
10	4	1	6	60	6	2	4
11	5	1	6	61	1	2	3
12	6	1	6	62	2	2	3
13	1	1	5	63	3	2	3
14	2	1	5	64	4	2	3
15	3	1	5	65	5	2	3
16	4	1	5	66	6	2	3
17	5	1	5	67	1	2	2
18	6	1	5	68	2	2	2
19	1	1	4	69	3	2	2
20	2	1	4	70	4	2	2
21	3	1	4	71	5	2	2
22	4	1	4	72	6	2	2
23	5	1	4	73	1	3	1
24	6	1	4	74	2	3	1
25	1	1	3	75	3	3	1
26	2	1	3	76	4	3	1
27	3	1	3	77	5	3	1
28	4	1	3	78	6	3	1
29	5	1	3	79	1	3	6
30	6	1	3	80	2	3	6
31	1	1	2	81	3	3	6
32	2	1	2	82	4	3	6
33	3	1	2	83	5	3	6
34	4	1	2	84	6	3	6
35	5	1	2	85	1	3	5
36	6	1	2	86	2	3	5
37	1	2	1	87	3	3	5
38	2	2	1	88	4	3	5
39	3	2	1	89	5	3	5
40	4	2	1	90	6	3	5
41	5	2	1	91	1	3	4
42	6	2	1	92	2	3	4
43	1	2	6	93	3	3	4
44	2	2	6	94	4	3	4
45	3	2	6	95	5	3	4
46	4	2	6	96	6	3	4
47	5	2	6	97	1	3	3
48	6	2	6	98	2	3	3
49	1	2	5	99	3	3	3
50	2	2	5				

34 RECEPTACLE FEMALE SHELL

Position	Left Post	Center Post	Right Post	Position	Left Post	Center Post	Right Post
01	4	4	4	51	6	3	2
02	4	4	3	52	6	3	1
03	4	4	2	53	6	3	6
04	4	4	1	54	6	3	5
05	4	4	6	55	1	3	4
06	4	4	5	56	1	3	3
07	5	4	4	57	1	3	2
08	5	4	3	58	1	3	1
09	5	4	2	59	1	3	6
10	5	4	1	60	1	3	5
11	5	4	6	61	2	3	4
12	5	4	5	62	2	3	3
13	6	4	4	63	2	3	2
14	6	4	3	64	2	3	1
15	6	4	2	65	2	3	6
16	6	4	1	66	2	3	5
17	6	4	6	67	3	3	4
18	6	4	5	68	3	3	3
19	1	4	4	69	3	3	2
20	1	4	3	70	3	3	1
21	1	4	2	71	3	3	6
22	1	4	1	72	3	3	5
23	1	4	6	73	4	2	4
24	1	4	5	74	4	2	3
25	2	4	4	75	4	2	2
26	2	4	3	76	4	2	1
27	2	4	2	77	4	2	6
28	2	4	1	78	4	2	5
29	2	4	6	79	5	2	4
30	2	4	5	80	5	2	3
31	3	4	4	81	5	2	2
32	3	4	3	82	5	2	1
33	3	4	2	83	5	2	6
34	3	4	1	84	5	2	5
35	3	4	6	85	6	2	4
36	3	4	5	86	6	2	3
37	4	3	4	87	6	2	2
38	4	3	3	88	6	2	1
39	4	3	2	89	6	2	6
40	4	3	1	90	6	2	5
41	4	3	6	91	1	2	4
42	4	3	5	92	1	2	3
43	5	3	4	93	1	2	2
44	5	3	3	94	1	2	1
45	5	3	2	95	1	2	6
46	5	3	1	96	1	2	5
47	5	3	6	97	2	2	4
48	5	3	5	98	2	2	3
49	6	3	4	99	2	2	2
50	6	3	3				

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

DPXNA/DPXNE RACK/PANEL CONNECTORS

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

Dimensions subject to change.
(millimeters are in parenthesis)

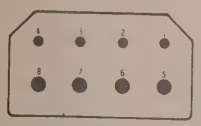
CONTACT ARRANGEMENTS

FACE VIEW OF PIN INSULATOR SHOWN

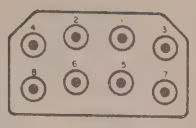
CONTACT ARRANGEMENTS

MS3157	ITTCE
C8	W8M
D8	D8M
10C3	10W3M
26	26M
32C2	32W2M
32C4	32W4M
40	40M
40C1	40W1M
45	45M
57	57M
67	67M
106	A106

LAYOUT
CONTACTS
TEST

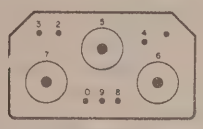


D8M
4 #16, 4 #12
1500



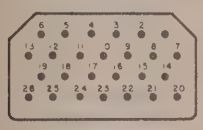
W8M
8 COAXIAL*
1000

LAYOUT
CONTACTS
TEST

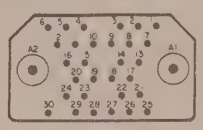


10W3M
7H.D. #20, 3 COAXIAL§
1500
(COAX 1000)

LAYOUT
CONTACTS
TEST

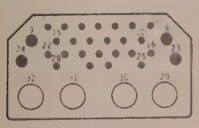


32W2M
30HD #20, 2 COAXIAL†
1500
(COAX 1000)

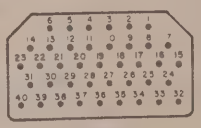


26M
26 #16
1500

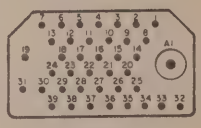
LAYOUT
CONTACTS
TEST



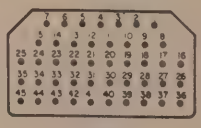
32W4M
24H.D. #20
4 #16, 4 COAXIAL*
1500
(COAX 1000)



40M
40 HD #20
1500



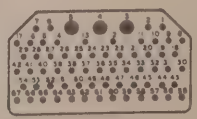
40W1M
39HD #20, 1 COAXIAL†
1500
(COAX 1000)



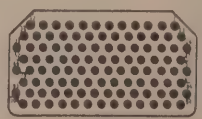
45M
45HD #20
1500

LAYOUT
CONTACTS
TEST

57M
57HD #20
1500



67M
64H.D. #20, 3 #16
1000



A106‡
106 #22
1000

· SIZE 5 COAXIAL
: REVERSED CONTACT SEX LAYOUT
SIZE 9 COAXIAL
i SIZE 11 COAXIAL

NOTE: All coaxial layouts except C2 and AC3, supplied less coaxial contacts (i.e. W8M, 10W3M, 32W2M, 32W4M, 40W1M)

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

DPXNA/DPXNE RACK/PANEL CONNECTORS

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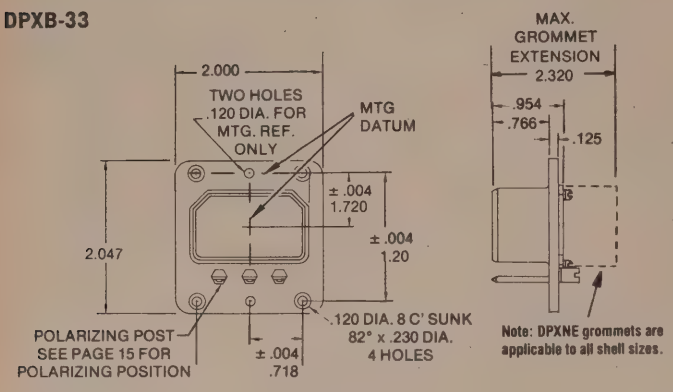
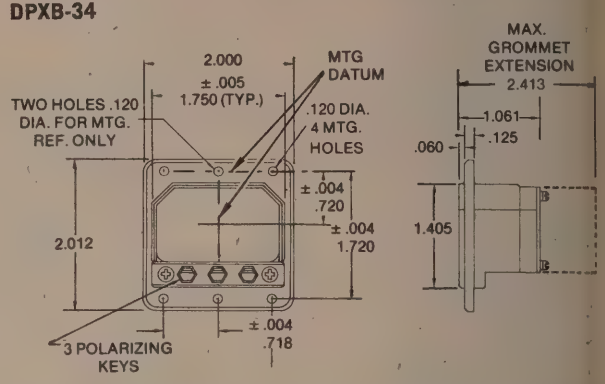
Dimensions subject to change.
(millimeters are in parenthesis)

SHELL DIMENSIONS/MODIFICATIONS

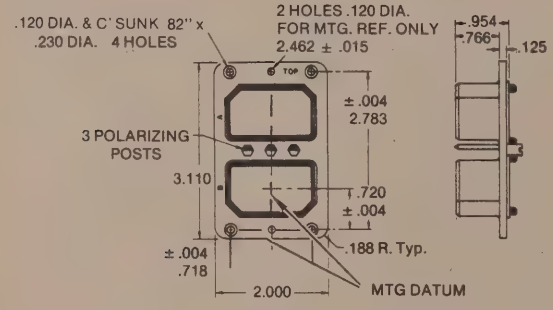
DPXB-33


2.000
TWO HOLES .120 DIA. FOR MTG. REF. ONLY
MTG DATUM
± .004 1.720
± .004 1.20
2.047
POLARIZING POST SEE PAGE 15 FOR POLARIZING POSITION
± .004 .718
.120 DIA. 8 C' SUNK 82° x .230 DIA. 4 HOLES
MAX. GROMMET EXTENSION 2.320
.954
.766
.125
Note: DPXNE grommets are applicable to all shell sizes.

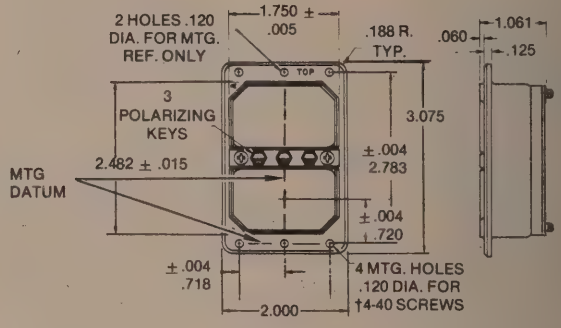
DPXB-34



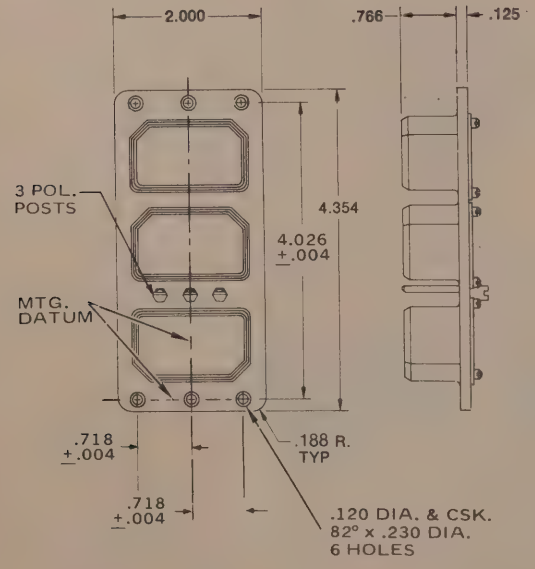
DPX2-33B



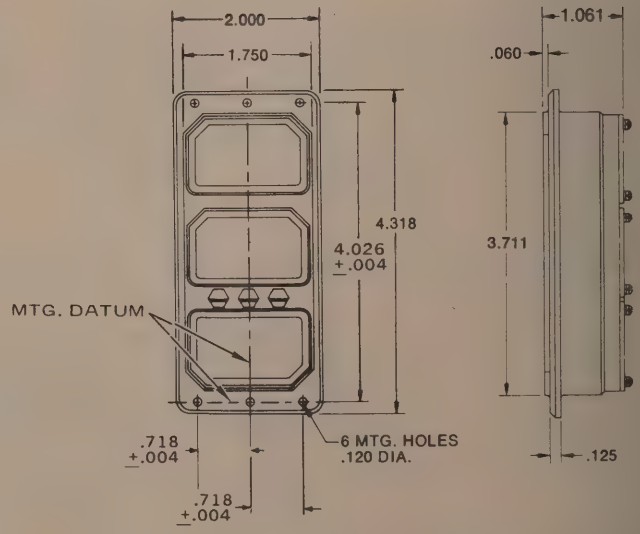
DPX2-34B



DPX3-33



DPX3-34



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ITT CANNON ELECTRIC

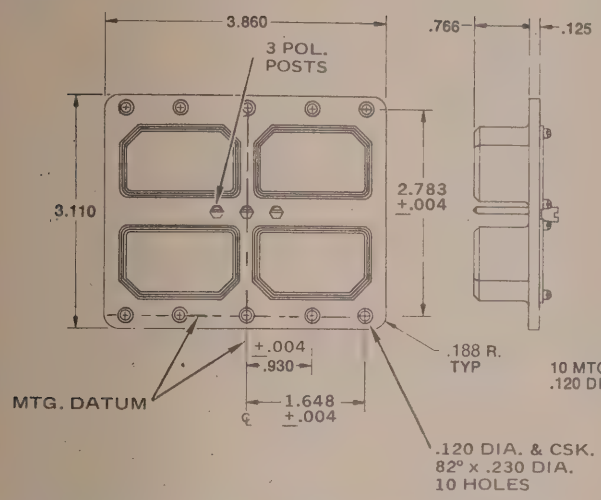
DPXNA/DPXNE RACK/PANEL CONNECTORS

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

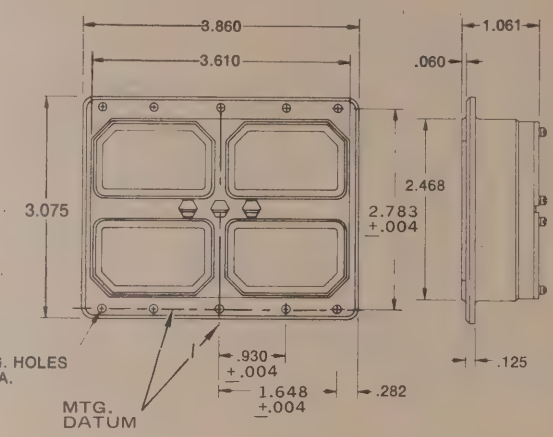
SHELL DIMENSIONS

Dimensions subject to change.
(millimeters are in parenthesis)

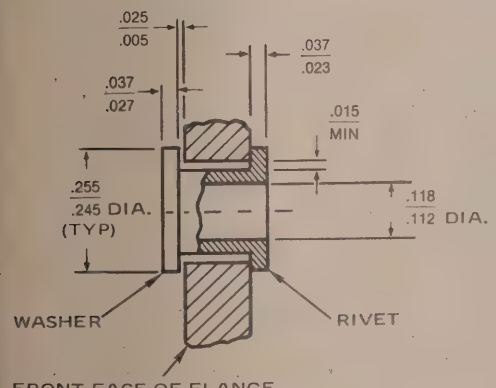
DPX4-33



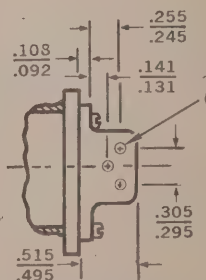
DPX4-34



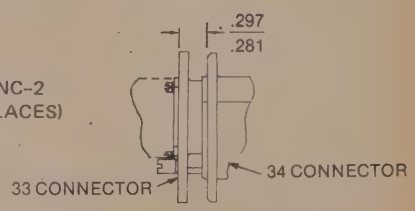
SHELL MODIFICATIONS AND RECOMMENDED MATED POSITION



-2301 MODIFICATION FLOATING EYELETS



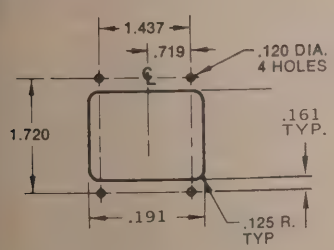
-0201 MODIFICATION BRACKETS FOR ATTACHING J/S



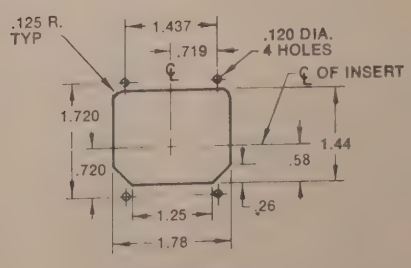
RECOMMENDED MATED POSITION

PANEL CUTOUTS

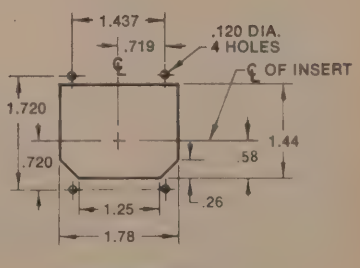
DPXB



-33 FRONT MOUNT



-34 FRONT MOUNT



-33 REAR MOUNT
-34 REAR MOUNT

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ITT CANNON ELECTRIC

DPXNA/DPXNE RACK/PANEL CONNECTORS

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Dimensions subject to change.
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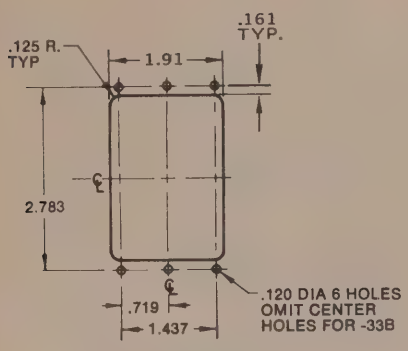
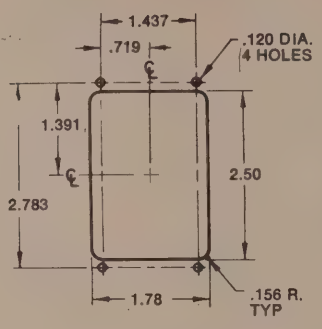
PANEL CUTOUTS

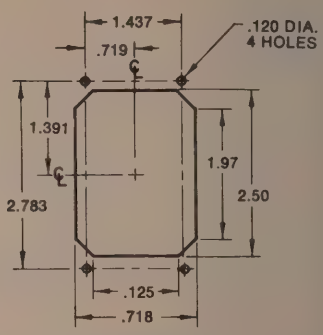
DPX2



-33B FRONT MOUNT

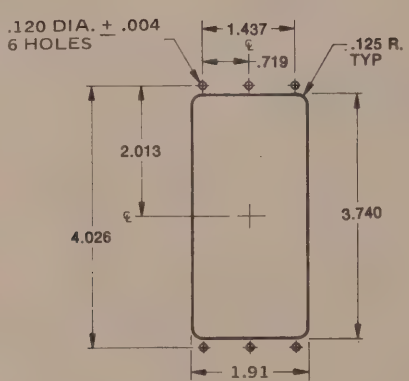


-34B FRONT MOUNT

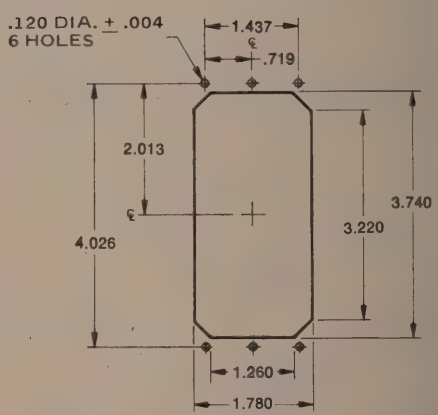


-33B REAR MOUNT
-34B REAR MOUNT

DPX3

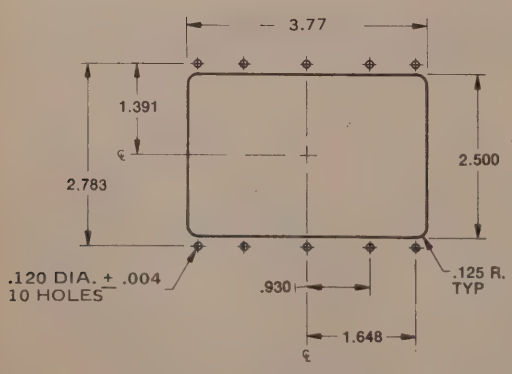


FRONT MOUNT

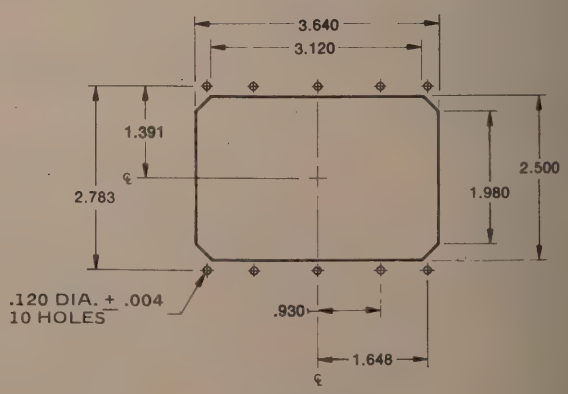


REAR MOUNT

DPX4



FRONT MOUNT



REAR MOUNT

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ITT CANNON ELECTRIC

SMA SERIES CONNECTORS

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

The SMA Series is a 50 ohm impedance, threaded coupling, high frequency (0-18 GHz) connector. ITT CANNON ELECTRIC SMA's meet all requirements of and, indicated connectors are, qualified to MIL-C-39012. The stainless steel bodies are available in gold plated or passivated finishes. Both male and female center contacts are gold plated beryllium copper. The dielectric material is TFE. Moisture sealing is provided by silicone rubber gaskets.

PERFORMANCE DATA AND SPECIAL APPLICATIONS INFORMATION AVAILABLE UPON REQUEST.

SMA SERIES STRAIGHT CABLE PLUGS (MALE CENTER CONTACT)

Fig.	Cable Group Size — Type	Dimensions Inches (Millimeters) A	B	C	ITT CANNON ELECTRIC Cable Termination Tool Number	Notes	Military P/N M39012/ ( )	ITT CANNON ELECTRIC Gold Plated P/N	Passivated P/N
1	.047 Dia. Semi-rigid	.049(1.2)	—	—	None Required	Solder Clamp — Captive Contact — Thick Wall	—	150500-4010	150500-4011
1	.056 Dia. Semi-rigid	.058(1.5)	—	—	None Required	Solder Clamp — Captive Contact — Thick Wall	—	150500-4020	150500-4021
1	.070 Dia. Semi-rigid	.071(1.8)	—	—	None Required	Solder Clamp — Captive Contact — Thick Wall	—	150500-4030	150500-4031
1	.086 Dia. Semi-rigid (RG-405/U)	.0875(2.2)	—	—	None Required	Solder Clamp — Captive Contact — Thick Wall	—	150500-4040	150500-4041
1		.0875(2.2)	—	—	None Required	Solder Clamp — Captive Contact — Thin Wall	—	150500-4042	150500-4043
3		—	—	—	None Required	Simplon Clamp — Captive Contact — Thick Wall	—	150500-5040	150500-5041
3		—	—	—	None Required	Simplon Clamp — Captive Contact — Thin Wall	—	150500-5042	150500-5043
2		.0875(2.2)	.120(3.0)	.440(11.2)	152200-1000	Military Standard Version	/79-3001	150505-3046	150505-3045
2		.0875(2.2)	.120(3.0)	.435(11.0)	152200-1000	Solder on Center Contact	—	150505-3047	150505-3048
1	.141 Dia. Semi-rigid (RG-402/U)	.142(3.6)	—	—	None Required	Solder Clamp — Captive Contact — Thick Wall	—	150500-4050	150500-4051
1		.142(3.6)	—	—	None Required	Solder Clamp — Captive Contact — Thin Wall	—	150500-4052	150500-4053
3		—	—	—	None Required	Simplon Clamp — Captive Contact — Thick Wall	—	150500-5050	150500-5052
3		—	—	—	None Required	Simplon Clamp — Captive Contact — Thin Wall	—	150500-5057	150500-5058
2		.142(3.6)	.180(4.6)	.445(11.3)	152200-1000	Trimmed Center Conductor	—	150505-3050	150505-3054
2		.142(3.6)	.180(4.6)	.440(11.2)	152200-1000	Solder on Center Contact	—	150505-3052	150505-3150
2		.142(3.6)	.180(4.6)	.440(11.2)	152200-1000	Military Standard Version	/79-3002	150505-3801	150505-3059
2	.141 Dia. Semi-rigid Microporous TFE	.142(3.6)	.180(4.6)	.440(11.2)	152200-1000	Solder on Center Contact	—	150505-3151	150505-3152
4	RG-58C/U RG-141A/U RG-303/U	—	—	—		Direct Crimp — Captive Contact	—	150500-1200	150500-1202
4		—	—	—		Military Standard Version	/55-3021	150500-1207	150500-1205
4		—	—	—		Military Standard Version	/55-3024	150500-1208	150500-1206
4		—	—	—	Frame	Military Standard Version	/55-3029	150500-1203	150500-1204
4		—	—	—	#995-0001-761	Crimp Clamp — Captive Contact — Thick Wall	—	150500-1209	150500-1180
4		—	—	—	Die Set	Crimp Clamp — Captive Contact — Thin Wall	—	150500-1181	150500-1182
5		—	—	—	#995-0001-863	Direct Crimp — Non-Captive Contact	—	150505-1200	150505-1201
5		—	—	—		Military Standard Version	/55-3014	150505-1203	150505-1204
5		—	—	—		Military Standard Version	/55-3017	150505-1202	150505-1205
5		—	—	—		Direct Crimp — Captive Contact — Thick Wall	—	150505-1209	150505-1180
4	RG-55B/U RG-142B/U RG-223/U RG-400/U	—	—	—		Direct Crimp — Captive Contact	—	150500-1210	150500-1212
4		—	—	—		Military Standard Version	/55-3022	150500-1217	150500-1215
4		—	—	—		Military Standard Version	/55-3023	150500-1218	150500-1216
4		—	—	—	Frame	Military Standard Version	/55-3028	150500-1213	150500-1214
4		—	—	—	#995-0001-761	Crimp Clamp — Captive Contact — Thick Wall	—	150500-1190	150500-1191
4		—	—	—	Die Set	Crimp Clamp — Captive Contact — Thin Wall	—	150500-1192	150500-1193
5		—	—	—	#995-0001-863	Direct Crimp — Non-Captive Contact	—	150505-1210	150505-1211
5		—	—	—		Military Standard Version	/55-3015	150505-1213	150505-1214
5		—	—	—		Military Standard Version	/55-3016	150505-1212	150505-1215
5		—	—	—		Direct Crimp—Non-Captive Contact—Thick Wall	—	150505-1219	150505-1190
4	RG-174/U RG-179B/U RG-187A/U RG-188A/U RG-316/U	—	—	—		Direct Crimp — Captive Contact	—	150500-1270	150500-1272
4		—	—	—		Military Standard Version	/55-3019	150500-1277	150500-1275
4		—	—	—	Frame	Military Standard Version	/55-3026	150500-1278	150500-1276
4		—	—	—	#995-0001-761	Crimp Clamp — Captive Contact — Thick Wall	—	150500-1170	150500-1171
4		—	—	—	Die Set	Crimp Clamp — Captive Contact — Thin Wall	—	150500-1172	150500-1173
5		—	—	—	#995-0001-868	Crimp — Non-Captive Contact	—	150505-1270	150505-1272
5		—	—	—		Military Standard Version	/55-3012	150505-1273	150505-1274
5		—	—	—		Crimp — Non-Captive Contact — Thick Wall	—	150505-1279	150505-1170
4	RG-178B/U RG-196A/U	—	—	—	Frame	Military Standard Version	/55-3018	150500-1283	150500-1285
4		—	—	—	#995-0001-761	Military Standard Version	/55-3025	150500-1282	150500-1284
4		—	—	—	Die Set	Crimp Clamp — Captive Contact — Thick Wall	—	150500-1280	150500-1281
4		—	—	—	#995-0001-868	Crimp Clamp — Captive Contact — Thin Wall	—	150500-1286	150500-1287
4	RG-180B/U RG-195A/U	—	—	—	Frame	Crimp Clamp — Captive Contact — Thick Wall	—	150500-1261	150500-1262
4		—	—	—	#995-0001-761	Crimp Clamp — Captive Contact — Thin Wall	—	150500-1263	150500-1264
5		—	—	—	Die Set #995-0001-861	Crimp — Non-Captive Contact — Thick Wall	—	150505-1261	150505-1262

SMA SERIES RIGHT ANGLE CABLE PLUGS (MALE CENTER CONTACT — CAPTIVE)

(millimeters are in parentheses)

Fig.	Cable Group Size — Type	Dimensions Inches (Millimeters) A	—	—	ITT CANNON ELECTRIC Cable Termination Tool Number	Notes	Military P/N M39012/ ( )	ITT CANNON ELECTRIC Gold Plated P/N	Passivated P/N
6	.086 Dia. Semi-rigid (RG-405/U)	.0875(2.2)	—	—	152200-1000	Direct Solder — Thin Wall	—	150520-3040	150520-3042
6		.0875(2.2)	—	—	152200-1000	Military Standard Version	/80-3003	150520-3044	150520-3043
6		.0875(2.2)	—	—	152200-1000	Direct Solder — Thin Wall — Epoxy Captive	—	150520-3045	150520-3046
6		.0875(2.2)	—	—	152200-1000	Direct Solder — Thick Wall — Epoxy Captive	—	150520-3047	150520-3048
7		—	—	—	None Required	Simplon Clamp — Thick Wall	—	150526-5040	150526-5041
7		—	—	—	None Required	Simplon Clamp — Thin Wall	—	150526-5042	150526-5043
6	.141 Dia. Semi-rigid (RG-402/U)	.142(3.6)	—	—	152200-1000	Direct Solder — Thin Wall	—	150520-3050	150520-3052
6		.142(3.6)	—	—	152200-1000	Military Standard Version	/80-3004	150520-3055	150520-3054
6		.142(3.6)	—	—	152200-1000	Direct Solder — Thin Wall — Epoxy Captive	—	150520-3058	150520-3059
6		.142(3.6)	—	—	152200-1000	Direct Solder — Thick Wall — Epoxy Captive	—	150520-3151	150520-3152
7		—	—	—	None Required	Simplon Clamp — Thick Wall	—	150526-5050	150526-5052
7		—	—	—	None Required	Simplon Clamp — Thin Wall	—	150526-5056	150526-5057

(CONTINUED)

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

SMA SERIES CONNECTORS

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

SMA SERIES RIGHT ANGLE PLUGS (Cont'd)

Fig.	Cable Group Size — Type	Dimensions Inches (Millimeters) A	—	—	ITT CANNON ELECTRIC Cable Termination Tool Number	Notes	Military P/N M39012/ ( )	ITT CANNON ELECTRIC Gold Plated P/N	Passivated P/N
6	.141 Dia. Semi-rigid Microporous TFE	.142(3.6)	—	—	152200-1000	Direct Solder — Thin Wall — Epoxy Captive	—	150520-3056	150520-3057
8		.475(12.1)	—	—		Direct Crimp — Thin Wall	—	150520-1200	150520-1201
8	RG-58C/U	.475(12.1)	—	—	Frame	Military Standard Version	/56-3021	150520-1207	150520-1205
8	RG-141A/U	.475(12.1)	—	—	#995-0001-761	Military Standard Version	/56-3024	150520-1208	150520-1206
8	RG-303/U	.475(12.1)	—	—	Die Set	Military Standard Version	/56-3029	150520-1203	150520-1204
8		.475(12.1)	—	—	#995-0001-863	Direct Crimp — Thin Wall — Epoxy Captive	—	150520-1180	150520-1181
8		.475(12.1)	—	—		Direct Crimp — Thick Wall — Epoxy Captive	—	150520-1182	150520-1183
8		.475(12.1)	—	—		Direct Crimp — Thin Wall	—	150520-1210	150520-1211
8	RG-55B/U	.475(12.1)	—	—	Frame	Military Standard Version	/56-3022	150520-1217	150520-1215
8	RG-142B/U	.475(12.1)	—	—	#995-0001-761	Military Standard Version	/56-3023	150520-1218	150520-1216
8	RG-223/U	.475(12.1)	—	—	Die Set	Military Standard Version	/56-3028	150520-1213	150520-1214
8	RG-400/U	.475(12.1)	—	—	#995-0001-863	Direct Crimp — Thin Wall — Epoxy Captive	—	150520-1219	150520-1190
8		.475(12.1)	—	—		Direct Crimp — Thick Wall — Epoxy Captive	—	150520-1191	150520-1192
8	RG-55B, 58C, 141A, 142B, 223, 303, 400/U	.630(16.0)	—	—	N/A	Solder Ferrule	—	150520-6202	150520-6203
8	RG-174/U	.475(12.1)	—	—	Frame	Direct Crimp — Thin Wall	—	150520-1270	150520-1273
8	RG-179B/U	.475(12.1)	—	—	#995-0001-761	Military Standard Version	/56-3019	150520-1277	150520-1275
8	RG-187A/U	.475(12.1)	—	—	Die Set	Military Standard Version	/56-3026	150520-1278	150520-1276
8	RG-188A/U	.475(12.1)	—	—	#995-0001-868	Direct Crimp — Thin Wall — Epoxy Captive	—	150520-1170	150520-1171
8	RG-316/U	.475(12.1)	—	—		Direct Crimp — Thick Wall — Epoxy Captive	—	150520-1172	150520-1173
8		.440(11.2)	—	—	N/A	Solder Ferrule	—	150520-6273	150520-6274
8		.475(12.1)	—	—	Frame	Military Standard Version	/56-3018	150520-1283	150520-1285
8	RG-178B/U	.475(12.1)	—	—	#995-0001-761	Military Standard Version	/56-3025	150520-1282	150520-1284
8	RG-196A/U	.475(12.1)	—	—	Die Set	Direct Crimp — Thin Wall — Epoxy Captive	—	150520-1286	150520-1287
8		.475(12.1)	—	—	#995-0001-868	Direct Crimp — Thick Wall — Epoxy Captive	—	150520-1288	150520-1289
8	RG-180B/U	.475(12.1)	—	—	Frame #995-0001-761	Direct Crimp — Thin Wall — Epoxy Captive	—	150520-1262	150520-1263
8	RG-195A/U	.475(12.1)	—	—	Die Set #995-0001-861	Direct Crimp — Thick Wall — Epoxy Captive	—	150520-1264	150520-1265

(millimeters are in parentheses)

SMA SERIES STRAIGHT CABLE JACKS (FEMALE CENTER CONTACT)

Fig.	Cable Group Size — Type	Dimensions Inches (Millimeters) A	B	C	ITT CANNON ELECTRIC Cable Termination Tool Number	Notes	Military P/N M39012/ ( )	ITT CANNON ELECTRIC Gold Plated P/N	Passivated P/N
9		.0875(2.2)	.120(3.0)	—		Preassembled Dielectric	—	150515-3040	—
9		.0875(2.2)	.120(3.0)	—		Military Standard Version	/81-3001	150515-3043	—
9		.0875(2.2)	.120(3.0)	—		—	—	150515-3044	—
10		.0875(2.2)	.120(3.0)	—		Preassembled Dielectric	—	150516-3040	—
10	.086 Dia. Semi-rigid	.0875(2.2)	.120(3.0)	—	152200-1000	—	—	150516-3043	—
11	(RG-405/U)	.0875(2.2)	.120(3.0)	.560(14.2)		Preassembled Dielectric	—	150518-3040	—
11		.0875(2.2)	.120(3.0)	.560(14.2)		Military Standard Version	/82-3001	150518-3042	—
11		.0875(2.2)	.120(3.0)	.500(12.7)		—	—	150518-3043	—
12		.0875(2.2)	.120(3.0)	.500(12.7)		—	—	150519-3040	—
13		.0875(2.2)	.120(3.0)	—	None Required	Solder Clamp	—	150518-4040	150518-4041
14		—	—	—	None Required	Simplon Clamp	—	150511-5040	150511-5041
9		.142(3.6)	.185(4.7)	—		Preassembled Dielectric	—	150515-3050	—
9		.142(3.6)	.185(4.7)	—		Military Standard Version	/81-3002	150515-3057	—
9		.142(3.6)	.185(4.7)	—		—	—	150515-3059	—
10		.142(3.6)	.185(4.7)	—		Preassembled Dielectric	—	150516-3050	—
10	.141 Dia. Semi-rigid	.142(3.6)	.185(4.7)	—	152200-1000	—	—	150516-3150	—
11	(RG-402/U)	.142(3.6)	.185(4.7)	.560(14.2)		Preassembled Dielectric	—	150518-3050	—
11		.142(3.6)	.185(4.7)	.560(14.2)		Military Standard Version	/82-3002	150518-3052	—
11		.142(3.6)	.185(4.7)	.560(14.2)		—	—	150518-3054	—
12		.142(3.6)	.185(4.7)	.560(14.2)		—	—	150519-3050	—
13		.142(3.6)	.185(4.7)	—	None Required	Solder Clamp	—	150518-4050	150518-4051
14		—	—	—	None Required	Simplon Clamp	—	150511-5050	150511-5051
9	.141 Dia. Semi-rigid	.142(3.6)	.185(4.7)	—	152200-1000	—	—	150515-3058	—
10	Microporous TFE	.142(3.6)	.185(4.7)	—	152200-1000	—	—	150516-3059	—
11		.142(3.6)	.185(4.7)	.560(14.2)	152200-1000	—	—	150518-3053	—
15	RG-58C/U	—	—	—	Frame	Direct Crimp	—	150511-1200	150511-1202
15	RG-141A/U	—	—	—	#995-0001-761	Crimp Clamp	—	150511-1203	150511-1204
16	RG-303/U	—	—	—	Die Set	Direct Crimp	—	150513-1200	150513-1201
16		—	—	—	#995-0001-863	Crimp Clamp	—	150513-1202	150513-1203
15	RG-55B/U	—	—	—	Frame	Direct Crimp	—	150511-1210	150511-1212
15	RG-142B/U	—	—	—	#995-0001-761	Crimp Clamp	—	150511-1215	150511-1216
16	RG-223/U	—	—	—	Die Set	Direct Crimp	—	150513-1210	150513-1211
16	RG-400/U	—	—	—	#995-0001-863	Crimp Clamp	—	150513-1215	150513-1216
15	RG-174/U	—	—	—	Frame	Direct Crimp	—	150511-1270	150511-1271
15	RG-179B/U	—	—	—	#995-0001-761	Crimp Clamp	—	150511-1273	150511-1274
16	RG-187A/U	—	—	—	Die Set	Direct Crimp	—	150513-1270	150513-1271
16	RG-188A/U RG-316/U	—	—	—	#995-0001-868	Crimp Clamp	—	150513-1272	150513-1273
15	RG-178B/U	—	—	—	Frame #995-0001-761	Crimp Clamp	—	150511-1280	150511-1281
16	RG-196A/U	—	—	—	Die Set #995-0001-868	Crimp Clamp	—	150513-1280	150513-1281
15	RG-180B/U	—	—	—	Frame #995-0001-761	Crimp Clamp	—	150511-1260	150511-1261
16	RG-195A/U	—	—	—	Die Set #995-001-861	Crimp Clamp	—	150513-1261	150513-1262

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ITT CANNON ELECTRIC

SMA SERIES CONNECTORS

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SMA SERIES RECEPTACLES
PLUGS (MALE CENTER CONTACT)
JACKS (FEMALE CENTER CONTACT)

Fig.	Dimensions — Inches (Millimeters) A	B	—	Notes	ITT CANNON ELECTRIC Gold Plated (P/N)	Passivated P/N
17	—	—	—	Captive Contact	150542-0000	150542-0001
17	—	—	—	Captive Contact — Thick Wall	150542-0006	150542-0007
17	—	—	—	Non-Captive Contact	150542-4000	150542-4001
17	—	—	—	Non-Captive Contact — Thick Wall	150542-4002	150542-4003
18	—	—	—	Captive Contact	150550-0001	150550-0007
18	—	—	—	Non-Captive Contact	150550-4001	150550-4009
19	—	—	—	Captive Contact	150551-0001	150551-0005
19	—	—	—	Non-Captive Contact	150551-4002	150551-4003
20	.014(0.4)	—	—	Captive Contact	150550-0047	150550-0048
20	.014(0.4)	—	—	Non-Captive Contact	150550-4005	150550-4006
20	.020(0.5)	—	—	Captive Contact	150550-0045	150550-0049
20	.020(0.5)	—	—	Non-Captive Contact	150550-4007	150550-4008
20	.030(0.8)	—	—	Captive Contact	150550-0050	150550-0051
20	.030(0.8)	—	—	Non-Captive Contact	150550-4010	150550-4011
21	—	—	—	Captive Contact	150550-0000	150550-0006
22	—	—	—	Captive Contact	150550-0014	150550-0056
22	—	—	—	Non-Captive Contact	150550-4012	150550-4013
23	—	—	—	Captive Contact	150551-0010	150551-0029
23	—	—	—	Non-Captive Contact	150551-0009	150551-0028
24	—	—	—	Captive Contact	150551-0000	150551-0004
25	—	—	—	Captive Contact	150548-0000	150548-0003
26	—	—	—	Captive Contact	150592-0008	150592-0012
27	—	—	—	Captive Contact	150562-0000	150562-0002
28	—	—	—	Captive Contact	150563-0001	—
29	—	—	—	Captive Contact	150553-0000	—
30	.031(0.8)	—	—	—	150554-4004	150554-4008
30	.063(1.6)	—	—	—	150554-4005	150554-4007
30	.125(3.2)	—	—	—	150554-4000	150554-4009
31	.031(0.8)	—	—	—	150554-4003	150554-4011
31	.063(1.6)	—	—	—	150554-4002	150554-4010
31	.125(3.2)	—	—	—	150554-4001	150554-4006
32	.062(1.6)	.025(0.6)	—	—	—	150555-0006
32	.125(3.2)	.050(1.3)	—	—	—	150555-0007
32	.250(6.4)	.050(1.3)	—	—	—	150555-0008
33	—	—	—	—	—	150555-0009

STRAIGHT PLUGS

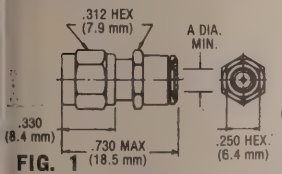

FIG. 1

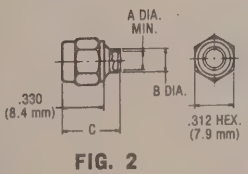

FIG. 2

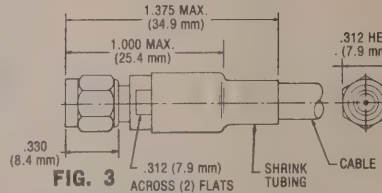

FIG. 3

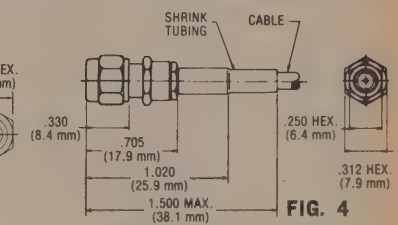

FIG. 4

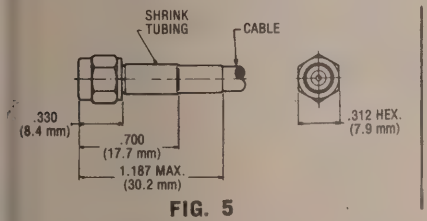

FIG. 5

RIGHT ANGLE PLUGS

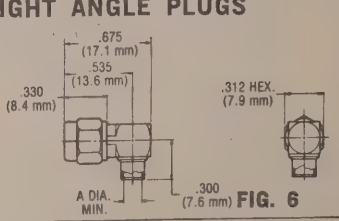

FIG. 6

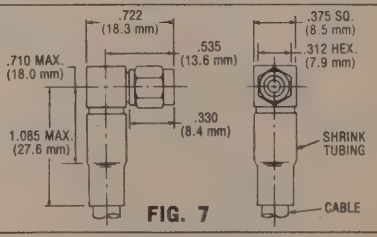

FIG. 7

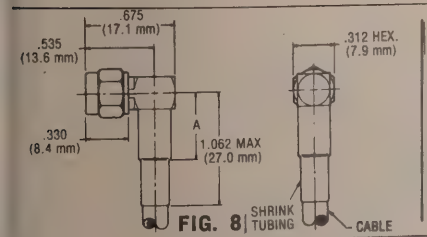

FIG. 8

STRAIGHT CABLE JACKS

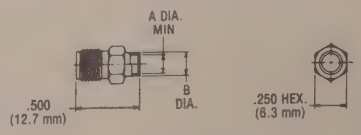

FIG. 9

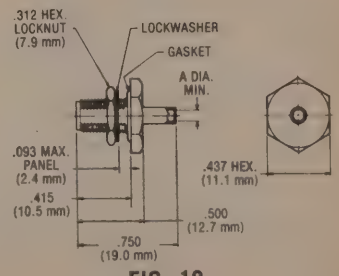

FIG. 10

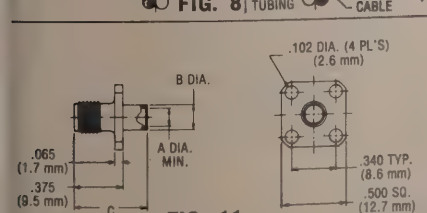

FIG. 11

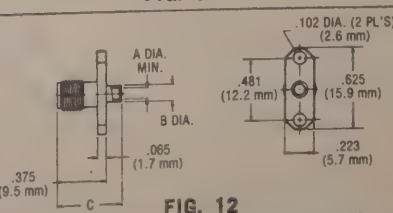

FIG. 12

(millimeters are in parentheses)

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

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SMA SERIES CONNECTORS

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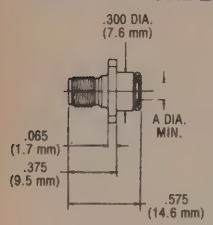
STRAIGHT CABLE JACKS *(CONTINUED)*



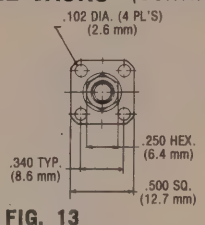


FIG. 13

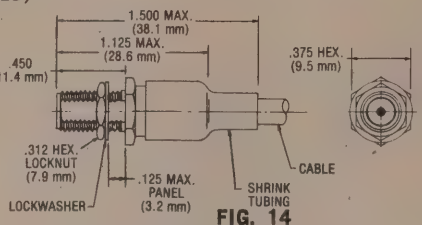


FIG. 14

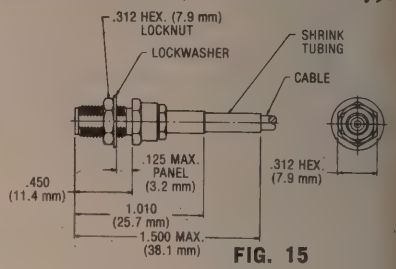


FIG. 15

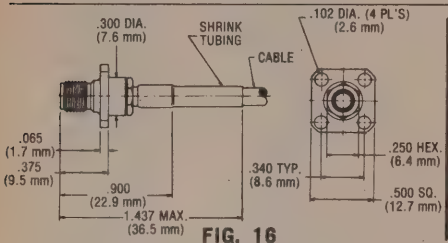


FIG. 16

RECEPTACLES

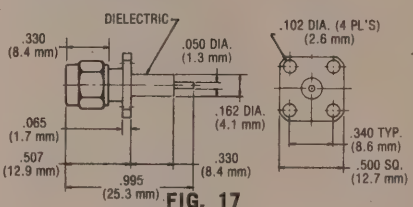


FIG. 17

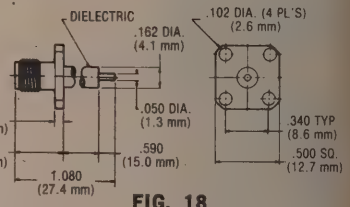


FIG. 18

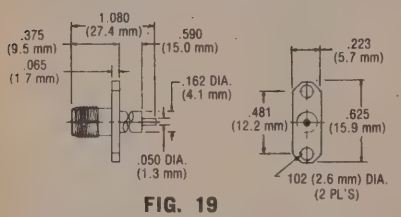


FIG. 19

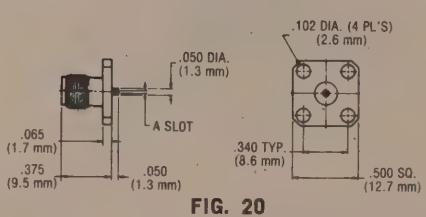


FIG. 20

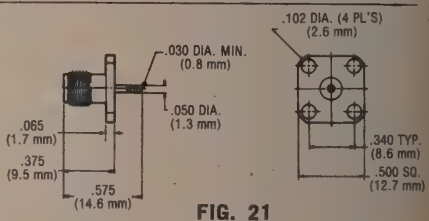


FIG. 21

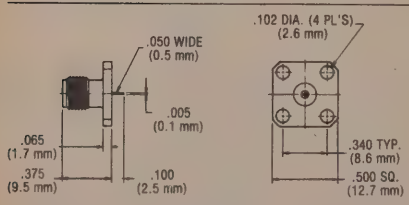


FIG. 22

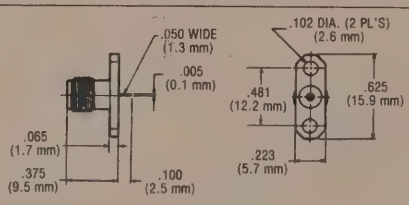


FIG. 23

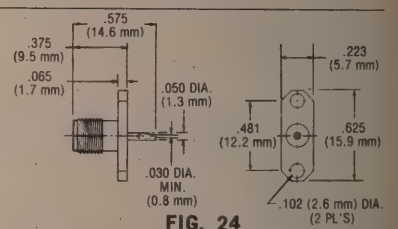


FIG. 24

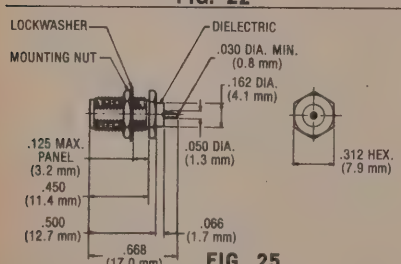


FIG. 25

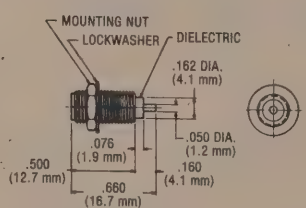


FIG. 26

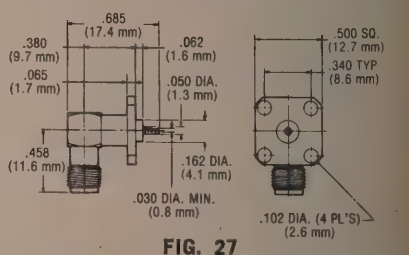


FIG. 27

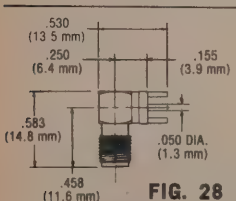
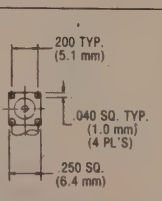


FIG. 28



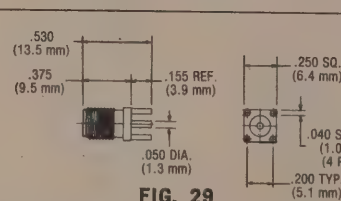


FIG. 29

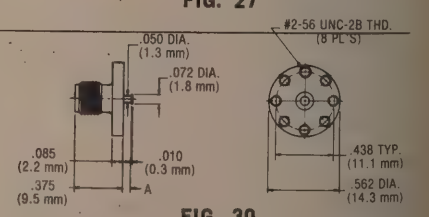


FIG. 30

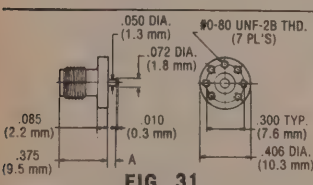


FIG. 31

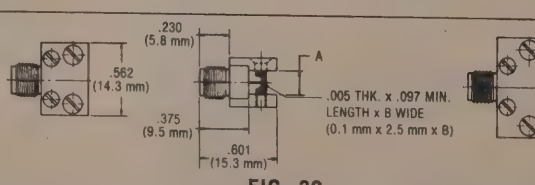

.562 (14.3 mm)
.230 (5.8 mm)
.375 (9.5 mm)
.601 (15.3 mm)
A
.005 THK. x .097 MIN. LENGTH x B WIDE (0.1 mm x 2.5 mm x B)
.767 (19.5 mm)
.250 (6.4 mm)
.005 THK. x .097 MIN. LENGTH x .050 WIDE (0.1 mm x 2.5 mm x 1.3 mm)

FIG. 32

(millimeters are in parentheses)

FIG. 33

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ADAPTA-CON P. C. AND I/O PACKAGING

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A SPECIAL APPROACH TO P. C. AND I/O PACKAGING DESIGNS...

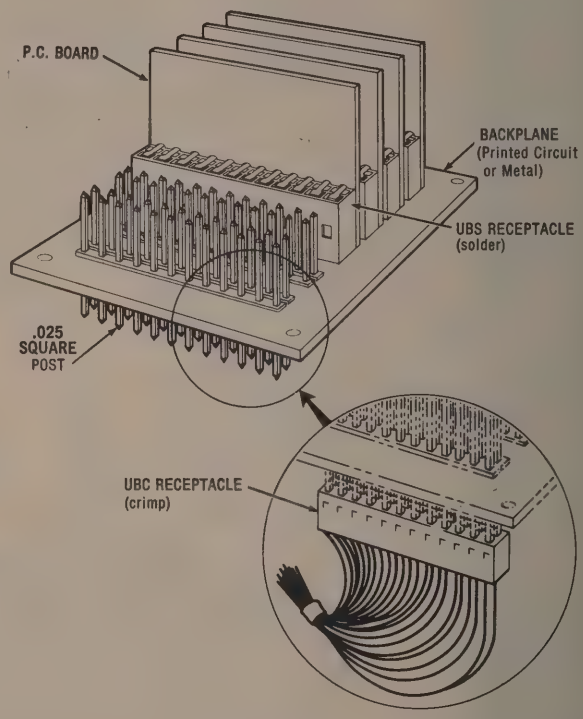
- Low cost
- Post and Receptacle P. C. interconnections
- Printed circuit, I/O applications
- Custom made backplane panels
- Contacts on .100" (2,54), .125" (3,18) and .150" (3,81) centers
- High and low force versions

ITT Cannon Electric's ADAPTA-CON connector series meets the ever increasing demand for more versatile post and receptacle interconnections at less cost per termination. The ADAPTA-CON connector series reflects a new concept in electronic packaging and represents the latest state of the art.

ADAPTA-CON connectors provide a versatile approach to dual contact P. C. and I/O interconnecting packaging designs. They are available in two styles: the UBS (solder type) for printed circuit applications; and the UBC (crimp type) for I/O applications. These designs fulfill the industry's need for post and receptacle connections between P. C. boards and backplane assemblies as well as for I/O applications.

UBS receptacles are mounted to the P. C. board by standard flow-solder techniques. The unit is then mated with UBP posts mounted in a metal or epoxy backplane.

UBC receptacles utilize insertable and removable crimp contacts that accommodate #18 thru #30 AWG wire for I/O applications.



STANDARD DATA

	UBS (P.C.)	UBC (I/O)
MATERIALS AND FINISHES		
Insulator	Phenolic Self Extinguishing Thermoplastic UL 94 VI min.	Phenolic Self Extinguishing Thermoplastic UL 94 VI min.
Contacts, Low and High Force	Material: Copper alloy Finish: Gold over nickel 90/10 tin lead electrodeposited*	Material: Copper alloy Finish: Gold over nickel 90/10 tin lead electrodeposited*
MECHANICAL FEATURES		
Termination Technique	Flow solder (.013" (0,33) x .026" (0,66) solder tab)	Crimp
Max. Engagement Force	6.0 oz. (1.67 N) per contact (low) 8.0 oz. (2,22 N) per contact (high)	6.0 oz. (1.67 N) per contact (low) 8.0 oz. (2,22 N) per contact (high)
Min. Separation Force	0.5 oz. (0,14 N) per contact (low) 2.0 oz. (0,56 N) per contact (high)	0.5 oz. (0,14 N) per contact (low) 2.0 oz. (0,56 N) per contact (high)
ELECTRICAL DATA		
Current Rating	3 amps max.	3 amps max.
Temperature Rating	−65°C to +105°C	−65°C to +85°C
Insulation Resistance	≥ 5000 Megohms	≥ 5000 Megohms
Contact Resistance (Initial)	8 Milliohms max.	8 Milliohms max.
Dielectric Withstanding Voltage (sea level)	650 Vac	650 Vac

*Consult factory for performance.

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

ADAPTA-CON P. C. AND I/O PACKAGING

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GENERAL INFORMATION

Dimensions subject to change.
(millimeters are in parenthesis)

HOW TO ORDER

UBS connector assemblies with solder contact termination (.100" (2,54), .125" (3,18) and .150" (3,81) centers)

UBS 4 D 022 A 1 D L *

- Series Prefix
- Contact Spacing
- Contact Finish
- Number of Contacts
- Termination Length
- Mounting
- Contact Rows
- Contact Forces
- Modification Code

SERIES PREFIX
UBS — Solder type P.C.

CONTACT SPACING
4 — .100" (2,54) centers
5 — .125" (3,18) centers
6 — .150" (3.81) centers

CONTACT FINISH (selective plating)
A — 20 microinches gold over 50 microinches nickel
B — 30 microinches gold over 50 microinches nickel
C — 50 microinches gold over 50 microinches nickel
E — Electrodeposited bright 90% tin and 10% lead†

NUMBER OF CONTACTS
4 to 65 — (.100" (2,54) centers) single row*
8 to 130 — (.100" (2,54) centers) double row
4 to 51 — (.125" (3,18) centers) single row*
4 to 43 — (.150" (3,81) centers) single row*
8 to 86 — (.150" (3,81) centers) double row

TERMINATION LENGTH
A — .115 (2.92) nominal
C — .125 (3,18) for .062 (1,57) thick PCB—vertical mount.
D — .156 (3,96) for .093 (2,36) thick PCB—vertical mount
E — .188 (4,78) for .125 (3,18) thick PCB—vertical mount

MOUNTING
1 — P.C. board mounting
4 — P.C. board mounting, vertical

CONTACT ROWS
S — Single
D — Double

CONTACT FORCES
L — Low: .5 to 6 oz. (0,14 to 1,67 N)
H — High: 2 to 8 oz. (0,56 to 2,22 N)

MODIFICATION CODE
Consult factory for modifications

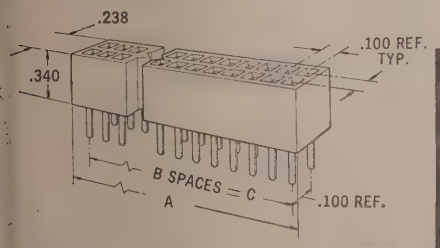
* When ordering an even number of contacts for the single row UBS connector the number 1 contact will have the termination tail on the mating face (left hand side) unless otherwise specified.
† Consult factory for availability.

UBC connector insulators with crimp contact termination (.100" (2,54), .125" (3,18) and .150" (3,81) centers)

To order UBC connector insulators use the part numbers shown in the tables on pages 150 and 151. Contacts for UBC connections are available in bulk or reel and must be ordered separately.

See page 152 for contact part numbers. Please consult the factory for termination tooling for UBC.

UBS CONNECTOR ASSEMBLIES—VERTICAL PC MOUNTING .100" CENTERS



No. of Contacts	Part Number	A	B	C
4/8	UBS 4 * 008 * 4D	.420	3	.300
5/10	010	.520	4	.400
6/12	012	.620	5	.500
7/14	014	.720	6	.600
8/16	016	.820	7	.700
9/18	018	.920	8	.800
10/20	020	1.020	9	.900
11/22	022	1.120	10	1.000
12/24	024	1.220	11	1.100
13/26	026	1.320	12	1.200
14/28	028	1.420	13	1.300
15/30	030	1.520	14	1.400
16/32	032	1.620	15	1.500
17/34	034	1.720	16	1.600
18/36	UBS 4 * 036 * 4D	1.820	17	1.700
19/38	038	1.920	18	1.800
20/40	040	2.020	19	1.900
21/42	042	2.120	20	2.000
22/44	044	2.220	21	2.100
23/46	046	2.320	22	2.200
24/48	048	2.420	23	2.300
25/50	050	2.520	24	2.400
26/52	052	2.620	25	2.500
27/54	054	2.720	26	2.600
28/56	056	2.820	27	2.700
29/58	058	2.920	28	2.800
30/60	060	3.020	29	2.900
31/62	062	3.120	30	3.000
32/64	064	3.220	31	3.100
33/66	066	3.320	32	3.200
34/68	068	3.420	33	3.300
35/70	070	3.520	34	3.400
36/72	072	3.620	35	3.500
37/74	074	3.720	36	3.600
38/76	076	3.820	37	3.700
39/78	078	3.920	38	3.800
40/80	080	4.020	39	3.900
41/82	082	4.120	40	4.000
42/84	UBS 4 * 084 * 4D	4.220	41	4.100
43/86	086	4.320	42	4.200
44/88	088	4.420	43	4.300
45/90	090	4.520	44	4.400
46/92	092	4.620	45	4.500
47/94	094	4.720	46	4.600
48/96	096	4.820	47	4.700
49/98	098	4.920	48	4.800
50/100	100	5.020	49	4.900
51/102	102	5.120	50	5.000
52/104	104	5.220	51	5.100
53/106	106	5.320	52	5.200
54/108	108	5.420	53	5.300
55/110	110	5.520	54	5.400
56/112	112	5.620	55	5.500
57/114	114	5.720	56	5.600
58/116	116	5.820	57	5.700
59/118	118	5.920	58	5.800
60/120	120	6.020	59	5.900
61/122	122	6.120	60	6.000
62/124	124	6.220	61	6.100
63/126	126	6.320	62	6.200
64/128	128	6.420	63	6.300
65/130	130	6.520	64	6.400

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

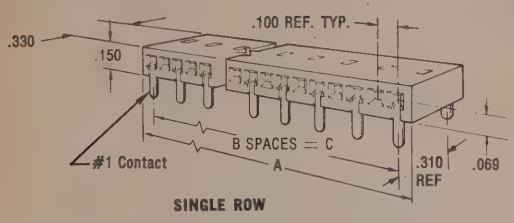
ADAPTA-CON
P. C. AND I/O PACKAGING

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

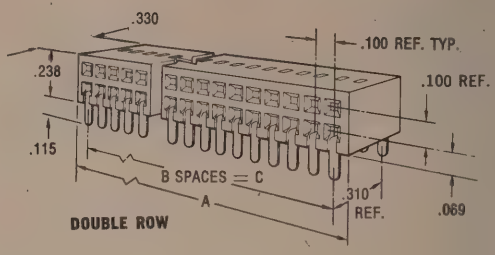
UBS CONNECTOR ASSEMBLIES

Dimensions subject to change.

.100" CENTERS



SINGLE ROW



DOUBLE ROW

SINGLE ROW, .100" CENTERS

No. of Contacts	Part Number	A	B	C	No. of Contacts	Part Number	A	B	C	No. of Contacts	Part Number	A	B	C
4	UBS 4 * 004 * 1S	.435	3	.300	25	UBS 4 * 025 * 1S	2.535	24	2.400	46	UBS 4 * 046 * 1S	4.635	45	4.500
5	005	.535	4	.400	26	026	2.635	25	2.500	47	047	4.735	46	4.600
6	006	.635	5	.500	27	027	2.735	26	2.600	48	048	4.835	47	4.700
7	007	.735	6	.600	28	028	2.835	27	2.700	49	049	4.935	48	4.800
8	008	.835	7	.700	29	029	2.935	28	2.800	50	050	5.035	49	4.900
9	009	.935	8	.800	30	030	3.035	29	2.900	51	051	5.135	50	5.000
10	010	1.035	9	.900	31	031	3.135	30	3.000	52	052	5.235	51	5.100
11	011	1.135	10	1.000	32	032	3.235	31	3.100	53	053	5.335	52	5.200
12	012	1.235	11	1.100	33	033	3.335	32	3.200	54	054	5.435	53	5.300
13	013	1.335	12	1.200	34	034	3.435	33	3.300	55	055	5.535	54	5.400
14	014	1.435	13	1.300	35	035	3.535	34	3.400	56	056	5.635	55	5.500
15	015	1.535	14	1.400	36	036	3.635	35	3.500	57	057	5.735	56	5.600
16	016	1.635	15	1.500	37	037	3.735	36	3.600	58	058	5.835	57	5.700
17	017	1.735	16	1.600	38	038	3.835	37	3.700	59	059	5.935	58	5.800
18	018	1.835	17	1.700	39	039	3.935	38	3.800	60	060	6.035	59	5.900
19	019	1.935	18	1.800	40	040	4.035	39	3.900	61	061	6.135	60	6.000
20	020	2.035	19	1.900	41	041	4.135	40	4.000	62	062	6.235	61	6.100
21	021	2.135	20	2.000	42	042	4.235	41	4.100	63	063	6.335	62	6.200
22	022	2.235	21	2.100	43	043	4.335	42	4.200	64	064	6.435	63	6.300
23	023	2.335	22	2.200	44	044	4.435	43	4.300	65	065	6.545	64	6.400
24	024	2.435	23	2.300	45	045	4.535	44	4.400					

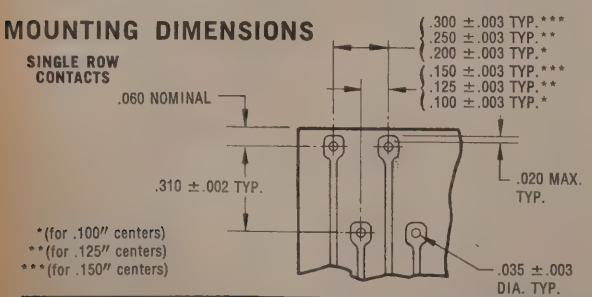
DOUBLE ROW, .100" x .100" CENTERS

No. of Contacts	Part Number	A	B	C	No. of Contacts	Part Number	A	B	C	No. of Contacts	Part Number	A	B	C
4/8	UBS 4 *008 * 1D	.435	3	.300	25/50	UBS 4 * 050 * 1D	2.535	24	2.400	46/92	UBS 4 * 092 * 1D	4.635	45	4.500
5/10	010	.535	4	.400	26/52	052	2.635	25	2.500	47/94	094	4.735	46	4.600
6/12	012	.635	5	.500	27/54	054	2.735	26	2.600	48/96	096	4.835	47	4.700
7/14	014	.735	6	.600	28/56	056	2.835	27	2.700	49/98	098	4.935	48	4.800
8/16	016	.835	7	.700	29/58	058	2.935	28	2.800	50/100	100	5.035	49	4.900
9/18	018	.935	8	.800	30/60	060	3.035	29	2.900	51/102	102	5.135	50	5.000
10/20	020	1.035	9	.900	31/62	062	3.135	30	3.000	52/104	104	5.235	51	5.100
11/22	022	1.135	10	1.000	32/64	064	3.235	31	3.100	53/106	106	5.335	52	5.200
12/24	024	1.235	11	1.100	33/66	066	3.335	32	3.200	54/108	108	5.435	53	5.300
13/26	026	1.335	12	1.200	34/68	068	3.435	33	3.300	55/110	110	5.535	54	5.400
14/28	028	1.435	13	1.300	35/70	070	3.535	34	3.400	56/112	112	5.635	55	5.500
15/30	030	1.535	14	1.400	36/72	072	3.635	35	3.500	57/114	114	5.735	56	5.600
16/32	032	1.635	15	1.500	37/74	074	3.735	36	3.600	58/116	116	5.835	57	5.700
17/34	034	1.735	16	1.600	38/76	076	3.835	37	3.700	59/118	118	5.935	58	5.800
18/36	036	1.835	17	1.700	39/78	078	3.935	38	3.800	60/120	120	6.035	59	5.900
19/38	038	1.935	18	1.800	40/80	080	4.035	39	3.900	61/122	122	6.135	60	6.000
20/40	040	2.035	19	1.900	41/82	082	4.135	40	4.000	62/124	124	6.235	61	6.100
21/42	042	2.135	20	2.000	42/84	084	4.235	41	4.100	63/126	126	6.335	62	6.200
22/44	044	2.235	21	2.100	43/86	086	4.335	42	4.200	64/128	128	6.435	63	6.300
23/46	046	2.335	22	2.200	44/88	088	4.435	43	4.300	65/130	130	6.545	64	6.400
24/48	048	2.435	23	2.300	45/90	090	4.535	44	4.400					

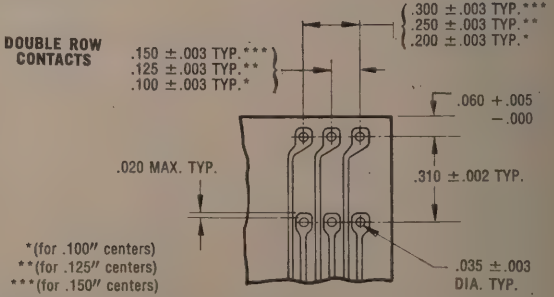
* Plating Code.

MOUNTING DIMENSIONS

SINGLE ROW CONTACTS



DOUBLE ROW CONTACTS



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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

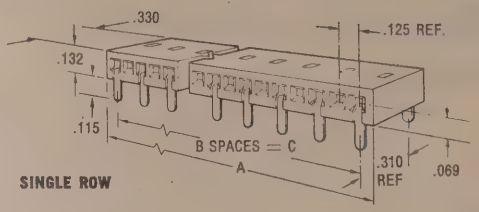
ITT CANNON ELECTRIC

ADAPTA-CON
P. C. AND I/O PACKAGING

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

Dimensions subject to change.

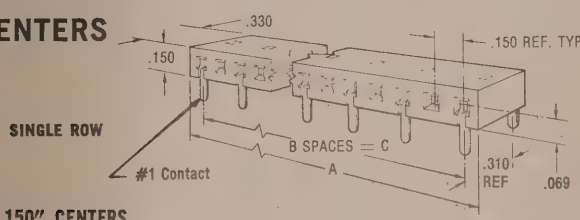
UBS CONNECTOR ASSEMBLIES
.125" CENTERS

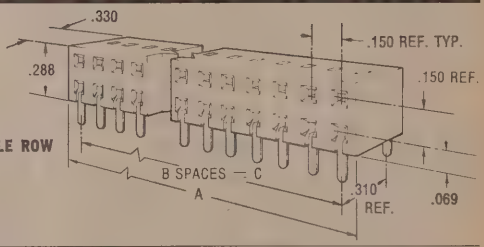


SINGLE ROW .125" CENTERS

No. of Contacts	Part Number	A	B	C	No. of Contacts	Part Number	A	B	C	No. of Contacts	Part Number	A	B	C
4	UBS 5 * 004 * 1S	.530	3	.375	20	UBS 5 * 020 * 1S	2.530	19	2.375	36	UBS 5 * 036 * 1S	4.530	35	4.375
5	005	.655	4	.500	21	021	2.655	20	2.500	37	037	4.655	36	4.500
6	006	.780	5	.625	22	022	2.780	21	2.625	38	038	4.780	37	4.625
7	007	.905	6	.750	23	023	2.905	22	2.750	39	039	4.905	38	4.750
8	008	1.030	7	.875	24	024	3.030	23	2.875	40	040	5.030	39	4.875
9	009	1.155	8	1.000	25	025	3.155	24	3.000	41	041	5.155	40	5.000
10	010	1.280	9	1.125	26	026	3.280	25	3.125	42	042	5.280	41	5.125
11	011	1.405	10	1.250	27	027	3.405	26	3.250	43	043	5.405	42	5.250
12	012	1.530	11	1.375	28	028	3.530	27	3.375	44	044	5.530	43	5.375
13	013	1.655	12	1.500	29	029	3.655	28	3.500	45	045	5.655	44	5.500
14	014	1.780	13	1.625	30	030	3.780	29	3.625	46	046	5.780	45	5.625
15	015	1.905	14	1.750	31	031	3.905	30	3.750	47	047	5.905	46	5.750
16	016	2.030	15	1.875	32	032	4.030	31	3.875	48	048	6.030	47	5.875
17	017	2.155	16	2.000	33	033	4.155	32	4.000	49	049	6.155	48	6.000
18	018	2.280	17	2.125	34	034	4.280	33	4.125	50	050	6.280	49	6.125
19	019	2.405	18	2.250	35	035	4.405	34	4.250	51	051	6.405	50	6.250

.150" CENTERS





SINGLE ROW .150" CENTERS

No. of Contacts	Part Number	A	B	C	No. of Contacts	Part Number	A	B	C	No. of Contacts	Part Number	A	B	C
4	UBS 6 * 004 * 1S	.600	3	.450	18	UBS 6 * 018 * 1S	2.700	17	2.550	32	UBS 6 * 032 * 1S	4.800	31	4.650
5	005	.750	4	.600	19	019	2.850	18	2.700	33	033	4.950	32	4.800
6	006	.900	5	.750	20	020	3.000	19	2.850	34	034	5.100	33	4.950
7	007	1.050	6	.900	21	021	3.150	20	3.000	35	035	5.250	34	5.100
8	008	1.200	7	1.050	22	022	3.300	21	3.150	36	036	5.400	35	5.250
9	009	1.350	8	1.200	23	023	3.450	22	3.300	37	037	5.550	36	5.400
10	010	1.500	9	1.350	24	024	3.600	23	3.450	38	038	5.700	37	5.550
11	011	1.650	10	1.500	25	025	3.750	24	3.600	39	039	5.850	38	5.700
12	012	1.800	11	1.650	26	026	3.900	25	3.750	40	040	6.000	39	5.850
13	013	1.950	12	1.800	27	027	4.050	26	3.900	41	041	6.150	40	6.000
14	014	2.100	13	1.950	28	028	4.200	27	4.050	42	042	6.300	41	6.150
15	015	2.250	14	2.100	29	029	4.350	28	4.200	43	043	6.445	42	6.300
16	016	2.400	15	2.250	30	030	4.500	29	4.350					
17	017	2.550	16	2.400	31	031	4.650	30	4.500					

DOUBLE ROW .150" CENTERS

No. of Contacts	Part Number	A	B	C	No. of Contacts	Part Number	A	B	C	No. of Contacts	Part Number	A	B	C
4/8	UBS 6 * 008 * 1D	.600	3	.450	18/36	UBS 6 * 036 * 1D	2.700	17	2.550	32/64	UBS 6 * 064 * 1D	4.800	31	4.650
5/10	010	.750	4	.600	19/38	038	2.850	18	2.700	33/66	066	4.950	32	4.800
6/12	012	.900	5	.750	20/40	040	3.000	19	2.850	34/68	068	5.100	33	4.950
7/14	014	1.050	6	.900	21/42	042	3.150	20	3.000	35/70	070	5.250	34	5.100
8/16	016	1.200	7	1.050	22/44	044	3.300	21	3.150	36/72	072	5.400	35	5.250
9/18	018	1.350	8	1.200	23/46	046	3.450	22	3.300	37/74	074	5.550	36	5.400
10/20	020	1.500	9	1.350	24/48	048	3.600	23	3.450	38/76	076	5.700	37	5.550
11/22	022	1.650	10	1.500	25/50	050	3.750	24	3.600	39/78	078	5.850	38	5.700
12/24	024	1.800	11	1.650	26/52	052	3.900	25	3.750	40/80	080	6.000	39	5.850
13/26	026	1.950	12	1.800	27/54	054	4.050	26	3.900	41/82	082	6.150	40	6.000
14/28	028	2.100	13	1.950	28/56	056	4.200	27	4.050	42/84	084	6.300	41	6.150
15/30	030	2.250	14	2.100	29/58	058	4.350	28	4.200	43/86	086	6.445	42	6.300
16/32	032	2.400	15	2.250	30/60	060	4.500	29	4.350					
17/34	034	2.550	16	2.400	31/62	062	4.650	30	4.500					

* Plating Code.

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ITT CANNON ELECTRIC

ADAPTA-CON
P. C. AND I/O PACKAGING

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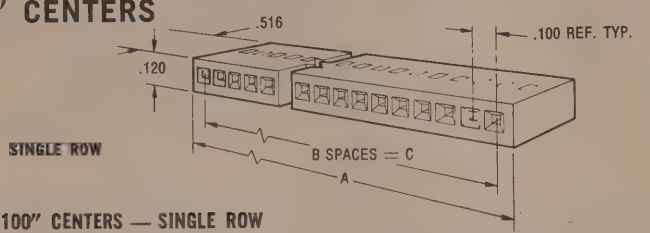
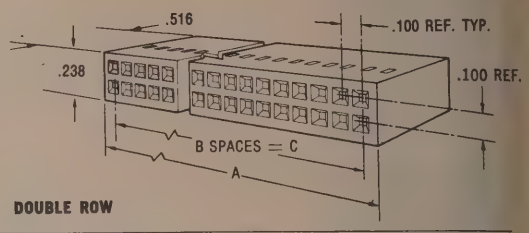
Dimensions subject to change.

UBC CONNECTOR INSULATORS

.100" CENTERS





DOUBLE ROW

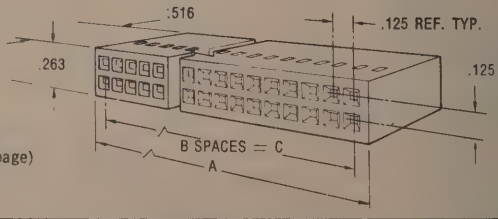
CRIMP .100" CENTERS — SINGLE ROW

No. of Contacts	Part Number	A	B	C	No. of Contacts	Part Number	A	B	C	No. of Contacts	Part Number	A	B	C
4	121-7356-004	.420	3	.300	25	121-7356-025	2.520	24	2.400	46	121-7356-046	4.620	45	4.500
5	005	.520	4	.400	26	026	2.620	25	2.500	47	047	4.720	46	4.600
6	006	.620	5	.500	27	027	2.720	26	2.600	48	048	4.820	47	4.700
7	007	.720	6	.600	28	028	2.820	27	2.700	49	049	4.920	48	4.800
8	008	.820	7	.700	29	029	2.920	28	2.800	50	050	5.020	49	4.900
9	009	.920	8	.800	30	030	3.020	29	2.900	51	051	5.120	50	5.000
10	010	1.020	9	.900	31	031	3.120	30	3.000	52	052	5.220	51	5.100
11	011	1.120	10	1.000	32	032	3.220	31	3.100	53	053	5.320	52	5.200
12	012	1.220	11	1.100	33	033	3.320	32	3.200	54	054	5.420	53	5.300
13	013	1.320	12	1.200	34	034	3.420	33	3.300	55	055	5.520	54	5.400
14	014	1.420	13	1.300	35	035	3.520	34	3.400	56	056	5.620	55	5.500
15	015	1.520	14	1.400	36	036	3.620	35	3.500	57	057	5.720	56	5.600
16	016	1.620	15	1.500	37	037	3.720	36	3.600	58	058	5.820	57	5.700
17	017	1.720	16	1.600	38	038	3.820	37	3.700	59	059	5.920	58	5.800
18	018	1.820	17	1.700	39	039	3.920	38	3.800	60	060	6.020	59	5.900
19	019	1.920	18	1.800	40	040	4.020	39	3.900	61	061	6.120	60	6.000
20	020	2.020	19	1.900	41	041	4.120	40	4.000	62	062	6.220	61	6.100
21	021	2.120	20	2.000	42	042	4.220	41	4.100	63	063	6.320	62	6.200
22	022	2.220	21	2.100	43	043	4.320	42	4.200	64	064	6.420	63	6.300
23	023	2.320	22	2.200	44	044	4.420	43	4.300	65	065	6.520	64	6.400
24	024	2.420	23	2.300	45	045	4.520	44	4.400					

CRIMP .100" CENTERS — DOUBLE ROW

No. of Contacts	Part Number	A	B	C	No. of Contacts	Part Number	A	B	C	No. of Contacts	Part Number	A	B	C
2/4	121-7326-202	.235	1	.100	12/24	121-7326-112	1.235	11	1.100	23/46	121-7236-123	2.335	22	2.200
3/6	203	.335	2	.200	13/26	113	1.335	12	1.200	24/48	124	2.435	23	2.300
4/8	204	.435	3	.300	14/28	114	1.435	13	1.300	25/50	125	2.535	24	2.400
5/10	105	.535	4	.400	15/30	115	1.535	14	1.400	26/52	126	2.635	25	2.500
6/12	106	.635	5	.500	16/32	116	1.635	15	1.500	27/54	127	2.735	26	2.600
7/14	107	.735	6	.600	17/34	117	1.735	16	1.600	28/56	128	2.835	27	2.700
8/16	108	.835	7	.700	18/36	118	1.835	17	1.700	29/58	129	2.935	28	2.800
9/18	109	.935	8	.800	19/38	119	1.935	18	1.800	30/60	130	3.035	29	3.000
10/20	110	1.035	9	.900	20/40	120	2.035	19	1.900	31/62	131	3.135	30	3.000
11/22	111	1.135	10	1.000	21/42	121	2.135	20	2.000	32/64	132	3.235	31	3.100
					22/44	122	2.235	21	2.100					

.125" CENTERS



DOUBLE ROW
(single row .125" centers on following page)

CRIMP .125" CENTERS — DOUBLE ROW

No. of Contacts	Part Number	A	B	C	No. of Contacts	Part Number	A	B	C	No. of Contacts	Part Number	A	B	C
4/8	121-7325-104	.515	3	.375	14/28	121-7325-114	1.765	13	1.625	24/48	121-7325-124	3.015	23	2.875
5/10	105	.640	4	.500	15/30	115	1.890	14	1.750	25/50	125	3.140	24	3.000
6/12	106	.765	5	.625	16/32	116	2.015	15	1.875	26/52	126	3.265	25	3.125
7/14	107	.890	6	.750	17/34	117	2.140	16	2.000	27/54	127	3.390	26	3.250
8/16	108	1.015	7	.875	18/36	118	2.265	17	2.125	28/56	128	3.515	27	3.375
9/18	109	1.140	8	1.000	19/38	119	2.390	18	2.250	29/58	129	3.640	28	3.500
10/20	110	1.265	9	1.125	20/40	120	2.515	19	2.375	30/60	130	3.765	29	3.625
11/22	111	1.390	10	1.250	21/42	121	2.640	20	2.500	31/62	131	3.890	30	3.750
12/24	112	1.515	11	1.375	22/44	122	2.765	21	2.625	32/64	132	4.015	31	3.875
13/26	113	1.640	12	1.500	23/46	123	2.890	22	2.750					

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

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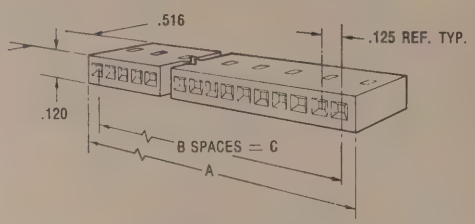
Dimensions subject to change.

UBC CONNECTOR INSULATORS

.125" CENTERS

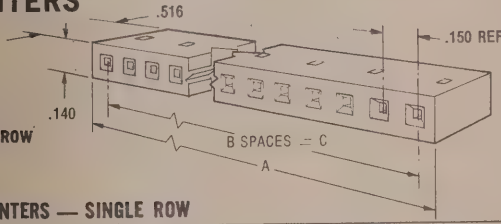


SINGLE ROW

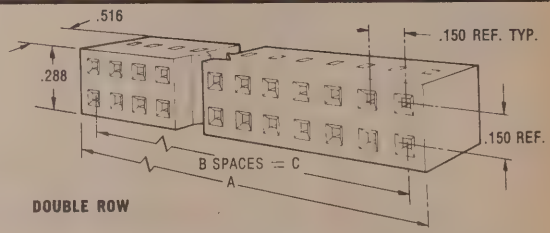
CRIMP .125" CENTERS — SINGLE ROW

No. of Contacts	Part Number	A	B	C	No. of Contacts	Part Number	A	B	C	No. of Contacts	Part Number	A	B	C
4	121-7358-004	.495	3	.375	20	121-7358-020	2.495	19	2.375	36	121-7358-036	4.495	35	4.375
5	005	.620	4	.500	21	021	2.620	20	2.500	37	037	4.620	36	4.500
6	006	.745	5	.625	22	022	2.745	21	2.625	38	038	4.745	37	4.625
7	007	.870	6	.750	23	023	2.870	22	2.750	39	039	4.870	38	4.750
8	008	.995	7	.875	24	024	2.995	23	2.875	40	040	4.995	39	4.875
9	009	1.120	8	1.000	25	025	3.120	24	3.000	41	041	5.120	40	5.000
10	010	1.245	9	1.125	26	026	3.245	25	3.125	42	042	5.245	41	5.125
11	011	1.370	10	1.250	27	027	3.370	26	3.250	43	043	5.370	42	5.250
12	012	1.495	11	1.375	28	028	3.495	27	3.375	44	044	5.495	43	5.375
13	013	1.620	12	1.500	29	029	3.620	28	3.500	45	045	5.620	44	5.500
14	014	1.745	13	1.625	30	030	3.745	29	3.625	46	046	5.745	45	5.625
15	015	1.870	14	1.750	31	031	3.870	30	3.750	47	047	5.870	46	5.750
16	016	1.995	15	1.875	32	032	3.995	31	3.875	48	048	5.995	47	5.875
17	017	2.120	16	2.000	33	033	4.120	32	4.000	49	049	6.120	48	6.000
18	018	2.245	17	2.125	34	034	4.245	33	4.125	50	050	6.245	49	6.125
19	019	2.370	18	2.250	35	035	4.370	34	4.250	51	051	6.370	50	6.250

.150" CENTERS



SINGLE ROW



DOUBLE ROW

CRIMP .150" CENTERS — SINGLE ROW

No. of Contacts	Part Number	A	B	C	No. of Contacts	Part Number	A	B	C	No. of Contacts	Part Number	A	B	C
4	121-7357-004	.570	3	.450	18	121-7357-018	2.670	17	2.550	32	121-7357-032	4.770	31	4.650
5	005	.720	4	.600	19	019	2.820	18	2.700	33	033	4.920	32	4.800
6	006	.870	5	.750	20	020	2.970	19	2.850	34	034	5.070	33	4.950
7	007	1.020	6	.900	21	021	3.120	20	3.000	35	035	5.220	34	5.100
8	008	1.170	7	1.050	22	022	3.270	21	3.150	36	036	5.370	35	5.250
9	009	1.320	8	1.200	23	023	3.420	22	3.300	37	037	5.520	36	5.400
10	010	1.470	9	1.350	24	024	3.570	23	3.450	38	038	5.670	37	5.550
11	011	1.620	10	1.500	25	025	3.720	24	3.600	39	039	5.820	38	5.700
12	012	1.770	11	1.650	26	026	3.870	25	3.750	40	040	5.970	39	5.850
13	013	1.920	12	1.800	27	027	4.020	26	3.900	41	041	6.120	40	6.000
14	014	2.070	13	1.950	28	028	4.170	27	4.050	42	042	6.270	41	6.150
15	015	2.220	14	2.100	29	029	4.320	28	4.200	43	043	6.420	42	6.300
16	016	2.370	15	2.250	30	030	4.470	29	4.350					
17	017	2.520	16	2.400	31	031	4.620	30	4.500					

CRIMP .150" CENTERS — DOUBLE ROW

No. of Contacts	Part Number	A	B	C	No. of Contacts	Part Number	A	B	C	No. of Contacts	Part Number	A	B	C
4/8	121-7355-104	.590	3	.450	18/36	121-7355-118	2.690	17	2.550	32/64	121-7355-132	4.790	31	4.650
5/10	105	.740	4	.600	19/38	119	2.840	18	2.700	33/66	133	4.940	32	4.800
6/12	106	.890	5	.750	20/40	120	2.990	19	2.850	34/68	134	5.090	33	4.950
7/14	107	1.040	6	.900	21/42	121	3.140	20	3.000	35/70	135	5.240	34	5.100
8/16	108	1.190	7	1.050	22/44	122	3.290	21	3.150	36/72	136	5.390	35	5.250
9/18	109	1.340	8	1.200	23/46	123	3.440	22	3.300	37/74	137	5.540	36	5.400
10/20	110	1.490	9	1.350	24/48	124	3.590	23	3.450	38/76	138	5.690	37	5.550
11/22	111	1.640	10	1.500	25/50	125	3.740	24	3.600	39/78	139	5.840	38	5.700
12/24	112	1.790	11	1.650	26/52	126	3.890	25	3.750	40/80	140	5.990	39	5.850
13/26	113	1.940	12	1.800	27/54	127	4.040	26	3.900	41/82	141	6.140	40	6.000
14/28	114	2.090	13	1.950	28/56	128	4.190	27	4.050	42/84	142	6.290	41	6.150
15/30	115	2.240	14	2.100	29/58	129	4.340	28	4.200	43/86	143	6.440	42	6.300
16/32	116	2.390	15	2.250	30/60	130	4.490	29	4.350					
17/34	117	2.540	16	2.400	31/62	131	4.640	30	4.500					

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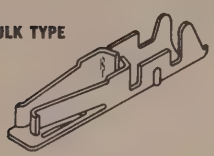
Dimensions subject to change.

UBC CRIMP CONTACTS

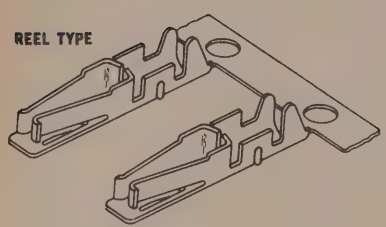
At the time of ordering, customer may specify whether reel carrier strip contacts or loose contacts are desired. Ordering information is below.

NOTE: All gold plated contacts are selectively plated with specified minimums of gold in contact area only. Balance of contact is plated gold flash. For example, -012 plating is defined as 20 microinches of gold in contact area over 50 microinches nickel with gold flash in non-contact area.

BULK TYPE



REEL TYPE



BULK — (Supplied in Quantity, Loose)

Wire Range	Withdrawal Force, Min.	Insertion Force, Max.	Contact and Plating Thickness	Part No.
18-22 AWG	2 oz.	8 oz.	90/10 tin lead electrodeposited*	030-7313-506
			20 microinches gold over 50 microinches nickel	030-7313-016
			30 microinches gold over 50 microinches nickel	030-7313-096
			50 microinches gold over 50 microinches nickel	030-7313-076
	0.5 oz.	6 oz.	90/10 tin lead electrodeposited*	030-7361-506
			20 microinches gold over 50 microinches nickel	030-7361-016
			30 microinches gold over 50 microinches nickel	030-7361-096
			50 microinches gold over 50 microinches nickel	030-7361-076
24-30 AWG	2 oz.	8 oz.	90/10 tin lead electrodeposited*	030-7313-502
			20 microinches gold over 50 microinches nickel	030-7313-012
			30 microinches gold over 50 microinches nickel	030-7313-092
			50 microinches gold over 50 microinches nickel	030-7313-072
	0.5 oz.	6 oz.	90/10 tin lead electrodeposited*	030-7361-502
			20 microinches gold over 50 microinches nickel	030-7361-012
			30 microinches gold over 50 microinches nickel	030-7361-092
			50 microinches gold over 50 microinches nickel	030-7361-072

REEL — (Supplied 5000 Contacts per Reel)

Wire Range	Withdrawal Force, Min.	Insertion Force, Max.	Plating	Part No.
18-22 AWG	2 oz.	8 oz.	90/10 tin lead electrodeposited*	
			20 microinches gold over 50 microinches nickel	110238-0095
			30 microinches gold over 50 microinches nickel	110238-0155
			50 microinches gold over 50 microinches nickel	110238-0154
	0.5 oz.	6 oz.	90/10 tin lead electrodeposited*	
			20 microinches gold over 50 microinches nickel	110238-0099
			30 microinches gold over 50 microinches nickel	110238-0157
			50 microinches gold over 50 microinches nickel	110238-0156
24-30 AWG	2 oz.	8 oz.	90/10 tin lead electrodeposited*	
			20 microinches gold over 50 microinches nickel	110238-0087
			30 microinches gold over 50 microinches nickel	110238-0151
			50 microinches gold over 50 microinches nickel	110238-0150
	0.5 oz.	6 oz.	90/10 tin lead electrodeposited*	
			20 microinches gold over 50 microinches nickel	110238-0091
			30 microinches gold over 50 microinches nickel	110238-0153
			50 microinches gold over 50 microinches nickel	110238-0152

NOTE: Minimum withdrawal force using .024 sq. gauge. Maximum insertion force using .026 sq. gauge.
*Consult factory for availability.

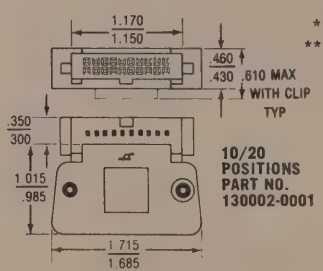
SPECIAL ASSEMBLIES

These three special assemblies consist of a modified UBC insulator into which standard UBC contacts are inserted. Cable protection and strain relief is provided by molded plastic clam shells. A locking clip is also provided for latching to printed circuit headers. These connectors mate to matching groups of .025 square pins.

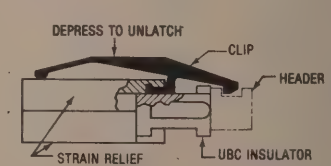
	Material
Contacts	Copper Alloy
Insulator	30% Glass Filled Nylon
Strain Relief	30% Glass Filled Nylon

Positions	Insulator	Clam Shell Strain Relief*	Kit**	Kit***
10/20	121-7366-000	317-7301-001	130002-0001	130002-0101
20/40	121-7367-000	317-7302-002	130002-0002	130002-0102
25/50	121-7367-002	317-7305-000	130002-0005	130002-0105

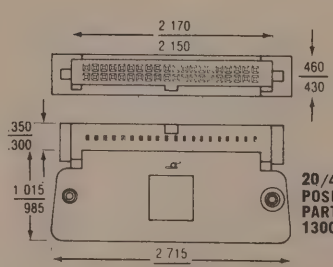
*Requires 2.
** Consists of 1 insulator, 2 clam shells and 2 screws.
***Consists of 1 insulator, 2 clam shells, 2 screws and a locking clip.



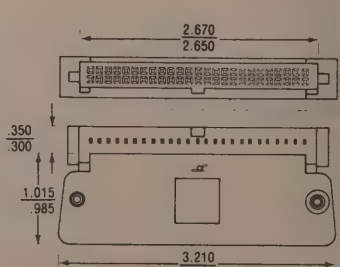
10/20 POSITIONS PART NO. 130002-0001



PART NO. 029-7300-0000 LOCKING CLIP



20/40 POSITIONS PART NO. 130002-0002



25/50 POSITIONS PART NO. 130002-0005

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ITT CANNON ELECTRIC

MAS/TER™—IDC INSULATION DISPLACEMENT CONNECTORS

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

Mas/Ter-IDC™ INSULATION DISPLACEMENT CONNECTORS

ITT Cannon's Mas/Ter IDC Insulation Displacement Connector system is based on a detailed analysis of packaging needs in telecommunications, computer, industrial control, and other applications requiring low cost and high performance. We at ITT Cannon Electric have responded with an interconnect family that is comprehensive, extensive, and still growing. It includes ITT Cannon's popular Mas/Ter-D Subminiatures, Edgecard, DIP, PCB, receptacle, header and transition connectors, plus ribbon cable in #26/28 AWG stranded and solid wire.

Mas/Ter-IDC insulation displacement connectors provide high speed mass termination of round conductor flat cables, lowering your total installed cost and increasing end product reliability. With Mas/Ter-IDC fifty or more mass terminations can be accomplished in a single operation that eliminates the need for time-consuming wire stripping, crimping and soldering. Simple hand tools quickly turn out reliable mass terminations and achieve substantial reductions in labor costs.

With the introduction of Mas/Ter-IDC, you can count on ITT Cannon for all your connector system packaging needs. When you specify CANNON® Connectors across the board, you are assured of complete component compatibility. And you'll save time by dealing with a single, reliable source.

Mas/Ter™-IDC PRODUCT	NUMBER OF CONTACTS														
	8	9	10	14	15	16	20	24	25	26	34	37	40	50	70
Mas/Ter-D CONNECTORS D Subminiature pin and socket connectors provide reliable, high-speed mass terminations of flat ribbon cable at a lower total installed cost.		●			●				●			●			
Mas/Ter 90° D*P CONNECTORS 90° PCB flame-retardant connectors, fully intermateable with all D Subminiature types; can be mounted directly over PC patterns without short circuiting.		●			●				●			●		●	
Mas/Ter G08 HEADERS (SHROUDED) For 2-piece connector applications requiring fast and dependable disconnect/connect capability; headers are permanently mounted on a PC board and mate with the ribbon-terminated G08 receptacle.			●	●		●	●			●	●		●	●	
Mas/Ter G08 Headers (UNSHROUDED) Double readout male connectors useable with both Mas/Ter G08 receptacles or UBC crimp housings.	●	8 thru 70 (even increments)													●
Mas/Ter G08 RECEPTACLES Socket receptacle for termination directly to ribbon cable, mates with PC board-mounted headers or PC boards having .025" (0.64) square pins on .100"x.100" (2.54x2.54) grid patterns.			●	●		●	●			●	●		●	●	
Mas/Ter RTG08A DUAL INLINE PLUG CONNECTORS DIP connectors terminate directly to ribbon cable and can be permanently soldered to the PCB board or used as a plug-in to IC sockets.				●		●		●					●		
Mas/Ter RTG08B PC BOARD TRANSITION CONNECTORS High density PCB connector provides soldering interface between ribbon cable and PC board. When terminated, interconnects electrically with all .050" (1.27) centers etched circuitry.			●				●			●	●		●	●	
Mas/Ter G03 EDGECARD CONNECTORS Edgecard connectors are designed for .050" (1.27) center direct ribbon cable interconnections to standard .062" (1.57) thick PC boards have .100" (2.54) center spacing.							●			●	●		●	●	
Mas/Ter RIBBON CABLES Available as flat cable or twisted pairs; fully compatible with Mas/Ter Interconnect System.															
Mas/Ter TOOLING Versatile termination hand press, tools and shears to assure fast, reliable assembly.															

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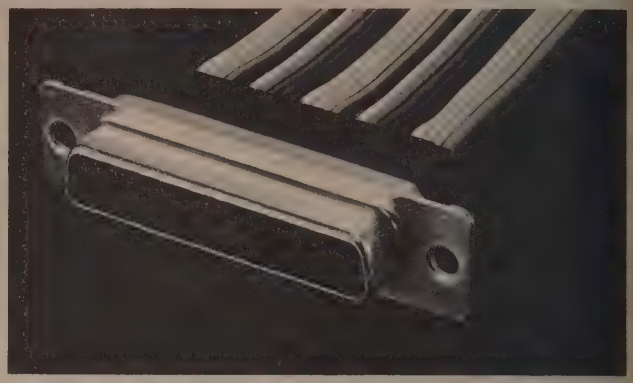
Mas/Ter-D CONNECTORS

Mas/Ter-D pin-and-socket connectors can be used to terminate cables or incorporated into daisy chain configurations without a break in the cable. They provide a reliable mass termination using standard round conductor flat cable or individual wires, either solid or stranded. For added application flexibility, Mas/Ter-D is fully intermateable and intermountable with all D Subminiature connectors on the market.

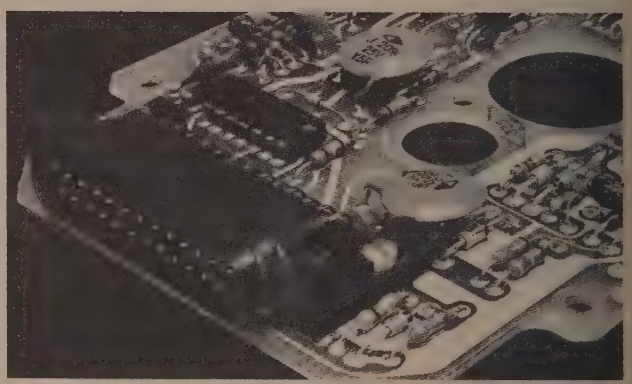
When installed the Mas/Ter-D contact penetrates and displaces the insulation—without severing the conductor—and continues to provide insulation support to the wire. This contact design provides 25% more wire-to-contact surface area to increase reliability and conductivity.



Mas/Ter 90° D*P CONNECTORS

Mas/Ter 90° D*P right-angle printed circuit board connectors are ideal for telecommunications, computer, industrial control and other applications that require low cost and high performance. Made from a flame retardant, U.L. listed; glass-filled thermoplastic, the D*P can be mounted directly over printed circuit patterns without causing short circuiting. Universal design means these benefits can be easily obtained. The D*P can be used to replace any D Subminiature-type 90° printed circuit connector without redrilling the circuit boards or requiring extra hardware.

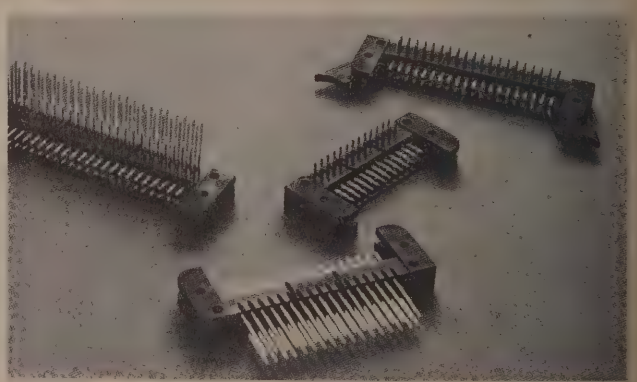
The D*P is fully intermateable with all D-Subminiature connectors, whether insulation displacement solder or crimp-on design. Mating is complete even where junction shells are used, as in telephone industry applications.



Mas/Ter G08 HEADERS (SHROUDED)

Mas/Ter G08 headers are used to interconnect electrically rigid printed circuit boards with ribbon cable socket connectors. They are designed for applications that require a fast and reliable disconnect/connect capability, and are available with or without a locking latch feature. The ITT Cannon locking system provides a positive, secure grip on the receptacle and also incorporates an ejection feature to simplify disconnection. The receptacle is ejected when the locking latches are released. These locking latches are ruggedly pinned to the insulator and will not release until a sideways pressure is exerted.

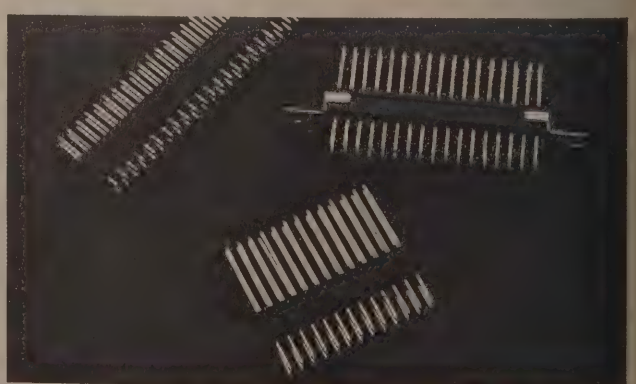
Mas/Ter G08 headers are available in both straight and right-angle mounting configurations, with contact termination by solder or wrap posts. In this version, a plastic shroud along one side protects the engaging end of the male electrical contact.



Mas/Ter G08 HEADERS (UNSHROUDED)

Mas/Ter G08 unshrouded headers are available in a double readout version accommodating from 8 to 70 contacts with termination by solder or wrap posts. They are available in straight configurations with or without mounting brackets for a variety of mounting applications.

Mas/Ter G08 headers are used to interconnect electrically rigid printed circuit boards with UBC crimp housings or ribbon cable socket connectors.



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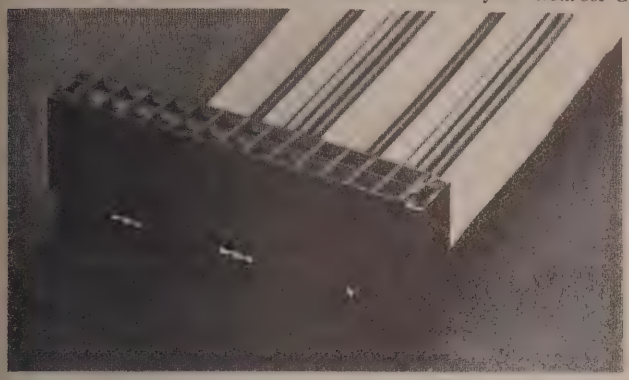
ITT CANNON ELECTRIC

MAS/TER™—IDC INSULATION DISPLACEMENT CONNECTORS

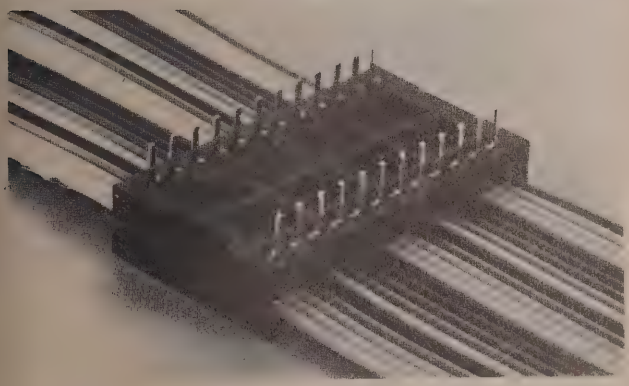
For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).



Mas/Ter G08 RECEPTACLES

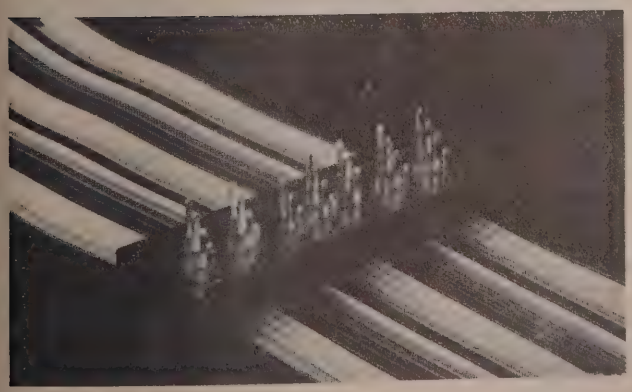
Mas/Ter G08 double readout socket receptacles mate with .025" (0.64) square or round posts staked into the printed circuit board or with the Mas/Ter G08 headers described on pages 8-11. They are available in a variety of arrangements accommodating from 10 to 50 contacts, and in open (feed-through or daisy chain) and closed-end styles.

These Mas/Ter receptacles terminate cable quickly and efficiently without stripping the insulation, and 50 or more conductors can be terminated simultaneously. Polarization is by a visual marking arrow shown on the insulator which aligns with a corresponding arrow on the mating G08 header.



Mas/Ter RTG08A DUAL INLINE PLUG CONNECTORS

Mas/Ter DIP connectors terminate directly to ribbon cable and can be permanently soldered to a printed circuit board, or used as a plug-in for standard IC sockets. These connectors offer a low cost method of attaching a ribbon cable to the printed circuit board as only one connector is required. Due to its low profile design, this arrangement saves space vertically permitting greater packaging densities.



Mas/Ter RTG08B PC BOARD TRANSITION CONNECTORS

Mas/Ter RTG08B PCB connectors allow direct termination of the ribbon cable to the printed circuit board without the use of a mating connector. These connectors terminate directly to the ribbon cable with the contact tail soldered directly to the etched and drilled circuit eyelets of the printed circuit board. It is a fast, economical method of terminating ribbon cable to a PC BOARD AS ONLY ONE CONNECTOR IS REQUIRED. It can also be used for daisy chain or end type termination requirements.

Mas/Ter G03 EDGECARD CONNECTORS

Mas/Ter G03 edgecard connectors are used to facilitate easy replacement of PC BOARDS IN SYSTEMS. These connectors are mass terminated to the ribbon cable and then mated directly with the etched electrical circuit pads of a PC DAUGHTERBOARD. If a series of edgecard connectors are terminated to the same cable, they can be "daisy chain" connected from daughter-to-daughter board. The cable assembly can then act as a motherboard (backpanel) interconnecting method of packaging.

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MAS/TER™ — IDC INSULATION DISPLACEMENT CONNECTORS

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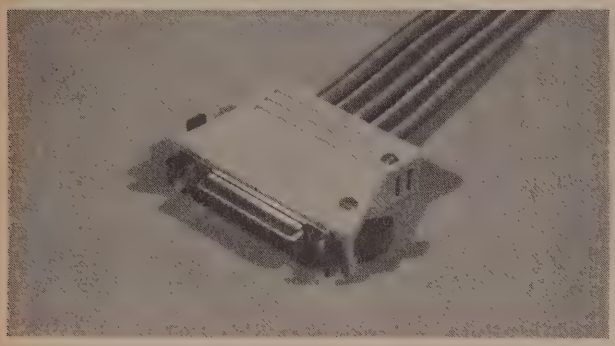
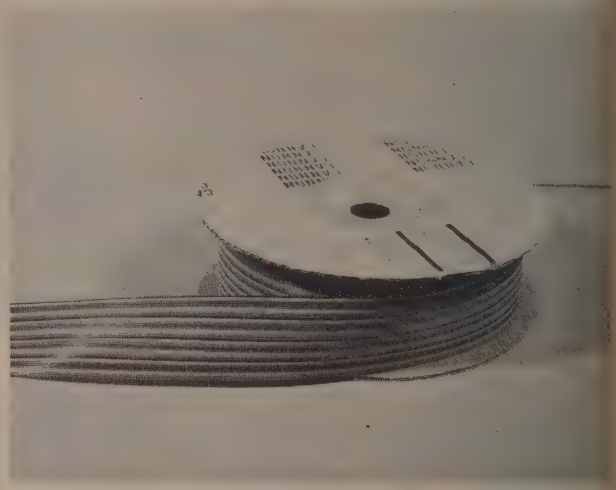
JUNCTION SHELL FOR Mas/Ter-D RIBBON CABLE CONNECTOR



The junction shell is made of light grey thermoplastic, and is also available with an optional locking mechanism.

Mas/Ter RIBBON CABLE



Mas/Ter-IDC FAMILY TERMINATION TOOLING

The lower total installed cost of the Mas/Ter interconnect system is achieved through a quick, simple termination procedure. The entire operation is performed at a single work station with a single stroke of the press, with no stripping of insulation and no complex tooling.

All of the Mas/Ter-IDC family of connectors can be terminated by one press. A single locator block with grooves fits all Mas/Ter GO and Mas/Ter RTGO connectors. A second locator block terminates the Mas/Ter-D Series. The ease of change in the tooling is a major feature. All Mas/Ter GO and Mas/Ter RTGO series connectors are placed into locator block in a pre-assembled, pre-loaded condition which makes handling fast and simple. A pneumatically operated version is available to ease operator fatigue on higher volume production.

CABLE SPLITTING

When terminating ribbon cable having .050" (1.27) centers, an interim step splits the cable into groups of three (3) and four (4) conductors and slightly spreads the groups to fit into a locator comb in the terminator press. The manually operated press is lightweight (10 pounds) and all required guides are included.

- Available as flat cable or twisted pairs, fully compatible with Cannons Mas/Ter Interconnect System.
- Fast, simple mass termination of all conductors and twisted pairs simultaneously reduces installation costs and errors.
- Precise spacing of all conductors and twisted pairs assures predictable, consistent performance.
- Light and flexible to save weight and space.
- Color coded for easier traceability.
- UL-recognized conductor and cable styles.

FLAT RIBBON CABLE

Ribbon cable Is fabricated with #28 AWG 7-strand conductors laminated into flat cables. Conductors are precisely positioned on .050" (1.27) centers. Standard laminating material is self-extinguishing PVC, with other materials available.

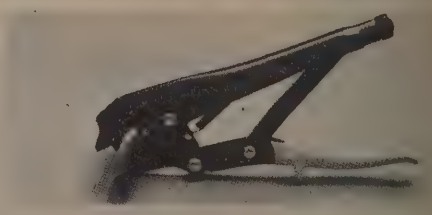
TWISTED PAIR RIBBON CABLE

Twisted pair ribbon cables are fabricated with alternating 18" (457.2) lengths in which conductors are twisted pairs, and 2" (50.8) lengths in which all conductors are laid out straight, parallel and on .050" (1.27) centers. Conductors are PVC—LAMINATED #28 AWG, 7-strand pre-insulated wires, with from 20 to 50 conductors (10 to 25 pairs) per cable.

CABLE SPLITTER

HAND TERMINATION PRESS

HAND CRIMP TOOL



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ITT CANNON ELECTRIC

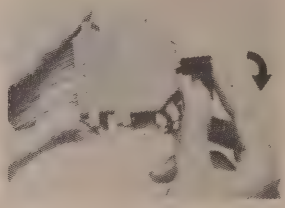
DL "ZIF" RECTANGULAR CONNECTORS

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

CANNON DL SERIES ZERO INSERTION FORCE CONNECTORS ARE LONG-LIVED, FAST AND INEXPENSIVE

This is our "DL" Series.

Simply place it together.



Turn the cam lock a quarter turn.

It's locked and mated.

The Cannon DL Series of ZIF connectors fills the need in the commercial/industrial, computer and peripheral equipment market places for low-cost, high performance multiple-wire power and signal connectors.

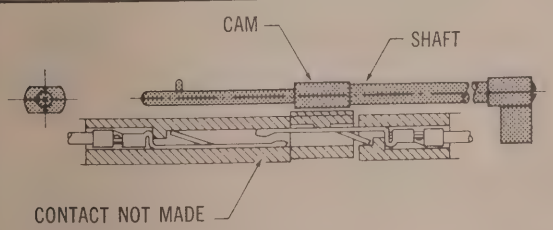
DL connectors feature: a minimum rated life of 10,000 complete mating and unmating cycles with no performance loss; can be mated and unmated in less than two seconds even with as many as 2,496 contacts; and they cost less (often as much as 25% less) per mated line than competitive high-density rack-and-panel connectors.

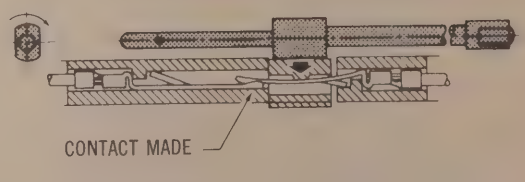
The long life and rapid mating are achieved through the use of our Zero Insertion Force design. Contacts in the plug and receptacle do not touch each other while the connector halves are being engaged. Instead, the plug is placed over the receptacle, then a quarter turn of an actuating shaft mates all the contacts at once, while also physically locking the connector halves together. Connector engagement force is zero, and the only wear on the contacts occurs as they are pressed together and lightly wiped past each other during the camming and locking operation.

Simple. Effective. And reliable.

Combining their special design with commercial-grade materials and low cost crimp and wrappable hermaphroditic contacts that may be hand or machine terminated makes the DL Series of ZIF connectors the finest low-cost-per-mated-line I/O connectors available today.

For more information, contact your nearest ITT Cannon Field Office.





STANDARD DATA

MATERIALS AND FINISHES

Connectors
- Glass filled thermoplastic insulator
- Copper alloy contacts
- Stainless steel insulator retainer
- Stainless steel cam actuator
- Contacts plated .000020" gold over .000050" nickel or 90/10 tin lead, electrodeposited

Accessories
- Thermoplastic junction shell
- Stainless steel cable clamp
- Glass filled nylon actuating handle
- Polyvinyl chloride protective boot
- Polyethylene protective cap

MECHANICAL FEATURES
- Crimp or wire wrapping contacts
- 60, 96, 156, 624, 1248 or 2496 contact positions
- Multiple polarizing positions
- 8 lbs. (35,585 N) min. contact retention
- Permanent raised cavity identification
- Actuation by screwdriver, socket wrench, allen wrench (for DLI, 2 and 3 only) or handle

ELECTRICAL DATA
- Ambient Operating Temperature: See page 128
- Wire Range: 18 AWG thru 30 AWG (solid or stranded)
- Current Rating: 5 amps (see page 128)
- DWV: 1200 VAC at sea level
- Contact Resistance: 15 milliohms max.
- 5000 megohms insulation resistance min.

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DL "ZIF" RECTANGULAR CONNECTORS

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HOW TO ORDER

(Millimeters are in parentheses)

STANDARD PLUGS AND RECEPTACLES

The basic DL connector is a standard plug and receptacle for applications requiring cable-to-cable, cable-to-panel and panel-to-panel interconnections. Either crimp or wrap post contacts may be used in any connector. DL Series connectors are available in shell sizes 1, 2, 3 and 4.

DL 4-2496 RW 4

Series Prefix

Shell Size
1, 2, 3 or 4

Number of Contacts
Shell Size 1: 156 Contacts
Shell Size 2: 96 Contacts
Shell Size 3: 60 Contacts
Shell Size 4: Three shell sizes — 2496 Contacts or 1248 Contacts or 624 Contacts

Shell Style
P — Plug (crimp contacts must be ordered separately)
R — Receptacle (crimp contacts must be ordered separately)
PW — Plug with wrap post contacts and adapter assembled (with front insertable/removable contacts)
RW — Receptacle with wrap post contacts and adapter assembled (with front insertable/removable contacts)
Note: DL1, 2 and 3 receptacles are also available with rear-entry wrap post contacts.

.025" (0,64) Square Wrap Post Tail Length
(Use only when specifying front removable wrap post contacts) 4: .605" (15,37) nominal

POLARIZED PLUGS AND RECEPTACLES

Polarizing is available only on DL1, 2 and 3 connectors, and requires three digits. If no polarization required, leave blank.

DL 1-156 RW 4 X X C

Series Prefix

Shell Size
1, 2 or 3

Number of Contacts
Shell Size 1: 156 Contacts
Shell Size 2: 96 Contacts
Shell Size 3: 60 Contacts

Shell Style
P — Plug (crimp contacts must be ordered separately)
R — Receptacle (crimp contacts must be ordered separately)
PW — Plug with wrap post contacts and adapter assembled (with front removable/insertable contacts)
RW — Receptacle with wrap post contacts and adapter assembled (with front removable/insertable contacts)
Note: DL1, 2 and 3 connectors are also available with rear-entry wrap post contacts.

.025" (0,64) Square Wrap Post Tail Length
(Use only when specifying front removable wrap post contacts) 4: .605" (15,37) nominal

Polarizing Position of Post Location A
(1 thru 6)

Polarizing Position of Post Location B
(1 thru 6)

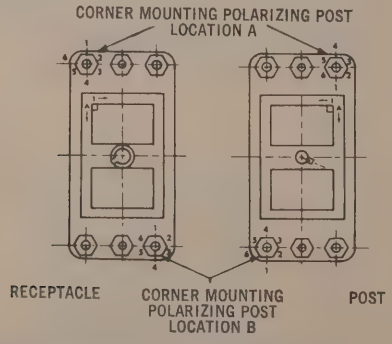
Corner Polarizing Post
Standard

EXAMPLE:
DL1-156RW432C describes a Size 1 receptacle connector with 156 front insertable/removable wrap post contacts with polarization position 3 at location A and position 2 at location B.

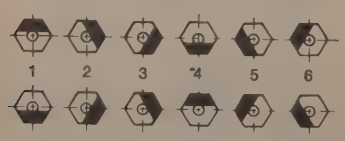
Note:
All corner mounting polarization is accomplished by replacing the nut with the polarizing post (Part No. DL-Pol-Post)

EXAMPLE:
Receptacle DL1-156RW432C would mate with plug DL1-156PW432C.

CORNER POLARIZING POST LAYOUTS (FOR CUSTOMER REFERENCE ONLY)



DL1-156, DL2-96 and DL3-60
REFERENCE VIEWS FOR POLARIZING ARRANGEMENTS



NOTE: All polarizing is accomplished by installing P/N DL-POL-POST in corners. May be used in place of mounting nut.

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DL "ZIF" RECTANGULAR CONNECTORS

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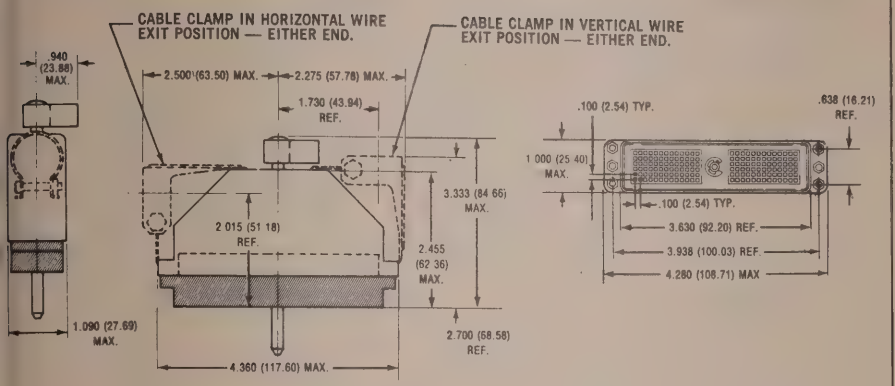
SHELL DIMENSIONS

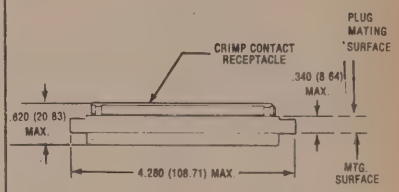
Dimensions subject to change.
(millimeters are in parentheses)

CRIMP CONTACTS

PLUG DL1-156P

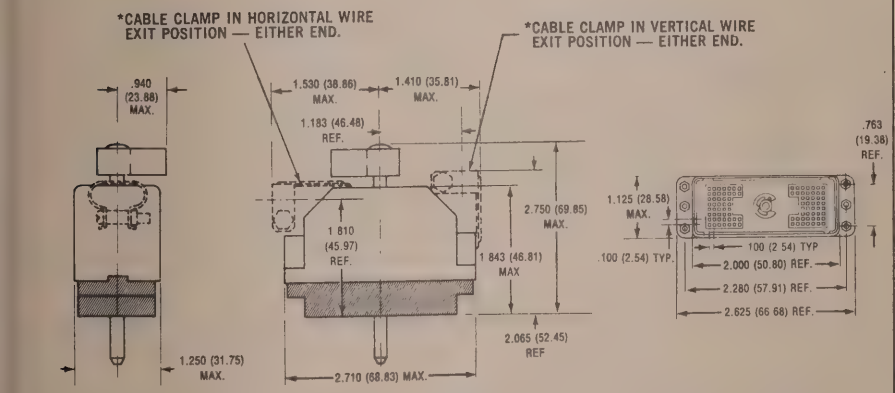


RECEPTACLE DL1-156R

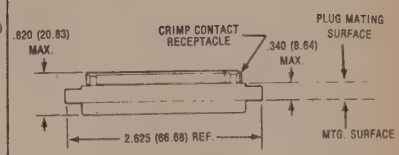


Note: Handle, clamp, and junction shell must be ordered separately.

PLUG DL2-96P

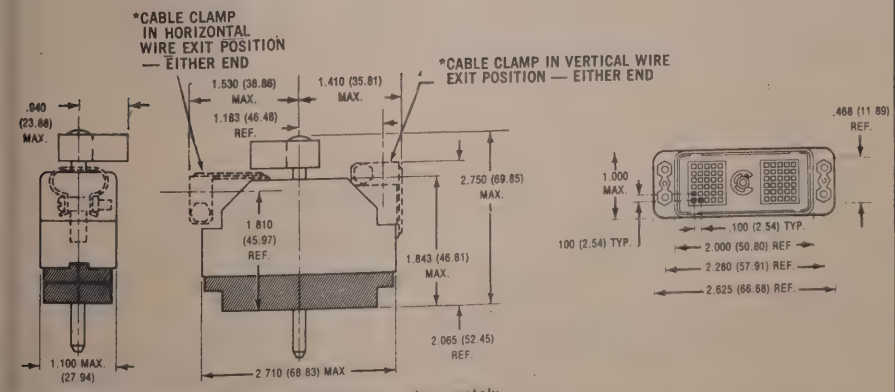


RECEPTACLE DL2-96R

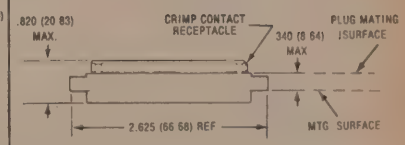


Note: Handle, clamp, and junction shell must be ordered separately.

PLUG DL3-60P



RECEPTACLE DL3-60R



Note: Handle, clamp, and junction shell must be ordered separately.

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DL "ZIF" RECTANGULAR CONNECTORS

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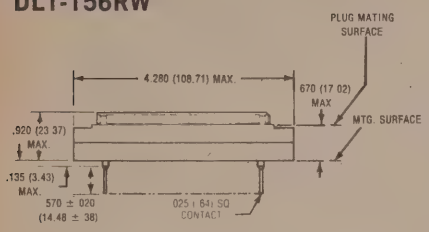
SHELL DIMENSIONS

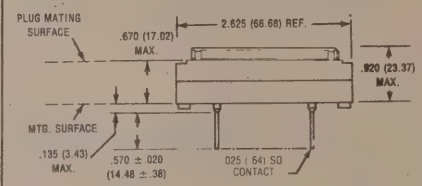
Dimensions subject to change.

SQUARE WRAP POST RECEPTACLES

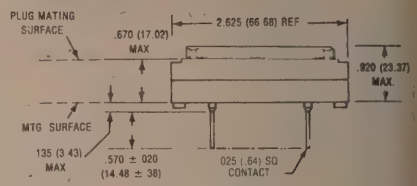
DL1-156RW



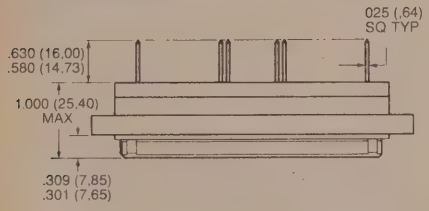
DL2-96RW



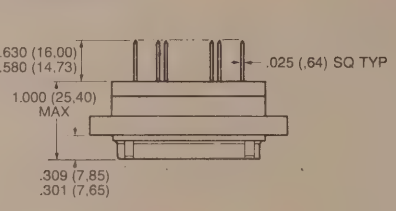
DL3-60RW



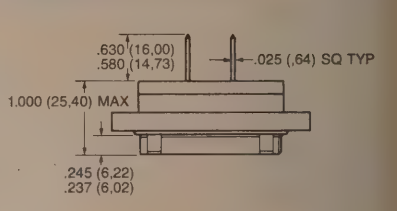
DL1-156RW4



DL2-96RW4

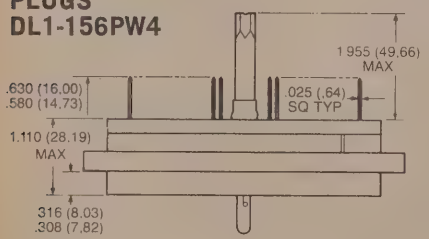


DL3-60RW4

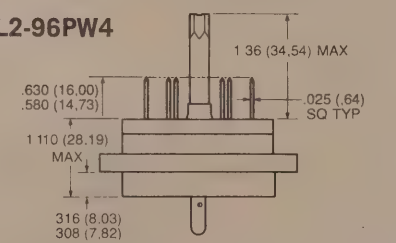


PLUGS

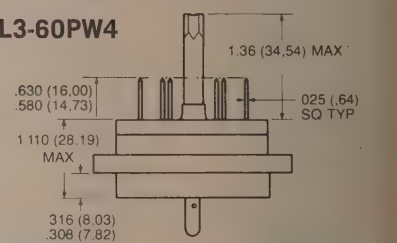
DL1-156PW4



DL2-96PW4



DL3-60PW4



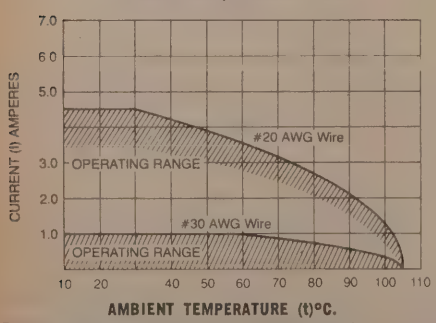
(millimeters are in parentheses)

TEMPERATURE/CURRENT RATING

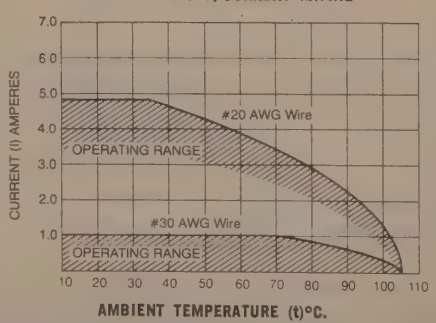
The curves shown represent the rated current carrying capacity of the Cannon DL1, DL2 and DL3 electrical connectors, derated to 80% of the values recorded using the methods specified by International Electro-Technical Commission Document 48 (1975).

Current was applied to the total connector (all contacts) in one-half ampere increments and maintained at each current level until thermal stability was achieved. A thermocouple inserted into the "hottest area" of each connector then measured the connector temperature at the same time that an ambient temperature reading was taken. The difference between the two measured values is the heat rise or self-heating created solely by the current flow, and this temperature rise for each current level was deducted from the insulator material rated temperature. These values were then derated to 80% to obtain the curves below.

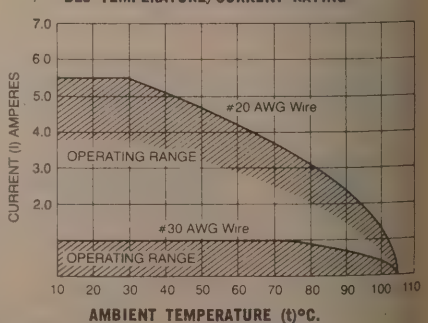
DL1 TEMPERATURE/CURRENT RATING



DL2 TEMPERATURE/CURRENT RATING



DL3 TEMPERATURE/CURRENT RATING



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DL "ZIF" RECTANGULAR CONNECTORS

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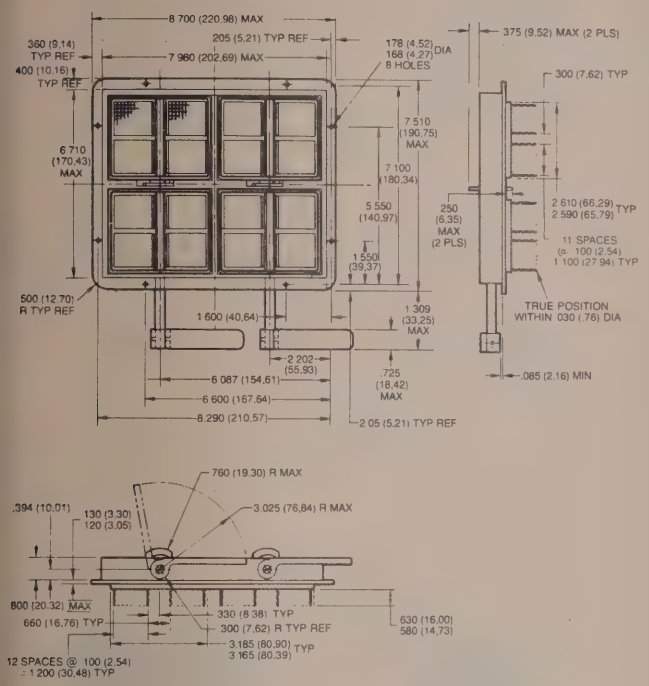
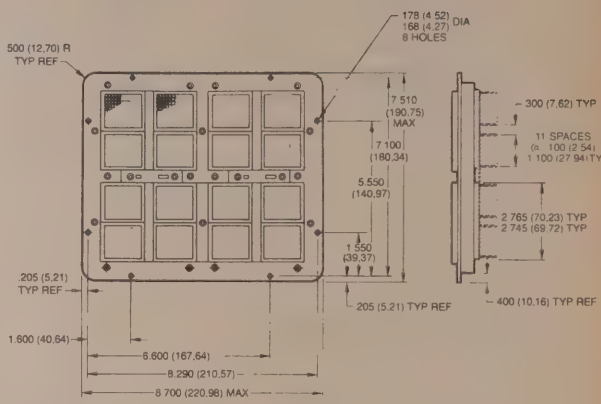
SHELL DIMENSIONS

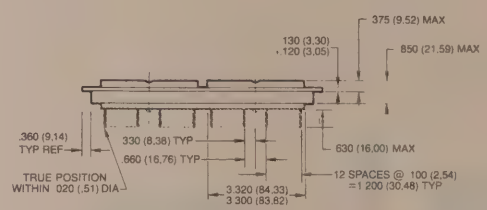
Dimensions are subject to change.
(millimeters are in parentheses)

DL4-2496P AND PW4 PLUGS



DL4-2496R AND RW4 RECEPTACLES





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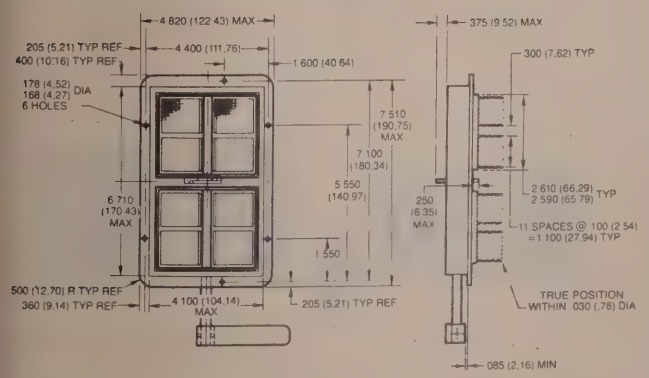
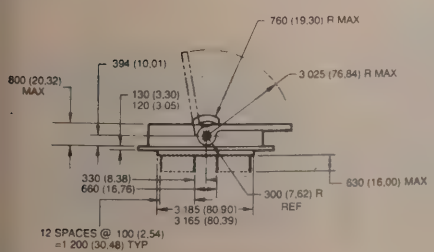
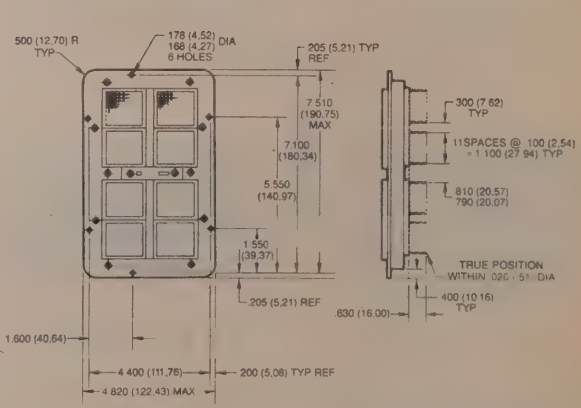
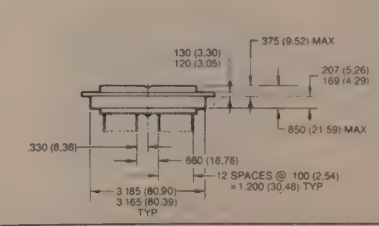




DL4-1248R AND RW4 RECEPTACLES





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SHELL DIMENSIONS

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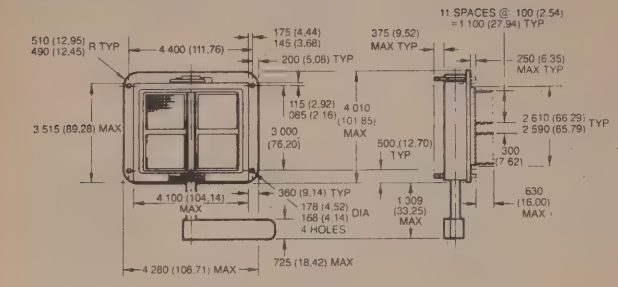
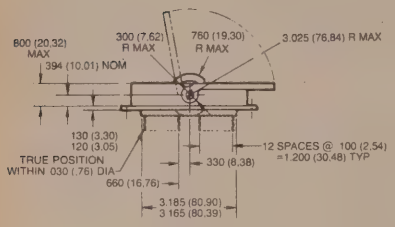
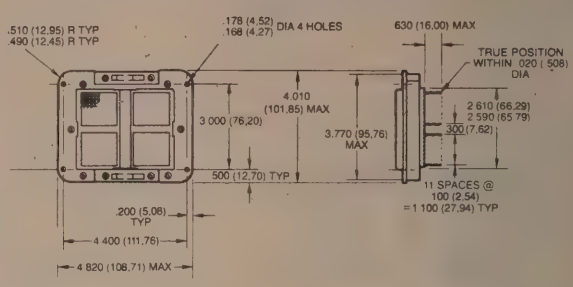
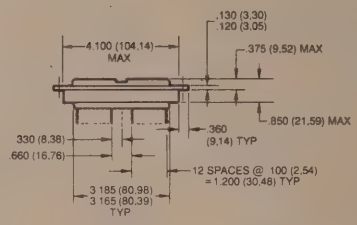
DL4-624P AND PW4 PLUGS



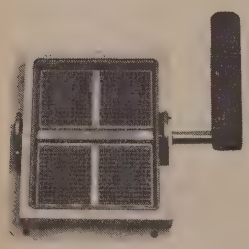


DL4-624R AND RW4 RECEPTACLES

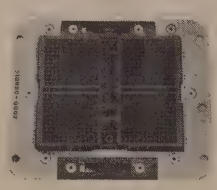




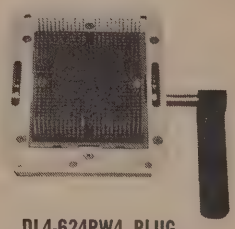
PLUGS AND RECEPTACLES



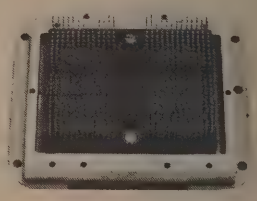
DL4-624P PLUG



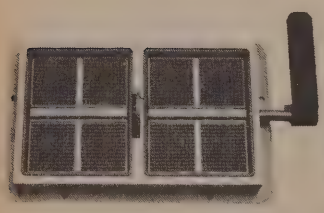
DL4-624R RECEPTACLE



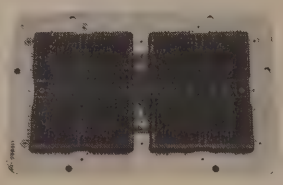
DL4-624PW4 PLUG



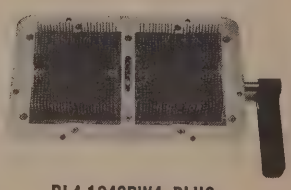
DL4-624RW4 RECEPTACLE



DL4-1248P PLUG



DL4-1248R RECEPTACLE



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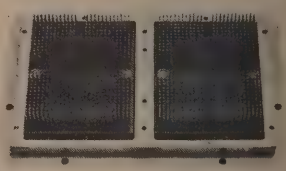

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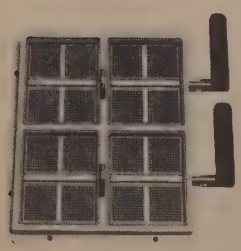

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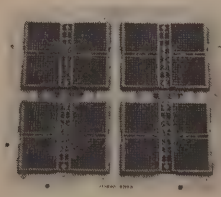

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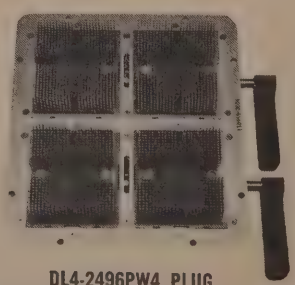

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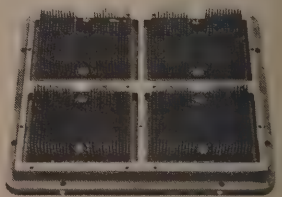

DL4-2496RW4 RECEPTACLE

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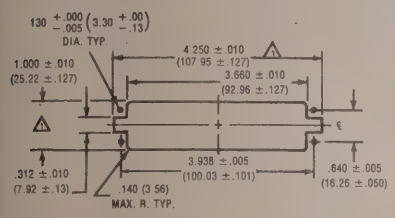
PANEL CUTOUTS

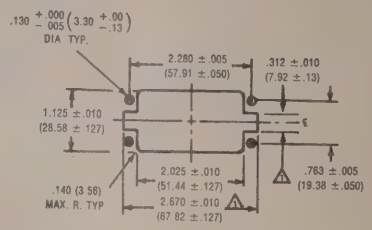
Dimensions subject to change.
(Millimeters are in parentheses)

STANDARD PLUGS AND RECEPTACLES

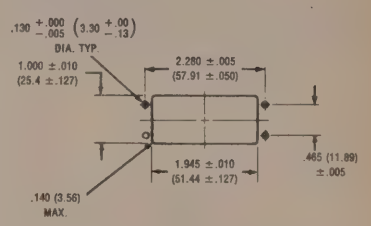
DL1-156



DL2-96

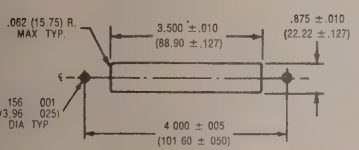


DL3-60

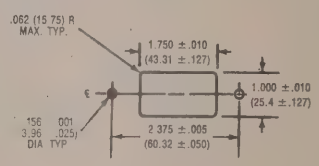


.025" (0,64) SQUARE POST RECEPTACLE PLATE CUTOUTS

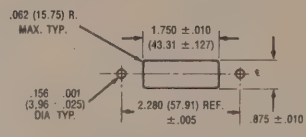
DL1-156RW



DL2-96RW



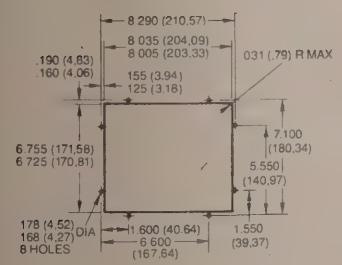
DL3-60RW



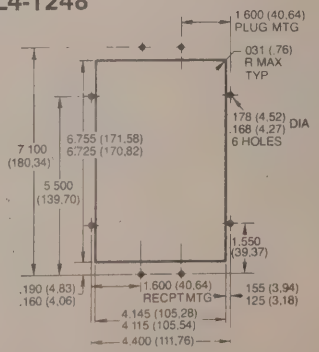
⚠ REQUIRED FOR CENTER MOUNTING POLARIZATION ONLY

DL4 SERIES PLUGS AND RECEPTACLES (CRIMP AND .025" (0,64) SQUARE POST CONTACTS)

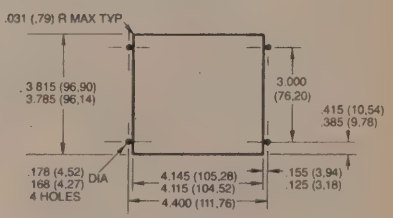
DL4-2496



DL4-1248



DL4-624



ACCESSORIES

JUNCTION SHELL KITS

(Standard for DL1)

PART NO. DL1-J/S

- Stainless steel cable clamps
- Fits on plug or receptacle housing
- Cable clamp can be mounted for right angle and straight cable entry
- Knockout plug provides alternate second cable entry

(Standard for DL3)

PART NO. DL3-J/S

- Stainless steel cable clamps
- For max. .625 (15,9) cable entry
- 90° or 180° cable entry

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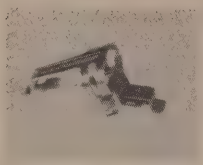
ACCESSORIES

CABLE CLAMPS

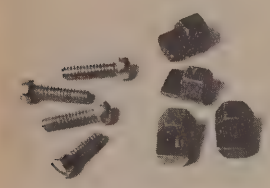
PART NO. DL1-C/C
- For use on DL1 junction shell only



PART NO. DL2-C/C
- Also used on DL3 junction shell

Standard for DL2)

PART NO. DL2-J/S-LRG-C/C
- Stainless steel cable clamps
- For .625" (15,9) max. cable entry
- Two piece junction shell
- 45° cable entry



(Standard for 1-156, 2-96 and 3-60)

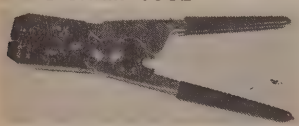
CORNER MOUNTING POLARIZING KIT
PART NO. DL-POL-POST
- Provides multiple polarizing positions

NOTE: For center mounting polarizing kit for DL1-156 and 2-96 please consult the factory.

ACTUATING HANDLE KIT
PART NO. DL-HANDLE
- Provides a convenient method of actuating the contacts and cam for locking the connector
- Kit provides actuating handle and attaching self tapping screw
- Pointer on handle denotes "locked" and "open" positions

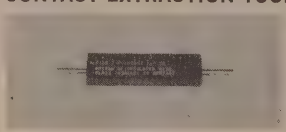
TOOLING

HAND CRIMP TOOL



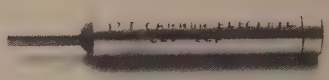
Part No. CCT-DL (for AWG 20 thru 30 wire)

CONTACT EXTRACTION TOOL



Part No. CET-DL-2

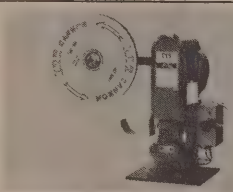
FRONT REMOVABLE CONTACT EXTRACTION TOOL



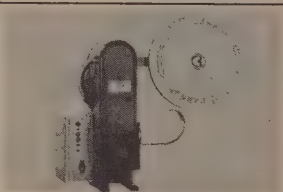
PART NO. CET-ECP
Front removable .025 (,64) Square Wrap Post Contact Extraction Tool.

SEMI-AUTOMATIC CRIMPING MACHINES (FOR REEL CARRIED CONTACTS)

Designed to meet high volume crimping requirements with 10,000 reel carried contacts on each reel. Modified "B" type crimp with wrap-around insulation support. Crimp machine and die set can be ordered together or separately.



ABT-500DL (Part No. 070186-0002)
Crimp machine. Die sets available for crimping contacts on pre-stripped individual #18 thru #30 AWG wires.



ABT-500CCS (Part No. 070232-0000) Stripper Crimper
Stripper-Crimper machine. Die sets available for stripping wire and crimping contacts onto multi-conductor jacketed cable in #18 thru #30 AWG sizes.

ABT-606DL (Part No. 070293-001)
Pneumatic crimp machine for crimping contacts onto pre-stripped individual #18 thru #30 AWG wires. Used by customers requiring moderate quantities of contacts.

CONTACTS

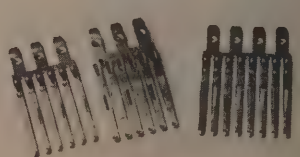
LOOSE

- Hermaphroditic for low cost

REELED

- Crimp removable with .025 (0,64) sq. posts for wire wrapping

BUSSING



- Accommodates #18 thru #30 AWG wire

Crimp type	Loose	Reeled	Plating
#22 thru #30 AWG	030-2064-010	110238-0039	.000020(,0005) gold
#20 thru #22 AWG	030-2064-014	110238-0167	over
#18 AWG	030-2064-028	110238-0207	.000050(,0012) nickel

DL Buss Contacts (Loose)	
DL-C, Buss 1 pair	030-7380-001
DL-C, Buss 2 pair	030-7380-002
DL-C, Buss 3 pair	030-7380-003
DL-C, Buss 4 pair	030-7380-004
DL-C, Buss 5 pair	030-7380-005
DL-C, Buss 6 pair	030-7380-006

Consult factory for information on buss contact removal tool.

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Cannon can!

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In electronic systems today, space is becoming a precious commodity. More and more is being designed into less and less space, with resulting demands for reductions in size and weight yet with no relaxation of reliability requirements.

A frequent choice for interconnecting microminiature systems has been hard-wiring—in spite of the loss of plugability and versatility—because conventional connectors are too large.

But there is a better choice.

Cannon microminiature connectors.

Our microminiature connectors are available with densities as high as 1600 contacts per square inch and, with reliability in excess of 99.9%, provide the reliability of hard-wired systems with none of the drawbacks. Three basic contact families encompass 40,000 standard line items that may be used in their standard configurations, readily and inexpensively modified for your specific applications, or provided in completely assembled, wired and tested multiple connector harnesses.

We have manufactured hundreds of millions of contact lines in our microminiature connectors and have a high volume capability and range of designs that make our microminiature connectors competitive in even the most cost-conscious commercial applications.

Our microminiature connectors are flying in artillery shells where they withstand 20,000 G shocks and in model airplanes, computer mainframes and peripherals, seismic streamers and portable radios.

The key to the high performance and reliability of Cannon microminiature connectors is the Twist Pin Contact* system. In this design, the conventional positions and action of the pin and socket are reversed. The spring action is in the flexible Twist Pin, not the socket, and the socket is exposed while the pin is recessed within a positive alignment cavity within the insulator.

The flexible Twist Pin Contact consists of several strands of wire in a compressible spiral which is welded at both ends, with one end crimped into a tubular sleeve. During mating, the protruding socket is guided into the pin cavity by the lead-in chamfer.

The walls of the pin cavity keep the pin within the capture radius of the socket, while the controlled radius on the pin tip combines with the interior chamfer of the socket to cam the pin into alignment, assuring positive mating. Once mated, the compression of the pin spring members exerts a constant pressure that ensure electrical continuity and resists the highest levels of shock and vibration.

These contacts are used in all three basic families of Cannon microminiature connectors: the CENTI line, with 5 amp Twist Pin contacts on .100" (2.54 mm) and .075" (1.91 mm) centers; the MICRO line with 3 amp Twist Pin contacts on .050" (1.27 mm) centers;

*Licensed by New Twist

Micro line

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

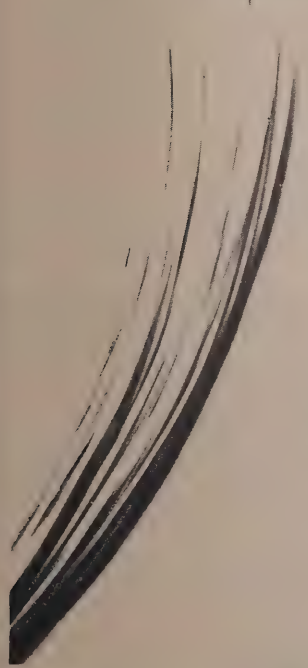
and the NANO line, with 1 amp Twist Pin contacts on .025"(0.64 mm) centers. Connectors are available in miniature rectangular, circular, center jackscrew, strip and many other special configurations. The MICRO and NANO lines can be ordered in metal and plastic shells; with solder pots and P.C. tail terminations; in your choice of several insulator materials, some with interfacial seals; as standard catalog items or customized versions; with coax or 16 amp power contacts; and in complete multi-connector

Nano line

Centi line

harnesses. The CENTI line is available as connectors you wire yourself or in complete assembled harnesses.

Those products described here that are not shown in the following pages are in our complete Microminiature Catalog (MMC). For this complete catalog and for more information and applications assistance, contact your nearest ITT Cannon Electric field office, or call our Microminiature Products Group at our 24-hour toll-free number. (800) 854-3573; in California, (800) 432-7063.



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For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

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For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

Section I: The MICRO Line

The Cannon MICRO Series established the standards for performance and reliability in microminiature interconnects. Exceptionally versatile, MICRO connectors are available in rectangular, circular, and strip configurations, with 3 amp MICROPIN®/MICROSOCKET® contacts on .050" (1.27 mm) centers, or with special arrangements of power and coaxial contacts.

The heart of the Cannon MICROPIN/MICROSOCKET contact system is a multi-element Twist Pin Contact recessed within an insulating housing. The rugged, cylindrical sockets are mounted in the exposed half of the connector. When connector halves are mated, the chamfered sockets are first aligned by the connector body, then guide the spiral MICROPIN contacts into proper and positive alignment, even under worst-case tolerance conditions. This is Cannon's POS-A-LINE® connector design.

The multiple spring elements of the MICROPIN, then under compression, form a multipoint contact system of high mechanical and electrical integrity. Contacts will provide fail-safe reliability over thousands of mating and unmating cycles, and have proven themselves in applications that range from commercial products to equipment that has been landed on the moon.

STANDARD DATA

- Contact rating—3 amps max.
- Minimum contact centers—0.050" (1.27 mm).
- Wire sizes—#26 thru #30 AWG, stranded or solid.
- Contact termination—multiple indent crimp.
- Contact retention—fixed via epoxy.
- Contact materials and finish—Copper alloy, gold-plated per MIL-G-45204, Type II, Grade C, Class 1.
- Mating/unmating force—8 oz. per contact, max.

PERFORMANCE DATA

The table below summarizes the results of key tests performed in accordance with MIL-STD-202, where applicable. Data is applicable to standard connectors with standard terminations. Variations may affect this data, so please consult the factory for further information on your requirements.

TEST	METHOD	CRITERIA OF ACCEPTANCE
Dielectric Withstanding Voltage	Method 301: 900 VAC at sea level 300 VAC at 70,000' altitude Solder Pots at 600 VAC at sea level Shielded Cable 150 VAC at 70,000' altitude	 No breakdown No breakdown
Insulation Resistance	Method 302, Condition B	5,000 megohms minimum
Thermal Shock	Method 107, Condition B: −65°C to +125°C	No physical damage
Physical Shock	Method 213, Condition I: 100 G's, 3-axes, 6 millisecond duration sawtooth pulse	No physical damage No loss of continuity >1 μsec
Vibration	Method 204, Condition B: 15 G's, 10-2,000 Hz, 12 hrs.	No physical damage No loss of continuity >1 μsec
Durability	500 cycles of mating and unmating, 500 CPH max.	No mechanical or electrical defects
Moisture Resistance	Method 106, Condition B	Insulation resistance >100 megohms
Salt Spray	Method 101, Condition B: 48 hours	Shall be capable of mating and unmating, and meet contact resistance requirements
Contact Resistance	Method 307: At 3 amps At 1 milliamp	 8 milliohms maximum 10 milliohms maximum
Contact Retention	— —	5 lb. minimum axial load

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

MICROMINIATURE CONNECTORS MDM SERIES

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

INTRODUCTION

MDM connectors are used in applications requiring highly reliable, extremely small, lightweight connectors. They are available in 7 shell sizes accommodating from 9 to 1 contacts, and special arrangements of power and coaxial contacts.

These connectors are designed to meet the rapidly increasing demands for an environmental, high performance, rugged, moisture-sealed microminiature connector. This connector employs size 24 MICROPIN® /MICROSOCKET® contacts on .050" (1,27 mm) centers in a contact density identical to the standard MICRO-D connector series, but with these additional features:

- Aluminum shells to provide greater strength, prevent chipping, cracking or breaking, offer electromagnetic (EMI) and RFI shielding.
- Silicone elastomer compression interfacial seal to provide a complete moisture and humidity seal between each contact and between contacts and shell.

For further technical and applications information, contact your nearest ITT Cannon Electric field office or call our Microminiature Products Group at our 24-hour toll-free number: (800) 854-3573; in California, (800) 432-7063.

STANDARD DATA

STANDARD MATERIALS AND FINISHES

Shell	— Aluminum alloy, cadmium plate, yellow chromate
Insulator	— Glass-filled diallyl phthalate per MIL-M-14, Type SDGF.
Contacts	— Copper alloy, gold plate
Jackscrew & Jackpost	— 300 Series stainless steel, passivate

ELECTRICAL DATA

No. of Contacts	— 9 thru 51 standard; 5 signal/2 coaxial; 5 signal/2 power; 20 signal/4 coaxial; 20 signal/4 power
Coaxial Cable	— RG-196/U and RG-178/U
Wire Size	— #26 thru #30 AWG
Contact Termination	— Crimp stationary

MECHANICAL FEATURES

Size or Length	— 7 sizes
Service Classes	— Environmental
Coupling	— Friction/jackscrews
Polarization	— Keystone-shaped shells
Contact Spacing Centers	— .050 (1,27)
Shell Styles	— Plug and receptacle

HOW TO ORDER

MDM - 51 P H 001 P - XXX

- Series
- Contact Layout
- Contact Type
- Termination Type
- Termination Code
- Hardware
- Shell Plating Mods

SERIES
Micro D Metal Shell Series

CONTACT ARRANGEMENTS
9-15-21-25-31-37-51 (standard)
7C2, 24C4 (coaxial)
7P2, 24P4 (power)

CONTACT TYPE
P = Pin
S = Socket

TERMINATION TYPE
H = Harness-insulated wire.
L = Solid-uninsulated wire.
S = Solder pot to accept #26 AWG MAX. harness wire.

TERMINATION CODE*
(H) 001 = 18" #26 AWG-MIL-W-16878-Type E Teflon, yellow.
(H) 003 = 18" #26 AWG-MIL-W-16878-E Teflon, color coded to MIL-STD-681 System I.
(L) 1 = ½" uninsulated solid #25 AWG gold plated copper.
(L) 2 = 1" uninsulated solid #25 AWG gold plated copper.

HARDWARE
P = Jackpost
K = Jackscrew — standard
L = Jackscrew — low profile
F = Float mounting
B = No hardware

SHELL FINISH MOD CODES

No Number	= Standard cadmium yellow chromate
A174	= Electroless nickel
A172	= Gold over nickel
A141	= Irridite/alodine
A30	= Black anodize

*See below for additional Termination Codes.

NOTE: For other modification not listed, consult the factory.

(millimeters are in parentheses)

STANDARD WIRE TERMINATION CODES

The following termination codes are listed for your information. For lengths not shown, consult factory for proper modification code. All wire lengths are minimum.

HARNESS TYPE (H)
#26 AWG per MIL-W-16878 type E. Teflon stranded.

Length	All Yellow	Color Coded
3(76.2)	H020	H027
6(152.4)	H019	H016
8(203.2)	H026	H034
10(254.0)	H029	H025
12(304.8)	H028	H002
18(457.2)	H001	H003
20(508.0)	H038	H023
24(609.6)	H009	H004
30(762.0)	H010	H005
36(914.4)	H011	H006
48(1219.2)	H013	H048
72(1828.8	H017	H046
120(3048.0)	H042	H041

SOLID UNINSULATED TYPE (L)
#25 AWG gold plated copper.

	Length
L61	.125(3.18)
L56	.150(3.81)
L57	.190(4.83)
L39	.250(6.35)
L58	.375(9.52)
L1	.500(12.70)
L14	.750(19.05)
L2	1.000(25.40)
L7	1.500(38.10)
L6	2.000(50.80)
L16	2.500(63.50)
L10	3.000(76.20)

Dimensions subject to change.

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

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MICROMINIATURE CONNECTORS
MDM SERIES

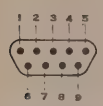
For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

Dimensions subject to change

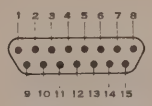
CONTACT ARRANGEMENTS

Face view of pin insert — use reverse order for socket side

STANDARD



9 CONTACTS



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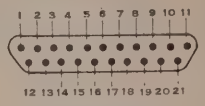
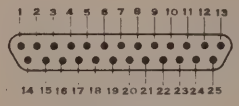


21 CONTACTS



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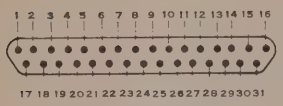
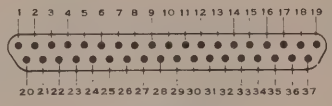
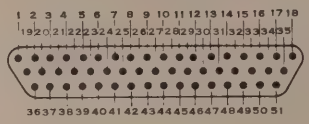


31 CONTACTS



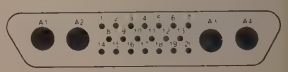
37 CONTACTS



51 CONTACTS

COAXIAL

5 MICRO CONTACTS
2 COAX OR 2 POWER



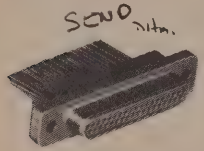
20 MICRO CONTACTS
4 COAX OR 4 POWER

Contact identification numbers do not appear on connector.

(millimeters are in parentheses)

SHELL DIMENSIONS

MDM



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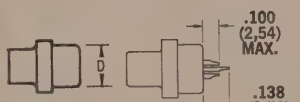

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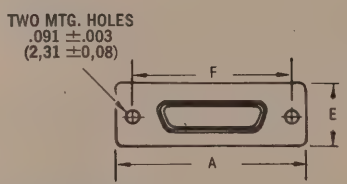

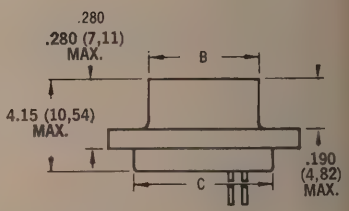

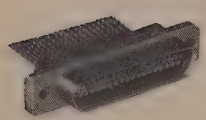

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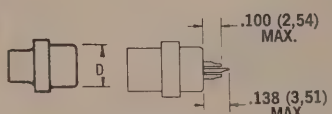

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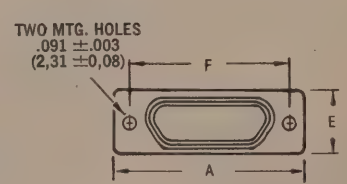

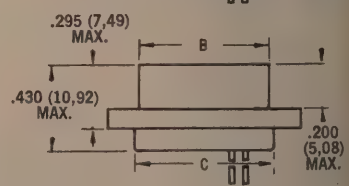

Part Number by Shell Size	A Max.	B Max.	C Max.	D Max.	E Max.	F ±.005(0,13)	Average Weights** oz(gm) ±5%
MDM-9P*	.785(19,94)	.340(8,64)	.405(10,29)	.270(6,86)	.305(7,75)	.565(14,35)	.063(1.79)
MDM-9S*	.785(19,94)	.395(10,03)	.405(10,29)	.270(6,86)	.305(7,75)	.565(14,35)	.063(1.79)
MDM-15P*	.935(23,75)	.490(12,45)	.555(14,10)	.270(6.86)	.305(7.75)	.715(18,16)	.084(2,39)
MDM-15S*	.935(23,75)	.545(13,84)	.555(14.10)	.270(6.86)	.305(7.75)	.715(18,16)	.083(2,37)
MDM-21P*	1.085(27,56)	.640(16,26)	.705(17,91)	.270(6,86)	.305(7,75)	.865(21,97)	.105(2,99)
MDM-21S*	1.085(27.56)	.695(17,65)	.705(17,91)	.270(6,86)	.305(7,75)	.865(21,97)	.104(2,97)
MDM-25P*	1.185(30,10)	.740(18,80)	.805(20,45)	.270(6,86)	.305(7,75)	.965(24,51)	.119(3,39)
MDM-25S*	1.185(30,10)	.795(20,19)	.805(20,45)	.270(6,86)	.305(7,75)	.965(24,51)	.118(3,36)
MDM-31P*	1.335(33,91)	.890(22,61)	.955(24,26)	.270(6,86)	.305(7,75)	1.115(28,32)	.140(3,99)
MDM-31S*	1.335(33,91)	.945(24,00)	.955(24,26)	.270(6,86)	.305(7,75)	1.115(28,32)	.139(3,96)
MDM-37P*	1.485(37,72)	1.040(26,42)	1.105(28,07)	.270(6,86)	.305(7,75)	1.265(32,13)	.161(4,59)
MDM-37S*	1.485(37,72)	1.095(27,81)	1.105(28.07)	.270(6,86)	.305(7,75)	1.265(32,13)	.160(4,56)
MDM-51P*	1.435(36,45)	.990(25,15)	1.055(26,80)	.310(7,87)	.345(8,76)	1.215(30,86)	.193(5,50)
MDM-51S*	1.435(36,45)	1.045(26,54)	1.055(26,80)	.310(7,87)	.345(8,76)	1.215(30,86)	.188(5,35)

*Add lead type and length; see How To Order.
**Weight given is ½", uninsulated, solid, #25 AWG gold plated copper pigtails.

NOTE: SHELL DIMENSIONS MAY BE MODIFIED UPON REQUEST. CONSULT THE FACTORY.

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

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ITT CANNON ELECTRIC

MICROMINIATURE CONNECTORS
MDM-PCB SERIES

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

INTRODUCTION

MDM-PCB connectors are designed for use with flex circuitry, flat cable and printed circuit boards. They use the standard MDM metal shell and provide high density and high reliability in board-to-board, board-to-cable and cable-to-cable applications.

MDM-PCB connectors are available in 7 shell sizes with 9 to 51 contacts. Terminations may be straight or at 90° for PCB mounting. Jackpost mounting and locking hardware is also available.

If the connectors shown in this catalog do not meet the requirements of your application, a special shape, size or layout using the standard MDM metal shell can be made available. Contact the factory for details.

For further technical and applications information, contact your nearest ITT Cannon Electric field office or call our Microminiature Products Group at our 24-hour toll-free number: (800) 854-3573; in California, (800) 432-7063.

HOW TO ORDER

MDM- 37 S BR * - ***

- Series
- Contact Arrangements
- Contact Type
- Termination Type
- Hardware
- Modification Codes

CONNECTOR SERIES Micro D metal shell

CONTACT ARRANGEMENTS 9-15-21-25-31-37-51 (see page 170 for basic arrangements)

CONTACT TYPE S = Socket
P = Pin

TERMINATION TYPE BR = 90° PCB Terminations
BS = Straight PCB Terminations
CBR = 90° Narrow Profile PCB Terminations

HARDWARE P = Jackpost
No Letter = Less Hardware

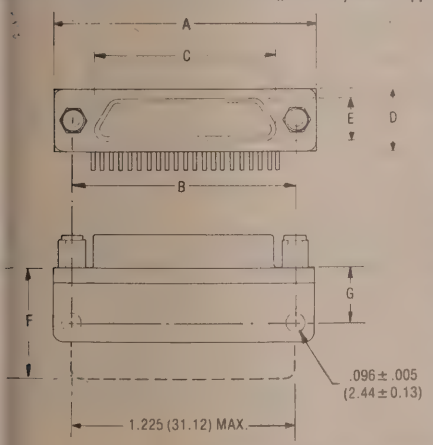
SHELL FINISH MODIFICATION CODES
No Number = Standard Cadmium over Yellow Chromate
A174 = Electroless Nickel
A172 = Gold over Nickel
A141 = Irridite/Alodine
A304 = Black Anodize

NOTE: FOR OTHER MODIFICATIONS NOT LISTED CONSULT THE FACTORY.

CBR SERIES (90° NARROW PROFILE MOUNTING)

Dimensions subject to change

NOTE: Standard lead termination is #24 AWG, solid copper, solder or tin dipped.



Part Number By Shell Size	A Max.	B ±.005 (±0.13)	C Max.	D Max.	E Max.	F Max.	G ±.010 (±0.25)
MDM-9PCBR*	.785(19.94)	.565(14.35)	.340(8.64)	.305(7.75)	.185(4.70)	.420(10.67)	.250(6.35)
MDM-9SCBR*	.785(19.94)	.565(14.35)	.395(10.03)	.305(7.75)	.245(6.22)	.420(10.67)	.250(6.35)
MDM-15PCBR*	.935(23.75)	.715(18.16)	.490(12.45)	.305(7.75)	.185(4.70)	.420(10.67)	.250(6.35)
MDM-15SCBR*	.935(23.75)	.715(18.16)	.545(13.84)	.305(7.75)	.245(6.22)	.420(10.67)	.250(6.35)
MDM-21PCBR*	1.085(27.56)	.865(21.97)	.640(16.26)	.305(7.75)	.185(4.70)	.420(10.67)	.250(6.35)
MDM-21SCBR*	1.085(27.56)	.865(21.97)	.695(17.65)	.305(7.75)	.245(6.22)	.420(10.67)	.250(6.35)
MDM-25PCBR*	1.185(30.10)	.965(24.51)	.740(18.80)	.305(7.75)	.185(4.70)	.420(10.67)	.250(6.35)
MDM-25SCBR*	1.185(30.10)	.965(24.51)	.795(20.19)	.305(7.75)	.245(6.22)	.420(10.67)	.250(6.35)
MDM-31PCBR*	1.335(33.91)	1.115(28.32)	.890(22.61)	.305(7.75)	.185(4.70)	.520(13.21)	.250(6.35)
MDM-31SCBR*	1.335(33.91)	1.115(28.32)	.945(24.00)	.305(7.75)	.245(6.22)	.520(13.21)	.250(6.35)
MDM-37PCBR*	1.485(37.72)	1.265(32.13)	1.040(26.42)	.305(7.75)	.185(4.70)	.520(13.21)	.250(6.35)
MDM-37SCBR*	1.485(37.72)	1.265(32.13)	1.095(27.81)	.305(7.75)	.245(6.22)	.520(13.21)	.250(6.35)
MDM-51PCBR*	1.435(36.45)	1.215(30.86)	.990(25.15)	.345(8.76)	.230(5.84)	.650(16.51)	.300(7.62)
MDM-51SCBR*	1.435(36.45)	1.215(30.86)	1.045(26.54)	.345(8.76)	.290(7.37)	.650(16.51)	.300(7.62)

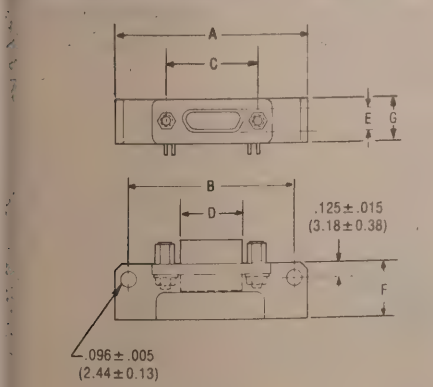
*For jackpost locking add letter "P."

CUSTOMER USE DRAWINGS 25838Y, 25839Y, 25840Y & 25841Y, AVAILABLE ON REQUEST.

CONSULT FACTORY FOR PCB PIN IDENTIFICATION NUMBERS AND FOR MOUNTING HOLE PATTERN DIMENSIONS

BR SERIES (90° MOUNTING)

NOTE: Standard lead termination is #24 AWG, solid copper, solder or tin dipped.



Part Number By Shell Size	A Max.	B ±.007 (±0.18)	C ±.005 (±0.13)	D Max.	E Max.	F Max.	G Max.
MDM-9PBR*	1.390(35.31)	1.150(29.21)	.565(14.35)	.340(8.64)	.185(4.70)	.455(11.56)	.305(7.75)
MDM-9SBR*	1.390(35.31)	1.150(29.21)	.565(14.35)	.395(10.03)	.245(6.22)	.455(11.56)	.305(7.75)
MDM-15PBR*	1.540(39.12)	1.300(33.02)	.715(18.16)	.490(12.45)	.185(4.70)	.455(11.56)	.305(7.75)
MDM-15SBR*	1.540(39.12)	1.300(33.02)	.715(18.16)	.545(13.84)	.245(6.22)	.455(11.56)	.305(7.75)
MDM-21PBR*	1.690(42.93)	1.450(30.83)	.865(21.97)	.640(16.26)	.185(4.70)	.455(11.56)	.305(7.75)
MDM-21SBR*	1.690(42.93)	1.450(30.83)	.865(21.97)	.695(17.65)	.245(6.22)	.455(11.56)	.305(7.75)
MDM-25PBR*	1.790(45.47)	1.550(39.37)	.965(24.51)	.740(18.80)	.185(4.70)	.455(11.56)	.305(7.75)
MDM-25SBR*	1.790(45.47)	1.550(39.37)	.965(24.51)	.795(20.19)	.245(6.22)	.455(11.56)	.305(7.75)
MDM-31PBR*	2.040(51.82)	1.800(45.72)	1.115(28.32)	.890(22.61)	.185(4.70)	.455(11.56)	.305(7.75)
MDM-31SBR*	2.040(51.82)	1.800(45.72)	1.115(28.32)	.945(24.00)	.245(6.22)	.455(11.56)	.305(7.75)
MDM-37PBR*	2.340(59.44)	2.100(53.34)	1.265(32.13)	1.040(26.42)	.185(4.70)	.455(11.56)	.305(7.75)
MDM-37SBR*	2.340(59.44)	2.100(53.34)	1.265(32.13)	1.095(27.81)	.245(6.22)	.455(11.56)	.305(7.75)
MDM-51PBR*	1.875(47.63)	1.600(40.64)	1.215(30.86)	.990(25.15)	.230(5.84)	.565(14.35)	.345(8.76)
MDM-51SBR*	1.875(47.63)	1.600(40.64)	1.215(30.86)	1.045(26.54)	.290(7.37)	.565(14.35)	.345(8.76)

*For jackpost locking add letter "P."

(millimeters are in parentheses)

CUSTOMER USE DRAWINGS 25803Y, 25803Y-2, 25803Y-4 & 25803Y-6, AVAILABLE ON REQUEST.

CONSULT FACTORY FOR PCB PIN IDENTIFICATION NUMBERS AND FOR MOUNTING HOLE PATTERN DIMENSIONS

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

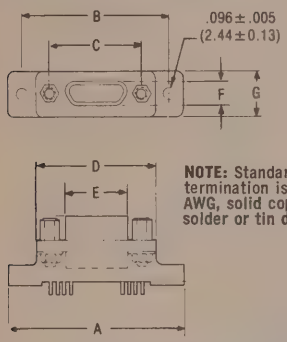
ITT CANNON ELECTRIC

MICROMINIATURE CONNECTORS
MDM-PCB SERIES/MDM COAXIAL POWER SERIES

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory)

Dimensions subject to change

BS SERIES (STRAIGHT)



NOTE: Standard lead termination is #24 AWG, solid copper, solder or tin dipped.

Part Number by Shell Size	A Max.	B ±.007(±0.18)	C ±.005(±.013)	D Max.	E Max.	F Max.	G Max.
MDM-9PBS*	1.390(35.31)	1.150(29.21)	.565(14.35)	.785(19.94)	.340(8.64)	.185(4.70)	.305(7.75)
MDM-9SBS*	1.390(35.31)	1.150(29.21)	.565(14.35)	.785(19.94)	.395(10.03)	.245(6.22)	.305(7.75)
MDM-15PBS*	1.390(35.31)	1.150(29.21)	.715(18.16)	.935(23.75)	.490(12.45)	.185(4.70)	.305(7.75)
MDM-15SPS*	1.390(35.31)	1.150(29.21)	.715(18.16)	.935(23.75)	.545(13.84)	.245(6.22)	.305(7.75)
MDM-21PBS*	1.690(42.93)	1.450(30.83)	.865(21.97)	1.085(27.56)	.640(16.26)	.185(4.70)	.305(7.75)
MDM-21SBS*	1.690(42.93)	1.450(30.83)	.865(21.97)	1.085(27.56)	.695(17.65)	.245(6.22)	.305(7.75)
MDM-25PBS*	1.740(44.20)	1.500(38.10)	.965(24.51)	1.185(30.10)	.740(18.80)	.185(4.70)	.305(7.75)
MDM-25SBS*	1.740(44.20)	1.500(38.10)	.965(24.51)	1.185(30.10)	.795(20.19)	.245(6.22)	.305(7.75)
MDM-31PBS*	2.040(51.82)	1.800(45.72)	1.115(28.32)	1.335(33.91)	.890(22.61)	.185(4.70)	.305(7.75)
MDM-31SBS*	2.040(51.82)	1.800(45.72)	1.115(28.32)	1.335(33.91)	.945(24.00)	.245(6.22)	.305(7.75)
MDM-37PBS*	2.340(59.44)	2.100(53.34)	1.265(32,13)	1.485(37.72)	1.040(26.42)	.185(4.70)	.305(7.75)
MDM-37SBS*	2.340(59.44)	2.100(53.34)	1.265(32.13)	1.485(37.72)	1.095(27.81)	.245(6.22)	.305(7.75)
MDM-51PBS*	2.270(57.66)	2.000(50.80)	1.215(30.86)	1.435(36.45)	.990(25.15)	.230(5.84)	.345(8.76)
MDM-51SBS*	2.270(57.66)	2.000(50.80)	1.215(30.86)	1.435(36.45)	1.045(26.54)	.290(7.37)	.345(8.76)

*For jackpost locking add letter "P."
Consult factory for PCB pin identification number and for mounting hole pattern dimensions.

CUSTOMER USE DRAWINGS 25603Y-1, 25803Y-3, 25803Y-5 & 25803Y-7, AVAILABLE ON REQUEST.

CONSULT FACTORY FOR PCB PIN IDENTIFICATION NUMBERS AND FOR MOUNTING HOLE PATTERN DIMENSIONS

MDM COAXIAL/POWER SERIES

MDM COAXIAL

The MDM Metal Shell Connectors have been tooled in several coaxial layouts and offer the versatility of combining coaxial and signal lines in the same connector. Any modifications to these layouts or new requirements, please consult the factory. For ordering information see page 169. For contact layouts see page 170.

MDM POWER

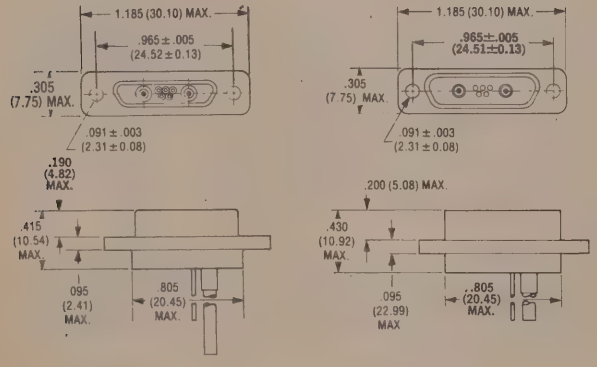
The same insulator that is used with coaxial contacts is available with power contacts. This offers the versatility of combining power and signal lines in the same connector. Power contacts are rated at 13 amps, 24V rms, AWG #16 white stranded.

MDM COAXIAL/POWER

Power and coaxial contacts can be interchanged as desired.

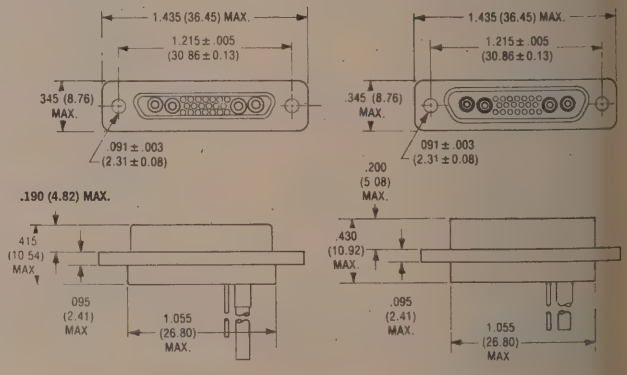
(millimeters are in parentheses)

7C2/7P2



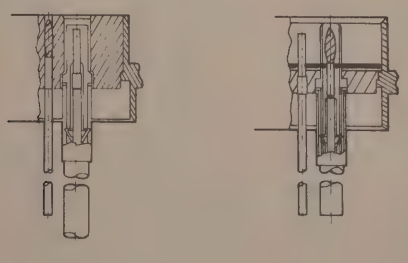
PLUG RECEPTACLE

24C4/24P4



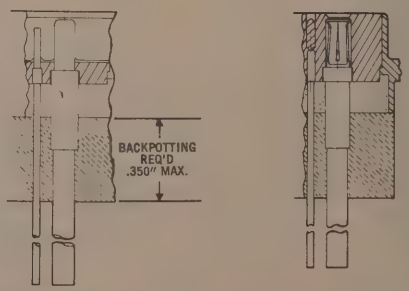
PLUG RECEPTACLE

COAXIAL CONTACTS



PLUG RECEPTACLE

POWER CONTACTS



RECEPTACLE PLUG

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

MICROMINIATURE CONNECTORS MIK/MIKM/MIKQ SERIES

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

INTRODUCTION

Dimensions subject to change

MICRO-K microminiature circular connectors are rugged yet lightweight — and meet or exceed the applicable requirements of MIL-C-26482. Applications include computers, biomedical, instrumentation and miniature black boxes.

MIK: Accommodate up to 55 contacts on .050(1,27mm) centers (equivalent to 420 contacts per square inch). Five keyway polarization prevents cross plugging. The threaded coupling nuts provide strong, reliable coupling. MIK receptacles can be either front or back panel mounted; in back mounting applications, panel thickness of up to 3/32" can be used on the larger sizes.

Standard MIK connectors are available in two shell sizes accommodating two contact arrangements pre-wired to your specific requirements.

MIKM: Similar to our MIK, except has a steel shell and receptacle for improved ruggedness and RFI resistance. It accommodates up to 85 twist pin contacts.

MIKQ: A quick disconnect metal shell and receptacle version that can be instantaneously disconnected yet provides a solid lock when engaged. Applications include commercial TV cameras, portable radios, military gun sights, airborne landing systems and medical equipment.

For other variations of the basic MIK circular design, contact your nearest ITT Cannon Electric office or call our Microminiature Products Group at our 24-hour toll-free number: (800) 854-3573, in California, (800) 432-7063.

STANDARD DATA

STANDARD MATERIAL AND FINISHES

	MIK	MIKM	MIKQ
Shell	Thermoplastic	Stainless Steel	Brass
Coupling Nut	Stainless Steel Passivated	Stainless Steel Passivated	Brass, Electroless Nickel Plated
Insulator	— Glass-reinforced Thermoplastic —		
Contacts	— 50 Microinch Gold Plated Copper Alloy —		

*Availability at time of printing, consult factory for others

ELECTRO/MECHANICAL FEATURES

	MIK	MIKM	MIKQ
No. of Contacts*	7,55	7,55,85	7,19
Wire Size	#26 AWG thru #32 AWG		
Contact Termination	Crimp or Solder Pot		
Contact Rating	3 Amps		
Coupling	Threaded	Threaded	Push/Pull
Polarization	Keyways		
Contact Spacing	.050" (1,27 mm) Centers		
Shell Styles	0-Wall Mtg. 6-Straight Plug	0-Wall Mtg. 6-Straight Plug	7-Jam Nut 6-Straight Plug

HOW TO ORDER

MIK M 6- 4- 55 P * **

- Series
- Connector Type
- Shell Style
- Shell Size
- Contact Arrangement
- Contact Type
- Termination Type
- Termination Length Code

SERIES
MIK: ITT Cannon Prefix

CONNECTOR TYPES
No letter = Screw coupling, plastic shell
M = Screw coupling, metal shell
Q = Push/Pull, metal shell

SHELL STYLES
0 = Wall mounting receptacle (MIK and MIKM only)
6 = Straight plug (MIK, MIKM and MIKQ)
7 = Jam nut mount (MIKQ only)

CONTACT ARRANGEMENTS
1-7, 2-19, 4-55, 5-85

CONTACT TYPE
P = Pin
S = Socket

TERMINATION TYPES
H = Insulated round hook-up wire
L = Uninsulated round solid wire

TERMINATION LENGTH CODES (STANDARDS)
(H)001 = 18" #26 AWG MIL-W-16878, Type E, yellow wire
(H)003 = 18" #26 AWG MIL-W-16878 Type E, color coded wire per MIL-STD-681
(L)1 = ½" uninsulated solid #25 AWG gold plated copper round wire
(L)2 = 1" uninsulated solid #25 AWG gold plated copper round wire

NOTE: Contact types cannot be interchanged between plug and receptacle.

STANDARD WIRE TERMINATION CODES

The following termination mod codes are listed for your information. For lengths not shown, consult factory for proper modification code. All wire lengths are minimum.

HARNESS TYPE (H)

#26 AWG per MIL-W-16878 Type E, Teflon Stranded

Length	— All Yellow	Color Coded
3(76,2)	020	027
6(152,4)	019	016
8(203,2)	026	034
10(254,0)	029	025
12(304,8)	028	002
18(457,2)	001	003
20(508,0)	038	023
24(609,6)	009	004
30(762,0)	010	005
36(914,4)	011	006
48(1219,2)	013	048
72(1828,8)	017	046
120(3048,0)	042	041

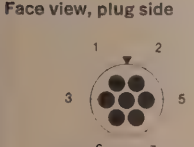
SOLID UNINSULATED TYPE (L)

#25 AWG Gold Plated Copper

	Length
L61	.125(3,18)
L56	.150(3,81)
L57	.190(4,33)
L39	.250(6,35)
L58	.375(9,52)
L1	.500(12,70)
L14	.750(19,05)
L2	1.000(25,10)
L7	1.500(38,10)
L6	2.000(50,80)
L16	2.500(63,50)
L10	3.000(76,20)

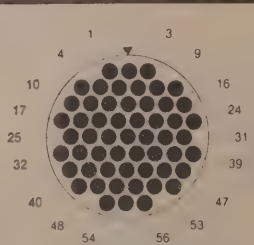
CONTACT ARRANGEMENTS

Face view, plug side

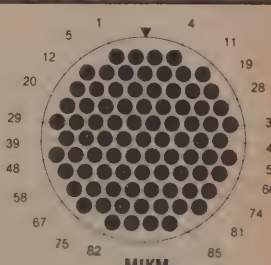


MIK/MIKM/MIKQ
7 CONTACTS

MIKQ
19 CONTACTS



MIK/MIKM
55 CONTACTS



MIKM
85 CONTACTS

Cavity identification numbers are for reference, do not appear on connectors.

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

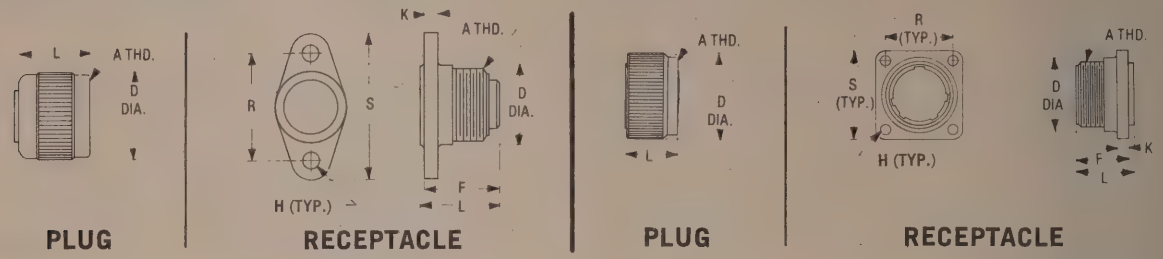
MICROMINIATURE CONNECTORS MIK/MIKM/MIKQ SERIES

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

SHELL DIMENSIONS

Dimensions subject to change
(millimeters are in parentheses)

MIK (Rear Panel Mount Thickness — see Tabulation "T")



PLUG | RECEPTACLE | PLUG | RECEPTACLE

Size 1 | Size 4

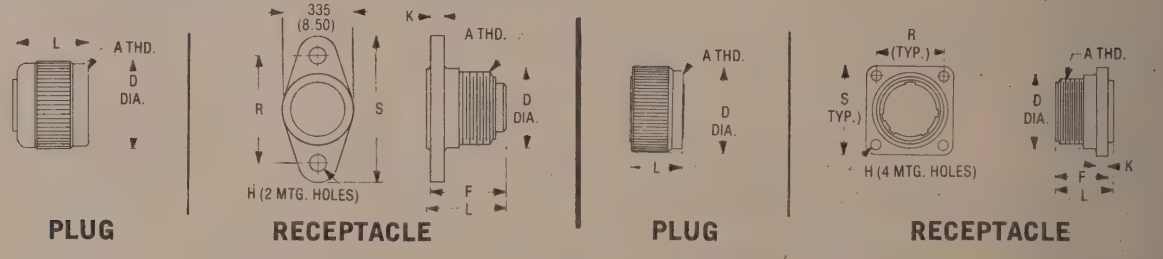
PLUG

Part Number by Shell Size	A Thread	D Max.	L Max.	Avg. Weight oz. (gm.) ±5%
MIK6-1-7P	5/16-24UNEF-2B	.375(9.52)	.315(8.00)	2.900(82.21)
MIK6-4-55P	5/16-24UNEF-2A	.755(19.18)	.460(11.68)	2.135(60.53)

RECEPTACLE

Part Number by Shell Size	A Thread	D ±.010	F Max.	H ±.003(±0.08)	K ±.010	L Max.	R ±.005(±0.13)	S Max.	Avg. Weight oz. (gm.) ±5%	T Max.
MIK0-1-7S	5/16-24UNEF-2A	.325(8.26)	.315(8.00)	.078(1.98)	.062(1.57)	.355(9.02)	.460(11.68)	.630(16.00)	.242(6.86)	.032(0.81)
MIK0-4-55S	5/16-24UNEF-2A	.625(15.88)	.440(11.18)	.089(2.26)	.100(2.54)	.495(12.57)	.580(14.73)	.760(19.30)	2.065(58.54)	.062(1.57)

MIKM (Rear Panel Mount Thickness — see Tabulation "T")



PLUG | RECEPTACLE | PLUG | RECEPTACLE

Size 1 | Size 4

PLUG

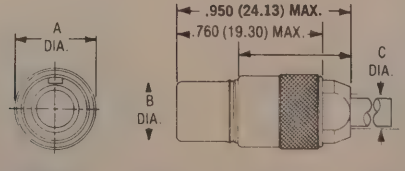
Part Number by Shell Size	A Thread	D Max.	L Max.
MIKMG6-1-7P	5/16-24UNEF-2B	.375(9.52)	.315(8.00)
MIKMG6-4-55P	5/8-24UNEF-2B	.755(19.18)	.440(11.18)
MIKMG6-5-85P	11/16-24UNEF-2B	.860(21.84)	.440(11.18)

RECEPTACLE

Part Number by Shell Size	A Thread	D	F Max.	H ±.003(±0.08)	K	L Max.	R ±.005(±0.13)	S Max.	T Max.
MIKM0-1-7S	5/16-24UNEF-2A	.325(8.26)	.320(8.13)	.078(1.98)	.062(1.57)	.400(10.16)	.460(11.68)	.630(16.00)	.032(0.81)
MIKM0-4-55S	5/8-24UNEF-2A	.625(15.88)	.426(10.82)	.091(2.31)	.062(1.57)	.490(12.45)	.580(14.73)	.760(19.30)	.125(3.18)
MIKM0-5-85S	11/16-24UNEF-2A	.745(18.92)	.426(10.82)	.091(2.31)	.062(1.57)	.490(12.45)	.674(17.12)	.845(21.46)	.125(3.18)

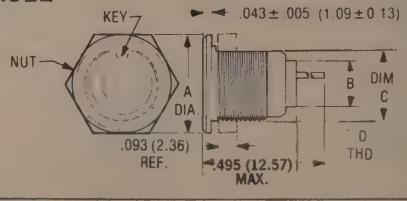
MIKQ (Front Panel Mounting Only — .093(2.36) Thickness)

PLUG



Part Number by Shell Size	A Max.	B Max.	C Ref.
MIKQ6-1-7S	.385(9.78)	.305(7.75)	.180(4.57)
MIKQ6-2-19S	.515(13.08)	.405(10.29)	.260(6.60)

RECEPTACLE



Part Number by Shell Size	A Max.	B Max.	C Max.	D Thread
MIKQ7-1-7P	.510(12.95)	.245(6.22)	.353(8.97)	3/8-32UNEF-2A
MIKQ7-2-19P	.575(14.60)	.345(8.76)	.470(11.94)	1/2-28UNEF-2A

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

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MICROMINIATURE CONNECTORS MT SERIES

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

PRINTED CIRCUIT BOARD AND CARD MOUNTING FRAME APPLICATIONS

CONTACTS ON .050" (1,27 mm) CENTERS

50-MIL STRIP microminiature connectors are designed for space and weight saving applications in a space conscious industry. The strip configuration provides an extremely dense and reliable interconnection device in a minimum profile package, giving great application flexibility.

These connectors are available in many combinations of length, contact spacing and terminations to give designers maximum latitude in their packaging and interconnection solutions. They have been used successfully on printed circuit boards and card mounting frames. Because of its configuration, the 50-MIL STRIP connector is particularly suited for mounting with high strength epoxy adhesive. In lengths over 2" (50,80 mm), guides, rails or other systems should be used to assure alignment.

50-MIL STRIP connectors use either a flexible insulator of polycarbonate or nylon thermoplastic that can be mounted on curved surfaces up to a radius of approximately eight inches, or a more rigid insulator of diallyl phthalate — giving the connector a higher temperature capability. Up to 120 micropin contacts can be held in a single strip on .050" (1,27 mm) centers. Guide pins and polarizing devices are available. Special termination with hookup wire is available to meet specific customer requirements. Crimping hookup wire to contacts before they are inserted is often desirable in high density contact arrangements. Color coded wires of any length in sizes #26 thru #30 AWG solid and #26 thru #30 AWG stranded can be harnessed by the factory. For further technical and applications information, contact your nearest ITT Cannon Electric field office or call our Microminiature Products Group at our 24-hour toll-free number: 800-854-3573; in California, 800-432-7063.

HOW TO ORDER

MT* 1- 120 P L 1- **

- Series and Materials
- Contact Spacing
- Number of Insulator Cavities
- Contact Type
- Termination Type
- Termination Code
- Modification

SERIES AND MATERIALS

MTA = Glass filled polycarbonate (105°C)
MTB = Glass filled diallyl phthalate (150°C)
MTN = Glass filled nylon (105°C)
MTV = Glass filled polyester (125°C)

CONTACT SPACING

1 = .050" (1,27 mm) centers MTA1, MTB1, MTN1 and MTV1 only
2 = .100" (2,54 mm) centers MTA2, MTB2, MTN2 and MTV2 only

*See Termination Codes below for additional length modification codes.
*Consult factory for variations from standard not shown.

NUMBER OF INSULATOR CAVITIES

MTV1, MTA1, MTN1 = 120 Max.
MTV2, MTA1, MTN2 = 60 Max.
MTB1 = 81 Max.
MTB2 = 41 Max.

CONTACT TYPE

P = Pin
S = Socket

TERMINATION TYPE

L = Uninsulated solid pigtail
H = Insulated
S = Solder pots

TERMINATION CODE*

(H) 001 = 18" #26 AWG per MIL-W-16878 Type E Teflon yellow.
(H) 003 = 18" #26 AWG MIL-W-16878 Type E Teflon, color coded to MIL-STD-681, System I.
(L) 1 = ½" uninsulated solid #25 AWG gold plated copper.
(L) 2 = 1" uninsulated solid #25 AWG gold plated copper.

MODIFICATION**

01 = Guide posts each end of socket strip — blank cavities each end of pin strips.

NOTE: PCB terminations preformed at 90° incréments of .050" (1,27 mm) to bend from rear of insulator on solid uninsulated leads are available. Consult factory for proper ordering nomenclature.

STANDARD WIRE TERMINATION CODES

The following termination codes are listed for your Teflon information. For lengths not shown, consult factory for proper modification code. All wire lengths are minimum.

HARNESS TYPE — (H)

#26 AWG per MIL-W-16878 Type E, Teflon Stranded

Length	All Yellow	Color Coded
3(76,2)	H020	H027
6(152,4)	H019	H016
8(203,2)	H026	H034
10(254,0)	H029	H025
12(304,8)	H028	H002
18(457,2)	H001	H003
20(508,0)	H038	H023
24(609,6)	H009	H004
30(762,0)	H010	H005
36(914,4)	H011	H006
48(1219,2)	H013	H048
72(1828,8)	H017	H046
120(3048,0)	H020	H027

SOLID UNINSULATED TYPE — (L)

#25 AWG Gold Plated Copper

	Length
L61	.125(3,18)
L56	.150(3,81)
L57	.190(4,83)
L39	.250(6,35)
L58	.375(9,52)
L1	.500(12,70)
L14	.750(19,05)
L2	1.000(25,40)
L7	1.500(38,10)
L6	2.000(50,80)
L16	2.500(63,50)
L10	3.000(76,20)

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MICROMINIATURE CONNECTORS MT SERIES

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

STANDARD DATA

STANDARD MATERIALS AND FINISHES

One-piece insulator	— MTA: glass-filled polycarbonate MTB: glass-filled diallyl phthalate MTN: glass-filled nylon MTV: glass-filled polyester
Contacts	Copper alloy, gold plate

ELECTRICAL DATA

No. of Contacts	— MTA/MTN/MTV: 120 max. MTB: 81 max.
Wire Size	— Solid: #24 thru #30 AWG Stranded: #26 thru #30 AWG
Contact Termination	— Crimp stationary

MECHANICAL FEATURES

Size or Length	— MTA/MTN/MTV: 6.04" (153,42 mm) max. "yardage" MTB: 4.09" (103,89 mm) max. "yardage"
Coupling	— Friction
Polarization	— Guide posts
Contact Spacing Centers	— .050" (1,27 mm) and .100" (2,54 mm)

TEST DATA

(millimeters are in parentheses)

CONTACT RESISTANCE

Tests give constant resistance readings from 10μa to 3 amps on individually mated contacts. The maximum allowable contact resistance, measured on the wire at the rear of the contact, is 8 milliohms. The average contact resistance is 6 milliohms.

Current Rating—3 amps max.
Max. Voltage Drop—24 millivolts at 3 amps.
Average Voltage Drop—12 millivolts at 3 amps.
Low Level Contact Resistance—Measured voltage drop is .24 x 10^{-3} volts at 10 x 10^{-6} amps.

DIELECTRIC WITHSTANDING VOLTAGE

Min. Flashover voltage (at room temp.) at 60 cps rms 50% R.H.
Sea Level—900 VAC
70,000 feet—250 VAC

VIBRATION AND SHOCK

No discontinuity detected (in excess of 1 micro second) after twelve 15-min. sweeps from 10 to 2000 cps at .060" (1,52 mm) double amplitude or 20g, or after twenty shocks of 50g. Connectors were mounted to simulate service condition. Tests conducted to MIL-STD-202, Method 204A, Condition D and Method 213, Condition G.

TEMPERATURE RANGE

MTA, MTN: —65°F to +275°F (—53°C to +135°C)
MTB: —65°F to +302°F (—53°C to +150°C)

ENGAGING AND SEPARATING FORCE

For an individual contact the maximum engaging force is 8 ounces (226,80 grams). Minimum separating force is 0.5 ounces (14,17 grams) per contact. Test conducted using min./max. bushings.

SALT SPRAY

No damage or unacceptable increase in contact resistance after mated sample subjected to 48 hours of salt spray per MIL-STD-202, Method 101C, 5% solution, Condition B.

Note: MICRO-D environmental connectors were tested successfully in accordance with MIL-C-26482, Para. 4.6.14, and MIL-STD-202, Method 106B. The moisture resistance test was conducted using mineral-free water for a 10-day period. After this, insulaton resistance tests were conducted with satisfactory results.

CONTACT AND INSERT RETENTION

Over 6 lbs. (2,72 kg.) min. axial load after 10 cycles.

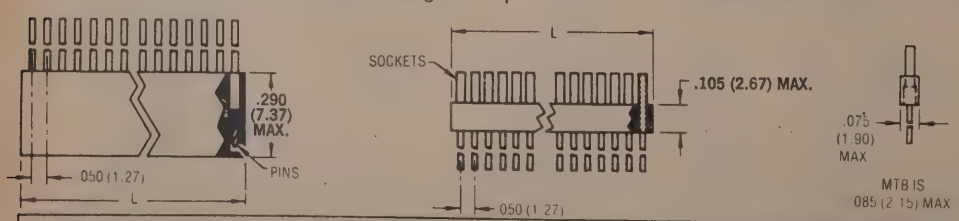
DIMENSIONAL DATA

LENGTH

Contact cavities in 50-MIL STRIP connectors are in a single row and located on .050" (1,27 mm) centers or increments thereof. MTA and MTN connectors can be supplied in lengths up to 6.02 inches (157,91 mm) with a maximum of 120 contacts on .050" (1,27 mm) centers. MTB connectors can be supplied in lengths up to 4.07 inches (103,37 mm) with a maximum of 81 contacts on .050" (1,27 mm) centers. Length of connectors can be calculated as follows:

L = number of contacts times .050" (1,27 mm) plus .020" (0,51 mm)

EXAMPLE:
50 contacts (installed in each cavity):
L = (50 x .050") + .020" = 2.52" length of strip
L = (50 x 1,27 mm) + 0,51 mm = 64,01 mm length of strip

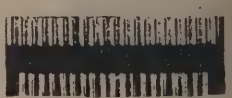


WEIGHT

			lbs.	gms.
Contact (with std. ½" copper pigtails)		pin	.000088	.040
		socket	.000088	.040
Insulator (per contact cavity)	MTB	pin	.000046	.021
	MTB	socket	.000013	.006
	MTA MTN	pin	.000031	.014
	MTV	socket	.000009	.004
Guide Post	Stainless Steel		.000079	.035

NOTE: MTA not to be terminated with insulated wire in more than 41 cavities.

POLARIZATION



Modification code "-01" in the part number refer to guide posts located on both ends of the socket side of the 50-MIL STRIP connector and blank cavities on the pin side to accept the guide posts.

Although in many cases it is not necessary to polarize 50-MIL STRIP connectors, there are several ways to prevent cross plugging. One method is the use of guide posts that can be located in specified cavities to assure that the contacts will align when these posts are positioned before mating.

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

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For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

Section II: The CENTI Line

Cannon CENTI connectors are especially suitable for commercial applications such as computers, instrumentation, model airplane R/C equipment, calculators, communications and audio equipment. They are available in subminiature size metal shell rectangular, plastic shell rectangular and strip configurations.

All CENTI connectors use the same reliable Twist Pin Contact design as our MICRO connectors, but in a slightly larger 5 amp version terminated on .075" (1.91 mm) and .100" (2.54 mm) centers. This larger contact is crimp removable, so CENTI Series connectors are available in connector kits and as bulk parts for customer assembly. Standard crimp and assembly tools are available.

As in our MICRO Series, the Twist Pin Contact is recessed within the insulator housing while the rugged cylindrical socket is exposed. When the connector halves are mated, the chamfered sockets guide the pins into positive alignment.

The CENTIPIN contact, now under compression, forms a multi-point contact with the CENTISOCKET to provide fail-safe reliability over thousands of mating and unmating cycles.

STANDARD DATA

Contact rating—5 amps max.
Minimum contact centers—0.075"(1.91 mm).
Wire sizes—#22 thru #26 AWG, stranded or solid.
Contact termination—multiple indent crimp.

- Contact retention—crimp snap-in/removable.
- Contact materials and finish—Copper alloy, gold-plated per MIL-G-45204, Type II, Class 0.
- Mating/unmating force—10 oz. per contact, max.

PERFORMANCE DATA

The table below summarizes the results of key tests performed in accordance with MIL-STD-202, where applicable. Data is applicable to standard connectors with standard terminations. Variations may affect this data, so please consult the factory for further information on your requirements.

TEST	METHOD	CRITERIA OF ACCEPTANCE
Dielectric Withstanding Voltage	Method 301: 1,000 VAC at sea level 300 VAC at 70,000' altitude	 No breakdown No breakdown
Insulation Resistance	Method 302, Condition A	5,000 megohms minimum
Thermal Shock	Method 107, Condition A: −55°C to +85°C	No physical damage
Physical Shock	Method 213, Condition I: 100 G's, 3 axes, 6 millisecond duration sawtooth pulse	No physical damage No loss of continuity >1μsec
Vibration	Method 204, Condition B: 15 G's, 10-2,000 Hz, 12 hours	No physical damage No loss of continuity >1 μsec
Durability	500 cycles of mating and unmating, 500 CPH max.	No mechanical or electrical defects
Moisture Resistance	Method 106m omit 7b	Insulation resistance >100 megohms
Salt Spray	Method 101, Condition B: 48 hours	Shall be capable of mating and unmating, and meet contact resistance requirements
Contact Resistance	Method 307: At 5 amps	 9 milliohms maximum
Contact Retention	— —	4 lb. minimum axial load

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

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MICROMINIATURE CONNECTORS
2D CONNECTORS

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

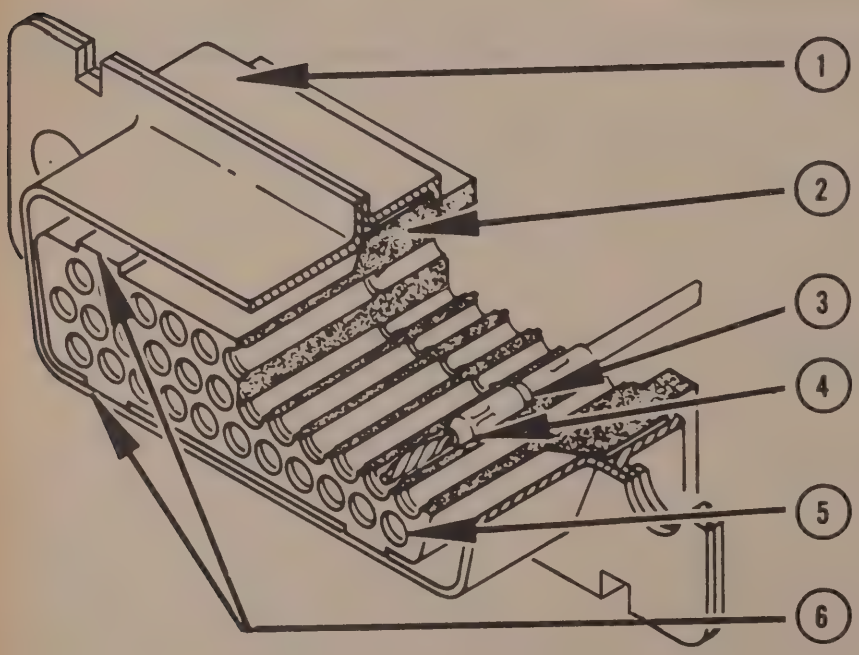
INTRODUCTION

The Double Density D is a rectangular connector in the popular D Subminiature shell configuration featuring double the contact density in the same insert area. The Double Density D connector can thus accommodate up to 100 contacts instead of 50.

This double contact density is achieved by using field-proven, highly reliable centipin/centisocket contacts on .075" (1,91) mm) centers, in the positive contact alignment design. In this design contact positions are reversed; the flexible centipin contacts are recessed in the insulator and the more rugged centisocket contacts are exposed. This reversal of positions, and the chamfered-entry of the sockets, assures positive mating even under severe misalignment conditions. The contacts are retained in the monobloc insulator by a resilient internal shoulder that snaps into a locking groove in the contact. The chamfered front of the contact will not damage the internal shoulder in the insulator. Contacts are crimp removable type.

The Double Density D connector is available in the five popular shell and insert sizes accommodating up to 100 contacts. While these connectors do not intermate with standard D Subminiature connectors, they do share a wide range of accessories that can be used interchangeably, including junction shells, potting cups, switching shells, guide pin plates, and dust caps.

For further technical and applications information, contact your nearest ITT Cannon Electric field office or call our Microminiature Products Group at our 24-hour toll-free number: (800) 854-3573; in California, (800) 432-7063.



1. **STANDARD D HARDWARE—** including full range of D Subminiature accessories
2. **MONOBLOC INSULATOR—** glass-filled nylon material
3. **CONTACT RETENTION—** thermoplastic internal shoulder snaps into a locking groove in the contact.

   Retention Force: 10 lbs. min. initially 4 lbs. min. after 10 cycles.
4. **TWIST PIN CONTACTS—** seven outer wiping surfaces assure electrical continuity even under severe shock and vibration
5. **POSITIVE CONTACT ALIGNMENT—** flexible pin is recessed in insulator cavity and rugged socket is exposed
6. **GUIDE-IN KEYS AND KEYWAYS—** assure alignment during mating and prevent scooping

(millimeters are in parentheses)

DOUBLE DENSITY D/CENTI-LOC® CONNECTORS ASSEMBLY INSTRUCTIONS

The Double Density D and CENTI-LOC Connectors are highly reliable and simple connectors to use. There are a few helpful suggestions that will assure complete satisfaction when followed:

1. The instructions found under the section marked ASSEMBLY should be followed.

2. The proper crimp tool and locator (if required) must be used. These tools have been designed for use with this product. Substitutions of crimping equipment may result in connector failure at the assembly operation.

3. After crimping a contact to a lead the selection of insertion tools is shown in the section marked TOOLING. It is of vital importance that the proper tool be used to assure seating the contact in the insulator in the proper position. Any substitution of insertion tools may result in over or under insertion of the contact which will damage the retention system of the insulator.

4. The female (socket) side of the connector has been designed with a controlled float to allow for ease of mating. To avoid reducing this float or causing a splaying of the contacts, any unnecessary strain by clamping too close to the rear of the connector should be avoided.

Recommended tooling together with proper assembly techniques with the knowledge and care required by a microminiature unit will pay dividends in reliability and reduced costs.

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MICROMINIATURE CONNECTORS
2D CONNECTORS

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HOW TO ORDER

2D E -19 S
2D A F -31 P XXXX

- Series
- Shell Size
- Float Mounts
- Contact Arrangement
- Contact Type
- Modification

SERIES
2D = ITT Cannon prefix

SHELL SIZE
E, A, B, C and D

FLOAT MOUNTS
F = Float Mount

CONTACT ARRANGEMENT
9, 31, 52, 79 and 100

CONTACT TYPE
P = Pin
S = Socket

MODIFICATION
F171 = Jackpost assembly
F172 = Standard jackscrew
F173 = Low profile jackscrew
For other modifications consult factory

NOTE: Connectors may be ordered less contacts by adding the mod callout "FO" at end of number. Contacts are then supplied in bulk form. For type of contacts and installation/assembly tools refer to pages 182-183.

STANDARD DATA

STANDARD MATERIALS AND FINISHES

Shell	— Steel, cadmium plated with yellow chromate supplementary coating
Float mounts	— Stainless steel
Insulator	— Glass-filled nylon
Contacts	— Copper alloy, gold plate

MECHANICAL FEATURES

Sizes	— Five shell sizes: E, A, B, C, and D
Coupling	— Friction, jackscrew
Polarization	— Keystone-shaped shells
Contact Spacing	— .075 (1,91)
Contact Termination	— Crimp snap-in

ELECTRICAL DATA

No. of Contacts	— 19, 31, 52, 79 and 100
Wire Size	— #26, #24 and #22 AWG stranded wire
Current Rating	— 5 amps/contact
Contact Resistance	— 9 milliohms max.
DWV	– Sea level: 1000 VAC 70,000 ft.: 250 VAC
Max. Voltage Drop	— 45 millivolts at 5 amps
Temperature Rating	— —55°C to 105°C

*Brass non-magnetic also available

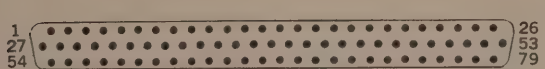
CONTACT ARRANGEMENTS

All views are pin front face. Use reverse order for socket side.

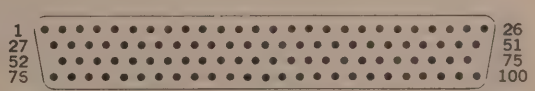
DE
19 CONTACTS

DA
31 CONTACTS

DB
52 CONTACTS



DC
79 CONTACTS



DD
100 CONTACTS

Cavity identification numbers are shown for reference only and do not appear on insulator or connector.

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WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
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MICROMINIATURE CONNECTORS
2D CONNECTORS

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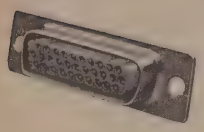
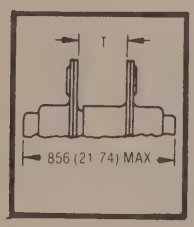
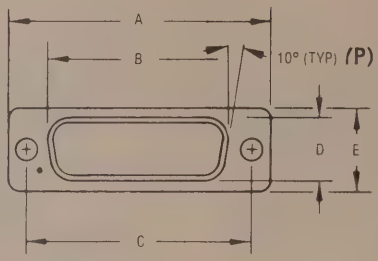
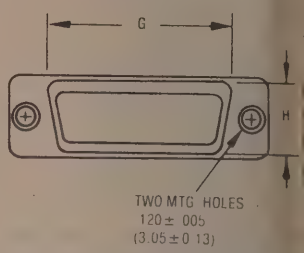
Dimensions subject to change
(millimeters are in parenthese

STANDARD SHELL

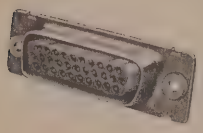


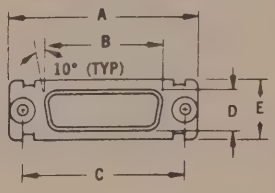


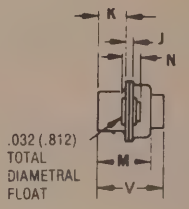


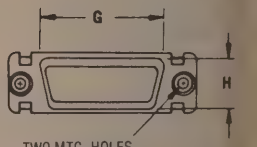


FLOAT MOUNT



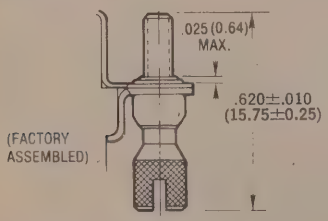




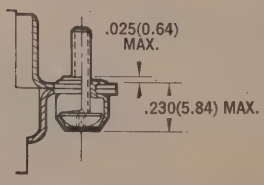


MODIFICATION CODES

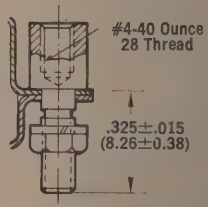
STANDARD JACKSCREW (F172) (factory installed)



LOW PROFILE JACKSCREW (F173) (factory installed)



JACKPOST ASSEMBLY (F171



INCHES

Part Number by Shell Size	A ±.015	B ±.010	C ±.010	D ±.010	E ±.015	G ±.010	H ±.010	J ±.010	K ±.010	L ±.010	M ±.010	N ±.010	T +.020 ±.000	V Max.	Weight (in oz.) Less Contacts	Weight (in oz.) With Contacts
2DE19P	1.213	.697	.984	.360	.494	.759	.422	.030	.236	.045	.422	.120	.250	.546	.142	.177
2DE19S	1.213	.640	.984	.308	.494	.759	.422	.030	.243	.045	.429	.120	.250	.555	.133	.182
2DA31P	1.541	1.025	1.312	.360	.494	1.083	.422	.030	.236	.045	.422	.120	.250	.546	.183	.239
2DA31S	1.541	.968	1.312	.308	.494	1.083	.422	.030	.243	.045	.429	.120	.250	.555	.173	.255
2DB52P	2.088	1.583	1.852	.378	.494	1.625	.422	.039	.231	.060	.426	.129	.236	.546	.308	.402
2DB52S	2.088	1.508	1.852	.308	.494	1.625	.422	.030	.243	.045	.429	.120	.236	.555	.252	.390
2DC79P	2.729	2.231	2.500	.378	.494	2.272	.422	.039	.231	.060	.426	.129	.236	.546	.413	.555
2DC79S	2.729	2.156	2.500	.308	.494	2.272	.422	.030	.243	.045	.429	.120	.236	.555	.342	.551
2DD100P	2.635	2.127	2.406	.484	.605	2.178	.534	.039	.231	.060	.426	.129	.236	.546	.453	.633
2DD100S	2.635	2.062	2.406	.420	.605	2.178	.534	.030	.243	.045	.429	.120	.236	.555	.386	.651

For shell with float mounts, add letter F after shell size, e.g., 2DEF19P.

MILLIMETERS

Part Number by Shell Size	A ±0.38	B ±0.25	C ±0.25	D ±0.25	E ±0.38	G ±0.25	H ±0.25	J ±0.25	K ±0.25	L ±0.25	M ±0.25	N ±0.25	T +0.51 ±0.00	V Max.	Weight (in gr.) Less Contacts	Weight (in gr.) With Contacts
2DE19P	30.81	17.70	24.99	9.14	12.55	19.28	10.72	.762	5.99	1.14	10.72	3.05	6.35	13.87	4.05	5.02
2DE19S	30.81	16.26	24.99	7.82	12.55	19.28	10.72	.762	6.17	1.14	10.90	3.05	6.35	14.10	3.75	5.17
2DA31P	39.14	26.03	33.32	9.14	12.55	27.51	10.72	.762	5.99	1.14	10.72	3.05	6.35	13.87	5.20	6.78
2DA31S	39.14	24.58	33.32	7.82	12.55	27.51	10.72	.762	6.17	1.14	10.90	3.05	6.35	14.10	4.90	7.22
2DB52P	53.03	40.21	47.04	9.60	12.55	41.27	10.72	.990	5.87	1.52	10.82	3.28	5.99	3.87	8.75	11.40
2DB52S	53.03	38.30	47.04	7.82	12.55	41.27	10.72	.762	6.17	1.14	10.90	3.05	5.99	14.10	7.15	11.05
2DC79P	69.31	56.67	63.50	9.60	12.55	57.71	10.72	.990	5.87	1.52	10.82	3.28	5.99	13.87	11.70	15.73
2DC79S	69.31	54.76	63.50	7.82	12.55	57.71	10.72	.762	6.17	1.14	10.90	3.05	5.99	14.10	9.70	15.62
2DD100P	66.92	54.02	61.11	12.29	15.37	55.32	13.56	.990	5.87	1.52	10.82	3.28	5.99	13.87	12.85	17.95
2DD100S	66.92	52.37	61.11	10.67	15.37	55.32	13.56	.762	6.17	1.14	10.90	3.05	5.99	14.10	10.95	18.45

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

MICROMINIATURE CONNECTORS
CTA STRIP CONNECTORS

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

NTRODUCTION

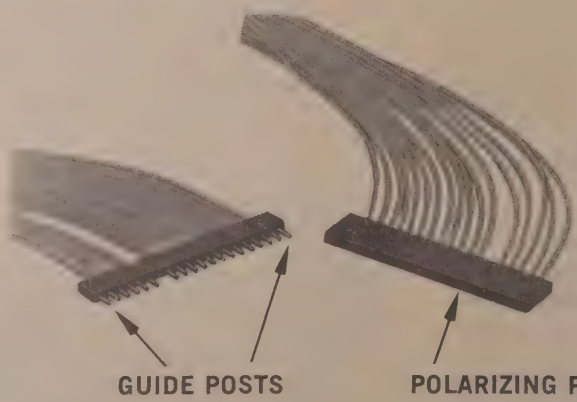
ENTILOC® connectors are low-cost nylon strip connectors de-igned for commercial applications such as computers, instru-ients, communications, audio equipment, calculators, model quipment and prototype development. They are available in yardage" from up to a 6" (152,40 mm) maximum length, ccommodating from 1 to 60 rear insertion, front release, crimp nap-in size 22 CENTIPIN/CENTISOCKET contacts. These con-acts are utilized in the proven positive contact alignment de-ign, giving additional contact strength and positive contact lignment during mating.

These connectors can be ordered in kit or bulk form. The kit omprises all the parts necessary to assemble one complete " (152,40 mm) strip connector with 60 contacts on .100" 2,54 mm) centers or a 4" (101,60 mm) strip with 53 contacts n .075" (1,91 mm) centers. If more than one connector is re-uired, the parts can be ordered in bulk and assembled as esired.

For further technical and applications information, contact our nearest ITT Cannon Electric field office or call our Micro-iniature Products Group at our 24-hour toll-free number: 800-54-3573; in California, 800-432-7063.

ORDERING INFORMATION FOR STRIP CONNECTORS

The CENTI-LOC strip connector can be ordered n kit or bulk form. The kit includes mating nsulators with a full compliment of contacts ınd two guide posts. If more than one con-ıector is required, the parts can be ordered in ıulk and assembled as desired.



KIT FORM

its include mating insulators with full complement of ontacts and two guide posts.

Part Number	Contact Center Spacing
CTA3-KIT	.075 (1,91)
CTA4-KIT	.100 (25,40)
CTA3-CTA4-KIT	.075 (1,91) & .100 (2,54)

The guide posts and polarizing posts are inserted in the same manner as the contacts. The guide posts are inserted into the socket insulator, and the polarizing posts are inserted into the pin insulator. The corresponding contact in the mating insulator must be removed for each.

For a quick response to your application needs call one of the following District Offices:
WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

ITT CANNON ELECTRIC

MICROMINIATURE CONNECTORS CTA SERIES

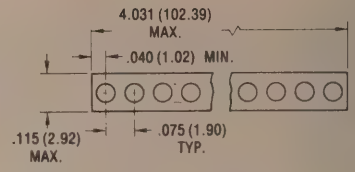
For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

Dimensions subject to change

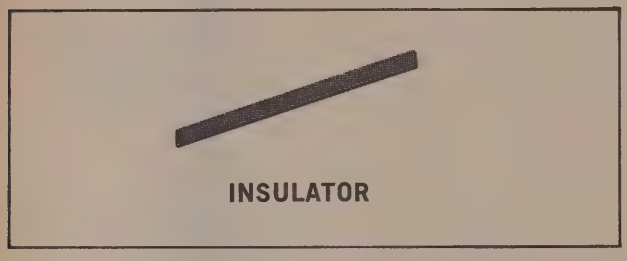
DIMENSIONAL DATA FOR STRIP CONNECTORS

COMPONENTS AND ACCESSORIES

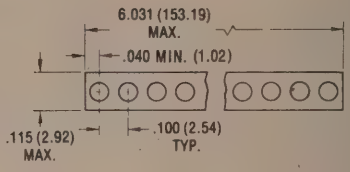
	Part Number	Contact Center Spacing	Contact Type	Material
Insulators	CTA3-IP	.075 (1.91)	Pin	Nylon
	CTA3-1S	.075 (1.91)	Socket	Nylon
	CTA4-IP	.100 (2.54)	Pin	Nylon
	CTA4-IS	.100 (2.54)	Socket	Nylon
Guide Post	CTA-GP	—	—	Pas. St. Stl.
Polarizing Post	CTA-PP	—	—	Pas. St. Stl.



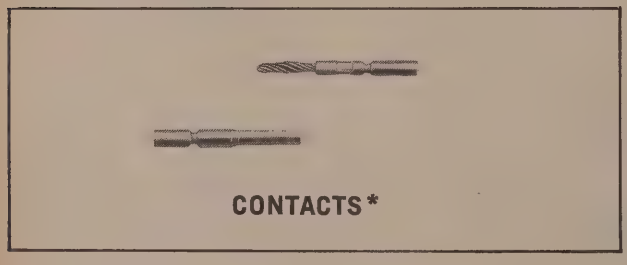
CTA 3-.075 (1,91) CENTERS



INSULATOR



CTA4-.100 (2,54) CENTERS



CONTACTS*

WEIGHTS

Part Number	No. of Contacts	Contact Type	Avg. Weight oz.	5% gm.
CTA3	53	pin	.185	5.25
		socket	.203	5.75
CTA4	60	pin	.230	6.30
		socket	.241	6.90

*See below for part numbers.

2D/CTA CONTACT DATA

CONTACT PART NUMBERS

The contacts are retained in the monobloc insulator by means of a resilient internal shoulder that allows contact to snap into a locking groove.

The front of the contact is chamfered so that the internal shoulder in the insulator is not damaged as the contact is pushed thru.

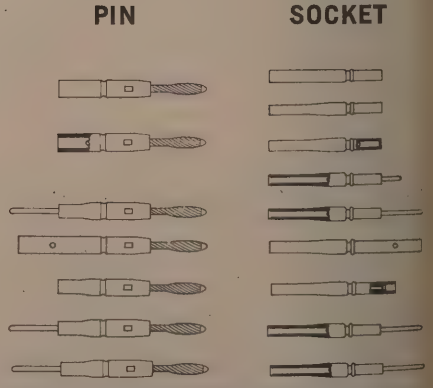
NOTE: Plating except as noted is 30 pin gold.

*Consult factory for any tail size or plating requirements.

CONTACT PART NUMBERS

Part Number Pin	Part Number Socket	Type
031-9540-000	030-9542-001	Standard
031-9540-004	030-9542-002	50μ in. plating
031-9540-005	030-9542-004	With inspection hole; 50μ in. plating
N/A	030-9542-011	P.C. tail .026 dia.x.190 lg.
*031-9540-013	030-9542-012	P.C. tail .020 dia.x.190 lg.
031-9540-016	030-9542-014	Long crimp barrel
031-9540-007	030-9556-000	Small crimp bore
*031-9540-015	030-9542-015	P.C. tail .020 dia. x .250 lg.
*021-9540-019	030-9542-016	P.C. tail .018 dia. x .450 lg.; 50μ in. plating

(millimeters are in parentheses)



Use sleeve adaptors 003-9508-000 with standard contacts to terminate #28 and #30 AWG wire.

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WESTERN REGION: PACIFIC (714) 549-7810 ROCKY MOUNTAIN (602) 273-6879 EASTERN REGION: ATLANTIC (215) 828-3520 NORTHEAST (617) 245-1609
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Add Dept. EM to address to tell them you saw it in eem

ITT CANNON ELECTRIC

MICROMINIATURE CONNECTORS 2D/CTA TOOLING

For immediate budgetary information contact your nearest Cannon Sales Office or Distributor (see Manufacturers' Directory).

Dimensions subject to change.

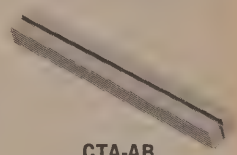
CRIMP AND ASSEMBLY TOOLS 2D AND CENTI-LOC

CRIMP TOOLS

Part Number	Pin	Socket
M22520/2-01	L3198-CLP	L3198-CLS

M22520/2-01

096268-0000



CTA-AB ASSEMBLY HOLDING BLOCK

INSERTION TOOLS FOR STANDARD CONTACT

AWG Size*	Kit Part Number (handle and tip)	Tip Part Number**	Handle Part Number**
22	CIT-PS-CTA-22	323-5910-001	204-9500-000
24	CIT-PS-CTA-24	323-9510-002	204-9500-000
26	CIT-PS-CTA-26	323-9510-003	204-9500-000

*Based on wire size per MIL-W-16878 with Type E insulation, use smaller tool for wire with thin insulation, larger tool for wire having thick insulation.

**The 3 insertion tips (part numbers 323-9510-001 thru -003), plus handle, and the pin and socket extraction tips may be ordered as a SINGLE KIT by specifying the part number CIET-CTA-2.

CIET-CTA HANDLE

INSERTION TIPS

INSERTION TIP PART NUMBERS FOR LONG CRIMP BARREL CONTACT

AWG Size*	Tip Part Number*** Pin Contact	Tip Part Number*** Socket Contact	Handle Part Number**
22	323-9510-008	323-9510-012	204-9500-000
24	323-9510-009	323-9510-013	204-9500-000
26	323-9510-010	323-9510-014	204-9500-000

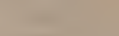
*Based on wire size per MIL-W-16878 with Type E insulation, use smaller tool for wire with thin insulation, larger tool for wire having thick insulation.

***To order the SINGLE KIT for the long crimp barrel contact (tip part numbers 323-9510-008 thru -014, handle and pin and socket extraction tips) please specify CIET-CTA-3.

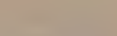
EXTRACTION TOOLS

Contact	Kit Part Number (handle and tip)	Tip Part Number**	Handle Part Number**
Pin	CET-P-CTA-1	324-9502-000	204-9500-000
Socket	CET-S-CTA-1	324-9501-000	204-9500-000

*The 3 insertion tips (part numbers 323-9510-001 thru -003), plus handle, and the pin and socket extraction tips may be ordered as a SINGLE KIT by specifying the part number CIET-CTA-2.



SOCKET EXTRACTION TIP



PIN EXTRACTION TIP

For a quick response to your application needs call one of the following District Offices:
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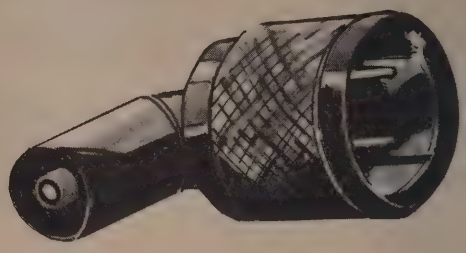
CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

CONNECTOR SELECTION GUIDE



This guide lists additional catalog information (for products now shown in this directory) available from ITT Cannon.

It is designed to help you select the proper connector series and the appropriate catalog from which to specify your requirements. Determine your basic application: Rectangular, Rack/Panel, Circular, Printed Circuit/Input-Output, Filters, or Special Application connectors.

Go to the appropriate heading in the chart. Below each heading are several blocks listing the various connector series. Check these requirements with the data on the right side of each block. Write ITT Cannon electric, 666 E. Dyer Road, Santa Ana, California 92702, or telephone (714) 557-4700 for the proper catalog, detailed product data, and ordering information, or consult your nearest ITT Cannon sales office. Should you need immediate information dial our direct, no charge, 24 hour "Hot Line" number: 800/854-3573 (in California: 800/432-7063).

ITT CANNON ELECTRIC
666 E. DYER ROAD, SANTA ANA, CALIF. 92702
A DIVISION OF INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION

CANNON PLUGS

Your Application Requirement

Rectangular Rack/Panel

DPGM/DPJM — general purpose, environmental

DPGM — short shell, economical ring-type contact retention
DPJM — same as DPGM except shell is longer
DPJMB — rear insertion/release of crimp snap-in contacts

■ DPGM/DPJM CATALOG

12-98 CONTACTS
Contacts/Wire Size
20
16
12
Coax. contacts avail.
CRIMP TERMINATION

DJS — environmental, high density, rugged

Single gang, two gang, size 22D KJ crimp snap-in contacts, miniature

■ DJS CATALOG

78-128 CONTACTS
Contact/Wire Size
22
24
26
28
CRIMP TERMINATION

DPD Series — general purpose single gang

DPD — standard rack/panel connector with widest range of contact arrangements
DPDMA — rear release of crimp snap-in contacts

— two gang DPD

DPD2 — two gang DPD
DPD2MA — two gang DPD with rear release of crimp snap-in contacts

■ DPD CATALOG

2-128 CONTACTS (single gang)
4-256 CONTACTS (two gang)
Contact/Wire Size
20
16
14
10
8
6
4
2
□
Coax. contacts avail.
SOLDER OR CRIMP TERMINATION

DPX Series — small, rugged, general purpose, single gang
For commercial/industrial application

DPXA — single shell
DPXAF — float mount DPXA
DPXB — polarized ARINC shell
DPXL — large flange
DPXLF — float mount DPXL
DPXAMA — LITTLE CAESAR® contact assembly
DPXBMA — LITTLE CAESAR® contact assembly
DPXBME — LITTLE CAESAR® contact assembly — environmental

DPX2 — two gang DPX

DPX2 — two gang DPX
DPX2A — ARINC A shell
DPX2B — ARINC B shell
DPX2MA — LITTLE CAESAR® contact assembly
DPX2ME — LITTLE CAESAR® contact assembly — environmental

DPX3 — three gang DPX

DPX3 — three gang DPX
DPX3MA — LITTLE CAESAR® contact assembly
DPX3ME — LITTLE CAESAR® contact assembly — environmental

DPX4 — four gang DPX

DPX4 — four gang DPX
DPX4MA — LITTLE CAESAR® contact assembly
DPX4ME — LITTLE CAESAR® contact assembly — environmental

■ • DPX CATALOG

2-106 CONTACTS
Contact/Wire Size
22
20
16
2
6
4
Coax. contacts avail.
SOLDER OR CRIMP TERMINATION

4-212 CONTACTS

6-318 CONTACTS

8-424 CONTACTS

LEGEND

□ Environmental version only
■ Environmental versions available. Consult factory.
• Hermetic versions available. For information please write for applicable hermetic catalogs, or consult factory.

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CENTRAL REGION: SOUTH CENTRAL (214) 239-6761 CENTRAL (312) 298-3497 NORTH CENTRAL (612) 854-4485

Microminiature

RACK/PANEL, connectors
Micro-D connectors
plastic shells

MD — Clip mounting, diallyl phthalate insulator
MDA — Clip mounting, polycarbonate insulator
MDB — Screw mounting, diallyl phthalate insulator
MDC — Screw mounting, polycarbonate insulator
MDN — Clip mounting, nylon insulator
MDNB — Screw mounting, nylon insulator
MDV — Clip mounting, polyester insulator
MDVB — Screw mounting, polyester insulator

.050" Centers

metal shells

MDM — Screw mounting, aluminum die cast shell, coaxial arrangements
MDMH — Plate mounting, sealed environmental

■ **MMC CATALOG — Section I**

9-51 CONTACTS
3 Amps
SOLID OR STRANDED LEADS
SOLDER TERMINATION
Coaxial contact layouts available

RECTANGULAR CONNECTORS
Center jack screw

MJS — Micro contact, interconnect pc boards, pc boards-to-harness, in-line wire interconnects.

MMC CATALOG — Section I

NJS — Nano contact, interconnect pc boards, pc boards-to-harness, in-line wire interconnects.

MMC CATALOG — Section III

10-66 CONTACTS
3 Amps
SOLID OR STRANDED LEADS

9-22 CONTACTS
1 Amp
SOLID OR STRANDED LEADS

NANO connectors — strip

.0" Centers

A high density connector using twist pins on .025" centers. Available to various configurations including center jackscrew version.

MMC CATALOG — Section III

1-40 CONTACTS
1 Amp
SOLID OR STRANDED LEADS

Circular

SRC — miniature circular, rugged, general purpose

Threaded Coupling

Lightweight, economical, used for test instrumentation, electronic and industrial equipment, and other general purpose application.

SRC CATALOG

3-24 CONTACTS
Contact/Wire Size
20
16
SOLDER OR CRIMP TERMINATION

MR — standard weatherproof, submersible

Submersible

Rugged environmental MIL-C-5015 type, designed to MIL-C-12520B

□ **HEC CATALOG**

1-56 CONTACTS
Contact/Wire Size
16
12
8
4
0
SOLDER TERMINATION

WATERPROOF connectors

For extreme underwater geophysical applications, uses MIL-C-5015 contact arrangements, Acme thread coupling.

HEC CATALOG

1-56 CONTACTS
Contact/Wire Size
16
12
8
4
0
Coax. contacts avail
SOLDER TERMINATION

HIGH TEMPERATURE connectors

Threaded Coupling

HRM — 1300° F, nuclear radiation-resistant miniature circular connector
CA-HR — 650° & 1000° F, radiation-resistant

HEC CATALOG

1-73 CONTACTS
Contact/Wire Size
16
12
8
4
0
CRIMP OR WELD TERMINATIONS

FIREWALL CONNECTORS

Threaded Coupling

MS-K — 350° F, meets MIL-C-5015 fireproof test, crimp contacts
CA-KE — 350° F, moisture-resistant, for sealable wires, meets MIL-C-5015 fireproof test or 350° F continuous
FRF — Firewall connector with front release crimp snap-in MS90453, MS90454 contacts; moisture sealed, exceeds MIL-C-5015 fireproof requirements; 400°F continuous, 800°F shorter term

■ **HEC CATALOG**

1-47 CONTACTS
Contact Wire Size
16
12
8
4
0
CRIMP TERMINATION

KO — rugged lightweight

Acme Threads

Miniature environmental version of standard K connector with special Acme threads

□ ● **MC CATALOG**

3-50 CONTACTS
Contact Wire Size
20
16
12
SOLDER TERMINATION

MC — subminiature, sealed connectors

Rugged

Designed to withstand severe handling and environmental conditions

□ ● **MC CATALOG**

3-12 CONTACTS
Contact Wire Size
20
SOLDER TERMINATION

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BPC CATALOG

CONTACTS
Any number of contacts available
WIRE-WRAPPING TERMINATION

CONTACTS
By Request
WIRE-WRAPPING TERMINATION

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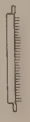
Economically designed, low cost, low profile sockets that unplug. size 14, 16, 24, 28, and 40 contact layouts in solder pin versions. Size 14 and 16 contact

DICA CATALOG

14-40 CONTACTS	
Amps	
3	
SOLDER OR WIRE-WRAPPING TERMINATIONS	

PRINTED CIRCUIT BOARD connectors

MDMPC — metal shell, high reliability, board-to-board, board-to-cable, cable-to-cable applications



MEB — metal shell, mother board, daughter board 2-piece edgeboard connector system. Meets MK-E-5400.

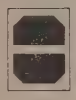
DUAL-ROW — plastic version of MEB available in 74 contacts on .075" centers

MMC CATALOG — Section I

9-51 CONTACTS	128, 184 CONTACTS
Amps	Amps
3	5
90° OR STRAIGHT LEADS	SOLID OR STRANDED LEADS

Filters — RFI/EMI

DPXJ



Rack/panel filter connectors in single, two, three or four gang shells inter-changeable with standard DPX, DPXMA, DPXME and meets require-ments of ARINC 404. Provide optimum attenuation of RFI/EMI.

FDPXJ CATALOG

CONTACTS
Contact/Wire Size
22
20
16
Coax contacts avail
SOLDER TERMINATION
Consult factory for availability of crimp filter contacts

D*J

Rectangular subminiature filter connectors intermateable with standard D subminiature and MIL-24308 types. Optimum RFI/EMI attenuation provided.

FDJ CATALOG

CONTACTS
Contact/Wire Size
20
Coax. contacts avail.
SOLDER TERMINATION
Consult factory for availability of crimp filter contacts

PVJ

Bayonet Coupling

Miniature circular filter connectors provide optimum attenuation of RFI/EMI. PVJ equivalents to MIL-C-26482 and MIL-C-83723 types.

PVJ CATALOG

CONTACTS
Contact/Wire Size
20
16
SOLDER TERMINATION
Consult factory for availability of crimp filter contacts

KJJ/KJJL

Bayonet Coupling

KJJ (low profile)/KJJL (scoop proof) miniature circular filter connectors combine functions of standard connec-tor and a feed-thru filter into one com-plete package. Meet applicable por-tions of MIL-C-38999. Provides optimum RFI/EMI attenuation.

KJJ CATALOG

CONTACTS
Contact/Wire Size
22D
20
SOLDER TERMINATION
Consult factory for availability of crimp filter contacts

Special Applications

AUDIO/ELECTRONIC connectors

Used on microphones, tape recorders, amplifiers, test instrumentation, computers and other low level circuit applications.

AUD CATALOG

2-8 CONTACTS
Contact/Wire Size
10
14
16
Coax contacts avail
SOLDER OR CRIMP TERMINATION

CABLE TELEVISION connectors

All-weather resistant coaxial connectors used for CATV application. Exceptional long-life RFI leakage provided.

CATV CATALOG

Cable Sizes
412, .500, 750
SOLDER OR CLAMP TERMINATION

VE connectors — heavy duty automotive/transportation, general purpose

Applications include trucks, off-road equip-ment and farm machinery. Environmentally sealed, withstand prolonged shock and vibration. Super Caesar™ contact assembly retention.

VE CATALOG

12-37 CONTACTS
Contact/Wire Size
16
12
II
II
CRIMP TERMINATION

SMA COAXIAL connectors

Plugs, jacks, receptacles, adapters, and terminations, microwave components, coaxial components.

SMA CATALOG

SURE SEAL™ connectors

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Designed to Meet Rigid Industrial and Military Applications

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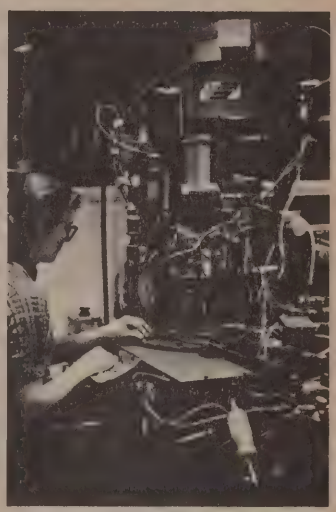

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ADAPTER

MODEL 1432
(Specify Color)

BANANA JACK TO PIN TIP

Permits standard single banana plug patch cords to be used with equipment having tip jacks.

UPPER: Banana jack, .166 dia. Brass, nickel plated.

LOWER: Pin tip, .080 dia. Brass, nickel plated. Cross hole (.166 dia.) in body provides side Stack Up connection.

COLORS: Black, Red.

QUANTITY DISC. CODE ●

Standard Package: 10 (per color)

NET .35

NET PRICES	(A) 1-24	25-49	50-99	100-249
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.20	.20	.18	.17	.14
.22	.22	.20	.19	.15
.25	.25	.23	.21	.18
.29	.29	.26	.25	.20
.35	.35	.32	.30	.25
.45	.45	.41	.38	.32

¾" SPACED MOLDED BANANA PLUGS

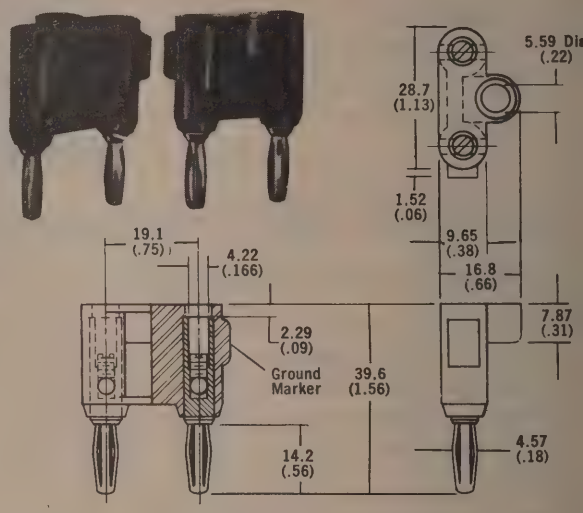
POMONA ELECTRONICS

General specifications listed below apply to items using banana plugs in this catalog.

FEATURES

- One piece beryllium copper heat treated spring for maximum long life.
- Rounded spring design results in maximum contact area.
- Stack-up feature allows an unlimited number of connections at the same electrical point.
- Tough thermoplastic molded directly on to the metal body of the plugs and connectors.

Two-thirds Size



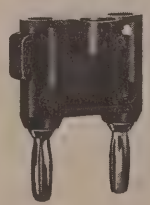
SPECIFICATIONS

- Fits standard 4.22mm (.166) dia. banana jacks.
- Spring, beryllium copper alloy 170 per QQ-C-533.
- Plug body, brass per QQ-B-626, berylco 25.
- Nickel plated per QQ-N-290, Class 2.
- Contact resistance less than 0.001 ohm per banana plug.

RATINGS	MODELS: MDP; MDP-ST; 1330; 1330-ST; 2970
• Capacity	0.8 pf to 10 MHz
• Current	15 amps. cont., 30 amps. int.
• Voltage	5000 W VDC
• Temperature	−25°C to +85°C, operating temp.

DOUBLE BANANA PLUG

Double banana plug on ¾" centers; set screws secure leads; simplifies cable construction or component mounting; banana jacks permit top stack-up for multiple connections.



Model No.	Color
MDP-0	Black
MDP-1	Brown
MDP-2	Red
MDP-3	Orange
MDP-4	Yellow
MDP-5	Green
MDP-6	Blue
MDP-7	Violet
MDP-8	Gray
MDP-9	White

★QUANTITY DISC. CODE A NET 1.10

DOUBLE BANANA PLUG WITH SOLDER TURRET TERMINALS

Similar to Model MDP, except has solder turret terminals for permanent noise-free connections of cables and components. Double banana plug on ¾" centers; banana jacks permit top stack-up for multiple connections.

COLOR: Black

Model No.
MDP-ST

QUANTITY DISC. CODE A NET 1.25

INSULATED SHORTING BAR

Ideal as a connecting link for use with ¾" spaced banana jacks. Banana plugs internally solder-bonded with #14 AWG wire. Banana jacks provide top stack-up. Cross holes 4.22mm (.166) dia. in body provide side stack-up connections. Resistance less than 1.5 milliohms installed. "Shorting Bar" marked on top of plug.

Model No.	Color
MDP-S-0	Black
MDP-S-2	Red
MDP-S-9	White

★QUANTITY DISC. CODE A NET 1.50

COMPONENT MOUNTING DOUBLE BANANA PLUG

Double banana plug on ¾" centers; set screws secure leads; features recess for mounting small components; banana jacks permit top stack-up for multiple connections.

Model No.	Color
1330-0	Black
1330-2	Red

★QUANTITY DISC. CODE A NET .95

COMPONENT PLUG WITH SOLDER TURRET TERMINALS

Similar to Model 1330, except has solder turret terminals for permanent noise-free connections of components, etc. Double banana plug on ¾" centers: Banana jacks permit top stack-up for multiple connections.

Model No.	Color
1330-ST-0	Black
1330-ST-2	Red

★QUANTITY DISC. CODE A NET 1.25

2.03mm (.080) DIA. TIP JACKS TO DOUBLE BANANA PLUG

Permits 2.03mm (.080) dia. tip plugs to be used with equipment having banana jacks.

UPPER: Tip jacks, beryllium copper, gold flashed; spaced on ¾" centers to accept 2.03mm (.080) dia. pin tip plugs.

LOWER: Double banana plug, on ¾" centers, nickel plated. Cross holes 4.22-mm (.166) dia. in body provide side stack-up connections.

COLOR: Black

Model No.
1845

QUANTITY DISC. CODE A NET 1.25

★Colors may be aggregated for best quantity price.

BANANA PLUG ACCESSORIES

POMONA ELECTRONICS

SOLDERLESS BANANA PLUG—STACK-UP

Wire firmly held in place with internal set screw, eliminating soldering. Assembly of test leads simplified.

UPPER: Banana jack, 4.22mm (.166) dia.; brass, nickel plated.

LOWER: Banana plug, one piece nickel plated beryllium copper spring for use with standard 4.22mm (.166) dia. banana jack.

Model No.	Color
1325-0	Black
1325-1	Brown
1325-2	Red
1325-3	Orange
1325-4	Yellow
1325-5	Green
1325-6	Blue
1325-7	Violet
1325-8	Gray
1325-9	White

★QUANTITY DISC. CODE A NET .60 EA.
(Sold in Lots of 10)

SOLDERLESS BANANA PLUG WITH SAFETY COLLAR—STACK-UP

Features integral safety collar that insulates exposed wire leads. Wire firmly held in place with internal set screw, eliminates soldering, simplified assembly of test leads.

UPPER: Banana jack, 4.22mm (.166) dia.; brass, nickel plated.

LOWER: Banana plug, one piece nickel plated beryllium copper spring for use with standard 4.22mm (.166) dia. banana jack.

Model No.	Color
1825-0	Black
1825-1	Brown
1825-2	Red
1825-3	Orange
1825-4	Yellow
1825-5	Green
1825-6	Blue
1825-7	Violet
1825-8	Gray
1825-9	White

★QUANTITY DISC. CODE A NET .60 EA.
(Sold in Lots of 10)

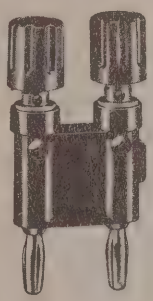
BINDING POSTS TO DOUBLE BANANA PLUG

Features insulated binding posts on ¾" centers for rapid mounting and interchangeability of components. Binding posts allow top stack-up for multiple connections. Side stack-up provided by thru-holes in plug body.

UPPER: Insulated double binding posts, 1 red, 1 black, on ¾" centers. Cross holes 4.22mm (.166) dia. in body provide side stack-up connections.

LOWER: Double banana plug, on ¾" centers.

COLOR: Black



Model No.
1286

QUANTITY DISC. CODE A NET 2.95

BINDING POST TO SINGLE BANANA PLUG

Features insulated binding post. Binding post allows top stack-up for multiple connections. Side stack-up provided by thru-hole in plug body.

UPPER: Insulated binding posts, red or black. Cross hole 4.22mm (.166) dia. in body provides side stack-up connections.

LOWER: Single banana plug, one piece nickel plated beryllium copper spring for use with standard 4.22mm (.166) dia. banana jack.

BODY COLOR: Black

Model No.	Color
2894-0	Black
2894-2	Red

★QUANTITY DISC. CODE A NET 1.75

MOLDED PRECISION RESISTOR

Ideal where rapid interchange of resistance values is required. Used in breadboarding, R & D labs, standards, terminations, etc. Deposited carbon 1% resistor, ½ watt, molded internally. Resistor soldered to double banana plug, on ¾" centers. Top stack-up provided for multiple connections. Cross holes 4.22mm (.166) dia. in body provide side stack-up connections. Resistance value stamped on top of plug.

COLOR: Red

Model No.
MPD-R

Specify Resistance in Ohms				
50	200	1K	100K	1 Meg.
75	250	5K	200K	2 Meg.
120	500	10K	250K	5 Meg.
130	600	20K	500K	10 Meg.
150	900	50K		

★QUANTITY DISC. CODE A NET 3.50

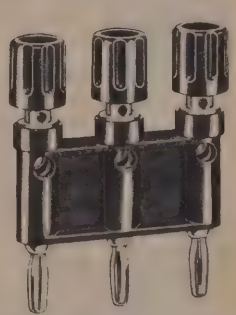
BINDING POSTS TO TRIPLE BANANA PLUG

Features insulated binding posts on ¾" centers for rapid component mounting and interchangeability. Binding posts allow top stack-up for multiple connections. Side stack-up provided by thru-holes in plug body.

UPPER: Insulated triple binding posts, red-black-black, on ¾" centers. Cross holes 4.22mm (.166) dia. in body provide side stack-up connections.

LOWER: Triple banana plug, on ¾" centers.

COLOR: Black

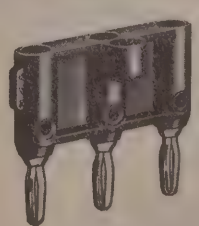


Model No.
3405

QUANTITY DISC. CODE A NET 5.85

TRIPLE BANANA PLUG

Triple banana plug on ¾" centers; set screws secure leads. Ideal for balanced line 2 conductor shielded cable assemblies. Banana jacks permit top stack-up for multiple connections.



Model No.	Color
2970-0	Black
2970-2	Red

★QUANTITY DISC. CODE A NET 1.85

METAL SHORTING BAR

Low profile, nickel plated brass shorting bar. Double banana plugs on ¾" centers swaged to 3/32" thick brass bar. Resistance, less than 1.5 milliohms installed. Cur. rating: 15 amps., cont., 30 amps. int.

Model No.
1855

QUANTITY DISC. CODE A NET 1.25

★Colors may be aggregated for best quantity price.

2.03mm (.080) DIA. PIN TIP PLUG ACCESSORIES

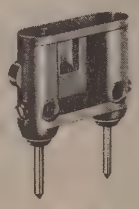
POMONA ELECTRONICS

COMPONENT MOUNTING — TIP JACKS TO DOUBLE PIN TIP PLUG — SET SCREWS

Features set screws on side of body to secure leads or components. Recess permits mounting of small component parts.

UPPER: Tip jacks, beryllium copper, gold flashed, spaced on ¾" centers, to accept 2.03mm (.080) dia. pin tip plugs.

LOWER: Pin tips, 2.03mm (.080) dia. on ¾" centers. Brass, nickel plated.



Model No.	Color
2192-0	Black
2192-2	Red

★QUANTITY DISC. CODE A **NET 3.50**

COMPONENT MOUNTING PLUG— BANANA JACKS TO DOUBLE PIN TIP —SET SCREWS

Permits single or double banana plugs to be used in equipment having tip jacks. Features recess for component mounting. Internal set screws firmly secure wire leads.

UPPER: Banana jacks, 4.22mm (.166) dia., on ¾" centers. Brass, nickel plated.

LOWER: Pin tips 2.03mm (.080) dia. on ¾" centers. Brass, nickel plated.

COLOR: Black

Model No.
1858

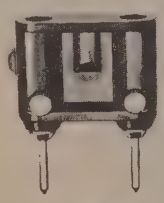
QUANTITY DISC. CODE A **NET 1.25**

PLUG — COMPONENT MOUNTING — DOUBLE PIN TIP PLUG—SOLDER TURRETS

Features recess for mounting components. Gold flashed solder turret terminals for permanent noise-free connections.

UPPER: Tip jacks, beryllium copper, gold flashed; spaced on ¾" centers to accept 2.03mm (.080) dia. pin tip plugs.

LOWER: Pin tips, 2.03mm (.080) dia. Brass, nickel plated.



Model No.	Color
1904-0	Black
1904-2	Red

★QUANTITY DISC. CODE A **NET 1.75**

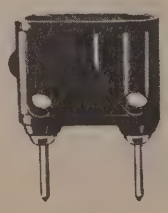
INSULATED SHORTING BAR

Used as a connecting link with equipment having tip jacks. Plugs internally solder bonded with 14 AWG wire. Top stack-up feature.

Current rating: 5 amps. cont., 10 amps. int. "Shorting Bar" marked on top of plug.

UPPER: Banana jacks, 4.22mm (.166) dia. on ¾" centers. Brass, nickel plated.

LOWER: Pin tips, 2.03mm (.080) dia. on ¾" centers. Brass, nickel plated. Cross holes 4.22mm (.166) dia. in body provide side stack-up connections.



Model No.	Color
1730-0	Black
1730-2	Red

★QUANTITY DISC. CODE A **NET 1.95**

METAL SHORTING BAR

Used as a connecting link with equipment having tip jacks. Low profile, nickel plated brass shorting bar. Double pin tip plugs on ¾" centers swaged to 3/32" thick brass bar.

RESISTANCE: Less than 1.5 milliohms installed.

CURRENT RATING: 5 amps. cont., 10 amps. int.

Model No.
2072

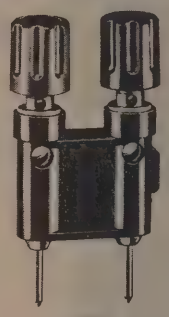
QUANTITY DISC. CODE A **NET 1.25**

BINDING POSTS TO DOUBLE PIN TIP PLUG

Features insulated binding posts on ¾" centers for rapid mounting and interchangeability of components. Binding posts allow top stack-up for multiple connections. Side stack-up provided by thru-holes in plug body.

UPPER: Insulated double binding posts, 1 red, 1 black, on ¾" centers. Top and side stack-up connectors 4.22mm (.166) dia. Cross holes 4.22mm (.166) dia. in body provide side stack-up connections. 1 red and 1 black.

LOWER: Pin tips, 2.03mm (.080) dia. on ¾" centers. Brass, nickel plated.



Model No.
2978

COLOR: Black

QUANTITY DISC. CODE A **NET 3.25**

BINDING POST TO SINGLE PIN TIP PLUG

Features insulated binding post. Binding post allows top stack-up for multiple connections. Side stack-up provided by thru-holes in plug body.

UPPER: Insulated binding post, red or black. Top and side stack-up connectors 4.22mm (.166) dia. Cross hole 4.22mm (.166) dia. in body provides side stack-up connections.

LOWER: Pin tip, 2.03mm (0.80) dia. Brass, nickel plated.

Model No.	Color
2953-0	Black
2953-2	Red

★QUANTITY DISC. CODE A **NET 1.50**

SOLDERLESS PIN TIP PLUG—STACK-UP

Wire firmly held in place with internal set screw, eliminates soldering. Assembly of test leads simplified.

UPPER: Tip jack, beryllium copper, gold flashed; accepts 2.03mm (.080) dia. pin.

LOWER: Pin tip, 2.03mm (.080) dia. Brass, nickel plated.

Model No.	Color
1922-0	Black
1922-2	Red

(Sold in Lots of 10)

★QUANTITY DISC. CODE A **NET 1.50 EA.**

BANANA JACK TO PIN TIP

Permits standard single banana plug patch cords to be used with equipment having tip jacks.

UPPER: Banana jack, 4.22mm (.166) dia. Brass, nickel plated.

LOWER: Pin tip, 2.03mm (.080) dia. Brass, nickel plated. Cross hole 4.22mm (.166) dia. in body provides side stack-up connection.

Model No.	Color
1432-0	Black
1432-2	Red

(Sold in Lots of 10)

★QUANTITY DISC. CODE A **NET .35 EA.**

2,03mm (.080) DIA. TIP JACK TO BANANA PLUG

Permits 2.03mm (.080) dia. pin tip cords to be used with equipment having banana jacks. Insulation molded to plug body.

UPPER: Tip jack, beryllium copper, gold flashed. Accepts 2.03mm (.080) dia. pin.

LOWER: Banana plug, one piece nickel plated beryllium copper spring for use with standard 4.22mm (.166) dia. banana jack. Cross hole 4.22mm (.166) dia. in body provides side stack-up connection.

Model No.	Color
1809-0	Black
1809-2	Red

(Sold in Lots of 10)

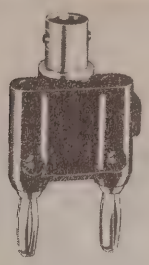
★QUANTITY DISC. CODE A **NET .75 EA.**

★Colors may be aggregated for best quantity price.

BNC TEST ADAPTERS

POMONA ELECTRONICS

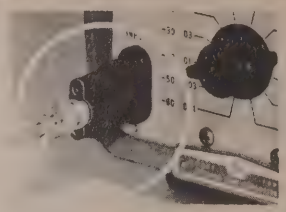
BNC RECEPTACLE TO DOUBLE BANANA PLUG



Permits BNC plug to be used with equipment having banana jacks. Excellent for adapting laboratory VTVM, oscilloscopes and signal generator inputs to readily available coaxial cables.
UPPER: BNC receptacle.
LOWER: Double banana plug, on ¾" centers. Cross holes 4.22mm (.166) dia. in body provide side stack-up connections.
COLOR: Black

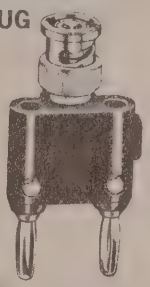
Model No.
1269

QUANTITY DISC. CODE A **NET 3.50**



Now! Increase the flexibility of your laboratory with the use of POMONA Molded test accessories. Minimize the necessity of stocking a large quantity and variety of coaxial cables by using POMONA molded adapters. Tough thermo-plastic material molded to plug body or connectors insures maximum strength, moisture resistance and excellent insulative properties.

BNC PLUG TO DOUBLE BANANA PLUG

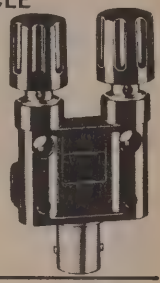


Permits BNC receptacle to be used with equipment having banana jacks. Minimizes number of coaxial connections for maximum efficiency.
UPPER BNC plug.
LOWER: Double banana plug, on ¾" centers. Cross holes 4.22mm (.166) dia. in body provide side stack-up connections.
COLOR: Black

Model No.
1270

QUANTITY DISC. CODE A **NET 4.25**

BINDING POSTS TO BNC RECEPTACLE

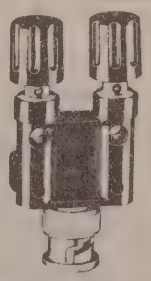


Permits single or double banana plugs to be used with equipment having BNC plug.
UPPER: Insulated binding posts, 1 Red, 1 Black, on ¾" centers with 4.22mm (.166) dia. banana jacks. Cross holes 4.22mm (.166) dia. in body provide side stack-up connections.
LOWER: BNC receptacle.
COLOR: Black

Model No.
1452

QUANTITY DISC. CODE A
NET 4.95

BINDING POSTS TO BNC PLUG



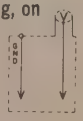
Permits single or double banana plugs to be used with equipment having BNC receptacle. Excellent for use with laboratory oscilloscopes.
UPPER: Insulated binding posts, 1 Red, 1 Black, on ¾" centers with 4.22mm (.166) dia. banana jacks. Cross holes 4.22mm (.166) dia. in body provide side stack-up connections.
LOWER: BNC plug.
COLOR: Black

Model No.
1296

QUANTITY DISC. CODE A **NET 5.45**

BNC RECEPTACLE TO SHIELDED BANANA PLUGS

Permits BNC plug to be used with equipment having banana jack binding posts. Black anodized aluminum shield, noise rejection greater than 70 db. Ideal for low level inputs to oscilloscopes, wave analyzers, etc.
UPPER: BNC receptacle.
LOWER: Shielded double banana plug, on ¾" centers.



Model No.
1645

QUANTITY DISC. CODE A
NET 4.85

SINGLE BINDING POST TO BNC PLUG

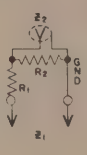
Permits single banana plug to be used with equipment having a BNC receptacle. Connector body features a non-tarnish finish.
UPPER: Insulated binding post, Red or Black, for multiple stacking.
LOWER: BNC plug.

Model No.	Color
3430-0	Black
3430-2	Red

★QUANTITY DISC. CODE A **NET 2.50**

BNC MATCHING PAD

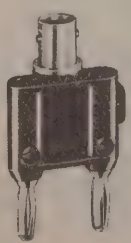
Adapts 600 OHM sources to 50, 75 or 93 OHM cables. Excellent for matching signal generators and VTVM's to standard coaxial cables. Ideal for receiver alignment. Molded in deposited carbon resistors 1%, ¼W.
UPPER: BNC receptacle.
LOWER: Double banana plug, on ¾" centers. Cross holes 4.22mm (.166) dia. in body provide side stack-up connections.



Model No.	Color	Range — Ohms
1656-1	Yellow	600 to 50
1656-2	Red	600 to 75
1656-3	White	600 to 93
1656-4	Blue	300 to 50

QUANTITY DISC. CODE A
NET 12.50

SIGNAL ISOLATOR — BNC RECEPTACLE TO DOUBLE BANANA PLUG



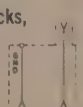
Permits BNC male connector to be used with equipment having banana jacks. General purpose ceramic capacitor molded internally. Rated @ .01 MFD ±20%, 200 W VDC. Insulation resistance 10,000 megohms min. Ideal for isolating DC signals from VTVM inputs and signal generator outputs.
UPPER: BNC receptacle.
LOWER: Double banana plug, on ¾" centers. Cross holes 4.22mm (.166) dia. in body provide side stack-up connections.

Model No.	Color
1868-6	Blue

QUANTITY DISC. CODE A **NET 8.50**

BNC RECEPTACLE TO SHIELDED BANANA JACKS

Permits BNC plug to be used with equipment having banana plugs. Black anodized aluminum shield, noise rejection greater than 70 db. Ideal for low level inputs to oscilloscopes, wave analyzers, etc.
UPPER: BNC receptacle,
LOWER: Shielded double banana jacks, on ¾" centers.



Model No.
1681

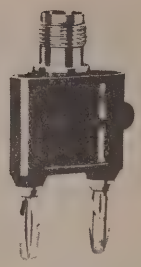
QUANTITY DISC. CODE A
NET 5.85

★Colors may be aggregated for best quantity price.

TNC & TYPE N ADAPTERS

POMONA ELECTRONICS

TNC RECEPTACLE TO DOUBLE BANANA PLUG



Permits TNC plug to be used with equipment having banana jacks. Perfect for connecting modern control systems to laboratory test equipment.
UPPER: TNC receptacle.
LOWER: Double banana plug, on ¾" centers. Cross holes 4.22mm (.166) dia. in body provide side stack-up connections.
COLOR: Black

Model No.	QUANTITY DISC. CODE	NET
1340	A	8.85

TYPE "N" RECEPTACLE TO DOUBLE BANANA PLUG

Permits Type "N" plug to be used with equipment having banana jacks. Ideal for connecting R.F. equipment to conventional test equipment.
UPPER: Type "N" receptable.
LOWER: Double banana plug, on ¾" centers. Cross holes 4.22mm (.166) dia. in body provide side stack-up connections.
COLOR: Black

Model No.	QUANTITY DISC. CODE	NET
1740	A	7.50

TNC PLUG TO DOUBLE BANANA PLUG

Permits TNC receptacle to be used with equipment having banana jacks. Minimizes your stock of coaxial cables.
UPPER: TNC plug.
LOWER: Double banana plug, on ¾" centers. Cross holes 4.22mm (.166) dia. in body provide side stack-up connections.
COLOR: Black

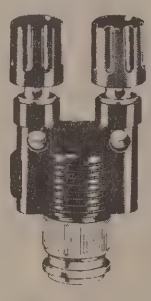
Model No.	QUANTITY DISC. CODE	NET
1981	A	8.85

TYPE "N" PLUG TO DOUBLE BANANA PLUG

Permits Type "N" receptable to be used with equipment having banana jacks.
UPPER: Type "N" plug.
LOWER: Double banana plug on ¾" centers. Cross holes 4.22mm (.166) dia. in body provide side stack-up connections.
COLOR: Black

Model No.	QUANTITY DISC. CODE	NET
1770	A	9.50

BINDING POSTS TO TNC PLUG



Permits single or double banana plugs to be used with equipment having a TNC receptacle. Exceptional for signal insertion with rapid interchangeability of terminations.
UPPER: Insulated binding posts, 1 Red, 1 Black, on ¾" centers with 4.22mm (.166) dia. banana jacks. Cross holes 4.22mm (.166) dia. in body provide side stack-up connections.
LOWER: TNC plug.
COLOR: Black

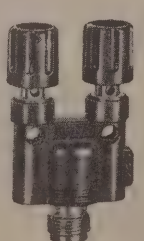
Model No.	QUANTITY DISC. CODE	NET
1982	A	8.85

BINDING POSTS TO TYPE "N" PLUG

Permits single or double banana plugs to be used with equipment having Type "N" receptacle. Binding posts allow component insertion.
UPPER: Insulated binding posts, 1 Red, 1 Black, on ¾" centers with 4.22mm (.166) dia. banana jacks. Cross holes 4.22mm (.166) dia. in body provide side stack-up connections.
LOWER Type "N" plug.
COLOR: Black

Model No.	QUANTITY DISC. CODE	NET
1796	A	9.50

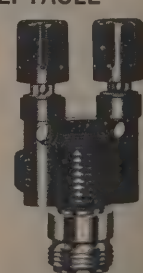
BINDING POSTS TO TNC RECEPTACLE



Permits single or double banana plugs to be used with equipment having TNC plug. Useful for rapid interconnection of systems and components.
UPPER: Insulated binding posts, 1 Red, 1 Black, on ¾" centers with 4.22mm (.166) dia. banana jacks. Cross holes 4.22mm (.166) dia. in body provide side stack-up connections.
LOWER: TNC receptable.
COLOR: Black

Model No.	QUANTITY DISC. CODE	NET
1976	A	7.85

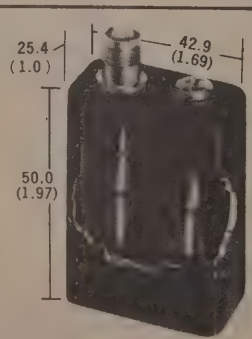
BINDING POSTS TO TYPE "N" RECEPTACLE



Permits single or double banana plugs to be used with equipment having Type "N" plug. Useful for rapid interconnection of systems and components.
UPPER: Insulated binding posts, 1 Red, 1 Black, on ¾" centers with 4.22mm (.166) dia. banana jacks. Cross holes 4.22mm (.166) dia. in body provide side stack-up connections.
LOWER: Type "N" receptacle.
COLOR: Black

Model No.	QUANTITY DISC. CODE	NET
1992	A	7.85

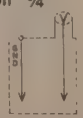
TNC RECEPTACLE TO SHIELDED BANANA PLUGS



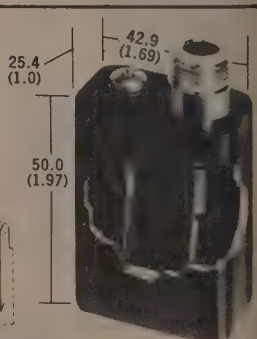
Permits TNC plug to be used with equipment having banana jack binding posts. Black anodized aluminum shield, noise rejection greater than 70 db.
UPPER: TNC receptacle.
LOWER: Double banana plug, on ¾" centers.

Model No.	NET
1975	7.85

QUANTITY DISC. CODE A



TYPE "N" RECEPTACLE TO SHIELDED BANANA PLUGS



Permits Type "N" plug to be used with equipment having banana jack binding posts. Black anodized aluminum shield, noise rejection greater than 70 db.
UPPER: Type "N" receptacle.
LOWER: Double banana plug, on ¾" centers.

Model No.	NET
1983	7.85

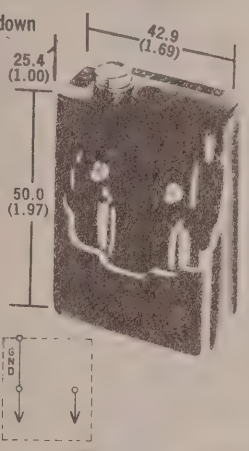
QUANTITY DISC. CODE A

SHIELDED BANANA PLUGS & UHF ADAPTERS

POMONA ELECTRONICS

SHIELDED DOUBLE BANANA PLUG IN-LINE CABLE ENTRY

RATED: 15A Continuous 3400 VDC Breakdown
1200 W VDC 2.5 PF @ 1 MHz



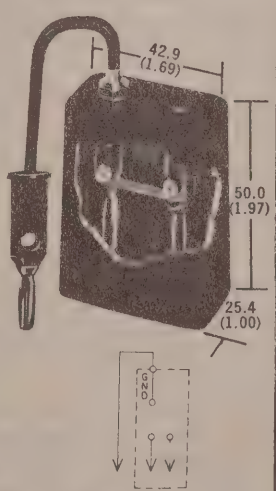
- Shielded double plug, ¾" spaced.
- Die cast aluminum shell, black anodized.
- Noise rejection: greater than 70 db.
- Gold flashed solder turret terminals for positive reliable cable connections.
- One piece nickel plated beryllium copper springs for use with standard 4.22mm (.166) dia. banana jack binding posts.
- Rounded banana spring design results in maximum contact area and minimum contact resistance.
- GND clearly molded in shell.
- Cable opening, 7/32" diameter.

Model No.
1433

QUANTITY DISC. CODE A **NET 3.95**

BALANCED LINE SHIELDED DOUBLE BANANA PLUG

RATED: 15A Continuous
1000 W V Peak; Line to Shield
2000 W V Peak; Line to Line
2500 V Peak Breakdown; Line to Shield
5000 V Peak Breakdown, Line to Line
2.0 PF @ 1 MHz Capacity; Line to Line
3.0 PF @ 1 MHz Capacity; Both Lines to Shield



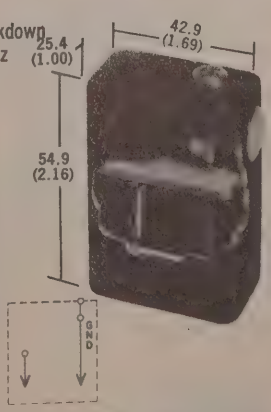
- Unique 3 terminal design allows connection to shielded two conductor cable while maintaining balanced conditions.
- Minimizes ground loop errors in low signal level applications.
- Die cast aluminum shell, black anodized.
- Noise rejection: greater than 70 db.
- Gold flashed solder turret terminals for reliable noise free connections.
- One piece nickel plated beryllium copper springs for use with standard 4.22mm (.166) dia. banana jack binding posts.

Model No.
1921

QUANTITY DISC. CODE A **NET 8.50**

SHIELDED DOUBLE BANANA PLUG RIGHT ANGLE CABLE ENTRY

RATED: 15A Continuous 5000 VDC Breakdown
2800 Peak W V 2.0 PF @ 1 MHz



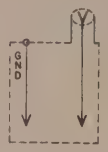
- Shielded double plug, ¾" spaced.
- Polycarbonate insulating base.
- Die cast aluminum shell, black anodized.
- GND clearly molded in shell.
- Noise rejection: greater than 70 db.
- One piece nickel plated beryllium copper springs for use with standard 4.22mm (.166) dia. banana jack binding posts.
- Rounded banana spring design results in maximum contact area and minimum contact resistance.
- Vinyl grommet and nickel plated snap button supplied.

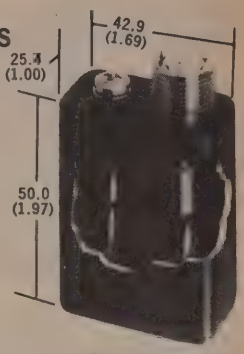
Model No.
1791

QUANTITY DISC. CODE A **NET 4.95**

UHF RECEPTACLE TO SHIELDED BANANA PLUGS

Permits UHF plug to be used with equipment having banana jack binding posts. Black anodized shield, noise rejection greater than 70 db.
UPPER: UHF receptacle, 5/8" dia.
LOWER: Double banana plug on ¾" centers.



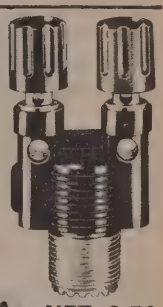


Model No.
1708

QUANTITY DISC. CODE A **NET 8.50**

BINDING POSTS TO UHF RECEPTACLE

Permits single or double banana plugs to be used with equipment having UHF plug.
UPPER: Insulated binding posts, 1 red, 1 black, on ¾" centers with 4.22mm (.166) dia. jacks. Cross holes 4.22mm dia. in body provide side stack-up connections.
LOWER: UHF receptacle, 5/8" dia.
COLOR: Black



Model No.
1792

QUANTITY DISC. CODE A **NET 8.50**

UHF RECEPTACLE TO DOUBLE BANANA PLUG

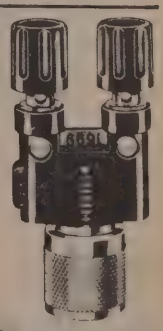
Permits UHF plug to be used with equipment having banana jacks.
UPPER: UHF receptacle, 5/8" dia.
LOWER: Double banana plug, on ¾" centers. Cross holes 4.22mm (.166) dia. in body provide side stack-up connections.
COLOR: Black

Model No.
1707

QUANTITY DISC. CODE A **NET 6.50**

BINDING POSTS TO UHF PLUG

Permits single or double banana plugs to be used with equipment having a UHF receptacle, 5/8" dia. Convenient for use with modern oscilloscopes.
UPPER: Insulated binding posts, 1 red, 1 black, on ¾" centers with 4.22mm (.166) dia. jacks.
LOWER: UHF plug.
COLOR: Black



Model No.
1699

QUANTITY DISC. CODE A **NET 6.85**

BINDING POST TO UHF PLUG

Permits single banana plug to be used with equipment having a UHF receptacle, 5/8" dia. Adds flexibility to your oscilloscope.
UPPER: Insulated binding post with 4.22 mm (.166) dia. banana jack. **COLOR:** Red
LOWER: UHF plug.

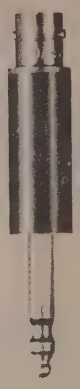
Model No.
1698

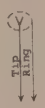
QUANTITY DISC. CODE A **NET 4.85**

PHONE PLUG TEST ADAPTERS

POMONA ELECTRONICS

BNC RECEPTACLE TO PJ-068/WE-309* PHONE PLUG





Permits BNC plug to be used with equipment having three circuit phone jacks for 5.23mm (.206) dia. phone plugs. Readily adapts equipment to available BNC coaxial cables. Tip connected to inner contact of connector and ring connected to shell. Sleeve, no connection.

UPPER: BNC receptacle, UG1094/U.

LOWER: Phone plug, PJ-068/WE-309*.

COLOR: Black

*WE-309 interchangeable with PJ-068.

Model No.
1794

QUANTITY DISC. CODE A **NET 8.85**

BNC RECEPTACLE TO PJ-051* PHONE PLUG

Permits BNC plug to be used with equipment having three circuit phone jacks for 6.35mm (.250) dia. phone plugs. Readily adapts equipment to available BNC coaxial cables. Tip connected to inner contact of connector and ring connected to shell. Sleeve, no connection.

UPPER: BNC receptacle, UG1094/U.

LOWER: Phone plug, PJ-051*.

COLOR: Black

*PJ-051 interchangeable with WE-310.

Model No.
2798

QUANTITY DISC. CODE A **NET 8.85**

BINDING POSTS TO PJ-068/WE-309* PHONE PLUG

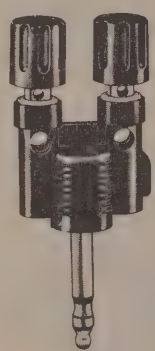
Permits single or double banana plug to be used with equipment having three circuit phone jacks for 5.23mm (.206) dia. phone plugs. Ideal for rapid mounting of components and test leads. The PJ-068 and WE-309 plugs have the same mechanical dimensions.

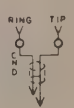
UPPER: Insulated binding posts, 1 red, 1 black, on ¾" centers with 4.22mm (.166) dia. banana jacks. Cross holes 4.22mm (.166) dia. in body provide side stack-up.

LOWER: Phone plug, PJ-068/WE-309*.

COLOR: Black

*WE-309 interchangeable with PJ-068.





Model No.
3365

QUANTITY DISC. CODE A **NET 8.85**

BINDING POSTS TO PJ-051* PHONE PLUG

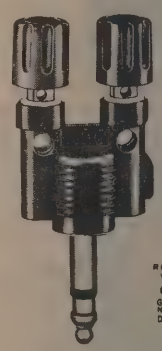
Permits single or double banana plug to be used with equipment having three circuit phone jacks for 6.35mm (.250) dia. phone plugs. Tip connected to hot side of adapter and ring connected to ground side. Sleeve, no connection.

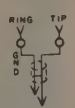
UPPER: Insulated binding posts, 1 red, 1 black, on ¾" centers with 4.22mm (.166) dia. banana jacks. Cross holes 4.22mm (.166) dia. in body provide side stack-up.

LOWER: Phone plug, PJ-051*.

COLOR: Black

*PJ-051 interchangeable with WE-310.





Model No.
2112

QUANTITY DISC. CODE A **NET 7.85**

BINDING POSTS PHONE PLUG

Permits single or double banana plug to be used with equipment having phone jacks. Ideal for rapid mounting of components and test leads.

UPPER: Insulated binding posts, 1 red, 1 black, on ¾" centers with 4.22mm (.166) dia. banana jacks. Cross holes 4.22mm (1.66) dia. in body provide side stack-up connections.

LOWER: Standard ¼" dia. phone plug, 1 3/16" long.

COLOR: Black

Model No.
1285

QUANTITY DISC. CODE A **NET 4.85**

BANANA JACKS TO PHONE PLUG

Permits single or double banana plug to be used with equipment having phone jacks.

UPPER: Double banana jack, on ¾" centers. Cross holes 4.22mm (.166) dia. in body provide side stack-up connections.

LOWER: Standard ¼" dia. phone plug, 1 3/16" long.

COLOR: Black

Model No.
1980

QUANTITY DISC. CODE A **NET 4.50**

BNC RECEPTACLE TO PHONE PLUG

Permits BNC plug to be used with equipment having standard ¼" dia. phone jacks. Readily adapts equipment to available BNC coaxial cables. All metal construction to insure proper shielding.

UPPER: BNC receptacle, UG1094/U.

LOWER: Standard ¼" dia. phone plug, 1 3/16" long.

Model No.
1297

QUANTITY DISC. CODE A **NET 5.85**

PHONE PLUG JACK TO BNC PLUG

Permits a standard 2 conductor ¼" dia. phone plug to be used with equipment having BNC receptacle. All metal construction to insure proper shielding.

UPPER: Phone plug jack, accepts standard ¼" dia. phone plug, 1 3/16" long.

LOWER: BNC plug.

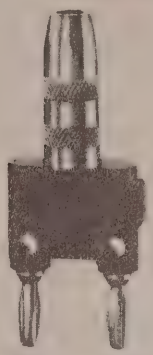
Model No.
4043

QUANTITY DISC. CODE A **NET 8.85**

MISCELLANEOUS TEST ADAPTERS

POMONA ELECTRONICS

PHONE PLUG JACK TO DOUBLE BANANA PLUG



Permits a standard 2 conductor ¼" dia. phone plug to be used with equipment having banana jacks or binding posts.

UPPER: Phone plug jack, accepts standard ¼" dia. phone plug, 1 3/16" long.

LOWER: Double banana plug on ¾" centers. Cross holes 4.22mm (.166) dia. in body provide side stack-up connections.

COLOR: Black

Model No.
4044

QUANTITY DISC. CODE A **NET 6.85**

PHONE PLUG JACK TO BNC RECEPTACLE

This adapter allows a cable with a 2 conductor ¼" dia. phone plug to be attached to a cable with a BNC plug. All metal construction for proper shielding.

UPPER: Phone plug jack, accepts standard ¼" dia. phone plug, 1 3/16" long.

LOWER: BNC receptacle UG1094/U.

Model No.
4026

QUANTITY DISC. CODE A **NET 6.85**

BNC RECEPTACLE TO MICRO-PLUG

Permits BNC plugs to be used with equipment having micro-jacks. Readily adapts equipment to available BNC coaxial cables. All metal construction to insure proper shielding.

UPPER: BNC receptacle UG1094/U.

LOWER: 2 conductor micro-plug.

Model No.
4267

QUANTITY DISC. CODE A **NET 4.85**

BNC RECEPTACLE TO TINI-PLUG

Permits BNC plugs to be used with equipment having Tini-Jacks. Readily adapts equipment to available BNC coaxial cables. All metal construction to insure proper shielding.

UPPER: BNC receptacle UG1094/U.

LOWER: 2 conductor Tini-Plug.

Model No.
3837

QUANTITY DISC. CODE A **NET 4.85**

ADAPTER — BNC RECEPTACLE TO SHIELDED BANANA PLUG

Permits BNC plug to be used with equipment having banana jacks or binding posts. Ideal for use when shielding of single banana jacks are needed. All metal construction for proper shielding.

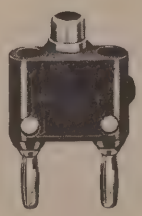
UPPER: BNC receptacle, UG1094/U.

LOWER: Shielded single banana plug.

Model No.
2990

QUANTITY DISC. CODE A **NET 2.95**

PHONO JACK TO DOUBLE BANANA PLUG



Permits phono plug to be used with equipment having banana jacks or binding posts. Quickly converts a cable with a phono plug to a double banana plug.

UPPER: Phono jack.

LOWER: Double banana plug on ¾" centers. Cross holes 4.22mm (.166) dia. in body provides side stack-up connections.

COLOR: Black

Model No.
1442

QUANTITY DISC. CODE A **NET 4.85**

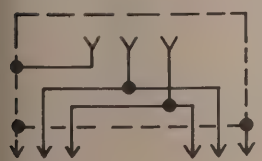
LOOPING PLUG WITH MONITOR JACK

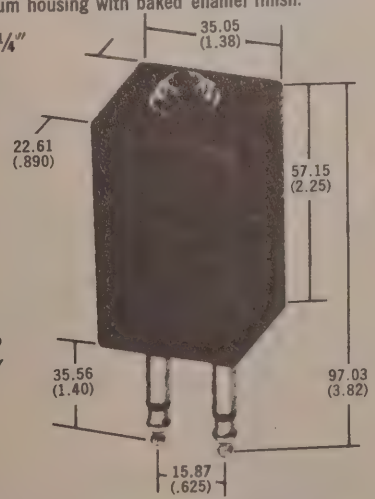
With this combination adapter it is possible to monitor the looping plug circuit. Die cast aluminum housing with baked enamel finish.

UPPER: Phone Jack (Accepts ¼" Dia. PJ-051 Plug).

LOWER: (2) Phone Plugs, PJ-051 on ⅝" Centers (Equivalent to WE-310).

COLOR: Blue

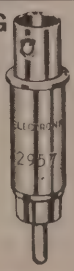




Model No.
4104A

QUANTITY DISC. CODE A **NET 29.95**

BNC RECEPTACLE TO PHONO PLUG



Permits BNC plug to be used with equipment having phono jacks. Readily adapts equipment to available BNC coaxial cables. All metal construction to insure proper shielding.

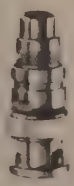
UPPER: BNC receptacle UG1094/U.

LOWER: Phono plug.

Model No.
2957

QUANTITY DISC. CODE A **NET 3.95**

PHONO JACK TO BNC PLUG



Permits phono plug to be used with equipment having BNC receptacles. Quickly converts a cable with a phono plug to a BNC plug. All metal construction to insure proper shielding.

UPPER: Phono jack.

LOWER: BNC plug.

Model No.
4054

QUANTITY DISC. CODE A **NET 5.85**

MISCELLANEOUS TEST ACCESSORIES

POMONA ELECTRONICS

ADAPTER—MHV RECEPTACLE TO DOUBLE BANANA PLUG

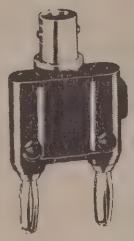
This adapter allows a MHV plug to be used with equipment having ¾" spaced banana jacks.

UPPER: MHV receptacle.

LOWER: Double banana plug, on ¾" centers. Cross holes 4.22mm (.166) dia. in body provide side stack-up connections.

VOLTAGE RATING: 5,000 volts peak.

COLOR: Black



Model No.
3290

QUANTITY DISC. CODE A **NET 8.85**

ADAPTER—BINDING POSTS TO MHV PLUG

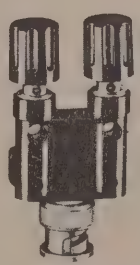
This adapter converts a MHV receptacle to standard ¾" 5-way binding posts

UPPER: Insulated binding posts, 1 Red, 1 Black, on ¾" centers with 4.22mm (.166) dia. banana jacks. Cross holes 4.22mm (.166) dia. in body provide side stack-up connections.

LOWER: MHV plug.

VOLTAGE RATING: 5,000 volts peak.

COLOR: Black



Model No.
3291

QUANTITY DISC. CODE A **NET 13.85**

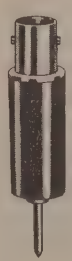
ADAPTER—BNC RECEPTACLE TO SINGLE PIN TIP PLUG

Permits BNC plug to be used with equipment having 2.03mm (.080) dia. pin tip jacks. Inner conductor connected only. Excellent for adapting laboratory VTVM, oscilloscopes and signal generator inputs to readily available coaxial cables.

UPPER: BNC receptacle, UG1094/U.

LOWER: Single pin tip plug 2.03mm (.080) dia.

COLOR: Black



Model No.
3415

QUANTITY DISC. CODE A **NET 2.85**

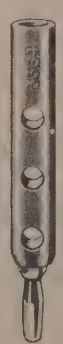
QUAD STACKING PLUG

Features four parallel connectors to the same point. Excellent for use when many test points must be tied together.

UPPER: Banana jack, 4.22mm (.166) dia. brass, nickel plated.

CENTER: 3 crossholes, 4.22mm (.166) dia. in body provide side stack-up connection.

LOWER: Banana plug, one piece heat treated beryllium copper spring, nickel plated, for use with 4.22mm (.166) dia. banana jack.



Model No.	Color
3364-0	Black
3364-2	Red

QUANTITY DISC. CODE A **NET 2.50**

INSULATED SPADE LUG ADAPTER

Permits single banana plug to be used with equipment having binding posts. Tough thermoplastic molded to body for maximum reliability and low shock hazard. Spade lug body, one piece machined brass, nickel plated.

UPPER: Banana jack, 4.22mm (.166) dia.

LOWER: Spade lug, 6.60mm (.26) opening, 1.52mm (.06) thick.

Model No.	Color
1614-0	Black
1614-2	Red

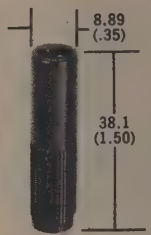
★QUANTITY DISC. CODE A **NET .50 E**

(Sold in Lots of 10)

DO-IT-YOURSELF IN-LINE BANANA JACK

This In-Line Banana Jack will accept all standard banana plugs including the 20.3mm (.800) long European version. Jack can either be soldered or crimped.

MATERIAL: Jack, brass nickel plated. Jacket, Glass-filled nylon.



Model No.	Color	accept wires AWG
4237-0	Black	22, 20, 18
4237-2	Red	
4499-0	Black	16, 14
4499-2	Red	

QUANTITY DISC. CODE A **NET .75**

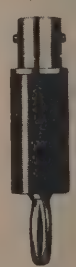
ADAPTER—BNC RECEPTACLE TO SINGLE BANANA PLUG

Permits BNC plug to be used with equipment having banana jacks. Inner conductor connected only. Excellent for adapting laboratory VTVM, oscilloscopes and signal generator inputs to readily available coaxial cables.

UPPER: BNC receptacle, UG1094/U.

LOWER: Single banana plug.

COLOR: Black



Model No.
1894

QUANTITY DISC. CODE A **NET 2.75**

TELLURIUM COPPER INSULATED SPADE LUG ADAPTER

Permits single banana plug to be used with equipment having binding posts. Tough thermoplastic molded to body for maximum reliability and low shock hazard. Spade lug body, one piece machined tellurium copper, gold plated per MIL-G-45204, Type 11, Class 1.

UPPER: Banana jack, 4.22mm (.166) dia.

LOWER: Spade lug, 6.60mm (.26) opening, 2.03mm (.08) thick.

Model No.
2305

QUANTITY DISC. CODE A **NET 3.00**

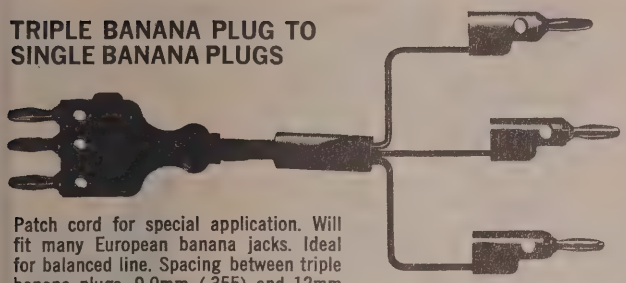
(per pkg.
(package 1 Red & 1 Black)

★Colors may be aggregated for best quantity price.

EUROPEAN CABLE ASSEMBLIES & ADAPTERS

POMONA ELECTRONICS

TRIPLE BANANA PLUG TO SINGLE BANANA PLUGS



Patch cord for special application. Will fit many European banana jacks. Ideal for balanced line. Spacing between triple banana plugs, 9.0mm (.355) and 12mm (.47) will mate with Model 4163.

Model No.	Length
1701-18	18″
1701-24	24″
1701-36	36″
1701-48	48″
1701-60	60″

★QUANTITY
DISC. CODE B
NET 24.95

TRIPLE BANANA PLUG ONE END

Patch cord for special application. Will fit many European banana jacks. Ideal for balanced line. Spacing between triple banana plugs. 9.0mm (.355) and 12mm (.47) will mate with Model 4163.

1st END — Triple Banana Plug:

MATERIAL: Spring, one piece heat treated beryllium copper. Berylco 25 per QQ-C-533. Plug body, brass per QQ-B-626, alloy #360.

FINISH: Nickel plated.

INSULATION: Polyethylene thermoplastic. Color: Black.

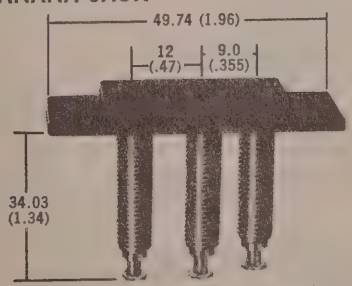
CABLE: Two conductor shielded microphone. 22 AWG, stranding 19 x 34 T.C. Color: Gray.

Model No.	Length	Model No.	Length
4523-18	18″	4523-36	36″
4523-24	24″	4523-48	48″
		4523-60	60″

★QUANTITY
DISC. CODE B
NET 19.95

EUROPEAN TRIPLE BANANA JACK

- Initial connection made with ground receptacle.
- Accepts 20.32mm (.800″) long European banana plugs.
- Mates with Model 1701.
- Supplied with (2) 6-32 hex nuts and screws.



Model No.	Color
4163-0	Black
4163-2	Red
4163-8	Gray

★QUANTITY DISC. CODE A **NET 2.95**

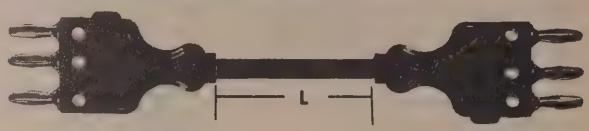
STANDARD TYPE BINDING POST

This binding post is made longer to accept the 20.30mm (.800) long European banana plug. Brass body and thumb nut insert, nickel plated per QQ-N-290 Class 2.

Model No.	Color
4244-0	Black
4244-2	Red
4244-4	Yellow
4244-5	Green
4244-6	Blue
4244-9	White

★QUANTITY DISC. CODE A **NET 1.50**

TRIPLE BANANA PLUG BOTH ENDS



Patch cord for special application. Will fit many European banana jacks. Ideal for balanced line. Spacing between triple banana plugs, 9.0mm (.355) and 12mm (.47) will mate with Model 4163.

1st End — Triple Banana Plug:

MATERIAL: Spring, one piece heat treated beryllium copper, Berylco 25 per QQ-C-533. Plug body, brass per QQ-B-626, alloy #360.

FINISH: Nickel plated.

INSULATION: Polyethylene thermoplastic. Color: Black.

CABLE: Two conductor shielded microphone. 22 AWG, stranding 19 x 34 T.C. Color: Gray.

2nd END — Same as first.

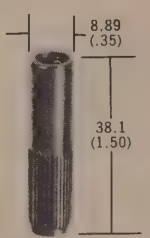
Model No.	Length	Model No.	Length
4428-18	18″	4428-36	36″
4428-24	24″	4428-48	48″
		4428-60	60″

★QUANTITY
DISC. CODE B
NET 24.95

DO-IT-YOURSELF IN-LINE BANANA JACK

This In-Line Banana Jack will accept all standard banana plugs including the 20.3mm (.800) long European version. Jack can either be soldered or crimped.

MATERIAL: Jack, brass nickel plated. Jacket, Glass-filled nylon.



Model No.	Color	accept wires AWG
4237-0	Black	22, 20, 18
4237-2	Red	
4499-0	Black	16, 14
4499-2	Red	

★QUANTITY DISC. CODE A **NET .75**

DO-IT-YOURSELF IN-LINE BANANA PLUG

This In-Line Banana Plug is ideal for on the job repairs of patch cords. Plug can either be soldered or crimped.

MATERIAL: Plug body: brass, nickel plated. Spring: Beryllium copper, nickel plated. Jacket: Glass-filled nylon.

Model No.	Color	accept wires AWG
4433-0	Black	22, 20, 18
4433-2	Red	
4498-0	Black	16, 14
4498-2	Red	

★QUANTITY DISCOUNT CODE A **NET 1.50**

DO-IT-YOURSELF 2.03MM (.080) DIA. PIN TIP PLUG

This In-Line 2.03mm (.080) dia. pin tip plug is ideal for on the job repairs of patch cords. Plug can either be soldered or crimped.

MATERIAL: Brass nickel plated. Jacket: Glass-filled nylon.

Model No.	Color	accept wires AWG
4495-0	Black	22, 20, 18
4495-2	Red	
4497-0	Black	16, 14
4497-2	Red	

★QUANTITY DISC. CODE A **NET 1.25**

★Various lengths may be aggregated for best quantity price.

SPLICES/BNC TEST ADAPTERS

POMONA ELECTRONICS

SINGLE MINIATURE BANANA PLUG SPLICE

Permits splicing of single miniature banana plugs. Tough thermoplastic molded onto the body eliminates shock hazard by enclosing plugs.

UPPER: Miniature banana jacks 2.64mm (.104) dia., brass, nickel plated.

LOWER: Same as upper.

Model No.	Color
3833-0	Black
3833-2	Red

QUANTITY DISC. CODE A NET .95 EA.
(Sold in Lots of 10)

STANDARD BANANA PLUG TO MINIATURE BANANA PLUG SPLICE

This splice accepts a standard banana plug on one end and a miniature banana plug on the other end. Tough thermoplastic molded onto the body eliminates shock hazard by enclosing the plugs.

UPPER: Standard banana jack, 4.22mm (.166) dia., brass, nickel plated.

LOWER: Miniature banana jack, 2.64mm (.104) dia., brass, nickel plated.

Model No.	Color
3835-0	Black
3835-2	Red

★QUANTITY DISC. CODE A NET .50 EA.
(Sold in Lots of 10)

SINGLE 2.03MM (.080) DIA. PIN TIP PLUG SPLICE

Permits splicing of single 2.03mm (.080) dia. pin tip patch cords. Tough thermoplastic molded onto the body eliminates shock hazard by enclosing plugs.

UPPER: Tip jack, beryllium copper, gold plated, accepts 2.03mm (.080) dia. pin.

LOWER: Same as upper.

Model No.	Color
3832-0	Black
3832-2	Red

★QUANTITY DISC. CODE A NET .95 EA.
(Sold in Lots of 10)

STANDARD BANANA PLUG TO 2.03MM (.080) DIA. PIN TIP PLUG SPLICE

This splice accepts a standard banana plug on one end and a 2.03mm .080 pin tip plug on the other end. Tough thermoplastic molded onto the body eliminates shock hazard by enclosing plugs.

UPPER: Standard banana jack, 4.22mm (.166) dia. Brass, nickel plated.

LOWER: Tip jack, beryllium copper, gold plated, accents 2.03mm (.808) dia. pin.

Model No.	Color
3834-0	Black
3834-2	Red

★QUANTITY DISC. CODE A NET .85 EA.
(Sold in Lots of 10)

SINGLE BANANA PLUG SPLICE

Provides rapid method for splicing single banana plug patch cords. Reduces the necessity of storing extra long patch cords. Molded thermoplastic body eliminates shock hazard by completely enclosing banana plug contact. Brass, nickel plated banana jack, 4.22mm (.166) dia.

Model No.	Color
1829-0	Black
1829-2	Red

★QUANTITY DISC. CODE A NET .40 EA.
(Sold in Lots of 10)

DOUBLE BANANA PLUG SPLICE

Provides rapid method for splicing cables. Reduces necessity of storing extra long cables. Molded thermoplastic body eliminates shock hazard by completely enclosing banana plug contact. Brass, nickel plated banana jacks. 4.22mm (.166) dia., on ¾" centers.

Model No.	Color
1823-0	Black
1823-2	Red

★QUANTITY DISC. CODE A NET .95 EA.
(Sold in Lots of 10)

ADAPTER — BINDING POSTS TO DOUBLE BANANA PLUG WITH BNC JACK

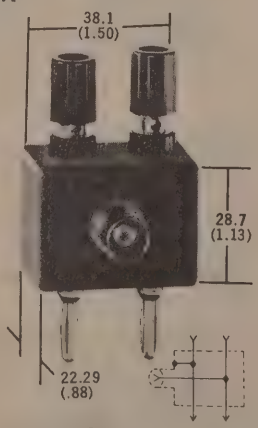
With this combination adapter it is possible to connect to equipment cables with both, double banana plugs and BNC plugs. Excellent for use with signal generators. Die cast aluminum housing with baked enamel finish.

UPPER: Insulated binding posts on ¾" centers. Black/Red.

CENTER: BNC receptacle, UG1094/U.

LOWER: Banana plugs on ¾" centers, nickel plated.

COLOR: Blue.



Model No.
4050

QUANTITY DISC. CODE A NET 15.85

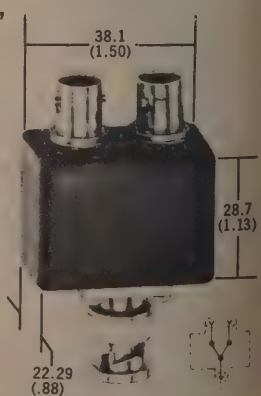
TWO BNC JACKS TO BNC PLUG — "IN LINE T"

Excellent for use where space requires cables to come straight out instead of at a right angle. Die cast aluminum housing with baked enamel finish. All metal construction to insure proper shielding.

UPPER: (2) BNC receptacles UG1094/U.

LOWER: BNC plug UG1104A/U.

COLOR: Blue.



Model No.
4057

QUANTITY DISC. CODE A NET 15.85

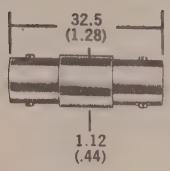
★Various lengths may be aggregated for best quantity price.

COAXIAL TEST ACCESSORIES

POMONA ELECTRONICS

BNC JACK TO JACK

Allows the interconnection of two coaxial cables with BNC plugs.

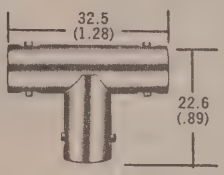


FEATURES:
- Non-tarnish finish.
- 50 Ohm impedance.
- Teflon insulation.
- Gold flashed beryllium copper contacts.

Model No.	
3283	QUANTITY DISC. CODE A NET 1.85

BNC "T" — 3 JACKS

Allows the interconnection of three coaxial cables with BNC plugs.

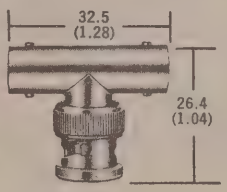


FEATURES:
- Non-tarnish finish.
- 50 Ohm impedance.
- Teflon insulation.
- Gold flashed beryllium copper contacts.

Model No.	
3284	QUANTITY DISC. CODE A NET 6.25

BNC "T" JACK — PLUG — JACK

With this adapter, equipment or coaxial cables having a single BNC jack are changed to two BNC jacks.

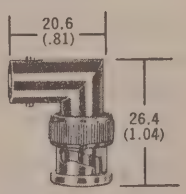


FEATURES:
- Non-tarnish finish.
- 50 Ohm impedance.
- Teflon insulation.
- Gold flashed beryllium copper female and outer male contact.

Model No.	
3285	QUANTITY DISC. CODE A NET 4.85

RIGHT ANGLE BNC JACK TO BNC PLUG

Adapts straight BNC plug to right angle BNC plug.



FEATURES:
- Non-tarnish finish.
- 50 Ohm impedance.
- Teflon insulation.
- Beryllium copper female and outer finger contact.
- Gold flashed female and male contact.

Model No.	
3534	QUANTITY DISC. CODE A NET 4.95

BNC CAP FOR PLUGS — WITH BEAD CHAIN

Female dust cap for protection of BNC plugs from dirt and accidental shorting.

FEATURES:
- Non-tarnish finish.
- 3⅛" bead chain.
- 7.11mm (.28) dia. hole in lug.

Model No.	
4157	QUANTITY DISC. CODE A NET 1.75

BNC CAP FOR JACKS — WITH BEAD CHAIN

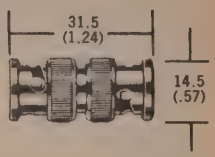
Male dust cap for protection of BNC jacks from dirt and accidental shorting.

FEATURES:
- Non-tarnish finish.
- 2¼" bead chain.
- 3.56mm (.14) dia. hole in lug.

Model No.	
3839	QUANTITY DISC. CODE A NET 1.50

BNC PLUG TO PLUG

Allows the interconnection of two coaxial cables with BNC jacks.

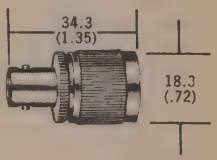


FEATURES:
- Non-tarnish finish.
- 50 Ohm impedance.
- Teflon insulation.
- Beryllium copper outer finger contacts.
- Gold flashed male contacts.

Model No.	
3533	QUANTITY DISC. CODE A NET 3.95

BNC JACK TO UHF PLUG

Allows the use of a BNC plug on equipment having a UHF jack.

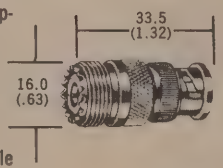


FEATURES:
- Non-tarnish finish.
- Rexolite insulation.
- Gold flashed beryllium copper female contact.
- Gold flashed male contact.

Model No.	
3286	QUANTITY DISC. CODE A NET 3.95

UHF JACK TO BNC PLUG

Allows the use of a UHF plug on equipment having a BNC jack.

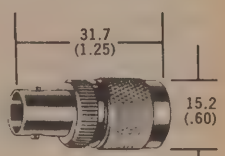


FEATURES:
- Non-tarnish finish.
- 50 Ohm impedance.
- Rexolite insulation.
- Gold flashed Phosphor Bronze female UHF and male BNC contacts.

Model No.	
3287	QUANTITY DISC. CODE A NET 4.25

BNC JACK TO TNC PLUG

Allows the use of a BNC plug on equipment having a TNC jack.

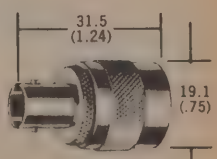


FEATURES:
- Non-tarnish finish.
- 50 Ohm impedance.
- Teflon insulation.
- Beryllium copper outer finger TNC contacts.
- Gold flashed beryllium copper female BNC and TNC male contact.

Model No.	
3844	QUANTITY DISC. CODE A NET 7.25

BNC JACK TO TYPE "C" PLUG

Allows the use of a BNC plug on equipment having a Type "C" jack.



FEATURES:
- Non-tarnish finish.
- 50 Ohm impedance.
- Teflon insulation.
- Beryllium copper Type "C" outer finger contact.
- Gold flashed beryllium copper female BNC and TNC male contact.

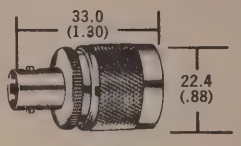
Model No.	
3845	QUANTITY DISC. CODE A NET 6.85

COAXIAL TEST ACCESSORIES

POMONA ELECTRONICS

BNC JACK TO TYPE "N" PLUG

Allows the use of a BNC plug on equipment having a Type "N" jack.



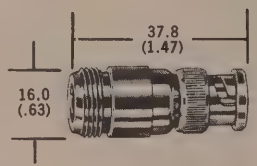
FEATURES:
- Non-tarnish finish.
- Teflon insulation.
- Gold flashed contacts.

Model No.
3288

QUANTITY DISC. CODE A **NET 3.50**

TYPE "N" JACK TO BNC PLUG

Allows the use of a Type "N" plug on equipment having a BNC jack.



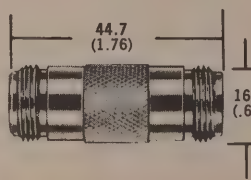
FEATURES:
- Non-tarnish finish.
- Teflon insulation.
- Beryllium copper female "N" contact and BNC outer finger contact.
- Gold flashed female "N" and male BNC contact.

Model No.
3535

QUANTITY DISC. CODE A **NET 5.75**

TYPE "N" JACK TO JACK

Allows the interconnection of two coaxial cables with Type "N" plugs.



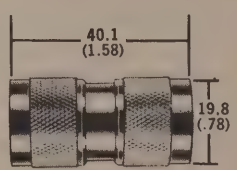
FEATURES:
- Non-tarnish finish.
- 50 Ohm impedance.
- Teflon insulation.
- Gold flashed beryllium copper contacts.

Model No.
3841

QUANTITY DISC. CODE A **NET 4.50**

TYPE "N" PLUG TO PLUG

Allows the interconnection of two coaxial cables with Type "N" jacks.



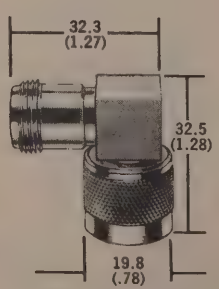
FEATURES:
- Non-tarnish finish.
- 50 Ohm impedance.
- Teflon insulation.
- Phosphor bronze outer finger contacts. Gold flashed male contacts.

Model No.
3842

QUANTITY DISC. CODE A **NET 5.25**

RIGHT ANGLE TYPE "N" JACK TO TYPE "N" PLUG

Adapts straight Type "N" plug to right angle Type "N" plug.



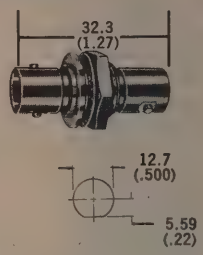
FEATURES:
- Non-tarnish finish.
- 50 Ohm impedance.
- Teflon insulation.
- Phosphor bronze outer finger contact.
- Gold flashed beryllium copper female and male contact.

Model No.
3843

QUANTITY DISC. CODE A **NET 6.50**

ISOLATED GROUND BNC JACK TO JACK

Outer conductor is isolated from the panel. Excellent for feeding through panels which require a floating shield.



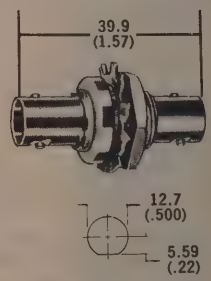
FEATURES:
- Non-tarnish finish.
- 50 Ohm impedance.
- Teflon insulation.
- Gold flashed beryllium copper contacts.
- Mounts in panels up to 4.44mm (.175") thick.

Model No.
3846

QUANTITY DISC. CODE A **NET 8.85**

HERMETIC SEALED BNC JACK TO JACK

Excellent for use with equipment which requires a hermetic seal for pressure differences.



FEATURES:
- Non-tarnish finish.
- 50 Ohm impedance.
- Teflon insulation.
- Gold flashed beryllium copper contacts.
- Silicone rubber O ring.
- Mounts in panels up to 7.09mm (.279") thick.

Model No.
3847

QUANTITY DISC. CODE A **NET 5.45**

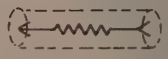
BNC — FEED-THRU SERIES RESISTOR

Ideal for adding in series resistance to coaxial lines with BNC connectors.

1st end: Female BNC.
2nd end: Male BNC.

FEATURES:
- 5% 2 watt resistor.
- Resistance value stamped on body.
- Non-tarnish finish.
- Teflon insulation.
- Gold plated contacts.

Model No.	Resist. in Ohms
4391-1	50
4391-2	75
4391-3	93
4391-4	600



QUANTITY DISC. CODE A **NET 7.85**

BNC CABLE PLUG

For use on RG58A/U, 58C/U, 141/U and 141A/U cable. This connector meets MIL-C-39012 requirements.

FEATURES:
- Non tarnish finish
- 50 Ohm impedance.
- Teflon insulation.
- Gold flashed male contact.

Model No.
4488

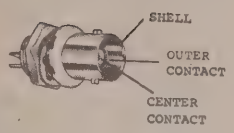
QUANTITY DISC. CODE A **NET 1.95**

COAXIAL TEST ACCESSORIES / TERMINATIONS

POMONA ELECTRONICS

TWINAX JACKS, PLUGS

Twinax patch cords and jacks accommodate the need for low level signal patching and balanced line applications. Designed for use with 2 conductor shielded cable.
These connectors feature a concentric design with a center contact, outer contact and outer shell (see dwg.). This concentric design does not require matching of halves such as the polarized stepped insulator connectors.



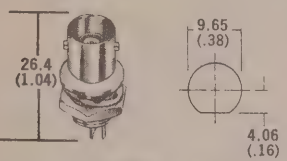
MATERIAL:
- Bodies and fittings: Brass per QQ-B-626, alloy #360.
- Insulators: Teflon per MIL-P-19468.
- Center contacts: Female — beryllium copper per QQ-C-530 Cond. H. Male — brass per QQ-B-626, alloy #360.
- Outer contacts: Beryllium copper per QQ-C-530 Cond. H.

FINISH:
- Bodies and fittings: Non-tarnish.
- Center contacts: Gold over copper plate.
- Outer contacts: Gold over copper plate.

RATING:
- 500 VRMS.

TWINAX BULKHEAD RECEPTACLE

FEATURE:
- Mounts in panels up to 6.35mm (.25) thick.

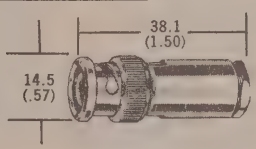


Model No.
3580

QUANTITY DISC. CODE A **NET 6.95**

TWINAX CABLE PLUG

- For use with RG 108A/U and Belden 9272.

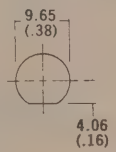


Model No.
3600

QUANTITY DISC. CODE A **NET 7.85**

TWINAX BNC HERMETIC SEALED BULKHEAD RECEPTACLE

FEATURES:
- Mounts in panels up to 6,35mm (.25") thick.
- Gasket seal will withstand 50 psi.

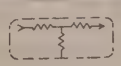


Model No.
4388

QUANTITY DISC. CODE A **NET 19.95**

BNC 50-OHM ATTENUATORS

For use with pulse, microwave, or UHF instruments.
1st end: Female BNC.
2nd end: Male BNC.
50 Ohm, 2 watt T-Pad network.



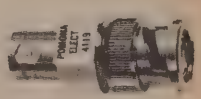
FEATURES:
- Non-tarnish finish.
- Teflon insulation.
- Gold plated contacts.

Model No.	Attenuation	VSWR	Attenuation (Limits)
4108-1	3 db	1.1 to 1 GHz	±0.4 db to 1 GHz
4108-2	6 db	1.2 to 2 GHz	±0.45 db to 2 GHz
4108-3	10 db	1.35 to 4 GHz	±0.65 db to 4 GHz
4108-4	14 db	1.45 to 6 GHz	±0.75 db to 6 GHz
4108-5	20 db	1.65 to 8 GHz	±0.9 db to 8 GHz

QUANTITY DISC. CODE A **NET 24.95**

BNC FEED-THRU TERMINATION

Ideal for terminating pulse, microwave or UHF instruments in their characteristic impedance.
1st end: Female BNC.
2nd end: Male BNC.
50 Ohm termination resistor, 1%, 2W.



FEATURES:
- Non-tarnish finish.
- Teflon insulation.
- Gold plated contacts.
- Maximum VSWR: DC to 250 MHz: 1.1 250 MHz to 500 MHz: 1.2

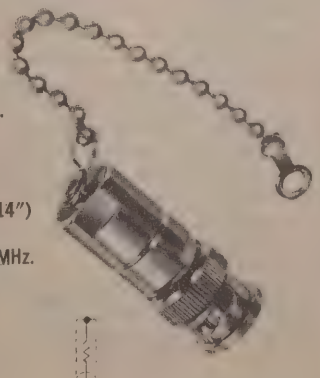
Model No.	Resist. in Ohms
4119-1	50
4119-2	75
4119-3	93
4119-4	600

QUANTITY DISC. CODE A **NET 25.85**

BNC RESISTOR TERMINATED PLUG

Ideal for terminating coaxial lines.

FEATURES:
- 1% resistor, ½ watt.
- Resistance value stamped on body.
- Non-tarnish finish.
- Teflon insulation.
- Gold plated male contact.
- 3½" bead chain with 3.56mm (.14") dia. hole in lug.
- VSWR: 1.1 max. from DC to 250 MHz.



Model No.	Resist. in Ohms
3840-1	50
3840-2	75
3840-3	93
3840-4	100
3840-5	600

QUANTITY DISC. CODE A **NET 4.85**

TYPE N-RESISTOR TERMINATED PLUG

Ideal for terminating coaxial lines.

FEATURES:
- 1% 1 watt, deposited carbon resistor.
- Resistance value stamped on body.
- Non-tarnish finish.
- Teflon insulation.
- Gold plated male contact.
- 5" bead chain with 3.56mm (.14") dia. hole in lug.
- VSWR: 1.15 max. from DC to 100 MHz.

Model No.	Resist. in Ohms
4240-1	50
4240-2	75
4240-3	93
4240-4	100
4240-5	600

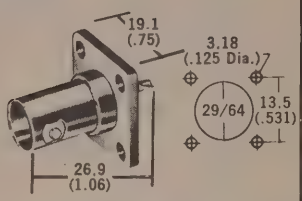
QUANTITY DISC. CODE A **NET 8.85**

PANEL/BULKHEAD RECEPTACLES

POMONA ELECTRONICS

BNC FEMALE PANEL RECEPTACLE

FEATURES:
- Non-tarnish finish.
- 50 Ohm impedance.
- Teflon insulation.
- Gold flashed beryllium copper contacts.
- Solder cup connection.

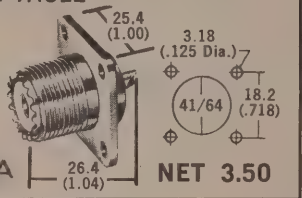


Model No.
2451

QUANTITY DISC. CODE A **NET 1.85**

UHF FEMALE PANEL RECEPTACLE

FEATURES:
- Non-tarnish finish.
- Teflon insulation.
- Gold flashed phosphor bronze contact.
- Solder cup connection.

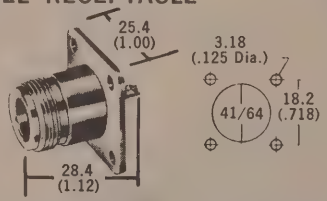


Model No.
2449

QUANTITY DISC. CODE A **NET 3.50**

TYPE "N" FEMALE PANEL RECEPTACLE

FEATURES:
- Non-tarnish finish.
- 50 Ohm impedance.
- Teflon insulation.
- Gold flashed beryllium copper contacts.
- Solder cup connection.

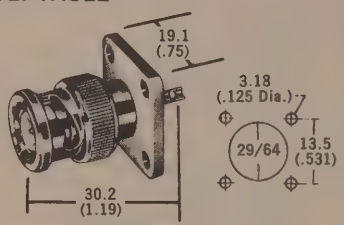


Model No.
2455

QUANTITY DISC. CODE A **NET 2.95**

BNC MALE PANEL RECEPTACLE

FEATURES:
- Non-tarnish finish.
- 50 Ohm impedance.
- Teflon insulation.
- Beryllium copper outer finger contact.
- Gold flashed male contact.
- Solder cup connection.

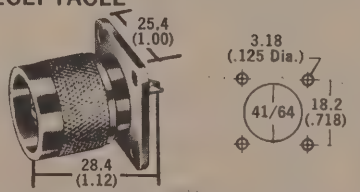


Model No.
2447

QUANTITY DISC. CODE A **NET 3.75**

UHF MALE PANEL RECEPTACLE

FEATURES:
- Non-tarnish finish.
- Teflon insulation.
- Gold flashed male contact.
- Solder cup connection.

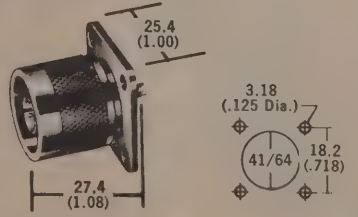


Model No.
2450

QUANTITY DISC. CODE A **NET 7.25**

TYPE "N" MALE PANEL RECEPTACLE

FEATURES:
- Non-tarnish finish.
- 50 Ohm impedance.
- Teflon insulation.
- Beryllium copper outer finger contact.
- Gold flashed male contact.
- Solder cup connection.

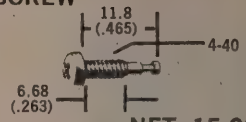


Model No.
2454

QUANTITY DISC. CODE A **NET 9.85**

SOLDER TURRET TERMINAL SCREW

Excellent for mounting of panel receptacles. Turret on end of screw for soldering. #4-40, Phillips head, steel, cadmium plated.



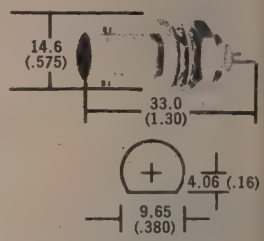
Model No.
2352

QUANTITY DISC. CODE A **NET 15.00** (100 per pkg.)

BNC PRESSURIZED BULKHEAD RECEPTACLE

Excellent for use with equipment which requires pressure differences. Front hole mounting.

FEATURES:
- Non-tarnish finish.
- 50 Ohm impedance.
- Teflon insulation.
- Gold flashed beryllium copper contact.
- Silicon rubber O ring, withstands 50 psi.
- Mounts in panels up to 6.15mm (.242) thick.



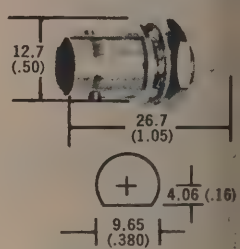
Model No.
4158

QUANTITY DISC. CODE A **NET 4.25**

BNC BULKHEAD RECEPTACLE

Ideal for use where space requirements between connectors are at a premium.

FEATURES:
- Non-tarnish finish.
- 50 Ohm impedance.
- Teflon insulation.
- Gold flashed beryllium copper contact.
- Mounts in panels up to 3.40mm (.134) thick.



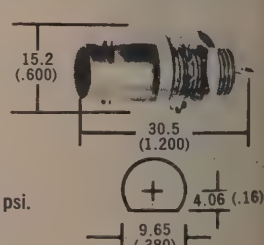
Model No.
4160

QUANTITY DISC. CODE A **NET 1.50**

BNC HERMETIC SEALED BULKHEAD RECEPTACLE

Excellent for use with equipment which requires a hermetic seal for pressure differences. Front hole mounting.

FEATURES:
- Non-tarnish finish.
- 50 Ohm impedance.
- Teflon insulation.
- Gold flashed beryllium copper contact.
- Silicon rubber O ring, withstands 50 psi.
- Mounts in panels up to 9.37mm (.369) thick.



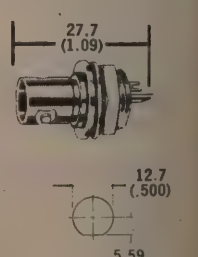
Model No.
4159

QUANTITY DISC. CODE A **NET 4.95**

BNC — ISOLATED GROUND BULKHEAD RECEPTACLE

This connector has the outer conductor isolated from the panel. Excellent for use with equipment requiring a floating input.

FEATURES:
- Non-tarnish finish.
- 50 Ohm impedance.
- Teflon insulation.
- Gold flashed beryllium copper contact.
- Mounts in panels up to 4.44mm (.175) thick.



Model No.
3778

QUANTITY DISC. CODE A **NET 5.45**

SMA ADAPTERS/TERMINATIONS

POMONA ELECTRONICS

These SMA adapters are manufactured in accordance with MIL-C-39012. The 50 ohm miniature series R.F. connectors are especially adaptable to microwave component applications such as couplers, dividers and mixers.

MATERIAL:

- Bodies and coupling nut: Beryllium copper per QQ-C-530, cond. H.T., gold plated.
- Female contact: Beryllium copper, gold plated, cond. H.T.
- Male contact: Brass per QQ-B-626, alloy #360, hard, gold plated.
- Teflon insulation.
- Gaskets: Silicone rubber per ZZ-R-765a, Class II, Grade 50.

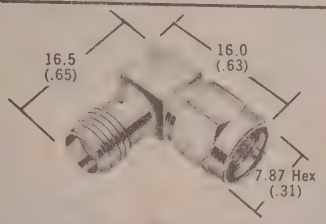
SPECIFICATIONS:

- Nominal impedance: 50 ohms.
- Frequency range: 0-12.4 GHz.
- Dielectric withstanding voltage: 1000 VRMS, 60 Hz at sea level.
- R.F. leakage: 90 db min. between 6-8 GHz.
- Temperature range: −65°C to +165°C.

WITHIN SERIES

ACTUAL SIZE

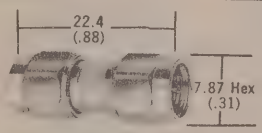
FEMALE TO MALE RIGHT ANGLE



Model No. 4282

QUANTITY DISC. CODE A **NET 17.85**

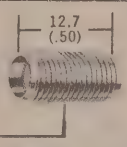
FEED THRU MALE TO MALE



Model No. 4283

QUANTITY DISC. CODE A **NET 12.50**

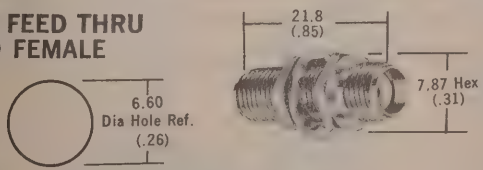
FEED THRU FEMALE TO FEMALE



Model No. 4284

QUANTITY DISC. CODE A **NET 10.50**

BULKHEAD FEED THRU FEMALE TO FEMALE

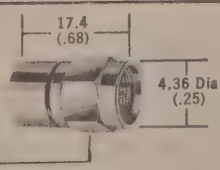


Model No. 4285

QUANTITY DISC. CODE A **NET 8.85**

MALE TERMINATION

VSWR Readings
1.25 Max to 18 GHz
50 Ohms ½ Watt

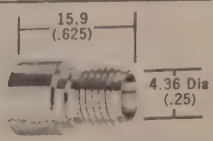


Model No. 4286

QUANTITY DISC. CODE A **NET 34.50**

FEMALE TERMINATION

VSWR Readings
1.25 Max to 18 GHz
50 Ohms ½ Watt

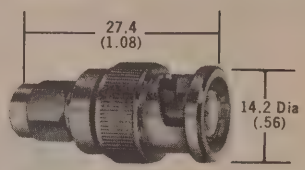


Model No. 4287

QUANTITY DISC. CODE A **NET 34.50**

SMA TO BNC

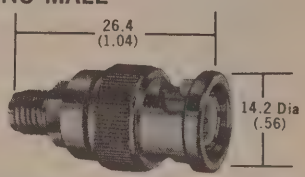
SMA MALE TO BNC MALE



Model No. 4288

QUANTITY DISC. CODE A **NET 10.50**

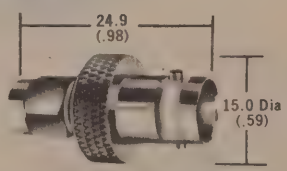
SMA FEMALE TO BNC MALE



Model No. 4289

QUANTITY DISC. CODE A **NET 10.50**

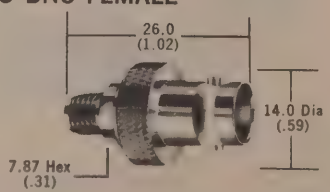
SMA MALE TO BNC FEMALE



Model No. 4290

QUANTITY DISC. CODE A **NET 7.85**

SMA FEMALE TO BNC FEMALE



Model No. 4291

QUANTITY DISC. CODE A **NET 11.85**

SMA DUST CAPS

Model No. 4484

QUANTITY DISC. CODE A **NET 5.85**

SMA ADAPTERS

POMONA ELECTRONICS

These SMA adapters are manufactured in accordance with MIL-C-39012. The 50 ohm miniature series R.F. connectors are especially adaptable to microwave component applications such as couplers, dividers and mixers.

MATERIAL:

- Bodies and coupling nut: Beryllium copper per QQ-C-530, cond. H.T., gold plated.
- Female contact: Beryllium copper, gold plated, cond. H.T.
- Male contact: Brass per QQ-B-626, alloy #360, hard, gold plated.
- Teflon insulation.
- Gaskets: Silicone rubber per ZZ-R-765a, Class II, Grade 50.

SPECIFICATIONS:

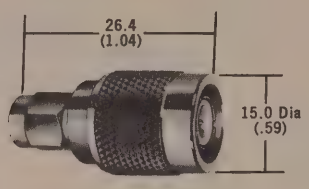
- Nominal impedance: 50 ohms.
- Frequency range: 0-12.4 GHz.
- Dielectric withstanding voltage: 1000 VRMS, 60 Hz at sea level.
- R.F. leakage: 90 db min. between 6-8 GHz.
- Temperature range: −65°C to +165°C.

SMA TO TNC

ACTUAL SIZE

SMA TO N

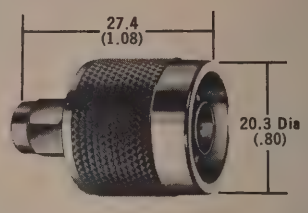
SMA MALE TO TNC MALE



Model No.
4292

QUANTITY DISC. CODE A **NET 10.85**

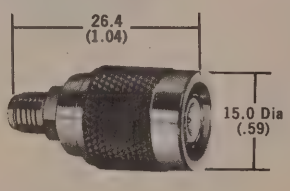
SMA MALE TO N MALE



Model No.
4296

QUANTITY DISC. CODE A **NET 9.85**

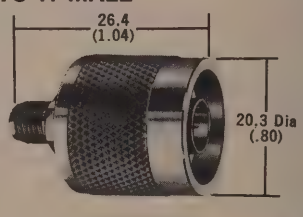
SMA FEMALE TO TNC MALE



Model No.
4293

QUANTITY DISC. CODE A **NET 15.85**

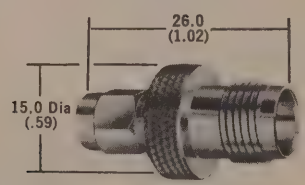
SMA FEMALE TO N MALE



Model No.
4297

QUANTITY DISC. CODE A **NET 10.85**

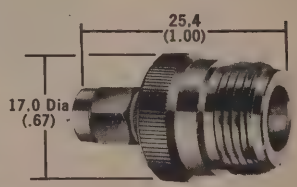
SMA MALE TO TNC FEMALE



Model No.
4294

QUANTITY DISC. CODE A **NET 9.85**

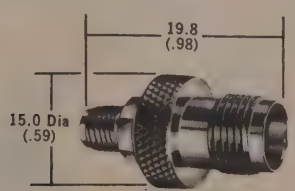
SMA MALE TO N FEMALE



Model No.
4298

QUANTITY DISC. CODE A **NET 10.85**

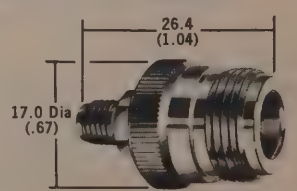
SMA FEMALE TO TNC FEMALE



Model No.
4295

QUANTITY DISC. CODE A **NET 11.50**

SMA FEMALE TO N FEMALE



Model No.
4299

QUANTITY DISC. CODE A **NET 10.85**

COMPONENT MOUNTING ISOLATION PLUGS

POMONA ELECTRONICS

SPLIT-TERMINAL ISOLATION PLUGS

Create passive and active networks, voltage dividers, isolation networks or attenuators with the split-terminal isolation plugs described below.

Gold flashed solder turret terminals provide permanent, reliable noise-free connections for component mounting.

Tough thermoplastic material molded to plug body and connectors insures maximum strength, moisture resistance and excellent insulative properties.

Specifications for MDP-X, 1390, 1837, 1468:

- Fits standard 4.22mm (.166) dia. banana jack.
- Spring, heat treated beryllium copper berylco 25 per QQ-C-533.
- Plug body, brass per QQ-B-626, alloy #360.
- Nickel plated per QQ-N-290, class 2.
- Contact resistance less than 0.001 Ohms per banana plug.

TYPICAL APPLICATION

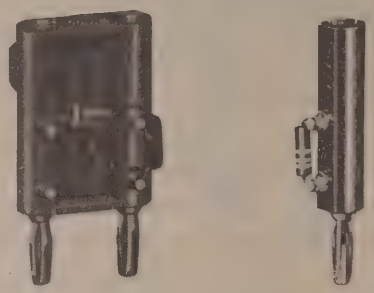


PHOTO REDUCED TO TWO-THIRDS SIZE

Model No.
MDP-X

Model No.
1390

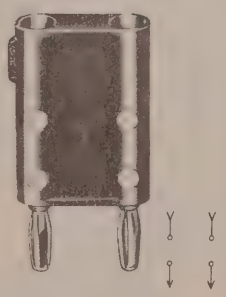
DOUBLE BANANA PLUG, FOUR TERMINAL ISOLATION

Provides four terminal isolation. Top stack-up receptacles isolated from lower plugs. Ideal for insertion of matching networks in laboratory VTVM's, signal generators, etc. Gold flashed solder turret terminals for permanent noise-free connections.

UPPER: Double banana jacks, 4.22mm (.166) dia., on ¾" centers.

LOWER: Double banana plug on ¾" centers.

COLOR: Red.



Model No.
MDP-X

QUANTITY DISC. CODE A **NET 3.85**

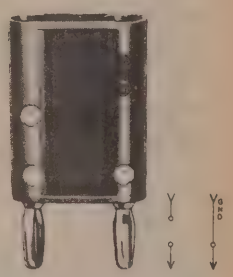
DOUBLE BANANA PLUG, THREE TERMINAL ISOLATION

Provides three terminal isolation. Excellent for "L" and "Pi" networks. Plug and receptacle nickel plated. Gold flashed solder turret terminals for permanent noise-free connections. "Ground" is straight feed-thru. Hot side isolated.

UPPER: Banana jacks, 4.22mm (.166) dia. on ¾" centers.

LOWER: Double banana plug on ¾" centers.

COLOR: Blue.



Model No.
1837-6

QUANTITY DISC. CODE A **NET 2.95**

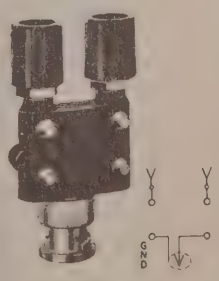
ADAPTER — BINDING POSTS TO BNC PLUG, ISOLATION

Permits single or double banana plugs to be used with equipment having BNC receptacle. Provides isolation for a four terminal network. Binding posts facilitate connections of test leads or additional components. Gold flashed solder turret terminals provide permanent noise-free connections.

UPPER: Insulated binding posts, on ¾" centers with 4.22mm (.166) dia. jacks.

LOWER: BNC plug.

COLOR: Black.



Model No.
1469

QUANTITY DISC. CODE A **NET 10.85**

ADAPTER — BNC RECEPTACLE TO DOUBLE BANANA PLUG, ISOLATION

Permits BNC plug to be used with equipment having banana jacks. Provides isolation for a four terminal network. Excellent for matching pad networks. Gold flashed solder turret terminals for permanent noise-free connections.

UPPER: BNC receptacle.

LOWER: Double banana plug on ¾" centers.

COLOR: Black.

Model No.
1468

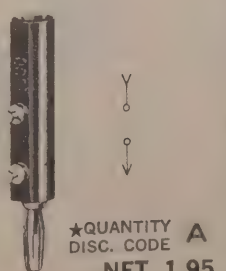
QUANTITY DISC. CODE A **NET 9.85**

PLUG — SINGLE BANANA, ISOLATION

Provides two terminal isolation. Top stack-up receptacle is isolated from lower plug to permit addition of series resistors, diodes, etc. Ideal for computers, lab, circuit design and testing. Gold flashed solder turret terminals for permanent noise-free connections.

UPPER: Banana jack, 4.22mm (.166) dia.

LOWER: Banana plug.



Model No.	Color
1390-0	Black
1390-2	Red

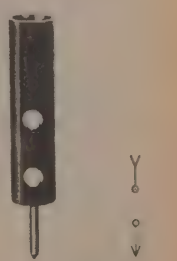
★QUANTITY DISC. CODE A **NET 1.95**

PLUG — PIN TIP, ISOLATION

Pin tip jack is isolated from 2.03mm (.080) pin tip plug. Provides for addition of series components. Ideal for use with computer boards, lab circuit designs, etc. Gold flashed solder turret terminals for permanent noise-free connections.

UPPER: Tip jack, beryllium copper, gold flashed; accepts 2.03mm (.080) dia. pin.

LOWER: Pin tip, 2.03mm (.080) dia. Brass, nickel plated.



Model No.	Color
1910-0	Black
1910-2	Red

★QUANTITY DISC. CODE A **NET 2.50**

★Colors may be aggregated for best quantity price.

SERIES PARALLEL ISOLATION PLUGS & CONNECTOR TEST ADAPTERS

POMONA ELECTRONICS

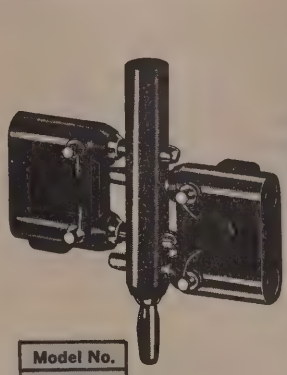
SERIES PARALLEL ISOLATION PLUGS

These plugs enable you to build unlimited combinations of series parallel networks e.g., voltage dividers attenuator, etc.

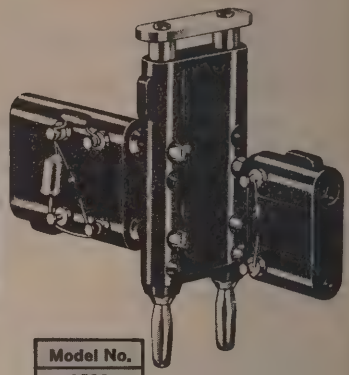
Upper crossholes spaced ¾" on centers from lower crossholes to allow connection of double banana plugs. Double banana plugs may be plugged in from both sides.

FEATURES:

- Fits 4.22mm (.166) dia. banana jacks.
- Spring, heat treated beryllium copper berylco 25 per QQ-C-533.
- Plug bodies and jacks, brass, nickel plated per QQ-N-290 class 2.
- Tough thermoplastic molded to banana jacks and plug bodies.



Model No. 3501



Model No. 3502

SERIES-PARALLEL ISOLATION PLUG

Top banana jack and upper pair of crossholes isolated from lower pair of crossholes and banana plug.

UPPER: Banana jack 4.22mm (.166) dia.

CENTER: 4 crossholes 4.22mm (.166) dia.

LOWER: Banana plug.

COLOR: Red.

Model No.
3501

QUANTITY DISC. CODE A **NET 3.95**

DUAL SERIES-PARALLEL ISOLATION PLUG

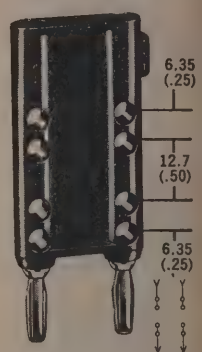
Excellent for building attenuators, voltage dividers, isolation networks, etc. Top banana jacks and upper pair of crossholes isolated from lower pair of crossholes and banana plugs.

UPPER: Double banana jack 4.22mm (.166) dia., on ¾" centers.

CENTER: 8 crossholes 4.22mm (.166) dia.

LOWER: Double banana plug on ¾" centers.

COLOR: Red.



Model No.
3502

QUANTITY DISC. CODE A **NET 5.85**

CONNECTOR TEST ADAPTERS

An ideal test adapter for the rapid testing of the hard to get at contacts of multi-pin MS type connectors such as miniature circular, standard circular and rack and panel. Excellent for testing of continuity, voltage and signal on individual contacts. Test adapter available in pin and socket contact sizes 20, 16 and 12.

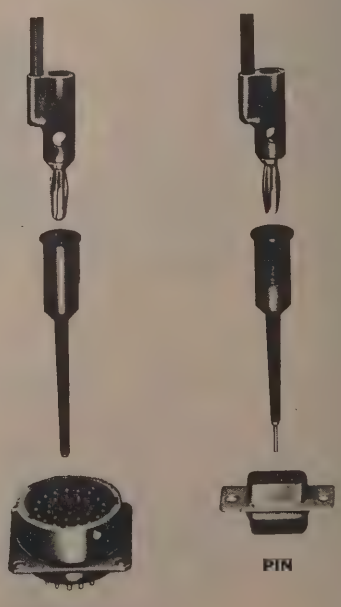
- Gold flashed contacts conform to "MS" dimensions.
- Flexible tip prevents damage to connector contacts if test adapter is accidentally bent.
- Flexible tip allows testing of adjacent contacts.
- Fully insulated to prevent accidental shorting.
- Accepts standard banana plug.

UPPER: Banana jack, 4.22mm (.166) dia., brass, nickel plated.

LOWER: "MS" style contact, gold flashed, see tab block.

Model No.	Color	Contact Size		Type	Net
3560-0	Black	20		Socket	1.50
3560-2	Red	20		Socket	1.50
3561-0	Black	20	1.02mm (.040 dia.)	Pin	1.50
3561-2	Red	20	1.02mm (.040 dia.)	Pin	1.50
3562-0	Black	16		Socket	1.75
3562-2	Red	16		Socket	1.75
3563-0	Black	16	1.60mm (.063 dia.)	Pin	1.50
3563-2	Red	16	1.60mm (.063 dia.)	Pin	1.50
3564-0	Black	12		Socket	2.50
3564-2	Red	12		Socket	2.50
3565-0	Black	12	2.36mm (.093 dia.)	Pin	1.50
3565-2	Red	12	2.36mm (.093 dia.)	Pin	1.50

TYPICAL APPLICATION



SOCKET PIN

★QUANTITY DISC. CODE A

*Colors may be aggregated for best quantity prices.

MISCELLANEOUS ACCESSORIES

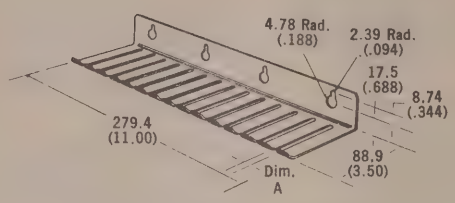
POMONA ELECTRONICS

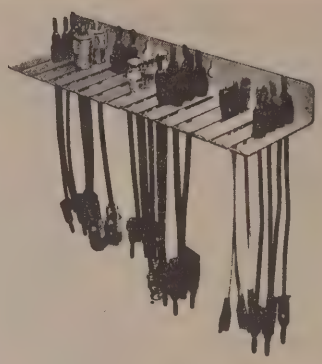
TEST LEAD HOLDER

No need to spend time searching for a particular test lead. With these new racks, all of your patch cords and cable assemblies can be conveniently filed for instant selection — within easy reach. Holder mounts quickly on any vertical surface. Test leads are easy to store, easy to remove. Three models to choose from for different size cables.

MATERIAL: Cold rolled steel.

FINISH: Baked enamel.





Model No.	Color	Max. Cable Dia. (Dim. A)	Net
1508-3	Orange	5.33mm (.210")	3.85
2708-6	Blue	11.4mm (.450")	3.85
4408-0	Black	8.13mm (.320")	3.85

SEE PAGE 72 FOR TEST SOCKET ADAPTER HOLDER

QUANTITY DISC. CODE A

Universal Harness

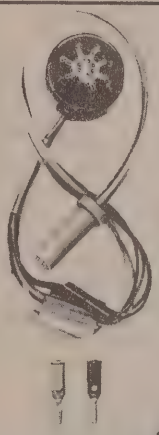
TESTING ADAPTER

Takes the Trouble out of Trouble Shooting!

TEST SOCKET: Extended test tabs, phosphor bronze contacts, heavy duty molded phenolic base with easy-to-read socket connections.

CURRENT MEASUREMENT CONNECTIONS: Fully insulated, molded 2.03mm (.080) phone tip plugs.

INSULATED PLUG: Fits either shielded or unshielded tube sockets.



Model No.	Pin	Net
1737	(7 Pin)	14.95
1738	(8 Pin)	14.95
1739	(9 Pin)	14.95

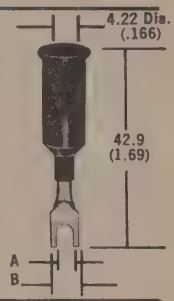
QUANTITY DISC. CODE D

INSULATED BARRIER STRIP SPADE LUG ADAPTERS

Permits single banana plug to be used with equipment having barrier strips. Lugs fit a No. 4, 5, 6, 8, or 10 screw (see listing). Tough thermoplastic molded to body for maximum reliability.

UPPER: Banana jack, 4.22mm (.166) dia., brass, nickel plated.

LOWER: 0.76mm (.03) thick. Spade lug, (see listing). Copper, electro-tin plated.



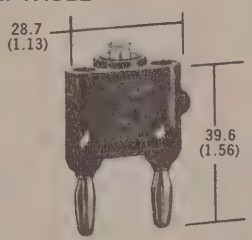
Model No.	Color	Lug Size	Dim. A	Dim. B
3744-0	Black	4, 5 & 6	3.81 (.15)	6.1 (.24)
3744-2	Red	4, 5, & 6	3.81 (.15)	6.1 (.24)
3777-0	Black	8 & 10	4.83 (.19)	7.62 (.30)
3777-2	Red	8 & 10	4.83 (.19)	7.62 (.30)

★QUANTITY DISC. CODE A NET .85

ADAPTER — MICRODOT RECEPTACLE TO DOUBLE BANANA PLUG

Permits miniature coaxial plug to be used with equipment having banana jacks. Cross holes in body provide side stack-up connections.

LOWER: Double banana plug, on ¾" centers. Cross holes 4.22mm (.166) dia. in body provide side stack-up connections.



Model No.	Color	Type (Ohms)	Receptacle Type	Net
1275-5	Green	50	10-32 thread	12.50
1276-0	Black	50	Slide-on	12.50
1277-7	Violet	70	12-32 thread	12.50
1279-9	White	93	¼-32 thread	12.50

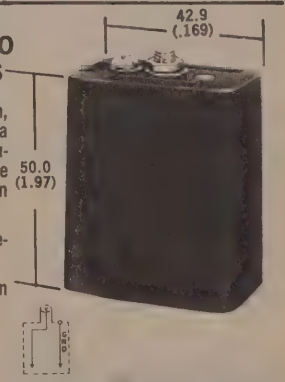
QUANTITY DISC. CODE A

ADAPTER — MICRODOT RECEPTACLE TO SHIELDED BANANA PLUGS

Permits miniature coaxial plug, 50 ohm, to be used with equipment having banana jack binding posts. Black anodized aluminum shield reduces noise pick-up more than 70 db. Ideal for noise reduction in low level acceleration systems.

UPPER: Receptacle, screw-on type, receptacle thread 10-32.

LOWER: Shielded double banana plug, on ¾" centers.

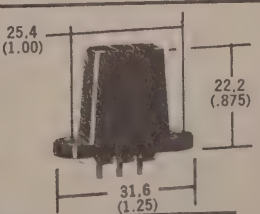


Model No.
1575

QUANTITY DISC. CODE A NET 15.85

TRANSISTOR SOCKET

For use in testing 3 lead transistors with 0.43mm (.017) dia. leads. Beryllium copper springs for long life. Ideal for aging racks, incoming inspection, life testing, etc.



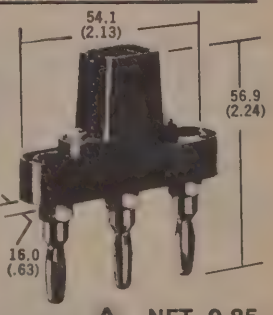
Model No.	Color	Temp. Range	Insulation Resistance	Net
TS187-0	Black	−100°C to +200°C	1 x 10^5 Megohms Min. @ 500 VDC @ 40% R.H., 24°C	2.95

QUANTITY DISC. CODE A

ADAPTER — TRANSISTOR TEST SOCKET

Permits the insertion of transistors with 0.43mm (.017) dia. leads into equipment having banana jacks on ¾" centers. Ideal for incoming inspection. Transistor socket contact and banana spring made of beryllium copper. Heavy duty phenolic construction. Insulation resistant: 1 x 10^5 megohms min. @ 500 VDC at 40% R.H., 24°C.

COLOR: Black.



Model No.
1472

QUANTITY DISC. CODE A NET 9.85

★Colors may be aggregated for best quantity price.

INSULATED BINDING POSTS

POMONA ELECTRONICS

INSULATED LEXAN* POLYCARBONATE BINDING POSTS

These binding posts fill the needs of most critical requirements. The plastic molding on these units is Lexan* polycarbonate which has high impact strength, low loss, low power factor and high insulation resistance. Thin line design for high-density packaging.

FEATURES:

- Polycarbonate insulation.
- Thin line design.
- Standard and low thermal EMF types available.
- Lower insulator, white.
- 5 way binding post.
- Accepts standard banana plug.
- Captive thumb nut.
- Gold or nickel plated.
- Upper insulator same color as thumb nut.
- 2.54mm (.100) dia. wire cross hole is perpendicular with flat on insulator.
- 8-32 hex nut and lockwasher included.
- Mounts in panels 1/16-1/4" thick.

RATINGS:

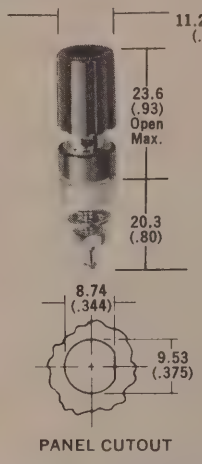
- Operating temperature: −65°C to +150°C.
- Working voltage: 1500 VDC.
- Current: 15 amps cont., 30 amps int.

STANDARD TYPE

Brass body and thumb nut insert, available gold flashed per MIL-G-45204 or nickel plated per QQ-N-290 class 2.

Gold Flashed		Nickel Plated	
Model No.	Color	Model No.	Color
3750-0	Black	3760-0	Black
3750-1	Brown	3760-1	Brown
3750-2	Red	3760-2	Red
3750-3	Orange	3760-3	Orange
3750-4	Yellow	3760-4	Yellow
3750-5	Green	3760-5	Green
3750-6	Blue	3760-6	Blue
3750-7	Violet	3760-7	Violet
3750-8	Gray	3760-8	Gray
3750-9	White	3760-9	White
★QUANTITY DISC. CODE A		★QUANTITY DISC. CODE A	
NET 1.50 EA.		NET 1.10 EA.	

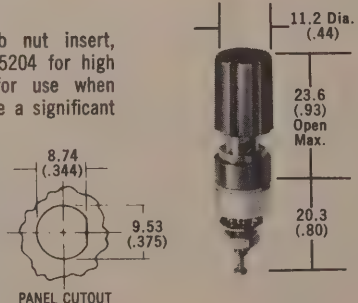
(Sold in Lots of 10)



LOW THERMAL EMF STANDARD TYPE

Copper body and thumb nut insert, gold flashed per MIL-G-45204 for high conductivity. Excellent for use when thermoelectric effects are a significant source of error.

Model No.	Color
3770-0	Black
3770-1	Brown
3770-2	Red
3770-3	Orange
3770-4	Yellow
3770-5	Green
3770-6	Blue
3770-7	Violet
3770-8	Gray
3770-9	White



★QUANTITY DISC. CODE A **NET 2.85 EA.**
(Sold in Lots of 10)

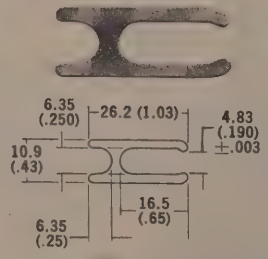
SHORTING LINK FOR STANDARD BINDING POSTS

Shorting link for standard binding posts on ¾" centers. A snap-on feature holds link on post when short not needed.

MATERIAL: Brass 0.78mm (.031) thick.

FINISH: Nickel plated per QQ-N-290 class 2.

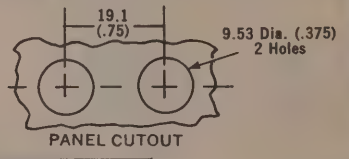
Model No.
4115

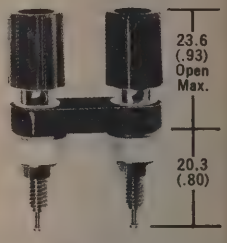


QUANTITY DISC. CODE A **NET .15 EA.**
(Sold in Lots of 10)

DOUBLE BINDING POSTS ASSEMBLY

One red and one black nickel plated binding post with double mounting base.



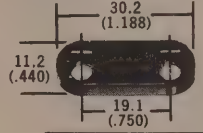


Model No.	Color
4243-0	Black
4243-2	Red

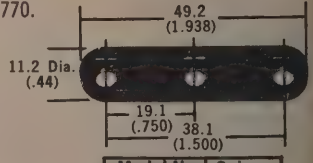
★QUANTITY DISC. CODE A **NET 2.50**

DOUBLE AND TRIPLE MOUNTING BASES

Lexan* polycarbonate bases which may be used with Models 3750, 3760 or 3770.



Model No.	Color
3862-0	Black
3862-2	Red
★QUANTITY DISC. CODE A	
NET .25 EA.	



Model No.	Color
3863-0	Black
3863-2	Red
★QUANTITY DISC. CODE A	
NET .30 EA.	

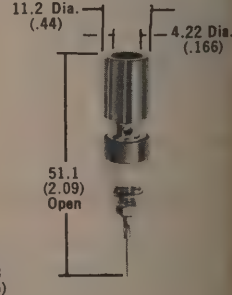
(Sold in Lots of 10)

STANDARD BINDING POST WITH WIRE-WRAP† TERMINAL

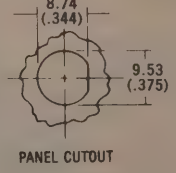
Excellent for rapid connection of wires using wire-wrapping tools or machines.

FEATURES:

- Gold plated beryllium copper 0.63mm (.025) sq. Wire-Wrap† terminal.



Model No.	Color
4098-0	Black
4098-2	Red
4098-4	Yellow
4098-5	Green
4098-6	Blue
4098-8	Grey
4098-9	White



★QUANTITY DISC. CODE A **NET 1.95**

★Colors may be aggregated for best quantity price. *Lexan is a trademark of General Electric.
†Wire-Wrap is a trademark of Gardner-Denver.

INSULATED BANANA JACKS

POMONA ELECTRONICS

INSULATED LEXAN POLYCARBONATE BANANA JACKS

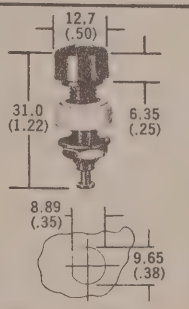
These jacks are molded of Lexan* polycarbonate thermoplastic which has high impact strength, low loss, low power factor and high insulation resistance.

FEATURES: (All Models)

- Lexan* polycarbonate insulator head molded directly to one piece brass body.
- Panel insulator molded of white Lexan* polycarbonate.
- Solder turret or Wire-Wrap† terminal.
- Nickel plated lockwasher and hex nut included unassembled.
- Operating temperature: —65°C to +150°C.

BANANA JACK — NICKEL PLATED

- Nickel plated brass body.
- Closed entry receptacle, 4.22mm (.166) dia. x 23.37mm (.920) deep.
- Rated 2500 W VDC 15 amps cont., 30 amps int.
- Mounts in panels from 0.89mm (.035") to 9.53mm (.375") thick.
- ¼-32 thread.

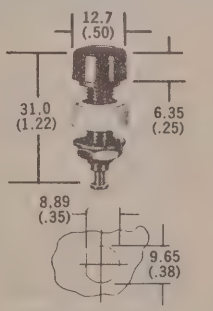


Model No.	Color	Model No.	Color
1581-0	Black	1581-5	Green
1583-1	Brown	1581-6	Blue
1581-2	Red	1581-7	Violet
1581-3	Orange	1581-8	Gray
1581-4	Yellow	1581-9	White

★QUANTITY DISC. CODE **A** **NET .35 EA.**
(Sold in Lots of 10)

BANANA JACK — GOLD PLATED

- Gold plated brass body.
- Closed entry receptacle, 4.22mm (.166) dia. x 23.37mm (.920) deep.
- Rated 2500 W VDC 15 amps cont., 30 amps int.
- Mounts in panels from 0.89mm (.035") to 9.53mm (.375") thick.
- ¼-32 thread.

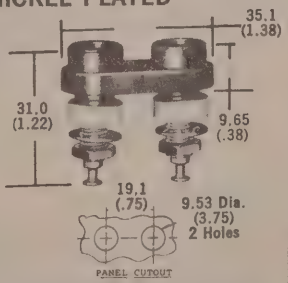


Model No.	Color	Model No.	Color
2854-0	Black	2854-5	Green
2854-1	Brown	2854-6	Blue
2854-2	Red	2854-7	Violet
2854-3	Orange	2854-8	Gray
2854-4	Yellow	2854-9	White

★QUANTITY DISC. CODE **A** **NET .75 EA.**
(Sold in Lots of 10)

DOUBLE BANANA JACK — NICKEL PLATED

- Nickel plated brass body.
- Closed entry receptacle, 4.22mm (.166) dia. x 23.37mm (.920) deep.
- Rated 2500 W VDC 15 amps cont., 30 amps int.
- Mounts in panels from 0.89mm (.035") to 9.53mm (.375") thick.
- One red and one black jack.
- Choice of black or red plate.
- ¼-32 thread on ¾" centers.



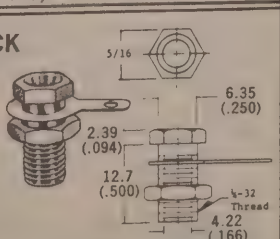
Model No.	Color
2269-0	Black
2269-2	Red

★QUANTITY DISC. CODE **A** **NET 1.25 EA.**
(Sold in Lots of 5)

UNINSULATED—BANANA JACK

Threaded for rapid mounting. Used with standard banana plugs. Furnished with hex nut and solder lug.

- Jack body, brass per QQ-B-626, alloy #360.
- Plating, nickel per QQ-N-290, class 2.
- Rated, 15 amps cont., 30 amps int.
- ¼-32 hex nut, solder lug included.



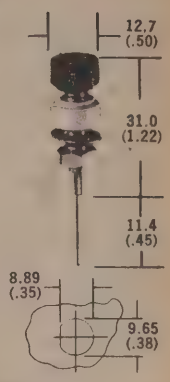
Model No.
3267

QUANTITY DISC. CODE **A** **NET .25 EA.**
(Sold in Lots of 10)

BANANA JACK — WITH WIRE-WRAP TERMINAL

Excellent for rapid connection of wires using wire-wrapping tools or machines.

- Gold plated beryllium copper 0.64mm (.025) sq. Wire-Wrapt† terminal.
- Nickel plated brass body.
- Closed entry receptacle 4.22mm (.166) dia. x (.920) deep.
- Rated 2500 W VDC 15 amps. cont., 30 amps int.
- Mounts in panels from 0.89mm (.035") to 9.52mm (.375") thick.
- ¼-32 thread.



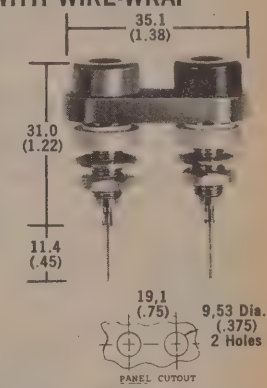
Model No.	Color	Model No.	Color
4005-0	Black	4005-6	Blue
4005-2	Red	4005-8	Gray
4005-4	Yellow	4005-9	White
4005-5	Green		

★QUANTITY DISC. CODE **A** **NET .75 EA.**
(Sold in Lots of 10)

DOUBLE BANANA JACK — WITH WIRE-WRAP TERMINAL

Excellent for rapid connection of wires using wire-wrapping tools or machines.

- Gold plated beryllium copper 0.64mm (.025) sq. Wire-Wrap† terminal.
- Nickel plated brass bodies.
- Closed entry receptacle, 4.22mm (.166) dia. x 23.37mm (.920) deep.
- Rated 2500 W VDC 15 amps. cont., 30 amps. int.
- Mounts in panels from 0.89mm (.035") to 6.98mm (.275") thick.
- One red and one black jack.
- Choice of black or red plate.
- ¼-32 thread on ¾" centers.

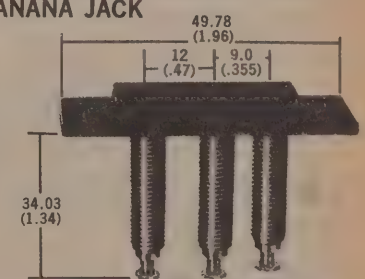


Model No.	Color
4069-0	Black plate
4069-2	Red plate

★QUANTITY DISC. CODE **A** **NET 2.20 EA.**
(Sold in Lots of 5)

EUROPEAN TRIPLE BANANA JACK

- Initial connection made with ground receptacle.
- Accepts 20.32mm (.800") long European banana plugs.
- Supplied with (2) 6-32 hex nuts and screws.
- Brass nickel plated.



Model No.	Color
4163-0	Black
4163-2	Red
4163-8	Gray

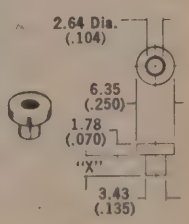
★QUANTITY DISC. CODE **A** **NET 2.95**

MINIATURE — RIVET TYPE BANANA JACK

Excellent for riveting to panels or boards. 2.64mm (.104) dia. jack accepts miniature banana plug.

- Jack body, leaded copper.
- Plating, gold flashed per MIL-G-45204 Type II.
- Rated, 5 amps cont., 10 amps int.

(Swaging Tool No. 3523 .....Net 23.95)



Model No.	"X" Dim.	Panel
3280	2,67 (.105)	3/32"
3281	3,43 (.135)	3/32"
3282	4,19 (.165)	1/8"

QUANTITY DISC. CODE **A** **NET .15 EA.**
(Sold in Lots of 10)

★Colors may be aggregated for best quantity price. *Lexan is a trademark of General Electric.
†Wire-Wrap is a trademark of Gardner-Denver.

STANDARD & MINIATURE BANANA PLUGS & JACKS

POMONA ELECTRONICS

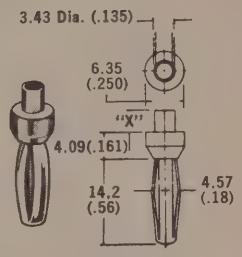
RIVET TYPE BANANA PLUG

Excellent for riveting to panels or boards. Used with standard 4,22mm (.166) dia. banana jacks.

- Spring, one piece heat treated beryllium copper, berylco 25 per QQ-C-533.
- Jack body, brass per QQ-B-626, alloy #360.
- Plating, nickel per QQ-N-290 class 2.
- Rated 16 amps cont., 30 amps int.

(Swaging Tool No. 3518 .....Net 23.95)

Model No.	"X" Dim.	Panel
3257	(2.39) .094	1/16"
3258	(3.18) .125	3/32"
3259	(3.96) .156	1/8"



QUANTITY DISC. CODE A NET .45 EA.
(Sold in Lots of 10)

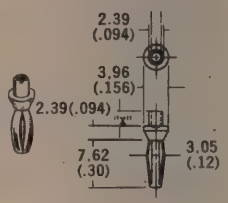
MINIATURE — RIVET TYPE BANANA PLUG

Excellent for riveting to panels or boards. Used with miniature 2,64mm (.104) dia. banana jacks.

- Spring, one piece heat treated beryllium copper, berylco 25 per QQ-C-533.
- Plug body, brass per QQ-B-626, alloy #360.
- Plating, gold flashed per MIL-G-45204 Type II.
- Rated, 5 amps cont., 10 amps int.

(Swaging Tool No. 3520 .....Net 23.95)

Model No.	"X" Dim.	Panel
3268	2.39 (.094)	1/16"
3271	3.18 (.125)	3/32"
3272	3.96 (.156)	1/8"



QUANTITY DISC. CODE A NET .38 EA.
(Sold in Lots of 10)

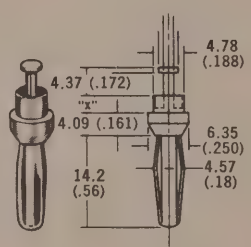
RIVET TYPE BANANA PLUG WITH TURRET

Excellent for riveting to panels or boards. Solder turret for rapid attachment of wires. Used with standard 4.22mm (.166) dia. banana jacks.

- Spring, one piece heat treated beryllium copper, berylco 25 per QQ-C-533.
- Plug body, brass per QQ-B-26, alloy #360.
- Plating, nickel per QQ-N-290 class 2.
- Rated, 15 amps cont., 30 amps int.

(Swaging Tool No. 3519 .....Net 23.95)

Model No.	"X" Dim.	Panel
3260	(2,67) .105	1/16"
3261	(3.43) .135	3/32"
3262	(4.19) .165	1/8"



QUANTITY DISC. CODE A NET .45 EA.
(Sold in Lots of 10)

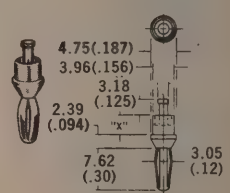
MINIATURE — RIVET TYPE BANANA PLUG WITH TURRET

Excellent for riveting to panels or boards. Solder turret for rapid attachment of wires. Used with miniature 2.64mm (.104) dia. banana jacks.

- Spring, one piece heat treated beryllium copper berylco 25 per QQ-C-533.
- Plug body, brass per QQ-B-626, alloy #360.
- Plating, gold flashed per MIL-G-45204 Type II.
- Rated, 5 amps cont., 10 amps int.

(Swaging Tool No. 3521 .....Net 23.95)

Model No.	"X" Dim.	Panel
3273	2.67 (.105)	1/16"
3274	3.43 (.135)	3/32"
3275	4.19 (.165)	1/8"



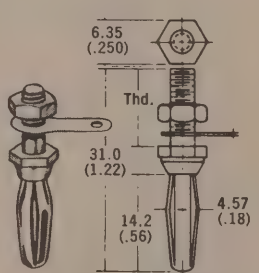
QUANTITY DISC. CODE A NET .50 EA.
(Sold in Lots of 10)

BANANA PLUG WITH THREADED STUD

Threaded stud for rapid mounting. Used with standard 4,22mm (.166) dia. banana jacks. Furnished with hex nut and solder lug.

- Spring, one piece heat treated beryllium copper, berylco 25 per QQ-C-533.
- Plug body, brass per QQ-B-626, alloy #360.
- Plating, nickel per QQ-N-290 class 2.
- Rated, 15 amps cont., 30 amps int.

Model No.	Thread
3263	6-32 x 1/2"
3264	8-32 x 1/2"
4511	6-32 x 5/8"
4512	8-32 x 5/8"



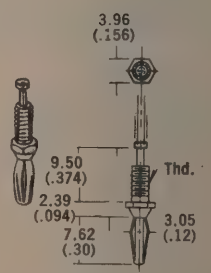
(unassembled)
QUANTITY DISC. CODE A NET .50 EA.
(Sold in Lots of 10)

MINIATURE — BANANA PLUG WITH THREADED STUD

Threaded stud for rapid mounting. Solder turret for attachment of wires. Used with 2.64mm (.104) dia. miniature banana jacks.

- Spring, one piece heat treated beryllium copper, berylco 25 per QQ-C-533.
- Plug body, brass per QQ-B-626, alloy #360.
- Plating, gold flashed per MIL-G-45204 Type II.
- Rated, 5 amps cont., 10 amps int.
- Furnished with 4-40 nickel plated hex nut.

Model No.	Thread
3276	4-40 x 3/8"
4513	4-40 x 5/8"



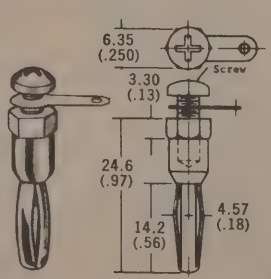
QUANTITY DISC. CODE A NET .40 EA.
(Sold in Lots of 10)

BANANA PLUG WITH SCREW

Mounts to various size panels. Used with standard 4,22mm (.166) dia. banana jacks. Furnished with screw and solder lug.

- Spring, one piece heat treated beryllium copper, berylco 25 per QQ-C-533.
- Plug body, brass per QQ-B-626, alloy #360.
- Plating, nickel per QQ-N-290 class 2.
- Rated, 15 amps cont., 30 amps int.

Model No.	Screw
3265	6-32 x 1/4"
3266	8-32 x 1/4"



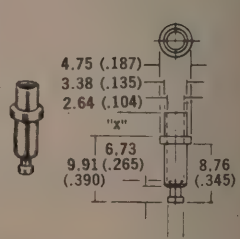
unassembled)
QUANTITY DISC. CODE A NET .50 EA.
(Sold in Lots of 10)

MINIATURE — RIVET TYPE BANANA JACK WITH TURRET

Excellent for riveting to panels or boards. Solder turret for rapid attachment of wires 2.64mm (.104) dia. jack accepts miniature banana plug.

- Jack body, leaded copper.
- Plating, gold flashed per MIL-G-45204 Type II.
- Rated, 5 amps cont., 10 amps int.

Model No.	"X" Dim.	Panel
3277	2.67 (.105)	1/16"
3278	3.43 (.135)	3/32"
3279	4.19 (.165)	1/8"



QUANTITY DISC. CODE A NET .22 EA.
(Sold in Lots of 10)

TEST CLIPS & ½" SPACED PIN TIP PLUGS

POMONA ELECTRONICS

INSULATED ALLIGATOR CLIP TO BANANA JACK

Alligator clip, steel, cadmium plated, vinyl insulators, red or black. Unassembled.

10 clips and 10 insulators per pkg.

Model No.	Color
2240-0	Black
2240-2	Red

QUANTITY DISC. CODE A (Sold in Lots of 10) NET .30 EA.

GOLD PLATED—INSULATED ALLIGATOR CLIP TO BANANA JACK

Alligator clip, solid copper, gold plated, vinyl insulators, red or black. Unassembled.

10 clips and 10 insulators per pkg.

Model No.	Color
3289-0	Black
3289-2	Red

QUANTITY DISC. CODE A (Sold in Lots of 10) NET .95 EA.

INSULATED ALLIGATOR CLIP TO PIN TIP JACK

Alligator clip, steel, cadmium plated. Tip jack, beryllium copper, gold flashed, accepts 2.03mm (.080) dia. pin tip plug. Vinyl insulators, red or black. Unassembled.

10 clips and 10 insulators per pkg.

Model No.	Color
1437-0	Black
1437-2	Red

QUANTITY DISC. CODE A (Sold in Lots of 10) NET .95 EA.

INSULATED MINIGATOR CLIP TO BANANA JACK

This minigator clip accepts a standard banana plug in the rear. Clip is steel, cadmium plated. Banana jack, brass, nickel plated. Pinned hinge construction with full-meshing jaws for small wires. Vinyl insulators, red or black. Unassembled.

10 clips and 10 insulators per pkg.

Model No.	Color
3448-0	Black
3448-2	Red

QUANTITY DISC. CODE A (Sold in Lots of 10) NET .95 EA.

INSULATED MINIGATOR CLIP TO PIN TIP JACK

This minigator clip accepts a 2.03mm (.080) dia. pin tip plug. Clip is steel, cadmium plated. Tip jack, beryllium copper, gold flashed. Pinned hinge construction with full-meshing jaws for small wires. Vinyl insulators, red or black. Unassembled.

10 clips and 10 insulators per pkg.

Model No.	Color
3491-0	Black
3491-2	Red

QUANTITY DISC. CODE A (Sold in Lots of 10) NET 1.35 EA.

MINIGATOR CLIP WITH 6-32 THREAD

This minigator can be used with oscilloscopes and leads equipped with a 6-32 screw on tip.

Vinyl insulators, red or black. Unassembled.

10 clips and 10 insulators per pkg.

Model No.	Color
4517-0	Black
4517-2	Red

QUANTITY DISC. CODE A (Sold in Lots of 10) NET .65 EA.

FEATURES:

- Fits 2.03mm (.080) dia. pin tip jacks.
- Plug body brass, gold flashed per MIL-G-45204 Type 2 (.00001/.00002).
- Stack-up spring, beryllco 25 per QQ-C-533, gold flashed.
- Tough thermoplastic molded directly to plug bodies.

RATINGS:

- Operating Temperature: −25°C to +85°C.
- Working Voltage: 2500 VDC.
- Current: 5 amps cont., 10 amps int.

MINIATURE — DOUBLE PIN TIP PLUG WITH SET SCREWS

Miniature 2.03mm (.080) double pin tip plug on ½" centers. Set screws secure cable or component leads.

(Recommend using Screwdriver No. 3736)

Model No.	Color
3544-0	Black
3544-2	Red

★QUANTITY DISC. CODE A NET 1.50

MINIATURE — DOUBLE PIN TIP PLUG WITH SOLDER TURRET TERMINALS

Miniature 2.03mm (.080) double pin tip plug on ½" centers. Gold flashed solder turrent terminals for permanent noise-free connection of cables. 2.03mm (.080) tip jacks on ½" centers permit top stacking.

Model No.	Color
3545-0	Black
3545-2	Red

★QUANTITY DISC. CODE A NET 2.50

MINIATURE — DOUBLE PIN TIP PLUG WITH SHORTING BAR

Ideal as a connecting link for use with ½" spaced pin tip jacks. 2.03mm (.080) dia. tip jacks on ½" centers permit top stacking. Miniature 2.03mm (.080) double pin tip plugs internally solder-bonded with #20 AWG wire. "Shorting bar" stamped on plug.

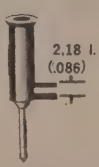
Model No.	Color
3452-0	Black
3452-2	Red

★QUANTITY DISC. CODE A NET 1.85

MINIATURE — SOLDERLESS PIN TIP PLUG WITH SAFETY COLLAR

This integral collar insulates exposed wire leads and acts as a strain relief by preventing the flexing of the lead at the set screw. Wire firmly held in place with internal set screw, eliminating soldering.

(Recommend using Screwdriver No. 3736)

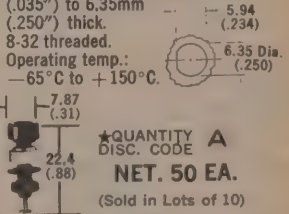


Model No.	Color
3548-0	Black
3548-2	Red

★QUANTITY DISC. CODE A NET .85

MINIATURE — PIN TIP JACK 2.03MM (.080) DIA.

- Gold plated brass body.
- Contact spring, heat treated beryllium copper, gold flashed.
- Rated 1500 W VDC, 5 amps cont., 10 amps int.
- Mounts in panels from 0.88mm (.035") to 6.35mm (.250") thick.
- 8-32 threaded.
- Operating temp.: −65°C to +150°C.



Model No.	Color	Model No.	Color
3542-0	Black	3542-5	Green
3542-1	Brown	3542-6	Blue
3542-2	Red	3542-7	Violet
3542-3	Orange	3542-8	Gray
3542-4	Yellow	3542-9	White

★QUANTITY DISC. CODE A NET. 50 EA. (Sold in Lots of 10)

★Colors may be aggregated for best quantity price.

½" SPACED MINIATURE BANANA PLUGS

POMONA ELECTRONICS

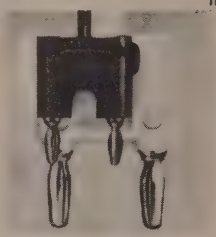
One-third smaller miniature banana plugs, a state-of-the-art development for the ever increasing demand for miniaturized test equipment.

SPECIFICATIONS:

- Fits 2.64mm (.104) dia. miniature banana jacks.
- Plug body brass, per QQ-B-626, alloy #360.
- Gold flashed per MIL-G-45204 Type II 0,0025/0,0051 mm (.0001/.0002).
- Spring, beryllium copper Berylco 25 per QQ-C-533.

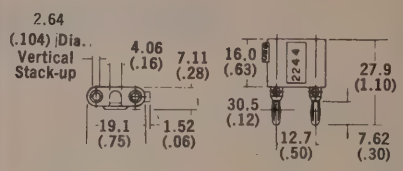
RATINGS:

- Operating temperature: −25°C to +85°C.
- Working voltage: 2500 VDC.
- Current: 5 amps cont., 10 amps int.



Two-thirds Size

Banana plug springs are precision formed of one-piece beryllium copper, heat treated for maximum life and low contact resistance. Tough thermoplastic molded to plug bodies.



ACTUAL SIZE

MINIATURE—DOUBLE BANANA PLUG WITH SET SCREWS

Miniature double banana plug on ½" centers. Internal set screws to secure cable or component leads. 2.64mm (.104) dia. banana jacks on ½" centers permit top stack-up for multiple connections.

(Recommend using Screwdriver No. 3736)

Model No.	Color
2244-0	Black
2244-2	Red

★QUANTITY DISC. CODE A **NET 1.50**

MINIATURE—DOUBLE BANANA PLUG WITH SOLDER TURRET TERMINALS

Miniature double banana plug on ½" centers. Solder turret terminals for permanent noise-free connections of cables or components. 2.64mm (.104) dia. banana jacks on ½" centers permit top stack-up for multiple connections.

Model No.	Color
2245-0	Black
2245-2	Red

★QUANTITY DISC. CODE A **NET 1.95**

MINIATURE SOLDERLESS BANANA PLUG WITH SAFETY COLLAR-STACK-UP

This integral collar insulates exposed wire leads and acts as a strain relief by preventing the flexing of the lead at the set screw. Wire firmly held in place with internal set screw, eliminating soldering.

(Recommend using Screwdriver No. 3736)

Model No.	Color
2945-0	Black
2945-2	Red

★QUANTITY DISC. CODE A **NET .85**

MINIATURE SOLDER TYPE BANANA PLUG

Miniature in line plug for use with miniature binding posts or banana jacks. Wire is soldered directly to the threaded plug. Glass-filled nylon insulated handle.

Model No.	Color
3690-0	Black
3690-2	Red

★QUANTITY DISC. CODE A **NET .55**

MINIATURE SCREWDRIVER FOR SET SCREWS

A specially designed screwdriver with slender tip for tightening of set screws on miniature plugs.

Model No.
3736

QUANTITY DISC. CODE A **NET .75**

MINIATURE—DOUBLE BANANA PLUG WITH SHORTING BAR

Ideal as a connecting link for use with ½" spaced banana jacks. 2.64mm (.104) dia. banana jacks on ½" centers permit top stack-up for multiple connections. Banana plugs internally solder-bonded with #18 AWG wire. "Shorting bar" stamped on plug.

Model No.	Color
2035-0	Black
2035-2	Red

★QUANTITY DISC. CODE A **NET 1.85**

MINIATURE SOLDERLESS BANANA PLUG-STACK-UP

Miniature banana plug for rapid assembly of test leads. For use with miniature binding posts or banana jacks. Wire firmly held in place with internal set screw, eliminating soldering.

(Recommend using Screwdriver No. 3736

Model No.	Color
2944-0	Black
2944-2	Red

★QUANTITY DISC. CODE A **NET .85**

ADAPTER — MINIATURE BINDING POSTS TO MINIATURE DOUBLE BANANA PLUG

This adapter converts miniature banana jacks to miniature binding posts. Excellent for attaching wires or components. Insulated gold flashed 5 way binding posts. Gold flashed one piece heat treated beryllium copper spring. Binding posts, Black/Red.

COLOR: Black.

Model No.
3822

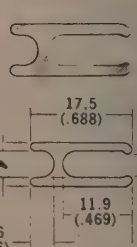
QUANTITY DISC. CODE A **NET 4.25**

SHORTING LINK FOR MINIATURE BINDING POSTS

Shorting link for miniature binding posts on ½" centers. A snap-on feature holds link on post when short not needed.

MATERIAL: Brass 0.79mm (.031) thick.

FINISH: Nickel plated per QQ-N-290 class 2 or gold flashed per MIL-G-45204 Type 2.



Gold Flashed Model No.	Nickel Plated Model No.
3478	3479
NET .25 EA.	NET .25 EA.

(Sold in Lots of 10)

★QUANTITY DISC. CODE A

★Colors may be aggregated for best quantity price.

½" SPACED MINIATURE BINDING POSTS & JACKS

POMONA ELECTRONICS

MINIATURE BINDING POSTS

A complete 5-way binding post in "miniature." Captive thumb nut and binding post body, machined brass; gold or nickel plated. Thumb nut, mounting base and shouldered insulator molded of high impact polycarbonate thermoplastic. 8-32 hex nut and lockwasher included, unassembled, nickel plated.

SPECIFICATIONS:

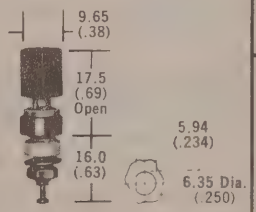
- 5-way binding post.
- Mounts ¼" dia. "D" hole.
- Panels up to 3/16" thick.
- Lower insulator white Lexan.
- Captive thumb nut.
- 2.08mm (.082) dia. cross hole.
- Thumb nut and binding post body — gold flashed per MIL-G-45204 Type 2 or nickel plated per QQ-N-290 class 2.
- Upper insulator same color as thumb nut.

RATINGS:

- Operating temperature: —65°C to +150°C.
- Working voltage: 1500 VDC.
- Current: 5 amps cont., 10 amps int.

MINIATURE—INSULATED BINDING POST

Gold Flashed		Nickel Plated	
Model No.	Color	Model No.	Color
2382-0	Black	2439-0	Black
2382-1	Brown	2439-1	Brown
2382-2	Red	2439-2	Red
2382-3	Orange	2439-3	Orange
2382-4	Yellow	2439-4	Yellow
2382-5	Green	2439-5	Green
2382-6	Blue	2439-6	Blue
2382-7	Violet	2439-7	Violet
2382-8	Gray	2439-8	Gray
2382-9	White	2439-9	White
★QUANTITY DISC. CODE A NET 1.50 EA.		★QUANTITY DISC. CODE A NET 1.25 EA.	

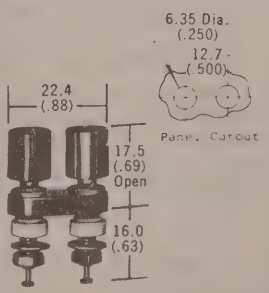


†(Sold in Lots of 10)

MINIATURE—INSULATED DOUBLE BINDING POST

Double binding post body on ½" centers with one red and one black binding post. Choice of black or red plate.

Gold Flashed		Nickel Plated	
Model No.	Color	Model No.	Color
2383-0	Black	2440-0	Black
2383-2	Red	2440-2	Red
★QUANTITY DISC. CODE A NET 2.95 EA.		★QUANTITY DISC. CODE A NET 2.40 EA.	



†(Sold in Lots of 5)

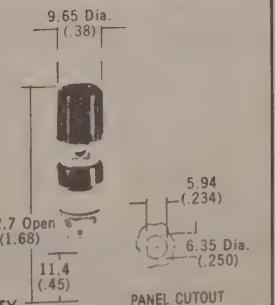
MINIATURE BINDING POST WITH WIRE-WRAP TERMINAL

Excellent for rapid connection of wires using wire-wrapping tools or machines.

FEATURES:

- Gold plated beryllium copper, 0.64mm (.025) sq. Wire-Wrap terminal.

Model No.	Color
4101-0	Black
4101-2	Red
4101-4	Yellow
4101-5	Green
4101-6	Blue
4101-8	Gray
4101-9	White



★QUANTITY DISC. CODE A NET 1.75 ea.

PANEL CUTOUT

MINIATURE BANANA JACKS

Insulator head and shouldered washer molded of high impact polycarbonate thermoplastic. Banana jack body, machined brass, gold flashed on 2142 and 2143, nickel plated on 4022. 8-32 hex nut and lockwasher included, unassembled, nickel plated.

SPECIFICATIONS:

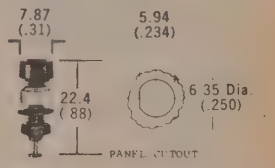
- Closed entry jack 2.64mm (.104) dia.
- Lexan polycarbonate insulator head molded to body.
- Mounts in ¼" dia. hole. Model 2142 and 4022, panels up to ¼" thick. Model 2143, panels up to 3/16" thick. Solder turret or Wire-Wrap† terminal.
- Lower insulator Lexan polycarbonate, white.

RATINGS:

- Operating temperature: —65°C to +150°C.
- Working voltage: 1500 VDC.
- Current: 5 amps cont., 10 amps int.

MINIATURE—INSULATED BANANA JACK

Model No.	Color
2142-0	Black
2142-1	Brown
2142-2	Red
2142-3	Orange
2142-4	Yellow
2142-5	Green
2142-6	Blue
2142-7	Violet
2142-8	Gray
2142-9	White



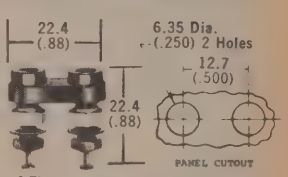
†(Sold in Lots of 10)

★QUANTITY DISC. CODE A NET .35 EA.

MINIATURE—INSULATED DOUBLE BANANA JACK

Double banana jack on ½" centers with one red and one black jack. Choice of black or red plate.

Model No.	Color
2143-0	Black
2143-2	Red



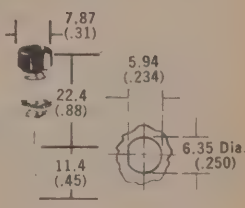
†(Sold in Lots of 5)

★QUANTITY DISC. CODE A NET .95 EA.

MINIATURE—INSULATED BANANA JACK WITH WIRE-WRAP TERMINAL

Excellent for rapid connection of wires using wire-wrapping tools or machines. Gold plated beryllium copper 0,64mm (.025") sq. Wire-Wrap terminal. Nickel plated brass bodies.

Model No.	Color
4022-0	Black
4022-2	Red
4022-4	Yellow
4022-5	Green
4022-6	Blue
4022-8	Gray
4022-9	White



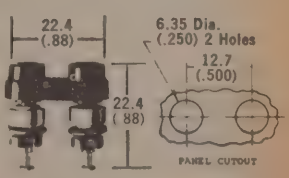
†(Sold in Lots of 10)

★QUANTITY DISC. CODE A NET .85 EA.

MINIATURE — INSULATED DOUBLE-PIN TIP JACKS 2.03MM (.080) DIA.

Double pin tip jacks on ½" centers with one red and one black jack. Choice of black or red plate.

Model No.	Color
4543-0	Black
4543-2	Red



†(Sold in Lots of 5)

★QUANTITY DISC. CODE A NET 1.50 EA.

★Colors and Length may be aggregated for best quantity price.
†All Lots Sold Per Color

½″ SPACED MINIATURE BANANA PLUG ADAPTERS & ACCESSORIES

POMONA ELECTRONICS

BNC RECEPTACLE TO MINIATURE DOUBLE BANANA PLUG

This adapter allows a BNC plug to be used with equipment having ½″ spaced miniature 2.64mm (.104) dia. banana jacks. Excellent for adapting test equipment to standard coaxial cables.

UPPER: BNC receptacle, UG 1094/U.

LOWER: Miniature double banana plug on ½″ centers, for use with 2.64mm (.104) dia. miniature jacks. Gold flashed one piece heat treated beryllium copper springs.

Model No.	COLOR: Black.
3269	

QUANTITY DISC. CODE A

NET 4.25

STANDARD BANANA JACK TO MINIATURE BANANA PLUG

Permits standard banana plug to be used with equipment having miniature banana jacks.

UPPER: Banana jack, 4.22mm (.166) dia.; brass, nickel plated.

LOWER: Miniature banana plug, one piece nickel plated beryllium copper sping for use with 2.64mm (.104) dia. miniature banana jacks.

Model No.	Color
2138-0	Black
2138-2	Red

★QUANTITY DISC. CODE A

NET .75

MINIATURE BANANA JACK TO STANDARD BANANA PLUG

Permits miniature banana plugs to be used with equipment having standard banana jacks.

UPPER: Miniature banana jack, 2.64mm (.104) dia.; brass, nickel plated.

LOWER: Standard banana plug, one piece nickel plated beryllium copper spring for use with 4.22mm (.166) dia. banana jacks.

Model No.	Color
2477-0	Black
2477-2	Red

★QUANTITY DISC. CODE A

NET .65

MINIATURE BINDING POSTS TO BNC PLUG

This adapter converts a BNC receptacle to miniature ½″ spaced 5-way binding posts.

UPPER: Insulated, gold flashed miniature 5-way binding posts on ½″ centers with 2.64mm (.104) dia. miniature banana jacks.

LOWER: BNC plug.

Model No.	COLOR: Black.
3296	

QUANTITY DISC. CODE A

NET 5.85

METAL SHORTING BAR

Low profile, gold flashed, brass shorting bar. Miniature banana plugs on ½″ centers swaged to 1/16″ thick brass bar. Center hole accepts #4-40 screw for easy removal. Current rating 5 amps cont., 10 amps int.

Model No.
3030

QUANTITY DISC. CODE A

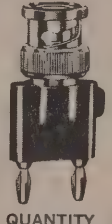
NET 1.50

BNC PLUG TO MINIATURE DOUBLE BANANA PLUG

Allows a BNC cable jack to be used on equipment having ½″ spaced 2.64mm (.104) dia. banana jacks.

UPPER: BNC plug.

LOWER: Miniature double banana plug on ½″ centers, for use with 2.64mm (.104) dia. miniature jacks. Gold flashed one piece heat treated beryllium copper springs.



Model No.	COLOR: Black.
3270	

QUANTITY DISC. CODE A

NET 5.85

INSULATED MINIGATOR CLIP TO MINIATURE BANANA JACK

This minigator clip accepts a miniature banana plug in the rear. Clip is steel, cadmium plated. Pinned hinge construction with full-meshing jaws for small wires. Vinyl insulators (red or black). Unassembled.

10 clips and 10 insulators per pkg.

Model No.	Color
3217-0	Black
3217-2	Red

QUANTITY DISC. CODE A (Sold in Lots of 10)

NET .30 EA.

STANDARD DOUBLE BANANA JACK TO MINIATURE DOUBLE BANANA PLUG

Permits standard double banana plug on ¾″ centers to be used with equipment having miniature double banana jacks on ½″ centers.

UPPER: Standard double banana jacks 4.22mm (.166) dia. on ¾″ centers. Brass, nickel plated.

LOWER: Miniature double banana plug on ½″ centers. One piece nickel plated beryllium copper spring for use with 2.64mm (.104) dia. miniature banana jacks.

Model No.	COLOR: Black.
2952	

QUANTITY DISC. CODE A

NET 2.50

SINGLE BANANA PLUG ISOLATION

Provides two terminal isolation. Allows for addition of series components. Excellent for circuit design and testing. Gold flashed solder turret terminals for permanent noise-free connections.

UPPER: Miniature banana jack, 2.64mm (.104) dia. brass, gold flashed.

LOWER: Miniature banana plug, one piece gold flashed beryllium copper spring.

Model No.	Color	Model No.	Color
2831-0	Black	2831-2	Red

★QUANTITY DISC. CODE A

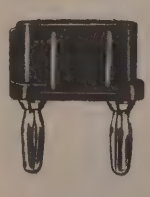
NET 2.95

MINIATURE DOUBLE BANANA JACK TO STANDARD DOUBLE BANANA PLUG

Permits miniature double banana plug on ½″ centers to be used with equipment having standard double banana jacks on ¾″ centers.

UPPER: Miniature double banana jacks, 2.64mm (.104) dia. on ½″ centers. Brass, nickel plated.

LOWER: Standard double banana plug on ¾″ centers. One piece nickel plated beryllium copper spring for use with 4.22mm (.166) dia. standard banana jacks.



Model No.	COLOR: Black.
2943	

QUANTITY DISC. CODE A

NET 2.25

DOUBLE BANANA PLUG — 4 TERMINAL ISOLATION

Provides four terminal isolation. Top stack-up receptacles isolated from lower plugs. Ideal for insertion of matching networks in computer boards, circuit design and testing. Gold flashed solder turret terminals for permanent noise-free connections.

UPPER: Miniature double banana jack, 2.64mm (.104) dia. brass, gold flashed.

LOWER: Miniature double banana plug on ½″ centers. Gold flashed one piece beryllium copper spring.

Model No.	Color	Model No.	Color
2830-0	Black	2830-2	Red

★QUANTITY DISC. CODE A

NET 3.85

★Colors may be aggregated for best quantity price.

MINIATURE TEST PROBES

POMONA ELECTRONICS

These slim miniature test probe features a sharp replaceable needle tip. The tip easily pierces varnish or plating to give a good electrical reading. The probe also has a tubular replaceable tip for non-slip use over the ends of leads. This aids in the checking of components from the back side of circuit boards.

Tough thermoplastic is molded directly onto probe tip and wire lead providing a strong, reliable integral unit.

NEEDLE TIP: Replaceable, stainless steel.

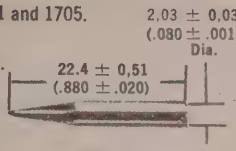
TUBE TIP: Replaceable brass, cadmium plated.

TIP NUT: Insulated.

WIRE: 20 AWG, strand 41 x 36 T.C. extra flexible polyvinyl insulation 2.21mm (.087) OD.

REPLACEMENT NEEDLE TIP

- Fits Models 4410, 4411, 4071, 3860, 3861 and 1705.
- Stainless steel 2.03mm (.08) dia.
- 2.03mm (.08) dia. to fit pin tip receptacle.
- Sharp point to pierce varnish for good electrical contact.

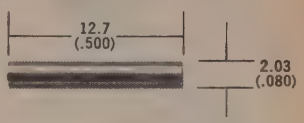


Model No.
4174

QUANTITY DISCOUNT CODE (Sold in Lots of 10) **A** **NET .20 EA.**

REPLACEMENT TUBE TIP

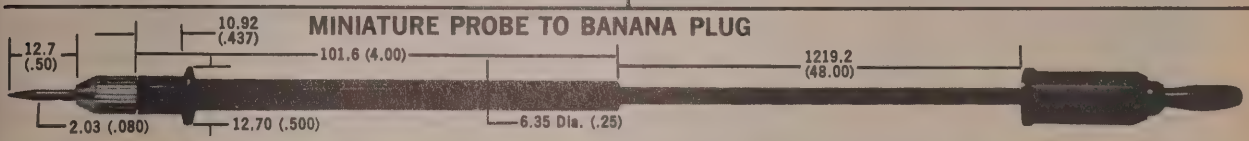
- Fits Models 4410, 4411, 4071, 3860, 3861 and 1705.
- Brass, cadmium plated.
- 2.03mm (.080) dia.
- 1.68mm (.066) I.D.



Model No.
4574

QUANTITY DISCOUNT CODE (Sold in Lots of 10) **A** **NET .20 EA.**

MINIATURE PROBE TO BANANA PLUG



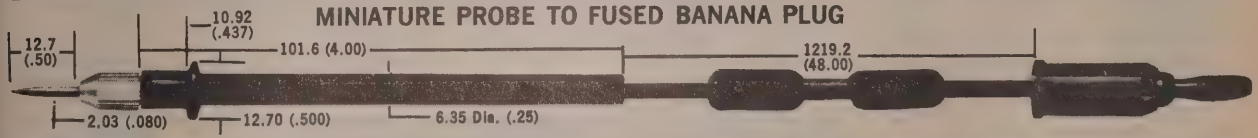
Model No.	Color	Length
4410-48-0	Black	48″
4410-48-2	Red	48″

OPERATING TEMPERATURE: —25°C to +105°C.

★QUANTITY DISCOUNT CODE **A** **NET 3.85**

BANANA PLUG: Spring, one piece beryllium copper, heat treated, nickel plated. Tough thermoplastic molded to plug body and wire.

MINIATURE PROBE TO FUSED BANANA PLUG



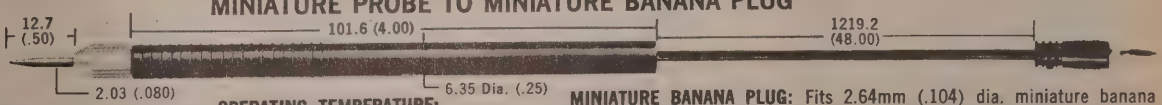
Model No.	Color	Length
4411-48-0	Black	48″
4411-48-2	Red	48″

OPERATING TEMPERATURE: —25°C to +105°C.

★QUANTITY DISCOUNT CODE **A** **NET 4.85**

BANANA PLUG: Spring, one piece beryllium copper, heat treated, nickel plated. Tough thermoplastic molded to plug body and wire. (Fuse not included.)

MINIATURE PROBE TO MINIATURE BANANA PLUG



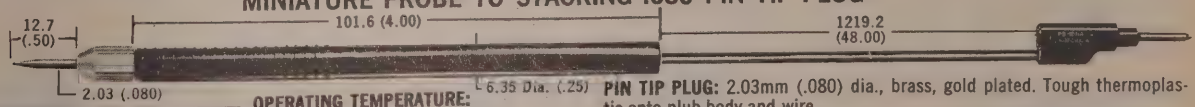
Model No.	Color	Length
4071-48-0	Black	48″
4071-48-2	Red	48″

OPERATING TEMPERATURE: —0°C to +105°C.

★QUAN DISC. CODE **A** **NET 3.85**

MINIATURE BANANA PLUG: Fits 2.64mm (.104) dia. miniature banana jacks. Spring, one piece heat treated beryllium copper. Plug body, brass per QQ-B-626, alloy #360. Gold plated. Tough thermoplastic molded onto plug body and wire.

MINIATURE PROBE TO STACKING .080 PIN TIP PLUG



Model No.	Color	Length
3860-48-0	Black	48″
3860-48-2	Red	48″

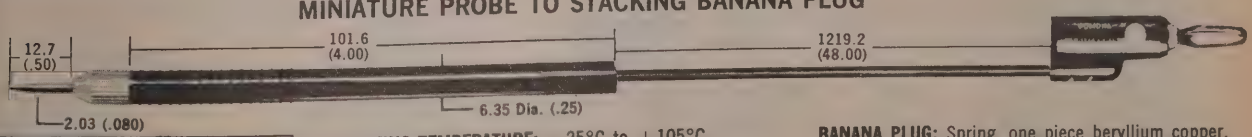
OPERATING TEMPERATURE: —25°C to +105°C.

★QUAN DISC. CODE **A** **NET 3.85**

PIN TIP PLUG: 2.03mm (.080) dia., brass, gold plated. Tough thermoplastic onto plub body and wire.

STACK-UP: Beryllium copper spring, gold plated, accepts 2.03mm (.080) dia. pin.

MINIATURE PROBE TO STACKING BANANA PLUG



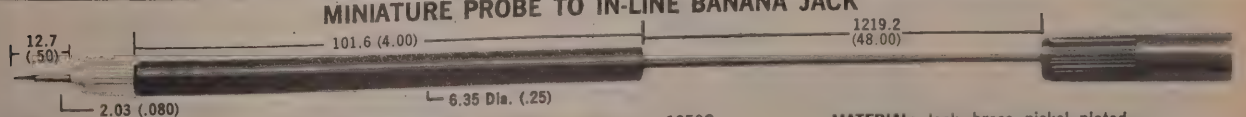
Model No.	Color	Length
3861-48-0	Black	48″
3861-48-2	Red	48″

OPERATING TEMPERATURE: —25°C to +105°C.

★QUANTITY DISCOUNT CODE **A** **NET 3.85**

BANANA PLUG: Spring, one piece beryllium copper, heat treated, nickel plated. Tough thermoplastic molded to plug body and wire.

MINIATURE PROBE TO IN-LINE BANANA JACK



Model No.	Color	Length
4540-48-0	Black	48″
4540-48-2	Red	48″

OPERATING TEMPERATURE: —25°C to +105°C.

★QUANTITY DISCOUNT CODE **A** **NET 4.85**

MATERIAL: Jack, brass nickel plated. Jacket, Glass-filled nylon.

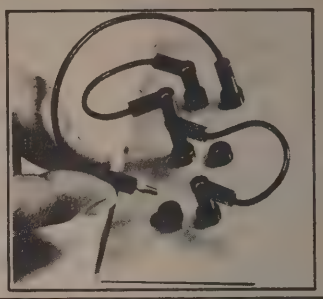
★Colors and Length may be aggregated for best quantity price.

MINIATURE BANANA PLUG PATCH CORDS

POMONA ELECTRONICS

Miniature patch cords for use with 2.64mm (.104) dia. miniature banana jacks. Excellent for miniaturization of test equipment and high density packaging for patch systems.

Banana plug springs precision formed of one piece beryllium copper, heat treated for maximum life and low contact resistance. Tough thermoplastic molded to plug body and wire.



FEATURES:

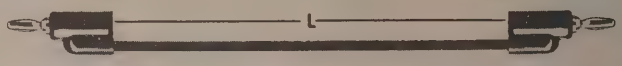
- Fits 2.64mm (.104) dia. miniature banana jacks. Plug body brass, per QQ-B-626, alloy #360.
- Gold flashed per MIL-G-45204 Type II (.00001/.00002). Spring, one piece heat treated beryllium copper, berylco 25 per QQ-C-533.

SPECIFICATIONS:

- Wire: 20 awg, strand. 41 x 36 T.C. extra flexible polyvinyl insulation 2,21mm (.087") O.D.
- Rated: 5 amps cont., 10 amps int., 5000 VDC • Operating temperature: −0°C to +105°C.

MINIATURE — BANANA PLUG STACK-UP PATCH CORD

Model No.	Color	Length	Net
1081-4-*	*	4"	1.80
1081-8-*	*	8"	1.80
1081-12-*	*	12"	1.80
1081-18-*	*	18"	1.80
1081-24-*	*	24"	1.80
1081-36-*	*	36"	1.80
1081-48-*	*	48"	1.90
1081-60-*	*	60"	2.00

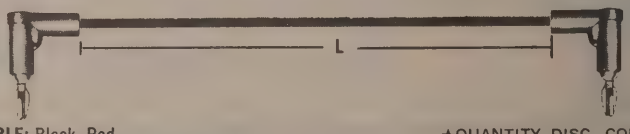


COLORS AVAILABLE: Black, Brown, Red, Orange, Yellow, Green, Blue, Violet, Gray, White.

★QUANTITY DISC. CODE A

MINIATURE — RIGHT ANGLE BANANA PLUG PATCH CORD STACK-UP

Model No.	Color	Length	Net
2860-4-*	*	4"	1.95
2860-8-*	*	8"	1.95
2860-12-*	*	12"	1.95
2860-18-*	*	18"	1.95
2860-24-*	*	24"	1.95
2860-36-*	*	36"	1.95
2860-48-*	*	48"	2.05
2860-60-*	*	60"	2.15



COLORS AVAILABLE: Black, Red.

★QUANTITY DISC. CODE A

MINIATURE — BANANA PLUG PATCH CORD

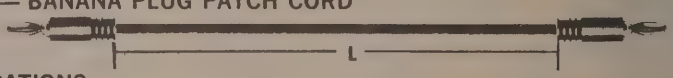
Model No.	Color	Length	Net
2842-4-*	*	4"	1.85
2842-8-*	*	8"	1.85
2842-12-*	*	12"	1.85
2842-18-*	*	18"	1.85
2842-24-*	*	24"	1.85
2842-36-*	*	36"	1.85
2842-48-*	*	48"	1.95
2842-60-*	*	60"	2.05

COLORS AVAILABLE: Red, Black.

★QUANTITY DISC. CODE A

MINIATURE — BANANA PLUG PATCH CORD

Model No.	Color	Length	Net
4514-4-*	*	4"	2.35
4514-8-*	*	8"	2.35
4514-12-*	*	12"	2.35
4514-18-*	*	18"	2.35
4514-24-*	*	24"	2.35
4514-36-*	*	36"	2.35
4514-48-*	*	48"	2.45
4514-60-*	*	60"	2.55



SPECIFICATIONS:

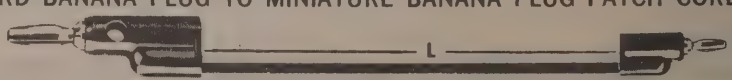
- 24 AWG, strand 45 x 40 T.C.
- Superflexible rubber jacket.
- O.D. 1.68mm (.066).
- WVDC 1,000.
- Breakdown 10,000 VDC.

COLORS AVAILABLE: Black, Red.

★QUANTITY DISCOUNT CODE A

STANDARD BANANA PLUG TO MINIATURE BANANA PLUG PATCH CORD

Model No.	Color	Length	Net
3014-12-*	*	12"	2.25
3014-18-*	*	18"	2.25
3014-24-*	*	24"	2.25
3014-36-*	*	36"	2.25
3014-48-*	*	48"	2.35
3014-60-*	*	60"	2.45



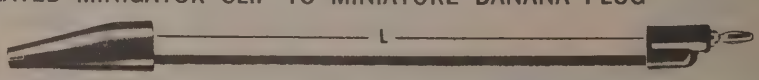
STANDARD BANANA PLUG: Spring, Beryllium copper, nickel plated.

COLORS AVAILABLE: Black, Red.

★QUANTITY DISC. CODE A

INSULATED MINIGATOR CLIP TO MINIATURE BANANA PLUG

Model No.	Color	Length	Net
3222-12-*	*	12"	1.50
3222-18-*	*	18"	1.50
3222-24-*	*	24"	1.50
3222-36-*	*	36"	1.50
3222-48-*	*	48"	1.60
3222-60-*	*	60"	1.70



CLIP: Minigator, steel, cadmium plated. **INSULATOR:** Vinyl, red with red wire, black with black wire.

COLORS AVAILABLE: Black, Red.

★QUANTITY DISC. CODE A

★various lengths may be aggregated for best quantity price. Other lengths available to order.

*Consult factory for color code part numbers.

½" SPACED MINIATURE DOUBLE BANANA PLUG PATCH CORDS

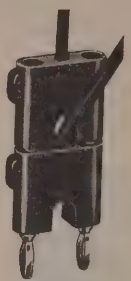
POMONA ELECTRONICS

MOLDED MINIATURE DOUBLE BANANA PLUG PATCH CORDS ⅓ SMALLER

A miniature double banana plug on ½" centers. This patch cord enables miniaturization of test equipment and high density packaging for patch systems.

Banana plug springs precision formed of one piece beryllium copper, heat treated for maximum life and low contact resistance.

ACTUAL SIZE



STACK-UP

FEATURES:

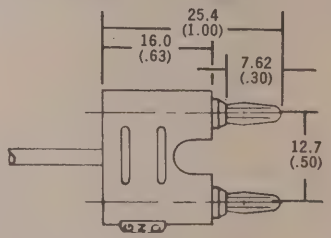
- One piece beryllium copper heat treated spring for long life.
- Rounded spring design results in maximum contact area.
- G.N.D., clearly molded on plug body and shell.
- Solder-bonded noise-free connections.

SPECIFICATIONS:

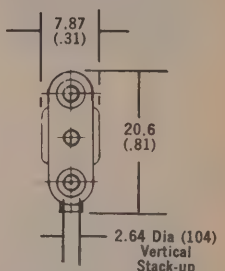
- Fits standard 2.64mm (0.104) dia. banana jacks, on ½" centers.
- Spring, beryllium copper berylco 25 per QQ-C-533.
- Plug body brass per QQ-B-626, alloy #360.
- Gold flashed per MIL-G-45204, Type II.

CABLE DESCRIPTION:

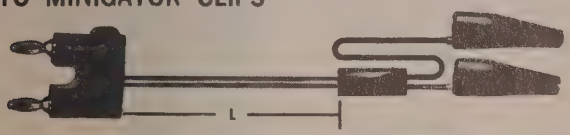
Shielded coax., RG174/U polyethylene insulation, vinyl jacket, nom. cap. 29.5 pf/ft., nom. imp. 50 ohms, nom. O.D. 2.54mm (100"). Color: Black.



NOTE: Molded double plug matches color of cable.



MINIATURE — DOUBLE BANANA PLUG TO MINIGATOR CLIPS

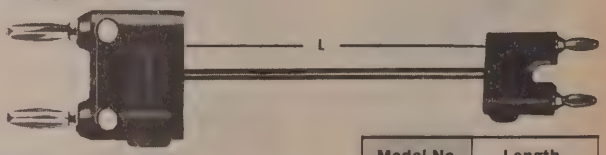


CONN: 1st END
Miniature double banana plug on ½" centers.
CABLE:
Shielded coax., RG174/U.
CONN: 2nd END
Minigator clips, steel, cad. plated; insulators, vinyl. Color: Black/Red.

Model No.	Length
3027-K-12	12"
3027-K-24	24"
3027-K-36	36"
3027-K-48	48"
3027-K-60	60"

★QUANTITY DISC. CODE **B** **NET 6.85**

DOUBLE BANANA PLUG TO MINIATURE DOUBLE BANANA PLUG

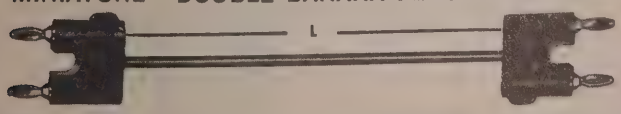


CONN: 1st END
Double banana plug, on ¾" centers.
CABLE:
Shielded coax., RG174/U.
CONN: 2nd END
Miniature double banana plug on ½" centers.

Model No.	Length
2443-K-12	12"
2443-K-24	24"
2443-K-36	36"
2443-K-48	48"
2443-K-60	60"

★QUANTITY DISC. CODE **B** **NET 6.85**

MINIATURE — DOUBLE BANANA PLUG BOTH ENDS

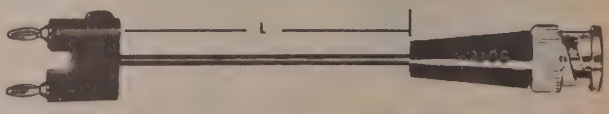


CONN: 1st END
Miniature double banana plug on ½" centers.
CABLE:
Shielded coax., RG174/U.
CONN: 2nd END
Miniature double banana plug on ½" centers.

Model No.	Length
2247-K-12	12"
2247-K-24	24"
2247-K-36	36"
2247-K-48	48"
2247-K-60	60"

★QUANTITY DISC. CODE **B** **NET 5.95**

MINIATURE–DOUBLE BANANA PLUG TO BNC MALE



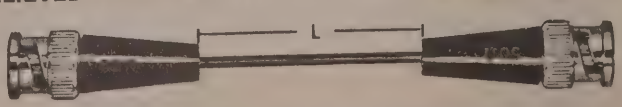
CONN: 1st END
Miniature double banana plug on ½" centers.
CABLE:
Shielded coax., RG174/U.
CONN: 2nd END
Male BNC.

Model No.	Length
2248-K-12	12"
2248-K-24	24"
2248-K-36	36"
2248-K-48	48"
2248-K-60	60"

★QUANTITY DISC. CODE **B** **NET 7.50**

STRESS RELIEVED AND WEATHERPROOFED CRIMP BNC CABLE ASSEMBLY

CONN: 1st END Crimp male BNC (comparable to UG88E/U)
CABLE: Shielded coaxial, RG174/U
CONN: 2nd END Crimp male BNC (comparable to UG88E/U)



★QUANTITY DISC. CODE **B** **NET 5.95**

Model No.	Length
2249-K-12	12"
2249-K-24	24"
2249-K-36	36"
2249-K-48	48"
2249-K-60	60"

★Various lengths may be aggregated for best quantity price. Other lengths available to order.

PHENOLIC "BLACK BOXES"

POMONA ELECTRONICS

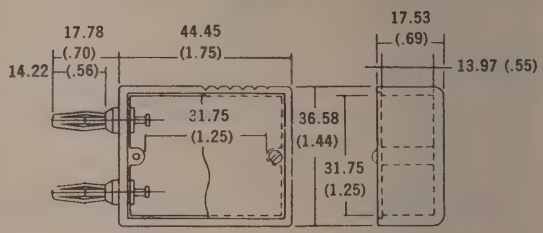
Create passive and active networks, voltage dividers, isolation networks or attenuators with these units. Solder turret terminals for permanent noise-free connection of components, etc. Entire unit may be potted or encapsulated.

Housing molded of thermosetting electrical grade phenolic. Cover, punched XXP laminated paper base phenolic. Color, housing and cover, black. Cover plate and 2 each #2-56 cover screws included.

OPERATING TEMPERATURE: −25°C to +125°C. WORKING VOLTAGE: 5000 VDC. CURRENT: 15 amps cont., 30 amps int.

COMPONENT MOUNTING—ACROSS BANANA PLUGS

UPPER: No connection.
LOWER: Banana plugs on ¾" centers. One piece beryllium copper spring, heat treated, nickel plated. Plug body and solder turret terminals, brass, nickel plated. For use with standard 4.22mm (.166") dia. banana jacks.
(Includes cover and screws)

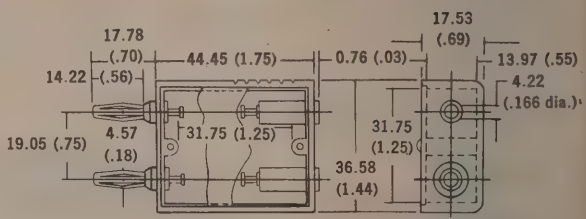


Model No.	
2096	QUANTITY

DISC. CODE A **NET 2.75**

COMPONENT MOUNTING—BANANA JACKS TO DOUBLE BANANA PLUG—JUNIOR SIZE

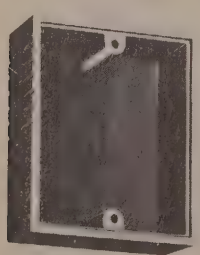
UPPER: Banana jacks, 4.22mm (.166") dia. and solder turret terminals on ¾" centers. Brass, nickel plated. Polarity indicator on top; color, red.
LOWER: Banana plugs on ¾" centers. One piece beryllium copper spring, heat treated, nickel plated. Plug body and solder turret terminals, brass, nickel plated. For use with standard 4.22mm (.166") dia. banana jacks.
(Includes cover and screws)



Model No.	
2098	QUANTITY

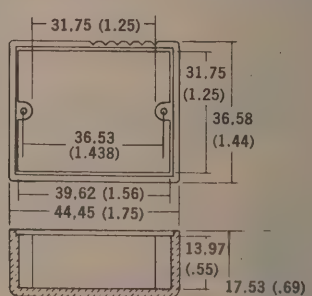
DISC. CODE A **NET 4.50**

BLACK BOX—JUNIOR SIZE



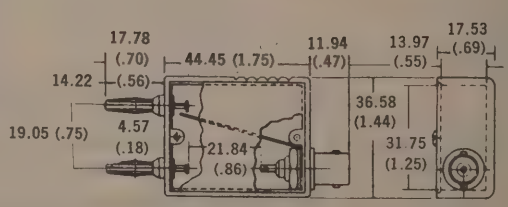
Model No.	Color
2105-0	Black
3720-2	Red
3721-5	Green

QUANTITY DISC. CODE A **NET .95**
(Includes cover and screws)



COMPONENT MOUNTING—BNC RECEPTACLE TO DOUBLE BANANA PLUG

UPPER: BNC receptacle M39012/21-0002.
LOWER: Banana plugs on ¾" centers. One piece beryllium copper spring, heat treated, nickel plated. Plug body and solder turret terminals, brass, nickel plated. For use with standard 4.22mm (.166") dia. banana jacks.
APPLICABLE SPECIFICATIONS: Operating temp.: −25°C to +125°C. Working voltage: 500 V peak.
(Includes cover and screws)



Model No.	
2097	QUANTITY

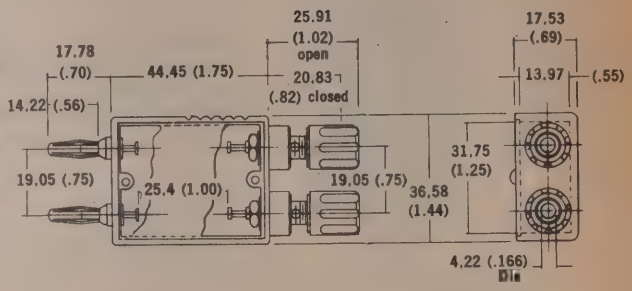
DISC. CODE A **NET 5.25**

PHENOLIC "BLACK BOXES"

POMONA ELECTRONICS

COMPONENT MOUNTING—BINDING POSTS TO DOUBLE BANANA PLUG

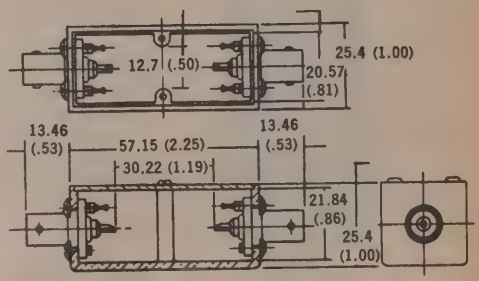
UPPER: Banana jack binding posts with solder turret terminals, on ¾" centers. One red and one black.
LOWER: Banana plugs on ¾" centers. One piece beryllium copper spring, heat treated, nickel plated. Plug body and solder turret terminals, brass, nickel plated. For use with standard 4.22mm (.166") dia. banana jacks.
(Includes cover and screws)



Model No.	QUANTITY
2249	DISC. CODE A NET 5.95

COMPONENT MOUNTING—BNC RECEPTACLE BOTH ENDS

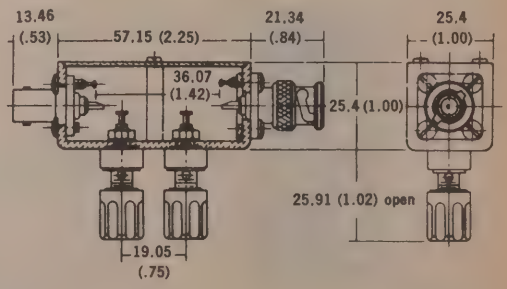
UPPER: BNC receptacle M39012/22-0001
LOWER: BNC receptacle M39012/22-0001
APPLICABLE SPECIFICATIONS:
Operating temp.: −25°C to +125°C.
Working voltage: 500 V peak.
(Includes cover and screws)



Model No.	QUANTITY
2101	DISC. CODE A NET 8.95

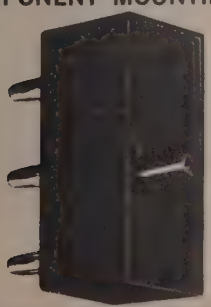
COMPONENT MOUNTING—BNC RECEPTACLE TO BNC PLUG WITH BINDING POSTS

UPPER: BNC receptacle M39012/22-0001
CENTER: Banana jack binding posts with solder turret terminals. One red and one black.
APPLICABLE SPECIFICATIONS:
Operating temp.: −25°C to +125°C.
Working voltage: 500 V peak.
(Includes cover and screws)

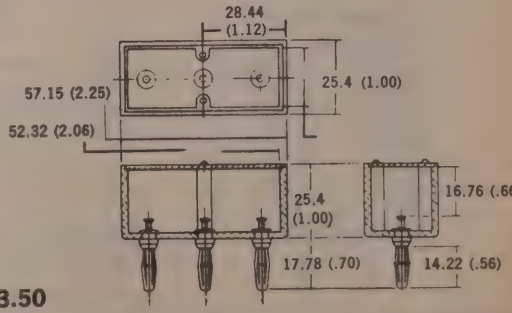


Model No.	QUANTITY
2100	DISC. CODE A NET 14.85

COMPONENT MOUNTING—(3) ¾" SPACED BANANA PLUGS



Three-in-line ¾" spaced banana plugs. One piece beryllium copper spring, heat treated, nickel plated. Plug body and solder turret terminals, brass, nickel plated. For use with standard 4.22mm (.166") dia. banana jacks.
APPLICABLE SPECIFICATIONS:
Operating temp.: −25°C to +125°C.
Working voltage: 5000 VDC.
Current: 15 amps cont., 30 amps int.
(Includes cover and screws)



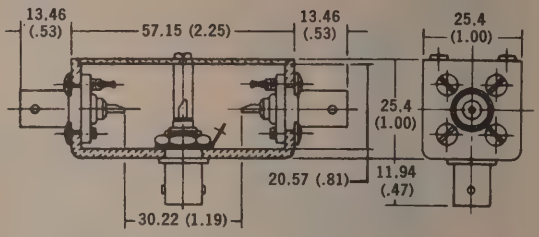
Model No.	QUANTITY
2095	DISC. CODE A NET 3.50

PHENOLIC "BLACK BOXES"

POMONA ELECTRONICS

COMPONENT MOUNTING— BNC RECEPTACLE "T"

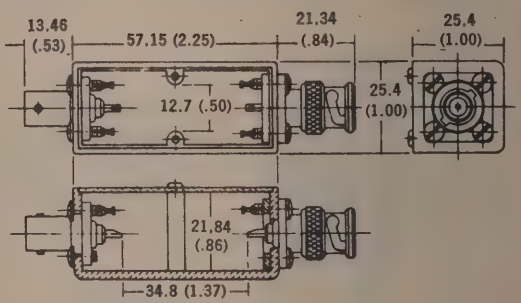
UPPER: BNC receptacle M39012/22-0001
CENTER: BNC receptacle M39012/22-0001
LOWER: BNC receptable M39012/22-0001
APPLICABLE SPECIFICATIONS:
Operating temp.: −25°C to +125°C.
Working voltage: 500 V peak.
(Includes cover and screws)



Model No.	QUANTITY
2102	DISC. CODE A NET 12.50

COMPONENT MOUNTING— BNC RECEPTACLE TO BNC PLUG

UPPER: BNC receptacle M39012/22-0001
LOWER: BNC plug UG1104A/U
APPLICABLE SPECIFICATIONS:
Operating temp.: −25°C to +125°C.
Working voltage: 500 V peak.
(Includes cover and screws)

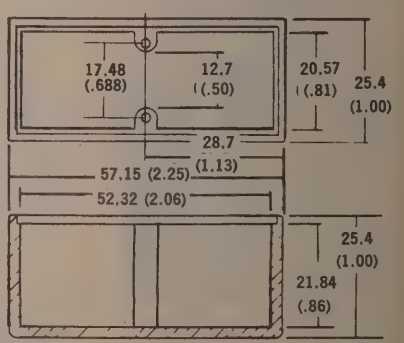


Model No.	QUANTITY
2099	DISC. CODE A NET 10.85

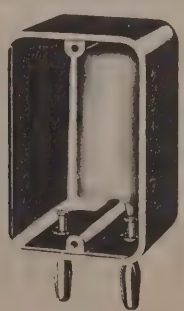
BLACK BOX—QUEEN SIZE

Model No.	Color
2103-0	Black
3722-2	Red
3723-5	Green

QUANTITY DISC. CODE A NET .95
(Includes cover and screws)



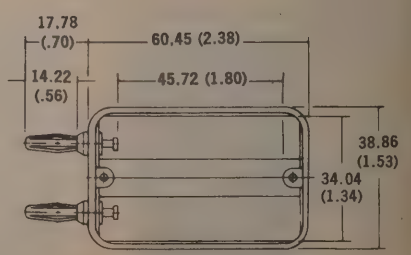
COMPONENT MOUNTING — ACROSS BANANA PLUGS



UPPER: No connection.
LOWER: Banana plugs on ¾" centers. One piece beryllium copper spring, heat treated, nickel plated. Plug body and solder turret terminals, brass, nickel plated. For use with standard 4.22mm (.166") dia. banana jacks.

Model No.	QUANTITY
1177	DISC. CODE A NET 2.75

(Includes cover and screws)



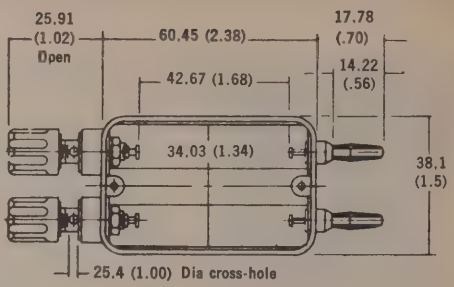
PHENOLIC "BLACK BOXES"

POMONA ELECTRONICS

COMPONENT MOUNTING— BINDING POSTS TO DOUBLE BANANA PLUG

UPPER: Banana jack binding posts with solder turret terminals, on ¾" centers. One red and one black.

LOWER: Banana plugs on ¾" centers. One piece beryllium copper spring, heat treated, nickel plated. Plug body and solder turret terminals, brass, nickel plated. For use with standard 4.22mm (.166") dia. banana jacks.



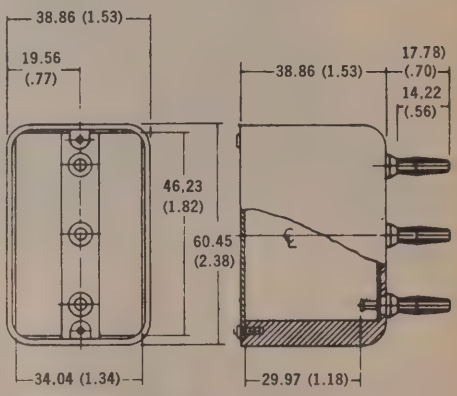
Model No.	QUANTITY DISC. CODE	
2262	A	NET 5.95

(Includes cover and screws)

COMPONENT MOUNTING — (3) ¾" SPACED BANANA PLUGS — KING SIZE

Three-in-line ¾" spaced banana plugs. One piece beryllium copper spring, heat treated, nickel plated. Plug body and solder turret terminals, brass, nickel plated. For use with standard 4.22mm (.166") dia. banana jacks.

APPLICABLE SPECIFICATIONS:
Operating temp.: −25°C to +125°C.
Working voltage: 5000 VDC.
Current: 15 amps cont., 30 amps int.



Model No.	QUANTITY DISC. CODE	
1943	A	NET 3.75

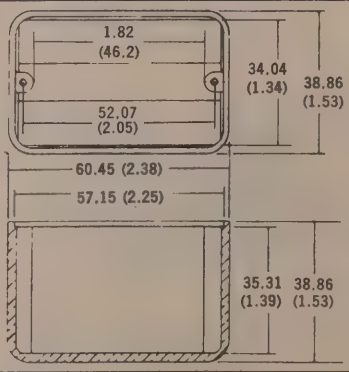
(Includes cover and screws)

BLACK BOX—KING SIZE

Model No.	Color
2104-0	Black
3724-2	Red
3725-5	Green

QUANTITY DISC. CODE A NET .95

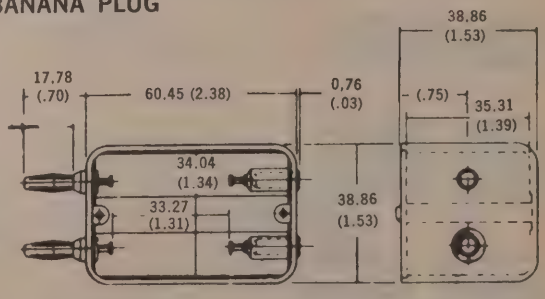
(Includes cover and screws)



COMPONENT MOUNTING— BANANA JACKS TO DOUBLE BANANA PLUG

UPPER: Banana jacks, 4.22mm (.166") dia. and solder turret terminals on ¾" centers. Brass, nickel plated. Polarity indicator on top; color, red.

LOWER: Banana plugs on ¾" centers. One piece beryllium copper spring, heat treated, nickel plated. Plug body and solder turret terminals, brass, nickel plated. For use with standard 4.22mm (.166") dia. banana jacks.



Model No.	QUANTITY DISC. CODE	
2224	A	NET 4.50

(Includes cover and screws)

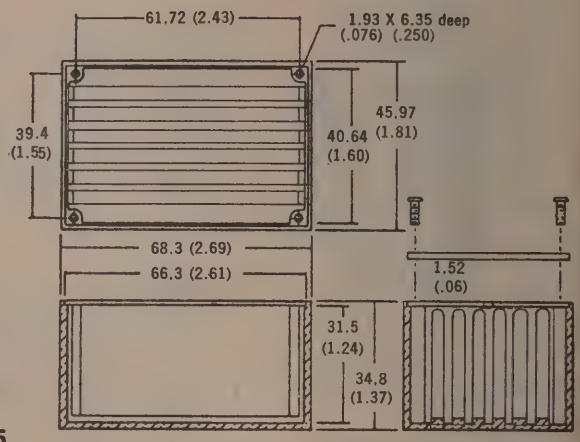
THERMOPLASTIC "BLACK BOXES & FLAT RIBBON CABLE

POMONA ELECTRONICS

MOLDED THERMOPLASTIC BOX WITH CARD GUIDES

The box and cover are molded of glass filled nylon thermoplastic and are almost unbreakable under normal use. Box and cover are easily machined. Three slots are provided for 1/16" circuit board. Cover and 4 each #2-56 cover screws included.

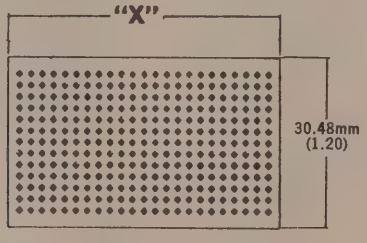
Model No.	Color
3850-0	Black
3850-6	Blue
3850-9	White

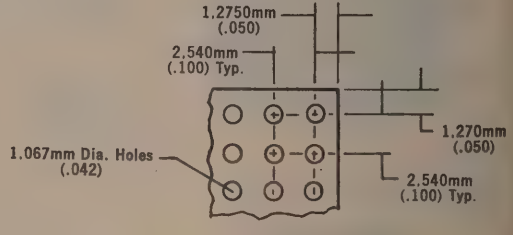


QUANTITY DISC. CODE **A** **NET 1.25**
(Includes cover and screws)

CIRCUIT MOUNTING BOARDS

Two models of pre-punched circuit boards for rapid assembly of components. Both boards are made of Glass Epoxy. Model 4392 is Copper Clad one side. Both models fit the Model 3850 housing. Boards are 1/16" thick.



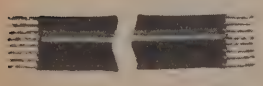


Model No.	No. of Holes	"X" Dim.	Material	Net
4393	25 x 12	63.30mm (2.50)	Glass-Epoxy (GEE)	.95
4392	25 x 12	63.30mm (2.50)	Glass-Epoxy (GEE) Copper Clad 1 Side	.95

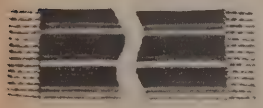
QUANTITY DISC. CODE **A**

FLAT RIBBON CABLE 24" LONG

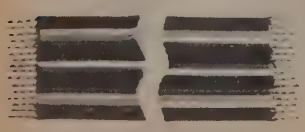
26 AWG; stranding, 7/34, flat ribbon cable, color coded & bonded. Wire individually stripped and tinned 6.35mm (.25) long.



8 CONDUCTOR
MODEL NO. 4191



14 CONDUCTOR
MODEL NO. 4192



16 CONDUCTOR
MODEL NO. 4193

24 CONDUCTOR
MODEL 4194

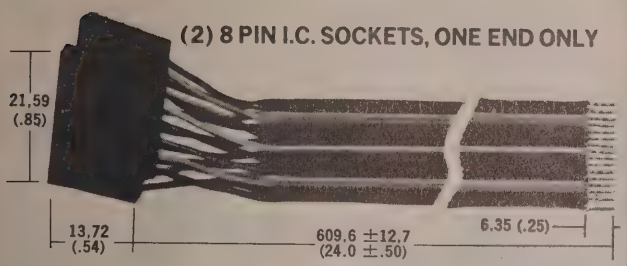
Model No.	Conductors	Net
4191	8 Conductor	2.50
4192	14 Conductor	2.75
4193	16 Conductor	2.95
4194	24 Conductor	3.95

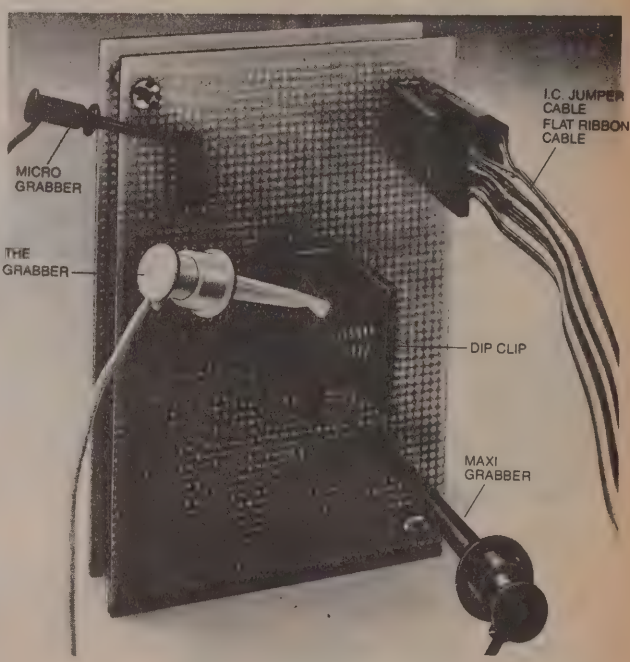
★QUANTITY DISC. CODE **A**

I.C. ACCESSORIES

POMONA ELECTRONICS

I.C. JUMPER CABLE (FOR USE WITH 3916 & 4236)





CONN:
1st end – (2) 8 Pin I.C. Sockets.
MATERIAL: Contacts, Beryllium Copper.
FINISH: Gold Plated.
INSULATION: Thermoplastic (Black).

WIRE: 26 AWG; stranding, 7/34, 16 conductor flat ribbon cable. color coded.

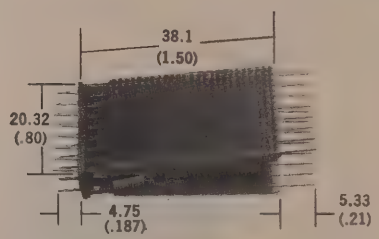
CONN:
2nd end – None (Wires individually stripped & tinned 1/4" long).

Model No.
4185-24

QUANTITY DISC. CODE **A** **NET 11.85**

14/16 PIN DUAL IN-LINE TEST CLIP WITH ATTACHED HEADER

The Dip Clip with attached header is an excellent tool for plugging into 14/16 pin IC sockets to test circuits. You can either solder wires directly to the top pins of the Dip Clip or more convenient, you can attach the Pomona I.C. Jumper Cable 4185. The Dip Clip has been designed using glass-filled nylon material that will withstand 240° at 40% R.H.



COLOR: Red.

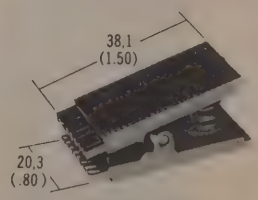
Model No.
4566

QUANTITY DISC. CODE **C** **NET 7.85**

14/16 PIN DUAL IN-LINE DIP REMOVER

The dip remover is an excellent tool for the removal of 14/16 pin dual in-line I.C. chips. With this tool accidental bending of the contacts is at a minimum. The dip remover has been designed using a glass-filled nylon material that will withstand 240°C at 40% R.H.

COLOR: Red.



Model No.
4386

QUANTITY DISC. CODE **C** **NET 1.85**

"DIP CLIP"™ IC TEST CLIP

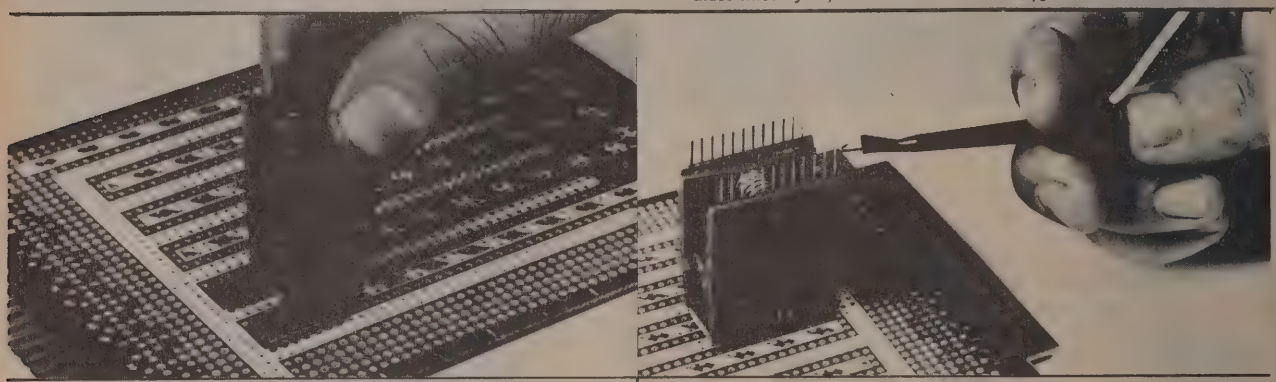
POMONA ELECTRONICS

The "Dip Clip" is engineered for the attachment of test probes to I.C. Packages. The clip has many built in features that permits hand-free testing and still maintains a good electrical connection. Several test probes can be used at one time.

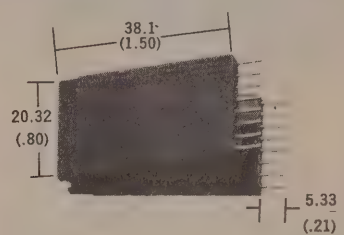
The "Dip Clips" with reduced thickness are used for testing ultra dense packaged chips that have only 2,54mm, (.100") spacing between each other. Models: 4236, 4324 and 4340.

FEATURES

- Solid non-tarnish nickel silver contacts.
- Serrated 1.02mm (.040) wide contacts on lower end for good electrical connection. Will assist in removal of foreign material from DIP.
- 0.63mm, (.025") square serrated test points on upper end will accept wire wraps or mini test clips.
- Molded barrier between each contact allows connections to be made on live boards without accidental shorting of adjacent contacts.
- Can be used as an insertion and removal tool for DIPS.
- Glass-filled nylon, withstands 240°C at 40% R.H.



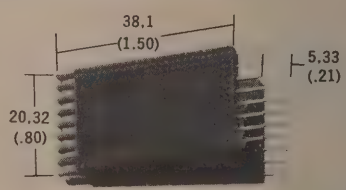
14/16 PIN DUAL IN-LINE TEST CLIP



Model No.
3916

QUANTITY DISC. CODE A **NET 4.50**

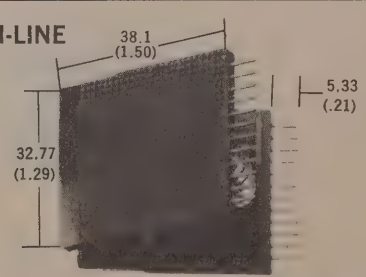
14/16 PIN DUAL IN-LINE TEST CLIP — Reduced thickness for testing ultra dense packages.



Model No.
4236

QUANTITY DISC. CODE A **NET 4.50**

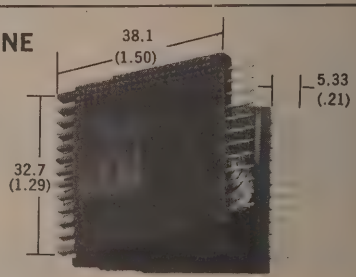
24 PIN DUAL IN-LINE TEST CLIP



Model No.
4124

QUANTITY DISC. CODE A **NET 12.85**

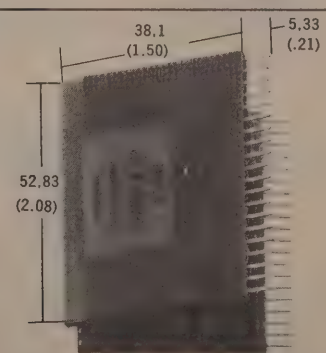
24 PIN DUAL IN-LINE TEST CLIP Reduced thickness for testing ultra dense packages.



Model No.
4324

QUANTITY DISC. CODE A **NET 12.85**

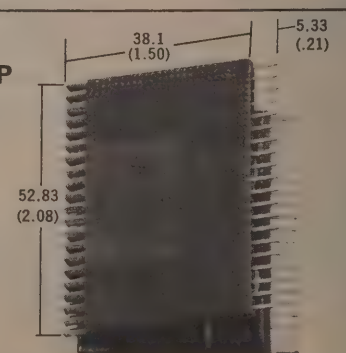
40 PIN DUAL IN-LINE TEST CLIP



Model No.
4140

QUANTITY DISC. CODE A **NET 18.85**

40 PIN DUAL IN-LINE TEST CLIP Reduced thickness for testing ultra dense packages.



Model No.
4340

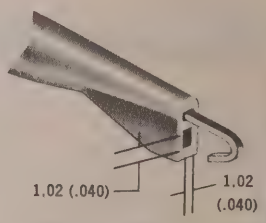
QUANTITY DISC. CODE A **NET 18.85**

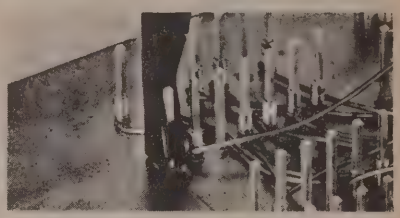
DO IT YOURSELF GRABBER

POMONA ELECTRONICS

FEATURES:

- Plunger type action between thumb and two fingers.
- Comfortable finger grip operation.
- Positive connection that won't pop off.
- No sharp teeth to damage or nick wires.
- Simplified assembly procedure.
- High temperature material that resists melting when soldering.





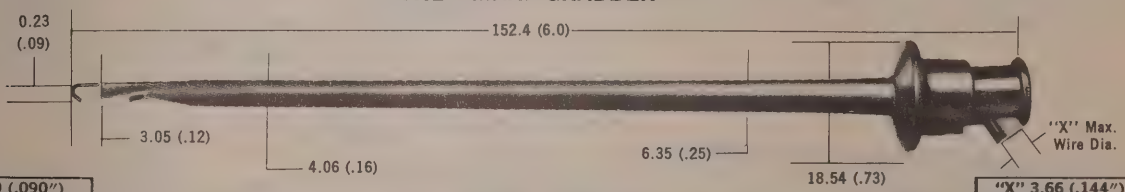
MATERIALS:

- Molded glass-filled nylon, withstands 240°C at 40% R.H.
- Beryllium copper contact per QQ-C-533, Berylco 25 .
- Gold plated per MIL-G-45204 Type I.
- Stainless steel spring.

SIMPLIFIED ASSEMBLY PROCEDURE

1. Pull off thumb cap to expose contact connection.
2. Thread wire through thumb cap and strip ⅛".
3. Insert stripped end through tapered hole on contact, and solder.
   NOTE: Stripped end should be placed into the large opening of the tapered hole.
4. Slide thumb cap back onto contact.

THE "MAXI GRABBER"



"X" 2.29 (.090")	
Model No.	Color
4225-0	Black
4225-1	Brown
4225-2	Red
4225-3	Orange
4225-4	Yellow
4225-5	Green
4225-6	Blue
4225-7	Violet
4225-8	Gray
4225-9	White

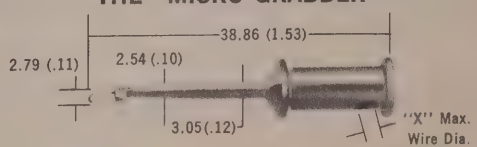
The maxi-grabber is an extended length do-it-yourself grabber designed especially for high-rise packaging of electronic components where depth of testing point is a key factor. The maxi-grabber will fit entry holes as small as ¼" dia. and the unit is completely field serviceable. The gold plated contact hook can be connected rapidly to component leads or the tip will accept 0.63mm (.025) square Wire-Wrap† terminals. The entire unit is molded of nylon thermoplastic.

★QUANTITY DISC. CODE **A NET 1.65**

"X" 3.66 (.144")	
Model No.	Color
4563-0	Black
4563-1	Brown
4563-2	Red
4563-3	Orange
4563-4	Yellow
4563-5	Green
4563-6	Blue
4563-7	Violet
4563-8	Gray
4563-9	White

THE "MICRO GRABBER"

"X" 2.29 (.090")	
Model No.	Color
4233-0	Black
4233-1	Brown
4233-2	Red
4233-3	Orange
4233-4	Yellow
4233-5	Green
4233-6	Blue
4233-7	Violet
4233-8	Gray
4233-9	White

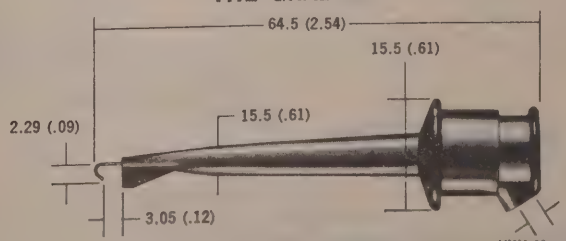


This do-it-yourself grabber is designed for testing of high density packaging. Lightweight and small size permits multiple usage of units in confined areas.

★QUANTITY DISC. CODE
A NET 1.00

THE GRABBER

"X" 2.29 (.090")	
Model No.	Color
3925-0	Black
3925-1	Brown
3925-2	Red
3925-3	Orange
3925-4	Yellow
3925-5	Green
3925-6	Blue
3925-7	Violet
3925-8	Gray
3925-9	White



★QUANTITY DISC. CODE
A NET .85 EA.
(Sold in Lots of 10)

"X" 3.66 (.144")	
Model No.	Color
4555-0	Black
4555-1	Brown
4555-2	Red
4555-3	Orange
4555-4	Yellow
4555-5	Green
4555-6	Blue
4555-7	Violet
4555-8	Gray
4555-9	White

DO-IT-YOURSELF "GRABBER" KIT

Model No.
4176

This kit contains 2 pcs. of Model 3925

(pkgd. 1 black and 1 red)
QUANTITY DISC. CODE **A NET 1.95**

★Colors may be aggregated for best quantity price.

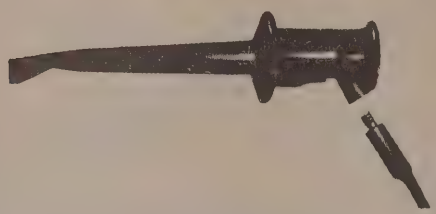
DO IT YOURSELF GRABBER & MINI TEST CLIP GRABBER

POMONA ELECTRONICS

"GRABBER" WITH 6-32 THREAD

This Grabber can be used with oscilloscopes and leads equipped with a 6-32 screw on tip.

- Gold plated hook tip and threaded insert.
- Stainless steel spring.
- Molded nylon body per MIL-P-20693.



Model No.	Color
4011-0	Black
4011-2	Red

★QUANTITY DISC. CODE A **NET 1.50**

6-32 SCREW-ON TIP

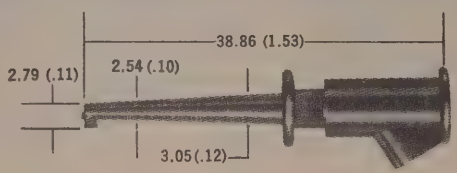
- Can be crimped or soldered to wire.
- Nickel plated brass.
- Supplied with shrink sleeving.
- Mates with 4011.

Model No.
4311

(Sold in Lots of 10)
QUANTITY DISC. CODE A **NET .75 EA.**

THE "MICRO GRABBER" WITH 0.63mm (.025") SQUARE PIN

This do-it-yourself grabber is designed for testing of high density packaging. Light weight and small size permits multiple usage of units in confined areas. Gold plated Beryllium copper contact.



Model No.	Color
4521-0	Black
4521-1	Brown
4521-2	Red
4521-3	Orange
4521-4	Yellow
4521-5	Green
4521-6	Blue
4521-7	Violet
4521-8	Gray
4521-9	White

★QUANTITY DISCOUNT CODE A **NET 1.25**

THE "MAXI GRABBER" TO MINIATURE BANANA PLUG WITH IN-LINE FUSE

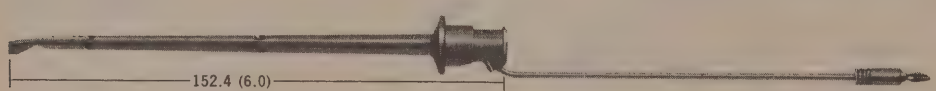
Model No.	Color	Length
4556-48-0	Black	48"
4556-48-2	Red	48"

(Fuse not included.)

*COLORS: Black, red.

★QUANTITY DISCOUNT CODE A **NET 4.85**

THE "MAXI GRABBER" TO MINIATURE BANANA PLUG

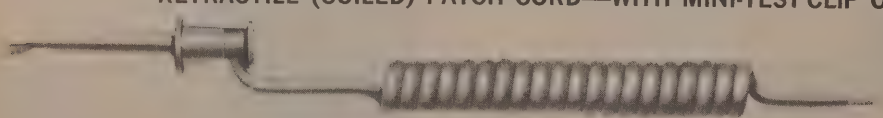


Model No.	Color	Length
4557-48-0	Black	48"
4557-48-2	Red	48"

*COLORS: Black, red.

★QUANTITY DISCOUNT CODE A **NET 4.25**

RETRACTILE (COILED) PATCH CORD—WITH MINI-TEST CLIP ONE END ONLY



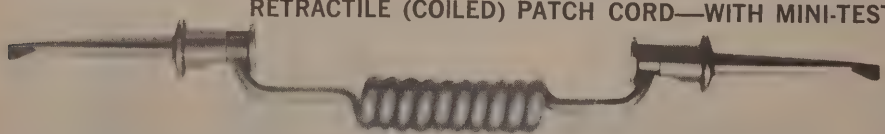
Model No.	Color	Length
4536-48-0	Black	48"
4536-48-2	Red	48"

Permits the use of one size patch cord in place of many various lengths.

*COLORS: Black, red.

★QUANTITY DISCOUNT CODE A **NET 4.75**

RETRACTILE (COILED) PATCH CORD—WITH MINI-TEST CLIP



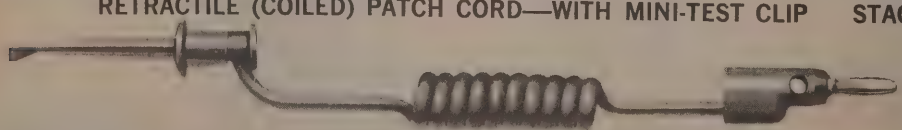
Model No.	Color	Length
4537-48-0	Black	48"
4537-48-2	Red	48"

Permits the use of one size patch cord in place of many various lengths.

*COLORS: Black, red.

★QUANTITY DISCOUNT CODE A **NET 5.25**

RETRACTILE (COILED) PATCH CORD—WITH MINI-TEST CLIP STACK-UP BANANA PLUG



Model No.	Color	Length
4538-48-0	Black	48"
4538-48-2	Red	48"

Permits the use of one size patch cord in place of many various lengths.

*COLORS: Black, red.

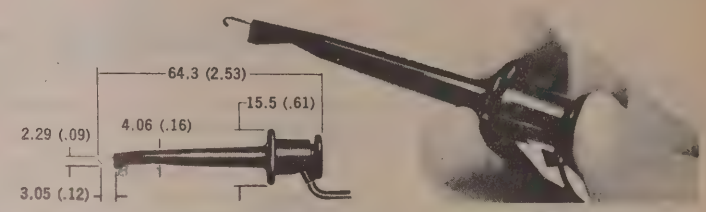
★QUANTITY DISCOUNT CODE A **NET 4.85**

★Colors may be aggregated for best quantity price.

MINI TEST CLIP GRABBER

POMONA ELECTRONICS

These plunger type action clips are called "grabbers." The gold plated contact hook can be connected rapidly to component leads and the specially designed tip slides down over 0.63mm (.025") square Wire-Wrap† pins. Nylon insulation molded directly onto clip and wire providing a strong, reliable integral unit. Clip is completely insulated to point of connection.

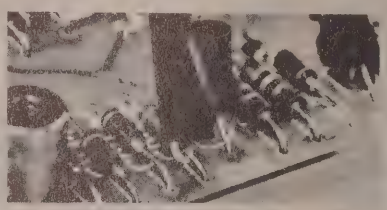


FEATURES:

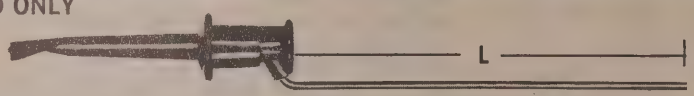
- Plunger type action between thumb and two fingers.
- Comfortable finger grip operation.
- Positive connection that won't pop off.
- No sharp teeth to damage or nick wires.
- Beryllium copper conductor berylco 25 per QQ-C-533; gold plated per MIL-G-45204 Type I.
- Stainless steel spring.
- Molded glass-filled nylon. Nylon insulation molded directly onto clip and wire.

WIRE: 20 AWG, stranded 41 x 38 T.C. Extra flexible polyvinyl insulation 2.21mm (.087) O.D.

OPERATING TEMPERATURE: —25°C to +105°C.



MINI-TEST CLIP GRABBER — ONE END ONLY

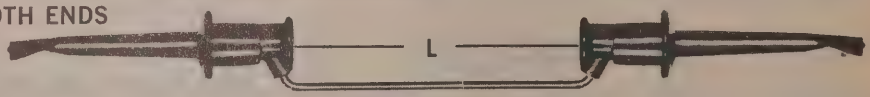


Model No.	Length	Net
3780-8-*	8″	1.00
3780-12-*	12″	1.00
3780-24-*	24″	1.00
3780-36-*	36″	1.00
3780-48-*	48″	1.05
3780-60-*	60″	1.10

Miniature test clip with wire connected one end only. No connector on opposite end allows connection of various components. Nylon insulation is molded directly onto clip and wire.

★QUANTITY DISC. CODE A

MINI-TEST CLIP GRABBER — BOTH ENDS



Model No.	Length	Net
3781-8-*	8″	1.65
3781-12-*	12″	1.65
3781-18-*	18″	1.65
3781-24-*	24″	1.65
3781-36-*	36″	1.65
3781-48-*	48″	1.70
3781-60-*	60″	1.75

Miniature test clip on both ends for rapid interconnection of test points. Connects quickly and gently to test points without damage from sharp teeth.

★QUANTITY DISC. CODE A

MINI-TEST CLIP GRABBER — TO STACKING BANANA PLUG

Model No.	Length	Net
3782-12-*	12″	1.65
3782-24-*	24″	1.65
3782-36-*	36″	1.65
3782-48-*	48″	1.70
3782-60-*	60″	1.75

Miniature test clip lead adapts to equipment using standard banana jacks.

BANANA PLUG: Spring, one piece beryllium copper, heat treated, nickel plated. Tough thermoplastic molded to plug body and wire.

★QUANTITY DISC. CODE A

MINI-TEST CLIP GRABBER — TO STACKING MINIATURE BANANA PLUG

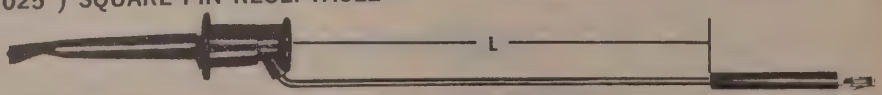
Model No.	Length	Net
3784-12-*	12″	1.85
3784-24-*	24″	1.85
3784-36-*	36″	1.85
3784-48-*	48″	1.95
3784-60-*	60″	2.05

Miniature test clip adapts to equipment using miniature banana jacks.

MINIATURE BANANA PLUG: Spring, one piece beryllium copper, heat treated, gold flashed. Tough thermoplastic molded to plug body and wire.

★QUANTITY DISC. CODE A

MINI-TEST CLIP TO 0.63mm (.025″) SQUARE PIN RECEPTACLE



Model No.	Length	Net
3783-12-*	12″	2.25
3783-24-*	24″	2.25
3783-36-*	36″	2.25
3783-48-*	48″	2.35
3783-60-*	60″	2.45

This miniature test clip lead has a 0.63mm (.025″) square pin receptacle which slides over 0.63mm (.025″) square pins.

.025 PIN RECEPTACLE: Gold plated phosphor bronze contact.

COLORS AVAILABLE: Black, red only.

★QUANTITY DISC. CODE A

★Colors and Length may be aggregated for best quantity price. Other lengths available to order.

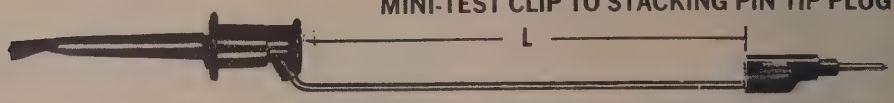
†Wire-Wrap is a trademark of Gardner-Denver.

* Consult factory for color code part numbers.

MINI TEST CLIP GRABBER

POMONA ELECTRONICS

MINI-TEST CLIP TO STACKING PIN TIP PLUG

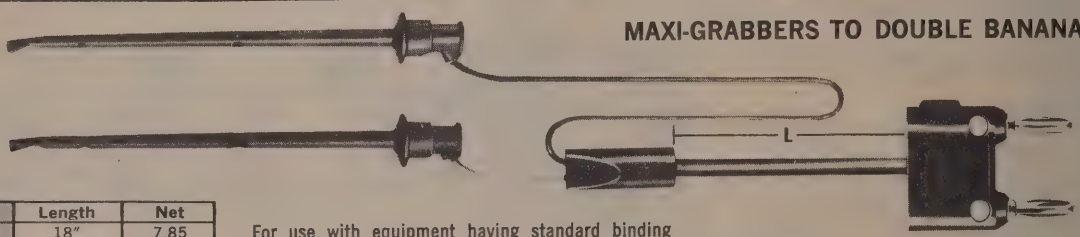


Model No.	Length	Net
3785-12-*	12″	1.85
3785-24-*	24″	1.85
3785-36-*	36″	1.85
3785-48-*	48″	1.95
3785-60-*	60″	2.05

Miniature test clip adapts to equipment using standard pin tip jacks.
COLOR: Black, red.
★QUANTITY DISC. CODE **A**

PIN TIP PLUG: 2.03mm (.080″) dia., ½″ long, brass, gold flashed.
STACK-UP: Beryllium copper, gold flashed. Accepts 2.03mm (.080″) dia. pin.

MAXI-GRABBERS TO DOUBLE BANANA PLUG



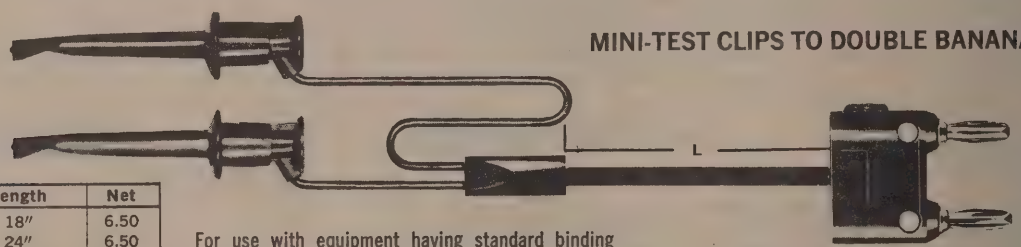
Model No.	Length	Net
4559-C-18	18″	7.85
4559-C-24	24″	7.85
4559-C-36	36″	7.85
4559-C-48	48″	7.85
4559-C-60	60″	7.85

★QUANTITY DISC. CODE **B**

For use with equipment having standard binding posts or banana jacks.
MAXI-TEST CLIP: Beryllium copper gold plated hook tip. Nylon insulation molded directly onto clip and wire: one red, one black.
CABLE: Shielded coax., RG58C/U, 4.95mm (.195″)

O.D., nom. cap. 28.5 pf/ft. Color, black.
DOUBLE BANANA PLUG: On ¾″ center. Spring, one piece beryllium copper, heat treated, nickel plated. Tough thermoplastic molded onto double plug body and cable. Color, black.

MINI-TEST CLIPS TO DOUBLE BANANA PLUG



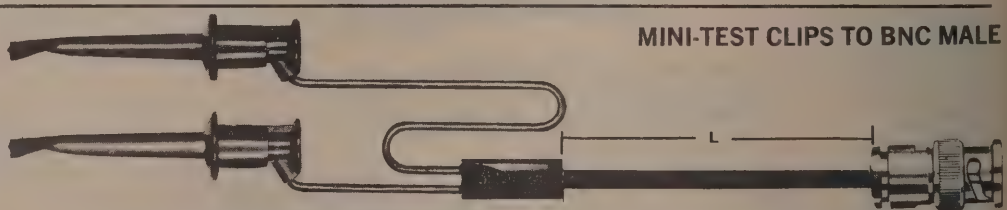
Model No.	Length	Net
3786-C-18	18″	6.50
3786-C-24	24″	6.50
3786-C-36	36″	6.50
3786-C-48	48″	6.50
3786-C-60	60″	6.50

★QUANTITY DISC. CODE **B**

For use with equipment having standard binding posts or banana jacks.
MINI-TEST CLIP: Beryllium copper gold plated hook tip. Nylon insulation molded directly onto clip and wire: one red, one black.
CABLE: Shielded coax., RG58C/U, 4,95mm (.195″)

O.D., nom. cap. 28.5 pf/ft. Color, black.
DOUBLE BANANA PLUG: On ¾″ center. Spring, one piece beryllium copper, heat treated, nickel plated. Tough thermoplastic molded onto double plug body and cable. Color, black.

MINI-TEST CLIPS TO BNC MALE



Model No.	Length	Net
3787-C-18	18″	6.50
3787-C-24	24″	6.50
3787-C-36	36″	6.50
3787-C-48	48″	6.50
3787-C-60	60″	6.50

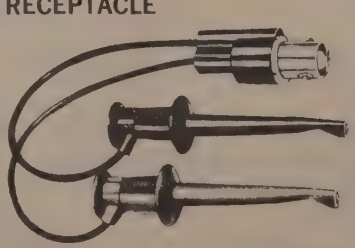
★QUANTITY DISC. CODE **B**

For use with equipment having BNC receptacles.
MINI-TEST CLIPS: Beryllium copper gold plated hook tip. Nylon insulation molded directly onto clip and wire: one red, one black.

CABLE: Shielded coax., RG58C/U, 4.95mm (.195″) O.D., nom. cap 28.5 pf/ft. Color: black.
CONNECTOR: BNC male, M39012/16-0001 with non-tarnish finish.

MINI-TEST CLIPS TO BNC RECEPTACLE

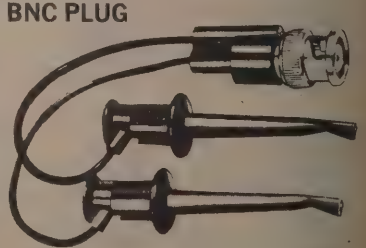
This molded breakout converts to coaxial cable with a male plug to a test cable with clips.
MINI-TEST CLIPS: Beryllium copper gold plated hook tip. Nylon insulation molded directly onto clip and wire: one black, one red.
WIRE: 20 AWG, stranded, 41 x 36 T.C. PVC insulation 2.21mm (.087″) O.D.
CONNECTOR: BNC receptacle UG1094/U with non-tarnish finish.
INSULATION: Tough thermoplastic molded to connector and wire.
OVERALL LENGTH: 7″.



Model No.	QUANTITY DISC. CODE	NET
3788	A	3.95

MINI-TEST CLIPS TO BNC PLUG

This molded breakout converts a coaxial cable with a BNC receptacle to a test cable with clips.
MINI-TEST CLIPS: Beryllium copper gold plated hook tip. Nylon insulation molded directly onto clip and wire: one black, one red.
WIRE: 20 AWG, stranded, 41 x 36 T.C. PVC insulation 2.21mm (.087″) O.D.
CONNECTOR: BNC plug with non-tarnish finish.
INSULATION: Tough thermoplastic molded to connector and wire.
OVERALL LENGTH: 7″.



Model No.	QUANTITY DISC. CODE	NET
3789	A	4.95

★Colors and Length may be aggregated for best quantity price. Other lengths available to order.

DIE CAST SHIELDED "BLACK BOXES"

POMONA ELECTRONICS

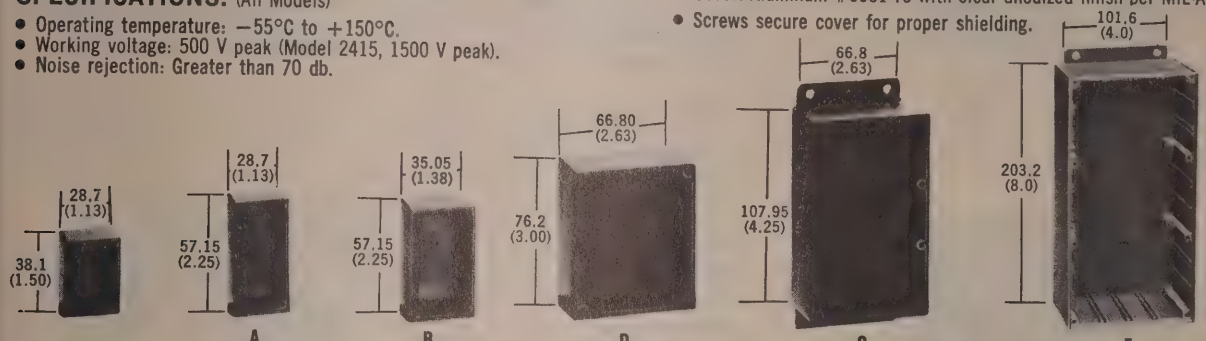
Now available, **shielded** "Black Boxes." Boxes that fulfill the requirement for RF applications.
Ideal for compact packaging (voltage dividers, isolation networks, impedance matching networks), and other varied uses.
Cover and screws included.

SPECIFICATIONS: (All Models)

- Operating temperature: −55°C to +150°C.
- Working voltage: 500 V peak (Model 2415, 1500 V peak).
- Noise rejection: Greater than 70 db.

FEATURES:

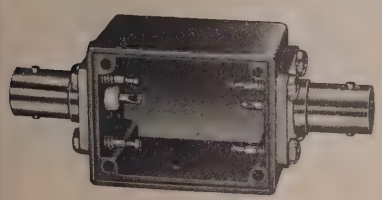
- Shielded housing; Die cast aluminum.
- Finish: Blue baked enamel per Federal Standard 595 #25109 over phosphoric etch per MIL-C-15328A.
- Cover: Aluminum #6061-T6 with clear anodized finish per MIL-A-8625A.
- Screws secure cover for proper shielding.



See following pages for Model Numbers.

SHIELDED "BLACK BOXES" MINIATURE SIZE

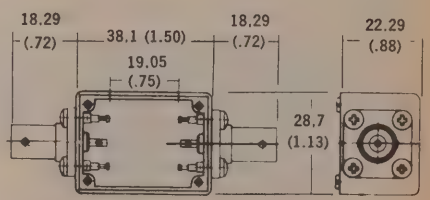
COMPONENT MOUNTING— BNC RECEPTACLE BOTH ENDS



CONN: 1st END
BNC receptacle jack, M39012/22-0001.
CONN: 2nd END
BNC receptacle jack, M39012/22-0001.

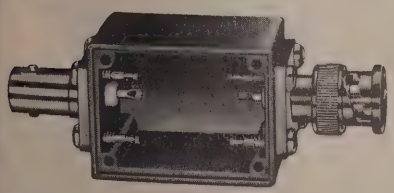
Model No.
3751

QUANTITY DISC. CODE **A** **NET 9.85**



(Includes cover and screws)

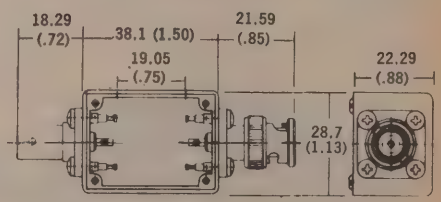
COMPONENT MOUNTING— BNC RECEPTACLE TO BNC PLUG



CONN: 1st END
BNC receptacle jack, M29012/22-0001
CONN: 2nd END
BNC receptacle plug, UG1104A/U.

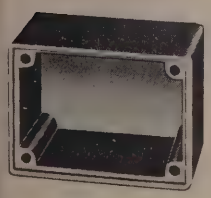
Model No.
3752

QUANTITY DISC. CODE **A** **NET 10.85**



(Includes cover and screws)

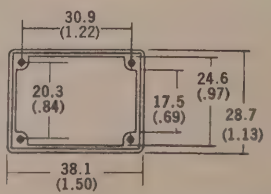
EMPTY — SHIELDED "BLACK BOX"

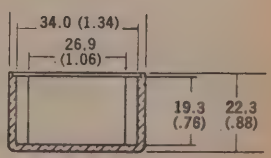


Model No.	Net
3753	2.95
3754	2.75

QUANTITY DISC. CODE **A**

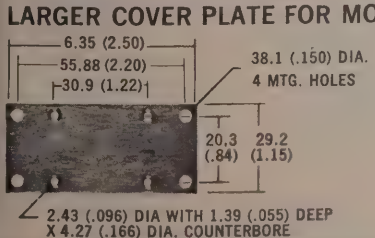
MODEL 3753
FINISH: Blue baked enamel. Includes cover with part number on cover and four cover screws.
MODEL 3754
FINISH: None. Includes unmarked cover and four cover screws.





(Includes cover and screws)

LARGER COVER PLATE FOR MOUNTING MINIATURE SIZE BOXES



This larger plate, when attached to the box, provides flanges for mounting.

MATERIAL: 2.03mm (.080") aluminum #6061-T6, clear anodized per MIL-A-8625A.

Model No.
3729
(plate only)

QUANTITY DISC. CODE **A** **NET .85**

SHIELDED "BLACK BOXES"—SIZE "A"

POMONA ELECTRONICS

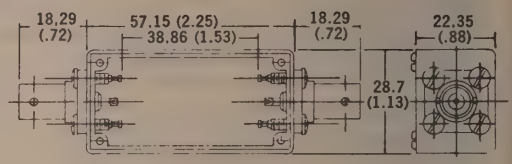
COMPONENT MOUNTING—BNC RECEPTACLE BOTH ENDS

Model No.	QUANTITY DISC. CODE	
2390	A	NET 9.85

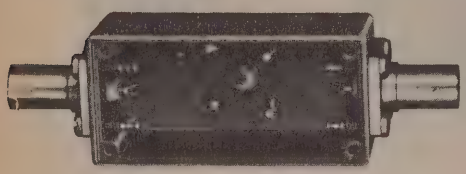
CONN: 1st END
BNC receptacle jack, M39012/22-0001.

CONN: 2nd END
BNC receptacle jack, M39012/22-0001.

(Includes cover and screws)



COMPONENT MOUNTING—BNC RECEPTACLE "T"



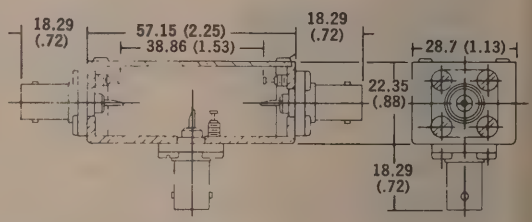
Model No.	QUANTITY DISC. CODE	
2392	A	NET 11.50

CONN: 1st END
BNC receptacle jack, M39012/22-0001.

CENTER:
BNC receptacle jack, M39012/22-0001.

CONN: 2nd END
BNC receptacle jack, M39012/22-0001.

(Includes cover and screws)



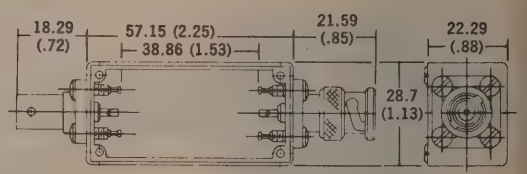
COMPONENT MOUNTING—BNC RECEPTACLE TO BNC PLUG

Model No.	QUANTITY DISC. CODE	
2391	A	NET 10.85

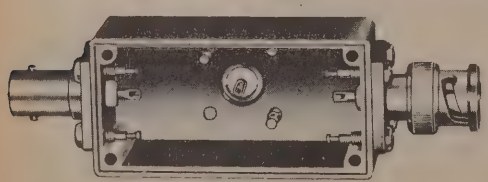
CONN: 1st END
BNC receptacle jack, M39012/22-0001.

CONN: 2nd END
BNC receptacle plug, UG1104A/U.

(Includes cover and screws)



COMPONENT MOUNTING—"T" TWO BNC RECEPTACLES TO BNC PLUG



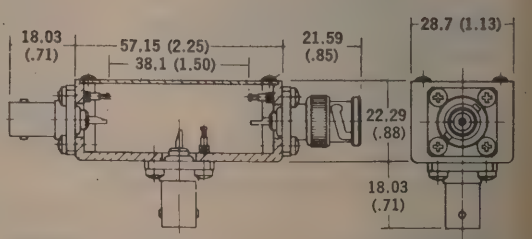
Model No.	QUANTITY DISC. CODE	
2401	A	NET 12.85

CONN:
1st END
BNC receptacle M39012/22-0001 jack,

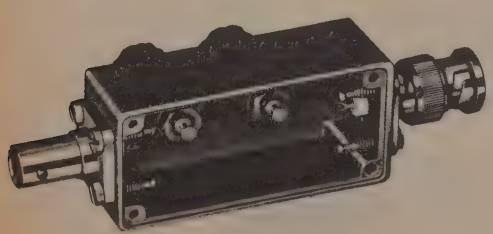
CENTER:
BNC receptacle jack, M39012/22-0001

CONN: 2nd END
BNC receptacle plug, UG1104A/U.

(Includes cover and screws)



COMPONENT MOUNTING—BNC RECEPTACLE TO BNC PLUG WITH BINDING POSTS



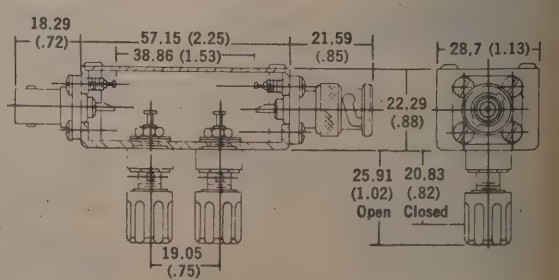
Model No.	QUANTITY DISC. CODE	
2393	A	NET 14.85

CONN:
1st END
BNC receptacle jack, M39012/22-0001.

CENTER:
Banana jack binding posts with solder turret terminals; red and black.

CONN: 2nd END
BNC receptacle plug, UG1104A/U.

(Includes cover and screws)

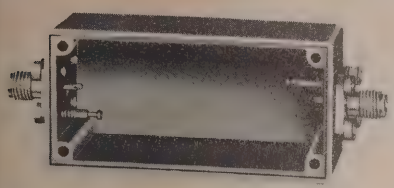


Add Dept. EM to address to tell them you saw it in eem

SHIELDED "BLACK BOXES" — SIZE "A"

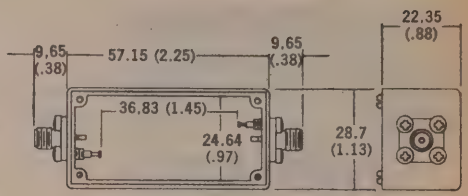
POMONA ELECTRONICS

COMPONENT MOUNTING — SMA RECEPTACLE BOTH ENDS



CONN: 1st END
SMA receptacle jack.

CONN: 2nd END
SMA receptacle jack.

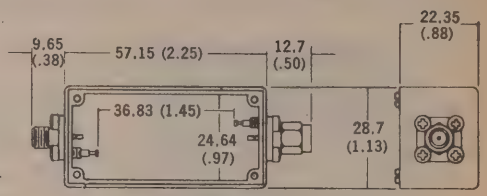


Model No.	QUANTITY DISC. CODE	
2399	A	NET 19.95

(Includes cover and screws)

COMPONENT MOUNTING — SMA RECEPTACLE TO SMA PLUG

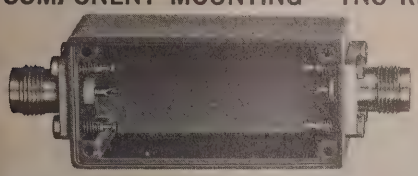
CONN: 1st END
SMA receptacle jack.
SMA receptacle plug.



Model No.	QUANTITY DISC. CODE	
2398	A	NET 24.95

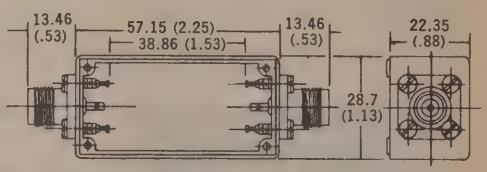
(Includes cover and screws)

COMPONENT MOUNTING — TNC RECEPTACLE BOTH ENDS



CONN: 1st END
TNC receptacle jack.

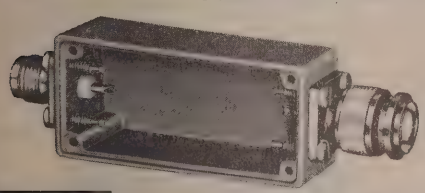
CONN: 2nd END
TNC receptacle jack.



Model No.	QUANTITY DISC. CODE	
2396	A	NET 14.85

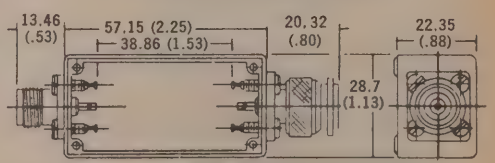
(Includes cover and screws)

COMPONENT MOUNTING — TNC RECEPTACLE TO TNC PLUG



CONN: 1st END
TNC receptacle jack.

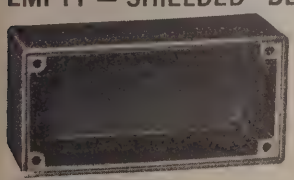
CONN: 2nd END
TNC receptacle plug.



Model No.	QUANTITY DISC. CODE	
2395	A	NET 17.85

(Includes cover and screws)

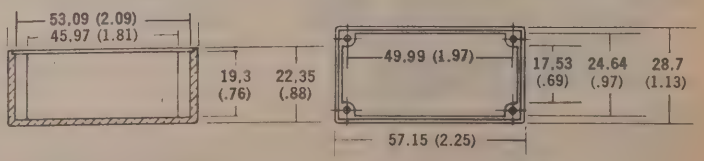
EMPTY — SHIELDED "BLACK BOX"



MODEL 2397
FINISH: Blue baked enamel.
Includes cover with part number on cover and four cover screws.

MODEL 2400
FINISH: None.
Includes unmarked cover and four cover screws.

Model	NET
2397	2.95
2400	2.75

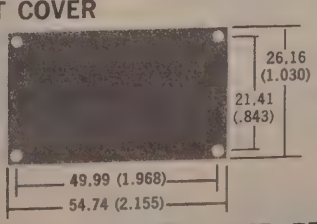


QUANTITY DISC. CODE A

(Includes cover and screws)

BLANK REPLACEMENT COVER FOR SIZE "A" BOX

MATERIAL: .040 aluminum #6061-T6, clear anodized per MIL-A-8625A.

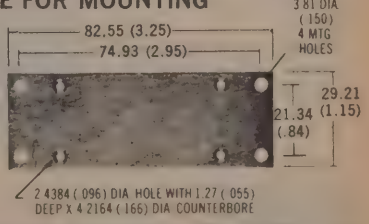


Model No.	QUANTITY DISC. CODE	
4245	A	NET .75

LARGER COVER PLATE FOR MOUNTING SIZE "A" BOXES

This larger plate, when attached to the box, provides flanges for mounting.

MATERIAL: .080 aluminum #6061-T6, clear anodized per MIL-A-8625A.

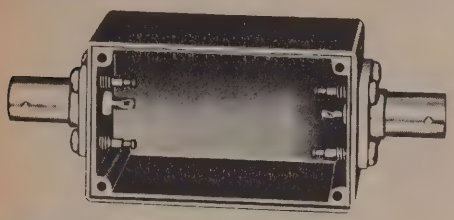


Model No.	QUANTITY DISC. CODE	
3728	A	NET 1.50

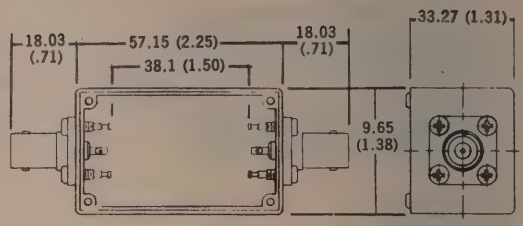
SHIELDED "BLACK BOXES" — SIZE "B"

POMONA ELECTRONICS

COMPONENT MOUNTING — BNC RECEPTACLE BOTH ENDS



CONN: 1st END
BNC receptacle jack, M39012/22-0001.
CONN: 2nd END
BNC receptacle jack, M39012/22-0001.

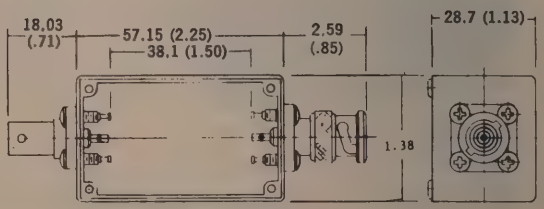


Model No.	QUANTITY DISC. CODE	
3230	A	NET 9.85

(Includes cover and screws)

COMPONENT MOUNTING — BNC RECEPTACLE TO BNC PLUG

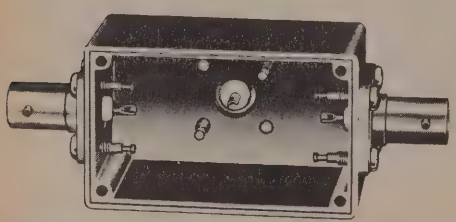
CONN: 1st END
BNC receptacle jack, M39012/22-0001.
CONN: 2nd END
BNC receptacle plug, M39012/22-0001.



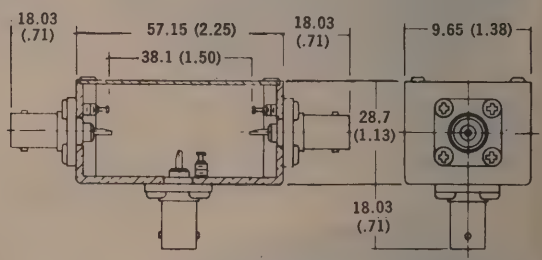
Model No.	QUANTITY DISC. CODE	
3231	A	NET 10.85

(Includes cover and screws)

COMPONENT MOUNTING — BNC RECEPTACLE "T"



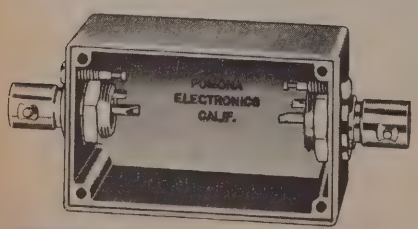
CONN: 1st END
BNC receptacle jack, M39012/22-0001.
CENTER:
BNC receptacle jack, M39012/22-0001.
CONN: 2nd END
BNC receptacle jack, M39012/22-0001.



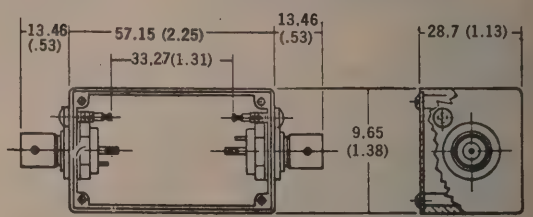
Model No.	QUANTITY DISC. CODE	
3232	A	NET 11.50

(Includes cover and screws)

COMPONENT MOUNTING — ISOLATED BNC RECEPTACLE BOTH ENDS



CONN: 1st END
Isolated BNC receptacle jack.
CONN: 2nd END
Isolated BNC receptacle jack.

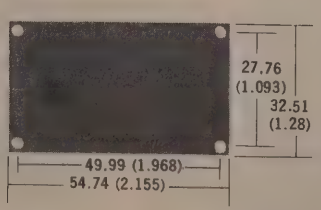


Model No.	QUANTITY DISC. CODE	
3239	A	NET 16.85

(Includes cover and screws)

BLANK REPLACEMENT COVER FOR SIZE "B" BOX

MATERIAL: 1.02mm (.040) aluminum #6061-T6, clear anodized per MIL-A-8625A.

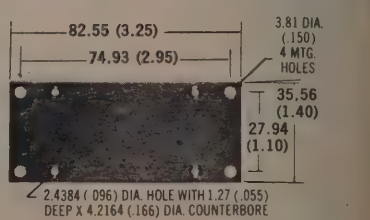


Model No.	QUANTITY DISC. CODE	
4246	A	NET .75

LARGER COVER PLATE FOR MOUNTING SIZE "B" BOXES

This larger plate, when attached to the box, provides flanges for mounting.

MATERIAL: 2.03mm (.080) aluminum #6061-T6, clear anodized per MIL-T-8625A.

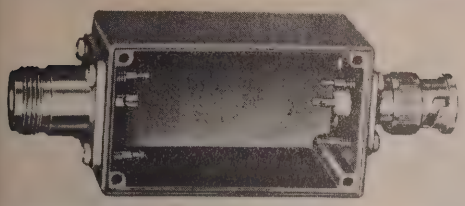


Model No.	QUANTITY DISC. CODE	
3719 (plate only)	A	NET 1.50

SHIELDED "BLACK BOXES" — SIZE "B"

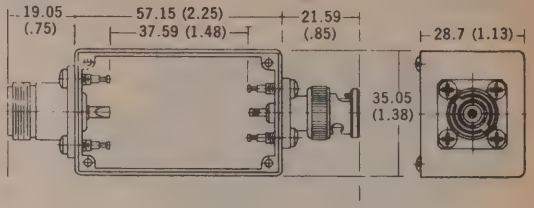
POMONA ELECTRONICS

COMPONENT MOUNTING — TYPE "N" RECEPTACLE TO BNC PLUG



CONN: 1st END
Type "N" receptacle jack, M39012/04-0002.

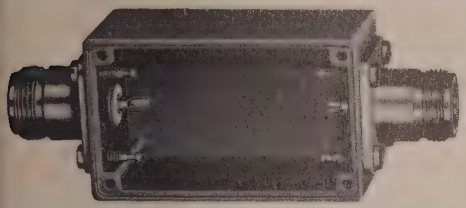
CONN: 2nd END
BNC receptacle plug, M39012/02-0002.



Model No.	QUANTITY DISC. CODE	
2421	A	NET 12.85

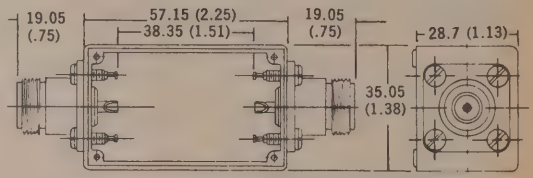
(Includes cover and screws)

COMPONENT MOUNTING — TYPE "N" RECEPTACLE BOTH ENDS



CONN: 1st END
Type "N" receptacle jack, M39012/04-0002.

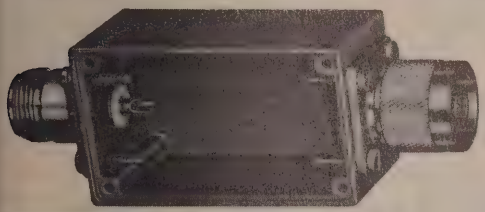
CONN: 2nd END
Type "N" receptacle jack, M39012/04-0002.



Model No.	QUANTITY DISC. CODE	
2410	A	NET 11.85

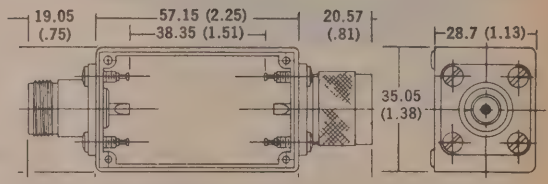
(Includes cover and screws)

COMPONENT MOUNTING — TYPE "N" RECEPTACLE TO TYPE "N" PLUG



CONN: 1st END
Type "N" receptacle jack, M39012/04-0002.

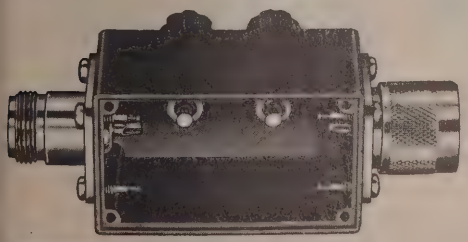
CONN: 2nd END
Type "N" receptacle plug.



Model No.	QUANTITY DISC. CODE	
2411	A	NET 14.85

(Includes cover and screws)

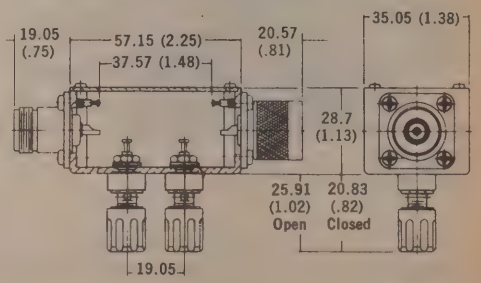
COMPONENT MOUNTING TYPE "N" RECEPTACLE TO TYPE "N" PLUG WITH BINDING POSTS



CONN: 1st END
Type "N" receptacle jack, M39012/04-0002.

CENTER:
Banana jack binding posts with solder turret terminals; red and black.

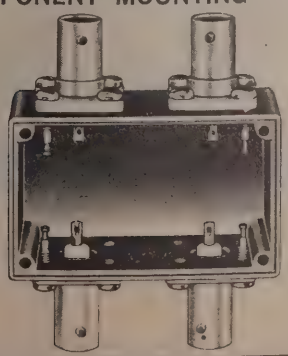
CONN: 2nd END
Type "N" receptacle plug.



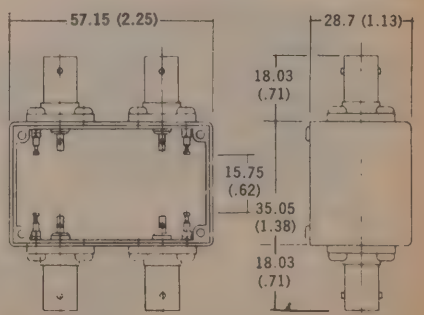
Model No.	QUANTITY DISC. CODE	
2423	A	NET 19.85

(Includes cover and screws)

COMPONENT MOUNTING — CROSS CONNECTIONS



CONN:
4 each BNC receptacle jacks, M39012/04-0002.



(Includes cover and screws)

Model No.	QUANTITY DISC. CODE	
3234	A	NET 14.85

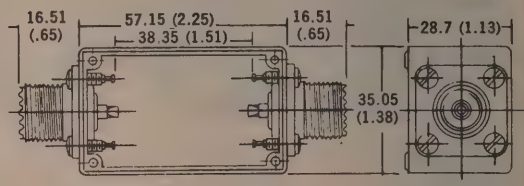
SHIELDED "BLACK BOXES" — SIZE "B"

POMONA ELECTRONICS

COMPONENT MOUNTING — UHF RECEPTACLE BOTH ENDS

CONN: 1st END
UHF receptacle jack.

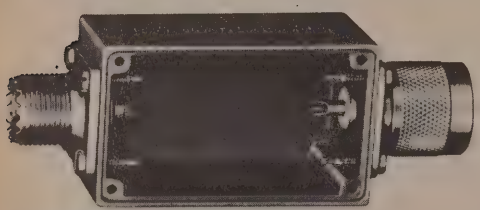
CONN: 2nd END
UHF receptacle jack.



Model No.	QUANTITY DISC. CODE	
2412	A	NET 11.85

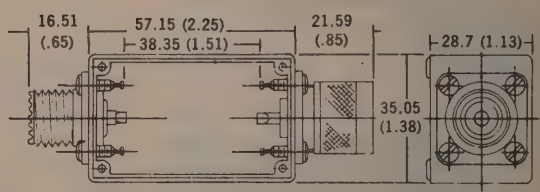
(Includes cover and screws)

COMPONENT MOUNTING — UHF RECEPTACLE TO UHF PLUG



CONN: 1st END
UHF receptacle jack.

CONN: 2nd END
UHF receptacle plug.



Model No.	QUANTITY DISC. CODE	
2413	A	NET 14.85

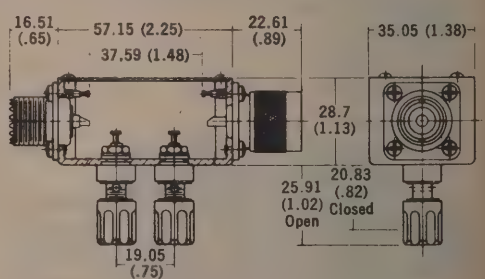
(Includes cover and screws)

COMPONENT MOUNTING — UHF RECEPTACLE TO UHF PLUG WITH BINDING POSTS

CONN: 1st END
UHF receptacle jack.

CENTER:
Banana jack binding posts with solder turret terminals; red and black.

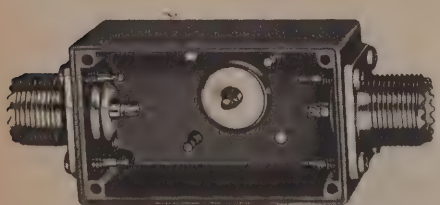
CONN: 2nd END
UHF receptacle plug.



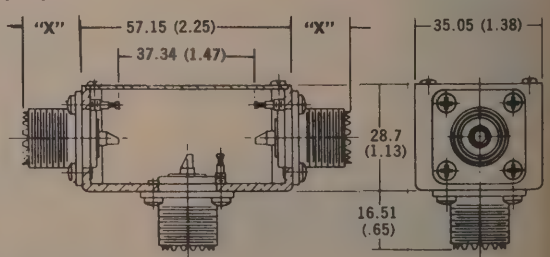
Model No.	QUANTITY DISC. CODE	
2422	A	NET 17.85

(Includes cover and screws)

COMPONENT MOUNTING—UHF AND TYPE "N" RECEPTACLE "T"



MODEL 2418 SHOWN



(Includes cover and screws)

Model No.	Connectors	"X" Dim.	Disc. Quan. Code	Net
2418	(3) UHF receptacle jacks	16.51 (.65)	A	14.85
2419	(3) Type "N" receptacle jacks, M39012/04-0002	19.05 (.75)	A	13.85

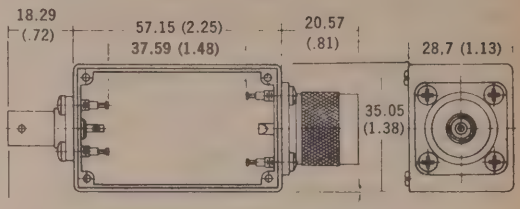
SHIELDED "BLACK BOXES" — SIZE "B"

POMONA ELECTRONICS

COMPONENT MOUNTING — BNC RECEPTACLE TO TYPE "N" PLUG

CONN: 1st END
BNC receptacle jack, M39012/22-0001.

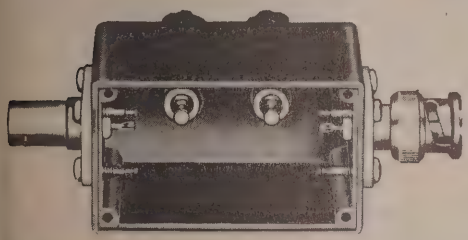
CONN: 2nd END
Type "N" receptacle plug.



Model No.	
2420	QUANTITY DISC. CODE A NET 14.85

(Includes cover and screws)

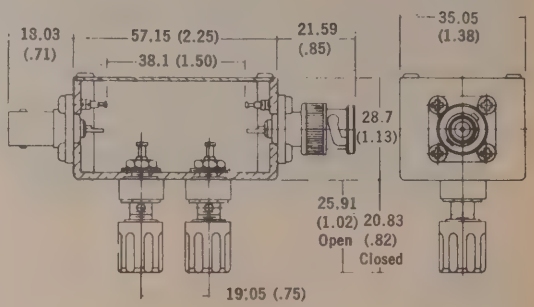
COMPONENT MOUNTING — BNC RECEPTACLE TO BNC PLUG WITH BINDING POSTS



CONN: 1st END
BNC receptacle jack, M39012/22-0001.

CENTER:
Banana jack binding posts with solder turret terminals; red and black.

CONN: 2nd END
BNC receptacle plug, UG1104A/U.



Model No.	
3233	QUANTITY DISC. CODE A NET 14.85

(Includes cover and screws)

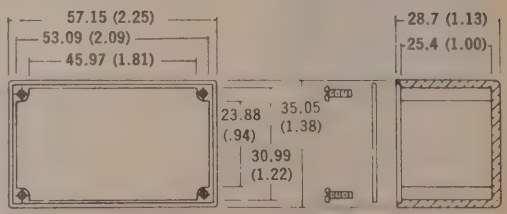
EMPTY — SHIELDED "BLACK BOX"

(Includes cover and screws)
QUANTITY DISC. CODE A

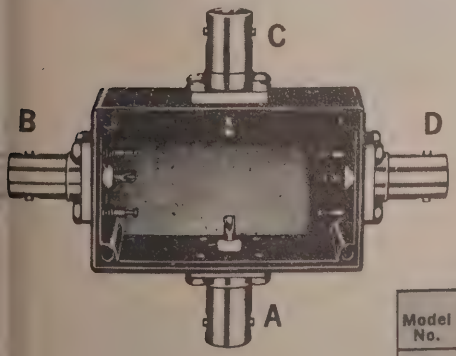
MODEL 2417
FINISH: Blue baked enamel.
Includes cover with part number on cover and four cover screws.

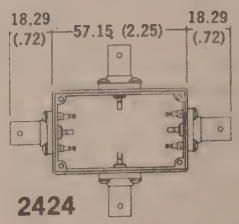
MODEL 2428
FINISH: None.
Includes unmarked cover and four cover screws.

Model No.	Net
2417	2.95
2428	2.75

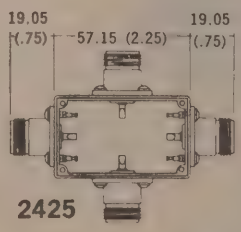


COMPONENT MOUNTING — CROSS CONNECTIONS





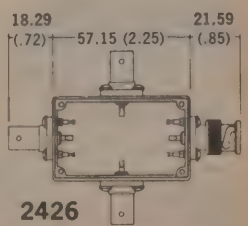
2424



2425

(Includes cover and screws)

Model No.	Connection A, B and C	Connection D	Quantity Disc. Code	Net
2424	BNC receptacle jack, M39012/22-0001	BNC receptacle jack, M39012/22-0001	A	14.85
2425	Type "N" receptacle jack, M39012/04-0002	Type "N" receptacle jack, M39012/04-0002	A	14.85
2426	BNC receptacle jack, M39012/22-0001	BNC receptacle plug, UG1104A/U	A	14.85



2426

SHIELDED "BLACK BOXES" — SIZE "C"

POMONA ELECTRONICS

A series of larger shielded "Black Boxes."

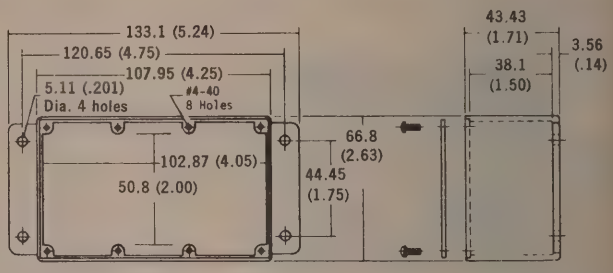
These larger boxes are excellent for compact packaging of voltage dividers, isolation networks and many other applications.

SPECIFICATIONS: (All Models)

- Operating temperature: −55°C to +150°C.
- Working voltage: 500 peak.
- Noise rejection: Greater than 70 db.

FEATURES:

- Shielded housing: Die cast aluminum, alloy #A380.
- Finish: Blue baked enamel per Federal Standard 595 #25109 over phosphoric etch per MIL-C-15328A.
- Cover: 2.03mm (.080) thick aluminum #6061-T6 with clear anodized finish per MIL-A-8625A.
- 8 ea. #4-40 x ¼" screws secure cover for proper shielding.
- Solder turret terminals for permanent noise free connection of components.
- 2 flanges for easy mounting of box.



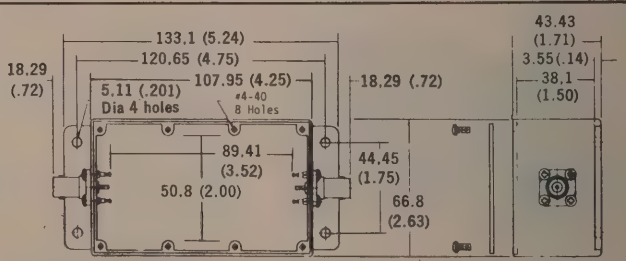
Model No.		
2901	(Shown 2/3 actual size)	NET 7.85
2906	Same as Model 2901 except box is unpainted and cover is unmarked.	NET 7.50

(Includes cover and screws)
QUANTITY DISC. CODE A

(Includes cover and screws)

Model No.	QUANTITY DISC. CODE	NET
2902	A	14.85

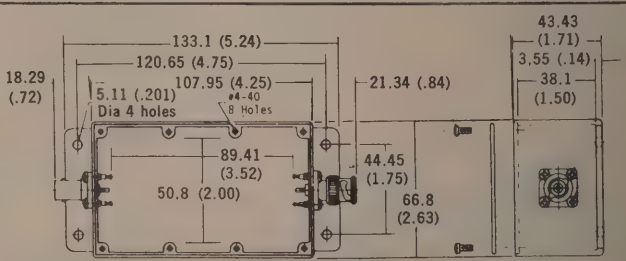
CONN: 1st END	CONN: 2nd END
BNC receptacle jack M39012/ 22-0001	BNC receptacle jack M39012/ 22-0001



(Includes cover and screws)

Model No.	QUANTITY DISC. CODE	NET
2903	A	15.85

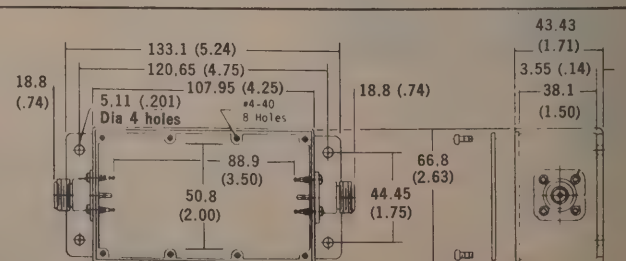
CONN: 1st END	CONN: 2nd END
BNC receptacle jack M39012/ 22-0001	BNC receptacle plug UG1104A/U



(Includes cover and screws)

Model No.	QUANTITY DISC. CODE	NET
2904	A	12.85

CONN. 1st END	CONN. 2nd END
Type "N" receptacle jack M39012/ 04-0002	Type "N" receptacle jack M39012/ 04-0002



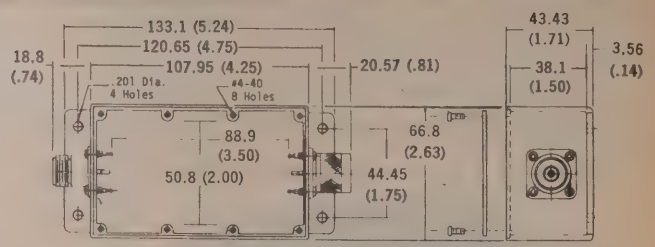
SHIELDED "BLACK BOXES" — SIZE "C" & "E"

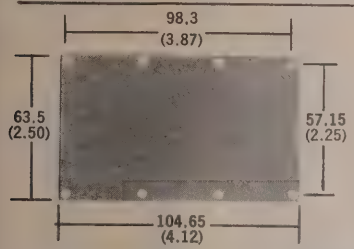
POMONA ELECTRONICS

(Includes cover and screws)

Model No.	QUANTITY DISC. CODE	NET
2905	A	18.85

CONN. 1st END	CONN. 2nd END
Type "N" receptacle jack M39012/ 04-0002	Type "N" receptacle plug





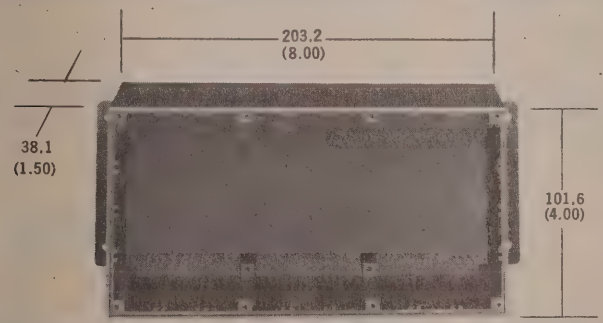
BLANK REPLACEMENT COVER FOR SIZE "C" BOX

MATERIAL: 2.03mm (.080) aluminum #6061-T6 clear anodized per MIL-A-8625A.

Model No.
4248

QUANTITY DISC. CODE **A** **NET 1.50**

101.6MM (4″) X 203.2MM (8″) DIE CAST BOX WITH CARD GUIDES — SIZE "E"



SHIELDED HOUSING: Die Cast Aluminum, Alloy #A380.

FINISH: BLUE baked enamel per Federal Standard 595 #25109 over phosphoric etch per MIL-C-15328A.

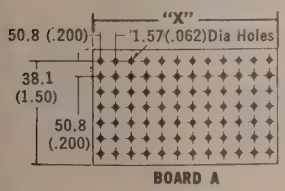
COVERS: Top 2.03mm (.080) thick Aluminum #6061-T6 with clear anodized Finish per MIL-A-8625A.

(Includes cover and screws)

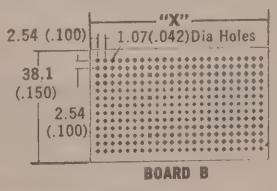
Model No.	QUANTITY DISC. CODE	NET
4226	A	19.95

CIRCUIT MOUNTING BOARDS FOR SIZE "E" BOX

Three sizes of various types of punched and blank circuit boards for rapid assembly of components. Pre-cut to the proper size. Boards slide easily into the box card guides. All boards are 1/16" thick. These boards are for use with Model 4226.

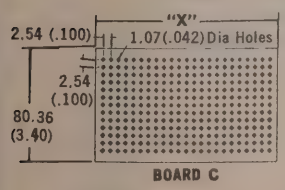


BOARD A



BOARD B

HORIZONTAL BOARD FOR MODEL 14226



BOARD C

Brd.	Model No.	No. of Holes	Material	Net
A	4261	37 x 7	Glass-Epoxy (GEE)	1.95
A	4263	37 x 7	Glass-Epoxy Copper-Clad 1 Side	3.25
B	4262	75 x 15	Glass-Epoxy	2.95
A	3330	19 x 7	Paper-Epoxy (PEE)	.95
A	3331	19 x 7	99.06 (3.90) Glass-Epoxy (GEE)	.95
A	3332	19 x 7	99.06 (3.90) Glass-Epoxy (GEE) Copper-Clad 1 Side	1.95
B	3333	38 x 15	99.06 (3.90) Glass-Epoxy (GEE)	1.85

QUANTITY DISC. CODE **A**

Brd.	Model No.	No. of Holes	Material	Net
C	4481	75 x 33	Glass-Epoxy (GEE)	3.85
C	4482	75 x 33	Glass-Epoxy Copper-Clad 1 Side	4.50

QUANTITY DISC. CODE **A**

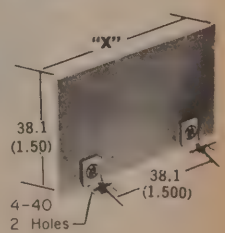
SHIELDING DIVIDERS FOR SIZE "E" BOX

These aluminum dividers are for dividing the box into shielded compartments.

MATERIAL: 1.60mm (.063) aluminum, clear anodized per MIL-A-8625A.

- Divider 38.1mm (1.50) x 60.71mm (2.39) used laterally.
- Divider 38.1mm (1.50) x 99.06mm (3.90) used lengthwise.

This divider is for use with Model 4226.



Model	"X" Dim.	Net
4265	203.2 (8.00)	3.00
3334	99.06 (3.90)	1.90

QUANTITY DISC. CODE **A**

SHIELDED "BLACK BOXES" — SIZE "D"

POMONA ELECTRONICS

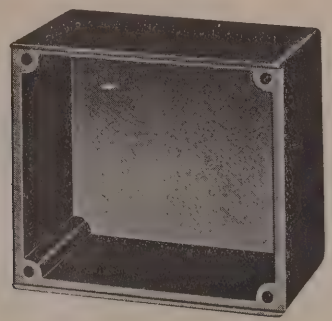
Another series of shielded "Black Boxes." These boxes fill the need between the size "B" and "C" boxes and are excellent for compact packaging of voltage dividers, isolation networks and many other applications.

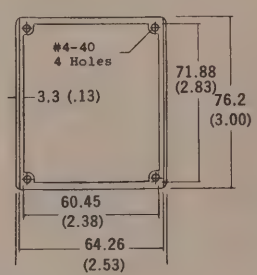
SPECIFICATIONS: (All Models)

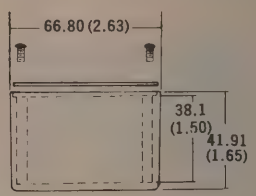
- Operating temperature: −55°C to +150°C.
- Working voltage: 500 peak.
- Noise rejection: Greater than 70 db.

FEATURES:

- Shielded housing: Die cast aluminum, alloy #A380.
- Finish: Blue baked enamel per Federal Standard 595 #25109 over phosphoric etch per MIL-C-15328A.
- Cover: 1.60mm (.063) thick aluminum #6061-T6 with clear anodized finish per MIL-A-8625A.
- 4 ea. #4-40 x ¼" screws secure cover for proper shielding.
- Solder turret terminals for permanent noise free connection of components.

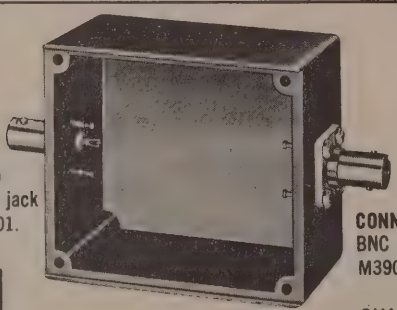






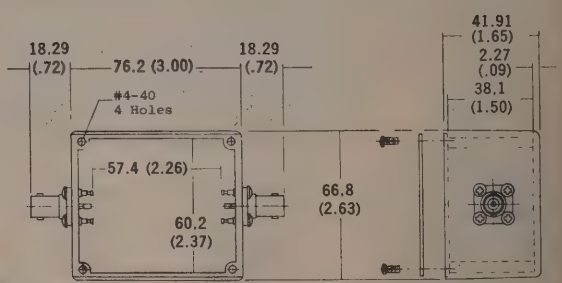
Model No.		
3601	(Shown 2/3 actual size)	NET 5.85
3606	Same as Model 3601 except box is unpainted and cover is unmarked.	NET 5.45

(Includes cover and screws)
QUANTITY DISC. CODE A



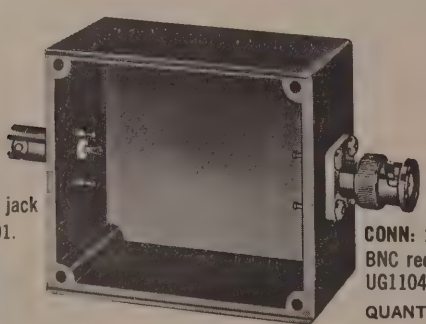
CONN: 1st END
BNC receptacle jack
M39012/22-0001.

CONN: 2nd END
BNC receptacle jack
M39012/22-0001.



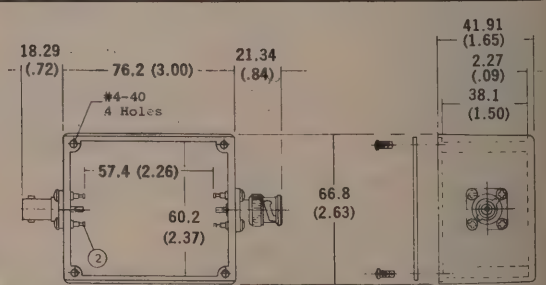
Model No.
3602

QUANTITY DISC. CODE A **NET 11.85** (Includes cover and screws)



CONN: 1st END
BNC receptacle jack
M39012/22-0001.

CONN: 2nd END
BNC receptacle plug
UG1104A/U.



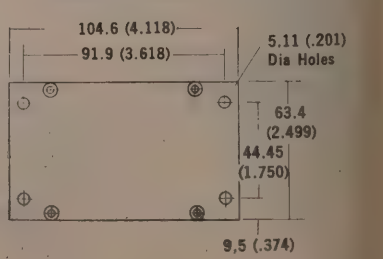
Model No.
3603

QUANTITY DISC. CODE A **NET 13.50** (Includes cover and screws)

LARGER BOTTOM PLATE FOR MOUNTING

This larger plate, when attached to the box provides flanges for mounting. Four #4-40 flat head screws included.

MATERIAL: 2.03mm (.080) aluminum #6061-T6, clear anodized per MIL-A-8625A.



Model No.
3958

QUANTITY DISC. CODE A
NET 1.75

SHIELDED "BLACK BOXES"

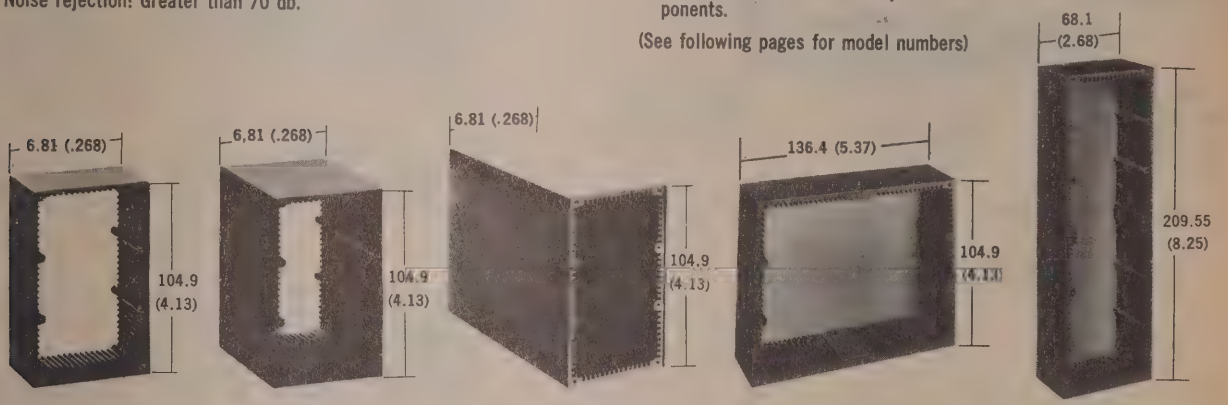
POMONA ELECTRONICS

Aluminum boxes, slotted to accept 1/16" circuit boards and shielding dividers. Excellent for packaging electronic circuitry. Boxes have removable top and bottom covers.

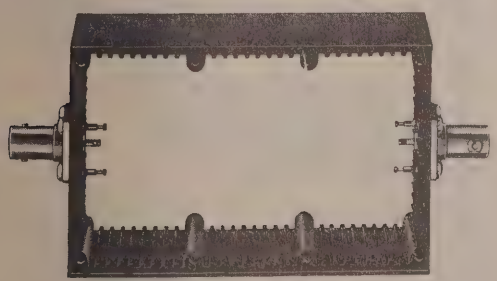
SPECIFICATIONS: (All Models)
- Operating temperature: −55°C to +150°C.
- Working voltage: 500 peak.
- Noise rejection: Greater than 70 db.

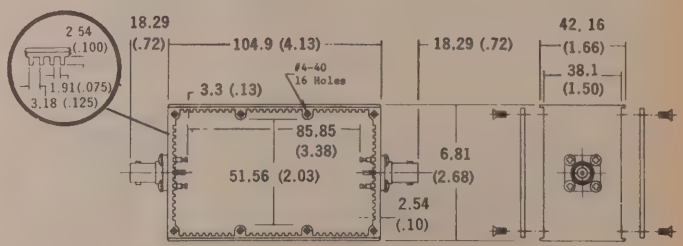
FEATURES:
- Shielded housing: Extruded aluminum, alloy #6061-T6.
- Finish: Blue baked enamel per Federal Standard 595 #25109 over phosphoric etch per MIL-C-15328A.
- Covers: Top and bottom, 2.03mm (.080) thick aluminum #6016-T6 with clear anodized finish per MIL-A-8625A.
- Cover screws: #4-40 x ¼" screws secure top and bottom cover for proper shielding.
- Solder turret terminals for permanent noise free connection of components.

(See following pages for model numbers)



SHIELDED "BLACK BOXES" 1½" DEEP



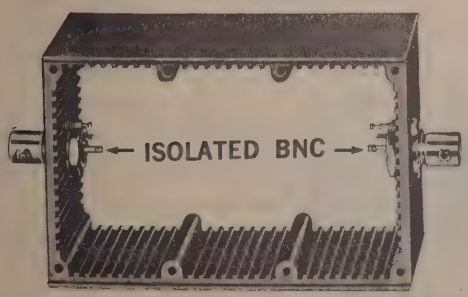


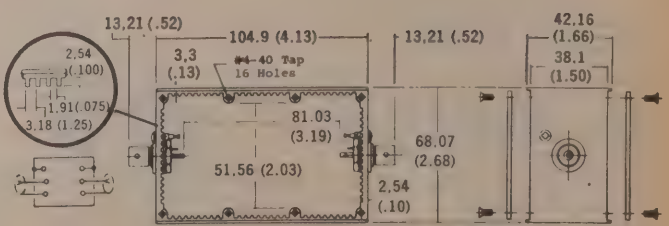
CONN: 1st END
BNC receptacle jack M39012/ 22-0001.

Model No.
3302

CONN: 2nd END
BNC receptacle jack M39012/ 22-0001.

(Includes cover and screws)
QUANTITY DISC. CODE **A** **NET 17.85**





CONN: 1st END
Isolated BNC receptacle jack

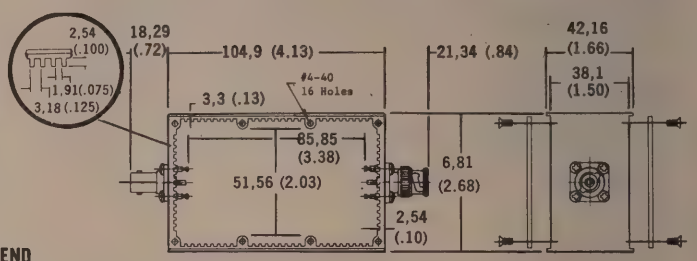
Model No.
3307

CONN: 2nd END
Isolated BNC receptacle jack

(Includes cover and screws)
QUANTITY DISC. CODE **A** **NET 24.95**

SHIELDED "BLACK BOXES" WITH CARD GUIDES—1½" DEEP

POMONA ELECTRONICS



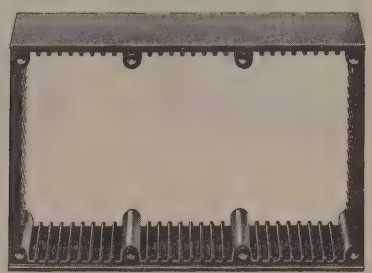
CONN: 1st END
BNC receptacle jack M39012/ 22-0001.

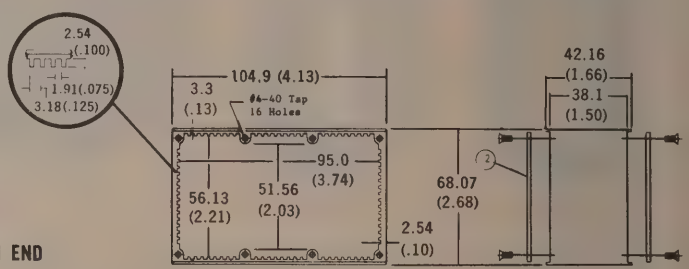
(Includes cover and screws)

Model No.
3303

CONN: 2nd END
BNC receptacle plug UG1104A/U

QUANTITY DISC. CODE **A** **NET 19.95**





CONN: 1st END
None

(Includes cover and screws)

CONN: 2nd END
None

QUANTITY DISC. CODE **A**

FINISH: Blue baked enamel. Includes top and bottom covers with part number on one and 16 cover screws.

Model No.	Net
3301	11.85

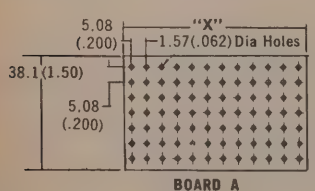
FINISH: None. Includes unmarked top and bottom covers with 16 cover screws.

Model No.	Net
3306	11.50

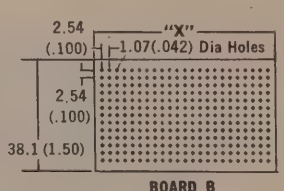
CIRCUIT MOUNTING BOARDS

Two sizes of various types of punched and blank circuit boards for rapid assembly of components. Pre-cut to the proper size. Boards slide easily into the box card guides. All boards are 1/16" thick.

- Boards 1.50 x 2.39 used laterally.
- Boards 1.50 x 3.90 used lengthwise.



BOARD A



BOARD B

Brd.	Model No.	No. of Holes	"X" Dim.	Material	Net
A	3321	12 x 7	60.71 (2.39)	Paper-Epoxy (PEE)	.60
A	3322	None	60.71 (2.39)	Paper-Epoxy (PEE)	.55
A	3323	12 x 7	60.71 (2.39)	Glass-Epoxy (GEE)	.85
A	3324	None	60.71 (2.39)	Glass-Epoxy (GEE)	.55
A	3325	12 x 7	60.71 (2.39)	Glass-Epoxy (GEE) Copper Clad 1 Side	1.75
B	3326	24 x 15	60.71 (2.39)	Glass-Epoxy (GEE)	.95
A	3330	19 x 7	99.06 (3.90)	Paper-Epoxy (PEE)	.95
A	3331	19 x 7	99.06 (3.90)	Glass-Epoxy (GEE)	.95
A	3332	19 x 7	99.06 (3.90)	Glass-Epoxy (GEE) Copper Clad 1 Side	1.95
B	3333	38 x 15	99.06 (3.90)	Glass-Epoxy (GEE)	1.85

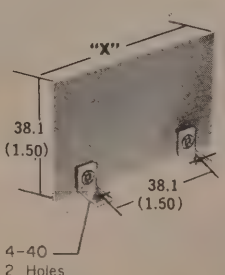
QUANTITY DISC. CODE **A** **NET 1.25**

SHIELDING DIVIDERS

Two sizes of aluminum dividers for dividing the box into shielded compartments.
MATERIAL: 1.60mm (.063) aluminum, clear anodized per MIL-A-8625A.

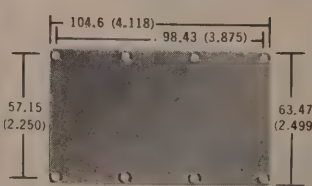
- Divider 38.1mm (1.50) x 6.71mm (2.39) used laterally.
- Divider 38.1mm (1.50) x 99.06mm (3.90) used lengthwise.

Model No.	"X" Dim.	Net
3327	60.71 (2.39)	1.50
3334	99.06 (3.90)	1.90

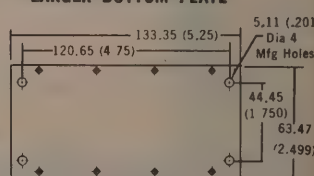


QUANTITY DISC. CODE **A**

COVER



LARGER BOTTOM PLATE



FOR MOUNTING

Model No.
4247

MATERIAL: 2.03mm (.080) aluminum #6061-T6, clear anodized per MIL-A-8625A.

Model No.
3328

NET 1.95

QUANTITY DISC. CODE **A** **NET 2.50**

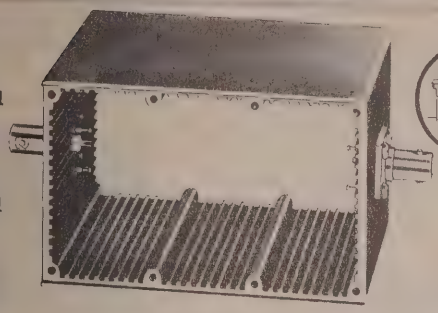
SHIELDED "BLACK BOXES" WITH CARD GUIDES—3" & 6" DEEP

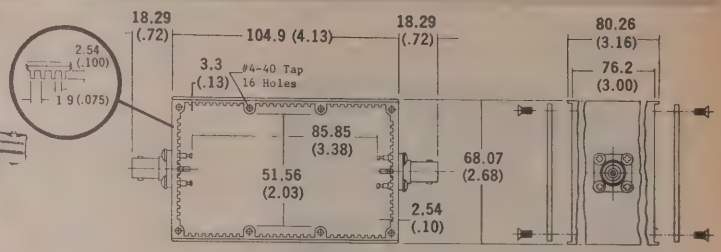
POMONA ELECTRONICS

CONN: 1st END
BNC
receptacle jack
M39012/22-0001

CONN: 2nd END
BNC
receptacle jack
M39012/22-0001

Model No.
3312





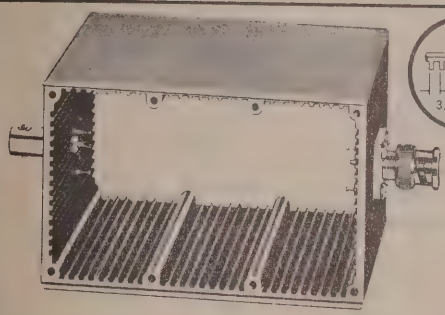
(Includes cover and screws)

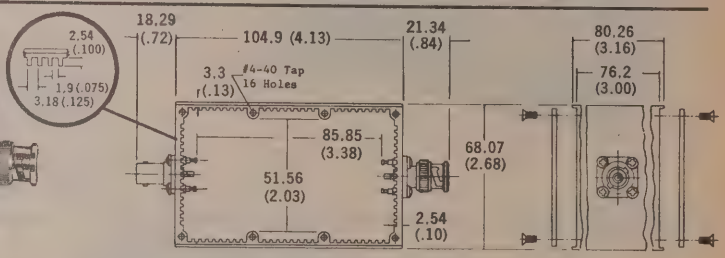
QUANTITY DISC. CODE **A** **NET 19.95**

CONN: 1st END
BNC
receptacle jack
M39012/22-0001

CONN: 2nd END
BNC
receptacle plug
UG1104A/U

Model No.
3313



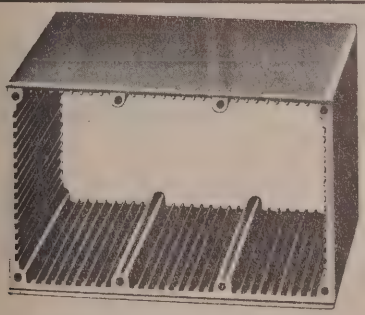


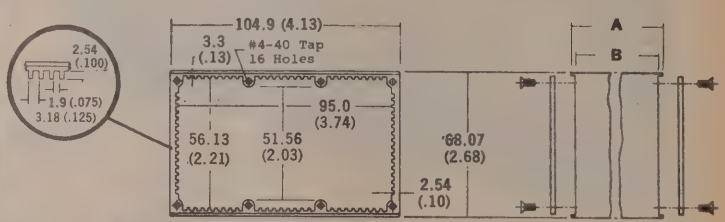
(Includes cover and screws)

QUANTITY DISC. CODE **A** **NET 19.95**

CONN: 1st END
None

CONN: 2nd END
None





Model No.	Dim. A	Dim. B	Net
3311	80.26 (3.16)	76.2 (3.00)	14.85
3316	80.26 (3.16)	76.2 (3.00)	14.50
3742	156.46 (6.16)	152.4 (6.00)	17.95
3743	156.46 (6.16)	152.4 (6.00)	17.60

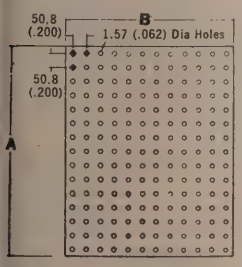
(Includes cover and screws)

QUANTITY DISC. CODE **A**

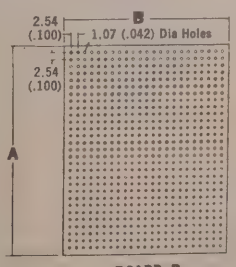
MODEL No.'s 3311 & 3742
FINISH: Blue baked enamel. Includes top and bottom cover with part no. on one.

MODEL No.'s 3316 & 3743
FINISH: None. Unmarked covers.

3" AND 6" BOX CIRCUIT MOUNTING BOARDS



BOARD A



BOARD B

Brd.	Model No.	No. of Holes	Dim. A	Dim. B	Material	Net
A	3550	12 x 15	76.2 (3.00)	60.71 (2.39)	Paper-Epoxy (PEE)	1.50
A	3551	12 x 15	76.2 (3.00)	60.71 (2.39)	Glass-Epoxy (GEE)	1.85
A	3552	12 x 15	76.2 (3.00)	60.71 (2.39)	Glass-Epoxy (GEE) Copper Clad 1 Side	2.25
B	3553	23 x 30	76.2 (3.00)	60.71 (2.39)	Glass-Epoxy (GEE)	2.25
A	3554	19 x 15	76.2 (3.00)	99.06 (3.90)	Paper-Epoxy (PEE)	1.50
A	3556	19 x 15	76.2 (3.00)	99.06 (3.90)	Glass-Epoxy (GEE) Copper Clad 1 Side	2.25
B	3557	39 x 30	76.2 (3.00)	99.06 (3.90)	Glass-Epoxy (GEE)	2.25
B	3726	23 x 60	152.4 (6.00)	60.71 (2.39)	Glass-Epoxy (GEE)	4.50
B	3727	39 x 60	152.4 (6.00)	99.06 (3.90)	Glass-Epoxy (GEE)	4.50

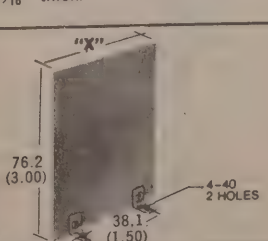
Various sizes and types of punched and blank circuit boards for rapid assembly of components. Pre-cut to the proper size. Boards slide easily into the box card guides. All boards are 1/16" thick.

- Boards 76.2 (3.00) and 152.4 (6.00) x 60.71 (2.39) used laterally.
- Boards 76.2 (3.00) and 152.4 (6.00) x 99.06 (3.90) used lengthwise.

DISC. CODE **A**

3" BOX SHIELDING DIVIDERS

Model No.	"X" Dim.	Net
3558	60.71 (2.39)	1.95
3559	99.06 (3.90)	2.25



Two sizes of aluminum dividers for dividing the box into shielded compartments.

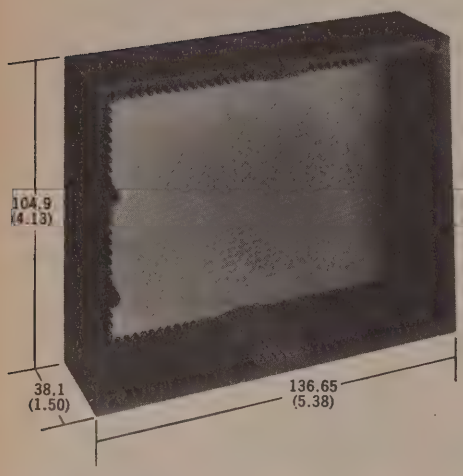
MATERIAL: 1.6 (.063) aluminum, clear anodized per MIL-A-8625A.

- Divider 76.2 (3.00) x 60.71 (2.39) used laterally.
- Divider 76.2 (3.00) x 99.06 (3.90) used lengthwise.

QUANTITY DISC. CODE **A**

SHIELDED "BLACK BOXES" WITH CARD GUIDES—1½" DEEP

POMONA ELECTRONICS

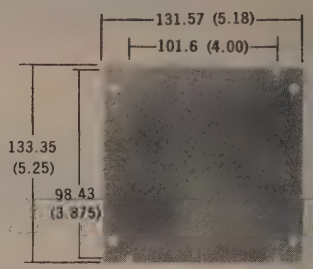


FINISH: Blue baked enamel. Includes top and bottom covers and cover screws.

Model No.
4253

QUANTITY DISC. CODE **A NET 24.95**

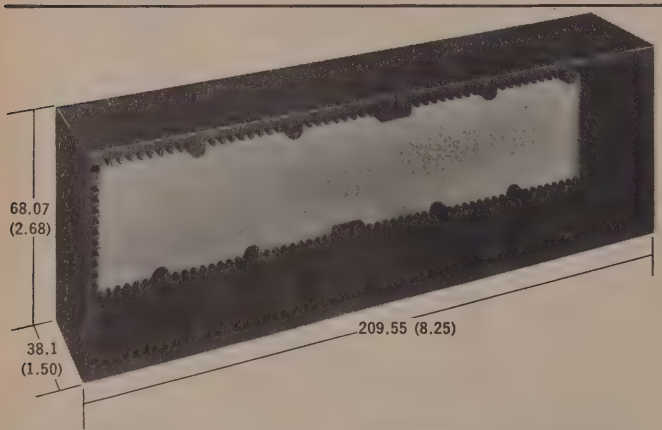
BOTTOM PLATE FOR MOUNTING



This larger plate, when attached to the box, provides flanges for mounting.
MATERIAL: 2.03mm (.080) aluminum #6061-T6, clear anodized per MIL-A-8625A.

QUANTITY DISC. CODE **A NET 3.95**

Model No.
4257

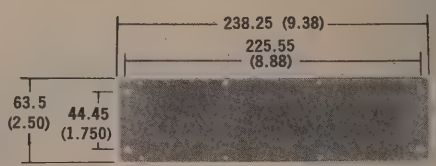


FINISH: Blue baked enamel. Includes top and bottom covers with part number on one and 16 cover screws.

Model No.
4260

QUANTITY DISC. CODE **A NET 24.95**

BOTTOM PLATE FOR MOUNTING



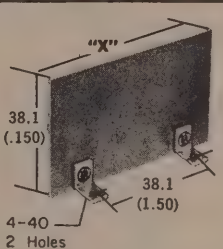
This larger plate, when attached to the box, provides flanges for mounting.
MATERIAL: 2.03mm (.080) aluminum #6061-T6, clear anodized per MIL-A-8625A.

QUANTITY DISC. CODE **A NET 3.95**

Model No.
4264

SHIELDING DIVIDERS

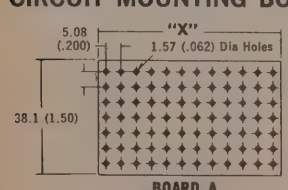
Two sizes of aluminum dividers for dividing the box into shielded compartments.
MATERIAL: 1.60mm (.063) aluminum, clear anodized per MIL-A-8625A.

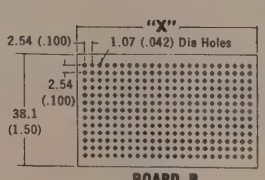


Model No.	"X" Dim.	Net
3327	60.71 (2.39)	1.50
3334	99.06 (3.90)	1.90
4265	203.2 (8.00)	3.00
4258	128.52 (5.06)	2.50

QUANTITY DISC. CODE **A**

CIRCUIT MOUNTING BOARDS





Two sizes of various types of punched and blank circuit boards for rapid assembly of components. Pre-cut to the proper size. Boards slide easily into the box card guides. All boards are 1/16" thick.

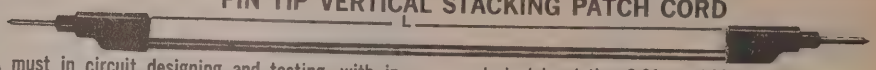
QUANTITY DISC. CODE **A**

Brd.	Model No.	No. of Holes	"X" Dim.	Material	Net
A	3321	12 x 7	60.71 (2.39)	Paper-Epoxy	.60
A	3325	12 x 7	60.71 (2.39)	Glass-Epoxy Cop. Clad 1 Side	1.75
B	3326	24 x 15	60.71 (2.39)	Glass-Epoxy	.95
A	4261	37 x 7	203.2 (8.00)	Paper-Epoxy	1.95
A	4263	37 x 7	203.2 (8.00)	Glass-Epoxy Cop. Clad 1 Side	3.25
B	4262	75 x 15	203.2 (8.00)	Glass-Epoxy	2.95
A	4254	25 x 7	128.52 (5.06)	Paper-Epoxy	1.75
B	4255	51 x 15	128.52 (5.06)	Glass-Epoxy	2.50
A	4256	25 x 7	128.52 (5.06)	Glass-Epoxy Copper Clad	2.25
A	3330	19 x 7	99.06 (3.90)	Paper-Epoxy	.95
A	3332	19 x 7	99.06 (3.90)	Glass-Epoxy Copper Clad	1.95
B	3333	38 x 15	99.06 (3.90)	Glass-Epoxy	1.85

2.03mm (.080) PIN TIP PATCH CORDS

POMONA ELECTRONICS

PIN TIP VERTICAL STACKING PATCH CORD

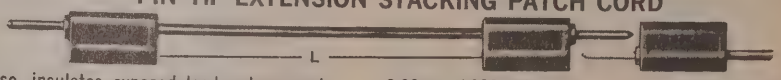


Model No.	Length	Net
P-4 *	4″	1.85
P-8 *	8″	1.85
P-12 *	12″	1.85
P-18 *	18″	1.85
P-24 *	24″	1.85
P-36 *	36″	1.85
P-48 *	48″	1.95
P-60 *	60″	2.05

A must in circuit designing and testing, with instruments that utilize tip jacks.
PIN TIP: 2.03mm (.080) dia., ½″ long, brass, gold flashed.
TIP JACK, STACK-UP: Beryllium copper, gold flashed. Accepts 2.03mm (.080) dia. pin.
WIRE: 20 AWG, strand. 41 x 36 T.C. Extra flexible polyvinyl insulation 2.21mm (.087″) O.D.
RATED: 5 amps cont., 10 amps int. 5,000 W VDC.
OPERATING TEMPERATURE: −0°C to +105°C.
***Colors:** Black, brown, red, orange, yellow, green, blue, violet, gray, white.

★QUANTITY DISC. CODE A

PIN TIP EXTENSION STACKING PATCH CORD

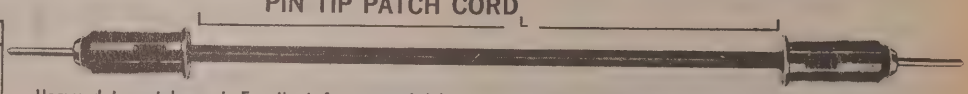


Model No.	Length	Net
1727-4 *	4″	2.50
1727-8 *	8″	2.50
1727-12 *	12″	2.50
1727-18 *	18″	2.50
1727-24 *	24″	2.50
1727-36 *	36″	2.50
1727-48 *	48″	2.60
1727-60 *	60″	2.70

Dual purpose, insulates exposed leads when used as an extension cord. Endless extension coupling possible. Also provides stacking from 2.03mm (.080) jack.
PIN TIP: 2.03mm (.080) dia., ½″ long, brass, gold flashed.
TIP JACK: Beryllium copper, gold flashed. Accepts 2.03mm (.080) dia. pin.
WIRE: 20 AWG, strand. 41 x 36 T.C. Extra flexible polyvinyl insulation 2.21mm (.087″) O.D.
RATED: 5 amps cont., 10 amps int. 5,000 W VDC.
OPERATING TEMPERATURE: −0°C to +105°C.
***Colors:** Black, red.

★QUANTITY DISC. CODE A

PIN TIP PATCH CORD

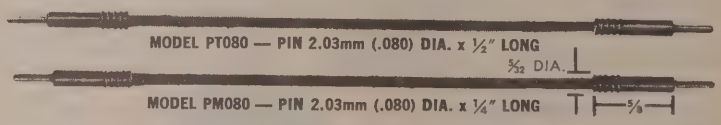


Model No.	Length	Net
1990-4 *	4″	1.95
1990-8 *	8″	1.95
1990-12 *	12″	1.95
1990-18 *	18″	1.95
1990-24 *	24″	1.95
1990-36 *	36″	1.95
1990-48 *	48″	2.05
1990-60 *	60″	2.15

Heavy duty patch cord. Excellent for general lab work. Permits interconnection between test instruments that utilize tip jacks.
PIN TIP: 2.03mm (.080) dia. ½″ long, brass, nickel plated.
WIRE: 18 AWG, strand. 65 x 36 T.C. Extra flexible polyvinyl insulation 3.66mm (.144″) O.D.
RATED: 5 amps cont., 10 amps int. 10,000 W VDC.
OPERATING TEMPERATURE: −0°C to +105°C.
***Colors:** Black, red.

★QUANTITY DISC. CODE A

2.03 (.080) PIN TIP PATCH CORDS

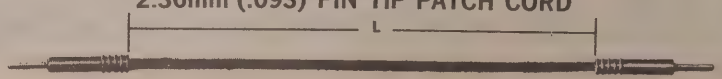


Model No.		Lgth.	Net
PT080-4 *	PM080-4 *	4″	1.50
PT080-8 *	PM080-8 *	8″	1.50
PT080-12 *	PM080-12 *	12″	1.50
PT080-18 *	PM080-18 *	18″	1.50
PT080-24 *	PM080-24 *	24″	1.50
PT080-36 *	PM080-36 *	36″	1.50
PT080-48 *	PM080-48 *	48″	1.60
PT080-60 *	PM080-60 *	60″	1.70

Small body style permits usage in equipment having receptacles spaced closely together. Three models shown.
PIN TIP: Leaded copper. Gold flashed.
WIRE: 22 AWG, strand. 19 x 34 T.C. Insulation, polyvinyl 1,63mm (.064″) O.D.
RATED: 3 amps cont., 7.5 amps int. 1,000 W VDC.
OPERATING TEMPERATURE: −0°C to +105°C.
***Colors:** Black, red.

★QUANTITY DISC. CODE A

2.36mm (.093) PIN TIP PATCH CORD

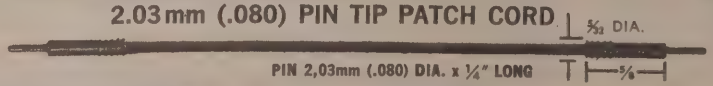


Model No.	Length	Net
4493-4 *	4″	1.50
4493-8 *	8″	1.50
4493-12*	12″	1.50
4493-18*	18″	1.50
4493-24*	24″	1.50
4493-36*	36″	1.50
4493-40*	48″	1.60
4493-60*	60″	1.70

PIN TIP: Leaded copper. Gold flashed.
WIRE: 20 AWG, strand. 41 x 36 T.C. PVC. 1.63mm (.064″ O.D.
RATED: 3 amps cont., 7.5 amps int. 1,000 W VDC.
OPERATING TEMPERATURE: −0°C to +105°C.
***Colors:** Black, red.

★ QUANTITY DISC. CODE A

2.03mm (.080) PIN TIP PATCH CORD

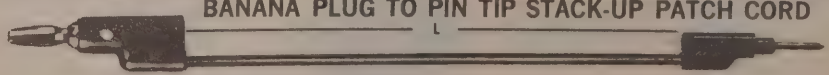


Model No.	Length	Net
4526-4 *	4″	2.05
4526-8 *	8″	2.05
4526-12*	12″	2.05
4526-18*	18″	2.05
4526-24*	24″	2.05
4526-36*	36″	2.05
4526-40*	48″	2.15
4526-60*	60″	2.25

- **PIN TIP:** Leaded copper. Gold flashed.
- **WIRE:** 24 AWG, strand 45 x 40 T.C.
- Super flexible rubber jacket.
- O.D. 1.68mm (.066).
- W VDC 1,000.
- Breakdown 10,000 VDC.
- **COLOR:** Black, red.

★QUANTITY DISCOUNT CODE A

BANANA PLUG TO PIN TIP STACK-UP PATCH CORD



Model No.	Length	Net
1126-4 *	4″	1.95
1126-8 *	8″	1.95
1126-12 *	12″	1.95
1126-18 *	18″	1.95
1126-24 *	24″	1.95
1126-36 *	36″	1.95
1126-48 *	48″	2.05
1126-60 *	60″	2.15

Adapts to equipment using banana jacks and pin jacks. Banana plug and pin tip allow vertical stack-up.
BANANA PLUG: Spring, one piece beryllium copper, heat treated, nickel plated.
PIN TIP: 2.03mm (.080) dia., ½″ long, brass, gold flashed.
TIP JACK, STACK-UP: Beryllium copper, gold flashed. Accepts 2.03mm (.080) dia. pin.
WIRE: 20 AWG, strand. 41 x 36 T.C. Extra flexible polyvinyl insulation 2.21mm (.087) O.D.
RATED: 5 amps cont., 10 amps int. 5,000 W VDC.
OPERATING TEMPERATURE: −0°C to +105°C.
***Colors:** Black, red.

★QUANTITY DISC. CODE A

★Various lengths may be aggregated for best quantity price. Other lengths available to order.
* Consult factory for color code part numbers.

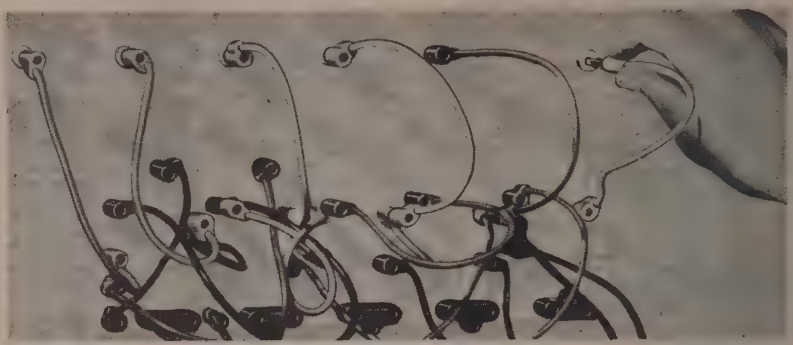
STANDARD BANANA PLUG PATCH CORDS

POMONA ELECTRONICS

POMONA BANANA PLUG PATCH CORDS

Tough thermoplastic insulation molds the plug and leads into a strong moisture resistant integral unit. Excellent for computer board and test equipment applications.

Used by leading industries in applications where extreme reliability is of prime importance.



FEATURES:

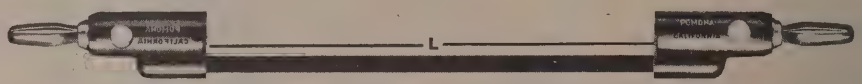
- One piece beryllium copper heat treated spring for maximum long life.
- Rounded spring design results in maximum contact area.
- Extra flexible polyvinyl insulation used on all leads.
- Nickel plated per QQ-N-290, Class 2.
- Contact resistance less than 0.001 ohm per banana plug.
- Operating temperature: −0°C to +105°C.
- Wire, 18 AWG, stranding 65 x 36 T.C.
- Insulation, polyvinyl 3.66mm (.144″) O.D.
- Ratings: 15 amps cont., 30 amps int. 10,000 W VDC.

SPECIFICATIONS:

- Fits standard 4.22mm (.166) dia. banana jacks.
- Spring, beryllium copper Berylco 25 per QQ-C-533.
- Plug body, brass per QQ-B-626, alloy #360.

STACK-UP BANANA PLUG PATCH CORD

Model No.	Length	Net
B-4 *	4″	1.80
B-8 *	8″	1.80
B-12 *	12″	1.80
B-18 *	18″	1.80
B-24 *	24″	1.80
B-36 *	36″	1.80
B-48 *	48″	1.90
B-60 *	60″	2.00
B-72 *	72″	2.10



Multiple stacking feature accommodates the most complex stacking; keeps circuitry neater. Greatly simplifies circuit connections and changes. Reliable solder-bonded connections withstand pull test in excess of 50 lbs. Banana plugs both ends.
*COLORS: Black, brown, red, orange, yellow, green, blue, violet, gray, white.

★QUANTITY DISC. CODE A

EXTENSION STACKING BANANA PLUG PATCH CORD

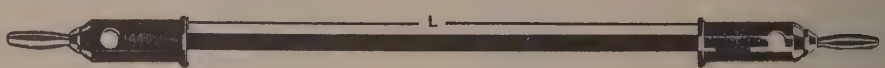
Model No.	Length	Net
HB-4 *	4″	2.50
HB-8 *	8″	2.50
HB-12 *	12″	2.50
HB-18 *	18″	2.50
HB-24 *	24″	2.50
HB-36 *	36″	2.50
HB-48 *	48″	2.60
HB-60 *	60″	2.70

Dual purpose. Insulates all hot leads when used as an extension cord. Endless extension couplings possible with any banana plug patch cord. Provides vertical stacking from any jack. Reliable solder-bonded connections withstand pull test in excess of 50 lbs. Banana plugs both ends.
*COLORS: Black, brown, red, orange, yellow, green, blue, violet, gray, white.

★QUANTITY DISC. CODE A

HORIZONTAL STACKING BANANA PLUG PATCH CORD

Model No.	Length	Net
1440-4 *	4″	1.80
1440-8 *	8″	1.80
1440-12 *	12″	1.80
1440-18 *	18″	1.80
1440-24 *	24″	1.80
1440-36 *	36″	1.80
1440-48 *	48″	1.90
1440-60 *	60″	2.00



Ideal as an interconnecting lead between power supplies, test equipment, etc. Horizontal stacking feature. Banana plugs on both ends.
*COLORS: Black, red.

★QUANTITY DISC. CODE A

18 AWG WIRE

This is the same quality wire that Pomona uses on their 18 AWG patch cords. Ideal for do-it-yourself leads.

SPECIFICATIONS:

STRANDING: 65 x 36 tinned copper.

O.D.: 3.66mm (.144″).

JACKET: 105°C PVC.

TEMP. RANGE: —20°C to +105°C.

Model No.	Color
4418-0	Black
4418-2	Red

(Std. Pkg. 500′ Reel)
★ QUANTITY DISC. CODE A

NET 65.00

20 AWG WIRE

This is the same quality wire that Pomona uses on their 20 AWG patch cords. Ideal for do-it-yourself leads.

SPECIFICATIONS:

STRANDING: 41 x 36 tinned copper.

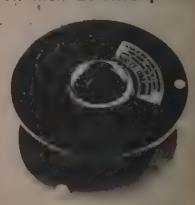
O.D.: 2.21mm (.087″).

JACKET: 105°C PVC.

TEMP. RANGE: —20°C to +105°C.

Model No.	Color
4420-0	Black
4420-2	Red

(Std. Pkg. 500′ Reel)
★ QUANTITY DISC. CODE A



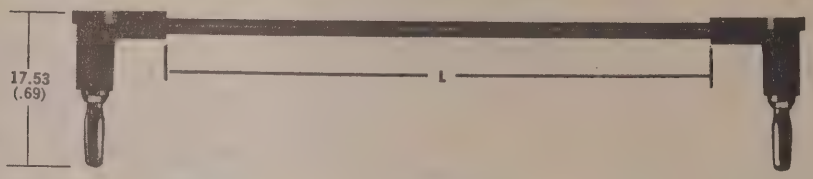
NET 50.00

★Various lengths may be aggregated for best quantity price. Other lengths available to order.
* Consult factory for color code part numbers.

STANDARD BANANA PLUG PATCH CORDS

POMONA ELECTRONICS

STACK-UP RIGHT ANGLE BANANA PLUG PATCH CORD

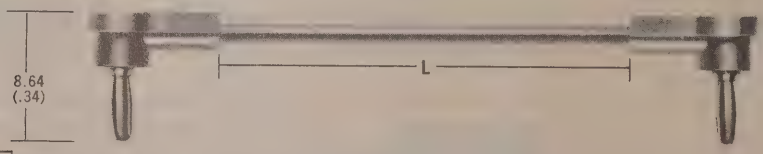


Model No.	Length	Net
2864-4 *	4″	2.25
2864-8 *	8″	2.25
2864-12 *	12″	2.25
2864-18 *	18″	2.25
2864-24 *	24″	2.25
2864-36 *	36″	2.25
2864-48 *	48″	2.35
2864-60 *	60″	2.45

Vertical stacking feature allows endless circuit connections and the right angle design keeps wires close to the chassis. An oversize shoulder allows easy connect and disconnect.
BANANA PLUGS: Spring, one piece beryllium copper, heat treated, nickel plated. Tough thermoplastic molded to plug body and wire.
WIRE: 18 AWG, strand. 65 x 36 T.C. Extra flexible polyvinyl insulation, 3.66mm (.144″) O.D.
OPERATING TEMPERATURE: −0°C to +105°C.
RATED: 15 amps cont., 30 amps int. 10,000 W VDC
***COLORS:** Black, red.

★QUANTITY DISC. CODE A

RIGHT ANGLE BANANA PLUG PATCH CORD

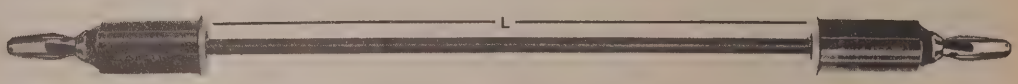


Model No.	Length	Net
4567-4 *	4″	1.95
4567-8 *	8″	1.95
4567-12 *	12″	1.95
4567-18 *	18″	1.95
4567-24 *	24″	1.95
4567-36 *	36″	1.95
4567-48 *	48″	2.05
4567-60 *	60″	2.15

Designed for use where vertical space is limited. Right angle plug features concave ribbed top and oversize shoulder for ease of connect and disconnect in tight places.
BANANA PLUGS: Spring, one piece beryllium copper, heat treated, nickel plated. Tough thermoplastic molded to plug body and wire.
WIRE: 18 AWG, strand. 65 x 36 T.C. Extra flexible polyvinyl insulation, 3.66mm (.144″) O.D.
OPERATING TEMPERATURE: −0°C to +105°C.
RATED: 15 amps cont., 30 amps int. 10,000 W VDC.
***COLORS:** Black, red.

★QUANTITY DISC. CODE A

BANANA PLUG PATCH CORD



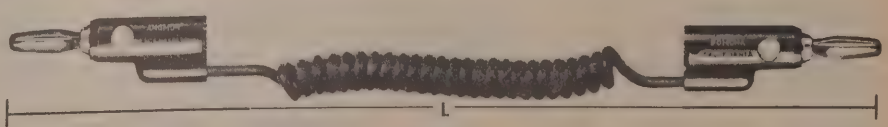
Model No.	Length	Net
1985-4 *	4″	1.70
1985-8 *	8″	1.70
1985-12 *	12″	1.70
1985-18 *	18″	1.70
1985-24 *	24″	1.70
1985-36 *	36″	1.70
1985-48 *	48″	1.80
1985-60 *	60″	1.90

Excellent for general lab work. Permits interconnection between test instruments, etc. Banana plugs both ends.

BANANA PLUGS: Spring, one piece beryllium copper, heat treated, nickel plated. Tough thermoplastic molded to plug body and wire.
WIRE: 18 AWG, strand. 65 x 36 T.C. Extra flexible polyvinyl insulation, 3.66mm (.144″) O.D.
OPERATING TEMPERATURE: −0°C to +105°C.
RATED: 15 amps cont., 30 amps int. 10,000 W VDC.
***COLORS:** Black, red.

★QUANTITY DISC. CODE A

RETRACTILE (COILED) PATCH CORD—WITH STACK-UP BANANA PLUGS



Model No.	Length	Net
2484-36 *	36″	4.25
2484-48 *	48″	4.25
2484-60 *	60″	4.25

Permits the use of one size patch cord in place of many various lengths.
BANANA PLUGS: Spring, one piece beryllium copper, heat treated, nickel plated. Tough thermoplastic molded to body and wire.
WIRE: 20 AWG, strand. 41 x 36 T.C. Rubber insulation 3.68mm (.145″) O.D.
RATED: 4 amps cont., 10 amps int. 5,000 W VDC.
OPERATING TEMPERATURE: −0°C to +105°C.
***COLORS:** Black, red.

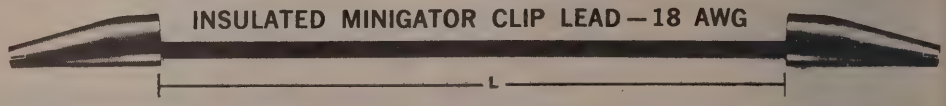
★QUANTITY DISC. CODE A

★Various lengths may be aggregated for best quantity price. Other lengths available to order.
* Consult factory for color code part numbers.

CLIP LEADS & SPADE LUG JUMPERS

POMONA ELECTRONICS

INSULATED MINIGATOR CLIP LEAD—18 AWG



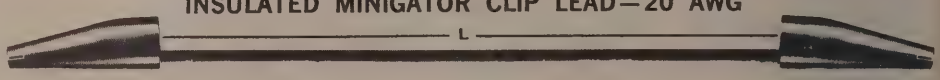
Model No.	Length	Net
MG-B-4 *	4″	1.50
MG-B-8 *	8″	1.50
MG-B-12 *	12″	1.50
MG-B-24 *	24″	1.50
MG-B-36 *	36″	1.50
MG-B-48 *	48″	1.60
MG-B-60 *	60″	1.70

★QUANTITY DISC. CODE A

CLIP: Minigator, steel, cad. plated.
WIRE: 18 AWG, strand. 65 x 36 T.C. Extra flexible polyvinyl insulation 3.66mm (.144″) O.D.

INSULATOR: Red vinyl with red wire. Black on all other colors.
OPERATING TEMPERATURE: −25°C to +105°C.
***COLORS:** Black, red.

INSULATED MINIGATOR CLIP LEAD—20 AWG



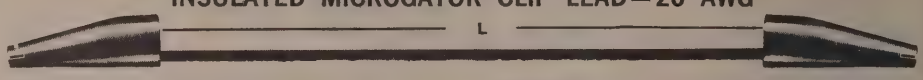
Model No.	Length	Net
1236-4 *	4″	1.50
1236-8 *	8″	1.50
1236-12 *	12″	1.50
1236-24 *	24″	1.50
1236-36 *	36″	1.50
1236-48 *	48″	1.60
1236-60 *	60″	1.70

★QUANTITY DISC. CODE A

CLIP: Minigator, solid copper.
WIRE: 20 AWG, strand. 41 x 36 T.C. Extra flexible polyvinyl insulation, 2.21mm (.087″) O.D.

INSULATOR: Red vinyl with red wire. Black on all other colors.
OPERATING TEMPERATURE: −25°C to +105°C.
***COLORS:** Black, red.

INSULATED MICROGATOR CLIP LEAD—20 AWG



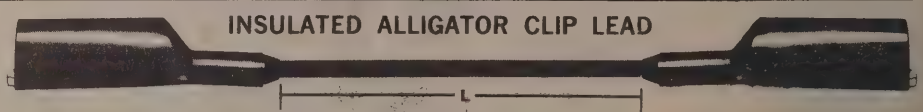
Model No.	Length	Net
1613-4 *	4″	1.50
1613-8 *	8″	1.50
1613-12 *	12″	1.50
1613-24 *	24″	1.50
1613-36 *	36″	1.50
1613-48 *	48″	1.60
1613-60 *	60″	1.70

★QUANTITY DISC. CODE A

CLIP: Microgator, solid copper.
WIRE: 20 AWG, strand. 41 x 36 T.C. Extra flexible polyvinyl insulation, 2.21mm (.087″) O.D.

INSULATOR: Red vinyl with red wire. Black on all other colors.
OPERATING TEMPERATURE: −25°C to +105°C.
***COLORS:** Black, red.

INSULATED ALLIGATOR CLIP LEAD



Model No.	Length	Net
AL-B-4 *	4″	1.75
AL-B-8 *	8″	1.75
AL-B-12 *	12″	1.75
AL-B-24 *	24″	1.75
AL-B-36 *	36″	1.75
AL-B-48 *	48″	1.85
AL-B-60 *	60″	1.95

★QUANTITY DISC. CODE A

CLIP: Alligator, steel, cad. plated.
WIRE: 18 AWG, strand. 65 x 36 T.C. Extra flexible polyvinyl insulation 3.66mm (.144″) O.D.

INSULATOR: Red vinyl with red wire. Black on all other colors.
OPERATING TEMPERATURE: −25°C to +105°C.
***COLORS:** Black, red.

INSULATED SPADE LUG JUMPER

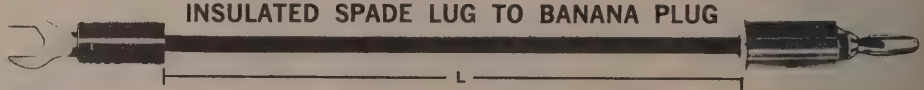
Model No.	Length	Net
1743-12 *	12″	1.95
1743-24 *	24″	1.95
1743-36 *	36″	1.95
1743-48 *	48″	2.05
1743-60 *	60″	2.15

(Typical Dimensions spade lug)

★QUANTITY DISC. CODE A

Spade lug, heavy duty stamped one piece brass. Tough thermo-plastic molded to spade lug body.
SPADE LUG: Brass 1/16″ thick, nickel plated.
WIRE: 18 AWG, strand. 65 x 36 T.C. Extra flexible polyvinyl insulation 3.66mm (.144″) O.D.
RATED: 15 amps cont., 30 amps int. 10,000 W VDC.
OPERATING TEMPERATURE: −25°C to +105°C.
***COLORS:** Black, red,

INSULATED SPADE LUG TO BANANA PLUG

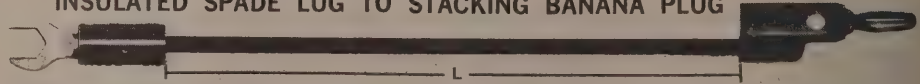


Model No.	Length	Net
1987-12 *	12″	1.95
1987-24 *	24″	1.95
1987-36 *	36″	1.95
1987-48 *	48″	2.05
1987-60 *	60″	2.15

★QUANTITY DISC. CODE A

SPADE LUG: Brass 1/16″ thick, nickel plated.
BANANA PLUG: Spring one piece beryllium copper heat treated, nickel plated.
WIRE: 18 AWG, strand. 65 x 36 T.C. Extra flexible polyvinyl insulation 3,66mm (.144″) O.D.
RATED: 15 amps cont., 30 amps int. 10,000 W VDC.
OPERATING TEMPERATURE: −25°C to +105°C.
***COLORS:** Black, red.

INSULATED SPADE LUG TO STACKING BANANA PLUG

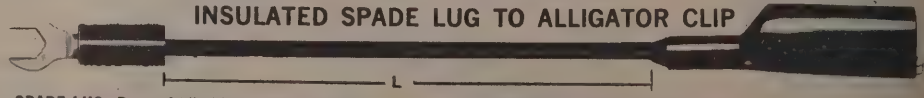


Model No.	Length	Net
1370-12 *	12″	1.95
1370-24 *	24″	1.95
1370-36 *	36″	1.95
1370-48 *	48″	2.05
1370-60 *	60″	2.15

★QUANTITY DISC. CODE A

SPADE LUG: Brass 1/16″ thick, nickel plated.
BANANA PLUG: Spring one piece beryllium copper heat treated, nickel plated.
WIRE: 18 AWG, strand. 65 x 36 T.C. Extra flexible polyvinyl insulation 3.66mm (.144″) O.D.
RATED: 15 amps cont., 30 amps int. 10,000 W VDC.
OPERATING TEMPERATURE: −25°C to +105°C.
***COLORS:** Black, red,

INSULATED SPADE LUG TO ALLIGATOR CLIP



Model No.	Length	Net
1960-12 *	12″	1.95
1960-24 *	24″	1.95
1980-36 *	36″	1.95
1960-48 *	48″	2.05
1960-60 *	60″	2.15

★QUANTITY DISC. CODE A

SPADE LUG: Brass 1/16″ thick, nickel plated.
INSULATOR: Red vinyl with red wire. Black on all other colors.
CLIP: Alligator, steel, cad. plated.
WIRE: 18 AWG, strand. 65 x 36 T.C. Extra flexible polyvinyl insulation 3.66mm (.144″) O.D.
OPERATING TEMPERATURE: −25°C to +105°C.
***COLORS:** Black, red.

★Various lengths may be aggregated for best quantity price. Other lengths available to order. Consult factory for color code part numbers.

PATCH CORDS WITH MOLDED IN-LINE FUSE HOLDERS

POMONA ELECTRONICS

These molded in-line fuse holder patch cords are used as an added safety feature for your electronic test equipment. Fuse holder will accept ¼" dia. SFE and AGC fuses (fuse not included). Fuse holder specifications:

- **MATERIAL:** Brass.
- **FINISH:** Electro-tin plated.
- **INSULATION:** Polyvinylchloride.
- **COLOR:** Red or black.
- **RATINGS** — Banana plugs and wire:
  Operating temperature: 0°C to +105°C.
  Working voltage: 10,000 VDC.
  Current: 15 amps cont., 30 amps int.
  Contact resistance: Less than .001 ohm per banana plug.

STACK-UP BANANA PLUG PATCH CORD

Model No.	Length
4274-12 *	12"
4274-24 *	24"
4274-36 *	36"
4274-48 *	48"
4274-60 *	60"

Multiple stacking feature accommodates the most complex stacking; keeps circuitry neater. Greatly simplifies circuit connections and changes. Reliable solder-bonded connections withstand pull test in excess of 50 lbs. Banana plugs both ends.
***COLORS:** Black, red.

★QUANTITY DISC. CODE A **NET 3.50**

BANANA PLUG PATCH CORD

Model No.	Length
4273-12 *	12"
4273-24 *	24"
4273-36 *	36"
4273-48 *	48"
4273-60 *	60"

Excellent for general lab work. Permits interconnection between test instruments, etc. Banana plugs both ends.
***COLORS:** Black, red.

★QUANTITY DISC. CODE A **NET 3.50**

INSULATED SPADE LUG JUMPER

Model No.	Length
4353-12 *	12"
4353-24 *	24"
4353-36 *	36"
4353-48 *	48"
4353-60 *	60"

Spade lug heavy duty machined one piece brass. Tough thermoplastic molded to spade lug body.
SPADE LUGS: Brass 1/16" thick, nickel plated.
WIRE: 18 AWG, strand. 65 x 36 T.C. Extra flexible polyvinyl insulation 3.66mm (.144") O.D.
***COLORS:** Black, red.

★QUANTITY DISC. CODE A **NET 3.50**

INSULATED ALLIGATOR CLIP LEAD

Model No.	Length
4354-12 *	12"
4354-24 *	24"
4354-36 *	36"
4354-48 *	48"
4354-60 *	60"

CLIP: Alligator, steel, cad. plated.
WIRE: 18 AWG, strand. 65 x 36 T.C. Extra flexible polyvinyl insulation 3.66mm (.144") O.D.
INSULATOR: Red vinyl, black vinyl.
***COLORS:** Black, red.

★QUANTITY DISC. CODE A **NET 3.50**

INSULATED MINIGATOR CLIP LEAD

Model No.	Length
4355-12 *	12"
4355-24 *	24"
4355-36 *	36"
4355-48 *	48"
4355-60 *	60"

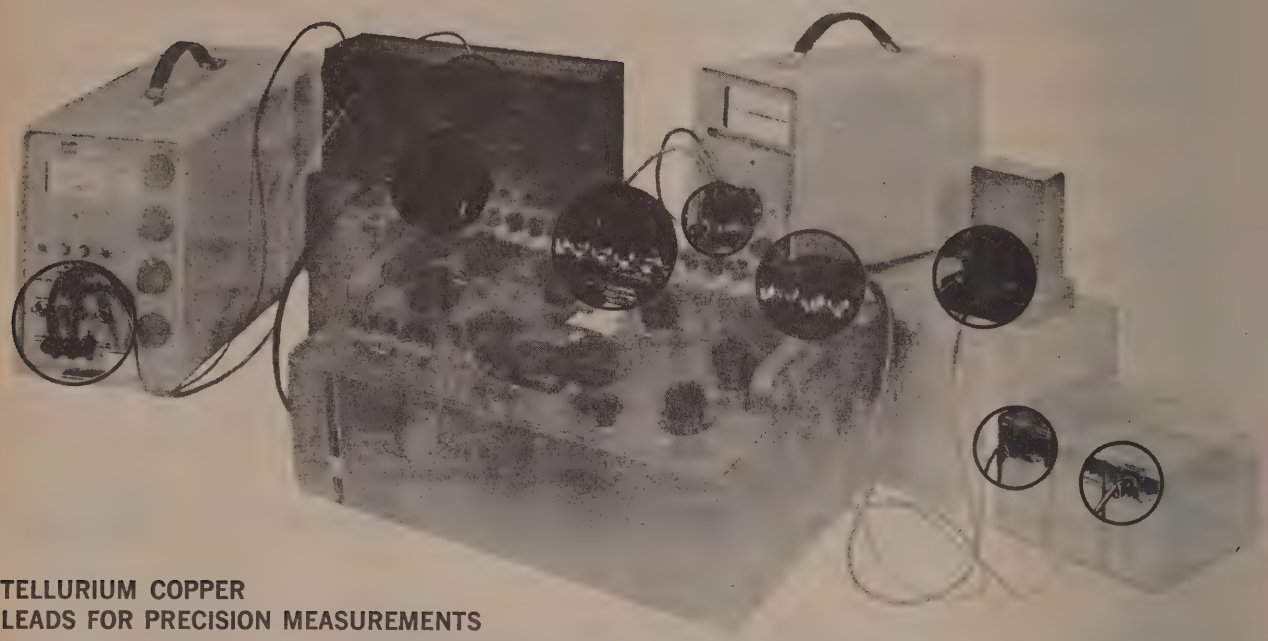
CLIP: Minigator, steel, cad. plated.
WIRE: 18 AWG, strand. 65 x 36 T.C. Extra flexible polyvinyl insulation 3.66mm (.144") O.D.
INSULATOR: Red vinyl, black vinyl.
***COLORS:** Black, red.

★QUANTITY DISC. CODE A **NET 3.50**

★Various lengths may be aggregated for best quantity price. Other lengths available to order.
*Consult factory for color code part numbers.

LOW TERMINAL E.M.F. SPADE LUG JUMPERS

POMONA ELECTRONICS



TELLURIUM COPPER LEADS FOR PRECISION MEASUREMENTS

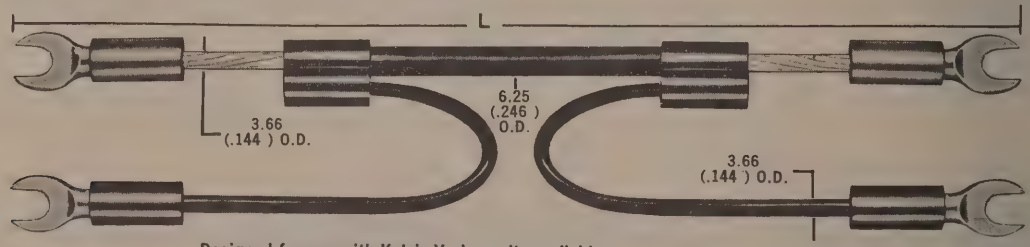
Pomona Electronics has advanced the state of the art in measurements where Thermoelectric Effects are significant sources of error. Comparators designed for use with the Kelvin-Varley voltage divider and microvolt leads were tested with Primary Standards Laboratory equipment.

Thermoelectric voltages were not detected until the most sensitive galvanometer range was used.

Thermoelectric properties — Tellurium copper gold plated spade lugs cold-staked to multi-stranded 12 gauge copper wire minimize thermoelectric effects — an absolute necessity for low voltage, high precision measurements.

Low resistance — 12 gauge multi-stranded copper wire results in extremely low cable resistance. Spade lugs plated with 15 micro inches gold for minimum contact resistance and minimum thermal EMF when using copper binding posts (less than 0.01 μV/°C).

TELLURIUM COPPER SPADE LUGS, SHIELDED LEAD

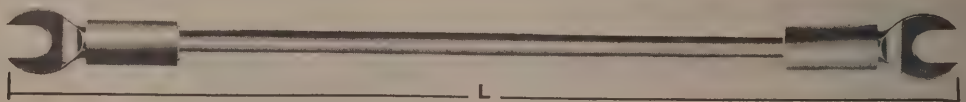


Model No.	Length
1756-24	24″
1756-48	48″

Designed for use with Kelvin-Varley voltage dividers where extreme precision is required for low voltage measurements. Features guard shield to effectively reduce shunt resistance. Tough thermoplastic molded to spade lug body, color; center conductor lug red, shield lug black. Tellurium copper heavy duty one piece stamped spade lug gold plated per MIL-G-45204, Type II, Class I. Center conductor 12 AWG multi-stranded bare copper, shield lead wire, 18 AWG, stranded. Polyethylene primary insulation. Braided shield bare copper. Polyvinyl jacket, color black, per MIL-C-17C Type IIA.

★QUANTITY DISC. CODE A **NET 14.85**

TELLURIUM COPPER SPADE LUG JUMPER



Model No.	Length
1693-12*	12″
1693-18*	18″
1693-24*	24″
1693-36*	36″
1693-48*	48″
1693-60*	60″

Single conductor tellurium copper spade lug jumper used in applications where guard shield is not required. Tough thermoplastic molded to spade lug body. Color matches wire. Tellurium copper heavy duty one piece stamped spade lug, gold plated per MIL-G-45204, Type II, Class I. Conductor, 12 AWG multi-stranded bare copper. Insulation polyvinyl, 105°C, 3.66mm (.144″) O.D.

***COLORS:** Black, red, green.

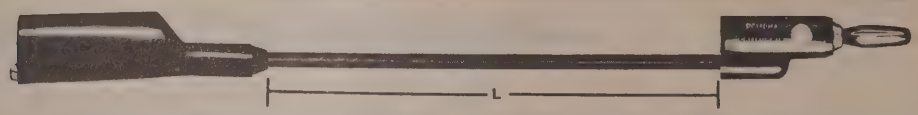
★QUANTITY DISC. CODE A **NET 4.25**

★Various lengths may be aggregated for best quantity price. Other lengths available to order.
*Consult factory for color code part numbers.

CLIP LEADS & TEST PROBES

POMONA ELECTRONICS

ALLIGATOR CLIP TO STACKING BANANA PLUG



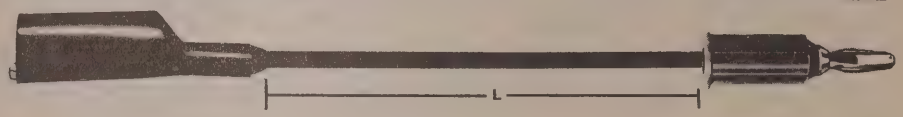
Model No.	Length	Net
1166-4*	4″	1.95
1166-8*	8″	1.95
1166-12*	12″	1.95
1166-24*	24″	1.95
1166-36*	36″	1.95
1166-48*	48″	2.05
1166-60*	60″	2.15

Adapts to equipment using standard banana jacks.
CLIP: Alligator, steel, cadmium plated.
BANANA PLUG: Spring, one piece beryllium copper, heat treated, nickel plated. Tough thermoplastic molded to plug body and wire.

INSULATOR: Red vinyl with red wire. Black on all other colors.
WIRE: 18 AWG, strand. 65 x 36 T.C. Extra flexible polyvinyl insulation 3.66mm (.144″) O.D.
OPERATING TEMPERATURE: −25°C to +105°C.
*COLORS: Black, red.

★QUANTITY DISC. CODE A

ALLIGATOR CLIP LEAD TO BANANA PLUG



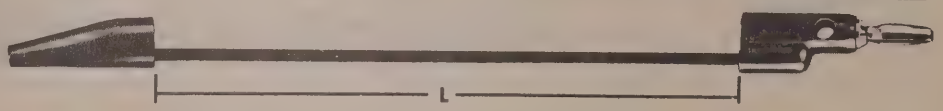
Model No.	Length	Net
1959-4*	4″	1.95
1959-8*	8″	1.95
1959-12*	12″	1.95
1959-24*	24″	1.95
1959-36*	36″	1.95
1959-48*	48″	2.05
1959-60*	60″	2.15

Adapts to equipment using standard banana jacks.
CLIP: Alligator, steel, cadmium plated.
BANANA PLUG: Spring, one piece beryllium copper, heat treated, nickel plated. Tough thermoplastic molded to plug body and wire.

INSULATOR: Red vinyl with red wire. Black on all other colors.
WIRE: 18 AWG, strand. 65 x 36 T.C. Extra flexible polyvinyl insulation 3.66mm (.144″) O.D.
OPERATING TEMPERATURE: −25°C to +105°C.
*COLORS: Black, red.

★QUANTITY DISC. CODE A

MINIGATOR CLIP TO STACKING BANANA PLUG



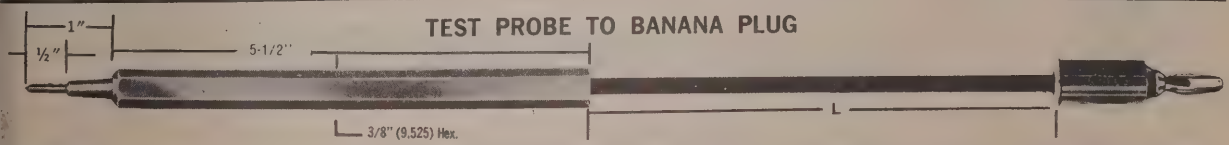
Model No.	Length	Net
3220-4*	4″	1.95
3220-8*	8″	1.95
3220-12*	12″	1.95
3220-24*	24″	1.95
3220-36*	36″	1.95
3220-48*	48″	2.05
3220-60*	60″	2.15

Adapts to equipment using standard banana jacks.
CLIP: Minigator, steel, cadmium plated.
BANANA PLUG: Spring, one piece beryllium copper, heat treated, nickel plated. Tough thermoplastic molded to plug body and wire.

INSULATOR: Red vinyl with red wire. Black on all other colors.
WIRE: 20 AWG, strand. 41 x 36 T.C. Extra flexible polyvinyl insulation 2.21mm (.087″) O.D.
OPERATING TEMPERATURE: −25°C to +105°C.
*COLORS: Black, red.

★QUANTITY DISC. CODE A

TEST PROBE TO BANANA PLUG



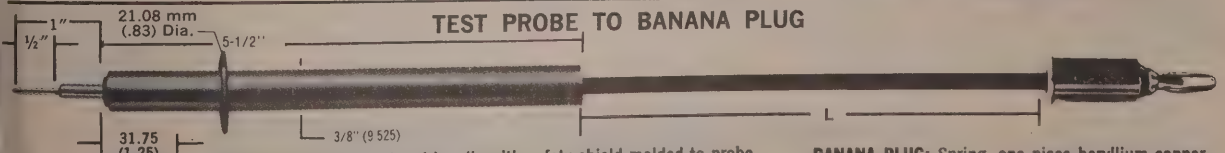
Model No.	Length
1986-36*	36″
1986-48*	48″

Insulated handle molded to probe tip and wire lead.
PROBE PIN TIP: 2.03mm (.080) dia. x ½″ long. Brass nickel plated.
WIRE: 18 AWG, strand. 65 x 36 T.C. Extra flexible polyvinyl insulation. 3.66mm (.144″) O.D.

BANANA PLUG: Spring, one piece beryllium copper, heat treated, nickel plated. Tough thermoplastic molded to body.
*COLORS: Black, red.

QUANTITY DISC. CODE A **NET 3.25**

TEST PROBE TO BANANA PLUG



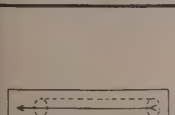
Model No.	Length
4546-36*	36″
4546-48*	48″

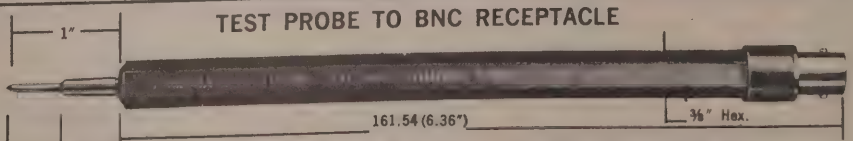
Insulated handle with safety shield molded to probe tip and wire lead.
PROBE PIN TIP: 2.03 mm (.080) dia. x ½″ long. Brass nickel plated.
WIRE: 18 AWG, strand. 65 x 36 T.C. Extra flexible polyvinyl insulation, 3.66 mm (.144″) O.D.

BANANA PLUG: Spring, one piece beryllium copper, heat treated, nickel plated. Tough thermoplastic molded to body.
*COLORS: Black, red.

QUANTITY DISC. CODE A **NET 3.25**

TEST PROBE TO BNC RECEPTACLE





Model No.	Color
1748-0	Black
1748-2	Red

BNC receptacle in handle connected to tip. Permits the use of coaxial cables with BNC plug for circuit testing as a test prod. Tough thermoplastic molded to BNC receptacle and tip. Shield extends to within 1½″ of the probe tip end.
PIN TIP: 2.03mm (.080) dia. x ½″ long, brass, nickel plated.
RECEPTACLE: BNC, UG1094/U.

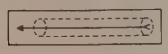
QUANTITY DISC. CODE A **NET 6.50**

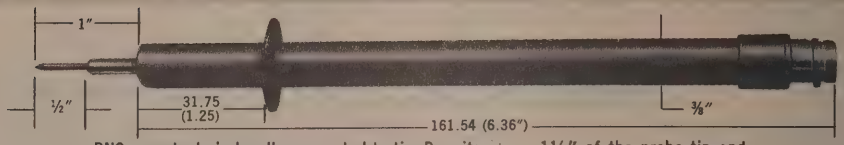
★Various lengths may be aggregated for best quantity price. Other lengths available to order.
*Consult factory for color code part numbers.

TEST PROBES

POMONA ELECTRONICS

TEST PROBE TO BNC RECEPTACLE





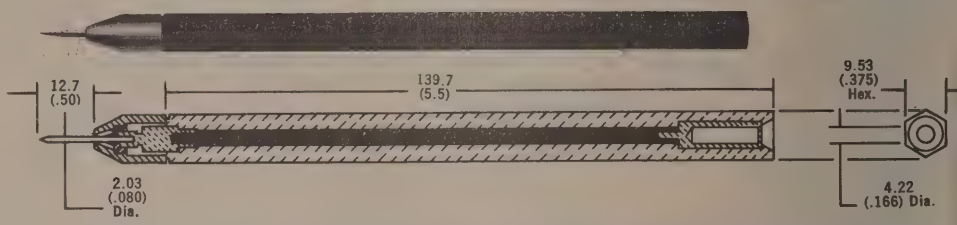
Model No.	Color
4548-0	Black
4548-2	Red

BNC receptacle in handle connected to tip. Permits the use of coaxial cables with BNC plug for circuit testing as a test prod. Tough thermoplastic molded to BNC receptacle and tip. Shield extends to within 1½" of the probe tip end.

PIN TIP: 2.03mm (.080) dia. x ½" long, brass, nickel plated.
RECEPTACLE: BNC, UG1094/U.

QUANTITY DISC. CODE **A** **NET 6.50**

NEEDLE TIP PROBE TO BANANA JACK



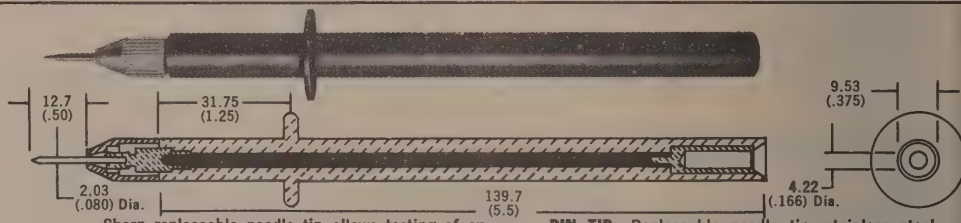
Model No.	Color
1705-0	Black
1705-2	Red

Sharp replaceable needle tip allows testing of encapsulated circuits. Banana jack in handle connected to tip. Permits use of standard banana plugs for circuit testing as a test prod. Heavy duty insulated handle molded to banana jack and tip.

PIN TIP: Replaceable needle tip, stainless steel. Needle tip nut insulated.
BANANA JACK: 4.22mm (.166) dia. brass nickel plated. Accepts standard banana plug.

★QUANTITY DISC. CODE **A** **NET 1.95**

NEEDLE TIP PROBE TO BANANA JACK



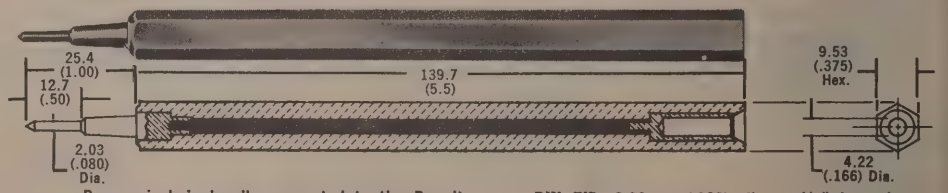
Model No.	Color
4545-0	Black
4545-2	Red

Sharp replaceable needle tip allows testing of encapsulated circuits. Banana jack in handle connected to tip. Permits use of standard banana plugs for circuit testing as a test prod. Heavy duty insulated handle with safety shield molded to banana jack and tip.

PIN TIP: Replaceable needle tip, stainless steel. Needle tip nut insulated.
BANANA JACK: 4.22 mm (.166) dia. brass nickel plated. Accepts standard banana plug.

★QUANTITY DISC CODE **A** **NET 1.95**

TEST PROBE TO BANANA JACK



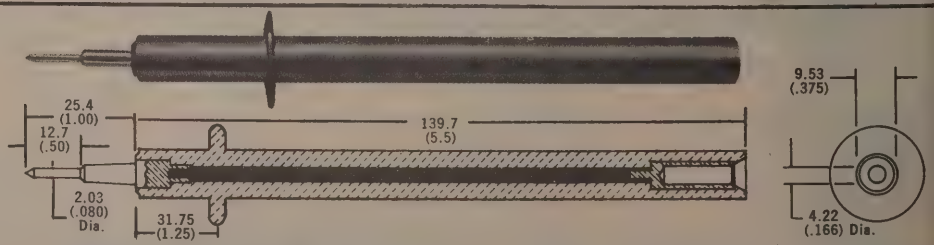
Model No.	Color
1589-0	Black
1589-2	Red

Banana jack in handle connected to tip. Permits use of standard banana plugs for circuit testing as a test prod. Heavy duty insulated handle molded to banana jack and tip.

PIN TIP: 2.03mm (.080) dia. x ½" long, brass nickel plated.
BANANA JACK: 4.22mm (.166) dia. brass nickel plated. Accepts standard banana plug.

★QUANTITY DISC. CODE **A** **NET 1.95**

TEST PROBE TO BANANA JACK



Model No.	Color
4572-0	Black
4572-2	Red

Banana jack in handle connected to tip. Permits use of standard banana plugs for circuit testing as a test prod. Heavy duty insulated handle with safety shield molded to banana jack and tip.

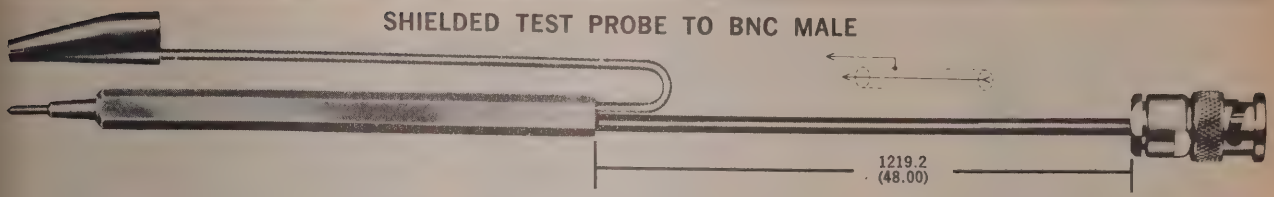
PIN TIP: 2.03 mm (.080) dia. x ½" long, brass nickel plated.
BANANA JACK: 4.22 mm (.166) dia. brass nickel plated. Accepts standard banana plug.

★QUANTITY DISC CODE **A** **NET 1.95**

TEST PROBES

POMONA ELECTRONICS

SHIELDED TEST PROBE TO BNC MALE



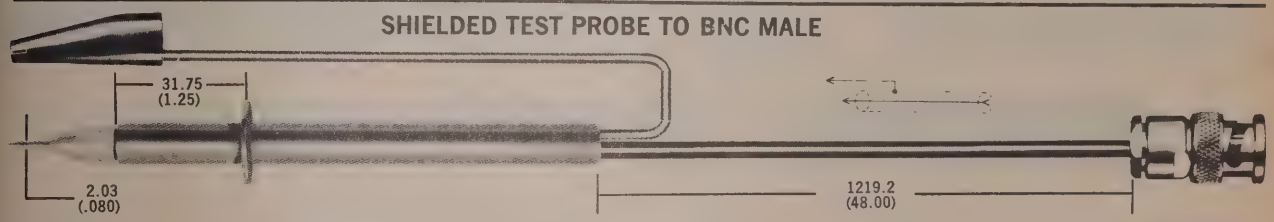
Model No.	Length
2739-C-48	48″

A shielded test probe with the shield extending to within 1½″ of the probe tip end. One piece molded construction. Insulated handle molded to probe tip and cable. Insulated minigator clip connected to shield lead.
PROBE PIN TIP: 2.03mm (.080) dia. x ½″ long. Brass nickel plated.
CONNECTOR: BNC male, M39012/16-0001

CLIP: Minigator, steel, cadmium plated.
INSULATOR, VINYL: Color, black.
CABLE: Shielded coax., RG58C/U, polyethylene insulation. Vinyl jacket, 4.95mm (.195″) O.D., nom. Cap. 28.5 pf/ft.
HANDLE: Color, red, molded of tough thermoplastic.

QUANTITY DISC. CODE **B** **NET 8.50**

SHIELDED TEST PROBE TO BNC MALE



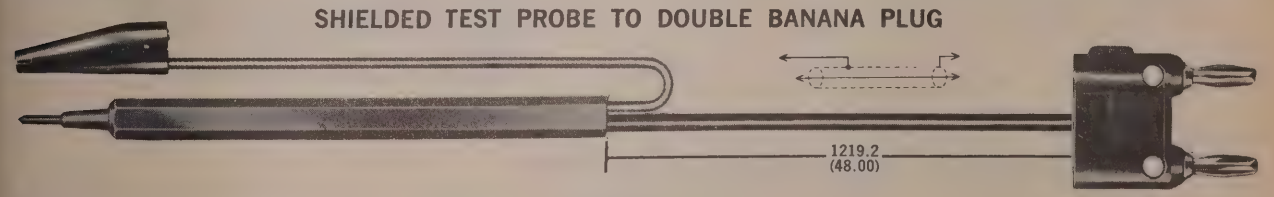
Model No.	Length
4539-48	48″

A shielded test probe with the shield extending to within 1½″ of the probe tip end. One piece molded construction. Insulated handle molded to probe tip and cable. Insulated minigator clip connected to shield lead.
PIN TIP: Replaceable needle tip, stainless steel. Needle tip nut insulated.
CONNECTOR: BNC male, M39012/16-0001

CLIP: Minigator, steel, cadmium plated.
INSULATOR, VINYL: Color, black.
CABLE: Shielded coax., RG58C/U, polyethylene insulation. Vinyl jacket, 4.95mm (.195″) O.D., nom. Cap. 28.5 pf/ft.
HANDLE: Color, red, molded of tough thermoplastic.

QUANTITY DISC. CODE **B** **NET 8.50**

SHIELDED TEST PROBE TO DOUBLE BANANA PLUG



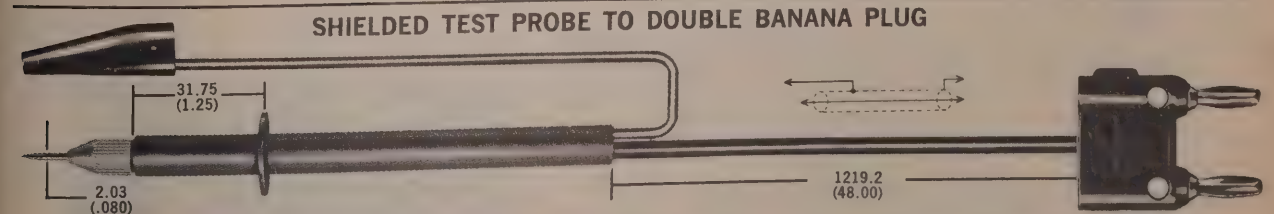
Model No.	Length
1569-C-48	48″

A shielded test probe with the shield extending to within 1½″ of the probe tip end. One piece molded construction. Insulated handle molded to probe tip and cable. Insulated minigator clip connected to shield lead.
PROBE PIN TIP: 2.03mm (.080) dia. x ½″ long. Brass nickel plated.
DOUBLE BANANA PLUG: On ¾″ centers. Spring, one piece beryllium copper, heat treated, nickel plated.

Tough thermoplastic molded to double plug body. Color, black.
CLIP: Minigator, steel, cadmium plated.
INSULATOR, VINYL: Color, black.
CABLE: Shielded coax., RG58C/U, polyethylene insulation. Vinyl jacket, 4.95mm (.195″) O.D., nom. Cap. 28.5 pf/ft.
HANDLE: Color, red, molded of tough thermoplastic.

QUANTITY DISC. CODE **B** **NET 8.95**

SHIELDED TEST PROBE TO DOUBLE BANANA PLUG



Model No.	Length
4569-48	48″

A shielded test probe with the shield extending to within 1½″ of the probe tip end. One piece molded construction. Insulated handle molded to probe tip and cable. Insulated minigator clip connected to shield lead.
PIN TIP: Replaceable needle tip, stainless steel. Needle tip nut insulated.
DOUBLE BANANA PLUG: On ¾″ centers. Spring, one piece beryllium copper, heat treated, nickel plated.

Tough thermoplastic molded to double plug body. Color, black.
CLIP: Minigator, steel, cadmium plated.
INSULATOR, VINYL: Color, black.
CABLE: Shielded coax., RG58C/U, polyethylene insulation. Vinyl jacket, 4.95mm (.195″) O.D., nom. Cap. 28.5 pf/ft.
HANDLE: Color, red, molded of tough thermoplastic.

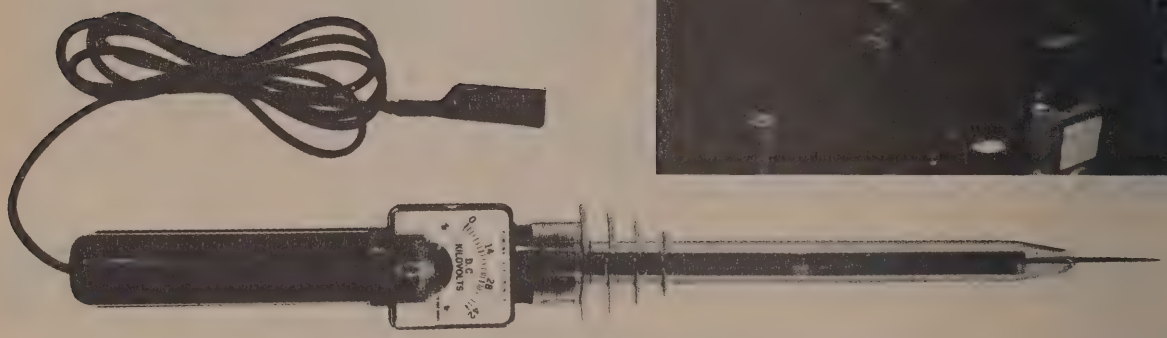
QUANTITY DISC. CODE **B** **NET 8.95**

Other lengths available to order.

HIGH VOLTAGE TEST PROBES

POMONA ELECTRONICS

Pomona Electronics developed and introduced the first high voltage test probe with built-in meter in 1967. Now we offer five D.C. high voltage probes and one A.C. high voltage probe.



TEST VOLTAGES UP TO 42 KV ON COLOR & BLACK & WHITE TELEVISION SETS — USING THIS ONE SELF-CONTAINED INSTRUMENT

The Model 4242 is for testing existing television sets (color or black & white), plus new and future models with voltages up to 42 KV.

It is easy to make high voltage adjustments in the home without carrying bulk equipment. Ground the probe to TV chassis with alligator clip, contact test probe top to high voltage anode, read voltage indicated on built-in meter, and make adjustments as required. On-off switch in handle protects meter when not in use.

SPECIFICATIONS:

- **RANGE:** 42,000 VDC.
- **SENSITIVITY:** 20,000 ohms/volt.
- **METER MOVEMENT:** 50 μa.
- **ACCURACY:** ±2% full scale.
- **MULTIPLIER RESISTANCE:** 840 megohm ±2%
- **MATERIAL:** Handle and probe Lexan*.
- **LENGTH:** 14¾" overall.
- **WEIGHT:** 8¼ ounces.

Model No.
4242-A

★ QUANTITY DISC. CODE C **NET 24.95**

42 KV — HIGH VOLTAGE PROBE — DESIGNED TO BE USED ON POSITIVE OR NEGATIVE GROUNDED EQUIPMENT

The Model 4250 has a built-in reversing switch to change the probe from reading a positive voltage to a negative voltage.

SPECIFICATIONS:

- **RANGE:** 42,000 VDC.
- **SENSITIVITY:** 20,000 ohms/volt.
- **METER MOVEMENT:** 50 μa.
- **ACCURACY:** ±2% full scale.
- **MULTIPLIER RESISTANCE:** 840 megohm ±2%
- **MATERIAL:** Handle and probe Lexan*.
- **LENGTH:** 14¾" overall.
- **WEIGHT:** 8¼ ounces.

Model No.
4250

★QUANTITY DISC. CODE C **NET 49.95**

CARRYING CASE FOR ALL HIGH VOLTAGE PROBES

A quality built carrying case for protection of your high voltage probe. The case is made of tough thermoplastic. The inside is lined with soft, shock absorbing material. All of the above probes fit in this protective carrying case.

Model No.
3295

★QUANTITY DISC. CODE D **NET 5.95**

*Lexan is a trademark of General Electric.

★Various lengths may be aggregated for best quantity price. Other lengths available to order.

HIGH VOLTAGE TEST PROBES

POMONA ELECTRONICS

heck Ionizer screen for voltage

Check transformer operation

Probe fits in optional carrying case

VOLTAGES UP TO 15 KV — DESIGNED TO TROUBLESHOOT ELECTRONIC AIR CLEANER SYSTEM MALFUNCTIONS

The Model 3157 High Voltage Test Probe is designed to speed and simplify the servicing of electronic air cleaner systems. It replaces heavy, bulky old fashiond voltmeters with a modern, compact hand-held instrument which a serviceman can carry in his tool case. He can use it to check for ionizer screen continuity, line opens, transformer failure, or other component malfunctions in less than a minute. Extended probe tip gets into those hard-to-reach places with ease. Unit is priced so low that every serviceman can carry his own probe.

SPECIFICATIONS:

- **RANGE:** 15,000 VDC.
- **SENSITIVITY:** 20,000 ohms/volt.
- **METER MOVEMENT:** 50 μa.
- **ACCURACY:** ±3% full scale.
- **MULTIPLIER RESISTANCE:** 300 megohm ±2%.
- **MATERIAL:** Handle and probe Lexan*.
- **LENGTH:** 14¾" overall.
- **WEIGHT:** 8¼ ounces.

Model No.
3157

★ QUANTITY DISC. CODE C **NET 24.95**

15 KV — HIGH VOLTAGE PROBE — DESIGNED TO BE USED ON POSITIVE OR NEGATIVE GROUNDED EQUIPMENT

The Model 4475 has a built-in reversing switch to change the probe from reading a positive voltage to a negative voltage.

SPECIFICATIONS:

- **RANGE:** 15,000 VDC.
- **SENSITIVITY:** 20,000 ohms/volt.
- **METER MOVEMENT:** 50 μa.
- **ACCURACY:** ±3% full scale.
- **MULTIPLIER RESISTANCE:** 300 megohm ±2%.
- **MATERIAL:** Handle and probe Lexan*.
- **LENGTH:** 14¾" overall.
- **WEIGHT:** 8¼ ounces.

Model No.
4475

★ QUANTITY DISC. CODE C **NET 49.95**

10 KV AC HIGH VOLTAGE TEST PROBE WITH BUILT-IN METER

This AC high voltage probe is excellent for testing of high potential AC voltages such as neon sign transformers, Hi-pot testers, etc. Shielded meter movement for protection from stray magnetic fields. Probe is supplied with Model 3295 carrying case.

Easy to operate! Just ground the test probe instrument by attaching alligator clip to chassis, contact test probe tip to high voltage being measured and read voltage from the built-in meter. No warm-up time. No batteries.

SPECIFICATIONS:

- **RANGE:** 10,000 VAC.
- **SENSITIVITY:** 2,000 ohms/volt (500 μA) movement.
- **ACCURACY:** ±3% 30 Hz to 1,000 Hz.
- **MULTIPLIER RESISTANCE:** 20 megohm ±2%.
- **MATERIAL:** Handle and probe Lexan*.
- **LENGTH:** 14¾" overall.
- **WEIGHT:** 8 ounces.

Model No.
3200

★ QUANTITY DISC. CODE C **NET 34.50**

15 KV POSITIVE GROUND HIGH VOLTAGE PROBE

The Model 4312 has been designed with a positive ground for use in microwave oven repair.

SPECIFICATIONS:

- **RANGE:** 15,000 VDC.
- **SENSITIVITY:** 20,000 ohms/volt.
- **METER MOVEMENT:** 50 μa.
- **ACCURACY:** ±2% full scale.
- **MULTIPLIER RESISTANCE:** 300 megohm ±2%.
- **MATERIAL:** Handle and probe Lexan*.
- **LENGTH:** 14¾" overall.
- **WEIGHT:** 8¼ ounces.

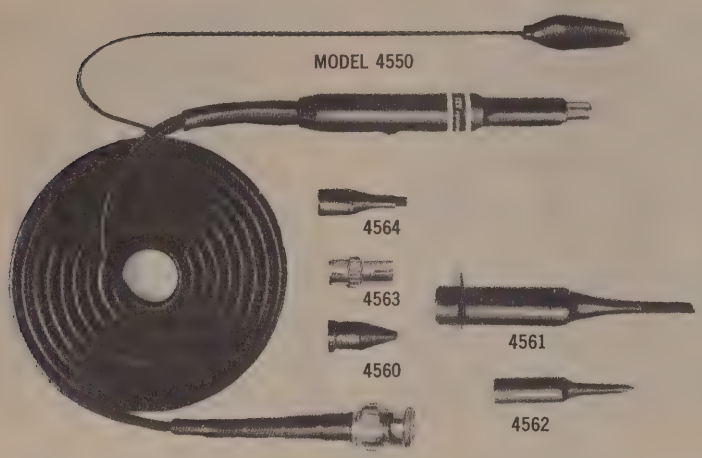
Model No.
4312

★ QUANTITY DISC. CODE C **NET 24.95**

*Lexan is a trademark of General Electric.
★Various lengths may be aggregated for best quantity price. Other lengths available to order.

OSCILLOSCOPE PROBE KIT

POMONA ELECTRONICS



ACCESSORIES SUPPLIED WITH MODEL 4550 PROBE KIT.

Insulating Tip	4560
Sprung Hook	4561
Trimmer Tool	4562
BNC Adaptor	4563
I.C. Tip	4564

This passive probe incorporates a three-position slide switch in the head and has a cable length of 1.5 metres (4.92 ft.). The specification is as follows:

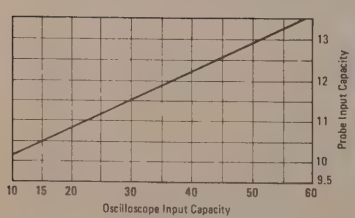
Position x 1

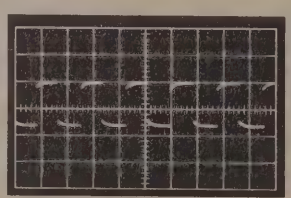
Bandwidth:	D.C. to 10MHz
Input Resistance:	1MΩ (oscilloscope input)
Input Capacity:	40pF. Plus oscilloscope capacity
Working Voltage:	600 Volts D.C. (including Peak A.C.)
Cable Length:	1.5 meters (4.92 ft.)

Position Ref.
Probe top grounded via 9MΩ resistor, oscilloscope input grounded

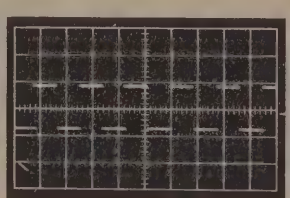
Position x 10

Bandwidth:	D.C. to 100 MHz
Risetime:	3.5 nanoseconds
Input Resistance:	10MΩ when used with oscilloscopes which have 1MΩ input. (Probe resistance 9MΩ ±1%)
Input Capacity:	11.5pF when used with oscilloscopes which have a 30pF input capacity For other values see graph.
Compensation Range:	10-60pF
Working Voltage:	600 Volts D.C. (including Peak A.C.)

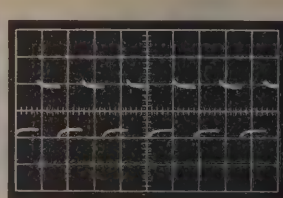




Undercompensated



Correct



Overcompensated

Model No.
4550

★QUANTITY DISCOUNT CODE **D** **NET 44.95**

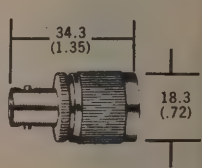
REPLACEMENT ACCESSORIES FOR OSCILLOSCOPE PROBES

Model No.	Description	Net
4560	Insulating Tip	.50
4561	Sprung Hook	6.85
4562	Trimmer Tool	.75
4563	BNC Adaptor	1.70
4564	I.C. Tip	1.30

QUANTITY DISC. CODE **A**

BNC JACK TO UHF PLUG

Allows the use of a BNC plug on equipment having a UHF jack.



FEATURES:
- Non-tarnish finish.
- Rexolite insulation.
- Gold flashed beryllium copper female contact.
- Gold flashed male contact.

Model No.
3286

QUANTITY DISC. CODE **A** **NET 2.95**

MOLDED BREAKOUTS

POMONA ELECTRONICS

A new series of "Breakouts," designed to convert standard coaxial cables to test cables.

By connecting proper breakout receptacle or plug to corresponding cable plug or receptacle, any standard coaxial cable becomes a test cable equipped with clip leads.

All connections feature a non-tarnish finish, and tough thermoplastic insulation molded to connector and wire.

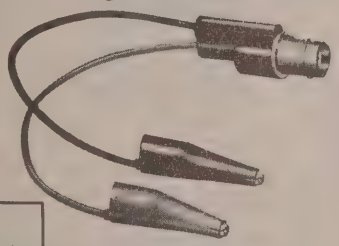
SPECIFICATIONS:

- **WIRE:** (With alligator clips) 18 AWG, strand. 65 x 36 T.C. Extra flexible polyvinyl insulation, 4.22mm (.144") O.D.
- **WIRE:** (With minigator clips) 20 AWG, strand. 41 x 36 T.C. Extra flexible polyvinyl insulation, 2.21mm (.087") O.D.
- **OPERATING TEMPERATURE:** −25°C to +85°C.
- **WORKING VOLTAGE:** 500 V peak.

BNC RECEPTACLE TO TEST CLIPS

CONNECTOR: BNC receptacle, UG1094/U.
INSULATION: Tough thermoplastic molded to connector and wire.
WIRE: See above.
TEST CLIPS: Minigator or alligator, steel, cad. plated. Insulators, Vinyl: 1 black, 1 red.

OVERALL LENGTH 177.8mm (7")



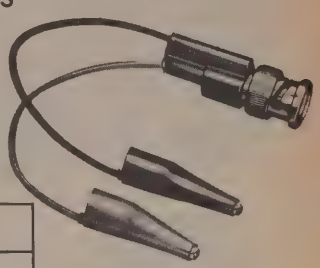
Model No.	
2630	(Alligator Clips)
2631	(Minigator Clips)

QUANTITY DISC. CODE A **NET 3.75**

BNC PLUG TO TEST CLIPS

CONNECTOR: BNC plug.
INSULATION: Tough thermoplastic molded to connector and wire.
WIRE: See above.
TEST CLIPS: Minigator or alligator, steel, cad. plated. Insulators, Vinyl: 1 black, 1 red.

OVERALL LENGTH 177.8mm (7")



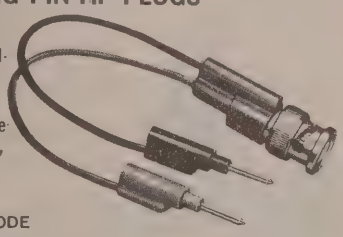
Model No.	
2885	(Alligator Clips)
2886	(Minigator Clips)

QUANTITY DISC. CODE A **NET 4.95**

BNC PLUG TO STACKING PIN TIP PLUGS

CONNECTOR: BNC plug.
INSULATION: Tough thermoplastic molded to connector and wire.
WIRE: See above, 20 AWG.
STACKING PIN TIP PLUGS: 2 single plugs, 2.03mm (.080) dia.: 1 black, 1 red.

OVERALL LENGTH 177.8mm (7")

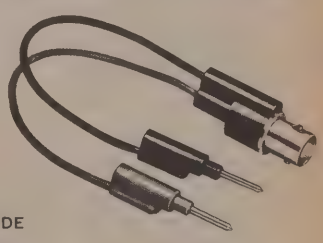


Model No.	QUANTITY DISC. CODE
3901	A **NET 4.95**

BNC RECEPTACLE TO STACKING PIN TIP PLUGS

CONNECTOR: BNC receptacle, UG1094/U.
INSULATION: Tough thermoplastic molded to connector and wire.
WIRE: See above, 20 AWG.
STACKING PIN TIP PLUGS: 2 single plugs, 2.03mm (.080) dia.: 1 black, 1 red.

OVERALL LENGTH 177.8mm (7")

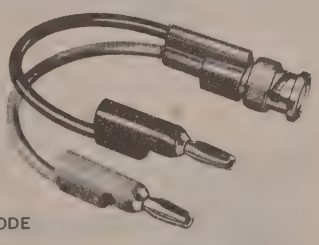


Model No.	QUANTITY DISC. CODE
3221	A **NET 3.85**

BNC PLUG TO STACKING BANANA PLUGS

CONNECTOR: BNC plug.
INSULATION: Tough thermoplastic molded to connector and wire.
WIRE: See above, 18 AWG.
STACKING BANANA PLUGS: Spring, one piece heat-treated beryllium copper, nickel plated: 1 black, 1 red.

OVERALL LENGTH 177.8mm (7")

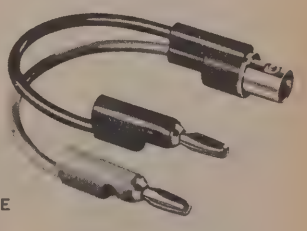


Model No.	QUANTITY DISC. CODE
3957	A **NET 4.95**

BNC RECEPTACLE TO STACKING BANANA PLUGS

CONNECTOR: BNC receptacle, UG1094/U.
INSULATION: Tough thermoplastic molded to connector and wire.
WIRE: See above, 18 AWG.
STACKING BANANA PLUGS: Spring, one piece heat-treated beryllium copper, nickel plated: 1 black, 1 red.

OVERALL LENGTH 177.8mm (7")

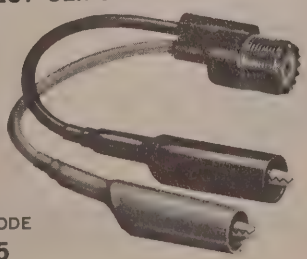


Model No.	QUANTITY DISC. CODE
3073	A **NET 3.85**

UHF RECEPTACLE TO TEST CLIPS

CONNECTOR: UHF receptacle jack.
INSULATION: Tough thermoplastic molded to connector and wire.
WIRE: See above.
TEST CLIPS: Alligator, steel, cad. plated. Insulators, Vinyl: 1 black, 1 red.

OVERALL LENGTH 177.8mm (7")

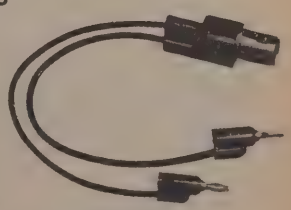


Model No.	QUANTITY DISC. CODE
2632	A **NET 5.45**

BNC RECEPTACLE TO MINIATURE STACKING BANANA PLUGS

CONNECTOR: BNC receptacle, UG1094/U.
INSULATION: Tough thermoplastic molded to connector and wire.
WIRE: See above, 20 AWG.
MINIATURE STACKING BANANA PLUGS: For use with 2.64mm (.104) dia. jacks. Spring, one piece beryllium copper, gold plated: 1 black, 1 red.

OVERALL LENGTH 177.8mm (7")



Model No.	QUANTITY DISC. CODE
3966	A **NET 4.50**

PHONO JACK TO TEST CLIPS

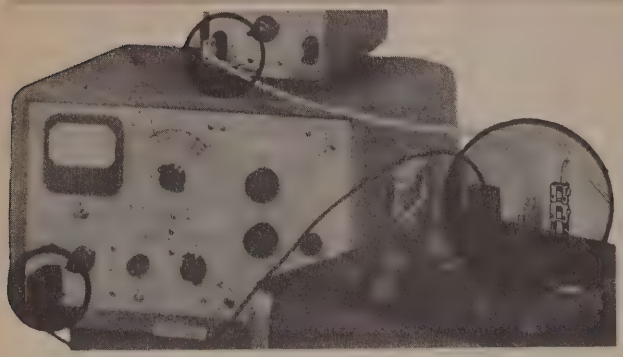
CONNECTOR: Phono receptacle.
INSULATION: Tough thermoplastic molded to connector and wire.
WIRE: See above.
TEST CLIPS: Minigator steel, cad. plated. Insulators, Vinyl: 1 black, 1 red.
OVERALL LENGTH: 177.8 mm (7").

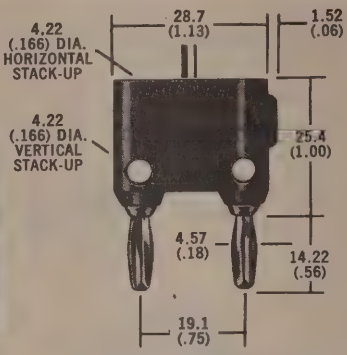
Model No.
4515

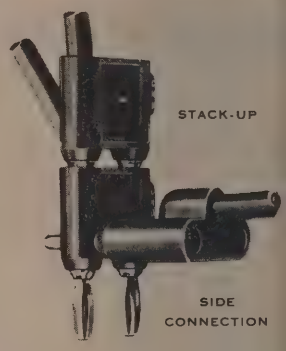
QUANTITY DISC. CODE A **NET 4.95**

¾" DOUBLE BANANA PLUG PATCH CORDS

POMONA ELECTRONICS







These patch cords are indispensable for bridge transformer connections, three terminal capacitor measurements and general hook-up for two wire systems. They are horizontally and vertically stackable in parallel. Tough thermoplastic material molded to plug body and cable insures maximum strength, moisture resistance and excellent insulative properties. Used by leading industries in applications where extreme reliability is of prime importance.

FEATURES:

- One piece beryllium copper heat treated spring for long life.
- Rounded spring design results in maximum contact area.
- GND., clearly molded on plug body and shell.
- Solder-bonded noise-free connections.

SPECIFICATIONS:

- Fits standard 4.22mm (.166) dia. banana jacks, on ¾" centers.
- Contact resistance less than 0.001 ohms per plug.
- Spring beryllium copper Brylco 25 per QQ-C-533.
- Plug body brass per QQ-B-626, alloy #360
- Nickel plated per QQ-N-290, Class 2.

CABLE TYPE DESCRIPTION

Two cond. twisted pair: 18 AWG, strand. 65 x 36 T.C. vinyl insulation. Vinyl jacket, 6.35mm (.250") O.D. Nom. Cap. 30 pf/ft.
Color: Gray.
Shielded microphone cable: Polyethylene insulation. Vinyl jacket, 4.95mm (.195") O.D. nom. cap 25 pf/ft.
Color: Gray.

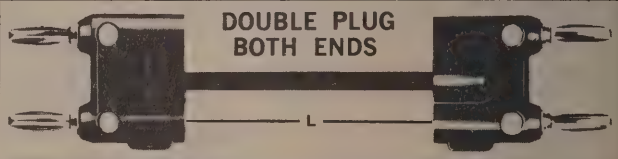
SHIELDED COAXIAL CABLE

Polyethylene insulation, vinyl jacket.

Types	RG58C/U	RG59B/U	RG62A/U
Color	Black	Black	Black
Nom. Imp.	50	75	93
Cap. pf/ft.	30	21	13.5
O.D.	4.93mm (.195)	6.15mm (.242)	6.15mm (.242)

NOTE: Molded double plug matches color of cable. Two cond. twisted pair, gray. Shielded mic. cable, gray. Coaxial RG58C/U cable, black.

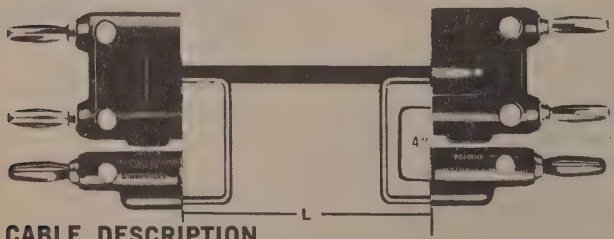
DOUBLE PLUG BOTH ENDS



Two Cond. Twisted Pr.	Shielded Mic. Cable	RG58C/U	RG59B/U	Length
2BA-18	2BB-18	2BC-18	2BE-18	18"
2BA-24	2BB-24	2BC-24	2BE-24	24"
2BA-30	2BB-30	2BC-30	2BE-30	30"
2BA-36	2BB-36	2BC-36	2BE-36	36"
2BA-48	2BB-48	2BC-48	2BE-48	48"
2BA-60	2BB-60	2BC-60	2BE-60	60"

★QUANTITY DISC. CODE B **NET 5.95**

TWO COND. SHIELDED BALANCED LINE



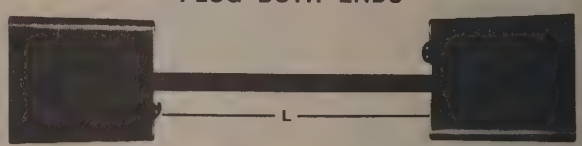
CABLE DESCRIPTION

Two cond. shielded mic. cable. Polyethylene insulation. Vinyl jacket, 6.12mm (.241") O.D. nom. cap. between cond. 18 pf/ft. nom. cap. between one cond. and remaining cond. connected to shield, 32 pf/ft. Color: Cable and double plug, gray. Single ground plug, green.

Model No.	Length	Model No.	Length
1167-18	18"	1167-36	36"
1167-24	24"	1167-48	48"
1167-30	30"	1167-60	60"

★QUANTITY DISC. CODE B **NET 11.85**

SHIELDED DOUBLE PLUG BOTH ENDS

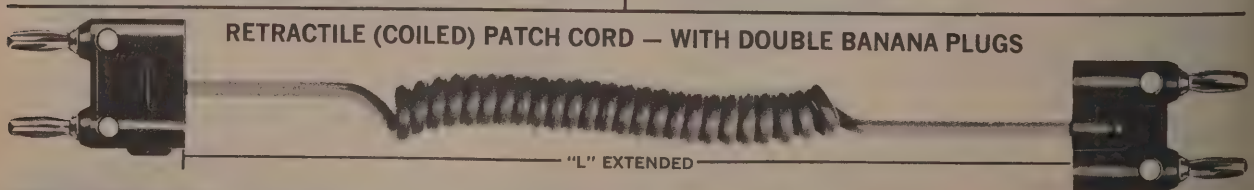


Shielded double plug — black anodized aluminum.

Model No.	Length
1550-C-18	18"
1550-C-24	24"
1550-C-30	30"
1550-C-36	36"
1550-C-48	48"
1550-C-60	60"

★QUANTITY DISC. CODE B **NET 12.85**

RETRACTILE (COILED) PATCH CORD — WITH DOUBLE BANANA PLUGS



DOUBLE BANANA PLUGS: On ¾" centers. Spring, one piece beryllium copper, heat treated, nickel plated. Tough thermoplastic molded to plug bodies and cable. Color: Black.
CABLE: Shielded microphone. Center conductor 24 AWG (45 x 40), rubber insulated Spiral T.C. shield with neoprene jacket 4.06 mm (.160) O.D. Color: Black.

Model No.	Length
3864-48	48"
3864-60	60"
3864-72	72"

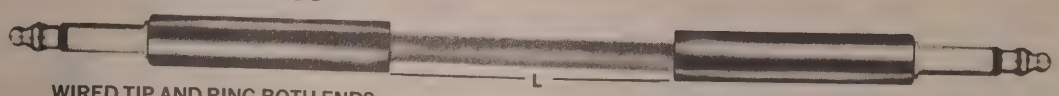
QUANTITY DISC. CODE B **NET 9.85**

★Various lengths may be aggregated for best quantity price.

PATCH CORDS & CABLE ASSEMBLIES

POMONA ELECTRONICS

PJ-051* PHONE PLUG BOTH ENDS



WIRED TIP AND RING BOTH ENDS

Cable Description:
Two cond. twisted pair. 18 AWG, strand. 65 x 36 T.C. vinyl insulation. Vinyl jacket 6.35mm (.250") O.D. nom. cap. 30 pf/ft. Color: Cable, gray. Phone plug handle, red.

Model No.	Length
2524-A-18	18"
2524-A-24	24"
2524-A-36	36"
2524-A-48	48"
2524-A-60	60"

*PJ-051 interchangeable with WE310.

★QUANTITY DISC. CODE B **NET 11.50**

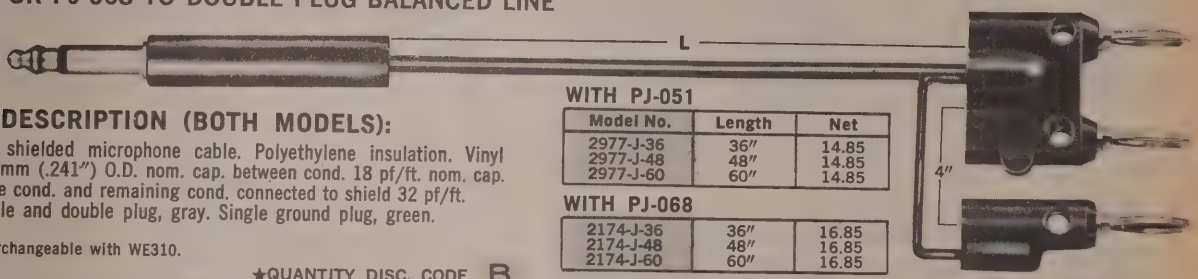
WIRED TIP, RING AND SLEEVE BOTH ENDS

Cable Description:
Two cond. shielded microphone cable. Polyethylene insulation. Vinyl jacket. 6.12mm (.241") O.D. nom. cap. between cond. 18 pf/ft. nom. cap. between one cond. and remaining cond. connected to shield, 32 pf/ft. Color: Cable, gray. Phone plug handle, red.

Model No.	Length
2524-J-18	18"
2524-J-24	24"
2524-J-36	36"
2524-J-48	48"
2524-J-60	60"

★QUANTITY DISC. CODE B **NET 14.85**

PJ-051* OR PJ-068 TO DOUBLE PLUG BALANCED LINE



CABLE DESCRIPTION (BOTH MODELS):

Two cond. shielded microphone cable. Polyethylene insulation. Vinyl jacket, 6.12mm (.241") O.D. nom. cap. between cond. 18 pf/ft. nom. cap. between one cond. and remaining cond. connected to shield 32 pf/ft. Colors: Cable and double plug, gray. Single ground plug, green.

*PJ-051 interchangeable with WE310.

★QUANTITY DISC. CODE B

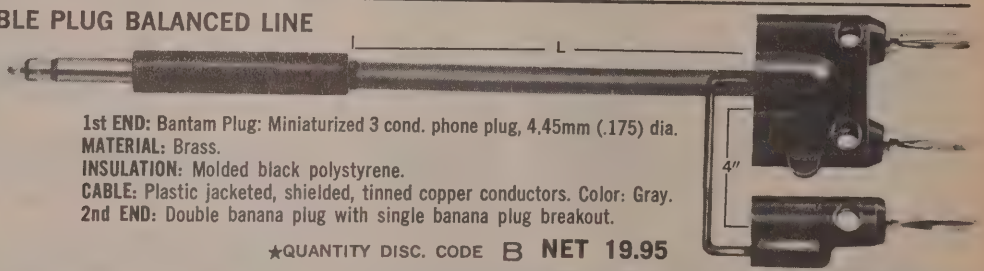
WITH PJ-051

Model No.	Length	Net
2977-J-36	36"	14.85
2977-J-48	48"	14.85
2977-J-60	60"	14.85

WITH PJ-068

2174-J-36	36"	16.85
2174-J-48	48"	16.85
2174-J-60	60"	16.85

BANTAM PLUG TO DOUBLE PLUG BALANCED LINE

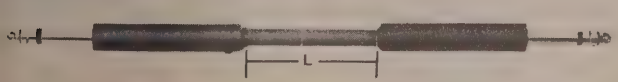


Model No.	Length
4281-12	12"
4281-24	24"
4281-36	36"
4281-48	48"
4281-60	60"

1st END: Bantam Plug: Miniaturized 3 cond. phone plug, 4.45mm (.175) dia.
MATERIAL: Brass.
INSULATION: Molded black polystyrene.
CABLE: Plastic jacketed, shielded, tinned copper conductors. Color: Gray.
2nd END: Double banana plug with single banana plug breakout.

★QUANTITY DISC. CODE B **NET 19.95**

BANTAM PLUG TO BANTAM PLUG

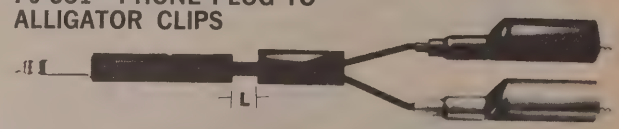


Miniaturized 3 cond. phone plug, 4.45mm (.175) dia. Both ends.
MATERIAL: Brass.
INSULATION: Molded black polystyrene.
CABLE: Plastic jacketed, shielded, tinned copper conductors. Color: Gray.

Model No.	Length	Model No.	Length
4279-12	12"	4279-48	48"
4279-24	24"	4279-60	60"
4279-36	36"		

★QUANTITY DISC. CODE B **NET 16.85**

PJ-051* PHONE PLUG TO ALLIGATOR CLIPS



Plug wired tip to red alligator and ring to black alligator.
PHONE PLUG: PJ-051 with red handle.
CLIPS: Alligator, steel, cadmium plated.
INSULATORS: Vinyl, 1 red and 1 black.

Model No.	Length	Net
3352-A-36	36"	11.50
3352-A-60	60"	11.50
3352-A-84	84"	13.50
3352-A-120	120"	14.85

*PJ-051 interchangeable with WE310.

CABLE DESCRIPTION:
Two cond. twisted pair, 18 AWG, strand. 65 x 36 T.C. vinyl insulation. Vinyl jacket 6.35mm (.250") O.D., nom. cap. 30 pf/ft. Color: Cable, grey.

★QUANTITY DISC. CODE B

BANTAM PLUG TO PJ-051

1st END: Miniaturized 3 cond. phone plug, 4.45mm (.175) dia.
MATERIAL: Brass.
INSULATION: Molded black polystyrene.
CABLE: Plastic jacketed, shielded, tinned copper conductors. Color: Gray.
2nd END: PJ-051 phone plug.

Model No.	Length	Model No.	Length
4280-12	12"	4280-48	48"
4280-24	24"	4280-60	60"
4280-36	36"		

★QUANTITY DISC. CODE B **NET 17.85**

STANDARD PHONE PLUG BOTH ENDS

STANDARD 2 CONDUCTOR PLUG: Tip and sleeve, brass, nickel plated.
INSULATION: Polypropylene molded directly to handle and cable.
CABLE: Shielded microphone coaxial, polyethylene insulation, gray vinyl jacket 4.93 mm (.195) O.D. nom. cap. 25 pf/ft. Color: Plug handle and cable, gray.

Model No.	Length	Model No.	Length
4053-B-12	12"	4053-B-48	48"
4053-B-24	24"	4053-B-60	60"
4053-B-36	36"		

★QUANTITY DISC. CODE B **NET 5.85**

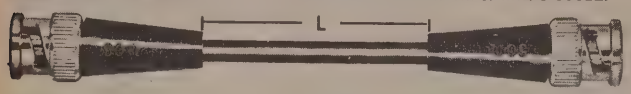
★Various lengths may be aggregated for best quantity price.

BNC CABLE ASSEMBLIES & PATCH CORDS

POMONA ELECTRONICS

STRESS RELIEVED AND WEATHERPROOFED CRIMP BNC CABLE ASSEMBLIES

These new cable assemblies feature PVC collars which are molded directly onto cable jacket and connector body. The resulting encapsulation offers two outstanding advantages, stress protection against failure from excess bending, flexing, and twisting. Weatherproof seal between cable and connector. Connectors have non-tarnish finish and conform to MIL-C-39012.

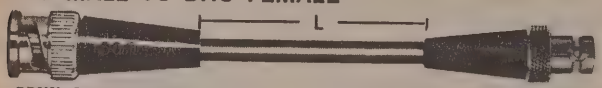


CONN: 1st END Crimp male BNC **CONN: 1st END** Crimp male BNC
CABLE: Shielded coaxial, RG58C/U **CABLE:** Shielded coaxial, RG59B/U or RG62A/U
CONN: 2nd END Crimp male BNC **CONN: 2nd END** Crimp male BNC

RG58C/U 50 Ohm	RG59B/U 75 Ohm	Net	RG62A/U 93 Ohm	Length	Net
2249-C-12	2249-E-12	5.95	2249-M-12	12″	6.85
2249-C-24	2249-E-24	5.95	2249-M-24	24″	6.85
2249-C-36	2249-E-36	5.95	2249-M-36	36″	6.85
2249-C-48	2249-E-48	5.95	2249-M-48	48″	6.85
2249-C-60	2249-E-60	5.95	2249-M-60	60″	6.85

★QUANTITY DISC. CODE B

BNC MALE TO BNC FEMALE

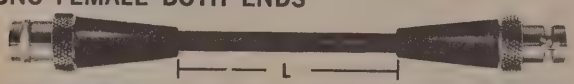


CONN: 1st **END** Crimp male BNC **CONN: 1st END** Crimp male BNC
CABLE: Shielded coaxial, RG58C/U **CABLE:** Shielded coaxial, RG59B/U or RG62A/U
CONN: 2nd END Crimp male BNC **CONN: 2nd END** Crimp male BNC

RG58C/U 50 Ohm	RG59B/U 75 Ohm	Net	RG62A/U 93 Ohm	Length	Net
4524-C-12	4524-E-12	8.85	4524-M-12	12″	9.85
4524-C-24	4524-E-24	8.85	4524-M-24	24″	9.85
4524-C-36	4524-E-36	8.85	4524-M-36	36″	9.85
4524-C-48	4524-E-48	8.85	4524-M-48	48″	9.85
4524-C-60	4524-E-60	8.85	4524-M-60	60″	9.85

★QUANTITY DISC. CODE B

BNC FEMALE BOTH ENDS

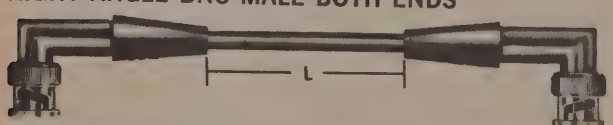


CONN: 1st END Crimp female BNC **CONN: 1st END** Crimp female BNC
CABLE: Shielded coax., RG58C/U **CABLE:** Shielded coax., RG59B/U or RG62A/U
CONN: 2nd END Crimp female BNC **CONN: 2nd END** Crimp female BNC

RG58C/U 50 Ohm	RG59B/U 75 Ohm	Net	RG62A/U 93 Ohm	Length	Net
4277-C-12	4277-E-12	9.85	4277-M-12	12″	9.85
4277-C-24	4277-E-24	9.85	4277-M-24	24″	9.85
4277-C-36	4277-E-36	9.85	4277-M-36	36″	9.85
4277-C-48	4277-E-48	9.85	4277-M-48	48″	9.85
4277-C-60	4277-E-60	9.85	4277-M-60	60″	9.85

★QUANTITY DISC. CODE B

RIGHT ANGLE BNC MALE BOTH ENDS



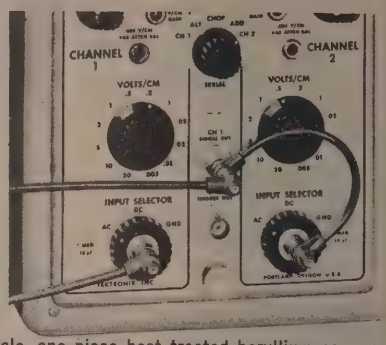
CONN: 1st END Crimp male BNC **CONN: 1st END** Crimp male BNC
CABLE: Shielded coax., RG58C/U **CABLE:** Shielded coax., RG59B/U or RG62A/U
CONN: 2nd END Crimp male BNC **CONN: 2nd END** Crimp male BNC

RG58C/U 50 Ohm	RG59B/U 75 Ohm	Net	RG62A/U 93 Ohm	Length	Net
4276-C-12	4276-E-12	14.85	4276-M-12	12″	15.85
4276-C-24	4276-E-24	14.85	4276-M-24	24″	15.85
4276-C-36	4276-E-36	14.85	4276-M-36	36″	15.85
4276-C-48	4276-E-48	14.85	4276-M-48	48″	15.85
4276-C-60	4276-E-60	14.85	4276-M-60	60″	15.85

★QUANTITY DISC. CODE B

"PUSH ON" STACKING BNC PATCH CORDS

These multiple stacking patch cords connect the center conductors of BNC jacks having a common chassis. Excellent for use with instruments such as oscilloscopes. Stacking feature enables a multiple number of connections to the same point.

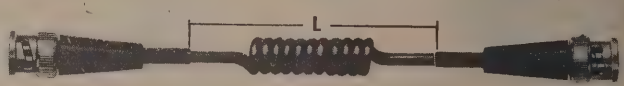


FEATURES:

- **CONTACT:** Male and female, one piece heat treated beryllium copper, gold flashed.
- **WIRE:** 18 AWG, stranded 65 x 36 T.C., polyvinyl insulation.
- **INSULATION:** Tough thermoplastic, polypropylene, molded around contact and wire.
- **OPERATING TEMPERATURE:** −25°C to +125°C.

STRESS RELIEVED AND WEATHERPROOFED CRIMP BNC ON RETRACTILE (COILED) CORD

This one size cord can be used in place of many varied lengths.



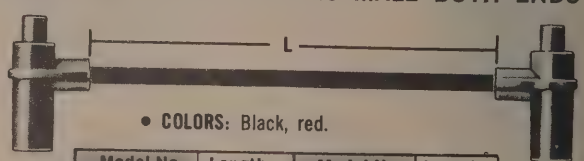
CONN: 1st END Crimp male BNC **CONN: 1st END** Crimp male BNC.
CABLE: Shielded microphone. Center conductor 24 AWG (45 x 40), rubber insulated Spiral T.C. shield with neoprene packet 4.06 mm (.160) O.D. Color: Black.

Model No.	Length
4487-48	48″
4487-60	60″
4487-72	72″

NET 21.95

★QUANTITY DISC. CODE B

"PUSH ON" STACKING BNC MALE BOTH ENDS

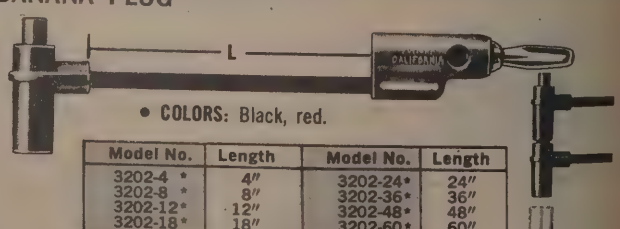


- **COLORS:** Black, red.

Model No.	Length	Model No.	Length
3201-4 *	4″	3201-24*	24″
3201-8 *	8″	3201-36*	36″
3201-12*	12″	3201-48*	48″
3201-18*	18″	3201-60*	60″

★QUANTITY DISC. CODE B **NET 3.50**

"PUSH ON" STACKING BNC MALE TO STACKING BANANA PLUG



- **COLORS:** Black, red.

Model No.	Length	Model No.	Length
3202-4 *	4″	3202-24*	24″
3202-8 *	8″	3202-36*	36″
3202-12*	12″	3202-48*	48″
3202-18*	18″	3202-60*	60″

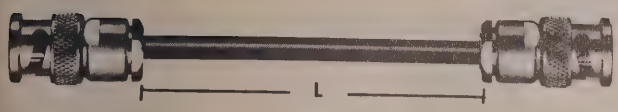
★QUANTITY DISC. CODE B **NET 2.50**

★Various lengths may be aggregated for best quantity price. Other lengths available to order.
*Consult factory for color code part numbers.

CABLE ASSEMBLIES & PATCH CORDS

POMONA ELECTRONICS

BNC MALE BOTH ENDS



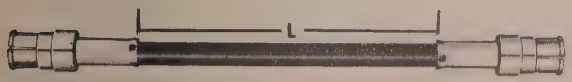
CONN: 1st END M39012/16-0001 male BNC
CABLE: Shielded coax., RG58C/U
CONN: 2nd END M39012/16-0001 male BNC

CONN: 1st END M39012/16-0002 male BNC
CABLE: Shielded coax., RG59B/U or RG62A/U
CONN: 2nd END M39012/16-0002 male BNC

Shielded Mic. Cable 50 Ohms	RG58C/U 50 Ohms	Net	RG59B/U 75 Ohms	RG62A/U 93 Ohms	Length	Net
BNC-B-18	BNC-C-18	6.85	BNC-E-18	BNC-M-18	18″	8.85
BNC-B-24	BNC-C-24	6.85	BNC-E-24	BNC-M-24	24″	8.85
BNC-B-30	BNC-C-30	6.85	BNC-E-30	BNC-M-30	30″	8.85
BNC-B-36	BNC-C-36	6.85	BNC-E-36	BNC-M-36	36″	8.85
BNC-B-48	BNC-C-48	6.85	BNC-E-48	BNC-M-48	48″	8.85
BNC-B-60	BNC-C-60	6.85	BNC-E-60	BNC-M-60	60″	8.85

★QUANTITY DISC. CODE B

"PUSH ON" BNC MALE BOTH ENDS



CONN: 1st END Crimp "PUSH ON" BNC, male

CABLE: Shielded coax., RG58C/U

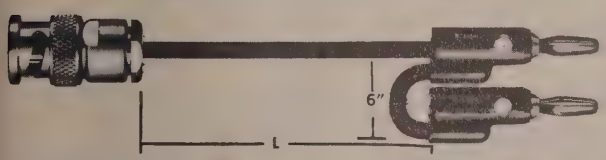
CONN: 2nd END Crimp "PUSH ON" BNC, male

A test cable for rapid interconnection of equipment. Connector is pushed on and requires no twisting. Beryllium copper outer fingers maintain continuity of shield. Excellent for hard to get at places.

Model No.	Length
3199-C-12	12″
3199-C-24	24″
3199-C-36	36″
3199-C-48	48″
3199-C-60	60″

★QUANTITY DISC. CODE B **NET 6.85**

BNC MALE TO SINGLE BANANA PLUGS



CONN: 1st END M39012/16-0001 male BNC

CABLE: Shielded coax., RG58C/U

CONN: 2nd END Single banana plugs
Color: 1 black, 1 red

Model No.	Length
2241-C-18	18″
2241-C-24	24″
2241-C-36	36″
2241-C-48	48″

★QUANTITY DISC. CODE B
NET 7.50

BNC MALE TO GR-874

CONN: 1st END M39012/16-0001 male BNC

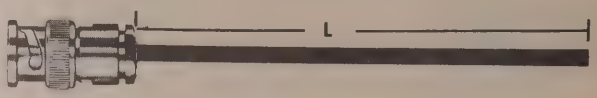
CABLE: Shielded coax., RG58C/U

CONN: 2nd END GR-874

Model No.	Length
1703-C-24	24″
1703-C-36	36″
1703-C-48	48″

★QUANTITY DISC. CODE D
NET 18.85

BNC MALE ONE END ONLY



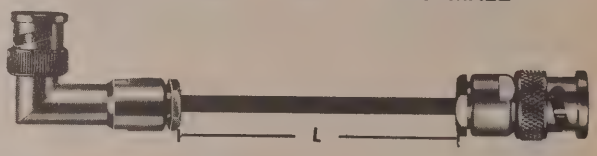
CONN: 1st END M39012/16-0001 male BNC
CABLE: Shielded coax., RG58C/U
CONN: 2nd END None

CONN: 1st END UG260B/U male BNC
CABLE: Shielded coax., RG59B/U or RG62A/U
CONN: 2nd END None

RG58C/U	Net	RG59B/U	Length	Net
1661-C-12	3.95	1661-E-12	12″	4.85
1661-C-24	3.95	1661-E-24	24″	4.85
1661-C-36	3.95	1661-E-36	36″	4.85
1661-C-48	3.95	1661-E-48	48″	4.85
1661-C-60	3.95	1661-E-60	60″	4.85

★QUANTITY DISC. CODE B

RIGHT ANGLE BNC TO BNC MALE



CONN: 1st END UG913A/U, angle male BNC

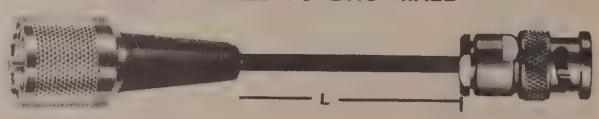
CABLE: Shielded coax., RG58C/U

CONN: 2nd END M39012/16-0001 male BNC

Model No.	Length	Model No.	Length
1383-C-18	18″	1383-C-36	36″
1383-C-24	24″	1383-C-48	48″
		1383-C-60	60″

★QUANTITY DISC. CODE B
NET 12.85

UHF MALE TO BNC MALE



CONN: 1st END Crimp UHF male

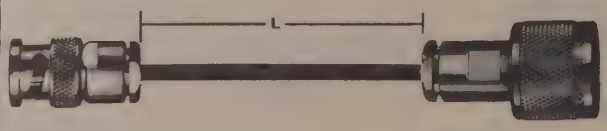
CABLE: Shielded coax., RG58C/U

CONN: 2nd END M39012/16-0001 male BNC

Model No.	Length	Model No.	Length
1367-C-18	18″	1367-C-36	36″
1367-C-24	24″	1367-C-48	48″
		1367-C-60	60″

★QUANTITY DISC. CODE B
NET 6.95

BNC MALE TO SERIES "N" MALE



CONN: 1st END M39012/16-0001 male BNC

CABLE: Shielded coax., RG58C/U

CONN: 2nd END UG536B/U "N" male

Model No.	Length
1366-C-24	24″
1366-C-36	36″
1366-C-48	48″

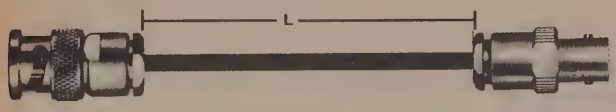
★QUANTITY DISC. CODE B
NET 7.85

★Various lengths may be aggregated for best quantity price. Other lengths available to order.

CABLE ASSEMBLIES & PATCH CORDS

POMONA ELECTRONICS

BNC MALE TO BNC FEMALE



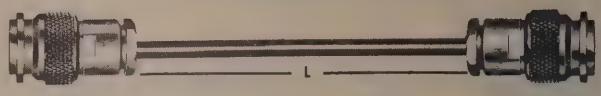
CONN: 1st END M39012/16-0001 male BNC
CABLE: Shielded coax., RG58C/U
CONN: 2nd END UG89C/U female BNC

Model No.	Length
2223-C-12	12″
2223-C-24	24″
2223-C-36	36″
2223-C-48	48″
2223-C-60	60″

★QUANTITY DISC. CODE B

NET 7.50

TNC MALE BOTH ENDS



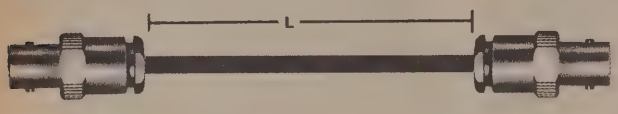
CONN: 1st END Male TNC
CABLE: Shielded coax., RG58C/U
CONN: 2nd END Male TNC

Model No.	Length
1944-C-12	12″
1944-C-24	24″
1944-C-36	36″
1944-C-48	48″
1944-C-60	60″

★QUANTITY DISC. CODE B

NET 9.85

BNC FEMALE BOTH ENDS



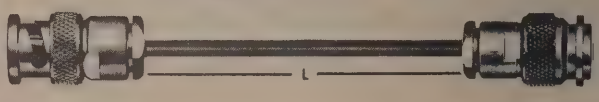
CONN: 1st END UG89C/U female BNC
CABLE: Shielded coax., RG58C/U
CONN: 2nd END UG89C/U female BNC

Model No.	Length
1808-C-12	12″
1808-C-24	24″
1808-C-36	36″
1808-C-48	48″
1808-C-60	60″

★QUANTITY DISC. CODE B

NET 7.50

BNC MALE TO TNC MALE



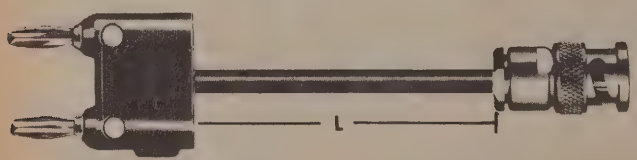
CONN: 1st END BNC, male M39012/16-0001
CABLE: Shielded coax., RG58C/U
CONN: 2nd END Male TNC

Model No.	Length
1948-C-12	12″
1948-C-24	24″
1948-C-36	36″
1948-C-48	48″
1948-C-60	60″

★QUANTITY DISC. CODE B

NET 8.85

DOUBLE BANANA PLUG TO BNC MALE



CONN: 1st END Double banana plug, on ¾″ centers
CABLE: Shielded coax., RG58C/U
CONN: 2nd END M39012/16-0001 male BNC

Shielded Mic. Cable	Shielded Coax. Cable	Length
2BB-BNC-18	2BC-BNC-18	18″
2BB-BNC-24	2BC-BNC-24	24″
2BB-BNC-30	2BC-BNC-30	30″
2BB-BNC-36	2BC-BNC-36	36″
2BB-BNC-48	2BC-BNC-48	48″
2BB-BNC-60	2BC-BNC-60	60″

★QUANTITY DISC. CODE B **NET 6.95**

RIGHT ANGLE TYPE "N" MALE BOTH ENDS

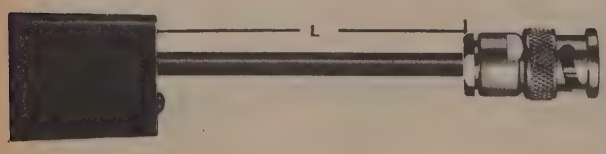
CONN:1st END Crimp type "N" conn.
CABLE: Shielded coax., RG58C/U
CONN:2nd END Crimp type "N" conn.

CONN: 1st END Crimp type "N" conn.
CABLE: Shielded coax., RG59B/U or RG62A/U
CONN: 2nd END Crimp type "N" conn.

RG58C/U 50 Ohm	RG59B/U 75 Ohm	Net	RG62A/U 93 Ohm	Length	Net
4278-C-12	4278-E-12	24.95	4278-M-12	12″	25.85
4278-C-24	4278-E-24	24.95	4278-M-24	24″	25.85
4278-C-36	4278-E-36	24.95	4278-M-36	36″	25.85
4278-C-48	4278-E-48	24.95	4278-M-48	48″	25.85
4278-C-60	4278-E-60	24.95	4278-M-60	60″	25.85

★QUANTITY DISC. CODE B

SHIELDED DOUBLE PLUG TO BNC MALE



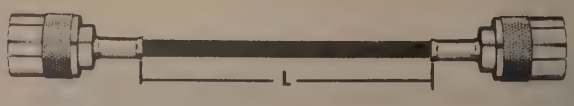
CONN: 1st END Shielded double plug, on ¾″ centers. Black anodized aluminum.
CABLE: Shielded coax., RG58C/U
CONN: 2nd END UG88E/U, male BNC

Model No.	Length	Model No.	Length
1555-C-18	18″	1555-C-36	36″
1555-C-24	24″	1555-C-48	48″
1555-C-30	30″	1555-C-60	60″

★ QUANTITY DISC. CODE B

NET 11.85

PUSH ON UHF MALE BOTH ENDS



CONN: 1st END Crimp push on UHF, male
CABLE: Shielded coax., RG58C/U
CONN: 2nd END Crimp push on UHF, male

Model No.	Length
3137-C-12	12″
3137-C-24	24″
3137-C-36	36″
3137-C-48	48″
3137-C-60	60″

★QUANTITY DISC. CODE B

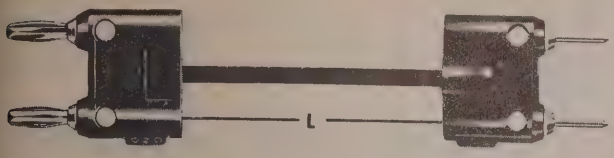
NET 9.85

★Various lengths may be aggregated for best quantity price. Other lengths available to order.

PATCH CORDS & CABLE ASSEMBLIES

POMONA ELECTRONICS

DOUBLE BANANA PLUG TO DOUBLE PIN TIP PLUG



CONN: 1st END Double banana plug, on ¾" centers

CABLE: Shielded coax., RG58C/U

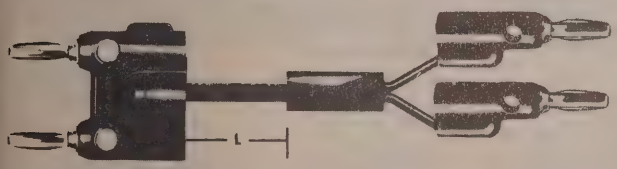
CONN: 2nd END Double pin tip plug, 2.03mm (.080) dia. on ¾" centers

Model No.	Length
2288-C-18	18"
2288-C-24	24"
2288-C-36	36"
2288-C-48	48"
2288-C-60	60"

★QUANTITY DISC. CODE B

NET 6.95

DOUBLE PLUG TO SINGLE BANANA PLUGS



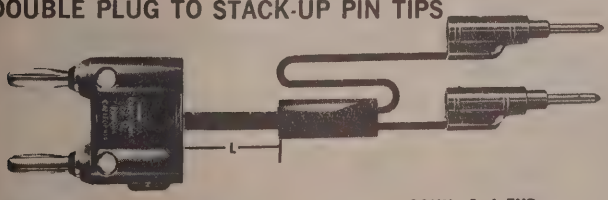
CABLE DESCRIPTION: TO COND. TWISTED PAIR
18 AWG, strand. 65 x 36 T.C. vinyl insulation. Vinyl jacket, 6.35 mm (.250") O.D. nom. cap. 30 pf/ft
Color: Double plug, gray. Single plugs: red, black.

Model No.	Length
1368-A-18	18"
1368-A-24	24"
1368-A-30	30"
1368-A-36	36"
1368-A-48	48"
1368-A-60	60"

★QUANTITY DISC. CODE B

NET 8.85

DOUBLE PLUG TO STACK-UP PIN TIPS



CONN: 1st END Double banana plug, on ¾" centers

CABLE: Shielded coax., RG58C/U

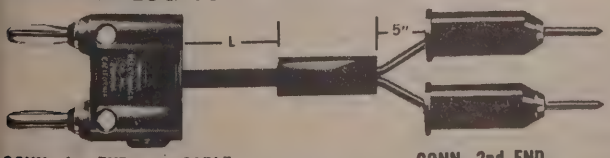
CONN: 2nd END Single stack-up pin tip plugs, 2.03mm (.080) dia. Color: 1 black, 1 red

Model No.	Length
2BC-PP-18	18"
2BC-PP-24	24"
2BC-PP-36	36"
2BC-PP-48	48"
2BC-PP-60	60"

★QUANTITY DISC. CODE B

NET 7.50

DOUBLE PLUG TO SINGLE PIN TIPS



CONN: 1st END Double banana plug, on ¾" centers

CABLE: Two cond. twisted pair

CONN: 2nd END Single pin tip plugs, 2.03mm (.080) dia. Color: 1 black, 1 red

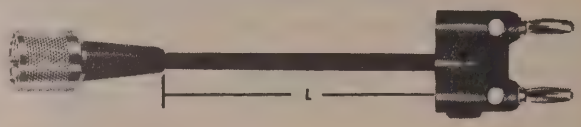
Model No.	Length
2184-A-24	24"
2184-A-36	36"
2184-A-48	48"
2184-A-60	60"

★QUANTITY DISC. CODE B

NET 7.85

★Various lengths may be aggregated for best quantity price.

UHF MALE TO DOUBLE PLUG



CONN: 1st END Crimp UHF, male

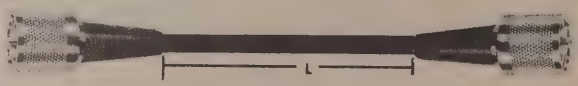
CABLE: Shielded coax., RG58C/U

CONN: 2nd END Double banana plug, on ¾" centers

Model No.	Length	Model No.	Length
2BC-UHF-18	18"	2BC-UHF-36	36"
2BC-UHF-24	24"	2BC-UHF-48	48"
		2BC-UHF-60	60"

★QUANTITY DISC. CODE B NET 6.95

UHF MALE BOTH ENDS



CONN: 1st END Crimp UHF, male

CABLE: Shielded coax., RG58C/U

CONN: 2nd END Crimp UHF, male

Model No.	Length	Model No.	Length
UHF-C-18	18"	UHF-C-36	36"
UHF-C-24	24"	UHF-C-48	48"
		UHF-C-60	60"

★QUANTITY DISC. CODE B NET 7.85

ALLIGATOR CLIPS TO UHF MALE

CONN: 1st END Alligator clips, steel, cadmium plated. Insulators, vinyl: Black-red

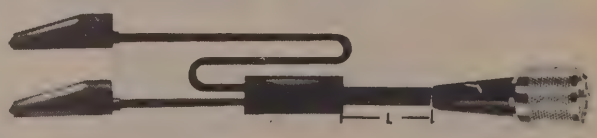
CABLE: Shielded coax., RG58C/U

CONN: 2nd END Crimp UHF, male

Model No.	Length	Model No.	Length
AL-C-UHF-18	18"	AL-C-UHF-36	36"
AL-C-UHF-24	24"	AL-C-UHF-48	48"
		AL-C-UHF-60	60"

★QUANTITY DISC. CODE B NET 7.85

MINIGATOR CLIPS TO UHF MALE



CONN: 1st END Minigator clips, steel, cadmium plated. Insulators, vinyl: Black-red

CABLE: Shielded coax., RG58C/U

CONN: 2nd END Crimp UHF, male

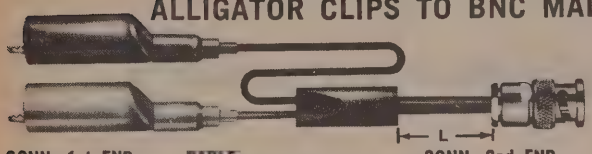
Model No.	Length	Model No.	Length
MG-C-UHF-18	18"	MG-C-UHF-36	36"
MG-C-UHF-24	24"	MG-C-UHF-48	48"
		MG-C-UHF-60	60"

★QUANTITY DISC. CODE B NET 7.85

PATCH CORDS & CABLE ASSEMBLIES

POMONA ELECTRONICS

ALLIGATOR CLIPS TO BNC MALE



CONN: 1st END Alligator clips, steel, cadmium plated. Insulators, vinyl: Black-red

CABLE: Shielded mic. or Shielded coax., RG58C/U

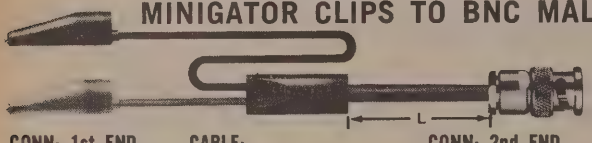
CONN: 2nd END M39012/16-0001 BNC, male

Shielded Mic. Cable	Shielded Coax. Cable	Length
AL-B-BNC-18	AL-C-BNC-18	18″
AL-B-BNC-24	AL-C-BNC-24	24″
AL-B-BNC-30	AL-C-BNC-30	30″
AL-B-BNC-36	AL-C-BNC-36	36″
AL-B-BNC-48	AL-C-BNC-48	48″
AL-B-BNC-60	AL-C-BNC-60	60″

★QUANTITY DISC. CODE B

NET 6.85

MINIGATOR CLIPS TO BNC MALE



CONN: 1st END Minigator clips, steel, cadmium plated. Insulators, vinyl: Black-red

CABLE: Shielded mic. or Shielded coax., RG58C/U

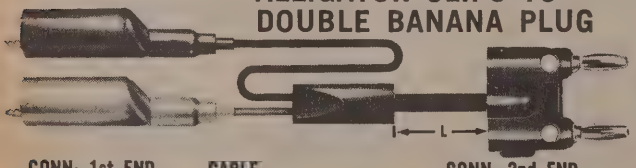
CONN: 2nd END M39012/16-0001 BNC, male

Shielded Mic. Cable	Shielded Coax. Cable	Length
MG-B-BNC-18	MG-C-BNC-18	18″
MG-B-BNC-24	MG-C-BNC-24	24″
MG-B-BNC-30	MG-C-BNC-30	30″
MG-B-BNC-36	MG-C-BNC-36	36″
MG-B-BNC-48	MG-C-BNC-48	48″
MG-B-BNC-60	MG-B-BNC-60	60″

★QUANTITY DISC. CODE B

NET 6.85

ALLIGATOR CLIPS TO DOUBLE BANANA PLUG



CONN: 1st END Alligator clips, steel, cadmium plated. Insulators, vinyl: Black-red

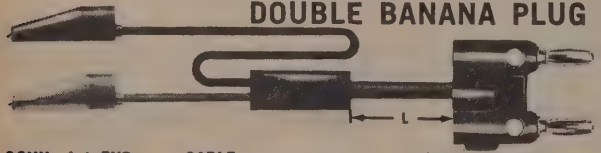
CABLE: Two cond. twisted pair, shielded mic. or shielded coax., RG58C/U

CONN: 2nd END Double banana plug, on ¾″ centers

★QUANTITY DISC. CODE B NET 6.95

Two Cond. Twisted Pair	Shielded Mic. Cable	Shielded Coax. Cable	Length
2BA-AL-18	2BB-AL-18	2BC-AL-18	18″
2BA-AL-24	2BB-AL-24	2BC-AL-24	24″
2BA-AL-30	2BB-AL-30	2BC-AL-30	30″
2BA-AL-36	2BB-AL-36	2BC-AL-36	36″
2BA-AL-48	2BB-AL-48	2BC-AL-48	48″
2BA-AL-60	2BB-AL-60	2BC-AL-60	60″

MINIGATOR CLIPS TO DOUBLE BANANA PLUG



CONN: 1st END Minigator clips, steel, cadmium plated. Insulators, vinyl: Black-red

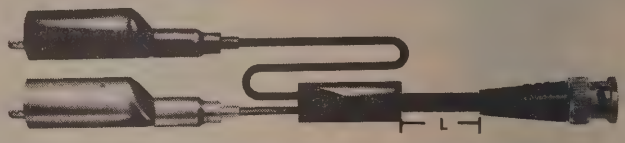
CABLE: Two cond. twisted pair, shielded mic. or shielded coax., RG58C/U

CONN: 2nd END Double banana plug, on ¾″ centers

★QUANTITY DISC. CODE B NET 6.95

Two Cond. Twisted Pair	Shielded Mic. Cable	Shielded Coax. Cable	Length
2BA-MG-18	2BB-MG-18	2BC-MG-18	18″
2BA-MG-24	2BB-MG-24	2BC-MG-24	24″
2BA-MG-30	2BB-MG-30	2BC-MG-30	30″
2BA-MG-36	2BB-MG-36	2BC-MG-36	36″
2BA-MG-48	2BB-MG-48	2BC-MG-48	48″
2BA-MG-60	2BB-MG-60	2BC-MG-60	60″

ALLIGATOR CLIPS TO WEATHERPROOFED CRIMP BNC MALE



CONN: 1st END Alligator clips, steel, cadmium plated. Insulators, vinyl: Black-red

CABLE: Shielded coaxial, RG58C/U

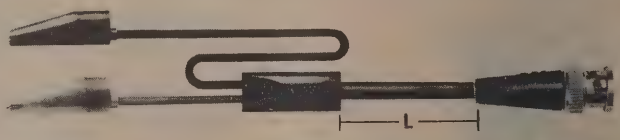
CONN: 2nd END Crimp male BNC

Model No.	Length
4531-18	18″
4531-24	24″
4531-30	30″
4531-36	36″
4531-48	48″
4531-60	60″

★QUANTITY DISC. CODE B

NET 6.85

MINIGATOR CLIPS TO WEATHERPROOFED CRIMP BNC MALE



CONN: 1st END Minigator clips, steel, cadmium plated. Insulators, vinyl: Black-red

CABLE: Shielded coaxial, RG58C/U

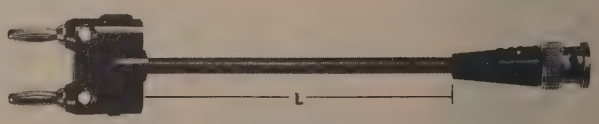
CONN: 2nd END Crimp male BNC

Model No.	Length
4532-18	18″
4532-24	24″
4532-30	30″
4532-36	36″
4532-48	48″
4532-60	60″

★QUANTITY DISC. CODE B

NET 6.85

DOUBLE BANANA PLUG TO WEATHERPROOFED CRIMP BNC MALE



CONN: 1st END Double banana plug, on ¾″ centers

CABLE: Shielded coax, RG58C/U

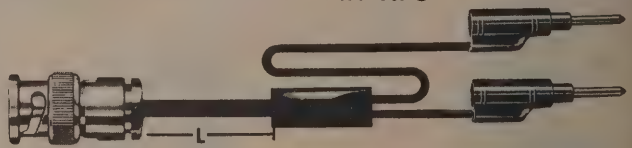
CONN: 2nd END Crimp male BNC

Model No.	Length
4530-18	18″
4530-24	24″
4530-36	36″
4530-48	48″
4530-60	60″

★QUANTITY DISC. CODE B

NET 6.95

BNC MALE TO STACK-UP PIN TIPS



CONN: 1st END BNC, male M39012/16-0001

CABLE: Shielded coax., RG58C/U

CONN: 2nd END Single stack-up pin tip plugs, 2.03mm (.080) dia. Color: 1 black, 1 red

Model No.	Length
2882-C-18	18″
2882-C-24	24″
2882-C-36	36″
2882-C-48	48″
2882-C-60	60″

★QUANTITY DISC. CODE B

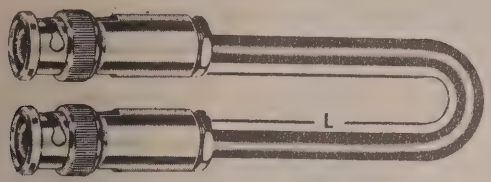
NET 7.50

★Various lengths may be aggregated for best quantity price.

PATCH CORDS & CABLE ASSEMBLIES

POMONA ELECTRONICS

TWINAX CABLE PLUG BOTH ENDS



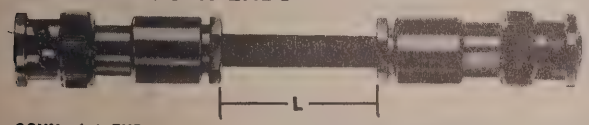
CABLE DESCRIPTION:

Belden 9272. Impedance, 78 ohm. 2 conductor shielded. Conductors, 20 AWG (7 x 28) with polyethylene insulation. Shield, tinned copper. Jacket, blue vinyl, 6.15mm (.242") O.D. Capacitance, between conductors, 19 pf/ft.

Model No.	Length
3581-CC-18	18"
3581-CC-24	24"
3581-CC-36	36"
3581-CC-48	48"
3581-CC-60	60"

★QUANTITY DISC. CODE B **NET 22.95**

MHV MALE BOTH ENDS



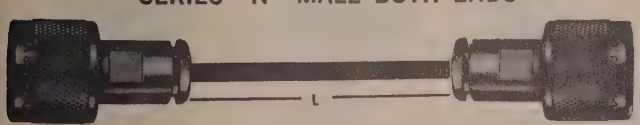
CONN: 1st END MHV conn.
CABLE: Shielded coax., RG58C/U
CONN: 2nd END MHV conn.

CONN: 1st END MHV conn. UG932C/U
CABLE: Shielded coax., RG59B/U or RG62A/U
CONN: 2nd END MHV conn. UG932C/U

Shielded Mic. Cable 50 Ohm	RG58C/U 50 Ohm	RG59B/U 75 Ohm	Net	RG62A/U 93 Ohm	Length	Net
4175-B-18	4175-C-18	4175-E-18	19.95	4175-M-18	18"	20.95
4175-B-24	4175-C-24	4175-E-24	19.95	4175-M-24	24"	20.95
4175-B-30	4175-C-30	4175-E-30	19.95	4175-M-30	30"	20.95
4175-B-36	4175-C-36	4175-E-36	19.95	4175-M-36	36"	20.95
4175-B-48	4175-C-48	4175-E-48	19.95	4175-M-48	48"	20.95
4175-B-60	4175-C-60	4175-E-60	19.95	4175-M-60	60"	20.95

★QUANTITY DISC. CODE B

SERIES "N" MALE BOTH ENDS



CONN: 1st END UG536B/U "N" male
CABLE: Shielded coax., RG58C/U
CONN: 2nd END UG536B/U "N" male

Model No.	Length
2256-C-24	24"
2256-C-36	36"
2256-C-48	48"
2256-C-60	60"

★QUANTITY DISC. CODE B
NET 9.85

NON-STACKING DOUBLE PLUG BOTH ENDS

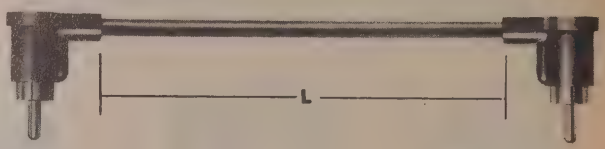
This non-stacking cable is excellent for those applications requiring no exposed metal when inserted. There is no side or top stacking.

DOUBLE BANANA PLUG: On ¾" center. Spring, one-piece beryllium copper, heat treated, nickel plated. Tough thermoplastic molded onto double plug body and cable.

Two Cond. Twisted Pr.	RG58C/U	Length
4059-A-12	4059-C-12	12"
4059-A-24	4059-C-24	24"
4059-A-36	4059-C-36	36"
4059-A-48	4059-C-48	48"
4059-A-60	4059-C-60	60"

★QUANTITY DISC. CODE B
NET 6.85

RIGHT ANGLE MOLDED PHONO PLUG BOTH ENDS



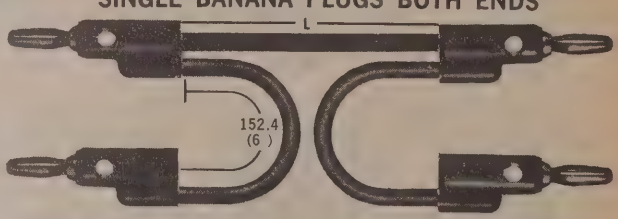
CONN: 1st END Phono plug
CABLE: Shielded mic.
CONN: 2nd END Phono Plug

A stress relieved and weatherproofed phono plug cable assembly. The molded boot is molded directly to the cable and connector.

Model No.	Length	Model No.	Length
4430-18	18"	4430-36	36"
4430-24	24"	4430-48	48"
		4430-60	60"

★QUANTITY DISC. CODE B **NET 3.75**

SINGLE BANANA PLUGS BOTH ENDS



CONN: 1st END Single banana plugs. Colors: Inner conductor plug, red. Ground plug, black.
CABLE: Shielded coax., RG122/U
CONN: 2nd END Single banana plugs. Colors: Inner conductor plug, red. Ground plug, black.

Model No.	Length
2239-R-24	24"
2239-R-36	36"
2239-R-48	48"
2239-R-60	60"

★QUANTITY DISC. CODE B
NET 7.85

ALLIGATOR CLIPS BOTH ENDS

CONN: 1st END Alligator clips, steel, cad. plated. Insulators, vinyl: Black-red.
CABLE: Shielded coax., RG58C/U
CONN: 2nd END Alligator clips, steel, cad. plated. Insulators, vinyl: Black-red.

Model No.	Length
1152-C-12	12"
1152-C-24	24"
1152-C-36	36"
1152-C-48	48"
1152-C-60	60"

★QUANTITY DISC. CODE B
NET 7.50

SERIES "N" MALE BOTH ENDS

CONN: 1st END UG21E/U "N" male
CABLE: Coax., RG213/U or RG214/U
CONN: 2nd END UG21E/U "N" male

RG213/U	Net	Length	RG214/U	Net
1658-S-18	12.50	18"	1658-T-18	16.85
1658-S-24	12.50	24"	1658-T-24	16.85
1658-S-36	12.50	36"	1658-T-36	16.85
1658-S-48	13.25	48"	1658-T-48	18.60
1658-S-60	14.00	60"	1658-T-60	20.35

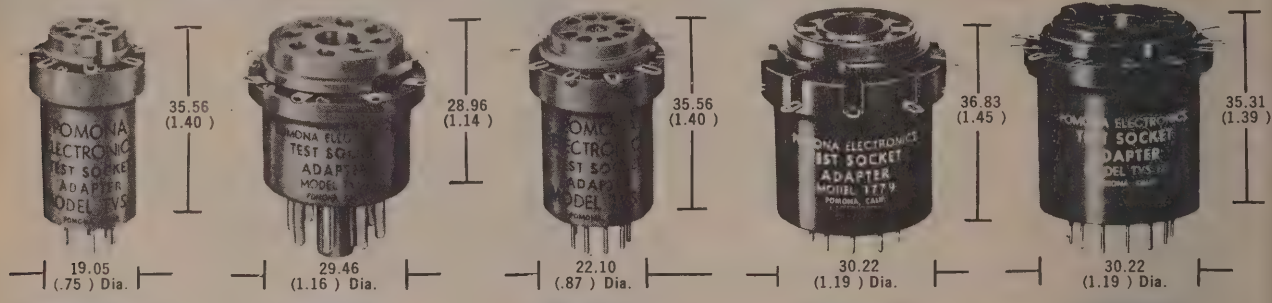
★QUANTITY DISC. CODE B

★Various lengths may be aggregated for best quantity price.

TUBE TEST SOCKET ADAPTERS & HOLDER

POMONA ELECTRONICS

Pomona test socket tube adapters are ideal for making measurements of voltage, resistance, audio and video without tracing complicated circuits from the bottom of the chassis. They feature: Extended test tabs for easy use with either alligator clips or test prods; low loss mica-filled molded phenolic construction per MIL-M-14, MFE. Power factor less than 0.010 at 10 MHz; high insulation resistance, the I.R. exceeds 500,000 megohms at 40% R.H., at 24°C; distributed capacity, inter-element approximately 1 pico farad; high voltage operation, voltage breakdown elements exceeds 1,700 VAC or DC. Models TVS-12 and 1779 molded of electrical grade black phenolic.



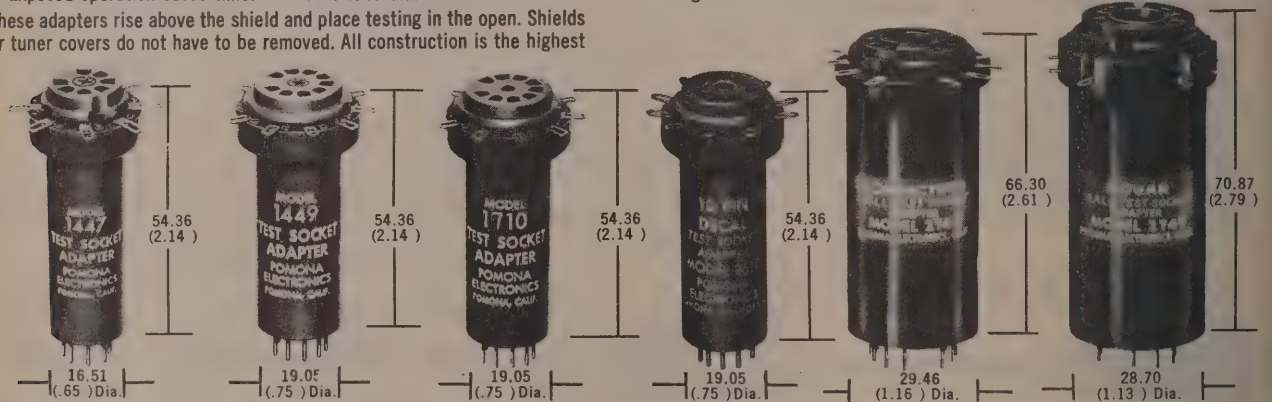
Model No.	TVS-7	TVS-8	TVS-9	1779	TVS-12
	7 PIN MIN.	8 PIN OCTAL	9 PIN MIN.	9 PIN NOVAR	12 PIN COMPACTRON
	NET 2.75	NET 3.25	NET 2.95	NET 3.25	NET 3.85

QUANTITY DISC. CODE C

TALL TEST SOCKET TUBE ADAPTERS For sockets having captive or telescoping tube shields

- Extra height — clears shields.
- Exposed operation saves time.
- Ready access to socket connections.
- Pins .040 dia.

These adapters rise above the shield and place testing in the open. Shields or tuner covers do not have to be removed. All construction is the highest quality. Inter-element distributed capacity is approximately 1.5 pico farad. Voltage breakdown elements exceed 1800 VAC or DC.

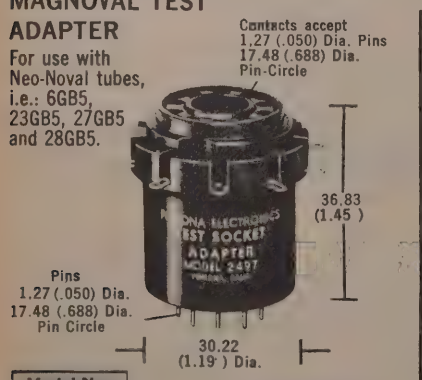


Model No.	1447	1449	1710	2610	2742	2749
	7 PIN MIN.	9 PIN MIN.	10 PIN MIN.	10 PIN DECAL	12 PIN COMPACTRON	9 PIN NOVAR
	NET 2.75	NET 2.95	NET 3.85	NET 3.85	NET 4.75	NET 4.25

QUANTITY DISC. CODE C

MAGNOVAL TEST ADAPTER

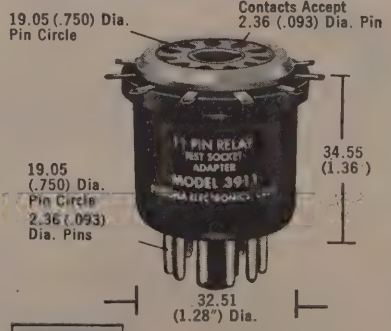
For use with Neo-Noval tubes, i.e.: 6GB5, 23GB5, 27GB5 and 28GB5.



Model No. 2497 — 9 PIN MAGNOVAL

QUANTITY DISC. CODE C NET 3.50

11 PIN RELAY TEST SOCKET ADAPTER

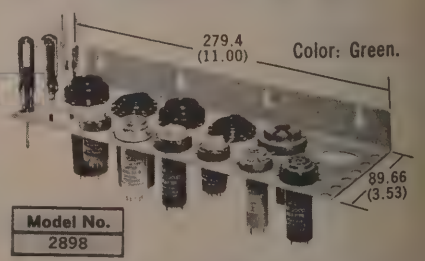


Model No. 3911

QUANTITY DISC. CODE C NET 17.50

TEST SOCKET ADAPTER HOLDER

The holder accepts up to seven socket adapters of 7/8" in diameter or less, and six adapters of 1 3/32" in diameter or less. Holes at both ends of the rack accommodate 12 service tools. Mounting holes are provided for easy installation on any vertical surface. Fabricated from cold rolled steel with baked enamel finish.



Model No. 2898

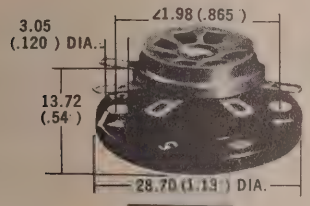
QUANTITY DISC. CODE A NET 3.85

BREADBOARD SOCKETS—RELAY SOCKETS & SOCKETS SAVERS® ADAPTERS

POMONA ELECTRONICS

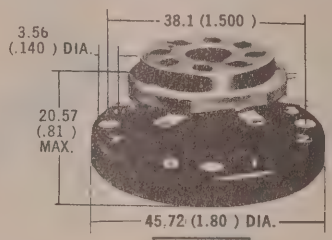
SURFACE MOUNTED BREADBOARD SOCKETS

Surface mounted breadboard sockets are ideal for experimental circuit design, portable and enclosed units, plug-in and packaged assemblies. They feature: An insulated base to prevent connections from shorting to chassis; elimination of double chassis design; circuits may be wired in an enclosed unit; base connections are numbered for easy identification; grade-A phosphor bronze spring contacts; standard center to center mounting holes. For ease of installation the 7 and 9 pin miniatures may be mounted either in the center or on the sides, the 8 pin octal is mounted on the sides; small mounting holes permits the re-use of experimental chassis.



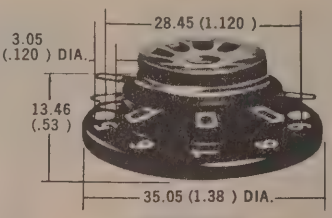
Model No.
XS-7

7 PIN MINIATURE
(600 VRMS)
NET .90



Model No.
XS-8

8 PIN OCTAL
(600 VRMS
AT 10 AMPS)
NET 1.50



Model No.
XS-9

9 PIN MINIATURE
(600 VRMS)
NET 1.10

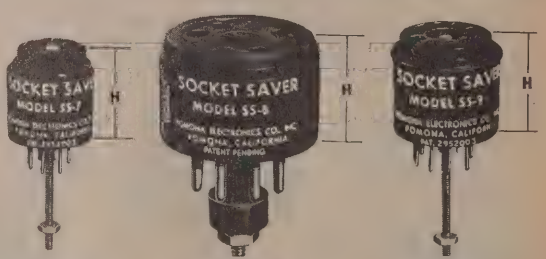
QUANTITY DISC. CODE **C**

SOCKET SAVER® ADAPTERS

The Socket Saver® Adapter is designed to be installed on tube checkers and other electronic equipment to prevent wear and tear of sockets on original equipment. They are easy to install and remove. This eliminates the necessity of replacing and rewiring sockets on original equipment. Built of quality materials. Beryllium copper long life contacts to give maximum service.

Model No.	Type	Size H	Net
SS-7	7 Pin Miniature	20.57mm (.81)	2.50
SS-8	8 Pin Octal	20.57mm (.81)	4.50
SS-9	9 Pin Miniature	20.57mm (.81)	2.85
SS-11	11 Pin Octal	34.29mm (1.35)	8.50
SS-12	12 Pin Compactron	20.57mm (.81)	3.50
1451	9 Pin Magnoval	22.35mm (.88)	3.25
1751	9 Pin Novar	20.57mm (.81)	3.25

U.S. Pat. No. 2952003



Model No.	Model No.	Model No.
SS-7	SS-8	SS-9

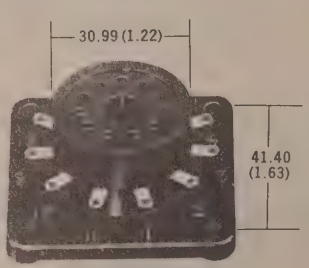
QUANTITY DISC. CODE **C**

11 CONTACT RELAY SOCKET

Ideal for use in Industrial Control equipment requiring a rugged compact 11 contact configuration.

FEATURES:

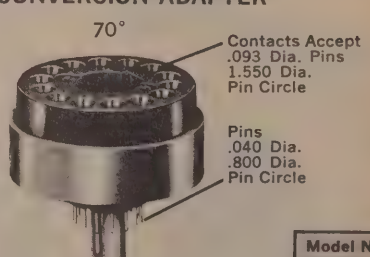
- Simplified above chassis mounting.
- Socket and base molded of melamine-phenolic, electrical, per MIL-M-14 Type CMG.
- Socket connections numbered for easy identification.
- Socket may be gang mounted.
- Heat treated beryllium copper contacts.
- 600 VRMS at 10 amps.
- Contacts accept 2.36mm (.093) dia. pins.
- Height 22,35mm (.88).
- 50.8mm (2.00) square base.
- Mounting holes 41,40mm (1.63) center to center. Dia. 3.81mm (.150).
- 19,05mm (.750) pin circle dia.
- Contact tab holes 1,98mm (.078 dia.).



Model No.
2811

QUANTITY DISC. CODE **A** **NET 3.85**

70° TO 90° COLOR CRT CONVERSION ADAPTER



Converts Color 70° 21AXP22A CRT base to 90° 25AP22A CRT base.

Socket End: Neo-Diheptal Socket, 14AL/AU Basing.
Plug End: Miniature Diheptal Plug, 14BE Basing.

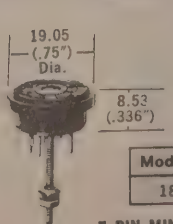
Model No.
3020

QUANTITY DISC. CODE **C**

NET 9.95

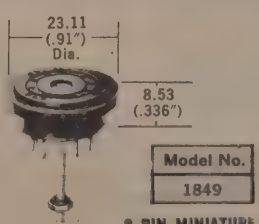
MINIATURIZED SOCKET SAVER® ADAPTERS

For use in applications where vertical height is restricted. Contacts made of beryllium copper, heat treated. Models 1847 and 1849 closed entry receptacles, contact and pin one piece formed beryllium copper, molded of black phenolic electrical grade.



Model No.
1847

7 PIN MINIATURE
NET 2.50



Model No.
1849

9 PIN MINIATURE
NET 2.85

QUANTITY DISC. CODE **C**

TEST SOCKETS

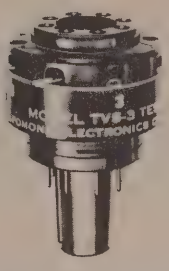
POMONA ELECTRONICS

■ POMONA Test Socket Adaptors are ideal for making measurements of voltage, resistance, and video from the base of the picture tube. The test socket adapter is inserted between the CR Tube base and its socket. This completes the circuit and makes all connections readily accessible. Measurements can be made without tracing circuit wiring to test points below the chassis, thereby saving valuable time and increasing efficiency in trouble shooting.

NEO-DIHEPTAL
For 70° color Television picture tubes

Model	Net
TVS-2	8.50

EIGHTAR (.040 PINS)
For 110° Television picture tubes



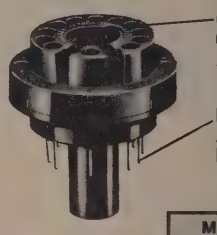
Model	Net
TVS-3	6.50

MINIATURE DIHEPTAL (.040 Pins)
For 90° Color CRT

Model	Net
2380	6.85

90° COLOR CRT PIN SAVER

MINIATURE DIHEPTAL
For 90° Color Television Picture Tubes
Provision for spark gaps.

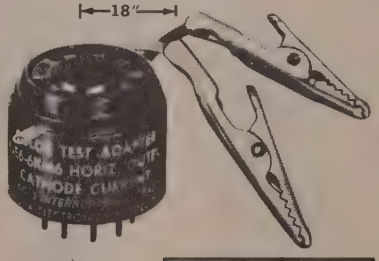


Model	Net
2887	5.85

NOVAR-6JE6 CATHODE CURRENT HORIZONTAL OUTPUT COLOR TEST ADAPTER

When making adjustments of the horizontal efficiency coil this adapter is used to measure cathode current of horizontal output tubes without removing chassis or unsoldering jumpers. 9QL basing, with pin No. 3 interrupted.

TEST TAB ON PIN NO. 2 FOR CONTROL GRID (G-1) HORIZONTAL DRIVE MEASUREMENT

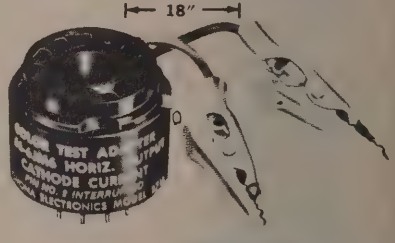


Model	Net
2599A	5.75

COMPACTRON — 6JS6 CATHODE CURRENT HORIZONTAL OUTPUT COLOR TEST ADAPTER

When making adjustments of the horizontal efficiency coil this adapter is used to measure cathode current of horizontal output tubes without removing chassis or unsoldering jumpers. 12YF basing, with pin No. 2 interrupted.

TEST TAB ON PIN NO. 5 FOR CONTROL GRID (G-1) HORIZONTAL DRIVE MEASUREMENT

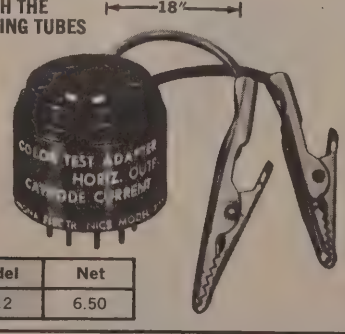


Model	Net
2712A	5.75

COMPACTRON — CATHODE CURRENT HORIZONTAL OUTPUT COLOR TEST ADAPTER PINS 4 & 10 INTERRUPTED

For use when making horizontal efficiency coil adjustments.

USE WITH THE FOLLOWING TUBES
6GE5
6GF5
6GV5
6GX5
6HB5
6HD5
6HF5

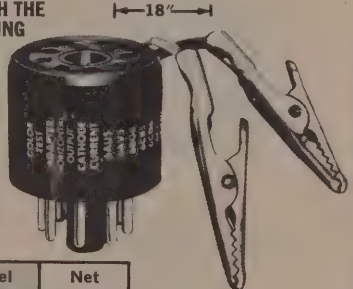


Model	Net
3012	6.50

OCTAL — CATHODE CURRENT HORIZONTAL OUTPUT COLOR TEST ADAPTER PINS 3 & 6 INTERRUPTED

For use when making horizontal efficiency coil adjustments.

USE WITH THE FOLLOWING TUBES
6AU5
6AV5
6BG6
6CB5
6CD6
6CL5
6DN6
6DQ5
6FW5

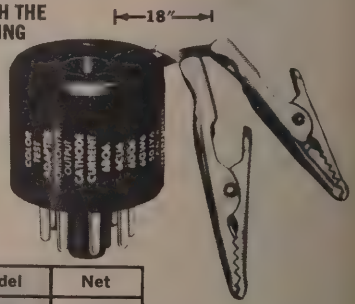


Model	Net
3403	5.25

OCTAL — CATHODE CURRENT HORIZONTAL OUTPUT COLOR TEST ADAPTER PIN 8 INTERRUPTED

For use when making horizontal efficiency adjustments.

USE WITH THE FOLLOWING TUBES
6BQ6
6CU6
6DQ6
6GW6
50JY6



Model	Net
3408	5.75

SMALL DIA. NECK CRT CONVERSION ADAPTER

SOCKET END: 7GR Basing.
PLUG END: 12L Duo-Decal Basing.
Use this new socket adapter with your present test equipment to test the small diameter neck cathode-ray tubes used in small screen personal (portable) television sets. A clearance hole is provided in the socket base which accepts the evacuation stem of the CRT being tested — no chance of breaking CRT stem.

Model	Net
2713	5.45

90° TO 70° COLOR CRT CONVERSION ADAPTER

Converts color 90° 25AP22A CRT base to 70° color 21-AXP22A CRT base. Provision for accepting bases equipped with spark gaps.

Socket End: Miniature Diheptal Socket, 14BE Basing.

Plug End: Neo-Diheptal Base, 14AL/AU Basing.

Model	Net
2276	8.85

high-voltage cable assemblies

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JOHNSON

E. F. JOHNSON COMPANY, WASECA, MINNESOTA 56093

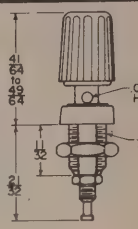
Electronic Hardware

Binding Posts

Binding Posts

New miniature binding post designed for compact test equipment applications. Rated at 15 amps.-thumb nut to terminal, 5 amps.-jack to terminal. Peak withstanding voltage: 5,000 volts. Capacitance to 1/8" panel; 3pF. Mounts in 17/64" diameter circular hole; "D" or double flat hole — .219" across flats. Equipped with single 1/4"-32 nut for fast mounting. The 200 series accepts .080 tip plug; 400 series accepts .120 miniature banana plug 108-1000-001.

Part no.	Color	Part no.	Color
111-0201-001	Wht	111-0401-001	Wht
111-0202-001	Red	111-0402-001	Red
111-0203-001	Blk	111-0403-001	Blk
111-0204-001	Grn	111-0404-001	Grn
111-0207-001	Yel	111-0407-001	Yel
111-0210-001	Blu	111-0410-001	Blu



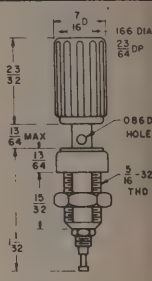
111-0200-001 ACCEPTS .080 DIA. TIP PLUG

111-0400-001 ACCEPTS .120 DIA. MINATURE BANANA PLUG IN .104 DIA. HOLE

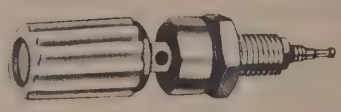
ACTUAL SIZE

Rated at 15 amps. Current carrying capacity. Peak withstanding voltage: 8,000 volts. Capacitance to 1/8" panel: 3.3 pF. Mounts in 21/64" diameter circular hole; "D" or double flat hole — 1/4" across flats. Single 5/16"-32 mounting nut furnished — no other hardware required.

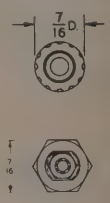
Part no.	Color	Part no.	Color
111-0101-001	Wht	111-0107-001	Yel
111-0102-001	Red	111-0108-001	Brn
111-0103-001	Blk	111-0110-001	Blu
111-0104-001	Grn	111-1112-001	Vio
111-0106-001	Orn	111-0113-001	Gry



.166 DIA. X 23/64 DEEP HOLE ACCEPTS BANANA PLUG



ACTUAL SIZE

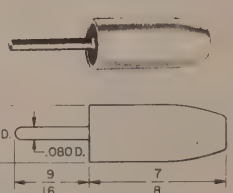


Tip Plugs/Printed Circuit Jacks

Solderless Tip Plug

Completely insulated, molded sleeve. Recessed metal head prevents exposure of metal surfaces when engaged in any standard tip jack. All metal parts are nickel-plated brass. Designed for solderless connection of up to 16 gauge stranded wire. Fits all standard tip jacks. Current rating: 10 amps.

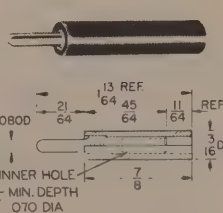
Part no.	Color	Part no.	Color
105-0301-001	Wht	105-0307-001	Yel
105-0302-001	Red	105-0308-001	Brn
105-0303-001	Blk	105-0310-001	Blu
105-0304-001	Grn	105-0312-001	Vio
105-0306-001	Orn	105-0313-001	Gry



Sub-Miniature Tip Plug

For use with miniature jacks, .080" dia. tip. Nickel-plated machined brass body, solder lead connection. Current rating: 5 amps.

Part no.	Color	Part no.	Color
105-0771-001	Wht	105-0774-001	Grn
105-0772-001	Red	105-0777-001	Yel
105-0773-001	Blk	105-0780-001	Blu



Horizontal Jack

(U.S. Patent No. 3,208,027)

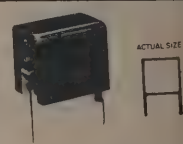
Unique design accepts .080" dia. tip plug in either end, or from top or bottom. Cross-hole also accepts hook-type oscilloscope probe. Silver-plated and Iridited beryllium copper formed contact. Two common terminals. Current rating: 5 amps. Note: Available as specials in production quantities without cross hole or with gold flash.

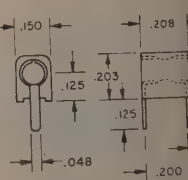
Part no.	Color	Part no.	Color
105-0751-001	Wht	105-0757-001	Yel
105-0752-001	Red	105-0758-001	Brn
105-0753-001	Blk	105-0760-001	Blu
105-0754-001	Grn	105-0762-001	Vio
105-0756-001	Orn	105-0763-001	Gry

New Horizontal Jack

New design accepts .080" diameter tip plug in either end. Silver-plated and Iridited beryllium copper formed contact. Two common terminals. Approximately one half size of standard Tip Jack. Current rating: 5 amps.

Part no.	Color	Part no.	Color
105-1101-001	Wht	105-1107-001	Yel
105-1102-001	Red	105-1108-001	Brn
105-1103-001	Blk	105-1110-001	Blu
105-1104-001	Grn	105-1112-001	Vio
105-1106-001	Orn	105-1113-001	Gry

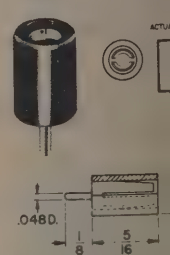




Vertical Jack

Mounts through single .052" dia. hole, requires minimum mounting area. Accepts .080" dia. tip plug. Silver-plated, machined beryllium copper contact. Current rating: 5 amps.

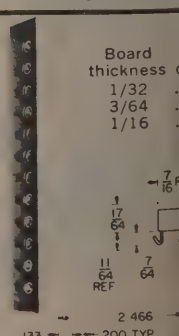
Part no.	Color	Part no.	Color
105-0851-001	Wht	105-0857-001	Yel
105-0852-001	Red	105-0858-001	Brn
105-0853-001	Blk	105-0860-001	Blu
105-0854-001	Grn	105-0862-001	Vio
105-0856-001	Orn	105-0863-001	Gry

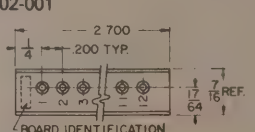


Test Point Strip Handle

This unique component offers ready access to desired portions of the circuit, without the use of jumper cables, for fast, efficient testing and troubleshooting. Accepts .080" dia. tip plugs. Rapid mounting accomplished by manual positioning; secured permanently in the wave solder operation. Operating voltage: 1500 volts RMS at sea level. Standard model has 12 contacts. Available as specials in production quantities with up to 24 contacts. (Red)

Part no. 266-0402-001





P.C. BOARD MOUNTING DE

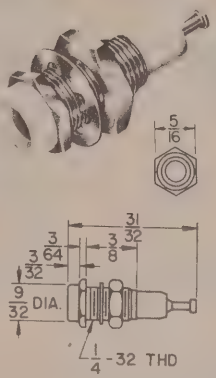
JOHNSON
E. F. JOHNSON COMPANY, WASECA, MINNESOTA 56093

Electronic Hardware

Tip Jacks

Metal-Clad Tip Jacks—Military

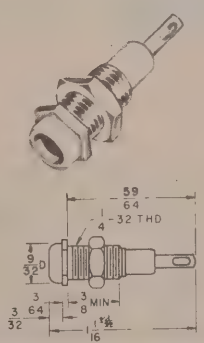
High reliability tip jack for military use or demanding industrial applications. Highest quality materials — withstand severe environmental temperature, vibration and salt spray conditions. Complies with MS-16108, Rev. F of MIL-STD-242A and MIL-C-39024/10. Closed entry contact design. Heavy nickel-plated brass jacket. Gold-plated beryllium copper contact spring. Current rating: 5 amps. Peak withstanding voltage: 8,000 volts DC. Brass solder terminal is gold-plated.



Part no.	Color	Part no.	Color
105-0201-200	Wht	105-0207-200	Yel
105-0202-200	Red	105-0208-200	Brn
105-0203-200	Blk	105-0210-200	Blu
105-0204-200	Grn	105-0212-200	Vio
105-0206-200	Orn	105-0213-200	Gry

Metal-Clad Tip Jacks—Standard

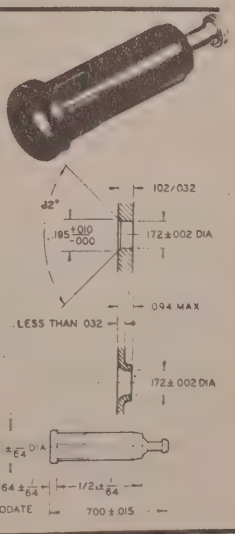
Molded body, nickel-plated machined brass jacket. Formed, silver-plated phosphor bronze contact. Current rating: 10 amps. Peak withstanding voltage: 7,000 volts. Capacity to 1/8" panel: 3.8 pF. 1/4"-32 nut furnished.



Part no.	Color	Part no.	Color
105-0251-001	Wht	105-0257-001	Yel
105-0252-001	Red	105-0258-001	Brn
105-0253-001	Blk	105-0260-001	Blu
105-0254-001	Grn	105-0262-001	Vio
105-0256-001	Orn	105-0263-001	Gry

RIB-LOC® Press-In Tip Jacks

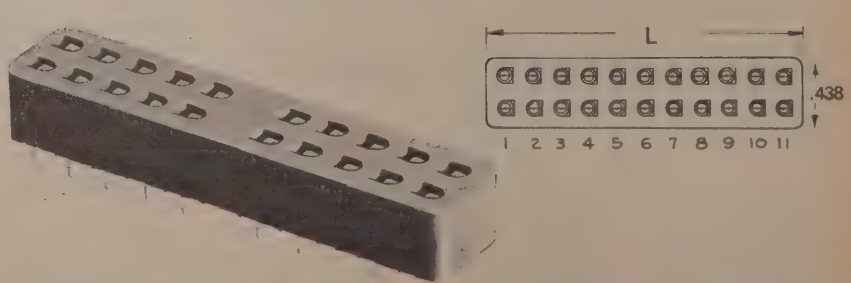
RIB-LOC® design permits substantial production line savings — no mounting hardware to handle and assemble. RIB-LOC® tip jacks install by pressing into proper size chassis hole. Accept .080" tip plug in recessed, closed-entry type contact that rejects plugs .085" or larger to prevent accidental contact damage. Insulating body molded of low-loss polyamide. Current rating: 10 amps. Peak withstanding voltage: 5,000 volts.



Part no.	Color	Part no.	Color
105-1041-001	Wht	105-1047-001	Yel
105-1042-001	Red	105-1048-001	Brn
105-1043-001	Blk	105-1050-001	Blu
105-1044-001	Grn	105-1052-001	Vio
105-1046-001	Orn	105-1053-001	Gry

Multiple Crystal Holder Sockets

Accommodate type HC-25/U Crystal holders with .040" diameter pins spaced on .192" centers. Contacts are beryllium copper, silver plated and Iridited for low contact resistance. Insulation is red polyamide. Height above board 11/32" ref.

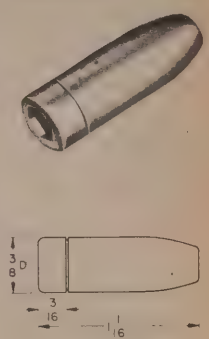


Part no.	No. of crystals	"L" dimension Ref.
126-0110-001	10	2 1/8"
126-0110-004	2	7/16"
126-0110-006	12	2 11/16"
126-0110-009	4	13/16"
126-0110-012	6	1 3/16"
126-0110-016	1	1/4"

Jack and Sleeve Assembly

(U.S. Patent No. 2,704,357)

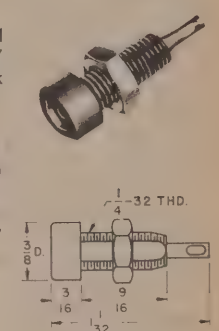
Includes Deluxe Tip Jack 105-0600-001, less mounting nut, with inside threaded molded sleeve. Ideal for patch cords, or insulated rear connection of panel mounted tip jack. Current rating: 10 amps.



Part no.	Color	Part no.	Color
105-0701-001	Wht	105-0704-001	Grn
105-0702-001	Red	105-0707-001	Yel
105-0703-001	Blk	105-0710-001	Blu

Standard Tip Jack

Molded body with recessed, cadmium-plated formed phosphor bronze contact. Accepts .080" dia. tip plug. Current rating: 10 amps. Peak withstanding voltage: 9,000 volts.

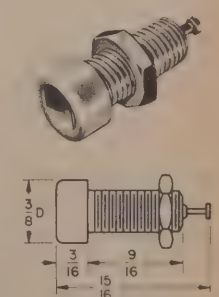


Part no.	Color	Part no.	Color
105-0801-001	Wht	105-0807-001	Yel
105-0802-001	Red	105-0808-001	Brn
105-0803-001	Blk	105-0810-001	Blu
105-0804-001	Grn	105-0812-001	Vio
105-0806-001	Orn	105-0813-001	Gry

Deluxe Tip Jack

(U.S. Patent No. 2,704,357)

Molded body with recessed closed entry design contact. Silver-plated beryllium copper contact spring. Current rating: 10 amps. Peak withstanding voltage: 11,000 volts. Capacity to 1/8" panel:2 pF 1/4"-32 nut furnished.



Part no.	Color	Part no.	Color
105-0601-001	Wht	105-0607-001	Yel
105-0602-001	Red	105-0608-001	Brn
105-0603-001	Blk	105-0610-001	Blu
105-0604-001	Grn	105-0612-001	Vio
105-0606-001	Orn	105-0613-001	Gry

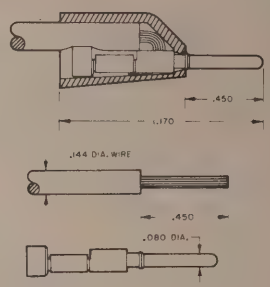
JOHNSON
E. F. JOHNSON COMPANY, WASECA, MINNESOTA 56093

Electronic Hardware

Banana Plugs/Banana Jacks

Stacking .080 Standard Tip Plugs

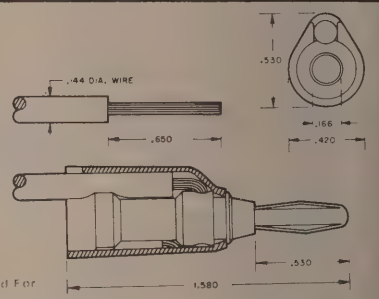
Precision machined brass plug body with .0002" nickel plating. Internal jack spring is beryllium copper with .0002" nickel plating. Current rating: 10 amps.



Part no.	Color	Part no.	Color
105-1201-001	Wht	105-1204-001	Grn
105-1202-001	Red	105-1207-001	Yel
105-1203-001	Blk	105-1210-001	Blu

Stacking Standard Banana Plugs

Plug body is precision machined brass with .0002" nickel plating. Spring is one-piece nickel-silver — highly resistant to corrosion. Current rating: 15 amps. Plastic housing is polyamide with operating temperature range of -55°C to +105°C. Assembly with assembly tool and fixture is recommended.

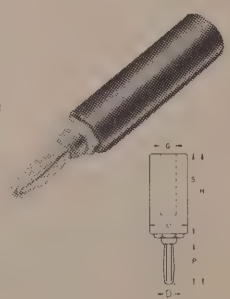


Part no.	Color	Part no.	Color
108-1081-001	Wht	108-1084-001	Grn
108-1082-001	Red	108-1087-001	Yel
108-1083-001	Blk	108-1090-001	Blu

Standard Insulated Banana Plugs

These standard insulated banana plugs are equipped with plastic handles, brass nickel-plated bodies, and nickel-silver springs. Current rating: 15 amps.

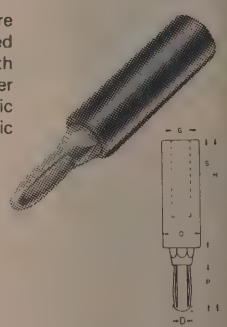
The 108-0752-001 has a black plastic handle, the 108-0752-002 has a red plastic handle.



Part no.	S	P	D	H	G	O
108-0752-001	1 3/8"	17/32"	.175"	2 1/8"	7/32"	7/16"
108-0752-002	1 3/8"	17/32"	.175"	2 1/8"	7/32"	7/16"

Jumbo Insulated Banana Plugs

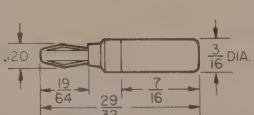
These jumbo size insulated banana plugs are similar in design to the standard types listed above, but are somewhat larger in size. With brass nickel-plated bodies, and nickel-silver springs. The 108-0772-001 has a black plastic handle — the 108-0772-002 has a red plastic handle. Current rating: 40 amps.



Part no.	S	P	D	H	G	O
108-0772-001	1 3/4"	3/4"	.300"	2 25/32"	3/8"	5/8"
108-0772-002	1 3/4"	3/4"	.300"	2 25/32"	3/8"	5/8"

Miniature Banana Plugs

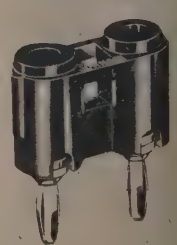
Extremely small insulated banana plugs with precision machined phosphor bronze body, nickel-plated. One-piece springs are beryllium copper, nickel-plated, .120" dia. Polyamide sleeve. Current rating: 10 amps.



Part no.	Color	Part no.	Color
108-1001-001	Wht	108-1004-001	Grn
108-1002-001	Red	108-1007-001	Yel
108-1003-001	Blk	108-1010-001	Blu

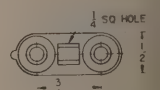
Dual Banana Plugs

Extremely versatile dual banana plug available for either solderless or set screw connection. Molded body incorporates polarity indication and strain relief hole for wire leads. Springs are high quality nickel-silver — bodies are nickel plated. Accurately machined brass studs extend full length of pins for extra strength. Peak withstanding voltage: 10,000 volts. Capacity plug to plug: 1.3 pF. Current rating: 15 amps.



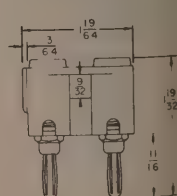
(solderless)

Part no.	Color	Part no.	Color
108-0201-001	Wht	108-0204-001	Grn
108-0202-001	Red	108-0207-001	Yel
108-0203-001	Blk	108-0210-001	Blu



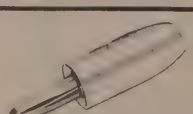
(with set screws)

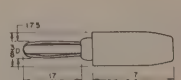
Part no.	Color
108-0252-001	Red
108-0253-001	Blk



Solderless Banana Plugs

Compact, high voltage insulated plug for a wide variety of applications. Designed for fast, solderless connection of up to 16 gauge standard wire. Body and pin are constructed of one-piece, nickel-plated brass with high grade nickel-silver springs. Polyamide sleeve. Current rating: 15 amps.





Part no.	Color	Part no.	Color
108-0301-001	Wht	108-0307-001	Yel
108-0302-001	Red	108-0308-001	Brn
108-0303-001	Blk	108-0310-001	Blu
108-0304-001	Grn	108-0312-001	Vio
108-0306-001	Orn	108-0313-001	Gry

JOHNSON
E. F. JOHNSON COMPANY, WASECA, MINNESOTA 56093

Electronic Hardware

Banana Plugs/Banana Jacks

Standard Banana Plugs.

This group of standard banana plugs has precision machined brass studs which extend the full length of the plugs, providing extra strength. Springs are nickel-silver — highly resistant to corrosion. Bodies and hardware .0001 nickel-plated. Solder terminal and nut or screw furnished. Current rating: 15 amps.

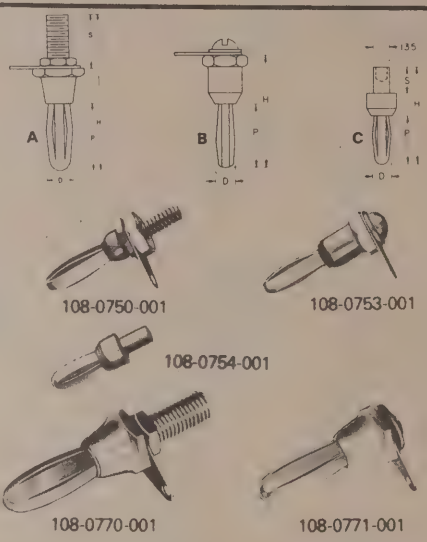
Part no.	Dwg.	S	P	D	H	Thread
108-0750-001	A	3/8"	17/32"	.175"	1 1/8"	6-32
108-0750-002	A	3/4"	17/32"	.175"	1 1/2"	6-32
108-0753-001	B	—	17/32"	.175"	15/16"	6-32

This banana plug is similar to the standard types listed above, except that it is designed for riveting. Springs are beryllium copper, cadmium-plated. Current rating: 10 amps.

108-0754-001	C	7/32"	13/32"	.155"	13/16"	—

Jumbo type banana plugs have accurately machined brass studs extending full length of the pins. Nickel-silver springs. Bodies and hardware .0001 nickel-plated. With solder lug and nut or screw. Current rating: 40 amps.

108-0770-001	A	5/8"	3/4"	.300"	1 25/32"	1/4"-28
108-0771-001	B	—	3/4"	.300"	1 1/8"	10-32



Standard Banana Jacks

High quality, machined brass banana jack. Nickel-plated. Furnished complete with solder terminal and nut.

Part No.	F	D	S	H	Hole Dia.	Thread
108-0740-001	3/8"	1/4"	17/32"	5/8"	.166"	1/4"-28

High quality machined brass banana jacks with plastic head molded to body. Nickel-plated. Furnished complete with solder terminal and nut. The 108-0745-001 is equipped with red plastic head — the 108-0745-002 is equipped with black plastic head.

108-0745-001	7/16"	1/4"	32/64"	21/32"	.166"	1/4"-28
108-0745-002	7/16"	1/4"	32/64"	21/32"	.166"	1/4"-28

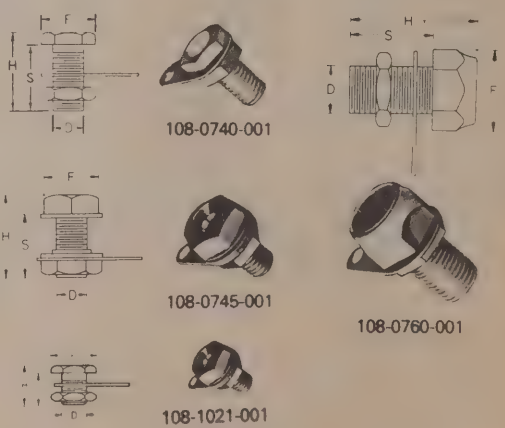
This jumbo banana jack will accommodate plugs such as the 108-0770-001 and the 108-0771-001 listed above. Machined brass, nickel-plated. Furnished complete with solder terminal and nut.

108-0760-001	9/16"	3/8"	21/32"	1"	.277"	3/8"-32

New Miniature Banana Jack

Internal .104" hole accepts miniature banana plug 108-1000-001 with .120" dia. plug. Precision machined brass, nickel-plated. Copper terminal is pre-plated .00004" tin, hot-tin-dipped beyond solder area.

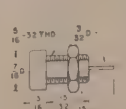
108-1021-001	23/64"	13/64"	1/4"	9/16"	.104"	10-32



Banana Jack

Completely insulated polyamide body with cadmium-plated insert. Accommodates banana plugs of nominal .175" diameter. Peak withstanding voltage: 5,000 volts DC. Mounts in 21/64" diameter circular, "D", or double flat hole (1/4" across flats).

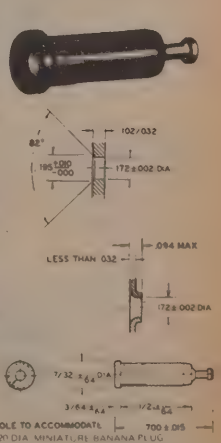
Part no.	Color	Part no.	Color
108-0901-001	Wht	108-0907-001	Yel
108-0902-001	Red	108-0908-001	Brn
108-0903-001	Blk	108-0910-001	Blu
108-0904-001	Grn	108-0912-001	Vio
108-0906-001	Orn	108-0913-001	Gry



RIB-LOC® Press-In Banana Jacks

Johnson RIB-LOC® design permits substantial production line savings — no mounting hardware to handle and assemble. RIB-LOC® banana jacks install by pressing into proper size chassis hole. Accept .120" banana plug in recessed contact. Silver-plated brass contact. Brass solder terminal silver-plated and iridited for good solderability. Insulating body molded of low-loss polyamide. Current rating: 10 amps. Peak withstanding voltage: 5,000 volts. Capacity to 1/8" panel: 1.4 pF nominal.

Part no.	Color	Part no.	Color
108-1101-001	Wht	108-1104-001	Grn
108-1102-001	Red	108-1107-001	Yel
108-1103-001	Blk	108-1110-001	Blu



JOHNSON

E. F. JOHNSON COMPANY, WASECA, MINNESOTA 56093

Connectors

COAXIAL CONNECTORS

The JCM is a miniature (3mm) connector that is fully compatible with SMA types, at a fraction of SMA prices.

The JCM is designed for commercial and industrial applications where low cost is a major factor, and SMA compatibility is required.

The non-galling gold finish is resistant to wear and abrasion.

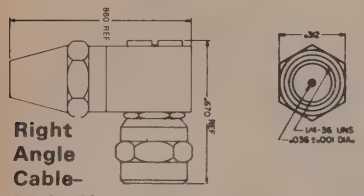
Cable clamp JCM plugs and jacks consist of 5 or fewer parts which are easily assembled. Only one set of stripping dimensions is required for all cables from 0.075 to 0.216" overall diameter. Panel, bulkhead, and PC mounting receptacles are preassembled.

Beryllium copper center contacts assure superior spring qualities and lowest contact resistance.

Available on special order basis with nickel plating for especially cost conscious applications.

ELECTRICAL, TYPICAL

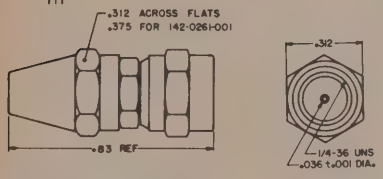
Impedance	50 ohms
Frequency	DC - 6 GHz or more
Voltage Rating	500 V RMS @ sea level
Dielectric Withstanding	1000 V RMS @ sea level
VSWR	1.15 : 1 to 6 GHz
Contact Resistance	3.0 milliohms or less
Insulation Resistance	5000 megohms



Right Angle Cable–Male Plug

Cable Group

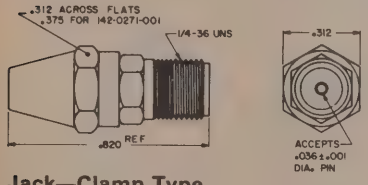
I — 142-0202-001
II — 142-0222-001
III — 142-0262-001



Plug—Clamp Type

Cable Group

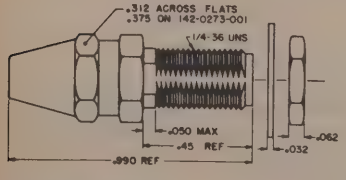
I — 142-0201-001
II — 142-0221-001
III — 142-0261-001



Jack—Clamp Type

Cable Group

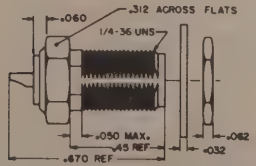
I — 142-0211-001
II — 142-0231-001
III — 142-0271-001



Bulkhead Jack—Clamp Type

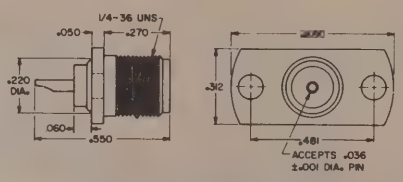
Cable Group

I — 142-0213-001
II — 142-0233-001
III — 142-0273-001



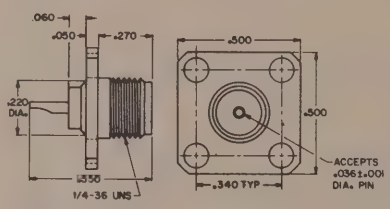
Bulkhead Receptacle, Rear Mount

142-0294-001



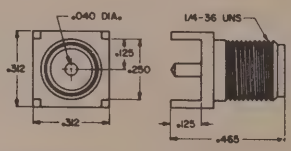
2-hole Panel Receptacle, Front Mount

142-0296-001



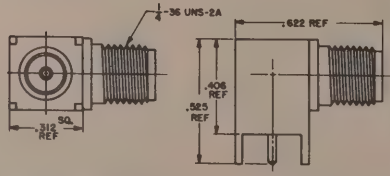
4-hole Panel Receptacle, Front Mount

142-0297-001



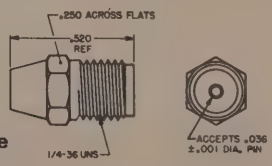
PC Receptacle

142-0298-001



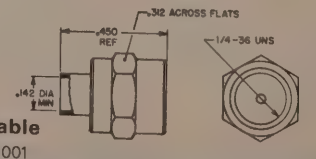
Right angle PC mount, receptacle

142-0299-001



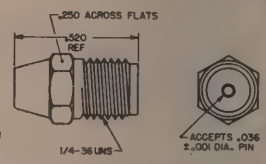
Jack/Cable

142-0284-001



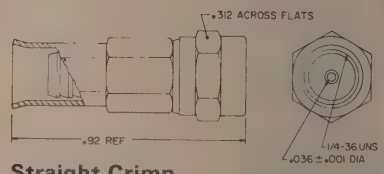
Plug/Cable

142-0281-001



Jack/Cable

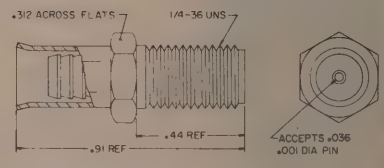
142-0283-001



Straight Crimp Type Cable Plug

Cable Group

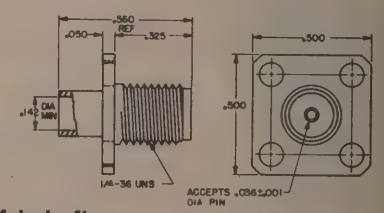
I — 142-0301-001
II — 142-0321-001
III — 142-0361-001



Straight Crimp Type Cable Jack

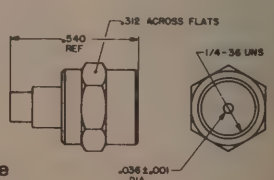
Cable Group

I — 142-0311-001
II — 142-0331-001
III — 142-0371-001



4-hole flange mount, cable/jack

142-0286-001

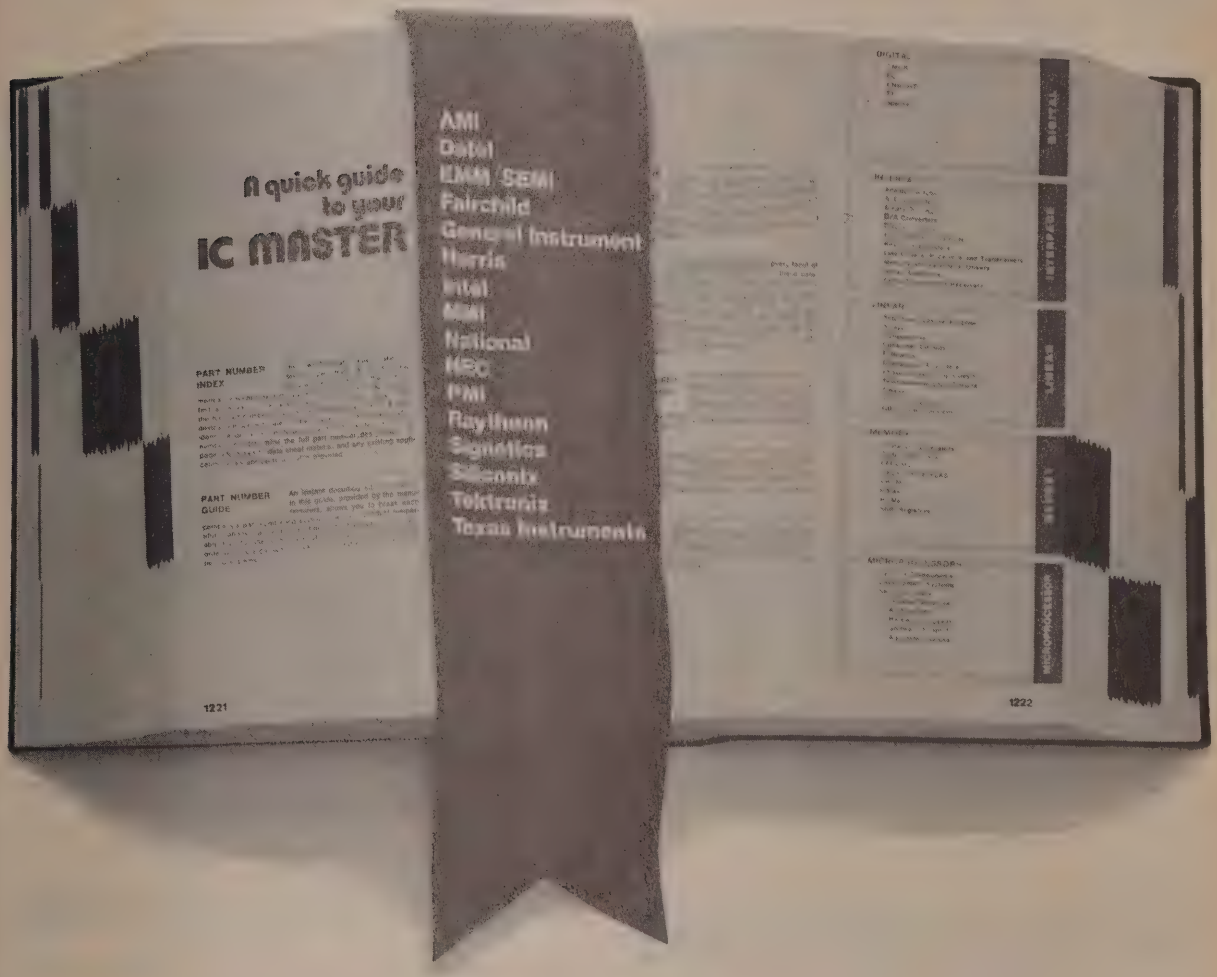


Plug/Cable

142-0282-001

Prices available on request.

A GOOD BOOK IS KNOWN BY THE COMPANIES IT KEEPS.



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STANDARDIZED TERMINAL BOARDS

STANDARDIZED TURRET TERMINAL BOARDS

Cut your production cost by eliminating the tooling and setup charge usually applied to nonstandardized boards. Terminals are securely riveted and hot tinned for easy soldering.

TERMINALS: Your choice of most popular types.
Made of Brass: QQ-626, comp. 22, ½ hard.
Hot Dip Solder finish: Mil-F-14072 Type 221.

Material: Your choice of either PBE or GEE Phenolic.

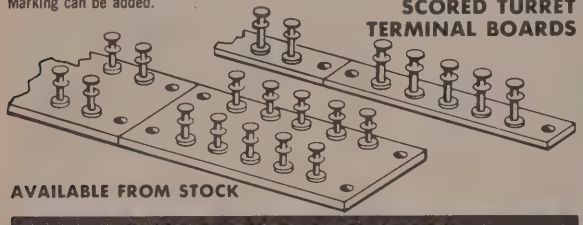
PBE: Paper base electrical, Mil-P-3115C, Temp. 250° F max. Type XXXP.

GEE: Glass Epoxy, Mil-P-18177, Temp. 300° F max. Type G-10.

Five sections **SCORED** for easy **separation** M'tg. holes in each section.

These boards **CAN BE MODIFIED** with terminals staked in all holes, scoring eliminated. Marking can be added.

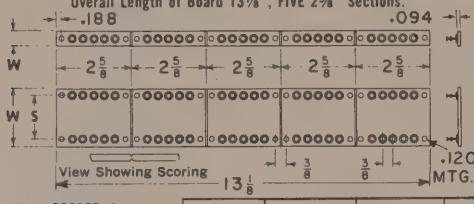
SCORED TURRET TERMINAL BOARDS



AVAILABLE FROM STOCK

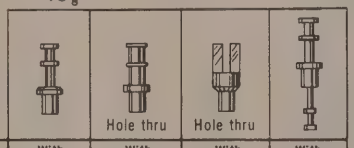
3/8" SPACING AND SCORED

3/32" THICK PHENOLIC — Choice of 4 Types of Terminals
Overall Length of Board 13⅛", FIVE 2⅝" Sections.



Five sections **SCORED** for easy operation.
M'tg. holes in each section.

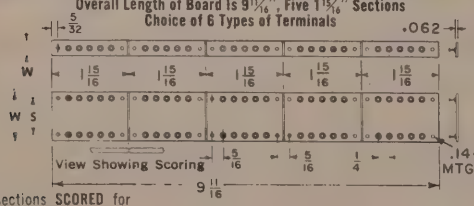
CHOICE OF TERMINALS



W	S	No. of Terms.	Material	With 1503 Term. Cat. No.	With 1509 Term. Cat. No.	With 1507 Term. Cat. No.	With 1545 Term. Cat. No.
½	Single Row	25	PBE	15031	15091	15071	15041
			GEE	15231	15291	15271	15241
1½	1	50	PBE	15032	15092	15072	15042
			GEE	15232	15292	15272	15242
1½	1 3/16	50	PBE	15036	15096	15076	15046
			GEE	15236	15296	15276	15246
2	1½	50	PBE	15033	15093	15073	15043
			GEE	15233	15293	15273	15243
2½	2	50	PBE	15034	15094	15074	15044
			GEE	15234	15294	15274	15244
3	2½	50	PBE	15035	15095	15075	15045
			GEE	15235	15295	15275	15245

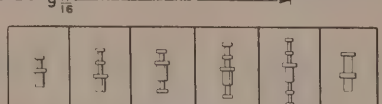
MINIATURE TURRET TERMINAL BOARDS

1/4" SPACING AND SCORED — 1/16" THICK PHENOLIC
Overall Length of Board Is 9 1/16", Five 1 15/16" Sections
Choice of 6 Types of Terminals



Five sections **SCORED** for easy operation.
M'tg. holes in each section.

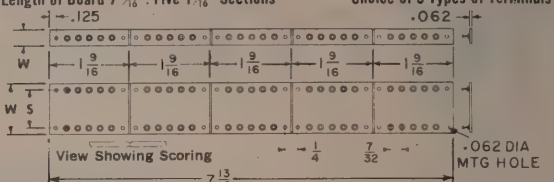
CHOICE OF TERMINALS



W	S	No. of Terms.	Material	With 1572 Term. Cat. No.	With 1573 Term. Cat. No.	With 1574 Term. Cat. No.	With 1575 Term. Cat. No.	With 1583 Term. Cat. No.	With 1559 Term. Cat. No.
5/16	Single Row	25	PBE	15047	15057	15067	15077	15087	15097
			GEE	15247	15257	15267	15277	15287	15297
7/8	9/16	50	PBE	15048	15058	15068	15078	15088	15098
			GEE	15248	15258	15268	15278	15288	15298
1⅛	13/16	50	PBE	15049	15059	15069	15079	15089	15099
			GEE	15249	15259	15269	15279	15289	15299

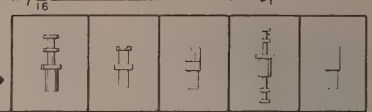
MINIATURE TURRET TERMINAL BOARDS

7/32" SPACING AND SCORED — 1/16" THICK PHENOLIC
Overall Length of Board 7 13/16". Five 1 9/16" Sections
Choice of 5 Types of Terminals



Five sections **SCORED** for easy operation.
M'tg. holes in each section

CHOICE OF TERMINALS



W	S	No. of Terms.	Material	With 1502 Term. Cat. No.	With 1562 Term. Cat. No.	With 1526 Term. Cat. No.	With 1512 Term. Cat. No.	With 1533 Term. Cat. No.
5/16	Single Row	25	PBE	15021	15023	15025	15063	15053
			GEE	15221	15223	15225	15263	15253
3/4	½	50	PBE	15028	15029	15026	15064	15054
			GEE	15228	15229	15226	15264	15254
1	3/4	50	PBE	15022	15024	15030	15065	15056
			GEE	15222	15224	15230	15265	15256

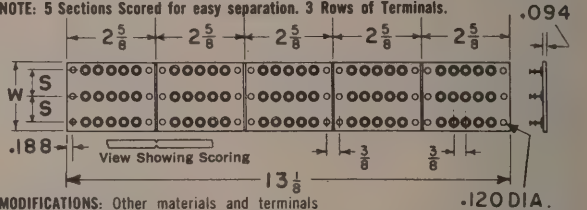
UNIVERSAL TERMINAL BOARDS

Designed for production or experimental use, these **standardized boards** are well suited for any electronic application requiring a sturdy mounting surface for resistors, condensers and components.

TERMINAL: 1503-3 HOT TIN DIP finish for easier soldering and infinite shelf life.

MATERIALS: **PBE** (Paper Base Elect. Mil-P-3115C type XXXP)
GEE (Glass Epoxy Mil-P-18177 type G-10)

NOTE: 5 Sections Scored for easy separation. 3 Rows of Terminals.



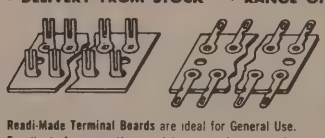
MODIFICATIONS: Other materials and terminals of your choice supplied. Marking may be added.

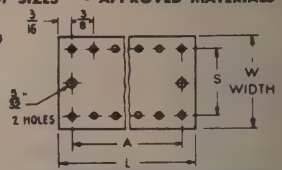
Assembled. with **TERMINAL** 1503-3

W	S	Total No. of Terms.	Material	Cat. No.
2½	1	75	PBE	15332
			GEE	15342
3½	1½	75	PBE	15333
			GEE	15343

READI-MADE TERMINAL BOARDS

• ECONOMICAL • SAVE TOOLING COST
• DELIVERY FROM STOCK • RANGE OF SIZES • APPROVED MATERIALS





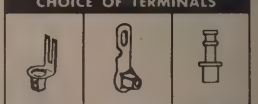
Readi-Made Terminal Boards are ideal for General Use. Excellent for mounting resistors, condensers, etc. Choice of Terminals.

MATERIAL: 1/16" thick Bakelite (Mil Spec 3115C-Pbe-P grade).

TERMINALS: 1204 and 1268 are stamped from .023 thick brass. 1539 is turned from 3/16" dia. brass rod.

PLATING: 1204 is Cadmium plated. 1268 and 1539 are Hot Tinned for easy soldering.

CHOICE OF TERMINALS



W	L	S	A	Terminals Each Side	With 1268 Term. Cat. No.	With 1204 Term. Cat. No.	With 1539 Term. Cat. No.
1	1⅛	11/16	1½	5	1268-10	1204-10	1239-10
1	2¼	11/16	1⅞	6	1268-12	1204-12	1239-12
1	5¼	11/16	4¾	14	1268-28	1204-28	1239-28
1¾	3¼	1⅛	3¾	10	1268-20	1204-20	1239-20
1¾	4⅛	1⅛	3¾	11	1268-22	1204-22	1239-22
1¾	7⅛	1⅛	6¾	19	1268-38	1204-38	1239-38
½	7⅛	Single Row	6¾	19	1268-19	1204-19	1239-19

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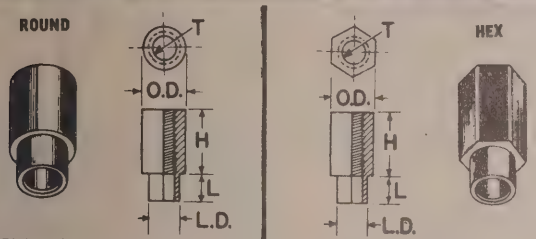
SWAGE TYPE THREADED STANDOFFS



Nickel Plate MIl-F-14072 QQ-N-290 Type VII.

Cadmium plate per QQ-P-416 Type 2 Class B and clear chromate.

Material: MADE OF: BRASS MIL SPEC. QQ-B-626A COMP. 22—½ HARD.

ROUND Nickel Plated Cat. No.	H Height Above Panel	L	For Panel Thickness	LD	OD	T Thread	HEX Cadmium Plated Cat. No.
1589-2	⅛	.109	1/16	.125	5/32	2-56	—
1589-3	⅛	.140	3/32	.125	5/32	2-56	—
1590-2	3/16	.109	1/16	.125	5/32	2-56	—
1590-3	3/16	.140	3/32	.125	5/32	2-56	—
1591-2	¼	.109	1/16	.125	5/32	2-56	—
1591-3	¼	.140	3/32	.125	5/32	2-56	—
1596-2	⅜	.109	1/16	.125	5/32	2-56	—
1596-3	⅜	.140	3/32	.125	5/32	2-56	—
1560 A	⅛	.109	1/16	.187	¼	4-40	1653-2
1560 F	⅛	.140	3/32	.187	¼	4-40	1653-3
1650-2	¼	.109	1/16	.187	¼	4-40	1627-2
1650-3	¼	.140	3/32	.187	¼	4-40	1627-3
1651-2	⅜	.109	1/16	.187	¼	4-40	1628-2
1651-3	⅜	.140	3/32	.187	¼	4-40	1628-3
1623-2	½	.109	1/16	.187	¼	4-40	1629-2
1623-3	½	.140	3/32	.187	¼	4-40	1629-3
1624-2	⅝	.109	1/16	.187	¼	4-40	1654-2
1624-3	⅝	.140	3/32	.187	¼	4-40	1654-3
1625-2	¾	.109	1/16	.187	¼	4-40	1655-2
1625-3	¾	.140	3/32	.187	¼	4-40	1655-3
1652-2	1	.109	1/16	.187	¼	4-40	1630-2
1652-3	1	.140	3/32	.187	¼	4-40	1630-3
1560 B	⅛	.109	1/16	.187	¼	6-32	1620-2
1560 C	⅛	.140	3/32	.187	¼	6-32	1620-3
1560 D	⅛	.171	⅛	.187	¼	6-32	1620-4
1612-2	3/16	.109	1/16	.187	¼	6-32	—
1612-3	3/16	.140	3/32	.187	¼	6-32	—
1612-4	3/16	.171	⅛	.187	¼	6-32	—
1546	¼	.109	1/16	.187	¼	6-32	1621-2
1546 B	¼	.140	3/32	.187	¼	6-32	1621-3
1546 D	¼	.171	⅛	.187	¼	6-32	1621-4
1561 B	⅜	.109	1/16	.187	¼	6-32	1622-2
1561 C	⅜	.140	3/32	.187	¼	6-32	1622-3
1561 D	⅜	.171	⅛	.187	¼	6-32	1622-4
1604-2	½	.109	1/16	.187	¼	6-32	—
1604-3	½	.140	3/32	.187	¼	6-32	—
1604-4	½	.171	⅛	.187	¼	6-32	—
1605-2	⅝	.109	1/16	.187	¼	6-32	—
1605-3	⅝	.140	3/32	.187	¼	6-32	—
1605-4	⅝	.171	⅛	.187	¼	6-32	—
1608-2	¾	.109	1/16	.187	¼	6-32	—
1608-3	¾	.140	3/32	.187	¼	6-32	—
1608-4	¾	.171	⅛	.187	¼	6-32	—
1609-2	1	.109	1/16	.187	¼	6-32	—
1609-3	1	.140	3/32	.187	¼	6-32	—
1609-4	1	.171	⅛	.187	¼	6-32	—

ALUMINUM SPACERS

WITH IRIDITE FINISH PER SPEC MIL-C-5541

- Lightweight
- Round — Clear Hole
- Spacers — Drilled Hole Only

- Non-magnetic
- Round — Tapped Hole
- Spacers — with Tapped Hole

SPACERS — DRILLED HOLE ONLY

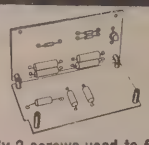
Length Inches	For #4 Screw .120 Hole Cat. No.	For #6 Screw .140 Hole Cat. No.	For #8 Screw .171 Hole Cat. No.
¼ (.250)	3457	3464	3471
⅜ (.375)	3458	3465	3472
½ (.500)	3459	3466	3473
¾ (.750)	3460	3467	3474
1 (1.000)	3461	3468	3475
1½ (1.500)	3462	3469	3476
2 (2.000)	3463	3470	3477

SPACERS — WITH TAPPED HOLE

Length Inches	4-40 Thread Cat. No.	6-32 Thread Cat. No.	8-32 Thread Cat. No.
¼ (.250)	3478	3485	3492
⅜ (.375)	3479	3486	3493
½ (.500)	3480	3487	3494
¾ (.750)	3481	3488	3495
1 (1.000)	3482	3489	3496
1½ (1.500)	3483	3490	3497
2 (2.000)	3484	3491	3498

1.500 and 2″ are tapped ⅜ deep each end

HINGED STANDOFFS FOR TERMINAL BOARDS

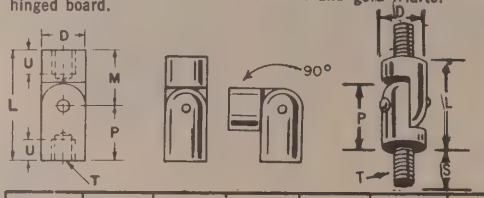


Only 2 screws used to fasten board in place or open the hinged board.

- APPLICATIONS UNLIMITED • TIME SAVER
- CUT COST OF SERVICING • SPACE SAVER
- INTERCONNECT CIRCUITS OR SERVICES WITHOUT DANGER OF SHORTING • WIRING EXPOSED FOR EASY TEST

Material: Made of Brass MIL Spec. QQ-B-626A Comp. 22—½ Hard.

Finishes: Cadmium plate per QQ-P-416 Type 2 Class 2 and gold iridite.



These standoffs mount at front of the board.

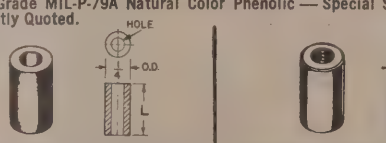
Hinge Cat. No.	T Thread	D Diam.	L Length	U	M	P	Standoff Only Cat. No.
351	4-40	.187	¾	.172	.375	.375	1657A
352	4-40	.187	1	.250	.375	.625	1657B
353	6-32	.250	¾	.172	.375	.375	1548E
354	6-32	.250	1	.250	.375	.625	1548F
355	8-32	.250	¾	.172	.375	.375	1692D
356	8-32	.250	1	.250	.375	.625	1692E

Hinge Cat. No.	T Thread	L Length	D Diam.	S	P	Standoff Only For Front of Board Cat. No.
357	4-40	½	.187	¼	¼	1657
358	6-32	½	.250	5/16	¼	1548C
359	8-32	½	.250	5/16	¼	1692C

PHENOLIC SPACERS

- GOOD MECHANICAL STRENGTH • RESISTS ABRASIONS & CHEMICALS
- EXCELLENT DIELECTRIC • LOW MOISTURE ABSORPTION

Material: PBE Grade MIL-P-79A Natural Color Phenolic — Special Sizes Made to Order — Promptly Quoted.



SPACERS — DRILLED HOLE ONLY

SPACERS — WITH TAPPED HOLE

Length Inches	For #4 Screw .120 Hole Cat. No.	For #6 Screw .140 Hole Cat. No.	For #8 Screw .171 Hole Cat. No.	4-40 Thread Cat. No.	6-32 Thread Cat. No.	8-32 Thread Cat. No.
¼ (.250)	360	367	1490	376	383	390
⅜ (.375)	361	368	1491	377	384	391
½ (.500)	362	369	1492	378	385	392
¾ (.750)	363	370	1493	379	386	393
1 (1.000)	364	371	1494	380	387	394
1½ (1.500)	365	372	374	381	389	395
2 (2.000)	366	373	375	382	389	396

1.500 and 2″ are tapped ⅜ deep each end.

ALUMINUM ECONOMY SPACERS

FOR No. 4, 6 or 8 SCREWS

- PRECISION FORMED • NO BURRS

Made of flat strip aluminum and rolled on precision equipment. Assures maximum bearing surface, square ends.

Description and Tolerance

Spacer For	I.D. ±.005	O.D. ±.007
#4	.125	.167
#6	.151	.193
#8	.178	.232

L Length Inches	For #4 Cat. No.	For #6 Cat. No.	For #8 Cat. No.	L Length Inches	For #4 Cat. No.	For #6 Cat. No.	For #8 Cat. No.
3/16	397	—	—	¾	418	425	432
¼	398	405	412	⅞	419	426	433
5/16	399	406	413	1	420	427	434
⅜	400	407	414	1¼	421	428	435
7/16	401	408	415	1½	422	429	436
½	402	409	416	1¾	—	430	437
⅝	403	410	417	2	—	—	438

ELECTRONIC COMPONENTS

KEYSTONE ELECTRONICS CORP. DESIGNERS MANUFACTURERS NEW YORK N.Y. 10012

PLUG IN HOUSINGS

Enhance the appearance and give that professional look to your products using these molded housings. Ideally suited for packaging relays, logic packages, networks and miniature circuitry. Durable, lightweight covers that will withstand vibrations and rough usage.

HEADERS: Molded of GP black phenolic and fit standard sockets. Pins are brass. Nickel plated guide hole tapped 8-32 for terminal board mounting stud.

- **Variety of molded materials**
- **Good chemical resistance**

MATERIAL CHARACTERISTICS:

Polystyrene: For general purpose use where high impact strength is not required and temperature would not exceed 170°F.

Butyrate: 3 times the impact strength of Polystyrene and excellent electrical properties, use wherever temperatures of 210°F exist.

Nylon: Impact strength slightly less than Butyrate but recommended for use where temperatures are as high as 300°F.

FIG. 1

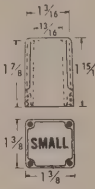


FIG. 2

FIG. 3

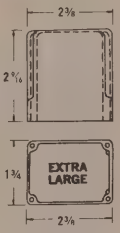


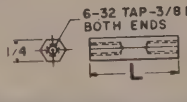
FIG. 4

Housing with Octal Header & 4 Screws Cat. No.	Housing Only Cat. No.	Fig. No.	Type	Material	Color
660	670	1	Mini	Butyrate	Clear
661	671	1	Mini	Nylon	White
662	672	1	Mini	Polystyrene	Clear
641	645	1	Mini	Polystyrene	Opaque Black
642	646	1	Mini	Polystyrene	Transp Red
663	673	2	Small	Butyrate	Clear
664	674	2	Small	Nylon	White
665	676	2	Small	Polystyrene	Clear
643	647	2	Small	Polystyrene	Opaque Black
644	648	2	Small	Polystyrene	Transp Red
650	649	3	Large	Butyrate	Clear
668	679	3	Large	Polystyrene	Clear
677	686	3	Large	Polystyrene	Opaque Black
678	667	3	Large	Polystyrene	Transp Red
639	640	4	Xtra-Lge	Polystyrene	Clear
710	711	4	Xtra-Lge	Polystyrene	Opaque Black
712	713	4	Xtra-Lge	Butyrate	Clear

HEX SPACERS 6-32 TAPPED BOTH ENDS

Extra long length spacers ideal as standoff legs for Keystone pre-punched boards or your special application.

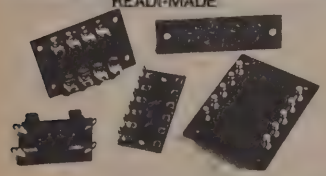
Brass cadmium plated and chromate. ¼" O.D. with 6-32 x ⅜" deep tapped holes both ends.



Cat. No.	Length
1635	1
1636	1¼
1637	1½
1638	1¾
1639	2
1642	2¼
1643	2½

TERMINAL BOARDS

READI-MADE



SEND BLUEPRINTS FOR SPECIAL FABRICATION PROMPT QUOTATIONS RENDERED

NEW FREE CATALOG ON REQUEST

CUSTOM FABRICATED

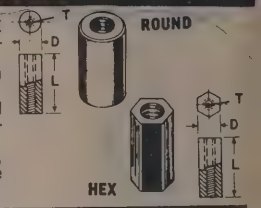
THREADED SPACERS

Material: ALL HARDWARE ON THIS PAGE IS MADE OF: BRASS MIL SPEC. QQ-B-626A COMP. 22 — ½ HARD.

Finishes: Nickel Plate Mil-F-14072 QQ-N-290 Type V.

Cadmium plate per QQ-P-416 Type 2 Class B and clear chromate. Other finishes available on special order.

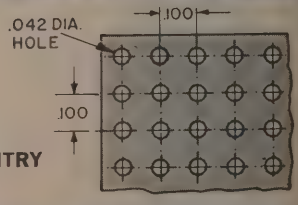
Threaded spacers ¼" O.D. threaded 4-40, 6-32, 8-32 available either in round or hex. Round type is nickel plated, hex type is cadmium.



HEX Cadmium Plated Cat. No.	D	L	T Thread	ROUND Nickel Plated Cat. No.
1450	3/16	¼	4-40	1547
1656	3/16	½	4-40	1657
1656A	3/16	¾	4-40	1657A
1656B	3/16	1	4-40	1657B
1450A	¼	¼	4-40	1547A
1450B	¼	⅜	4-40	1547B
1450C	¼	½	4-40	1547C
1450D	¼	¾	4-40	1547D
1450E	¼	1	4-40	1547E
1451A	¼	¼	6-32	1548A
1451B	¼	⅜	6-32	1548B
1451C	¼	½	6-32	1584C
1451D	¼	⅝	6-32	1548D
1451E	¼	¾	6-32	1548E
1635	¼	1	6-32	1548F
1474A	¼	¼	8-32	1692A
1474B	¼	⅜	8-32	1692B
1474C	¼	½	8-32	1692C
1474D	¼	¾	8-32	1692D
1474E	¼	1	8-32	1692E
1452A	⅜	⅜	8-32	1549A
1452B	⅜	½	8-32	1549B
1452C	⅜	⅝	8-32	1549C
1452D	⅜	¾	8-32	1549D
1452E	⅜	1	8-32	1549E

MICRO-MINIATURE KEYBOARDS

- FOR MODULE STACKS
- SMALLER PLUG-IN CARDS POSSIBLE
- PERMITS HIGHER COMPONENT DENSITY FOR SUBMINIATURE CIRCUITRY



"P" PATTERN .042 HOLES .100 x .100

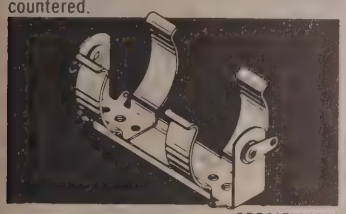
Width & Length	No. Holes W & L	Glass Epoxy	Glass Epoxy Cop. Clad (1 Side)	XXXP Natural Phenolic
1/32 THICK MATERIAL		Cat. No.	Cat. No.	Cat. No.
2 x 4½	19 x 44	4225	4234	—
2 x 6	19 x 59	4226	4235	—
4½ x 6	44 x 59	4227	4236	—
6 x 17	59 x 169	4228	4237	—
3/64 THICK MATERIAL		Cat. No.	Cat. No.	Cat. No.
2 x 4½	19 x 44	4229	4238	—
2 x 6	19 x 59	4230	4239	—
4½ x 6	44 x 59	4231	4240	—
6 x 17	59 x 169	4232	4241	—
1/16 THICK MATERIAL		Cat. No.	Cat. No.	Cat. No.
2 x 4½	19 x 44	3405	3415	3396
2 x 6	19 x 59	3406	3416	3397
2.73 x 17	26 x 169	3407	3417	3398
3 x 4½	29 x 44	3408	3418	3399
4½ x 6	44 x 59	3409	3419	3400
4½ x 6½	44 x 64	3410	3420	3404
4½ x 8½	44 x 84	3411	3421	3425
4½ x 17	44 x 169	3412	3422	3426
6 x 17	59 x 169	3413	3423	3427

KEYSTONE ELECTRONICS CORP., 49 BLEECKER STREET, N.Y., N.Y. 10012 • (212) 475-4600 TWX 710-581-2861 CABLE-KEYELCO

KEYSTONE ALL STEEL BATTERY HOLDERS

STANDARDIZED ALL STEEL BATTERY HOLDERS

An important advance in design that has gained wide acceptance for military and commercial usage. Battery when installed is held under spring tension at a constant pressure assuring low resistance contact will hold up to 4 cells in series in sturdy insulating tube. Retainer clips available to lock battery securely. This prevents shifting or loosening of battery in holder. Recommended for use where shock or severe vibration is encountered.



- CORROSION RESISTANT NICKEL PLATED
- STAINLESS STEEL CONTACTS
- MOISTURE PROOF INSULATING WASHERS
- IDEAL FOR NI-CAD AND ALKALINE CELLS

SPECIFICATIONS

Made of SAE 1065 Carbon Steel to MIL Spec. 17919, heat treated to spring temper and nickel plated .0002 thick. Contact assembly consists of a stainless steel eyelet, moisture proof vulcoid washers and a coated copper solder lug. Ribbed carbon steel base for added support is nickel plated and has 2 mounting holes for ease in mounting.

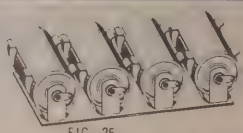


FIG 25

FIG 23

FIG 19

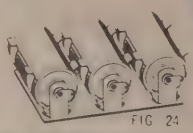


FIG 24

FIG 20

FIG 21

FIG 22

SPACE SAVER BATTERY CLIPS

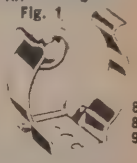
Available with insulated contact or dimple. Positive contact grips battery securely. They will accommodate the "AA" — "C" — "D" — Mercury and NI-CAD batteries.

- CORROSION RESISTANT NICKEL PLATED
- STAINLESS STEEL CONTACTS

Clips — Carbon Steel, SAE 1065 per Mil-S-17919-#4, Heated Treated to Spring Temper, Nickel Plate Finish.
Contact Eyelets — Stainless Steel per Mil-S-18170 Comp 304.
Insulating Washers — Resin Impregnated Fibre.
Terminal Lugs — Copper Per QQ-C-576A, Cad. Plated per QQ-P-416.

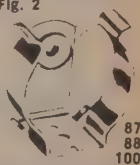
Cat. No.	Fig.	A Dia. Min. - Max.	Steel Thickness	For Cells
86	1	.875 to 1.125	.020	C
87	2	.875 to 1.125	.020	C
88	2	1.187 to 1.350	.020	D
89	1	1.187 to 1.350	.020	D
99	1	.531 to .650	.015	AA
100	2	.531 to .650	.015	AA

Fig. 1



DIMPLE CONTACT

Fig. 2



INSULATED CONTACT

DIMPLE CONTACT — INSULATED CONTACT

INSULATED CONTACTS

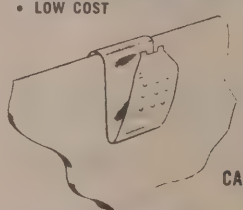
One Insulated Contact	All Contacts Insulated	Fig. No.	Holds No. of Cells	All Batteries in the Group are of Similar Size and Fit Holders Listed Burgess	Eveready	RCA
PENCELL HOLDERS						
Cat. No.	Cat. No.					
1139	2139	19	1	Z, HG9	E9, E12	VS034A
	2140*	23	2	CD6, 9R	E91, E133	VS144
	2171*	24	3	HG12R	E502, N46	VS149
	2182*	25	4	H133	515, 915	VS313A
1189	2189	20	2	HG502R	1015	VS334
1191	2191	21	3	920		
1194	2194	22	4	930		
"C" CELL HOLDERS						
1173	2173	19	1	1		VS035A
	2174*	23	2	P6	E233	VS300
	2187*	24	3	120	635	VS335
	2188*	25	4	130	935	VS400
1185	2185	20	2	H233		
1195	2195	21	3	302599		
1198	2198	22	4			
"D" CELL HOLDERS						
1175	2175	19	1	2	E42	VS036
	2176*	23	2	2R	N56	VS036A
	2190*	24	3	CD7	E95	VS336
	2192*	25	4	210	D99	
1186	2186	20	2	230	A100	
1199	2199	21	3		950	
1162	2162	22	4		1050	
1179	2179	19	1		E94	

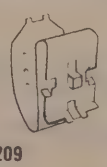
*Clips mounted on phenolic 1/16" thick Mil Spec 3115B

PENCELL SNAP-ON BATTERY HOLDER CLIPS

Clips over panels from .060 to .070 thick and is anchored by sharp barbs. Made of spring tempered steel, nickel plated.

- IDEAL FOR MOLDED CASES
- LOW COST
- SELF ANCHORING
- SNAG-FREE BATTERY INSERTION


CAT. No. 209



ECONOMY CLIPS for "AA" Pencells — "C" and "D" Cells

A low cost clip used with non-metallic bases. **Features:** Single eyelet mount — non-rotating tab. **Material:** Spring Temper Steel and Nickel Plated.

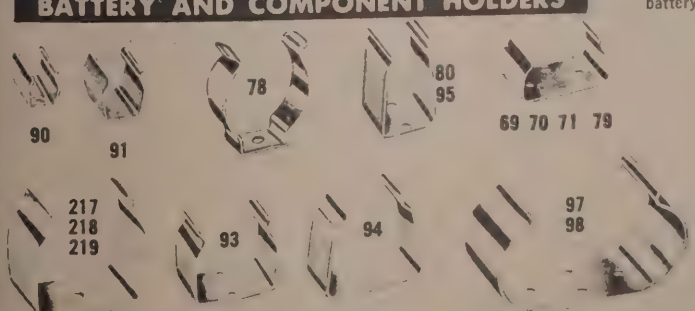
206

Cat. No.	B	C	H	M Mtg. Hole	For Cells
206	.609	.468	.500	.128	AA
207	.687	.547	.875	.128	C
208	.765	.562	1.290	.128	D
67	.765	.562	1.290	.156	D

67 does not have Non-Rotation Tab

BATTERY AND COMPONENT HOLDERS

A complete line of clips suitable for secure mounting of round or square battery cells or electronic components.



Cat. No.	A Min.-Max. Dia. or Size	Material	For Cells*
69	.562 (2)	.015 Steel	(2) AA
70	.656 (2)	.025 Alum.	(2) RM12
71	.593 x 1.031	.015 Steel	2U6
78	1.187 to 1.350	.020 Steel	D
79	.650 x 1.280	.015 Steel	T 146 X
80	.650 x 1.280	.020 Steel	T 146 X
90	.375 to .468	.016 Alum.	AAA
91	.531 to .656	.020 Alum.	AA
93	.875 to 1.1250	.025 Alum.	C
94	1.187 to 1.375	.032 Alum.	D
95	.625 x 1.000	.025 Alum.	U-15
97	1.031 (2)	.025 Alum.	(2) C
98	1.312 (2)	.032 Alum.	(2) D
217	1.375 to 1.500	.025 Steel	NI-CAD
218	1.437 to 1.687	.025 Steel	NI-CAD
219	2.000 to 2.500	.025 Steel	NI-CAD

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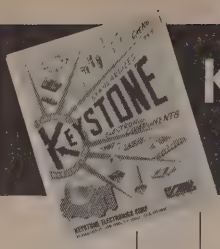


KEYSTONE BATTERY HOLDERS

NEW COMPLETE CATALOG ON REQUEST

KEYSTONE ELECTRONICS CORP. DESIGNED AND MANUFACTURED IN U.S.A.

Cat. No.	Holds No. of Cells	Fig. No.	ALL BATTERIES LISTED WITHIN BOXES ARE IN THE SAME SIZE GROUP BATTERY CROSS REFERENCE BURGESS	EVEREADY	R.C.A.
MINIATURE CELL HOLDERS					
137	1	1	7	912	VS074
138	2	2			
169	3	3			
170	4	4			
PENCELL HOLDERS					
139	1	1	CD6	E9, E12	VS034A
140	2	2	9R, Z	E91	VS144
171	3	3	HC9	E133	VS149
182	4	4	HG12R	333	VS313A
189	2	5	H133	E502	VS334
191	3	6	HG502R	515	
192	4	7	920	915, 1015	
193	6	8	930	N46	
"C" CELL HOLDERS					
173	1	1	1	226	VS035A
174	2	2	P6	E233	VS300
187	3	3	120	635	VS335
185	2	5	130	935	VS400
195	3	6	H233		
196	4	7	302599		
197	6	8			
"D" CELL HOLDERS					
175	1	1	2	E42	VS036A
176	2	2	2R	N56	VS036
190	3	3	CD7	E95	VS336
186	2	5	210	D99	
199	3	6	230	A100	
200	4	7		950	
201	6	8		1050	
205	6	12			
1½ VOLT CELL HOLDERS					
154	1	1	N	E340	VS073
155	2	2		E400	
156	3	3		E401	
160	1	1	21R	964	VS236
179	1	1		E94	
4½ VOLT CELL HOLDERS					
139	1	1		333	VS1149
9 VOLT CELL HOLDERS					
139-B	1	1		206	VS327
203P	1	14	2U6	216	VS323
173P	1	1	P6M	226	VS300A
15 VOLT CELL HOLDERS					
163	1	11	K10	417	
161	1	11	U10		VS083
166	1	9			
167	2	10		411	
225	1	1	Y10	504	
226	2	2			
22½ VOLT CELL HOLDERS					
164	1	11	K15		
168	1	11		420	
177	1	9	U15	412	VS084
178	2	10			
139A	1	1	Y15	505	
140A	2	2			
171A	3	3			
182A	4	4			
30 VOLT CELL HOLDERS					
157	1	14	Y20	506	
165	1	11	K20	430	
183	1	9	U20	413	VS085
184	2	10			
134	1	1	Y20S	507	

POLARITY LABELS

Cat. No. 58

- PRESSURE SENSITIVE
- WILL ADHERE TO ANY SURFACE
- NO GLUE OR DAMPING REQUIRED
- ECONOMICAL

Wherever circuit polarity is to be shown labels are colored Blue and Red.

A standard line of battery holders available for immediate shipment from stock. Low cost, lightweight and sturdily constructed of quality materials. Good electrical contact, low leakage current and snap-fit clips are the outstanding features.

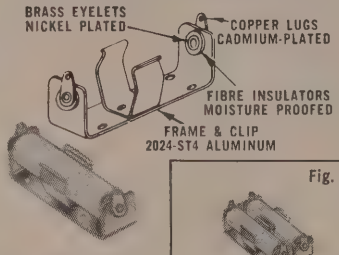

BRASS EYELETS NICKEL PLATED
COPPER LUGS CADMIUM-PLATED
FIBRE INSULATORS MOISTURE PROOFED
FRAME & CLIP 2024-ST4 ALUMINUM

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

Fig. 8

Fig. 9

Fig. 10

Fig. 11

Fig. 12

Fig. 14

MERCURY BATTERY HOLDERS

Fig. 13

Fig. 15

Fig. 16

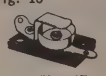


Fig. 17

Fig. 18

Fig. 19

Mallory Mercury Battery Listing	Aluminum and Phenolic Base Holders Cat. No.	Fig. No.	All Steel Holders One Insulated Contact Cat. No.	Fig. No.	All Steel Holders All Contacts Insulated Cat. No.	Fig. No.
RM1R	101*	13	1101	15	2101	16
RM3R	103*	13	1103	15	2103	16
RM4R	104*	13	1104	15	2104	16
ZM9	139	1	1139	19	2139	19
RM12R	139	1	1139	19	2139	19
RM42	175	1	1175	19	2175	19
TR113			1113	15	2113	16
TR114			1114	15	2114	16
TR115	132	1	1132	15	2132	16
TR132	132	1	1132	15	2132	16
TR133	139	1	1139	19	2139	19
TR134	134	1	1134	15	2134	19
TR135	135	5	1135	19	2135	19
TR136	189	5	1189	19	2189	19
TR137			1125	19	2125	15
TR145			1145	15	2145	16
TR152	124**	1				
TR153	106**	1				
TR162			1113	15	2113	16
TR163	132	1	1132	15	2132	16
TR164	109	1	1109	19	2109	19
TR165	110	1	1110	19	2110	19
TR169	189	5	1189	19	2189	19
TR175	124**	1				
TR177			1142	19	2142	19
TR233	173	1	1173	19	2173	19
TR234			1144	19	2144	19
RM400	111*	18				
RM401	124**	1				
RM411	166**	9				
RM412	177**	9				
RM413	183**	9				
RM450	112*	17				
RM502	139	1	1139	19	2139	19
RM601			1116	15	2116	16
RM625	117*	17				
RM630	126*	18				
RM640	118*	13				
RM675	127*	18				
302351	119	1	1119	19	2119	19
302478	120	5	1120	19	2120	19
302642	121	1	1121	19	2121	19
302435	122**	1				
302437	139	1	1139	19	2139	19
302599	173	1	1173	19	2173	19

BATTERY STRAPS

Made for batteries requiring a snap-on connection. Contacts are mounted securely to fibre and wire leads attached.

FIG. 1

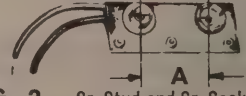
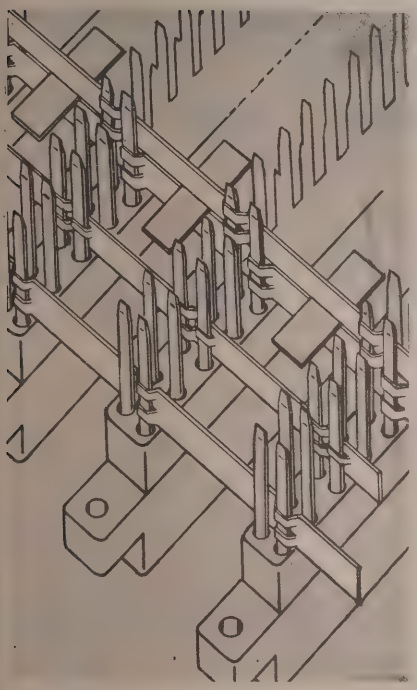


FIG. 2 Sr. Stud and Sr. Socket

Cat. No.	Fig. No.	A	EVEREADY	BURGESS	R.C.A.
72	1	½"	216	2U6	VS-312
83	2		246	2N6	305
			416	UX-5	318
73	2	¾"	266	M-6	
74	2	15/16"	495	N60X	VS-316
			479	P60	216
			437	XX50	217
			477	P45	218
75	2	1⅜"	276	D6	VS-306
76	2	1½"	455	XX-30	VS-055
			457	K45	082
			467	XX-45	016
77	2	2½"	490	N-60	VS-090

KEYSTONE ELECTRONICS CORP., 49 BLEECKER STREET, N.Y., N.Y. 10012 • (212) 475-4600 TWX 710-581-2861 CABLE-KEYELCO

LSI Pin Bar® means:



- Thousands of "hi-rel" solderless bussing connections per hour at a fraction the cost of your present busing method.
- Fast, simple, "foolproof" connections that lower production costs — eliminate continuity checks.
- Low uniform contact resistance that will electrically enhance any circuit—especially frequency applications.
- Efficient back panel design (greater pin exposure, increased discrete wiring area and easier checkout).
- A "spec" performance electrical component produced to your exact requirements.

solderless bus bar for common connections

SPECIFICATIONS

Terminal Spacing and Length: Selectable.

Spacing Tolerance: ±0.010" between terminals — ±0.020/foot cumulative.

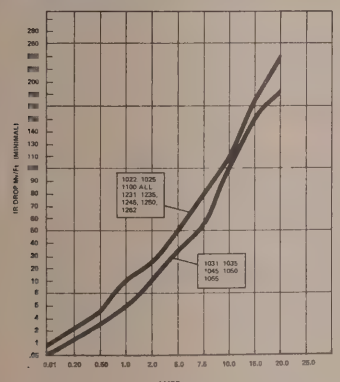
Material: 1000, 1200 Series: Beryllium Copper Alloy #172 per QQ-C-533.
1100 Series: Beryllium Copper Alloy #175 per QQ-C-533.

Standard Finishes:
Tin: Electro-tin plate, fused, per MIL-T-10727, Type I, 0.0003" thickness.
Gold: Gold plate per MIL-G-45204, Type II, 0.000050" minimum thickness over nickel plate per QQ-N290, 0.000050" minimum thickness.

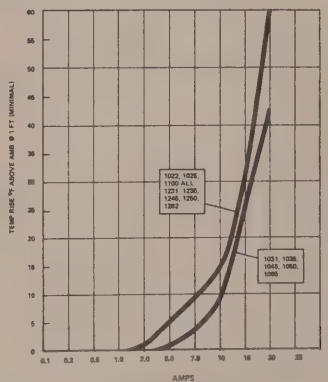
Options: Insulation, special finishes, unique end configurations.

Insertion: Manual or semi-automatic insertion equipment available.

PERFORMANCE DATA



IR DROP



TEMPERATURE RISE

The following performance data meets or exceeds MIL-STD-202 "D" (Full Report Available).

Thermal Shock: Method 107, Condition A.

Mechanical Shock: Method 213, Condition H.

Vibration: Method 201.

Corrosion Resistance: Method 101, Condition B 48 Hour Exposure Salt Spray.

Contact Voltage Drop: 0.533 millivolts maximum per amp.

Gas Tight Contact: 10 minutes of 1:1 hydrochloric/nitric acid followed by 10 minutes of ammonium sulfide fumes.

DESIRED PIN BAR CONFIGURATION

Alternate Pins (Series 1000 & 1200)	Connector Pin Size	Adjacent Pins (Series 1100)
1022	.022" x .036"	1122
1025	.025" x .025"	1125
1031 1231	.031" x .062"	1131
1035 1235	.035" x .050"	1135
1045 1245	.045" x .045"	1145
1050 1250	.050" x .035"	1150
1062 1262	.062" x .031"	1162

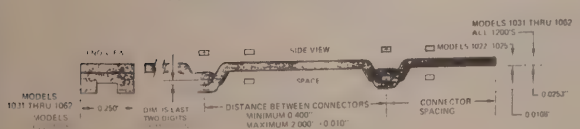
HOW TO ORDER

An 11-digit number is used for ordering. An example would be as follows:

1031 — 0.500 — 32 — G or T

Model No. | Connector Spacing 0.500" | No. of Contacts | gold finish | tin finish

MODEL 1000 & 1200 SERIES ALTERNATE PIN BUSS



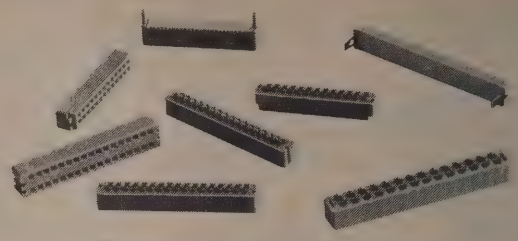
MODEL 1100 SERIES ADJACENT PIN BUSS

LEAR SIEGLER, INC.

LSI Pin Bar Products

ELECTRONIC INSTRUMENTATION DIVISION
714 NORTH BROOKHURST STREET • ANAHEIM, CALIFORNIA 92803
(714) 774-1010 TWX — 910-591-1157 • TLX — 65-5444

Scotchflex® BRAND SOCKET CONNECTORS



INTRODUCTION

"Scotchflex" Brand socket connectors are available in all of the sizes and center spacings required to fit standard wrap panels, including most custom configurations. Where quick disconnect/reconnect capability is required, "Scotchflex" socket connectors may be used in conjunction with mating "Scotchflex" headers. Optional strain reliefs are available for the entire line of socket connectors should design needs require them.

TYPICAL PROPERTIES OF Scotchflex® BRAND SOCKET CONNECTORS

ELECTRICAL PROPERTIES	
CURRENT RATING	1 AMP
INSULATION RESISTANCE	$>1 \times 10^9$ Ohms
DIELECTRIC WITHSTANDING VOLTAGE	>1,000 Volts at Sea Level
ENVIRONMENTAL PROPERTIES	
TEMPERATURE RATING	-67°F to +221°F (-55°C to +105°C)
PHYSICAL PROPERTIES	
INSULATION MATERIAL	Glass Reinforced Polyester; U.L. Flammability Rating 94V-0
COLOR	All except 3327 Series: Gray 3327 Series: Red
CONTACT MATERIAL	Beryllium Copper
CONTACT PLATING	0.000030" (.762 µm) Min. Gold* Per Mil-G-45204 Type II over 0.000050" (1.27 µm) Min. Nickel
MARKING	Raised Figures; 3M Logo, Part Identification Numbers, Contact Position Numbers, Orientation Triangle
WIRE ACCOMMODATION	All except 3450 and 3441 Series: 26 AWG Solid; 28 AWG Solid or Stranded; 30 AWG Solid 3450 Series: 26 AWG Solid; 24 AWG Stranded 3441 Series: 24 AWG Stranded
CONTACT INSERTION FORCE	All except 3450, 3441 and 3307 Series: .50 lb. (2.2N) per Contact 3450 Series: .20 lb. (.89N) per Contact 3441 Series: .16 lb. (.71N) per Contact 3307 Series: .30 lb. (1.33N) per Contact
CONTACT WITHDRAWAL FORCE	All except 3450, 3441 and 3307 Series: .50 lb. (2.2N) per Contact 3450 Series: .10 lb. (.44N) per Contact 3441 Series: .11 lb. (.49N) per Contact 3307 Series: .26 lb. (1.16N) per Contact

*0.000050" (1.27 µm) Min. Gold on 3450 Series

Most "Scotchflex" Brand products are identified by an eight-digit 3M Part Number. When ordering, be sure to include the complete series/suffix number (i.e., 3471-0000).

TOLERANCE UNLESS NOTED			
	.0	.00	.000
INCH	±.1	±.01	±.005
mm	±.3	±.13	

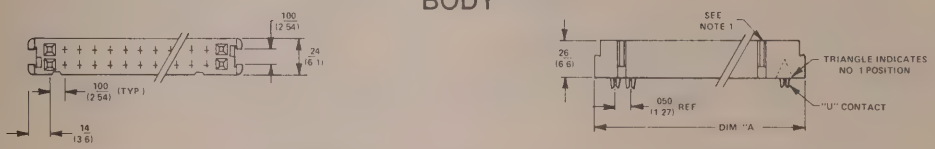
Note that throughout this book all U.S. dimensions are followed with their corresponding metric dimensions in parenthesis.

Electronic Products Division 3M COMPANY
3M CENTER • SAINT PAUL, MINNESOTA 55101

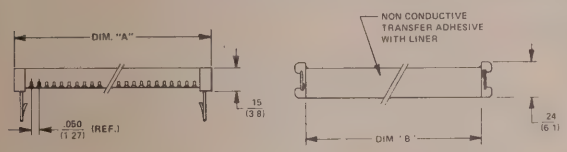
Scotchflex® BRAND SOCKET CONNECTORS

.100"(2.54mm) X .100"(2.54mm) GRID SPACING

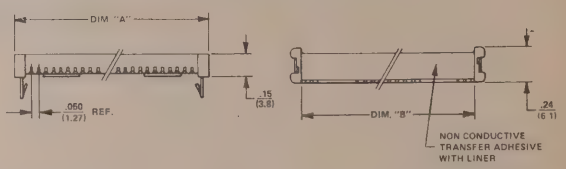
BODY



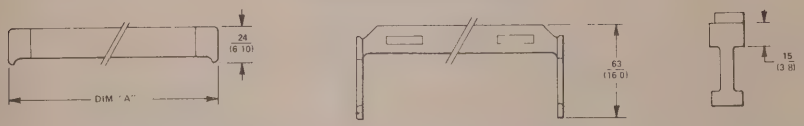
OPEN END COVER



CLOSED END COVER



STRAIN RELIEF

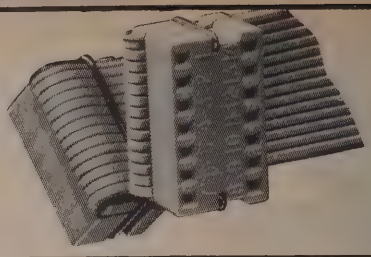


CONTACT QUANTITY	3M PART NO.	DESCRIPTION	DIMENSION A	DIMENSION B
10	3473-6000 -6010 -7000 -7010	Open end Cover w/o Strain Relief Open end Cover with Strain Relief Closed end Cover w/o Strain Relief Closed end Cover with Strain Relief	.68 (17.3)	.54 (14.0)
16	3452-6000 -6016 -7000 -7016	Open end Cover w/o Strain Relief Open end Cover with Strain Relief Closed end Cover w/o Strain Relief Closed end Cover with Strain Relief	.98 (38.6)	.84 (33.01)
20	3421-6000 -6020 -7000 -7020	Open end Cover w/o Strain Relief Open end Cover with Strain Relief Closed end Cover w/o Strain Relief Closed end Cover with Strain Relief	1.18 (30.0)	1.04 (26.7)
26	3399-6000 -6026 -7000 -7026	Open end Cover w/o Strain Relief Open end Cover with Strain Relief Closed end Cover w/o Strain Relief Closed end Cover with Strain Relief	1.48 (37.6)	1.34 (34.3)
34	3414-6000 -6034 -7000 -7034	Open end Cover w/o Strain Relief Open end Cover with Strain Relief Closed end Cover w/o Strain Relief Closed end Cover with Strain Relief	1.88 (47.8)	1.74 (44.5)
40	3417-6000 -6040 -7000 -7040	Open end Cover w/o Strain Relief Open end Cover with Strain Relief Closed end Cover w/o Strain Relief Closed end Cover with Strain Relief	2.18 (55.4)	2.04 (52.1)
50	3425-6000 -6050 -7000 -7050	Open end Cover w/o Strain Relief Open end Cover with Strain Relief Closed end Cover w/o Strain Relief Closed end Cover with Strain Relief	2.68 (68.1)	2.54 (64.8)
60	3334-6000 -6060 -7000 -7060	Open end Cover w/o Strain Relief Open end Cover with Strain Relief Closed end Cover w/o Strain Relief Closed end Cover with Strain Relief	3.18 (80.8)	3.04 (77.2)

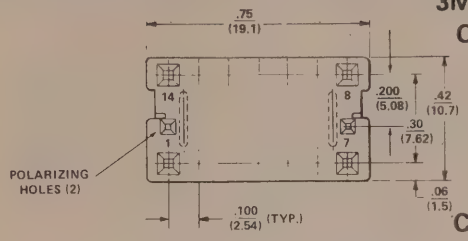
Electronic Products Division 3M COMPANY
3M CENTER • SAINT PAUL, MINNESOTA 55101

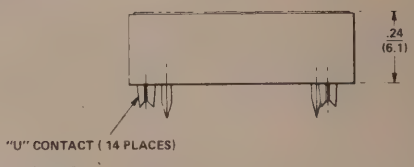
Scotchflex® BRAND SOCKET CONNECTORS

.100"(2.54mm) X .300"(7.62mm) GRID SPACING

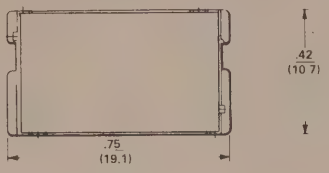


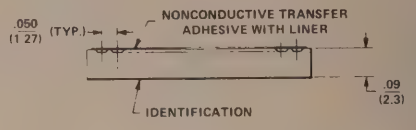
3M PART NO. 3407-0000
CONNECTOR BODY



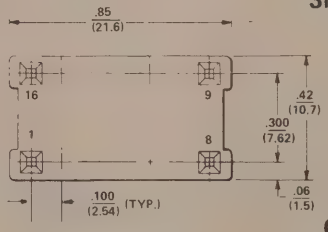


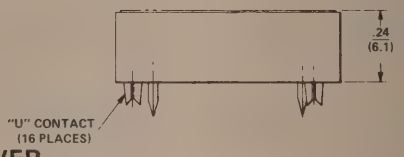
CONNECTOR COVER



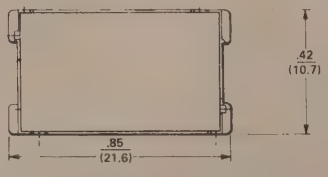


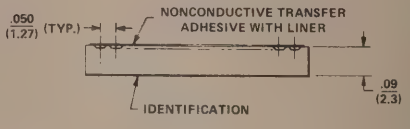
3M PART NO. 3327-0000
CONNECTOR BODY



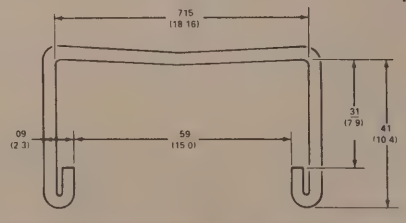


CONNECTOR COVER





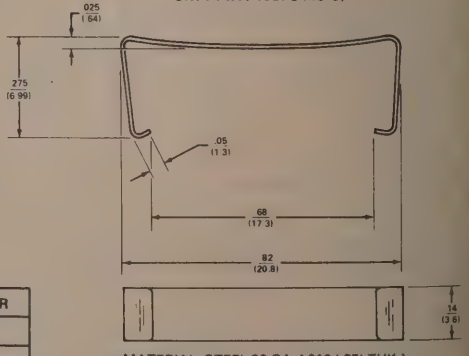
STRAIN RELIEF FOR 3407-0000
(3M PART NO. 3448-3)



MATERIAL: NICKEL PLATED STEEL MUSIC WIRE, 13 GA. [.031 (.79) DIA.].

TOLERANCE UNLESS NOTED			
	.0	.00	.000
INCH	±.1	±.01	±.005
mm	±.3	±.13	.

STRAIN RELIEF FOR 3327-0000
3M PART No. 3448-8)



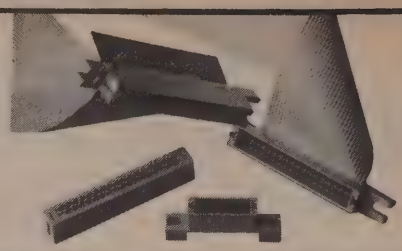
MATERIAL: STEEL 30 GA. [.010 (.25) THK.].
FINISH: RED EPOXY COATING, .01 (.3) NOMINAL.

CONTACT QUANTITY	3M PART NUMBER
14	3407-0000
16	3327-0000

Most "Scotchflex" Brand products are identified by an eight-digit 3M Part Number. When ordering be sure to include the complete series/suffix number (i.e., 3407-0000).

Electronic Products Division 3M COMPANY
3M CENTER • SAINT PAUL, MINNESOTA 55101

Scotchflex® BRAND PLUG CONNECTORS

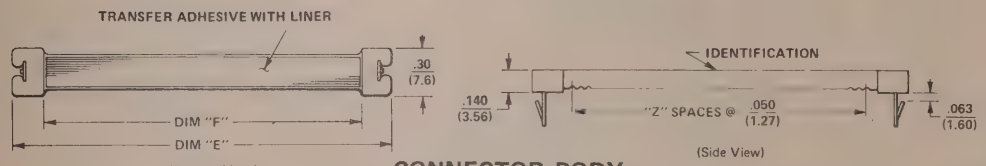


Featuring .025" (0.64 mm) square pins, this new family of connectors provides plug compatibility to SCOTCHFLEX socket connectors. Increased versatility is achieved since the connector is offered in two different configurations. For rack and panel type applications, the connector is designed with mounting flanges. When mid-spanning the plug connector is available without mounting flanges.

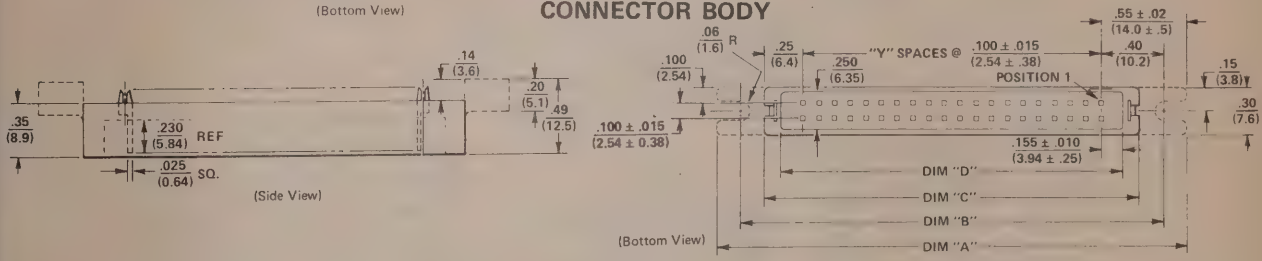
Design applications for the SCTOCHFLEX plug connector include use as a T-tap from a cable buss; a splice connector, or as an I/O interface.

PLUG CONNECTOR DIMENSIONS

CONNECTOR COVER



CONNECTOR BODY



3M Part Number	Mounting Style
-0000	With Mounting Flanges
-0001	Without Mounting Flanges

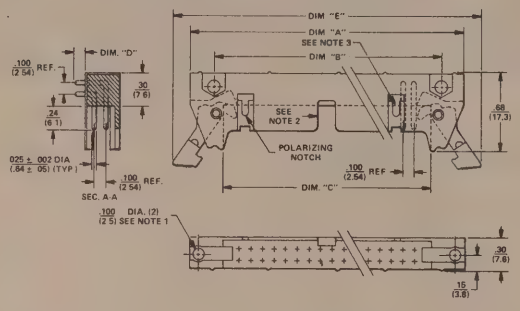
Contact Qty.	3M Part No.	Dim "A" ± .02/.5	Dim "B"	Dim "C"	Dim "D"	Dim "E"	Dim "F"	"Y"	"Z"
10	3325	1.50 (38.1)	1.20 (30.5)	.90 (22.7)	.71 (18.0)	.90 (22.9)	.51 (12.4)	4	9
20	3326	2.00 (50.8)	1.70 (43.2)	1.40 (35.6)	1.21 (30.7)	1.40 (35.6)	1.05 (26.7)	9	19
26	3328	2.30 (56.6)	2.00 (50.8)	1.70 (43.2)	1.51 (38.4)	1.70 (43.2)	1.35 (52.1)	12	25
34	3329	2.70 (68.6)	2.40 (61.0)	2.10 (53.3)	1.91 (48.5)	2.10 (53.3)	1.75 (44.5)	16	33
40	3324	3.00 (76.2)	2.70 (68.6)	2.40 (61.0)	2.21 (56.1)	2.40 (61.0)	2.05 (52.1)	19	39
50	3331	3.50 (88.9)	3.20 (81.3)	2.90 (73.7)	2.71 (68.8)	2.90 (73.7)	2.55 (64.8)	24	49

TYPICAL PROPERTIES CHART	
PHYSICAL	
INSULATOR MATERIAL	Glass reinforced polyester; U.L. flammability rating 94V-0.
COLOR	Gray
CONTACT MATERIAL	Beryllium Copper
CONTACT PLATING	0.000030" (.762 µm) min. gold per MIL-G-45204 Type II over 0.000050" (1.27 µm) min nickel
MARKING	Raised Figures; 3M logo, part identification number, and orientation triangle.
WIRE ACCOMMODATION	26 AWG solid, 28 AWG solid and stranded, 30 AWG solid
ELECTRICAL	
CURRENT RATING	1A
INSULATION RESISTANCE	>5MΩ
DIELECTRIC WITHSTANDING VOLTAGE	>500 V rms
ENVIRONMENTAL	
TEMPERATURE RATING	–67°F to +221°F (–55°C to +105°C)

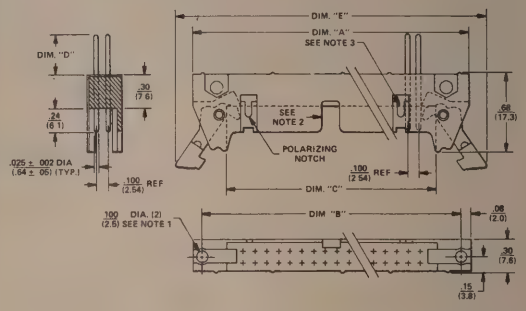
Scotchflex® BRAND HEADERS

.100" (2.54mm) x .100" (2.54mm)

RIGHT ANGLE CONTACT



STRAIGHT CONTACT



NOTES:

1. ACCEPTS NO. 2-56 ROUND HEAD SCREW (FRONT MOUNTING), NO. 4 SELF-TAPPING SCREW (REAR MOUNTING), OR NO. 2 RIVET. (WHEN USING NO. 4 SELF-TAPPING SCREW, HOLE DIAMETER SHOULD BE INCREASED TO 116 [2.95]).
2. DOUBLE SLOT ON 3372 AND 3433 SERIES. NO SLOT ON 3446 SERIES.
3. THIS NOTCH NON-EXISTANT ON 3446 SERIES.

CONTACT QUANTITY	3M PART NUMBER		DESCRIPTION	A	B	C	E
	SOLDER TAIL*	WRAP TAIL					
10	3446-100_	3446-3005	Right Angle Pin w/o Ejector	1.27 (32.3)	.86 (21.8)	.71 (18.0)	1.90 (48.3)
	120_	3205	Right Angle Pin w/short Ejector				2.06 (52.3)
	130_	3305	Right Angle Pin w/long Ejector				
	200_	4005	Straight Pin w/o Ejector		1.10 (27.9)		1.90 (48.3)
	220_	4250	Straight Pin w/short Ejector				2.06 (52.3)
	230_	4305	Straight Pin w/long Ejector				
16	3408-100_	3408-3005	Right Angle Pin w/o Ejector	1.57 (39.9)	1.16 (29.5)	1.01 (25.7)	2.20 (55.9)
	120_	3205	Right Angle Pin w/short Ejector				2.36 (59.9)
	130_	3305	Right Angle Pin w/long Ejector				
	200_	4005	Straight Pin w/o Ejector		1.40 (35.6)		2.20 (55.9)
	220_	4205	Straight Pin w/short Ejector				2.36 (59.9)
	230_	4305	Straight Pin w/long Ejector				
20	3428-100_	3428-3005	Right Angle Pin w/o Ejector	1.76 (44.7)	1.36 (34.5)	1.21 (30.7)	2.39 (60.7)
	120_	3205	Right Angle Pin w/short Ejector				2.55 (64.8)
	130_	3305	Right Angle Pin w/long Ejector				
	200_	4005	Straight Pin w/o Ejector		1.60 (40.6)		2.39 (60.7)
	220_	4205	Straight Pin w/short Ejector				2.55 (64.8)
	230_	4305	Straight Pin w/long Ejector				
26	3429-100_	3429-3005	Right Angle Pin w/o Ejector	2.06 (52.3)	1.66 (42.2)	1.51 (38.4)	2.69 (68.3)
	120_	3205	Right Angle Pin w/short Ejector				2.85 (72.4)
	130_	3305	Right Angle Pin w/long Ejector				
	200_	4005	Straight Pin w/o Ejector		1.90 (48.3)		2.69 (68.3)
	220_	4205	Straight Pin w/short Ejector				2.85 (72.4)
	230_	4305	Straight Pin w/long Ejector				
34	3431-100_	3431-3005	Right Angle Pin w/o Ejector	2.46 (62.5)	2.06 (52.3)	1.91 (48.5)	3.09 (78.5)
	120_	3205	Right Angle Pin w/short Ejector				3.25 (82.6)
	130_	3305	Right Angle Pin w/long Ejector				
	200_	4005	Straight Pin w/o Ejector		2.30 (58.4)		3.09 (78.5)
	220_	4205	Straight Pin w/short Ejector				3.25 (82.6)
	230_	4305	Straight Pin w/long Ejector				
40	3432-100_	3432-3005	Right Angle Pin w/o Ejector	2.76 (70.1)	2.36 (59.9)	2.21 (56.1)	3.39 (86.1)
	120_	3205	Right Angle Pin w/short Ejector				3.55 (90.2)
	130_	3305	Right Angle Pin w/long Ejector				
	200_	4005	Straight Pin w/o Ejector		2.60 (66.0)		3.39 (86.1)
	220_	4205	Straight Pin w/short Ejector				3.55 (90.2)
	230_	4305	Straight Pin w/long Ejector				
50	3433-100_	3433-3005	Right Angle Pin w/o Ejector	3.26 (82.8)	2.86 (72.6)	2.71 (68.8)	3.89 (98.8)
	120_	3205	Right Angle Pin w/short Ejector				4.05 (102.9)
	130_	3305	Right Angle Pin w/long Ejector				
	200_	4005	Straight Pin w/o Ejector		3.10 (78.7)		3.89 (98.8)
	220_	4205	Straight Pin w/short Ejector				4.05 (102.9)
	230_	4305	Straight Pin w/long Ejector				
60	3472-100_	3472-3005	Right Angle Pin w/o Ejector	3.77 (95.8)	3.36 (85.3)	3.21 (81.5)	4.40 (111.8)
	120_	3205	Right Angle Pin w/short Ejector				4.56 (115.9)
	130_	3305	Right Angle Pin w/long Ejector				
	200_	4005	Straight Pin w/o Ejector		3.60 (91.4)		4.40 (111.8)
	220_	4205	Straight Pin w/short Ejector				4.56 (115.9)
	230_	4305	Straight Pin w/long Ejector				

*Determine P.C. board thickness and use chart below to determine final digit for solder tail part numbers.

3M PART NUMBER	P.C.B. THICKNESS	DIM. "D" ± .010 (± .25)
XXXX-XXX2	.062 (1.57)	.092 (2.34)
XXXX-XXX3	.094 .125 (2.39-3.18)	.155 (3.94)

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Scotchflex® BRAND P.C.B. CONNECTORS

INTRODUCTION

Flat cable may be terminated at the circuit card by hand or flow solderable SCOTCHFLEX connectors. The contacts which are positioned in the connector body are soldered to the board as a unit. The flat cable terminates in the connector to the "U" form end of the contacts. As with other SCOTCHFLEX connectors, no stripping or soldering of conductors is required. SCOTCHFLEX P.C.B. Connectors come in a variety of configurations to mate with SCOTCHFLEX flat cable.

TYPICAL PROPERTIES OF Scotchflex® BRAND P.C.B. CONNECTORS

PHYSICAL PROPERTIES			
3M PART NUMBER	3474-____T 3402-____T 3422-____T 3418-____T 3434-____T 3426-____T	3470-0000T	3378-____T 3468-0000T
INSULATION MATERIAL	GLASS FILLED POLYESTER; U.L. FLAME RETARDANT RATING 94V-O		
COLOR	GRAY		
CONTACT MATERIAL	BERYLLIUM COPPER		
CONTACT PLATING	TIN ALLOY		
MARKING	RAISED FIGURES, 3M PART & IDENTIFICATION NUMBER		
WIRE ACCOMMODATION	26 AWG SOLID, 28 AWG SOLID & STRANDED 30 AWG SOLID	24 AWG STRANDED	24 AWG STRANDED
CABLE ACCEPTANCE	.050" (1.27 mm) CONDUCTOR CENTERS	.0625" (1.59 mm) CONDUCTOR CENTERS	.075" (1.90 mm) CONDUCTOR CENTERS
ELECTRICAL PROPERTIES			
CURRENT RATING	1 AMP		
INSULATION RESISTANCE	$>5 \times 10^6$ OHMS		
DIELECTRIC WITHSTANDING VOLTAGE	>500 VOLTS AT SEA LEVEL		
ENVIRONMENTAL PROPERTIES			
TEMPERATURE RATING	-67°F TO +221°F (-55°C TO +105°C)		

REFERENCE CHART FOR P.C.B. CONNECTORS

NO. OF CONTACTS	3M PART NUMBER	FOR PC BOARD THICKNESS	FOR ASSEMBLY BEFORE SOLDERING USE LOCATOR PLATE PART NUMBER	FOR ASSEMBLY AFTER SOLDERING USE LOCATOR PLATE PART NUMBER	MATES WITH 3M FLAT CABLE
10	3474-0000T	.062 (1.57)	3443-15	3443-8	3350/10, 3365/10, 3306/10
	3474-0001T	.094-.125 (2.39-3.18)			
20	3422-0000T	.062 (1.57)	3443-16	3443-8	3350/20, 3365/20, 3306/20, 3369/20, 3476/20
	3422-0001T	.094-.125 (2.39-3.18)			
24	3470-0000T	.062 (1.57)	3443-34	3443-8	3451/24
	3470-0001T	.094-.125 (2.39-3.18)			
26	3434-0000T	.062 (1.57)	3443-15	3443-8	3350/26, 3365/26, 3306/26, 3469/26, 3476/26
	3434-0001T	.094-.125 (2.39-3.18)			
28	3468-0000T	.062 (1.57)	3443-33	3443-8	3405/28
	3468-0001T	.094-.125 (2.39-3.18)			
34	3402-0000T	.062 (1.57)	3443-15	3443-8	3350/34, 3365/34, 3306/34, 3469/34, 3476/34
	3402-0001T	.094-.125 (2.39-3.18)			
36	3378-0000T	.062 (1.57)	3443-19	3443-8	3405/36
	**3378-1000T	.062 (1.57)			Individ Insulated Wire
40	3418-0000T	.062 (1.57)	3443-16	3443-8	3350/40, 3365/40, 3306/40, 3380/40, 3469/40, 3476/40
	3418-0001T	.094-.125 (2.39-3.18)			
50	3426-0000T	.062 (1.57)	3443-15	3443-8	3350/50, 3365/50, 3306/50, 3380/50, 3469/50, 3476/50
	3426-0001T	.094-.125 (2.39-3.18)			

DIMENSIONS	
US	Inches
Metric	(mm)

**3378-1000 denotes individual wire cover

NOTE: All connectors listed use the 3442-1 standard platen, except the 3378-____T connector, which utilizes the 3442-2 platen.

While the above data was correct at the time of publication, it is recommended that for specification purposes a current Spec Data Sheet on the particular connector be requested. These sheets contain full dimensional details and are available from the Scotchflex sales representative in your area.

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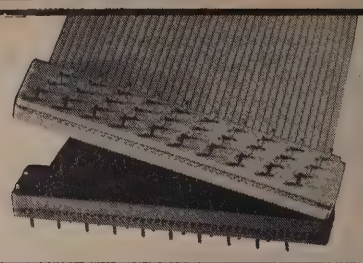
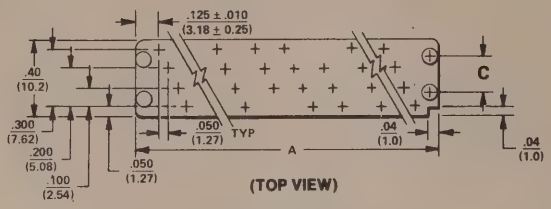
Scotchflex® BRAND P.C.B. CONNECTORS

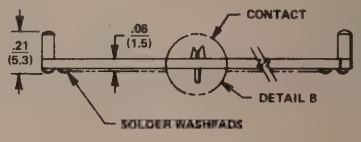


3M PART NOS. 3474-_____T, 3434-_____T, 3402-_____T, & 3426-_____T

CONNECTOR BODY

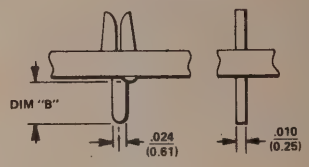


(TOP VIEW)



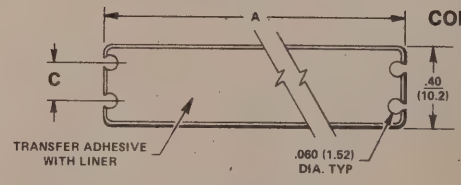
(SIDE VIEW)

DIMENSIONS	
U.S.	Inches
Metric	(mm)

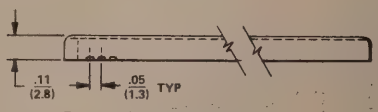


DETAIL B

CONNECTOR COVER



(TOP VIEW)

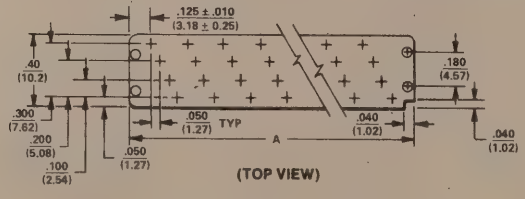


(SIDE VIEW)

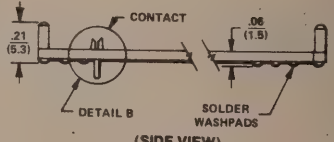
Scotchflex BRAND P.C.B. CONNECTORS					
CONTACT QUANTITY	CONNECTOR PART NUMBER	DIMENSIONS			
		A	B	C
10	3474-0000T	.70 (17.8)	.100 ± .010 (2.54 ± .025)	.200 (5.08)
	3474-0001T		.156 ± .010 (3.96 ± .025)	
20	3422-0000T	1.20 (30.5)	.100 ± .010 (2.54 ± .025)	
	3422-0001T		.156 ± .010 (3.96 ± .025)	
26	3434-0000T	1.50 (38.1)	.100 ± .010 (2.54 ± .025)	.181 (4.60)
	3434-0001T		.156 ± .010 (3.96 ± .025)	
34	3402-0000T	1.90 (48.3)	.100 ± .010 (2.54 ± .025)	.181 (4.60)
	3402-0001T		.156 ± .010 (3.96 ± .025)	
40	3418-0000T	2.20 (55.9)	.100 ± .010 (2.54 ± .025)	
	3418-0001T		.156 ± .010 (3.96 ± .025)	
50	3426-0000T	2.70 (68.6)	.100 ± .010 (2.54 ± .025)	.181 (4.60)
	3426-0001T		.156 ± .010 (3.96 ± .025)	

3M PART NOS. 3422-_____T & 3418-_____T

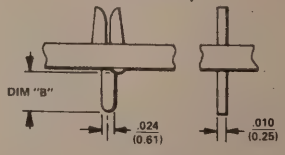
CONNECTOR BODY



(TOP VIEW)

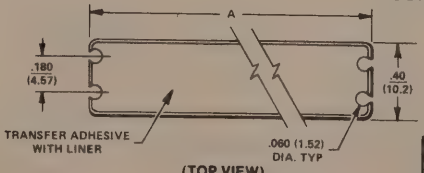


(SIDE VIEW)

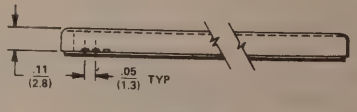


DETAIL B

CONNECTOR COVER



(TOP VIEW)



(SIDE VIEW)

DIMENSIONS	
U.S	Inches
Metric	(mm)

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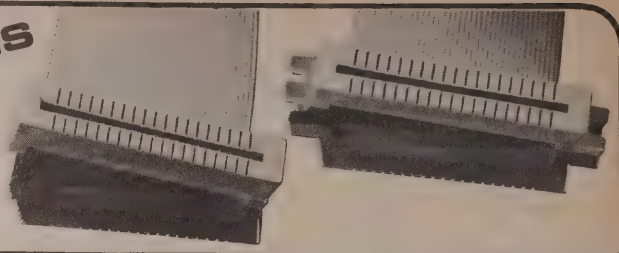
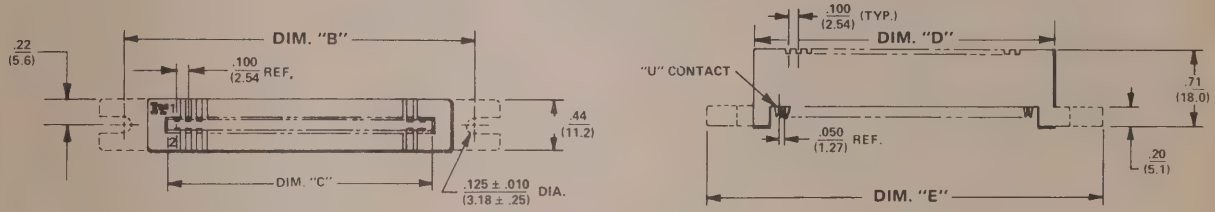
Scotchflex® BRAND CARD-EDGE CONNECTORS



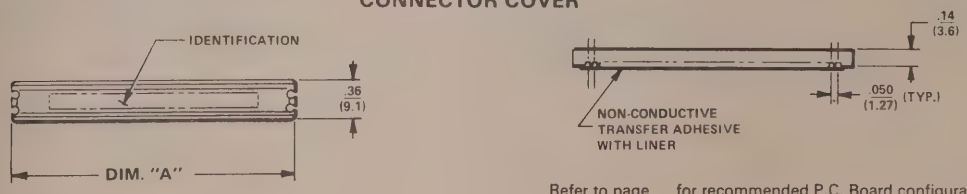
Dual-readout "Scotchflex" Card-Edge Connectors let you make up to 50 terminations in a single step. All styles are offered with or without mounting ears; both versions have bifurcated, gold-plated beryllium copper contacts insuring dependable electrical interface through repeated insertions and withdrawals. Insulation-piercing "U" contacts are on .050" (1.27mm) centers, staggered to accept .100" (2.54mm) spacing on card-edge.

3461, 3462, 3463 & 3464 SERIES

CONNECTOR BODY



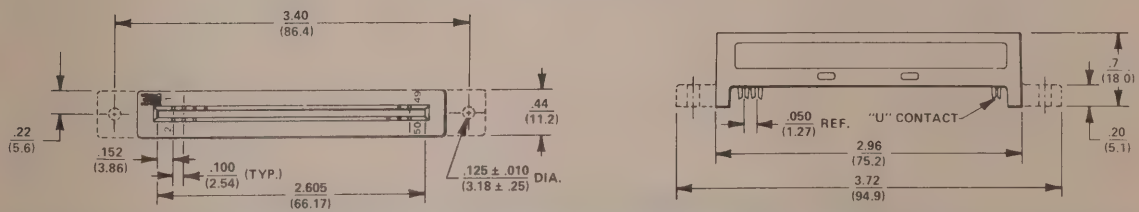
CONNECTOR COVER



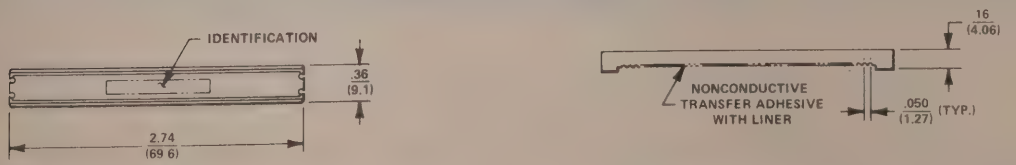
Refer to page for recommended P.C. Board configuration.

3415 SERIES

CONNECTOR BODY



CONNECTOR COVER



Refer to page for recommended P.C. Board configuration.

TOLERANCE UNLESS NOTED			
	.0	.00	.000
INCH	± .1	± .01	± .005
mm	± .3	± .13	

Most "Scotchflex" Brand products are identified by an eight-digit 3M Part Number. When ordering, be sure to include the complete series/suffix number (i.e., 3461-0000).

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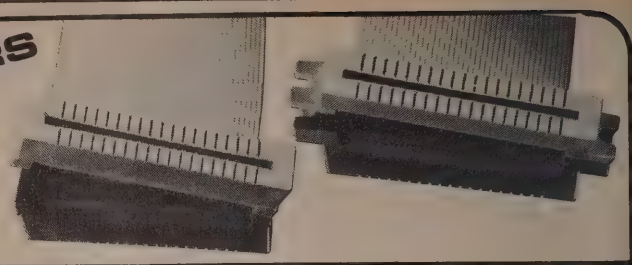
Scotchflex® BRAND CARD-EDGE CONNECTORS



TYPICAL PROPERTIES FOR ALL CARD-EDGE CONNECTORS

ELECTRICAL	
Current Rating	1 AMP
Dielectric Withstanding Voltage	>1,000 Volts at Sea Level
Insulation Resistance	>1 x 10^9 Ohms
ENVIRONMENTAL	
Temperature Rating	-67°F to +221°F (-55°C to 105°C)
PHYSICAL	
Insulation Material	Glass-filled thermoplastic
Contact Material	Beryllium Copper
Contact Plating	.000050" (1.27 μm) Min. Gold per MIL-G-45204 Type II over .000100" (2.54 μm) Min. Nickel
Color	Gray
Contact Spacing	.100" (2.54 mm); accepts Scotchflex Cables on .050" (1.27 mm) Centers. Mates with P.C. Board Pads on .100" (2.54 mm) Centers.

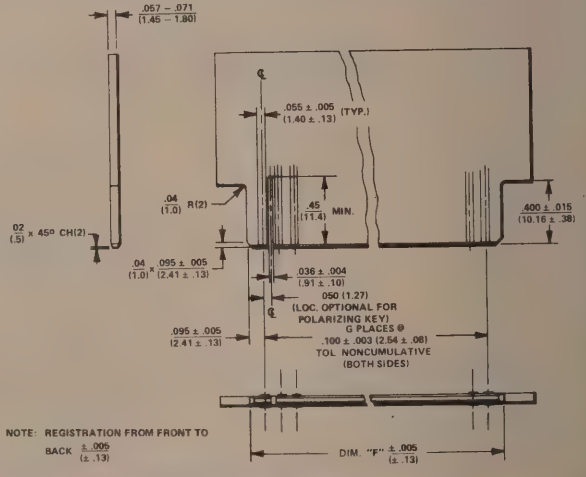
POLARIZING KEYS FOR ALL CARD-EDGE CONNECTORS

3M Part No. 3439-0000

3M Part No. 3439-1000

TOLERANCE UNLESS NOTED			
	.0	.00	.000
INCH	±.1	±.01	±.005
mm	±.3	±.13	

RECOMMENDED P.C. BOARD CONFIGURATION FOR ALL CARD-EDGE CONNECTORS



SCOTCHFLEX BRAND CARD-EDGE CONNECTOR REFERENCE CHART

CONTACT QUANTITY	3M PART NUMBER	MOUNTING STYLE	DIM A	DIM B	DIM C	DIM D	DIM E	DIM F	G PLACES	PLATEN NUMBER	MATING SCOTCHFLEX CABLE
20	3461-0000	With Mounting Ears	1.24 (31.5)	1.80 (45.7)	1.104 (28.04)	1.50 (38.1)	2.00 (50.8)	1.095 (27.81)	9	3442-4	3350/20, 3365/20, 3306/20, 3469/20, 3476/20, 3302/20
	3461-0001	Without Mounting Ears	"	"	"	"	"	"	"	"	"
26	3462-0000	With Mounting Ears	1.54 (39.1)	2.10 (53.3)	1.404 (35.66)	1.80 (45.7)	2.30 (58.4)	1.395 (35.43)	12	3442-7	3350/26, 3365/26, 3306/26, 3469/26, 3476/26, 3302/26
	3462-0001	Without Mounting Ears	"	"	"	"	"	"	"	"	"
34	3463-0000	With Mounting Ears	1.94 (49.3)	2.50 (63.5)	1.804 (45.82)	2.20 (55.9)	2.70 (68.6)	1.795 (45.59)	16	3442-3	3350/34, 3365/34, 3306/34, 3469/34, 3476/34, 3302/34
	3463-0001	Without Mounting Ears	"	"	"	"	"	"	"	"	"
40	3464-0000	With Mounting Ears	2.24 (56.9)	2.80 (71.1)	2.104 (53.42)	2.50 (63.5)	3.00 (76.2)	2.095 (53.21)	19	3442-8	3350/40, 3365/40, 3306/40, 3380/40, 3469/40, 3476/40, 3302/40
	3464-0001	Without Mounting Ears	"	"	"	"	"	"	"	"	"
50	3415-0000	With Mounting Ears	2.85 (69.6)	3.40 (86.4)	2.605 (66.17)	2.96 (75.2)	3.72 (94.9)	2.595 (65.91)	24	3442-1	3350/50, 3365/50, 3306/50, 3380/50, 3469/50, 3476/50, 3302/50
	3415-0001	Without Mounting Ears	"	"	"	"	"	"	"	"	"

NOTE: All Scotchflex Card-Edge Connectors use Locator Plate 3443-11.

Most "Scotchflex" Brand products are identified by an eight-digit 3M Part Number. When ordering, be sure to include the complete series/suffix number (i.e., 3461-0000).

Electronic Products Division 3M COMPANY

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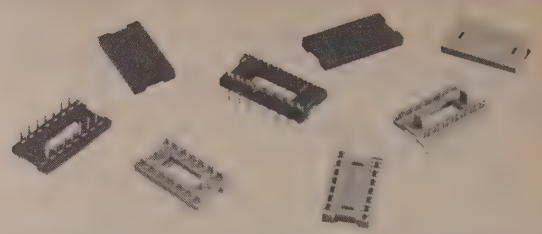
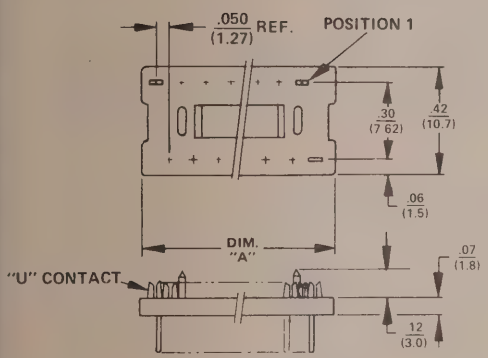
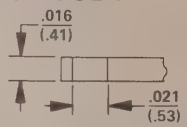
Scotchflex BRAND D.I.P. CONNECTORS

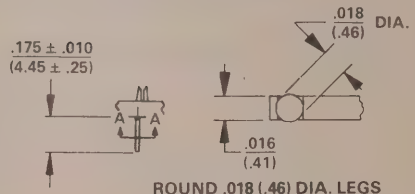


3406 & 3416 SERIES CONNECTOR BODY





RECTANGULAR .016 (.41) LEGS
(Used on 3M Part Nos. 3406-0000, 3406-1000, 3416-0000 and 3416-1000)

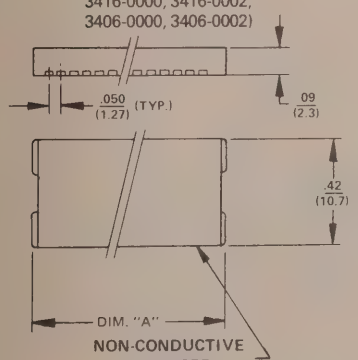


ROUND .018 (.46) DIA. LEGS
(Used on 3M Part Nos. 3406-0002, 3406-1002, 3416-0002 and 3416-1002)

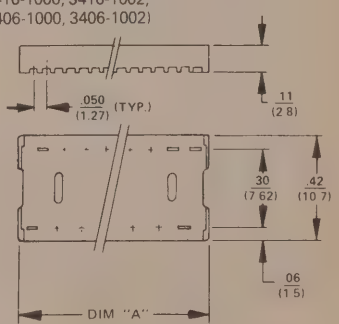
Contact Quantity	3M Part Number	DIM. "A"
14	3406-0000	.75 (19.1)
	3406-0002	"
	3406-1000	"
	3406-1002	"
16	3416-0000	.85 (21.6)
	3416-0002	"
	3416-1000	"
	3416-1002	"

CONNECTOR COVERS

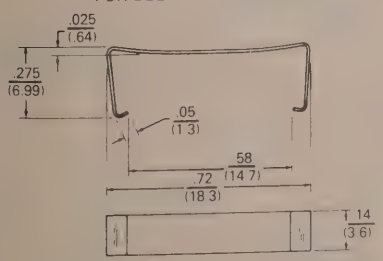
FLAT CABLE COVER
(Used on 3M Part Nos. 3416-0000, 3416-0002, 3406-0000, 3406-0002)



INDIVIDUAL WIRE COVER
(Used on 3M Part Nos. 3416-1000, 3416-1002, 3406-1000, 3406-1002)



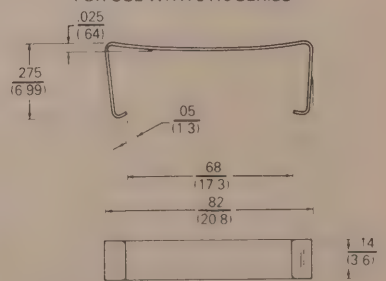
STRAIN RELIEF
(3M Part No. 3448-7)
FOR USE WITH 3406 SERIES



MATERIAL: GRAY EPOXY-COATED STEEL [.010 (.25) THICK].

TOLERANCE UNLESS NOTED			
	.0	.00	.000
INCH	± .1	± .01	± .005
mm	± .3	± .13	

STRAIN RELIEF
(3M Part No. 3448-8)
FOR USE WITH 3416 SERIES



MATERIAL: RED EPOXY-COATED STEEL [.010 (.25) THICK].

Most "Scotchflex" Brand products are identified by an eight-digit 3M Part Number. When ordering, be sure to include the complete series/suffix number (i.e., 3416 0000).

Electronic Products Division 3M COMPANY
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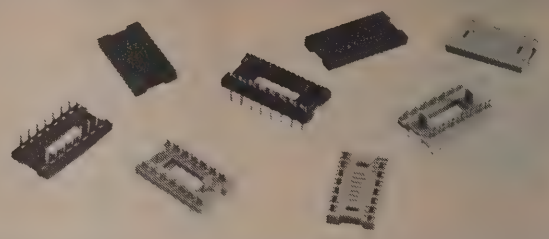
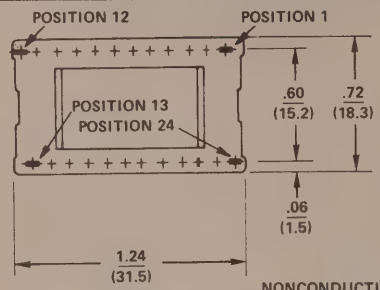
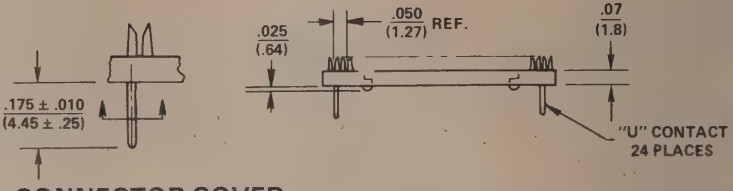
Scotchflex® BRAND D.I.P. CONNECTORS

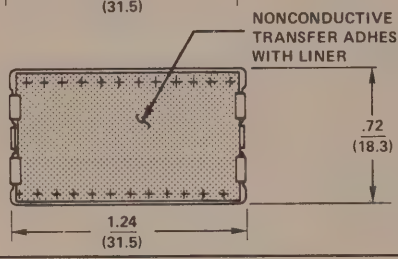


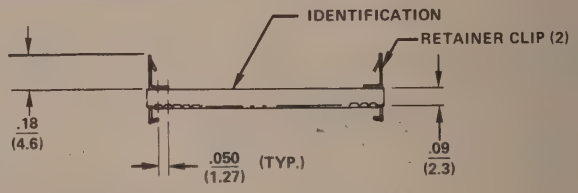
3460 SERIES CONNECTOR BODY



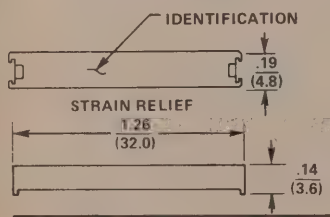


CONNECTOR COVER

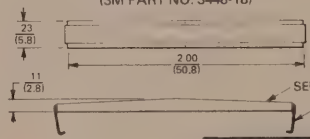




STRAIN RELIEF FOR 3460 SERIES
(SHIPPED WITH CONNECTOR)

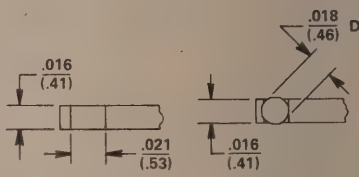


STRAIN RELIEF FOR 3508 CONNECTOR
(3M PART NO. 3448-18)



NOTES:
1. STAINLESS STEEL .010 (.25) THK.
2. MATERIAL: GRAY GLASS FILLED POLYESTER

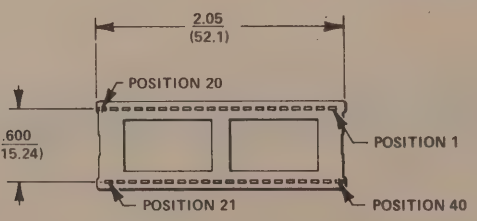
TOLERANCE UNLESS NOTED			
	0	00	000
INCH	± 1	± 01	± 005
mm	± 3	± 13	

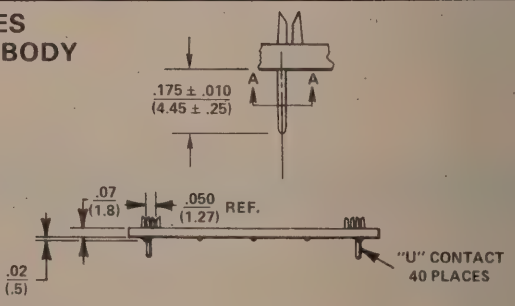


RECTANGULAR
.016 (.41) LEGS
(Used on 3M Parts No. 3460-0000, 3508-0000)

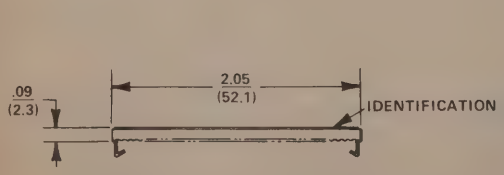
ROUND
.018 (.46) DIA. LEGS
(Used on 3M Parts No. 3460-0002, 3508-0002)

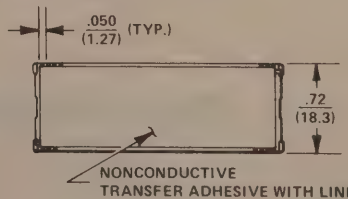
3508 SERIES CONNECTOR BODY





CONNECTOR COVER





Contact Quantity	3M Part Number	Leg Type
24	3460-0000	Rectangular
	3460-0002	Round
40	3508-0000	Rectangular
	3508-0002	Round

Most "Scotchflex" Brand products are identified by an eight-digit 3M Part Number. When ordering, be sure to include the complete series/suffix number (i.e., 3460-0000).

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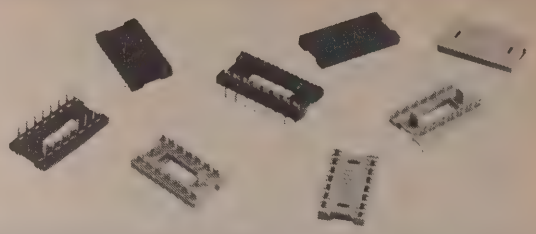
Scotchflex® BRAND D.I.P. CONNECTORS



Scotchflex® BRAND D.I.P. CONNECTOR REFERENCE CHART

Contact Quantity	Grid Spacing	3M Part No.	Connector Description	Mates With:	Strain Relief Part No.	Platen Part No.	Locator Plate Part No.
14	.100 x .300 (2.54 x 7.62)	3406-0000	Rectangular leg with flat cable cover	3M Flat Cable 3350, 3365, 3302, 3306, 3469	3448-7	3442-1	3443-12
	"	3406-0002	Round leg with flat cable cover		"	"	"
	"	3406-1000	Rectangular leg with individual wire cover	28 AWG & 26 AWG Stranded & Solid Individual Insulated Wire	"	"	"
	"	3406-1002	Round leg with individual wire cover		"	"	"
16	"	3416-0000	Rectangular leg with flat cable cover	3M Flat Cable 3350, 3365, 3302, 3306, 3469	3448-8	3442-1	3443-13
	"	3416-0002	Round leg with flat cable cover		"	"	"
	"	3416-1000	Rectangular leg with individual wire cover	28 AWG & 26 AWG Stranded & Solid Individual Insulated Wire	"	"	"
	"	3416-1002	Round leg with flat cable cover		"	"	"
	"	3498-0000	Pluggable leg with flat cable cover	3M Flat Cable 3350, 3365, 3302, 3306, 3469	"	"	3443-43
24	.100 x .600 (2.54 x 15.24)	3460-0000	Rectangular leg with flat cable cover	3M Flat Cable 3350, 3365, 3302, 3306	(Shipped with Connector)	3442-6	3443-10
	"	3460-0002	Round leg with flat cable cover		"	"	"
40	"	3508-0000	Rectangular leg with flat cable cover	3M Flat Cable 3350, 3365, 3302, 3306, 3469, 3476	3448-18	3442 8	3443-47
	"	3508-0002	Round leg with flat cable cover		"	"	"

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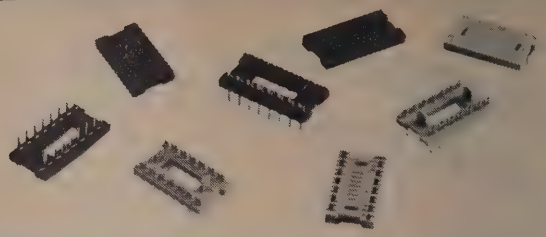
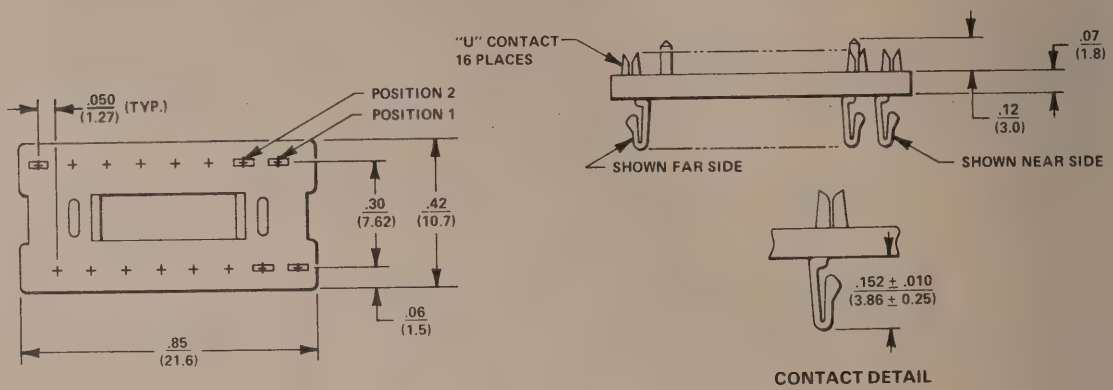
Scotchflex® BRAND D.I.P. CONNECTORS



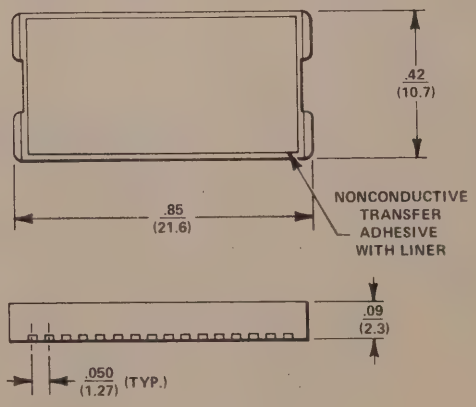
3M PART NO. 3498-0000

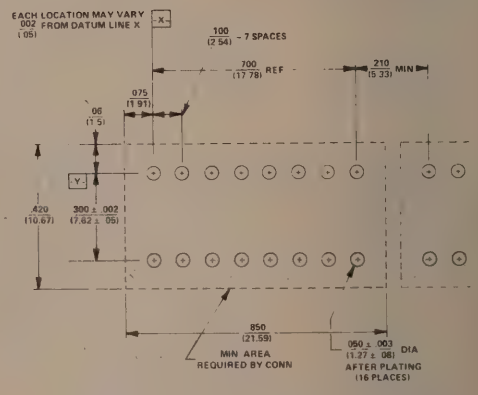
This is a solderless low-profile, pluggable connector that can be inserted or removed directly from a P.C.B. board having the proper hole pattern. It can be soldered if desired, and does not require an I.C. socket.

CONNECTOR BODY



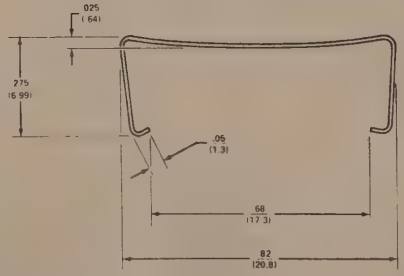
CONNECTOR COVER



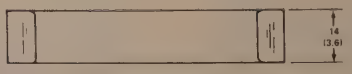

EACH LOCATION MAY VARY .002 (.05) FROM DATUM LINE X
X
100 (2.54) - 7 SPACES
700 (17.78) REF
210 (5.33) MIN
075 (1.91)
06 (1.5)
Y
420 (10.67)
300 ± .002 (7.62 ± .05)
850 (21.59)
MIN AREA REQUIRED BY CONN
050 ± .003 (1.27 ± .08) DIA AFTER PLATING (16 PLACES)

RECOMMENDED P.C. BOARD PATTERN
(Shown for mounting side of board)

3448-8 STRAIN RELIEF FOR USE WITH 3498-0000



TOLERANCE UNLESS NOTED			
	.0	.00	.000
INCH	±.1	± 01	±.005
mm	±.3	±.13	



MATERIAL: RED EPOXY-COATED STEEL [.010 (.25) THK].

Most "Scotchflex" Brand products are identified by an eight-digit 3M Part Number. When ordering, be sure to include the complete series/suffix number (i.e., 3498-0000).

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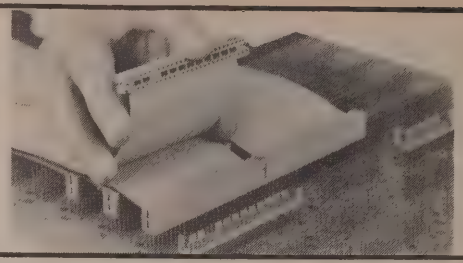
Scotchflex® BRAND SOCKET CONNECTOR AND KEYING HEADER SYSTEM



Unique polarizing, keying and backplane interconnection capabilities have been added to the Scotchflex Cable/Connector line with the introduction of a new mass terminating Socket Connector and Keying Header.

The 50 position Socket Connector will directly interface with .025" square backplane wrap pins. This Connector mates with 50 conductor Scotchflex Brand Flat Cables in 26 AWG or 30 AWG solid conductor and 28 AWG solid or stranded conductor versions.

Polarizing is accomplished with the Keying Header which is placed directly over 54, .025" square pins.

Its design includes posts on opposite corners for alignment of the header over the wrap pins. These posts also serve as a depth guide for .237" engagement, eliminating the need to cut pins, and allowing for two layers of wrap below the header.

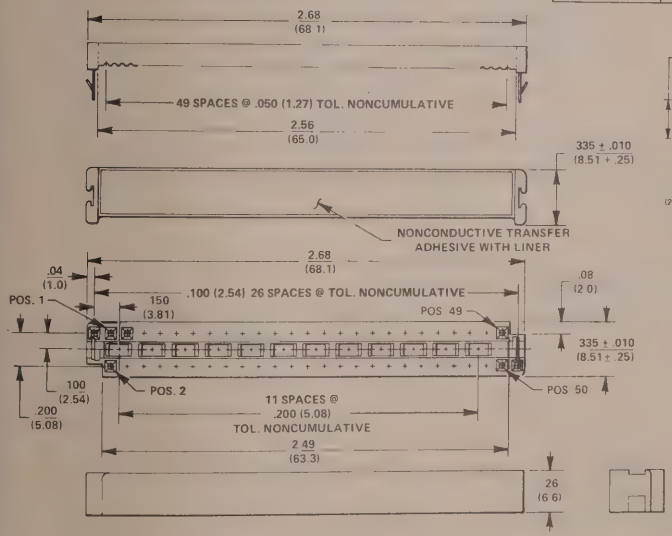
Rectangular keying posts in the center of the header break away to allow positive keying of the Socket Connector. A polarizing key is inserted into the keying holes on the Connector for mistakeproof polarization.

A wire form strain relief handle is available which minimizes stress to the contact/conductor interconnection and provides an area for identification.

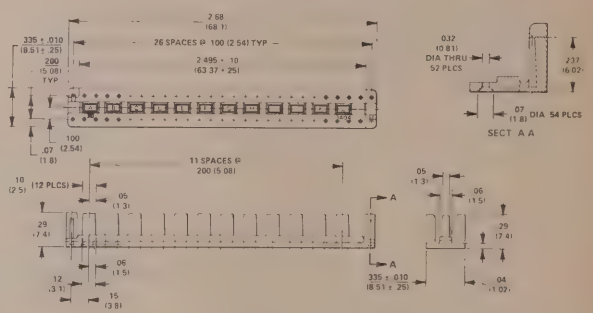
All Connector housings and polarizing keys are constructed of glass-reinforced thermoplastic with a flammability rating of 94 V-0.

SOCKET CONNECTOR DIMENSIONS
3M PART NO. 3307

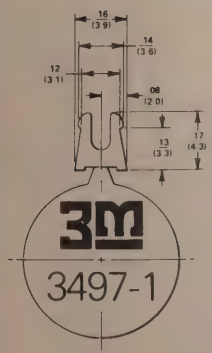
DIMENSIONS	
English	Inches
Metric	(mm)



KEYING HEADER DIMENSIONS
3M PART NO. 3404



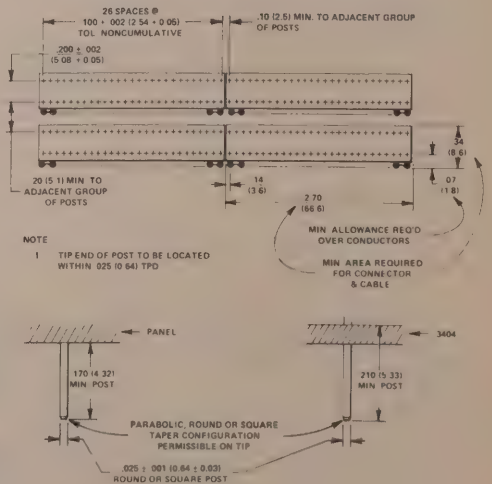
POLARIZING KEY
3M PART NO. 3497-1



NOTES:
1. MATERIAL – POLYESTER
2. COLOR – GREY
3. MARKING – RAISED FIGURES

DIMENSIONS	
English	Inches
Metric	(mm)

WRAP POST SPECIFICATION

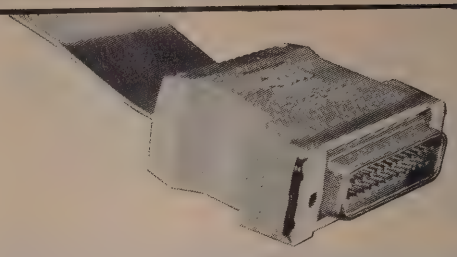

26 SPACES @ 100 ± .002 (2.54 ± 0.05) TOL. NONCUMULATIVE
.10 (2.5) MIN. TO ADJACENT GROUP OF POSTS
.200 ± .002 (5.08 ± 0.05)
.34 (8.6)
.07 (1.8)
20 (5.1) MIN. TO ADJACENT GROUP OF POSTS
.14 (3.6)
2.70 (66.6)
MIN ALLOWANCE REQ'D OVER CONDUCTORS
MIN AREA REQUIRED FOR CONNECTOR & CABLE
NOTE
1 TIP END OF POST TO BE LOCATED WITHIN .025 (0.64) TPD
PANEL
3404
.170 (4.32) MIN POST
.210 (5.33) MIN POST
PARABOLIC, ROUND OR SQUARE TAPER CONFIGURATION PERMISSIBLE ON TIP
.025 ± .001 (0.64 ± 0.03) ROUND OR SQUARE POST

SOCKET CONNECTOR/KEYING HEADER REFERENCE CHART

Socket CONNECTOR NO.	CONTACT QTY.	GRID SPACING	LOCATOR PLATE NO.	PLATEN NO.	STRAIN RELIEF NO.
3307	50	.100 x .200 (2.54) x (5.08)	3443-42	3442-9	3448-17

POLARIZING KEY NO.	KEYING HEADER NO.	SCOTCHFLEX CABLE NOS. USED WITH SYSTEM
3497-1	3404	3306/50 3469/50 3365/50 3476/50 3350/50 3380/50 3302/50

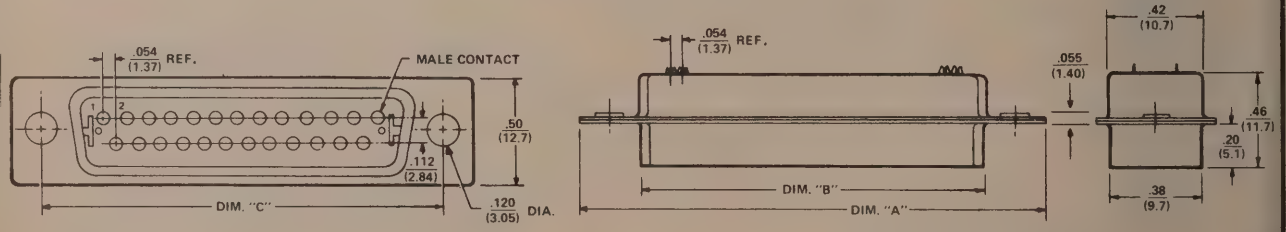
Scotchflex® BRAND DELTA CONNECTOR SYSTEM



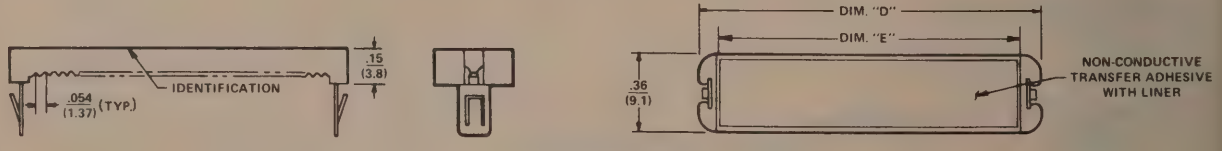
Here is the first system in the industry to permit mass connection of "D" subminiature connectors without the time-consuming stripping, soldering, crimping and individual positioning of discrete wires required by other systems. The "Scotchflex" Delta Connector System offers simultaneous stripping and terminating using the proven "U" contact principle pioneered by 3M. To provide instant interfacing of equipment having two different center spacings, the "Scotchflex" Delta System offers cables with unique variable patterns of center spacing (see page 00). The "Scotchflex" Delta System provides unequaled versatility, since its connectors are cable-compatible with all other "Scotchflex" connectors (Socket, P.C.B., D.I.P., Plug and Card-Edge) and also mate with all other "D" subminiature connectors in the industry. A complete line of accessory components is available.

TYPICAL PROPERTIES OF THE SCOTCHFLEX DELTA CONNECTOR	
ELECTRICAL	
Current Rating	1 Amp
Insulation Resistance	$>1 \times 10^9$ ohms
Dielectric Strength	>1,000 volts at sea level
ENVIRONMENTAL	
Temperature Rating	-67°F to +221°F (-55°C to +105°C)
PHYSICAL	
Contact Housing	Gray glass-reinforced polyester (U.L. Flammability Rating 94V-O) encased in steel shell plated with yellow chromate over clear cadmium
Contact Material	Beryllium copper
Contact Plating	.000050" (1.27μm) min. gold per MIL-G-45204 over .000050" (1.27μm) min. nickel
Marking	Raised figures: 3M logo, part identification numbers, contact position numbers
Wire Accommodation	26 AWG Solid and 28 AWG Stranded

3M PART NOS. 3482-1000 & 3502-1000 CONNECTOR BODY



CONNECTOR COVER

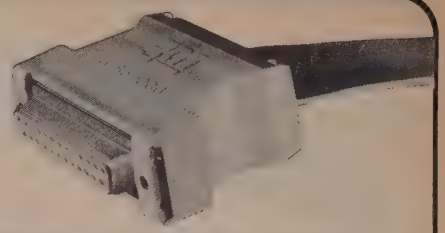


TOLERANCE UNLESS NOTED			
	.0	.00	.000
INCH	±.1	±.01	±.005
mm	±.3	±.13	

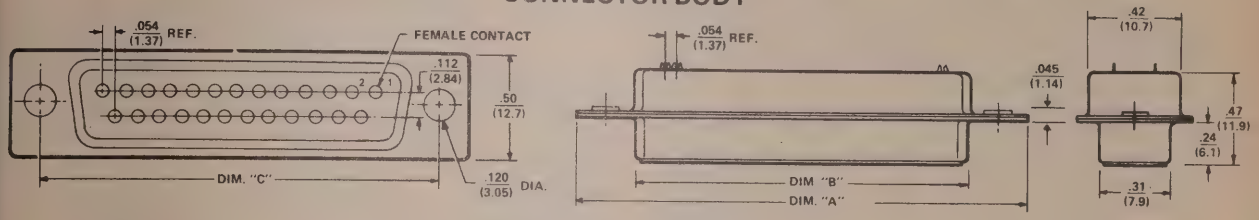
Most "Scotchflex" Brand products are identified by an eight-digit 3M Part Number. When ordering, be sure to include the complete series/suffix number (i.e., 3482-1000).

Electronic Products Division 3M COMPANY
3M CENTER • SAINT PAUL, MINNESOTA 55101

Scotchflex® BRAND DELTA CONNECTOR SYSTEM



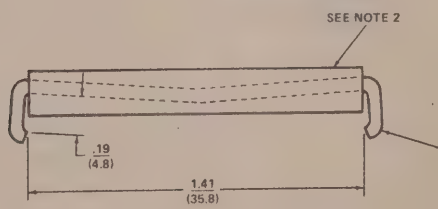
3M PART NOS. 3483-1000 & 3503-1000
CONNECTOR BODY



CONNECTOR COVER

STRAIN RELIEF FOR ALL DELTA CONNECTORS

(3M PART NO. 3448-6)

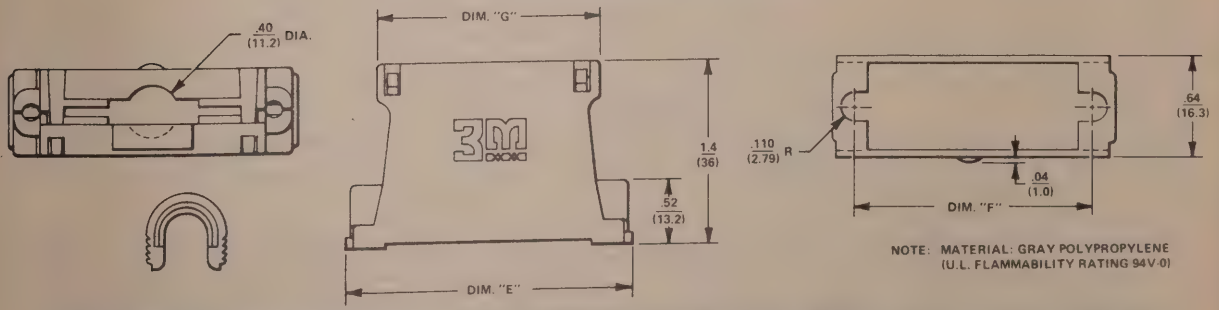


NOTES:

1. MATERIAL: NICKEL-PLATED STEEL MUSIC WIRE, 19 GA. [.043 (1.09) DIA.].
2. MATERIAL: GRAY EXTRUDED POLYVINYL CHLORIDE.

TOLERANCE UNLESS NOTED			
	.0	.00	.000
INCH	±.1	±.01	±.005
mm	±.3	±.13	

JUNCTION SHELL
(3M PART NOS. 3485-1000 & 3485-4000)



NOTE: MATERIAL: GRAY POLYPROPYLENE (U.L. FLAMMABILITY RATING 94V-0)

CONTACT QUANTITY	3M PART NUMBER	CONNECTOR TYPE	DIM. "A"	DIM. "B"	DIM. "C"	DIM. "D"	TAKES JUNCTION SHELL NO.	DIM. "E"	DIM. "F"	DIM. "G"
25	3482-1000	Pin	2.09 (53.1)	1.58 (40.1)	1.85 (47.0)	1.53 (38.9)	3485-1000	2.20 (55.9)	1.85 (47.0)	1.72 (43.7)
	3483-1000	Socket	"	1.51 (38.4)	"	"	"	"	"	"
37	3502-1000	Pin	2.74 (69.6)	2.23 (56.7)	2.50 (63.5)	2.18 (55.4)	3485-4000	2.84 (72.1)	2.50 (63.5)	2.40 (61.0)
	3503-1000	Socket	"	2.16 (54.8)	"	"	"	"	"	"

Most "Scotchflex" Brand products are identified by an eight-digit 3M Part Number. When ordering, be sure to include the complete series/suffix number (i.e., 3482-1000).

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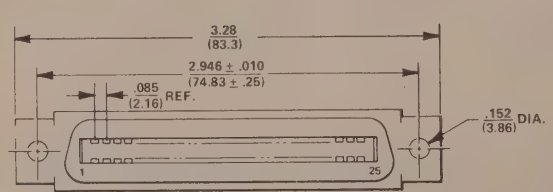
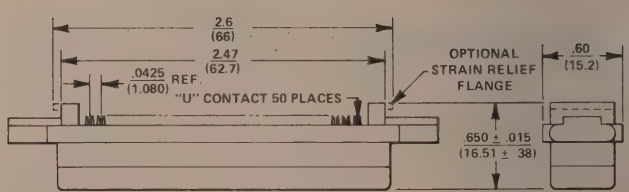
Scotchflex® BRAND DELTA RIBBON CONNECTOR SYSTEM

Now you can mass-terminate ribbon connectors without the expensive wire preparation and assembly costs required by other systems. The "Scotchflex" Delta Ribbon Connector System eliminates all stripping, soldering, crimping and individual positioning of discrete wires; using 3M's proven "U" contact principle you strip and terminate 50 conductors (25 pairs) simultaneously. To provide instant interfacing of equipment having two different center spacings, the "Scotchflex" Delta Ribbon System offers cables with unique variable patterns of center spacing (see page 00). Unequaled versatility is provided by the system, since all Delta Ribbon connectors are cable-compatible with other connectors in the "Scotchflex" line (Socket, P.C.B., D.I.P., Plug and Card-Edge, and also mate with all other "D" subminiature connectors in the industry. A complete line of accessory components is available.

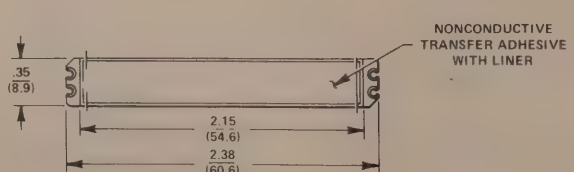
TYPICAL PROPERTIES FOR ALL DELTA RIBBON CONNECTORS	
ELECTRICAL	
Current Rating	1 AMP
Dielectric Withstanding Voltage	>1,000 Volts at Sea Level
Insulation Resistance	>1x10⁹ Ohms
ENVIRONMENTAL	
Temperature Range	-67°F to +221°F (-55°C to +105°C)
PHYSICAL	
Insulation Material	Glass-filled polyester
Contact Material	Beryllium copper
Contact Plating	0.000030" (.762μm) min. gold per MIL-G-45204 Type II on wiping tab over 0.000100" (2.54μm) min. nickel. Gold flash overall.
Color	Gray
Wire Accommodation	28 AWG Stranded, 26 AWG Solid

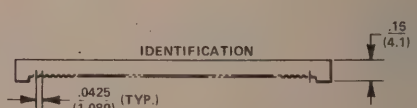
3489 SERIES SOCKET BODY





SOCKET COVER





CONTACT QUANTITY	3M PART NUMBER	STRAIN RELIEF PROVISION
50	3489-1000	Without Strain Relief Flanges
	3489-1001	With Strain Relief Flanges

TOLERANCE UNLESS NOTED			
	.0	.00	.000
INCH	±.1	±.01	±.005
mm	±.3	±.13	

Most "Scotchflex" Brand products are identified by an eight-digit 3M Part Number. When ordering, be sure to include the complete series/suffix number (i.e., 3489-1000).

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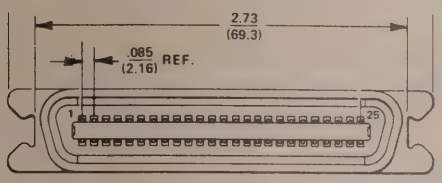
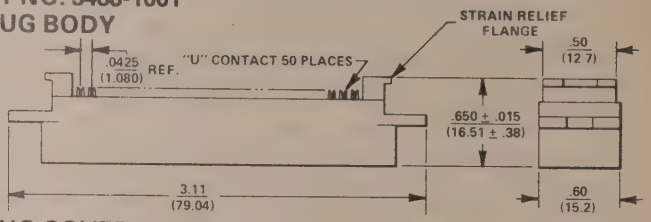
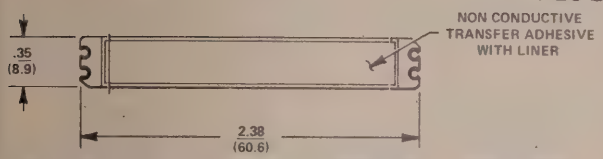
Scotchflex® BRAND DELTA RIBBON CONNECTOR SYSTEM

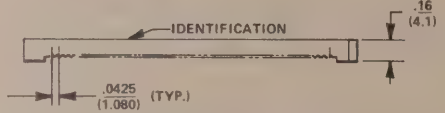
3M PART NO. 3488-1001 PLUG BODY



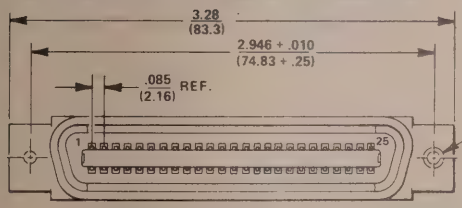


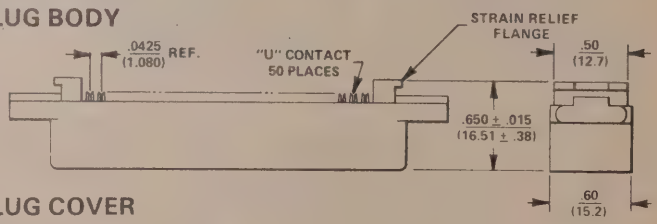
PLUG COVER



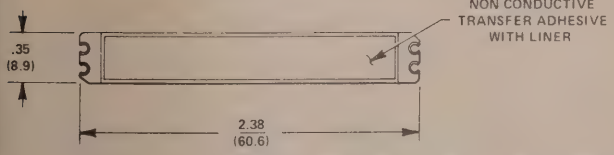


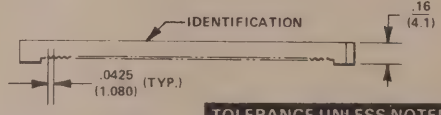
3M PART NO. 3488-1002 PLUG BODY





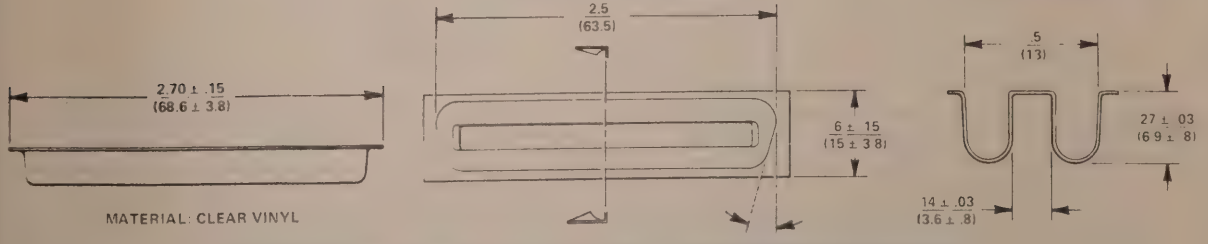
PLUG COVER





TOLERANCE UNLESS NOTED			
	.0	.00	.000
INCH	± .1	± .01	± .005
mm	± .3	± .13	

DUST COVER (3M PART NO. 3412)



MATERIAL: CLEAR VINYL

Scotchflex DELTA RIBBON CONNECTOR SYSTEM REFERENCE CHART

CONTACT QUANTITY	3M PART NUMBER	FOR ASSEMBLY USE LOCATOR PLATE NO.	STRAIN RELIEF NO.	STRAIN RELIEF HOOD NO.	ACCEPTS 3M FLAT CABLE NO.	BAIL MOUNT KIT	SCREW MOUNT KIT	JACK SOCKET KIT	DUST COVER
50	3489-1000	3443-41		-	3389-50, 3384-50	3475-1	3342-3	3441-2	3412
	3489-1001	"	3448-15	3485-2	"	"	"	"	"
	3488-1001	3443-48	"	"	"	"			"
	3448-1002	"	"	"	"		3342-3	3341-2	"

For proper assembly of connector, ask your 3M sales representative for free instruction booklet "Instructions and Installation Procedures for Operation of the SCOTCHFLEX Delta Ribbon Connector System."

Most "Scotchflex" Brand products are identified by an eight-digit 3M Part Number. When ordering, be sure to include the complete series/suffix number (i.e., 3489-1000).

Electronic Products Division 3M COMPANY
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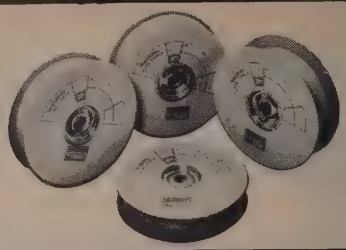
Scotchflex® BRAND FLAT CABLES



INTRODUCTION

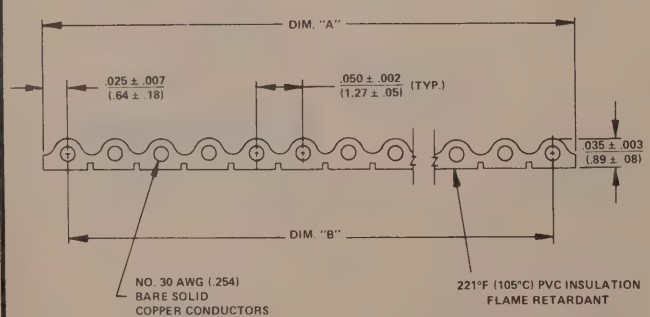
3M Company's lightweight, low-profile flat cables are designed to mate with all standard industry connectors. They are offered in standard round conductor, ground plane, ground plane with drain wire, and color-coded versions. Being flexible, these flat cables can be bent or folded without damaging either conductors or insulation. Conductors are joined in one-piece construction with a ribbed top side for positioning in mating connectors; there is a red, black or green coding stripe along one edge of the cable to simplify orientation. Insulation is polyvinyl chloride, U.L. listed at 300 VRMS, 221°F (105°C), with an FR-1 rating. Using "Scotchflex" connectors, 3M flat cables are also suitable for bussing operations. The 3M Company's high production standards assure close center-spacing tolerances to give predictable and consistent electrical characteristics. Using the 3M flat cable and connector system, jumper assembly labor costs are appreciably reduced, since hand wiring and soldering are eliminated. For assistance with special design problems, contact your local 3M sales representative or "Scotchflex" distributor.

ROUND CONDUCTOR FLAT CABLE

The 3M Company supplies 7 standard round conductor flat cables. They come in wire sizes #30 AWG Solid, #28 AWG Stranded, #26 AWG Solid, and #24 AWG Stranded with up to 64 conductor widths. Depending on the particular cable, there are three center spacings to choose from — .050", .0625" and .075". Being zippable, breakouts can be made when more than one connector is required on an end. With this wide selection, 3M has the right cable to meet your needs.

3350 SERIES

#30 AWG SOLID FLAT CABLE .050 (1.27) CENTER SPACING


DIM. "A"
.025 ± .007 (.64 ± .18)
.050 ± .002 (1.27 ± .05) (TYP.)
.035 ± .003 (.89 ± .08)
DIM. "B"
NO. 30 AWG (.254) BARE SOLID COPPER CONDUCTORS
221°F (105°C) PVC INSULATION FLAME RETARDANT

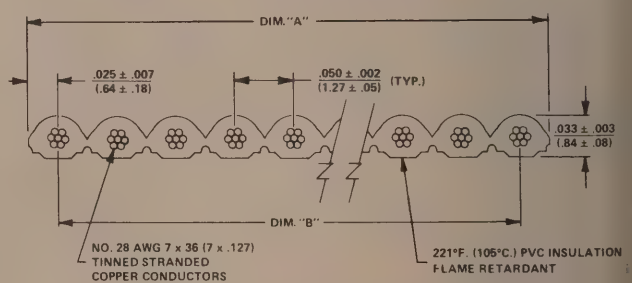
Number of Conductors	3M Part No.	DIM. "A"	DIM. "B"
10	3350/10	.500 ± .010 (12.70 ± .25)	.450 ± .007 (11.43 ± .18)
14	3350/14	.700 ± .010 (17.78 ± .25)	.650 ± .007 (16.51 ± .18)
16	3350/16	.800 ± .015 (20.32 ± .38)	.750 ± .011 (19.05 ± .28)
20	3350/20	1.000 ± .015 (25.40 ± .38)	.950 ± .011 (24 13 ± .28)
24	3350/24	1.200 ± .015 (30.48 ± .38)	1.150 ± .011 (29.21 ± .28)
26	3350/26	1.300 ± .015 (33.02 ± .38)	1.250 ± .011 (31.75 ± .28)
34	3350/34	1.700 ± .020 (43.18 ± .51)	1.650 ± .015 (41.91 ± .38)
40	3350/40	2.000 ± .020 (50.80 ± .51)	1.950 ± .015 (49.53 ± .38)
50	3350/50	2.500 ± .020 (63.50 ± .51)	2.450 ± .015 (62.23 ± .38)

NOTE: RED MARKING ON ONE EDGE OF CABLE

U.L. STYLE NO. 2651

3365 SERIES

#28 AWG STRANDED FLAT CABLE .050 (1.27) CENTER SPACING


DIM. "A"
.025 ± .007 (.64 ± .18)
.050 ± .002 (1.27 ± .05) (TYP.)
.033 ± .003 (.84 ± .08)
DIM. "B"
NO. 28 AWG 7 x 36 (7 x .127) TINNED STRANDED COPPER CONDUCTORS
221°F. (105°C.) PVC INSULATION FLAME RETARDANT

Number of Conductors	3M Part No.	DIM. "A"	DIM. "B"
10	3365/10	.500 ± .010 (12.70 ± .25)	.450 ± .007 (11.43 ± .18)
14	3365/14	.700 ± .010 (17.78 ± .25)	.650 ± .007 (16.51 ± .18)
16	3365/16	.800 ± .015 (20.32 ± .38)	.750 ± .011 (19.05 ± .28)
20	3365/20	1.000 ± .015 (25.40 ± .38)	.950 ± .011 (24.13 ± .28)
24	3365/24	1.200 ± .015 (30.48 ± .38)	1.150 ± .011 (29.21 ± .28)
26	3365/26	1.300 ± .015 (33.02 ± .38)	1.250 ± .011 (31.75 ± .28)
34	3365/34	1.700 ± .020 (43.18 ± .51)	1.650 ± .015 (41.91 ± .38)
40	3365/40	2.000 ± .020 (50.80 ± .51)	1.950 ± .015 (49.53 ± .38)
50	3365/50	2.500 ± .020 (63.50 ± .51)	2.450 ± .015 (62.23 ± .38)
60	3365/60	3.000 ± .020 (76.20 ± .51)	2.950 ± .015 (74.93 ± .38)
64	3365/64	3.200 ± .020 (81.28 ± .51)	3.100 ± .015 (78.74 ± .38)

NOTE: RED MARKING ON ONE EDGE OF CABLE

U.L. STYLE NO. 2651

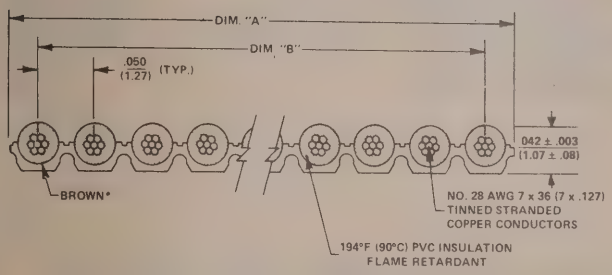
TOLERANCE UNLESS NOTED			
	.0	.00	.000
INCH	±.1	±.01	±.005
mm	±.3	±.13	

Most "Scotchflex" Brand products are identified by a multiple-digit 3M Part Number. When ordering, be sure to include the complete series/suffix number (i.e., 3350/10).

Scotchflex® BRAND FLAT CABLES

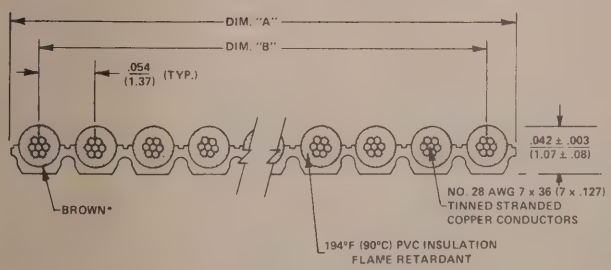
Color-coding adds the convenience of individual wire identification to the proven advantages of the "Scotchflex" mass termination system. Similar to our familiar gray cable, these new additions to the "Scotchflex" line are fully zippable, permitting conductors to be either mass terminated or separated for multiple discrete connections. Depending on the particular cable, they are available with 28 AWG stranded and 26 AWG solid conductors on .0425", .050" or .054" centers, in cable sizes up to 64 conductors.

3302 SERIES
#28 AWG STRANDED COLOR-CODED FLAT CABLE
.050 (1.27) CENTER SPACING


DIM. "A"
DIM. "B"
.050 (1.27) (TYP.)
.042 ± .003 (1.07 ± .08)
BROWN*
NO. 28 AWG 7 x 36 (7 x .127) TINNED STRANDED COPPER CONDUCTORS
194°F (90°C) PVC INSULATION FLAME RETARDANT

3M Part Number	DIM. "A"	DIM. "B"
3302/10	.500 ± .015 (12.70 ± .38)	.450 ± .010 (11.43 ± .25)
3302/14	.700 ± .015 (17.78 ± .38)	.650 ± .010 (16.51 ± .25)
3302/16	.800 ± .020 (20.32 ± .51)	.750 ± .015 (19.05 ± .38)
3302/20	1.000 ± .020 (25.40 ± .51)	.950 ± .015 (24.13 ± .38)
3302/24	1.200 ± .020 (30.48 ± .51)	1.150 ± .015 (29.21 ± .38)
3302/26	1.300 ± .020 (33.02 ± .51)	1.250 ± .015 (31.75 ± .38)
3302/34	1.700 ± .025 (43.18 ± .63)	1.650 ± .020 (41.91 ± .51)
3302/40	2.000 ± .025 (50.80 ± .63)	1.950 ± .020 (49.53 ± .51)
3302/50	2.500 ± .025 (63.50 ± .63)	2.450 ± .020 (62.23 ± .51)
3302/64	3.200 ± .025 (81.28 ± .63)	3.100 ± .020 (78.74 ± .51)

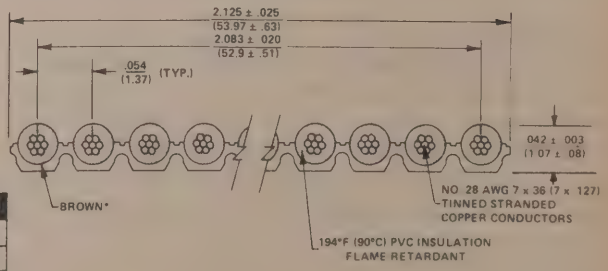
3301 SERIES
#28 AWG STRANDED COLOR-CODED FLAT CABLE
.054 (1.37) CENTER SPACING
25 CONDUCTORS


DIM. "A"
DIM. "B"
.054 (1.37) (TYP.)
.042 ± .003 (1.07 ± .08)
BROWN*
NO. 28 AWG 7 x 36 (7 x .127) TINNED STRANDED COPPER CONDUCTORS
194°F (90°C) PVC INSULATION FLAME RETARDANT

Number of Conductors	3M Part No.	Dim. "A"	Dim. "B"
25	3301/25	1.350 ± .020 (34.29 ± .51)	1.296 ± .015 (32.92 ± .38)
37	3301/37	1.998 ± .025 (50.75 ± .63)	1.944 ± .020 49.37 ± .51)

3M PART NO. 3384/50
#26 AWG SOLID COLOR-CODED FLAT CABLE
.0425 (1.08) CENTER SPACING
50 CONDUCTORS

3M PART NO. 3389/50
#28 AWG STRANDED COLOR-CODED FLAT CABLE
.0425 (1.08) CENTER SPACING
50 CONDUCTORS


2.125 ± .025 (53.97 ± .63)
2.083 ± .020 (52.9 ± .51)
.054 (1.37) (TYP.)
042 ± .003 (1 07 ± .08)
BROWN*
NO. 28 AWG 7 x 36 (7 x .127) TINNED STRANDED COPPER CONDUCTORS
194°F (90°C) PVC INSULATION FLAME RETARDANT

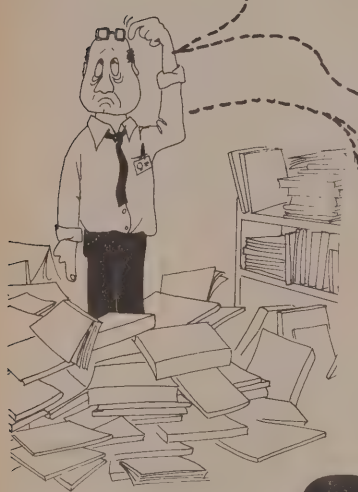
TOLERANCE UNLESS NOTED			
	.0	.00	.000
INCH	± .1	± .01	± .005
mm	± .3	± .13	

Most "Scotchflex" Brand products are identified by an eight-digit 3M Part Number. When ordering, be sure to include the complete series/suffix number (i.e., 3302/10)

Electronic Products Division 3M COMPANY
3M CENTER • SAINT PAUL, MINNESOTA 55101

What can I use to keep all the manufacturers' product data I receive in order?

What system makes filing or retrieving manufacturers' catalogs fast and easy?



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The publishers of **eem** have put together a unique filing system for electronic product information. The complete system includes: a product index booklet which classifies electronic products into 3,000 listings both alphabetically and by product group, and 45 file folders imprinted with the **eem** product sections (extra gummed labels included for expanding the system.)

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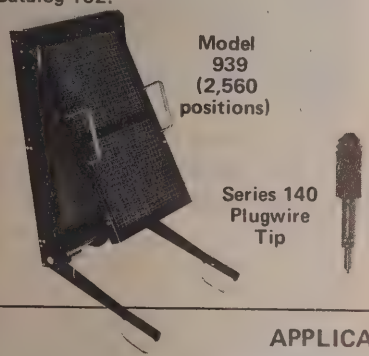
MAC/PANEL

1958-1978 Our 20th Year
PLUGBOARD PROGRAMMING SYSTEMS

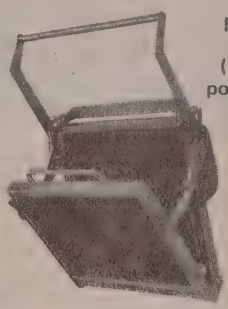
SERIES 140 PLUGBOARD SYSTEMS
Extremely strong and compact systems with removable plugboards. Features cam-closing mechanism. Choice of taper pin or wrap terminations for connecting to external equipment. A complete line of Series 140 plugwires is offered. Catalog 102.



Model 939 (2,560 positions)

Series 140 Plugwire Tip

SERIES 157 PLUGBOARD SYSTEMS
Reliable economical program control. Taper pin or wrap terminations to external equipment. Removable plugboard patched with Series 157 plugwires. Catalog 101.

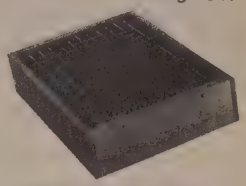


Model 922 (1,280 positions)

Series 157 Plugwire Tip

SERIES 157 FIXED SYSTEMS
Used where program change requirements do not dictate the use of removable plugboards. Systems from 200 to 1280 contact positions are offered from stock. Sizes up to 9,600 positions are made to order. Catalog 101.

Model 809 (816 positions)



IN-STOCK CONNECTORS & TOOLS
We maintain shelf stock on connectors, and crimping, insertion and extracting hand tools. Used for interconnecting the plugboard system to external equipment.

APPLICATIONS OF REMOVABLE PLUGBOARD SYSTEMS

MAC/PANEL Plugboard Programming Systems are used whenever there is a need for frequent or fast changes in the functions performed by electrical equipment and circuits or in the interconnection of two or more machines and/or circuits. Removable Plugboards are prewired with plugwire assemblies to provide a given pattern of interconnection. Changes can be made either by changing the program wired in the removable Plugboard or by simply replacing the Plugboard in the Receiver with another pre-programmed Plugboard in a matter of seconds. **MAC/PANEL** Plugboard Programming Systems are used as large connectors with up to 5,120 contact positions on standard models. Thousands of **MAC/PANEL** systems have been installed in the United States and in over forty foreign countries since 1958.

SERIES 157 PLUGBOARD SYSTEMS (Catalog 101)
(Accepts Series 157 Plugwire Tips)

CONTACT POSITIONS	MODEL NUMBER	HOLE PATTERN HOR.-VERT.	LOCKING MECHANISM	RECEIVER DIMENSIONS W	H	D
200	902	10 X 20	SPRING	4.1	10.4	3.0
320	903	16 X 20	SPRING	5.6	10.4	3.0
440	904	22 X 20	SPRING	7.1	10.4	3.0
440	905	20 X 22	SPRING	6.6	11.0	3.0
680	901	20 X 34	LEVER-ARM	8.6	14.1	6.0
748	906	22 X 34	LEVER-ARM	8.6	14.1	6.0
816	907	24 X 34	LEVER-ARM	9.2	14.1	6.0
1280	922	40 X 32	LEVER-ARM	13.4	13.6	6.0
1600	921	50 X 32	LEVER-ARM	16.3	13.6	6.0
680	918	20 X 34	CAM-ARM	8.0	12.1	2.5
748	920	22 X 34	CAM-ARM	8.0	12.1	2.5
816	919	24 X 34	CAM-ARM	8.6	12.1	2.5
1088	988	32 X 34	CAM-ARM	11.0	12.1	2.5
1280	924	40 X 32	CAM-ARM	12.5	11.6	2.5
1496	923	44 X 34	CAM-ARM	16.0	12.5	4.0
1632	925	48 X 34	CAM-ARM	17.0	12.5	4.0
2560	926	40 X 64	CAM-ARM	13.0	23.0	4.0
3264	927	48 X 68	CAM-ARM	17.5	24.0	4.0
4896	928	48 X 102	CAM-ARM	17.5	35.0	4.0
5120	929	80 X 64	CAM-ARM	24.5	23.0	4.0

SERIES 140 PLUGBOARD SYSTEMS (Catalog 102)
(Accepts Series 140 Plugwire Tips)

CONTACT POSITIONS	MODEL NUMBER	HOLE PATTERN HOR.-VERT.	LOCKING MECHANISM	RECEIVER DIMENSIONS W	H	D
240	930	10 X 24	CAM-ARM	5.2	8.9	2.0
480	931	20 X 24	CAM-ARM	7.7	8.9	2.0
640	932	20 X 32	CAM-ARM	7.7	10.9	2.0
816	933	24 X 34	CAM-ARM	8.7	11.4	2.0
1280	934	40 X 32	CAM-ARM	13.1	10.9	2.0
1632	935	48 X 34	CAM-ARM	15.1	11.4	2.0
2560	939	40 X 64	CAM-ARM	13.5	22.0	2.5
3264	937	48 X 68	CAM-ARM	15.9	23.0	2.5
5120	938	64 X 80	CAM-ARM	20.1	26.0	2.5

GENERAL PRODUCT DESCRIPTION

Each system consists of a Receiver and one or more removable Plugboards. The Receiver is the frame and the engaging mechanism that accepts the removable Plugboard. Depending on the system there are from one to six molded black phenolic or blue diallyl phthalate panels in the Receiver and Plugboard frames. A molded panel will contain up to 1280 holes or contact positions. These panels are silk screened with a grid pattern that provides a unique alphanumeric address for each contact position in the system. Special customized printing in any number of colors can be provided on either the Plugboard or Receiver.

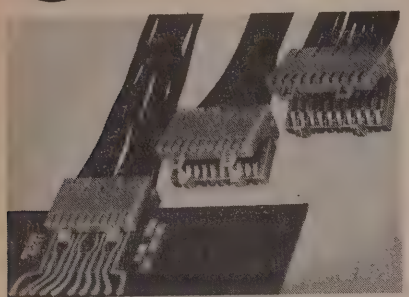
A contact spring is factory installed in each Receiver contact position. The front portion of these nickel or gold plated contact springs mates with nickel or gold plated plugwire tips inserted in the appropriate contact position of the Plugboard when the Plugboard is inserted in the Receiver. All Receivers are equipped with a mechanical interlock that assures proper mating of contact springs and plugwire tips. Each contact position can also be directly connected to the equipment from the rear of the Receiver by soldering, insertion of taper pins, or wire-wrapping. The desired method of connection must be determined prior to ordering so that the appropriate type of contact springs will be provided in the Receiver.

MAC/PANEL maintains shelf stock on over 500 types of plugwire assemblies. These include single conductor and multi-conductor unshielded and shielded plugwires as well as crimpable and wire-wrapable plugwire tips.

MAC/PANEL customer service personnel and design engineers invite your inquiries. We can promptly and economically design, build, and install a special custom system or plugwire if our standard product will not meet your requirements.

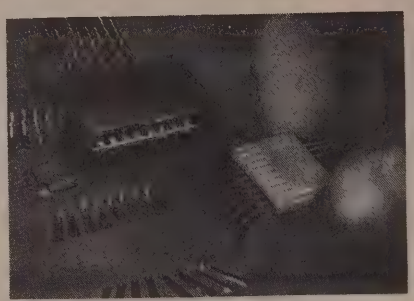
MAC/PANEL COMPANY
P. O. Box 5027, High Point, N. C. 27262
Telephone (919) 882-8138

Methode Electronics, Inc.
Interconnect Products Division



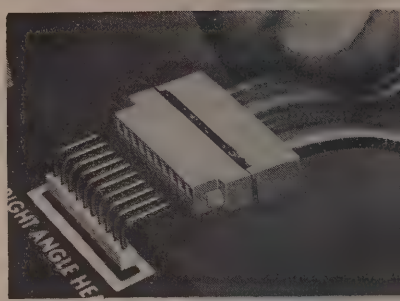
"Clam" Zero Insert Force Miniature Connectors. 1300-300 Series.

Term-Acon® .100 center clam connectors are designed to offer low insertion force gas tight connection to double or single sided .062 thick P.C. boards. Connectors snap close over P.C. board edge exerting 3-4 times normal gram loading. Permits highly reliable interface even when applied to solder plated P.C. edge. No abrasive forces during insertion or removal. Unique retaining dog actuates and releases swivel-clamp action. Contacts are brass tin plate. Housing material is Polyester 94V-O. Available in 10 circuits (single sided) or 20 circuits (double sided).



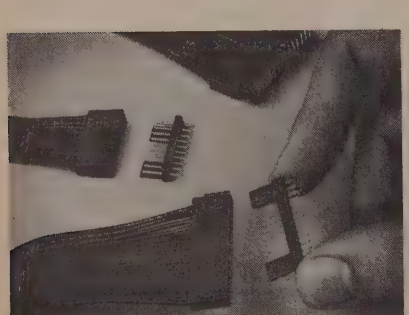
Miniature Card Edge Connector For Wire-To-Board Interconnects. 1500 Series.

Crimp type edge connector provides .100 centers wire-to-board interconnects plus in-the-field contact removal or replacement. Designed to mate with an .062 ±.007 thick single sided P.C. board. Permits independent wire harness assembly for 2-25 conductor cable. Methode 1400 Series crimp contacts used are rated at 3.5 amps. Contacts are available in either tin or gold plating. Housing material is furnished in 94V-2 material.



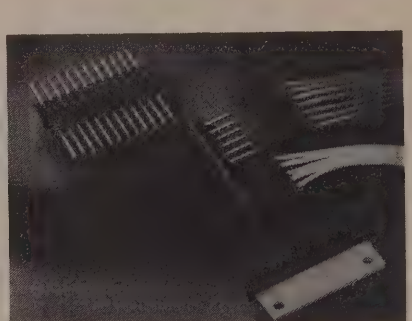
Mass Termination "Jaguar 100"® Connector for Ribbon Cable On .100 Centers 1300-200 Series.

"Jaguar 100"® connectors eliminate rejections caused by shorts to adjacent conductors, the major cause for rejects when terminating connectors on .050 centers. Cable-to-board ribbon cable can be mass terminated on .100 centers with Methode's insulation displacement connectors. Straight-on and right angle versions are available. They handle double the current rating of presently available mass termination products on .050 centers. They're designed for piercing ribbon cable or discrete wires 10-28 contact positions (22 through 30 AWG) on .100 centers. Insulation displacement tin plated brass contacts are standard. Connector housing material is Polyester 94V-O flame-retardant.



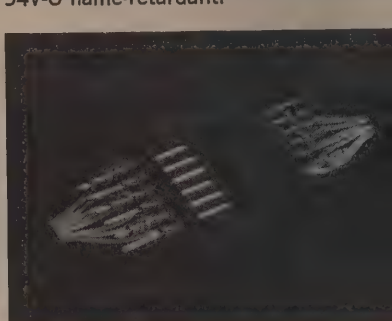
Miniature "Pol-R-Lok" Polarized Locking Connector on .100 Centers. 1100-8, -9 Series.

"Pol-R-Lok" miniature connectors offer high density positive locking and polarized interconnections for video games, calculators, T.V., CB radios, and other consumer applications. The locking polarizing header and mating crimp receptacle are available with 2-28 positions on .100 centers. Either straight or right angle .025 square pins are available on the headers. Receptacle's bellows contacts can accommodate 22-30 AWG leads. Header and receptacle bodies are made of 94V-O material. Contacts and pins are available in either tin or gold plated brass that can handle 3.5 amps at 250 VAC.



"Double-Header" Miniature Connectors New Approach to P.C. Board Interconnection Problems. 3100-14 Series.

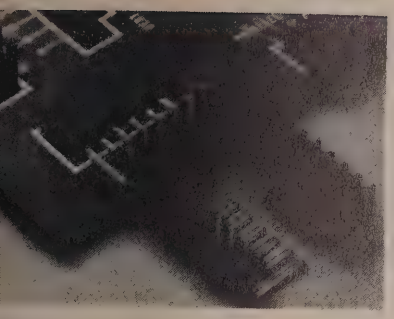
"Double-Header" miniature Term-Acon® connectors provide new approach to interfacing different size crimp contact receptacles on P.C. board bulkheads. Available with in-line or right angle pin configurations. Screw, rivet or snap-in mounts plus stacked arrays and extended configurations up to 24 pins are also offered. The .045" square pins may be positively identified with a permanent legend on the connector body. Optional locking legs are available to assure positive connections under high impact or vibration conditions. Pins are rated at 7A, 250 VAC.



Miniature "Happy Wrapper" Connectors For Wire Wrap Applications. 3300-1 Series.

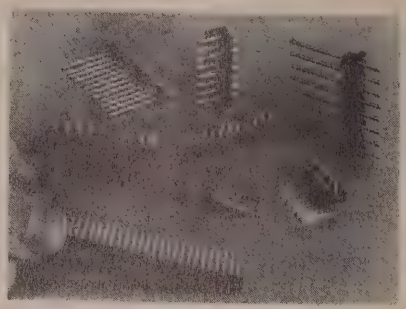
Principle feature of this connector is th ability to connect flying leads by har wire wrap terminations to both pin ar socket elements. The line disconnect d vice also offers the option of bulkhead circuit board attachment of the p header member. The connector will ma with .045 round or square pins on .15 centers. Pins will withstand 8 inc ounces of wrapping torque without d gradation. Receptacle material is Nyl 6/6 94V-2 and contacts are brass t plated.

Methode Electronics, Inc.
Interconnect Products Division



Miniature "Platform Connectors" Mount Anywhere on P.C. Board Without Card Edge Location. 3600 Series.

ow profile connectors are engineered for ast assembly production usage in con-umer electronic, communications and ndustrial control products. Contact posi-ons are on .156 centers. Minimum with-rawal force 2.5 ozs. Twin termination esign for wave soldering to circuit oard provides approximately 50% more urrent capacity. Housing material, Ny-n 6/6 94V-2. Contacts are tin plated rass. Connectors rated 7 Amps 250 AC.

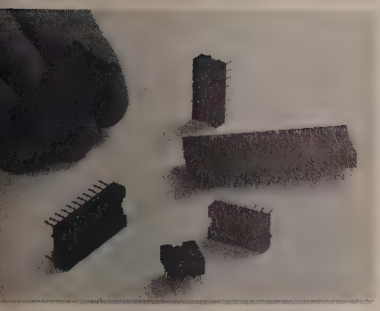


Miniature Term-Acon® Series Connectors Solve Majority of P.C. Board Interconnect Problems. 1000, 2000 & 3000 Series.

Term-Acon® Series offer a moderately priced, reliable solution to interconnect problems on telecommunication systems, data processing equipment, consumer electronic devices. Series 1000 has .025 square pin headers, P.C. board mounted and crimp connectors on .100 centers for hi-density usage. Series 2000 utilize .045 square pins on .200 centers. Series 3000 have .045 round or square pins on .156 centers. Housing materials are furnished in both 94V-2 and 94V-O.

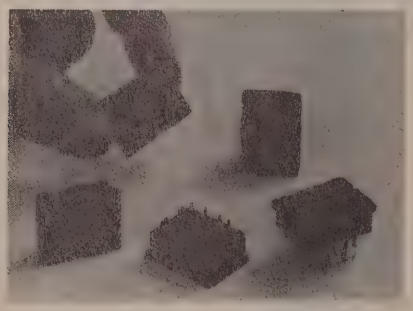
New 40-Page Term-Acon® Catalog Features Economical P.C. Card & Cable-to-Cable Connectors.

Catalog #77081 features the moderately priced Term-Acon® connector line. Connectors are designed for P.C. card receptacles, interconnecting receptacles and headers, flying lead, cable-to-cable connections, mass termination, utilizing crimp or insulation displacement, plus wire wrap plug and receptacle applications. Complete specs and dimensional drawings are provided for the Series 1000 with .025 square pin headers and mating receptacles on .100 centers. Series 2000 with .045 square pins on .200 centers and Series 3000 connectors with .045 square or round pins on .156" centers.



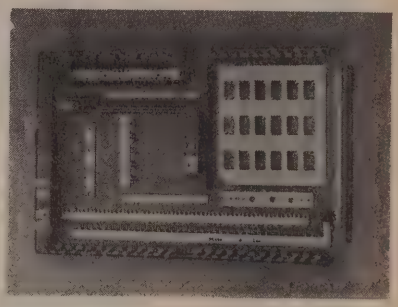
ethode Uni-Pac® Low Cost, ow Profile, Anti-Wicking I. C. ockets. R-4000 Series.

ethode I. C. sockets offer high density d and side stack-ability on a .100 grid. zes for all standard DIP packages avail-le on .300, .400 and .600 centers. I. C. ckets meet EIA standard RS-415 and ature large lead-ins, side-wipe spring nper contacts with tin or gold plating, cket bodies of 94V-O glass-filled nylon h a .030" stand-off for reliable solder-g and cleaning. Large ramped lead-in simple assembly of I. C. package and d repairs. Available in 8, 14, 16, 22, 28 and 40 pin sizes. Eight page Uni-c® catalog available.



Uni-Pac® Miniature Relay Sockets For P.C. Board & Chassis Mounting. M-2100 Series.

Miniature relay sockets are U. L. listed for use with popular industrial relays. Models are available for .062 or .125 thick printed circuit boards and for chassis mounting with optional retaining spring clip. Rugged thermoset molded mica filled or general-purpose phenolic bodies with phospor bronze tin plated contacts. The Uni-Pac® relay sockets are also available with "omit ground lugs" for custom relay applications. Both, conventional wiring tails (.375 long) and printed circuit wiring tails (.235 long) are offered.

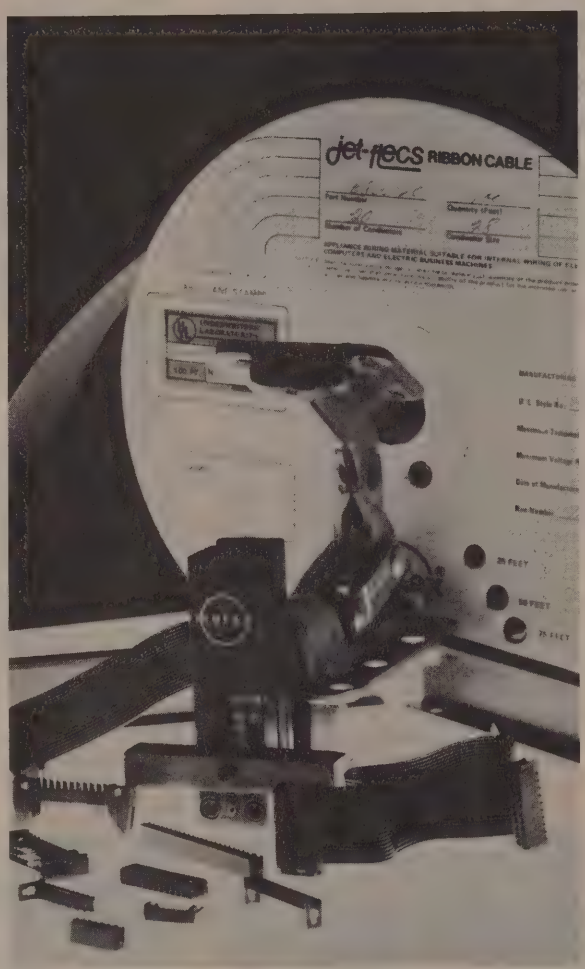


"Omny-Bus"® Bars & Systems Eliminate Many Cable & Wire Harness Problems

Individual units and complete custom systems available to accommodate your power, ground and signal distribution requirements. Our design and manufacturing capabilities have provided users with a wide variety of bus bar constructions from 1 to 21 layers, weighing from ½ ounce to 200 pounds, in lengths from 4 inches to 100 feet. Types include: printed circuit, solderless wrap, Lectro lam, jumper, flexible, and shielded configurations. "Omny-Bus"® tailor-made designs eliminate intermittencies, cross talk, stray EMI and assure uniform conductivity, insulation resistance, inductance, and capacitance. Our 15 year experience has developed a 44 page catalog to assist bus bar users.

New Insulation Displacement Ribbon Cable Systems
for .050", .100" and .156" center applications

molex®



The Complete Jet-Flecs™ Systems includes:

- Connectors
- Assemblies
- Headers
- Cable
- Application Tooling

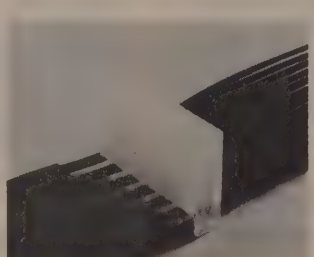
The 050 ribbon cables are available in #28 AWG Stranded (7/36) conductors. Ribbon cable design allows individual or groups of conductors to be separated from the cable through a "zipping" process. The cable is black or gray with a 1st circuit color marke

Molex ribbon cables are UL listed at 105° C and 300 V RMS. They are also FR-1 rated under UL Flammability Specifications.

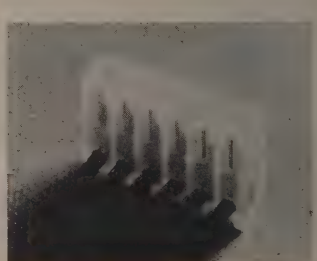
These ribbon cables are designed to mate with the Molex 4700 Connector System, recently designed straight and right angle Headers and compatible insulation displacement systems.

The .050 Jet-Flecs™ cable, header and connector system are available in 10, 14, 16, 20, 26, 34, 40, 50, 60 and 64 circuits. Connectors are available with strain relief, daisy chain and closed end covers.

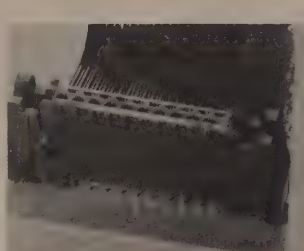
Application tooling for the Jet-Flecs™ .10 and .156 center cable and descrete wire connectors is available for mass termination applications.



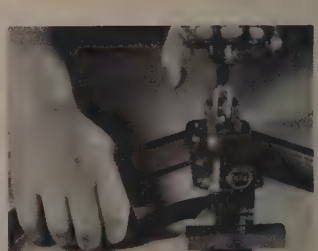
The .156" housing and cable assembly new insulation connector.



The versatile .156" housing will accept discrete and ribbon cable applications.



The new 6792 straight header.

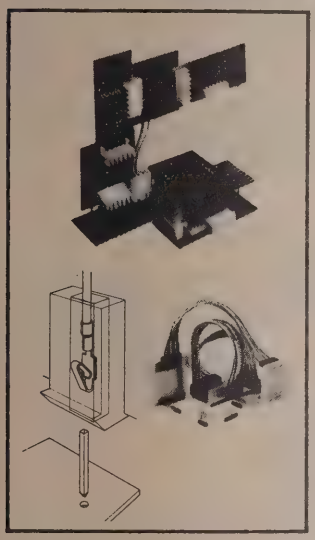


Application tooling is available for .050", .100" and .156" center systems from Molex.

Molex Incorporated, Dept. EEM74, 2222 Wellington Court, Lisle, Illinois 60532, (312) 969-455

Molex Value-Engineered Connectors

molex



KK-100 and KK-156 Interconnection Systems

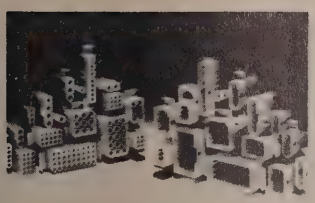
11 basic components handle all your printed circuit interconnection needs: cable-to-board; board-to-board, parallel; board-to-board, perpendicular; board-to-chassis; and power transistor connectors.

Cable-to-board connections: 2 to 24 circuits
Board-to-board connections: 2 to 18 circuits
Pin material: tin-plated brass; gold plating available upon request
Housing material: nylon 94VE-2 (SE-2 rated)

.025" and .045" rigid square wire pins—simple . . . low cost . . . reliable. 1/2" to 2" lengths permit connecting multiple boards to the same circuit.

KK system includes:

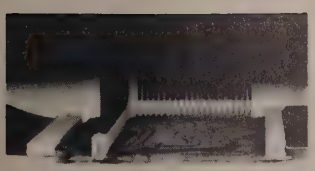
- Flat wafer connectors (round wire with nylon wafer).
- Crimp-type connectors with locking ramp.
- Nylon wafer connectors (round wire).
- Right-angle wafer connectors (square wire with nylon wafer).
- Friction-lock wafer connectors (round wire with nylon wafer).
- P.C. board connectors (right-angle, top, and bottom entry).
- Polarizing wafer connectors (round wire with nylon wafer).
- Crimp-type connectors (mates to square wire or round wire assembly).
- Crimp-type edge connectors (plain and with optional mounting ears)
- Power transistor sockets (.156" crimp-type and solder-tail; .100" crimp-type and solder-tail).



Molex .093"/.062" Multi-Pin Connectors

.093" connectors in 3, 6, 9, and 15 circuits
.062" connectors in 1 through 36 circuits

These famous Molex connectors are SE-2 rated nylon with integral shielding sleeves that isolate each terminal. A positive locking device prevents connectors from separating due to vibration. Integrally molded mounting ears provide fast snap-lock panel mounting without screws, brackets, etc. Connectors cannot be misconnected. Pin and socket terminals can be inserted for added polarity. Use Molex standard .093" dia crimp-type pin and socket. Hand, bench, and automatic assembly tools are available



Edgecon® Edge Connectors

Fast, reliable, and economical means for connecting circuits to the edges of .063" printed circuit boards. Bifurcated flat terminal contact makes excellent connection with board contact faces without damaging pads. Available with or without mounting flanges and in right angle or straight models for added design flexibility. Housings accept Molex 1797/1799 crimp terminals. Also, terminals can be supplied with selective or overall gold plating. Consult Molex for details.

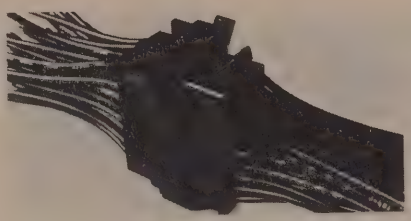
Wafercon® Printed Circuit Connectors

These .093" bead pin-type terminals are preassembled into nylon wafers to save time and labor during production, testing, and servicing. Assemblies are supplied ready for press fitting and soldering into place. Intermix of male and female terminals assures error-free connection and positive polarity. Wafercon connectors may be mated anywhere on the board—circuits do not have to be run to the edge. Use Molex standard .093" dia receptacles.

Molex Incorporated, Dept. EEM74, 2222 Wellington Court, Lisle, Illinois 60532

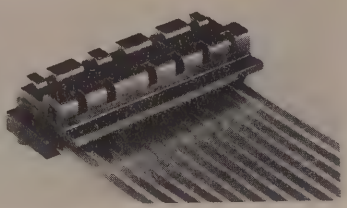
New Molex Value-Engineered Connectors

molex®



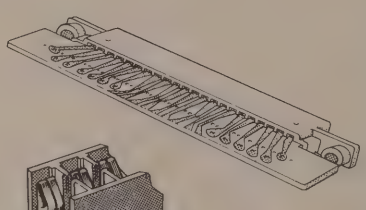
ZIFCON 4346 Zero Force Connector

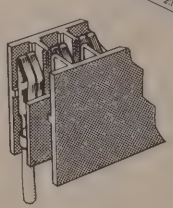
The design and operation of the 4346 ZIFCON zero insertion force connector is simple, economical and reliable. When the plug is mated with the receptacle, there is a gap between the terminals and no contact is made. As the actuating cams are closed, contact is made between the terminals and the two housings are positively locked together. The operation can be made with one hand. The connector comes in 16, 24 and 36 circuit sizes.



4850 FLAT CONDUCTOR Connector

The new Molex 4850 Flat Conductor connector is designed for cable or flexible etched circuits with a zero insertion/extraction force. The focal point of the connector is a unique two-piece design with a snap-on hinge cam, which allows numerous insertions and withdrawals without damaging expensive and fragile etched circuits. The 4850 is available in 5 through 25 circuit sizes.

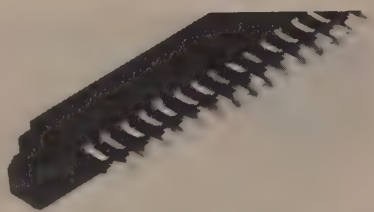




4338

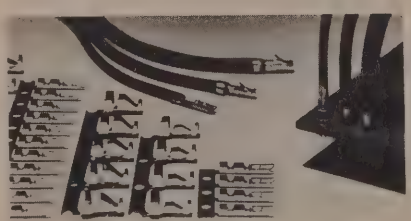
DUALCON™ Dual P.C. Board Edge Connector
4338 Series

Molex has introduced a new .156 crimp/snap-in dual read out edge connector for .062 P.C. cards. The crimp snap-in type contact allows greater production flexibility and at the same time reduces labor/assembly man-hours, because you use only the contacts you need. Th black polyester housing is dimensionally stable and requires no moun panel revisions to replace most of the currently available edge-connec of the solder loop or P.C./wire wrap type. The 5 AMP rated terminal are available with pre-tin gold over nickel, or selective gold plating an will accommodate 18-24, and 24-30 AWG. Crimp, solder loop, and s eyelet type terminals are available. Inter-contact and on-contact pola keys are optional. The connector housing is available with or withou mounting flanges in 6, 8, 10, 12, 15, 18, 22, 24, 25 and 28 dual row positions.



6511 DOUBLE-SIDED, P.C. Tail Edge Connector

With the 6511, Molex enters the P.C. tail double sided edge connector market. Terminals are phosphor bronze, selectively gold plated on .156" centers and .140" and .200" row to row spacing of P.C. tails. Housings are sturdy 30% glass filled polyester.



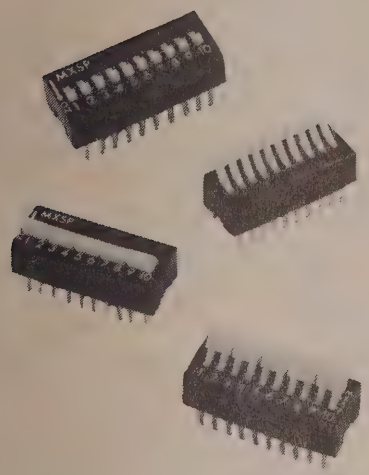
4811 STRAIN RELIEF Terminal

The recently developed 4811 series of strain relief terminals are used to secure wire leads to a printed circuit board prior to soldering. Thus, eliminating the need for pre-affixed eyelets or griplets on the printed circuit board. The terminal construction allows the actual wire lead to be soldered, and because the terminal fills the printed circuit board hole, solder voiding is minimized.

Molex Incorporated, Dept. EEM74, 2222 Wellington Court, Lisle, Illinois 60532, (312) 969-455

Molex Switch Products

The BOSS™ Switch 4130 series
Binary Option Selection Switch



BOSS™ Multi Position Dip Switches
4130 Series **2-10 circuits**

Molex has introduced a versatile DIP switch family developed for printed circuit board applications. The Boss (Binary Option Selection Switch) Switch Family consists of a unique SPST long actuator lever, SPDT or DPST model, and SPST low profile (.360" high) version. Every switch in the Boss Family offers a truly low cost method of programming functions into solid state equipment. Any electronic device requiring optional preset logic to achieve a varying result can use this type of product. Solder-tail leads on .100 x .300 centers let you mount the Boss through a DIP socket or directly to the P.C. board eliminating the cost of interconnection wiring to perform the switching function. Snap-on covers and rubber boots are available. The Boss is rated for 50 ma at 30 VDC; minimum contact resistance of 100 Milli-Ohms and tested to 5,000 actuations; and it programs a savings of up to 50%.

Molex Lighted Pushbutton Switches

MOLEX's 10400 SERIES REPLACEABLE LAMP LIGHTED PUSHBUTTON SWITCH

- Low cost
- In stock through our national distributor network
- 10400 rectangular bezel w/molded mounting ears
- 10410 rectangular bezel w/spring clip mounting
- 10420 square bezel w/spring clip mounting
- Neon lamp option

FEATURES

- SPST, SPDT, DPST or DPDT
- Replaceable bulb
- Square buttons molded in color
- Black bezel
- Snap mounting for panels
- 50,000 cycle minimum life
- Wide selection of legends
- Removable from front of panel (10410 and 10420 versions)
- U.L. rated
- 100 milliamp available
- 10.1 amp standard
- New 15 amp version
- Connector system option

Molex Incorporated, Dept.,EEM74, 2222 Wellington Court, Lisle, Illinois 60532, (312) 969-4550

mueller clips

a complete line of

ALLIGATOR TEST & BATTERY CLIPS

Mueller Electric Co. CLEVELAND, OHIO 44114

"60 SERIES" ALLIGATOR CLIPS

U.S. Patent No. 3,321,736

No. 60—CONVENTIONAL TYPE

New slim design with full-meshing teeth. Convenient, round thumb grip, barrel connection for banana plug. Equipped with small soldering lip. Strong spring with a hard bite. Cadmium plated. 2" long.

EACH NET..... $0.19 LOTS OF 10..... $0.14

No. 60-S—SCREW CONNECTION

Eliminates necessity for soldering. Otherwise same as No. 60.

EACH NET... $0.21 LOTS OF 10... $0.159

No. 60-NS—ALLIGATOR NEEDLE CLIP

Like No. 60-S, but with insulation piercing needle in one jaw. Screw connection. 2" long. 10 per box.

EACH NET..... $0.40 LOTS OF 10..... $0.30

No. 60-CS—COPPER ALLIGATOR CLIP

Solid copper version of No. 60-S. Screw connection. 2" long. 10 per box.

EACH NET..... $0.32 LOTS OF 10..... $0.24

No. 60PR-2—SPECIAL BARREL FOR TEST PROD OR PHONE TIP

Barrel crimped to provide friction fit on standard test prod or phone tip. Holds prod on test, frees hand for other work.

EACH NET..... $0.28 LOTS OF 10..... $0.21

No. 62 FLEXIBLE VINYL INSULATOR

Red and black insulators for Alligator Clips 60, 60-S, 60-CS, 60PR-2, 60-NS.

EACH NET..... $0.09 LOTS OF 10..... $0.071

No. 60-HS—STEEL ALLIGATOR CLIP WITH INSULATED HANDLE

Same as No. 60-S except equipped with red and black insulating sleeves on end. Very convenient for distinguishing leads. Has screw connection also. Cadmium plated. 2 1/32" long. Shipped half red, half black.

EACH NET..... $0.29 LOTS OF 10..... $0.218

No. 60-CHS—COPPER ALLIGATOR CLIP, INSULATED HANDLE

Solid copper version of No. 60-HS. Screw connection. Shipped with half red, half black insulating sleeves. 10 per box.

EACH NET..... $0.39 LOTS OF 10..... $0.295

"70 SERIES" ALLIGATOR CLIPS

U.S. Patent No. 2,762,028

Features simplified design, fast connection of wire with cord strain relief ears, patented hinge construction and lower cost.

No. 70—FOR SOLDERED CONNECTION

Steel, cadmium plated. 1 1/4" long.

EACH NET..... $0.15 LOTS OF 10..... $0.113

No. 70-S—SCREW CONNECTION

Otherwise same as No. 70.

EACH NET..... $0.18 LOTS OF 10..... $0.133

No. 70-CS—COPPER SCREW CONNECTION

Solid copper version of No. 70-S.

EACH NET..... $0.29 LOTS OF 10..... $0.216

No. 72— SKIN-TIGHT INSULATOR FOR 70 SERIES ALLIGATOR CLIPS!

For the first time complete, skin-tight, one-piece insulation for a standard size Alligator Clip! Covers entire clip right down to nose. Special tip slot permits full jaw opening without exposing teeth.

EACH NET..... $0.09 LOTS OF 10..... $0.071

MICRO-GATOR CLIP

(Smallest Insulated Clip Ever Made)

U.S. Patent No. 2,762,028 Trademark Reg.

Micro-Gator

Micro-Gator with Insulator

The alligator clip with the microscopic tip! This is the alligator clip you now can use where no other clip will do . . . on printed circuits, in tight spots and on tiny terminals too crowded for anything but its microscopic tip. Including separate skin-tight insulator the tip is no bigger than the head of a pin! Yet the Micro-gator has ample thumb grip, and plenty of bite to stand up straight on the smallest terminals. Ample 7/32" jaw spread. 1 3/32" long. Solder connection. Skin-tight flexible vinyl insulator (sold separately) has "lip-action" tip slot so that jaws stay covered whether open or closed.

No. 34 (Steel, cadmium plated)

EACH NET..... $0.12 LOTS OF 10..... $0.091

No. 34-C (Solid Copper)

EACH NET..... $0.15 LOTS OF 10..... $0.112

No. 36 (Insulator for Nos. 34 and 34-C)

EACH NET..... $0.08 LOTS OF 10..... $0.06

MINI-GATOR CLIP

U.S. Patent No. 3,321,736

Trademark Reg.

Mini-gator

Mini-gator with Insulator

Indispensable for testing or incorporation into miniaturized equipment. New design features rivet hinge for greater strength, full-meshing teeth to grip finest wires. Skin-tight flexible Vinyl insulator (sold separately) covers completely — has slotted "lip action" tip. Clip weighs 1/20th oz., has tiny 1 1/64" O.D. nose, but ample 3/16" jaw spread 1 3/32" long. Crimping ears. Solder connection. Surprisingly strong bite penetrates corrosion and coatings.

No. 30 (Steel, cadmium plated)

EACH NET..... $0.15 LOTS OF 10..... $0.115

No. 30-C (Solid Copper)

EACH NET..... $0.18 LOTS OF 10..... $0.135

No. 32 (Insulator for Nos. 30 and 30-C)

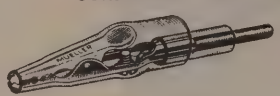
EACH NET..... $0.08 LOTS OF 10..... $0.06

COMPLETELY INSULATED ALLIGATOR CLIPS

Patent Pending

No. 63 or 63-C Clip

Sold only as a unit, with factory-applied insulators.



Completely insulated right down to the nose. Flexible 2-piece skin-type vinyl insulator of high dielectric strength, with "lip action" slotted tip that permits opening of clip without exposing metal. Insulator nose is only 13/64" O.D. The tight fitting sheath preserves all the slimness of the Alligator Clip, still giving complete protection against shorts in even the tightest spots. Screw connection easily made by slipping insulator forward. 2 1/8" long.

No. 63—INSULATED ALLIGATOR CLIP (STEEL)

Composed of Mueller No. 60-S Alligator Clip steel, cadmium plated, screw connection, complete with 2-piece vinyl insulator. Shipped half with red insulators, half black. 10 per box.

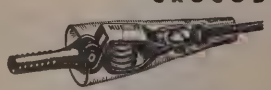
EACH NET..... $0.42 LOTS OF 10..... $0.317

No. 63-C—INSULATED ALLIGATOR CLIP (COPPER)

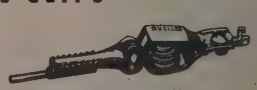
Composed of Mueller No. 60-CS Alligator Clip, solid copper, screw connection. Shipped half with red insulators, half black. 10 per box.

EACH NET..... $0.48 LOTS OF 10..... $0.36

CROCODILE CLIPS



No. 85 or 85-C Clip with No. 87 Insulator



No. 85-T Clip

No. 85—A very small clip with slender, elongated jaws for getting into tight places in radio or electrical test work. Screw connection. 2 1/8" long.

EACH NET..... $0.20 LOTS OF 10..... $0.152

No. 85-C—Same as No. 85,, except solid copper with phosphor bronze spring, brass screw. A radio frequency, entirely non-ferrous test clip. 10 per box.

EACH NET..... $0.40 LOTS OF 10..... $0.30

No. 85-T—Crocodile "Tip-Clip"—equipped with standard phone tip on one jaw, otherwise same as No. 85. Ideal for use as a prod, for ordinary clip connections and for connections to insulated binding posts having non-removale heads. 2 5/8" long. 10 per box.

EACH NET..... $0.54 LOTS OF 10..... $0.402

Use No. 87 Insulators for clips 85, 85-C and 85-T. Red and Black. Cover entire clip except nose. Protect against short and shock. Help to distinguish leads.

mueller clips

a complete line of

ALLIGATOR TEST & BATTERY CLIPS

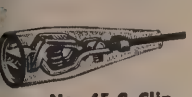
Mueller Electric Co. CLEVELAND, OHIO 44114

TEST CLIPS

No. 45 PEE WEE

A very small test clip for radio, ignition, meter and similar work. 1⅛" long. Jaw spread 5/16". Steel, cadmium plated.

EACH NET..... $0.18 LOTS OF 10..... $0.133



No. 45-C Clip
No. 47 Insulator

No. 45-C
Solid Copper R.F. Test Clip

Solid copper radio frequency test clip. Phosphor bronze spring, brass screw. Will not heat up in high frequency test work, entirely non-ferrous. 1⅛" long. 10 per box.

EACH NET..... $0.31 LOTS OF 10..... $0.235

Use No. 47 Insulator for clips 45 and 45-C.

No. 48-B

A small test and battery clip for radio use and general testing purposes. 2" long. Jaw spread ½". Steel, cadmium plated. 10 per box.

EACH NET..... $0.26 LOTS OF 10..... $0.198

No. 48C—Solid Copper. Same size as 48-B.

EACH NET..... $0.35 LOTS OF 10..... $0.265

No. 50-C Needle Clip

Solid copper. Needle pierces insulation of wire for quick test contact. 2¼" long. 10 per box.

EACH NET.... $0.56 LOTS OF 10 ....0.42

No. 51-C—Large crocodile clip. Same as 50-C but without needle. 10 per box.

EACH NET....$0.40 LOTS OF 10.....$0.30

Use No. 49 insulator for Clips 48-B, 48-C, 50-C and 51-C.

No. 27

A high grade test clip with meshing teeth on three sides of jaws. For laboratory and shop test work 2 7/16" long. Jaw spread 5/8". Steel, cadmium plated. 10 per box.

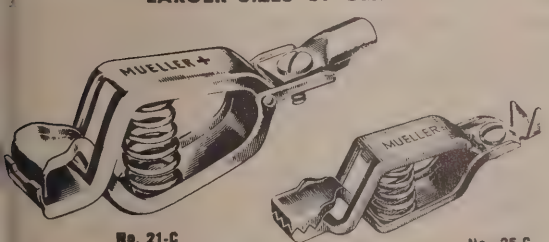
EACH NET..... $0.32 LOTS OF 10..... $0.243

No. 27-C—Solid copper. Same size as No. 27. 10 per box.

EACH NET..... $0.50 LOTS OF 10..... $0.375

Use No. 29 Insulator for clips 27 and 27-C.

LARGER SIZES OF CLIPS



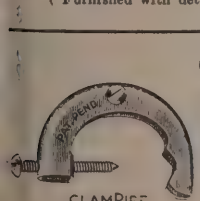
No. 21-C

No. 25-C

All packed 10 per box.

		Each Net	Lots of 10
No. 24-A	— 25 Amp. Steel, lead plated, 2⅜" long	$0.51	$0.38
No. 25	— 40 Amp. Steel, cadmium plated, 3" long	.46	.343
No. 25-C	— 75 Amp. Solid Copper, 3" long	.85	.64
No. 21-A	— 50 Amp. Steel, lead plated, 4" long	.93	.70
No. 21-C*	—100 Amp. Solid Copper, 4½" long	2.06	1.54
No. 11-A*	—100 Amp. Steel, lead plated, 6" long	2.44	1.83
No. 11-C*	—200 Amp. Solid Copper, 6" long	3.97	2.98
No. 33-C*	—300 Amp. Solid Copper, 7¾" long	7.25	5.45

(*Furnished with detachable lug connection for easy securing to large cables.)



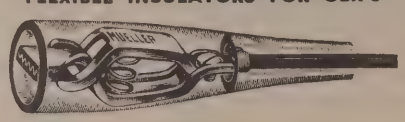
CLAMPIPE
No. 58

GROUND CLAMP

The ClamPipe will not spread, bend or lop over when applied. Point of large screw bites through corrosion into clean metal to insure good contact. Applicable to pipe ⅜" to 1⅜" O.D. The best ground clamp on the market!

EACH NET..... $0.56 LOTS OF 10.....$0.42

FLEXIBLE INSULATORS FOR CLIPS



A convenient protection against short circuit and electric shock. Colors help to distinguish leads. Packed half red and half black to indicate polarity. Long tail prevents breakage of wire. Constructed so that clip is held in firmly. NOW AVAILABLE also in blue, white, yellow and green at 10% above regular price are insulators marked * below.

Insulator No.	For Use with Clip No.	Each Net	Lots of 10
13*	11-A, 11-C	$1.43	$1.07
23*	21-A, 21-C	.71	.53
26*	24-A, 25, 25-C	.49	.366
29*	27, 27-C	.32	.24
32*	30, 30-C	.08	.06
35	33-C	3.99	2.99
36*	34, 34-C	.08	.06
47*	45, 45-C	.14	.106
49*	48-B, 48-C, 50-C, 51-C	.25	.187
62*	60, 60-S, 60-CS, 60PR-2, 60-NS (also 70 Series)	.09	.071
72*	70, 70-S, 70-CS	.09	.071
87*	85, 85-C, 85-T	.13	.095

*Also available in blue, white, yellow and green.

MUELLER *QUALITY* BATTERY BOOSTER CABLES

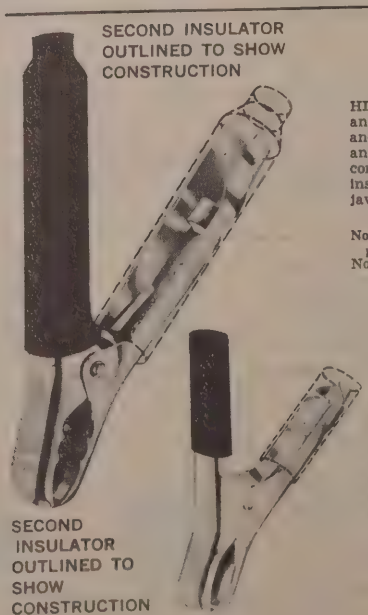
Highest quality cables, equipped with famous Hippo-Clips, for boosting "dead" 6 or 12-volt vehicle batteries with an external battery. Cables are pure copper, finely stranded for high flexibility and covered with rubber insulation which stays flexible in the coldest weather and resists oil, grease and acid. 413 strands of No. 30 wire in the 4-gauge cable and 259 strands of No. 30 wire in the 6-gauge cable. The many fine features of the Hippo-Clips alone are listed elsewhere on this page. The clips are both soldered to the cable and clinched around the cable insulation by means of clinching ears.

Packaged: pair of cables with clips in a bright, attractive display carton. Standard shipping container 10 cartons.

No. 8A6—8 ft., 6-gauge, with No. 41A Hippo-Clips (Steel, bright copper plated)
NET PRICE PER PAIR..... $12.60

No. 12A6—12 ft., 6-gauge, with No. 41A Hippo-Clips (Steel, bright copper plated)
NET PRICE PER PAIR..... $16.20

No. 12C4—12 ft., 4-gauge, with No. 41C Hippo-Clips (Solid Copper)
NET PRICE PER PAIR..... $26.40



HIPPO-CLIP

HIPPO-CLIP—For battery booster cables and fast chargers. Proved higher quality and superior design. Built-in solder strap and clinching ears for fast, sure cable connection. Supplied with vinyl handle insulators in red or black. Full 1-9/16" jaw spread. 6" long.

Net price ea.

No. 41-A Steel, bright copper plated, 100 amp. $1.05
No. 41-C Solid Copper, 200 amp. ... 2.61

PIGMY HIPPO-CLIP

PIGMY HIPPO-CLIP—A new small plier clip for battery operated equipment and automotive test. Flat, wide handle allows positive grip. Won't "squirt away". Built-in solder strap and wire clinching ears. Supplied with vinyl handle insulators in red or black. Ample 1⅛" jaw spread. 3" long.

Net price ea.

No. 46-A Steel, bright copper plated, 50 amp. $0.34
No. 46-C Solid Copper, 75 amp. ..... .53

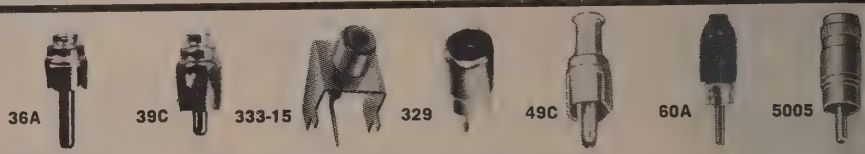
NATIONAL TEL-TRONICS

DEPT. EM, STATE ROAD HILL, MEADVILLE, PA. 16325
A division of Electro Audio Dynamics, Inc. (814) 724-6440

For all your connector and component needs, there is no larger or more reliable source than National Tel-Tronics. Having produced parts for over twenty-five years for all the major OEM equipment manufacturers, National Tel-Tronics has a vast background of component and connector experience on which to draw. Complete tool shop, stamping facilities and in house production capability enable us to have the flexibility to rapidly produce a vast range of electronic connectors and components, either standard or to the customer's specific requirements. Many of our standard parts are listed here. If you don't see your specific requirement, contact our company for a fast and reliable quotation.

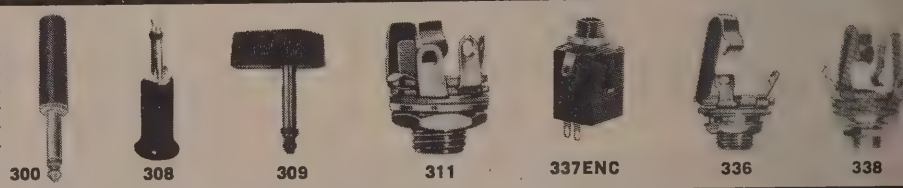
PHONO PLUGS AND JACK PLUGS

Choose from the largest selection of plugs; solder, all-crimp, shielded, short and long shell, handled and insulated versions. Also offering the largest selection of single and multiple phono jacks for chassis, panel and P.C. mounting.



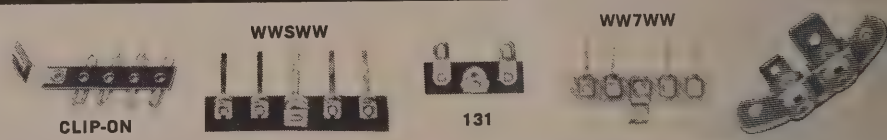
PHONE PLUGS AND JACKS

All standard 2 and 3 circuit jacks and plugs including stereo circuit types are stock items. Ultra-miniature, miniature and standard size jacks are available in both enclosed and standard wafer types. Phone Plugs include both screw and solder type and are available in military versions per MIL-P-642.



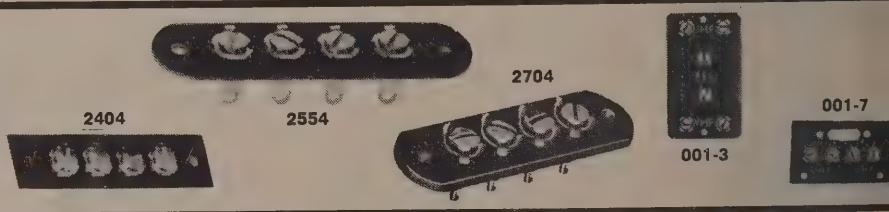
TERMINAL STRIPS

Thousands of configurations available in XP phenolic or UL approved flame retardant materials. ⅜" or ½" spacing is standard. Solder-type, wrap-around, quick disconnect. miniature and sub-miniature types are all standard.



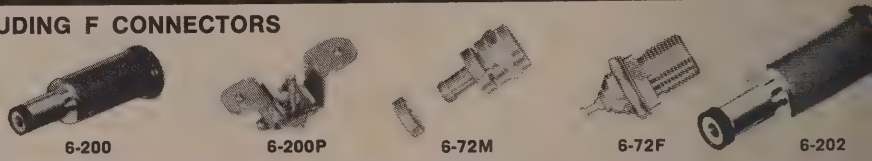
BINDING POST BOARDS

6-32 screw type binding post boards manufactured to standard and custom configurations. Standards include 1 through 12 lug positions in 7/16" or ½" spacing. Heavy-duty ⅛" boards and heavy-duty binding post lugs also available. Can be manufactured to custom configurations with silk-screening, hot stamping, fungus resistant finishes and other special requirements.



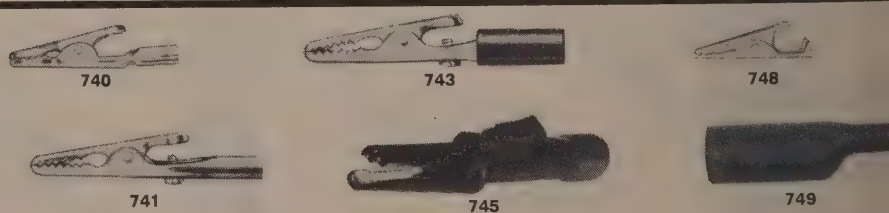
COAXIAL PLUG AND JACKS, INCLUDING F CONNECTORS

Standard coaxial connectors for battery chargers, AC adapters, calculators, etc. Available in .218 and .195 O.D.'s. Male mating plugs also available. F connectors available in both male and female versions for RG cable. Also have solderless type for RG 58 and 59 versions and PL-259 variations.



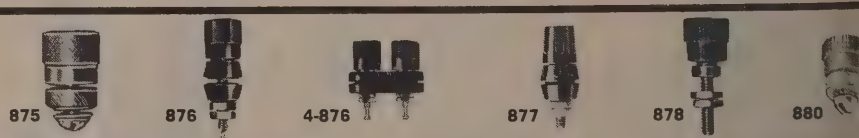
ALLIGATOR CLIPS

Available in both standard high-grade plated steel and in copper construction for extra low resistance. Standard type have ⅜" jaw opening and will accept banana plug in the rear. Both screw and solder versions are standard. Also available in insulated handle versions and in screw and solder types, tip plug adapters, miniature versions for space saving applications and vinyl insulators in six colors for both the standard and the miniature versions.



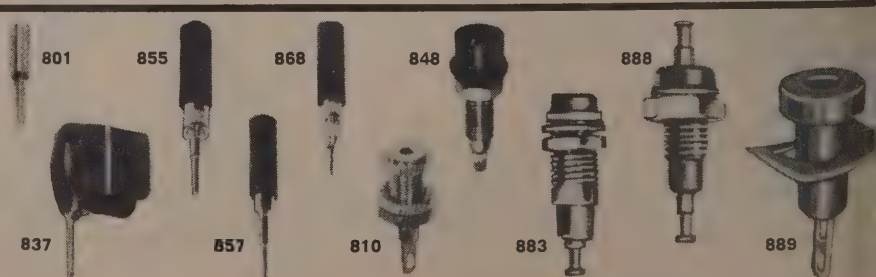
4 AND 5 WAY BINDING POSTS

All metal and insulated molded posts are standard items. Available in nickle and gold plating in both 10-32 and 8-32 threads. Dual binding posts in red or black combinations and ¾" spring also standard.



TIP PLUGS AND JACKS

.080 tip plugs are available in a full selection of both solder and solderless types, insulated and non-insulated, including the needle tip and chuck versions. Fully insulated push button meter type plug is also standard for rapid assembly. Molded handles in 1", 4" and 5½" lengths, both threaded and force fit are standard for creating insulated plugs or test probes. Tip jacks are available in insulated and non-insulated types in a variety of colors. Molded nylon tip jacks with metal shell or all nylon shells are also available, including a speed clip type for inexpensive and rapid assembly.



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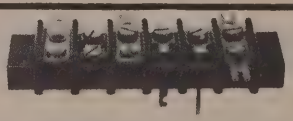
ntt

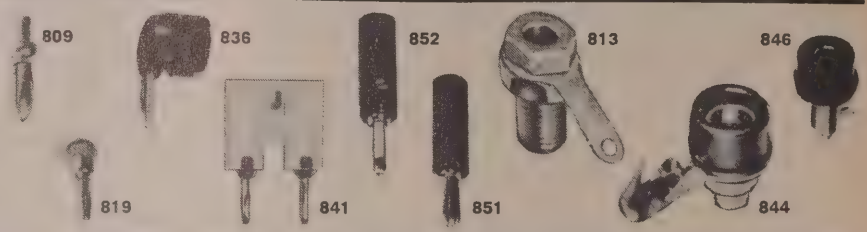
BARRIER BLOCKS

A complete line of high quality, double row, barrier blocks are available in 3/8" and 7/16" pitch spacing with a variety of terminations to meet your needs. Both eyelet and screw type terminations are available. Eleven terminal variations, 2 block styles and 20 lead positions offer a choice of over 400 standard configurations.



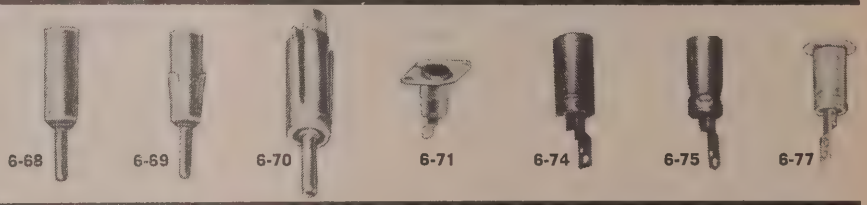
BANANA PLUGS AND JACKS

A full variety of standard and miniature banana plugs with nickle-plated brass bodies and phosphor bronze springs are standard, including side screw and top hex stud mounting version. Insulated handles are available for all plugs. Insulated push-button meter type plug is also standard. Included in the standard line are stacking banana plugs in both single and dual fully molded versions. Banana jacks are available in insulated and non-insulated types in a variety of colors.



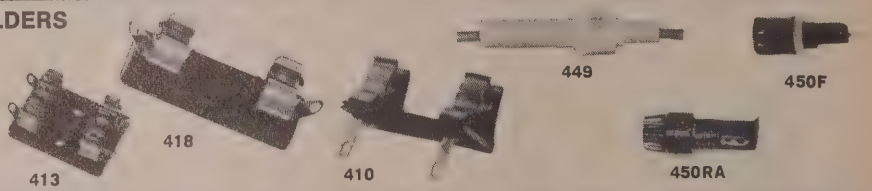
ANTENNA PLUGS AND JACKS

National Tel-Tronics is a prime supplier to the major automotive car radio manufacturers as well as to CATV-MATV industry. All standard antenna plugs and jacks are available. The standard 4 prong Motorola type plug as well as less expensive 2 and 3 prong plugs are manufactured to exacting standards. A great variation in shell and contact design in the antenna jacks is available from our inventory.



FUSE MOUNTING BASES AND HOLDERS

Designed for 3AG type fuses, fuse mounting bases are available in a variety of materials from 1/16" to 1/8" XP phenolic and UL rated FR materials, in both single and multiple configurations. Panel mount fuse holders for 3AG short type fuses are available in both straight and space-saving right-angle configurations with ribbed and fluted caps. The panel mounted fuse holder parts are CSA and UL approved.

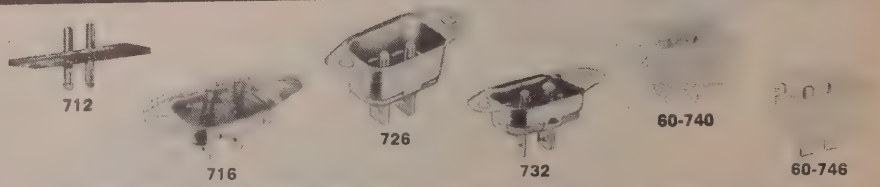


ANODE AND HIGH VOLTAGE CONNECTORS

Anode connectors to 40 KV rating for BW and color television, and oscilloscopes, are available in a variety of configurations. Spring clips and solderless stainless-steel clips assure continuity. Anode cups are standard in neoprene rubber, flame retardant grade PVC or silicone rubber variations in sizes of 1½", 1¾" and 3". Anode connectors are UL approved.

INTERLOCK RECEPTACLES

Both flush and bathtub type receptacles for AC connections are standard in a variety of materials from XP phenolic through UL approved flame retardant materials. Solder type, polarized and quick disconnect type pins are standard. Molded snap-in types are also available in flame retardant materials. All the interlocks are approved by Underwriter's Laboratories and Canadian Standard Assn.



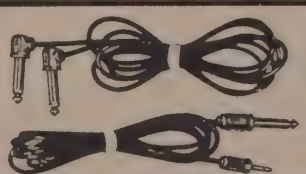
MOLDED AND COMPRESSION TERMINAL BLOCKS

A variety of molded terminal blocks in flexible PVC are available as standard items. Screw type connections, screw driver slot, and .250 quick disconnect connections are standard. Standard size blocks are in a 12 position configuration but can be cut to smaller size if desired.

Two types of compression type boards are available from stock. Series 927 features push-button multi-covered terminals which are mounted on phenolic or FR type boards. Available in six different colors in single or multi-roll configurations.

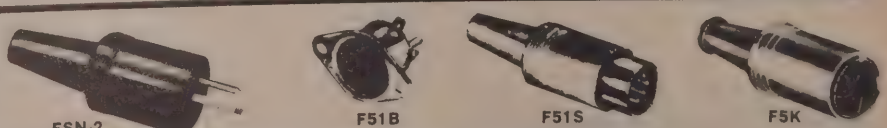
MOLDED CABLE AND HARNESS ASSEMBLIES

A complete molding facility allows great flexibility in providing the audio and electronics industry with a variety of molded cable assemblies. Standard molds includes phone plugs and jacks in 2 and 3 conductor configurations, phono plugs and jacks, miniature phono plugs and miniature jacks, mike connectors, ultra-miniature plugs, coaxial connectors and various adapters. Coaxial and zip cord cables are readily available as well as those for more special applications. Custom assemblies include molds designed to customer specifications and also include capability of amp and molex crimp type assemblies, wire harnesses and multiple conductor assemblies.



DIN CONNECTORS

DIN European style "Europlugs" are available in 2, 3, three and five contact arrangements in both male and female versions. In-line and panel mounted types are standard in both flush and extended barrel configurations.



This listing will give you some indication of the capabilities of National Tel-Tronics.
For more details and specifications, send for our complete catalog.

THE MC² TM FROM PYLE GIVES YOU MORE DESIGN

CONNECTOR FEATURES

The all new Pyle-National **MC² thermoplastic connector** line features **precision molded plug with oil resistant seal, receptacle, coupling mechanism, and modular contact carriers** which when combined form the most versatile circular multi-pin system now available on the market.

The shells are molded in a high dielectric **glass filled thermoplastic,** exhibiting **high impact strength, excellent thermal characteristics, low moisture absorption, excellent aging properties,** and **high mechanical attributes.**

The **key to the versatility** is the **insertable modular contact carrier or module,** which snaps simply into the shell cavity.

A **series of modules,** which are available in a choice of contact sizes and contact arrangements, builds the desired circuit. With this locking system **tools are not required for module insertion** in any cell position. Additional contact density is provided with the fixed size 16 contact cavities spaced in the shell body.

The receptacle shells contain **5 keyways** with a master key way being wider than the slave keyways. The same is true in reverse on the plug shell which contains protruding keys that mate with the keyways in the receptacle.

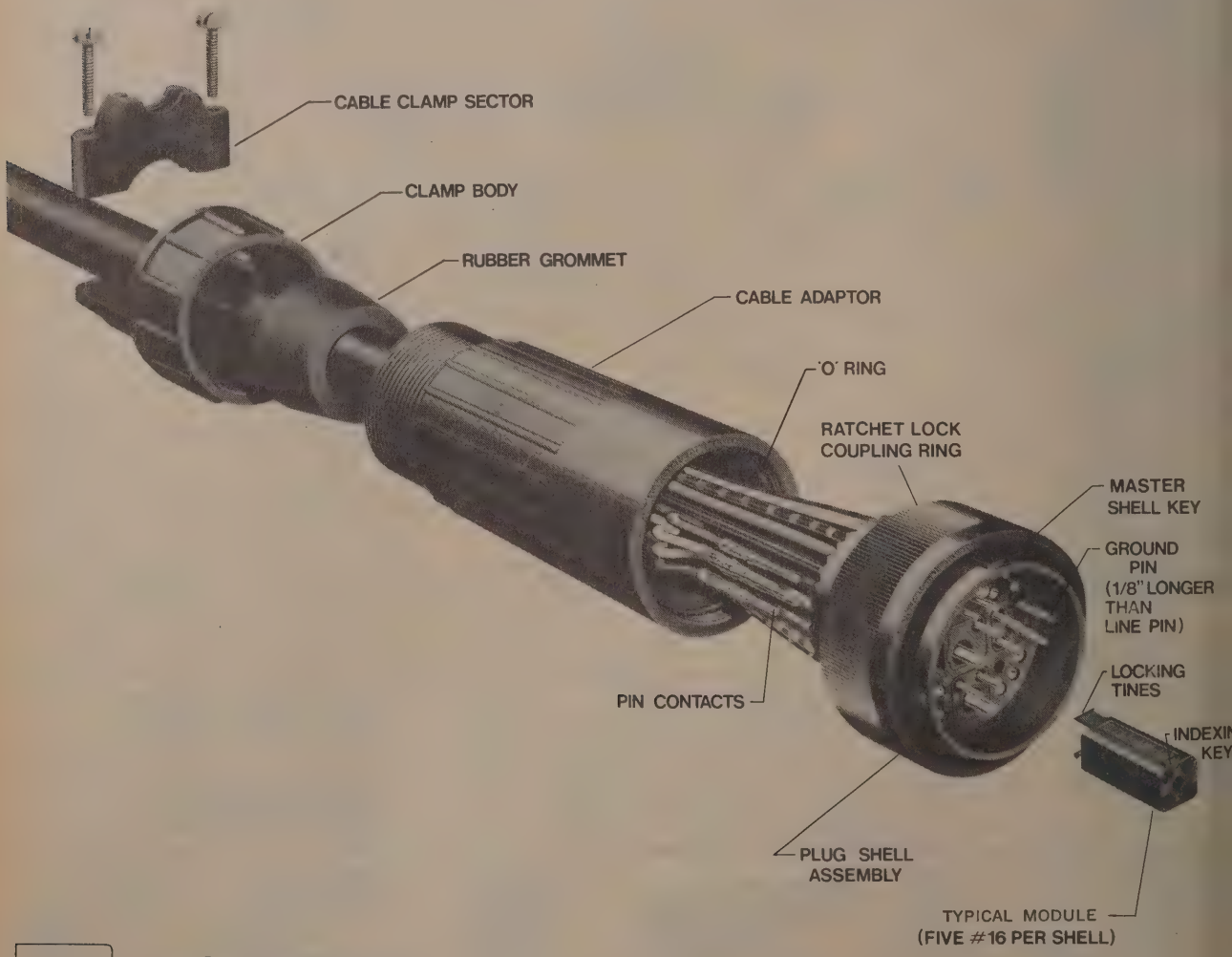
Shells are available in sizes 20, 24, 28, and 32. The square flange receptacle can be mounted in MIL-C-5015 cutouts for the same shell size.

Quick connect/disconnect is achieved with a double lead acme type coupling thread system with mating accomplished in 2¾ turns.

Built-in non-decoupling of the plug shell from the receptacle is achieved with a unique integrally molded ramp and follower mechanism, which prevents rotation of the coupling nut under vibration.

Alternate keying is accomplished with keying plugs strategically located in size 16 cavities.

Fixed contact positions and modules will accommodate either pin or socket contact. **Pin and socket contacts can be mixed in the plug or receptacle shell cavity.**



pyle-national company
A Division of Brand-Rex Company
1334 NORTH KOSTNER AVENUE, CHICAGO, IL 60651 / (312) 342-6300

FLEXIBILITY THAN ANY CONNECTOR IN HISTORY

CONTACT FEATURES*

A wide choice of contacts in pin, ground pin and socket are available.

Size 16 contacts accommodate #18, #16, and #14 AWG
Size 12 contacts accommodate #14, and #12 AWG
Size 10 contacts accommodate #12, and #10 AWG
Size 08 contacts accommodate #10, and #8 AWG

Size 16 contacts are stamped and formed from high conductivity phosphor bronze strip, grain oriented stock, and plated with a nickel-tin alloy.

Size 16 contacts employ a unique socket arrangement wherein an internal pencil clip spring provides the engagement restriction and is protected from abuse by an integral hood.

Sizes 12, 10, and 8 contacts are precision machined from leaded commercial bronze bar stock, and are electro-plated tin. The socket contacts being of the split tine design are shrouded with a multi-tang hood subassembly.

Contacts are designed for crimp tool wire termination, and are provided with a spring system for positive retention in the cavity and easy removal with the appropriate removal tool.

Other contact platings, such as gold, are available on request.

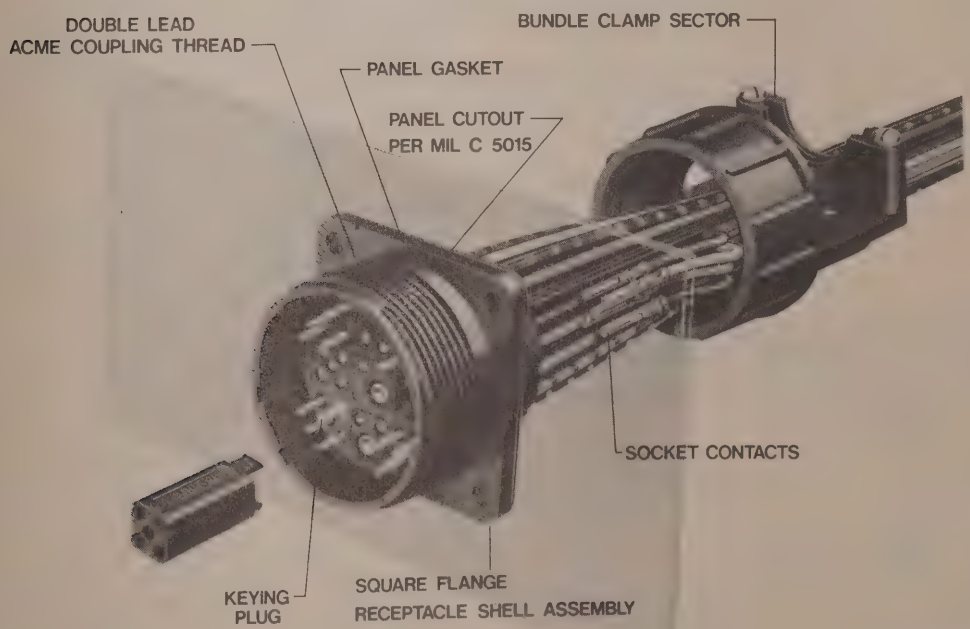
*Consult factory for information regarding:

A) 20-24 AWG Terminations
B) Rectangular arrangements of MC² Modules
C) Gold Plated Contacts

OPTIONAL ACCESSORIES

An extended range **cable clamp** complete with three clamp halves in each of the four shell sizes is available.

A **cable adapter** with tapered grommet seal and plug to receptacle shell seal for environmental applications is available. Includes choice of gland nut or cable clamp.



pyle-national company
A Division of Brand-Rex Company
1334 NORTH KOSTNER AVENUE
CHICAGO, IL 60651 / (312) 342-6300

MC² PERFORMANCE SPECIFICATIONS

test description	MC² capability
Magnetic Permeability	Less than 2.0
Thermal Shock	−55°C to +105°C.

Contact Retention

Contact Size	Min. Axial Load (Lbs.)
16	25
12	25
10	35
08	40

Contact Insertion & Removal Forces

Contact Size	Max. Force for Insertion & Removal (Lbs.)
16	5
12	8
10	10
08	10

Insert Retention (Module) 25 Lbs. Min.

Dielectric Withstanding Voltages

Service Rating	Test Voltage AC (rms) Sea Level
A	2000
D	2800

Insulation Resistance — Room Temp. (25°C), 10,000 Megohms Minimum.

Durability — 200 Cycles of mate and unmate with coupling ring in place results in no damage.

Vibration — Complies with (MIL-STD-202, Method 204, Test Condition B).

Shock — 50G, ½ sine wave, 11 milli-second duration — one shock in each of 3 mutually perpendicular axis.

Moisture Resistance — Maintain Minimum (I.R.) Insulation Resistance of 280 Megohms at 25°C — Using MIL-STD-1344, Method 1002, Condition II, 10 days.

Contact Resistance

Contact Size	Wire Size	Test Current (AMP)	Voltage Drop (Milli Volts)
16	16	13	60
12	12	23	35
10	10	33	40
08	8	46	25

test description	MC² capability

Crimp Tensile Strength

Contact Size	Wire Size	Min. Tensile (Lbs.)
16	18	40
	16	50
	14	65
12	14	70
	12	95
10	12	95
	10	110
08	10	110
	8	125

Contact Engagement & Separation Forces

Contact Size	Min. Separation With Min. Dia. Pin (Oz.)	Max. Avg. Engagement With Max. Dia. Pin (Oz.)
16	2	20
12	3	25
10	4	50
08	5	80

External Bending Moment (Mated Pair) Flange Receptacle — Straight Plug

Shell Size	Bending Momen (Inch Lbs.)
20	300
24	380
28	420
32	500

Cable Pull-Out

Cable Max.	Seal Range Min.	Pull-Out Force (Lbs.)
.387	.515	50
.512	.614	50
.575	.738	50
.700	.926	75
.926	1.200	75
1.200	1.363	75

Corrosion (Complete Connectors & Contacts) — No exposure of base metal after tes in Salt spray for 48 hours.

Maintenance Aging — No damage after 10 insertion and extractions of contacts.

Humidity — 95% R.H. @ 71°C for 14 Days

Rating	Test Voltage (Volts-rms)
A	750
D	1350

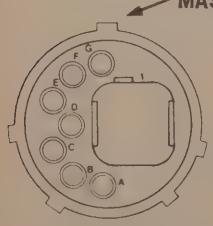
Fluid Immersion
A. Hydraulic Fluid (MIL-H-5606)
B. Lubricating Oil (MIL-L-7808)

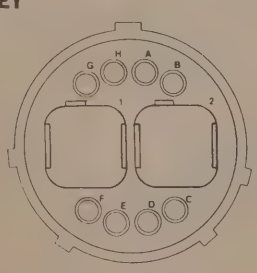
Connectors mate properly after 2 hours in each fluid.

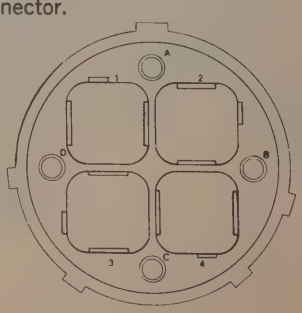
MC SHELL/INSERT AVAILABILITY*

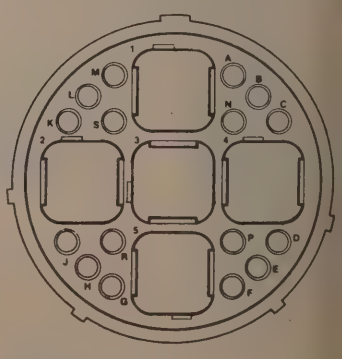
Cavity identification shown is typical for front face of plug connector.

MASTER KEY









◯ Size 16 Fixed Cavities.

Shell Size — 20
Modules — 1
Contacts — 7—#16's
Service Voltage Rating — A

Shell Size — 24
Modules — 2
Contacts — 8—#16's
Service Voltage Rating — A

Shell Size — 28
Modules — 4
Contacts — 4—#16's
Service Voltage Rating — D

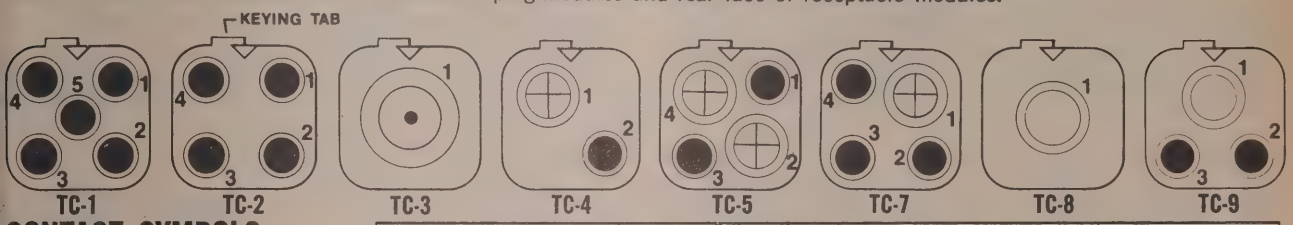
Shell Size — 32
Modules — 5
Contacts — 16—#16's
Service Voltage Rating — A

*Consult factory for rectangular shells for MC² modules.

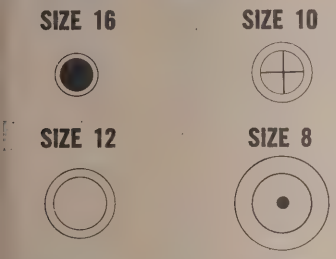
MC2 TM

MODULE SELECTION GUIDE

Module identification shown is for front face of plug modules and rear face of receptacle modules.



CONTACT SYMBOLS



Module Part Number		Cavity		Service Voltage Rating
Plug	Receptacle	Quantity	Size	
TC-1P	TC-1R	5	#16	A
TC-2P	TC-2R	4	#16	D
TC-3P	TC-3R	1	# 8	D
TC-4P	TC-4R	1 1	#16 #12	D
TC-5P	TC-5R	2 2	#16 #12	A
TC-7P	TC-7R	3 1	#16 #12	A
TC-8P	TC-8R	1	#10	D
TC-9P	TC-9R	2 1	#16 #10	A

CONTACT SPECIFICATIONS

MS AMPERE RATINGS

Based on the combination of the following:

The amount of current which an individual pin and socket contact may carry is a function of contact material and design efficiency of the pin and socket system as well as the ability of the primary conductor insulation to resist temperature rises due to inherent copper losses and bundling factors.

Total current carrying capacity of the connector is a function of the insert temperature which is rated at 225°F for continuous operation. The total operating temperature is the summation of the ambient temperature plus the heat rise resulting from the thermal losses of each contact.

MIL-W-5088 specifications may be used as a general reference on the subject inasmuch as pertinent cable derating data is included.

CONTACT RATINGS

Wire Size (AWG)	Contact Size	Non-Circuit Breaking Ampere Ratings	
		MS	N.E.C.**
18 16 14	16	22	16
14 12	12	41	30
12 10	10	55	40
10 8	08	73	50

**Based on Temperature rise (National Electrical Code Requirement).

N.E.C. NON-CIRCUIT-BREAKING OR DISCONNECT AMPERE RATINGS

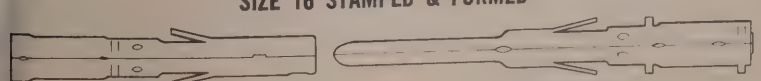
The non-interrupting current ratings, shown in the table, are based on the temperature of the contacts being within the range specified by Underwriter's Laboratories, Inc. when wire sizes are selected in accordance with the National Electrical Code.

When multiple conductors are used, the current carrying capacity depends upon various factors such as:

1. Size and number of wires.
2. Temperature rating of wires.
3. Duty Cycle.
4. Ambient temperature.

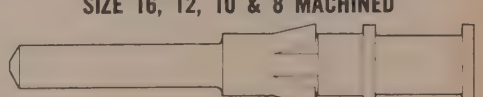
Proper care must be taken to make sure that all the derating factors are considered in arriving at the total ampere capacity of the connector.

SIZE 16 STAMPED & FORMED



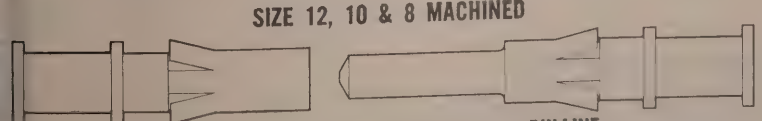
SOCKET PIN-LINE

SIZE 16, 12, 10 & 8 MACHINED



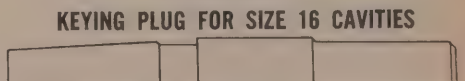
GROUND-PIN

SIZE 12, 10 & 8 MACHINED



SOCKET PIN-LINE

KEYING PLUG FOR SIZE 16 CAVITIES



TC-4016-59R

Contact Size	Type	Pin-Line Part No.	Ground-Pin Part No.	Socket Part No.	Wire Accommodation
16	Stamped & Formed	TC-16PBS	—	TC-16SBS	#18, #16, #14 AWG
16	Machined	—	TC-16GDM	—	#18, #16, #14 AWG
12	Machined	TC-12PDM	TC-12GDM	TC-12SDM	#14, #12 AWG
10	Machined	TC-10PDM	TC-10GDM	TC-10SDM	#12, #10 AWG
08	Machined	TC- 8PDM	TC- 8GDM	TC- 8SDM	#10, #8 AWG

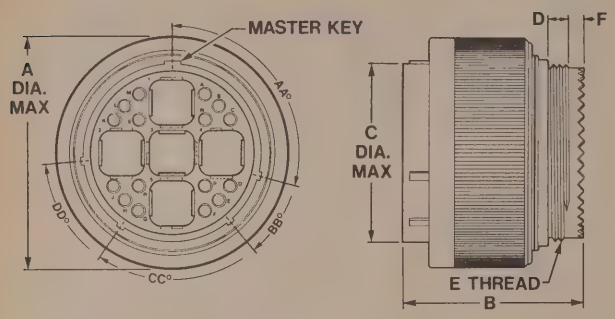
**Based on temperature rise (National Electrical Code Requirement).

pyle-national company
A Division of Brand-Rex Company
1334 NORTH KOSTNER AVENUE
CHICAGO, IL 60651 / (312) 342-6300

CONNECTOR COMPONENTS

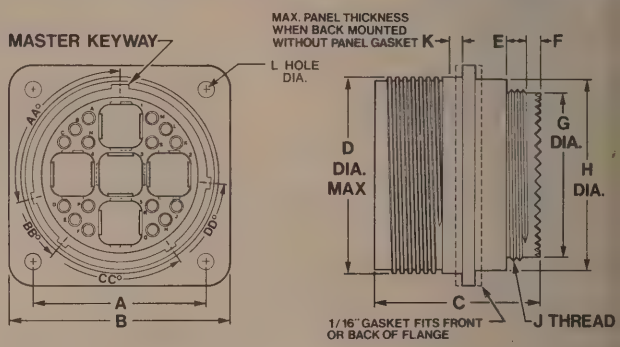
BASIC BARREL FOR STRAIGHT PLUG

The basic plug assembly includes the basic plug barrel with seal and coupling nut assembled. Contact modules are not included and must be ordered separately.



BASIC BARREL FOR SQUARE FLANGE RECEPTACLE

The basic receptacle assembly includes the basic receptacle barrel with panel gasket. Contact modules are not included in basic receptacle assembly and must be ordered separately.



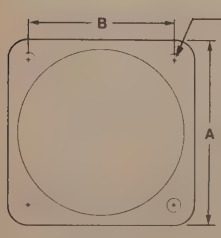
BASIC BARREL FOR STRAIGHT PLUG

Shell Size	Part No.	Dimensions						Keyway Arrangement			
		A	B	C	D	E	F	AA°	BB°	CC°	DD°
20	TC-20P-1	1.479	1.849	1.023	.268	1.000-20 UNEF	.142	105°	140°	215°	265°
24	TC-24P-1	1.760	1.849	1.273	.268	1.1875-18 UNEF	.142	105°	140°	215°	265°
28	TC-28P-1	2.025	1.849	1.508	.268	1.4375-18 UNEF	.142	105°	140°	215°	265°
32	TC-32P-1	2.265	1.786	1.755	.205	1.750-18 UNS	.142	105°	140°	215°	265°

BASIC BARREL FOR SQUARE FLANGE RECEPTACLE

Shell Size	Part No. With Panel Gasket	Dimensions											Keyway Arrangement			
		A	B	C	D	E	F	G	H	J	K	L	AA°	BB°	CC°	DD°
20	TC-20R-1	1.156	1.500	1.754	1.250	.268	.142	.9353	1.175	1.000-20 UNEF	.125	.120	105°	140°	215°	265°
24	TC-24R-1	1.375	1.750	1.754	1.500	.268	.142	1.1158	1.425	1.1875-18 UNEF	.125	.147	105°	140°	215°	265°
28	TC-28R-1	1.562	2.000	1.754	1.750	.268	.142	1.3658	1.700	1.4375-18 UNEF	.125	.147	105°	140°	215°	265°
32	TC-32R-1	1.750	2.250	1.691	2.000	.205	.142	1.6783	1.950	1.750-18 UNS	.125	.173	105°	140°	215°	265°

SPARE PANEL GASKET

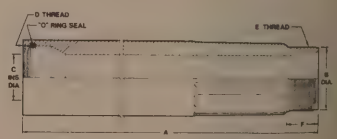


Shell Size	Part No.	Dimensions		
		A	B	L
20	TC-6520-10	1.500	1.156	.120
24	TC-6524-10	1.750	1.375	.147
28	TC-6528-10	2.000	1.562	.147
32	TC-6532-10	2.250	1.750	.173

CABLE ADAPTER COMPONENTS & ACCESSORIES

The sealing of the connector back shells is accomplished by use of a cable adapter and tapered grommet. The grommet may be pressurized either by a gland nut or cable clamp if additional strain relief is desired. The back shell — cable adapter seal is accomplished with an "O" ring seal.

*Cable adapter assemblies complete with grommet and clamp or gland nut can be ordered. Consult factory.



*CABLE ADAPTER WITH "O" RING SEAL

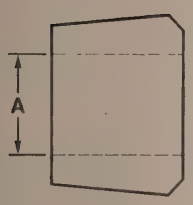
Shell Size	Short Length Part No.	Standard Length Part No.	Dimensions					
			A	B	C	D	E	F
20	TC-20W-4-2	TC-20W-6-2	4 or 6	.9353	.720	1.000-20 UNEF-2B	1.000-20 UNEF-2A	5/8
24	TC-24W-4-2	TC-24W-6-2	4 or 6	1.1158	.850	1.1875-18 UNEF-2B	1.1875-18 UNEF-2A	3/4
28	TC-28W-4-2	TC-28W-6-2	4 or 6	1.3658	1.031	1.4375-18 UNEF-2B	1.4375-18 UNEF-2A	7/8
32	TC-32W-4-2	TC-32W-6-2	4 or 6	1.6783	1.260	1.750-18 UNS-2B	1.750-18 UNS-2A	7/8

NOTE: Cable adapters are available in lengths other than those shown — consult factory. Some cable adapter lengths are extruded without fluting.

MC2™

CONNECTOR COMPONENTS

CABLE ADAPTER ACCESSORIES



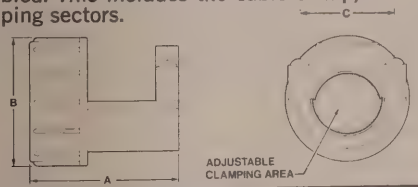
CABLE GROMMET SELECTION CHART

Shell Size	Part No.	Cable Dia. Range Dimension A	Outside Dia.
20	TC-6320-Z	BLANK*	.94
	TC-6320-F	.125 to .250	
	TC-6320-V	.187 to .312	
	TC-6320-E	.250 to .375	
	TC-6320-J	.312 to .437	
	TC-6320-D	.375 to .500	
	TC-6320-U	.437 to .562	
	TC-6320-C	.500 to .625	
24	TC-6324-Z	BLANK*	1.03
	TC-6324-X	.250 to .312	
	TC-6324-U	.312 to .375	
	TC-6324-E	.375 to .437	
	TC-6324-D	.437 to .500	
	TC-6324-R	.500 to .562	
	TC-6324-K	.562 to .625	
	TC-6324-O	.625 to .687	
	TC-6324-C	.687 to .750	
28	TC-6328-J	.625 to .750	1.28
	TC-6328-K	.687 to .812	
	TC-6328-H	.750 to .875	
	TC-6328-L	.812 to .937	
	TC-6328-C	.875 to 1.000	
32	TC-6332-N	.750 to .812	1.50
	TC-6332-H	.812 to .875	
	TC-6332-J	.875 to .937	
	TC-6332-M	.937 to 1.000	
	TC-6332-U	1.000 to 1.062	
	TC-6332-C	1.062 to 1.125	
	TC-6332-Q	1.125 to 1.187	
	TC-6332-D	1.187 to 1.250	

*For drilling in the field to suit special requirements.

CABLE CLAMP

The cable clamping area is adjustable by changing the clamping sectors. Components for all cable clamps are packaged unassembled. This includes the cable clamp, two screws and the clamping sectors.



Shell Size	Part No.	Cable Range Max. O.D.	Cable Range Min. O.D.	Dimensions A	Dimensions B	Dimensions C
20	TC-20Z	.718	.100	1 13/16	1.393	1.018
24	TC-24Z	.878	.140	2 3/16	1.537	1.162
28	TC-28Z	1.035	.165	2 7/16	1.787	1.412
32	TC-32Z	1.260	.300	2 7/16	2.100	1.615

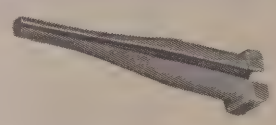
CRIMP, INSERTION AND REMOVAL TOOLS

CONTACT CRIMP TOOL

Crimp tool comes with adjustable stop wrench end and setting gauge end.

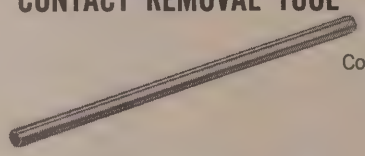
Contact Size	Range of Conductor Sizes (AWG)	Tool Only	Gauge & Wrench	Contact Locator Pin & Socket	Contact Locator Ground-Pin
16	14 thru 18	TP-201387-A	TP-201387-B	TP-201388-12	TP-201388-08G
12	12 thru 14	TP-201387-A	TP-201387-B	TP-201388-12	TP-201388-08G
10	10 thru 12	TP-201387-A	TP-201387-B	TP-201388-08	TP-201388-08G
08	8 thru 10	TP-201387-A	TP-201387-B	TP-201388-08	TP-201388-08G

INSERTION TOOL FOR #16 CONTACT



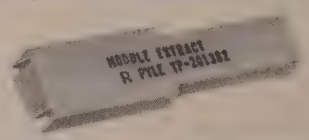
Tool Number
TP-201384-16-6

CONTACT REMOVAL TOOL



Contact Size	Tool Number
16	TP-201386-16
12	TP-201386-12
10	TP-201386-10
08	TP-201386-8

MODULE REMOVAL TOOL



Tool Number
TP-201382
For use with all modules

HOW TO ORDER*— SHELLS, MODULES, CONTACT ASSEMBLIES

1. Establish application requirements
- ☐ Size of circuit conductors
- ☐ Number of circuit conductors
- ☐ Voltage class requirements

2. To order assembly of shell and modules without contacts
- ☐ A—Start with product code identification letters **TC**
- ☐ B—Identify "P" for plug, "R" for sq. flange receptacle.
- ☐ C—Identify shell size (see p. 3 for shell configurations)
- ☐ D—Identify module type by location (see p. 4 for module identification)

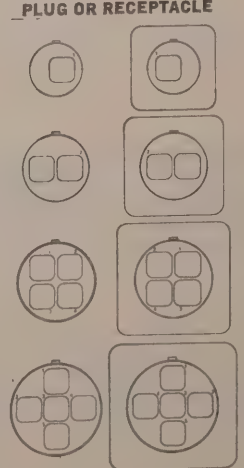
PART NUMBER

Step: A — B — C — D

TC — P or R — 20 — —
TC — P or R — 24 — — —
TC — P or R — 28 — — — —
TC — P or R — 32 — — — — —

1, 2, 3, 4, 5, 7, 8, 9 or 0 if no module required

PLUG OR RECEPTACLE



3. To order assembly of shell, modules and contacts with all cavities filled with contacts of same gender
- ☐ A—Start with product code identification letters **TC**
- ☐ B—Identify "P" for plug, "R" for sq. flange receptacle
- ☐ C—Identify shell size (see p. 3 for shell configurations)
- ☐ D—Identify module type by location (see p. 4 for module identification)
- ☐ E—Identify type of contact (Pin-line, socket, or ground-pin)

PART NUMBER

Step: A — B — C — D — E

TC — P or R — 20 — —
TC — P or R — 24 — — —
TC — P or R — 28 — — — —
TC — P or R — 32 — — — — —

E: P = All Pins; or S = All Sockets; or G = All Pins, One Ground Pin of Largest Contact Size in the Configuration

1, 2, 3, 4, 5, 7, 8, 9 or 0 if no module required

*OTHER COMPONENTS TO BE ORDERED SEPARATELY

RAYTHEON

JACKS

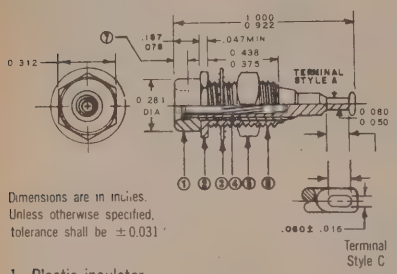
See other Raytheon Products in EEM

Opto-electronics—Section 3700
Switches—Section 5100
Knobs—Section 2400
Hardware—Section 2800

BUSHING MOUNTED TIP JACK

The Raytheon MIL-C-39024/10 tip jack combines highest quality materials and design techniques to provide a highly reliable tip jack for both military and industrial electronic equipment applications. The tip jacks fully meet the requirements of MIL-C-39024. An outstanding, and exclusive, design feature of this jack is its separate beryllium copper spring pin closed entry contact. Closed entry contact design prevents damage to contact through careless probe insertion.

These jacks are designed to accept a 0.080 ± 0.001 dia. test probe and to **prevent** the entrance of a 0.085" test probe.



Dimensions are in inches.
Unless otherwise specified, tolerance shall be ±0.031'

Terminal Style C

1. Plastic insulator
2. Metal sleeve
3. Internal tooth lockwasher 13/32 o.d. x .013 to .026 thk
4. Spring pin contact
5. Hex nut 11/32 across flats x 1/8 thk
6. Threaded body (insulator) 1/4-32 UNEF-2A
7. Plastic to metal distance 0.062 min.

MATERIAL DATA

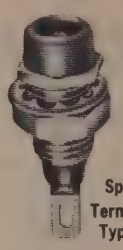
Insulator—Polyamide per MIL-P-17091. Teflon material per MIL-P-19468.
Contact—Beryllium copper per QQ C-533, Cond. A, gold plated per MIL-G-45204, Type II, Class I (50 millionths).
Threaded Sleeve—Brass per QQ-B-626, nickel plated per QQ-N-290. Type V, Class 1.
Terminal—Brass per QQ B-626, plated
Mounting Nut—Brass per QQ-B-626, nickel plated per QQ-N-290, Type V, Class I.
Lockwasher—Phosphor bronze per QQ-P-330, Cond. A, Spring temper. Nickel plated per QQ-N-290, Type V, Class I.

ENVIRONMENTAL AND MECHANICAL DATA

Thermal Shock— −65°C to 125°C Method 107 Cond. B MIL-STD-202.
Salt Spray—48 hours—Method 101, Cond. B. MIL-STD-202.
Vibration—Method 201 MIL-STD-202.
Durability—1000 insertion-withdrawal cycles.
Withdrawal Force— 8 oz. minimum (0.080 ± 0.001 probe)
Insertion Force—5 lb. max.
Shock Test—MIL-STD-202, Method 213, acceleration at 50G.

ELECTRICAL CHARACTERISTICS

Rated Current—5 amperes, max.
Operating Voltage—2000 volts RMS at sea level, 350 volts RMS at 80,000 feet.
Insulation Resistance—5,000 megohms per Method 302, MIL-STD-202 Cond. A 100 vdc.
Dielectric Withstanding Voltage—3000 volts RMS, 60 Hz, at sea level per Method 301, MIL-STD-202.
Millivolt Drop—at 5 amperes, 15 mv after completion of all environmental and durability tests.
Capacitance— < 10 pf at 1500 KC.



Spade Terminals Type C

Turret Terminals Type A

ORDERING DATA

Commercial Version also available
Contact and terminal has 400 millionth tin-plate. To order add C in order number prefix. That is, TJC, etc.

TURRET TERMINALS

Insulator Color	MIL-C-39024/10 TYPE A	Raytheon Cat. No.	Fed. Std. 595 Color No.
White	MIL-C-39024/10-01	TJ108W	17875
Red	MIL-C-39024/10-02	TJ103R	11105
Black	MIL-C-39024/10-03	TJ105BL	17038
Brown	MIL-C-39024/10-04	TJ102B	10075
Green	MIL-C-39024/10-05	TJ106GN	14110
Orange	MIL-C-39024/10-06	TJ1040R	12246
Marine Blue	MIL-C-39024/10-07	TJ107MB	15123
Yellow	MIL-C-39024/10-08	TJ101Y	13655
Gray	MIL-C-39024/10-09	TJ109GY	16187
Purple	MIL-C-39024/10-10	TJ110V	27144
Natural Nylon	NO MIL-SPEC	TJ100N	
Natural Teflon	NO MIL-SPEC	TJ111WT	

SPADE TERMINALS

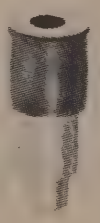
Insulator Color	MIL-C-39024/10 TYPE C	Raytheon Cat. No.	Fed. Std. 595 Color No.
White	MIL-C-39024/10-11	TJ158W	17875
Red	MIL-C-39024/10-12	TJ153R	11105
Black	MIL-C-39024/10-13	TJ155BL	17038
Brown	MIL-C-39024/10-14	TJ152B	10075
Green	MIL-C-39024/10-15	TJ156GN	14110
Orange	MIL-C-39024/10-16	TJ1540R	12246
Marine Blue	MIL-C-39024/10-17	TJ157MB	15123
Yellow	MIL-C-39024/10-18	TJ151Y	13655
Gray	MIL-C-39024/10-19	TJ159GY	16187
Purple	MIL-C-39024/10-20	TJ160V	27144

MINIATURE PC MOUNT JACKS

Raytheon Printed Circuit Test Jacks are miniature units designed specifically for printed circuit applications. Two types are offered; a **standard** model for dip solder board application, and a **short** model for use on boards soldered on automatic flow soldering equipment, or for back-to-back board mounting.

The units consist of a small diameter nylon insulator, a Beryllium-copper spring pin contact, and a gold-plated contact sleeve. Nine brilliant insulator colors are available for convenient visual circuit identification. They accept the standard. .080 dia. test prods.

Standard



Short

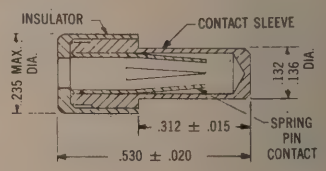
ELECTRICAL AND MATERIAL SPECIFICATIONS

Rated current: 5 amperes maximum
Operating voltage: 1500 volts RMS, 60Hz at sea level, and 300 volts RMS, 60Hz at 80,000 feet.
Contact Resistance: Less than .0015 ohm, at room temperature with standard .080 test prod.
Insulator material: Nylon, per MIL-M-20693.
Contact Sleeve material: Brass, yellow per QQ-B-626, Comp 22, half hard temper, underplate of .0002 minimum thickness of copper per class 3 of MIL-C-14550, overplate of .004 thick tin plate per type 1 of MIL-T-10727.
Contact material: Beryllium copper per QQ-C-533, Condition A. Gold plated (50 millionths) per MIL-G-45204 type 11, class 1.

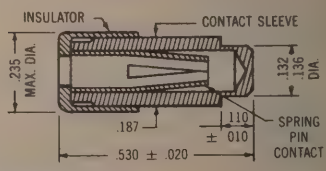
ENVIRONMENTAL AND MECHANICAL DATA

Thermal Shock: MIL-STD-202, Method 107, Condition B (−65°C to +125°C)
Salt Spray: MIL-STD-202, Method 101, Condition B (48 hours)
Humidity: MIL-STD-202, Method 103, Condition B (96 hours)
Fungus: Non-nutrient material.
Solderability: Per MIL-STD-202
Insertion force: 5.0 lbs. maximum
Withdrawal force: 0.4 lbs. minimum (.080 ± .001 test probe)

Standard Style: For panels up to 1/4" thk.



Short Style: For panels up to 3/16" thk.



ORDERING DATA

Commercial Version also available
Contact and terminal has 400 millionth tin-plate. To order add C in order number prefix. That is, TJC, etc.

Insulator	Fed STD 595	Standard	Short
Color	Color No.	Catalog No.	Catalog No.
Natural		TJ300N	TJ360N
Yellow	13655	TJ301Y	TJ361Y
Brown	10075	TJ302B	TJ362B
Red	11105	TJ303R	TJ363R
Orange	12246	TJ3040R	TJ3640R
Black	17038	TJ305BL	TJ365BL
Green	14110	TJ306GN	TJ366GN
Blue	15123	TJ307MB	TJ367MB
White	17875	TJ308W	TJ368W
Gray	16187	TJ309GY	TJ369GY
Violet	27144	TJ310V	TJ370V

RAYTHEON COMPANY / DISTRIBUTOR PRODUCTS OPERATION
DEPT. EM / FOURTH AVE. / BURLINGTON, MA 01803 / TEL: (617) 272-6400 / TWX: 710-332-7641

Add Dept. EM to address to tell them you saw it in eem

RAYTHEON

TEST JACKS

See other Raytheon Products in EEM

Opto-electronics—Section 3700
Switches—Section 5100
Knobs—Section 2400
Hardware—Section 2800

RIGHT ANGLE PC MOUNT TEST JACKS

Raytheon right angle test jacks fulfill a need for a high quality, single .080 contact connector for use with closely spaced printed circuit boards. Straight-forward design and use of highest quality materials combine to provide a miniature connector with an unusual degree of reliability at modest cost.

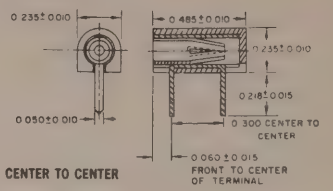
Their entry contact design prevents damage to contact through careless probe insertion.

These jacks are listed in U.S. Navy Handbook of Miniature Parts for Electronic Equipment (NAVSHIPS-93440(B)) because of their high reliability.

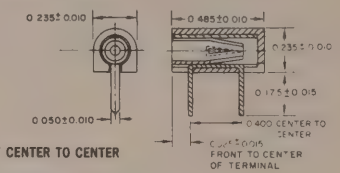
They are also color coded in ten Federal Standard 595 colors.

As illustrated in the figures, two terminal spacings are available, either on .300" or .400" centers.

RIGHT ANGLE



.3" CENTER TO CENTER



.4" CENTER TO CENTER

MATERIAL DATA

Insulator—Polyamide per MIL-M-20693. Colors—Per MS16108C and MIL-STD-174A (Both based on Fed. Std. 595).

Contact—Beryllium per QQ-C-533, Condition A. Finish—Gold plated per MIL-G-45204 Type II Class I (50 millionths).

Contact Sleeve—Brass, half hard per QQ-B-613, Composition 2. Finish—Under plate of .0002 min. silver per QQ-S-365 Type I or III with .00003 gold overplate.

ENVIRONMENTAL AND MECHANICAL DATA

Thermal Shock—MIL-STD-202B, Method 107A Condition B (−65°C — +125°C)

Salt Spray—MIL-E-5272C, Procedure 1 (240 hours)

Humidity—MIL-STD-202B, Method 103A, Condition B (96 hours)

Fungus—MIL-E-5272C, Procedure 1

Solderability—Per MIL-S-6872

Withdrawal Force—8 oz. minimum (.080 ± .001 probe)

Mounting—.300 or .400 centers

Also applicable paragraphs of MIL-J-6751

ELECTRICAL CHARACTERISTICS

Rated Current—5 amperes max.

Operating Voltage—2000 volts RMS (sea level), 350 volts RMS (80,000 ft.)

Contact Resistance—Less than 2 milliohms

Capacitance—Less than 10 $\mu\mu$f at 1500 kc

ORDERING DATA

Commercial Version also available

Contact and terminal has 400 millionth tin-plate. To order add C in order number prefix. That is, TJC, etc.

Color	Fed Std 595 Color Designation	Catalog Numbers .3" Spacing	Catalog Numbers .4" Spacing
Yellow	13655	TJ-201Y	TJ-251Y
Brown	10075	TJ-202BR	TJ-252BR
Red	11105	TJ-203R	TJ-253R
Orange	12246	TJ-2040R	TJ-2540R
Black	17038	TJ-205BL	TJ-255BL
Green	14110	TJ-206GN	TJ-256GN
Marine Blue	15123	TJ-207MB	TJ-257MB
White	17875	TJ-208W	TJ-258W
Gray	16187	TJ-209GY	TJ-259GY
Violet (purple)	27144	TJ-210V	TJ-260V

SNAP-IN MOUNTED/SUBMINIATURE

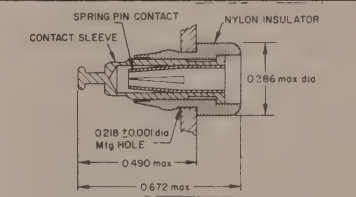
These subminiature jacks are suitable for use on standard, miniature, or subminiature electronic equipment. Designed for minimum size, they are ruggedly constructed and accept a standard .080 diameter test prod. They nylon insulator is available in any of nine brilliant colors to permit convenient visual coding of circuit check points. An outstanding feature of this jack is the ease and speed with which it may be mounted on a panel or chassis. This is done merely by inserting the insulator in a hole of suitable diameter and pressing the contact assembly into the insulator until it is firmly seated. (See dimension data for recommended insertion tool). The portion of the insulator extending behind the panel expands slightly, locking the unit firmly in place. The entire mounting operation is performed from the front of the panel.

ELECTRICAL SPECIFICATIONS

1. Contact Resistance (at room temperature, with standard .080 diameter test prod): Less than .0015 ohm.
2. Capacitance to ground (jack mounted on .052" thick metal panel): 3mmfd.
3. Voltage breakdown: Arcing at 10 KVDC (front of jack to panel, mounted on .052" thick panel.

PHYSICAL SPECIFICATIONS

1. Overall length: .655 max.
2. Insulator diameter: .286 max.
3. Insulator material: per MIL-M-20693.
4. Contact material: Beryllium-copper, per QQ-C-533, Cond. A., gold-plated.
5. Contact sleeve material: Brass per QQ-B-626, gold-plated.
6. Mounting hole diameter: .218 ± .001
7. Range of acceptable panel thickness: .031-.093
8. Weight: .002 lb. each



Insertion Tool* (for inserting contact assembly)

*Not supplied by Raytheon

ORDERING DATA

Commercial Version also available

Contact and terminal has 400 millionth tin-plate. To order add C in order number prefix. That is, TJC, etc.

Catalog No.	Color	Catalog No.	Color
TJ-400N	Natural	TJ-405BL	Black
TJ-401Y	Yellow	TJ-406GN	Green
TJ-402B	Brown	TJ-407MB	Blue
TJ-403R	Red	TJ-408W	White
TJ-4040R	Orange		

CIRCUIT BOARD MOUNTING BRACKETS

The Raytheon Circuit Board Mounting Bracket is a heavy duty component designed to mount terminals, printed circuits and resistor boards rigidly. Stacked assemblies need Fig. 1 style.

Each bracket will support a load of one-half pound when subjected to vibrational frequencies through 55 CPS with table excursions up to .060 inches or impact loads through 2000 foot-pounds.

- Four sizes for panels from 1-3/8" to 3-7/16" wide
- Provides Rigid Support under Shock or Vibration
- Mounts Single or Double Panels
- Meets Military Specifications MIL-E-16400A (Ships), MIL-E-5400, and MIL-P-11268B (Sig C.)
- Formed from .090" Cold-Rolled Carbon Steel, Cadmium Plated

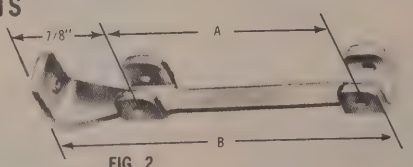


FIG. 2

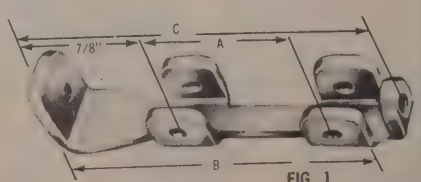


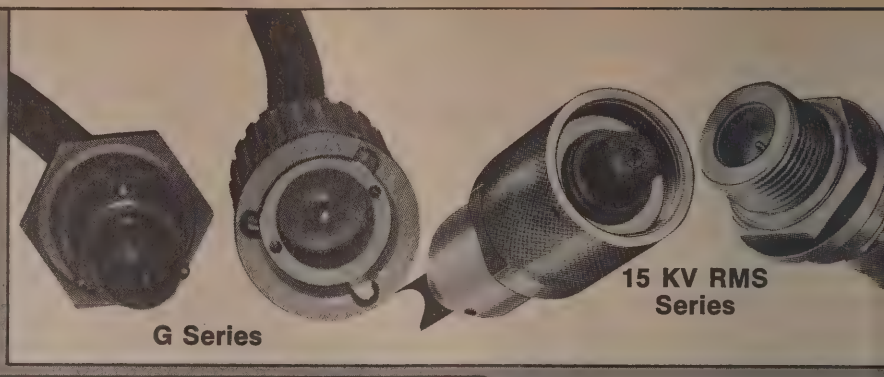
FIG. 1

PANEL WIDTH RANGE	CATALOG NUMBER STEEL	FIG.	A	B	C
1-3/8—1-15/16	MB125	2	1	2-1/16	—
2—2-7/16	MB126	2	1-1/2	2-9/16	—
2-1/2—2-15/16	MB127	2	2	3-1/16	—
3—3-7/16	MB128	2	2-1/2	3-9/16	—
1-3/8—1-15/16	MB133	1	1	2-1/16	2-5/16
2—2-7/16	MB134	1	1-1/2	2-9/16	2-13/16
2-1/2—2-15/16	MB135	1	2	3-1/16	3-5/16
3—3-7/16	MB136	1	2-1/2	3-9/16	3-13/16

Tolerances. ± 1/64 unless otherwise specified

Rowe Coaxial Connectors and Cable Assemblies

Employ high-voltage, corona-free design techniques. They are ideal for use in pulse as well as DC voltage applications, through 150 KV. A wide variety of molded-on or field assembly types are offered. Available in quick disconnect or screw couplings.

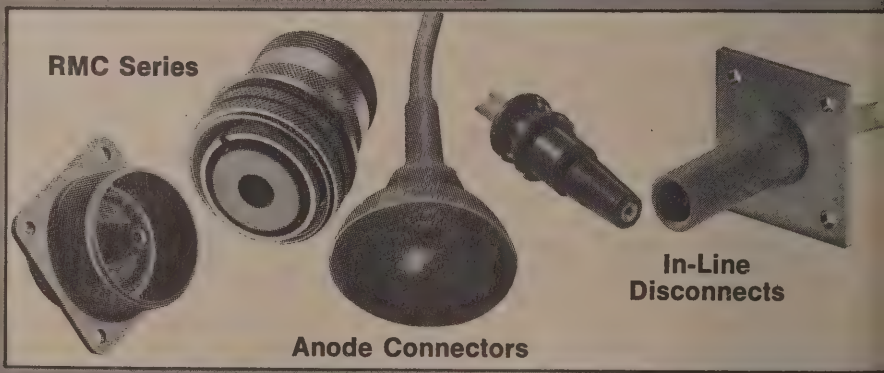


Rowe Triaxial Connectors and Cable Assemblies

A full spectrum of both molded-on and field assembly types are available for a wide variety of cable types such as the triaxial version of RG-8, up through and including specialized construction for operation in excess of 100 KV.

Rowe Single Contact Connectors and Cable Assemblies

Offered is an extensive listing of single contact high-voltage assemblies, which include anode connectors, in-line disconnects and others which are used unshielded to solve your simple high-voltage interconnection problems.



Rowe Multiple Contact Connectors and Cable Assemblies

Offer contact arrangements from one to thirty contacts, panel receptacles, cable plugs, rack and panel combinations, in-line types and many others. Both field assemblies and molded-on types are standard in this line.

Rowe Industries has designed and developed over 700 specialized interconnections for which tooling is available.

World's Leader in High-Voltage

(through 200 KV)

Corona-Free CONNECTORS and CABLE ASSEMBLIES

ROWE INDUSTRIES

CONNECTORS • CABLE ASSEMBLIES • ELECTRONIC PRODUCTS

6225 BENORE ROAD · TOLEDO, OHIO 43612 · (419) 729-9761

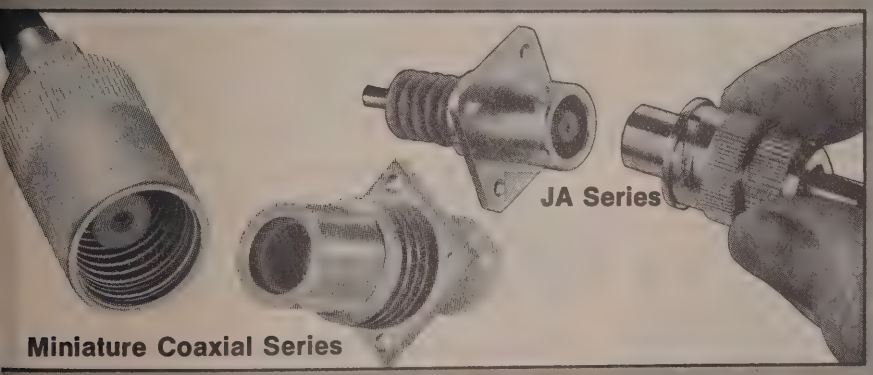
WEST COAST OFFICE: (415) 969-4831 OR (213) 235-2070

EAST COAST OFFICE: (617) 879-3250

DESIGN — DEVELOPMENT — MANUFACTURING

For reliable high voltage and all temperature wire and cable, see Rowe's ad in the Wire/Cable/Harnesses Section.

FOR YOUR COMMERCIAL, INDUSTRIAL OR MILITARY DESIGN NEEDS

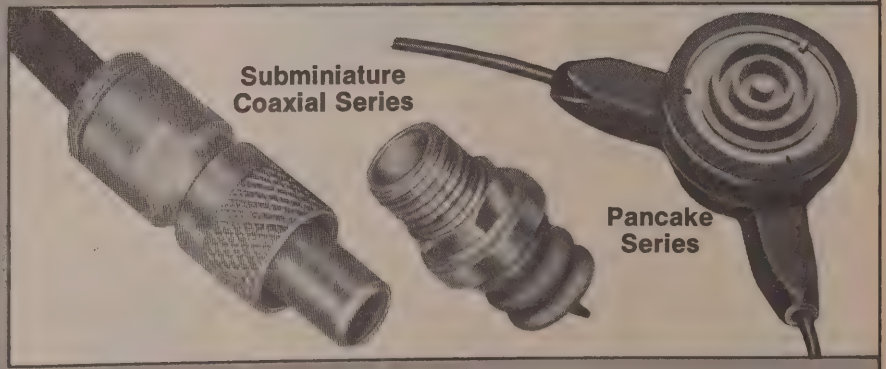


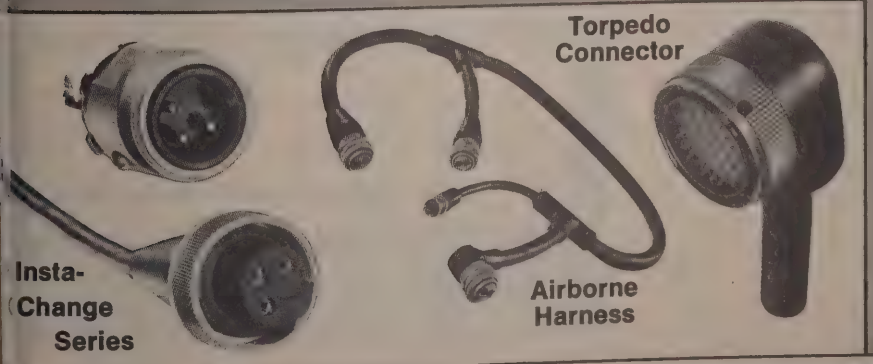
Rowe
Miniature Coaxial
Connectors and Cable Assemblies

Employ the same high-voltage design techniques as the coaxial series, but are much smaller in size for use in restricted spaces. Available in quick disconnect and screw couplings (the JA Series can be adapted to such standard type cables as RG 58 and RG 59).

Rowe
Subminiature Coaxial
Connectors and Cable Assemblies

Are ideally suited for use where space is at a premium. Employing the traditional Rowe high capability features, the subminiature sizes offer unusually high voltage operating capabilities, through 20 KV.

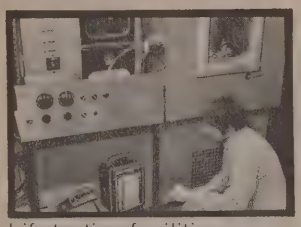




Rowe
Low-Voltage, Molded-On
Connectors and Cable Assemblies

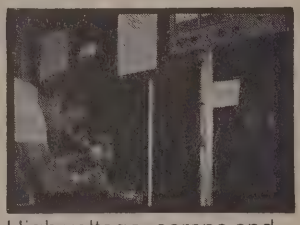
For use in severe environments. We can mold your STD connectors to cable for an environmental seal and provide a molded strain relief. Our exclusive Insta-Change series was designed for factory, mining, nuclear and oil well use.

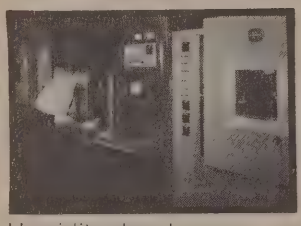
ROWE knows Specialized Interconnections


Life testing facilities.

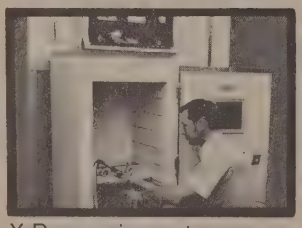
High altitude pressure chamber.

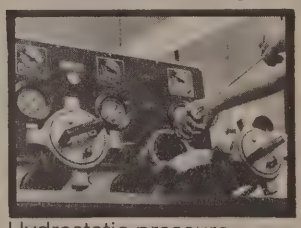
RFI-EMI-EMP test chamber.


High voltage, corona and dielectric test chamber.


Humidity chamber.

DIT-MCO computerized random access testing.


X-Ray equipment.


Hydrostatic pressure testing.

We're specialists in complete interconnection systems and, in particular, connectors and cable assemblies for extreme environments and unique applications. In fact, we've designed and manufactured hundreds of different connectors and cable assemblies for nuclear instrumentation and control, high voltage, corona-free thru 200 KV+, underwater instrumentation, geophysical, high and low temperatures, corrosive environments, high altitude and deep space, high and low pressures and other sophisticated military and industrial systems.

Rowe engineers design and specify custom products to meet exacting requirements and Rowe craftsmen produce them to the highest quality standards. In addition, we operate one of the most complete testing facilities in the industry. Our destructive and non-destructive testing capability includes:

Electrical Testing
Dielectric strength, corona measurement, RFI/EMI and DIT-MCO computer controlled circuit testing.

Mechanical and Physical Testing
Plating verification thru microscopic analysis, shock and vibration, hydrostatic pressure and helium leak, tensile strength,contact force measurement, optical comparitor equipment, complete x-ray lab.

Environmental Testing
Altitude thru 150,000 feet, temperature, humidity, corrosive atmospheres, accelerated life combining various conditions simultaneously.

Quality Control
Rowe's quality control and inspection systems meet or exceed MIL-Q-9858, ISR-1, NRC's 10CFR50 appendix B and standards of all aerospace and industrial firms.

With so many interconnections to choose from, chances are that we've already developed the one that meets your needs. If not, we'll custom design one for you.

Call or write: Dept. 110

Rowe Industries, 6100 Benore Road, Toledo, Ohio 43612

Gentlemen: Please send technical literature I've checked. Thank you.

- ☐ Corona: simple techniques to eliminate it
- ☐ H.V. In-Line Disconnects and Anode Connectors thru 60 KV
- ☐ Rowe multi-contact H.V. connectors
- ☐ Sub-Miniature H.V. coax connectors thru 15 KV
- ☐ RG cable H.V. connectors (JA Series)
- ☐ Miniature Coax Connectors thru 30 KV
- ☐ Corona-free coax connectors thru 20 KV
- ☐ Corona-free high pulse coax connectors thru 40 KV
- ☐ 75 KV coax connectors (R75 Series)
- ☐ Lanyard/Umbilical Connectors
- ☐ Triaxial Connectors thru 30 KV
- ☐ Triaxial Connectors thru 55 KV
- ☐ Molded-On Interconnections
- ☐ Low-Voltage Multi-Pin Connectors (Insta-Change Series)
- ☐ High-Voltage Cable & Wire
- ☐ "All-Temp" High Temperature Wire and Cable
- ☐ SRML, SF-2, SFF-2, Aircraft & Locomotive

Print Name _____

Company _____

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City _____ Zip _____

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CONNECTORS • CABLE ASSEMBLIES • ELECTRONIC PRODUCTS

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WEST COAST OFFICE: (415) 969-4831 OR (213) 235-2070

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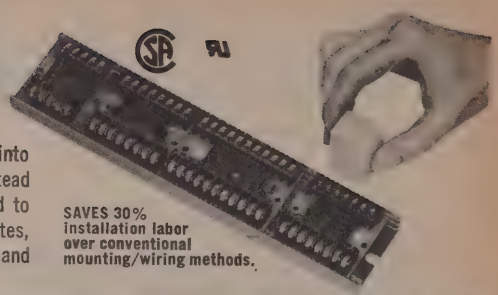
RDI/Reed Devices Inc.

SNAPTRACK™ RELAY/TIMER MOUNTING SYSTEM

A low cost, convenient method for installing plug-in relays, timers, tubes, etc. Assemblies snap into continuous lengths of Snaptrack, up to 4 feet long, requiring 2 fasteners per foot of track instead of per socket assembly. Sockets and break-resistant barrier terminal blocks are wave soldered to epoxy/glass p.c. board featuring 2 oz. copper conductor. Standard screws feature wire-clamp plates, eliminating need for crimp-on terminals. Strip the wire, place under plate and screw down. UL and CSA certified.



SAVES 30% installation labor over conventional mounting/wiring methods.

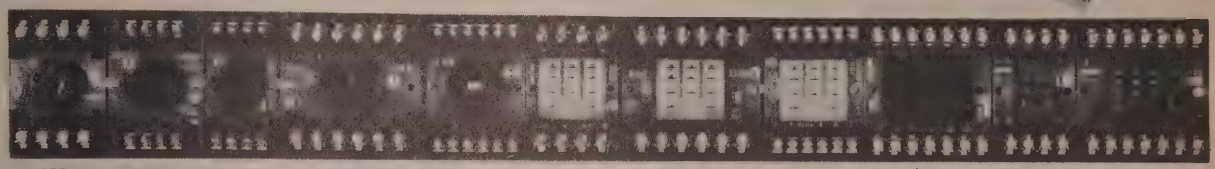


FIG. 1 8BR 208BR 218BR 11BR 211BR 8BS 11BS 211BS 684BS 622BS 624BS

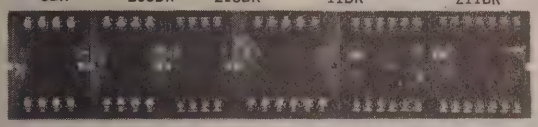


FIG. 2 708BR 708BRA 318BR 711BR 311BR 314BS

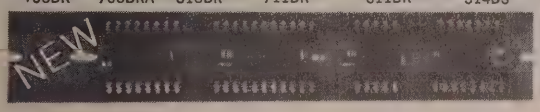


FIG. 4 802BS 804BS 806BS 814BS

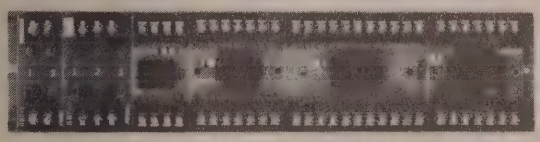


FIG. 5 6BF-2 6BF-3 202BS 204BS 206BS 214BS

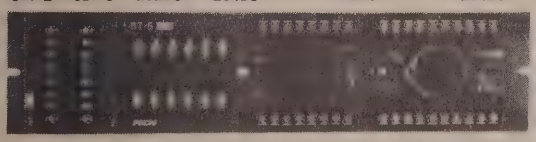


FIG. 6 2BT-8 BT-6 416BS 220BR

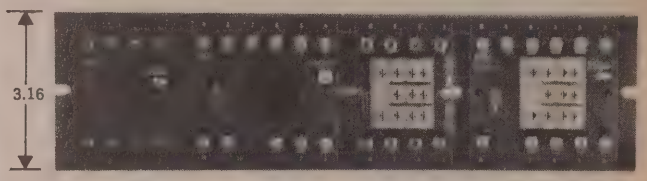


FIG. 3 8QR 11QR 8QS 11QS

COIL INDICATOR LAMP OPTION

Wired-in relay coil indicator lamps are available on most Snaptrack socket assemblies. Offers better display than lamp built into relay. Infinite life lamps stay with socket . . . saves cost.

To specify, add suffix per table at right. Ex: **8BR-1** is socket with 120VAC neon lamp.

ORDERING INFORMATION

Lamp Voltage/Type	Add to Cat. No.
120VAC neon	-1
240VAC neon	-2
6VAC/DC led	-6
12VAC/DC led	-12
24VAC/DC led	-24
48VAC/DC led	-48

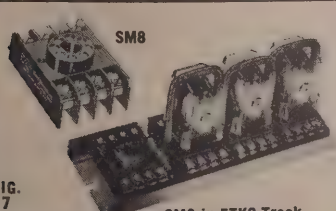


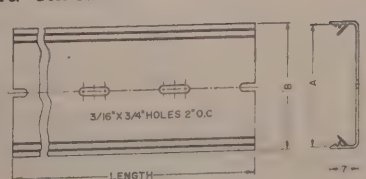
FIG. 7 SM8 in 5TK2 Track

FIG. 8

SNAPTRACK™ MOUNTING CHANNEL

Dim. "A" Socket Width (inches)	Dim. "B" Track Width (inches)	RDI* Cat. No. (48" lg.)
3.00	3.16	TK2-48
2.75	2.90	2TK2-48
2.50	2.63	5TK2-48
2.19	2.3	8TK2-48

To specify lengths of 6, 12 or 24 inches, substitute 6, 12 or 24 in place of "48". Ex: TK2-24 is 24 inches long.



TK2, 2TK2, 3TK2 and 8TK2 series

RDI Cat. No.	Fig.	Description	Length (inches)	Fits Track Series
OCTAL (8 PIN) SOCKET ASSEMBLIES (1 & 2 POLE)				
8BR	1	#8 Screws, 10A, 250VAC	2.0	TK2
8QR	3	¼" Double Quick-Connect Tabs	2.0	TK2
208BR	1	#4 Screws, holes for bails	2.0	TK2
218BR	1	Space Saver — #4 Screws, 10A, 150VAC	1.5	TK2
318BR	2	Space Saver — #4 Screws, narrow track	1.5	2TK2
708BR	2	#6 Screws, 10A, 250VAC, narrow track	2.0	2TK2
708BRA	2	#6 Binder Head Screws, narrow track	2.0	2TK2
11 PIN ROUND SOCKET ASSEMBLIES (3 POLE)				
11BR	1	#8 Screws, 10A, 250VAC	3.0	TK2
11QR	3	¼" Double Quick-Connect Tabs	3.0	TK2
211BR	1	Space Saver — #4 Screws, 10A, 150VAC	2⅛	TK2
311BR	2	Space Saver — #4 Screws, narrow track	2⅛	2TK2
711BR	2	#6 Screws, 10A, 250VAC	2.9	2TK2
711BRA	—	#6 Binder Head Screws	2.9	2TK2
SQUARE BASE SOCKETS (2, 3 & 4 POLE)				
8BS	1	2PDT, #8 Screws, 10A, 250VAC	2.0	TK2
8QS	3	2PDT, ¼" Double Quick-Connect Tabs	2.0	TK2
11BS	1	3PDT, #8 Screws, 10A, 250VAC	3.0	TK2
11QS	3	3PDT, ¼" Double Quick-Connect Tabs	3.0	TK2
211BS	1	3PDT, #4 Screws, 10A, 150VAC	2⅛	TK2
684BS	1	4PDT, #6 Screws, 10A, 250VAC	2.75	TK2
10 AMP/250VAC RATED MINIATURE SOCKET ASSEMBLIES				
622BS	1	2PDT, #6 Screws	1.75	TK2
624BS	1	4PDT, #6 Screws	2.75	TK2
MINIATURE RELAY SOCKET ASSEMBLIES, 5A, 150VAC				
214BS	5	4PDT, #4 Screws	2.5	TK2
314BS	2	4PDT, #4 Screws, narrow track	2.5	2TK2
312BS	—	Two N.O., two SPDT contact forms	2⅛	2TK2
814BS	4	4PDT, #3 Screws, mini track	2¼	8TK2
SUB-MINIATURE RELAY SOCKET ASSEMBLIES, 5A, 150VAC				
202BS	5	2PDT, #4 Screws	1.5	TK2
802BS	4	2PDT, #3 Screws, mini track	2.0	8TK2
204BS	5	4PDT, #4 Screws	2.5	TK2
804BS	4	4PDT, #3 Screws, mini track	2.25	8TK2
206BS	5	6PDT, #4 Screws	3.75	TK2
806BS	4	6PDT, #3 Screws, mini track	3.0	8TK2
SPECIALTY SOCKET, FUSE AND TERMINAL BLOCK ASSEMBLIES				
220BR	6	20 Pin Round, #4 Screws, latch	3.5	TK2
414BS	6	Telephone Type 4PDT, #4 Screws	2.5	TK2
416BS	6	Telephone Type 6PDT, #4 Screws	2.82	TK2
BT6	6	Double Terminal Block, 6 #8 Screws	3.0	TK2
2BT8	6	Double Terminal Block, 8 #4 Screws	2.38	TK2
6BF-2	5	2 sets 3AG Fuse clips, #6 Screws	1.2	TK2
6BF-3	5	3 sets 3AG Fuse clips, #6 Screws	1.75	TK2
MOLDED SOCKET ASSEMBLIES				
SM8-A	7	Octal, #6 Binder Head Screws	1.63	5TK2
SM8-C	7	Octal, #6 Wireclamp Screws	1.63	5TK2
SM8-RC	—	Reverse #6 w.c. Screws, top insulator	1.63	—
SM11-A	8	11 Pin, #6 Binder Head Screws	2.34	—
SM11-C	8	11 Pin, #6 Wireclamp Screws	2.34	—
SM11-CA	—	#6 w.c. Screws, adapter for track	2.34	5TK2

RDI barrier

NEW! SERIES 3 QUARTER INCH

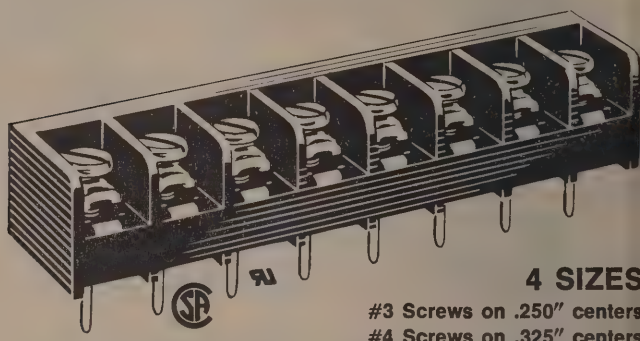
...a fresh approach to field wiring

.250" ctr - ctr spacing featuring #3-48 screws.

New packaging design opportunities are yours as the new sub-miniature series 3 joins RDI's unique terminal blocks. All the popular terminal shapes & styles are available as featured in larger blocks.

RDI pioneered molding in resilient plastic, wire-ready (raised) screws, flat p.c. pins, back-barrier, integral stand-offs.

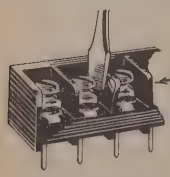
All RDI terminal blocks are available from local authorized distributors.



4 SIZES

#3 Screws on .250" centers
#4 Screws on .325" centers
#6 Screws on .375" centers
#8 Screws on .4375" centers

here's why RDI is the leader in terminal block design...



BREAK RESISTANT BARRIERS

RAISED SCREWS... READY FOR WIRING

featuring wire-clamping screws... secures 2 different wires, eliminates need to lug wires.

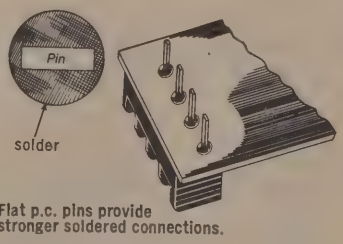
Binder head screws also available

BACK BARRIER safeguards components from field wiring...

contains strands of wire-stops shorting with adjacent wire.

Standoffs allow cleaning flux from the top side of pcb.

Integral Stand-offs



Flat p.c. pins provide stronger soldered connections.

SPECIFICATIONS

BARRIER MATERIALS
Standard: Polypropylene, U.L. grade 94V-0, 105°C operating, black.
Premium: Polyester, U.L. grade 94V-0, 130°C operating, black.

TERMINALS
Standard: Steel, bright-acid-tin plated.
Premium: Brass, bright-acid-tin plated

SCREWS
Standard: Zinc dichromate plated steel binder head or with captive wire clamping plate.
Premium: Zinc dichromate plated brass. Special order.
Sizes: #3-48, 4-40, 6-32, 8-32.

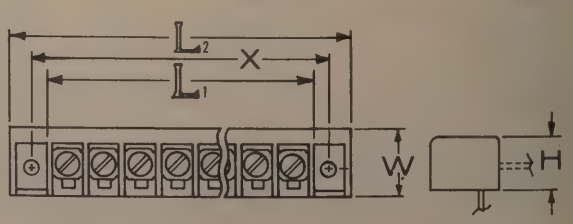
RATING
#3 Series: 5 Amperes, 300 Volts, 2500V. Dielectric
#4 Series: 10 Amperes, 300 Volts, 2500V. Dielectric
#6 Series: 15 Amperes, 600 Volts, 2500V. Dielectric
#8 Series: 20 Amperes, 600 Volts, 2500V. Dielectric

WIRE RANGE
#3 Series: 18 to 22 AWG, each side of screw
#4 Series: 14 to 20 AWG, each side of screw
#6 Series: 12 to 18 AWG each side of screw
#8 Series: 10 to 16 AWG each side of screw

APPROVALS
Underwriters Laboratories Inc. recognized under Component-Wire Connectors, File E54800, Guide XCFR2.
Canadian Standards Association certified File #LR30811, Guide 184-N-90, Class 3211.

DIMENSIONS

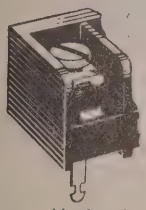
Terminal Block Series	L_1 Screws All Positions	L_2 Screws and End Mounting Holes	X Mounting Hole Centers	W (Inches)	H (Inches)
#3	.25(N)+.07"	.25(N)+.56"	L_2-.31"	.55	.5
#4	.325(N)+.07"	.325(N)+.71"	L_2-.385"	.6	.5
#6	.375(N)+.07"	.375(N)+.81"	L_2-.435"	.7	.6
#8	.4375(N)+.08"	.4375(N)+.945"	L_2-.5075"	.8	.7

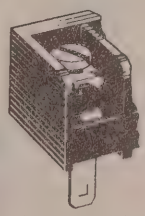


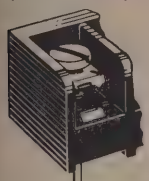
terminal blocks

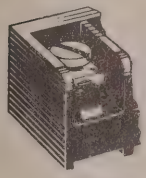
all the popular terminal styles

printed circuit pins

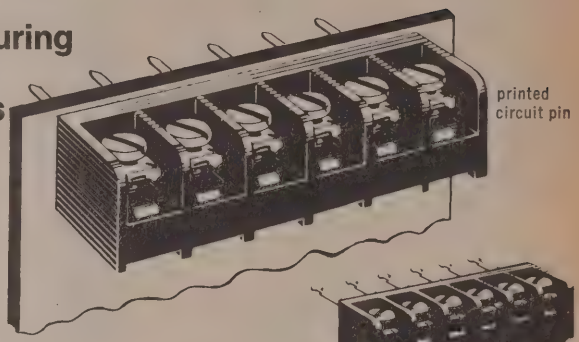

solder turret

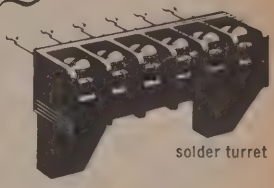

quick connect tabs

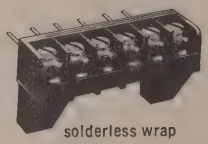

solderless wrap

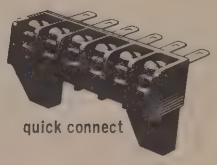

surface mount

. . . plus featuring right angle mount styles


printed circuit pin


solder turret

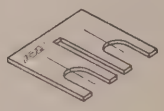

solderless wrap


quick connect

ACCESSORIES

cover kits

Q. C. terminal


jumpers . . . write for details

CATALOG NUMBER CODE

To specify standard and readily available premium materials and construction, use the codes listed below to develop the catalog number. For other variations, contact the factory.

6 PC V - 06 - 001

5. Modifier
4. Number of screw terminals
3. Terminal Orientation
2. Terminal Style
1. Size

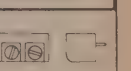
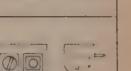
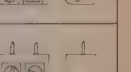
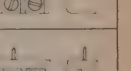
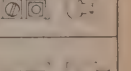
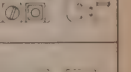
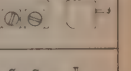
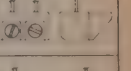
1. Screw Size/Spacing
- 3 = #3-48 on .250″ centers.
- 4 = #4-40 on .325″ centers.
- 6 = #6-32 on .375″ centers.
- 8 = #8-32 on .4375″ centers.

2. Terminal Style
- PC = Printed-circuit pin
- QC = Quick-Connect tab[3]
- ST = Solder turret
- TB = Surface Mount (no feed-thru)
- WW = Solderless-wrap pin[4]

3. Terminal Orientation
- V = Vertical (regular)
- R = Right angle

4. Number of Screw Terminals
(Do not include barrier positions)
For example:
- **02** = 2 Screw terminals
- **10** = 10 Screw terminals
- #3 Series = 32 max.
- #4 Series = 30 max.
- #6 Series = 28 max.
- #8 Series = 25 max.

5. Modifier

Model & Modifier[1]	Screw Style	Terminal Material	Barrier[2] Material	Construction
XPCV-XX-**000** XPCV-XX-**001** XPCV-XX-002 XPCV-XX-003	Wire-Clamp Binder Head Wire-Clamp Binder Head	Steel Steel Brass Brass	Polypropylene Polypropylene Polyester Polyester	
XPCV-XX-**004** XPCV-XX-**005** XPCV-XX-006 XPCV-XX-007	Wire-Clamp Binder Head Wire-Clamp Binder Head	Steel Steel Brass Brass	Polypropylene Polypropylene Polyester Polyester	
XPCR-XX-**000** XPCR-XX-**001** XPCR-XX-002 XPCR-XX-003	Wire-Clamp Binder Head Wire-Clamp Binder Head	Steel Steel Brass Brass	Polypropylene Polypropylene Polyester Polyester	
XPCR-XX-**004** XPCR-XX-**005** XPCR-XX-006 XPCR-XX-007	Wire-Clamp Binder Head Wire-Clamp Binder Head	Steel Steel Brass Brass	Polypropylene Polypropylene Polyester Polyester	
XQCV-XX-**000** XSTV-XX-**001** XTBV-XX-002 XWWV-XX-003	Wire-Clamp Binder Head Wire-Clamp Binder Head	Steel Steel Brass Brass	Polypropylene Polypropylene Polyester Polyester	
XWWV-XX-**004** XWWV-XX-**005** XWWV-XX-006 XWWV-XX-007	Wire-Clamp Binder Head Wire-Clamp Binder Head	Steel Steel Brass Brass	Polypropylene Polypropylene Polyester Polyester	
XQCR-XX-**000** XSTR-XX-**001** XWWR-XX-002 003	Wire-Clamp Binder Head Wire-Clamp Binder Head	Steel Steel Brass Brass	Polypropylene Polypropylene Polyester Polyester	
XQCR-XX-**004** XSTR-XX-**005** XWWR-XX-006 007	Wire-Clamp Binder Head Wire-Clamp Binder Head	Steel Steel Brass Brass	Polypropylene Polypropylene Polyester Polyester	

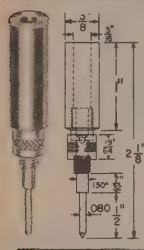
Notes:
1. If modifier is -000 (standard construction), it may be omitted; i.e. 6PCV-06-000 should be noted as 6PCV-06. Modifiers in bold print are standard; others are premium.
2. Barrier materials are U.L. approved flame-retardant grades of thermoplastic, slightly flexible to prevent breakage.
3. Available #8 Series only.
4. Vertical (regular) terminal available all series. Right angle available #6 and #8 series only.

H. H. SMITH ELECTRONIC COMPONENTS

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

COLOR CODE SUFFIX
See Colors Available for Each Item

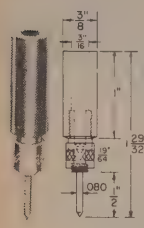
—101 WHITE	—104 GREEN	—107 YELLOW	—112 PURPLE
—102 RED	—105 BLUE	—108 BROWN	—113 GREY
—103 BLACK	—106 ORANGE		



INSULATED TIP PLUG
Solderless

HANDLE: MOLDED NYLON, per MIL-P-20693A. Red, Black, Yellow, Green, Blue, White. **SPECIFY COLOR**
PLUG: Brass, nickel plated.
RATING: 12 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Solderless: wire fits through body of tip then wrapped around screw portion and tightened with knurled collar. Threaded type. Fits standard phone tip jacks. **Std. Pkg. 100**

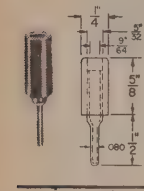
No.	Type	NET Per C
200	Senior	$25.00



INSULATED TIP PLUG
Solderless

HANDLE: MOLDED NYLON, per MIL-P-20693A. Red, Black, Yellow, Green, Blue, White. **SPECIFY COLOR**
PLUG: Brass, nickel plated.
RATING: 12 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Solderless: wire fits through body of tip then wrapped around screw portion and tightened with knurled collar. Threaded type. Fits standard phone tip jacks. **Std. Pkg. 100**

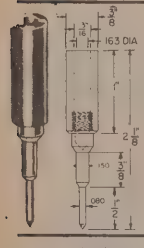
No.	Type	NET Per C
201	Junior	$25.00



INSULATED TIP PLUG
Solder Type

HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red and Black. **SPECIFY COLOR**
PLUG: Brass, nickel plated our No. 158.
RATING: 12 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Drawn hollow tip for easy soldering. Fits standard phone tip jack. **Std. Pkg. 100**

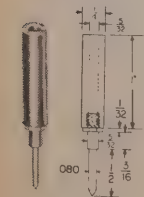
No.	NET Per C
237	$10.00



INSULATED TIP PLUG
Heavy Duty Type

HANDLE: MOLDED NYLON, per MIL-P-20693A. Red, Black. **SPECIFY COLOR**
PLUG: Brass, nickel plated.
RATING: 12 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Large diameter well enables soldering of heavy duty wire directly into plug. Fits standard phone tip jacks. **Std. Pkg. 100**

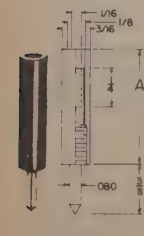
No.	NET Per C
229	$26.00



SUB-MINIATURE TIP PLUG

HANDLE: FIBRE, per MIL-F-1148A, Grade CH. Red, Black. **SPECIFY COLOR**
PLUG: Brass, nickel plated.
RATING: 12 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Ideally suited for checking sub-miniature equipment. Fits standard phone tip jacks. **Std. Pkg. 100**

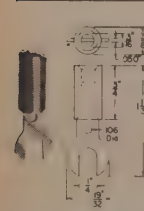
No.	NET Per C
270	$30.00



MINIATURE TIP PLUG
AND TEST PROD

HANDLE: MACHINED BUTYRATE, per Mil-P-10408A, Type I, Class II. Red or Black. **SPECIFY COLOR**
PLUG: Brass, nickel plated.
RATING: 2 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Ideally suited for checking sub-miniature equipment. Fits standard phone tip jacks.

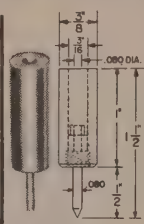
No.	Length (A)	Std. Pkg.	NET Per C
244	3/4"	100	$20.00
666	3"	25	33.00



INSULATED SPADE LUG

HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red or Black **SPECIFY COLOR**
LUG: Brass, .050 thick, nickel plated.
RATING: 30 Amps AC, for 10°C Temp. rise, continuous duty.
DESCR.: 1/4" I.D. fits all standard Multi-purpose binding posts. Accepts up to #10 insulated wire, which solders in front hole. **Std. Pkg. 100**

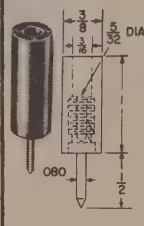
No.	NET Per C
400	$15.00



INSULATED SHORT TIP PLUG

HANDLE: MOLDED NYLON, per MIL-P-20693A. Red, Black, Yellow, Green, Blue, White. **SPECIFY COLOR**
PLUG: Brass, nickel plated.
RATING: 12 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Inserts flush to insulated handle, no metal exposed; eliminates possibility of shock or grounding. Fits standard phone tip jacks. **Std. Pkg. 100**

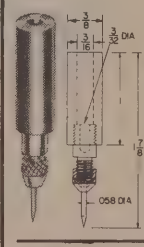
No.	NET Per C
203	$22.00



INSULATED SHORT TIP PLUG
Solderless

HANDLE: MOLDED NYLON, per MIL-P-20693A. Red, Black, Yellow, Green, Blue, White. **SPECIFY COLOR**
PLUG: Brass, nickel plated.
RATING: 12 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Solderless: wire fits through handle and body of tip then wrapped around screw portion. Inserts flush to insulated handle, no metal exposed, eliminates possibility of shock or grounding. Fits standard phone tip jacks. **Std. Pkg. 100**

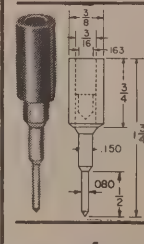
No.	NET Per C
283	$22.00



INSULATED TIP PLUG
Phono Needle

HANDLE: MOLDED NYLON, per MIL-P-20693A. Red, Black. **SPECIFY COLOR**
PLUG: Brass, nickel plated.
RATING: 12 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Removable chuck for easy replacement of broken needle. Needle pierces corrosion or plating for positive reading. **Std. Pkg. 100**

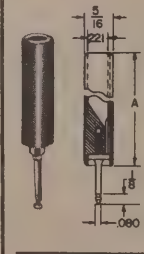
No.	NET Per C
216	$34.00



ADAPTER
Banana Plug to Tip Plug

HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red and Black. **SPECIFY COLOR**
PLUG: Brass, nickel plated.
RATING: 12 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Accepts standard banana plugs, adapts to standard tip plug. **Std. Pkg. 100**

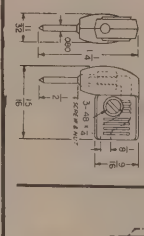
No.	NET Per C
215	$26.00



SUB-MINIATURE TIP PLUG
AND TEST PROD

HANDLE: Molded Nylon, per MIL-P-20693A. Available in Red or Black. **SPECIFY COLOR**
TIP: Brass, Silver plated.
DESCR.: Solderless assembly. Ideal for use with sub-miniature printed-circuit tip jacks. Sharp tip breaks flux or oxide coating on printed-circuit pattern for positive contact when used as prod. Grooved head of prod makes positive contact when laid across wires. Fits all standard .080" tip jacks.

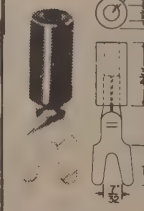
No.	Handle (A) Overall (B)	Std. Pkg.	NET Per C
348	1 inch 1 5/16"	100	$40.00
349	4 inch 4 5/16"	25	50.00



METER TIP PLUG

HANDLE: MOLDED PHENOLIC plastic, Red and Black. **SPECIFY COLOR**
PLUG: Brass, nickel plated.
RATING: 12 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Molded in two halves for easy assembly with screw and nut. Fits standard phone tip jacks. **Std. Pkg. 50**

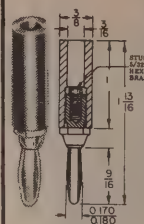
No.	NET Per C
235	$35.00



INSULATED SPADE LUG

HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red and Black. **SPECIFY COLOR**
LUG: Steel electro tinned, .020 thick.
RATING: 15 Amp AC for 10°C Temp. rise, continuous duty.
DESCR.: Tapered slot fits studs from 1/4" dia. down to #6 dia. Fits all standard binding posts. Accepts standard banana plugs in rear. Solder bridge for wire connection up to No. 18 AWG.

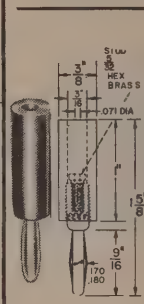
No.	Description	Pkg.	NET Per C
218	Insulated Spade Lug	100	$10.00
129	Lug Only	1000	2.80



INSULATED BANANA PLUG

HANDLE: MOLDED NYLON, per MIL-P-20693A. Red, Black, Yellow, Green, Blue, White. **SPECIFY COLOR**
PLUG: Hex brass, nickel or silver plated.
SPRING: Four-leaved phosphor bronze or beryllium copper, nickel or silver plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Wire can be soldered to brass stud or directly into plug itself. Stud also locks wire to plug for solderless connection. Fits standard banana jacks. **Std. Pkg. 100**

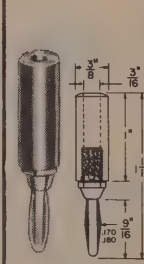
No.	Spring Material	Plating	NET Per C
212	Phosphor Bronze	Nickel	$35.00
232	Phosphor Bronze	Silver	39.00
242	Beryllium Copper	Nickel	41.00
262	Beryllium Copper	Silver	44.00



INSULATED BANANA PLUG

HANDLE: MOLDED NYLON, per MIL-P-20693A. Red, Black, Yellow, Green, Blue, White. **SPECIFY COLOR**
PLUG: Brass, nickel or silver plated.
SPRING: Four-leaved phosphor bronze or beryllium copper, nickel or silver plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Wire can be soldered to brass stud or directly into plug itself. Stud also locks wire to plug for solderless connection. Fits standard banana jacks. **Std. Pkg. 100**

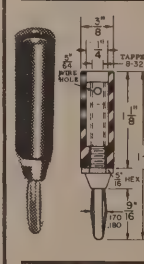
No.	Spring Material	Plating	NET Per C
211	Phosphor Bronze	Nickel	$30.00
261	Phosphor Bronze	Silver	33.00
271	Beryllium Copper	Nickel	35.00
281	Beryllium Copper	Silver	39.00



INSULATED BANANA PLUG
Solderless

HANDLE: MOLDED NYLON, per MIL-P-20693A. Red, Black, Yellow, Green, Blue, White. **SPECIFY COLOR**
PLUG: Hex brass, nickel or silver plated.
SPRING: Four-leaved phosphor bronze or beryllium copper, nickel or silver plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Solderless: Wire fits through handle and body of tip then wrapped around screw portion. Fits standard banana jacks. **Std. Pkg. 100**

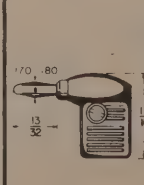
No.	Spring Material	Plating	NET Per C
295	Phosphor Bronze	Nickel	$42.00
296	Phosphor Bronze	Silver	46.00
297	Beryllium Copper	Nickel	48.00
298	Beryllium Copper	Silver	51.00



INSULATED BANANA PLUG
Solderless

HANDLE: MACHINED BUTYRATE, per Mil-P-10408A, Type I, Class II. Red or Black. **SPECIFY COLOR**
SPRING: Four-leaved phosphor bronze, nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Cross drilled hole in spacer enables quick solderless connection of wire to plug. Fits standard banana jacks. **Std. Pkg. 100**

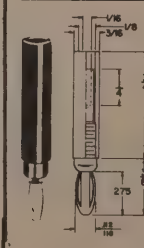
No.	NET Per C
236	$62.00



METER BANANA PLUG

HANDLE: MOLDED PHENOLIC plastic, Red and Black. **SPECIFY COLOR**
PLUG: Brass, nickel plated.
SPRING: Four-leaved phosphor bronze, nickel plated.
RATING: 10 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Molded in two halves for easy assembly with screw and nut. Fits standard banana jacks. **Std. Pkg. 50**

No.	NET Per C
255	$48.00



MINIATURE INSULATED
BANANA PLUG
Midget Type

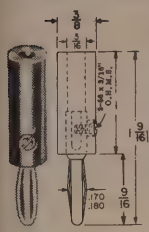
HANDLE: MACHINED BUTYRATE, per MIL-P-10408A, Type I, Class II. Red or Black. **SPECIFY COLOR**
PLUG: Brass, nickel plated.
SPRING: Beryllium Copper, nickel plated.
RATING: 2 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Wire soldered directly into stud. Fits miniature banana jacks. **Std. Pkg. 100**

No.	NET Per C
288	$50.00

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

ELECTRONIC COMPONENTS — SMITH

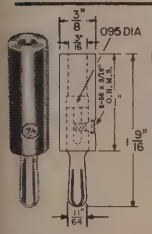
INSULATED BANANA PLUG
With Side Screw



HANDLE: MOLDED NYLON, per MIL-P-20693A. Red, Black, Yellow, Green, Blue, White. **SPECIFY COLOR**
PLUG: Brass, nickel plated.
SPRING: Four-leaved phosphor bronze or beryllium copper, nickel plated
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Set screw secures wire without soldering. Fits standard banana jacks. **Std. Pkg. 100**

No.	Spring	NET Per C
204	Phosphor Bronze	$30.00
254	Beryllium Copper	35.00

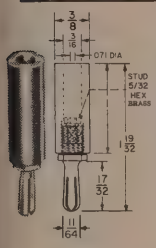
INSULATED BANANA PLUG
Split Type With Side Screw



HANDLE: MOLDED NYLON, per MIL-P-20693A. Red, Black, Yellow, Green, Blue, White. **SPECIFY COLOR**
PLUG: Brass, nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Cross-slotted for spring tension. Set screw secures wire, without soldering. Fits standard banana jacks. **Std. Pkg. 100**

No.	NET Per C
213	$28.00

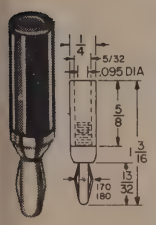
INSULATED BANANA PLUG
Split Type With Internal Stud



HANDLE: MOLDED NYLON, per MIL-P-20693A. Red, Black. **SPECIFY COLOR**
PLUG: Brass, nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Cross-slotted for spring tension. Wire can be soldered to brass stud or directly into plug itself. Stud also locks wire to plug for solderless connection. Fits standard banana jacks. **Std. Pkg. 100**

No.	NET Per C
253	$32.00

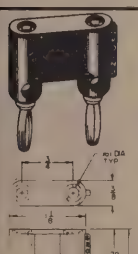
INSULATED BANANA PLUG
Midget Type



HANDLE: MACHINED BUTYRATE, per MIL-P-10408A, Type I, Class II. Red, Black. **SPECIFY COLOR**
PLUG: Brass, nickel or silver plated.
SPRING: Phosphor bronze or beryllium copper, nickel or silver plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Wire soldered directly into stud. Fits standard banana jacks. **Std. Pkg. 100**

No.	Spring Material	Plating	NET Per C
291	Phosphor Bronze	Nickel	$30.00
292	Phosphor Bronze	Silver	33.00
293	Beryllium Copper	Nickel	35.00
294	Beryllium Copper	Silver	39.00

DUAL SHORTING PLUG



HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS, Red or Black. **SPECIFY COLOR**
PLUG: Brass, Nickel plated
SPRING: Four-leaved beryllium copper, nickel plated.
RATING: 15 Amps, AC for 10°C Temp. rise continuous working voltage.
DESCR.: Internally shorted plug mates with standard dual binding posts on ¾" centers. Used for grounding or shorting input and output connections. Can be stacked for additional current rating. Rear banana jack holes allow connection to shorted posts. **Std. Pkg. 10**

No.	NET Per C
1516	$120.00

DUAL BANANA PLUG

BODY: MOLDED POLYSTYRENE, Red or Black **SPECIFY COLOR**
PLUG: Brass, nickel plated.
SPRING: Four-leaved .phosphor bronze, nickel plated
SCREW: Steel, cadmium plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty. 5K Volts 60 cycle AC continuous working voltage. CAPACITANCE 1.0 mmfd. between conductors.
DESCR: Mates with standard dual binding post ¾" centers. Polarity indicated on top and side. Wire held with internal set screw. Can be stacked for multiple connections. **Std. Pkg. 25**

No.	Net Per C
210	$120.00

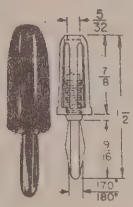
NYLON HANDLE TIP & BANANA PLUGS

COLOR CODE SUFFIX Add to Catalog Number as required

—101 WHITE
—102 RED
—103 BLACK
—104 GREEN
—105 BLUE
—106 ORANGE
—107 YELLOW
—108 BROWN
—112 PURPLE
—113 GREY

BANANA PLUG TYPE

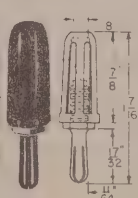
NYLON BANANA PLUG



HANDLE: MOLDED NYLON, per MIL-P 20693A.
COLORS Available in 10 std. colors as coded above. **SPECIFY COLOR**
PLUG: Brass, nickel plated.
SPRING: Phosphor bronze or beryllium copper, nickel or silver plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Wire can be soldered to brass stud or directly into plug itself. Stud also locks wire to plug for solderless connection. Fits standard banana jacks. **Std. Pkg. 100**

No.	Spring Material	Plating	NET Per C
476	Phosphor Bronze	Nickel	$31.00
477	Phosphor Bronze	Silver	34.00
478	Beryllium Copper	Nickel	37.00
479	Beryllium Copper	Silver	40.00

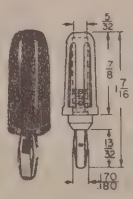
NYLON BANANA PLUG
Split Type



HANDLE: MOLDED NYLON, per MIL-P 20693A.
COLORS Available in 10 std. colors as coded above. **SPECIFY COLOR**
PLUG: Brass, nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Cross-slotted for spring tension. Wire can be soldered to brass stud or directly into plug itself. Stud also locks wire to plug for solderless connection. Fits standard banana jacks. **Std. Pkg. 100**

No.	NET Per C
494	$28.00

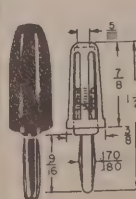
NYLON BANANA PLUG
Short Spring



HANDLE: MOLDED NYLON, per MIL-P 20693A.
COLORS Available in 10 std. colors as coded above.
PLUG: Brass, nickel or silver plated.
SPRING: Phosphor bronze or beryllium copper, nickel or silver plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Wire soldered directly into stud. Fits standard banana jacks. **Std. Pkg. 100**

No.	Spring Material	Plating	NET Per C
426	Phosphor Bronze	Nickel	$28.00
427	Phosphor Bronze	Silver	31.00
428	Beryllium Copper	Nickel	33.00
429	Beryllium Copper	Silver	37.00

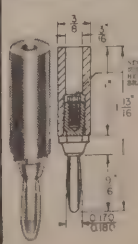
NYLON BANANA PLUG
Solderless



HANDLE: MOLDED NYLON, per MIL-P 20693A.
COLORS Available in 10 std. colors as coded above. **SPECIFY COLOR**
PLUG: Brass, nickel or silver plated.
SPRING: Phosphor bronze or beryllium copper, nickel or silver plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Solderless: Wire fits through handle and body of tip than wrapped around screw portion. Inserts flush to handle, no metal exposed, eliminates possibility of shock or grounding. Fits standard banana jacks. **Std. Pkg. 100**

No.	Spring Material	Plating	NET Per C
455	Phosphor Bronze	Nickel	$31.00
456	Phosphor Bronze	Nickel	34.00
457	Beryllium Copper	Silver	37.00
458	Beryllium Copper	Nickel	40.00

HIGH TEMPERATURE BANANA PLUG

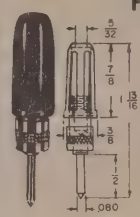


HANDLE: MOLDED NYLON, per MIL-P-20693A. Red or Black. **SPECIFY COLOR**
PLUG: Hex brass, nickel plated.
SPRING: Four-leaved, INCONEL.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Withstands temperature to 1200 degrees F Full resiliency—non-oxidizing. Excellent for thermo-couple connection on plastic extruding die heads. **Std. Pkg. 10**

No.	NET Per C
388	$120.00

PIN TIP TYPE

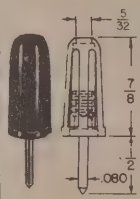
NYLON TIP PLUG
Solderless



HANDLE: MOLDED NYLON, per MIL-P 20693A. Specify color as coded above.
PLUG: Brass, nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Solderless: Wire fits through body of tip then wrapped around screw portions and tightened with knurled collar. Threaded type. Fits standard phone tip jacks. **Std. Pkg. 100**

No.	NET Per C
490	$25.00

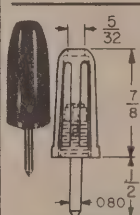
NYLON SHORT TIP PLUG
Solderless



HANDLE: MOLDED NYLON, per MIL-P 20693A. Specify color as coded above.
PLUG: Brass, nickel plated.
RATING: 12 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Solderless: Wire fits through handle and body of tip then wrapped around screw portion. Inserts flush to handle, no metal exposed, eliminates possibility of shock or grounding. Fits standard phone tip jacks. **Std. Pkg. 100**

No.	NET Per C
492	$23.00

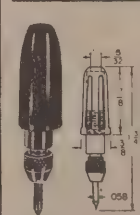
NYLON SHORT TIP PLUG



HANDLE: MOLDED NYLON, per MIL-P 20693A. Specify color as coded above.
PLUG: Brass, nickel plated.
RATING: 12 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Inserts flush to insulated handle, no metal exposed; eliminates possibility of shock or grounding. Fits standard phone tip jacks. **Std. Pkg. 100**

No.	NET Per C
491	$23.00

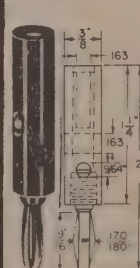
NYLON TIP PLUG
Phone Needle



HANDLE: MOLDED NYLON, per MIL-P 20693A. Specify color as coded above.
PLUG: Brass, nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Removable chuck for easy replacement of broken needles. Needle pierces corrosion or plating for positive reading. **Std. Pkg. 100**

No.	NET Per C
493	$35.00

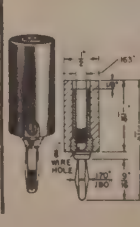
STACK BANANA PLUG
Solderless



HANDLE: MACHINED BUTYRATE, per MIL-P-10408A, Type I, Class II. Red, Black, Yellow or Green. **SPECIFY COLOR**
BODY: Brass, nickel plated.
SPRING: Four-leaved phosphor bronze or beryllium copper, nickel plated
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Solderless connection. Accepts standard banana plugs in top and side. Interconnects unlimited amount of multiple circuits. **Std. Pkg. 50**

No.	Spring Material	NET Per C
1511	Phosphor Bronze	$65.00
1512	Beryllium Copper	73.00

STACK BANANA PLUG



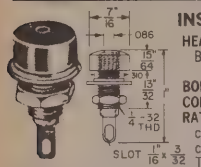
BODY: MOLDED POLYSTYRENE, Red or Black. **SPECIFY COLOR**
PLUG: Brass, nickel plated.
SPRING: Four-leaved phosphor bronze, nickel plated.
SCREW: Steel, cadmium plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty
DESCR.: Internal set screw for wire or phone tip connection. Can be stacked for multiple connections **Std. Pkg. 50**

No.	NET Per C
324	$58.00

H. H. SMITH ELECTRONIC COMPONENTS

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

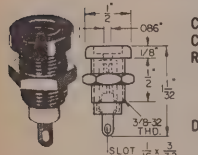
INSULATED PHONE TIP JACK



HEAD: MOLDED PHENOLIC plastic, Red, Black, Yellow, Green, Blue, White. **SPECIFY COLOR**
BODY: Brass, nickel plated.
CONTACT: Phosphor bronze.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty. 750 Volts 60 cycle AC continuous working voltage. CAPACITANCE 4.0 pf.
DESCR.: Positive contact with standard phone tip plugs. Supplied complete with hex nut and fibre washer. Mounts in 15/16" hole in panels up to 3/8" thick. Accepts standard phone tip plugs. **Std. Pkg. 100**

No.	NET Per C
202	$24.00

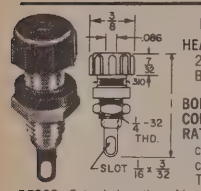
MOLDED NYLON TIP JACK



BODY: MOLDED NYLON, per MIL-P-20693A, Red, Black. **SPECIFY COLOR**
CONTACT: Phosphor bronze.
CAP: Brass, nickel plated.
RATING: 10 Amps AC for 10°C Temp. rise, continuous duty. 5K Volts 60 cycle AC continuous working voltage CAPACITANCE 3.0 pf
DESCR.: Mounts in 3/8" holes in panels up to 5/16" thick. Accepts standard phone tip plugs. **Std. Pkg. 100**

No.	NET Per C
240	$25.00

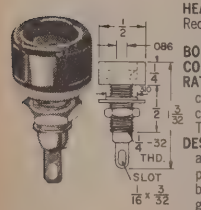
NYLON PHONE TIP JACK



HEAD: MOLDED NYLON, per MIL-P-20693A. With molded nylon washer. Red, Black, Yellow, Green, Blue. **SPECIFY COLOR**
BODY: Brass, nickel plated.
CONTACT: Phosphor bronze.
RATING: 12 Amps AC for 10°C Temp. rise, continuous duty. 750 Volts 60 cycle AC continuous working voltage. CAPACITANCE 4.0 pf.
DESCR.: Extruded portion of head and washer provides excellent insulation from panel. Supplied with hex nut. Mounts in 5/16" hole in panels up to 1/4" thick. Accepts standard phone tip plugs. **Std. Pkg. 100**

No.	NET Per C
241	$38.00

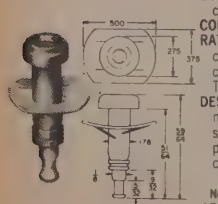
INSULATED TIP JACK Meter Type



HEAD: MOLDED PHENOLIC plastic, Red or Black. **SPECIFY COLOR**
BODY: Brass, nickel plated.
CONTACT: Phosphor bronze.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty. 750 Volts 60 cycle AC continuous working voltage. CAPACITANCE 4.0 pf.
DESCR.: Supplied complete with hex nut and fibre washer. Mounts in 5/16" hole in panels up to 3/8" thick. Recessed jack body prevents possibility of shock or grounding. Accepts standard phone tip plugs. **Std. Pkg. 100**

No.	NET Per C
282	$35.00

NYLON TEST TIP JACK



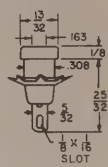
BODY: Nylon, Grade FM 10001. Specify color as coded above. 10 colors.
CONTACT: Phosphor bronze, gold plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty. 3 K Volts 60 cycle AC continuous working voltage. CAPACITANCE 4.0 pf.
DESCR.: Mounts in 3/16" hole, with Tinnerman speed nut for fast permanent assembly. Teeth embed into jack body, preventing pulling out and turning. Accepts standard phone tip plugs. **Std. Pkg. 25**

No.	NET Per C
1598	$17.00

SEE OUR COMPLETE LINE OF TEFLON TERMINALS AND TEST JACKS ON SMITH PAGES 45 THRU 53

"SPEEDI-MOUNT" BANANA JACK

#398

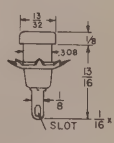


BODY: MOLDED PHENOLIC plastic, Red, Black, Yellow, Green, Blue, White. **SPECIFY COLOR**
CONTACT: Brass, cadmium plated.
WASHER: Steel cadmium plated, internal and external tooth.
RATING: 12 Amps AC for 10 ° C Temp. rise, continuous duty. 3 K Volts 60 cycle AC continuous working voltage. CAPACITANCE 4.0 pf.
DESCR.: Unusual dished lockwasher permits fast assembly. Teeth embed into jack and panels, prevent pulling out and turning. Mounts in 5/16" hole in panels up to 3/16" thick. Accepts standard banana plugs. **Std. Pkg. 100**

No.	Description	NET Per C.
398	Head 13/32" Dia.	$10.00

"SPEEDI-MOUNT" TIP JACK

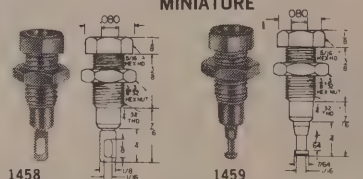
#279



BODY: MOLDED PHENOLIC plastic, Red, Black, Yellow, Green, Blue, White. **SPECIFY COLOR**
CONTACT: Phosphor bronze.
WASHER: Steel cadmium plated, Internal and external tooth.
RATING: 12 Amps AC for 10°C Temp. rise, continuous duty. 3 K Volts 60 cycle AC continuous working voltage. CAPACITANCE 3.0 pf.
DESCR.: Unusual dished lockwater permits fast assembly. Teeth embed into jack and panels, prevents pulling out and turning. Mounts in 5/16" hole in panels up to 3/16" thick. Accepts standard phone tip plugs. **Std. Pkg. 100**

No.	Description	NET Per C
279	Head 13/32" Dia.	$10.00

NYLON BANANA JACKS MINIATURE



1458 1459

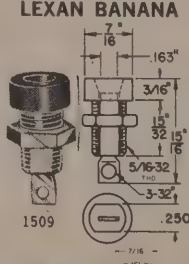
BODY: MOLDED NYLON, per MIL-P-20693A.
COLORS: Available in 10 std. colors as coded above. Specify color by adding color code suffix to basic catalog number.
CONTACT: Brass, gold washed.
RATING: 10 Amps AC for 10°C Temp. rise, continuous duty. 2 KV 60 cycle AC continuous working voltage. CAPACITANCE 3.0 pf.
DESCR.: Mounts in 1/4" hole in panels up to 1/4" thick. Accepts subminiature banana plugs. One-piece turret contact allows sealed panel entry hole. Hex head for ease in mounting. Recessed contact provides for full seating of plug with no exposed metal. **Std. Pkg. 100**

No.	Terminal	NET Per C
1458	Pierced	$33.00
1459	Turret	23.00

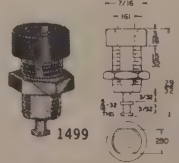
WE INVITE YOU to use our manufacturing and engineering facilities and our know-how to meet YOUR PARTICULAR REQUIREMENTS.

LEXAN BANANA JACKS

"DOUBLE-D" BODY



1509



1499

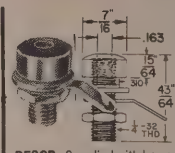
BODY: MOLDED LEXAN
COLORS: Available in 10 std. colors as coded above.
CONTACT: Brass, Cadmium Plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty. 1K Volts 60 cycle AC continuous working voltage. CAPACITANCE 5.5 pf.
DESCR.: Mounts in 5/16" round, single or double "D" holes in panels up to 5/16" thick. Accepts standard banana plugs. **Std. Pkg. 100**

No.	NET Per C
1509	$15.00

As above but completely enclosed jack with solder turret terminals. **Std. Pkg. 50**

No.	NET Per C
1499	$18.00

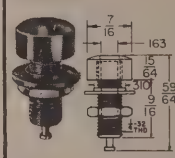
INSULATED BANANA JACK



HEAD: MOLDED PHENOLIC plastic, Red, Black, Yellow, Green, Blue, White. **SPECIFY COLOR**
BODY: Brass, nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty. 750 Volts 60 cycle AC continuous working voltage. CAPACITANCE 4.0 pf.
DESCR.: Supplied with hex nut, fibre washer, and brass tinned lug. Mounts in 5/16" hole in panels up to 3/8" thick. Accepts standard banana plugs. **Std. Pkg. 100**

No.	NET Per C
205	$20.00

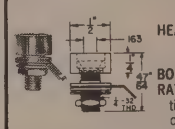
INSULATED BANANA JACK With Turret Terminal



HEAD: MOLDED PHENOLIC plastic, Red, Black, Yellow, Green, Blue, White. **SPECIFY COLOR**
BODY: Brass, nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty. 750 Volts 60 cycle AC continuous working voltage. CAPACITANCE 4.0 pf.
DESCR.: Supplied with hex nut & fibre washer. Mounts in 5/16" hole in panels up to 5/8" thick. Solder direct to turret terminal. Accepts standard banana plugs. **Std. Pkg. 100**

No.	NET Per C
256	$27.00

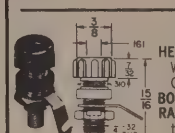
INSULATED BANANA JACK



HEAD: MOLDED PHENOLIC plastic, Red, Black, **SPECIFY COLOR**
BODY: Brass, nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty. 750 Volts 60 cycle AC continuous working voltage. CAPACITANCE 4.0 pf.
DESCR.: Supplied with hex nut, fibre washer, lockwasher and brass tinned lug. Mounts in 5/16" hole in panels up to 3/8" thick. Jack body recessed for snug contact. Accepts standard banana plugs. **Std. Pkg. 100**

No.	NET Per C
219	$28.00

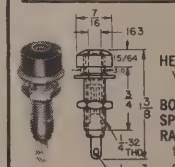
NYLON BANANA JACK



HEAD: MOLDED NYLON, per MIL-P-20693A. With molded nylon washer. Red, Black, Yellow, Green, Blue. **SPECIFY COLOR**
BODY: Brass, nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty. 1K Volts 60 cycle AC continuous working voltage. CAPACITANCE 4.0 pf.
DESCR.: Extruded portion of head and washer provides excellent insulation from panel. Supplied with hex nut, brass tinned lug. Mounts in 5/16" hole in panets up to 1/4" thick. **Std. Pkg. 100**

No.	NET Per C
221	$38.00

INSULATED JACK Combination Type



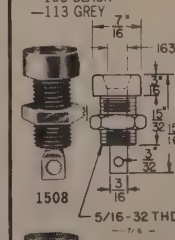
HEAD: MOLDED PHENOLIC plastic, Red, Black, Yellow, Green, Blue, White. **SPECIFY COLOR**
BODY: Brass, nickel plated.
SPRING: Phosphor bronze.
RATING: 12 Amps AC for 10°C Temp. rise, continuous duty. 750 Volts 60 cycle AC continuous working voltage. CAPACITANCE 4.0 mmfd.
DESCR.: Supplied with hex nut & fibre washer. Accepts standard phone tip plugs or standard banana plugs. Mounts in 5/16" hole in panels up to 1/2" thick. **Std. Pkg. 100**

No.	NET Per C
206	$32.00

COLOR CODE SUFFIX—Add to Catalog Number as required

—101 WHITE	—104 GREEN	—107 YELLOW
—102 RED	—105 BLUE	—108 BROWN
—103 BLACK	—106 ORANGE	—112 PURPLE
—113 GREY		

FULL-ROUND BODY



1508

1498

BODY: MOLDED LEXAN
COLORS: Available in 10 std. colors as coded above. Specify color by adding color code suffix to basic catalog number.
CONTACT: Brass, electro-tin plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty. 1K Volts 60 cycle AC continuous working voltage. CAPACITANCE 5.0 pf.
DESCR.: Mounts in 5/16" hole in panels up to 5/16" thick. Accepts standard banana plugs. **Std. Pkg. 100**

No.	NET Per C
1508	$15.00

As above but completely enclosed jack with solder turret terminals. **Std. Pkg. 50**

No.	NET Per C
1498	$18.00

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

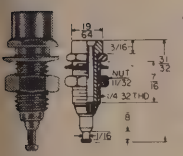
ELECTRONIC COMPONENTS H. H. SMITH

NYLON TIP JACK

With Metal Shell
Made to meet MIL-C-39024/10

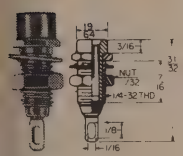
COLOR CODE SUFFIX
(Add to Catalog Number as Required)

—101 WHITE	—105 BLUE	—108 BROWN
—102 RED	—106 ORANGE	—112 PURPLE
—103 BLACK	—107 YELLOW	—113 GREY
—104 GREEN		



1501
3501

BODY: MOLDED NYLON, per MIL-M-20693. Available in 10 colors as coded above. **SPECIFY COLOR**
SHELL & NUT: Brass, per QQ-B-626, nickel plated per QQ-N-290.
LOCKWASHER: Phosphor bronze, per QQ-B-750, nickel plated per QQ-N-290.
TERMINAL: Brass, per QQ-B-626, gold plated per MIL-G-45204
CONTACT: Beryllium copper, per QQ-C-533, gold plated per MIL-G-45204.
RATINGS: *Operating voltage:* 2 KV, 60 Hz. at sea level. *Current:* 5 amps, AC, for 10°C temp. rise, continuous duty. *Contact resistance:* 2 milliohms max at rated current.
DESCR: Nylon tip jack accepts standard .080" tip plugs. Caged, closed entry contact assures maximum retention with minimum contact resistance. Metal shell eliminates possibility of stripping threads during assembly. Mounts in 1/4" hole in panels up to 1/4" thick.



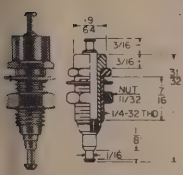
1502
3502

No.	TYPE	DASH NO.	STD PKG.	Net per C
1501	Turret	01 thru 10	25	$60.00
1502	Eyelet	-11 thru -20	25	$70.00

COMMERCIAL NYLON TIP JACK

With Metal Shell

New



1503

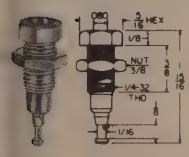
BODY: MOLDED NYLON, per MIL-P-20693. Available in 10 colors as coded above **SPECIFY COLOR.**
SHELL & NUT: Brass, nickel plated.
LOCKWASHER: Phosphor bronze, nickel plated.
CONTACT: Phosphor bronze, bright tin plate.
FEED THRU: Brass, bright tin plate.
RATINGS: 2 KV, 60 Hz AC continuous working voltage. 10 amps AC for 10°C temp. rise, continuous duty. Capacitance 10 pf.
DESCR: Nylon tip jack accepts standard .080" tip plugs. Split contact provides low contact resistance. Metal shell eliminates possibility of stripping threads during assembly. Mounts in 1/4" hole in panels up to 1/4" thick.

No.	TYPE	STD. PKG.	Net per C
3501	Turret	100	$40.00
3502	Eyelet	50	45.00
1503	Feed-Thru	50	35.00

COLOR CODE SUFFIX
(Add to Catalog Number as Required)

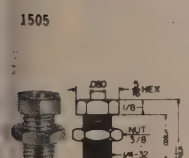
—101 WHITE	—106 ORANGE	
—102 RED	—107 YELLOW	
—103 BLACK	—108 BROWN	
—104 GREEN	—112 PURPLE	
—105 BLUE	—113 GREY	

ALL NYLON TIP JACKS

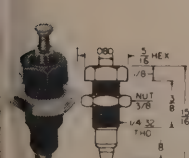


1505

BODY: MOLDED NYLON, per MIL-P-20693
NUT: Brass, nickle plated
CONTACT: PHOSPHOR BRONZE, BRIGHT TIN PLATE
FEED-THRU: Brass Bright Tin Plate
RATNG: 3 KV, 60 Hz AC continuous working voltage. 10 amps AC for 10°C temp. rise, continuous duty. Capacitance 3.0 pf.
DESCR.: Accepts standard .080" tip plugs. Split contact provides low contact resistance. Hex molded head aids in tightening. Mounts in ¼" hole in panels up to ¼" thick.
COLORS: Available in White, Red, Black, Green, Blue, Orange, Yellow, Brown, Purple, Grey. **SPECIFY COLOR**



1506



1507

NO.	TYPE	STD. PKG.	NET PER C
1505	Turret	100	$27.00
1506	Eyelet	50	36.00
1507	Feed-thru	50	34.00

RIGHT ANGLE PRINTED CIRCUIT TEST JACKS

MILITARY TYPE - MIL-C-39024/11C
QUALIFIED PRODUCTS LISTED

BODY: MOLDED NYLON, Per **MIL-P-20693.** 10 Colors, specify color, as coded.
SPRING: Beryllium Copper, Per QQ-C-533.
FINISH: Gold Plate, per MIL-G-45204, CLASS I. Type 2. Nickel underplate, per QQ-N-290, Class I Type 7, .0002" thick.
MOUNTING: Mounts in .052" dia. holes on .400" centers. Board thickness as specified below. Can be spaced side-by-side .160" on centers minimum.
MECHANICAL DATA: Thermal shock, vibration, humidity, insulation resistance, salt spray per MIL-STD-202B. All mechanical Tests per applicable section of MIL-C-39024. Insertion force 30 oz. max., withdrawal force 8 oz. min., with .080" (±.001") probe.
RATINGS: Operating voltage 1500 volts, 60 cps RMS, sea level. 350 volts, 60 cps RMS at 50,000 feet. 5 amps. AC max. current rating. Contact resistance 20 millivolt drop max. At specified current, at 25° C.
DESCR.: Double entry design, probe inserts from either end of jack. Closed entry construction will not accept probes larger than .084", will contact probes down to .074". Closed bottom design keeps jack from fouling with solder of flux. Locking ears keep jack firmly in board until soldered. Precise dimensions allow for automated assembly on boards.

QUALIFIED PRODUCTS LISTED Std. Pkg. 100

"L" DIMENSION 0.130
For boards up to 1/16" thick, MIL-C-39024/11C-01 thru 10

No.	NET Per C
3325	$19.00

COMMERCIAL TYPES Same as above except Plating

"L" DIMENSION 0.130 For boards up to 1/16" thick

No.	Spring Plating	NET Per C
325	Gold Plate over .0002" Nickel	$15.00

"L" DIMENSION 0.219

No.	For Boards up to 1/8" thick.	NET Per C
321	Gold Plate over .0002" Nickel	$15.00

ECONOMY TYPE

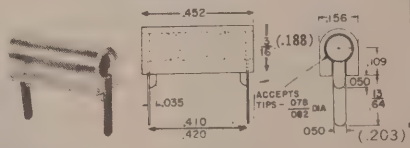
"L" DIMENSION 0.130 For boards up to 1/16" thick.

No.	Spring Plating	NET Per C
306	Gold flash over .0002 Silver	$13.00
359	.0002 Silver	12.00

"L" DIMENSION 0.219 For boards up to 1/8" thick

No.	Spring Plating	NET Per C
328	Gold flash over .0002 Silver	$13.00
402	.0002 Silver	12.00

COMMERCIAL TYPE



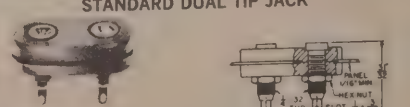
BODY: MOLDED NYLON, Per MIL-P-20693A. 10 Colors, specify color, as coded.
SPRING: Beryllium Copper, Per QQ-C-533.
FINISH: Silver underplate, .0002" min., per QQ-S-365, Type I, with .00003" Gold overplate; per MIL-F-14072, M-310.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty. 1.5 KV. 60 cycle AC continuous working voltage. Contact resistance 5 milliohms max. at rated current. Capacitance less than 5 MHz at 1 pf.
MOUNTING: Mounts in .052" dia. holes on .400" centers, in boards up to 3/16" thick. Can be spaced side-by-side .160" on centers min.
MECHANICAL DATA: Thermal shock, vibration, humidity, insulation resistance, and salt spray tests per MIL-STD-202B. Solderability per MIL-S-6872. Insertion and withdrawal force: 8 oz. min., 5 lbs. max. with .080" (±.001") dia. probe.
DESCR.: Double-entry design, probe inserts from either end of jack. Closed entry construction will not accept probes larger than .084", will contact probes down to .074". Closed bottom construction keeps jack from fouling with solder or flux. Locking ears hold jack firmly in board until soldered. Precise dimensions allow for automated assembly on boards. Std. Pkg. 100

No.	NET Per C
430	$15.00

ECONOMY TYPE

499	Spring—Gold flash over .0002 Silver	$13.00
498	Spring—.0002 Silver	12.00

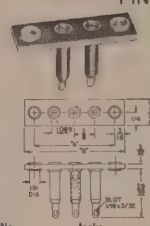
STANDARD DUAL TIP JACK



Same as 489, except:
BODY: Recessed, brass, nickel plated.
DESCR.: Mounts in two 1/2" holes on 3/4" mounting centers in panels up to 1/4" thick. Accommodates standard phone tip plugs. Supplied with two hex nuts. Std. Pkg. 10

No.	NET Per C
488	$65.00

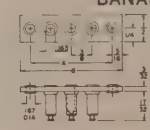
PIN JACK STRIPS



STRIP: LAMINATED PHENOLIC, XP. Black.
BODY: Brass, nickel plated.
SPRING: Phosphor bronze.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty. 1 KV, 60 cycle AC continuous working voltage.
DESCR.: From 2 to 10 pin jacks assembled on 3/8" centers on a heavy-duty board. Provides positive contact with standard phone tip plugs. Mounting holes accept screws up to #8.

No.	Jacks	Mtg. Ctrs. ("A")	Length ("B")	NET Per C
1982	2	1⅛"	1½"	$56.00
1983	3	1½"	1⅞"	72.00
1984	4	1⅞"	2¼"	88.00
1985	5	2¼"	2⅝"	110.00
1986	6	2⅝"	3"	120.00
1987	7	3"	3⅜"	136.00
1988	8	3⅜"	3¾"	152.00
1989	9	3¾"	4⅛"	168.00
1990	10	4⅛"	4½"	184.00

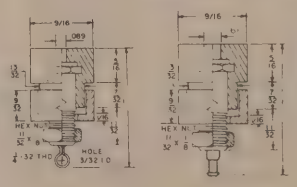
BANANA JACK STRIPS



DESCR.: From 2 to 10 Banana jacks assembled on 3/8" centers on a heavy-duty board. Provides positive contact with standard banana plugs. Mounting holes accept screws up to #8. Std. Pkg. 25

No.	Jacks	Mtg. Ctrs. ("A")	Length ("B")	NET Per C
1972	2	1⅛"	1½"	$39.00
1973	3	1½"	1⅞"	48.00
1974	4	1⅞"	2¼"	57.00
1975	5	2¼"	2⅝"	67.00
1976	6	2⅝"	3"	75.00
1977	7	3"	3⅜"	84.00
1978	8	3⅜"	3¾"	94.00
1979	9	3¾"	4⅛"	103.00
1980	10	4⅛"	4½"	112.00

HIGH VOLTAGE NYLON JACKS



1522

HIGH VOLTAGE NYLON JACKS
Made to meet MS-16107 Spec.

Heavy molded nylon body and cup washer prevent high-voltage flashover to panel. Meets following requirements:

1. Salt Spray Test—Withstands 100 hours.
2. Electrical Rating—15 Amps AC for 10°C Temp. rise, continuous duty. 5 KV 60 cycle AC continuous working voltage. Millivolt drop per MIL-J-6751. CAPACITANCE 2.0 pf.
3. Material Specifications.
   - A. Insulator and Washer:—Molded Nylon, per MIL-P-20693A. Colors to Fed. Std. 595 Specify color as coded above.
   - B. Insert Shell and Nut: Brass, Nickel plated per QQ-N-290, type V (FC).
   - C. Contact: Phosphor bronze, Silver plated .0002" per QQ-S-365, Gold plated overall.

Specify color as coded above, 10 colors. Std. Pkg. 25

No.		NET Per C
1521	Phone Tip	$60.00
1522	Banana	60.00

STANDARD DUAL BANANA JACK

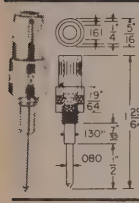
INSULA.: MOLDED black STYRENE.
BODY: Brass, nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty. 2 K Volts 60 cycle AC continuous working voltage. CAPACITANCE 2.0 pf. between conductors, 4.0 pf. to panel.
DESCR.: Mounts in two 1/2" holes on 3/4" mounting centers in panels up to 1/4" thick. Accommodates standard and dual banana plugs. Supplied with two hex nuts, 4 flat washers and brass tinned lugs.

Std. Pkg. 10

No.	NET Per C
489	$65.00

H. H. SMITH ELECTRONIC COMPONENTS

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE



SOLDERLESS TIP PLUG

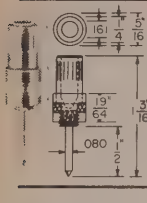
BODY: Brass, nickel plated.
RATING: 12 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Solderless: wire fits through body of tip then wraps around screw portion and tightened with knurled collar. Force fit type. Fits standard phone tip jacks. **Std. Pkg. 100**

No.	Type	NET Per C
105	Senior	$21.00

NEEDLE TIP AND CHUCK

BODY: Brass, nickel plated.
NEEDLE: Steel, nickel plated.
RATING: 12 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Removable chuck for easy replacement. Needle pierces plating or corrosion for positive reading. **Std. Pkg. 100**

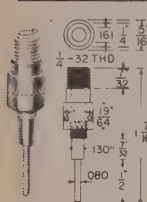
No.	Type	NET Per C
128		$30.00



SOLDERLESS TIP PLUG

BODY: Brass, nickel plated.
RATING: 12 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Solderless: wire fits through body of tip then wraps around screw portion and tightened with knurled collar. Force fit type. Fits standard phone tip jacks. **Std. Pkg. 100**

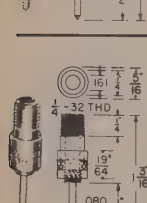
No.	Type	NET Per C
106	Junior	$21.00



SOLDERLESS TIP PLUG
Threaded Sr.

BODY: Brass, nickel plated.
RATING: 12 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Solderless: wire fits through body of tip then wraps around screw portion and tightened with knurled collar. Threaded for easy assembly in plastic handle. Fits standard phone tip jacks. **Std. Pkg. 100**

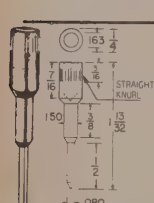
No.	Type	NET Per C
124	Senior	$21.00



SOLDERLESS TIP PLUG
Threaded Jr.

BODY: Brass, nickel plated.
RATING: 12 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Solderless: wire fits through body of tip then wraps around screw portion and tightened with assembly in plastic handle. Fits knurled collar. Threaded for easy standard phone tip jacks. **Std. Pkg. 100**

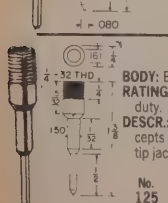
No.	Type	NET Per C
127	Junior	$21.00



HEAVY DUTY TIP PLUG
Force-Fit

BODY: Brass, nickel plated.
RATING: 12 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Extra large well for soldering. Rear of plug accepts standard banana plugs. Fits all standard phone tip jacks. **Std. Pkg. 100**

No.	Type	NET Per C
156	Force Fit	$21.00

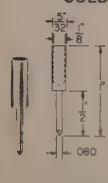


HEAVY DUTY TIP PLUG

BODY: Brass, nickel plated.
DESCR.: Extra large well for soldering. Rear of plug accepts standard banana plugs. Fits all standard phone tip jacks. Threaded for easy assembly in plastic handle. **Std. Pkg. 100**

No.	Type	NET Per C
125	Threaded	$21.00

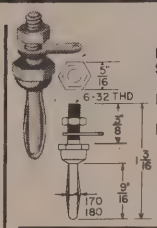
SOLDER TYPE PHONE TIPS



108 123 158

RATING: 12 Amps AC for 10°C Temp. rise, continuous duty.
MATERIAL: Brass, nickel plated. **Std. Pkg. 100**

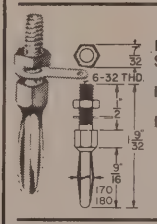
No.	Type	NET Per C
108	Standard	$5.50
123	Large I.D.	$13.00
158	Drawn	2.50



BANANA PLUG

BODY: HEX BRASS, nickel plated.
SPRING: Four-leaved phosphor bronze, nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Supplied with hex nut and phosphor bronze tinned lug. Threaded stud for panel mounting. Fits standard banana jacks. **Std. Pkg. 100**

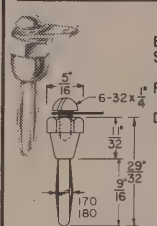
No.	NET Per C
102	$34.00



BANANA PLUG

BODY: HEX BRASS, nickel plated.
SPRING: Four-leaved phosphor bronze, nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Supplied with hex nut and phosphor bronze tinned lug. Threaded stud for panel mounting. Fits standard banana jacks. **Std. Pkg. 100**

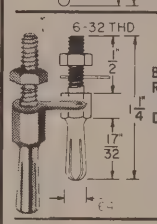
No.	NET Per C
103	$29.00



BANANA PLUG

BODY: HEX BRASS, nickel plated.
SPRING: Four-leaved phosphor bronze or beryllium copper, nickel plated
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Supplied with screw and phosphor bronze tinned lug. Internal female permits use on all size panels. Fits standard banana jacks. **Std. Pkg. 100**

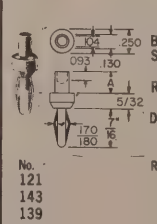
No.	Spring Material	NET Per C
100	Phosphor Bronze	$33.00
190	Beryllium Copper	40.00



BANANA PLUG
Split Type

BODY: HEX BRASS, nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Fits all standard banana jacks. Supplied with hex nut and phosphor bronze lug, threaded stud for panel mounting. Fits standard banana jacks. **Std. Pkg. 100**

No.	NET Per C
104	$22.00



MIDGET BANANA PLUG
Rivet Type

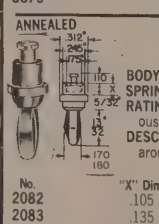
BODY: BRASS, silver plated.
SPRING: Four-leaved phosphor bronze, silver plated.
RATING: 10 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Rivet body can be flanged into countersunk hole in chassis for flush mount, or curled for thinner chassis plates. **Std. Pkg. 100**

No.	Rivet Length "A"	NET Per C
121	7/32"	$22.00
143	5/16"	22.00
139	1/8"	22.00
3875	Staking Tool	Net Ea $1.50

MIL-SPEC. TYPE

Same as above, made to meet Signal Corps drawings **Std. Pkg. 100**

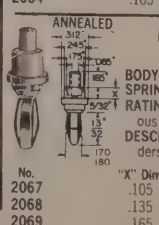
No.	Rivet Length "A"	NET Per C
122	0.261	$25.00
3875	Staking Tool	Net Ea $1.50



RIVET TYPE BANANA PLUG
Wrap Around Type

BODY: BRASS, nickel plated.
SPRING: Four leaved, beryllium copper, nickel plated.
RATING: 10 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Rivets to panel or bakelite board. Wire wraps around stud and is then soldered. **Std. Pkg. 100**

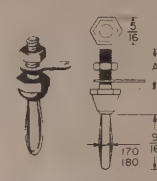
No.	"X" Dim.	Panel	NET Per C
2082	.105	1/16"	$33.00
2083	.135	3/32"	33.00
2084	.165	1/8"	33.00



RIVET TYPE BANANA PLUG
Solder Well Type

BODY: BRASS, nickel plated.
SPRING: Four leaved, beryllium copper, nickel plated.
RATING: 10 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Rivets to panel or bakelite board. Wire solders to well in rear of plug. **Std. Pkg. 100**

No.	"X" Dim.	Panel	NET Per C
2067	.105	1/16"	$33.00
2068	.135	3/32"	33.00
2069	.165	1/16"	33.00

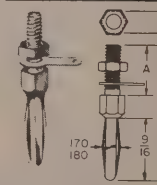


BANANA PLUG

BODY: HEX BRASS, nickel or silver plated.
SPRING: Phosphor bronze or beryllium copper, nickel or silver plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Supplied with hex nut and tinned phosphor bronze lug threaded stud for panel mounting. Fits standard banana jacks. **Std. Pkg. 100**

PHOS. BR. SPRING Nickel Plated Overall				BERYL. COP. SPRING Nickel Plated Overall	
No.	NET Per C	A	B	No.	NET Per C
431	$34.00	6-32x3/8"	1 7/32"	443	$39.00
432	37.00	6-32x1/2"	1 7/32"	444	42.00
433	40.00	6-32x3/4"	1 19/32"	445	45.00
434	34.00	8-32x3/8"	1 7/32"	446	39.00
435	37.00	8-32x1/2"	1 1/32"	447	42.00
436	40.00	8-32x3/4"	1 19/32"	448	45.00

PHOS. BR. SPRING Silver Plated Overall				BERYL. COP. SPRING Silver Plated Overall	
No.	NET Per C	A	B	No.	NET Per C
437	$37.00	6-32x3/8"	1 7/32"	449	$42.00
438	40.00	6-32x1/2"	1 1/32"	450	45.00
439	43.00	6-32x3/4"	1 19/32"	451	48.00
440	37.00	8-32x3/8"	1 7/32"	452	42.00
441	40.00	8-32x1/2"	1 1/32"	453	45.00
442	43.00	8-32x3/4"	1 19/32"	454	48.00

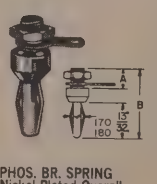


BANANA PLUG

BODY: HEX BRASS, nickel or silver plated.
SPRING: Phosphor bronze or beryllium copper, nickel or silver plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Supplied with hex nut and tinned phosphor bronze lug threaded stud for panel mounting. Fits standard banana jacks. **Std. Pkg. 100**

PHOS. BR. SPRING Nickel Plated Overall				BERYL. COP. SPRING Nickel Plated Overall	
No.	NET Per C	A	B	No.	NET Per C
401	$28.00	6-32x3/8"	1 7/32"	414	$31.00
403	29.00	6-32x1/2"	1 1/32"	415	34.00
404	33.00	6-32x3/4"	1 19/32"	416	39.00
405	28.00	8-32x3/8"	1 7/32"	417	31.00
406	29.00	8-32x1/2"	1 1/32"	418	34.00
407	33.00	8-32x3/4"	1 19/32"	419	39.00

PHOS. BR. SPRING Silver Plated Overall				BERYL. COP. SPRING Silver Plated Overall	
No.	NET Per C	A	B	No.	NET Per C
408	$31.00	6-32x3/8"	1 7/32"	420	$34.00
409	32.00	6-32x1/2"	1 1/32"	421	37.00
410	36.00	6-32x3/4"	1 19/32"	422	42.00
411	31.00	8-32x3/8"	1 7/32"	423	34.00
412	32.00	8-32x1/2"	1 1/32"	424	37.00
413	36.00	8-32x3/4"	1 19/32"	425	42.00

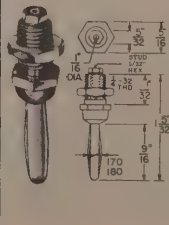


MIDGET BANANA PLUG

BODY: BRASS, nickel or silver plated.
SPRING: Phosphor bronze or beryllium copper, nickel or silver plated.
RATING: 10 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Supplied with hex nut and tinned phosphor bronze lug threaded stud for panel mounting. Fits standard banana jacks. **Std. Pkg. 100**

PHOS. BR. SPRING Nickel Plated Overall				BERYL. COP. SPRING Nickel Plated Overall	
No.	NET Per C	A	B	No.	NET Per C
460	$29.00	4-40x3/8"	15/16"	468	$33.00
461	29.00	4-40x1/2"	1 1/16"	469	33.00
462	29.00	6-32x3/8"	15/16"	470	33.00
463	29.00	6-32x1/2"	1 1/16"	471	33.00

PHOS. BR. SPRING Silver Plated Overall				BERYL. COP. SPRING Silver Plated Overall	
No.	NET Per C	A	B	No.	NET Per C
464	$32.00	4-40x3/8"	15/16"	472	$36.00
465	32.00	4-40x1/2"	1 1/16"	473	36.00
466	32.00	6-32x3/8"	15/16"	474	36.00
467	32.00	6-32x1/2"	1 1/16"	475	36.00



BANANA PLUG

BODY: BRASS, nickel plated
SPRING: Phosphor bronze or beryllium copper, nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Supplied with hex nut. Wire can be soldered to brass stud or directly into plug itself. Stud also locks wire to plug for solderless connection. **Std. Pkg. 50**

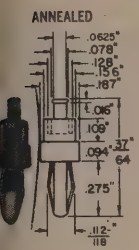
No.	Spring Material	NET Per C
145	Phosphor Bronze	$34.00
135	Beryllium Copper	40.00

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

ELECTRONIC COMPONENTS by H. H. SMITH

SUBMINIATURE PLUGS & JACKS

ANNEALED

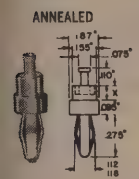


MINIATURE BANANA PLUG Rivet Type

BODY: Brass, nickel plated.
SPRING: Four-leaved beryllium copper, silver plated.
RATING: 10 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: One piece beryllium copper spring insures positive and lasting contact.
Std. Pkg. 100

No.		NET Per C
191		$21.00
No. 3876	Staking Tool Kit	Net Ea $3.00

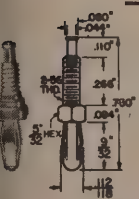
ANNEALED



MINIATURE BANANA PLUG Rivet Type

BODY: Brass, silver plated.
SPRING: Four-leaved beryllium copper, silver plated.
RATING: 10 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: One piece beryllium copper spring insures positive and lasting contact.
Std. Pkg. 100

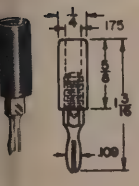
No.	"X" Dim.	Panel	NET Per C
2073	.105	1/16"	$21.00
2074	.135	3/32"	21.00
2075	.165	1/8"	21.00
No. 3876	Staking Tool Kit		Net Ea. $3.00



MINIATURE BANANA PLUG

BODY: Brass, silver plated.
SPRING: Four-leaved beryllium copper, silver plated.
RATING: 10 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: One piece beryllium copper spring insures positive and lasting contact.
Std. Pkg. 100

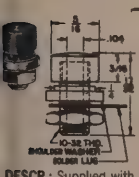
No.	NET Per C
192	$30.00



INSULATED BANANA PLUG Miniature

HANDLE: MACHINED BUTYRATE, per Fed. Spec. L-P344, Type I, Class MH, Red or Black. SPECIFY COLOR
PLUG: Brass, nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Cross-slotted for spring tension. Wire solders directly into plug. Fits standard midget banana jacks. **Std. Pkg. 100**

No.	NET Per C
197	$32.00

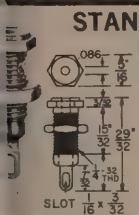


INSULATED BANANA JACK Miniature

HEAD: MACHINED BUTYRATE, per Fed. Spec. L-P344, Type i, Class MH, Red or Black. SPECIFY COLOR
BODY: Brass, nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty. 750 volts 60 cycle AC continuous working voltage. CAPACITANCE 6.0 pf.
DESCR.: Supplied with hex nut, fibre washer and tinned lug. Mounts in 1/4" hole in panels up to 1/8" thick. Accepts standard midget banana plugs. **Std. Pkg. 100**

No.	NET Per C
196	$40.00

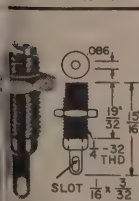
STANDARD TIP JACKS



PHONE TIP JACK

BODY: Brass, nickel plated.
SPRING: Phosphor bronze.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Positive contact with standard phone tip plugs. Supplied hex nut. Mounts in 1/4" hole in panels up to 3/8" thick. **Std. Pkg. 100**

No.	NET Per C
107	$28.00



HEADLESS PHONE TIP JACK

BODY: Brass, nickel plated.
SPRING: Phosphor bronze.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Supplied with hex nut. Used with plastic molded instrument cases, where jack body is screwed into case. Accepts standard phone tip plugs. **Std. Pkg. 100**

No.	NET Per C
147	$17.00

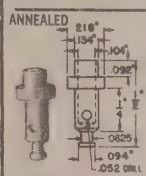
ORIGINAL EQUIPMENT MANUFACTURER:
Contact the Smith factory for your production requirements of Smith standard products.

MINIATURE BANANA JACK

BODY: Brass, silver plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: This jack is riveted directly to chassis or to printed circuit board for easy assembly. **Std. Pkg. 1000**

No.		NET Per M
194		$27.00
No. 3875	Staking Tool	NET Ea $1.50

ANNEALED

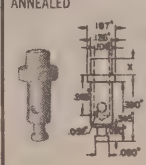


MINIATURE BANANA JACK

BODY: Brass, silver plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: This jack is riveted directly to chassis or to printed circuit board for easy assembly. **Std. Pkg. 100**

No.		NET Per C
193		$15.00
No. 3860	Staking Tool Kit	Net Ea. $3.00

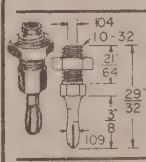
ANNEALED



MINIATURE BANANA JACK Panel Mount

BODY: Brass, silver plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: This jack is riveted directly to chassis or to printed circuit board for easy assembly. **Std. Pkg. 100**

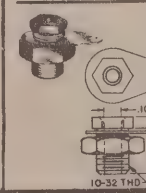
No.	"X" Dim.	Panel	NET Per C
2076	.105	1/16"	$15.00
2077	.135	3/32"	15.00
2078	.165	1/8"	15.00
No. 3860	Staking Tool Kit		Net Ea $3.00



MINIATURE BANANA PLUG

BODY: Brass, nickel plated.
RATING: 10 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Cross-slotted, supplied with hex nut. Fits midget banana jacks. **Std. Pkg. 100**

No.	NET Per C
111	$17.00

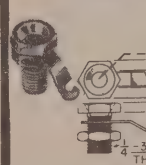


MINIATURE BANANA JACK

BODY: Hex brass, nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Supplied with hex nut and tinned lug. Mounts in .196 (#10) hole in panels up to 1/8" thick. Accepts standard midget banana plugs. **Std. Pkg. 100**

No.	NET Per C
195	$20.00

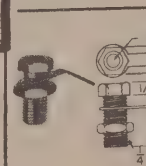
STANDARD BANANA JACKS



BANANA JACK

BODY: Hex brass, nickel plated. with recessed head.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Supplied with hex nut and brass tinned lug. Mounts in 1/4" hole; fits panels up to 5/16" thick. Accepts standard banana plugs. **Std. Pkg. 100**

No.	NET Per C
101	$19.00

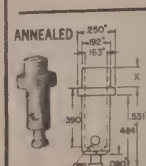


BANANA JACK

BODY: Hex brass, nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Supplied with hex nut and brass tinned lug. Mounts in 1/4" hole in panels up to 3/8" thick. Accepts standard banana plugs. **Std. Pkg. 100**

No.	NET Per C
109	$19.00

ANNEALED



PANEL MOUNT BANANA JACK

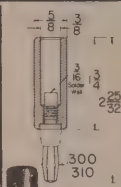
BODY: Brass, nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Accepts all standard banana plugs. These jacks are riveted directly to chassis or bakelite board. **Std. Pkg. 100**

No.	"X" Dim.	Panel	NET Per C
2079	.105	1/16"	$18.00
2080	.135	3/32"	18.00
2081	.165	1/8"	18.00

NEED SPECIAL BINDING POSTS?

We Design and Produce to Your Individual Needs

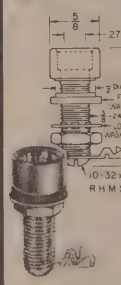
GIANT BANANA PLUGS & JACKS



INS. GIANT BANANA PLUG

HANDLE: MACHINED PHENOLIC plastic. Red or Black. SPECIFY COLOR
BODY: Hex brass, nickel plated.
SPRING: Six-leaved phosphor bronze, nickel plated.
RATING: 25 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Large deep internal well for soldering heavy duty wire. Recessed so that no metal portions are exposed when plugged into mating jack in order to present shocks or grounding. **Std. Pkg. 50**

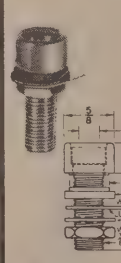
No.	NET Per C
285	$150.00



INS. GIANT BANANA JACK

HEAD: MACHINED BUTYRATE, per Fed. Spec. L-P344, Type I, class MH, Red or Black. SPECIFY COLOR
BODY: Hex brass, nickel plated.
RATING: 25 Amps AC for 10°C Temp. rise, continuous duty. 1K Volts 60 cycle AC continuous working voltage. CAPACITANCE 7.0 pf.
DESCR.: Supplied with hex nut, fibre washer, lock-washer, screw and tinned copper lug. Jack body recessed for snug contact. Mounts in 1/2" hole in panel up to 3/4" thick. **Std. Pkg. 50**

No.	NET Per C
286	$95.00



INS. GIANT BANANA JACK

HEAD: MACHINED BUTYRATE, per Fed. Spec. L-P344, Type I, class MH, Red or Black. SPECIFY COLOR
BODY: Hex brass, nickel plated.
RATING: 25 Amps AC for 10°C Temp. rise, continuous duty. 1K Volts 60 cycle AC continuous working voltage. CAPACITANCE 7.0 pf.
DESCR.: Supplied with hex nut, fibre washer, lock-washer, and brass tinned lug. Jack body recessed for snug contact. Mounts in 1/2" hole in panel up to 3/4" thick. **Std. Pkg. 50**

No.	NET Per C
287	$95.00

GIANT BANANA PLUG

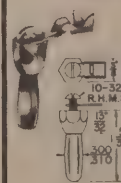
BODY: Hex brass, nickel plated.
SPRING: Six-leaved phosphor bronze, nickel plated.
RATING: 25 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Supplied with hex nut and brass tinned lug. Large deep internal well for soldering heavy duty wire. **Std. Pkg. 50**

No.	NET Per C
185	$90.00

GIANT BANANA PLUG

BODY: Hex brass, nickel plated.
SPRING: Six-leaved phosphor bronze, nickel plated.
RATING: 25 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Supplied with screw and brass tinned lug, internal female permits use on all size panels. **Std. Pkg. 50**

No.	NET Per C
186	$80.00



GIANT BANANA PLUG

BODY: Hex brass, nickel plated.
SPRING: Six-leaved phosphor bronze, nickel plated.
RATING: 25 Amps AC for 10°C Temp. rise continuous duty.
DESCR.: Supplied with screw and brass tinned lug. Internal female thread permits use on all size panels. **Std. Pkg. 50**

No.	NET Per C
188	$65.00

GIANT BANANA PLUG

BODY: Hex brass, nickel plated.
RATING: 25 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Supplied with hex nut and brass tinned lug. **Std. Pkg. 50**

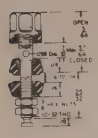
No.	Hex Head	Mtg. Hole	Panel	NET Per C
187	1/2"	3/8"	1/2"	$60.00
157	5/8"	1/2"	5/8"	70.00

187

INSULATED BINDING POSTS

30 AMPS RATING HEX AND FLUTED HEADS

257



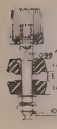
HEAD: CAPTIVE MOLDED LEXAN WITH BRASS. GOLD PLATED INSERT.
BODY: Brass Gold Plated.
WASHERS: Molded Lexan, with Gold-Plated Brass Insert.
RATINGS: 30 Amps AC for 10C Temp. rise, continuous duty. 2 KV AC 60 Hertz, continuous working voltage. 5.0 pf. capacitance to 1/8" thick aluminum panel.
ACCEPTS: Phone tip plug, spade lug, banana plug, alligator clip, stranded or solid wire up to 14 awg.
DESCR: Captivated Lexan head to prevent loss. Keyed. Lexan base washers completely insulate post from panel and prevent turning. Mounts in 1/2" round or single "D" hole as indicated. Wires directly to wrap-around solder turret, or to solder lug (not supplied) between nuts.
COLORS: Red, black, yellow, green, blue white.

No.	Type	SPECIFY COLOR Std. Pkg. 100 NET Per C
257	Hex Head	$65.00
459	Fluted Head	65.00

459

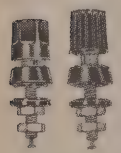
MIL-SPEC BINDING POSTS per MIL-P-55149/1

Same as Types 257 and 459 above, except meets requirements of MIL-P-55149/1. Dtd. 1 Nov. 1961. Brass per QQ-B-626, Comp. 22. Includes gold-plated flat washer and internal tooth lockwasher. **Std. Pkg. 100**



No.	Type	Head	NET Per C
267-102 (Red)	PB01FA03	Hex	$70.00
267-103 (Black)	PB01FA04	Hex	70.00
495-102 (Red)	PB01FA03	Fluted	70.00
495-103 (Black)	PB01FA04	Fluted	70.00

ECONOMY TYPE GOLD PLATE


1257 1259 898 897

Same as Types 257 and 459, except utilizes solid molded lexan keyed back-up washer, instead of brass-insert washer. Provides same usage and features with added economy. Colors: Red, black, yellow, green, blue and white. **Std. Pkg. 100**

No.	Type	NET Per C
1257	Hex Head	$58.00
1259	Fluted Head	58.00

COMMERCIAL TYPE BRIGHT TIN PLATE

799

Same as Types 257 and 259 except all metal parts are nickel plated instead of gold. Supplied in red and black only. **Std. Pkg. 100**

No.	Type	NET Per C
899	Hex Head	$58.00
799	Fluted Head	58.00

COMMERCIAL TYPE with LEXAN WASHER BRIGHT TIN PLATE

899

Same as Types 257 and 459, except all metal parts are nickel plated instead of gold, and utilizes solid molded lexan keyed back-up washer, instead of brass-insert washer. Provides same usages and features with maximum economy. Supplied in red and black only. **Std. Pkg. 100**

No.	Type	NET Per C
898	Hex Head	$51.00
897	Fluted Head	51.00

"D" PUNCH

Designed to punch a "D" HOLE ½" x 15/32" for use with all binding posts on top half of page.

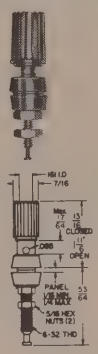
No. 3837 **$13.55 Ea.**

MIL-SPEC BINDING POST Made to meet MIL-P-55149/8

HEAD & BODY: Brass. Silver-Plated.
SPRING & CONTACT PLATE: Steel.
WASHERS: Molded Nylon.
O-RINGS AND CAP: Silicon Rubber. Red or Black Cap. SPECIFY COLOR.
DESCR.: Style U-106/U binding post (Sig. Corp. Dwng. SC-C-16495). Meets requirements of Mil-P-55149/8, DTD 30 Sep 1963. Mounts in 5/16" hole, in panels from 1/16" to ⅛" thick. "O" ring seals provide waterproof seal in panel. Push on cap opens slot in which wire is inserted. Releasing cap grips wire with heavy spring pressure on serrated steel plates for minimum contact resistance. Provided with either red or black silicon rubber insulating cap boot. **Std. Pkg. 5**

No.	Type	NET Ea.
1837-102 (Red)	PB08NA02	$5.00
1837-103 (Black)	PB08NA01	5.00

15 AMPS RATING



HEAD: CAPTIVE, MOLDED LEXAN, with brass Gold-Plated insert.
BODY: Brass, Gold Plated.
WASHERS: MOLDED LEXAN, with brass Gold-plated inserts.
ACCEPTS: Phone tip plug, spade lug, banana plug, alligator clip, or wire strand.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty. 1 KV Volts 60 cycle AC continuous working voltage. CAPACITANCE 3.0 pf.
DESCR.: Molded washers completely insulate post from panel. Minature washers and narrow fluted head require minimum panel space. Mounts in 3/8" round or "D" hole in panel as indicated. Wrap-around solder terminal on stud for direct connection.
COLORS: Red, Black, Yellow, Green, Blue, White. **SPECIFY COLOR Std. Pkg. 100**

No.	NET Per C
1517	$65.00

MIL-SPEC BINDING POSTS per MIL-P-55149/1

Same as Type 1517 above, except meets requirements of MIL-P-55149/1, Dtd. 1 Nov. 1961. Brass per QQ-B-626, Comp. 22. Includes gold-plated flat washer and internal tooth lockwasher. Behind-panel length is .690" instead of 53/64". **Std. Pkg. 100**

No.	Type No.	NET Per C
1514-102 (Red)	PB01FA01	$70.00
1514-103 (Black)	PB01FA02	70.00

ECONOMY TYPE GOLD PLATE

1277

Same as Type 1517, except utilizes solid molded lexan keyed back-up washer, instead of brass-insert washer. Provides same usage and features with added economy. Red, black, yellow, green, blue, and white. Specify color, as coded above. **Std. Pkg. 100**

No.	NET Per C
1277	$58.00

COMMERCIAL TYPE BRIGHT TIN PLATE

1275

Same as Type 1517, except all metal parts are nickel plated, instead of gold. Supplied in red and black only. **Std. Pkg. 100**

No.	NET Per C
1275	$58.00

COMMERCIAL TYPE with LEXAN WASHER BRIGHT TIN PLATE

1276

Same as Type 1517, except all metal parts are nickel plated, instead of gold, and utilizes solid molded lexan keyed backup washer, instead of brass-insert washer. Provides same usages and features with maximum economy. Supplied in red and black only. **Std. Pkg. 100**

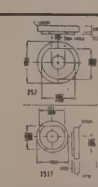
No.	NET Per C
1276	$51.00

ALL-INSULATED BINDING POST

HEAD: Captive molded Lexan, per MIL-P-20693A.
BODY: Brass, Silver plated.
NUT: Brass, nickel plated; 5/16-32, 3/32 thick, 7/16 A.F.
ACCEPTS: Phone tip plug, banana plug, alligator clip, spade lug, or wire strand.
RATING: 15 amps AC for 10°C temp. rise, continuous duty. 5 KV, 60 Hz. Continuous working voltage. Capacitance 3.3 PF.
DESCR: Single threaded body mounts in 5/16 round, or double D hole without loose washers or nuts. Bushing dimensions similar to our No. 1509. Wrap-around solder terminal on stud for direct connection.
COLORS: Red, Black, Yellow, Green, Blue, White. Specify color as coded above. **Std. Pkg. 100**

No.	Type	NET Per C
1463	Round	50.00
1464	Double "D"	50.00

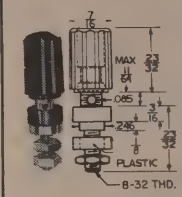
LEXAN WASHERS



COLORS: Red, Black, Yellow, Green, Blue, White. **SPECIFY COLOR Std. Pkg. 100**

No.	NET Per C
257-12	$5.00
1517-12	5.00

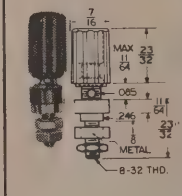
BINDING POST - Insulated



HEAD: CAPTIVE: MOLDED LEXAN. Red or Black. SPECIFY COLOR.
BODY: Brass, nickel plated.
WASHERS: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS.
ACCEPTS: Phone tip plug, spade lug, banana plug, alligator clip or wire strand.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty. 1 K Volts 60 cycle AC continuous working voltage. CAPACITANCE 5.0 mmfd.
DESCR.: Mounts in ¼" hole in panel. Supplied with one hex nut. **Std. Pkg. 100**

No.	NET Per C
1480	$36.00

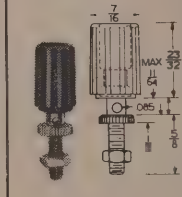
BINDING POST - Grounded



HEAD: CAPTIVE: MOLDED LEXAN. Red or Black. SPECIFY COLOR.
BODY: Brass, nickel plated.
WASHERS: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Mounting Washer—Molded plastic. Back-up Washer—Brass, nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Mounts in ¼" hole in panel. Grounded to panel by back-up washer. Supplied with one hex nut. **Std. Pkg. 100**

No.	NET Per C
1481	$33.00

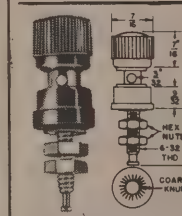
BINDING POST - Grounded



HEAD: GROUNDED MOLDED LEXAN. CAPTIVE: MOLDED.
COLORS: Available in Red, Black, Yellow, Green, Blue and White. SPECIFY COLOR
BODY: Brass, nickel plated.
ACCEPTS: Phone tip plug, spade lug, banana plug, alligator clip or wire strand.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty. 1 K Volts 60 cycle AC continuous working voltage, when insulated from panel as recommended. CAPACITANCE 5.0 mmfd.
DESCR.: Can be completely insulated from panel by using our 2155 and 2163 fibre washers, supplied with 2 hex nuts. **Std. Pkg. 100**

No.	Stud	NET Per C
1482	8-32 x 1/2"	$34.00
1483	6-32 x 3/8"	34.00

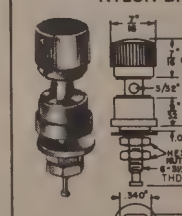
NYLON BINDING POST Grounded



HEAD: CAPTIVE MOLDED NYLON, per MIL-P-20693A. Red or Black with brass nickel plated insert. SPECIFY COLOR
WASHER: Molded nylon with brass nickel plated insert.
BODY: Brass, nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty. 1K Volts 60 cycle AC continuous working voltage. CAPACITANCE 6.0 pf.
DESCR.: Supplied with 2 hex nuts. Grounds to panel but supplied with nylon washer for uniformity of height with No. 378 when used on same panel. Can be installed from panel by using our No. 2150 shoulder washer. **Std. Pkg. 100**

No. 377 **NET Per C $60.00**

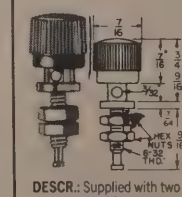
NYLON BINDING POST: Insulated



HEAD: CAPTIVE: MOLDED NYLON, per MIL-P-20693A. Red or Black with brass nickel plated insert. SPECIFY COLOR
WASHER: Molded nylon with brass nickel plated insert.
BODY: Brass, nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty. 1K Volts 60 cycle AC continuous working voltage. CAPACITANCE 4.0 pf.
DESCR.: Supplied with two hex nuts. Boss washer insulated post from chassis when used with bakelite washer supplied. **Std. Pkg. 100**

No.	Min. Panel Thickness	NET Per C
378	1/16"	$60.00

NYLON BINDING POST Grounded



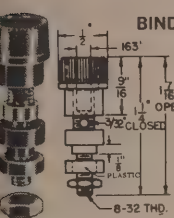
HEAD: CAPTIVE MOLDED NYLON, per MIL-P-20693A. Red or Black with brass nickel plated insert. SPECIFY COLOR
BODY: Brass, nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty. 1K Volts 60 cycle AC continuous working voltage. CAPACITANCE 7.0 pf.
DESCR.: Supplied with two hex nuts. Can be insulated from panel by using our No. 2150 shoulder washer and 2162 flat washer. **Std. Pkg. 100**

No. 379 **NET Per C $55.00**

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

ELECTRONIC COMPONENTS H. H. SMITH

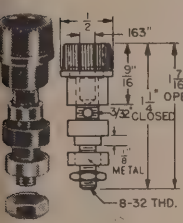
BINDING POST Insulated



HEAD: CAPTIVE MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red or black. SPECIFY COLOR
BODY: Brass, nickel plated.
WASHERS: MOLDED BUTYRATE, per Fed Spec. L-P349A, Type 3, Class MS.
ACCEPTS: Phone tip plug, spade lug, banana plug, alligator clip or wire strand.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty. 1K Volts 60 cycle AC continuous working voltage. CAPACITANCE 5.0 pf.
DESCR.: Mounts in 1/4" hole in panel. Supplied with one hex nut. **Std. Pkg. 100**

No.	NET Per C
386	$36.00

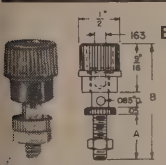
BINDING POST Grounded



HEAD: CAPTIVE MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red or black. SPECIFY COLOR
BODY: Brass, nickel plated.
WASHERS: MOLDED BUTYRATE, per Fed Spec. L-P349A, Type 3, Class MS. Mounting Washer—Molded plastic. Back-up Washer—Brass, nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Mounts in 1/4" hole in panel. Grounded to panel by back-up washer. Supplied with one hex nut. **Std. Pkg. 100**

No.	NET Per C
387	$33.00

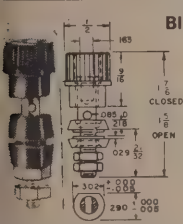
BINDING POST Grounded



HEAD: CAPTIVE MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red or black. SPECIFY COLOR
BODY: Brass, nickel plated.
ACCEPTS: Phone tip plug, spade lug, banana plug, alligator clip or wire strand.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty. 1K Volts 60 cycle AC continuous working voltage. CAPACITANCE 5.0 pf.
DESCR.: Can be completely insulated from panel by using our 2155 and 2163 fibre washers. **Std. Pkg. 100**

No.	Description	NET Per C
220	8-32 x 1/2 Stud	$34.00
230	6-32 x 3/8 Stud	34.00

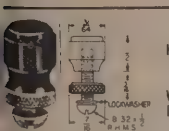
BINDING POST Insulated



HEAD: CAPTIVE MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red or black. SPECIFY COLOR
BODY: Brass, nickel plated.
WASHERS: MOLDED BUTYRATE, per MIL-L-P349A, Type 3, Class MS. With brass inserts.
ACCEPTS: Phone tip plug, spade lug, banana plug, alligator clip or wire strand.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty. 1K Volts 60 cycle AC continuous working voltage. CAPACITANCE 3.0 pf.
DESCR.: Mounts in 5/16" hole in panel with milled slot for locking, supplied with two hex nuts. **Std. Pkg. 100**

No.	Description	NET Per C
260	8-32 Stud	$55.00
259	6-32 Stud	55.00

BINDING POST



HEAD: MOLDED PHENOLIC plastic, with molded-in brass threaded insert. Red or Black. SPECIFY COLOR
WASHER: brass nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Supplied complete with screw and lockwasher. **Std. Pkg. 100**

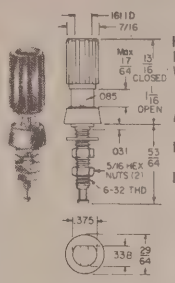
No.	NET Per C
266	$30.00

BINDING POST KNOBS

Threaded 8-32 brass inserts **Std. Pkg. 50**

No.	Style	O.D.	Height	Color	NET Per C
2271	A	3/4"	1/2"	Black	$17.00
2272	A	3/4"	1/2"	Red	18.00
2285	B	1/2"	7/16"	Red	13.00
2286	B	1/2"	7/16"	Black	13.00
2287	C	1/2"	1/2"	Red	13.00
2288	C	1/2"	1/2"	Black	13.00

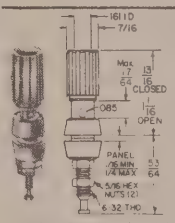
METAL BINDING POST Grounded



HEAD: CAPTIVE, Fluted Brass, Gold-plated.
BODY: Brass, gold plated.
WASHER: MOLDED BLACK NYLON, per MIL-P-20693A, with brass Gold-plated insert.
ACCEPTS: Phone tip plug, spade lug, banana plug, alligator clip or wire strand.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Fluted-head metal post to match our No. 1517. For use where direct ground connection is made to panel or chassis. Supplied with brass, gold-plated flat metal washer for grounding. **Std. Pkg. 100**

No.	NET Per C
1518	$90.00

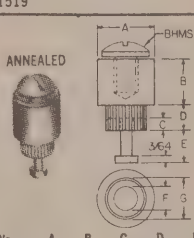
METAL BINDING POST INSULATED



HEAD: CAPTIVE, Fluted Brass, Gold-plated.
BODY: Brass, gold plated.
WASHER: MOLDED BLACK NYLON, per MIL-P-20603A, with brass Gold-plated insert.
ACCEPTS: Phone tip plug, spade lug, banana plug, alligator clip, or wire strand.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty. 1K Volts 60 cycle AC continuous working voltage. CAPACITANCE 3.0 pf.
DESCR.: Fluted-head metal post to match our No. 1517. Mounts in 3/8" round or "D" hole in panel. Molded washers insulate post from panel for use where internal ground circuit is isolated from chassis or panel. **Std. Pkg. 100**

No	NET Per C
1519	$95.00

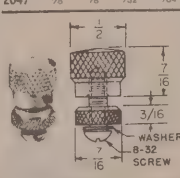
COMBINATION TERMINALS



MATERIAL: BRASS, alloy plate.
DESCR.: Combination Screw and Turret Terminal. Knurled shank prevents turning. Supplied complete with BHMS and Internal Tooth Lockwasher, unassembled. **Std. Pkg. 25**

No.	A	B	C	D	E	F	G	BH MS	Panel Thk	NET Per C
2045	5/16	1/4	1/16	9/64	1 1/64	1/8	.220	6-32	3/32	$20.00
2046	1 1/32	5/16	9/64	1 1/64	13/64	9/64	.250	8-32	1/8	20.00
2047	3/8	3/8	5/32	1 5/64	13/64	5/32	.257	10-32	3/16	20.00

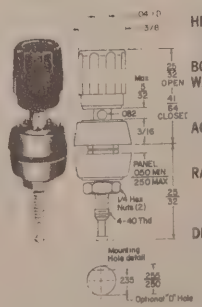
METAL BINDING POST



HEAD: BRASS, nickel plated.
WASHER: Brass, nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Supplied complete with screw and lockwasher. **Std. Pkg. 100**

No.	NET Per C
110	$35.00

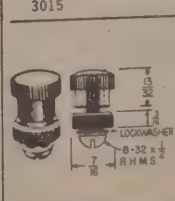
MINIATURE BINDING POST



HEAD: Captive MOLDED NYLON, per MIL-P-20693A, with Brass, gold plated insert.
BODY: Brass, gold plated.
WASHERS: Molded Nylon, per MIL-P-20693A, with Brass Gold Plated inserts.
ACCEPTS: Standard .080" phone tip, #6 spade lug, miniature banana plug, alligator clip or wire.
RATING: 5 Amps AC for 10°C Temp. rise, continuous duty. 1K Volts 60 cycle AC continuous working voltage. CAPACITANCE 2.5 PF.
DESCR.: Compact Binding post designed for use with miniaturized equipment. Molded washers completely insulate post from panel. Mounts in 1/4 round or "D" hole in panel as indicated. Wrap-around solder turret for direct wire connection.
COLORS: Red, Black, Yellow, Green, Blue, White. SPECIFY COLOR by adding Color Code suffix to basic Catolog No. **Std. Pkg. 100**

No.	NET Per C
3015	$60.00

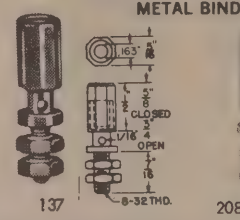
BINDING POST



HEAD: MOLDED PHENOLIC plastic, with molded-in brass threaded insert. Red or Black. SPECIFY COLOR
WASHER: Brass, nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Supplied complete with screw and lockwasher. **Std. Pkg. 100**

No.	NET Per C
265	$30.00

METAL BINDING POST

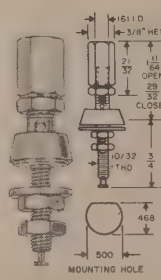


137 208

HEAD: CAPTIVE, octagonal brass, nickel plated
BODY: Brass, nickel plated.
ACCEPTS: Phone tip, spade lug, banana plug, alligator clip or wire strand.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty 1 K Volts 60 cycle AC continuous working voltage. CAPACITANCE 5.0 mmfd.
DESCR.: Can be completely insulated from panel by using fibre washers. Supplied with two hex nuts. **Std. Pkg. 100**

No.	Description	NET Per C
137	Standard	$50.00
208	Wrap-around	65.00

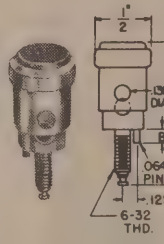
METAL BINDING POST



HEAD: Captive, Hex Brass, Nickel plated.
BODY: Brass, Nickel plated
ACCEPTS: Phone tip plug, spade lug, banana plug, alligator clip or wire strand.
RATING: 30 Amps AC for a 10°C temp. rise, continuous duty
DESC.: Mounts in a 1/2" round or "D" hole For use where direct ground connection is made to panel or chassis 1/32 to 3/8 max. thickness. Supplied with Nickel plated flat metal washer for grounding and 2-10/32 Nickel plated nuts. **Std. Pkg. 100**

No.	NET Per C
1835	$65.00

BINDING POST Spring Loaded



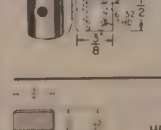
HEAD: Captive brass, nickel plated.
CAP: STYRENE, Red or black. SPECIFY COLOR
BODY: Brass, nickel plated.
PIN: Nickel Silver.
ACCEPTS: Standard phone tip or wire in side hole and locks them in place on release of pressure on cap.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Side dowel pin locates and prevents post from turning when mounted in panel. **Std. Pkg. 100**

A	B	Dowel Pin No.	With Dowel Pin NET Per C	Less Dowel Pin No.	NET Per C
5/16"	1/8"	2701	$65.00	2801	$60.00
3/8"	1/8"	2702	67.00	2802	62.00
1/2"	1/4"	2703	69.00	2803	64.00
3/4"	1/4"	2704	71.00	2804	68.00
1"	3/8"	2705	75.00	2805	70.00

Same as above less threaded stud. Supplied with 6-32 internal mounting thread. **Std. Pkg. 50**

No.	Description	NET Per C
2709	With 1/8" lg. Dowel Pin	$50.00
2809	Without Dowel Pin	50.00

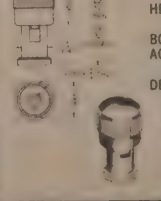
METAL BINDING POST



HEAD: BRASS, nickel plated.
BODY: Brass, nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Accepts standard phone tips or banana plugs. **Std. Pkg. 100**

No.	NET Per C
136	$35.00

BINDING POST Compression Type



HEAD: Captive, brass nickel plated. Straight knurled for finger grip.
BODY: Brass, nickel plated
ACCEPTS: Phone tips or wire (up to #10 gauge.)
DESCR.: Head screws down to compress wire between body and sliding contact. Internally threaded for 6-32 mounting screw. Base knurled for positive grip to panel. **Std. Pkg. 100**

No.	NET Per C
159	$30.00

H. H. SMITH ELECTRONIC COMPONENTS

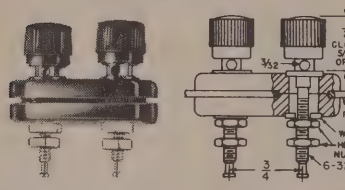
STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

DUAL BINDING POST

INSUL.: MOLDED black STYRENE, cross slotted (+) to accept standard phone tips in post either forward, or sideways.
BODY: Brass, nickel plated.
HEAD: Captive, MOLDED LEXAN, per MIL-P-20693A, with molded in brass insert.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty. 2K Volts 60 cycle AC continuous working voltage. CAPACITANCE 2.0 pf, between conductors, 3.0 pf to panel.
DESCR.: Mounts in two 1/2" holes on 3/4" mounting centers in panels up to 1/4" thick. Accommodates single or dual banana plugs. Supplied with 4 hex nuts, 2 flat washers. **Std. Pkg. 25**

No.	Description	NET Per C
269BB	Two Black Heads	$125.00
269RR	Two Red Heads	125.00
269RB	One Red, One Black Head	125.00

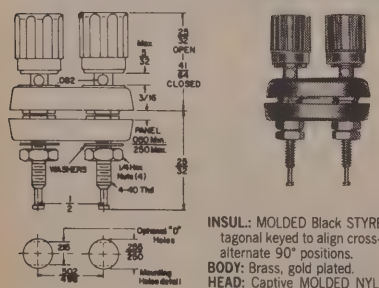
DUAL BINDING POST NYLON



INSUL.: MOLDED black STYRENE, cross slotted (+) to accept standard phone tips in post either forward, or sideways.
BODY: Brass, nickel plated.
HEAD: Captive: MOLDED NYLON, per MIL-P-20693A, with molded in brass insert.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty. 2K Volts 60 cycle AC continuous working voltage. CAPACITANCE 2.0 pf. between conductors, 3.0 pf. to panel.
DESCR.: Mounts in two 1/2" holes on 3/4" mounting centers in panels up to 1/4" thick. Accommodates single or dual banana plugs. Supplied with 4 hex nuts, 2 flat washers. **Std. Pkg. 25**

Net	Description	NET Per C
284BB	Two Black Heads	$95.00
284RR	Two Red Heads	95.00
284RB	One Red, One Black Head	95.00

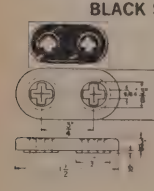
MINIATURE DUAL BINDING POST ASSEMBLY



INSUL.: MOLDED Black STYRENE, octagonal keyed to align cross-holes at alternate 90° positions.
BODY: Brass, gold plated.
HEAD: Captive MOLDED NYLON, per MIL-P-20693A, with Brass plated inserts.
HARDWARE: Brass, Gold plated.
RATING: 5 Amps AC for 10°C Temp. rise, continuous duty. 2K Volts 60 cycle AC continuous working voltage. CAPACITANCE 3.5 pf between conductors, 3.0 pf to panel.
DESCR.: Compact Dual Binding Post designed for use with miniaturized equipment. Mounts in two 1/4" round, single or double "D" holes on 1/2" centers, in panels up to 1/4" thick. 1/2" center spacing designed for use with miniature dual connectors. Also accepts single miniature banana plugs, .080" phone tips, #6 spade lugs, alligator clips or wire. Wraparound solder turret for direct wire connections. Supplied with two hex nuts and flat washers. **Std. Pkg. 25**

Net	Description	NET Per C
3016BB	Two Black Heads	$115.00
3016RR	Two Red Heads	115.00
3016RB	One Red, One Black Head	115.00

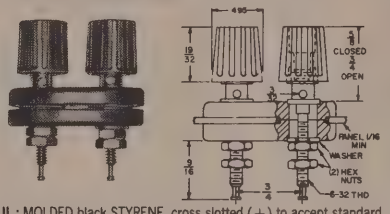
BLACK STYRENE INSULATOR



INSUL.: STYRENE, black, Spec. L-P416, Type I.
RATING: 2K Volts 60 cycle AC continuous working voltage.
DESCR.: Mounts in two 1/2" holes on 3/4" mounting centers in panels up to 1/4" thick. **Std. Pkg. 100**

No.	NET Per C
207	$7.00

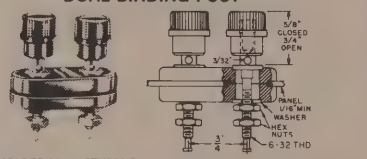
DUAL BINDING POST NYLON



INSUL.: MOLDED black STYRENE, cross slotted (+) to accept standard phone tips in post either forward, or sideways.
BODY: Brass, nickel plated.
HEAD: Captive MOLDED LEXAN. per MIL-P-20693A, with molded in brass insert.
RATING: 15 Amps AC for 10°C Temp. rise, continous duty. 2K Volts 60 cycle AC continuous working voltage. CAPACITANCE 2.0 pf. between conductors, 3.0 pf. to panel.
DESCR.: Mounts in two 1/2" holes on 3/4" mounting centers in panels up to 1/4" thick. Accommodates single or dual banana plugs. Supplied with 4 hex nuts, 2 flat washers. **Std. Pkg. 10**

Net	Description	NET Per C
1813BB	Two Black Heads	$115.00
1813RR	Two Red Heads	115.00
1813RB	One Red, One Black Head	115.00

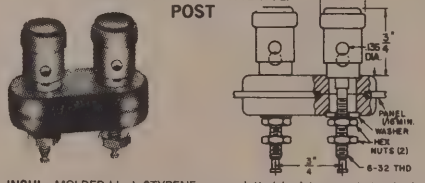
DUAL BINDING POST



INSUL.: MOLDED black STYRENE, cross slotted (+) to accept standard phone tips in post either forward, or sideways.
BODY: Brass, nickel plated.
HEAD: CAPTIVE MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red or black. SPECIFY COLOR
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty. 2K Volts 60 cycle AC continuous working voltage. CAPACITANCE 2.0 pf. between conductors, 3.0 pf. to panel.
DESCR.: Mounts in two 1/2" holes on 3/4" mounting centers in panels up to 1/4" thick. Accommodates single or dual banana plugs. Supplied with 4 hex nuts, 2 flat washers. **Std. Pkg. 25**

Net	Description	NET Per C
224BB	Two Black Heads	$95.00
224RR	Two Red Heads	95.00
224RB	One Red, One Black Head	95.00

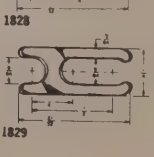
DUAL SPRING-LOADED BINDING POST



INSUL.: MOLDED black STYRENE, cross slotted (+) to accept standard phone tips in post either forward, or sideways. Supplied in colors on special order.
HEAD: Captive brass, nickel plated.
CAP: Molded black styrene.
BODY: Brass, nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Mounts in two 1/2" holes on 3/4" mounting centers in panels up to 1/4" thick. Accepts standard phone tips or wires in side holes, and locks them in place when pressure on cap is released. Supplied with 4 hex nuts, 2 flat washers. **Std. Pkg. 10**

No.	NET Per C
2713	$175.00

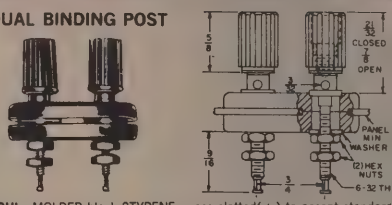
SHORTING LINK



MATERIAL: Spring brass, nickel plated, .031 thick.
RATING: 50 Amps A.C. continuous duty, for 10 °C Temp. rise (#1828 and #327) 25 Amps A.C. continuous duty, for 10°C Temp. rise (#1829)
DESCR.: Snaps over contact barrels of standard (3/4" centers) or miniature (1/2" centers) dual binding posts for positive shorting. Retaining feature allows link to slide on one post for temporary un-shorting without falling while loose. **Std. Pkg. 100**

No.	Descr.	Net Per C
327	Standard for 3/4" Posts	$7.00
1828	Standard for 3/4"Posts	7.00
1829	Miniature for 1/2" Posts	7.00

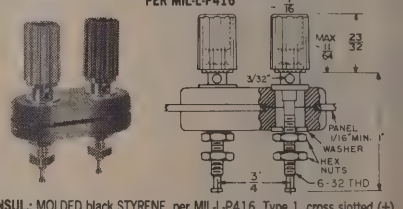
DUAL BINDING POST



INSUL.: MOLDED black STYRENE, cross slotted(+) to accept standard phone tips in post either forward, or sideways.
BODY: Brass, nickel plated.
HEAD: Captive: MOLDED LEXAN. per MIL-P-20693A, with molded in brass insert
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty. 2K Volts 60 cycle AC continuous working voltage. CAPACITANCE 2.0 pf. between conductors, 3.0 pf. to panel.
DESCR.: Mounts in two 1/2" holes on 3/4" mounting centers in panels up to 1/4" thick. Accommodates single or dual banana plugs. Supplied with 4 hex nuts, 2 flat washers. **Std. Pkg. 10**

Net	Description	NET Per C
1814BB	Two Black Heads	$115.00
1814RR	Two Red Heads	115.00
1814RB	One Red, One Black Head	115.00

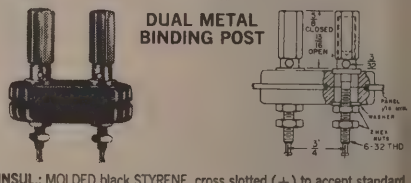
DUAL BINDING POST
PER MIL-L-P416



INSUL.: MOLDED black STYRENE, per MIL-L-P416, Type 1, cross slotted (+) to accept standard phone tips in post either forward or sideways.
BODY: Brass, nickel plated.
HEAD: Captive: MOLDED LEXAN Red or Black. SPECIFY COLOR
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty. 2 K Volts 60 cycle AC continuous working voltage. CAPACITANCE 2.0 mmfd. between conductors, 3.0 mmfd. to panel.
DESCR.: Mounts in two 1/2" holes on 3/4" mounting centers in panels up to 1/4" thick. Accommodates single or dual banana plugs. Supplied with 4 hex nuts, 2 flat washers. **Std. Pkg. 25**

No.	Description	NET Per C
1477BB	Two Black Heads	$ 95.00
1477RR	Two Red Heads	95.00
1477RB	One Red, One Black Head	95.00

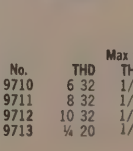
DUAL METAL BINDING POST



INSUL.: MOLDED black STYRENE, cross slotted (+) to accept standard phone tips in post either forward, or sideways.
BODY: Brass, nickel plated.
HEAD: Captive: Hex brass, nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty. 2K Volts 60 cycle AC continuous working voltage. CAPACITANCE 2.0 pf. between conductors, 3.0 pf. to panel.
DESCR.: Mounts in two 1/2" holes on 3/4" mounting centers in panels up to 1/4" thick. Accommodates single or dual banana plugs, Supplied with 4 hex nuts, 2 flat washers. **Std. Pkg. 25**

No.	NET Per C
209	$135.00

ECONOMY SPEAKER BINDING POSTS



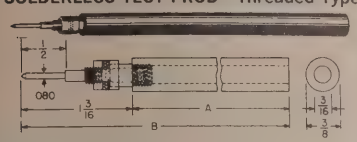
THUMB NUTS: Brass, nickel plated
SOLDER LUG: Brass, tin plated
FLAT WASH: Steel, nickel plated
SCREW, NUT & LOCK WASHER: Steel, Cadmium plated
DESCR: Economy, all metal binding posts for through panel connections. For speakers, power, grounding, etc. Available in four sizes to meet space of power requirements. May be insulated from panels using our flat and shoulder fibre washers as indicated below, (not supplied) **Std. Pkg. 100**

No.	THD	Max Panel THK.	Current Rating	Use Washer Numbers	NET Per C
9710	6 32	1/4"	5 A	2152 2160	$15.00
9711	8 32	1/4"	8 A	2155 2163	17.00
9712	10 32	1/8"	15 A	2156 2164	18.00
9713	1/4 20	1/2"	20 A	2154 2165	35.00

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

ELECTRONIC COMPONENTS — H. H. SMITH

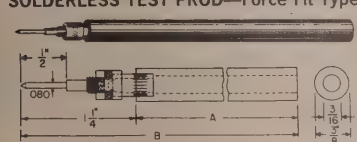
SOLDERLESS TEST PROD—Threaded Type



HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red or Black. SPECIFY COLOR
PLUG: Brass, nickel plated.
RATING: 12 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Solderless: Wire fits through handle and body of plug then wrapped around screw portion and tightened with knurled collar.
Std. Pkg. 25

No.	Handle (A)	Overall (B)	NET Per C
302	4"	5 1/4"	$33.00
303	5 1/2"	6 3/4	36.00

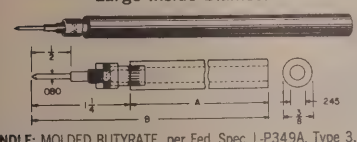
SOLDERLESS TEST PROD—Force Fit Type



HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red or Black. SPECIFY COLOR
PLUG: Brass, nickel plated.
RATING: 12 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Solderless: Wire fits through handle and body of plug then wrapped around screw portion and tightened with knurled collar.
Std. Pkg. 25

No.	Handle (A)	Overall (B)	NET Per C
382	4"	5 1/4"	$33.00
383	5 1/2"	6 3/4"	36.00

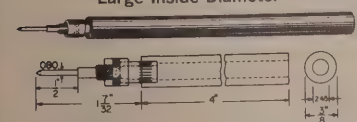
SOLDERLESS TEST PROD—Force Fit Type Large Inside Diameter



HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red or Black. SPECIFY COLOR
PLUG: Brass, nickel plated.
RATING: 12 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Solderless: Wire fits through handle and body of plug then wrapped around screw portion and tightened with knurled collar. Extra large I.D. for heavy duty wire.
Std. Pkg. 25

No.	Handle (A)	Overall (B)	NET Per C
352	4"	5 1/4"	$33.00
353	5 1/2"	6 3/4"	36.00

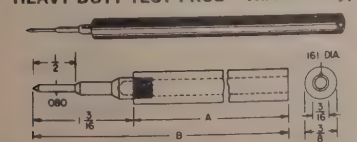
SOLDERLESS FIBRE TEST PROD Large Inside Diameter



HANDLE: FIBRE, per MIL-F-1148A Grade CH. Red, Black. SPECIFY COLOR
PLUG: Brass, nickel plated.
RATING: 12 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Solderless: Wire fits through handle and body of plug then wrapped around screw portion and tightened with knurled collar. Large I.D. permits use of heavy duty wire.
Std. Pkg. 25

No.	NET Per C
323	$39.00

HEAVY DUTY TEST PROD—Threaded Type

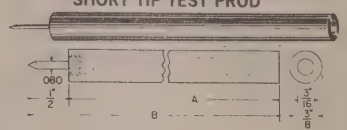


HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red or Black. SPECIFY COLOR
PLUG: Brass, nickel plated.
RATING: 12 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Large diameter well enables soldering of heavy duty wire directly into plug. Fits standard phone tip jacks.
Std. Pkg. 25

No.	Handle (A)	Overall (B)	NET Per C
319	4"	5 3/16"	$33.00
329	5 1/2"	6 11/16"	36.00

WE INVITE YOU to use our manufacturing and engineering facilities and our know-how to meet YOUR PARTICULAR REQUIREMENTS.

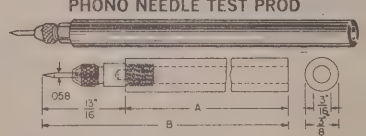
SHORT TIP TEST PROD



HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red or Black. SPECIFY COLOR
PLUG: Brass, nickel plated.
RATING: 12 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Inserts flush with insulated handle, no metal exposed; eliminates possibility of shock or grounding . Fits standard phone tip jacks.
Std. Pkg. 25

No.	Handle (A)	Overall (B)	NET Per C
363	4"	4 1/2"	$28.00
364	5 1/2"	6"	31.00

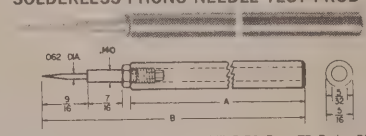
PHONO NEEDLE TEST PROD



HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red or Black. SPECIFY COLOR
PLUG: Brass, nickel plated.
RATING: 12 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Removable chuck for easy replacement or broken needles. Needle pierces corrosion or plating for positive reading.
Std. Pkg. 25

No.	Handle (A)	Overall (B)	NET Per C
317	4"	4 13/16"	$36.00
318	5 1/2"	6 5/16"	42.00

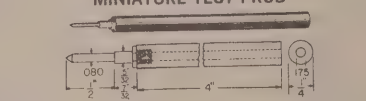
SOLDERLESS PHONO NEEDLE TEST PROD



HANDLE: XXXP Phenolic lacquered, per MIL-P-79, Form TR, Red or Black. SPECIFY COLOR
PLUG: Brass, nickel plated.
NEEDLE: Phono needle steel.
RATING: 12 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Wire can be soldered to brass stud or directly into plug itself. Stud also locks wire to pellet for solderless connections.
Std. Pkg. 25

No.	Handle (A)	Overall (B)	NET Per C
314	4"	5 3/32"	$83.00
313	6"	7 3/32"	90.00

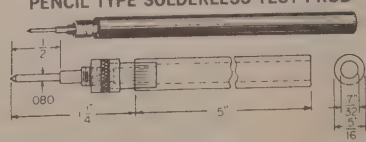
MINIATURE TEST PROD



HANDLE: FIBRE, per MIL-F-1148A Grade CH. Red, Black. SPECIFY COLOR
PLUG: Brass, nickel plated.
RATING: 12 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Threaded for easy assembly. Ideally suited for checking all types sub-miniature equipment.
Std. Pkg. 25

No.	NET Per C
322	$39.00

PENCIL TYPE SOLDERLESS TEST PROD

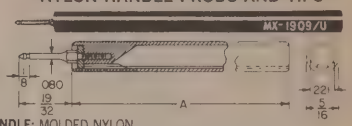


HANDLE: MACHINED BUTYRATE, per MIL-P-10408A, Type I, Class 2, Red or Black. SPECIFY COLOR
PLUG: Brass, nickel plated.
RATING: 12 Amps AC for 10°C Temp. rise, continous duty.
DESCR.: Solderless: Wire fits through handle and body of plug, then wraps around screw portion and is tightened with knurled collar.
Std. Pkg. 25

No		NET Per C
384	Force Fit Type	$33.00

SEE OUR NEW SAFETY TEST LEADS ON SMITH PAGE 14

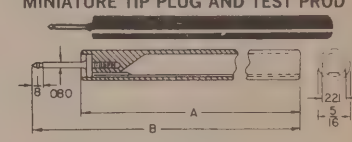
NYLON HANDLE PRODS AND TIPS



HANDLE: MOLDED NYLON, per MIL-P 20693A. Red or Black SPECIFY COLOR
TIP: Brass, silver plated.
RATING: 10 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Solderless: Made to meet Signal Corps Drawing SC-C-82761.
Std. Pkg. 25

No.	Sig. Corps. Drawing and Part No.	Size ("A")	Color	NET Per C
176	MX-1906/U	1"	Red	$40.00
177	MX-1907/U	1"	Black	40.00
178	MX-1909/U	4"	Red	50.00
179	MX-1910/U	4"	Black	50.00

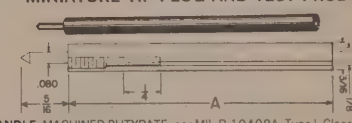
MINIATURE TIP PLUG AND TEST PROD



HANDLE: MOLDED NYLON, per MIL-P 20693A. Available in Red or Black. SPECIFY COLOR
TIP: Brass, Silver plated.
DESCR.: Solderless assembly. Ideal for use with sub-miniature printed-circuit tip jacks. Sharp tip breaks flux or oxide coating on printed-circuit pattern for positive contact when used as prod. Grooved head of prod makes positive contact when laid across wires. Fits all standard .080" tip jacks.

No.	Handle (A)	Overall (B)	Std. Pkg.	NET Per C
348	1"	1 5/16"	100	$40.00
349	4"	4 5/16"	25	50.00

MINIATURE TIP PLUG AND TEST PROD



HANDLE: MACHINED BUTYRATE, per MIL-P-10408A, Type I, Class II, Red or Black. SPECIFY COLOR
PLUG: Brass, nickel plated.
RATING: 2 Amps AC for 10° C Temp. rise, continuous duty.
DESCR.: Ideally suited for checking sub-miniature equipment. Fits standard phone tip jacks.

No.	Std. Pkg.	Handle (A)	NET Per C
244	100	3/4"	$20.00
666	25	3"	33.00

SEE THE NEW BredBlox, BredStix & BredBord Kits

Prototype Design Aids

ON SMITH PAGE 24

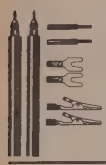
H. H. SMITH ELECTRONIC COMPONENTS

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

SOLDERLESS TIP TEST LEAD

HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red and Black.
TIP: Solderless: brass, nickel plated. **Std. Pkg. 6**

No.	Meter End	NET PR.
600	Phone Tips	$2.10
601	Spade Lugs	2.05
602	Alligator Clips	2.15



PHONO NEEDLE TEST LEAD

HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red and Black.
BODY: Brass, nickel plated.
NEEDLE: Steel, nickel plated. **Std. Pkg. 6**

No.	Meter End	NET PR.
613	Phone Tips	$2.15
614	Spade Lugs	2.10
615	Alligator Clips	2.20

ALL SOLDERLESS TEST LEAD

HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red and Black.
PLUG: MOLDED THERMOSETTING plastic. Red and Black per MIL-M-14-CFG.
TIP: Solderless: Brass, nickel plated. **Std. Pkg. 6**

No.	NET PR.
603	$2.40

SHORT TIP TEST LEAD

HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red and Black.
PLUG: MOLDED PHENOLIC plastic, Red and Black.
TIP: Brass, nickel plated. **Std. Pkg. 6**

No.	NET PR.
624	$2.20

SLIM HANDLE TEST LEAD

HANDLE: MACHINED BUTYRATE, per MIL-P-10408A, Type I, Class II, Red and Black. 5/16" O.D.
TIPS: Prod: Brass, nickel plated. Meter End: Drawn brass nickel plated. **Std. Pkg. 6**

No.	NET PR.
670	$2.20

BANANA PLUG TEST LEAD

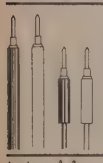
HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red and Black.
PLUG: MOLDED PHENOLIC plastic, Red and Black.
TIP PLUG: Solderless: Brass, nickel plated.
BODY: Brass, nickel plated.
SPRING: Four-leaved phosphor bronze, nickel plated. **Std. Pkg. 6**

No. 623 **NET PR. $2.50**

SOLDERLESS PHONE TIP TEST LEAD SLIM HANDLES

HANDLE: MOLDED NYLON, per MIL-P-20693A ¼" O.D. RED and BLACK.
TIP: Brass, Silver Plated with front retention groove.
WIRE: #18 AWG, 65/36 to an O.D. of .140, rubber covered. 10,000 volts.
DESCR: Wire slips thru molded hole in handles and is held securely by washer under tip. **Std. Pkg. 6**

No.	NET PR.
684	$2.90



SLIM HANDLE TEST LEAD

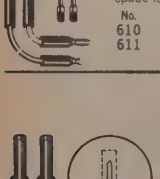
HANDLE: FIBRE, per MIL-F-1148A Grade CH. Red, Black. ¼" O.D.
PLUG: FIBRE, per MIL-F-1148A, Grade CH. Red, Black. ¼" O.D.
TIP: Brass, nickel plated. **Std. Pkg. 6**

No.	NET PR.
678	$3.00

TEST LEAD KIT

HANDLE: FIBRE, per MIL-F-1148A Grade CM. Red, Black. ¼"O.D.
DESCR.: Each kit is supplied with one pair of test leads. One end test prods, other end ins. banana plugs.
FITTINGS: Two each: Phone tips, alligator clips, spade lugs. **Std. Pkg. 6**

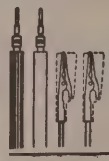
No.	Type	NET PR.
610	Solderless Prods	$3.00
611	Needle Tip Prods	3.10



SHIELDED TEST LEADS

HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red and Black.
TIP: Prod tip brass, nickel plated. Meter end, see type.
DESCR.: Plugs insert flush to insulated handle. Prods have retractable cover leaving no metal exposed. Eliminates possibility of shock or grounding. Supplied with either phone tip or banana plug meter ends. Other variations on special order. **Std. Pkg. 6**

No.	Type	NET PR.
616	Phone Tip End	$3.40
617	Banana Plug End	3.60



ALLIGATOR CLIP TEST LEAD

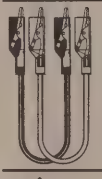
HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red and Black.
TIPS: Solderless: Brass, nickel plated.
CLIPS: Steel, cadmium plated.
BOOT: Vinyl plastic. Red and Black. **Std. Pkg. 6**

No.	NET PR.
672	$1.75

ALLIGATOR CLIP TEST LEAD

CLIPS: STEEL, cadmium plated. **Std. Pkg. 6**

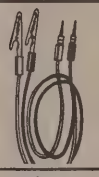
No.	Wire	NET PR.
604	12 inches	$1.10
605	24 inches	1.20
606	36 inches	1.30
607	48 inches	1.40



ALLIGATOR CLIP TEST LEAD With Boots

CLIPS: Steel, cadmium plated
BOOTS: Vinyl plastic Red and Black. **Std. Pkg. 6**

No.	Wire	NET PR.
629	12 inches	$1.15
657	24 inches	1.25
658	36 inches	1.35
659	48 inches	1.45



ALLIGATOR CLIP TEST LEAD

CLIP HANDLES: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS, Red and Black.
PLUG HANDLES: MOLDED PHENOLIC plastic, Red and Black.
CLIPS: Steel, cadmium plated.
TIPS: Solderless: Brass, nickel plated. **Std. Pkg. 6**

No.	NET PR.
627	$1.80

ALLIGATOR CLIP TEST LEAD

CLIP HANDLES: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS, Red and Black.
CLIPS: Steel, cadmium plated.
ELBOWS: MOLDED PHENOLIC plastic, Red and Black.
TIP: Brass, nickel plated. **Std. Pkg. 6**

No.		NET PR.
628	Phone Tip Meter Tip	$2.15
647	Banana Meter Tip	2.30

ALLIGATOR CLIP TEST LEAD

CLIP HANDLES: MOLDED BUTYRATE, per Fed. Spec. L-349A, Type 3, Class MS, Red and Black.
CLIPS: Steel, cadmium plated.
LUGS: Brass, nickel plated. **Std. Pkg. 6**

No.	NET PR.
649	$1.70

CROCODILE CLIP TEST LEAD

CLIPS: Steel, cadmium plated.
BOOT: Vinyl plastic, Red and Black.
HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red and Black.
LUG: Brass, nickel plated. **Std. Pkg. 6**

No.	NET PR.
671	$2.30

CROCODILE CLIP TEST LEAD

CLIPS: Steel, cadmium plated.
BOOTS: Vinyl plastic, Red and Black.
ELBOWS: MOLDED PHENOLIC plastic, Red and Black.
TIP: Brass, nickel plated.
SPRING: Four-leaved phosphor bronze, nickel plated. **Std. Pkg. 12**

No.		NET PR.
648	Banana Plug End	$2.55
675	Phone Tip End	2.40

MINIATURE TEST LEAD

HANDLE: MACHINED BUTYRATE, per MIL-P-10408A, Type I, Class II, Red or Black.
PLUG: MACHINED BUTYRATE, 3/16" O.D., 3/4" long, per MIL-P-10408A, Type I, Class II.
TIP: Brass, nickel plated. **Std. Pkg. 6**

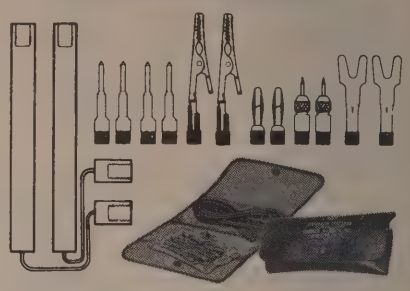
No.	NET PR.
660	$1.75

PHONO NEEDLE TEST LEAD FOR MINIATURE BANANA JACKS

Same as above, except:
WIRE: 5 KV PVC flexible wire, 19 strands #36 COPPER, #24AWG, insulated to an O.D. of .090 **Std. Pkg. 12**

No.	NET PR.
1341	$2.85

"UNIVERSAL" TEST LEAD KIT Completely Interchangeable



Fifty Leads in One! One lead can make any required test lead combination. All parts adapt into prod handle or tip handle. Complete as shown. With plastic kit.
WIRE: 5 KV rubber covered 26 strands #34 copper, #20 AWG insulated to an O.D. of .125". **Std. Pkg. 6**

No.	Description	NET PR.
699	Standard	$6.00
679	Miniature	6.00

METER TEST LEADS Solderless Prod

HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red and Black.
TIP: Solderless: Brass, nickel plated.
ELBOW: MOLDED THERMOSETTING plastic, per MIL-M-14 CFG, Red and Black.
BODY: Brass, nickel plated.
SPRING: Four-leaved phosphor bronze, nickel plated. **Std. Pkg. 12**

No.	Type	NET PR.
625	Phone Tip Meter Tip	$2.50
685	Banana Meter Tip	2.50

NEEDLE PROD

HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red and Black.
NEEDLE: Steel, nickel plated.
ELBOW: MOLDED PHENOLIC PLASTIC, Red and Black. Red and Black.
BODY: Brass, nickel plated.
SPRING: Four-leaved phosphor bronze, nickel plated. **Std. Pkg. 6**

No.	Type	NET PR.
626	Phone Tip Meter Tip	$2.60
686	Banana Meter Tip	2.60

MIDGET ALLIGATOR CLIP TEST LEAD

CLIPS: Steel, cadmium plated.
BOOTS: Vinyl plastic, Red and Black. **Std. Pkg. 6**

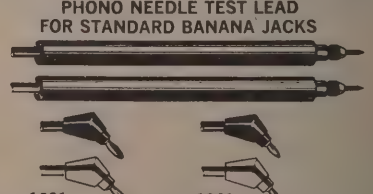
No.	Wire	NET PR.
716	12 inches	$1.15
717	18 inches	1.25
718	24 inches	1.35
719	36 inches	1.45

RETRACTILE ALL SOLDERLESS TEST LEAD

HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red and Black.
PLUG: MOLDED PHENOLIC plastic, Red and Black. MIL-M-14 CFG.
TIP: Solderless brass, nickel plated.
WIRE: #20 gauge, 41/36 strand, 4000 volt. nom. O.D. .165. Retracts to 12". Extends to 6 ft. **Std. Pkg. 6**

No.	NET PR.
618	$6.60

PHONO NEEDLE TEST LEAD FOR STANDARD BANANA JACKS



1331 1341

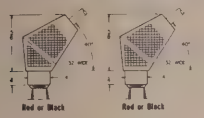
HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red and Black.
BODIES: Brass, nickel plated and aluminum.
NEEDLE: Steel, nickel plated.
SPRING: Four-leaved beryllium copper, nickel plated
WIRE: 10 KV PVC flexible wire, 65 strands #36 COPPER, #18AWG, insulated to an O.D. of .140 **Std. Pkg. 12**

No.	NET PR.
1331	$2.85

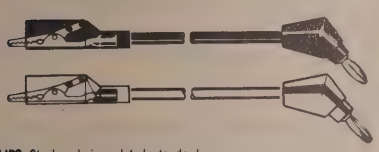
STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

ELECTRONIC COMPONENTS by SMITH

40° BANANA PLUG
STANDARD & MINIATURE



ALLIGATOR CLIP TEST LEAD FOR STANDARD BANANA JACKS



CLIPS: Steel, cadmium plated, standard.
BOOTS: Vinyl plastic, Red and Black.
BODIES: Brass, nickel plated and aluminum.
SPRING: Four-leaved beryllium copper, nickel plated.
WIRE: 10 KV PVC flexible wire, 65 strands # 36 COPPER, # 18AWG, insulated to an O.D. of .140. Std. Pkg. 12

No.	NET PR.
1332	$2.55

FOR MINIATURE BANANA JACKS

Same as above, except:
WIRE: 5 KV PVC flexible wire, 19 strands # 36 COPPER, # 24AWG, insulated to an O.D. of .090 Std. Pkg. 12

No.	NET PR.
1342	$2.55

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- Stamping
- Molding
- Assembly
- Quality Finishing

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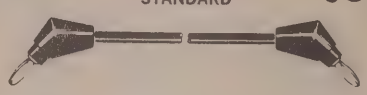
SEND FOR OUR NEW 104 PAGE CATALOG

A REFERENCE GUIDE FOR ENGINEERS AND PURCHASING AGENTS

BANANA PLUG STANDARD



HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red or Black SPECIFY COLOR
BODY: Brass, nickel plated and aluminum.
SPRING: Four-leaved beryllium copper, nickel plated.
WIRE: 10 KV PVC flexible wire, 65 strands # 36 COPPER, # 18 AWG, insulated to an O.D. of .140. Std. Pkg. 10

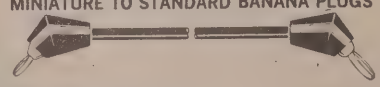
No.	Length ("A")	NET Each
1334-8	8 inches	$.85
1334-12	12 inches	.85
1334-24	24 inches	.95
1334-36	36 inches	1.05

MINIATURE

HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red or Black SPECIFY COLOR
BODY: Brass, nickel plated and aluminum.
SPRING: Four-leaved beryllium copper, nickel plated.
WIRE: 5 KV PVC flexible wire, 19 strands # 36 COPPER, # 24 AWG, insulated to an O.D. of .090. Std. Pkg. 10

No.	Length ("A")	NET Each
1344-8	8 inches	$.85
1344-12	12 inches	.85
1344-24	24 inches	.95
1344-36	36 inches	1.05

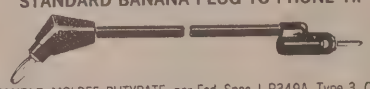
MINIATURE TO STANDARD BANANA PLUGS



HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red or Black SPECIFY COLOR
BODY: Brass, nickel plated and aluminum.
SPRING: Four-leaved beryllium copper, nickel plated.
WIRE: 5 KV PVC flexible wire, 19 strands # 36 COPPER, # 24 AWG, insulated to an O.D. of .090. Std. Pkg. 10

No.	Length ("A")	NET Each
1349-8	8 inches	$.85
1349-12	12 inches	.85
1349-24	24 inches	.95
1349-36	36 inches	1.05

STANDARD BANANA PLUG TO PHONE TIP



HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red or Black SPECIFY COLOR
BODY: Brass, nickel plated and aluminum.
SPRING: Four-leaved beryllium copper, nickel plated.
WIRE: 10 KV PVC flexible wire, 65 strands # 36 copper, # 18 AWG, insulated to an O.D. of .140. Std. Pkg. 10

No.	Length ("A")	NET Each
1336-8	8 inches	$1.00
1336-12	12 inches	1.00
1336-24	24 inches	1.10
1336-36	36 inches	1.20

CROSS PATCH TO BANANA PLUGS STANDARD

HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red or Black SPECIFY COLOR
BODY: Brass, nickel plated and aluminum
SPRING: Four-leaved beryllium copper, nickel plated.
WIRE: 10 KV PVC flexible wire, 65 strands # 36 COPPER, # 18 AWG, insulated to an O.D. of .140. Std. Pkg. 10

No.	Length ("A")	NET Each
1335-8	8 inches	$1.00
1335-12	12 inches	1.00
1335-24	24 inches	1.10
1335-36	36 inches	1.20

FOR FAST DELIVERY ON SOLDERLESS & SOLDER TERMINALS SPECIFY SMITH

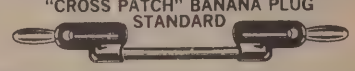
JUMPERS

COLOR CODE SUFFIX

Add to Catalog Number as required

—101 WHITE	—102 RED	—103 BLACK
—104 GREEN	—105 BLUE	—107 YELLOW

"CROSS PATCH" BANANA PLUG STANDARD



HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red, Black, Yellow, Green, Blue. White. SPECIFY COLOR
BODY: Brass, nickel plated.
SPRING: Four-leaved beryllium copper, nickel plated.
WIRE: 10 KV PVC flexible wire, 65 strands # 36 COPPER, # 18 AWG, insulated to an O.D. of .140.
DESCR: Interconnects unlimited number of multiple circuits. Positive lasting contact for all banana plugs on top and side. Std. Pkg. 10
WITH PLUG SPRING 9/16" LONG

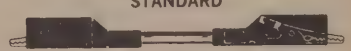
No.	Length	NET Each
1510-8	8 inches	$1.40
1510-12	12 inches	1.40
1510-24	24 inches	1.50
1510-36	36 inches	1.60

"CROSS PATCH" BANANA PLUG MINIATURE

HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS.
COLORS: Available in 10 std. colors as coded above. SPECIFY COLOR
BODY: Brass, silver plated.
SPRING: Four-leaved beryllium copper, nickel plated.
WIRE: General purpose, PVC insulated, 1/64" wall. # 18 AWG 41/34 stranded conductor. Voltage rating up to 1 KW R.M.S.
DESCR: Interconnects unlimited number of multiple circuits. Positive, lasting contact for banana plugs on top and side. Special lengths on request. Std. Pkg. 10

No.	Length	NET Each
1590-6	6 inches	$1.05
1590-12	12 inches	1.05
1590-18	18 inches	1.10
1590-24	24 inches	1.15

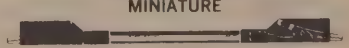
ALLIGATOR CLIP STANDARD



CLIPS: Steel, cadmium plated (No. 300).
BOOTS: Vinyl plastic. Boot colors match wire.
RATING: 5 Amps AC for 10°C Temp. rise, continuous duty.
WIRE: 10 KV PVC flexible wire, 65 strands # 36 copper, # 18 AWG, insulated to an O.D. of .140. Available in Red or Black, SPECIFY COLOR Std. Pkg. 10

No.	Length	NET Ea.
1596-12	12 inches	$.70
1596-24	24 inches	.80
1596-36	36 inches	.90
1596-48	48 inches	1.00
1596-60	60 inches	1.10

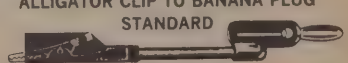
ALLIGATOR CLIP MINIATURE



CLIPS: Steel, cadmium plated (No. 338).
BOOTS: Vnyl plastic. Boot colors match wire.
RATING: 5 Amps AC for 10°C Temp. rise, continuous duty.
WIRE: General purpose, PCV insulated 1/64" wall, # 18 AWG, 16/30 STRANDED CONDUCTOR. Available in Red or Black SPECIFY COLOR Std. Pkg. 10

No.	Length	NET Ea.
1597-12	12 inches	$.70
1597-18	18 inches	.75
1597-24	24 inches	.80
1597-36	36 inches	.90
1597-48	48 inches	1.00
1597-60	60 inches	1.10

ALLIGATOR CLIP TO BANANA PLUG STANDARD



HANDLE: MOLDED PHENOLIC plastic, Red or Black SPECIFY COLOR

PLUG: Hex brass, nickel plated.
SPRING: Four-leaved phosphor bronze, nickel plated
CLIPS: Steel, cadmium plated.
BOOTS: Vinyl plastic. Boot colors match wire.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
WIRE: 10 KV PVC flexible wire, 65 strands # 36 copper, # 18 AWG, insulated to an O.D. of .140. Std. Pkg. 10

No.	Length	NET Ea.
1866-12	12 inches	$1.00
1866-24	24 inches	1.10
1866-36	36 inches	1.20
1866-48	48 inches	1.30
1866-60	60 inches	1.40

H. H. SMITH ELECTRONIC COMPONENTS

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

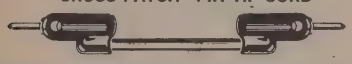
PATCH CORDS

COLOR CODE SUFFIX

Add to Catalog Number as required

—101 WHITE	—103 BLACK	—105 BLUE
—102 RED	—104 GREEN	—107 YELLOW

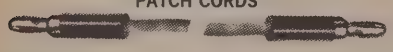
"CROSS PATCH" PIN TIP CORD



HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red, Black, Yellow, Green, Blue, White. SPECIFY COLOR
BODY: Brass, nickel plated.
CONTACT: Beryllium copper.
WIRE: 10 KV PVC flexible wire, 65 strands #36 copper, #18 AWG, insulated to an O.D. of .140.
DESCR.: Interconnects an unlimited number of multiple circuits .080" tip plug and female jack in rear of body fits all standard phone tips and jacks. Side holes accept standard banana plugs. **Std. Pkg. 10**

No.	Length	NET Ea.
1595-8	8 inches	$1.45
1595-12	12 inches	1.45
1595-24	24 inches	1.55
1595-36	36 inches	1.60

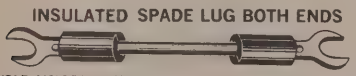
MINIATURE MOLDED PATCH CORDS



HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red or Black SPECIFY COLOR
BODY: Brass, nickel plated.
SPRING: Four-leaved beryllium copper, nickel plated.
WIRE: 10 KV PVC flexible wire, 65 strands #36 copper, #18 AWG, insulated to an O.D. of .140.
DESCR.: Interconnects banana jacks on closely spaced centers where space is at a premium. Fits standard banana jacks.
Std. Pkg. 10

No.	WIRE	NET Ea.
1860-8	8 inches	$ .95
1860-12	12 inches	.95
1860-24	24 inches	1.05
1860-36	36 inches	1.15

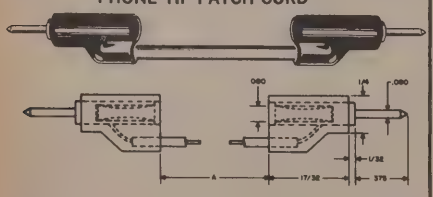
INSULATED SPADE LUG BOTH ENDS



HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red and Black. SPECIFY COLOR
LUG: Brass, .050 thick, nickel plated.
RATING: 25 Amps AC for 0°C Temp. rise, continuous duty.
WIRE: 10 KV PVC flexible wire, 65 strands #36 copper, #18 AWG, insulated to an O.D. of .140. **Std. Pkg. 10**

No.	Length	NET Ea.
1864-12	12 inches	$ .80
1864-24	24 inches	.90
1864-36	36 inches	1.00
1864-48	48 inches	1.10
1864-60	60 inches	1.20

PHONE TIP PATCH CORD



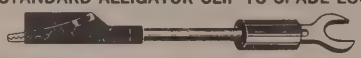
HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P39A, Type 3, Class MS. Available in 10 colors as coded above. SPECIFY COLOR
BODY: BRASS, NICKEL PLATED.
CONTACT: BERYLLIUM COPPER, GOLD FLASHED
WIRE: 5 KV PVC FLEXIBLE WIRE, 19 strands #36 copper, #24 awg, insulated to an O.D. of .090".
DESCR: Short phone tip plug for fully insulated insertion in miniature jacks. Captive cage jack in rear for unlimited stack-up. Special lengths on request. **Std. Pkg. 10**

No.	Length. ("A")	NET Ea.
1591-6	6 inches	$1.25
1591-12	12 inches	1.25
1591-18	18 inches	1.30
1591-24	24 inches	1.35

SEE "MIL-SPEC" AND Q.P.L. PC TEST JACKS SMITH PAGE 4

JUMPERS

STANDARD ALLIGATOR CLIP TO SPADE LUG



HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red and Black. SPECIFY COLOR
LUG: Brass, .050 thick, nickel plated.
CLIPS: Steel, cadmium plated.
BOOTS: Vinyl plastic. Boot colors match wire.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
WIRE: 10 KV PVC flexible wire, 65 strands #36 copper, #18 AWG, insulated to an O.D. of .140. **Std. Pkg. 10**

No.	Length	NET Ea.
1867-12	12 inches	$ .80
1867-24	24 inches	.90
1867-36	36 inches	1.00
1867-48	48 inches	1.10
1867-60	60 inches	1.20

STANDARD ALLIGATOR CLIP TO PIN PLUG

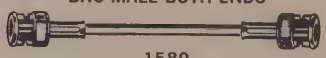
HANDLE: MOLDED PHENOLIC plastic, Red or Black SPECIFY COLOR
PLUG: Brass, nickel plated.
CLIPS: Steel, cadmium plated.
BOOTS: Vinyl plastic. Boot colors match wire.
RATING: 12 Amps AC for 10°C Temp. rise, continuous duty.
WIRE: 10 KV PVC flexible wire, 65 strands #36 copper, #18 AWG, insulated to an O.D. of .140. **Std. Pkg. 10**

No.	Length	NET Ea.
1865-12	12 inches	$1.00
1865-24	24 inches	1.10
1865-36	36 inches	1.20
1865-48	48 inches	1.30
1865-60	60 inches	1.40

RF PATCH CORDS

SUPPLIED WITH RG-58A COAXIAL CABLES WITH 95.4% BRAID SHIELDING which eliminates spurious radiation and guarantees VSWR — keeps loss at a minimum. Crimped for greater reliability. **PATENTED WATERPROOF SEAL** provides greater flexibility and strain relief. Nominal capicitance 50 Ohms impedance.

BNC MALE BOTH ENDS

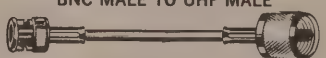


1589

Std. Pkg. 10

No.	Length	NET Ea.
1589-12	12"	$5.35
1589-24	24"	5.45
1589-36	36"	5.55
1589-48	48"	5.65
1589-60	60"	5.75

BNC MALE TO UHF MALE

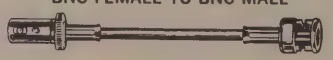


1879

Std. Pkg. 10

No.	Length	NET Ea.
1879-12	12 inches	$5.35
1879-24	24 inches	5.45
1879-36	36 inches	5.55
1879-48	48 inches	5.65
1879-60	60 inches	5.75

BNC FEMALE TO BNC MALE

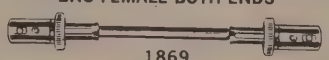


1878

Std. Pkg. 10

No.	Length	NET Ea.
1878-12	12 inches	$5.60
1878-24	24 inches	5.70
1878-36	36 inches	5.80
1878-48	48 inches	5.90
1878-60	60 inches	6.00

BNC FEMALE BOTH ENDS

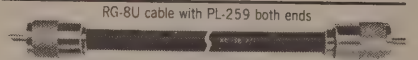


1869

Std. Pkg. 10

No.	Length	NET Ea.
1869-12	12 inches	$6.90
1869-24	24 inches	7.00
1869-36	36 inches	7.10
1869-48	48 inches	7.20
1869-60	60 inches	7.30

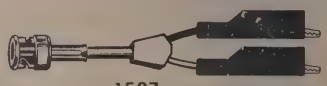
RG-8U cable with PL-259 both ends



Std. Pkg. 1

		NET Ea.
1807	3 Feet	$4.71
1808	50 "	22.50
1809	100 "	41.80

BNC MALE TO ALLIGATOR CLIPS

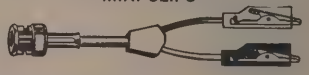


1587

CLIPS: Steel, cadmium plated (#300).
INSUL.: Molded vinyl (#300).
WIRE: As specified above.
DESCR.: For testing wave patterns, etc. One end with terminates withBNC male plug, other end with insulated alligator clips, one red, one black. **Std. Pkg. 10**

No.	Length	NET Ea.
1587-12	12"	$5.35
1587-24	24"	5.45
1587-36	36"	5.55
1587-48	48"	5.65
1587-60	60"	5.75

BNC MALE TO INSULATED MINI CLIPS



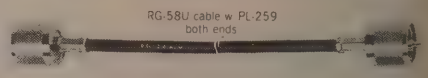
CLIPS: Steel, cadmium plated, No. 338.
INSULATOR: Molded vinyl plastic, No. 389.
WIRE: RG-174/U Coaxial Cable.
DESCR.: For testing wave patterns, etc One end terminals with BNC male, other end with insulated mini clips, one red, one black. **Std. Pkg. 10**

No.	Length	Net Ea.
1791-12	12 inches	$5.35
1791-24	24 inches	5.45
1791-36	36 inches	5.55
1791-48	48 inches	5.65
1791-60	60 inches	5.75

CB COAXIAL CABLES

Feature pre-assembled, flexible, weather resistant RG-58U & RG-8U cables. The coaxial connectors are crimped to wire with a patented waterproof seal to afford greater flexibility and strain relief. Ideal for all types of marine, mobile and base station installations.

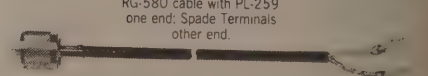
RG-58U cable w PL-259 both ends



Std. Pkg. 5

	Length	Net ea.
1871-12	12	$4.00
1871-24	24	4.20
1871-36	36	4.30
1871-48	48	4.40
1871-60	60	4.60
1871-144	144	5.60
1871-240	240	6.80

RG-58U cable with PL-259 one end; Spade Terminals other end.



Std. Pkg. 5

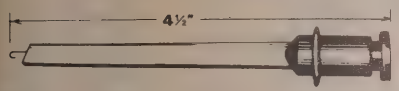
		NET Ea.
1804	36"	$2.57
1805	144"	3.87
1806	240"	5.04

Stocked and sold by every major electronics distributor in the U.S.A.

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

ELECTRONIC COMPONENTS H. H. SMITH

"HOOKON JUNIOR" PROBE with TEST TERMINATIONS

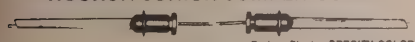


WIRES: 24 AWG, Extra-flexible PVC test lead wire, 5KV, .090" O.D. Red or Black. RG-58A/U Coaxial Cable, nominal 50 Ohms impedance RG No's 3079, 3080, 3081

- Wire-lead version of "Hookon" Probe.
- Field attachment and repair of leads.
- "No-Hands" connection to .025 Wire-Wraps, wires, components.
- Slides between .100" IC terminals.
- Hook locks forward for probing, retracts with a touch.
- "Super-tough" Nylon body (Zytel 801) Butyrate, per Fed. Spec. LP-349A, Type 3, Class MS
- Red or Black — Specify Color
- Standard Package 10.

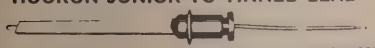
No.			Std. Pkg. 10 Net Ea.
3067	Red or Black	Specify Color	$1.80

HOOKON JUNIOR JUMPER CORD



No.	Length "L"	Red or Black SPECIFY COLOR Net Ea.
3068-12	12 inches	$4.50
3068-24	24 inches	4.60
3068-36	36 inches	4.70
3068-48	48 inches	4.80
3068-60	60 inches	4.90

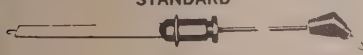
HOOKON JUNIOR TO TINNED LEAD



No.	Length "L"	Red or Black SPECIFY COLOR Net Ea.
3069-12	12 inches	$2.30
3069-24	24 inches	2.35
3069-36	36 inches	2.40
3069-48	48 inches	2.45
3069-60	60 inches	2.50

HOOKON JUNIOR TO ANGLE BANANA PLUG

STANDARD



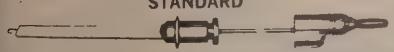
No.	Length "L"	Red or Black SPECIFY COLOR Net Ea.
3073-12	12 inches	$2.80
3073-24	24 inches	2.85
3073-36	36 inches	2.90
3073-48	48 inches	2.95
3073-60	60 inches	3.00

MINIATURE

No.	Length "L"	Red or Black SPECIFY COLOR Net Ea.
3074-12	12 inches	$2.80
3074-24	24 inches	2.85
3074-36	36 inches	2.90
3074-48	48 inches	2.95
3074-60	60 inches	3.00

HOOKON JUNIOR TO STACK BANANA PLUG

STANDARD

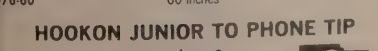


No.	Length "L"	Red or Black SPECIFY COLOR Net Ea.
3075-12	12 inches	$2.95
3075-24	24 inches	3.00
3075-36	36 inches	3.05
3075-48	48 inches	3.10
3075-60	60 inches	3.15

MINIATURE

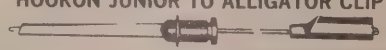
No.	Length "L"	Red or Black SPECIFY COLOR Net Ea.
3076-12	12 inches	$2.90
3076-24	24 inches	2.95
3076-36	36 inches	3.00
3076-48	48 inches	3.05
3076-60	60 inches	3.10

HOOKON JUNIOR TO PHONE TIP



No.	Length "L"	Red or Black SPECIFY COLOR Net Ea.
3077-12	12 inches	$2.95
3077-24	24 inches	3.00
3077-36	36 inches	3.05
3077-48	48 inches	3.10
3077-60	60 inches	3.15

HOOKON JUNIOR TO ALLIGATOR CLIP



No.	Length "L"	Red or Black SPECIFY COLOR Net Ea.
3078-12	12 inches	$2.90
3078-24	24 inches	2.95
3078-36	36 inches	3.00
3078-48	48 inches	3.05
3078-60	60 inches	3.10

HOOKON JUNIOR TO BNC MALE CONNECTOR

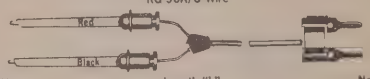
RG-58A/U

No.	Length "L"	Net Ea.
3081-24	24 inches	$6.50
3081-36	36 inches	6.60
3081-48	48 inches	6.70
3081-60	60 inches	6.80

HOOKON JUNIOR TO DUAL BANANA PLUG

STANDARD–3/4" CENTERS

RG-58A/U Wire



No.	Length "L"	Net Ea.
3079-24	24 inches	$6.00
3079-36	36 inches	6.10
3079-48	48 inches	6.20
3079-60	60 inches	6.30

MINIATURE–1/2" CENTERS

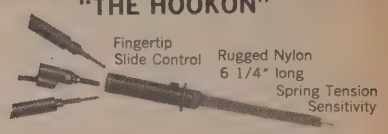
No.	Length "L"	Net Ea.
3080-24	24 inches	$6.00
3080-36	36 inches	6.10
3080-48	48 inches	6.20
3080-60	60 inches	6.30

HOOKON JUNIOR TO THREADED FEMALE JACK

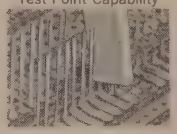
6-32 to fit Oscilloscope Ground Leads

No.	Length "L"	Red or Black SPECIFY COLOR Net Ea.
3082-12	12 inches	$2.80
3082-24	24 inches	2.85
3082-36	36 inches	2.90
3082-48	48 inches	2.95
3082-60	60 inches	3.00

"THE HOOKON"



Test Point Capability



Use Vertically or Laterally

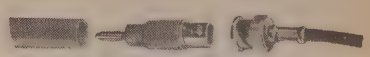
HOOKS — on to bare wires; components leads; wire-wrap tails; connector terminals; turret terminals, etc. Holds no-hands with spring tension.
PROBES — P.C. Pads and runs; soldered terminals; connector tips; finger contacts, etc. Hook locks forward for ease in probing.
SLIDES — on .025" square and .025 x .050 wire-wrap tails; up to 8 gauge solid wire tails, holds no-hands without extending contact.
FITS — between terminals spaces down to .100"; I.C. socket tails.

Red only

Supplied one each in plastic container
Std. Pkg. 1
No. 3070 Net Ea. $3.00

COAX CABLE ADAPTER FOR "HOOKON"

BNC Female to Banana Plug



Hookon Adapter Patch Cord

Now, the "HOOKON" is even more useful and versatile. This unique adapter lets you use "HOOKON" with equipment required shielded or co-axial inputs. Plastic Red body, Beryllium Copper banana plug spring. Red only
No. 3071 Std. Pkg. 6 Net Ea. $2.00

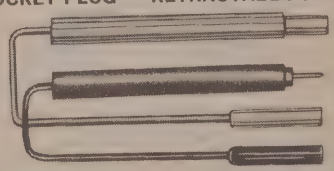
GROUND LEAD CLIP EXTENSION

Clips between shell and BNC Male connector and extends ground lead to selective positions. Tin plated wire clip, extra flexible 18" black lead terminated with insulated miniature alligator clip.

No. 3072 Std. Pkg. 6 Net Ea. $.60

SAFETY TEST LEADS

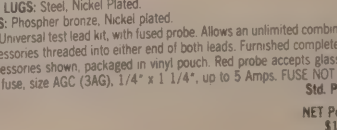
SOCKET PLUG — RETRACTABLE SHIELD



HANDLES: MOLDED Butyrate, per Fed. Spec. L-P349A, Type 3, Class MS. Red and Black.
BODIES: Brass, Nickel plated
WIRE: 10KV PVC flexible, #18 AWG
DESCR: Electrically safe test lead has no exposed metal parts. For use on meters with recessed Safety jack, that accepts a 5/16" socket plug. .080" tip prod is covered with a spring-loaded plastic shield that retracts as tip is inserted into jack or probed on contact.

Std. Pkg. 6
No. 680 NET Per Pr. $3.00

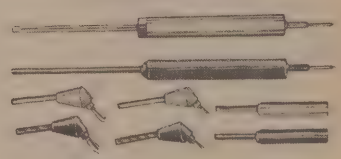
FUSED "UNIVERSAL" TEST LEAD KIT



WIRE: 5KV rubber covered, #20 AWG.
HANDLES: Machined Butyrate, per Fed. Spec. L-P349A, Type 3, Class MS. Red and Black.
BODIES: Brass, Nickel Plated.
CLIPS & LUGS: Steel, Nickel Plated.
SPRINGS: Phosphor bronze, Nickel plated.
DESCR: Universal test lead kit, with fused probe. Allows an unlimited combination of accessories threaded into either end of both leads. Furnished complete with all accessories shown, packaged in vinyl pouch. Red probe accepts glass cartridge fuse, size AGC (3AG), 1/4" x 1 1/4", up to 5 Amps. FUSE NOT SUPPLIED.

Std. Pkg. 1
No. 695 NET Per Kit $11.00

FUSED TEST LEAD



690 691 692

HANDLE: MACHINED Butyrate, per Fed. Spec. L-P349A, Type 3, Class MS. Red and Black.
BODIES:BRASS, Nickel Plated.
BAN. SPNG: Beryllium copper, nickel plated.
FUSE SPNG: Steel, Cadmium plated
WIRE: 5KV, rubber covered, #20 AWG
FUSE: Accepts glass cartridge fuse, seiz AGC(3AG). ¼"x1", up to 5 amps. FUSE NOT SUPPLIED
DESCR: Safety probe set accepts fuse in Red probe to protect instruments and circuits from excessive current or application of voltage in resistance reading. Screw-in cap on probe allows replacement of fuses. Black common probe has built-in strain relief. Available with either Standard or Miniature Angle Banana Plugs, or with Female Safety Socket plug for instrument with recessed Safety Jack.

Std. Pkg.6

No.	Descr.	NET Per Pr.
690	Standard Banana Plugs	$7.00
691	Miniature Banana Plugs	7.00
692	Standard Safety Sockets	7.00

JUST ADDED!

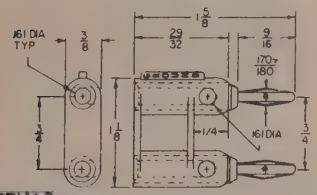
MAGNA-LITE and MAGNA-LITE, JR.

ON SMITH PAGE 39

H. H. SMITH ELECTRONIC COMPONENTS

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

STANDARD (3/4" CENTERS) DUAL TEST ADAPTERS



MATERIALS

BODY: Molded BUTYRATE, PER Fed Spec. L-P439A, Type 3, Class MS. Color BLACK unless otherwise specified.
CONDUCTOR: Brass, per QQ-B-626, Comp. 22, 1/2 hard.
SPRING: Four-leaved beryllium copper, heat treated.
HEAD: Molded nylon, per MIL-P-20693A.
SHIELD: Drawn aluminum.
SCREWS: Steel, cadmium plated.

COLOR CODE SUFFIX

Add to Catalog Number as required

—102 RED —103 BLACK

SPECIFICATIONS

BODY: Molded Butyrate, per Fed. Spec. L-P349A, Type 3, Class MS. Color as specified.
SPRING: Four-leaved beryllium copper, Nickel Plated.
TERMINAL: Gold washed.
CURRENT: 15 Amps AC (Standard); 5 Amps (Miniature) for 10°C Temp. Rise, continuous duty, except where limited by co-axial connectors.
VOLTAGE: 5KV (standard), 2KV (Miniature), 60 Cycle AC continuous working voltage, except where limited by co-axial connectors.
CAPACITY: 1.0 pf (Standard) nominal between ¾" spaced conductors; 3.0 pf (Miniature) nominal between ½" spaced conductors.
RESISTANCE: 1 milliohm or less per conductor.

CABLE MOUNTED DUAL BANANA PLUGS

1675 1676 1787

SET-SCREW TYPE

REAR: 7/32 Dia. cable guide. Dual banana jacks on 3/4" centers.
FRONT: Dual banana plugs on 3/4" centers. Set-screws secure leads to conductors.
COLORS: Available in Red and Black. SPECIFY COLOR

No.	Std. Pkg. 10	NET Ea.
1675		$1.10

TURRET-TERMINAL TYPE

REAR: 7/32 Dia. cable guide. Dual banana jacks on 3/4" centers.
FRONT: Dual banana plugs on 3/4" centers. Turret terminals for permanent solder connection of leads.
COLORS: Available in Red and Black. (Specify color)

No.	Std. Pkg. 10	NET Ea.
1676		$1.20

SHIELDED TYPE

REAR: Mounting screw and locating boss. Inline cable entry with flush cable guide.
FRONT: Dual banana plugs 3/4" centers. Turret terminals for permanent solder connection of leads.
SHIELD: Aluminum shield electrically connected to GND conductor fully enclosed plug and mating binding posts to reduce noise pickup.

No.	Std. Pkg. 1	NET Ea.
1787		$2.25

SET SCREW - BANANA PLUG

1677 1679

COMPONENT MOUNTING SET-SCREW BANANA

REAR: Dual banana jacks on ¾" centers for staeking.
FRONT: Dual banana plugs on ¾" centers. Set-screws secure component leads to conductors.
COLORS: Available in Red and Black as coded above. (Specify color)

No.	Std. Pkg. 10 NET Ea.
1677	1.10

DUAL PHONE-TIP TO DUAL BANANA PLUGS

REAR: Dual .080" phone tip jacks on ¾" centers.
FRONT: Dual banana plugs on ¾" centers. Banana jack holes for side stacking.

No.	Std. Pkg. 10	NET Ea.
1679	Black body	$.85

BANANA PLUG SPLICE

REAR: Standard or Miniature Banana Jack.
FRONT: Standard or miniature banana jack. Banana jack hole for side stacking. Std. Pkg. 50

No.	Description	NET Per C
245	Standard banana jack both ends	$28.00

COMPONENT MOUNTING DUAL PLUGS

1770 1696

ISOLATION TYPE THREE TERMINAL

REAR: Dual banana jacks on 3/4" centers for stacking.
CENTER: Turret-terminal connections to isolated front and rear conductors in HOT circuit, and straight-thru connection of GND circuit, with terminal, allow insertion of "T" and "P" networks in input-output circuits in instruments.
FRONT: Dual banana plugs on 3/4" centers.
COLORS: Available in Red and Black. (Specify color)

No.	Std. Pkg. 1	NET Ea.
1770		$2.50

FOUR TERMINAL

REAR: Dual banana jacks on 3/4" centers for stacking.
CENTER: Turret-terminal connections to isolated front and rear conductors in both GND and HOT circuits allow insertion of matching pad or other 4-terminal networks in input circuits of instruments.
FRONT: Dual banana plugs on 3/4" centers.
COLORS: Available in Red or Black as coded above. (Specify color)

No.	Std. Pkg. 1	NET Ea.
1696		$3.25

SHORTING TYPE

1516 1683

BANANA PLUG

REAR: Dual banana jacks on 3/4" centers for stacking.
INTERNAL: Busbar shorted across line.
FRONT: Dual banana plugs on 3/4" centers. Banana jack holes for side stacking.
COLORS: Available in Red, Black. SPECIFY COLOR

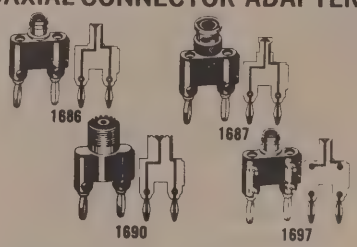
No.	Std. Pkg. 10	NET Ea.
1516		$120.00C

METAL SHORTING BAR TYPE

REAR: 3/32" thick brass busbar. 15 amps. continuous duty.
FRONT: Dual plugs on 3/4" ctrs. Unit sits flush to panel.

No.	Std. Pkg. 10	NET Ea.
1683	Dual Banana Plug	$1.25

COAXIAL CONNECTOR ADAPTERS



1686 1687 1690 1697

BNC FEMALE TO BANANA PLUGS

REAR: BNC series co-axial jack. Banana jack holes for side stacking.
FRONT: Dual banana plugs on 3/4" centers. Banana jack holes for side stacking.

No.	Std. Pkg. 1	NET Ea.
1686	Black body.	$2.60

BNC MALE TO BANANA PLUGS

REAR: BNC series co-axial plug.
FRONT: Dual banana plugs on 3/4" centers. Banana jack holes for side stacking.

No.	Std. Pkg. 1	NET Ea.
1687	Black body.	$3.60

UHF FEMALE TO BANANA PLUGS

REAR: UHF series co-axial jack.
FRONT: Dual banana plugs on 3/4" centers. Banana jack holes for side stacking.

No.	Std. Pkg. 1	NET Ea.
1690	Black body.	$4.60

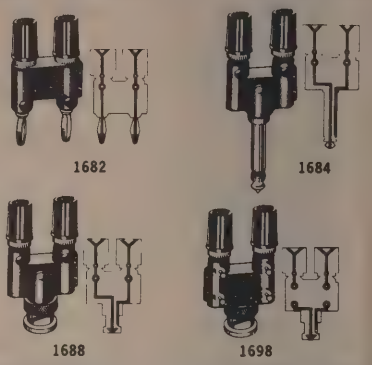
BNC FEMALE TO ISOLATED DUAL BANANA PLUGS

REAR: BNC series co-axial jack.
CENTER: Turret-terminal connections to isolated front and rear conductors in both GND and HOT circuits allow insertion of matching pad or other 4-terminal networks in input circuits.
FRONT: Dual banana plugs on 3/4" centers.

No.	Std. Pkg. 1	NET Ea.
1697	Black body.	$9.00

WE INVITE YOU to use our manufacturing and engineering facilities and our know-how to meet YOUR PARTICULAR REQUIREMENTS.

DUAL BINDING POST ADAPTERS



1682 1684 1688 1698

BINDING POSTS TO DUAL BANANA PLUGS

REAR: Insulated dual 5-way binding posts, Red and Black heads on .on 3/4" centers. Banana jack holes for side stacking. Black body.
FRONT: Dual banana plugs on 3/4" centers.

No.	Std Pkg. 1	Net e
1682	Black Body	$2.2

BINDING POSTS TO 2-CIRCUIT PHONE PLUG

REAR: Insulated dual 5-way binding posts, Red and Black heads on 3/4" centers. Banana jack holes for side stacking. Black body.
FRONT: Standard 1/4" 2-circuit phone plug.

No.	Std. Pkg. 1	NET Ea
1684	Black Body	$4.60

BINDING POSTS TO BNC MALE

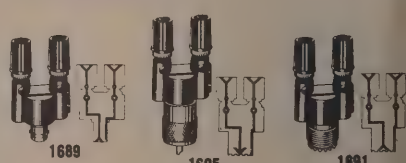
REAR: Insulated dual 5-way binding posts, Red and Black heads on 3/4" centers. Banana jack holes for side stacking. Black body.
FRONT: BNC series co-axial plug.

No.	Std. Pkg. 1	NET Ea
1688	Black Body	$4.60

BINDING POSTS TO ISOLATED BNC MALE

REAR: Insulated dual 5-way binding posts, Red and Black heads on 3/4" centers. Black body.
CENTER: Turret-terminal connections to isolated front and rear conduc tors in both GND and HOT circuits allow insertion of matching pad o other 4-terminal networks in input circuits.
FRONT: BNC series co-axial plug.

No.	Std. Pkg. 1	NET Ea
1698	Black Body	$10.0



1689 1695 1691

BINDING POSTS TO BNC FEMALE

REAR: Insulated dual 5 way binding posts. Red and black heads on 3/4" centers. Banana jack holes for side stacking.
FRONT: BNC series co-axial jack.

No.	Std. Pkg. 1	NET Ea.
1689	Black body.	$4.60

BINDING POSTS TO UHF MALE

REAR: Insulated dual 5 way binding posts. Red and black heads on 3/4" centers. Banana jack holes for side stacking.
FRONT: UHF series co-axial plug.

No.	Std. Pkg. 1	NET Ea.
1695	Black body.	$5.00

BINDING POSTS TO UHF FEMALE

REAR: Insulated dual 5 way binding posts. Red and black heads on 3/4" centers. Banana jack holes for side stacking.
FRONT: UHF series co-axial jack.

No.	Std. Pkg. 1	NET Ea.
1691	Black body.	$5.25

BINDING POSTS TO

1756

BNC MALE

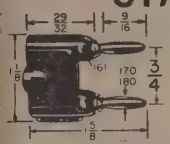
REAR: Insulated dual 5-way binding posts. Red and Black heads on 1/2" centers. Banana jack holes for side stacking.
FRONT: BNC series co-axial plug. Std. Pkg. 1

No.		NET Each
1756	Black body	$4.60

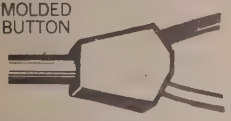
STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

ELECTRONIC COMPONENTS H. H. SMITH

STANDARD DUAL BANANA PLUG (3/4" CENTERS) PATCH CORDS



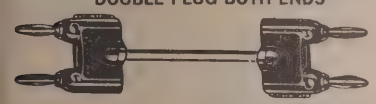
MOLDED BUTTON



CABLE TYPES AVAILABLE

	WIRE "A"	WIRE "B"
DESCRIPTION	2-COND. TW. 18 GA. 65/36 STR.	RG58/U Coaxial cable.
INSULATION	Vinyl	Polyethylene
JACKET	Vinyl	Vinyl
NOM. CAP.	30 pf/ft.	50 Ohm Impedance

DOUBLE PLUG BOTH ENDS

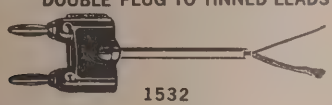


1530, 1580

HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Black or Grey to match wire.
PLUG: Brass, nickel plated.
SPRING: Four-leaved beryllium copper, nickel plated.
WIRE: As specified above.
DESCR.: Males with standard dual binding post having 3/4" center. Polarity indicated by the word GROUND molded on side. Interconnects unlimited number of multiple circuits top and side. Each end terminates with molded double banana plug. **Std. Pkg. 10**

No. Wire "A"	No. Wire "B"	Lgth.	NET Ea.
1530-12	1580-12	12"	$4.35
1530-24	1580-24	24"	4.45
1530-36	1580-36	36"	4.55
1530-48	1580-48	48"	4.65
1530-60	1580-60	60"	4.75

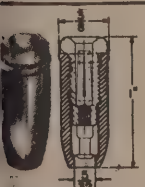
DOUBLE PLUG TO TINNED LEADS



1532

HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS.
PLUG: Brass, nickel or silver plated.
SPRING: Four-leaved beryllium copper, nickel plated.
WIRE: As specified above.
DESCR.: Mates with standard dual binding post having 3/4" center. Polarity indicated by the word GROUND molded on the side. One end terminates with double banana plug, other end stripped and tinned. **Std. Pkg. 10**

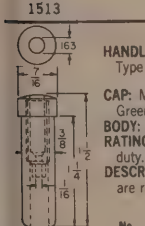
No. Wire "A"	Lgth.	NET Ea.
1532-12	12"	$3.35
1532-24	24"	3.45
1532-36	36"	3.55
1532-48	48"	3.65
1532-60	60"	3.75



NYLON IN-LINE TIP JACK

HANDLE: MOLDED NYLON, per MIL-P 20693A.
BODY: Molded Nylon, per MIL-P-20693A.
CONTACT: Phosphor Bronze, gold plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Fits all standard phone-tip plugs, with recessed contact for safe connection. Ideally suited for use in patch and extension cords. Can also be used for panel mounting where wrap-around terminal connection must be insulated at rear. **Std. Pkg. 50**

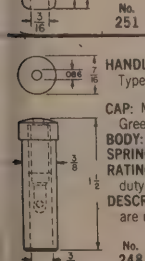
No.	SPECIFY COLOR	NET Per C
1513	Red & Black	$33.00



IN-LINE BANANA JACK

HANDLE: MACHINED BUTYRATE, per MIL-P-10408A, Type I, Class II. Red, Black, Yellow, Green. **SPECIFY COLOR**
CAP: MOLDED PHENOLIC plastic, Red, Black, Yellow, Green.
BODY: Brass, nickel plated.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Suitable for test lead extension where long leads are required. Accepts standard banana plugs. **Std. Pkg. 50**

No.	NET Per C
251	$23.00

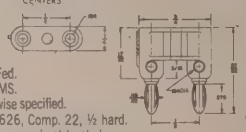


IN-LINE PHONE TIP JACK

HANDLE: MACHINED BUTYRATE, per MIL-P-10408A, Type I, Class II. Red, Black, Yellow, Green. **SPECIFY COLOR**
CAP: MOLDED PHENOLIC plastic, Red, Black, Yellow, Green.
BODY: Brass, nickel plated.
SPRING: Phosphor bronze.
RATING: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Suitable for test lead extension where long leads are required. Accepts standard phone tip plug. **Std. Pkg. 50**

No.	NET Per C
248	$23.00

MINIATURE DUAL (½") TEST ADAPTERS



MATERIALS:
BODY: Molded Butyrate, per Fed. Spec. L-P349A, Type 3, Class MS. Color BLACK unless otherwise specified.
CONDUCTOR: Brass, per QQ-B-626, Comp. 22, ½ hard.
SPRING: Four-leaved beryllium copper, heat treated.
HEAD: Molded Nylon, per MIL-P-20693A.
SCREWS: Steel, cadmium plated.
FINISHES:
CONDUCTOR: Nickel plate, per QQ-N-290, Class 1, Type VII.
SPRING: Nickel plated.
TERMINAL: Gold washed.
CONNECTOR: Non-tarnish Plate.
RATINGS:
CURRENT: 5 Amps AC for 10°C Temp. Rise, continuous duty, except where limited by co-axial connectors.
VOLTAGE: 2 KV, 60 cycle AC continuous working voltage, except where limited by co-axial connectors.
CAPACITY: 3.0 pf. nominal between ½" spaced conductors.
RESISTANCE: 1 milliohm or less per conductor.

SET SCREW CONNECTION

1749 1754

BANANA PLUGS

REAR: Dual banana jacks on 1/2" centers for stacking.
FRONT: Dual .080" phone tips on 1/2" centers. Set-screws secure leads to conductors.
COLORS: Available in Red or Black. **SPECIFY COLOR** **Std. Pkg. 10**

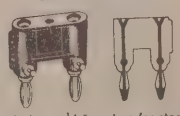
No.	NET Each
1749	$ .75

.080 PHONE TIP

REAR: Dual banana jacks on 1/2" centers for stacking.
FRONT: Dual .080" phone tips on 1/2" centers. Set-screws secure component leads to conductors.
COLORS: Available in Red or Black. **SPECIFY COLOR** **Std. Pkg. 10**

No.	NET Each
1754	$ .75

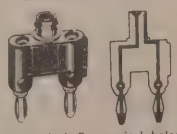
TURRET TERMINAL CONNECTION



REAR: Dual banana jacks on 1/2" centers for stacking.
FRONT: Dual banana plugs on 1/2" centers. Turret terminals for permanent solder connection of component leads.
COLORS: Available in Red or Black. **SPECIFY COLOR** **Std. Pkg. 10**

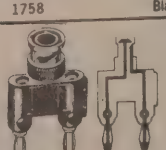
No.	NET Each
1750	$ .85

BNC FEMALE TO BANANA PLUGS



REAR: BNC series co-axial jack. Banana jack holes for stacking.
FRONT: Dual banana plugs on 1/2" centers. Banana jack holes for side stacking.

No.	Std. Pkg. 1	NET Ea.
1758	Black body	$3.00

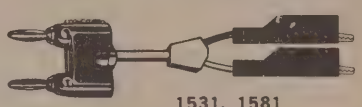


BNC MALE TO BANANA PLUGS

REAR: BNC series co-axial plug.
FRONT: Dual banana plugs on 1/2" centers. Banana jack holes for side stacking.

No.	Std. Pkg. 1	NET Ea.
1759	Black body	$3.95

DOUBLE PLUG TO ALLIGATOR CLIPS



1531, 1581

HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Black or Gray to match wire.
PLUG: Brass, nickel or silver plated.
SPRING: Four-leaved beryllium copper, nickel plated.
CLIP: Steel, cadmium plated (No. 300).
INSUL.: Molded vinyl plastic (No. 331).
WIRE: As specified above.
DESCR.: Mates with standard dual binding post having 3/4" center. Polarity indicated by the word GROUND molded on side. One end terminates with double banana plug, other end with insulated alligator clips, one Red, one Black. **Std. Pkg. 10**

No. Wire "A"	No. Wire "B"	Lgth.	NET Ea.
1531-12	1581-12	12"	$5.35
1531-24	1581-24	24"	5.45
1531-36	1581-36	36"	5.55
1531-48	1581-48	48"	5.65
1531-60	1581-60	60"	5.75

DOUBLE PLUG TO BNC MALE

1584

HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Black or Gray to match wire.
PLUG: Brass, nickel plated.
SPRING: Four-leaved beryllium copper, nickel plated.
WIRE: As specified above.
DESCR.: Mates with standard dual binding post having 3/4" center. Polarity indicated by the word GROUND molded on side. One end terminates with double banana plug, other end with BNC male plug. **Std. Pkg. 10**

No. Wire "B"	Length	NET Ea.
1584-12	12"	$5.35
1584-24	24"	5.45
1584-36	36"	5.55
1584-48	48"	5.65
1584-60	60"	5.75

AMP AC FAULT FINDER

CHECKS ALL THESE ELECTRICAL CIRCUIT CONDITIONS

• Open Ground • Open Hot • Open Neutral • Correct
• Hot/Ground—Reversed • Hot/Neutral—Reversed

This revolutionary AC Fault Finder has indicator lights and a chart on both sides to describe the condition for each lighting arrangement. Plug in and illuminated signals indicate: reverse polarity, faulty wiring, missing grounds and/or correct wiring conditions.

FEATURES:

Just plug in—simple & easy-to-use
No tools, meters, wires needed.
Easy to read from any angle—labeled on both sides
Break resistant plastic.
Designed for conventional 3 wire 120 V AC outlets
Checks dual wire outlets with use of polarized adapter and ground wire. **Std. Pkg. 12**

No.	Net Ea.
3030	$5.95

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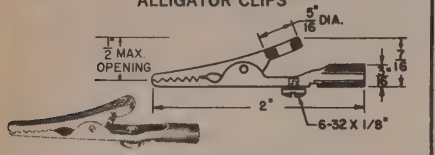
H. H. SMITH ELECTRONIC COMPONENTS

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

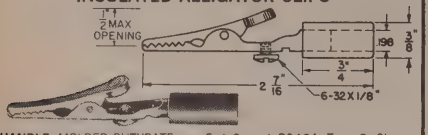
ALLIGATOR CLIPS



RATING: 5 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: 1/2" jaw opening. Jaws match accurately and grip securely, accepts standard banana plugs in rear. **Std. Pkg. 100**

Solder Connection			Screw Connection	
No.	NET Per C	Type	No.	NET Per C
300	$10.60	Steel, Cad. Pl.	350	$12.10
380	16.60	Solid Copper	360	18.20
332	18.00	Brass N.P.	339	20.00

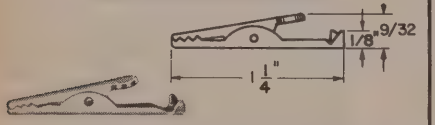
INSULATED ALLIGATOR CLIPS



HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red or Black. **SPECIFY COLOR**
RATING: 5 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: 1/2" jaw opening. Jaws match accurately and grip securely, accepts standard banana plugs in rear. **Std. Pkg. 100**

Solder Connection			Screw Connection	
No.	NET Per C	Type	No.	NET Per C
301	$15.10	Steel, Cad. Pl.	351	$16.60
381	21.10	Solid Copper	361	22.40
354	22.50	Brass N.P.	362	24.00

MINIATURE ALLIGATOR CLIP



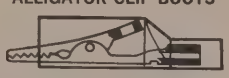
DESCR.: 3/16" jaw opening. Jaws match accurately and grip securely. Unique SMITH spring construction. Solder connection and ears for crimping. **Std. Pkg. 100**

No.	Type	NET Per C
338	Steel, Cad. Pl.	$ 8.80
367	Copper	10.20

MINIATURE INSULATION PIERCING ALLIGATOR CLIP

No.	NET Per C
326	$15.00

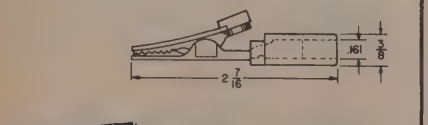
ALLIGATOR CLIP BOOTS



MATERIAL: MOLDED VINYL PLASTIC, Red, Black, Yellow, Green, Blue or White. **SPECIFY COLOR**
RATING: 1K Volts 60 cycle AC continuous working voltage.
DESCR.: Fully insulated clip while allowing maximum jaw opening. No. 331 for use on standard size alligator clips such as our No. 300. No. 389 for use on miniature alligator clips, such as our No. 338. **Std. Pkg. 100**

No.	Description	NET Per C
331	Standard	$5.50
389	Miniature	4.50

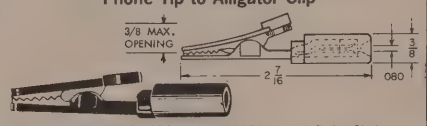
ALL INSULATED CLIP



INSULA.: MOLDED ABS PLASTIC per MIL-M-22544, type 4. Red or Black **SPECIFY COLOR**
CLIP: Steel cadmium plated.
RATING: 10 Amps AC for 10°C Temp. rise, continuous duty. 1K Volts 60 cycle AC continuous working voltage.
DESCR.: All metal parts fully insulated with molded plastic. Insures against shock or grounding. Solder type construction. **Std. Pkg. 50**

No.	NET Per C
337	$35.00

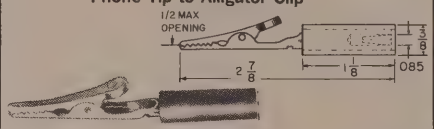
ALL INSULATED ADAPTERS
Phone Tip to Alligator Clip



INSULA.: MOLDED ABS PLASTIC per MIL-M-22544 type 4. Red or Black **SPECIFY COLOR**
CLIP: Steel, cadmium plated. **BODY:** Brass.
CONTACT: Phosphor bronze.
RATING: 5 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: All metal parts fully insulated with molded plastic. Insures against shock or grounding. Jack in rear permits adapting standard phone tip plugs to alligator clips. **Std. Pkg. 50**

No.	NET per C
336	$50.00

Phone Tip to Alligator Clip



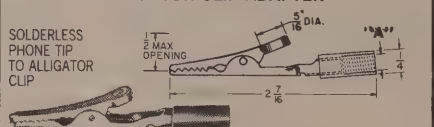
No.	Description	NET Per C
304	Steel Clip	$45.00
334	Copper Clip	55.00

Phone Tip or Banana Plug to Alligator Clip

No.	Description	NET Per C
305	Steel Clip	$55.00
335	Copper Clip	65.00

ALLIGATOR CLIP ADAPTER

SOLDERLESS PHONE TIP TO ALLIGATOR CLIP

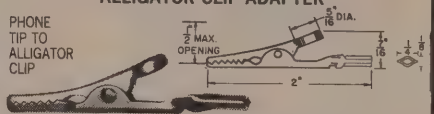


BUSHING: Brass, nickel plated.
CLIP: Steel cadmium plated.
RATING: 5 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: Adapts standard solderless tips to alligator clip. This novel quick-adapter is a must for all types of benchwork. **Std. Pkg. 50**

No.	Thd. "A"	NET Per C
310	10-32	$23.00
720	8-32	23.00

ALLIGATOR CLIP ADAPTER

PHONE TIP TO ALLIGATOR CLIP



CLIP: Steel, cadmium plated.
RATING: 5 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: 1/2" jaw opening. Jaws match accurately and grip securely. Accepts standard phone tip in rear. Crimped for spring tension. **Std. Pkg. 100**

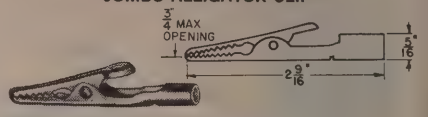
No.	NET Per C
333	$15.90

MINIATURE ALLIGATOR CLIP ADAPTERS

HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red or Black. **SPECIFY COLOR**
CLIP: Steel, Cadmium plated, or Copper.
BODY: Brass, Cadmium plated.
CONTACT: Beryllium Copper (Tip Jack only).
RATING: 1 Amp for 10°C Temp. rise, continuous duty.
DESCR.: Jack in rear adapts miniature alligator clip to phone tip plug, miniature banana plug or standard banana plug. **Std. Pkg. 50**

No.	Type	Jack Dia. "D"	NET Per C
STEEL, CADMIUM PLATED			
1320	Tip Plug	.080"	$45.00
1321	Min Banana Jack	.104"	45.00
1322	Std. Banana Jack	.161"	45.00
COPPER			
1323	Tip Plug	.080"	$52.00
1324	Min Banana Jack	.104"	52.00
1325	Std. Banana Jack	.161"	52.00

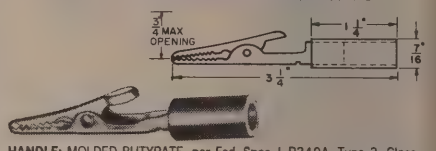
JUMBO ALLIGATOR CLIP



RATING: STEEL: 10 Amps AC for 10°C Temp. rise, continuous duty.
COPPER: 15 Amps AC for 10° C Temp. rise, continuous duty.
DESCR.: 3/4" jaw opening. Jaws match accurately. For heavy terminal use. **Std. Pkg. 100**

Solder Connection			Screw Connection	
No.	NET Per C	Type	No.	NET Per C
392	$23.00	Steel, Cad. Pl.	368	$27.00
396	31.00	Solid Copper	356	35.00

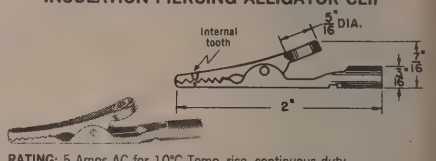
INSULATED JUMBO ALLIGATOR CLIPS



HANDLE: MOLDED BUTYRATE, per Fed. Spec. L-P349A, Type 3, Class MS. Red or Black. **SPECIFY COLOR**
RATING: STEEL: 10 Amps AC for 10°C Temp. rise, continuous duty.
COPPER: 15 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: 3/4" jaw opening. Jaws match accurately. For heavy terminal use. **Std. Pkg. 100**

Solder Connection			Screw Connection	
No.	NET Per C	Type	No.	NET Per C
393	$29.00	Steel, Cad. Pl.	369	$32.00
397	37.00	Solid Copper	357	40.00

INSULATION PIERCING ALLIGATOR CLIP



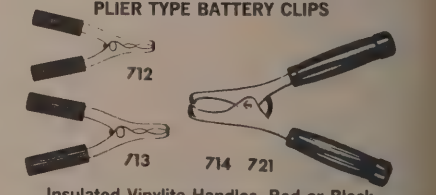
RATING: 5 Amps AC for 10°C Temp. rise, continuous duty.
DESCR.: 1/2" jaw opening. Jaws match accurately and grip securely. Internal tooth for piercing wire insulation. Accepts standard banana plug in rear. **Std. Pkg. 100**

No.	NET Per C
347	$18.00

BATTERY CLIPS

No.	Current Capacity	Jaw Spread	Length	Spring	Std. Pkg.	NET Per C
STEEL ELECTROPLATED						
365	5 Amp.	3/8"	1 5/8"	7 lbs.	100	$ 12.00
366	10 Amp.	9/16"	2"	10 lb.	100	17.00
701	25 Amp.	1"	2 1/2"	17 lbs.	10	23.00
702	50 Amp.	1 1/2"	3 7/8"	33 lbs.	5	30.00
704	100 Amp.	1 3/8"	5"	40 lbs.	5	90.00
SOLID COPPER						
703	50 Amp.	1"	2 1/2"	17 lbs.	5	40.00
705	100 Amp.	1 1/4"	4 3/4"	33 lbs.	5	120.00
706	200 Amp.	1 3/8"	5 3/4"	40 lbs.	5	130.00

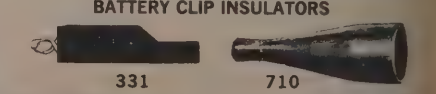
PLIER TYPE BATTERY CLIPS



Insulated Vinylite Handles, Red or Black. **SPECIFY COLOR**

No.	Amps.	Material	Overall Size	Std. Pkg.	NET Per C
712	35	Steel, Cop. Pl.	3 1/4"	10	$ 25.00
713	75	Steel, Cop. Pl.	4 1/2"	5	40.00
714	100	Steel, Cop. Pl.	7 1/2"	10	53.00
721	300	Solid Copper	7 1/2"	5	180.00

BATTERY CLIP INSULATORS



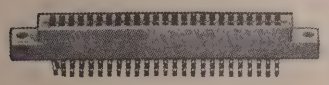
Red or Black. **SPECIFY COLOR**

No.	Made to fit Smith Clip #	Material	Std. Pkg.	NET Per C
331	365	Vinyl	100	$ 5.50
710	704, 706	H.D. Rubber	10	75.00

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

ELECTRONIC COMPONENTS by H. H. SMITH

PRINTED CIRCUIT CONNECTORS



COMMERCIAL

INSULATOR: Glass filled blue Alkyd.
CONTACTS: Beryl Copper .00001 gold flash; pierced terminal.
ACCEPTS: 1/16" Printed Circuit Cards.
MTG. HOLE: .125 Clearance.
DESCR.: Bifurcated bellows action assures positive electrical contact.

.156 SPACING

.125 Mtg. Hole Clearance Pierced Terminal — Std. Pkg. 5

Smith No.	No. of Contacts	Single or Double	Mtg. Centers	NET Ea.
6216	6	S	1.531	$2.10
6217	10	S	2.156	2.90
6218	15	S	2.937	3.60
6219	18	S	3.406	4.10
6220	22	S	4.031	4.40
6221	28	S	5.046	4.90
6222	36	S	6.219	6.10
6223	12	D	1.531	2.10
6224	20	D	2.156	2.90
6225	30	D	2.937	3.90
6226	36	D	3.406	4.10
6227	44	D	4.031	4.90
6228	56	D	5.046	5.60
6229	72	D	6.219	6.60
6230	86	D	7.302	7.60

MILITARY MIL-C-21097

INSULATOR: Diallyl Phthalate, Green Type GDI-30 per MIL-P-19833.
CONTACTS: Beryl. Copper .000031 gold per MIL-G-45204, Type II over .0005 silver per QQ-5-365, pierced terminal.
ACCEPTS: 1/16" Printed Circuit Cards.
MTG. HOLE: .125 Clearance.
DESCR.: Bifurcated bellows action assures positive electrical contact.

.156 SPACING

.125 Mtg. Hole Clearance. Pierced Terminal — Std. Pkg. 5

Smith No.	No. of Contacts	Single or Double	Mtg. Centers	NET Ea.
6200	6	S	1.531	$2.90
6201	10	S	2.156	3.90
6202	15	S	2.937	4.90
6203	18	S	3.406	5.20
6204	22	S	4.031	5.50
6205	28	S	5.046	7.00
6206	36	S	6.219	8.70
6207	43	S	7.302	10.50
6208	12	D	1.531	3.30
6209	20	D	2.156	4.60
6210	30	D	2.937	6.00
6211	36	D	3.406	6.50
6212	44	D	4.031	7.00
6213	56	D	5.046	8.10
6214	72	D	6.219	9.80
6215	86	D	7.302	10.50

.100 SPACING

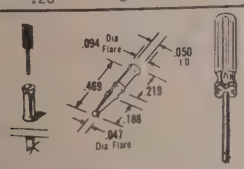
.125 Mtg. Hole Clearance. Pierced Terminal — Std. Pkg. 1

Smith No.	No. of Contacts	Single or Double	Mtg. Centers	NET Ea.
6231	40	D	2.625	$ 6.60
6232	60	D	—	8.60
6233	70	D	4.125	9.50
6234	80	D	4.625	10.40
6235	100	D	—	12.10
6236	120	D	6.625	14.00

.050 SPACING

.125 Mtg. Hole Clearance. Dip Solder Terminal — Std. Pkg. 1

Smith No.	No. of Contacts	Single or Double	Mtg. Centers	NET Ea.
6237	40	D	1.500	$12.70
6238	60	D	2.000	14.40
6239	80	D	2.500	15.20
6240	100	D	3.000	16.90
6241	110	D	3.250	17.40
6242	128	D	3.500	18.50



MINIATURE TUBULAR TERMINALS For .062-.067 Diam. Hole

For printed circuits. Suitable for mounting transistors, resistors, neons, etc. Tapered section retains wire leads: Positive locking in hole, no staking required. Firmly holds wires of .010 to .050 diam.
MATERIAL: .006 thick brass, precision-formed and pretinned.

Std. Pkg. 100

No.	NET Per C
6160	$2.60

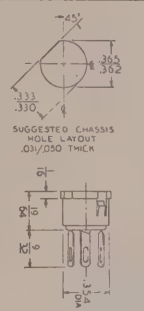
INSERTION TOOL, for hand insertion.

No.	Std. Pkg.	NET Each
6161	6	$1.50

DUAL IN-LINE I.C. SOCKETS

P.C. For 14 and 16 pin in-line Hybrid packages having 100" x 300" grid spacing. Accepts round or flat pins. Body of general purpose phenolic. Brass electro plated contacts.
Std. Pkg. 25

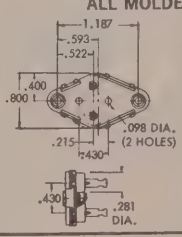
No.	Pins	NET Per C
6252	14	$66.00
6253	16	66.00



TRANSISTOR SOCKETS For TO-5 Case Style

Snap-in type transistor sockets for TO-5 and TO-18 3 and 4 lead, plus 3 lead in-line transistors. Phosphor bronze, cadmium plated contacts with a polysulfone body. Fits in "D" shape hole. Std. Pkg. 100

No.	Case	NET Per C
6265	TO-5	$20.00



ALL MOLDED POWER TRANSISTOR SOCKET

Fully insulated power transistor socket, for use with diamond case, TO-3 style. Body of self-extinguishing phenolic, U.L. Listed. Phosphor bronze contacts, gold plated over silver. Mounting plate tapped for 6-32 screws. Integrally molded bosses on mounting holes eliminate need for separate washers. Std. Pkg. 100

No.	NET Per C.
6266	$50.00

TEST LEAD RACKS
Heavy Gauge Steel, Blue Enamel Finish

Holds and organizes all test leads, patch cords, jumpers and co-axial cables, up to a maximum cable diameter of 7/32. Easily mounts on wall or any vertical surface. Short rack ideal for scope carts, mobile test stations, etc. Medium and long racks used at permanent test stations. Side-by-side mounting or mixed lengths fill any desired wall space. Mounting hardware (not supplied) Width — 3-3/4".
Std. Pkg. 1

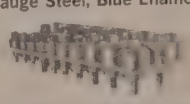
No.	Description	Net Ea.
3061	5½ Long, 7 slots	$3.00
3062	11 Long, 14 slots	3.50
3063	16¼ Long, 21 slots	3.90

ACCESSORY ADAPTER RACK
Heavy Gauge Steel; Blue Enamel Finish

Holds a variety of adapters, including 3/8" AND 1/2" dual plugs. BNC, UHF, N series Co Axial adapters in-line single adapters. "Hook-on" test probes. AC Grounding adapters, etc. Easily mounts on wall or any vertical surface with #8 screws (not supplied) 11" long by 3-1/2" wide.
Std. Pkg. 1

No.	Description	Net Ea.
3064	Adapter Rack	$3.50

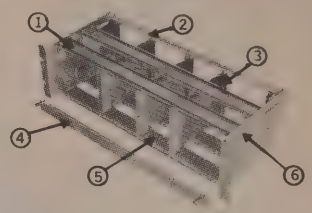
CHASSIS PUNCH RACK WITH PUNCHES
Heavy Gauge Steel; Blue Enamel Finish



Rack is 11" long x 3¾" wide, holds all sizes of round punches from ½ TO 1⅜ inclusive. Full set contains all punches and rack. Intermediate set contains punches from ½" TO 1-1/4" BY 1/8 increments (7 punches). Easily mounts on wall or any vertical surface with #8 screws (not supplied)
Std. Pkg. 1

No.	Description	Net Ea.
3066	Full set (16 punches) and Rack	$96.00
3844	Inter. set (7 punches) and Rack	45.00
3065	Rack only	3.50

PRINTED CIRCUIT CARD RACK
UNIVERSALLY ADJUSTABLE & STACKABLE
Fits Standard 19-inch Equipment Racks



ADJUSTABLE
1. **UP-AND-DOWN** For Card Widths 2 3/8" to 4 3/4"
2. **FRONT-TO-BACK** For Card Lengths 3 1/2" to 7 1/4"
3. For P.C. Connector Sizes
4. **LOCKING BAR** Holds Cards Securely against Rear Connectors
5. Variable in .400" Increments
6. **CALIBRATED SIDE PANELS** For Fast, Precise Adjustment to Any Card Size

- CARD CAPACITY UP TO 39 CARDS, 1/16" THICK.
- CARD SIZES WITH LOCKING BAR, 2 3/8" TO 4 3/4" MAXIMUM WIDTH. 4 3/8" TO 6 1/2" MAXIMUM LENGTH. WITHOUT LOCKING BAR, 3 1/2" TO 7 1/2" MAXIMUM LENGTH.
- CARD SPACING .400" MINIMUM CENTERS, ADJUSTABLE IN .400" INCREMENTS.
- ACCOMMODATES CARD EDGE CONNECTORS WITH MOUNTING CENTERS FROM 0.936" MINIMUM TO 4.437" MAXIMUM.

CARD RACK # 3050

Complete with Board Guides

In Lots of	Suggested Resale Each
1 to 9	$30.00
10 to 24	27.50
25 to 99	25.00
100 up	24.00

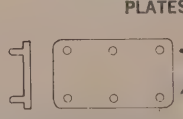
BOARD GUIDES

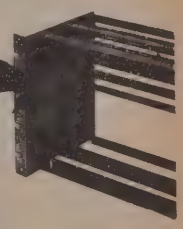
No.	Std. Pkg. 100
3051	$ 5.00

CARD RACK REPLACEMENT PARTS

Cat. No.	Description	NET Ea.
3050-1	Guide Rail	$2.50
3050-2	Guide Rail Bracket	.50
3050-3	Connector Rail Bkt	1.25
3050-4	Connector Rail	1.00
3050-5	Side Plate	2.50
3050-6	Locking Bar Bkt	.50
3050-7	Locking Bar	1.50
3050-8	Screw, 4-40 x ¼	.01
3050-9	Screw, 4-40 x 3/8	.01
3050-10	Screw, 6-32 x 5/16	.01
3050-11	Hex Nut, 4-40 x ¼	.01
3050-12	Int Tooth, #4	.01
3050-13	Nylon Guide Bushing	.02
3050-14	Captive Screw	.15
3050-16	Nylon Washer	.02
3050-17	Plastic Card Guide	.05
3050-18	Instructions	.50

P.C. CARD RACK STACKING PLATES

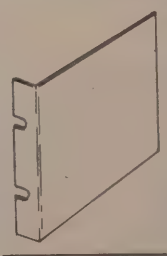




Designed to stack one or more No. 3050 card racks. Can also be used to create a double size card rack to accommodate larger size cards. Made of anodized aluminum, supplied with mounting hardware, available in pairs.
Std. Pkg. 1 Pair

No.	Net Per Pair
3057	$3.50

P.C. CARD RACK BLANK END PLATES



Anodized aluminum blank end plates for P.C. card racks. Designed for use with the standard No. 3050 hardware, to design custom rack sizes. Flanged and notched for RETMA mounting. Drill templates furnished with each pair of end plates to facilitate drilling within the P.C. card size limitations. Available in pairs.
Std. Pkg. 1 Pair

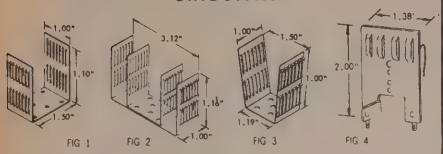
No.	Length	Height	Centers	Net Per Pair
3052	7.812	5.219	1.125	$4.80
3053	9.000	6.970	2.000	5.80
3054	11.000	8.719	2.875	7.00
3055	12.000	5.219	1.125	5.80
3056	12.000	10.470	3.750	9.00

SEE THE NEW
NORELCO
MINIATURE
PROJECTION LAMPS
ON SMITH PAGES 37-39

H. H. SMITH ELECTRONIC COMPONENTS

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

HEAT SINKS FOR SEMI-CONDUCTOR CIRCUITRY



LIGHTWEIGHT — ECONOMICAL — VERSATILE

SMITH HEAT SINKS can be depended upon for economical and efficient cooling of semi-conductor devices under individual environmental operating conditions. Designed with pre-punched transistor hole patterns of pre-painted aluminum with louver design for more efficient heat transfer, and of silver-bearing copper, also louvered, for constant retention under severe shock and vibration environments, ideal for printed circuit boards and metal surfaces where minimum space and weight are important considerations

THERMAL RESISTANCE

Thermal Resistance Hca is the measure of the effectiveness of a heat dissipator in keeping down the temperature of a semi-conductor while heat is being developed. The thermal resistance is multiplied by the number of watts dissipated; the result is a rise in temperature above ambient air. The lower the Hca figure, the cooler the semi-conductor. The Hca figures represent natural convection situations in a sea level atmosphere. Actual performance in individual situations depends upon air flow, proximity of interfering objects, thermal conductive effects of the chassis, and heat radiated or convected from other components.

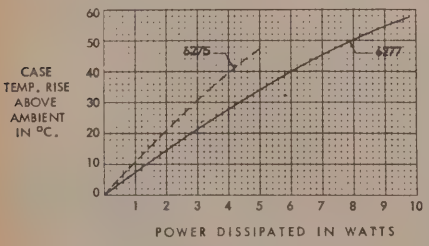
THERMOVANES

Manufactured of pre-painted aluminum .060" thick. Designed for thru-board mounting, except Fig. 4 provided with mounting Lugs.

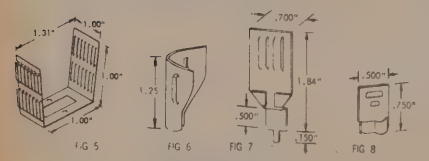
ALL HEAT SINKS ARE FURNISHED WITH PRE-PUNCHED TRANSISTOR HOLE PATTERNS

Smith No.	Fig. No.	Case Style	Thermal Res. C/W	Wt. in Grams	Std. Pkg.	Resale Per C
6275	1	TO-3	9.5	9.8	100	35.00
6276		TO-66, MD-17	9.5	9.8	100	35.00
6277	2	TO-3	5.6	28.4	50	95.00
6278	5	IC V21-675, Case 675	9.5	9.8	100	35.00
6279		TO-66, MD-17	5.6	23.4	50	95.00
6280	3	TO-36, Stud Mtd Types 1/4" max	10.0	10.8	100	35.00
6281	4	Flat Packs, Plastic or Tab	15.1	7.0	50	50.00

*Thermal Resistance measured in free air; lower when chassis mounted



CASE TEMPERATURE RISE ABOVE AMBIENT IN °C



THERMOFLAGS

Manufactured of silver-bearing copper, except Fig. 6 pre-painted, aluminum .018" thick. Designed for self support, except Fig. 7 provided with mounting lug

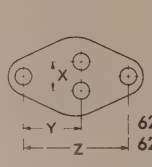
Smith No.	Fig. No.	Case Style	Thermal Res. C/W	Wt. in Grams	Std. Pkg.	Resale Per C
6282	6	TO-5, 0.325" Case Dia	46	1.0	100	$20.00
6283	7	152, Tab Mtd Flat Packs	40-43	1.6	100	$30.00
6284	8	TO-92, TO-98, All "D" Shape Styles	72	1.0	100	$16.00

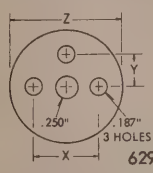
*Thermal Resistance measured in free air

"OFF-THE-SHELF"

SMITH Standard Products are stocked nationally on the shelves of every major Parts Distributor. "It's Sound Planning To SPECIFY SMITH!"

MICA INSULATING WAFERS For TO-3, TO-66 and TO-36 Case Styles

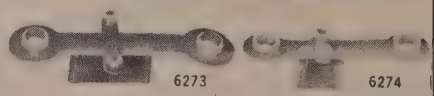




When installed between semi-conductor and chassis or heat dissipator, it yields a lower thermal resistance. Std. Pkg. 100

No.	Case Style	Dimensions X	Y	Z	NET Per C
6285	TO-3	.430"	.665"	1.187"	$5.00
6286	TO-66	.200"	.580"	.960"	5.00
6291	TO-36	.690"	.345"	1.187"	5.00

NYLON POWER TRANSISTOR MOUNTS



One-piece Nylon transistor mount replaces six pieces of conventional insulation when mounting power transistors. Built-in barrier separates and insulates base and emitter pins from each other. Screw insulators require 3/16" clearance holes, pin insulators .113 dia. clearance. Mounting centers are standard for types TO-3 and TO-66 power transistors. Std. Pkg. 100

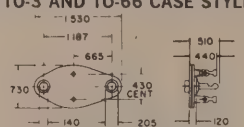
No.	Transistor Type	NET Per C
6273	TO-3	$4.00
6274	TO-66	4.00

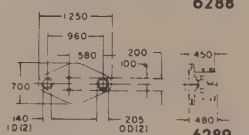
HIGH TEMPERATURE TRANSISTOR MOUNTS

Heavy Duty, Made of Celanese 917 J101 Polyester. Designed for excessive temperature and electrical requirements. Rated SE-O UL, 400° F Cont. Std. Pkg. 100

No.		NET Per C
6292	TO-3	8.00
6293	TO-66	8.00

TRANSISTOR WAFER SOCKETS FOR TO-3 AND TO-66 CASE STYLES

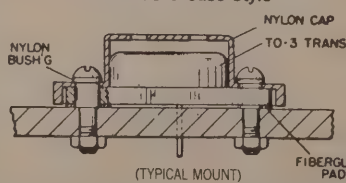




Molded nylon top with molded boss washer construction and self-threading mounting bracket for # 6 screw. Contacts and mounting plate are of cadmium plated brass. Std. Pkg. 100

NO.	FOR CASE	NET Per C
6288	TO-3	$20.00
6289	TO-66	20.00

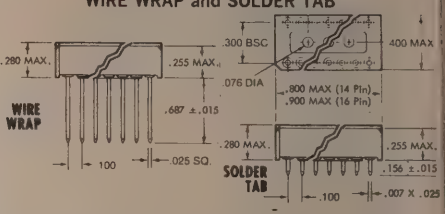
NYLON PROTECTIVE COVER For TO-3 Case Style



Insulates case from electrical shock and thermal contact. Power types in "SE-O" material. Std. Pkg. 100

No.	For Case Style	NET Per C
6287	TO-3	$40.00
6294	TO-66	33.00
6295	TO-5	5.50
6296	TO-18	4.50

LOW PROFILE I.C. SOCKETS WIRE WRAP and SOLDER TAB



Provided with removable cover for closed entry and contact replacement, polarity guide for assembly alignment. Made of glass filled Black Nylon, phosphor bronze (QQ 13-750 Comp A) contacts, 10-20 microinches gold over 30-100 microinches silver. Available in 14 and 16 pin, wire wrap and solder tab terminals. Std. Pkg. 50

No.	Pins	Contacts Lgth.	Thick.	Body	NET Per C
6245	14	.687"	.025" Sq.	Wire Wrp	$85.00
6246	16	.687"	.025" Sq.	Wire Wrp	95.00
6247	14	.156"	.025x.007"	Sldr Tab	75.00
6248	16	.156"	.025x.007"	Sldr Tab	80.00

UNIVERSAL TRANSISTOR SOCKET

Contacts are Phosphor Bronze, Cadmium Plated. Sockets are Molded of General Purpose Phenolic, or Mica Filled Phenolic. Other materials available upon request. Std. Pkg. 100

No. 6299 — Net per C $50.00

ORIGINAL EQUIPMENT MANUFACTURERS:

For your PRODUCTION requirements of SMITH standard products, we suggest you contact the factory. Use our facilities for variations to meet YOUR SPECIFICATIONS

PERPETUAL INVENTORY!

Every major electronic parts distributor in America stocks these standard SMITH products — and depends on our tremendous factory inventory for speedy and continuing replenishment

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

ELECTRONIC COMPONENTS SPECIFY SMITH

PRINTED CIRCUIT BOARD SUPPORTS

Made of Nylon and snaps into circuit board and chassis. Chassis hole .187 diameter, thickness from .034 to .080. P. C. board hole .156 1/16 thick. Std. Pkg. 100

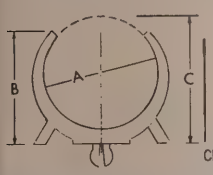
No.	Length	NET Per C
4093	3/16"	$3.00
4094	1/4"	3.10
4095	3/8"	3.30
4096	1/2"	3.50
4097	5/8"	3.75
4098	3/4"	4.00
4099	7/8"	4.50

SELF-EXTINGUISHING NYLON

Std. Pkg. 100

No.	Length	NET Per C
4293	3/16"	$4.20
4294	1/4"	4.50
4295	3/8"	4.85
4296	1/2"	5.20
4297	5/8"	5.50
4298	3/4"	6.00
4299	7/8"	6.75

COMPONENT CLIPS

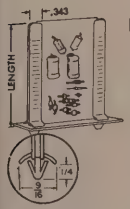


Clip Width 1/4" except #4081 3/16".

Made of black self-extinguishing Nylon. Mounts into chassis or P. C. board. For panel thickness 1/16", panel hole size 5/32"; except #4081; panel hole size 1/8". Std. Pkg. 100

No.	A	B	C	NET Per C
4081	7/32"	.265	.343	$ 5.70
4082	1/4"	.343	.375	6.40
4084	3/8"	.437	.500	7.40
4086	1/2"	.546	.625	9.00
4090	3/4"	.800	.875	12.00
4091	.800	.781	.925	13.00
4092	1.000	1.000	1.125	16.00

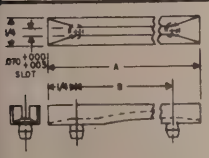
PRINTED CIRCUIT BOARD GUIDES



Position P.C. Boards of any width. Made of Natural Nylon, snaps into place. Double channeled for stacking and available in three sizes. Accepts board thicknesses from .030" to .075"; fits into panel hole .175" x .310 Add .100" to board width for mounting hole centers. Std. Pkg. 100

No.	Length	NET Per C
6249	1"	$17.00
6250	2"	18.50
6251	3"	20.00

RACK CARD GUIDES



Guides may be used horizontally or vertically for mounting circuit boards in rack chassis. Guides snap into .125" dia. hole at both ends. Four lengths in natural nylon. Std. Pkg. 50

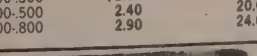
No.	A	B	NET Per C
6339	3"	2½"	$34.00
6340	4"	3½"	39.00
6341	6"	5½"	42.00
6342	8½"	8"	45.00

TWIST LOCK CABLE TIES

Time and cost saving white Nylon re-usable cable ties. Twists to lock wire into place, twists to unlock. Std. Pkg. 1

No.	For Wire Dia.	NET Per C	NET per M
8982	.200-.300	$2.10	$18.00
8983	.400-.500	2.40	20.00
8984	.700-.800	2.90	24.00

BLIND HOLE CABLE STRAPS



Mounting hole 1/4", 5/16" wide for panel thickness 1/14"

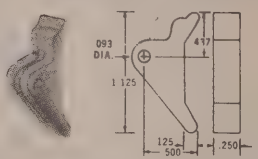
No.	Max. Cubic Dis.	NET Per C
8971	1/4"	$2.00
8972	7/16"	2.50
8973	5/8"	3.00

NYLON WIRE MARKER PLATES

Made of Nylon, attaches to wire harness with any type of wire tie or lacing cord. Write in identification. Available in three sizes. Reusable. Std. Pkg. 100

No.	Size	NET Per C
8979	3/4" x 1 1/2"	$ 9.00
8980	3/4" x 1 3/4"	9.50
8981	3/4" x 2"	10.00

NYLON CIRCUIT CARD EJECTOR



Designed for easy and quick removal of circuit boards. Lever action prevents damage to card and components. For use with cards up to 1/16" thick, supplied with mounting pins. Std. Pkg. 100

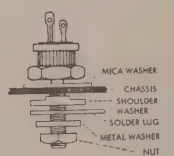
No.	NET Per C
6297	$35.00

NYLON CIRCUIT CARD HANDLE

Designed for use as a permanent handle or puller for quick and easy card insertion and removal. Std. Pkg. 100

No.	NET Per C
6298	$40.00

STUD TRANSISTOR MOUNTING HARDWARE



A complete listing of required mounting hardware for stud type transistors from #10 to #1/4 stud.

No.	Description	Std. Pkg.	NET Per C
1153	#10 Mica Washer	100	$3.40
1154	#1/4 Mica Washer	100	3.40
2666	#10 Nylon Shoulder Washer	100	2.20
2664	#1/4 Nylon Shoulder Washer	100	3.30
1410-10	#10 Solder Lug	1000	1.50
1468	#1/4 Solder Lug	1000	1.50
1152	#10 Metal Washer	1	.71
1147	#1/4 Metal Washer	1	.71
1367	#10-32 Nut	1	1.82
1368	#1/4-20 Nut	1	2.86
1399	#1/4-28 Nut	100	2.60

ENGINEERING TRANSISTOR MOUNT HARDWARE KIT

Contains all hardware necessary to mount and insulate stud mount transistors and TO-3, TO-66 types. Includes: 25 each of Smith Nos. 6285, 6286, 6291, 2666, 2664, 1410-10, 1468, 1152, 1147, 1367, 1368; 5 each of Smith Nos. 6287, 6294; 25 each of #10 mica washers, #1/4 mica washers and 1/4-28 nuts. Packaged in a clear plastic hinged box. Std. Pkg. 1

No.	NET Ea.
1319	$12.00

RADIO CHASSIS PUNCHES

A complete line of chassis hole punches for swiftly cutting clean, accurately located holes in chassis and panels. An assortment of round, square, "D," and Keyed holes can be punched by inserting in drilled pilot hole, and turning with wrench. Finished hole is smooth, accurately sized without burrs. Round punches are provided with center-line markings for enlarging holes larger than pilot hole. Individually packed. Std. Pkg. 1

ROUND

SQUARE

"KEY"

ROUND HOLE PUNCHES

No.	Hole Size	NET Ea.	No.	Hole Size	NET Ea.
3801	1/2"	$5.10	3814	1 1/4"	$ 5.90
3802	9/16"	5.10	3815	1 5/16"	7.45
3803	5/8"	5.10	3816	1 3/8"	7.45
3804	11/16"	5.15	3817	1 1/2"	8.05
3805	3/4"	5.15	3818	1 5/8"	9.85
3806	13/16"	5.15	3819	1 3/4"	11.05
3807	7/8"	5.15	3820	1 7/8"	13.70
3808	15/16"	5.70	3821	2"	14.35
3809	1"	5.70	3822	2 1/8"	15.55
3810	1 1/16"	5.90	3823	2 1/4"	16.35
3811	1 1/8"	5.90	3824	2 1/2"	26.10
3812	1 5/32"	5.90	3825	2 3/4"	36.35
3813	1 3/16"	5.90	3826	3"	50.00

SQUARE PUNCHES

3827	1/2"	$13.10	3830	7/8"	$16.70
3828	5/8"	12.95	3831	1"	17.20
3829	3/4"	14.20			

"KEY" PUNCHES

3832	15/32"	$14.85	3834	1 11/64"	$18.20
3833	15/16"	16.35	3835	1 17/64"	21.65

ROUND METER HOLE PUNCH

3836	2 25/32"	$26.20

"D" PUNCHES

3837	1/2x15/32"	$13.55	3838	5/8x19/32"	14.35

STANDARD DRIVE SCREWS

No.	Use with Nos.	NET Ea.
3847	3804 to 3807	$ .90
3848	3808 to 3817	1.00
3849	3818 to 3819	1.20
3850	3820 to 3824	1.30

BALL BEARING DRIVE SCREWS

Reduces friction and effort when punching round holes 11/16" and larger. For use only with Round punches listed above.

No.	Use with Nos.	NET Ea.
3839	3805 to 3808	$2.65
3840	3809 to 3817	2.95
3841	3818 to 3819	6.60
3842	3820 to 3824 and 3836	6.90

RELAY SOCKET PUNCH

P&B KHP Relay Socket Punch

No.	Hole Size	NET Ea.
3845	1.018 x .861	$33.50
3846	1.250 x 1.375	50.30
3851	.990 x 1.140	31.65

ROUND CHASSIS PUNCH SETS WITH RACK

Rack is 11" long x 3 1/4" wide, and holds all size round punches from 1/2" to 1 3/8" inclusive. Full set contains all punches and rack. Intermediate set contains punches from 1/2" to 1 1/4" by 1/8ths (7 punches). Easily mounts on wall or any vertical surface with #8 screws (not supplied). Std. Pkg. 1

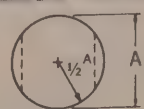
No.	Description	Net Ea.
3066	Full set (16 punches) and rack	$96.00
3844	Inter. Set (7 punches) and Rack	$45.00
3065	Rack only	$3.50

NYLON STRAIN RELIEFS

One-piece construction, absorbs pull and twist. Wire full anchored and insulated at chassis entrance. Available straight thru and right angle. Std. Pkg. 100

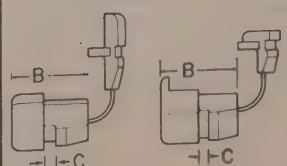
A = Chassis Hole. B = Length. C = Max. Chassis Thickness

STRAIGHT THRU



No.	Wire Type	Approx. Wire Size	A	B	C	NET Per C
937	AWM	1/8 - 3/16	.375"	.410"	.060"	$ 4.00
938	SP-1, SPT-1	.12 x .22	.437"	.410"	.062"	4.00
939	SV, SVT, HPD	.250-.290	.500"	.438"	.100"	4.50
822	SPT-1, SPT-2, SP-2, HPN	.12 to .30	.500"	.406"	.062"	6.00
823	SJ, SJT, SJO	.365-.360	.625"	.580"	.062"	9.50

RIGHT ANGLE



STRAIGHT THRU RIGHT ANGLE

824	SPT-1, SPT-2, SP-2, HPN	.12 to .30	.500"	.687"	.100"	8.50
825	SV, SVT, HPD	.250-.290	.500"	.687"	.100"	8.50
826	S, ST	.360-.430	.750"	1.085"	.125"	19.00

SETTING PLIERS

No. 940 Setting Pliers $35.00 NET Each

IT'S SOUND PLANNING TO "SPECIFY SMITH" WHEN DESIGNING OR PURCHASING

H. H. SMITH ELECTRONIC COMPONENTS

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

TIE DOWN TERMINAL STRIPS

Standard Type

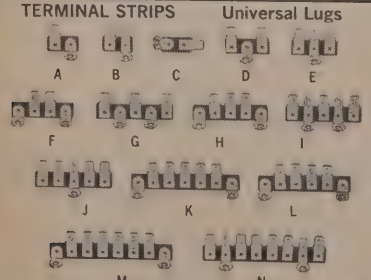
LUG: STEEL cadmium plated, spaced 3/8"
STRIP: XP Phenolic 3/8" wide x .062 thick.
MOUNT.: .140 I.D. for No. 6 screw.
Std. Pkg. 100

Miniature Type

LUG: STEEL cadmium plated, spaced 1/4" centers.
STRIP: XP Phenolic 5/16" wide x .062 thick.
MOUNT.: .096 I.D. for No. 3 screw or 3/32 rivet. Std. Pkg. 100

STANDARD TYPE No.	NET Per C	Illustration	MINIATURE TYPE No.	NET Per C
861	$6.00	A	1061	$ 8.00
862	6.00	B	1062	8.00
813	6.00	C	1003	8.00
820	6.00	D	1004	8.00
849	6.00	E	1039	8.00
828	6.00	F	1005	8.00
821	6.00	G	1009	8.00
830	7.00	H	1055	10.00
829	7.00	I	1043	10.00
864	7.00	J	1064	10.00
863	7.00	K	1063	10.00
846	7.00	L	1059	10.00
850	8.00	M	1074	11.00
857	8.00	N	1072	12.00
867	10.00	O	1067	15.00
853	11.00	P	1073	17.00
868	11.00	Q	1068	15.00
847	11.00	R	1071	15.00
865	11.00	S	1065	17.00
866	9.00	T	1066	15.00
855	9.00	U	1084	17.00
869	13.00	V	1069	18.00
854	13.00	W	1076	18.00
879	15.00	X	1158	20.00
859	15.00	Y	1156	20.00
871	15.00	Z	1157	20.00
860	15.00	AA	1060	20.00
848	17.00	BB	1078	19.00
900	17.00	CC	1075	19.00
858	17.00	DD	1096	19.00
870	17.00	EE	1070	19.00
901	15.00	FF		

TERMINAL STRIPS — Universal Lugs

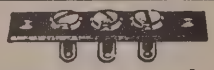


LUG: STEEL cadmium plated, spaced 3/8"
STRIP: XP Phenolic 3/8" wide x .062 thick.
MOUNT.: .140 I.D. for No. 6 screw.
DESCR.: QUICK CONNECT-DISCONNECT; TIE POINT SOLDER: WRAP and SOLDER.
Std. Pkg. 100

No.	Illust.	NET Per C	No.	Illust.	NET Per C
1085	A	$ 8.00	1092	H	$16.00
1086	B	8.00	1093	I	16.00
1087	C	8.00	1094	J	15.00
1088	D	11.00	1095	K	21.00
1089	E	11.00	1097	L	21.00
1090	F	14.00	1098	M	24.00
1091	G	16.00	1099	N	24.00

1576 Terminal Strip Connectors 5.00

SCREW TYPE TERMINAL BOARD

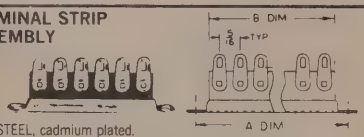


LUGS: BRASS, hot tinned, spaced 7/16" centers.
SCREW: Steel cadmium plated 6/32 x 3/8.
STRIP: XP Phenolic 5/8" wide x .062 thick.

No.	Terminal	Mounting Center	Std. Pkg.	NET Per C
914	1	7/8"	50	$16.00
872	2	1 7/16"	50	17.00
873	3	1 3/4"	50	25.00
874	4	2 3/16"	50	30.00
875	5	2 5/8"	25	37.00
876	6	3 1/16"	25	42.00
877	7	3 1/2"	25	50.00
928	8	3 15/16"	25	55.00
929	9	4 3/8"	25	60.00
930	10	4 13/16"	25	70.00

878 Shorting Link 2.50

TERMINAL STRIP ASSEMBLY



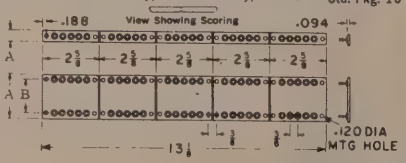
LUG: STEEL, cadmium plated.
BASE: STEEL, cadmium plated. Mounting holes for No. 6 screw.
STRIP: XP Phenolic
Std. Pkg. 100

No.	Terminals	Dimensions "A"	Dimensions "B"	NET Per C
3002	2	1.000	5/8"	$14.00
3003	3	1.312	15/16"	15.00
3004	4	1.625	1 1/4"	17.00
3005	5	1.937	9/16"	18.00
3006	6	2.250	1 7/8"	19.00
3007	7	2.562	2 3/16"	20.00
3008	8	2.875	2 1/2"	22.00
3009	9	3.187	2 13/16"	24.00
3010	10	3.500	3 1/8"	26.50
3011	11	3.812	3 7/16"	27.50
3012	12	4.125	3 3/4"	30.00
3013	13	4.937	4 3/32"	32.00

SCORED TERMINAL BOARDS

featuring
SNAP-APART SEPARATION

SMITH Scored Boards are fabricated in PBE material per MIL-P-3115C, Temp. 250°F. Max., Type XXXP. Terminals are securely staked and are made of Brass per QQ-626 comp. 22, half-hard with hot-tinned dip solder finish, per MIL-F-14072, Type 221. Smith type 2008. Std. Pkg. 10



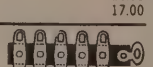
No.	A	B	Terminals	NET Price Each
2810	1/2"	Single Row	25	$ 2.65
2811	1 1/2"	1"	50	5.40
2812	2"	1 1/2	50	5.70
2813	2 1/2"	2"	50	5.90
2814	3"	2 1/2	50	6.10

BRACKET TYPE TERMINAL STRIPS

LUGS: STEEL cadmium plated, spaced 3/8" centers.
STRIP: XP Phenolic 3/8" wide x .062 thick.
MOUNT.: .140 I.D. for No. 6 screw.
Std. Pkg. 100

No.	Fig.	Lugs	NET Per C
1077	A	2	$ 7.00
1079	C	3	12.00
1080	B	3	13.00
1081	B	4	14.00
1082	B	5	16.00
1083	B	6	17.00

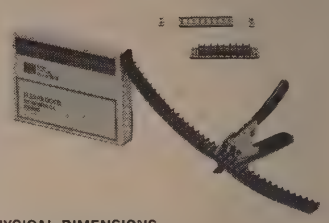
"T" TYPE TERMINAL STRIPS



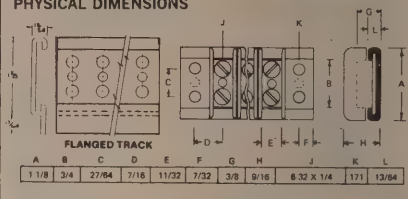
LUGS: STEEL cadmium plated, spaced 3/8" centers.
BRACKETS: Brass, cadmium plated.
STRIP: X Phenolic 3/8" wide x .062 thick.
MOUNT.: .140 I.D. for No. 6 screw.
Std. Pkg. 100

No.	Lugs	NET Per C
815	1	$ 7.00
816	2	10.00
817	3	12.00
818	4	13.00
819	5	16.00

AMP "FLEXI-BLOCK" TERMINAL BLOCK SYSTEM



PHYSICAL DIMENSIONS



A	B	C	D	E	F	G	H	J	K	L
1 1/8	3/4	27/64	7/16	11/32	7/32	3/8	9/16	6.32 X 1/4	171	13/64

Flexible, versatile terminal block comes in a roll on tape. Cut it, slide blocks into track, snap in end stops and the assembly is complete. Pre-drilled holes in track permit quick mounting on flat or curved surfaces.

FEATURES

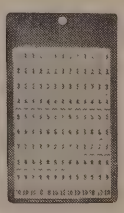
- Durable, tough nylon on flexible back. Bends without breaking.
- Track (G.E.) Nory' EN 265 conforms to Curved Surfaces.
- Offers quick customizing for any desired length.
- Track can be cut to desired length with AMP Special Industries cutting tool or hacksaw.
- Packaged in convenient dispenser carton.
- Easy — add-on capability.
- Block and track self-extinguishing.

RATING

Recognized under Component Recognition Program of Underwriters' Laboratories, Inc. For: 15AMP, 300 Volt Maximum. Wire Size — #22-14. Elect. File No. E60677

Amps	Breakdown Rms Line-to-Line	Breakdown Rmst Line-to-Ground	Max. Wire Size Comm. Term.
20	6,000	6,000	12

No.	Descr.	Net Each
9704	100 Terminal dispenser carton with Brass N. P. Screws	$15.00
9705	18" Flanged Track	.90
9706	18" Track	.69
9707	End Strips, 2 required per assy.	2.10/c
9708	Cutting tool cuts track or block	9.99



MARKER STRIPS

Supplied on cards; Die Cut for simple peel-off; For Flange Type track only; Numbers horizontal: 13 of each number. Std. Pkg. 5

NO.	DESCRIPTION	NET PER C
9709	Nos. 1 to 10	$51.00
9714	Nos. 1 to 20	$51.00

BATTERY CONNECTING STRIPS

1205 1217 1206 1218 1210 — 1219 1234 — 1296 — 1297

Std. Pkg. 50

No.	Term. Spacing	Fits Batteries No. Eveready	Burgess	RCA	Net per C
1205	1½"	455, 467, 475, 468	XX30, XX45, K45, V451	VS055, VS016, VS082, VS125	$40.00
1206	2½"	490	N60	VS090	
1210	15/16"	437, 495, 477, 2356, 479	XX50, N60X, P45, C6X, P60	VS217, VS316 VS218, VS219	40.00 40.00
1217	1¼"	707	D5	VS315	40.00
1218	1⅜"	274, 276	4D4, D6	VS306	40.00
1219	13/16"	243	2Z3	VS324	40.00
1234	½"	E126, 415, 216, 416, 246	H126, U30 2U6, UX45, 2N6	VS328, VS086, VS323, VS318, VS305	27.00

CONNECTOR SNAPS

Std. Pkg. 100

1296	Female	226, 228	P6, PM8	VS300A, VS329	15.00
1297	Male	2709		VS326	15.00

"SPECIALS" ARE STANDARD WITH SMITH

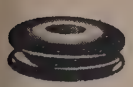
IT'S SOUND PLANNING TO "SPECIFY SMITH" WHEN DESIGNING OR PURCHASING

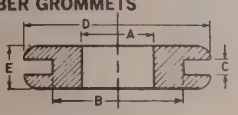
Add Dept. EM to address to tell them you saw it in eem

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

ELECTRONIC COMPONENTS BY SMITH

RUBBER GROMMETS



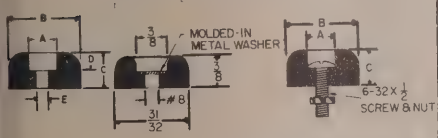


Formerly listed by Radio Essentials, Inc. and American Radio Hardware Inc., (Their catalog numbers as below, minus first digit).

Std. Pkg. 100

Cat. No.	I.D. A	P.H. B	P.T. C	O.D. D	W E	NET Per C
91114	1/8	1/4	/16	11/32	3/16	$ 2.50
91118	3/16	5/16	1/16	7/16	7/32	2.50
91103	3/16	15/32	1/8	9/16	3/8	3.30
91122	1/4	11/32	1/32	1/2	5/32	3.10
91119	1/4	13/32	1/16	9/16	1/4	2.70
91102	9/32	13/32	5/32	5/8	3/8	3.50
91123	9/32	1/2	1/4	11/16	7/16	5.50
91117	5/16	7/16	1/8	19/32	3/8	3.50
91116	5/16	1/2	1/8	3/4	3/8	5.00
91106	5/16	1/2	3/16	5/8	1/2	7.20
91120	19/64	7/16	1/16	5/8	1/4	3.10
91107	3/8	7/16	3/32	5/8	5/16	5.00
91121	3/8	1/2	1/16	21/32	1/4	3.00
91100	3/8	1/2	9/64	13/16	13/32	9.00
91111	3/8	11/16	9/64	7/8-1"	13/32	9.00
91109	3/8	7/8	1/4	1-1/16	3/8	15.00
91124	7/16	9/16	1/16	3/4	1/4	3.50
91112	49/64	1-3/32	1/16	1-5/8	5/16	15.00

RECESS RUBBER BUMPERS



NO.	A	B	C	D	E	NET PER C
2192	1/4	1/2	1/4	5/32	1/8	$1.80
2193	1/4	5/8	5/16	5/32	1/8	$3.00
2194	9/32	3/4	3/8	3/32	9/64	$3.50
2184	9/32	5/8	9/32	1/8	1/8	$3.50
2455	1/4"	17/32"	1/4"	5/32"	1/8"	$ 3.90
2456	5/16"	5/8"	5/8"	5/16"	11/64"	5.30
2457	1/4"	11/16"	13/32"	7/32"	1/8"	7.50
2458	7/32"	23/32"	17/32"	1/4"	3/32"	9.40
2459	1/4"	3/4"	17/64"	1/8"	1/8"	5.90
2460	3/8"	25/32"	9/16"	5/16"	3/16"	7.10
2461	1/4"	1"	1"	5/8"	1/8"	16.00

With Screw and Nut

NO.	SCREW SIZE	NET PER C
2196	6-32X 1/2	$7.00
2197	6-32X 1/2	$8.00
2198	6-32X 1/2	$9.00
2199	6-32X 1/2	$9.00
2466	4-40 x 3/8"	8.90
2467	8-32 x 1/2"	10.30
2468	4-40 x 3/8"	12.50
2469	2-56 x 1/2"	14.40
2470	4-40 x 3/8"	10.90
2471	8-32 x 1/2"	12.10
2472	4-40 x 1"	21.00

(With Molded-in Metal Washer)

2135	3/8	31/32	3/8		$5.00
2462	1/4"	17/32"	1/4"	5/32"	1/8"	6.60
2463	1/4"	11/16"	13/32"	7/32"	1/8"	11.00
2464	1/4"	3/4"	17/64"	1/8"	1/8"	8.40
2465	3/8"	25/32"	9/16"	5/16"	3/16"	12.00

2195	8-32 X 1/2	$10.00
2473	4-40 x 3/8"	11.60
2474	4-40 x 3/8"	16.00
2475	4-40 x 3/8"	13.40
2476	8-32 x 1/2"	17.00

SNAP-IN RUBBER BUMPERS

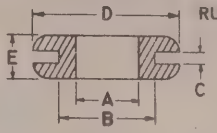
Snap-in rubber chassis bumpers require no mounting hardware, simply push into indicated chassis hole. Std. Pkg.100

No.	Fig.	Ch. Hole "A"	O.D. "B"	Height "C"	Ch. Thk. "D"	Lgth. "E"	Net per C
2450	1	5/32"	5/16"	15/64"	3/64"	25/64"	$2.90
2451	2	13/64"	3/8"	3/16"	3/64"	23/32"	3.00
2452	3	1/4"	3/8"	9/64"	1/16"	21/64"	3.00
2453	4	1/4"	1/2"	3/16"	1/16"	27/64"	3.90
2454	5	1/4"	9/16"	5/16"	3/32"	29/32"	3.90

VINYL CABINET BLACK BUMPERS

No.	Size Screw	A	B	NET Per C
2181	4	3/8"	9/16"	$5.50
2182	6	7/16"	3/4"	7.00
2183	8	5/8"	15/16"	9.00
		Grey		
2178	6	1/4"	11/16"	5.50
2179	8	5/16"	7/8"	7.00
2180	10	7/8"	1-11/16"	9.00

RUBBER GROMMETS



Std. Pkg. 100

Cat. No.	I.D. A	P.H. B	P.T. C	O.D. D	W E	NET Per C
2185	1/8	3/16	1/16	5/16	3/16	$2.40
2172	3/16	5/16	1/16	7/16	3/16	2.20
2170	1/4	3/8	1/16	5/8	1/4	2.50
2174	5/16	7/16	1/16	5/8	1/4	2.40
2175	3/8	1/2	1/16	21/32	1/4	2.50
2177	7/16	9/16	1/16	3/4	1/4	2.50
2186	1/2	3/4	1/16	1-1/16	5/16	5.30
2188	9/16	13/16	1/16	1-1/16	5/16	5.30
2187	5/8	7/8	1/16	1-1/8	5/16	5.40
2189	3/4	7/8	1/32	1"	5/32	5.20

VINYL GROMMETS

DESCR.: Exceptional aging qualities. High di-electric properties. Oil resistant. Durometer hardness 45 to 85. Std. Pkg. 100

Cat. No.	I.D. A	P.H. B	P.T. C	O.D. D	W E	NET Per C
2145	1/8	1/4	1/16	11/32	3/16	1.50
2146	3/16	5/16	1/16	7/16	7/32	1.80
2147	1/4	3/8	1/16	9/16	1/4	2.00
2148	3/8	1/2	1/16	5/8	1/4	2.20
2149	1/2	5/8	1/16	13/16	9/32	3.50

POLYETHYLENE GROMMETS

Molded of polyethylene and requires no mounting hardware or special tools, just snaps into hole. Color Gray, temperature rating 100-205°F. Std. Pkg. 100

max. panel thickness .095

No.	Mtg. Hole	Cable Dia.	Net Per C
8974	1/4"	1/8"	$2.00
8975	3/8"	1/4"	2.25
8976	1/2"	3/8"	2.50
8977	5/8"	1/2"	3.50
8978	3/4"	5/8"	4.00

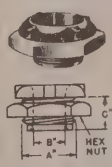
EXTRUDED "CATERPILLAR" NYLON GROMMET

Shape your own grommets to fit any size or shape opening. Made of non-conductive Black Nylon. Type 6/6, fungus resistant to conform to MIL M 20693a, Type I. Available in 25 ft. rolls for panel thickness .052 to .125

Std. Pkg. 1

No.	A	B	C	D	E	NET Ea.
2692	.052	.150	.040	.190	.125	$10.00
2693	.085	.155	.045	.200	.162	11.50
2694	.125	.175	.045	.220	.206	12.00

BAKELITE BUSHINGS

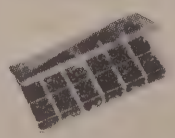


BODY: MOLDED Phenolic, black. U. L. approved, recommended for temperatures up to 300 degrees Fahrenheit.

NUT: Steel, cadmium plated. Std. Pkg. 50

No.	A	B	C	NET Per C
2136	13/32"	17/64"	1/4"	$ 4.70
2137	17/32"	5/16"	5/16"	6.50
2138	21/32"	29/64"	5/16"	8.00
2139	27/32"	9/16"	11/32"	25.00

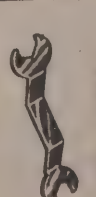
FIBRE WASHER KIT



Each kit contains about 1,000 Flat and Shoulder Washers, packed in an 18-compartment plastic box, in the following approximate quantities of SMITH standard washers:
100 each #2151, 2161, 2153, 2160; 75 each #2150, 2162; 60 each #2155, 2163; 50 each #2156, 2164, 2154, 2165; 35 each#2159, 2167; 25 each #2158, 2168; 10 each #2157, 2169.

No.	Std. Pkg. 1	NET Each
2173	Kit of 1,000 Washers	$20.00

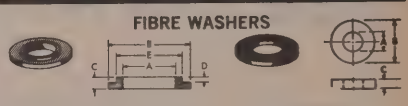
SHAFT WRENCHES



Specially designed offset, double-end wrenches for most hex sizes encountered in electronic construction. Made of heavy gauge, cadmium plated steel, clearly marked with size. No 999 is especially useful for Toggle Switch and Volume Control mounting nuts. Std. Pkg. 25

No.	For Nut Sizes	NET per C
998	5/16" - 3/8"	$30.00
999	1/2 - 9/16"	30.00
997	Set of 2 above	60.00

FIBRE WASHERS



SHOULDER WASHERS FLAT WASHERS

MATERIAL: Commercial vulcanized fibre, black, per MIL-F-1148A, grade CH.
TOLERANCES: "A" dim. (I.D.) — +.010 —.000
All other dimensions show, ±1/64".
"E" dim. (shoulder dia.) — +.000 —.010 Std. Pkg. 1

SHOULDER WASHERS

Cat. No.	Screw Clear.	A (I.D.)	B (O.D.)	C (Thk)	D (Shldr Hgt.)	E (Shldr Dia.)	NET Per C	NET Per M
2171	No. 2	.093	.250	.055	.025	.154	$1.90	$15.00
2151	No. 4	.115	.250	.062	.031	.187	1.40	11.00
2152	No. 6	.141	.250	.093	.031	.187	1.40	11.00
2153	No. 6	.141	.312	.093	.031	.187	1.50	12.00
2150	No. 6	.141	.375	.093	.031	.240	1.50	12.00
2155	No. 8	.167	.375	.093	.031	.246	1.50	12.00
2156	No. 10	.194	.375	.093	.031	.308	1.60	13.00
2154	1/4"	.253	.500	.093	.031	.308	1.60	13.00
2159	17/64"	.265	.500	.093	.031	.365	2.10	17.00
2158	3/8"	.385	.625	.093	.031	.498	2.30	19.00
2157	3/8"	.378	.750	.093	.031	.498	2.70	22.00

FLAT WASHERS

Cat. No.	Screw Clear	A (I.D.)	B (O.D.)	C (Thk)	NET Per C	NET Per M
2191	No. 2	.093	.250	1/32"	$ .80	$ 6.00
2161	No. 4	.115	.250	1/16"	.90	7.00
2160	No. 6	.141	.250	1/16"	.90	7.00
2162	No. 6	.141	.375	1/16"	.90	7.00
2163	No. 8	.169	.375	1/16"	1.00	8.00
2164	No. 10	.196	.375	1/16"	1.00	8.00
2165	1/4"	.253	.500	1/16"	1.00	8.00
2166	1/4"	.253	.500	3/32"	1.80	14.00
2167	5/16"	.315	.500	1/16"	1.30	10.00
2168	3/8"	.385	.625	1/16"	1.30	10.00
2169	3/8"	.378	.750	1/16"	1.90	15.00

NYLON WASHERS

MATERIAL: Nylon (Zytel 101), natural, per MIL-P-20693A.
TOLERANCES: "A" dim. (I.D.) — +.010 —.000
All other dimensions shown, ±1/64".
"E" dim. (shoulder dia.) — +.000 —.010

SHOULDER WASHERS

Cat. No.	Screw Clear.	A (I.D.)	B (O.D.)	C (Thk)	D (Shldr Hgt.)	E (Shldr Dia.)	NET Per C	NET Per M
2651	No. 2	.093	.250	.055	.025	.154	$2.20	$17.00
2661	No. 4	.115	.250	.062	.031	.187	2.00	15.00
2662	No. 6	.141	.250	.093	.031	.187	2.00	15.00
2663	No. 6	.141	.312	.093	.031	.187	2.10	16.00
2660	No. 6	.141	.375	.093	.031	.240	2.20	17.00
2665	No. 8	.167	.375	.093	.031	.246	2.20	17.00
2666	No. 10	.194	.375	.093	.031	.308	2.20	17.00
2664	1/4"	.253	.500	.093	.031	.308	3.30	25.00
2669	17/64"	.265	.500	.093	.031	.365	3.30	25.00
2668	3/8"	.385	.625	.093	.031	.498	3.30	25.00
2667	3/8"	.378	.750	.093	.031	.498	4.80	37.00

FLAT WASHERS

Cat. No.	Screw Clear	A (I.D.)	B (O.D.)	C (Thk)	NET Per C	NET Per M
2652	No. 2	.093	.250	1/32"	$1.00	$ 8.00
2671	No. 4	.115	.250	1/16"	1.20	9.00
2514	No. 4	.115	.281	3/64"	1.20	9.00
2670	No. 6	.141	.250	1/16"	1.20	9.00
2515	No. 6	.141	.312	3/64"	1.20	9.00
2672	No. 6	.141	.375	1/16"	1.40	11.00
2673	No. 8	.170	.375	1/16"	1.40	11.00
2516	No. 8	.170	.375	1/16"	1.40	11.00
2674	No. 10	.196	.375	1/16"	1.40	11.00
2517	No. 10	.196	.437	1/16"	1.80	14.00
2675	1/4"	.253	.500	1/16"	2.10	16.00
2676	1/4"	.253	.500	3/32"	3.30	25.00
2518	1/4"	.253	.562	1/16"	2.20	17.00
2677	5/16"	.315	.500	1/16"	2.10	16.00
2678	3/8"	.385	.625	1/16"	2.50	19.00
2679	3/8"	.378	.750	1/16"	3.90	30.00

MOLDED NYLON WASHERS

SHOULDER-FINISHING

Non conductive and corrosion resistant, ideal for insulation, cushioning or spacing protection. Meets Military Specification MIL-P-20693, Type 1. Available in Natural. Std. Pkg. 100

SHOULDER WASHERS

No.	A	B	C	D	E	NET Per C
2681	.122	.187	.281	.040	.040	$2.25
2682	.146	.218	.328	.040	.040	2.40
2683	.174	.250	.375	.060	.050	2.50
2684	.201	.281	.437	.050	.050	2.75
2685	.260	.375	.562	.060	.060	3.00
2686	.385	.500	.750	.060	.060	4.75

FINISHING WASHERS

No.	O.D.	I.D.	Thickness	NET Per C
2687	.437	.143	.100	$5.00
2688	.515	.171	.115	5.25
2689	.580	.191	.152	5.50
2690	.609	.225	.160	6.00
2691	.683	.251	.183	6.50

H. H. SMITH ELECTRONIC COMPONENTS

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

MACHINE SCREWS

ROUND HEAD
STEEL, CADMIUM PLATED

Size	No.	NET per C	No.	NET per M
2-56 x ¼"	1173C	$1.29	1173M	$11.90
2-56 x ½"	1174C	1.39	1174M	12.90
2-56 x ¾"	1175C	1.47	1175M	13.70
3-48 x ¾"	1176C	1.54	1176M	14.40
4-36 x ¼"	1177C	1.39	1177M	12.90
4-36 x 3/8"	1178C	1.43	1178M	13.30
4-36 x ½"	1183C	1.48	1183M	13.80
4-36 x 5/8"	1184C	1.56	1184M	14.60
4-36 x ¾"	1185C	1.59	1185M	14.90
4-40 x ¼"	1350C	1.39	1350M	12.90
4-40 x 3/8"	1351C	1.43	1351M	13.30
4-40 x ½"	1352C	1.48	1352M	13.80
4-40 x 5/8"	1353C	1.56	1353M	14.60
4-40 x ¾"	1354C	1.59	1354M	14.90
6-32 x ¼"	1000C	1.23	1000M	11.30
6-32 x 3/8"	1001C	1.27	1001M	11.70
6-32 x ½"	1002C	1.32	1002M	12.20
6-32 x 5/8"	1355C	1.40	1355M	13.00
6-32 x ¾"	1356C	1.48	1356M	13.80
6-32 x 1"	1357C	1.64	1357M	15.40
6-32 x 2"	1358C	3.42	1358M	33.20
8-32 x ¼"	1006C	1.55	1006M	14.50
8-32 x 3/8"	1007C	1.45	1007M	13.50
8-32 x ½"	1008C	1.55	1008M	14.50
8-32 x 5/8"	1010C	1.67	1010M	15.70
8-32 x ¾"	1359C	1.80	1359M	17.00
10-32 x ¼"	1271C	3.04	1271M	29.40
10-32 x ½"	1360C	1.84	1360M	17.40
10-32 x ¾"	1361C	2.14	1361M	20.40
10-32 x 1"	1362C	2.47	1362M	23.70

BRASS, NICKEL PLATED

Size	No.	NET per C	No.	NET per M
4-36 x ¼"	1044C	$2.72	1044M	$26.20
4-36 x 3/8"	1045C	2.79	1045M	26.90
4-36 x ½"	1046C	3.38	1046M	32.80
4-40 x ¼"	1047C	2.72	1047M	26.20
4-40 x 3/8"	1048C	2.79	1048M	26.90
4-40 x ½"	1049C	3.38	1049M	32.80
6-32 x ¼"	1050C	3.38	1050M	32.80
6-32 x 3/8"	1051C	3.61	1051M	35.10
6-32 x ½"	1052C	4.05	1052M	39.50
8-32 x ¼"	1056C	4.99	1056M	48.80
8-32 x 3/8"	1057C	5.27	1057M	51.70
8-32 x ½"	1058C	5.96	1058M	58.60

BINDING HEAD

STEEL, CADMIUM PLATED

Size	No.	NET per C	No.	NET per M
2-56 x ¼"	1369C	$1.29	1369M	$11.90
2-56 x ½"	1370C	1.39	1370M	12.90
2-56 x 5/8"	1371C	1.43	1371M	13.30
3-48 x ¼"	1272C	1.21	1272M	11.10
4-40 x ¼"	1372C	1.39	1372M	12.90
4-40 x ½"	1373C	1.48	1373M	13.80
4-40 x ¾"	1374C	1.60	1374M	15.00
6-32 x 1/8"	1273C	1.09	1273M	9.90
6-32 x 3/16"	1375C	1.40	1375M	13.00
6-32 x ¼"	1425C	1.23	1425M	11.30
6-32 x 3/8"	1426C	1.27	1426M	11.70
6-32 x ½"	1427C	1.32	1427M	12.20
6-32 x 5/8"	1376C	1.40	1376M	13.00
6-32 x ¾"	1377C	1.48	1377M	13.80
8-32 x ¼"	1428C	1.55	1428M	14.50
8-32 x 5/16"	1378C	1.50	1378M	14.00
8-32 x 3/8"	1429C	1.45	1429M	13.50
8-32 x ½"	1430C	1.55	1430M	14.50
8-32 x ¾"	1379C	1.80	1379M	17.00
10-32 x ½"	1380C	1.84	1380M	17.40
10-32 x ¾"	1381C	2.14	1381M	20.40

OVAL HEAD RACK SCREWS

STEEL, NICKEL PLATED

Size	No.	NET per C	No.	NET per M
6-32 x ¾"	1382C	$1.55	1382M	$14.50
8-32 x ¾"	1383C	1.96	1383M	18.60
10-32 x ½"	1111C	2.53	1111M	24.30
10-32 x ¾"	1112C	2.44	1112M	23.40

COUNTER SUNK WASHERS

BRASS, NICKEL PLATED

Size	No.	NET per C	No.	NET per M
#6	1115C	$1.90	1115M	$18.00
#8	1116C	1.95	1116M	18.50
#10	1117C	2.00	1117M	19.00

HEXAGON NUTS

BRASS NICKEL PLATED

Thread Size	WD A.F.	Thick-ness	No.	NET per C	No.	NET per M
2-56	3/16	1/16	1326C	$1.30	1326M	$12.00
3-48	3/16	1/16	1327C	1.30	1327M	12.00
4-36	1/4	3/32	1188C	1.33	1188M	12.30
4-40	1/4	3/32	1168C	1.33	1168M	12.30
6-32	1/4	3/32	1189C	1.33	1189M	12.30
6-32	5/16	7/64	1190C	1.87	1190M	17.70
8-32	1/4	3/32	1328C	1.60	1328M	15.00
8-32	5/16	7/64	1192C	1.79	1192M	16.90
10-32	5/16	7/64	1193C	1.85	1193M	17.30

VOLUME CONTROL —SWITCH AND POTENTIOMETER NUTS

HEX BRASS NICKEL PLATED

Thrd Size	WD. A.F.	Thk-ness	No.	Net Per C	No.	Net Per M
¼-20	7/16	3/16	1329C	$5.10	1329M	$50.00
¼-28	3/8	3/32	1243C	2.40	1243M	23.00
¼-28	3/8	1/8	1244C	2.50	1244M	24.00
¼-32	5/16	5/64	1245C	2.10	1245M	20.00
¼-32	3/8	3/32	1187C	2.60	1187M	25.00
5/16-32	7/16	.101	1255C	3.80	1255M	37.00
3/8-32	½	3/32	1195C	2.33	1195M	22.30
*3/8-32	½	3/32	*1199C	2.50	1199M	22.00
3/8-32	9/16	3/32	1258C	3.10	1258M	30.00
15/32-32	9/16	5/64	1196C	2.42	1196M	23.20
15/32-32	9/16	3/32	1260C	2.70	1260M	26.00

**STEEL, CADMIUM PLATED

RING NUTS, BRASS NICKEL PLATED

Thrd Size	Dia.	Thk-ness	No.	Net Per C	No.	Net Per M
3/8-32	½	1/16	1120C	$ 5.10	1120M	$ 50.00
15/32-32	5/8	1/16	1197C	3.10	1197M	30.00

DRESS NUT BRASS NICKEL PLATED

15/32-32	5/8	3/32	1198C	22.00	1198M	200.00

HEXAGON NUTS

STEEL, CADMIUM PLATED

2-56	3/16	1/16	1363C	$1.47	1363M	$13.70
3-48	3/16	1/16	1364C	1.47	1364M	13.70
4-36	1/4	3/32	1398C	1.42	1398M	13.20
4-40	1/4	3/32	1365C	1.42	1365M	13.20
6-32	1/4	3/32	1179C	1.42	1179M	13.20
6-32	5/16	7/64	1180C	1.42	1180M	13.20
8-32	1/4	3/32	1366C	1.42	1366M	13.20
8-32	5/16	7/64	1181C	1.70	1181M	16.00
10-32	3/8	1/8	1367C	1.82	1367M	17.20
1/4-20	7/16	3/16	1368C	2.86	1368M	27.60
1/2-32	3/8	1/8	1186C	2.90	1186M	28.00

NYLON SCREWS

Natural Color, MIL-P-20693A — Std. Pkg. 100

BINDING HEAD A

ROUND HEAD B

FLAT HEAD C

Size	A No.	B No.	C No.	
4-40 x ¼	2500	2520	2580	$4.50
4-40 x ⅜	2501	2521	2581	4.50
4-40 x ½	2502	2522	2582	4.50
6-32 x ¼	2503	2523	2583	4.50
6-32 x ⅜	2504	2524	2584	4.50
6-32 x ½	2505	2525	2585	4.50
6-32 x ⅝	2506	2526	2586	4.50
6-32 x ¾	2507	2527	2587	4.50
8-32 x ¼	2509	2529	2589	4.50
8-32 x ⅜	2510	2530	2590	4.50
8-32 x ½	2511	2531	2591	4.50
8-32 x ⅝	2512	2532	2592	4.50

NYLON HEX NUTS

Natural Color, MIL-P-20693A. Std. Pkg. 100

No.	Size	NET per C
2554	4-40 x ¼"	$8.00
2555	6-32 x 5/16"	8.00
2556	8-32 x 11/32"	8.00
2557	10-32 x ⅜"	8.00

SEE "MIL-SPEC" AND Q.P.L. PC TEST JACKS

SMITH PAGE 4

CAP NUTS

BRASS NICKEL PLATED

Thrd Size	Hex	Ht.	No.	Net Per C	No.	Net Per M
6-32	5/16	9/32	1300C	$ 4.10	1300M	$ 40.00
8-32	5/16	9/32	1301C	4.10	1301M	40.00
10-32	3/8	11/32	1302C	5.10	1302M	50.00
¼-20	7/16	3/8	1303C	7.10	1303M	70.00
¼-20	½	11/32	1304C	8.10	1304M	80.00
¼-28	7/16	3/8	1305C	7.10	1305M	70.00
5/16-18	9/16	7/16	1306C	13.00	1306M	120.00
3/8-16	5/8	½	1307C	17.00	1307M	160.00
3/8-24	5/8	½	1308C	17.00	1308M	160.00

OPEN END CAP NUTS

8-32	5/16	¼	1309C	$ 3.90	1309M	$ 38.00
¼-20	7/16	21/64	1310C	7.10	1310M	70.00
¼-20	½	3/8	1311C	9.10	1311M	90.00
5/16-18	9/16	5/8	1312C	12.00	1312M	110.00

KNURLED THUMB NUTS

BRASS NICKEL PLATED

Thrd Size	Dia.	Ht.	No.	Net Per C	No.	Net Per M
6-32	3/8	¼	1313C	$ 4.10	1313M	$ 40.00
8-32	7/16	5/16	1314C	6.10	1314M	60.00
10-24	½	21/64	1315C	7.10	1315M	70.00
10-32	½	21/64	1316C	7.10	1316M	70.00
¼-20	5/8	3/8	1317C	11.00	1317M	100.00

BATTERY NUTS

BRASS NICKEL PLATED

Thrd Size	Dia.	Ht.	No.	Net Per C	No.	Net Per M
6-32	11/32	13/64	1248C	$3.10	1248M	$30.00
8-32	11/32	13/64	1249C	3.10	1249M	30.00

ROUND LOCK NUTS

BRASS NICKEL PLATED

Thrd Size	Dia.	Thk-ness	No.	Net Per C	No.	Net Per M
⅛P	9/16	3/32	1240C	$3.40	1240M	$33.00
⅛P	¾	3/32	1241C	6.60	1241M	65.00

HEX LOCK NUT

1/8P	½	⅛	1242C	$3.40	1242M	$33.00

INTERNAL TOOTH LOCKWASHERS

STEEL – CADMIUM PLATED

I.D. (Clear)	O.D.	Thk-ness	No.	Net Per C	No.	Net Per M
#2	3/16	1/32	1118C	$ .91	1118M	$ 8.10
#3	7/32	1/32	1119C	.71	1119M	7.00
#4	¼	1/32	1127C	.85	1127M	7.50
#6	9/32	1/32	1128C	.83	1128M	7.30
#8	11/32	3/64	1129C	.83	1129M	7.30
#10	3/8	3/64	1130C	.85	1130M	7.50
¼"	15/32	1/16	1132C	1.38	1132M	12.80
5/16"	11/16	1/16	1131C	1.85	1131M	17.50
3/8"	½	3/64	1145C	1.98	1145M	18.80
15/32	19/32	1/32	1146C	2.10	1146M	20.00

EXTERNAL TOOTH LOCKWASHERS

STEEL – CADMIUM PLATED

#4	¼	1/32	1139C	$ .85	1139M	$ 7.50
#6	5/16	1/32	1140C	.83	1140M	7.30
#8	3/8	1/32	1141C	.83	1141M	7.30
#10	13/32	3/64	1142C	.85	1142M	7.50
¼"	½	1/16	1144C	1.38	1144M	12.80
5/16"	11/16	5/64	1143C	1.85	1143M	17.50

FLAT WASHERS

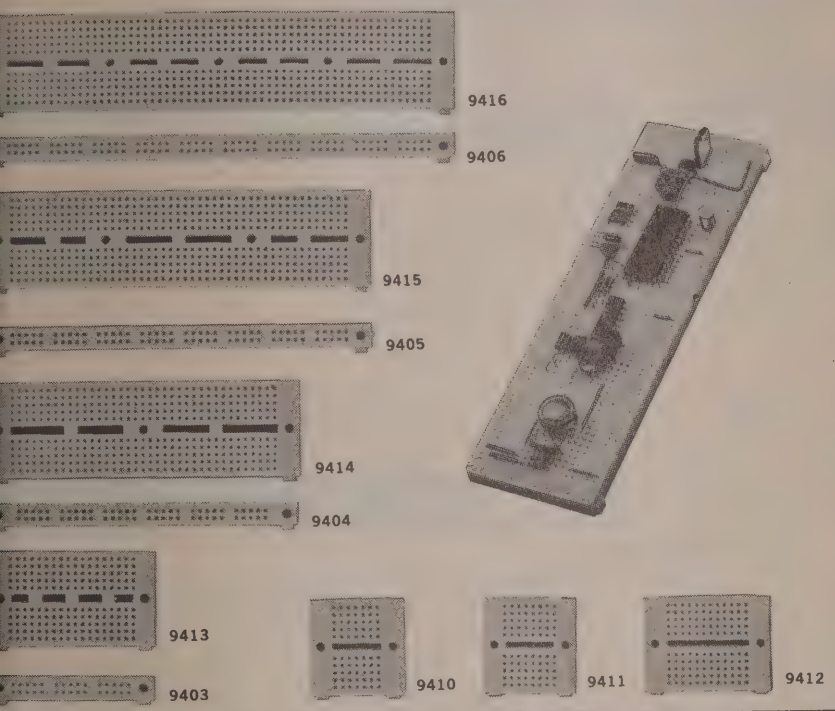
STEEL, NICKEL PLATED

I.D. (Clear)	O.D.	Thk-ness	No.	Net Per C	No.	Net Per M
#2	¼	1/32	1138C	$.71	1138M	$7.00
#4	5/16	1/32	1149C	.71	1149M	7.00
#6	3/8	1/32	1150C	.71	1150M	7.00
#8	3/8	1/32	1151C	.71	1151M	7.00
#10	3/8	1/32	1152C	.71	1152M	7.00
¼"	9/16	3/64	1147C	.71	1147M	7.00
5/16"	5/8	1/32	1148C	.71	1148M	7.00

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

ELECTRONIC COMPONENTS BY SMITH

BREDBLOX & BREDSTIX
MODULAR PROTOTYPE AIDS



SPECIAL FEATURES:

MATERIAL: DELRIN, which retains both its dimensional stability and clean smooth surface after years of use.

CONTACTS: Precision stamped, corrosion resistant nickel silver, which retains its grip after thousands of insertion cycles.

MOUNTING: Mounting of both BredBlox and BredStix is exceptionally easy. SNAP-PLUGS, supplied with each unit. SNAP the entire block on to base plate when matching 1/8" holes are supplied. When installed, these plugs finish the surface of the block leaving no dirt-catching holes.
For thick plate mounting, #4 Flat head screws and nuts may be used, or #6 self-tapping screws may be inserted from below.

STACKING: Exclusive DOVE-TAIL stackers hold blocks and strips of similar size together in perfect alignment for use as portable Super-Strips.

INDIVIDUAL FEATURES:

BREDBLOX: BredBlox have two separated rows of five interconnected contacts each. The median separates the rows by .300" (minimum DIP spacing). Therefore, each pin of a DIP (or other component) inserted in the strip will have four additional tie-points per pin in which to insert connecting wires or components. They accept leads and components up to .032 diameter. Inter connections are readily made with #22 AWG solid wire. All contact sockets are on a .100 square grid. Blox are 1 5/16" wide.

BREDSTIX: BredStix are buss strips to be used in conjunction with BredBlox for distribution of power and common signal lines. They consist of two separate rows of common terminals, grouped into clusters of five. Lengths match the four most common multiple IC BredBlox to provide common power and signal distribution for all IC's. All contact sockets are separated by .100. Stix are 5/16" wide.

Std. Pkg.: BredBlox 5. BredStix 10.

BredBlox

No.	Jacks	Lgth.	Each
9410	70	1 5/16"	$2.25
9411	80	1 5/16"	2.50
9412	120	1 13/16"	3.00
9413	180	2 5/16"	4.00
9414	370	4 5/16"	6.00
9415	470	5 5/16"	8.00
9416	590	6 1/2"	10.00

BredStix

No.	Jacks	Lgth.	Each
9403	30	2 5/16"	$ .75
9404	60	4 5/16"	1.25
9405	80	5 5/16"	1.50
9406	100	6 1/2"	2.00

BREDBORD KITS
PROTOTYPE DESIGN AIDS

new concept in solderless circuit evaluation and design aids. Smith BredBords e each supplied in easy-to-assemble Kit Form, for low cost and maximum flexibil- of use. All BredBords fit directly on standard Smith Instrument Cases to allow e addition of power supplies, clocks, level switches, etc. at the discretion of the er.

odern, color-coded binding posts (one connected to ground-plane) allow inter- ce to meters, scopes and other devices. BredBords are built on heavy duty ass-epoxy boards. Insulated and screened on top, with full copper ground plane elow. Each kit is supplied complete with all parts and hardware, including the clusive Smith Snap-Mount pins, and complete assembly instructions.

BredBord 1

TERMINALS: 630 TEST POINTS. 94 seperate 5 point terminals, plus 4 bus lines of 40 common test points each.
CAPACITY: Up to 6 14 pin, or 5 16 pin DIP IC's.
BINDING POSTS: Four, coded Black, Red, Green, and Yellow.
SIZE: 6" Wide, 3 1/2" Long.
FITS: Smith No. 2255 Meter Case.
CONTAINS: Punched and screened Glass-Epoxy ground plane board; 4 binding posts with hardware; 4 bumper feet, 1-No. 9415 Bred-Blox, 2-No. 9405 BredStix; Snap-Pins for rapid mounting and assembly instructions.
Std. Pkg. 1

No. 9420 **NET Ea. $15.00**

BredBord 2

TERMINALS: 800 TEST POINTS. 148 seperate 5 point terminals, plus 2 bus lines of 30 common test points each.
CAPACITY: Up to 10 14 pin, or 8 16 pin DIP IC's.
BINDING POSTS: Two, coded Red and Black.
SIZE: 3 1/2" Wide 6" Long.
FITS: Smith No. 2255 Meter Case.
CONTAINS: Punched and screened Glass-Epoxy ground plane board; 2 Binding Posts with hardware; 4 bumper feet, 2-No. 9414 Bred-Blox, 1-No. 9404 BredStix; Snap-Pins for rapid mounting, and assembly instructions.
Std. Pkg. 1

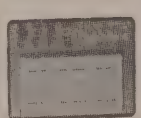
No. 9421 **NET Ea. $18.60**

BredBord 3

TERMINALS: 980 TEST POINTS. 148 seperate 5 point terminals, plus 6 vertical and 2 horizontal bus lines of 30 common test points each.
CAPACITY: Up to 10 14 pin, or 8 16 pin DIP IC's.
BINDING POSTS: Four, coded Black, Red, Green, and Yellow.
SIZE: 5" Wide, 6 1/2" Long.
FITS: Smith No. 2257 Meter Case.
CONTAINS: Punched and screened Glass-Epoxy ground-plane board; 4 Binding posts with hardware; 4 bumper feet; 2 No. 9414 Bred-Blox; 4 No. 9404 Bred Stix; Snap-Pins for rapid mounting, and assembly instructions.
Std. Pkg. 1

No. 9422 **NET Ea. $21.00**

BredBord 4



TERMINALS: 1,020 TEST POINTS. 188 seperate 5 point terminals, plus 2 horizontal bus lines of 40 common test points each.
CAPACITY: Up to 12 14 pin, or 10 16 pin DIP IC's.
BINDING POSTS: Four, coded Black, Red, Green, and Yellow.
SIZE: 6 1/2" Wide, 5" Long.
FITS: Smith No. 2257 Meter Case.
CONTAINS: Punched and screened Glass-Epoxy ground-plane board; 4 Binding Posts with hardware, 4 bumper feet, 2 No. 9415 Bred-Blox; 1 No. 9405 BredStix; Snap-Pins for rapid mounting, and assembly instructions.
Std. Pkg. 1

No. 9423 **NET Ea. $24.00**

BREDBORD 5

TERMINALS: 1,240 TEST POINTS. 188 separate 5 point terminals, plus 6 vertical bus lines of 40 common test points each, and 2 horizontal bus lines of 30 common test points each.
CAPACITY: Up to 12 14 pin, or 10 16 pin DIP IC's.
BINDING POSTS: Four, color coded Black, Red, Green, and Yellow.
SIZE: 5" Wide, 6 1/2" Long.
FITS: Smith No. 2257 Meter Case.
CONTAINS: Punched and screened Glass-Epoxy ground-plane board; 4 Binding Posts with hardware; 4 bumper feet; 2 No. 9415 BredBlox; 3 No. 9405 BredStix; 1 No. 9404 BredStix; Snap-Pins for rapid mounting, and assembly instructions.
Std. Pkg. 1

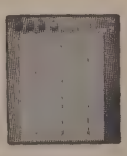
No. 9424 **NET Ea. $30.00**

BredBord 6

TERMINALS: 1,810 TEST POINTS. 282 seperate 5 point terminals, plus 8 vertical and 2 horizontal bus lines of 40 common test points each.
CAPACITY: Up to 18 14 pin, or 15 16 pin DIP IC's.
BINDING POSTS: Four, color coded Black, Red, Green, and Yellow.
SIZE: 7 3/32" Wide, 8 3/32" Long.
FITS: Smith No. 2289 Meter Case
CONTAINS: Punched and Screened Glass-Epoxy ground plane board; 4 Binding Posts with hardware; 4 bumper feet; 3 No. 9415 Bred-Blox; 5 No. 9405 BredStix, Snap-Pins for rapid mounting, and assembly instructions.
Std. Pkg. 1

No. 9425 **NET Ea. $39.00**

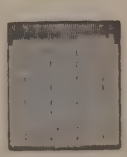
BredBord 7



TERMINALS: 2,330 TEST POINTS. 354 seperate 5 point terminals, plus 8 vertical bus lines of 50 common test points each, and 4 horizontal bus lines of 40 common test points each.
CAPACITY: Up to 24 14 pin, or 21 16 pin DIP IC's.
BINDING POSTS: Four, color coded Black, Red, Green, and Yellow.
SIZE: 7 3/32" Wide, 8 3/32" Long.
FITS: Smith No. 2289 Meter Case.
CONTAINS: Punched and screened Glass-Epoxy ground-plane board; 4 Binding Posts with hardware; 4 bumper feet, 3 No. 9416 Bred-Blox; 4 No. 9406 BredStix; 2 No. 9405 Bred-Stix, Snap-Pins for rapid mounting, and assembly instructions.
Std. Pkg. 1

No. 9426 **NET Ea. $45.00**

BredBord 8



TERMINALS: 3,060 TEST POINTS. 472 seperate 5 point terminals, plus 10 vertical and 4 horizontal bus lines of 50 common test points each.
CAPACITY: Up to 32 14 pin, or 28 16 pin DIP IC's.
BINDING POSTS: Four, color coded Black, Red, Green, and Yellow.
SIZE: 7 3/32" Wide, 8 3/32" Long.
FITS: Smith No. 2289 Meter Case.
CONTAINS: Punched and screened Glass-Epoxy ground-plane board; 4 Binding Posts with hardware; 6 bumper feet, 4 No. 9416 Bred-Blox; 6 No. 9406 BredStix, Snap-Pins for rapid mounting, and assembly instructions.
Std. Pkg. 1

9427 **NET Ea. $51.00**

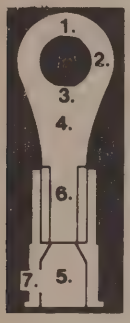
H. H. SMITH ELECTRONIC COMPONENTS

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

3M COMPANY SOLDERLESS TERMINALS

Manufactured by 3M Company - Distributed by HERMAN H. SMITH, INC. Through Electronic Distributors

COLOR CODE	
CLEAR	26 24 AWG
RED	22 18 AWG
BLUE	16 14 AWG
YELLOW	12 10 AWG



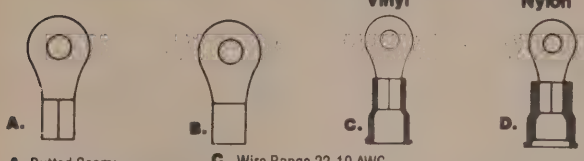
FEATURES

1. One piece, burr free construction for maximum electrical conductivity.
2. Electro-tin plating for maximum corrosion resistance.
3. Construction of pure electrolytic (ETP) copper annealed to relieve stress points and to insure maximum installed strength.
4. Barrel to pad transition designed to minimize flexing and bending.
5. Funnel barrel construction for positive and easy wire insertion — eliminating strand hangups.
6. Multiple "V" grooves in selective sizes for maximum holding power and current flow.
7. Insulation has a non-slip ridge for ease of positioning crimping tool.

U.L. AND C.S.A. listed.

BARREL STYLES

NON-INSULATED | INSULATED (Vinyl, Nylon)

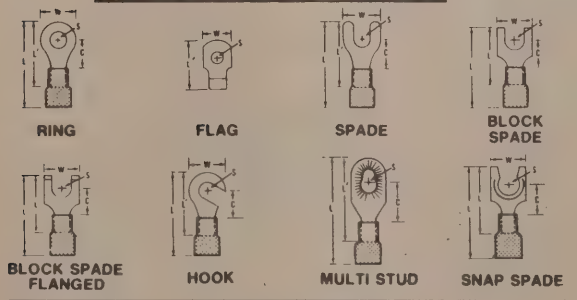


A. Butted Seam; Wire Range — 26-10 AWG.
B. Silver Brazed Seam; Wire Range — 22-10 AWG.
C. Wire Range 22-10 AWG.
D. Wire Range 26-10 AWG.

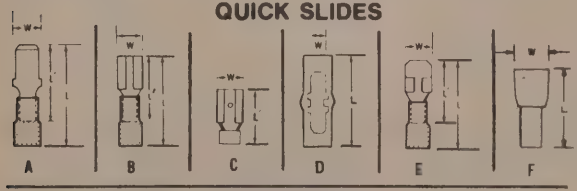
Oper. temp. range -(C & D) continuous duty 40°F to 250°F; Intermittent duty to 350°F.

SUGG. RESALE DISCOUNT SCHEDULE

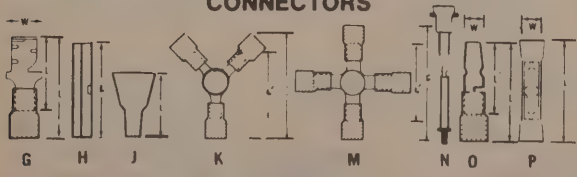
1,000 — 4,999	NET
5,000 — 14,999	NET LESS 10%
15,000 — 24,999	NET LESS 15%
25,000 — And Up	NET LESS 20%



QUICK SLIDES



CONNECTORS



QUICK SLIDE ACCESSORIES

26-24 WIRE RANGE

BARREL I.D. .035
THICKNESS .020

RING

BASIC DIMENSIONS			L'	BUTTED		BRAZED		L	VINYL INSUL.		NYLON INSUL.	
STUD	WIDTH	CLEAR		NO.	NET/C	NO.	NET/C		NO.	NET/C	NO.	NET/C
1-2	14	11	32	5100	2.30			46			5101	9.40
3-4	20	.21	46	4968	2.30			60			4972	9.40
5-6	20	.21	46	4969	2.30			60			4973	9.40
8	.25	27	54	4970	2.30			68			4974	9.40
10	.25	.27	54	4971	2.30			68			4975	9.40

SPADE

3-4	.20	.21	46	4976	2.30			60			4978	9.40
5-6	.25	.27	54	4977	2.30			68			4979	9.40

22-18 WIRE RANGE

BARREL I.D. .075
THICKNESS .030

RING

BASIC DIMENSIONS			L'	BUTTED		BRAZED		L	VINYL INSUL.		NYLON INSUL.	
STUD	WIDTH	CLEAR		NO.	NET/C	NO.	NET/C		NO.	NET C	NO.	NET/C
1-2	25	23	60	5102	2.30	5107	4.00	80	5112	4.90	5117	8.10
3-4	25	23	60	5103	2.30	5108	4.00	80	5113	4.90	5118	8.10
5-6	25	23	60	4801	2.30	4804	4.00	80	4809	4.90	4812	8.10
8	33	29	70	4802	2.30	4805	4.00	90	4810	4.90	4813	8.10
10	33	29	70	4803	2.30	4806	4.00	90	4811	4.90	4814	8.10
1/4	47	40	89	5104	3.10	5109	4.80	1.09	5114	5.80	5119	10.00
5/16	47	40	89	5105	3.40	5110	5.10	1.09	5115	7.00	5120	10.70
3/8	57	40	94	5106	3.40	5111	5.10	1.14	5116	7.00	5121	10.70

FLAG

4-6	.38	.34	66	5122	3.50							
8	.38	.34	66	5123	3.50							
10	.38	.34	66	4815	3.50							

MULTI-STUD RING

2-4-6	.28	.29	.74	5200	2.50			94	5202	5.40		
6-8-10	.35	.30	.82	5201	3.40			1.02	5203	6.30		

SPADE

4-6	.34	.29	70	4816	2.30	4819	4.00	90	4822	4.90	4825	8.10
8	.34	.29	70	4817	2.30	4820	4.00	90	4823	4.90	4826	8.10
10	.34	.29	70	4818	2.30	4821	4.00	90	4824	4.90	4827	8.10

SNAP SPADE

4	.25	.25	.68	5204	2.50			.88	5208	5.40		
6	.25	.25	.68	5205	2.50			.88	5209	5.40		
8	.30	.25	.68	5206	2.50			.88	5210	5.40		
10	.32	.25	.68	5207	2.50			.88	5211	5.40		

BLOCK SPADE

4-6	.30	.25	.65	4829	2.30	4832	4.00	85	4835	4.90	4838	8.10
8	.30	.25	.65	4830	2.30	4833	4.00	85	4836	4.90	4839	8.10
10	.30	.25	.65	4831	2.30	4834	4.00	85	4837	4.90	4840	8.10

BLOCK SPADE FLANGED

4-6	.30	.25	.56	4841	2.30	4844	4.00	.85	4847	4.90	4850	8.10
8	.30	.25	.56	4842	2.30	4845	4.00	.85	4848	4.90	4851	8.10
10	.30	.25	.56	4843	2.30	4846	4.00	.85	4849	4.90	4852	8.10

HOOK

4-6	.33	.29	70	4853	2.30	4856	4.00	90	4859	4.90	4862	8.10
8	.33	.29	70	4854	2.30	4857	4.00	90	4860	4.90	4863	8.10
10	.33	.29	70	4855	2.30	4858	4.00	90	4861	4.90	4864	8.10

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

ELECTRONIC COMPONENTS BY H. H. SMITH

COLOR CODE
CLEAR AMBER 26 24 AWG
RED 22 18 AWG
BLUE 16 14 AWG
YELLOW 12 10 AWG

SOLDERLESS TERMINALS

Manufactured by 3M Company – Distributed by **HERMAN H. SMITH, INC.** Through Electronic Distributors

3M COMPANY

16-14 WIRE RANGE

BARREL I.D. .095
THICKNESS .030

RING

(SEE ILLUSTRATION ON PREVIOUS PAGE)

BASIC DIMENSIONS			L'	BUTTED		BRAZED		L	VINYL INSUL.		NYLON INSUL.	
STUD	WIDTH	CLEAR		NO.	NET/C	NO.	NET C		NO.	NET/C	NO.	NET/C
1-2	25	23	60	5125	2 30	5129	4 00	80	5133	5 00	5137	7 00
3-4	25	23	60	5126	2.30	5130	4 00	80	5134	5 00	5138	7.00
5-6	25	23	60	4865	2 30	4869	4 00	80	4873	5 00	4877	7 00
8	33	29	70	4866	2 30	4870	4 00	90	4874	5 00	4878	7 00
10	33	29	70	4867	2 30	4871	4 00	90	4875	5 00	4879	7 00
1/4	47	40	89	4868	3 10	4872	4 80	1 09	4876	5 80	4880	10 00
7/16	47	40	89	5127	3 40	5131	5 10	1 09	5135	7 00	5139	10 70
1/2	57	40	94	5128	3 40	5132	5 10	1 14	5136	7 00	5140	10 70

FLAG

(SEE ILLUSTRATION ON PREVIOUS PAGE)

4-6	38	34	68	5141	3 50							
8	38	34	68	5142	3 50							
10	38	34	68	4881	3 50							

MULTI-STUD RING

2-4-6	25	29	74	5212	2 50			94	5214	5 40		
6-8-10	35	30	82	5213	3 50			1 02	5215	6 30		

SPADE

(SEE ILLUSTRATION ON PREVIOUS PAGE)

4-6	34	29	70	4882	2.30	4885	4.00	90	4888	4.90	4891	8 10
8	34	29	70	4883	2.30	4886	4 00	90	4889	4.90	4892	8.10
10	34	29	70	4884	2.30	4887	4.00	90	4890	4.90	4893	8.10

SNAP SPADE

(SEE ILLUSTRATION ON PREVIOUS PAGE)

4	25	25	68	5216	2 50			88	5220	5 40		
6	25	25	68	5217	2 50			88	5221	5 40		
8	30	25	68	5218	2 50			88	5222	5 40		
10	32	25	68	5219	2 50			88	5223	5 40		

BLOCK SPADE

(SEE ILLUSTRATION ON PREVIOUS PAGE)

4-6	30	25	65	4894	2.30	4897	4.00	85	4901	4 90	4904	8.10
8	30	25	65	4895	2.30	4898	4 00	85	4902	4.90	4905	8.10
10	30	25	65	4896	2.30	4899	4.00	85	4903	4.90	4906	8.10

BLOCK SPADE FLANGED

(SEE ILLUSTRATION ON PREVIOUS PAGE)

4-6	30	25	65	4907	2.30	4910	4.00	85	4913	4.90	4916	8.10
8	30	25	65	4908	2.30	4911	4 00	85	4914	4.90	4917	8.10
10	30	25	65	4909	2.30	4912	4.00	85	4915	4.90	4918	8.10

HOOK

(SEE ILLUSTRATION ON PREVIOUS PAGE)

4-6	33	29	70	4919	2 30	4922	4.00	90	4925	4 90	4928	8.10
8	33	29	70	4920	2 30	4923	4.00	90	4926	4 90	4929	8.10
10	33	29	70	4921	2.30	4924	4.00	90	4927	4 90	4930	8.10

12-10 WIRE RANGE

BARREL I.D. .138
THICKNESS .040

RING

(SEE ILLUSTRATION ON PREVIOUS PAGE)

BASIC DIMENSIONS			L'	BUTTED		BRAZED		L	VINYL INSUL.		NYLON INSUL.	
STUD	WIDTH	CLEAR		NO	NET C	NO	NET C		NO	NET C	NO	NET C
3-4	28	29	69	5144	3 20	5150	6 30	99	5156	6 00	5162	10 00
5-6	28	29	69	5145	3 20	5151	6 30	99	5157	6 00	5163	10 00
8	38	29	73	5146	3 20	5152	6 30	1 03	5158	6 00	5164	10 00
10	38	29	73	4931	3 20	4934	6 30	1 03	4937	6 00	4940	10 00
1/4	61	44	99	4932	3 80	4935	7 00	1 29	4938	7 10	4941	11 00
7/16	61	44	99	4933	3 80	4936	7 00	1 29	4939	7 10	4942	11 00
1/2	61	44	99	5148	3 80	5154	7 00	1 29	5160	7 10	5166	11 00
5/8	75	59	1 22	5149	8 50	5155	11 60	1 52	5161	10 40	5167	13 80

FLAG

(SEE ILLUSTRATION ON PREVIOUS PAGE)

4-6	38	29	68	5168	4 00							
8	38	29	68	5169	4 00							
10	38	29	68	4943	4 00							

MULTI-STUD RING

(SEE ILLUSTRATION ON PREVIOUS PAGE)

6-8-10	39	34	91	5224	4.50			1 21	5225	7 70		

SPADE

(SEE ILLUSTRATION ON PREVIOUS PAGE)

4-6	38	29	73	5171	3.20	5172	6.30	1 03	5173	6 00	5174	10 00
8	38	29	73	4944	3 20	4946	6.30	1 03	4948	6 00	4950	10 00
10	38	29	73	4945	3 20	4947	6 30	1 03	4949	6 00	4951	10 00

SNAP SPADE

(SEE ILLUSTRATION ON PREVIOUS PAGE)

4-6	28	28	73	5226	3 50			1 03	5230	7 70		
8	32	28	73	5227	3 50			1 03	5231	7 70		
10	32	28	73	5228	3 50			1 03	5232	7 70		
1/4	43	44	94	5229	6 10			1 24	5233	8 90		

BLOCK SPADE

(SEE ILLUSTRATION ON PREVIOUS PAGE)

4-6	32	29	73	5175	3 20	5176	6 30	1 03	5177	6 00	5178	10 00
8	32	29	73	4952	3 20	4954	6 30	1 03	4956	6 00	4958	10 00
10	32	29	73	4953	3 20	4955	6 30	1 03	4957	6 00	4959	10 00

HOOK

(SEE ILLUSTRATION ON PREVIOUS PAGE)

4-6	38	29	73	5179	3 20	5180	6.30	1 03	5181	6 00	5182	10 00
8	38	29	73	4960	3 20	4962	6 30	1 03	4964	6 00	4966	10 00
10	38	29	73	4961	3 20	4963	6 30	1 03	4965	6 00	4967	10 00

QUICK SLIDES

MALE

(FIGURE A)

BASIC DIMENSIONS			L'	BUTTED		BRAZED		L	VINYL INSUL.		NYLON INSUL	
WIRE SIZE	TAB WIDTH	TAB THICK		NO	NET C	NO	NET C		NO	NET C	NO	NET C
16-14	187	016	50	5011	2 40			79	5013	5 10		
16-14	250	030	73	5012	2 40			93	5014	5 10		

FEMALE

(FIGURE B)

16-14	187	016	47	5007	2 60			77	5009	5 20		
16-14	250	030	64	5008	2 60			86	5010	5 20		

MALE-ALL INSULATED

(FIGURE F)

22-18	250	030						95	5053	10 50		
18-14	250	030						95	5054	10 50		

FEMALE-ALL INSULATED

(FIGURE F)

22-18	250	030						89	5055	10 50		
18-14	250	030						89	5056	10 50		

FLAG FEMALE

(FIGURE C)

22-18	187	030	46	5184	3 10							
22-18	250	030	50	5185	3 10							
18-14	187	030	49	5186	3 10							
18-14	250	030	51	5187	3.10							

QUICK SLIDES CONTINUED

SELF MATING

(FIGURE E)

18-14	187		47	5015	2 60			77	5017	5 20		
18-14	250		64	5016	2 60			86	5018	5 20		

RECEPTACLE

(FIGURE D)

BASIC DIMENSIONS			L'	BUTTED		BRAZED		L	VINYL INSUL.		NYLON INSUL.	
WIRE SIZE	TAB WIDTH	TAB THICK		NO	NET C	NO	NET C		NO	NET C	NO	NET C
	250	030						1 12	5019	10 60		

CROSS LOCK-SELF MATING

(FIGURE G)

22-18	25	030	75	5001	4 40			95	5003	6 70		
16-14	25	030	75	5002	4 40			95	5004	6 70		

QUICK SLIDE ACCESSORIES

MULTI STACK DISCONNECTS

(FIGURE T)

BASIC DIMENSIONS			L'	BUTTED		BRAZED		L	VINYL INSUL.		NYLON INSUL.	
WIRE SIZE	TAB WIDTH	TAB THICK		NO.	NET/C	NO.	NET/C		NO.	NET/C	NO.	NET/C
22-18	250	030	65	5077	6 50			85	5079	8 70		
16-14	250	030	65	5078	6 50			85	5080	8 70		
20-14	250	030	85	5082	6.50			OPEN BARREL			FIGURE U	

DOUBLE MALE FEMALE ADAPTER

	250	030	75	5081	6 90						FIGURE V	
	250	030	76	5086	5.00						FIGURE W	

MALE TABS

(FIGURE X)

BASIC DIMENSIONS			L'	BUTTED		BRAZED		L	VINYL INSUL		NYLON INSUL.	
STUD	WIDTH	CLEAR		NO.	NET C	NO.	NET. C		NO.	NET C	NO.	NET/C
6	250	26	85	5083	2 80							
8	250	26	85	5084	2 80							
10	250	26	85	5085	2 80							

H. H. SMITH ELECTRONIC COMPONENTS

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

3M COMPANY SOLDERLESS TERMINALS

Manufactured by 3M Company - Distributed by **HERMAN H. SMITH, INC.** Through Electronic Distributors

COLOR CODE
CLEAR: 26-24 AWG.
RED: 22-18 AWG.
BLUE: 16-14 AWG.
YELLOW: 12-10 AWG.

CONNECTORS

BUTT (FIGURE H)

BASIC DIMENSIONS			L'	BUTTED		BRAZED		L	VINYL INSUL.		NYLON INSUL.	
WIRE SIZE	MAT THK.	CLEAR		NO.	NET/C	NO.	NET/C		NO.	NET/C	NO.	NET/C
26-24	020		38	4986	2 40			88			4990	12 90
22-18	030		56	4987	2 40			1 00	4991	5 20		
16-14	030		56	4988	2 40			1 00	4992	5.20		
12-10	040		56	4989	3.80			1 04	4993	6.50		

PARALLEL (FIGURE H)

22-18	030		32	4994	2 00			67	4997	4 40		
16-14	030		32	4995	2 00			67	4998	4 40		
12-10	040		32	4996	2 80			67	4999	5 40		

BUTT-CLOSED END (FIGURE J)

WIRE												
22-14								61			5005	4.30
16-10								74			5006	5.40

3 WAY CONNECTOR (FIGURE K)

22-18			89	5188	7 80				5191	15 90		
16-14			89	5189	7 80				5192	15 90		
12-10			89	5190	10 70				5193	17 60		

4 WAY CONNECTOR (FIGURE M)

22-18			1 08	5194	10 20				5197	21 20		
16-14			1 08	5195	10 20				5198	21 20		
12-10			1 08	5196	14 70				5199	25 60		

"T" TAP WITH MATING PLUG (FIGURE N)

									5183	16 40		

SNAP PLUGS (FIGURE O)

WIRE SIZE	SNAP AREA	BARREL LENGTH										
16-14	157	18	59	5020	2 30			85	5022	5 00		
16-14	176	18	59	5021	2.30			85	5023	5 00		

SNAP PLUG RECEPTACLE (FIGURE P)

	157							1.34	5024	8.00		

SOLDERLESS TERMINAL KITS
18 Assorted Styles — Packaged in Plastic Boxes

UNINSULATED
200 TERMINALS

No.	Descr.	Net Ea.
4981	With Tool	$14.00
4984	Less Tool	$7.00

VINYL INSULATED
180 TERMINALS

No.	Descr.	Net Ea.
4982	With Tool	$17.50
4985	Less Tool	10.50

NYLON INSULATED
165 TERMINALS

No.	Descr.	Net Ea.
4983	With Tool	$23.00
5000	Less Tool	$16.00

CRIMPING TOOLS

No.	Type	Net Ea.
4980	Less Bolt Cutter	6.80
5050	With Bolt Cutter	$7.50

SMALL PKGS. OF FASTEST MOVING TERMINALS FOR M.R.O., PROTOTYPE & LABS
Minimum Quantity Order — 10 Pkgs. Each

RING TYPE-UNINSULATED
SMALL PACKAGE NET Ea. $.55

NO.	STUD	QTY.
	WIRE 22-18	
55103	3-4	12
54801	5-6	12
54802	8	12
54803	10	12
	WIRE 16-14	
54865	5-6	12
54866	8	12
54867	10	12
	WIRE 12-10	
55146	8	8
54931	10	8
54932	1/4	6

SPADE TYPE-UNINSULATED

	WIRE 22-18	
54816	4-6	12
54817	8	12
54818	10	12
	WIRE 16-14	
54882	4-6	12
54883	8	12
54884	10	12
	WIRE 12-10	
54944	8	8
54945	10	8

QUICK SLIDE .250 UNINS

	WIRE 18-14	
55012	Male	12
55008	Female	10
55187	Flag Fem.	8

RING TYPE-UNINSULATED
LARGE PACKAGE NET Ea. $1.05

NO.	STUD	QTY.
	WIRE 22-18	
15103	3-4	30
14801	5-6	30
14802	8	30
14803	10	30
	WIRE 16-14	
14865	5-6	30
14866	8	30
14867	10	30
	WIRE 12-10	
15146	8	22
14931	10	22
14932	1/4	18

SPADE TYPE-UNINSULATED

	WIRE 22-18	
14816	4-6	30
14817	8	30
14818	10	30
	WIRE 16-14	
14882	4-6	30
14883	8	30
14884	10	30
	WIRE 12-10	
14944	8	22
14945	10	22

BUTT CONNECTOR-INSL

14991	22-18 WIRE	14
14992	16-14 WIRE	14
14993	12-10 WIRE	12

RING TYPE-INSULATED
LARGE PACKAGE NET Ea. $1.05

NO.	STUD	QTY.
	WIRE 22-18	
15113	3-4	15
14809	5-6	15
14810	8	15
14811	10	15
	WIRE 16-14	
14873	5-6	15
14874	8	15
14875	10	15
	WIRE 12-10	
15158	8	12
14937	10	12
14938	1/4	10

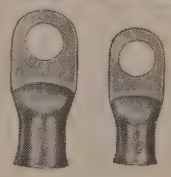
SPADE TYPE-INSULATED

	WIRE 22-18	
14822	4-6	15
14823	8	15
14824	10	15
	WIRE 16-14	
14888	4	15
14889	8	15
14890	10	15
	WIRE 12-10	
14948	8	12
14949	10	12

QUICK SLIDE .250 INSL

	WIRE 18-14	
15014	Male	14
15010	Female	14

NEW POWER TERMINALS



- One piece, electrolytic copper, drawn seamless terminals
- I D Tolerance is evenly drawn to eliminate "Hot Spots"
- Flared entry design facilitates wire insertion
- Lugs are totally closed to eliminate accumulation of moisture and corrosion
- Ten sizes — #6 to #4/0 AWG in various stud diameters
- Each lug is stamped with wire size for easy identification

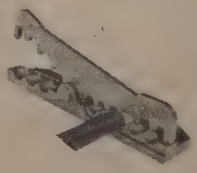
No.	AWG	Stud	Std. Pkg.	Net Per C
9680	6	1/4	25	$ 30.00
9681	4	1/4	25	36.00
9682	2	3/8	25	48.00
9683	1	3/8	25	51.00
9684	1/0	3/8	10	63.00
9685	1/0	1/2	10	63.00
9686	2/0	3/8	10	72.00
9687	2/0	1/2	10	72.00
9688	3/0	1/2	10	93.00
9689	4/0	1/2	10	117.00

POWER TERMINAL KIT

- Kit includes assortment of 50 most popular power terminals — #6 to #4/0 AWG
- Kit includes the Model 9691 Crimping Tool
- Packaged in an unbreakable plastic box — compartmented to identify each size

No. 9690 **Net ea. $48.00**

CRIMPING TOOL



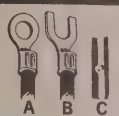
- Compact size, machined hardened steel
- Crimping slots designed to hold terminal. Each slot identified by wire size for precision crimping
- Crimping action accomplished either in a vise or by a single hammer blow
- Single crimp detent affords a pull-out force exceeding U.L. requirements
- Complete with instructions and wire stripping information

No. 9691 **Net ea. $18.00**

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

ELECTRONIC COMPONENTS H. H. SMITH

AMP "SOLISTRAND" Non-Insulated



The only terminal designed for use with solid, stranded or irregularly shaped wires, or combinations of wires. Corrosion resistant, high strength, electro-tinned; versatile—widely adjustable. Std. Pkg. 100

RING TONGUE (A)

Wire Size	No.	AMP No.	Stud Size	Tong. W.	O'all L.	Stud Clear.	NET Per C
22	2850	32989	4	7/32	17/32	5/32	$6.00
	2851	34194	6	7/32	17/32	5/32	6.00
	2852	32990	8	9/32	11/16	15/64	7.00
to	2853	33214	10	5/16	11/16	9/32	7.00
	2854	33215	1/4	15/32	15/16	27/64	10.00
16	2855	33452	5/16	15/32	15/16	27/64	10.00
	2856	33453	3/8	17/32	1 1/16	17/32	10.00
	2857	32991	4	1/4	9/16	11/64	$7.00
16	2858	34197	6	1/4	9/16	11/64	7.00
	2859	32992	8	5/16	11/32	1/4	7.00
to	2860	320093	10	5/16	11/32	1/4	7.00
	2861	33218	1/4	15/32	15/16	7/16	10.00
14	2862	33454	5/16	15/32	15/16	7/16	10.00
	2863	33455	3/8	17/32	1 1/16	17/32	10.00

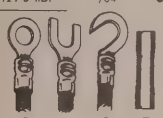
SPADE TONGUE (B)

22	2864	32897	6	11/32	5/8	13/64	$6.00
to	2865	32898	8	11/32	5/8	13/64	6.00
16	2866	32899	10	11/32	5/8	13/64	6.00
16	2867	32903	6	11/32	5/8	13/64	$6.00
to	2868	32904	8	11/32	5/8	13/64	6.00
14	2869	32905	10	11/32	5/8	13/64	6.00

BUTT CONNECTOR (C)

2870	31818	22-16	.140 I.D.	37/64		$8.00
2871	31819	16-14	.170 I.D.	37/64		8.00

AMP "PLASTI-GRIP" (P.G.)



Insulated strong, special plastic has high dielectric strength. Applied with single operation of press dies or hand tools. High tensile strength. High conductivity copper, electro-tinned. Color coded for wire size. Std. Pkg. 100

RING TONGUE (A)

Wire Size	No.	AMP No.	Stud Size	Tong. W.	O'all L.	Stud Clear.	NET Per C
22	2750	34141	4	7/32	21/32	5/32	$10.50
	2751	34142	6	7/32	21/32	5/32	10.50
	2752	34145	8	9/32	25/32	1/4	10.50
to	2753	34146	10	9/32	25/32	1/4	10.50
	2754	34150	1/4	15/32	1 1/16	27/64	12.00
16	2755	34151	5/16	15/32	1 1/16	27/64	12.00
	2756	34152	3/8	17/32	1 13/64	33/64	12.00
	2757	34157	4	1/4	11/16	5/32	10.50
16	2758	34158	6	1/4	11/16	5/32	10.50
	2759	34160	8	11/32	27/32	17/64	10.50
to	2760	34161	10	11/32	27/32	17/64	10.50
	2761	34162	1/4	15/32	1 1/16	27/64	12.00
14	2762	34163	5/16	15/32	1 1/16	27/64	12.00
	2763	34164	3/8	17/32	1 13/64	33/64	12.00

SPADE TONGUE (B)

22	2764	34153	6	11/32	49/64	13/64	$10.50
to	2765	34155	8	3/8	57/64	19/64	10.50
16	2766	34156	10	3/8	57/64	19/64	10.50
16	2767	34165	6	3/8	57/64	19/64	10.50
to	2768	34166	8	3/8	57/64	19/64	10.50
14	2769	34167	14	3/8	57/64	19/64	10.50

HOOK TONGUE (C)

20-16	2770	34501	6	9/32	47/64	3/16	$10.50
	2771	321699	8	11/32	55/64	9/32	10.50
16-14	2772	320263	8	11/32	55/64	17/64	14.00

BUTT CONNECTOR (D)

2773	34070	22-16	.140	I.D.	1	$12.00
2774	34071	16-14	.70	I.D.	1 1/64	12.00

SOLDERLESS TERMINAL ASSORTMENTS*

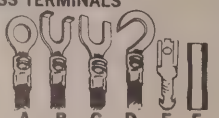
A basic assortment of the most commonly used Ring Tongue and Spade Terminals for wire sizes 22 thru 14. Packed in a re-usable clear plastic compartmented box. Std. Pkg. 1

No.	Approx. Quantity of Terminals	Style	NET Ea.
1526	200	"PLASTI-GRIP"	$25.00
1527	300	"PLASTI-GRIP"	35.00
1528	200	"SOLISTRAND"	16.00
1529	300	"SOLISTRAND"	22.00
1577	200	"P.I.D.G."	30.00
1578	300	"P.I.D.G."	45.00

*Refers to AMP Solderless Terminals

SOLDERLESS TERMINALS

AMP Pre-insulated Diamond Grip



Color-coded for wire size. Std. Pkg. 100

RING TONGUE (A)

Wire Size	No.	AMP No.	Stud Size	Tong. W.	O'all L.	Stud Clear.	NET Per C
22	1550	320882	4	3/16	21/32	5/32	$13.00
	1551	31881	6	7/32	21/32	5/32	13.00
to	1552	31886	8	9/32	25/32	1/4	13.00
	1553	31887	10	9/32	25/32	1/4	13.00
16	1554	31894	1/4	15/32	1 1/16	27/64	15.00
14	1555	32441	4	1/4	11/16	11/64	13.00
	1556	32442	6	1/4	11/16	11/64	13.00
to	1557	31902	8	11/32	27/32	9/32	13.00
	1558	322238	10	5/16		1/4	13.00
16	1559	31906	1/4	15/32	1/16	7/16	15.00

FLANGED SPADE (B)

22-16	1560	32562	6	19/64	23/32	13/64	$13.00
	1561	32498	8	27/64	13/16	1/4	13.00
14-16	1562	320881	6	19/64	23/32	13/64	13.00
	1563	320862	8	19/64	23/32	13/64	16.00
	1564	320863	10	19/64	23/32	13/64	16.00

SPADE TONGUE (C)

22-16	1565	34541	6	1/4	51/64	19/64	$13.00
	1566	32053	8	3/8	57/64	19/64	15.00
	1567	32054	10	3/8	57/64	19/64	13.00
14-16	1568	35559	6	19/64	47/64	13/64	13.00
	1569	321233	8	19/64	47/64	13/64	13.00
	1570	32060	10	3/8	57/64	5/16	15.00

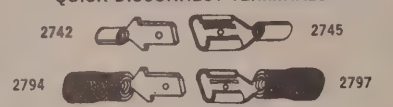
HOOK TONGUE (D)

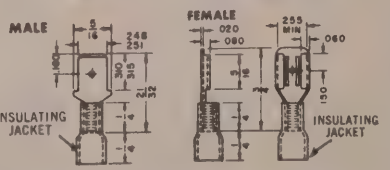
22-16	1571	34313	6	9/32	47/64	13/64	$13.00
	1572	32456	8	11/32	55/64	9/32	13.00
14-16	1573	320381	6	11/32	27/32	9/32	13.00
	1574	320306	8	11/32	27/32	9/32	15.00
	1575	35481	10	11/32	27/32	9/32	13.00
18-14	1576	Terminal Strip Connectors (E)					$5.00

BUTT CONNECTOR (F)

22-16	1548	320559	.125 I.D.	—	—	$50.00
16-14	1549	320562	.150 I.D.	—	—	50.00

QUICK DISCONNECT TERMINALS





Terminals of pure electrolytic copper. Resists corrosion and insures shelf life. Beveled entry for easy wire threading and improved V-ridges for wire protection. Male tongue width .248/.251, female entry .225 Min. Std. Pkg. 100

Non-Insulated

Male	Female	Wire-Size	NET Per C
2742	2745	22-16	$2.10
2743	2746	16-14	2.10
2744	2747	12-10	2.10

Insulated

2794	2797	22-16	4.50
2795	2798	16-14	4.50
2796	2799	12-10	4.50

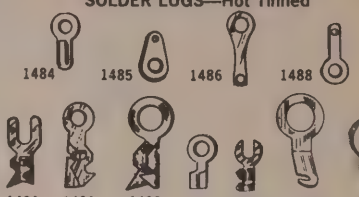
No. 2748 — Kit, 50 each, 12 types in plastic box — Std. Pkg. 1 — NET Ea. $19.80

LOCKING TERMINAL LUG ASSORTMENT

A complete assortment of the most widely used Locking Terminal Lug styles with hole sizes from #4 thru #10. Packed in a re-usable clear plastic compartmented box. Std. Pkg. 1

No.	Approx. Quantity of Terminals	NET
1547	900	$20.00

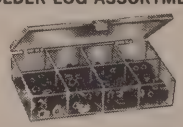
SOLDER LUGS—Hot Tinned



Std. Pkg. 1000

No.	Material	Length	Thick.	Hole	NET Per M
1484	Ph. Br.	5/8"	.020"	No. 6	$12.00
1485-4	Ph. Br.	17/32"	.012"	No. 4	12.00
1485-6	Ph. Br.	17/32"	.012"	No. 6	12.00
1485-8	Ph. Br.	17/32"	.012"	No. 8	12.00
1485-10	Ph. Br.	17/32"	.012"	No. 10	12.00
1486-4	Ph. Br.	13/16"	.012"	No. 4	12.00
1486-6	Ph. Br.	13/16"	.012"	No. 6	12.00
1486-8	Ph. Br.	13/16"	.012"	No. 8	12.00
1486-10	Ph. Br.	13/16"	.012"	No. 10	12.00
1488-4	Ph. Br.	9/16"	.012"	No. 4	12.00
1488-6	Ph. Br.	9/16"	.012"	No. 6	12.00
1488-8	Ph. Br.	9/16"	.012"	No. 8	12.00
1490	Brass	3/4"	.020"	No. 10	17.00
1491	Copper	15/16"	.020"	No. 10	30.00
1493	Brass	1-1/8"	.027"	1/4"	30.00
1494-6	Brass	5/8"	.020"	No. 6	15.00
1494-8	Brass	5/8"	.020"	No. 8	15.00
1495	Brass	5/8"	.020"	No. 8	15.00
1496	Brass	3/4"	.020"	1/4"	15.00
1497	Brass	7/8"	.017"	3/8"	18.00

SOLDER LUG ASSORTMENT



A complete assortment of the most widely used Solder Lug styles, with hole sizes from #4 thru #10. Packed in a re-usable clear plastic compartmented box. Std. Pkg. 1

No.	Approx Quantity of Terminals	NET Each
1546	1400	$ 20.00

LOCKING TERMINAL LUGS

BRASS HOT TINNED

Std. Pkg. 1000

No.	Length	Thick	Hole	NET Per M
1410-4	7/8"	.018"	No. 4	$15.00
1410-6	7/8"	.018"	No. 6	15.00
1410-8	7/8"	.018"	No. 8	15.00
1410-10	57/64"	.018"	No. 10	15.00
1410-14	13/16"	.018"	1/4"	15.00
1411-4	47/64"	.020"	No. 4	15.00
1411-6	47/64"	.020"	No. 6	15.00
1411-8	47/64"	.020"	No. 8	15.00
1412-4	5/8"	.018"	No. 4	15.00
1412-6	5/8"	.018"	No. 6	15.00
1412-8	5/8"	.018"	No. 8	15.00
1413-4	23/32"	.018"	No. 4	15.00
1413-6	23/32"	.018"	No. 6	15.00
1413-8	23/32"	.018"	No. 8	15.00
1414-4	13/16"	.018"	No. 4	15.00
1414-6	13/16"	.018"	No. 6	15.00
1414-8	13/16"	.018"	No. 8	15.00
1414-10	53/64"	.018"	No. 10	15.00
1415-4	41/64"	.018"	No. 4	15.00
1415-6	41/64"	.018"	No. 6	15.00
1415-8	41/64"	.018"	No. 8	15.00
1416-4	11/16"	.020"	No. 4	15.00
1416-6	11/16"	.020"	No. 6	15.00
1416-8	11/16"	.020"	No. 8	15.00

LOCKING TYPE TERMINAL LUGS

BRASS HOT TINNED

Std. Pkg. 1000

No.	Length	Thick	Hole	NET Per M
1465	47/64"	.020	#4	$15.00
1466	47/64"	.020	#6	15.00
1467	7/8"	.020	#8	15.00
1468	13/16"	.020	1/4"	15.00

TERMINAL LUGS & SCREWS

Recommended for heavy duty terminal strips. Lugs are tapped with screw inserted. Brass hot tinned.

No.	Screw	Std. Pkg. 100	NET Per C
1478	6-32		$7.00
1479	8-32		12.00

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

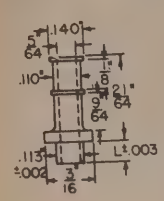
ELECTRONIC COMPONENTS by H. H. SMITH

SWAGE TURRET TERMINALS

Terminals shown below are "stock" items, available for speedy delivery. All brass, silver-plated, precision made. See next page for Suggested Resale Prices. For quantities over 15,000 request special prices. Inquiries are invited, for special types and sizes to particular requirements. L indicates shank length of lug. T indicates thickness of mounting boards.

Standard Package 100

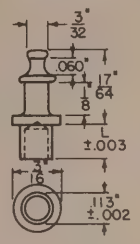
2000
HOLLOW LUG



No.	L	T
2000A	.075	1/32
2000B	.105	1/16
2000C	.135	3/32
2000D	.165	1/8
2000E	.195	5/32
2000F	.230	3/16

Staking Tool Kit No. 3860

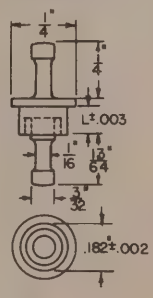
2001
SHORT TERMINAL LUG



No.	L	T
2001A	.075	1/32
2001B	.105	1/16
2001C	.135	3/32
2001D	.165	1/8

Staking Tool Kit No. 3860

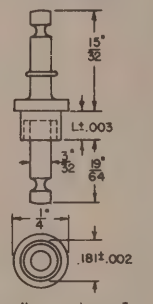
2002
DOUBLE END TERMINAL LUG



No.	L	T
2002A	.105	1/16
2002B	.135	3/32
2002C	.165	1/8
2002D	.195	5/32
2002E	.230	1/16

Staking Tool Kit No. 3861

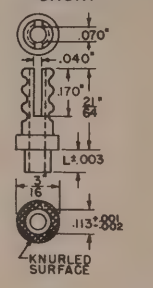
2003
DOUBLE END LUG, LONG



No.	L	T
2003A	.105	1/16
2003B	.135	3/32
2003C	.165	1/8
2003D	.195	5/32
2003E	.230	3/16

Staking Tool Kit No. 3862

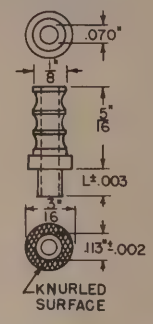
2004
SLOTTED TERMINAL LUG SHORT



No.	L	T
2004A	.075	1/32
2004B	.105	1/16
2004C	.135	3/32
2004D	.165	1/8

Staking Tool Kit No. 3863

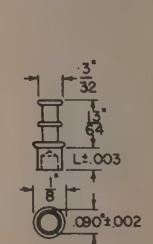
2005
HOLLOW KNURLED LUG



No.	L	T
2005A	.105	1/16
2005B	.135	3/32
2005C	.165	1/8

Staking Tool Kit No. 3860

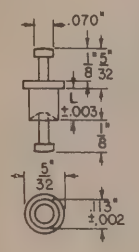
2006
SHORT TERMINAL LUG



No.	L	T
2006A	.075	1/32
2006B	.105	1/16
2006C	.135	3/32
2006D	.165	1/8

Staking Tool Kit No. 3864

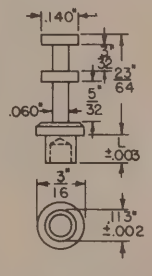
2007
SHORT DOUBLE END LUG



No.	L	T
2007A	.075	1/32
2007B	.105	1/16
2007C	.135	3/32
2007D	.165	1/8

Staking Tool Kit No. 3865

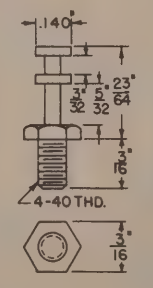
2008
TERMINAL LUG



No.	L	T
2008A	.075	1/32
2008B	.105	1/16
2008C	.135	3/32
2008D	.165	1/8
2008E	.195	5/32
2008F	.230	3/16
2008G	.293	1/4

Staking Tool Kit No. 3860

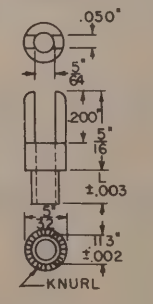
2009
TERMINAL LUG



No. 2009

Staking Tool Kit Not Required

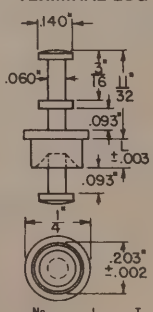
2010
SPLIT TERMINAL LUG



No.	L	T
2010A	.075	1/32
2010B	.105	1/16
2010C	.135	3/32
2010D	.165	1/8

Staking Tool Kit No. 3866

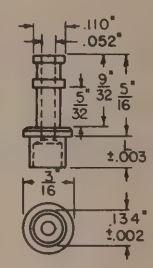
2011
DOUBLE END TERMINAL LUG



No.	L	T
2011A	.105	1/16
2011B	.135	3/32
2011C	.165	1/8
2011D	.195	5/32
2011E	.230	3/16

Staking Tool Kit Not Available

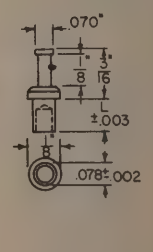
2012
TERMINAL LUG



No.	L	T
2012A	.105	1/16
2012B	.135	3/32
2012C	.165	1/8

Staking Tool Kit No. 3860

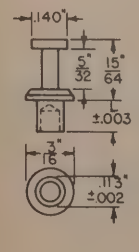
2013
TERMINAL LUG



No.	L	T
2013A	.075	1/32
2013B	.105	1/16
2013C	.135	3/32
2013D	.165	1/8

Staking Tool Kit No. 3864

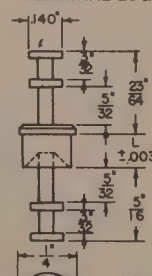
2014
TERMINAL LUG



No.	L	T
2014A	.105	1/16
2014B	.135	3/32
2014C	.165	1/8
2014D	.195	5/32
2014E	.230	3/16

Staking Tool Kit No. 3860

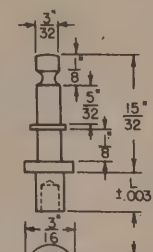
2015
TERMINAL LUG



No.	L	T
2015A	.135	3/32
2015B	.165	1/8
2015C	.195	5/32
2015D	.230	3/16

Staking Tool Kit Not Available

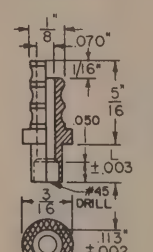
2016
TERMINAL LUG



No.	L	T
2016A	.105	1/16
2016B	.135	3/32
2016C	.165	1/8

Staking Tool Kit No. 3860

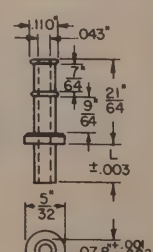
2017
HOLLOW KNURLED LUG



No.	L	T
2017A	.105	1/16
2017B	.135	3/32
2017C	.165	1/8
2017D	.195	5/32

Staking Tool Kit No. 3860

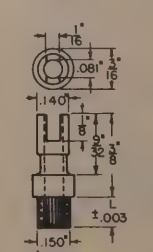
2018
HOLLOW TERMINAL LUG



No.	L	T
2018A	.075	1/32
2018B	.105	1/16
2018C	.135	3/32
2018D	.165	1/8
2018E	.195	5/32
2018F	.230	3/16

Staking Tool Kit No. 3863

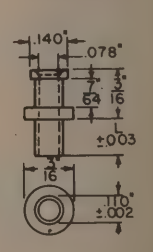
2019
SPLIT TERMINAL LUG



No.	L	T
2019A	.075	1/32
2019B	.105	1/16
2019C	.135	3/32
2019D	.165	1/8
2019E	.195	5/32
2019F	.230	3/16

Staking Tool Kit No. 3860

2020
TERMINAL LUG



No.	L	T
2020A	.075	1/32
2020B	.105	1/16
2020C	.135	3/32
2020D	.165	1/8

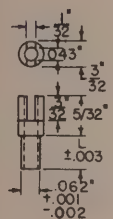
Staking Tool Kit No. 3860

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

ELECTRONIC COMPONENTS BY H. H. SMITH

SWAGE TURRET TERMINALS

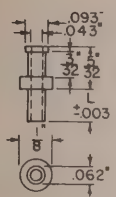
2021
MINIATURE SPADE LUG



No.	L	T
2021A	.037	1/64
2021B	.053	1/32
2021C	.084	1/16
2021D	.115	3/32
2021E	.147	1/8

Staking Tool Kit No. 3867

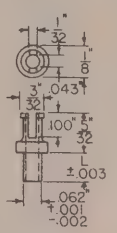
2022
MINIATURE HOLLOW LUG



No.	L	T
2022A	.037	1/64
2022B	.053	1/32
2022C	.084	1/16
2022D	.115	1/32
2022E	.147	1/8

Staking Tool Kit No. 3864

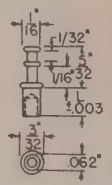
2023
MINIATURE HOLLOW SPLIT LUG



No.	L	T
2023A	.037	1/64
2023B	.053	1/32
2023C	.084	1/16
2023D	.115	3/32
2023E	.147	1/8

Staking Tool Kit No. 3864

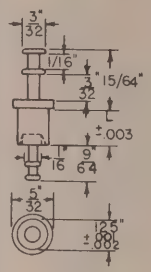
2024
MINIATURE DOUBLE TIE LUG



No.	L	T
2024A	.037	1/64
2024B	.053	1/32
2024C	.084	1/16
2024D	.115	3/32
2024E	.147	1/8

Staking Tool Kit No. 3868

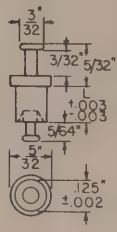
2025
MINIATURE THROUGH LUG



No.	L	T
2025A	.075	1/32
2025B	.105	1/16
2025C	.135	1/32
2025D	.165	1/8

Staking Tool Kit No. 3869

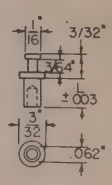
2026
MINIATURE THROUGH LUG



No.	L	T
2026A	.075	1/32
2026B	.105	1/16
2026C	.135	3/32
2026D	.165	1/8

Staking Tool Kit No. 3869

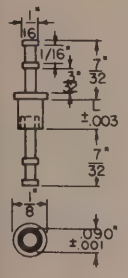
2027
MINIATURE LUG



No.	L	T
2027A	.037	1/64
2027B	.054	1/32
2027C	.084	1/16
2027D	.115	3/32
2027E	.147	1/8

Staking Tool Kit No. 3868

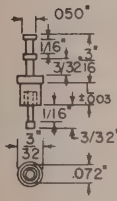
2028
FEED-THRU TERMINAL LUG



No.	L	T
2028A	.054	1/32
2028B	.084	1/16
2028C	.115	3/32
2028D	.147	1/8

Staking Tool Kit No. 3870

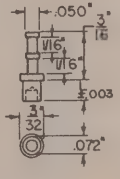
2029
TERMINAL LUG



No.	L	T
2029A	.054	1/32
2029B	.084	1/16
2029C	.115	3/32
2029D	.147	1/8

Staking Tool Kit No. 3871

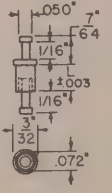
2030
TERMINAL LUG



No.	L	T
2030A	.054	1/32
2030B	.084	1/16
2030C	.115	3/32
2030D	.147	1/8

Staking Tool Kit No. 3868

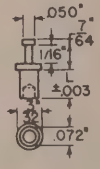
2031
FEED TERMINAL LUG



No.	L	T
2031A	.054	1/32
2031B	.084	1/16
2031C	.115	3/32
2031D	.147	1/8

Staking Tool Kit No. 3871

2032
TERMINAL LUG



No.	L	T
2032A	.054	1/32
2032B	.084	1/16
2032C	.115	1/32
2032D	.147	1/8

Staking Tool Kit No. 3868

SUGGESTED RESALE PRICES & QUANTITY DISCOUNT SCHEDULE

Cat. No.	NET Per C	Cat. No.	NET Per C
2000	$ 6.10	2021	$ 4.60
2001	6.00	2022	3.50
2002	14.60	2023	5.00
2003	14.90	2024	3.50
2004	8.70	2025	7.50
2005	6.80	2026	5.30
2006	3.60	2027	3.50
2007	5.00	2028	4.60
2008	6.00	2029	4.50
2009	9.10	2030	3.20
2010	9.20	2031	3.60
2011	10.00	2032	3.50
2012	6.60	2033	10.80
2013	3.20	2034	11.50
2014	4.50	2035	10.30
2015	13.50	2036	11.10
2016	6.60	2037	15.00
2017	8.00	2038	15.00
2018	6.70		
2019	9.00		
2020	4.80		

QUANTITY DISCOUNT OFF NET

100	- 999	Net
1,000	- 4,999	15%
5,000	- 9,999	25%
10,000	- 24,999	35%
25,000	- 49,999	40%
50,000	- 99,999	50%
100,000		On Request

ALL STAKING TOOL KITS
Each. $3.00

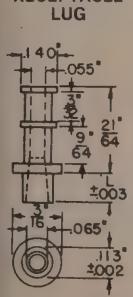
ACCESSORY TOOL HOLDERS

Anvil Bench Tool Holder, 1/4" anvils. Malleable iron base with bottom felt pad for bench use.
No. 3877 Net. Ea. $4.20

Anvil tool holder for use with drill press, arbor, kick press, punch press or vise.
No. 3878 Net. Ea. $1.50

We invite your inquiries on other types of turret terminals not shown here.

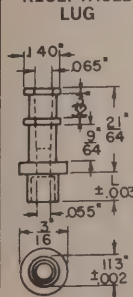
2033
RECEPTACLE LUG



No.	L	T
2033A	.075	1/32
2033B	.105	1/16
2033C	.135	3/32
2033D	.165	1/8
2033E	.195	5/32
2033F	.230	3/16

Staking Tool Kit No. 3860

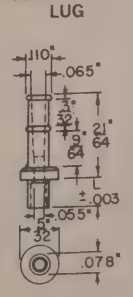
2034
RECEPTACLE LUG



No.	L	T
2034A	.075	1/32
2034B	.105	1/16
2034C	.135	3/32
2034D	.165	1/8
2034E	.195	5/32
2034F	.230	3/16

Staking Tool Kit No. 3860

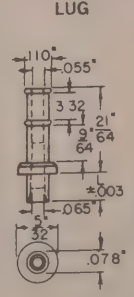
2035
RECEPTACLE LUG



No.	L	T
2035A	.075	1/32
2035B	.105	1/16
2035C	135	3/32
2035D	165	1/8
2035E	195	5/32
2035F	.230	3/16

Staking Tool Kit No. 3863

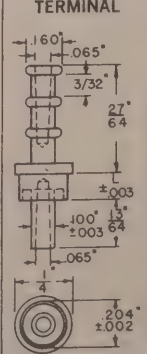
2036
RECEPTACLE LUG



No.	L	T
2036A	.075	1/32
2036B	.105	1/16
2036C	.135	3/32
2036D	.165	1/8
2036E	.195	5/32
2036F	.230	5/16

Staking Tool Kit No. 3863

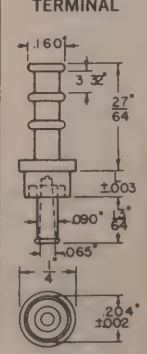
2037
TAPERED TERMINAL



No.	L	T
2037A	.105	1/16
2037B	.135	3/32
2037C	.165	1/8

Staking Tool Kit Not Available

2038
TAPERED TERMINAL



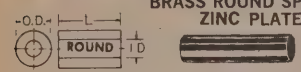
No.	L	T
2038A	.105	1/16
2038B	.135	3/32
2038C	.165	1/8

Staking Tool Kit Not Available

H. H. SMITH — OVER 1000 TYPES & SIZES — SPACERS

CONTACT YOUR LOCAL DISTRIBUTOR, OR FACTORY DIRECT, FOR PRODUCTION QUANTITIES

BRASS ROUND SPACERS ZINC PLATED



1/4" O.D.

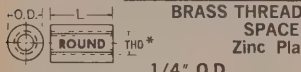
CLEARANCE HOLE — Std. Pkg. 100

Length "L"	#4 (.115) No.	#6 (.140) No.	#8 (.171) No.	NET Per C
.125	8700	8701	8702	$ 5.70
.187	8703	8704	8705	6.20
.250	2340	2100	2105	7.00
.312	8706	8707	8708	7.90
.375	2341	2101	2106	8.40
.437	8709	8710	8711	9.20
.500	2342	2102	2107	9.40
.562	8712	8713	8714	10.70
.652	8715	8716	8717	11.20
.687	8718	8719	8720	14.00
.750	2343	2103	2108	14.50
.812	8721	8722	8723	15.00
.875	8724	8725	8726	16.30
.937	8727	8728	8726	16.80
1.000	2344	2104	2109	18.60

3/8" O.D.

.125	8730	8731	8732	$10.20
.187	8733	8734	8735	11.90
.250	2345	2110	2115	12.50
.312	8736	8737	8738	13.40
.375	2346	2111	2116	15.90
.437	8739	8740	8741	16.90
.500	2347	2112	2117	17.30
.562	8742	8743	8744	21.80
.625	8745	8746	8747	22.60
.687	8748	8749	8750	23.30
.750	2348	2113	2118	20.60
.812	8751	8752	8753	24.10
.875	8754	8755	8756	27.40
.937	8757	8758	8759	28.20
1.000	2349	2114	2119	29.30

BRASS THREADED ROUND SPACERS Zinc Plated

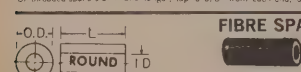


1/4" O.D.

Length "L"	THD 4-40 No.	THD 6-32 No.	THD 8-32 No.	NET Per C
.125	8760	8761	8762	$ 7.40
.187	8763	8764	8765	7.70
.250	2370	2120	2125	8.00
.312	8766	8767	8768	8.50
.375	2371	2121	2126	9.50
.437	8769	8770	8771	10.10
.500	2372	2122	2127	12.40
.562	8772	8773	8774	13.20
.625	8775	8776	8777	13.70
.687	8778	8779	8780	17.80
.750	2373	2123	2128	18.00
.812	8781	8782	8783	18.10
.875	8784	8785	8786	19.10
.937	8787	8788	8789	19.50
1.000	2374	2124	2129	21.00

*On threaded spacers 3/4" and longer, tap is 3/8" from each end, and not continuous through

FIBRE SPACERS



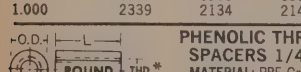
MATERIAL: FIBRE, per MIL-F-1148A, Grade CH. Std. Pkg. 100

1/4" O.D.

Clearance Hole

Length "L"	#4 (.115) No.	#6 (.140) No.	#8 (.171) No.	NET Per C
.125	8880	8881	8882	$ 5.20
.187	8883	8884	8885	5.80
.250	2335	2130	2140	6.30
.312	8886	8887	8888	7.10
.375	2336	2131	2141	7.80
.437	8889	8890	8891	8.50
.500	2337	2132	2142	9.20
.562	8892	8893	8894	10.20
.625	8895	8896	8897	10.60
.687	8898	8899	8900	11.70
.750	2338	2133	2143	12.60
.812	8901	8902	8903	13.80
.875	8904	8905	8906	14.50
.937	8907	8908	8909	15.20
1.000	2339	2134	2144	15.50

PHENOLIC THREADED SPACERS 1/4" O.D.

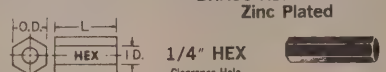


MATERIAL: PBE Grade MIL-P-79A, Natural color. Std. Pkg. 100

Length "L"	THD. 4-40 No.	THD. 6-32 No.	THD. 8-32 No.	NET Per C
.250	8660	8661	8662	$ 9.40
.312	8663	8664	8665	10.40
.375	8666	8667	8668	12.00
.437	8669	8670	8671	12.40
.500	8672	8673	8674	13.40
.562	8675	8676	8677	14.00
.625	8678	8679	8680	15.00
.687	8681	8682	8683	16.70
.750	8684	8685	8686	17.70
.812	8687	8688	8689	18.40
.875	8690	8691	8692	19.40
.937	8693	8694	8695	20.00
1.000	8696	8697	8698	21.00

*On threaded spacers 3/4" and longer, tap is 3/8" from each end, and not continuous through

BRASS HEX SPACERS Zinc Plated



1/4" HEX

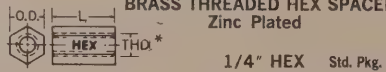
Clearance Hole

Length "L"	#4 (.115) No.	#6 (.140) No.	#8 (.171) No.	NET Per C
.125	8790	8791	8792	$ 6.40
.187	8793	8794	8795	6.80
.250	2380	2300	2305	7.50
.312	8796	8797	8798	8.90
.375	2381	2301	2306	9.20
.437	8799	8800	8801	9.50
.500	2382	2302	2307	9.80
.562	8802	8803	8804	10.80
.625	8805	8806	8807	11.40
.687	8808	8809	8810	14.20
.750	2383	2303	2308	14.50
.812	8811	8812	8813	15.70
.875	8814	8815	8816	17.50
.937	8817	8818	8819	19.00
1.000	2384	2304	2309	20.00

3/8" HEX

.125	8850	8851	8852	$10.60
.187	8853	8854	8855	11.90
.250	2385	2310	2315	12.80
.312	8856	8857	8858	14.80
.375	2386	2311	2316	16.20
.437	8859	8860	8861	19.80
.500	2387	2312	2317	20.50
.562	8862	8863	8864	21.50
.625	8865	8866	8867	23.70
.687	8868	8869	8870	24.10
.750	2388	2313	2318	25.10
.812	8871	8872	8873	26.40
.875	8874	8875	8876	29.50
.937	8877	8878	8879	29.90
1.000	2389	2314	2319	32.60

BRASS THREADED HEX SPACERS Zinc Plated



1/4" HEX

Std. Pkg. 100

Length "L"	THD 4-40 No.	THD 6-32 No.	THD 8-32 No.	NET Per C
.125	8820	8821	8822	$ 7.50
.187	8823	8824	8825	8.00
.250	2330	2320	2325	8.70
.312	8826	8827	8828	9.40
.375	2331	2321	2326	10.60
.437	8829	8830	8831	11.40
.500	2332	2322	2327	12.40
.562	8832	8833	8834	14.50
.625	8835	8836	8837	17.30
.687	8838	8839	8840	18.30
.750	2333	2323	2328	19.30
.812	8841	8842	8843	20.00
.875	8844	8845	8846	20.30
.937	8847	8848	8849	21.30
1.000	2334	2324	2329	22.80

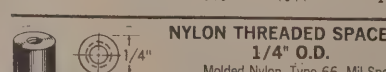
*On threaded spacers 3/4" and longer, tap is 3/8" from each end, and not continuous through.

NYLON SPACERS 1/4" O.D.

Non-conductive and molded of corrosive resistant Nylon. Useful for a wide variety of applications as well as for bushings, bearings, rollers and glides. Available in Natural finish. 1/4" O.D. in various clearance hole diameters. Std. Pkg. 100

Length "L"	#4 (.115") No.	#6 (.140") No.	#8 (.171") No.	NET Per C
.125	4000	4001	4002	$ 3.30
.187	4003	4004	4005	3.80
.250	4006	4007	4008	4.30
.312	4009	4010	4011	4.90
.375	4012	4013	4014	5.50
.437	4015	4016	4017	6.00
.500	4018	4019	4020	6.50
.562	4021	4022	4023	7.00
.625	4024	4025	4026	7.50
.687	4027	4028	4029	8.00
.750	4030	4031	4032	8.50
.812	4033	4034	4035	8.80
.875	4036	4037	4038	9.30
.937	4039	4040	4041	9.70
1.000	4042	4043	4044	10.00

NYLON THREADED SPACERS 1/4" O.D.



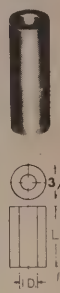
Molded Nylon, Type 66, Mil Spec 20693A, 1/4" O.D. machine tapped.

*On threaded spacers 3/4" and longer, tap is 3/8" from each end, and not continuous through.

Std. Pkg. 100

LENGTH "L"	4/40 No.	6/32 No.	8/32 No.	NET per C
1/4"	4050	4051	4052	$11.00
3/8	4053	4054	4055	12.00
1/2"	4056	4057	4058	15.00
3/4"	4059	4060	4061	15.75
1"	4062	4063	4064	16.90

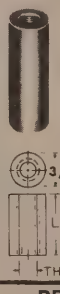
BRASS ROUND SPACERS, ZINC PLATE 3/16" O.D.



CLEARANCE HOLE — Std. Pkg. 100

DIM. "L"	#2(.093) No.	#4(.115) No.	NET Per C
.125	9000	9015	$ 5.70
.187	9001	9016	6.20
.250	9002	9017	7.00
.312	9003	9018	7.90
.375	9004	9019	8.40
.437	9005	9020	$ 9.00
.500	9006	9021	9.40
.562	9007	9022	10.70
.625	9008	9023	11.20
.687	9009	9024	14.00
.750	9010	9025	$14.50
.812	9011	9026	15.00
.875	9012	9027	16.30
.937	9013	9028	16.80
1.000	9014	9029	18.00

ROUND THREADED 3/16" O.D.

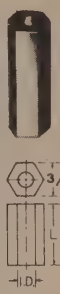


*On Threaded Spacers over 1/2", tap is 3/8" from each end and not continuous through. Std. Pkg. 100

THREADED

DIM. "L"	2-56 No.	4-40 No.	NET Per C
.125	9030	9045	$ 7.40
.187	9031	9046	7.70
.250	9032	9047	8.00
.312	9033	9048	8.50
.375	9034	9049	9.50
.437	9035	9050	$10.10
.500	9036	9051	12.40
.562	9037	9052	13.20
.625	9038	9053	13.70
.687	9039	9054	17.80
.750	9040	9055	$18.00
.812	9041	9056	18.10
.875	9042	9057	19.10
.937	9043	9058	19.50
1.000	9044	9059	21.00

BRASS HEX SPACERS 3/16" HEX



CLEARANCE HOLE — Std. Pkg. 100

DIM. "L"	#2(.093) No.	#4(.115) No.	NET Per C
.125	9100	9115	$ 6.40
.187	9101	9116	6.80
.250	9102	9117	7.50
.312	9103	9118	8.90
.375	9104	9119	9.20
.437	9105	9120	$ 9.50
.500	9106	9121	9.80
.562	9107	9122	10.80
.625	9108	9123	11.40
.6875	9109	9124	14.20
.750	9110	9125	$14.50
.812	9111	9126	15.70
.875	9112	9127	17.50
.937	9113	9128	19.00
1.000	9114	9129	20.00

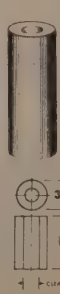
3/16" HEX THREADED SPACERS

*On Threaded Spacers over 1/2", tap is 3/8" from each end and not continuous through. Std. Pkg. 100

THREADED

DIM. "L"	2-56 No.	4-40 No.	NET Per C
.125	9130	9145	$ 7.50
.187	9131	9146	8.00
.250	9132	9147	8.70
.312	9133	9148	9.40
.375	9134	9149	10.60
.437	9135	9150	$11.40
.500	9136	9151	12.40
.562	9137	9152	14.50
.625	9138	9153	17.30
.687	9139	9154	18.30
.750	9140	9155	$19.30
.812	9141	9156	20.00
.875	9142	9157	20.30
.937	9143	9158	21.30
1.000	9144	9159	22.80

NYLON SPACERS 3/16" O.D.



Molded Nylon Type 66, Mil Spec. 20693A Std. Pkg. 100

DIM "L"	#2 (091) No.	#4 (115) No.	NET PER C
.125	9160	9180	3.30
.187	9161	9181	3.80
.250	9162	9182	4.30
.312	9163	9183	4.90
.375	9164	9184	5.50
.437	9165	9185	6.00
.500	9166	9186	6.50
.562	9167	9187	7.00
.625	9168	9188	7.50
.687	9169	9189	8.00
.750	9170	9190	8.50
.812	9171	9191	8.80
.975	9172	9192	9.30
.937	9173	9193	9.70
1000	9174	9194	10.00

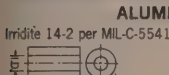
STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

ELECTRONIC COMPONENTS

H. H. SMITH

ALUMINUM SPACERS

Irridite 14-2 per MIL-C-5541



ROUND — Std. Pkg. 100

¼" O.D. Clearance Hole — 5/16" O.D. Clearance Hole

LENGTH "L"	#4(.115) No.	#6(.140) No.	#8(.171) No.	NET Per C	#10(.200) No.	NET Per C
.125	8480	8500	8520	$5.00	8540	$ 7.00
.187	9200	9207	9214	5.50	9221	7.50
.250	8481	8501	8521	6.00	8541	8.00
.312	9201	9208	9215	6.50	9222	8.50
.375	8482	8502	8522	7.00	8542	9.00
.437	9202	9209	9216	7.50	9223	9.50
.500	8483	8503	8523	8.00	8543	10.00
.562	9203	9210	9217	8.50	9224	10.50
.625	8484	8504	8524	9.00	8544	11.00
.687	9204	9211	9218	9.50	9225	11.50
.750	8485	8505	8525	10.00	8545	12.00
.812	9205	9212	9219	10.50	9226	12.50
.875	8486	8506	8526	11.00	8546	13.00
.937	9206	9213	9220	11.50	9227	13.50
1.000	8487	8507	8527	12.00	8547	14.00
1.250	8488	8508	8528	15.00	8548	15.00
1.500	8489	8509	8529	16.00	8549	16.00
1.750	8490	8510	8530	17.00	8550	17.00
2.000	8491	8511	8531	18.00	8551	18.00

ROUND THREADED

¼" O.D. — 5/16" O.D.

LENGTH "L"	4-40 No.	6-32 No.	8-32 No.	NET Per C	10-32 No.	NET Per C
.125	8320	8340	8360	$6.00	8380	$8.00
.187	9228	9235	9242	6.50	9249	8.50
.250	8321	8341	8361	7.00	8381	9.00
.312	9229	9236	9243	7.50	9250	9.50
.375	8322	8342	8362	8.00	8382	10.00
.437	9230	9237	9244	8.50	9251	10.50
.500	8323	8343	8363	9.00	8383	11.00
.562	9231	9238	9245	9.50	9252	11.50
.625	8324	8344	8364	10.00	8384	12.00
.687	9232	9239	9246	10.50	9253	12.50
.750	8325	8345	8365	11.00	8385	13.00
.812	9233	9240	9247	11.50	9254	13.50
.875	8326	8346	8366	12.00	8386	14.00
.937	9234	9241	9248	12.50	9255	14.50
1.000	8327	8347	8367	14.00	8387	15.00
1.250	8328	8348	8368	16.00	8388	16.00
1.500	8329	8349	8369	17.00	8389	17.00
1.750	8330	8350	8370	18.00	8390	18.00
2.000	8331	8351	8371	19.00	8391	19.00

*On threaded spacers 3/4" and longer, tap is 3/8" from each end, and not continuous through.

HEX

¼" O.D. — CLEARANCE HOLE — CLEAR 5/16" O.D.

LENGTH "L"	#4 (.115) No.	#6 (.140) No.	#8 (.171) No.	NET Per C	#10 (.200) No.	NET Per C
.125	8560	8580	8600	$6.00	8620	$9.00
.187	9256	9263	9270	6.50	9277	9.50
.250	8561	8581	8601	7.00	8621	10.00
.312	9257	9264	9271	7.50	9278	10.50
.375	8562	8582	8602	8.00	8622	11.00
.437	9258	9265	9272	8.50	9279	11.50
.500	8563	8583	8603	9.00	8623	12.00
.562	9259	9266	9273	9.50	9280	12.50
.625	8564	8584	8604	10.00	8624	13.00
.687	9260	9267	9274	10.50	9281	13.50
.750	8565	8585	8605	11.00	8625	14.00
.812	9261	9268	9275	11.50	9282	14.50
.875	8566	8586	8606	12.00	8626	15.00
.937	9262	9269	9276	12.50	9283	15.50
1.000	8567	8587	8607	13.00	8627	16.00

HEX THREADED

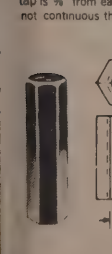
¼" O.D. — 5/16" O.D.

LENGTH "L"	4-40 No.	6-32 No.	8-32 No.	NET Per C	10-32 No.	NET Per C
.125	8400	8420	8440	$ 7.00	8460	$ 10.00
.187	9284	9291	9298	7.50	9305	10.50
.250	8401	8421	8441	8.00	8461	11.00
.312	9285	9292	9299	8.50	9306	11.50
.375	8402	8422	8442	9.00	8462	12.00
.437	9286	9293	9300	9.50	9307	12.50
.500	8403	8423	8443	10.00	8463	13.00
.562	9287	9294	9301	10.50	9308	13.50
.625	8404	8424	8444	11.00	8464	14.00
.687	9288	9295	9302	11.50	9309	14.50
.750	8405	8425	8445	12.00	8465	15.00
.812	9289	9296	9303	12.50	9310	15.50
.875	8406	8426	8446	13.00	8466	16.00
.937	9290	9297	9304	13.50	9311	16.50
1.000	8407	8427	8447	14.00	8467	17.00

*On threaded spacers 3/4" and longer, tap is 3/8" from each end, and not continuous through.

THREADED HEX STAINLESS STEEL SPACERS

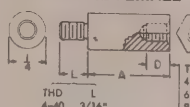
*On Threaded Spacers over ½", tap is ⅝" from each end and not continuous through.



MINIMUM Std. Pkg. 100

DIM. "L"	4-40	6-32	NET Per C
.125	9060	9080	$29.00
.187	9061	9081	30.00
.250	9062	9082	31.00
.312	9063	9083	32.00
.375	9064	9084	33.00
.437	9065	9085	38.00
.500	9066	9086	43.00
.562	9067	9087	46.00
.625	9068	9088	49.00
.687	9069	9089	52.00
.750	9070	9090	54.00
.812	9071	9091	55.00
.875	9072	9092	56.00
.937	9073	9093	57.00
1.000	9074	9094	58.00

MALE-FEMALE THREADED SPACERS



THD	L
4-40	3/16"
6-32	1/4"
8-32	3/8"

THD	D
4-40	1/4"
6-32	3/8"
8-32	7/16"

BRASS, cadmium plated. Std. Pkg. 100

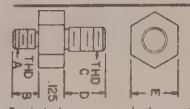
ROUND

4-40 Thd. No.	6-32 Thd. No.	8-32 Thd. No.	Length "A"	NET Per C
8200	8232	8264	.250	$22.80
8201	8233	8265	.375	23.20
8202	8234	8266	.500	23.70
8203	8235	8267	.625	24.20
8204	8236	8268	.750	24.70
8205	8237	8269	.875	25.20
8206	8238	8270	1.000	25.90
8207	8239	8271	1.125	26.40
8208	8240	8272	1.250	27.60
8209	8241	8273	1.375	29.30
8210	8242	8274	1.500	30.30
8211	8243	8275	1.625	31.00
8212	8244	8276	1.750	31.60
8213	8245	8277	2.000	32.40
8214	8246	8278	2.500	33.90
8215	8247	8279	3.000	36.80

HEX

4-40 Thd. No.	6-32 Thd. No.	8-32 Thd. No.	Length "A"	NET Per C
8216	8248	8280	.250	$22.80
8217	8249	8281	.375	23.20
8218	8250	8282	.500	23.70
8219	8251	8283	.625	24.20
8220	8252	8284	.750	24.70
8221	8253	8285	.875	25.20
8222	8254	8286	1.000	25.90
8223	8255	8287	1.125	26.40
8224	8256	8288	1.250	27.60
8225	8257	8289	1.375	29.30
8226	8258	8290	1.500	30.30
8227	8259	8291	1.625	31.00
8228	8260	8292	1.750	31.60
8229	8261	8293	2.000	32.40
8230	8262	8294	2.500	33.90
8231	8263	8295	3.000	36.80

MALE SPACER ADAPTERS



Dual-stud spacer adapters convert female threaded spacers to male-female or splice spacers together for added length. Brass, cadmium plated hex body for wrench tightening. Adds 1/8" to length of spacer. Std. Pkg. 25

No.	Thd. A	Lgth. B	Thd. C	Lgth. D	Hex E	NET Per C
8300	4-40	3/16"	4-40	3/16"	1/4"	$21.30
8301	4-40	3/16"	6-32	1/4"	1/4"	23.60
8302	6-32	1/4"	6-32	1/4"	1/4"	24.50
8303	6-32	1/4"	8-32	3/8"	1/4"	25.00
8304	8-32	3/8"	8-32	3/8"	1/4"	26.00
8305	8-32	3/8"	10-32	3/8"	1/4"	27.00
8306	8-32	3/8"	10-32	3/8"	5/16"	29.10
8307	10-32	3/8"	10-32	3/8"	5/16"	30.60

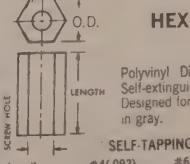
ROUND PLASTIC SPACERS

Polyvinyl Dichloride (PVDC) 1/4" O.D plastic spacers. Self-extinguishing and high temperature resistant. Available in gray. Std. Pkg. 100

CLEARANCE HOLE

Length	#4(.115) No.	#6(.140) No.	#8(.171) No.	NET Per C
1/4"	4154	4155	4156	$3.20
3/8"	4157	4158	4159	3.35
1/2"	4160	4161	4162	3.50
5/8"	4163	4164	4165	3.75
1/4"	4166	4167	4168	4.20
1"	4169	4170	4177	4.35

HEX PLASTIC SPACERS



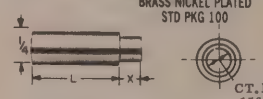
Polyvinyl Dichloride (PVDC) 1/4" Hex Spacers. Self-extinguishing and high temperature resistant. Designed for use with self-tapping screws Available in gray. Std. Pkg. 100

SELF-TAPPING SCREW HOLE SIZE

Length	#4(.092) O.D. 3/16" No.	#6(.110) O.D. 1/4" No.	#8(.141) O.D. 3/8" No.	NET Per C
3/8"	4178	—	—	$3.50
1/2"	4179	4180	—	4.00
5/8"	4181	4182	4183	4.20
3/4"	4184	4185	4186	4.35
7/8"	4187	4188	4189	5.00
1"	4190	4191	4192	5.50

THREADED SWAGE STANDOFFS

BRASS NICKEL PLATED
STD PKG 100



NOTE: For 1" STANDOFFS. TAP IS ½" FROM EACH END, AND NOT CONTINUOUS THRU. 8-32 TAPS ARE FULL LENGTH, BUT DO NOT CLEAR COUNTERBORE.
C = Counter Bore S = Shoulder

					ROUND No.	ROUND Net Per C	HEX No.	HEX Net Per C
2-56 THREAD	PANEL	"X"	"L"	"S" dia. .125			"C" I.D. .098	
RD & HEX O.D. .156	3/64	.094	.125		4369	10.00	4269	10.40
			.187		4370	10.40	4270	10.70
			.250		4371	10.70	4271	11.00
4-40 THREAD	PANEL	"X"	"L"	"S" dia. .138			"C" I.D. .113	
	3/64	.094	.125		4354	10.00	4254	10.40
STK.TOOL 3879 $3.00			.187		4358	10.40	4258	10.70
			.250		4362	10.40	4262	11.00
	1/16	.105	.125		4355	10.00	4255	10.40
			.107		4359	10.40	4259	10.70
	3/32	.135	.125		4356	10.00	4256	10.40
			.187		4360	10.40	4260	10.70
	1/8	.165	.125		4357	10.00	4257	10.40
			.187		4361	10.40	4261	10.70
4-40 THREAD	PANEL	"X"	"L"	"S" dia. .187			"C" I.D. .156	
	1/16	.105	.250		4100	10.40	4200	11.00
			.375		4103	12.00	4203	12.70
			.500		4106	14.70	4206	15.40
			.625		4109	15.40	4209	16.00
			.750		4112	17.00	4212	17.70
			1.000		4115	22.00	4215	22.70
STK.TOOL 3372 $3.00	3/32	.135	.250		4101	10.40	4201	11.00
			.375		4104	12.00	4204	12.70
			.500		4107	14.70	4207	15.40
			.625		4110	15.40	4210	16.00
			.750		4113	17.00	4213	17.70
			1.000		4116	22.00	4216	22.70
	1/8	.165	.250		4102	10.40	4202	11.00
			.375		4105	12.00	4205	12.70
			.500		4108	14.70	4208	15.40
			.625		4111	15.40	4211	16.00
			.750		4114	17.00	4214	17.70
			1.000		4117	22.00	4217	22.70
6-32 THREAD	PANEL	"X"	"L"	"S" dia. .138			"C" I.D. .113	
	1/16	.105	.125		4363	10.00	4263	10.40
STK.TOOL 3880 $3.00			.187		4366	10.40	4266	10.70
	3/32	.135	.125		4364	10.00	4264	10.40
			.137		4367	10.40	4267	10.70
	1/8	.165	.125		4365	10.00	4265	10.40
			.137		4368	10.40	4268	10.70
6-32 THREAD	PANEL	"X"	"L"	"S" dia. .187			"C" I.D. .156	
	1/15	.125	.250		4118	10.40	4218	11.00
			.375		4121	12.00	4221	12.70
			.500		4124	14.70	4224	15.40
			.625		4127	15.40	4227	16.00
			.750		4130	17.00	4230	17.70
			1.000		4133	22.00	4233	22.70
STK.TOOL 3873 $3.00	3/32	.125	.250		4119	10.40	4219	11.00
			.375		4122	12.00	4222	12.70
			.500		4125	14.70	4225	15.40
			.625		4128	15.40	4228	16.00
			.750		4131	17.00	4231	17.70
			1.000		4134	22.00	4234	22.70
	1/8	.135	.250		4120	10.40	4220	11.00
			.375		4123	12.00	4223	12.70
			.500		4126	14.70	4226	15.40
			.625		4129	15.40	4229	16.00
			.750		4132	17.00	4232	17.70
			1.000		4135	22.00	4235	22.70
8-32 THREAD	PANEL	"X"	"L"	"S" dia. .187			"C" I.D. .156	
	1/16	.105	.250		4136	10.40	4236	11.00
			.375		4139	12.00	4239	12.70
			.500		4142	14.70	4242	15.40
			.625		4145	15.40	4245	16.00
			.750		4148	17.00	4248	17.70
			1.000		4151	22.00	4251	22.70
STK.TOOL $3.00	3/32	.135	.230		4137	10.40	4237	11.00
			.375		4140	12.00	4240	12.70
			.500		4143	14.70	4243	15.40
			.625		4146	15.40	4246	16.00
			.750		4149	17.00	4249	17.70
			1.000		4152	22.00	4252	22.70
	1/8	.165	.250		4138	10.40	4238	11.00
			.375		4141	12.00	4241	12.70
			.500		4144	14.70	4244	15.40
			.625		4147	15.40	4247	16.00
			.750		4150	17.00	4250	17.70
			1.000		4153	22.00	4253	22.70

H. H. SMITH ELECTRONIC COMPONENTS

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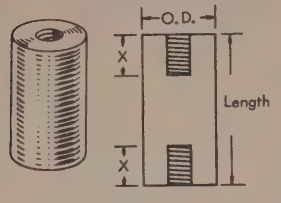
CERAMIC STANDOFFS
MIL SPEC. GRADE L-5 MIL 1-10



ROUND — Std. Pkg. 100

3/8" Dia. 6/32 Thread

No.	MIL Type	Length	X	NET Per C
2600	NL523W01-004	.500	5/32	$31.00
2601	NL523W01-005	.625	3/16	32.00
2602	NL523W01-006	.750	1/4	33.00
2603	NL523W01-008	1.000	3/8	35.00
2604	NL523W01-010	1.250	3/8	38.00
2605	NL523W01-012	1.500	3/8	40.00
2606	NL523W01-016	2.000	3/8	45.00

1/2" Dia. 8/32 Thread

No.	MIL Type	Length	X	NET Per C
2607	NL523W02-005	.625	3/16	$33.00
2608	NL523W02-006	.750	1/4	35.00
2609	NL523W02-008	1.000	1/4	38.00
2610	NL523W02-010	1.250	3/8	40.00
2611	NL523W02-012	1.500	3/8	43.00
2612	NL523W02-016	2.000	3/8	48.00
2613	NL523W02-020	2.500	3/8	54.00
2614	NL523W02-024	3.000	3/8	59.00

3/4" Dia. 10/32 Thread

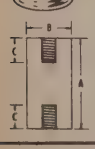
No.	MIL Type	Length	X	NET Per C
2615	NL523W03-008	1.000	3/8	$ 70.00
2616	NL523W03-010	1.250	3/8	75.00
2617	NL523W03-012	1.500	3/8	86.00
2618	NL523W03-016	2.000	3/8	89.00
2619	NL523W03-020	2.500	3/8	100.00
2620	NL523W03-024	3.000	3/8	111.00
2621	NL523W03-032	4.000	3/8	121.00

1" Dia. 1/4 x 20 Thread

No.	MIL Type	Length	X	NET Per C
2622	NL523W04-010	1.250	7/16	$100.00
2623	NL523W04-012	1.500	1/2	107.00
2624	NL523W04-016	2.000	5/8	125.00
2625	NL523W04-020	2.500	5/8	139.00
2626	NL523W04-024	3.000	5/8	150.00
2627	NL523W04-032	4.000	5/8	164.00
2628	NL523W04-040	5.000	5/8	178.00
2629	NL523W04-048	6.000	5/8	193.00

CERAMIC STANDOFFS, COMMERCIAL

Grade L5 Ceramic with outside glazed. Std. Pkg. 100

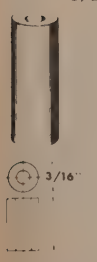


No.	A	B	C	Thd.	NET Per C
2640	1/4	1/4	THRU	6-32	$ 27.00
2641	1/2	1/4	5/32	6-32	28.00
2642	3/8	3/8	5/32	6-32	29.00
2643	1/2	3/8	3/16	6-32	30.00
2644	1/2	1/2	9/64	6-32	31.00
2645	3/4	1/2	1/4	6-32	33.00
2646	1	1/2	3/8	6-32	35.00
2647	1 1/2	1/2	9/16	6-32	41.00
2648	2 1/2	1/2	1/2	6-32	70.00
2649	2 1/2	3/4	3/4	1/4-20	140.00
2650	4	3/4	3/4	1/4-20	163.00

NYLON SPACERS

3/16" O.D. Molded Nylon, Type 66, Mil Spec. 20693A

Std. Pkg. 100



DIM "L"	#2 (.091) No.	#4 (.115) No.	NET PER C
.125	9160	9180	3.30
.187	9161	9181	3.80
.250	9162	9182	4.30
.312	9163	9183	4.90
.375	9164	9184	5.50
.437	9165	9185	6.00
500	9166	9186	6.50
562	9167	9187	7.00
625	9168	9188	7.50
687	9169	9189	8.00
750	9170	9190	8.50
.812	9171	9191	8.80
875	9172	9192	9.30
937	9173	9193	9.70
1.000	9174	9194	10.00

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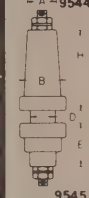
STEATITE AND PORCELAIN INSULATORS

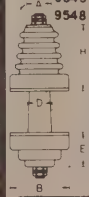
STEATITE INSULATED THRU-PANEL BUSHINGS

Consists of a pair of identical steatite insulators along with cushion washers and hardware. The 9555 assembly has interlocking insulators which are self-centering in mounting hole and may be used on very thin panels.

No.	Std. Pkg.	H	B	D	A	Hdwre	Net Ea.
9555	50	1/4"	3/4"	15/32"	1/2"	6-32	.48
9550	25	1/2"	3/4"	15/32"	3/8"	6-32	.66
9551	10	13/16"	1 1/4"	27/32"	5/8"	10-32	1.05
9552	10	1 1/8"	1 3/4"	1 7/32	7/8"	1/4"-20	1.50

THRU-PANEL INSULATORS





Compression mounted by means of a stud throughout the entire length of the unit. Extrusion of insulator base extends thru mounting hole, increasing the breakdown rating. Units have flat mounting surfaces and are furnished with cushion washer. Types with jacks have terminal permitting connection above, as well as below, panel.

STEATITE

No.	Std. Pkg.	H	B	D	E	A	Hdwre	Net Ea.
9544	50	5/8"	5/8"	5/16"	5/16"	3/8"	6-32	.75
9542	25	7/8"	3/4"	13/32"	3/8"	1/2"	10-32	.84
9540	25	1 1/4"	5/16"	7/16"	1/2"	19/32"	10-32	1.00
9543	10		No. 9542 with Std. Ban. Jack					1.03
9541	10		No. 9540 with Std. Ban. Jack					1.19

PORCELAIN

No.	Std. Pkg.	H	B	D	E	A	Hdwre	Ea.
9545	25	1 3/8"	1 1/4"	1/2"	11/15"	5/8"	10-32	1.10
9548	10	2"	1 3/8"	11/16"	7/8"	3/4"	10-32	1.68
9546	10	2 3/4"	1 5/8"	11/16"	1"	15/15"	1/4"-20	2.15
9547	10	4 1/2"	2 1/8"	31/32"	1 1/2"	1 1/16"	1/4"-20	3.60
9557	10		No. 9545 with Std. Ban. Jack					1.30
9558	10		No. 9548 with Std. Ban. Jack					1.88
9556	10		No. 9546 with Giant Ban. Jk.					2.75

STEATITE CONE INSULATORS

9500 Constructed of grade L-423 or better steatite, with
9501 threaded holes. Insulators are furnished complete with
9502 two nickel-plated machine screws, nickel-plated brass washers, and a cork cushion washer.

No.	Std. Pkg.	H	B	A	Hdwre	NET PER C
9500	50	21/32"	5/8"	7/16"	6-32	$90.00
9501	25	1 1/32"	3/4"	1/2"	8-32	125.00
9502	25	1 7/16"	1"	1/2"	8-32	130.00
9503	10	2 1/16"	1 1/8"	5/8"	10-32	300.00
9504	10	3 1/16"	1 1/2"	3/4"	10-32	700.00

STEATITE STAND-OFF INSULATORS

Two hole mounting permits substantial lateral loads. Hardware includes screw, flat washer, and two nuts.

No.	Std. Pkg.	H	B	M	A	Hdwre	Net Ea.
9524	50	5/8"	1"	11/16"	1 3/8"	6-32	$.35
9522	50	1"	1 5/32"	13/16"	15/32"	8-32	.50
9520	25	1 9/16"	1 3/4"	1 5/16"	3/4"	10-32	.70
9523	10		No. 9522 with Std. Ban. Jack				.62
9521	10		No. 9520 with Std. Ban. Jack				.80

SWIVEL STANDOFFS

MATERIALS: BRASS
FINISH: TIN PLATED
DESCR.: FOR PRINTED CIRCUIT BOARDS

STD. PKG. 25

FEMALE INTERNAL THREAD

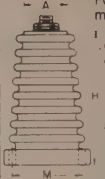
NO.	O.D.	THD.	TOP (T)	DEP. (U)	BOT (B)	DEP. (V)	LGTH (L)	NET PER C
3021	3/16	4-40	.375	.172	.375	.172	3/4"	$34.00
3022	3/16	4-40	.375	.172	.625	.250	1"	34.00
3023	1/4	6-32	.375	.172	.375	.172	3/4"	36.00
3024	1/4	6-32	.375	.172	.625	.250	1"	37.00
3025	1/4	8-32	.375	.172	.375	.172	3/4"	35.00
3026	1/4	8-32	.375	.172	.625	.250	1"	36.00

MALE EXTERNAL THREAD

NO.	O.D.	THD.	TOP (T)	DEP. (U)	BOT (B)	DEP. (V)	LGTH (L)	NET PER C
3027	3/16	4-40	.250	.250	.250	.250	1/2"	$30.00
3028	1/4	6-32	.250	.312	.250	.312	1/2"	35.00
3029	1/4	8-32	.250	.312	.250	.312	1/2"	34.00

NOTE; SPECIAL SIZES ON REQUEST.

PORCELAIN STAND-OFF INSULATORS



Feature square mounting bases with four mounting holes. Porcelain is dense molded and glazed, except on mounting surfaces.

No.	Std. Pkg.	H	B	M	A	Hdwre	Net Ea.
9562	10	2 3/4"	1 7/8"	1 3/8"	7/8"	1/4"-20	$1.75
9560	10	4 1/2"	2 1/2"	1 7/8"	1 3/16"	1/4"-20	2.10

This group is supplied with drawn and etched aluminum bases.

No.	Std. Pkg.	H	B	M	A	Hdwre	Net ea.
9565	10	1 3/8"	1 7/8"	1 1/2"	5/8"	10-32	2.30
9568	10	2"	1 3/4"	1 3/8"	23/32"	10-32	2.40
9566	10	2 3/4"	1 3/4"	1 3/8"	1"	1/4"-20	2.50
9567	10	4 1/2"	2 1/4"	1 1/4"	1 1/16"	1/4"-20	2.75

PORCELAIN LEAD-IN BUSHINGS

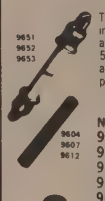
Consisting of single porcelain insulators less all hardware and mounting flange except cushion washer.

No.	Std. Pkg.	H	B	A	Net Ea.
9553	10	1 3/4"	2 1/2"	1 1/16"	1.70
9554	10	4"	3 1/2"	1"	2.15

Stamped aluminum mounting flanges, for three mounting holes spaced 120 degrees apart.

	No.	Std. Pkg.	For Bushing No.	Net Ea.
9590	9590	10	9553	$2.75
9591	9591	10	9554	2.75

PORCELAIN ANTENNA STRAIN INSULATORS



The 9651, 9652, and 9653 have heavy 1½ diameter wet porcelain insulator with specially sealed end bells of non-corrosive aluminum alloy Porcelain is glazed to prevent moisture absorption. 1 diameter 5/8 square. The 9632 is a compression type strain insulator for aircraft or guy wire applications—made of dry process glazed porcelain

No.	Std. Pkg.	Breaking Strength	Length Net	Length Overall	Net Ea.
9632	50	EGG	—	1½"	$.30
9604	25	400 lbs.	—	4"	2.00
9607	25	800 lbs.	—	7"	8.50
9612	25	800 lbs.	—	12"	9.50
9651	1	5000 lbs.	8"	15½"	42.00
9652	1	5000 lbs.	12"	19½"	45.00
9653	1	5000 lbs.	20"	25½"	66.00

PORCELAIN FEEDER INSULATORS

Conventional feeder spreaders for constructing high efficiency, open-wire antenna feeders and transmission lines. Insulators are made of high grade, low absorption porcelain silicone impregnated for moisture resistance. Insulators have 3/8" x 1/2" cross section. The 9622 has extra notches for 1½" line spacing.

No.	Std. Pkg.	Length	Net Ea.
9622	25	2"	.24
9624	25	4"	.48
9626	25	6"	.60

SMITH TEFLON TERMINALS

- Standoff — Feed-thru
- Probes — Test Jacks
- Connectors — Sockets
- Custom Fabrication
- Miniature
- Subminiature
- Microminiature

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

ELECTRONIC COMPONENTS BY H. H. SMITH

INSTRUMENT KNOBS

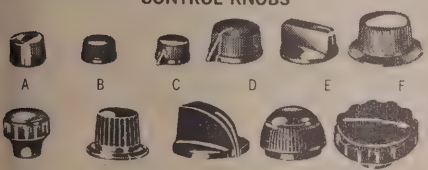
Plain | With Pointer | With Skirt

Molded black bakelite instrument knobs with molded in brass insert for 1/4" shafts. Style B pointer knobs have white vinyl pointer. Style C skirt type have white indicator line. Style D same as style A except with protruding brass insert for mounting special dials and pointers.

Std. Pkg. 10

No.	Style	O.D.	Pointer Size	Height	NET Per C
2200	A	1 1/8"		5/8"	$ 63.00
2201	A	1 3/8"		11/16"	65.00
2202	A	1 5/8"		3/4"	72.00
2203	A	2 3/8"		7/8"	99.00
2204	B	1 1/8"	3/4" pointer	11/16"	94.00
2205	B	1 3/8"	1 1/16" pointer	11/16"	96.00
2206	B	1 5/8"	1 3/16" pointer	13/16"	102.00
2207	B	2 3/8"	1 9/16" pointer	15/16"	133.00
2208	C	1 1/8"	1 1/2" Skirt	13/16"	130.00
2209	C	1 3/8"	1 3/4" Skirt	7/8"	138.00
2210	C	1 5/8"	2 1/16" Skirt	29/32"	150.00
2211	C	2 3/8"	3" Skirt	1 1/32"	187.00

CONTROL KNOBS



Molded bakelite control knobs. Supplied with 1/4" molded hole; complete with set screw. *Recessed for locknut.

Std. Pkg. 50

No.	Style	O.D.	Height	Color	NET Per C
2240	A	3/4"	13/32"	Black	$31.00
2242	B	11/16"	13/32"	Black	14.00
2244*	B	1"	1/2"	Black	24.00
2275†	B	11/16"	13/32"	Black	24.00
2246	C	11/16"	13/32"	Black	15.00
2273†	C	11/16"	13/32"	Black	26.00
2248*	D	1"	1/2"	Black	32.00
2250*	E	1 1/8"	9/16"	Black	28.00
2252*	F	1 1/2"	11/16"	Black	35.00
2258	G	7/8"	3/4"	Black	31.00
2265	H	29/32"	19/32"	Black	32.00
2267	J	1 3/16"	5/8"	Black	26.00
2283	L	7/8"	1/2"	Black	43.00

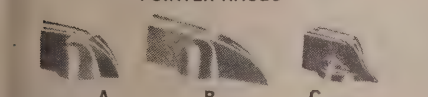
† Supplied with brass insert.

PUSH BUTTON KNOBS

Std. Pkg. 50

No.	Style	O.D.	Height	Color	Per C
2277	A	1/2"	51/64"	Black	$13.00
2279	B	31/64"	9/16"	Black	9.00

POINTER KNOBS



Molded bakelite pointer knobs, supplied with 1/4" plain hole or brass insert. Complete with set screw.

Std. Pkg. 50

No.	Style	Type Hole	Color	NET Per C
2220	A	1/4" Plain	Black	$30.00
2223	A	1/4"Brass Insert	Black	36.00
2226	B	1/4" Plain	Black	34.00
2228	B	1/4" Brass Insert	Black	50.00
2230	C	1/4" Plain	Black	26.00

LEVER KNOBS

Molded bakelite lever knobs with 1/4" brass insert, complete with set screw.

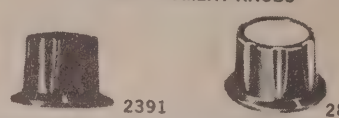
Std. Pkg. 50

No.	Style	Length	Height	Color	NET Per C
2232	A	1 5/8"	19/32"	Black	$51.00
2234	B	1 15/16"	19/32"	Black	89.00
2236	C	2 1/2"	5/8"	Black	50.00
2238	D	2 13/16"	5/8"	Black	89.00

UTILIZE OUR FACILITIES

- ENGINEERING & DESIGN
- PRECISION TURNING
- ASSEMBLY
- STAMPING
- MOLDING

FLUTED INSTRUMENT KNOBS



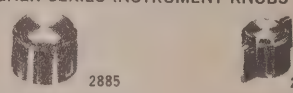
2391 | 2891

Molded Black bakelite, supplied with white filled line on crown and skirt. Supplied with 1/4" plain hole with set screw.

Std. Pkg. 10

No.	Skirt	Height	Net Per C
2391	3/4"	1/2"	$45.00
2392	1 1/8"	5/8"	50.00
2393	1 1/4"	3/4"	56.00
2394	1 1/2"	7/8"	60.00
2395	2.000"	15/16"	77.00
With 1/8" plain hole and set screw			
2396	3/4"	1/2"	46.00
Same as above, except for spun Silver insert and lined skirt.			
2891	3/4"	1/2"	65.00
2892	1 1/8"	5/8"	81.00
2893	1 1/4"	3/4"	70.00
2894	1 1/2"	7/8"	90.00
2895	2.000"	15/16"	112.00
With 1/8" plain hole and set screw			
2896	3/4"	1/2"	67.00

DESIGNER SERIES INSTRUMENT KNOBS

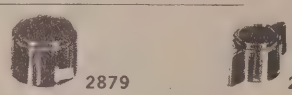


2885 | 2890

Molded Black bakelite with lined spun Silver insert. Supplied with plain 1/4" hole and set screw.

Std. Pkg. 10

No.	Height	Diameter	Net Per C
2885	5/8"	3/4"	$71.00
2886	11/16"	1.000"	69.00
2887	3/4"	1 3/8"	83.00
2888	13/16"	1 3/4"	91.00
Pointer type, white line on pointer.			
2890	5/8"	1 1/4"	91.00
With 1/8" plain hole and set screw			
2889	5/8"	1/2"	72.00



2879 | 2884

Same as above, lined crown, less the spun Silver insert.

2879	5/8"	3/4"	$42.00
2880	11/16"	1.000"	45.00
2881	3/4"	1 3/8"	54.00
2882	13/16"	1 3/4"	60.00
With 1/8" plain hole and set screw			
2883	5/8"	1/2"	41.00
Pointer type, white line on pointer.			
2884	5/8"	1 1/4"	50.00

CONCENTRIC FLUTED INSTRUMENT KNOB

2397 | 2897

Molded Black and Red bakelite dual concentric knob. Black outside knob with White filled line on skirt. Red inner knob with White filled line on skirt and crown. Supplied with set screws.

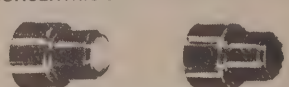
Std. Pkg. 10

No.	NET Per C
2397	$95.00

Same as above except with lined spun Silver insert on Red inner knob.

2897	$125.00

CONCENTRIC DESIGNER SERIES KNOBS



Molded Black outside knob with filled line 1/4 hole, inner molded Black knob with lined spun Silver lined insert, 1/8 hole.

Std. Pkg. 10

No.	NET Per C
2898	$130.00

Same as above except less the spun Silver insert, outside knob with lined side, top inner knob with lined crown.

No.	NET Per C
2899	96.00

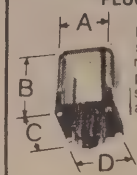
CAP AND CHAIN

DESCR.: Brass, nickel plated. Seals chassis connectors against dust. Eliminates noisy connections. Used with any threaded one or two conductor chassis unit.

Std. Pkg. 25

No.		NET Per C
118	5/8-27 Thread	$110.00

PLUG-IN MODULE HOUSINGS



Molded plastic housings and pin headers fit standard tube sockets. For use in packaging relays, networks, miniature interchangeable circuits in plug-in, replaceable modules. Available in three sizes and materials for a wide range of temperature and environmental applications.

Std. Pkg. 25

HEADERS	A	B	C	D
MIN.	1 3/16	1 9/16	1⅜	1⅜
STD.	1 3/16	1 15/16	1⅜	1⅜
LGE.	1¾	2 15/16	1 31/32	1 31/32

HEADER BLACK	STYRENE BLACK Cat. No.	Net. Ea.	BUTYRATE BLACK Cat. No.	Net Ea.	NYLON NATURAL Cat. No.	Net Ea.
MINIATURE						
8 Pin	2437-08	$ .75	2421-08	$ .90	2424-08	$ .80
9 Pin	2437-09	.90	2421-09	1.00	2424-09	1.00
11 Pin	2437-11	.90	2421-11	1.00	2424-11	1.00
20 Pin	2437-20	1.00	2421-20	1.15	2424-20	1.15
STANDARD						
8 Pin	2438-08	$ .75	2422-08	$ .75	2432-08	$ .90
9 Pin	2438-09	.80	2422-09	.90	2432-09	1.00
11 Pin	2438-11	.80	2422-11	.90	2432-11	1.00
20 Pin	2438-20	1.00	2422-20	1.00	2432-20	1.15
LARGE						
8 Pin	2439-08	$ .95	2423-08	$1.40	—	—
11 Pin	2439-11	1.00	2423-11	1.45	—	—
20 Pin	2439-20	1.35	2423-20	1.70	—	—

INSTRUMENT CASES AND COVERS

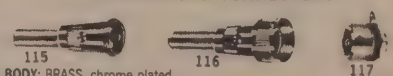
Ideal for small instruments and test equipment. The right size and the right mounting for your requirements. Molded of high quality, glass finish, thermosetting plastic. Threaded brass insert for cover mounting. BLACK ONLY

Std. Pkg. 5.

No.	H	W	D	Insert	NET Ea.
2377	4"	2⅞"	1 9/16"	4-40*	$ .80
2291	5"	4¼"	1¾"	6-32	1.60
2255	6¼"	3¾"	2"	6-32	1.50
2257	6 13/16"	5 9/32"	2 5/16"	4-40	2.65
2289	8½"	7 7/16"	3"	6-32	3.00
PHENOLIC COVERS					
2378	For No. 2377				$ .30
2292	For No. 2291				.45
2256	For No. 2255				1.00
2260	For No. 2257				1.75
2390	For No. 2289				2.60
PANEL PLATE					
2379	Brushed and lacquered Aluminum For No. 2255				1.30

*SELF TAPPING

MICROPHONE CONNECTORS



BODY: BRASS, chrome plated.
SPRING: Steel, cadmium plated.
INSUL.: XXXP PHENOLIC.
DESCR.: Designed for use with single conductor cable. Microphone connectors provided with flexible protector spring. Cable clamped firmly to connector by hollow point set screw.

Std. Pkg. 50

MICROPHONE CONNECTORS

No.	Type	NET Per C
115	Single Contact Male	$48.00
116	Single Contact Female	65.00

CHASSIS CONNECTORS

Mount to .385 hole grounded; .500 hole insulated with shoulder washer.

No.	Type	Std. Pkg.	NET Per C
117	Single Contact Male	25	$60.00

PHONE PLUG ADAPTER

BODY: Body, tip, sleeve—Brass, nickel plated.
INSUL.: XXXP PHENOLIC.
RATING: 5 Amps AC for 10°C Temp. rise, continuous duty. 750 Volts 60 cycle AC continuous working voltage.
DESCR.: Assembled to insure positive contact with input wire of mating microphone connector. Molded styrene separator insures maximum insulation between conductors. Mates with No. 116 microphone connector. Fits standard phone jacks.

Std. Pkg. 25

No.	NET Per C
113	$47.00

H. H. SMITH ELECTRONIC COMPONENTS

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

EQUIPMENT HANDLES

MATERIAL AND FINISH SPECIFICATIONS

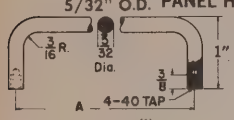
ALL HANDLES BUFFED AND POLISHED

SEND US YOUR DRAWINGS FOR SPECIAL SIZE HANDLES

MATERIALS:
BRASS: QQ-B-620, Comp 1/2 Hard.
ALUMINUM: QQ-A-365, Comp A. Type 3.

FINISHES:
CHROME: Chrome Plate over Copper.
BLACK OXIDE: In accordance with MIL-F-495A
SATIN ETCH: Commercial finish.
BLACK ANODIZE: In accordance with MIL-A-8625A
OPTICAL BLACK: Color in accordance with Fed. Std. 595, type 37038. Paint complies with Fed. Spec. TT-E-527

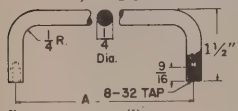
5/32" O.D. PANEL HANDLES



5/32" Diameter panel handles. Brass and Aluminum finished as shown, with internal 4-40 thread. Individually packaged. **Std. Pkg. 10**

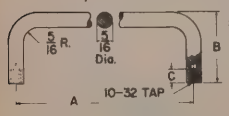
No.	(A)	Finish	NET Ea.
		BRASS	
1632	1 1/4"	Nickel Plate	$1.20
1633	1 1/4"	Black Oxide	1.05
1636	2"	Nickel Plate	1.40
1637	2"	Black Oxide	1.20
1640	3"	Nickel Plate	1.50
1641	3"	Black Oxide	1.35
		ALUMINUM	
1634	1 1/4"	Satin	$1.15
1635	1 1/4"	Blk. Anodize	1.20
1638	2"	Satin	1.35
1639	2"	Blk. Anodize	1.40
1642	3"	Satin	1.45
1643	3"	Blk. Anodize	1.45

1/4" O.D. PANEL HANDLES



No.	(A)	Finish	NET Ea.
		BRASS	
1616	2"	Nickel Plate	$1.45
1617	2"	Black Oxide	1.25
1620	3"	Nickel Plate	1.60
1621	3"	Black Oxide	1.50
1624	4"	Nickel Plate	1.75
1625	4"	Black Oxide	1.65
1628	6"	Nickel Plate	2.10
1629	6"	Black Oxide	1.95
		ALUMINUM	
1618	2"	Satin	$1.00
1619	2"	Blk. Anodize	1.05
1622	3"	Satin	1.05
1623	3"	Blk. Anodize	1.15
1626	4"	Satin	1.15
1627	4"	Blk. Anodize	1.25
1630	6"	Satin	1.45
1631	6"	Blk. Anodize	1.55

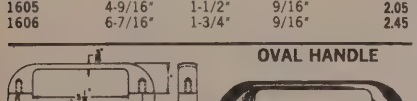
PANEL HANDLES 5/16" O.D.



Brass Panel Handles, finished as shown, with internal thread. Individually packaged. **Std. Pkg. 10**

No.	(A)	(B)	(C)	NET Ea.
		BRASS NICKEL PLATE		
2050	3"	1-5/16"	7/16"	$1.65
2057	3"	1-1/2"	9/16"	1.70
2056	4-1/4"	1-1/2"	9/16"	2.05
2051	4-9/16"	1-1/2"	9/16"	2.10
2052	6-7/16"	1-3/4"	9/16"	2.55
		BRASS BLACK OXIDE		
1601	3"	1-5/16"	7/16"	$1.50
1602	3"	1-1/2"	9/16"	1.60
1604	4-1/4"	1-1/2"	9/16"	2.00
1605	4-9/16"	1-1/2"	9/16"	2.05
1606	6-7/16"	1-3/4"	9/16"	2.45

OVAL HANDLE



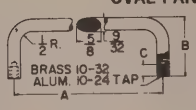
Die Cast Zamac Handle. Brush chrome plated. **Std. Pkg. 10**

No.	(A)	(B)	(C)	Net Per C
2070	2 3/4"	8-32 x 3/8"	3/8"	$ 95.00
2066	3 1/2"	10-24 x 3/8"	5/8"	145.00
2065	4"	10-24 x 3/8"	5/8"	150.00

THESE HANDLES ARE STANDARD AND STOCKED IN DEPTH

We welcome your inquiry for special sizes, materials and plating.

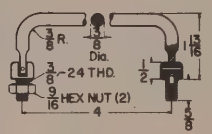
OVAL PANEL HANDLES



Flat, oval panel handles in Brass, and Aluminum, finished as shown. Brass handles have internal 10-32 thread. Aluminum handles have internal 10-24 thread. Individually packaged. **Std. Pkg. 10**

No.	Mtg. Ctrs. (A)	Height (B)	Tap Depth (C)	Finish	NET Ea.
			BRASS		
1644	3"	1-9/32"	9/32"	Nickel Plate	$3.00
1645	3"	1-9/32"	9/32"	Black Oxide	3.00
1647	4-9/16"	1-1/2"	1/2"	Nickel Plate	3.50
1648	4-9/16"	1-1/2"	1/2"	Black Oxide	3.50
1651	6-7/16"	1-3/4"	1/2"	Nickel Plate	3.65
1653	6-7/16"	1-3/4"	1/2"	Black Oxide	3.65
1655	9"	1-3/4"	1/2"	Nickel Plate	4.15
1657	9"	1-3/4"	1/2"	Black Oxide	4.15
			ALUMINUM		
1646	3"	1-9/32"	9/32"	Black Anodize	3.00
1649	4-9/16"	1-1/2"	9/32"	Black Anodize	3.50
1654	6-7/16"	1-3/4"	9/32"	Black Anodize	3.65
1658	9"	1-3/4"	9/32"	Black Anodize	4.15

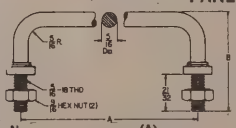
FOLDING HANDLES



Folding Brass panel handles with spring-loaded detents which snap into upright or left-or-right folded position. Finished as shown. Supplied with brass, nickel plated hex nuts. Mounts in 3/8" panel holes. Individually packaged. **Std. Pkg. 10**

No.	Finish	NET Ea.
1662	Nickel Plate	$10.00
1663	Black Oxide	10.00

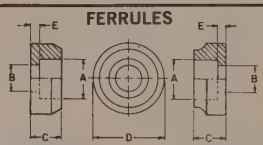
5/16" O.D. PANEL HANDLES



Brass Panel Handles, finished as shown with male threaded stud. Supplied complete with matching ferrules, and brass nickel plated hex nuts. Individually packaged. **Std. Pkg. 10**

No.	(A)	(B)	NET Ea.
		BRASS NICKEL PLATE	
1607	2"	2 1/8"	$2.35
1609	3"	2 1/8"	2.60
1611	4"	2 1/8"	2.80
2053	4 1/4"	2 1/8"	2.90
1614	6"	2 11/16"	3.30
		BRASS BLACK OXIDE	
1608	2"	2 1/8"	$2.15
1610	3"	2 1/8"	2.40
1612	4"	2 1/8"	2.60
1613	4 1/4"	2 1/8"	2.75
1615	6"	2 11/16"	3.00

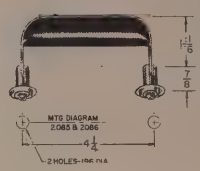
FERRULES



Brass and Aluminum ferrules, finished as shown, to match handles listed above. **Std. Pkg. 50**

No.	Fig.	(A)	(B)	(C)	(D)	(E)	NET Per C
				BRASS NICKEL PLATED			
1664	1	5/32"	.109	1/8"	1/4"	3/64"	$14.00
1668	1	1/4"	.203	3/16"	3/8"	1/16"	15.00
2055	1	5/16"	.219	1/4"	9/16"	1/16"	31.00
2054	2	5/16"	.196	5/16"	3/4"	3/32"	21.00
				BRASS, BLACK OXIDE			
1665	1	5/32"	.109	1/8"	1/4"	3/64"	$11.00
1669	1	1/4"	.203	3/16"	3/8"	1/16"	12.00
1673	1	5/16"	.219	1/4"	9/16"	1/16"	31.00
1672	2	5/16"	.196	5/16"	3/4"	3/32"	21.00
				ALUMINUM SATIN ETCH			
1666	1	5/32"	.109	1/8"	1/4"	3/64"	$12.00
1670	1	1/4"	.263	3/16"	3/8"	1/16"	12.00
				ALUMINUM, BLACK ANODIZED			
1667	1	5/32"	.109	1/8"	1/4"	3/64"	$12.00
1671	1	1/4"	.203	3/16"	3/8"	1/16"	12.00

MOLDED GRIP HANDLES

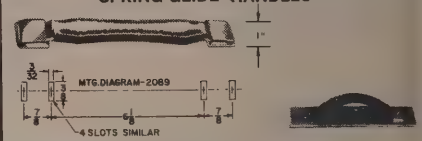


HANDLE: Molded high impact Styrene, fungus resistant.
HARDWARE: Steel, nickel plated.
RATING: 75 lbs. maximum load.
DESCR: Rounded palm fitting design.
Std. Pkg. 10

Attaches with 10-32 machine screws supplied. Maximum panel thickness 1/4".

No.	Color	NET per C
2085	Black	$250.00
2086	Grey	250.00

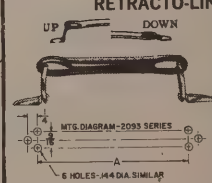
SPRING-GLIDE HANDLES



HANDLE: Black genuine leather, contoured stitched.
HARDWARE: Steel, chrome plate.
DESCR.: Strong spring-glide retract mechanism prevents handle rattle at vibration extremes, automatically lies flat against case when not in use. Attaches with fold tabes on cap against rear bearing washer plate. Spring and washer plate can be secured with optional screws. Maximum panel thickness 1/4". **Std. Pkg. 10**

No.	Color	NET Per C
2089	Black	$470.00

RETRACTO-LINK HANDLES

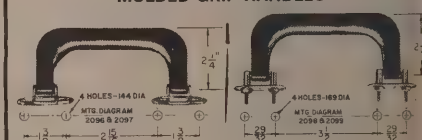


HANDLE: Black genuine leather, matching stitching.
HARDWARE: Steel, nickel plated.
RATING: 60 lbs. maximum load.
DESCR: Sliding link retracts inside handle to lie flat to panel when not in use. Shipped with all hardware assembled except decorative cover cap.
Attaches with fold tabs against bearing washer plate which can be secured with optional #6 screws (not supplied). Maximum panel thickness 1/2".

Attaches with #6 screws or rivets (not supplied). Maximum panel thickness unlimited.

			NET Per C
2093	4 1/2"	5 3/4"	$400.00
2094	5 1/2"	6 5/8"	400.00
2095	6 3/4"	7 7/8"	400.00

MOLDED GRIP HANDLES



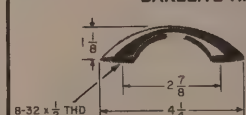
HANDLE: Molded high impact Styrene.
HARDWARE: Steel, nickel plated.
RATING: 60 lbs maximum load.
DESCR.: Designed for economy and rugged use. Folds flat to case. Attaches with rivets or #6 screws (not supplied). Maximum panel thickness unlimited. **Std. Pkg. 10**

No.	Color	NET Per C
2096	Black	$ 90.00
2097	Grey	90.00

Attaches with integral 8-32 studs and nuts supplied. Maximum panel thickness 3/8".

2098	Black	180.00

BAKELITE HANDLE



MATERIAL: Molded Phenolic, Red or Black.
RATING: 40 lbs. maximum load.
DESCR.: Molded cabinet handle attaches with two 8-32 screws (not supplied) on 2 7/8 mounting centers. **Std. Pkg. 10**

No.	Color	NET Per C
2281	Black	$30.00
2282	Red	30.00

MORE THAN 20 THOUSAND ITEMS MANUFACTURED UNDER ONE ROOF

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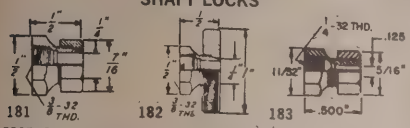
ELECTRONIC COMPONENTS — H. H. SMITH

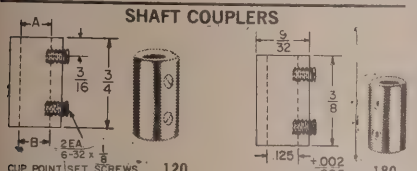
SHAFT LOCKS



DESCR.: Brass, nickel plated shaft locks, supplied with lock nut. Standard (No. 181, 182) for 1/4" shafts; miniature (No. 183) for 1/8" shafts.

No.	(A)	(B)	(C)	(D)	(E)	Std. Pkg.	Per C
181	.253	1/2"	1/2"	7/16"	3/8"-32	100	$50.00
182	.253	1/2"	1/2"	1"	3/8"-32	25	95.00
183	.128	1/2"	11/32"	5/16"	1/4"-32	25	34.00

SHAFT COUPLERS



DESCR.: Brass and insulated shaft couplers. Supplied with two 6-32 x 1/8" slotted cup-point set screws, except as indicated. Std. Pkg. 50

Brass, Nickel Plated Couplers

No.	(A)	(B)	(C)	(D)	(E)	NET Per C
120	1/4"	1/4"	7/16"	3/4"	3/16"	$40.00
131	1/4"	3/8"	1/2"	3/4"	3/16"	48.00
	With Four Set Screws, Spaced 90°					
138	1/4"	1/8"	7/16"	3/4"	3/16"	65.00
	Miniature Coupler, With 4-40 x 1/8" Allen Head Cup-Point Set Screws					Std. Pkg. 25
180	1/8"	1/8"	9/32"	3/8"	5/64"	40.00
	Insulated Black Fibre Per Mil-F-1148A, Grade Ch.					Std. Pkg. 50
140	1/4"	1/4"	7/16"	3/4"	3/16"	40.00

EXTENDERS Brass and Insulated

Long Shaft Type — Std. Pkg. 50

No.	A	B	C	Material	NET Per C
150	1/4"	-1/4"	1 1/4"	Brass N.P.	$65.00
130	1/4"	-1/4"	1 1/4"	Fibre	65.00

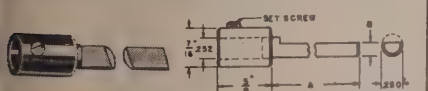
Short Shaft Type

No.	A	B	C	Material	NET Per C
160	1/4"	-1/4"	5/8"	Brass N.P.	$50.00
161	1/4"	-1/4"	5/8"	Fibre	50.00

MINIATURE EXTENDER With Allen Head Set Screws

189	1/8"	-1/8"	3/8"	Brass N.P.	$50.00

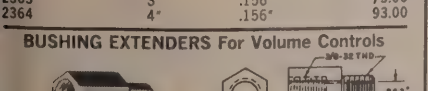
SHAFT EXTENDERS For Volume Controls



Brass, Nickel Plated. Std. Pkg. 25

No.	A	B	NET Per C
	FULL ROUND		
2356	2"	.250"	$63.00
2357	3"	.250"	64.00
2358	4"	.250"	68.00
	WITH FLAT		
2359	2"	.219"	69.00
2360	3"	.219"	75.00
2361	4"	.219"	93.00
2362	2"	.156"	69.00
2363	3"	.156"	75.00
2364	4"	.156"	93.00

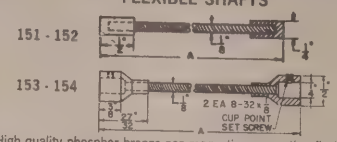
BUSHING EXTENDERS For Volume Controls



Brass, Nickel Plated. Std. Pkg. 25

No.	A	B	NET Per C
350	5/8"	3/16"	$55.00
351	5/8"	1/4"	60.00
352	5/8"	3/8"	65.00
353	11/16"	3/8"	75.00
354	11/16"	1/2"	77.00
355	3/4"	1/4"	80.00

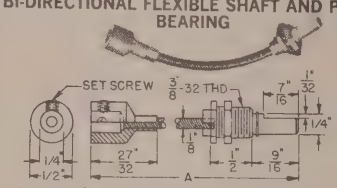
FLEXIBLE SHAFTS



High quality phosphor bronze non-magnetic, non-rusting flexible shafts. Remote control when necessary to mount condensers and potentiometers away from panel at unusual angles. Turns at any angle up to 90°; free from back lash. Std. Pkg. 25

No.	Size "A"	Description	NET Per C
151	3"	With 1/4" hub	$150.00
152	6"	With 1/4" hub	170.00
153	3 5/8"	With 1/4" coupler	220.00
154	6 5/8"	With 1/4" coupler	240.00

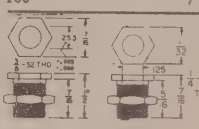
BI-DIRECTIONAL FLEXIBLE SHAFT AND PANEL BEARING



Combination of 1/4" Coupler at one end and Panel Bearing Assembly at other. High quality phosphor bronze non-magnetic, non-rusting flexible shaft, turns at angle up to 90°. Free from backlash. Std. Pkg. 25

No.	Length "A"	NET Ea.
165	4 1/16"	$2.30
166	7 1/16"	2.40

PANEL BEARINGS

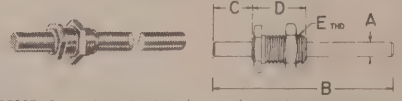


DESCR.: Brass, nickel plated panel bearings, supplied with hex nut. Standard (No. 119) for 1/4" shafts; miniature (No. 184) for 1/8" shafts. Std. Pkg. 100

No.	(A)	(B)	(C)	(D)	(E)	Per C
119	.253	7/16"	1/2"	7/16"	3/8"-32	$22.00
184	.128	11/32"	7/16"	5/16"	1/4"-32	22.00

PANEL BEARING ASSEMBLIES

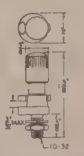
Standard & Miniature



DESCR.: Brass, nickel plated for 1/4" and 1/8" shafts. Std. Pkg. 50

No.	A	B	C	D	E	NET Per C
148	.250	3"	1/2	1/2	3/8-32	$75.00
149	.250	6"	1/2	1/2	3/8-32	80.00
1448	.125	2"	11/32	7/16	1/4-32	75.00
1449	.125	4"	11/32	7/16	1/4-32	80.00

DIAL LOCK



HEAD: Captive: Brass, nickel plated
BODY: Brass, nickel plated.
DESCR.: Prevents detuning of the dial when locked by means of the captive knurled nut. Supplied with hex nut & lockwasher. Std. Pkg. 25

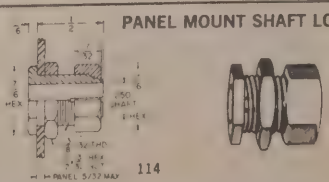
No.	NET Per C
199	$130.00

NYLON FLEXIBLE SHAFT COUPLING

DESCR.: Molded nylon with molded-in brass bushings. Hi-temp nylon not influenced by moisture. Designed for long reach shaft coupling. Supplied with 2 Allen head set screws. Std. Pkg. 25

No.	NET Per C
164	$165.00

PANEL MOUNT SHAFT LOCKS

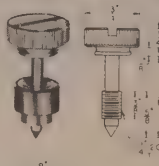


DESCR.: Brass, nickel plated combination panel bearings and shaft locks. Type 155 mounts on front of panel with 4-40 hardware thru flange plate. Type 14 mounts thru panel in 3/8" hole. For 1/4" shafts. Std. Pkg. 50

No.	TPE	NET Per C
114	Single-hole mount	$55.00

CAPTIVE SCREW & BUSHING

Large Head

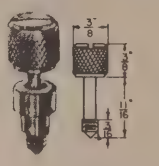


BODY: Brass, nickel plated.
DESCR.: Supplied with panel bushing as shown. Used extensively for quick removal of panels from chassis. Non-removable from panel. Std. Pkg. 25

No.	Panel Bushing Length (L)	Panel Thick.	NET Per C
2365-A	5/32"	1/8"	$125.00
2365-B	7/32"	3/16"	125.00
2365-C	9/32"	1/4"	125.00

CAPTIVE SCREW & BUSHING

Small Head



BODY: Brass, nickel plated.
DESCR.: Supplied with panel bushing as shown. Used extensively for quick removal of panels from chassis. Non-removable from panel. Std. Pkg. 25

No.	Panel Bushing Length (L)	Panel Thick.	NET Per C
2375-A	5/32"	1/8"	$55.00
2375-B	7/32"	3/16"	55.00
2375-C	9/32"	1/4"	55.00

BRASS THREADED RODS

1-Ft. Length Std. Pkg. 10			2-Ft. Length	
No.	NET Ea.	Threaded	No.	NET Ea.
1400-1	$. 90	6-32	1400-2	$1.80
1401-1	.90	8-32	1401-2	1.80
1402-1	.90	10-32	1402-2	1.80
1403-1	1.10	1/4-20	1403-2	2.20

NYLON THREADED RODS

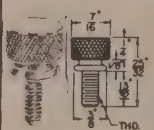
1-Ft. Length Std. Pkg. 10			2-Ft. Length	
No.	NET Ea.	Threaded	No.	NET Ea.
1420-1	$1.20	6-32	1420-2	2.40
1421-1	1.30	8-32	1421-2	2.60
1422-1	1.50	10-32	1422-2	3.00
1423-1	1.80	1/4-20	1423-2	3.60

PLAIN RODS

Brass, Acetate & Nylon

1/4" DIA Std. Pkg. 10				1/8" DIA	
No.	Net Ea.	Type	Length	No.	NET Ea.
1404	$ .70	Brass N.P.	6"	1431	$ .70
1405	1.40	Brass N.P.	12"	1432	1.20
1406	.15	Acetate	6"	1433	.15
1407	.30	Acetate	12"	1434	.30
1408	.35	Nylon	6"	1440	.35
1409	.70	Nylon	12"	1441	.70

THUMB SCREW

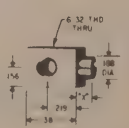


BODY: Brass, nickel plated.
DESCR.: Used extensively for quick removal of panels from chassis. Std. Pkg. 25

No.	Thread	NET Per C
2366	6-32	$30.00
2367	8-32	30.00
2368	10-32	30.00

CHASSIS FASTENERS

Annealed for ease of curling

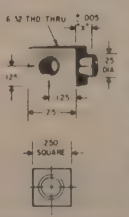


Designed to be swaged onto metal chassis for use as mounting surfaces for terminal boards, tie strips, etc. Brass, Cadmium Plated. Std. Pkg. 100

2039 SERIES

No.	"X"	Board Thickness	NET Per C
2039B	.105	.062	$30.00
3039C	.135	.094	30.00
2039D	.165	.125	30.00
3874	Staking Tool		Net Ea. $1.50

2040 SERIES



No.	"X"	Board Thickness	NET Per C
2040A	.075	.031	$30.00
2040B	.105	.062	30.00
2040C	.135	.094	30.00
2040D	.165	.125	30.00
3875	Staking Tool		Net Ea. $1.50

Norelco® MINIATURE LAMPS

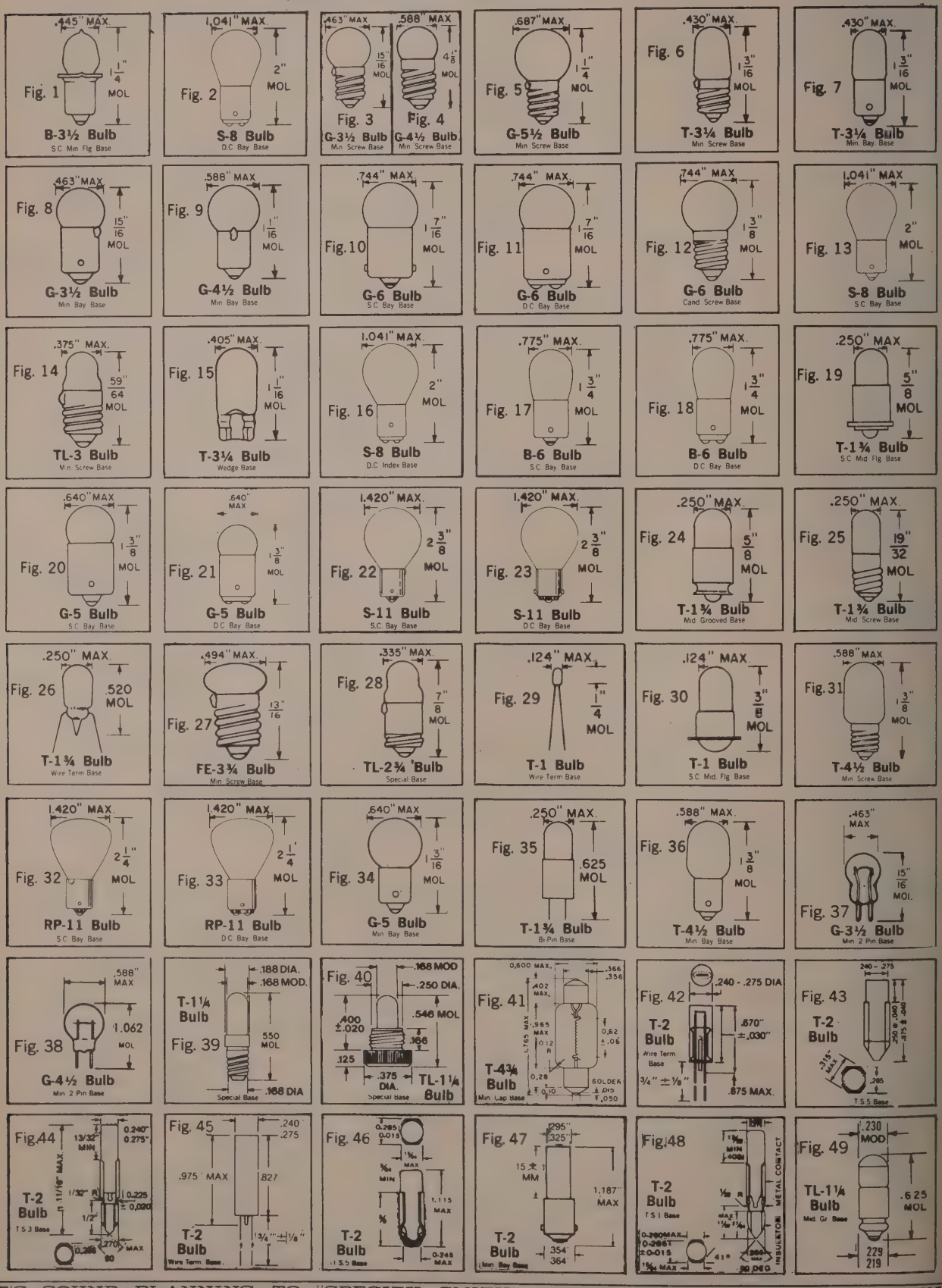


Fig. 1 .445" MAX. 1 1/4" MOL B-3½ Bulb SC Min Flg Base
Fig. 2 1.041" MAX. 2" MOL S-8 Bulb D.C Bay Base
Fig. 3 .463" MAX. 15/16" MOL G-3½ Bulb Min Screw Base
Fig. 4 .588" MAX. 4 1/8" MOL G-4½ Bulb Min Screw Base
Fig. 5 .687" MAX. 1 1/4" MOL G-5½ Bulb Min Screw Base
Fig. 6 .430" MAX. 1 3/16" MOL T-3¼ Bulb Min Screw Base
Fig. 7 .430" MAX. 1 3/16" MOL T-3¼ Bulb Min. Bay Base
Fig. 8 .463" MAX. 15/16" MOL G-3½ Bulb Min Bay Base
Fig. 9 .588" MAX. 1 1/16" MOL G-4½ Bulb Min Bay Base
Fig. 10 .744" MAX. 1 7/16" MOL G-6 Bulb S.C Bay Base
Fig. 11 .744" MAX. 1 7/16" MOL G-6 Bulb D.C Bay Base
Fig. 12 .744" MAX. 1 3/8" MOL G-6 Bulb Cand Screw Base
Fig. 13 1.041" MAX. 2" MOL S-8 Bulb S.C Bay Base
Fig. 14 .375" MAX. 59/64" MOL TL-3 Bulb Min Screw Base
Fig. 15 .405" MAX. 1 1/16" MOL T-3¼ Bulb Wedge Base
Fig. 16 1.041" MAX. 2" MOL S-8 Bulb D.C Index Base
Fig. 17 .775" MAX. 1 3/4" MOL B-6 Bulb S.C Bay Base
Fig. 18 .775" MAX. 1 3/4" MOL B-6 Bulb D.C Bay Base
Fig. 19 .250" MAX. 5/8" MOL T-1¾ Bulb S.C Mid Flg Base
Fig. 20 .640" MAX. 1 3/8" MOL G-5 Bulb S.C Bay Base
Fig. 21 .640" MAX. 1 3/8" MOL G-5 Bulb D.C Bay Base
Fig. 22 1.420" MAX. 2 3/8" MOL S-11 Bulb S.C. Bay Base
Fig. 23 1.420" MAX. 2 3/8" MOL S-11 Bulb D.C Bay Base
Fig. 24 .250" MAX. 5/8" MOL T-1¾ Bulb Mid Grooved Base
Fig. 25 .250" MAX. 19/32" MOL T-1¾ Bulb Mid Screw Base
Fig. 26 .250" MAX. .520 MOL T-1¾ Bulb Wire Term Base
Fig. 27 .494" MAX. 13/16" FE-3¾ Bulb Min Screw Base
Fig. 28 .335" MAX. 7/8" MOL TL-2¾ Bulb Special Base
Fig. 29 .124" MAX. 1" 1/4 MOL T-1 Bulb Wire Term Base
Fig. 30 .124" MAX. 3/8" MOL T-1 Bulb S.C Mid. Flg Base
Fig. 31 .588" MAX 1 3/8" MOL T-4½ Bulb Min Screw Base
Fig. 32 1.420" MAX. 2 1/4" MOL RP-11 Bulb S.C Bay Base
Fig. 33 1.420" MAX. 2 1/4" MOL RP-11 Bulb D.C Bay Base
Fig. 34 .640" MAX 1 3/16" MOL G-5 Bulb Min Bay Base
Fig. 35 .250" MAX. .625 MOL T-1¾ Bulb Bi-Pin Base
Fig. 36 .588" MAX. 1 3/8" MOL T-4½ Bulb Min Bay Base
Fig. 37 .463" MAX 15/16" MOL G-3½ Bulb Min 2 Pin Base
Fig. 38 .588" MAX 1.062 MOL G-4½ Bulb Min 2 Pin Base
Fig. 39 T-1¼ Bulb .188 DIA. .168 MOD. 550 MOL .168 DIA Special Base
Fig. 40 .168 MOD .250 DIA. .546 MOL .400 ±.020 .166 .125 .375 DIA. TL-1¼ Bulb Special Base
Fig. 41 T-4¾ Bulb .600 MAX. .402 MAX. .366 .356 .965 MAX .765 MAX .012 R .62 ±.06 .28 .10 SOLDER ±.010 T .050 Min Lap Base
Fig. 42 T-2 Bulb Wire Term Base .240 - .275 DIA. .670" ±.030" 3/4" ±1/8" .875 MAX.
Fig. 43 T-2 Bulb .240 - .275 .250 ±.040 .375 ±.040 .315 MAX .285 T 5.5 Base
Fig. 44 T-2 Bulb T 5.3 Base .240" .275" 13/32" MIN 11/16" MAX 1/32" R 0.225 ± 0.020 1/2" 0.268 .270" MAX 80
Fig. 45 T-2 Bulb Wire Term Base .240 .275 .975" MAX .827 3/4" ±1/8"
Fig. 46 T-2 Bulb T 5.5 Base 0.285 0.015 1/16 MAX 3/16 MIN 1.115 MAX 1/8 0.248 MAX
Fig. 47 T-2 Bulb Min Bay Base .295" .325" 15 MM ± 1.187" MAX .354" .364"
Fig. 48 T-2 Bulb T 5.1 Base 1/16 MIN .060 1/8 R MAX 1/16 1/8 0.290 MAX 0.286 ± 0.015 INSULATOR METAL CONTACT 1/16 MAX 41° 90 DEG
Fig. 49 TL-1¼ Bulb Mid. Gr Base .230 MOD .625 MOL 229 219

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

ELECTRONIC COMPONENTS BY SMITH

Norelco® MINIATURE LAMPS Standard Package of 10

Lamp No.	HHS No.	Fig. No.	Net Prices Per Lamp 10	100	500
PR2	43000	1	.24E	.21E	.18E
PR3	43020	1	.25E	.22E	.19E
PR4	43035	1	.25E	.22E	.19E
PR5	43050	1	.48E	.42E	.36E
PR6	43060	1	.25E	.22E	.19E
PR7	43075	1	.29E	.26E	.22E
PR12	43085	1	.25E	.22E	.19E
PR13	43100	1	.25E	.22E	.19E
PR15	43115	1	.33E	.29E	.25E
PR18	43135	1	.32E	.28E	.24E
PR20	43150	1	.38E	.33E	.29E
10	43185	37	.44E	.38E	.33E
12	43195	37	.36E	.31E	.27E
13	43205	3	.20E	.17E	.15E
14	43215	3	.20E	.17E	.15E
15	43230	38	.75E	.65E	.56E
19	43240	37	.50E	.43E	.37E
27	43250	4	.34E	.30E	.26E
31	43265	4	.54E	.45E	.37E
35	43275	5	1.02E	.89E	.76E
40	43285	6	.21E	.18E	.16E
41	43295	6	.47E	.41E	.35E
42	43305	6	.78E	.65E	.53E
43	43320	7	.42E	.37E	.31E
44	43330	7	.20E	.18E	.15E
45	43340	7	.54E	.48E	.41E
46	43345	6	.24E	.21E	.18E
47	43355	7	.19E	.17E	.14E
48	43365	6	.41E	.35E	.30E
49	43370	7	.37E	.32E	.28E
50	43375	3	.24E	.21E	.18E
51	43005	8	.17E	.15E	.13E
52	43380	3	.65E	.57E	.48E
53	40020	8	.19E	.17E	.14E
53X	40025	8	.25E	.22E	.19E
55	40035	9	.26E	.23E	.19E
57	40050	9	.23E	.20E	.17E
57X	40055	9	.25E	.22E	.19E
63	40060	10	.26E	.23E	.19E
64	40065	11	.37E	.32E	.27E
67	40075	10	.26E	.22E	.19E
68	40095	11	.35E	.31E	.26E
81	40105	10	.32E	.28E	.24E
82	40120	11	.32E	.28E	.24E
87	40140	13	.92E	.80E	.69E
89	40155	10	.26E	.23E	.19E
93	40180	13	.37E	.32E	.28E
94	40195	2	.61E	.53E	.46E
97	40210	10	.30E	.26E	.22E
97A	40213	10	.51E	.44E	.38E
112	43465	14	.53E	.46E	.40E
123	43485	3	.25E	.22E	.19E
130	43500	8	.27E	.23E	.20E
131	43515	3	.26E	.23E	.19E
137	43535	8	.36E	.32E	.27E
158	40215	15	.24E	.21E	.18E
159	43545	15	.31E	.27E	.23E
161	40225	15	.24E	.21E	.18E
194	40235	15	.24E	.21E	.18E
198	40245	16	.58E	.51E	.44E
199	40250	13	.56E	.49E	.42E
209	40255	17	.73E	.64E	.55E
210	40265	18	.48E	.42E	.36E
211	40275	41	.41E	.36E	.30E
212	40295	41	.45E	.37E	.30E
219	43555	8	.70E	.61E	.52E
222	43565	14	.34E	.30E	.26E
233	43575	27	.48E	.42E	.36E
224	43585	28	.68E	.60E	.51E
233	43600	3	.52E	.45E	.39E
239	43610	7	.81E	.71E	.61E
240	43620	7	.87E	.75E	.65E
243	43640	14	.66E	.58E	.50E
245	43655	3	.34E	.30E	.26E
257	43680	9	.48E	.42E	.36E
259	43690	15	.26E	.23E	.20E
268	46040	19	1.93E	1.69E	1.45E
293	40305	9	.24E	.21E	.18E
301	43715	20	.87E	.76E	.65E
303	43735	10	.77E	.68E	.58E
304	43745	11	.90E	.78E	.67E
305	43750	13	1.01E	.88E	.76E
306	43755	2	2.58E	2.26E	1.93E
307	43765	13	.80E	.70E	.60E
3071F	43775	13	1.27E	1.11E	.95E
308	43785	2	1.10E	.96E	.83E
3081F	43795	2	1.14E	.99E	.85E
309	43805	22	1.26E	1.11E	.95E
3091F	43815	22	2.03E	1.77E	1.52E
311	43835	22	1.56E	1.36E	1.17E
312	43845	23	3.16E	2.76E	2.37E
313	43855	7	.44E	.39E	.33E
313R	43865	7	.94E	.82E	.70E
315	43875	13	1.78E	1.55E	1.33E
327	46075	19	.45E	.39E	.34E
327AS-15	46085	19	1.82E	1.59E	1.36E
327R	46090	19	.88E	.77E	.66E
328	46100	19	.40E	.35E	.30E

Lamp No.	HHS No.	Fig. No.	Net Prices Per Lamp 10	100	500
328AS-10	46115	19	1.73E	1.51E	1.29E
328R	46120	19	.88E	.77E	.66E
330	46130	19	.66E	.57E	.49E
330R	46140	19	1.62E	1.41E	1.21E
331	46150	19	.92E	.81E	.69E
334	46165	24	.74E	.64E	.55E
335	46180	25	.79E	.69E	.59E
336	46195	24	.78E	.68E	.58E
337	46210	24	.82E	.72E	.61E
338	46225	19	.76E	.66E	.57E
342	46235	25	1.21E	1.06E	.90E
344	46250	19	.97E	.84E	.72E
345	46260	19	.87E	.76E	.65E
346	46275	24	.92E	.81E	.69E
349	46290	19	.73E	.63E	.54E
356	43885	8	.82E	.72E	.61E
367X	46300	19	1.76E	1.54E	1.32E
368	46320	19	.71E	.62E	.53E
370	46330	19	1.04E	.91E	.78E
373	46345	25	.87E	.76E	.65E
375	46360	19	1.14E	.99E	.85E
377	46370	19	.95E	.83E	.71E
378	46385	25	1.46E	1.27E	1.09E
379	46395	24	.96E	.84E	.72E
380	46405	19	.70E	.61E	.52E
381	46420	19	.84E	.74E	.63E
382	46430	19	.73E	.64E	.55E
385	46445	19	1.22E	1.06E	.91E
386	46455	24	.96E	.84E	.72E
387	46465	19	.43E	.37E	.32E
388	46475	24	.84E	.74E	.63E
394	46490	19	1.15E	1.01E	.86E
397	46500	24	1.04E	.91E	.78E
398	46510	24	.88E	.77E	.66E
401	43925	4	.83E	.73E	.62E
405	43940	4	.80E	.67E	.54E
406	43945	4	.62E	.54E	.47E
407	43950	4	.42E	.36E	.31E
425	43975	4	.34E	.30E	.25E
427	43990	9	.97E	.81E	.68E
432	44010	4	.65E	.57E	.49E
455	44020	4	.52E	.54E	.46E
458	44030	3	.92E	.77E	.56E
502	44035	4	.21E	.18E	.16E
503	44045	9	.37E	.32E	.27E
509K	44055	12	.58E	.50E	.43E
605	44065	4	.59E	.52E	.44E
631	40310	10	.55E	.48E	.41E
680	46540	29	.90E	.78E	.67E
680AS-15	46560	29	1.31E	1.15E	.98E
682	46565	30	1.55E	1.35E	1.16E
682AS-15	46575	30	2.13E	1.86E	1.59E
683	46580	29	.98E	.86E	.73E
683AS-15	46590	29	1.16E	1.01E	.87E
683R	46595	29	2.68E	1.47E	1.26E
685	46600	30	1.86E	1.63E	1.40E
685AS-15	46615	30	1.93E	1.69E	1.45E
713	46620	29	.94E	.82E	.70E
713AS-15	46625	29	1.21E	1.06E	.91E
714	46630	30	1.86E	1.63E	1.40E
714AS-15	46640	30	1.93E	1.69E	1.45E
715	46645	29	1.08E	.95E	.81E
715AS-15	46655	29	1.27E	1.11E	.95E
718	46670	30	1.47E	1.28E	1.10E
718AS-15	46675	30	1.69E	1.48E	1.26E
755	44075	7	.40E	.35E	.30E
756	44090	7	.66E	.57E	.49E
757	44105	7	.59E	.51E	.44E
965	44130	31	1.38E	1.20E	1.03E
1003	40320	17	.37E	.32E	.27E
1004	40325	18	.37E	.32E	.27E
1016	40335	16	1.12E	.98E	.84E
1034	40345	16	.41E	.36E	.31E
1034A	40365	16	.85E	.74E	.63E
1034NA	40375	16	1.13E	.94E	.79E
1073	40385	13	.48E	.42E	.36E
1129	40395	13	.64E	.56E	.48E
1130	40400	2	.95E	.83E	.71E
1133	40410	32	.92E	.80E	.69E
1134	40420	33	1.25E	1.09E	.94E
1141	40430	13	.60E	.53E	.45E
1142	40440	2	.63E	.55E	.47E
1143	40445	32	1.21E	1.06E	.91E
1144	40455	33	1.12E	1.13E	.97E
1154	40470	16	.79E	.69E	.59E
1155	40480	10	.46E	.40E	.34E
1156	40490	13	.66E	.58E	.50E
1157	40505	16	.36E	.31E	.27E
1157A	40530	16	.71E	.62E	.53E
1157NA	40540	16	.93E	.81E	.70E
1158	40545	2	1.06E	.93E	.79E
1176	40570	2	.92E	.80E	.69E
1183	40575	32	1.66E	1.45E	1.25E
1184	40585	33	1.63E	1.42E	1.22E
1195	40600	32	1.80E	1.58E	1.35E
1196	40610	33	2.01E	1.75E	1.50E
1203	40620	13	1.62E	1.41E	1.21E

Lamp No.	HHS No.	Fig. No.	Net Prices Per Lamp 10	100	500
1204	40630	2	3.21E	2.80E	2.40E
1224	44170	11	1.12E	.98E	.84E
1251	40640	10	.71E	.62E	.43E
1302	44180	7	.57E	.48E	.38E
1309	44190	17	3.68E	3.10E	2.50E
1408	44225	7	.38E	.33E	.28E
1445	40660	8	.24E	.21E	.18E
1446	44255	3	.63E	.55E	.47E
1447	44265	3	.27E	.24E	.20E
1449	44285	3	.20E	.18E	.15E
1450	44295	8	1.32E	1.15E	.99E
1458	44305	34	1.05E	.91E	.78E
1483	44335	4	.56E	.49E	.42E
1487	44345	6	.32E	.28E	.24E
1488	44355	7	.68E	.60E	.51E
1489	44370	7	5.45E	4.77E	4.08E
1490	44380	7	.64E	.56E	.48E
1493	44410	2	1.63E	1.43E	1.22E
1495	44425	36	.85E	.74E	.64E
1630	44455	**	2.14E	1.87E	1.60E
1651	44465	13	2.15E	1.88E	1.61E
1665	44475	13	1.91E	1.67E	1.43E
1665IF	44485	13	1.49E	1.30E	1.12E
1680	44495	13	1.25E	1.05E	.85E
1683	44525	13	1.89E	1.65E	1.41E
1691	40665	13	2.03E	1.78E	1.52E
1692	44540	2	3.04E	2.66E	2.28E
1705D	47000	26	.69E	.60E	.51E
1728	47015	26	.45E	.39E	.34E
1730D	47030	26	.45E	.39E	.34E
1738D	47040	26	.51E	.44E	.38E
1739D	47050	26	.63E	.55E	.47E
1762D	47060	26	.47E	.41E	.35E
1764D	47070	26	.52E	.46E	.39E
1767	47080	25	.69E	.60E	.51E
1768	47090	25	.87E	.76E	.65E
1769	47100	25	1.19E	.97E	.83E
1775	47110	25	1.14E	.99E	.85E
1783D	47120	26	.56E	.49E	.42E
1784D	47130	26	.72E	.63E	.54E
1810	44575	7	1.31E	1.14E	.98E
1813	44580	7	.34E	.30E	.25E
1815	44585	7	.40E	.35E	.30E
1816	44590	7	.28E	.25E	.21E
1818	44600	7	1.19E	1.04E	.89E
1819	44610	7	.48E	.42E	.36E
1820	44620	7	.47E	.41E	.35E
1821	44635	6	.147E	1.28E	1.10E
1822	44645	7	.80E	.70E	.60E
1823	44655	6	1.95E	1.70E	1.46E
1826	44665	7	.98E	.85E	.73E
1828	44675	7	.86E	.75E	.64E
1829	44685	7	.48E	.42E	.36E
1832	44705	6	2.23E	1.87E	1.57E
1835	44715	7	.97E	.85E	.72E
1847	44735	7	.23E	.20E	.17E
1850	44745	7	.48E	.42E	.36E
1855	44755	36	.73E	.64E	.55E
1864	44770	7	.59E	.52E	.44E
1866	44780	7	.28E	.25E	.21E
1867	44790	7	1.25E	1.05E	.85E
1869D	47140	26	1.13E	.99E	.85E
1888	40685	7	.70E	.61E	.52E
1889	40695	7	.25E	.22E	.19E
1891	44800	7	.22E	.20E	.17E
1892	44805	7	.32E	.28E	.24E
1893	44810	7	.23E	.20E	.17E
1895	40705	9	.23E	.20E	.17E
1906	44815	7	1.95E	1.64E	1.32E
2102D	47155	26	.90E	.78E	.67E
2107D	47165	26	.62E	.54E	.46E
2112D	47175	26	.76E	.67E	.57E
2114D	47185	49	.88E	.77E	.66E
2158D	47195	26	1.43E	1.25E	1.07E
2162D	47210	26	.70E	.61E	.52E
2169D	47220	26	1.37E	1.20E	1.02E
2174D	47240	26	.69E	.60E	.52E
2180D	47265	26	.58E	.51E	.44E
2181D	47280	26	.58E	.51E	.44E
2182D	47290	26	.67E	.59E	.50E
2187D	47310	26	.51E	.44E	.38E
7327	47470	35	.97E	.82E	.66E
7335	47480	19	.98E	.86E	.74E
7344	47490	35	1.14E	.95E	.77E
7349	47500	35	1.22E	1.03E	.83E
7367	47510	35	1.25E	1.05E	.85E
7370	47520	35	1.56E	1.31E	1.06E
7375	47530	35	2.65E	2.22E	1.80E
7377	47540	35	1.10E	.92E	.75E
7380	47550	35	1.87E	1.57E	1.27E
7381	47560	35	1.32E	1.11E	.90E
7382	47570	35	1.32E	1.11E	.90E
7387	47580	35	1.29E	1.09E	.88E

TELEPHONE LAMPS

Lamp No.	HHS No.	Fig. No.	Net Prices Per Lamp 10	100	500
4ES	48000	42	.71E	.62E	.53E
4ESB	48010	43	.93E	.81E	.70E
5ES	48020	42	.71E	.62E	.53E
5ESB	48030	43	.93E	.81E	.70E
6A	48335	44	.93E	.81E	.70E
6C	48345	44	.93E	.81E	.70E
6ES	48040	42	.71E	.62E	.53E
6ESB	48050	43	.93E	.81E	.70E
6PS	48060	45	.77E	.67E	.58E
6PSB	48070	46	1.00E	.87E	.75E
10A	48355	44	1.10E	.96E	.82E
10ES	48080	42	.71E	.62E	.53E
10ESB	48090	43	.91E	.79E	.68E
12A	48365	44	.93E	.81E	.70E
12B	48375	44	.88E	.74E	.60E
12C	48380	44	.93E	.81E	.70E
12ES	48100	42	1.13E	.99E	.85E
12ESB	48110	43	.91E	.79E	.68E
12PS	48120	45	.77E	.67E	.58E
12PSB	48130	46	1.00E	.87E	.75E
16ES	48140	42	.71E	.62E	.53E
16ESB	48150	43	.91E	.79E	.68E
18A	48395	44	1.10E	.96E	.82E
18B	48390	44	1.10E	.96E	.82E
24A	48400	44	.93E	.81E	.70E
24B	48405	44	.93E	.81E	.70E
24C	48410	44	.89E	.78E	.67E
24D	48415	44	.93E	.81E	.70E
24E	48420	44	.93E	.81E	.70E
24ES	48160	42	.93E	.81E	.70E
24ESB	48170	43	.93E	.81E	.70E
24PS	48180	45	.77E	.67E	.58E
24PSB	48190	46	1.00E	.87E	.75E
24X	48435	48	1.13E	.99E	.85E
28ES	48200	42	1.13E	.99E	.85E
28ESB	48210	43	.91E	.79E	.68E
28PS	48220	45	.77E	.67E	.58E
28PSB	48230	46	1.00E	.87E	.75E
30A	48440	44	1.10E	.96E	.82E
35A	48445	44	1.13E	.99E	.85E
48A	48450	44	.89E	.78E	.67E
48B	48460	44	1.13E	.99E	.85E
48C	48470	44	1.13E	.99E	.85E
48D	48480	44	1.13E	.99E	.85E
48ES	48240	42	1.00E	.87E	.75E
48ESB	48250	43	1.21E	1.06E	.91E
48PS	48260	45	.77E	.67E	.58E
48PSB	48270	46	1.00E	.87E	.75E
55B	48495	44	1.13E	.99E	.85E
55C	48500	44	1.13E	.99E	.85E
60A	48510	44	1.13E	.99E	.85E
60PS	48280	45	.84E	.73E	.63E
60	48290	46	1.00E	.87E	.75E
120MB	48300	47	1.09E	.95E	.82E
120PS	48310	45	.81E	.71E	.61E
120PSB	48325	46	1.09E	.95E	.82E

GLOW LAMPS

Lamp No.	HHS No.	Net Prices Per Lamp 10	100	500
NE-2	49000	.17E	.15E	.13E
NE-2A	49070	.17E	.15E	.13E
NE-2D	49200	1.45E	1.27E	1.09E
NE-2E	49090	.15E	.13E	.11E
NE-2H	49190	.15E	.13E	.11E
NE-2J	49210	1.35E	1.18E	1.01E
NE-2U	49086	.20E	.17E	.15E
NE-2V	49080	.17E	.15E	.13E
NE-3	49410	1.38E	1.20E	1.03E
NE-4	49415	.95E	.83E	.71E
NE-5	49420	1.38E	1.20E	1.03E
NE-7	49136	1.42E	1.24E	1.06E
NE-16	49400	2.21E	1.93E	1.65E
NE-17	49140	2.53E	2.21E	1.89E
NE-21	49150	1.97E	1.72E	1.48E
NE-23	49345	.45E	.39E	.33E
NE-30	49250	3.31E	2.90E	2.48E
NE-32	49295	2.23E	1.95E	1.67E
NE-45	49160	2.53E	2.21E	1.89E
NE-47	49170	2.53E	2.21E	1.89E
NE-48	49180	2.21E	1.93E	1.65E
NE-51	49115	.49E	.42E	.36E
NE-51H	49130	.49E	.42E	.36E
NE-56	49260	2.67E	2.34E	2.00E
NE-57	49220	2.41E	2.11E	1.81E
NE-58	49230	2.41E	2.11E	1.81E
NE-67	49395	1.00E	.88E	.75E
NE-68	49355	.59E	.52E	.44E
NE-76	49365	.95E	.83E	.71E
NE-81	49360	.80E	.70E	.60E
NE-83	49375	.61E	.53E	.46E
NE-84	49270	1.15E	1.01E	.86E
NE-86	49385	.46E	.40E	.34E
NE-96	49331	.76E	.67E	.57E
NE-97	49333	.57E	.50E	.43E
—	49020	.18E	.15E	.13E
—	49035	.20E	.17E	.15E
—	49088	.18E	.15E	.13E
AR-3	49240	1.82E	1.59E	1.37E

*Bulb: T5 Base: S.C. Bayonet M.O.L.: 1¾" ** Bulb: S8 Base: D.C. Pref. (A) M.O.L.: 2"

PROJECTION LAMPS

Lamp No.	HHS No.	Net Prices Per Lamp
BAK	50135	3.10E
BCK	52140	15.35E
BEH	50140	4.20E
BFK/BFL	50155	12.00E
BGB/BGK	50170	2.95E
BRH	52150	18.85E
BRK	50195	3.20E
BRL	52160	6.75E
BRS	50200	2.75E
BSK	50210	2.95E
BSB/BSS	50215	3.45E
BSW	50225	3.20E
BTD	50230	2.75E
BVK/BVS	50240	3.65E
BXA	50250	2.65E
BXN	50280	2.95E
BZA	50290	4.15E
CAL	50300	6.60E
CAR	50310	5.05E
CBA	52170	16.05E
CBC/CBJ	50335	4.50E
CBS/CBX	50340	4.50E
CDJ/CEL	50345	4.50E
CDS/CDX	50350	4.85E
CEW/CFC	50375	4.35E
CGT	50346	5.50E
CLD	50415	7.80E
CLG/CLS	50425	4.75E
CLX/CMB	50435	4.75E
CTT/DAX	50460	11.45E
CWA	50470	10.15E
CWD	50475	5.60E
CXK	50480	7.40E
CXL	50485	8.80E
CXY	50495	8.45E
CYC	50505	4.90E
CZA/CZB	50525	7.40E
CZS	50535	8.60E
CZX/DAB	50540	7.85E
DAK	50565	6.70E
DCA	50590	7.45E
DCX	50595	10.15E
DDB-115V	50605	8.20E
DDB-125V	50610	8.20E
DDY	50615	14.50E
DEJ	50630	9.25E
DEK	50640	7.45E
DEP	50645	7.00E
DFA/DFG	50660	7.45E
DFD	50665	8.80E
DFT	50685	8.80E
DFW	50690	7.75E
DFY	50695	9.85E
DGH	50710	14.65E
DGS	50725	10.95E
DHT	50740	13.35E
DLG	50755	8.90E
DLI	50760	11.70E
DLY	50765	14.40E
DMS	50775	9.35E
DMX-115V	50780	8.70E
DMX-130V	50785	8.95E
DPB	50800	8.95E
DPJ	50805	9.45E
DPT	50815	12.35E
DPW	50825	13.20E
DRB	50840	9.35E
DRC	50845	10.90E
DRG	50855	11.25E
DRS-115V	50865	9.45E
DRS-125V	50870	9.75E
DRW	50875	14.65E
DSA	50885	10.15E
DSB	50895	15.35E
DTJ	50900	20.70E
DVY	52180	11.65E
DWY	52490	13.10E
DWZ	52210	12.55E
DXN	52230	16.70E
DXW	52250	16.70E
DXX	52270	13.30E
DYA	52280	18.55E
DYH	52290	12.10E
DYP	52310	13.95E
DYS, DYV	52330	10.60E
DZZ	52372	11.05E
EBP	50925	8.20E
EDR	50945	8.20E
EEB	50950	6.70E
EFM	52380	11.20E
EFN	52390	13.00E
EFP	52400	13.00E
EFR	52410	13.05E
EGH	52420	12.55E
EGY	52683	15.00E
EHA	52430	17.25E
EHJ	52450	9.85E
EJL	52460	11.00E
EJM	52470	10.50E
EJN	52480	10.75E
ESA	52040	6.00E
ESB	52050	6.00E
ETA	52030	13.45E
EVA	52060	9.65E
EVB	52020	4.60E
EVC	52032	11.65E
EVD	52070	18.35E
FAD/DWY	52490	12.05E
FAL	52500	10.65E
FBY	52515	17.35E
FCB	52520	11.35E
FCM	52530	10.95E
FCR	52540	8.30E
FCS	52550	8.15E
FDF	52110	13.30E
FDS/DZE	52590	9.95E
FDT	52620	10.30E
FDV	52647	10.30E
FDX	52640	8.70E
FEL	52660	18.40E
FHD/ESA	52004	8.00E

SEE NEXT PAGE FOR NORELCO SPECIAL SERVICE LAMPS

H. H. SMITH ELECTRONIC COMPONENTS

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

Norelco SPECIAL SERVICE LAMPS

Sound Film Exciter · Home Cinema · Microscope Lighting

Lamp No.	HHS No.	Net Prices	Lamp No.	HHS No.	Net Prices	Lamp No.	HHS No.	Net Prices	Lamp No.	HHS No.	Net Prices
13347C	50110	8.25E	13072M	50125	7.50E	7027/BRL	52160	6.75E	7023/FCR	52540	8.30E
13347W	50115	6.90E	7387/ESA	52040	6.00E	6423/EFR	52410	13.05E	6814	41155	.70E
13347Z	50117	7.65E	7388/ESB	52050	6.00E	7748/EHJ	52450	9.85E	5972	52005	9.00E
13702C	50120	7.35E									

PILOT LIGHT SOCKETS

Sockets are available for Mini Screw, Mini Bayonet, Candelabra Screw. Candelalbra Bayonet (Single and Double Contact). Sub-Mini Groove, Wedge and Printed Circuit in Mini Bayonet and Sub-Mini groove. Brackets are made of .025-032 corrosion resistant plated steel, shells of nickel plated brass and tinned brass solder lugs.

For Printed Circuit Mounting
Two .070 Holes*
For Printed Circuit Mounting
Two .070 Holes*
*SPACING: .375" Miniature Bayonet; 19/64" Subminiature Groove.

FIG. 1 FIG. 2 FIG. 3 FIG. 4 FIG. 5 FIG. 6 FIG. 7 FIG. 8 FIG. 9 FIG. 10 FIG. 11 FIG. 12 FIG. 13

MINIATURE SCREW

No.	Fig. No.	Std. Pkg.	NET Per C
1922	1	100	$36.00
1923	2	100	36.00
1928	3	100	36.00
1929	4	100	36.00
1934	5	100	33.00

MINIATURE BAYONET

No.	Fig. No.	Std. Pkg.	NET Per C
1924	1	100	$33.00
1925	2	100	33.00
1930	3	100	33.00
1931	4	100	33.00
1935	5	100	33.00
1938	8	100	45.00
1900	6	25	65.00
1901	7	25	110.00

CANDELABRA SCREW

No.	Fig. No.	Std. Pkg.	NET Per C
1926	1	100	$ 43.00
1927	2	100	43.00
1932	3	100	43.00
1933	4	100	43.00
1936	5	100	33.00

CANDELABRA BAYONET — SINGLE CONTACT

No.	Fig. No.	Std. Pkg.	NET Per C
1902	9	25	$60.00
1903	10	25	60.00

CANDELABRA BAYONET — DOUBLE CONTACT

No.	Fig. No.	Std. Pkg.	NET Per C
1904	9	25	$75.00
1905	10	25	75.00

SUB-MINIATURE GROOVE

No.	Fig. No.	Std. Pkg.	NET Per C
1906	6	25	$120.00
1907	7	25	120.00
1908	11	25	75.00

WEDGE

No.	Fig. No.	Std. Pkg.	NET Per C
1909	13	25	$50.00
1910	12	25	50.00

"UNIVERSAL" FOREIGN ADAPTER PLUGS

1991 1992 1993 1994 852 856

Permits operation of American, British or Continental electric shavers, radios, record players and other small appliances from any electrical outlet anywhere in the world, supplying the required voltage. All plugs are rated at 15 amps/117 V; 7½ Amps/220 V. Std. Pkg. 25

No.	Male Plug	NET Per C
1991	Continental	$ 80.00
1992	American	100.00

Streamlined bakelite plug adapters. Adapts from American to Foreign type.

RATING: 125 VAC — 15 AMP
220 VAC — 7.5 AMP

Std. Pkg. 25

No.	Female End	Male End	NET per C
852	American	Continental	$ 60.00

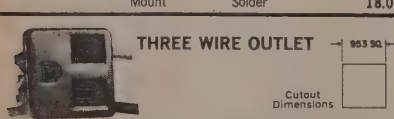
CONVENIENCE OUTLETS

BRACKET TYPE
Top or Bottom Mount

Flat steel bracket mounts with two #6 screws or equivalent size eyelets. Black only.
RATING: 15 Amps, 125 Volts AC or DC.
LEADS: No. 1279 has two leads, plastic wire #16 gauge, 8" long. UL approved. Std. Pkg. 50

No.	Type	Terminals	NET Per C
1299	Top or Bottom Mount	Solder	18.00

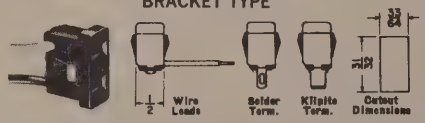
THREE WIRE OUTLET



(With grounding lead) Carbon steel spring clips lock unit securely in place when pushed into opening. UL approved
RATING: 15 Amps, 125 Volts, AC or DC.
LEADS: Two #14 gauge 6" long plastic wire and one #16 gauge green ground lead 6" long. Std. Pkg. 50

No.	Color	NET Per C
1280-103	Black	$55.00
1280-101	White	55.00

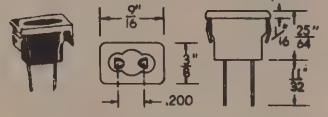
PUSH-IN SNAP-LOCK BRACKET TYPE



Carbon Steel spring clips lock unit securely in place when pushed into opening. UL approved.
RATING: 15 Amps, 125 Volts AC or DC.
LEADS: Plastic wire #14 gauge, 6" long. Std. Pkg. 50

No.	Terminals	Color	Per C
1283-103	Wire Leads	Black	$40.00
1284-103	Solder	Black	40.00
1285-103	Kilpite	Black	40.00

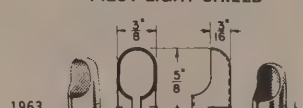
SNAP-IN BULB CONNECTOR



Designed for use with the new Twin Pin Baseless Miniature Lamps (G.E #10-25 volts, #12-6.3 volts, or #15-7.0 volts). Easily assembled to any unit for indicating purposes. Withstands excessive temperatures. Snaps into a .500 x.296 rectangular hole in panels .032 to .062 thick. Bezel — brass, cad. plated: contacts — brass, silver plated. Std. Pkg. 25

No. 1504 NET Per C $25.00

PILOT LIGHT SHIELD



Prevents glare when used in radio receiver meters, etc. Ribbed bottom holds shield securely in place on bulb. Std. Pkg. 100

No.	Type	Per C
1963	Brass Cad Plate	$5.50
1968	Plain Brass	5.00
1969	Flared Brass Cad. Plate	6.00

"SPECIALS" ARE STANDARD WITH SMITH

9499

MADE IN U.S.A.
PATENT PENDING

MAGNA-LITE

Lets You Focus on the Finest Detail Regardless of Lighting Conditions.

- Powerful 2X OPTICAL-QUALITY Magnifying Lens with Light
- 7 1/2 oz. lightweight — complete with 4 easily replaced Penlite batteries

IDEAL FOR:
- Electronics — Design & Production
- Lab Technicians & Engineers
- Industrial Inspection & Q.C.

Std. Pkg. 1 in individual display pack.
REPLACEMENT BULBS LARGE MAGNA LITE PR 12

No.	Description	Net. Ea.
9499	9 1/8" x 3 3/4"	$12.00

9498

DISPLAY CARTON

MAGNA-LITE JR.

- Powerful OPTICAL-QUALITY Magnifying Lens with Light.
- 1 1/2 oz., lightweight — complete with 2 easily replaced AA Penlite batteries.
- Packaged in handy counter display.

IDEAL FOR:
- Printed Microcircuit reading.
- Electronics — Design, Production & Inspection.
- Industrial — Engineers, Technicians, Draftsmen.
- Laboratory & Research.

Std. Pkg. 12 in a display carton.

REPLACEMENT BULBS SMALL MAGNA LITE JR. 222

No.	Description	Net Ea.
9498	4 3/4" x 1 1/2"	$4.00

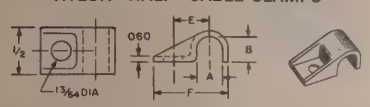
SEE OUR NEW TEST LEAD RACKS

SMITH PAGE 18

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

ELECTRONIC COMPONENTS — H. H. SMITH

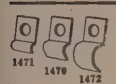
NYLON "HALF" CABLE CLAMPS



Made of solvent resistant Nylon, unaffected by most solvents, alkalies, dilute mineral acids and most organic acids. Available in Black and conforms to the following Military Specifications:
MIL-P17091A and Amendment 2, MIL-P-17091B/MIL-M-20693A. Type 1, MIL-STD-242A (Ships)/MIL-STD-242B (Ships), MS-39014 (ORD).
Std. Pkg. 100

No.	Wire Size	A	B	E	F	NET Per C
8964	1/8	.115	.115	.307	.675	5.50
8965	3/16	.172	.172	.336	.732	5.90
8966	1/4	.234	.234	.366	.732	6.50
8967	5/16	.297	.297	.400	.859	6.70
8968	3/8	.359	.359	.430	.920	7.00
8969	7/16	.422	.422	.460	.980	7.25
8970	1/2	.484	.484	.492	1.044	8.00

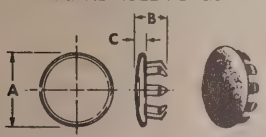
METAL CABLE CLAMPS



Steel Cadmium Plated with No. 8 Mtg. Hole
Std. Pkg. 100

No.	Length	Width	Cable	NET Per C
1471	5/8"	3/8"	1/8"	$1.10
1470	3/4"	3/8"	1/4"	1.00
1472	1"	3/8"	1/2"	1.20

METAL HOLE PLUGS



Metal plugs for covering punched or drilled holes. Firm grip spring action prongs in steel, nickel plated.
Std. Pkg. 100

No.	Hole Dia.	A	B	C	Prongs	NET per C
650	1/4"	13/32"	15/64"	1/16"	6	$ 4.00
651	5/16"	7/16"	1/4"	1/16"	6	4.00
652	3/8"	1/2"	15/64"	1/16"	6	4.00
653	1/2"	21/32"	9/32"	5/64"	8	5.00
654	5/8"	13/16"	19/64"	5/64"	8	6.00
655	3/4"	59/64"	19/64"	5/64"	12	6.00
608	7/8"	1 1/16"	19/64"	1/16"	12	7.00
612	1"	1 9/64"	21/64"	3/32"	12	8.00
656*	1"	1 5/32"	19/64"	5/64"	6	35.00
3084	1 1/8"	1 5/16"	11/32"	5/64"	12	11.00
3085	1 1/4"	1 7/16"	11/32"	3/32"	12	14.00
3086	1 3/8"	1 9/16"	13/32"	5/64"	12	14.00
3087	1 1/2"	1 41/64"	13/32"	3/32"	12	15.00

*Vent

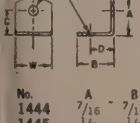
NYLON HOLE PLUGS

Nylon hole plug. Type 66, Mil Spec. 20693A. Maximum panel thickness .062", 1/4 and 5/16); all others .125". All flat heads, except 1 1/4" dia. domed, head thickness 1/16".
Std. Pkg. 100

No.	Hole Dia.	Head Dia.	Height	NET per C
3089	1/4"	5/16"	5/16"	$4.00
3090	5/16"	3/8"	5/16"	4.25
3091	3/8"	15/32"	13/32"	4.50
3092	1/2"	37/64"	13/32"	4.75
3093	5/8"	23/32"	13/32"	5.75
3094	3/4"	27/32"	13/32"	7.50
3095	1.000	1 1/8"	29/64"	10.00
3096	1 1/8"	1 7/32"	20/64"	10.75
3097	1 1/4"	1 3/8"	20/64"	13.00
3098	1 3/8"	1 15/32"	20/64"	15.00
3099	1 1/2"	1 39/64"	20/64"	16.50
3083*	1"	1 13/64"	20/64"	12.00

*Vent

ANGLES



A — Length of leg
B — Length of leg
T — Thickness
W — Width
C — Hole Location
D — Hole Location
H1 — Hole Diameter
H2 — Hole Diameter

STEEL, Cadmium Plated
Std. Pkg. 100

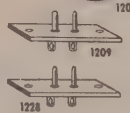
No.	A	B	C	D	W	T	H1	H2	Net Per C
1444	7/16	7/16	17/64	1/4	3/8	.032	3/16	#4	$1.00
1445	1/2	1/2	11/32	23/64	1/2	.050	#6	#4	1.50
1446	49/64	27/64	39/64	15/64	5/16	.032	#6	#6	1.60
1447	19/64	1/2	61/64	23/64	5/16	.050	#8	#8	2.20
1476	11/16	11/16	1/2	1/2	3/8	.032	#6	#6	2.50

Note: No. 1476 has Hot Tin Dipped finish

BRASS, Nickel Plated

1474	15/32	15/32	19/64	19/64	5/16	.025	#8	#8	$4.50
1475	21/32	21/32	3/8	3/8	3/8	.050	#8	#8	7.50

INTERLOCK PLUGS



RATING: 125 VAC — 15 AMP
Std. Pkg. 100

No.	Type	NET Per C
1208	Recessed-Metal Shell	$23.00
1209	Polarized	27.00
1228	Flush	11.00

"CLEAPS" (Connectors for Joining Severed Wires)

MATERIAL: Brass, cadmium plated.
WIRE SIZE: For wires, .010" to .050" (B&S Gauge 16 to 30)
DESCR.: Used to splice cut leads of condensers, resistors, etc., in process of trouble-shooting. Insert wire in each tapered end and solder thru center opening.
Std. Pkg. 1000

No. 1270 — NET Per M $30.00

TV SNAP-ON FUSE HOLDER

Snap fuse clip over burned out fuse. Insert new fuse without soldering.

No. 529 — Std. Pkg. 50 — Net per C $50.00

FUSE MOUNTING BASES

Black bakelite, panel mount type. Will accommodate the 3 A G Auto type cartridge fuse.
Std. Pkg. 50

No.	Type	NET per C
530	Single	$30.00
531	Double	45.00

FAHNESTOCK SPRING BATTERY CLIPS

Clips are made of brass, nickel plated and are available in the single and double clip types.
Std. Pkg. 100

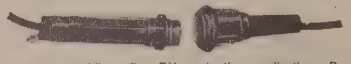
SINGLE CLIPS

No.	Width	Length	Mtg. Hole	NET Per C
539	7/32"	11/16"	#4	$2.80
533	5/16"	25/32"	#6	2.80
534	3/8"	1"	#6	5.00

DOUBLE CLIPS

535	5/16"	1 15/32"	#6	16.00
536	3/8"	2 1/8"	#8	20.00

MOLDED "IN-LINE" FUSE HOLDER



For use in automobile radios, T.V., and other applications. Provides positive insulated connection. For use with 3AG fuse, supplied with 18" wire loop, less fuse.
Std. Pkg. 50

No.	NET Per C
1295	$40.00

SHRINK TUBING ASSORTMENT

Laboratory or Work Shop assortment of Heat Shrink Polyolefin tubing, meets Mil Spec 123053/5. Contains 6 different colors of all sizes from 1/16" thru 1/8" in 12" lengths, total of 36 feet.
Std. Pkge 5

No.	Suggested Resale/Ea.
7705	$10.80

P.V.C. TUBING ASSORTMENT

A 36 piece assortment of tubing consisting of 12" lengths, sizes #24 thru #2; 3 lengths of each size, a total of 12 sizes in assorted colors. Made of Military Grade 105°PVC, conforms to Mil-I-631D.
Std. Pkg. 6

No.	Net Ea.
7706	$3.00

HEX AND SPLINE KEYS

Made of special alloy steel, tempered to avoid brittleness and impose maximum resistance to torsional strain. Ends ground for easy insertion.
Std. Pkg. 100

HEX KEYS

No.	Screw	O.D.	NET Per C
340	No. 2	.034	$8.60
341	No. 3, 4	.050	8.60
342	No. 5, 6	.062	8.60
343	No. 8	.078	8.60
344	No. 10	.093	9.90
345	1/4"	.125	9.90
346	5/16"	.156	9.90

SPLINE KEYS

No.	Screw	O.D.	NET Per C
370	No. 4	.058	$8.60
371	No. 5	.068	8.60
372	No. 6	.075	8.60
373	No. 8	.093	8.60
374	No. 10	.109	9.90
375	1/4"	.143	9.90
376	5/16"	.182	9.90

HEX AND SPLINE KEY KITS

Attractive tearproof vinyl plastic kit with individual pockets for each of six keys in kit.
Std. Pkg. 10

No.		NET per C
355	Kit of 6 hex keys for screws from No. 3 to 5/16".	$66.00
385	Kit of 6 spline keys for screws from No. 5 to 5/16".	$66.00
390	Combination Kit of 3 hex and 3 spline keys for No. 6-8-10 screws	$66.00
395	Kit of 7 hex keys for screws from No. 2 to 5/16" and 4 spline keys Nos. 4, 6, 8, and 10.	$130.00

TEFLON* SPAGHETTI TUBING COLOR CODE CHART

— 101 WHITE
— 102 RED
—103 BLACK
— 104 GREEN
— 105 BLUE
— 106 ORANGE
— 107 YELLOW
— 108 BROWN
— 112 PURPLE
— 113 GREY
— 115 NATURAL

SPECIFY COLOR
(If no color is specified, Natural Teflon (—115) will be supplied.)

Meets and exceeds MIL-I-22129B. Ideal for slip-on insulation, and provides greater reliability and resistance to high temperatures. Shrink-back is virtually eliminated. Individually packed in dust-proof bags.

STANDARD WALL

CAT. No.	AWG WIRE SIZE	NOM I.D.	NOM. WALL THK.	STD. PKG. FT.	NET EA.
7701-24	24	.022	.012	100	$8.66
7701-22	22	.027	.012	100	9.57
7701-20	20	.034	.016	100	12.91
7701-19	19	.038	.016	100	14.04
7701-18	18	.042	.016	100	15.12
7701-17	17	.047	.016	100	16.46
7701-16	16	.053	.016	100	17.46
7701-15	15	.059	.016	100	18.36
7701-14	14	.066	.016	100	19.65
7701-13	13	.076	.016	100	21.81
7701-12	12	.085	.016	100	23.32
7701-11	11	.095	.016	100	25.92
7701-10	10	.106	.016	100	30.91
7701-09	9	.118	.020	100	46.32
7701-81	1/8"	.125	.020	100	52.80
7701-08	8	.133	.020	50	27.55
7701-07	7	.148	.020	50	28.20
7701-06	6	.166	.020	50	30.38
7701-05	5	.186	.020	50	33.24
7701-04	4	.208	.020	50	38.40
7701-03	3	.234	.020	50	41.16
7701-41	1/4"	.250	.020	50	44.40
7701-02	2	.263	.020	50	45.19
7701-01	1	.294	.020	50	50.40
7701-51	5/16"	.312	.020	50	57.60
7701-00	0	.330	.020	50	55.80

LIGHTWEIGHT

CAT NO.	AWG WIRE SIZE	NOM I.D.	NOM. WALL THK.	STD. PKG. FT.	NET EA.
7703-28	28	.015	.006	100	$7.54
7703-26	26	.018	.006	100	6.00
7703-24	24	.022	.006	100	6.48
7703-22	22	.027	.006	100	7.44
7703-20	20	.034	.006	100	9.24
7703-19	19	.038	.006	100	9.72
7703-18	18	.042	.006	100	10.10
7703-17	17	.047	.006	100	11.52
7703-16	16	.053	.006	100	12.60
7703-15	15	.059	.006	100	12.96
7703-14	14	.066	.008	100	13.80
7703-13	13	.076	.008	100	15.60
7703-12	12	.085	.008	100	16.92
7703-11	11	.095	.008	100	18.36
7703-10	10	.106	.008	100	20.16
7703-09	9	.118	.008	50	14.83
7703-81	1/8"	.125	.008	50	15.60
7703-08	8	.133	.008	50	16.32
7703-07	7	.148	.008	50	20.64
7703-06	6	.166	.010	50	23.88
7703-05	5	.186	.010	50	26.04
7703-04	4	.208	.010	50	29.28
7703-03	3	.234	.010	50	31.68
7703-41	1/4	.250	.010	50	33.60
7703-02	" 2	.263	.010	50	35.76
7703-01	1	.294	.010	50	40.08
7703-51	5/16"	.312	.012	50	43.20
7703-00	0	.330	.012	50	45.48

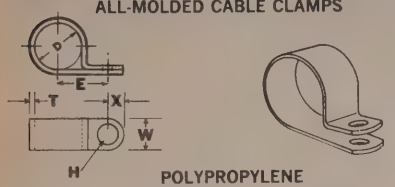
THINWALL

CAT. NO.	AWG WIRE SIZE	NOM. I.D.	NOM. WALL THK.	STD. PKG. FT.	NET EA.
7702-30	30	.012	.009	100	$7.80
7702-28	28	.015	.009	100	6.84
7702-26	26	.018	.009	100	6.24
7702-24	24	.022	.010	100	6.84
7702-22	22	.027	.010	100	7.56
7702-20	20	.034	.012	100	9.36
7702-19	19	.038	.012	100	10.08
7702-18	18	.042	.012	100	10.92
7702-17	17	.047	.012	100	11.88
7702-16	16	.053	.012	100	12.96
7702-15	15	.059	.012	100	13.20
7702-14	14	.066	.012	100	14.16
7702-13	13	.076	.012	100	15.96
7702-12	12	.085	.012	100	17.04
7702-11	11	.095	.012	100	18.96
7702-10	10	.106	.012	100	20.40
7702-09	9	.118	.015	100	28.68
7702-81	1/8"	.125	.015	100	29.28
7702-08	8	.133	.015	50	16.66
7702-07	7	.148	.015	50	20.40
7702-06	6	.166	.015	50	26.04
7702-05	5	.186	.015	50	29.16
7702-04	4	.208	.015	50	31.68
7702-03	3	.234	.015	50	34.20
7702-41	1/4"	.250	.015	50	36.00
7702-02	2	.263	.015	50	38.88
7702-01	1	.294	.015	50	39.60
7702-51	5/16"	.312	.015	50	46.80
7702-00	0	.330	.015	50	48.00

H. H. SMITH ELECTRONIC COMPONENTS

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

ALL-MOLDED CABLE CLAMPS



POLYPROPYLENE

Marked for easy identification. Polypropylene cable clamps feature excellent support at low cost. Manufactured entirely from propylene, they exhibit no environmental stress cracking and have excellent heat resistance at prolonged periods of time. Propylene clamps are impervious to most acids, alkalines, organic solvents and detergents. Conforms to applicable Mil. Specs. **Std. Pkg. 100**

T = .060 X = 7/32" W = 1/2" H = 13/64"

No.	Hole (D)	E	NET Per C
8910	1/8"	.360	$1.60
8911	3/16"	.423	1.80
8912	1/4"	.457	1.90
8913	5/16"	.498	2.00
8914	3/8"	.529	2.10
8915	7/16"	.560	2.20
8916	1/2"	.592	2.30
8917	9/16"	.623	2.40
8918	5/8"	.654	2.50
8919	11/16"	.752	2.60
8920	3/4"	.783	2.70
8921	7/8"	.845	2.90
8922	1"	.908	3.00

CELLULOSE

Marked for easy identification. Cellulose Cable Clamps feature excellent support at low cost. Made entirely from cellulose, they are ultra-violet stabilized for extreme weather resistance. Tough and lightweight, they provide exceptional service in both outdoor and indoor applications. Conforms to applicable Mil. Specs. **Std. Pkg. 100**

T = .060 X = 7/32" W = 1/2" H = 13/64"

No.	Hole (D)	E	NET Per C
8925	1/8"	.360	$2.10
8926	3/16"	.423	2.20
8927	1/4"	.457	2.30
8928	5/16"	.498	2.40
8929	3/8"	.529	2.50
8930	7/16"	.560	2.60
8931	1/2"	.592	2.70
8932	9/16"	.623	2.90
8933	5/8"	.654	3.00
8934	11/16"	.752	3.30
8935	3/4"	.783	3.50
8936	7/8"	.845	3.70
8937	1"	.908	3.90

NYLON

Marked for easy identification. Black Nylon Cable Clamps feature excellent support. Manufactured from the best material available they exhibit a tough rigidity at elevated temperatures. Nylon is insoluble in common solvents, alkalies, dilute mineral acids and most organic acids. Made to meet these Military Specifications: Mil-Std-24E; MS-30914 (ord.) Mil-C-21565(NAS); Mil-P-17091-B; Mil-P-20693. **Std. Pkg. 100**

T = .060 X = 7/32" W = 1/2" H = 13/64"

No.	Hole (D)	E	NET Per C
8940	1/8"	.360	$2.30
8941	3/16"	.423	2.40
8942	1/4"	.457	2.50
8943	5/16"	.495	2.60
8944	3/8"	.529	2.70
8945	7/16"	.560	2.80
8946	1/2"	.592	2.90
8947	9/16"	.623	3.00
8948	5/8"	.654	3.20
8949	11/16"	.752	3.30
8950	3/4"	.783	3.50
8951	7/8"	.845	3.70
8952	1"	.908	3.90

T .050 W 3/8" X 7/32" H = 13/64"

8955	1/8"	.325	1.90
8956	3/16"	.378	2.00
8957	1/4"	.409	2.10
8958	5/16"	.441	2.20
8959	3/8"	.471	2.30
8960	7/16"	.519	2.40
8961	1/2"	.550	2.50

BEADED WIRE TIES
White Nylon

Std. Pkg. 100

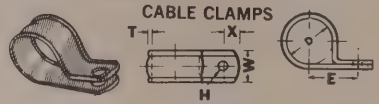
No. 8962 — 5" Long — NET Per C $2.30

NYLON SPACER BUSHINGS

Natural Color, MIL-P-20693A. **Std. Pkg. 100**

No.	I.D.(A)	B	C	D	E	NET Per C
2534	#4 (.115)	.235	3/64	1/4	.147	$2.30
2535	#6 (.143)	.290	3/64	1/4	.170	2.40
2536	#8 (.170)	.344	1/16	3/8	.205	2.50
2537	#10 (.200)	.399	1/16	3/8	.260	2.70
2538	1/4" (.260)	.513	1/16	3/8	.312	3.00

CABLE CLAMPS



BUTYRATE

Made to meet MIL Std 243B (Ships), MS 3914 (Ord.) Withstands temperatures from −60 to +175 degrees F.

T = .060 W = 1/2" X = 7/32" H = .204 **Std. Pkg. 100**

No.	Hole (D)	E	NET Per C
831	1/8	.360	$ 2.34
832	3/16	.423	2.40
833	1/4	.457	2.58
834	5/16	.498	2.85
835	5/8	.529	3.00
836	7/16	.560	3.30
837	1/3	.592	3.60
838	9/16	.623	4.20
839	5/8	.654	4.50
840	11/16	.752	4.80
841	3/4	.783	5.10
842	7/8	.845	5.40
843	1	.908	5.70
844	1 1/8	.970	6.00
845	1 1/4	1.062	6.30

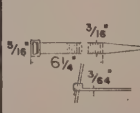
NYLON

MIL P17091A, Amend 2. Withstands temperature from −60 to +250 degrees F. **Std. Pkg. 100**

1/8" to 1/2"(D)-T=.040; W=5/8"; X=5/32"; H=.167
9/16" to 1¼"(D)-T=.060; W=½"; X=3/64; H=.204

No.	Hole (D)	E	Per C
771	1/8	.310	$ 3.60
772	3/16	.373	3.90
773	1/4	.407	4.20
774	5/16	.448	4.65
775	3/8	.479	4.80
776	7/16	.510	5.10
777	1/2	.542	5.40
778	5/16	.623	6.60
779	5/8	.654	7.20
780	11/16	.752	7.50
781	3/4	.783	8.10
782	7/8	.845	8.70
783	1	.908	10.20
784	1 1/8	1.002	12.00
785	1 1/4	1.062	13.80

NYLON LOCKING CLAMP



Wedge and ratchet design makes for positive holding and locking. Accommodates cables from 1/8" to 1 3/4". No knot tying, just slip clamp around cable, insert tongue and pull tight. **Std. Pkg. 100**

No.		NET Per C
800	100	$9.00

NYLON MOUNTING TABS

For use with No. 800 locking clamp when premounted assembly points are desired. Furnished with 203 mounting hole. **Std. Pkg. 100**

No.	NET Per C
801	$5.00

NYLON PERFORTATING STRAPPING

For bundling of wire, cable and tubing. Time saver for harnessing. Use No. 803 ratchet buckle for fast assembly. Supplied on 50' rolls. **Std. Pkg. 1**

No. Roll	NET Per roll
802	$28.00 Ea.

NYLON RATCHET BUCKLE

For No. 802 strapping. Quick and easier assembly with this ingenious item. **Std. Pkg. 100**

No.		Net Per C
803	For 1/2" Strapping	$12.00

TIGHTENING TOOL

Used with strapping for fast assembly. **Std. Pkg. 1**

No.	NET Each
804	$22.00

NYLON ADJUSTABLE CABLE TIE

Efficiently and economically replaces lacing cord, tape and other fasteners in wrap-around applications. Adjustable from 1/8" to 1 3/8" diameter. Once applied it cannot slip. Made of Nylon.

No. 8963C — NET Per C 1.50
No. 8963M — NET Per M 13.00

USE OUR MOLDING AND SCREW MACHINE FACILITIES

FOR VARIATIONS AND FOR SPECIAL PARTS WHICH WE WILL BE HAPPY TO MANUFACTURE

TO YOUR SPECIFICATIONS

LACING CORD AND TAPES

Designed for use with all types of wire and insulation. Resistant to fungus, flame, acids and abrasion.

ROUND NYLON

Meets MIL-T-713-D Type P, MW finish, classes 1,2,3. Supplied by the pound (two 8 oz. spools). **Std. Pkg. 1**

NATURAL

NO.	Cl.	Test	Dia.	Ydg/Lb.	NET. EA.
734	1	70	.050	560	$13.00
735	2	48	.035	750	13.00
736	3	32	.030	1180	13.00

BLACK

791	1	70	.050	560	17.00
792	2	48	.035	750	17.00
793	3	32	.030	1180	17.00

FLAT NYLON TAPE

Meets Mil-T-43435, Type 1, Polyamide (NYLON), B finish. **Std. Pkg. 1**

					NATURAL		BLACK	
Sze.	Width	Thk.	Test	Yds.	NO.	NET. EA.	NO.	NET. EA.
1	.225	.014	135	250	763	$18.00	787	20.00
2	.125	.013	80	250	764	18.00	788	20.00
3	.090	.012	50	500	766	18.00	769	20.00
4	.062	.012	25	500	765	18.00	789	20.00
5	.048	.008	15	500	767	18.00	770	20.00

FLAT DACRON TAPE

Meets MIL-T-43434, Type 2, Polyester (DACRON), B finish. Supplied on 500 yd. Spools. **Std. Pkg. 1**

NATURAL

NO.	Sze.	Width	Thk.	Test	NET EA.
737	1	.225	.014	135	$18.00
738	2	.090	.014	50	18.00
741	4	.062	.010	25	18.00

BLACK

728	1	.225	.014	135	20.00
729	2	.090	.014	50	20.00
731	4	.062	.010	25	20.00

LINEN LACING CORD

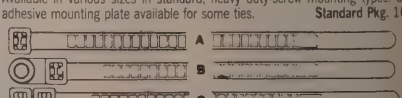
Meets MIL-T-713-D, Type N. Mildew-proofed. Supplied in 1-lb. tubes. **Std. Pkg. 1**

NATURAL

NO.	Ply	Class	Ydge.	NET EA.
727	4	—	850	$15.00
730	6	3	600	15.00
739	8	2	470	15.00
733	9	—	400	15.00
742	12	1	300	15.00

SELF-LOCKING CABLE TIES
Meets Applicable MIL Specs

Double Pawled Head prevents slippage
Double sided seration insures positive locking action.
White Nylon — Flexible & Conformable — Flame Retardant — Fungus Inert — Resistant to Solvents, Alkalines and Grease. Normal operating temperature ranges from -40°F to 185°F.
Available in various sizes in standard, heavy duty-screw mounting types. Self adhesive mounting plate available for some ties. **Standard Pkg. 100**



REGULAR (Fig. A)

No.	Tensile Strength	M.S. No.	Bundle Din. Min. - Max.	Length	Width	Thick	Stud	Net Per C
9692	18	3367-4	1/16 - 5/8	3 3/4	.144	.053	—	$ 3.00
9693*	30	3367-5	1/16 - 1 1/4	5 13/16	.187	.053	—	4.30
9694*	50	3367-1	1/16 - 1 3/4	7 15/16	.187	.053	—	5.00
9695*	50	3367-7	1/16 - 3	12 1/16	.187	.053	—	11.00
9696*	50	3367-2	1/16 - 4	15 1/16	.187	.053	—	12.00
9697	120	3367-3	3/16 - 4	15 1/16	.298	.080	—	19.20

SCREW MOUNTING (Fig. B)

No.	Tensile Strength	M.S. No.	Bundle Din. Min. - Max.	Length	Width	Thick	Stud	Net Per C
9701	50	—	1/16 - 1 3/4	8 7/16	.187	.053	10	$ 8 70
9702	50	—	1/16 4	15 9/16	.187	.053	10	17.40
9703	120	—	1/16 - 4	15 21/32	.298	.080	1/4	27.30

DOUBLE LOOP (Fig. C)

Double Loop to permit Double Looping, saving time and cost of additional ties

9698	50	—	1/16 - 4	15 7/32	.187	080	—	18.60
9699	120	—	3/16 - 4	15 11/32	.298	.080	—	28.70

MOUNTING PLATE (Fig. D)

Self Adhesive — 1 1/2" x 1 1 2" — can be used with cable ties marked with *

9700 — $ 8.40

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

ELECTRONIC COMPONENTS H. H. SMITH

COAXIAL CONNECTORS

R.F. Connectors for use with RG-6, 8, 11, 58 and 59/U coaxial cables.

Std. Pkg. 5

STRAIGHT COAXIAL CONNECTOR

No.	Type	Std. Pkg 10 Net Ea.
1713	PL-259	$80.00C

CHASSIS TYPE COAXIAL RECEPTICAL

No.	Type	Std. Pkg. 10 Net Ea.
1715	SO-239	$150.00C

COAXIAL JUNCTION

For joining separate cable lengths. Std. Pkg. 10

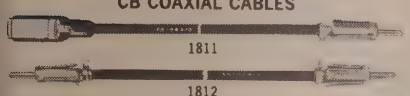
No.	Type	NET Ea.
1716	PL-258	$122.00C

COAXIAL CABLE REDUCING ADAPTER

Std. Pkg. 10

No.	Type	Wire	NET Per C
1719	UG-175 U	58/U	$27.00
1711	UG-176 U	59/U	27.00

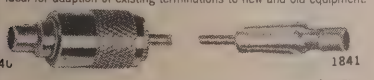
CB COAXIAL CABLES



No.	Length	Description	Net ea.
1811	24"	Motorola plug one end. Female other.	$1.90
1812	24"	Motorola plug both ends.	1.95

CB ADAPTERS

Ideal for adaption of existing terminations to new and old equipment.



Std. Pkg. 12

No.	Description	Net ea.
1840	Phono jack to PL-259	$1.41
1841	Phono jack to Motorola plug	.51

MOTOROLA PLUGS & JACKS

Std. Pkg. 100

No.	Description	Net per C
1200	Motorola Type Plug.	$15.00
1207	Motorola Jack.	20.00
1235	Motorola Jack without flange.	10.00

SOLDERLESS WIRE CONNECTORS

Precision engineered for tight locking action. Molded from Pheriolic or Urea. Connectors far exceed UL dielectric and temperature requirements. Supplied with hardened steel spring OR molded-in threads.

Std. Pkg. 100

PART NO.	VOLTAGE RATING	WIRE COMBINATIONS MIN	WIRE COMBINATIONS MAX	SUGGESTED RETAIL 109-999 PER C	SUGGESTED RETAIL 1000 & UP PER M
		Black Phenolic (Width Spring Grip)			
1842	300V	2 #20	2 #18	2.50	22.50
1843	600V	2 #18	2 #18+1 #12	3.10	28.90
1844	600V	2 #18	2 #18+1 #16	2.90	26.10
1845	600V	2 #14	3 #18+1 #14	3.50	31.50
1846	600V	2 #14	2 #16+2 #14	3.50	31.50
1847	600V	2 #14	2 #14+1 #10	4.60	41.40
1848	600V	2 #12	3 #16+3 #12	5.80	52.20
1849	600V	2 #18	3 #18+3 #12	4.60	41.40
		White Urea (Without Spring Grip)			
1850	300V	2#22	2 #18	1.40	12.60
1851	300V	2#20	2#18+1#16	1.40	12.60
1852	300V	2#18	1#18+2#16	1.60	14.40
1853	600V	2#18	2#16+1#18	2.10	18.90
1854	600V	3#18	2#18+2#14	3.20	28.80

CATV SOLDERLESS COAXIAL CONNECTORS & ACCESSORIES

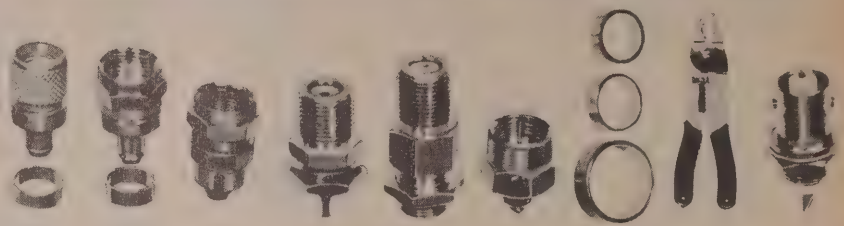


FIG 1 FIG 2 FIG 3 FIG 4 FIG 5 FIG 6 FIG 7 FIG 8 FIG 9

MALE CABLE CONNECTORS Crimp Type

Designed to crimp onto cable, and use the center conductor of the cable for the male pin. For use with RG-59/U, RG-11/U and RG-6/U cable.

Std. Pkg. 25

No.	Style	Fig.	Descr.	NET Each.
1652	C-52	1	RG-59/U Separate Ring	$ .48
1816	F-59	2	RG-59/U Separate Ring	.30
1817	F-59A	3	RG-59/U Integral Ring	.35
1818	F-56	2	RG-6/U Separate Ring	.35
1819	F-11	2	RG-11/U Separate Ring	.70

FEMALE CHASSIS FITTINGS

Designed to accept above series connectors. Supplied with nut and washer. Std. Pkg. 25

No.	Style	Fig.	Descr.	NET Each
1820	F-61	4	Mounts in 3/8" hole	$ .50

CABLE COUPLINGS

Female splice fittings for joining two cables with above series "C" and "F" connectors. Can also be used as bulkhead thru fittings. Supplied with nut for bulkhead mount. Std. Pkg. 25

No.	Style	Fig.	Descr.	NET Each
1680	C-81	5	Mounts in 1/4" hole	$ .90
1821	F-81	5	Mounts in 3/8" hole	.70

ACCESSORIES

"F" Series 75-ohm termination 1/4 Watt 5%. Std. Pkg. 25

No.	Fig.	NET Each
1822	6	$ .75

No.	Crimp Ring for:	Fig.	Std. Pkg.	Net Per C
1823	RG-59/U Cable	7	100	$2.50
1824	RG-11/U Cable	7	100	4.50
1825	RG-6/U Cable	7	100	$4.00

CRIMPING & STRIPPING TOOL

Combination crimp and stripping tool for above connectors. Std. Pkg. 1

No.	Fig.	NET Each
1826	8	$4.50

BNC FEMALE JACK

Std. Pg. 5

No.	Type	Fig.	Descr.	NET Ea.
1768	UG-1094/U	9	Single Hole Jack	$1.00

RF ADAPTERS

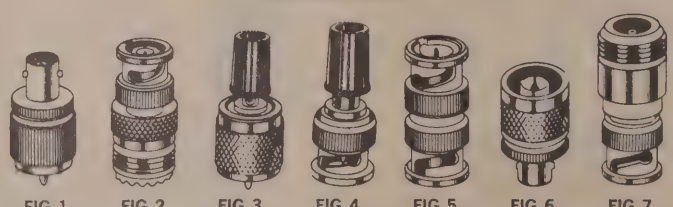


FIG 1 FIG 2 FIG 3 FIG 4 FIG 5 FIG 6 FIG 7

BNC FEMALE TO UHF MALE

FRONT: UHF plug.
REAR: BNC jack.
DESCR.: Permits the use of a BNC plug on equipment using a UHF jack. Std. Pkg. 1

No.	Fig.	NET Each
1703	1	$2.20
		2.50

UHF FEMALE TO BNC MALE

FRONT: BNC plug.
REAR: UHF jack.
DESCR.: Permits the use of a UHF plug to equipment using a BNC jack. Std. Pkg. 1

No.	Fig.	NET Each
1700	2	$4.00

BINDING POST TO UHF MALE

FRONT: UHF male.
REAR: Insulated 5-way binding post.
DESCR.: Permits the adaptation of a 5-way insulated binding post to equipment using a UHF jack. Available in Red or Black. Std. Pkg. 1

No.	Fig.	NET Each
1706	3	$4.80

BINDING POST TO BNC MALE

FRONT: BNC male.
REAR: Insulated 5-way binding post.
DESCR.: Permits adaptation of a 5-way insulated binding post to equipment using a BNC JACK. Available in Red or Black. Std. Pkg. 1

No.	Fig.	NET Each
1705	4	$3.70

TIP JACK TO BANANA PLUG

REAR: Standard .080 phone tip jack.
FRONT: Standard or miniature banana plug. Banana jack hole for side stacking. Std. Pkg. 50

No.	Description	NET PER C
214	Standard Adapter	$55.00

BNC MALE TO BNC MALE

FRONT: BNC plug.
REAR: BNC plug.
DESCR.: Permits interconnection between cable terminations with BNC jacks. Std. Pkg. 1

No.	Fig.	NET Each
1704	5	$3.40

BNC FEMALE TO TYPE "N" MALE

FRONT: Type "N" plug.
REAR: BNC jack.
DESCR.: Permits the use of a BNC plug on equipment using a type "N" jack. Std. Pkg. 1

No.	Fig.	NET Each
1701	6	$3.60

TYPE "N" FEMALE TO BNC MALE

FRONT: BNC plug.
REAR: Type "N" jack.
DESCR.: Permits the use of a type "N" plug on equipment using a BNC jack. Std. Pkg. 1

No	Fig.	NET Each
1702	7	$5.00

STACKING SOLDERLESS PHONE TIP

REAR: Standard or Miniature Banana Jack for stacking.
SIDE: Wire lead hole secures test lead with internal set-screw
FRONT: Standard .080 phone tip. Std. Pkg. 10

No.	Description	NET Ea.
5031	Standard Adapter	$ .70

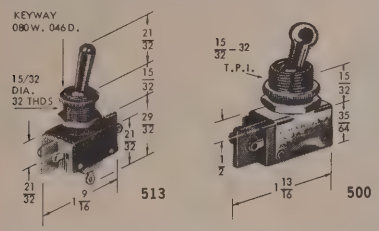
FLEXIBLE TERMINAL BLOCKS!
SEE SMITH PAGE 21

H. H. SMITH ELECTRONIC COMPONENTS

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

ARROW HART SWITCHES

SMALL CANOPY TYPE SWITCHES

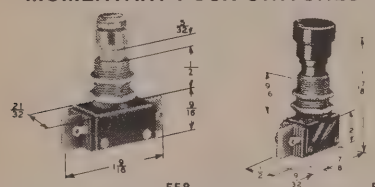


513 500

Laminated type 15/32-32 slotted sleeve, nickel finish. Supplied with hex nut and knurled nut. Solder terminals, SPST rated at 3 amps-250 volts AC-DC; all other rated at 1 amp-250 volts, 3 amps-125 volts AC-DC.
Std. Pkg. 10

BAT LEVER	*Positive Action* 15/32" long shaft		BALL LEVER	
No.	NET Each	CIRCUIT	No.	NET Each
510	$2.30	SPST	500	$2.30
511	2.95	SPDT	502	2.95
512	4.20	DPST	504	4.20
513	4.85	DPDT	506	4.85

MOMENTARY PUSH SWITCHES



558 579

Laminated type 15/32-32 x 9/16" slotted sleeve, nickel finish. Supplied with hex nut and knurled nut. All switches accept snap on button. SPST rated at 3 amps-250 volts AC-DC. All others rated at 1 amp-250 volts, 3 amps-125 volts AC-DC.
Std. Pkg. 10

SUPPLIED LESS BUTTON: ORDER BUTTON SEPARATELY.

QUICK MAKE AND BREAK

Normally Closed (ON)			Normally Open (OFF)	
No.	NET Each	CIRCUIT	No.	NET Each
552	$4.45	SPST	555	$4.45
556	5.35	SPDT	—	—
557	5.45	2 Circ.	—	—
564	6.35	DPST	558	6.35
559	7.15	DPDT	—	—

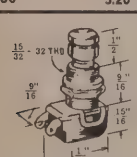
SLOW MAKE AND BREAK

Rated at 1 amp.-125 volts AC

Normally Closed (ON)			Normally Open (OFF)	
No.	NET Each	CIRCUIT	No.	NET Each
582	$3.25	SPST	579	$2.55
580	3.20	2 Circ.	—	

MIDGET MOMENTARY SWITCH

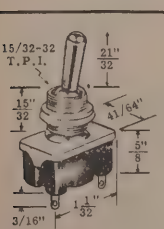
SLOW MAKE AND BREAK



Molded Phenolic Base 15/32-32 x 9/16" slotted sleeve. Nickel Finish. Supplied with hex nut and knurled nut. Side connected silver plated solder contacts. Rated at 3 amps-120 volts A. C. Supplied less button; order button separately.
Std. Pkg. 10

Normally Closed (ON)			Normally Open (OFF)	
No.	NET Each	Circuit	No.	NET Each
925	$1.85	SPST	927	$1.85
926	2.10	2 Circ.		

MIDGET TOGGLE SWITCH

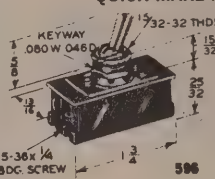


Bat lever. Molded phenolic base. 15/32-32 x 15/32" long. Slotted sleeve, nickel finish. Supplied with hex nut and knurled nut. Back connected silver plated solder contacts. Rated 1 amp.-250 volts; 3 amps.-125 volts.
Std. Pkg. 10

No.	Circuit	NET Each
920	SPST	$1.85
921	SPDT	2.20
923	DPST	2.70
924	DPDT	3.15

STANDARD DUTY TOGGLE SWITCHES

QUICK MAKE AND BREAK

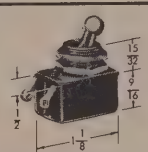


596

Molded phenolic base, 15/32-32 x 7/16" long slotted sleeve, nickel finish. Screw terminals. Supplied with hex nuts. All rated at 6 amps-250 volts, 12 amps-125 volts AC-DC. DPST also rated at 1 HP at 250 volts AC-DC.
Std. Pkg. 10

BAT LEVER		
No.	CIRCUIT	NET Each
597	SPST	$3.10
598	SPDT	3.10
596	DPST	3.10

MIDGET SIZE TOGGLE SWITCHES

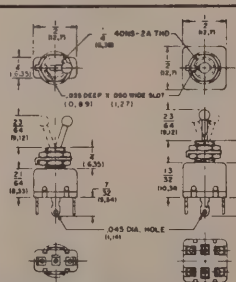


590

Molded phenolic base, 15/32-32 x 15/32" long slotted sleeve, nickel finish. Side connected silver plated soider contacts. Supplied with hex nut and knurled nut. SPST rated at 2 amps 250 volts; 6 amps.-125 volts; all others rated at 1 amp-250 volts, 6 amps.-125 volts.
Std. Pkg.10

BALL LEVER			BAT LEVER	
No.	NET Each	CIRCUIT	No.	NET Each
590	$1.65	SPST	591	$1.65
589	2.00	SPDT	592	2.00

MIDGET TOGGLE SWITCHES



ARROW HART

SUB-MINIATURE TOGGLE SWITCHES

Offers the greatest switching flexibility and is available in both positive and momentary action. Gold plated silver stationary contacts to insure continuity on low energy circuits and Rhodium plated silver movable contacts to withstand mechanical wear. Molded daillyl phthalate and aluminum housing. Available in Commercial and Military types Rating. Resistive and *Inductive.
Std. Pkg. 5

5A 125V. AC
5A 29V. DC
Max. Inrush: 25A

Mimimum rating: 40 milliamps at 1.5 volts
*AC: 75% Power Factor
IDC: An Inductors
Mechanical Life: 100,000 cycles

COMMERCIAL

Housing and mounting hardware gold anodized. Available only in stainless steel ball lever.

Smith No.	A H No.	Circuit*	Net Each
4740	TC-3	SPDT A-B-A	$ 8.00
4741	TE-3	SPDT C-B-A	8.50
4742	TG-3	SPDT C-B-C	8.50
4743	TM-3	SPDT C-D-A	8.50
4744	TS-1	SPST B-D-A	7.50
4745	TS-2	DPST B-D-A	9.10
4746	TS-3	SPDT A-D-A	8.00
4747	TC-6	DPDT A-B-A	10.40
4748	TE-6	DPDT C-B-C	13.30
4749	TG-6	DPDT C-B-C	12.70
4750	TM-6	DPDT C-D-A	13.30
4751	TS-6	DPDT A-D-A	10.40

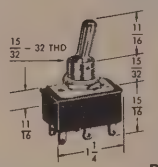
MILITARY

Meets Mil S-3950B, MS75028 and MS75029. Housing and hardware, clear anodized. Available only with aluminum bat lever.

Smith No.	A H No.	MS No.	Circuit*	Net Each
4760	TC-3-M	MS75028-21	SPDT A-B-A	$ 8.50
4761	TE-3-M	MS75028-31	SPDT C-B-A	9.10
4762	TG-3-M	MS75028-27	SPDT C-B-C	9.10
4763	TM-3-M	MS75028-26	SPDT C-D-A	9.10
4764	TS-1-M	MS75028-22	SPST B-D-A	8.00
4765	TS-2-M	MS75029-22	DPST B-D-A	9.60
4766	TS-3-M	MS75028-23	SPDT A-D-A	8.50
4767	TC-6-M	MS75029-21	DPDT A-B-A	10.90
4768	TE-6-M	MS75029-31	DPDT C-B-A	13.90
4769	TG-6-M	MS75029-27	DPDT C-B-C	13.90
4770	TM-6-M	MS75029-26	DPDT C-D-A	13.90
4771	TS-6-M	MS75029-23	DPDT A-D-A	10.90

*A-ON, B-OFF. C-Momentary ON, D-None

INTERMEDIATE SIZE TOGGLE SWITCHES

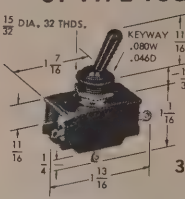


Molded phenolic base. 15/32-32 x 15/32" long slotted sleeve, nickel finish. Supplied with hex nut and knurled nut. Back connected silver plated solder contacts. SPDT rated at 1 amp-250 volts, 6 amps-125 volts AC-DC; all others rated at 3 amps-250 volts, 6 amps-125 volts AC-DC.
Std. Pkg. 10

BAT LEVER

POSITIVE ACTION				MOMENTARY ACTION
No.	NET Each	CIRCUIT	No.	NET Each
520	$1.85	SPST	524	OFF $2.90
521	2.20	SPDT	—	
522	2.75	DPST	537	OFF 3.80
523	3.15	DPDT	525	4.60

ST TYPE TOGGLE SWITCHES



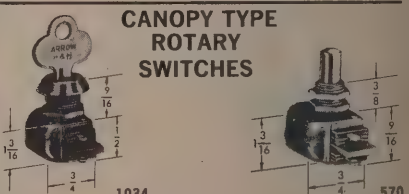
MEETS MIL-S-3950B

3 POSITION – CENTER OFF

Rated at 3 amps-250 volts, 6 amps-125 volts AC-DC.
Std. Pkg. 10

No.	CIRCUIT	NET Each
566	SPDT	$3.55
567	DPDT	4.35

CANOPY TYPE ROTARY SWITCHES

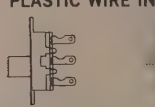


1034 570

Laminated type, 11/32-32 x 15/32" sleeve, nickel finish. Solder lugs. Supplied with hex nut and dress nut, SPST rated at 3 amps-250 volts AC-DC, all others rated at 1 amp-250 volts, 3 amps-125 volts, AC-DC. Key removable in OFF position only on SPST and DPST—key removable in both positions on all others. 1 1/8" shaft.
Std. Pkg. 10

KEY TYPE		CIRCUIT	ROTARY TYPE	
No.	NET Each		No.	NET Each
1034	$6.00	SPST	570	$3.15
1035	6.15	SPDT	—	—
1037	7.65	DPST	—	—
1038	7.70	DPDT	573	4.35

PLASTIC WIRE INSULATOR

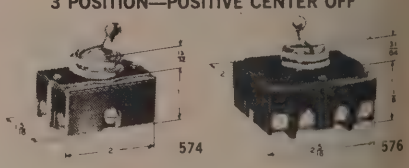


For SPST and SPDT standard slide switches. Insulates lug and wire. Eliminates need of shrink-tubing insulation.

No.	NET Per C
8699	$7.00

EXTRA HEAVY DUTY POWER SWITCHES

3 POSITION—POSITIVE CENTER OFF



574 576

Slotted sleeve 3/4-32, nickel finish. Screw terminals. Supplied with 2 hex nuts. Rated at 5 amps-250 volts, 10 amps-125 volts plus HP rating shown below.
Std. Pkg. 5

No.	Description	CIRCUIT	NET Each
574	3/4 HP 250 volts AC-DC	DPDT	$ 8.10
575	1/2 HP 115/230 volts AC, 3 phase	TPDT	12.50
576	1/2 HP 115/230 volts AC, 2 phase	4PDT	16.80

STOCKED BY LEADING DISTRIBUTORS NATIONWIDE

ELECTRONIC COMPONENTS H. H. SMITH

CUTLER-HAMMER

TOGGLE SWITCHES
STANDARD DUTY

15 Amps. 125 Volts — 10 Amps, 250 Volts AC, UL Approved 15/32" shank; slow-make and break; bakelite case. AC rated only for longer life and greater capacity. Std. Pkg. 10

BACK CONNECTED LUG TERMINALS

No.	C-H No.	Type	NET Each
966	7501K13	SPST	$1.50
967	7505K4	SPDT	1.70
968	7561K4	DPST	2.30
969	7565K5	DPDT	2.80
970	7611K2	TPST	4.30
971	7615K2	TPDT	5.30

BACK CONNECTED SCREW TERMINALS

No.	C-H No.	Type	NET Each
972	7500K14	SPST	$1.70
973	7504K4	SPDT	2.00
974	7560K5	DPST	2.80
975	7564K6	DPDT	3.40
976	7610K2	TPST	5.00
977	7614K2	TPDT	6.30

CENTER OFF STANDARD DUTY TOGGLE SWITCHES

BACK CONNECTED LUG TERMINALS

No.	C-H No.	Type	NET Each
978	7503K13	SPDT	$1.70
979	7563K4	DPDT	2.80
980	7613K2	TPDT	5.30

BACK CONNECTED SCREW TERMINALS

No.	C-H No.	Type	NET Each
981	7502K13	SPDT	$2.00
982	7562K4	DPDT	3.40
983	7612K2	TPDT	6.30

TOGGLE SWITCHES
LIGHT DUTY

AC-DC, UL Approved; 15/32" shank; quick make — quick break; bakelite case. Unusually small size for electrical capacity. Std. Pkg. 10

BACK CONNECTED LUG TERMINALS
SMALL BAT HANDLE 15/32" LONG

Current Rating

No.	C-H No.	Type	125 V.	250 V	NET Each
950	8280K16	SPST		3 Amps.	$1.45
951	8381K8	SPST	6 Amps.	3 Amps.	1.50
952	8282K14	SPDT	3 Amps.	1 Amp.	1.80
955	8370K7	DPST	6 Amps.	3 Amsp.	2.60
957	8373K7	DPDT	6 Amps.	3 Amps.	3.00

SIDE CONNECTED SCREW TERMINALS

Small Bat Handle 15/32" Long

Current Rating

No.	C-H No.	Type	125 V.	250 V	NET Each
958	8285K8	SPST		3 Amps.	$1.70
959	8396K8	SPST	6 Amps.	3 Amps.	1.75
961	8372K7	DPST	6 Amps.	3 Amps.	3.15
963	8375K7	DPDT	6 Amps.	3 Amps.	4.00

WIRE LEADS — SIX INCHES LONG

Current Rating

No.	C-H No.	Type	125 V.	250 V	NET Each
954	8290K16	SPST		3 Amps.	$1.70
955	8391K8	SPST	6 Amps.	3 Amps.	1.75

TOGGLE SWITCHES
HEAVY DUTY

AC-DC, UL Approved: 15/32" shank; quick make-quick break; bakelite case. Screw Terminals. Std. Pkg. 10

Current Rating

No.	C-H No.	Type	125 V	250 V	NET Each
984*	7321K3	SPST	12 A	6 A	$2.90
985*	7320K3	DPST	12 A	6 A	2.70
986+	7361K5	SPST	15 A	10 A	4.85
987+	7360K8	DPST	15 A	10 A	4.60
988±	7402K4	DPST	20 A	20 A	6.20

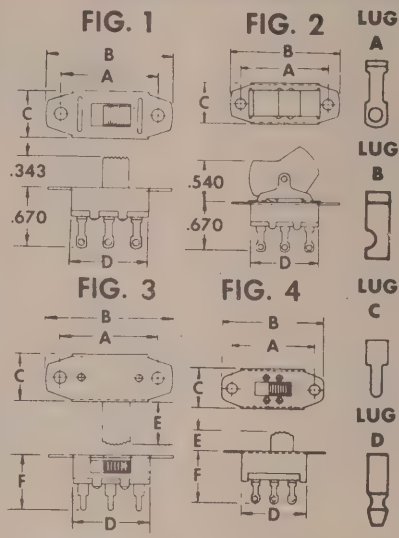
* Hp — 125/250V. + 1½ Hp — 125/250V. ± 1½ Hp — 125V. 2 Hp — 250 V.

PUSH BUTTON MOMENTARY SWITCHES
Std. Pkg. 10

AC-DC, UL Approved, 15/32" shank; rated at ¾ Amp. 125 volts — ¼ Amp. 250 volts.

No.	C-H No.	Type	Term.	NET Each
992	8411K11	SP Norm. Op	Lug	$1.00
993	8411K12	SP Norm. Op	Screw	1.20
994	8411K8	SP Norm. Cl	Lug	1.00
995	8411K7	SP Norm. Cl	Screw	1.20

CONTINENTAL-WIRT SLIDE SWITCHES



RATINGS: Based on 125 Volts

Rating A — 3.0 amps AC, 0.5 amps DC
Rating B — 6.0 amps AC, 0.5 amps DC
Rating C — 0.5 amp AC-DC

SLIDE SWITCHES—STANDARD
DETENT.

FIG. 1 — LUG A

TYPE	DIMENSIONS A	B	C	D	RATING "A" No.	NET Per C	RATING "D" No.	NET Per C
SPST	1.12	1.40	0.54	0.88	515	$17.00	1105	$24.00
SPDT	1.12	1.40	0.54	0.88	516	18.00	1106	25.00
DPST	1.12	1.40	0.54	0.88	517	24.00	1107	32.00
DPDT	1.12	1.40	0.54	0.88	518	25.00	1108	33.00
DP3Pos	1.40	1.65	0.54	1.18	1054	35.00	8637	37.00
3PDT	1.12	1.40	0.71	0.88	1109	55.00	8638	65.00
3P3Pos	1.40	1.65	0.78	1.18	8635	65.00	8639	75.00
4PDT	1.12	1.40	1.00	0.88	1104	75.00	8640	80.00
4P3Pos	1.40	1.65	1.00	1.18	8636	90.00	8641	100.00
SPRING RETURN								
SPST	1.12	1.40	0.54	0.88	568	36.00	8643	33.00
SPDT	1.12	1.40	0.54	0.88	569	40.00	8644	35.00
DPDT	1.12	1.40	0.71	0.88	8642	45.00	8645	50.00

ROCKER

FIG. 2 — LUG A - RATING "A"

TYPE	DIMENSIONS A	B	C	D	DETENT No.	NET Per C	SPRING RETURN No.	NET Per C
SPST	1.12	1.40	0.54	0.88	8646	50.00	8651	60.00
SPDT	1.12	1.40	0.54	0.88	8647	55.00	8652	65.00
DPST	1.12	1.40	0.54	0.88	8648	60.00	—	—
DPDT	1.12	1.40	0.54	0.88	8649	62.00	—	—
SPDT	1.12	1.40	0.71	0.88	8650	90.00	—	—

SIDE ACTION

FIG. 3 — LUG A - RATING "A"

TYPE	DIMENSIONS A	B	C	D	E	F	No.	NET Per C
SPDT	1.12	1.40	0.54	0.88	0.51	.610	8653	$30.00
DPDT	1.12	1.40	0.54	0.88	0.51	.610	8654	35.00

CUTLER-HAMMER SWITCHES
PUSH BUTTON SWITCHES

Push to make—Push to break

AC-DC, UL Approved: 11/16" shank; bakelite case. Pushing the button once closes the contacts. Pushing it again opens the contacts. Rated at 6 Amps. 125 Volts; 3 Amps. 250 Volts. Std. Pkg. 10

No.	C-H No.	Type	Term.	NET Each
989	7206K4	SPST	Lug	$2.20
990	7208K4	SPST	Screw	2.50
991	7207K4	SPST	Wire	2.50

PRINTED CIRCUIT

FIG. 1 — LUG C - RATING "A"

TYPE	DIMENSIONS A	B	C	D	E	F	No.	NET Per C
SPDT	1.12	1.40	0.54	0.88	—	—	8613	20.00
DPDT	1.12	1.40	0.54	0.88	—	—	8614	30.00

PRINTED CIRCUIT — SIDE ACTION

FIG. 3 — LUG C - RATING "C"

TYPE	DIMENSIONS A	B	C	D	E	F	No.	NET Per C
DPDT	1.125	1.406	0.54	0.88	0.515	.610	8615	30.00

SUBMINIATURE SLIDE SWITCHES
DETENT

FIG. 4 — LUG A or B - RATING "C"

TYPE	LUG	DIMENSIONS A	B	C	D	E	F	No.	NET Per C
SPDT	B	0.56	0.76	0.31	0.33	0.19	0.261	8655	$45.00
SPDT	A	0.81	1.00	0.40	0.63	0.20	0.550	1226	27.00
DPDT	A	0.81	1.00	0.40	0.63	0.20	0.550	1227	35.00
SP3Pos	A	1.00	1.19	0.40	0.80	0.20	0.550	1238	40.00
DP3Pos	A	1.00	1.19	0.40	0.80	0.20	0.550	1239	45.00
SPRING RETURN									
SPDT	A	0.81	1.00	0.40	0.63	0.20	0.550	1236	40.00

PRINTED CIRCUIT

FIG. 4—LUG C or D - RATING "C"

TYPE	LUG	DIMENSIONS A	B	C	D	E	F	No.	NET Per C
SPST	C	0.812	1.00	0.400	0.628	0.208	0.550	8632	30.00
DPDT	C	0.812	1.00	0.400	0.628	0.208	0.550	8633	36.00
DPDT	D	0.562	0.762	0.312	0.380	0.187	0.371	8634	65.00

PRINTED CIRCUIT — SIDE ACTION

FIG.3 — LUG C - RATING "C"

TYPE	DIMENSIONS A	B	C	D	E	F	No.	NET Per C
SPDT	0.812	1.00	0.400	0.628	0.456	0.504	8616	45.00
DPDT	0.812	1.00	0.400	0.628	0.456	0.504	8617	50.00
DP3Pos	1.000	1.19	0.400	0.800	0.456	0.504	8618	65.00

SIDE TOGGLE SWITCHES

FIG. 5 — LUG A - RATING "B"

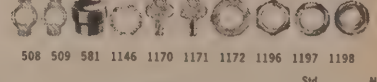
No.	TYPE	DIMENSIONS C	D	NET Per C
1100	SPDT	0.544	0.88	$93.00
1101	DPDT	0.544	0.88	100.00
1102	3PDT	0.714	0.88	130.00
1103	4PDT	1.000	0.88	150.00

SLIDE SWITCH ACCESSORIES

519 8656 8557

No.	Description	NET Per C
519	Nylon Shield	$15.00
8656	Black Slide Topper for Standard Switch	12.00
8657	Black Slide Topper For Miniature Switch	12.00

SWITCH ACCESSORIES



508 509 581 1146 1170 1171 1172 1196 1197 1198

No.	Description	Std. Pkg.	NET Per C
508	ON-OFF name plate	100	$ 7.00
509	HI-LO name plate	100	7.00
581	Snap-On Button (Red or Black)	50	35.00
1146	Narrow Rim Lockwasher	100	2.10
1170	Key—Remove off position	50	33.00
1171	Key—Remove both positions	50	33.00
1172	Locking Ring	100	3.20
1196	Hex Nut—Brass N. P.	100	2.42
1197	Ring Nut—Brass N. P.	100	3.10
1198	Dress Nut—Brass N. P.	100	22.00

USE OUR VAST NATIONAL DISTRIBUTION NETWORK FOR OFF-THE-SHELF DELIVERIES OF YOUR SMALLER HARDWARE REQUIREMENTS.

H. H. SMITH TEFLON* TERMINALS

*Du Pont's registered trademark

FOR RAPID REFERRAL

This Catalog is arranged to facilitate rapid selection in accordance with your DIMENSIONAL REQUIREMENTS. Terminals are listed (within each figure group) in ascending order of the MOST PERTINENT DIMENSIONS.

PLATING INFORMATION
-P1 STANDARD For "63" SERIES (TEST JACKS)
-P12 STANDARD For ALL OTHER SERIES

1000 Pieces Minimum Order For Plating Other Than Standard

COLOR CODE SUFFIX - Add to Catalog Number as Required

— 101 WHITE* — 104 GREEN — 107 YELLOW — 112 PURPLE
— 102 RED — 105 BLUE — 108 BROWN — 113 GREY
— 103 BLACK — 106 ORANGE

*White is natural "Teflon" per MIL-P-19468 and will be supplied if no color is specified.

COLORS: SUPPLIED IN WHITE (-101) UNLESS OTHERWISE SPECIFIED. COLORS OTHER THAN WHITE (-101), MINIMUM 1000 PIECES EXCEPT "63" SERIES. TEN COLORS AVAILABLE. PLATING: STANDARD (-P12)

PLATING DASH NO.	TYPE OF PLATING	THICKNESS OF PLATE	APPLICABLE SPECIFICATIONS if any
—P1 (STANDARD)	Copper strike Gold flash	0.0005 0.000020	QQ-S-365, Type III MIL-G-45204, Type II
—P2	Copper strike Silver plate	0.0003/0.0005	QQ-S-365, Type III
—P3	Copper strike Solder plate	0.0005 Min.	(M-259) MIL-F-14072 (M222, Type I)
—P4	Copper strike Gold flash	0.000010/0.000020	MIL-G-45204, Type II
—P5	Copper strike Silver plate Gold plate	0.0003 0.000050	QQ-S-365, Type III MIL-G-45204, Type II
—P6	Copper strike Gold plate	0.000050/0.000070	MIL-G-45204, C1.1, Type II
—P7	Copper strike Gold plate	0.000200/0.000250	MIL-G-45204, C1.3, Type II
—P8	Copper strike Gold plate	0.000100/0.000150	MIL-G-45204, C1.2, Type II
—P9	Copper strike Nickel plate Gold plate	0.000050/0.000070 0.000030/0.000050	QQ-N-290, Class I MIL-G-45204, Type II
—P10	Copper strike Gold plate	0.00030 Min.	MIL-G-45204, Type II
—P11	Copper Tin plate	0.0002 0.0002/0.0004	MIL-T-10727, Type I
—P12 (STANDARD)	Copper Bright acid tin "Tintilate"	0.000050 0.0003	MIL-T-10727, Type I
—P13	Hot tin dip	Approx. 0.0002	MIL-T-10727, Type II
—P17	Copper strike Nickel plate	0.0003/0.0005	QQ-N-290, C1.1, Type VI (KC)
—P18	Silver Gold	0.0005 0.000030	QQ-S-365, Type III

Add $5.00 per M to List Prices For Colors

QUANTITY DISCOUNTS

FOR ALL SMITH TEFLON TERMINALS LISTED IN THIS DIRECTORY

100— 999	Net
1,000— 4,999	25%
5,000—14,999	35%
15,000— & up	On request

PROBES & PLUGS

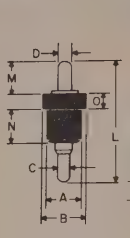


FIG. 80

FIG. 81

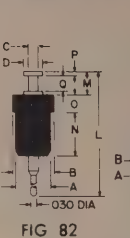


FIG 82

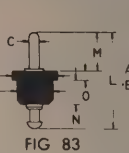


FIG 83

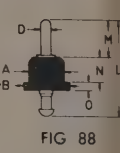


FIG 88

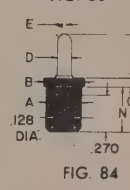


FIG. 84

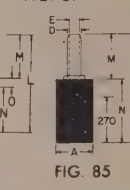


FIG. 85

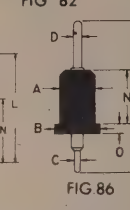


FIG.86

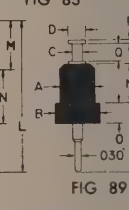


FIG 89

FOR RAPID SELECTION: terminals are listed (within figure groups) in ascending order of the MOST PERTINENT DIMENSION:
C & D = PROBE DIAS. **M** = LGTH. OF PIN **A** = MIN. DIA. **B** = MAJ. DIA. **N** = LGTH. OF MIN. DIA **O** = LGTH. OF MAJ. DIA **L** = OVERALL LGTH.

FIG. No.	SMITH No.	A	B	C	D	E	L	M	N	O	P	Q	NET Per M
80	73-1028	.185	.218	.030	.040	—	1.870	.120	.250	.046	—	—	$240.00
80	73-1018	.148	.172	.030	.050	—	1.937	.250	.165	.046	—	—	240.00
80	73-1003	.185	.218	.030	.050	—	1.937	.250	.140	.046	—	—	240.00
80	73-1001	.185	.218	.030	.050	—	.906	.250	.287	.046	—	—	240.00
80	73-1000	.185	.218	.030	.050	—	1.531	.250	.287	.046	—	—	240.00
80	73-1002	.185	.218	.030	.050	—	2.083	.250	.287	.046	—	—	240.00
80	73-3006	.218	.250	.040	.050	—	1.531	.312	.375	.157	—	—	260.00
80	73-1006	.185	.218	.050	.081	—	.739	.281	.287	.046	—	—	$230.00
81	73-1010	.185	.218	.060	.125	—	1.052	.281	.287	.046	.031	.093	240.00
82	73-1009	.185	.218	.050	.093	—	2.000	.125	.150	.230	.020	.085	$230.00
82	73-1008	.185	.218	.050	.093	—	1.000	.125	.287	.093	.020	.085	230.00
82	73-1007	.185	.218	.050	.093	—	2.005	.125	.287	.093	.020	.085	230.00
83	73-1182	.148	.172	.040	—	—	.415	.125	.100	.040	—	—	$210.00
83	73-1156	.148	.172	.040	—	—	.478	.188	.100	.040	—	—	210.00
83	73-1022	.171	.187	.040	—	—	.687	.272	.212	.040	—	—	$220.00
83	73-1011	.185	.218	.050	—	—	.562	.250	.135	.052	—	—	$220.00
83	73-1016	.185	.218	.050	—	—	.562	.250	.141	.046	—	—	220.00
83	73-1023	.185	.218	.050	—	—	.906	.250	.287	.046	—	—	280.00
83	73-1027	.185	.218	.062	—	—	.612	.250	.141	.046	—	—	$200.00
83	73-1017	.185	.218	.081	—	—	.562	.250	.141	.046	—	—	$220.00
83	73-1015	.185	.218	.081	—	—	.739	.281	.287	.046	—	—	220.00
83	73-1026	.185	.218	.090	—	—	.648	.190	.287	.046	—	—	$220.00
		PLATING: Standard (-P17) unless otherwise specified.											
84	73-3010	.218	.250	—	.080	.062	.695	.270	.325	.050	—	—	$220.00
85	73-3001	.218	—	—	.080	.062	.645	.270	.375	—	—	—	$230.00
85	73-3016	.218	—	—	.080	.062	.875	.500	.375	—	—	—	270.00
85	73-3012	.218	—	—	.090	.062	.645	.270	.375	—	—	—	$230.00
86	37-1028	.185	.218	.030	.040	—	1.870	.120	.250	.046	—	—	$200.00
86	37-1018	.148	.172	.030	.050	—	1.937	.250	.165	.046	—	—	200.00
86	37-1003	.185	.218	.030	.050	—	1.937	.250	.141	.046	—	—	210.00
86	37-1001	.185	.218	.030	.050	—	.906	.250	.287	.046	—	—	220.00
86	37-1000	.185	.218	.030	.050	—	1.531	.250	.287	.046	—	—	240.00
86	37-1002	.185	.218	.030	.050	—	2.083	.250	.287	.046	—	—	250.00
86	37-1006	.185	.218	.050	.081	—	.739	.281	.287	.046	—	—	230.00
88	37-1182	.148	.172	.040	—	—	.415	.125	.100	.040	—	—	$220.00
88	37-1156	.148	.172	.040	—	—	.478	.188	.100	.040	—	—	220.00
88	37-1022	.171	.187	.040	—	—	.687	.272	.212	.040	—	—	240.00
88	37-1011	.185	.218	.050	—	—	.562	.250	.135	.052	—	—	$190.00
88	37-1016	.185	.218	.050	—	—	.562	.250	.141	.046	—	—	190.00
88	37-1023	.185	.218	.050	—	—	.906	.250	.287	.046	—	—	210.00
88	37-1027	.185	.218	.062	—	—	.612	.250	.141	.046	—	—	$210.00
88	37-1017	.185	.218	.081	—	—	.562	.250	.141	.046	—	—	$210.00
88	37-1015	.185	.218	.081	—	—	.739	.281	.287	.046	—	—	220.00
88	37-1026	.185	.218	.090	—	—	.648	.190	.287	.046	—	—	$220.00
89	37-1009	.185	.218	.050	.093	—	2.000	.125	.150	.230	.020	.085	$230.00
89	37-1008	.185	.218	.050	.093	—	1.000	.125	.287	.093	.020	.085	230.00
89	37-1007	.185	.218	.050	.093	—	2.005	.125	.287	.093	.020	.085	230.00

COLORS: SUPPLIED IN WHITE (-101) UNLESS OTHERWISE SPECIFIED COLORS OTHER THAN WHITE (-101) MINIMUM 1000 PIECES EXCEPT "63" SERIES TEN COLORS AVAILABLE. PLATING: Standard (-P17)

For COLOR CODE, PLATING SUFFIXES, and QUANTITY DISCOUNT SCHEDULE see left hand column, this page.

SMITH TEFLON* TERMINALS

TEST JACKS

*Du Pont's registered trademark

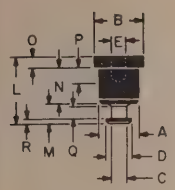


FIG. 68

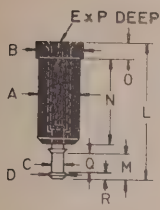


FIG. 69

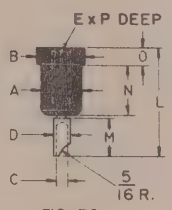


FIG. 70

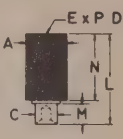


FIG. 71

FIG. 72

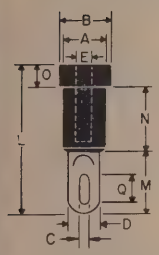


FIG. 76

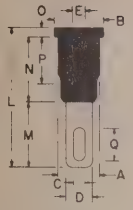


FIG. 77

FIG. 97

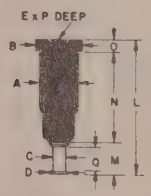


FIG. 98

FIG. 96

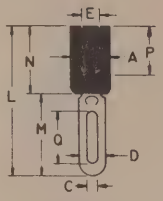


FIG. 78

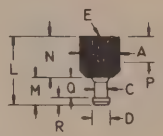


FIG. 79

FOR RAPID SELECTION:
terminals are listed (within figure groups) in ascending order of the MOST PERTINENT DIMENSION:

E = PROBE
P = PROBE DEPTH
A = MIN. DIA.
B = MAJ. DIA.
N = LGTH. OF MIN. DIA.
O = LGTH. OF MAJ. DIA.
M = LGTH. OF PIN
C = DIA. OF PIN
L = OVERALL LGTH.

PANEL BOARD MOUNT

FIG. No.	SMITH No.	DIMENSIONS A	B	C	D	E	L	M	N	O	P	Q	R	NET Per M
68	63-1033	.120	.150	.046	.080	.040	.203	.060	.113	.030	.078	.040	.010	$370.00
68	63-1032	.148	.172	.046	.080	.040	.203	.060	.097	.046	.078	.040	.010	370.00
68	63-1029	.140	.172	.046	.080	.040	.253	.060	.143	.050	.125	.040	.010	360.00
68	63-1077	.140	.172	.046	.060	.040	.345	.120	.179	.046	.140	.077	.023	360.00
68	63-1010	.148	.172	.040	.060	.040	.345	.120	.179	.046	.140	.077	.023	360.00
68	•63-1061	.148	.172	.040	.060	.040	.345	.120	.179	.046	.140	.077	.023	590.00
68	63-1072	.120	.142	.040	.060	.040	.410	.120	.244	.046	.205	.060	.030	360.00
68	63-1012	.120	.142	.040	.060	.040	.449	.120	.283	.046	.245	.060	.030	360.00
68	63-1079	.185	.218	.054	.074	.050	.437	.120	.271	.046	.195	.053	.037	$380.00
68	63-1004	.185	.218	.054	.074	.080	.437	.120	.271	.046	.195	.053	.037	$380.00
68	•63-1060	.185	.218	.054	.074	.080	.437	.120	.271	.046	.195	.053	.037	600.00
68	63-1075	.185	.218	.054	.074	.080	.504	.187	.271	.046	.195	.104	.037	580.00
68	63-1006	.204	.250	.054	.074	.080	.437	.120	.271	.046	.195	.053	.037	400.00
68	63-1057	.185	.218	.054	.074	.080	.367	.120	.301	.046	.225	.047	.035	390.00
68	63-1005	.185	.218	.054	.074	.080	.640	.187	.400	.050	.287	.104	.037	390.00
68	63-1080	.185	.218	.080	.125	.080	.455	.105	.300	.050	.315	.065	.020	390.00
68	63-1054	.185	.218	.054	.074	.090	.340	.120	.174	.046	.140	.077	.023	$360.00
68	63-1003	.185	.218	.054	.074	.090	.437	.120	.271	.046	.195	.053	.037	380.00
68	63-1007	.170	.218	.046	.078	.090	.375	.066	.269	.046	.250	.040	.010	390.00
68	63-1028	.200	.218	.054	.074	.093	.699	.187	.386	.125	.390	.116	.035	$390.00
68	63-1013	.200	.218	.054	.074	.093	.761	.187	.386	.187	.455	.116	.035	400.00
68	63-1081	.200	.375	.054	.074	.093	.834	.187	.417	.230	.518	.116	.035	500.00
68	63-1011	.218	.250	.066	.098	.104	.400	.060	.294	.046	.250	.037	.010	$390.00
69	63-1500	.148	.171	.040	.060	.040	.470	.100	.285	.065	.225	.070	.020	$390.00
69	63-1504	.148	.171	.040	.060	.062	.470	.100	.285	.065	.225	.070	.020	390.00
70	63-1083	.148	.171	.046	.061	.040	.359	.140	.154	.065	.125	—	—	$400.00
70	63-1093	.148	.188	.046	.061	.040	.359	.140	.154	.065	.125	—	—	400.00
70	63-1506	.148	.172	.046	.060	.040	.531	.147	.334	.050	.250	—	—	400.00
70	63-1505	.203	.245	.046	.060	.040	.531	.147	.334	.050	.250	—	—	400.00
70	63-1510	.185	.250	.080	.100	.080	.437	.156	.216	.065	.187	—	—	$510.00
76	63-1001	.185	.218	.050	.115	.040	.687	.354	.287	.046	.250	.156	—	$290.00
76	63-1016	.185	.218	.050	.115	.050	.624	.354	.224	.046	.200	.156	—	290.00
76	63-1037	.185	.218	.050	.115	.050	.687	.330	.146	.187	.200	.156	—	290.00
76	63-1014	.185	.218	.050	.115	.050	.687	.354	.281	.052	.250	.156	—	290.00
76	63-1000	.185	.218	.050	.115	.050	.687	.354	.287	.046	.250	.156	—	290.00
76	63-1017	.185	.218	.050	.115	.060	.718	.316	.356	.046	.315	.156	—	$290.00
76	63-1015	.185	.218	.050	.115	.080	.687	.330	.146	.187	.187	.156	—	290.00
76	63-1002	.185	.218	.050	.115	.080	.687	.354	.287	.046	.250	.156	—	290.00
76	63-1085	.185	.218	—	.110	.080	.710	.354	.287	.070	.275	.156	.050	290.00
77	63-1052	.185	.218	.050	.115	.050	.620	.287	.287	.046	.250	.156	—	$290.00
77	63-1063	.185	.218	.050	.115	.080	.704	.354	.304	.046	.280	.156	—	290.00
97	63-1095	.148	.18	.040	.—	.040	.359	.140	.154	.065	.135	—	—	$400.00
98	63-1151	.185	.218	.055	.070	.050	.890	.150	.275	.046	.350	.090	—	$560.00

•Closed Entry Type

VERTICAL - FLOATING

FIG. No.	SMITH No.	DIMENSIONS A	B	C	D	E	L	M	N	O	P	Q	R	NET Per M
71	63-3018	.187	—	.066	—	.080	.376	.085	.281	—	.200	—	—	$500.00
71	63-3019	.187	—	.066	—	.080	.376	.085	.281	—	.200	—	—	500.00
71	63-3020	.187	—	.062	—	.080	.381	.090	.281	—	.250	—	—	500.00
71	63-3008	.218	—	.112	—	.080	.381	.080	.281	—	.250	—	—	500.00
71	63-3007	.218	—	.112	—	.080	.441	.078	.343	—	.250	—	—	500.00
72	63-3017	.187	—	.048	.056	.080	.391	.100	.281	.250	.250	—	—	$500.00
96	63-1073	.218	—	.050	—	.080	.585	.140	.430	—	.278	—	—	$390.00
78	63-1086	.185	—	—	.105	.050	.641	.354	.287	—	.204	—	—	$290.00
79	63-1034	.140	—	.046	.080	.025	.203	.060	.143	—	.075	.040	.010	$400.00
79	63-1009	.120	—	.046	.080	.040	.203	.060	.140	—	.075	.040	.010	400.00
79	63-1008	.140	—	.046	.080	.040	.203	.060	.140	—	.075	.040	.010	400.00
79	63-1039	.187	—	.046	.078	.090	1.000	.060	.940	—	.825	.040	.010	540.00
79	63-1038	.218	—	.046	.078	.090	1.000	.060	.940	—	.825	.040	.010	540.00

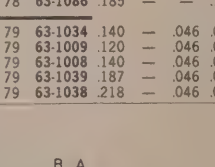


FIG. 73

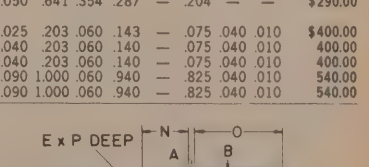


FIG. 74 & 75

RIGHT ANGLE - PRINTED CIRCUIT MOUNT

FIG. No.	SMITH No.	DIMENSIONS A	B	C	D	E	L	M	N	O	P	Q	R	RESALE Per M
73	63-1098	218	250	040	—	040	300	437	154	046	190	—	—	$570.00
73	63-1099	218	250	040	—	040	500	437	154	046	190	—	—	570.00
73	63-3000	218	250	050	080	080	400	250	316	.046	250	125	—	620.00
74	63-3003	187	218	050	080	080	400	140	.046	300	125	250	—	$620.00
74	63-3002	.187	218	.050	.080	.080	.500	.140	.046	.420	.125	.250	—	620.00
74	63-3004	187	218	040	080	080	520	140	.046	340	130	250	—	620.00
74	63-3005	187	218	035	080	080	400	140	.046	300	187	250	—	620.00
75	63-3009	.187	218	.050	.080	.080	.500	.140	.230	.425	.125	.500	—	$620.00

COLORS: Supplied in White (-101) unless otherwise specified. Ten colors available. PLATING: standard (-P1)

For COLOR CODE, PLATING SUFFIXES, and QUANTITY DISCOUNT SCHEDULE see SMITH PAGE 45 in this Directory.

SMITH TEFLON* TERMINALS

*Du Pont's registered trademark

FEED-THRUS

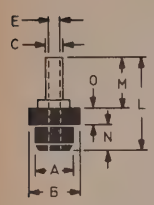


FIG. 48

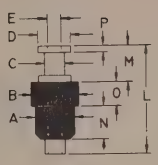


FIG. 49

FOR RAPID SELECTION:
terminals are listed (within figure groups) in ascending order of the MOST PERTINENT DIMENSION:

A = MIN. DIA. **B** = MAJ. DIA.
N = LGTH. OF MIN. DIA. **O** = LGTH. OF MAJ. DIA.
M = LGTH. OF PIN **C** = DIA. OF PIN
L = OVERALL LGTH.

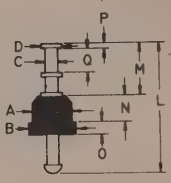


FIG. 42

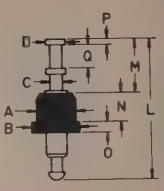


FIG. 43

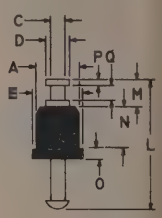


FIG. 44

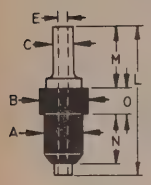


FIG. 50

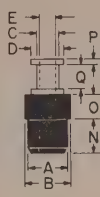


FIG. 52

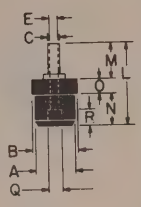


FIG. 54

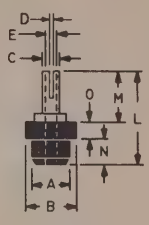


FIG. 51

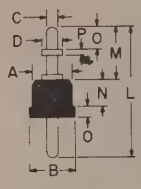


FIG. 46

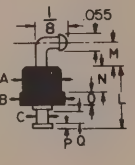


FIG. 47

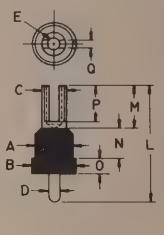


FIG. 64

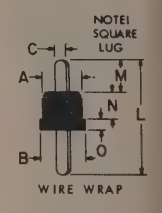


FIG. 101

SUB-MINIATURE TUBULAR

FIG. No.	SMITH No.	DIMENSIONS A	B	C	D	E	L	M	N	O	P	Q	R	NET Per M
48	82-1134	.093	.125	.040	—	.030	.215	.125	.050	.040	—	—	—	$180.00
1 48	*82-1040	.093	.125	.040	—	.030	.225	.125	.060	.040	—	—	—	180.00
48	82-1135	.093	.125	.040	—	.030	.312	.207	.060	.040	—	—	—	180.00
48	82-1115	.093	.125	.040	—	.030	.317	.187	.090	.040	—	—	—	180.00
48	82-1116	.093	.125	.040	—	.030	.405	.275	.090	.040	—	—	—	180.00
48	82-1161	.093	.125	.043	—	.030	.252	.100	.110	.040	—	—	—	180.00
2 48	*82-1037	.120	.130	.040	—	.030	.310	.207	.053	.050	—	—	—	$180.00
48	82-1036	.125	.150	.040	—	.030	.225	.125	.060	.040	—	—	—	$160.00
48	82-1151	.125	.150	.040	—	.030	.225	.126	.075	.025	—	—	—	160.00
48	82-1126	.125	.150	.040	—	.030	.247	.147	.075	.025	—	—	—	160.00
48	82-1124	.125	.150	.040	—	.030	.325	.125	.075	.125	—	—	—	160.00
48	82-1123	.148	.172	.040	—	.030	.245	.147	.053	.045	—	—	—	$170.00
48	82-1035	.148	.172	.040	—	.030	.250	.147	.053	.050	—	—	—	170.00
48	82-1034	.148	.172	.040	—	.030	.310	.207	.053	.050	—	—	—	170.00
48	82-1127	.148	.172	.080	—	.052	.193	.105	.063	.025	—	—	—	170.00
48	82-1090	.148	.172	.085	—	.063	.332	.207	.075	.050	—	—	—	170.00
48	82-1038	.148	.172	.040	—	.030	.296	.136	.100	.060	—	—	—	170.00
3 48	*82-1017	.148	.172	.085	—	.063	.367	.207	.110	.050	—	—	—	170.00
48	82-1091	.148	.172	.085	—	.070	.367	.207	.110	.050	—	—	—	170.00
48	82-1089	.148	.172	.085	—	.063	.413	.207	.156	.050	—	—	—	170.00
48	82-1039	.171	.218	.040	—	.030	.367	.207	.110	.050	—	—	—	$180.00
48	82-1041	.171	.218	.085	—	.063	.367	.207	.110	.050	—	—	—	180.00
48	82-1024	.200	.240	.085	—	.063	.367	.207	.110	.050	—	—	—	$190.00
49	82-1055	.148	.172	.040	—	.030	.296	.136	.100	.060	—	—	—	$240.00
50	82-1146	.082	.093	.040	—	.030	.375	.172	.148	.040	—	—	—	$190.00
52	82-1119	.093	.125	.040	.080	.030	.215	.125	.050	.040	.020	.093	—	$200.00
52	82-1120	.125	.150	.060	.090	.030	.293	.133	.060	.040	.020	.093	—	$170.00
52	82-1122	.125	.150	.060	.090	.030	.200	.090	.060	.050	.020	.093	—	170.00
52	82-1049	.125	.150	.060	.090	.030	.273	.133	.080	.060	.020	.093	—	170.00
52	82-1103	.125	.150	.060	.090	.030	.273	.133	.100	.040	.020	.093	—	170.00
52	82-1118	.125	.150	.060	.090	.030	.293	.133	.110	.050	.020	.093	—	170.00
52	82-1093	.148	.172	.060	.093	.040	.238	.133	.065	.040	.020	.093	—	$160.00
52	82-1054	.148	.172	.060	.090	.030	.273	.133	.100	.040	.020	.093	—	160.00
52	82-1050	.148	.172	.060	.090	.030	.303	.133	.100	.040	.020	.093	—	160.00
52	82-1051	.148	.172	.060	.090	.030	.333	.133	.110	.050	.020	.093	—	160.00
52	82-1096	.148	.172	.060	.093	.030	.293	.133	.110	.050	.020	.093	—	160.00
52	82-1016	.148	172	082	125	.063	.351	.133	.125	.093	.020	.093	—	160.00
52	82-1092	.148	.172	.060	.090	.030	.303	.133	.130	.040	.020	.093	—	160.00
52	82-1060	.148	.172	.060	.093	.042	.392	.162	.130	.100	.020	.130	—	160.00
52	82-1052	.171	.188	.082	.125	.062	.381	.133	.125	.093	.020	.093	—	$180.00
54	82-1046	.148	.172	.040	—	.030	.282	.147	.075	.060	—	.070	.042	$170.00
54	82-1085	.148	.172	.040	—	.030	.387	.207	.110	.050	—	.050	.050	170.00
54	82-2150	.148	.172	.072	—	.052	.606	.025	.220	.025	—	.062	.011	180.00
54	82-1088	.171	.218	.085	—	.063	.710	.500	.160	.040	—	.085	.050	$180.00
54	82-1047	.171	.218	.085	—	.063	.417	.207	.160	.050	—	.085	.050	170.00
54	82-1044	.200	.240	.040	—	.030	.367	.207	.110	.050	—	.050	.057	$170.00
54	82-1045	.218	.250	.060	—	.030	.287	.147	.100	.040	—	.050	.030	170.00
51	82-2015	.125	.150	.050	.030	.030	.160	.062	.073	.025	—	—	—	$280.00

*Made to meet MIL-T=55155 with dimensions as above	Smith No.	Mil. No.	NET Per M
	82-1040	(1) FT-05-09-B-01	$140.00
	82-1037	(2) FT-05-09-B-02	180.00
	82-1017	(3) FT-05-09-B-03	170.00

REVERSED SUB-MINIATURE TURRET

FIG. No.	SMITH No.	DIMENSIONS A	B	C	D	E	L	M	N	O	P	Q	R	NET Per M
42	28-1516	.093	.125	.040	.080	—	.500	.210	.100	.040	.020	.100	—	$140.00
42	28-1551	.116	.172	.040	.080	—	.500	.210	.100	.040	.020	.100	—	$150.00
42	28-1521	.125	.150	.040	.080	—	.500	.210	.060	.040	.020	.100	—	$140.00
42	28-1518	.148	.172	.040	.080	—	.500	.210	.060	.040	.020	.100	—	$140.00
42	28-1536	.148	.172	.040	.080	—	.685	.395	.065	.040	.020	.070	—	140.00
42	28-1539	.148	.172	.040	.080	—	.438	.210	.083	.040	.020	.100	—	140.00
42	28-1509	.148	.172	.040	.080	—	.438	.210	.100	.040	.020	.100	—	140.00
42	28-1500	.148	.172	.040	.080	—	.500	.210	.100	.040	.020	.100	—	140.00
42	28-1537	.148	.172	.040	.080	—	.550	.245	.125	.040	.020	.100	—	175.00
42	28-1512	.148	.172	.040	.080	—	.609	.210	.125	.093	.020	.100	—	150.00
42	28-1527	.148	.172	.040	.080	—	.609	.210	.158	.060	.020	.100	—	150.00
42	28-1501	.148	.172	.040	.080	—	.500	.210	.165	.040	.020	.100	—	150.00
42	28-1550	.148	.172	.040	.080	—	.531	.210	.165	.040	.020	.100	—	180.00
42	28-1532	.148	.172	.040	.080	—	.609	.210	.165	.040	.020	.100	—	150.00
42	28-1538	.148	.172	.040	.080	—	.812	.210	.165	.040	.020	.100	—	150.00
42	28-1546	.152	.172	.047	.093	—	.437	.156	.088	.040	.020	.047	—	$150.00
42	28-1547	.152	.172	.047	.093	—	.437	.156	.100	.040	.020	.047	—	150.00
42	28-1514	.152	.172	.047	.093	—	.500	.156	.150	.040	.020	.047	—	150.00
42	28-1502	.179	.200	.040	.080	—	.500	.210	.100	.040	.020	.100	—	$160.00
42	28-1515	.185	.218	.040	.080	—	.438	.210	.100	.040	.020	.100	—	$155.00
42	28-1534	.185	.218	.040	.080	—	.609	.210	.125	.093	.020	.100	—	155.00
43	28-1504	.148	.172	.040	.080	—	.531	.210	.100	.040	.020	.100	—	$150.00
43	28-1523	.148	.172	.040	.080	—	.531	.210	.100	.040	.020	.100	—	150.00
43	28-1505	.148	.172	.040	.080	—	.531	.210	.125	.040	.020	.100	—	170.00
43	28-1520	.175	.218	.040	.080	—	.531	.210	.100	.040	.020	.100	—	$190.00
43	28-1506	.185	.218	.040	.080	—	.531	.210	.100	.040	.020	.100	—	$190.00
43	28-1507	.185	.218	.040	.080	—	.531	.210	.125	.040	.020	.100	—	190.00
44	28-1540	.093	.125	.040	.080	—	.350	.125	.100	.040	.020	.085	—	$140.00
44	28-1524	.125	.150	.040	.080	—	.350	.125	.060	.040	.020	.095	—	$160.00
44	28-1558	.148	.172	.040	.080	—	.380	.090	.100	.040	.020	.060	—	$150.00
44	28-1510	.148	.172	.040	.080	—	.443	.093	.100	.040	.020	.062	—	150.00
44	28-1513	.148	.172	.040	.080	—	.350	.125	.100	.040	.020	.094	—	140.00
44	28-1137	.148	.172	.040	.080	—	.450	.190	.100	.040	.020	.160	—	170.00
44	28-1581	.148	.172	.040	.080	—	.520	.190	.100	.040	.020	.160	—	150.00
44	28-1557	.148	.172	.040	.080	—	.640	.250	.125	.040	.020	.210	—	150.00
44	28-1549	.148	.172	.040	.093	—	.781	.078	.125	.040	.015	.062	—	150.00
44	28-1542	.148	.172	.040	.080	—	.493	.093	.170	.020	.020	.063	—	150.00
44	28-1511	.148	.172	.040	.080	—	.493	.093	.180	.040	.020	.062	—	150.00
44	28-1525	.172	.200	.048	.090	—	.500	.120	.125	.075	.020	.080	—	$160.00
44	28-1541	.172	.200	.080	.125	—	.500	.120	.125	.075	.020	.080	—	170.00
44	28-1143	.263	.312	.050	.093	—	.781	.078	.100	.040	.015	—	—	$190.00
46	28-1545	.148	.172	.040	.080	—	.500	.210	.100	.040	.020	.120	—	$175.00
47	28-1598	.148	.172	.040	.080	—	.240	.109	.100	.040	.020	.062	—	$210.00
64	28-2050	.148	.172	.125	.040	.062	.495	.190	.125	.060	.140	.042	—	$230.00
101	28-1140	.172	.187	.050	—	—	1.060	.500	.187	.100	—	—	—	160.00

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FEED-THRUS

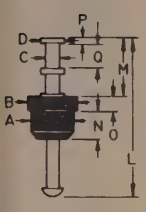


FIG. 37

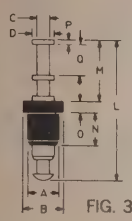


FIG. 38

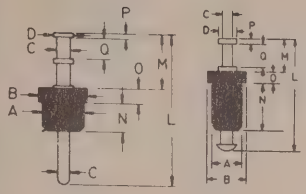


FIG. 39

FIG. 40

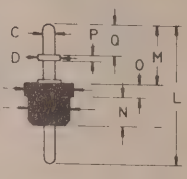


FIG. 41

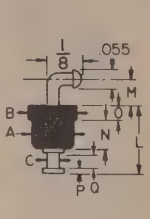


FIG. 45

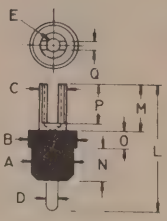


FIG. 87

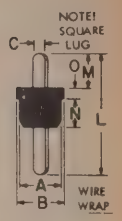


FIG. 100

FOR RAPID SELECTION: terminals are listed (within figure groups) in ascending order of the MOST PERTINENT DIMENSION:

A = MIN. DIA.
B = MAJ. DIA.
N = LGTH. OF MIN. DIA.
O = LGTH. OF MAJ. DIA.
M = LGTH. OF PIN
C = DIA. OF PIN
L = OVERALL LGTH.

SUB-MINIATURE TURRET

FIG. No.	SMITH No.	DIMENSIONS A	B	C	D	E	L	M	N	O	P	Q	R	NET Per M
1 37	*82-1516	.093	.125	.040	.080	—	.500	.210	.100	.040	.020	.100	—	$140.00
37	82-1551	.116	.172	.040	.080	—	.500	.210	.100	.040	.020	.100	—	$150.00
37	82-1521	.125	.150	.040	.080	—	.500	.210	.060	.040	.020	.100	—	$140.00
37	82-1518	.148	.172	.040	.080	—	.500	.210	.060	.040	.020	.100	—	$140.00
37	82-1536	148	172	040	080	—	685	395	065	040	020	070	—	140.00
37	82-1539	.148	.172	.040	.080	—	.438	.210	.083	.040	.020	.100	—	140.00
37	82-1509	148	172	040	080	—	438	210	100	040	020	100	—	140.00
37	82-1500	.148	.172	.040	.080	—	.500	.210	.100	.040	.020	.100	—	140.00
37	82-1537	.148	.172	.040	.080	—	.550	.245	.125	.040	.020	.100	—	140.00
37	82-1512	.148	.172	.040	.080	—	.609	.210	.125	.093	.020	.100	—	140.00
37	82-1527	.148	.172	.040	.080	—	.609	.210	.158	.060	.020	.100	—	140.00
37	82-1501	.148	.172	.040	.080	—	.500	.210	.165	.040	.020	.100	—	140.00
37	82-1550	.148	.172	.040	.080	—	.531	.210	.165	.040	.020	.100	—	150.00
37	82-1532	.148	.172	.040	.080	—	.609	.210	.165	.040	.020	.100	—	150.00
37	82-1538	.148	.172	.040	.080	—	.812	.210	.165	.040	.020	.100	—	150.00
2 37	*82-1597	.148	.172	.040	.080	—	.500	.210	.100	.040	.020	.100	—	160.00
37	82-1546	.152	.172	.047	.093	—	.437	.155	.088	.040	.020	.047	—	$150.00
37	82-1547	.152	.172	.047	.093	—	.437	.156	.100	.040	.020	.047	—	150.00
37	82-1514	.152	.172	.047	.093	—	.500	.156	.150	.040	.020	.047	—	150.00
37	82-1502	.179	.200	.040	.080	—	.500	.210	.100	.040	.020	.100	—	$150.00
37	82-1515	.185	.218	.040	.080	—	.438	.210	.100	.040	.020	.100	—	$150.00
37	82-1534	.185	.218	.040	.080	—	.609	.210	.125	.093	.020	.100	—	150.00
38	82-1504	148	172	040	080	—	531	210	100	040	020	100	—	$170.00
38	82-1505	.148	.172	.040	.080	—	.531	.210	.125	.040	.020	100	—	170.00
38	82-1520	.175	.218	.040	.080	—	.531	.210	.100	.040	.020	.100	—	$170.00
38	82-1506	.185	.218	.040	.080	—	.531	.210	.100	.040	.020	.100	—	$170.00
38	82-1507	.185	.218	.040	.080	—	.531	.210	.125	.040	.020	.100	—	170.00
39	82-1523	148	172	040	080	—	.531	.210	.100	.040	.020	.100	—	$140.00
40	82 1540	093	125	040	.080	—	350	125	100	040	020	085	—	$140.00
40	82-1524	.125	.150	.040	.080	—	.350	.125	.060	.040	.020	.095	—	$140.00
40	82-1558	148	172	040	080	—	380	090	100	040	020	060	—	$140.00
40	82-1510	.148	.172	.040	.080	—	.443	.093	.100	.040	.020	.062	—	140.00
40	82-1513	.148	.172	.040	.080	—	.350	.125	.100	.040	.020	.094	—	140.00
40	82-1570	.148	.172	.040	.093	—	385	160	100	.040	.020	130	—	150.00
40	82-1137	148	172	040	080	—	450	190	100	040	020	160	—	145.00
40	82-1581	148	172	040	080	—	520	190	100	040	020	160	—	140.00
40	82-1557	.148	.172	.040	.080	—	.640	.250	.125	.040	.020	.210	—	150.00
40	82-1549	.148	.172	.040	.080	—	.500	.120	.130	.040	.020	.080	—	150.00
40	82-1542	.148	.172	.040	.080	—	.493	.093	.170	.020	.020	.063	—	150.00
40	82-1511	.148	.172	.040	.080	—	.493	.093	.180	.040	.020	.062	—	150.00
40	82-1525	.172	.200	.048	.090	—	.500	.120	.125	.075	.020	.080	—	$160.00
40	82-1541	.172	.200	.080	.125	—	.500	.120	.125	.075	.020	.080	—	170.00
40	82-1143	.263	.312	050	093	—	781	078	100	040	015	—	—	$190.00
41	82-1545	148	172	040	080	—	500	.210	.100	.040	.020	.120	—	$175.00
45	82-1598	.148	.172	.040	.080	—	.350	.097	.100	.040	.020	.062	—	$210.00
87	82-2050	148	172	125	040	062	495	190	125	060	140	042	—	230.00
100	82-1140	172	187	050	—	—	1 060	500	187	100	—	—	—	160.00

*Made to meet MIL-T-55155 with dimensions as above	Smith No.	Mil. No.	NET Per M
	82-1516	(1) FT 04-09-B-03	$140.00
	82-1597	(2) FT-04-09-B-01	160.00

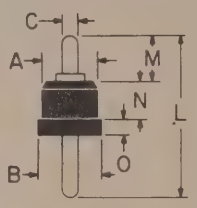


FIG 36

REVERSED SUB-MINIATURE STRAIGHT PIN

FIG. No.	SMITH No.	DIMENSIONS A	B	C	D	E	L	M	N	O	P	Q	R	NET Per M
36	28-1023	.093	.125	.040	—	—	.375	.147	.075	.040	—	—	—	$140.00
36	28-1025	.093	.125	.040	—	—	.335	.125	.100	.040	—	—	—	140.00
36	28-1076	.093	.125	.040	—	—	.453	.156	.100	.040	—	—	—	160.00
36	28-1022	.093	.125	.040	—	—	.515	.210	.100	.040	—	—	—	160.00
36	28-1077	.093	.125	.040	—	—	.987	.687	.100	.040	—	—	—	170.00
36	28-1031	.125	.150	.040	—	—	.335	.125	.060	.040	—	—	—	145.00
36	28-1032	.125	.150	.040	—	—	.350	.187	.060	.040	—	—	—	145.00
36	28-1018	.125	.150	.040	—	—	.515	.210	.060	.040	—	—	—	$145.00
36	28-1002	.148	.172	.040	—	—	.515	.210	.050	.050	—	—	—	$160.00
36	28-1075	.148	.172	.040	—	—	.325	.075	.100	.040	—	—	—	150.00
36	28-1080	148	172	040	—	—	443	093	100	040	—	—	—	150.00
36	28-1021	.148	.172	.040	—	—	.375	125	.100	.040	—	—	—	150.00
36	28-1000	.148	.172	.040	—	—	.443	.210	.100	.040	—	—	—	150.00
36	28-1003	.148	.172	.040	—	—	.515	.210	.100	.040	—	—	—	150.00
36	28-1068	.148	.172	.040	—	—	.562	.210	.100	.040	—	—	—	150.00
36	28-1010	148	172	040	—	—	725	210	100	040	—	—	—	160.00
36	28-1011	.148	.172	.040	—	—	1.000	.210	.100	.040	—	—	—	160.00
36	28-1084	.148	.172	.045	—	—	.585	.320	.100	.040	—	—	—	150.00
36	28-1033	.148	.172	.040	—	—	.890	.625	.100	.040	—	—	—	160.00
36	28-1069	.148	.172	.040	—	—	.431	.106	.110	.050	—	—	—	140.00
36	28-1001	.148	.172	.040	—	—	.410	.147	.110	.050	—	—	—	140.00
36	28-1004	.148	.172	.040	—	—	.535	.210	.110	.050	—	—	—	140.00
36	28-1007	148	172	040	—	—	535	210	120	040	—	—	—	140.00
36	28-1028	.148	.172	.040	—	—	.407	.125	.132	.040	—	—	—	140.00
36	28-1086	.148	.172	.040	—	—	2.500	.175	.132	.040	—	—	—	150.00
36	28-1027	.148	.172	.040	—	—	.515	.210	.132	.040	—	—	—	140.00
36	28-1008	.148	.172	.040	—	—	.535	.210	.132	.040	—	—	—	150.00
36	28-1009	.148	.172	.040	—	—	.535	.210	.160	.040	—	—	—	150.00
36	28-1081	.148	.172	.040	—	—	.535	.210	.160	.040	—	—	—	150.00
36	28-1030	148	172	040	—	—	571	210	160	040	—	—	—	150.00
36	28-1063	148	172	040	—	—	630	210	170	040	—	—	—	150.00
36	28-1064	.148	.172	.040	—	—	.630	.210	.170	.040	—	—	—	150.00
36	28-1065	.148	.172	.040	—	—	.630	.210	.217	.040	—	—	—	160.00
36	28-1067	.148	.172	.040	—	—	.725	.210	.250	.040	—	—	—	160.00
36	28-1026	.157	.172	.040	—	—	.515	.210	.100	.040	—	—	—	$140.00
36	28-1073	.169	.218	.049	—	—	.250	.125	.100	.040	—	—	—	$210.00
36	28-1072	.169	.218	.049	—	—	.937	.125	.100	.040	—	—	—	210.00
36	28-1071	.169	.218	.049	—	—	1.875	.125	.100	.040	—	—	—	210.00
36	28-1013	169	219	040	—	—	2.500	460	100	040	—	—	—	250.00
36	28-1014	.169	.219	.040	—	—	2.500	.460	.100	.040	—	—	—	250.00
36	28-1082	.171	.218	.040	—	—	1.090	.680	.110	.050	—	—	—	$210.00
36	28-1012	.171	.218	.040	—	—	2.000	.680	.110	.050	—	—	—	250.00
36	28-1015	172	195	040	—	—	515	210	100	040	—	—	—	$140.00
36	28-1070	172	195	040	—	—	560	210	100	040	—	—	—	150.00
36	28-1005	.179	.200	.040	—	—	.515	.210	.100	.040	—	—	—	$140.00
36	28-1006	218	250	040	—	—	515	210	100	040	—	—	—	$150.00

ORS: SUPPLIED IN WHITE (-101) UNLESS OTHERWISE SPECIFIED COLORS OTHER THAN WHITE (-101). MINIMUM 1000 PIECES EXCEPT "63" SERIES TEN COLORS AVAILABLE
ING Standard (-P12) For COLOR CODE, PLATING SUFFIXES, and QUANTITY DISCOUNT SCHEDULE see SMITH PAGE 45 in this Directory.

T'S SOUND PLANNING TO SPECIFY SMITH WHEN DESIGNING OR PURCHASING

H. H. SMITH TEFLON* TERMINALS

*Du Pont's registered trademark

FEED-THRUS

FIG. 55

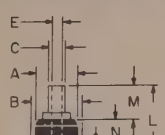


FIG. 56

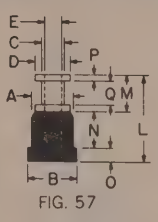


FIG. 57

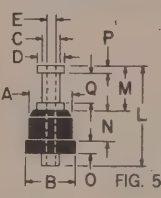


FIG. 58

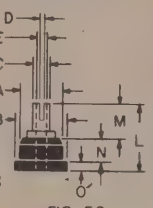


FIG. 53

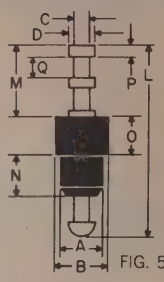


FIG. 59

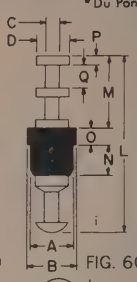


FIG. 60

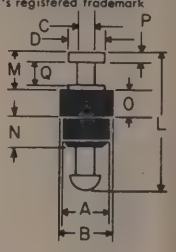


FIG. 61

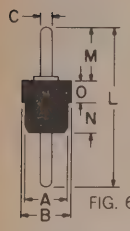


FIG. 62

FOR RAPID SELECTION: terminals are listed (within figure groups) in ascending order of the MOST PERTINENT DIMENSION:

A = MIN. DIA.
B = MAJ. DIA.
N = LGTH. OF MIN. DIA.
O = LGTH. OF MAJ. DIA.
M = LGTH. OF PIN
C = DIA. OF PIN
L = OVERALL LGTH.

MINIATURE

FIG. No.	SMITH No.	A	B	C	D	E	L	M	N	O	P	Q	R	NET Per M
59	83-1509	.148	.172	.040	.093	—	.836	.250	.165	.187	.020	.095	—	$190.00
59	83-1510	.148	.172	.040	.093	—	.836	.250	.230	.125	.020	.095	—	190.00
59	83-1530	.148	.172	.040	.080	—	.812	.210	.287	.046	.020	.100	—	190.00
1. 59	83-1597	.148	.172	.040	.093	—	.836	.250	.230	.125	.020	.093		$200.00
59	83-1544	.161	.187	.050	.093	—	.836	.250	.212	.187	.020	.093	—	$190.00
59	83-1524	.171	.187	.050	.093	—	.836	.250	.150	.250	.020	.093	—	$200.00
59	83-1511	.171	.187	.050	.093	—	.836	.250	.212	.187	.020	.095	—	200.00
59	83-1553	.171	.187	.050	.093	—	1.337	.281	.400	.375	.031	.093	—	250.00
59	83-1512	.204	.250	.040	.093	—	.836	.250	.212	.187	.020	.093	—	$200.00
59	83-1513	.230	.250	.040	.093	—	.836	.250	.212	.187	.020	.093	—	$200.00
59	83-1501	.234	.250	.040	.080	—	.500	.210	.100	.040	.020	.100	—	$180.00
59	83-1500	.264	.312	.040	.080	—	.531	.210	.100	.040	.020	.100	—	$170.00
60	83-1516	.171	.187	.062	.125	—	.828	.281	.200	.125	.031	.093	—	$180.00
60	83-1515	.185	.218	.062	.125	—	.828	.281	.210	.094	.031	.093	—	$190.00
60	83-1542	.185	.218	.062	.125	—	.828	.281	.212	.187	.031	.093	—	190.00
60	83-1570	.218	.250	.062	.125	—	.828	.281	.212	.050	.031	.093	—	$190.00
60	83-1571	.218	.250	.062	.125	—	.828	.281	.310	.050	.031	.093	—	190.00
61	83-1540	.171	.187	.050	.093	—	.740	.125	.125	.187	.020	.093	—	$180.00
61	83-1505	.171	.187	.050	.093	—	.740	.125	.150	.250	.031	.062	—	180.00
61	83-1502	.171	.187	.046	.093	—	.540	.133	.171	.063	.020	.093	—	160.00
61	83-1504	.171	.187	.050	.093	—	.740	.125	.212	.187	.031	.062	—	160.00
61	83-1521	.171	.187	.050	.125	—	1.115	.125	.212	.562	.031	.062	—	240.00
61	83-1506	.171	.187	.050	.093	—	.865	.125	.275	.250	.031	.062	—	180.00
61	83-1551	.171	.187	.050	.093	—	1.115	.125	.318	.365	.031	.062	—	240.00
61	83-1552	.171	.187	.050	.093	—	1.115	.125	.340	.375	.031	.062	—	240.00
61	83-1507	.171	.187	.050	.125	—	1.115	.125	.400	.375	.031	.062	—	230.00
61	83-1520	.171	.250	.050	.093	—	.740	.125	.212	.187	.031	.062	—	200.00
61	83-1522	.171	.250	.050	.125	—	1.365	.125	.525	.500	.031	.062	—	250.00
61	83-1523	.171	.250	.050	.125	—	1.965	.125	.825	.800	.031	.062	—	390.00
61	83-1503	.185	.215	.046	.093	—	.640	.133	.210	.093	.020	.093	—	$160.00
61	83-1519	.185	.215	.046	.093	—	.718	.133	.288	.093	.020	.093	—	170.00
61	83-1508	.217	.250	.050	.125	—	1.365	.125	.525	.500	.031	.062	—	$310.00
61	83-1514	.217	.250	.050	.125	—	1.965	.125	.825	.800	.031	.062	—	350.00
62	83-1002	.148	.172	.040	—	—	.619	.187	.105	.140	—	—	—	$180.00
2.62 *	83-1000	.165	.187	.040	—	—	.675	.200	.150	.125	—	—	—	$170.00
62	83-1001	.165	.187	.040	—	—	.710	.210	.150	.125	—	—	—	180.00
62	83-1003	.171	.187	.046	—	—	.540	.133	.171	.063	—	—	—	$180.00
62	83-1004	.171	.187	.063	—	—	.740	.125	.212	.187	—	—	—	180.00
62	83-1005	.171	.187	.050	—	—	.865	.125	.275	.250	—	—	—	180.00
63	83-1531	.171	.312	.125	.188	—	.506	.099	.171	.063	.020	.048	—	200.00
63	83-1532	.171	.312	.046	.093	—	.540	.133	.171	.063	.020	.093	—	250.00
65	83-1525	.218	.250	.062	.125	—	1.187	.281	.375	.250	.031	.093	—	$380.00
65	83-1526	.218	.250	.062	.125	—	1.687	.281	.625	.500	.031	.093	—	380.00
65	83-1527	.218	.250	.062	.125	—	2.287	.281	.925	.800	.031	.093	—	490.00
66	83-2050	.148	.172	.062	.125	—	.495	.190	.125	.060	.140	.042	—	$220.00
66	83-2031	.171	.187	.078	.148	—	.593	.203	.150	.100	.156	.046	—	$250.00
66	83-2001	.171	.187	.046	.148	—	.821	.203	.212	.187	.156	.030	—	250.00
66	83-2000	.171	.187	.078	.148	—	.821	.203	.212	.187	.156	.046	—	250.00
66	83-2003	.171	.187	.046	.148	—	.947	.203	.275	.250	.156	.030	—	250.00
66	83-2002	.171	.187	.078	.148	—	.947	.203	.275	.250	.156	.046	—	250.00
66	83-2005	.171	.187	.046	.148	—	1.197	.203	.400	.375	.156	.030	—	250.00
66	83-2004	.171	.187	.078	.148	—	1.197	.203	.400	.375	.156	.046	—	250.00
66	83-2007	.171	.187	.078	.148	—	1.197	.203	.525	.250	.156	.046	—	250.00
66	83-2006	.171	.187	.078	.148	—	1.197	.203	.550	.225	.156	.046	—	250.00
66	83-2034	.218	.250	.086	.156	—	.828	.281	.310	.050	.200	—	—	$250.00
67	83-2500	.171	.187	.050	—	4-36	.899	.281	.212	.187	—	—	—	$260.00
67	83-2502	.171	.187	.050	—	4-36	1.024	.281	.275	.250	—	—	—	260.00
67	83-2504	.171	.187	.050	—	4-36	1.274	.281	.400	.375	—	—	—	260.00
67	83-2501	.171	.187	.050	—	4-40	.899	.281	.212	.187	—	—	—	260.00
67	83-2503	.171	.187	.050	—	4-40	1.024	.281	.275	.250	—	—	—	260.00
67	83-2505	.171	.187	.050	—	4-40	1.274	.281	.400	.375	—	—	—	260.00

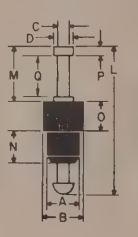


FIG. 63

FIG. 65

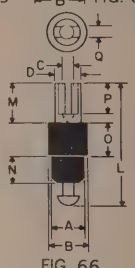


FIG. 66

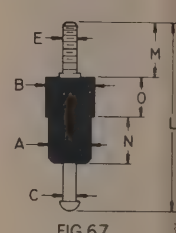


FIG.67

REVERSED SUB-MINIATURE TUBULAR

FIG. No.	SMITH No.	A	B	C	D	E	L	M	N	O	P	Q	R	NET Per M
55	28-1046	.148	.172	.040	—	.030	.282	.147	.075	.060	—	.070	.042	$180.00
55	28-1085	.148	.172	.040	—	.030	.387	.207	.110	.050	—	.050	.050	180.00
55	28-1150	.148	.172	.072	—	.052	.606	.025	.220	.025	—	.062	.011	180.00
55	28-1088	.171	.218	.085	—	.063	.710	.500	.160	.040	—	.085	.050	$190.00
55	28-1047	.171	.218	.085	—	.063	.417	.207	.160	.050	—	.085	.050	190.00
55	28-1044	.200	.240	.040	—	.030	.367	.207	.110	.050	—	.050	.057	$200.00
55	28-1045	.218	.250	.060	—	.030	.287	.147	.100	.040	—	.050	.030	$200.00
56	28-1134	.093	.125	.040	—	.030	.215	.125	.050	.040	—	—	—	$180.00
56	28-1040	.093	.125	.040	—	.030	.225	.125	.060	.040	—	—	—	180.00
56	28-1135	.093	.125	.040	—	.030	.312	.207	.060	.040	—	—	—	180.00
56	28-1115	.093	.125	.040	—	.030	.317	.187	.090	.040	—	—	—	180.00
56	28-1116	.093	.125	.040	—	.030	.405	.275	.090	.040	—	—	—	180.00
56	28-1161	.093	.125	.043	—	.030	.252	.100	.110	.040	—	—	—	180.00
56	28-1037	.120	.130	.040	—	.030	.310	.207	.053	.050	—	—	—	$170.00
3.56	28-1042	.125	.150	.050	—	.030	.193	.105	.063	.025	—	—	—	190.00
56	28-1036	.125	.150	.040	—	.030	.225	.125	.060	.040	—	—	—	$190.00
56	28-1151	.125	.150	.040	—	.030	.225	.126	.075	.025	—	—	—	190.00
56	28-1126	.125	.150	.040	—	.030	.247	.147	.075	.025	—	—	—	190.00
56	28-1124	.125	.150	.040	—	.030	.325	.125	.075	.125	—	—	—	190.00
56	28-1123	.148	.172	.040	—	.030	.245	.147	.053	.045	—	—	—	$180.00
56	28-1035	.148	.172	.040	—	.030	.250	.147	.053	.050	—	—	—	180.00
56	28-1034	.148	.172	.040	—	.030	.310	.207	.053	.050	—	—	—	180.00
56	28-1127	.148	.172	.080	—	.052	.193	.105	.063	.025	—	—	—	180.00
56	28-1090	.148	.172	.085	—	.063	.332	.207	.075	.050	—	—	—	180.00
56	28-1038	.148	.172	.040	—	.030	.296	.136	.100	.060	—	—	—	180.00
4.56	28-1017	.148	.172	.085	—	.063	.367	.207	.110	.050	—	—	—	180.00
56	28-1091	.148	.172	.085	—	.070	.367	.207	.110	.050	—	—	—	180.00
56	28-1089	.148	.172	.085	—	.063	.413	.207	.156	.050	—	—	—	180.00
56	28-1039	.171	.218	.040	—	.030	.367	.207	.110	.050	—	—	—	$190.00
56	28-1041	.171	.218	.085	—	.063	.367	.207	.110	.050	—	—	—	190.00
56	28-1024	.200	.240	.085	—	.063	.367	.207	.110	.050	—	—	—	$200.00
57	28-1119	.093	.125	.040	.080	.030	.215	.125	.050	.040	.020	.093	—	$200.00
57	28-1120	.125	.150	.060	.090	.030	.293	.133	.060	.040	.020	.093	—	$170.00
57	28-1122	.125	.150	.060	.090	.030	.200	.090	.060	.050	.020	.093	—	170.00
57	28-1049	.125	.150	.060	.090	.030	.273	.133	.080	.060	.020	.093	—	170.00
57	28-1103	.125	.150	.060	.090	.030	.273	.133	.100	.040	.020	.093	—	170.00
57	28-1118	.125	.150	.060	.090	.030	.293	.133	.110	.050	.020	.093	—	170.00
57	28-1093	.148	.172	.060	.093	.040	.238	.133	.065	.040	.020	.093	—	$180.00
57	28-1054	.148	.172	.060	.090	.030	.273	.133	.100	.040	.020	.093	—	180.00
57	28-1096	.148	.172	.060	.093	.030	.293	.133	.110	.050	.020	.093	—	180.00
57	28-1016	.148	.172	.082	.125	.063	.351	.133	.125	.093	.020	.093	—	180.00
57	28-1092	.148	.172	.060	.090	.030	.303	.133	.130	.040	.020	.093	—	180.00
57	28-1060	.148	.172	.060	.093	.042	.392	.162	.130	.100	.020	.130	—	180.00
57	28-1052	.171	.188	.082	.125	.062	.381	.133	.125	.093	.020	.093	—	$175.00
57	28-1048	.263	.297	.060	.090	.030	.333	.133	.160	.040	.020	.093	—	$200.00
58	28-1050	.148	.172	.060	.090	.030	.303	.133	.100	.040	.020	.093	—	$190.00
58	28-1051	.148	.172	.060	.090	.030	.333	.133	.110	.050	.020	.093	—	190.00
53	28-2015	.125	.150	.050	.030	.030	.160	.062	.073	.025	—	—	—	$290.00

*Made to meet MIL-T-55155 with dimensions as above	Smith No.	Mil. No.	NET Per M
	83-1597	(1) FT-04-9-B-02	$200.00
	83-1000	(2) FT-03-9-B-03	170.00
	28-1042	(3) FT-06-9-B-01	190.00
	28-1017	(4) FT-06-9-B-02	180.00

COLORS: SUPPLIED IN WHITE (-101) UNLESS OTHERWISE SPECIFIED COLORS OTHER THAN WHITE (-101). MINIMUM 1000 PIECES EXCEPT "63" SERIES TEN COLORS AVAILABLE PLATING Standard (-P12)

For COLOR CODE, PLATING SUFFIXES, and QUANTITY DISCOUNT SCHEDULE see SMITH PAGE 45 in this Directory.

IT'S SOUND PLANNING TO "SPECIFY SMITH" WHEN DESIGNING OR PURCHASING

TEFLON* TERMINALS SMITH

*Du Pont's registered trademark

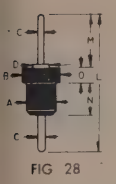


FIG 28

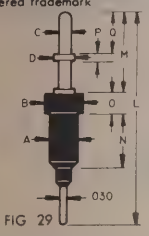


FIG 29

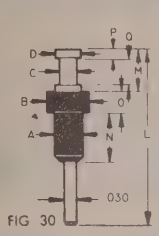


FIG 30

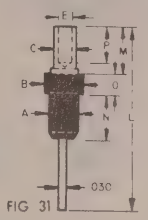


FIG 31

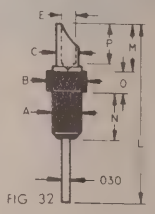


FIG 32

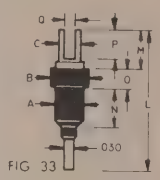


FIG 33

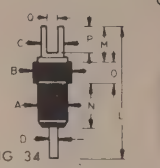


FIG 34

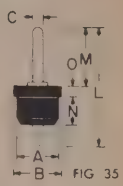


FIG 35

FEED-THRU MICRO-MINIATURE

Miniature
Micro-Miniature

FOR RAPID SELECTION: terminals are listed (within figure groups) in ascending order of the MOST PERTINENT DIMENSION:

A = MIN. DIA.
B = MAJ. DIA.
N = LGTH. OF MIN. DIA.
O = LGTH. OF MAJ. DIA.
M = LGTH. OF PIN
C = DIA. OF PIN
L = OVERALL LGTH.

FIG. No.	SMITH No.	DIMENSIONS A	B	C	D	E	L	M	N	O	P	Q	R	RESALE Per M
28	81-1019	.058	.093	.018	.062	—	.450	.200	.060	.020	—	—	—	$320.00
28	81-1016	.075	.093	.030	.060	—	.550	.275	.100	.040	—	—	—	$320.00
29	81-1515	.075	.093	.032	.060	—	1.500	.210	.100	.040	.020	.100	—	$330.00
29	81-1514	.075	.093	.030	.060	—	1.500	.210	.125	.040	.020	.100	—	330.00
29	81-1513	.075	.093	.032	.060	—	1.500	.210	.125	.040	.020	.100	—	330.00
29	81-1516	.075	.093	.032	.060	—	1.700	.210	.125	.090	.020	.100	—	350.00
30	81-1506	.075	.093	.040	.060	—	.250	.090	.060	.030	.020	.050	—	$280.00
30	81-1505	.075	.093	.040	.060	—	.510	.100	.100	.040	.020	.060	—	280.00
31	81-1007	.075	.093	.060	—	.040	.588	.125	.100	.040	.080	—	—	370.00
32	81-1009	.075	.093	.060	—	.040	.588	.120	.100	.040	.080	—	—	$390.00
33	81-2002	.075	.093	.060	—	—	.471	.100	.090	.040	.080	.024	—	$260.00
33	81-2000	.075	.093	.060	—	—	.510	.100	.090	.040	.080	.024	—	260.00
33	81-2001	.075	.093	.060	—	—	.635	.225	.090	.040	.075	.024	—	260.00
34	81-2005	.075	.093	.060	—	—	.320	.100	.100	.040	.080	.024	—	$260.00
34	81-2003	.075	.093	.060	—	—	.510	.100	.100	.040	.080	.024	—	260.00
34	81-2004	.075	.093	.060	—	—	.525	.100	.100	.040	.080	.024	—	260.00
34	81-2016	.075	.093	.060	—	—	.320	.100	.125	.040	.080	.024	—	260.00
34	81-2017	.075	.093	.066	—	—	.320	.100	.125	.040	.080	.024	—	260.00

METAL HEX STAND-OFFS

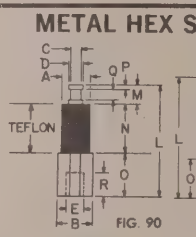


FIG. 90

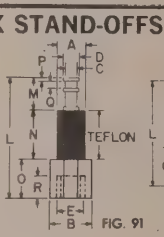


FIG. 91

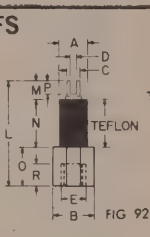


FIG 92

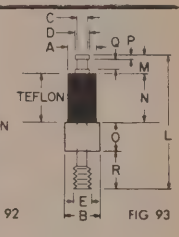


FIG 93

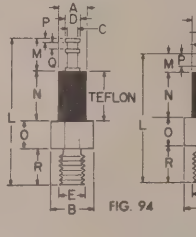


FIG. 94

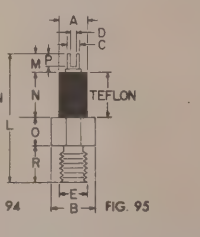


FIG. 95

R = LGTH. OF THD.
B = DIA. OF HEX
L = OVERALL LGTH.
O = LGTH. OF HEX
N = LGTH. OF TEFLON
A = DIA. OF TEFLON

* Made to meet MIL-T-55155.

(1)	FT-03-09-B-04
(2)	FT-03-09-B-01
(3)	FT-03-09-B-02

FEED-THRU SUB-MINIATURE STRAIGHT PIN

FIG. No.	SMITH No.	DIMENSIONS A	B	C	D	E	L	M	N	O	P	Q	R	NET Per M
35	82-1023	.093	.125	.040	—	—	.375	.147	.075	.040	—	—	—	$140.00
35	82-1025	.093	.125	.040	—	—	.337	.125	.100	.040	—	—	—	140.00
35	82-1076	.093	.125	.040	—	—	.453	.156	.100	.040	—	—	—	160.00
35	*82-1022	.093	.125	.040	—	—	.515	.210	.100	.040	—	—	—	160.00
35	82-1077	.093	.125	.040	—	—	.987	.687	.100	.040	—	—	—	170.00
35	82-1031	.125	.150	.040	—	—	.335	.125	.060	.040	—	—	—	$145.00
35	82-1032	.125	.150	.040	—	—	.350	.187	.060	.040	—	—	—	145.00
35	82-1018	.125	.150	.040	—	—	.515	.210	.060	.040	—	—	—	145.00
35	82-1002	.148	.172	.040	—	—	.515	.210	050	.050	—	—	—	$160.00
35	82-1075	.148	.172	.040	—	—	.325	.075	100	.040	—	—	—	150.00
35	82-1080	.148	.172	.040	—	—	.443	.093	100	.040	—	—	—	150.00
35	*82-1021	.148	.172	.040	—	—	.375	125	.100	.040	—	—	—	150.00
35	82-1000	.148	.172	.040	—	—	.443	.210	.100	.040	—	—	—	150.00
35	*82-1003	.148	.172	.040	—	—	.515	.210	.100	.040	—	—	—	150.00
35	82-1068	.148	.172	.040	—	—	.562	.210	.100	.040	—	—	—	150.00
35	82-1010	.148	.172	.040	—	—	.725	.210	.100	.040	—	—	—	160.00
35	82-1011	.148	.172	.040	—	—	1.000	.210	.100	.040	—	—	—	160.00
35	82-1084	.148	.172	.045	—	—	.585	.320	.100	.040	—	—	—	150.00
35	82-1033	.148	.172	.040	—	—	.890	.625	.100	.040	—	—	—	160.00
35	82-1069	.148	.172	.040	—	—	.431	.106	.110	.050	—	—	—	150.00
35	82-1001	.148	.172	.040	—	—	.410	147	110	050	—	—	—	140.00
35	82-1004	.148	.172	.040	—	—	.535	.210	.110	.050	—	—	—	140.00
35	82-1007	.148	.172	.040	—	—	.535	.210	.120	.040	—	—	—	140.00
35	82-1028	.148	.172	.040	—	—	.407	.125	.132	.040	—	—	—	140.00
35	82-1027	.148	.172	.040	—	—	.515	210	132	040	—	—	—	140.00
35	82-1008	.148	.172	.040	—	—	.535	210	132	040	—	—	—	150.00
35	82-1086	.148	.172	.040	—	—	2.500	750	132	040	—	—	—	220.00
35	82-1009	.148	.172	.040	—	—	.535	.210	160	040	—	—	—	150.00
35	82-1081	.148	.172	.040	—	—	.535	.210	.160	.040	—	—	—	150.00
35	82-1030	.148	.172	.040	—	—	.571	.210	.160	.040	—	—	—	150.00
35	82-1063	.148	.172	.040	—	—	.630	.210	170	040	—	—	—	150.00
35	82-1064	.148	.172	.040	—	—	.630	.210	.170	.040	—	—	—	150.00
35	82-1065	.148	.172	.040	—	—	.630	.210	.217	.040	—	—	—	160.00
35	82-1067	.148	.172	.040	—	—	.725	.210	.250	.040	—	—	—	160.00
35	82-1026	.157	.172	.040	—	—	.515	.210	.100	.040	—	—	—	$140.00
35	82-1072	.169	.218	.049	—	—	.937	.125	.100	.040	—	—	—	$210.00
35	82-1071	.169	.218	.049	—	—	1.187	125	100	040	—	—	—	210.00
35	82-1073	.169	218	049	—	—	1.250	125	100	040	—	—	—	210.00
35	82-1013	.169	.219	.040	—	—	1.500	.460	.100	.040	—	—	—	250.00
35	82-1014	.169	.219	.049	—	—	1.500	.460	.100	.040	—	—	—	250.00
35	82-1082	.171	.218	.040	—	—	1.090	.680	.110	.050	—	—	—	$210.00
35	82-1012	.171	.218	.040	—	—	1.000	.680	.110	.050	—	—	—	250.00
35	82-1015	.172	.195	.040	—	—	.515	.210	100	.040	—	—	—	$140.00
35	82-1070	.172	.195	.040	—	—	560	.210	100	040	—	—	—	130.00
35	82-1005	.179	.200	.040	—	—	.515	.210	.100	.040	—	—	—	$140.00
35	82-1006	.218	.250	.040	—	—	.515	.210	.100	.040	—	—	—	150.00

SUB-MINIATURE TURRET - BIFURCATED

FIG. No.	SMITH No.	DIMENSIONS A	B	C	D	E	L	M	N	O	P	Q	R	NET Per M
90	52-1504	.125	.156	.045	.066	4-40	.484	.079	.218	.181	.018	.049	.100	$470.00
90	52-1503	.245	.250	.039	.140	4-40	.594	.180	.156	.258	.031	.120	.156	530.00
90	52-1510	.245	.250	.039	.140	4-40	1.172	.180	.750	.258	.031	.120	.156	620.00
90	•52-1501	.245	.250	.069	.140	6-32	.594	.180	.156	.258	.031	.120	.156	$530.00
90	52-1511	.245	.250	.039	.140	6-32	1.172	.180	.750	.258	.031	.120	.156	620.00
• 91	52-1500	.125	.156	.045	.066	4-40	.547	.148	.218	.181	.018	.031	.100	$470.00
1. 91	*52-1512	.245	.250	.069	.140	6-32	.719	.310	.156	.258	.025	.100	.156	550.00
91	52-1505	.245	.250	.069	.140	4-40	.719	.310	.156	.258	.025	.100	.156	530.00
91	52-1507	.245	.250	.069	140	4-40	1.297	.310	.750	.258	.025	.100	.156	620.00
91	52-1502	245	.250	069	140	6-32	.719	310	.156	.258	.025	100	156	510.00
2. 91	*52-1513	.245	.250	.069	.140	6-32	.719	.310	.156	.258	.025	.100	.156	550.00
91	52-1508	.245	.250	069	140	6-32	1.297	310	.750	258	025	100	156	620.00
92	52-2002	.125	.156	.066	.036	4-40	.484	.087	.218	.181	.067	—	.100	$600.00
92	52-2001	.245	.250	.140	.060	4-40	.594	.174	.156	.258	.101	—	.156	510.00
92	52-2003	.245	.250	.140	.060	4-40	1.172	.174	.750	.258	.101	—	.156	620.00
92	52-2000	.245	.250	.140	.060	6-32	.594	.174	.156	258	.101	—	.156	550.00
92	52-2004	.245	.250	.140	.060	6-32	1.172	.174	.750	258	.101	—	.156	620.00
93	53-1504	.125	.156	.045	.066	4-40	.672	.079	.218	.128	.018	.049	.250	$500.00
93	53-1503	.245	.250	.069	.140	4-40	.766	.180	.156	.180	.031	.120	.250	560.00
93	53-1510	.245	.250	.069	.140	4-40	1.344	.180	.750	.180	.031	.120	.250	650.00
93	53-1509	.125	.156	.045	.066	6-32	.672	.079	.218	.128	.018	.049	.250	$500.00
93	53-1501	245	.250	069	140	6-32	.766	180	.156	180	031	120	250	560.00
93	53-1511	.245	250	069	140	6-32	1.344	180	.750	180	031	120	.250	650.00
94	53-1500	125	.156	045	066	4-40	.750	148	218	128	018	031	250	$520.00
3. 94	* 53-1512	.125	.156	.045	.066	4-40	.750	.148	.218	.128	.018	.031	.250	560.00
94	53-1505	.245	.250	.069	.140	4-40	.890	.310	.156	.180	.025	.100	.250	560.00
94	53-1507	.245	250	069	140	4-40	1.469	310	750	180	025	100	250	650.00
94	53-1506	.125	.156	.045	.066	6-32	.750	.148	.218	.128	.018	.031	.250	$500.00
4. 94	*53-1513	.245	.250	.069	.100	6-32	.890	.310	.156	.180	.025	.100	.250	600.00
94	53-1502	.245	.250	069	140	6-32	.890	.310	.156	.180	025	100	250	560.00
94	53-1508	.245	.250	069	140	6-32	1.469	.310	.750	.180	025	100	250	650.00
95	53-2002	.125	.156	.066	.036	4-40	.672	.087	.218	.128	.067	—	.250	$630.00
95	53-2001	.245	.250	.140	.060	4-40	.766	.174	.156	.180	.101	—	.250	540.00
95	53-2003	.245	250	140	060	4-40	1.344	174	750	180	101	—	250	650.00
95	53-2005	125	156	066	036	6-32	672	087	218	128	067	—	250	$630.00
95	53-2000	.245	.250	.140	.060	6-32	.766	.174	.156	.180	.101	—	.250	580.00
95	53-2004	.245	.250	.140	.060	6-32	1.344	.174	.750	.180	.101	—	.250	650.00

(HEX BASE: Cad. Plate, Chromate Conversion)

	Smith No.	Mil. No.	NET Per M
•Made to meet MIL-T-55155 with dimensions as above	52-1512	(1) SE-10-9-D-02	$550.00
	52-1513	(2) SE-10-9-D-01	550.00
	53-1512	(3) SE-09-9-E-02	560.00
	53-1513	(4) SE-09-9-E-01	600.00

LORS: SUPPLIED IN WHITE (-101) UNLESS OTHERWISE SPECIFIED. COLORS OTHER THAN WHITE (-101). MINIMUM 1000 PIECES EXCEPT "63" SERIES. TEN COLORS AVAILABLE
ATING: Standard (-P12) **For COLOR CODE, PLATING SUFFIXES, and QUANTITY DISCOUNT SCHEDULE see SMITH PAGE 45 in this Directory.**

IT'S SOUND PLANNING TO "SPECIFY SMITH" WHEN DESIGNING OR PURCHASING

H. H. SMITH TEFLON* TERMINALS

STAND-OFFS

*Du Pont's registered trademark

*SE-07-09-B-03
SE-07-09-B-01

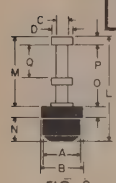


FIG. 3

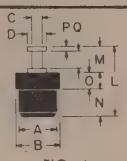


FIG. 4

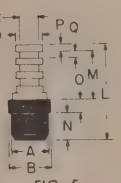


FIG. 5

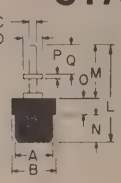


FIG. 6

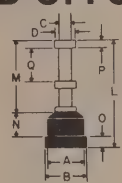


FIG. 9

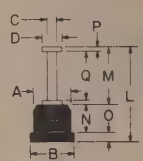


FIG. 10

FIG. 11

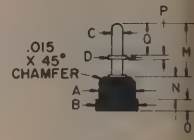


FIG. 12

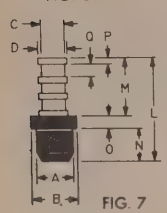


FIG. 7

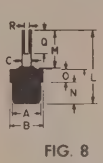


FIG. 8

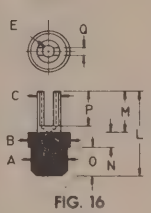


FIG. 16

FOR RAPID SELECTION:
terminals are listed (within figure groups) in ascending order of the MOST PERTINENT DIMENSION:

A = MIN. DIA.
B = MAJ. DIA.
N = LGTH. OF MIN. DIA.
O = LGTH. OF MAJ. DIA.
M = LGTH. OF PIN
C = DIA. OF PIN
L = OVERALL LGTH.

FIG. 13

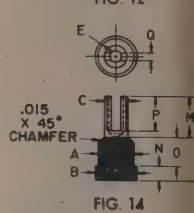


FIG. 14

SUB-MINIATURE
TURRET - SINGLE - MULTIPLE BIFURCATED

FIG. No.	SMITH No.	DIMENSIONS A	B	C	D	E	L	M	N	O	P	Q	R	NET Per M
3	92-1577	.093	.125	.040	.080	—	.280	.140	.100	.040	.030	.040	—	$150.00
3	92-1500	.093	.125	.030	.060	—	.310	.170	.100	.040	.020	.060	—	150.00
3	*92-1528	.093	.125	.040	.080	—	.350	.210	.100	.040	.020	.100	—	150.00
3	92-1587	.093	.125	.040	.080	—	.390	.210	.140	.040	.020	.100	—	150.00
3	92-1540	.130	.172	.040	.093	—	.480	.250	.190	.040	.020	.093	—	$155.00
3	92-1519	.148	.172	.046	.090	—	.254	.154	.060	.040	.020	.046	—	$140.00
3	92-1511	.148	.172	.046	.093	—	.296	.156	.100	.040	.020	.046	—	140.00
3	92-1500	.148	.172	.040	.080	—	.350	.210	.100	.040	.020	.100	—	140.00
3	92-1578	.148	.172	.040	.080	—	.390	.250	.100	.040	.020	.093	—	140.00
3	92-1573	.148	.172	.040	.080	—	.400	.210	.100	.090	.020	.093	—	140.00
3	92-1586	.148	.172	.045	.093	—	.443	.250	.100	.093	.020	.085	—	140.00
3	*92-1542	.148	.172	.040	.080	—	.359	.210	.109	.040	.020	.100	—	140.00
3	92-1570	.148	.172	.046	.093	—	.319	.154	.125	.040	.020	.046	—	140.00
3	92-1501	.148	.172	.040	.080	—	.375	.210	.125	.040	.020	.100	—	140.00
3	92-1505	.148	.172	.040	.080	—	.428	.210	.125	.093	.020	.100	—	140.00
3	92-1504	.148	.172	.046	.093	—	.334	.154	.140	.040	.020	.046	—	140.00
3	92-1566	.148	.172	.040	.080	—	.406	.210	.156	.040	.020	.100	—	140.00
3	92-1524	.148	.172	.040	.080	—	.461	.210	.158	.093	.020	.100	—	140.00
3	92-1506	.148	.172	.040	.093	—	.455	.250	.160	.040	.020	.093	—	140.00
3	92-1567	.148	.172	.040	.093	—	.470	.250	.180	.040	.020	.093	—	140.00
3	92-1507	.148	.172	.040	.093	—	.500	.210	.250	.040	.020	.100	—	140.00
3	92-1512	.148	.172	.040	.080	—	.540	.250	.250	.040	.020	.093	—	140.00
3	92-1534	.152	.172	.047	.093	—	.335	.207	.088	.040	.020	.093	—	$140.00
3	92-1532	.152	.172	.047	.093	—	.296	.156	.100	.040	.020	.047	—	140.00
3	92-1535	.152	.172	.047	.093	—	.347	.207	.100	.040	.020	.093	—	140.00
3	92-1531	.152	.172	.047	.093	—	.346	.156	.150	.040	.020	.047	—	140.00
3	92-1533	.152	.172	.047	.093	—	.361	.156	.165	.040	.020	.047	—	140.00
3	92-1513	.171	.187	.040	.080	—	.405	.210	.155	.040	.020	.100	—	$150.00
3	92-1502	.179	.200	.040	.080	—	.350	.210	.100	.040	.020	.100	—	$150.00
3	92-1508	.185	.218	.040	.080	—	.350	.210	.100	.040	.020	.100	—	$155.00
3	92-1523	.185	.218	.040	.080	—	.460	.300	.120	.040	.020	.140	—	155.00
3	92-1503	.185	.218	.040	.080	—	.375	.210	.125	.040	.020	.100	—	155.00
3	92-1526	.204	.250	.040	.080	—	.350	.210	.100	.040	.020	.100	—	$160.00
4	92-1579	.093	.125	.040	.080	—	.230	.090	.100	.040	.020	.060	—	$150.00
4	92-1527	.148	.172	.040	.080	—	.262	.125	.087	.050	.020	.085	—	$150.00
4	92-1525	.148	.172	.040	.080	—	.250	.110	.100	.040	.020	.080	—	150.00
4	92-1563	.148	.172	.046	.093	—	.296	.156	.100	.040	.020	.116	—	150.00
4	92-1562	.148	.172	.040	.080	—	.382	.227	.130	.025	.020	.187	—	150.00
4	92-1571	.148	.172	.045	.093	—	.468	.250	.168	.050	.020	.180	—	150.00
4	92-1521	.148	.172	.040	.080	—	.455	.227	.187	.040	.020	.187	—	150.00
4	92-1581	.150	.175	.045	.093	—	.468	.250	.168	.050	.020	.190	—	170.00
4	92-1520	.171	.200	.048	.090	—	.320	.120	.125	.075	.020	.080	—	$175.00
5	92-1517	.148	.172	.070	.109	—	.362	.232	.080	.050	.029	.031	—	$200.00
5	92-1514	.148	.172	.070	.109	—	.392	.232	.110	.050	.029	.031	—	200.00
6	92-1509	.148	.172	.040	.080	—	.328	.210	.075	.040	.020	.120	—	$140.00
6	92-1545	.148	.172	.040	.080	—	.350	.210	.100	.040	.020	.120	—	140.00
6	92-1546	.148	.172	.040	.080	—	.415	.210	.165	.040	.020	.120	—	140.00
7	92-1516	.093	.125	.068	.078	—	.255	.150	.075	.030	.015	.031	—	$200.00
7	92-1515	.093	.125	.068	.078	—	.344	.153	.140	.041	.015	.031	—	200.00
8	92-2008	.104	.125	.080	—	—	.350	.210	.100	.040	—	.180	.036	$200.00
8	92-2000	.148	.172	.040	—	—	.265	.125	.100	.040	—	.010	.010	$200.00
8	92-2009	.148	172	.040	·	·	.275	.125	110	040	·	050	010	200.00
16	92-2010	.148	.172	.125	—	.062	.375	.190	.125	.060	.140	.030	—	$210.00

*Made to meet MIL-T-55155

Smith No.	MIL No.
92-1528	SE-07-9-B-02
92-1542	SE-07-9-B-01

REVERSED SUB-MINIATURE
TURRET - SINGLE - MULTIPLE BIFURCATED

FIG. No.	SMITH No.	DIMENSIONS A	B	C	D	E	L	M	N	O	P	Q	R	NET Per M
9	29-1577	.093	.125	.040	.080	—	.280	.140	.100	.040	.020	.040	—	$150.00
9	29-1500	.093	.125	.030	.060	—	.310	.170	.100	.040	.020	.060	—	150.00
9	29-1528	.093	.125	.040	.080	—	.350	.210	.100	.040	.020	.100	—	150.00
9	29-1587	.093	.125	.040	.080	—	.390	.210	.140	.040	.020	.100	—	150.00
9	29-1540	.130	.172	.040	.093	—	.480	.250	.190	.040	.020	.093	—	$155.00
9	29-1519	.148	.172	.046	.093	—	.254	.154	.060	.040	.020	.046	—	$140.00
9	29-1511	.148	.172	.046	.093	—	.296	.156	.100	.040	.020	.046	—	140.00
9	29-1500	.148	.172	.040	.080	—	.350	.210	.100	.040	.020	.100	—	140.00
9	29-1578	.148	.172	.040	.080	—	.390	.250	.100	.040	.020	.093	—	140.00
9	29-1573	.148	.172	.040	.080	—	.400	.210	.100	.090	.020	.093	—	140.00
9	29-1586	.148	.172	.045	.093	—	.443	.250	.100	.093	.020	.085	—	140.00
9	29-1542	.148	.172	.040	.080	—	.359	.210	.109	.040	.020	.100	—	140.00
9	29-1570	.148	.172	.046	.093	—	.319	.154	.125	.040	.020	.046	—	140.00
9	29-1501	.148	.172	.040	.080	—	.375	.210	.125	.040	.020	.100	—	140.00
9	29-1505	.148	.172	.040	.080	—	.428	.210	.125	.093	.020	.100	—	140.00
9	29-1504	.148	.172	.046	.093	—	.334	.154	.140	.040	.020	.046	—	140.00
9	29-1566	.148	.172	.040	.080	—	.406	.210	.156	.040	.020	.100	—	140.00
9	29-1524	.148	.172	.040	.080	—	.461	.210	.158	.093	.020	.100	—	140.00
9	29-1506	.148	.172	.040	.093	—	.455	.250	.160	.040	.020	.093	—	140.00
9	29-1567	.148	.172	.040	.093	—	.470	.250	.180	.040	.020	.093	—	140.00
9	29-1507	.148	.172	.040	.093	—	.500	.210	.250	.040	.020	.100	—	140.00
9	29-1512	.148	.172	.040	.080	—	.540	.250	.250	.040	.020	.093	—	140.00
9	29-1534	.152	.172	.047	.093	—	.335	.207	.088	.040	.020	.093	—	$140.00
9	29-1532	.152	.172	.047	.093	—	.296	.156	.100	.040	.020	.047	—	140.00
9	29-1535	.152	.172	.047	.093	—	.347	.207	.100	.040	.020	.093	—	140.00
9	29-1531	.152	.172	.047	.093	—	.346	.156	.150	.040	.020	.047	—	140.00
9	29-1533	.152	.172	.047	.093	—	.361	.156	.165	.040	.020	.047	—	140.00
9	29-1513	.171	.187	.040	.080	—	.405	.210	.155	.040	.020	.100	—	$150.00
9	29-1502	.179	.200	.040	.080	—	.350	.210	.100	.040	.020	.100	—	$150.00
9	29-1508	.185	.218	.040	.080	—	.350	.210	.100	.040	.020	.100	—	$155.00
9	29-1523	.185	.218	.040	.080	—	.460	.300	.120	.040	.020	.140	—	155.00
9	29-1503	.185	.218	.040	.080	—	.375	.210	.125	.040	.020	.100	—	155.00
9	29-1526	.204	.250	.040	.080	—	.350	.210	.100	.040	.020	.100	—	$160.00
10	29-1579	.093	.125	.040	.080	—	.230	.090	.100	.040	.020	.060	—	$150.00
10	29-1527	.148	.172	.040	.080	—	.262	.125	.087	.050	.020	.085	—	$150.00
10	29-1525	.148	.172	.040	.080	—	.250	.110	.100	.040	.020	.080	—	150.00
10	29-1563	.148	.172	.046	.093	—	.296	.156	.100	.040	.020	.116	—	150.00
10	29-1562	.148	.172	.040	.080	—	.382	.227	.130	.025	.020	.187	—	150.00
10	29-1571	.148	.172	.045	.093	—	.468	.250	.168	.050	.020	.180	—	150.00
10	29-1521	.148	.172	.040	.080	—	.455	.227	.187	.040	.020	.187	—	150.00
10	29-1581	.150	.175	.045	.093	—	.468	.250	.168	.050	.020	.190	—	$170.00
10	29-1520	.171	.200	.048	.090	—	.320	.120	.125	.075	.020	.080	—	$175.00
11	29-1515	.093	.125	.068	.078	—	.344	.153	.140	.041	.015	.031	—	$200.00
11	29-1516	.093	.125	.068	.078	—	.255	.150	.075	.030	.015	.031	—	200.00
11	29-1514	.148	.172	.070	.109	—	.392	.232	.110	.050	.029	.031	—	$210.00
12	29-1509	.148	.172	.040	.080	—	.328	.210	.075	.040	.020	.120	—	$140.00
12	29-1545	.148	.172	.040	.080	—	.350	.210	.100	.040	.020	.120	—	140.00
12	29-1546	.148	.172	.040	.080	—	.415	.210	.165	.040	.020	.120	—	140.00
13	29-2008	.104	.125	.080	—	—	.350	.210	.100	.040	—	.180	.036	$200.00
13	29-2000	.148	.172	.040	—	—	.265	.125	.100	.040	—	.010	.010	$200.00
13	29-2009	.148	.172	.040	—	—	.275	.125	.110	.040	—	.050	.010	200.00
14	29-2010	.148	.172	.125	—	.062	.375	.190	.125	.060	.140	9030	—	$210.00

COLORS: SUPPLIED IN WHITE (-101) UNLESS OTHERWISE SPECIFIED COLORS OTHER THAN WHITE (-101). MINIMUM 1,000 PIECES EXCEPT "63" SERIES TEN COLORS AVAILAB
PLATING Standard (-P12) **For COLOR CODE, PLATING SUFFIXES, and QUANTITY DISCOUNT SCHEDULE see SMITH PAGE 45 in this Directory.**

IT'S SOUND PLANNING TO "SPECIFY SMITH" WHEN DESIGNING OR PURCHASING

Add Dept. EM to address to tell them you saw it in eem

TEFLON* TERMINALS — H. H. SMITH

* Du Pont's registered trademark

STAND-OFFS

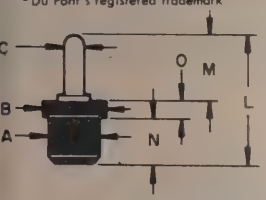


FIG. 1

FOR RAPID SELECTION:
terminals are listed (within figure groups) in ascending order of the MOST PERTINENT DIMENSION:

A = MIN. DIA.
B = MAJ. DIA.
N = LGTH. OF MIN. DIA.
O = LGTH. OF MAJ. DIA.
M = LGTH. OF PIN
C = DIA. OF PIN
L = OVERALL LGTH.

FIG. 2

SUB-MINIATURE STRAIGHT PIN

FIG. No.	SMITH No.	A	B	C	D	E	L	M	N	O	P	Q	R	NET Per M
1	92-1025	.093	.125	.040	—	—	.262	.147	.075	.050	—	—	—	$150.00
1	92-1055	.093	.125	.040	—	—	.299	.174	.085	.040	—	—	—	150.00
1	92-1053	.093	.125	.040	—	—	.213	.093	.089	.031	—	—	—	150.00
1	92-1066	.093	.125	.040	—	—	.250	.130	.089	.031	—	—	—	150.00
1	• 92-1034	.093	.125	.040	—	—	.350	.210	.100	.040	—	—	—	150.00
1	92-1089	.093	.125	.040	—	—	.572	.432	.100	.040	—	—	—	150.00
1	92-1095	.093	.125	.040	—	—	.587	.447	.100	.040	—	—	—	150.00
1	92-1089	.093	.125	.040	—	—	.672	.532	.100	.040	—	—	—	150.00
1	92-1090	.093	.125	.040	—	—	.737	.597	.100	.040	—	—	—	170.00
1	92-1094	.093	.125	.040	—	—	.755	.615	.100	.040	—	—	—	170.00
1	92-1091	.093	.125	.040	—	—	.770	.630	.100	.040	—	—	—	170.00
1	92-1098	.093	.125	.040	—	—	.797	.657	.100	.040	—	—	—	170.00
1	92-1086	.093	.125	.040	—	—	1.025	.885	.100	.040	—	—	—	200.00
1	92-1087	.093	.125	.040	—	—	1.125	.985	.100	.040	—	—	—	200.00
1	92-1003	.104	.125	.040	—	—	.250	.130	.098	.031	—	—	—	$150.00
1	92-1035	.104	.125	.040	—	—	.250	.130	.089	.031	—	—	—	150.00
1	92-1067	.106	.125	.040	—	—	.250	.130	.089	.031	—	—	—	$150.00
1	92-1070	.112	.172	.040	—	—	.350	.210	.120	.020	—	—	—	$150.00
1	92-1061	.112	.172	.040	—	—	.350	.210	.120	.020	—	—	—	150.00
2	• 92-1097	.148	.172	.040	—	—	.350	.100		.040	—	—	—	$190.00
1	92-1971	.125	.150	.040	—	—	.310	.210	.060	.040	—	—	—	$155.00
1	92-1022	.148	.172	.040	—	—	.247	.147	.050	.050	—	—	—	$155.00
1	92-1020	.148	.172	.040	—	—	.310	.210	.050	.050	—	—	—	155.00
1	92-1052	.148	.172	.040	—	—	.210	.120	.060	.030	—	—	—	155.00
1	92-1054	.148	.172	.040	—	—	.350	.210	.062	.076	—	—	—	155.00
1	92-1008	.148	.172	.040	—	—	.350	.210	.062	.078	—	—	—	155.00
1	92-1015	.148	.172	.040	—	—	.250	.150	.070	.030	—	—	—	155.00
1	92-1037	.148	.172	.040	—	—	.260	.145	.075	.040	—	—	—	155.00
1	92-1038	.148	.172	.040	—	—	.230	.105	.075	.050	—	—	—	155.00
1	92-1012	.148	.172	.040	—	—	.335	.210	.075	.050	—	—	—	155.00
1	92-1006	.148	.172	.040	—	—	.345	.210	.075	.060	—	—	—	155.00
1	92-1062	.148	.172	.040	—	—	.330	.210	.100	.020	—	—	—	155.00
1	92-1017	.148	.172	.040	—	—	.250	.110	.100	.040	—	—	—	155.00
1	92-1016	.148	.172	.040	—	—	.265	.125	.100	.040	—	—	—	155.00
1	92-1018	.148	.172	.040	—	—	.285	.145	.100	.040	—	—	—	155.00
1	92-1000	.148	.172	.040	—	—	.350	.210	.100	.040	—	—	—	155.00
1	92-1050	.148	.172	.040	—	—	.460	.320	.100	.040	—	—	—	155.00
1	92-1011	.148	.172	.040	—	—	.594	.450	.100	.040	—	—	—	155.00
1	92-1019	.148	.172	.040	—	—	.750	.610	.100	.040	—	—	—	155.00
1	92-1085	.148	.172	.040	—	—	.797	.657	.100	.040	—	—	—	155.00
1	92-1021	.148	.172	.040	—	—	.305	.145	.110	.050	—	—	—	155.00
1	92-1001	.148	.172	.040	—	—	.370	.210	.110	.050	—	—	—	155.00
1	92-1069	.148	.172	.040	—	—	.350	.210	.120	.020	—	—	—	155.00
1	92-1007	.148	.172	.040	—	—	.370	.210	.120	.040	—	—	—	155.00
1	92-1060	.148	.172	.040	—	—	.350	.210	.125	.015	—	—	—	155.00
1	92-1051	.148	.172	.040	—	—	.280	.125	.125	.040	—	—	—	151.00
1	92-1036	.148	.172	.040	—	—	.365	.193	.132	.040	—	—	—	155.00
1	92-1068	.148	.172	.040	—	—	.382	.210	.132	.040	—	—	—	155.00
1	92-1072	.148	.172	.040	—	—	.390	.218	.132	.040	—	—	—	155.00
1	92-1073	.148	.172	.040	—	—	.750	.578	.132	.040	—	—	—	155.00
1	92-1009	.148	.172	.040	—	—	.406	.210	.156	.040	—	—	—	155.00
1	92-1010	.148	.172	.040	—	—	.500	.210	.250	.040	—	—	—	155.00
1	92-1063	.148	.172	.040	—	—	.500	.210	.250	.040	—	—	—	130.00
1	92-1003	.171	.195	.040	—	—	.350	.210	.100	.040	—	—	—	$160.00
1	92-1004	.179	.200	.040	—	—	.350	.210	.100	.040	—	—	—	$160.00
1	92-1005	.218	.250	.040	—	—	.350	.210	.100	.040	—	—	—	$160.00

***Made to meet Mil-T-55155 with dimensions as above**

Smith No.	Mil. No.	NET Per M
92-1034	(1) SE-08-09-B-02	$150.00
92-1097	(2) SE-08-09-B-01	190.00

REVERSED SUB-MINIATURE STRAIGHT PIN

FIG. No.	SMITH No.	A	B	C	D	E	L	M	N	O	P	Q	R	NET Per M
2	29-1025	.093	.125	.040	—	—	.262	.147	.075	.050	—	—	—	$150.00
2	29-1055	.093	.125	.040	—	—	.299	.174	.085	.040	—	—	—	150.00
2	29-1053	.093	.125	.040	—	—	.213	.093	.089	.031	—	—	—	150.00
2	29-1066	.093	.125	.040	—	—	.250	.130	.089	.031	—	—	—	150.00
2	29-1034	.093	.125	.040	—	—	.350	.210	.100	.040	—	—	—	150.00
2	29-1089	.093	.125	.040	—	—	.572	.432	.100	.040	—	—	—	150.00
2	29-1095	.093	.125	.040	—	—	.587	.447	.100	.040	—	—	—	170.00
2	29-1088	.093	.125	.040	—	—	.672	.532	.100	.040	—	—	—	170.00
2	29-1090	.093	.125	.040	—	—	.737	.597	.100	.040	—	—	—	155.00
2	29-1094	.093	.125	.040	—	—	.755	.615	.100	.040	—	—	—	170.00
2	29-1091	.148	.172	.040	—	—	.795	.630	.100	.065	—	—	—	160.00
2	29-1098	.093	.125	.040	—	—	.797	.657	.100	.040	—	—	—	170.00
2	29-1086	.093	.125	.040	—	—	1.025	.885	.100	.040	—	—	—	200.00
2	29-1087	.093	.125	.040	—	—	1.125	.985	.100	.040	—	—	—	200.00
2	29-1003	.104	.125	.040	—	—	.250	.130	.089	.031	—	—	—	150.00
2	29-1035	.104	.125	.040	—	—	.250	.130	.089	.031	—	—	—	$150.00
2	29-1067	.106	.125	.040	—	—	.250	.130	.089	.031	—	—	—	150.00
2	29-1070	.112	.172	.040	—	—	.350	.210	.120	.020	—	—	—	$150.00
2	29-1061	.112	.172	.040	—	—	.350	.210	.125	.015	—	—	—	$150.00
2	29-1071	.125	.150	.040	—	—	.310	.210	.060	.040	—	—	—	155.00
2	29-1022	.148	.172	.040	—	—	.247	.147	.050	.050	—	—	—	155.00
2	29-1020	.148	.172	.040	—	—	.310	.210	.050	.050	—	—	—	155.00
2	29-1052	.148	.172	.040	—	—	.210	.120	.060	.030	—	—	—	155.00
2	29-1008	.148	.172	.040	—	—	.350	.210	.062	.078	—	—	—	155.00
2	29-1054	.148	.172	.040	—	—	.350	.210	.062	.078	—	—	—	155.00
2	29-1015	.148	.172	.040	—	—	.250	.150	.070	.030	—	—	—	155.00
2	29-1037	.148	.172	.040	—	—	.260	.145	.075	.040	—	—	—	155.00
2	29-1038	.148	.172	.040	—	—	.230	.105	.075	.050	—	—	—	155.00
2	29-1012	.148	.172	.040	—	—	.335	.210	.075	.050	—	—	—	155.00
2	29-1006	.148	.172	.040	—	—	.345	.210	.075	.060	—	—	—	155.00
2	29-1062	.148	.172	.040	—	—	.330	.210	.100	.020	—	—	—	155.00
2	29-1017	.148	.172	.040	—	—	.250	.110	.100	.040	—	—	—	155.00
2	29-1016	.148	.172	.040	—	—	.265	.125	.100	.040	—	—	—	155.00
2	29-1018	.148	.172	.040	—	—	.285	.145	.100	.040	—	—	—	155.00
2	29-1000	.148	.172	.040	—	—	.350	.210	.100	.040	—	—	—	155.00
2	29-1050	.148	.172	.040	—	—	.460	.320	.100	.040	—	—	—	155.00
2	29-1011	.148	.172	.040	—	—	.594	.450	.100	.040	—	—	—	155.00
2	29-1019	.148	.172	.040	—	—	.750	.610	.100	.040	—	—	—	155.00
2	29-1085	.148	.172	.040	—	—	.797	.657	.100	.040	—	—	—	155.00
2	29-1021	.148	.172	.040	—	—	.305	.145	.110	.050	—	—	—	155.00
2	29-1001	.148	.172	.040	—	—	.370	.210	.110	.050	—	—	—	155.00
2	29-1069	.148	.172	.040	—	—	.350	.210	.120	.020	—	—	—	155.00
2	29-1007	.148	.172	.040	—	—	.370	.210	.120	.040	—	—	—	155.00
2	29-1060	.148	.172	.040	—	—	.350	.210	.125	.015	—	—	—	155.00
2	29-1051	.148	.172	.040	—	—	.280	.125	.125	.040	—	—	—	155.00
2	29-1036	.148	.172	.040	—	—	.365	.193	.132	.040	—	—	—	155.00
2	29-1068	.148	.172	.040	—	—	.382	.210	.132	.040	—	—	—	155.00
2	29-1072	.148	.172	.040	—	—	.390	.218	.132	.040	—	—	—	155.00
2	29-1073	.148	.172	.040	—	—	.750	.578	.132	.040	—	—	—	155.00
2	29-1009	.148	.172	.040	—	—	.406	.210	.156	.040	—	—	—	155.00
2	29-1010	.148	.172	.040	—	—	.500	.210	.250	.040	—	—	—	155.00
2	29-1063	.148	.172	.040	—	—	.330	.210	.074	.046	—	—	—	155.00
2	29-1003	.171	.195	.040	—	—	.350	.210	.100	.040	—	—	—	$160.00
2	29-1004	.179	.200	.040	—	—	.350	.210	.100	.040	—	—	—	$160.00
2	29-1005	.218	.250	.040	—	—	.350	.210	.100	.040	—	—	—	$160.00

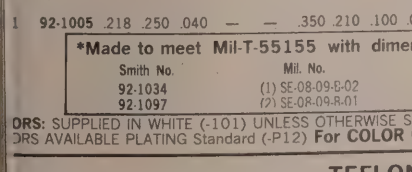
ORS: SUPPLIED IN WHITE (-101) UNLESS OTHERWISE SPECIFIED COLORS OTHER THAN WHITE (-101), MINIMUM 1000 PIECES EXCEPT "63" SERIES TEN
ORS AVAILABLE PLATING Standard (-P12) **For COLOR CODE, PLATING SUFFIXES, and QUANTITY DISCOUNT SCHEDULE see SMITH PAGE 45 in this Directory.**

TEFLON* TRANSISTOR HOLDERS

se holders provide insulated top and botton chassis mounting support of transistors. They e thru-holes and turreted solder terminals for wiring transistor leads and passive compo- nts, eliminating the need of a pad and providing total insulation and strain relief.

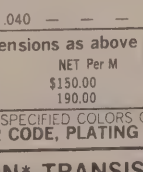
Holders shown represent the basic configurations available for JEDEC Packages TO-5 (.200" Dia. Pitch Circle) and TO-18 (.100" Dia. Pitch Circle). Other styles and variations are constantly being added. Consult our ENGINEERING Dept for special requirements.

TYPE



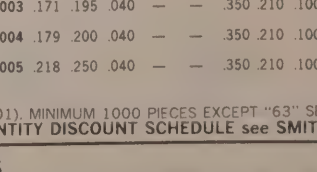
STANDARD REVERSED

3-PIN



A 3 PINS — B 3 PINS 3 HOLES

4-PIN



C 4 PINS — D 4 PINS 4 HOLES

3-PIN

No.	Type	Fig.	NET Each
34-1000	Std.	A	$.53
43-1000	Rev.	A	$.53
34-1003	Std.	B	$.53
43-1003	Rev.	B	$.53

4-PIN

No.	Type	Fig.	NET Each
34-1100	Std	C	$.56
43-1100	Rev.	C	$.56
34-1104	Std.	D	$.56
43-1104	Rev.	D	$.56

DISCOUNT SCHEDULE

	NET
1 - 99	
100 - 249	10% Off
250 - 499	15% Off
500 - 999	25% Off
1000 and up	On Request

H. H. SMITH TEFLON* TERMINALS

* Du Pont's registered trademark

STAND-OFFS

FIG. 17

FIG. 18

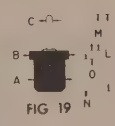


FIG. 19

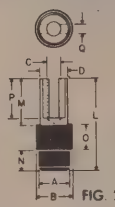


FIG. 20

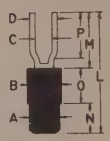


FIG. 21

FIG. 22

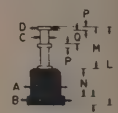


FIG. 23

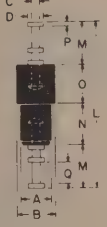


FIG. 24

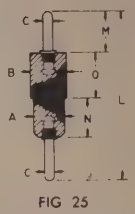


FIG. 25

FIG. 26

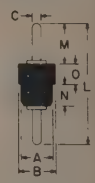


FIG. 27

FOR RAPID SELECTION: terminals are listed (within figure groups) in ascending order of the MOST PERTINENT DIMENSION:

A = MIN. DIA.
B = MAJ. DIA.
N = LGTH. OF MIN. DIA.
O = LGTH. OF MAJ. DIA.
M = LGTH. OF PIN
C = DIA. OF PIN
L = OVERALL LGTH.

MINIATURE TURRET

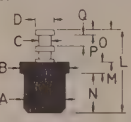


FIG. 15

FIG. No.	SMITH No.	DIMENSIONS A	B	C	D	E	L	M	N	O	P	Q	R	NET Per M
15	93-1515	.104	.125	.046	.090	—	.346	.156	.087	.103	.020	.046	—	$150.00
15	93-1542	.104	.125	.046	.093	—	.346	.156	.087	.103	.020	.046	—	150.00
15	93-1549	.104	.125	.046	.093	—	.359	.156	.100	.103	.020	.046	—	150.00
15	93-1526	.127	.156	.046	.090	—	.531	.156	.156	.219	.020	.046	—	$185.00
15	93-1527	.135	.187	.040	.093	—	.647	.250	.150	.250	.020	.093	—	$160.00
15	93-1518	.148	.172	.040	.093	—	.482	.250	.110	.125	.020	.093	—	$155.00
15	93-1525	.148	.172	.040	.093	—	.598	.250	.165	.187	.020	.093	—	155.00
15	93-1535	.165	.187	.046	.093	—	.656	.156	.100	.400	.020	.046	—	$170.00
15	93-1563	.165	.187	.040	.093	—	.797	.250	.100	.400	.020	.093	—	170.00
15	93-1524	.165	.187	.046	.093	—	.468	.156	.125	.187	.020	.046	—	160.00
1. 15	*93-1500	.165	.187	.046	.093	—	.431	.156	.150	.125	.020	.046	—	160.00
15	93-1551	.165	.187	.040	.080	—	.485	.210	.150	.125	.020	.100	—	160.00
15	93-1502	.165	.187	.040	.093	—	.522	.250	.150	.125	.020	.093	—	160.00
15	93-1503	.165	.187	.046	.125	—	.556	.281	.150	.125	.031	.093	—	160.00
15	93-1519	.165	.187	.046	.125	—	.556	.281	.150	.125	.031	.093	—	160.00
15	93-1501	.165	.187	.046	.093	—	.493	.156	.150	.187	.020	.046	—	160.00
15	93-1504	.165	.187	.040	.093	—	.584	.250	.150	.187	.020	.093	—	160.00
15	93-1506	.165	.187	.046	.125	—	.616	.281	.150	.187	.031	.093	—	170.00
15	93-1505	.165	.187	.046	.093	—	.556	.156	.150	.250	.020	.046	—	160.00
15	93-1529	.165	.187	.040	.093	—	.647	.250	.150	.250	.020	.093	—	130.00
15	93-1530	.165	.187	.046	.125	—	.681	.281	.150	.250	.031	.093	—	180.00
15	93-1534	.165	.187	.046	.093	—	.706	.156	.150	.400	.020	.046	—	190.00
15	93-1533	.165	.187	.040	.093	—	.797	.250	.150	.400	.020	.093	—	190.00
15	93-1507	.165	.187	.046	.125	—	.831	.281	.150	.400	.031	.093	—	190.00
15	93-1528	.165	.187	.046	.125	—	.681	.281	.200	.200	.031	.093	—	190.00
15	93-1560	.165	.187	.046	.125	—	.831	.281	.200	.350	.031	.093	—	190.00
15	93-1561	.165	.187	.047	.125	—	.893	.343	.200	.350	.031	.125	—	190.00
15	93-1532	.165	.187	.046	.093	—	.706	.156	.300	.250	.020	.046	—	190.00
15	93-1579	.171	.187	.040	.093	—	.390	.250	.100	.040	.020	.093	—	$160.00
15	93-1574	.171	.187	.040	.093	—	.525	.250	.125	.150	.020	.093	—	160.00
15	93-1510	.171	.187	.046	.093	—	.431	.156	.150	.125	.020	.046	—	160.00
15	93-1552	.171	.187	.046	.080	—	.485	.210	.150	.125	.020	.100	—	160.00
15	93-1580	.171	.187	.040	.093	—	.525	.250	.150	.125	.020	.093	—	160.00
15	93-1520	.171	.187	.046	.125	—	.556	.281	.150	.125	.031	.093	—	160.00
15	93-1521	.171	.187	.062	.125	—	.556	.281	.150	.125	.031	.093	—	160.00
15	93-1511	.171	.187	.046	.093	—	.493	.156	.150	.187	.020	.046	—	160.00
15	93-1516	.171	.187	.040	.093	—	.584	.250	.150	.187	.020	.093	—	160.00
15	93-1583	.171	.187	.046	.125	—	.619	.281	.150	.187	.031	.093	—	170.00
15	93-1512	.171	.187	.046	.093	—	.556	.156	.150	.250	.020	.046	—	170.00
15	93-1547	.171	.187	.040	.080	—	.610	.210	.150	.250	.020	.100	—	170.00
15	93-1581	.171	.187	.040	.093	—	.650	.250	.150	.250	.020	.093	—	170.00
15	93-1531	.171	.187	.046	.125	—	.681	.281	.150	.250	.031	.093	—	180.00
15	93-1513	.171	.187	.046	.125	—	.831	.281	.150	.400	.031	.093	—	180.00
15	93-1582	.171	.187	.040	.093	—	.800	.250	.150	.400	.020	.093	—	180.00
15	93-1557	.171	.187	.046	.093	—	.593	.156	.187	.250	.020	.046	—	180.00
15	93-1543	.171	.187	.062	.125	—	.621	.281	.215	.125	.031	.093	—	180.00
15	93-1559	.171	.187	.046	.093	—	.706	.156	.300	.250	.020	.046	—	180.00
15	93-1562	.171	.187	.046	.125	—	.831	.281	.300	.250	.031	.093	—	190.00
15	93-1578	.171	.218	.040	.080	—	.350	.210	.100	.040	.020	.100	—	160.00
15	93-1522	.171	.218	.040	.080	—	.485	.210	.150	.125	.020	.100	—	160.00
15	93-1536	.171	.250	.046	.125	—	.968	.281	.187	.500	.031	.093	—	240.00
15	93-1514	.171	.250	.046	.125	—	1.268	.281	.187	.800	.031	.093	—	280.00
15	93-1553	.185	.218	.046	.125	—	.546	.281	.140	.125	.031	.093	—	$170.00
15	93-1000	.185	.218	.046	.093	—	.487	.154	.287	.046	.020	.046	—	170.00
15	93-1005	.185	.218	.046	.093	—	.583	.250	.287	.046	.020	.093	—	170.00
15	93-1558	.215	.250	.046	.125	—	.718	.281	.187	.250	.031	.093	—	$210.00
15	93-1538	.215	.250	.046	.093	—	.843	.156	.187	.500	.020	.046	—	250.00
15	93-1537	.215	.250	.040	.093	—	.934	.250	.187	.500	.020	.093	—	250.00
15	93-1508	.215	.250	.046	.125	—	.968	.281	.187	.500	.031	.093	—	250.00
15	93-1540	.215	.250	.046	.093	—	1.143	.156	.187	.800	.020	.046	—	260.00
15	93-1539	.215	.250	.040	.093	—	1.234	.250	.187	.800	.020	.093	—	260.00
15	93-1509	.215	.250	.046	.125	—	1.268	.281	.187	.800	.031	.093	—	260.00
15	93-1576	.215	.250	.046	.125	—	.641	.281	.310	.050	.031	.093	—	220.00
15	93-1564	.215	.250	.046	.125	—	.968	.281	.317	.370	.031	.093	—	230.00
15	93-1571	.312	.375	.125	.187	—	.812	.500	.250	.062	.032	.200	—	$300.00

*Made to meet MIL-T-55155 with dimensions as above	Smith No.	Mil. No.	NET Per M
	93-1500	(1) SE-07-9-B-02	$160.00

MINIATURE SUB-MINIATURE

FIG. No.	SMITH No.	DIMENSIONS A	B	C	D	E	L	M	N	O	P	Q	R	NET Per M
17	93-1554	.171	.187	.046	.093	—	.555	.218	.150	.187	.020	.046	—	$235.00
18	93-1575	.171	.250	.046	.125	—	.993	.281	.187	.500	.031	.140	—	$250.00
19	93-1003	.165	.187	.040	—	—	.55	.210	.150	.125	—	—	—	$155.00
19	93-1004	.165	.187	.040	—	—	.547	.210	.150	.187	—	—	—	155.00
19	93-1006	.165	.187	.040	—	—	.718	.312	.218	.187	—	—	—	180.00
19	93-1007	.180	.200	.062	—	—	.600	.300	.175	.125	—	—	—	$180.00
19	93-1001	.185	.218	.040	—	—	.543	.210	.287	.046	—	—	—	$180.00
19	93-1002	.185	.218	.040	—	—	1.133	.800	.333	.046	—	—	—	230.00
20	93-2010	.165	.187	.078	.148	—	.603	.203	.150	.250	.156	.046	—	$250.00
20	93-2012	.171	.187	.078	.148	—	.703	.203	.100	.406	.156	.046	—	$255.00
20	93-2006	.171	.187	.046	.148	—	.478	.203	.150	.125	.156	.030	—	220.00
20	93-2007	.171	.187	.046	.148	—	.478	.203	.150	.125	.161	.030	—	220.00
20	93-2000	.171	.187	.078	.148	—	.478	.203	.150	.125	.156	.046	—	220.00
20	93-2008	.171	.187	.046	.148	—	.540	.203	.150	.187	.161	.030	—	220.00
20	93-2001	.171	.187	.078	.148	—	.540	.203	.150	.187	.156	.046	—	240.00
20	93-2009	.171	.187	.046	.148	—	.603	.203	.150	.250	.156	.030	—	240.00
20	93-2002	.171	.187	.078	.148	—	.603	.203	.150	.250	.156	.046	—	240.00
20	93-2011	.171	.187	.046	.148	—	.753	.203	.150	.400	.161	.030	—	250.00
20	93-2003	.171	.187	.078	.148	—	.753	.203	.150	.400	.156	.046	—	250.00
20	93-2017	.171	.187	.046	.148	—	.555	.203	.165	.187	.161	.030	—	250.00
20	93-2014	.171	.187	.078	.148	—	.890	.203	.187	.500	.156	.046	—	270.00
20	93-2018	.171	.187	.078	.148	—	.602	.203	.212	.187	.156	.046	—	250.00
20	93-2020	.171	.187	.078	.148	—	.620	.203	.230	.187	.156	.046	—	230.00
20	93-2016	.171	.250	.078	.148	—	1.190	.203	.187	.800	.156	.046	—	340.00
20	93-2013	.217	.250	.046	.148	—	.890	.203	.187	.500	.161	.030	—	$300.00
20	93-2004	.217	.250	.078	.148	—	.890	.203	.187	.500	.156	.046	—	300.00
20	93-2015	.217	.250	.046	.148	—	1.190	.203	.187	.800	.161	.030	—	340.00
20	93-2005	.217	.250	.078	.148	—	1.190	.203	.187	.800	.156	.046	—	340.00
20	93-2021	.218	.250	.086	.156	—	.641	.281	.310	.050	.200	.055	—	$240.00
21	93-2019	.171	.187	.090	.150	—	.633	.296	.150	.187	.234	—	—	$280.00
22	93-1003	.165	.187	.040	—	—	.485	.210	.150	.125	—	—	—	$165.00
22	93-1004	.165	.187	.040	—	—	.547	.210	.150	.187	—	—	—	165.00
22	93-1006	.165	.187	.040	—	—	.718	.312	.218	.187	—	—	—	180.00
22	93-1007	.180	.200	.062	—	—	.600	.300	.175	.125	—	—	—	$180.00
22	93-1001	.185	.218	.040	—	—	.543	.210	.287	.046	—	—	—	180.00
22	93-1002	.185	.218	.040	—	—	1.133	.800	.333	.046	—	—	—	230.00
23	93-1000	.185	.218	.046	.093	—	.487	.154	.287	.046	.020	.046	—	$180.00
23	93-1005	.185	.218	.046	.093	—	.583	.250	.287	.046	.020	.093	—	180.00
24	92-3500	.169	.205	.040	.080	—	.640	.210	.170	.050	.020	.100	—	$240.00
24	93-3509	.148	.187	.040	.080	—	.819	.210	.212	.187	.020	.100	—	$265.00
24	93-3500	.171	.187	.040	.080	—	.819	.210	.212	.187	.020	.100	—	$265.00
24	93-3505	.187	.218	.040	.080	—	.819	.210	.212	.187	.020	.100	—	$275.00
24	93-3501	.218	.250	.046	.125	—	1.187	.281	.375	.250	.031	.093	—	$350.00
24	93-3502	.218	.250	.046	.125	—	1.687	.281	.625	.500	.031	.093	—	410.00
24	93-3503	.218	.250	.046	.125	—	1.287	.281	.925	.800	.031	.093	—	465.00
25	93-3512	.148	.172	.040	—	—	.819	.210	.187	.212	—	—	—	$270.00
25	93-3511	.148	.187	.040	—	—	.819	.210	.187	.212	—	—	—	270.00
25	93-3507	.171	.187	.040	—	—	.572	.110	.140	.212	—	—	—	$270.00
25	93-3508	.171	.187	.040	—	—	.696	.172	.140	.212	—	—	—	270.00
25	93-3513	.171	.187	.040	—	—	.587	.125	.187	.150	—	—	—	270.00
25	93-3504	.171	.187	.040	—	—	.819	.210	.187	.212	—	—	—	270.00
26	93-3510	.171	.187	.040	.080	—	.819	.210	.212	.187	.020	.120	—	$270.00
27	92-3003	.148	.172	.040	—	—	.515	.155	.160	.040	—	—	—	$260.00
27	92-3001	.148	.172	.040	—	—	.560	.180	.160	.040	—	—	—	260.00
27	92-3002	.148	.172	.040	—	—	.606	.155	.210	.080	—	—	—	260.00
27	92-3000	.169	.205	.040	—	—	.640	.210	.170	.020	—	—	—	250.00

COLORS: SUPPLIED IN WHITE (-101) UNLESS OTHERWISE SPECIFIED COLORS OTHER THAN WHITE (-101). MINIMUM 1000 PIECES EXCEPT "63" SERIES TEN COLORS AVAILABLE PLATING Standard (-P12) **For COLOR CODE, PLATING SUFFIXES, and QUANTITY DISCOUNT SCHEDULE see SMITH PAGE 45 in this Directory.**

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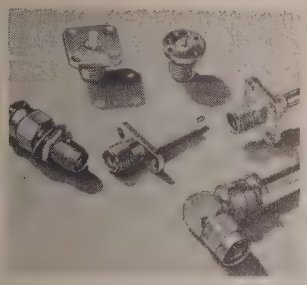
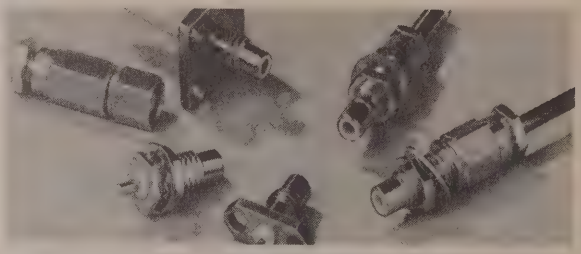
CONNECTIONS

COAXIAL RF CONNECTORS

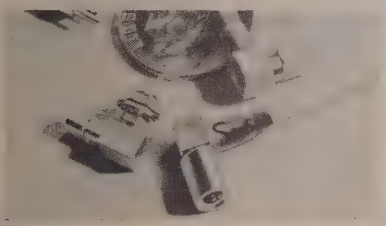
SMA
DC-26
GHz



SMB—Snap-On
DC-12.4 GHz
SMC—
Screw-On
DC-12.4 GHz

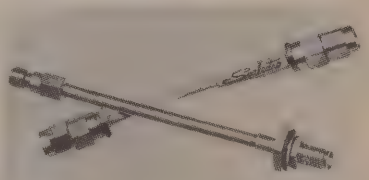


NanoheX—DC-12.4 GHz



ADAPTORS—Between Series

CABLE ASSEMBLIES—



The world's largest supplier of RF subminiature connectors offers the world's largest selection of configurations. Every Sealectro connector is designed for maximum performance including lowest VSWR, greatest mechanical integrity, and best value. Most complete QPL listings in SMA, SMB & SMC types. Send for complete catalog.

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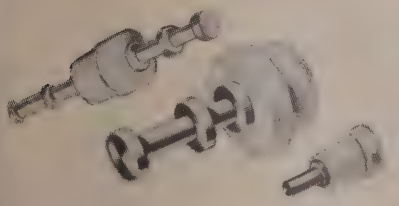
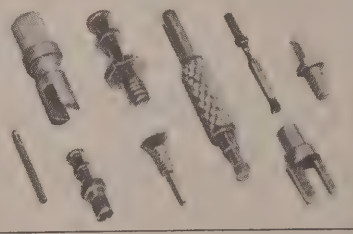


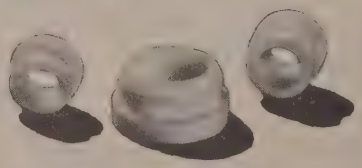
METAL TERMINALS



PC SOCKETS

TRANSISTOR IC SOCKETS

TEFLON BUSHINGS



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Greatest choice of all types of electrical interconnections for metal chassis, PC boards, and flex circuits. Famous Teflon-insulated "Press-Fit" terminals offer thousands of choices for the designer. Metal sockets provide the means to mass produce PC chassis at lowest cost. Jumper plugs provide low cost programming with either male or female connectors. Send for complete catalog.

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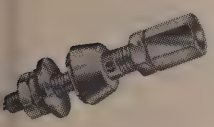
FLUTED NUT TYPES

Plastic parts of standard (not miniature) size types molded of Lexan polycarbonate resin; brass parts are gold-plated. Rated for 30 amperes, 1000 volts working. Nickel-plated brass types available on special order.

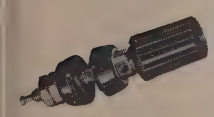
HEX NUT TYPES

Rated for 30 amperes, 1000 volts working. Brass parts are gold-plated; plastic parts are of nylon compounded to meet military specifications MIL-P-20693A, Type IV. Nickel-plated brass types available on order.



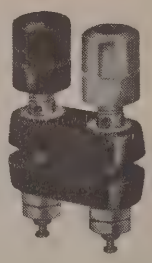
GROUNDING TYPE

For making rapid connections to ground. Made of finely machined brass nickel-plated and polished. Panel grounding collar frozen to shaft has "D" type shoulder for locking in keyed panel hole.



MINIATURE TYPES

Fluted nut design only. Rated for 15 amperes, 1000 volts working. Gold-plated brass parts; nylon plastic parts compounded to meet military specification MIL-P-20693A, Type IV. Types with nickel-plated brass available also.



DOUBLE ASSEMBLY TYPES

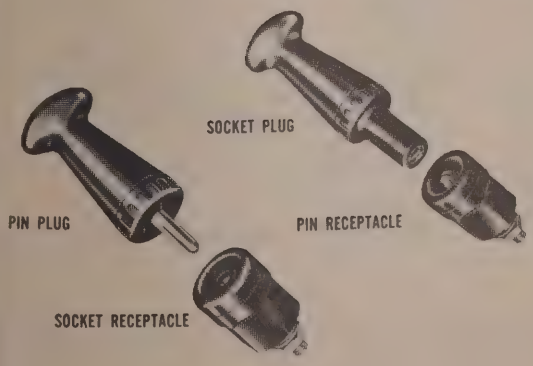
For instrument and equipment panels requiring binding posts mounted on ¾" centers. Rated for a current capacity of 30 amperes and a working voltage of 1000 volts. Brass parts are gold-plated; panel insulators in black only. Rugged, self-contained assembly makes mounting more accurate, faster and easier than two individual binding posts and gives maximum strength where connections are frequently made.

STYLE	TYPE
BINDING POSTS	
FLUTED NUT — STANDARD	DF31*
HEX NUT — STANDARD	DF30*
GROUNDING — ALL METAL	GP30NC
FLUTED NUT — MINIATURE	DF21*

STYLE	TYPE
DOUBLE ASSEMBLY TYPES	
BLACK & RED HEX NUTS	DF30-2-BRC

*Add desired color suffix to series designation number: BC (black), BLC (blue), RC (red), WTC (white), YC (yellow), GNC (green). For example: DF21BLC.

SUPERCON® ELECTRICAL CONNECTORS



Nylon plastic parts; gold-plated brass current-carrying parts. Wiring connections to the same plug can be either soldered or solderless. Plug cable-fastening screws permit a wide range of cable sizes. Plug grips are of a simple, two-piece threaded construction for quick assembly. All receptacle plastic parts are molded of the same color to permit more rapid and accurate circuit identification front and back of panel when installed. The 25, 50 and 100 ampere types are listed by Underwriters' Laboratories, Inc.

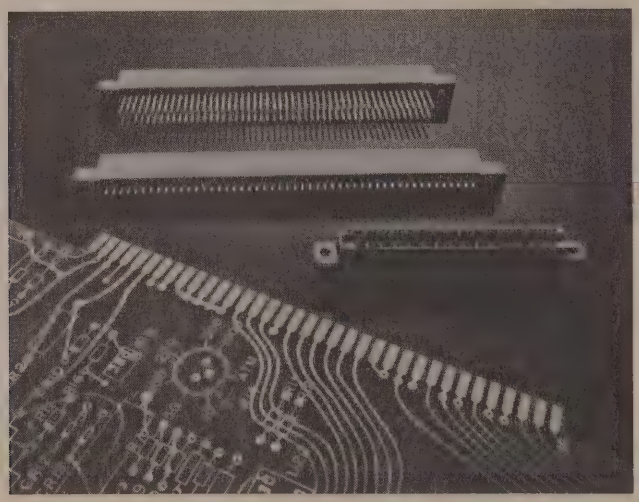
AMPERES	PIN PLUGS TYPE†	SOCKET RECEPTACLES TYPE†	SOCKET PLUGS TYPE†	PIN RECEPTACLES TYPE†
25	PP25G	RS25G	PS25G	RP25G
50	PP50G	RS50G	PS50G	RP50G
100	PP100G	RS100G	PS100G	RP100G
250	PP250G	RS250G	PS250G	RP250G

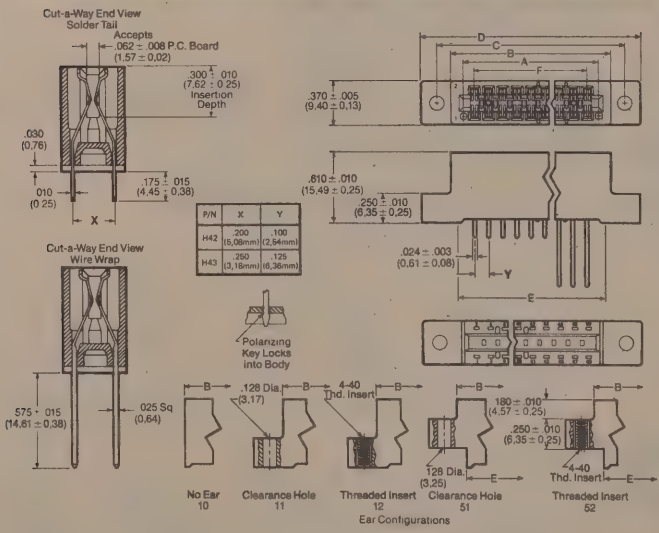
†Add desired color suffix to series designation number: B (black), BL (blue), R (red), WT (white), Y (yellow), GN (green). For example: PS25GWT.

THE SUPERIOR ELECTRIC COMPANY
1000 MIDDLE STREET • BRISTOL, CONN. 06010 • PHONE: (203) 582-9561

TEXAS INSTRUMENTS
Texas Instruments Incorporated
Mail Station 2-16
Attleboro, MA 02703
Tel: (617) 222-2800 Ext. 268, 269, 7327

Edgeboard Connectors





CHARACTERISTICS

ELECTRICAL	.100" Centers	.125" Centers
Current Rating (amps)	3	3
Insulation Resistance (megohms)	5000 min.	5000 min.
Contact Resistance (milliohms)	15 max.	15 max.
Dielectric Withstanding Voltage (RMS)	1000 min.	1500 min.
Capacitance (picofarads)	2 max.	2 max.

MECHANICAL FOR .062" (1,57mm) Typ. P.C. BOARD

Insertion Force:
12 oz./position max.
(3.36 N/position max.)

Withdrawal Force:
(2 oz./position min.)
(0.56 N position min.)

Durability:
100 cycles min. with .062" steel blade.

Automatically Wire Wrappable

ENVIRONMENTAL

Operating Temperature:
−65°C to +125°C

Humidity:*
90-95% Relative Humidity (40°C, 96 hr)
*Reference: MIL-C-21097

MATERIALS

Body Dielectric:
Glass-filled thermoplastic polyester
Color black
Meets U.L. Flammability Classification 94V-0

Contacts:
CA 725 copper-nickel-tin alloy
Gold inlay
Wire Wrap – min. .000050 in. Au (0,00127 mm.)
Solder Tail – min. .000075 in. Au (0,00190 mm.)
Over min. .000100 in. nickel (0,00254 mm.)
Wire Wrap posts half-hard copper alloy.
Grid Spacing:
.100" x .200" (2.54 mm. x 5.08 mm.)
.125" x .250" (3.18 mm. x 6.36 mm.)

Polarization Keys:
Self-locking into plastic body.

TEXAS INSTRUMENTS
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Edgeboard Connectors

H4 Series .100" x .200" Edgeboard Connectors

Positions / Contacts*	Part No. Wire Wrap	Part No. Solder Tail	A ±.005 (±0,25)	B ±.015 (±0,38)	C ±.010 (±0,25)	D ±.015 (±0,38)	E ±.015 (±0,38)	F ±.005 (±0,13)
18/36	H42XX11-18	H42XX21-18	1.900 (48,26)	2.060 (52,32)	2.375 (60,33)	2.635 (66,93)	1.950 (49,53)	1.700 (43,18)
22/44	H42XX11-22	H42XX21-22	2.300 (58,42)	2.460 (62,48)	2.775 (70,49)	3.035 (77,09)	2.350 (59,69)	2.100 (53,34)
25/50	H42XX11-25	H42XX21-25	2.600 (66,04)	2.760 (70,10)	3.075 (78,11)	3.335 (84,71)	2.650 (67,31)	2.400 (60,96)
30/60	H42XX11-30	H42XX21-30	3.100 (78,74)	3.260 (82,80)	3.575 (90,81)	3.835 (97,41)	3.150 (80,01)	2.900 (73,66)
31/62	H42XX11-31	H42XX21-31	3.200 (81,28)	3.360 (85,34)	3.675 (93,35)	3.935 (99,95)	3.250 (82,55)	3.000 (76,20)
36/72	H42XX11-36	H42XX21-36	3.700 (93,98)	3.860 (98,04)	4.175 (106,05)	4.435 (112,65)	3.750 (95,25)	3.500 (88,90)
40/80	H42XX11-40	H42XX21-40	4.100 (104,14)	4.260 (108,20)	4.575 (116,21)	4.835 (122,81)	4.150 (105,41)	3.900 (99,06)
43/86	H42XX11-43	H42XX21-43	4.400 (111,76)	4.560 (115,82)	4.875 (123,83)	5.135 (130,43)	4.450 (113,03)	4.200 (106,68)
50/100	H42XX11-50	H42XX21-50	5.100 (129,54)	5.260 (133,60)	5.575 (141,61)	5.835 (148,21)	5.150 (130,81)	4.900 (124,46)

For "XX" see part number breakdown; ( ) = millimeters; for polarizing keys order P/N R1164-2.

H4 Series .125" x .250" Edgeboard Connectors

Positions / Contacts*	Part No. Wire Wrap	Part No. Solder Tail	A ±.010 (±0,25)	B ±.015 (±0,38)	C ±.010 (±0,25)	D ±.015 (±0,38)	E ±.015 (±0,38)	F ±.005 (±0,13)
22/44	H43XX11-22	H43XX21-22	2.875 (73,03)	3.035 (77,09)	3.295 (83,69)	3.555 (90,30)	2.875 (73,03)	2.625 (66,68)
28/56	H43XX11-28	H43XX21-28	3.625 (92,08)	3.785 (96,14)	4.045 (102,74)	4.305 (109,35)	3.625 (92,08)	3.375 (85,73)
31/62	H43XX11-31	H43XX21-31	4.000 (101,60)	4.160 (105,66)	4.420 (112,27)	4.680 (118,87)	4.000 (101,60)	3.750 (95,25)
36/72	H43XX11-36	H43XX21-36	4.625 (117,48)	4.785 (121,54)	5.045 (128,14)	5.305 (134,75)	4.625 (117,48)	4.375 (111,13)
40/80	H43XX11-40	H43XX21-40	5.125 (130,18)	5.285 (134,24)	5.545 (140,84)	5.805 (147,45)	5.125 (130,18)	4.875 (123,83)
44/88	H43XX11-44	H43XX21-44	5.625 (142,88)	5.785 (146,94)	6.045 (153,54)	6.305 (160,15)	5.625 (142,88)	5.375 (136,53)
50/100	H43XX11-50	H43XX21-50	6.375 (161,93)	6.535 (165,99)	6.795 (172,59)	7.055 (179,20)	6.375 (161,93)	6.125 (155,58)

For "XX" see part number breakdown; ( ) = millimeters; for polarizing keys order P/N R1164-2.

ORDERING GUIDE
PART NUMBER BREAKDOWN
.100" AND .125" CENTERS

H4 2 51 2 1 – 18

- 18 — No. of Positions*
- 1 — Gold Inlay
- 2 — Termination
  1. Wire Wrap
  2. Solder Tail
- 51 — Mounting Styles
  10. No Ears
  11. Flush ears, clearance hole
  12. Flush ears, threaded insert
  51. Centered ears, clearance hole
  52. Centered ears, threaded insert
- 2 — Spacing
  2. .100" x .200"
  3. .125" x .250"
- H4 — Product Series

In the above example (H425121-18), the part number describes an H4 Series edgeboard connector with .100" x .200" termination spacing, centered mounting ears with clearance hole mounting, solder tail terminations, 75 microinches of gold inlay per contact, and 18 contact positions (36 contacts).

*Other sizes will soon become available, please consult the factory for details.

TEXAS INSTRUMENTS
Texas Instruments Incorporated
Mail Station 2-16
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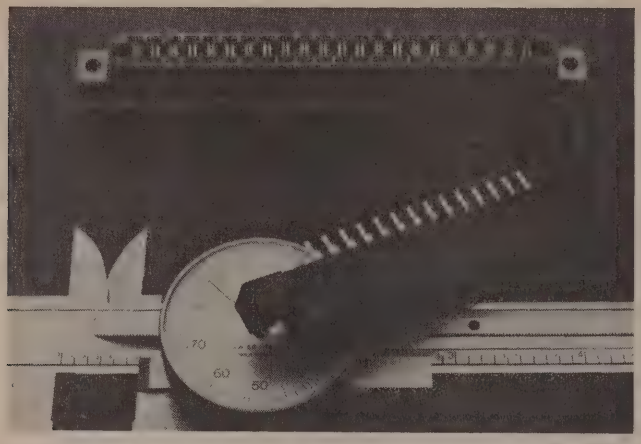
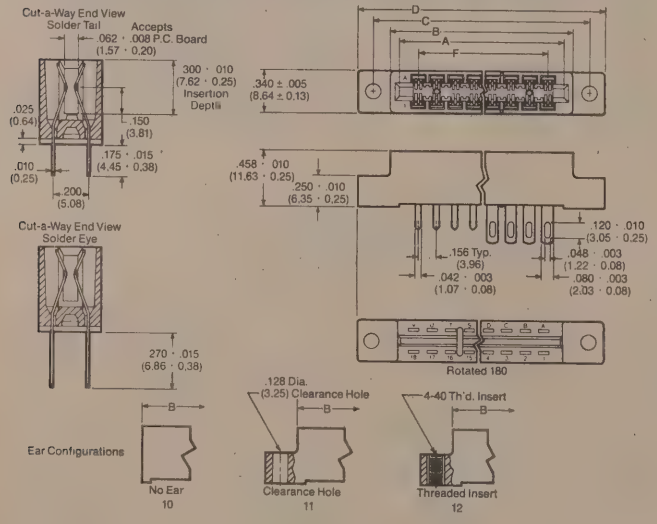
.156" x .200" Edgeboard Connectors



Positions / Contacts *	Part No. Solder Tail	Part No. Solder Eye	A ±.010 (±0,25)	B ±.015 (±0,38)	C ±.010 (±0,25)	D ±.015 (±0,38)	F ±.005 (±0,13)
10/20	H41XX21-10	H41XX31-10	1.724 (43,79)	1.866 (47,40)	2.158 (54,81)	2.408 (61,16)	1.404 (35,66)
15/30	H41XX21-15	H41XX31-15	2.504 (63,60)	2.646 (67,21)	2.938 (74,63)	3.188 (80,98)	2.184 (55,47)
18/36	H41XX21-18	H41XX31-18	2.972 (75,49)	3.114 (79,09)	3.406 (86,51)	3.656 (92,86)	2.652 (67,36)
22/44	H41XX21-22	H41XX31-22	3.596 (91,34)	3.738 (94,94)	4.030 (102,36)	4.280 (108,71)	3.276 (83,21)
25/50	H41XX21-25	H41XX31-25	4.064 (103,23)	4.206 (106,83)	4.498 (114,25)	4.748 (120,60)	3.744 (95,10)

For "XX" see part number breakdown; ( )=millimeters; for polarizing keys order P/N R1164-1.



CHARACTERISTICS

ELECTRICAL

Current Rating:
5 amps
Insulation Resistance:
5000 megohms min.
Contact Resistance:
15 milliohms max.
Dielectric Withstanding Voltage:
1800 RMS min.
Capacitance:
2 picofarads max.

MECHANICAL FOR .062" (1,57mm) BLADE

Insertion Force:
14 oz/position (max.)
(3.92 N position max.)
Withdrawal Force:
2 oz/position (min.)
(0.56 N position max.)
(Designed to MIL-C-21097)

ENVIRONMENTAL

Operating Temperature:
−65°C to +125°C
Humidity:*
90-95% Relative Humidity (40°C, 96 hr)
*Reference: MIL-C-21097

MATERIALS

Body Dielectric:
Glass-filled thermoplastic polyester
Color black
Meets U.L. Flammability Classification 94V-0
Contacts:
CA 725 copper-nickel-tin alloy
Min. .000075 in. (0,00190 mm) gold at point of contact over min. .000100 in. (0,00254 mm) of nickel interliner/diffusion barrier.
Polarization Keys:
Self locking into plastic body

ORDERING GUIDE

PART NUMBER BREAKDOWN .156" CENTERS

H4 1 10 2 1–10

- 1–10 — No. of Positions*
- 1 — Gold Inlay
- 2 — Termination
  - 2. Solder Tail
  - 3. Solder Eye
- 10 — Mounting Styles
  - 10. No ears
  - 11. Flush, clearance holes
  - 12. Flush, threaded insert
- 1 — .156" x .200" Spacing
- H4 — Product Series

*Other sizes will soon become available, please consult the factory for details.

TEXAS INSTRUMENTS
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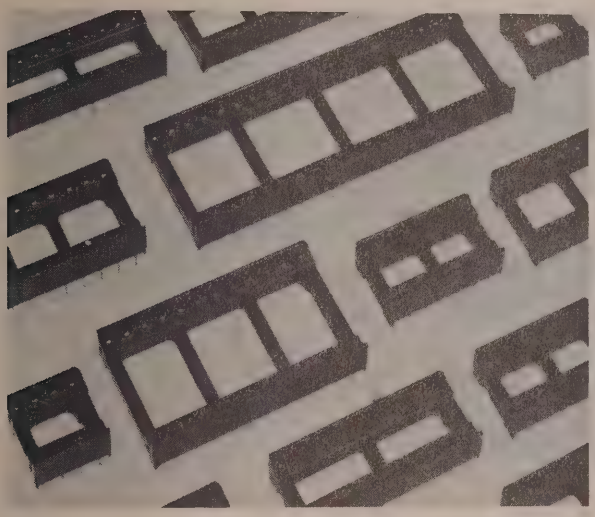
Low Profile DIP Sockets Face Grip



- Low insertion, high retention forces
- Anti-wicking design
- Inlay in contact area cuts cost and improves performance
- Dual beam contact

SPECIFICATIONS

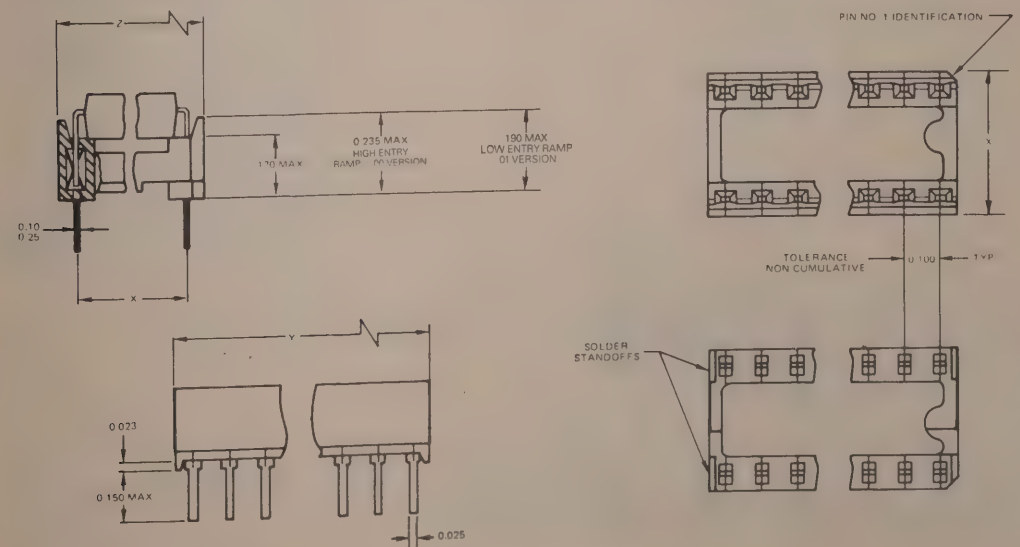
Material:

A. Body – glass reinforced polyester UL rated 94V-O
B. Contact – copper nickel alloy
C. Finish – 75 micro-inch min. gold inlay (C95 only)
200 micro-inch min. tin inlay (C85 only)

Notes:

A. Operating Temperature
−65°C to +125°C (C95 only)
−10°C to +100°C (C85 only)
B. Accommodates standard IC leads up to 0.014 in. thick and 0.025 in. wide
C. Sockets may be mounted end to end and side to side
D. Closed entry and ramp features provided to facilitate automatic IC insertion
E. Large opening and high standoff features provide improved heat dissipation and cleaning
F. Contacts have redundant spring elements

LOW (.018") ENTRY RAMP GOLD PART NO.	HIGH (.060") ENTRY RAMP GOLD PART NO.	DIMENSION					HIGH (.060") ENTRY RAMP TIN PART NO.	LOW (.018") ENTRY RAMP TIN PART NO.
		PINS	"X" ±0.005	"Y" MAX.	"Z" MAX.	PINS		
C95-08-01	C95-08-00	8	0.300	0.400	0.400	8	C85-08-00	C85-08-01
C95-14-01	C95-14-00	14	0.300	0.700	0.400	14	C85-14-00	C85-14-01
C95-16-01	C95-16-00	16	0.300	0.800	0.400	16	C85-16-00	C85-16-01
C95-18-01	C95-18-00	18	0.300	0.900	0.400	18	C85-18-00	C85-18-01
C95-20-01	C95-20-00	20	0.300	1.000	0.400	20	C85-20-00	C85-20-01
C95-22-01	C95-22-00	22	0.400	1.100	0.500	22	C85-22-00	C85-22-01
C95-24-01	C95-24-00	24	0.600	1.200	0.700	24	C85-24-00	C85-24-01
C95-28-01	C95-28-00	28	0.600	1.400	0.700	28	C85-28-00	C85-28-01
C95-40-01	C95-40-00	40	0.600	2.000	0.700	40	C85-40-00	C85-40-01



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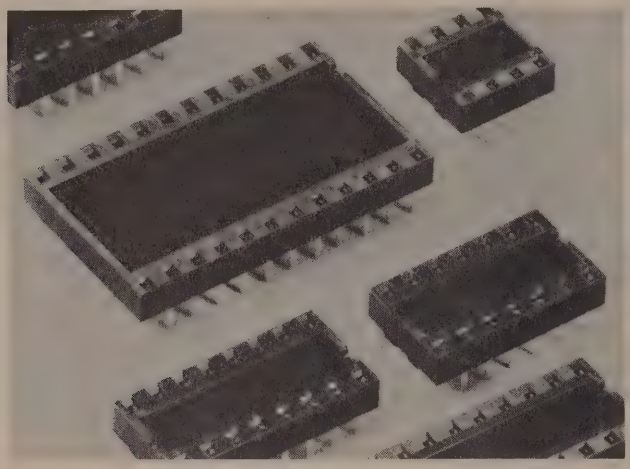
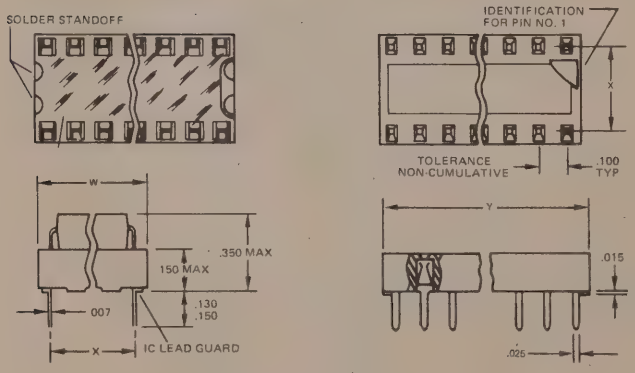
Mail Station 2-16
Attleboro, MA 02703
Tel: (617) 222-2800 Ext. 268, 269, 7327

Low Profile DIP Sockets Edge Grip



- Universal mounting and packaging
- Anti-wicking feature
- Solder standoffs for easy cleaning
- Redundant contact points for low contact resistance, higher reliability and repetitive insertion.

Here's the line of low profile solder tail sockets that makes wrought gold contact surfaces available at a price competitive with tin. And finally makes low price *and* high performance available by using a new, durable tin inlay. Only you know your performance requirements. But now, using gold or tin inlay, you can pick your own kind of savings – with TI sockets.



SPECIFICATIONS

Material:

A. Body – Thermo plastic material meeting UL specification 94V-O
B. Contact – copper nickel alloy
C. Finish: – see part number schedule
C84 Series – 200 Micro-inch tin inlay (Min)
C93 Series – 75 Micro-inch gold inlay (Min)

Notes:

A. Sockets meet requirements of Texas Instruments test specifications TS-0005 and test report TR-0003
B. Operating temperature
−65°C to +125°C (Gold)
−40°C to +100°C (Tin)
C. Contacts have redundant spring elements
D. Accommodates standard IC leads up to .011 ±.003 x .018 ±.003
E. Contact is designed and oriented in the plastic body to generate maximum possible contact pressure
F. Socket is designed to achieve maximum density on boards
G. Sockets may be mounted end to end on .100" centers continuous line
H. Socket is designed to prevent IC leads from contacting P/C board
I. Closed entry feature provided to facilitate automatic IC insertion and protects the IC leads against damage.

GOLD INLAY		TIN INLAY	
Pins	Part Number	Pins	Part Number
8	C93-08-02	8	C84-08-02
14	C93-14-02	14	C84-14-02
16	C93-16-02	16	C84-16-02
18	C93-18-02	18	C84-18-02
20	C93-20-02	20	C84-20-02
22	C93-22-02	22	C84-22-02
24	C93-24-02	24	C84-24-02
28	C93-28-02	28	C84-28-02
40	C93-40-02	40	C84-40-02

	8 Pin	14 Pin	16 Pin	18 Pin
Dimension X ± .005	.300	.300	.300	.300
Dimension V ± .015	.400	.700	.800	.900
Dimension W (max.)	.400	.400	.400	.400

	20 Pin	22 Pin	24 Pin	28 Pin	40 Pin
Dimension X ±.005	.300	.400	.600	.600	.600
Dimension V ±.015	1.000	1.100	1.200	1.400	2.000
Dimension W (max.)	.400	.500	.700	.700	.700

TEXAS INSTRUMENTS
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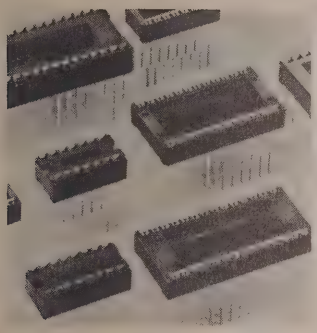
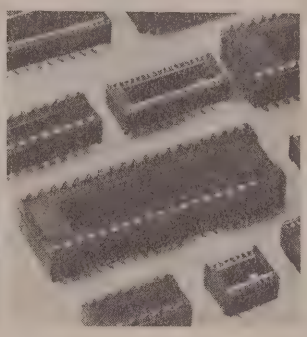
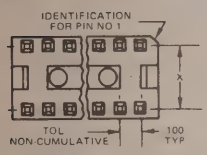
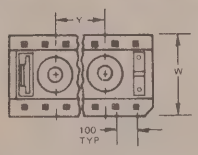
Tel: (617) 222-2800 Ext. 268, 269, 7327

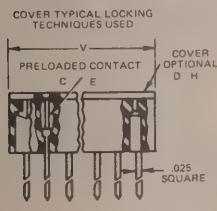
Standard Profile
DIP Sockets
F Series Connectors

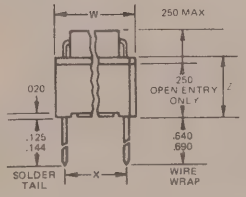












	8 Pin	14 Pin	16 Pin	18 Pin	20 Pin	22 Pin	24 Pin	28 Pin	36 Pin	40 Pin
Dimen. V ±.010	.465	.765	.865	.965	1.065	1.180	1.280	1.480	1.880	2.080
Dimen. W (max.)	.400	.400	.400	.400	.400	.500	.700	.700	.700	.700
Dimen. X ±.005	.300	.300	.300	.300	.300	.400	.600	.600	.600	.600
Dimen. Y ±.010	NA	.300	.400	.400	.400	.500	.500	.500	.800	.800
Dimen. Z ±.005	.280	.280	.280	.280	.280	.280	.280	.280	.280	.280

DIP Sockets

SPECIFICATIONS FOR DIP SOCKETS

Material:

A. Body – glass filled nylon (GFN) or 94 V-O glass filled polyester
B. Contact:
Solder tail – phosphor bronze per QQ-B-750 (C-82), copper nickel alloy (C-92) Wire Wrap – phosphor bronze per QQ-B-750 (C-81), copper nickel alloy (C-91)
C. Finish – see part number schedule

Notes:

A. Contacts are replaceable
B. Contacts have redundant spring elements
C. Cover is removable
D. Contact is designed and oriented in the plastic body to generate maximum possible contact pressure
E. Operating temperature −65°C to +125°C
F. Socket is designed to achieve maximum density on boards
G. Closed entry cover is provided to facilitate automatic insertion and protect IC leads against damage
H. Accommodates standard IC leads up to .011 ± .003 x .018 ± .003
I. Sockets are capable of being automatically or semiautomatically wire wrapped
J. Open entry, coverless version available. Order by specifying C9X-XX-50 for gold inlay or C8X-XX-54 for tin plate. N/A in 36 and 40 pins.

SOLDER TAIL			WIRE WRAP	
75μ IN. MIN GOLD INLAY	200μ IN. MIN TIN PLATE PER MIL-T-10727	NO. PINS	50μ IN. MIN GOLD INLAY	200μ IN. MIN TIN PLATE PER MIL-T-10727
C92-08-00	C82-08-04	8	C91-08-00	C81-08-04
C92-14-00	C82-14-04	14	C91-14-00	C81-14-04
C92-16-00	C82-16-04	16	C91-16-00	C81-16-04
C92-18-00	C82-18-04	18	C91-18-00	C81-18-04
C92-20-00	C82-20-04	20	C91-20-00	C81-20-04
C92-22-00	C82-22-04	22	C91-22-00	C81-22-04
C92-24-00	C82-24-04	24	C91-24-00	C81-24-04
C92-28-00	C82-28-04	28	C91-28-00	C81-28-04
C92-36-00	C82-36-04	36	C91-36-00	C81-36-04
C92-40-00	C82-40-04	40	C91-40-00	C81-40-04

F Series (Military) Connectors

Texas Instruments F Series is a line of high reliability, precision connectors comprising a versatile system to meet the requirements of electronic equipment.

F Series connectors feature:
- Gold plated screw machined contacts
- Closed entry Be-Cu female sockets
- Diallyl phthlate molded bodies
- Passivated stainless steel hardware

The connectors meet the requirements of MIL-C-55302 and are suitable for use in military as well as non-military equipment, wherever severe environmental conditions exist.

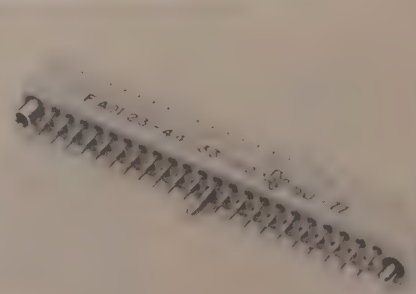
For use in:
- Civil and Military avionics equipment – Airborne and ground support
- Communications equipment – Airborne and ground based
- Civil and Military radar – Airborne and ground based
- Airport landing systems
- Missiles
- Instrumentation
- Computers
- Test equipment

F Series connectors are designed to connect
- printed circuit boards
- chassis, and
- cables

in virtually any combination.

The wide selection of body styles, contact designs, and assembly hardware available in this series permit custom designed connectors at off-the-shelf prices. Available with 10 to 160 contact positions.

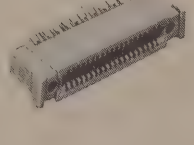
Comprehensive literature is available which fully illustrates each F Series connector in all of its possible contact sizes. This Designers' Guide also shows the numerous contact and hardware variations which are possible. The guide, along with a list which can be used to cross reference these connectors to the proper military numbers, may be obtained by contacting the factory.

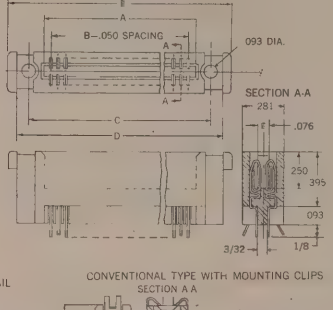


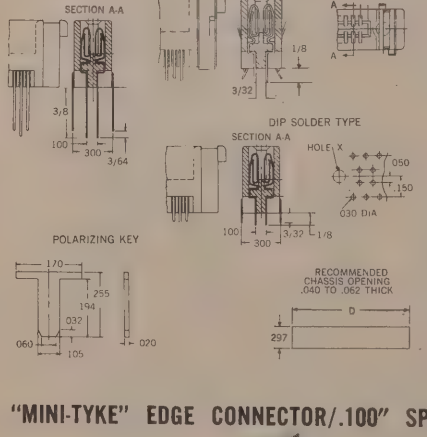
TRW CINCH CONNECTORS

MINIATURE PC CONNECTORS

"TYKON" EDGE CONNECTORS/.050" SPACING - DOUBLE READOUT FOR 1/16" PRINTED CIRCUIT BOARDS







FEATURES AND SPECIFICATIONS

SPECIAL FEATURES: High density (.050" centers) miniature edge connector with special ribbon-type contacts.

Potential applications include standard and thin film memory planes, diodes on insulating substrates and virtually any type of modular plug-in unit.

Available in wide range of sizes with variety of terminations and mounting styles.

SIZES: Available in 6, 10, 15, 20 and 25 contact position sizes with intermediate sizes available on special order.

TERMINATIONS: Available with conventional ribbon-type wiring tails; dip solder or wire wrap versions also available.

MOUNTING STYLES: Conventional wiring tail types available with special mounting clips for snap-in removable semi-flush panel mounting or without clips and using plain .093" dia. holes for standard mounting.

INSULATOR MATERIAL: Green glass-filled diallyl phthalate, type SDG-F per MIL-M-14.

CONTACT MATERIAL & PLATING: Beryllium copper with 30 micro-inches gold finish over 50 micro-inches copper.

MOUNTING CLIP MATERIAL & PLATING: Carbon steel with cadmium plate plus yellow chromate finish.

POLARIZING KEY MATERIALS: Made of cellulose acetate and must be ordered separately.

PERFORMANCE SPECIFICATIONS: Contact factory.

ORDERING INFORMATION

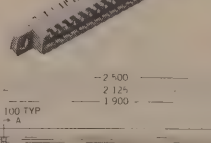
DESCRIPTION	PART NUMBERS* CONVENTIONAL TYPE W/O CLIPS**	PART NUMBERS* CONVENTIONAL TYPE W/CLIPS	NO. OF POSITIONS	NO. OF CONTACTS
6-Position Connector	255-06-30-190	255-06-30-200	6	12
10-Position Connector	255-10-30-190	255-10-30-200	10	20
15-Position Connector	255-15-30-190	255-15-30-200	15	30
20-Position Connector	255-20-30-190	255-20-30-200	20	40
25-Position Connector	255-25-30-190	255-25-30-200	25	50
Polarizing Key	Part No. 456-99-99-190			

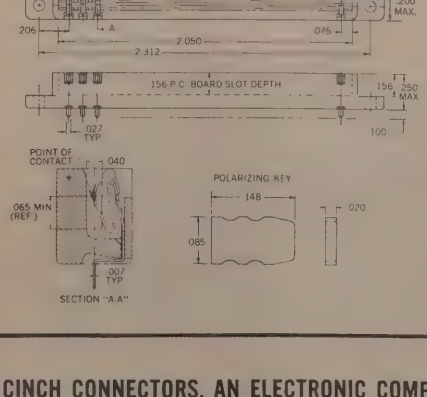
* To order DIP SOLDER or WIRE WRAP TYPES: Substitute "210" as final three figures of part number for dip solder types and "220" for wire wrap types (e.g. 255-06-30-210 or 255-06-30-220); both types available in all sizes shown above.
** These items available through Cinch Distributors.

DIMENSIONAL DATA

SIZE (No. of Contact Positions)	DIMENSIONS "A"	"B"	"C"	"D"	"E"
6	.350	.250	.550	.725	.850
10	.550	.450	.750	.925	1.050
15	.800	.700	1.000	1.175	1.300
20	1.050	.950	1.250	1.425	1.550
25	1.300	1.200	1.500	1.675	1.800

"MINI-TYKE" EDGE CONNECTOR/.100" SPACING - SINGLE READOUT FOR 1/32" PRINTED CIRCUIT BOARDS





FEATURES AND SPECIFICATIONS

SPECIAL FEATURES: Extremely low profile connector for compact packaging — overall 1/4" height of connector less than half that of standard PC connectors.

Preloaded contact construction provides uniformity of gap and assures adequate contact pressure. Ideally suited for a wide range of miniature PC board plug-in applications including airborne equipment, test equipment and digital components.

SIZE: Available in 20 contact position size only.

TERMINATION: Dip solder tails for insertion and wave soldering in PC mother board.

MOUNTING STYLE: Plain .094" Dia. holes for standard mounting.

INSULATOR MATERIAL: Green glass-filled diallyl phthalate, type SDG-F per MIL-M-14.

CONTACT MATERIAL & PLATING: Beryllium copper with 50 micro-inches gold finish over 50 micro-inches copper.

POLARIZING KEY MATERIAL: Made of nylon and must be ordered separately.

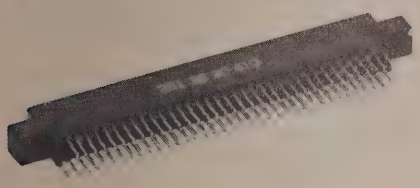
PERFORMANCE SPECIFICATIONS: Contact factory.

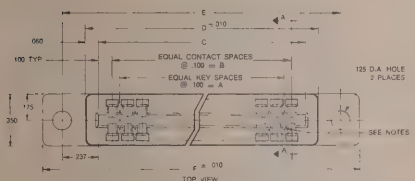
ORDERING INFORMATION

DESCRIPTION	PART NUMBER	NO. OF POSITIONS	NO. OF CONTACTS
Connector	259-20-30-233	20	20
Polarizing Key	457-01-25-008	—	—

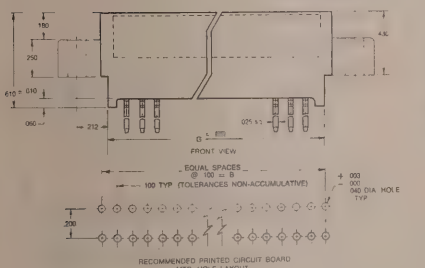
TRW CINCH CONNECTORS

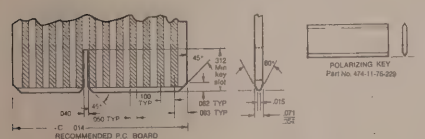
PC BOARD CONNECTORS WITH TERMINALS ON .100 CENTERS





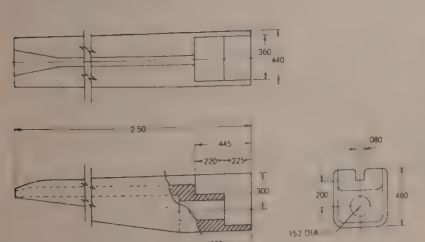
NOTE: POLARIZING KEY SLOTS LOCATED SYMMETRICALLY BETWEEN CONTACT POSITIONS.


FRONT VIEW
EQUAL SPACES @ 100 = B
100 TYP (TOLERANCES NON-ACCUMULATIVE)
040 DIA HOLE TYP
RECOMMENDED PRINTED CIRCUIT BOARD MTG HOLE LAYOUT



CARD GUIDE POST NO. 474-11-90-259

Card Guides No. 474-11-90-259 can be ordered separately and can be assembled with any 251- or 253- connector with clearance mounting holes. Available through Cinch distributors; specify No. 50-GP-1.



FEATURES AND SPECIFICATIONS

CURRENT RATING: 3 amperes.

RATED VOLTAGE (Sea Level): 600 VDC.

INSULATION RESISTANCE: 5000 megohms min.

CONTACT RESISTANCE: 16 milliohms max.

TERMINAL STYLES: Dip Solder, Wire Wrap or Solder Tab.

TOTAL INSERTION FORCE: A maximum of one lb. times the number of contact pairs when measured with a .070 in. thick steel blade in accordance with MIL-C-21097.

INDIVIDUAL SEPARATION FORCE: A minimum of one oz. per pair of contacts when measured with a .054 in. thick blade in accordance with MIL-C-21097.

INSULATOR MATERIAL: Diallyl phthalate, type SDG-F per MIL-M-14 Color Green.

POLARIZING KEY MATERIAL: Nylon.

CARD GUIDE MATERIAL: Polypropylene, Color Green.

CONTACT MATERIAL: Alloy 688 high tensile brass.

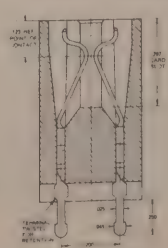
CONTACT PLATING MATERIAL: .00003 min. gold over .00005 min. nickel on contacting area .00001 gold on remainder of contact.

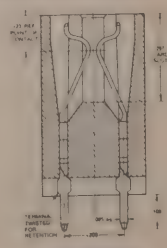
"Recognized under the Component Program of Underwriters' Laboratories, Inc."

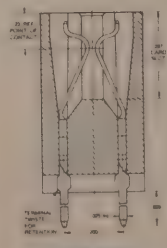
DIMENSIONAL DATA

	PART NUMBER	NO. OF CONTACTS	DIMENSIONS A	B	C	D	E	F	G
SOLDER TAB	*251-10-30-410	10/20	.800	.900	1.100	1.260	1.575	1.835	1.150
	†251-15-30-410	15/30	1.300	1.400	1.600	1.760	2.075	2.335	1.650
	*251-18-30-410	18/36	1.600	1.700	1.900	2.060	2.375	2.635	1.950
	*251-20-30-410	20/40	1.800	1.900	2.100	2.260	2.575	2.835	2.150
	†251-22-30-410	22/44	2.000	2.100	2.300	2.460	2.775	3.035	2.350
	*251-25-30-410	25/50	2.300	2.400	2.600	2.760	3.075	3.335	2.650
	*251-28-30-410	28/56	2.600	2.700	2.900	3.060	3.375	3.635	2.950
	*251-30-30-410	30/60	2.800	2.900	3.100	3.260	3.575	3.835	3.150
	*251-31-30-410	31/62	2.900	3.000	3.200	3.360	3.675	3.935	3.250
	*251-35-30-410	35/70	3.300	3.400	3.600	3.760	4.075	4.335	3.650
	†251-36-30-410	36/72	3.400	3.500	3.700	3.860	4.175	4.435	3.750
	†251-40-30-410	40/80	3.800	3.900	4.100	4.260	4.575	4.835	4.150
	†251-43-30-410	43/86	4.100	4.200	4.400	4.560	4.875	5.135	4.450
	*251-44-30-410	44/88	4.200	4.300	4.500	4.660	4.975	5.235	4.550
	*251-49-30-410	49/98	4.700	4.800	5.000	5.160	5.475	5.735	5.050
	†251-50-30-410	50/100	4.800	4.900	5.100	5.260	5.575	5.835	5.150
DIP SOLDER	*252-10-30-360	10/20	.800	.900	1.100	1.260	—	—	1.150
	†252-15-30-360	15/30	1.300	1.400	1.600	1.760	—	—	1.650
	*252-18-30-360	18/36	1.600	1.700	1.900	2.060	—	—	1.950
	*252-20-30-360	20/40	1.800	1.900	2.100	2.260	—	—	2.150
	†252-22-30-360	22/44	2.000	2.100	2.300	2.460	—	—	2.350
	*252-25-30-360	25/50	2.300	2.400	2.600	2.760	—	—	2.650
	*252-28-30-360	28/56	2.600	2.700	2.900	3.060	—	—	2.950
	*252-30-30-360	30/60	2.800	2.900	3.100	3.260	—	—	3.150
	*252-31-30-360	31/62	2.900	3.000	3.200	3.360	—	—	3.250
	*252-35-30-360	35/70	3.300	3.400	3.600	3.760	—	—	3.650
	†252-36-30-360	36/72	3.400	3.500	3.700	3.860	—	—	3.750
	†252-40-30-360	40/80	3.800	3.900	4.100	4.260	—	—	4.150
	†252-43-30-360	43/86	4.100	4.200	4.400	4.560	—	—	4.450
	*252-44-30-360	44/88	4.200	4.300	4.500	4.660	—	—	4.550
	*252-49-30-360	49/98	4.700	4.800	5.000	5.160	—	—	5.050
	†252-50-30-360	50/100	4.800	4.900	5.100	5.260	—	—	5.150
WIRE WRAP	*253-10-30-260	10/20	.800	.900	1.100	1.260	1.575	1.835	1.150
	†253-15-30-260	15/30	1.300	1.400	1.600	1.760	2.075	2.335	1.650
	*253-18-30-260	18/36	1.600	1.700	1.900	2.060	2.375	2.635	1.950
	*253-20-30-260	20/40	1.800	1.900	2.100	2.260	2.575	2.835	2.150
	†253-22-30-260	22/44	2.000	2.100	2.300	2.460	2.775	3.035	2.350
	*253-25-30-260	25/50	2.300	2.400	2.600	2.760	3.075	3.335	2.650
	*253-28-30-260	28/56	2.600	2.700	2.900	3.060	3.375	3.635	2.950
	*253-30-30-260	30/60	2.800	2.900	3.100	3.260	3.575	3.835	3.150
	*253-31-30-260	31/62	2.900	3.000	3.200	3.360	3.675	3.935	3.250
	*253-35-30-260	35/70	3.300	3.400	3.600	3.760	4.075	4.335	3.650
	†253-36-30-260	36/72	3.100	3.500	3.700	3.860	4.175	4.435	3.750
	†253-40-30-260	40/80	3.800	3.900	4.100	4.260	4.575	4.835	4.150
	†253-43-30-260	43/86	4.100	4.200	4.400	4.560	4.875	5.135	4.450
	*253-44-30-260	44/88	4.200	4.300	4.500	4.660	4.975	5.235	4.550
	*253-49-30-260	49/98	4.700	4.800	5.000	5.160	5.475	5.735	5.050
	†253-50-30-260	50/100	4.800	4.900	5.100	5.260	5.575	5.835	5.150

* To be made available at a later date. Contact factory.
† Indicates items available through Cinch Distributors.

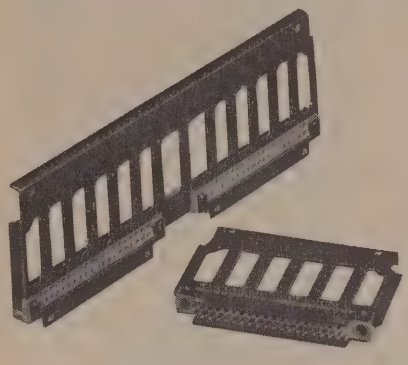

SOLDER TAB


DIP SOLDER


WIRE WRAP

TRW CINCH CONNECTORS

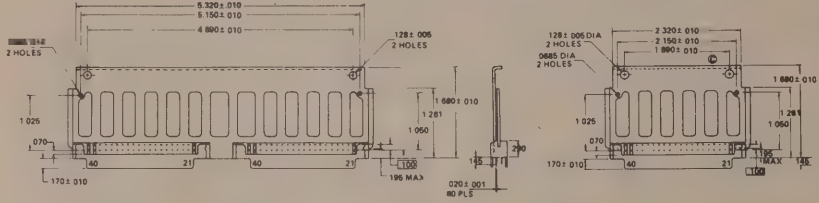
NAFI 40 & 80 CONTACT PC CONNECTOR & MODULES

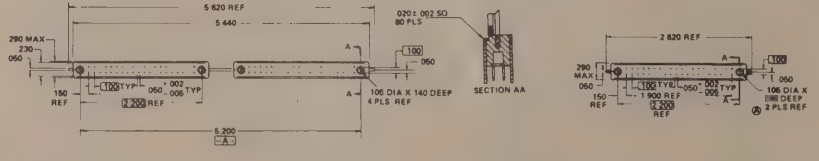


This miniature connector assembly can be quickly and easily disassembled and reassembled for wave solder installation of PC boards as well as for field servicing and retrofit.

These 40 and 80 pin connectors are designed to meet, or exceed, the requirements of MIL-STD-1389 and MIL-M-28787.

These assemblies function as headers for the support of a printed circuit board measuring approximately 2 5/16", or 5 5/16" x 1 5/32". They provide for the assembly of dual-in-line packages, the leads of which will extend through the cutouts in the metal frame portion, into the printed circuit board allowing for their interconnection by wave soldering. The metal frame acts as a heat sink to carry away the heat generated by the dual-in-line devices.





The connector contains 40 contacts, 2 rows of 20 each arranged in .100" x .100" centers, which are gold plated brass.

These assemblies may be mated to back panel assemblies with insulated or grounded mini-mod receptacles described on this page, or with any receptacle arrangement conforming to NavOrd specification WS6157.

ELECTRICAL SPECIFICATIONS

Current Rating: 3.0 amps.
Contact Resistance: 6.0 milliohms max.
Dielectric Strength: 1000V RMS, 1200V DC.
Insulation Resistance: 100,000 megohms min.

MATERIALS AND FINISHES

Contact Strip: Glass filled diallyl phthalate per MIL-M-14F, Type SDG.

Contact Pins: Brass alloy per QQ-B-613, 50 microinches gold minimum over nickel.
Frame: Black anodized aluminum per QQ-A-250.

MECHANICAL SPECIFICATIONS

Molded-in pins will withstand 20 oz. pull.
Guide ribs will withstand 10 in.-lbs. torque.
Extractor fin withstands 6 in.-lbs. torque.
Pin shield withstands 6 lbs. pull.

ORDERING INFORMATION

Cinch Part No.	NavOrd No.	Description
299 99 00 004	0102-655	Single Span
299 99 00 005	0102-660	Double Span

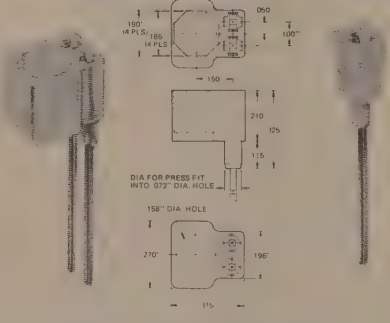
Consult the factory for other frame cutout configurations.

RECEPTACLE HARDWARE *

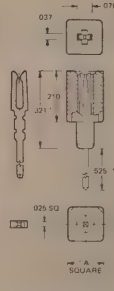
Grid	Dim. "A"	Dim. "B"
.100" x .100"	.095"	.095"
.125" x .125"	.120"	.120"
.150" x .150"	.145"	.145"

**Other tail lengths available upon request.

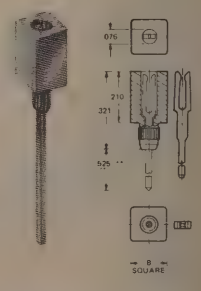
POLARIZING MODULE



SIGNAL MODULE



GROUND MODULE



MINI-MOD MODULES

FEATURES

- Modular construction for wide latitude of configurations on .100" x .100", 125" x .125" and .150" x .150" grid.
- Meet stringent requirements for military airborne applications.
- Meet NAFI's standard packaging concept per WS-6157A.
- Nylon modules serve as both contact retention devices and as a dielectric.
- Available in colors for easy color coding and identification.

*CONSULT FACTORY FOR PART NUMBERS

- Automatic assembly operations offer low overall costs.

PHYSICAL CHARACTERISTICS

Insulator Material: White nylon per MIL-M-20693A. Other colors available on request.

Ground Material: Aluminum per QQ-A-225.

Contact Material: Phosphor bronze per QQ-B-750. Comp. A or Beryllium copper per QQ-C-533.

Contact Plating: 30 microinches gold per MIL-G-45204B over copper flash. Other finishes available on request.

ELECTRICAL CHARACTERISTICS

Current Rating: 3 amps.

Withstanding Voltage: 1800V AC tested per EIA std. RS-364.

Operating Voltage: 600V AC — 1/3 withstanding voltage per EIA std. RS-364.

Contact Resistance: 8 milliohms max.

Insulation Resistance: 5000 megohms min.

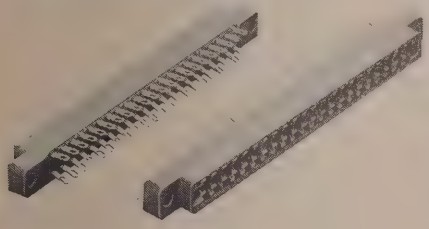
MECHANICAL DATA

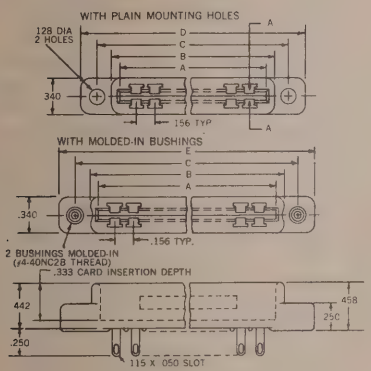
Individual contact insertion and withdrawal with an .020 blade — 2-10 oz.
Individual contact retention — 8 lbs. min.

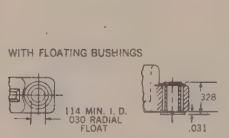
TRW CINCH CONNECTORS

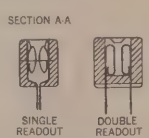
STANDARD PC CONNECTORS

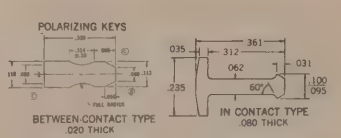
STANDARD EDGE CONNECTORS WITH SOLDER TAB CONTACTS/ .156" SPACING - SINGLE OR DOUBLE READOUT FOR 1/16" PRINTED CIRCUIT BOARDS











FEATURES AND SPECIFICATIONS

SPECIAL FEATURES: Patented bifurcated bellows contacts Pat. No. 3274532 provide added contact reliability especially in applications where vibration and board irregularities are involved.

SIZES: Both single and double readout versions are available in 6, 10, 12, 15, 18, 20, 22 and 25-contact position sizes.

TERMINATION: Bifurcated contacts with conventional .115" x .050" slot solder tabs.

MOUNTING STYLES: Available with either .128" diameter holes for standard mounting molded-in bushings or floating bushings. .142" diameter plain holes also available on special order.

INSULATOR MATERIAL: Green glass-filled diallyl phthalate, type SDG-F per MIL-M-14.

CONTACT MATERIALS & PLATING: Contacts are available in either phosphor bronze or beryllium copper. Standard finish is 30 micro-inches gold in the contacting area and 10 micro-inches gold on the remainder of the contact. Beryllium copper contacts can also be supplied with special finish of 50 micro-inches gold over 100 micro-inches copper to meet MIL-C-21079 C.

POLARIZING KEY MATERIALS: Two types of polarizing keys are available, and must be ordered separately as follows: Part No. 456-07-35-003 (for between-contact polarization) is made of glass epoxy; Part No. 474-11-54-200 (for in-contact polarization) is made of diallyl phthalate.

PERFORMANCE SPECIFICATIONS: Contact factory.

SINGLE READOUT

"Recognized under the Component Program of Underwriters' Laboratories, Inc."

NO. OF CONTACT POSITIONS	TYPE 1 PART NO. (Plain Mtg. Holes .128" Dia.)	TYPE 1A PART NO. (Plain Mtg. Holes .142" Dia.)	TYPE 2 PART NO. (Molded-In Bushings)	TYPE 3 PART NO. (Floating Bushings)	CONTACT MATERIAL	DIMENSIONS A	B	C	D	E	NO. OF CONTACT POSITIONS
6	250-06-30-170*	250-06-30-211	250-06-30-190	250-06-30-200	Phosphor Bronze	1.100	1.239	1.531	1.785	1.937	6
	250-06-30-171†	250-06-30-210	250-06-30-191†	250-06-30-201†	Beryllium Copper						
10	250-10-30-170*	250-10-30-211	250-10-30-190	250-10-30-200	Phosphor Bronze	1.724	1.864	2.156	2.410	2.562	10
	250-10-30-171†	250-10-30-210	250-10-30-191†	250-10-30-201†	Beryllium Copper						
12	250-12-30-170*	250-12-30-211	250-12-30-190	250-12-30-200	Phosphor Bronze	2.036	2.177	2.469	2.723	2.875	12
	250-12-30-171	250-12-30-210	250-12-30-191	250-12-30-201	Beryllium Copper						
15	250-15-30-170*	250-15-30-211	250-15-30-190	250-15-30-200	Phosphor Bronze	2.504	2.645	2.937	3.191	3.343	15
	250-15-30-171†	250-15-30-210	250-15-30-191†	250-15-30-201†	Beryllium Copper						
18	250-18-30-170*	250-18-30-211	250-18-30-190	250-18-30-200	Phosphor Bronze	2.972	3.114	3.406	3.660	3.812	18
	250-18-30-171†	250-18-30-210	250-18-30-191†	250-18-30-201†	Beryllium Copper						
20	250-20-30-170	250-20-30-211	250-20-30-190	250-20-30-200	Phosphor Bronze	3.286	3.427	3.719	3.973	4.125	20
	250-20-30-171	250-20-30-210	250-20-30-191	250-20-30-201	Beryllium Copper						
22	250-22-30-170*	250-22-30-211	250-22-30-190	250-22-30-200	Phosphor Bronze	3.596	3.739	4.031	4.285	4.437	22
	250-22-30-171†	250-22-30-210	250-22-30-191†	250-22-30-201†	Beryllium Copper						
25	250-25-30-170*	250-25-30-211	250-25-30-190	250-25-30-200	Phosphor Bronze	4.067	4.208	4.500	4.754	4.906	25
	250-25-30-171	250-25-30-210	250-25-30-191	250-25-30-201	Beryllium Copper						

DOUBLE READOUT

"Recognized under the Component Program of Underwriters' Laboratories, Inc."

NO. OF CONTACT POSITIONS	TYPE 1 PART NO. (Plain Mtg. Holes .128" Dia.)	TYPE 1A PART NO. (Plain Mtg. Holes .142" Dia.)	TYPE 2 PART NO. (Molded-In Bushings)	TYPE 3 PART NO. (Floating Bushings)	CONTACT MATERIAL	DIMENSIONS A	B	C	D	E	NO. OF CONTACT POSITIONS
6	251-06-30-160*	251-06-30-260	251-06-30-210	251-06-30-220	Phosphor Bronze	1.100	1.239	1.531	1.785	1.937	6
	251-06-30-161†	251-06-30-261	251-06-30-211†	251-06-30-221†	Beryllium Copper						
10	251-10-30-160*	251-10-30-260	251-10-30-210	251-10-30-220	Phosphor Bronze	1.724	1.864	2.156	2.410	2.562	10
	251-10-30-161†	251-10-30-261	251-10-30-211†	251-10-30-221†	Beryllium Copper						
12	251-12-30-160*	251-12-30-260	251-12-30-210	251-12-30-220	Phosphor Bronze	2.036	2.177	2.469	2.723	2.875	12
	251-12-30-161	251-12-30-261	251-12-30-211	251-12-30-221	Beryllium Copper						
15	251-15-30-160*	251-15-30-260	251-15-30-210	251-15-30-220	Phosphor Bronze	2.504	2.645	2.937	3.191	3.343	15
	251-15-30-161†	251-15-30-261	251-15-30-211†	251-15-30-221†	Beryllium Copper						
18	251-18-30-160*	251-18-30-260	251-18-30-210	251-18-30-220	Phosphor Bronze	2.972	3.114	3.406	3.660	3.812	18
	251-18-30-161†	251-18-30-261	251-18-30-211†	251-18-30-221†	Beryllium Copper						
20	251-20-30-160	251-20-30-260	251-20-30-210	251-20-30-220	Phosphor Bronze	3.286	3.427	3.719	3.973	4.125	20
	251-20-30-161	251-20-30-261	251-20-30-211	251-20-30-221	Beryllium Copper						
22	251-22-30-160*	251-22-30-260	251-22-30-210	251-22-30-220	Phosphor Bronze	3.596	3.739	4.031	4.285	4.437	22
	251-22-30-161†	251-22-30-261	251-22-30-211†	251-22-30-221†	Beryllium Copper						
25	251-25-30-160*	251-25-30-260	251-25-30-210	251-25-30-220	Phosphor Bronze	4.067	4.208	4.500	4.754	4.906	25
	251-25-30-161	251-25-30-261	251-25-30-211	251-25-30-221	Beryllium Copper						

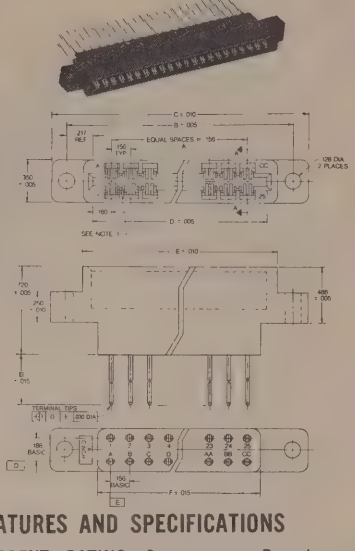
* These items available through Cinch distributors.

† Can be supplied to meet MIL-C-21097C. See page 19.

TRW CINCH CONNECTORS

PC BOARD CONNECTORS WITH TERMINALS ON .156 CENTERS

PRINTED CIRCUIT BOARD CONNECTORS/WITH WIRE WRAP .031 x .062 TERMINALS ON .156 CENTERS



CONTACT RESISTANCE (Millivolt Drop @ 3 Amp): 16 millivolt max.

TOTAL INSERTION FORCE: 20 lbs. max. Performed in accordance with Paragraph 4.6.6.2 of MIL-C-21097 using .070 inch thick blade.

INDIVIDUAL CONTACT ENGAGING AND SEPARATION FORCE: 2 - 16 oz. Performed in accordance with Paragraph 4.6.6.1.1 of MIL-C-21097B using .062 inch thick blade.

INDIVIDUAL SEPARATION FORCE: 1 oz. min. Performed in accordance with Paragraph 4.6.6.1.2 of MIL-C-21097 using .054 inch thick blade.

DURABILITY: 100 cycles with steel blade .070 inch thick. Contact resistance and individual contact separation force requirements met after test.

INSULATOR MATERIALS: General purpose impact phenolic — color black.

POLARIZING KEY: Nylon

CONTACT: Phosphor bronze

CONTACT PLATING: .00006 min. gold over copper in contacting area .0001 min. gold on remainder of contact.

GENERAL DESCRIPTION: 10 to 30 contact positions double read-out .156 center to center spacing. For 1/16 (.054-.070) thick printed circuit card. Bifurcated — cantilever type contacts. Wire wrap termination .031 x .062. Between contact polarizing.

FEATURES AND SPECIFICATIONS

CURRENT RATING: 3 amperes. Based upon all contacts carrying specified current and a temperature rise of 30°C above ambient.

RATED VOLTAGE (Sea Level): 900 V AC RMS 1200 V DC. (Based on 1/3 voltage breakdown)

TEST VOLTAGE (Sea Level): 2000 V AC RMS 2700 V DC. (Based on 75% voltage breakdown)

ORDERING INFORMATION

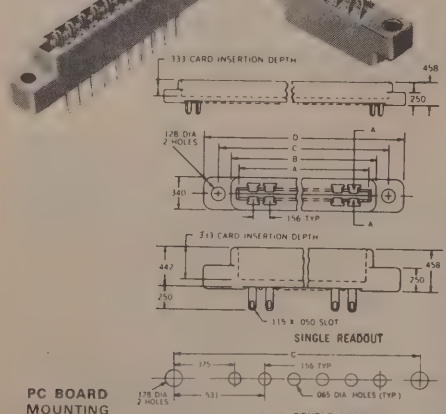
"Recognized under the Component Program of Underwriters' Laboratories, Inc."

PART NUMBER	NO. OF CONTACTS	DIMENSIONS						
		A	B	C	D	E	F	G
253-10-00-253†	10/20	1.404	2.158	2.408	1.724	1.878	1.616	.550
253-10-00-254†	10/20	1.404	2.158	2.408	1.724	1.878	1.616	.755
253-10-00-255†	10/20	1.404	2.158	2.408	1.724	1.878	1.616	1.051
253-15-00-253†	15/30	2.184	2.938	3.188	2.504	2.658	2.396	.550
253-15-00-254†	15/30	2.184	2.938	3.188	2.504	2.658	2.396	.755
253-15-00-255†	15/30	2.184	2.938	3.188	2.504	2.658	2.396	1.051
253-18-00-253†	18/36	2.652	3.406	3.656	2.972	3.126	2.864	.550
253-18-00-254†	18/36	2.652	3.406	3.656	2.972	3.126	2.864	.755
253-18-00-255†	18/36	2.652	3.406	3.656	2.972	3.126	2.864	1.051
253-22-00-253†	22/44	3.276	4.030	4.280	3.596	3.750	3.488	.550
253-22-00-254†	22/44	3.276	4.030	4.280	3.596	3.750	3.488	.755
253-22-00-255†	22/44	3.276	4.030	4.280	3.596	3.750	3.488	1.051
253-25-00-253†	25/50	3.744	4.498	4.748	4.064	4.218	3.956	.550
253-25-00-254†	25/50	3.744	4.498	4.748	4.064	4.218	3.956	.755
253-25-00-255†	25/50	3.744	4.498	4.748	4.064	4.218	3.956	1.051
253-30-00-253†	30/60	4.524	5.278	5.528	4.844	4.988	4.736	.550
253-30-00-254†	30/60	4.524	5.278	5.528	4.844	4.998	4.736	.755
253-30-00-255†	30/60	4.524	5.278	5.528	4.844	4.998	4.736	1.051
474-11-76-229†		Polarizing Key						

† Indicates items available through Cinch Distributors.

SPECIAL PURPOSE .156 CENTER PC BOARD EDGE CONNECTORS

PC BOARD EDGE CONNECTORS FOR INTERCONNECTING TWO OR MORE STANDARD 1/16" PRINTED CIRCUIT BOARDS



PC BOARD MOUNTING HOLE LAYOUT

RATED VOLTAGE: AC RMS, adj. terminals 830 V (Sea Level) 300 V (3.4 Hg. 50,000 feet); 200 V (1.3 Hg. 70,000 feet).

CURRENT: 5.0 Amps.

PLATING: All contacts selective plated — 30 micro-inches gold in contacting area and 10 micro-inches gold on remainder of contact.

CONTACT RESISTANCE: .005 Ohms at Rated Current.

INSULATION RESISTANCE: 5000 Megohms.

ENVIRONMENTAL: Per MIL-C-21097 and MIL-STD-202, latest versions.

SHOCK: 3 blows of 50G, Method 202B.

TEMPERATURE CYCLING: 5 continuous cycles per Method 107B, Test Condition B: Beryllium copper −65°C to 125°C; Phosphor bronze −65°C to 105°C.

SALT SPRAY: 48 hrs. per Method 101B, Condition B.

VIBRATION: Per Method 204A, Condition B.

HUMIDITY: Per Method 103B, Condition B.

ORDERING INFORMATION

NO. OF CONTACT POSITIONS	CARD EXTENDER	EXTENDED DIP SOLDER TERMINATIONS	
	DOUBLE READOUT PART NUMBER	SINGLE READOUT PART NUMBER	DOUBLE READOUT PART NUMBER
6	251-06-30-390	252-06-30-230	252-06-30-260
10	251-10-30-390	252-10-30-230	252-10-30-260
12	251-12-30-390	252-12-30-230	252-12-30-260
15	251-15-30-390	252-15-30-230	252-15-30-260
18	251-18-30-390	252-18-30-230	252-18-30-260
22	251-22-30-390	252-22-30-230	252-22-30-260
25	251-25-30-390	252-25-30-230	252-25-30-260

All connectors listed are available "off-the-shelf" from Cinch Distributors.

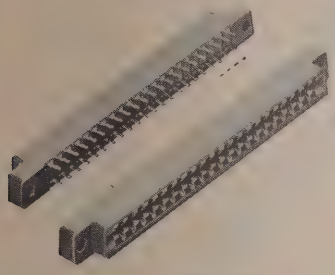
DIMENSIONAL DATA

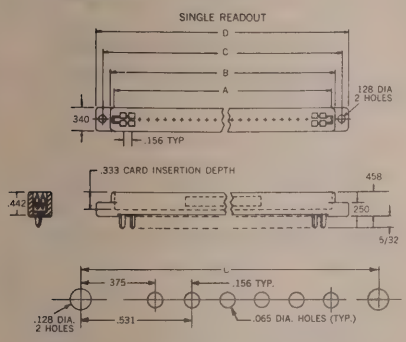
NO. OF CONTACT POSITIONS	A	B	C	D
6	1.100	1.239	1.531	1.785
10	1.724	1.864	2.156	2.410
12	2.036	2.177	2.469	2.723
15	2.504	2.645	2.937	3.191
18	2.972	3.114	3.406	3.660
22	3.596	3.739	4.031	4.285
25	4.067	4.208	4.500	4.754

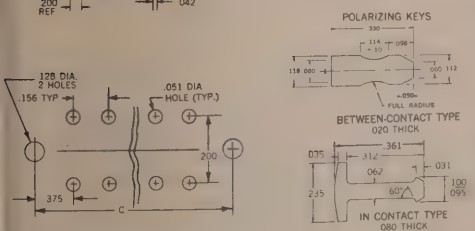
TRW CINCH CONNECTORS

STANDARD DIP SOLDER PC CONNECTORS .156 CENTER SPACING

STANDARD EDGE CONNECTORS WITH DIP SOLDER CONTACTS/ .156" SPACING - SINGLE OR DOUBLE READOUT FOR 1/16" PRINTED CIRCUIT BOARDS







DIMENSIONAL DATA

SIZE (No. of Contact Positions)	DIMENSIONS "A"	"B"	"C"	"D"
6	1.100	1.239	1.531	1.785
10	1.724	1.864	2.156	2.410
12	2.036	2.177	2.469	2.723
15	2.504	2.645	2.937	3.191
18	2.972	3.114	3.406	3.660
20	3.286	3.427	3.719	3.973
22	3.596	3.739	4.031	4.285
25	4.067	4.208	4.500	4.754

FEATURES AND SPECIFICATIONS

SPECIAL FEATURES. Patented bifurcated bellows contacts Pat. No. 374532 provide added contact reliability especially in applications where vibration and board irregularities are involved.

SIZES: Both single and double readout versions are available in 6, 10, 12, 15, 18, 20, 22 and 25-contact position sizes.

TERMINATIONS: Bifurcated contacts with tails designed for dip soldering 5/32" long. Other lengths available on special order.

MOUNTING STYLE: Plain .128" diameter holes for standard mounting.

INSULATOR MATERIAL: Green glass-filled diallyl phthalate, type SDG-F per MIL-M-14.

CONTACT MATERIALS & PLATING: Contacts are available in either phosphor bronze or beryllium copper. Standard finish is 30 micro-inches gold in contacting area and 10 micro-inches on remainder of contact. Connectors can also be supplied with a contact finish of 50 micro-inches gold over 100 micro-inches copper to meet MIL-C-21097C.

POLARIZING KEY MATERIALS: Two types of polarizing keys are available, and must be ordered separately as follows: Part No. 456-07-35-003 (for between-contact polarization) is made of glass epoxy; Part No. 474-11-54-200 (for in-contact polarization) is made of diallyl phthalate.

PERFORMANCE SPECIFICATIONS: Contact factory.

SINGLE READOUT

"Recognized under the Component Program of Underwriters' Laboratories, Inc."

NO. OF CONTACT POSITIONS	PART NO. (Plain Mounting Holes)	CONTACT MATERIAL	DIMENSIONS A	B	C	D	NO. OF CONTACT POSITIONS
6	252-06-30-240 * 252-06-30-241	Phosphor Bronze Beryllium Copper	1.100	1.239	1.531	1.785	6
10	252-10-30-240 * 252-10-30-241	Phosphor Bronze Beryllium Copper	1.724	1.864	2.156	2.410	10
12	252-12-30-240 252-12-30-241	Phosphor Bronze Beryllium Copper	2.036	2.177	2.469	2.723	12
15	252-15-30-240 * 252-15-30-241	Phosphor Bronze Beryllium Copper	2.504	2.645	2.937	3.191	15
18	252-18-30-240 * 252-18-30-241	Phosphor Bronze Beryllium Copper	2.972	3.114	3.406	3.660	18
20	252-20-30-240 252-20-30-241	Phosphor Bronze Beryllium Copper	3.286	3.427	3.719	3.973	20
22	252-22-30-240 * 252-22-30-241	Phosphor Bronze Beryllium Copper	3.596	3.739	4.031	4.285	22
25	252-25-30-240 * 252-25-30-241	Phosphor Bronze Beryllium Copper	4.067	4.208	4.500	4.754	25

DOUBLE READOUT

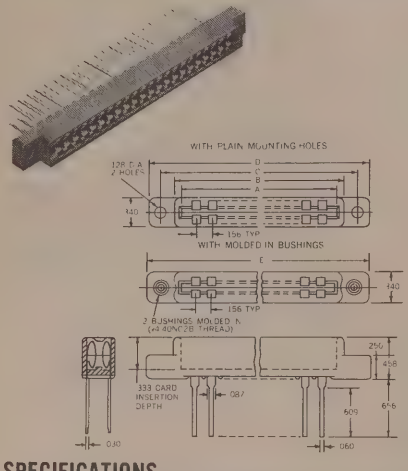
NO. OF CONTACT POSITIONS	PART NO. (Plain Mounting Holes)	CONTACT MATERIAL	DIMENSIONS A	B	C	D	NO. OF CONTACT POSITIONS
6	252-06-30-160* 252-06-30-161†	Phosphor Bronze Beryllium Copper	1.100	1.239	1.531	1.785	6
10	252-10-30-160 * 252-10-30-161†	Phosphor Bronze Beryllium Copper	1.724	1.864	2.156	2.410	10
12	252-12-30-160* 252-12-30-161	Phosphor Bronze Beryllium Copper	2.036	2.177	2.469	2.723	12
15	252-15-30-160* 252-15-30-161†	Phosphor Bronze Beryllium Copper	2.504	2.645	2.937	3.191	15
18	252-18-30-160* 252-18-30-161†	Phosphor Bronze Beryllium Copper	2.972	3.114	3.406	3.660	18
20	252-20-30-160 252-20-30-161	Phosphor Bronze Beryllium Copper	3.286	3.427	3.719	3.973	20
22	252-22-30-160* 252-22-30-161†	Phosphor Bronze Beryllium Copper	3.596	3.739	4.031	4.285	22
25	252-25-30-160 * 252-25-30-161	Phosphor Bronze Beryllium Copper	4.067	4.208	4.500	4.754	25

* These items available through Cinch distributors.
† Can be supplied to meet MIL-C-21097C.

TRW CINCH CONNECTORS

STANDARD PC CONNECTORS .156 CENTER SPACING

STANDARD EDGE CONNECTORS WITH WIRE WRAP POST CONTACTS/ .156" SPACING - DOUBLE READOUT FOR 1/16" PRINTED CIRCUIT BOARDS



FEATURES AND SPECIFICATIONS

SPECIAL FEATURES: Available in wide range of sizes and mounting styles.

SIZES: Available in 6, 10, 12, 15, 18, 20 and 25 contact position sizes.

TERMINATION: Special wrap post contacts with .060" x .030" tails designed for wire wrapping.

MOUNTING STYLES: Available with plain .128" diameter holes for standard mounting, molded-in bushings or floating bushings.

INSULATOR MATERIAL: Green glass-filled diallyl phthalate, type SDG-F per MIL-M-14.

CONTACT MATERIALS & PLATING: Contacts are available in either phosphor bronze or beryllium copper with 30 micro-inches gold finish.

POLARIZING KEY MATERIALS: Two types of polarizing keys are available and must be ordered separately as follows: Part No. 456-07-35-003 key (for between-contact polarization) is made of glass epoxy. Part No. 474-11-54-200 key (for in-contact polarization) is made of diallyl phthalate (see page 13).

PERFORMANCE SPECIFICATIONS: Contact factory.

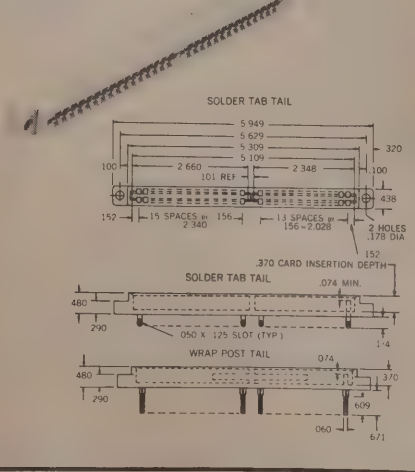
SPECIFICATIONS

NO. OF CONTACT POSITIONS	TYPE 1 PART NO. (Plain Mounting Holes)	TYPE 2 PART NO. (Molded-In Bushings)	TYPE 3 PART NO. (Floating Bushings)	CONTACT MATERIAL	DIMENSIONS A	B	C	D	E
6	253-06-30-140*	253-06-30-180	253-06-30-170	Phosphor Bronze	1.100	1.239	1.531	1.785	1.937
	253-06-30-141	253-06-30-181	253-06-30-171	Beryllium Copper					
10	253-10-30-140*	253-10-30-180	253-10-30-170	Phosphor Bronze	1.724	1.864	2.156	2.410	2.562
	253-10-30-141	253-10-30-181	253-10-30-171	Beryllium Copper					
12	253-12-30-140*	253-12-30-180	253-12-30-170	Phosphor Bronze	2.036	2.177	2.469	2.723	2.875
	253-12-30-141	253-12-30-181	253-12-30-171	Beryllium Copper					
15	253-15-30-140*	253-15-30-180	253-15-30-170	Phosphor Bronze	2.504	2.645	2.937	3.191	3.343
	253-15-30-141	253-15-30-181	253-15-30-171	Beryllium Copper					
18	253-18-30-140*	253-18-30-180	253-18-30-170	Phosphor Bronze	2.972	3.114	3.406	3.660	3.812
	253-18-30-141	253-18-30-181	253-18-30-171	Beryllium Copper					
20	253-20-30-140	253-20-30-180	253-20-30-170	Phosphor Bronze	3.286	3.427	3.719	3.973	4.125
	253-20-30-141	253-20-30-181	253-20-30-171	Beryllium Copper					
22	253-22-30-140*	253-22-30-180	253-22-30-170	Phosphor Bronze	3.596	3.739	4.031	4.285	4.437
	253-22-30-141	253-22-30-181	253-22-30-171	Beryllium Copper					
25	253-25-30-140	253-25-30-180	253-25-30-170	Phosphor Bronze	4.067	4.208	4.500	4.754	4.906
	253-25-30-141	253-25-30-181	253-25-30-171	Beryllium Copper					

* These items available through Cinch distributors.

SPECIAL DESIGN PC CONNECTORS .156 CENTER SPACING

SPECIAL EDGE CONNECTORS WITH CENTER BRIDGE DESIGN/ .156" SPACING - DOUBLE READOUT FOR 1/16" PRINTED CIRCUIT BOARDS



FEATURES AND SPECIFICATIONS

SPECIAL FEATURES: Center bridge construction utilized in insulator to minimize warpage. Available with both solder tab and wrap post termination.

SIZE: Available in 30-position size only.

TERMINATIONS: Available with conventional solder tab tails or .060" x .030" wrap post contacts.

MOUNTING STYLE: Plain .178" diameter holes for standard mounting.

INSULATOR MATERIAL: Green glass-filled diallyl phthalate, type SDG-F per MIL-M-14.

CONTACT MATERIALS & PLATING: Contacts are available in either phosphor bronze or beryllium copper with 30 micro-inches gold on the contacting area and 10 micro-inches gold on the remainder of contact.

POLARIZING KEY MATERIALS: Available with "in-contact" polarization only; polarizing key is made of diallyl phthalate and must be ordered separately. (Part No. 474-11-54-200).

PERFORMANCE SPECIFICATIONS: Contact factory.

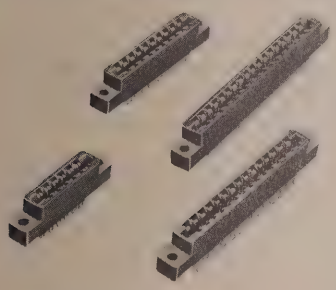
ORDERING INFORMATION

DESCRIPTION	PART NO.	CONTACT MATERIAL	NO. OF POSITIONS	NO. OF CONTACTS
Connector w/Solder Tab Tails	251-30-30-232	Phosphor Bronze	30	60
	251-30-30-231	Beryllium Copper		
Connector w/Wrap Post Tails	253-30-30-212*	Phosphor Bronze	30	60
	253-30-30-213*	Beryllium Copper		

* Plated 30 micro-inches gold. Not selective.

TRW CINCH CONNECTORS

SERIES 90 ECONO-LINE LOW-COST P.C. EDGE CONNECTORS
ON .156" CENTERS FOR 1/16" BOARDS — .333 DEEP CARD SLOT



Most of the performance features of TRW/Cinch Connectors standard printed circuit edge connectors are found in this low-cost version for commercial applications. Except for the reduced amount of gold-plating, the Series 90 Econo-Line connectors meet all the latest requirements of MIL-C-21097, Std. 202.

The Series 90 incorporates a newly developed high tensile brass, Alcoloy* 688, in its bifurcated bellow contacts. The contact area is selectively plated with 20 microinches of gold over 30 microinches of nickel that provides a non-migrating base. A green, glass-filled thermoplastic polyester replaces the more expensive diallyl phthalate used in the standard connector insulator.

Econo-Line connectors are supplied in 6, 10, 12, 15, 18, 22 and 25 positions, with either single or double readout in either conventional solder eyelet or dip solder tails.

*T.M. Olin Corporation.

PERFORMANCE DATA

MECHANICAL

Contact Insertion Force: 16 oz. max. per contact position.
Individual Separation Force: 1 oz. min. Performed in accordance with Para. 4.6.6.1.2 of MIL-C-21097 using .054-in. thick blade.
Durability: 100 cycles with steel blade .070-in. thick. Contact resistance and individual contact separation force requirements met after test.

ELECTRICAL

Voltage Rating (AC RMS, adjacent terminals): 830V (sea level); 300V (3.4" Hg, 50,000 feet); 450V (1.3" Hg, 70,000 feet).
Test Voltage (AC RMS, adjacent terminals): 1870V (sea level); 675V (3.4" Hg, 50,000 feet); 450V (1.3" Hg, 70,000 feet).
Current Rating: 5 amperes.
(Based upon all contacts carrying specified current and a temperature rise of 30°C. above ambient.)
Contact Resistance (at rated current): .005 ohms.
Insulation Resistance: 5000 Megohms.

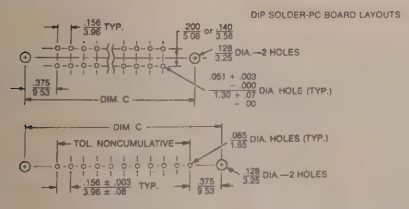
ENVIRONMENTAL SPECIFICATIONS

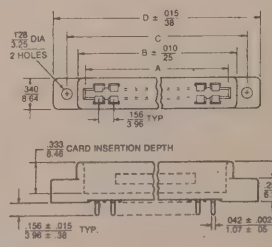
(Per MIL-C-21097 and MIL-STD-202, latest versions)
Shock: 3 blows at 50G, Method 202B.
Temperature Cycling: 5 continuous cycles per Method 107B.
Test Condition B: −65°C to +125°C.
Salt Spray: 48 hours per Method 101B, Condition B.
Vibration: Per Method 204A, Condition B for bifurcated contacts.
Humidity: Per Method 103B, Condition B.

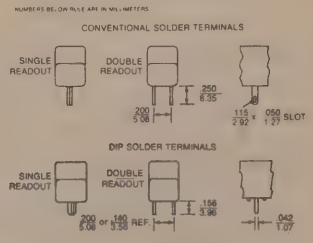
MATERIALS & FINISHES

Contacts: Alcoloy 688 high tensile brass.
Plating: Contact surface selectively plated with 20 microinches gold over 30 microinches nickel overall; solder-coated terminals.
Insulator: 30% glass-filled green polyester, SEO-rated.

DIMENSIONS







DIP SOLDER TERMINALS, .200 SPACING BETWEEN ROWS

Contact Positions	SINGLE READOUT		DOUBLE READOUT	
	Part No.	Distributor Part No.	Part No.	Distributor Part No.
6	252-06-90-240	50-6EE-10	252-06-90-160	50-12EE-40
10	252-10-90-240	50-10EE-10	252-10-90-160	50-20EE-40
12	252-12-90-240	50-12EE-10	252-12-90-160	50-24EE-40
15	252-15-90-240	50-15EE-10	252-15-90-160	50-30EE-40
18	252-18-90-240	50-18EE-10	252-18-90-160	50-36EE-40
22	252-22-90-240	50-22EE-10	252-22-90-160	50-44EE-40
25	252-25-90-240	50-25EE-10	252-25-90-160	50-50EE-40

No. of Contact Pos.	DIMENSIONS			
	A	B	C	D
6	1.100	1.239	1.531	1.785
10	1.724	1.864	2.156	2.410
12	2.036	2.177	2.469	2.723
15	2.504	2.645	2.937	3.191
18	2.972	3.114	3.406	3.660
22	3.596	3.739	4.031	4.285
25	4.067	4.208	4.500	4.754

CONVENTIONAL SOLDER TERMINALS

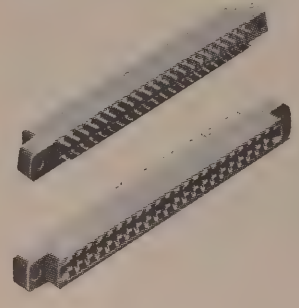
Contact Positions	SINGLE READOUT		DOUBLE READOUT	
	Part No.	Distributor Part No.	Part No.	Distributor Part No.
6	250-06-90-170	50-6EE-20	251-06-90-160	50-12EE-30
10	250-10-90-170	50-10EE-20	251-10-90-160	50-20EE-30
12	250-12-90-170	50-12EE-20	251-12-90-160	50-24EE-30
15	250-15-90-170	50-15EE-20	251-15-90-160	50-30EE-30
18	250-18-90-170	50-18EE-20	251-18-90-160	50-36EE-30
22	250-22-90-170	50-22EE-20	251-22-90-160	50-44EE-30
25	250-25-90-170	50-25EE-20	251-25-90-160	50-50EE-30

DIP SOLDER TAILS, DOUBLE READOUT, .140 SPACING BETWEEN ROWS

Contact Positions	Distributor Part No.	Factory No.
6	50-12EE-140	252-06-90-210
10	50-20EE-140	252-10-90-210
12	50-24EE-140	252-12-90-210
15	50-30EE-140	252-15-90-210
18	50-36EE-140	252-18-90-210
22	50-44EE-140	252-22-90-210
25	50-50EE-140	252-25-90-210

TRW CINCH CONNECTORS

DIP SOLDER TERMINAL PC CONNECTORS
0.140" SPACING BETWEEN ROWS 0.156" CONTACT CENTERS



- Patented bifurcated bellows contacts for added contact reliability.
- Ideal for applications involving vibration or board irregularities.
- 6, 10, 12, 15, 18, 22 and 25-contact sizes, double readout.
- Available with or without mounting ears.
- Accepts single or double 1/16" thick sided boards.
- 0.125" long dip solder terminations.

MATERIALS

Insulator Material: Green glass-filled diallyl phthalate, type SDG-F per MIL-M-14.

Contact Material: Contacts are available in phosphor bronze. Standard finish is 30 micro-inches gold in contacting area and 10 micro-inches gold on remainder of contact.

Polarizing Key Materials: Two types of polarizing keys are available, and must be ordered separately as follows: Part No. 456-07-35-003 (for between contact polarization) is made of glass epoxy; Part No. 474-11-54-200 (for in-contact polarization) is made of diallyl phthalate.

ENVIRONMENTAL SPECIFICATIONS

Shock: 3 blows of 50G per MIL-STD-202C, Method 202B.

Temperature Cycling: 5 continuous cycles (−65°C to +105°C) per MIL-STD-202C, Method 107B, Test Condition B.

Salt Spray: 48 hours per MIL-STD-202C, Method 101B, Condition B.

Vibration: Per MIL-STD-202C, Method 204A, Test Condition B.

Humidity: Per MIL-STD-202C, Method 103B, Condition B.

ELECTRICAL SPECIFICATIONS

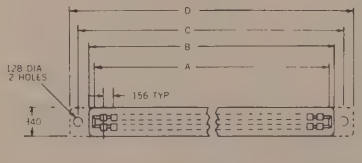
Test Voltage (AC RMS, adjacent terminals): 830V (sea level); 300V (3.4" Hg, 50,000 feet); 200V (1.3" Hg, 70,000 feet).

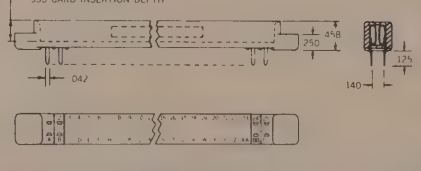
Current Rating: 5.0 amperes.

Contact Resistance at Rated Current: .005 ohms.

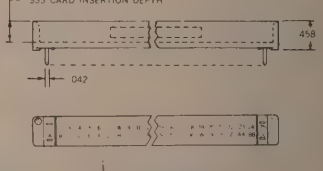
Insulation Resistance: 5000 megohms.

DIMENSIONS





210 SERIES



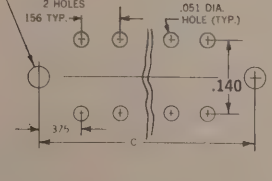
211 SERIES

POLARIZING KEYS

456-07-35-003

474-11-54-200

MOUNTING HOLE LAYOUT



WITH MOUNTING HOLES

Contact Positions	Contacts	Factory Part No.	Dimensions A	B	C	D
6	12	252-06-30-210*	1.100	1.239	1.531	1.785
10	20	252-10-30-210*	1.724	1.864	2.156	2.410
12	24	252-12-30-210*	2.036	2.177	2.469	2.723
15	30	252-15-30-210*	2.504	2.645	2.937	3.191
18	36	252-18-30-210*	2.972	3.114	3.406	3.660
22	44	252-22-30-210*	3.596	3.739	4.031	4.285
25	50	252-25-30-210*	4.067	4.208	4.500	4.754

WITHOUT MOUNTING HOLES

6	12	252-06-30-211*	1.100	1.239		
10	20	252-10-30-211*	1.724	1.864		
12	24	252-12-30-211*	2.036	2.177		
15	30	252-15-30-211*	2.504	2.645		
18	36	252-18-30-211*	2.972	3.114		
22	44	252-22-30-211*	3.596	3.739		
25	50	252-25-30-211*	4.067	4.208		

*These items available through Cinch distributors.

TRW CINCH CONNECTORS

CINCH D-SUBMINIATURE CONNECTORS†

All Cinch D-Subminiature Connectors undergo final assembly and inspection in the ultra-modern, temperature controlled Cinch "clean room." In this room, contacts, insulators and shells are stored and assembled under tight quality control inspection. Ultrasonic cleaning capabilities are also available on request.

GENERAL DESCRIPTION

The Cinch D-Subminiature Connectors described in this catalog are designed for applications where space and weight are prime considerations. These high contact density connectors are especially well-suited for aircraft, missile and ground support installations. Although designed essentially for rack-and-panel installations, D series connectors may be adapted for cable attachment by means of accessory junction shells with integral clamps.

In addition to the original D series with solder pot contacts in a two piece insulator, Cinch now offers Golden D, Mark I Connectors with solder pot contacts in a monobloc insulator for improved moisture resistance; Royal D, Mark III connectors with crimp snap-in contacts in the Little Caesar assembly for high performance, high reliability applications, and the Burgun-D with insertable and removable stamped or machine contacts for commercial applications.

All D-Subminiature Connectors will inter-mate if insert arrangements correspond. Mark I and Mark III connectors are designed to meet or exceed the requirements of MIL-C-24308 Rev. A.

A wide range of insert arrangements is offered accommodating up to 50 contacts accepting standard AWG wire as indicated in the individual specifications. Combination layouts are available, with provisions for coaxial and/or high voltage contacts. Printed circuit and wire wrap terminations are also available. The versatility of the D series is further enhanced by the variety of insulating materials and finishes, as well as a complete line of accessories.

The D-Subminiature series is handled by leading electronic distributors throughout the country. Questions regarding modifications of these designs or any connector requirement should be addressed to your local Cinch representative and will receive his immediate attention.

CONNECTORS INDIVIDUALLY PACKED IN HEAT-SEALED CONTAINERS TO ASSURE EXTENDED SHELF-LIFE

To protect D-Subminiature Connectors from contamination and other corrosive elements in the air, Cinch individually packs each connector in heat-sealed polyvinyl-chloride containers (as shown). This assures every customer of an extended shelf life. A separate compartment is also provided in each container for the loose crimp-type contacts supplied with the Royal D Mark III Connectors. Connectors can also be packed in individual polyethylene bags if desired.

INDEX CONNECTORS

Type	Description	Common Name	Insulator Type	Contact Termination	Page
D*C	D connectors with crimp snap-in contacts in two-piece insulators, with integral retension system	Burgun D	Two-piece, Nylon	Crimp Snap-in Screw machine and stamped contacts	4-8
D*MA	D connectors with crimp snap-in contacts in monobloc insulators utilizing Little Caesar rear release contact assembly	Royal D, Mark III	Monobloc, diallyl phthalate	Crimp Snap-in	20-21
D*M	D connectors with monobloc insulators for more critical application requirements	Golden D, Mark I	Monobloc, diallyl phthalate	Solder Pot	15-19
		Golden D, Mark I Combination	Monobloc, diallyl phthalate	Solder Pot with coaxial and/or HV and/or power	
D*	Original D connector with two-piece insulators	Original D	Two-piece, Nylon	Solder Pot	13-14

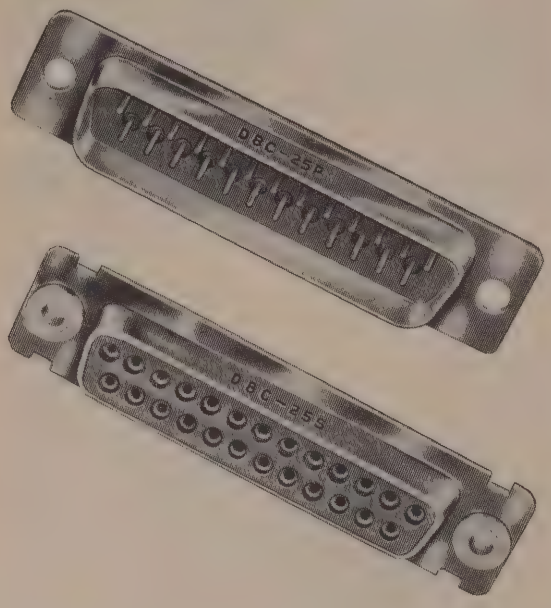
ACCESSORIES 24-25
GENERAL RATINGS AND SPECIFICATIONS 12
HOW TO ORDER AND STANDARD DIMENSIONS 11

DURA-CON MICRO MINIATURE STRIP AND RECTANGULAR CONNECTORS ON .050 CENTERS 26-27

†Manufactured under license agreement with ITT Cannon Electric Inc.

TRW CINCH CONNECTORS

BURGUN-D MARK IV CONNECTORS



The TRW/Cinch Burgun-D subminiature connector is designed for commercial applications where space, weight, and economy are important considerations.

It is especially suited to plug-in module, cable to panel and cable to cable installations, in computers and peripherals, test equipment, communications equipment and a wide range of other applications.

The Burgun-D (Mark IV) Series utilizes rear-release crimp snap-in contacts, that are readily inserted and removed by means of a simple, expendable insertion/extraction tool.

It offers these important features:

- Mates with existing original D and Mark I, Mark II and Mark III connectors.
- Operates at temperatures to 250°F (120°C).
- Size 20 contacts accommodate wire size #18 through #30 AWG stranded wire. (Screw machine only.)
- Closed-entry sockets automatically corrects misaligned pins.
- Rated at 5 amperes for #20 wire.
- Available in 9, 15, 25, 37, and 50 contact arrangements.
- Variety of contacts for hand and machine assembly and PC board insertion.

A COMPLETE LINE OF HARDWARE and accessories including junction shells, hoods, dust caps and lock assemblies is available and listed in TRW/Cinch Catalogs CD-12, and C-46.

FOR IMMEDIATE DELIVERY from stock, contact your TRW/Cinch D-subminiature industrial distributor.

CONDENSED DATA

STANDARD MATERIALS & FINISHES

Shell: Steel, yellow chromate over cadmium plate.

Insulator: Glass-filled burgundy nylon (per Fed. Spec. L-P-395B).

Contacts:

Machined — Copper alloy.

Stamped — Cadmium copper.

Contact Plating:

Selective Stamped — 30 microinches of gold (min.) over 50 microinches of nickel (min.) at contacting area, with gold flash overall.

Overall Stamped — 20 microinches of gold (min.) over 60 microinches of nickel (min.).

Machined — 20 microinches of gold over 60 microinches nickel (min.).

Rivets and Washers: Stainless steel (float mounting).

MECHANICAL FEATURES

Coupling: Friction and lock accessories.

Polarization: Keystone-shaped shells.

Contact Type: Crimp snap-in.

ELECTRICAL DATA

Contact Termination: Crimp.

Wire Size:

Size 20 Contacts — #20, #22, and #24 AWG stranded wire.

Size 20-18 Contacts — One #18 or two #22 AWG stranded wires.

Current Rating: Size 20 Contacts — 5 amps.

VOLTAGE RATING

	Sea Level	20,000 ft.	70,000 ft.	120,000 ft.
Average Flashover:	1500V AC	1000V AC	500V AC	255V AC
Test:	1000V AC	650V AC	325V AC	175V AC

Voltage Drop: Size 20 Contacts — 2.67 millivolts max. per amp when tested in accordance with MIL-STD-202, Method 307.

TRW CINCH CONNECTORS

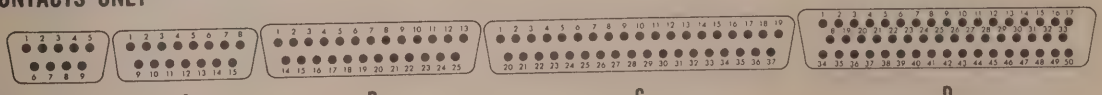
HOW TO ORDER BURGUN-D CONNECTORS

D B C F 15 P A * FO

- **D** — Series Prefix
- **B** — Shell Sizes: A, B, C, D, E
- **C** — C — BURGUN-D Series with core retention, rear release removable contacts
- **F** — No Designation: Standard .120 dia. hole; R: Reverse float mount for front panel mounting; F: Float mounts for rear panel mounting
- **15** — Contact Arrangement
- **P** — P — Pin; S — Socket
- **A** — Printed Circuit Terminal Modifier: A: Right angle printed circuit connector; B: Straight printed circuit connector
- ***** — Modification: D: .026/.022 dia. right angle machined contacts with bracket; F: .026/.022 dia. straight machined contacts; K: .026/.022 dia. right angle less bracket. Note: For additional modifiers contact factory.
- **FO** — Connector less contacts (FO not stamped on connector)

BASIC CONTACT ARRANGEMENTS

#20 CONTACTS ONLY



Shell Size	E	A	B	C	D
No. of Contacts	9	15	25	37	50
Contact Size	#20	#20	#20	#20	#20

PART NUMBERS

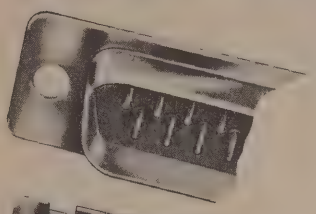
CONNECTORS WITH STD. .120 MOUNTING HOLE

With Loose Machine Contacts		Less Contacts	
Description Part No.	Factory Part No.	Description Part No.	Factory Part No.
DEC-9P	234-09-11-102	DEC-9PFO	234-09-11-100
DEC-9S	233-09-11-102	DEC-9SFO	233-09-11-100
DAC-15P	234-15-11-102	DAC-15PFO	234-15-11-100
DAC-15S	233-15-11-102	DAC-15SFO	233-15-11-100
DBC-25P	234-25-11-102	DBC-25PFO	234-25-11-100
DBC-25S	233-25-11-102	DBC-25SFO	233-25-11-100
DCC-37P	234-37-11-102	DCC-37PFO	234-37-11-100
DCC-37S	233-37-11-102	DCC-37SFO	233-37-11-100
DDC-50P	234-50-11-102	DDC-50PFO	234-50-11-100
DDC-50S	233-50-11-102	DDC-50SFO	233-50-11-100

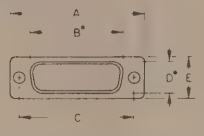
CONNECTORS WITH FLOAT MOUNTS

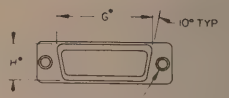
With Loose Machine Contacts		Less Contacts	
Description Part No.	Factory Part No.	Description Part No.	Factory Part No.
DECF-9P	234-09-11-107	DECF-9PFO	234-09-11-106
DECF-9S	233-09-11-107	DECF-9SFO	233-09-11-106
DACF-15P	234-15-11-107	DACF-15PFO	234-15-11-106
DACF-15S	233-15-11-107	DACF-15SFO	233-15-11-106
DBCF-25P	234-25-11-107	DBCF-25PFO	234-25-11-106
DBCF-25S	233-25-11-107	DBCF-25SFO	233-25-11-106
DCCF-37P	234-37-11-107	DCCF-37PFO	234-37-11-106
DCCF-37S	233-37-11-107	DCCF-37SFO	233-37-11-106
DDCF-50P	234-50-11-107	DDCF-50PFO	234-50-11-106
DDCF-50S	233-50-11-107	DDCF-50SFO	233-50-11-106

TRW CINCH CONNECTORS

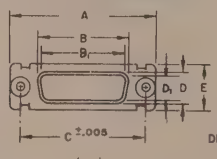


STANDARD SHELL





SHELL WITH FLOAT MOUNTS

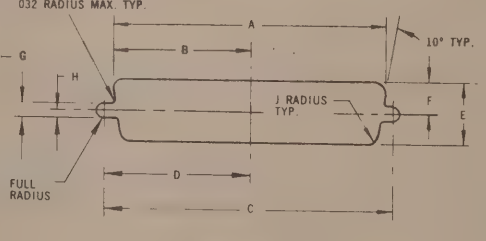


It is recommended that only one assembly, either pin or socket, be float mounted. For front panel mounting use reverse float mount.

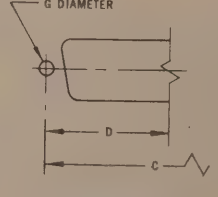
Description Part No.	A ±.015(0.38)	B* ±.010(0.25)	B_1 ±.005(0.13)	C ±.005(0.13)	D* ±.010(0.25)	D_1 ±.010(0.25)	E ±.015(0.38)	G* ±.010(0.25)
DEC-9P	1.213(30.81)	.640(16.26)	.666 (16.9)	.984(24.99)	.308(7.82)	.329 (8.4)	.494(12.55)	.759(19.28)
DEC-9S	1.213(30.81)			.984(24.99)			.494(12.55)	.759(19.28)
DAC-15P	1.541(39.14)		.994 (25.3)	1.312(33.32)		.329 (8.4)	.494(12.55)	1.083(27.51)
DAC-15S	1.541(39.14)	.968(24.59)		1.312(33.32)	.308(7.82)		.494(12.55)	1.083(27.51)
DBC-25P	2.088(53.04)		1.534 (39.0)	1.852(47.04)		.329 (8.4)	.494(12.55)	1.625(41.27)
DBC-25S	2.088(53.04)	1.508(38.30)		1.852(47.04)	.308(7.82)		.494(12.55)	1.625(41.27)
DCC-37P	2.729(63.32)		2.182 (55.4)	2.500(63.50)		.329 (8.4)	.494(12.55)	2.272(57.71)
DCC-37S	2.729(63.32)	2.156(54.76)		2.500(63.50)	.308(7.82)		.494(12.55)	2.272(57.71)
DDC-50P	2.635(66.93)		2.079 (52.8)	2.406(61.11)		.436 (11.1)	.605(15.37)	2.178(55.32)
DDC-50S	2.635(66.93)	2.062(52.34)		2.406(61.11)	.420(10.67)		.605(15.37)	2.178(55.32)

Description Number	H* ±.010(0.25)	J ±.010(0.25)	K ±.010(0.25)	L ±.010(0.25)	M ±.010(0.25)	N ±.010(0.25)
DEC-9P	.422(10.72)	.030(0.76)	.236(5.99)	.045(1.14)	.422(10.72)	.120(3.05)
DEC-9S	.422(10.72)	.030(0.76)	.243(6.17)	.045(1.14)	.429(10.92)	.120(3.05)
DAC-15P	.422(10.72)	.030(0.76)	.236(5.99)	.045(1.14)	.422(10.72)	.120(3.05)
DAC-15S	.422(10.72)	.030(0.76)	.243(6.17)	.045(1.14)	.429(10.92)	.120(3.05)
DBC-25P	.422(10.72)	.039(0.99)	.231(5.87)	.060(1.52)	.426(10.82)	.129(3.28)
DBC-25S	.422(10.72)	.030(0.76)	.243(6.17)	.045(1.14)	.429(10.92)	.120(3.05)
DCC-37P	.422(10.72)	.039(0.99)	.231(5.87)	.060(1.52)	.426(10.82)	.129(3.28)
DCC-37S	.422(10.72)	.030(0.76)	.243(6.17)	.045(1.14)	.429(10.92)	.120(3.05)
DDC-50P	.422(10.72)	.039(0.99)	.231(5.87)	.060(1.52)	.426(10.82)	.129(3.28)
DDC-50S	.534(13.56)	.030(0.76)	.243(6.17)	.045(1.14)	.429(10.92)	.120(3.05)

B and D are the outside dimensions (for socket side). B_1 and D_1 are the inside dimensions (for pin side). For shell with float mounts, add F after C, e.g., DECF-9P. (Bracketed figures mm)



Standard Cutout



Optional Cutout
(For rear mounting)

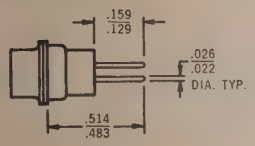
Plug	Mounting Method	A ±.005(0.13)	B ±.005(0.13)	C ±.005(0.13)	D ±.005(0.13)	E ±.005(0.13)	F ±.005(0.13)	G ±.002(0.05)	H ±.002(0.05	J ±.005(0.13)
DA,	Front Mtg.	1.202(30.53)	.601(15.26)	1.312(33.32)	.656(16.66)	.513(13.03)	.257(6.53)	.120(3.05)	.060(1.52)	.083(2.11)
DAC	Rear Mtg.	1.134(28.80)	.567(14.40)	1.312(33.32)	.656(16.66)	.449(11.40)	.225(5.72)	.120(3.05)	.060(1.52)	.132(3.35)
DAF,	Front Mtg.	1.234(31.34)	.617(15.67)	1.312(33.32)	.656(16.66)	.545(13.84)	.273(6.93)	.088(2.24)	.044(1.12)	.083(2.11)
DACF	Rear Mtg.	1.166(29.62)	.583(14.81)	1.312(33.32)	.656(16.66)	.481(12.22)	.241(6.12)	.088(2.24)	.044(1.12)	.132(3.35)
DB,	Front Mtg.	1.743(44.27)	.872(22.15)	1.852(38.61)	.926(23.52)	.513(13.03)	.257(6.53)	.120(3.05)	.060(1.52)	.083(2.11)
DBC	Rear Mtg.	1.674(42.52)	.837(21.26)	1.852(38.61)	.926(23.52)	.449(11.40)	.225(5.72)	.120(3.05)	.060(1.52)	.132(3.35)
DBF,	Front Mtg.	1.775(45.08)	.888(22.26)	1.852(38.61)	.926(23.52)	.545(13.84)	.273(6.93)	.088(2.24)	.044(1.12)	.083(2.11)
DBCF	Rear Mtg.	1.706(43.33)	.853(21.67)	1.852(38.61)	.926(23.52)	.481(12.22)	.241(6.12)	.088(2.24)	.044(1.12)	.132(3.35)
DC,	Front Mtg.	2.391(60.73)	1.196(30.38)	2.500(63.50)	1.250(38.10)	.513(13.03)	.257(6.53)	.120(3.05)	.060(1.52)	.083(2.11)
DCC	Rear Mtg.	2.326(59.08)	1.163(29.54)	2.500(63.50)	1.250(38.10)	.449(11.40)	.225(5.72)	.120(3.05)	.060(1.52)	.132(3.35)
DCF,	Front Mtg.	2.423(61.54)	1.212(30.78)	2.500(63.50)	1 250(38.10)	.545(13.84)	.273(6.93)	.088(2.24)	.044(1.12)	.083(2.11)
DCCF	Rear Mtg.	2.354(59.79)	1.177(29.90)	2.500(63.50)	1.250(38.10)	.481(12.22)	.241(6.12)	.088(2.24)	.044(1.12)	.132(3.35)
DD,	Front Mtg.	2.297(58.34)	1.149(29.18)	2.406(61.11)	1 203(30.56)	.623(15.82)	.312(7.92)	.120(3.05)	.060(1.52)	.083(2.11)
DDC	Rear Mtg.	2.218(56.34)	1.109(28.17)	2.406(61.11)	1.203(30.56)	.555(14.10)	.278(7.06)	.120(3.05)	.060(1.52)	.132(3.35)
DDF,	Front Mtg.	2.329(59.16)	1.165(29.59)	2.406(61.11)	1.203(30 56)	.655(16.64)	.328(8.33)	.088(2.24)	.044(1.12)	.083(2.11)
DDCF	Rear Mtg.	2.250(57.15)	1.125(28.57)	2.406(61.11)	1.203(30.56)	.587(14.91)	.294(7.47)	.088(2.24)	.044(1.12)	.132(3.35)
DE,	Front Mtg.	.874(22.20)	.437(11.10)	.984(24.99)	.492(12.50)	.513(13.03)	.257(6.53)	.120(3.05)	.060(1.52)	.083(2.11)
DEC	Rear Mtg.	.806(20.47)	.403(10.24)	.984(24.99)	.492(12.50)	.449(11.40)	.225(5.72)	.120(3.05)	.060(1.52)	.132(3.35)
DEF,	Front Mtg.	.906(23.01)	.453(11.51)	.984(24.99)	.492(12.50)	.545(13.84)	.273(6.93)	.088(2.24)	.044(1.12)	.083(2.11)
DECF	Rear Mtg.	.838(21.29)	.419(10.41)	.984(24.99)	.492(12.50)	.481(12.22)	.241(6.12)	.088(2.24)	.044(1.12)	.132(3.35)

(Bracketed figures mm)

TRW CINCH CONNECTORS

PRINTED CIRCUIT CONNECTORS

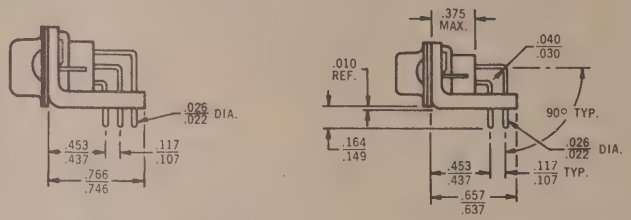
STRAIGHT PRINTED CIRCUIT CONTACT CONNECTORS



Supplied as complete assemblies with gold plated machined contacts.

Description Part No.	Part No.
DEC-9PBF	234-09-11-104
DEC-9SBF	233-09-11-104
DAC-15PBF	234-15-11-104
DAC-15SBF	233-15-11-104
DBC-25PBF	234-25-11-104
DBC-25SBF	233-25-11-104
DCC-37PBF	234-37-11-104
DCC-37SBF	233-37-11-104
DDC-50PBF	234-50-11-104
DDC-50SBF	233-50-11-104

RIGHT ANGLE CONNECTORS



With Assembled Contacts

With Molded Bracket		Less Bracket	
Description Part No.	Factory Part No.	Description Part No.	Factory Part No.
DEC-9SAD	233-09-11-101	DEC-9SAK	233-09-11-105
DEC-9PAD	234-09-11-101	DEC-9PAK	234-09-11-105
DAC-15SAD	233-15-11-101	DAC-15SAK	233-15-11-105
DAC-15PAD	234-15-11-101	DAC-15PAK	234-15-11-105
DBC-25SAD	233-25-11-101	DBC-25SAK	233-25-11-105
DBC-25PAD	234-25-11-101	DBC-25PAK	234-25-11-105
DCC-37SAD	233-37-11-101	DCC-37SAK	233-37-11-105
DCC-37PAD	234-37-11-101	DCC-37PAK	234-37-11-105
DDC-50SAD	233-50-11-101	DDC-50SAK	233-50-11-105
DDC-50PAD	234-50-11-101	DDC-50PAK	234-50-11-105

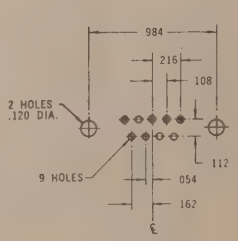
METRIC EQUIVALENTS FOR PC BOARD CONNECTOR LAYOUTS

Inches	mm's	Inches	mm's
.039	0.99	.435	11.09
.054	1.37	.489	12.42
.055	1.40	.544	13.82
.108	2.74	.598	15.19
.109	2.77	.652	16.56
.112	2.84	.707	17.96
.120	3.05	.761	19.33
.162	4.11	.815	20.70
.163	4.14	.870	22.10
.216	5.49	.924	23.47
.218	5.54	.978	24.84
.224	5.69	.984	24.99
.272	6.91	1.312	33.32
.324	8.23	1.852	47.04
.326	8.28	2.406	61.11
.381	9.68	2.500	63.50

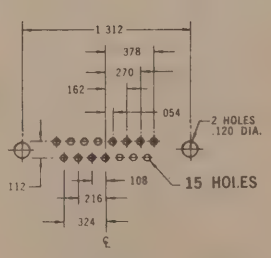
LEAD HOLE SIZE

Terminal Dia.	Hole Dia.
.040	.055
.030	.045
.024	.039

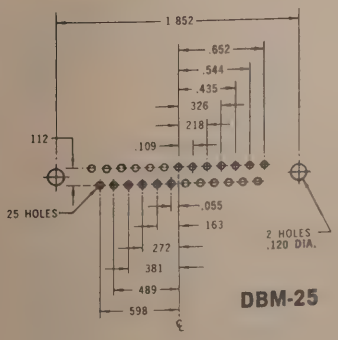
BOARD LAYOUTS



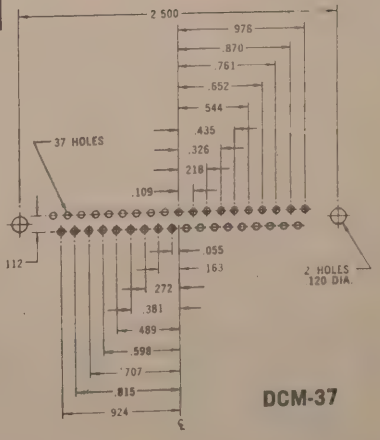
DEM-9



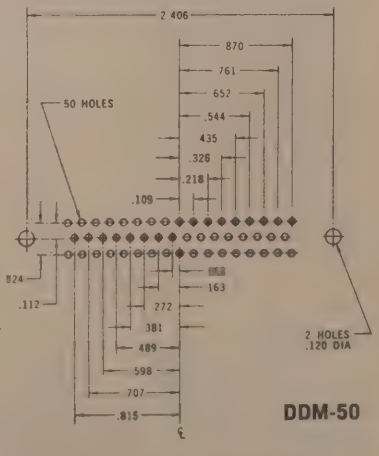
DAM-15



DBM-25



DCM-37



DDM-50

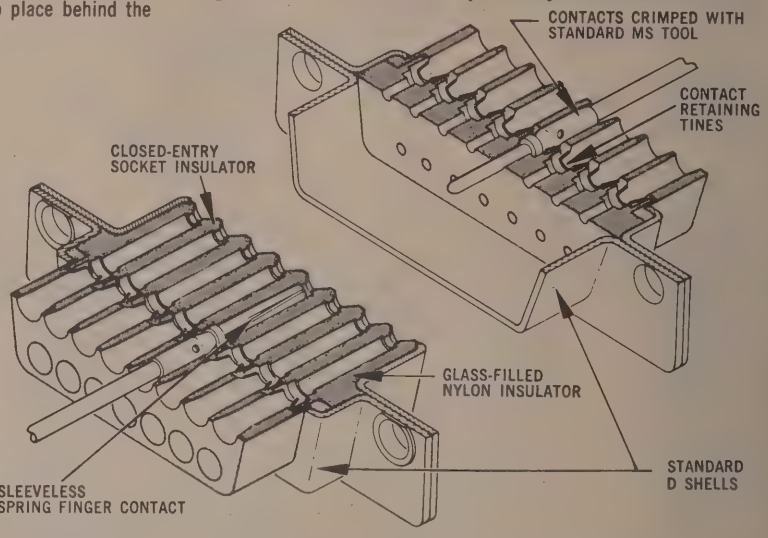
TRW CINCH CONNECTORS

REAR RELEASE CONTACT RETENTION SYSTEM

The BURGUN-D connector features a rear insulator with integral, molded contact retaining tines. These plastic tines permit the insertion and extraction of contacts from the rear of the connector with a simple, expendable plastic insertion/extraction tool. During contact insertion, the retaining tines expand as the contact passes thru. These rugged tines snap into place behind the contact shoulder when the contact is fully inserted. The tool is inserted to expand the tines, allowing easy extraction of the wired contact.

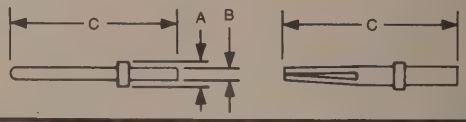
The retention system and the integral contact retaining tines guarantee functional reliability in many environments.

- Mates with existing D types.
- Operates in temperatures to +250°F.
- Crimp snap-in contacts.
- Highly reliable socket contacts.
- Insertion/extraction with expendable tool.
- Corrects misaligned contacts.



MACHINED CONTACTS

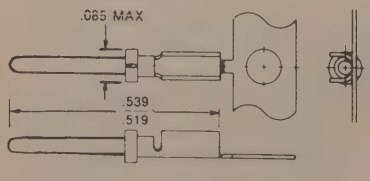
Machined contacts are supplied loose for use with hand crimp tools or in vibration hopper feeder crimp machines. A vibrator-feed, semi-automatic tool, 599-11-11-225 is available. These contacts are supplied in three wire cup sizes.

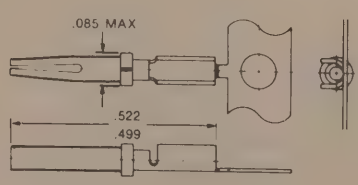


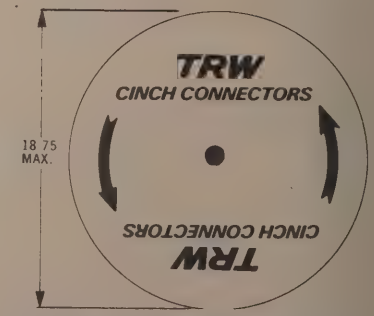
Description	Part No.	Cannon Reference	Wire Accommodation	A ±.002(.051)	B ±.002(.051)	C Max.
Pin 20	403-30-15-130-410	030-1952-000*	#20, 22, 24	.067(1.70)	.042(1.07)	.537(13.64)
Pin 20-18	403-30-99-129-410	030-1954-000	#18 or 2-#22	.086(2.18)	.066(1.68)	.874(22.20)
Pin 20-26	403-30-99-126-410	030-1952-002	#26, 28, 30	.067(1.70)	.025(0.64)	.537(13.64)
Socket 20	414-30-14-227-410	030-1953-000*	#20, 22, 24	.067(1.70)	.042(1.07)	.523(13.28)
Socket 20-18	414-30-99-236-410	030-1955-000	#18 or 2-#22	.086(2.18)	.062(1.68)	.852(21.64)
Socket 20-26	414-30-99-233-410	030-1953-002	#26, 28, 30	.067(1.70)	.025(0.64)	.523(13.28)

STAMPED CONTACTS

Stamped contacts are supplied loose for use with hand crimp tools, or on reels for use with the semiautomatic machines, selectively gold plated or with gold plate overall. These contacts will accommodate wire sizes #20 through #28 AWG by adjusting or changing the crimp die set. (For other wire sizes consult factory.)







LOOSE CONTACTS

Type	Plating	Factory Part No.	Dist. No. Reference
Pin	Selective	402-30-11-135	030-1960-005*
Pin	Overall	402-30-11-137	030-1960-001
Socket	Selective	412-30-14-355	030-1957-005*
Socket	Overall	412-30-14-361	030-1957-001

*These items available through Cinch distributors.

RIGHT HAND FEED CONTACTS ON REELS

Type (RH)	Plating	Factory Part No.	Dist. No. Reference
Pin	Selective	402-30-11-134	BCR-1960-20P*
Pin	Overall	402-30-11-136	—
Socket	Selective	412-30-14-354	BCR-1957-20S*
Socket	Overall	412-30-14-360	—

LEFT HAND FEED CONTACTS ON REELS

Type (LH)	Plating	Factory Part No.	Dist. No. Reference
Pin	Selective	402-30-11-138	D110238-034*
Pin	Overall	402-30-11-139	D110238-004
Socket	Selective	412-30-14-362	D110238-035*
Socket	Overall	412-30-14-363	D110238-005

Add Dept. EM to address to tell them you saw it in eem

TRW CINCH CONNECTORS

HOW TO ORDER — TYPES D*MA, D*M & D CONNECTORS

D | B | MA | M | R | 15 | P | A | * | FO

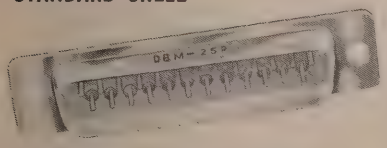
- **D** — Series Prefix
- **B** — Shell Sizes A, B, C, D, E
- **MA** — No designator — 2 pc. nylon insulator — solder type contacts — original "D" series
  - M: Monobloc insert — solder type contacts Mark I series
  - MA: Monobloc insert — crimp type contacts Mark III series
- **M** — M: For connectors having .00005 gold plate over .0001 min. copper plate on contacts — omit for standard Mark I and Mark III only.
- **R** — No designator — standard .120 diameter hole
  - E — 4-40 clinch nut for rear panel mounting
  - F — float mounts for rear panel mounting
  - R — reverse float mount for front panel mounting
- **15** — Contact Arrangement, See page 12
- **P** — P — Pin; S — Socket
- **A** — Printed circuit terminal modifier — applicable to the Mark I Series (monobloc, solder type).
  - A — Right-angle printed circuit connector with .040 diameter terminals; with bracket assembly and accommodates printed circuit boards up to 1/16 maximum thickness. (Plug only.)
  - B — Straight printed circuit connector with .040 diameter terminals; accommodates printed circuit boards up to 3/32 maximum thickness.
  - H — Straight printed circuit connector with .040 diameter terminals; accommodates printed circuit boards up to 1/8 maximum thickness.
  - L — Right-angle printed circuit connector with .030 diameter terminals with bracket assembly and accommodates printed circuit boards up to 3/32 maximum thickness. (Plug only.)

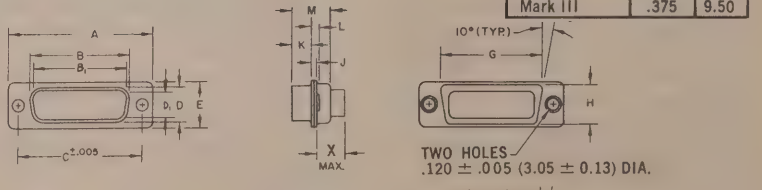
  Printed Circuit Terminal Modifier — Applicable to the original "D" series.
  - V — Straight printed circuit connector with .040 diameter terminals; accommodates printed circuit boards up to 1/16 maximum thickness.
- ***** — Modification — consult factory
- **FO** — Connector less contacts (FO not stamped on connector)

STANDARD DIMENSIONS

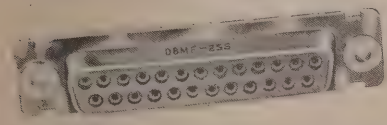
	Dim. X	mm
Original "D"	.312	7.92
Mark I	.390	9.91
Mark III	.375	9.50

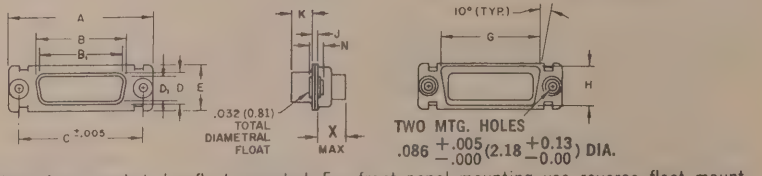
STANDARD SHELL





SHELL WITH FLOAT MOUNTS





It is recommended that only one assembly, either pin or socket, be float mounted. For front panel mounting use reverse float mount.

Shell Size	Connector Type
E	9P
	9S
A	15P
	15S
B	25P
	25S
C	37P
	37S
D	50P
	50S

A ±.015(0.38)	B* ±.010(0.25)	B1 ±.005(0.13)	C ±.005(0.13)	D* ±.010(0.25)	D1 ±.010(0.25)	E ±.015(0.38)	G* ±.010(0.25)
1.213(30.81)	.640(16.26)	.666 (16.9)	.984(24.99)	.308(7.82)	.329 (8.4)	.494(12.55)	.759(19.28)
1.213(30.81)		.994 (25.3)	.984(24.99)			.494(12.55)	.759(19.28)
1.541(39.14)			1.312(33.32)		.329 (8.4)	.494(12.55)	1.083(27.51)
1.541(39.14)	.968(24.59)		1.312(33.32)	.308(7.82)		.494(12.55)	1.083(27.51)
2.088(53.04)		1.534 (39.0)	1.852(47.04)		.329 (8.4)	.494(12.55)	1.625(41.27)
2.088(53.04)	1.508(38.30)		1.852(47.04)	.308(7.82)		.494(12.55)	1.625(41.27)
2.729(63.32)		2.182 (55.4)	2.500(63.50)		.329 (8.4)	.494(12.55)	2.272(57.71)
2.729(63.32)	2.156(54.76)		2.500(63.50)	.308(7.82)		.494(12.55)	2.272(57.71)
2.635(66.93)		2.079 (52.8)	2.406(61.11)		.436 (11.1)	.605(15.37)	2.178(55.32)
2.635(66.93)	2.062(52.34)		2.406(61.11)	.420(10.67)		.605(15.37)	2.178(55.32)

H* ±.010(0.25)	I ±.010(0.25)	K ±.010(0.25)	L ±.010(0.25)	M ±.010(0.25)	N ±.010(0.25)
.422(10.72)	.030(0.76)	.236(5.99)	.045(1.14)	.422(10.72)	.120(3.05)
.422(10.72)	.030(0.76)	.243(6.17)	.045(1.14)	.429(10.92)	.120(3.05)
.422(10.72)	.030(0.76)	.236(5.99)	.045(1.14)	.422(10.72)	.120(3.05)
.422(10.72)	.030(0.76)	.243(6.17)	.045(1.14)	.429(10.92)	.120(3.05)
.422(10.72)	.039(0.99)	.231(5.87)	.060(1.52)	.426(10.82)	.129(3.28)
.422(10.72)	.030(0.76)	.243(6.17)	.045(1.14)	.429(10.92)	.120(3.05)
.422(10.72)	.039(0.99)	.231(5.87)	.060(1.52)	.426(10.82)	.129(3.28)
.422(10.72)	.030(0.76)	.243(6.17)	.045(1.14)	.429(10.92)	.120(3.05)
.422(10.72)	.039(0.99)	.231(5.87)	.060(1.52)	.426(10.82)	.129(3.28)
.534(13.56)	.030(0.76)	.243(6.17)	.045(1.14)	.429(10.92)	.120(3.05)

B and D are the outside dimensions (for socket side). B_1 and D_1 are the inside dimensions (for pin side). For shell with float mounts, add F after C, e.g., DECF-9P. (Bracketed figures mm)

TRW CINCH CONNECTORS

GENERAL RATINGS AND SPECIFICATIONS

VOLTAGE RATINGS

All voltage figures are AC (rms), 60 cps. measured at approximately 77°F., 50% RH.

Connectors with Basic Arrangements
AWG #20 wire contacts only

All voltages are measured from contact to contact, and contact to shell, in unmated condition.

Connector Type		Altitude (feet) Sea Level	20,000	50,000	70,000
D*MA	Average Flashover	1500	1000	500	500
	Test	1000	650	325	325
D*M D*	Average Flashover	1700	1000	650	500
	Test	1250	750	475	375

Connectors with Combination Arrangements
AWG #20 wire contacts with coaxial, high power, and/or high voltage contacts
All voltages are for plugs and receptacles in both mated and unmated conditions.

Altitude (feet)		Sea Level		20,000		Sea Level		20,000	
Type of Contact		90°	Straight	90°	Straight	90°	Straight	90°	Straight
Center Conductor to Coaxial Shell	Average Flashover	1200	1500	900	1000	600	700	400	500
	Test	800	1000	600	650	400	475	275	325
High Power Contact and/or Coaxial Shell to Plug Shell	Average Flashover	1500	1500	1000	1000	500	500	500	500
	Test	1000	1000	650	650	325	325	325	325
Coaxial Shell to Nearest Standard Solder Pot Contact	Average Flashover	•	1500	•	1500	•	900	•	650
	Test	•	1000	•	1000	•	600	•	425
HV Contact to Nearest #20 Contact or to Shell	Average Flashover	3800	3800	2300	2300	500	900	650	650
	Test	2800	2800	1700	1700	675	675	475	475

• Not applicable due to variable rotation.

CURRENT RATINGS

Cinch vs. Military.

The Cinch rating for #20 contacts is 5 amps, which means 5 amps for all contacts simultaneously. MIL-W-5088 rates #20 contacts at 7.5 amps maximum. The explanation is as follows:

MIL-W-5088B, Paragraph 3-9-2-1-2 specifies:

"Table I current ratings for cables in bundles are based upon 15 or more cables carrying no more than 20% of the total carrying capacity of the bundle."

Table I specifies a current rating of 7.5 amps maximum for single wires in bundles of 15 or more wires. NOTE: Wires and contacts are both considered to be in the category of conductors.

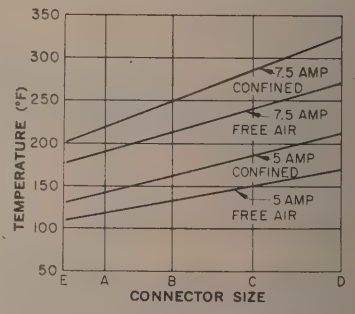
Explanation

If 15 wires (normally rated at 7.5 amps per wire maximum, or at a total bundle current of 112.5 amps) are not to carry more than 20% of the total 112.5 amps, the **average** current rating per wire is 20% of 112.5 amps (total bundle capacity) divided by 15 (number of wires).

Conclusion

The Military rating of #20 contacts or wires is 1.5 amps average (based on 15 wires per bundle or 15 contacts per connector) vs. a Cinch rating of 5 amps.

Average Maximum Temperature vs. Connector Size for various current ratings of mated pairs of D Subminiature Connectors.

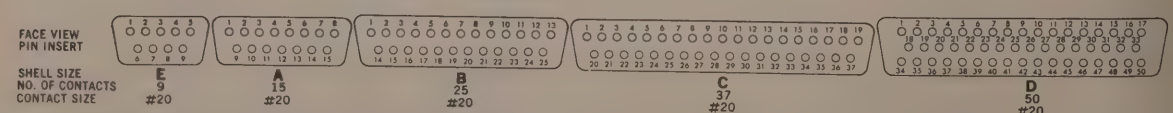


Notes:
1. Free air condition. Connectors not shielded from ambient condition in any manner.
2. Confined condition. Connectors placed in insulated box (1 x 2 x 3.5) during test, with no moving air.
3. Average maximum temperature stabilization: 1 hour or less in all cases.
4. All contacts in each mated pair tested were wired in series with specified current flowing.
5. Ambient conditions 77°F. 50% rh.

MATERIAL AND PLATING SPECIFICATIONS

Material	Application	Per Specification
Berryllium Copper	Coax. Recept. Outer Body	QQ-C-530
Brass	Contact	QQ-B-626a, Composition 22, HH
Brass	Shell	QQ-B-613a, Composition 2, soft temper
Diallyl phthalate, glass fibre filled, (short)	Insulator	MIL-M-14F. Type SDGF
Diallyl phthalate, glass fibre filled, (long)	Insulator	MIL-P-19833. Type GDI-30F
Leaded copper	Contact	Anaconda Alloy 1870 or equivalent
Nylon	Insulator	MIL-P-17091B
Phosphor bronze	Contact	ASTM B139. Alloy BE per QQ-B-750
Stainless steel	Float rivet	per QQ-S-764B
Stainless steel	Float washer	No. 304, per QQ-S-766c
Steel	Shell	QQ-S-636
Teflon	Coaxial Insulator	—
Plating	**Application**	**Per Specification**
Cadmium plate	Shell	QQ-P-416a. Type II, Class 2
Copper	Contact	MIL-C-14550, Class I
Gold plate	Contact	MIL-G-45204, Type II, Class I
Silver plate	Contact	QQ-S-365a
Tin plate	Shell and contact	MIL-T-10727A

BASIC CONTACT ARRANGEMENTS (Applicable to all Series)



TRW CINCH CONNECTORS

ORIGINAL D CONNECTORS

GENERAL INFORMATION

The Cinch Original D Plug utilizes a two-piece nylon insulator housed in a variety of five basic shell sizes: E, A, B, C, and D. These shell sizes contain 9, 15, 25, 37, and 50 #20 solder pot contacts respectively. Standard contact terminations accommodate up to #20 AWG stranded wire. Current rating is 5 amperes.*

The keystone shape of the shell assures proper polarization. Coupling is by means of friction; locking accessories are available. Also available are shells with float mounts. Connectors with #4-40 or #2-56 clinch nut mounts may be provided.

With standard nylon insulators, operating temperatures range from −65°F to +250°F (the limiting factor being the insulator material). When diallyl phthalate insulator is substituted, the operating temperature range is from −65°F to +275°F.

*Military rating of #20 contacts or wires is 1.5 amps average, and 7.5 amps maximum. See explanation on page 12.

MATERIALS AND FINISHES

Shells: Steel, cadmium plated with yellow chromate supplementary coating.
Pin Contacts: Brass, gold plated (.00002 min.) over nickel plate (.000060 min.).
Socket Contacts: Phosphor bronze, gold plated (.00002 min.) over nickel plate (.000060 min.).
Insulators: Nylon, two-piece.
Float Mounting Rivets and Washers: Stainless steel.

For listing of applicable specifications see page 12.

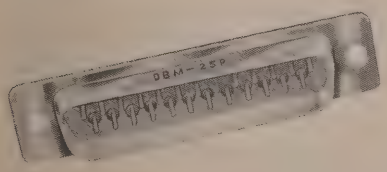
PERFORMANCE DATA

Voltage Rating: See tabulation on page 12.
Insulation Resistance: Greater than 5,000 megohms, determined in accordance with MIL-STD-202D, Method 302, Condition B.
Contact Resistance: 2.7 milliohms maximum @ 7.5 amps.
Individual Contact Separation Force: 1 to 8 ounces.
Moisture Resistance: Exceeds test requirements of MIL-STD-202D, Method 106.†
Vibration: Exceeds test requirements of MIL-STD-202D, Method 204, Condition B.†
Shock: Exceeds test requirements of MIL-STD-202D, Method 213, Condition G.†
Corrosion Resistance: Exceeds requirements of 48 hr. exposure to salt spray in accordance with MIL-STD-202D, Method 101C, Condition B.†

†As referenced in MIL-C-24308.

ORDERING INFORMATION

STANDARD MOUNT



Shell Size	Layout	Order No.*	Factory No.
E	9 Contact Plug	DE-9P *	231-09-11-101
	Socket	DE-9S *	230-09-11-101
A	15 Contact Plug	DA-15P *	231-15-11-101
	Socket	DA-15S *	230-15-11-101
B	25 Contact Plug	DB-25P *	231-25-11-101
	Socket	DB-25S *	230-25-11-112
C	37 Contact Plug	DC-37P *	231-37-11-101
	Socket	DC-37S *	230-37-11-101
D	50 Contact Plug	DD-50P *	231-50-11-101
	Socket	DD-50S *	230-50-11-101

FLOAT MOUNT

Shell Size	Layout	Order No.*	Factory No.
E	9 Contact Plug	DEF-9P *	231-09-11-306
	Socket	DEF-9S *	230-09-11-301
A	15 Contact Plug	DAF-15P *	231-15-11-301
	Socket	DAF-15S *	230-15-11-301
B	25 Contact Plug	DBF-25P *	231-25-11-301
	Socket	DBF-25S *	230-25-11-301
C	37 Contact Plug	DCF-37P *	231-37-11-301
	Socket	DCF-37S *	230-37-11-301
D	50 Contact Plug	DDF-50P *	231-50-11-304
	Socket	DDF-50S *	230-50-11-301

* These items available through Cinch distributors.

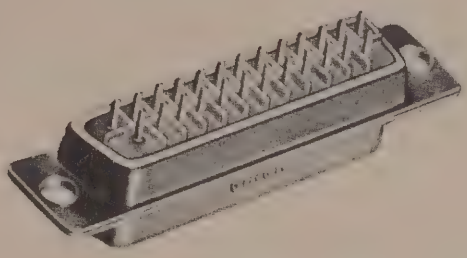
FOR DIMENSIONS SEE C-46 PAGE 11

TRW CINCH CONNECTORS

ORIGINAL D CONNECTORS (Cont'd)

PRINTED CIRCUIT TERMINALS

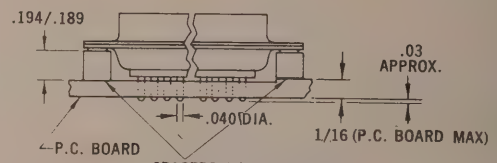
Straight terminals for printed circuit boards up to and including 1/16" maximum thickness. Terminals extend 3/32" beyond the rear of the insert. For greater board thicknesses consult factory.



ORDERING INFORMATION

Shell Size	Layout	Order No.*	Factory No.
E	9 Contact Plug	DE-9PV *	231-09-12-112
	Socket	DE-9SV *	230-09-12-115
A	15 Contact Plug	DA-15PV *	231-15-12-121
	Socket	DA-15SV *	230-15-12-131
B	25 Contact Plug	DB-25PV *	231-25-12-116
	Socket	DB-25SV *	230-25-12-105
C	37 Contact Plug	DC-37PV *	231-37-12-115
	Socket	DC-37SV *	230-37-12-114
D	50 Contact Plug	DD-50PV *	231-50-12-114
	Socket	DD-50SV *	230-50-12-113

* These items available through Cinch distributors.



SPACERS NOT SUPPLIED

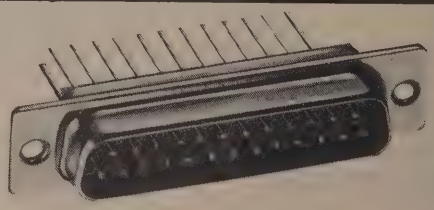
For additional dimensions see table on page 11.

WIRE WRAP TERMINALS

RACK AND PANEL CONNECTORS WITH 0.025" SQUARE WIRE WRAP* TAILS

Cinch D-Subminiature Connectors are designed for applications where space and weight considerations are prime considerations. These high contact density connectors are especially well-suited for aircraft, missile and ground support installations. They are designed to meet or exceed most of the requirements of MIL-C-24308.

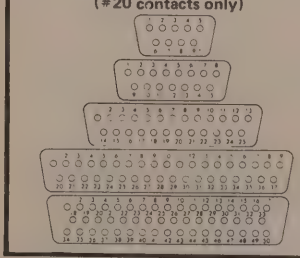
These wire-wrap versions are available in 9, 15, 25, 37 and 50 contact sizes in both plug and socket types. Two tail lengths are available: 3/8" long to accommodate two wires, and 37/64" long to accommodate three wires. Socket contacts and plug pins are copper alloy gold plated over silver. Insulators are two-piece nylon, and the outer shells are yellow chromate finished, cadmium-plated steel.



These D-Subminiature Connectors will intermate with any other D-Subminiature Connector of the same insert configuration. Mating connectors with standard termination may be adapted for cable attachment by means of accessory junction shells with integral clamps.

IMMEDIATE DELIVERY FROM CINCH DISTRIBUTORS can be provided on the 3/8" long termination types.

ORDERING INFORMATION



Layout	Shell Size	3/8" TAIL LENGTH**		37/64" TAIL LENGTH	
		Order No.	Factory No.	Order No.	Factory No.
9 Contact Plug Socket	E	DE-9P-F179 DE-9S-F179	231-09-13-133 230-09-13-132	DE-9P-F179C DE-9S-F179C	231-09-13-134 230-09-13-133
15 Contact Plug Socket	A	DA-15P-F179 DA-15S-F179	231-15-13-152 230-15-13-142	DA-15P-F179C DA-15S-F179C	231-15-13-153 230-15-13-143
25 Contact Plug Socket	B	DB-25P-F179 DB-25S-F179	231-25-13-157 230-25-13-149	DB-25P-F179C DB-25S-F179C	231-25-13-161 230-25-13-150
37 Contact Plug Socket	C	DC-37P-F179 DC-37S-F179	231-37-13-141 230-37-13-131	DC-37P-F179C DC-37S-F179C	231-37-13-142 230-37-13-132
50 Contact Plug Socket	D	DD-50P-F179 DD-50S-F179	231-50-13-136 230-50-13-124	DD-50P-F179C DD-50S-F179C	231-50-13-137 230-50-13-125

*Trademark Gardner-Denver Corp.

**All 3/8" Tail length D-Subminiature Connectors are available for immediate delivery from local Authorized Cinch Distributors.

FOR DIMENSIONS SEE C-46 PAGE 11

TRW CINCH CONNECTORS

GOLDEN D MARK I CONNECTORS

GENERAL INFORMATION

Cinch D*M Connectors feature solder pot contacts in a monobloc insulator for improved temperature characteristics and increased moisture resistance. Two insulator types are available: (a) combination layouts with coaxial and/or high voltage contacts plus standard AWG wire contacts, and (b) layouts with standard AWG wire contacts only. The five amp* solder pot contacts accommodate wire sizes up to #20 AWG stranded wire. Socket contacts are of the closed entry type. Operating temperatures range from −65°F to +300°F.

Combination layouts are supplied with unfilled coaxial and/or HV contact cavities. Coaxial and HV contacts must be ordered separately, and may be used interchangeably in any of the layouts listed. HV contacts accommodate wire sizes up to #20. In both, coaxial and HV contacts, the center contacts have solder type termination. Braid, on coaxial contacts, may be soldered or crimped to the outer conductor. Both of the above contacts are snap-in, removable type.

Standard coaxial and HV plugs contain female center contacts; receptacles contain male center contacts. Special reversed versions are available. Pin connector assemblies accommodate coaxial and HV plugs only; socket assemblies accommodate receptacles. Connector assemblies and contact inserts are matched and color coded to ease assembly. Pins and plugs are coded red, sockets and receptacles are coded blue. No insertion tool is required. Coaxial and HV inserts may be removed with Cinch Tool CET-C6B.

Five basic shell sizes are available. Polarization is by means of the keystone cornered shell. Coupling is by friction; locking accessories are available. Shells with float mounts are also available.

Printed circuit plugs are listed on page 9 with other popular modifications. For additional modifications and special plugs, consult factory. Accessories such as junction shells are shown on pages 24 and 25.

*Military rating of #20 contacts or wires is 1.5 amps average, and 7.5 amps maximum. See explanation on page 12.

MATERIALS AND FINISHES

Shells: Steel, cadmium plated with yellow chromate supplementary coating.

Insulators: Diallyl phthalate, glass fibre filled, med. green color, monobloc construction.

#20 Contacts (Standard): Pins and sockets: brass, gold plated (.00002 min.) over nickel (.00006 min.).

Coaxial Contacts (Standard):

- **Outer Contact —** Plug: Brass, gold plated (.00003) over silver plate (.0001). Receptacle: Beryllium copper, gold plated (.00003) over silver plate (.0001).
- **Center Female Contact —** Phosphor bronze, gold plated (.00003) over silver plate (.0001).
- **Center Male Contact —** Brass, gold plated (.00003) over silver plate (.0001).
- **Insulator —** Teflon.

High Voltage Contacts (Standard):

- **Socket Contact —** Phosphor bronze, gold plated (.00003) over silver plate (.0002).
- **Pin Contact —** Brass, gold plated (.00003) over silver plate (.0002).
- **Insulator —** Nylon (temperature range: −65°F to +250°F).

For listing of applicable specifications see page 12.

PERFORMANCE DATA

VOLTAGE RATING:

Insulation Resistance Ref. MIL-C-24308	— Greater than 5000 megohms in accordance with MIL-STD-202D, Method 302, Condition B
Contact Resistance Ref. MIL-C-24308	— (#20 contacts) 2.67 milliohms max. exceeds requirements of Para 3.53
Contact Engagement Force Ref. MIL-C-24308	— .7 to 12 oz. when tested with MS3197 test pin
Contact Separation Force Ref. MIL-C-24308	— .7 to 8 oz. when tested with MS3197 test pin
Moisture Resistance Ref. MIL-C-24308	— Exceeds test requirements of MIL-STD-202D, Method 106
Vibration Ref. MIL-C-24308	— Exceeds test requirements of MIL-STD-202D, Method 204, Condition B
Shock Ref. MIL-C-24308	— Exceeds test requirements of MIL-STD-202D, Method 213, Condition G
Corrosion Resistance Ref. MIL-C-24308	— Exceeds requirements of 48-hour exposure to salt spray in accordance with MIL-STD-202D, Method 101C, Condition B
High Potential Test Voltage Ref. MIL-C-24308	— MIL-STD-202D, Method 301
Temperature Cycling Ref. MIL-C-24308	— MIL-STD-202D, Method 102A, Condition D

See tabulation on page 12.

CROSS REFERENCE MIL-C-24308 MILITARY PART NO. VERSUS CINCH PART NO.

	Mark I Solder Contact Connectors	
	Military Part No.	Cinch Part No.
Sockets	M24308/1-1	230-09-09-129
	M24308/1-2	230-15-09-129
	M24308/1-3	230-25-09-129
	M24308/1-4	230-37-09-129
	M24308/1-5	230-50-09-129
Plugs	M24308/3-1	231-09-09-129
	M24308/3-2	231-15-09-129
	M24308/3-3	231-25-09-129
	M24308/3-4	231-37-09-129
	M24308/3-5	231-50-09-129

	Mark I Solder Contact Connectors With Float Mount	
	Military Part No.	Cinch Part No.
Sockets	M24308/1-12	230-09-09-322
	M24308/1-13	230-15-09-322
	M24308/1-14	230-25-09-322
	M24308/1-15	230-37-09-322
	M24308/1-16	230-50-09-322
Plugs	M24308/3-12	231-09-09-322
	M24308/3-13	231-15-09-322
	M24308/3-14	231-25-09-322
	M24308/3-15	231-37-09-322
	M24308/3-16	231-50-09-322

	Solder Contact Connectors (Non-Magnetic)	
	Military Part No.	Cinch Part No.
Sockets	M24308/5-1	230-09-09-513
	M24308/5-2	230-15-09-513
	M24308/5-3	230-25-09-513
	M24308/5-4	230-37-09-513
	M24308/5-5	230-50-09-513
Plugs	M24308/7-1	231-09-09-513
	M24308/7-2	231-15-09-513
	M24308/7-3	231-25-09-513
	M24308/7-4	231-37-09-513
	M24308/7-5	231-50-09-513

	Solder Contact Connectors (Non-Magnetic) With Float Mount	
	Military Part No.	Cinch Part No.
Sockets	M24308/5-12	230-09-09-210
	M24308/5-13	230-15-09-210
	M24308/5-14	230-25-09-210
	M24308/5-15	230-37-09-210
	M24308/5-16	230-50-09-210
Plugs	M24308/7-12	231-09-09-210
	M24308/7-13	231-15-09-210
	M24308/7-14	231-25-09-210
	M24308/7-15	231-37-09-210
	M24308/7-16	231-50-09-210

TRW CINCH CONNECTORS

GOLDEN D MARK I CONNECTORS (Cont'd)

STANDARD MOUNT

PLUG WITH BASIC LAYOUT IN STANDARD SHELL

FLOAT MOUNT

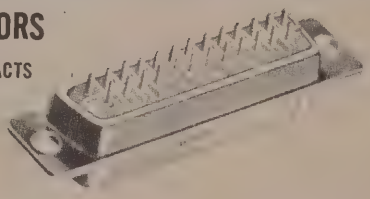
SOCKET WITH BASIC LAYOUT IN SHELL WITH FLOAT MOUNTS

Shell Size	Layout	Standard Connectors Order No.*	Standard Connectors Factory No.	Commercial Equivalents of MIL-C-24308 Connectors Order No.	Commercial Equivalents of MIL-C-24308 Connectors Factory No.
E	9 Contact Plug	DEM-9P*	231-09-09-105	DEMM-9P	231-09-09-120
	Socket	DEM-9S*	230-09-09-107	DEMM-9S	230-09-09-120
A	15 Contact Plug	DAM-15P*	231-15-09-108	DAMM-15P	231-15-09-127
	Socket	DAM-15S*	230-15-09-110	DAMM-15S	230-15-09-123
B	25 Contact Plug	DBM-25P*	231-25-09-109	DBMM-25P	231-25-09-124
	Socket	DBM-25S*	230-25-09-111	DBMM-25S	230-25-09-125
C	37 Contact Plug	DCM-37P*	231-37-09-109	DCMM-37P	231-37-09-131
	Socket	DCM-37S*	230-37-09-109	DCMM-37S	230-37-09-119
D	50 Contact Plug	DDM-50P*	231-50-09-109	DDMM-50P	231-50-09-132
	Socket	DDM-50S*	230-50-09-111	DDMM-50S	230-50-09-131

Shell Size	Layout	Standard Connectors Order No.*	Standard Connectors Factory No.	Commercial Equivalents of MIL-C-24308 Connectors Order No.	Commercial Equivalents of MIL-C-24308 Connectors Factory No.
E	9 Contact Plug	DEMF-9P*	231-09-09-301	DEMMF-9P	231-09-09-305
	Socket	DEMF-9S*	230-09-09-301	DEMMF-9S	230-09-09-314
A	15 Contact Plug	DAMF-15P*	231-15-09-301	DAMMF-15P	231-15-09-304
	Socket	DAMF-15S*	230-15-09-302	DAMMF-15S	230-15-09-312
B	25 Contact Plug	DBMF-25P*	231-25-09-301	DBMMF-25P	231-25-09-308
	Socket	DBMF-25S*	230-25-09-301	DBMMF-25S	230-25-09-312
C	37 Contact Plug	DCMF-37P*	231-37-09-301	DCMMF-37P	231-37-09-307
	Socket	DCMF-37S*	230-37-09-302	DCMMF-37S	230-37-09-314
D	50 Contact Plug	DDMF-50P*	231-50-09-301	DDMMF-50P	231-50-09-308
	Socket	DDMF-50S*	230-50-09-301	DDMMF-50S	230-50-09-313

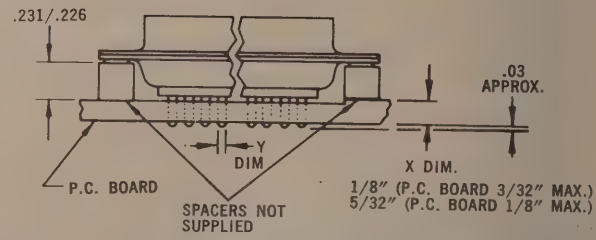
PC CONNECTORS

STRAIGHT PC CONTACTS



These compact, high contact density connectors are designed for direct, above board mounting to printed circuit boards up to ⅛" thick. They provide a highly reliable means for direct inline interconnection of printed circuitry with mother-board mounted sockets.

Shell Size	Layout	.040 Dia. 3/32" Board Order No.	.040 Dia. 3/32" Board Factory No.	.040 Dia. ⅛" Board Order No.	.040 Dia. ⅛" Board Factory No.
E	9 Contact Plug	DEM-9PB	231-09-09-117	DEM-9PH	231-09-09-130
	Socket	DEM-9SB	230-09-09-127	DEM-9SH	230-09-09-128
A	15 Contact Plug	DAM-15PB	231-15-09-124	DAM-15PH	231-15-09-139
	Socket	DAM-15SB	230-15-09-118	DAM-15SH	230-15-09-127
B	25 Contact Plug	DBM-25PB	231-25-09-127	DBM-25PH	231-25-09-125
	Socket	DBM-25SB	230-25-09-122	DBM-25SH	230-25-09-121
C	37 Contact Plug	DCM-37PB	231-37-09-118	DCM-37PH	231-37-09-121
	Socket	DCM-37SB	230-37-09-114	DCM-37SH	230-37-09-120
D	50 Contact Plug	DDM-50PB	231-50-09-133	DDM-50PH	231-50-09-136
	Socket	DDM-50SB	230-50-09-119	DDM-50SH	230-50-09-135

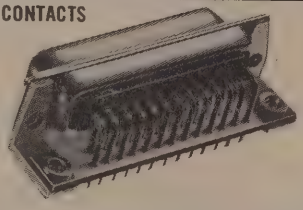


Dimensions subject to change

Part No. Printed Circuit Terminal Modifier	X	Y ±.003
B	3/32	.040
H	⅛	.040

For additional dimensions see table on page 11.

RIGHT ANGLE PC CONTACTS



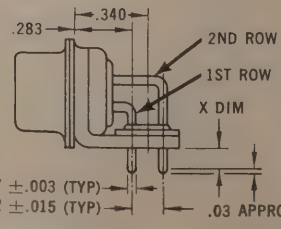
Shell Size	Layout Plug Contact	.040 Dia. 1/16" Board Order No.	.040 Dia. 1/16" Board 1 Piece Molded Nylon	.040 Dia. 1/16" Board 3 Piece Bracket	.030 Dia. 3/32" Board Order No.	.030 Dia. 3/32" Board 3 Piece Bracket
E	9	DEM-9PA	231-09-09-126	231-09-09-124	DEM-9PL	231-09-09-118
A	15	DAM-15PA	231-15-09-133	231-15-09-115	DAM-15PL	231-15-09-125
B	25	DBM-25PA	231-25-09-137	231-25-09-116	DBM-25PL	231-25-09-121
C	37	DCM-37PA	231-37-09-137	231-37-09-130	DCM-37PL	231-37-09-127

For additional dimensions see table on page 11.

These right-angle plugs are available in 9, 15, 25, and 37 contact configurations. The standard units listed herein are supplied with 0.040" or 0.030" nominal diameter pins that extend 0.093" below the 90° bracket for 1/16" boards and .135 for 3/32" boards, other pin diameters and lengths may be obtained on special order.

Design and construction of these connectors meets or exceeds many of the requirements of MIL-C-24308.

These right-angle D-Subminiature connectors will mate with any other D-Subminiature connector of the same insert configuration. Mating connectors may be adapted for cable attachment by means of accessory junction shells.

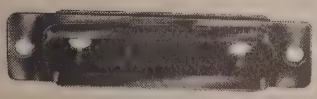


Part No. Printed Circuit Terminal Modifier	X	Y ±.003 Typ.
A	.093	.040
L	.135	.030

FOR DIMENSIONS SEE C-46 PAGE 11 These items available through Cinch distributors.

TRW CINCH CONNECTORS

GOLDEN D MARK I CONNECTORS (Cont'd)



PLUG WITH COMBINATION LAYOUT IN STANDARD SHELL

MARK 1 — COMBINATION PLUG & SOCKET LAYOUTS STANDARD SHELL — STANDARD FINISH ON CONTACTS

Shell Size	Order No.*	Factory No.
E	*DEM-5W1P	236-05-00-101
	*DEM-5W1S	235-05-00-101
A	*DAM-3W3P	236-03-00-101
	*DAM-3W3S	235-03-00-101
	*DAM-7W2P	236-07-00-101
	*DAM-7W2S	235-07-00-101
	*DAM-11WIP	236-11-00-102
	*DAM-11W1S	235-11-00-101
B	*DBM-9W4P	236-09-00-101
	*DBM-9W4S	235-09-00-101
	*DBM-13W3P	236-13-00-101
	*DBM-13W3S	235-13-00-101
	*DBM-17W2P	236-17-00-101
	*DBM-17W2S	235-17-00-101
	*DBM-21W1P	236-21-00-101
	*DBM-21W1S	235-21-00-101
C	DCM-8W8P	236-08-00-101
	DCM-8W8S	235-08-00-101
	*DCM-13W6P	236-13-00-102
	*DCM-13W6S	235-13-00-102
	DCM-17W5P	236-17-00-102
	DCM-17W5S	235-17-00-102
	DCM-21W4P	236-21-00-107
	DCM-21W4S	235-21-00-105
	DCM-25W3P	236-25-00-101
	DCM-25W3S	235-25-00-101
	DCM-27W2P	236-27-00-101
	DCM-27W2S	235-27-00-101
D	DDM-24W7P	236-24-00-101
	DDM-24W7S	235-24-00-101
	DDM-36W4P	236-36-00-101
	DDM-36W4S	235-36-00-101

MARK 1 — COMBINATION PLUG & SOCKET LAYOUTS STANDARD SHELL — MILITARY FINISH ON CONTACTS

Shell Size	Order No.	Factory No.
E	DEMM-5W1P	236-05-00-102
	DEMM-5W1S	235-05-00-105
A	DAMM-3W3P	236-03-00-102
	DAMM-3W3S	235-03-00-102
	DAMM-7W2P	236-07-00-104
	DAMM-7W2S	235-07-00-102
	DAMM-11W1P	236-11-00-106
	DAMM-11W1S	235-11-00-103
B	DBMM-9W4P	236-09-00-104
	DBMM-9W4S	235-09-00-106
	DBMM-13W3P	236-13-00-105
	DBMM-13W3S	235-13-00-103
	DBMM-17W2P	236-17-00-110
	DBMM-17W2S	235-17-00-107
	DBMM-21W1P	236-21-00-103
	DBMM-21W1S	235-21-00-103
C	DCMM-8W8P	236-08-00-103
	DCMM-8W8S	235-08-00-103
	DCMM-13W6P	236-13-00-108
	DCMM-13W6S	235-13-00-109
	DCMM-17W5P	236-17-00-116
	DCMM-17W5S	235-17-00-112
	DCMM-21W4P	236-21-00-102
	DCMM-21W4S	235-21-00-102
	DCMM-25W3P	236-25-00-106
	DCMM-25W3S	235-25-00-105
	DCMM-27W2P	236-27-00-102
	DCMM-27W2S	235-27-00-102
D	DDMM-24W7P	236-24-00-106
	DDMM-24W7S	235-24-00-107
	DDMM-36W4P	236-36-00-103
	DDMM-36W4S	235-36-00-102

SOCKET WITH COMBINATION LAYOUT IN SHELL WITH FLOAT MOUNTS

MARK 1 — COMBINATION PLUG & SOCKET LAYOUTS SHELL WITH FLOAT MOUNTS — STANDARD FINISH ON CONTACTS

Shell Size	Order No.*	Factory No.
E	DEMF-5W1P	236-05-00-301
	DEMF-5W1S	235-05-00-301
A	DAMF-3W3P	236-03-00-301
	*DAMF-3W3S	235-03-00-301
	DAMF-7W2P	236-07-00-301
	DAMF-7W2S	235-07-00-301
	*DAMF-11W1P	236-11-00-301
	*DAMF-11W1S	235-11-00-301
B	*DBMF-9W4P	236-09-00-301
	*DBMF-9W4S	235-09-00-301
	DBMF-13W3P	236-13-00-301
	DBMF-13W3S	235-13-00-301
	*DBMF-17W2P	236-17-00-301
	*DBMF-17W2S	235-17-00-302
	DBMF-21W1P	236-21-00-301
	DBMF-21W1S	235-21-00-301
C	DCMF-8W8P	236-08-00-301
	DCMF-8W8S	235-08-00-301
	DCMF-13W6P	236-13-00-302
	DCMF-13W6S	235-13-00-302
	DCMF-17W5P	236-17-00-302
	DCMF-17W5S	235-17-00-307
	DCMF-21W4P	236-21-00-303
	DCMF-21W4S	235-21-00-305
	DCMF-25W3P	236-25-00-301
	DCMF-25W3S	235-25-00-301
	DCMF-27W2P	236-27-00-301
	DCMF-27W2S	235-27-00-301
D	DDMF-24W7P	236-24-00-301
	DDMF-24W7S	235-24-00-302
	DDMF-36W4P	236-36-00-301
	DDMF-36W4S	235-36-00-302

MARK 1 — COMBINATION PLUG & SOCKET LAYOUTS SHELL WITH FLOAT MOUNTS — MILITARY FINISH ON CONTACTS

Shell Size	Order No.	Factory No.
E	DEMMF-5W1P	236-05-00-302
	DEMMF-5W1S	235-05-00-304
A	DAMMF-3W3P	236-03-00-302
	DAMMF-3W3S	235-03-00-305
	DAMMF-7W2P	236-07-00-302
	DAMMF-7W2S	235-07-00-305
	DAMMF-11W1P	236-11-00-302
	DAMMF-11W1S	235-11-00-307
B	DBMMF-9W4P	236-09-00-302
	DBMMF-9W4S	235-09-00-306
	DBMMF-13W3P	236-13-00-303
	DBMMF-13W3S	235-13-00-307
	DBMMF-17W2P	236-17-00-303
	DBMMF-17W2S	235-17-00-314
	DBMMF-21W1P	236-21-00-302
	DBMMF-21W1S	235-21-00-304
C	DCMMF-8W8P	236-08-00-302
	DCMMF-8W8S	235-08-00-302
	DCMMF-13W6P	236-13-00-304
	DCMMF-13W6S	235-13-00-309
	DCMMF-17W5P	236-17-00-304
	DCMMF-17W5S	235-17-00-317
	DCMMF-21W4P	236-21-00-302
	DCMMF-21W4S	235-21-00-306
	DCMMF-25W3P	236-25-00-302
	DCMMF-25W3S	235-25-00-305
	DCMMF-27W2P	236-27-00-304
	DCMMF-27W2S	235-27-00-302
D	DDMMF-24W7P	236-24-00-302
	DDMMF-24W7S	235-24-00-304
	DDMMF-36W4P	236-36-00-302
	DDMMF-36W4S	235-36-00-304

FOR DIMENSIONS SEE C-46 PAGE 11

* These items available through Cinch distributors.

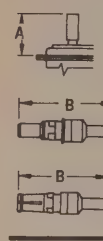
TRW CINCH CONNECTORS

GOLDEN D MARK I CONNECTORS (Cont'd)

REMOVABLE COAXIAL, HIGH VOLTAGE, AND HIGH POWER CONTACTS

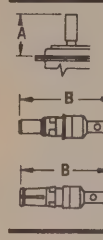
All coaxial and high voltage contacts have solder center contact. For coax, high voltage, and power contact material, see page 15.

COAXIAL CONTACT TERMINATIONS For D*M coaxial crimp tools, consult factory.



STRAIGHT CRIMP BRAID CONTACTS

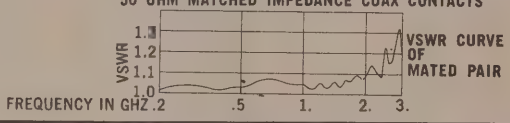
	Part Number				Dimensions			RG Cable No.	
	Standard Finish		Military Finish **		A	B	D		
	Order No.	Factory No.	Order No.	Factory No.	Max.	Ref.	±.005	Old	New
Plug	DM53740	167-0133-000	DM53740-17	167-0251-000	.739	.929	.040	196/U	178B/U
Plug	DM53740-1	167-0126-000	DM53740-15	167-0007-000	.739	.929	.067	187/U	179B/U
								188/U	316B/U
Plug	DM53740-3	167-0130-000	DM53740-16	167-0057-000	.847	1.037	.110	195/U	180B/U
Plug	DM53740-5	167-0088-000	DM53740-18	167-0252-000	.847	1.037	.125	58/U	58B/U
Receptacle	DM53742	167-0124-000	DM53742-18	167-0253-000	.739	.929	.040	196/U	178B/U
Receptacle	DM53742-1	167-0118-000	DM53742-16	167-0006-000	.739	.929	.067	187/U	179B/U
								188/U	316B/U
Receptacle	DM53742-3	167-0122-000	DM53742-17	167-0041-000	.847	1.037	.110	195/U	180B/U
Receptacle	DM53742-5	167-0086-000	DM53742-19	167-0254-000	.847	1.037	.125	58/U	58B/U



STRAIGHT SOLDER BRAID CONTACTS

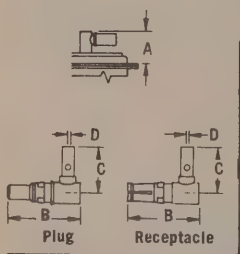
Plug	DM53740-5008*	167-0189-000	DM53740-5015	167-0113-000	.739	.929	.040	196/U	178B/U
Plug	DM53740-5001*	167-0153-000	DM53740-5099	167-0010-000	.739	.929	.067	187/U	179B/U
								188/U	316B/U
Plug	DM53740-5002*	167-0132-000	DM53740-5104	7-0237-000	.847	1.037	.110	195/U	180B/U
Plug	DM53740-5005	167-0150-000	DM53740-5101	167-0207-000	.847	1.037	.125	58/U	58B/U
Receptacle	DM53742-5006	167-0190-000	DM53742-5092	167-0138-000	.739	.929	.040	196/U	178B/U
Receptacle	DM53742-5001*	167-0169-000	DM53742-5089	167-0012-000	.739	.929	.067	187/U	179B/U
								188/U	316B/U
Receptacle	DM53742-5002*	167-0168-000	DM53742-5091	167-0139-000	.847	1.037	.110	195/U	180B/U
Receptacle	DM53742-5004*	167-0172-000	DM53742-5086	167-0137-000	.847	1.037	.125	58/U	58B/U
Plug (Short)	DM53740-5000*	167-0129-000	DM53740-5100	167-0011-000	.670	.860	.040	196/U	178B/U
Receptacle (Short)	DM53742-5000*	167-0121-000	DM53742-5085	167-0023-000	.670	.860	.040	196/U	178B/U

50 OHM MATCHED IMPEDANCE COAX CONTACTS



Description	Part No.
Straight Plug 50 Ohm	167-02-46-000
Straight Receptacle 50 Ohm	167-02-45-000

To be used with UT-85 coax cable

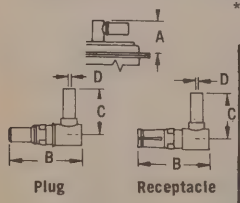


RIGHT ANGLE SOLDER BRAID CONTACTS

Cinch can also supply 50 ohm matched impedance coax contacts to be used with UT-85 coax cable.

	Part Number				Dimensions				RG Cable No.	
	Standard Finish		Military Finish **		A	B		D		
	Order No.	Factory No.	Order No.	Factory No.	Max.	Ref.	C	±.005	Old	New
Plug	DM53741-5000*	167-0187-000	DM53741-5059	167-0020-000	.530	.734	.492	.040	196/U	178B/U
Plug	DM53741-5001*	167-0128-000	DM53741-5062	167-0074-000	.530	.734	.492	.067	187/U	179B/U
									188/U	316B/U
Plug	DM53741-5003	167-0151-000	DM53741-5063	167-0159-000	.530	.734	.601	.110	195/U	130B/U
Plug	DM53741-5004	167-0173-000	DM53741-5060	167-0255-000	.530	.734	.601	.125	58/U	58B/U
Receptacle	DM53743-5000*	167-0119-000	DM53743-5073	167-0013-000	.530	.734	.492	.040	196/U	178B/U
Receptacle	DM53743-5001*	167-0120-000	DM53743-5076	167-0101-000	.530	.734	.492	.067	187/U	179B/U
									188/U	316B/U
Receptacle	DM53743-5003	167-0171-000	DM53743-5077	167-0158-000	.530	.734	.601	.110	195/U	180B/U
Receptacle	DM53743-5004	167-0170-000	DM53743-5074	167-0106-000	.530	.734	.601	.125	58/U	58B/U

** MIL-C-24308 Finish: .00005 minimum gold plate over .0001 minimum copper plate.

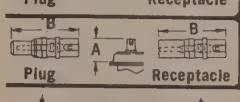


RIGHT ANGLE CRIMP BRAID CONTACTS

Plug	DM53741	167-0176-000	DM53741-12	167-0256-000	.530	.734	.492	.040	196/U	178B/U
Plug	DM53741-1	167-0152-000	DM53741-11	167-0162-000	.530	.734	.492	.067	187/U	179B/U
									188/U	316B/U
Plug	DM53741-3	167-0160-000	DM53741-10	167-0072-000	.530	.734	.601	.110	195/U	180B/U
Plug	DM53741-4	167-0149-000	DM53741-13	167-0257-000	.530	.734	.601	.125	58/U	58B/U
Receptacle	DM53743-2	167-0174-000	DM53743-18	167-0258-000	.530	.734	.492	.040	196/U	178B/U
Receptacle	DM53743-3	167-0166-000	DM53743-16	167-0161-000	.530	.734	.492	.067	187/U	179B/U
									188/U	316B/U
Receptacle	DM53743-5	167-0165-000	DM53743-17	167-0055-000	.530	.734	.601	.110	195/U	180B/U
Receptacle	DM53743-6	167-0164-000	DM53743-19	167-0259-000	.530	.734	.601	.125	58/U	58B/U

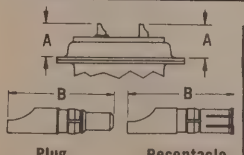
STRAIGHT HIGH VOLTAGE CONTACTS

	Part Number				Dimensions		
	Standard Finish		Military Finish **		A	B	
	Order No.	Factory No.	Order No.	Factory No.	Max.	Ref.	Wire Size
Plug	DM51157	167-0002-000	DM51157-8	167-0263-000	.539	.734	#20
Receptacle	DM51155	167-0111-000	DM51155-7	167-0221-000	.539	.734	#20



RIGHT ANGLE HIGH VOLTAGE CONTACTS

Plug	DM51157-5000	167-0260-000	DM51157-5005	167-0261-000	.491	.697	#20
Receptacle	DM51155-5000	167-0089-000	DM51155-5004	167-0262-000	.491	.697	#20



HIGH POWER SOLDER TYPE CONTACTS

	Part Number				Dimensions			
	Standard Finish		Military Finish **		A	B	Cur. Rating	Wire Size
	Order No.	Factory No.	Order No.	Factory No.	Max.	Ref.	(amps)	Wire Size
Plug	DM53745-1	167-0144-000	DM53745-28	167-0219-000	.666	.866	40	#8
Plug	DM53745-7	167-0042-000	DM53745-27	167-0167-000	.666	.866	20	#21
Plug	DM53745-8	167-0115-000	DM53745-25	167-0187-000	.666	.866	10	#16
Receptacle	DM53744-1	167-0145-000	DM53744-21	167-0220-000	.666	.856	40	#8
Receptacle	DM53744-6	167-0043-000	DM53744-25	167-0215-000	.666	.856	20	#21
Receptacle	DM53744-7	167-0087-000	DM53744-24	167-0188-000	.666	.856	10	#16

** MIL-C-24308 Finish: .00005 minimum gold plate over .0001 minimum copper plate.
* These items available through Cinch distributors.

Add Dept. EM to address to tell them you saw it in eem

eem/1978

TRW CINCH CONNECTORS

GOLDEN D MARK I CONNECTORS (Cont'd)

COMBINATION ARRANGEMENTS #20 CONTACTS WITH COAX, POWER AND/OR HIGH VOLTAGE CONTACTS

Coax and/or high voltage contacts must be ordered separately. See page 11 for ordering numbers.

Shell Size	E	A	A	A	B*	B	B	B
Arrangement	5W1	3W3	7W2	11W1	5W5	9W4	13W3	17W2
No. of Contacts	4	0	5	10	0	5	10	15
Contact Size	#20	–	#20	#20	–	#20	#20	#20
Coax or HV Cavities	1	3	2	1	5	4	3	2

Shell Size	B	C	C	C	C*
Arrangement	21W1	8W8	13W6	17W5	21WA4
No. of Contacts	20	0	7	12	17
Contact Size	#20	–	#20	#20	#20
Coax or HV Cavities	1	8	6	5	4

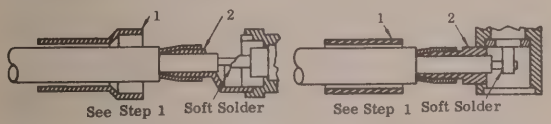
Shell Size	C	D	D	D*
Arrangement	25W3	24W7	43W2	30WS7
No. of Contacts	22	17	41	23
Contact Size	#20	#20	#20	#20
Coax or HV Cavities	3	7	2	7 shielded contacts

Consult factory for D*MA Series combination arrangements.

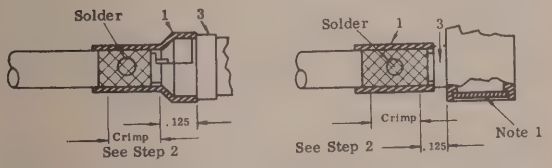
* These items not tooled.

COAXIAL CABLE INSTALLATION INSTRUCTIONS

STRAIGHT COAXIAL **90° COAXIAL**



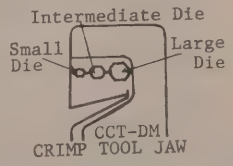
STEP 1. Slide outer ring (1) over cable jacket. Trim cable. Insert cable dielectric and center conductor into inside diameter of inner sleeve (2) solder center conductor to coaxial center contact.



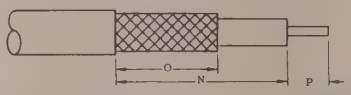
STEP 2. Slide outer ring (1) forward until flush with coaxial shell, (3) confining braid between outer ring and inner sleeve. For solder type coaxials, soft solder outer ring to assembly through cross-drilled solder hole. For crimp type coaxials, crimp with tool indicated being sure to crimp in area defined.

NOTES

1. Soft solder or stake access cap into shell after cable assembly on 90° type coaxials.
2. Crimp tool description — Cannon CCT-DM (to crimp outer sleeve only).
   - A. Use small die.
   - B. Use intermediate die.
   - C. Use large die.



3. Pin assemblies will accommodate high voltage and coaxial plugs only. Socket assemblies will accommodate high voltage and coaxial receptacles only.



TRIM COAXIAL CABLE TO THESE DIMENSIONS FOR INSTALLATION TO D*M COAXIAL CONTACTS

RECOMMENDED COAXIAL CABLE DIMENSIONS

Nomenclature	N	O	P	Tool No. Note 2
DM-53740	5/16	1/4	5/64	A
-1	5/16	1/4	5/64	B
-3	3/8	5/16	5/64	C
-5	3/8	5/16	5/64	C
DM-53741	3/8	15/64	1/16	A
-1	3/8	15/64	1/16	B
-3	27/64	5/16	3/32	C
-4	27/64	5/16	3/32	C
DM-53742	5/16	1/4	5/64	A
-1	5/16	1/4	5/64	B
-3	3/8	5/16	5/64	C
-5	3/8	5/16	5/64	C
DM-53743-2	3/8	15/64	1/16	A
-3	3/8	15/64	1/16	B
-5	27/64	5/16	3/32	C
-6	27/64	5/16	3/32	C
DM-53740-5000	5/16	1/4	5/64	None
-5001	5/16	1/4	5/64	None
-5002	3/8	5/16	5/64	None
-5005	3/8	5/16	5/64	None
-5008	5/16	1/4	5/64	None
DM-53741-5000	3/8	15/64	1/16	None
-5001	3/8	15/64	1/16	None
-5003	27/64	5/16	3/32	None
-5004	27/64	5/16	3/32	None
DM-53742-5000	5/16	1/4	5/64	None
-5001	5/16	1/4	5/64	None
-5002	3/8	5/16	5/64	None
-5004	3/8	5/16	5/64	None
-5006	5/16	1/4	5/64	None
DM-53743-5000	3/8	15/64	1/16	None
-5001	3/8	15/64	1/16	None
-5003	27/64	5/16	3/32	None
-5004	27/64	5/16	3/32	None

All tolerances ±.010 inch.

RECOMMENDED AWG WIRE DIMENSIONS

TRIM AWG WIRE TO THIS DIMENSION FOR INSTALLATION TO #20 CONTACTS

All tolerances ±.010 inch.

Nomenclature	N	Tool No. Note 2
DM-53744	.119	None
-5000	.119	None
DM-53745	.119	None
-5000	.119	None
Solder Type #20 Contact	.119	None

TRW CINCH CONNECTORS

ROYAL D MARK III CONNECTORS

GENERAL INFORMATION

The D*MA connector is a D-Subminiature Connector that utilizes the "Little Caesar" rear release contact assembly. This contact assembly allows rear insertion, release and extraction of crimp snap-in contacts. The simplified contact design with no undercuts offers greater bend resistance and a hard, closed entry socket insulator insures positive contact alignment. Crimp terminations accommodate #20, #22 and #24 AWG stranded wire and are rated for 5 amps.* ROYAL D-connectors are intermateable and interchangeable with all other D-Subminiature Connectors having compatible contact arrangement.

Polarization is by keystone shape of shell; coupling is by friction. Accessories are shown on pages 24 and 25. An extraction tool is supplied with ROYAL D-connectors. Extra contacts may be ordered for replacement purposes. See page 21 for ordering information.

MATERIALS, FINISHES AND TYPES

Shell: Steel, cadmium plated with yellow chromate supplementary coating.

Insulator: Diallyl phthalate, glass fibre filled, per MIL-P-19833, Type GDI-30F, royal purple color, monobloc construction.

Contacts: Pin—leaded copper, gold plate over nickel plate. Socket—copper alloy, gold plate over nickel plate with stainless steel sleeves.

Current Rating: (#20 Contacts) 5 amps.*

Contact Termination: Crimp, accommodating #20, #22 or #24 AWG stranded wire. The 20-18 contacts accommodate one #18 or two #22 AWG stranded wires.

Contact Type: Snap-in, removable, crimp, with rear release assembly. Contacts not interchangeable with other D Series.

Socket Type: Closed entry.

Float Mounting

Rivets & Washers: Stainless steel.

For listing of applicable specifications, see page 12.

*Military rating of #20 contacts or wires is 1.5 amps average, and 7.5 amps maximum. See explanation on page 12.

PERFORMANCE DATA

VOLTAGE RATING:

Insulation Resistance Ref. MIL-C-24308	— Greater than 5000 megohms in accordance with MIL-STD-202D, Method 302, Condition B
Contact Resistance Exceeds Req'ts of MIL-C-24308	— (#20 contacts) 20 milliohms max. in accordance with Para 3.5.8
Contact Engagement Force Ref. MIL-C-24308	— .7 to 12 oz. when tested with MS3197 test pin
Contact Separation Force Ref. MIL-C-24308	— .7 to 8 oz. when tested with MS3197 test pin
Moisture Resistance Ref. MIL-C-24308	— Exceeds test requirements of MIL-STD-202D, Method 106
Vibration Ref. MIL-C-24308	— Meets test requirements of MIL-STD-202D, Method 204, Condition B
Shock Ref. MIL-C-24308	— Meets test requirements of MIL-STD-202D, Method 213, Condition G
Corrosion Resistance Ref. MIL-C-24308	— Exceeds requirements of 48-hour exposure to salt spray in accordance with MIL-STD-202D, Method 101A, Condition B
High Potential Test Voltage Ref. MIL-C-24308	— MIL-STD-202D, Method 301
Temperature Cycling Ref. MIL-C-24308	— MIL-STD-202D, Method 102A, Condition B

See tabulation on page 12.

Military Part No.	Cinch Part No.
*M24308/10-1 Socket	415-30-99-130
*M24308/11-1 Pin	403-30-99-106

Mark III Crimp Removable Contact Connectors

	Military Part No. With Contacts	Cinch Part No. Complete	Military Part No. Less Contacts	Cinch Part No. Less Contacts	Marked
Sockets	M24308/2-1 *	230-01-09-102	M24308/2-281	230-01-09-109	M24308/2-1
	M24308/2-2 *	230-01-15-102	M24308/2-282	230-01-15-109	M24308/2-2
	M24308/2-3 *	230-01-25-102	M24308/2-283	230-01-25-109	M24308/2-3
	M24308/2-4 *	230-01-37-102	M24308/2-284	230-01-37-109	M24308/2-4
	M24308/2-5 *	230-01-50-102	M24308/2-285	230-01-50-109	M24308/2-5
Plugs	M24308/4-1 *	231-01-09-102	M24308/4-259	231-01-09-109	M24308/4-1
	M24308/4-2 *	231-01-15-102	M24308/4-260	231-01-15-109	M24308/4-2
	M24308/4-3 *	231-01-25-102	M24308/4-261	231-01-25-109	M24308/4-3
	M24308/4-4 *	231-01-37-102	M24308/4-262	231-01-37-109	M24308/4-4
	M24308/4-5 *	231-01-50-102	M24308/4-263	231-01-50-109	M24308/4-5

Mark III Crimp Removable Contact Connectors With Float Mount

	Military Part No. With Contacts	Cinch Part No. Complete	Military Part No. Less Contacts	Cinch Part No. Less Contacts	Marked
Sockets	M24308/2-23	230-01-09-307	M24308/2-292	230-01-09-308	M24308/2-23
	M24308/2-24	230-01-15-307	M24308/2-293	230-01-15-308	M24308/2-24
	M24308/2-25	230-01-25-307	M24308/2-294	230-01-25-308	M24308/2-25
	M24308/2-26	230-01-37-307	M24308/2-295	230-01-37-308	M24308/2-26
	M24308/2-27	230-01-50-307	M24308/2-296	230-01-50-308	M24308/2-27
Plugs	M24308/4-302	231-01-09-307	M24308/4-324	231-01-09-308	M24308/4-302
	M24308/4-303	231-01-15-307	M24308/4-325	231-01-15-308	M24308/4-303
	M24308/4-304	231-01-25-307	M24308/4-326	231-01-25-308	M24308/4-304
	M24308/4-305	231-01-37-307	M24308/4-327	231-01-37-308	M24308/4-305
	M24308/4-306	231-01-50-307	M24308/4-328	231-01-50-308	M24308/4-306

Mark III Crimp Removable Contact Connectors (Non-Magnetic)

	Military Part No. With Contacts	Cinch Part No. Complete	Military Part No. Less Contacts	Cinch Part No. Less Contacts	Marked
Sockets	M24308/6-1	230-01-09-500	M24308/6-281	230-01-09-504	M24308/6-1
	M24308/6-2	230-01-15-500	M24308/6-282	230-01-15-504	M24308/6-2
	M24308/6-3	230-01-25-500	M24308/6-283	230-01-25-504	M24308/6-3
	M24308/6-4	230-01-37-500	M24308/6-284	230-01-37-504	M24308/6-4
	M24308/6-5	230-01-50-500	M24308/6-285	230-01-50-504	M24308/6-5
Plugs	M24308/8-1	231-01-09-500	M24308/8-259	231-01-09-504	M24308/8-1
	M24308/8-2	231-01-15-500	M24308/8-260	231-01-15-504	M24308/8-2
	M24308/8-3	231-01-25-500	M24308/8-261	231-01-25-504	M24308/8-3
	M24308/8-4	231-01-37-500	M24308/8-262	231-01-37-504	M24308/8-4
	M24308/8-5	231-01-50-500	M24308/8-263	231-01-50-504	M24308/8-5

Mark III Crimp Removable Contact Connectors (Non-Magnetic) With Float Mount

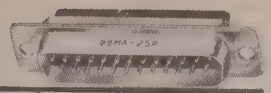
	Military Part No. With Contacts	Cinch Part No. Complete	Military Part No. Less Contacts	Cinch Part No. Less Contacts	Marked
Sockets	M24308/6-259	230-01-09-200	M24308/6-324	230-01-09-201	M24308/6-259
	M24308/6-260	230-01-15-200	M24308/6-325	230-01-15-201	M24308/6-260
	M24308/6-261	230-01-25-200	M24308/6-326	230-01-25-201	M24308/6-261
	M24308/6-262	230-01-37-200	M24308/6-327	230-01-37-201	M24308/6-262
	M24308/6-263	230-01-50-200	M24308/6-328	230-01-50-201	M24308/6-263
Plugs	M24308/8-302	231-01-09-200	M24308/8-324	231-01-09-201	M24308/8-302
	M24308/8-303	231-01-15-200	M24308/8-325	231-01-15-201	M24308/8-303
	M24308/8-304	231-01-25-200	M24308/8-326	231-01-25-201	M24308/8-304
	M24308/8-305	231-01-37-200	M24308/8-327	231-01-37-201	M24308/8-305
	M24308/8-306	231-01-50-200	M24308/8-328	231-01-50-201	M24308/8-306

* These items available through Cinch distributors.

TRW CINCH CONNECTORS

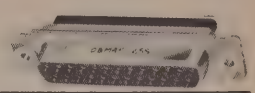
ROYAL D MARK III CONNECTORS (CONT'D)

ORDERING INFORMATION



STANDARD SHELL

Shell Size	Layout	Order No.*	Factory No.	Order No.	Factory No.
E	9 Contact				
	Plug	DEMA-9P*	231-01-09-100	DEMAM-9P	231-01-09-108
	Socket	DEMA-9S*	230-01-09-100	DEMAM-9S	230-01-09-108
A	15 Contact				
	Plug	DAMA-15P*	231-01-15-100	DAMAM-15P	231-01-15-107
	Socket	DAMA-15S*	230-01-15-100	DAMAM-15S	230-01-15-107
B	25 Contact				
	Plug	DBMA-25P*	231-01-25-100	DBMAM-25P	231-01-25-108
	Socket	DBMA-25S*	230-01-25-100	DBMAM-25S	230-01-25-107
C	37 Contact				
	Plug	DCMA-37P*	231-01-37-100	DCMAM-37P	231-01-37-108
	Socket	DCMA-37S*	230-01-37-100	DCMAM-37S	230-01-37-108
D	50 Contact				
	Plug	DDMA-50P*	231-01-50-100	DDMAM-50P	231-01-50-107
	Socket	DDMA-50S*	230-01-50-100	DDMAM-50S	230-01-50-105



SHELL WITH FLOAT MOUNTS

Shell Size	Layout	Order No.*	Factory No.	Order No.	Factory No.
E	9 Contact				
	Plug	DEMAF-9P*	231-01-09-300	DEMAMF-9P	231-01-09-305
	Socket	DEMAF-9S*	230-01-09-300	DEMAMF-9S	230-01-09-305
A	15 Contact				
	Plug	DAMAF-15P*	231-01-15-300	DAMAMF-15P	231-01-15-305
	Socket	DAMAF-15S*	230-01-15-300	DAMAMF-15S	230-01-15-305
B	25 Contact				
	Plug	DBMAF-25P*	231-01-25-300	DBMAMF-25P	231-01-25-304
	Socket	DBMAF-25S*	230-01-25-300	DBMAMF-25S	230-01-25-304
C	37 Contact				
	Plug	DCMAF-37P*	231-01-37-300	DCMAMF-37P	231-01-37-302
	Socket	DCMAF-37S*	230-01-37-300	DCMAMF-37S	230-01-37-305
D	50 Contact				
	Plug	DDMAF-50P*	231-01-50-300	DDMAMF-50P	231-01-50-302
	Socket	DDMAF-50S*	230-01-50-300	DDMAMF-50S	230-01-50-304

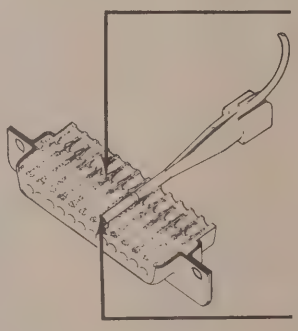
FOR DIMENSIONS SEE PAGE 11

"LITTLE CAESAR" REAR RELEASE CONTACT ASSEMBLY

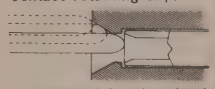
The "Little Caesar" rear release contact assembly permits contacts to be inserted by hand and to be released and extracted from the rear of the connector with a simple, expendable plastic tool.

The contact is inserted from the rear of the connector thru a cylindrical clip in the insulator until the indented tines of the clip snap securely behind the contact shoulder. The contact is released as the plastic tool is inserted into the rear of the connector, expanding the tines beyond the contact shoulder and permitting contact extraction. The simplified contact design improves bend resistance through a single holding shoulder with no undercuts.

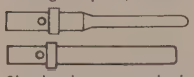
The "Little Caesar" contact assembly was selected by the National Aerospace Standards Committee for use in a major industry connector specification for vital programs demanding great operational reliability.



Contact retaining clip.

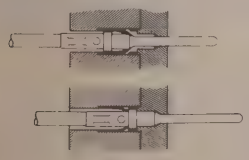


Hard dielectric, closed-entry socket inserts realigns bent or misaligned pin contacts.



Simple stronger contact without undercuts for greater bend resistance.

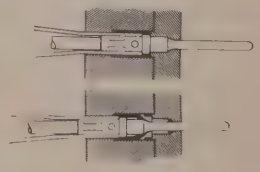
CONTACT INSERTION



Contact partially inserted.

Tines snap behind contact shoulder when contact is fully inserted.

CONTACT EXTRACTION



Insert extraction tool to fully bottomed condition.

Tines expanded beyond contact shoulder.

Remove contact by pulling on wire.

Contact partially removed.

ORDERING INFORMATION FOR ADDITIONAL CONTACTS

All D*MA connectors are supplied with the proper number of crimp type contacts. Additional contacts may be ordered for replacement purposes as indicated.

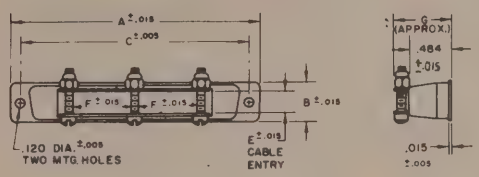
Contact Size	Contact Part Numbers			
	Pin		Socket	
	Order No.	Factory No.	Order No.	Factory No.
20 Standard Finish	330-5291-000*	403-30-99-214	031-1007-000*	415-30-99-119
20-18 Standard Finish	330-5291-001	403-30-99-215	031-1007-001	415-30-99-118
20 Military Finish	M24308/11-1*	403-30-99-106	M24308/10-1*	415-30-99-130

* These items available through Cinch distributors.

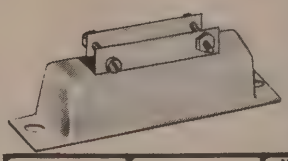
TRW CINCH CONNECTORS

ACCESSORIES JUNCTION SHELLS

19678 STRAIGHT CLAMP



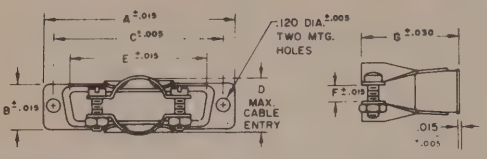
For use with D*, D*M and D*MA only



Material: Low carbon steel.
Finish: Cadmium plate, yellow chromate
Corrosion Resistance: Passes 48 hour exposure to salt spray in accordance with MIL-STD-202D, Method 101C, Condition B. All tolerances are ±.010 unless noted otherwise.

Order No.* by Shell Size	Factory No.	No. of Cable Locking Screws Required	A	B	C	E	F	G
DA-19678-1*	239-13-22-004	2	1.531	.500	1.312	.296	.312	.640
DB-19678-2*	239-13-22-003	2	2.078	.500	1.852	.296	.796	.640
DC-19678-3*	239-13-22-002	3	2.718	.500	2.500	.296	.687	.640
DD-19678-4*	239-13-22-001	3	2.625	.609	2.406	.390	.687	.703

ROUND CLAMP

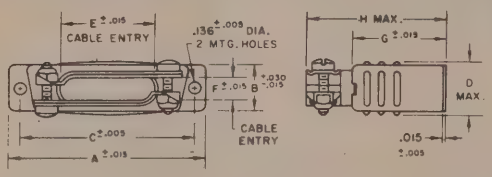


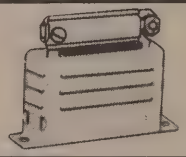
For use with D*, D*M and D*MA only

Material: Low carbon steel.
Finish: Cadmium plate, yellow chromate.
Corrosion Resistance: Passes 48 hour exposure to salt spray in accordance with MIL-STD-202D, Method 101C, Condition B.

Order No.* by Shell Size	Factory No.	A	B	C	D	E	F	G
DA-20961	239-14-22-017	1.531	.500	1.322	.406	.984	.125	1.031
DB-20962	239-14-22-018	2.078	.500	1.852	.593	1.515	.187	1.062
DC-20963	239-14-22-019	2.718	.500	2.500	.718	2.171	.250	1.062
DD-20964	239-14-22-020	2.625	.609	2.406	.812	2.093	.312	1.062

DEEP, STRAIGHT CLAMP

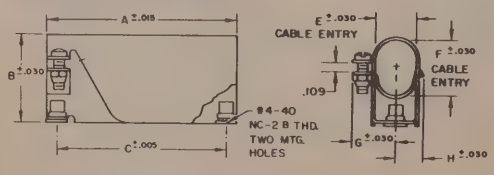




Material: Low carbon steel.
Finish: Cadmium plate, yellow chromate.
Corrosion Resistance: Passes 48 hour exposure to salt spray in accordance with MIL-STD-202D, Method 101C, Condition B.

Order No.* by Shell Size	Factory No.	A	B	C	D	E	F	G	H
DE-24657*	239-14-23-030	1.203	.484	.984	.578	.375	.375	.750	1.219
DA-24658*	239-14-22-068	1.531	.484	1.312	.578	.713	.312	.750	1.250
DB-24659*	239-14-22-066	2.078	.484	1.852	.578	1.000	.312	1.000	1.531
DC-24660*	239-14-22-067	2.718	.484	2.500	.578	1.375	.312	1.000	1.531
DD-24661*	239-14-22-049	2.625	.593	2.406	.687	1.406	.406	1.125	1.656

19977 RIGHT ANGLE CLAMP

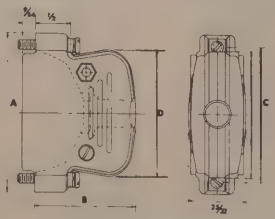


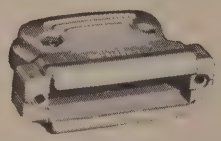
For use with D*, D*M and D*MA only

Material: Low carbon steel.
Finish: Cadmium plate, yellow chromate.
Corrosion Resistance: Passes 48 hours exposure to salt spray in accordance with MIL-STD-202D, Method 101C, Condition B.

Order No.* by Shell Size	Factory No.	A	B	C	E	F	G	H
DE-19977-5*	239-14-22-021	1.203	.718	.984	.437	.437	.468	.281
DA-19977-1*	239-14-22-013	1.531	.718	1.312	.437	.437	.468	.281
DB-19977-2*	239-14-22-014	2.078	.968	1.852	.437	.625	.468	.281
DC-19977-3*	239-14-22-015	2.718	1.187	2.500	.437	.812	.468	.281
DD-19977-4*	239-14-22-016	2.625	1.250	2.406	.562	.906	.531	.343

ALL MOLDED HOOD

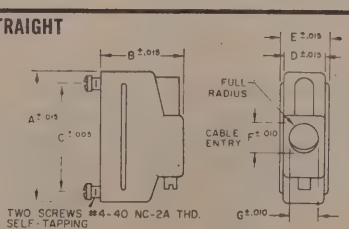


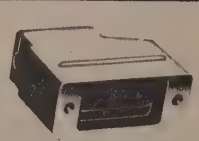


Material: Grey Melamine.
Finish: None.
Corrosion Resistance: Hardware passes 48 hour exposure to salt spray in accordance with MIL-STD-202D, Method 101C, Condition B.

Order No.* by Shell Size	Factory No.	A	B	C	D
DA-51225-1*	239-13-99-069	1 41/64	1 13/64	1.312	1 1/32
DB-51226-1*	239-13-99-070	2 13/64	1 13/32	1.852	1 51/64

PLASTIC STRAIGHT





Material: None.
Finish: None.
Corrosion Resistance: Hardware passes 48 hour exposure to salt spray in accordance with MIL-STD-202D, Method 101C, Condition B.

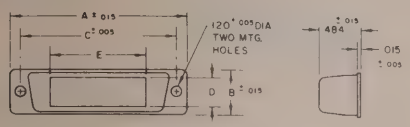
Order No.* by Shell Size	Factory No.	A	B	C	D	E	F	G
DE-51218-1*	239-13-99-101	1.218	1.000	.984	.500	.562	.281	.281
DA-51210-1*	239-13-99-124	1.546	1.000	1.312	.500	.562	.360	.360
DB-51212-1*	239-13-99-135	2.093	1.250	1.852	.500	.562	.493	.360

* These items available through Cinch distributors.

TRW CINCH CONNECTORS

ACCESSORIES (Cont'd)

POTTING SHELLS

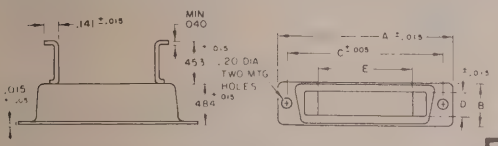


For use with D*, D*M and D*MA only

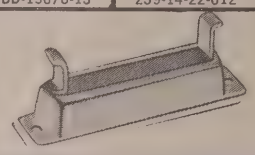
Material: Low carbon steel.
Finish: Cadmium plate, yellow chromate.
Corrosion Resistance: Passes 48 hour exposure to salt spray in accordance with MIL-STD-202D, Method 101C, Condition B.

All tolerances are ±.010 unless noted otherwise.

Order No. by Shell Size	Factory No.	A	B	C	D	E
DA-19678-10	239-14-22-009	1.531	.500	1.312	.300	.588
DB-19678-11	239-14-22-010	2.078	.500	1.852	.300	1.125
DC-19678-12	239-14-22-011	2.718	.500	2.500	.300	1.750
DD-19678-13	239-14-22-012	2.625	.609	2.406	.390	1.750



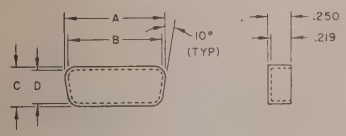
For use with D*, D*M and D*MA only



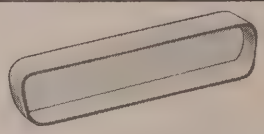
Material: Low carbon steel.
Finish: Cadmium plate, yellow chromate.
Corrosion Resistance: Passes 48 hour exposure to salt spray in accordance with MIL-STD-202D, Method 101C, Condition B.

DA-19678-14	239-19-22-074	1.531	.500	1.312	.300	.588
DB-19678-15	239-19-22-075	2.078	.500	1.852	.300	1.125
DC-19678-16	239-19-22-076	2.718	.500	2.500	.300	1.750
DD-19678-17	239-19-22-077	2.625	.009	2.406	.390	1.750

DUST CAPS



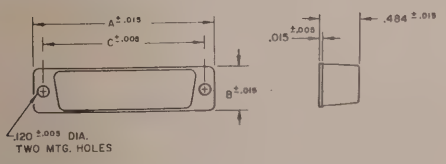
*These items available through Cinch distributors.



Material: Polypropylene
Finish: None.

Order No. by Shell Size*	For Use with	Factory No.	A	B	C	D
DE-59-20	DE-9S	474-11-92-303	.694	.627	.362	.295
DE-60-20	DE-9P	474-11-92-304	.749	.682	.412	.345
DA-59-20	DA-15S	474-11-92-305	1.022	.955	.362	.295
DA-60-20	DA-15P	474-11-92-306	1.077	1.010	.412	.345
DB-59-20	DB-25S	474-11-92-301	1.562	1.495	.362	.295
DB-60-20	DB-25P	474-11-92-302	1.635	1.568	.430	.363
DC-59-20	DC-37S	474-11-92-307	2.210	2.143	.362	.295
DC-60-20	DC-37P	474-11-92-308	2.283	2.216	.430	.363
DD-59-20	DD-50S	474-11-92-309	2.116	2.049	.474	.407
DD-60-20	DD-50P	474-11-92-310	2.179	2.112	.536	.469

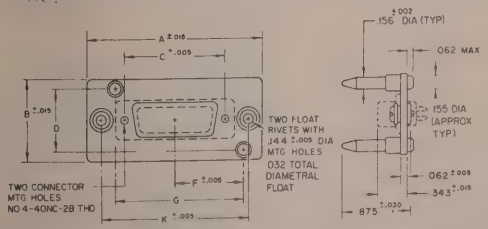
SWITCHING SHELLS



Material: Low carbon steel.
Finish: Cadmium plate, yellow chromate.
Corrosion Resistance: Passes 48 hour exposure to salt spray in accordance with MIL-STD-202D, Method 101C, Condition B.

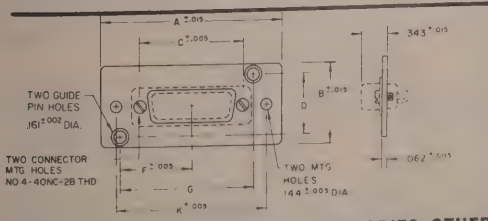
Order No. by Shell Size	Factory No.	A	B	C
DA-19678-6	239-14-22-005	1.531	.500	1.312
DB-19678-7	239-14-22-006	2.078	.500	1.852
DC-19678-8	239-14-22-007	2.718	.500	2.500
DD-19678-9	239-14-22-008	2.625	.609	2.406

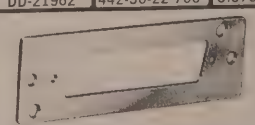
GUIDE PIN PLATES



Material: Plates and float hardware are cold rolled steel; guidepins are stainless steel.
Finish: Cadmium plate, yellow chromate.
Corrosion Resistance: Passes 48 hour exposure to salt spray in accordance with MIL-STD-202A, Method 101A, Condition B.

Order No. by Shell Size	Factory No.	A	B	C	D	F	G	K
DA-22213	442-36-22-703	2.281	1.000	1.312	.750	.898	1.663	1.906
DB-22255	442-36-22-701	2.820	1.000	1.852	.750	1.168	2.203	2.446
DC-22070	442-36-22-702	3.468	1.000	2.500	.750	1.492	2.851	3.094
DD-21962	442-36-22-706	3.375	1.125	2.406	.874	1.437	2.749	3.000





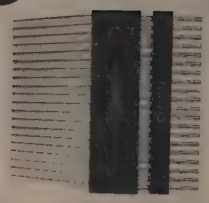
Material: Cold rolled steel.
Finish: Cadmium plate, yellow chromate.
Corrosion Resistance: Passes 48 hour exposure to salt spray in accordance with MIL-STD-202A, Method 101A, Condition B.

DA-22214	442-36-22-503	2.281	1.000	1.312	.750	.898	1.663	1.906
DB-22254	442-36-22-502	2.820	1.000	1.852	.750	1.168	2.203	2.446
DC-22071	442-36-22-501	3.468	1.000	2.500	.750	1.492	2.851	3 094
DD-21961	442-36-22-500	3.375	1.125	2.406	.874	1.437	2.749	3.000

FOR ACCESSORIES OTHER THAN THOSE SHOWN, CONSULT FACTORY

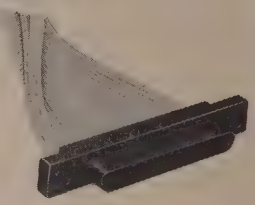
TRW CINCH CONNECTORS

MICROMINIATURE CONNECTORS



DURA-CON*SERIES CONNECTORS ON .050" CENTERS

- High contact density with up to 266 contacts per square inch
- Lightweight
- Rugged, reliable contacts
- Shock and vibration resistant



The Cinch Dura-Con Series of Microminiature Strip and Rectangular connectors are ideally suited for space and weight reduction in miniaturized airborne electronics and for shorter signal paths in electronic data processing equipment. Both Cinch Dura-Con Series have rugged, high-performance contacts capable of providing shock and vibration proof continuity from dry circuit to three amperes current.

This is accomplished by making the pin the spring member. The Cinch Dura-Con is made from a precision miniature spring cable with a welded tip. The expanded cable provides seven spring members peripherally around the pin so that no matter what radial forces are applied, contact is maintained with the mating socket wall. Furthermore, this flexible spring pin can be bent many times without evidencing any metal fatigue. By protecting this pin in a recessed tolerance cavity, reliable mating is assured. Hence, despite its small size, the Cinch Dura-Con provides superior performance.

* Trade name TRW Inc.
Licensed by New Twist Connector Corporation.

DURA-CON D RECTANGULAR MICROMINIATURE CONNECTORS

This series of microminiature rectangular connectors is available in contact layouts with 9, 15, 21, 25, 37, and 51 positions. In addition to the ½" long #24 AWG solid copper leads and 18" long #26 AWG stranded Type E insulated wire terminations, this connector series can be supplied with custom terminations.

Contacts: 24 size; copper alloy, gold plated.
Insulator: Glass-filled polyester 94V-0.

PERFORMANCE DATA

ELECTRICAL

Current Rating: 3 amperes.
Contact Resistance: Nominal 4 milliohms, maximum 8 milliohms.
Dielectric Withstanding Voltage:
Sea Level: 900V RMS 60 Hz. **70,000 Ft.:** 300V RMS 60 Hz.
Insulation Resistance: 5,000 megohms minimum.

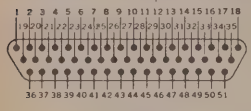
MECHANICAL

Contact Engaging Force: 6 oz. per contact maximum.
Contact Separation Force: ½ oz. per contact minimum.

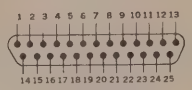
ENVIRONMENTAL

Temperature: −65°F to 300°F.
Vibration and Shock: No discontinuity detected (equipment sensitivity 6 nanoseconds) during 10 to 2,000 cps at .06" double amplitude or 50 g. 20 shocks 500 g.
Durability: Contact resistance still within specification after 500 cycles mating and unmating.
Salt Spray: No damage — Contact resistance still within specification after mated sample exposed 48 hours per MIL-STD-202B, Method 101A, Condition B.

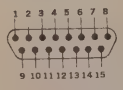
CONTACT ARRANGEMENTS (FACE VIEW OF PIN INSERT)



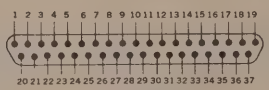
51 CONTACTS



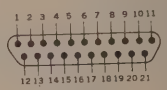
25 CONTACTS



15 CONTACTS



37 CONTACTS



21 CONTACTS

9 CONTACTS

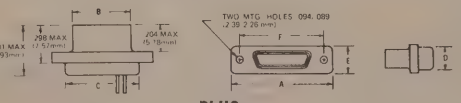
Termination: #24 AWG Solid Copper Leads, ½" long.

No. of Contacts	P — Pin S — Socket	Distributor Part No.	Factory Part No.
9	P	DCDA-9P4C4-00.5	280-51-09-001
	S	DCDA-9S4C4-00.5	280-52-09-001
15	P	DCDA-15P4C4-00.5	280-51-15-001
	S	DCDA-15S4C4-00.5	280-52-15-001
21	P	DCDA-21P4C4-00.5	280-51-21-001
	S	DCDA-21S4C4-00.5	280-52-21-001
25	P	DCDA-25P4C4-00.5	280-51-25-001
	S	DCDA-25S4C4-00.5	280-52-25-001
37	P	DCDA-37P4C4-00.5	280-51-37-001
	S	DCDA-37S4C4-00.5	280-52-37-001
51	P	DCDA-51P4C4-00.5	280-51-51-001
	S	DCDA-51S4C4-00.5	280-52-51-001

Termination: 18" #26 AWG Stranded, Type E, Yellow Insulation.

No. of Contacts	P — Pin S — Socket	Distributor Part No.	Factory Part No.
9	P	DCDA-9P6E2-18.0	280-53-09-001
	S	DCDA-9S6E2-18.0	280-54-09-001
15	P	DCDA-15P6E2-18.0	280-53-15-001
	S	DCDA-15S6E2-18.0	280-54-15-001
21	P	DCDA-21P6E2-18.0	280-53-21-001
	S	DCDA-21S6E2-18.0	280-54-21-001
25	P	DCDA-25P6E2-18.0	280-53-25-001
	S	DCDA-25S6E2-18.0	280-54-25-001
37	P	DCDA-37P6E2-18.0	280-53-37-001
	S	DCDA-37S6E2-18.0	280-54-37-001
51	P	DCDA-51P6E2-18.0	280-53-51-001
	S	DCDA-51S6E2-18.0	280-54-51-001

DIMENSIONS



PLUG

RECEPTACLE

Part No.	A Max.	B Max.	C Max.	D Max.	E Max.	F Max.
DCDA-9P	.785(19.93)	.2905(7.38)	.403(10.23)	.170(4.32)	.215(5.46)	.565(14.35)
DCDA-9S	.785(19.93)	.3760(9.55)	.403(10.23)	.170(4.32)	.215(5.46)	.565(14.35)
DCDA-15P	.935(23.74)	.4405(11.21)	.553(14.04)	.170(4.32)	.215(5.46)	.715(18.16)
DCDA-15S	.935(23.74)	.5260(13.36)	.553(14.04)	.170(4.32)	.215(5.46)	.715(18.16)
DCDA-21P	1.085(27.38)	.5905(14.91)	.703(17.73)	.170(4.32)	.205(5.26)	.865(21.97)
DCDA-21S	1.085(27.38)	.5905(15.14)	.703(17.73)	.170(4.32)	.205(5.26)	.865(21.97)
DCDA-25P	1.185(30.09)	.6905(17.54)	.803(20.39)	.170(4.32)	.215(5.46)	.965(24.51)
DCDA-25S	1.185(30.09)	.7760(19.71)	.803(20.39)	.170(4.32)	.215(5.46)	.965(24.51)
DCDA-37P	1.485(37.71)	.9905(25.16)	1.103(28.01)	.170(4.32)	.215(5.46)	1.270(32.25)
DCDA-37S	1.485(37.71)	1.0760(27.33)	1.103(28.01)	.170(4.32)	.215(5.46)	1.270(32.25)
DCDA-51P	1.435(36.44)	.9405(23.89)	1.053(26.74)	.213(5.41)	.258(6.55)	1.215(30.86)
DCDA-51S	1.435(36.44)	1.0260(26.06)	1.053(26.74)	.213(5.41)	.258(6.55)	1.215(30.86)

Note: P — Pin (Plug), S — Socket (Receptacle) (Bracketed figures millimeters)

TRW CINCH CONNECTORS

DURA-CON D MICROMINIATURE CONNECTORS (Cont'd)

PANEL CUTOUT DIMENSIONS

FIGURE 1 — FRONT MOUNTING

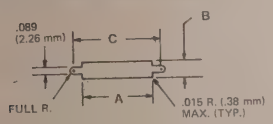
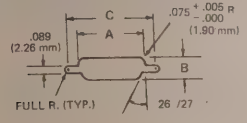


FIGURE 2 — REAR MOUNTING



Size	Figure	A +.004(.102) −.000(.000)	B +.004(.102) −.000(.000)	C +.005(.127) −.000(.000)
DCDA-9	1	.408(10.36)	.172(4.37)	.570(14.49)
	2	.381(9.68)	.216(5.49)	.570(14.49)
DCDA-15	1	.558(14.17)	.172(4.37)	.720(18.29)
	2	.531(13.49)	.216(5.49)	.720(18.29)
DCDA-21	1	.706(17.93)	.172(4.37)	.870(22.10)
	2	.673(17.09)	.216(5.49)	.870(22.10)
DCDA-25	1	.808(20.52)	.172(4.37)	.970(24.64)
	2	.731(18.56)	.216(5.49)	.970(24.64)
DCDA-37	1	1.108(28.14)	.172(4.37)	1.270(32.26)
	2	1.081(27.46)	.216(5.49)	1.270(32.26)
DCDA-51	1	1.058(26.87)	.215(5.46)	1.220(30.99)
	2	1.031(26.19)	.259(6.58)	1.220(30.99)

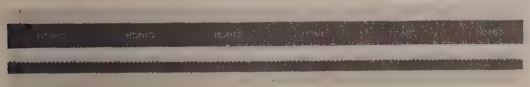
(Bracketed figures millimeters)

DURA-CON STRIP CONNECTORS

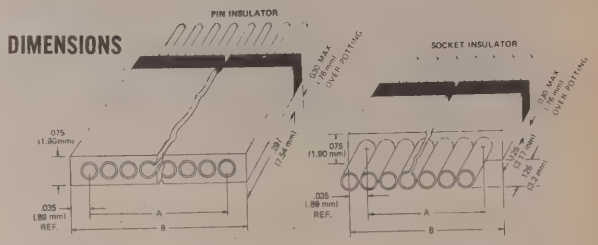
For maximum flexibility of application, Cinch Dura-Con contacts are available in strips on .050" centers. By cutting, adding, or stacking, a variety of contact arrangements can be achieved. These versatile connector strips are available with up to 120 contact positions on special order. Moreover, guide pins that engage prior to the contact in the mating cycle, can be provided to assist in mating and polarization.

Contacts: 24 gage copper alloy, gold plated.

Insulator: Glass-filled polyester 94V-0.



DIMENSIONS



Part No.	A	B Max.
CSA1-5P/5S	.200(5.080)	.270(6.858)
CSA1-10P/10S	.450(11.420)	.520(13.198)
CSA1-15P/15S	.700(17.780)	.770(19.558)
CSA1-20P/20S	.950(24.130)	1.020(25.908)

(Bracketed figures millimeters)

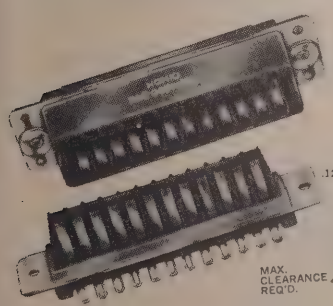
Termination: #24 AWG Solid Copper Leads, ½" Long.

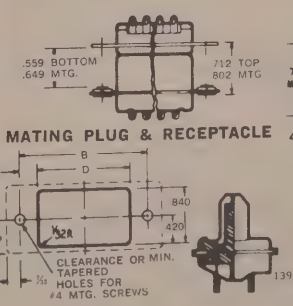
No. of Contacts	P — Pin S — Socket	Distributor Part No.	Factory Part No.
5	P	CSA1-5P4C4-00.5	280-10-05-001
	S	CSA1-5S4C4-00.5	280-20-05-001
10	P	CSA1-10P4C4-00.5	280-10-10-001
	S	CSA1-10S4C4-00.5	280-20-10-001
15	P	CSA1-15P4C4-00.5	280-10-15-001
	S	CSA1-15S4C4-00.5	280-20-15-001
20	P	CSA1-20P4C4-00.5	280-10-20-001
	S	CSA1-20S4C4-00.5	280-20-20-001

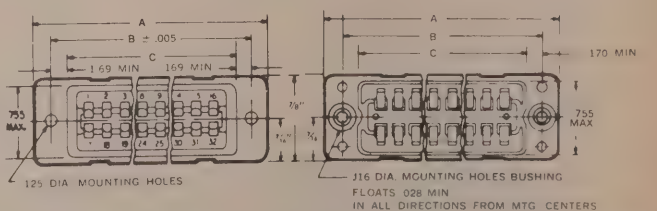
Termination: 18" #26 AWG Stranded, Type E, Yellow Insulation.

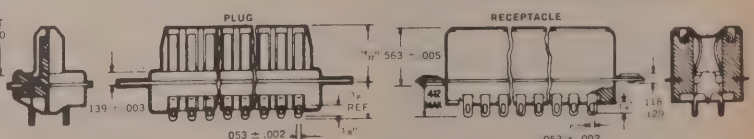
No. of Contacts	P — Pin S — Socket	Distributor Part No.	Factory Part No.
5	P	CSA1-5P6E2-18.0	280-30-05-001
	S	CSA1-5S6E2-18.0	280-40-05-001
10	P	CSA1-10P6E2-18.0	280-30-10-001
	S	CSA1-10S6E2-18.0	280-40-10-001
15	P	CSA1-15P6E2-18.0	280-30-15-001
	S	CSA1-15S6E2-18.0	280-40-15-001
20	P	CSA1-20P6E2-18.0	280-30-20-001
	S	CSA1-20S6E2-18.0	280-40-20-001

BLUE RIBBON‡ RECTANGULAR CONNECTORS









ELECTRICAL SPECIFICATIONS VOLTAGE RATINGS: (a) At Sea Level 800 VDC, (b) At 70,000 Feet 300 VDC; CONTACT CURRENT RATING: 5 Amperes; CONTACT RESISTANCE: .003 Ohms Maximum; INSULATION RESISTANCE (As Received): 100,000 Megohms Minimum.

MECHANICAL SPECIFICATIONS CONTACTS: Plug, Copper, ASTM-B-152, Type ETP, Socket, Phosphor bronze, ASTM-B-103, MIL-B-892, Grade A; FINISH: Gold per MIL-G-45204, Type II over copper flash; MOUNTING PLATE: Passivated stainless steel. TEMPERATURE RANGE: —67°C to 130°C.

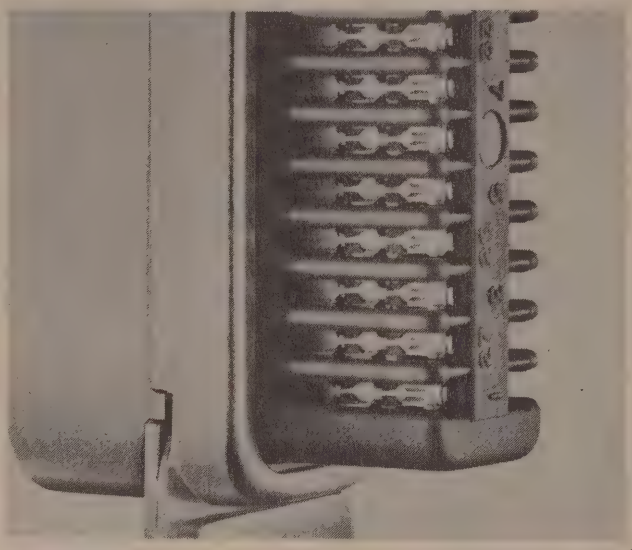
No. of Contacts	Part Numbers Plug	Part Numbers Socket	A	Dimensions B	Dimensions C	D (Min.)
8	26-4100-8P	26-4200-8S	1 23/32	1.375	1 1/32	1.120
16	26-4100-16P	26-4200-16S	2 15/32	2.125	1 25/32	1.868
24	26-4100-24P	26-4200-24S	3 7/32	2.875	2 17/32	2.620
32	26-4100-32P	26-4200-32S	3 31/32	3.625	3 9/32	3.370

*Tolerances: Fractions ± 1/64 Decimals ± .005

‡ Trade Mark Bunker Ramo Corp.

TRW CINCH CONNECTORS

CINCH SOLDERLESS RIBBON CONNECTORS

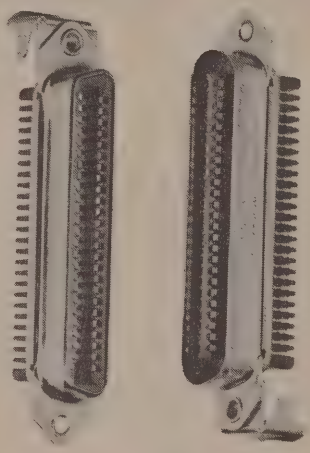


The Solderless Cinch Ribbon Connector has all the quality features of the solder type Cinch Ribbon Connectors, are intermateable and utilize all the same hardware.

The solderless Cinch Ribbon Series can be terminated with automatic, semi-automatic or field hand tools. Each contact provides four gas-tight connections for both 24 and 26 gauge solid wire*. Termination speeds far exceed soldering techniques.

This newly designed connector incorporates a built-in strain relief in each contact to prevent any inadvertant removal of the wires; however, contacts can be reused without physical damage or electrical degradation.

CABLE-TO-CABLE PLUG & RECEPTACLE



Miniaturized rack and panel connectors utilizing "ribbon" contact feature. Smooth, easy insertion/extraction action plus the double-sided self-cleaning flexing action of both mated contact members provide added reliability. Shell polarization and float-mounted receptacle assure proper alignment. Insulator material is 30% glass-filled polyester. Plug and receptacle contacts are of cadmium bronze, ASTM-B-105, with a finish of gold per MIL-G-45204 Type II over copper flash. Shells are steel with a finish of .0002 to .0004 zinc. No stripping of wires required for perfect connections when terminated with Cinch Auto-Clinch, Certi-Clinch, or Mini-Clinch tools.

CONNECTORS WITH DEEP HOOD

No. of Contacts*	PLUGS TRW/Cinch Part No. (CD)	RECEPTACLE TRW/Cinch Part No. (CD)
50	223-15-50-001	223-16-50-001

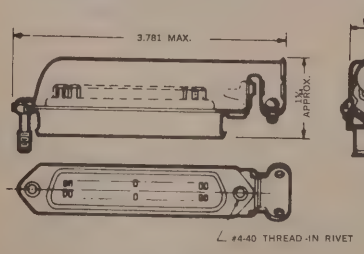
CONNECTORS WITH SHALLOW HOODS

No. of Contacts*	PLUGS TRW/Cinch Part No. (CD)	RECEPTACLE TRW/Cinch Part No. (CD)
50	223-15-50-002	223-16-50-002

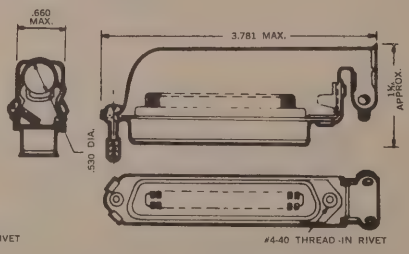
(CD) Indicates items normally available through Cinch distributors.

* Also available in 14, 24, 36 and 64 contact sizes. All sizes can be terminated with solid wire 24 and 26 gauge (with .040" mas. insulation dia.). For stranded wire, consult factory.

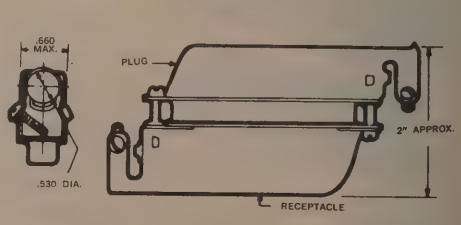
DIMENSIONAL DATA



PLUG



RECEPTACLE



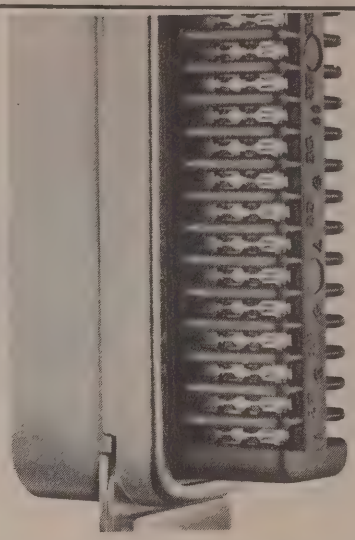
MATING PLUG & RECEPTACLE

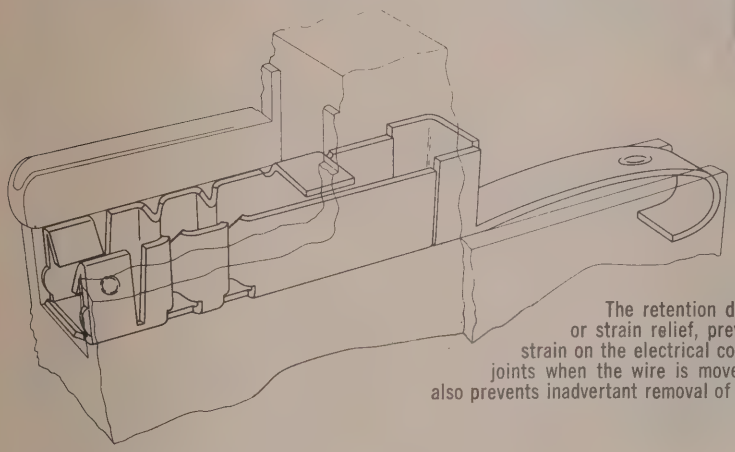
TRW CINCH CONNECTORS

CINCH SOLDERLESS RIBBON CONNECTORS

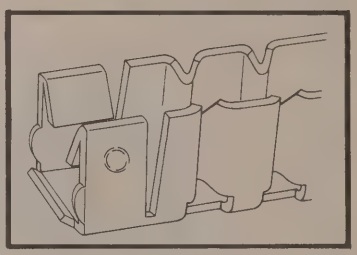
FEATURES

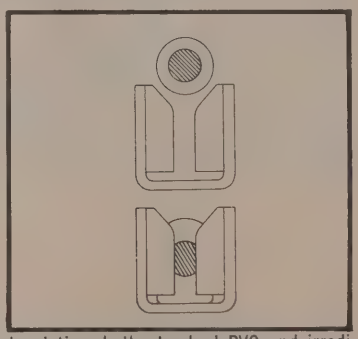
- Identical mating to standard solder type connector.
- Same contact material.
- Same mating and mounting dimensions.
- Will handle 22, 24 and 26 gauge solid wire* (with .040 max. insulation dia.)
- Built-in wire restraint.
- 4 points of contact provide redundancy.
- Exactly same mounting and auxiliary hardware.
- Rapid field wiring.
- Totally interchangeable with existing Cinch Ribbon Connectors and hardware.





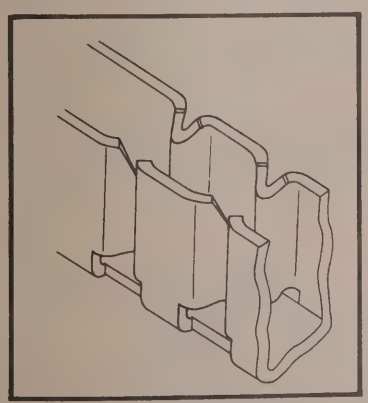
The retention device or strain relief, prevents strain on the electrical contact joints when the wire is moved. It also prevents inadvertant removal of wire.

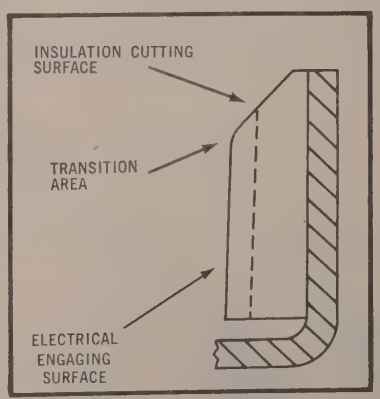




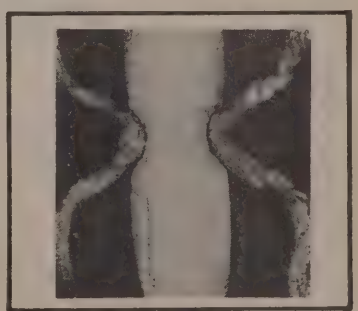
Insulation, both standard PVC and irradiated PVC is pierced sufficiently to facilitate electrical connection.

* For stranded wire applications consult factory.





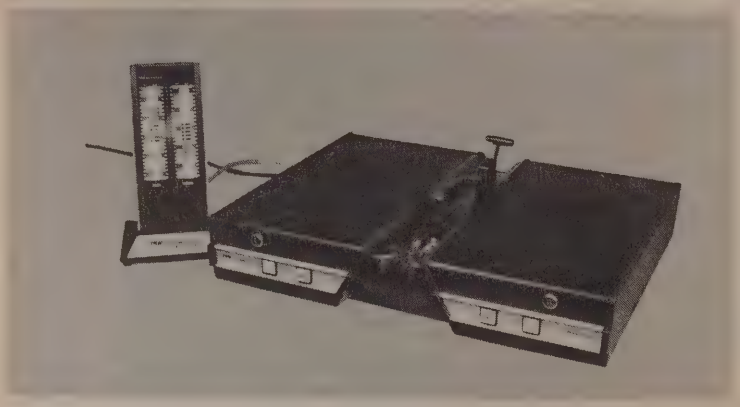
The shape of the wire terminating end of the contact is arranged with four indents. These indents are so constructed and shaped as to peel the insulation off the wire at these points. The step-by-step progression is as follows. As the wire enters, the insulation is peeled off by the ramp shape of the contact indents. This leads into a coined, relatively sharp area. As the wire, after the insulation is removed, progresses into the remaining contact pocket, the transition area permits the conductor to be deformed and held between each set of the two opposing indented sections. The result is four gas tight connections on each conductor.



Photomicrographic of 24 gauge longitudinal cross section of prime electrical contact area.

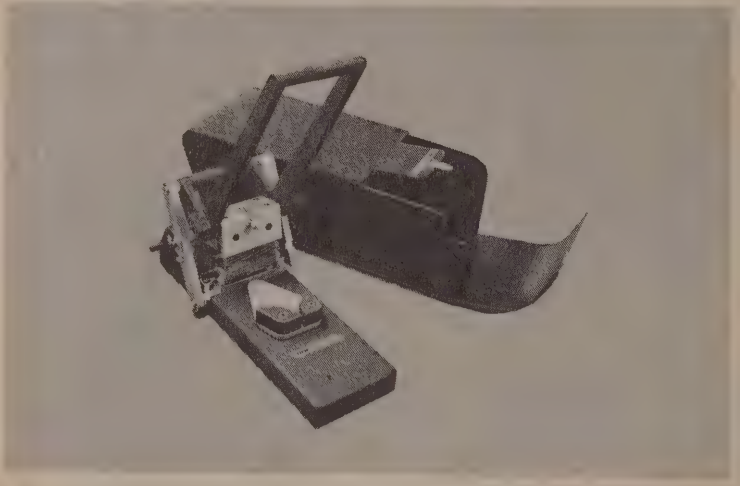
TRW CINCH CONNECTORS

SYSTEMS FOR TERMINATING THE CINCH SOLDERLESS RIBBON CONNECTOR



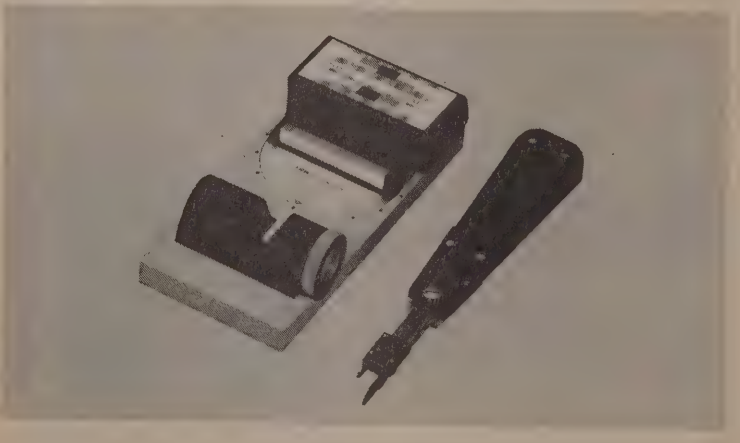
AUTO-CLINCH

Auto-Clinch for rapid factory wiring. Completely terminates a 50-contact connector in less than 2 minutes. Has provision for omission of wires, inspection check during wiring and correction of errors. Options include Color Code display, selective programmer, Auto-Test and Cable Clamp Closer.



CERTA-CLINCH

Certa-Clinch terminates a 50-contact connector in less than 4 minutes. Designed for field assembly and low production applications, it is readily portable and requires no set-up time.



MINI-CLINCH (CD)

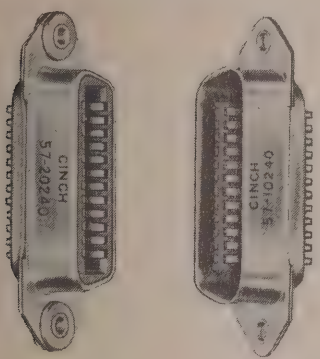
Mini-Clinch is a lightweight belt-mounted unit that enables a serviceman in the field to terminate a 50-contact connector in less than 5 minutes. It can be used with 90° or 180° connectors. Wires are automatically cut as they are inserted into the terminals.

(CD) Indicates items normally available through Cinch distributors.

TRW CINCH CONNECTORS

CINCH RIBBON CONNECTORS

RACK AND PANEL PLUGS & RECEPTACLES



57-20240 RECEPTACLE 57-10240 PLUG

Miniaturized rack and panel connectors utilizing "ribbon" contact feature. Smooth, easy insertion/extraction action plus the double-sided, self-cleaning, flexing action of both mating contact members provide added reliability. Shell-type polarization and float-mounted receptacle assure proper alignment on rack and panel only, not applicable to P.C. types. Insulator material is diallyl phthalate, type MDG per MIL-M-14F. Plug and receptacle contacts are of cadmium bronze ASTM-B-105, with a finish of gold per MIL-G-45204 type II over copper flash. Shells are brass, ASTM-B-36 Alloy 6, with a finish of .0002 to .0004 zinc. Pretinning wires before soldering is recommended. 14, 24, 36 and 50-contact sizes are available.

PART NUMBER ORDERING INFORMATION

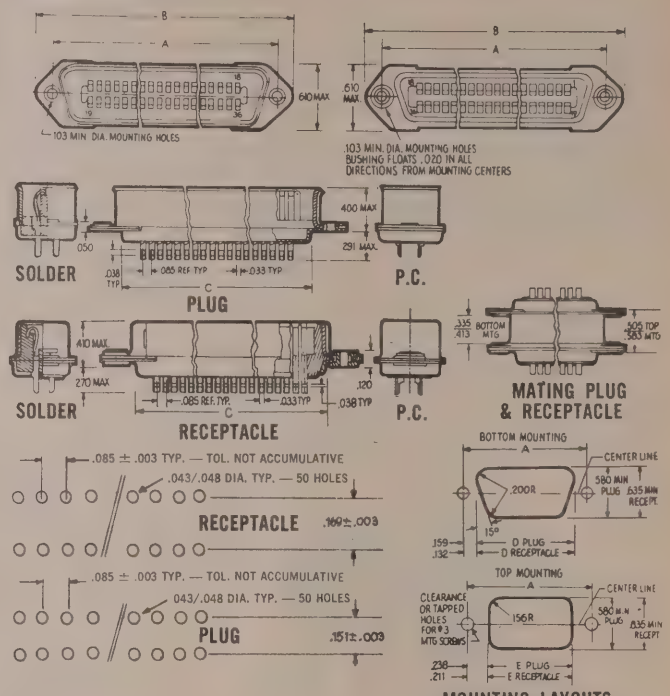
No. of Contacts	SOLDER Plug Part No.* (CD)	SOLDER Receptacle Part No.* (CD)	P.C. Plug Part No. (CD)	P.C. Receptacle Part No. (CD)
14	57-10140	57-20140	57-10140-4	57-20140-8†
24	57-10240	57-20240	57-10240-3	57-20240-8†
36	57-10360	57-20360	57-10360-13	57-20360-9†
50	57-10500	57-20500	57-10500-27	57-20500-31

*Part numbers shown in Listing have finish of **clear** chromate. If finish of **yellow** chromate is desired, add "-1" to appropriate part number(s) in listing to indicate same. (Examples: 57-10140-1 or 57-20140-1.)

† No float bushings supplied — mtg. hole is .185 dia.

(CD) Indicates items normally available through Cinch distributors.

DIMENSIONAL DATA



P.C.	SOLDER	DIMENSIONS‡ TYPE	A	B	C	D Min.	E Min.
57-10140-4	57-10140	Plug	1.417	1.750	.910	1.098	.940
57-20140-8	57-20140	Receptacle	1.417	1.750	.910	1.153	.995
57-10240-3	57-10240	Plug	1.842	2.175	1.335	1.523	1.365
57-20240-8	57-20240	Receptacle	1.842	2.175	1.335	1.578	1.420
57-10360-13	57-10360	Plug	2.352	2.685	1.845	2.033	1.875
57-20360-9	57-20360	Receptacle	2.352	2.685	1.845	2.088	1.930
57-10500-27	57-10500	Plug	2.947	3.270	2.440	2.628	2.472
57-20500-31	57-20500	Receptacle	2.947	3.270	2.440	2.683	2.525

‡NOTE: All dimensions are reference.

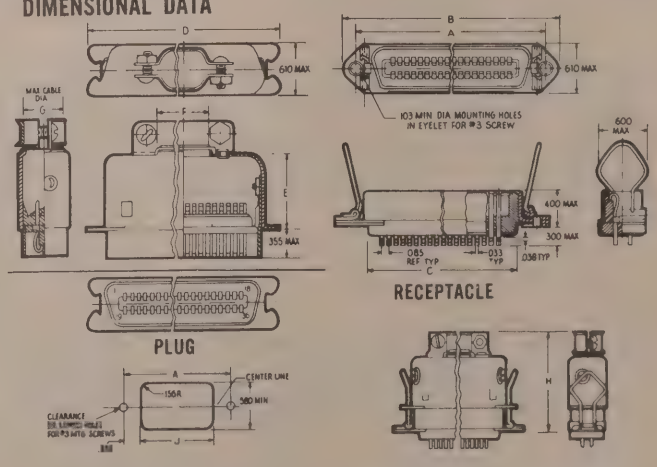
CABLE TO CHASSIS PLUGS & RECEPTACLES

57-40360 57-30360

Miniaturized connectors with same basic features as those shown on above except plug is equipped with hood and cable clamp while receptacle has sturdy spring-type latches which are guided and held by cut-outs in plug hood flanges. Insulator body is molded of diallyl phthalate, type MDG per MIL-M-14F. Plug and

CONTINUED ON NEXT PAGE

DIMENSIONAL DATA



TRW CINCH CONNECTORS

CINCH RIBBON CONNECTORS (Cont'd)

CABLE TO CHASSIS PLUGS & RECEPTACLES (Cont'd)

receptacle contacts are cadmium bronze, ASTM-B-105 with a finish of gold per MIL-G-45204 type II over copper flash. Shells are brass, ASTM-B-36 Alloy 6, with a finish of .0002 to .0004 zinc. Pretinning wires before soldering is recommended. 14, 24, 36 and 50-contact sizes are available.

PART NUMBER ORDERING INFORMATION

No. of Contacts	Plug Part No.* (with hood) (CD)	Receptacle Part No.* (with latches) (CD)
14	57-30140	57-40140
24	57-30240	57-40240
36	57-30360	57-40360
50	57-30500	57-40500

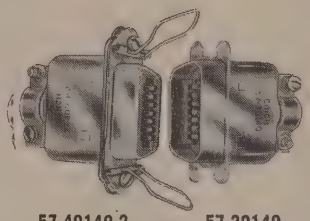
*Part numbers shown in listing have finish of **clear** chromate. If finish of **yellow** chromate is desired, add "-1" to appropriate part number(s) in listing to indicate same. (Example: 57-30140-1 or 57-40140-1.)

(CD) Indicates items normally available through Cinch distributors.

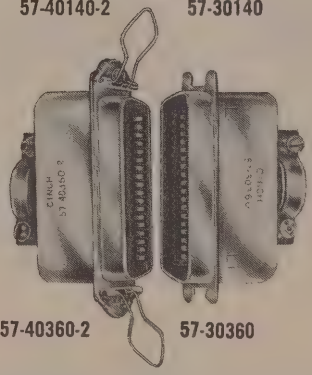
Dimensions‡	Type	A	B	C	D	E	F	G	H	J min.
57-30140	Plug	—	—	—	1.495	.843	.306	.422	1.668	—
57-40140	Receptacle	1.417	1.750	.910	—	—	—	—	—	.940
57-30240	Plug	—	—	—	1.920	.825	.473	.473	1.668	—
57-40240	Receptacle	1.842	2.175	1.335	—	—	—	—	—	1.365
57-30360	Plug	—	—	—	2.431	.905	.640	.473	1.730	—
57-40360	Receptacle	2.352	2.685	1.845	—	—	—	—	—	1.875
57-30500	Plug	—	—	—	3.025	.995	.766	.473	1.825	—
57-40500	Receptacle	2.947	3.270	2.440	—	—	—	—	—	2.472

‡NOTE: All dimensions are reference.

CABLE-TO-CABLE PLUGS & RECEPTACLES



57-40140-2 57-30140



57-40360-2 57-30360

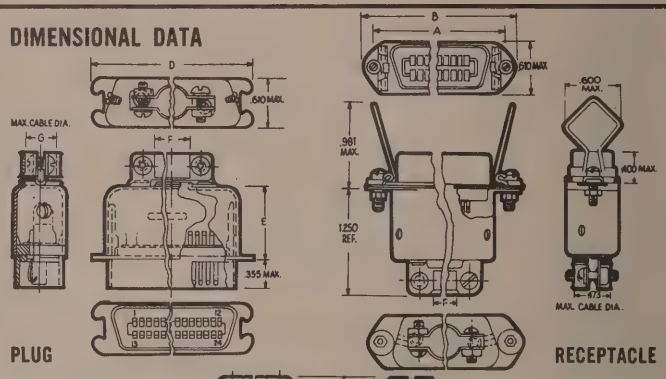
Same miniaturized connectors as shown on two previous pages except both plug and receptacle are equipped with hood and cable clamp for cable-to-cable application. Receptacle also has spring-type latches which are held by cutouts in plug hood flanges. Insulator material is diallyl phthalate, type MDG per MIL-M-14F. Plug and receptacle contacts are cadmium bronze, ASTM-B-105 with a finish of gold per MIL-G-45204 type II over copper flash. Shells are brass, ASTM-B-36 Alloy 6, with a finish of .0002 to .0004 zinc. Pretinning wires before soldering is recommended. 14, 24, 36 and 50-contact sizes are available.

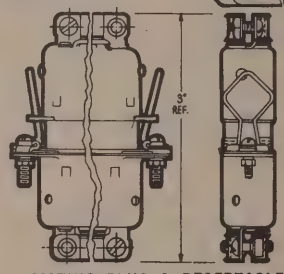
PART NUMBER ORDERING INFORMATION

No. of Contacts	Plug Part No.* (with hood) (CD)	Receptacle Part No.* (with hood and latches)
14	57-30140	57-40140-2†
24	57-30240	57-40240-3†
36	57-30360	57-40360-2†
50	57-30500	57-40500-2†

(CD) Indicates items normally available through Cinch distributors.

DIMENSIONAL DATA





MATING PLUG & RECEPTACLE

Dimensions‡	Type	A	B	D	E	F	G
57-30140	Plug	—	—	1.495	.843	.306	.422
57-40140-2	Receptacle	1.417	1.750	—	—	.306	.422
57-30240	Plug	—	—	1.920	.825	.473	.473
57-40240-3	Receptacle	1.842	2.175	—	—	.473	.473
57-30360	Plug	—	—	2.431	.905	.640	.473
57-40360-2	Receptacle	2.352	2.685	—	—	.640	.473
57-30500	Plug	—	—	3.025	.995	.766	.473
57-40500-2	Receptacle	2.947	3.270	—	—	.766	.473

*Part numbers shown in listing have **clear** chromate finish. If finish of **yellow** chromate is desired, add "-1" to appropriate plug part number(s) in listing. (Example: 57-30240-1) and "-6" to appropriate receptacle part number(s). (Example: 57-40240-6.)

NOTES:
†These cable-to-cable receptacles are available for large volume requirements only; consult factory for details.
‡All dimensions are reference.

TRW CINCH CONNECTORS

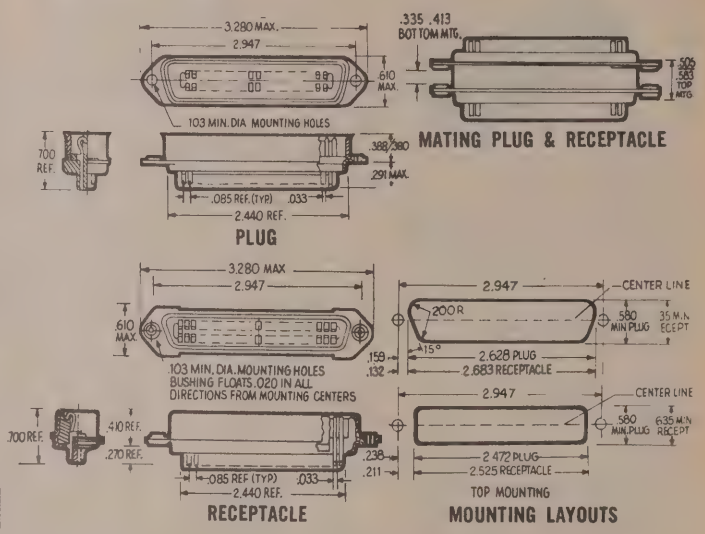
CINCH RIBBON CONNECTORS (Cont'd)

SPECIAL "HIGH-BARRIER" RACK AND PANEL PLUG & RECEPTACLE

57-10500-6 57-20500-6

Available in 50-contact size only. Same as 50-contact rack and panel connector shown on page 5, except for a special "high barrier" (additional insulator material) interposed between opposite rows of contacts. Insulator body is molded of diallyl phthalate, type MDG per MIL-M-14F. Plug and receptacle contacts are of cadmium bronze, ASTM-B-105, with a finish of .00003 gold per MIL-G-45204 type II over gold flash per MIL-G-45204 type I over .00005 copper per MIL-C-14550. Shells are brass, ASTM-B-36 Alloy 6, with a finish of .0002 to .0004 zinc. Polyethylene dust covers also available as shown below.

DIMENSIONAL DATA

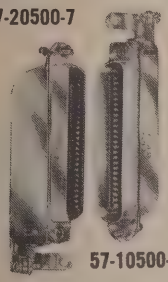


PART NUMBER ORDERING INFORMATION

No. of Contacts	Plug Part No. (CD)	Receptacle Part No. (CD)
50	57-10500-6	57-20500-6

SPECIAL "HIGH-BARRIER" CABLE-TO-CABLE PLUG & RECEPTACLE

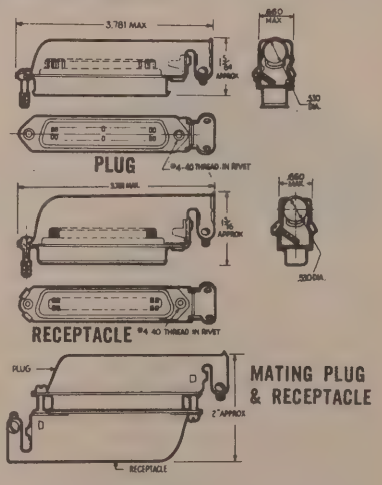
57-20500-7



57-10500-7

Same as 50-contact rack and panel connector shown above except for special hood and hardware for cable-to-cable applications. Plug and receptacle have same special "high barrier" of insulator material interposed between opposite rows of contacts. Insulator body is molded of diallyl phthalate, type MDG per MIL-M-14F. Plug and receptacle contacts are of cadmium bronze, ASTM-B-105 with a finish of .00003 gold per MIL-G-45204 type II over gold flash per MIL-G-45204 type I over .00005 copper per MIL-C-14550. Shells are brass, ASTM-B-36 Alloy 6, with a finish of .0002 to .0004 zinc. Polyethylene dust covers are supplied.

DIMENSIONAL DATA



PART NUMBER ORDERING INFORMATION

No. of Contacts	Plug Part No. (CD)	Receptacle Part No. (CD)
50	57-10500-7	57-20500-7

POLYETHYLENE DUST COVERS

57-1008 Plug Cover

57-1022 Receptacle Cover

The 50-contact Cinch Ribbon connectors can be supplied with optional polyethylene dust covers. Two types of covers are available: one for the plugs and one for the receptacles. The plug cover is blue and fits inside the shell. The receptacle cover is red and fits outside the shell. The covers can be used only with these 50-contact size connectors.

PART NUMBER ORDERING INFORMATION

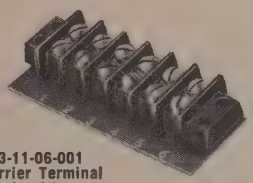
Plug Cover Part No.	Color and Type	Receptacle Cover Part No.	Color and Type
57-1008	Blue — Fits Inside Shell	57-1022	Red — Fits Outside Shell

(CD) Indicates items normally available through Cinch distributors.

TRW CINCH CONNECTORS

140 SERIES (UL RECOGNIZED)

BARRIER TERMINAL BLOCKS AND MARKER STRIPS

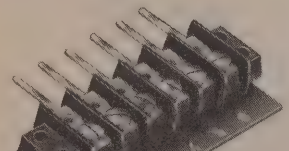


353-11-06-001
Barrier Terminal
Block with
363-11-06-011
Marker Strip (Imprinted)

Available in 1 to 25 terminal sizes with standard, "W," "¾W" and "Y" type terminals. Has 5-40 binder head screws. Accommodates up to #14 solid wire. Terminal centers are ⅜". Creepage distance from terminal to terminal and terminal to ground is ¼". Materials and finishes designated below. Electrical ratings are shown on the inside front cover.

Marker strips are available to mount beneath barrier block and afford additional insulation for metal mounting surface. "Single" marker strips that extend out on only one side are shown in listing below; "double" marker strips extending out on both sides are also available. Marker strips can be imprinted with terminal designations as described on page 12.

WITH WRAPOST TERMINALS (UL RECOGNIZED)



353-19-06-383
Barrier Terminal
Block with
363-11-06-011
Marker Strip (Imprinted)

"Jones" Barrier Blocks with wrapost terminals on one side permit faster connections — four times faster than standard screw terminals. There are three terminal angles presently available — parallel to, at a 45° angle to, and perpendicular to the mounting surface. Choose the angle that best suits your application.

Available in 1 to 25-terminal sizes with each of the terminal angles. Has 5-40 binder head screw opposite terminal. Terminal centers are ⅜". Creepage distance is ¼". Materials and finishes designated below. Electrical ratings are shown on the inside front cover.

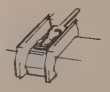
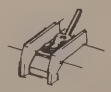
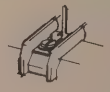
Standard 140 Series marker strips are available to mount beneath the barrier block and insulate against the metal mounting surface. "Single" or "double" marker strips are available. Marker strips can be imprinted with terminal designations as shown on page 12.

140 SERIES PART NUMBER ORDERING INFORMATION

NO. OF TERMINALS	STANDARD TERMINAL 5-40 x 3/16 B.H. Screws (CD)	"W" TYPE TERMINAL 5-40 x ¼ B.H. Screws	"¾W" TYPE TERMINAL 5-40 x ¼ (CD) B.H. Screws	MARKER STRIPS* FOR STANDARD, "W" and "¾W" TYPE TERMINALS (CD)	"Y" TYPE TERMINAL 5-40 x ¼ (CD) B.H. Screws	MARKER STRIPS* FOR "Y" TYPE TERMINAL
1	353-11-01-001	353-16-01-001	353-17-01-001	363-11-01-010	353-18-01-001	363-12-01-010
2	†353-11-02-001	353-16-02-001	353-17-02-001	363-11-02-010	353-18-02-001	363-12-02-010
3	†353-11-03-001	353-16-03-001	353-17-03-001	363-11-03-010	353-18-03-001	363-12-03-010
4	†353-11-04-001	353-16-04-001	353-17-04-001	363-11-04-010	353-18-04-001	363-12-04-010
5	†353-11-05-001	353-16-05-001	353-17-05-001	363-11-05-010	353-18-05-001	363-12-05-010
6	†353-11-06-001	353-16-06-001	353-17-06-001	363-11-06-010	353-18-06-001	363-12-06-010
7	†353-11-07-001	353-16-07-001	353-17-07-001	363-11-07-010	353-18-07-001	363-12-07-010
8	†353-11-08-001	353-16-08-001	353-17-08-001	363-11-08-010	353-18-08-001	363-12-08-010
9	†353-11-09-001	353-16-09-001	353-17-09-001	363-11-09-010	353-18-09-001	363-12-09-010
10	†353-11-10-001	353-16-10-001	353-17-10-001	363-11-10-010	353-18-10-001	363-12-10-010
11	†353-11-11-001	353-16-11-001	353-17-11-001	363-11-11-010	353-18-11-001	363-12-11-010
12	†353-11-12-001	353-16-12-001	353-17-12-001	363-11-12-010	353-18-12-001	363-12-12-010
13	†353-11-13-001	353-16-13-001	353-17-13-001	363-11-13-010	353-18-13-001	363-12-13-010
14	†353-11-14-001	353-16-14-001	353-17-14-001	363-11-14-010	353-18-14-001	363-12-14-010
15	†353-11-15-001	353-16-15-001	353-17-15-001	363-11-15-010	353-18-15-001	363-12-15-010
16	†353-11-16-001	353-16-16-001	353-17-16-001	363-11-16-010	353-18-16-001	363-12-16-010
17	†353-11-17-001	353-16-17-001	353-17-17-001	363-11-17-010	353-18-17-001	363-12-17-010
18	†353-11-18-001	353-16-18-001	353-17-18-001	363-11-18-010	353-18-18-001	363-12-18-010
19	†353-11-19-001	353-16-19-001	353-17-19-001	363-11-19-010	353-18-19-001	363-12-19-010
20	†353-11-20-001	353-16-20-001	353-17-20-001	363-11-20-010	353-18-20-001	363-12-20-010
21	†353-11-21-001	353-16-21-001	353-17-21-001	363-11-21-010	353-18-21-001	363-12-21-010
22	†353-11-22-001	353-16-22-001	353-17-22-001	363-11-22-010	353-18-22-001	363-12-22-010
23	†353-11-23-001	353-16-23-001	353-17-23-001	363-11-23-010	353-18-23-001	363-12-23-010
24	†353-11-24-001	353-16-24-001	353-17-24-001	363-11-24-010	353-18-24-001	363-12-24-010
25	†353-11-25-001	353-16-25-001	353-17-25-001	363-11-25-010	353-18-25-001	363-12-25-010

†Available with SEMS Screws through Cinch Distributors. See Page 12.

140 SERIES (WRAPOST) PART NUMBER ORDERING INFORMATION

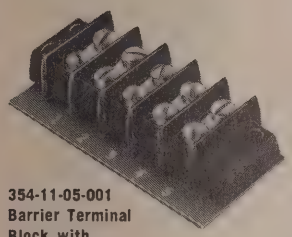
NO. OF TERMINALS	 PARALLEL (180°) STYLE 5-40 x 3/16 B.H. Screws	 45° STYLE 5-40 x 3/16 B.H. Screws	 PERPENDICULAR (90°) STYLE 5-40 x 3/16 B.H. Screws	MARKER STRIPS* FOR ALL STYLES (CD)
1	353-19-01-383	353-19-01-385	353-19-01-386	363-11-01-010
2	353-19-02-383	353-19-02-385	353-19-02-386	363-11-02-010
3	353-19-03-383	353-19-03-385	353-19-03-386	363-11-03-010
4	353-19-04-383	353-19-04-385	353-19-04-386	363-11-04-010
5	353-19-05-383	353-19-05-385	353-19-05-386	363-11-05-010
6	353-19-06-383	353-19-06-385	353-19-06-386	363-11-06-010
7	353-19-07-383	353-19-07-385	353-19-07-386	363-11-07-010
8	353-19-08-383	353-19-08-385	353-19-08-386	363-11-08-010
9	353-19-09-383	353-19-09-385	353-19-09-386	363-11-09-010
10	353-19-10-383	353-19-10-385	353-19-10-386	363-11-10-010
11	353-19-11-383	353-19-11-385	353-19-11-386	363-11-11-010
12	353-19-12-383	353-19-12-385	353-19-12-386	363-11-12-010
13	353-19-13-383	353-19-13-385	353-19-13-386	363-11-13-010
14	353-19-14-383	353-19-14-385	353-19-14-386	363-11-14-010
15	353-19-15-383	353-19-15-385	353-19-15-386	363-11-15-010
16	353-19-16-383	353-19-16-385	353-19-16-386	363-11-16-010
17	353-19-17-383	353-19-17-385	353-19-17-386	363-11-17-010
18	353-19-18-383	353-19-18-385	353-19-18-386	363-11-18-010
19	353-19-19-383	353-19-19-385	353-19-19-386	363-11-19-010
20	353-19-20-383	353-19-20-385	353-19-20-386	363-11-20-010
21	353-19-21-383	353-19-21-385	353-19-21-386	363-11-21-010
22	353-19-22-383	353-19-22-385	353-19-22-386	363-11-22-010
23	353-19-23-383	353-19-23-385	353-19-23-386	363-11-23-010
24	353-19-24-383	353-19-24-385	353-19-24-386	363-11-24-010
25	353-19-25-383	353-19-25-385	353-19-25-386	363-11-25-010

INSULATOR MATERIAL: General Purpose Black Phenolic; Other Materials Available.
EYELET MATERIAL and FINISH: Brass, Nickel-Plated. No Eyelet on Wrapost.
SCREW MATERIAL and FINISH: Steel, Nickel-Plated.
"W", "¾W" and "Y" TERMINAL MATERIAL and FINISH: Brass, Hot Solder Dipped. Wrapost Terminal Electro Tin Plate.
MARKER STRIP MATERIAL: 1/32" NEMA Grade XPC, UL Rated 94V-0.
* Marker strip part numbers shown are "single sided" not imprinted type that extend out on only one side; equivalent "double" type strips extending out on both sides also available. To order change second field to 14. To order imprinted marker strips change fourth field from 010 to 011.
(CD) Indicates items normally available through Cinch Distributors.

TRW CINCH CONNECTORS

141 SERIES (UL RECOGNIZED)

BARRIER TERMINAL BLOCKS AND MARKER STRIPS



354-11-05-001
Barrier Terminal
Block with
364-11-05-011
Marker Strip (Imprinted)

Available in 1 to 20-terminal sizes with standard, "W," "¾W" and "Y" type terminals. Has 6-32 binder head screws. Accommodates up to #12 solid wire. Terminal centers are 7/16". Creepage distance from terminal to terminal is 3/8" and terminal to ground is 5/16". Materials and finishes described below. Electrical ratings shown on inside front cover. Marker strips are available to mount beneath barrier block and provide insulation for metal mounting surface. "Single" or "double" marker strips are available. Marker strips can be imprinted with terminal designations as described on page 12.

141 SERIES PART NUMBER ORDERING INFORMATION

NO. OF TERMINALS	STANDARD TERMINAL 6-32 x ¼ B.H. Screws	"W" TYPE TERMINAL 6-32 x 5/16 B.H. Screws	"¾W" TYPE TERMINAL 6-32 x 5/16 B.H. Screws	MARKER STRIPS* FOR STANDARD, "W" and "¾W" TERMINALS	"Y" TYPE TERMINAL 6-32 x 5/16 B.H. Screws	MARKER STRIPS* FOR "Y" TYPE TERMINAL
1	354-11-01-001	354-16-01-001	354-17-01-001	364-11-01-010	354-18-01-001	364-12-01-010
2	†354-11-02-001	354-16-02-001	354-17-02-001	364-11-02-010	354-18-02-001	364-12-02-010
3	†354-11-03-001	354-16-03-001	354-17-03-001	364-11-03-010	354-18-03-001	364-12-03-010
4	†354-11-04-001	354-16-04-001	354-17-04-001	364-11-04-010	354-18-04-001	364-12-04-010
5	†354-11-05-001	354-16-05-001	354-17-05-001	364-11-05-010	354-18-05-001	364-12-05-010
6	†354-11-06-001	354-16-06-001	354-17-06-001	364-11-06-010	354-18-06-001	364-12-06-010
7	†354-11-07-001	354-16-07-001	354-17-07-001	364-11-07-010	354-18-07-001	364-12-07-010
8	†354-11-08-001	354-16-08-001	354-17-08-001	364-11-08-010	354-18-08-001	364-12-08-010
9	†354-11-09-001	354-16-09-001	354-17-09-001	364-11-09-010	354-18-09-001	364-12-09-010
10	†354-11-10-001	354-16-10-001	354-17-10-001	364-11-10-010	354-18-10-001	364-12-10-010
11	†354-11-11-001	354-16-11-001	354-17-11-001	364-11-11-010	354-18-11-001	364-12-11-010
12	†354-11-12-001	354-16-12-001	354-17-12-001	364-11-12-010	354-18-12-001	364-12-12-010
13	†354-11-13-001	354-16-13-001	354-17-13-001	364-11-13-010	354-18-13-001	364-12-13-010
14	†354-11-14-001	354-16-14-001	354-17-14-001	364-11-14-010	354-18-14-001	364-12-14-010
15	†354-11-15-001	354-16-15-001	354-17-15-001	364-11-15-010	354-18-15-001	364-12-15-010
16	†354-11-16-001	354-16-16-001	354-17-16-001	364-11-16-010	354-18-16-001	364-12-16-010
17	†354-11-17-001	354-16-17-001	354-17-17-001	364-11-17-010	354-18-17-001	364-12-17-010
18	†354-11-18-001	354-16-18-001	354-17-18-001	364-11-18-010	354-18-18-001	364-12-18-010
19	†354-11-19-001	354-16-19-001	354-17-19-001	364-11-19-010	354-18-19-001	364-12-19-010
20	†354-11-20-001	354-16-20-001	354-17-20-001	364-11-20-010	354-18-20-001	364-12-20-010

†Available with SEMS Screws through Cinch Distributors. See Page 12.

WITH QUICK-CLAMP* TERMINALS (UL RECOGNIZED)

357-11-05-001
Barrier Terminal
Block with
364-11-05-011
Marker Strip (Imprinted)

141 Series Barrier Blocks with Quick-Clamp Terminals permit efficient rapid assembly without costly wire terminals and without bending conductors around screws. Just insert the conductors and tighten screws to make positive contact.

Available in 1 to 20-terminal sizes for one side only, both sides, with "¾W" connection on one side and with "Y" connection through the panel. Uses 6-32 binder head screws. Terminal centers are 7/16". See page 12 for more complete description on the terminal itself and wire gauges accommodated. Materials and finishes described below. Electrical ratings are shown on the inside front cover.

141 Series marker strips are available to mount beneath the barrier block and provide insulation from the metal mounting surface. "Single" or "double" marker strips are available. Terminal designations can be imprinted on marker strips as shown on page 12.

* Patent Pending

141 SERIES (QUICK-CLAMP) PART NUMBER ORDERING INFORMATION

NO. OF TERMINALS	STANDARD TERMINAL (One Side Only) 6-32 x 5/16 B.H. Screws	STANDARD TERMINAL (Both Sides) 6-32 x 5/16 B.H. Screws	"¾W" TYPE TERMINAL 6-32 x 3/8 B.H. Screws	MARKER STRIPS* FOR STANDARD "¾W" TYPE TERMINAL	"Y" TYPE TERMINAL 6-32 x 3/8 B.H. Screws	MARKER STRIPS* FOR "Y" TYPE TERMINAL
1	357-11-01-001	357-12-01-001	357-13-01-001	364-11-01-010	357-14-01-001	364-12-01-010
2	357-11-02-001	357-12-02-001	357-13-02-001	364-11-02-010	357-14-02-001	364-12-02-010
3	357-11-03-001	357-12-03-001	357-13-03-001	364-11-03-010	357-14-03-001	364-12-03-010
4	357-11-04-001	357-12-04-001	357-13-04-001	364-11-04-010	357-14-04-001	364-12-04-010
5	357-11-05-001	357-12-05-001	357-13-05-001	364-11-05-010	357-14-05-001	364-12-05-010
6	357-11-06-001	357-12-06-001	357-13-06-001	364-11-06-010	357-14-06-001	364-12-06-010
7	357-11-07-001	357-12-07-001	357-13-07-001	364-11-07-010	357-14-07-001	364-12-07-010
8	357-11-08-001	357-12-08-001	357-13-08-001	364-11-08-010	357-14-08-001	364-12-08-010
9	357-11-09-001	357-12-09-001	357-13-09-001	364-11-09-010	357-14-09-001	364-12-09-010
10	357-11-10-001	357-12-10-001	357-13-10-001	364-11-10-010	357-14-10-001	364-12-10-010
11	357-11-11-001	357-12-11-001	357-13-11-001	364-11-11-010	357-14-11-001	364-12-11-010
12	357-11-12-001	357-12-12-001	357-13-12-001	364-11-12-010	357-14-12-001	364-12-12-010
13	357-11-13-001	357-12-13-001	357-13-13-001	364-11-13-010	357-14-13-001	364-12-13-010
14	357-11-14-001	357-12-14-001	357-13-14-001	364-11-14-010	357-14-14-001	364-12-14-010
15	357-11-15-001	357-12-15-001	357-13-15-001	364-11-15-010	357-14-15-001	364-12-15-010
16	357-11-16-001	357-12-16-001	357-13-16-001	364-11-16-010	357-14-16-001	364-12-16-010
17	357-11-17-001	357-12-17-001	357-13-17-001	364-11-17-010	357-14-17-001	364-12-17-010
18	357-11-18-001	357-12-18-001	357-13-18-001	364-11-18-010	357-14-18-001	364-12-18-010
19	357-11-19-001	357-12-19-001	357-13-19-001	364-11-19-010	357-14-19-001	364-12-19-010
20	357-11-20-001	357-12-20-001	357-13-20-001	364-11-20-010	357-14-20-001	364-12-20-010

INSULATOR MATERIAL: General Purpose Black Phenolic; Other Materials Available.
TERMINAL MATERIAL and FINISH: Brass, Nickel-Plated.
SCREW MATERIAL and FINISH: Steel, Nickel-Plated.
"W", "¾W" and "Y" TERMINAL MATERIAL and FINISH: Brass, Hot Solder Dipped.
MARKER STRIP MATERIAL: ½" NEMA Grade XPC, UL Rated 94V-O.

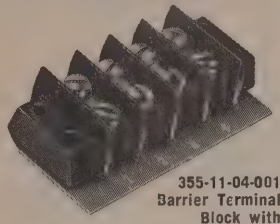
* Marker strip part numbers shown are "single sided" not imprinted type that extend out on only one side; equivalent "double" type strips extending out on both sides also available. To order change second field to 14. To order imprinted marker strips change fourth field from 010 to 011.

(CD) Indicates items normally available through Cinch Distributors.

TRW CINCH CONNECTORS

142 SERIES (UL RECOGNIZED)

BARRIER TERMINAL BLOCKS AND MARKER STRIPS



355-11-04-001
Barrier Terminal
Block with
365-11-04-011
Marker Strip (Imprinted)

Available in 1 to 17-terminal sizes with standard, "W," "¾W" and "Y" type terminals. Has 8-32 binder head screws. Accommodates up to #10 solid wire. Terminal centers are ⅜". Creepage distance from terminal to terminal is ⅜" and terminal to ground is ⅜". Materials and finishes described below. Electrical ratings shown on inside front cover.

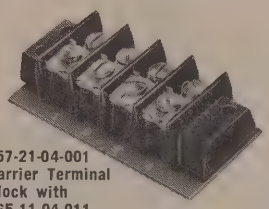
Marker strips are available to mount beneath barrier block and provide insulation for metal mounting surface. "Single" or "double" marker strips are available. Terminal designations can be imprinted on marker strips as described on page 12.

142 SERIES PART NUMBER ORDERING INFORMATION

NO. OF TERMINALS	STANDARD TERMINAL 8-32 x 5/16 B.H. Screws	"W" TYPE TERMINAL 8-32 x 5/16 B.H. Screws	"¾W" TYPE TERMINAL 8-32 x 5/16 B.H. Screws	MARKER STRIPS* FOR STANDARD, "W" and "¾W" TYPE TERMINALS	"Y" TYPE TERMINAL 8-32 x 5/16 B.H. Screws	MARKER STRIPS* FOR "Y" TYPE TERMINAL
1	355-11-01-001	355-16-01-001	355-17-01-001	365-11-01-010	355-18-01-001	365-12-01-010
2	†355-11-02-001	355-16-02-001	355-17-02-001	365-11-02-010	355-18-02-001	365-12-02-010
3	†355-11-03-001	355-16-03-001	355-17-03-001	365-11-03-010	355-18-03-001	365-12-03-010
4	†355-11-04-001	355-16-04-001	355-17-04-001	365-11-04-010	355-18-04-001	365-12-04-010
5	†355-11-05-001	355-16-05-001	355-17-05-001	365-11-05-010	355-18-05-001	365-12-05-010
6	†355-11-06-001	355-16-06-001	355-17-06-001	365-11-06-010	355-18-06-001	365-12-06-010
7	†355-11-07-001	355-16-07-001	355-17-07-001	365-11-07-010	355-18-07-001	365-12-07-010
8	†355-11-08-001	355-16-08-001	355-17-08-001	365-11-08-010	355-18-08-001	365-12-08-010
9	†355-11-09-001	355-16-09-001	355-17-09-001	365-11-09-010	355-18-09-001	365-12-09-010
10	†355-11-10-001	355-16-10-001	355-17-10-001	365-11-10-010	355-18-10-001	365-12-10-010
11	†355-11-11-001	355-16-11-001	355-17-11-001	365-11-11-010	355-18-11-001	365-12-11-010
12	†355-11-12-001	355-16-12-001	355-17-12-001	365-11-12-010	355-18-12-001	365-12-12-010
13	†355-11-13-001	355-16-13-001	355-17-13-001	365-11-13-010	355-18-13-001	365-12-13-010
14	†355-11-14-001	355-16-14-001	355-17-14-001	365-11-14-010	355-18-14-001	365-12-14-010
15	†355-11-15-001	355-16-15-001	355-17-15-001	365-11-15-010	355-18-15-001	365-12-15-010
16	†355-11-16-001	355-16-16-001	355-17-16-001	365-11-16-010	355-18-16-001	365-12-16-010
17	†355-11-17-001	355-16-17-001	355-17-17-001	365-11-17-010	355-18-17-001	365-12-17-010

†Available with SEMS Screws through Cinch Distributors. See Page 12.

WITH QUICK-CLAMP* TERMINALS (UL RECOGNIZED)



357-21-04-001
Barrier Terminal
Block with
365-11-04-011
Marker Strip (Imprinted)

142 Series Barrier Blocks with Quick-Clamp Terminals permit fast, efficient assembly without costly wire terminals and without bending conductors around screws. Insert the conductors, tighten the screws and positive contact is made.

Available in 1 to 17-terminal sizes for one side only, both sides, with "¾W" connection on one side and with "Y" connection through the panel. 8-32 binder head screws are used. ⅜" terminal centers. Refer to page 12 for more complete description on the terminal itself and wire gauges accommodated. Materials and finishes described below. Electrical ratings are shown on the inside front cover.

142 Series marker strips are available to mount beneath the barrier block and afford insulation from the metal mounting surface. "Single" or "double" marker strips are available. Marker strips can be imprinted with terminal designations as shown on page 12.

*Patent Pending

142 SERIES (QUICK-CLAMP) PART NUMBER ORDERING INFORMATION

NO. OF TERMINALS	STANDARD TERMINAL (One Side Only) 8-32 x 3/8 B.H. Screws	STANDARD TERMINAL (Both Sides) 8-32 x 3/8 B.H. Screws	"¾W" TYPE TERMINAL 8-32 x 3/8 B.H. Screws	MARKER STRIPS* FOR STANDARD, "W" and "¾W" TYPE TERMINALS	"Y" TYPE TERMINAL 8-32 x 3/8 B.H. Screws	MARKER STRIPS* FOR "Y" TYPE TERMINAL
1	357-21-01-001	357-22-01-001	357-23-01-001	365-11-01-010	357-24-01-001	365-12-01-010
2	357-21-02-001	357-22-02-001	357-23-02-001	365-11-02-010	357-24-02-001	365-12-02-010
3	357-21-03-001	357-22-03-001	357-23-03-001	365-11-03-010	357-24-03-001	365-12-03-010
4	357-21-04-001	357-22-04-001	357-23-04-001	365-11-04-010	357-24-04-001	365-12-04-010
5	357-21-05-001	357-22-05-001	357-23-05-001	365-11-05-010	357-24-05-001	365-12-05-010
6	357-21-06-001	357-22-06-001	357-23-06-001	365-11-06-010	357-24-06-001	365-12-06-010
7	357-21-07-001	357-22-07-001	357-23-07-001	365-11-07-010	357-24-07-001	365-12-07-010
8	357-21-08-001	357-22-08-001	357-23-08-001	365-11-08-010	357-24-08-001	365-12-08-010
9	357-21-09-001	357-22-09-001	357-23-09-001	365-11-09-010	357-24-09-001	365-12-09-010
10	357-21-10-001	357-22-10-001	357-23-10-001	365-11-10-010	357-24-10-001	365-12-10-010
11	357-21-11-001	357-22-11-001	357-23-11-001	365-11-11-010	357-24-11-001	365-12-11-010
12	357-21-12-001	357-22-12-001	357-23-12-001	365-11-12-010	357-24-12-001	365-12-12-010
13	357-21-13-001	357-22-13-001	357-23-13-001	365-11-13-010	357-24-13-001	365-12-13-010
14	357-21-14-001	357-22-14-001	357-23-14-001	365-11-14-010	357-24-14-001	365-12-14-010
15	357-21-15-001	357-22-15-001	357-23-15-001	365-11-15-010	357-24-15-001	365-12-15-010
16	357-21-16-001	357-22-16-001	357-23-16-001	365-11-16-010	357-24-16-001	365-12-16-010
17	357-21-17-001	357-22-17-001	357-23-17-001	365-11-17-010	357-24-17-001	365-12-17-010

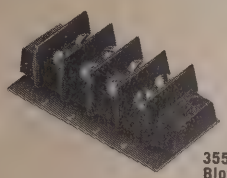
INSULATOR MATERIAL: General Purpose Black Phenolic; Other Materials Available.
TERMINAL MATERIAL and FINISH: Brass, Hot Solder Dipped.
MARKER STRIP MATERIAL: 1/32" NEMA Grade XPC, UL Rated 94V-0.

* Marker strip part numbers shown are "single sided" not imprinted type that extend out on only one side; equivalent "double" type strips extending out on both sides also available. To order change second field to 14. To order imprinted marker strips change fourth field from 010 to 011.

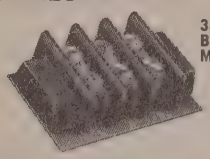
(CD) Indicates items normally available through Cinch Distributors.

TRW CINCH CONNECTORS

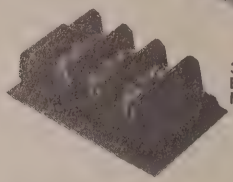
142/150/151/152 SERIES



355-11-04-222 Barrier Terminal Block with 365-11-04-011 Marker Strip (Imprinted)



356-11-03-001 Barrier Terminal Block with 366-11-03-011 Marker Strip (Imprinted)



356-21-03-001 Barrier Terminal Block with 366-21-03-011 Marker Strip (Imprinted)

356-31-02-001 Barrier Terminal Block with 366-31-02-011 Marker Strip (Imprinted)

142 SERIES
SPECIAL HIGH BARRIER TERMINAL BLOCKS AND MARKER STRIPS

The 142 Series is also available, in 1 to 4-terminal sizes only, with special ¾" high barriers to meet requirements for certain 220 volt specifications. Terminal centers still 5/16". Creepage distance becomes ¾". "Single" or "double" marker strips available for use with each size barrier block and can be imprinted with terminal designations as shown on page 12.

SPECIAL 142 SERIES PART NUMBER ORDERING INFORMATION

NO. OF TERMINALS	STD. TERM. ONLY (As Shown) 8-32 x 5/16 B.H. Screws	MARKER STRIPS*
1	355-11-01-223	365-11-01-010
2	355-11-02-224	365-11-02-010
3	355-11-03-225	365-11-03-010
4	355-11-04-222	365-11-04-010

150 SERIES (UL RECOGNIZED) BARRIER TERMINAL BLOCKS AND MARKER STRIPS

Available in 1 to 10-terminal sizes with standard, "W," "¾W" and "Y" type terminals. Uses 10-32 binder screws. Accommodates up to #10 wire or 50 amp solder lug for #6 stranded wire. Terminal centers are 1 1/16". Creepage distance from terminal to terminal is 5/8"; from terminal to ground is 3/16". Materials and finishes described below. Electrical ratings are shown on the inside front cover.

Marker strips are available to mount beneath barrier block and provide insulation for metal mounting surface. "Single" or "double" marker strips are available. Terminal designations can be imprinted on marker strips as shown on page 12.

150 SERIES PART NUMBER ORDERING INFORMATION

NO. OF TERMINALS	STANDARD TERMINAL 10-32 x 5/16 B.H. Screws	"W" TYPE TERMINAL 10-32 x 5/16 B.H. Screws	"¾W" TYPE TERMINAL 10-32 x 5/16 B.H. Screws	MARKER STRIPS* FOR STANDARD "W" and "¾W" TYPE TERMINALS	"Y" TYPE TERMINAL 10-32 x 5/16 B.H. Screws	MARKER STRIPS* FOR "Y" TYPE TERMINAL
1	356-11-01-001	356-16-01-001	356-17-01-001	366-11-01-010	356-18-01-001	366-12-01-010
2	356-11-02-001	356-16-02-001	356-17-02-001	366-11-02-010	356-18-02-001	366-12-02-010
3	356-11-03-001	356-16-03-001	356-17-03-001	366-11-03-010	356-18-03-001	366-12-03-010
4	356-11-04-001	356-16-04-001	356-17-04-001	366-11-04-010	356-18-04-001	366-12-04-010
5	356-11-05-001	356-16-05-001	356-17-05-001	366-11-05-010	356-18-05-001	366-12-05-010
6	356-11-06-001	356-16-06-001	356-17-06-001	366-11-06-010	356-18-06-001	366-12-06-010
7	356-11-07-001	356-16-07-001	356-17-07-001	366-11-07-010	356-18-07-001	366-12-07-010
8	356-11-08-001	356-16-08-001	356-17-08-001	366-11-08-010	356-18-08-001	366-12-08-010
9	356-11-09-001	356-16-09-001	356-17-09-001	366-11-09-010	356-18-09-001	366-12-09-010
10	356-11-10-001	356-16-10-001	356-17-10-001	366-11-10-010	356-18-10-001	366-12-10-010

151 SERIES (UL RECOGNIZED) BARRIER TERMINAL BLOCKS AND MARKER STRIPS

Available in 1 to 8-terminal sizes with standard, "W" and "¾W" type terminals. Has 12-32 binder head screws. Accommodates up to #8 wire or 70 amp solder lug for #4 stranded wire. Creepage distance is ¾" from terminal to terminal and ½" from terminal to ground. 7/8" terminal centers. Materials and finishes described below. Electrical ratings are shown on the inside front cover.

Marker strips to mount beneath barrier block and provide insulation for metal mounting surface are available. "Single" or "double" marker strips are available. Marker strips can be imprinted with terminal designations as described on page 12.

151 SERIES PART NUMBER ORDERING INFORMATION

NO. OF TERMINALS	STANDARD TERMINAL 12-32 x 3/8 B.H. Screws	"W" TYPE TERMINAL 12-32 x 3/8 B.H. Screws	"¾W" TYPE TERMINAL 12-32 x 3/8 B.H. Screws	MARKER STRIPS* FOR ALL 151 SERIES TERMINALS
1	356-21-01-001	356-26-01-001	356-27-01-001	366-21-01-010
2	356-21-02-001	356-26-02-001	356-27-02-001	366-21-02-010
3	356-21-03-001	356-26-03-001	356-27-03-001	366-21-03-010
4	356-21-04-001	356-26-04-001	356-27-04-001	366-21-04-010
5	356-21-05-001	356-26-05-001	356-27-05-001	366-21-05-010
6	356-21-06-001	356-26-06-001	356-27-06-001	366-21-06-010
7	356-21-07-001	356-26-07-001	356-27-07-001	366-21-07-010
8	356-21-08-001	356-26-08-001	356-27-08-001	366-21-08-010

152 SERIES (UL RECOGNIZED) BARRIER TERMINAL BLOCKS AND MARKER STRIPS

Available in 1 to 6-terminal sizes with standard, "W" and "¾W" type terminals. Uses ¼"-28 binder head screws. Accommodates up to #6 wire or 90 amp solder lug for #2 stranded wire. Creepage distance from terminal to terminal is 1", from terminal to ground 5/8". Terminal centers are 1⅛". Materials and finishes described below. Electrical ratings are shown on the inside front cover.

Marker strips are available to mount beneath barrier block and afford insulation for metal mounting surface. "Single" or "double" marker strips are also available. Terminal designations can be imprinted on marker strips as described on page 12.

152 SERIES PART NUMBER ORDERING INFORMATION

NO. OF TERMINALS	STANDARD TERMINAL ¼"-28 x ½ B.H. Screws	"W" TYPE TERMINAL ¼"-28 x ½ B.H. Screws	"¾W" TYPE TERMINAL ¼"-28 x ½ B.H. Screws	MARKER STRIPS* FOR ALL 152 SERIES TERMINALS
1	356-31-01-001	356-36-01-001	356-37-01-001	366-31-01-010
2	356-31-02-001	356-36-02-001	356-37-02-001	366-31-02-010
3	356-31-03-001	356-36-03-001	356-37-03-001	366-31-03-010
4	356-31-04-001	356-36-04-001	356-37-04-001	366-31-04-010
5	356-31-05-001	356-36-05-001	356-37-05-001	366-31-05-010
6	356-31-06-001	356-36-06-001	356-37-06-001	366-31-06-010

INSULATOR MATERIAL: General Purpose Black Phenolic; Other Materials Available.
TERMINAL MATERIAL and FINISH: Brass, Nickel-Plated.
SCREW MATERIAL and FINISH: Steel, Nickel-Plated.
"W", "¾W" and "Y" TERMINAL MATERIAL and FINISH: Brass, Hot Solder Dipped.
MARKER STRIP MATERIAL: 1/32" NEMA Grade XPC, UL Rated 94V-0.

* Marker strip part numbers shown are "single sided" not imprinted type that extend out on only one side; equivalent "double" type strips extending out on both sides also available. To order change second field to 14. To order imprinted marker strips change fourth field from 010 to 011.

Indicates items normally available through Cinch Distributors.

TRW CINCH CONNECTORS

164 SERIES (UL RECOGNIZED)

BARRIER TERMINAL BLOCKS AND MARKER STRIPS

354-21-06-001
Barrier Terminal Block
with 363-11-06-011
Marker Strip (Imprinted)

Similar to the 140 Series except equipped with 6-32 screws. Available in 1 to 21-terminal sizes with standard, "W," "¾W" and "Y" type terminals. Accommodates up to #14 solid wire. Terminal centers are ⅜". Creepage distance from terminal to terminal and terminal to ground is ¼". Materials and finishes described below. Electrical ratings shown on inside front cover.

Marker strips are available to mount beneath barrier block and provide insulation for metal mounting surface. "Single" or "double" marker strips are available. Terminal designations can be imprinted on marker strips as described on page 12.

164 SERIES PART NUMBER ORDERING INFORMATION

NO. OF TERMINALS	STANDARD TERMINAL 6-32 x ¼ B.H. Screws	"W" TYPE TERMINAL 6-32 x ¼ B.H. Screws	"¾W" TYPE TERMINAL 6-32 x ¼ B.H. Screws	MARKER STRIPS* FOR STANDARD, "W" and "¾W" TYPE TERMINALS	"Y" TYPE TERMINAL 6-32 x ¼ B.H. Screws	MARKER STRIPS* FOR "Y" TYPE TERMINAL
1	354-21-01-001	354-26-01-001	354-27-01-001	363-11-01-010	354-28-01-001	363-12-01-010
2	354-21-02-001	354-26-02-001	354-27-02-001	363-11-02-010	354-28-02-001	363-12-02-010
3	354-21-03-001	354-26-03-001	354-27-03-001	363-11-03-010	354-28-03-001	363-12-03-010
4	354-21-04-001	354-26-04-001	354-27-04-001	363-11-04-010	354-28-04-001	363-12-04-010
5	354-21-05-001	354-26-05-001	354-27-05-001	363-11-05-010	354-28-05-001	363-12-05-010
6	354-21-06-001	354-26-06-001	354-27-06-001	363-11-06-010	354-28-06-001	363-12-06-010
7	354-21-07-001	354-26-07-001	354-27-07-001	363-11-07-010	354-28-07-001	363-12-07-010
8	354-21-08-001	354-26-08-001	354-27-08-001	363-11-08-010	354-28-08-001	363-12-08-010
9	354-21-09-001	354-26-09-001	354-27-09-001	363-11-09-010	354-28-09-001	363-12-09-010
10	354-21-10-001	354-26-10-001	354-27-10-001	363-11-10-010	354-28-10-001	363-12-10-010
11	354-21-11-001	354-26-11-001	354-27-11-001	363-11-11-010	354-28-11-001	363-12-11-010
12	354-21-12-001	354-26-12-001	354-27-12-001	363-11-12-010	354-28-12-001	363-12-12-010
13	354-21-13-001	354-26-13-001	354-27-13-001	363-11-13-010	354-28-13-001	363-12-13-010
14	354-21-14-001	354-26-14-001	354-27-14-001	363-11-14-010	354-28-14-001	363-12-14-010
15	354-21-15-001	354-26-15-001	354-27-15-001	363-11-15-010	354-28-15-001	363-12-15-010
16	354-21-16-001	354-26-16-001	354-27-16-001	363-11-16-010	354-28-16-001	363-12-16-010
17	354-21-17-001	354-26-17-001	354-27-17-001	363-11-17-010	354-28-17-001	363-12-17-010
18	354-21-18-001	354-26-18-001	354-27-18-001	363-11-18-010	354-28-18-001	363-12-18-010
19	354-21-19-001	354-26-19-001	354-27-19-001	363-11-19-010	354-28-19-001	363-12-19-010
20	354-21-20-001	354-26-20-001	354-27-20-001	363-11-20-010	354-28-20-001	363-12-20-010
21	354-21-21-001	354-26-21-001	354-27-21-001	363-11-21-010	354-28-21-001	363-12-21-010

171 SERIES (UL RECOGNIZED)

BARRIER TERMINAL BLOCKS

351-11-08-001 Barrier
Terminal Block

A miniature barrier terminal block with single screw terminals. Available in 1 to 8 terminal sizes with standard type terminal only. Has 2-56 x 3/16" binder head screws. Terminal centers are ¼". Insulator material is general purpose black phenolic. Eyelets are brass with nickel-plated finish. Marker strips are not available for use with the 171 Series. Screws are steel, nickel-plated.

171 SERIES PART NUMBER ORDERING INFORMATION

NO. OF TERMINALS	PART NUMBER	NO. OF TERMINALS	PART NUMBER
1	351-11-01-001	5	351-11-05-001
2	351-11-02-001	6	351-11-06-001
3	351-11-03-001	7	351-11-07-001
4	351-11-04-001	8	351-11-08-001

172 SERIES (UL RECOGNIZED)

BARRIER TERMINAL BLOCKS

351-21-08-001 Barrier
Terminal Block

Miniature barrier terminal block with double screw terminals. Available in 1 to 14-terminal sizes with standard, "W," "¾W" and "Y" type terminals. 2-56 binder head screws. ¼" terminal centers. Insulator molded of general purpose black phenolic. Eyelets and screws are nickel-plated brass. "W," "¾W" and "Y" terminals are made of brass, hot solder dipped. Marker strips are available; write for details.

172 SERIES PART NUMBER ORDERING INFORMATION

NO. OF TERMINALS	STANDARD TERMINAL 2-56 x 3/16 B.H. Screws	"W" TYPE TERMINAL 2-56 x ¼ B.H. Screws	"¾W" TYPE TERMINAL 2-56 x ¼ B.H. Screws	"Y" TYPE TERMINAL 2-56 x 3/16 B.H. Screws
1	351-21-01-001	351-26-01-001	351-27-01-001	351-28-01-001
2	351-21-02-001	351-26-02-001	351-27-02-001	351-28-02-001
3	351-21-03-001	351-26-03-001	351-27-03-001	351-28-03-001
4	351-21-04-001	351-26-04-001	351-27-04-001	351-28-04-001
5	351-21-05-001	351-26-05-001	351-27-05-001	351-28-05-001
6	351-21-06-001	351-26-06-001	351-27-06-001	351-28-06-001
7	351-21-07-001	351-26-07-001	351-27-07-001	351-28-07-001
8	351-21-08-001	351-26-08-001	351-27-08-001	351-28-08-001
9	351-21-09-001	351-26-09-001	351-27-09-001	351-28-09-001
10	351-21-10-001	351-26-10-001	351-27-10-001	351-28-10-001
11	351-21-11-001	351-26-11-001	351-27-11-001	351-28-11-001
12	351-21-12-001	351-26-12-001	351-27-12-001	351-28-12-001
13	351-21-13-001	351-26-13-001	351-27-13-001	351-28-13-001
14	351-21-14-001	351-26-14-001	351-27-14-001	351-28-14-001

INSULATOR MATERIAL: General Purpose Black Phenolic; Other Materials Available.
EYELET MATERIAL and FINISH: Brass, Nickel-Plated.
SCREW MATERIAL and FINISH: Steel, Nickel-Plated.
"W", "¾W" and "Y" TERMINAL MATERIAL and FINISH: Brass, Hot Solder Dipped.
MARKER STRIP MATERIAL: 1/32" NEMA Grade XPC, UL Rated 94V-0.

* Marker strip part numbers shown are "single sided" not imprinted type that extend out on only one side; equivalent "double" type strips extending out on both sides also available. To order change second field to 14. To order imprinted marker strips change fourth field from 010 to 011.

Indicates items normally available through Cinch Distributors.

TRW CINCH CONNECTORS

173/174/176 SERIES

BARRIER TERMINAL BLOCKS

352-11-06-001
Barrier Terminal Block
Series 173/174

353-51-07-001
Series 176

240/241/242 SERIES

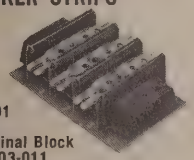
BARRIER TERMINAL BLOCKS AND MARKER STRIPS

359-14-06-001
240 Series
Barrier Terminal Block with
363-11-06-011 Marker Strip
(Imprinted)

Similar to the 140, 141 and 142 Series except that solder terminals are used instead of screw terminals. These solder terminals are designed to accommodate one or more wires, which can be brought through slot into hole, simplifying soldering. Terminal sizes available are: 1-25 for the 240 Series, 1-20 for the 241 and 1-17 for the 242. Terminal centers are shown in the dimensional drawings. Materials and finishes are described below. Electrical ratings are shown on the inside front cover. Marker strips that mount beneath barrier block and afford insulation from metal mounting surfaces are available in either "single" or "double" type. See page 12 for information on imprinting terminal designations in these marker strips.

250/251/252 SERIES

BARRIER TERMINAL BLOCKS AND MARKER STRIPS



359-44-03-001
250 Series
Barrier Terminal Block
with 366-11-03-011
Marker Strip (Imprinted)

Similar to the 150, 151 and 152 Series except for use of solder terminals instead of screw terminals. Solder terminals accommodate one or more wires that can be brought through slot into hole, simplifying solder operation. Terminal sizes available include: 1-10 for the 250 Series, 1-8 for the 251 and 1-6 for the 252. Refer to dimensional drawings for terminal centers. Materials and finishes are described below. Electrical ratings are shown on inside front cover. "Single" or "double" marker strips are available to mount beneath barrier block and provide insulation from metal mounting surface. Terminal designations can be imprinted on marker strips as described on page 12.

173/174 SERIES BARRIER TERMINAL BLOCKS

Single screw terminal barrier blocks. Terminals centers are 3/8". 173 Series has 4-40 x 3/16" Sems type binder head screws. 174 Series has 4-40 x 1/4" plain binder head screws. Both types have general purpose black phenolic insulators. Nickel-plated brass eyelets and steel screws, both nickel-plated.

176 SERIES FEED-THRU TERMINALS

Same dimensions and materials as 173/174 except 5-40 x 3/16" binder head screws. Feed-thru terminals are molded-in electro-tin plated brass. Available with or without mounting tabs, with 1/8" leads for 1/16" boards or 3/16" leads for 1/8" boards. Terminals are 0.093" diameter, for insertion in 3/64" hole.

PART NUMBER ORDERING INFORMATION

No. OF TERMINALS	173 SERIES 4-40 x 3/16 Sems Type B.H. Screws	174 SERIES 4-40 x 1/4 Plain Type B.H. Screws	176 SERIES for 1/16" boards with mounting tabs	176 SERIES for 1/16" boards without mounting tabs	176 SERIES for 1/8" boards with mounting tabs	176 SERIES for 1/8" boards without mounting tabs
1	352-15-01-001	352-11-01-001				
2	352-15-02-001	352-11-02-001	353-51-02-001	353-51-02-002	353-51-02-100	353-51-02-101
3	352-15-03-001	352-11-03-001	353-51-03-001	353-51-03-002	353-51-03-100	353-51-03-101
4	352-15-04-001	352-11-04-001	353-51-04-001	353-51-04-002	353-51-04-100	353-51-04-101
5	352-15-05-001	352-11-05-001	353-51-05-001	353-51-05-002	353-51-05-100	353-51-05-101
6	352-15-06-001	352-11-06-001	353-51-06-001	353-51-06-002	353-51-06-100	353-51-06-101
7	352-15-07-001	352-11-07-001	353-51-07-001	353-51-07-002	353-51-07-100	353-51-07-101
8	352-15-08-001	352-11-08-001	353-51-08-001	353-51-08-002	353-51-08-100	353-51-08-101
9	352-15-09-001	352-11-09-001	353-51-09-001	353-51-09-002	353-51-09-100	353-51-09-101
10	352-15-10-001	352-11-10-001	353-51-10-001	353-51-10-002	353-51-10-100	353-51-10-101

PART NUMBER ORDERING INFORMATION

NO. OF TERMINALS	240 SERIES BARRIER BLOCKS With Solder Terminals	240 SERIES MARKER STRIPS*	241 SERIES BARRIER BLOCKS With Solder Terminals	241 SERIES MARKER STRIPS*	242 SERIES BARRIER BLOCKS With Solder Terminals	242 SERIES MARKER STRIPS*
1	359-14-01-001	363-11-01-010	359-24-01-001	364-11-01-010	359-34-01-001	365-11-01-010
2	359-14-02-001	363-11-02-010	359-24-02-001	364-11-02-010	359-34-02-001	365-11-02-010
3	359-14-03-001	363-11-03-010	359-24-03-001	364-11-03-010	359-34-03-001	365-11-03-010
4	359-14-04-001	363-11-04-010	359-24-04-001	364-11-04-010	359-34-04-001	365-11-04-010
5	359-14-05-001	363-11-05-010	359-24-05-001	364-11-05-010	359-34-05-001	365-11-05-010
6	359-14-06-001	363-11-06-010	359-24-06-001	364-11-06-010	359-34-06-001	365-11-06-010
7	359-14-07-001	363-11-07-010	359-24-07-001	364-11-07-010	359-34-07-001	365-11-07-010
8	359-14-08-001	363-11-08-010	359-24-08-001	364-11-08-010	359-34-08-001	365-11-08-010
9	359-14-09-001	363-11-09-010	359-24-09-001	364-11-09-010	359-34-09-001	365-11-09-010
10	359-14-10-001	363-11-10-010	359-24-10-001	364-11-10-010	359-34-10-001	365-11-10-010
11	359-14-11-001	363-11-11-010	359-24-11-001	364-11-11-010	359-34-11-001	365-11-11-010
12	359-14-12-001	363-11-12-010	359-24-12-001	364-11-12-010	359-34-12-001	365-11-12-010
13	359-14-13-001	363-11-13-010	359-24-13-001	364-11-13-010	359-34-13-001	365-11-13-010
14	359-14-14-001	363-11-14-010	359-24-14-001	364-11-14-010	359-34-14-001	365-11-14-010
15	359-14-15-001	363-11-15-010	359-24-15-001	364-11-15-010	359-34-15-001	365-11-15-010
16	359-14-16-001	363-11-16-010	359-24-16-001	364-11-16-010	359-34-16-001	365-11-16-010
17	359-14-17-001	363-11-17-010	359-24-17-001	364-11-17-010	359-34-17-001	365-11-17-010
18	359-14-18-001	363-11-18-010	359-24-18-001	364-11-18-010		
19	359-14-19-001	363-11-19-010	359-24-19-001	364-11-19-010		
20	359-14-20-001	363-11-20-010	359-24-20-001	364-11-20-010		
21	359-14-21-001	363-11-21-010				
22	359-14-22-001	363-11-22-010				
23	359-14-23-001	363-11-23-010				
24	359-14-24-001	363-11-24-010				
25	359-14-25-001	363-11-25-010				

PART NUMBER ORDERING INFORMATION

NO. OF TERMINALS	250 SERIES BARRIER BLOCKS With Solder Terminals	250 SERIES MARKER STRIPS*	251 SERIES BARRIER BLOCKS With Solder Terminals	251 SERIES MARKER STRIPS*	252 SERIES BARRIER BLOCKS With Solder Terminals	252 SERIES MARKER STRIPS*
1	359-44-01-001	366-11-01-010	359-54-01-001	366-21-01-001	359-64-01-001	366-31-01-010
2	359-44-02-001	366-11-02-010	359-54-02-001	366-21-02-010	359-64-02-001	366-31-02-010
3	359-44-03-001	366-11-03-010	359-54-03-001	366-21-03-010	359-64-03-001	366-31-03-010
4	359-44-04-001	366-11-04-010	359-54-04-001	366-21-04-010	359-64-04-001	366-31-04-010
5	359-44-05-001	366-11-05-010	359-54-05-001	366-21-05-010	359-64-05-001	366-31-05-010
6	359-44-06-001	366-11-06-010	359-54-06-001	366-21-06-010	359-64-06-001	366-31-06-010
7	359-44-07-001	366-11-07-010	359-54-07-001	366-21-07-010		
8	359-44-08-001	366-11-08-010	359-54-08-001	366-21-08-010		
9	359-44-09-001	366-11-09-010				
10	359-44-10-001	366-11-10-010				

INSULATOR MATERIAL: General Purpose Black Phenolic; Other Materials Available.

TERMINAL MATERIAL and FINISH: Brass, Hot Solder Dipped.

MARKER STRIP MATERIAL: 1/32" NEMA Grade XPC, UL Rated 94V-0.

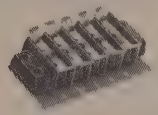
* Marker strip part numbers shown are "single sided" not imprinted type that extend out on only one side; equivalent "double" type strips extending out on both sides also available. To order change second field to 14. To order imprinted marker strips change fourth field from 010 to 011.

CD Indicates items normally available through Cinch Distributors.

TRW CINCH CONNECTORS

341/342 SERIES (UL RECOGNIZED)

BARRIER TERMINAL BLOCKS AND MARKER STRIPS



354-32-05-001 341 Series Barrier Terminal Block with 364-11-05-011 Marker Strip (Imprinted)

Similar to 141 and 142 Series except equipped with solderless-type terminals to accommodate either AMP tab receptacles or Ark-Les quick connects. (Contact manufacturer for exact part number.) Terminal sizes available are 1-20 for the 341 Series and 1-17 for the 342. A variety of terminal types are available for each series as shown. Refer to dimensional drawings for terminal centers. Materials and finishes are described below. Electrical ratings are shown on inside front cover.

"Single" or "double" type marker strips can be supplied to mount beneath barrier block and afford insulation from metal mounting surfaces. Terminal designations can be imprinted on marker strips as described on page 12.

9 different types of terminals can be supplied with any of the 341 or 342 Series barrier blocks. Identify these types by changing the **second field** of the part number to match the 341 or 342 series number opposite the desired terminal drawing below. For example, to order a 5-terminal 341 Series with both terminals at right angles (Type C), signify part no. 354-33-05-001. In addition, there are 4 more terminal types as shown which can be ordered in combination with the 9 regular terminal types. To order any of these 4 "combination" types, write direct to the factory for more further information, enclosing detailed drawings where possible.

PART NUMBER ORDERING INFORMATION

Insert in 2nd Field 341 Series	Insert in 2nd Field 342 Series	Terminal Drawing	Terminal Type
31	21		A
32	22		B
33	23		C
34	24		D
35	25		E
36	26		F
37	27		G
38	28		H
39	29		J
Combination Types			

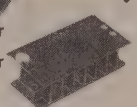
NO. OF TERMINALS	341 SERIES BARRIER BLOCKS† With Solderless Terminals	341 SERIES MARKER STRIPS* CD	342 SERIES BARRIER BLOCKS† With Solderless Terminals	342 SERIES MARKER STRIPS* CD
1	354-31-01-001	364-11-01-010	355-21-01-001	365-11-01-010
2	354-31-02-001	364-11-02-010	355-21-02-001	365-11-02-010
3	354-31-03-001	364-11-03-010	355-21-03-001	365-11-03-010
4	354-31-04-001	364-11-04-010	355-21-04-001	365-11-04-010
5	354-31-05-001	364-11-05-010	355-21-05-001	365-11-05-010
6	354-31-06-001	364-11-06-010	355-21-06-001	365-11-06-010
7	354-31-07-001	364-11-07-010	355-21-07-001	365-11-07-010
8	354-31-08-001	364-11-08-010	355-21-08-001	365-11-08-010
9	354-31-09-001	364-11-09-010	355-21-09-001	365-11-09-010
10	354-31-10-001	364-11-10-010	355-21-10-001	365-11-10-010
11	354-31-11-001	364-11-11-010	355-21-11-001	365-11-11-010
12	354-31-12-001	364-11-12-010	355-21-12-001	365-11-12-010
13	354-31-13-001	364-11-13-010	355-21-13-001	365-11-13-010
14	354-31-14-001	364-11-14-010	355-21-14-001	365-11-14-010
15	354-31-15-001	364-11-15-010	355-21-15-001	365-11-15-010
16	354-31-16-001	364-11-16-010	355-21-16-001	365-11-16-010
17	354-31-17-001	364-11-17-010	355-21-17-001	365-11-17-010
18	354-31-18-001	364-11-18-010		
19	354-31-19-001	364-11-19-010		
20	354-31-20-001	364-11-20-010		

540 SERIES (UL RECOGNIZED)

BARRIER TERMINAL BLOCKS AND MARKER STRIPS

Drive Pin 463-10-22-015

353-21-06-001 Barrier Terminal Block with 363-21-06-071 Marker Strip (Imprinted)



353-21-06-001 Barrier Terminal Block with 363-31-06-020 "Cover"

Available in 1 to 31 terminal sizes with standard, "W," "¾W" and "Y" type terminals. Particularly recommended when electrical and mechanical performance requirements are especially critical. Same terminal centers (⅜") as 140 Series. Also uses same 5-40 binder head screws. Otherwise, has higher and wider barriers. Extra material between barriers at the base strengthens construction and maintains same ½" creepage distance between terminal to terminal and terminal to ground. Terminal designations can be imprinted on this base. Materials and finishes are described below. Electrical ratings are shown on inside front cover.

Bottoms are closed so that insulating strips are not required. However, knockouts are molded into the base so that "Y" terminals can be accommodated if desired. A top-mounted marker strip, ¼" wide is available and can be imprinted with ⅛" numbers or a "double" marker strip can be used as a "cover" with one end position slotted to facilitate swinging the cover clear for quick inspection. Character designations can be imprinted on one or both sides of the cover if desired as described on page 12.

540 SERIES PART NUMBER ORDERING INFORMATION

NO. OF TERMINALS	STANDARD TERMINAL 5-40 x ¼ B.H. Screws CD	"W" TYPE TERMINAL 5-40 x ¼ B.H. Screws	"¾W" TYPE TERMINAL 5-40 x ¼ B.H. Screws	"Y" TYPE TERMINAL 5-40 x ¼ B.H. Screws	540 SERIES TOP-MOUNTED MARKER STRIPS§ CD	540 SERIES COVERS‡¶ (DOUBLE MARKER STRIPS)
1	353-21-01-001	353-26-01-001	353-27-01-001	353-28-01-001	363-21-01-070	363-31-01-020
2	353-21-02-001	353-26-02-001	353-27-02-001	353-28-02-001	363-21-02-070	363-31-02-020
3	353-21-03-001	353-26-03-001	353-27-03-001	353-28-03-001	363-21-03-070	363-31-03-020
4	353-21-04-001	353-26-04-001	353-27-04-001	353-28-04-001	363-21-05-070	363-31-04-020
5	353-21-05-001	353-26-05-001	353-27-05-001	353-28-05-001	363-21-05-070	363-31-05-020
6	353-21-06-001	353-26-06-001	353-27-06-001	353-28-06-001	363-21-06-070	363-31-06-020
7	353-21-07-001	353-26-07-001	353-27-07-001	353-28-07-001	363-21-07-070	363-21-07-020
8	353-21-08-001	353-26-08-001	353-27-08-001	353-28-08-001	363-21-08-070	363-31-08-020
9	353-21-09-001	353-26-09-001	353-27-09-001	353-28-09-001	363-21-09-070	363-31-09-020
10	353-21-10-001	353-26-10-001	353-27-10-001	353-28-10-001	363-21-10-070	363-31-10-020
11	353-21-11-001	353-26-11-001	353-27-11-001	353-28-11-001	363-21-11-070	363-31-11-020
12	353-21-12-001	353-26-12-001	353-27-12-001	353-28-12-001	363-21-12-070	363-31-12-020
13	353-21-13-001	353-26-13-001	353-27-13-001	353-28-13-001	363-21-13-070	363-31-13-020
14	353-21-14-001	353-26-14-001	353-27-14-001	353-28-14-001	363-21-14-070	363-31-14-020
15	353-21-15-001	353-26-15-001	353-27-15-001	353-28-15-001	363-21-15-070	363-31-15-020
16	353-21-16-001	353-26-16-001	353-27-16-001	353-28-16-001	363-21-16-070	363-31-16-020
17	353-21-17-001	353-26-17-001	353-27-17-001	353-28-17-001	363-21-17-070	363-31-17-020
18	353-21-18-001	353-26-18-001	353-27-18-001	353-28-18-001	363-21-18-070	363-31-18-020
19	353-21-19-001	353-26-19-001	353-27-19-001	353-28-19-001	363-21-19-070	363-31-19-020
20	353-21-20-001	353-26-20-001	353-27-20-001	353-28-20-001	363-21-20-070	363-31-20-020
21	353-21-21-001	353-26-21-001	353-27-21-001	353-28-21-001	363-21-21-070	363-31-21-020
22	353-21-22-001	353-26-22-001	353-27-22-001	353-28-22-001	363-21-22-070	363-31-22-020
23	353-21-23-001	353-26-23-001	353-27-23-001	353-28-23-001	363-21-23-070	363-31-23-020
24	353-21-24-001	353-26-24-001	353-27-24-001	353-28-24-001	363-21-24-070	363-31-24-020
25	353-21-25-001	353-26-25-001	353-27-25-001	353-28-25-001	363-21-25-070	363-31-25-020
26	353-21-26-001	353-26-26-001	353-27-26-001	353-28-26-001	363-21-26-070	363-31-26-020
27	353-21-27-001	353-26-27-001	353-27-27-001	353-28-27-001	363-21-27-070	363-31-27-020
28	353-21-28-001	353-26-28-001	353-27-28-001	353-28-28-001	363-21-28-070	363-31-28-020
29	353-21-29-001	353-26-29-001	353-27-29-001	353-28-29-001	363-21-29-070	363-31-29-020
30	353-21-30-001	353-26-30-001	353-27-30-001	353-28-30-001	363-21-30-070	363-31-30-020
31	353-21-31-001	353-26-31-001	353-27-31-001	353-28-31-001	363-21-31-070	363-31-31-020

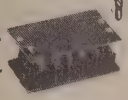
INSULATOR MATERIAL: General Purpose Black Phenolic; Other Materials Available.
TERMINAL MATERIAL and FINISH: Brass, Nickel-Plated.
"W," "¾W" and "Y" TERMINAL MATERIAL and FINISH: Brass, Hot Solder Dipped.
* Marker strip part numbers shown are "single sided" not imprinted type that extend out on only one side; equivalent "double" type strips extending out on both sides also available. To order change second field to 14. To order imprinted marker strips change fourth field from 010 to 011.
† See information on "341 and 342 Series Terminals" on how to signify desired terminal type by changing second field part numbers above. "31" and "21" are given as examples.
341 and 342 SERIES TERMINAL MATERIAL and FINISH: Brass, Cadmium-Plated.
341 and 342 SERIES MARKER STRIP MATERIAL: 1/32" NEMA Grade XPC, UL Rated 94V-0.
‡ 7/64" spacers should be used with 540 Series cover available on special request.
§ TOP-MOUNTED MARKER STRIP MATERIAL: 1/16" NEMA Grade XPC, UL Rated 94V-0.
¶ COVER (DOUBLE MARKER STRIP) MATERIAL: 1/32" NEMA Grade XPC, UL Rated 94V-0.
SCREW MATERIAL and FINISH: Steel, Nickel-Plated.
CD Indicates items normally available through Cinch Distributors.

TRW CINCH CONNECTORS

541 SERIES (UL RECOGNIZED)

BARRIER TERMINAL BLOCKS AND ACCESSORIES

Drive Pin 163-10-22-014



354-61-05-001 Barrier Terminal Block with 364-61-05-071 Marker Strip (Imprinted)

354-61-05-001 Barrier Terminal Block with 364-71-05-020 "Cover"

Available in 1 to 30 terminal sizes with standard, "W," "¾W" and "Y" type terminals. Ideal for higher voltage requirements. Same terminal centers (7/16") as 141 Series. 6-32 binder head screws. Has higher and wider barriers with extra material between barriers at the base. Creepage distance is 5/8" between terminal to terminal and terminal to ground. Terminal designations can be imprinted on base. Materials and finishes are described below. Electrical ratings are shown on inside front cover.

Insulating strips are not required because of closed bottoms on barrier block. However, "Y" terminals can still be accommodated if desired through use of knockouts molded into base. Top-mounted ¼" wide marker strip is available and can be imprinted with ⅛" numbers or a "double" marker strip can be used as a "cover" with one end position slotted to facilitate swinging clear. Cover can be imprinted with character designations on one or both sides as described on page 12.

542 SERIES (UL RECOGNIZED)

BARRIER TERMINAL BLOCKS AND ACCESSORIES

Drive Pin 63-10-22-014

355-31-04-001 Barrier Terminal Block with 365-31-04-071 Marker Strip (Imprinted)

355-31-04-001 Barrier Terminal Block with 365-41-04-020 "Cover"

Available in 1-26 terminal sizes with standard, "W," "¾W" and "Y" type terminals. Higher and wider barriers increase voltage ratings. Same 3/16" terminal centers as 142 Series. Also uses 8-32 x 3/16" binder head screws. Extra material between barriers at base adds strength and maintains same ¾" creepage distance between terminal to terminal and terminal to ground. Terminal designations can be imprinted on base. Materials and finishes described below. Electrical ratings shown on inside front cover.

Bottoms are closed, eliminating need for insulating strips. Knockouts are molded into base to accommodate "Y" terminals if desired. Top mounted ¼" wide marker strip is available and can be imprinted with ⅛" numbers or a "double" marker strip can be used as a "cover" with one end position slotted to facilitate swinging clear for fast inspection. Character designations can be imprinted on one or both side of the cover if desired.

541 SERIES PART NUMBER ORDERING INFORMATION

NO. OF TERMINALS	STANDARD TERMINAL 6-32 x 1/4 B.H. Screws (CO)	"W" TYPE TERMINAL 6-32 x 3/16 B.H. Screws	"¾W" TYPE TERMINAL 6-32 x 3/16 B.H. Screws	"Y" TYPE TERMINAL 6-32 x 3/16 B.H. Screws	541 SERIES TOP-MOUNTED MARKER STRIPS (CO)	541 SERIES COVERS† (DOUBLE MARKER STRIPS)
1	354-61-01-001	354-66-01-001	354-67-01-001	354-68-01-001	364-61-01-070	364-71-01-020
2	354-61-02-001	354-66-02-001	354-67-02-001	354-68-02-001	364-61-02-070	364-71-02-020
3	354-61-03-001	354-66-03-001	354-67-03-001	354-68-03-001	364-61-03-070	364-71-03-020
4	354-61-04-001	354-66-04-001	354-67-04-001	354-68-04-001	364-61-04-070	364-71-04-020
5	354-61-05-001	354-66-05-001	354-67-05-001	354-68-05-001	364-61-05-070	364-71-05-020
6	354-61-06-001	354-66-06-001	354-67-06-001	354-68-06-001	364-61-06-070	364-71-06-020
7	354-61-07-001	354-66-07-001	354-67-07-001	354-68-07-001	364-61-07-070	364-71-07-020
8	354-61-08-001	354-66-08-001	354-67-08-001	354-68-08-001	364-61-08-070	364-71-08-020
9	354-61-09-001	354-66-09-001	354-67-09-001	354-68-09-001	364-61-09-070	364-71-09-020
10	354-61-10-001	354-66-10-001	354-67-10-001	354-68-10-001	364-61-10-070	364-71-10-020
11	354-61-11-001	354-66-11-001	354-67-11-001	354-68-11-001	364-61-11-070	364-71-11-020
12	354-61-12-001	354-66-12-001	354-67-12-001	354-68-12-001	364-61-12-070	364-71-12-020
13	354-61-13-001	354-66-13-001	354-67-13-001	354-68-13-001	364-61-13-070	364-71-13-020
14	354-61-14-001	354-66-14-001	354-67-14-001	354-68-14-001	364-61-14-070	364-71-14-020
15	354-61-15-001	354-66-15-001	354-67-15-001	354-68-15-001	364-61-15-070	364-71-15-020
16	354-61-16-001	354-66-16-001	354-67-16-001	354-68-16-001	364-61-16-070	364-71-16-020
17	354-61-17-001	354-66-17-001	354-67-17-001	354-68-17-001	364-61-17-070	364-71-17-020
18	354-61-18-001	354-66-18-001	354-67-18-001	354-68-18-001	364-61-18-070	364-71-18-020
19	354-61-19-001	354-66-19-001	354-67-19-001	354-68-19-001	364-61-19-070	364-71-19-020
20	354-61-20-001	354-66-20-001	354-67-20-001	354-68-20-001	364-61-20-070	364-71-20-020
21	354-61-21-001	354-66-21-001	354-67-21-001	354-68-21-001	364-61-21-070	364-71-21-020
22	354-61-22-001	354-66-22-001	354-67-22-001	354-68-22-001	364-61-22-070	364-71-22-020
23	354-61-23-001	354-66-23-001	354-67-23-001	354-68-23-001	364-61-23-070	364-71-23-020
24	354-61-24-001	354-66-24-001	354-67-24-001	354-68-24-001	364-61-24-070	364-71-24-020
25	354-61-25-001	354-66-25-001	354-67-25-001	354-68-25-001	364-61-25-070	364-71-25-020
26	354-61-26-001	354-66-26-001	354-67-26-001	354-68-26-001	364-61-26-070	364-71-26-020
27	354-61-27-001	354-66-27-001	354-67-27-001	354-68-27-001	364-61-27-070	364-71-27-020
28	354-61-28-001	354-66-28-001	354-67-28-001	354-68-28-001	364-61-28-070	364-71-28-020
29	354-61-29-001	354-66-29-001	354-67-29-001	354-68-29-001	364-61-29-070	364-71-29-020
30	354-61-30-001	354-66-30-001	354-67-30-001	354-68-30-001	364-61-30-070	364-71-30-020

542 SERIES PART NUMBER ORDERING INFORMATION

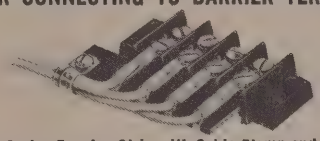
NO. OF TERMINALS	STANDARD TERMINAL 8-32 x 3/16 B.H. Screws (CO)	"W" TYPE TERMINAL 8-32 x 3/16 B.H. Screws	"¾W" TYPE TERMINAL 8-32 x 3/16 B.H. Screws	"Y" TYPE TERMINAL 8-32 x 3/16 B.H. Screws	542 SERIES (CO) TOP-MOUNTED MARKER STRIPS	542 SERIES COVERS‡ (DOUBLE MARKER STRIPS)
1	355-31-01-001	355-36-01-001	355-37-01-001	355-38-01-001	365-31-01-070	365-41-01-020
2	355-31-02-001	355-36-02-001	355-37-02-001	355-38-02-001	365-31-02-070	365-41-02-020
3	355-31-03-001	355-36-03-001	355-37-03-001	355-38-03-001	365-31-03-070	365-41-03-020
4	355-31-04-001	355-36-04-001	355-37-04-001	355-38-04-001	365-31-04-070	365-41-04-020
5	355-31-05-001	355-36-05-001	355-37-05-001	355-38-05-001	365-31-05-070	365-41-05-020
6	355-31-06-001	355-36-06-001	355-37-06-001	355-38-06-001	365-31-06-070	365-41-06-020
7	355-31-07-001	355-36-07-001	355-37-07-001	355-38-07-001	365-31-07-070	365-41-07-020
8	355-31-08-001	355-36-08-001	355-37-08-001	355-38-08-001	365-31-08-070	365-41-08-020
9	355-31-09-001	355-36-09-001	355-37-09-001	355-38-09-001	365-31-09-070	365-41-09-020
10	355-31-10-001	355-36-10-001	355-37-10-001	355-38-10-001	365-31-10-070	365-41-10-020
11	355-31-11-001	355-36-11-001	355-37-11-001	355-38-11-001	365-31-11-070	365-41-11-020
12	355-31-12-001	355-36-12-001	355-37-12-001	355-38-12-001	365-31-12-070	365-41-12-020
13	355-31-13-001	355-36-13-001	355-37-13-001	355-38-13-001	365-31-13-070	365-41-13-020
14	355-31-14-001	355-36-14-001	355-37-14-001	355-38-14-001	365-31-14-070	365-41-14-020
15	355-31-15-001	355-36-15-001	355-37-15-001	355-38-15-001	365-31-15-070	365-41-15-020
16	355-31-16-001	355-36-16-001	355-37-16-001	355-38-16-001	365-31-16-070	365-41-16-020
17	355-31-17-001	355-36-17-001	355-37-17-001	355-38-17-001	365-31-17-070	365-41-17-020
18	355-31-18-001	355-36-18-001	355-37-18-001	355-38-18-001	365-31-18-070	365-41-18-020
19	355-31-19-001	355-36-19-001	355-37-19-001	355-38-19-001	365-31-19-070	365-41-19-020
20	355-31-20-001	355-36-20-001	355-37-20-001	355-38-20-001	365-31-20-070	365-41-20-020
21	355-31-21-001	355-36-21-001	355-37-21-001	355-38-21-001	365-31-21-070	365-41-21-020
22	355-31-22-001	355-36-22-001	355-37-22-001	355-38-22-001	365-31-22-070	365-41-22-020
23	355-31-23-001	355-36-23-001	355-37-23-001	355-38-23-001	365-31-23-070	365-41-23-020
24	355-31-24-001	355-36-24-001	355-37-24-001	355-38-24-001	365-31-24-070	365-41-24-020
25	355-31-25-001	355-36-25-001	355-37-25-001	355-38-25-001	365-31-25-070	365-41-25-020
26	355-31-26-001	355-36-26-001	355-37-26-001	355-38-26-001	365-31-26-070	365-41-26-020

INSULATOR MATERIAL: General Purpose Black Phenolic; Other Materials Available.
TERMINAL MATERIAL and FINISH: Brass, Nickel-Plated.
SCREW MATERIAL and FINISH: Steel, Nickel-Plated.
"W", "¾W" and "Y" TERMINAL MATERIAL and FINISH: Brass, Hot Solder Dipped.
TOP-MOUNTED MARKER STRIP MATERIAL: 1/16" NEMA Grade XPC, UL Rated 94V-0.
COVER (DOUBLE MARKER STRIP) MATERIAL: 1/32" NEMA Grade XPC, UL Rated 94V-0.
(CO) Indicates items normally available through Cinch Distributors.

TRW CINCH CONNECTORS

FANNING STRIPS

FOR CONNECTING TO BARRIER TERMINAL BLOCKS



161 Series Fanning Strip with Cable Clamp and 141 Series Barrier Terminal Block

Fanning strips serve as a convenient means for rapidly making and removing connections from barrier terminal blocks. They facilitate cable or harness wiring and minimize the possibility of subsequent wiring errors. Both straight and angle type fanning strips are available. Terminals are made of .032" brass, cadmium-plated. The 3/32" thick, 1/2" wide XP black phenolic mounts are furnished with a hole, in either the right or left side, for securing the cable with lacing twine. For larger sizes, use of a cable clamp as shown on page 12 is recommended.

STRAIGHT TYPE FANNING STRIP PART NUMBER ORDERING INFORMATION

NO. OF TERMINALS	160 SERIES (CD) 327-11-02-001 — Fits 140 Series Barrier Blocks 3/8" Terminal Centers		160B SERIES 327-22-02-001 — Fits 140 Series Barrier Blocks 3/8" Terminal Centers		161 SERIES (CD) 327-31-02-001 — Fits 141 Series Barrier Blocks 7/16" Terminal Centers		162 SERIES (CD) 327-42-02-001 — Fits 142 Series Barrier Blocks 7/16" Terminal Centers	
	C.C. Hole on Left	C.C. Hole on Right	C.C. Hole on Left	C.C. Hole on Right	C.C. Hole on Left	C.C. Hole on Right	C.C. Hole on Left	C.C. Hole on Right
2	327-11-02-001	327-12-02-001	327-21-02-001	327-22-02-001	327-31-02-001	327-32-02-001	327-41-02-001	327-42-02-001
3	327-11-03-001	327-12-03-001	327-21-03-001	327-22-03-001	327-31-03-001	327-32-03-001	327-41-03-001	327-42-03-001
4	327-11-04-001	327-12-04-001	327-21-04-001	327-22-04-001	327-31-04-001	327-32-04-001	327-41-04-001	327-42-04-001
5	327-11-05-001	327-12-05-001	327-21-05-001	327-22-05-001	327-31-05-001	327-32-05-001	327-41-05-001	327-42-05-001
6	327-11-06-001	327-12-06-001	327-21-06-001	327-22-06-001	327-31-06-001	327-32-06-001	327-41-06-001	327-42-06-001
7	327-11-07-001	327-12-07-001	327-21-07-001	327-22-07-001	327-31-07-001	327-32-07-001	327-41-07-001	327-42-07-001
8	327-11-08-001	327-12-08-001	327-21-08-001	327-22-08-001	327-31-08-001	327-32-08-001	327-41-08-001	327-42-08-001
9	327-11-09-001	327-12-09-001	327-21-09-001	327-22-09-001	327-31-09-001	327-32-09-001	327-41-09-001	327-32-09-001
10	327-11-10-001	327-12-10-001	327-21-10-001	327-22-10-001	327-31-10-001	327-32-10-001	327-41-10-001	327-42-10-001
11	327-11-11-001	327-12-11-001	327-21-11-001	327-22-11-001	327-31-11-001	327-32-11-001	327-41-11-001	327-42-11-001
12	327-11-12-001	327-12-12-001	327-21-12-001	327-22-12-001	327-31-12-001	327-32-12-001	327-41-12-001	327-42-12-001
13	327-11-13-001	327-12-13-001	327-21-13-001	327-22-13-001	327-31-13-001	327-32-13-001	327-41-13-001	327-42-13-001
14	327-11-14-001	327-12-14-001	327-21-14-001	327-22-14-001	327-31-14-001	327-32-14-001	327-41-14-001	327-42-14-001
15	327-11-15-001	327-12-15-001	327-21-15-001	327-22-15-001	327-31-15-001	327-32-15-001	327-41-15-001	327-42-15-001
16	327-11-16-001	327-12-16-001	327-21-16-001	327-22-16-001	327-31-16-001	327-32-16-001	327-41-16-001	327-42-16-001
17	327-11-17-001	327-12-17-001	327-21-17-001	327-22-17-001	327-31-17-001	327-32-17-001	327-41-17-001	327-42-17-001
18	327-11-18-001	327-12-18-001	327-21-18-001	327-22-18-001	327-31-18-001	327-32-18-001		
19	327-11-19-001	327-12-19-001	327-21-19-001	327-22-19-001	327-31-19-001	327-32-19-001		
20	327-11-20-001	327-12-20-001	327-21-20-001	327-22-20-001	327-31-20-001	327-32-20-001		
21	327-11-21-001	327-12-21-001	327-21-21-001	327-22-21-001				

ANGLE TYPE FANNING STRIP PART NUMBER ORDERING INFORMATION

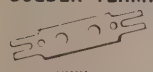
NO. OF TERMINALS	160A SERIES 327-14-02-001 — Fits 140 Series Barrier Blocks 3/8" Terminal Centers		160BA SERIES 327-23-02-001 — Fits 140 Series Barrier Blocks 3/8" Terminal Centers		161A SERIES 327-34-02-001 — Fits 141 Series Barrier Blocks 7/16" Terminal Centers		162A SERIES 327-43-02-001 — Fits 142 Series Barrier Blocks 7/16" Terminal Centers	
	C.C. Hole on Left	C.C. Hole on Right	C.C. Hole on Left	C.C. Hole on Right	C.C. Hole on Left	C.C. Hole on Right	C.C. Hole on Left	C.C. Hole on Right
2	327-13-02-001	327-14-02-001	327-23-02-001	327-24-02-001	327-33-02-001	327-34-02-001	327-43-02-001	327-44-02-001
3	327-13-03-001	327-14-03-001	327-23-03-001	327-24-03-001	327-33-03-001	327-34-03-001	327-43-03-001	327-44-03-001
4	327-13-04-001	327-14-04-001	327-23-04-001	327-24-04-001	327-33-04-001	327-34-04-001	327-43-04-001	327-44-04-001
5	327-13-05-001	327-14-05-001	327-23-05-001	327-24-05-001	327-33-05-001	327-34-05-001	327-43-05-001	327-44-05-001
6	327-13-06-001	327-14-06-001	327-23-06-001	327-24-06-001	327-33-06-001	327-34-06-001	327-43-06-001	327-44-06-001
7	327-13-07-001	327-14-07-001	327-23-07-001	327-24-07-001	327-33-07-001	327-34-07-001	327-43-07-001	327-44-07-001
8	327-13-08-001	327-14-08-001	327-23-08-001	327-24-08-001	327-33-08-001	327-34-08-001	327-43-08-001	327-44-08-001
9	327-13-09-001	327-14-09-001	327-23-09-001	327-24-09-001	327-33-09-001	327-34-09-001	327-43-09-001	327-44-09-001
10	327-13-10-001	327-14-10-001	327-23-10-001	327-24-10-001	327-33-10-001	327-34-10-001	327-43-10-001	327-44-10-001
11	327-13-11-001	327-14-11-001	327-23-11-001	327-24-11-001	327-33-11-001	327-34-11-001	327-43-11-001	327-44-11-001
12	327-13-12-001	327-14-12-001	327-23-12-001	327-24-12-001	327-33-12-001	327-34-12-001	327-43-12-001	327-44-12-001
13	327-13-13-001	327-14-13-001	327-23-13-001	327-24-13-001	327-33-13-001	327-34-13-001	327-43-13-001	327-44-13-001
14	327-13-14-001	327-14-14-001	327-23-14-001	327-24-14-001	327-33-14-001	327-34-14-001	327-43-14-001	327-44-14-001
15	327-13-15-001	327-14-15-001	327-23-15-001	327-24-15-001	327-33-15-001	327-34-15-001	327-43-15-001	327-44-15-001
16	327-13-16-001	327-14-16-001	327-23-16-001	327-24-16-001	327-33-16-001	327-34-16-001	327-43-16-001	327-44-16-001
17	327-13-17-001	327-14-17-001	327-23-17-001	327-24-17-001	327-33-17-001	327-34-17-001	327-43-17-001	327-44-17-001
18	327-13-18-001	327-14-18-001	327-23-18-001	327-24-18-001	327-33-18-001	327-34-18-001		
19	327-13-19-001	327-14-19-001	327-23-19-001	327-24-19-001	327-33-19-001	327-34-19-001		
20	327-13-20-001	327-14-20-001	327-23-20-001	327-24-20-001	327-33-20-001	327-34-20-001		
21	327-13-21-001	327-14-21-001	327-23-21-001	327-24-21-001				

(CD) Indicates items normally available through Cinch Distributors.

TRW CINCH CONNECTORS

OPTIONAL TERMINALS, JUMPERS AND CABLE CLAMPS

SOLDER TERMINALS


"W"

"¾W"

"Y"

"W," "¾W" and "Y" terminals are available optionally as separate terminals for use with 140, 141 and 142 Series barrier blocks as indicated below. Also specify hot solder dipped finish when ordering. Material is brass.

SOLDER TERMINALS PART NUMBER ORDERING INFORMATION

FOR:	"W" TYPE	"¾W" TYPE	"Y" TYPE
140 Series	495-11-11-017	495-11-11-019	495-12-11-016
141 Series	495-11-11-020	495-11-11-022	495-12-11-012
142 Series	495-11-11-023	495-11-11-025	495-12-11-011

QUICK-CLAMP* TERMINALS

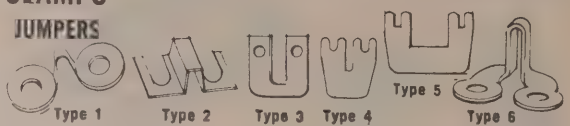
Simplifies engaging of wires to barrier blocks. Wire is inserted into flared opening and screw is tightened. Screws are nickel-plated brass, binder head type. Terminals are electro-tinned brass. Set includes two mating clamps and one screw. For use with 141 and 142 Series barrier blocks as shown below.

* Patent Pending

QUICK-CLAMP* TERMINALS PART NUMBER ORDERING INFORMATION

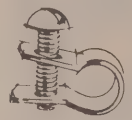
FOR:	PART NO.	WIRE GAUGES	SCREW SIZE
141 Series	422-14-11-143	14 thru 22	6-32 x 5/16"
142 Series	422-14-11-144	8 thru 16	8-32 x 3/8"

JUMPERS



Used for making permanent connections between adjacent barrier block terminals, except for type 5, which connects two alternate terminals bridging the intermediate terminal. Six types for use with 140, 141, 142, 540, 541 and 542 Series barrier blocks as shown. All jumpers are brass with nickel-plated satin finish.

CABLE CLAMPS



For use with "Jones" Fanning Strips shown on page 20. Recommended for securing the cable where at least several conductors are to be terminated with fanning strips. As indicated, six different inner diameter sizes are available. Clamps and 6-32 x ½" round head screws are stainless steel, passivated. For convenience cable clamps are supplied unassembled.

PART NUMBER ORDERING INFORMATION

JUMPERS FOR:	PART NO.	TYPE	CABLE CLAMPS INNER DIA.	PART NO.
141 Series	422-13-11-026	1	¼"	422-04-11-109
142 Series	422-13-11-025	1	3/8"	422-04-11-110
140 Series	422-13-11-013	2	½"	422-04-11-111
141 Series	422-13-11-012	3	5/8"	422-04-11-112
142, 542 Series	422-13-11-028	4	¾"	422-04-11-113
142, 542 Series	422-13-11-027	5	7/8"	422-04-11-114
540 Series	422-13-11-029	6		
541 Series	422-13-11-030	6		
542 Series	422-13-11-031	6		

SEMS SCREW TERMINALS

The Sems screw termination, with integral lockwasher, permits rapid, permanent attachment of solid or stranded wire leads or spade lug terminations to the barrier terminal block. The lockwasher teeth cut into the termination material, assuring excellent electrical contact and the ability to withstand substantial strain and vibration.

The Sems screws are nickel plated steel and the lockwasher is nickel plated phosphor bronze.

When ordering by ten digit manufacturing part number, change second digit from 11 to 12. (Example: 355-12-02-001)

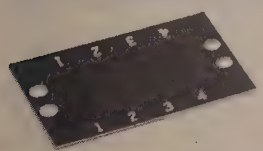
When ordering by distributor part number, add letter (E). (Example: 2-140-E)

IMPRINTING INFORMATION ON MARKER STRIPS (UL RECOGNIZED)

"SINGLE" MARKER STRIPS

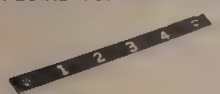
All "single" marker strips, extending out on only one side, as shown in this catalog, can be supplied at extra cost with terminal designations as desired, imprinted directly on the strips. Either 3/32" or 1/8" high letters, number, words or symbols can be imprinted in white. If no preference is given, the size best suited for the particular order will be used. Each imprinting order necessitates a set-up charge in addition to regular imprinting charges based on the number of characters and panels. Please make sure all imprinting instructions are clear and concise.

"DOUBLE" MARKER STRIPS



"Double" marker strips, extending out on both sides, can also have terminal designations imprinted at extra cost on one or two sides, if desired 1/8" high letters, numbers, words or symbols can be imprinted in white and if no preference is given, the best suited size for the particular order will be used. When used as a "cover" for the 540, 541 or 542 Series, "double" marker strips can also be imprinted on either side, as specified. Regular imprinting and set-up charges apply. Please indicate whether the marker strip is being used as "double" or "cover."

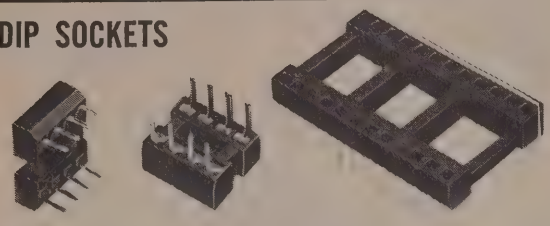
SPECIAL TOP-MOUNTED MARKER STRIPS

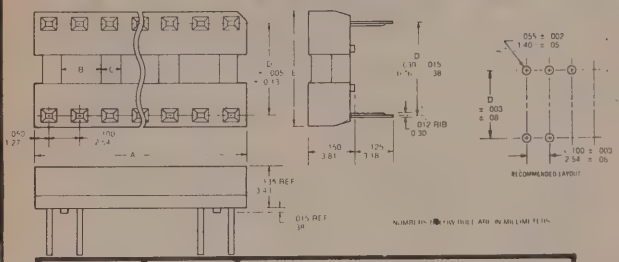


Special marker strips used on top of 540, 541 and 542 Series barrier blocks can be imprinted with terminal designations at extra cost. 1/8" letters, numbers, words or symbols can be imprinted in white. Each imprinting order requires both set-up and regular imprinting charges. Please make sure all necessary instructions are included.

TRW CINCH CONNECTORS

DIP SOCKETS





No. of Contacts	Inches				
	A	B	C	D	E
8	.400	.220	0	.300	.376
14	.700	.130	.065	.300	.376
16	.800	.160	.070	.300	.376
18	.900	.190	.075	.300	.376
22	1.100	.260	.070	.400	.476
24	1.200	.290	.075	.600	.676
40	2.000	.540	.100	.600	.676

These low profile DIP sockets are extremely economical. The unique design permits substantial reduction in assembly costs and, at the same time, incorporates many features that were previously available only in more expensive sockets. TRW/Cinch DIP sockets are produced in 8, 14, 16 and 24 contact sizes as standard items. Other sizes can be developed by the addition of insulator tooling.

LOW PROFILE SOCKETS with P. C. BOARD TERMINALS

MATERIALS INSULATOR: Glass fiber polyester 94V-0 (U.L. rated); CONTACTS: Brass Alloy (Olin 688); PLATING: 0.001 electroplated solder (60/40) over 0.0005 electroplated copper or .00003 gold inlay on phosphor bronze.

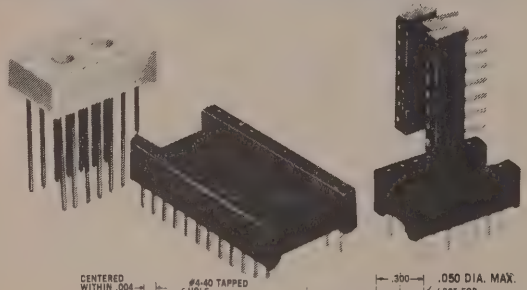
ELECTRICAL/ENVIRONMENTAL SPECIFICATIONS CURRENT RATING: 1 Amp; INSULATION RESISTANCE: 20 x 10^6 megohms (EIARS-364-TP21); WITHSTANDING VOLTAGE: 1000 Volts AC RMS (EIARS-364-TP20); CONTACT RESISTANCE: 12 milliohms @ 1 Amp, 10 milliohms @ 1 milliampere and 20 millivolts; INTERLEAD CAPACITANCE: 0.35 pf at 1 MHz (MIL-STD-202, Method 305); VIBRATION: No interruption of current when tested per EIARS-364-TP28; SHOCK: No mechanical failure or disengagement when tested per EIA-TP27, RS-364; HUMIDITY: Insulation resistance exceeded 20 x 10^6 megohms after 96 hours @ 40°C and 95% R.H. per EIA-TP21, Method II, Condition A, RS-364.

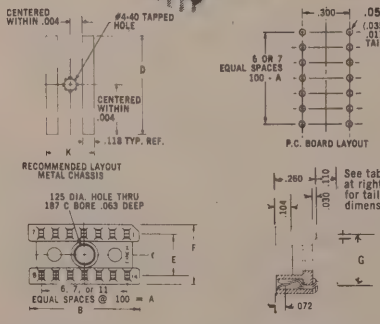
MECHANICAL SPECIFICATIONS CONTACT INSERTION FORCE: 3.0 oz. minimum, 4.0 oz. maximum; CONTACT WITHDRAWAL FORCE: 3.5 oz. minimum, 4.5 oz. maximum; CONTACT RETENTION: 12 oz. minimum, 15 oz. average.

ORDERING INFORMATION

No. of Contacts	Electroplated Solder Contacts		Gold Inlay Contacts	
	Distributor Part No.	Factory Part No.	Distributor Part No.	Factory Part No.
8	8E-DIP	133-58-90-091	8E-DIP-4	133-58-90-094
14	14E-DIP	133-59-90-090	14E-DIP-4	133-59-90-095
16	16E-DIP	133-59-90-092	16E-DIP-4	133-59-90-096
18	18E-DIP	133-59-90-098	18E-DIP-4	133-59-90-101
22	22E-DIP	133-59-90-099	22E-DIP-4	133-59-90-102
24	24E-DIP	133-59-90-093	24E-DIP-4	133-59-90-097
40	40E-DIP	133-59-90-100	40E-DIP-4	133-59-90-103

PRECISION SOCKETS — DIP SOLDER TAILS





MATERIALS INSULATORS: GP Black Phenolic per MIL-M-14, Diallyl Phthalate per MIL-M-14, Type SDG, Contacts: Beryllium copper with gold or electro-tin plating. RECOMMENDED MOUNTING METHODS: CHASSIS: 4-40 x ¼" Fillister head screw; P.C. BOARD: Solder in.

ELECTRICAL SPECIFICATIONS CURRENT RATING: 1.0 amp; CONTACT RESISTANCE: 6 milliohms (at 1 amp); CAPACITANCE PER MIL-STD-202; Method 305 at 100 KHz between adj. contacts: 0.33 pfd avg. WITHSTANDING VOLTAGE BETWEEN ADJACENT CONTACTS: 1800 VRMS; INSULATION RESISTANCE: 1.0 x 10^6 megohms minimum.

MECHANICAL SPECIFICATIONS VIBRATION: Per MIL-STD-202C, Condition D, Method 204A. No continuity interruptions of 1 microsecond or longer. No damage to contact or insulator. No disengagement of DIP module from the socket; SHOCK: Per MIL-STD-202C, Method 202B. Shock level of 150 G's. No continuity interruptions of 1 microsecond or longer. No damage to contact or insulator. No disengagement of DIP module from the socket; TEMPERATURE RANGE: Phenolic: −65°C to 150°C.

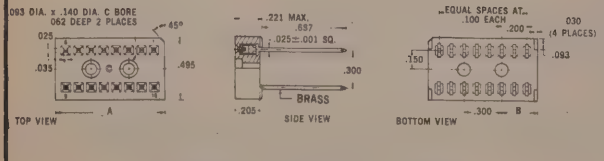
Contacts	Insulator	Contact Plating	.017x.033 Tails .170 long	.017x.033 Tails .120 long	.017x.033 Sq. Tails .110 long
14	Diallyl Phthalate	Gold Plated	133-51-92-072	‡133-59-92-060	‡133-51-02-005
14	Diallyl Phthalate	Electro-Tin	133-51-92-071	133-59-92-066	133-51-92-001
14	GP Black Phenolic	Electro-Tin	133-51-02-073	‡133-59-02-059	‡133-51-02-003
14	GP Black Phenolic	Gold Plated	133-51-02-074	133-59-02-065	133-51-02-004
16	Diallyl Phthalate	Gold Plated	133-51-92-077	‡133-59-92-061	‡133-51-92-008
16	Diallyl Phthalate	Electro-Tin	133-51-92-076	133-59-92-067	133-51-92-002
16	GP Black Phenolic	Gold Plated	133-51-02-078	133-59-02-068	133-51-02-007
16	GP Black Phenolic	Electro-Tin	133-51-02-075	‡133-59-02-062	‡133-51-02-006
24	Diallyl Phthalate	Electro-Tin	133-59-92-079	133-59-92-070	133-59-92-009
24	Diallyl Phthalate	Gold Plated	133-59-92-080	133-59-92-064	‡133-59-92-010
24	GP Black Phenolic	Electro-Tin	133-59-02-081	‡133-59-02-063	‡133-59-02-011
24	GP Black Phenolic	Gold Plated	133-59-02-082	133-59-02-069	133-59-02-012

‡These items available through Cinch distributors.

No. of Contacts	A	B	C	D	E	F	G ±.015	H	J
14	.600	.770	.796	.300	.424	.187	.300	.093	.446
16	.700	.870	.896	.300	.424	.187	.300	.093	.446
24	1.100	1.270	1.296	.600	.724	.488	.600	.125	.746

PRECISION SOCKETS — WIRE WRAP TAILS

.025 x .025 W.W. TAILS .687 LONG



DIM.	14 Pin	16 Pin
A	.770	.870
B	.235	.285

MATERIALS INSULATORS: Glass Nylon −65°C to 125°C; CONTACTS: Solid .025 brass wire wrap post with sharp (.003 max. radius) corners. (Gold or electro-tin plated).

ELECTRICAL SPECIFICATIONS CURRENT RATING: 1 ampere; CONTACT RESISTANCE: 6 milliohms; INSULATION RESISTANCE: 1 x 10^6 Megohms; WITHSTANDING VOLTAGE: 1000 Volts AC RMS; INTERLEAD CAPACITANCE: 0.40 pf at 1 MHz.

MECHANICAL SPECIFICATIONS CONTACT SEPARATION FORCE: Min. 4 oz., Max. 1 oz.; MIN. CONTACT SEPARATION FORCE AFTER 100 CYCLES: 1 oz.

Part No.	Contacts	Insulator	Contacts
‡133-59-91-055	14	Black	Electro-Tin
‡133-59-91-056	14	White	Electro-Tin
‡133-59-91-051	14	Black	Gold Plated
‡133-59-91-052	14	White	Gold Plated
‡133-59-91-058	16	Black	Electro-Tin
‡133-59-91-057	16	White	Electro-Tin
‡133-59-91-054	16	Black	Gold Plated
‡133-59-91-053	16	White	Gold Plated

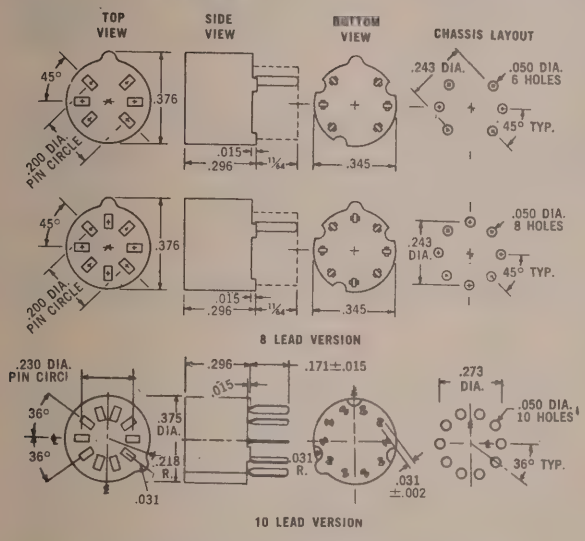
‡These items available through Cinch distributors.

TRW CINCH CONNECTORS

IC SOCKETS

TO-5 CASE SOCKETS

These Cinch miniature sockets are designed especially for integrated circuits mounted in 6, 8 or 10-lead TO-5 cases. They provide a convenient, dependable means of installing or removing IC's from the printed circuit board. Interconnections can be made without bending the leads, which substantially reduces the possibility of breaking leads or destroying the hermetic seal of the cases. Insulation material is diallyl phthalate Type SDG, contacts are beryllium copper with 30 micro-inches of gold over a copper flash.



SPECIFICATIONS

ELECTRICAL

Current Rating: 1.0 ampere
Contact Resistance: 0.050 ohms, maximum
Withstanding Voltage Between Adjacent Contacts:

AC RMS	DC
1020	1560 (at sea level)
350	465 (at 50,000 ft.)

Insulation Resistance: 50,000 megohm, minimum

MECHANICAL

Shock: 50 g per MIL-STD-202
Temperature Range: −65°C to +125°C
Insertion Force: 16 lb. maximum
Withdrawal Force: 3 lb. minimum
Recommended Mtg. Method: Solder in PC Board

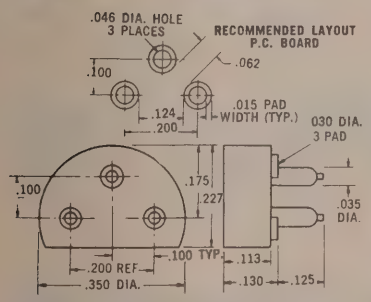
MATERIALS

Insulator: Diallyl phthalate Type SDG per MIL-M-14
Contacts: Beryllium copper
Finish: Copper flash plus .00003 gold plate

Part No.	No. of Leads
‡133-96-92-060	6
‡133-98-92-061	8
‡133-99-92-054	10

LOW PROFILE 3-PIN P.C. SOCKETS FOR TO-5 CASES

These high quality Cinch-designed 3-pin sockets for TO-5 series transistors incorporate many unique features necessary for high circuit reliability . . . features not found in similar competitive units.



SPECIFICATIONS

ELECTRICAL

Voltage Ratings:

AC RMS	DC
1500	2000 (at sea level)
500	700 (at 50,000 ft.)

Current Rating: 2.5 amperes
Contact Resistance: 0.005 ohms
Insulation Resistance: 100,000 megohms

MECHANICAL

Maximum Pin Diameter: .019 inch
Maximum Pin Depth: 0.200 ±0.010 inch
Maximum Insertion Force: 5 ounces measured with an 0.017" diameter pin
Minimum Withdrawal Force: ¼ ounce measured with an 0.014" diameter pin, after 3 sizing cycles with an 0.017" diameter pin
Durability: ¼ ounce minimum withdrawal force after 100 cycles with an 0.017" diameter pin

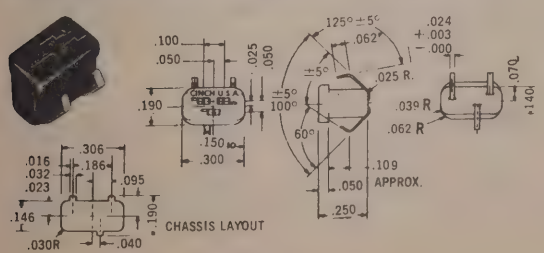
MATERIALS

Insulator: 20% glass filled natural nylon.
Contacts: Beryllium Copper, Tin Plate over Copper Base.
Insulator Colors:

Part No.	Color
‡133-23-92-041	Black
‡133-23-92-039	Natural
‡133-23-92-040	Green

TRANSISTOR SOCKETS

PRESS-IN AND SNAP-IN TRANSISTOR SOCKETS TYPE T-1



A commercial transistor socket with contact arrangement for exact mating with TO-18 transistors. Presses into polarized chassis cutout in 1/16" thick boards having bottom circuitry only. Insulator body is approved general purpose black phenolic (Type CFG per MIL-M-14) and contacts are beryllium copper with 30 micro-inches gold finish.

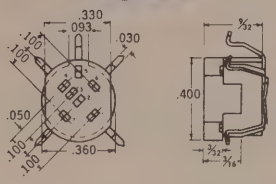
Part No.	No. of Contacts	Insulator Material	Contact Material
131-73-02-062	3	Black	Beryllium Copper

‡These items available through Cinch Distributors.

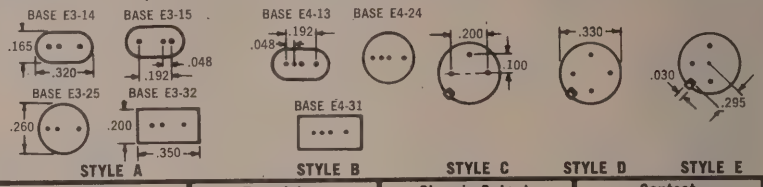
TRW CINCH CONNECTORS

TRANSISTOR SOCKETS (CONT.)

UNIVERSAL TRANSISTOR SOCKETS TYPE T-7



For use with ten transistor bases and five base styles illustrated. Insulator bodies are all mica-filled low loss phenolic (MFE). Contacts are beryllium copper, gold-plated. For use with 1/16" thick printed circuit board. Table lists the chassis cutout tabs required for the various base types.

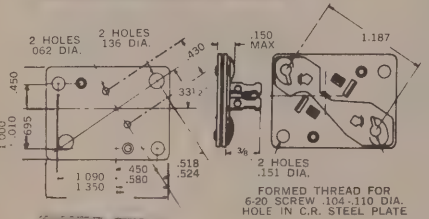


Part No.	Transistor Base Styles	Chassis Cutout Tabs Used	Contact Positions Used
‡133-27-12-011	All	a, b, c, d, e	All
‡133-24-12-012*	A & C	c, d, e	1, 3, 4, 7
133-25-12-013*	B & C	b, c, d, e	1, 2, 3, 4, 7
‡133-23-12-014*	C	c, d, e	1, 4, 7
‡133-25-12-015	D	a, b, c, d, e	1, 4, 5, 6, 7
‡133-23-12-016*	E	b, d, e	1, 6, 7
‡133-24-12-017	A & C	c, d, e	1, 3, 4, 7

*In positions where contacts are not required, cavity for contacts is also omitted except in position 5.

POWER TRANSISTOR SOCKETS

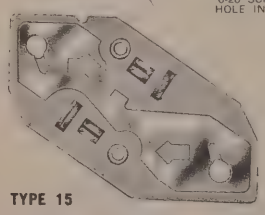
TYPE 14



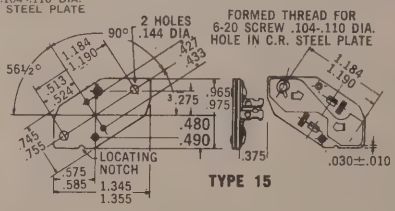
Type 14 and 15 power transistor sockets with laminated top and bottom plates are used under the most severe vibration conditions because of high initial withdrawal force. Transistor can be grounded to collector plate and at the same time be completely insulated from the chassis. Type 14 and 15 top and bottom plates are made of Valox 310. Collector plates are cadmium-plated steel and contacts are made of cadmium-plated brass. Type 16 power transistor socket with molded insulator body is designed for mobile communication receivers. Type 16 socket has an insulating body of general purpose black phenolic (also available in mica and diallyl) and contacts are phosphor bronze, cadmium plated.

Part No.	Type	Insulator Material	Contact Material	Contact Finish	Collector Plate Material & Finish
‡133-32-10-013	14	XPC 94V-0 Black	Brass	Cadmium	Cadmium-Plated Steel
133-32-10-021	15	XPC 94V-0 Black	Brass	Cadmium	Cadmium-Plated Steel
‡133-12-02-016	16		Phosphor Bronze	Cadmium	—

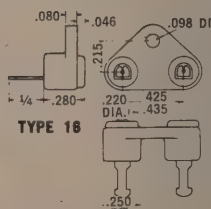
†Also available in mica and diallyl.



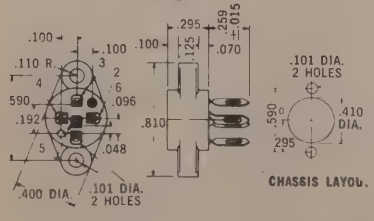
TYPE 15



TYPE 16



GENERAL PURPOSE TRANSISTOR SOCKETS TYPE 13



Multi-purpose all-molded sockets designed to the triangular base layout (.2" x .1" JETEC-30 contact centers) as well as the 3-contact in-line layout (.048" x .192" contact centers). Insulator material is either general purpose black phenolic or mica-filled low loss phenolic (Type MFE per MIL-M-14). Contacts are made of phosphor bronze, cadmium plated. Sockets may be used with E3-14, E3-15, E3-25, E3-32, E3-43, E3-44 and E3-51 EIA base designations.

Part No.	Type	Insulator Material	Contact Material	Contact Finish	Contact Positions Used
‡133-14-01-011	13	Black	Phosphor Bronze	Cadmium	1, 2, 3, 5
133-14-11-014	13	Mica	Phosphor Bronze	Cadmium	1, 2, 3, 5
133-13-01-012	13	Black	Phosphor Bronze	Cadmium	1, 2, 3
133-13-11-025	13	Mica	Phosphor Bronze	Cadmium	1, 2, 3

‡These items available through Cinch Distributors.

TRW CINCH CONNECTORS

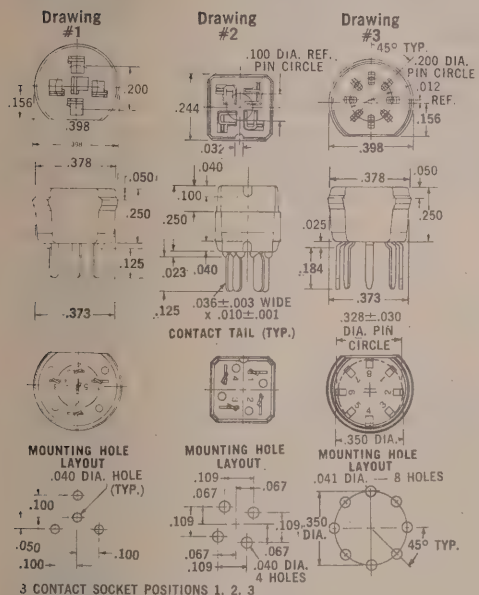
MINIATURE SEMICONDUCTOR SOCKETS

TO-5 AND TO-18 CASE DEVICES

This group of semiconductor sockets, for printed circuit board insertion, covers the standard configurations in most common use today.

Their low profile (.250") makes them especially applicable in high density applications. All units are made of MFE, mica-filled phenolic, and the six position TO-5 socket, is also available in FEP fluoro-carbon resin.

These Cinch sockets have low contact resistance, low capacitance and insulation resistance of over 1000 megohms. They are rated at 1.0 amperes and 750 volts A.C.



SPECIFICATIONS

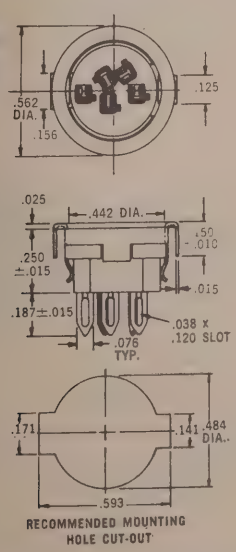
Maximum Voltage: 750 VAC
Maximum Current: 1.0 amperes
Max. Capacitance: 1.3 pf (1.0 pf for FEP)
Insulation Test: 1685 VAC
Insulation Resistance: 1000 megohm, minimum
Contact Resistance: 0.05 ohms

Socket Size	No. of Contacts	Terminal Mounting	Contact Material	Insulator Material**	Part No.	Contact Plating*	Dim. Drawing
TO-5	3	PC Board	Phos. Bronze	MFE	‡133-23-11-024	(1)	#1
TO-5	4	PC Board	Phos. Bronze	MFE	‡133-24-11-026	(1)	#1
TO-5	6	PC Board or Chassis	Ber. Copper	MFE	‡133-96-12-062	(2)	#3
TO-5	6	PC Board or Chassis	Ber. Copper	FEP	‡133-96-92-067	(2)	#3
TO-5	8	PC Board or Chassis	Ber. Copper	MFE	‡133-98-12-062	(2)	#3
TO-18	3	PC Board	Phos. Bronze	MFE	‡133-23-11-034	(2)	#2
TO-18	4	PC Board	Phos. Bronze	MFE	‡133-24-11-035	(2)	#2

*CONTACT PLATING: (1) Chromate over .0003" cadmium
(2) .0003" tin over .0001" copper

**INSULATOR MATERIAL: MFE — Mica filled phenolic
FEP — Fluorocarbon resin

NUVISTOR TRIODE TUBE SOCKETS



MECHANICAL CRIMP MOUNTING TYPE

This type socket is fastened to the chassis by two tabs, which are an integral part of the metal saddle retaining the insulator body. These tabs are rolled against the underneath side of the chassis. Insulator material is mica-filled low loss phenolic (Type MFE), glass-filled diallyl phthalate (Type SDG-F per MIL-M-14). Contacts are made of brass, phosphor bronze or beryllium copper with finishes as shown below. Saddles are made of cold rolled steel or brass, with finishes as shown below.

Part No.	Insulator Material*	Contact Material	Contact Finish	Saddle Material	Saddle Finish
‡133-65-10-001	Mica	Brass	.0001 Cadmium	C.R. Steel	Copper Flash plus .0001 Cadmium
133-65-11-011	Mica	Phosphor Bronze	.0001 Silver†	C.R. Steel	Copper Flash plus .0001 Cadmium
133-65-12-012	Mica	Beryllium Copper	.0001 Silver†	C.R. Steel	Copper Flash plus .0001 Cadmium
133-65-92-025	Diallyl	Beryllium Copper	0005 Gold	C.R. Steel	Copper Flash plus .0001 Cadmium

*Also available in general purpose black phenolic. †Contact tails hot solder coated.

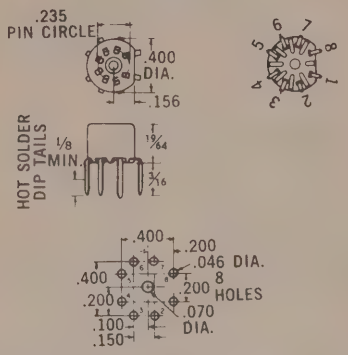
‡These items available through Cinch Distributors.

TRW CINCH CONNECTORS

SUBMINIATURE TUBE SOCKETS

SUBMINIATURE MILITARY STAND-OFF SOCKETS TYPE S-1, S-3

TYPE S-1



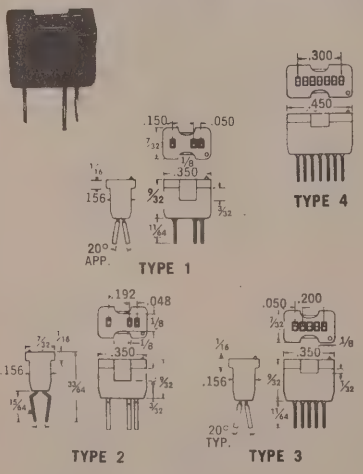
Two types of subminiature stand-off sockets designed and tooled under military contract to meet MIL specifications. They are designed to drop through clearance holes arranged on a .050″ x .050″ grid layout. Insulator bodies are available in either mica-filled low loss phenolic (MFE) or diallyl phthalate (Type SDG). Both types have beryllium copper contacts, silver-plated, with tips hot solder dipped.

The Type S-1 subminiature socket has an eight button base for vertical tube position and has no center shield.

The Type S-3 socket is a seven-contact in-line subminiature right angle socket for horizontal tube position. A nickel-plated brass mounting bracket provides additional support when mounted to the printed circuit board.

Part No.	Type	No. of Contacts	Insulator Materials	Contact Material
131-78-12-024	S-1	8	Mica	Beryllium Copper
131-78-92-025	S-1	8	Diallyl Phthalate	Beryllium Copper

THREE, FIVE AND SEVEN CONTACT IN-LINE SOCKETS



The first subminiature sockets ever produced. Type 1 and 2 three-contact sockets can be used with 3-prong transistors. Type 1, 3 and 4 sockets can be swaged or cemented into chassis or mounted with rings shown below. Type 2 is a stand-off style socket used primarily in printed circuitry but also suitable for conventional wiring. Insulating bodies are either general purpose black phenolic or mica-filled low loss phenolic (Type MFE per MIL-M-14). Contacts are of beryllium copper, either silver or cadmium plated as indicated.

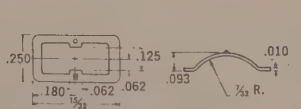
Part No.	Type	No. of Contacts	Insulator Material	Contact Material	Contact Finish
131-13-02-061	1	3	Black	Beryllium Copper	Silver
131-13-02-054	2	3	Black	Beryllium Copper	Cadmium
131-15-12-011	3	5	Mica†	Beryllium Copper	Silver
131-15-12-013	3	5	Mica	Beryllium Copper	Silver*
131-17-12-038	4	7	Mica†	Beryllium Copper	Silver
131-17-12-039	4	7	Mica	Beryllium Copper	Silver*

†Also available in black. *Contact tails hot solder coated.

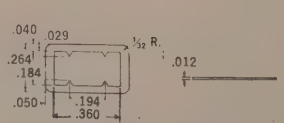
MOUNTING SPRING AND MOUNTING RINGS

No. 441-00-23-094 spring is designed for use with Type 1 and 2 three-contact sockets having a .093″ deep slot in the side of the insulator. Tempered spring steel material ensures positive retention of socket in chassis.

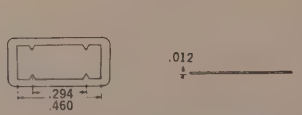
No. 441-00-11-082 ring is for use with Type 1, 2 and 3 sockets. No. 441-00-11-084 is for use with Type 4 and 5 sockets. Sharp teeth bite into side of insulator when ring is pressed on. Both rings are made of brass.



PART NO. 441-00-23-094



PART NO. 441-00-11-082

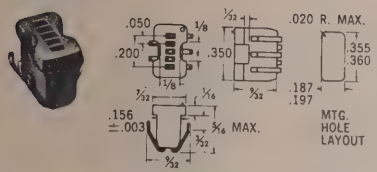


PART NO. 441-00-11-084

TRW CINCH CONNECTORS

SUBMINIATURE TUBE SOCKETS (CONT'D)

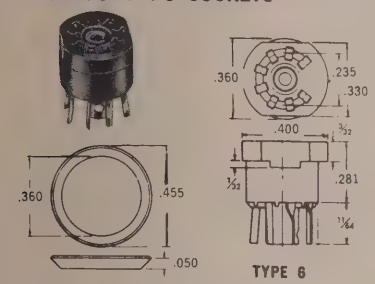
TYPE S-5



Type S-5 is a commercial 5-contact socket that presses into a non-polarized chassis cutout. For use on 1/16" thick boards. Insulator body is mica-filled low loss phenolic (MFE). Contacts are beryllium copper, silver-plated.

Part No.	No. of Contacts	Insulator Material	Contact Material
131-75-12-045	5	Mica	Beryllium Copper

RING MOUNT T-3 SOCKETS

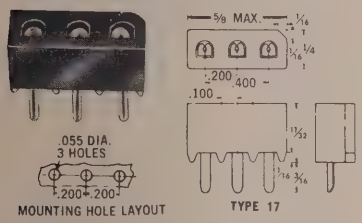


These 8-contact sockets can be swaged or cemented into chassis or mounted with mounting ring No. 441-00-11-099. Insulator material is mica-filled low loss phenolic (Type MFE per MIL-M-14). Contacts have twisted tails and are made of beryllium copper with silver plated finish. Center shield is brass, cadmium plated. Mounting ring is .010 brass.

Part No.	Type	Insulator Material	Contact Finish	Contact Finish	Center Shield Material	Center Shield Finish
132-18-12-011	6	Mica	Beryllium Copper	Silver	Brass	Cadmium
132-18-12-017	6	Mica	Beryllium Copper	Silver*	Brass	Cadmium

*Contact tails and center shield hot solder coated.

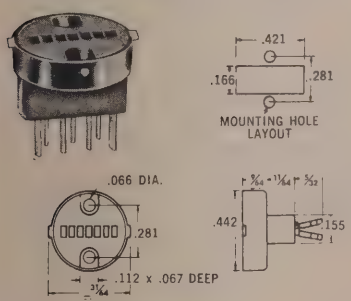
DOUBLE DIODE SOCKET



Special 3-contact socket used for mounting a diode in printed circuit applications. Used in horizontal phase detector. Insulator material is general purpose black phenolic. Contacts are made of brass with electro-tinned over copper flash finish.

Part No.	Type	Insulator Material	Contact Material	Contact Finish
203-91-03-029	17	Black	Brass	Electro-Tinned over Copper Flash

IN-LINE TYPE MILITARY SOCKETS

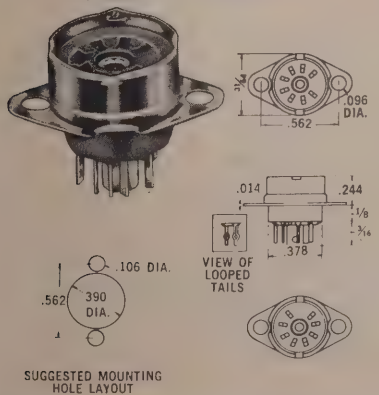


These in-line sockets are designed and tooled under military contact to meet MIL specifications. Available with or without nickel-plated brass mounting base. Either type can be mounted with No. 422-11-11-098 nickel-plated brass nut and No. 460-14-19-106 0-80 NF-2 stainless steel filister head type screws, which must be ordered separately. Insulator material is diallyl phthalate (Type SDG per MIL-M-14). Silver-plated beryllium copper contacts available with twisted tails as shown.

Part No.	Insulator Material	Contact Material	Contact Finish	Tail Type	Military Standard
131-27-92-011	Diallyl	Beryllium Copper	Silver*	Twisted	MS-35408-1
131-17-92-032	Diallyl	Beryllium Copper	Silver*	Twisted	—
131-17-92-034	Diallyl	Beryllium Copper	Silver	Looped	—

*Contact tails hot solder coated.

T-3 TYPE MILITARY SOCKETS



These sockets, utilizing the T-3 pin layout, are designed for military use in equipment subject to humidity or vibration conditions. Available with or without nickel-plated shield base type mounting saddle as shown. Insulator material is either diallyl phthalate (Type SDG per MIL-M-14) or mica-filled low loss phenolic (Type MFE per MIL-M-14). Contacts are beryllium copper, silver-plated. Sockets available with twisted or looped contact tails as indicated. Sockets also available with keyway rotated 90°. Center shields, when supplied, are brass, hot solder coated.

Part No.	Insulator Material	Contact Material	Contact Finish	Tail Type	Center Shield	Military Standard
132-28-92-022	Diallyl	Beryllium Copper	Silver*	Twisted	Yes	MS-35407-1
*132-28-12-023	Mica	Beryllium Copper	Silver*	Twisted	Yes	MS-35407-2
132-28-92-019	Diallyl	Beryllium Copper	Silver	Looped	No	—
132-28-92-023	Diallyl	Beryllium Copper	Silver	Looped	No	—
132-28-92-025	Diallyl	Beryllium Copper	Silver*	Twisted	Yes	—
132-28-12-026	Mica	Beryllium Copper	Silver*	Twisted	Yes	—

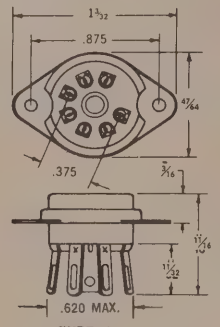
*Contact tails hot solder coated.

TRW CINCH CONNECTORS

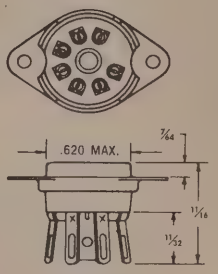
7-PIN MINIATURE TUBE SOCKETS

MOLDED MINIATURE SOCKETS WITH MOUNTING SADDLES

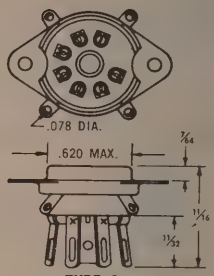
Securely holds all standard 7-pin miniature tubes. Available in top-mount, bottom-mount with ground lugs or bottom-mount with integral eyelets. Molded of high dielectric black phenolic, mica-filled low loss phenolic or ceramic material. Copper flash and electrolytic tin steel saddle with 7/8" mounting centers and .098 or .125 diameter mounting holes. Designed for mounting through chassis in 5/8" diameter hole. Center ground shield is brass. Positive grip contacts of spring temper brass alloy are cadmium-plated. Phosphor bronze and beryllium copper contacts are silver-plated. Standard contact length is 11/32", as shown in drawings; 3/16" and 1/4" contact lengths are also available on special order.



TYPE 1
Top Mount



TYPE 2
Bottom Mount



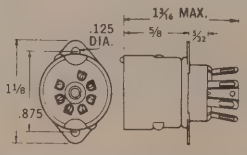
TYPE 3
Bottom Mount
With Ground Lugs

Part No.	Mtg. Hole Dia.	Part No.	Mtg. Hole Dia.	Type	Insulator Material	Contact Material	Center Shield O.D.
‡111-12-00-026	.098	111-12-00-037	.125	1	Black	Brass	3/16"
‡111-12-10-027	.098	111-12-10-038	.125	1	Mica	Brass	3/16"
111-12-20-035	.098	111-12-20-039	.125	1	Ceramic	Brass	3/16"
111-12-00-028	.098	111-12-00-034	.125	1	Black	Brass	—
111-12-10-029	.098	111-12-10-032	.125	1	Mica	Brass	—
111-12-20-036	.098	111-12-20-040	.125	1	Ceramic	Brass	—
‡111-11-00-011	.098	111-11-00-016	.125	2	Black	Brass	3/16"
‡111-11-10-012	.098	111-11-10-017	.125	2	Mica	Brass	3/16"
‡111-11-20-020	.098	111-11-20-024	.125	2	Ceramic	Brass	3/16"
111-11-00-013	.098	111-11-00-022	.125	2	Black	Brass	—
111-11-10-019	.098	111-11-10-023	.125	2	Mica	Brass	—
111-11-20-021	.098	111-11-20-025	.125	2	Ceramic	Brass	—
111-11-11-048	.098	111-11-11-041	.125	2	Mica	Phosphor Bronze	3/16"
—	—	111-11-12-014	.125	2	Mica	Beryllium Copper	3/16"
111-25-00-012	.098	—	—	3	Black*	Brass	3/16"

*Also available in Mica and Ceramic insulator materials.

MINIATURE SHIELD BASE SOCKETS

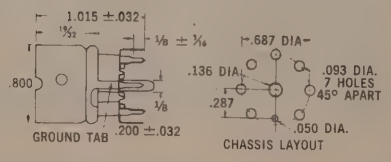
Shield base is attached to socket body for mounting through top of chassis. Molded from high dielectric black phenolic, mica-filled low loss phenolic or ceramic material. Cadmium-plated brass contacts and hot-solder-coated center shield. Cadmium-plated steel shield base with 7/8" mounting centers. Use J-slot type tube shields with these sockets.



Part No.	Mtg. Hole Dia.	Insulator Material	Contact Material	Center Shield O.D.
‡111-31-00-012	.125	Black	Brass	3/16"
‡111-31-10-011	.125	Mica	Brass	3/16"
‡111-31-20-102	.125	Ceramic	Brass	3/16"

MINIATURE SHIELD BASE STAND-OFF SOCKETS TYPE MSB-1

These miniature sockets have an attached bayonet type shield base. Bases have ground tab where specified in listings below. May also be obtained with heli-coil insert for use with No. 4-40 NC-2 screw. Sockets listed are for use in 1/16" thick printed circuit board, but others may also be obtained for use in 3/32" and 1/8" boards. Insulator bodies are mica-filled low loss phenolic (MFE). Contacts are phosphor bronze with copper flash and electrolytic tin. Center shield is copper flash and electrolytic tin brass and shield base and ground tab are nickel-plated brass.



Part No.	Insulator Material	Contact Material	Center Shield	Ground Tab
‡111-51-11-084	Mica	Phosphor Bronze	Yes	Yes
111-51-11-085	Mica	Phosphor Bronze	No	No
111-51-11-086	Mica	Phosphor Bronze	No	Yes

‡These items available through Cinch Distributors.

TRW CINCH CONNECTORS

7-PIN MINIATURE TUBE SOCKETS (CONT'D)

MILITARY CONTRACT PC SOCKETS

TYPE MSB-2

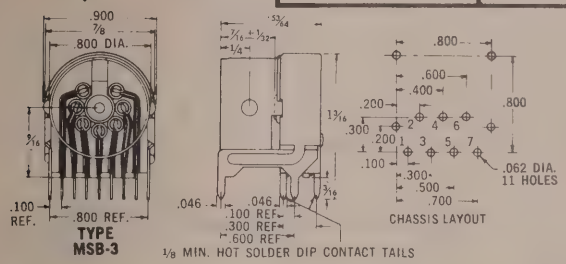
TYPE MSB-3

Two types of miniature shield base sockets designed for military use to meet rigid MIL specifications. Both types drop through clearance holes arranged on a .1" x .1" grid layout. The Type MSB-2 socket has a mica-filled low loss phenolic (MFE) insulator body. Contacts are phosphor bronze, silver-plated with hot solder dipped tails. Center shield is brass, hot solder dipped, and shield base is brass, nickel-plated. Hot solder dipped ground tab is an integral part of the base. The Type MSB-3 socket, for right angle tube position, also has a mica-filled low loss phenolic (MFE) insulator body. Contacts are made of beryllium copper, silver-plated with hot solder dipped tails. Shield base is brass, copper flash and electrolytic tin.

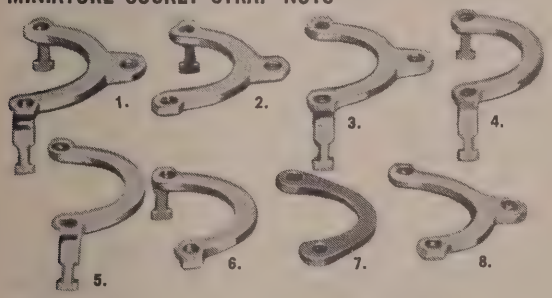
IMPORTANT

All of the sockets shown on this panel can **only** be purchased with a Government contract number. No exceptions can be made.

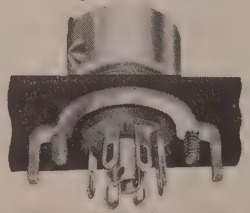
Part No.	Type	Insulator Material	Contact Material	Center Shield
111-54-11-101	MSB-2	Mica	Phosphor Bronze	Yes
111-54-12-149	MSB-3	Mica	Beryllium Copper	No



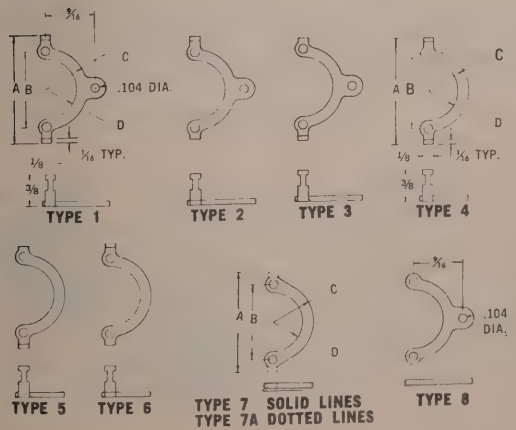
MINIATURE SOCKET STRAP NUTS



A Cinch development for ease and simplicity in mounting miniature sockets. One strap nut takes the place of two conventional type nuts. Generally used in assembling shield base sockets. 8 types are available, with hot tin dipped ground lugs attached for convenience in wiring. All are made of 1/16" brass. Three finishes are available with each type: .0005 cadmium-plated, .0005 cadmium-plated plus yellow chromate or .0003 electro-tin. Desired finish must be specified. Strap nuts with .104 diameter rivet hole can be used for mounting or for grounding to aluminum chassis. All mounting holes are tapped to accept No. 4-40 screws.



TYPICAL STRAP NUT ASSEMBLY WITH SHIELD BASE SOCKET



Part. No.*	Type	Dim. A	Dim. B	Dim. C	Dim. D
422-05-11-113	1	1 1/4	.875	15/32	11/32
422-05-11-133	2	1 3/16	.875	15/32	11/32
422-05-11-143	3	1 3/16	.875	15/32	11/32
‡422-05-11-103	4	1 1/4	.875	15/32	11/32
422-05-11-083	5	1 3/16	.875	15/32	11/32
422-05-11-093	6	1 3/16	.875	15/32	11/32
422-05-11-153	7	—	.875	7/16	21/64
422-05-11-148	8	—	.875	15/32	11/32

* Specify finish.

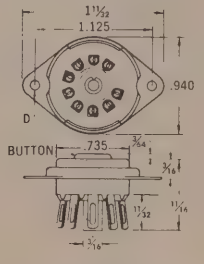
‡ These items available through Cinch Distributors.

TRW CINCH CONNECTORS

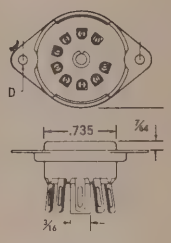
9-PIN NOVAL TUBE SOCKETS

MOLDED NOVAL SOCKETS WITH MOUNTING SADDLES

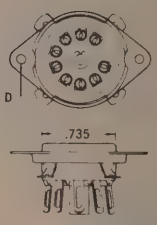
For all standard 9-pin noval tubes. Available in top-mount with or without button guide, bottom mount, bottom mount with ground lugs or bottom mount with integral eyelets. Molded of high dielectric black phenolic, mica-filled low loss phenolic or ceramic material (top mount only) with cadmium-plated brass contacts and hot-solder-coated center shield. Designed for mounting through chassis in ¾" diameter hole, copper flash and electrolytic tin steel saddle with 1⅛" mounting centers and .098 or .125 diameter mounting holes.



TYPE 1
Top Mount Without Button
TYPE 1A
Top Mount With Button



TYPE 2
Bottom Mount

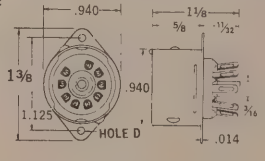


TYPE 3
Bottom Mount With Ground Lugs

Part No.	Mtg. Hole Dia. (D)	Part No.	Mtg. Hole Dia.	Type	Insulator Material	Contact Material	Center Shield O.D.
‡121-12-00-017	.098	121-12-00-023	.125	1	Black	Brass	3/16"
‡121-12-10-018	.098	121-12-10-022	.125	1	Mica	Brass	3/16"
121-14-20-094	.098	121-14-20-095	.125	1A	Ceramic	Brass	3/16"
‡121-11-00-016	.098	121-11-00-021	.125	2	Black	Brass	3/16"
121-11-00-029	.098	121-11-00-027	.125	2	Black	Brass	—
‡121-11-10-015	.098	121-11-10-020	.125	2	Mica	Brass	3/16"
121-11-10-019	.098	121-11-10-026	.125	2	Mica	Brass	—
121-25-00-013	.098	121-25-00-015	.125	3	Black	Brass	3/16"
121-25-10-014	.098	121-25-10-016	.125	3	Mica	Brass	3/16"

NOVAL SHIELD BASE SOCKETS

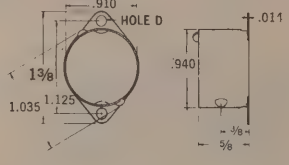
Molded from high dielectric black phenolic, mica-filled low loss phenolic or ceramic material. One piece cadmium-plated steel shield base and saddle on 1⅛" centers. Cadmium-plated brass contacts and copper flash and elctrolytic tin center shield. Mounts through top of chassis in ¾" diameter hole. Use Cinch J-Slot type shields with these sockets.



Part No.	Mtg. Hole Dia. (D)	Part No.	Mtg. Hole Dia. (D)	Insulator Material	Contact Material
‡121-31-00-015	.098	121-31-00-014	.125	Black	Brass
‡121-31-10-012	.098	121-31-10-011	.125	Mica	Brass
‡121-31-20-018	.098	121-31-20-019	.125	Ceramic	Brass

J-SLOT SHIELD BASES

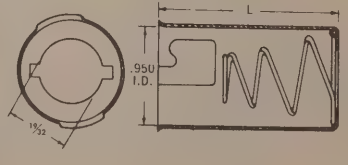
Durable cadmium-plated steel or nickel-plated brass shield bases designed for use with J-slot shields. 1⅛" mounting centers. May be used with any 9-pin saddle type socket shown.



Part No.	Mtg. Hole Dia. (D)	Part No.	Mtg. Hole Dia. (D)	Material
441-41-22-213	.098	‡441-43-22-212	.125	Steel
441-41-11-216	.098	441-43-11-215	.125	Brass

J-SLOT TUBE SHIELDS

Made from durable cadmium-plated steel. Complete with tube pressure spring. J-slot feature designed to fit securely with Cinch noval shield base sockets and shield base.



Part No.	Dim. L	Material
‡151-11-13-011	1½"	Steel
‡151-11-23-012	1 15/16"	Steel
‡151-11-33-013	2⅜"	Steel

‡These items available through Cinch Distributors.

TRW CINCH CONNECTORS

300 SERIES WITH STANDARD TERMINATION

The "Jones" 300 Series plugs and sockets, designed for light and medium duty applications, are small in size with good separation between contacts. This series is available in sizes from 2 to 33 contacts, arranged for either cap or panel mounting. All plugs and sockets are polarized so that plugs of one size cannot fit with sockets of another size. 24 to 33-contact plugs with standard termination also have a special polarizing pin to facilitate faster positioning of the mating plug and socket.

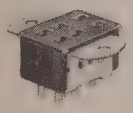
The insulating material is general purpose black phenolic. Phosphor bronze "knife-switch" type socket contacts engage both sides of flat brass plug contacts, providing double contact area. All contacts are cadmium-plated. Plug prongs are 5/32" wide and 3/64" thick. All solder lugs provided with size .093" x .062" wiring hole. Formed metal caps have black wrinkle finish with insulating liners. Other finishes and material available. Consult factory.

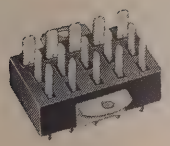
The 300 Series plugs and sockets feature MONOBLOCK (one-piece) construction. MONOBLOCK eliminates internal moisture traps. 300, 400 and 2400 Series UL recognized.

Note: All 2-contact plugs and sockets are round; all other sizes are rectangular. *U.S. Pat. Nos. 2688123 & 2980881

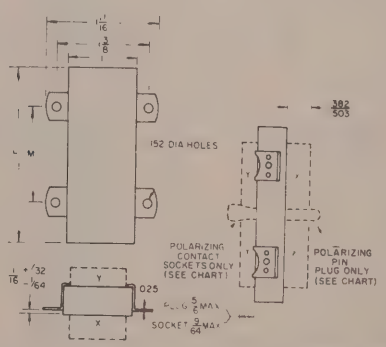
TYPE AB WITH ANGLE BRACKET

P-306-AB


S-306-AB


P-315-AB

S-315-AB

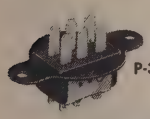


No. of Contacts	Part No.*	Dimensions In Inches Tolerance: ±1/64" or ±.005" A	B	C	D
2	P-302-AB S-302-AB	21/32 Dia.	—	31/32	1 7/32
3	P-303-AB S-303-AB	1	7/16	3/4	1 1/16
4	P-304-AB S-304-AB	3/4	11/16	1	1 5/16
6	P-306-AB S-306-AB	1	11/16	1	1 5/16
8	P-308-AB S-308-AB	1 1/4	11/16	1	1 5/16
10	P-310-AB S-310-AB	1 3/16	11/16	1	1 5/16
12	P-312-AB S-312-AB	1 1/4	15/16	1 1/4	1 5/16

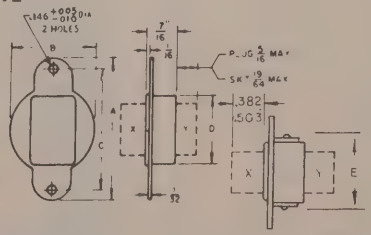
No. of Contacts	Part No.*	Dimensions Tol.: ±1/64" or ±.005" L	M	Polarizing Contact Pin	Polarizing In Cont. or Pin Position
15	P-315-AB S-315-AB	1 5/8	See Note	No	—
18	P-318-AB S-318-AB	1 15/16	1 1/4	No	—
21	P-321-AB S-321-AB	2 1/4	15/16	No	—
24	P-324-AB S-324-AB	2 5/16	1 1/4	Yes	14
27	P-327-AB S-327-AB	2 7/8	1 5/16	Yes	14
30	P-330-AB S-330-AB	3 5/16	1 7/8	Yes	14
33	P-333-AB S-333-AB	3 1/2	2 5/16	Yes	17

Note: P-315-AB and S-315-AB require only two mounting brackets, mounted at center on longer sides.
18-33 contact sizes require four mounting brackets.

TYPE FP WITH FLUSH PLATE


P-306-FP

S-306-FP

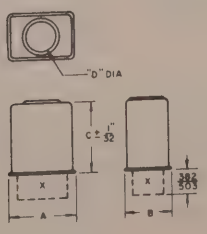


No. of Contacts	Part No.	Tolerance: ±1/64" or ±.005" A	B	C	D	E (Max.)
2	P-302-FP S-302-FP	2 1/16	1 1/4	1 3/4	—	2 3/32
3	P-303-FP S-303-FP	2 1/16	1 1/4	1 3/4	15/16	1/2
4	P-304-FP S-304-FP	2 1/16	1 1/4	1 3/4	11/16	3/4
6	P-306-FP S-306-FP	2 1/16	1 1/4	1 3/4	15/16	3/4
8	P-308-FP S-308-FP	2 5/16	1 3/4	2 1/4	1 3/16	3/4
10	P-310-FP S-310-FP	2 5/16	1 3/4	2 1/4	1 1/2	3/4
12	P-312-FP S-312-FP	2 5/16	1 3/4	2 1/4	1 3/16	1

TYPE FHT WITH FLARED HOLE IN TOP

P-306-FHT

S-306-FHT



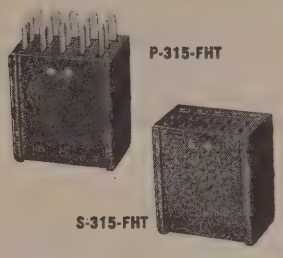
No. of Contacts	Part No.*	Tolerance: ±1/64" or ±.005" A	B	C	D
2	P-302-FHT S-302-FHT	21/32 Dia.	—	61/64	3/8
3	P-303-FHT S-303-FHT	1	7/16	61/64	5/16
4	P-304-FHT S-304-FHT	3/4	11/16	61/64	3/8
6	P-306-FHT S-306-FHT	1	11/16	1 3/64	5/16
8	P-308-FHT S-308-FHT	1 1/4	11/16	1 3/64	1/2
10	P-310-FHT S-310-FHT	1 5/16	11/16	1 13/64	1/2
12	P-312-FHT S-312-FHT	1 1/4	15/16	1 13/64	9/16

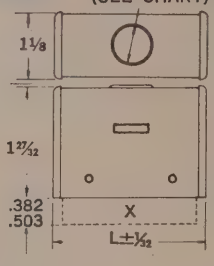
*P-Indicates Plug S-Indicates Socket.
X dimension is applicable to plugs only, with allowance made for pin float.
Y is the dimension for contact tail extension.
(CD) Indicates items normally available through Cinch Distributors.

TRW CINCH CONNECTORS

300 SERIES WITH STANDARD TERMINATION (cont'd)

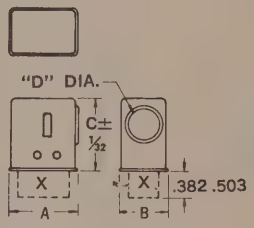
TYPE FHT WITH FLARED HOLE IN TOP (Cont'd)



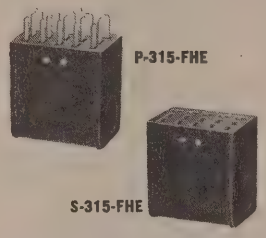


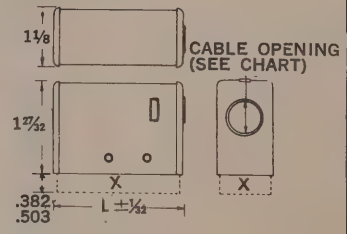
No. of Contacts	Part No.*	Dimensions In Inches L ±1/32	Cable Opening	Polarizing Contact Pin	Polarizing In Cont. or Pin Position
15	P-315-FHT S-315-FHT	1 11/16	5/16	No	—
18	P-318-FHT S-318-FHT	2	5/16	No	—
21	P-321-FHT S-321-FHT	2 5/16	5/8	No	—
24	P-324-FHT S-324-FHT	2 5/8	5/8	Yes	14
27	P-327-FHT S-327-FHT	2 15/16	5/8	Yes	14
30	P-330-FHT S-330-FHT	3 1/4	3/4	Yes	14
33	P-333-FHT S-333-FHT	3 5/16	3/4	Yes	17

TYPE FHE WITH FLARED HOLE IN END



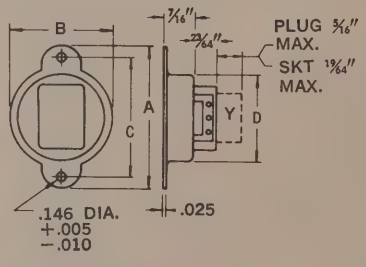
No. of Contacts	Part No.*	Dimensions In Inches Tolerance: ±1/64" or ±.005" A	B	C	D
2	P-302-FHE S-302-FHE	21/32 Dia.	—	61/64	5/16
3	P-303-FHE S-303-FHE	1	7/16	61/64	1/4
4	P-304-FHE S-304-FHE	3/4	11/16	61/64	3/8
6	P-306-FHE S-306-FHE	1	11/16	1 5/64	7/16
8	P-308-FHE S-308-FHE	1 1/4	11/16	1 5/64	1/2
10	P-310-FHE S-310-FHE	1 5/16	11/16	1 13/64	1/2
12	P-312-FHE S-312-FHE	1 1/4	15/16	1 13/64	9/16





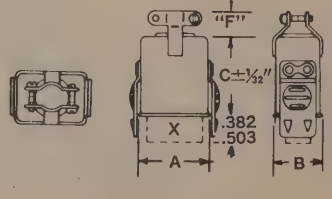
No. of Contacts	Part No.*	Dimensions In Inches L ±1/32	Cable Opening	Polarizing Contact Pin	Polarizing In Cont. or Pin Position
15	P-315-FHE S-315-FHE	1 11/16	5/16	No	—
18	P-318-FHE S-318-FHE	2	5/16	No	—
21	P-321-FHE S-321-FHE	2 5/16	5/8	No	—
24	P-324-FHE S-324-FHE	2 5/8	5/8	Yes	14
27	P-327-FHE S-327-FHE	2 15/16	5/8	Yes	14
30	P-330-FHE S-330-FHE	3 1/4	3/4	Yes	14
33	P-333-FHE S-333-FHE	3 5/16	3/4	Yes	17

TYPE RP WITH RECESSED PLATE



No. of Contacts	Ⓒ Ⓓ Part No.*	Dimensions In Inches Tolerance: ±1/64" or ±.005" A	B	C	D (Max.)
2	P-302-RP S-302-RP	2 1/16	1 1/2	1 3/4	1.350
3	P-303-RP S-303-RP	2 1/16	1 1/2	1 3/4	1.350
4	P-304-RP S-304-RP	2 1/16	1 1/2	1 3/4	1.350
6	P-306-RP S-306-RP	2 1/16	1 1/2	1 3/4	1.350
8	P-308-RP S-308-RP	2 5/16	2	2 1/4	1.850
10	P-310-RP S-310-RP	2 5/16	2	2 1/4	1.850
12	P-312-RP S-312-RP	2 5/16	2	2 1/4	1.850

TYPE CCT-L WITH CABLE CLAMP IN TOP OF CAP AND WITH LOCKS



No. of Contacts	Ⓒ Ⓓ Part No.*	Dimensions In Inches Tolerance: ±1/64" or ±.005" A	B	C	F	Cable Opening
2	P-302-CCT-L	21/32 Dia.	—	61/64	25/64	3/8
3	P-303-CCT-L	1	7/16	61/64	25/64	5/16
4	P-304-CCT-L	3/4	11/16	61/64	27/64	3/8
6	P-306-CCT-L	1	11/16	1 5/64	27/64	7/16
8	P-308-CCT-L	1 1/4	11/16	1 5/64	27/64	1/2
10	P-310-CCT-L	1 5/16	11/16	1 13/64	27/64	1/2
12	P-312-CCT-L	1 1/4	15/16	1 13/64	27/64	9/16

*P-Indicates Plug S-Indicates Socket

X dimension is applicable to plugs only, with allowance made for pin float.

Y is the dimension for contact tail extension.

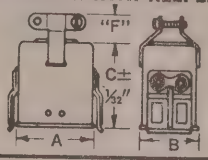
Ⓒ Ⓓ Indicates items normally available through Cinch Distributors.

TRW CINCH CONNECTORS

300 SERIES WITH STANDARD TERMINATION (cont'd)

TYPE CCT-K WITH CABLE CLAMP IN TOP OF CAP & WITH KEEPERS

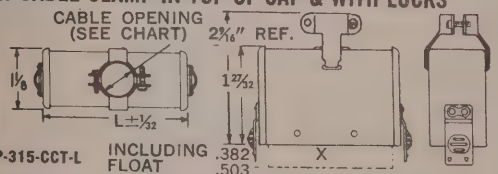
S-306-CCT-K



No. of Contacts	Part No.*	Dimensions In Inches Tolerance: ±1/64" or ±.005" A	B	C	F	Cable Opening
2	S-302-CCT-K	21/32 Dia.	—	61/64	25/64	3/8
3	S-303-CCT-K	1	7/16	61/64	25/64	5/16
4	S-304-CCT-K	3/4	11/16	61/64	27/64	3/8
6	S-306-CCT-K	1	11/16	15/64	27/64	7/16
8	S-308-CCT-K	1 1/4	11/16	15/64	27/64	1/2
10	S-310-CCT-K	1 5/16	11/16	1 13/64	27/64	1/2
12	S-312-CCT-K	1 1/4	15/16	1 13/64	27/64	9/16

TYPE CCT-L WITH CABLE CLAMP IN TOP OF CAP & WITH LOCKS

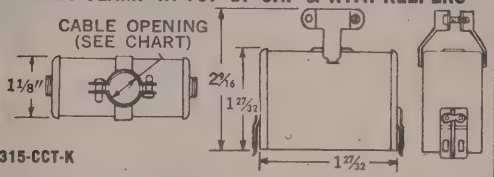
P-315-CCT-L



No. of Contacts	Part No.*	Dimensions In Inches L ±1/32	Cable Opening	Polarizing Contact Pin	Polarizing In Cont. Pin Pos.
15	P-315-CCT-L	1 11/16	9/16	No	—
18	P-318-CCT-L	2	9/16	No	—
21	P-321-CCT-L	2 5/16	5/8	No	—
24	P-324-CCT-L	2 5/8	5/8	Yes	14
27	P-327-CCT-L‡	2 15/16	5/8	Yes	14
30	P-330-CCT-L‡	3 1/4	3/4	Yes	14
33	P-333-CCT-L‡	3 9/16	3/4	Yes	17

TYPE CCT-K WITH CABLE CLAMP IN TOP OF CAP & WITH KEEPERS

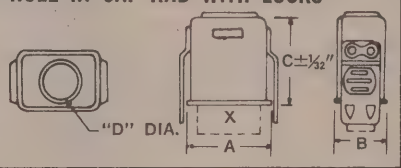
S-315-CCT-K



No. of Contacts	Part No.*	Dimensions In Inches L ±1/32	Cable Opening	Polarizing Contact Pin	Polarizing In Cont. Pin Pos.
15	S-315-CCT-K	1 11/16	9/16	No	—
18	S-318-CCT-K	2	9/16	No	—
21	S-321-CCT-K	2 5/16	5/8	No	—
24	S-324-CCT-K	2 5/8	5/8	Yes	14
27	S-327-CCT-K‡	2 15/16	5/8	Yes	14
30	S-330-CCT-K‡	3 1/4	3/4	Yes	14
33	S-333-CCT-K‡	3 9/16	3/4	Yes	17

TYPE FHT-L WITH FLARED HOLE IN CAP AND WITH LOCKS

P-306-FHT-L



No. of Contacts	Part No.*	Dimensions In Inches Tolerance: ±1/64" or .005" A	B	C	D
2	P-302-FHT-L	21/32 Dia.	—	61/64	3/8
3	P-303-FHT-L	1	7/16	61/64	5/16
4	P-304-FHT-L	3/4	11/16	61/64	3/8
6	P-306-FHT-L	1	11/16	15/64	7/16
8	P-308-FHT-L	1 1/4	11/16	15/64	1/2
10	P-310-FHT-L	1 5/16	11/16	1 13/64	1/2
12	P-312-FHT-L	1 1/4	15/16	1 13/64	9/16

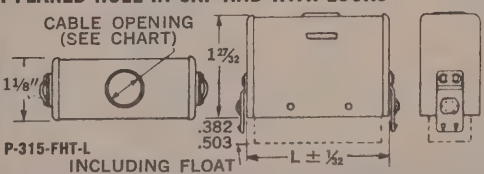
TYPE FHT-K WITH FLARED HOLE IN CAP AND WITH KEEPERS

S-306-FHT-K

No. of Contacts	Part No.*	Dimensions In Inches Tolerance: ±1/64" or .005" A	B	C	D
2	S-302-FHT-K	21/32 Dia.	—	61/64	3/8
3	S-303-FHT-K	1	7/16	61/64	5/16
4	S-304-FHT-K	3/4	11/16	61/64	3/8
6	S-306-FHT-K	1	11/16	15/64	7/16
8	S-308-FHT-K	1 1/4	11/16	15/64	1/2
10	S-310-FHT-K	1 5/16	11/16	1 13/64	1/2
12	S-312-FHT-K	1 1/4	15/16	1 13/64	9/16

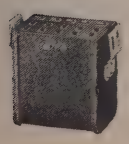
TYPE FHT-L WITH FLARED HOLE IN CAP AND WITH LOCKS

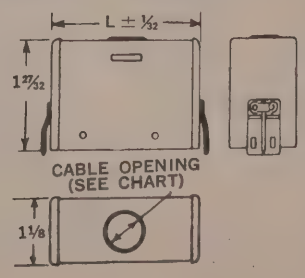
P-315-FHT-L



No. of Contacts	Part No.*	Dimensions In Inches L ±1/32	Cable Opening	Polarizing Contact Pin	Polarizing In Cont. Pin Pos.
15	P-315-FHT-L	1 11/16	9/16	No	—
18	P-318-FHT-L	2	9/16	No	—
21	P-321-FHT-L	2 5/16	5/8	No	—
24	P-324-FHT-L	2 5/8	5/8	Yes	14
27	P-327-FHT-L‡	2 15/16	5/8	Yes	14
30	P-330-FHT-L‡	3 1/4	3/4	Yes	14
33	P-333-FHT-L‡	3 9/16	3/4	Yes	17

TYPE FHT-K WITH FLARED HOLE IN CAP AND WITH KEEPERS


S-315-FHT-K



No. of Contacts	Part No.*	Dimensions In Inches L ±1/32	Cable Opening	Polarizing Contact Pin	Polarizing In Cont. Pin Pos.
15	S-315-FHT-K	1 11/16	9/16	No	—
18	S-318-FHT-K	2	9/16	No	—
21	S-321-FHT-K	2 5/16	5/8	No	—
24	S-324-FHT-K	2 5/8	5/8	Yes	14
27	S-327-FHT-K‡	2 15/16	5/8	Yes	14
30	S-330-FHT-K‡	3 1/4	3/4	Yes	14
33	S-333-FHT-K‡	3 9/16	3/4	Yes	17

*P-Indicates Plug S-Indicates Socket

‡Keepers and locks are centered on each side, not on each end as shown.

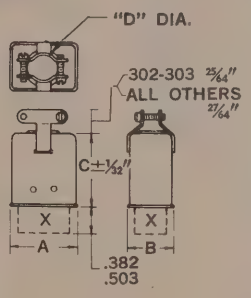
X dimension is applicable to plugs only, with allowance made for pin float.

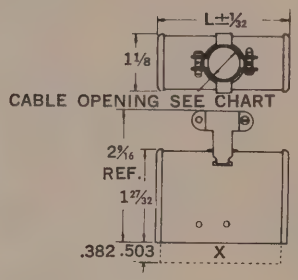
CD Indicates items normally available through Cinch Distributors.

TRW CINCH CONNECTORS

300 SERIES WITH STANDARD TERMINATION (cont'd)

TYPE CCT WITH CABLE CLAMP IN TOP

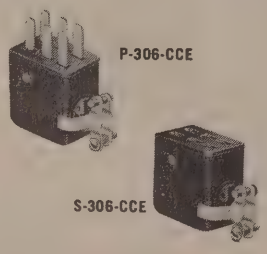


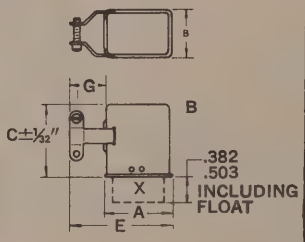


No. of Contacts	Part No.*	Dimensions In Inches Tolerance: ±1/64" or ±.005" A	B	C	D
2	P-302-CCT S-302-CCT	21/32 Dia.	—	61/64	3/8
3	P-303-CCT S-303-CCT	1	7/16	61/64	5/16
4	P-304-CCT S-304-CCT	3/4	11/16	61/64	3/8
6	P-306-CCT S-306-CCT	1	11/16	1 3/64	7/16
8	P-308-CCT S-308-CCT	1 1/4	11/16	1 3/64	1/2
10	P-310-CCT S-310-CCT	1 5/16	11/16	1 13/64	1/2
12	P-312-CCT S-312-CCT	1 1/4	15/16	1 13/64	9/16

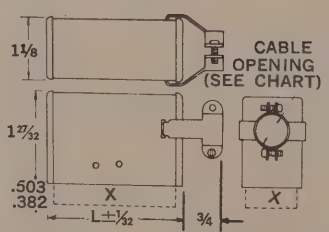
No. of Contacts	Part No.*	Dimensions In Inches L ±1/32	Cable Opening	Polarizing Contact Pin	Polarizing In Cont. Pin Pos.
15	P-315-CCT S-315-CCT	1 11/16	3/16	No	—
18	P-318-CCT S-318-CCT	2	3/16	No	—
21	P-321-CCT S-321-CCT	2 5/16	5/8	No	—
24	P-324-CCT S-324-CCT	2 5/8	5/8	Yes	14
27	P-327-CCT S-327-CCT	2 15/16	5/8	Yes	14
30	P-330-CCT S-330-CCT	3 1/4	3/4	Yes	14
33	P-333-CCT S-333-CCT	3 5/16	3/4	Yes	17

TYPE CCE WITH CABLE CLAMP IN END





No. of Contacts	Part No.*	Dimensions In Inches ±1/64" or ±.005" A	B	C	G	Cable Opening
2	P-302-CCE S-302-CCE	21/32 Dia.	—	61/64	3/16	5/16
3	P-303-CCE S-303-CCE	1	7/16	61/64	25/64	1/4
4	P-304-CCE S-304-CCE	3/4	11/16	61/64	27/64	3/8
6	P-306-CCE S-306-CCE	1	11/16	1 3/64	27/64	7/16
8	P-308-CCE S-308-CCE	1 1/4	11/16	1 3/64	27/64	1/2
10	P-310-CCE S-310-CCE	1 5/16	11/16	1 13/64	27/64	1/2
12	P-312-CCE S-312-CCE	1 1/4	15/16	1 13/64	27/64	9/16



No. of Contacts	Part No.*	Dimensions In Inches L ±1/32	Cable Opening	Polarizing Contact Pin	Polarizing In Cont. Pin Pos.
15	P-315-CCE S-315-CCE	1 11/16	3/16	No	—
18	P-318-CCE S-318-CCE	2	3/16	No	—
21	P-321-CCE S-321-CCE	2 5/16	5/8	No	—
24	P-324-CCE S-324-CCE	2 5/8	5/8	Yes	14
27	P-327-CCE S-327-CCE	2 15/16	5/8	Yes	14
30	P-330-CCE S-330-CCE	3 1/4	3/4	Yes	14
33	P-333-CCE S-333-CCE	3 5/16	3/4	Yes	17

"See pg. 10 cable clamp for CCE caps."

*P-Indicates Plug S-Indicates Socket

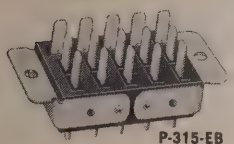
X dimension is applicable to plugs only, with allowance made for pin float.

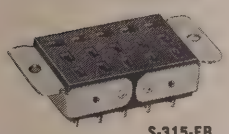
(CD) Indicates items normally available through Cinch Distributors.

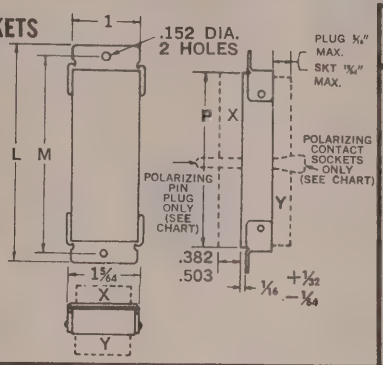
TRW CINCH CONNECTORS

300 SERIES WITH STANDARD TERMINATION (cont'd)

TYPE EB WITH END BRACKETS

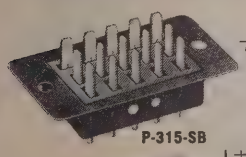

P-315-EB

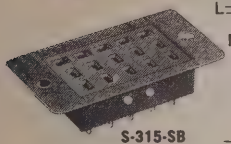

S-315-EB

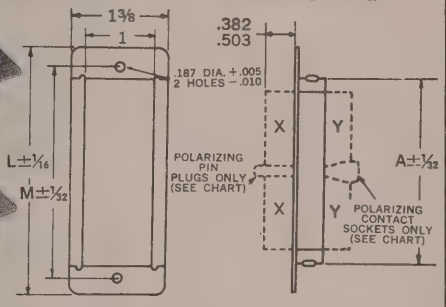


No. of Contacts	Part No.* (CD)	Dimensions In Inches L ±1/32	M ±1/32	P ±1/64	Polar. Contact Pins	Polar. In Cont. Pin Pos.
15	P-315-EB S-315-EB	2 5/16	2	1 5/8	No	—
18	P-318-EB S-318-EB	2 5/8	2 3/16	1 13/16	No	—
21	P-321-EB S-321-EB	2 13/16	2 5/8	2 1/4	No	—
24	P-324-EB S-324-EB	3 1/4	2 13/16	2 7/16	Yes	14
27	P-327-EB S-327-EB	3 7/16	3 1/4	2 7/8	Yes	14
30	P-330-EB S-330-EB	3 7/8	3 7/16	3 3/16	Yes	14
33	P-333-EB S-333-EB	4 3/16	3 7/8	3 1/2	Yes	17

TYPE SB WITH SHALLOW BRACKET FOR FLUSH MOUNTING


P-315-SB


S-315-SB

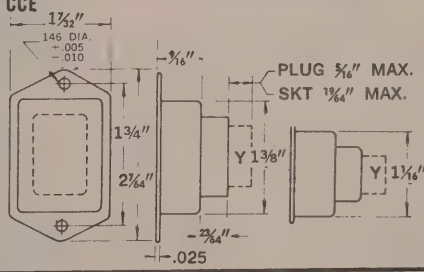


No. of Contacts	Part No.* (CD)	Dimensions In Inches A ±1/32	M ±1/32	L ±1/16	Polar. Contact Pins	Polar. In Cont. Pin Pos.
15	P-315-SB S-315-SB	1 11/16	2 1/8	2 35/64	No	—
18	P-318-SB S-318-SB	2	2 7/16	2 55/64	No	—
21	P-321-SB S-321-SB	2 5/16	2 3/4	3 11/64	No	—
24	P-324-SB S-324-SB	2 5/8	3 1/16	3 31/64	Yes	14
27	P-327-SB S-327-SB	2 13/16	3 3/8	3 51/64	Yes	14
30	P-330-SB S-330-SB	3 1/4	3 11/16	4 7/64	Yes	14
33	P-333-SB S-333-SB	3 5/16	4	4 27/64	Yes	17

TYPE DB WITH DEEP BRACKET FOR RECESSED MOUNTING
CANNOT BE USED WITH CCE

P-306-DB

S-306-DB

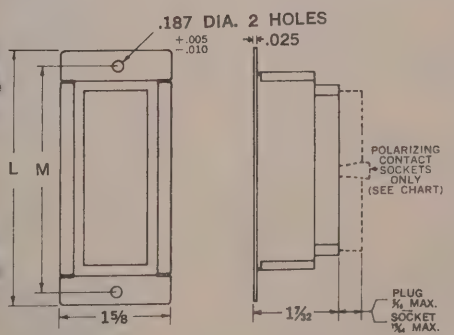


No. of Contacts	Part No.* (CD)
2	P-302-DB S-302-DB
3	P-303-DB S-303-DB
4	P-304-DB S-304-DB
6	P-306-DB S-306-DB
8	P-308-DB S-308-DB
12	P-312-DB S-312-DB

See Dimensions On Diagram

P-315-DB

S-315-DB



No. of Contacts	Part No.* (CD)	Dimensions In Inches L ±1/16	M ±1/32	Polarizing Contact Pins	Polarizing In Cont. Pin Pos.
15	P-315-DB S-315-DB	2 13/16	2 3/8	No	—
18	P-318-DB S-318-DB	3 1/8	2 11/16	No	—
21	P-321-DB S-321-DB	3 7/16	3	No	—
24	P-324-DB S-324-DB	3 3/4	3 5/16	Yes	14
27	P-327-DB S-327-DB	4 1/16	3 5/8	Yes	14
30	P-330-DB S-330-DB	4 3/8	3 15/16	Yes	14
33	P-333-DB S-333-DB	4 11/16	4 1/4	Yes	17

*P-Indicates Plug S-Indicates Socket

X dimension is applicable to plugs only, with allowance made for pin float.

Y is the dimension for contact tail extension.

(CD) Indicates items normally available through Cinch Distributors.

TRW CINCH CONNECTORS

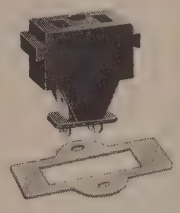
400 SERIES WITH STANDARD TERMINATION

The "400" Series plugs and sockets from the famous "Jones" line of quality components are rated for duty beyond the range of the 300 Series. Maximum rating is 1200 volts r.m.s. at 15 amperes.

400 Series plugs and sockets are available in sizes of 2, 4, 6, 8, 10 and 12 contacts, each size being polarized and suitable for either cap or panel mounting. "Knife-switch" type socket contacts are made of cadmium-plated phosphor bronze. These contacts engage both sides of the flat plug contacts, providing double the contact area.

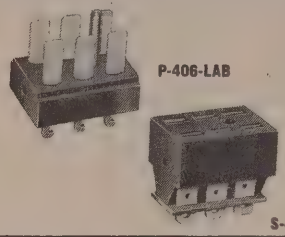
Plug prongs are made of cadmium-plated brass ¼" wide by 1/16" thick. Caps are finished in black wrinkle and equipped with insulating lining. Other finishes and material available. Consult factory.

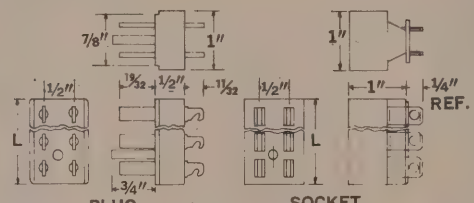
Should a connector be required which is rated for higher voltages, the "Jones" 2400 Series plugs and sockets are similar to the 400 Series except that the 2400 Series has a higher voltage rating.



Note: The 2-contact angle bracket (AB) type socket will not accept the standard angle bracket as shown in the S-406-AB illustration below. Instead, a special bracket is supplied for mounting to a panel or chassis. The illustration at the left shows the S-402-AB socket with the special bracket.

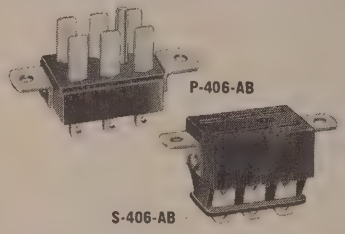
TYPE LAB LESS ANGLE BRACKETS

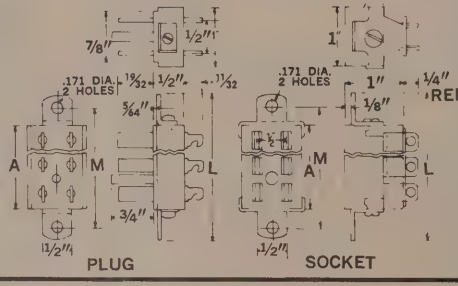




No. of Contacts	Part No.*	Dimensions In Inches ±1/64" L
2	P-402-LAB S-402-LAB	5/16
4	P-404-LAB S-404-LAB	1
6	P-406-LAB S-406-LAB	1 7/16
8	P-408-LAB S-408-LAB	1 7/8
10	P-410-LAB S-410-LAB	2 5/16
12	P-412-LAB S-412-LAB	2 3/4

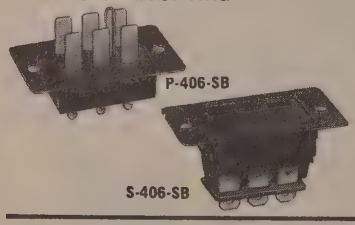
TYPE AB WITH ANGLE BRACKETS

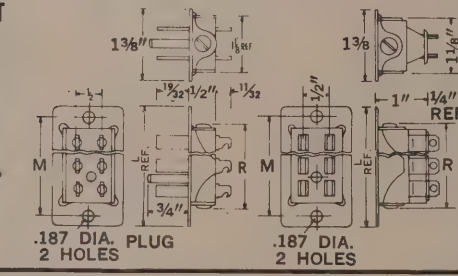




No. of Contacts	Part No.*	Dimensions In Inches ±1/64" A	M	L
2	P-402-AB S-402-AB	5/16	1 3/16	1 19/32
4	P-404-AB S-404-AB	1	1 5/8	2 1/32
6	P-406-AB S-406-AB	1 7/16	2 1/16	2 13/32
8	P-408-AB S-408-AB	1 7/8	2 1/2	2 29/32
10	P-410-AB S-410-AB	2 5/16	2 13/16	3 11/32
12	P-412-AB S-412-AB	2 3/4	3 3/8	3 25/32

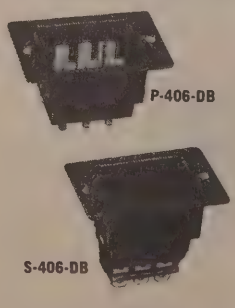
TYPE SB WITH SHALLOW BRACKET FOR FLUSH MOUNTING

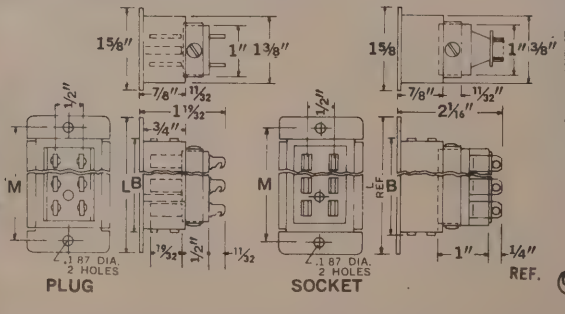




No. of Contacts	Part No.*	Dimensions In Inches ±1/64" L	M	R(Max.)
2	P-402-SB S-402-SB	1 1/2	1 1/16	49/64
4	P-404-SB S-404-SB	1 13/16	1 1/2	1 15/64
6	P-406-SB S-406-SB	2 3/8	1 13/16	1 43/64
8	P-408-SB S-408-SB	2 13/16	2 3/8	2 7/64
10	P-410-SB S-410-SB	3 1/4	2 13/16	2 35/64
12	P-412-SB S-412-SB	3 11/16	3 1/4	2 63/64

TYPE DB WITH DEEP BRACKET FOR RECESSED MOUNTING





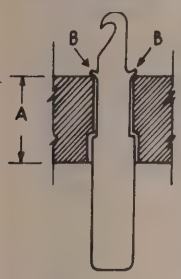
No. of Contacts	Part No.*	Dimensions In Inches ±1/64" B	L	M
2	P-402-DB S-402-DB	5/64	1 3/4	1 5/16
4	P-404-DB S-404-DB	1 23/64	2 1/16	1 3/4
6	P-406-DB S-406-DB	1 51/64	2 5/8	2 1/16
8	P-408-DB S-408-DB	2 15/64	3 1/16	2 5/8
10	P-410-DB S-410-DB	2 43/64	3 1/2	3 1/16
12	P-412-DB S-412-DB	3 7/64	3 15/16	3 1/2

*P-Indicates Plug S-Indicates Socket

(CD) Indicates items normally available through Cinch Distributors.

TRW CINCH CONNECTORS

400 SERIES WITH STANDARD TERMINATION (cont'd)

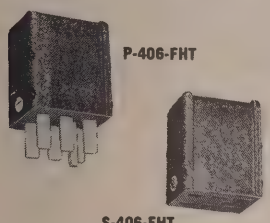


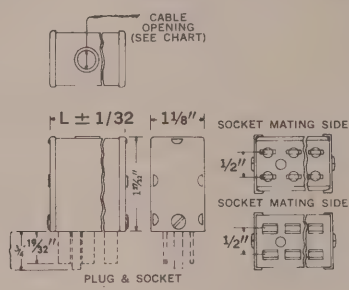
NOTE REGARDING LOOSE CONTACTS ON 400 SERIES PLUGS

This illustration shows the method of staking 400 Series plug contacts in the phenolic body. Manufacturing tolerances permit a slight variation in the "A" dimension during the molding process. Thus, in some instances the fit between the contact and the body at points "B" may not be perfectly snug. When this condition occurs, the contact appears to be "loose" in the connector body. However, the security of the contact is in no way jeopardized and the performance of the connector is not impaired.

It is recommended that personnel responsible for inspection and installation of the connectors be informed of this condition to avoid unnecessary delays and correspondence arising from a mistaken conclusion that the connectors are faulty. In case of doubt, however, it is advisable to check with the local Cinch representative or contact the factory before any action is taken.

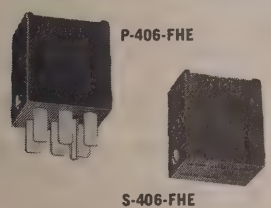
TYPE FHT WITH FLARED HOLE IN TOP

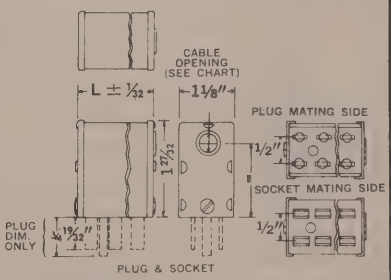




No. of Contacts	Part No.*	Dimensions In Inches L ±1/32"	Cable Opening ±1/64"
2	P-402-FHT S-402-FHT	5/8	3/16
4	P-404-FHT S-404-FHT	1 1/16	7/16
6	P-406-FHT S-406-FHT	1 1/2	7/16
8	P-408-FHT S-408-FHT	1 15/16	9/16
10	P-410-FHT S-410-FHT	2 3/8	9/16
12	P-412-FHT S-412-FHT	2 13/16	5/8

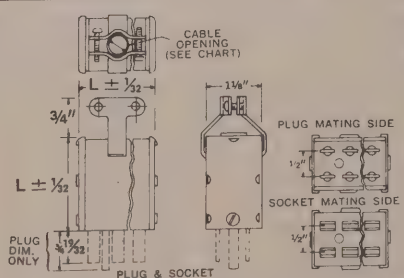
TYPE FHE WITH FLARED HOLE IN END





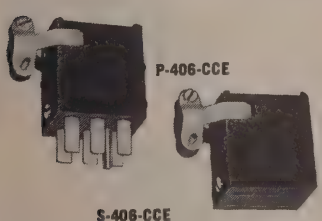
No. of Contacts	Part No.*	Dimensions In Inches F	L ±1/32"	Cable Opening ±1/64"
2	P-402-FHE S-402-FHE	1 3/8	5/8	3/8
4	P-404-FHE S-404-FHE	1 3/8	1 1/16	7/16
6	P-406-FHE S-406-FHE	1 3/8	1 1/2	7/16
8	P-408-FHE S-408-FHE	1 11/32	1 15/16	9/16
10	P-410-FHE S-410-FHE	1 11/32	2 3/8	9/16
12	P-412-FHE S-412-FHE	1 5/16	2 13/16	5/8

TYPE CCT WITH CABLE CLAMP IN TOP

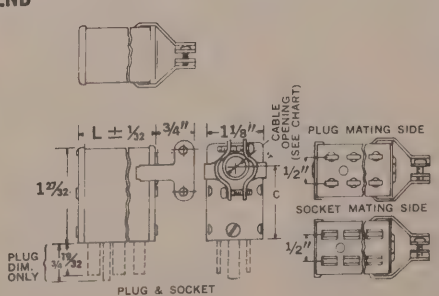


No. of Contacts	Ⓒ Part No.*	Dimensions In Inches L ±1/32"	Cable Opening ±1/64"
2	P-402-CCT S-402-CCT	5/8	3/16
4	P-404-CCT S-404-CCT	1 1/16	7/16
6	P-406-CCT S-406-CCT	1 1/2	7/16
8	P-408-CCT S-408-CCT	1 15/16	9/16
10	P-410-CCT S-410-CCT	2 3/8	9/16
12	P-412-CCT S-412-CCT	2 13/16	5/8

TYPE CCE WITH CABLE CLAMP IN END



"See p. 9 cable clamp for CCE Caps"



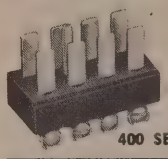
No. of Contacts	Ⓒ Part No.*	Dimensions In Inches L ±1/32"	C	Cable Opening ±1/64"
2	P-402-CCE S-402-CCE	5/8	1 3/8	3/8
4	P-404-CCE S-404-CCE	1 1/16	1 3/8	7/16
6	P-406-CCE S-406-CCE	1 1/2	1 3/8	7/16
8	P-408-CCE S-408-CCE	1 15/16	1 11/32	9/16
10	P-410-CCE S-410-CCE	2 3/8	1 11/32	9/16
12	P-412-CCE S-412-CCE	2 13/16	1 5/16	5/8

*P-Indicates Plug S-Indicates Socket

Ⓒ Indicates items normally available through Cinch Distributors.

TRW CINCH CONNECTORS

400 SERIES — WITH SCREW TERMINALS



400 SERIES PLUG

400 SERIES SOCKET

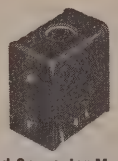
400 SERIES PLUGS AND SOCKETS WITH SCREW TERMINALS

In addition to the solder-type terminals, the 400 Series is also available with screw terminals as listed below. The plug and socket bodies are of slightly different construction from those used with the standard solder-type. This is necessary in order to accommodate the screw terminals. However, the overall dimensions for installation purposes are compatible with the standard type. (To order see top pg. 11.)

No. of Contacts	Type LAB (Less Angle Brackets) Part No.*	Type AB (With Angle Brackets) Part No.*	Type SB (With Shallow Bracket) Part No.*	Type DB (With Deep Bracket) Part No.*	Type FHT (With Flared Hole in Top) Part No.*	Type FHE (With Flared Hole in End) Part No.*	Type CCT (With Cable Clamp in Top) Part No.*	Type CCE (With Cable Clamp in End) Part No.*
2	P-402-LAB-ST SS-402-LAB-ST	P-402-AB-ST SS-402-AB-ST	P-402-SB-ST SS-402-SB-ST	P-402-DB-ST SS-402-DB-ST	P-402-FHT-ST SS-402-FHT-ST	P-402-FHE-ST SS-402-FHE-ST	P-402-CCT-ST SS-402-CCT-ST	P-402-CCE-ST SS-402-CCE-ST
4	P-404-LAB-ST SS-404-LAB-ST	P-404-AB-ST SS-404-AB-ST	P-404-SB-ST SS-404-SB-ST	P-404-DB-ST SS-404-DB-ST	P-404-FHT-ST SS-404-FHT-ST	P-404-FHE-ST SS-404-FHE-ST	P-404-CCT-ST SS-404-CCT-ST	P-404-CCE-ST SS-404-CCE-ST
6	P-406-LAB-ST SS-406-LAB-ST	P-406-AB-ST SS-406-AB-ST	P-406-SB-ST SS-406-SB-ST	P-406-DB-ST SS-406-DB-ST	P-406-FHT-ST SS-406-FHT-ST	P-406-FHE-ST SS-406-FHE-ST	P-406-CCT-ST SS-406-CCT-ST	P-406-CCE-ST SS-406-CCE-ST
8	P-408-LAB-ST SS-408-LAB-ST	P-408-AB-ST SS-408-AB-ST	P-408-SB-ST SS-408-SB-ST	P-408-DB-ST SS-408-DB-ST	P-408-FHT-ST SS-408-FHT-ST	P-408-FHE-ST SS-408-FHE-ST	P-408-CCT-ST SS-408-CCT-ST	P-408-CCE-ST SS-408-CCE-ST
10	P-410-LAB-ST SS-410-LAB-ST	P-410-AB-ST SS-410-AB-ST	P-410-SB-ST SS-410-SB-ST	P-410-DB-ST SS-410-DB-ST	P-410-FHT-ST SS-410-FHT-ST	P-410-FHE-ST SS-410-FHE-ST	P-410-CCT-ST SS-410-CCT-ST	P-410-CCE-ST SS-410-CCE-ST
12	P-412-LAB-ST SS-412-LAB-ST	P-412-AB-ST SS-412-AB-ST	P-412-SB-ST SS-412-SB-ST	P-412-DB-ST SS-412-DB-ST	P-412-FHT-ST SS-412-FHT-ST	P-412-FHE-ST SS-412-FHE-ST	P-412-CCT-ST SS-412-CCT-ST	P-412-CCE-ST SS-412-CCE-ST

*P-Indicates Plug SS-Indicates Sockets

AUXILIARY LOCKING ARRANGEMENTS



Capped Connector Member Showing Extrusion for Engaged Auxiliary Lock

Auxiliary Lock 63A Factory No. 422-12-14-012

Complete Auxiliary Locking Assembly

AUXILIARY LOCK 63A — FACTORY NO. 422-12-14-012

Where connectors are subject to shock or vibration, the Auxiliary Locking Arrangement (No. 63A) is recommended. It can be used with the 300 Series end bracket (EB), shallow bracket (SB) or deep bracket (DB) types. It consists of a set of spring locks secured by the mounted bolts which engage extrusions on the cap creating a secure, shakeproof mating condition.

The No. 63A locks must be ordered separately, one pair for each plug and socket. The part numbers for the plugs and sockets with the special extrusions on the caps are found in the table below. Note that there are two types of caps, one with extrusions placed for end bracket or shallow bracket mates (S-type) and the other for deep bracket mates (D-type).

IMPORTANT: As indicated below, the caps with the S-type mates are the only ones which can be used with FHE and CCE plugs and sockets.

PLUGS AND SOCKETS WITH D-TYPE EXTRUSIONS

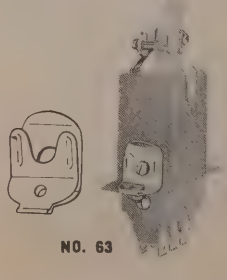
For Deep Bracket (DB) Mates

PLUGS AND SOCKETS WITH S-TYPE EXTRUSIONS

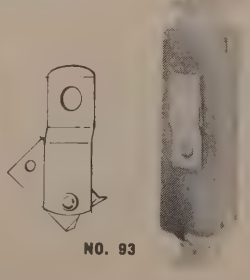
For Shallow Bracket (SB) and End Bracket (EB) Mates

No. of Contacts	Type FHT (With Flared Hole in Top) Part No.*	Type CCT (With Cable Clamp in Top) Part No.*	Type FHT (With Flared Hole in Top) Part No.*	Type CCT (With Cable Clamp in Top) Part No.*	Type CCE (With Cable Clamp in End) Part No.*
15	P-315-FHT-63A-DB S-315-FHT-63A-DB	P-315-CCT-63A-DB S-315-CCT-63A-DB	P-315-FHT-63A-SB S-315-FHT-63A-SB	P-315-CCT-63A-SB S-315-CCT-63A-SB	P-315-CCE-63A-SB S-315-CCE-63A-SB
18	P-318-FHT-63A-DB S-318-FHT-63A-DB	P-318-CCT-63A-DB S-318-CCT-63A-DB	P-318-FHT-63A-SB S-318-FHT-63A-SB	P-318-CCT-63A-SB S-318-CCT-63A-SB	P-318-CCE-63A-SB S-318-CCE-63A-SB
21	P-321-FHT-63A-DB S-321-FHT-63A-DB	P-321-CCT-63A-DB S-321-CCT-63A-DB	P-321-FHT-63A-SB S-321-FHT-63A-SB	P-321-CCT-63A-SB S-321-CCT-63A-SB	P-321-CCE-63A-SB S-321-CCE-63A-SB
24	P-324-FHT-63A-DB S-324-FHT-63A-DB	P-324-CCT-63A-DB S-324-CCT-63A-DB	P-324-FHT-63A-SB S-324-FHT-63A-SB	P-324-CCT-63A-SB S-324-CCT-63A-SB	P-324-CCE-63A-SB S-324-CCE-63A-SB
27	P-327-FHT-63A-DB S-327-FHT-63A-DB	P-327-CCT-63A-DB S-327-CCT-63A-DB	P-327-FHT-63A-SB S-327-FHT-63A-SB	P-327-CCT-63A-SB S-327-CCT-63A-SB	P-327-CCE-63A-SB S-327-CCE-63A-SB
30	P-330-FHT-63A-DB S-330-FHT-63A-DB	P-330-CCT-63A-DB S-330-CCT-63A-DB	P-330-FHT-63A-SB S-330-FHT-63A-SB	P-330-CCT-63A-SB S-330-CCT-63A-SB	P-330-CCE-63A-SB S-330-CCE-63A-SB
33	P-333-FHT-63A-DB S-333-FHT-63A-DB	P-333-CCT-63A-DB S-333-CCT-63A-DB	P-333-FHT-63A-SB S-333-FHT-63A-SB	P-333-CCT-63A-SB S-333-CCT-63A-SB	P-333-CCE-63A-SB S-333-CCE-63A-SB

*P-Indicates Plug S-Indicates Socket



NO. 63



NO. 93

AUXILIARY LOCK NO. 63 — FACTORY NO. 422-12-14-011

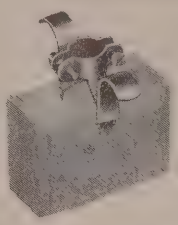
Spring Lock For Use With 400 Series Panel-Mounted Plugs and Sockets: Can be used with Type AB or SB. Proper operation requires that the mounted plug or socket body be flush with the top of the panel. The standard binder head screws furnished for fastening the mating connector body to a cap must be replaced by filister head screws.

AUXILIARY LOCK NO. 93 — FACTORY NO. 319-01-99-003

Extension-Cable Lock For Use With 400 Series: Can be used with any 400 Series unmounted (cap-type) plug or socket when both mating units are attached to cables. The lock is attached to the plug cap with the screw which holds the cap to the connector body. The binder head screws in the socket cap must be replaced with filister head screws and the opening in the lock snaps over the filister head screws, completing the lock.

TRW CINCH CONNECTORS

NO. 121



NO. 120

No. S-2408-CCE with #21851

COMBINATION CABLE CLAMPS AND HANDLES

These units provide relief from strain on connector wiring and also facilitate connector separation in close quarters. Can be used for both plugs and sockets. Cap is not included.

No. 120 fits all Type CCT plugs and sockets of the 400 and 2400 Series and 15-33 contact plugs and sockets of the 300 Series.

No. 121 fits the following Type FHT plugs and sockets of the 300, 400 and 2400 Series: 300 Series — 24, 27, 30 and 33 contact; 400 Series — 10 and 12 contact; 2400 Series — 10 and 12 contact.

CABLE CLAMP FOR CCE CAPS — When Used with Deep Bracket

When ordering CCE caps for 315-333, 402-412, 2402-2412 Series plugs or sockets that are to be mated with DB plugs or sockets specify cable clamp No. 21851. (For example, P-2408-CCE with No. 2185.) There is no difference in price. Standard cable clamps normally furnished with all CCE will mate with SB plugs and sockets only.

2400 SERIES WITH STANDARD TERMINATION

Cross-section of 2400 Series socket showing four-surfaced contact with plug prong.

IMPORTANT NOTICE

All 2400 Series plugs and sockets are available with "early mate" grounding connections that engage before contacts mate. To order, simply add letter "G" to part number desired.

Example:

Plug without grounding pin P-2402-LAB
Plug with grounding pin PG-2402-LAB
Socket without grounding terminal S-2402-LAB
Socket with grounding terminal SG-2402-LAB

The "Jones" 2400 Series plugs and sockets are designed for excellent electrical and mechanical performance. Ratings for the 2400 Series **voltage** (for which the 2400 Series carries a 50% higher rating). Note the electrical rating chart on the inside front cover.

A unique socket contact designed is utilized in the 2400 Series as shown in the above illustration. Four individual flexing surfaces make contact make contact over practically their entire length. Note in the illustration how they exert maximum pressure at every point. Also note the unique method of anchoring terminals in the block — they cannot be moved up or down.

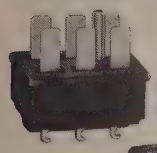
The contact-to-contact and contact-to-ground distance has been considerabiy increased by mounting the contacts into recessed pockets with a phenolic barrier surrounding and extending above. This method is used on both the top and bottom side of both plugs and sockets, greatly increasing the leakage path.

All units of the 2400 Series are interchangeable with corresponding units of the 400 Series. The same 2, 4, 6, 8, 10 and 12-contact plug and socket sizes are available, each size being polarized and suitable for either cap or panel mounting.

Plug and socket bodies are molded of general purpose black phenolic. Socket prongs are of heavy brass ¼" x 1/16", cadmium-plated. The formed metal caps have a black wrinkle finish with insulating liners.

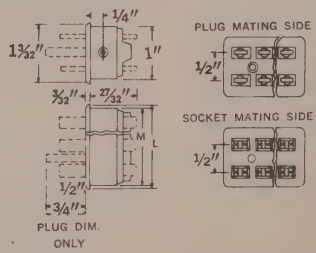
A shoulder extends around the mating side of the 2400 Series plug and socket presenting a finished appearance when mounted in bracket or cap. Because of this shoulder, when angle brackets are used, they must first be removed from the plug or socket. The unit is then inserted into the chassis with the brackets replaced underneath the panel.

TYPE LAB (LESS ANGLE BRACKETS)



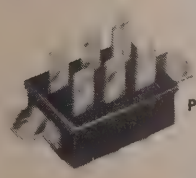
P-2406-LAB

S-2406-LAB



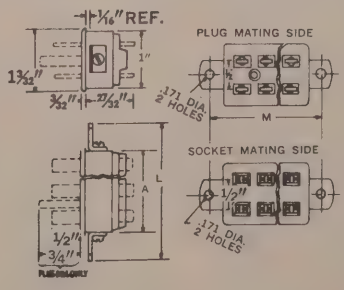
No. of Contacts	Part No.* (CD)	Dim. In Inches ±1/64" L	M
2	P-2402-LAB S-2402-LAB	21/32	9/16
4	P-2404-LAB S-2404-LAB	1 3/32	1
6	P-2406-LAB S-2406-LAB	1 17/32	1 7/16
8	P-2408-LAB S-2408-LAB	1 33/32	1 7/8
10	P-2410-LAB S-2410-LAB	2 13/32	2 5/16
12	P-2412-LAB S-2412-LAB	2 27/32	2 3/4

TYPE AB (WITH ANGLE BRACKETS)



P-2406-AB

S-2406-AB



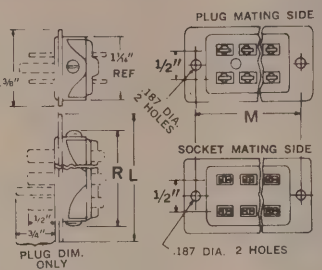
No. of Contacts	Part No.*	Dim. In Inches ±1/64" L	M	A
2	P-2402-AB S-2402-AB	1 19/32	1 3/16	9/16
4	P-2404-AB S-2404-AB	2 1/32	1 5/8	1
6	P-2406-AB S-2406-AB	2 15/32	2 1/16	1 7/16
8	P-2408-AB S-2408-AB	2 29/32	2 1/2	1 7/8
10	P-2410-AB S-2410-AB	3 1/32	2 15/16	2 5/16
12	P-2412-AB S-2412-AB	3 23/32	3 3/8	2 3/4

*P-Indicates Plug S-Indicates Socket
(CD) Indicates items normally available through Cinch Distributors.

TRW CINCH CONNECTORS

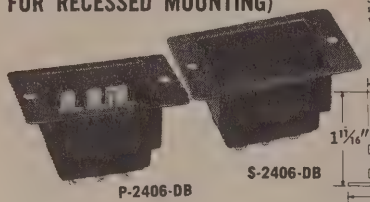
2400 SERIES WITH STANDARD TERMINATION (cont'd)

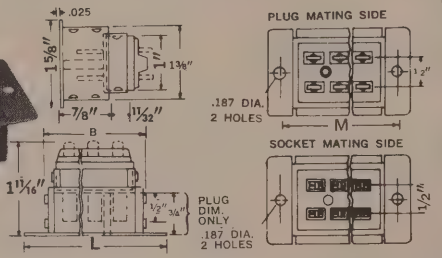
TYPE SB (WITH SHALLOW BRACKET FOR FLUSH MOUNTING)



No. of Contacts	Part No.*	Dim. In Inches R ±1/16"	L ±1/64	M ±1/64
2	P-2402-SB S-2402-SB	1⅜	1½	1⅛
4	P-2404-SB S-2404-SB	1¼	1 15/16	1½
6	P-2406-SB S-2406-SB	1 11/16	2⅜	1 15/16
8	P-2408-SB S-2408-SB	2⅛	2 13/16	2⅜
10	P-2410-SB S-2410-SB	2 5/16	3¼	2 13/16
12	P-2412-SB S-2412-SB	3	3 11/16	3¼

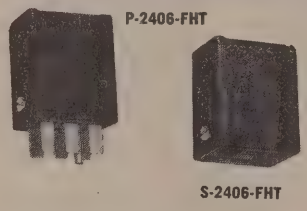
TYPE DB (WITH DEEP BRACKET FOR RECESSED MOUNTING)

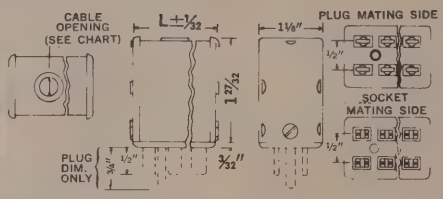




No. of Contacts	Part. No.*	Dim. In Inches B ±1/64"	L ±1/16"	M ±1/32"
2	P-2402-DB S-2402-DB	1 5/16	1¾	1 5/16
4	P-2404-DB S-2404-DB	1⅜	2 1/16	1¾
6	P-2406-DB S-2406-DB	1 13/16	2⅝	2 1/16
8	P-2408-DB S-2408-DB	2¼	3 1/16	2⅝
10	P-2410-DB S-2410-DB	2 11/16	3½	3 1/16
12	P-2412-DB S-2412-DB	3⅛	3 15/16	3½

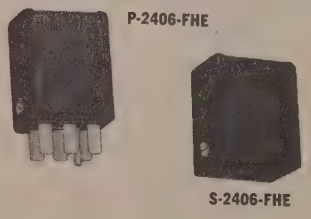
TYPE FHT (WITH FLARED HOLE IN TOP)

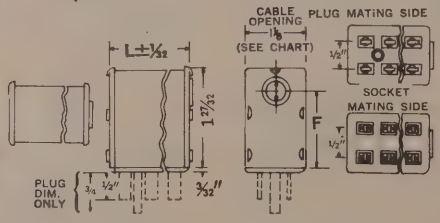




No. of Contacts	Part. No.*	Dim. In Inches Cable Opening	L ±1/32"
2	P-2402-FHT S-2402-FHT	5/16	5/8
4	P-2404-FHT S-2404-FHT	7/16	1 1/16
6	P-2406-FHT S-2406-FHT	7/16	1½
8	P-2408-FHT S-2408-FHT	9/16	1 15/16
10	P-2410-FHT S-2410-FHT	9/16	2⅜
12	P-2412-FHT S-2412-FHT	5/8	2 13/16

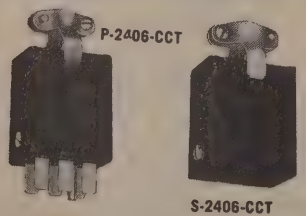
TYPE FHE (WITH FLARED HOLE IN END)

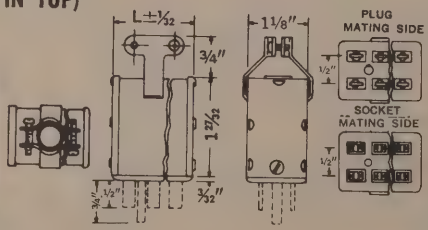




No. of Contacts	Part. No.*	Dim. In Inches Cable Opening	L ±1/32"	F ±1/32"
2	P-2402-FHE S-2402-FHE	3/8	5/8	1 3/8
4	P-2404-FHE S-2404-FHE	7/16	1 1/16	1 3/8
6	P-2406-FHE S-2406-FHE	7/16	1½	1 3/8
8	P-2408-FHE S-2408-FHE	9/16	1 15/16	1 17/32
10	P-2410-FHE S-2410-FHE	9/16	2 3/8	1 17/32
12	P-2412-FHE S-2412-FHE	5/8	2 13/16	1 5/16

TYPE CCT (WITH CABLE CLAMP IN TOP)





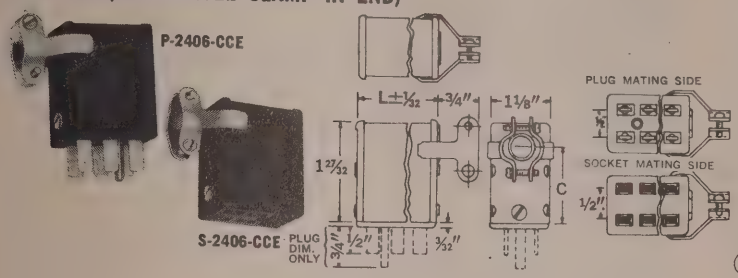
No. of Contacts	Part. No.*	Dim. In Inches L ±1/32"	Cable Opening
2	P-2402-CCT S-2402-CCT	5/8	5/16
4	P-2404-CCT S-2404-CCT	1 1/16	7/16
6	P-2406-CCT S-2406-CCT	1½	7/16
8	P-2408-CCT S-2408-CCT	1 15/16	9/16
10	P-2410-CCT S-2410-CCT	2 3/8	9/16
12	P-2412-CCT S-2412-CCT	2 13/16	5/8

(CD) Indicates items normally available through Cinch Distributors.
*P-Indicates Plug S-Indicates Socket

TRW CINCH CONNECTORS

2400 SERIES WITH STANDARD TERMINATION (cont'd)

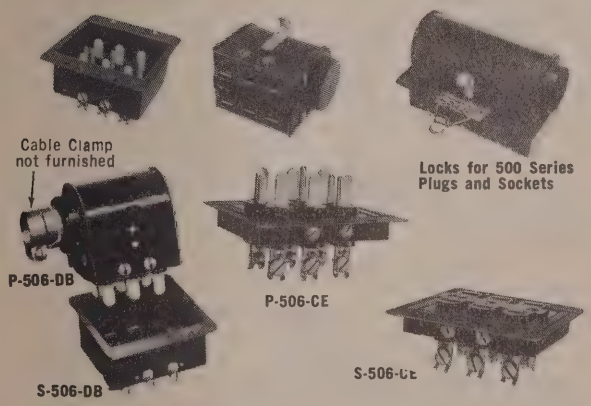
TYPE CCE (WITH CABLE CLAMP IN END)



No. of Contacts	Part No.*	L ±1/32"	C ±1/32"	Cable Opening
2	P-2402-CCE S-2402-CCE	5/8	1 3/8	3/8
4	P-2404-CCE S-2404-CCE	1 1/16	1 3/8	7/16
6	P-2406-CCE S-2406-CCE	1 1/2	1 3/8	7/16
8	P-2408-CCE S-2408-CCE	1 15/16	1 11/32	9/16
10	P-2410-CCE S-2410-CCE	2 3/8	1 11/32	9/16
12	P-2412-CCE S-2412-CCE	2 13/16	1 5/16	5/8

(CD) Indicates items normally available through Cinch Distributors.
*P-Indicates Plug S-Indicates Socket

500 SERIES — WITH STANDARD SCREW TERMINALS / MOUNTING DATA



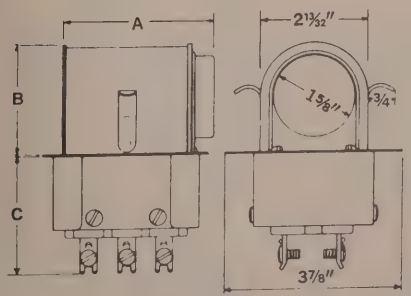
No. 500-L Lock fits any deep bracket and cap combination. It holds securely, but can be released instantly. The lock is fastened by the same screw or rivet that holds the deep bracket to the panel. Two locks are required. Cannot be used on shallow brackets.

The "Jones" 500 Series plugs and sockets are designed for use in extremely heavy-duty applications. Ratings are somewhat dependent on the parameters of the associated circuitry, but maximum voltage is nominally 3000 volts and maximum current is nominally 25 amperes per contact. Wattage per contact should not exceed 5000 watts.

500 Series plugs and sockets are available in sizes of 2, 4, 6, 8, 10 and 12 contacts, each size being polarized so as to prevent accidental mismating with any other size. The units have been designed to allow maximum accessibility under plug caps for making terminal connections and also subsequent inspection. Plug and socket blocks will accept all appropriately-sized caps and brackets interchangeably.

Male contacts are brass and female contacts are phosphor bronze, cadmium-plated. Metal parts of caps and brackets are steel and made rustproof by parkerizing. All caps are insulated with canvas bakelite. Plug prong cross section is 5/16" by 3/32".

IMPORTANT: When used with high voltages present, it is recommended that a deep bracket type (DB) be used as one plug or socket and that its mate has a cap. Shallow brackets (Type SB) are for use only in connecting to mates of the same type.



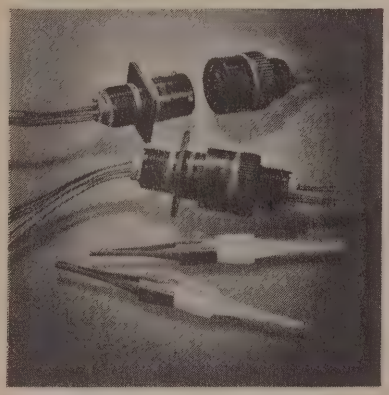
For Type DB connectors, dimension B is 2 1/4" and Dimension C is 2 5/8" reference on the socket and 2 1/16" reference on the plug. For Type SB connectors, dimension C is 1 3/16", cap height is 2 37/64".

No. of Contacts	(CD) Type DB (With Deep Bracket for Recess Mounting) Type DB Part No.*	(CD) Type CE (With Cap) Type CE Part No.*	Type SB (With (CD) Shallow Bracket for Flush Mounting) Type SB Part No.*	Dimen. "A"
2	P-502-DB S-502-DB	P-502-CE S-502-CE	P-502-SB S-502-SB	1 11/16"
4	P-504-DB S-504-DB	P-504-CE S-504-CE	P-504-SB S-504-SB	2 1/2"
6	P-506-DB S-506-DB	P-506-CE S-506-CE	P-506-SB S-506-SB	3 5/16"
8	P-508-DB S-508-DB	P-508-CE S-508-CE	P-508-SB S-508-SB	4 1/8"
10	P-510-DB S-510-DB	P-510-CE S-510-CE	P-510-SB S-510-SB	4 15/16"
12	P-512-DB S-512-DB	P-512-CE S-512-CE	P-512-SB S-512-SB	5 3/4"

*P-Indicates Plug S-Indicates Socket
(CD) Indicates items normally available through Cinch Distributors.

TRW CINCH CONNECTORS

NUCON MIL-C-83723 SERIES III CYLINDRICAL CONNECTORS



The TRW Cinch Nucon Series of cylindrical connectors are built to exceed the specifications of MIL-C-83723 Series III. The design combines the exacting high reliability miniature connector specifications of MIL-C-26500 with a rear-release contact retention system.

The series features an all-plastic retention disc, thus eliminating the metal clips that shorten the insulation resistance path. The user therefore obtains maximum insulation protection in a miniature connector design. The shells are totally machined from aluminum bar stock to ensure close tolerances and uniformity.

The closed entry-socket side insulator has a lead-in chamfer that will not accept a pin contact that is bent beyond a pre-established limit. The interfacial seal on the pin side has raised barriers around each pin. When the connector is mated, barriers displace into the socket chamfers to provide a positive moisture seal.

The Nucon Series utilizes the same plastic tool specified for use with most qualified rear-release connectors. The tool is designed to break before damaging the connector if it is misused by the assembler.

The Nucon Series is made in a full range of shell sizes from 8 through 24 and both square flange and single hole mounting are available.

PERFORMANCE CHARACTERISTICS

Durability: No detrimental damage after 500 mating-unmating cycles.

Corrosion: Salt spray test per method 1001, condition B, MIL-STD-1344: no exposure of basis metal affecting performance.

Moisture Resistance: 100 megohms or greater at 25°C when tested per MIL-STD-1344, Method 1002.

Dielectric Withstanding Voltage: Sea level test per Method 3001 of MIL-STD-1344.

Altitude Immersion: 1000 megohms or greater when tested per MIL-STD-1344, Method 1004. Temperature Cycling: Tested per Condition C, Method 102, MIL-STD-202.

Vibration: No discontinuity longer than 1 microsecond per Method 214, MIL-STD-202.

MATERIALS AND FINISHES

Pin and Socket Contacts: Copper base alloy gold plated per MIL-G-45204 over suitable underplate.

Shells: Aluminum Alloy.

Finish: Conductive (Electroless Nickel); Non-conductive (Anodized).

Retention Disc: Temperature and fluid resistant thermoplastic.

Physical Shock: No discontinuity greater than 1 microsecond during application of ½ sinewave transient shock impulses of 300 gravity units to 3 planes for 3 milliseconds. Connectors shall not be damaged, parts shall not become loose.

Condition	Test Voltage AC, RMS Mated
Sea Level	1500
50,000	500
70,000	375
110,000	200

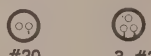
Grommets, Seals, and "O" Rings: Cinch Nuline Proprietary silicone and fluorosilicone elastomers.

Bayonet Rivets: Stainless Steel, passivated.

Inserts: Temperature and fluid resistant thermoplastic.

INSERTS AVAILABLE (showing front face of socket insert)

SHELL SIZE 8 — 83723



2 #20 — 2 CONTACTS
3 #20 — 3 CONTACTS

SHELL SIZE 10 — 83723

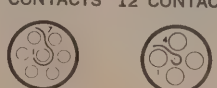
5 #20 — 5 CONTACTS
2 #20 — 2 CONTACTS

SHELL SIZE 12 — 83723

12 #20 — 12 CONTACTS
3 #16 — 3 CONTACTS

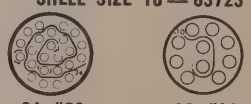
SHELL SIZE 14 — 83723

15 #20 — 15 CONTACTS
9 #20 3 #16 — 12 CONTACTS



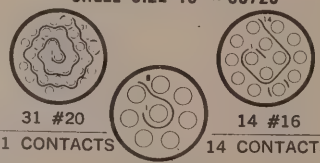
7 #16 — 7 CONTACTS
4 #12 — 4 CONTACTS

SHELL SIZE 16 — 83723



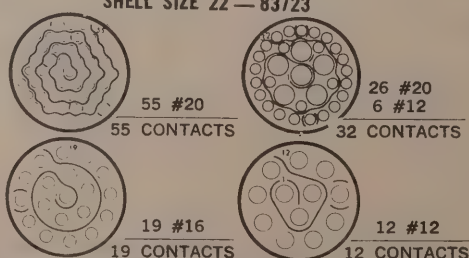
24 #20 — 24 CONTACTS
10 #16 — 10 CONTACTS

SHELL SIZE 18 — 83723



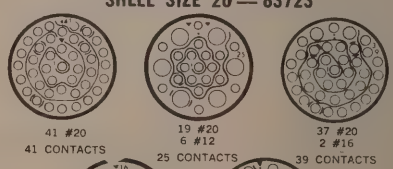
31 #20 — 31 CONTACTS
14 #16 — 14 CONTACTS
8 #12 — 8 CONTACTS

SHELL SIZE 22 — 83723



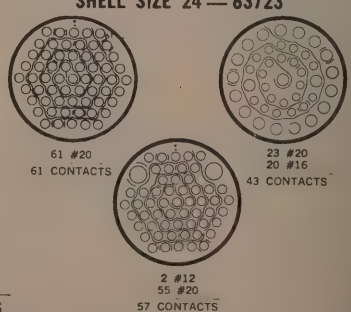
55 #20 — 55 CONTACTS
26 #20 6 #12 — 32 CONTACTS
19 #16 — 19 CONTACTS
12 #12 — 12 CONTACTS

SHELL SIZE 20 — 83723



41 #20 — 41 CONTACTS
19 #20 6 #12 — 25 CONTACTS
37 #20 2 #16 — 39 CONTACTS
16 #16 — 16 CONTACTS
24 #20 4 #12 — 28 CONTACTS

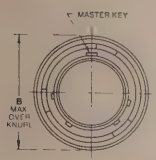
SHELL SIZE 24 — 83723

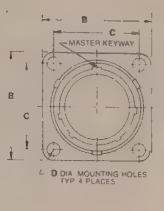


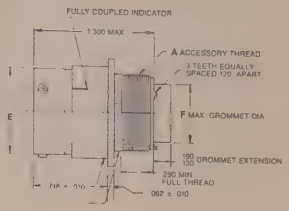
61 #20 — 61 CONTACTS
23 #20 20 #16 — 43 CONTACTS
2 #12 55 #20 — 57 CONTACTS

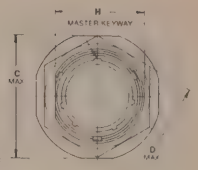
TRW CINCH CONNECTORS

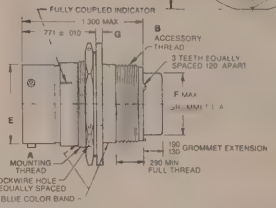
NUCON MIL-C-83723 SERIES III CYLINDRICAL CONNECTORS (Cont'd)

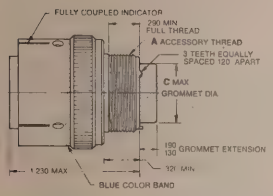












MOUNTING DIMENSIONS

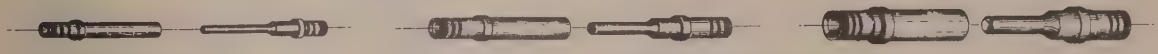
Shell Size	A Accessory Thd.	B ±.005	C ±.005	D ±.005	E	F
8	½-20 UNF-2A	.812	.594	.120	.536/ .531	.305
10	⅝-24 UNEF-2A	.937	.719	.120	.659/ .654	.405
12	¾-20 UNEF-2A	1.031	.812	.120	.829/ .824	.531
14	⅞-20 UNEF-2A	1.125	.906	.120	.898/ .893	.665
16	1-20 UNEF-2A	1.250	.969	.120	1.025/1.020	.790
18	1 1/16-18 UNEF-2A	1.343	1.062	.120	1.313/1.126	.869
20	1 3/16-18 UNEF-2A	1.437	1.156	.120	1.256/1.251	.994
22	1 5/16-18 UNEF-2A	1.562	1.250	.120	1.381/1.376	1.119
24	1 7/16-18 UNEF-2A	1.703	1.375	.149	1.506/1.501	1.244

DIMENSIONAL DATA

Shell Size	A Accessory Thd.	B	C
8	½-20 UNF-2A	.766	.305
10	⅝-20 UNEF-2A	.906	.405
12	¾-20 UNEF-2A	1.078	.531
14	⅞-20 UNEF-2A	1.141	.665
16	1-20 UNEF-2A	1.266	.790
18	1 1/16-18 UNEF-2A	1.375	.869
20	1 3/16-18 UNEF-2A	1.510	.994
22	1 5/16-18 UNEF-2A	1.625	1.119
24	1 7/16-18 UNEF-2A	1.760	1.244

Shell Size	A Mounting Thd.	B Accessory Thd.	C	D	E	F	G	H ±.005
8	⅝-20 UN-2A	½-20 UNF-2A	.979	.828	.536/ .531	.305	.137/.097	.592
10	¾-20 UNEF-2A	⅝-24 UNEF-2A	1.104	.953	.659/ .654	.405	.137/.097	.717
12	1 5/16-20 UNEF-2A	¾-20 UNEF-2A	1.291	1.140	.829/ .824	.531	.113/.097	.904
14	1-20 UNEF-2A	⅞-20 UNEF-2A	1.391	1.250	.898/ .893	.665	.137/.097	.967
16	1 1/8-20 UN-20	1-20 UNEF-2A	1.516	1.329	1.025/1.020	.790	.137/.097	1.092
18	1 1/4-20 UN-2A	1 1/16-18 UNEF-2A	1.641	1.455	1.131/1.126	.869	.137/.097	1.216
20	1 3/8-18 UNEF-2A	1 3/16-18 UNEF-2A	1.766	1.642	1.256/1.251	.994	.137/.097	1.341
22	1 1/2-20 UN-2A	1 5/16-18 UNEF-2A	1.954	1.705	1.381/1.376	1.119	.168/.128	1.466
24	1 5/8-18 UNEF-2A	1 7/16-18 UNEF-2A	2.079	1.892	1.506/1.501	1.244	.168/.128	1.591

CONTACTS AND INSERTION/EXTRACTION TOOLS



MIL-C-83723 CONTACTS

Cinch Catalog No.	Military No.	Type & Size
CN0930-2001P	M39029/4-20-20	Pin 20-20
CN0930-2001S	M39029/5-20-20	Socket 20-20
CN0930-1601P	M39029/4-16-16	Pin 16-16
CN0930-1601S	M39029/5-16-16	Socket 16-16
CN0930-1201P	M39029/4-12-12	Pin 12-12
CN0930-1201S	M39029/5-12-12	Socket 12-12

INSERTION/EXTRACTION TOOLS

Cinch Catalog No.	Military No.	Size
CN0930-0020	M83723/31-20	20
CN0930-0016	M83723/31-16	16
CN0930-0012	M83723/31-12	12

SEALING PLUGS

Size	Color	Cinch Catalog No.	Military No.
20	Red	CN0930-3020	M83723/28-20
16	Blue	CN0930-3016	M83723/28-16
12	Yellow	CN0930-3012	M83723/28-12

ORDERING INFORMATION

MIL-C-83723 CONNECTORS ONLY

CN0930 S 1 0 A 10—02 N 115

- **Series Designation**
- **Contact Style** ("P" Pin, "S" Socket)
- **Coupling Type** ("0" Threaded "1" Bayonet)
- **Shell Style** ("6" Straight Plug, "0" sq. fl. recept., "3" Single Hole Mount)
- **Class** ("A" non-conductive finish, "R" conductive finish)
- **Shell Size** (08, 10, 12, 14, 16, 18, 20, 22, and 24)
- **Insert Arrangement**
- **Polarity** (N, 6, 7, 8, 9 or 10)
- **Connector Deviations**
  - 115—Standard Connector Only
  - 116—Standard Connector Less Contacts and Seal Plugs
  - 117—Standard Connector with Contacts and Seal Plugs Less Insertion and Extraction Tools

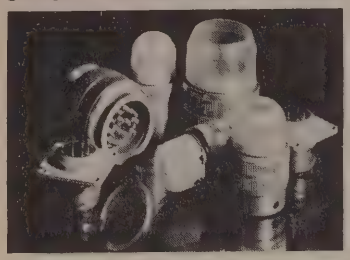
MIL-C-83723 BACKSHELLS ONLY

CN0930-A 1 A-22

- **Series Designation**
- **Type "A"** M83723/15 Backshell
- **Shell Size**
- **Style**
  - "A" Backshell with 90° Clamp
  - "N" Backshell with No Clamp
  - "S" Backshell with Straight Clamp
- **Finish Designation**
  - "1" Conductive Finish
  - "2" Non-conductive Finish

TRW CINCH CONNECTORS

CINCH NULINE 904 SERIES COMMERCIAL INPUT/OUTPUT CONNECTORS



FEATURES

Meets or exceeds appropriate MIL-C-5015 requirements for:

- Moisture resistance (when potted).
- Insulation resistance.
- Environmental resistance.
- Temperature cycling.

Additional features of the 904 Series:

- Lightweight.
- Visual engagement ring.
- Positive locking.
- Hooded female contacts.
- Three pin coupling.
- Stainless steel pins and bayonet slots.

PERFORMANCE CHARACTERISTICS

Durability: Connectors do not show any damage detrimental to the operation of the connector after 100 mating-unmating cycles at a rate of 300 cycles per hour.

Corrosion Resistance: After salt-spray testing per MIL-STD-202, Method 101C, Test Condition B connectors show no exposure of base metal which will affect performance.

Dielectric Withstanding Voltage: Connectors show no evidence of breakdown or flash over between adjacent contacts and from contacts to outer shell when subjected to the conditions specified in table below. (Tests performed per Method 3001 of MIL-STD-1344.)

	Condition*	Test V RMS	Recommended Working Voltage DC	Recommended Working Voltage AC
Sea Level	Unsealed	1500	700	500
	Sealed	2000	700	500
70,000 Ft.	Unsealed	375	175	125
	Sealed	1500	700	500

*(Unsealed) Refers to connectors with no provisions made for sealing front or rear areas.
(Sealed) Refers to connectors that are potted or pressurized in mounting, having front and rear areas sealed.

Insulation Resistance: Minimum insulation resistance of 5000 megohms between adjacent contacts and from contacts to outer shell when tested in accordance with MIL-STD-202, Method 302, Test Condition B.

Vibration: There are no circuit descontinuities longer than one microsecond when subjected to vibration testing in accordance with MIL-STD-1344, Method 2005, Test Condition III.

Physical Shock: Connectors are not damaged when subjected to 1500 G's for 0.5 milliseconds in each of three mutually perpendicular planes per MIL-STD-202, Method 213A, Test Condition F.

Temperature Cycling: Mated connectors perform satisfactorily after being subjected to temperature cycling from −55°C to +85°C per MIL-STD-202, Method 102A, Test Condition D.

Humidity: Connectors remain completely functional after being subjected to humidity testing per MIL-STD-202, Method 103B, Test Condition A.

Contact Resistance: Contact resistance through each mated contact pair doesn't exceed the requirements specified in the following table when tested in accordance with MIL-STD-1344, Method 3004.

Contact Mating End Size	Wire Size	Test Current (Amp)	Millivolt Drop (Max.) Initial	Millivolt Drop (Max.) After Corrosion
#20	20	7.5	55	65
	22	5.0	45	55
	24	3.0	45	55
#16	16	13.0	50	60
	18	10.0	45	55
	20	7.5	45	55

MATERIALS & FINISHES

Contacts: Copper Base Alloy Gold Plated per MIL-G-45204, Type II, Grade C, Class 0 over Nickel Underplate.

Shells: Aluminum Alloy 6262 per QQ-A-225/10 Gray Anodized per MIL-A-8625.

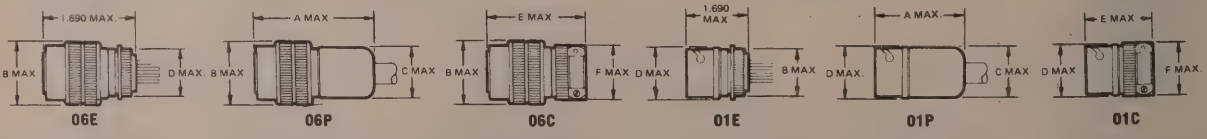
Inserts: Diallyl Phthalate per MIL-M-14F, Type MDG.

Face Seals: Neoprene Rubber per MIL-R-3065.

Bayonet Pins: Stainless Steel Type 303 Passivated.

Component Parts: Anodized Aluminum conforming to QQ-A-225 or Passivated Stainless Steel in accordance with QQ-S-764.

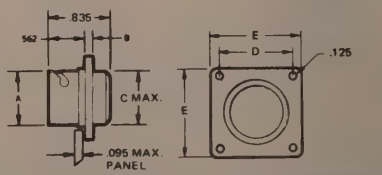
DIMENSIONS



Connector Size	A Inches	A Centimeters	B Inches	B Centimeters	C Inches	C Centimeters	D Inches	D Centimeters	E Inches	E Centimeters	F Inches	F Centimeters
12	1.687	4.284	.957	2.430	.795	2.019	.895	2.273	1.870	4.749	.817	2.075
14	1.687	4.284	1.082	2.748	.920	2.336	1.000	2.540	1.870	4.749	.967	2.456
18	1.687	4.284	1.375	3.492	1.170	2.971	1.250	3.175	1.870	4.749	1.185	3.009
20	1.734	4.404	1.500	3.810	1.223	3.106	1.375	3.492	1.970	5.003	1.312	3.332
22	1.734	4.404	1.625	4.127	1.352	3.434	1.468	3.728	1.970	5.003	1.440	3.657

MOUNTING DIMENSIONS (For Square Flange Connectors)

Connector Size	A Inches	A Centimeters	B Inches	B Centimeters	C Inches	C Centimeters	D Inches	D Centimeters	E Inches	E Centimeters
12	.662	1.681	.062	0.157	.690	1.752	.812	2.062	1.031	2.618
14	.781	1.983	.062	0.157	.812	2.062	.906	2.301	1.125	2.857
18	1.032	2.621	.093	0.236	1.062	2.697	1.062	2.697	1.312	3.332
20	1.156	2.936	.093	0.236	1.187	3.014	1.156	2.936	1.437	3.649
22	1.281	3.253	.093	0.236	1.281	3.253	1.250	3.175	1.562	3.967



TRW CINCH CONNECTORS

904 SERIES (Cont'd)

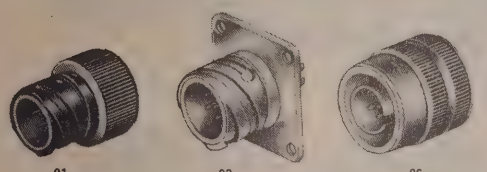
HOW TO ORDER

To get the 904 Series Connector you want, put together the part number as per the example in the following chart. The available combinations of shell styles and construction classes are shown below along with available inserts.

CN0904 06 E 12-7 P W

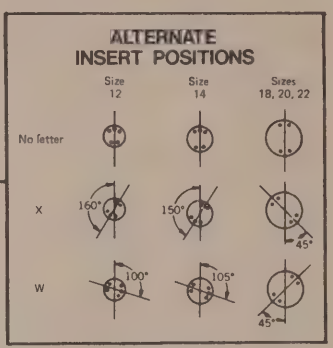
SERIES DESIGNATION
CN0904

SHELL STYLE



01 Cable Mounting Receptacle
02 4-Hole Mount Panel Receptacle
06 Cable Plug-Straight

ALTERNATE INSERT POSITIONS

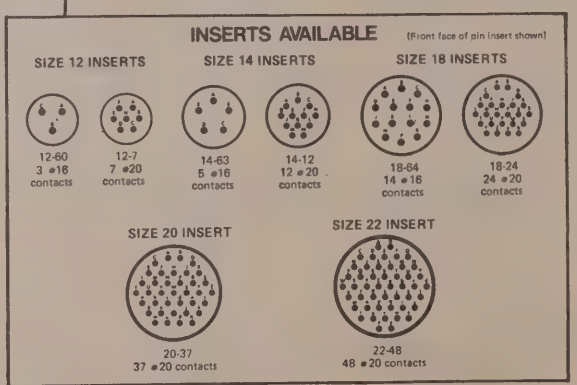


TYPE OF CONTACT
P-Pin S-Socket

CONSTRUCTION

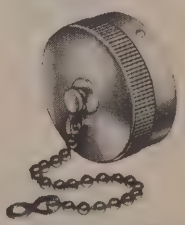
E Environmentally sealed (Unitized grommet)
P Environmentally sealed (Disposable Polyethylene Potting Form Furnished)
C Mechanical Clamp (Sealed only when potted)

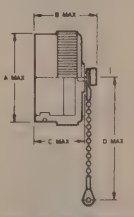
INSERTS AVAILABLE (Front face of pin insert shown)



CAP & CHAIN ASSEMBLIES

Cap and chain assemblies for 904 Series Receptacles are waterproof and include a sealing gasket. They provide protection against live circuits and contamination when receptacles are unmated.





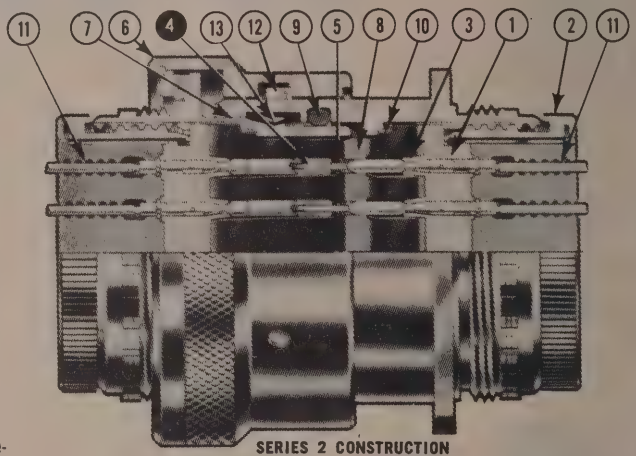
Connector Size	Part No.	A		B		C		D	
		Inches	Centimeters	Inches	Centimeters	Inches	Centimeters	Inches	Centimeters
12	CN0904-1200	.804	2.042	.774	1.965	.603	1.531	3.5	8.890
14	CN0904-1400	.938	2.382	.750	1.905	.594	1.508	3.5	8.890
18	CN0904-1800	1.172	2.976	.774	1.965	.603	1.531	3.5	8.890
20	CN0904-2000	1.296	3.291	.774	1.965	.603	1.531	4.0	10.160
22	CN0904-2200	1.421	3.609	.774	1.965	.603	1.531	4.0	10.160

TRW CINCH CONNECTORS

CINCH-NULINE ASTRO/348® MIL-C-81511 HIGH DENSITY CONNECTORS

DESIGN FEATURES

1. Molded One-Piece Contact Retention Disc.
2. Captivated Rear-Locking Nut (Metal to Metal Bottoming).
3. Individual Contact Risers.
4. Anti-Scoop Recessed Pin Contacts (in receptacle).
5. Closed Entry Socket Insert and Contacts.
6. Captivated Triple Bayonet Coupling System.
7. 5 Key Shell Polarization. (Series 2, Size 8 has 2 keys.)
8. Interfacial Mating Seal.
9. Dynamic "O" Ring Peripheral Shell Ring.
10. Monoblock Construction — Inserts Bonded to Shells.
11. Self-Sealing Rear Grommets.
12. Visual Mating Indicator.
13. Shell to Shell Grounding Fingers.



SERIES 2 CONSTRUCTION

SERIES 2

SERIES 1

Astro/348 has been designed to eliminate the costly space-wasters in removable contacts. Problem-causing metal retention clips for each contact are gone. Instead, a single one-piece molded dielectric retention system locks Poke-Home contacts in place. Designed as a high density subminiature, Astro/348 is the best high density miniature and standard connector ever made. It packs more contacts of every size into standard shells than any other design. MIL-C-81511* has established the standard connector family for the next decade.

The single-piece retention disc gives other excellent advantages in addition to density. Dielectric wall thicknesses in the subminiature #23-22 contact arrangements **are equal to standard miniatures.** With greater density, #20's, #16's and #12's provide dielectric separation comparable to standard miniature and power connectors.

*MIL-C-81511 is a Military Specification for Connectors, Electric, Circular, High Density, Quick Disconnect, Environment Resistant.

**Astro/348 and Poke-Home are Trade Marks of the Bunker-Ramo Corp.

GROUNDING FINGERS

Shell-to-shell grounding is established by beryllium spring fingers permanently fixed to the Series 2 receptacle shell and permanently fixed to the Series 1 plug shell. These spring fingers, spaced at a minimum of 6 per inch (except at key-ways in Series 2 construction), make contact at least .090" before pin-socket electrical engagement occurs during mating and maintain contact at least .090" after pin-socket disengagement during unmating.

SHELL CONSTRUCTIONS SERIES 2

Plug
348-46EXX-XX

Single Hole Mtg. Receptacle
348-43EXX-XX

Square Flange Receptacle
348-40EXX-XX

Cable Receptacle
348-41EXX-XX

SHELL CONSTRUCTIONS SERIES 1

Plug 348-36EXX-XX

Square Flange Receptacle
348-30EXX-XX

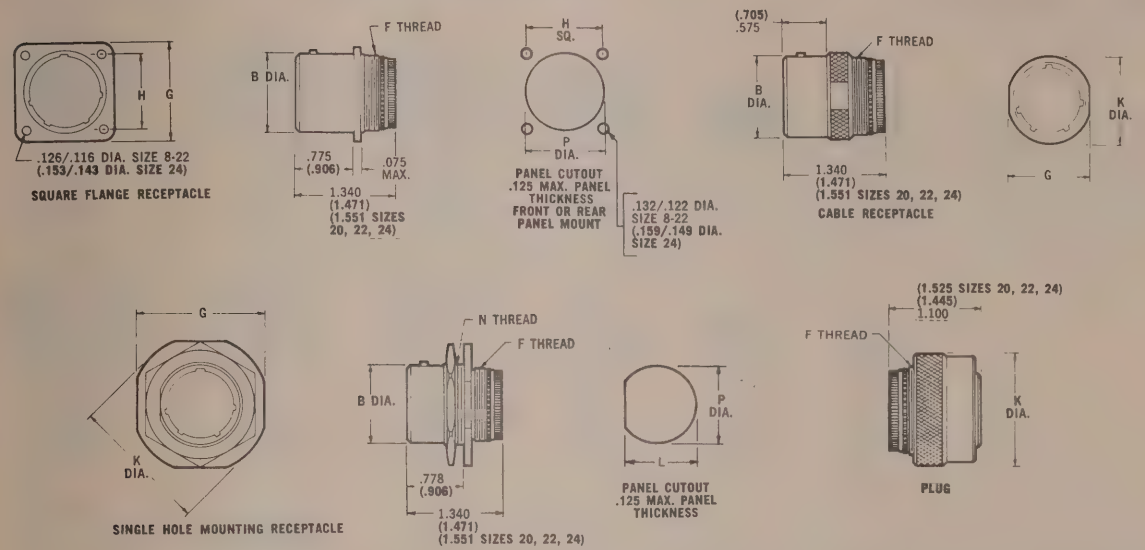
Single Hole Mtg. Receptacle
348-33EXX-XX

Cable Receptacle
348-31EXX-XX

TRW CINCH CONNECTORS

CINCH-NULINE ASTRO/348 HIGH DENSITY CONNECTORS (Cont'd)

SHELL DIMENSIONS (inches) All Dimensions Are Shown As MAX.



Bold face in parentheses indicates Series 1-Long 100% No-Scoop Design.

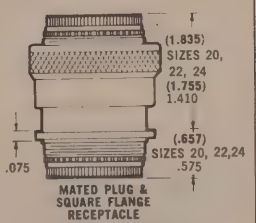
DIMENSIONS

	SHELL SIZE						
	8-Standard Series 2	8-Long Series 1	10-Standard Series 2	10-Long Series 1	14-Standard Series 2	14-Long Series 1	16-Standard Series 2
B Dia. Max.	.553	.553	.678	.678	.928	.928	1.054
F Thread	½-28	½-28	⅝-28	⅝-28	⅞-28	⅞-28	1-28
G Max. Sq. Flange Recept.	.820	.820	.945	.945	1.133	1.133	1.258
G. Max. Cable Recept. Flats	.565	.565	.690	.690	.940	.940	1.066
G Max. Single Hole Mtg. Recept. & Her. Seal "D" Hole Recept.	.989	.989	1.114	1.114	1.401	1.401	1.526
H ±.005	.594	.594	.719	.719	.906	.906	.969
K Dia. Max. Cable Recept.	.780	.780	.900	.900	1.150	1.150	1.280
K Dia. Max. Single Hole Mtg. Recept. & Herm. Seal Single Hole	1.072	1.072	1.197	1.197	1.510	1.510	1.635
K Dia. Max. Plug	.850	.850	.975	.975	1.225	1.225	1.350
K Dia. Max. Herm. Seal Solder Flange Recept.	.945	.945	1.070	1.070	1.320	1.320	1.446
L ±.005	.605	.605	.730	.730	.980	.980	1.105
N Thread	⅝-20	⅝-20	¾-20	¾-20	1-20	1-20	1⅛-20
P Dia. ±.005	.635	.635	.760	.760	1.010	1.010	1.135
Q Max.	.710	.843	.710	.843	.710	.843	.710
R Dia. ±.005	.661	.661	.786	.786	1.036	1.036	1.162

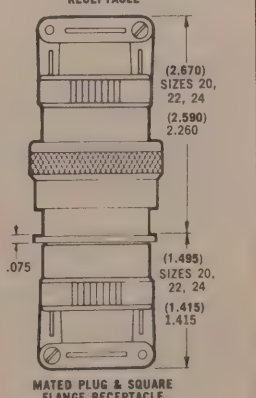
	SHELL SIZE					
	16-Long Series 1	18-Standard Series 2	18-Long Series 1	20-Long Series 1	22-Long Series 1	24-Long Series 1
B Dia. Max.	1.054	1.178	1.178	1.303	1.428	1.553
F Thread	1-28	1⅛-28	1⅛-28	1¼-28	1⅜-28	1½-28
G Max. Sq. Flange Recept.	1.258	1.351	1.351	1.475	1.570	1.711
G. Max. Cable Recept. Flats	1.066	1.190	1.190	1.315	1.440	1.565
G Max. Single Hole Mtg. Recept. & Her. Seal "D" Hole Recept.	1.526	1.651	1.651	1.776	1.901	2.026
H ±.005	.969	1.062	1.062	1.156	1.250	1.375
K Dia. Max. Cable Recept.	1.280	1.400	1.400	1.525	1.650	1.775
K Dia. Max. Single Hole Mtg. Recept. & Herm. Seal Single Hole	1.635	1.745	1.745	1.870	1.995	2.120
K Dia. Max. Plug	1.350	1.475	1.475	1.624	1.749	1.874
K Dia. Max. Herm. Seal Solder Flange Recept.	1.446	1.570	1.570	1.816	1.941	2.066
L ±.005	1.105	1.230	1.230	1.355	1.480	1.605
N Thread	1⅛-20	1¼-20	1¼-20	1⅜-20	1½-20	1⅝-20
P Dia. ±.005	1.135	1.260	1.260	1.385	1.510	1.635
Q Max.	.843	.740	.873	.903	.903	.903
R Dia. ±.005	1.162	1.286	1.286	1.411	1.536	1.661

N.A. — Hermetics available only in Standard Sizes 8 through 18, Long Size 24.
Screened area indicates Series 1-Long 100% No-Scoop Design.

MATED CONNECTORS DIMENSIONS (inches)



MATED PLUG & SQUARE FLANGE RECEPTACLE



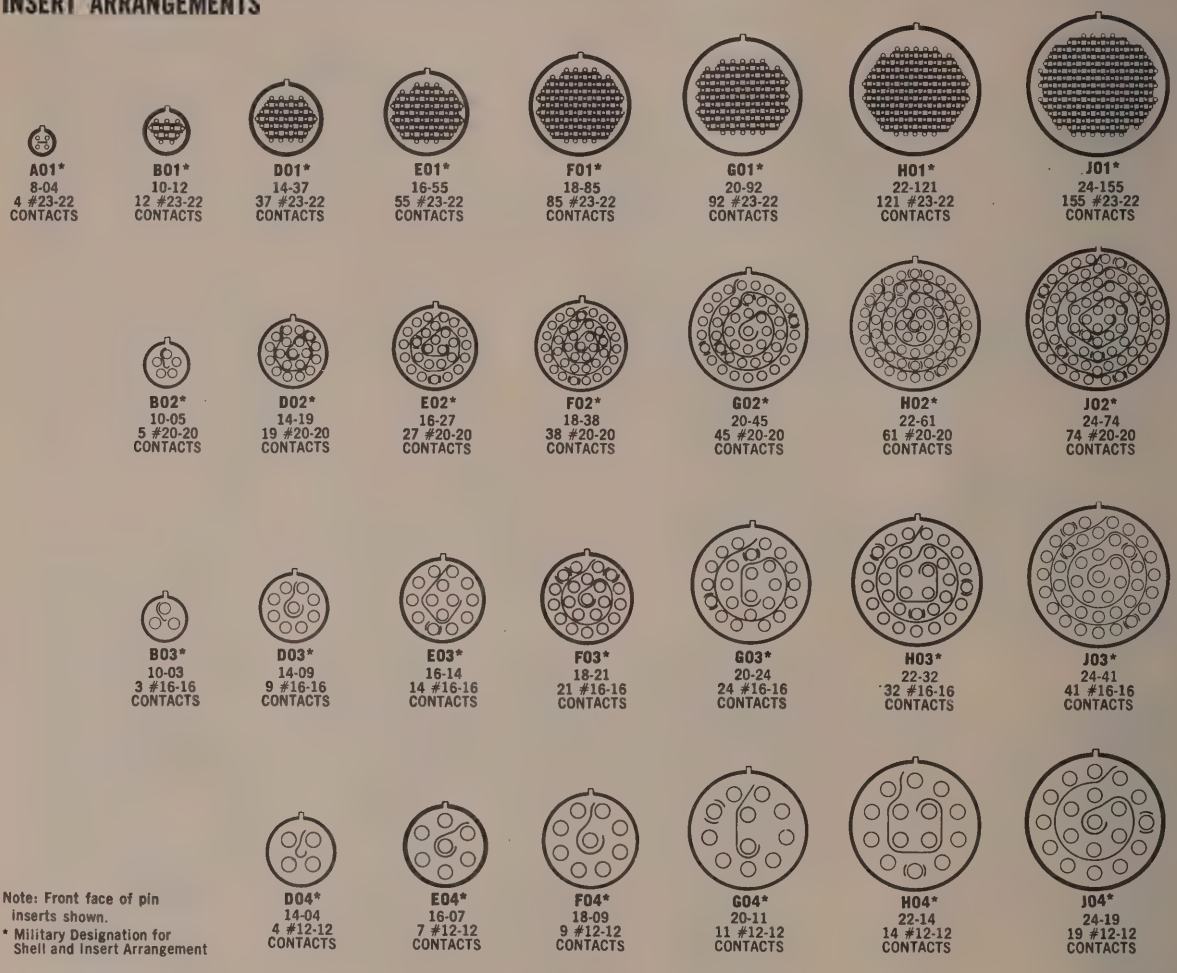
MATED PLUG & SQUARE FLANGE RECEPTACLE WITH CABLE SUPPORT

Bold face in parentheses indicates Series 1-Long 100% No-Scoop Design.

TRW CINCH CONNECTORS

CINCH-NULINE ASTRO/348 HIGH DENSITY CONNECTORS (Cont'd)

INSERT ARRANGEMENTS



Note: Front face of pin inserts shown.

* Military Designation for Shell and Insert Arrangement

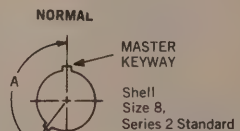
STANDARD — SERIES 2

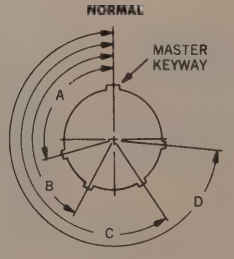
Key and Keyway Arrangement	Angular Location (All Dimensions In Degrees)								
	Shell Size 8	Shell Sizes 10, 14				Shell Sizes 16, 18			
	A	A	B	C	D	A	B	C	D
1	128	105	140	215	265	105	140	215	265
2	190	102	132	248	320	18	149	192	259
3	205	80	118	230	312	92	152	222	342
4	220	35	140	205	275	84	152	204	334
5	235	64	155	235	304	24	135	199	240
6	250	35	115	220	270	98	152	268	338

LONG — SERIES 1

Key and Keyway Arrangement	Angular Location (All Dimensions In Degrees)											
	Shell Size 8				Shell Sizes 10, 14				Shell Sizes 16, 18, 20, 22, 24			
	A	B	C	D	A	B	C	D	A	B	C	D
1	105	140	215	265	95	141	208	236	80	142	196	293
2	102	132	248	320	113	156	182	292	135	170	200	310
3	80	118	230	312	90	145	195	252	49	169	200	244
4	35	140	205	275	53	156	220	255	66	140	200	257
5	64	155	234	304	119	146	176	298	62	145	180	280
6	91	131	197	240	51	141	184	242	79	153	197	272

ALTERNATE SHELL POSITIONS

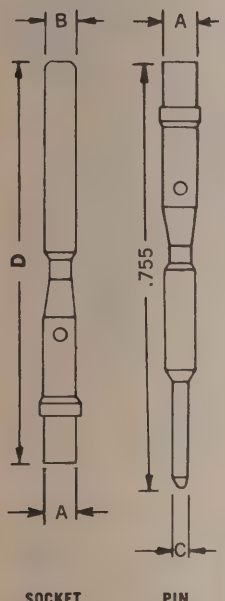




TRW CINCH CONNECTORS

CINCH-NULINE ASTRO/348 HIGH DENSITY CONNECTORS (Cont'd)

CONTACTS



DIMENSIONS

Size	A. Max.		B Max.		C Max.		D Ref.		Current Rating
	Series 2	Series 1	Series 2	Series 1	Series 2	Series 1	Series 2	Series 1	
23-22	.050	.050	.051	.051	.028	.028	.718	1.048	5.0 Amps
23-28	.050	.050	.051	.051	.028	.028	.718	1.048	1.5 Amps
20-20	.078	.078	.078	.078	.041	.041	.718	1.048	7.5 Amps
16-16	.103	.103	.113	.113	.063	.063	.718	1.048	13.0 Amps
12-12	.158	.158	.161	.161	.095	.095	.718	1.048	23.0 Amps

Screened area indicates Series 1 (100% No-Scoop) Design.

TABLE OF POWER CONTACTS

Contact Size		Wire Size Accommodations	Cinch-Nuline Part No.		MS Part No.	
			Socket	Pin	Socket	Pin
23-22		#22, #24, #26	348-100-2201S-02	348-100-2202P-02	MS90460A23-22	MS90461A23-22
23-28	Series	#28, #30, #32	348-100-5047S-02	348-100-5047P-02	MS90460A23-28	MS90461A23-28
20-20	2	#20, #22, #24	348-100-2000S-02	348-100-2000P-02	MS90460A20-20	MS90461A20-20
16-16		#16, #18, #20	348-100-1600S-02	348-100-1600P-02	MS90460A16-16	MS90461A16-16
12-12		#12, #14	348-100-1200S-02	348-100-1200P-02	MS90460A12-12	MS90461A12-12
23-22		#22, #24, #26	348-100-2203S-02	348-100-2202P-02	MS3343A23-22	MS90461A23-22
23-28	Series	#28, #30, #32	348-100-5048S-02	348-100-5047P-02	MS3343A23-28	MS90461A23-28
20-20	1	#20, #22, #24	348-100-2003S-02	348-100-2000P-02	MS3343A20-20	MS90461A20-20
16-16		#16, #18, #20	348-100-1603S-02	348-100-1600P-02	MS3343A16-16	MS90461A16-16
12-12		#12, #14	348-100-1203S-02	348-100-1200P-02	MS3343A12-12	MS90461A12-12

FOR CONTACT FINISHES:
"A" 150°C. MS rating, use Cinch-Nuline P/N with .02 (see table).
"B" 200°C. MS rating, use Cinch-Nuline P/N with -03.
EXAMPLE: MS90460B23-22 is equivalent to 348-100-2201S-03.

Screened area indicates Series 1 (100% No-Scoop) Design.

HOW TO ORDER

To get the specific Astro/348 Connector you want, put together the part number as per the following example:

348 - 3 0 E 18 - 85 P 1 (200)

- **Series Designation**
- **Connector Type**
  - 150°C Oper. Temp.
    3-Series 1 Connector
    4-Series 2 Connector
  - 200°C Oper. Temp.
    5-Series 1 Connector
    6-Series 2 Connector
  - High Fluid Resistance
    7-Series 1 Connector
    8-Series 2 Connector
    175°C Oper. Temp.
- 0-Sq. Flange Recept.
  1-Cable Receptacle
  3-Single Hole Mtg. Recept.
  5-Solder Flange Recept. (Hermetic only)
  6—Straight Plug
- **Class**
  E-Environmental
  H-Hermetic (Solder cap contacts)
  P-Potting seal
- **Shell Size**
  08 10 14 16 18 20* 22* 24*
  *Available only in Series 1-Long
- **Insert Arrangement**
  03 04 05 07 09 11
  12 14 19 21 24 27
  32 37 38 41 45 55
  61 74 85 92
  121 (01)* 155 (01)*
- **Contact Style**
  P-Pin
  S-Socket
- **Alternate Shell Positions**
  1 Normal,
  2, 3, 4, 5, 6
  As per table on Page 2-1023
- Omit if no cable clamp is desired.
  (200)—Connector with cable clamp.
  (201)—Connector less contacts.
  (207)—Connector with Fluorosilicone rubber seals and ins.rt, Connector Types 3 & 4 only.

MIL-STD PART NO. FORMAT FOR REV. "C" CONNECTORS

Note: Under Rev. "C" of MIL-C-81511, the part numbering system has been revised to a 15 digit system to be in conformance with Defense Standardization Manual 4120-3-M.
The connector part number is put together as per the following example:

M81511 / 01 E F 01 P 1

- **Specification No.**
- **Shell Style**
  Series 2 Connectors
  /01 Sq. Flange Recept.
  /02 Solder Flange Recept., Hermetic
  /03 Single Hole Mtg. Recept.
  /04 Single Hole Mtg. Recept., Hermetic
  /05 Cable Receptacle
  /06 Straight Plug
  /28 Single Hole Mtg. Recept., Bulkhead Feed thru Contacts, Hermetic
  /31 Square Flange Recept., Potting Seal
  /32 Single Hole Mtg. Recept., Potting Seal
  /33 Cable Recept., Potting Seal
  /34 Straight Plug, Potting Seal
  Series 1 Connectors
  /21 Square Flange Recept.
  /22 Solder Flange Recept., Hermetic
  /23 Single Hole Mtg. Recept.
  /24 Single Hole Mtg. Recept., Hermetic
  /25 Cable Receptacle
  /26 Straight Plug
  /27 Single Hole Mtg. Recept., Bulkhead Feed thru Contacts, Hermetic
  /35 Square Flange Recept., Potting Seal
  /36 Single Hole Mtg. Recept., Potting Seal
  /37 Cable Recept., Potting Seal
  /38 Straight Plug, Potting Seal
- **Class**
  E-Grommet Seal Connectors (150°C Oper. Temp.)
  F-Grommet Seal Connectors (175°C Oper. Temp.)
  A-Grommet Seal Connectors (200°C Oper. Temp.)
  H-Hermetic Seal Connectors (150°C Oper. Temp.)
  G-Hermetic Seal Connectors (175°C Oper. Temp.)
  B-Hermetic Seal Connectors (200°C Oper. Temp.)
  P-Potting Seal Connectors (150°C Oper. Temp.)
  T-Potting Seal Connectors (175°C Oper. Temp.)
  C-Potting Seal Connectors (200°C Oper. Temp.)
- **Shell Size**
  8 10 14 16 18 20 22 24
  A B D E F G H J
- **Insert Arrangement**
  Code numbers coordinated with insert arrangements Page 2-1023.
  Example:
  F01 is 18-85 insert.
- **Contact**
  P-Pin, S-Socket,
  C-Feed thru Cont.
- **Alternate Shell Positions**
  1, 2, 3, 4, 5, 6
  As per table on Page 2-1023

TRW CINCH CONNECTORS

CINCH-NULINE "OMEGA" SERIES — HIGH EFFICIENCY CIRCULAR CONNECTORS

MIL-C-26500 VERSION

MIL-C-38300 VERSION OR "GOLDEN OMEGA"

MORE CONTACTS IN LESS SPACE

When it becomes necessary to provide connections for a large number of circuits in a limited amount of space, a CINCH-NULINE "Omega" Series High Environmental Circular Connector is your best choice. CINCH-NULINE offers a wide selection of these miniature connectors that meet and exceed the requirements of MIL-C-26500 and MIL-C-38300. They are available in a variety of constructions, including those which can be potted. Most connectors feature MIL-C-26636 Crim-Lok contacts. Many others are available also with coaxial or shielded or thermocouple contacts.

SIGNIFICANT ADVANCE IN STATE-OF-THE-ART

On the ground or in space, wherever there is a requirement for superior environmental protection, high reliability and minimum weight and bulk, CINCH-NULINE "Omega" Series Connectors are the answer. To produce this series requires the satisfaction of many exacting requirements on reliability, logistics and present and anticipated environmental conditions. To meet these requirements, it was necessary to develop advanced design concepts, formulate materials for specific connector usage and work out new production techniques. The resulting connectors exceed the stringent requirements of MIL-C-26500 (USAF) and MIL-C-38300 (USAF) for performance and reliability.

THE "GOLDEN OMEGA" — CLOSED ENTRY & FRONT SERVICING

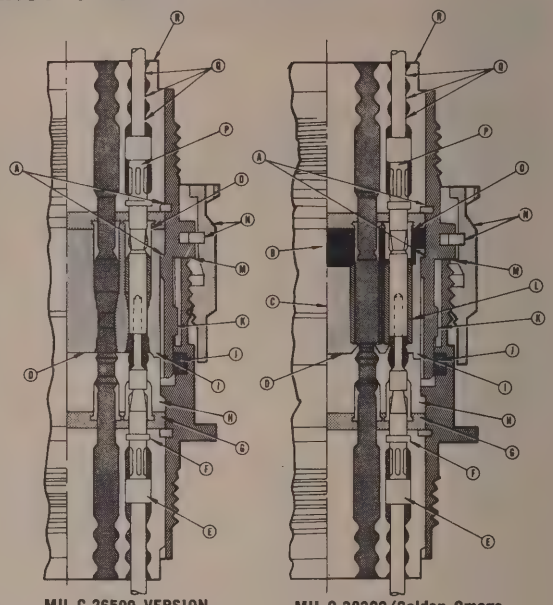
"Golden Omega" Connectors are identical to the other connectors in the "Omega" Series, except the socket inserts have a hard face of glass-filled epoxy. They are the first connectors to combine the positive reliability of closed entry with the speed and convenience of front servicing. In addition, the MIL-C-26636 contacts are tamper proof. Wrong-size contacts or oversize test prods cannot be inserted in the hard dielectric contact entry-ways on the socket inserts.

COMPLETE ENVIRONMENTAL SEALING

CINCH-NULINE "Omega" Series Connectors are fully sealed against extreme environmental conditions. Silicone rubber dielectric provides resilience and unsurpassed resistance to tear, compression set, fluids and high temperatures.

When the connectors are mated, insert faces compress to form a resilient dielectric seal around each individual contact. A continuous barrier on the periphery of the socket insert mates with a recess around the pin insert to form an additional compression seal. A dynamic "O" ring seal between mated shells constitutes still another barrier to dirt and moisture, and protects the integrity of the face seals. Together with monoblock construction, this puts void-free, continuous dielectric around each contact through the entire connector length.

Monoblock construction, with bonded interfaces between the dielectric components (insert, anti-deflection disc, and grommet) eliminates air voids and protects connectors from degrading moisture and altitude conditions. A pressurizing seal around each contact at the major O.D. prevents the passage of air or moisture through the contact hole, and triple sealing riser design at each wire hole in the grommet seals each individual wire.



MIL-C-26500 VERSION — MIL-C-38300/Golden Omega

A. Positive Location Captivated Insert (Mechanical Interlock)
B. Resilient Rear Insert (Only on MIL-C-38300 Version)
C. Closed Entry Hard Dielectric Front Insert (Only on MIL-C-38300 Version)
D. Insert Static Face Seal
E. Pin Contact, MIL-C-26636
F. Contact Pressurizing Seal
G. Anti-Deflection Disc
H. Resilient Pin Insert
I. Insert Rim Seal
J. Dynamic "O" Ring Shell Seal
K. Five Key Shell Polarization
L. Releasing Sleeve
M. Metal to Metal Shoulder
N. Bayonet or Threaded Coupling, Permanent Captivation
O. Contact Retention Clip
P. Socket Contact, MIL-C-26636
Q. Wire Sealing Risers
R. Grommet

WIDE VARIETY OF CONFIGURATIONS

Detailed information on configurations available, shell sizes, dimensions and data on how to order are given on the following pages.

GO/NO-GO RELIABILITY

When a "Golden Omega" connector is mated, you can be sure there is proper contact. The socket contacts are closely surrounded by hard dielectric with a chamfered entry to guide in the pins accurately. However, if the pins are bent, the hard dielectric presents a closed entry and prevents mating.

LIGHTWEIGHT & HIGH CONTACT DENSITY

Connector shells are impact-extruded aluminum forgings with a high strength-to-weight ratio. The insert arrangement is designed for the maximum number of contacts within the area available.

CRIM-LOK CONTACTS

Crim-Lok contacts (front release, rear insertable) provide for easy servicing of connector circuits without disassembling the connector from its mounting, or disturbing adjacent contacts. MIL-C-26636 contacts are crimped quickly, consistently, and reliably with either hand or power tools. They have high electrical conductivity, present a smooth configuration, and completely protect electrical contact pressure-members from environmental and handling damage. The contacts come in sizes 20, 16, 12, and shielded coaxial, with rhodium-over-silver plating. (Other platings such as gold are available; write factory for details.)

TRW CINCH CONNECTORS

CINCH-NULINE "OMEGA" SERIES — HIGH EFFICIENCY CIRCULAR CONNECTORS (Cont'd)

ALTERNATE SHELL POSITIONS

THREADED PLUG

THREADED SQUARE FLANGE RECEPTACLE

THREADED SINGLE HOLE MOUNTING RECEPTACLE

BAYONET PLUG

BAYONET SQUARE FLANGE RECEPTACLE

BAYONET SINGLE HOLE MOUNTING RECEPTACLE

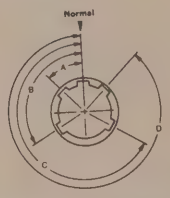
FOR CONNECTORS SIZE 8 & 10

(All Dimensions In Degrees)				
Position	A	B	C	D
Normal	105	140	215	265
6	102	132	248	320
7	80	118	230	312
8	35	140	205	275
9	64	155	234	304
10*	25	115	220	270

FOR CONNECTORS SIZE 12, 14, 16, 18, 20, 22, 24

(All Dimensions In Degrees)				
Position	A	B	C	D
Normal	105	140	215	265
6	18	149	192	259
7	92	152	222	342
8	84	152	204	334
9	24	135	199	240
10	98	152	268	338

* Size 10 only

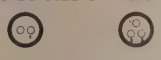


FRONT FACE OF RECEPTACLE SHOWN

Note: Alternate positions 6 thru 10 incorporate special shell polarizing key and keyways. All inserts remain in normal position.

INSERTS AVAILABLE — (Showing front face of socket insert)

SHELL SIZE 8 — MS27561

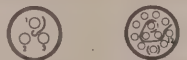


2 #20 CONTACTS INSERT 8-2 | 3 #20 CONTACTS INSERT 8-3

SHELL SIZE 10 — MS24260

2 #20 CONTACTS INSERT 10-2 | 2 #16 CONTACTS INSERT 10-20 | 5 #20 CONTACTS * INSERT 10-5

SHELL SIZE 12 — MS24260

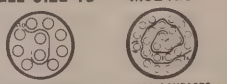


3 #16 CONTACTS * INSERT 12-3 | 2 #20 CONTACTS * INSERT 12-12

SHELL SIZE 14 — MS24260

2 #16 CONTACTS 1 #2 SHIELDED CONTACT INSERT 14-3 | 4 #12 CONTACTS * INSERT 14-4 | 7 #16 CONTACTS * INSERT 14-7 | 9 #20 CONTACTS 3 #16 CONTACTS INSERT 14-12 | 15 #20 CONTACTS * INSERT 14-15

SHELL SIZE 16 — MS24261



10 #16 CONTACTS INSERT 16-10 | 24 #20 CONTACTS * INSERT 16-24

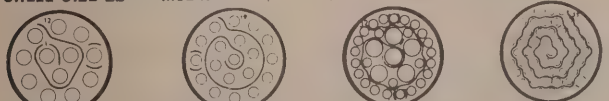
SHELL SIZE 18 — MS24262

8 #12 CONTACTS INSERT 18-8 | 10 #16 CONTACTS 1 #2 SHIELDED CONTACT INSERT 18-11 | 14 #16 CONTACTS * INSERT 18-14 | 31 #20 CONTACTS* INSERT 18-31

SHELL SIZE 20 — MS27561

16 #16 CONTACTS INSERT 20-16 | 19 #20 CONTACTS 6 #12 CONTACTS INSERT 20-25 | 24 #20 CONTACTS 4 #12 CONTACTS INSERT 20-28 | 37 #20 CONTACTS 2 #16 CONTACTS INSERT 20-39 | 41 #20 CONTACTS * INSERT 20-41

SHELL SIZE 22 — MS24263



12 #12 CONTACTS INSERT 22-12 | 19 #16 CONTACTS * INSERT 22-19 | 26 #20 CONTACTS 6 #12 CONTACTS INSERT 22-32 | 55 #20 CONTACTS * INSERT 22-55

SHELL SIZE 24 — MS27561

23 #20 CONTACTS 20 #16 CONTACTS INSERT 24-43 | 2 #12 CONTACTS 55 #20 CONTACTS INSERT 24-57 | 61 #20 CONTACTS * INSERT 24-61

SPECIFICATIONS

Contact Size	Rated Amps	for AWG Wire Size	Insulation Max.	O.D. Min.
20	7.5	24-22-20	.090	.040
16	20.	18-16	.130	.064
12	35.	14-12	.170	.106
#2 Shielded	7.5	Shielded Cable Size 20 per MIL-C-7078. Type II		

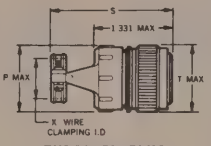
*Available with hard-dielectric face socket inserts for "Golden Omega" (MIL-C-38300) connectors.
Pin inserts for MIL-C-38300 connectors have a resilient face and, except for marking, are identical to MIL-C-26500 pin inserts.

TRW CINCH CONNECTORS

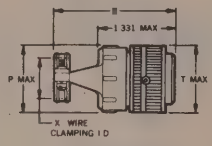
CINCH-NULINE "OMEGA" SERIES — HIGH EFFICIENCY CIRCULAR CONNECTORS (Cont'd)

DIMENSIONS

PLUGS



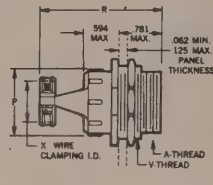
THREADED PLUG
C48-06RXX-XXX
MS24266RXXT-XXX



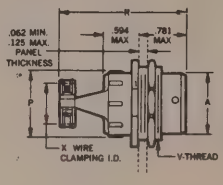
BAYONET PLUG
C48-16RXX-XXX
MS24266RXXB-XXX

Shell Size	P Max.	T Max. Th'd	T Max. Bay.	X ±.015	S Max.
8	.582	.708	.766	.180	1.832
10	.731	.836	.906	.270	1.832
12	.919	1.025	1.078	.400	1.832
14	.981	1.125	1.141	.460	2.067
16	1.106	1.250	1.266	.610	2.067
18	1.231	1.375	1.375	.690	2.067
20	1.356	1.510	1.510	.830	2.067
22	1.481	1.625	1.625	.940	2.067
24	1.606	1.760	1.760	1.040	2.067

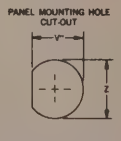
SINGLE HOLE MOUNTING RECEPTACLES



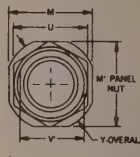
THREADED RECEPTACLE
C48-03RXX-XXX
MS24265RXXT-XXX



BAYONET RECEPTACLE
C48-13RXX-XXX
MS24265RXXB-XXX



PANEL CUTOUT

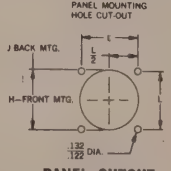


FLANGE AND NUT

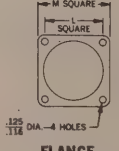
BOTH THREADED & BAYONET RECEPTACLES

Shell Size	DIMENSIONS (Inches) A Th'd	A +.000 −.005	M Max.	M' Max.	P Max.	U Max.	V Th'd	V' ±.003	V'' ±.005	X ±.015	Y Max.	Z ±.005	R Max.
8	9/16-24	.536	.984	.938	.582	.828	5/8-20	.593	.605	.180	1.068	.635	1.890
10	11/16-24	.659	1.109	1.082	.731	.953	3/4-20	.718	.730	.270	1.192	.760	1.890
12	7/8-20	.829	1.296	1.299	.919	1.140	15/16-20	.905	.917	.400	1.380	.947	1.890
14	15/16-20	.898	1.396	1.371	.981	1.250	1-20	.968	.980	.460	1.505	1.010	2.125
16	1 1/16-18	1.025	1.521	1.515	1.106	1.329	1 1/8-20	1.093	1.105	.610	1.630	1.135	2.125
18	1 3/16-18	1.131	1.646	1.660	1.231	1.455	1 1/4-20	1.217	1.225	.690	1.740	1.260	2.125
20	1 5/16-18	1.266	1.771	1.770	1.356	1.642	1 1/8-18	1.342	1.350	.830	1.860	1.385	2.125
22	1 7/16-18	1.381	1.959	1.948	1.481	1.705	1 1/2-20	1.467	1.475	.940	2.040	1.510	2.125
24	1 9/16-18	1.506	2.084	2.084	1.606	1.892	1 5/8-18	1.592	1.600	1.040	2.160	1.635	2.125

SQUARE FLANGE RECEPTACLES

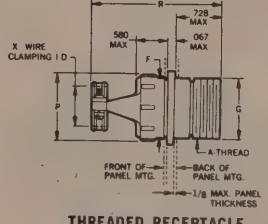


PANEL CUTOUT

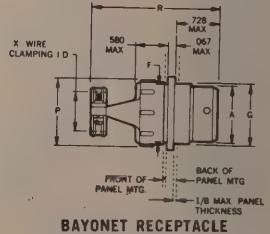


FLANGE

BOTH THREADED & BAYONET RECEPTACLES



THREADED RECEPTACLE
C48-00RXX-XXX
MS24264RXXT-XXX



BAYONET RECEPTACLE
C48-10RXX-XXX
MS24264RXXB-XXX

Shell Size	DIMENSIONS (Inches) A Th'd	A +.000 −.005	F Max.	G Max.	H Min.	J Min.	L ±.005	M ±.005	P Max.	X ±.015	R Max.
8	9/16-24	.536	.437	.561	.447	.620	.594	.812	.582	.180	1.890
10	11/16-24	.659	.562	.696	.572	.748	.719	.937	.731	.270	1.890
12	7/8-20	.829	.750	.875	.760	.913	.812	1.031	.919	.400	1.890
14	15/16-20	.898	.812	.935	.822	.980	.906	1.125	.981	.460	2.125
16	1 1/16-18	1.025	.938	1.062	.948	1.107	.969	1.250	1.106	.610	2.125
18	1 3/16-18	1.131	1.062	1.187	1.072	1.209	1.062	1.343	1.231	.690	2.125
20	1 5/16-18	1.256	1.182	1.312	1.192	1.337	1.156	1.437	1.356	.830	2.125
22	1 7/16-18	1.381	1.312	1.437	1.322	1.452	1.250	1.562	1.481	.940	2.125
24	1 9/16-18	1.506	1.432	1.562	1.442	1.577	1.375	1.703	1.606	1.040	2.125

TRW CINCH CONNECTORS

HOW TO ORDER

To get the specific "Omega" Series Connector you want, put together the part number as per the following typical example. (Remember, of course, that only the inserts shown on Page 2245 are available.)

C48 - 0 6 R 22 - 55 P 6 - (102)

Series Designation C48—

Coupling Type 0-Threaded
1-Bayonet

Shell Style 0-Square Flange Receptacle
3-Single Hole Mounting Receptacle
6-Straight Plug

Environmental Class R-Meets MIL-C-26500(USAF)
C-Meets MIL-C-38300(USAF)*

Shell Size 8,10, 12, 14, 16, 18, 20, 22, 24

See Table of available inserts on Page 2245

Number of Contacts 2, 3, 4, 5, 7, 8, 10, 11, 12, 14, 15, 16, 19, 24, 25, 29, 31, 32, 39, 41, 43, 55, 61

*CONSULT FACTORY

Deviations
Connector for Potting (100)—
Connector Less Cable Support (102)—
Connector Less Contacts (105)—
Connector Less Contacts & Less Cable Support (106)—

Alternate Shell Positions as per Table on Page 2245 (Omit for normal position)

Contact Style P-Pin, S-Socket

MIL STANDARD PART NUMBERS

You can use MS as well as CINCH-NULINE part numbers in ordering "Omega" Series Connectors. The MS part numbers for MIL-C-26500 Connectors are worked out on the basis shown in the table below. Whether you order by the MS or the "Omega" Series Number, all qualified connectors are shipped with the MS marking.

MS24266 R 22 T 55 P 6

MS Shell Drawing
MS24264—Sq. Flange Recept.
MS24265—Single Hole Mtg. Receptacle
MS24266—Straight Plug

Environmental Class
R-Meets MIL-C-26500(USAF)

Shell Size 8, 10, 12, 14, 16, 18, 20, 22, 24

Coupling Type T-Threaded, B-Bayonet

Number of Contacts 2, 3, etc.

Alternate Shell **Style** P-Pin S-Socket

Contact Style
P-Pin
S-Socket

TRW CINCH CONNECTORS

CINCH-NULINE "OMEGA" SERIES

CRIM-LOK CONTACTS & SEALING PLUGS

MIL-C-26636 CONTACTS

When you order "Omega" Series Connectors with contacts, the contact package contains 20% spares. The package also includes seal plugs for at least 15% of the contact holes (or at least 3 sealing plugs).

To order contacts and sealing plugs separately use the part numbers in the table at right. (The contacts, of course, are MIL-C-26636 contacts.) Contacts may also be ordered in reels for use with automatic crimping tools.

CONTACT DATA

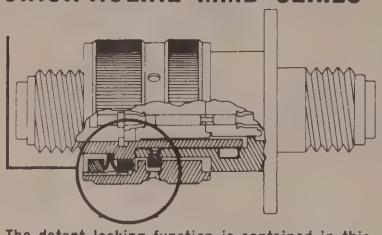
Contact Size	Max. Current Rating	Wire Size	CINCH-NULINE Part No.		MS Part No.	
			Pin	Socket	Pin	Socket
No. 20	7.5 Amps	24-22-20 AWG	C48-1595-02	C48-100-2000S-02	MS24254-20P	MS24255-20S
No. 16	22 Amps	18-16 AWG	C48-1825-02	C48-100-1600S-02	MS24254-16P	MS24255-16S
No. 12	41 Amps	14-12 AWG	C48-1827-02	C48-1215-02	MS24254-12P	MS24255-12S
No. 1* (Shielded)	3 Amps	RG179/U, 179A/U, 187/U, 188/U, 161/U	C48-1226-50	C48-1227-50	—	—
No. 2** (Shielded)	7.5 Amps	RG195/U	C48-2187-50	C48-2188-50	—	—
No. 2** (Shielded)	7.5 Amps	—	C48-2187-02	C48-2188-02	MS27184	MS21785

*Cables RG178/U, RG178A/U, and RG196/U can be accommodated with modification to shielded contacts.
**AWG 18, 20, and 22 shielded wire per MIL-C-7078 Type II or MIL-C-27500 (USAF) can be accommodated with modification to shielded contacts.
***MS numbers represent similar type contacts, pending qualification of CINCH-NULINE part numbers.

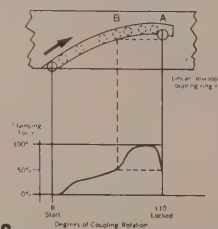
GROMMET SEALING PLUGS

Color Code	Size	CINCH-NULINE Part No.	MS Part No.	Color Code	Size	CINCH-NULINE Part No.	MS Part No.
Yellow	12	C48-2221-12	MS27187-2	Red	20	CC48-2221-20	MS27186-1
Blue	16	C48-2221-16	MS27187-1	White	#2 Shielded	C48-1458	MS25251-8

CINCH-NULINE MMB SERIES



The detent locking function is contained in this area and isolated from the mechanism which locks the connectors together.
Patent Numbers: 3,805,379, 3,750,087



CONTACTS

When you order connectors with contacts, the contact package contains enough contacts to complete the insert arrangement and have 2 spares left. The package also includes enough sealing plugs for at least 15% of the contacts in the insert, in any case a minimum of 3 sealing plugs. To provide proper sealing, insert unwired contacts and sealing plugs in all unused holes. (Use a #12 contact for a #1 shielded hole.) To order contacts and sealing plugs separately use the part numbers in the table at right. Contacts may also be ordered in reels for use with automatic crimping tools.

GROMMET SEALING PLUGS

Color Code	Size	TRW/Cinch Part No.	MS Part No.
Yellow	12 & #1 Shielded	C48-2221-12	MS27187-2
Blue	16	C48-2221-16	MS27187-1
Red	20	C48-2221-20	MS27186-1
White	#2 Shielded	C48-1458-01	—

• The convenience of bayonet coupling. **• The rigidity of screw type coupling**

Severe vibration, such as that which occasionally occurs in airborne equipment, can cause a high rate of early failure in connectors. This is especially true of the bayonet type of coupling connectors. To overcome this problem, aircraft manufacturers put out a call for connector manufacturers to design a more vibration-proof model, within definite limits.

Realizing that a new type of connector could cost more per unit than the failure-prone type, the aircraft companies stipulated that the increased costs should be justified by reduced maintenance cost and lower air traffic revenue losses caused by excessive downtime. Also, to prevent a complete re-engineering of the present connection systems used in airplanes, the new design would have to:

1. Mate with the standard MIL-C-26500 and MIL-C-83723 bayonet receptacle presently used on the aircraft.
2. Use standard contacts.
3. Use standard crimping, insertion and removal tools.
4. Withstand vibration and shock equivalent to the capability of thread-coupled connectors locked up metal-to-metal.

To meet the challenging conditions imposed by the aircraft manufacturers, TRW/Cinch NuLine engineers decided to approach the development of a new design based on an analysis of the failure-modes of the present connector system.

Critical analysis of the connector needing improvement revealed that a vibration envelope induced forces on the connector that resulted in a wear producing relative motion between the plug and its mating receptacle.

Further analysis of the connector design disclosed that the "relative motion" was due to the unloading effect on the clamping force when the bayonet dropped into its detent in the coupling ring ramp.

Contact Size	Wire Size AWG	Max. Current Rating Amps	TRW/Cinch Part No.		MS Part No.		Crimping Tool	Bushing (Positioner)	Crimp Jaw Setting Dia. (Insp.)	Insertion Tool	Removal Tool Standard Connector
			Pin	Socket	Pin	Socket					
No. 20	24 22 20	3.0 5.0 7.5			MS24254-20P	MS24255-20S	294-126 294-186 294-243 294-293 294-358 294-506	Included 294-1266 Turret Hd. Turret Hd. 294-444 Automatic	.031-.041 .031-.041 .031-.041	294-88 (MS24256A20) 94 294-213	294-89 (MS24256R20)
No. 16	18 16	16 22			MS24254-16P	MS24255-16S	294-126 294-243 294-293 294-358 294-506	Included Turret Hd. Turret Hd. 294-901 Automatic	.041-.053 .041-.053	294-96 (MS24256A16)	294-97 (MS24256R16)
No. 12	14 12	32 41			MS24254-12P	MS24255-12S	294-86 294-126 294-243 294-293 294-358 294-506	294-903 Included Turret Hd. Turret Hd. 294-903 Automatic	.0625 .062-.072 .062-.072	294-72 (MS2425BA12)	294-73 (MS24256R12)
No. 1* (Shielded)	** **** *****	3 1 1	C48-1226-02 C48-1226-54 C48-1226-55	C48-1227-02 C48-1227-54 C48-1227-55			294-289	294-1631		294-72† (MS24256A12)	294-73† (S24256R12)
No. 2 (Shielded)	***	7.5	C48-2187-02	C48-2188-02			294-358	294-1015		294-128†	294-127†

*Replaces No. 12 power contact.
**Accommodates Cables RG174/U, RG179/U, RG179A/U, RG187/Y, RG188/U, and RG161/U as well as shielded wire. Can also accommodate Cable MIL-C-27500-22 K1N6 (Extruded) or 22 AWG per MIL-C-7078 Type II.
***Accommodates Cable MIL-C-27500-22 K1N6; 20 K1N6; 18 K1N6 (Extruded) or 22, 20, 18 AWG, per MIL-C-7078 Type II.
****For use with RG195/U, RG180/U, RG180A/U, and RG180B/U.
*****Accommodates Cables RG178/U, RG178A/U, RG178B/U, and RG196/U.
†These tools are applicable to all #1 or #2 shielded contacts, respectively, not just contacts listed here.

TRW CINCH CONNECTORS

CINCH-NULINE MMB SERIES (Cont'd)

INSERTS

SHELL SIZE 8 — MS27561

2 #20 CONTACTS INSERT 8-2 — 3 #20 CONTACTS INSERT 8-3

SHELL SIZE 10 — MS24260

2 #20 CONTACTS INSERT 10-2 — 2 #16 CONTACTS INSERT 10-20 — 5 #20 CONTACTS INSERT 10-5

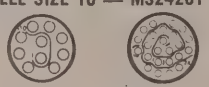
SHELL SIZE 12 — MS24260

3 #16 CONTACTS INSERT 12-3 — 12 #20 CONTACTS INSERT 12-12

SHELL SIZE 14 — MS24260

2 #16 CONTACTS 1 #2 SHIELDED CONTACT INSERT 14-3 — 4 #12 CONTACTS INSERT 14-4 — 7 #16 CONTACTS INSERT 14-7 — 9 #20 CONTACTS 3 #16 CONTACTS INSERT 14-12 — 15 #20 CONTACTS INSERT 14-15

SHELL SIZE 16 — MS24261



10 #16 CONTACTS INSERT 16-10 — 24 #20 CONTACTS INSERT 16-24

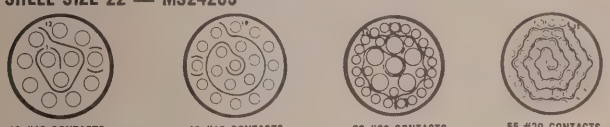
SHELL SIZE 18 — MS24262

8 #12 CONTACTS INSERT 18-8 — 10 #16 CONTACTS 1 #2 SHIELDED CONTACT INSERT 18-11 — 14 #16 CONTACTS INSERT 18-14 — 31 #20 CONTACTS INSERT 18-31

SHELL SIZE 20 — MS27561

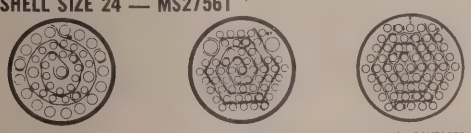
16 #16 CONTACTS INSERT 20-16 — 19 #20 CONTACTS 6 #12 CONTACTS INSERT 20-25 — 24 #20 CONTACTS 4 #12 CONTACTS INSERT 20-28 — 37 #20 CONTACTS 2 #16 CONTACTS INSERT 20-39 — 41 #20 CONTACTS INSERT 20-41

SHELL SIZE 22 — MS24263



12 #12 CONTACTS INSERT 22-12 — 19 #16 CONTACTS INSERT 22-19 — 26 #20 CONTACTS 6 #12 CONTACTS INSERT 22-32 — 55 #20 CONTACTS INSERT 22-55

SHELL SIZE 24 — MS27561



23 #20 CONTACTS 20 #16 CONTACTS INSERT 24-43 — 2 #12 CONTACTS 55 #20 CONTACTS INSERT 24-57 — 61 #20 CONTACTS INSERT 24-61

TABLE I

Shell and Insert	Shell Size	Contacts	Drawing
08-02	8	2 #20	MS27561
08-03	8	3 #20	MS27561
10-02	10	2 #20	MS24260
10-05	10	5 #20	MS24260
10-20	10	2 #16	MS24260
12-03	12	3 #16	MS24260
12-12	12	12 #20	MS24260
14-03	14	2 #16	MS24260
		1 #2 Coax	
14-04	14	4 #12	MS24260
14-07	14	7 #16	MS24260
14-12	14	9 #20	MS24260
		3 #16	
14-15	14	15 #20	MS24260
16-10	16	10 #16	MS24261
16-24	16	24 #20	MS24261
18-08	18	8 #12	MS24262
18-11	18	10 #16	MS24262
		1 #2 Coax	
18-14	18	14 #16	MS24262
18-31	18	31 #20	MS24262
20-16	20	16 #16	MS27561
20-25	20	19 #20	MS27561
		6 #12	
20-28	20	24 #20	MS27561
		4 #12	
20-39	20	37 #20	MS27561
		2 #16	
20-41	20	41 #20	MS27561
22-12	22	12 #12	MS24263
22-19	22	19 #16	MS24263
22-32	22	26 #20	MS24263
		6 #12	
22-55	22	55 #20	MS24263
24-43	24	23 #20	MS27561
		20 #16	
24-57	24	55 #20	MS27561
		2 #12	
24-61	24	61 #20	MS27561

TABLE II

Shell Size	A +.000 −.005	B Min.	C Max.	D +.003	E +.000 −.003	J (3 Full Threads Min.)	K Min.	M +.005 −.000	R Min.	S Max.	V +.003
8	.424	.352	.312	.084	.234	7/16-28 UNEF-2A	.079	.539	.632	.766	.042
10	.526	.428	.388	.084	.285	9/16-24 UNEF-2A	.094	.662	.760	.906	.052
12	.696	.598	.558	.084	.370	3/4-20 UNEF-2A	.094	.832	.930	1.078	.052
14	.765	.667	.627	.084	.405	13/16-20 UNEF-2A	.094	.901	.999	1.141	.052
16	.892	.794	.754	.115	.468	15/16-20 UNEF-2A	.094	1.028	1.126	1.266	.052
18	.998	.900	.860	.115	.521	1 1/16-18 UNEF-2A	.094	1.134	1.232	1.375	.052
20	1.123	1.025	.985	.115	.583	1 3/16-18 UNEF-2A	.094	1.261	1.357	1.510	.052
22	1.248	1.150	1.110	.115	.646	1 5/16-18 UNEF-2A	.094	1.384	1.482	1.625	.052
24	1.373	1.275	1.235	.115	.708	1 7/16-18 UNEF-2A	.094	1.511	1.607	1.760	.052

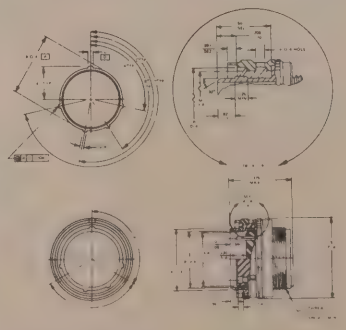


TABLE III — ALTERNATE SHELL KEY POSITIONS

Shell	Position	A°	B°	C°	D°
8 and 10	Normal	105	140	215	265
	6	102	132	248	320
	7	80	118	230	312
	8	35	140	205	275
	9	64	155	234	304
10	10	25	115	220	270
12 14 16 18 20 22 24	Normal	105	140	215	265
	6	18	149	192	259
	7	92	152	222	342
	8	84	152	204	334
	9	24	135	199	240
	10	98	152	268	338

TABLE IV
TRW/CINCH NULINE PART NO. CODE (EXAMPLE)

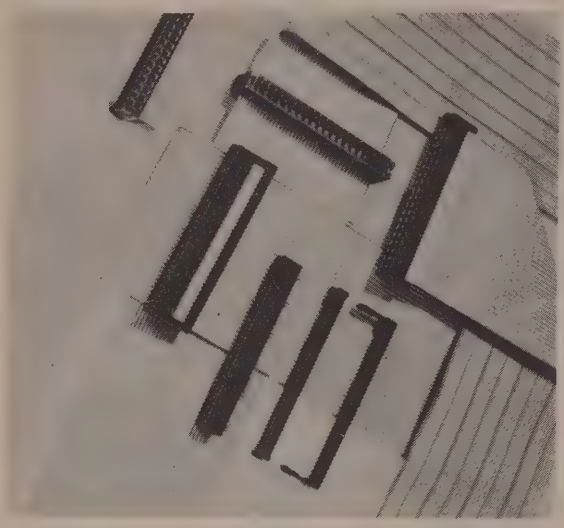
C0909A 10 — 05 P 8 — XXX

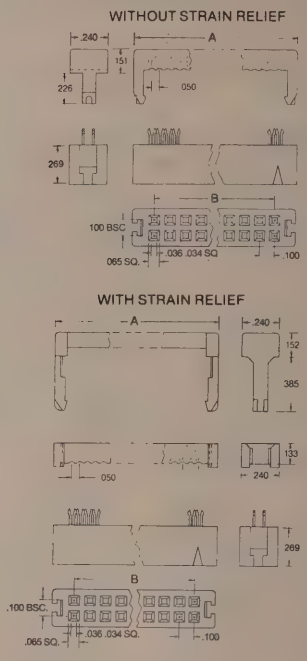
- C0909A — Basic Part No.
- 10 — Shell Size (See Table I)
- 05 — Insert Arrangement (See Table I)
- P — P-Pin Insert, S-Socket Insert
- 8 — Alternate Shell Key Position (See Table III)
- XXX — Deviation
  - -102 Less Cable Support
  - -105 Less Contacts
  - -106 Less Contacts and Less Cable Support
  - -998 Nickel Plate per MIL-C-26074 Class 3 Grade A. .001 Min.

NOTES:
1. The C0909A-XX-XXXX-XXX complies with the requirements of TRW/Cinch Nuline PS-C0909 product specification.
2. The last three digits of the part number in Table IV are optional and denote deviations to the Standard Connector.

TRW CINCH CONNECTORS

SERIES 299 FLAT CABLE CONNECTORS





- Available in six sizes
- Optional strain relief
- Cable accurately positioned automatically by cover
- Integral molded locking tabs for added retention
- Two wire contact points for extra reliability
- Ultra-compact design saves board space

TRW Cinch flat cable connectors, either with strain relief or without, are available in six sizes — 10, 20, 26, 34, 40 and 50 positions. All accept flat cable with .05 inch (1,27mm) spacing in wire gauges #24 through #30. Gold plated bifurcated contacts provide two wire contact points for added reliability. Strain relief is provided through the use of a three-piece assembly.

With TRW Cinch flat cable connectors, the cable is automatically positioned for termination by means of grooves on the cover rather than by the terminating tool. TRW Cinch terminating tool fixtures are interchangeable with a customer's existing tools.

Flat ribbon cable manufactured by TRW Holyoke Wire & Cable is available through TRW Cinch Connectors distributors.

MATERIALS AND FINISHES

Contacts: Beryllium Copper
Contact Plating: 30 microinches gold over 50 microinches nickel per MIL-G-45204
Insulator: Glass-filled polyester (black), 94 V-0 rating
Wire Accommodation: 24 to 30 AWG, solid; 26 to 30 AWG, stranded
Contact Insertion Force (Individual): 6 oz. max.
Contact Withdrawal Force (Individual): 1 oz. min.

PERFORMANCE DATA

ELECTRICAL

Voltage Rating (AC RMS, Adjacent Terminals): 300 volts (sea level)
Test Voltage (AC RMS, Adjacent Terminals): 1500 volts (sea level)
Rated Current: 1 ampere
Insulation Resistance: 5000 Megohms Min.

ENVIRONMENTAL

Temperature Rating: 105°C

ORDERING INFORMATION

No. of Contacts	Factory Part Numbers		Distributor Part Numbers	
	Without Strain Relief	With Strain Relief	Without Strain Relief	With Strain Relief
10	299-14-00-001	299-14-00-002	FC-10	FC-10SR
20	299-14-00-003	299-14-00-004	FC-20	FC-20SR
26	299-14-00-005	299-14-00-006	FC-26	FC-26SR
34	299-14-00-007	299-14-00-008	FC-34	FC-34SR
40	299-14-00-009	299-14-00-010	FC-40	FC-40SR
50	299-14-00-011	299-14-00-012	FC-50	FC-50SR

No. of Contacts	A	B
10	.685	.400
20	1.185	.900
26	1.485	1.200
34	1.885	1.600
40	2.185	1.900
50	2.685	2.400

8000 SERIES FLAT LAMINATED CABLE

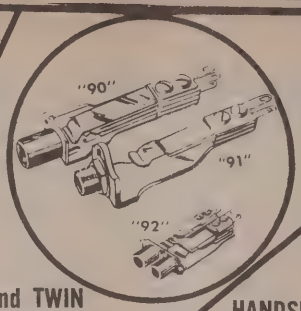
ORDERING INFORMATION

No. of Conductors	Part No.
10	8000-10
14	8000-14
16	8000-16
20	8000-20
26	8000-26
34	8000-34
40	8000-40
50	8000-50

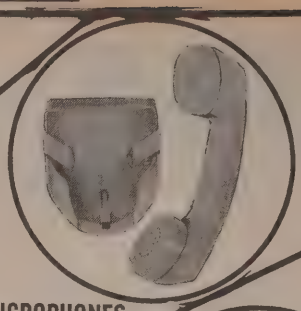
SPECIFICATIONS

Configuration: Conductors on .050 spacing
Conductor: #28 AWG stranded (7/36) soft annealed copper
Insulation: Flame Retardant PVC
Temperature: 105°C UL Style 2678
Voltage Rating: 150 VAC
Insulation Resistance: 10^{10} ohms min. per 10 feet
Impedance: 105 ohms balanced; 73 ohms unbalanced
Capacitance: 9.6 pf per foot — pair 17.0 pf per foot — triplet
Wall Thickness: .009″ average; .006″ minimum
Polarization: Color Band for #1 position
Standard Put-up: 100 foot spools

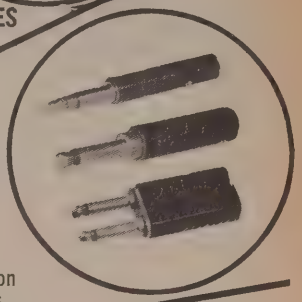
JACK MOUNTING PANELS
Used for mounting standard and miniature telephone and coaxial jacks, keys, lamp sockets, etc. Equivalents of W.E. and many others available. Request bulletins on Product Family 70.



SINGLE and TWIN TELEPHONE JACKS
Standard and miniature size jacks. All circuit configurations. Panels for these provided by Product Family 70. Request bulletin on Product Family 51, 53, and 55 on jacks.



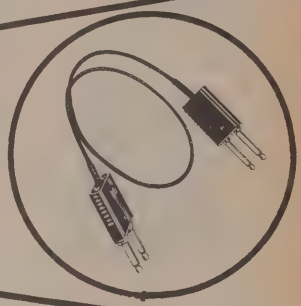
HANDSETS—HEADSET-MICROPHONES and ACCESSORIES
Types for all telecommunication, telephone operators, broadcast station, intercomm, etc. applications. Includes sound powered and carbon microphones, a variety of push-to-talk switches, cords, and accessories, such as cradles for hanging handsets. Request bulletins on Product Family 20.



TELEPHONE PLUGS
Nearly all types, W.E. Kellogg, A.E., etc. both single and twin in two and three circuit forms. All have molded in place nylon insulation. Request bulletins on Product Family 80.

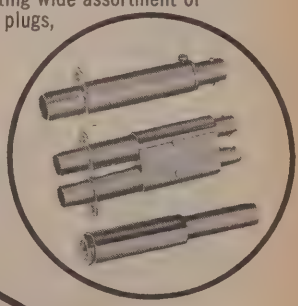
TRIMM'S Full Line

Available from our industrial distributor in your area



AUDIO PATCH, SWITCHBOARD, and TEST CORDS
With standard and miniature size single and twin telephone plugs. Nylon braided tinsel conductor cords. Request bulletin on Product Family 30.

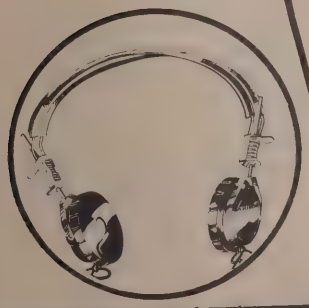
COAX JACKS — PLUGS — PATCH CORDS — and RELATED COMPONENTS
Standard sized single and twin jacks including normal through and terminating types, W.E. and RCA compatible, fitting wide assortment of coax cables and other connectors. Twin looping plugs, single plugs, plug adapters, patch cords, etc. Also specialized triax and twinax concentric series jacks and plugs as well as miniaturized type. Request bulletin on Product Family 60.

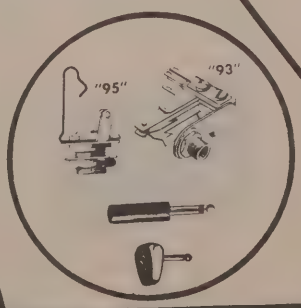


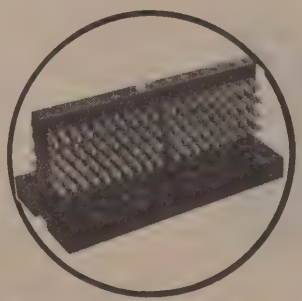
HEADSETS
Many types in all cost ranges, applicable to wide variety of applications. Request bulletin on Product Family 01 through 19.

AUDIO PLUGS and JACKS
Numerous low cost plugs and jacks for hi-fi, tape recorders, sound equipment, etc. Request bulletin on Product Family 40.

TERMINAL BLOCKS
Originally used by the telephone industry (often called Christmas Tree type) now also widely used in other system work. Up to 14 rows per block; 10, 20, and 26 terminals per row. Lug types — solder, wire-wrap, and hybrid solder, wire-wrap. Request bulletin on Product Family 35.







Dept. EM, 400 W. Lake St., P.O. Box 489, Libertyville, IL 60048
Phone (312) 362-3700

TRIMM INC.

AMF
4105 PEMBROKE ROAD
HOLLYWOOD, FLORIDA 33021
PHONE: (305) 981-1211
TWX: 510-954-9810

UID Electronics Division

POWER TRANSISTOR SOCKETS

DESCRIPTION

Economical power transistor sockets in a wide selection for the popular TO-3 and TO-66 cases are now available from a single manufacturer. UID's line of fabricated sockets is based upon eight basic designs, each having several configurations to meet your specific mounting requirements.

These heavy duty sockets are designed for all applications, especially those where trouble-free life is required. Corrosion resistance is assured by cadmium plating of all metal parts. This plating also facilitates wiring to the terminals and collector lugs, and meets EIA solderability specification RS-178A. Valox wafers permit the transistor sockets to be used in temperatures from -200C to +1050C. Threaded #6-20 collector plates (for B, BF, BT or BG screws) allow direct mounting of the transistor and socket to the chassis in one operation. A maximum torque of 9 inch pounds securely mounts these sockets. Numerous boss heights on the PTS-2, -5 and -10 series sockets offer a selection to match mounting specifications. All sockets can be ordered with flame retardant materials.

The specification chart and drawings provide all the necessary ordering information. For special requirements, do not hesitate to call UID or our nearest Sales Engineering Office.

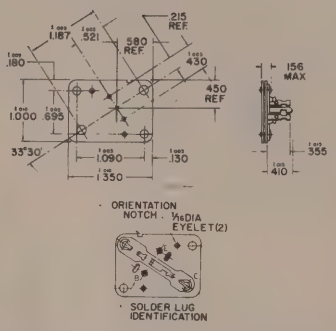
MATERIAL SPECIFICATIONS

Collector Plate
- Cadmium plate steel.

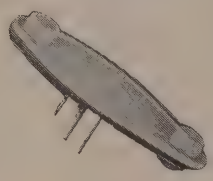
Contacts and Terminals
- Cadmium plated brass is standard.

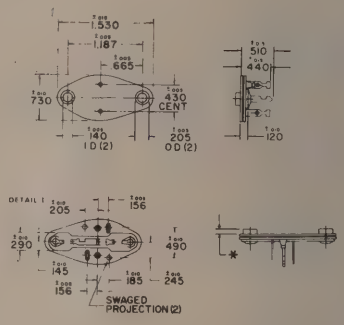
Wafer Insulator
- Both wafers XP phenolic on PTS-1, -4, and -6
- Top wafer valox (various boss heights) on PTS-2, -5 and -10 series.
- Bottom wafer XP phenolic on PTS-2, -5 and -10 series.
- Flame retardant materials available.

PTS-1
FOR TO-3 CASE
(Pin Size .040)

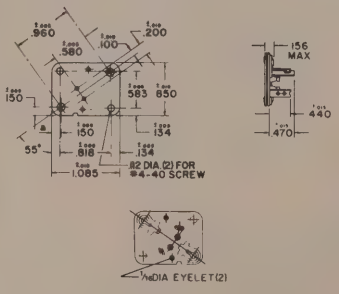


PTS-2, PTS-2C
FOR TO-3 CASE
(PTS-2 .090 ± .005) *
(PTS-2C.030 ± .005)

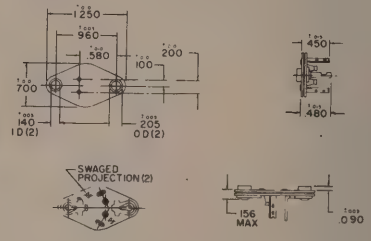




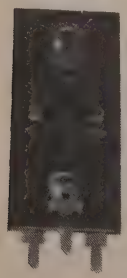
PTS-4
FOR SILICON CONTROLLED RECTIFIERS OR TO-66 CASE
(Pin Size,.030)

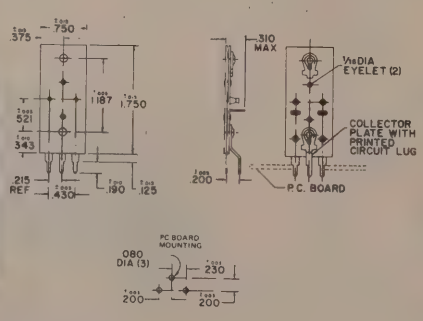


PTS-5D
FOR SILICON CONTROLLED RECTIFIERS OR TO-66 CASE

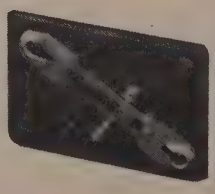


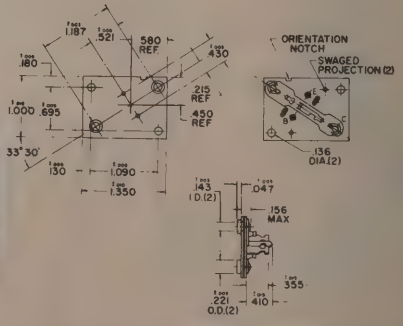
PTS-6
FOR TO-3 CASE





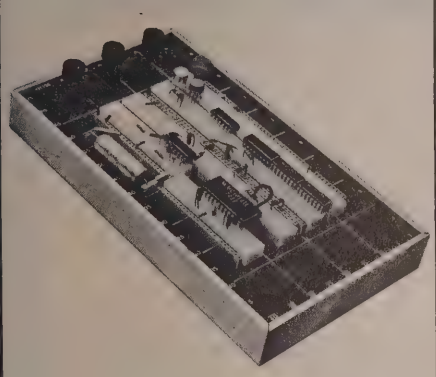
PTS-10 B
FOR TO-3 CASE





KLIP-BLOK/STRIP BREADBOARDING SYSTEM

Vector



51X KIT

(Circuit elements not included in kit)

No Soldering **Use With DIPs, Other I.C.s and Discrete Components** **No Wrapping**

Build circuits quickly with Klip-Bloks, Klip-Strips and Klip-Buses. Simply insert components into these spring clip units and make interconnections with ordinary wire. Designing, modifying and testing the circuit is easily accomplished without the need of special patch cords or risk of damaging components.

Klip-Bloks, Strips and Buses consist of spring clips with four connected tie points or 'quads.' Klip-Strips and Buses utilize the quads in strips of various lengths, from 4 to 48 tie points with insulated casings, while Klip-Bloks have these quads encased in nylon shells, either 8 (T66-32) or 24 (T66-96) quads each. All Klip-Bloks, Strips and Buses are spaced on 0.1" grids for optimum I.C. breadboarding. Klip-Bloks, Strips and Buses accept leads from 0.015" to 0.032" dia. Ordinary 22 ga. wire (0.0253" dia.) is ideal for strapping. Components may be inserted into the clips from either top or bottom. The Bloks serve as sockets for components with extra tie points for interconnections. Accompanying Klip-Buses make voltage and ground readily accessible.

Contacts used in Klip-Bloks and Strips are tin lead coated beryllium copper for thousands of reliable connections. Plastic housings on Klip-Bloks are nylon, and insulated brass shells are used on Klip-Strips and Buses.

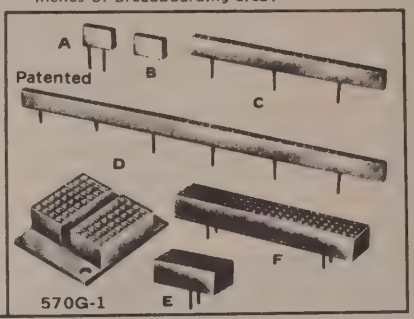
VERSATILE. Klip-Bloks, Strips and Buses fit "P" Pattern Micro-Vectorbord (0.042" dia. holes on 0.1" grid). Thus units may be "moved around" as needed with NO WASTED TIE POINTS. Plus, there is extra SPACE on the Vectorbord base to mount switches, pots, transformers--OR extra Klip units.

REUSABLE. Low-cost Klips and chassis panels may be used over and over again. Klips are good for thousands of insertions and may also be removed and replaced as desired.

EFFICIENT USE OF SPACE. Since components may be mounted on both top and bottom of the Vectorbord base, space is fully utilized. T49-1 Adapter Pins for leads to 0.050" dia. are available.

EXPANDABLE BREADBOARDS. 4½"x8" modules may be coupled together or mounted in larger frames for up to multiples of 144 sq. inches of breadboarding area.

Fig.	Part No.	Description	Pkg. Qty.
A	T45-4	Klip-Strip w/mtg. pins	16, 100
B	T45A4	Patch-Klip - no mtg. pins	16, 100
--	T45-8	Klip-Strip - two quads	10, 100
C	T45-24	Klip-Bus	2, 10
D	T45-48	Klip-Bus	2, 10
--	P154-1	Insertion/Removal Tool for above Klip units	1
E	T66-32	Klip-Blok (8-quad)	4, 16
F	T66-96	Klip-Blok (24-quad)	2, 8
--	P92B	Removal Prod for Bloks	1
--	T49-1	Adapter Pins for leads to .050"	100
--	570G1	Solderless Breadbd. Socket (2 8-qd. Klip-Bloks mounted on nylon base)-for 14-or 16-pin DIP. Stick-or screw-on.	1



570G-1

51X KLIP-BLOK KIT - Assembled

Accepts up to 12 DIPs, has 970 tie points. Consists of big 4½"x8"x1/16" glass epoxy premarked Micro-Vectorbord® base, panel mounted on 1" high aluminum frame with eight 24-quad (T66-96) Klip-Bloks and four 48-contact Klip-Buses installed, ready for plugging in up to 12 DIPs and associated circuitry. Three 5-way binding posts are installed at one end. The Micro-Vectorbord panel provides space and facility for mounting extra large components. Kit includes stick-on MS9A and MS10A DIP contact Marker Strips, and special T49-1 Adapter Pins for plugging large components into Klip-Bloks/Strips.

PLUG-IN CASES For Building Modular Plug-In Circuits

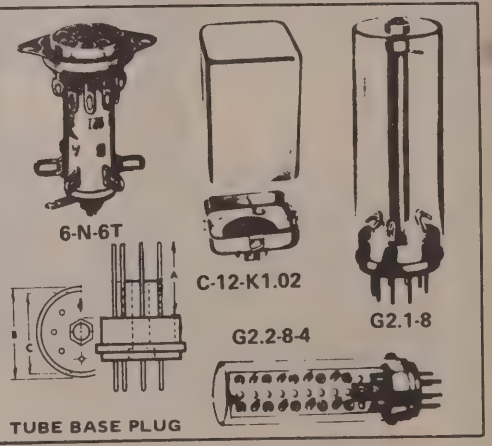
ROUND CASES listed consist of a mica filled phenolic tube base type plug, either standard 7-pin miniature, 9-pin noval, or 8-pin octal type, and cover. Some listed models have interior wiring structures for mounting components. Covers attach with furnished screws. Other sizes and "specials" to order -- write factory.

Base Plug Type	Part No.	Dia.	Lgth.*	Furnished Internal Structure
7-pin Min.	G2.2-8	5/8"	2"	Center Screw + Insul. Spacer
9-pin Min.	G2.1-8	3/4"	2"	Center Screw + Insul. Spacer
7-pin Min.	G2.2-8F	5/8"	2"	None
9-pin Min.	G2.1-8F	3/4"	2"	None
7-pin Min.	G2.2-8-4	5/8"	2"	Terminal Wall Strip w/ Terminals
9-pin Min.	G2.1-8-4	3/4"	2"	Terminal Wall Strip w/ Terminals
8-pin Octal	G2-10	1¼"	2½"	None
8-pin Octal	G2-10-4	1¼"	2½"	Terminal Wall Strip w/ Terminals

*Does not include plug pins.

SQUARE CASES with retainer ring mounted mica filled phenolic plugs. Models listed have 8-pin octal type plugs retainer-ring-mounted in bases to which covers attach with 3 furnished side screws.

Base Plug Type	Part No.	Size (Lgth. Less Plug Pins)	Furnished Internal Structure
8-pin Octal	B8	1-3/8"sq. x 2" long	None
8-pin Octal	B10	1-3/8"sq. x 2½" long	None
8-pin Octal	B10T	1-3/8"sq. x 2½" long	Turret w/ 12 Lugs
8-pin Octal	C10	2" sq. x 2½" long	None
8-pin Octal	C12T	2" sq. x 3" long	Turret w/ 12 Lugs



2" SQ. CASES WITH CRIMPED 8-PIN BAKELITE OCTAL PLUGS

Available Terminal Cards w/ O/A Hole Pattern & Mtd. Brackets

Part No.	O/A Lgth.	Large Holes (.093) Spaced .265x.265 Phenolic Material	Small Holes (.062) Spaced .1 x .2 Epoxy Glass Mat'l
C10K1.02	2½"	None	None
C12K1.02	3"	511	514

TUBE BASE PLUGS

Mica filled phenolic or white glass filled polyimide material for building miniature plug-in units. Plugs match standard tube base sockets and have tinned phosphor bronze pins for soldering components on upper end. Flange on plug body serves as "stop" and bonding point for covers if used. Pins on plug-in side are 17/64" long. Models with recessed knurled nuts are available -- write factory. *Plugs listed below do not have center post.*

No. Pins	Mica Filled Phenolic	Polyimide	Type	Key Way	Dimensions A	B	C
7	K1.313	—	7-pin Min. Straight Pins	No	3/16	.620	.575
7	K1.302	—	7-pin Min. Straight Pins	Yes	17/32	.620	.575
7	K1.334	—	7-pin Min. Hooked Pins	Yes	3/16	.620	.575
9	K1.413	K1.413B	9-pin Straight Pins	No	3/16	.750	.700
9	K1.402	—	9-pin Straight Pins	Yes	17/32	.750	.700
9	K1.434	—	9-pin Hooked Pins	Yes	3/16	.750	.700

TURRETS

Post and Socket Types

Compact wiring structures are ideal for mounting discrete components on minimum chassis space. Socket type has ½" dia. phenolic post attached to socket, and one or two rings of tinned lugs for soldering components. Post type mounts with 6-32 screw into recessed knurl nut inside turret, or with protruding 6-32 screw. Many other sizes and types available -- write factory.

Part No.	Mounting Style	Turret Height	No. Term.	No. Rings	Spacing Betw. Rings
10-0-9T	Octal Socket	2½"	9	2	1-3/8"
6M6T	7-pin Min. Skt.	1½"	6	1	—
8M9T	7-pin Min. Skt.	2"	9	2	1"
6N6T	9-pin Min. Skt.	1½"	6	1	—
8N9T	9-pin Min. Skt.	2"	9	2	1"
8-12	6-32 Screw/Nut	1-27/32"	12	2	1"
10-12	6-32 Screw/Nut	2½"	12	2	1-3/8"
6H12	6-32 Knurl Nut	1½"	12	2	7/8"

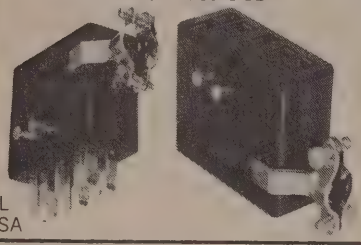
In the interest of improved design and performance, Vector reserves the right to make changes in its specifications without prior notice.

VECTOR ELECTRONIC COMPANY, INC. 12460 Gladstone Avenue, Sylmar CA 91342 Phone (213) 365-9661 TWX 910-496-1539

BEAU®

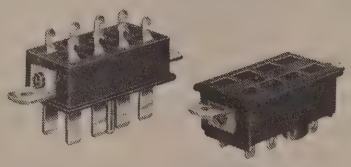
Plug & Socket Connectors

3300 SERIES
10 amps, 750 volts
2-33 contacts



UL
CSA

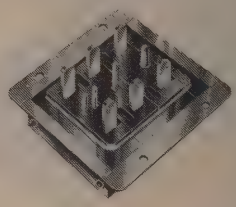
5400 SERIES
15 amps, 1750 volts
4-16 contacts



UL
CSA

Also, 4400 Series—for mounting from back of panel.

5500 SERIES
50 amps, 600 volts
2-16 contacts



Shallow-bracket mounting

SEVEN EXCLUSIVE INNOVATIONS

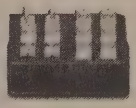
1. PRE-GROUNDING—see next page.

2. THERMOPLASTIC BACKSHELLS.

(Metal also.) Resilient thermoplastic backshells provide greater dielectric strength and greater safety. They're also non-rusting and acid resistant. UL; CSA.

3. WAVE SOLDERABLE CONTACT TAILS.

Special tail design (S_6 and P_7) allows for mounting directly to PC boards and flexible circuits — and gives you the economy of automatic wave soldering. 3300 Series. UL; CSA.



4. 16 CONTACTS IN THE SPACE OF 12.

Our 15 amp connectors can have up to 16 contacts—4 more than other 15 amp makes. That's 33% more contacts in the same amount of space. UL; CSA.

5. PANEL MOUNTED IN ONE-FOURTH THE TIME.

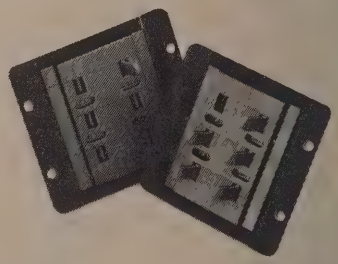
C-clip mounting of Beau connectors cuts panel mounting time by 3/4ths. No drilling. No screws. Just slide on C-clips and it's secure. 3300, 5400 Series. UL; CSA.

6. SELF-POLARIZING 6-CONTACT CONNECTOR.

With contacts set in opposing directions, even a heavy hand can't mismate our 6-contact 10 amp plugs and sockets. UL; CSA.

7. HERMAPHRODITIC SELF-POLARIZING.

With male and female contacts in both halves, or with conventional polarization. Can gang in building block fashion. 50 amp.



PANEL MOUNTING HARDWARE

AB	= Angle Bracket	**EBR**	= End Bracket Reversed
ABR	= Angle Bracket Reversed	**EBT**	= End Bracket Tapped
LAB	= Less Angle Bracket	**FP**	= Flat Plate
ABT	= Angle Bracket Tapped	**SB**	= Shallow Bracket
DB	= Deep Bracket	**SCC**	= Snap "C" Clip
EB	= End Bracket	**RP**	= Recessed Plate

CABLE MOUNTING HARDWARE

BBS	= Blank Back Shell	**FHE**	= Flared Hole End
CCE	= Cable Clamp End	**FHE-L**	= Flared Hole End, Latch
CCE-L	= Cable Clamp End, Latch	**FHE-K**	= Flared Hole End, Keeper
CCE-K	= Cable Clamp End, Keeper	**FHT**	= Flared Hole Top
CCT	= Cable Clamp Top	**FHT-L**	= Flared Hole Top, Latch
CCT-L	= Cable Clamp Top, Latch	**FHT-K**	= Flared Hole Top, Keeper
CCT-K	= Cable Clamp Top, Keeper		

CONTACT TAILS

3300 SERIES				5400 SERIES						5500
P or S Solder eye	**P_1 or S_1** Quick Connect .110 tab	**P_4 (long) P_7 (short)** Wire-Wrap	**S_6** Printed Circuit	**P** Solder hook	**P_1** .205 tab **P_2** .187 tab	**P_6, S_6** Printed Circuit	**P_3** Large Solder eye	**S_1** Quick Connect/ Sold. eye	**S_3** Large Solder Eye	**P or S** Binding head screw

Beau Products
DIVISION OF VERNITRON CORPORATION

BOX 10, LACONIA, NEW HAMPSHIRE 03246
TEL: (603) 524-5101 TWX: 710-364-1843
Also available in Canada, England, Europe and Japan

BEAU®

Pre-Grounding Connectors

3300 SERIES: 10 amps per contact
5400 SERIES: 15 amps per contact

PRE-GROUNDING FOR GREATER SAFETY

Beau gives you the greater safety of U.L. recognized pre-grounding plug and socket connectors. The extra long grounding contact engages before any other active contacts are mated. Available for chassis and cable mounting.

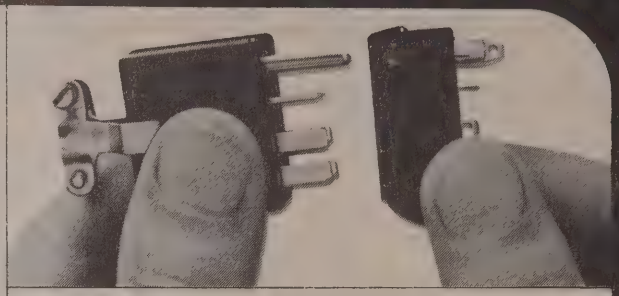
LOWEST INSTALLED COST

Only Beau offers the longer pre-grounding contact. Thus, you will never have to cut any contacts to a shorter length to achieve a safer connection. No more costly, time-consuming hand cutting operations.

CONTACT POSITION

In the 3300 Series, the grounding contact takes the place of a regular contact. Connector sizes 3324 through 3333 are already of the pre-grounding type, and there is no need to specify the grounding contact.

In the 5400 Series, the grounding contact is an additional contact position rather than taking the place of a standard contact.



SPECIFICATIONS

For other specifications and data, see previous page.
Rating: 3300 Series, 10 amps per contact at 750 volts,
5400 Series, 15 amps per contact at 1750 volts.
Grounding contact rating: 30 amps at rated voltages.
No. of contacts: 3300 Series, 3 to 33 (incl. grounding contact),
5400 Series, 5 to 13 (incl. grounding contact)
Grounding contact: Extra long, heavy-duty plated brass.
Grounding contact tail: 5400 Series, mounted on an elevated creep path barrier that puts required distance between ground and active contacts.
U.L. RECOGNIZED. CSA CERTIFIED.

Single-Row High-Barrier Resilient Terminal Strips

72000 SERIES: thermoplastic

SINGLE ROW; 3/8" CENTERS
20 AMPS, 150/250 VOLTS
FEED THRU OR CLOSED BACK

BEND BARRIERS WITHOUT BREAKING

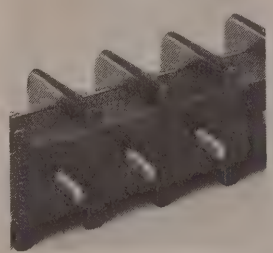
Beau's flexible barrier strips reduce breakage dramatically because they are made of highly resilient glass-filled thermoplastic materials. Impact strength is many times greater than phenolics. Production line and infield damage (and time-consuming re-wiring) are virtually eliminated.

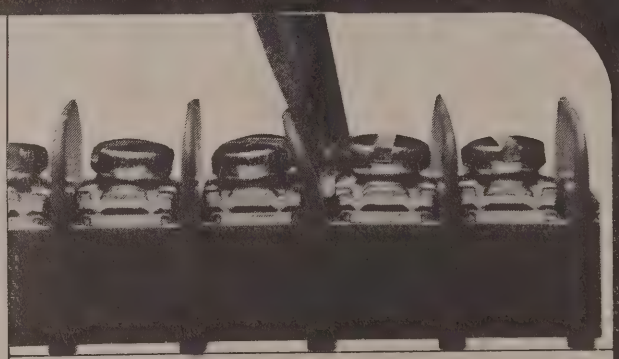
PROTECTS SOLDER JOINTS FROM DAMAGE

Exclusive from Beau — terminals are ultrasonically imbedded in the base. This eliminates solder joint damage from torqueing screws, or from strain in dressing down wire bundles. Also, pull-out strength is double the other makes.

TERMINAL TAILS ENCLOSED

Cavities are eliminated around dip solder terminal tails. This allows mounting directly on PC board without affecting circuit isolation. It eliminates entrapment of foreign matter, reduces solder wicking.





SPECIFICATIONS

Size: 5/8" w x 21/32" h*

No. of terminals: 1 to 26

Terminal styles (bottom):

- Printed circuit, straight or right angle
- Wire wrap with long extended tail
- Quick connect tab (insulated feed thru)
- Solder turret (insulated feed thru)
- Closed back

Terminal styles (screw side):

- #6-32 x 1/4" binding head screw
- Wire clamp plate, self rising
- Quick connect tab (1 to 6 terminations per circuit)
- Solder terminal, single or double ended

Colors: Black (standard), others available.

U.L. RECOGNIZED. CSA CERTIFIED.

* Also available with barrier height of 5/16" (71000 Series)

Beau Products
DIVISION OF VERNITRON CORPORATION

BOX 10, LACONIA, NEW HAMPSHIRE 03246
TEL: (603) 524-5101 TWX: 710-364-1843
Also available in Canada, England, Europe and Japan.

BEAU®

Double-Row High-Barrier Resilient Terminal Strips

76000 SERIES: thermoplastic

DOUBLE ROW; 3/8" CENTERS
20 AMPS, 150/250 VOLTS
CLOSED BACK OR FEED THRU

BEND BARRIERS WITHOUT BREAKING
Beau's flexible barrier strips reduce breakage dramatically because they are made of highly resilient glass-filled thermoplastic materials with highest U.L. flame retardant rating, 94V-0. Impact strength is many times greater than phenolics. Production line and in-field damage and time-consuming re-wiring are virtually eliminated.

GET 20 AMPS IN THE SAME SPACE AS 15
These 20-ampere strips are designed to take the same panel space as any double-row 15-ampere barrier terminal strip. They are 7/8-inches wide and have screw terminals 3/8-inches on centers.

SCREW TERMINALS WON'T PULL OUT
The 76000 Series eliminates the problem of insecure terminal retention commonly found in closed back double-row barrier terminal strips. Eyelets and nails have been eliminated. Instead, screw terminals are ultrasonically welded (imbedded) into the barrier strip. It's more rugged, and has a greater creep path. With a closed back, you get the electrical rating you want — without insulating strips.

FEED THRU STYLES HAVE ENCLOSED CONTACT TAILS
Unlike the typical thru-hole in feed thru styles, ours is virtually the same size as the contact tail. This maximizes circuit isolation, eliminates entrapment of foreign matter, reduces solder wicking.

SPECIFICATIONS

Size: 7/8" W x 5/8" H*

No. of terminals: 2 to 30 (molded to length; no rough cut ends)

Base style: Closed back or feed thru

Mounting: With or without mounting ends

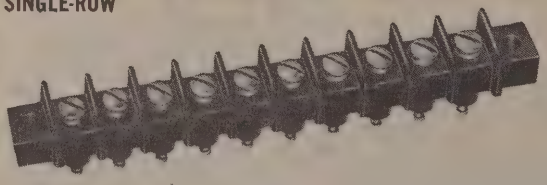
Terminal styles:
#6-32 x 1/4" binding head screw (standard)
Wire clamp plate, self rising
Quick connect tab (1 to 6 terminations per circuit)
Solder terminal, single or double
Feed-thru solder, long and short
Feed-thru PC, long and short
Feed-thru wire wrap
Z terminal, over-the-side PC

Colors: Black (standard) others available

U.L. RECOGNIZED. CSA CERTIFIED.
* Also available with barrier height of 7/16" (77000 Series).

Single & Double-Row Barrier Terminal Strips

SINGLE-ROW



Available in 15 and 20 amp models, both have high-impact glass-filled phenolic bases with excellent breakage resistance. They are furnished in green, with or without mounting ends. Nickel-plated brass screws. Cadmium or tin plated terminals. Imprinting on barrier strip body available.

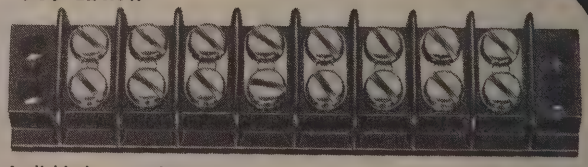
U.L. RECOGNIZED. CSA CERTIFIED.

Rating, Amps	Series No.	Back Types	No. Circuits	Width	Height	Terminal Screws	Term. Ctrs.
15	12000	Feed thru or Closed	1-31	35/64"	7/16"	5-40x3/16"	3/8"
20	13000	Feed thru or Closed	1-26	47/64"	35/64"	6-32x1/4"	7/16"

TERMINALS

12000 SERIES	13000 SERIES	
Closed back	Screw	Insulated taper pin
PC	Closed back	PC
Turret	Turret, insul.	Turret
Quick connect	PC, insul.	Quick connect

DOUBLE-ROW



Available in general-purpose phenolic or glass-filled phenolic materials (black). Also, four series available in highly resilient glass-filled thermoplastic, with highest U.L. flame retardant rating, 94V-0. Wide choice of terminal styles, marker/insulation strips and other hardware. Black, standard.

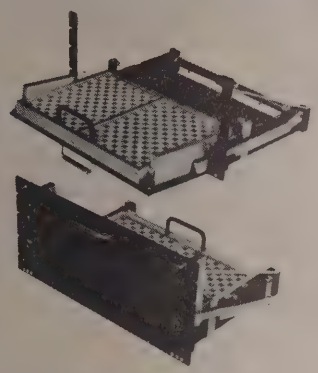
U.L. RECOGNIZED. CSA CERTIFIED.

Rating, Amps	Series No.	Back Types	No. Circuits	Width	Height	Terminal Screws	Term. Ctrs.
PHENOLIC CONSTRUCTION							
10	10000	Open	1-20	5/8"	3/16"	2-56x3/16"	1/4"
15	14000	Open	1-30	7/8"	13/32"	5-40x1/4"	3/8"
	15000	Closed	1-31	7/8"	27/64"	5-40x1/4"	3/8"
20	16000	Open	1-30	7/8"	13/32"	6-32x1/4"	3/8"
	17000	Closed	1-31	7/8"	27/64"	6-32x1/4"	3/8"
	18000	Open	1-30	1 1/8"	1/2"	6-32x1/4"	7/16"
	19000	Closed	1-30	1 1/8"	35/64"	6-32x1/4"	7/16"
30	21000	Open	1-25	1 5/16"	5/8"	8-32x5/16"	5/16"
	22000	Closed	1-26	1 5/16"	21/32"	8-32x5/16"	5/16"
THERMOPLASTIC CONSTRUCTION							
15	14000T	Open	1-30	7/8"	13/32"	5-40x1/4"	3/8"
20	16000T	Open	1-30	7/8"	13/32"	6-32x1/4"	3/8"
20	18000T	Open	1-30	1 1/8"	1/2"	6-32x1/4"	7/16"
20	78000	Closed	1-30	1 1/8"	35/64"	6-32x1/4"	7/16"

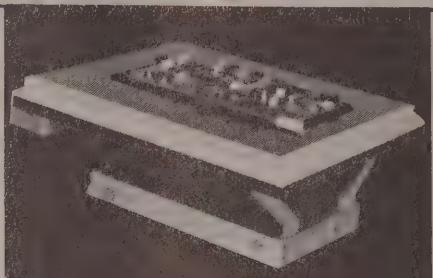
Beau Products
DIVISION OF VERNITRON CORPORATION

BOX 10, LACONIA, NEW HAMPSHIRE 03246
TEL: (603) 524-5101 TWX: 710-364-1843
Also available in Canada, England, Europe and Japan.

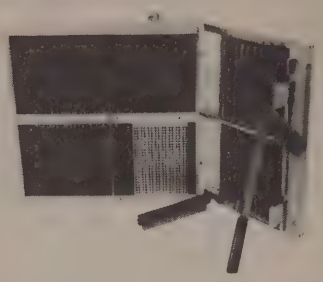
VPC Patchboard Programming Systems and Accessories



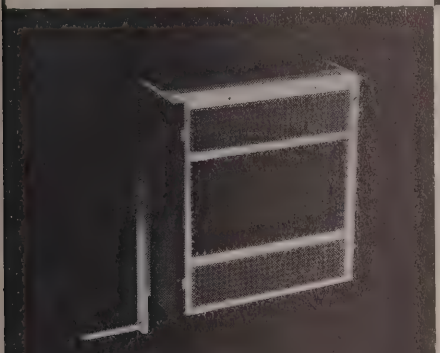
Drawer Type Systems—a roll cam designed for horizontal mounting to save up to 50% in panel areas. Also provides R.F. shielding. Five standard sizes range from 480 to 1870 contacts. All fit 19" wide racks.



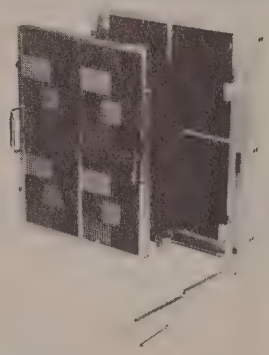
TEST FIXTURE — VPC has available two sizes of fixtures: Large fixture will accept P.C. boards up to 10" x 14". Small fixture accepts PBC up to 7" x 10.500. Fixtures for larger boards are available upon request; contact factory. Fixtures are available in Kit form or Wired to customer specifications.



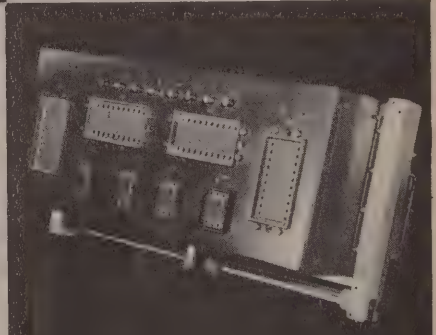
Modular Systems offer true thru shielded matched impedance. Regular shielded and digital modules. Printed circuit boards can be flow soldered to rear of module or wired with Virginia Panel Corporation .093 Locktite Terminals, 2400 front removable contacts.



True Thru-Shielded Systems—offer individual shielding, matched impedance, VSWR of 1.01 from 100 MHz to 500 MHz. These advanced programming systems can be manufactured to virtually any specifications.

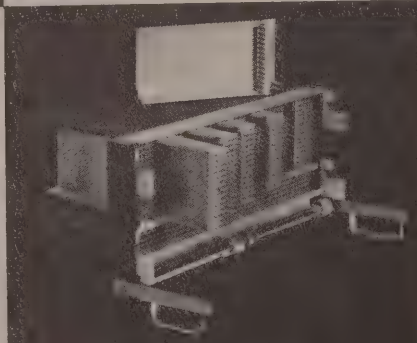


Roll Cam Systems—offer greatest capability and reliability, large number of contacts (24 sizes from 48 to 5120 contacts). Camming action engages full patchboard gently and accurately.



Pre-Wired Systems—can be standard panel boards wired to special quick connectors to eliminate hours of wiring and permit instantaneous re-circuiting. The 2560-contact roll cam system shown terminates in only 13 connectors.

Plating—Nickel or Gold
Board Material—Phenolic or Diallyl Phthalate
Contact Diameters—.093 and .053
Connections—Solder, wire wrap or Locktite
Finish—clear polish or black anodized
Silk Screen—Alpha/ numeric grid or special designs
Patchcords—Manual or fixed; single tip to nine-prong tip; squids; splits; shunts.
All unconditionally guaranteed.
Tools—a variety of 27 tools for crimping, extraction, insertion, and paddle contact.
Send for complete 40-page catalog today.



Roll Cam Modular Systems. This system is the same as Virginia Panel Corporation standard Roll Cam system except being Modular. Printed circuit boards can be attached to rear of Module or can be wired with Virginia Panel Corporation .093 Locktite Terminals, 1632 contacts.

We have salesmen in 42 U.S. Cities. Please refer to the proper section in this catalog for the one nearest you, or contact our factory in Waynesboro, Va.

Besides our 75 standard models of programming systems, some of which are described on this page, VPC also produces a wide variety of custom products.

We invite your inquiries and will appreciate your business.

VIRGINIA PANEL CORPORATION

MAIN PLANT
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WAYNESBORO, VIRGINIA 22980
(703) 942-8376

TEST DIVISION
1432 E. KATELLA AVENUE
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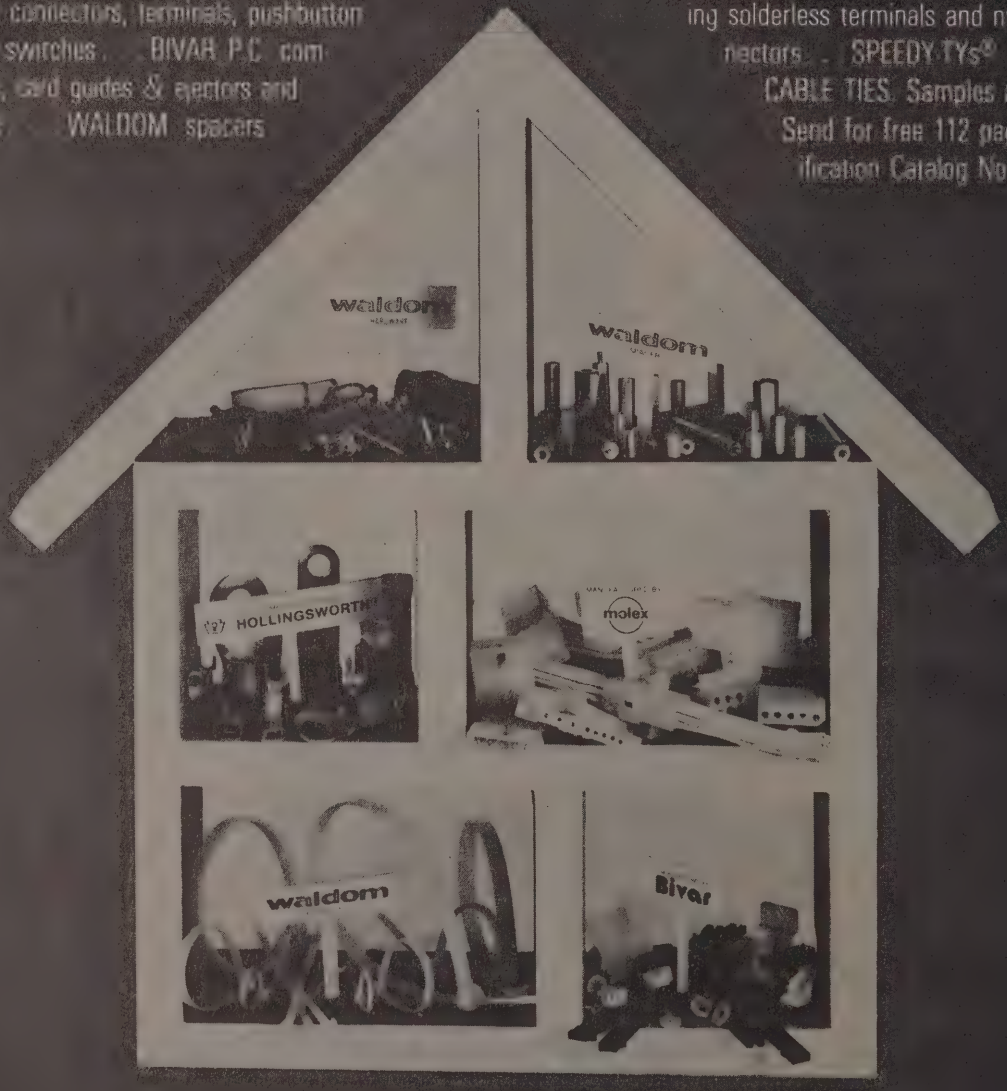

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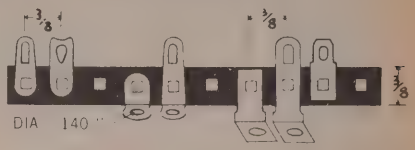
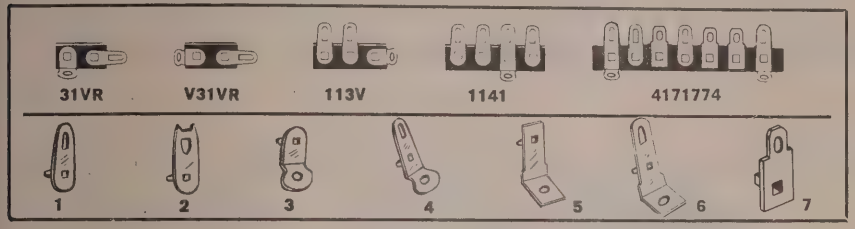
STANDARD TERMINAL STRIPS

Our new automatic machinery is equipped to meet every terminal strip need. Some of the most popular numbers are shown below. Other combinations are available upon request. Brass or steel cadmium plated lugs are firmly locked into a 1/16" thick bakelite. Spacing between lug centers is 3/8".



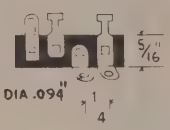


Where layouts or blue prints are not readily available, orders can be filled by simple use of our Part Numbers.

Example — Fig. A contains Lug No. 7 and Bracket No. 4. Specify Item No. 77477.

MINIATURE INSULATED TERMINAL STRIPS

Miniature terminal strips are recommended for all applications where space is a factor. These strips are made of the same materials as the standard terminal strips described above except smaller. Strips are 1/16" by 5/16" wide grade XP laminated phenolic with brass lugs securely eyeletted in position. Lugs are supplied in any of the finishes used on the standard series with the insulation likewise available in a choice of materials and finishes.



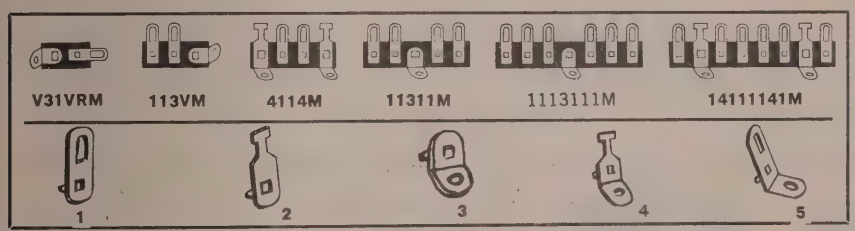


FIG. B

Example — Fig. B contains Lug No. 1 and Bracket No. 4 Specify Item No. 11411M.

"T" TYPE TERMINAL STRIPS

Lugs: Steel cadmium plated spaced 3/8" centers.

Strips: XP Bakelite — 3/8" wide x .062" thick.

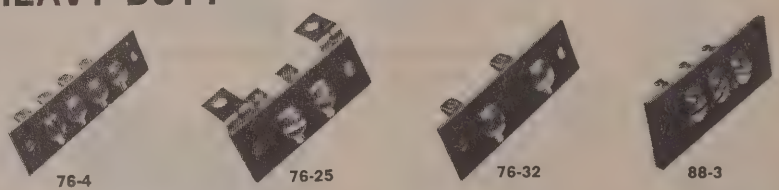
Mount: 140 I.D. for No. 6 screw.

Can be supplied in any length or to any specification.

ALSO AVAILABLE IN MINIATURE

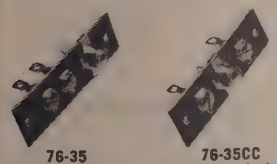
Lugs: Brass cadmium plated 1/4" centers.

BINDING POST BOARDS — STANDARD & HEAVY DUTY



Binding post boards are manufactured to standard and custom specifications. Standard range from 1 to 10 lug positions in 7/16" spacing. Screws are 6/32" x 3/8" binding head cadmium or nickel plated. Heavy duty range from 1 to 12 lug positions in 1/2" spacing. Screws are 8/32" x 5/16" binding head nickel plated.

ANTENNA BINDING POST BOARDS with RCA Phono Jack

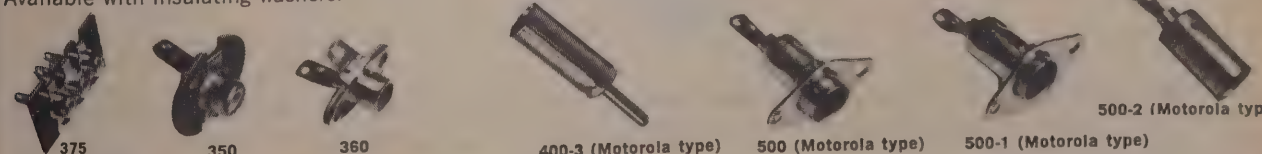


PHONO PLUGS AND JACKS

Largest selection of types manufactured.

PHONO JACKS

Available with insulating washers.



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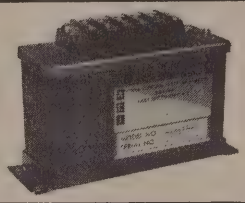
MEASUREMENT AND CONTROL

"an advanced line of transducer and sensor instrumentation utilizing state-of-the-art techniques providing high performance economically . . ."

FREQUENCY TRANSDUCER MONITOR

Model 3510 (55-65 Hz)
Model 3511 (380-420 Hz)

Output: 0-1 or 0-5 VDC
Accuracy: 1%
Linearity: .05% center Freq.
Temp.: −20°C to +71°C
Size: 4½" x 1½" x 3"



FREQUENCY TRANSDUCER CONTROLLER

Model 3750 (55-65 Hz)
Model 3751 (380-420 Hz)

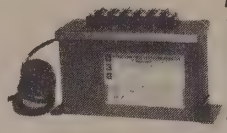
Output 1: 0-1 or 0-5 VDC
Output 2: Solid State or Relay adjustable Hi and Lo limits
Time Delay: Adjustable
Accuracy: 1%
Linearity: .05% center freq.
Temp.: −20°C to +71°C
Size: 6½" x 1½" x 3"

D.C. CURRENT CONTROLLER

Thru-Current Ranges:

0-10 MA	0-100 MA	0-1 Amp
0-20 MA	0-200 MA	0-2 Amp
0-50 MA	0-500 MA	0-5 Amp

Model 4501 — 4502
Excitation: 28 VDC ±4 VDC
Output 1: 0-5 VDC
Output 2: Solid State or Relay Single or Hi and Lo limits (adjustable)
Accuracy: 0.5% **PASS-THRU**
Size: 4½" x 1½" x 3"



A.C. CURRENT MONITOR/ CONTROLLER

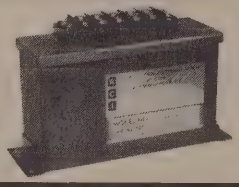
Model 4025 (60 Hz)
Model 4026 (400 Hz)

Excitation: 115 or 220 VAC
Output 1: 0-1 or 0-5 VDC
Output 2: Solid State or Relay adjustable Hi and Lo limits
Time Delay: Adjustable
Temp.: −20°C to +71°C
Size: 6½" x 1½" x 3"

A.C. VOLTAGE TRANSDUCER MONITOR

Model 9001 (60 Hz)
Model 9002 (400 Hz)

Input: 90-140 VAC
Output: 0-1 or 0-5 VDC
Accuracy: 1%
Response: less than 0.25 Hz
Temp.: −20°C to +71°C
Size: 4½" x 1½" x 3"



A.C. VOLTAGE TRANSDUCER CONTROLLER

Hi and Lo Control Limits
Model 9601 (60 Hz)
Model 9602 (400 Hz)

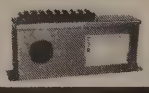
Input: 90-140 VAC
Output 1: 0-1 or 0-5 VDC
Output 2: Solid State or Relay adjustable Hi and Lo limits
Accuracy: 1%
Response: Less than 0.25 Hz
Time Delay: Adjustable
Size: 6½" x 1½" x 3"

POWER LINE MONITOR/ CONTROLLER

Model 4301
1ϕ Voltage and Frequency
Model 4302 (60 Hz or 400 Hz)
3ϕ Voltage and Frequency

Voltage Band: 100-130 VAC
Freq. Band: 50-70 Hz or 380-420 Hz
Hi-Lo Limits: Adj. to any points within Band
Output Relay: SPDT or 3PDT 10 Amp
Time Delay: Adjustable 0 to 250 MSEC
Temp: −20°C to +71°C
Size: 7½" x 3" x 3½"

WATTS/POWER FACTOR TRANSDUCER CONTROLLER



Model 9401-9405

Input: 90-150 & 160-250 VAC 0-500 W to 0-100 kW
Output 1: 0-1, 0-2 or 0-5 VDC
Output 2: Solid State or Relay adjustable Hi and Lo limits
Size: 6½" x 1½" x 3"
Watts Ranges:

0-500 W	0-10 kW
0-1 kW	0-20 kW
0-2 kW	0-50 kW
0-5 kW	0-100 kW

D.C. CURRENT SENSORS

Thru-Current Ranges:

0-10 MA	0-200 MA	0-5 Amp
0-20 MA	0-500 MA	
0-50 MA	0-1 Amp	
0-100 MA	0-2 Amp	

Model 6001
Excitation: 28 VDC ±4 VDC
Output: 0-5 VDC
Accuracy: 0.5% **PASS-THRU**
Response: 1 MSEC
Temp.: −20°C to +71°C
Size: 4½" x 1½" x 3"

Model 6002
Bi-Directional
Thru-Current Ranges:

0-10 MA	0-100 MA	0-1 Amp
0-20 MA	0-200 MA	0-2 Amp
0-50 MA	0-500 MA	0-5 Amp

Excitation: ±15 VDC
Output: 0- ±5 VDC
Accuracy: 0.5%
Response: 1 MSEC
Temp.: −20°C to +71°C
Size: 4½" x 1½" x 3"

D.C. CURRENT SENSOR

Thru-Current Ranges:

0-10 MA	0-200 MA	0-5 Amp
0-20 MA	0-500 MA	0-10 Amp
0-50 MA	0-1 Amp	0-20 Amp
0-100 MA	0-2 Amp	0-50 Amp
		0-100 Amp

Model 6011
Excitation: 115 VAC ±10% 60 Hz
Output: 0-5 VDC **PASS-THRU**
Accuracy: 1%
Response: 0.5 Sec.
50KV → ISOLATION
Temp: −20°C to +71°C
Size: 6½" x 1½" x 3"

SENSOR CONTROLLER

Thru-Current Ranges:

0-10 MA	0-200 MA	0-5 Amp
0-20 MA	0-500 MA	0-10 Amp
0-50 MA	0-1 Amp	0-20 Amp
0-100 MA	0-2 Amp	0-50 Amp
		0-100 Amp

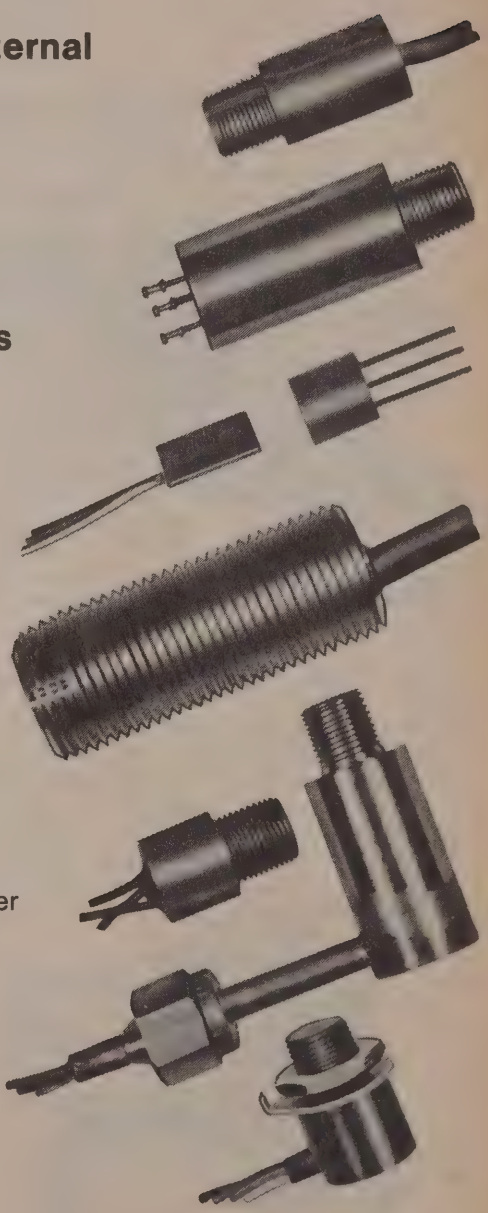
Model 4551
Excitation: 115 VAC ±10% 60 Hz
Output 1: 0-5 VDC
Output 2: Solid State or Relay adjustable Hi and Lo limits
Accuracy: 1%
Temp: −20°C to +71°C
Size: 6½" x 1½" x 3"

Telephone or write for individual detail sheets prices and applications assistance.

Speed-Independent Magnetic Pick-ups

Their output voltage amplitudes are totally independent of the rate of change to the external magnetic field. They provide

- **True zero speed sensing**
- **Contactless limit switches**
- **Translational and rotational velocity, direction and position sensing**
- **Counting, indexing, and timing functions**



Benefits:

- Simplify designs
- Low power consumption
- Rugged enough for engine environments
- Aerospace reliability
- Operate from logic power bus
- Freedom from EMI (no choppers or oscillators)
- Freedom from actuator mechanisms
- Can replace optical systems

Applications:

Computer peripherals—sensing of indexing marks for drive mechanisms in card readers / magnetic tape memories / paper roll drive, and character selection in printers

Transportation—wheel speed sensing (skid-controlled braking) / ignition system timing / vehicle sensing (traffic control)

Industrial — speed, position and limit sensing

Aerospace — wide applications

Other Products:

Solid state Push Button and Toggle Switches / Solid state current sensors / Hall Effect Devices / Magnetoresistors / Fluxmeters / Gaussmeters.

For information and comprehensive technical assistance, contact:

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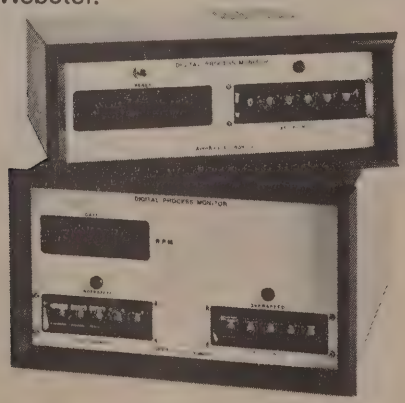
About analog tach systems,

Need indication alone? Indication and switching (with up to 4 switchpoints)? Or indication and industrial signal output? Airpax manufactures a system which will meet your needs for as low as $251.65, including the magnetic pickup, gear, tachometer, and meter. A wide variety of enclosures is available. For up-to-the-minute price and technical information, call or write Paul Webster.

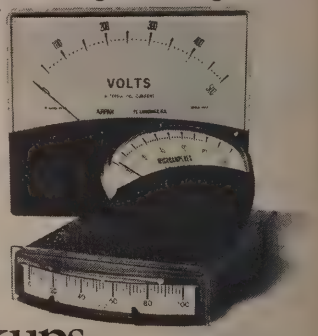
Or digital tachometers...

Airpax makes digital instrumentation which will handle anything from simple accumulation, to speed, to sophisticated ratio functions. You'll find features like overspeed and underspeed protection, input switching, adjustable clock rates, even current or voltage outputs. Pricing is competitive, even compared with less versatile tachometers. For more information, write or call Paul Webster.



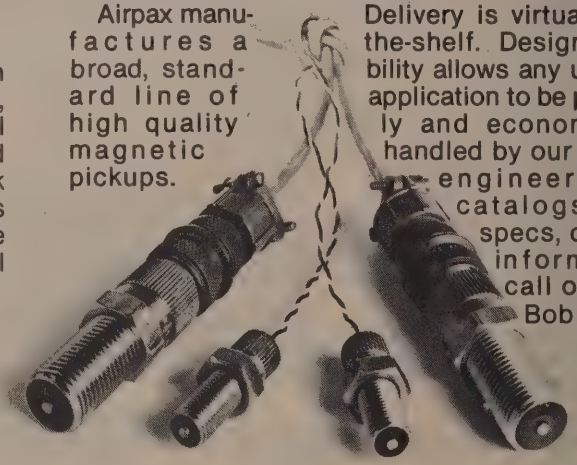
Analog meters,

Two week delivery on your custom meter! Even faster delivery on our complete line of dependable panel and edge-reading meters. All panel meters feature a variety of ranges, extremely compact design (no protruding barrel), and ease of mounting. An edge-reading contactless control meter is available which is versatile enough for any number of function control applications. For catalogs, tech specs or price information, write or call Herb Hedberg.



Magnetic pickups,

Airpax manufactures a broad, standard line of high quality magnetic pickups. Delivery is virtually off-the-shelf. Design flexibility allows any unusual application to be promptly and economically handled by our design engineers. For catalogs, tech specs, or price information, call or write Bob Knabe.



Even custom systems.

Airpax has a staff of experienced design engineers who can produce whatever you need for your very special or even unique application. Call us.

AIRPAX

Controls Division

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Other Divisions: Circuit Breakers and Glass Seals, Cambridge Division, Cambridge, Md. • Broadcast T.V. Equipment, American Data Corp., Huntsville, Ala.

Custom Electronics

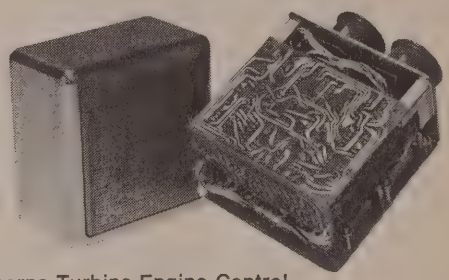
Designed and manufactured to your exacting specifications

- Over 20 years solving tough design problems for OEM and government customers.
- In depth commercial, industrial and aerospace experience.
- Rapid response.
- Strict quality control (MIL-Q-9858A).
- Production capacity.
- Total program capability — From specification development assistance through production . . . including qualification testing and MTBF studies.

Microprocessor-Computer Instrumentation/Control Interfaces are our Specialty

Sensors & Controls

- Compact — Analog-Digital sensing and control of: Speed — Temperature — Position — Voltage — Light — Current — Power — Phasing — Frequency — Pressure
- All sensors and controls available with status and auto test capability



Airborne Turbine Engine Control

Instrumentation

Custom Instrumentation and Analog/Digital Data Conversion Products with wide range of user defined arithmetic power.

- Multi-level analog input multiplexing
- Micro computer based
- Flexible I/O capability

Switching Power Supplies

- Computer grade/mil qualified
- AC or DC inputs
- Efficiencies to 90%
- Switching to 50 KHz
- Single or multiple outputs
- Programmable options available
- Fully protected against transients and overloads
- Self test and status options available
- Compact — hi-density custom packaging
- EMI Filtered (MIL-STD-461)

Power Supply
85 Watts Output,
2.5 Watts/cu inch

Autronics Corporation

Call us to discuss your requirements. We'll put our 20 years of know-how to work for you.

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ELECTRODYNAMICS

Division of General Time Corporation • A Talley Industries Company
1200 Hicks Road • Rolling Meadows, Illinois 60008
Telex 28-1070 • Telephone (312) 259-0740

Miniature Elapsed Time Indicators & Events Counters

DC - EVENTS
MODEL
B16C

AC - ETI
MODELS
95A & 25A

DC - EVENTS
MODELS
B16F & B16G

AC - ETI
MODELS
95C & 25C

AC - ETI
MODELS
95B & 25B

DC - ETI
MODELS
16C & 16B-Y

These products conform to MIL-M-7793, special MIL specifications part numbers and cross reference data below.

FEATURES

Miniature Elapsed Time Indicators and Events Counters provide a built-in record of numbers that provide *how-long* data and *how-many* data.

Where safety is concerned, where operating fatigue exists, or component functioning must be measured, they provide the critical record — for maintenance, repair or replacement.

They —

- Anticipate breakdowns
- Predict component mortality
- Reduce "down time"
- Count the "ons" and "offs"
- Count the evolutions or revolutions
- Record the service life
- Warn of impending failure

The standard elapsed time indicators and events counters described on this page are only representative of the available special models that can be provided. Information on other capabilities will be supplied on request.

APPLICATIONS

Electrodynamics offers a complete line of subminiature elapsed time indicators and events counters for aerospace, military and industrial applications.

- SPACE EXPLORATION
- MILITARY MISSILES
- COMMUNICATIONS EQUIPMENT
- AIRCRAFT OF ALL TYPES
- COMPUTERS
- AUTOMATIC PRODUCTION MACHINERY
- LABORATORY EQUIPMENT
- GROUND SUPPORT EQUIPMENT
- PREVENTIVE MAINTENANCE SYSTEMS

WRITE OR CALL
for Complete Catalog 136B

CROSS REFERENCE GUIDE

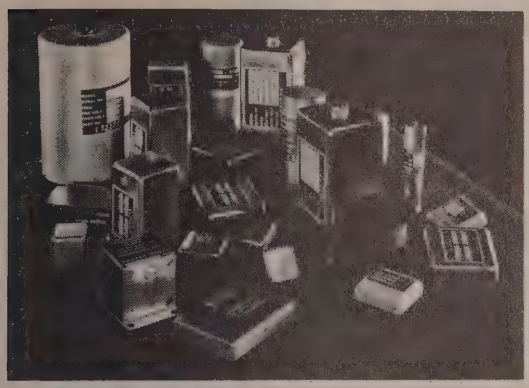
Elapsed Time Indicators

Mil. Spec. Reference	Electrodynamics Model Numbers
Round Case — 28 V.D.C. Systems — Four Digit Readout	
MS17321-1	16B3CE-Y
MS17321-2	16B8CE-Y
MS17321-3	16B3A-Y
MS17321-4	16B8A-Y
MS17321-9	16B8C2-Y
Square Case — 28 V.D.C. Systems — Four Digit Readout	
MS17321-5	16C3CE
MS17321-6	16C8CE
MS17321-7	16C3A
MS17321-8	16C8A
MS17321-10	16C8C2
MS21341-01	16C8CA-16
thru -26	16C8CW-8-16
Round Case — 400 Hz. Systems — Four Digit Readout	
MS17322-1 and 1A	95B3CE and 3CE-50
MS17322-2 and 2A	95B8CE and 8CE-50
MS17322-3 and 3A	95B3A and 3A-50
MS17322-4 and 4A	95B8A and 8A-50
MS17322-9	95B8C2
Square Case — 400 Hz. Systems — Four Digit Readout	
MS17322-5 and 5A	95C3CE and 3CE-50
MS17322-6 and 6A	95C8CE and 8CE-50
MS17322-7 and 7A	95C3A and 3A-50
MS17322-8 and 8A	95C8A and 8A-50
MS17322-10	95C8C2
MS27650-01A 26 V.A.C.	25C8C7A-16
thru -26H 26 V.A.C.	25C8VW-1-8-16
MS27651-01A 115 V.A.C.	95C8C7A-16
thru -26H 115 V.A.C.	95C8VW-1-8-16
Round Case — 400 Hz Systems — Dial Readout	
MS17323-1 and 1A	95A5CE and 5CE-50
MS17323-2 and 2A	95A8CE and 8CE-50
Events Counters — 28 V.D.C. Systems — Four Digit Readout	
MS21228-1	B16C8A-245
MS21228-2	B16C8CE-245
MS21228-3	B16C8A-232
MS21228-4	B16C8CE-232

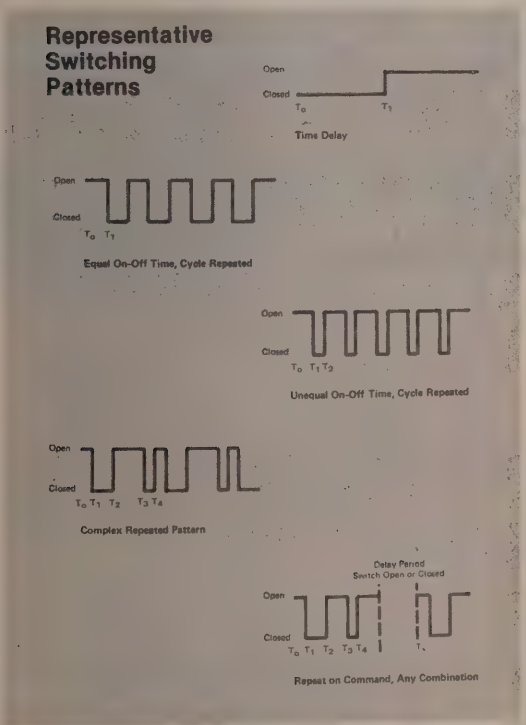
BULOVA® Timers TMR Series

Highly Accurate Solid State With Switching Capability

Measured Period: From Milliseconds to Centuries



Typical Packages



The timers can be preset for virtually any desired pattern. Pattern complexity may affect package size and configuration.

Bulova's TMR Series solid state timers are precision instruments tailored precisely to the customers specific requirements. For many applications TMR Series timers can be supplied as exact functional replacements for electro-mechanical timers.

BASIC OPERATING MODES

Pre-set or Adjustable. Usually the TMR timers are factory-set for both operating mode and timing period. Where the user desires to make laboratory or field adjustments, versions can be supplied with provision for changing the operating mode and/or the cycle time.

Normally Open or Normally Closed. Switch can be held open or closed until the desired count down time has elapsed.

Cycling. Pre-set cycle of on-off periods can be repeated. "On" and "Off" periods need not be equal. Cycling may be a repeat of a single pattern or a complex of differing on-off periods.

Automatic or Commanded Cycling. The prearranged cycle can be repeated automatically or reset only on command from an external signal.

Loads. The contacts are rated for resistive loads but motor, inductive and lamp loads also can be switched.

SPECIFICATIONS

Measured Time. From 1 millisecond up, to order. Below 1 ms available as special.

Accuracy & Stability. Function of time base: crystal, tuning fork oscillator, or other.

Output Voltages. Equal to input minus 2 V for high current, within a few millivolts for low current applications.

Output Current. To specification, from milliamps up.

Input Voltage. 5 or 12 V dc for the timing circuit but requirements are flexible.

Input Power. 100 mA plus external device. For low current applications this can be considerably lower.

Environmental. Meet or exceed most MIL Specs.

Readout and Display

Timers in the TMR Series are available with readout and/or display. Either elapsed time or time remaining can be displayed directly on the package, or at a remote point or both on the package and at a remote point.

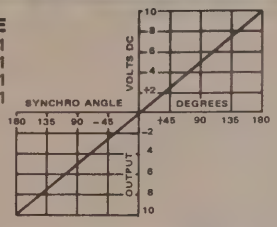
BULOVA®
ELECTRONICS DIVISION
OF BULOVA WATCH COMPANY, INC.
61-20 WOODSIDE AVENUE
WOODSIDE, N. Y. 11377 • 212 335-6000

AMERICAN TIME PRODUCTS

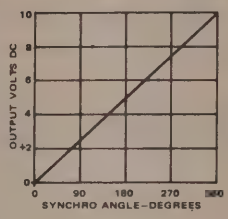
NEED MORE INFO?
Call or Write for Full Spec Bulletin

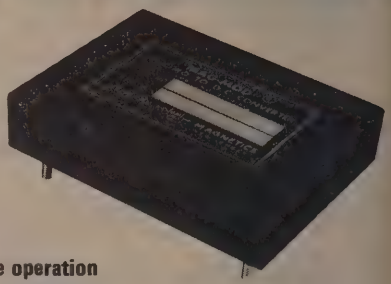
Solid State 3 Wire Synchro To Linear DC Converters...

RESPONSE CURVE
MAC 1422-1
MAC 1449-1
MAC 1458-1
MAC 1459-1



RESPONSE CURVE
MAC 1460-1
MAC 1461-1





FEATURES:

- Develops a DC output voltage linearly proportional to a synchro angle over a ± 180° range.
- Completely solid state with all of the inherent advantages over a mechanical system such as:
  - High reliability (since there are no moving parts)
  - Light weight–6 ozs.
  - Small size
  - All units hermetically sealed
- Wide temperature range operation
- Output short circuit protected
- Three wire inputs isolated from ground
- Package size may be altered at no extra cost
- Units can be altered to accept different line to line voltages or different operating frequencies at no extra cost
- Not affected by reference voltage or power supply variations.

UNIT	MAC 1422-1	MAC 1449-1	MAC 1458-1	MAC 1459-1	MAC 1460-1	MAC 1461-1
TRANSFER EQUATION	±IV/18°	±IV/18°	±IV/18°	±IV/18°	+IV/36°	+IV/36°
ACCURACY (+25°C)	½%	½%	½%	½%	½%	½%
ACCURACY (–25°C-+85°C)	1%	1%	1%	1%	1%	1%
L - L SYNCHRO INPUT (VRMS)	11.8	90	11.8	90	11.8	90
FREQUENCY (Hz)	400	400	60	60	400	400
FULL SCALE OUTPUT	±10V	±10V	±10V	±10V	+10V	+10V
OUTPUT IMPEDANCE	<1Ω	<1Ω	<1Ω	<1Ω	<1Ω	<1Ω
L - L INPUT IMPEDANCE	>10K	>30K	>2K	>10K	>10K	>30K
REFERENCE VOLTAGE (VRMS)	26	115	26	115	26	115
OPERATING TEMP. °C	–25 - +85	–25 - +85	–25 - +85	–25 - +85	–25 - +85	–25 - +85
D.C. SUPPLY	±15V	±15V	±15V	±15V	±15V	±15V
D.C. SUPPLY CURRENT	±75MA	±75MA	±75MA	±75MA	±75MA	±75MA
BANDWIDTH	10Hz	10Hz	OPT.	OPT.	10Hz	10Hz
WEIGHT	6 oz.	6 oz.	6 oz.	8 oz.	6 oz.	6 oz.
SIZE	3.6x2.5x0.6	3.6x2.5x0.6	3.6x3.0x0.6	3.6x3.0x1.0	3.6x2.5x0.6	3.6x2.5x0.6

Precision AC Line Regulators...

Type # MLR-1476-1/TOTAL REGULATION 0.1% MAXIMUM

FEATURES

- Distortion free output sine wave.
- Regulation control better than one order of magnitude superior to commercial AC Voltage Regulators transformer product lines.
- No active filter or tuned resonant circuits employed.
- Regulation virtually indifferent of frequency, line amplitude, temperature or load changes.
- 1 watt output level.
- Extremely small size.
- Isolation between input and output.

SPECIFICATIONS

AC input line voltage: 26vrms ±20% at 400 Hz. ±20%.
Output: 26vrms ±1% for set point range.
Load: 0 to 40 ma.
Total regulation: ±0.1% maximum (any combination line aplitude, frequency, load).
Distortion: Less than 0.5%
Temperature Range: –55°C to +125°C
Size: 2" x 1.8" x 0.5"
Output Phase Angle = 0° ±0.1° over entire temperature range and ±20% frequency variations.
Weight: 1 Oz.
Case material: High permeability Nickel Alloy
Terminals: Glass to metal hermetic seal pins

Type # MLR-1476-2

FEATURES

- 0.1% total line and load regulation
- Independent of ±20% frequency fluctuation
- 6.5 watt output
- Small size
- Input and output completely isolated
- Short circuit protected

SPECIFICATIONS

- AC line voltage: 115V ±20% @ 400Hz ±20%
- Line current at full load: 95ma
- Output: 26V ±1% for set point
- Load: 0 to 250 ma
- Total regulation for line, load and frequency changes: ±0.1%
- Distortion: 2%
- Temperature Range: –55°C to +85°C
- Size: 2" x 4.5" x 0.9"

There is No Substitute for Reliability

GENERAL MAGNETICS • INC
211 Grove St., Bloomfield, New Jersey 07003 - Tel: (201) 743-2700

High Precision Analog Multipliers

PRODUCT ACCURACY (MCM 1519-1) ± ½% OF ALL THEORETICAL OUTPUT VALUES OVER FULL MILITARY TEMPERATURE RANGE OF –55°C TO +125°C ZERO POINT ERROR FOR ANY INPUT COMBINATION IS ± 2MVRMS

FEATURES

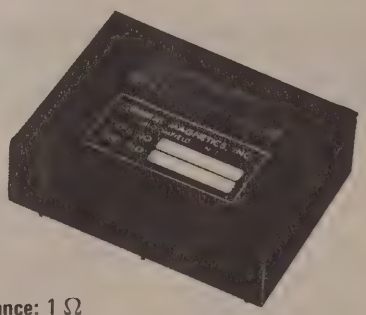
- **No external trims required**
- **Distortion free AC output over entire dynamic range**
- **Linearity, product accuracy and zero point virtually unaffected by temperature**
- **All units are hermetically sealed and are not affected by external fields**
- **High analog product accuracy and wave quality allows dual multiplier assemblies to be matched within 1% of point over the specified temperature range**
- **Full four quadrant operation**
- **Package size, power supply requirements and other specs. may be altered to your exact requirements at no extra cost**

Type No.	*Product Accuracy	Operating Temperature Range
MCM 1519-1	± 0.5%	–55°C - +125°C
MCM 1519-2	± 0.5%	–25°C - +85°C
MCM 1519-3	± 0.5%	0°C - +70°C
MCM 1520-1	± 1.0%	–55°C - +125°C
MCM 1520-2	± 1.0%	–25°C - +85°C
MCM 1520-3	± 1.0%	0°C - +70°C

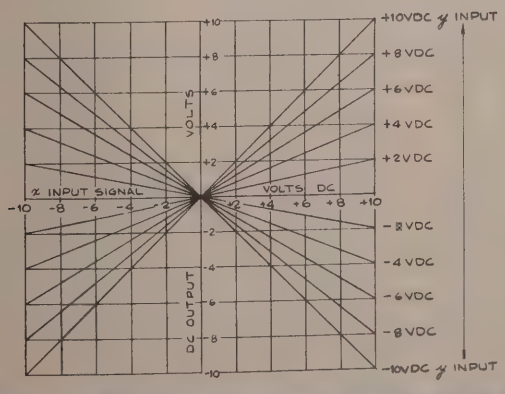
*Product accuracy is defined as the percentage error between the measured output voltage and the theoretical value of the product of the X and Y analog voltages (XY/10) at any point within the four quadrant range of the device. This specification applies over the full operating temperature range and guarantees superior accuracy at low level outputs when compared with devices specified in terms of full scale output. All accuracies are given as a % of point ± 2MVRMS (whichever is greater) in order to account for the zero point offset.

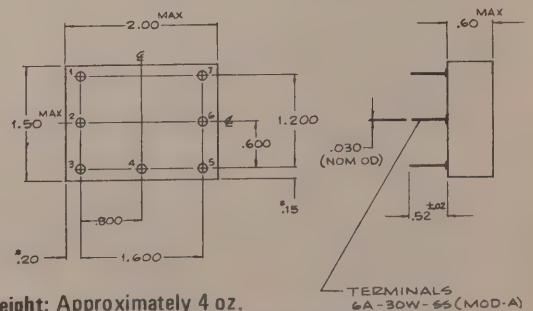
SPECIFICATIONS

- **Transfer equation:** Eo=XY/10
- **X & Y input signal ranges:** 0 to ± 10V PK
- **Maximum dynamic and static product error:** See chart for accuracy and temperature range desired
- **Maximum zero point error (X=0 Y=0 or X=± 10 Y=0 or X=0 Y=± 10):** 2MVRMS
- **Input impedance:** Both inputs 20K min.
- **Full scale output:** ± 10V peak
- **Minimum load resistance for full scale output:** 2K Ω
- **Frequency response characteristics (both inputs)**
  - **1% amplitude error:** DC to 1200HZ (min.)
  - **0.5DB amplitude error:** DC to 3500HZ min.
  - **3DB point:** Approximately 10K HZ
  - **Roll off rate:** 18DB/octave



- **Output impedance:** 1 Ω
- **Short circuit duration:** 5 sec.
- **Noise level:** 5MV PK-PK at 100K HZ (approx.)
- **Operating temperature range:** See chart
- **Storage temperature range:** –55°C to +125°C
- **DC power:** ± 15V ± 1% @ 30MA





Weight: Approximately 4 oz.
Case material: High permeability nickel alloy
Terminals: Glass to metal hermatic seal pins

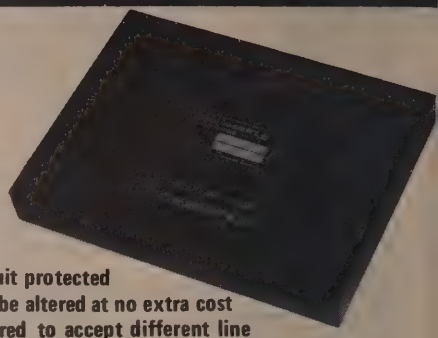
There is No Substitute for Reliability

GM INC.

GENERAL MAGNETICS • INC
211 Grove St., Bloomfield, New Jersey 07003 - Tel. (201) 743-2700

Solid State 4 Wire Resolver To Linear DC Converters...

Type # MACR 1492 (11.8V L-L)
Type # MACR 1493 (90V L-L)



FEATURES

- Develops a DC output voltage linearly proportional to a resolver angle over a ± 180° range
- Completely solid state with all of the inherent advantages over a mechanical system such as:
  - High reliability
  - Light weight—6 ozs.
  - Small size
- All units come in hermetically sealed metal cans
- Four wire inputs isolated from ground and from each other
- Wide temperature range operation (MACR 1492-1 & MACR 1493-1)
- Economical room temperature units available (MACR 1492-2 & MACR 1493-2)
- Output short circuit protected
- Package size may be altered at no extra cost
- Units can be altered to accept different line to line voltages or different operating frequencies
- Not affected by reference voltage or power supply variations

SPECIFICATIONS

Transfer equation: ± 1V/± 18°
Accuracy: 1492-1 ± 0.5% @ 25°C ± 20°C
1493-1 ± 1% @ –25°C to +85°C
1492-2 ± 0.5% @ 25°C ± 20°C
1493-2
Input voltage: 1492—11.8V, 400HZ 4 wire resolver input; 26V, 400 HZ reference
1493—90V, 400HZ 4 wire resolver input; 115V, 400HZ reference

Operating frequency: 400HZ ± 20%
Input impedance: 10K min.
Full scale output: ± 10V DC (± 180°)
Minimum load resistance for full scale output: 2K
Output impedance: < 1Ω
Storage temperature range: –55°C to +100°C
DC pwoer: ± 15V ± 1% @ 75ma (approximate)
Case material: High permeability nickel alloy

'Mag Mod' Micro-miniature Magnetic Modulators...

...Design Analog Computers with Micro Magnetics

Withstands High Intensity Nuclear Radiation

Circuit Isolation—DC to AC Sinusoidal Conversion and Amplification

"MAG MODS" PROVIDE FOUR QUADRANT OPERATION, extreme stability with negligible change of phase, gain and zero position over a wide temperature range. Design is simple, featherweight and rugged—with no vacuum tubes, semiconductors or moving parts to limit life.

TYPE NUMBER	IMM 987-1	IMM 821-1	IMM 847-1	IMM 1112-1
Reference Carrier Voltage and Frequency	115 V 400 Hz	3 V RMS @ 96 KHz	5 V @ 800 Hz	3.5 V RMS @ 1 MHz
Input Control Signal Range	0 to ±150 μa DC	0 to ±100 μa (DC to 1000 Hz)	0 to ±200 μa DC	0 to ±3 ma DC (DC to 200 KHz)
DC Resistance of Input DC Signal Winding	3 Inputs — 4.5 K each	150 ohms	12.5 K ohms	1000 ohms
AM Phase Reversing AC Output Range	0 to 5 V RMS @ 400 Hz	0 to 0.6 V RMS @ 96 KHz	0 to 1 V RMS @ 800 Hz	0 to 3 V RMS @ 1 MHz
Differential Gain RMS mv. AC Output/ua DC Sig. Input	33 mv RMS/μa DC	6 mv RMS/μa	5 mv RMS/μa DC	1 V RMS/ma DC
AC Output Null (Noise Level) RMS	25 mv RMS	20 mv RMS Max.	5 mv RMS	30 mv RMS
Output Impedance	1.2 K ohms	7.5 K ohms	10 K ohms	3 K ohms
External Load	25 K ohms	100 K ohms	50 K ohms	50 K ohms
Excitation (Carrier Winding) Impedance	200 K ohms	115 ohms	12 K ohms	800 ohms
Zero Point Drift over Temp. Range Referred to DC Input Terminals	±0.2 μa DC	±0.2%	±0.5 μa DC	±0.5%
Hysteresis in Percent of Max. Input DC Signal	±0.2%	±0.2%	±0.4%	±0.5%
% Harmonic Distortion in Output Wave	10%	5%	10%	3%
Temperature Range	–55°C to +80°C	0°C to +100°C	–55°C to +100°C	–55°C to +85°C
Frequency Response	DC to 100 Hz	DC to 1000 Hz	DC to 200 Hz	DC to 200 KHz
Overall Dimensions (in inches)	.550 X .750 X .550	0.562 X 0.40 X .750	1 3/16 X 1 3/16 X ½	0.4 X 0.5 X 0.6
Type of Mounting	2-56 Studs	Printed Circuit Board	Printed Circuit Board	Printed Circuit Board 1/10" Grid
Approximate Weight (in ounces)	0.3 ounce	0.12 ounce	0.2 ounce	0.1 ounce

"MAG MODS" conform to MIL-T-27A and MIL-E-5400 Specifications

The above units are but a fraction of the line of "MAG MODS" available for design applications.

There is No Substitute for Reliability

GM INC

GENERAL MAGNETICS • INC

211 Grove St., Bloomfield, New Jersey 07003 · Tel. (201) 743-2700

Solid State Magnetic Demodulators...

FEATURES

- High reference impedance resulting in very small reference power requirements
- Output as high as ±10 v. DC in present units
- Unit operation frequencies: 60 Hz to 100 KHz
- Very low DC offset null voltages (as low as 0.1% of full scale)
- Operation over wide environmental conditions
- Completely solid state—no moving parts
- Signal and reference terminals may be isolated
- Low output impedance
- Small physical size

Demodulator Type Number	DMD-803-1	DMD-831-1	DMD-1012-1	DMD-1013-1	DMD-1017-1	DMD-1023-1	DMD-1025-1	DMD-1040-1	DMD-1028-1
REFERENCE									
A. Voltage	120 V ±10 V	26 V	115 V	115 V	115 V	30 V-P-P	30 V	115 V	15 V
B. Frequency	60 Hertz	400 Hertz	60	400 Hertz	400 Hertz	55 Hertz	900 Hertz	400 Hertz	50 to 60 Hertz
C. Impedance	15 K	30 K	> 50 K	> 50 K	> 5 K	≈ 2.7 K	≈ 31 K	> 100 K	≈ 5.1 K
SIGNAL									
A. Voltage Range	0-760 mv	0-12 V	0-1 V	0-10 V	0-10 V	0-5 V	0-0.05 V	0-3.2 V	0-10 V
B. Frequency	60 Hertz	400 Hertz	60 Hertz	400 Hertz	400 Hertz	55 Hertz	900 Hertz	400 Hertz	50 to 60 Hertz
C. Impedance	10 K	> 10 K	10 K ±10%	10 K ±10%	> 10 K	> 10 K	> 3 K	> 3 K	≈ 3 K
OUTPUT									
A. Maximum Output	±1 V ±5%	±3.6 V ±10%	±0.5 V ±5%	±5 V ±5%	±3 V ±5%	±4 V ±5%	±0.5 V ±10%	±5 V ±5%	±10 V ±5%
B. Load	—	10 K	25 K	5 K	2 K	10 K	1 M	50 K	10 K
C. Linearity	±0.8% fs	±2% A	±1% fs	±1% fs	±1% fs	±1% fs	±1% fs	±1% fs	±1% fs
D. Frequency Response	—	20 cps	—	—	40 Hertz	0.5 Hertz	10 Hertz	—	—
E. Ripple	8.4 mv	< 100 mv	No Filter	No Filter	< 150 mv	< 200 mv	< 10 mv	No Filter	< 400 mv
F. Null	1 mv	< 15 mv	< 10 mv	< 10 mv	< 10 mv	< 10 mv	< 1 mv	< 10 mv	< 15 mv
AMBIENT TEMP. RANGE	—40°F to +120°F	—15°C to +60°C	—30°C to +85°C	—30°C to +85°C	—30°C to +71°C	0°C to +50°C	0°C to +50°C	—30°C to +85°C	—10°C to +55°C
PHYSICAL SIZE	3 x 2⅝ x 4⅞	2 x 2 x 0.7	1 x 1 x 2.5	1 x 1 x 2.5	1 x 1 x 2.5	0.95 x 1 x 2.5	1 x 1.7 x 0.75	1 x 1 x 2.5	1.9 x 1.25 x 2.9
TERMINAL TYPE	HP PIN	PIN	PIN	PIN	PIN	PIN	HP PIN	PIN	HP
D.C. POWER	No	No	±15 V	±15 V	28 V	±15 V	±15 V	No	±15 V

Demodulator Type Number	DMD-1034-1	DMD-1053-3	DMD-1074-1	DMD-1095-1	DMD-1104-1	DMD 1206-1	DMD 1207-1	DMD 1268-1	DMD 1377-1	DMD 1420-1
REFERENCE										
A. Voltage	26 V	115 V	115 V ±5%	26 V ±5%	26 V	26 V	26 V	26 V	10 V RMS ±10%	7 V RMS
B. Frequency	400 Hertz	400 Hertz	400 Hertz ±5%	400 Hertz ±5%	800 Hertz	400 Hertz	2 K Hertz	400 Hertz	60 Hertz to 2 K Hertz	100 Hertz
C. Impedance	> 8 K	> 100 K	> 100 K	> 10 K Ω	35 K	> 50 K	> 50 K	> 5 K	> 25 K	> 4 K
SIGNAL										
A. Voltage Range	0-5 V	0-10 V	0-50 V	0-±6.36 V	0-1 V	0-1 V	0-1 V	0-10 V	0-5 V RMS	0-7 V RMS
B. Frequency	400 Hertz	400 Hertz	400 Hertz	400 Hertz	800 Hertz	400 Hertz	2 K Hertz	400 Hertz	60 Hertz to 2 K Hertz	100 Hertz
C. Impedance	> 10 K	> 100 K	> 1 MEG	> 20 K Ω	> 50 K	> 15 K	> 15 K	> 10 K	> 50 K	> 20 K
OUTPUT										
A. Maximum Output	±5 V ±5%	±2.5 V ±10%	±50 V ±5%	±5.73 V ±5%	±2.0 V ±5%	1.0 V	1.0 V	±3 V ±5%	2.5 V ±5%	3 V ±5%
B. Load	10 K	10 K	100 K	10 K Ω	10 K Ω	30 K	30 K	2 K	1 Meg	1 Meg
C. Linearity	±1% fs	±1% fs	±1% fs	±1% fs	±1% fs	0.5% fs	0.5% fs	±1% fs	0.2%	0.2%
D. Frequency Response	≈ 100 Hertz	30 Hertz	80 Hertz	—	N.S.	30 Hertz	30 Hertz	40 Hertz	—	—
E. Ripple	< 450 mv	< 125 mv	< 50 mv	No Filter	< 50 mv	< 30 mv	< 10 mv	< 150 mv	No Filter	No Filter
F. Null	< 15 mv	<4 mv	< 100 mv	< 15 mv	< 10 mv	1 mv	1 mv	< 5 mv	< 2 mv	< 3 mv
AMBIENT TEMP. RANGE	0°C to +85°C	—20°C to +50°C	0°C to +65°C	—54°C to +55°C	1200 M	—55°C to +125°C	—55°C to +125°C	—30°C to +71°C	0°C to +70°C	—25°C to +40°C
PHYSICAL SIZE	0.6 x 0.9 x 1.8	1 x 1 x 2.5	2.6 x 1.95 x 2	1.200 x 1.250 x 0.500	1.350 x .600 x .650	0.95 x 1.65 x 0.1	0.95 x 1.3 x 0.1	1 x 1 x 2.5	0.9 x 1.65 x 0.6	1.25 x 1.125 x 0.8
TERMINAL TYPE	PIN	PIN	HP	PIN	PIN	PIN	PIN	PIN	PIN	PIN
D.C. POWER	±15 V	+24-32 V	±15 V ±60 V	±15 V	±15 V	±15 V	± 15 V	+28 V	±15 V DC	±15 V DC

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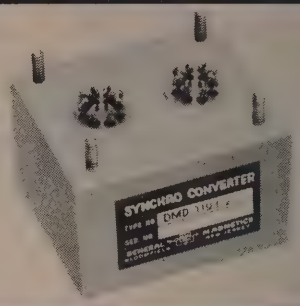
GENERAL MAGNETICS • INC

211 Grove St., Bloomfield, New Jersey 07003 - Tel. (201) 743-2700

Solid State Sine-Cosine Synchro Converters...

This new encapsulated circuit converts a 3-wire synchro input to a pair of d-c outputs proportional to the sine and cosine of the synchro angle.

- **Complete solid state construction.**
- **Operates over a wide temperature range.**

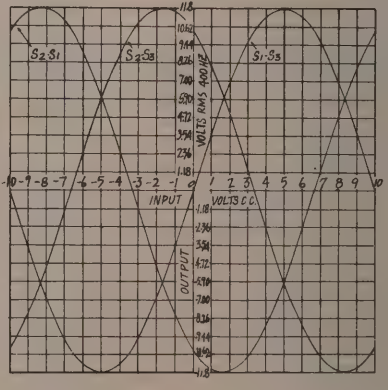


UNIT	DMD 1436-1	DMD 1430-1	DMD 1403-2	DMD 1361-6	DMD 1361-4	DMD 1193-4	DMD 1361-8	DMD 1446-1	DMD 1193-5	DMD 1193-6	DMD 1361-10	DMD 1472-2
L - L SYNCHRO INPUT (VRMS)	11.8	90	95	90	11.8	11.8	11.8	11.8	11.8	11.8	11.8	90
FREQUENCY (Hz)	400	400	60	400	400	400	400	400	400	400	400	60
FULL SCALE OUTPUT (VDC)	±10	±10	±3	±3	±3	±10	±10	±10	±10	±10	±10	±10
OUTPUT IMPEDANCE	<1Ω	<1Ω	<1Ω	<1Ω	<1Ω	<1Ω	<1Ω	<10Ω	<1Ω	<1Ω	<1Ω	<1Ω
L - L INPUT IMPEDANCE	>10K	>30K	>5K	>30K	>5K	>5K	>5K	>5K	>5K	>5K	>5K	>5K
REFERENCE VOLTAGE (VRMS)	26	115	115	115	26	115	26	115	115	115	26	115
ACCURACY SIN/COS (+25°C)	±6MIN	±6MIN	±6MIN	±6MIN	±6MIN	±6MIN	±6MIN	±0.5%	±6MIN	±6MIN	±6MIN	±6MIN
FULL TEMPERATURE SIN RANGE ACCURACY COS	±15MIN	±15MIN	±15MIN	±15MIN	±15MIN	±15MIN	±15MIN	±0.5%	±15MIN	±15MIN	±15MIN	±15MIN
D.C. SUPPLY (VDC)	±15	±15	±15	±15	±15	±15	±15	±15	±15	±15	±15	±15
D.C. SUPPLY CURRENT	<30MA	<30MA	<30MA	<30MA	<30MA	<30MA	<30MA	<30MA	<30MA	<30MA	<30MA	<30MA
BANDWIDTH	>10Hz	>10Hz	external set	>20Hz	>5Hz	>10Hz	>10Hz	>10Hz	>2Hz	>40Hz	>5Hz	external set
SIZE	1.1x3.0 x1.1	2.0x2.25 x1.4	1.1x3.0 x1.1	1.5x1.5 x0.6	1.85x0.85 x0.5	2.01x2.25 x1.4	0.85x1.85 x0.5	2x2.25 x1.4	2x2.25 x1.4	2x2.25 x1.4	2.15x1.25 x0.5	1.1x3.0 x1.1
NOTES	–	dual channel unit	–	–	–	dual channel unit	–	dual sine output	dual channel unit	dual channel unit	–	–
TEMPERATURE RANGE	–40°C to +100°C	–40°C to +100°C	–40°C to +100°C	–40°C to +100°C	–40°C to +100°C	–40°C to +100°C	–40°C to +100°C	–40°C to +100°C	–40°C to +100°C	–40°C to +100°C	–40°C to +100°C	–40°C to +100°C

Solid State DC To Synchro Converters...

PROVIDES A THREE WIRE AC OUTPUT PROPORTIONAL TO A DC VOLTAGE INPUT

MAC 1562-1



FEATURES:

- Developes a fully isolated 3-wire AC output proportional to a DC signal
- Maintains accuracy with tracking speeds as high as 720°/SEC
- Isolated reference input
- Accuracy is not affected by reference voltage or power supply variations
- Provides 0.5 VA output drive
- Three wire AC output developed with 15 minute accuracy
- Hermetically sealed metal package
- Package size and terminal configuration may be altered at no extra cost
- Units can be altered to meet your exact voltage and frequency requirements– in most cases at no extra cost
- Output remains contant for ± 10% reference voltage variations
- Low output distortion (<0.5%)
- Infinite resolution

SPECIFICATIONS: MAC 1561-1

- Input Signal – 0 to ± 10V DC
- Input Signal Resistance – 10K minimum
- Reference Input – 26 V RMS ± 10%
- Operating Frequency – 400 HZ ± 10%
- DC Power – ± 15V ± 1%
  ± 50MA no load
  ± 100 MA full load (139ΩL-L)
- Full Scale Output – 11.8V AC line to line ± 2%
- Power Output – 0.5VA max.
- Transfer Function

  S1-S3= $11.8V \times SIN\left(TT \times \frac{EIN}{10V}\right)$

  S2-S3= $11.8V \times SIN\left(TT \times \frac{EIN}{10V} + 120°\right)$

  S2-S1= $11.8V \times SIN\left(TT \times \frac{EIN}{10V} + 240°\right)$
- Operating Temperature Range 0°C to 70°C
- Distortion 0.5% max.
- Accuracy*
  15 minutes of ARC (Max) at 20°C ±10°C
  30 minutes of ARC (Max) over the operating temp. range
  * Accuracy is based on the following equation:

  $\theta = TAN^{-1} \frac{\sqrt{3}(1-K)}{(1+K)}$

  Where K is the measured ratio (S3-S2)/(S1-S2)
- Tracking Speed – 720°/SEC

For units to meet wider temperature range and other specifications please consult the factory.

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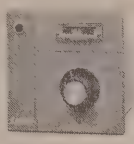
HARREL PRECISION CONTROLS, SYSTEMS, & SENSORS

PROPORTIONAL TEMPERATURE CONTROLS

- CLOSE CONTROL: Proportional **plus automatic reset plus rate** action eliminates temperature "droop" and ensures close temperature control.
- RELIABLE: Latest integrated and hybrid circuitry ensures highest reliability and long life.
- HIGH POWER: From a few watts to 300 Kw; single phase or three phase; 115, 230, or 480 volts.
- ANY TEMPERATURE RANGE: Control either heaters or coolers from −200°C to +1100°C, using either resistance sensors or thermocouples.

¼ DIN

Compact plug-in instrument occupies only 4" x 4" panel space. Single turn or digital dial.



½ DIN

Plug-in instrument in popular ½ DIN standard metric size. Single turn or digital dial.

LARGE DIGITAL DIAL

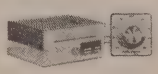
Plug-in instrument with large 15/32" high numerals easily readable from 30 ft. away. Includes front panel on-off switch, pilot light, and power output meter.

ENVIRONMENTAL EQUIPMENT CONTROLS

A complete line of controllers for temperature and humidity in environmental test equipment.

LOW COST CONTROLLERS

Performance of proportional plus automatic reset plus rate controllers at low cost. For built-in OEM applications.



HIGH RELIABILITY MILITARY CONTROLLERS

Precision temperature control to a single selected temperature. Ideal for control of gyros, delay lines, and similar equipment. True proportional or RFI-free.

TEMPERATURE SENSORS

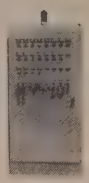
A complete line of temperature sensors. Patch type for surface measurement, tubular style, bayonet mount, air sensing, etc.

COMPUTERIZED CONTROL AND MANAGEMENT SYSTEMS

Complete digital control and management of industrial processes. Includes control of machine parameters, overall closed loop control of the process, and complete management reporting.

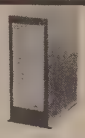
MICROPROCESSOR-BASED "DIGIPANELS"

Total control of industrial processes; includes transducers, interfaces, programming and application engineering.



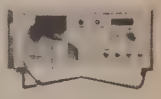
COMPUTER INTERFACE/SIGNAL CONDITIONERS

A complete line of interface modules for computer control and monitoring of temperatures, pressures, RPM's, etc.



PROGRAMMERS

A complete line of programmers for control of temperature, pressure, etc., from a preset program.

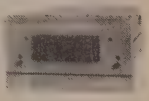


PRESSURE CONTROLS

A complete line of pressure controls for extruders, blow molders, injection machines and similar industrial machinery.

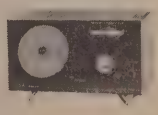
TEMPERATURE, PRESSURE OR RPM INDICATOR/ALARMS

Display temperature, pressure, or RPM in easy-to-read, ½" high numerals. One or two process alarms for high, low, or two stage alarm.



LABORATORY TEMPERATURE RECORDER

Expanded scale readout of temperature. Eleven ranges give .02% accuracy. 1, 7, and 30 hours.



PANEL MOUNT: STRIP CHART

For continuous indication and recording of temperature and pressure at remote points.

SOLID STATE POWER UNITS

For reliable, long life control of heater power. Power to 300 Kw, single phase or three phase, 115 to 550 volts.

COMPLETE CONTROL PANELS

Complete panels for industrial processes. Includes temperature, pressure, and closed loop system controls. Computer control optional.

HARREL, incorporated 16 Fitch Street, East Norwalk, Connecticut. Phone: (203) 866-2573

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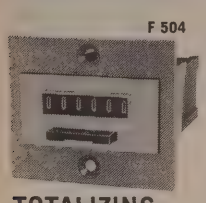
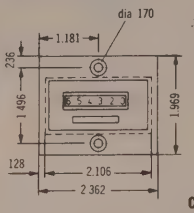
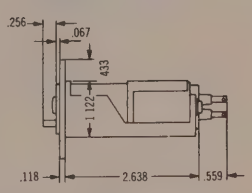
YOUR BUSINESS PARTNER IN COUNTING AND CONTROLLING.

COUNTERS

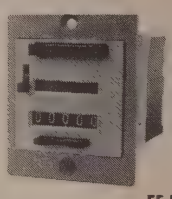
ELECTROMECHANICAL COUNTERS

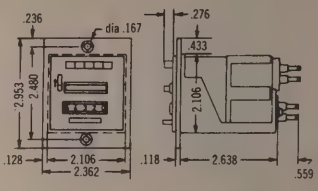

F 504





CUT-OUT SIZE 2.16" x 1.16"


FE 504



CUT-OUT SIZE 2.17" x 2.17"

TOTALIZING

Series	No. Digits	Front Reset (Code)	Illustrated Configuration (Code)	Voltages	Speed CPS (Code)	Power W/VA	Minimum Time On	Minimum Time Off
F 504	6	PB (5)	Basic unit, Panel frame and socket box (E)	6, 12, 24, 48, 110 DC	20 (4)	2.2	25	25
	6	Key (4)		24, 115, 220 AC	10 (2)	3	50	50
	6, 8	None (0)						

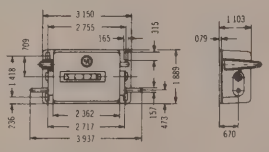
PREDETERMINING† ADDING

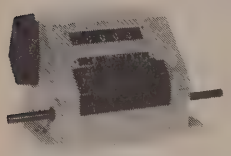
FE 504	3, 5	PB (5)	Basic unit, Panel frame and socket box (E)	6, 12, 24, 48, 110 DC 24, 115, 220 AC	20 (4) 10 (2)	2.2 3	25 50	25 50

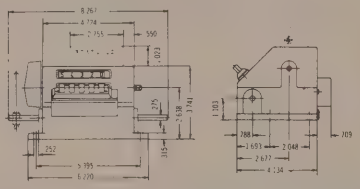
†Contact rating for predetermining counters is 30W maximum 220V maximum or 2A.

MECHANICAL COUNTERS

U/H/M 104



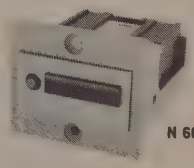

U/H/M E 280 U/H/M E 280Z

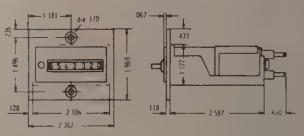


Series	No. Digits	Type Reset	Shaft Rotation	Max. Speed, RPM
TOTALIZING				
U/H/M 104	5	Lever	TC or TG	3000
PREDETERMINING* ADDING				
U/H/M E 280	5	Lever	TC or TG	6000
U/H/M E 280Z	5	Lever	TC or TG	6000
	E 280 has a single predetermining setting. E 280Z has two predetermining settings.			

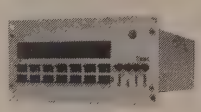
*Contact rating for SPDT switch for predetermining counters is 30W or 220V or 2A maximum.

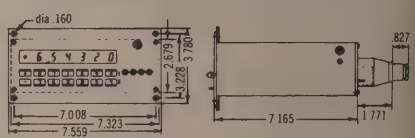
ELECTRONIC COUNTERS


N 604



CUT-OUT SIZE 2.16" x 1.16"


NE 655

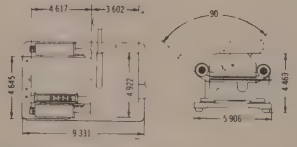


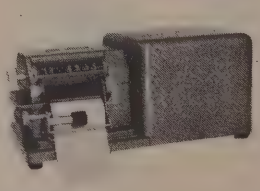
Series	No. Digits	Reset (Code)	Illustrated Configuration (Code)	Voltages	Speed CPS (Code)	Power W/VA
TOTALIZING						
N 604	7	PB (5)	Basic unit, Panel frame and socket box (E)	6, 12, 24 DC	1K	1.2 W
	7	PB (7)* with battery		6, 12, 24 AC		
	*The N 604.77 features rechargeable built-in battery.					
PREDETERMINING BIDIRECTIONAL						
NE 655	6 (+ – sign)	PB, Remote	Panel mount	24, 115, 220 AC	50 mech. 10K electronic	—

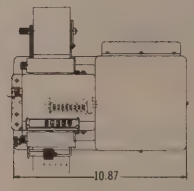
*Contact rating for SPDT switch for predetermining counters is 30W or 220V or 2A maximum.

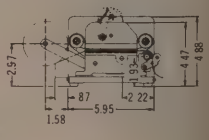
PRINTERS

ELECTROMECHANICAL (IMPULSE)









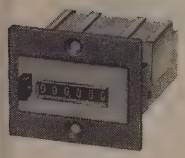
Series	No. Digits	Reset (Code)	Voltages	Speed CPS (Code)	Power	Minimum Time On	Minimum Time Off	Duty Cycle	Print Cycle
MANUAL									
FD 270	6	None (0)	12, 24, 110 DC	5 (1)	14 W	100	100	100	—
		After print (5)	24, 110, 220 AC	5 (1)	20 VA	100	100	100	—
AUTOMATIC									
FD 272	6	None (0)	12, 24, 110 DC	5 (1)	14 W	100	100	100	1-1.5 Sec.
		After print (5)	24, 110, 220 AC	5 (1)	20 VA	100	100	100	

IVO INDUSTRIES, INC.
1109 GREEN GROVE ROAD ☐ P.O. BOX 36 C ☐ NEPTUNE, NEW JERSEY 07753
PHONE: (201) 922-3600 ☐ TELEX: 132-414

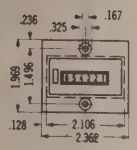
YOUR BUSINESS PARTNER IN COUNTING AND CONTROLLING.

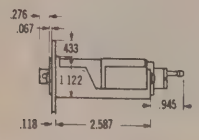
COUNTERS

PNEUMATIC COUNTERS

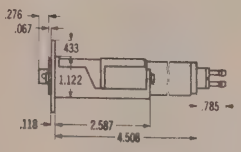


P104/105



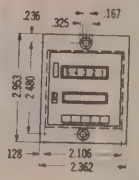


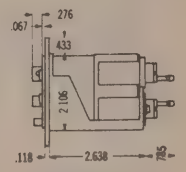
MANUAL RESET



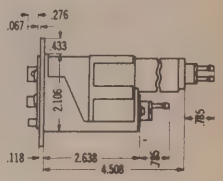
AIR RESET

PE104/105





MANUAL RESET



AIR RESET

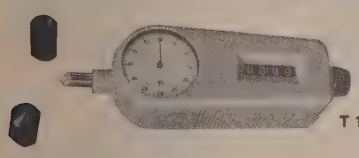
TOTALIZING

Series	No. Digits	Reset (Code)	Digit Height 3, 5	Digit Height 6	Illustrated Configuration (Code)	Air Press. Count/Reset	Air Press. Control Switch	Speed CPS (Code)	Minimum Time MSEC On	Minimum Time MSEC Off	Minimum Time MSEC Reset	Fittings
P 104	5, 6	PB (5)	.187	.156	Basic unit Panel frame and socket box (E)	14-85 psi	70-85 psi	10 (2) to 25 cps on special order	50	50	200	Barbed for #2 (⅛" plastic tubing)
P 105	5, 6	Air										

PREDETERMINING ADDING

PE 104	3, 5	PB (5)	.187	N/A	Basic unit Panel frame and socket box (E)	14-85 psi	70-85 psi	10 (2) to 25 cps on special order	50	50	200	Barbed for #2 (⅛" plastic tubing)
PE 105	3, 5	Air										

HAND HELD SPEED TACHOMETERS AND TALLY COUNTERS



T 110

- Speed 6000 rpm
- Figure height 11/64" (4.5mm)
- Reset & watch winding—1 turn
- Complete w/case & 2 tips

T 104

- Speed 6000 rpm
- Figure height 11/64" (4.5mm)
- Reset 1 turn
- Complete w/case & 1 tip

T 120

- 4 digits—3/16"
- Thumb actuated
- Knob reset
- Also with base (T 123) and wall (T 124) mounts

NEW!

NE 638, AN ELECTRONIC PREDETERMINING COUNTER

The NE 638 has full 5-digit control with bidirectional pushbutton switches, 5-digit LED display with pushbutton and remote reset. It's available in adding or subtracting models, with optional pre-contact in subtract mode. Input can be electronic at speeds to 1000 cps or higher, or mechanical to 50 cps. Output is a SPDT, 2A contact 100-ms pulse or latch. The counter operates on 24 VDC or 115 VAC.

NE 638

PREDETERMINING ADDING OR SUBTRACTING

Series	No. Digits	Reset	Illustrated Configuration	Voltages	Speed CPS	Power W/VA	Output SPDT Relay
NE 638.4 Add NE 638.5 Subtract	5	PB Remote	Panel mount	24 DC 24, 110, 220 AC	1K electronic input	8VA	100 ms pulse, latch opt.

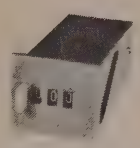
ABOUT IVO

IVO has one of the most extensive lines of counters in the world. Only a sampling can be listed in this limited space. Complete catalogs are available for each basic counter line: mechanical, electromechanical, electronic, and printer. Please send for those in which you are interested. Please consult IVO with any counting problem. There's no obligation.

ADDING-TOTALIZING COUNTERS

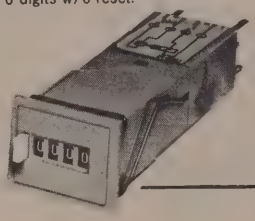
LOW COST — STOCK DELIVERIES

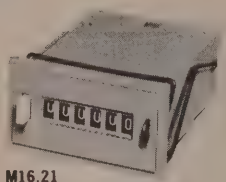
These high performance totalizing counters are designed for long life - 250 million counts - and accuracy even at speeds up to 50 counts/sec. They can be supplied for any voltage in 5 mounting styles with many options.



M13.21
3 digits with manual or electrical reset — 4 digits with no reset. Available in gray or black housing.

M14.23
4 digit with push button reset. Electrical reset optional. 5 or 6 digits w/o reset.

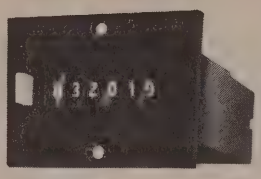




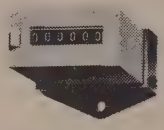
M16.21
6 digit with push button reset. Electrical reset optional. Black or gray housing. Mounts in 1.97 x .98 panel cutout.

M18.20
8 digit non reset. Spring clip mount. Black or gray housing. 1.97 x .98 panel cutout.

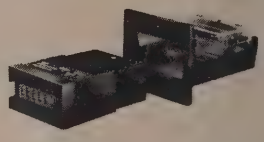
OPTIONAL MOUNTING STYLES



M16.11
Mounts with 2 screws.



ALM16.01
Base or surface mount.



M16.01
Plugs into F1 frame & socket.

CALL TOLL FREE 800-631-2165 FOR IMMEDIATE DELIVERY

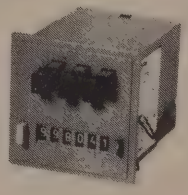
PREDETERMINING COUNTERS

GIVES SWITCH OUTPUT AT END OF COUNT

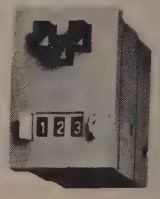
EVS13.11

EVS15.13

These two predetermining counters count down from the manually preset number to operate a built-in SPDT switch as the number wheels pass from all zeros to all 9's. Manual or optional electrical or automatic reset returns wheels to preset number and counter is ready to start again. Numbers are preset by holding in reset button, lifting locking bar and indexing number wheels to preset position with small rod supplied.



MVS 16.
New 6 digit predetermining subtracting counter features large staggered buttons for easy preset — manual and electrical reset. Fits 1.97" square panel cutout. Extra internal presignal switch optional.



MVS13.21
New 3 digit predetermining counter. Identical functionally to 6 digit unit on left, but is narrower to take up less panel space. All mounting options available, also manual and electrical reset. Any voltage, AC or DC at speeds up to 50 counts per second.

HOW TO ORDER

The basic catalog number, i.e. M13, M14 through M18 or MVS13, 16 and EVS13, 15 counters followed by:

1st Number: M16.2—
0 = Small Faceplate rear mount
1 = Large Faceplate panel mount by 2 screws
2 = Spring clip mount – eliminates 2 screws

2nd Number: M16.—2
0 = No reset
1 = Manual Reset Only
2 = Electrical reset only
3 = Manual and Electrical

Followed by: Voltage required and count speed per second; 10, 25, or 50.

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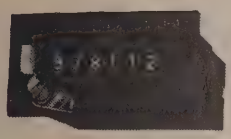
All other Areas Dial Toll Free (800) 631-2165

Telex: 132496
IMMEDIATE DELIVERY ON ALL ITEMS

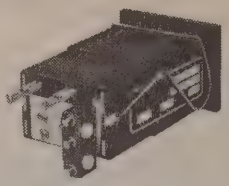
Pneumatic Counters Available

Some Optional Features

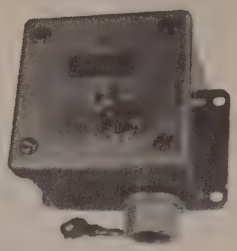


Locking lever rotates to prevent accidental reset

Spade key reset to prevent unauthorized reset



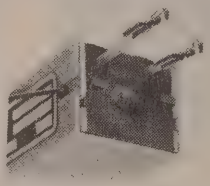
Micro switch operated by manual or electrical reset



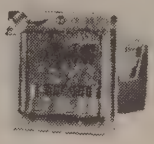
Nema 4 Water-tight & Weather proof. Nema 7 explosion proof also available

Special number wheels read out in time, money and reverse colors.

Top viewing-surface mount type ALM 16.01 saves space behind or in front of panel



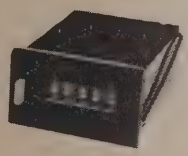
Quick Disconnect terminals or solder terminal are standard. Terminal block optional.



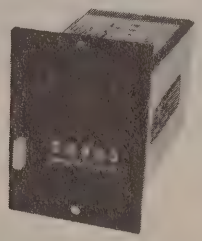
Transparent polycarbonate cover makes any counter water and dust proof.

ADD SUBTRACT COUNTERS

These rugged units have proved extremely reliable for differential counting - they are all in stock for fast delivery.



ED15.21
Available with or without manual or electrical reset. Count speed 10, 25, 40/sec.



ED25.11
Provides zero switch output with or w/o manual resets.

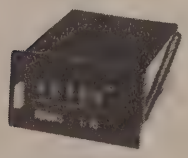
EDVS25.11
Add subtract predetermining. Reset point may be changed in the field.

EDA 15
Add subtract counter. Provides 10 line or BCD electrical read out.

ELAPSED TIME METERS

Accurate long life and attractive styling are features of these units.

Type B2 for 110 or 220 VAC. 60 HZ or 50 HZ. Attractive rear mounting. Hours only.



ETH15.21
110V 60 HZ with or without electrical and manual reset. Available in hours, minutes or seconds. Identical DC units available.

EZ16.21
Stop clock reads seconds and 10ths directly from 50 or 60 HZ line.

ETMVS15.11
Predetermining Elapsed Time Counter: Operates SPDT switch as numbers pass from 00000 to 9999. AC or DC models. Hrs., Min., or Secs.

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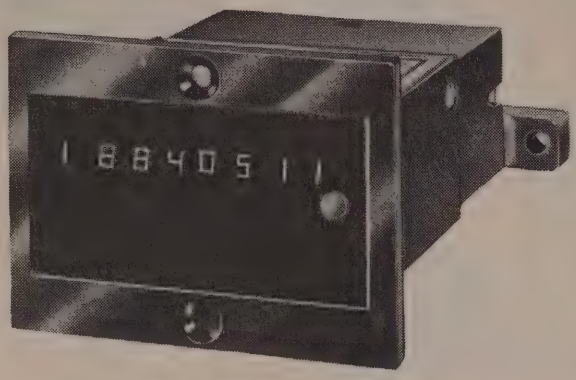
IMMEDIATE DELIVERY ON ALL ITEMS

Pneumatic Counters Available

NEW!

Low Cost ELECTRONIC COUNTERS



- Interchangeable with electromechanical counters. Fits 1.97 x .98 panel cutout.
- Up to 8 digits.
- Add Subtract option.
- Built-in Battery holds count if power fails for 6 months.
- Power with 5 - 30VDC
- Pulse with 2 - 30VDC
- 8 digits .170"; 4 digits .400"
- Up to 5 megahertz count speed.
- Fast Delivery.

FOR OUR OTHER ELECTRONIC COUNTERS AND TIMERS — Including Preset and 110VAC Models plus Full Line of Input Devices — i.e. Photoelectrics, Shaft Encoders and Proximity Switches See Page 1650 in Product Section 2000.

HOW TO ORDER

Family — HO7

Lo - 6 digit low cost add only
H07 - 7 digit low current built in battery
R18 - 8 digit add-subtract built in battery

2	2	H24	A	7	A

Mounting: 1 = Panel, 2 = Spring Clip

Reset: 1 = Panel, 2 = Remote, 3 = Both

COUNT OUTPUT: C = Dry Switch Closure, H = Voltage Pulse & Voltage

Digit Size: A = .200", D = .400"

Power Supply: 1 = 12 vdc, 2 = 24 vdc, 7 = 5 vdc

Power Quality: A = Regulated, B = Unregulated

LIST OF REPRESENTATIVES

LOS ANGELES:	Groh Associates 213-923-0963	BOSTON:	Gilway Sales 617-935-4442	SEATTLE:	Marra & Associates 206-641-3535
CHICAGO:	Lincoln-Hodges 312-297-3810	DETROIT:	Pitcher-Poulin 313-582-5450	CLEVELAND:	RPM Sales 216-247-3295
SAN FRANCISCO:	Serra Associates 408-738-1117	N.Y./N.J.:	Swedelco, Inc. 914-946-1122	ATLANTA:	Electro-Mech 404-449-6337
DENVER:	Palmer Associates 303-629-0112	WASH. D.C. / MD.:	Strayton Associates 301-831-7007	PHILADELPHIA:	W. Reeves & Associates 215-566-6709
MINNEAPOLIS:	R. J. Sales, Inc. 612-922-1425	KANSAS CITY:	Midtech Associates 913-441-6565	ROCHESTER:	Tacom Sales 716-647-3940
				DALLAS:	Delta Components 214-241-4914

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All other Areas Dial Toll Free (800) 631-2165

Telex: 132496

IMMEDIATE DELIVERY ON ALL ITEMS

Pneumatic Counters Available

POSITIONING and TRACKING CONTROLS FOR THE HUMAN OPERATOR

- **JOYSTICKS — FORCE OPERATED • ANALOG or DIGITAL OUTPUT**
- **JOYSTICKS — DISPLACEMENT • POTENTIOMETER**
- **JOYSTICKS — SWITCHING**
- **TRACKBALLS — 2, 3 or 3½ INCH SIZES • ANALOG or DIGITAL OUTPUT**

Model 541
Joystick

Model 622
2-inch Trackball

Model 1505
Control Grip

Model 869
Joystick with
Pulse Rate
Output

Write or phone for the MS catalog, listing over 50 standard items.

MS MEASUREMENT SYSTEMS, INC.

121 Water Street, Norwalk, CT 06854 USA / Telephone: (203) 838-5561
TWX: 710-468-2185 / Cable: MEASYSTEMS

INDICATORS AND TIMERS

Commercial Elapsed Time Indicators

Maintain record of equipment on/off time and provide utilization time information for maintenance, billing, etc. Many different models and mounts. Up to 6 digit readouts.

Type	Series No.	Operating V ac	Styles
Standard Commercial	K42200	6-230, 50 or 60 Hz	Round and rectangular
Microminiature Commercial	K49200	115 60 or 400 Hz	End or side readout

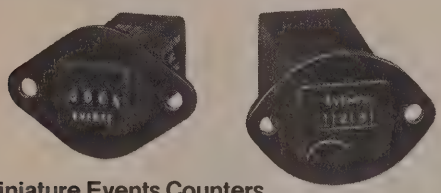
Ask for Reference Sheets PI-125 and CI-706

MIL Spec Elapsed Time Indicators

Conform to MIL-M-7793. In either subminiature (5-digit) or microminiature (4-digit) sizes. White numerals on black; "tenths" digit red on white. Hermetically sealed.

Type	Series No.	Operating Voltage
Subminiature	K4200 K23200 K25200	28V dc 115V ac, 60 Hz 115V ac, 400 Hz
Microminiature	K19200 (Square) K19220 (Round)	24 or 120V ac 400 Hz
	KT19700 (Square) KT19720 (Round)	28V dc

Ask for Reference Sheets MI-602 and MI-603

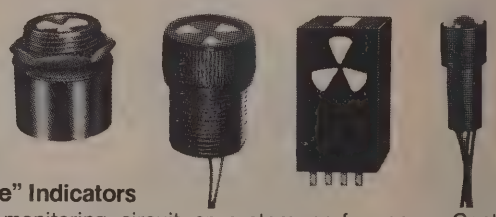


Microminiature Events Counters

Meet MIL-M-7793 environmental requirements. Up to 6 digit display, depending on model. Non-resettable and resettable types. Many standard mountings.

Type	Digits	Series No. 28V dc	115V 60 Hz	115V 400 Hz
Non-resettable	4	K19502	K19511	K19501
	5	K19504	K19513	K19503
	6	K19506	K19515	K19505
Resettable	3	LM19502	LM19511	LM19501
	4	LM19504	LM19513	LM19503
	5	LM19506	LM19515	LM19505

Ask for Reference Sheet MI-604



"Bite" Indicators

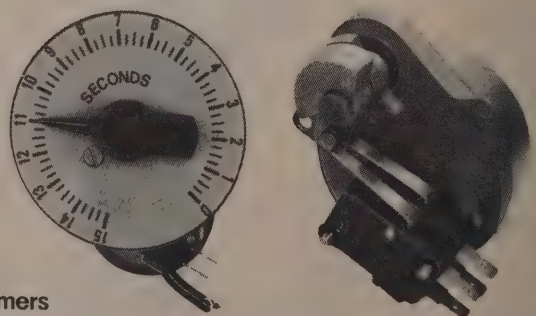
For monitoring circuit or system performance. Contrasting colored flag or ball appears in window to indicate fault condition. Magnetic latch retains fault condition until manually or electrically reset. Rectangular, round and ball-type units.

Type	Series	MIL Ref.	DC Voltage	Operating Time
Rectangular	K21500	MIL-E-5400J	17-29	50ms.
Round	K21600	MIL-M-83287	17-29	50ms.
Round-Manual Reset	L21603/01	MIL-M-83287	3-28	50ms.
Round-Electric Reset	L21603/02	MIL-M-83287	17-29	50ms.
Ball-Electric Reset	K21700		17-29	50ms.

Ask for Reference Sheets MI-605, MI-606, MI-607

Clocks

A wide range of clock devices from lab stop clocks to sophisticated electronic aircraft clock systems. Analog, digital or combination displays. Write for information.



Timers

Interval timers or repeat cycle timers. Synchronous motor driven. Stock items available. Most units U/L or CSA recognized. Write for information.

A. W. HAYDON CO. PRODUCTS

NORTH AMERICAN PHILIPS CONTROLS CORP.

Cheshire, Conn. 06410 • (203) 272-0301

CONVERTERS & INTEGRATORS

North Hills

VOLTAGE-TO-FREQUENCY

Complete line of Voltage-to-Frequency Converters for:

- A/D conversion.
- Electronic integration.
- Telemetering.
- Process control applications.

All have one-cycle response, excellent linearity down to zero frequency, low TC.

FIXED RANGE SERIES

AC-line operated models accommodate all popular system interface configurations.

0-10 volt input, 0.02% linearity, zero and full-scale trimmers.

Standard full-scale output frequencies:
2.5, 5, 10, 25, 50, 100, 250, 500 Hz
1, 2.5, 5, 10, 25, 50, 100 kHz

Series	Output
DF-11	Transformer-isolated pulses
DF-12	5 or 13 V pulses, TTL, CMOS compatible
DF-13	5 V TTL balanced line driver
DF-14	Opto-isolated uncommitted transistor
DF-15	75 ohm coax line driver
DF-16	124 ohm balanced line driver
DF-17	EIA RS-232-C interface driver

ADJUSTABLE RANGE SERIES

AC-line operated models accommodate a variety of inputs, including all process control standards.

Full-scale output frequency is field-settable with high resolution over 1 to 100,000 Hz range.

Model No.	Input	Output
DF-100	0-10 V	Frequency
DF-101	1-5 mA	Frequency
DF-102	4-20 mA	Frequency
DF-103	10-50 mA	Frequency
DF-110	−10 to +10 V	Frequency and logic output indicating polarity
DF-120	−10 to +10 V	Separate frequencies for + and − inputs

PLUG-IN MODULE SERIES

Series DF-10 plug-in modules require ±15 Vdc at 25 mA.

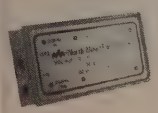
Input: 0-10 V

Input Impedance: > 100 MΩ

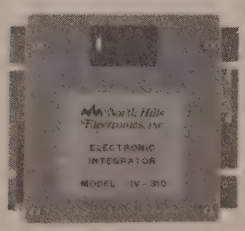
Linearity: 0.02%

Zero and full-scale trimmers

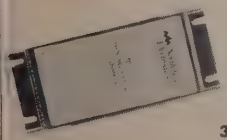
Full-scale output frequencies available:
25, 50, 100, 250, 500 Hz
1, 2.5, 5, 10, 25, 50, 100 kHz



Model DF-10
3.5 x 1.82 x 1 in.
±15 Vdc powered



Model IV-310



Model DF-12
3.5 x 8.5 x 2.3 in.
Ac-line powered

FREQUENCY-TO-VOLTAGE

Line of high-performance Frequency-to-Voltage Converters for:

- Tachometry.
- Telemetering.
- Frequency monitoring.
- Control application.

All feature ripple-free outputs and excellent linearity.

FULL-RANGE SERIES

AC-line operated models feature various input circuit options.

Output: 0-10 V

Linearity: 0.02% down to 1% of full-scale

Fast response, negligible ripple

Standard full-scale input frequencies available:
25, 50, 100, 250, 500 Hz
1, 2.5, 5, 10, 25, 50, 100 kHz

Series	Input Circuit	Input Level
FD-11	TTL balanced line driver	5 V nom.
FD-12	High impedance (> 100 KΩ)	1-100 V peak
FD-13	Opto-isolated diode	10 mA nom.

PLUG-IN MODULE SERIES

Series FD-14 has identical performance to Series FD-12, but requires an external source of ±15 Vdc power.

The unit is configured as a printed circuit plug-in module.

ULTRA-FAST NARROW RANGE SERIES

Series FT-100 Frequency Transducers cover narrow bands about power frequencies of 50, 60, and 400 Hz.

The instruments feature one-cycle response, internal crystal calibrators, and ±10 V output at 60 mA — sufficient to drive galvanometer and other types of recorders.

Model No.	Frequency Range
FT-101-1	40-60 Hz
FT-101-2	45-55 Hz
FT-102-1	50-70 Hz
FT-102-2	55-65 Hz
FT-103-1	360-440 Hz
FT-103-2	380-420 Hz

ELECTRONIC INTEGRATORS

Compute time-integral of sensor outputs; output pulses drive external or self-contained 24 V electro-mechanical totalizing counters (8 W max.). Full-scale output pulse rate field-settable with high resolution between 100 and 50,000 counts/hour.

Model No.	Input	Output
IV-100-X*	Process control currents	No count for less than min. current
IV-110	0 to 10 V	No count for −V
IV-200	−10 V to +10 V	Dual outputs for up-down counter
IV-201	−10 V to +10 V	Count ignores input polarity
IV-300	as above	Integral counter display
TA-101	4-15 V, 0-100 KHz	Analog total 0-10 Vdc at 2 mA
TD-101	1-5, 4-20, or 10-50 mA 0-10 V, −10 to +10 V	LED readout, selectable time base

* 1 = 1-5 mA, 2 = 4-20 mA, 3 = 10-50 mA.

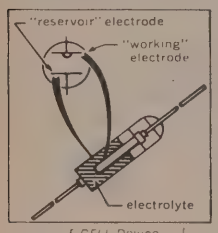
North Hills Electronics, INC. GLEN COVE, N.Y. 11542 • 516-671-5700

E-CELL (TM) COMPONENTS

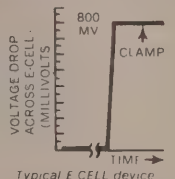
- LOW COST* • TIMING: Seconds to months
- INTEGRATION • NON-VOLATILE MEMORY

1. WHAT IS AN E-CELL?

An E-CELL is a highly reliable yet simple circuit element that performs the function of a complex assembly. The E-CELL consists of a center working electrode surrounded by electrolyte and an outside case which serves as the second electrode, the reservoir and the source of material for plating onto the center electrode. Plating the working electrode converts the current-time product (Integral) into equivalent metal mass (exactly one atom is plated for each electron passed). Once plated, this metal mass remains unchanged until additional plating or deplating takes place, thus achieving a non-volatile memory of the current time integral. Applying a known current (positive potential to the case) for a known time will set a known integral into the E-CELL, i.e. 100 µA for 1 hr = 100 µA hr set. Deplating this E-CELL at 1 µA (positive potential to the center electrode) will result in a 100 hour "timeout". During the deplate process the voltage drop across the E-CELL is a few millivolts, and at the point when all of the plated mass has been recovered a sharp voltage rise occurs signalling the end of the timeout process. The E-CELL is low cost, small size, electrically stable, insensitive to severe environments, compatible with low current and voltage circuitry, and can operate over an extremely long time frame. From 1967 to date over 20 million E-CELLS have been used for timing and integrating applications, on both military and industrial/commercial programs.



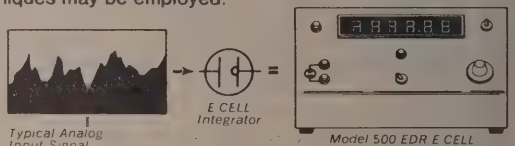
E CELL Device and Circuit Symbol



Typical E CELL device voltage rise

2. HOW DO YOU USE AN E-CELL DEVICE?

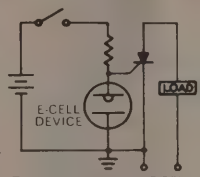
The E-CELL has two basic applications: integration and timing. In integration applications the unset E-CELL can accept current with any wave form, and store the integral on the working electrode. To read out this stored data, the cell is simply deplated (timed out) at a known rate. Plessey has developed an E-CELL Digital Readout Instrument (EDR500) for this purpose. However, any number of simple readout techniques may be employed.



Typical Analog Input Signal

Model 500 EDR E CELL Digital Readout Instrument

Operation in the Timing mode is the opposite of integration. The E-CELL is preset with a known integral and deplated at a known current rate until timeout, thus creating an accurate timing period. The timeout signal can be used to turn on semiconductor devices which allows a variety of control functions to be performed.



Typical circuit using E-CELL components

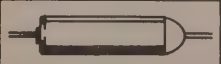
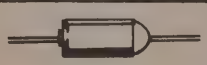
3. APPLICATIONS

Some samples of E-CELL applications are: **TIMING** – safing and arming ordnance – automotive and stationary equipment maintenance timers – anything requiring long time delays. **REPETITIVE TIMING and CONTROL** – automatic lubrication systems – maintenance and calibration cycle indicators – sequence control – appliance timers. **PULSE COUNTING and MEMORY** – event counter – maintenance indicator. **USE-TIME MEASUREMENT** – end of life, elapsed use. **CURRENT-TIME INTEGRATION** – battery charge control, environmental data gathering, transducer output integration, laboratory data integration.

4. APPLICATIONS ENGINEERING and MANUFACTURING

Plessey Electro-Products has been giving design assistance in the use of the E-CELL since 1967. Our expertise in all phases of design and manufacturing of electronic assemblies is available to prospective E-CELL users. Call us if we can assist you in design, development and manufacturing of electronic assemblies.

E-CELL INTEGRATING AND TIMING COMPONENTS

Type (Actual Size)	Application	Charge Range	Accuracy at 25°C	Physical Characteristics
 Series 560	Integrating	10-1000 µa-hr	±2%	Axial leads. Operating Temperature Range: −40C to +71°C. Storage Range −55°C to +85°C.†
	Timing	10-3000 µa-hr	±2%	
Series 550	Integrating	10-1000 µa-hr	±2%	Plug-in type. Operating Temperature Range: −40°C to +71°C. Storage Range −55°C to +85°C.†
	Timing	10-3000 µa-hr	±2%	
 Series 570	Integrating	3-350 µa-hr	±2%	Axial leads. Operating Temperature Range: −40°C to +71°C. Storage Range −55°C to +85°C.†
	Timing	3-1000 µa-hr	±2%	
● MILITARY 500 SERIES E-CELLS ALSO AVAILABLE				† For additional information, see Technical Publications

PRICING*

Less than $1.00 in large quantities.

ORDERING INFORMATION

560 – XXX X

Series — Preset if any — Multiplier

Examples:
560-3001
(3000 µa-hr Preset Timer)
560-2500
(250 µa-hr Preset Timer
560-0002
(Integrator)

E-CELL components and instruments are protected by one or more of the following U.S. patents: 2,744,217; 3,387,288; 3,423,642; 3,423,643; 3,423,644; 3,423,648. Other U.S. and foreign patents pending.

Specifications subject to change without notice.

For additional technical information and applications notes, contact:
PLESSEY ELECTRO-PRODUCTS
subsidiary of PLESSEY INCORPORATED
3860 Centinela Ave., Los Angeles, Calif. 90066
Tel: (213) 390-3585 • TWX: 910-343-6483

VERNITRON CONTROL COMPONENTS

a Division of Vernitron Corporation

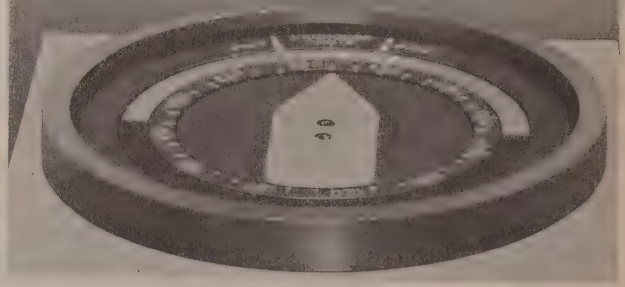
1601 PRECISION PARK LANE • SAN DIEGO, CALIFORNIA 92073 • (714) 428-5581, TWX: 910-322-1862

PANCAKE SYNCHROS AND RESOLVERS PROVIDE . . .

. . . Lower cost and higher accuracy in position sensing systems. Gimbal mounted synchros, resolvers and linear transformers are available in various configurations . . . single speed accuracies to 10 seconds . . . dual and multi-speed units with accuracies to 3 seconds. Other provisions include wide ranges of frequency, voltage, and temperature.

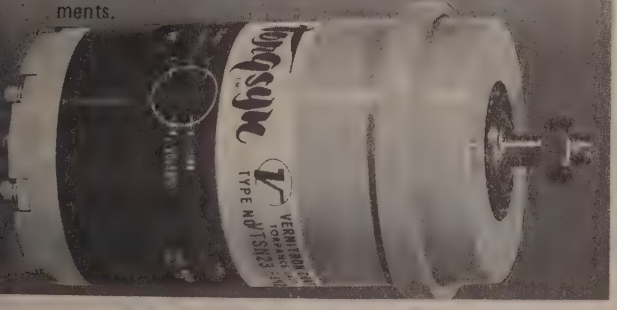
RELIABLE ELECTRO-MECHANICAL INDICATORS THAT . . .

. . . tell you where it's at – time after time. Simple remote readouts or complex multiple display – rudder angle, thrust direction, ship heading, target bearing, weapon system position – Vernitron can supply dependable performance under severe operating conditions. Talk to us about your electromechanical indicator requirements.



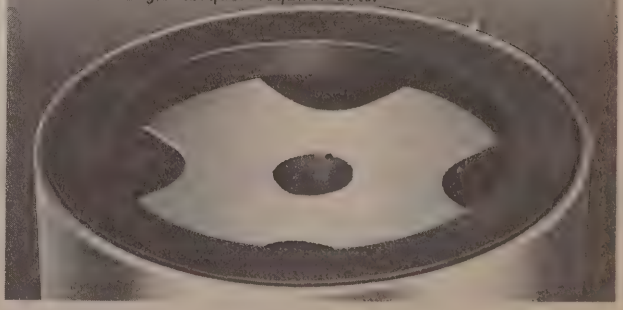
Torqsyn® REMOTE POSITIONERS ARE . . .

. . . completely integrated direct drive servo packages . . . no gearing required . . . compact. Operation over 50-440 Hz, most models. High input impedance . . . reliable . . . no reflected torque to driving source . . . high torque gradient . . . high inertia load capability. Available in frame sizes 11, 15, 23, and 37. Talk to us about your remote positioning and indicating requirements.



Vernitorq® WIDE ANGLE BRUSHLESS DC TORQUERS FOR . . .

. . . all your precise positioning, actuating, tensioning, measuring and indicating applications. Highly reliable, limited rotation, direct drive units are available frameless or housed in both two or four pole versions. Various sizes and outputs. Talk to us about your wide angle torquer requirements.



STANDARD SYNCHROS, RESOLVERS AND SELSYNS

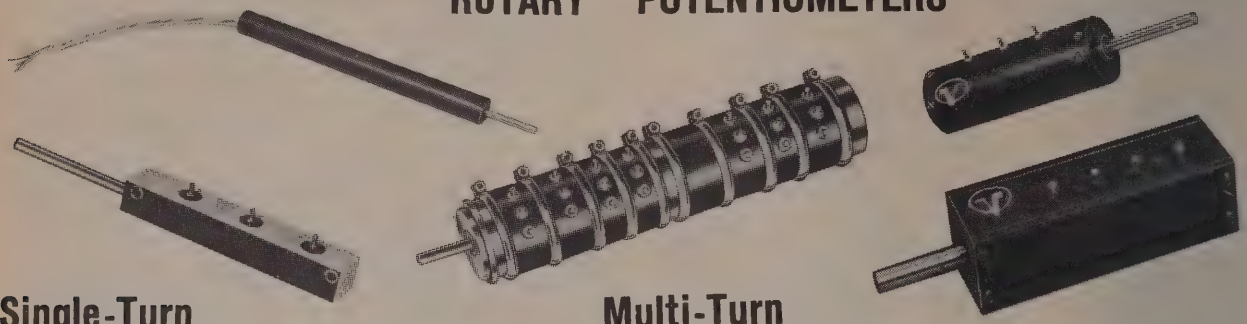
Mil-Spec designs housed in all standard and existing frame sizes, plus Selsyn replacement type units are available with accuracies down to 20 seconds on housed synchros and resolvers. Additional features include temperature compensation, varying voltage, frequency and impedance levels.

WRITE OR PHONE FOR DETAILED 20 PAGE CATALOG.

VERNITECH
Division of VERNITRON CORPORATION

CIC Infinite Resolution PRECISION COMPONENTS

ROTARY POTENTIOMETERS



Single-Turn

LINEAR-FUNCTIONAL/SINE-COSINE

SPECIFICATIONS

	LINEAR	SINE-COSINE
Mechanical Rotation	360° Continuous	
Electrical Function Angle	350° Nominal	360°
Resistance Range	0.5KΩ-2 MegΩ	500Ω-50KΩ/Quad.
Best Linearity or Conformity	.1% ÷ Inch of Dia.	.3% P-P ÷ Inch of Dia.
Resolution*	1/250,000	
Wattage	Diameter x 2 Watt(s)	
Temperature Range	−55°C to +125°C	
Taps. Maximum No.	Diameter x 6	
Starting Torque (In.—Oz.)	Diameter x .15	Diameter x .3
Life** (at 100 R.P.M.)	To 30 Million Cycles Depending on Circuitry	

Multi-Turn

LINEAR-FUNCTIONAL

SPECIFICATIONS

MULTI-TURNS			
3600° +20° −0°	3700° MIN. to 36,000°	3600° +100° −0°	3600° +110° −0°
3600° ±10°	3600° ±40°	3600° ±5°	3600° ±10°
5KΩ-250KΩ	1KΩ-125KΩ	5KΩ-500KΩ	5Ω-1MegΩ
To ±0.1%	To ±0.1%	To ±0.05%	To 0.01%
1/150,000	1/200,000	1/400,000	1/400,000
2	1	2	4
−55°C to +125°C			
1	2	1	1
0.2	1.5	1.0	2.0
To 5 Million Cycles Depending on Model and Application			
10 IN. OZ. MAX.		75 IN. OZ.	160 IN. OZ.

VERNITECH Elements — Rotary and/or Linear — Available on Order

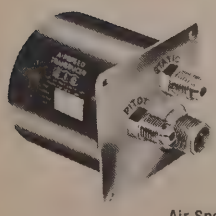
LINEAR MOTION POTENTIOMETERS

Electrical Stroke	To 60″	To 28″	To 12″	To 4″	To 1″	To 1.2″	To 1.5″	To 1.25″	To 10″
Cross Section Configuration	○	□	□	○	□	□	□		○
Resistance Range	250Ω/in. to 200KΩ/in.	150Ω/in to 200KΩ/in.		500Ω/in. to 250KΩ/in.		150Ω/in. to 125KΩ/in.	250Ω/in. to 125KΩ/in.	500Ω/in. to 250KΩ/in.	350Ω/in. to 250KΩ/in.
Best Linearity	0.2% ÷ Length of Electrical Stroke								
Resolution*	1/400,000								
Wattage	1 Watt per Inch of Stroke								
Temperature Range	−55° to +125°C								
Taps Maximum No.***	4	To Suit		1		To Suit	1		
Starting Force Oz. at 25°C	16	8	4	8	4		8		
Life	30 Million Strokes, Depending on Circuitry								
Shaft Misalignment Feature	Available			Not Available		Available	Not Avail.		Available

CIC PRECISION PRESSURE TRANSDUCERS/TRANSMITTERS

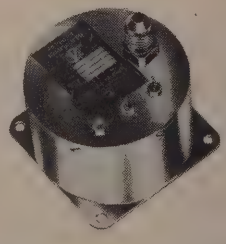
LINEAR WITH PRESSURE / ALTITUDE / AIRSPEED / FLOW / SQUARE ROOT

WEATHER-PROOF
(Available in All Models)



Air Speed Transducer

Pressure Range 0-10,000 PSI
Linearity
Repeatability To ±.05% F.S.

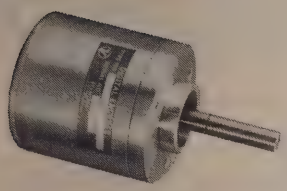


EXPLOSION-PROOF
(Available in All Models)

VERNITECH
Division of VERNITRON CORPORATION

DEPT. EM, 300 MARCUS BOULEVARD
DEER PARK, LONG ISLAND, NY 1172
PHONE (516) 586-5100 TWX 510-227-607

VERNITECH
Division of VERNITRON CORPORATION



SHAFT ENCODERS
CONTACTING AND OPTICAL
INCREMENTAL — ABSOLUTE

OPTICAL INCREMENTAL

Size	Resolution	Diameter	Length	Features (Optical)	Options
11	To 1024 Pulses	1.062	1.500	All Solid State Light Source High Reliability Industrially Designed Construction	• Sealed • Index Marker • Quadrature Output • 1X-2X-4X Multiplier • Extended Temperature Range • Non-Std. Supply Voltage • Line Drivers • Connectors • Direction Sensing
23	To 2048 Pulses	2.250	1.875		
25	To 2540 Pulses	2.500	2.500		
35	To 2500 Pulses	3.500	2.250		

OPTICAL ABSOLUTE

Size	Output Code	Counts/Turn	Least Count Angle	Features	Options
23	BCD	Up to 1000	.18°	Quadrature Output on LSB Available	• Serial Output Available • Size 30 Available With Parity Bit • Multiturn Available
30	Any	Up to 1024	.18°		

CONTACTING ABSOLUTE

Size	Code	Counts/Turn	Revolutions for Full Count	Full Count	Features	Options
11	Gray/Binary	To 256	1 to 64	To 2^{14}	Operating Speed: To 200 RPM DTL/TTL Compatable 5,000,000 Rev. — Life Slew Speed: 1000 RPM Output: Parallel Non-Ambiguous All Units Contain Self-Selecting Logic	• Operating Temp.: −55°C to 125°C • Various Output Voltage Ratings • 18 and 19 Bit Total Count • Connectors • Increasing Count — CCW Rotation
	BCD	To 100	1 to 100	To 9999		
18	Gray/Binary	To 512	1 to 2048	To 2^{19}		
23	Binary	To 256	1 to 2048	To 2^{19}		
	BCD	To 400	1 to 100	1 x 10^6 BCD		
31	Gray/Binary	1024	Single Turn	To 2^{10}		

OPTICAL KIT — INCREMENTAL — INDUSTRIAL USE

Size	Resolution	Light Source	Construction	Features	Options	
15-23 Un-Housed	To 1024 Pulses	LED	Modular	Low Cost	2 Channel Output Index Channels	Squared Output Operating Voltages: 5 to 15 V.D.C.

oused versions also available.

VERNITECH.
Division of VERNITRON CORPORATION

DEPT. EM, 300 MARCUS BOULEVARD
DEER PARK, LONG ISLAND, NY 11729
PHONE (516) 586-5100 TWX 510-227-6079

SERIES 76 Oscillator — 1 Hz to 300 MHz

FREQUENCY STABILITY

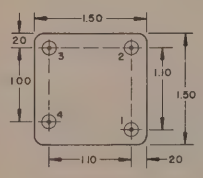
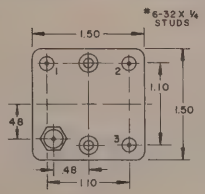
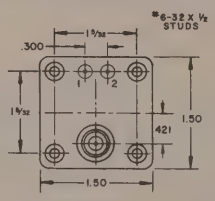
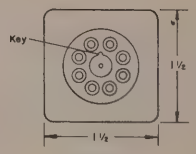
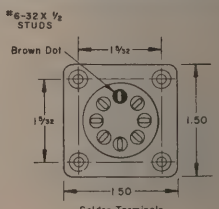
PARAMETER	ORDERING GUIDE W	X	Z
Temperature Range:	−55°C to +75°C	0°C to +60°C	+15°C to +35°C
Frequency Stability:	±0.005%	±0.001%	±0.0005%

OUTPUT SPECIFICATIONS

PARAMETER	ORDERING GUIDE A	B	C
Frequency Range:	1Hz to 5MHz	1Hz to 25MHz	10MHz to 150 MHz
Supply VO:	±5VDC to ±12VDC ±5%	+5VDC ±5%	+5VDC or −5.2VDC ±5%
Current Drain:	<4MA	<18MA	<50MA
Wave Form:	Square	Square	Basically Square
Output VO:	Compatible CMOS-MOS	Compatible TTL	Compatible ECL
Tr/Tf	<100NS	<100NS	<3NS
Symmetry:	50/50 ±20%	50/50 ±20%	———
Distortion:	———	———	———
Load Resistance:	10 CMOS-MOS	10 TTL	10 TTL or ECL
Termination:	▼1 ▼4 ▼5 Only	▼1 ▼4 ▼5 Only	▼1 ▼2 ▼3 Only
Height: (Inches)	.62 1.5 1.5	.62 1.5 1.5	1.0 1.5 2.0

PARAMETER	D	E	F
Frequency Range:	150MHz to 300MHz	60Hz to 1MHz	1MHz to 300MHz
Supply VO:	+5VDC or −5.2VDC ±5%	+12VDC ±5%	+12VDC ±5%
Current Drain:	<50MA	<15MA	<50MA
Wave Form:	Basically Square	Sine	Sine
Output VO:	Compatible ECL	1VRMS ±10%	+10dbm ±3dbm
Tr/Tf	<3NS	———	———
Symmetry:	———	———	———
Distortion:	———	<5%	−25db min.
Load Resistance:	10 ECL	10K Ω	50 Ω
Termination:	▼1 ▼2 ▼3 Only	▼1 ▼4 ▼5 Only	▼1 ▼2 ▼3 Only
Height: (Inches)	1.5 2.0 3.0	1.5 2.0 2.0	1.5 2.0 2.5

TERMINATION

ORDERING GUIDE 1	2	3	4	5
 Printed Circuit Pins	 OSM Connector	 BNC Connector	 Octal Plug	 Solder Terminals

FILL IN BLANKS TO CONSTRUCT YOUR PART NO. — Example [X] [F] [3]

When ordering
▼ SPECIFY
Model No.
Frequency
Supply Vo.

Freq. Stab.	Output Spec.	Termination
W, X or Z	A, B, C, D, E or F	1, 2, 3, 4 or 5

accutronics | DEPT. EM, 628 NORTH ST., GENEVA, IL 60134, U.S.A. / (312) 232-2600
TWX: 910-237-1680 / CABLE: AKUTRONX

SERIES 77 LCVCO

1 MHz to 250 MHz

FREQUENCY STABILITY

PARAMETER	ORDERING GUIDE		
	S	T	V
Temperature Range:	−40°C to +80°C	0°C to +60°C	+15°C to +35°C
Frequency Stability:	±0.5%	±0.2%	±0.1%
Setting Accuracy:	±0.05%	±0.05%	±0.05%
△f vs Supply:	±.02% per 1% change in supply voltage		
△f vs Load:	±50PPM no load to full load		

OUTPUT SPECIFICATIONS

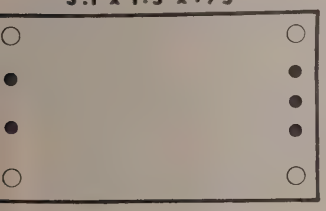
PARAMETER	ORDERING GUIDE		
	G	H	J
Frequency Range:	1MHz to 40MHz	40MHz to 250MHz	1MHz to 250MHz
Supply VO:	+12VDC ±5%	+ or −12VDC ±5%	+12VDC ±5%
Current Drain:	<30MA	<50MA	<50MA
Wave Form:	Square	Square	Sine
Output VO:	Compatible TTL	Compatible TTL or ECL	0dbm min.
Tr/Tf:	<30NS	<5NS	———
Symmetry:	50/50 ±20%	50/50 ±20%	———
Harmonics:	———	———	−20db min.
Spurious:	———	———	−60db min.
Load Resistance:	3 ea. TTL	3 ea. TTL or ECL	50Ω
Tuning Voltage:	0V ±5VDC	0V ±5VDC	0V ±5VDC
Mod. Bandwidth:	DC to 20KHZ — 3db	DC to 20KHZ — 3db	DC to 20KHZ — 3db
Size:	Option 1, 3	Option 1, 2, 3, 4	Option 2, 4
Termination:	PC Pins	PC Pins or BNC	BNC

DEVIATION/LINEARITY

PARAMETER	ORDERING GUIDE			
	6	7	8	9
Deviation:	±1%	±5%	±10%	±25%
Linearity:	±1%	±2%	±4%	±10%

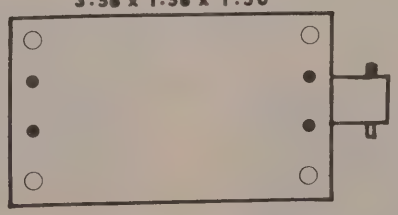
Option 1

3.1 x 1.5 x .75



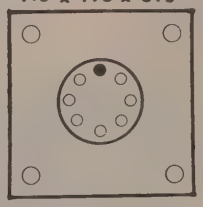
Option 2

3.56 x 1.56 x 1.50



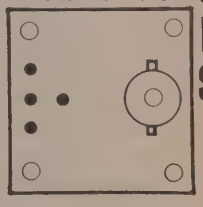
Option 3

1.5 x 1.5 x 3.5



Option 4

1.5 x 1.5 x 3.5



FILL IN BLANKS TO CONSTRUCT YOUR PART NO. — Example T G 8 3

When ordering SPECIFY
Model No.
Frequency
Supply Vo.

Freq. Stab.	Output Spec.	Dev./Lin.	Size
S, T or V	G, H or J	6, 7, 8 or 9	1, 2, 3, 4

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accutronics oscillators

Alpha Components, inc.

TM

PERFORMANC STANDARDS YOU CAN DEPEND ON

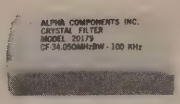
Constant Time Delay Low Pass & Bandpass Filter • Crystal Discriminators • Custom Networks • Equalizers

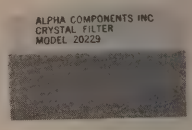
MEETING NEARLY ANY SYSTEM REQUIREMENT

At Alpha Components, we use a modern approach to the synthesis of passive filters and discriminators. In our broad line of components, we utilize both crystal and lumped elements as principal resonators. Our in-house computer assures rapid and accurate analysis of new applications. Most designs employ insertion loss & image parameter theory. Alpha's capabilities cover a frequency range from audio to 100 MHz. Bandwidths start at .005 percent of center frequency with crystal stability, range from 1 to 20 percent of center frequency with hybrid structures of crystal and L-C elements. Filters with bandwidths above 20 percent of center frequency primarily employ L-C elements.

In Alpha Components' library of proven filter designs, there is certain to be one that, with minor modifications, will fit your needs precisely. Call us anytime for technical assistance. We'll be glad to discuss your requirements, evaluate your problems and give you a price and delivery date on prototypes. Furthermore, we'll give you production estimates within one working day when your specifications fit a design already in our library.

The standard through which your signal must pass is precise. An Alpha Standard is one you can depend on.

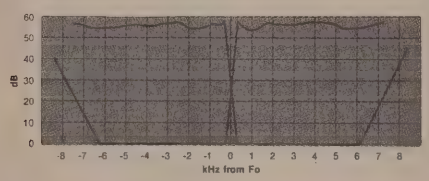


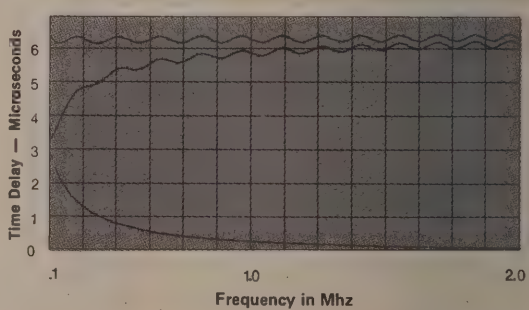


SINGLE SIDEBAND FILTERS

Model FX - 102, Lower Sideband
Model FX - 103, Upper Sideband

Fo . . . . . 2 MHz-
2 dB Bandwidth . . . . . .6 kHz
Size (l x w x h) . . . . 2.5 x 1.65 x 1.05 in.

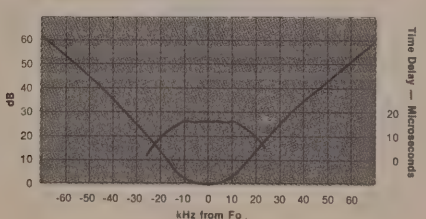




SWEPT FILTER (BESSEL)

Model FB - 999

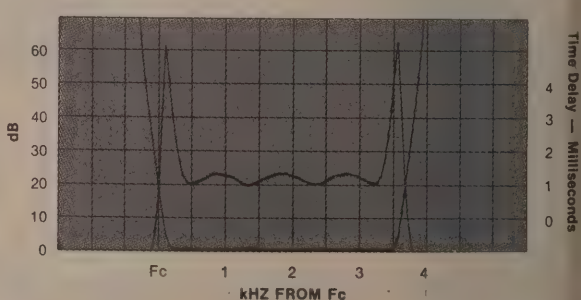
Fo . . . . . 21.4 MHz
3 dB Bandwidth . . . . . .20 kHz
Z . . . . . 50 ohms
Size (l x w x h) . . . . . 2 x 1 x .65 in.



DELAY EQUALIZER

Model 8080

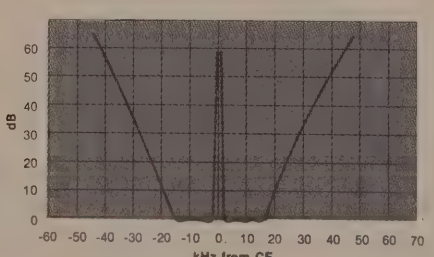
Bandwidth . . . . . 100 KHz to 2 MHz
Impedance . . . . . 600 ohms
Pass Band Ripple . . . . . 1 db P-P
Max P-P Delay . . . . . 300 ns



RADAR CLUTTER FILTER

Model RM - 109

Center Frequency . . . . . 10 MHz
3 dB Bandwidth . . . . . .30 kHz
60 dB Bandwidth . . . . . 90 kHz max.
Notch: 3 dB Bandwidth . . . 4 kHz max.
60 dB Bandwidth . 1.4 kHz min.
Z . . . . . 50 ohms
Size (l x w x h) . . . . .3.8 x 1.9 x 1.05 in.



MULTIPLEX CARRIER DATA CHANNEL

Model 2044

Fc . . . . . .1 to 2 MHz
3 db Bandwidth . . . . . 3.1 KHz
60 db Bandwidth. . . . . 4.4 KHz
Z . . . . . 1200 ohms
Pass Band Ripple. . . . . 1 db max.

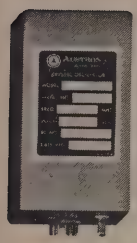
TM Alpha Components, inc.

1106 E. Simpson Road • Mechanicsburg, PA 17055
Phone: 717-697-8595 TWX: 510-650-4930

AUSTRON
1915 KRAMER LANE
AUSTIN, TEXAS 78758
TELEPHONE (512) 836-3523

HIGH STABILITY OVEN-CONTROLLED SERIES 1100 CRYSTAL OSCILLATORS

The Sulzer Model Oscillator is a compact, rugged crystal oscillator designed for use in counters, synthesizers and communications systems.



Model	Frequency:	Aging:	Output:	Input Voltage:	Input Power:	Size:	Weight:
1150	5 MHz	5 x 10 ^{11}/day ultimate aging	1 vrms sine wave	12 to 27 VDC	2.5 watts operating	2⅓ x 3-3/16 x 5"	32 oz.
1120	1 MHz	1 x 10 ^{9}/day ultimate aging	1 vrms sine wave	12 V to 27 VDC	3 watts operating	2¼ x 2-1/8" x 4"	9 oz.
1115	5 MHz	1 x 10 ^{9}/day ultimate aging	1 vrms sine wave	12 to 15 VDC	150 mw @25°C typical	2" diameter x 5½ length	12 oz.
1105	1 MHz	1 x 10 ^{9}/day ultimate aging	TTL	+5VDC	260ma operating	1¼ x 1¾" x 3¼	7 oz.
1100	5 MHz	1 x 10 ^{9}/day ultimate aging	1 vrms sine wave	12 VDC to 27 VDC	2 watts operating	1¼ x 1¾" x 3¼"	7 oz.

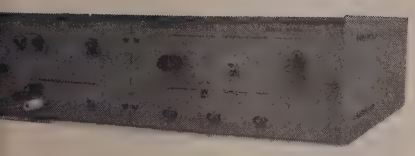
OPTIONS: Many options such as electrical tuning, special frequency, input and output voltage, pin connections and other aging rates.

NEW Lowest Phase Noise

1120S 5 MHz oscillator exhibits a SSB signal to noise ratio of 168 db/Hz at 100 Hz offset, and 176 db/Hz at 10 kHz. Corresponding Allan variance stabilities have been calculated at 3.5 x 10^{-13} for the 10 ms to 30 ms range of averaging times.

Time/frequency instruments

2004



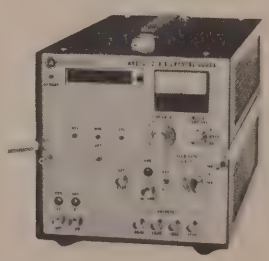
The AUSTRON Model 2004 is the first Loran-C Frequency Monitor Receiver available to standards laboratories, atomic standards research and others involved in high resolution frequency measurement and inter-comparison. The Model 2004 comes complete with internal chart recorder, protected vital controls and electronic cycle identifier.

1250

The AUSTRON Model 1250 Crystal Frequency Standard generates highly stable output frequencies at 5MHz, 1MHz, and 100kHz. Each of these outputs has excellent waveform and spectral purity.

The Model 1250 employs an AUSTRON Model 1150 Crystal Oscillator. In Model 1150, a highly stabilized feedback amplifier is used in connection with an AGC system to maintain the crystal power at the low constant value that is necessary to attain high frequency stability.

1210D



The Model 1210D Portable Crystal Clock is a compact, self-contained, self-powered time reference providing stable fine outputs at several pulse frequencies. Thus, the Model 1210D Clock can be used to transfer precise time from one geographical location to another. In addition to the pulse outputs, the Model 1210D has sinusoidal outputs at 5MHz and 1MHz. A time-of-day display is also provided.

For further information call (814) 838-3571 or TWX 510-696-6886
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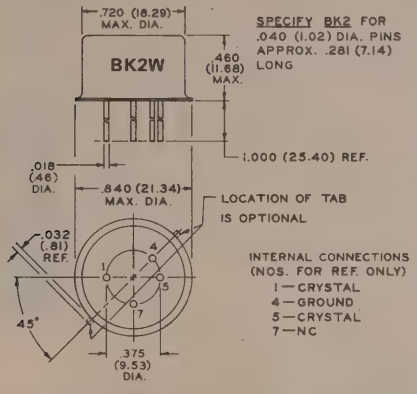
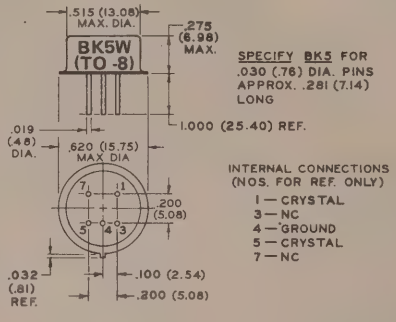
CRYSTALS

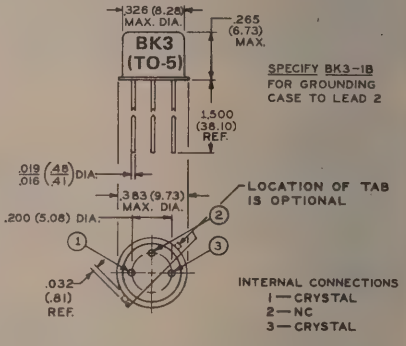
Coldweld Vacuum Sealed Transistor Case Styles

Bliley — first name in frequency | control

UNMATCHED PERFORMANCE DURING EXTREME SHOCK AND VIBRATION COMBINED WITH SUPERIOR AGING AND HIGH RELIABILITY HAVE FIRMLY ESTABLISHED THIS STYLE AS FIRST CHOICE IN ADVANCED MILITARY AND SPACE SYSTEMS. EASE OF MOUNTING, FORM COMPATIBILITY AND MODERATE COST ALSO ATTRACT QUALITY COMMERCIAL USAGE.







BLILEY TYPE	FREQUENCY RANGE (MHz)	FREQ. TOL. (%) vs TEMP. RANGE (°C) (INCLUDES CALIBRATION AT +25°C)				MAX. SERIES RES. (Ω)	CRYSTAL CUT-AT (MODE)	TYPICAL DRIVE LEVEL (mW)
		0 TO 50	0 TO 70	–40 TO +70	–55 TO +105			
BK2W	.86 – .99	±.0015	±.002	±.0025	±.003	300	FUNDAMENTAL	1.0
	1 – 1.9					150		
	2 – 2.9					40		
	3 – 6.0					25		
BK5W	2 – 2.9					250		
	3 – 3.9					120		
	4 – 4.9					60		
	5 – 5.9					30		
	6 – 7.9					20		
	8 – 15					10		
BK3	7 – 9.9					40		0.5
	10 – 25					25		
	25 – 75					40	3RD	
	75 – 125					60	5TH	
	125 – 150					100	7TH	

BLILEY TYPE	BK2W	BK3-1B	BK5W
MIL-H-10056 HOLDER DESIGNATION	HC-40/U	HC-35/U	HC-37/U
AGING GUIDELINES: 1ST MONTH FOLLOWING YEAR	2 PPM 1.5 PPM	2 PPM 3 PPM	2 PPM 2 PPM
VIBRATION	20 G FROM 10 - 2000 Hz		
SHOCK	150 G FOR 7 ms		

For further information call (814) 838-3571 or TWX 510-696-6886
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CRYSTALS

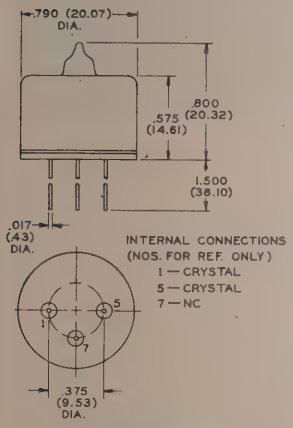
Bliley

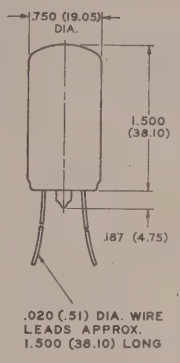
first name in frequency control

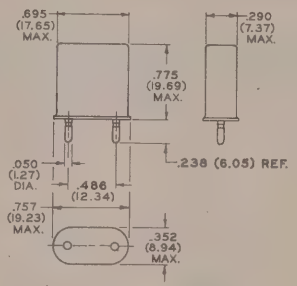
Vacuum Sealed
Ultra High Stability

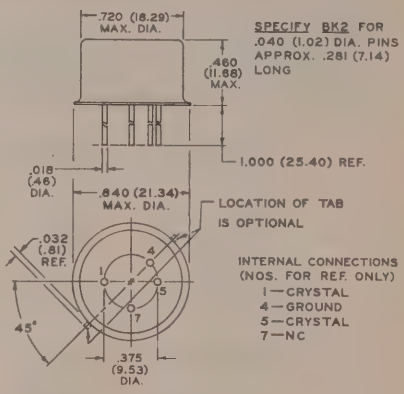
DESIGNED FOR OPTIMUM PERFORMANCE WITH TEMPERATURE CONTROL

THIS OUTSTANDING GROUP INCORPORATES THE TECHNOLOGY AND CRAFTSMANSHIP THAT HAS MADE BLILEY FAMOUS FOR QUALITY WITHOUT COMPROMISE. EXCEPTIONALLY LOW AGING AND HIGH Q CHARACTERISTICS PROVIDE PRECISION REFERENCE FOR FREQUENCY STANDARDS, SYNTHESIZERS AND ULTRA STABLE SYSTEM CLOCKS.









BG61AH-5S/3S **BG61AH-5** (GLASS ENCLOSURES)

BA6/BA6W **BK2/BK2W** (COLDWELD SEALED METAL ENCLOSURES)

	5TH OVERTONE		3RD OVERTONE					
BLILEY TYPE	BG61AH-5S	BG61AH-5	BG61AH-3S	BA6/BA6W		BK2/BK2W		
FREQ. (MHz)	5		3.8 – 6.0	3.8–7.9	8–12	3.8–6.0	6.1–10.9	11 – 15
AVERAGE Q (10^6)	2.5		1.5		0.6	1.0	0.6	0.4
TEMPERATURE COEFFICIENT	$<1 \times 10^{-7}$/°C FOR 1° EACH SIDE OF TURNING POINT							
TURNING POINT	AVAILABLE AT ANY TEMPERATURE (±5°C) FROM +45°C TO +90°C (TOLERANCE OF ±3° OR ±4° AVAILABLE UPON REQUEST)							
FREQ. TOL. AT TURNING POINT	±1 PPM		±4 PPM	±5 PPM				
AGING AT +75°C	5×10^{-10}/DAY AFTER 3 DAYS 7×10^{-10}/WEEK AFTER 1 MONTH	1×10^{-9}/DAY AFTER 3 DAYS 1×10^{-9}/WEEK AFTER 1 MONTH	2×10^{-9}/DAY AFTER 3 DAYS 2×10^{-9}/WEEK AFTER 1 MONTH	2×10^{-8}/WEEK AFTER 1 WEEK				
RETRACE OFFSET AFTER RESTART	$<1 \times 10^{-9}$ IN 24 HOURS		$<3 \times 10^{-9}$ IN 24 HOURS	—				
MAX. SERIES RESISTANCE (Ω)	140		50	35		50	40	35
DRIVE LEVEL	70μA ±20%		15μW MAX.	25μW MAX.				
FREQ. CHANGE SHOCK-50G OR VIBRATION-10G	$<\pm1 \times 10^{-8}$		$<\pm2 \times 10^{-8}$					
	10 – 200 Hz		10 – 1500 Hz			10 – 2000 Hz		

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CRYSTALS

General Purpose and Mil-Spec.

Bliley — first name in frequency control

GOOD PERFORMANCE AND RELIABILITY PLUS VERSATILITY IN MOUNTING AND ECONOMY PINPOINT THIS GROUP AS THE LOGICAL CHOICE FOR MOST COMPUTER, DATA PROCESSING AND GENERAL PURPOSE APPLICATIONS. A VARIETY OF HOLDER STYLES IS AVAILABLE WITH THE FAMILIAR MIL-SPEC SOLDER SEAL OR OUR "RESISTANCE-WELD" SEAL, A NEWER PROCESS IDEALLY ADAPTED TO VOLUME PRODUCTION AT LOWEST COST WITH A REDUCED POSSIBILITY OF CONTAMINATION.

BLILEY TYPE	FREQUENCY RANGE (kHz)	TEMPERATURE RANGE (°C)								CRYSTAL CUT	AGING (PPM)		MAX. DRIVE LEVEL (mW)
		0 TO 50		0 TO 75		−40 TO +70		−55 TO +90					
		FREQ. TOL. (%)	MAX. SERIES RES. (Ω)	FREQ. TOL. (%)	MAX. SERIES RES. (Ω)	FREQ. TOL. (%)	MAX. SERIES RES. (Ω)	FREQ. TOL. (%)	MAX. SERIES RES. (Ω)		1ST MONTH	NEXT 12 MOS.	
BH9	2.5-5	±.01	75k	±.015	85k	±.02	85k	±.025	100k	JT	40	100	0.1
	5-8		60k		75k		75k		90k				
	8-13.5		50k		60k		60k		75k				
	13.5-30	±.005	75k	±.009	100k	±.012	100k	±.02	125k	NT	20	50	
	30-50		65k		90k		90k		110k				
	50-100		55k		75k		75k		90k				
	90-175	±.015	3.5k	±.017	3.5k	±.02	4k	±.03	5k	+5°X	25	70	2
	175-250		4k		4k		4.5k		6k				
BH6	200-300		4k		4k		4.5k		6k				

		FREQ. TOL. (%) vs TEMP. RANGE (°C)				MAX. SERIES RES. (Ω)				
		0 TO 50	0 TO 75	−40 TO +70	−55 TO +90					
BH6	200-299	±.007	±.008	±.01	±.015	4000	DT	20	40	2
	300-399					5000				
	400-500					6000				
BH6 & BX	300-500	±.003	±.004	±.007	±.011	1500	SL			
	500-599					2000				
	600-800					2500				
BH6	325-499	±.0025	±.003	±.005	±.007	2000	GT			
	500-600					2500				
	450-599	±.007	±.009	±.01	±.02	2500	P			
	600-750					3000				
BH6/BR6 & BH4	1-2 MHz	±.002	±.0025	±.003	±.005 −55 TO +105	400	A_f	4	3	5
	2-3 MHz					200				
	3-4 MHz					100				
BH6/BR6 BH4 & BX/BR2	4-7 MHz					60				
	7-10 MHz					30				
	10-20 MHz					25				
	20-60 MHz					40	A_3			2
BX/BR2	60-87 MHz					60	A_5	4	4	
	87-100 MHz					75				
	100-150 MHz					90	A_7			

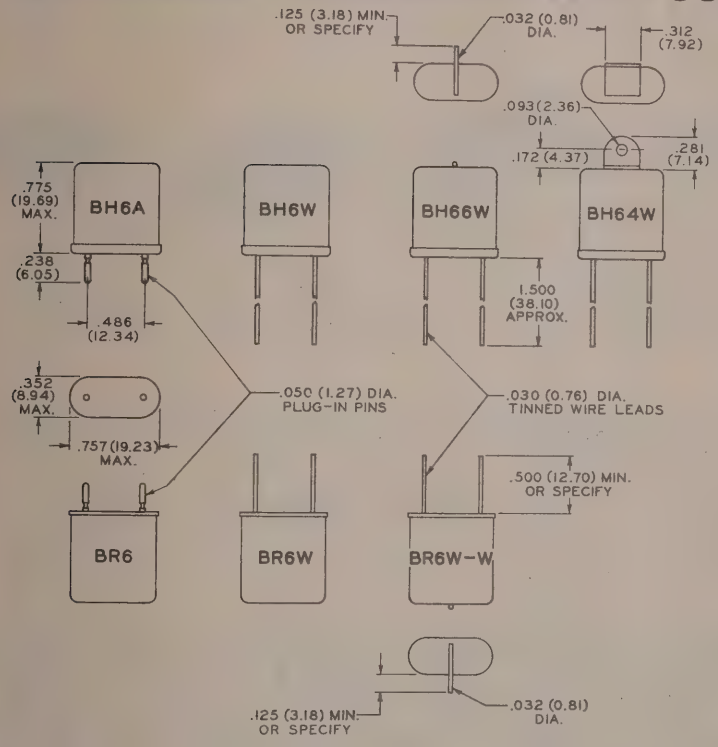
ALL FREQUENCY TOLERANCES INCLUDE INITIAL CALIBRATION AT +25°C.
AGING VALUES ARE BASED UPON CONTINUOUS OPERATION AT +85°C AND DRIVE LEVELS AS INDICATED.
A_f, A_3, A_5, A_7 DENOTE AT CUT-FUNDAMENTAL MODE, 3RD OVERTONE MODE, ETC.

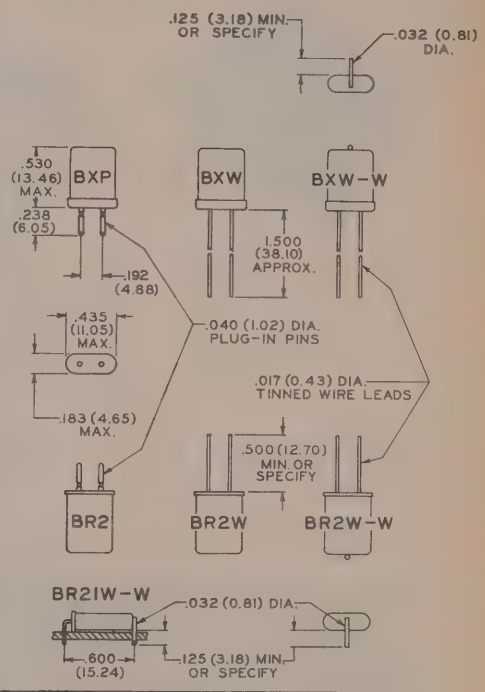
For further information call (814) 838-3571 or TWX 510-696-6886
BLILEY ELECTRIC COMPANY
2545 W. GRANDVIEW BOULEVARD
P.O. BOX 3428
ERIE/PENNSYLVANIA 16508

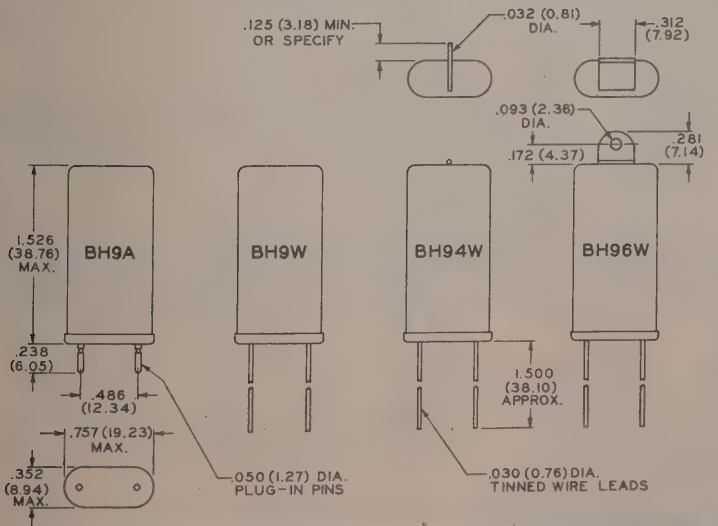
CRYSTAL HOLDERS

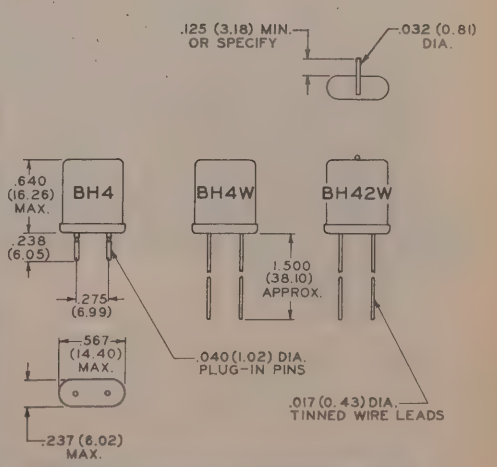
Bliley — first name in frequency control

BH & BX Series • solder sealed
BR Series • resistance-weld sealed









BLILEY TYPE	BH6A	BH6W	BR6 SERIES	BXP	BXW	BR2 SERIES	BH9A	BH9W	BH4	BH4W
MIL-H-10056 HOLDER DESIGNATION	HC-6/U	HC-33/U	——	HC-25/U	HC-18/U	——	HC-13/U	HC-34/U	HC-32/U	——
VIBRATION	10 G FROM 10 TO 500 Hz									
SHOCK	100 G FOR 11 ms									

INTERNALLY RUGGEDIZED DESIGNS ARE AVAILABLE FOR HIGHER LEVEL SHOCK AND VIBRATION

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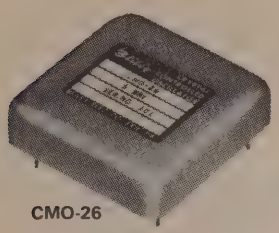
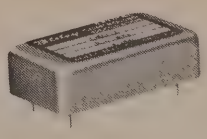
CRYSTAL OSCILLATORS

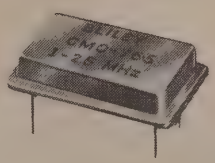
General Purpose-Clock Oscillators

Bliley — first name in frequency control

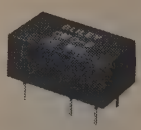
Designed with primary emphasis on Quality — Backed up by Top Technology

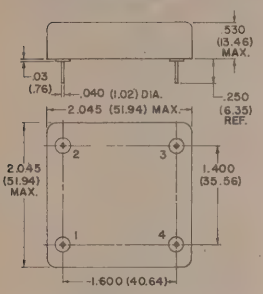

CMO-26


CMO-3

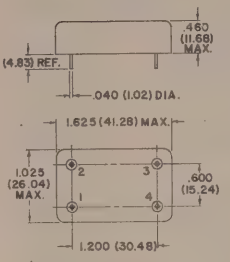

CMO-76-5

CMO-32C

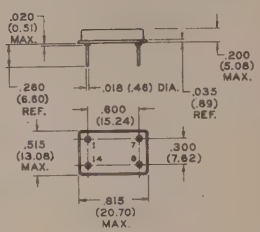

CMO-8



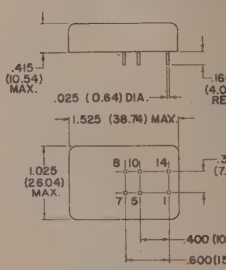
1 – NEG. OSC. & RF GND.
2 – VOLTAGE CONTROL OR N.C.
3 – +5 VDC
4 – OUTPUT



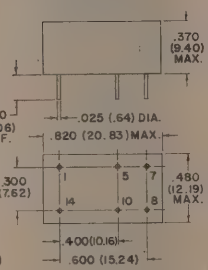
1 – NEG. OSC. & RF GND.
2 – N.C.
3 – +5 VDC
4 – OUTPUT



1 – N.C.
7 – GND.
8 – OUTPUT
14 – +5 VDC
(14 PIN DIP COMPATIBLE)



1, 5, 10 – N.C.
7 – COMMON
8 – OUTPUT
14 – +5 VDC
(14 PIN DIP COMPATIBLE)



1, 5, 10 – N.C.
7 – GROUND
8 – OUTPUT
14 – +5 VDC
(14 PIN DIP COMPATIBLE)

BLILEY TYPE	FREQUENCY RANGE	FREQ. TOL. (%) vs TEMP. RANGE (°C) (INCLUDES CALIBRATION AT +25°C)				OUTPUT
		0 TO 50	0 TO 70	–20 TO +70	–40 TO +70	
CMO-26	1 Hz – 4 kHz	±.004	±.006	±.008	±.01	TTL LOGIC
	1 kHz – 50 kHz	±.003	±.005	±.007	±.009	
	50 kHz – 100 MHz	±.001	±.0012	±.0015	±.002	
	800 kHz – 150 MHz					SINE WAVE
CMO-3	20 kHz – 50 kHz	±.003	±.005	±.007	±.009	TTL LOGIC
	50 kHz – 25 MHz	±.001	±.0012	±.0015	±.002	
	3 MHz – 150 MHz					SINE WAVE
CMO-76-5	1 MHz – 25 MHz	—	±.01	—	—	TTL LOGIC
CMO-32C	1 MHz – 100 MHz	±.0025	±.005	±.01	—	
CMO-8	4 MHz – 100 MHz					

GENERAL SPECIFICATIONS

SUPPLY: +5 VDC
OUTPUT: TTL LOGIC "1" +2.4 V MIN., LOGIC "0" +0.4 V MAX.
SYMMETRY: 60/40 DUTY CYCLE WORST CASE
LOAD: 10 TTL GATES
SINE WAVE: 0.7 VRMS (1000 Ω LOAD), 800 kHz – 25 MHz
0.2 VRMS (50 Ω LOAD), 1 – 150 MHz
CMOS LOGIC AVAILABLE AS A CUSTOM OPTION
FREQUENCY ADJUSTMENT: ELECTRICAL OR MECHANICAL AVAILABLE ON CMO-26 AS A CUSTOM OPTION
HERMETIC ENCLOSURES: CMO-26, CMO-3 AND CMO-76-5

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ERIE / PENNSYLVANIA 16508

CRYSTAL OSCILLATORS

Bliley — first name in frequency control

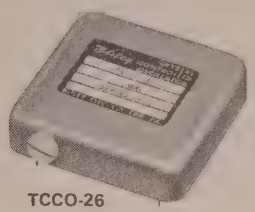
Temperature Compensated (TCXO) Crystal Oscillators

BLILEY TEMPERATURE COMPENSATED CRYSTAL OSCILLATORS ARE DESIGNED TO INTEGRATE THE CHARACTERISTICS OF HIGH QUALITY COLDWELD SEALED CRYSTALS WITH TEMPERATURE COMPENSATED CIRCUITRY TO ACHIEVE IMPROVED FREQUENCY STABILITY WITHOUT TEMPERATURE CONTROL AND LOW AGING TO ASSURE LONG TERM RELIABILITY.

STOCK OSCILLATORS – FAST DELIVERY

BLILEY TYPE NO.	FREQ. (MHz)	FREQ. STABILITY	SUPPLY (DC) VOLTS	REG.	(mA)	TTL LOGIC OUTPUT
TCCO-26MA	1	±1 x 10^{-6} OVER 0–60°C	+ 5	± 1%	30	"0": +0.4V MAX. "1": +2.4V MIN. T_r & T_f: 12 NS MAX. SYMMETRY: 60/40 LOAD: 10 TTL GATES
TCCO-26MA-5			+12	±10%	25	
TCCO-26LA	5		+ 5	± 1%	20	
TCCO-26LA-5			+12	±10%	30	

FREQ. ADJUST. RANGE: ±5 X 10^{-6} MIN. AGING RATE: 1 X 10^{-6}/YR.

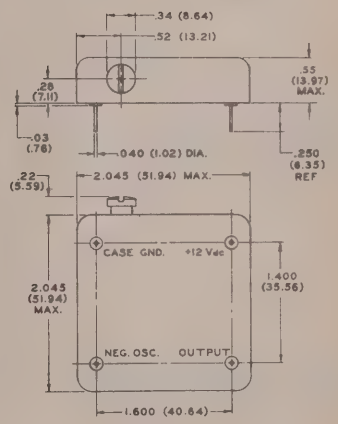


TCCO-26

CUSTOM OSCILLATORS

SINE WAVE OUTPUT 1 MHz – 20 MHz	TTL LOGIC OUTPUT 50 kHz – 20 MHz	FREQUENCY STABILITY vs TEMPERATURE RANGE	
BLILEY TYPE			
TCCO-26	TCCO-26A	±1 x 10^{-6}	0 to +60°C
TCCO-26-1	TCCO-26A-1	±5 x 10^{-7}	
TCCO-26-2	TCCO-26A-2	±1 x 10^{-6}	–20 to +70°C
TCCO-26-3	TCCO-26A-3	±5 x 10^{-7}	
TCCO-26-4	TCCO-26A-4	±1 x 10^{-6}	–40 to +70°C
TCCO-26-5	TCCO-26A-5	±2 x 10^{-6}	–55 to +70°C
TCCO-26-6	TCCO-26A-6	±1 x 10^{-7}	+20 to +40°C

SUPPLY REQUIREMENTS: +12 VDC ±10% REG. AGING RATE: 1 X 10^{-6}/YR.



Custom options available
- CMOS logic output from 1 Hz – 20 MHz
- Sine Wave & TTL logic output from 20 MHz – 100 MHz
- Other Supply Voltages

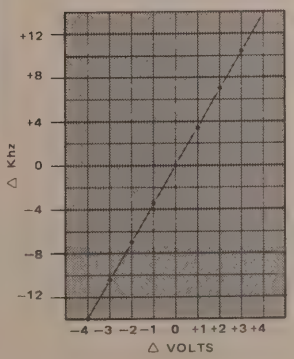
Voltage Controlled (VCXO) Crystal Oscillators

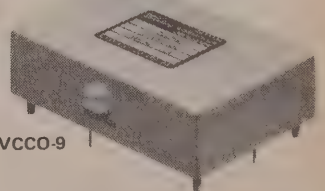
BLILEY VOLTAGE CONTROLLED CRYSTAL OSCILLATORS COMBINE INHERENT CRYSTAL STABILITY AND VOLTAGE CONTROLLED FREQUENCY DEVIATION IN A SINGLE SOLID STATE DEVICE. CENTER FREQUENCY RANGE FROM 1–100 MHz WITH PERFORMANCE CHARACTERISTICS TABULATED BELOW:

FREQUENCY DEVIATION	FREQUENCY STABILITY	TEMPERATURE RANGE
± .01%	± .001%	0 to 50°C
	± .002%	–20 to +70°C
± .05%	± .002%	0 to 50°C
	± .005%	–20 to +70°C
± .1%	± .004%	0 to 50°C
	± .008%	–20 to +70°C
± .2%	± .005%	0 to 50°C
	± .01%	–20 to +70°C

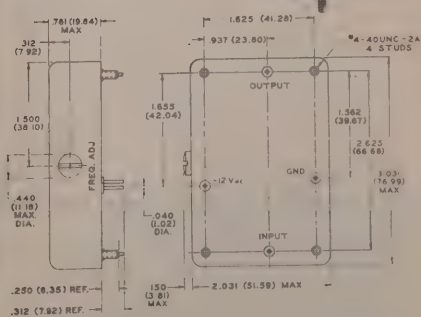
- Standard design parameters are based on operation with –12 Vdc; 25 mA supply. Other voltages may be specified as a custom option.
- Standard output is sine wave, typical 1V rms into 1000 ohms or .25V rms into 50 ohms.
- Mechanical trim is provided for center frequency adjustment.
- Typical modulation voltage is ±5V with a modulating input impedance of 10K ohms and modulation rate from DC to 20 kHz

TYPICAL VCCO LINEARTY CHART (C.F. 45 MHz & ± 14 kHz DEVIATION)

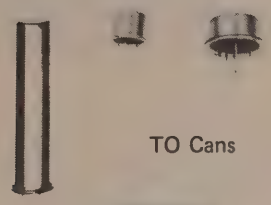




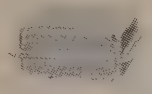
VCCO-9



BULOVA® Crystals / 1 kHz to 185 MHz



TO Cans



Flatpacks

Solder Sealed

Coldweld

SOME BULOVA SPECIALS

Microprocessor Crystals. Over 50 standard models for the frequencies from 1 to 48 MHz cover the most widely used microprocessors, clocks and ICs. All available in Coldweld HC-18 cans, some also in HC-33.

Crystals for Filters and Oscillators. Matched sets and high stability.

High Qs. Better than 1×10^6 in some ranges, also spurious mode suppressions from 20 to 65dB.

Special Environments. High shock and radiation hardened.

Small Packages. 10 MHz in TO-5 (HC-35/U) can, .700 to 1.3 MHz in .215" high HC-18 coldweld.

For more than 25 years Bulova has been a major supplier of crystals for MIL Spec, general industrial and special applications. A wide variety of packages are available in coldweld and solder seal. Strong on engineering as well as production, Bulova's Frequency Control Products group can often be of assistance to the circuit designer.

1 kHz to 1.3 MHz

Cuts: JT • H (+5° Flexural) • NT
E (+5° Extensional) D • DT Bar

Typical Performance

		E	DT	DT Bar	JT	H	NT
Temp. Range	-40° +85°C (MIL)	±.015%	±.01%	±.01%	±.02%	±.1%	±.01%
	-10° +60°C (Com.)	±.008%	±.005%	±.005%	±.01%	±.05%	±.005%
Drive Level	in Milliwatts	1	1	1	.1	.1	.1
Freq. Stability	P.P.M./mo.						
	Coldweld	0.5	0.1	0.1	0.5	0.5	0.1
	Solder Seal	2.0	1.0	1.0	2.0	1.0	1.0

STANDARD HOLDERS

Cuts	Frequency Range, kHz	Bulova No.	Mil No.	Seal[2]
JT	1–15	71	HC-13/U	S
	3–15	73	HC-13/U	S
	4–15	124	HC-37/U(1.5")	C
	4–15	118	HC-35/U(1.5")	C
	4–15	131	HC-41/U	C
	10–15	122	HC-37/U(.6")	C
	10–15	117	HC-35/U(.6")	C
H +5° Flexure Mode	10–90	71	HC-13/U(1")	S
	15–90	73	HC-13/U	S
	15–90	124	HC-37/U(1.5")	C
	15–90	118	HC-35/U(1.5")	C
	15–90	131	HC-41/U	C
	45–90	117	HC-35/U(1")	C
	45–90	122	HC-37/U(.6")	C
NT	8–200	71	HC-13/U	S
	15–200	73	HC-13/U	S
	20–200	124	HC-37/U(1½")	C
	20–200	118	HC-35/U(1½")	C
	20–200	131	HC-41/U	C
	45–200	117	HC-35/U(1")	C
	45–200	122	HC-37/U(.6")	C
	85–200	70	HC-6/U	S
	85–200	78	HC-33/U	S
	85–200	113	HC-36/U	C
E +5° Extensional Mode	50–300	71	HC-13/U (1.75 to 3.50)	S
	85–300	73	HC-13/U	S
	100–300	118	HC-35/U(1½)	C
	100–300	131	HC-41/U	C
	162–300	117	HC-35(1")	C
	185–300	70	HC-6/U	S
	185–300	78	HC-33/U	S
	235–300	113	HC-36/U	C
	240–300	130	HC-39/U	C
DT	80–400	90	HC-21/U	S
	150–400	70	HC-6/U	S
	150–400	78	HC-33/U	S
	200–400	113	HC-36/U	C
	200–400	130	HC-39/U	C
	325–400	116	HC-35/U(.6")	C
DT Bar	150–1000	73	HC-13/U	S
	180–1000	131	HC-41/U	C
	250–1000	122	HC-37/U(.6")	C
	285–1000	70	HC-6/U	S
	285–1000	78	HC-33/U	S
	300–1000	113	HC-36/U	C
	300–1000	130	HC-39/U	C
	440–1000	75	HC-32/U	S
	450–1000	116	HC-35/U(.6")	C
	800–1050	115	HC-35/U	C
	700–1300	110	HC-18(.215")	C

1 MHz to 185 MHz
AT Cuts

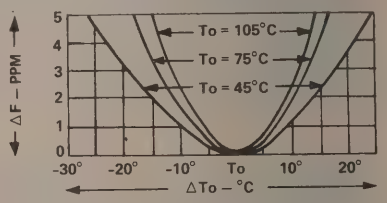
TYPICAL PERFORMANCE

Frequency tolerance: as tight as ± .002% from -55°C to +105°C, .0003% from -10°C to +60°C with reference to +25°C

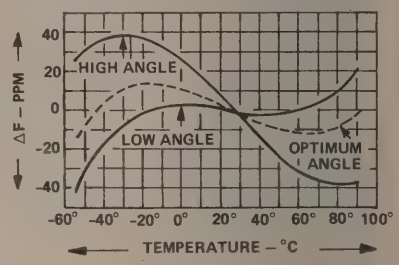
Frequency Stability: Aging, 5 parts in 10^6/30 days to 4 parts 10^8/30 depending upon package, frequency and temperature

Drive Level: 0.01mW to 10mW

AT CUT, ΔF vs. To FOR OVEN UNITS
To = Zero Temperature Coefficient Point



AT CUT, ΔF IN PPM vs. Δ°C
Coefficients, Non-ovenized Applications



STANDARD HOLDERS

Bulova No.	Mil No.	Seal[2]
70	HC-6/U	S
75	HC-32/U	S
78	HC-33/U	S
79	HC-17/U	S
80	HC-18/U	S
83	HC-25/U	S
91	HC-11A/U	S
92	—	S
95	—	S
110	HC-43/U	C
111	HC-24/U	C
112	HC-47/U	C
113	HC-36/U	C
115	HC-35/U	C
120	HC-37/U	C
121	—	C
130	HC-39/U	C
77	HC-27/U	G

Notes 1. *Numbers in parentheses after MIL type number indicates height or height range of modified can. For configuration and dimensions see illustrations.*

2. *Seals. "S" = solder sealed, "C" = coldweld.*

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FREQUENCY CONTROL PRODUCTS

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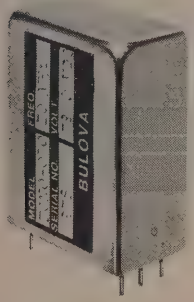
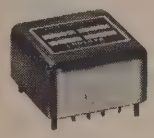
BULOVA® Oscillators / CRYSTAL and FORK

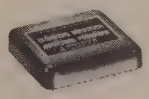
CRYSTAL: Temperature Compensated • Ovenized • Computer Clocks

TEMPERATURE COMPENSATED

Outputs: Sine TTL, CMOS, ECL







*Other voltages and packages available.

Bulova temperature compensated crystal oscillators employ a computer selected and optimized variable capacitance diode and thermistor compensation network to maintain frequency stability over wide temperature ranges, without the use of an oven.

Stability ppm	Temp. Range °C	Basic Model No.	Voltage*	Dimensions* (inches)
0.2	-40 to +75	TCXO-2-475-020-A	12	2 x 2 x 1
0.25	0 to +70	TCXO-70-070-025-E	12	1.8 x 1.35 x .75
0.5	-40 to +75	TCXO-1A-475-050-B	18	2 x 2 x 0.5
	-40 to +75	TCXO-1B-475-050-B	12	2 x 2 x 0.5
	-40 to +75	TCXO-5-475-050-A	12	2 x 2 x 1
	-40 to +75	TCXO-6-475-050-A	18	2 x 2 x 1
	-40 to +75	TCXO-34-475-050-D	12	1.5 x 1.5 x 0.5
	0 to +70	TCXO-70-070-050-E	12	1.8 x 1.35 x .75
1	-55 to +105	TCXO-18-505-100-A	12	2 x 2 x 1
	-55 to +85	TCXO-7-585-100-A	12	2 x 2 x 1
	-55 to +85	TCXO-8-585-100-A	18	2 x 2 x 1
	-40 to +75	TCXO-1-475-100-B	18	2 x 2 x 0.5
	-40 to +75	TCXO-1B-475-100-B	12	2 x 2 x 0.5
	-40 to +75	TCXO-3-475-100-A	12	2 x 2 x 1
	-40 to +75	TCXO-4-475-100-A	18	2 x 2 x 1
	-40 to +75	TCXO-34-475-100-D	12	1.5 x 1.5 x 0.5
	0 to +70	TCXO-70-070-100-E	12	1.8 x 1.35 x .75
2	-55 to +105	TCXO-18-505-200-A	18	2 x 2 x 1
	-55 to +85	TCXO-7-585-200-A	12	2 x 2 x 1
	-55 to +85	TCXO-8-585-200-A	18	2 x 2 x 1
	-40 to +75	TCXO-1-475-200-B	18	2 x 2 x 0.5
	-40 to +75	TCXO-1B-475-200-B	12	2 x 2 x 0.5
	-40 to +75	TCXO-3-475-200-A	12	2 x 2 x 1
	-40 to +75	TCXO-4-475-200-A	18	2 x 2 x 1
	-40 to +75	TCXO-34-475-200-D	12	1.5 x 1.5 x 0.5
	0 to +70	TCXO-70-070-200-E	12	1.8 x 1.35 x .75

OVENIZED

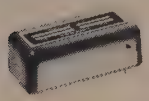
Dimensions 2" x 2" x 4"

*Other frequencies can be supplied as custom units.

The high frequency stability of these oscillators results from housing a high precision crystal and an oscillator circuit with AGC to maintain low constant crystal drive in a stable DC proportional control oven.

MODEL	PCOXO-102	PCOXO-103	PCOXO-3	PCOXO-4
Frequency Range*	1.0 to 10MHz	1 to 10MHz	1.0 to 10MHz	1.0 to 10MHz
Temp. Range	-55°C to +70°C	-55°C to +70°C	0°C to +60°C	0°C to +60°C
Stability				
Temp. Range	±1pp10^8	±2.5pp10^8	4pp10^{10}/°C	4pp10^{10}/°C
Aging per day	3pp10^9	5pp10^9	5pp10^9	10pp10^9
Output	.5VRMS (min)	.5VRMS (min)	1VRMS (min)	1VRMS (min)
Load	50 ohms	50 ohms	1K ohms	1K ohms
Input Voltage	+28Vdc	+28Vdc	+28Vdc	+28Vdc
Turn on Power	18W	18W	12W	12W
Power at 25°C	4.5W (typ)	4.5W (Typ)	4.2W (Typ)	4.2W (Typ)

COMPUTER CLOCK

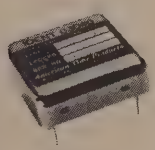


Bulova also produces a varied line of uncompensated oscillator packages compatible with TTL and DTL loads for computer clock and other counting functions and for applications where a stable frequency source is required. Frequency range covered is from 1 to 25 MHz. Typical stability is ±50 ppm for the -55°C to +85°C temperature range. Output is: Logic 0, +0.2V ±0.2V; Logic 1, +2.6V to +5V.

FORK OR CRYSTAL

LOW FREQUENCY

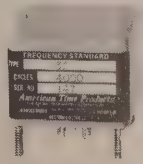
MICROPOWER



P.C. BOARD

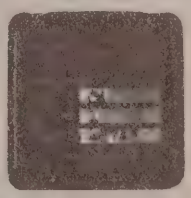
SIMULTANEOUS MULTIPLE OUTPUTS

WIDE RANGE MODULAR



MODEL	FS 200	FS 11, FS 11-1 FS 11-F	FS 300 or FS 400	FS 32, FS 32-1 FS 32-F
Frequency, Hz	360 to 1000 Hz	400 Hz to 50 kHz	60,120,240,480 50,100,200,400	240 Hz to 100 kHz
Frequency Accuracy	up to ±.01%	up to ±.02%	up to ±.002%	up to ±.002%
Temperature Range	FOR SOME ACCURACIES AS MUCH AS -65°C to + 125°C			
Input	1.5 V DC at 6 to 20 microamps	STANDARD 28 V DC (AVAILABLE 3 to 40 V DC)		
Output	0.1 volt	SINE, SQUARE WAVE or COMPATIBLE with LOGIC		
Load	500 K ohms	10 K OHMS to 500 K OHMS or LOGIC CIRCUITRY		
Size	1-5/16" x 1-5/16" x 3/8"	1-1/2" x 1-1/2" x 3/8"	1-1/2" x 1-1/2" x 1-3/16"	1-1/2" x 1-1/2" x 1-3/16"
Weight	1 ounce	1-1/2 ounces	2-1/2 ounces	2-1/2 ounces

VERY LOW FREQUENCY



1.5 Hr/Period to 25kHz

Models:
- OA1, CMOS Compatible
- OA2, DTL & TTL Compatible
- OA3, Resistor Loading

Typical Temperature Temperature Accuracy
- 15° to 35°C, ±0.02%
- 0° to 65°C, ±0.1%
- -55° to 85°C, 0.2%

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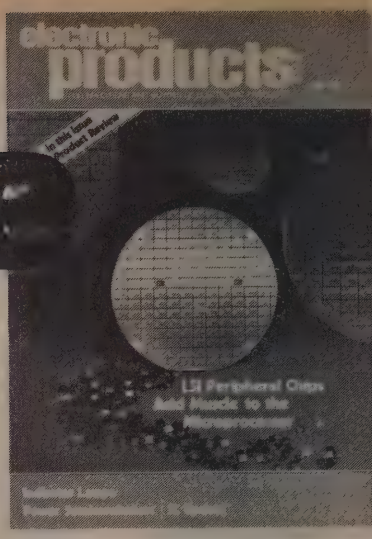

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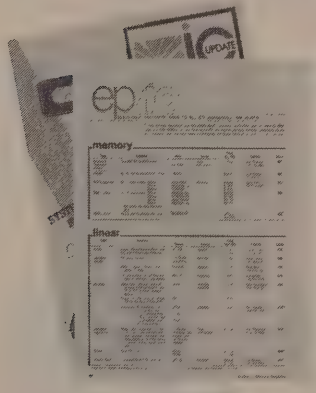

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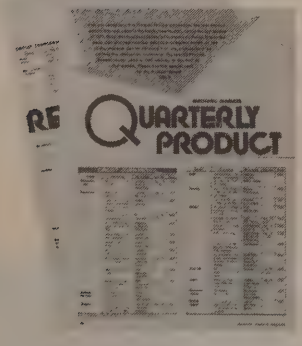

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Part No.	CK-1	CK-2	CK-3	CK-4	CK-5	CK-6	CK-7	CK-8	CK-9	CK-10	CK-11	CK-12	CK-13
Freq-MHz	3.000	4.000	5.000	10.000	10.000	25.000	25.000	50.000	50.000	100.000	125.000	150.000	200.000
Vibration Mode	fund	fund	fund	3rd	fund	fund	3rd	3rd	5th	5th	5th	7th	7th
Holder Type	glass HC/27	glass HC/27	glass HC/27	glass HC/27	metal HC/6	metal HC/18	metal HC/18	metal HC/18	metal HC/18	metal HC/18	metal HC/18	metal HC/18	metal HC/18
Drive Level-MW	0.10	0.10	0.10	0.10	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Calibrate Value-Ohms	10	10	10	22	10	10	30	40	40	51	51	60	60
Resonance	A/R 50 pF	A/R 50 pF	A/R 50 pF	A/R 28 pF	A/R 32 pF	Series	Series	Series	Series	Series	Series	Series	Series
Nominal C_o-pF	3.2	3.2	3.2	4.9	4.4	3.7	4.2	3.75	3.50	3.50	3.50	3.50	3.50
Nominal C_1-pF	.0114	.0114	.0114	.0022	.02	.016	.0018	.0015	.0005	.00045	.00042	.00027	.00025
Nominal L-Mh	247	139	89	115	12.7	2.54	22.7	6.76	20.3	5.63	3.86	4.17	2.54
Nominal R-Ohms	4.65	4.65	4.65	12	7.96	9.96	22.1	26.5	40.0	44.5	47.5	54.5	57.7
Nominal "Q"	1 Million	750K	600K	600K	100K	40K	160K	80K	160K	80K	64K	74K	55.5K
Pullability Δf-ppm**	162	162	162	29.8	275	224	24.9	21.0	7.0	6.3	5.9	3.8	3.5
Test Set	*** TS/330	*** TS/330	*** TS/330	*** TS/330	TS/330	TS/683	TS/683	TS/683	TS/683	TS/15 TS/683	TS/15	TS/15	TS/15

Operating Temperature Range = 0°C to +60°C
Temperature Coefficient = ± 10 ppm
Calibration @ +25°C = ± 10 ppm

**Δf ppm Series to AR-32 pF
***Modified
*Note: Any Anti Resonant value may be used.

$$C_1 \cong \frac{2(C_o + C_x^*)\Delta f}{f}$$

$$L = \frac{1}{(2\pi f)^2 C_1}$$

$$Q = \frac{1}{4\pi R \Delta f (C_o + C_x)}$$

Where:
C_o = Total shunt capacitance of crystal unit in farads.
C_x = Equivalent load capacitance in series with crystal in series mode oscillator in farads.
R = Equivalent series arm resistance of crystal unit in ohms.
C_1 = Equivalent motional arm capacitance of crystal unit in farads.
L = Equivalent motional arm inductance of crystal unit in Henries.
Δf = Δf or difference in series resonant frequency and anti resonant frequency with C_x in series with crystal in cps
f = Frequency in cps.

PARTIAL LISTING OF COLORADO CRYSTAL CORPORATION PRODUCT APPLICATION

Microwave Frequency Source Crystals
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TCXO Crystals
Non Temperature Controlled Crystals
Oven Controlled Crystals
Filter — Narrow Bandwidth Crystals
Filter — Wide Bandwidth Crystals
Filter — Notch Crystals
Discriminators
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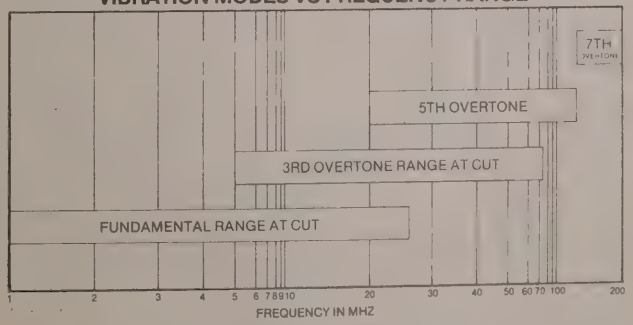
VIBRATION MODES VS FREQUENCY RANGE


7TH OVERTONE
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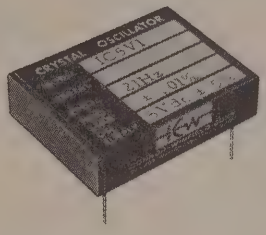
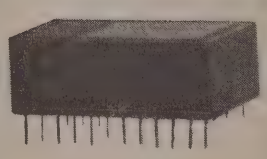
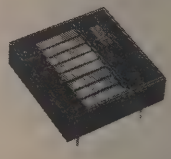
TTL FLAT PACK MODEL 1C5-1 SERIES



SPECIFICATIONS	
Fixed Frequencies Available	Fixed frequencies from 1 Hz to 10 MHz
Frequency Tolerance and Temperature Range	Models for 20 Hz to 10 MHz 1C5K1 ±.001% +20°C to +40°C 1C5R1 ±.0025% 0°C to +50°C 1C5Y1 ±.005% +25°C to +65°C 1C5V1 ±.01% −55°C to +125°C Models for 1 Hz to 20 Hz are available with looser tolerance
Output Waveform	TTL, fanout 10 TTL
Supply Voltage	5 Vdc ±5%
Supply Current (no load)	15 ma to 100 ma depending on frequency
Dimensions	40.6mm x 30.5mm x 10.2mm
Termination	Flat package with .03″ (0.76mm) diameter gold-plated pins for printed circuit board mounting

TCXO MODEL C12 AND C24 SERIES



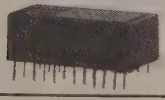


SPECIFICATIONS	C12A C24A	C12B C24B	C12C C24C
Fixed Frequencies Available	1 Hz to 20 MHz		
Frequency Adjust	±.001% minimum		
Short Term Stability	With supply tolerance ±1% temperature ±5°C ±1 x 10^{-9} for 1 sec, ±2 x 10^{-9} for 10 sec, ±5 x 10^{-8} for 24 hours		
Frequency Tolerance and Temperature Range	±5 x 10^{-7} +25°C to +35°C	±1.5 x 10^{-6} 0°C to +50°C	±2.5 x 10^{-6} −25°C to +65°C
Output Waveform and Supply Voltage	TTL, 5 V ±1% supply CMOS, any fixed voltage +8 Vdc to +15 Vdc ±1% 5 MHz maximum		
Dimensions	C12- ≥ 2 kHz, 44.5mm sq. x 10.2mm C12- < 2 kHz, 50.8mm sq. x 15.2mm C24- 24 pin DIP, 31.8mm x 20.3mm x 11.2mm		

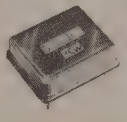
CMOS

24 PIN DIP CMOS MODEL L24R SERIES

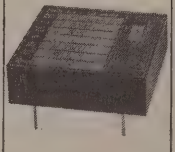
12 BINARY DIVISIONS OF FUNDAMENTAL FREQUENCY OUT SIMULTANEOUSLY



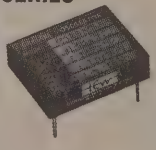
MODEL C16MS SERIES



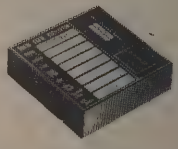
MODEL C130MS



MODEL C123MS SERIES



SINEWAVE MODEL L220 SERIES



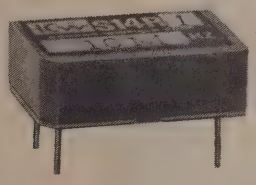
SPECIFICATIONS	24 PIN DIP CMOS MODEL L24R SERIES	MODEL C16MS SERIES	MODEL C130MS	MODEL C123MS SERIES	SINEWAVE MODEL L220 SERIES
					L220-A to J, L220-D, L220-V
Fixed Frequencies Available	Any fundamental frequency from 500 Hz to 2 MHz—L24R1 Series 2 MHz to 10 MHz—L24R3 Series	< 1 Hz to 1 MHz	24.4 Hz to 250 kHz	0.1 Hz to 10 MHz .24 Hz	50 Hz to 10 kHz
Frequency Tolerance and Temperature Range	L24R1K ±.001% 20°C to +40°C L24R1R ±.0025% 0°C to +50°C L24R1M ±.005% −40°C to +85°C L24R3K ±.001% 20°C to +40°C L24R3R ±.0025% 0°C to +50°C L24R3M ±.005% −40°C to +85°C	C16MSB, ±.005%, 0°C to +50°C C16MSW, ±.02%, −40°C to +85°C C16MSJ, ±.05%, −55°C to +125°C	Frequency Stability: 0.1% Frequency Accuracy: 0.1% 0°C to +50°C	C123MSK, ±.001%, +20°C to +40°C C123MSR, ±.0025%, 0°C to +50°C C123MSM, ±.005%, −40°C to +85°C C123MSV, ±.01%, −55°C to +125°C	L220A ±.002% +20°C to +40°C L220B ±.005% 0°C to +50°C L220D ±.01% 0°C to +65°C L220F ±.02% −25°C to +75°C L220H ±.05% −55°C to +75°C L220J ±.05% −55°C to +125°C
Output Waveform Output Amplitude and Load	Standard CMOS Output				5 Vrms ±2 Vrms into a 10 kΩ load Amplitude Stability ±5% sinewave, Total Harmonic Distortion ≤ 5%
Supply Voltage	Any voltage from +5 Vdc to +15 Vdc				Supply Voltage 12 Vdc ±10%
Supply Current (no load)	5 ma at +5 Vdc, 10 ma at +10 Vdc, 15 ma at +15 Vdc	1 ma maximum at +5 Vdc 5 ma maximum at +15 Vdc	1 ma to 6 ma	1 ma at + 5 Vdc 2 ma at +10 Vdc 3 ma at +15 Vdc	15 ma to 100 ma depending on specifications. Other units with harmonic distortion ≤ 1% and/or amplitude stability ≤ 0.25% are available.
Termination	24 pin DIP socket	Flat package with .03″ (0.76mm) diameter gold-plated pins for printed circuit board mounting			
Dimensions	31.8mm x 20.3mm x 10.9mm	24.9mm x 20.3mm x 5.03mm	38.1mm sq. x 12.7mm	40.6mm x 30.5mm x 10.2mm H	50.8mm sq. x 15.2mm

UNIT PRICE DEPENDS ON QUANTITY PURCHASED, FREQUENCY DESIRED AND TOLERANCE SPECIFICATION WHICH VARIES BETWEEN MODELS. FAST QUOTATION BY CABLE, TELEGRAM OR NIGHT LETTER. AVAILABILITY ON ALL MODELS 2 WEEKS TO 7 WEEKS AFTER RECEIPT OF WRITTEN ORDER (AWO).

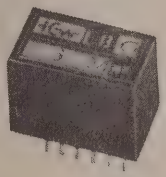
THE CONNOR-WINFIELD CORPORATION
WEST CHICAGO, ILL. 60185 U.S.A. • PHONE (312) 231-5270
CABLE: CONWINWCGO TWX NO. 910-230-3231

EPOXY ENCAPSULATED PACKAGE

MODEL S13R- and S14R- SERIES

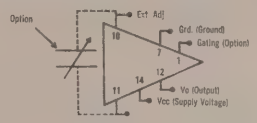


MODEL D13- and D14- SERIES

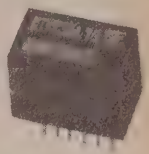


MODEL L13- and L14- SERIES

Frequency adjust option; other options available on request



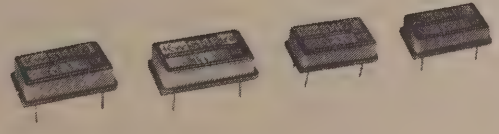
SINEWAVE MODELS L83- L84- and L14- SERIES



SPECIFICATIONS	Model S13R1, S14R1	Model S13R2, S14R2	D14C D13C	D14D D13D	D14E D13E	L13C L14C	L13D L14D	L13E L14E	L83F L84F L13F L14F	L83G L84G L13G L14G	L83I L84I L13I L14I
Fixed Frequencies Available	3 MHz to 25 MHz			16 kHz to 25 MHz		1 Hz to 25 MHz	1 Hz to 60 MHz		L13- or L14-, 100 kHz to 60 MHz L83- or L84-, 20 kHz to < 100 kHz		
Frequency Tolerance	±.01%		±.005%	±.0075%	±.01%	±.001%	±.0025%	±.005%	±.001%	±.0025%	±.005%
Frequency Accuracy	See Tolerance		±.0025%	±.0035%	±.005%						
Frequency Stability	See Tolerance		±.0025%	±.004%	±.005%						
Temperature Range	−25°C to +75°C		0°C +50°C	0°C +65°C	−25°C to +75°C	0°C to +50°C	0°C to +65°C	−25°C to +75°C	0°C to +50°C	0°C to +65°C	−25°C to +75°C
Output	Standard TTL	Standard CMOS	Standard TTL			Squarewave, duty cycle 50 ±1% ≤ 10 MHz 50 ±20% ≥ 10 MHz Logic 1 ≥ 2.4V Logic 0 ≤ 0.4V 200Ω to 2 kΩ Fanout 10 TTL			Sinewave, Thd. ≤ 5% 3 Vrms ±1 Vrms 10 KΩ		
Supply Voltage	5 Vdc ±20%	Any fixed voltage from 5 to 15 Vdc	5 Vdc ±5%			5 Vdc ±10%					
Supply Current (no load)	1 ma to 10 ma depending on frequency and supply voltage		15 ma to 40 ma			15 ma to 100 ma, depending on frequency					
Termination .02" (0.51mm) Diameter Gold Plated Pins	3 pin DIP to plug into 14 pin IC socket		3 pin DIP to plug into 14 pin IC socket. Specify Model D13 for pin 8 output, Model D14 for pin 1 output			Specify Model L14 or L84 for flat pins .016" (0.4mm) x 0.23" (0.6mm) Specify Model L13 or L83 for square pins .017" (0.4mm) square					
Pin Connections	S13-, Pin 7-Grd; Pin 8-V_o; Pin 14- V_{cc} S14-, Pin 7-Grd; Pin 1-V_o; Pin 14- V_{cc}		Pin 7-Grd; Pin 1-V_o; Pin 14-V_{cc}			See diagram above (same for all models)					
Dimensions	20.3mm x 12.7mm x 7.6mm H		20.3mm x 12.5mm x 7.6mm H			19.8mm x 12.4mm x 9.6mm H depending on frequency			30.5mm x 20.3mm x 12.2mm H		

HERMETICALLY SEALED METAL CAN

MODELS
S14R4
S14R4C
S14R4T
S14R5
S15R5*

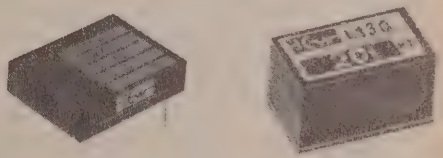


SPECIFICATIONS	Model S14R4	Model S14R4C	Model S14R4T	Model S14R5
Fixed Frequencies Available	32 kHz to 70 kHz	8 Hz to 35 kHz		32 kHz to 20 MHz
Freq. Tolerance and Temp. Range	Accuracy, ±.005% at 25°C ±3°C Stability, ±.02% −25°C to +70°C			±.01% −25°C to +75°C
Output Waveform Output Amplitude and Load	Standard TTL or CMOS	Standard CMOS	Standard TTL	
Supply Voltage	Any fixed voltage from 5 Vdc to 15 Vdc		5 Vdc ±5%	5 Vdc ±5%
Supply Current (no load)	2 ma to 15 ma depending on frequency and supply voltage		2 ma to 25 ma	20 ma to 75 ma
Termination 14 pin DIP with Gold-Plated Pins	3 pin DIP to plug into 14 pin IC socket	4 pin DIP to plug into 14 pin IC socket		
Pin Connections	Pin 7 - Grd; Pin 8 - V_o; Pin 14 - V_{cc}	Pin 7 - Grd; Pin 1 - V_o; Pin 14 - V_{cc}; Pin 8 - Oscillator Monitor		Pin 7 - Grd; Pin 1 and 8 - V_o; Pin 14 - V_{cc}
Dimensions	S14R4 and S14R5: 22.4mm x 12.5mm x 5.1mm H S14R4C and T: 22.4mm x 12.5mm x 6.4mm H			

*S15R5 (TTL) and C15R5 (CMOS), TTL Frequency Range 200 kHz to 25 MHz, CMOS Frequency Range 600 Hz to 10 MHz, Frequency Tolerances ±.01%, 0°C to +50°C.

SOLID STATE CONTROLLED OSCILLATORS HIGH VIBRATIONAL SHOCK RESISTANCE

MODELS
L117A, L118A
L79A, L80A
L14A, L14Q



SPECIFICATIONS	Model L117A, L118A	Model L79A, L80A	Model L14A, L14Q
Fixed Frequencies Available	1 Hz to 20 kHz	1 Hz to 32 kHz	60 Hz to 32 kHz
Freq. Accuracy	±2% internal 20 turn adjustment set by external resistance		
Freq. Tolerance	±0.1%	±0.1%	±1.0%
Temp. Range	0°C to +50°C		
Output	Standard TTL output	L79A, TTL pulse L80A, CMOS pulse	L14A, TTL pulse L14Q, Standard TTL
Supply Voltage	TTL, 5 Vdc ±5% CMOS, 12 Vdc ±5%		

Other supply voltages available on request. Many other solid state models are available including triangular waveform, and squarewave

Pin Connections	.076mm (.03") diameter pins for PC board mounting		Pin 7 - Grd; Pin 12 - V_o; Pin 14 - V_{cc}. Wire-wound or metal film pot or fixed resistor necessary Pin 1 to Pin 14
Dimensions	40.6mm x 30.5mm x 10.2mm H	30.5mm x 20.3mm x 12.2mm H	L14A, 19.8mm x 12.4mm x 4.3mm H L14Q, 19.8mm x 12.4mm x 11.2mm H

UNIT PRICE DEPENDS ON QUANTITY PURCHASED, FREQUENCY DESIRED AND TOLERANCE SPECIFICATION WHICH VARIES BETWEEN MODELS. FAST QUOTATION BY CABLE, TELEGRAM OR NIGHT LETTER. AVAILABILITY ON ALL MODELS 2 WEEKS TO 7 WEEKS AFTER RECEIPT OF WRITTEN ORDER (AWO).

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CRYSTEK

"The Pulse of Dependability"

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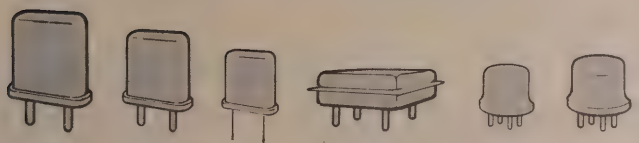
Phone: (813) 936-2109 / TWX: 510-951-7448

CRYSTAL DIVISION



HC-6 HC-33 HC-36 | HC-25 HC-18 HC-43 HC-42 | HC-45 | FLAT PACKS | T05 | T08

SOLDER SEAL OR KOLD WELD

800KHz to 225 MHz

± .0005% to 1% Tol.

PRECISION / MILITARY / GENERAL PURPOSE

Microprocessors
•
Marine
•
Two Way Communications
•
Aircraft
•
Monitors, R.C. and C.B.
•
Amateur
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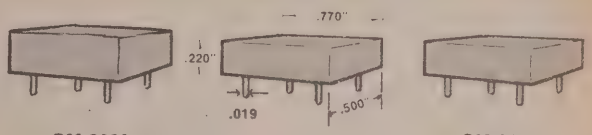
Custom Requirements

INDUSTRIAL DISTRIBUTORS OEM SALES REPRESENTATIVES

Free Samples with valid request. Engineering Assistance at no charge. To inquire or order, please state Frequency, Holder, Temperature Range, Frequency Tolerance, and Crystal Correlation. Delivery from stock to 6 weeks.

MICROELECTRONICS DIVISION



CM 2000 MILITARY MIL-0-55310 | CM 2100 ± .01% INCLUSIVE | CM 2105 ± .05% or .1% ECONOMY

HYBRID CLOCK OSCILLATORS

250 KHz to 70 MHz

LOW PROFILE D.I.P. PACKAGE

TTL	500 KHz to 70 MHz
CMOS	250 KHz to 10 MHz
ECL	5 MHz to 70 MHz

FAST LOGIC START UP
.6ms Typical

FAST RISE / FALL TIMES
3ns Typical

After hermetically sealing each gold plated crystal into a custom enclosure, the ceramic substrate containing the hybridized oscillator circuitry and hermetically sealed crystal are then transfer molded into a single package offering unsurpassed reliability under extreme environmental conditions over commercial and military temperatures.

ENGINEERING ASSISTANCE AVAILABLE AT NO CHARGE

To inquire or order, please state Frequency, Temperature Range, Frequency Tolerance, and Output Logic. Delivery from stock to 6 weeks. Data Sheets and Environmental Test Data available upon request.

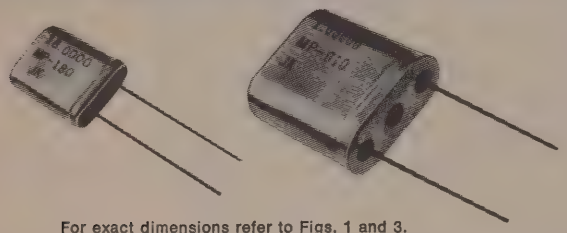
CTS KNIGHTS, INC.

SUBSIDIARY OF CTS CORPORATION, ELKHART, INDIANA

SPECIALISTS IN FREQUENCY MANAGEMENT

CRYSTALS

STANDARD MICROPROCESSOR CRYSTALS



For exact dimensions refer to Figs. 1 and 3.

"OFF THE SHELF" FROM CTS AUTHORIZED DISTRIBUTORS

36 frequencies, each designed for specific microprocessors. Contact CTS Knights for crystal specs on microprocessors and clock IC's not shown in table. Mil-approved manufacturing processes assure reliability and low start-up resistance. Final frequency calibration with gold and silver guarantees outstanding long-term stability.

Frequency	CTS P/N	Microprocessor or Clock IC	Specifications**	Approximate Price 10 Pcs.	Approximate Price 100 Pcs.
1.0 MHz	MP010	MOT 6800/S6860	±.02%, 0-70°C, H17W	$9.80	$5.50
1.8432 MHz	MP018	MC14411 Baud Rate Generator	±.02%, 0-70°C, H17W	9.80	5.50
2.0 MHz	MP020	F8/F8-1/CPU 3850	±.015%, 0-70°C, H17W	8.50	4.80
2.097152 MHz	MP021	NSCMM5378 MM5379 Auto Clock	±.015%, 0-70°C, H17W(H3W)*	8.50	4.80
2.4576 MHz	MP024	34702 Bit Rate Generator	±.015%, 0-70°C, H17W(H3W)*	8.50	4.80
2.667 MHz	MP026	NSC Pace, IPC-16A/520D	±.015%, 0-70°C, H17W(H3W)*	8.50	4.80
3.00 MHz	MP030	INTEL MCS48, 8048/8748/8035	±.015%, 0-70°C, H17W(H3W)*	8.50	4.80
3.20 MHz	MP031	RCA 1802/1803	±.015%, −20-70°C, H17W(H3W)*	8.50	4.80
3.2768 MHz	MP032	Intersil ICM 7205/IM 6100	±.008%, −20-70°C, H17W(H3W)*	8.50	4.80
3.579545 MHz	MP036	NSC MM5369 (TV Color Burst), MOT. 6802+ Intersil IM6102	±.015%, 0-70°C, H17W(H3W)*	8.50	4.80
4.0 MHz	MP040	Intel 4040/4004/4201	±.015%, 0-70°C, H3W	6.15	3.40
4.0 MHz	MP04A	NSC Pace, IPC-16A/502D, MOT 6875+	±.015%, 0-70°C, H3W	6.15	3.40
4.194304 MHz	MP041	Intersil ICM 7038A	±.007%, 0-50°C, H3W	6.15	3.40
4.91520 MHz	MP042	Standard Clock Frequency	±.015%, 0-70°C, H3W	6.15	3.40
5.0 MHz	MP05A	CP1600	±.015%, 0-70°C, H3W	6.15	3.40
5.0688 MHz	MP050	COM 5016 Dual Baud Rate Generator COM 5016T Dual Baud Rate Generator	±.015%, 0-70°C, H3W	6.15	3.40
5.185 MHz	MP051	Intel 4040/4004/4201	±.015%, 0-70°C, H3W	6.15	3.40
5.7143 MHz	MP057	NSC Pace	±.015%, 0-70°C, H3W	6.15	3.40
6.00 MHz	MP060	INTEL MCS48 8035/8041/8048/8741 Intersil IM8048/IM8748	±.015%, 0-70°C, H3W	6.15	3.40
6.144 MHz	MP061	Intel 8085	±.015%, 0-70°C, H3W	6.15	3.40
6.250 MHz	MP062	Special Frequency	±.015%, 0-70°C, H3W	6.15	3.40
6.40 MHz	MP064	RCA 1803	±.015%, 0-70°C, H3W	6.15	3.40
6.5536 MHz	MP065	Intersil Precision Timer Crystal ICM 7045	±.015%, 0-70°C, H3W	6.15	3.40
8.0 MHz	MP080	Signetics 8X300, MOT 6875*	±.015%, 0-70°C, H3W	6.15	3.40
10.0 MHz	MP100	Special Frequency in Series Resonance	±.015%, 0-70°C, H3W	4.95	2.75
10.0 MHz	MP101	Special Frequency at Anti-Resonance	±.015%, 0-70°C, H3W	4.95	2.75
15.0 MHz	MP150	Special Frequency	±.015%, 0-70°C, H3W	4.95	2.75
18.00 MHz	MP180	Intel 8080/8080A/8008/8224	±.015%, 0-70°C, H3W	4.95	2.75
18.432 MHz	MP184	Intel 8080/8080A/8008/8224	±.015%, 0-70°C, H3W	4.95	2.75
20.0 MHz	MP200	Intel 8080/8008	±.015%, 0-70°C, H3W	4.95	2.75
22.1184 MHz	MP221	Intel 8080A	±.015%, 0-70°C, H3W	5.30	3.10
24.00 MHz	MP240	Special Frequency	±.015%, 0-70°C, H3W	4.95	2.75
25.00 MHz	MP250	Special Frequency	±.015%, 0-70°C, H3W	4.95	2.75
27.00 MHz	MP270	Intel 8080A Series	±.015%, 0-70°C, H3W	4.95	2.75
36.0 MHz	MP360	Intel 8080A Series	±.015%, 0-70°C, H3W	4.95	2.75
48.0 MHz	MP480	T.I. Mod. TIM9904 P.N. SNLS362	±.015%, 0-70°C, H3W	4.95	2.75

*Miniature H3W package available for these frequencies on special order. Contact CTS Knights for prices and exact specs.

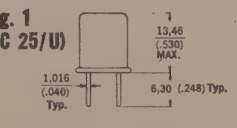
**For applications where ±.50%, 0-70°C is acceptable, CTS Knights is offering a 15% reduction off current prices. These crystals have to be special ordered and lead time will be approximately 8 weeks ARO. Just add an "L" to the appropriate part number, such as MP036L.

†Requires external circuit. Contact CTS Knights for details.

SOLDER SEAL CRYSTALS/OUTLINE DRAWINGS

Dimensions shown are maximum unless otherwise noted.

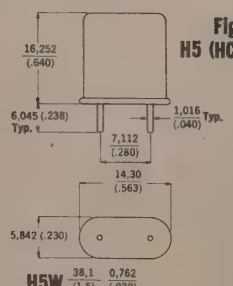
Fig. 1
H3 (HC 25/U)



H3W (HC 18/U) 38,1 (1.5) LEADS 0,432 (.017) DIA.

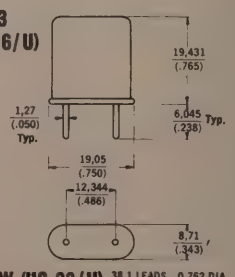
KEY = mm / (Inches)

Fig. 2
H5 (HC 32/U)



H5W 38,1 (1.5) LEADS 0,762 (.030) DIA.

Fig. 3
H17 (HC 6/U)



H17W (HC 33/U) 38,1 LEADS (1.5) LEADS 0,762 DIA. (.030) DIA.

CTS KNIGHTS, INC.

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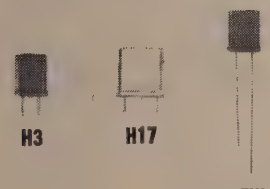
SPECIALISTS IN FREQUENCY MANAGEMENT

CRYSTALS

SOLDER SEAL CRYSTALS, GENERAL PURPOSE 1 MHz-175 MHz



For modems, data terminals, computers and peripheral equipment, test and measuring instruments, communications equipment and many other industrial applications where first-year aging rates in the range of 5-10 ppm are acceptable, CTS Knights standard S-designs are built with military production processes. Specifications shown in the tables below can easily be modified for specific oscillator requirements.

GENERAL SPECIFICATIONS

Frequency Tolerance @ 25°C: ±.002% (.001% thru .1% available)
Freq. Drift Over Temp. Range: ±.003% from −30°C to +70°C
Drive Level: 2-5 mw
Vibration Mode: Fundamental
Unwanted Modes: −6 dB min.

Aging, First Year: ±5 to 8 ppm
Load Capacitance (C_L): Specified by customer, 12 pf minimum. If no C_L is specified, crystal supplied will be for series resonant circuit.
Equivalent Series Resistance (R_S): See table

CRYSTAL TYPES S1553, S1453, S1835, S1535, S1435, S1335, S1235

Regular designs for small to medium quantities when shortest possible delivery is required. Typical series resistances of regular designs under 3 MHz are somewhat lower than volume designs. **Note H3/H3W availability as low as 2.0 MHz.**

Frequency MHz	Type	RsΩ Typ.	RsΩ Max.	H3/H3W Fig. 1 Approx. Price 100/Freq.	H17/H17W Fig. 3 H5*/H5W* Fig. 2 Approx. Price 100/Freq.
1.000-1.149	S1553	210	550	—	$7.95
1.150-1.399	S1553	180	420	—	7.95
1.400-1.500	S1553	155	350	—	7.40
1.501-1.550	S1553	145	320	—	7.40
1.551-1.700	S1553	135	300	—	6.55
1.701-1.999	S1553	115	250	—	6.55
2.000-2.249	S1453	100	200	—	5.75
2.000-2.399	S1835	125	250	$4.96	—
2.250-2.899	S1453	80	160	—	5.75
2.400-2.999	S1535	100	200	4.65	—
2.900-2.999	S1453	65	130	—	5.75
3.000-3.699	S1453	50	100	—	5.40
3.000-3.699	S1535	60	120	4.40	—
3.700-3.999	S1453	40	75	—	5.40
3.700-3.999	S1435	50	90	3.35	—
4.000-4.249	S1335	40	75	3.65	4.20
4.250-4.999	S1335	35	65	3.65	4.20
5.000-5.499	S1335	30	55	3.00	3.55
5.500-6.499	S1235	25	50	2.80	3.35
6.500-6.999	S1235	27	45	2.80	3.35
7.000-8.499	S1235	20	40	2.75	3.30
8.500-9.999	S1235	18	35	2.75	3.30

*H5/H5W available only for Types S1835, S1535, S1435, S1335, S1235

CRYSTAL TYPES S1753, S1735, S1640, S1635
(For Larger Quantities)

Minimum quantity 100 pcs. per frequency. Volume processing of crystal blanks results in lower prices. Delivery time is somewhat longer and typical series resistances are slightly higher than for regular designs.

Frequency MHz	Type	RsΩ Typ.	RsΩ Max.	H3/H3W Fig. 1 Approx. Price 100/Freq.	H17/H17W Fig. 3 H5*/H5W* Fig. 2 Approx. Price 100/Freq.
1.000-1.149	S1753	250	550	—	$5.70
1.150-1.399	S1753	200	420	—	5.70
1.400-1.500	S1753	170	350	—	5.25
1.501-1.550	S1753	160	320	—	5.25
1.551-1.700	S1753	150	300	—	5.25
1.701-1.999	S1753	130	250	—	4.50
2.000-2.249	S1753	110	200	—	4.50
2.250-2.899	S1753	90	160	—	4.50
2.900-2.999	S1753	70	130	—	4.50
3.000-3.699	S1753	50	100	—	4.20
3.000-3.699	S1735	60	120	$3.45	—
3.000-3.699	S1640	80	140	—	3.71
3.700-3.999	S1753	40	75	—	4.20
3.700-3.999	S1640	65	100	—	3.71
3.700-3.999	S1635	50	90	2.75	—
4.000-4.249	S1635	40	75	2.75	3.15
4.250-4.999	S1635	35	65	2.75	3.15
5.000-5.499	S1635	30	55	2.20	2.65
5.500-6.499	S1635	25	50	2.20	2.65
6.500-6.999	S1635	27	45	2.20	2.65
7.000-8.499	S1635	20	40	2.20	2.65
8.500-9.999	S1635	18	35	2.20	2.65

*H5/H5W available only for Types S1735, S1640, S1635

CTS KNIGHTS, INC.

SUBSIDIARY OF CTS CORPORATION, ELKHART, INDIANA

SPECIALISTS IN FREQUENCY MANAGEMENT

CRYSTALS

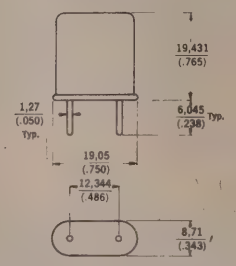
SOLDER SEAL CRYSTALS, GENERAL PURPOSE 1 MHz-175 MHz

10-175 MHz
GENERAL SPECIFICATIONS

Frequency Tolerance @ 25°C: ±.002% (.001% thru .1% available)
Freq. Drift Over Temp. Range: ±.003% from −30°C to +70°C
Drive Level: 2 mw
Vibration Mode: See table
Unwanted Modes: −6 dB minimum
Aging, First Year: ±5 to 8 ppm
Load Capacitance: Specified by customer, 12 pf min. If no C_L is specified, crystal supplied will be for series resonant circuit.
Equivalent Series Resistance (R_S): See table

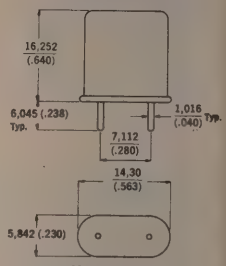
Frequency MHz	Type	Vibration Mode	RsΩ Typ.	RsΩ Max.	H3/H3W Fig. 1 Approx. Price 100/Freq.	H5/H5W Fig. 2 H17/H17W Fig. 3 Approx. Price 100/Freq.
10.000-11.999	S1035	Fund.	15	30	$2.25	$2.85
12.000-13.999	S1032	Fund.	14	28	2.25	2.85
14.000-15.999	S1032	Fund.	13	25	2.25	2.85
16.000-18.999	S1032	Fund.	13	25	2.30	2.95
19.000-20.999	S1027	Fund.	12	25	2.60	3.25
21.000-25.000	S1027	Fund.	12	25	2.90	3.65
17.000-19.999	S3335	3rd O.T.	35	60	3.00	3.60
20.000-29.999	S3032	3rd O.T.	27	45	2.20	2.80
30.000-35.999	S3032	3rd O.T.	27	45	2.20	2.80
36.000-41.999	S3032	3rd O.T.	27	45	2.20	2.80
42.000-47.999	S3032	3rd O.T.	30	50	2.20	2.80
42.000-47.999	S3132	3rd O.T.	20	30	2.80	3.45
48.000-53.999	S3032	3rd O.T.	30	50	2.25	2.90
48.000-53.999	S3132	3rd O.T.	20	30	3.00	3.65
54.000-56.999	S3127	3rd O.T.	20	30	3.00	3.65
57.000-63.000	S3127	3rd O.T.	22	35	3.40	4.10
63.000-75.000	S3127	3rd O.T.	22	35	4.35	5.10
40.000-49.999	S5132	5th O.T.	40	80	2.90	—
50.000-59.999	S5132	5th O.T.	40	80	2.90	—
60.000-79.999	S5127	5th O.T.	40	80	2.95	—
80.000-94.999	S5127	5th O.T.	40	80	2.95	—
95.000-104.99	S5127	5th O.T.	45	80	3.40	—
105.00-125.00	S5127	5th O.T.	45	80	5.15	—
110.00-111.99	S7127	7th O.T.	70	120	3.90	—
112.00-134.99	S7127	7th O.T.	70	120	3.90	—
135.00-146.99	S7127	7th O.T.	70	120	4.35	—
147.00-153.99	S7127	7th O.T.	70	120	5.40	—
154.00-175.00	S7127	7th O.T.	70	120	5.70	—

Fig. 3
H17 (HC 6/U)



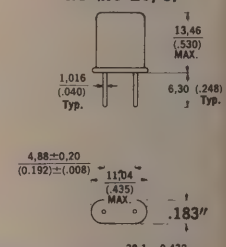
H17W (HC 33/U) 38,1 LEADS (1.5) 0,762 DIA. (.030)

Fig. 2
H5 (HC 32/U)



H5W 38,1 LEADS (1.5) 0,762 DIA. (.030)

Fig. 1
H3 (HC 25/U)



H3W (HC 18/U) 38,1 LEADS (1.5) 0,432 DIA. (.017)

TYPICAL FREQUENCY PULLABILITY VS LOAD CAPACITY

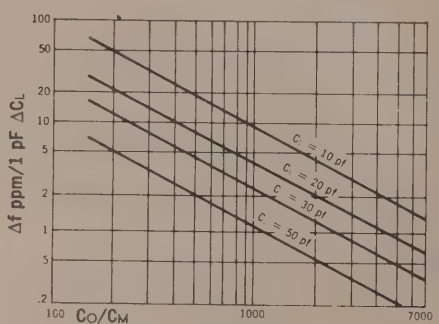


Fig. 4

TYPICAL C_O/C_M RATIOS FIGURE 4

Freq. MHz	Mode	H5/H17	H3
1-2	F	400	—
2-3	F	400	440
3-3.5	F	240-350	440
3.5-4	F	240-350	275-425
4-5	F	240-350	240-425
5-10	F	240-350	240
10-18	F	250	250
18-20	F	260	260
20-25	F	275	275
17-30	3rd	3,000	3,000
30-60	3rd	3,250	3,250
40-90	5th	12,000	12,000

ECONOMICAL COLDWELD CRYSTALS 8-160 MHz

CTS Knights KL3/KL3W Coldweld Crystals fill the gap between general purpose solder seal crystals and precision crystals. The KL3 Coldwelds offer much better reliability and long-term aging than solder seal crystals, yet cost no more for ±.001% calibration tolerance; slightly higher than solder seal crystals for looser tolerances.

Freq. MHz	Mode	Cal. Tol. @ 25°C ppm	Freq. Drift/ −30°C to +70°C ppm	ppm Aging First Year Typ.	ppm Aging First Year Max.	Max. RsΩ	Approx. Price 100 Pcs. ±.001%
8-10	Fund.	±10-50	±20	2	3	35	$3.35
10-14	Fund.	±10-50	±20	2	3	28	2.85
14-19	Fund.	±10-50	±20	2	3	25	2.85
19-21	Fund.	±10-50	±20	2	3	22	3.35
21-25	Fund.	±10-50	±20	2	3	25	3.90
22.5-52	3rd	±10-50	±20	2	3	45	2.75
52-63	3rd	±10-50	±20	2	3	35	4.25
63-75	3rd	±10-50	±20	2	3	35	5.65
40-105	5th	±10-50	±20	3	5	75	4.25
105-125	5th	±10-50	±20	3	5	75	6.30
110-160	7th	±10-50	±20	3	5		4.60-6.90

Fig. 5

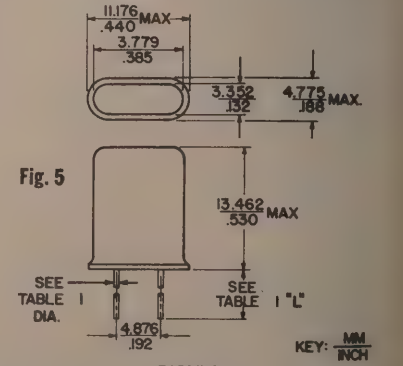


TABLE I

Type	Leads "L" in.	Leads "L" mm	Leads Dia. in.	Leads Dia. mm
KL3	.238	6.045	.042/.038	1.066/.965
KL3W	1.500 Min.	38.100 Min.	.019/.016	.482/.406

CTS KNIGHTS, INC.

SUBSIDIARY OF CTS CORPORATION, ELKHART, INDIANA

SPECIALISTS IN FREQUENCY MANAGEMENT

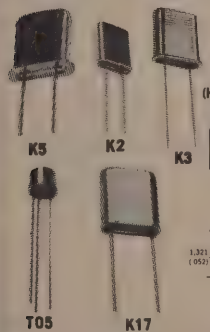
CRYSTALS

MILITARY CRYSTAL TYPES — MIL-C-3098/*

CTS Knights is QPL approved on the following military crystal types. All production lots subjected to stringent "Group A" acceptance tests prior to shipment. CTS Knights' test lab is government approved to perform qualification testing to MIL-C-3098F.

*Spec Sheet MIL-C-3098	Mil. Type	Mil. Holder	CTS Holder	Freq. Range MHz	Vibration Mode	Operating Temp. Range (°C)	Freq. Tol. vs. Temp. (%)	Load Cap or Series
/3	CR18A/U	HC6/U	H17	1.0-20.0	Fund.	−55 to +105	±.005	32 pf
/4	CR19A/U	HC6/U	H17	1.0-20.0	Fund.	−55 to +105	±.005	Series
/30	CR52A/U	HC6/U	H17	20.0-61.0	3rd O.T.	−55 to +105	±.005	Series
/32	CR54A/U	HC6/U	H17	50.0-100.0	5th O.T.	−55 to +105	±.005	Series
/33	CR55A/U	HC18/U	H3W	20.0-62.0	3rd O.T.	−55 to +105	±.005	Series
/34	CR56A/U	HC18/U	H3W	50.0-110.0	5th O.T.	−55 to +105	±.005	Series
/36	CR58A/U	HC17/U	H17 Mod.	1.0-20.0	Fund.	−55 to +105	±.005	32 pf
/38	CR60A/U	HC18/U	H3W	5.0-20.0	Fund.	−55 to +105	±.005	Series
/42	CR64/U	HC18/U	H3W	4.2-20.0	Fund.	−55 to +105	±.005	30 pf
/45	CR67A/U	HC18/U	H3W	20.0-61.0	3rd O.T.	−55 to +105	±.0025	Series
/50	CR72/U	HC25/U Mod.	H3 Mod.	20.0-61.0	3rd O.T.	−55 to +105	±.005	Series
/53	CR76A/U	HC18/U	H3W	20.0-61.0	3rd O.T.	−40 to +90 −(55 to 40) & +(90 to 105)	±.002 ±.003	Series
/55	CR77/U	HC25/U	H3	20.0-62.0	3rd O.T.	−40 to +90 −(55 to 40) & +(90 to 105)	±.002 ±.003	Series
/62	CR78A/U	HC25/U	H3	4.2-20.0	Fund.	−55 to +105	±.005	30 pf
/63	CR79/U	HC25/U	H3	4.2-20.0	Fund.	−55 to +105	±.005	Series
/57	CR80/U	HC18/U	H3W	50.0-110.0	5th O.T.	−40 to +90 −(55 to 40) & +(90 to 105)	±.002 ±.003	Series
/58	CR81/U	HC25/U	H3	20.0-62.0	3rd O.T.	−55 to +105	±.005	Series
/59	CR82/U	HC25/U	H3	50.0-110.0	5th O.T.	−55 to +105	±.005	Series
/60	CR83/U	HC25/U	H3	50.0-110.0	5th O.T.	−40 to +90 −(55 to 40) & +(90 to 105)	±.002 ±.003	Series
/67	CR89/U	HC32/U	H5	2.12-6.2	Fund.	−55 to +90	±.005	30 pf
/72	CR97/U	HC18/U	H3W	8.0-10.0	Fund.	−40 to +85	±.005	32 pf
/82	CR106/U	HC18/U	H3W	10.5-11.5	Fund.	−55 to +105	±.005	32 pf
/87	CR111/U	HC18/U	H3W	20.0-62.0	3rd O.T.	−55 to +105	±.005	Series
/90	CR114/U	HC25/U Mod.	H3 Mod.	2.9-3.85	Fund.	−55 to +105	±.005	32 pf
/93	CR117/U	HC25/U	H3	30.0-63.0	3rd O.T.	Ref. 25°C −40 to +65	±.001 ±.0015	Series
/101	CR124/U	HC18/U	H3W	2.9-3.8	Fund.	−55 to +100	±.005	32 pf
/108	CR128/U	HC18/U	H3W	20.0-62.0	3rd O.T.	−55 to +105	±.005	Series
/118	CR139/U	HC18/U	H3W	20.0-22.0	Fund.	−55 to +105	±.005	30 pf
/119	CR140/U	HC6/U	H17	9.5-12.5	Fund.	−55 to +90	±.005	60 pf
/122	CR141/U	HC18/U Mod.	H3W Mod.	50.0-90.0	5th O.T.	−30 to +55 −(55 to 30) & +(55 to 65)	±.0025 ±.0045	Series
/137	CR157/U	HC33/U	H17W	1.0-20.0	Fund.	−55 to +105	±.005	Series

HIGH STABILITY PRECISION COLDWELD CRYSTALS 1 MHz-150 MHz



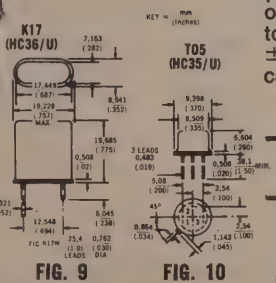


FIG. 9 FIG. 10

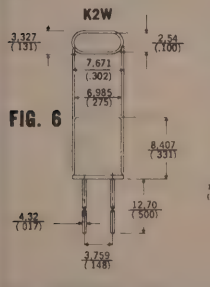


FIG. 6

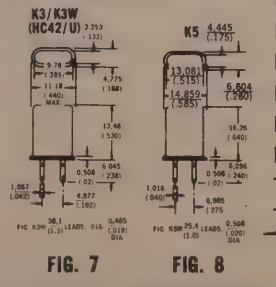


FIG. 7 FIG. 8

Precision crystals are used in applications where long term aging much less than 5 ppm/year is required. The aging rate shown in the table below is after 30 days of operation at a constant temperature. Frequency stability over temperature is tailored to customer's specific need. Frequency deviation over temperature may be held within ±5 ppm of the characteristic AT curve. Pricing varies with crystal parameter specifications. Contact CTS Knights for specific pricing.

CTS Holder	Frequency Range	Calibration Tolerance @ 25°C	Aging	Drive	Mode	Dimensional Outline
K2W	10-25 MHz	$\pm 10 \times 10^{-6}$	1×10^{-8}/day 1.5×10^{-6}/yr.	.1 mw	FUND.	FIG. 6
K2W	30-150 MHz	$\pm 10 \times 10^{-6}$	2×10^{-8}/day 3.0×10^{-6}/yr.	.1 mw	OVERTONE	FIG. 6
K3/K3W	8-25 MHz	$\pm 10 \times 10^{-6}$	1×10^{-8}/day 1.5×10^{-6}/yr.	.1 mw	FUND.	FIG. 7
K3/K3W	24-75 MHz	$\pm 10 \times 10^{-6}$	1×10^{-8}/day 1.5×10^{-6}/yr.	.1 mw	3RD	FIG. 7
K3/K3W	40-125 MHz	$\pm 10 \times 10^{-6}$	2×10^{-8}/day 3.0×10^{-6}/yr.	.1 mw	5TH	FIG. 7
K5/K5W	3-25 MHz	$\pm 10 \times 10^{-6}$	1×10^{-8}/day 1.5×10^{-6}/yr.	.1 mw	FUND.	FIG. 8
K17/K17W	1-10 MHz	$\pm 10 \times 10^{-6}$	1×10^{-8}/day 1.5×10^{-6}/yr.	.1 mw	FUND.	FIG. 9
K17/K17W	4-30 MHz	$\pm 10 \times 10^{-6}$	1×10^{-8}/day 1.5×10^{-6}/yr.	.1 mw	OVERTONE	FIG. 9
T05	10-25 MHz	$\pm 10 \times 10^{-6}$	1×10^{-8}/day 1.5×10^{-6}/yr.	.1 mw	FUND.	FIG. 10
T05	30-150 MHz	$\pm 10 \times 10^{-6}$	2×10^{-8}/day 3.0×10^{-6}/yr.	.1 mw	OVERTONE	FIG. 10

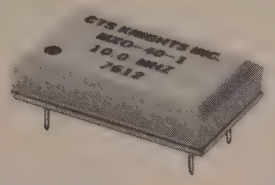
CTS KNIGHTS, INC.

SUBSIDIARY OF CTS CORPORATION, ELKHART, INDIANA

SPECIALISTS IN FREQUENCY MANAGEMENT

CLOCK OSCILLATORS

MXO-40 TTL HYBRID OSCILLATORS 20 KHz-60 MHz



- LOW PROFILE DIP
- 96% ALUMINA CERAMIC CASE
- TTL COMPATIBLE OUTPUT
- SYMMETRY TYPICALLY 48%-52%
- VERY LOW COST

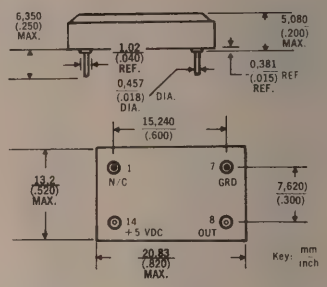


Fig. 11

Pin	Connections
Pin 1	N/C
Pin 7	Grd.
Pin 8	Output
Pin 14	+5 VDC

SPECIFICATIONS

FREQUENCY STABILITY:

(Inclusive of calibration tolerance @ 25°C., operating temp. range, environmental conditions, input voltage change, aging and load change):

MXO-40-1 ±.1% MXO-40-2 ±.01%

MXO-40-3 ±.005%

.0025% to 1.0% available upon request.

OPERATING CONDITIONS:

Supply Voltage: 5.0V ±10%

Operating Tempearture: 0 to 70°C

Fan Out: 20 KHz-25 MHz: 10 Std. TTL Loads
25 MHz-60 MHz: 10 Schottky TTL Loads

Storage Temperature: −55°C to +125°C

ELECTRICAL CHARACTERISTICS 20 KHz-25 MHz

	Min.	Typ.	Max.	Units
Logic 1 Level	2.5	3.8		V
Logic 0 Level			.4	V
Symmetry		48.52	45-55	%
Start Up Time		2.0	5.0	ms
Short Circuit Output Current	18		100	ma
Rise/Fall Time: 2.5-25 MHz		3	10	ns
Rise/Fall Time: 20 KHz-2.5 MHz		6	15	ns

ELECTRICAL CHARACTERISTICS 25 MHz-60 MHz

	Min.	Typ.	Max.	Units
Logic 1 Level	2.5	3.8		V
Logic 0 Level			.4	V
Symmetry		45-55	40-60	%
Start Up Time			5	ms
Short Circuit Output Current			100	ma
Rise/Fall Time			5	ns

APPROXIMATE PRICE

	20 KHz-299 KHz		300 KHz-4.499 MHz		4.5 MHz-18.99 MHz		19.0 MHz-24.99 MHz		25-60 MHz	
	10 Pcs.	100 Pcs.	10 Pcs.	100 Pcs.	10 Pcs.	100 Pcs.	10 Pcs.	100 Pcs.	10 Pcs.	100 Pcs.
MX040-1	$31.50	$15.00	$29.00	$13.80	$14.00	$7.50	$15.00	$8.00	$16.00	$8.50
MX040-2	32.00	15.50	29.50	14.00	14.50	8.00	15.50	8.40	16.75	9.00
MX040-3	34.00	16.25	31.00	14.75	15.50	8.50	16.00	9.00	17.75	9.75

SUPPLY CURRENT

	Typ.	Max.	Units
20-350 KHz	75	120	MA
.35-2.5 MHz	45	75	MA
2.5-5 MHz	30	50	MA
5-26 MHz	16	30	MA
25-60 MHz	32	50	MA

CXO-20 CMOS COMPATIBLE HYBRID OSCILLATORS 250 Hz-12.0 MHz

An inexpensive clock source for a variety of CMOS circuit applications. Low profile, 96% alumina ceramic package (Figure 11) is compatible with 14-pin DIL configurations (same as MXO-40).

SPECIFICATIONS

Frequency Range: 250 Hz-12.0 MHz

Frequency Stability: ±50 ppm, 100 ppm, 500 ppm, 1000 ppm (Inclusive of operating temp. range, environmental conditions, input voltage changes, aging and load coefficient)

Supply Voltage: 8 VDC to 15 VDC (5 VDC available upon request)

Operating Temperature: −40°C to +85°C

Storage Temperature: −55°C to +125°C

APPROXIMATE PRICES

Frequency	10 Pcs.	100 Pcs.
4-10 MHz	$19.00	$9.00

Contact factory for prices on other frequencies.

ELECTRICAL CHARACTERISTICS

	Min.	Typ.	Max.	Units
Logic 1 Level	VDD-.1 VDC			V
Logic 0 Level			.1	V
Symmetry		45-55	40-60	%
Rise/Fall Time 15 pf load			50	NS

SUPPLY CURRENT (AT VDD = 12 VDC, C_L = 15 pf)

	I Max.	I Typ.	Units
12 MHz	10.0	7.0	MA
4 MHz	3.5	2.5	MA
1 MHz	6.0	4.5	MA
100 KHz	5.5	4.0	MA
250 Hz	6.0	4.0	MA

CTS KNIGHTS, INC.
SUBSIDIARY OF CTS CORPORATION, ELKHART, INDIANA
SPECIALISTS IN FREQUENCY MANAGEMENT

CLOCK OSCILLATORS

JKTO-79 TO-8 COLDWELD SEALED OSCILLATORS 250 KHz-26 MHz

Designed for digital applications where coldweld hybrid reliability is desired and available PC board space is minimal. The JKTO-79C has an enable line and is available with complementary and dual outputs. The JKTO-79 Series Oscillators can be supplied to MIL-O-55310 specifications.

Model	Frequency Range	Dimensions (Inches)	Supply Voltage	Stability vs. Operating Temperature		Cal. Tol. @ 25°C	Output	Symmetry
JKTO-79B-1	8-26 MHz	TO-8 Holder	+5 VDC	$\pm 25 \times 10^{-6}$	0 to 70°C	$\pm 25 \times 10^{-6}$	TTL	35/65%
JKTO-79B-2	Same as above except stability:			$\pm 100 \times 10^{-6}$	−55 to 125°C	$\pm 25 \times 10^{-6}$	TTL	30/70%
JKTO-79C-1	.25-8 MHz	TO-8 Holder	+5 VDC	$\pm 25 \times 10^{-6}$	0 to 70°C	$\pm 25 \times 10^{-6}$	TTL	35/65%
JKTO-79C-2	Same as above except stability:			$\pm 100 \times 10^{-6}$	−55 to 125°C	$\pm 25 \times 10^{-6}$	TTL	30/70%
JKTO-79S-1	8-20 MHz	TO-8 Holder	+5 VDC	$\pm 25 \times 10^{-6}$	0 to 70°C	$\pm 25 \times 10^{-6}$	SINE	—
JKTO-79S-2	Same as above except stability:			$\pm 100 \times 10^{-6}$	−55 to 125°C	$\pm 25 \times 10^{-6}$	SINE	—

Model	Approximate Price (In Same Sequence As Table)	
	10 pcs	100 pcs
JKTO-79B-1	$30.00	$16.00
JKTO-79B-2	36.00	20.00
JKTO-79C-1	36.00	20.00
JKTO-79C-2	43.00	24.00
JKTO-79S-1	Contact Factory	
JKTO-79S-2	Contact Factory	

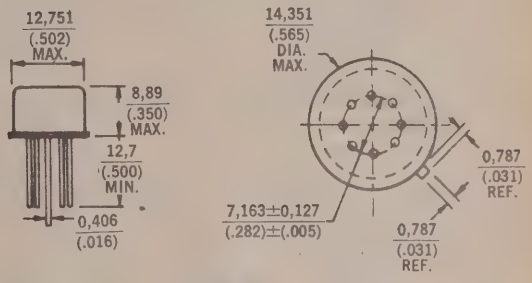


Fig. 12

JKTO-77 & JKTO-78 DISCRETE PACKAGED CLOCK OSCILLATORS 50 KHz-60 MHz

The JKTO-77 and JKTO-78 Oscillators are useful in applications where size is not a problem. Hermetically sealed metal packages make these oscillators ideal for severe environments. Normal output is TTL, however, sine wave or CMOS output is available on special order. Operating temperature range −55°C to +125°C. Designed for MIL-O-55310A environmental specifications.

Model	Frequency Range	Approximate Price (In Sequence)	
		10 pcs	100 pcs
JKT077	1-4.99 MHz	$69.00	$34.00
JKT077	5-50 MHz	55.00	28.00
JKT078	50-999 kHz	86.00	42.00
JKT078	1-50 MHz	58.00	29.00

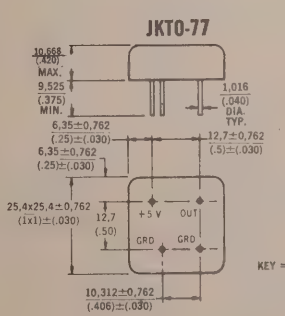


Fig. 13

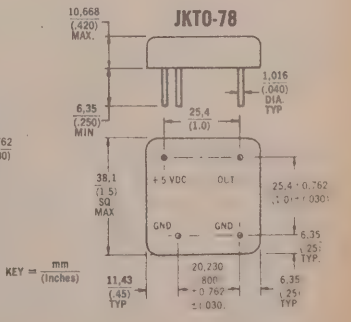


Fig. 14

Model	Frequency Range	Dimensions		Supply Voltage	Stability vs. Operating Temperature		Cal. Tol. @ 25°C	Output
		inches	mm					
JKTO-77	5-20 MHz	1.0x1.0x.375	25,4x25,4x9,525	+5 VDC	±.01%	−55 to 125°C	$\pm 50 \times 10^{-6}$	TTL
JKTO-78	50-50,000 KHz	1.5x1.5x.420	38,1x38,1x10,668	+5 VDC	±.01%	−55 to 125°C	$\pm 50 \times 10^{-6}$	TTL

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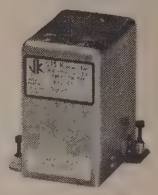
SPECIALISTS IN FREQUENCY MANAGEMENT

CRYSTAL OSCILLATORS

HIGH STABILITY OVENIZED CRYSTAL OSCILLATORS

CTS Knights ovenized oscillators are available in thermostatically controlled models as well as proportional control models. A variety of design options is available to the user, including very high stability, low power, small size and sine wave or square wave (TTL or CMOS) output. Contact CTS Knights for your special requirements.



JKTO-83

JKTO-41

Model	Frequency Range	Dimensions Inches	Dimensions mm	Oscillator Input	Oven Input	Temperature Control	Stability vs. Time†	Stability vs. Temp.	Output	Dimen. Outline
JKTO-9	20 KHz-10 MHz	1.313 O.D. x1.047	33,350 O.D. x26,594	+28 VDC	+28 VDC/AC 20 W.	Thermostat	$\pm1x10^{-7}$/day $\pm1x10^{-6}$/yr	−40 to +55°C $\pm1x10^{-6}$	Sine Wave 1 V ±10% 10K Ohm Load	Fig. 13
JKTO-30	1-4 MHz	2.0x2.0x4.0	50,8x50,8x101,6	+28 VDC	+28 VDC or 115 VAC 10 W. Max.	Proportional	$\pm1x10^{-8}$/day $\pm1x10^{-6}$/yr	−10 to +55°C $\pm5x10^{-8}$	Sine Wave 1 V RMS 500 Ohm Load	Fig. 14
JKTO-30	4-10 MHz	2.0x2.0x4.0	50,8x50,8x101,6	+12 to +28 VDC	+28 VDC or 115 VAC 10 W. Max.	Proportional	$\pm1x10^{-8}$/day $\pm1x10^{-6}$/yr	−10 to +55°C $\pm5x10^{-8}$	Sine Wave 1 V RMS 500 Ohm Load	Fig. 14
JKTO-41	1-10 MHz	2.0x2.0x4.25	50,8x50,8x107,95	+28 VDC	+28 VDC 10 W. Max.	Proportional	$\pm2x10^{-9}$/day $\pm2.5x10^{-7}$/yr	−40 to +70°C $\pm3x10^{-8}$	Sine Wave .316 V Min. 50 Ohm Load	Fig. 15
JKTO-41	10-100 MHz	2.0x2.0x4.25	50,8x50,8x107,95	+28 VDC	+28 VDC 10 W. Max.	Proportional	$\pm5x10^{-8}$/day $\pm1x10^{-6}$/yr	−25 to +65°C $\pm5x10^{-8}$	Sine Wave .316 V Min. 50 Ohm Load	Fig. 15
JKTO-51	1-2 MHz	1.844x2.0 x3.436	46,838x50,8 87,274	+28 VDC	+28 VDC 10 W. Max.	Proportional	$\pm1x10^{-8}$/day $\pm3x10^{-7}$/yr	−55 to +75°C $\pm5x10^{-8}$	Sine Wave 1 V RMS 10K Ohm Load	Fig. 16
JKTO-56	4-6 MHz	2.0x2.0x4.0	50,8x50,8x101,6	+12 VDC	+24 VDC 5 W. Max.	Proportional	$\pm2.5x10^{-7}$/yr	−10 to +60°C $\pm1x10^{-8}$	Sine Wave .224 V Min. 50 Ohm Load	Fig. 17
					Same as Above Except		$\pm1x10^{-6}$/yr	−10 to +60°C $\pm5x10^{-8}$		
JKTO-66	5 MHz	7x19 Panel	177,8x482,6 Panel	(115 VAC Power Supply		Double Oven Proportional	$\pm5x10^{-10}$/day $\pm2x10^{-8}$/yr	0 to 50°C $\pm2x10^{-9}$	Sine Wave 1 V Min. 50 Ohm Load	Std. Rack Mtg.
JKTO-83	1-6 MHz	2.437x2 x3.187	61,899x50,8 x80,950	+30 VDC	+30 VDC 45 W. Max.	Double Oven Proportional	$\pm1x10^{-9}$/day $\pm2.5x10^{-7}$/yr	−55 to +70°C $\pm1x10^{-8}$	Sine Wave 1 V Min. 50 Ohm Load	Fig. 18
JKTO-88-1	1-10 MHz	2.0x2.25 x.800	50,8x57,15 x20,32	5 & 12 VDC	+28 VDC 10 W. Max.	Proportional	$\pm5x10^{-9}$/day $\pm3x10^{-7}$/yr	−25 to +65°C $\pm1x10^{-7}$	TTL Sym. ±15% Fan Out 5	Fig. 19

† At a constant temperature

APPROXIMATE PRICE

Model	10 Pcs.	100 Pcs.
JKTO-9	$190.00	$120.00
JKTO-30 (1-4 MHz)	192.00	121.00
JKTO-30 (4-10 MHz)	200.00	126.00
JKTO-41 (1-10 MHz)	315.00	198.00
JKTO-51	297.00	186.00
JKTO-56 (.25 ppm/yr.)	545.00	343.00
JKTO-56 (1 ppm/yr.)	444.00	279.00
JKTO-66	2000.00	N/A
JKTO-83	770.00	489.00
JKTO-88-1	321.00	201.00

OUTLINE DRAWINGS

Fig. 13

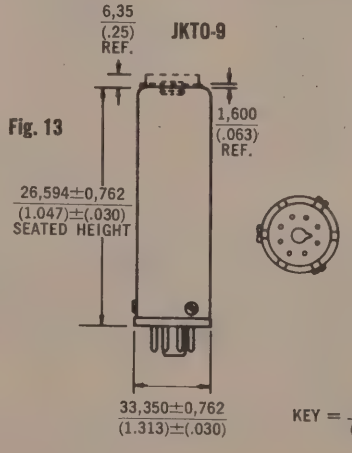
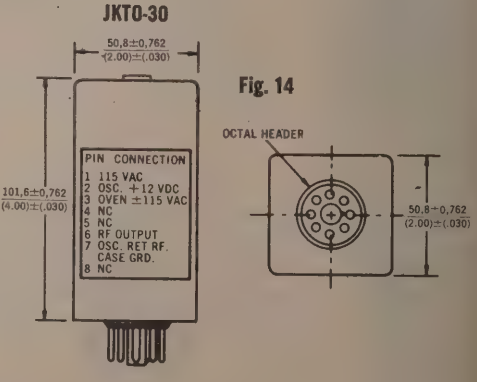


Fig. 14



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CRYSTAL OSCILLATORS

HIGH STABILITY OVENIZED CRYSTAL OSCILLATORS (Continued)

OUTLINE DRAWINGS

JKTO-41

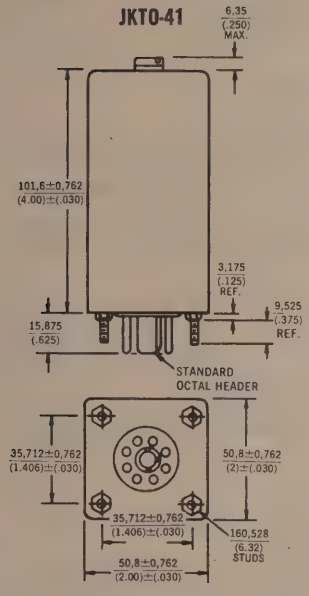

Fig. 15

JKTO-51

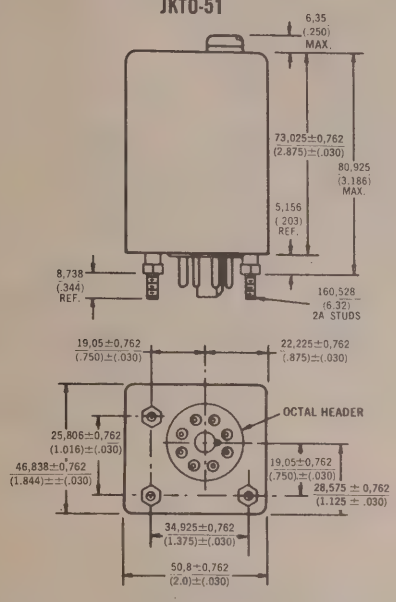

Fig. 16

JKTO-56

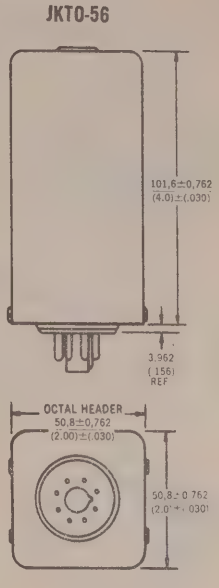

Fig. 17

JKTO-83

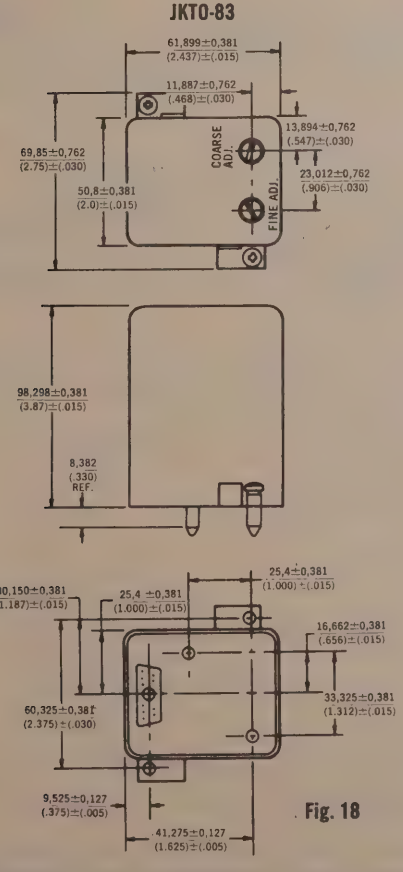

Fig. 18

JKTO-88

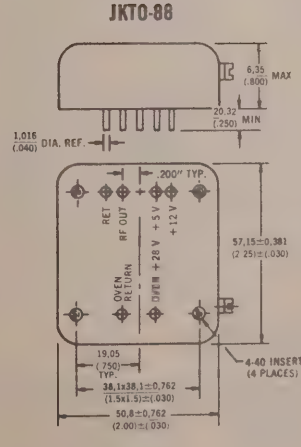

Fig. 19

CTS KNIGHTS, INC.

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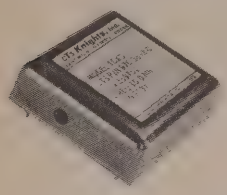
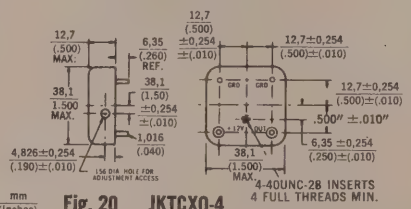
SPECIALISTS IN FREQUENCY MANAGEMENT

CRYSTAL OSCILLATORS

TEMPERATURE COMPENSATED OSCILLATORS (TCXO)

Low power requirements, high stability and excellent environmental capability characterize CTS Knights' temperature compensated crystal oscillators, CTS Knights has many years experience in developing economical TCXO designs for instrument and communications applications. Stabilities as high as $\pm 5 \times 10^{-7}$ over a wide temperature range are practical. CTS Knights can supply most TCXO designs with sine wave, TTL or CMOS compatible output. Special designs available. Contact CTS for custom package designs.





KEY = mm / (Inches)

Fig. 20 JKTCXO-4

JKTCXO-4

- Lightweight (1 oz.)
- Available hermetically sealed or non-hermetic package.
- Trimmer capacitor access on side of case.
- PC Board mountable.
- Good shock and vibration immunity.

Model	Series	Frequency Range	Dimensions inches	Dimensions mm	Supply Voltage	Stability vs. Operating Temperature	Stability vs. Time	Output	Dimensional Outline	Approx. Price 10 pcs.	Approx. Price 100 pcs.
JKTCXO-4	—	3.2-	1.50x	38,1x	12 VDC	$\pm 2 \times 10^{-6}$ −55 to +85°C	$\pm 1 \times 10^{-6}$/	TTL	Fig. 20	150.00	75.00
JKTCXO-4	Option 1	20 MHz	1.50x	38,1x	@	$\pm 5 \times 10^{-7}$ 0 to +50°C	yr.	Logic 0:.5 V Max.		150.00	75.00
JKTCXO-4	Option 2		.50	12,7	10 MA	$\pm 1 \times 10^{-6}$ −30 to +70°C		Logic 1:2.5 V Min.		150.00	75.00

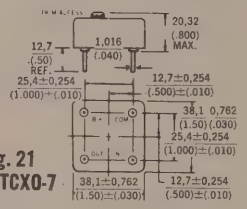
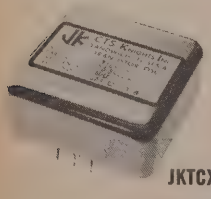


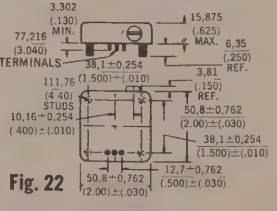
Fig. 21 JKTCXO-7

JKTCXO-7

- Requires less than 120 mw input power.
- Hermetically sealed package.
- Capacitor trim (access screw on top).
- Ideal for military application.

Model	Series	Frequency Range	Dimensions inches	Dimensions mm	Supply Voltage	Stability vs. Operating Temperature	Stability vs. Time	Output	Dimensional Outline	Approx. Price 10 pcs.	Approx. Price 100 pcs.
JKTCXO-7	974-1000	3-	1.50x	38,1x	12 VDC	$\pm 5 \times 10^{-7}$ +15 to +70°C	$\pm 1 \times 10^{-6}$/	TTL	Fig. 21	150.00	75.00
JKTCXO-7	974-2000	10 MHz	1.50x	38,1x	@	$\pm 1 \times 10^{-6}$ 0 to +70°C	yr.	Logic 0:.5 V Max.		150.00	75.00
JKTCXO-7	974-3000		.800	20,32	10 MA	$\pm 2 \times 10^{-6}$ −40 to +70°C		Logic 1:2.5 V Min.		150.00	75.00





JKTCXO-8 Fig. 22

TERMINATION OPTIONS FOR JKTCXO-8

Option A: 4-40 Inserts are available in lieu of the 4-40 studs.

Option B: Case available with 4 .040" dia. mounting terminals in lieu of the 4 4-40 studs and trim access centered. Connections to the oscillator are to the 4 .040" terminals.

JKTCXO-8

- Best stability over temperature.
- Designed for military and instrument applications.
- Less than 120 mw power consumption.
- Hermetically sealed with capacitor trim access on side of case.

Model	Series	Frequency Range	Dimensions inches	Dimensions mm	Supply Voltage	Stability vs. Operating Temperature	Stability vs. Time	Output	Dimensional Outline	Approx. Price 10 pcs.	Approx. Price 100 pcs.
JKTCXO-8	972-1000	25 KHz-	2.00x	50,8x	12 VDC	$\pm 1 \times 10^{-6}$ −40 to +70°C	$\pm 1 \times 10^{-6}$/	TTL	Fig. 22	170.00	85.00
JKTCXO-8	972-2000	20 MHz	2.00x	50,8x	@	$\pm 2 \times 10^{-6}$ −40 to +70°C	yr.	Logic 0:.5 V Max.		156.00	77.00
JKTCXO-8	972-3000		.625	15,875	10 MA	$\pm 5 \times 10^{-6}$ −40 to +70°C		Logic 1:2.5 V Min.		150.00	74.00
JKTCXO-8	972-4000					$\pm 2 \times 10^{-6}$ −55 to +85°C				170.00	84.00

NEW PRODUCTS

A) PASSIVE COMPENSATED, 5 VDC, 10 MHz TCXO:

Featuring TTL out, and stabilities of 1×10^{-6} from 0 to +55°C and 1×10^{-6}/year. Contact CTS for additional data.

B) HYBRID TCXO'S:

Featuring very small size and comparable stability. Contact CTS for additional data.

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SPECIALISTS IN FREQUENCY MANAGEMENT

OVENS

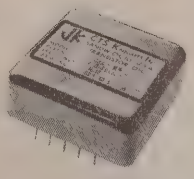
Precise control and reliability are the main features of CTS Knights ovens. Snap-action thermostats known for their long life are used on every thermostat design. Hermetically sealed, double insulated thermostats are used on 115 V models and are optional on others. Contact CTS Knights for special cavity and internal component mounting requirements.

Series	Temperature Control	External Dimensions (Max.) Inches	External Dimensions (Max.) mm	Cavity Size Inches	Cavity Size mm	Calibration Temp.	Oven Temp. Cycling @ 25°C Amb.	Max. Oven Temp. Change vs. Ambient*	Voltage	Mounting	Approx. Price 100 Pcs.
905	Thermostat	1.299‡ x1.718 H	32,995‡ 43,637 H	1.03§ x.860	26,162§ x21,844	+65 to 85°C ±2.5°C	±.1°C	1°C from −55°C	6.3 to 28V AC/DC 115 VAC	Octal Plug-in	$16.00
906	Thermostat	1.299‡ x2.468 H	32,995‡ 62,687 H	1.03§ x1.609	26,162§ x40,869	+65 to 85°C ±2.5°C	±.1°C	1°C from −55°C	6.3 to 28V AC/DC 115 VAC	Octal Plug-in	18.00
923	Proportional Control	2.0x2.0 x1.0 H	50,8x50,8 x25,4	1.50 x 1.50 x.453	38,1x38,1 x11,506	+60 to 100°C ±2°C	±.015°C	.5°C from −40°C	24-32 VDC	Octal Plug-in	52.00
947	Thermostat	3.187‡ x3.50 H	80,949‡ x88,9 H	2.468§ x2.406	62,687§ x61,112	+65 to 85°C ±3°C	±.1°C	2°C from 0°C	28V AC/DC 115 VAC	Octal Plug-in	50.00
948	Thermostat	3.187‡ x4.875 H	80,949‡ x123,825 H	2.468§ x3.843	62,687§ x97,612	+65 to 85°C	±.1°C	2°C from 0°C	28V AC/DC 115 VAC	Octal Plug-in	50.00

* Stability from temperature shown to within 10°C of oven temperature.
‡ Outside Diameter. § Inside Diameter.

VOLTAGE CONTROLLED CRYSTAL OSCILLATORS

Voltage controlled oscillators can be supplied by CTS Knights for various stability versus temperature requirements by adding oven control or temperature compensating circuitry. Contact CTS Knights for special requirements.



Model	Frequency Range	Dimensions Inches	Dimensions mm	Oscillator Input	Oven Input	Modulation Input	Modulation Deviation	Modulation Linearity	Stability vs. Temperature	Dimensional Outline	Approximate Price 10 pcs	Approximate Price 100 pcs
JKTO-86	5-30 MHz	2.0x 2.0x.750	50,8x 50,8x19,05	12 VDC ±1	None	±3 VP.P., DC to 20 KHz	±1000 PPM	±10%	0 to +50°C ±100x10^{-6}	Fig. 25	318.00	160.00
JKTO-87	10-27 MHz	2.0x 2.25x.800	50,8x 57,2x20,32	+12 & +5 VDC	+28 VDC	±3 VP.P., DC to 20 KHz	±1000 PPM	±5%	−40 to +70°C ±10x10^{-6}	Fig. 26	560.00	350.00
JKTO-87	10-27 MHz	Same as Above Except Stability vs. Temperature							0 to +55°C ±5x10^{-6}	Fig. 26	560.00	350.00
JKTO-100 Hybrid Design	10-25 MHz	.860x .830x.350	21,844x 21,082x8,89	12 & +5 VDC	None	±5 VP.P., DC to 10 KHz	±200 PPM	±10%	0 to +60°C ±4x10^{-5}	Fig. 27	200.00	95.00

All dimensions are maximum unless otherwise noted.

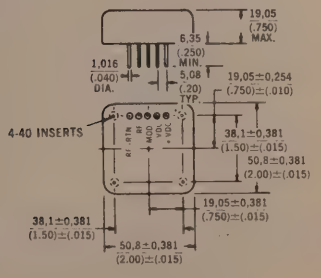


Fig. 25
JKTO-86

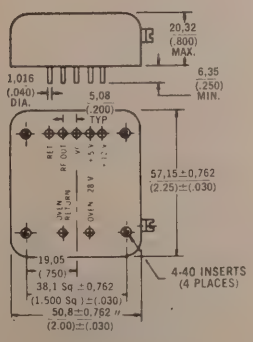


Fig. 26
JKTO-87

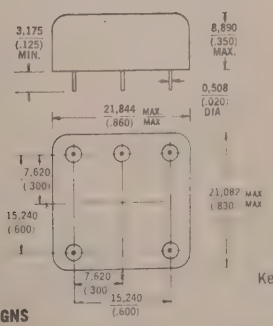


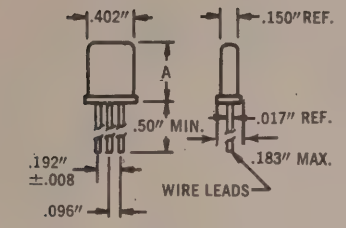
Fig. 27
JKTO-100
HYBRID DESIGNS

CTS KNIGHTS, INC.

SUBSIDIARY OF CTS CORPORATION, ELKHART, INDIANA

SPECIALISTS IN FREQUENCY MANAGEMENT

CUSTOM-BUILT CRYSTAL FILTERS



Holder	"A" dim.	Freq. Range
H3W3	.530″ max.	7-75 MHz
H3Y3	.500″ max.	7-75 MHz
H3T3	.463″ max.	10-75 MHz

Fig. 28

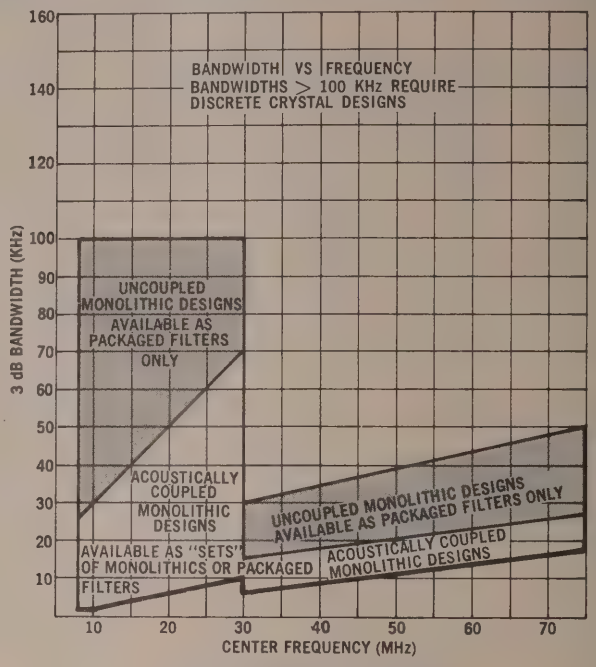

BANDWIDTH VS FREQUENCY
BANDWIDTHS > 100 KHz REQUIRE DISCRETE CRYSTAL DESIGNS
3 dB BANDWIDTH (KHz)
CENTER FREQUENCY (MHz)
UNCOUPLED MONOLITHIC DESIGNS AVAILABLE AS PACKAGED FILTERS ONLY
ACOUSTICALLY COUPLED MONOLITHIC DESIGNS
AVAILABLE AS "SETS" OF MONOLITHICS OR PACKAGED FILTERS
UNCOUPLED MONOLITHIC DESIGNS AVAILABLE AS PACKAGED FILTERS ONLY
ACOUSTICALLY COUPLED MONOLITHIC DESIGNS

Fig. 29 Bandwidth vs. Frequency

CUSTOM FILTERS

The basic building block for all custom built CTS Knights filters is the two-pole monolithic filter available in standard package styles as shown in figure 28.

Two-pole monolithic filters can be cascaded to produce four, six and eight or more pole filter responses with the addition of coupling capacitors between two-pole sections. Using the bandwidth, impedance and shape factor charts (fig's. 29, 32 and 31) the equipment designer can specify an inexpensive filter supplied by CTS Knights to his specifications as a set of two, three, four or more "Monolithics" (coupling capacitor information will also be provided). For applications requiring plug-in packaged filters, the filter specifier may select one of the five standard CTS Knights packages (fig's. 34, 35, 36, 37, 38) or supply dimensional termination and mounting information on a package of his choice. Input/Output impedances of packaged filters may be specified at 50 ohms minimum.

Filter parameters such as insertion loss, ripple, spurious response and ultimate attenuation are not easily chartable. However, some general guidelines to specifying these values are given below:

Insertion loss — typically 1.5 dB per 2-pole section

Ripple — 1 dB minimum for most designs

Ultimate attenuation — 35 dB maximum per 2-pole section for acoustically coupled designs

Spurious attenuation — (Best attainable for most designs)

2-pole	20 dB
4-pole	35 dB
6-pole	45 dB
8-pole	60 dB
10-pole	75 dB

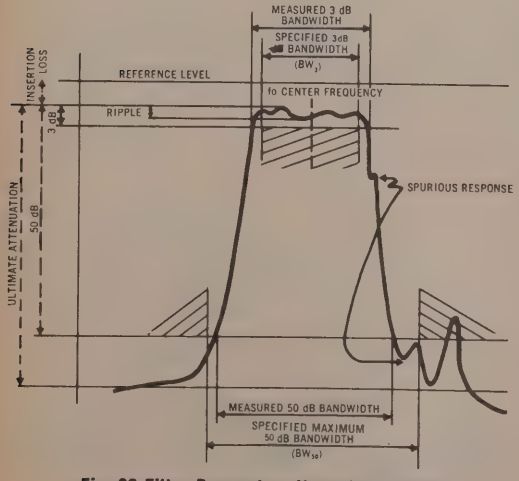


Fig. 30 Filter Parameters Normally Specified

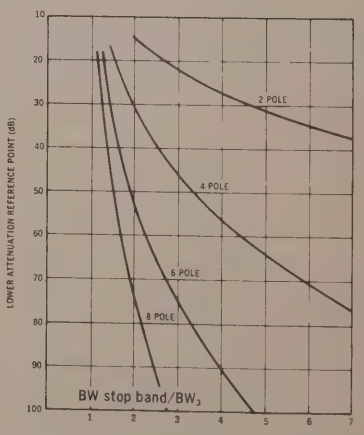


Fig. 31
Theoretical Shape Factor
(Normalized to 3 dB Bandwidth)

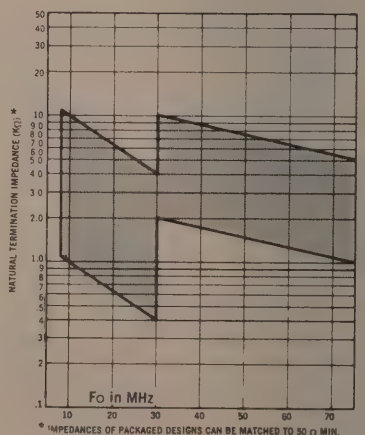


Fig. 32
Natural Termination Impedance vs. Frequency for Acoustically Coupled Monolithic Filters

CTS KNIGHTS, INC.

SUBSIDIARY OF CTS CORPORATION, ELKHART, INDIANA

SPECIALISTS IN FREQUENCY MANAGEMENT

STANDARD FILTERS

10.7 MHz — 1000 SERIES
21.4 MHz — 2000 SERIES
AVAILABLE OFF-THE-SHELF (Monolithic Sets)
ONE WEEK DELIVERY UP TO 10 PCS PKG. A-E

1 411 A

- 1 — 1ST DIGIT OF CTS SERIES
- 411 — ELECTRICAL RESPONSE CODE
- A — STANDARD PACKAGE (USE M FOR MONOLITHIC SETS)

Over 100 different 10.7 MHz (CTS 1000 Series) and 21.4 MHz (CTS 2000 Series) filter configurations are available with virtually OFF-THE-SHELF delivery from CTS Knights. The basic building block for CTS Knights' standard filters is the H3T3 dual resonator monolithic crystal. Standard filters ordered as "Monolithic Sets," are supplied as loose H3T3 dual resonator crystals separated by type with instructions on how to couple the crystals together for total filter performance. Filters ordered in standard packages A, B, C, D, or E provide plug-in convenience. Order from table by part number as shown below.

Electrical Response Code	3 dB BW_3 KHz Min.	40 dB BW_{40} KHz Max.	60 dB BW_{60} KHz Max.	Insertion Loss dB Max.	Ripple dB Max.	Input/Output Impedance Ω Nom. 10.7 MHz 1000 Ser.	Input/Output Impedance Ω Nom. 21.4 MHz 2000 Ser.	Mechanical Configuration Monolithic Sets Set of ( ) H3T3	Mechanical Configuration Standard Package Available	Approximate 25 Piece Price Series 1000 Package	Series 1000 Monolithic	Series 2000 Package	Series 2000 Monolithic
211	13	143	—	1.5	2	2,200	600	(1)		—	$2.90	—	$4.15
411	13	41	84	2.0	2	3,200	810	(2)	A, B, C, D, E1	$21.50	5.75	$24.10	8.30
611	13	26	38	3.0	2	3,400	860	(3)	A, B, C, D, E2	24.40	8.60	28.25	12.45
811	13	23	27	4.0	2	3,400	860	(4)	A, B, C, D, E3	27.30	11.50	32.40	16.60
412	13	41	84	2.5	2	50	50	—	A, B, C	24.40	—	27.00	—
612	13	26	38	3.5	2	50	50	—	A, B, C	27.30	—	31.10	—
812	13	23	27	4.5	2	50	50	—	A, B, C	30.15	—	35.30	—
221	15	165	—	1.5	2	2,500	690	(1)		—	2.90	—	4.15
421	15	46	96	2.0	2	3,400	850	(2)	A, B, C, D, E1	21.50	5.75	24.10	8.30
621	15	29	43	3.0	2	3,700	930	(3)	A, B, C, D, E2	24.40	8.60	28.25	12.45
821	15	26	31	4.0	2	3,700	930	(4)	A, B, C, D, E3	27.70	11.50	32.40	16.60
422	15	46	96	2.5	2	50	50	—	A, B, C	24.40	—	27.00	—
622	15	29	43	3.5	2	50	50	—	A, B, C	27.30	—	31.10	—
822	15	26	31	4.5	2	50	50	—	A, B, C	30.14	—	35.30	—
231	30	330	—	1.5	2	4,000	1,200	(1)		—	2.90	—	4.15
431	30	90	185	2.0	2	5,600	1,800	(2)	A, B, C, D, E1	21.50	5.75	24.10	8.30
631	30	56	83	3.0	2	5,900	1,800	(3)	A, B, C, D, E2	24.40	8.60	28.25	12.45
831	30	50	60	4.0	2	5,900	2,000	(4)	A, B, C, D, E3	27.30	11.50	32.40	16.60
432	30	90	185	2.5	2	50	50	—	A, B, C	24.40	—	27.00	—
632	30	56	83	3.5	2	50	50	—	A, B, C	27.30	—	31.10	—
832	30	50	60	4.5	2	50	50	—	A, B, C	30.15	—	35.10	—
742	72	—	225	6.0	3	50	*	—	See Factory-A	50.60	—	—	—
452	240	1000	—	5.0	2†	50	*	—	See Factory-A	30.60	—	—	—

* Available as 1000 Series only.

† Filter designed for wide band FM use. Maximum deviation of measured phase shift from the best fit (least squares method) straight line is less than the greater of 5° or 10% of the phase value read from the straight line.

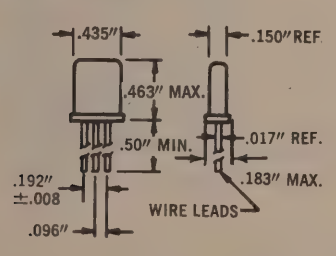


Fig. 33

H3T3 — 7-75 MHz

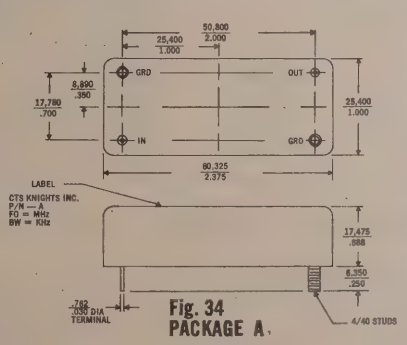


Fig. 34
PACKAGE A

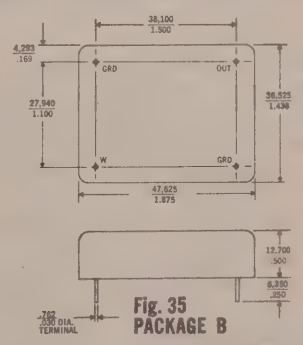


Fig. 35
PACKAGE B

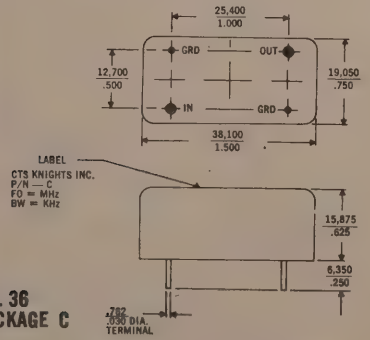


Fig. 36
PACKAGE C

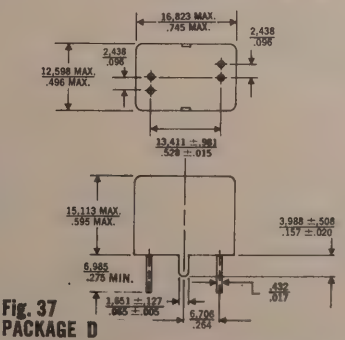


Fig. 37
PACKAGE D

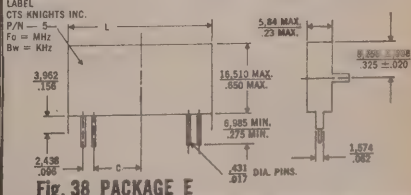


Fig. 38 PACKAGE E

Case Style	L (Max.) In.	L (Max.) mm	C In.	C mm
E1	.910	23,114	.217	5,512
E2	1.360	34,544	.435	11,049
E3	1.750	44,450	.654	16,611

CTS KNIGHTS, INC.

SUBSIDIARY OF CTS CORPORATION, ELKHART, INDIANA

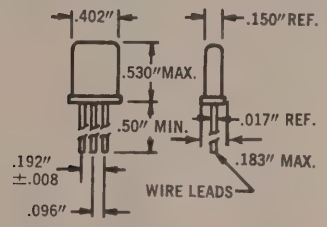
SPECIALISTS IN FREQUENCY MANAGEMENT

STANDARD CRYSTAL FILTERS

MODEL MCF 4500
45 MHz 2-POLE CRYSTAL FILTER

SPECIFICATIONS

Fo:	45 MHz
BW3:	18 KHz min.
BW20:	65 KHz max.
Ripple:	2 dB max.
Insertion Loss:	2 dB max.
Input & Output Impedance:	2.5K
Spurious Attenuation:	15 dB min.
Case Style:	H3W3 (Fig.)
Approximate Price:	10 Pcs. $15.00 25 Pcs. $10.00 100 Pcs. $7.00
Availability:	Up to 25 Pcs. from stock



H3W3 **Fig. 39**

MODEL MCF 6200 AM FILTER 10-13 MHz
MODEL MCF 6201 SSB FILTER 10-13 MHz

These crystal filters feature an enchanced six-pole tchebychev design, resulting in superior selectivity while conserving cost. The MCF 6200 (AM) and the MCF 6201 (SSB) may be ordered at any frequency in the range of 10 to 13 MHz. Model 6201 may be specified for upper or lower sideband.

SPECIFICATIONS

	MCF 6200 (AM)		MCF 6201 (SSB)	
Center Frequency:	10-13 MHz		10-13 MHz	
Bandwidth @ 3 dB:	5 KHz Min.		2.2-2.7 KHz Min.	
Shape Factor 50 dB/3 dB:	2.0 Max.		2.0 Max.	
Unwanted Mode Attenuation:	60 dB Min.		60 dB Min.	
Ultimate Attenuation:	75 dB Min.		75 dB Min.	
Ripple:	1 dB Typical 2 dB Max.		1 dB Typical 2 dB Max.	
Insertion Loss:	5 dB		6 dB	
	Natural	Matched	Natural	Matched
Termination Impedance:	750-1500Ω	50Ω	500-1000Ω	50Ω
Package Styles:	A thru E3	A	A thru E3	A

AVAILABILITY FROM STOCK (1 WEEK)

Model	Freq.	BW3	I/O-Z	Package	Approx. Price 10 Pcs.	Approx. Price 25 Pcs.
MCF 6200	10.7 MHz	5 KHz Min.		A Fig. 34	$37.00	$25.00
MCF 6201	10.7 MHz	2.5 KHz USB		A Fig. 34	37.00	25.00
MCF 6201	10.7 MHz	2.5 KHz LSB		A Fig. 34	37.00	25.00

2-POLE DISCRIMINATOR CRYSTALS 8-25 MHz

Monolithic dual resonator crystals, to function with integrated circuit quadrature detectors such as the RCA CA3089E. These crystals are available with center frequency bandwidth limitations as shown in the table. Contact factory for price.

Center Freq. MHz	Peak-to-Peak Bandwidth % of Center Freq.	Linearity %	Center Frequency Stability	Package Fig. 39
8-25	.05 to .25	3-7	$\pm 3 \times 10^{-5}$ −20 to 85°C	H3W3

AVAILABILITY FROM STOCK

Model	Freq. MHz	Peak-Peak Bandwidth KHz	Linearity	Ctr. Freq. Stability −20°C to +85°C	Package	Approx. Price 10	Approx. Price 25
MCD1211	10.7	13	5%	±30 ppm	H3W3 Fig. 39	3.50	3.00
MCD1221	10.7	15	5%	±30 ppm	H3W3 Fig. 39	3.50	3.00
MCD1231	10.7	30	5%	±30 ppm	H3W3 Fig. 39	3.50	3.00
MCD2211	21.4	13	5%	±30 ppm	H3W3 Fig. 39	7.00	6.00
MCD2221	21.4	15	5%	±30 ppm	H3W3 Fig. 39	7.00	6.00
MCD2231	21.4	30	5%	±30 ppm	H3W3 Fig. 39	7.00	6.00

SWITCHABLE BANDWIDTH FILTER (AM/LSB) 10-13 MHz

This 8-pole crystal filter was designed for use as a dual AM/LSB IF filter. Switching is accomplished with a diode matrix.

SPECIFICATIONS

Bandwidth @ 3 dB:	Switching Current off — 6 KHz min. Switching Current on — 2.7 KHz min. Switching Current: 50 ma @ 7 VDC
Shape Factor 60 dB/3 dB:	2:1 max.
Unwanted Modes:	−80 dB min.
Ripple:	1 dB typ., 2 dB max.
Insertion Loss:	4 dB typ., 6 dB max.
In/Out Z:	50Ω Resistive or natural (2.5KΩ, 4.8 pf)
Ctr. Freq. Drift vs. Op. Temp:	±20 ppm max. −20°C to +60°C

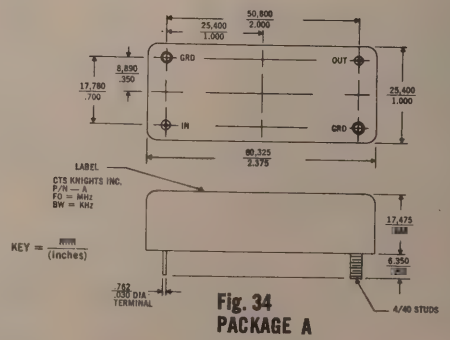


Fig. 34
PACKAGE A

CTS KNIGHTS, INC.
SUBSIDIARY OF CTS CORPORATION, ELKHART, INDIANA
SPECIALISTS IN FREQUENCY MANAGEMENT

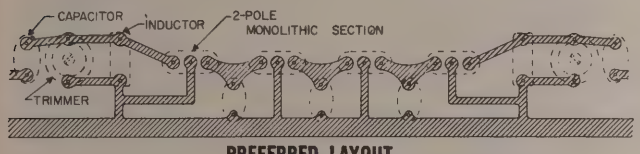
CRYSTAL FILTERS APPLICATIONS NOTES

P.C. BOARD LAYOUT FOR FILTERS PURCHASED AS "MONOLITHIC SETS"

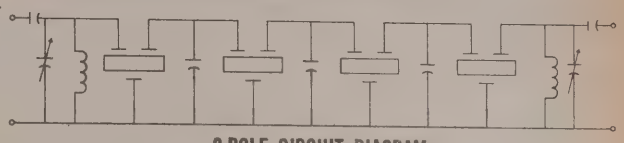
A good board layout will, 1) Maximize ultimate attenuation, 2) Minimize interstage and terminating stray capacitances and 3) Maintain acceptable levels of ripple and insertion loss.

Shown below are a circuit diagram of an 8-pole filter, plus 2 acceptable P.C. board layouts. The following points are important in board layout design:

1) Separate the signal input and output as much as possible.
2) Keep interstage connections as short as practical to reduce electro magnetic coupling directly from input to output.
3) Make conductive runs to the interstage capacitors as short as possible.
4) If possible, separate each 2-pole stage with a ground strip.
5) Provide a single run ground plane and make sure that input and output trimmers and coils are connected to the ground plane through single conductive runs.



PREFERRED LAYOUT


8-POLE CIRCUIT DIAGRAM

ACCEPTABLE LAYOUT FOR LIMITED P.C. BOARD AREA

TEST FIXTURES FOR STANDARD 10.7 & 21.4 MHz MONOLITHIC CRYSTAL FILTER SETS

Completely enclosed test fixtures equipped with standard BNC IN/OUT connectors, plug-in sockets (for crystals and junction capacitors) and surface access to tuning capacitors are available from CTS Knights at a nominal cost of $50.00 each. Order by part number shown with test circuit.

COMPONENTS FOR TEST CIRCUITS

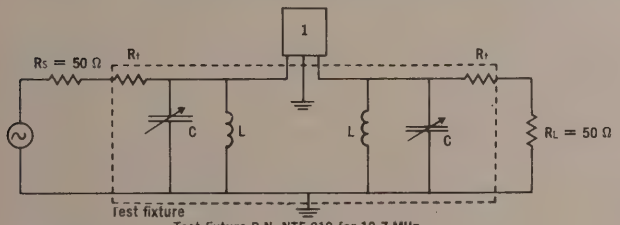
Inductors (L): All 10.7 MHz filters — 60 turns #36 wire on micrometals T30-6 core.
All 21.4 MHz filters — 30 turns #36 wire on micrometals T30-6 core.

Terminating Resistors (R): Always the same value as the natural impedance of the monolithic filter set (see table pg. 12).

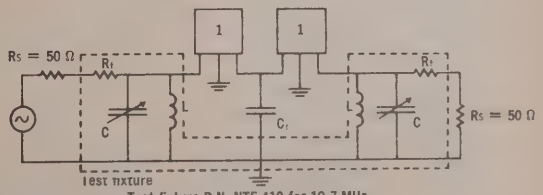
Trimmer Cap (C): 4.5-20pf

Junction Capacitors (Cj):

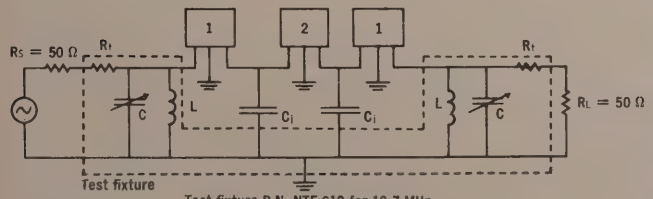
10.7 MHz Filters	Cj	21.4 MHz Filters	Cj
1411M, 1611M, 1811M	6 pf	2411M, 2611M, 2811M	13 pf
1421M, 1621M, 1821M	5 pf	2421M, 2621M, 2821M	11 pf
1431M, 1631M, 1831M	1 pf	2431M, 2631M, 2831M	2 pf



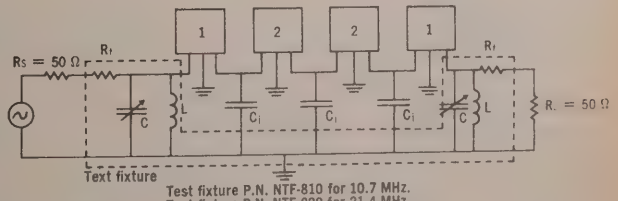
2-POLE
Test fixture P.N. NTF-210 for 10.7 MHz.
Test fixture P.N. NTF-220 for 21.4 MHz.



4-POLE
Test fixture P.N. NTF-410 for 10.7 MHz.
Test fixture P.N. NTF-420 for 21.4 MHz.



6-POLE
Test fixture P.N. NTF-610 for 10.7 MHz.
Text fixture P.N. NTF-620 for 21.4 MHz.



8-POLE
Test fixture P.N. NTF-810 for 10.7 MHz.
Test fixture P.N. NTF-820 for 21.4 MHz.

MEASURING INSERTION LOSS

1. For 50 ohm filters and other purely resistive terminations: Replace filter with a short; use this as 0 dB reference level. Remove short and replace with filter. The difference between the two signal levels is the insertion loss.

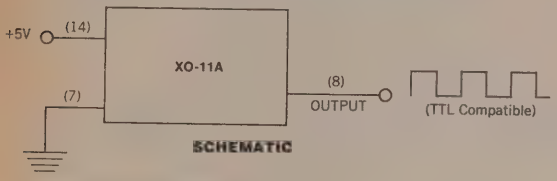
2. For naturally terminated monolithic crystal filters: In these applications the load is not purely resistive, thus the 0 dB reference signal level must first be determined by tuning the test fixture itself to maximum response with filter shorted. (With a spectrum analyzer/tracking generator, the 0 dB reference can be determined simply by switching to a broad frequency range and reading the peak response of the fixture.) The next step is to replace the short with the filter and retune for optimum bandpass characteristics. The difference between the previously determined 0 dB reference level and the peak response of the filter is the insertion loss.

DALE®

MODEL XO-11A
480 KHz to 5 MHz

DIP CLOCK OSCILLATOR
LOW COST
2.5% STABILITY

This LOW COST clock oscillator in a 4-pin package is compatible with 14-pin dual-in-line configurations. Standard frequencies shown below are maintained as stock items. The oscillator output is TTL compatible and will drive a fan-out of 10 TTL loads.



SCHEMATIC

SPECIFICATIONS

Output Frequency: As specified from .48 to 5.0 MHz

Accuracy & Stability (all conditions): ±2.5% max.

Input Voltage: 5.0 VDC ±10%

Operating Temperature Range: 0°C to +60°C

Storage Temperature: −40°C to +85°C

Input Current: 50 mA typ., 70 mA max.

Waveform Symmetry: 50/50 ±10%

Rise & Fall Time: 10 nS typ., 20 nS max.

"Zero" Level, Sinking 16 mA: 0.4 volts max.

"One" Level, Sourcing 0.4 mA: 2.4 volts min.

Standard Frequencies include:

.48 MHz	1.228 MHz
.50 MHz	3.579 MHz
.9216 MHz	5.00 MHz
1.00 MHz	

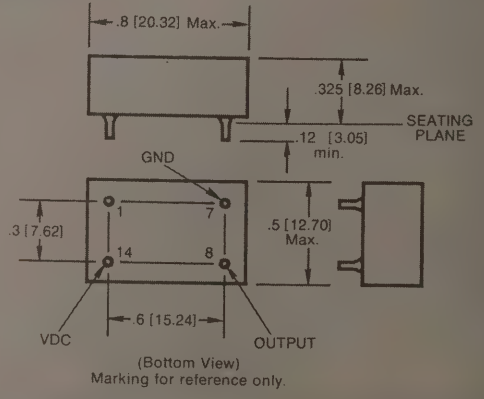
NOTE: Other frequencies available on request.

PIN	CONNECTION
1	N.C.
7	GND
8	OUTPUT
14	+5 VDC

HOW TO ORDER

XO-11A (PART NO. CODE) 5.0 (FREQ./MHz)

MODEL XO-11A DIMENSIONS



For additional information, contact:
DALE ELECTRONICS, INC.
FREQUENCY CONTROL GROUP
930 West 23rd Street, Tempe, Arizona 85282
Phone: (602) 967-7875 • TWX: (910) 950-1943

DALE®

MODEL XO-12
3.7 MHz to 25 MHz
14-Pin DIP Compatible

CRYSTAL CLOCK OSCILLATOR

Here's a complete family of packaged crystal oscillators offering card-compatible 14-pin DIP configurations and choice of four different frequency/temperature characteristics over an operating temperature range of 0°C to +60°C. Standard frequencies shown below are maintained as stock items. All units are TTL compatible and will drive a fan-out of 10 TTL loads.

SPECIFICATIONS

Output Frequency: As specified from 3.7 to 25 MHz
Input Voltage: 5.0 VDC ±10%
Operating Temperature: 0°C to +60°C
Storage Temperature: −55° to +105°C

STANDARD FREQUENCIES (MHz)	INPUT CURRENT (mA)	WAVEFORM SYMMETRY	RISE & FALL TIME (From Zero to One Level)	"ZERO" LEVEL SINKING 16 mA	"ONE" LEVEL SOURCING 0.4 mA
4.0	40 max. 25 typ.	60/40	10 nS typ./20 nS max.	0.4 volts max.	2.4 volts min.
4.9152	40 max. 25 typ.	60/40	10 nS typ./20 nS max.	0.4 volts max.	2.4 volts min.
5.0	40 max. 25 typ.	60/40	10 nS typ./20 nS max.	0.4 volts max.	2.4 volts min.
8.0	40 max. 25 typ.	60/40	10 nS typ./20 nS max.	0.4 volts max.	2.4 volts min.
10.0	40 max. 25 typ.	60/40	10 nS typ./20 nS max.	0.4 volts max.	2.4 volts min.
20.0	70 max. 45 typ.	60/40	3 nS typ./10 nS max.	0.5 volts max.	2.4 volts min.

HOW TO ORDER

XO-12	A	25
PART NO. CODE	FREQ. ACCURACY (All Conditions)	FREQ./MHz

A = ±.005% (±50 PPM)
B = ±.01% (±100 PPM)
C = ±.05% (±500 PPM)
D = ±.1% (±1000 PPM)

For additional information, contact:
DALE ELECTRONICS, INC.
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930 West 23rd Street, Tempe, Arizona 85282
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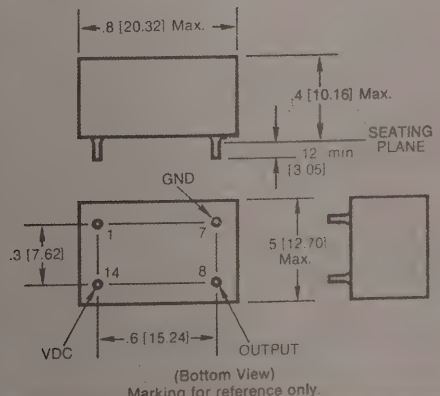
MODEL XO-12 DIMENSIONS

PIN	CONNECTION
1	N.C.
7	GND
8	OUTPUT
14	+5VDC



(Bottom View)
Marking for reference only.

DALE®

MODEL TCXO-22
Commercial Grade

TEMPERATURE COMPENSATED CRYSTAL OSCILLATOR

This LOW COST precision frequency source is available at any frequency from 4.0 to 20 MHz. *The following frequencies are maintained as stock items: 4.0, 5.0 and 10.0 MHz.*

SPECIFICATIONS

Frequency Range: 4 MHz to 20 MHz

Accuracy at +25°C: ±1 PPM. (adjustable with trimmer)

Stability vs. Input Voltage: ±0.2 PPM for ±10% voltage change typical

Stability vs. Temperature:
TCXO-22A ±1 PPM 0 to 55°C
TCXO-22B ±1 PPM +15 to 50°C
TCXO-22C ±5 PPM 0 to 55°C

Stability vs. Time: 1 PPM/year, maximum

Stability vs. Loading: ±0.1 PPM for ±20% load change

Input Power: Voltage = 5 VDC ±10%
Current = 12 mA typical, 16 mA max.

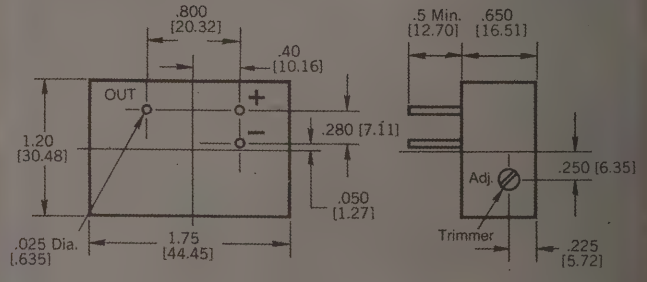
Output Signal: TTL Compatible, drives 10 TTL loads

Rise Fall Time: 10 nS typ., 20 nS max.

Symmetry: 60/40 or better at 1.4 V level

Mechanical: Epoxy and metal case. Access hole for frequency trim.

MODEL TCXO-22 DIMENSIONS



HOW TO ORDER

TCXO-22	A	4
PART NO. CODE	STABILITY	FREQ./MHz

For additional information, contact:
DALE ELECTRONICS, INC.
FREQUENCY CONTROL GROUP
930 West 23rd Street, Tempe, Arizona 85282
Phone (602) 967-7875 • TWX: (910) 950-1943

DALE®

MODEL XO-33

3.7 MHz to 25 MHz
Low Profile

HYBRID CRYSTAL CLOCK OSCILLATOR

SPECIFICATIONS

Frequency Range: As specified from 3.7 to 25 MHz. Standard frequencies shown below are maintained as stock items.

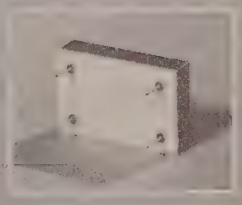
Frequency Accuracy: (inclusive of calibration tolerance at 25°C, operating temperature range, input voltage loading and operating environment)

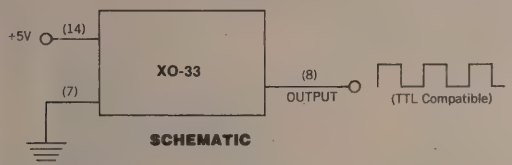
A = ±.005% (±50 PPM)
B = ±.01% (±100 PPM)
C = ±.05% (±500 PPM)
D = ±.1% (±1000 PPM)

Temperature Range: Operating: 0°C to 70°C
Storage: –55°C to +125°C

Input Voltage: +5 VDC ±0.5 V

STANDARD FREQUENCIES (MHz)	INPUT CURRENT (mA)	WAVEFORM SYMMETRY @ 1.4 VDC	TTL OUTPUT RISE & FALL TIME (From Zero to One Level)	"ZERO" LEVEL SINKING 16 mA	"ONE" LEVEL SOURCING 0.4 mA
4.0	40 max. 30 typ.	60/40	10 nS typ. /15 nS max.	0.4 volts max.	2.4 volts min.
4.9152	40 max. 30 typ.	60/40	10 nS typ. /15 nS max.	0.4 volts max.	2.4 volts min.
5.0	40 max. 30 typ.	60/40	10 nS typ. /15 nS max.	0.4 volts max.	2.4 volts min.
8.0	40 max. 30 typ.	60/40	10 nS typ. /15 nS max.	0.4 volts max.	2.4 volts min.
10.0	70 max. 60 typ.	60/40	10 nS typ. /15 nS max.	0.4 volts max.	2.4 volts min.
20.0	70 max. 60 typ.	60/40	3 nS typ. /10 nS max.	0.5 volts max.	2.4 volts min.





SCHEMATIC

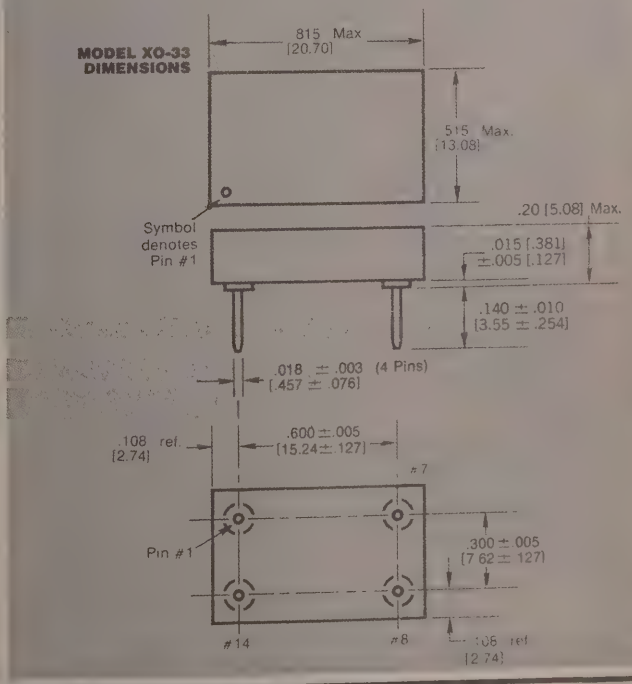
PIN	CONNECTION
1	N.C.
7	GND
8	OUTPUT
14	+5VDC

Environmental:

Temperature Cycle: –55°C to +85°C, 3 cycles
Shock: 100 G's 0.1 millisecond, 1/2 sine wave, 3 shocks each plane
Vibration: .06" D.A., 10-55 Hz, 35 G, 55-2000 Hz
Humidity: 85% relative humidity @ 85°C, 240 Hours

Mechanical:

Hermetically Sealed Package: Leak rate less than 2 x 10^{-8} atmosphere cc/sec. of helium
Pin Material: Phosphor bronze, .00003" thick gold flash finish
Marking Ink: Epoxy, solvent resistant
Solvent Resistance: Isopropyl alcohol, Tricholoroethane, Freon TMC



HOW TO ORDER

XO-33	A	25
PART NO. CODE	FREQ. ACCURACY (All Conditions)	FREQ./MHz

A = ±.005% (±50 PPM)
B = ±.01% (±100 PPM)
C = ±.05% (±500 PPM)
D = ±.1% (±1000 PPM)

For additional information, contact:

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FREQUENCY CONTROL GROUP
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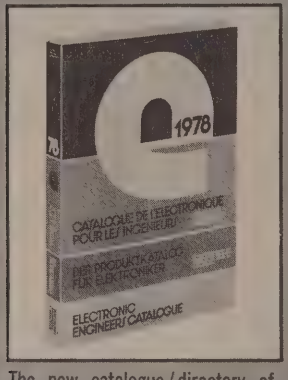

The new catalogue/directory of electronic products available to and from Western Europe and the United Kingdom. Designed especially for the European electronics engineer.

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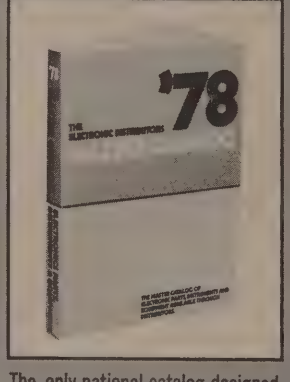

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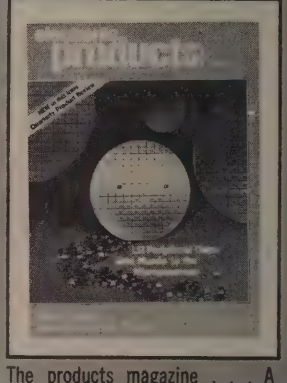

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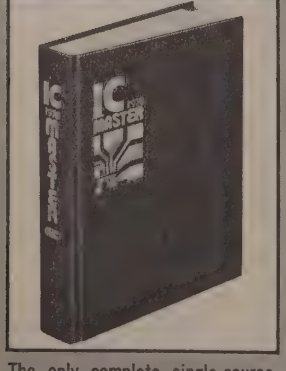

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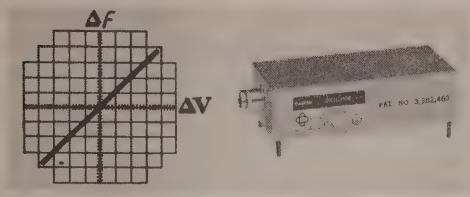
DAMON THE FORM FACTOR SPECIALISTS

VCXOs — 1 KHz to 500 MHz

Damon VCXOs provide high stability over a broad range of center frequencies. An optional square wave or pulse output signal compatible with I. C. logic circuits is available.

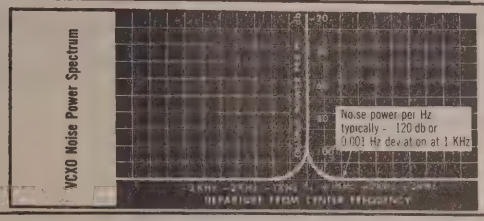


VCXO CHARACTERISTICS:

Center Frequency .. 1 KHz to 500 MHz
Deviation ..... .01% to 0.5% of Center Frequency
Linearity 1% to 5% of Peak Deviation
Frequency Stability .... Determined by Peak Deviation and Operating Temp.
Modulation Rates ..... DC to 2 MHz

Low Noise VCXOs

Damon low noise miniaturized VCXOs are all solid state quartz crystal stable oscillators whose frequencies can be varied linearly by an external DC or AC modulating signal. Only a source of power and control signal are required . . . no auxiliary compensating circuitry.

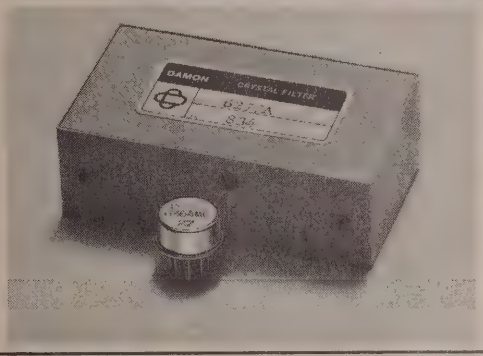


TYPICAL CHARACTERISTICS:

Center Frequency 10.000 MHz ±1 KHz
Deviation ..... ±10 KHz
Linearity ..... ±1%
Modulation Rate ..... Flat to 4 KHz
Output Power ..... >1 MW

Gaussian Crystal Filters

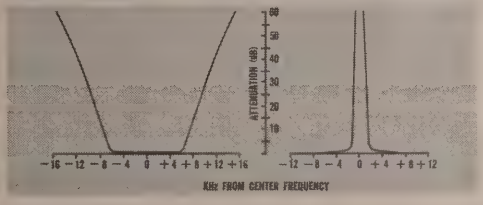
Gaussian Crystal Filters of either conventional or monolithic design. Useful in FM communications or radar systems where flat time delay is required. In a coherent pulsed radar, it can minimize return-pulse overshoot. Eliminates ringing problems in swept spectrum analysis. Available in 2 to 8 pole designs.



Center Frequency
Conventional ..... 10 KHz - 35 MHz
Monolithic ..... 3 - 30 MHz
3 dB Bandwidth ..... 100 Hz - 30 KHz
Shape Factor, 30 dB to 3 dB 3:1 to 7:1
Ringing, Pulse or Impulse 25 - 50 dB down
Phase Linearity ..... ±2%
No. of Poles
Conventional ..... 2 - 8
Monolithic ..... 2 - 4
Volume
Conventional ..... 1 - 6 cu. in.
Monolithic ..... 0.016 - 0.4 cu. in.

Band-Pass/Reject Crystal Filters

A wide variety of conventional crystal filters are produced at Damon. Standards designs such as Butterworth, Chebyshev, Gaussian, Bessel, and Legendre, as well as custom tailored designs are available.

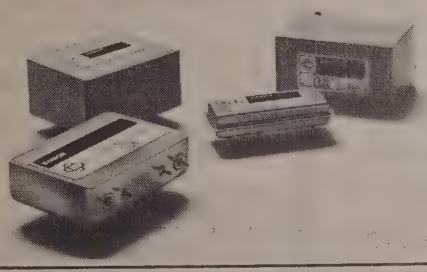


RANGE OF PARAMETERS:

Center Frequency .... 10 KHz - 75 MHz
Bandwidth ..... .01% - 3% of C.F.
Shape Factor ..... Down to 1.2:1
Differential Phase Shift ..... ±2°
Group Delay Uniformity ..... ±5%

Surface-Wave Delay Lines

With signal transfer **across** the surface instead of through the body (a state-of-the-art development), the new Surface-Wave concept results in substantially smaller packages, lower cost in production quantities and superior performance over a 20 MHz to 300 MHz range.



RANGE OF PARAMETERS:

Frequency Range .. 20 MHz - 300 MHz
Time Delay Range 0.5 - 20 Microsecs.
Bandwidth at −3 dB ..... 3% - 30% of Center Frequency
Insertion Loss ..... 10 - 20 dB
Spurious Responses 25 - 30 dB below Desired Response
Environment ..... Full Military Temp., Shock, Vibration Available
Typical Size ..... < 1 cu. in.

Monolithic Crystal Filters

Damon Monolithic Filters utilize a single quartz plate for multiple resonators and the coupling medium between them. Advantages over conventional crystal filters include smaller size, superior stability, and lower cost. Available in a wide variety of computer-assisted designs from Chebyshev to Gaussian characteristics and from 2 to 8 poles.

MONOLITHIC CHARACTERISTICS:

Center Frequency ..... 2.5 - 30 MHz
3 dB Bandwidth ..... 0.3 - 30 KHz
No. of Coupled Resonators ..... 2 - 6
Insertion Loss ..... 1 - 6 dB
Ripple ..... 0.5 dB Max.
Terminations .. 50 Ohms to 20 Kohms
Size ..... TO-5, TO-8, or Flat-Pack

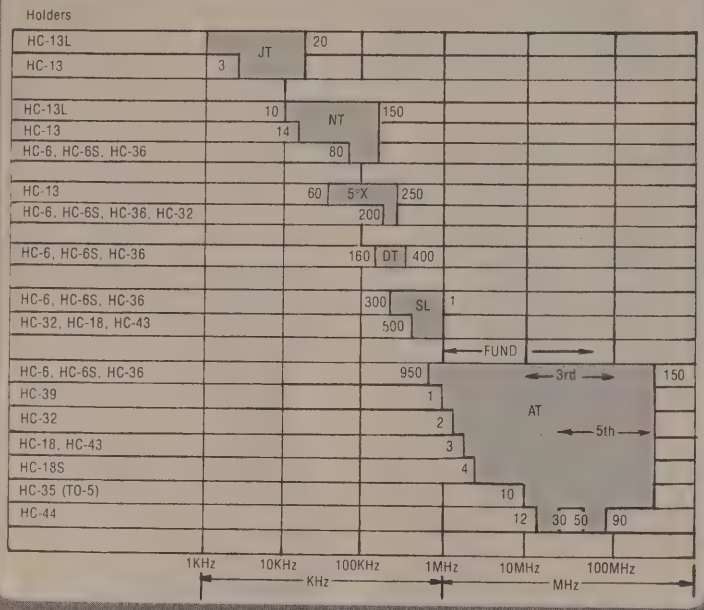
Write for technical bulletins.

DAMON/ELECTRONICS DIVISION
DEPT. EM, 80 WILSON WAY, WESTWOOD, MASS. 02090, TEL: (617) 449-0800

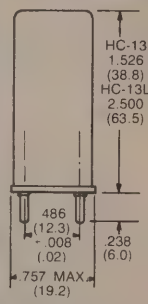
QUARTZ CRYSTALS

Erie Frequency Control manufactures crystal cuts capable of handling the entire frequency spectrum from 1 KHz to 150 MHz. The chart below shows the type cut, and the holder into which the crystal can be placed. Specifications for crystals vary widely with regard to the equipment in which they are being used. Erie manufactures to Military CR types and is qualified on the QPL list for some frequencies. It also manufactures crystals specifically to the customer's own specifications. Erie welcomes the opportunity to quote on any type of crystal in solder seal or cold weld holders.

MAJOR CRYSTAL TYPES FREQUENCY vs. HOLDERS

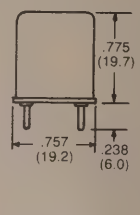


CRYSTAL HOLDERS



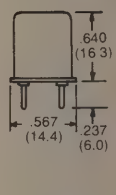
HC-13

	in.	mm
Pin Dia.	.050	1.3
Spacing	.486	12.3
Thickness	.352	8.9



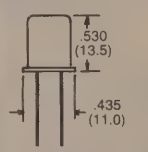
HC-6

	in.	mm
Pin Dia.	.050	1.3
Spacing	.486	12.3
Thickness	.352	8.9



HC-32

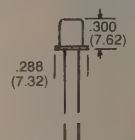
	in.	mm
Pin Dia.	.040	1.0
Spacing	.275	7.0
Thickness	.237	6.0



HC-18/25

	in.	mm
Lead Dia.	.017	.4
Spacing	.192	4.9
Thickness	.183	4.6

Variations in lead length, diameter, ground pins and mounting available in all holder sizes upon request.



HC-44

	in.	mm
Lead Dia.	.018	.457
Spacing	.112	2.84
Thickness	.096	2.44

ERIE MICROPROCESSOR CRYSTALS

Erie Frequency Control manufactures a complete line of quality micro-processor crystals from 1 to 100 MHz. High standards and mil-approved manufacturing processes guarantee reliability and dependability. Contact our sales office for information concerning your specific requirements.

AT CRYSTALS Performance Summary

General — A Thickness — shear type crystal, manufactured by controlled lapping of miniature substrates to exact thickness dimensions.

Frequency Range	950KHz to 150MHz	1MHz to 150MHz	2MHz to 150MHz	3MHz to 150MHz	4MHz to 150MHz	10MHz to 150MHz	12MHz to 30MHz	50MHz to 90MHz
Solder Seal Holder Type	HC-6 HC-6S	N/A	HC-32	HC-18 / HC-25	HC-18S	N/A	HC-44	
Cold weld Holder Type	HC-36	HC-39	N/A	HC-43 / HC-42	N/A	HC-35 (TO-5)	N/A	
Maximum Height	.775 (19.69)	.296 (7.518)	.640 (16.26)	.530 (13.46)	.530 (13.46)	.259 (6.58)	.300 (7.62)	

Nominal Frequency Tolerance . . . ±.005% from −55°C to +105°C
Best Frequency Tolerance . . . . . Varies with Frequency
Zero Temperature Coefficient . . . . . Per customer spec between +25°C and +100°C
Q Range . . . . . 50 K to 500 K (function of frequency range)
Aging . . . . . ≤2×10^{-8} / day initial
≤5×10^{-9} / day after 3 months

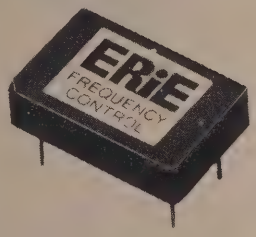
ERIE

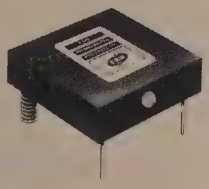
ERIE FREQUENCY CONTROL
Division of Erie Technological Products
453 Lincoln Street, Carlisle, Pa. 17013
Telephone 717-249-2232 Telex 084-2328

CRYSTAL OSCILLATORS

ERIE manufactures a complete line of oscillators ranging from digital DIP clock oscillators to high stability, high reliability frequency sources. A sampling of our standard models are described on these pages. As a majority of our oscillators are custom designed, we welcome your inquiries and specifications.

XO CLOCK OSCILLATORS TTL, ECL, C/MOS OR SINE





ERIE Model No.	Fig.	Size	Frequency Range	Freq. Stab.	Temp. Range	Power Supply Volt	Power Supply Current	Output See Below
1301-1305		.5 x .8 x .2/.25	4.0M to 28 MHz	±100ppm	0°C to 60°C	+5VDC	30 ma max	TTL
20A01111	1	.5 x .8 x .4	200K to 80MHz				40ma	TTL Fo-2
20A01295		.5 x .8 x .4	200Hz to 3MHz		0°C to +50°C	+8/15VDC	10ma	C/MOS
20A01084	2	1 x 1 x .312	3.0M to 60MHz	±50ppm	0°C to +70°C	+5VDC	50 ma	TTL
20A01088B			3.0M to 8.0MHz	±25ppm		+3/15VDC	Per Volt	C/MOS
20A01090	3	1.5 x 1.5 x .4	200Hz to 100MHz	±70ppm		+5VDC	Per	TTL
20A01089			.01Hz to 3MHz	±25ppm		+5/15VDC	Freq.	C/MOS
20A01281		1.5 x 1.5 x .4	4.0M to 20MHz	±50ppm		−5.2VDC	and	ECL
20A01286		1.5 x 1.5 x .5	200Hz to 25MHz			+5/15VDC	Voltage	1VRMS/1K
20A01168	4	2 x 2 x .5	100K to 125MHz		−55°C to +125°C	+12VDC	20ma	Sine
20A01170								
20A01171	*	1.3 x 3.8 x .9	125M to 300MHz	±100ppm		+12/28VDC	50ma	0 to 20 DBM
20A01172								
20A01287	*	2 x 4 x 1.0	300M to 500MHz		0°C to +70°C	+28VDC	100ma	

PACKAGE DIMENSIONS

FIG 1

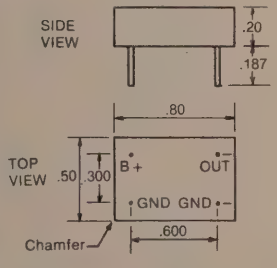


FIG 2

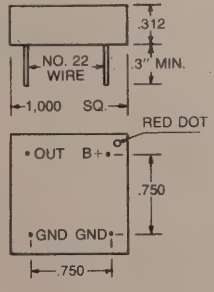


FIG 3

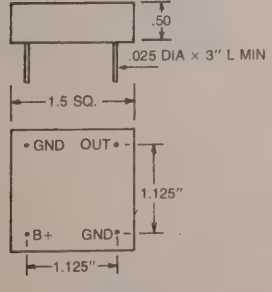
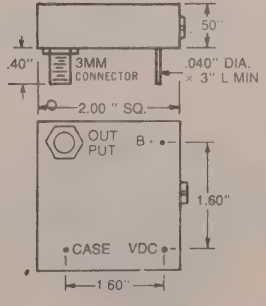


FIG 4



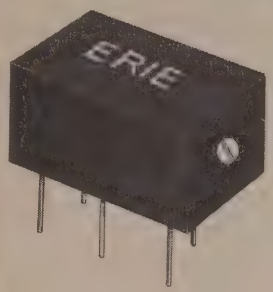
GENERAL OUTPUT SPECIFICATIONS

	TTL	C/MOS	ECL	SINE
Logic "0"	0.4 V Max.	1.0 V Max.	−1.89 V	1 VPP Min./1K ohms
Logic "1"	2.4 V Min.	VCC - 1 V	−0.89 V	or 0 DBM/50 ohms
Symmetry	40/60	40/60	40/60	Harmonics 5% Max.
Rise/Fall	15 Nsec at 5 MHz	Per Freq.	3 Nsec	Spurious −80 DB
Load	10 Gates	50 pf Max.	5 Gates	

ERIE FREQUENCY CONTROL
Division of Erie Technological Products
453 Lincoln Street, Carlisle, Pa. 17013
Telephone 717-249-2232 Telex 084-2328

CRYSTAL OSCILLATORS

OCXO OVENIZED OSCILLATOR PROPORTIONAL CONTROL



ERIE Model Numbers	Fig.	Size Inches)	Frequency Range	Stability vs. Temp.	Temp. Range	Aging Per Day	Input	Output Options
20B01020	5	1.5 x 1.5 x 3.0	100KHz to 20MHz	±5PP 10^8	0°C to +60°C	± 1PP 10^8	+12VDC	Sine or TTL
20B01175			20MHz to 100 MHz	±5PP 10^7		±5PP 10^8		Sine or Square
20B01257	6	2 x 2 x 4	1Hz to 150 MHz	±3PP 10^8	−20°C to +70°C	±3PP 10^9	10 to 30VDC	

Voltage Control Option (V) to ±100 PPM for ±3VDC

PACKAGE DIMENSIONS

FIG 5

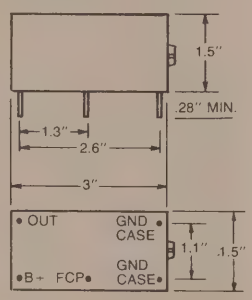


FIG 6

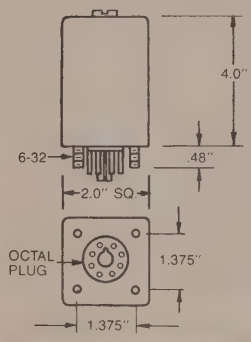


FIG 7

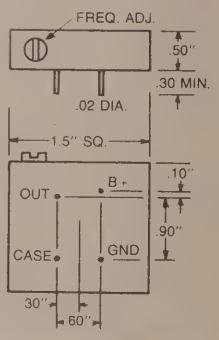
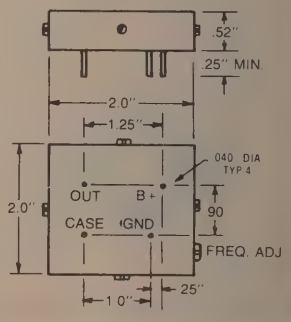
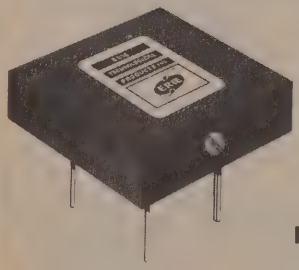


FIG 8



TCXO TEMPERATURE COMPENSATED OSCILLATOR



ERIE Model Numbers	Fig.	Size (Inches)	Frequency Range	Stability Option See Below	Aging Per Year	Freq. Adj.	Input	Output Options
20T01165	7	1.5 x 1.5 x .5	1MHz to 20MHz	1 and 2	± 3 PPM	Option	9 to 12VDC	TTL or Sine
20T01176	8	2 x 2 x .5	400KHz to 25 MHz	1 thru 4	±2 PPM	±5 PPM	50 to 15VDC	Square or Sine
20T01270	*		400KHZ to 25 MHz	5 thru 7	±1 PPM		10 to 15VDC	
20T01285	*	2 x 2.5 x .75	25MHz to 80MHz	2 and 8	±2 PPM		12 to 20VDC	Sine

*Special Pin Configuration

Frequency Stability vs Temperature Options

1	±2 PPM	0°C to + 60°C	5	±5 PP 10^7	0°C to + 60°C
2	±1 PPM	0°C to + 50°C	6	±5 PP 10^7	−40°C to + 75°C
3	±5 PPM	0°C to + 50°C	7	±1 PPM	−55°C to + 85°C
4	±5 PPM	−30°C to + 70°C	8	±2 PPM	−40°C to + 75°C

ERIE FREQUENCY CONTROL
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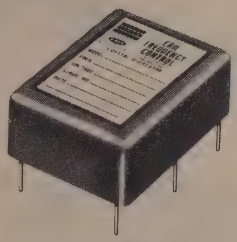
Telephone 717-249-2232 Telex 084-2328

CRYSTAL OSCILLATORS

VCXO VOLTAGE CONTROLLED OSCILLATOR



ERIE Model Numbers	Fig.	Size (Inches)	Frequency Range	Stability 0°C to +70°C	Deviations ±3 VDC	Linearity To	Input	Output Options
20V01021	9	1.6 x 2.2 x .75	40KHz to 80MHz	±50 PPM	To ±.05%	±5%	+12 VDC	Sine or TTL
20V01280	10	2 x 2 x .5	4MHz to 20MHz		To ±.001%		6 to 20VDC	Sine or Square
20V01290	11	2 x 3 x .75	200Hz to 100MHz	±100 PPM	To ±.1%	±1%	9 to 20VDC	

The VCXO's can be supplied with various modulation ranges & stabilities.

PACKAGE DIMENSIONS

FIG 9

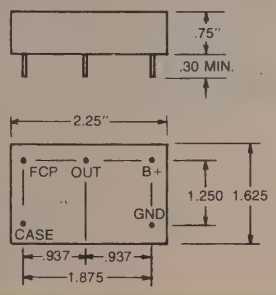


FIG 10

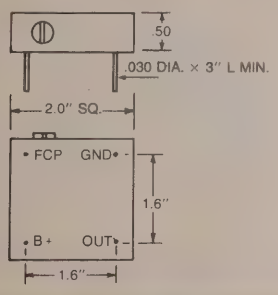
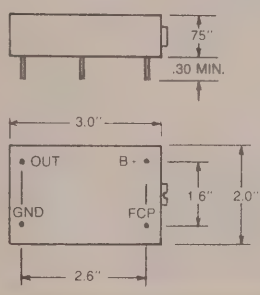
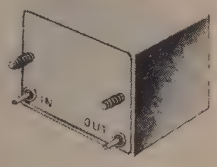


FIG 11



CRYSTAL FILTERS



Erie offers a complete line of sophisticated, discrete crystal filters ranging in frequency from 1KHz to 100 MHz. In addition, we specialize in handling custom design specifications to fit your demanding applications. The high reliability units are rugged, compact, and most can be designed to meet the environmental requirements of Mil-F-18327.
We invite your questions and encourage you to come to Erie for your special design requirements.

Center Frequency: 1KHZ to 100MHz

Bandwidth: .005% to 10% of F_o

Shape Factor: As low as 1.25 to 1

Ripple: Generally less than 1db

Insertion Loss: Usually less than 3.0db

Ultimate Attenuation: 100db max.

Max. Operating Temp.: 55°C to 125°C

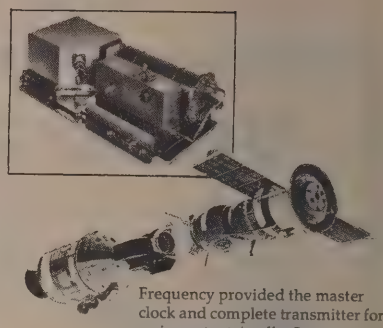
ERIE

ERIE FREQUENCY CONTROL
Division of Erie Technological Products
453 Lincoln Street, Carlisle, Pa. 17013
Telephone 717-249-2232 Telex 084-2328

Frequency Electronics, Inc.

3 Delaware Dr., New Hyde Park, N.Y. 11040
(516) 328-0100

Timekeeper for Outer Space . . .
Ask anyone who knows anything about this nation's deep space probe and satellite programs to mention any 10. Our instruments or equipment are aboard at least 8.



Frequency provided the master clock and complete transmitter for an important Apollo-Soyuz experiment.

INSTRUMENTS

DISCIPLINED TIME FREQUENCY STANDARDS
HIGH STABILITY FREQUENCY STANDARDS
FREQUENCY STANDARD CARRYING CASES
DIGITAL PHASE COMPARATORS
FREQUENCY ERROR ANALYZERS
DISTRIBUTION AMPLIFIERS
VIDEO DISTRIBUTION AMPLIFIERS
RF SWITCHOVERS
PASSIVE COMBINERS
DIGITAL CLOCKS
C/KT RATIOMETERS
MICROWAVE FREQUENCY MULTIPLIERS
IF NOISE GENERATORS
HIGH FREQUENCY AMPLIFIERS
UHF DOWN-CONVERTERS
UHF UP-CONVERTERS

SYSTEMS

TIME & FREQUENCY CONTROL SYSTEMS
UHF SYNTHESIZERS
FREQUENCY GENERATORS
COHERENT MICROWAVE SYNTHESIZERS
RF SWITCHING SYSTEMS

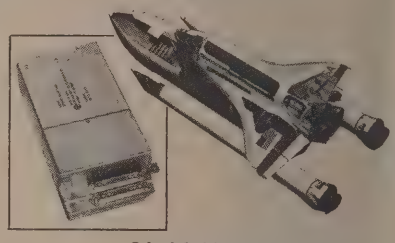
CRYSTAL FILTERS AND DISCRIMINATORS

NARROW BAND CRYSTAL FILTERS
INTERMEDIATE WIDE BAND CRYSTAL FILTERS
BAND REJECT CRYSTAL FILTERS
SINGLE SIDE BAND CRYSTAL FILTERS
DISCRIMINATORS

OSCILLATORS

OVENIZED CRYSTAL OSCILLATORS
OVENIZED VOLTAGE CONTROLLED CRYSTAL OSCILLATORS
TEMPERATURE COMPENSATED VOLTAGE CONTROLLED CRYSTAL OSCILLATORS
TEMPERATURE COMPENSATED CRYSTAL OSCILLATORS
NON-OVENIZED CRYSTAL OSCILLATORS
LC VOLTAGE CONTROLLED OSCILLATORS
PRECISION LOW POWER OSCILLATORS
HIGH STABILITY PROPORTIONAL OVENS
CUSTOM ENGINEERED OSCILLATORS

LOW PHASE-NOISE FREQUENCY SOURCES TO 10 GHz



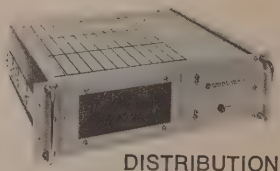
Scheduled for launch during 1979, NASA's Space Shuttle is designed to become America's manned reusable space transportation system. Frequency has delivered Oscillators for the Master Timing Unit Redundant Clock for the Space Shuttle Orbiter, built by Rockwell International Corporation's Space Division.

INSTRUMENTS

IMPROVED FREQUENCY STANDARD

HIGH STABILITY FREQUENCY STANDARD

HIGH LEVEL IF NOISE GENERATOR



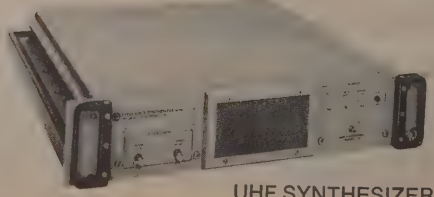
DISTRIBUTION AMPLIFIER

UHF DOWN-CONVERTER

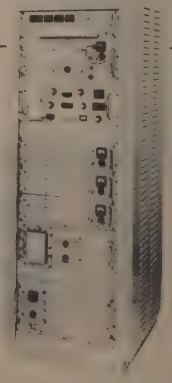
DISCIPLINED TIME FREQUENCY STANDARD

SYSTEMS

FREQUENCY STABILIZATION EQUIPMENT



UHF SYNTHESIZER



FREQUENCY-TIME STANDARD SET

type spacecraft.

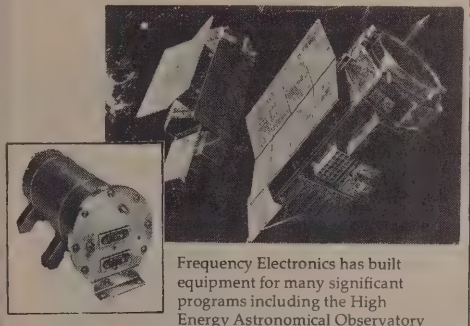
The NTS-1 crystal clock, built by Frequency Electronics, Inc., is still functioning very well, according to Easton. It has exhibited a long-term stability of about one part in 10^{11}, Easton said.

This corresponds to an error of 800' in measuring range to the satellite if a crystal

—From "Frequency Standard Orbital Test Set," by Philip J. Klass in "Aviation Week & Space Technology" magazine, Oct. 11, 1976.

Roger Easton is Branch Head of Naval Research Laboratory's space applications.

The Navigation Technology Satellite—NTS-1—built by NRL, was launched on July 14, 1974.



Frequency Electronics has built equipment for many significant programs including the High Energy Astronomical Observatory (HEAO) Satellite.

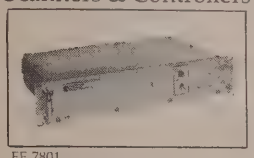
Frequency Electronics, Inc.

3 Delaware Dr., New Hyde Park, N.Y. 11040 (516) 328-0100

Broad Band Modular Switching Systems

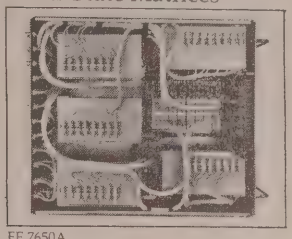
Complete systems with power supplies, digital interface converters, I/O equipment, control panels, and various other functions are available. FEI switching systems are presently being used in: Satellite Automatic Checkout Equipment, High-Speed PCB Testers, Direction Finders, Antenna Distribution Systems, Video Distribution Systems.

Scanners & Controllers



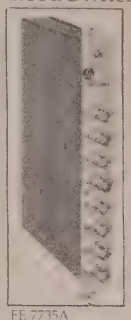
FE 7801
DIGITAL INTERFACE UNIT

Solid-State Matrices



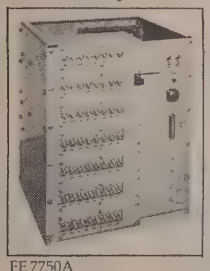
FE 7650A
8×50 MATRIX

Reed Switches

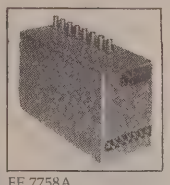


FE 7735A
1×8 SWITCH

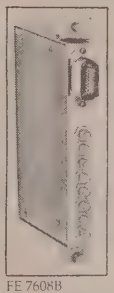
Reed Relay Matrices



FE 7750A
5×56 MATRIX

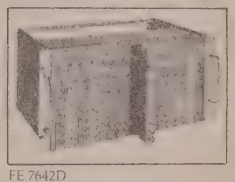


FE 7758A
7×8 MATRIX



FE 7608B
1×8 SWITCH

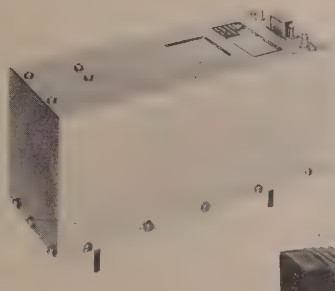
Solid-State Switches



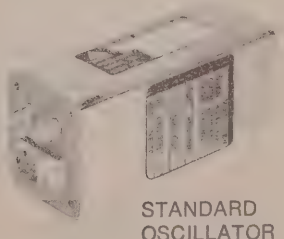
FE 7642D
4×92 SWITCH

OSCILLATORS

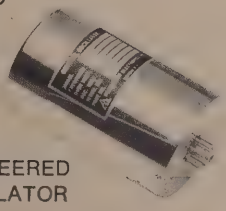
VOLTAGE CONTROLLED CRYSTAL OSCILLATOR



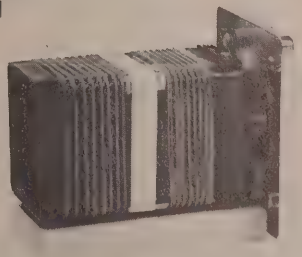
SATELLITE CRYSTAL OSCILLATOR



STANDARD OSCILLATOR



CUSTOM ENGINEERED OSCILLATOR

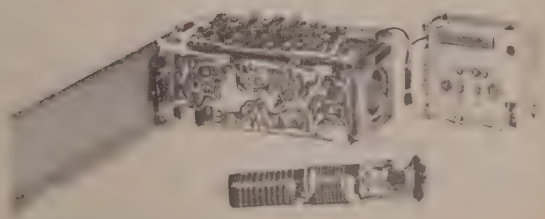


HIGH STABILITY PROPORTIONAL OVEN

STANDARD OSCILLATOR

CRYSTAL FILTERS AND DISCRIMINATORS

HIGH RELIABILITY PRODUCTS



Filters and Networks

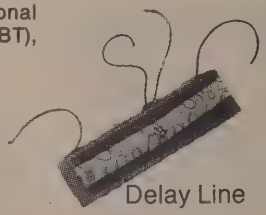
LC Filters • Crystal Filters
Delay Lines • Discriminators

from **FSN** **FREQUENCY SELECTIVE NETWORKS, INC.**

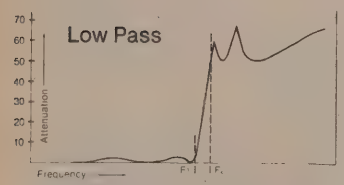
FSN is a filter and network house. We are strong in engineering. We are able and willing to work with system designers to apply state-of-the-art filter technology to optimize not just the filter but the application of filters to help our customers optimize their systems.

Use us as your filter specialist. We are knowledgeable in and have experience with all classes of filters, whether crystal or LC. We can select the proper type for best performance while optimizing the cost-vs-performance trade-off. We design and manufacture **all** the families such as: Butterworth, Chebyshev, Legendre, Cauer (elliptical), General Parameter, Gaussian, Bessel, Transitional Butterworth-Thompson (TBT), Bode, Lerner and others.

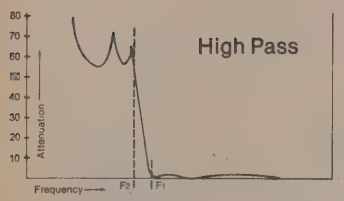
We also design and manufacture such other networks as delay lines, attenuators, phase and delay equalizers, discriminators, matching networks, etc.



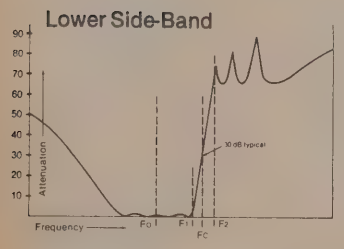
Representative Network Packages



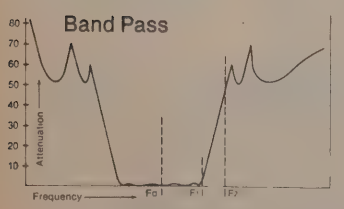
Shape Factor = $\frac{F_2}{F_1}$ As Low as 1.03



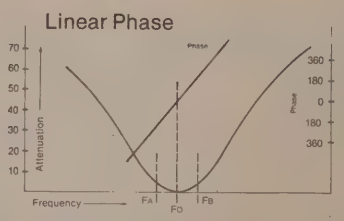
Shape Factor = $\frac{F_1}{F_2}$ As Low as 1.03



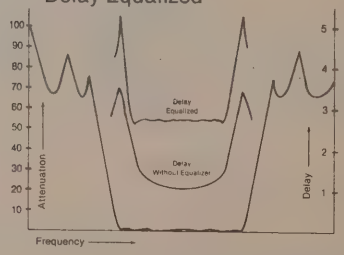
Shape Factor = $\frac{F_2 - F_0}{F_1 - F_0}$ As Low as 1.05



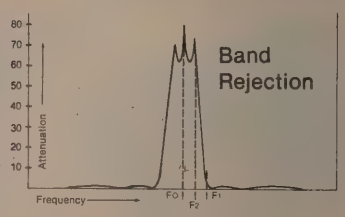
Shape Factor = $\frac{F_2 - F_0}{F_1 - F_0}$ As Low as 1.05



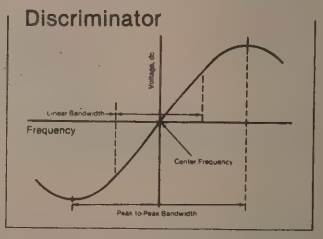
Phase Linearity better than 1°



Shape Factors better than 1.10
Delay Variation better than 2%



Shape Factor = $\frac{F_1 - F_0}{F_2 - F_0}$ As Low as 1.20



Wide and Narrow Band Linearity ± 1%

69-20 Garfield Avenue
Woodside, N.Y. 11377
(212) 424-7500

FSN FREQUENCY SELECTIVE NETWORKS, INC.

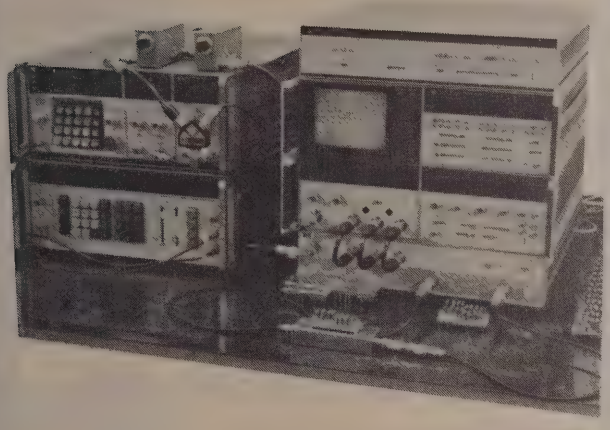
LC Filters • Crystal Filters • Delay Lines • Discriminators

filter technology, incorporated

Granger Associates
Filter Group

CUSTOM DESIGNED QUARTZ CRYSTAL FILTERS

SOPHISTICATED NETWORK ANALYSIS EQUIPMENT ASSISTS IN PRECISE DESIGN VERIFICATION



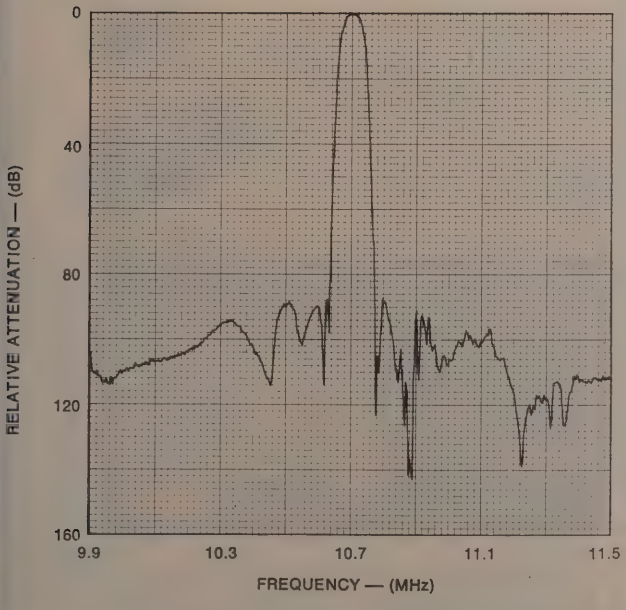
- Proven Design Capability from LF to VHF
- Unsurpassed Data Measurement Resolution and Precision
- Quick-Turnaround Prototype Design, Fabrication and Test
- Complete Network Characterization Using Newest Digital Normalizing Techniques

FILTER DESIGN CAPABILITY

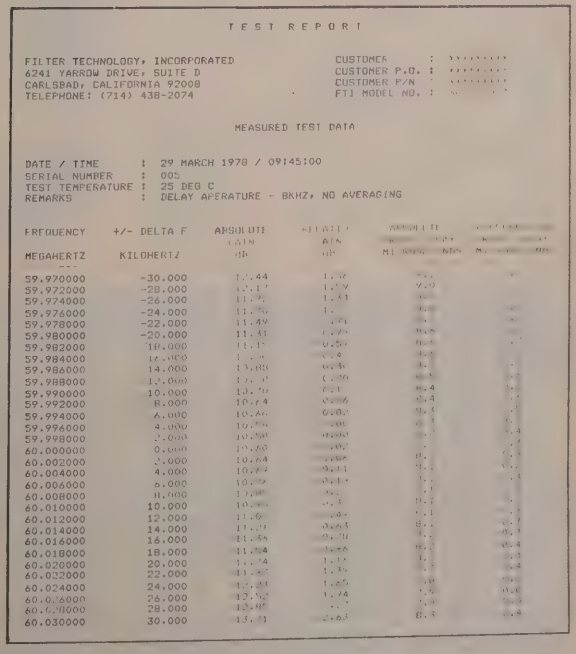
REQUIREMENT	FREQUENCY RANGE LF	MF	HF	VHF
Center Frequency (MHz)	0.258	1.65	10.7	60.0
3 dB Bandwidth — min (kHz)	3.4*	3.0	50	50**
Insertion Loss (dB)	5.5/7.5	<6	<8	10±1
Differential Group Delay (μs)	<55***	<15	<8	<2
In-Band Ripple — max (dB)	0.5	N/S	0.5	N/S
Minimum Rejection (dB)	62	40	80	55
@ Bandwidth (kHz)	4.6	6.0	150	1100
Ultimate Rejection (dB)	76	60	90	55

* 0.6 dB Bandwidth
** 2 dB Bandwidth
*** Over 2.8 kHz

HIGH RESOLUTION DIGITAL PLOTTING PERMITS ACCURATE STOPBAND VISUALIZATION



AUTOMATED TESTING AND DATA COLLECTION PROVIDES DETAILED PERMANENT RECORDS



TEST REPORT

FILTER TECHNOLOGY, INCORPORATED
6241 YARROW DRIVE, SUITE D
CARLSBAD, CALIFORNIA 92008
TELEPHONE: (714) 438-2074

CUSTOMER :
CUSTOMER P.O. :
CUSTOMER P/N :
FTI MODEL NO. :

MEASURED TEST DATA

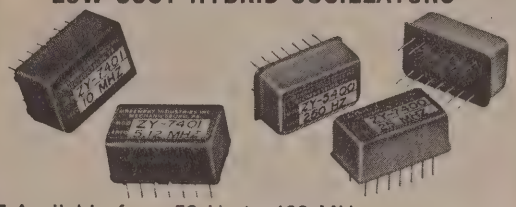
DATE / TIME : 29 MARCH 1978 / 09145:00
SERIAL NUMBER : 005
TEST TEMPERATURE : 25 DEG C
REMARKS : DELAY APERATURE - 8KHZ, NO AVERAGING

FREQUENCY	+/- DELTA F	ABSOLUTE LOSS	RIPPLE	ABSOLUTE	
MEGAHERTZ	KILOHERTZ	dB	dB	MI	MS
59.970000	-30.000	1.44	1.37		
59.972000	-28.000	1.17	1.09		
59.974000	-26.000	1.15	1.11		
59.976000	-24.000	1.			
59.978000	-22.000	1.14			
59.980000	-20.000	1.11			
59.982000	-18.000	1.1			
59.984000	-16.000	1.			
59.986000	-14.000	1.			
59.988000	-12.000	1.			
59.990000	-10.000	1.			
59.992000	-8.000	1.			
59.994000	-6.000	1.			
59.996000	-4.000	1.			
59.998000	-2.000	1.			
60.000000	0.000	1.			
60.002000	2.000	1.			
60.004000	4.000	1.			
60.006000	6.000	1.			
60.008000	8.000	1.			
60.010000	10.000	1.			
60.012000	12.000	1.			
60.014000	14.000	1.			
60.016000	16.000	1.			
60.018000	18.000	1.			
60.020000	20.000	1.			
60.022000	22.000	1.			
60.024000	24.000	1.			
60.026000	26.000	1.			
60.028000	28.000	1.			
60.030000	30.000	1.			

CALL OR WRITE TODAY FOR COMPLETE INFORMATION, ATTENTION BOB CRAWFORD OR DOUG HEYDON
6241 YARROW DRIVE, SUITE D, CARLSBAD, CALIFORNIA 92008 TELEPHONE (714) 438-2074

Oscillators .01 Hz to 600 MHz

LOW COST HYBRID OSCILLATORS

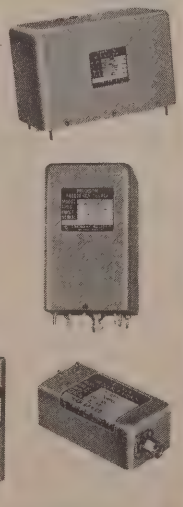


- Available from 50 Hz to 100 MHz
- Small size—typically .8 × .5 × .3″ (L-W-H) or less
- Stabilities up to $\pm 1 \times 10^{-6}$
- Outputs: To drive TTL, CMOS, ECL or sine wave
- Temperature ranges from laboratory up to −55° to +125°C
- Most units fit DIP socket
- Some units available from stock

CRYSTAL OSCILLATORS and TEMPERATURE COMPENSATED CRYSTAL OSCILLATORS

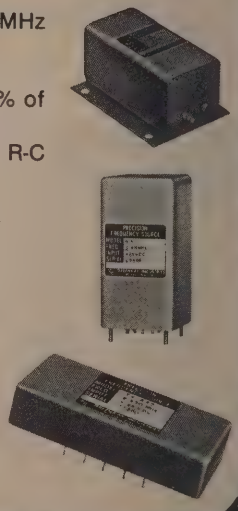
- Available from 1 Hz to 600 MHz
- Many size, mounting, and connector configuration
- Stabilities up to $\pm 5 \times 10^{-7}$
- Output levels from 1 mw to 10 watts, or outputs to direct drive TTL, CMOS or ECL logic are available
- Temperature ranges from laboratory up to −55° to +125°C
- Low phase noise designs—off-the-shelf

HIGH STABILITY OSCILLATORS



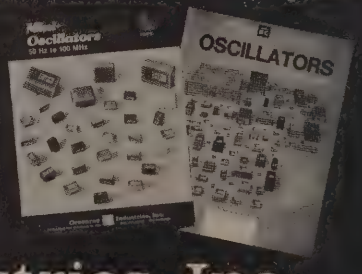
- Available from 1 Hz to 600 MHz
- Stabilities up to $\pm 5 \times 10^{-10}$
- Outputs in sine wave or to direct drive all popular logic types
- Temperature ranges from Laboratory up to −55° to +125°C
- Low single sideband phase noise versions
- Short term stabilities up to 1×10^{-12}/second
- Dual proportional oven designs available
- Many low power oven designs available
- Low aging designs

VOLTAGE CONTROLLED OSCILLATORS



- Available from 1 Hz to 600 MHz
- Voltage controlled crystal oscillators will supply frequency deviation to ±1% of center frequency
- Voltage controlled L-C and R-C oscillators will supply frequency deviation to ±30% of center frequency
- Outputs in sine wave or to direct drive all popular logic types
- Stabilities up to $\pm 1 \times 10^{-9}$
- Temperature ranges from Laboratory up to −55° to +125°C
- Excellent for phase locked loop applications.

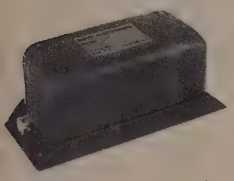
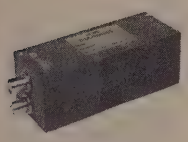
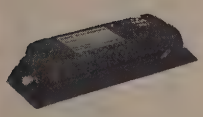
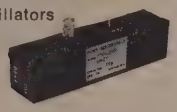
GREENRAY INDUSTRIES, INC. manufactures a complete line of oscillators for all applications. Units may be custom designed to your exact requirements.
Call or write for your copy of our latest catalogs or to discuss a new requirement you may have.



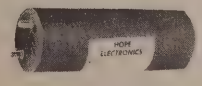
Greenray Industries, Inc.
840 West Church Road, Mechanicsburg, Pa. 17055
Phone: (717) 766-0223 TWX: 510-650-4939

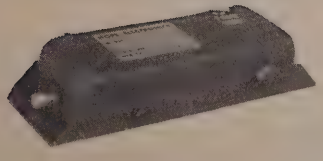
HOPE ELECTRONICS

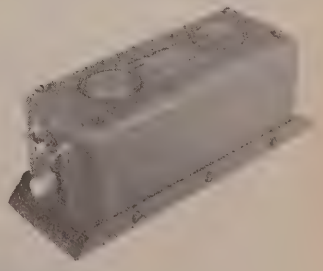
CRYSTAL OSCILLATORS AND FREQUENCY SOURCES

	Frequency Range	Tuning Range	Stability	Power Output	Tuning	Model	Price 1-24
Crystal Oscillators 	70 KHZ-99 KHZ 100 KHZ-499 KHZ 500 KHZ-849 KHZ 850 KHZ-1.499 KHZ 1.5 MHZ-59 MHZ 60 MHZ-79 MHZ 80 MHZ-139 MHZ 140 MHZ-300 MHZ	Crystal Oscillators Fixed Frequency	0.005% —20°C to +50°C	>10 mw	Center Frequency Adjust For Crystal Aging Compensation	EXO-10	$135.00 $135.00 $135.00 $100.00 $100.00 $100.00 $120.00 $130.00
	10 HZ-99 HZ 100 HZ-999 HZ 1 KHZ-9 KHZ 10 KHZ-99 KHZ 100 KHZ-999 KHZ 1 MHZ-10 MHZ		0.005% —50° to +75°C	10V P-P into 1K Sine or Square Wave		XO-10V	$250.00 $225.00 $200.00 $175.00 $150.00 $100.00
	1 MHZ-3 MHZ 4 MHZ-60 MHZ 61 MHZ-80 MHZ 81 MHZ-140 MHZ 141 MHZ-240 MHZ 241-MHZ-300 MHZ 301 MHZ-400 MHZ 401 MHZ-600 MHZ		0.005% —50° to +75°C	>10 mw		XO-10	$150.00 $135.00 $135.00 $150.00 $170.00 $180.00 $190.00 $250.00
	1 MHZ-60 MHZ 61.1 MHZ-120 MHZ 120.1 MHZ-180 MHZ 180.1 MHZ-240 MHZ 240.1 MHZ-400 MHZ		0.005% —50° to +75°C	>100 mw Adjustable 20 db Range >50 mw Adjustable 20 db Range		XO-100	$250.00 $275.00 $295.00 $325.00 $350.00
	1 HZ-1 KHZ 1 KHZ-100 KHZ 100 KHZ-10 MHZ		0.005% —20°C to +50°C	Square Wave 4V into 50		ICXO-4	$120.00 $100.00 $80.00
L C Oscillators 	100 KHZ-300 MHZ 200 MHZ-1000 MHZ	±25% of Center Frequency	100 ppm/°C	>10 mw	Mechanical Screw Adjustment	FTO-10A FTO-10B	$95.00 $150.00
	100 KHZ-300 MHZ 200 MHZ-1000 MHZ	±5% of Center Frequency		>100 mw		FTO-100A FTO-100B	$95.00 $150.00
Voltage Tunable Oscillators	100 KHZ-300 MHZ 200 MHZ-1000 MHZ	±10% of Center Frequency	100 ppm/°C	>10 mw	Electrical 0 to 30V	VCO-10A VCO-10B	$125.00 $150.00
	100 KHZ-300 MHZ 200 KHZ-1000 MHZ	±5% of Frequency		>50 mw		VCO-100A VCO-100B	$150.00 $175.00

HUNDREDS OF CUSTOM MODELS AVAILABLE







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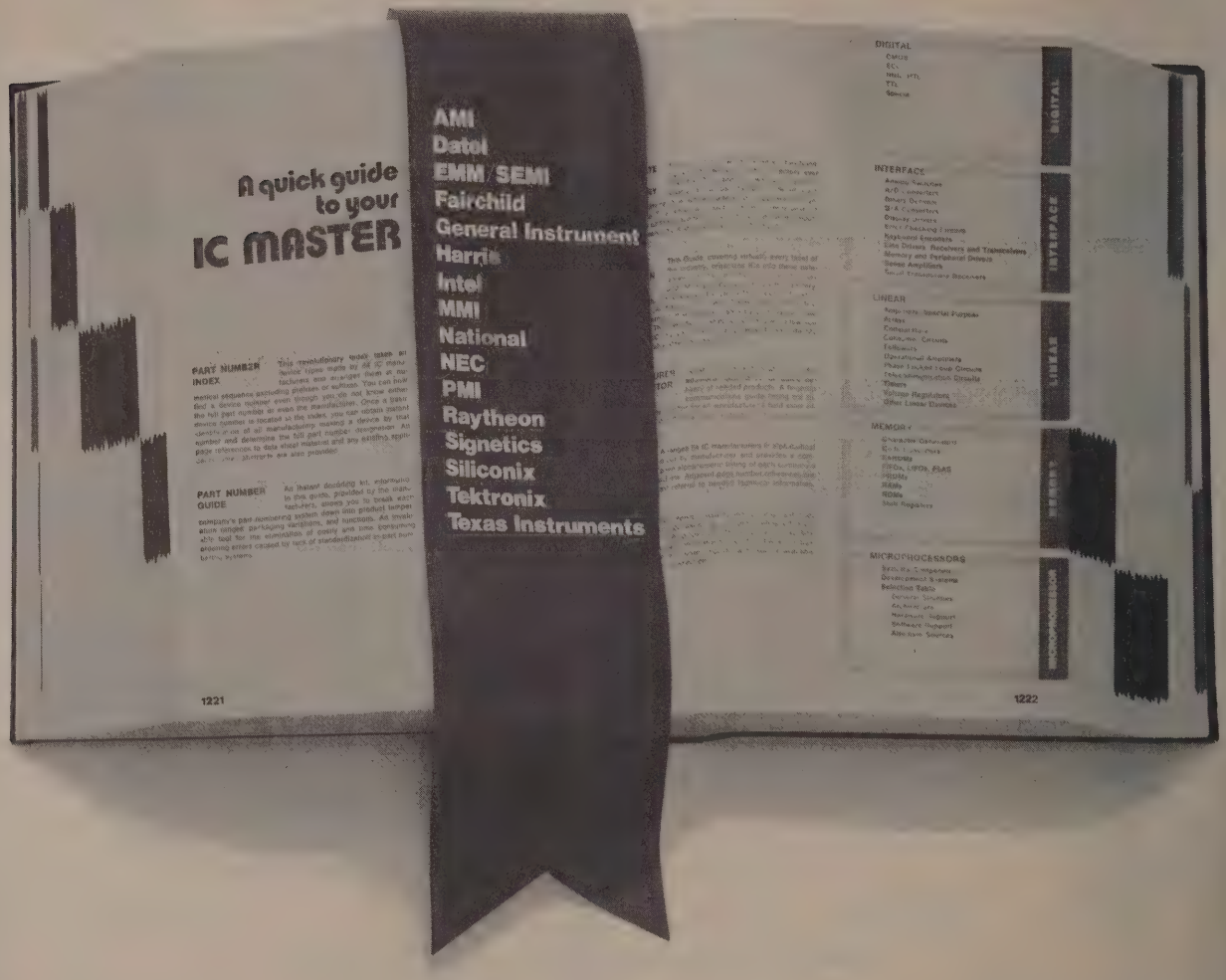
A GOOD BOOK IS KNOWN BY THE COMPANIES IT KEEPS



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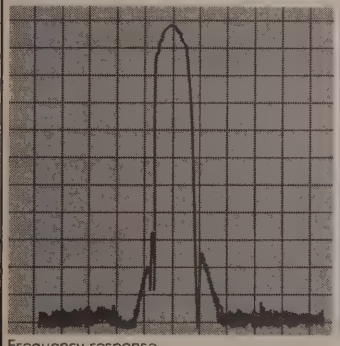
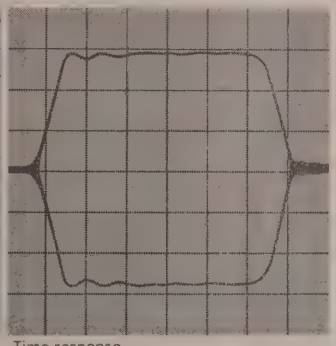
It's Faster With the Master

Hughes Frequency Control Devices

Complex crystal filter shown with typical attenuation and time response characteristics.



Frequency response



Time response

Crystal Filters
- Bandpass filters—shape factors to 1.15:1 (60 to 3dB)
- Band reject filters—shape factors to 1.5:1 (60 to 3dB)
- Upper sideband filters—shape factors to 1.11:1 (60 to 3dB)
- Lower sideband filters—shape factors to 1.11:1 (60 to 3dB)
- Gaussian (linear phase) filters—shape factors to 5:1 (60 to 3dB)
- Phase (or delay) compensated filters (to ± 1%)—shape factors to 1.15:1 (60 to 3dB)
- Frequency selection: 20 kHz to 125 MHz
- Percent bandwidth range: .005 to 5.0

Discriminators—Frequencies/bandwidths similar to filters

TCXOs
- Computer synthesized selection of components
- Small size, light weight, low power drain, instant warmup
- Frequency range: 1 Hz to 200 MHz
- Frequency stability: ± 1 ppm over −55° to +85°C or ±.1 ppm over 0° to +70°C

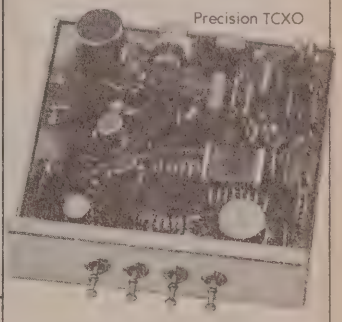
TC/VCXOs
- Frequency range to 200 MHz
- Frequency deviation to ± 3000 ppm
- Deviation sensitivity to ± 250 ppm/volt, or as desired
- Linearity to ± 1% of best straight line
- Short term stability to ± 1 ppm/sec.
- Frequency stability: ± 1 ppm over −55° to 85°C or ± .1 ppm over 0° to +70°C

Hybrid Oscillators
- TO-5, TO-8, E-7, DIP configurations
- TTL, CMOS compatible
- Frequency range: 1 Hz to 40 MHz
- Frequency stability: ± 40 ppm over −55° to +125°C
- Capable of meeting MIL-STD-883

TO-8 Hybrid Oscillator

(with crystal removed)

Note: Input voltages from ± 5 VDC to ± 50 VDC are acceptable for all oscillators. Input power, dependent on application, can be as low as 10 mW.



Precision TCXO

All Hughes' filters, discriminators and oscillators are capable of meeting military, commercial or space-qualified environments. For more information, send for six-page frequency control device brochure describing Hughes' custom and standard product capabilities.

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Microelectronic Products Division
500 Superior Avenue, Dept. E8
Newport Beach, California 92663.
Telephone (714) 759-2411.

HUGHES
HUGHES AIRCRAFT COMPANY
MICROELECTRONIC & PRODUCTS DIVISION

ICM Low Frequency Crystals

70 KHz – 999 KHz

On this page we present our four most popular crystal mountings and the data for the crystals available in these mountings according to the various frequency ranges.

mode of oscillation
70-200 KHz . . . Length Shear
185-599 KHz . . . Edge Shear
600-999 KHz . . . Shear

shunt capacitance 7 pf (Maximum)
70-200 KHz . . . 10,000- 7,000 Ohms
200-500 KHz . . . 6,500-11,000 Ohms
800-999 KHz . . . 625 Ohms

drive (Maximum)
70-499 KHz 2 Milliwatts
500-999 KHz 10 Milliwatts

REMEMBER: Just any crystal and just any oscillator will not combine to produce designated spot frequencies!

DESCRIPTION AND DATA: All of these crystals are of the plated, wire mounted type. Low drift, AT-cut blanks are used in these units above 600 KHz, and low drift CT-cut, DT-cut, SL-cut, and 5°X blanks are used in units below 600 KHz. Any crystal can be supplied for operation with or without an oven.

TYPE SPECIFICATIONS

1. **General Purpose** (GP) crystals will be calibrated to within ±.02% of frequency when operated into the customers specified fundamental load capacitance only (32 pf will be used when none is specified).
GP crystals 500-999 KHz will hold temperature tolerance of ±.005% from —30° to 60°C and ±.02% for frequencies below 500 KHz.
2. **Commercial Standard** (CS) crystals will be calibrated as noted below, as specified for operation in customers load. CS crystals will hold temperature tolerance ±.003% —30° to 60°C above 600 KHz and ±.02% below 600 KHz.

CIRCUIT: As specified by customer. Crystals are available for all major two-way equipment and in most cases the necessary correlation data is on file. Where circuit is not specified, the crystal will be calibrated for operation into a load capacitance of 32 mmf.
The CS series of crystal units is available to commercial or military specifications demanding tight frequency tolerance, long term stability and low frequency response.

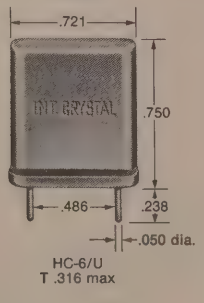
WHEN ORDERING — SPECIFY THE FOLLOWING FOR EACH CRYSTAL

A. Crystal frequency
B. Type GP or CS
C. Calibration temperature (Room temperature or over 60°C)
D. Holder (see below)
E. Circuit load and correlation data.

Note: For GP specify 10, 20 or 32 pf. Do not specify equipment types in the case of GP crystals. These are made only to 10, 20 or 32 pf load. When circuit load is not specified crystals will be correlated for a 32 pf load.

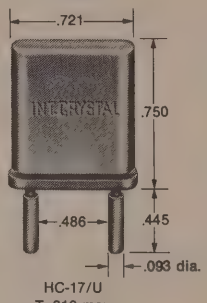
FREQUENCY	TYPE	
	GENERAL PURPOSE (1)	COMMERCIAL STANDARD (2)
	Calibration Tolerance As Noted	Calibration Tolerance As Noted
70- 99 KHz	.02% $24.00	.01% $27.50
100-199 KHz	.02% 14.30	.01% 16.30
200-599 KHz	.02% 14.30	.01% 16.30
600-849 KHz	.01% 37.50	.0025% 39.50
850-999 KHz	.01% 14.30	.0025% 16.30

F-605



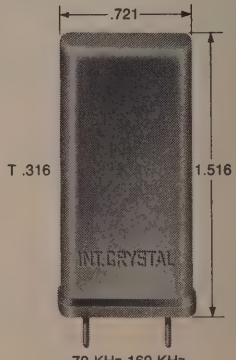
HC-6/U
T .316 max

F-609



HC-17/U
T .316 max

F-13



70 KHz-160 KHz
HC-13/U
(70-99 KHz 2.5" height)

HOW TO ORDER:

MAIL: International Crystal Mfg., Inc., 10 North Lee, Oklahoma City, Okla. 73102
PHONE: Area Code 405 236-3741
WESTERN UNION TELEX: 747-147
CABLE: INCRYSTAL
BELL SYSTEM TWX: 910-831-3177

ICM

INTERNATIONAL CRYSTAL MFG. CO., INC.
10 North Lee / Oklahoma City, Okla 73102

ICM Medium Frequency Crystals

1 MHz — 25 MHz

FUNDAMENTAL TYPE

TYPE SPECIFICATIONS

1. **GENERAL PURPOSE** (GP) crystals will be calibrated to within ±.01% of frequency when operated into 10, 20 or 32 pf load capacitance only (32 pf will be used when none is specified.)
   GP crystals will hold temperature tolerance of ±.005% from —30° to 60°C.
2. **COMMERCIAL STANDARD** (CS) and (CS-1) crystals will be calibrated to either .0025% or .001% as specified for operation in customer's load. CS crystal will hold temperature tolerance ±.003% −30° to 60°C.
3. A calibration tolerance of ±.001 (or special) can only be obtained when a definite circuit load capacitance and drive level are specified. Where a definite load capacitance is not specified and correlation is required from a copy of the intended circuit a tolerance of ±.01%, should be expected.
4. **HIGH ACCURACY** (HA) and (HA-5) crystals are for use in circuits where tolerances better than ±.002% −30° to 60°C are required. Tolerances of .0005% (HA-5) over the range −30° to 60°C will require circuit compensation. Without compensation the range will be limited to −10° to 60°C. Compensators are not included with the crystals and tolerance is for crystals only and does not allow for any change in circuit parameters over the temperature range.

mode of oscillation
1-25 MHz Shear AT

shunt capacitance
9 pf (Max.)

resistance
1.000- 1.499 MHz 490 ohms
1.500- 1.999 MHz 375 ohms
2.000- 2.999 MHz 270 ohms
3.000- 3.999 MHz 150 ohms
4.000-25.000 MHz 75 to 25 ohms

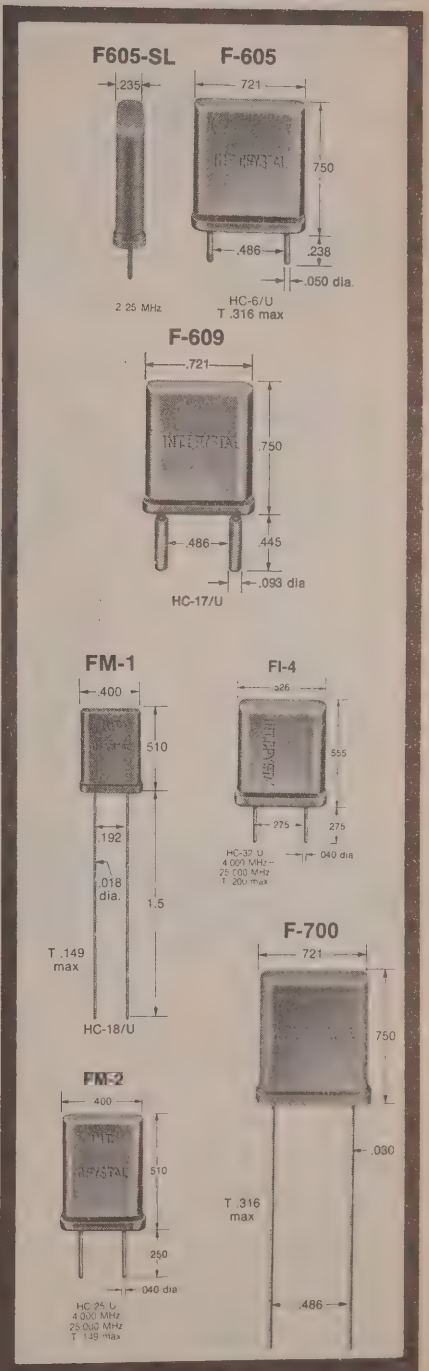
drive (max.)
1.000- 9.999 MHz 10 milliwatts
10.000-22.000 MHz 4 milliwatts
22.000-25.000 MHz 1 milliwatt

*Available 2-2.99 MHz
**FM Holder Available above 6 MHz

FREQUENCY	TYPE				
	GENERAL PURPOSE(1)	COMMERCIAL STANDARD(2)		HIGH ACCURACY (4)	
	Calibration Tolerance	Calibration Tolerance (3) .001% / CS — 1		Temperature Tolerance +10° to +50°	
	.01%	.0025%	Special (3)	.002%	.0005%
1.000- 1.499 MHz	$ 9.40	$12.40	$15.00		
1.500- 2.999 MHz	7.40	8.30	9.40	$ 9.40*	
3.000-10.999 MHz**	5.90	6.35	7.35	7.90	$10.90**
11.000-19.999 MHz	7.40	8.30	9.40	9.40	10.90
20.000-25.000 MHz	9.40	11.40	12.40	12.40	13.90

WHEN ORDERING — SPECIFY THE FOLLOWING FOR EACH CRYSTAL

A. Crystal frequency
B. Type — GP, CS, or HA
C. Calibration tolerance — .0025% or .001% / Special (not required for GP as this type is supplied only in .01%).
D. Calibration temperature (room temperature or over 60°C, 75°C, 85°C.
E. Holder (see below)
F. Circuit load and correlation data
Note: For GP specify 10, 20 or 32 pf. Do not specify equipment types in the case of GP crystals. These are made only to 10, 20 or 32 pf load. When not specified crystals will be correlated for a 32 pf load.



HOW TO ORDER:

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PHONE: Area Code 405 236-3741 **CABLE:** INCRYSTAL
WESTERN UNION TELEX: 747-147 **BELL SYSTEM** TWX: 910-831-3177

ICM

INTERNATIONAL CRYSTAL MFG. CO., INC.
10 North Lee / Oklahoma City, Okla. 73102

ICM High Frequency Crystals

15 MHz — 160 MHz

Crystals for use in military equipment can be supplied to conform to specifications of MIL-C-3098E

MODE OF OSCILLATION	
15- 75 MHz	Shear third mechanical overtone AT
61-110 MHz	Shear fifth mechanical overtone AT
111-140 MHz	Shear seventh mechanical overtone AT
141-160 MHz	Shear ninth mechanical overtone AT

Shunt Capacitance .....9 pf (Max.)

RESISTANCE ((Max.)	
15- 75 MHz	..... 40 ohms
61-110 MHz	..... 60 ohms
111-140 MHz	..... 80 ohms
141-160 MHz	.....100 ohms

Drive (Max.) .....2 milliwatts

TYPE SPECIFICATIONS

1. **General Purpose** (GP) crystals will be calibrated to within ±.01% of frequency when operated into the customer's specified circuit load only. When none is specified series resonance will be used.
   GP overtone crystals will hold temperature tolerance of ±.005% from —30° to 60°C.
2. **Commercial Standard** (CS) and (CS-1) crystals will be calibrated to either .0025% (CS) or .001% (CS-1) as specified for operation in customer's load. CS crystal will hold temperature ±.003% —30° to 60°C.
3. A calibration tolerance of ±.001% (or special) can only be obtained when a definite circuit load and drive level are specified. Where a definite load is not specified and correlation is required from a copy of the intended circuit a tolerance of .01% should be expected.
4. **High Accuracy** (HA) and (HA-5) crystals are for use in circuits where tolerances better than ±.002% —30° to 60°C are required. Tolerances of .0005% over the range —30° to 60°C will require circuit compensation. Without compensation the range will be limited to —10° to 60°C. Compensators are not included with the crystals and tolerance is for crystals only and does not allow for any change in circuit parameters over the temperature range.

FREQUENCY MHz		TYPE				
		General Purpose(1)	Commercial Standard(2)		High Accuracy (3) (4)	
		Calibration Tolerance	Calibration Tolerance	(3) CS-1	Temperature Tolerance +10° to +60°	
		.01%	.0025%	.001%/Special	.002%	.0005%
15- 75	(3rd)	$ 6.40	$ 8.30	$ 9.20	†$10.90	†$13.15
61- 79	(5th)	7.30	12.40	13.15		
80-110	(5th)	9.40	16.15	17.15		
111-139	(7th)	11.15	19.15			
140-160	(9th)	16.15	19.15			

WHEN ORDERING — SPECIFY THE FOLLOWING FOR EACH CRYSTAL

A. Crystal frequency

B. Type — GP, CS, or HA

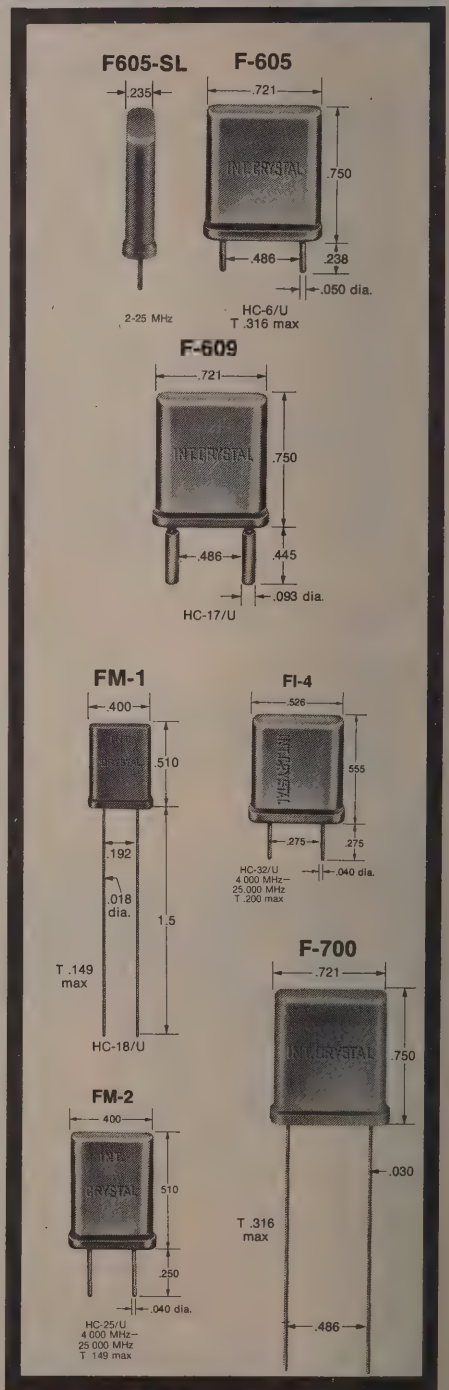
C. Calibration tolerance — .0025% or .001% / Special (not required for GP as this type is supplied only in .01%)

D. Calibration temperature — Room temperature or oven 85°C

E. Holder (see above)

F. Circuit load and correlation data — normal series resonate or anti-resonate
Note: Do not specify equipment types in the case of GP crystals.

*Other dimensions same as F-605
**Not supplied below 15 MHz
†Available in FM-1 and FM-2 holder only above 20 MHz



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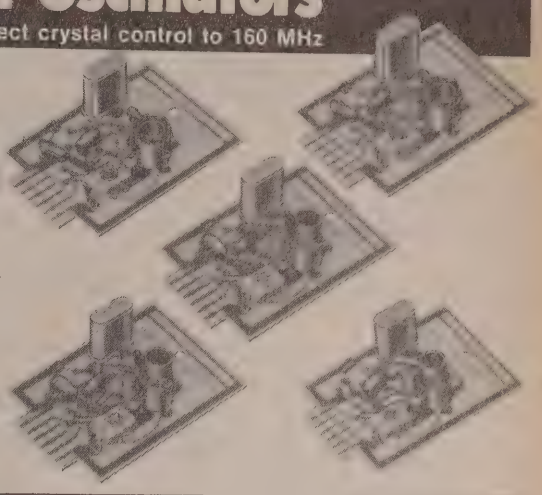
ICM

INTERNATIONAL CRYSTAL MFG. CO., INC.
10 North Lee / Oklahoma City, Okla. 73102

ICM Plug-in Transistor Oscillators

direct crystal control to 160 MHz



HIGH FREQUENCY (20 MHz — 160 MHz)

- Signal Generators For Receiver Alignment
- Quick-Change Plug-In Oscillators

Five transistor oscillators covering 20 MHz - 160 MHz. Standard 77°F calibration tolerance ± .0025%. The frequency tolerance is ±.0035%. Oscillator output is .2 volts (min.) across 51 ohms. Power requirement: 9 vdc @ 10 ma. max.

Catalog Number	Oscillator Type	Oscillator Range	Temperature Tol. -40°F to 150°F	Oscillator (Less Crystal) Price
035200	OT-124	20-40 MHz	±.0035%	$8.00
035201	OT-146	40-60 MHz	±.0035%	8.00
035202	OT-161	60-100 MHz	±.0035%	8.00
035203	OT-1140	100-140 MHz	±.0035%	8.00
035204	OT-1160	145-160 MHz	±.0035%	8.00

LOW FREQUENCY (70 KHz - 20,000 KHz)

- Band Edge Markers ▪ Frequency Markers For Oscilloscopes ▪ Portable Signal Standards
- Accessory Cases

Four transistor oscillators covering 70 KHz — 20,000 KHz. Trimmer capacitor for zeroing crystal. When oscillator is ordered with crystal the standard will be ±.0025%. Oscillator output is 1 volt (min.) across 470 ohms. Power requirement: 9 vdc @ 10 ma. max.

Catalog Number	Oscillator Type	Oscillator Range	Temperature Tol. -40°F to 150°F	Oscillator (Less Crystal) Price
035205	OT-11	70-150 KHz	±.015%	$8.00
035206	OT-12A	150-400 Khz	200-600 KHz±.01%	8.00
035207	OT-12	400-5,000 KHz	600-5,000 KHz±.0035%	8.00
035208	OT-13	2,000-12,000 KHz	±.0035%	8.00
035209	OT-14	10,000-20,000 KHz	±.0035%	8.00

OE Crystal Oscillator Elements

International's OE series of Crystal Oscillator Elements provide a complete crystal controlled signal source. The OE units cover the range 2000 KHz to 160 MHz. The standard OE unit is designed to mount direct on a printed circuit board. Also available is printed circuit board plug-in type.

The various OE units are divded into groups by frequency and by temperature stability. Models OE-20 and OE-30 are temperature compensated units. The listed "Overall Accuracy" includes room temperature or 25° C tolerance and may be considered a maximum value rather than nominal.

All OE units are designed for 9.5 to 15 volts dc operation. The OE-20 and OE-30 require a regulated source to maintain the listed tolerance with input supply less than 12 vdc.

Prices listed include oscillator and crystal. For the plug-in type add the suffix "P" after the OE number; eg OE-1P.

OE-1, 5 and 10 can be supplied to operate at 5 vdc with reduced rf output. Specify 5 vdc. when ordering.

Output — 10 dbm min. All oscillators over 66 MHz do not have frequency adjust trimmers.

Catalog	Oscillator Element Type	2000 KHz to 66 MHz	67 MHz to 139 MHz	140 MHz to 160 MHz	Overall Accuracy	25°C Tolerance
035213 035214 035215	OE-1 OE-1 OE-1	$13.50	$15.50	$19.50	±.01% −30° to +60°C	±.005%
035216 035217 035218	OE-5 OE-5 OE-5	$16.75	$19.75	$26.00	±.002% −10° to +60°C	±.0005% 2 − 66MHz ±.001% 67 to 139 MHz ±.0025% 140 to 160 MHz

Catalog Number	Oscillator Element Type	4000 KHz to 20000 KHz	Overall Accuracy	25°C Tolerance
035219	OE-10	$19.75	±.0005% −10° to +60°C	Zero trimmer
035220	OE-20	$29.00	±.0005% −30° to +60°C	Zero trimmer
035221	OE-30	$60.00	±.0002% −30° to +60°C	Zero trimmer

ICM

INTERNATIONAL CRYSTAL MFG. CO., INC.
10 North Lee / Oklahoma City, Okla. 73102

HOW TO ORDER:

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WESTERN UNION TELEX: 747-147 **BELL SYSTEM** TWX: 910-831-3177

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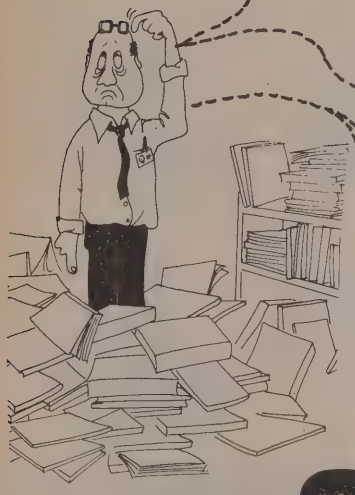

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OVENS

ISOTEMP RESEARCH, INC.

PRODUCTS

TCXO'S

- 1 HZ TO 50 MHZ
- SMALL SIZE
- LOW POWER
- ± 0.5 PPM – MOST TEMPERATURE RANGES
- TTL – CMOS – SINE OUTPUTS

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- 1 HZ TO 150 MHZ
- LOW POWER – FAST WARMUP
- AMBIENT STABILITIES 1×10^{-8} /°C TO 1×10^{-10} /°C
- AGING – TO 5×10^{-10} /DAY MOST STANDARD FREQUENCIES
- MECHANICAL CONFIGURATIONS TO MEET ALL NEEDS

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- 1 HZ TO 50 MHZ
- LOW COST
- ±10 PPM TO ± 1000 PPM TOLERANCES
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- SMALL SIZE

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McCOY ELECTRONICS COMPANY

a subsidiary of OAK Industries Inc.

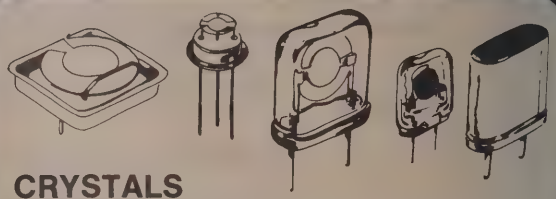
MT. HOLLY SPRINGS, PA. 17065 • 717-486-3411 - TWX: 510-650-3548

Nearly a quarter century of dedication to **Quartz Crystals, Filters,** and **Oscillators** has earned McCoy Electronics Company the foremost reputation for performance. McCoy's achievements have provided the base for extensive domestic sales representation and worldwide distribution. The versatility of design and capability in McCoy's precision components has placed them in the vanguard of not only the commercial and industrial crystal market, but also NASA's aerospace programs and computer systems for communication and defense, thus exemplifying the esteem accorded the McCoy product line.

McCoy customer service has grown in unison with the rapidly expanding McCoy technology. An additional plant facility now supplements the present vast engineering, manufacturing, and distribution capability—the foundation of the McCoy Company reputation. The unequaled versatility of custom manufacturing and resultant customer confidence are enhanced with ever increasing efficiency by our computer assisted design capability. Laboratory trial and error efforts are eliminated through the accurate analyses and directions provided by the computer.

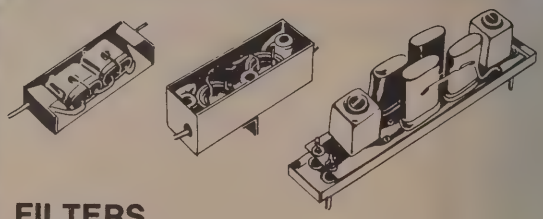
The McCoy name has been synonymous with quality in the crystal industry for more than two decades. Our catalog contains crystals, filters, and oscillators continually proven to be the ultimate in performance critique. The various components listed herein are supported by PC Board, chemical milling, and other photo-fabrication capabilities, and represent only a small cross section of products and services offered. Our many years of experience assure each customer that the industry's finest skills are at his command.

"ADVANCING CRYSTAL TECHNOLOGY FOR TWO DECADES"



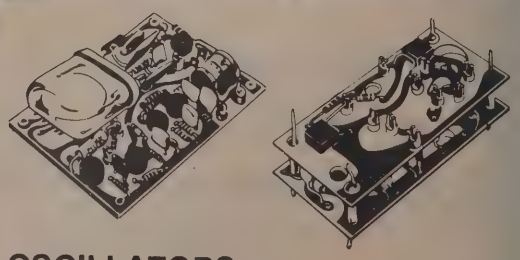
CRYSTALS

McCoy's leadership in crystal design and production permits precision blanks from 700 Hz to 250 MHz to be cut, angles controlled to within ±15″, and fundamental frequencies lapped to 45 MHz. Thousands of electrode masks, permitting maximum latitude in controlling motional parameters, give range and depth to McCoy's crystal capabilities.



FILTERS

Crystal filters from 1KHz to 250MHz are designed by computer assistance to exacting specifications. Monolithic filters, with spurious mode suppression capabilities, offer an infinite variety of designs for custom application.



OSCILLATORS

The precision standard, oven, temperature compensated (TCXO) and voltage controlled (VCXO) crystal oscillators each feature a matched McCoy crystal. Coupled with the McCoy expertise in manufacturing smooth discontinuity-free crystals, these oscillators offer unequaled performance when tailored to blend with the equipment or system needs.

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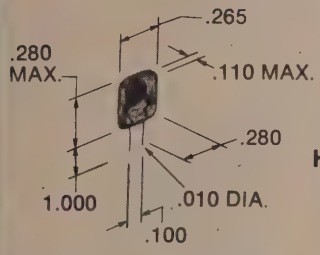
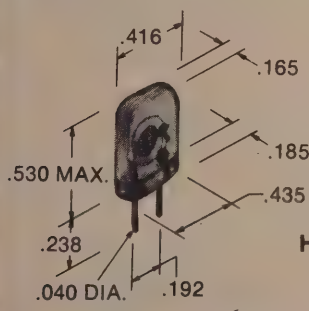
McCOY CRYSTALS

PRECISION GLASS CRYSTALS

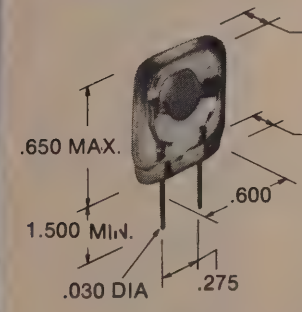


HOLDER SERIES MM
Frequency Range:
10 MHz to 250 MHz

HOLDER SERIES G-20
Frequency Range:
5 MHz to 100 MHz



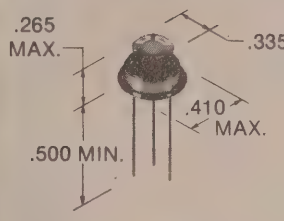
HOLDER SERIES G-21
Frequency Range:
5 MHz to 100 MHz



HOLDER SERIES G-30
Frequency Range:
3 MHz to 100 MHz

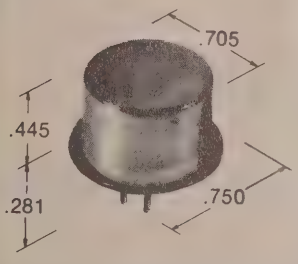
HOLDER SERIES G-31
Frequency Range:
3 MHz to 100 MHz

COLD WELD CRYSTALS

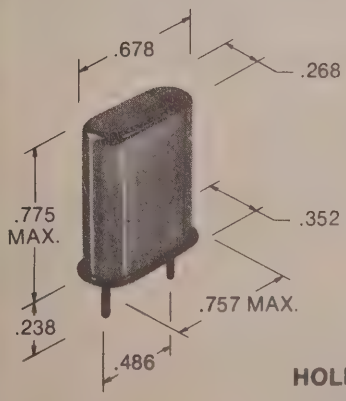


HOLDER SERIES W-6
Frequency Range:
10 MHz to 250 MHz

HOLDER SERIES W-7
Frequency Range:
3 MHz to 250 MHz



HOLDER SERIES W-8
Frequency Range:
0.8 MHz to 250 MHz



HOLDER SERIES W-1
Frequency Range:
1 MHz to 250 MHz

HOLDER SERIES W-10
Frequency Range:
1 MHz to 250 MHz

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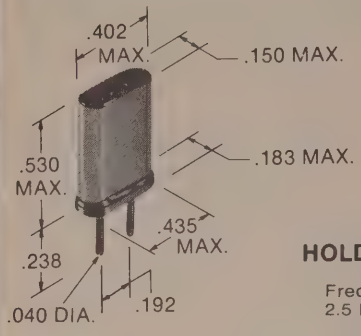
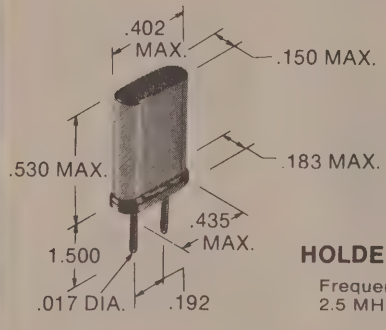
McCOY CRYSTALS

SOLDER SEAL CRYSTALS



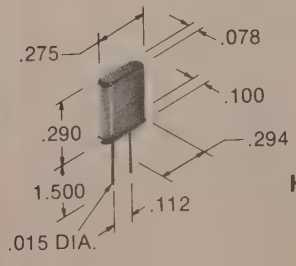
HOLDER SERIES M-21

Frequency Range:
2.5 MHz to 250 MHz



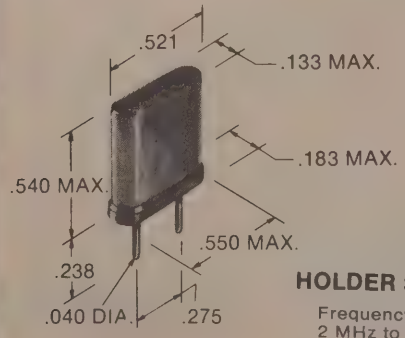
HOLDER SERIES M-20

Frequency Range:
2.5 MHz to 250 MHz



HOLDER SERIES M-60

Frequency Range:
12.5 MHz to 250 MHz

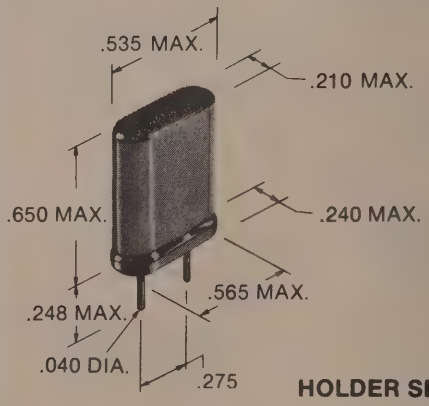


HOLDER SERIES M-41

Frequency Range:
2 MHz to 250 MHz

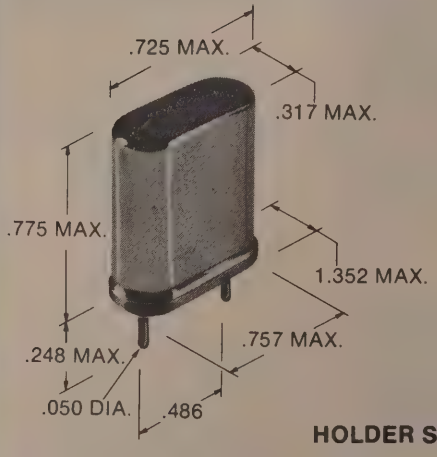
HOLDER SERIES M-28

Frequency Range:
2 MHz to 250 MHz



HOLDER SERIES M-25

Frequency Range:
2 MHz to 250 MHz



HOLDER SERIES M-1

Frequency Range:
0.7 MHz to 250 MHz

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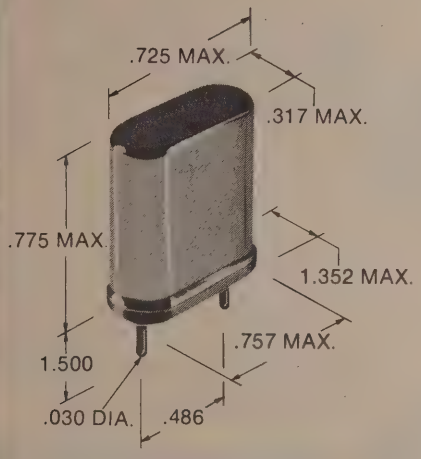
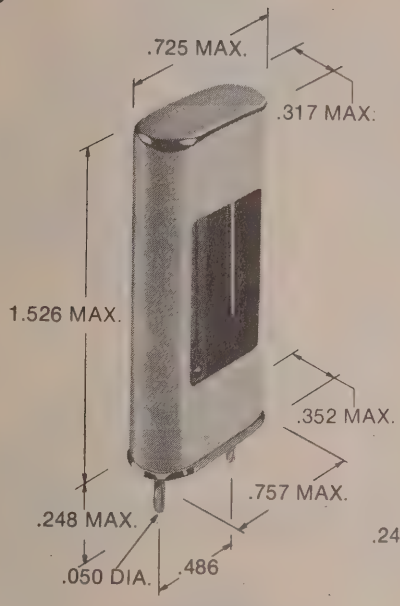
McCOY CRYSTALS

SOLDER SEAL CRYSTALS



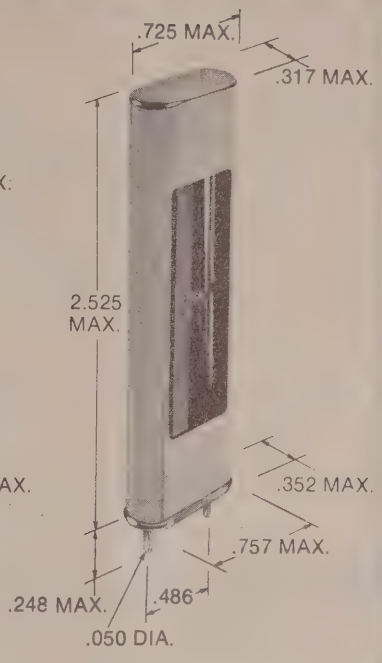
HOLDER SERIES M-4

Frequency Range:
0.7 MHz to 250 MHz



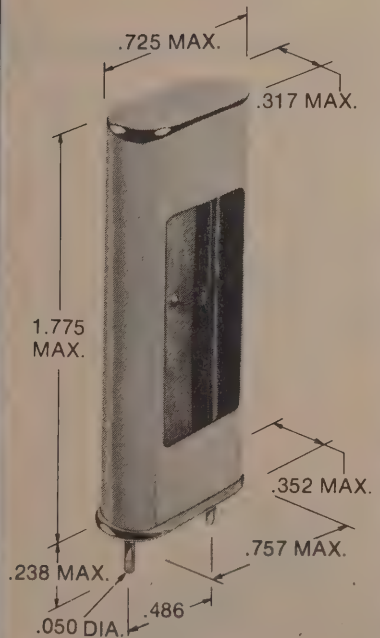
HOLDER SERIES M-22

Frequency Range:
4 Hz to 15 KHz



HOLDER SERIES M-22A

Frequency Range:
700 Hz to 1.5 KHz



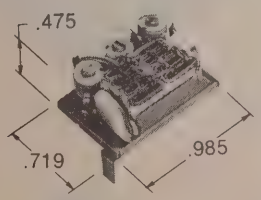
HOLDER SERIES M-22B

Frequency Range:
1.5 Hz to 4 KHz

McCOY CRYSTAL FILTERS

Filter
MODEL 80B36

F_o 57.836 MHz



SPECIFICATIONS

Package FM 3965
3db BW ±25 KHz min.
45db BW 140 KHz max.
Insertion Loss: 6db max. @ RT, 7db over temp.
Ripple: 1db max. @ RT, 2db over temp.
Temperature Range: −54° to +100° C
Source/Load Impedance: 50Ω
Shock: MIL-F-18327, Method I
Vibration: MIL-STD-202, Method 204B, Test Condition A
Spurious Response Attenuation:
35db min. from 58.036 to 58.236 MHz
45db min. from 10 to 57.766 MHz and 58.236 to 150 MHz

Filter
MODEL 20B94

F_o 17.000 MHz

SPECIFICATIONS

Package FM 2856
3db BW ±115 KHz min
40db BW ±400 KHz max.
Insertion Loss: 4db max
Ripple: ±1db max.
Temperature Range: −55° to +105° C
Source/Load Impedance: 50Ω

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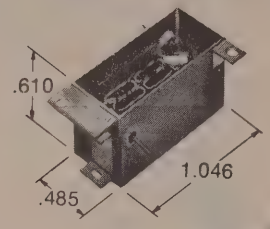
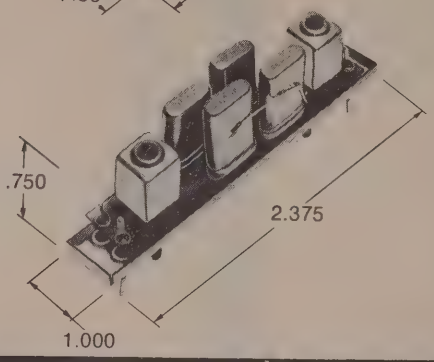
McCOY CRYSTAL FILTERS

Filter
MODEL 2B164
F_o 30.000 MHz



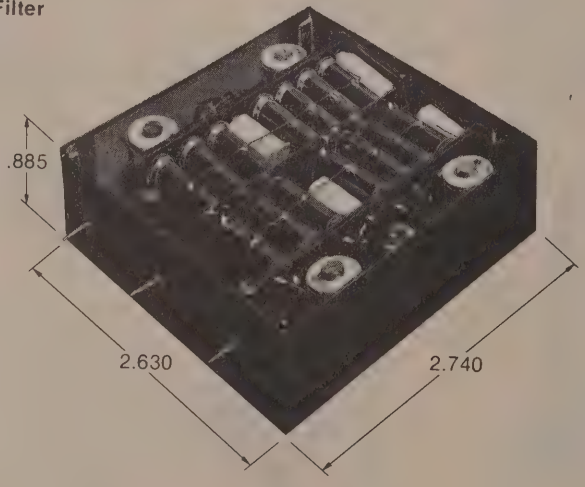
SPECIFICATIONS
Package FM 3389
3db BW ±31.8 KHz min.
6db BW ±34.5 KHz min.
60db BW ±57 KHz max.
Insertion Loss: 3db max.
Ripple: 1db max. over ±25 KHz
Ultimate Attenuation: 60db min.
Temperature Range: −55° to +105° C
Source Impedance: 2000 Ω
Load Impedance: 50 Ω

Filter
MODEL 53B20
F_o 455.000 KHz



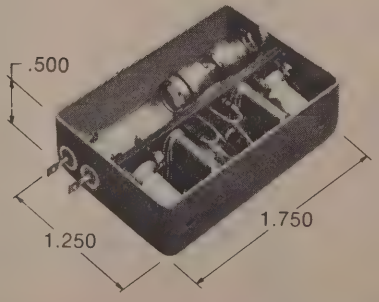
SPECIFICATIONS
Package FM 3361
3db BW ±150 KHz min.
60db BW ±925 KHz max.
Transmission Loss: 14db max.
Ripple: 3db max.
Ultimate Attenuation: 60db min.
Temperature Range: −40° to +85° C
Transfer Impedance: 6500 Ω ±20%

Single Sideband Filter
MODEL 20B110
F_o 1.750 MHz



SPECIFICATIONS
Package FM 2871
BW min. @ 1db F_o +295Hz to F_o +3100Hz
BW max. @ 60db F_o −125Hz to F_o +3975Hz
Insertion Loss: 5db max.
Ripple: 1db max. over 1db BW
Temperature Range: −40° to +70° C
Intermodulation Distortion Levels: At least 65db below two equal level (100mv.) signals, F_o +900Hz and F_o +2800Hz, applied simultaneously
Source/Load Impedance: 500Ω
Shock: MIL-STD-202, Method 205, Test Conditions set forth in para 4.8.11.1 of MIL-F-39025
Vibration: MIL-STD-202, Method 204A, Test Condition A
Carrier Attenuation: @ F_o 40db min.
Differential Delay: 400 ms. max. over the band defined from F_o +800 Hz to F_o +3050 Hz

Crystal Discriminator
MODEL 6D1
F_o 11.000 MHz



SPECIFICATIONS
Package D1007
Peak-Peak BW: ±20 KHz
Linear BW: ±15 KHz
Linearity: ±3%
Sensitivity: .75 v/KHz
Driver Source Impedance: 1000 Ω
Discriminator Load Impedance: 75000 Ω
Drive Level: 3VRMS @ F_o
Temperature Range: +10° to +50° C

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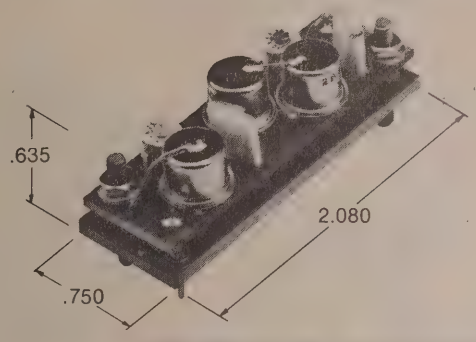
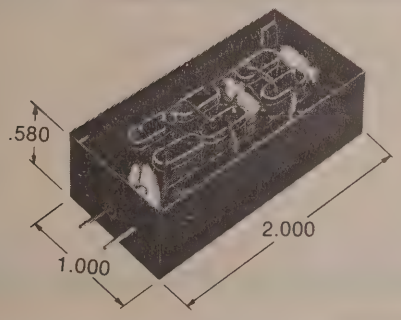
McCOY CRYSTAL FILTERS

Filter
MODEL 2B308
F_o 25.500 MHz



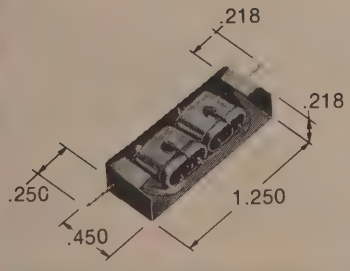
SPECIFICATIONS
Package FM 7055
6db BW ±34.5 KHz min.
60db BW ±80 KHz max.
Insertion Loss: 5db max.
Ripple: 1db max.
Temperature Range: −55° to +71° C
Source/Load Impedance: 2700 Ω
Shock: 50G^S 11ms
Vibration: 5-500 Hz 10G^S

Filter
MODEL 2B91
F_o 9.000 MHz



SPECIFICATIONS
Package FM 2561
3db BW ±6 KHz min. ±7 KHz max.
60db BW 51 KHz max.
Insertion Loss: 6db max.
Ripple: 1db max.
Ultimate Attenuation: 60db min.
Temperature Range: −40° to +70° C
Source Impedance: 450Ω
Load Impedance: 50 Ω

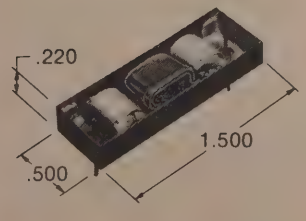
McCOY MONOLITHIC FILTERS



Monolithic Filter
MODEL 48Q3
F_o 11.500 MHz

Quality four pole space saver for miniaturized applications.

SPECIFICATIONS
Package FM 2885
3db BW ±10.5 KHz min
40db BW 59 KHz max.
Insertion Loss: 2.5db max.
Ripple: 1db max.
Ultimate Attenuation: 60db min
Temperature Range: −40° to +70° C
Source/Load Impedance: 2700 Ω



Monolithic Filters
MODELS 20Q4
1 through 16
F_o 11.000 - 15.000 MHz

Compact filter with termination matched to customer's requirement.

SPECIFICATIONS
Package FM 3919
3db BW ±7 KHz min
10db BW 32 KHz max.
20db BW 50 KHz max.
Insertion Loss: 2db max
Ripple: ±1db max.
Ultimate Attenuation: 30db min.
Temperature Range: −40° to +70° C
Source/Load Impedance: 50 Ω
Spurious Response Attenuation: 15db min

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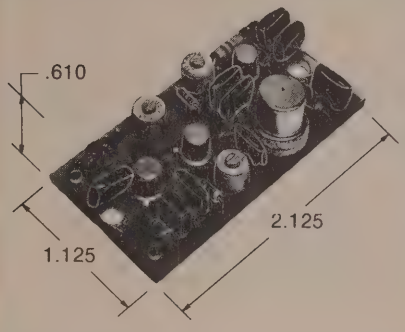
McCOY CRYSTAL OSCILLATORS

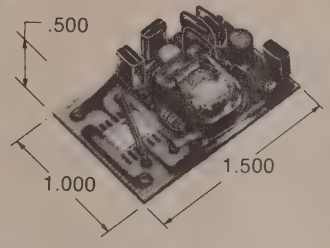


Crystal Controlled Oscillator
MODEL MC308X1

Multi-frequency crystal oscillator designed to allow the user to change frequency by inserting a new crystal and performing a simple retuning process.

SPECIFICATIONS

Frequency Range: 80 MHz to 110 MHz
Frequency Stability vs. Temperature Range (typical choices):
±20 PPM over −20° to +60° C from RT value
±50 PPM over −55° to +85° C from RT value
±100 PPM over −55° to +85° C from RT value
Frequency @ RT: Resolution of less than 1 PPM
Input Voltage: +12VDC ±2%
Input Current: 15ma. max.
Output:
7mw. min. into a 50Ω Load, sine wave, (−20° to +60° C)
5mw. min. into a 50Ω Load, sine wave, (−55° to +85° C)
Weight: 2 ounces max.
Mounting: Direct to printed circuit board using 4 wire leads
Package Volume: 1.63 cubic inches nominal
Crystal Type Used: TO-5 (McCoy Type W-6)



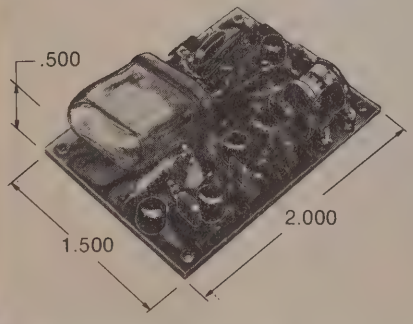
NOTE: Where height is critical, order MODEL MC210A1 which is the same as MC209A1 except height of .360 max.

Crystal Controlled Oscillator
MODEL MC209A1

An offshoot of our MC109A1, the MC209A1 is utilized where an extra logic is required, thus obtaining lower output frequencies. It uses all MIL-approved parts where required on government work.

SPECIFICATIONS

Frequency Range: 1.8 KHz to 650 KHz
Frequency Stability vs. Temperature Range (suggested values only):
1.8 KHz to 12 KHz
±150 PPM over −55° to +105° C
± 70 PPM over 0° to +50° C
12 KHz to 650 KHz
± 50 PPM over −55° to +105° C
±100 PPM over −55° to +105° C
± 30 PPM over 0° to +50° C
Input Voltage: +5VDC ±5%
Output: Logic
Seal: Hermetic
Weight: 1.5 ounces max.
Mounting: Direct PC Mount

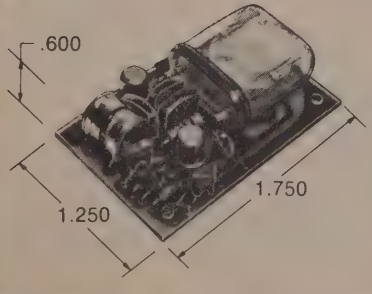


Temperature Compensated Crystal Oscillator
MODEL MC380A2

High Stabilities achieved with a single +5VDC input instead of 2 separate inputs.

SPECIFICATIONS

Frequency Range: 187.5 KHz to 25 MHz
Frequency Stability:
±0.5 PPM
±1.0 PPM
±2.0 PPM
±5.0 PPM
Temperature Range:
0° to +50° C
−10° to +70° C
−30° to +70° C
−40° to +85° C
Input Voltage: +5VDC ±1%
Output: TTL/DTL Compatible
Seal: Hermetic
Outside Trim: Available on request (5 PPM total pull)



Standard Oscillator
MODEL MC350X1

Versatile, economical crystal oscillator for PC board applications offering frequency trim adjustment and square wave output.

SPECIFICATIONS

Frequency Range: 188 KHz to 25 MHz
Frequency Stability: ±50 PPM
Temperature Range: −55° to +105° C
Frequency Accuracy at 25° C:
*Units with Trim - ±1 PPM
*Units without Trim - ±5 PPM
Input Voltage: +5VDC ±5%
Output: Compatible with TTL and DTL Logic
Seal: Hermetic
Weight: Less than 3 ounces
Package Size: 1.25 x 1.75 x .600
Volume: 1.312 cubic inches
*The frequency trim adjustment is optional and should be specified when required.

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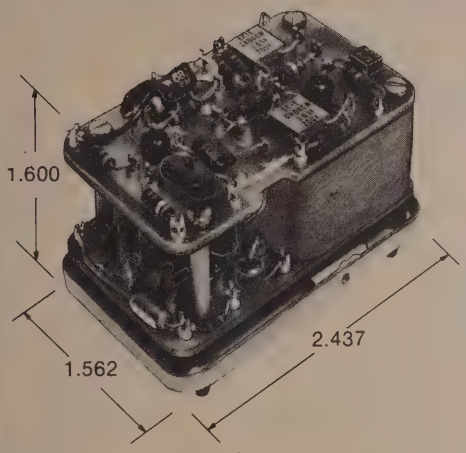
McCOY CRYSTAL OSCILLATORS



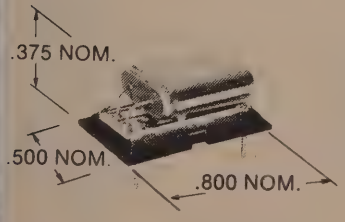
Oven Controlled Crystal Oscillator
MODEL MC645X4

Small, stable oven used where the upper ambient must be as high as +90° C.

SPECIFICATIONS

Frequency Range: 2.0 to 25 MHz
Frequency Stability: ±10 PPM over the temperature range
Temperature Range: −55° to +90° C
Input Voltage:
Oscillator: +16VDC ±5%
Oven: +18VDC to +35VDC (select value)

Output Waveshape: sine or square
Output Voltage: 4VP-P ±3db into a 10,000 Ω Load
Outside Trim: Yes, to better than 0.1 PPM of nameplate frequency
Oven Control: Proportional Type Solid State
Oven Power:
6 watts max. at −55° C turn-on and +28VDC input
3.5 watts max. steady state at 55° C and +28VDC input
Warm-up time: 10 minutes at −55° C (unit will be within frequency tolerance over the temperature range.



Miniature Dip Crystal Clock Oscillator
701/702 SERIES

SPECIFICATIONS

Size:
MC 701A1 -4 Pin Dip Plastic Pkg.
MC 702A1 -14 Pin Dip Plastic Pkg.
Pin Conn:
MC 701A1/MC 702A2 Pin #1 NC
Pin #7 GND
Pin #8 RF Output
Pin #14 +5VDC
Frequency Range:
156 KHz to 25 MHz
Frequency Stability Over Temp:
± 20 PPM, +15 °C to +34 °C
± 50 PPM, 0 °C to +70 °C
± 60 PPM, -40 °C to +85 °C
± 70 PPM, -55 °C to +105 °C
Frequency Calibration @ +25 °C:
± 25 PPM
± 10 PPM (Optional @ Prem.)
Frequency Stability vs. B+ (5.0 VDC) ± 10%:
± 2.0 PPM
Frequency Stability vs. A Load, 1 to 10 Loads:
± 2.0 PPM

Aging vs. Time:
± 5 PPM, 1st Yr. ± 3 PPM/Yr. For Subsequent Yrs
Symmetry:
40% to 60% Typ., 35% to 65% max
Risetime:
(.5V to 2.4V): 10 to 25 nsec Value Related to Output Frequency
Fall Time:
(2.4 to .5V): 10 to 25 nsec Value Related to Frequency
Fanout:
1 to 10^2T L Loads
(1 sink = 16.0 ma. max., 1 source = 4 ma. max.)
Output Voltage:
Logic "1": 2.4V min
Logic "0": 0.4V max.
Input:
+5VDC. ± 10%
2.5 MHz to 25 MHz, 15 ma. typ. (25 ma. max.)
625 KHz to 2.5 MHz, 30 ma. typ. (50 ma. max.)
156 KHz to 625 KHz, 40 ma. typ. (65 ma. max.)
Features: MC701A1:
Utilizes 4 pins to facilitate mounting on PC board solder operation.
MC702A1:
Utilizes 14 Pins for mounting in 14 pin dip socket for maximum engagement under shock and vibration conditions.

MF CRYSTAL OSCILLATORS

MF GUARANTEED CRYSTAL OSCILLATORS (TCXO and XO) • 1 Hz - 20 MHz

- Improved input voltage characteristic
- Screwdriver adjustable
- Choice of 2 cases

HOW TO ORDER: For Part Number...Add case style and frequency to the Series

For example:

Series 5401, Flatpack case, 10 MHz frequency

5401 – 1 – 10 M

Series 5403, Compact case, 153.6 KHz frequency

5403 – 2 – 153.6K

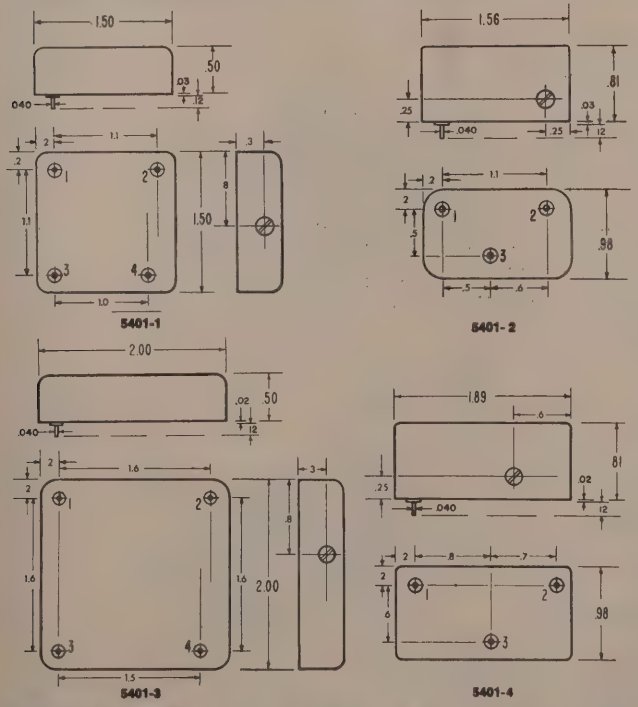
SERIES 5401

TEMPERATURE COMPENSATED CRYSTAL OSCILLATORS (TCXO) • 1 Hz - 20 MHz

	5401-1, 2	5401-3, 4
Frequency range	As specified from 250 KHz to 20 MHz	As specified from 1 Hz to 249 KHz
Input Current, Maximum	50 ma	100 ma

	MINIMUM	TYPICAL	MAXIMUM	
Input Voltage	4.75	5.00	5.25	Volt
Frequency Screwdriver Adjustment	±5	±10		ppm
Frequency Stability with Temperature from 0 to 65°C		±0.4	±0.8	ppm
Frequency Stability with Input Voltage from 4.75 to 5.25 volts		±0.1	±0.2	ppm
Ageing, per month, after 60 days		±0.2		ppm
Output Fan Out			10	TTL loads
Symmetry, at 1.5 volts	40/60		60/40	
Rise Time, 0.8 to 2.4 volts 1 Hz to 10 MHz Over 10 MHz to 20 MHz		7 2.5	20 5	ns ns
Fall Time, 2.4 to 0.8 volts 1 Hz to 10 MHz Over 10 MHz to 20 MHz		4 2	20 5	ns ns

SPECIFICATIONS, SERIES 5401



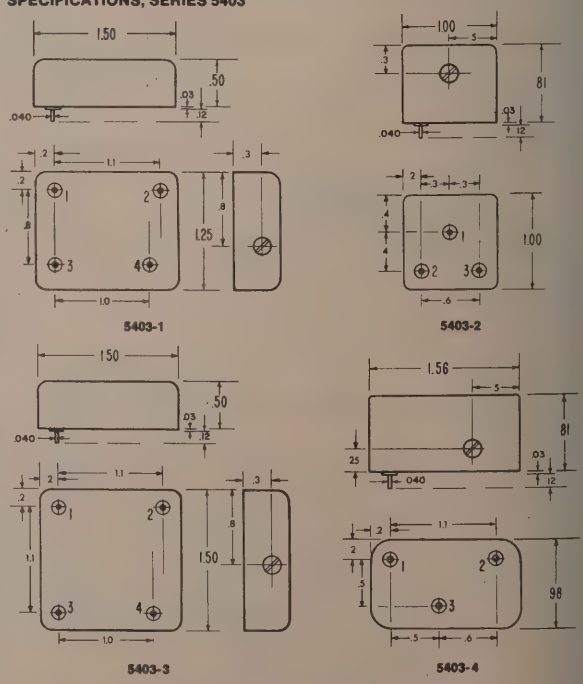
SERIES 5403

CRYSTAL OSCILLATORS (XO) • 1 Hz - 20 MHz

	5403-1, 2	5403-3, 4
Frequency range	As specified from 250 KHz to 20 MHz	As specified from 1 Hz to 249 KHz
Input Current, Maximum	50 ma	100 ma

	MINIMUM	TYPICAL	MAXIMUM	
Input Voltage	4.75	5.00	5.25	Volt
Frequency Screwdriver Adjustment	±5	±10		ppm
Frequency Stability with Temperature from 0 to 65°C		±7	±10	ppm
Frequency Stability with Input Voltage from 4.75 to 5.25 volts		±0.3	±1	ppm
Ageing, per month, after 60 days		±0.2		ppm
Output Fan Out			10	TTL loads
Symmetry, at 1.5 volts	40/60		60/40	
Rise Time, 0.8 to 2.4 volts 1 Hz to 10 MHz Over 10 MHz to 20 MHz		7 2.5	20 5	ns ns
Fall Time, 2.4 to 0.8 volts 1 Hz to 10 MHz Over 10 MHz to 20 MHz		4 2	20 5	ns ns

SPECIFICATIONS, SERIES 5403



AVAILABLE IN CMOS LOGIC

MF ELECTRONICS CORP.
118 EAST 25th STREET, NEW YORK, N.Y. 10010 • (212) 674-5360 • TWX: 710-581-4109

MF DIP CRYSTAL OSCILLATORS

MF GUARANTEED DIP OSCILLATORS

The Broadest line in the industry.

- Most units molded—greatly resistant to moisture and abuse.
- Units use overtone crystals from 20 MHz to 65 MHz, very stable electrically and more reliable mechanically.
- Each oscillator serialized and date coded.
- Units specified at temperatures exceeding 0 to 65°C are individually recorded 100% for frequency vs temperature-insuring compliance.
- All units guaranteed for one year to operate within specifications.

DESCRIPTION	FREQUENCY	PART NO. (substitute frequency for ...)	TOTAL ACCURACY Parts Per Million	TEMPERATURE	
Round pins, commercial.	4 to 65 MHz	5404- ...M	± 50 ppm	0 to +65°C	
Round pins, commercial.	4 to 65 MHz	5404-1...M	± 25 ppm	0 to +65°C	Fig. A
Dual DIP, commercial.	80 KHz to 4.99 MHz	5405 ...M	±200 ppm	0 to +65°C	Fig. B
Dual DIP, commercial.	80 KHz to 4.99 MHz	5405-1...M	±100 ppm	0 to +65°C	
Molded DIP, .300" high	4 to 65 MHz	5406 ...M	± 50 ppm	0 to +65°C	
Molded DIP, .300" high	4 to 65 MHz	5406-1...M	± 25 ppm	0 to +65°C	
Molded DIP, .300" high	4 to 65 MHz	5406-2...M	± 50 ppm	−55 to +65°C	
Molded DIP, .300" high	4 to 65 MHz	5406-3...M	± 50 ppm	0 to +85°C	
Molded DIP, .300" high	4 to 65 MHz	5406-4...M	± 75 ppm	0 to +125°C	
Molded DIP, .300" high	4 to 65 MHz	5406-5...M	± 50 ppm	−55 to +85°C	
Molded DIP, .300" high	4 to 65 MHz	5406-6...M	± 75 ppm	−55 to +125°C	
Molded DIP, .300" high all dashes same as 5406, except units tunable.	4 to 65 MHz	5407 ...M	± 50 ppm	0 to +65°C	
Molded DIP, .300" high, 4 pins, lowest cost.	4 to 65 MHz	5408 ...M	±100 ppm	0 to +70°C	
Molded DIP, herm. seal, crystal and IC. Mil use.	4 to 65 MHz	5410 ...M	± 50 ppm	−55 to +85°C	Fig. C
Same as above with stand-off.	4 to 65 MHz	5410S ...M	± 50 ppm	−55 to +85°C	
Molded DIP, herm. seal, crystal and IC. Mil use.	4 to 65 MHz	5411 ...M	± 75 ppm	−55 to +125°C	
Same as above with stand-off.	4 to 65 MHz	5411S ...M	± 75 ppm	−55 to +125°C	
Molded DIP, herm. seal, crystal and IC; all hi-rel parts. Additional screening available. Mil use.	4 to 65 MHz	5412 ...M	± 50 ppm	−55 to +85°C	
Same as above with stand-off.	4 to 65 MHz	5412S ...M	± 50 ppm	−55 to +85°C	
Molded DIP, herm. seal, crystal and IC; all hi-rel parts. Additional screening available. Mil use.	4 to 65 MHz	5413 ...M	± 75 ppm	−55 to +125°C	
Same as above with stand-off.	4 to 65 MHz	5413S ...M	± 75 ppm	−55 to +125°C	
Herm. seal case, herm. seal crystal and IC. Mil use.	4 to 65 MHz	5420 ...M	± 50 ppm	−55 to +85°C	
Herm. seal case, herm. seal crystal and IC. Mil use.	4 to 65 MHz	5421 ...M	± 75 ppm	−55 to +125°C	
Herm. seal case; all hi-rel parts. Cold weld crystal. Mil use, extensive 100% screening. Most reliable part available.	4 to 65 MHz	5422 ...M	± 50 ppm	−55 to +85°C	Fig. D
Herm. seal case; all hi-rel parts. Cold weld crystal. Mil use, extensive 100% screening. Most reliable part available.	4 to 65 MHz	5423 ...M	± 75 ppm	−55 to +125°C	

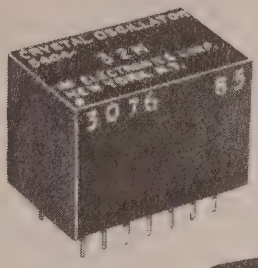


Fig. A

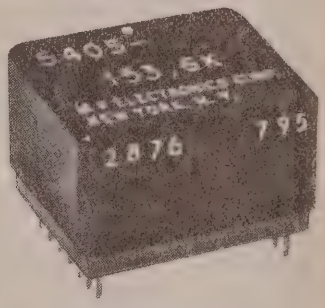


Fig. B

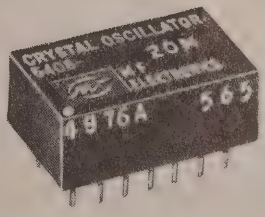


Fig. C

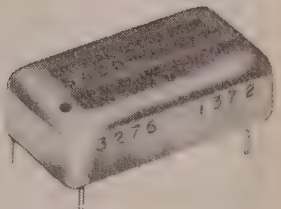


Fig. D

Telephone for complete literature.

HOW TO ORDER:

For Part Number . . . Add frequency to the Series

For example:

Series 5404, ±50 ppm, 0 to 65°C 10 MHz frequency

→ **5404 - 10M**

Series 5406-5, ±50 ppm, −55 to +85°C 4.096 MHz frequency

→ **5406-5 - 4.096M**

MF ELECTRONICS CORP.
118 EAST 25th STREET, NEW YORK, N.Y. 10010 • (212) 674-5360 • TWX: 710-581-4109

MICROSONICS

Dept. EM / 60 Winter Street / Weymouth, MA 02188 / Tel: (617) 337-4200

SANGAMO WESTON
Schlumberger

STABLE TEMPERATURE COMPENSATED (TCXO) CRYSTAL OSCILLATORS

Model K1084A / 4 MHz - 21 MHz — 1.55″ x 2.1″ x .69″ — Metal Case
Model K1085A / 250 kHz - 42 MHz — 2.0″ x 2.0″ x .52″ — Metal Case
Model K1087A / 250 kHz - 21 MHz — 1.21″ x 1.75″ x .65″ — Plastic Case

GENERAL SPECIFICATIONS

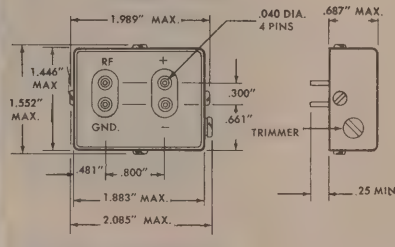
Frequency Stability vs. Voltage Change: ±1 x 10^{-6} for ±10%
Frequency Stability vs. Load Change: ±1 x 10^{-6} for ±10%
Frequency Stability vs. Time: ±1 x 10^{-6}/year
Input Power, Typical: 100 mW @ 5 VDC
Low Power Version: 20 mW @ 5 VDC
Mounting: Pins for PCB mounting with solder connections

Standard Options Available:
Input Voltages: 1, 2, 3, 4
Wave Shape: S, T
Frequency Adjust: 0, 1
Temperature Stability: A, B, C, D, E

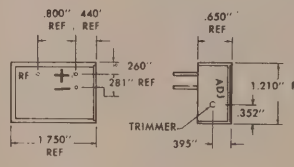
Optional Specifications		Optional Suffixes (These must be specified)
Input Voltage:	5 VDC	1
	9 VDC	2
	12 VDC	3
	15 VDC	4
Wave Shape:		
Sine Wave:	0.7 VRMS into 1 kΩ	S
Square Wave:	T^2L Drive up to 10 gates @ 1.6 mA per gate. Duty cycle 50% ±10%	T
Frequency Adjust (±10 ppm):	Not included	0
	Trimmer	1
Temperature Stability:	±1 x 10^{-7} (+20°C to +30°C)	A
	±1 x 10^{-6} (0°C to +55°C)	B
	±5 x 10^{-6} (0°C to +55°C)	C
	±5 x 10^{-6} (−30°C to +85°C)	D
	±10 x 10^{-6} (−30°C to +85°C)	E

OUTLINE DETAILS

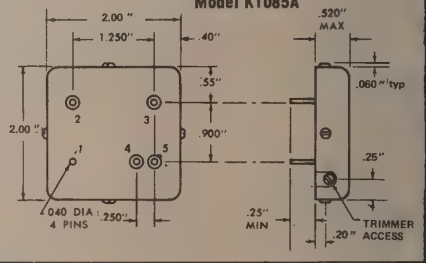
Model K1084A



Model K1087A



Model K1085A



ORDERING INFORMATION

Each TCXO ordered must have a suffix code denoting input voltage, output waveform, whether frequency adjust is desired and the temperature range required. This suffix is added to the basic model number. The first suffix number denotes the input voltage; the second, a letter, denotes waveform; the third, a number, denotes frequency adjustment; and the fourth letter suffix, the stability over the temperature range. The versatility of this suffix system allows you to specify a single Oscillator from many models without poring over endless specification sheets.
The diagram shows this format more clearly.

Model No.	Suffix	Denotes Option for
K1087A	□□□□	Temperature Stability
		Frequency Adjust
		Output Waveform
		Input Voltage

If for instance, Model K1087A is desired with 9 volts input, sine-wave output, frequency adjustment, and a temperature stability of ±1 x 10^{-6} from 0°C to +55°C, the Model Number is K1087A-2S1B.

CRYSTAL FILTERS

Microsonics has been manufacturing crystal filters since 1962. During that time, the company's expertise has grown by imaginative planning and a firm commitment by management to produce the best precision crystal filters available. Today, Microsonics offers customized precision designs with operating frequencies to 150 MHz in typical filter types such as bandpass, single sideband, comb sets and crystal discriminators. Production capabilities include crystal manufacturing, cold welding, automated wave soldering, high reliability assembly techniques and automated test equipment. Typical custom tailored filters previously designed and manufactured are described below.

FILTER MODEL P108C

Features a very good shape factor combined with excellent phase linearity.
Fo: 10 MHz
Bandwidth:
9.4 kHz @ 1 dB
12.5 kHz @ 15 dB
15.7 kHz @ 40 dB
Insertion Loss: 4 dB
Ripple: 1 dB
Spurious: 40 dB
Impedance: 50 ohms
Ultimate Rejection: 45 dB
Phase Linearity: ±6° max.
Size: 2.5 x 1.0 x 1.25

FILTER MODEL P961

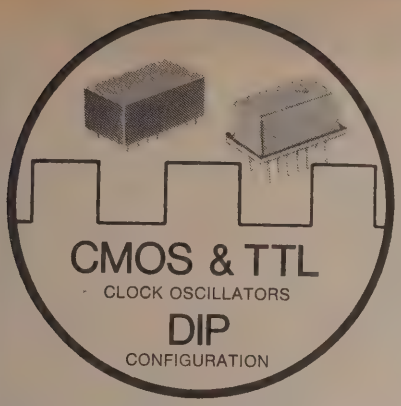
Equalized to improve phase linearity while maintaining a 2.75 to 1, 3 dB / 60 dB shape factor.
Fo: 7.470 MHz
Bandwidth:
±2 kHz min. @ .5 dB
±3 kHz min. @ 15 dB
±6 kHz max. @ 60 dB
Insertion Loss: 3 dB
Ripple: .25 dB
Spurious: 60 dB
Impedance: 50 ohms
Ultimate Rejection: 70 dB
Phase Linearity: 8° over Fo ±2 kHz
Size: 2.1 x 1.515 x .7
Shock: 2500 G Pyrotechnic
Vibration: 100 G Sine
This filter has successfully passed all qualification tests for space satellite systems.

FILTER MODEL P408B

Demonstrates Microsonics' ability to manufacture high frequency, 42 MHz, fundamental AT cut crystals. Bandwidths of 2.5% of center frequency are possible at frequencies up to 40 MHz.
Fo: 40 MHz ±3 kHz
Bandwidth: 100 ±10 kHz
Shape Factor: 2:1
Insertion Loss: 5 dB max.
Spurious: 50 dB
Ripple: 1 dB max.
Impedance: 480 ohms
Ultimate Rejection: 60 dB
Operating Temp.: 0°C to 65°C
Size: 1.765 x .865 x .60 max.
Meets Requirements of MIL-F-18327

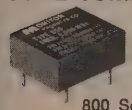
CRYSTAL DISCRIMINATOR MODEL D402C

A Discriminator which demonstrates exceptional bandwidth at 40 MHz with good linearity.
Fo: 40 MHz ±2.5 kHz
Bandwidth: ±80 kHz P-P
Linearity:
5° over ±25 kHz
10° over ±50 kHz
Source Impedance: 1 kHz
Load Impedance: 20 kHz
Operating Temp.: 0 to 50°C
Size: 2.1 x 1.0 x .75
Shock-Vibration MIL-STD-202 Methods 201A, 202C



Monitor has CMOS and TTL logic crystal-controlled precision clock oscillators for all your commercial, industrial, and military environment needs. Example:

ECONOMY TTL LOGIC 50Hz-60MHz/DIP PLUG-IN

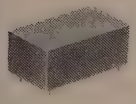


800 Series

900 Series

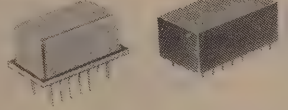
Input: 5VDC±10% / Output: "O" = +.4Vmax., "1" = +2.4Vmin / Current Drain: 50MA/Typ./Stability to ±30 PPM, 0°-60°C. Nominal calibration: ±50PPM @ 25°C. Full ambient units available/ Size: as small as 1″x.75″x .35″./DIP plug-in, TO-116 compatible pin pattern.

978A SERIES/3-10MHz CMOS LOGIC/14-PIN DIP



Input: 10-15VDC, 3MAmax./ Output: "0" = +.5V-max., "1" =80% of supply voltage min./ Stability: ±.005% —40° to +85°C. Nominal calibration: ±.01% @ 25°C/Std. frequencies: 4.194304MHz (1Hz binary multiple). 3.932160MHz (60Hz binary multiple), 4.096MHz (1KHz binary multiple).

TTL LOGIC/14-PIN DIP 3.5MHz-20MHz



Hermetically Sealed

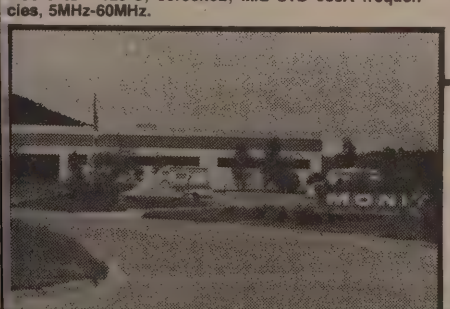
Input: 5VDC±10%, 50MA max./Output: TTL symmetry 60/40, +2.4V min./Rise-Fall: 20 nanosec. nominal/Load: Up to 10TTL gates (1.6MA ea.)/ Typ. stability: ±100PPM, 0°-70°C std., --55° to +125°C opt. (stabilities to ±25PPM available)/ Set tolerance: ±100PPM@+25°C (±20PPM available)/Environmental: Ref. Mil-Std-202, Mil-O-55310

968/969 SERIES/MULTIPLE OUTPUT/TTL LOGIC/14-PIN DIP

Multiple binary related output from the same unit. 1, 2, 4, 8 and 16 MHz, Type 969. 1.25, 2.5, 5, 10, and 20 MHz, Type 968. Microprocessor clock frequencies standard/.46″x.80″x.35″h.

HYBRID HI-REL OSCILLATORS

Special and TO-116 compatible. .5″W x .8″L x .250″H; —55°C to +125°C; screened; MIL STD 883A frequencies, 5MHz-60MHz.



Among leading suppliers of LC and quartz crystal filters, Monitor will meet your Total Filter Needs, in the frequency spectrum from audio to 30MHz. No restriction to bandwidth.

- **CCIR Filters for Multi-Channel Transmission Systems**
- **Diagnostic Filters for Dynamic Analysis**
- **Comb-Filter Sets**
- **Very Narrow Bandwith Filters**
- **Multiplex Filters**
- **Single Side Band Filters**

Minimized aging parameters and established reliability (ER) conformance are inherent in Monitor's Koldweld Crystal techniques.

The KX Types are cross referenced to standard HC-6, HC-18 and HC-13 military specification units. Monitor's KTO Series is an extension of the TO-5/TO-18 Configurations.

Solid State Mercury 28VDC and 115VAC

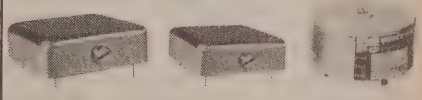
Proportional Control 12VDC, 28VDC and 115VAC

Several hundred models available based on over three decades of oven design experience. Why settle for less?

Monitor Temperature Compensated Crystal Oscillators assure precise frequency control and high stability, extremely low current drain and zero warm up time. A full range of designs are available with sine wave, TTL or CMOS compatible outputs. Monitor TCXOs and TC/VCXOs are widely used in industrial, military and spacebourne environments where high density packaging, and maximum reliability are required. Ref. Mil-Std-202 and Mil-O-55310.

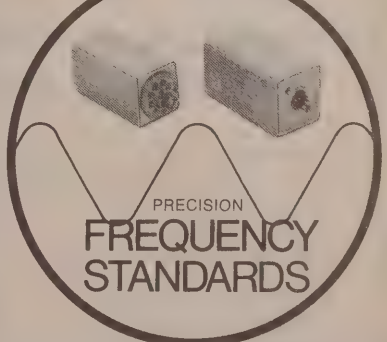
TCXOs, TC/VCXOs .2-20MHz

Designs available from 50Hz-50MHz. Check our stock for your needs.



E07-E42 2″x2″x.53″ | **E43-E78** 1.5″x1.5″x.53″ | **E79-E90** 2″ dia.x.9″

Input: 5-15VDC (+15V±5% std.), 3-20MA/Outputs: TTL std. (10TTL loads), CMOS and sine wave (0 DBM min., 50 ohms)/Temp. vs. stability: ±.5PM, 0°-70°C; ±1PPM 0°-60°C; ±2PPM, —55° to +71°C; ±1PPM —20° to +70°C, other stabilities available/Aging: ±1 part in 10^{-6} per year, ±.5 parts in 10^{-7} available.



Order your precision frequency standards from Monitor. Major electronic counter and instrument manufacturers are satisfied users. Ask for our complete line of thermally stabilized standards.

Typical Specifications-Input: 115VAC or 28VDC oven, 2 watts @25°C, 6 watts turn-on; 15-30VDC oscillator, 15MA typical/Outputs: TTL compatible, sine wave and CMOS optional/Frequencies: 1, 5 and 10MHz std., other available/Aging rates up to 3 parts in 10^{-9} per day std., 1 part in 10^{-9} per day opt./Short term stability: ±5 parts in 10^{-10} per second, typ./Size: as small as 1.5″x1.5″x3.25″h.

MONITOR PRODUCTS CO., INC.

51 Years of Frequency Control Know-How

MONITOR PC

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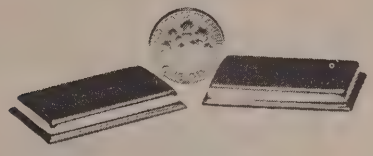
PHONE: (714) 433-4510 / TWX: (910) 322-1381

Microprocessor Clocks

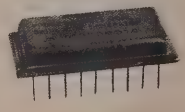
Designed specifically to drive	Intel 8080 & 8080A		Motorola M6800 MPU		
MODEL	K1117A	K1117B	MC6870A	MC6871A	MC6871B
Frequency	1 MHz to 2.2 MHz 2 MHz std.	1 MHz to 3.125 MHz 3 MHz std.	250 kHz to 2.5 MHz 1 MHz std.	850 kHz to 2.5 MHz 1 MHz std.	250 kHz to 2.5 MHz 1 MHz std.
Frequency Stability (Inclusive of calibration tolerance at 25°C, operating temperature, input voltage change, load change, aging, shock, and vibration.)	±.01%	±.01%	±.01%	±.01%	±.01%
Operating temp. range	0°C to 70°C	0°C to 70°C	0°C to 70°C	0°C to 70°C	0°C to 70°C
Input Voltage	VDD +12V VCC + 5V VSS Gnd.	VDD + 12V VCC + 5V VSS Gnd.	+5V	+5V	+5V
Logic Output Features	ϕ_1/ϕ_2 NMOS ϕ_1/ϕ_2 TTL	ϕ_1/ϕ_2 NMOS ϕ_1/ϕ_2 TTL 2xFc (TTL)	ϕ_1/ϕ_2 NMOS ϕ_2 TTL	ϕ_1/ϕ_2 NMOS ϕ_2 TTL memory clock, (TTL) 2xFc (TTL)	ϕ_1/ϕ_2 NMOS ϕ_2 TTL ϕ_2 TTL, (ungated) 2xFc (TTL)
Logic Input Features for clock stretching DMA, etc.	None	Memory Ready	None	$\overline{\text{Hold 1}}$ Memory Ready	$\overline{\text{Hold 1}}$ $\overline{\text{Hold 2}}$
Dimensions	1.34"L x .84"W x .200 seated height	1.34"L x .84"W x .200 seated height	1.34"L x .84"W x .200 seated height	1.34"L x .84"W x .200 seated height	1.34"L x .84"W x .200 seated height



Microprocessor clock models K1117A and MC6870A are designed to provide the critical two-phase, non-overlapping wave forms required by the specific microprocessor, as well as TTL outputs for VMA. Additional input and output features are added to models K1117B, MC6871A, and MC6871B to accommodate systems that use fast and slow memories, direct memory access, etc. Crystal, oscillator, NMOS drivers and necessary wave shaping circuitry are packaged by hybrid thick film IC technology into one dual-in-line module that reduces your component count and board space.

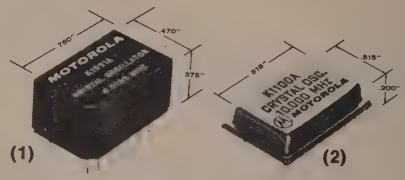
Baud Rate Generator

Crystal Frequency = 5.06888 MHz Reference Frequency = 1.2672 MHz									
Transmit/Receive Address				Baud Rate	Theoretical Frequency 16X Clock	Actual Frequency 16X Clock	Percent Error	Duty Cycle %	Divisor
D	C	B	A						
0	0	0	0	50	0.8 kHz	0.8 kHz	—	50/50	6336
0	0	0	1	75	1.2	1.2	—	50/50	4224
0	0	1	0	110	1.76	1.76	—	50/50	2880
0	0	1	1	134.5	2.152	2.1523	0.016	50/50	2355
0	1	0	0	150	2.4	2.4	—	50/50	2112
0	1	0	1	300	4.8	4.8	—	50/50	1056
0	1	1	0	600	9.6	9.6	—	50/50	528
0	1	1	1	1200	19.2	19.2	—	50/50	264
1	0	0	0	1800	28.8	28.8	—	50/50	176
1	0	0	1	2000	32.0	32.081	0.253	50/50	158
1	0	1	0	2400	38.4	38.4	—	50/50	132
1	0	1	1	3600	57.6	57.6	—	50/50	88
1	1	0	0	4800	76.8	76.8	—	50/50	66
1	1	0	1	7200	115.2	115.2	—	50/50	44
1	1	1	0	9600	153.6	153.6	—	48/52	33
1	1	1	1	19,200	307.2	316.8	3.125	50/50	16



The K1135A is indeed a complete ,unctional baud rate generator. It's purpose is to provide the stable reference frequencies needed by serial interface devices, such as UARTs, Telephone Modems, Teletype, cassettes, etc. This generator features Internal crystal • Choice of 2 x 16 output frequencies • Direct UART/USRT compatibility • Full duplex communications • Re-programmable rom allows generation of other frequencies • Space saving low profile hybrid package • Pin compatible with SMC 5036.

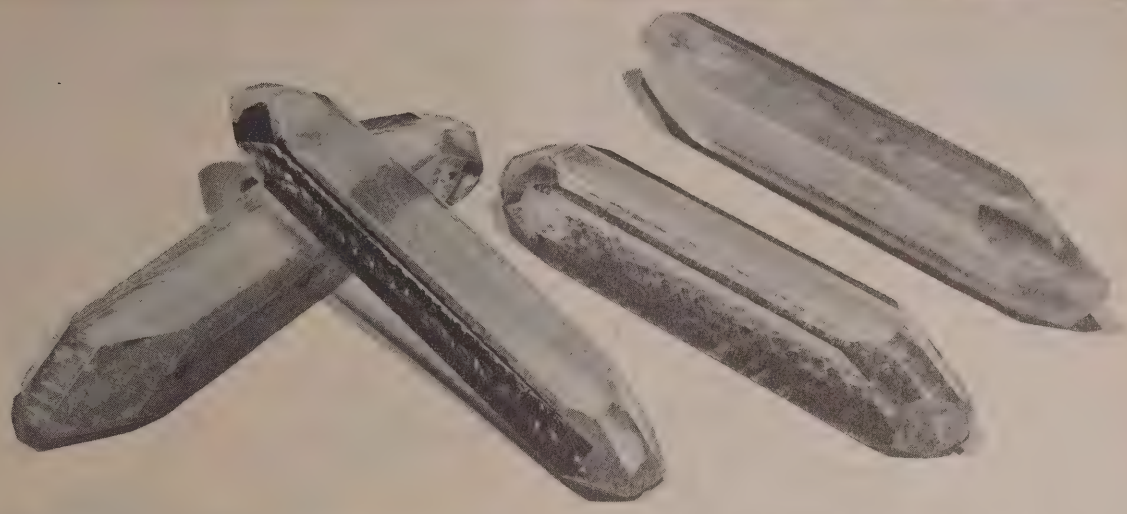
Integrated Circuit Crystal Clock Oscillators



(1) (2)

SPECIFICATION	K1091A (1)	K1144A (2)	K1145A (2)	K1100A (2)	K1114A (2)	K1115A (2)	K1116A (2)
Frequency Range:	.4 MHz to 20 MHz	.250 kHz to 70 MHz			250 kHz to 70 MHz		
Frequency Stability: (Inclusive of calibration tolerance at 25°C, operating temperature, input voltage change, load change, aging, shock, and vibration.)	±0.01%	±.0025%	±.005%	±0.01%	±0.05%	±.1%	±1.0%
Temperature Range Operating: Storage:	0°C to +70°C −55°C to +125°C	0°C to +70°C −55°C to +125°C			0°C to +70°C −55°C to +125°C		
Input Voltage: Input Current (typical):	+5V dc ±.5V 60 mA	+5V dc ±0.5V 105 mA (250-1,000 kHz) 90 mA (1-4 MHz) 30 mA (4-9 MHz) 60 mA (9-30 MHz) 70 mA (30-70 MHz)			+5V dc ±0.5V 105 mA (250-1,000 kHz) 90 mA (1-4 MHz) 30 mA (4-9 MHz) 60 mA (9-30 MHz) 70 mA (30-70 MHz)		
Output: Square Wave: Rise & Fall Time: Levels: Symmetry: Fan Out:	TTL Compatible 10 nsec maximum "0" = 0.4V, "1" = 3.0V 60/40 duty cycle at 1.4V dc level 1 to 10 gates, 1.6 mA/gate	TTL Compatible 15 nsec Maximum (.25 to 9 MHz) 10 nsec Maximum (9 to 30 MHz) 5 nsec Maximum (30 to 70 MHz) "0" = 0.4V, "1" = 2.4V 60/40% at 1.4V dc level 1 to 10 gates, 1.6 mA/gate			TTL Compatible 15 nsec Maximum (.25 to 9 MHz) 10 nsec Maximum (9 to 30 MHz) 5 nsec Maximum (30 to 70 MHz) "0" = 0.4V, "1" = 2.4V 60/40% at 1.4V dc level 1 to 10 gates, 1.6 mA/gate		
Environmental Shock:	Withstand 40 G's for 11 ms, 3 mutually perpendicular planes	1,000 G's for 0.35 ms, ½ sine wave, 3 shocks each plane			1,000 G's for 0.35 ms, ½ sine wave, 3 shocks each plane		
Vibration:	5-55 Hz, 0.06" double amplitude 15 minutes each plane	10-55 Hz, 0.060" double amplitude; 55 Hz-2 kHz, 35 G's 12 hours duration			10-55 Hz, 0.060" double amplitude; 55 Hz-2 kHz, 35 G's 12 hours duration		

MOTOROLA INC.
COMPONENT PRODUCTS
2553 N. Edgington, Franklin Park, Illinois 60131
Phone: (312) 451-1000
TWX: 910-227-0799



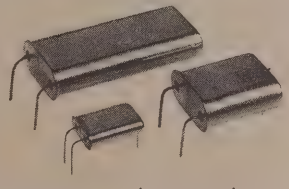
The Common Denominator Of An Uncommon Company

. . . is quartz. To this is added Northern Engineering Laboratories' 24-years of manufacturing and design experience in producing frequency control devices, and a philosophy of service that is unique to the industry.

NEL SERVICE — HELP WHEN YOU NEED IT

Whether your application requires tight parameter controls or a low, unit-cost approach, consulting NEL as early in the design stage as possible can help you make the best possible crystal selection. Our broad coverage in the communication, instrumentation and digital fields enables us to offer you this assistance.

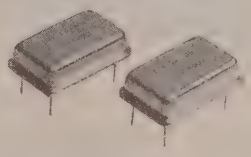
LOW AND HIGH FREQUENCY CRYSTALS



By providing the widest variety of cuts available in the 1 KHz to 800 KHz range, NEL gives you one of the most comprehensive selections in the industry. It's just one reason why we have continued to be a "preferred source" for low frequency crystals since before the transistor was "here to stay."

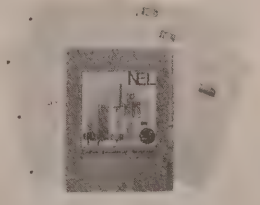
In addition, NEL also provides high frequency crystals with fundamental modes ranging from 1 MHz to 30 MHz and third overtone units up to 60 MHz. Specialized manufacturing techniques and equipment coupled with high volume production assures you of competitively priced units of the highest quality.

HYBRID OSCILLATORS



TTL compatible CMOS and TTL oscillators using the latest hybrid techniques are available from NEL and are described in detail in *Data Sheets 977A* and *977B*. These hermetically sealed, all-metal package, DIP compatible units range from 600 Hz to 30 MHz.

FREE DESIGN ASSISTANCE



Our catalog/design manual and additional publications can assist you with your design and specification problems.

For assistance or your FREE copies, phone or write to:

NEL *Northern Engineering Laboratories,* INC.

357 BELOIT STREET • BURLINGTON, WISCONSIN 53105 • (414) 763-3591

CUSTOM FILTERS / CRYSTAL, L.C. AND ACTIVE

- Low Pass
- High Pass
- Band Reject
- Band Pass
- Linear Phase
- Constant Group Delay
- Constant Time Delay
- MIL-F-18327

OPT is a major supplier of active and passive custom designed filters. Our active filter capability employs the classical solutions that are augmented by unique circuit approaches. Our passive filter capability include L-C and Crystal versions. Frequencies range from low audio to 400 MHz.

OPT is at the forefront of filter engineering as a result of company sponsored research and development in addition to the technology gained through the acquisition of Burnell Company, Nytronics Filter Division; Omnitec Corporation, Filter Division; Ortho Filter Company; and Bulova Watch Company, Crystal Filter Division. Broad application experience, supported by a library of computer synthesis, analysis and optimization programs, assist in supplying the best solution to specific requirements.

OPT is unique in being able to provide in depth engineering support on prototype development as well as the controlled manufacturing capacity to supply high volume requirements.

Production equipment and processes allow for production of laminated components, toroids, and pot core assemblies. Component stabilization procedures permit guaranteeing maximum stability with operating life. Areas of specialization include delay correction, phase matching and time domain synthesis.

We encourage your inquiries and provide application engineering support at no cost. Please forward your requirements to OPT Filter Division or call our Engineering Department for free consultation.

TYPICAL EXAMPLE CUSTOM L.C. FILTER
ACCU-PULSE SERIES

FEATURES

- Constant time delay throughout pass band, into stop band
- Excellent step frequency discrimination characteristics
- Flat group delay
- Pass band amplitude response approximates Gaussian response with steep stop band roll-off
- Superior monotonic amplitude response
- Precisely balanced pass band pole frequency location and zeros of transmission

TYPICAL SPECIFICATIONS — 4 MHz Accu-Pulse Filter (Accu-Pulse Filters available to 100 MHz cut-off frequency)

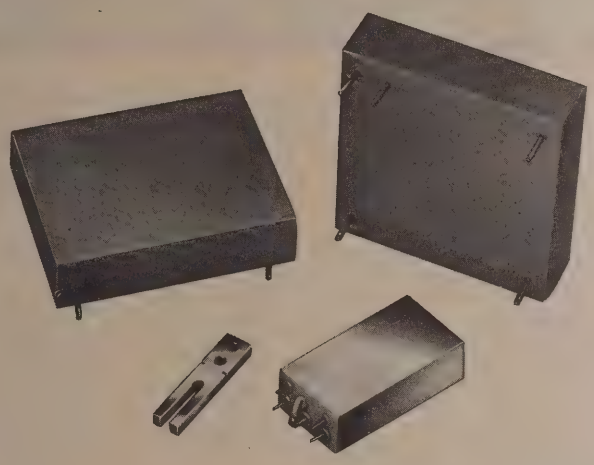
Insertion Loss	0.2 db max. @ 0 Hz
Cut-off Frequency (3 db)	4 MHz min.
Attenuation	35 db min. @ 10 MHz 60 db min. @ 12 MHz
Group Delay	100 nanosec
Group Delay Distortion	±6 nanosec typical
Impedance	75 ohms
Operating Level	1 watt
D.C. Voltage	50 vdc max.

SEE OTHER OPT INDUSTRIES PRODUCT LINES IN eem
OPT INDUSTRIES ALSO MANUFACTURES CUSTOM POWER SUPPLIES AND TRANSFORMERS
SEE OUR PRODUCT DATA ON THESE PRODUCTS IN SECTION 4000 PAGE 0000

opt INDUSTRIES INC.

Dept. EM, 300 Red School La.
Phillipsburg, NJ 08865,
(201) 454-2600 TWX 510-235-2920

Call or Write For Our Facilities and Capabilities Brochure



Tuning Fork Oscillators

Extremely **rugged** and **reliable** hermetically-sealed frequency sources using 10 KHz to 20 KHz separately evacuated 20,000 Q Tuning Fork Resonators. C/MOS dividers used for output frequencies below 10 KHz.

Absolute frequency accuracies from ±.05% to ±.001% over temperature ranges up to from −55°C to +105°C

Sine Wave Outputs: low distortion, constant voltage, from 60 to 10,000 Hz, DC inputs from +15V to +30V.

Logic Outputs: 1.0 to 20,000 Hz, DC inputs +5V & up

MIL quality components, low current drain designs, full MIL shock & vibration & environmental capability

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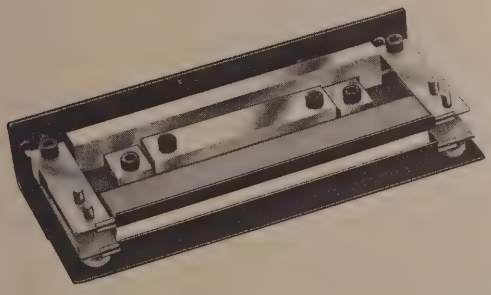

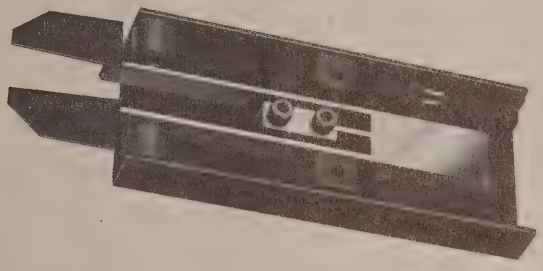

Tuning Fork Light Choppers

Frequencies from 40 to 1000 Hz . . for modulating or chopping light or energy beams. May often be used to replace motor driven choppers . . offering weight and power savings plus eliminating need for lubrication.

Particular design & construction technology provides exceptional fork balance and high resistance to shock and vibration as required for most MIL applications.

Tine ends may be fitted either with shutters, lenses, or mirrors to suit your special requirements. Drive circuits available either for slave or oscillator mode.

Philamon® products are known for their conservative ratings and performance reliability and are extensively used in major MIL programs. Our QC exceeds MIL-I-45208A and subscribes to the "intent" of MIL-Q-9858A.

For complete application information on either standard models or custom engineered units to suit your particular needs . . . phone, write, or twx . . .

Philamon® INCORPORATED

33 DUBON COURT/FARMINGDALE, NEW YORK 11735/PHONE: (516) 249-2700/TWX: 510-224-6512

ovenaire oscillators

Ovenaire has the capabilities, experience and production techniques to meet the most exacting crystal oscillator requirements — from State-Of-The-Art Precision Crystal Oscillators to high volume, low cost TCXO's.

The following tables list condensed specifications on regular production models. For additional information on these and other crystal oscillators, call the Ovenaire factory.

PRECISION CRYSTAL OSCILLATORS

Model Series	Frequency MHz	Aging	Power @ 25°C	Supply Voltage	Output	Max. Size mm	Ambient Range	Ambient Stability
OSC18-6	1 or 3	1x10-8/WK	3.0 Watts	+24VDC	Sine	57x57x93	0°C to +55°C	±1x10-8
OSC18-7	5 to 30	1x10-8/WK	3.0 Watts	+24VDC	Sine	57x57x93	−20°C to +65°C	5x10-9/°C
OSC46-1A	1	2x10-8/WK	2.2 Watts	+25VDC	Sine	75x75x93	−10°C to +60°C	2x10-10/°C
OSC46-2A	1	2x10-8/WK	2.2 Watts	+30VDC	Sine	75x75x93	−10°C to +60°C	2x10-10/°C
OSC49-3	3 or 10	1x10-8/WK	2.2 Watts	+28VDC	Sine	41x114x53	−15°C to +60°C	±7.5x10-9
OSC49-5	10	4x10-9/WK	2.2 Watts	+20VDC	Optional	(A) 51x51x84 (B) 49x75x54	0°C to +60°C	7x10-9
OSC74	7.5 to 15	1.5x10-8/WK	2.0 Watts	+15VDC	TTL	(A) 64x81x32 (B) 51x51x79	−15°C to +60°C	3x10-10/°C
OSC75	10	1x10-8/WK	2.2 Watts	+28VDC	TTL	37x44x90	−40°C to +70°C	3x10-10/°C
OSC78-12	5	2x10-8/WK	0.6 Watts	+15VDC	TTL	65x75x114	0°C to +50°C	5x10-10/°C

OVENIZED CRYSTAL OSCILLATORS

Model Series	Frequency MHz	Aging	Power @ 25°C	Supply Voltage		Max. Size mm	Ambient Range	Ambient Stability
				OSC	Oven			
OSC11-3	1	1.5x10-7/WK	3.5 Watts	+12 or +24VDC	115VAC	38x38x84	−20°C to +60°C	5x10-9/°C
OSC11-5	1	1.5x10-7/WK	1.9 Watts	+12 or +24VDC	+12 or +24VDC	57x57x93	−30°C to +60°C	5x10-9/°C
OSC11-7A	1 thru 20	5x10-7/WK	4.0 Watts	+12 or +24VDC	115VAC	38x38x84	−20°C to +60°C	8x10-9/°C
OSC11-7B	3 thru 8	5x10-8/WK	4.0 Watts	+12 or +24VDC	115VAC	38x38x84	−20°C to +60°C	5x10-9/°C
OSC18-1	0.5 to 2	5x10-8/WK	3.0 Watts	+12 or +24VDC	+12 or +24VDC	57x57x93	−20°C to +55°C	1x10-9/°C
OSC18-2	1	2x10-8/WK	3.0 Watts	+12 or +24VDC	+12 or +24VDC	57x57x93	−20°C to +55°C	2x10-10/°C
OSC18-5	1 to 5	5x10-8/WK	3.4 Watts	+12 or +24VDC	+12 or +24VDC	57x57x93	−20°C to +65°C	±5x10-7
OSC29-32	12 to 22	8x10-7/YR	2.5 Watts	+24VDC	+24VDC	37x48x90	−20°C to +60°C	±1x10-7
OSC29-1	10 to 25	2x10-7/WK	2.2 Watts	+22.5VDC	+28VDC	37x48x83	−20°C to +60°C	5x10-9/°C
OSC29-2	2 to 10	1x10-7/WK	2.7 Watts	+22.5VDC	+28VDC	37x48x83	−20°C to +60°C	2.5x10-9/°C
OSC32-1	2 to 10	2x10-6/YR	.54 Watts	+12VDC	+24VDC	51x51x70	0°C to +55°C	±2x10-8
OSC44-1	2 to 40	1x10-6/YR	1.6 Watts	+9, +12 or +15VDC	+15, +20, +24 or +28VDC	Choice of 3 Compact Packages, Octal or Solder Pin Mounting	−20°C to +60°C	±4x10-7
OSC44-2	2 to 40	1x10-6/YR	1.6 Watts	+12 or +15VDC	+15, +20, +24 or +28VDC		−10°C to +60°C	±4x10-7
OSC44-3	2 to 40	1x10-6/YR	1.1 Watts	+9, +12 or +15VDC	+15, +20, +24 or +28VDC		−20°C to +55°C	±3x10-7
OSC44-4	2 to 40	1x10-6/YR	1.1 Watts	+12 or +15VDC	+15, +20, +24 or +28VDC		−20°C to +55°C	±3x10-7
OSC45	2 to 12	1x10-6/YR	1.8 Watts	+9 to +28VDC	+9 to +28VDC	(A) 43x64x33 (B) 32x44x70	0°C to +55°C	±1x10-7
OSC55	10 to 55	1x10-6/YR	1.4 Watts	+28VDC	+28VDC	33x67x19	−20°C to +50°C	±1x10-6
OSC70	22 to 120	2x10-6/YR	2.2 Watts	+28VDC	+28VDC	37x48x90	−20°C to +60°C	±5x10-8
OSC73-1	9 to 15	3.5x10-7/YR	2.0 Watts	+15VDC	+15VDC	33x79x54	−30°C to +65°C	±7.5x10-8
OSC73-2	2 to 6	5x10-7/YR	2.0 Watts	+15VDC	+15VDC	47x68x35	−10°C to +65°C	±5x10-8
OSC73-3	12 to 25	1.5x10-6/YR	2.3 Watts	+20VDC	+20VDC	36x75x41	−30°C to +65°C	±1x10-7
OSC83	7.2 to 13.2	1.5x10-6/YR	2.2 Watts	+28VDC	+28VDC	37x48x84	−10°C to +55°C	±2x10-7

PCB MOUNT CRYSTAL OSCILLATORS

Model Series	Frequency MHz	Aging	Power	Supply Voltage	Output	Max. Size mm	Ambient Range	Ambient Stability
OSC51	1 to 60	N/S	300MW	+12VDC	Optional	38x38x13	0°C to +60°C	±1x10-5
OSC52	10 to 150	N/S	300MW	+12VDC	Sine	38x38x25	0°C to +60°C	±1x10-5
OSC69-2	5 to 20	1x10-5/YR	75MW	+5VDC	TTL	25x38x13	−30°C to +85°C	±5x10-5
OSC69-3	6 to 22	8x10-6/YR	75MW	+5VDC	TTL	25x38x13	−30°C to +85°C	±3.5x10-5

TCXO'S

Model Series	Frequency MHz	Aging	Power	Supply Voltage	Output	Max. Size mm	Ambient Range	Ambient Stability
OSC20-1	10 to 15	3x10-6/YR	135MW	5 or 9VDC	Sine	26x15x54	−30°C to +75°C	±5x10-6
OSC20-2	10 to 15	3x10-6/YR	135MW	5 or 9VDC	Sine	26x15x54	0°C to +50°C	±2x10-6
OSC27-5-1	2 to 12	1x10-6/YR	300MW	+12VDC	TTL	51x51x15	0°C to +55°C	±1x10-6
OSC27-5-2	2 to 12	1x10-6/YR	300MW	+12VDC	TTL	51x51x15	0°C to +55°C	±5x10-7
OSC27-5-3	2 to 5	5x10-6/YR	300MW	+12VDC	TTL	51x51x15	0°C to +55°C	±3x10-7
OSC27-6-1	2 to 12	1x10-6/YR	360MW	+12VDC	TTL	51x51x15	−40°C to +85°C	±1.5x10-6
OSC27-6-2	2 to 12	1x10-6/YR	360MW	+12VDC	TTL	51x51x15	−30°C to +75°C	±1x10-6
OSC27-6-3	2 to 6	5x10-7/YR	360MW	+12VDC	TTL	51x51x15	−15°C to +70°C	±5x10-7
OSC34-2	10 to 20	7.5x10-7/YR	240MW	+12VDC	Sine	45x45x15	0°C to +50°C	±1x10-6
OSC35-1-1	2.5 to 12	1x10-6/YR	300MW	+12VDC	TTL	51x51x13	−5°C to +60°C	±1x10-6
OSC35-1-2	2.5 to 12	1x10-6/YR	300MW	+12VDC	TTL	51x51x13	−5°C to +60°C	±5x10-7
OSC35-1-3	2.5 to 6	5x10-7/YR	300MW	+12VDC	TTL	51x51x13	0°C to +55°C	±3x10-7
OSC37-1-1	1 to 5	1x10-6/YR	180MW	+12VDC	TTL	44x44x19	0°C to +55°C	±2x10-6
OSC37-2-1	5.01 to 10	2.5x10-6/YR	180MW	+12VDC	TTL	44x44x19	0°C to +55°C	±2x10-6
OSC37-3-1	1 to 5	1x10-6/YR	216MW	+12VDC	TTL	44x44x19	−5°C to +60°C	±1x10-6
OSC37-1-2	1 to 5	1x10-6/YR	180MW	+12VDC	TTL	44x44x19	−10°C to +65°C	±1.5x10-6
OSC37-2-2	5.01 to 10	2.5x10-6/YR	180MW	+12VDC	TTL	44x44x19	−10°C to +65°C	±1.5x10-6
OSC39-1	2.5 to 12	1x10-6/YR	125MW	+5VDC	TTL	48x31x17	0°C to +60°C	±1x10-6
OSC40-1	4KHz to 1MHz	1x10-6/YR	504MW	−18VDC	AC Square	57x51x21	0°C to +55°C	±8x10-6
OSC61-1	7 to 15	1x10-6/YR	180MW	+12VDC	CMOS	36x27x12	−10°C to +60°C	±9x10-6
OSC67-1-1	2 to 8	1x10-6/YR	275MW	+12 & +5VDC	TTL	51x41x17	0°C to +55°C	±2x10-6
OSC67-1-2	2 to 8	1x10-6/YR	275MW	+12 & +5VDC	TTL	51x41x17	0°C to +55°C	±1x10-6

OVENAIRE-AUDIO-CARPENTER
Division of Walter Kidde & Company, Inc. 706 FORREST STREET – CHARLOTTESVILLE, VIRGINIA 22901
TELEPHONE 804-977-8050 TWX 510-587-5461 CABLE "OVENS"
KIDDE

ovenaire oscillators

Ovenaire has acquired the product line of W. H. Ferwalt, Inc. of Lapwai, Idaho. Former Ferwalt models are now being produced by Ovenaire and models listed in the following tables are currently available from Ovenaire.

PKG STYLE A
Printed ckt mount
Encapsulated
1.5″ x 2.0″ x .56″
(AX: Without mtg. hole)
(AC: 7 pin plug-in; stud mt.)

PKG STYLE B
Printed ckt mount
Encapsulated
1.9″ x 2.5″ x .5″
(BY: 1.9″ x 2.5″ x 1.0″)
(BZ: 1.9″ x 2.5″ x .375″)

PKG STYLE F & Q
Printed ckt mount
Encapsulated
F: 1.0″ x 1.25″ x .5″
Q: 2″ x 2″ x .6″

PKG STYLE G
I.C. plug-in
Encapsulated
.78″ x 1.125″ x .5″
(GX: .75″ x 1.5″ x .5″)

PKG STYLE H
Printed ckt mount
Encapsulated
.875″ x .875″ x .5″

PKG STYLE J
Printed ckt mount
Encapsulated
1.25″ x 1.25″ x .5″
(JX: 1.25″ x 1.25″ x .32″)

PKG STYLE K
I.C. 14 pin D.I.P.
.485″ x .78″ x .45″
(KX: .485″ x .78″ x .57″)

PKG STYLE L
Octal plug-in
Stud mount
Metal can
2″ x 2″ x .75″

PKG STYLE P
Special plug-in
Encapsulated metal can
.7″ x 1.3″ x 1.7″

PKG STYLE M, N, & O
Printed ckt mount
Encapsulated metal can
M: 2.5″ x 2.5″ x .625″
N: 2″ x 2″ x .75″
O: 2″ x 2.5″ x .75″
(stud mount)
OA: 2″ x 2.5″ x .65″

Model Series	Frequency Range	Stability	Temperature Range	PK-to-PK Output	Load	Supply Voltage	Pkg. Style	1-9 Price Range[4]
CRYSTAL CONTROLLED OSCILLATORS — NO OVEN REQUIRED								
X0128	7.5KHz to 85KHz	±.02%	0°C to +70°C	6.7V Sine	10K ohms	+15V	Q	$158 to $168
X062	4KHz to 16MHz	±.01 to ±.025%[4]	−20°C to +70°C	5V Square	1.5K ohms	+12V	AX	$49 to $77
X0110	4MHz to 10MHz	±.01%	0°C to +70°C	4V Square	10 TTL	+5V	F	$34 to $44
X0111	250KHz to 3.99MHz	±.01%	0°C to +70°C	4V Square	10 TTL	+5V	J	$36 to $50
X0112	63Hz to 249KHz	±.01%	0°C to +70°C	4V Square	10 TTL	+5V	AX	$43 to $70
X0120	30Hz to 39MHz	±.01%	0°C to +70°C	4V Square	9 TTL	+5V	K or KX[4]	$62 to $165
X0123	7.5KHz to 60KHz	±.01%	0°C to +50°C	1.5V Sine	10K ohms	+5V	A	$132.87
X0100	.005Hz to 3MHz	±.007%	−40°C to +85°C[2]	12V Square[5]	50 CMOS[5]	+12V	A	$76 to $88
X096	5MHz to 16MHz	±.005%	0°C to +70°C	1V Square	3 ECL	−5V	JX	$68.28
X032	12.5KHz to 5.99MHz	±.003 to ±.01%[4]	0°C to +75°C[2]	4V Square[3]	25 DTL	+5V	A	$72 to $106
X032C	6MHz to 40MHz	±.003%	0°C to +75°C[2]	4V Square[3]	9 TTL	+5V	A	$82 to $97
X033	.001Hz to 30MHz	±.003%	0°C to +75°C[2]	4V Square[3]	9 DTL/TTL	+5V	B	$74 to $190
X082	190KHz to 30MHz	±.003%	0°C to +75°C[2]	4V Square	9 DTL/TTL	+5V	F	$58 to $78
X094	190KHz to 16MHz	±.003%	0°C to +75°C[2]	4V Square	9 DTL/TTL	+5V	H	$65 to $84
X0181	12Hz to 12.49KHz	±.003%	0°C to +75°C[2]	4V Square	1 TTL	+5V	GX	$126 to $149
X081	12.5KHz to 199KHz	±.003%	0°C to +75°C[2]	4V Square	9 DTL/TTL	+5V	GX	$98 to $116
X071	200KHz to 20MHz	±.003%	0°C to +75°C[2]	4V Square	9 DTL/TTL	+5V	G	$70 to $88
X081	20.1MHz to 30MHz	±.003%	0°C to +75°C[2]	4V Square	9 DTL/TTL	+5V	GX	$78.05
X045	1MHz to 5MHz	±.001%	+10°C to +50°C	.63V Sine	50 ohms	+15V	AC	$120.12
LC AND RC OSCILLATORS								
LC035	70KHz to 5MHz	±.5%	0°C to +85°C	2V Sine	10K ohms	+12V	A	$34.90
LC01028	733KHz to 5MHz	±1%	−50°C to +100°C	2V Sine	1K ohms	+12V	J	$51.21
PS057	10Hz to 40KHz	±1%/±2%[4]	0°C to +50°C	6V Sine	10K ohms	+12V	A	$39 to $46
RC036A	1Hz to 1MHz	±2%	−20°C to +85°C	4V Square[3]	9 DTL/TTL	+5V	A	$34 to $59
RC036B	1Hz to 1MHz	±1%	0°C to +75°C	4V Square[3]	9 DTL/TTL	+5V	A	$32 to $52
UJ039A	.1Hz to 100Hz	±2%	0°C to +50°C	3V Square	1.5K ohms	+12V	A	$25.50
RC0109	1Hz to 1MHz	±1%	0°C to +50°C	2.5V Sine	600 ohms	+15V	B	$62 to $83
RC0168	1.5Hz to 30KHz	±.5%	0°C to +75°C	4V Square[3]	9 DTL/TTL	+10V	B	$73 to $94
SINE WAVE OPTIONS — ADD "S" VERSION TO MODEL NUMBER (MAY REQUIRE LARGER PACKAGE[4])								
S11/12[4]	10KHz to 40MHz	5% Distortion	0°C to +75°C	1 mw into 50 ohms	+12V	May be Combined with Oscillator Voltage[4]		Add $20
S13	5Hz to 100KHz	5% Distortion	−55°C to +75°C	1.75V RMS into 600 ohms	+15V			Add $25
S14	10KHz to 1MHz	3% Distortion	−55°C to +125°C	2V pk-to-pk into 10K ohms	None			Add $15
S17	20Hz to 200KHz	5% Distortion	0°C to +50°C	3V pk-to-pk into 10K ohms	+5V			Add $20
S18	5Hz to 100KHz	3% Distortion	−55°C to +75°C	2.5V pk-to-pk into 600 ohms	+15V			Add $25
S19/20[4]	10KHz to 40MHz	5% Distortion	0°C to +75°C	2mw into 50 ohms	+15V			Add $20
S21	20Hz to 200KHz	5% Distortion	0°C to +50°C	3V RMS into 10K ohms	+15V			Add $25
S23	10KHz to 1MHz	1% Distortion	0°C to +75°C	8V pk-to-pk into 10K ohms	+12V			Add $30
S24	100KHz to 15MHz	5% Distortion	0°C to +75°C	.5V RMS into 5K ohms	None			Add $20

[1] ±5 x 10^{-10} short term stability.
[2] For ±.01% over −55°C to +125°C add "A" to Model Number (Price increases).
[3] Sine wave options listed above.
[4] Depending on frequency.
[5] TTL option available.

TEMPERATURE COMPENSATED CRYSTAL OSCILLATORS

Model Series	Frequency Range	Stability	Temperature Range	Aging at Const. Temp.	PK-to-PK Output	Load	Supply Voltage	Pkg. Style	1-9 Price Range[4]
TCX0101	.0075Hz to 10MHz	±1PPM	0°C to +50°C	±2/10^8 per day[1]	12V Square[5]	50 CMOS[5]	+12V	B	$170 to $179
TCX0101A	.0075Hz to 10MHz	±5PPM	−55°C to +75°C	±2/10^8 per day[1]	12V Square[5]	50 CMOS[5]	+12V	B	$203 to $258
TCX01013	4KHz to 17MHz	±2PPM	−18°C to +55°C	±2/10^8 per day[1]	4V Square	9 DTL/TTL	+5V	B	$194 to $204
TCX034	.0005Hz to 40MHz	±1PPM	0°C to +50°C	±2/10^8 per day[1]	4V Square[3]	9 DTL/TTL	+5V	B	$171 to $216
TCX056	100KHz to 30MHz	±1PPM	0°C to +50°C	±2/10^8 per day[1]	4V Square[3]	9 DTL/TTL	+5V	A	$182 to $210
TCX01133	2MHz to 10MHz	±.6PPM	0°C to +30°C	±1PPM per year	12V Square[5]	50 CMOS[5]	+12V	B	$199.61
TCX0146-04	4MHz to 10MHz	±.5PPM	0°C to +70°C	±1/10^8 per day	1V Sine	1K ohm	+10V	P	$208.74
TCX0138	2MHz to 6MHz	±.2PPM	+10°C to +55°C	±1/10^8 per day	4V Sine	500 ohms	±9V	L	$386.95
TCX0152	200Hz to 10MHz	±.1PPM	0°C to +50°C	±1/10^8 per day	10V Square[5]	50 CMOS[5]	+15V	OA	$248 to $270
TCX0152A	200Hz to 10MHz	±1PPM	−40°C to +70°C	±1PPM per year	10V Square[5]	50 CMOS[5]	+15V	OA	$248 to $270

TEMPERATURE COMPENSATED VOLTAGE CONTROLLED CRYSTAL OSCILLATORS

Model Series	Center Frequency Range	Deviation	Input[6]	Linearity	Stability	Temperature Range	PK-to-PK Output	Load	Supply Voltage	Pkg. Style	1-9 Price Range[4]
TCVCX0151	1Hz to 10MHz	±20PPM	+3V to −3V	±10%	±1PPM	0°C to +50°C	12V Square	50CMOS	+12V	B	$199 to $243
TCVCX0144	125KHz to 30MHz	±20PPM	+2.7V to −2.7V	±15%	±1PPM	−40°C to +71°C	4V Square	9 TTL	±9V	O	$259 to $284
TCVCX0149	30MHz to 50MHz	±25PPM	+2.5V to −2.5V	±5%	±2PPM	−40°C to +70°C	1V Sine	50 ohms	+6V & +14V	—	$313.50
TCVCX0129	1MHz to 10MHz	±25PPM	+3V to −3V	±5%	±.1PPM	+10°C to +50°C	4V Square[3]	9 TTL	±9V	M	$298 to $321
TCVCX0143	30KHz to 10MHz	±1PPM	+10V to 0V	±5%	±.1PPM	0°C to +50°C	10V Square	50CMOS	+10V	N	$235 to $244

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ovenaire oscillators

VOLTAGE CONTROLLED OSCILLATORS — CRYSTAL AND NON-CRYSTAL TYPES											
Model Series	Center Frequency Range	Minimum Deviation	Input[2]	Linearity	Stability	Temperature Range	PK-to-PK Output	Load	Voltage Supply	Pkg. Style	1-9 Price Range[4]
VC0115	60Hz to 50KHz[6]	0 to 100%	0V to +10V	±.1% F.S.	±.1% F.S.	+15°C to +55°C	4V Square	10 TTL	±15V	B	$145 to $149
VC0114	300Hz to 10KHz	±60%	+1.5V to +9V	±10%	±5%	+10°C to +44°C	3V Sine	125 ohms	+6V	B	$178.70
VC0137	1Hz to 30MHz	±10%	−5V to +5V	±10%	±.5%	0°C to +50°C	4V Square[3]	9 TTL	+5V	B	$107 to $184
VC047	1Hz to 75MHz	±10%	0V to −7V	±10%	±3%	0°C to +75°C	4V Square[3]	9 TTL	+5V	B	$82 to $159
VC068	5Hz to 15KHz	±10%	0V to −7V	±1%	±.5%	0°C to +75°C	4V Square[3]	9 TTL	+15V	B	$73 to $94
VC01019	.5MHz to 5MHz	±2%	+5V to −5V	±5% to ±10%[4]	±.5%	+55°F to +95°F	4V Square	5 TTL	+12V	A	$83.88
VC01160	100KHz to 30MHz	±1.25%	−5V to +5V	±5%	±.5%	0°C to +50°C	.8V Sine	50 ohms	+12V	BM	$147 to $162
VCX01095B	35MHz to 85MHz	±0.03%	−5V to +5V	±5%	±.01%	−40°C to +90°C	1V Square	3 ECL	+5V & −5.2V	BY	$507.66
VCX0103	1Hz to 20MHz	±.01% to ±10%	±3V or 0V to +6V	±5% to ±10%	±.0001% to ±1%	0°C to +50°C	4V Square[3]	5 TTL	+5V	BY	$276 to $405
VCX0255	1Hz to 40MHz	±.005%	0V to +6V	±5%	±.003%	0°C to +75°C	4V Square[3]	9 TTL	+5V	B	$99 to $176

CRYSTAL AND RC CONTROLLED TIMERS — CYCLE TYPE WITH PUSH BUTTON RESET								
Model Series	Time Intervals	Accuracy	Temperature Range	Output	Load	Supply Voltage	Size	1-9 Price Range[4]
TMX271B	15-30-60 Min.	±30 Sec. per day	−30°F to +130°F	SPDT Contacts	.5 Amp.	+7.5V	7″ x 4″ x 2½″	$229.00
TMX272	1 Min. to 12 Hr.[7]	±10 Sec. per day	−30°F to +130°F	SPDT Contacts	.5 Amp.	+7.5 V	6.9″ x 3.5″ x 2.6″	$398.50
TMX83	15-30-60 Min.	±3 Sec. per Mo.	+14°F to +120°F	SPDT Contacts	.5 Amp.	+7.5V	7″ x 4″ x 2½″	$355.00
TMX83A	5-15-30 Min.	±3 Sec. per Mo.	+14°F to +120°F	SPDT Contacts	.5 Amp.	+7.5V	7″ x 4″ x 2½″	$363.00
TMX183A	5-15-30 Min.	±3 Sec. per Mo.	+14°F to +120°F	SPDT Contacts	.5 Amp.	+8.3V	7″ x 4″ x 2½″	$363.00
TMX145	5-15-30-60 Min.[7]	±3 Sec. per Mo.	+14°F to +120°F	SPDT Contacts	.5 Amp.	+7.5V	5.6″ x 3.1″ x 1.53″	$390.00
TMC37	5 to 30 Sec. Adj.	±10%	+20°F to +150°F	SPST Contacts	5 Amp.	6V or 12V	4″ x 2¼″ x 2¼″	$51.94

[1] 1 PPM per year option available.

[2] See page 1 for sine wave options. S11/12/19/20 not available for voltage control ranges greater than ±1%.

[4] Depending on frequency.

[5] TTL option available.

[6] Full scale frequency.

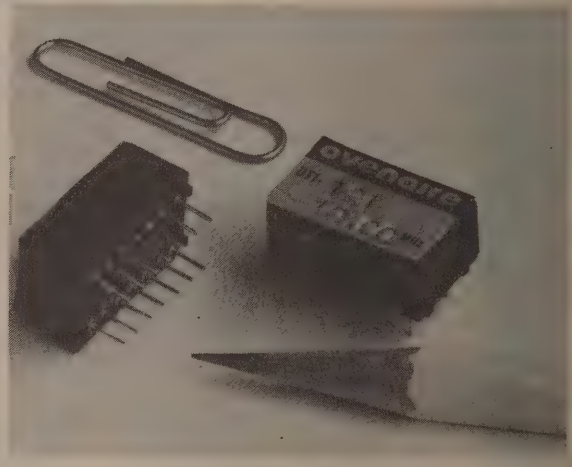
[7] Includes time display.

[8] For minimum frequency to maximum frequency.

DIP Hybrid Circuit Crystal Oscillators

Low-cost Models DT1-121 & DT1-221 designed for digital clock applications

- **Frequency Range:** 20KHz to 25MHz
- **Overall Stability:** ±0.01%—Model DT1-121
±0.005%—Model DT1-221
- **Temperature Range:** 0°C to +70°C
- **Output Waveform:** Squarewave 50/50±20% to drive 10 TTL loads. 0.4V max. "0" and 2.4V min. "1" level.
- **Input Power:** Voltage +5±5%. Current 30 to 120MA depending on frequency.
- **Package:** 14 pin DIP, glass-filled nylon. Fits into standard 14-pin socket.
- **Size: (WLH):** Approx. 0.50″×0.80″×0.37″



Contact factory for details on other DIP Hybrid Oscillator Models.

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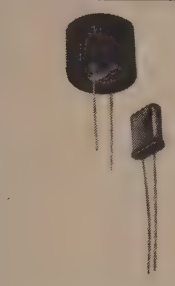
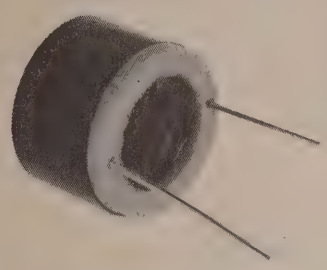
ovenaire ovens

Ovenaire's Circuit Design Technology is providing State-Of-The-Art Electronic Proportional Control Miniature Crystal and Component Ovens. Space-saving packages for PCB mount, low power consumption, low cost. A representative few of many available designs are shown. Most models are available with temperature setting from +35°C to +95°C, voltage from 5VDC to 36VDC. Ovenaire also offers a complete range of other ovens for commercial and military applications.



MODEL PCL1-27

For HC-18/U, HC-25/U, HC-42/U or HC-43/U crystals. 0.750″ dia., 0.562″ high. Temperature stability ±3°C over −30°C to +60°C typical. Also available with temperature adjustability of ±5°C of nominal.

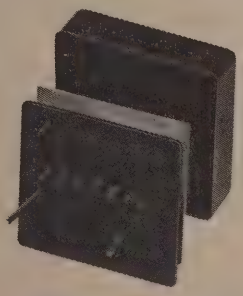


MODEL TO5P

For TO5 crystal, transistor or IC. 0.750″ dia., 0.500″ high. Temperature stability ±3°C over −30°C to +60°C ambient typical. Available with temperature adjustability of ±5°C nominal.

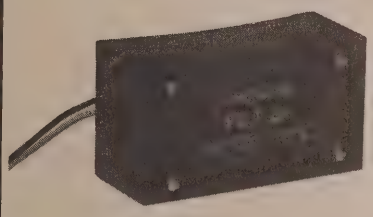
MODEL TO8A

For TO8 crystal, transistor or IC. 0.875″ dia., 0.625″ high. Temperature stability ±3°C over −30°C to +60°C ambient typical.



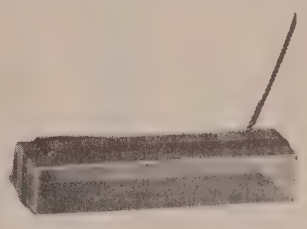
MODEL PC1-25

For 14 pin or 16 pin DIP IC or .375″ x .875″ x .156″ component. Overall size .312″ x 1″ x 1″. Temperature stability ±4°C over −30°C to +60°C ambient typical.



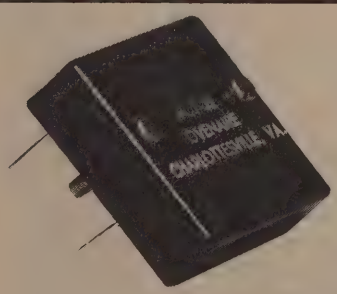
MODEL PCL1-34

For 24 pin flat pack IC. Overall size 1.80″ x 1.00″ x .775″ high. Temperature stability ±2°C over 0°C to +60°C ambient typical.



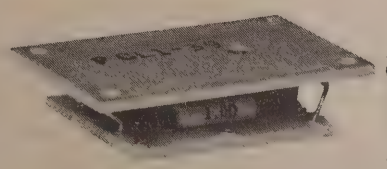
MODEL PCL12-18

Miniature PCB mount oven for 12 HC-18/U crystals. Overall size 2.812″ x .510″ x .831″ high. Temperature stability of 5°C over −20°C to +60°C ambient typical when used with urethane boot.



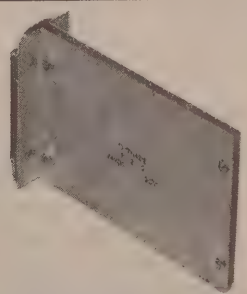
MODEL PC1-32

Direct heater plate contact oven for IC, PCB or other components. Component area 1.50″ sq. x .270″ high. Overall size 1.50″ sq. x .500″ high. Temperature stability ±4°C over −30°C to +60°C ambient typical.



MODEL PCL1-39

Direct heater plate contact oven for IC or PCB up to 1.50″ x .970″. Overall size 1.50″ x .970″ x .330″ high. Temperature stability ±3°C over −40°C to +40°C ambient.



MODEL PCL2-10

A dual direct heater plate contact oven for 2 PCB's or IC's — one on each 4.030″ x 2.50″ heater plate surface. Overall size 0.470″ x 2.50″ x .900″. Temperature stability ±4°C over 0°C to +60°C ambient.

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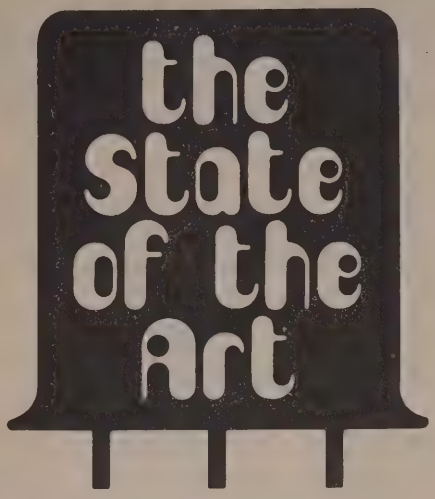


MONOLITHIC CRYSTAL FILTERS

If you need crystal filters, chances are your best bet is a monolithic — for cost, for size, for performance. If you need monolithics, you need PTI — the oldest and largest supplier. And monolithics are our principal product — not a sideline.

STANDARD MODELS

For low cost, take our 10.7 MHz and 21.4 MHz integrated crystal filters. All models are available off-the-shelf. All feature tandem monolithic construction for minimum size and high stopband performance. Our 10.7's and 21.4's are available in upright, flatpack, p.c. assemblies or sets of monolithic units for assembly on your own board.

Guide to Standard 10.7 MHz Models

13 kHz Bandwidth	15 kHz Bandwidth	30 kHz Bandwidth	No. Poles (Resonators)	Dimensions WxLxH
2194F	2195F	2196F	2	.185x.432x.45
1463	1464	1465	4	.47x.59x.60
1466	1467	1468	4	.63x.89x.23
1469	1470	1471	6	.47x.59x.60
1472	1473	1474	6	.63x1.32x.23
1475	1476	1477	8	.50x.75x.60
1478	1479	1480	8	.63x1.75x.23
1433	1434	1435	8	1.02x2.39x.52

Models 1433 - 35 interchange with commonly used conventional crystal filters.
Standard European configurations are also available.

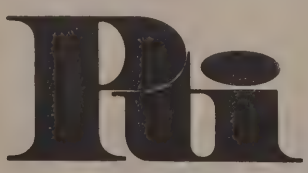
Guide to Standard 21.4 MHz Models

13kHz Bandwidth	15 kHz Bandwidth	30 kHz Bandwidth	No. Poles (Resonators)	Maximum Dimensions WxLxH (in.)
2249F	2250F	2251F	2	.185x.432x.45
1617	1618	1619	4	.47x.59x.60
1620	1621	1622	4	.63x.89x.23
1623	1624	1625	6	.47x.59x.60
1626	1627	1628	6	.63x 1.32x.23
1629	1630	1631	8	.50x.75x.60
1632	1633	1634	8	.63x 1.75x.23

PTI also offers standard models at many other popular frequencies including 5.26, 6.46, 8.0, 16.9, 20.0, 30.0, 32.0, 75 and 156 MHz.

CUSTOM MODELS

The same cost saving techniques of PTI standard integrated crystal filters can be applied to your high volume custom requirements in I-F filtering, spectrum clean-up, parametric up-conversion and front-end filtering, just to name a few. PTI engineers will work with you from start to finish to meet your specific requirements from 5 to 300 MHz. They'll be glad to discuss performance characteristics, packaging and cost. Prototypes are usually available within 4 to 6 weeks. Specification forms are yours for the asking. Write or call. If you have questions about monolithics, we've got the answers.



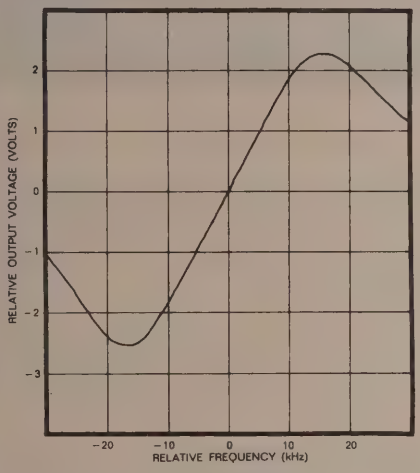
Piezo Technology Inc.

2525 Shader Road
Orlando, Florida 32804
(305) 298-2000
TWX 810-850-4136

The standard in monolithic crystal filters

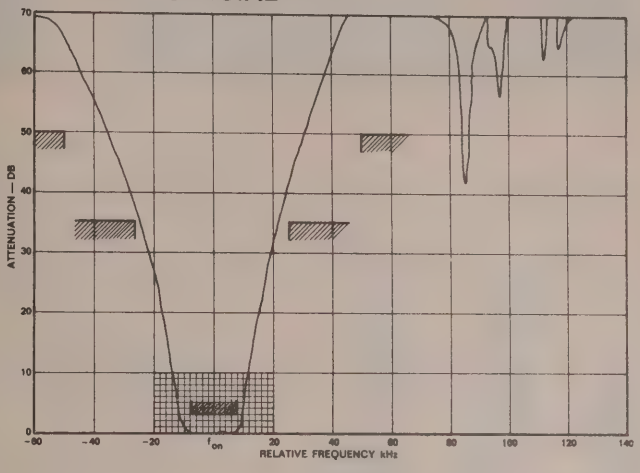
More Off The Shelf From P.T.I.

MONOLITHIC CRYSTAL DISCRIMINATOR



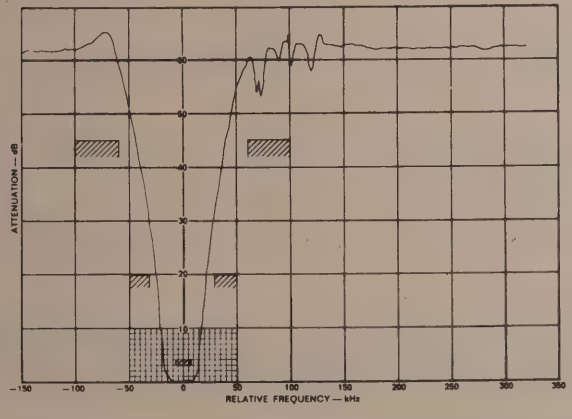
Model 2283F, at 10.7 MHz, offers 1% total harmonic distortion and 800 mV of recovered audio when used with a CA3089E quadrature detector. Model 2378F offers similar performance at 21.4 MHz. Data sheets available on request.

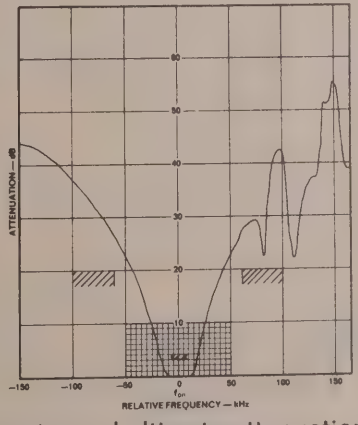
A 45 MHz SPECIAL



Our new 45 MHz Model 4371F is a 4-pole monolithic crystal filter offering maximum performance in a single HC-18 envelope. Designed for first IF use in new generation 900 MHz mobile receivers. Attenuation is 3dB max. over ± 7.5 kHz. Data sheet available on request.

FRONT-END FILTERS





These two-pole and four-pole monolithic crystal filters are designed especially for use as front-end filters for VHF low-band and high-band land mobile radios. All models are suitable for field or factory installation. They are matched to 50 ohms and fitted with phono-jacks (2-pole models) or BNC connectors (4-pole models). Two-pole models offer alternate channel rejection of 20dB min. and ultimate attenuation of 30dB. Four-pole models offer adjacent and alternate channel rejection of 20 and 45 dB (high-band) or 15 and 40 dB (low-band).

Case dimensions: l - 2.39 w - 1.02 h - 1.07

Other case styles available on special order. For OEM applications the monolithic elements can be supplied individually.

Piezo Technology Inc.
2525 Shader Road
Orlando, Florida 32804
(305) 298-2000
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The standard in monolithic crystal filters

Q-Tech Corporation

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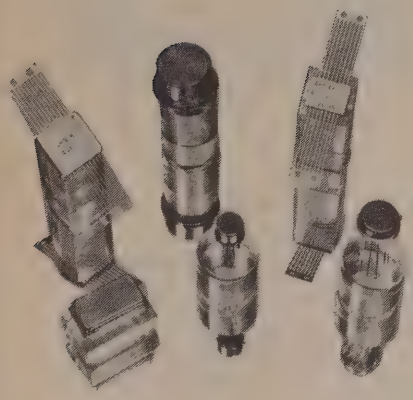
STATE OF THE ART DEVELOPMENT

MINIATURE CRYSTAL CLOCK OSCILLATORS



Q-TECH CLOCK OSCILLATORS

Q-TECH Crystal controlled clock oscillators are hybrid devices combining quartz crystal and semiconductor technologies. This, together with advanced processing procedures, results in units of exceptional reliability at attractive prices.

Q-TECH produces oscillators for both TTL and CMOS applications. TTL units operate at a nominal 5.0 Volts. CMOS units can be specified to operate at any specific voltage between 5 and 15.0 Volts.

Q-TECH clock oscillators are available to meet the stringent requirements of MIL-STD-883A, screening to Level A or Level B.

Q-TECH clock oscillators are available in 4 types: TO-5 (8 lead), TO-8 (8 or 12 lead), DIP (14 or 16 lead), and FLATPACK (QT21 and QT22). The TO5 and flatpack units cover limited frequency ranges, while the TO-8 and DIP both have an extremely wide output frequency range for an extensive variety of applications. The tables below provide full details.

FREQUENCY RANGES

TO-5 (QT1)	50KHz to 30.0MHz
TO-8 (QT2,3)	1000Hz to 25.0MHz
14 Pin Dip (QT4 & QT6)	0.1Hz to 25.0MHz
16 Pin DIP (QT5 & QT7)	0.1Hz to 25.0MHz
20 Lead Flat Pack (QT21)	1000Hz to 30.0MHz
16 Lead Flat Pack (QT22)	50KHz to 30.0MHz

STABILITIES AVAILABLE

2 x 10^{-6}	for 10% change of Vcc
1 x 10^{-6}	for 20% change of load
5 x 10^{-6}	Aging — 30 days
1 x 10^{-5}	Aging — 1 year

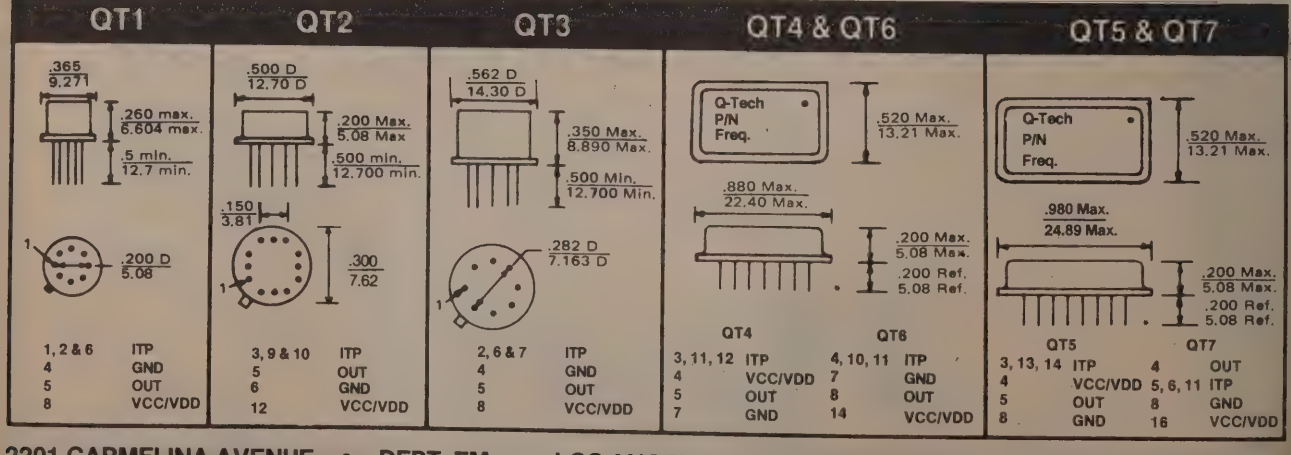
TYPICAL TOLERANCES

± .01% ± .005% * ± .0005%	0 to 50°C
*External Trimmer Required	
± .005%	0 to 70°C
± .0025%	– 20 + 70°C
± .005%	– 55 to + 105°C
± .005% ± .01%	– 55 to + 125°C

OPTIONS AVAILABLE

• GATED OUTPUT • MULTIPHASE OUTPUTS • MULTIPLE OUTPUTS • PRECISE PROGRAMMED OUTPUTS
• FINE FREQUENCY ADJUSTMENT • SPECIAL PACKAGING • MICROPROCESSOR COMPATIBLE OUTPUTS
• HIGHER FREQUENCIES WITH MORE OPEN TOLERANCES.

UPPER DIMENSIONS IN INCHES, LOWER DIMENSIONS IN MILLIMETERS.



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Q-Tech Corporation

PIONEERS IN HYBRID TECHNOLOGY
STATE OF THE ART DEVELOPMENT

MINIATURE CRYSTAL CLOCK OSCILLATORS

C-MOS CLOCK OSCILLATORS

Frequencies available in the C-MOS line of oscillators are limited presently to 15.0 MHz. This frequency limit is also related to input voltage. It is essential, therefore, when ordering a C-MOS unit to specify the input voltage.

Power requirements of C-MOS units are related to both frequency and input voltage. Most of the power is dissipated within the crystal oscillator portion of the device, and buffering, division, or other logic requirements within the unit contribute little to the total power consumption.

To accommodate low power and/or low voltage requirements for C-MOS applications that are frequently encountered, two series of oscillators are offered. These are the QT8 and the QT9. The larger diameter packages enable Q-TECH to continue to offer the stabilities of AT-cut crystals in relation to frequencies as low as 0.1Hz and additionally, afford low power consumption and operating voltages (VDD) as low as 4.0V. Frequency ranges that may be obtained from the two packages are shown in the tabulation "FREQUENCY RANGES AVAILABLE."

FREQUENCY RANGES AVAILABLE

Package Size	C-MOS Frequency Range	TTL Frequency Range
QT1	50KHz to 15MHz	400KHz to 30MHz
QT2 or QT3	300Hz to 15MHz	1KHz to 25MHz
QT4 or QT6	.1Hz to 15MHz	.1Hz to 25MHz
QT8	.1Hz to 6MHz	.1Hz to 16MHz
QT9	.1Hz to 3MHz	—
QT21	1.0Hz to 15MHz	1Hz to 30MHz
QT22	50KHz to 15MHz	400KHz to 30MHz

QUALITY CONFORMANCE AND RELIABILITY ASSURANCE

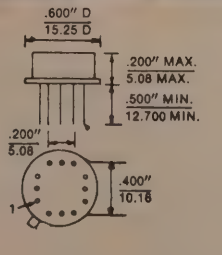
Q-Tech's facilities are qualified to MIL-I-45208 and are well equipped to perform the screening, quality conformance and reliability assurance requirements of MIL-M-38510A and MIL-STD-833. Q-Tech is fully equipped to provide hybrid oscillators under MIL-O-55310.

SPECIAL PACKAGES AND ENCLOSURES

Q-TECH can provide units to unusual package requirements including minature units withstanding 10,000 PSI and Flat Packs with less than .100 inch thickness.

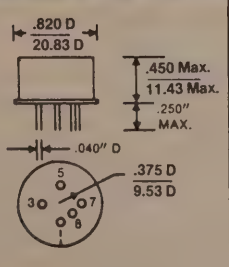
UPPER DIMENSIONS IN INCHES, LOWER DIMENSIONS IN MILLIMETERS.

QT8



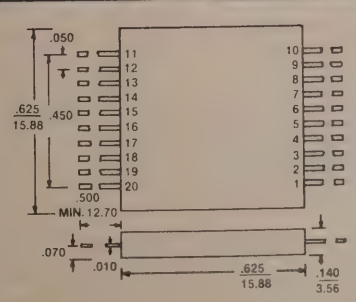
3 & 10	ITP
5	OUT
6	GND
12	VCC/VDD

QT9



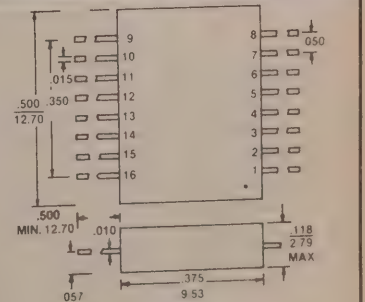
1	OUT
5	ITP
7	VCC/VDD
8	GND

QT21



7 & 16	ITP	10	GND
11	OUT	13	VCC/VDD

QT22



8 & 13	ITP	10	OUT
9	GND	8	VCC/VDD

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CATALOGUE DE L'ELECTRONIQUE POUR LES INGENIEURS
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ELECTRONIC ENGINEERS CATALOGUE

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The ELECTRONIC ENGINEERS CATALOGUE is the only comprehensive, trilingual catalogue/source-directory of electronic products available to—and from—Western Europe.

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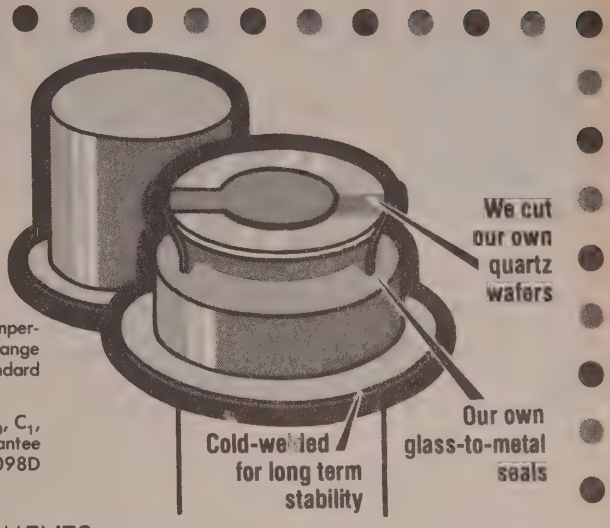


HIGH-RELIABILITY CRYSTALS

All Reeves-Hoffman crystal units pass rigorous final inspection, including a temperature test that measures frequency and deviations in frequency over the range −55° to +125° C. All test equipment is calibrated against our in-house standard that continuously monitors Bureau of Standards' VLF transmissions.

FILTER CRYSTALS. For filter applications, crystals are available with special C_0, C_1, L_1; with temperature coefficients to your specifications; pre-aged to guarantee stability; in special designs for high shock and vibration. All units meet Mil-3098D requirements.

CRYSTAL ELEMENTS

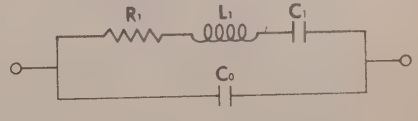
OLDERS	FREQUENCY RANGE kHz	TYPICAL ELECTRICAL EQUIVALENT PARAMETERS: Frequency kHz	R_1 ohms	L_1 H	C_1 pF	C_0 pF	Q
		X–Y ELEMENT					
-1	3.5–7.5	10	20 K	33.8 K	.0075	6.14	106 K
-2	7.5–50	30	30 K	5.6 K	.0045	2.31	39 K
H-13	8–50	50	30 K	2.9 K	.0033	1.85	33 K
		J ELEMENT					
-1	1.4–1.8	1	150 K	224 K	0.113	25.5	9 K
-2	1.8–15	2	75 K	64 K	0.0996	19.3	11 K
H-13	1.8–15	4	36 K	37 K	0.053	10	26 K
	NOTE: 1–1.8 uses 2½" RH-13	8	30 K	14 K	0.027	7.6	21.5 K
		12	15 K	7 K	0.0248	6.8	35.5 K
		N ELEMENT					
-2	16–150	16	15 K	4,389	0.0201	12.8	31 K
H-13	16–150	20	9 K	3,480	0.0182	11.37	48 K
H-6	85–150	50	10 K	1,021	0.010	9.05	32 K
H-36	90–150	90	11 K	483	0.0067	5.43	26 K
-2	16–150	150	12 K	393	0.0028	4.59	31.5 K
-3	50–150						
		H ELEMENT					
H-13	20–150	26.4	5 K	1,772	0.021	7.07	59 K
H-6	90–150	38.4	4 K	1,051	0.016	6.15	61 K
-2	20–150	66.4	3.5 K	510	0.011	4.95	63 K
		E ELEMENT					
-1	60–300	100	1.8 K	67	0.037	5.78	24 K
-2	85–300	200	2 K	48	0.014	3.33	30 K
H-13	85–300	300	2.5 K	39.2	0.0074	2.2	29 K
H-6	190–300						
H-36	190–300						
-2	85–300						
-3	140–300						
		D ELEMENT					
H-36	200–450	200	950	30	0.0207	9.25	41 K
H-512	300–450	300	1.7 K	24.5	0.0114	4.98	27 K
H-6	200–450	400	3 K	27	0.0055	2.72	23 K
-3	250–450	450	3.5 K	31	0.004	1.60	24 K

HOLDERS	FREQUENCY RANGE kHz	TYPICAL ELECTRICAL EQUIVALENT PARAMETERS: Frequency kHz	R_1 ohms	L_1 H	C_1 pF	C_0 pF	Q
		C ELEMENT					
RH-36	370–600	250	500	9.6	0.004	15.2	44 K
RH-6	370–600	400	600	11.29	0.0143	5.82	46 K
RH-512	455–600	500	1 K	10.88	0.0097	3.96	39 K
E-3	455–600	600	1 K	10.07	0.0072	3.12	39 K
		S ELEMENT					
RH-13	200–300	300	700	12.41	0.021	9.39	34 K
RH-36	310–800	400	700	12.5	0.012	5.4	45 K
RH-6	300–800	500	950	12.46	0.008	3.98	41 K
RH-512 & HC-18	450–1000	655	1,530	12.33	0.0047	2.69	33.5 K
E-3	330–1000						
A-5	900–1100						

HOLDERS	FREQUENCY RANGE MHz	TYPICAL ELECTRICAL EQUIVALENT PARAMETERS: Frequency kHz	R_1 ohms	L_1 H	C_1 pF	C_0 pF	Q
		A ELEMENT					
RH-36	1–20	500	1,500	20	.0050	2.35	44 K
RH-6	1–20	800	350	4.8	.0080	2.90	70 K
E-3	1–20	1,000	300	3.3	.0076	2.55	70 K
C	1–20	1,400	250	1.85	.0070	2.95	65 K
RH-512	5–200	3,000	65	.40	.007	2.41	128 K
RH-18	10–200	6,500	15	.02	.030	5.89	73 K
A-5	10–200	11,500	12	.01	.018	4.50	66 K
		11,514*	22	.1063	.0018	6.84	350 K
		20,769*	8	.0141	.0042	10.50	230 K
		40,374*	35	.0073	.0021	6.28	53 K

* Overtone—3

SIMPLIFIED ELECTRICAL EQUIVALENT OF RESONATING QUARTZ CRYSTAL



CRYSTAL HOLDERS

(All dimensions in inches. Coldweld—max. untrimmed)

COLDWELD HOLDER	Mil Type	Diam.	Height	Length	Width	Thick.	Nominal pin dimensions: Diam.	Length	Spacing
A-2	HC-35	.400	1.550				.0185	.500	.200
A-3	HC-35	.400	1.000				.0185	.500	.200
A-5	HC-35 (TO-5)	.400	.260				.0185	.500	.200
B-2	HC-37	.600	1.550				.0185	1.000	.282
B-5	HC-37 (TO-8)	.600	.260				.0185	1.000	.282
C	HC-40	.830	.350				.0185	1.000	.375
E-1			.360	2.100	.730		.020	.750	1.000
E-2	HC-41		.360	1.595	.730		.020	.750	1.000
E-3	HC-39		.360	.770	.770		.020	.750	.375
RH-36	HC-36		.810		.820	.420	.050	.206	.486
SOLDERSEAL HOLDER									
RH-6	HC-6		.775		.757	.352	.050	.238	.486
RH-13	HC-13		1.526		.757	.352	.050	.238	.486
RH-18	HC-18		.530		.435	.183	.0185	1.500	.192
RH-512			.650		.564	.234	.030	1.500	.275
RH-527			.777		.757	.245	.030	2.000	.486

Alternate pin configurations and locations are available.

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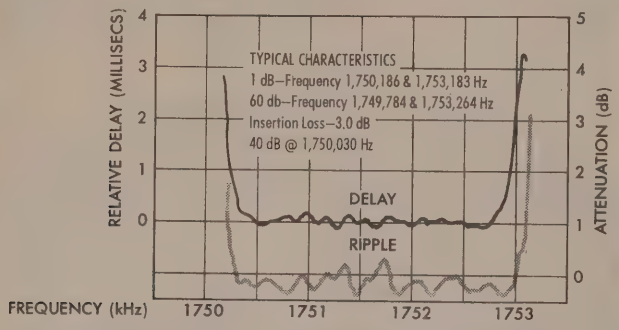
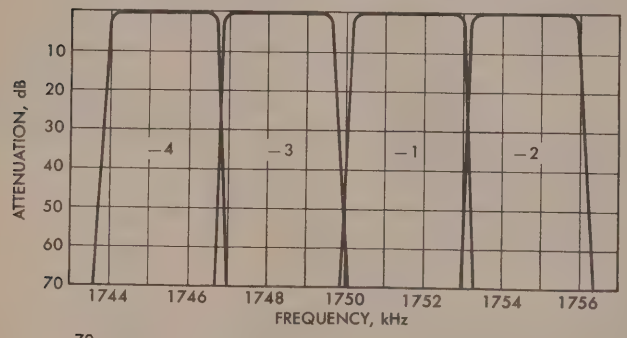
CRYSTAL FILTERS

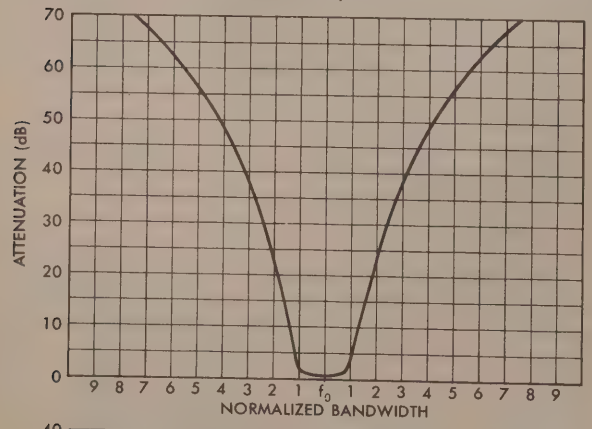
- ★ Computer-aided design saves development time and assures optimum performance
- ★ All crystals designed and built in Reeves-Hoffman's own plant, pre-aged and temperature tested for improved stability
- ★ Packaged to meet your most exacting requirements
- ★ Modern equipment automatically measures critical parameters over the specified temperature range to assure top performance
- ★ Complete environmental testing facilities

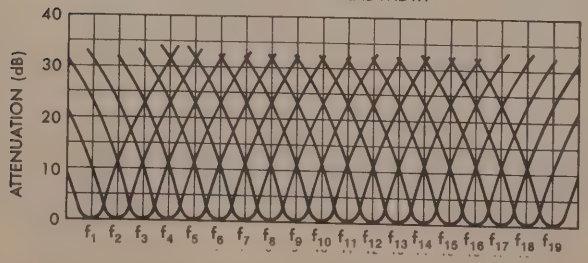
To order filters, please specify:

1. Center frequency and tolerance.
2. 3 or 6 dB bandwidth.
3. 40 or 60 dB bandwidth and frequencies at these points if asymmetric.
4. Minimum attenuation in stopband.
5. Passband ripple.
6. Insertion loss.
7. Input and output impedance (tolerance).
8. Operating temperature range.
9. Packaging details.
10. Additional electrical and environment specifications as required.









EQUALIZED DELAY FILTERS

FREQUENCY RANGE: 100 kHz–2 MHz
TYPICAL DELAY DISTORTION <200 μs
TYPICAL SHAPE FACTORS <1.2:1
IMPEDANCE LEVELS: To specifications
MEET MIL. STD. 188

SINGLE SIDEBAND FILTERS

FREQUENCY RANGE: 10 kHz–30 MHz
SYMMETRICAL—Use for either sideband
REGULAR—Specify upper or lower
SHAPE FACTOR: From 1.1:1
TYPICAL CARRIER ATTENUATION >30 dB
Illustrated: Model F11234—4-channel SSB multiplexing.

VERY NARROW BANDWIDTH FILTERS

DESIGNS: Bessel, Butterworth, Gaussian, Chebyshev
FREQUENCY RANGE: 10 kHz–30 MHz
TYPICAL SHAPE FACTOR <6:1
IMPEDANCE LEVEL: To specifications

COMB FILTERS

FREQUENCY RANGE: 10 kHz–30 MHz
TYPICAL BANDWIDTH <0.2%
TYPICAL SHAPE FACTOR <6:1

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MONOLITHIC CRYSTAL FILTERS

- ★ Computer-aided design
- ★ Coupled, two-pole or multi-pole configurations
- ★ Custom packaging to your specifications
- ★ Complete environmental testing facilities
- ★ Conformance to all military specifications

f_0 Range (MHz)	Holder	No. Resonators	Overtone (Mode)	Typical Shape Factor (See Fig 1) 20 dB BW to 3 dB BW Ratio	Typical Shape Factor (See Fig 1) 60 dB BW to 3 dB BW Ratio	Insertion Loss	Ripple (dB)	Spurious Attenuation (dB)	Ultimate Attenuation (dB)	Z in or Z out (KΩ)	3 dB BW / f_0 (%) Ratio
5 to 12 9 to 30 9 to 30	HC-6 HC-18 T05	2	Fundamental	3		1.0 to 4.0 dB	0.0 to 2.0	15	45	0.5 to 10.0	0.01 to 0.25
*5 to 12 *9 to 30 5 to 12 9 to 30	F 14765-2 F 14766-2 F 14765-1 F 14766-1	4	Fundamental	1.5	4.7	1.0 to 4.0 dB	0.0 to 2.0	50	65	0.5 to 10.0	0.01 to 0.25
5 to 12 9 to 30	F 14765-2 F 14766-2	6	Fundamental	1.25	2.6	1.0 to 4.0 dB	0.0 to 2.0	60	85	0.5 to 10.0	0.01 to 0.25
30 to 95	HC-18 T05	2	3rd Overtone	3		1.0 to 6.0 dB	0.0 to 2.0	10	40	0.5 to 10.0	0.005 to 0.05
30 to 95	F 14766-1 F 14766-2*	4	3rd Overtone	1.5	4.7	1.0 to 6.0 dB	0.0 to 2.0	50	65	0.5 to 10.0	0.005 to 0.05
30 to 95	F 14766-2	6	3rd Overtone	1.25	2.6	1.0 to 6.0 dB	0.0 to 2.0	60	75	0.5 to 10.0	0.005 to 0.05

*With transformer in holder.

CRYSTAL OSCILLATORS

- ★ Employing our own crystals, pre-aged for reliability
- ★ Complete environmental testing facilities
- ★ Outputs compatible with any logic family
- ★ Packaging to your specifications

HIGH-STABILITY OSCILLATORS

FREQUENCY RANGE:
100 kHz–60 MHz
TYPICAL STABILITY:
1 part in 10^8 per day to 2 parts in 10^{11} per day
OPERATING TEMPERATURE RANGE:
−55° C to +80° C
OUTPUTS:
1 volt RMS sine or to specifications
OUTPUT:
harmonics, noise & spurious—30 dB–100 dB

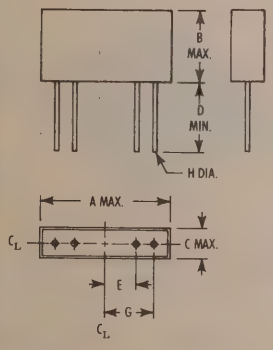
TEMPERATURE-COMPENSATED OSCILLATORS

FREQUENCY RANGE:
1 cps–200 MHz
TEMPERATURE RANGE:
Typical 0° C to 50° C
FREQUENCY STABILITY:
Typical, 1 part in 10^6
OUTPUT:
Sine or square wave
PACKAGING:
To specifications

VOLTAGE-CONTROLLED OSCILLATORS

FREQUENCY RANGE:
1 kHz–200 MHz
FREQUENCY DEVIATION:
0.01%–0.5%
TYPICAL LINEARITY:
1%–5% of peak deviation
MODULATION RATE:
0 to 200 kHz

HOLDERS All dimensions in inches.



CASE/SIZE	A	B	C	D	E ±.015	G ±.015	H ±.033
F14765-2	2.588	.995	.416	.500	.875	1.125	.030
F14765-1	1.713	.995	.416	.500	.438	.672	.030
F14766-2	1.845	.745	.250	.250	.656	.765	.017
F14766-1	1.175	.745	.250	.250	.344	.430	.017

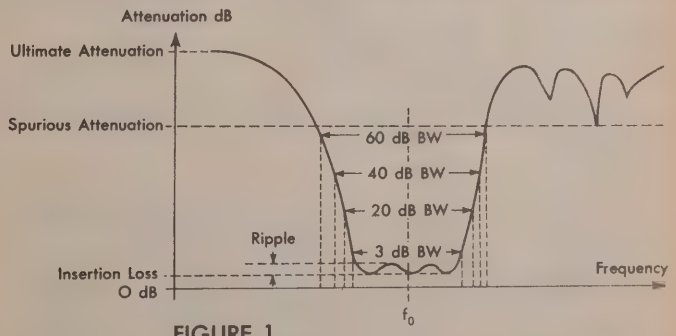


FIGURE 1

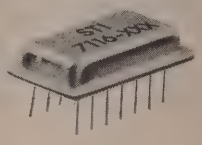
ACTUAL MEASURED DATA

BANDWIDTH	f_0 = 10.7 MHz HC-6 2-POLE	f_0 = 10.7 MHz F14765-1 4-POLE	f_0 = 10.7 MHz F14765-2 6-POLE	f_0 = 10.7 MHz HC-18 2-POLE	f_0 = 10.7 MHz F14766-1 4-POLE	f_0 = 10.7 MHz F14766-2 6-POLE
3 dB	13.5 kHz	13.2 kHz	13.8 kHz	15.5 kHz	12.5 kHz	15.4 kHz
6 dB	17.5 kHz	14.4 kHz	14.4 kHz	19.3 kHz	13.9 kHz	16.3 kHz
20 dB	41.1 kHz	20.4 kHz	17.1 kHz	43.1 kHz	20.0 kHz	20.1 kHz
30 dB	72.0 kHz			70.6 kHz		
40 dB		34.7 kHz	22.8 kHz	103.7 kHz	33.9 kHz	27.9 kHz
60 dB		72.4 kHz	30.7 kHz		61.0 kHz	39.3 kHz
BW_6/BW_3	1.30	1.10	1.05	1.25	1.12	1.07
BW_{20}/BW_3 BW_{30}/BW_3	3.05 5.34	1.55	1.24	2.79 4.56	1.60	1.31
BW_{40}/BW_3 BW_{60}/BW_3		2.63 5.49	1.65 2.23	6.70	2.72 4.87	1.81 2.55
RIPPLE	0.1 dB	0.2 dB	0.7 dB	0.3 dB	0.2 dB	0.3 dB
INSERTION LOSS	0.1 dB	0.3 dB	0.4 dB	0.3 dB	0.7 dB	1.0 dB
SPURIOUS ATTENUATION	11.1 dB	50.5 dB	60 dB	35.0 dB	65.5 dB	70 dB
INPUT & OUTPUT TERMINATION	1200 ohms	1500 ohms	1500 ohms	5100 ohms	6500 ohms	6500 ohms

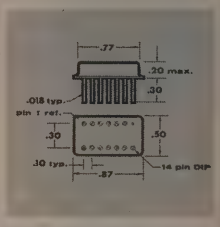
Spectrum Technology

Crystal Oscillators/IC Logic Clocks

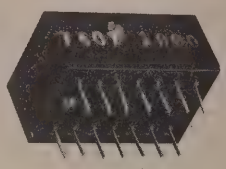
DUAL-IN LINE, LOW PROFILE, HYBRID CRYSTAL OSCILLATOR LOGIC CLOCKS:
Stabilities to ±.005%–55 to + 105° C, ±.01% to +125° C.
Package: Std. 14 pin DIP pattern, .87" x .50" x .20" metal case.
Std. Pin Connections: 7-GND, 8-Output, 14-Pos. Supply.
TTL- Series 7116—1 Hz to 65 MHz, 5 V d-c, TTL LOGIC
CMOS-Series 4116—.015 Hz to 15 MHz, 5 to 15 V d-c, CMOS LOGIC.
Both series available with MIL-STD-883, Level B Screening and in accordance with specified requirements of MIL-0-55310/8A. and /14 & /15.



PIN CONNECTIONS
7—Common (Integral to Header)
8—Output
14—Supply, Vd-c

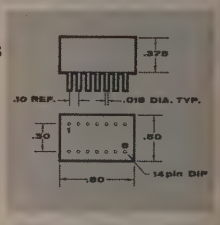


DUAL-IN-LINE CRYSTAL OSCILLATOR, LOGIC CLOCKS:
Stabilities to ±.005%, Temp. Ranges to –55 to +105° C.
Package: Std. 14 pin DIP pattern, .80" x .50" x .375" plastic case.
Std. Pin Connections: 7-GND, 8-Output, 14-Pos. Supply.
TTL- Series 7401—.75 Hz to 65 MHz, TTL LOGIC.
CMOS-Series 4401—.013 Hz to 15 MHz, CMOS LOGIC.

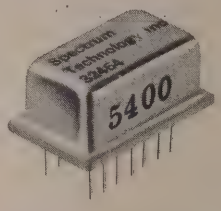


Model 7401

PIN CONNECTIONS
7—Common
8—Output
14—Supply

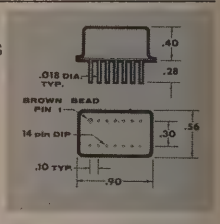


DUAL-IN-LINE CRYSTAL OSCILLATOR LOGIC CLOCKS:
Similar to 7401 & 4401 but with hermetically sealed metal package and extended temperature range.
Stabilities to ±.005%, Temp. Range to –55 to +125° C.
Package: Std. 14 pin DIP pattern, .90" x .56" x .40" metal case.
Std. Pin Connections: 7-GND, 8-Output, 14-Pos. Supply.
TTL- Series 5400—.75 Hz to 65 MHz, TTL LOGIC
CMOS-Series 4400—.013 Hz to 15 MHz, CMOS LOGIC

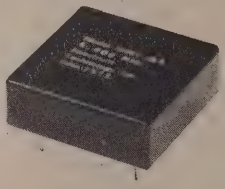


Model 5400

PIN CONNECTIONS
7—Common
8—Output
14—Supply

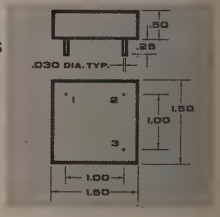


LOW COST ($4) CRYSTAL OSCILLATOR, LOGIC CLOCK:
As low as $4 each depending on quantity & frequency. Eliminate oscillator design, crystal procurement, and test problems. Low power consumption. Drive TTL or CMOS Logic.
TTL- Series 7060—Frequency: 200 KHz to 50 MHz; Stability ±.005%, 0 to +70° C; Output: Logic "O" = +0.4V max. sink 16 mA, Logic "1" =2.4V min. source .4 mA; Package: 1.50" x 1.50" x .50".
CMOS-Series 4060—Frequency: 200 Hz to 10 MHz; 5 to 15 V d-c; Stability: to ±.005%, 0 to +70° C; Output: CMOS; Package: 1.50" x 1.50" x .50".



Model 7060

PIN CONNECTIONS
1—Common
2—Supply
3—Output



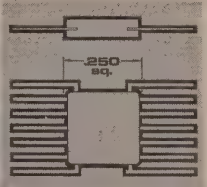
New

I Complete with internal crystal, ⅝" sq.
II Oscillator Module (uses selected external crystal) ¼" sq.

FLAT-PAK:

I

II



OSCILLATORS:

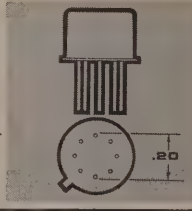
I TO-5
.200" P.C.
II TO-8
.300" Sq. Pin Pattern

Call or write for further information;

modifications welcomed.

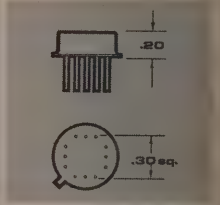
TO-5

I



TO-8

II

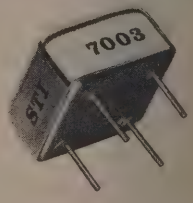


Standard (Alternate) Package Configurations

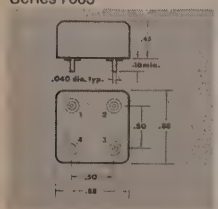
Spectrum Technology utilizes conventional P.C. Board or proven reliability Hybrid Circuits as required to supply most of the alternate oscillator packages previously designed into many commercial and military programs. Most packages can provide CMOS, TTL, Sinewave or ECL outputs from 1 Hz to 100 MHz.

PIN CONNECTIONS
Series 7003, 7042
1—Pos. Supply
2—Com. and Case
3—N/C
4—Output

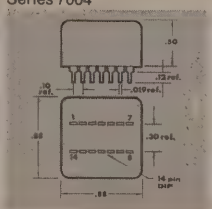
Series 7004, 7600, 7231, 5430
1—N/C
7—Com.
8—Output
14—Pos. Supply



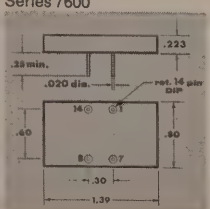
Series 7003



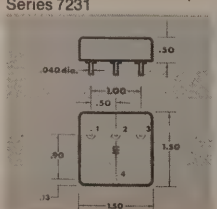
Series 7004



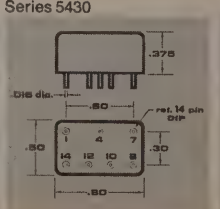
Series 7600



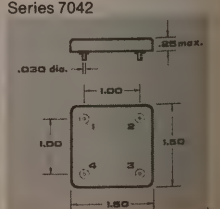
Series 7231



Series 5430



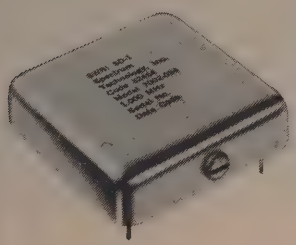
Series 7042



Spectrum Technology

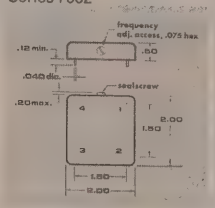
Temperature Compensated Crystal Oscillators

For applications requiring high stability, low power and zero warm-up time. Designed for P.C. Board mounting. Threaded inserts or mounting studs available. Special connectors and packages available.

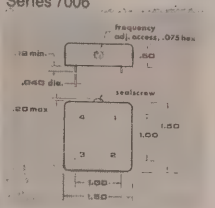


Input Voltage:	+10 to +20 volt range - regulation to +10%
Output Signal:	TTL standard; CMOS, SINE-WAVE or ECL available
Temp Stability:	$\pm 2 \times 10^{-7}$, 0 to +50°C; $\pm 5 \times 10^{-7}$, -20 to +65°C; $\pm 1 \times 10^{-6}$, -55 to +85°C; $\pm 5 \times 10^{-6}$, -55 to +125°C. Other ranges available
Freq Range:	10 KHz to 20 MHz; 1 Hz to 100 MHz available
Trim Adjust:	Mechanical or electrical for 5 to 10 years

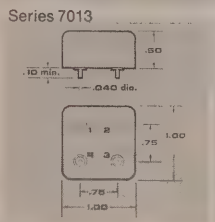
Series 7002



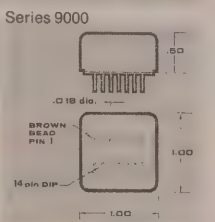
Series 7006



Series 7013



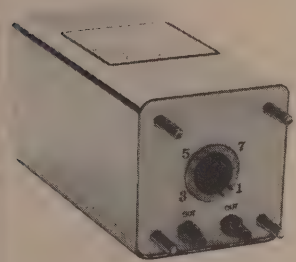
Series 9000



PIN CONNECTIONS
Series 7002
1—Pos. Supply
2—Com. and Case
3—N/C
4—Output
Series 7006
1—Pos. Supply
2—Com. and Case
3—N/C
4—Output
Series 7013
1—Pos. Supply
2—Com. and Case
3—N/C
4—Output

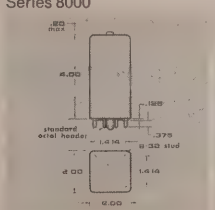
Oven Controlled Crystal Oscillators

For applications requiring extremely high stabilities where moderate power is available. Special packages and connectors available.

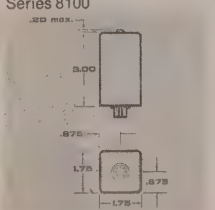


Input Voltage:	+28, +24, or +15 V d-c, ±10% regulation
Input Power:	15 watts max., 5 watts typical stabilized
Output Signal:	Sinewave standard; CMOS, TTL or ECL available.
Temp Stability:	$\pm 3 \times 10^{-8}$, -40 to +70°C. Other temperature ranges and stabilities available.
Aging:	To 1×10^{-9} per day
Freq Range:	1 MHz to 10 MHz; 1 Hz to 100 MHz available.

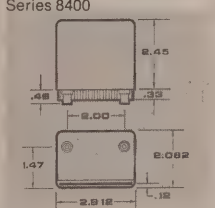
Series 8000



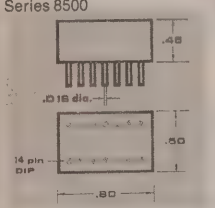
Series 8100



Series 8400



Series 8500



Special Custom Designs

Spectrum Technology manufactures a complete line of oscillators and timing systems including oven controlled crystal oscillators, temperature compensated crystal oscillators, and crystal oscillators/I.C. logic clocks. Special custom-designed devices and systems include oscillator/modulator assemblies, gated oscillators, and multiple frequency oscillators.

Spectrum Technology specilizes in proven reliability design devices featuring • Subminiature Size • Extremely Low Profiles • Low Power Consumption • High Stability • Output Frequencies or Pulse Rates from One Pulse Per Hour to Beyond the 100 MHz Region. Standard packages are available for PC mounting or dual-in-line circuit packaging cards.

Typical applications for Spectrum Technology devices include: Computers, Medical Instruments, Distance Measuring Equipment, Video, Motion Picture, and Sound Recording Constant Speed Drives, Seismological Recording and Sensing Systems, Aircraft Instrument Computers, Inertial Guidance Systems, Communication Satellites, Ground Support Systems, Tracking Systems, Torpedo Control Systems, Manned Space Applications.

QUALITY CONTROL measures at Spectrum Technology exceed requirements of MIL-I-45208A for inspection systems and MIL-C-45662A for equipment calibration. Workmanship and soldering standards are in accordance with Requirements 5 and 9 of MIL-STD-454B. Oscillators are designed and tested to the requirements of MIL-O-55310. Hybrid oscillators are designed and produced to requirements of MIL-O-55310 and are available screened in accordance with MIL-STD-883. PIND testing can also be performed.

FOR HIGH RELIABILITY applications, Spectrum Technology uses standard proven, conservative circuit designs and "ER" components. Transistors, Type JANTX or JANTXV per MIL-S-19500, I.C.'s per MIL-M-38510, or screened to MIL-STD-883. Passive components utilized are to the highest available or specified level of reliability. All soldering is in accordance with N.H.B.5300.4 (3A). Specific sections of MIL-Q-9858A are applicable on an as required basis. Traceability of all components, and assembly and test inspection points is on a unit serialized basis. Processing specifications include special screening on crystal units as well as production screening and testing during manufacturing including high temperature burn-in. Environmental levels proven by continuing tests include 50g sine vibration, $0.2g^2/Hz$ random vibration, 4000g acceleration and 1500g shock. 100% production screening tests include these plus thermal shock, temperature cycling, and leak test on as "as specified basis."

Spectrum Technology Inc.

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P. O. Box 948, Goleta, CA 93017
Federal Supplier Code No. 32464

Tel. (805) 964-7791
TWX 910-334-1163

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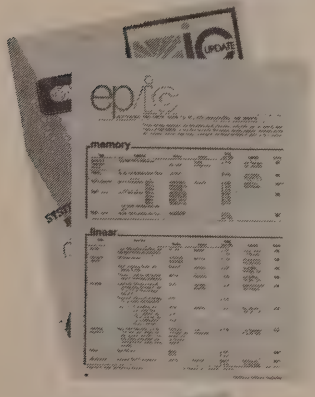

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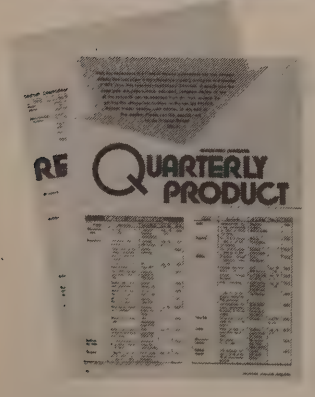

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STATEK

WATCH & TIME KEEPING
QUARTZ CRYSTALS
MODEL WX-6C
MODEL WX-7

STATEK NEW

SPECIFICATIONS*

	WX-6C	WX-7	UNITS
Frequency	32.768	32.768	kHz
Frequency Tolerance, at 25°	±15	±15	ppm
Motional Resistance, R_1	30	28	K ohm typical
	65	50	K ohm maximum
Motional Capacitance, C_1	1.90	1.90	f F typical
Q (Quality factor)	85,000	91,000	typical
	55,000	50,000	minimum
Shunt Capacitance, C_o	1.4	1.4	pf typical
Drive Level	1	1	uw maximum
Turning Point, T_o	25	25	±5°C
Temperature Coefficient, K	−0.035	−0.035	ppm/°C²
Aging (first year, at 25°C)	3	3	ppm maximum
Shock 3,000g, half sine 0.3 ms	3	3	ppm maximum
Vibration (10g RMS, 10 to 500 Hz)	1	1	ppm maximum
Operating Temperature	−10 to +60	−10 to +60	°C
Storage Temperature	−20 to +70	−20 to +70	°C

★ Specifications subject to change without notice.

1) Specified C_L 8 to 16 pf.

FEATURES

- Tuning Fork Design
- Low cost
- Laser Tuned Accuracy
- Low aging
- Small size
- High Shock Resistance

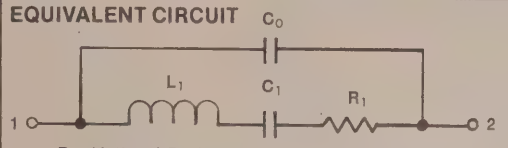
DESCRIPTION

Laser trimming of sealed tuning fork produces a very stable and high accuracy quartz watch crystal. Low cost is achieved by using semiconductor photolithographic wafer processing techniques and low cost packaging.

APPLICATIONS

Any timekeeping function from the smallest ladies watch to standard electrically powered timers.

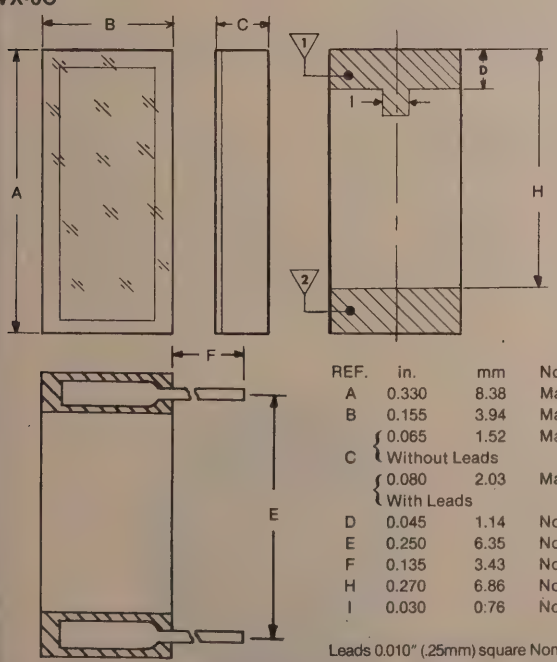
EQUIVALENT CIRCUIT



R_1 Motional Resistance L_1 Motional Inductance

C_1 Motional Capacitance C_O Shunt Capacitance

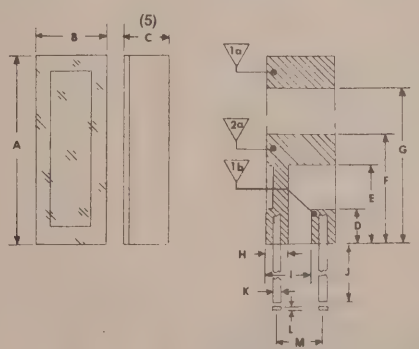
WX-6C



REF.	in.	mm	Notes
A	0.330	8.38	Max.
B	0.155	3.94	Max.
C (Without Leads)	0.065	1.52	Max.
C (With Leads)	0.080	2.03	Max.
D	0.045	1.14	Nom.
E	0.250	6.35	Nom.
F	0.135	3.43	Nom.
H	0.270	6.86	Nom.
I	0.030	0.76	Nom.

Leads 0.010" (.25mm) square Nom.

WX-7



REF.	in.	mm	Notes	REF.	in.	mm	Notes
A	0.275	6.99	Max	G	0.215	5.46	Nom
B	0.108	2.74	Max	H	0.030	0.76	Nom
C	0.065	1.65	Max	I	0.064	1.63	Nom
D	0.045	1.14	Nom	J	0.220	5 59	Min
E	0.110	2.79	Nom	K	0.013	0.33	Nom
F	0.150	3.81	Nom	L	0.005	0.13	Nom
				M	0.050	1.27	Nom

Notes:

(1) 1 & 2 Crystal

(2) Connection pads are gold plated and solderable, Au or Al bondable. Pad flush to +0.001 in. (+0.0076 mm) above surface.

(3) Glass lid has tin seal. Package may be heated for short periods during reflow soldering. Seal area must not exceed 210°C.

(4) Package material: white ceramic (94% alumina).

(5) Add 0.015 in. (0.38 mm) for leads.

(6) Side leads available, consult factory.
Tolerance ± 0.005 in. (± 0.127 mm).

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STATEK

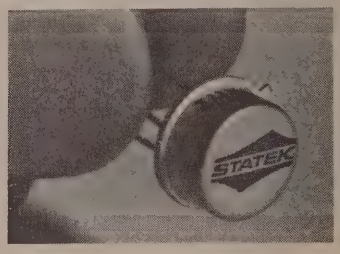
STATEK

LOW FREQUENCY
QUARTZ CRYSTALS
MODELS SX-1H & SX-1V

FEATURES
- Low cost
- 10 kHz to 300 kHz
- Hermetically sealed TO-5 can
- 18 SX-1 stock frequencies
- Low aging

APPLICATIONS
SX-1H CRYSTAL used in series resonant oscillator circuits (two inverters)

SX-1V CRYSTAL for parallel resonant (Pierce) oscillator circuits (single inverter)



SX Crystal in TO-5 Can

SPECIFICATION SUMMARY[1]

		SX-1 SERIES			
Frequency Range (kHz)		10.0-30.0	30.0-50.0	50.0-100.0	100.0-300.0
Calibration Tolerance at 25°C	Calibration A	± 0.01%	± 0.01%	± 0.02%	± 0.02%
	Calibration B	± 0.03%	± 0.03%	± 0.05%	± 0.05%
Frequency[2] Variation (%)	0-70°C	+.0065 to −.025	+.0095 to −.03	+.013 to −.035	+.0075 to −.032
	−40 +85°C	+.008 to −.036	+.015 to −.043	+.022 to −.05	+.009 to −.044
Series Resistance (MΩ)	SX-1H	4.0-1.0	1.0-0.8	0.8-0.4	0.4-0.15
	SX-1V	0.9-0.25	0.25-0.2	0.2-0.1	0.10-0.03
Q	SX-1H	3,500-7,500	7,500-11,000	11,000-14,000	14,000-22,000
	SX-1V	17,000-32,000	32,000-42,000	42,000-58,000	58,000-70,000
Motional Capacitance fF		1.3-0.85	0.85-0.75	0.75-0.60	0.25-0.30
Maximum Drive Current (μA rms)		0.35	0.5	0.5	0.5
First Year Aging at 25°C(ppm)		10	10	10	10
Shock and Vibration[3]		1000 g, 1 ms, ½ sinewave; 10 g, 10 to 1000 Hz sine sweep			
Stock Frequencies (kHz)[4]		10.0, 12.8, 15.36, 16.0, 16.384, 18.641, 19.2, 20.48, 30.72, 31.5, 32.768, 38.4, 40.96, 60.0, 76.8, 100.0, 153.6. (240.00, SX-1H only)			

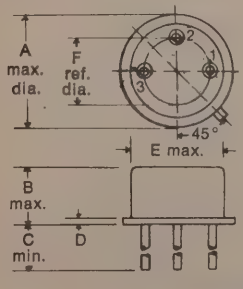
(1) Specifications are typical unless otherwise indicated. Subject to change without notice.
(2) Does not include calibration tolerance.
(3) Improved specifications available. 10 to 500Hz sine sweep below 15kHz.
(4) Non-stock frequencies 10 to 300 kHz avalible, contact factory.

PRICING SUMMARY*

	QUANTITIES						
	1-24	25-49	50-99	100-249	250-499	500-999	1000-2499
SX-1H, Stock Frequencies, Calibration A	$ 4.30	$ 3.70	$3.20	$2.87	$2.50	$2.20	$2.00
SX-1H, Stock Frequencies, Calibration B	$ 3.70	$ 3.10	$2.79	$2.44	$2.15	$1.90	$1.70
SX-1H, Non-Stock Frequencies, Calibration A	$11.30	$ 8.00	$6.30	$4.90	$3.60	$2.85	$2.20
SX-1H, Non-Stock Frequencies, Calibration B	$ 9.60	$ 6.90	$5.40	$4.15	$3.05	$2.40	$1.87
SX-1V, Stock Frequencies, Calibration A	$ 5.40	$ 4.60	$4.00	$3.59	$3.12	$2.80	$2.50
SX-1V, Stock Frequencies, Calibration B	$ 4.30	$ 3.70	$3.20	$2.87	$2.50	$2.20	$2.00
SX-1V, Non-Stock Frequencies, Calibration A	$14.00	$10.00	$7.90	$6.20	$4.50	$3.50	$2.75
SX-1V, Non-Stock Frequencies, Calibration B	$11.30	$ 8.00	$6.30	$4.90	$3.60	$2.85	$2.20

*Prices subject to change without notice.

Minimum order stock frequencies, $50.00; non-stock frequency minimum order, $200.00.
Prices are significantly lower for 10,000 or more units.



TO-5 TOP VIEW

SX-1V, SX-1H

Pin	Connection
1	+ Supply
2	Output
3	Gnd.

Dim	Inches	Millimeters
A	0.362	9.19
B	0.185	4.70
C	0.500	12.70
D	0.029	0.74
E	0.326	8.28
F	0.200	5.08

1. All metal parts are gold plated.
2. Leads are 0.019"; 0.48mm dia. (max.)

SX Crystal in TO-5 can with top removed.

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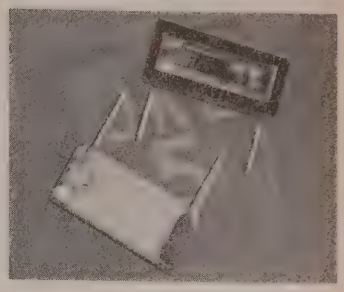
STATEK

LOW FREQUENCY
QUARTZ CRYSTALS
MODELS CX-1H & CX-1V

STATEK NEW

FEATURES
- High performance, low cost
- 10 kHz to 350 kHz
- Low profile package
- 18 CX-1 Stock frequencies
- Low aging
- Crystal visible for inspection

APPLICATIONS
The CX-1 series of quartz tuning fork crystals represent the next generation of general electronics crystals following the SX-1 series. The CX-1 series brings the high performance and production experience of millions of watch crystals to the general electronics market place. The CX-1H crystal is used in series resonant oscillator circuits (two inverters). The CX-1V crystal is used for parallel resonant, Pierce, oscillator circuits (single inverter).



SPECIFICATION SUMMARY[1]

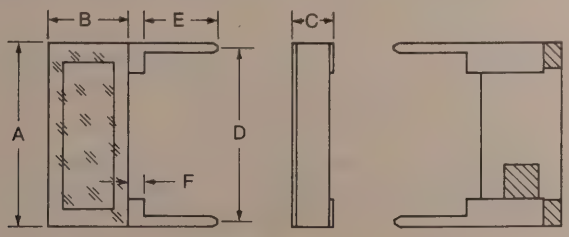
		CX-1 Series			
Frequency Range[2]		10.0–29.9	30.0–49.9	50.0–100.0	100.1–350.0
Calibration Tolerance at 25°C	Calibration A	± 0.003%	± 0.003%	± 0.005%	± 0.01%
	Calibration B	± 0.01%	± 0.01%	± 0.01%	± 0.02%
	Calibration C	± 0.05%	± 0.05%	± 0.05%	± 0.05%
Frequency[3] Variation (%)	0–70°C	– 0.01%	– 0.007%	– 0.013%	– 0.03%
	– 40 +85°C	– 0.02	– 0.014	– 0.02	– 0.07
	– 55 +125°C	– 0.045	– 0.04	– 0.05	– 0.20
Series Resistance (K ohms)	CX-1H	1250–275	275–200	200–100	125–75
	CX-1V	250–55	55–40	40–20	25–15
Motional Capacitance fF		2.4–1.1	1.1–0.74	0.74–0.55	0.8–0.30
Shunt Capacitance pf		1.3 pf			
Q (1,000's)	CX-1H	5.2–18	18–21	21–29	16–20
	CX-1V	26–88	88–107	107–145	79–101
Maximum Drive Level		0.5 μw	1.0 μw	1.0 μw	0.5 μw
First Year Aging at 250°C (ppm)		10	10	10	10
Shock and Vibration		1,000 g's, 1 ms ½ sine wave; 10 g's rms 10 to 2000 Hz random			
Stock Frequencies		10, 12.8, 15.36, 16, 16.384, 18.641, 19.2, 20.48, 30.72, 31.5, 32.768, 38.4, 40.96, 60, 76.8, 100, 153.6, 240			

[1]Specifications are typical unless otherwise indicated, and subject to change without notice.
[2]Values typical of a frequency within the range. Consult factory or full data sheet for specific values.
[3]Does not include calibration tolerance. Positive variations small compared to negative variations.

PRICING SUMMARY[1]

		QUANTITIES						
		1-24	25-49	50-99	100-249	250-499	500-999	1000-2499
CX-1H:	Stock Frequencies, Calibration A	4.30	3.70	3.20	2.87	2.50	2.20	2.00
	Stock Frequencies, Calibration B	3.70	3.10	2.79	2.44	2.15	1.90	1.70
	Stock Frequencies, Calibration C	3.33	2.79	2.51	2.20	1.94	1.71	1.53
	Non-Stock Frequencies, Calibration A	11.30	8.00	6.30	4.90	3.60	2.85	2.20
	Non-Stock Frequencies, Calibration B	9.60	6.90	5.40	4.15	3.05	2.40	1.87
	Non-Stock Frequencies, Calibration C	8.64	6.21	4.86	3.74	2.75	2.16	1.68
CX-1V:	Stock Frequencies, Calibration A	5.40	4.60	4.00	3.59	3.12	2.80	2.50
	Stock Frequencies, Calibration B	4.30	3.70	3.20	2.87	2.50	2.20	2.00
	Stock Frequencies, Calibration C	3.87	3.33	2.88	2.58	2.25	1.98	1.80
	Non-Stock Frequencies, Calibration A	14.00	10.00	7.90	6.20	4.50	3.50	2.75
	Non-Stock Frequencies, Calibration B	11.30	8.00	6.30	4.90	3.60	2.85	2.20
	Non-Stock Frequencies, Calibration C	10.17	7.20	5.67	4.41	3.24	2.57	1.98

Prices subject to change without notice.



Dim.	In.	mm	Notes
A	0.330	8.38	Max
B	0.155	3.94	Max
C	0.080	2.03	Max
D	0.300	7.62	Nom
E	0.125	3.23	Min.
F	0.025	0.64	Nom

Leads 0.010" x 0.018" (0.25 x 38 mm) Nom

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STATEK

LOW FREQUENCY
CRYSTAL OSCILLATORS
MODEL SQXO-2

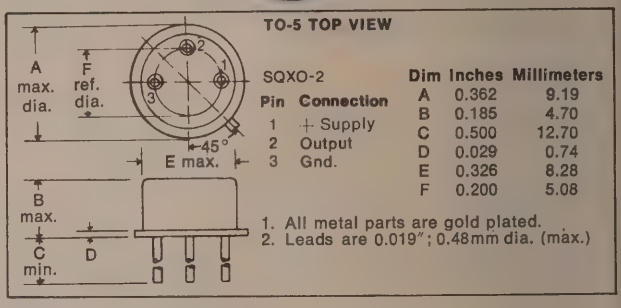
STATEK

FEATURES
- Oscillator frequency range — 10 kHz to 350 kHz
- Extremely small size
- Low milliamp current consumption
- Wide operating temperature range
- Withstands high shock and vibration levels
- CMOS and TTL compatible

DESCRIPTION
The SQXO-2 is a stable, rugged, buffered subminiature oscillator built using thick and thin film parts and the SX-1H Crystal.

APPLICATIONS
AF standards • computer clocks • data loggers • instruments • modems • pacemakers • POS terminals • telephone equipment • timers • tone generators • ultra sonic detectors

SQXO-2 Oscillator in TO-5 Can



SQXO-2

Pin	Connection
1	+ Supply
2	Output
3	Gnd.

Dim	Inches	Millimeters
A	0.362	9.19
B	0.185	4.70
C	0.500	12.70
D	0.029	0.74
E	0.326	8.28
F	0.200	5.08

1. All metal parts are gold plated.
2. Leads are 0.019"; 0.48mm dia. (max.)

SPECIFICATION SUMMARY*

	SQXO-2
Calibration and Operating Voltage	5± 0.5 VDC
Supply Voltage Range[1]	4 to 6 V
Current (typical, at Calibration Voltage into 10 pf and 10 MΩ load)	0.50 mA at 10 kHz to 2.0 mA at 250 kHz
Frequency Ranges	10 kHz to 250 kHz
Stock Frequencies Non-stock frequencies 10 to 300 kHz available, contact factory.	10.0, 12.8, 15.36, 16.0, 16.384, 19.2, 32.768 & 100.0 kHz
Standard Frequency (Calibration A) at 25°C	± 0.01% from 10 to 50 kHz and ± 0.02% from 50 to 250 kHz
Frequency Stability over Temperature Range	Approximates SX-1 Crystal Characteristics
Operating Temperature	0 to 70°C, (C) −40 to + 85°C (I) −55 to + 125°C (M)
Shock and Vibration Improved shock and vibration specifications available.	1000 g, 1 ms, ½ sinewave; 10 g, 10 to 1000 Hz sine sweep[2]

*Specifications subject to change without notice.
(1) Other voltage ranges available, consult factory
(2) 10 to 500 Hz sine sweep below 15 kHz.

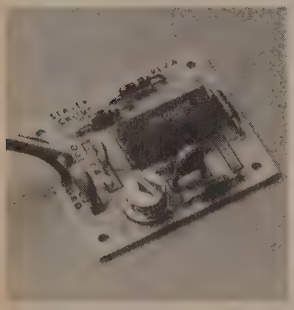
PRICING SUMMARY*

QUANTITY	SQXO-2(1) STOCK FREQ. (TO-5 CAN)	SQXO-2(1,2) NON-STOCK FREQ. (TO-5 CAN)
1- 4	$39.00	—
5-24	$29.00	$49.00
25-49	$23.50	$38.00
50-99	$23.50	$28.00
100	$19.50	$21.50

*Prices and specifications subject to change without notice.
(1) Prices shown are for Calibration A, 0 to 70°C units. Pricing for Units with different temperature and calibration ranges may be obtained from Statek.
(2) A minimum order of 5 units is required for non-stock frequency SQXO-2 oscillators.

CRYSTAL OSCILLATOR KITS — MODELS CK-1H & CK-1V

LOW FREQUENCY CRYSTAL OSCILLATOR KITS



NOTE: Models CK-1H and CK-1V Kits **do not** include integrated circuits, resistors, capacitors or wiring.

THE CK-1H AND CK-1V OSCILLATOR KITS CAN BE USED FOR:
- Oscillator breadboards
- Low volume production oscillators
- Reference oscillators for frequency correlation

DESCRIPTION
The CK-1V kit utilizes a Pierce (single inverter) oscillator circuit and contains five SX-1V crystals. The CK-1H kit utilizes a series circuit (two inverters) and contains six SX-1H crystals. The frequency calibration is ±0.01% for all frequencies except 100 kHz & 240 kHz which is ±.02%.

The table below lists the frequencies included in the kits.

Frequency	Applications
10.000 kHz	Decimal Time Base
15.360 kHz	60 Hz Time Base
19.200 kHz	Modem Clock
32.768 kHz	Seconds Timer
100.000 kHz	Decimal Time Base
240.000 kHz	Motor Speed Control

Both kits have an etched and drilled circuit board. The Model CK-1H Kit circuit uses three low cost transistors. The Model CK-1V Kit uses a CMOS 4007A Dual Complementary Pair Plus Inverter I.C.

DOCUMENTATION
The circuit documentation supplied with each kit consists of:
- Circuit schematics with a table of component values for different oscillator frequencies.
- A physical layout of the oscillator
- A parts list for various oscillator frequencies

Description of circuit operation, layout characteristics and mounting provisions are also included.

The kits are priced at $27.00 each in single quantity.

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STATEK

LOW FREQUENCY

CRYSTAL OSCILLATORS REPEAT CYCLE TIMERS

LQXO-3 DQXO-3

FEATURES

- LQ Series — 10 kHz to 350 kHz
- DQ Series — divided outputs to 1 cycle per day
- Low milliampere current
- TO-5 package
- Quartz stability
- Low aging

DESCRIPTION

The LQXO-3 is a tuning fork quartz crystal oscillator built using hybrid chip and wire construction. The DQXO-3 is an LQXO-3 with a CMOS divided output for frequencies below 10 kHz.

APPLICATIONS

The small size, moderate power consumption, high shock, CMOS drive capability of the LQXO-3 makes it suitable for instrumentation time bases, time-of-day clocks, audio standards, phase locked loop oscillators, digital circuit clocks, and industrial controllers. The longer period outputs of the DQXO-3 make it suitable for remote data timers, process controllers, long period repeat cycle timers, and tone generators.

DQXO-3

SPECIFICATION SUMMARY*

	LQXO-3	DQXO-3
Calibration Voltage	5 ±0.5 VDC	5 ±0.5 VDC
Supply Voltage Range	4 to 6 VDC[1]	4 to 6 VDC[1]
Current (no load)	1.5 Ma Maximum[2]	1.5 Ma Maximum[2]
Frequency Range	10 kHz to 300 kHz	10 kHz to 1Hz[3]
Stock Frequencies	10 and 100 kHz	1 Hz
Calibration Accuracy at 25°C	"A" ±0.01% (±0.02% at 50 kHz or higher) "B" ±0.03% (±0.05% at 50 kHz or higher)	
Operating Temperature	−40°C to +85°C standard; −55°C to +100°C special	
Frequency Stability −40°C to +85°C	10.0 to 30.0 kHz +0.008 to −0.036% 30.0 to 50.0 kHz +0.015 to −0.043% 50.0 to 100.0 kHz +0.022 to −0.05% 100.0 to 300.0 kHz +0.009 to −0.044%	
Shock	1000 g, 1 Ms, ½ sine	
Vibration	10 g, 10 to 1,000 Hz sine sweep[4]	

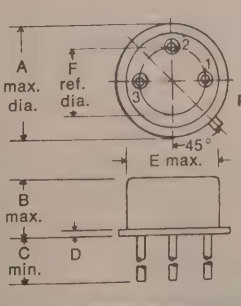
*Specifications subject to change without notice.

(1) Wider voltage range designs available; consult factory.
(2) Lower current, 12 V designs available; consult factory.
(3) For longer periods consult factory.
(4) 10 to 500 Hz sine swe-p below 15 kHz, consult factory for improved specifications

PRICING SUMMARY** Prices subject to change without notice.

	LQXO-3		DQXO-3	
Quantity	Stock	Non-Stock	Stock	Non-Stock
1 - 4	$39.00	—	$55.00	—
5 - 24	29.00	49.00	40.00	69.00
25 - 49	23.50	38.00	33.00	53.00
50 - 99	23.50	28.00	33.00	39.00
100 - 249	19.50	21.50	22.00	30.00
250 - 499	15.50	15.50	22.00	22.00
500 - 999	12.50	12.50	18.00	18.00
1000	10.00	10.00	14.00	14.00

"A" Calibration, −40°C to +85°C. "B" Calibration, approximately 10% lower. −55°C to +100°C approximately 10% higher. A minimum order of units is required for non-stock frequencies.



TO-5 TOP VIEW

LQXO-3, DQXO-3

Pin	Connection	Dim	Inches	Millimeters
1	+ Supply	A	0.362	9.19
2	Output	B	0.185	4.70
3	Gnd.	C	0.500	12.70
		D	0.029	0.74
		E	0.326	8.28
		F	0.200	5.08

1. All metal parts are gold plated.
2. Leads are 0.019"; 0.48mm dia. (max.)

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TOYOCOM TOYOCOM TOYOCOM TOYOCOM

A Long and Impressive History in Crystal Products

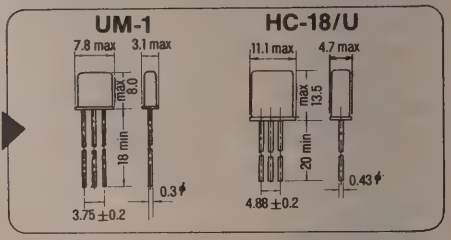
You specialize. We specialize. TOYOCOM is the leading manufacturer of synthetic quartz—quality unsurpassed—and originator of monolithic crystal filters. Our experience and history are both embodied in the following products—Reliability and Quality you can trust.

• For PAGER

*10.7MHz/21.4MHz HCM Filter

Unit: mm

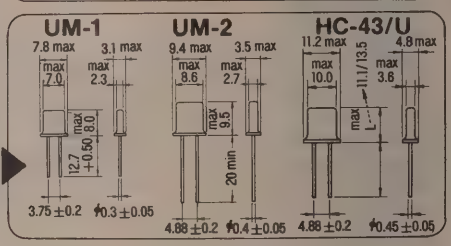
Freq.	Type	No. of pole	Case	Channel spacing (kHz)	Pass band (dB)	Pass band (kHz)	Stop band (dB)	Stop band (kHz)	Ripple (dB)	Loss (dB)	Termination	Operating temp. (°C)
10.7MHz	10M1B	2	HC-18/U	25	3	±7.5	18	±25	0.5	1.5	3kΩ // 2PF	−20～+70
	10M1E	2	HC-18/U	20	3	±6.0	20	±25	0.5	1.5	2.5kΩ // 2.5PF	−20～+70
21.4MHz	21J1B	2	UM-1	25	3	±7.5	18	±28	0.5	1.5	1.5kΩ // 2.5PF	−20～+70
	21M15A	2	UM-1	25	3	±7.5	18	±25	0.8	2.0	1.5kΩ // 2PF	−20～+70
	21J2B2	4	(UM-1)×2	25	3	±7.5	40	±25	1.0	2.0	1.5kΩ // 2PF	−20～+70
	21J1E	2	UM-1	20	3	±6.0	20	±25	0.5	1.5	1.2kΩ // 3PF	−20～+70
	21J2E2	4	(UM-1)×2	20	3	±6.0	40	±20	1.0	2.0	1.2kΩ // 2.5PF	−20～+70



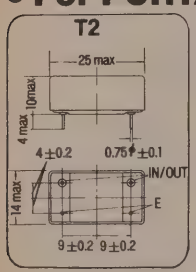
* Crystals

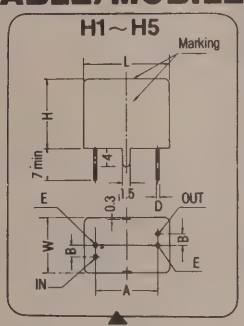
Remarks. Other channel spacings and frequencies are available.

Freq.	Case	Sealing	Osc. Mode	Freq. tolerance (25°C)	Stability (−20°C～+70°C)	Aging
10～200MHz	UM-1/UM-2	Resistance weld	Fund. 3rd, 5th, 7th	±8～±20ppm	±8～±50ppm	±2～±4ppm
3.0～200MHz	HC-43/U	Cold weld	Fund. 3rd, 5th, 7th	±8～±20ppm	±8～±30ppm	±1～±3ppm



• For PORTABLE/MOBILE RADIO COMMUNICATIONS *10.7MHz/21.4MHz HCM Filter





	L	W	H	A	B	D
H1	11.0	8.5	11.5	7.4	2.0	0.3
H3	15	12	15	9.0	2.5	0.43
H4	18.5	12	15	13.4	2.5	0.43
H5	23	12	15	17.8	2.5	0.43

Freq.	Type	No. of pole	Case	Channel spacing (kHz)	Pass band (dB)	Pass band (kHz)	Stop band (dB) (kHz)	Stop band (dB) (kHz)	Ripple (dB)	Loss (dB)	Termination	Operating temp. (°C)
10.7MHz	H33B01	6	H3	25	3	±7.5	45 ±17.5	65 ±25	2.0	2.5	3.4kΩ // 0.5PF	−40～+80
	H44B01	8	H4	25	3	±7.5	65 ±17.5	90 ±25	2.0	3.0	3.4kΩ // 0.5PF	−40～+80
	10M5B	10	H5	25	6	±7.5	75 ±15	90 ±17.5	2.0	4.0	2.8kΩ // 1PF	−20～+70
	H33E01	6	H3	20	3	±6.0	45 ±14	63 ±20	2.0	2.5	2.8kΩ // 1PF	−40～+80
	H44E01	8	H4	20	3	±6.0	65 ±14	90 ±20	2.0	3.0	2.8kΩ // 1PF	−40～+80
21.4MHz	21J3B	6	H1	25	3	±7.5	45 ±17.5	65 ±25	2.0	2.5	1.5kΩ // 2PF	−20～+70
	21J4B	8	H1	25	3	±7.5	65 ±17.5	85 ±25	2.0	3.0	1.5kΩ // 2PF	−20～+70
	T24B01-J	8	T2	25	3	±7.5	65 ±17.5	90 ±25	2.0	4.0	470Ω // 15PF	−20～+70
	21J3E	6	H1	20	3	±6.0	45 ±14	65 ±20	2.0	2.5	1.2kΩ // 2.5PF	−20～+70
	21J4E	8	H1	20	3	±6.0	65 ±14	85 ±20	2.0	3.0	1.2kΩ // 2.5PF	−20～+70
	T24E01-J	8	T2	20	3	±6.0	65 ±14	90 ±20	2.0	4.0	470Ω // 15PF	−20～+70

Remarks: Other channel spacings, frequencies and poles are available.

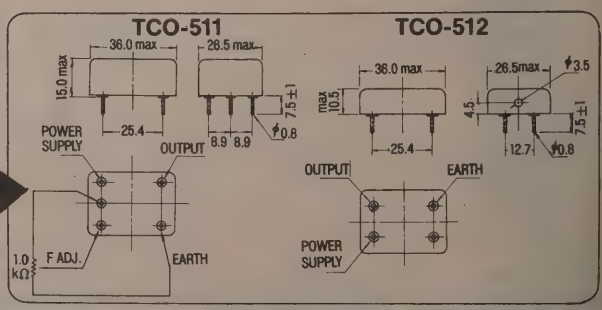
• For SYNTHESIZER

* Crystals

Freq.	Case	Sealing	Mode	Freq. tolerance (25°C)	Stability (−25°C～+65°C)	Aging
2.56MHz	HC-6/U	Cold/Solder	Fund.	±10ppm	±10～±30ppm	±1～±3ppm
3.2MHz	HC-43/U	Cold weld	Fund.	±10ppm	±15～±30ppm	±1～±3ppm

* TCXO

Freq.	Type	Supply voltage	Output	Stability	Aging
5～25MHz	TCO-511	DC +9～+12V 15mA max.	TTL	±1ppm (−10°～+60°C) ±2ppm (−20°～+70°C)	±1ppm/year
5～15MHz	TCO-512	DC +5V 15mA max.	TTL	±3ppm (−10°～+60°C)	±1ppm/year



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The frequencies listed are only a few of the popular frequencies carried in stock. Typical specifications:

Frequency range
1.000 to 100.000 Mhz

Frequency tolerance
±.002% @ 25°C

Holder size
1.000 to 3.999 Mhz HC33/u

Holder size
4.000 to 100 Mhz HC18/u

All made at series resonant unless otherwise specified.

In Stock Frequencies

1.000	4.0000	10.000
1.8432	4.1943	14.318
2.0000	4.9152	14.391
2.0100	5.0000	18.000
2.097152	5.0688	18.4320
2.4576	5.1850	20.0000
2.667	5.7143	22.1184
3.0000	6.000	27.0000
3.2000	6.144	32.0000
3.2768	6.400	36.0000
3.5795	6.5536	48.0000
	8.0000	

MICRO PROCESSOR

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Frequency range capabilities:
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1.000 Mhz to 29.000 Mhz
3rd overtone
16.000 Mhz to 85.000 Mhz
5th overtone
55.000 Mhz to 145.000 Mhz
7th overtone
125.000 Mhz to 203.000 Mhz
9th overtone
175.000 Mhz to 261.000 Mhz

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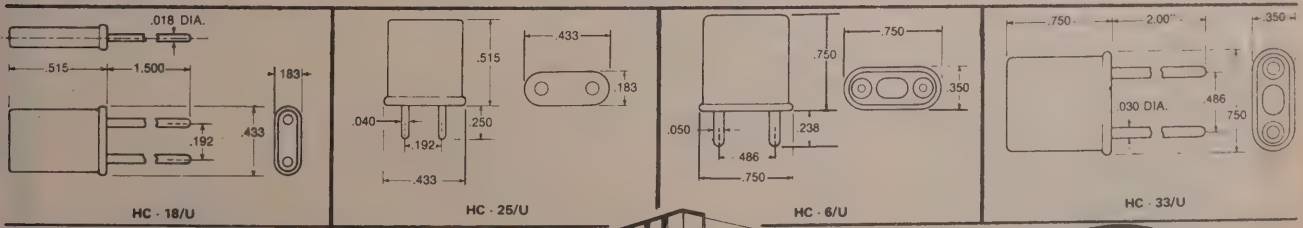

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Clock Oscillators

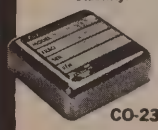
TTL

PRINTED CIRCUIT BOARD MOUNT ← → DIP COMPATIBLE

Features:	Most economical Broadest range of frequencies & options	Low profile only 0.3" high	Small board area only 1 inch sq.	Consumes space of only one 14 pin DIP .35" high	Reduced height 14 pin DIP .28" high	Larger DIP package but with frequencies as low as 50 Hz	Lowest profile unit only .225" high
Model:	**CO-231**	***CO-231LA (or B)***	***CO-232***	**CO-238A (or B or T)**	***CO-234A (or B)***	***CO-235***	***CO-239A (or B)***
Frequency:	1 Hz thru 100 MHz	200 KHz thru 30 MHz	3 MHz thru 30 MHz	3 MHz thru 100 MHz	4 MHz thru 25 MHz	50 Hz thru 30 MHz	4 MHz thru 100 MHz
Output:	Drives 10 TTL Loads. Logic "0": 0.4V max, sink 16 ma. Logic "1" 2.4V min, source 2 ma. (above 50 MHz drive capability decreases; at 100 MHz drives 2 Schottky TTL loads)						
Input Voltage:	5 VDC ±5%	5 VDC ±5%	5 VDC ±5%	5 VDC ±5%	5 VDC ±5%	5 VDC ±5%	5 VDC ±5%
Size:	1½" x 1½" x ½" 38 x 38 x 12.7 mm	1½" x 1½" x 0.3" 38 x 38 x 7.6 mm	1" x 1" x 0.5" 25 x 25 x 12.7 mm	.5" x .8" x .35" 12.7 x 20.3 x 8.9 mm	.5" x .8" x .28" 12.7 x 20.3 x 7.1 mm	1½" x 1½" x ½" 38 x 38 x 12.7 mm	1.4" x .8" x .225" 35.6 x 20.3 x 5.7 mm
Tuning Option Available:	*YES	NO	*YES	**YES	NO	*YES	NO
Accuracy: (at 25°C)	**CO-231:** ±.001% ***CO-231T:** ±.0001%	**CO-231LA:** ±.005% **CO-231LB:** ±.001%	**CO-232:** ±.001% ***CO-232T:** ±.0001%	**CO-238A:** ±.005% **CO-238B:** ±.001% ****CO-238T:** ±.0001%	**CO-234A:** ±.005% **CO-234B:** ±.001%	**CO-235:** ±.001% ***CO-235T:** ±.0001%	**CO-239A:** ±.005% **CO-239B:** ±.001%

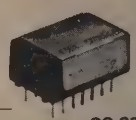
*Models with "T" suffix include tuning adjustment with nominal range of ±30 ppm below 25 MHz and 15 ppm above 25 MHz — setability is <.0001%

Stability: **Standard:** 0°C to + 70°C: ±.0025% (**CO-238T: 3-25 MHz only)



CO-231

—1 Option: −55°C to + 85°C: ±.005% (−40/+85°C for CO-231-1 <60 Hz)
—2 Option: −55°C to +125°C: ±.005% (70 MHz max for CO-238-2 & CO-239-2)
—3 Option: 0°C to + 50°C: ±.0003% (6 MHz min for CO-232, CO-238, CO-239, CO-234; 50 Hz min for CO-231; 100 Hz min for CO-235)
—4 Option: 0°C to + 50°C: ±.0001% (only for CO-231 in 12 KHz-20 MHz range)
—5 Option: 0°C to + 50°C: ±.0005% (4 MHz min for CO-232, CO-238; 100 Hz min for CO-235)
—6 Option: 0°C to + 50°C: ±.001%
—8 Option: 0°C to + 70°C: ±.01% (includes initial accuracy; do not specify A or B accuracy, or tuning with —8)
Y Option: Aging improved from 5 ppm/year typical to 1 ppm/year (only for CO-231 in 3-20 MHz range)



CO-238

Option "C": Fully sealed metal can for 100% r.h. requirements — results in slight height increase. Not available with tuning option.

CMOS

Features:	Most economical Broadest range of frequencies and options	DIP compatible Consumes space of one 14 pin DIP	Larger DIP package but with frequencies as low as 60 Hz
Model:	**CO-236**	***CO-636A (or B)***	***CO-536***
Frequency:	.01 Hz thru 10 MHz	3 MHz thru 10 MHz	60 Hz thru 10 MHz
Output:	CMOS compatible	CMOS compatible	CMOS compatible
Input:	5 VDC-15 VDC for frequencies below 6 MHz; 1-2 ma typical below 2 MHz.		
Size:	1½" x 1½" x ½" 38 x 38 x 12.7 mm	.5" x .8" x .42" 12.7 x 20.3 x 10.7 mm	1½" x 1½" x ½" 38 x 38 x 12.7 mm
Tuning Option Available:	*YES *Models with "T" suffix include tuning adjustment with setability <.0001%	NO	*YES
Accuracy: (at 25°C)	**CO-236:** ±.001% ***CO-236T:** ±.0001%	**CO-636A:** ±.005% **CO-636B:** ±.001%	**CO-536:** ±.001% ***CO-536T:** ±.0001%

Stability: **Standard:** 0/+ 70°C: ±.0025%

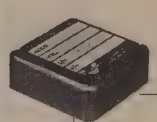
—1 Option: −40/+ 85°C: ±.005%
—2 Option: −55/+125°C: ±.005%
—3 Option: 0/+ 50°C: ±.0003% (2.5 MHz min; 6 MHz min for CO-636)
—4 Option: 0/+ 50°C: ±.0001% (only CO-236, 3-10 MHz)
—5 Option: 0/+ 50°C: ±.0005% (4 MHz min for CO-636)
—6 Option: 0/+ 50°C: ±.001%
—8 Option: 0/+ 70°C: ±.01% (includes accuracy)
—Y Option: Aging improved from 5 to 1 ppm/year (only CO-236, 3-10 MHz)

Option "C": Fully sealed metal can; results in slight height increase.

ECL

Features:	Most economical	Highest frequencies	DIP compatible
Model:	**CO-233ME**	**CO-233MEHA (or B)**	**CO-633A (or B)**
Frequency:	5 MHz thru 149.9 MHz	150 MHz thru 200 MHz Higher frequencies available in larger package	5 MHz thru 125 MHz
Output:	ECL compatible	ECL compatible	ECL compatible
Input Voltage:	−5.2 VDC ±5%	−5.2 VDC ±5%	−5.2 VDC ±5%
Size:	1½" x 1½" x ⅝" 38 x 38 x 16 mm	1½" x 1½" x ⅝" 38 x 38 x 16 mm	.5" x .8" x .5" 13 x 20 x 13mm
Tuning Option Available:	*YES *Tuning setable to .0001%	NO	NO
Accuracy: (at 25°C)	**CO-233ME:** ±.001% ***CO233MET:** ±.0001%	**CO-233MEHA:** ±.005% **CO-233MEHB:** ±.001%	**CO-633A:** ±.005% **CO-633B:** ±.001%

Stability: **Standard:** 0/+ 70°C: ±.0025%



**—1 Option: −55/+ 85°C: ±.005%
—2 Option: −55/+125°C: ±.005% (to 125 MHz)
—3 Option: 0/+ 50°C: ±.0003% (6 - 150 MHz)
—5 Option: 0/+ 50°C: ±.0005%
—6 Option: 0/+ 50°C: ±.001%
—8 Option: 0/+ 70°C: ±.01% (includes initial accuracy)
**—30°C lower limit above 125 MHz

Screen Tested Clock Oscillators

Each of the Clock Oscillators described above, except those with tuning, is available in a fully sealed metal can; simply add "C" to the Model No. (e.g. CO-238B-1C). For those high reliability applications requiring Screen Tested components, Vectron now offers the same Clock Oscillators:

- 100% Screen Tested as follows:
  - (A) Thermal Shock per MIL-STD-202, Method 107D, Test Condition A
  - (B) Seal Test per MIL-STD-202, Method 112B, Test Condition A
  - (C) Burn-in for 168 hours at maximum specified operating temperature
- Packaged in fully solder sealed metal housing
- Ruggedized for shock and vibration

HOW TO SPECIFY MODEL NUMBER . . .

□ □ □ □ — □ S — □ at □

- Basic Model
- Accuracy at 25°C
- Stability option
- S: Indicates sealed, screened model
- ★Shock and vibration
- Frequency

For example, 238A-2S-1 at 10 MHz = CO-238 Type at 10 MHz with
"A" accuracy of ±.005% at 25°C
"—2" stability of ±.005% over —55°C to +125°C
"S" for screen tested oscillator in solder sealed metal can
"—1" shock of 100g, 6 msec and vibration of 10g, to 500 Hz

★The following codes define the alternative shock and vibration specifications to which the oscillator is designed:

Code	Shock (MIL-STD-202, Meth 213B)	Vibration (MIL-STD-202)
"0"	30g, 11 msec per Test Cond J	10-55 Hz, .06" DA per Meth 201A and 5g to 500 Hz
"1"	100g, 6 msec per Test Cond C	10g to 500 Hz per Meth 204C, Cond A
"2"	100g, 6 msec per Test Cond C	20g to 2 KHz per Meth 204C, Cond D and 20 grms overall random to 2 KHz per Meth 214, Cond I-F

VECTRON

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166 Glover Ave. Norwalk, CT 06850
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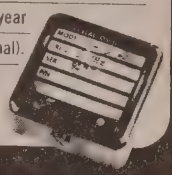
TCXOs Temperature Compensated Crystal Oscillators

	CO-251 SERIES	CO-252 SERIES	CO-254 VHF SERIES
Stability:	**CO-251:** 0/+50°C: ±1 x 10^{-6} **CO-251A:** 0/+50°C: ±5 x 10^{-7} **CO-251B:** +15/+35°C: ±2 x 10^{-7} **CO-251C:** 0/+65°C: ±1 x 10^{-6}	**CO-252-3:** 0/+50°C: ±2 x 10^{-7} **CO-252-3A:** 0/+50°C: ±1 x 10^{-7} **CO-252:** −20/+70°C: ±1 x 10^{-6} **CO-252A:** −20/+70°C: ±5 x 10^{-7} **CO-252-4:** −55/+85°C: ±5 x 10^{-6} **CO-252-4B:** −55/+85°C: ±2 x 10^{-6} **CO-252-4A:** −55/+85°C: ±1 x 10^{-6}	**CO-254-1:** 0/+50°C: ±1 x 10^{-6} **CO-254-2:** 0/+50°C: ±5 x 10^{-7} **CO-254-3:** 0/+50°C: ±2 x 10^{-7} **CO-254:** −20/+70°C: ±1 x 10^{-6} **CO-254A:** −20/+70°C: ±5 x 10^{-7} **CO-254-4:** −55/+85°C: ±5 x 10^{-6} **CO-254-4B:** −55/+85°C: ±2 x 10^{-6}
Frequency:	1, 2, 3, 4, 5 or 10 MHz standard (Any freq., 60 Hz to 20 MHz opt.)	1, 2, 3, 4, 5 or 10 MHz standard (Any freq., 60 Hz to 20 MHz opt.)	50 or 100 MHz standard (Any freq., 20 MHz to 400 MHz with freq. above 140 MHz in larger package)
Output:	TTL standard (Sine or CMOS optional)	1 vrms into 1KΩ standard (TTL, CMOS or 50Ω sine optional)	0.5 vrms into 50Ω standard (ECL or TTL optional)
Supply:	Any specified voltage in 5-32 VDC range; current as low as 4 ma for some types.		
Aging Rate:	1 x 10^{-6}/year	1 x 10^{-6}/year	2 x 10^{-6}/year
Size:	2" x 2" x ¾" (51 x 51 x 19 mm) printed circuit board mounting (Chassis mount with RF connector optional).		
Options:	• Other stability characteristics • Other mechanical configurations (Including ½" height) • Ruggedized units for high shock and vibration • Voltage frequency control (TC/VCXO)		

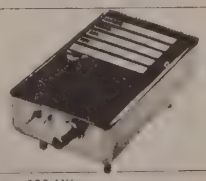


VCXOs Voltage Controlled Crystal Oscillators

	WIDE DEVIATION AND/OR LINEAR APPLICATIONS					NARROW DEVIATION PHASE LOCK APPLICATIONS	
Model:	**CO-271V**	**CO-275V**	**CO-272V**	**CO-276V**	**CO-273V CO-274V**	**CO-233V**	**CO-231V**
Frequency:	2-20 MHz	20-400 MHz (higher and lower frequencies available)	2-20 MHz	20-400 MHz	0.5-8 MHz 8-40 MHz	4-200 MHz (Higher frequencies available in larger package.)	500 KHz-70 MHz
Output:	1vrms/1KΩ	.5 vrms/50Ω	1vrms/1KΩ	.5 vrms/50Ω	1vrms/1KΩ .5vrms/50Ω	.5 vrms/50Ω	TTL compatible
	(TTL, CMOS, ECL or higher level sinewave available on some models)						
Deviation:	±.1%	±.1% (wider and narrower deviations available)	±.1%	±.1%	±.5%	±.003%. This allows correcting to specified center frequency over 0-50°C for 5-10 years. (Wider deviations optional).	
Mod. Voltage:	±5 volts (either higher or lower sensitivity available)					0 to +6V	0 to +5V
Linearity:	±1%	±1% (For ±5% linearity, resulting in reduced cost, add "N" to Model No.)	±1%	±1%	±1%	±20% Smooth monotonic characteristic	±20%
Stability: (0-50°C)	**A:** ± .01% **B:** ±.001%	**A:** ± .01% **B:** ±.001%	±.0001% (wider temperature range optional)	±.0001%	±.025%	±.001% (wider temp. range optional)	±.001%
Oven Control:	No oven	No oven	Proportional	Proportional	No oven	No oven	No oven
Size:	2" x 2" x ¾" (51 x 51 x 19 mm)	2" x 3" x ¾" (51 x 77 x 19 mm)	2" x 2" x 4" (51 x 51 x 102 mm)	2" x 2" x 4" (51 x 51 x 102 mm)	2" x 3" x ¾" 3" x 3½" x ¾"	1½" x 1½" x ⅝" (38 x 38 x 16 mm)	1½" x 1½" x ½" (38 x 38 x 13 mm)

Sinewave Oscillators

	LOW FREQUENCY CO-281	HIGH FREQUENCY CO-282	VHF CO-233 Series	VHF HIGH POWER CO-284W
Frequency: (Configuration)	1 KHz to 3 MHz (pins for p.c. mounting)	1 MHz to 20 MHz (pins for p.c. mounting)	**CO-233:** 5-149 MHz (printed circuit board mount) **CO-233H:** 150-300 MHz (printed circuit board mount) ***CO-233W:** 5-250 MHz (chassis mount, SMA connector, solder header) ***CO-233FW:** 5-500 MHz (chassis mount, SMA connector, EMI filter cap.) *For BNC connector, replace "W" with "X". For UG1619/U connector, replace "W" with "U".	5-500 MHz *(SMA and EMI filter cap on side)
Output:	1 vrms/1K std. 0 dBm/50Ω opt.	0.5 vrms/50Ω std. 1 vrms/1K opt.	0.5 vrms/50Ω (+7 dBm) standard 1 vrms/50Ω (+13 dBm) optional Above 200 MHz, only for CO-233 FW.	1 watt/50Ω (+30 dBm) to 300 MHz 0.5 watt/50Ω (+27 dbm) > 300 MHz
Input:	+15 VDC	+15 VDC	+15 VDC	18-32 VDC
	Any supply voltage in 15-32 VDC range optional; supply less than 15 VDC subject to reduced output level			
Accuracy: (at 25°C)	±10 ppm	±10 ppm	±10 ppm	±10 ppm
	Add "T" to model number for tuning adjustment with setability of ±1 ppm			
Stability:	**Standard:** 0°C to + 70°C: ±.0025% **−1** option: −55°C to + 85°C: ±.005% **−2** option: −55°C to +125°C: ±.005% **−3** option: 0°C to + 50°C: ±.0003% (N/A for CO-282 in 1-3 MHz range) **−4** option: 0°C to + 50°C: ±.0001% (only for CO-282 above 3 MHz and CO-281 any freq.) **−5** option: 0°C to + 50°C: ±.0005% **−6** option: 0°C to + 50°C: ±.001% For higher stability see TCXO and oven controlled types **Y** option: Aging improved from 5 ppm/year typical to 2 ppm/year			
Noise:	−130 dB/Hz SSB typical, 1 KHz from carrier, at frequencies below 100 MHz; 6 dB degradation per octave above 100 MHz			
Size:	2" x 2" x ¾" (51 x 51 x 19 mm)	1⅝" x 1⅝" x ½" (42 x 42 x 13 mm)	CO-233, CO-233H: 1½" x 1½" x ⅝" (38 x 38 x 16 mm) CO-233W, CO233FW: 2" x 2" x ¾" (51 x 51 x 19 mm)	2" x 3" x ¾" (51 x 76 x 19 mm)



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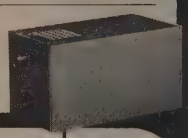
Oven Controlled Crystal Oscillators

High Frequency

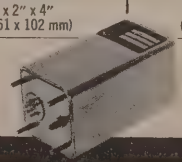
HIGH STABILITY → | ← ULTRA-STABLE

	(Single Oven) CO-211 Series	(Single Oven) CO-200 Series	(Double Oven) CO-244V	(Single Oven) CO-206V	(Double Oven) CO-246V
Aging Rate:	**CO-211:** 1 x 10^{-7}/day **CO-214:** 1 x 10^{-8}/day **CO-215:** 5 x 10^{-9}/day **CO-216:** 3 x 10^{-9}/day **CO-217:** 1 x 10^{-9}/day ***CO-218:** 5 x 10^{-10}/day	**CO-201:** 1 x 10^{-8}/day **CO-202:** 5 x 10^{-9}/day **CO-203:** 3 x 10^{-9}/day **CO-204:** 1 x 10^{-9}/day ***CO-205:** 5 x 10^{-10}/day	**CO-244V:** 1 x 10^{-9}/day ***CO-244V-1:** 5 x 10^{-10}/day	**CO-206V:** 3 x 10^{-10}/day 5 x 10^{-8}/year **CO-206V-1:** 1 x 10^{-10}/day 3 x 10^{-8}/year	**CO-246V:** 3 x 10^{-10}/day 5 x 10^{-8}/year **CO-246V-1:** 1 x 10^{-10}/day 3 x 10^{-8}/year
	*(5 x 10^{-10}/day average; at 1, 2, 4, 5 and 10 MHz only)				
Frequency:	1, 2, 4, 5 or 10 MHz standard (broad range of frequencies available)			5 MHz standard (other frequencies available)	
Output:	>1 vrms into 500 ohms Logic or 50Ω output opt.	>1 vrms into 50 ohms Logic output optional	>1 vrms into 500 ohms Logic or 50Ω output opt.	>1 vrms into 50 ohms Logic output optional	
Temperature:	0/50°C: <±5 x 10^{-8} "—1" OPTION 0/+50°C: <±1 x 10^{-8} −20/+70°C: <±3 x 10^{-8}	0/+50°C: <±5 x 10^{-9} −20/+70°C: <±1 x 10^{-8}	0/+50°C: ±1 x 10^{-9}	0/+50°C: ±5 x 10^{-9} "—2" OPTION −20/+70°C: ±1 x 10^{-8}	0/+50°C: ±5 x 10^{-10} "—2" OPTION 0/+50°C: ±1 x 10^{-10}
	(Wider temperature range optional)			(Wider temperature range optional)	
Supply:	24 VDC standard (Operation from any voltage in a 5-32 VDC range optional)			24 VDC standard (Operation from any voltage in 15-32 VDC range optional)	
Power Drain:	6 watts at turn-on; 3 watts stabilized at 25°C (Units with reduced power drain available)		8 watts at turn-on; 4 watts stabilized (25°C)	6 watts at turn-on 3 watts stabilized (25°C)	11 watts at turn-on 5 watts stabilized (25°C)
Freq. Adjust.:	Screwdriver adjustment; electronic tuning (VCXO) optional			Screwdriver adjustment and electronic tuning standard	
Size:	2" x 2" x 3" (51 x 51 x 76 mm)	2" x 2" x 4" (51 x 51 x 102 mm)	2¼" x 2¼" x 4¼" (58 x 58 x 108)	2¼" x 2¼" x 4¼" (58 x 58 x 108 mm)	3" x 3" x 5½" (77 x 77 x 140 mm)
Option "—5":	Oven and r.f. operates from 5VDC; output drives 10 TTL loads				
Option "D":	Same performance as CO-211 Series in 1½" x 1½" x 3" package				



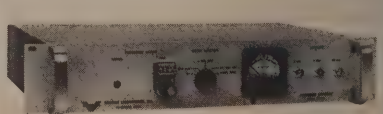
VHF

	CO-226 SERIES	CO-221 SERIES	CO-220 SERIES
Aging Rate:	**CO-226:** 1 x 10^{-7}/day **CO-227:** 5 x 10^{-8}/day **CO-228:** 3 x 10^{-8}/day **CO-229:** 1 x 10^{-8}/day	**CO-221:** 1 x 10^{-7}/day **CO-222:** 5 x 10^{-8}/day **CO-223:** 3 x 10^{-8}/day **CO-224:** 1 x 10^{-8}/day	**CO-220:** 3 x 10^{-9}/day **CO-220-1:** 1 x 10^{-9}/day (Uses Crystal below 12 MHz with internal multiplier)
Frequency:	25-200 MHz	25-400 MHz	25-200 MHz
Output:	+7 dBm/50Ω (TTL opt.)	+13 dbm/50Ω (ECL opt.)	+7 dBm/50Ω (+13 dBm opt.)
Temperature:	0-50°C: ±5 x 10^{-8}	0-50°C: ±5 x 10^{-8}	0-50°C: ±5 x 10^{-8}
	(higher stability and wider temperature range optional)		
Supply:	24 VDC standard	24 VDC standard	24 VDC standard
	(operation from any voltage in 15-32 VDC range optional)		
Power Drain:	6 watts at turn-on 3 watts stabilized	7 watts at turn-on 4 watts stabilized	7 watts at turn-on 4 watts stabilized
Freq. Adjust.:	Screwdriver adjust setable to 1 x 10^{-8} Electronic tuning (VCXO operation) optional		
Phase Noise: (Typ at 100 MHz)	−130 db/Hz 1 KHz from output	−130 db/Hz 1 KHz from output	−115 db/Hz 1 KHz from output
Size:	2" x 2" x 3" (51 x 51 x 76 mm)	2" x 2" x 4" (51 x 51 x 102 mm)	2" x 2" x 4" (51 x 51 x 102 mm)



Frequency Standards

Model	FS-321B	FS-323A
Aging Rate:	3 x 10^{-10} per day at time of shipment 1 x 10^{-10} per day typical within 60 days "—1" OPTION 1 x 10^{-10} per day at time of shipment	
Frequencies:	5, 1 & 0.1 MHz	
Output Level:	1 vrms/50 ohms	
Temperature:	±5 x 10^{-10} over 0-50°C "—2" OPTION ±1 x 10^{-10} over 0-50°C	
Noise Floor:	>150 db below 5 MHz output	
Oven Control:	Double proportional	
Input Voltage:	115/230 VAC or 22-30 VDC	115/230 VAC or 22-30 VDC
Battery Life:	35 hours rechargeable	None
Size:	5¼" x 19" x 14" (13.4 x 48.3 x 35.6 cm)	3½" x 19" x 14" (8.9 x 48.3 x 35.6 cm)



About VECTRON . . .

VECTRON'S customers include virtually every major U.S. electronics manufacturer, each of the prime military and government agencies and numerous foreign users.

VECTRON oscillators are widely used for both commercial and military applications in ground, shipboard, mobile, airborne, missile and space systems.

VECTRON quality and calibration procedures are per MIL-I-45208, MIL-Q-9858A and MIL-C-45662.

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NOTES

1. Many models and frequencies are available with off-the-shelf delivery.
2. When ordering a standard product, please specify model, frequency and any desired option.
3. While Vectron offers a broad line of standard products, we are equipped to handle "specials" expeditiously and economically.

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ARTRONIC INSTRUMENT COMPANY

MILITARY GRADE

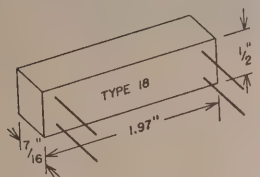
DELAY LINES

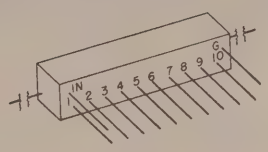
TYPE 18

RISE TIMES

Type 18Q: 12% of delay (Table at far right)
Type 18H, 18L: 20% to 25% of delay time

Delay (μsec)	Type 18H Impedance (ohms)	Type 18L Impedance (ohms)
0.05	125	62
0.1	250	62
0.2	500	50
0.25	625	62
0.3	750	75
0.4	1000	100
0.5	1250	125
0.6	1500	150
0.7	1750	175
0.75	1875	188
0.8	2000	200
0.9	2250	225
1.0	2500	250
1.5	1875	375
2.0	2500	500
2.5	3125	625
3	1875	750
4	2500	1000
5	3125	1250
6	1500	
7	1750	
8	2000	
9	2250	
10	2500	





Leads on end faces are spare ground leads to provide added mounting rigidity. They may be clipped off if not needed, since a third ground lead is provided on the long face.

TYPE 18 AND TYPE 227

Delay Tolerance: 3% or 1 nsec
Thermal Coefficient of Delay: 0.005%/°C to 0.01%/°C
Test Voltage: 800 VDC
Temperature Range: −65°C to 125°C
Ordering Information: Part Numbers are given by designating first the type number and then the delay, e.g., 227-0.75. Other values of delay and impedance can also be furnished.

TYPE 227

10 Taps, equally spaced
Rise Time: 10% of total delay time
Dimensions: ½" x 5/16" x 2½" (lead face is 5/16" wide)
Leads: #22 AWG tinned solid wire, 1¼" long

Delay (μsec)	TYPE 18Q Impedance (ohms)	TYPE 227 Impedance (ohms)
0.01		50
0.02	50	50
0.025	50	50
0.05	50	50
0.1	100	50
0.2	100	50
0.25	100	50
0.3	200	50
0.4	200	50
0.5	200	50
0.6	200	100
0.8	200	100
1.0	200	100
1.5	500	200
2	500	200
2.5	500	250
3	1000	500
4	1000	500
5	1000	500
6	1500	1000
8	2000	1000
10	2500	1000
12	2500	1200
15	3000	1500
20	4000	2000
25		2500

OTHER STANDARD SERIES

SERIES NQ: Untapped, 2% rise time, 5/16 x 2.1 x 6.4", 0.3 to 50 μsec.
SERIES N: 20 Taps, 4% rise time, ½ x 2 x 6.4", 0.2 to 100 μsec.
SERIES LQ: Untapped, 4% rise time, ½ x 1.6 x 2.9", 0.2 to 20 μsec.
SERIES L: 10 Taps, 8% rise time, ½ x 1.5 x 2.9", 0.1 to 30 μsec.
SERIES W: 20 Taps, 4% rise time, 0.4 x 2.05 x 4.4", 0.2 to 60 μsec.
TYPE 228: 20-Tap 227 (22 p.c. pins ¼" long in 227 lead face).
TYPE 22: 10 Taps, 20% rise time, similar to Type 227.
TYPE 26: 10 Taps, 20% rise time, ½ x 5/16 x 1.56".
TYPE 266: Untapped, 30% rise time, 0.38 x 0.45 x 0.7".

OTHER TYPES AND CUSTOM DESIGNS ALSO AVAILABLE

TYPE 42

20% Rise Time

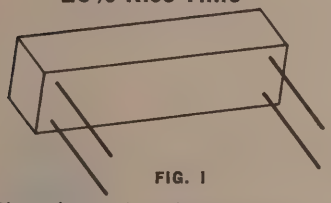


FIG. I

Dimensions: 0.3 x 0.35 x 1.4"
Delay Tolerance: ±3% ±1 nsec
Taps: Untapped
Thermal Coefficient of Delay: 0.005%/°C to 0.01%/°C
Test Voltage: 600 VDC
Temperature Range: −65°C to 125°C
Environmental: MIL-STD-202
Leads: #22 Tinned copper, 1½" long
Part Numbers: 42-T_d (μsec), e.g., 42-0.05

Total Delay (nsec)	Impedance (ohms)	Total Delay (μsec)	Impedance (ohms)
10	50	0.25	100
15	50	0.3	150
20	50	0.4	200
25	50	0.5	200
30	50	0.6	300
40	50	0.8	400
50	50	1.0	500
60	50	1.5	750
80	50	2.0	1000
100	50	2.5	1000
150	100	3.0	1250
200	100		

TYPE 56

10% Rise Time

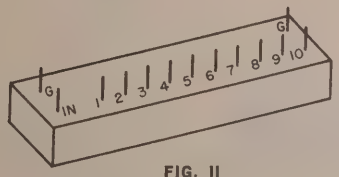


FIG. II

Dimensions: 0.35 x 0.43 x 2.5"
Delay Tolerance: ±3% ±1 nsec
Taps: 10, equally spaced
Thermal Coefficient of Delay: 0.005%/°C to 0.01%/°C
Test Voltage: 600 VDC
Temperature Range: −65°C to 125°C
Environmental: MIL-STD-202
Part Numbers: Type number followed by total delay in μsec, e.g., 56-0.08

Total Delay (nsec)	Impedance (ohms)	Total Delay (μsec)	Impedance (ohms)
10	50	0.5	200
20	50	0.6	200
25	50	0.8	200
30	50	1.0	200
40	50	1.5	500
50	50	2	500
60	50	3	500
80	50	4	1000
100	50	5	1000
200	50	6	1000
250	50	8	2000
300	50	10	2000
400	200	12	2000

TYPE 68

5% to 6% Rise Time

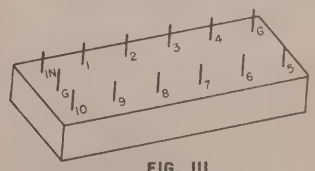


FIG. III

Dimensions: 0.4 x 0.9 x 2.9"
Delay Tolerance: ±2% ±1 nsec
Taps: 10, equally spaced (20 taps also available)
Thermal Coefficient of Delay: 0.005%/°C to 0.01%/°C
Test Voltage: 600 VDC
Temperature Range: −65°C to 125°C
Environmental: MIL-STD-202
Part Numbers: Type number followed by total delay in μsec, e.g., 68-0.02

Total Delay (nsec)	Impedance (ohms)	Total Delay (μsec)	Impedance (ohms)
20	50	1	100
30	50	1.5	200
40	100	2	200
50	50	2.5	200
60	100	3	500
80	50	4	500
100	50	5	500
200	50	6	500
250	50	8	1000
300	200	10	1000
400	200	12	1000
500	200	15	2000
600	100	20	2000
800	100	25	2000

THE ARTRONIC INSTRUMENT COMPANY

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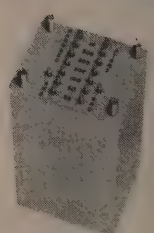
These Delay Lines have the highest ratio of time delay to rise time that has ever been built in a Lumped Constant Line. Unlike other types of high ratio lines, the Lumped Constant Delay Line has a passband from D.C. to its cutoff frequency and maintains a constant delay over these frequencies. These lines are also unique in that they offer relatively low insertion loss. The units are characterized by tight time delay tolerances, low pulse distortion, excellent phase linearity and good temperature stability.

To calculate rise time in microseconds, divide the ratio into the delay. To calculate bandwidth, divide rise time in microseconds into .36. Answer will be in MHz. Attenutation range 9 to 20db.

"HF"	"HR"	"VHR"
50/1 RATIO Delay Range .25 to 10 microseconds	100/1 RATIO Delay Range 11 to 500 microseconds.	150/1 RATIO Delay Range 5 to 500 microseconds.
75/1 RATIO Delay Range .5 to 10 microseconds.	130/1 RATIO Delay Range 5 to 500 microseconds.	200/1 RATIO Delay Range 10 to 75 microseconds.
100/1 RATIO Delay Range 1 to 10 microseconds.		250/1 RATIO Delay Range 20 to 100 microseconds.

PULSE & VIDEO DELAY LINE TYPE AV-397 STOCKED

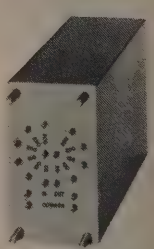


These delay lines are designed to be used with any 75 ohm system for either pulse or video delay. Although intended primarily for equalizing the delays in various lengths of coaxial cable, the line can be used wherever any delay from .025 μs. to 2.075 μs. is needed. The delay is changed by adding individual lines of various delays to give the desired total delay.

Maximum Delay: 2.075 microseconds ±3% variable in .025 microsecond steps from .025 microseconds to 2.075 microseconds.
Time Delay of Individual Lines: 1, .5, .2, .2, .1, .05, .025 microseconds.
Rise Time for Entire Line: .06 microseconds maximum.
Frequency Response: 3 db down at 5 MHz for 2.075 microseconds delay.
Distortion: 2% maximum with .2 microsecond input pulse.
Impedance: 75 ohms ±5%.
Temperature Coefficient: 50 parts/million/°C from −55°C to 105°C.
Attenuation: 7% maximum for 2.075 microsecond delay.
Mechanical: Hermetically sealed in a steel can 2" x 2½" x 5½", painted gray with black identification markings, and using 10/32 x ½ inch studs spaced on 1½" x 2" centers for mounting.

ALSO AVAILABLE: Model 75-2 — A switch variable version of the above Pulse & Video Delay Line.

TV LINE EQUALIZER TYPE AV-535 STOCKED



The Allen Avionic's AV-535 Equalizer is designed to compensate for losses in RG-11/U (75 ohm) cable and its equivalents. The unit is capable of equalizing 50 to 300 feet in 50 foot increments.

Terminals on mounting surface are so arranged to provide for simplified strapping for compensation of different cable lengths. All units are foamed and hermetically sealed in steel cans.

Size: 2 x 3½ x 5 inches (not including mounting stud length).
Mounting Centers: 1½ x 3 inches.
Stud Size: 8/32 x ½ inch long.

Impedance: 75 ohms ±2 ohms to 8 MHz.
Attenuation of Cable Plus Equalizer: 3 db.
Attenuation of equalizer alone is as shown in the following table:

Feet	0.1 MHz	2 MHz	4 MHz	8 MHz
50	2.97 db	2.86 db	2.79 db	2.67 db
100	2.93	2.68	2.53	2.27
150	2.90	2.51	2.28	1.88
200	2.86	2.35	2.03	1.52
250	2.82	2.19	1.82	1.21
300	2.78	2.02	1.58	0.86

Tolerance: ±.07 db.

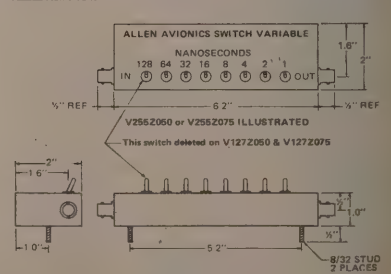
Call or write for our complete Delay Line Catalog, which includes an extensive line of VIDEO DELAY LINES and VIDEO FILTERS

"THE NANNO SWITCH"
SWITCH VARIABLE DELAY LINE

The units consist of individual delay lines each having its own switch. The time delay is changed by switching one or more individual delay lines in series with the input and output connections. The delayed output is always the summation of individual delay lines and not the result of a tapped line. This feature is an important factor in eliminating undesirable reflections in the output pulse. BNC female connectors are supplied for input and output terminations.

Part No. for 50 ohm impedance	V127Z050	V255Z050
Part No. for 75 ohm impedance	V127Z075	V255Z075
Maximum delay	127 nanosec.	255 nanosec.
Individual delay lines	1, 2, 4, 8, 16, 32, 64 nanosec.	1, 2, 4, 8, 16, 32, 64, 128 nanosec.
Rise time at maximum delay	14 nanosec.	16 nanosec.
Frequency response at maximum delay	−3 db @ 25 MHz	−3 db @ 22 MHz
Attenuation	5% maximum	8% maximum

Delay Tolerance at any Setting: 5% or 1 nanosecond, whichever is greater.
Distortion: 3% maximum with 20 nanosecond input rise time.
Temperature Coefficient: 50 parts/million/°C from −25°C to +85°C.



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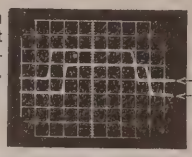
SPIRADEL is a small diameter, distributed constant fixed delay line, featuring higher delay to rise time ratio and excellent pulse fidelity. Its new shape offers greater package design versatility than most other delay lines available, and the entire unit is encapsulated for maximum environmental protection.

SPIRADEL covers a delay range of 20 to 6000 nanoseconds. Any delay within this range may be selected.

Time delay to rise time ratios range up to 30 to 1. Any impedance from 50 to 1000 ohms is available. Standard delay tolerance is 5%, although tighter tolerances can be held.

SPIRADEL is designed for operation from −55°C up to +105°C. Temperature coefficient over this range is 150 parts/million/°C. Bandwidth is from DC to frequency f = .35/rise time.

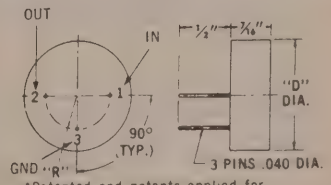


TO ORDER SPECIFY PART NUMBER STANDARD HEIGHT OF ALL UNITS: 7/16"

Part Number	Time Delay (Nanoseconds)	Rise Time (Nanoseconds) Maximum	Bandwidth Minimum (MHz)	Diam. Inches
IMPEDANCE 50 OHMS				
SP0050Z050	50	10.0	35.0	1.60
SP0100Z050	100	13.0	26.9	2.00
SP0150Z050	150	14.0	25.0	2.50
SP0200Z050	200	16.0	21.9	2.50
SP0250Z050	250	19.0	18.4	3.25
SP0300Z050	300	21.0	16.7	3.25
SP0350Z050	350	24.0	14.5	3.25
SP0400Z050	400	27.0	12.9	3.75
SP0450Z050	450	28.0	12.5	3.75
SP0500Z050	500	29.0	12.0	3.75
IMPEDANCE 75 OHMS				
SP0025Z075	25	4.5	77.7	1.20
SP0050Z075	50	6.0	58.3	1.20
SP0100Z075	100	9.5	36.8	1.60
SP0150Z075	150	11.5	30.4	2.00
SP0200Z075	200	13.0	26.9	2.00
SP0250Z075	250	14.0	25.0	2.50
SP0300Z075	300	16.0	21.8	2.50
SP0350Z075	350	18.0	19.4	2.50
SP0400Z075	400	20.0	17.5	3.25
SP0450Z075	450	21.9	15.9	3.25
SP0500Z075	500	24.0	14.5	3.25
SP0550Z075	550	26.0	13.4	3.75
SP0600Z075	600	28.0	12.5	3.75
SP0650Z075	650	30.0	11.6	3.75
SP0700Z075	700	32.0	10.9	3.75
IMPEDANCE 100 OHMS				
SP0050Z100	50	7.3	47.9	1.20
SP0060Z100	60	7.5	46.6	1.20
SP0070Z100	70	7.7	45.4	1.20
SP0080Z100	80	8.2	42.6	1.20
SP0090Z100	90	9.1	38.4	1.20
SP0100Z100	100	10.0	35.0	1.60
SP0150Z100	150	12.5	28.0	1.60
SP0200Z100	200	14.0	25.0	2.00
SP0250Z100	250	16.0	21.8	2.00
SP0300Z100	300	18.0	19.4	2.50
SP0350Z100	350	20.0	17.5	2.50
SP0400Z100	400	22.0	15.9	2.50
SP0450Z100	450	24.5	14.2	2.50
SP0500Z100	500	27.0	12.9	3.25
SP0550Z100	550	29.5	11.8	3.25
SP0600Z100	600	31.0	11.2	3.25
SP0650Z100	650	32.5	10.7	3.25
SP0700Z100	700	34.0	10.2	3.25
SP0750Z100	750	36.0	9.7	3.75
SP0800Z100	800	38.0	9.2	3.75
SP0850Z100	850	39.5	8.8	3.75
SP0900Z100	900	41.0	8.5	3.75
SP0950Z100	950	42.5	8.3	3.75
SP1000Z100	1000	44.0	7.9	3.75

Part Number	Time Delay (Nanoseconds)	Rise Time (Nanoseconds) Maximum	Bandwidth Minimum (MHz)	Diam. Inches
IMPEDANCE 150 OHMS				
SP0020Z150	20	5.0	70.0	1.20
SP0030Z150	30	6.5	53.8	1.20
SP0040Z150	40	7.5	46.6	1.20
SP0050Z150	50	7.7	45.4	1.20
SP0060Z150	60	7.9	44.3	1.20
SP0070Z150	70	8.0	43.7	1.20
SP0080Z150	80	8.2	42.6	1.20
SP0090Z150	90	8.5	41.1	1.20
SP0100Z150	100	9.0	38.8	1.20
SP0150Z150	150	12.0	29.1	1.60
SP0200Z150	200	14.0	25.0	1.60
SP0250Z150	250	15.0	23.3	2.00
SP0300Z150	300	17.5	20.0	2.00
SP0350Z150	350	19.0	18.4	2.00
SP0400Z150	400	20.0	17.5	2.00
SP0450Z150	450	22.0	15.9	2.50
SP0500Z150	500	24.0	14.5	2.50
SP0550Z150	550	25.6	13.6	2.50
SP0600Z150	600	27.0	12.9	2.50
SP0650Z150	650	28.6	12.2	2.50
SP0700Z150	700	30.0	11.6	2.50
SP0750Z150	750	31.6	11.0	3.25
SP0800Z150	800	33.0	10.6	3.25
SP0850Z150	850	34.5	10.1	3.25
SP0900Z150	900	36.0	9.4	3.25
SP0950Z150	950	38.0	9.2	3.25
SP1000Z150	1000	40.0	8.7	3.25
IMPEDANCE 325 OHMS				
SP0100Z325	100	12.0	29.2	1.20
SP0150Z325	150	14.0	25.0	1.20
SP0200Z325	200	17.0	20.6	1.20
SP0250Z325	250	19.0	18.4	1.60
SP0300Z325	300	21.0	16.7	1.60
SP0350Z325	350	23.0	15.3	1.60
SP0400Z325	400	24.0	14.6	1.60
SP0450Z325	450	26.0	13.5	2.00
SP0500Z325	500	28.0	12.5	2.00
SP0550Z325	550	29.0	12.1	2.00
SP0600Z325	600	31.0	11.3	2.00
SP0650Z325	650	33.0	10.6	2.50
SP0700Z325	700	34.0	10.3	2.50
SP0750Z325	750	35.0	10.0	2.50
SP0800Z325	800	37.0	9.5	2.50
SP0850Z325	850	39.0	9.0	2.50
SP0900Z325	900	41.0	8.5	2.50
SP0950Z325	950	43.0	8.1	2.50
SP1000Z325	1000	45.0	7.8	2.50
SP1100Z325	1100	49.0	7.1	3.25
SP1200Z325	1200	52.0	6.7	3.25
SP1300Z325	1300	55.0	6.3	3.25
SP1400Z325	1400	59.0	5.9	3.25
SP1500Z325	1500	62.0	5.6	3.25

Part Number	Time Delay (Nanoseconds)	Rise Time (Nanoseconds) Maximum	Bandwidth Minimum (MHz)	Diam. Inches
IMPEDANCE 500 OHMS				
SP0300Z500	300	33.0	10.6	1.20
SP0400Z500	400	40.0	8.7	1.60
SP0500Z500	500	44.0	7.9	1.60
SP0600Z500	600	50.0	7.0	1.60
SP0700Z500	700	55.0	6.3	2.00
SP0800Z500	800	57.0	6.1	2.00
SP0900Z500	900	60.0	5.8	2.00
SP1000Z500	1000	66.0	5.3	2.00
SP1500Z500	1500	87.0	4.0	2.50
SP2000Z500	2000	110.0	3.1	2.50
SP2500Z500	2500	120.0	2.9	3.25
SP3000Z500	3000	137.0	2.5	3.25
SP3500Z500	3500	154.0	2.2	3.25
SP4000Z500	4000	165.0	2.1	3.25
IMPEDANCE 600 OHMS				
SP0400Z600	400	46.0	7.6	1.20
SP0500Z600	500	48.0	7.2	1.60
SP0600Z600	600	54.0	6.4	1.60
SP0700Z600	700	58.0	6.0	1.60
SP0800Z600	800	60.0	5.8	1.60
SP0900Z600	900	65.0	5.3	2.00
SP1000Z600	1000	70.0	5.0	2.00
SP1500Z600	1500	85.0	4.1	2.50
SP2000Z600	2000	100.0	3.5	2.50
SP2500Z600	2500	115.0	3.0	2.50
SP3000Z600	3000	125.0	2.8	3.25
SP3500Z600	3500	140.0	2.5	3.25
SP4000Z600	4000	150.0	2.3	3.25
SP4500Z600	4500	165.0	2.1	3.75
SP5000Z600	5000	170.0	2.0	3.75
SP5500Z600	5500	185.0	1.8	3.75
SP6000Z600	6000	200.0	1.7	3.75
IMPEDANCE 1000 OHMS				
SP0500Z01K	500	58.0	6.0	1.20
SP0600Z01K	600	63.0	5.5	1.20
SP0700Z01K	700	72.0	4.8	1.20
SP0800Z01K	800	80.0	4.3	1.20
SP0900Z01K	900	87.0	4.0	1.60
SP1000Z01K	1000	95.0	3.6	1.60
SP1500Z01K	1500	116.0	3.0	1.60
SP2000Z01K	2000	126.0	2.7	2.00
SP2500Z01K	2500	147.0	2.3	2.00
SP3000Z01K	3000	158.0	2.2	2.00
SP3500Z01K	3500	182.0	1.9	2.50
SP4000Z01K	4000	203.0	1.7	2.50
SP4500Z01K	4500	220.0	1.5	2.50
SP5000Z01K	5000	240.0	1.4	3.25



"D"	"R"
1.20"	.400"
1.60"	.600"
2.00"	.800"
2.50"	1.050"
3.25"	1.425"
3.75"	1.675"

"TAPPED" UNITS AVAILABLE IN IMPEDANCES FROM 50 TO 325 OHMS INCLUSIVE. CALL OR WRITE FOR COMPLETE CATALOG.

*Patented and patents applied for.

ALLEN AVIONICS, INC.

224 EAST SECOND STREET • MINEOLA, NEW YORK 11501 • PHONES: 516-248-8080 OR 516-747-5450

SEE OUR PAGES UNDER
FILTERS
SECTION 2700
WRITE FOR CATALOG

NEW THE ULTIMATE IN MINIATURIZATION

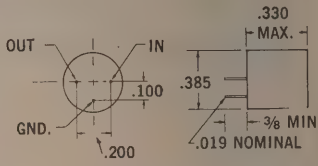
Lumped Constant, completely passive, delay lines housed in a commercial T05 package (.385 dia. x .330 high). Designed for compatibility with semiconductor and logic assemblies where space and good performance are prime considerations. Stocked in delays from 10 to 100 nanoseconds.

Delay Tolerance: ±5%.

Working Voltage: 50 volts DC.

Temp. Coefficient Over 0 to 80°C: 100 parts/million/°C.

Part No.	Time Delay (Nanoseconds)	Rise Time Max. (Nanoseconds)	Bandwidth (MHz)	Impedance (Ohms)	Attenuation (%)
T010	10	3	120.0	100	4
T020	20	4	90.0	100	5
T030	30	6	60.0	100	6
T040	40	8	45.0	100	7
T050	50	10	36.0	100	8
T060	60	12	30.0	50	8
T070	70	14	25.7	50	9
T080	80	16	22.5	50	10
T090	90	18	20.0	50	11
T01C	100	20	18.0	50	12



"LC DIP" DUAL-IN-LINE 14 PIN TAPPED LUMPED CONSTANT DELAY LINE

TO ORDER SPECIFY PART NUMBER

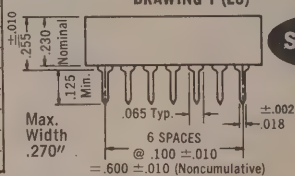
Part Number	Time Delay (Nanoseconds)	Rise Time (Nanoseconds)	Bandwidth (MHz)	Impedance (Ohms)	Maximum Attenuation (%)	Refer to Drawing
LC010Z100B	10	2.5	144.0	100	4	1
LC020Z100A	20	4.0	90.0	100	5	1
LC025Z100A	25	5.0	72.0	100	5	1
LC030Z100A	30	6.0	60.0	100	6	1
LC040Z100A	40	8.0	45.0	100	7	1
LC050Z100A	50	10.0	36.0	100	8	1
LC100Z100A	100	20.0	18.0	100	12	1
LC150Z100A	150	30.0	12.0	100	15	1
LC200Z100A	200	40.0	9.0	100	23	1
LC250Z100A	250	50.0	7.2	100	30	1
LCL250Z050A	250	50.0	7.2	50	35	2
LCL500Z100A	500	100.0	3.6	100	35	2
LCL500Z050A	500	100.0	3.6	50	40	2
LCL750Z050A	750	150.0	2.4	50	40	2
LCL01KZ050A	1000	200.0	1.8	50	45	2

THE "LC DIP" offers the ultimate in high density packaging and tapping capabilities. These units are excellent for high frequency applications. The availability of 10 equal delay increments and the dual-in-line packaging along with its low silhouette make for compatibility with semiconductor and other assemblies where circuit board height must be held to a minimum. This makes the "LC DIP" extremely adaptable for the computer and allied industries.

Delay Tolerance:
±5% or 4 ns (whichever is greater) for delays of 250 ns or less.
±5% or 20 ns (whichever is greater) for delays of over 250 ns.

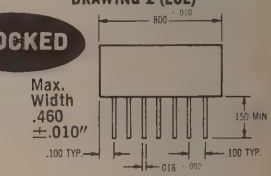
Working Voltage: 50 volts DC. **Construction:** Epoxy encapsulated.

DRAWING 1 (LC)



STOCKED

DRAWING 2 (LCL)



NOW AVAILABLE – A COMPLETE SERIES OF 20 TAPPED LUMPED CONSTANT 24 PIN DUAL-IN-LINE DELAY LINES

Available in delays from 10 nanoseconds to 1 microsecond, offering time delay to rise time ratios of 10 to 1.

DUAL-IN-LINE "MIDI" SPIRADEL®*

THE WORLD'S LOWEST COST DELAY LINE HAVING TIME DELAY TO RISE TIME GREATER THAN 5/1

"MIDI" SPIRADEL offers the same excellent pulse fidelity and phase linearity as the Standard Spiradel. Its low silhouette and dual-in-line mounting permit packaging with semiconductor and comparable components. In high volume use, the unit's low cost is competitive with all types of active devices with no sacrifice in stability and reliability. While units listed are standard-stocked, other delays and impedances are available on special order. Standard Delay Tolerance 10%. (5% on special order.)

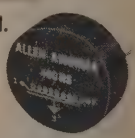
Part Number	Time Delay (Nanoseconds)	Rise Time (Nanoseconds) Maximum	Bandwidth Minimum (MHz)
IMPEDANCE 100 OHMS Maximum Attenuation 5%			
MD005Z100	5	2.0	180.0
MD010Z100	10	2.5	144.0
MD015Z100	15	3.0	120.0
MD020Z100	20	4.0	90.0
MD025Z100	25	5.0	72.0
MD030Z100	30	6.0	60.0
MD040Z100	40	7.5	48.0
MD050Z100	50	9.0	40.0
IMPEDANCE 175 Ohms Maximum Attenuation 8%			
MD060Z175	60	11.0	32.7
MD070Z175	70	12.0	30.0
MD080Z175	80	13.0	27.7
MD090Z175	90	14.0	25.7
MD100Z175	100	15.0	24.0

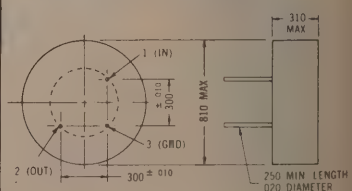
Part Number	Time Delay (Nanoseconds)	Rise Time (Nanoseconds) Maximum	Bandwidth Minimum (MHz)
IMPEDANCE 500 OHMS Maximum Attenuation 20%			
MD125Z500	125	25.0	14.4
MD150Z500	150	29.0	12.1
MD175Z500	175	32.0	11.3
MD200Z500	200	35.0	10.3
MD250Z500	250	40.0	9.0
IMPEDANCE 1000 OHMS Maximum Attenuation 20%			
MD300Z01K	300	60.0	6.0
MD350Z01K	350	67.0	5.4
MD400Z01K	400	74.0	4.9
MD450Z01K	450	78.0	4.6
MD500Z01K	500	81.0	4.4
MD550Z01K	550	83.0	4.3
MD600Z01K	600	85.0	4.2

TO ORDER SPECIFY PART NUMBER

STOCKED

Epoxy Encapsulated. Temperature Coefficient: Less than 200 PPM/°C from −55°C to +105°C.





DUAL-IN-LINE "MINI" SPIRADEL®* FOR IMMEDIATE DELIVERY!

STOCKED

*Patented and patents applied for.

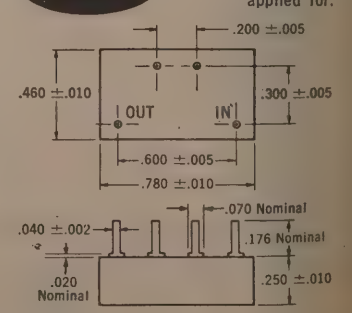
EXCELLENT PULSE FIDELITY • FLAT DELAY OVER WIDE FREQUENCY RANGE

Operation from −55°C up to +105°C. Units exhibit a change of less than 175 parts/million/°C over this temperature range. Dual-in-line mounting. Compatible with integrated circuits. Maximum attenuation for all delays: 7%.

TO ORDER SPECIFY PART NUMBER

Part Number	Time Delay (Nanoseconds)	Rise Time (Nanoseconds)	Impedance (Ohms)
MN005Z125	5	2.0	125
MN010Z125	10	2.5	125
MN020Z200	20	4.0	200
MN030Z250	30	6.0	250
MN040Z300	40	8.0	300
MN050Z350	50	10.0	350
MN060Z400	60	12.0	400

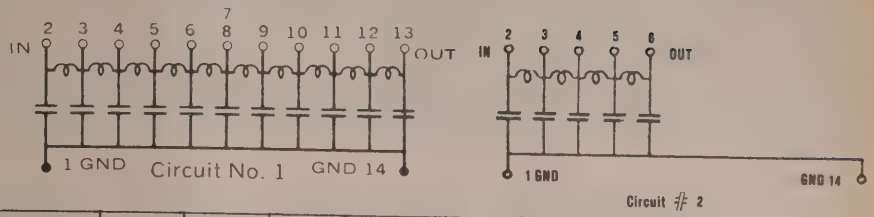
Part No.	Time Delay (Nanoseconds)	Rise Time (Nanoseconds)	Impedance (Ohms)
MN070Z400	70	14.0	400
MN080Z475	80	16.0	475
MN090Z500	90	18.0	500
MN100Z500	100	20.0	500
MN125Z500	125	25.0	500
MN150Z01K	150	30.0	1000
MN175Z01K	175	35.0	1000
MN200Z01K	200	40.0	1000



STANDARD DELAY TOLERANCE 10% (5% ON SPECIAL ORDERS)

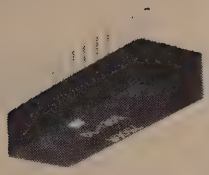
DELAY LINES

DUAL-IN-LINE DELAY LINES



Catalog Number	Imped. Z_o (Ω) ±10%	Total Delay (ns ±5%)	No. of Taps	Delay Per Tap (ns ±3ns)	Rise Time (ns Max.)	Total Delay Rise Time Ratio (Min.)	Distortion (% Max.)	Attenuation (% Max.)	Circuit No.
DL-1101	50	50	10	5(±2ns)	8.5	6	10	2.5	1
DL-1102*	50	100	10	10	17	6	10	7	1
DL-113*	50	125	10	12.5	21	6	10	7.5	1
DL-1104	100	50	10	5(±2ns)	8.5	6	10	2.5	1
DL-1105	100	100	10	10	17	6	10	9	1
DL-1106*	100	125	10	12.5	21	6	10	13	1
DL-1107*	100	150	10	15	25	6	10	15	1
DL-1110	100	10	4	2.5 (±1ns)	4	3	15	5.0	2
DL-1111	100	20	4	5.0 (±2ns)	7	3	15	5.0	2
DL-1112	100	30	4	7.5 (±2ns)	10	3	15	5.0	2
DL-1113	100	40	4	10	14	3	15	5.0	2
DL-1114	100	50	4	12.5	17	3	15	5.0	2
DL-1115	100	60	4	15	20	3	15	5.0	2
DL-1116	100	70	4	17.5	24	3	15	5.0	2
DL-1117	100	80	4	20	27	3	15	5.0	2
DL-1118	100	90	4	22.5	30	3	15	5.0	2
DL-1119	100	100	4	25	34	3	15	5.0	2

STANDARD DELAY LINES, SERIES DL-1300



Catalog Number	Imped. Z_o (Ω) ±1%	Total Delay (ns ±5%)	No. of Taps	Delay Per Tap (ns ±3ns)	Rise Time (ns Max.)	Total Delay Rise Time Ratio (Min.)	Distortion (% Max.)	Attenuation (1% Max.)
DL-1301	100	50	10	5(±2ns)	8.5	6	10	2
DL-1302	100	100	10	10	17	6	10	3.5
DL-1303	100	125	10	12.5	21	6	10	5
DL-1304	100	150	10	15	25	6	10	5
DL-1305	100	200	10	20	34	6	10	8
DL-1306	100	250	10	25	42	6	10	10

SPECIAL DELAY LINES, SERIES DL-1500/DL-1600

Catalog Number	Imped. Z_o (Ω) ±10%	Total Delay (ns±5%)	No. of Taps	Delay Per Tap (ns±2ns)	Rise Time (ns Max.)	Total Delay Rise Time Ratio (Min.)	Distortion (% Max.)	Attenuation (% Max.)
DL-1501	50	50	10	5(±2ns)	5.5	9	10	2
DL-1502	50	100	10,	10	11	9	10	5
DL-1503	50	125	10	12.5	13.8	9	10	6
DL-1504	50	150	10	15	16.5	9	10	8
DL-1505	50	200	10	20	22	9	10	12
DL-1506	100	50	10	5(±2ns)	5.5	9	10	3
DL-1507	100	100	10	10	11	9	10	3
DL-1508	100	125	10	12.5	13.8	9	10	9
DL-1509	100	150	10	15	16.5	9	10	14

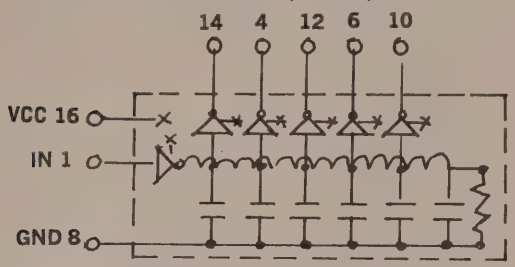
BOURNS INC
MAGNETICS PRODUCTS
DEPT. EM 28151 HIGHWAY 74
ROMOLAND, CALIFORNIA 92380
PHONE (714) 657-5195
TELEX 67-6446

bel defining a degree of excellence

DIGITAL DELAY LINE SERIES 447

Bel Fuse Digital Delay Line Series 447 features five equally tapped delay lines with total delays of 25 to 500 nanoseconds. The lines are compatible with TTL and DTL circuits. Either Logic "1" or Logic "0" inputs are accepted. Cascading of units causes no undesirable reflections. The .870 x .400 x .260 dimensions, with standard Dip Pin-Out permits dense packaging on your circuit board. Delay tolerances for total delay is 5%. Tap tolerances are ±2nsec or 5% whichever is greater. Operating temperature is 0°-70°C. Special designs upon request.

*14 Pin Unit Available Upon Request

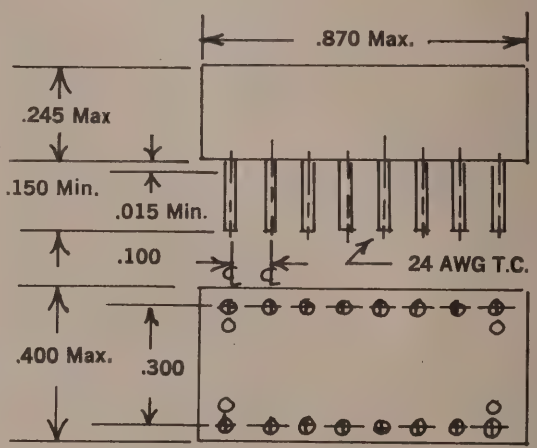


PIN

1—Input
14—20% Delay
4—40% Delay
12—60% Delay

PIN

6—80% Delay
10—100% Delay
8—Ground
16—Vcc



Part Number	Td (1)	Td Tap (1)	No. Taps	Tr (2)
0447-0025-01	25 Ns.	5 Ns.	5	4 Ns.
0447-0050-01	50 Ns.	10 Ns.	5	4 Ns.
0447-0100-01	100 Ns.	20 Ns.	5	4 Ns.
0447-0250-01	250 Ns.	50 Ns.	5	4 Ns.
0447-0500-01	500 Ns.	100 Ns.	5	4 Ns.

(1) Measured at 1.5 Volt Level, Leading Edge (2) Measured from 0.75V to 2.4V

Supply Voltage Vcc	4.5 to 5.5 Volts
Logic 1 Input Current	50 Microamps Max.
Logic 0 Input Current	2 Milliamps Max.
Logic 1 Output Voltage	2.6 Volts Min.
Logic 0 Output Voltage	.5 Volts Max.

All Measurements Made at VCC = 5.0 Volts @ 25°C

INPUT TEST CONDITIONS

Pulse Voltage	3.2 Volts
Rise Time	3.0 Nsec.
Supply Current	60 ma
Pulse Width	Min. of 40% Delay

DRIVE CAPABILITIES

Logic 0 Output	10 TTL Loads/Tap Max. (20 TTL loads/Unit Max.)
Logic 1 Output	10 TTL Loads/Unit Max.

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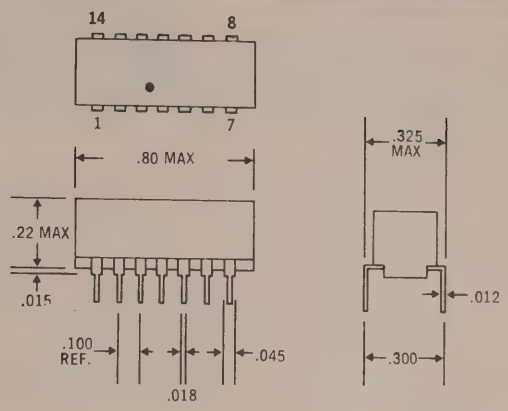
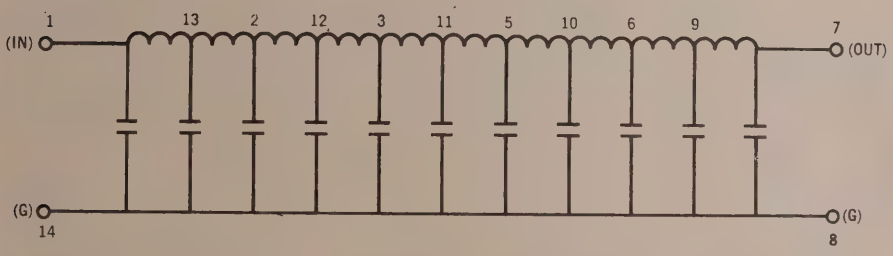
DIP DELAY LINES

- Built to conform to MIL-D-23859.
- Temperature Range −55°C to +125°C.
- Temperature Coefficient 100 ppm/°C or less.
- Will meet most stringent MIL requirements.
- Low attenuation.
- Excellent pulse fidelity.
- Compatible with TTL and other logic modes.
- Other delays available upon request.
- Contact Bel Engineering for special applications.
- Untapped Units Available Upon Request





10 EQUALLY SPACED TAPS

CUSTOM PIN LAYOUT AVAILABLE UPON REQUEST

Total Delay Nsec ±5%	Tap Delay	Distortion ±Max. %	Attenuation Max. %	Impedance ±10% 50Ω	100Ω	200Ω
20	2±1	10	5	0446-0020-50 Tr = 5	0446-0020-01 Tr = 5	0446-0020-02 Tr = 5
30	3±1	10	5	0446-0030-50 Tr = 7	0446-0030-01 Tr = 7	0446-0030-02 Tr = 7
40	4±1	10	5	0446-0040-50 Tr = 8.5	0446-0040-01 Tr = 8.5	0446-0040-02 Tr = 8.5
50	5±2	10	5	0446-0050-50 Tr = 10	0446-0050-01 Tr = 10	0446-0050-02 Tr = 10
60	6±2	10	8	0446-0060-50 Tr = 12	0446-0060-01 Tr = 12	0446-0060-02 Tr = 12
70	7±2	10	8	0446-0070-50 Tr = 14	0446-0070-01 Tr = 14	0446-0070-02 Tr = 14
80	8±2	10	8	0446-0080-50 Tr = 16	0446-0080-01 Tr = 16	0446-0080-02 Tr = 16
90	9±2	10	8	0446-0090-50 Tr = 18	0446-0090-01 Tr = 18	0446-0090-02 Tr = 18
100	10±3	10	10	0446-0100-50 Tr = 20	0446-0100-01 Tr = 20	0446-0100-02 Tr = 20
150	15±3	10	10	0446-0150-50 Tr = 30	0446-0150-01 Tr = 28	0446-0150-02 Tr = 30
200	20±3	10	10	0446-0200-50 Tr = 40	0446-0200-01 Tr = 35	0446-0200-02 Tr = 40
250	25±3	10	10	0446-0250-50 Tr = 50	0446-0250-01 Tr = 45	0446-0250-02 Tr = 50
300	30±3	10	10		0446-0300-01 Tr =160	0446-0300-02 Tr = 60
400	40±3	10	10		0446-0400-01 Tr = 80	0446-0400-02 Tr = 80
500	50±3	10	10		0446-0500-01 Tr = 100	0446-0500-02 Tr = 100

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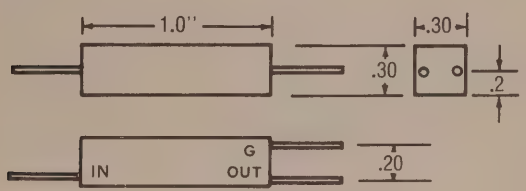
DELAY LINES

A



Lead Dia. = .032

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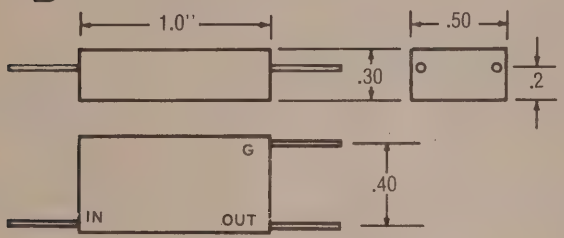

Lead Dia. = .032

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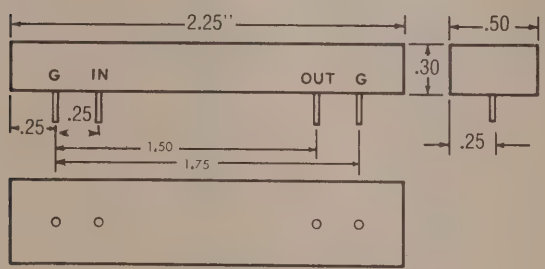

Lead Dia. = .032

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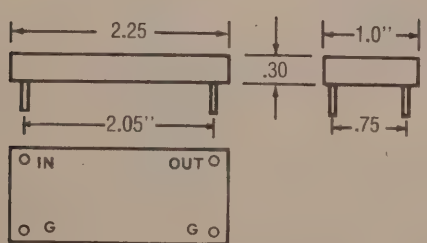

Lead Dia. = .032

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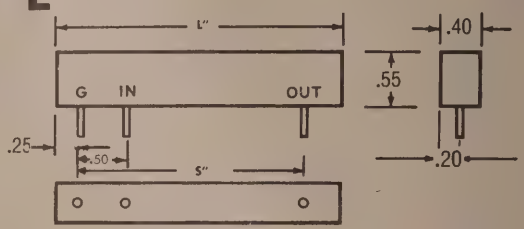

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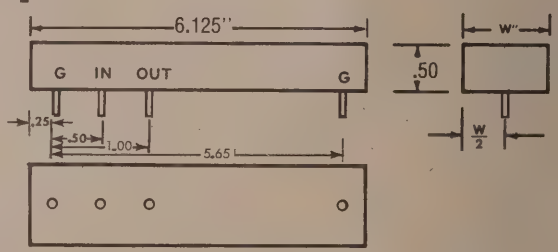

Lead Dia. = .032

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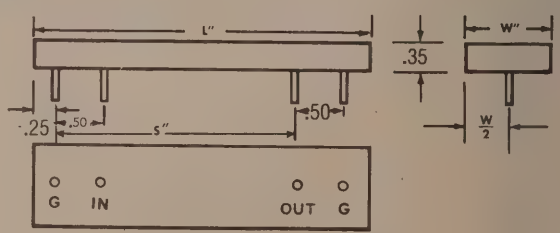

Lead Dia. = .032

The condensed version of our catalog items are listed here showing the most widely used sizes and types available for prompt shipment. Space prohibits the full listing of the many specials and the variations available.

CAUTION: Before finalizing your design, it is highly recommended you contact our Engineering Staff for their expert guidance, founded on our vast experience and up-to-date technology — a phone call can save you valuable time and money.

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NANOSECONDS

Part Number — Impedance ±10%				DELAY TIME ±5% nsec	RISE TIME nsec 93Ω	CONFIGURATION	LEAD SPACING "S" INCHES	LENGTH "L" INCHES	WIDTH "W" INCHES
93Ω	200Ω	500Ω	1000Ω						
0420-0001-93	0420-0001-02	0420-0001-05	0420-0001-10	1	4.0	A	—	1.0	.3
0420-0002-93	0420-0002-02	0420-0002-05	0420-0002-10	2	4.0	A	—	1.0	.3
0420-0003-93	0420-0003-02	0420-0003-05	0420-0003-10	3	4.0	A	—	1.0	.3
0420-0004-93	0420-0004-02	0420-0004-05	0420-0004-10	4	4.0	A	—	1.0	.3
0420-0005-93	0420-0005-02	0420-0005-05	0420-0005-10	5	4.0	A	—	1.0	.3
0420-0010-93	0420-0010-02	0420-0010-05	0420-0010-10	10	4.0	A	—	1.0	.3
0420-0015-93	0420-0015-02	0420-0015-05	0420-0015-10	15	4.0	B	—	1.0	.5
0420-0020-93	0420-0020-02	0420-0020-05	0420-0020-10	20	4.0	B	—	1.0	.5
0420-0025-93	0420-0025-02	0420-0025-05	0420-0025-10	25	5.0	C	—	2.25	.5
0420-0030-93	0420-0030-02	0420-0030-05	0420-0030-10	30	6.0	C	—	2.25	.5
0420-0035-93	0420-0035-02	0420-0035-05	0420-0035-10	35	7.0	C	—	2.25	.5
0420-0040-93	0420-0040-02	0420-0040-05	0420-0040-10	40	8.0	C	—	2.25	.5
0420-0045-93	0420-0045-02	0420-0045-05	0420-0045-10	45	9.0	C	—	2.25	.5
0420-0050-93	0420-0050-02	0420-0050-05	0420-0050-10	50	9.0	C	—	2.25	.5
0420-0055-93	0420-0055-02	0420-0055-05	0420-0055-10	55	10.0	D	—	2.25	1.0
0420-0060-93	0420-0060-02	0420-0060-05	0420-0060-10	60	10.0	D	—	2.25	1.0
0420-0065-93	0420-0065-02	0420-0065-05	0420-0065-10	65	11.0	D	—	2.25	1.0
0420-0070-93	0420-0070-02	0420-0070-05	0420-0070-10	70	12.0	D	—	2.25	1.0
0420-0075-93	0420-0075-02	0420-0075-05	0420-0075-10	75	12.0	D	—	2.25	1.0
0420-0080-93	0420-0080-02	0420-0080-05	0420-0080-10	80	13.0	D	—	2.25	1.0
0420-0085-93	0420-0085-02	0420-0085-05	0420-0085-10	85	13.0	D	—	2.25	1.0
0420-0090-93	0420-0090-02	0420-0090-05	0420-0090-10	90	14.0	D	—	2.25	1.0
0420-0095-93	0420-0095-02	0420-0095-05	0420-0095-10	95	14.0	D	—	2.25	1.0
0420-0100-93	0420-0100-02	0420-0100-05	0420-0100-10	100	15.0	D	—	2.25	1.0
0420-0125-93	—	—	—	125	15.0	G	2	3.00	.75
—	0420-0125-02	—	—	125	18.0	G	2.8	3.8	.625
—	—	0420-0125-05	0420-0125-10	125	30.0	E	1.20	1.8	.4
0420-0150-93	—	—	—	150	15.0	G	2	3.0	1.0
—	0420-0150-02	—	—	150	20.0	G	2.8	3.8	.625
—	—	0420-0150-05	0420-0150-10	150	27.0	E	1.20	1.8	.4
0420-0175-93	—	—	—	175	20.0	G	2	3.0	1.0
—	0420-0175-02	—	—	175	20.0	G	2.8	3.8	.625
—	—	0420-0175-05	0420-0175-10	175	30.0	E	1.20	1.8	.4
0420-0200-93	—	—	—	200	20.0	G	2	3.0	1.0
—	0420-0200-02	—	—	200	20.0	G	2.8	3.8	.625
—	—	0420-0200-05	0420-0200-10	200	35.0	E	1.20	1.8	.4
0420-0250-93	—	—	—	250	32.0	G	2	3.0	1.0
—	0420-0250-02	—	—	250	35.0	G	2.8	3.8	.625
—	—	0420-0250-05	0420-0250-10	250	40.0	E	1.20	1.8	.4
0420-0300-93	—	—	—	300	40.0	G	5.125	6.125	1.5
—	0420-0300-02	—	—	300	40.0	G	2.8	3.8	.925
—	—	0420-0300-05	0420-0300-10	300	45.0	E	2.20	3.0	.4
0420-0400-93	—	—	—	400	45.0	G	5.125	6.125	1.5
—	0420-0400-02	—	—	400	45.0	G	2.8	3.8	.925
—	—	0420-0400-05	0420-0400-10	400	55.0	E	2.20	3.0	.4
0420-0500-93	—	—	—	500	65.0	G	5.125	6.125	1.5
—	0420-0500-02	—	—	500	65.0	G	2.8	3.8	.925
—	—	0420-0500-05	0420-0500-10	500	70.0	E	2.20	3.0	.4
—	0420-0600-02	—	—	600	75.0	G	2.8	3.8	1.5
—	—	0420-0600-05	0420-0600-10	600	75.0	E	2.20	3.9	.4
—	0420-0700-02	—	—	700	85.0	G	5.125	6.125	.8
—	—	0420-0700-05	0420-0700-10	700	85.0	E	2.20	3.9	.4
—	0420-0800-02	—	—	800	85.0	G	5.125	6.125	.8
—	—	0420-0800-05	0420-0800-10	800	95.0	E	3.40	4.25	.4
—	0420-0900-02	—	—	900	95.0	G	5.125	6.125	.8
—	—	0420-0900-05	0420-0900-10	900	100.0	E	4.40	5.25	.4
—	0420-1000-02	—	—	1000	110.0	G	5.125	6.125	.8
—	—	0420-1000-05	0420-1000-10	1000	110.0	E	4.40	5.25	.4
—	0420-1500-02	—	—	1500	150.0	F	—	6.125	2.0
—	—	0420-1500-05	0420-1500-10	1500	150.0	F	—	6.125	.8
—	0420-2000-02	—	—	2000	200.0	F	—	6.125	2.0
—	—	0420-2000-05	0420-2000-10	2000	200.0	F	—	6.125	.8
—	0420-2500-02	—	—	2500	250.0	F	—	6.125	2.0
—	—	0420-2500-05	0420-2500-10	2500	250.0	F	—	6.125	.8
—	0420-3000-02	—	—	3000	300.0	F	—	6.125	2.0
—	—	0420-3000-05	0420-3000-10	3000	300.0	F	—	6.125	1.2
—	0420-3500-02	—	—	3500	350.0	F	—	6.125	3.0
—	—	0420-3500-05	0420-3500-10	3500	350.0	F	—	6.125	1.2
—	0420-4000-02	—	—	4000	400.0	F	—	6.125	3.0
—	—	0420-4000-05	0420-4000-10	4000	400.0	F	—	6.125	2.0
—	0420-4500-02	—	—	4500	450.0	F	—	6.125	3.0
—	—	0420-4500-05	0420-4500-10	4500	450.0	F	—	6.125	2.0
—	0420-5000-02	—	—	5000	500.0	F	—	6.125	3.0
—	—	0420-5000-05	0420-5000-10	5000	500.0	F	—	6.125	2.0

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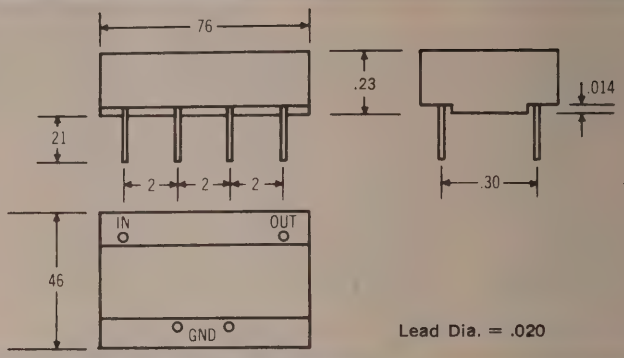
DUAL-IN-LINE DELAY LINES

- Delays from 1-1000 nanoseconds.
- Band Width to 60 mhz.
- Impedance 50 to 1000 ohms.
- Resistive Terminations if desired.
- Tapped Delay Lines available.
- Several separate lines in one case.
- Contact Bel Engineering for special applications.



Lead Dia. = .020

Time Delay nsec ±5%*	Impedance ±10%					
	50Ω	75Ω	100Ω	200Ω	500Ω	1000Ω
5	0440-0005-50 Tr = 5	0440-0005-75 Tr = 5	0440-0005-01 Tr = 5	0440-0005-02 Tr = 6	0440-0005-05 Tr = 6	0440-0005-10 Tr = 6
10	0440-0010-50 Tr = 5	0440-0010-75 Tr = 6	0440-0010-01 Tr = 6	0440-0010-02 Tr = 7	0440-0010-05 Tr = 7	0440-0010-10 Tr = 7
15	0440-0015-50 Tr = 8	0440-0015-75 Tr = 8	0440-0015-01 Tr = 8	0440-0015-02 Tr = 8	0440-0015-05 Tr = 8	0440-0015-10 Tr = 8
20	0444-0020-50 Tr = 10	0440-0020-75 Tr = 10	0440-0020-01 Tr = 10	0440-0020-02 Tr = 10	0440-0020-05 Tr = 10	0440-0020-10 Tr = 10
30	0444-0030-50 Tr = 12	0440-0030-75 Tr = 10	0440-0030-01 Tr = 10	0440-0030-02 Tr = 10	0440-0030-05 Tr = 10	0440-0030-10 Tr = 15
40	0444-0040-50 Tr = 17	0444-0040-75 Tr = 20	0440-0040-01 Tr = 13	0440-0040-02 Tr = 13	0440-0040-05 Tr = 15	0440-0040-10 Tr = 20
50	0444-0050-50 Tr = 18	0444-0050-75 Tr = 20	0440-0050-01 Tr = 15	0440-0050-02 Tr = 15	0440-0050-05 Tr = 18	0440-0050-10 Tr = 30
60	0444-0060-50 Tr = 23	0444-0060-75 Tr = 20	0444-0060-01 Tr = 18	0440-0060-02 Tr = 20	0440-0060-05 Tr = 22	0440-0060-10 Tr = 35
70	0444-0070-50 Tr = 23	0444-0070-75 Tr = 22	0444-0070-01 Tr = 19	0440-0070-02 Tr = 22	0440-0070-05 Tr = 25	0440-0070-10 Tr = 35
80	0444-0080-50 Tr = 28	0444-0080-75 Tr = 22	0444-0080-01 Tr = 19	0440-0080-02 Tr = 25	0440-0080-05 Tr = 30	0440-0080-10 Tr = 40
90	0444-0090-50 Tr = 30	0444-0090-75 Tr = 23	0444-0090-01 Tr = 20	0440-0090-02 Tr = 26	0440-0090-05 Tr = 33	0440-0090-10 Tr = 45
100	0444-0100-50 Tr = 35	0444-0100-75 Tr = 23	0444-0100-01 Tr = 20	0440-0100-02 Tr = 28	0440-0100-05 Tr = 35	0440-0100-10 Tr = 50
125	0444-0125-50 Tr = 45	0444-0125-75 Tr = 40	0444-0125-01 Tr = 22	0444-0125-02 Tr = 30	0440-0125-05 Tr = 37	0440-0125-10 Tr = 55
150	0444-0150-50 Tr = 50	0444-0150-75 Tr = 35	0444-0150-01 Tr = 27	0444-0150-02 Tr = 30	0440-0150-05 Tr = 40	0444-0150-10 Tr = 60
200	0444-0200-50 Tr = 55	0444-0200-75 Tr = 50	0444-0200-01 Tr = 37	0444-0200-02 Tr = 40	0444-0200-05 Tr = 40	0444-0200-10 Tr = 60
300			0444-0300-01 Tr = 57	0444-0300-02 Tr = 60	0444-0300-05 Tr = 55	0444-0300-10 Tr = 60
400				0444-0400-02 Tr = 60	0444-0400-05 Tr = 65	0444-0400-10 Tr = 70
500				0444-0500-02 Tr = 110	0444-0500-05 Tr = 95	0444-0500-10 Tr = 95
600				0444-0600-02 Tr = 110	0444-0600-05 Tr = 100	0444-0600-10 Tr = 125
700				0444-0700-02 Tr = 120	0444-0700-05 Tr = 110	0444-0700-10 Tr = 120
800					0444-0800-05 Tr = 120	0444-0800-10 Tr = 125
900					0444-0900-05 Tr = 135	0444-0900-10 Tr = 135
1000					0444-1000-05 Tr = 150	0444-1000-10 Tr = 150

or 1 nsec (whichever is greater)

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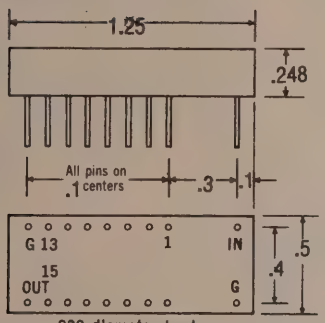
TAPPED DELAY LINES

A



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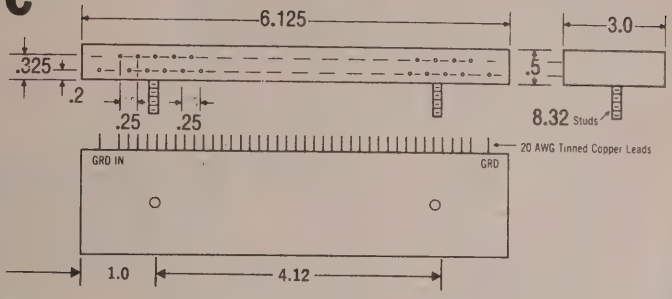

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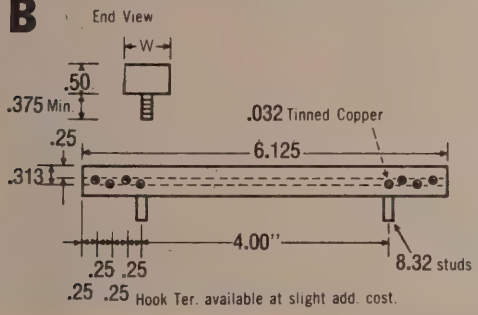

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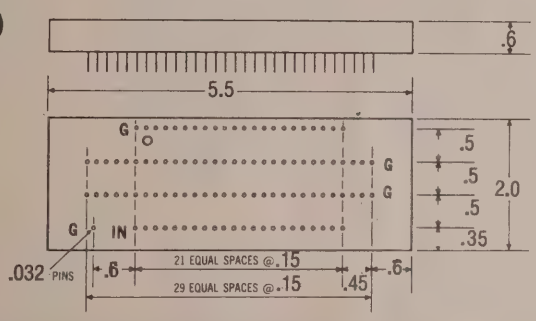


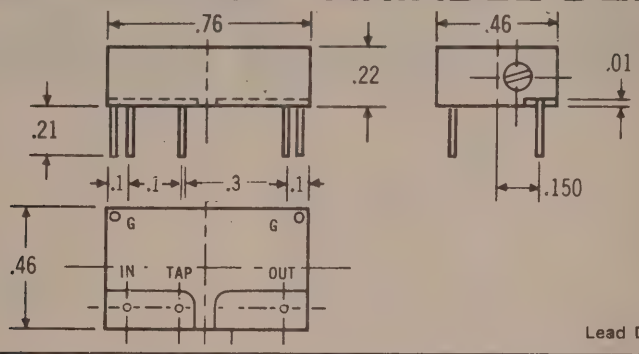
Part No.	Delay nsec	Tr nsec	No. of Taps	Delay/Tap nsec	Impedance	Width "	Style
0414-0155-01	15	5	15	1	100 ~	½	A
0414-0155-02	15	5	15	1	200 ~	½	A
0414-0155-03	15	5	15	1	500 ~	½	A
0414-0131-01	100	15	20	5	500 ~	.8	B
0414-0447-01	200	25	20	10	500 ~	.8	B
0414-0448-01	300	35	20	15	500 ~	.8	B
0414-0449-01	400	45	20	20	500 ~	.8	B
0414-0131-02	500	55	20	25	500 ~	.8	B
0414-0450-01	600	60	20	30	500 ~	.8	B
0414-0451-01	700	70	20	35	500 ~	.8	B
0414-0452-01	800	80	20	40	500 ~	.8	B
0414-0453-01	900	90	20	45	500 ~	.8	B
0414-0131-03	1000	100	20	50	500 ~	.8	B
0404-0454-01	1000	30	100	10	100 ~	2.0	D
0414-0455-01	2000	200	20	100	500 ~	.8	B
0404-0456-01	3000	300	20	150	500 ~	.8	B
0404-0457-01	4000	400	20	200	500 ~	.8	B
0404-0458-01	5000	500	20	250	500 ~	.8	B
0404-0459-01	7500	750	20	375	500 ~	1.5	B
0404-0460-01	10,000	1000	20	500	500 ~	1.5	B
0404-0461-01	12,500	750	25	500	500 ~	3	C
0404-0462-01	15,000	900	30	500	500 ~	3	C
0404-0463-01	17,500	1100	35	500	500 ~	3	C
0404-0464-01	20,000	1200	40	500	500 ~	3	C

bel BEL FUSE INC. 203 Van Vorst Street • Jersey City, N. J. 07302 • (201) 432-0463 • TWX 710-730-5301

bel defining a degree of excellence

DUAL-IN-LINE VARIABLE DELAY LINES

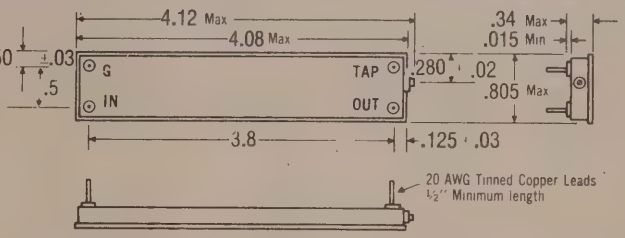
DV Series



BEL introduces the first variable delay line compatible with IC Dual-In-Line packaging featuring: • Hermetic Seal-O-Ring construction • Precious metal contacts • Resolution — MIN 2% (for high reliability performance)

Lead Dia. = .020

NV Series
PV Series

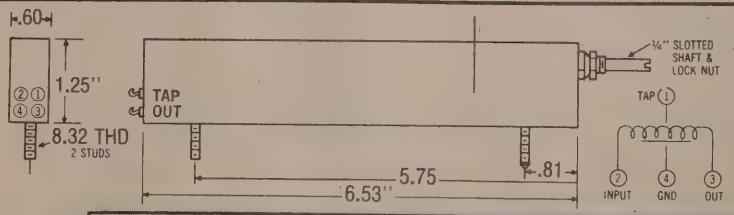


VARIABLES

These precision hermetically sealed variables are available in a wide range of delays and impedances. Both may be provided with various mounting and terminal configurations to suit most applications.

NV Series in Metal Case
PV Series in Epoxy Case

CV Series
LV Series



VARIABLES

These precision hermetically sealed variables are available in a wide range of delays and impedances. Both may be provided with various mounting and termination configurations to suit most applications

Part Number	Td Range	Rise Time	Impedance ±10%	Style
0430-0040-05	0-40 nsec	15 nsec	500 Ω	NV
0430-0050-02	0-50 nsec	12 nsec	200 Ω	
0430-0150-10	0-150 nsec	55 nsec	1000 Ω	
0430-0250-05	0-250 nsec	60 nsec	500 Ω	
0430-0250-04	0-250 nsec	55 nsec	400 Ω	
0433-0040-05	0-40 nsec	10 nsec	500 Ω	PV
0433-0050-02	0-50 nsec	10 nsec	200 Ω	
0433-0150-10	0-150 nsec	45 nsec	1000 Ω	
0433-0250-05	0-250 nsec	45 nsec	500 Ω	
0433-0250-04	0-250 nsec	45 nsec	400 Ω	
0431-0450-10	0-450 nsec	70 nsec	1000 Ω	CV
0431-0500-10	0-500 nsec	75 nsec	1000 Ω	
0431-0700-05	0-700 nsec	110 nsec	500 Ω	
0431-0750-05	0-750 nsec	110 nsec	500 Ω	
0431-1000-05	0-1000 nsec	135 nsec	500 Ω	
0448-0060-50	0-60 nsec	30 nsec	50 Ω	DV
0448-0005-01	0-5 nsec	5 nsec	100 Ω	
0448-0020-02	0-20 nsec	15 nsec	200 Ω	
0448-0030-03	0-30 nsec	20 nsec	350 Ω	
0448-0040-05	0-40 nsec	25 nsec	500 Ω	
0448-0060-05	0-60 nsec	45 nsec	500 Ω	
0432-0250-01	0-250 nsec	35 nsec	100 Ω	LV

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Columbia Components Delay Lines

LEADING MANUFACTURER OF

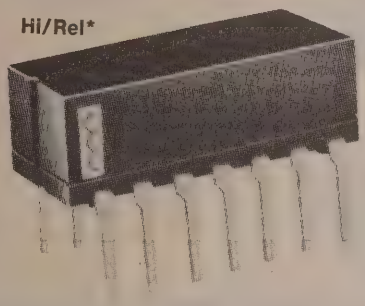
1. Video
2. Audio
3. Sonar
4. Computer
5. ATC (Air Traffic Control)
6. Video Cable Simulator
7. Millisec Delay Line
8. Programmable Adjustable Delay Line
9. Low Profile (Case height under 1/8")
10. Decade Delay Line
11. Low Temp. Coefficients Delay Lines
12. Digital Delay Line Series Compatability with TTL and DTL Circuits

The above is only part of our design capabilities.

Q-Lines (Lumped Constant)
State-of-the-art design and packaging technology enables CCC to offer delay to rise time ratios of up to 100:1, with the smallest envelope sizes possible. Coupled with extremely low attenuation, distortion and operating temperature ranges of −55°C to +125°C make CCC Q-Lines ideal for a wide range of applications.
Write for data sheet DL-6-368

Minilines (Distributed Constant)
Economically priced delay lines featuring low profile envelopes which are ideal for printed circuit mounting and applications requiring high package density. Delays up to 2 μsec, impedances for 100 to 1,000 ohms and rise times as low as 2.5 nanoseconds are available and meet all applicable portions of MIL-D-23859A.
Write for data sheet DL-4/5-368

Hi/Rel*

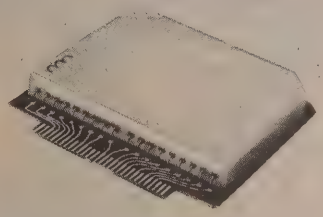


DIP-TAPPED DELAY LINES

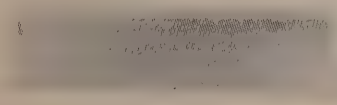
SERIES 500
- Delay: From 10 nsec to 200 nsec.
- No. Taps: 5 equally spaced taps.
- Taps Accuracy: ±5% of tap delay.
- Impedance: 50Ω, 100Ω, and 200Ω ±10%.
- Delay/Rise Time: 3/1.
- Dielectric: 50 Vdc min.
- Environment: Meets or exceeds MIL-D-23858C.
- Temperature Coefficient: 100 PPM/°C.
- Standard 14 DIP Case.

SERIES 1000
- Delay: From 10 nsec to 400 nsec.
- No. Taps: 10 equally spaced taps.
- Taps Accuracy: ±5% of tap delay.
- Impedance: 50Ω, 100Ω, and 200Ω ±10%.
- Delay/Rise Time: 5/1.
- Dielectric: 50 Vdc min.
- Environment: Meets or exceeds MIL-D-23859C.
- Temperature Coefficient: 100 PPM/°C.
- Standard 16 DIP Case.

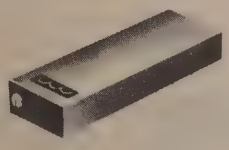
*High Reliability: Fully MIL-SPEC quality assurance available.



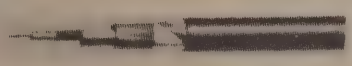
Transponder and Beacon Coder Delay Lines
Tap delay spacing of 1.45 microseconds with special tap delays designed for the various systems are available as off shelf and customer designed items. These lines have minimum volume and weight for airborne use and are normally supplied wired to printed circuit cards. These delay lines exhibit high delay accuracy and unsurpassed temperature stability — normally 10 PPM/°C.



Electrically Variable Delay Lines (E.V.D.L.)
Sophisticated voltage variable devices for applications such as Aperture Phase Correction in color television signal generation. Or as a Phase Modulator where the modulating voltage is used as the device bias. CCC E.V.D.L.'s are being used at frequencies up to 50 MHz by major producers of studio broadcasting equipment.



Varilines (Mechanically Variable Delay Lines)
Columbia manufactures a wide range of precision variable delay lines encompassing delay ranges of from 0 to 20 nanoseconds, to 0 to 15 microseconds in impedance ranges of 50 to 2,000 ohms. These units can be supplied continuously variable or may be decade switched, and suitable for printed circuit applications.
Write for data sheet DL-1-368



Magnetic Core Delay Cable
Economical low-loss, high impedance delay elements for use in pulse work demanding extremely fast rise times. These delay cables can be supplied in calibrated lengths with molded-on end terminations, ready for installation or may be obtained in bulk. Delivery is usually from stock.
Write for data sheet DL-7-368

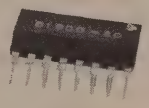
CONTACT US FOR SPECIFIC REQUIREMENTS. WE CUSTOMIZE.

COLUMBIA COMPONENTS DIVISION COMPUTER INSTRUMENTS CORP.
DEPT. EM, 100E MADISON AVENUE, HEMPSTEAD, NEW YORK 11550 / (516) 483-8200 / TWX 510-222-4189

FIXED AND TAPPED DELAY LINES

SUB-MINIATURE DUAL-IN-LINE TAPPED LUMPED CONSTANT LINES

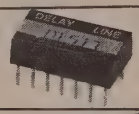
Each line has 10 tap delays spaced at equal intervals. Attenuation less than 1 dB. Temp. Coeff. less than 50 PPM/°C. DIP configuration compatible with automatic inserting equipment. Commercial and MIL Spec. models available.



MODEL	DELAY RANGE	RISE TIME OR FREQ. RESP.	IMPED-ANCE OHMS	SIZE INCHES
D1900-10	10 Nsec	2 Nsec	100	.21 x .30 x .78
D1900-20	20	3	100	.21 x .30 x .78
D1900-40	40	6	100	.21 x .30 x .78
D1900-60	60	9	100	.21 x .30 x .78
D1900-80	80	10	100	.21 x .30 x .78
D1900-100	100	20	100	.21 x .30 x .78
D8001	5	1	50	.21 x .30 x .78
D8004	10	2	100	.21 x .30 x .78
D8005	25	5	100	.21 x .30 x .78
D8007	30	6	100	.21 x .30 x .78

TAPPED DELAYS

Each line provides 10 tap delays spaced at equal intervals.



D1511-1	10 Nsec	3 Nsec		
D1511-2	20	6		
D1511-4	40	13		Dual-In-Line
D1511-6	60	20	100	Pin Spacing
D1511-8	80	26		.21 x .39 x .7
D1511-10	100	33		

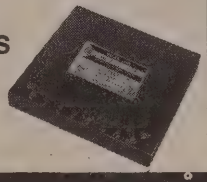
MINIATURE LUMPED CONSTANT

Hermetically sealed in a metal container. Delay tolerance ±5%. Temperature stability less than 50 PPM/°C, P.C. Mounting.

D647-110	50 Nsec	12 Nsec	50	.30 x 1.0 x 1.25
D647-211	100	12.5	50	.30 x 1.0 x 2.45
D647-312	250	21	50	.30 x 1.0 x 3.45
D647-323	500	42	150	.30 x 1.0 x 3.45
D647-334	750	63	500	.30 x 1.0 x 3.45
D647-115	1,000	250	50	.30 x 1.0 x 1.25
D647-236	1,450	180	500	.30 x 1.0 x 2.45
D647-327	2,900	240	150	.30 x 1.0 x 3.45
D647-338	4,350	360	500	.30 x 1.0 x 3.45

ATC TRANSPONDER AND BEACON CODING DELAY LINES

Standard 1.45 μsec tap spacings plus other special delay points are provided. Hermetically sealed steel cased, plastic encapsulated and P.C. mounted units are offered.



D1560	10.15 μsec	.33 μsec	400	.55 x 2.25 x 3.62
D1365	20.3	.5	180	.87 x 3.5 x 3.5
D1000	20.3	.5	330	.35 x 2 x 4
D120	25.0	.55	180	.75 x 5 x 4.37
D298A	25.3	.6	500	1.62 x 2.87 x 4.25
D637	20.3	.3	180	2.37 x 2.75 x 3.18
D1190	20.3	.4	400	.63 x 4 x 5
D1191	24.65	.5	500	.63 x 4 x 5
D1210	8.0	.5	500	5 x 1 x 4

VARIABLE DELAY LINES

DUAL-IN-LINE COMPATIBLE VARIABLE DELAY LINES

Sealed in plastic case. Temp. coeff. less than 50 PPM/°C. .020" P.C. mounting pins.

V1570-1	0 - 10 Nsec	2 Nsec	100	.25 x .75 x 1.5
V1570-2	0 - 20	4	100	.25 x .75 x 1.5
V1570-3	0 - 40	8	100	.25 x .75 x 1.5
V1570-4	0 - 80	16	100	.25 x .75 x 1.5
V1570-5	0 - 160	32	200	.25 x .75 x 1.5
V1570-6	0 - 320	64	200	.25 x .75 x 1.5

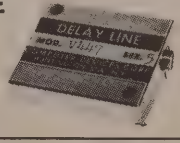
MIL VERSION

Hermetically sealed in a metal case.

V1768-1	0 - 10 Nsec	2 Nsec	100	.25 x .87 x 1.6
V1768-2	0 - 20	4	100	.25 x .87 x 1.6
V1768-3	0 - 40	8	100	.25 x .87 x 1.6

MINIATURE LUMPED VARIABLE Nanosecond Range

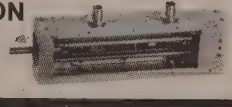
Hermetically sealed in a metal case. Lumped constant parameter. Temperature coefficient less than 50 PPM/°C. .030" P.C. mounting pins.



V447-1	0 - 55 Nsec	15 Nsec	150	.31 x 1 x 1.25
V447-2	0 - 100	30	50	.31 x 1 x 1.25
V447-3	0 - 150	25	150	.31 x 1 x 2.45
V447-4	0 - 250	30	50	.31 x 1 x 2.45
V447-5	0 - 300	30	150	.31 x 1 x 3.45
V447-6	0 - 500	60	50	.31 x 1 x 3.45

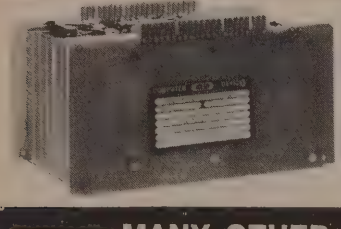
NOVEL INFINITE RESOLUTION

With input and output impedance of equal value. Voltage standing wave ratio less than ½ db to 45 MHz.



DV575-1	2 - 25 Nsec	70 MHz	200	1 x 1.25 x 5.37
DV575-2	2 - 50	70	100	1 x 1.25 x 5.37
DV575-3	2 - 50	70	200	1 x 1.25 x 5.37
DV575-4	2 - 50	70	93	1 x 1.25 x 5.37
DV575-5	2 - 25	70	50	1 x 1.25 x 5.37
DV575-6	2 - 50	70	93	1 x 1.25 x 5.37

DELAY LINE COMPUTER MEMORIES DELCOMS



THE DELAY LINE COMPUTER MEMORY (DELCOM) offers the **Lowest Price Per Bit** of any high speed memory device. Computer Devices Corp. offers convenient standard packages for all practical storage capacities from 10 bits to 20,000 bits in single delay line units as well as multi delay line units* with massive storage capacities. All Delcoms are compatible with DTL and T²L logic. Normal power requirements are +12 and −12 VDC and +5 VDC. However, Delcoms are tailored to your bit rate, delay, input-output logic and power requirements.

MANY OTHER MODELS AND SPECIALTY Delay Lines are available.
If exactly what you want is not listed, please call.

COMPUTER DEVICES CORP.
63 AUSTIN BOULEVARD COMMACK, N.Y. 11725
(516) 543-4220

military & commercial

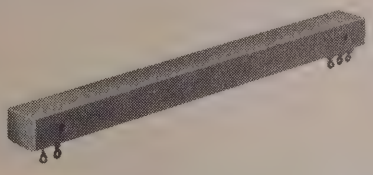
DELAY LINES

WITH OR WITHOUT CIRCUITRY

MAGNETOSTRICTIVE ★ LUMPED CONSTANT ★ ULTRASONIC ★ DISTRIBUTED CONSTANT ★ DISPERSIVE STRIP

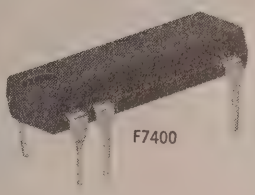
MAGNETOSTRICTIVE DELAY LINES — Fixed and variable delays to 10,000 microseconds. Fixed — FMS Series; Variable — VM Series.

FIXED MAGNETOSTRICTIVE DELAY LINE — Up to 10,000 bits of data for memory storage. Circuitry compatible with all microcircuit logic. Choice of data format: RZ, NRZ or Bipolar.



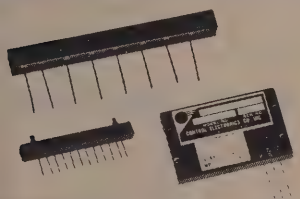
ULTRASONIC DELAY LINES — Replaces most quartz or glass lines. Offers superior performance, lower attenuation and smaller size at less cost. Frequencies to 30 MHz. Delays to 200 usec and greater.

SUBMINIATURE DELAY LINES

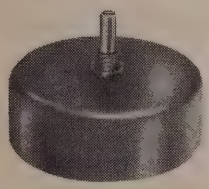


TO-5 and micrologic packaged delay lines from 0.01 to 0.64 and longer delays. Ideal for timing transistors and other circuit components.

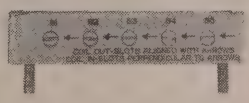
LUMPED CONSTANT DELAY LINES — Many shapes available including miniature types with pin connectors for PC Boards, connector fingers for plug-in units...multi-tapped units...terminal-ended units, etc. Delays from 0.05 usec to 500 usec for standard units. Delay to risetime ratios up to 100:1. Temperature stability to 50 ppm/C°.



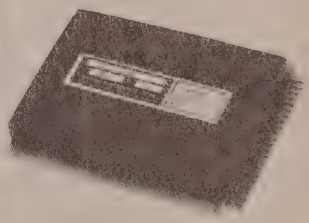
COMPACT FIXED DELAY LINES FOR PC BOARDS — Extremely high density packaging. Typical Unit: 25:1 delay-to-rise-time ratio in a volume of 2 cubic inches.



VARIABLE DELAY LINE Resolution of 1 part in 120. Delay up to 10 usec. 1″ x 3″.



UNIQUE BINARY CODED SECTIONAL DELAY LINE — Uses miniature transfer switches. Also available with terminals for remote switching.

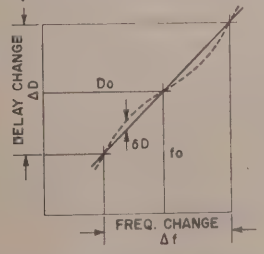


IFF MULTI-TAP DELAY LINES Standard IFF delay lines with taps every 1.45 usec. High density packaging available for airborne transponder use.

AUDIO, HIGH FREQUENCY & DISTRIBUTED CONSTANT DELAY LINES — With unusual circuits, extreme delays, high frequency application, rapid rise times, conforming waveform circuits and corrective circuits. Write for complete details.

AUDIO DELAY CABINET — Relay rack mounted cabinet houses 25 millisecond delay with taps at every ms. Units can be cascaded for longer delays.

DISPERSIVE STRIP DELAY LINES — Delay varies with frequency. A prime application is in Pulse Compression Radar Systems, eliminating large, expensive filter components. Compression ratios of 150:1, typical.



$\Delta D \cdot \Delta f$ = COMPRESSION RATIO OR DISPERSION FACTOR

$\frac{\Delta f}{fo}$ = BANDWIDTH %

fo = MIDBAND FREQUENCY

Do = MIDBAND DELAY

For all your Delay Line requirements, contact:

CONTROL ELECTRONICS COMPANY, INC.

153 Florida Street, Farmingdale, L.I., N.Y. 11735 · (516) 694-0125

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One more thing. When we promise twice weekly updates, we deliver. 52 weeks a year, consistently. Not monthly or every other month. We have a tradition of delivery on our promises, and we're certainly not going to stop now.

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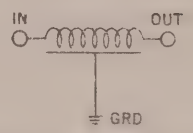
DATA DELAY DEVICES
SHORT FORM CATALOG

DUAL-IN-LINE DELAY LINES

PART NO.	Td (NS)	Ro (ohms)	H (INS.)	PART NO.	Td (NS)	Ro (ohms)	H (INS.)	PART NO.	Td (NS)	Ro (ohms)	H (INS.)	PART NO.	Td (NS)	Ro (ohms)	H (INS.)
1500-1	10	125	3/16	1500-7	15	240	1/8	1500-13	35	270	3/16	1500-19	30	300	1/8
1500-2	10	150	↓	1500-8	10	250	↓	1500-14	10	280	1/8	1500-20	40	300	↓
1500-3	15	200		1500-9	20	250		1500-15	20	280	↓	1500-21	50	300	
1500-4	15	220		1500-10	25	250		1500-16	30	280					
1500-5	25	220		1500-11	15	270	3/16	1500-17	10	300					
1500-6	10	240	1/8	1500-12	25	270	↓	1500-18	20	300	↓				
1501-1	10	100	1/8	1501-16	30	250	1/8	1501-31	10	350	1/8	1501-46	60	400	3/16
1501-2	20	100	↓	1501-17	40	250	↓	1501-32	20	350	↓	1501-47	70	400	↓
1501-3	30	100		1501-18	50	250		1501-33	30	350		1501-48	80	400	
1501-4	10	150		1501-19	10	300		1501-34	40	350	3/16	1501-49	90	400	
1501-5	20	150		1501-20	20	300		1501-35	50	350	↓	1501-50	100	400	
1501-6	30	150		1501-21	30	300		1501-36	60	350		1501-51	110	400	
1501-7	40	150		1501-22	40	300		1501-37	70	350		1501-52	20	500	
1501-8	10	200		1501-23	50	300	3/16	1501-38	80	350		1501-53	30	500	
1501-9	20	200		1501-24	60	300		1501-39	90	350		1501-54	40	500	
1501-10	30	200		1501-25	70	300		1501-40	100	350	↓	1501-55	50	500	
1501-11	40	200		1501-26	80	300		1501-41	10	400	1/8	1501-56	60	500	
1501-12	50	200		1501-27	90	300		1501-42	20	400	↓	1501-57	70	500	
1501-13	60	200		1501-28	100	300		1501-43	30	400		1501-58	80	500	
1501-14	10	250		1501-29	120	300		1501-44	40	400	3/16	1501-59	90	500	
1501-15	20	250	↓	1501-30	140	300	↓	1501-45	50	400	↓				↓

SERIES 1500 & 1501

STOCKED



SPECIFICATIONS

- Taps available
- Td/Tr $\geq$ 3/1 and 2/1 series 1501 & 1500 respectively
- Withstanding voltage – 100 vdc for series 1500; 50 vdc for series 1501
- Impedance – 100 to 500 ohms
- Longer cases available for longer delays
- Cases available without studs
- #22 gauge leads, hot-tin-dip

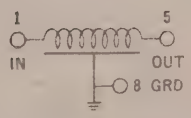
PART NO.	Td (NS)	Ro (ohm)	PART No.	Td (NS)	Ro (ohms)	PART NO.	Td (NS)	Ro (ohms)	PART NO.	Td (NS)	Ro (ohms)
1502-1	5	100	1502-15	20	200	1502-29	100	250	1502-43	40	350
1502-2	10	100	1502-16	30	200	1502-30	5	300	1502-44	50	350
1502-3	15	100	1502-17	40	200	1502-31	10	300	1502-45	80	350
1502-4	20	100	1502-18	80	200	1502-32	15	300	1502-46	100	350
1502-5	40	100	1502-19	80	200	1502-33	20	300	1502-47	10	400
1502-6	5	150	1502-20	5	250	1502-34	20	300	1502-48	20	400
1502-7	10	150	1502-21	10	250	1502-35	40	300	1502-49	30	400
1502-8	15	150	1502-22	15	250	1502-36	50	300	1502-50	40	400
1502-9	20	150	1502-23	20	250	1502-37	60	300	1502-51	10	500
1502-10	30	150	1502-24	30	250	1502-38	80	300	1502-52	20	500
1502-11	50	150	1502-25	40	250	1502-39	100	300	1502-53	30	500
1502-12	5	200	1502-26	50	250	1502-40	10	350			
1502-13	10	200	1502-27	60	250	1502-41	20	350			
1502-14	15	200	1502-28	80	250	1502-42	30	350			

SERIES 1502

STOCKED

SPECIFICATIONS

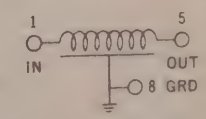
- Standard 14 lead I.C. case
- Case Height – 3/16 in.
- 50 vdc withstanding voltage
- Td/tr > 3/1
- Impedance 100 to 500 ohms
- Gold-plated leads
- Taps available



PART NO.	TOTAL DELAY (NS)	Imp. (Ω)	Rdc (Ω)	PART NO.	TOTAL DELAY (NS)	Imp. (Ω)	Rdc. (Ω)	PART NO.	TOTAL DELAY (NS)	Imp. (Ω)	Rdc (Ω)	PART NO.	TOTAL DELAY (NS)	Imp. (Ω)	Rdc (Ω)
1504-20A	20	50	1.0	1504-20C	20	200	2.0	1504-300D	300	8.0	250	1504-240F	240	400	12
1504-25A	25	50	1.0	1504-40C	40	200	2.0	1504-375D	375	250	8.4	1504-320F	320	400	13
1504-30A	30	50	1.2	1504-60C	60	200	2.5	1504-500D	500	250	12.5	1504-360F	360	400	15
1504-40A	40	50	1.5	1504-80C	80	200	3.0	1504-30E	30	300	2.0	1504-480F	480	400	18
1504-45A	45	50	1.5	1504-100C	100	200	4.0	1504-60E	60	300	2.0	1504-600F	600	400	20
1504-60A	60	50	1.5	1504-120C	120	200	4.5	1504-90E	90	300	3.0	1504-800F	800	400	23
1504-75A	75	50	1.8	1504-160C	160	200	5.0	1504-120E	120	300	5.0	1504-50G	50	500	3.0
1504-100A	100	50	2.0	1504-180C	180	200	5.5	1504-150E	150	300	6.0	1504-100G	100	500	6.0
1504-10B	10	100	1.0	1504-240C	240	200	6.0	1504-180E	180	300	7.0	1504-150G	150	500	8.0
1504-20B	20	100	1.5	1504-300C	300	200	7.0	1504-240E	240	300	7.5	1504-200G	200	500	11
1504-30B	30	100	1.5	1504-400C	400	200	8.0	1504-270E	270	300	8.0	1504-250G	250	500	13
1504-40B	40	100	1.8	1504-25D	25	250	2.0	1504-360E	360	300	11.0	1504-300G	300	500	16
1504-50B	50	100	2.0	1504-50D	50	250	2.5	1504-450E	450	300	14.0	1504-400G	400	500	18
1504-60B	60	100	2.0	1504-75D	75	250	3.5	1504-600E	600	300	17.0	1504-450G	450	500	20
1504-80B	80	100	2.2	1504-100D	100	250	4.5	1504-40F	40	400	2.0	1504-600G	600	500	22
1504-90B	90	100	2.4	1504-125D	125	250	5.0	1504-80F	80	400	5.0	1504-750G	750	500	24
1504-120B	120	100	2.8	1504-150D	150	250	5.5	1504-120F	120	400	6.0	1504-1000G	1000	500	30
1504-150B	150	100	3.0	1504-200D	200	250	6.3	1504-160F	160	400	7.0				
1504-200B	200	100	4.0	1504-225D	225	250	7.0	1504-200F	200	400	8.0				

SERIES 1504

STOCKED

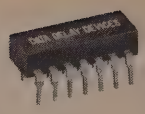


SPECIFICATIONS

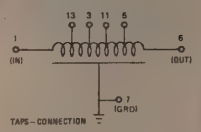
- Delay – (see table)
- Delay accuracy – ±5% (other tolerances on request)
- Delay Taps – Available on request
- Impedances (See table, others on request)
- Impedance Accuracy – ±10% (other tolerances on request)
- Rise Time – 20% of total time delay
- Operating voltage – 50 Vdc. Min.
- Temperature Coefficient – 100 PPM/°C
- Environment – Meets or exceeds MIL-D-23859C.

DIP-TAPPED DELAY LINES

STOCKED



SERIES 1517
5 TAPS



PART NO.	TOTAL DELAY (NS)	Imp. (Ω)	Rdc (Ω)	PART NO.	TOTAL DELAY (NS)	Imp. (Ω)	Rdc (Ω)	PART NO.	TOTAL DELAY (NS)	Imp. (Ω)	Rdc. (Ω)	PART NO.	TOTAL DELAY (NS)	Imp. (Ω)	Rdc (Ω)
1517-10A	10	50	0.6	1517-20C	20	200	1.0	1517-15E	15	300	1.0	1517-160F	160	400	6.5
1517-15A	15	50	0.6	1517-30C	30	200	1.2	1517-30E	30	300	1.0	1517-180F	180	400	7.5
1517-20A	20	50	0.7	1517-40C	40	200	1.5	1517-50E	50	300	1.5	1517-240F	240	400	9.0
1517-30A	30	50	0.7	1517-50C	50	200	2.0	1517-60E	60	300	2.5	1517-300F	300	400	10.0
1517-40A	40	50	0.9	1517-60C	60	200	2.2	1517-75E	75	300	3.0	1517-25G	25	500	1.5
1517-5B	5	100	0.5	1517-80C	80	200	2.5	1517-90E	90	300	3.5	1517-50G	50	500	3.0
1517-10B	10	100	0.7	1517-90C	90	200	2.7	1517-120E	120	300	3.7	1517-75G	75	500	4.0
1517-15B	15	100	0.7	1517-120C	120	200	3.0	1517-130E	130	300	4.0	1517-100G	100	500	5.5
1517-20B	20	100	0.9	1517-150C	150	200	3.5	1517-180E	180	300	5.5	1517-125G	125	500	6.5
1517-25B	25	100	1.0	1517-25D	25	250	1.2	1517-220E	220	300	7.0	1517-150G	150	500	8.0
1517-30B	30	100	1.0	1517-37D	37	250	1.7	1517-20F	20	400	1.0	1517-200G	200	500	9.0
1517-40B	40	100	1.1	1517-50D	50	250	2.2	1517-40F	40	400	2.5	1517-225G	225	500	10.0
1517-50B	50	100	1.2	1517-60D	60	250	2.5	1517-60F	60	400	3.0	1517-300G	300	500	11.0
1517-60B	60	100	1.4	1517-75D	75	250	2.7	1517-80F	80	400	3.5				
1517-75B	75	100	1.5	1517-100D	100	250	3.1	1517-100F	100	400	4.0				
1517-10C	10	200	1.0	1517-150D	150	250	4.0	1517-120F	120	400	6.0				

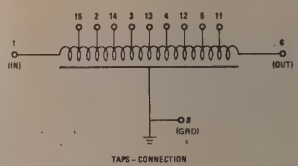
SPECIFICATIONS

- Delay accuracy — ±5% (others on request).
- No. taps — 5 Equally spaced taps.
- Taps accuracy — ±5% of tap delay.
- Impedance tolerance — ±10% (others on request).
- Rise-Time — 20% of time delay.
- Withstanding voltage — 50 Vdc. Min.
- Temperature coefficient — 100 PPM/°C.
- Environment — Meets or exceeds MIL-D-23859C.
- Overall case height — 0.280 inches.

DIP-TAPPED DELAY LINES

STOCKED

SERIES 1519
10 TAPS



PART NO.	TOTAL DELAY (NS)	Imp. (Ω)	Rdc (Ω)	PART NO.	TOTAL DELAY (NS)	Imp. (Ω)	Rdc. (Ω)	PART NO.	TOTAL DELAY (NS)	Imp. (Ω)	Rdc (Ω)	PART NO.	TOTAL DELAY (NS)	Imp. (Ω)	Rdc (Ω)
1519-20A	20	50	1.0	1519-150B	150	100	3.0	1519-200D	200	250	6.3	1519-160F	160	400	7.0
1519-25A	25	50	1.0	1519-200B	200	100	4.0	1519-225D	225	250	7.0	1519-200F	200	400	8.0
1519-30A	30	50	1.2	1519-20C	20	200	2.0	1519-300D	300	250	8.0	1519-240F	240	400	12
1519-40A	40	50	1.5	1519-40C	40	200	2.0	1519-375D	375	250	8.4	1519-320F	320	400	13
1519-45A	45	50	1.5	1519-60C	60	200	2.5	1519-500D	500	250	12.5	1519-360F	360	400	15
1519-50A	50	50	1.5	1519-80C	80	200	3.0	1519-30E	30	300	2.0	1519-480F	480	400	18
1519-50A	60	50	1.5	1519-100C	100	200	4.0	1519-60E	60	300	2.0	1519-600F	600	400	20
1519-75A	75	50	1.8	1519-120C	120	200	4.5	1519-90E	90	300	3.0	1519-800F	800	400	23
1519-100A	100	50	2.0	1519-160C	160	200	5.0	1519-120E	120	300	5.0	1519-50G	50	500	3.0
1519-10B	10	100	1.0	1519-180C	180	200	5.5	1519-150E	150	300	6.0	1519-100G	100	500	6.0
1519-20B	20	100	1.5	1519-240C	240	200	6.0	1519-180E	180	300	7.0	1519-150G	150	500	8.0
1519-30B	30	100	1.5	1519-300C	300	200	7.0	1519-240E	240	300	7.5	1519-200G	200	500	11
1519-40B	40	100	1.8	1519-400C	400	200	8.0	1519-270E	270	300	8.0	1519-250G	250	500	13
1519-50B	50	100	2.0	1519-25D	25	250	2.0	1519-360E	360	300	11.0	1519-300G	300	500	16
1519-60B	60	100	2.0	1519-50D	50	250	2.5	1519-450E	450	300	14.0	1519-400G	400	500	18
1519-80B	80	100	2.2	1519-75D	75	250	3.5	1519-600E	600	300	17.0	1519-450G	450	500	20
1519-90B	90	100	2.4	1519-100D	100	250	4.5	1519-40F	40	400	2.0	1519-600G	600	500	22
1519-100B	100	100	2.6	1519-125D	125	250	5.0	1519-80F	80	400	5.0	1519-750G	750	500	24
1519-120B	120	100	2.8	1519-150D	150	250	5.5	1519-120F	120	400	6.0	1519-1000G	1000	500	30

SPECIFICATIONS

- Delay accuracy — ±5% (others on request).
- No. taps — 10 Equally spaced taps.
- Taps accuracy — ±5% of tap delay.
- Impedance tolerance — ±10% (others on request).
- Rise-Time — 20% of time delay.
- Withstanding voltage — 50 Vdc. Min.
- Temperature coefficient — 100 PPM/°C.
- Environment — Meets or exceeds MIL-D-23859C.
- Overall case height — 0.280 inches.

DUAL-IN-LINE DELAY LINES

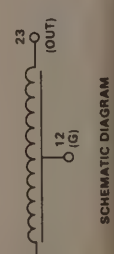
STOCKED

SERIES 2211

SPECIFICATIONS

- Standard 24 pins DIP.
- TTL and DTL compatible.
- Td/Tr = 10/1
- Delay tolerance: +5% or 1NS whichever is greater.
- Temperature coefficient: 100PPM/°C.
- Temperature range: −55°C to +125°C.
- Dielectric breakdown: 50 Vdc.
- Meets or exceeds MIL-D-23859.
- Epoxy encapsulated.

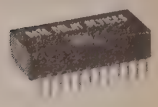
PART NO.	IMP. (Ω)	TOTAL DELAY (NS)	RISE-TIME (NS)	Rdc (Ω)	PART NO.	IMP. (Ω)	TOTAL DELAY (NS)	RISE-TIME (NS)	Rdc (Ω)	PART NO.	IMP. (Ω)	TOTAL DELAY (NS)	RISE-TIME (NS)	Rdc (Ω)
2211-50A	50	50	5	2.0	2211-120C	200	120	12	5.0	2211-600D	250	600	60	16.0
2211-60A	50	60	6	2.4	2211-200C	200	200	20	8.0	2211-750D	250	750	75	18.0
2211-80A	50	80	8	3.0	2211-300C	200	300	30	10.0	2211-200G	500	200	20	12.0
2211-100A	50	100	10	3.2	2211-400C	200	400	40	12.0	2211-300G	500	300	30	16.0
2211-150A	50	150	15	3.6	2211-500C	200	500	50	13.0	2211-400G	500	400	40	22.0
2211-50B	100	50	5	3.0	2211-600C	200	600	60	14.0	2211-500G	500	500	50	26.0
2211-60B	100	60	6	3.0	2211-50D	250	50	5	4.0	2211-600G	500	600	60	32.0
2211-80B	100	80	8	3.6	2211-100D	250	100	10	5.0	2211-800G	500	800	80	36.0
2211-100B	100	100	10	4.0	2211-150D	250	150	15	7.0	2211-1000G	500	1000	100	40.0
2211-150B	100	150	15	4.2	2211-200D	250	200	20	9.0	2211-1200G	500	1200	120	44.0
2211-200B	100	200	20	4.6	2211-250D	250	250	25	10.0	2211-1500G	500	1500	150	48.0
2211-300B	100	300	30	6.0	2211-300D	250	300	30	11.0	2211-2000G	500	2000	200	54.0
2211-40C	200	40	4	4.0	2211-400D	250	400	40	13.0					
2211-80C	200	80	8	4.0	2211-500D	250	500	50	14.0					



SCHEMATIC DIAGRAM

DUAL-IN-LINE DELAY LINES

SERIES 2214

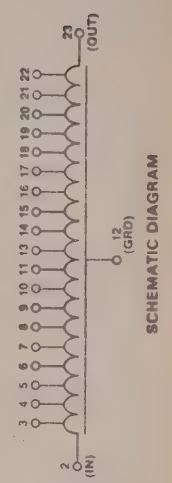


SPECIFICATIONS

- 20 Equally spaced taps.
- TTL and DTL compatible
- Td/Tr = 10/1
- Delay tolerance: ±5% or INS whichever is greater.
- Tap tolerance: ±5% or INS whichever is greater.
- Temperature coefficient: 100 PPM/°C.
- Temperature range: −55°C to +125°C.
- Dielectric breakdown: 50 Vdc.
- Meets or exceeds MIL-D-23859.
- Epoxy encapsulated.

PART NO.	IMP. (Ω)	TOTAL DELAY (NS)	TAP INCREMENT (NS)	RISE TIME (NS)	Rdc (Ω)	PART NO.	IMP. (Ω)	TOTAL DELAY (NS)	TAP INCREMENT (NS)	RISE TIME (NS)	Rdc (Ω)
2214-50A	50	50	2.5	5	2.0	2214-800C	200	800	40	80	16.0
2214-60A	50	60	3.0	6	2.4	2214-50D	250	50	2.5	5	4.0
2214-80A	50	80	4.0	8	3.0	2214-100D	250	100	5	10	5.0
2214-100A	50	100	5.0	10	3.2	2214-150D	250	150	7.5	15	7.0
2214-150A	50	150	7.5	15	3.6	2214-200D	250	200	10	20	9.0
2214-200A	50	200	10.0	20	4.0	2214-250D	250	250	12.5	25	10.0
2214-50B	100	50	2.5	5	3.0	2214-300D	250	300	15	30	11.0
2214-60B	100	60	3.0	6	3.0	2214-400D	250	400	20	40	13.0
2214-80B	100	80	4.0	8	3.6	2214-500D	250	500	25	50	14.0
2214-100B	100	100	5	10	4.0	2214-600D	250	600	30	60	16.0
2214-150B	100	150	7.5	15	4.2	2214-800D	250	800	40	80	18.0
2214-200B	100	200	10	20	4.6	2214-1000D	250	1000	50	100	25.0
2214-300B	100	300	15	30	6.0	2214-200G	500	200	10	20	12.0
2214-400B	100	400	20	40	8.0	2214-300G	500	300	15	30	16.0
2214-40C	200	40	2	4	4.0	2214-400G	500	400	20	40	22.0
2214-80C	200	80	4	8	4.0	2214-500G	500	500	25	50	26.0
2214-120C	200	120	6	12	5.0	2214-600G	500	600	30	60	32.0
2214-200C	200	200	10	20	8.0	2214-800G	500	800	40	80	36.0
2214-300C	200	300	15	30	10.0	2214-1000G	500	1000	50	100	40.0
2214-400C	200	400	20	40	12.0	2214-1200G	500	1200	60	120	44.0
2214-500C	200	500	25	50	13.0	2214-1500G	500	1500	75	150	48.0
2214-600C	200	600	30	60	14.0	2214-2000G	500	2000	100	200	54.0

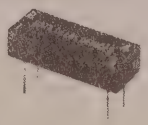
20 TAPS



SCHEMATIC DIAGRAM

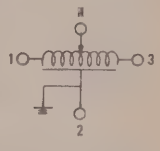
TRIM-DIP DELAY LINES

STOCKED



SERIES 1503

PART NO.	Td (NS)	Imp. (Ω)	Rdc (Ω)	Tr (NS)	PART NO.	Td (NS)	Imp. (Ω)	Rdc (Ω)	Tr (NS)	PART NO.	Td (NS)	Imp. (Ω)	Rdc (Ω)	Tr (NS)
1503-15A	15	50	.7	3	1503-30B	30	100	2.	6	1503-60C	60	200	8	12
1503-25A	25	50	.8	5	1503-50B	50	100	3.	10	1503-100C	100	200	14	20
1503-30A	30	50	1.	6	1503-60B	60	100	4.	12	1503-20D	20	250	5	4
1503-40A	40	50	1.5	8	1503-80B	80	100	5.	16	1503-20E	20	300	5	4
1503-50A	50	50	1.7	10	1503-100B	100	100	6	20	1503-30F	30	350	8	6
1503-60A	60	50	2.	12	1503-120B	120	100	8	24	1503-25G	25	400	8	5
1503-80A	80	50	3.	16	1503-160B	160	100	10	32	1503-40H	40	500	12	8
1503-100A	100	50	3.5	20	1503-200B	200	100	14	40					
1503-15B	15	100	1.	3	1503-30C	30	200	4	6					



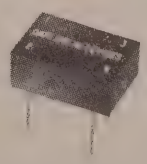
SPECIFICATIONS

- Continuously variable delay
- Multi-turn adjusting screw (40 turns approx.)
- Impedance (see table)
- Withstanding voltage — 50 Vdc
- Temperature Coefficient — 100 PPM/°C
- #20 gauge leads
- Resolution — .12NS approx.

MINI TRIM DELAY LINES

SERIES 1509

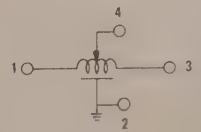
STOCKED



PART NO.	Td (NS)	IMPEDANCE (Ω)	TR (NS)	Rdc (Ω)
1509-05B	5	100	3	.4
1509-20C	20	200	8	1.0
1509-30F	30	400	10	7.0
1509-40H	40	500	15	13.0

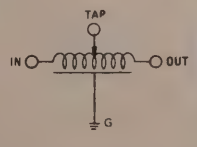
SPECIFICATIONS

- Low cost unit
- Fits standard DIP sockets
- Continuously variable
- 20 Turns approx.
- Resolution — .15 NS
- Withstanding voltage — 100 Vdc
- Temperature coefficient — 200 PPM/°C
- #22 gauge leads



TRIM-DIP DELAY LINES

SERIES 1503J



lectrical specifications: Same as 1503,
ize: 1.75 x .565 x .275

PART NO.	Td (NS)	Imp. (Ω)	Tr (NS)	Rdc (Ω)	PART NO.	Td (NS)	Imp. (Ω)	Tr (NS)	Rdc (Ω)
1503J-150A	150	50	22	5	1503J-30E	30	300	5	7
1503J-250B	250	100	38	21	1503J-40F	40	350	6	10
1503J-130C	130	200	20	21	1503J-35G	35	400	6	10
1503J-30D	30	250	5	7	1503J-60H	60	500	9	18

MINI-TRIM DELAY LINES

SERIES 1509J

Electrical specifications: Same as 1509,
Size: 1.75 x .565 x .275

STOCKED

PART NO.	Td (NS)	Imp. (Ω)	Rdc (Ω)	Tr (NS)
1509J-10B	10	100	.8	4
1509J-40C	40	200	1.5	9
1509J-40E	40	300	6.0	9
1509J-75F	75	400	12	16
1509J-80H	80	500	20	16

COMPUTER DELAY LINES

SERIES 1000

PART NO.	DELAY ± 2%	RISE TIME	RES. D.C. (Ω)	IMP. (Ω) 10%	LENGTH MAX. (IN)	PART NO.	DELAY ± 2%	RISE TIME	RES. D.C. (Ω)	IMP. (Ω) 10%	LENGTH MAX. (IN)
1000-25A	25ns	20ns	3.5	500	2	1000-400A	400ns	50ns	75	900	3
1000-50A	50ns	22ns	6	500	2	1000-450A	450ns	56ns	87	900	3
1000-100A	100ns	24ns	14	500	2	1000-500A	500ns	60ns	92	900	3
1000-125A	125ns	25ns	13.5	500	2	1000-600A	600ns	66ns	110	900	5.25
1000-200A	200ns	35ns	36	900	2	1000-700A	700ns	74ns	130	900	5.25
1000-225A	225ns	37ns	42	900	2	1000-800A	800ns	85ns	148	900	5.25
1000-250A	250ns	40ns	48	900	2	1000-900A	900ns	98ns	165	900	5.25
1000-300A	300ns	45ns	55	900	2						

SPECIFICATIONS

TEMPERATURE RANGE: -55°C to +125°C. DISTORTION: 5% Max. DC WORKING VOLTAGE:200 VDC. CASE EPOXY. SIZE L x .45 x .33 max.

CONTINUOUSLY VARIABLE DELAY LINES

SERIES 500

PART NO.	IMP. (Ω)	DELAY (μs)	TR (μs)	ATT. (db)	RES. (ns)	PART NO.	IMP. (Ω)	DELAY (μs)	TR (μs)	ATT. (db)	RES. (ns)
500-A	75	1.25	.12	1.5	2.5	500-F	250	0.50	.05	.5	1.0
500-A1	75	1.50	.15	1.5	3.0	500-F1	250	1.00	.10	2	1.2
500-B	100	1.00	.10	1.0	2.0	500-G	300	0.60	.06	1.2	.6
500-B1	100	1.50	.15	1.5	3.0	500-G1	300	1.25	.12	3	1.0
500-B2	100	2.00	.20	4	2	500-J	450	0.90	.09	2	.7
500-C	120	0.90	.09	1.0	2	501-A	220	0.15	.025	.25	.4
500-C1	120	1.75	.17	3	1.8	501-B	370	0.25	.040	.50	.5
500-D	150	0.62	.060	.9	1.3	501-C	400	0.35	.045	.50	.45
500-D1	150	1.50	.15	1.5	3	501-D	440	0.60	.060	.5	.6
500-D2	150	2.50	.25	9	2.0	501-E	540	0.70	.080	.6	.7
500-D3	150	2.75	.27	9	2.2	501-F	630	1.10	.10	1	.7
500-E	200	2.00	.20	6	1.6						

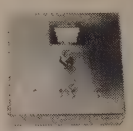
SPECIFICATIONS

DELAY VARIATION: 0 to 10 shaft rev. ACCURACY: ± 3% or better. BANDWIDTH: f(3db)=.35/TR. IMPEDANCE TOLERANCE: ± 10% or better. OPERATING TEMPERATURE: -60°C to +125°C. TEMPERATURE COEFFICIENT: 50 PPM/°C for type 500. 170 PPM/°C for type 501. CASE: plastic. DIMENSION: 6.5 x 1.56 x 1.12 (16.5 x 3.96 x 2.85 cm). SHAFT: .25 dia. (.635 cm). MOUNTING: 2 - 6 - 32 centered on 1.56 side, spaced 6.25.

CONTINUOUSLY VARIABLE DELAY LINES

SERIES 600

PART NO.	Ro (ohms)	Td (US)	Tr (US)	RES (NS)	ATT (db)	PART NO.	Ro (ohms)	Td (US)	Tr (US)	RES (NS)	ATT (db)
601-1	50	3.50	.25	1.8	1.5	601-11	133	2.0	.15	1.6	1.0
601-2	55	1.67	.15	2.0	.8	601-12	150	.60	.06	.8	.5
601-3	66	4.00	.40	3.2	1.5	601-13	150	1.21	.09	1.8	.7
601-4	75	2.44	.18	1.8	1.2	601-14	160	2.1	.19	1.5	1.2
601-5	75	4.30	.40	3.0	1.7	601-15	186	1.41	.14	1.1	1.2
601-6	82	1.20	.10	1.5	.5	601-16	200	.87	.06	1.8	.5
601-7	95	2.82	.26	2.2	1.4	601-17	220	1.52	.13	1.3	1.1
601-8	100	1.74	.12	1.8	1.0	601-18	260	1.01	.10	1.0	1.1
601-9	110	.83	.08	1.1	.5	601-19	305	1.09	.1	.8	1.0
601-10	110	3.00	.30	2.1	1.6						



PART NO.	Ro (ohms)	Td (US)	Tr (US)	RES (NS)	ATT (db)
602-1	436	.25	.025	.2	.15
602-2	460	.31	.030	.28	.15
602-3	520	.49	.038	.33	.3
602-4	636	.59	.057	.40	.5
602-5	720	.74	.072	.55	1.0

FEATURES

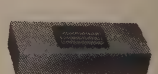
- Continuously variable
- High resolution, 0.15 Ns
- Long delay, 4.3 US
- One turn delay adjustment
- Low attenuation
- High fidelity of pulse reproduction

CONTINUOUSLY VARIABLE DELAY LINES

SERIES 636

SPECIFICATIONS

- Continuously variable delay adjustment.
- Multiple shaft revolution (60 Min.).
- Delay tolerance – ±5%
- Impedance tolerance – ±10%
- Operating temperature – –40°C to +85°C.
- Hermetically sealed unit.
- "O" ring provided at the shaft's end.
- Meets or exceeds MIL-D-23859C.
- Miniature size.
- Maximum delay – 2.5 US.



PART NO.	DELAY (NS)	RISE-TIME (NS)	IMP. (Ω)	RES. (NS)	ATT. (db)	TC PPM/°C	DIELECTRIC WITHSTANDING VOLTAGE (DC)	PART NO.	DELAY (NS)	RISE-TIME (NS)	IMP. (Ω)	RES. (NS)	ATT. (db)	TC PPM/°C	DIELECTRIC WITHSTANDING VOLTAGE (DC)
636-100A	100	10	50	.15	2.0	50	100	636-1800B	1,800	360	100	2.8	2.8	100	40
636-200A	200	20	50	.25	2.2	50	100	636-2000B	2,000	400	100	3	3.0	100	40
636-300A	300	30	50	.3	2.4	50	100	636-2200B	2,200	440	100	3.8	3.5	100	40
636-400A	400	40	50	.4	2.7	50	100	636-2400B	2,400	480	100	4.2	3.6	100	40
636-500A	500	50	50	.45	3.0	50	100	636-2500B	2,500	500	100	5.0	4.0	100	40
636-600A	600	60	50	.5	4.5	50	100	636-100C	100	10	200	.15	.8	50	100
636-800A	800	160	50	.6	1.0	100	40	636-200C	200	20	200	.25	1.0	50	100
636-1000A	1,000	200	50	.7	1.2	100	40	636-400C	400	40	200	.4	1.5	50	100
636-1200A	1,200	240	50	.8	1.5	100	40	636-500C	500	50	200	.45	2.0	50	100
636-100B	100	10	100	.15	1.6	50	100	636-700C	700	70	200	.6	2.2	50	100
636-200B	200	20	100	.25	1.7	50	100	636-800C	800	160	200	1.2	1.6	100	40
636-300B	300	30	100	.3	1.8	50	100	636-1000C	1,000	200	200	1.3	2.0	100	40
636-400B	400	40	100	.4	2.0	50	100	636-1200C	1,200	240	200	1.8	2.2	100	40
636-500B	500	50	100	.45	2.4	50	100	636-1400C	1,400	280	200	2.0	2.4	100	40
636-600B	600	60	100	.5	2.7	50	100	636-1500C	1,500	300	200	2.5	2.6	100	40
636-700B	700	70	100	0.6	3.0	50	100	636-1600C	1,600	320	200	3.0	3.0	100	40
636-800B	800	80	100	.8	3.2	50	100	636-1800C	1,800	360	200	3.2	3.5	100	40
636-900B	900	90	100	.9	3.6	50	100	636-200E	200	40	500	1.0	.6	100	40
636-1000B	1,000	100	100	1.0	4.0	50	100	636-400E	400	80	500	1.3	1.0	100	40
636-1200B	1,200	120	100	1.2	4.5	50	100	636-500E	500	100	500	1.8	1.2	100	40
636-1400B	1,400	280	100	1.7	2.2	100	40	636-600E	600	120	500	2.5	1.3	100	40
636-1500B	1,500	300	100	1.8	2.4	100	40	636-700E	700	140	500	3.0	1.7	100	40
636-1600B	1,600	320	100	2.0	2.6	100	40								

HIGH DENSITY DELAY LINES

SPECIFICATIONS

TIME DELAY: 0-35 μs DELAY ACCURACY: ± 3%. RISE TIME: 3% of time delay. IMPEDANCE up to 4000 ohms. PHASE RESPONSE: 1% up to 3db. FREQUENCY RESPONSE: up to 10 MC. ATTENUATION: Less than 0.1 db/μs TEMPERATURE COEFFICIENT: 1000 PPM/°C.

100A — DELAY / RISE-TIME = 30/1

PART NO.	DELAY (μs)	IMP (Ω)	PART NO.	DELAY (μs)	IMP (Ω)	PART NO.	DELAY (μs)	IMP (Ω)
100A-525A	5.25	075	100A-700E	7.00	400	100A-700G	7.00	600
100A-350B	3.50	100	100A-1050E	10.50	400	100A-1400G	14.00	600
100A-700B	7.00	100	100A-1400E	14.00	400	100A-2100G	21.00	600
100A-350C	3.50	150	100A-2100E	21.00	400	100A-2800G	28.00	600
100A-700C	7.90	150	100A-2800E	28.00	400	100A-3500G	35.00	600
100A-1050C	10.50	150	100A-700F	7.00	500	100A-700H	7.00	1000
100A-350D	3.50	200	100A-1050F	10.50	500	100A-1050H	10.50	1000
100A-700D	7.00	200	100A-1400F	14.00	500	100A-1400H	14.00	1000
100A-1050D	10.50	200	100A-2100F	21.00	500	100A-2100H	21.00	1000
100A-1400D	14.00	200	100A-2800F	28.00	500	100A-2800H	28.00	1000
			100A-3500F	35.00	500			

100B — DELAY / RISE-TIME = 20/1

PART NO.	DELAY (μs)	IMP (Ω)	PART NO.	DELAY (μs)	IMP (Ω)	PART NO.	DELAY (μs)	IMP (Ω)
100B-300A	3.00	075	100B-400E	4.00	400	100B-2000F	20.00	500
100B-200B	2.00	100	100B-600E	6.00	400	100B-200G	2.00	600
100B-400B	4.00	100	100B-800E	8.00	400	100B-400G	4.00	600
100B-200C	2.00	150	100B-1200E	12.00	400	100B-800G	8.00	600
100B-400C	4.00	150	100B-1600E	16.00	400	100B-1200G	12.00	600
100B-600C	6.00	150	100B-200F	2.00	500	100B-1600G	16.00	600
100B-200D	2.00	200	100B-400F	4.00	500	100B-2000G	20.00	600
100B-400D	4.00	200	100B-600F	6.00	500	100B-600H	6.00	1000
100B-600D	6.00	200	100B-800F	8.00	500	100B-800H	8.00	1000
100B-800D	8.00	200	100B-1200F	12.00	500	100B-1200H	12.00	1000
100B-200E	2.00	400	100B-1600F	16.00	500	100B-1600H	16.00	1000

SERIES 100

100C — DELAY / RISE-TIME = 10/1

PART NO.	BELAY (μs)	IMP (Ω)	PART NO.	DELAY (μs)	IMP (Ω)	PART NO.	DELAY (μs)	IMP (Ω)
100C-150A	1.50	075	100C 100F	1.00	500	100C 400H	4.00	1000
100C-100B	1.00	100	100C-200F	2.00	500	100C-600H	6.00	1000
100C-200B	2.00	100	100C-300F	3.00	500	100C-800H	8.00	1000
100C-100C	1.00	150	100C-400F	4.00	500	100C-030J	0.30	1500
100C-200C	2.00	150	100C-600F	6.00	500	100C-060J	0.60	1500
100C-300C	3.00	150	100C-800F	8.00	500	100C-100J	1.00	1500
100C-050D	0.50	200	100C-1000F	10.00	500	100C-200J	2.00	1500
100C-100D	1.00	200	100C-050G	0.50	600	100C-300J	3.00	1500
100C-200D	2.00	200	100C-100G	1.00	600	100C-400J	4.00	1500
100C-300D	3.00	200	100C-200G	2.00	600	100C-040K	0.40	2000
100C-400D	4.00	200	100C-400G	4.00	600	100C-080K	0.80	2000
100C-050E	0.50	400	100C-600G	6.00	600	100C-100K	1.00	2000
100C-100E	1.00	400	100C-800G	8.00	600	100C-200K	2.00	2000
100C-200E	2.00	400	100C-1000G	10.00	600	100C-300K	3.00	2000
100C-300E	3.00	400	100C-020H	0.20	1000	100C-200M	2.00	3000
100C-400E	4.00	400	100C-040H	0.40	1000	100C-200P	2.00	4000
100C-600E	6.00	400	100C-080H	0.80	1000			
100C-800E	8.00	400	100C-100H	1.00	1000			
100C-020F	0.20	500	100C-200H	2.00	1000			
100C-050F	0.50	500	100C-300H	3.00	1000			

100D — DELAY / RISE-TIME = 7/1

PART NO.	DELAY (μs)	IMP (Ω)	PART NO.	DELAY (μs)	IMP (Ω)	PART NO.	DELAY (μs)	IMP (Ω)
100D-075A	0.75	075	100D-050F	0.50	500	100D-200H	2.00	1000
100D-050B	0.50	100	100D-100F	1.00	500	100D-300H	3.00	1000
100D-100B	1.00	100	100D-150F	1.50	500	100D-400H	4.00	1000
100D-050C	0.50	150	100D-200F	2.00	500	100D-015J	0.15	1500
100D-100C	1.00	150	100D-300F	3.00	500	100D-030J	0.30	1500
100D-150C	1.50	150	100D-400F	4.00	500	100D-050J	0.50	1500
100D-025D	0.25	200	100D-500F	5.00	500	100D-100J	1.00	1500
100D-050D	0.50	200	100D-025G	0.25	600	100D-150J	1.50	1500
100D-100D	1.00	200	100D-050G	0.50	600	100D-200J	2.00	1500
100D-150D	1 50	200	100D-100G	1.00	600	100D-020K	0.20	2000
100D-200D	2.00	200	100D-200G	2.00	600	100D 040K	0.40	2000
100D-025E	0.25	400	100D-300G	3.00	600	100D-050K	0.50	2000
100D-050E	0.50	400	100D-400G	4.00	600	100D-100K	1.00	2000
100D-100E	1.00	400	100D-500G	5.00	600	100D-150K	1.50	2000
100D-150E	1.50	400	100D-010H	0 10	1000	100D-100M	1.00	3000
100D-200E	2.00	400	100D-020H	0.20	1000	100D 100P	1.00	4000
100D-300E	3.00	400	100D-040H	0.40	1000			
100D-400E	4.00	400	100D-050H	0.50	1000			
100D-010F	0.10	500	100D-100H	1.00	1000			
100D-025F	0.25	500	100D-150H	1.50	1000			

AUDIO DELAY LINES

SERIES 7000

PART NO.	DELAY (μs)	RISE-TIME (μs)	BW (KHZ)	IMP (Ω)	PART NO.	DELAY (μs)	RISE-TIME (μs)	BW (KHZ)	IMP (Ω)
7000-100A	100	4	0-80	500	7000-800B	800	32	0-10	1000
7000-100B	100	4	0-80	1000	7000-1000A	1000	40	0-8	500
7000-200A	200	8	0-40	500	7000-1000B	1000	40	0-8	1000
7000-200B	200	8	0-40	1000	7000-2000A	2000	80	0-4	500
7000-400A	400	16	0-20	500	7000-2000B	2000	80	0-4	1000
7000-400B	400	16	0-20	1000	7000-4000A	4000	160	0-2	500
7000-800A	800	32	0-10	500	7000-4000B	4000	160	0-2	1000

SPECIFICATIONS

TOTAL DELAY: See table. TAP DELAY: Normal IN and OUT (100 taps can be accommodated) DELAY ACCURACY: ± 3% (±½% on request). IMPEDANCE: 200 to 10,000 ohms. ±5%. ATTENUATION: 6db or better. PHASE RESPONSE: ±1% over bandwidth. TEMPERATURE RANGE: −55°C to +85°C (others on request). TEMPERATURE COEF. 100 PPM/°C (others on request). DIELECTRIC STRENGTH: 50Vdc (others on request). CASE: Hermetically sealed metal. SIZE: 5-3/4 x 3-3/16 x 2-1/2 (14.6 x 8.1 x 6.3cm) MOUNTING: (4) 10-32 studs, 1/2" long, spaced 3-1/2 x 2 (8.90 x 5.10 cm). TERMINALS: Glass-to-metal seal or press-fit type.

STEP VARIABLE DELAY LINES

SERIES 510 511 1510 1511

RISE TIME = 2% IMPEDANCE = 600 Ω				RISE TIME = 2% IMPEDANCE = 1000 Ω			
PART NO.	TOTAL DELAY (μs)	DELAY STEP (μs)	ATT. (db)	PART NO.	TOTAL DELAY (μs)	DELAY STEP (μs)	ATT. (db)
510-A	10.0	1.0	1	511-A	10.0	1.0	.6
510-B	25.0	2.5	1.5	511-B	25.0	2.5	1.0
510-C	50.0	5.0	2.0	511-C	50.0	5.0	1.5
510-D	100.00	10.0	3.5	511-D	100.0	10.0	2.5
510-E	500.00	50.0	4.0	511-E	500.0	50.0	3.0
510-F	1,000.00	100.00	4.5	511-F	1,000.00	100.0	4.0
1510-A	11.0	.1	1	1511-A	11.0	.1	.6
1510-B	110.0	1	3.5	1511-B	110.0	1	2.5
1510-C	1,100.0	10	4	1511-C	1,100.0	10	4.0
				1511-D	11,000	100	6.0

DESCRIPTION

L-C networks in tandem, with precise delay increments and low attenuation. Use as delay syntesizers for evaluation of Worst-Case design analysis; as time delay standards and Phase measuring devices. Meets Military specifications. Type 510 and 511 use a single 10 positions switch.

SPECIFICATIONS

ACCURACY: ± 2% of setting. ATTENUATION and *TIME DELAY see table. *RISE TIME: 2% of time delay or less. TEMPERATURE COEFFICIENT: ± 50 PPM/°C. DISTORTION: Less than 3% for pulse signals on most types. Essentially no harmonic distortion for sine wave signals. SIZE: 8 x 3.5 x 4.5 (20.32 x 8.89 x 11.43 cm) Max. for type 510 and 511 16 75 x 5.25 x 5.5 (41.54 x 13.33 x 13.97 cm) Max. for type 1510 and 1511 (Rack-Mount Panel available on request)

*other can be provided on request

DIGITAL DELAY LINES

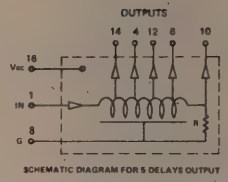
SERIES DDU-3J

SINGLE DELAY OUTPUT (NS)		2 DELAYS OUTPUT (NS)			5 DELAYS OUTPUT (NS)					
PART NO.	DELAY@ PIN # 10	PART NO.	DELAY@ PIN # 12	DELAY@ PIN # 10	PART NO.	DELAY@ PIN # 14	DELAY@ PIN # 4	DELAY@ PIN # 12	DELAY@ PIN # 6	DELAY@ PIN # 10
DDU-3J-1010	10	DDU-3J-2020	10	20	DDU-3J-5050	10	20	30	40	50
DDU-3J-1020	20	DDU-3J-2040	20	40	DDU-3J-5100	20	40	60	80	100
DDU-3J-1030	30	DDU-3J-2050	25	50	DDU-3J-5150	30	60	90	120	150
DDU-3J-1040	40	DDU-3J-2060	30	60	DDU-3J-5200	40	80	120	160	200
DDU-3J-1050	50	DDU-3J-2080	40	80	DDU-3J-5250	50	100	150	200	250
DDU-3J-1060	60	DDU-3J-2100	50	100	DDU-3J-5300	60	120	180	240	300
DDU-3J-1080	80	DDU-3J-2150	75	150	DDU-3J-5400	80	160	240	320	400
DDU-3J-1100	100	DDU-3J-2200	100	200	DDU-3J-5500	100	200	300	400	500
DDU-3J-1150	150	DDU-3J-2300	150	300						
DDU-3J-1200	200	DDU-3J-2400	200	400						
DDU-3J-1300	300	DDU-3J-2500	250	500						
DDU-3J-1400	400									
DDU-3J-1500	500									

SPECIFICATIONS

- Delay tolerance: ±5% or better.
- Rise-time: 4 NS typically.
- Temperature coefficient: 100 PPM/°C.
- Temperature range: − 0°C to 70°C standard. (− 55°C to + 125°C. on request)*
- Supply voltage: 4.5 to 5.5 Vdc.
- Logic 1 input current: 50 ua max.
- Logic 0 input current: −2 ma. max.
- Logic 1 V out: 2.5 V min.
- Logic 0 V out: 0.5 V max.
- Logic 1 Fan-out: 20/tap max.
- Logic 0 Fan-out: 10/tap max.
- Power Dissipation: 19 MW/Gate.
- 16 pin DIP case.

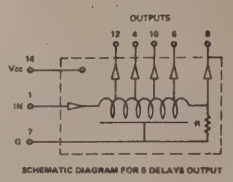
*Add "M" after PART NO.
Example DDU-3J-1010M



SCHEMATIC DIAGRAM FOR 5 DELAYS OUTPUT

SERIES DDU-4

SINGLE DELAY OUTPUT (NS)		2 DELAYS OUTPUT (NS)			5 DELAYS OUTPUT (NS)					
PART NO.	DELAY@ PIN # 8	PART NO.	DELAY@ PIN # 10	DELAY@ PIN # 8	PART NO.	DELAY@ PIN # 12	DELAY@ PIN # 4	DELAY@ PIN # 10	DELAY@ PIN # 6	DELAY@ PIN # 8
DDU-4-1010	10	DDU-4-2020	10	20	DDU-4-5050	10	20	30	40	50
DDU-4-1020	20	DDU-4-2040	20	40	DDU-4-5100	20	40	60	80	100
DDU-4-1030	30	DDU-4-2050	25	50	DDU-4-5150	30	60	90	120	150
DDU-4-1040	40	DDU-4-2060	30	60	DDU-4-5200	40	80	120	160	200
DDU-4-1050	50	DDU-4-2080	40	80	DDU-4-5250	50	100	150	200	250
DDU-4-1060	60	DDU-4-2100	50	100	DDU-4-5300	60	120	180	240	300
DDU-4-1080	80	DDU-4-2150	75	150	DDU-4-5400	80	160	240	320	400
DDU-4-1100	100	DDU-4-2200	100	200	DDU-4-5500	100	200	300	400	500
DDU-4-1150	150	DDU-4-2300	150	300						
DDU-4-1200	200	DDU-4-2400	200	400						
DDU-4-1300	300	DDU-4-2500	250	500						
DDU-4-1400	400									
DDU-4-1500	500									

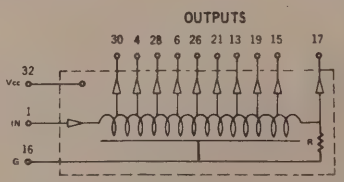


SCHEMATIC DIAGRAM FOR 5 DELAYS OUTPUT

Specifications same as DDU-3J except 14 pins dip case, low profile.

SERIES DDU-5J

PART NO.	TOTAL DELAY NS	DELAY PER TAP NS	PART NO.	TOTAL DELAY NS	DELAY PER TAP NS
DDU-5J-10100	100	10	DDU-5J-10400	400	40
DDU-5J-10150	150	15	DDU-5J-10500	500	50
DDU-5J-10200	200	20	DDU-5J-101000	1000	100
DDU-5J-10250	250	25	DDU-5J-101500	1500	150
DDU-5J-10300	300	30	DDU-5J-102000	2000	200

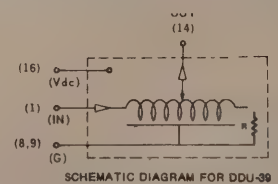


Specs. same as DDU-3J
Pins spacings .30 X 1.81

SERIES DDU-39

Continuously adjustable from 10 to 30 NS.

Specs. same as DDU-3J



SCHEMATIC DIAGRAM FOR DDU-39

PROGRAMMABLE DELAY UNIT

SERIES PDU-108

TRUTH TABLE

ENABLE	C	B	A	DELAY OUT
L	L	L	L	T_0
L	L	L	H	T_1
L	L	H	L	T_2
L	L	H	H	T_3
L	H	L	L	T_4
L	H	L	H	T_5
L	H	H	L	T_6
L	H	H	H	T_7
H	Φ	Φ	Φ	L

TEST CONDITIONS

- Input pulse-width: ≥ 40% of total delay.
- Input pulse rise-time: ≤ 6 NS.
- Input pulse voltage: −1.5 V.
- VEE supply voltage: −5.2 V.
- VEE supply current: 56 ma. typ.
- Operating temperature: 25° C.

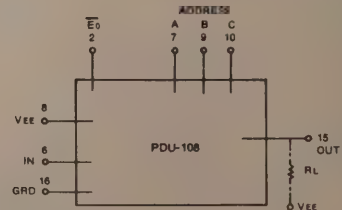
H = High L = Low Φ = Don't care
T_0 = Reference or inherent delay of circuit.
$T_1 \rightarrow T_7$ = Multiplier of incremental delay.

SPECIFICATIONS

- Logic 1 input voltage: −.980 V
- Logic 1 input current: .22 ma.
- Logic 0 input voltage: −1.65 V.
- Logic 0 input current: −.5 ua.
- Logic 1 output voltage: −.96 V.
- Logic 0 output voltage: −1.65 V.
- Operating temperature: 0° to 70°C.
- Storage temperature: −55° to +125° C.

PART NO.**	MIN. DELAY INCREMENT	TOTAL DELAY * CHANGE
PDU-108-10	10 NS	70 NS
PDU-108-20	20 NS	140 NS
PDU-108-40	40 NS	280 NS
PDU-108-50	50 NS	350 NS

* This delay value does not include the T_0 delay.
** Other delay increments available on request.



$R_L \geq 50\ \Omega$ (Not included inside the module)

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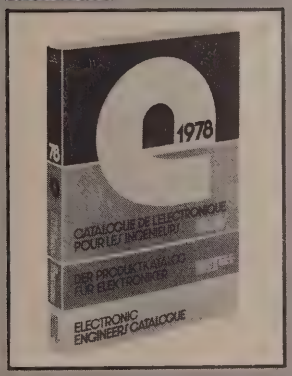

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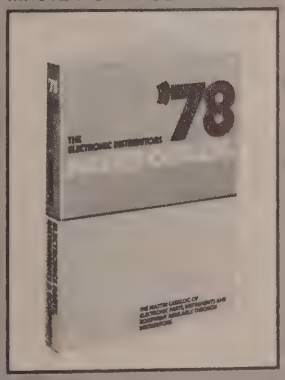

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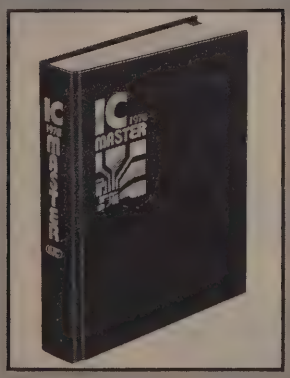

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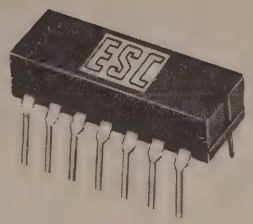
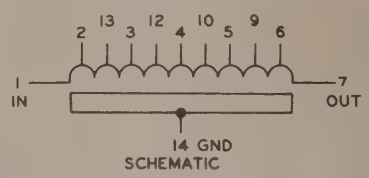
ESC The World's Leading Producer of Electromagnetic DELAY LINES

LOW PROFILE DIPS TO MIL-D-23859/23



SPECIFICATIONS:

- Total Time Delay Tolerance: ± 2 ns Below 40 ns Delay
  ± 5% Above 40 ns Delay
- Temperature Coefficient: 100 ppm/°C max.
- Operating Temp. Range: – 55°C to + 125°C
- Distortion: ± 10% max.
- Attenuation: 10% max.
- Dielectric Strength: 50 VDC
- Environmental Conditions: Per MIL-D-23859/23
- Size: 14 PIN, .750 lg X .300 w X .187 h.



SCHEMATIC

Total Td ns	Rise Time max(ns)	IMPEDANCE ± 10% 50Ω	100Ω	200Ω
10	3	A002	B102	–
15	4	A003	B103	–
20	5.5	A004	B104	–
25	6	A005	B105	–
30	6.5	A006	B106	–
35	7	A007	B107	–
40	8	A008	B108	C208
45	9	A009	B109	C209
50	10	A010	B110	C210
60	12	A012	B112	C212
80	16	A016	B116	C216
100	20	A020	B120	C220
120	24	A022	B122	C222
140	28	A024	B124	C224
150	30	A025	B125	C225
160	32	A026	B126	–
180	36	A028	B128	–
200	40	A030	B130	–
220	45	–	B132	–
240	50	–	B134	–
250	50	–	B135	–
260	55	–	B136	–
280	60	–	B138	–
300	60	–	B140	–
330	70	–	B143	–

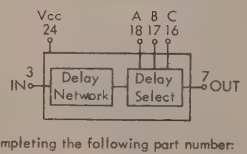
Request Bulletin – .187 DIP

HIGH PERFORMANCE DIGITALLY PROGRAMMABLE TTL & DTL

TRUTH TABLE			TIME DELAY (NSEC)		
Data Select			ESC MODEL NO.		
A	B	C	PDL10-10	PDL20-20	PDL50-50
L	L	L	10	20	50
H	L	L	20	40	100
L	H	L	30	60	150
H	H	L	40	80	200
L	L	H	50	100	250
H	L	H	60	120	300
L	H	H	70	140	350
H	H	H	80	160	400

L = 0V., H = + 5VDC

PIN NO.	FUNCTION
3	INPUT
7	OUTPUT
1, 12	GROUND
A=18 B=17 C=16	DELAY SELECT
24	Vcc = +5VDC

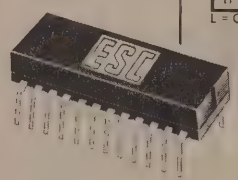


SPECIFICATIONS:

- Supply Voltage: + 4.5V to 5.5VDC
- Delay Tolerances: ± 5% or 1 ns. (Whichever is greater)
- Operating Temperature: – 55°C to + 125°C
- Output Voltage: 2.4 VDC MIN.
- Output Rise Time: 3 ns MAX.

TEST CONDITIONS:

- Input Pulse Width: 40% of Total Delay
- Input Pulse Rise Time: 2 ns.
- Input Pulse Voltage: + 3.0V
- Time Delay measured at: 1.5V Level
- Rise Time measured from: .75V to 2.4V
- Vcc.... + 5 VDC Temp: + 25°C
- Size: 24 PIN, 1.3 lg X .580 w X .350 h.



Order additional variations available by completing the following part number:

PDL ↑ Programmable Delay Line

↑ Minimum Time Delay (ns) (Min – 10 ns) (Max – 100 ns)

↑ Time Delay per increment (ns) (7 increments) (Min – 2 ns) (Max – 100 ns)

Example: PDL50-10 is a Programmable Delay Line adjustable from 50 ns to 120 ns in steps of 10 ns.

CONSULT FACTORY FOR OTHER REQUIREMENTS

Request Bulletin – PDL

WRITE-PHONE-FOR OTHER ESC LITERATURE:

SUBMINIATURE	Bulletin-SM
DISTRIBUTED CONSTANT	Bulletin-DC
TAPPED	Bulletin-T
PROGRAMMABLE (PASSIVE)	Bulletin-PR
STANDARD MIL TYPES (DELAYS TO 50 μsec)	Bulletin-MIL
CONTINUOUSLY VARIABLE	Bulletin-400-900
HIGH DENSITY PACKAGING (DELAYS TO 30 μsec)	Bulletin-PC
HIGH DELAY/RISE TIME RATIO (DELAYS TO 100 μsec)	Bulletin-HP
MILLISECOND (DELAYS TO 5 ms.	Bulletin-MS

The lines described above represent only a small segment of our total design capability.

ESC also designs and manufactures typically..

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Fixed programmable and mechanically-variable delay lines for the TV broadcast industry, including video cable simulators and voltage variable delay lines.

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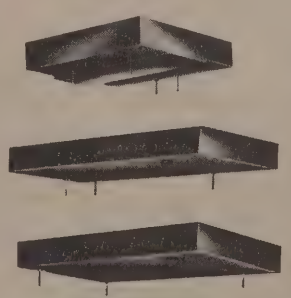

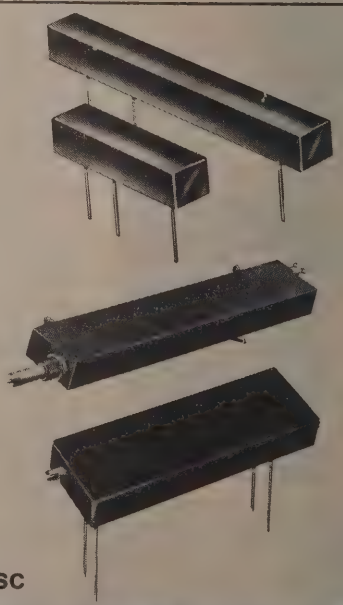

FOR ADDITIONAL INFORMATION CONTACT ESC

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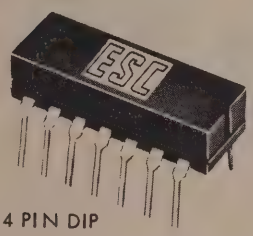
The World's Leading Producer of Electromagnetic DELAY LINES

ESC

DIP DELAY LINES

SPECIFICATIONS:
- Operating Temperature: -55°C to + 125°C
- Temperature Coefficient: 50 ppm/°C max
- Attenuation: 1 db max
- Distortion: 10% max
- Dielectric Strength: 50 VDC
- Conforms to applicable portions of MIL-D-23859
- Size: 1.3 lg. x .580 w. x .300 h.



14 PIN DIP

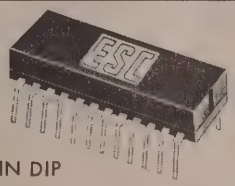
IMPEDANCE ± 10% →				50	75	93	100	200
Time Delay (nsec)± 5%	Rise Time (nsec)	No. of Taps	Delay per Tap (nsec) non-cumulative	MODEL NO.				
10 ± 1 ns	1.7	10	1.0 ± .5		7P10	9P10	1P10	
20	3.3	10	2.0 ± .5	5P20	7P20	9P20	1P20	2P20
30	5.0	10	3.0 ± 1	5P30	7P30	9P30	1P30	2P30
40	6.5	10	4.0 ± 1	5P40	7P40	9P40	1P40	2P40
50	8.0	10	5.0 ± 1	5P50	7P50	9P50	1P50	2P50
100	16	10	10 ± 1.5	5P100	7P100	9P100	1P100	2P100
150	25	10	15 ± 1.5				1P150	
200	35	10	20 ± 2				1P200	

IMPEDANCE ± 10% →				300	400	500
Time Delay ± 5%	Rise Time (nsec)Max	No. of Taps	Delay per Tap ± 5%	MODEL NO.		
300	75	5	60	3P300	4P300	5P300
400	100	5	80	3P400	4P400	5P400
500	125	5	100	3P500	4P500	5P500
600	150	5	120	3P600	4P600	5P600
800	200	5	160	3P800	4P800	5P800
1000	250	5	200	3P1000	4P1000	

Low Profile (.200") available for delays up to 100 nsec. *Request Bulletin-DIP*

SPECIFICATIONS:
- Operating Temperature: -55°C to + 125°C
- Temperature Coefficient: 50 ppm/°C max
- Attenuation: 1 db max
- Distortion: 10% max
- Dielectric Strength: 50 VDC
- Size: .785 lg. x .320 w. x .300 h.

IMPEDANCE ± 10% (OHMS) →				100	200
Time Delay ± 5%	Rise Time (nsec)Max	No. of Taps	Delay per Tap ± 5%	MODEL NO.	
500	42	20	25	124-5	224-5
600	50	20	30	124-6	224-6
800	67	20	40	124-8	224-8
1000	84	20	50	124-10	224-10
1200	110	20	60	124-12	224-12
1500	125	20	75	124-15	224-15
2000	170	20	100		224-20



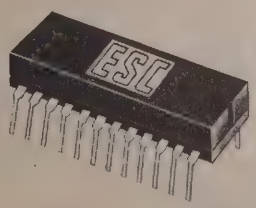
24 PIN DIP

Request Bulletin — DIP-24

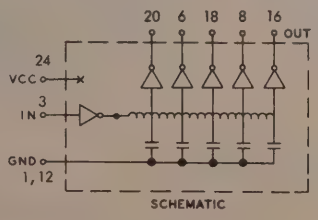
DIGITAL DELAY LINES

HIGH PERFORMANCE TAPPED TTL AND DTL COMPATIBLE IN 24 PIN PACKAGE

5 TAPS		
MODEL	Time Delay (nsec)	Delay per Tap (nsec)
5E05	50	10
5E10	100	20
5E15	150	30
5E20	200	40
5E25	250	50
5E50	500	100
5E100	1000	200

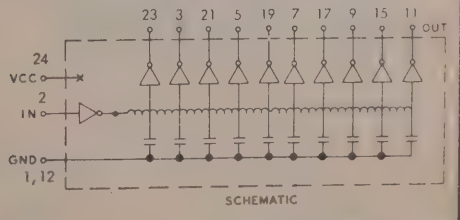


10 TAPS		
MODEL	Time Delay (nsec)	Delay per Tap (nsec)
10J10	100	10
10J15	150	15
10J20	200	20
10J25	250	25
10J30	300	30
10J50	500	50
10J100	1000	100



SCHEMATIC

SPECIFICATIONS:
- Temperature Range: -55°C to + 125°C.
- Vcc: + 4.5 to 5.5 VDC.
- Delay Tolerance: ± 2 ns or 5% whichever is greater.
- Rise Time: 4 ns typical.
- Size: 1.3 lg x .580 w. x .300 h.



SCHEMATIC

Request Bulletin DDL-24

ESC ELECTRONICS CORPORATION
534 BERGEN BOULEVARD ● PALISADES PARK, N.J. 07650
PHONE: (201) 947-0400 ● TWX 710-991-9780
TOLL FREE 800-631-0853 (except N.J.)

Looking for LC Filters or wideband video transformers? See Filter Ad Section 2700 EEM

Kappa Networks, Inc.

165 ROOSEVELT AVENUE / CARTERET, NEW JERSEY 07008 / TEL: (201) 541-1600

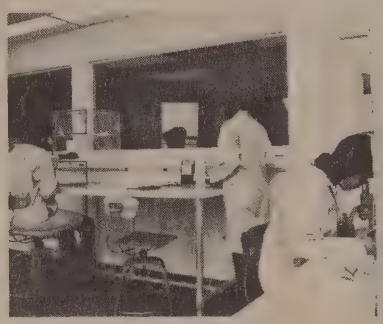
DESIGNERS AND MANUFACTURERS OF ELECTROMAGNETIC

DELAY LINES

FROM STOCK
CATALOGUE ORDER
CUSTOM

- FIXED OR VARIABLE
- DUAL-IN-LINE TO RACK MOUNTING
- MILITARY OR COMMERCIAL

The leading manufacturer of video delay lines since 1963

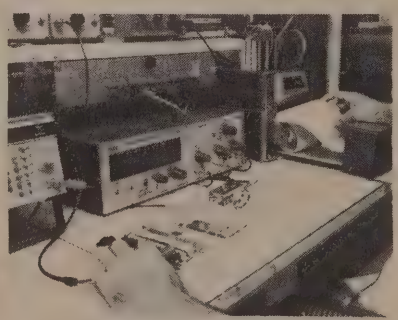


CLEAN ROOM

WINDING DEPT.

ASSEMBLY DEPT.

AUTOMATIC WINDING



PRINTOUT TESTING

CERTIFIED VENDOR STATUS

Dial toll free 800·631·5653

KAPPA NETWORKS, INC.

DELAY LINE SPECIALISTS • ELECTRIC WAVE FILTERS • MANUFACTURING ENGINEERS

165 ROOSEVELT AVENUE • CARTERET, NEW JERSEY 07008 • TEL. (201) 541-1600 • TELEX: 139408

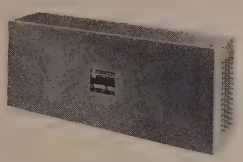
Kappa Networks, Inc.

PRECISION SONAR DELAY LINES / SERIES A

The basic design of this series incorporates unsymmetrical Pierce sections with precisely controlled equalization. These sections consist of closely matched high Q inductors and precision tolerance capacitors to assure unurpassed performance.

SPECIFICATIONS

Delay Range: from 500μsec to 10^6 μsec ±1%
Delay Linearity: available to within ±0.05%
Bandwidth: 70 KHz maximum
Dielectric Strength: 100 VDC
Operating Temperature: −55°C to + 125°C
Temperature Stability: under 50 ppm/°C



SUPER-η* DELAY LINES / SERIES H

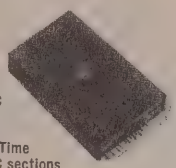
SUPER- LINES embody a new design principle providing the highest efficiency yet obtainable in lumped constant delay lines. Use of network synthesis techniques** rather than conventional m-derived methods result in sharply improved delay line efficiency. Compared to ordinary delay lines of the same delay-to-rise-time ratio, **Super-η** LINES use far fewer LC sections. For this reason these newly-developed lines provide such outstanding advantages as: • Greater Inherent Reliability • Smaller Package Size • Appreciable Cost Reduction **KAPPA Technical Report #TR-101

SPECIFICATIONS

Delay Range: 0.5 μsec to 500 μsec ±5%
Delay-to-Rise-Time Ratio: as required, up to 150
Delay Linearity: ±1%
Bandwidth: 70 MHz maximum
Distortion: ±10% maximum
Dielectric Strength: as required
Operating Temperature: −55°C to + 125°C
Temperature Stability: 50 ppm/°C

* = Delay Line Efficiency = $\frac{R}{N}$

where R = Ratio of Delay-to-Rise-Time
N = Required number of LC sections



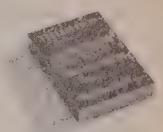
TRANSPONDER LINES / TACAN LINES DME LINES / SERIES C

Designed to meet the requirements of MIL-D-23859 and to withstand the most rigorous military environments.

• Tap Selection to Precise Tolerances • Compact Packaging • Used in Air and Ground Measuring and Signalling Equipment

SPECIFICATIONS

Tap-Spacing: as required
Tap Tolerance: as required
Delay-to-Rise-Time Ratio: 100 maximum
Delay Linearity: ±0.5%
Attenuation: from 1.5 to 6 db
Distortion: as required, to 1%
Dielectric Strength: as required
Operating Temperature: −55°C to + 125°C
Temperature Stability: 50 ppm/°C or less

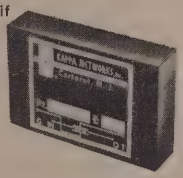


LOW DISTORTION LINES / SERIES D

Used primarily in precision instrumentation where high bandwidth and low distortion are critical considerations.

SPECIFICATIONS

Delay-to-Rise-Time Ratio: 50 maximum
Bandwidth: 50 MHz maximum
Dielectric Strength: as required
Operating Temperature: −55°C to + 125°C
Temperature Stability: 50 ppm/°C
Distortion at Output: 2% maximum
Distortion at Taps: less than 5% at any tap
Distortion Limit: as low as 0.1% if required
Delay Range: up to 100 μsec
Standard Tolerances: ±1% on Delays ±5% on Impedance

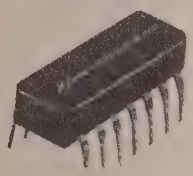


DUAL IN LINE / DELAY LINE / SERIES DP

This series widely used in computer, radar and timing applications. • Available with Tapped Delay Increments • Plug into Standard Dual-in-Line Sockets or P.C. Board • Manufactured and Tested to MIL-D-23859

SPECIFICATIONS

Delay Range: to 1000 nanoseconds
Distortion: 10%
Operating Temperature: −55°C to + 125°C
Temperature Stability: 50 ppm/°C
Dielectric Strength: 100 VDC

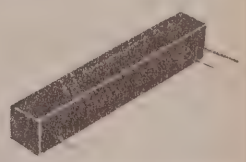


MINIATURE NANOSECOND DELAY LINE / SERIES KM

This series of lumped constant design, incorporates an advanced technique of packaging, to offer high figure of merit in small volume.

SPECIFICATIONS

Operating Temperature: −55°C to + 125°C
Temperature Coefficient: 50 ppm/°C
Attenuation: 0.5 db maximum
Dielectric Strength: 100 VDC
Distortion (typical): ±10%; Meets MIL-D-23859

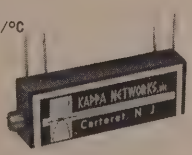


MINIATURE CONTINUOUSLY VARIABLE DELAY TRIMMERS / SERIES TT

This series is the smallest of its kind and is immediately available from stock. Intermittent-free operation is assured by KAPPA's unique contact design.

SPECIFICATIONS

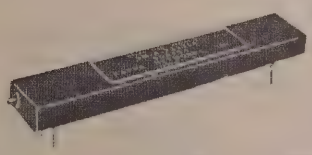
Size: ¼ cubic inch
Delay Range: up to 120 nanoseconds
Resolution: −25 nanoseconds or less
Relay-to-Rise-Time Ratio: 4/1
Bandwidth To: 70 MHz
Attenuation: .25 db maximum
Distortion: ±15% maximum
Dielectric Strength: 100 VDC
Operating Temperature: −55°C to + 125°C
Temperature Stability: 200 ppm/°C



MINITRIM DELAY LINE / SERIES MT

This series available in both distributed and lumped constant design. • Ideal for P.C. Board Insertion • Wide Range of Delay • KAPPA Minitrim Delay Lines are Designed for Circuits Requiring Precise Delay Adjustments

SPECIFICATIONS: Delay Range: up to 300 nanoseconds; **Resolution:** less than 1 nanoseconds; **Attenuation:** less than .5 db; **Dielectric Strength:** as required; **Operation Temperature:** −55°C to + 125°C

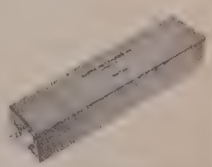


VIDEO BROADCAST DELAY LINES / SERIES BC

KAPPA Video Broadcast Delay Lines yield a greater delay-bandwidth from fewer components than conventional units, and their performance more nearly approaches constant delay at all transmitted frequencies than do conventional (m-derived) delay lines. This performance has established their wide acceptance for use in the most demanding color television applications of American and European Systems.

SPECIFICATIONS

Delay Range: to 10 μsec
Impedance: 75 ohms ±2%
Linear Delay Bandwidth: to 14 MHz, Delays to 1 μsec
7 MHz, Delays to 5 μsec
5 MHz, Delays to 10 μsec

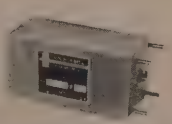


STANDARD LUMPED CONSTANT DELAY LINES / SERIES LC

Most standard KAPPA Lumped Constant Delay Lines utilize either the highly efficient Golay or unsymmetrical Pierce designs. Equalization is precisely calculated and realized, fully accounting for variations in magnetic core permeability, distributed capacity and other variables. The resulting units exhibit the specified delay linearity tolerance to frequencies beyond the 3 db passband.

SPECIFICATIONS

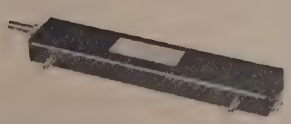
Delay: 50 nanoseconds to 1 second*
Impedance: 20 ohms to 50 K ohms
Delay-to-Rise-Time Ratio: 150 maximum
Delay Linearity: ±0.5%
Bandwidth: DC to 250 MHz*
Distortion: ±10% or as required
Operating Temperature: −55°C to + 125°C
Temperature Stability: 50 ppm/°C
*Subject to a limit on delay X bandwidth



CONTINUOUSLY VARIABLE DELAY LINES / SERIES K

This series offer continuously variable delay lines of lumped constant design. Incorporating special contact feature for intermittent free variation.

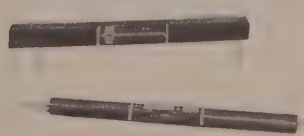
SPECIFICATIONS: Delay Range: to 2.0 μsec; **Resolutions:** 1/1000 of total delay or 1 nanosecond whichever is greater; **Delay-to-Rise-Time Ratio:** up to 10:1; **Attenuation:** under 1.5 db; **Dielectric Strength:** as required; **Operating Temperature:** −55°C to + 125°C; **Temperature Coefficient Delay:** 50 ppm/°C



STANDARD DISTRIBUTED CONSTANT DELAY LINES / SERIES DC

These Delay Lines offer limited delay-rise-time ratio and small volume at lowest cost. • Available for P.C. Board Insertion • Short Delivery Cycle

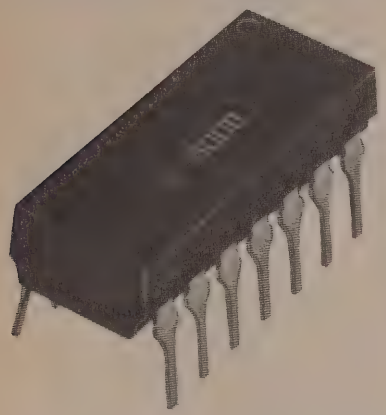
SPECIFICATIONS: Delay Range: up to 3 μsec ±5%; **Delay-to-Rise-Time Ratio:** 11 maximum; **Bandwidth:** 30 MHz maximum; **Distortion:** ±5% typical, ±10% maximum; **Dielectric Strength:** as required; **Operating Temperature:** −55°C to + 125°C; **Temperature Stability:** 200 ppm/°C maximum

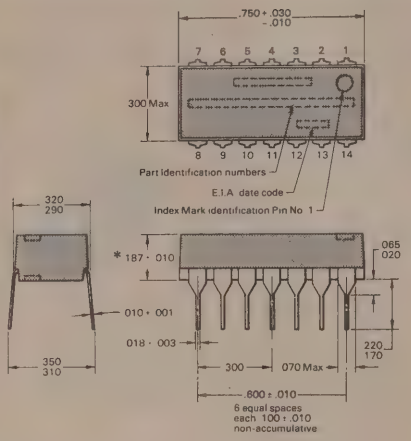


Nytronics Components Group, Inc.
ORANGE STREET, DARLINGTON, S. C. 29532
(803) 393-5421 — TWX 810-665-2182

DELAY LINE

SERIES DL-8000

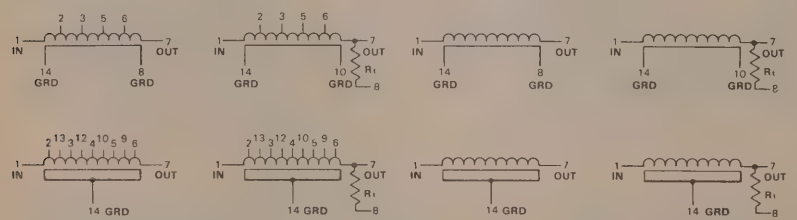




* Note: 0.100, 0.220 and other heights available. Contact Factory.

FEATURES

- Low Profile
- 14-Lead, DIP-IC Compatible Packages
- Standard Delay Times from 5 nsec to 500 nsec
- Choice of Standard High or Low Delay Time: Rise Time ratios
- Standard Impedances of 50, 100, 200, 360 and 500 ohms
- Standard and Special Attenuations
- Easy to Order Special Models
- Drift Elminiation by Lumped Constant Design
- Meets or Exceeds Applicable Requirements of MIL-STD-202 and MIL-STD-833
- Epoxy Transfer Molding for Cost/Delivery Time Savings
- Economy and Prompt Delivery on Standard Models
- High Reliability, Precision Performance, Broad Temperature Range Stability, Long Storage and Operational Life



R_t = Terminating Resistor (value of Z_o) ± 5%, ⅛ watt, carbon

Taps in equal increments of total delay

HOW TO ORDER

To allow the greatest possible range of parameters, the following ordering system should be followed on both standard and special orders.

Example: DL-8000 045 09 100 05 A
14-Pin Lumped Constant Dual In-Line Delay
Line, 45 nsec T_d, 9 nsec T_r, 100 ohm impedance, 5% (Max.) attenuation, internal configuration "A".

DL-8000 **045** **09** **100** **05** **A**

PLACE 1
Base No. DL-8000 = 14-pin, Lumped Constant Dual In-Line Delay Lines (6 characters and dash)

PLACE 2
Delay Time (T_d)
Standard Models:
005 = 5 nsec, 050 = 50 nsec, 150 = 150 nsec, etc., from above table (3 digits)
Special Orders:
Enter full 3-digit nsec value (e.g., 075)

PLACE 3
Rise Time (T_r)
Standard Models:
Enter nsec digit Value from table (e.g., 2.0, 6.5, 40)
Special Orders:
Enter desired rise time in nsec (2 or more digits)

PLACE 4
Impedance (Z_o)
Standard Models:
050 = 50 ohms, 200 = 200 ohms
100 = 100 ohms, 360 = 360 ohms
(3 digits)
Special Orders:
Enter full 3-digit Ohm value (e.g., 075)

PLACE 5
Attenuation
Standard Models:
Enter 2-digit percent value from table (e.g., 05, 10)
Special Orders:
Enter Max. allowable percent attenuation (2 digits)

PLACE 6
Internal Configuration
Enter Schematic reference letters
A, B, C, D, E, F, G or H
(1 letter)

Formerly Manufactured By McGraw-Edison Comp.: Edison Electronics Division
DAVEN DESIGN

Insulation Resistance: 100,000 megohms at 25°C.
Dielectric Withstanding Voltage 250VDC @ 50 milliamps., 5 sec Min.
Temperature Coefficient (Typ.): 100ppm/°C.

STANDARD DL-8000 MODELS

Delay Time (Td), nsec*	Rise Time (Tr), Max. nsec	% Attenuation Max. Per Impedance†				
		50 ohms	100 ohms	200 ohms	360 ohms	500 ohms
5	02	3	5	5	5	7
10	03	3	5	5	5	7
15	04	3	5	5	5	7
20	5.5	3	5	5	5	7
25	06	3	5	5	5	7
30	6.5	3	5	5	5	7
35	07	3	5	5	5	7
40	08	3	5	5	5	7
45	09	3	5	5	5	7
50	10	3	5	5	5	7
55	11	3	5	5	5	7
60	12	3	5	5	5	7
65	13	3	5	5	5	7
70	14	3	5	5	5	7
75	15	3	5	5	5	7
80	16	3	5	5	5	7
85	17	3	5	5	5	7
90	18	3	5	5	5	7
95	19	3	5	5	5	7
100	20	3	5	5	5	7
110	22	3	5	6	7	8
120	24	3	5	6	7	8
130	26	3	5	6	7	8
140	28	3	5	6	7	8
150	30	3	5	6	7	8
160	32	3	5	6	7	8
170	34	3	5	6	7	8
180	36	3	5	6	7	8
190	38	3	5	6	7	8
200	40	3	5	6	7	8
210	45	—	5	6	7	8
220	45	—	5	6	7	8
230	50	—	5	6	7	8
240	50	—	5	6	7	8
250	50	—	5	6	7	8
260	55	—	5	6	7	8
270	55	—	5	6	7	8
280	60	—	5	6	7	8
290	60	—	5	6	7	8
300	60	—	5	6	7	8
310	65	—	7	8	10	10
320	65	—	7	8	10	10
330	70	—	7	8	10	10
340	70	—	7	8	10	10
350	70	—	7	8	10	10
360	75	—	7	8	10	10
370	75	—	7	8	10	10
380	80	—	7	8	10	10
390	80	—	7	8	10	10
400	80	—	7	8	10	10
410	85	—	8	10	10	10
420	85	—	8	10	10	10
430	90	—	8	10	10	10
440	90	—	8	10	10	10
450	90	—	8	10	10	10
460	95	—	8	10	10	10
470	95	—	8	10	10	10
480	100	—	8	10	10	10
490	100	—	8	10	10	10
500	100	—	8	10	10	10

* ±5% Tolerance for 40 through 500 nsec Td. 2 nsec for 5 through 40 nsec Td.
† ±10% Impedance Tolerance.

Nytronics Components Group, Inc.
ORANGE STREET, DARLINGTON, S. C. 29532
(803) 393-5421 — TWX 810-665-2182

DELAY LINE SECTIONS

The Wee-Bit

(Nytronics Delay Line Sections)

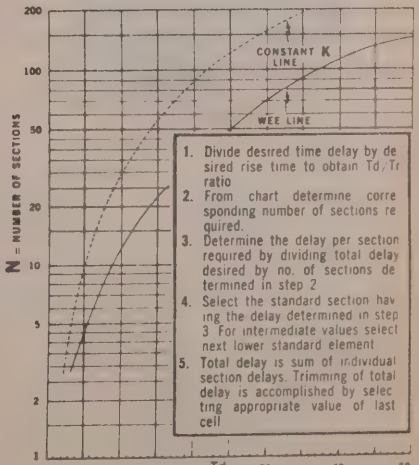
Unique sectional construction available utilizing individual pre-designed Wee-Bit Pulse Delay elements. No tooling expenses.

The **WEE-BIT** offers the advantage of assembling a unique sectionalized delay line that reduces delivery on prototype delay lines from weeks to days and eliminates expensive tooling and design efforts. Consisting of pre-designed LC sections called Wee-Bits, a discrete value of delay time is offered. The aggregate number of Wee-Bits determines the total delay time and is a function of delay to rise time ratio. An assembly is made of selected Wee-Bits mounted on printed circuit boards that conform to MIL-P-13949B, stacked or single layer and permits increment of delay to be tapped without disturbing uniform pulse shape. Wee-Bit size 0.401″ long by 0.625″ wide by 0.230″ height and are epoxy molded to meet environmental conditions of MIL-C-15305. Temperature range −55°C to 125°C. 300 VDC working voltage. Delay time available per Wee-Bit from 10 nanoseconds to 100 nanoseconds in 10 nanoseconds increments. Wee-Bits also stocked with 200 nanoseconds delay. This unique wee line sectionalized delay line concept allows reduction of approximately 40% in number of sections ordinarily required*, flexibility of design, and line tapping.

*Compared to constant K

NCG Part No.	Delay Time N.S.	Delay Tolerance	Approximate Band Width MHz	DC Resistance (ohms) Max.	Std. Impedance ohms ±10%
WL-10NS	10	±1NS	25 MHz	0.70	500
WL-20NS	20	±5%	19 MHz	1.10	500
WL-30NS	30	±5%	13 MHz	1.40	500
WL-40NS	40	±5%	7.5 MHz	1.60	500
WL-50NS	50	±5%	6.5 MHz	1.90	500
WL-60NS	60	±5%	5.5 MHz	2.10	500
WL-70NS	70	±5%	4.5 MHz	2.25	500
WL-80NS	80	±5%	4.0 MHz	2.50	500
WL-90NS	90	±5%	3.75 MHz	2.60	500
WL-100NS	100	±5%	3.5 MHz	2.80	500
WL-200NS	200	±5%	1.5 MHz	4.20	500

NOTE: Other impedance values available upon request.


N = NUMBER OF SECTIONS
CONSTANT K LINE
WEE LINE
1. Divide desired time delay by desired rise time to obtain Td/Tr ratio
2. From chart determine corresponding number of sections required.
3. Determine the delay per section required by dividing total delay desired by no. of sections determined in step 2
4. Select the standard section having the delay determined in step 3 For intermediate values select next lower standard element
5. Total delay is sum of individual section delays. Trimming of total delay is accomplished by selecting appropriate value of last cell
Td / Tr eff.
Tr eff = √(Tr²OUT − Tr²IN.)
IF Tr OUT ≥ 10x Tr IN, Tr eff. = Tr OUT

LEADING ELECTRICAL PARTICULARS

Delay Tolerance: ±5%
Risetime Tolerance: ±20%
Noise: 1 to 10%, less than 3% for most types
Ripple: 1 to 10%, less than 3% for most types
Attenuation: 0.2 db/usec. to 1.0 db/usec. most types 0.2 db/usec.
Temperature Coefficient: 150 $(10)^6$ us/us −°C
Impedance: 500 ohms ±5%
Operating Voltage: 300 Volts D.C.

Tr MEASURED AT 10% & 90% and Td MEASURED AT 50% POINTS OF INPUT AND OUTPUT PULSES. Individual Sections furnished in ±5% Tolerance (or ±1NS, whichever is greater) and must be tested in accordance with Nytronics, Inc. DSI 394.

LEADING MECHANICAL PARTICULARS

(for 15 section delay line)

Length of 15 cells	6.125″
Length of 15 cells plus P.C. mounting board	7.141″
Width of cells plus P.C. mounting board	0.750″
Height of cells plus P.C. mounting board	0.330″

Basic Cell Size: Length — 0.401″
Width — 0.625″
Height — 0.230″

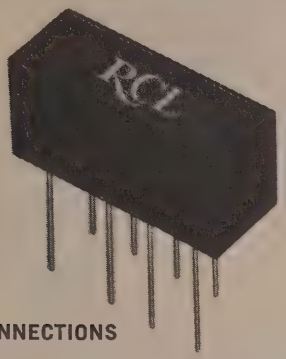
Temperature range and operation environmental conditions are covered by MIL-C-15305.

AMF
RCL Electronics

DELAY LINE DIVISION:
DEPT. EM, 195 McGREGOR STREET
MANCHESTER, NEW HAMPSHIRE 03102
TELEPHONE (603) 627-3831 • TWX 710-220-1876

"PLUG-IN" DIGITAL DIP. DELAY MODULES

COMPATIBLE WITH VIDEO CIRCUITS



- Fast Rise Time — Independent of Delay
- DTL and TTL Compatible
- 5 Tapped Delays
- High Fan Out Capability
- 50 ns, 100 ns, 250 ns Delays
- 16 Pin Dip Pattern
- In Stock

RCL "Plug-In" Digital Delay Modules provide the precise timing features of a Delay Line in a device which can be easily used with the DTL and TTL families. Considerable space savings and flexibility are achieved over the use of conventional components.

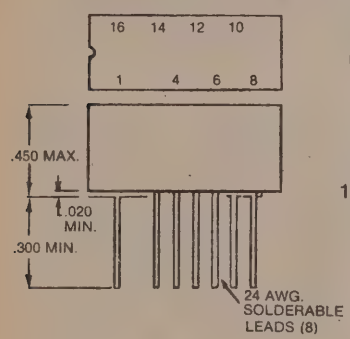
SPECIFICATIONS

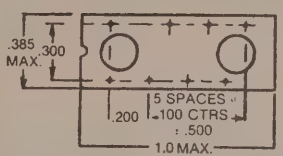
Supply Voltage Vcc ...+4.75 to 5.25VDC
Logic "1" Input Current ..... 50 μA Max.
Logic "0" Input Current ..... −2 mA Max.
Logic "1" V Out ..... 2.4V Min.
Logic "0" V Out ..... 0.4V Max.

DRIVE CAPABILITIES

Logic "0" Output ..... 10 TTL Loads/Tap Max. (20 TTL Loads/Unit Max.)
Logic "1" Output ..... 20 TTL Loads/Unit Max.

PIN CONNECTIONS





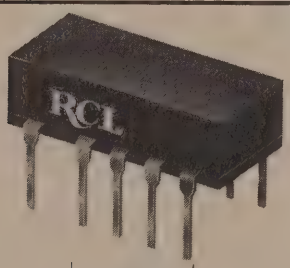
1 Input
14 20% Delay
4 40% Delay
12 60% Delay
6 80% Delay
10 Output
8 Ground
16 Vcc

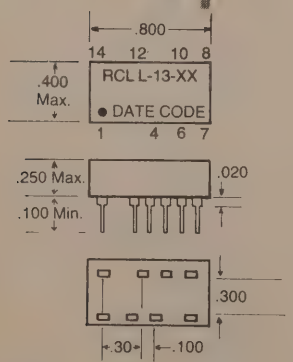
RCL No.	Delay Time (a)	Delay/Tap (a)	No/Taps	Rise Time[2]
L13-01	50 ns	10 ns	5	4 ns
L13-02	100 ns	20 ns	5	4 ns
L13-03	250 ns	50 ns	5	4 ns

All Measurements Made at Vcc = 5.0V @ 25°C
(a) Measured at 1.5V Level, Leading Edge (Tap to Tap)
Total Delay Tolerance = ±5%
Tap Delay Tolerance = 30 ns or ±5% whichever is greater

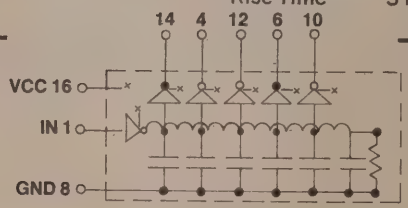
INPUT TEST CONDITIONS

Pulse Voltage 3.2V — Input Current 60 mA TYP
Rise Time 3 ns — Pulse Width Min. of 40% of Delay





Connection	PIN #
INPUT	1
40% TD	4
80% TD	6
GROUND	7
OUTPUT	8
60% TD	10
20% TD	12
Vcc	14



PIN NUMBERS FOR REFERENCE ONLY

RCL Part No.	1 Delay (TD)	2 Tap Delay
L-13-04	25 ns	5 ns
L-13-05	30 ns	6 ns
L-13-06	35 ns	7 ns
L-13-07	40 ns	8 ns
L-13-08	45 ns	9 ns
L-13-09	50 ns	10 ns
L-13-10	75 ns	15 ns
L-13-11	100 ns	20 ns
L-13-12	150 ns	30 ns
L-13-13	200 ns	40 ns
L-13-14	250 ns	50 ns

1. Measured at 1.5V level
2. Measured from .75V to 2.4V

All measurements at 25°C

COMPATIBLE WITH VIDEO CIRCUITS

Total Delay Tolerance ..... ±5%
Tap Delay Tolerance ..... ±3 ns or ±5%
[2] All Rise Times ..... 4 ns Max.
Logic "0" Out ..... .4V Max.
Logic "1" Out ..... 2.4V Min.
All Lines Internally Terminated
10 TTL Loads Per Tap Max.
20 TTL Loads Per Unit Max.
Operating Temperature ..... 0°C to 70°C
Vcc ..... 5VDC ±.25VDC
Logic "0" In ..... .8V Max., −2 mA Max.
Logic "1" In .. 2.0 to 5.5V, 50μA to 1 mA

INPUT TEST CONDITIONS

Pulse Width ..... 40% TD Min.
Vcc ..... 5.0VDC, 40 mA
Rise Time ..... 3.0 ns
Pulse Voltage 3.2V

OTHER PARAMETERS AND TOLERANCES AVAILABLE ON REQUEST

AMF
DELAY LINE DIVISION:
DEPT. EM, 195 McGREGOR STREET
MANCHESTER, NEW HAMPSHIRE 03102
TELEPHONE (603) 627-3831 • TWX 710-220-1876

RCL Electronics

ACTIVE-DIGITAL DELAY MODULES (FOR TTL & DTL APPLICATIONS)

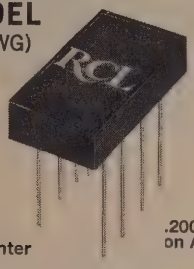
NOW RCL OFFERS DIGITAL DELAY MODULES WITH EXTENDED RANGE OF DELAYS

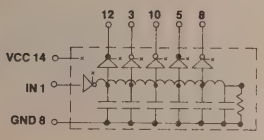
- DDM Range Extended from 25 to 1000 nsec.
- TTL and DTL Compatible
- Extremely Low Profile (.250" Off Board)

SPECIFICATIONS

Rise Time (All Models)	2 nsec. Max.
Logic 1V Out (All Models)	2.4V Min.
Logic 0V Out (All Models)	0.6V Max.

5 TAP MODEL
(All leads #24 AWG)





.300 Center-to-Center

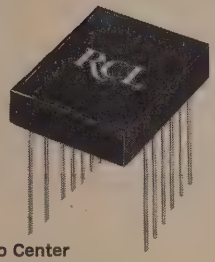
.200 Center to Center on Adjacent Leads

RCL now adds an entirely new dimension to its regular series of Delay Line Modules. 5 TAP packages (1"L x .4"W x .250"High), 10 TAP packages (1"L x .8"W x .250"High).

Built-in interface offers the customer direct plug-in devices without the necessity for additional components. Every model in the line is TTL and DTL compatible.

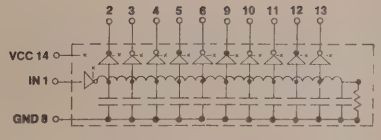
RCL offers 14 different models ranging in total delays from 25 to 1000 nsec.

10 TAP MODEL
(All leads #24 AWG)



.100 Center to Center on Adjacent Leads

.600 Center to Center



Input Conditions
Input Pulse V . . . 3.2V
Vcc . . . 5.00V ±.25V
Pulse Width . . . 40% Td. Min.

5 TAP MODEL

RCL Style	Total Delay (ns ±5%) (a) or ±2 nsec. whichever is greater	(a) (b) Delay (ns) Per Tap
L-28-00	25	5
L-28-01	50	10
L-28-02	100	20
L-28-03	150	30
L-28-04	200	40
L-28-05	250	50
L-28-06	500	100
L-28-07	1000	200

(a) Measured at 1.5V level
(b) ±10% or 2 ns, whichever is greater

Pin #	Connection
1	INPUT
3	40% TD
5	80% TD
7	GROUND
8	100% TD
10	60% TD
12	20% TD
14	Vcc

Temperature Range	0°C to 70°C
Logic "0" Drive Capabilities	10 Loads/Tap Max.
Logic "1" Drive Capabilities	20 Loads/Tap Max.
Total Delay Tolerance	±5% or ±2 ns
Tap Delay Tolerance	±10% or ±2 ns
Logic "1" Input Current	50 μA Max.
Logic "0" Input Current	−2 mA Max.

10 TAP MODEL

RCL Style	Total Delay (ns ±5%) (a) or ±2 nsec. whichever is greater	(a) (b) Delay (ns) Per Tap
L-29-01	100	10
L-29-02	150	15
L-29-03	200	20
L-29-04	250	25
L-29-05	500	50
L-29-06	1000	100

(a) Measured at 1.5V level
(b) ±10% or 2 ns, whichever is greater

Pin #	Connection
1	INPUT
2	TAP #1
3	TAP #2
4	TAP #3
5	TAP #4
6	TAP #5
8	GROUND
9	TAP #6
10	TAP #7
11	TAP #8
12	TAP #9
13	TAP #10
14	Vcc

OTHER PARAMETERS AND TOLERANCES AVAILABLE ON REQUEST

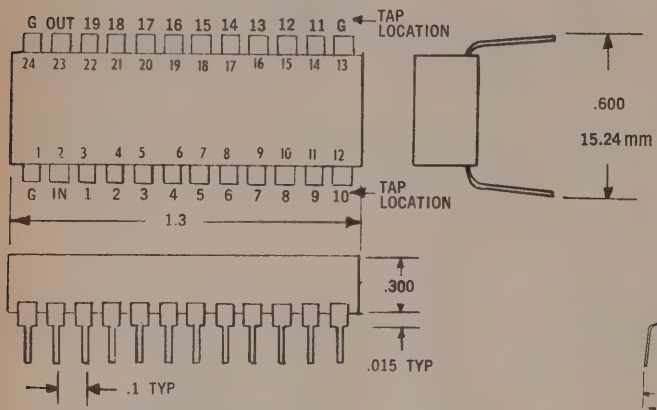
AMF
DELAY LINE DIVISION:
DEPT. EM, 195 McGREGOR STREET
MANCHESTER, NEW HAMPSHIRE 03102
TELEPHONE (603) 627-3831 • TWX 710-220-1876

RCL Electronics

24 PIN DIP DELAY LINE — Series L-23
(20 TAPS) DELAY RANGE 100 THRU 1500 Nsec

COMPATIBLE WITH VIDEO CIRCUITS

- Compatible with TTL circuits
- Total Delay Tolerance = ±5% or 1 nsec, whichever is greater
- Tap Interval Tolerance = ±10% or 1 nsec, whichever is greater
- Impedance Tolerance = ±10%
- Temperature Coefficient of Delay = 70 ppm/°C ±30 ppm/°C
- Operating Temperature Range = −55°C to +125°C
- Voltage Rating = 50VDC
- Low distortion
- Low attenuation
- Epoxy encapsulated
- Td/Tr Ratio = 10/1
- Exceeds applicable portions of MIL-D-23859



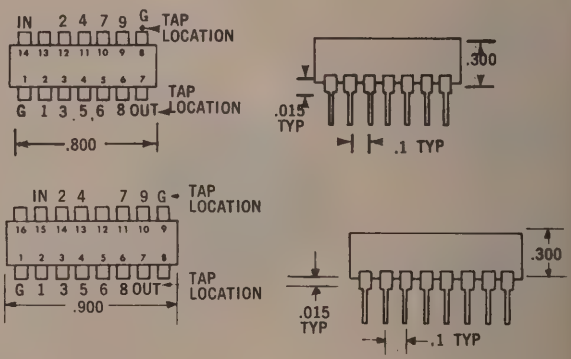
To Order 24 Pin, Series L-23, Use Chart Below

24 Pin Series L-23 Part No.	Impedance (ohms)	Total Delay (nsec.)	Tap Intervals (nsec.)	Rise Time (nsec.)	Max. Attenuation (db)
L-23-10	75	100	5	10	1 db
L-23-11	75	150	7.5	15	1 db
L-23-12	75	200	10	20	1 db
L-23-13	75	250	12.5	25	1 db
L-23-14	100	100	5	10	1 db
L-23-15	100	150	7.5	15	1 db
L-23-16	100	200	10	20	1 db
L-23-17	100	250	12.5	25	1 db
L-23-18	100	300	15	30	1 db
L-23-19	100	350	17.5	35	1 db
L-23-20	200	200	10	20	1 db
L-23-21	200	250	12.5	25	1 db
L-23-22	200	300	15	30	1 db
L-23-23	200	350	17.5	35	1 db
L-23-24	200	400	20	40	1 db
L-23-25	200	500	25	50	1 db
L-23-26	200	600	30	60	1 db
L-23-27	200	700	35	70	1 db
L-23-28	350	350	17.5	35	1 db
L-23-29	350	400	20	40	1 db
L-23-30	350	450	22.5	45	1 db
L-23-31	350	500	25	50	1 db
L-23-32	350	600	30	60	1 db
L-23-33	350	700	35	70	1 db
L-23-34	350	800	40	80	1 db
L-23-35	350	900	45	90	1 db
L-23-36	350	1000	50	100	1 db
L-23-37	350	1100	55	110	1 db
L-23-38	350	1200	60	120	1 db
L-23-39	500	500	25	50	1 db
L-23-40	500	600	30	60	1 db
L-23-41	500	700	35	70	1 db
L-23-42	500	800	40	80	1 db
L-23-43	500	900	45	90	1 db
L-23-44	500	1000	50	100	1 db
L-23-45	500	1500	75	150	1 db

OTHER PARAMETERS & TOLERANCES AVAILABLE ON REQUEST

NEW! 4th GENERATION COMPATIBLE
DELAY RANGE 5 THROUGH 45 Nsec
14 PIN & 16 PIN DIP — Series L-21 & L-22

- Compatible with all logic systems
- Total Delay Tolerance = ±5% or 1 nsec, whichever is greater
- Tap Interval Tolerance = ±20% or .35 nsec, whichever is greater
- Impedance Tolerance = ±10%
- Temperature Coefficient of Delay = 70 ppm/°C ±30 ppm/°C
- Operating Temperature Range = −55°C to +125°C
- Voltage Rating = 50WVDC
- Td/Tr Ratio = 5/1
- Economically priced
- Epoxy encapsulated
- Exceeds applicable portions of MIL-D-23859
- Low distortion
- Low attenuation



To Order 16 Pin Series Use Chart Below But Substitute "22" for "21"

14 Pin Series L-21 Part No.	Impedance (ohms)	Total Delay (nsec.)	Tap Intervals (nsec.)	Rise Time (nsec.)	Max. Attenuation (db)
L-21-250	50	5.0	0.50	2.5	0.5 db
L-21-251	50	7.5	0.75	3.0	0.5 db
L-21-252	50	10.0	1.00	3.5	0.5 db
L-21-253	50	12.5	1.25	4.0	0.5 db
L-21-254	50	15.0	1.50	4.5	0.5 db
L-21-255	50	17.5	1.75	5.0	0.5 db
L-21-256	50	20.0	2.00	5.5	0.5 db
L-21-257	50	25.0	2.50	6.0	0.5 db
L-21-258	50	30.0	3.00	6.5	0.5 db
L-21-259	50	35.0	3.50	7.0	0.5 db
L-21-260	75	5.0	0.50	2.5	0.75 db
L-21-261	75	7.5	0.75	3.0	0.75 db
L-21-262	75	10.0	1.00	3.5	0.75 db
L-21-263	75	12.5	1.25	4.0	0.75 db
L-21-264	75	15.0	1.50	4.5	0.75 db
L-21-265	75	17.5	1.75	5.0	0.75 db
L-21-266	75	20.0	2.00	5.5	0.75 db
L-21-267	75	25.0	2.50	6.0	0.75 db
L-21-268	75	30.0	3.00	6.5	0.75 db
L-21-269	75	35.0	3.50	7.0	0.75 db
L-21-270	100	5.0	0.50	2.5	0.75 db
L-21-271	100	7.5	0.75	3.0	0.75 db
L-21-272	100	10.0	1.00	3.5	0.75 db
L-21-273	100	12.5	1.25	4.0	0.75 db
L-21-274	100	15.0	1.50	4.5	0.75 db
L-21-275	100	17.5	1.75	5.0	0.75 db
L-21-276	100	20.0	2.00	5.5	0.75 db
L-21-277	100	25.0	2.50	6.0	0.75 db
L-21-278	100	30.0	3.00	6.5	0.75 db
L-21-279	100	35.0	3.50	7.0	0.75 db
L-21-280	100	40.0	4.00	8.0	0.75 db
L-21-281	100	45.0	4.50	9.0	0.75 db
L-21-282	200	10.0	1.00	3.5	1 db
L-21-283	200	12.5	1.25	4.0	1 db
L-21-284	200	15.0	1.50	4.5	1 db
L-21-285	200	17.5	1.75	5.0	1 db
L-21-286	200	20.0	2.00	5.5	1 db
L-21-287	200	25.0	2.50	6.0	1 db
L-21-288	200	30.0	3.00	6.5	1 db
L-21-289	200	35.0	3.50	7.0	1 db
L-21-290	200	40.0	4.00	8.0	1 db
L-21-291	200	45.0	4.50	9.0	1 db

OTHER PARAMETERS & TOLERANCES AVAILABLE ON REQUEST

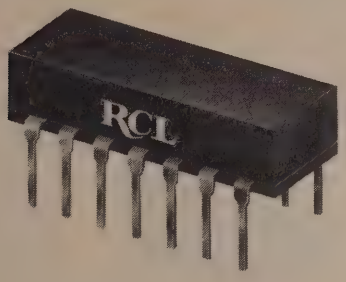
AVAILABLE IN CASE HEIGHTS OF .220 OR .187 FOR AUTOMATIC MACHINE INSERTION

Add Dept. EM to address to tell them you saw it in eem

AMF
DELAY LINE DIVISION:
DEPT. EM, 195 McGREGOR STREET
MANCHESTER, NEW HAMPSHIRE 03102
TELEPHONE (603) 627-3831 • TWX 710-220-1876

RCL Electronics

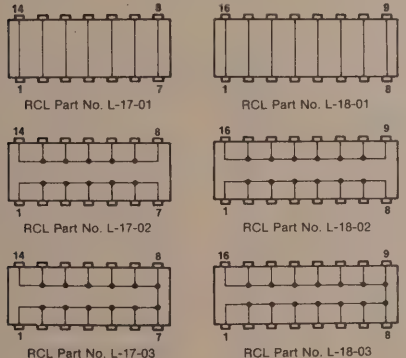
DELAY LINE DUAL-IN-LINE DIP OPTION BLOCKS For Micro Programming



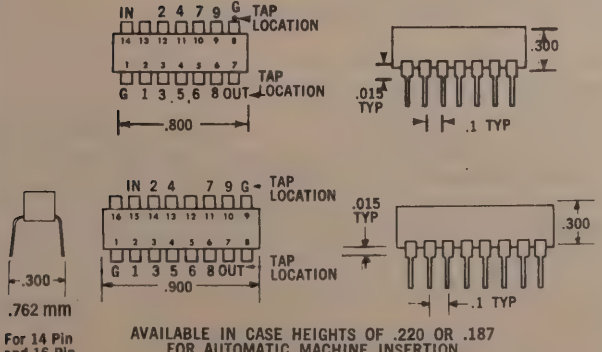
Designed to be used for bussing or micro programming, such as code conversion and rate multiplication. The units can also be used as shorting modules for test fixture compensation.

- 14 & 16 pin packages
- Custom configurations are available
- Shorting pattern may be modified by simply cutting off individual leads
- Allows shorting of multiple arrangements of pins for various circuit applications on circuit boards using a standard DIP spacing.
- May be used for bussing or micro programming, such as code conversion and rate multiplication.
- Can be used as shorting modules for test fixture compensation.

SCHEMATIC



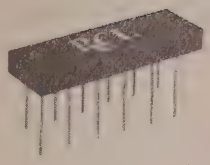
OUTLINE DRAWING


IN 2 4 7 9 G TAP LOCATION
G 1 3 5 6 8 OUT TAP LOCATION
.800
.300
.015 TYP
.1 TYP
IN 2 4 7 9 G TAP LOCATION
G 1 3 5 6 8 OUT TAP LOCATION
.900
.300
.762 mm
For 14 Pin and 16 Pin

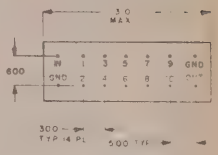
AVAILABLE IN CASE HEIGHTS OF .220 OR .187
FOR AUTOMATIC MACHINE INSERTION

MODULAR DELAY LINES Series L-44

Multiple Discreet Delay Lines in a Single Package

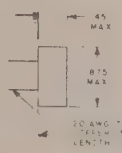


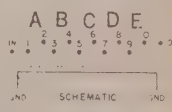
COMPATIBLE WITH VIDEO CIRCUITS



SPECIFICATIONS:

- Operating Temperature: −55°C to +125°C
- Attenuation: 1 db
- Distortion: ±10%
- Temperature Coefficient: 100 ppm/°C
- Dielectric Strength: 100 VDC
- Delay Tolerance: ±5% or ±3 nsec, whichever is greater.
- Impedance: ±10%



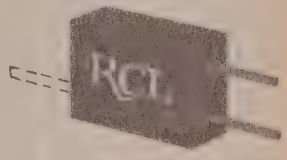


Part No.	Ohms Impedance	Time Delays (nsec.) A	B	C	D	E	Total	Total (nsec.) Rise Time
L-44-10	100	50	40	20	10	5	125	10
L-44-11	100	100	80	40	20	10	250	20
L-44-12	100	200	160	80	40	20	500	50
L-44-13	100	400	320	160	80	40	1000	80
L-44-14	200	50	40	20	10	5	125	10
L-44-15	200	100	80	40	20	10	250	20
L-44-16	200	200	160	80	40	20	500	50
L-44-17	200	400	320	160	80	40	1000	80
L-44-18	500	100	80	40	20	10	250	20
L-44-19	500	400	320	160	80	40	1000	80

OTHER PARAMETERS & TOLERANCES AVAILABLE ON REQUEST

ECONOLINE DELAY LINES Series L-09

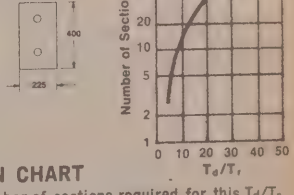
COMPATIBLE WITH VIDEO CIRCUITS



Lumped Constant, Econoline Modules are designed primarily for computer applications where large quantities of low cost time delays are required. Eleven different time delay values between 10 and 200 nanoseconds are available in this new modular form. Each module unit is a single time delay section. The required total delay and delay to rise time ratio can be obtained by simply interconnecting a number of modules. The accompanying chart shows how to select the proper module values.

Econoline Delay Line Modules are also ideal for prototypes and breadboard circuits. Single modules can be connected together on a circuit board with taps available at each connection point, if needed.

Econoline Delay Line Modules should be used in applications where pulse distortion and tolerance are not critical. They provide a convenient low cost time delay for commercial and industrial usage.



SELECTION CHART

The chart above can be used to determine the number of modules required to provide a desired delay and rise time.

1. Determine the delay to rise time ratio by dividing the desired time delay by the desired rise time.
2. Using the chart determine the number of sections required for this T_d/T_r.
3. Divide this number of sections by the total delay to determine the delay per section.

Total delay is the sum of the individual section delays. It can be trimmed to the desired value by selecting the proper value of the last module.

RCL Part No.	Delay nsec. (±10%)	Impedance ohms (±10%)	Attenuation db (max.)	Working Volt. (max.)
L-09-10	10	500	1	100
L-09-11	20	500	1	100
L-09-12	30	500	1	100
L-09-13	40	500	1	100
L-09-14	50	500	1	100
L-09-15	60	500	1	100
L-09-16	70	500	1	100
L-09-17	80	500	1	100
L-09-18	90	500	1	100
L-09-19	100	500	1	100
L-09-20	200	500	1	100

ORDERING INFORMATION

* For relocating ground terminal to Position A use Suffix -1

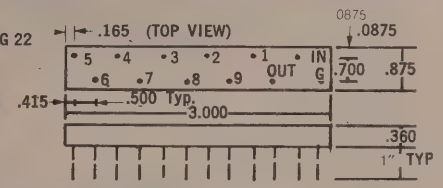
OTHER PARAMETERS & TOLERANCES AVAILABLE ON REQUEST

AMF

DELAY LINE DIVISION:
DEPT. EM, 195 McGREGOR STREET
MANCHESTER, NEW HAMPSHIRE 03102
TELEPHONE (603) 627-3831 • TWX 710-220-1876

RCL Electronics

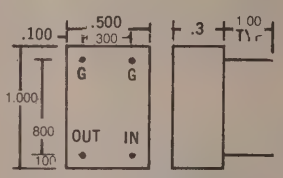
LUMPED CONSTANT DELAY LINES EPOXY ENCAPSULATED
Series L-24



RCL Part No.	Delay nsec.*	Rise Time nsec. (max.)	Impedance Ohms (±10%)	Output Distortion % (max.)	Attenuation % (max.)	Working Voltage (max.)	External Taps
L-24-10	50	7	100	10	10	100	Every 5 nsec.
L-24-11	100	12	100	10	10	100	Every 10 nsec.
L-24-12	200	20	100	10	10	100	Every 20 nsec.
L-24-13	250	25	100	10	10	100	Every 25 nsec.
L-24-14	300	30	100	10	10	100	Every 30 nsec.
L-24-15	400	40	100	10	10	100	Every 40 nsec.
L-24-16	500	50	100	10	10	100	Every 50 nsec.

* =1 nsec or 10%, whichever is greater on total delay or taps, referred to input.
OTHER PARAMETERS & TOLERANCES AVAILABLE ON REQUEST

MINIATURE DELAY LINES — Series L-04

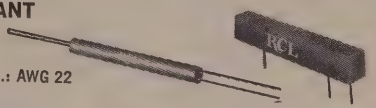


Lead Dia.: AWG 24

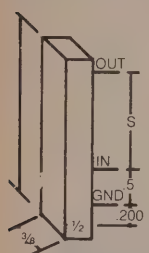
RCL Part No.	Delay nsec. (±5%)	Rise Time nsec.	Impedance ohms (±10%)	Distortion %	Attenuation %	Working Voltage (max.)
L-04-10	20	3	100	10	10	100
L-04-11	25	4	100	10	10	100
L-04-12	40	6	100	10	10	100
L-04-13	50	8	100	10	10	100
L-04-14	75	12	100	10	10	100
L-04-15	100	20	100	10	10	100

OTHER PARAMETERS & TOLERANCES AVAILABLE ON REQUEST

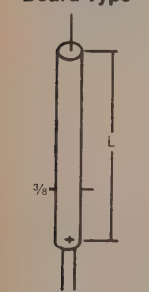
DISTRIBUTED CONSTANT DELAY LINES
Series L-07 & L-08



Lead Dia.: AWG 22



Printed Board Type

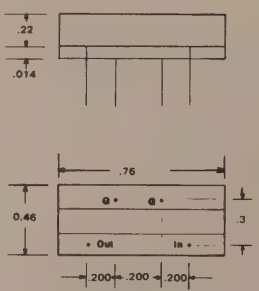


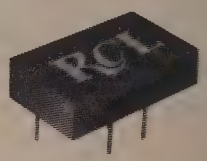
Cylindrical Type

Part No. Printed Board	Part No. Cylindrical Type	Delay μsec. †	Impedance ohms‡	Rise Time μsec.	Attenuation db	Printed Board "L"	Printed Board "S"
L-07-10	L-08-10	.1	500	.055	1.5 db/ μsec. or .25 db whichever is greater	2¼"	.7
L-07-11	L-08-11	.2		.075		2¼"	.7
L-07-12	L-08-12	.3		.080		2¼"	.7
L-07-13	L-08-13	.4		.085		2¾"	1.3
L-07-14	L-08-14	.5		.085		3¼"	1.7
L-07-15	L-08-15	.6		.10		3¾"	2.3
L-07-16	L-08-16	.7		.105		4"	2.5
L-07-17	L-08-17	.8		.120		4½"	2.9
L-07-18	L-08-18	.9		.125		5"	3.5
L-07-19	L-08-19	1.0		.130		5½"	3.9
L-07-20	L-08-20	1.1		.135		5¾"	4.3
L-07-21	L-08-21	1.2		.14		6¼"	4.7
L-07-22	L-08-22	.1	1000	.06	1.8 db/ μsec. or .25 db whichever is greater	2¼"	.7
L-07-23	L-08-23	.2		.065		2¼"	.7
L-07-24	L-08-24	.3		.075		2¾"	1.3
L-07-25	L-08-25	.4		.085		3¼"	1.7
L-07-26	L-08-26	.5		.09		3¾"	2.3
L-07-27	L-08-27	.6		.095		4"	2.5
L-07-28	L-08-28	.7		.100		4½"	2.9
L-07-29	L-08-29	.8		.105		5"	3.5
L-07-30	L-08-30	.9		.110		5½"	3.9
L-07-31	L-08-31	1.0		.120		6"	4.5
L-07-32	L-08-32	1.1		.130		6½"	4.9
L-07-33	L-08-33	.1	1200	.06	1.8 db/ μsec. or .25 db whichever is greater	2¼"	.7
L-07-34	L-08-34	.2		.075		2¼"	.7
L-07-35	L-08-35	.3		.08		2¾"	1.3
L-07-36	L-08-36	.4		.085		3¼"	1.7
L-07-37	L-08-37	.5		.09		4"	2.5
L-07-38	L-08-38	.6		.095		4½"	2.9
L-07-39	L-08-39	.7		.100		5¼"	3.7
L-07-40	L-08-40	.8		.110		5¾"	4.3
L-07-41	L-08-41	.9		.120		6½"	4.9
L-07-42	L-08-42	1.0		.130		6½"	4.9

† ±5% ‡ ±10%
When ordering, lead length should be specified (½" nominal).
OTHER PARAMETERS & TOLERANCES AVAILABLE ON REQUEST

DIP COMPATIBLE SUBMINIATURE DELAY LINES
Series L-05





TYPICAL EXAMPLES:

RCL Part No.	Delay nsec.*	Rise Time nsec.	Impedance† ohms (±10%)
L-05-00	5	2	50
L-05-01	10	4	50
L-05-02	25	10	50
L-05-03	5	2	75
L-05-04	10	4	75
L-05-05	25	10	75
L-05-06	50	20	75
L-05-07	10	4	100
L-05-08	15	6	100
L-05-09	20	8	100
L-05-10	25	10	100
L-05-11	50	20	100
L-05-12	100	46	100
L-05-13	200	80	100
L-05-14	30	16	200
L-05-15	50	20	200
L-05-16	200	80	200
L-05-17	50	20	500
L-05-18	200	80	500
L-05-19	100	46	1000
L-05-20	500	200	1000

Distortion: 10% all-encompassing

Attenuation: 10%

Working Voltage: 100V

Temperature Coefficient: 70 ppm/°C max. −55° to +125°C

Mil Spec: Meets or exceeds all applicable sections of MIL-D-23859.

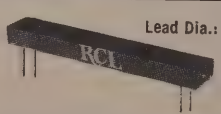
In addition to the above examples of Delays, many others are available on request.

Lead Dia.: AWG 24

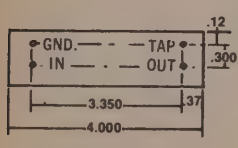
* ±1 nsec. or ±10%, whichever is greater.

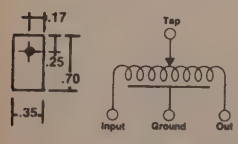
† OTHER PARAMETERS & TOLERANCES AVAILABLE ON REQUEST.

VARIABLE DELAY LINES — Series L-62



Lead Dia.: AWG 20





For applications which require adjustable delay time in the operating circuitry. The units are sealed against moisture and contamination. The adjusting shaft is equipped with a watertight "O" ring seal.

10 Turn Adjustment

RCL Part No.	Delay Range nsec.	Impedance ohms	Rise Time Max. nsec.
L-62-11	10-200	200	40
L-62-14	5-80	300	20
L-62-15	10-250	500	60
L-62-18	10-450	500	100
L-62-19	3-100	200	15

OTHER PARAMETERS & TOLERANCES AVAILABLE ON REQUEST

SPECIFYING DELAY LINES

When specifying a delay line for your application, bear in mind that there is often more than one way to meet a delay line requirement; needlessly over-specifying a parameter may substantially increase your cost. For less critical parameters it is always better to specify limits rather than a fixed value. If you are uncertain, don't hesitate to contact an RCL Delay Line Engineer, who will gladly confer with you, (without obligation) and make recommendations.

ALL ABOVE ITEMS COMPATIBLE WITH VIDEO CIRCUITS

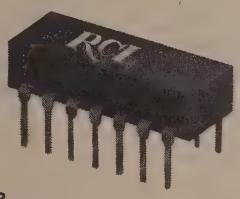
AMF
RCL Electronics
DELAY LINE DIVISION:
DEPT. EM, 195 McGREGOR STREET
MANCHESTER, NEW HAMPSHIRE 03102
TELEPHONE (603) 627-3831 • TWX 710-220-1876

14 AND 16 PIN — SERIES L-21 AND L-22

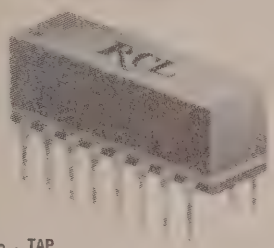
DELAY LINE
DUAL IN-LINE "DIP" PACKAGES

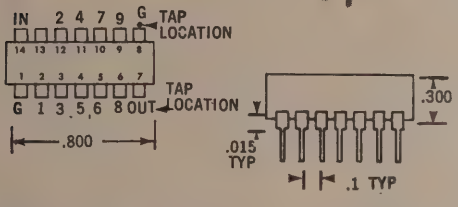
- Compatible with video circuits
- Compatible with TTL circuits
- Total Delay Tolerance = ±5% or 1 nsec, whichever is greater
- Impedance Tolerance = ±10%
- Temperature Coefficient of Delay 70 ppm/°C ±30 ppm/°C
- Tap Interval Tolerance = ±10% or 1 nsec, whichever is greater
- Operating Temperature Range = −55°C to +125°C
- Voltage Rating = 50 wvdc
- Td/Tr Ratio = 5/1 (24 pin = 10/1)
- Economically priced
- Epoxy encapsulated
- Exceeds applicable portions of MIL-D-23859
- Low distortion
- Low attenuation

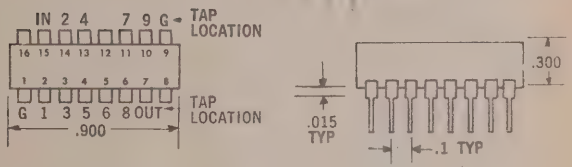
14 PIN DIP DELAY LINE SERIES L-21



16 PIN DIP DELAY LINE SERIES L-22







NOTE: Available in case heights of .220 or .187 for automatic machine insertion.

To order 16 Pin Series use chart below but substitute "22" for "21"

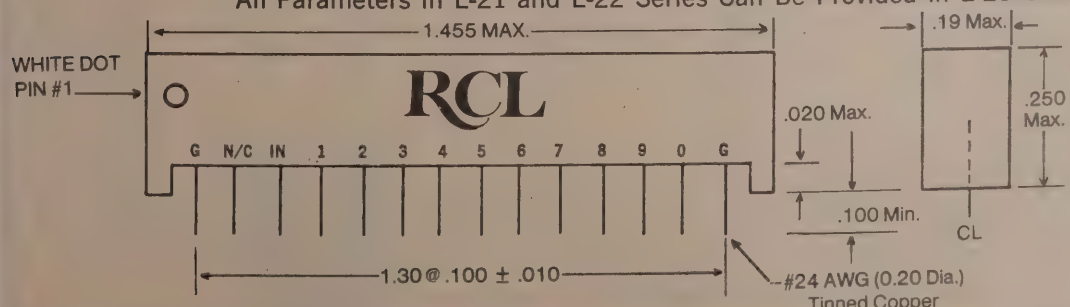
Part No.	Impedance (ohms)	Total Delay (nsec.)	Tap Intervals (nsec.)	Rise Time (nsec.)	Maximum Attenuation (db)
L-21-10	50	40	4	8	1 db
L-21-11	50	50	5	10	1 db
L-21-12	50	60	6	12	1 db
L-21-13	50	70	7	14	1 db
L-21-14	50	80	8	16	1 db
L-21-15	50	90	9	18	1 db
L-21-16	50	100	10	20	1 db
L-21-17	50	125	12.5	25	1 db
L-21-18	50	150	15	30	1 db
L-21-19	50	175	17.5	35	1 db
L-21-20	50	200	20	40	1 db
L-21-21	100	50	5	10	1 db
L-21-22	100	60	6	12	1 db
L-21-23	100	70	7	14	1 db
L-21-24	100	80	8	16	1 db
L-21-25	100	90	9	18	1 db
L-21-26	100	100	10	20	1 db
L-21-27	100	125	12.5	25	1 db
L-21-28	100	150	15	30	1 db
L-21-29	100	200	20	40	1 db
L-21-30	100	300	30	60	1 db

Part No.	Impedance (ohms)	Total Delay (nsec.)	Tap Intervals (nsec.)	Rise Time (nsec.)	Maximum Attenuation (db)
L-21-31	200	50	5	10	1 db
L-21-32	200	60	6	12	1 db
L-21-33	200	70	7	14	1 db
L-21-34	200	80	8	16	1 db
L-21-35	200	90	9	18	1 db
L-21-36	200	100	10	20	1 db
L-21-37	200	125	12.5	25	1 db
L-21-38	200	150	15	30	1 db
L-21-39	200	200	20	40	1 db
L-21-40	200	300	30	60	1 db
L-21-41	500	50	5	10	1 db
L-21-42	500	60	6	12	1 db
L-21-43	500	70	7	14	1 db
L-21-44	500	80	8	16	1 db
L-21-45	500	90	9	18	1 db
L-21-46	500	100	10	20	1 db
L-21-47	500	125	12.5	25	1 db
L-21-48	500	150	15	30	1 db
L-21-49	500	200	20	40	1 db
L-21-50	500	300	30	60	1 db

OTHER PARAMETERS & TOLERANCES AVAILABLE ON REQUEST

14 PIN SINGLE-IN-LINE (SIP) DELAY LINES SERIES L-26

All Parameters in L-21 and L-22 Series Can Be Provided in L-26 Series



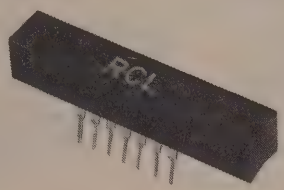
NOTE: PIN NUMBERS FOR REFERENCE ONLY.
PIN SPACING = 0.100"

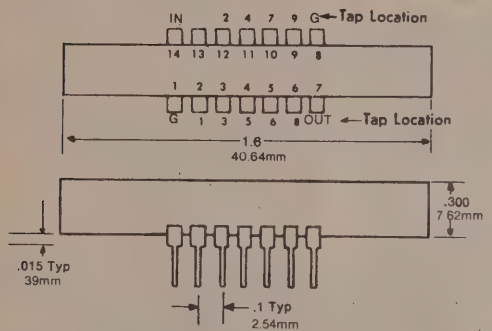
AMF
RCL Electronics
GENERAL SALES OFFICE:
DEPT. EM, 700 SOUTH 21st STREET
IRVINGTON, NEW JERSEY 07111
TELEPHONE (201) 374-3311 • TWX 710-999-5511 • TELEX 138163

14 & 16 PIN CANTILEVER DIP DELAY LINES (10 TAPS) SERIES L-33 & L-34

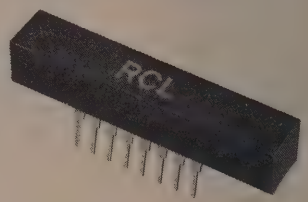
- Compatible with Video and TTL Circuits
- Total Delay Tolerance ± 5% or 1 nsec, whichever is greater
- Impedance Tolerance = ±10%
- Temperature Coefficient of Delay = 70 ppm/°C ±30 ppm/°C
- Tap Interval Tolerance = ±10% or 1 nsec, whichever is greater
- Operating Temperature Range = −55°C to +125°C
- Voltage Rating = 50 wvdc
- Td/Tr Ratio = 10/1
- Epoxy Encapsulated
- Exceeds Applicable Portions of Mil-D-23859
- Low Distortion and Attenuation

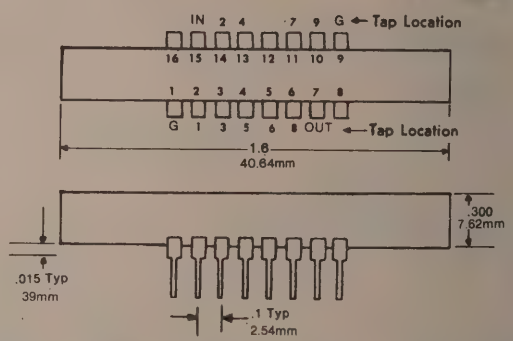
SERIES L-33 (14 PIN)





SERIES L-34 (16 PIN)





14 Pin Series L-33 Part No.	Impedance (ohms)	Total Delay (nsec)	Tap Intervals (nsec)	Rise Time (nsec)	Max. Atten. (db)
L-33-00	50	50	5.0	5.0	1 db
L-33-01	50	75	7.5	7.5	1 db
L-33-02	50	100	10.0	10.0	1 db
L-33-03	50	125	12.5	12.5	1 db
L-33-04	50	150	15.0	15.0	1 db
L-33-05	50	175	17.5	17.5	1 db
L-33-06	50	200	20.0	20.0	1 db
L-33-07	50	225	22.5	22.5	1 db
L-33-08	50	250	25.0	25.0	1 db
L-33-09	50	300	30.0	30.0	1 db
L-33-10	50	350	35.0	35.0	1 db
L-33-11	50	400	40.0	40.0	1 db
L-33-12	50	500	50.0	50.0	1 db
L-33-13	50	750	75.0	75.0	1 db
L-33-14	50	1000	100.0	100.0	1 db
L-33-15	75	50	5.0	5.0	1 db
L-33-16	75	75	7.5	7.5	1 db
L-33-17	75	100	10.0	10.0	1 db
L-33-18	75	125	12.5	12.5	1 db
L-33-19	75	150	15.0	15.0	1 db
L-33-20	75	175	17.5	17.5	1 db
L-33-21	75	200	20.0	20.0	1 db
L-33-22	75	225	22.5	22.5	1 db
L-33-23	75	250	25.0	25.0	1 db
L-33-24	75	300	30.0	30.0	1 db
L-33-25	75	350	35.0	35.0	1 db
L-33-26	75	400	40.0	40.0	1 db
L-33-27	75	500	50.0	50.0	1 db
L-33-28	75	750	75.0	75.0	1 db
L-33-29	75	1000	100.0	100.0	1 db
L-33-30	75	1250	125.0	125.0	1 db
L-33-31	75	1500	150.0	150.0	1 db

14 Pin Series L-33 Part No.	Impedance (ohms)	Total Delay (nsec)	Tap Intervals (nsec)	Rise Time (nsec)	Max. Atten. (db)
L-33-32	100	50	5.0	5.0	1 db
L-33-33	100	75	7.5	7.5	1 db
L-33-34	100	100	10.0	10.0	1 db
L-33-35	100	125	12.5	12.5	1 db
L-33-36	100	150	15.0	15.0	1 db
L-33-37	100	175	17.5	17.5	1 db
L-33-38	100	200	20.0	20.0	1 db
L-33-39	100	225	22.5	22.5	1 db
L-33-40	100	250	25.0	25.0	1 db
L-33-41	100	300	30.0	30.0	1 db
L-33-42	100	350	35.0	35.0	1 db
L-33-43	100	400	40.0	40.0	1 db
L-33-44	100	500	50.0	50.0	1 db
L-33-45	100	750	75.0	75.0	1 db
L-33-46	100	1000	100.0	100.0	1 db
L-33-47	100	1250	125.0	125.0	1 db
L-33-48	100	1500	150.0	150.0	1 db
L-33-49	100	1750	175.0	175.0	1 db
L-33-50	100	2000	200.0	200.0	1 db
L-33-51	200	100	10.0	10.0	1 db
L-33-52	200	125	12.5	12.5	1 db
L-33-53	200	150	15.0	15.0	1 db
L-33-54	200	175	17.5	17.5	1 db
L-33-55	200	200	20.0	20.0	1 db
L-33-56	200	225	22.5	22.5	1 db
L-33-57	200	250	25.0	25.0	1 db
L-33-58	200	300	30.0	30.0	1 db
L-33-59	200	350	35.0	35.0	1 db
L-33-60	200	400	40.0	40.0	1 db
L-33-61	200	500	50.0	50.0	1 db
L-33-62	200	750	75.0	75.0	1 db
L-33-63	200	1000	100.0	100.0	1 db
L-33-64	200	1250	125.0	125.0	1 db
L-33-65	200	1500	150.0	150.0	1 db

To Order 16 Pin (Series L-34) Substitute "34" or "33" (i.e. L-33-00 becomes L-34-00)

OTHER PARAMETERS AND TOLERANCES AVAILABLE ON REQUEST

A GOOD BOOK IS KNOWN BY THE COMPANIES IT KEEPS.

These manufacturers have invested in the IC MASTER to bring you the most complete information on their newest standard products.

HEN USING THE IC MASTER, REFER TO THESE MANUFACTURERS' COMPLETE DATA SHEETS TO HELP YOU IN YOUR IC SELECTION . . .

THE WHOLE WORLD FOLLOWS THE MASTER.

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It's Faster With the Master

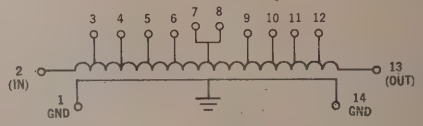
Technitrol, Inc.

DUAL-IN-LINE, LOW PROFILE MINIATURE LUMPED — CONSTANT DELAY LINES

Part No.	Delay (NS)	Rise Time (NS-Max.)	Impedance (Ohms) ±10%	DCR (Ohms Max.)	Tap Delay (NS-Max.)
LF10D1	10	2.2	100	1.0	1.0
LF10E1	12.5	3.5	100	1.0	1.25
LF10F1	20	3.3	100	1.5	2.0
LF10G1	25	3.7	100	1.5	2.5
LF10K1	50	8.4	100	2.5	5.0
LF10M1	100	17.0	100	5.0	10.0
LF10P1	200	38.0	100	11.5	20.0

Also available in 50 ohm, 200 ohm impedance. Other values of delay, taps on application.

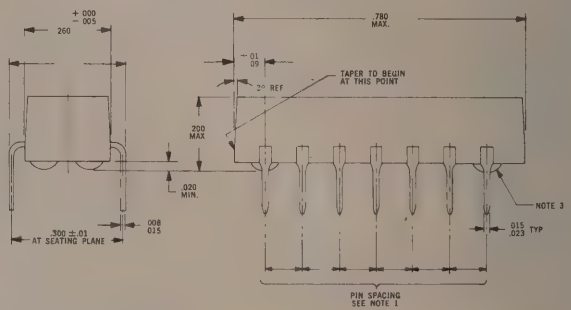
DISTORTION: Pre-Pulse ±10% Max.
Pulse ±10% Max.
INSULATION RESISTANCE: 10K megohms at 100 VDC
HIPOT: 100 VDC
TEMPERATURE COEFFICIENT: < 100 PPM/°C



NOTES:

1. Each pin is located ±.010 of its nominal multiple of .100 along this longitudinal dimension relative to pins 7 and 8.
2. Lead material Kovar tintillate plated.
3. Standoffs to be flat within .001 of each other.

Max. height of hi-performance line — .250". Standoff configuration may vary.

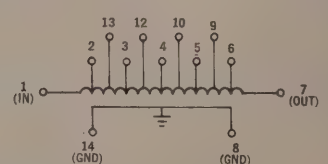


DUAL-IN-LINE HI PERFORMANCE DELAY LINES

Part No.	Delay (NS)	Rise Time (NS-Max.)	Impedance (Ohms) ±10%	DCR (Ohms Max.)	Tap Delay (NS-Max.)
LF10DW	10	1.5	100	1.0	1.0
LF10FW	20	3.0	100	1.0	2.0
LF10GW	25	3.8	100	1.0	2.5
LF10KW	50	7.5	100	1.5	5.0
LF10MW	100	14.5	100	3.2	10.0
LF10JW	200	29.0	100	4.1	20.0
LF10QW	250	40.0	100	5.0	25.0
LF10RW	500	80.0	100	7.5	50.0
LF10SW	1000	160.0	100	10.0	100.0

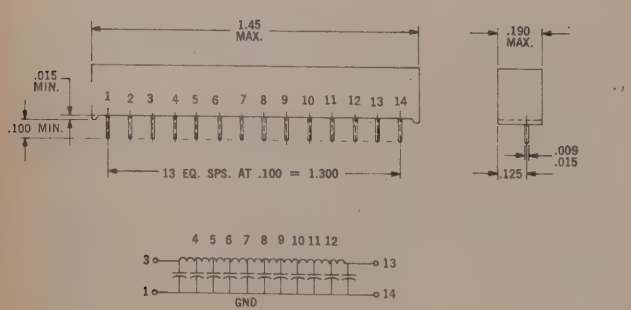
Also available in 50 ohm, 200 ohm impedance. Other values of delay, taps on application.

DISTORTION: Pre-Pulse ±10% Max.
Pulse ±10% Max.
INSULATION RESISTANCE: 10K megohms at 100 VDC
HIPOT: 100 VDC
TEMPERATURE COEFFICIENT: < 100 PPM/°C



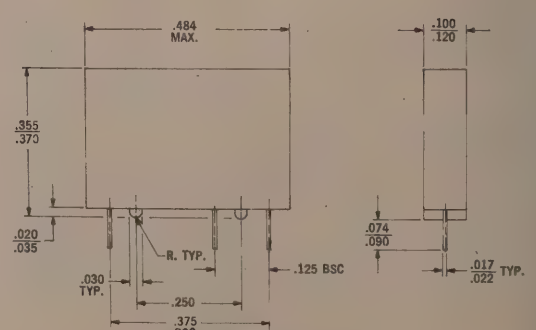
SINGLE-IN-LINE DELAY LINES

IMPEDANCE: 50, 75, 100, 200 ohms
DELAYS: 10 to 1000 NS, 10 taps
T_D/T_R: 5/1 typical



SLIM-PAC DELAY LINES

IMPEDANCE: 50, 75, 100 ohms
DELAYS: .5 to 8.0 NS
T_D/T_R: 3/1 typical



Specifications subject to change without notice.
CALL OR WRITE FOR COMPLETE CATALOG

SEE OUR TRANSFORMER PAGES IN SECTION 5600

Technitrol, Inc.
DEPT. EM, 1952 E. Allegheny Avenue
Philadelphia, Pa. 19134 • (215) 426-9105 • TELEX 834245

Specialists in transformers and completely transfer molded, welded DIP delay lines under 3/16" high

Technitrol, Inc.

TTL DELAY MODULES

TTL Delay Modules are designed to be used directly with super high speed TTL, standard TTL and DTL logic circuits. They provide many timing applications without any or with minimum interface.

TTL Delay Modules can be cascaded to get any combination of delay without degrading output rise time (T_R+ or T_R-). The delay to rise time ratio (T_D/T_R) of individual modules is very high (approximately 50:1) and improves with cascading modules.

Output rise times of each module are independent of input rise times up to 50 nsec. Each module can handle input pulse widths as low as 15 nsec. (with ≤2.5 nsec. input rise times). TTL Delay Modules are encapsulated by transfer molding. They are pin compatible with 74/54 Series TTL/SSI 14 Lead DIP Circuits.

Fanout: Logic 1 — 20 Loads. Logic 0 — 10 Loads.

PART NO.	NANOSECONDS					ALL TAPS T_R+ & T_R-
	T_D1	T_D2	T_D3	T_D4	T_D5	
TTLDL020	10.0 ± 1.5	12.5 ± 1.5	15.0 ± 1.5	17.5 ± 1.5	20.0 ± 1.5	≤1.0 ≤1.0 nsec.
TTLDL025	5.0 ± 1.5	10.0 ± 1.5	15.0 ± 1.5	20.0 ± 1.5	25.0 ± 1.5	≤1.0 ≤1.0 nsec.
TTLDL050	10.0 ± 1.5	20.0 ± 1.5	30.0 ± 1.5	40.0 ± 2.0	50.0 ± 2.5	≤1.0 ≤1.0 nsec.
TTLDL075	15.0 ± 1.5	30.0 ± 1.5	45.0 ± 2.25	60.0 ± 3.0	75.0 ± 3.75	≤2.0 ≤2.0 nsec.
TTLDL100	20.0 ± 1.5	40.0 ± 2.0	60.0 ± 3.0	80.0 ± 4.0	100.0 ± 5.0	≤2.0 ≤2.0 nsec.
TTLDL150	30.0 ± 1.5	60.0 ± 3.0	90.0 ± 4.5	120.0 ± 6.0	150.0 ± 9.0	≤ 2.0 ≤ 5.0
TTLDL200	40.0 ± 2.0	80.0 ± 4.0	120.0 ± 6.0	160.0 ± 8.0	200.0 ± 10.0	≤2.0 ≤5.0 nsec.
TTLDL250	50.0 ± 2.5	100.0 ± 5.0	150.0 ± 7.5	200.0 ± 10.0	250.0 ± 12.5	≤2.0 ≤5.0 nsec.
TTLDL500	100.0 ± 5.0	200.0 ± 10.0	300.0 ± 15.0	400.0 ± 20.0	500.0 ± 25.0	≤2.0 ≤9.0 nsec.

T_D — Time between +1.5 volt points on input and output voltage wave forms either low to high or high to low.
T_R — Time between +0.8 volt and +2.0 volt points on output wave form either low to high or high to low.
Delay Characteristics @ V_{CC} = 5.0V. 25°C.

All units are available in four versions: commercial, commercial with additional testing, military, and military Hi Rel.

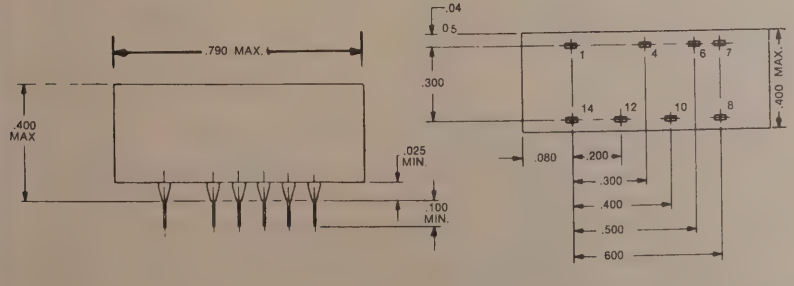
Commercial units use standard commercial grade IC's (plastic package), temperature range 0-70°C.

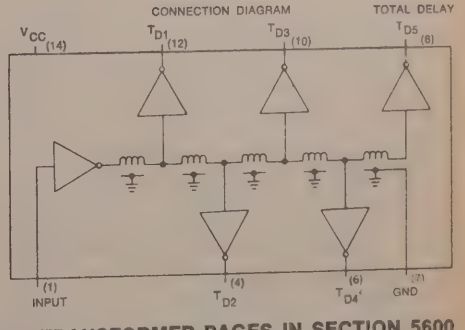
Military "M" units use military grade IC's (ceramic package) to meet MIL-STD-883 but not screened to that specification, temperature range −55°C to +120°C.

Military "MX" units use hermetically sealed IC's in a ceramic case meeting MIL-STD-883 and 38510/Mach IV program (Hi Rel. Spec.), screened and burned in. Temperature range −55°C to +125°C.

Consult factory for detailed specifications.

Custom or special order units available — for example: low power Schottky, 2 or 3 individual lines per package, low profile, single output (no taps), uneven tap spacing.





SEE OUR TRANSFORMER PAGES IN SECTION 5600

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DEPT. EM, 1952 E. Allegheny Avenue
Philadelphia, Pa. 19134 • (215) 426-9105 • TELEX 834245

Specialists in transformers and completely transfer molded, welded DIP delay lines under 3/16" high

ALCOKNOB

A unique collet design provides a firm attachment to any 1/8" or 1/4" shaft without use of exposed setscrews. Knobs with this feature provide the ultimate in appearance and offers protection from shock hazards. The inner collet is tightened around the shaft using only simple tools and is concealed by the cover which snaps in place. Many models are available to fit a number of applications. Additional accessories such as dials and nut covers readily available from stock. Ask for a copy of our full line catalog which shows further listings and details. Supplied complete with appropriate cover.

DISCOUNT SCHEDULE

X-FACTOR
For quantities over 100.

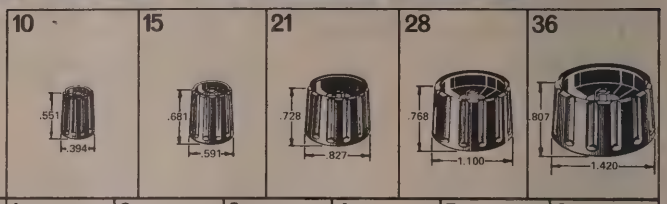
100-249	Multiply by	.90
250-499	Multiply by	.85
500-999	Multiply by	.80

◉ DIAMETER SIZE

Three easy steps to help you choose the knob size and style you require.

Five basic sizes should fill your every requirement. Box number corresponds to those in ◉ column.

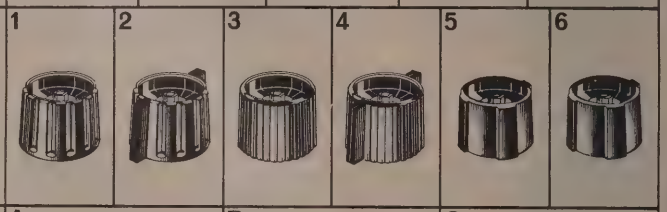
10 (mm)- .394" in diameter.
15 (mm)- .591" in diameter.
21 (mm)- .827" in diameter.
28 (mm)- 1.100" in diameter.
36 (mm)- 1.420" in diameter.



■ STYLES

Three basic family styles. Available either in plain, with protruding pointers or with white line indicators as shown.

1. Fluted, plain.
2. Fluted, with protruding pointer.
3. Serrated, plain.
4. Serrated, w/protruding pointer.
5. Mod, plain.
6. Mod, with indicator line.



▲ CAPS/COVERS

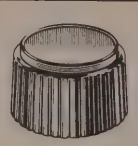
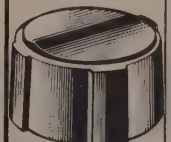
Three Cap/Cover styles complement the basic knob.

A. Lustrous Mod-Styled enhances equipment appearance.

B. Domed design in bright black finish with arrow indicator.

C. Flat with matte aluminum inlay.

Illustration	Model	Shaft Dia.	Color	◉	■	▲	One-99
	AR1-222-W2-202	1/8"	Black	10	1	A	$ .60
	AR1-322-W2-302	1/8"	Black	15	1	A	.65
	AR1-352-W2-302	1/4"	Black	15	1	A	.65
	AR1-422-W2-402	1/8"	Black	21	1	A	.75
	AR1-452-W2-402	1/4"	Black	21	1	A	.75
	AR1-552-W2-502	1/4"	Black	28	1	A	.90
	AR1-652-W2-602	1/4"	Black	36	1	A	1.05
	AR4-222-W2-202	1/8"	Black	10	2	A	$ .75
	AR4-322-W2-302	1/8"	Black	15	2	A	.80
	AR4-352-W2-302	1/4"	Black	15	2	A	.80
	AR4-422-W2-432	1/8"	Black	21	2	A	.90
	AR4-452-W2-432	1/4"	Black	21	2	A	.90
	AR4-552-W2-532	1/4"	Black	28	2	A	1.05
	AR1-222-W1-212	1/8"	Black	10	1	B	$ .65
	AR1-322-W1-312	1/8"	Black	15	1	B	.70
	AR1-352-W1-312	1/4"	Black	15	1	B	.70
	AR1-422-W1-412	1/8"	Black	21	1	B	.80
	AR1-452-W1-412	1/4"	Black	21	1	B	.80
	AR1-552-W1-512	1/4"	Black	28	1	B	.95
	AR1-652-W1-612	1/4"	Black	36	1	B	1.10
	AR1-222-W3-202	1/8"	Black	10	1	C	$ .70
	AR1-322-W3-302	1/8"	Black	15	1	C	.75
	AR1-352-W3-302	1/4"	Black	15	1	C	.75
	AR1-422-W3-402	1/8"	Black	21	1	C	.90
	AR1-452-W3-402	1/4"	Black	21	1	C	.90
	AR1-552-W3-502	1/4"	Black	28	1	C	1.05
	AR1-652-W3-602	1/4"	Black	36	1	C	1.25
	AS1-222-W2-202	1/8"	Black	10	3	A	$ .60
	AS1-322-W2-302	1/8"	Black	15	3	A	.65
	AS1-352-W2-302	1/4"	Black	15	3	A	.65
	AS1-422-W2-402	1/8"	Black	21	3	A	.75
	AS1-452-W2-402	1/4"	Black	21	3	A	.75
	AS1-552-W2-502	1/4"	Black	28	3	A	.90
	AS1-652-W2-602	1/4"	Black	36	3	A	1.05
	AS4-222-W2-202	1/8"	Black	10	4	A	$ .75
	AS4-322-W2-302	1/8"	Black	15	4	A	.80
	AS4-352-W2-302	1/4"	Black	15	4	A	.80
	AS4-422-W2-432	1/8"	Black	21	4	A	.90
	AS4-452-W2-432	1/4"	Black	21	4	A	.90

Illustration	Model	Shaft Dia.	Color	◉	■	▲	One-99
	AS1-222-W1-212	1/8"	Black	10	3	B	$ .65
	AS1-322-W1-312	1/8"	Black	15	3	B	.70
	AS1-352-W1-312	1/4"	Black	15	3	B	.70
	AS1-422-W1-412	1/8"	Black	21	3	B	.80
	AS1-452-W1-412	1/4"	Black	21	3	B	.80
	AS1-552-W1-512	1/4"	Black	28	3	B	.95
	AS1-652-W1-612	1/4"	Black	36	3	B	1.10
	AS1-222-W3-202	1/8"	Black	10	3	C	$ .70
	AS1-322-W3-302	1/8"	Black	15	3	C	.75
	AS1-352-W3-302	1/4"	Black	15	3	C	.75
	AS1-422-W3-402	1/8"	Black	21	3	C	.90
	AS1-452-W3-402	1/4"	Black	21	3	C	.90
	AS1-522-W3-502	1/4"	Black	28	3	C	1.05
	AS1-652-W3-602	1/4"	Black	36	3	C	1.25
	AT1-222-W2-202	1/8"	Black	10	5	A	$ .65
	AT1-322-W2-302	1/8"	Black	15	5	A	.70
	AT1-352-W2-302	1/4"	Black	15	5	A	.70
	AT1-422-W2-402	1/8"	Black	21	5	A	.80
	AT1-452-W2-402	1/4"	Black	21	5	A	.80
	AT1-552-W2-502	1/4"	Black	28	5	A	.95
	AT1-652-W2-602	1/4"	Black	36	5	A	1.10
	AT2-222-W2-202	1/8"	Black	10	6	A	$ .70
	AT2-322-W2-302	1/8"	Black	15	6	A	.75
	AT2-352-W2-302	1/4"	Black	15	6	A	.75
	AT2-422-W2-402	1/8"	Black	21	6	A	.85
	AT2-452-W2-402	1/4"	Black	21	6	A	.85
	AT2-552-W2-502	1/4"	Black	28	6	A	1.00
	AT2-652-W2-602	1/4"	Black	36	6	A	1.15
	AT1-227-W2-207	1/8"	Steel-Blue	10	5	A	$ .70
	AT1-327-W2-307	1/8"	Steel-Blue	15	5	A	.75
	AT1-357-W2-307	1/4"	Steel-Blue	15	5	A	.75
	AT1-427-W2-407	1/8"	Steel-Blue	21	5	A	.85
	AT1-457-W2-407	1/4"	Steel-Blue	21	5	A	.85
	AT1-557-W2-507	1/4"	Steel-Blue	28	5	A	1.00
	AT1-657-W2-607	1/4"	Steel-Blue	36	5	A	1.15
	AT2-227-W2-207	1/8"	Steel-Blue	10	6	A	$ .75
	AT2-327-W2-307	1/8"	Steel-Blue	15	6	A	.80
	AT2-357-W2-307	1/4"	Steel-Blue	15	6	A	.80
	AT2-427-W2-407	1/8"	Steel-Blue	21	6	A	.90
	AT2-457-W2-407	1/4"	Steel-Blue	21	6	A	.90
	AT2-557-W2-507	1/4"	Steel-Blue	28	6	A	1.05
	AT2-657-W2-607	1/4"	Steel-Blue	36	6	A	1.20

ALCO® ELECTRONIC PRODUCTS, INC.
1551 Osgood Street, North Andover, Ma. 01845 U.S.A.
Tel: (617) 685-4371 TWX: 710 342-0552

Prices and specifications subject to change without notice.

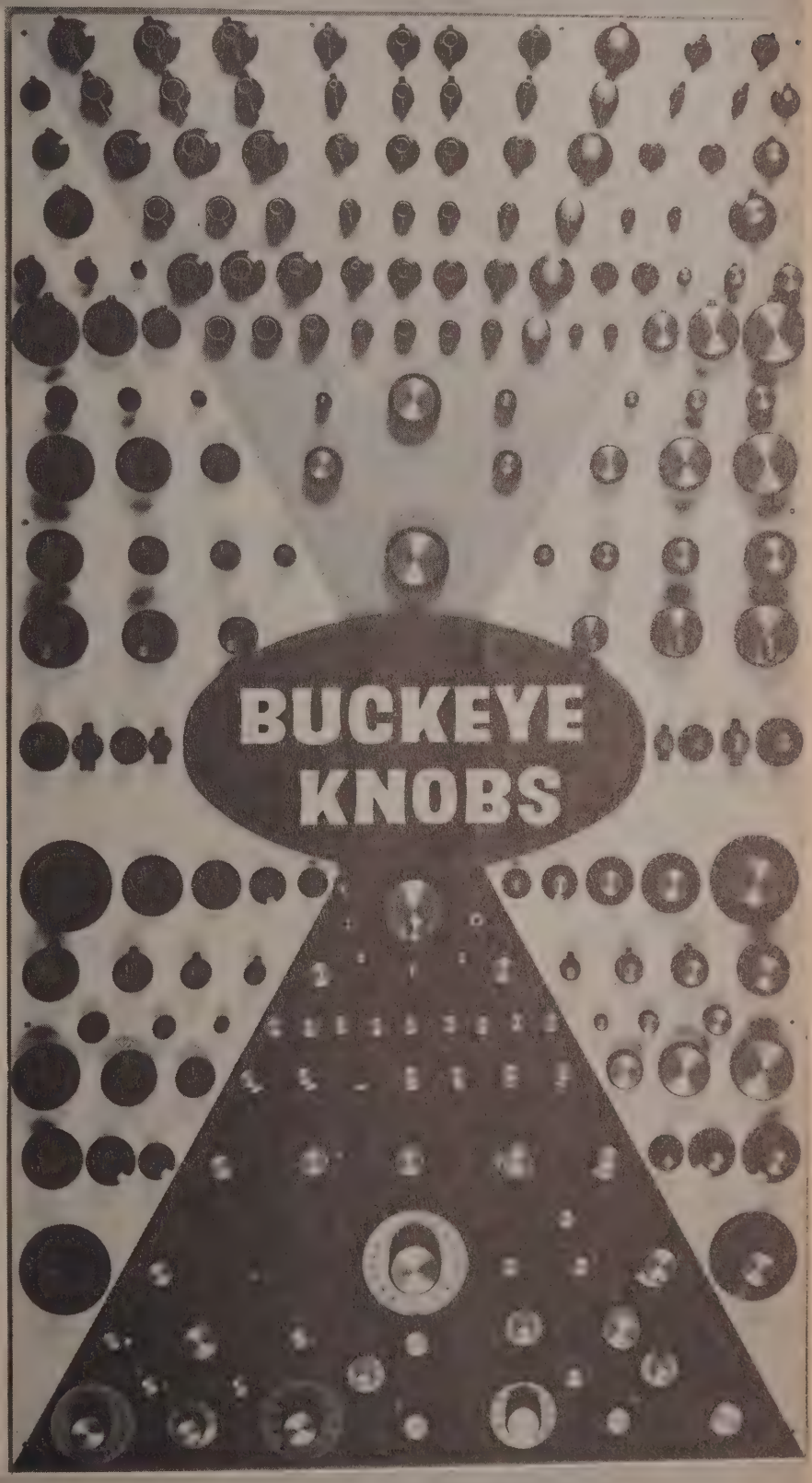
Buckeye KNOBS

IMPERIAL SERIES

DESIGNER SERIES

STANDARD SERIES

PRESTIGE SERIES



STANDARD AND CUSTOM MODIFICATIONS

SILK SCREENING

HOT STAMPING

Buckeye Stamping also manufactures:
Cabinets, Cases, Bord-pak Racks, and modular Card Guides shown on page 1025 section 1400

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"Quality Products Since 1902"

DATAK •dry transfer marking kits

MARK
- *CONTROL PANELS*
- *METERS & DIALS*
- *DRAWINGS & ART*
- *CIRCUIT BOARDS*

A ballpoint pen will transfer these amazing words, letters, numbers or symbols to any clean surface! JUST RUB AND IT'S MARKED. Reproduction quality printing is clean and sharp with no background film or haze. Heat resistant adhesive is safe for diazo copies. Makes your prototypes look like production units. Coat panels with DATAKOAT for permanency.

titles for electronic equipment

CT REJECT REGISTER REGISTER
Y RELAY RELEASE RELEASE REL
Y REMOTE REMOTE REMOTE REM
AT REPEATER REPETITION RESET

This popular set for professionals has well over 2000 titles plus letters and numbers. 24 sheets cover audio, aircraft, controls, communications, computers, microwaves and other specialties.

9581 Black Titles (24 sh.)	$7.49	9611 White Letters (12 sh.)	$3.75
9591 White Titles (24 sh.)	7.49	9621 Blk. Numbers (12 sh.)	3.75
9601 Black Letters (12 sh.)	3.75	9631 Wht. Numbers (12 sh.)	3.75

terminal & chassis marking kit

J J J J J J J J J J J P P P P P P P P P P
Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q
6667686970717273747576 77

Mark chassis, terminals, circuit boards and components with this handy set. Includes all standard component ID letters and consecutive number sheets from 1 to 227. Contains 24 3"x5" sheets.

9661 Black Set $7.49
9671 White Set $7.49

DATAMARK titles and alphabets

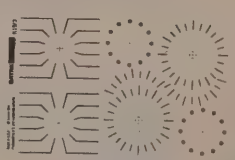
These economical sets offer DATAK quality in 12 specialized assortments of titles, symbols, alphabets and numerals. Each set of 6 sheets (3"x5") covers one electronic specialty. Sets use the same typeface and size as "Titles for Electronic Equipment" so they make handy refills. Coat transferred titles with DATAKOAT for permanency.

K58B Black (K58W — White) Audio, TV, Hi-Fi	$1.89
K59B Black (K59W — White) Amateur Radio & CB	1.89
K60B Black (K60W — White) Experimenter, Home & Intercom	1.89
K61B Black (K61W — White) Test Equipment, Industry	1.89
K62 Marks & Switch Patterns (Black & White)	1.89
K63 1/8" Letters & Numbers (Black, White & Gold)	1.89
K64 1/4" Letters & Numbers (Black, White & Gold)	1.89
K65 1/2" Letters & Numbers (Black, White & Gold)	1.89

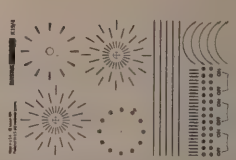
meter & dial marking kit

K19/1 BLK
K19/5 RED
K19/1* WHT

K19/2 BLK
K19/6 RED
K19/9 WHT



K19/3 BLK
K19/7 WHT
K19/12 RED



K19/4 BLK
K19/8, 10 WHT
K19/11 RED

Use directly on control panels and meter dial plates or as 1:1 master art. Tap switch marks are set for standard 15° and 30° detents but can be transferred at any angle for special situations. The complete set has meter arcs and graduations in black and red (white available as a refill)*. Other patterns, letters and numbers supplied in black, white and red. Protect finished panels with DATAKOAT SPRAY. Do not coat dialplates.

968 Meter & Dial Kit $7.49
K19/# (color) Refill of 4 Identical Sheets $4.58

JotdraFT..the reusable P.C. drafting transfer

Donuts on prec. centers transfer singly or in a group. .080"x.031" pads are shown on .200"x.300" centers (Cat #JD-131).

OD" x ID"	Center to center	Qty./kit	Cat #
.093 x .031	.200 x .300	4920	JD-132
.100 x .031	.200 x .300	4920	JD-133
.125 x .031	.200 x .300	4920	JD-134
.150 x .031	.200 x .300	4920	JD-135
.156 x .031	.250 x .250	4608	JD-136
.187 x .031	.250 x .250	4608	JD-137
.200 x .031	.312 x .280	3744	JD-138

Precision spaced donuts, sequential alphanumerics, pad patterns, targets, component outlines — over 700 varieties in black, red and blue. Many designs are reuseable. Transfer them down, then pick up and reposition like an acetate "stick-on". Order a sampler (listed below) or write for a JotDraft flyer and samples. They don't scratch, they don't break apart, they are extraordinary!

JD-# (all kits but samplers) $7.49
JDE-2X Twice Scale Sampler Asst. 4.95
JDE-1X Full Scale Sampler Asst. 4.95

DATAKOAT protective coating

High solids water-clear coat protects transfers under a tough plastic film. Will not attack most plastics, lacquers or cured enamels. No fluorocarbons.

04177 Gloss Spray (12 oz. net wt.) $3.59
04178 Matte Spray (12 oz. net wt.) 3.59
04176 Brushcoat & Thinner Kit (1 oz. ea.) 1.69

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KNOBS...for Anything You Can Think of.

Choose from EHC's vast off-the-shelf inventory of standard knobs and dials.
We probably have the right one for you in stock...
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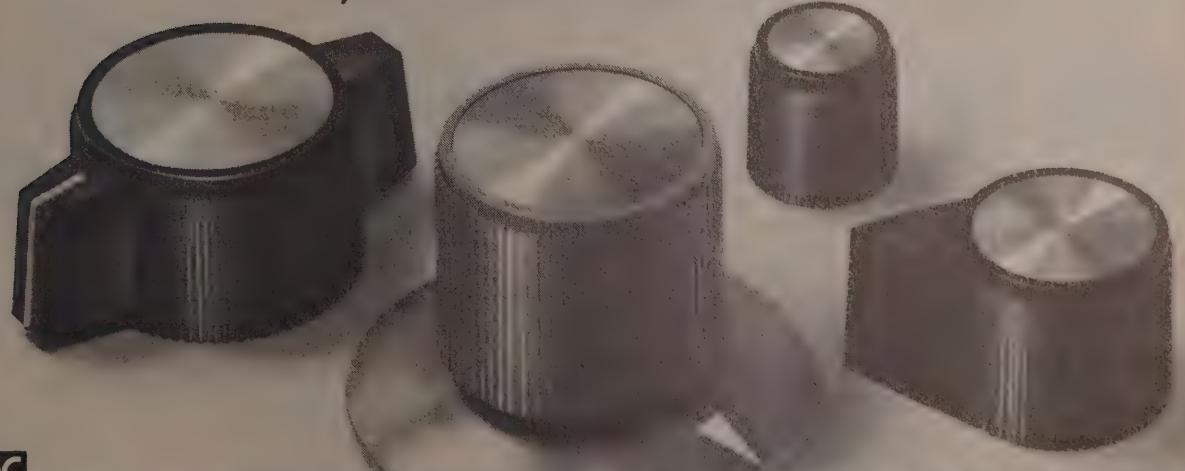
Or, Knobs and Dials built to your specifications...
Any material ● Any size or shape ● Any color or finish
If you can think of it, we can make it.



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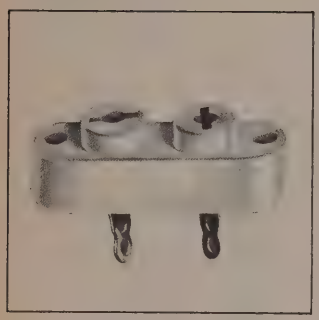
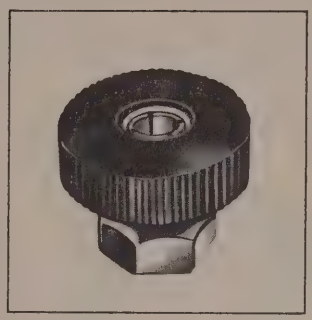
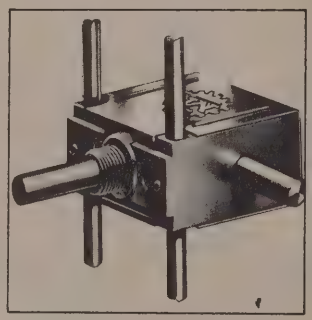
ELECTRONIC HARDWARE CORP

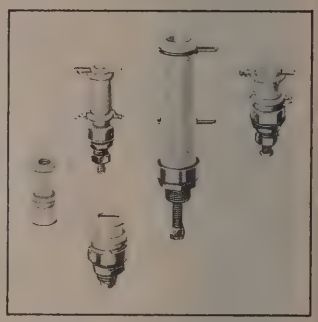
For more information and complete design specifications, write or call for your free copies of our catalogs. Electronic Hardware Corp., 320 Broad Hollow Rd., Farmingdale, N.Y. 11735. 516-752-1950.

GENUINE MILLEN COMPONENTS AND COILS STILL AVAILABLE*

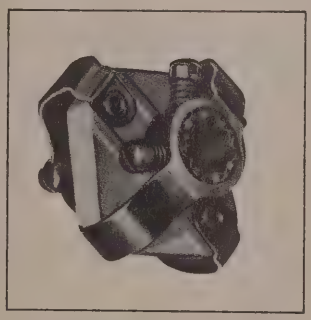

Crystal Socket No. 33102

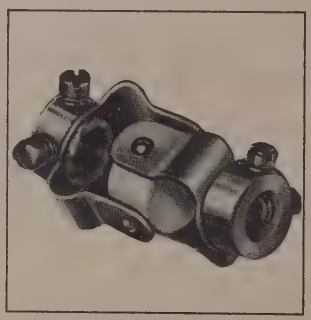

Shaft Lock No. 10062


Right Angle Gear Drive No. 10012


Ceramic Coil Forms 69000 Series

Insulated Coupling No. 39016


Insulated Coupling No. 39002


Insulated Coupling No. 39001

Inductors

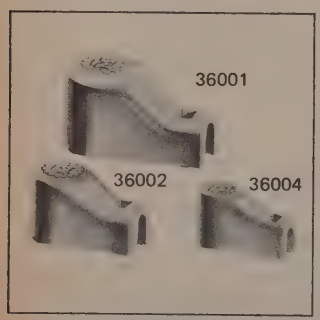
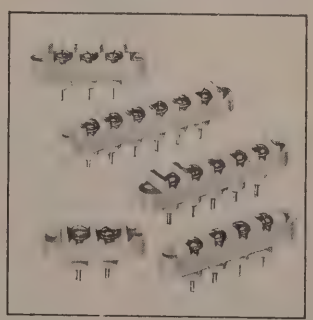
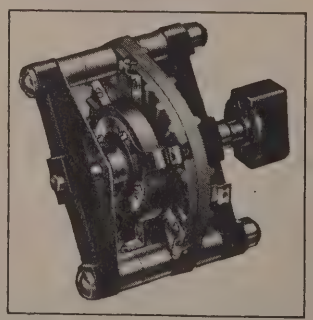
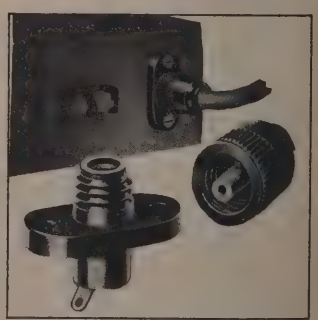


Plate Caps


Ceramic Terminal Strips 37300 Series


High Voltage R-F Switch No. 51001


Safety Terminal No. 37001

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Collet Knobs

INTERLOK
ONE OF THE PURDY GROUP OF COMPANIES

770 AIRPORT BOULEVARD, BURLINGAME, CALIFORNIA 94010 • TEL (415) 348-5625 • TWX 910-374-2353

Modular Design

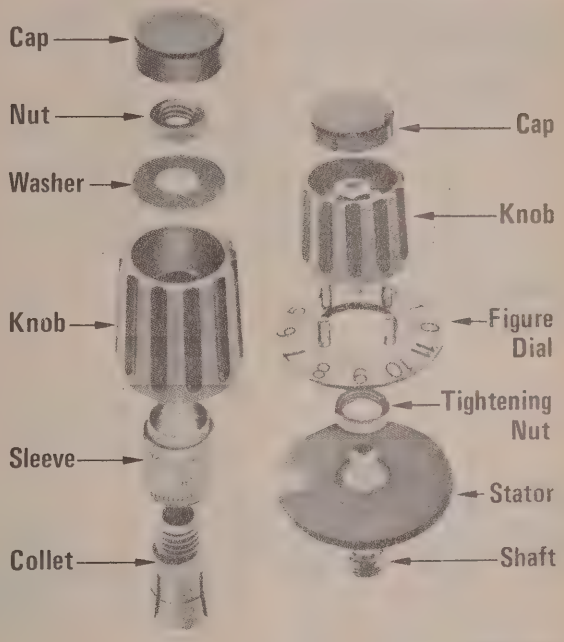
The modular design and the wide assortment of INTERLOK collet knobs offer countless possible combinations. There are 2 programs of INTERLOK collet knobs which differ from one another in their external appearance. The standard and wing knobs are of contemporary design, available in 7 sizes and various colors. A broad selection of accessory components is also available, including knob caps and pointers in no less than 10 colors, various printed dials, stators, sockets and nut covers.

Material

With the exception of the transparent figure dials all INTERLOK collet knobs and accessories are made of Polyamide.

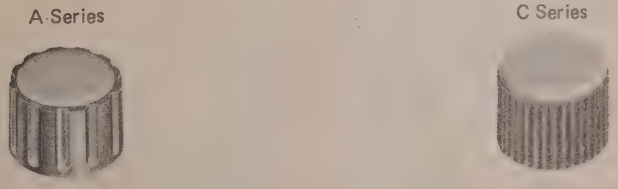
Colors

The INTERLOK collet knob series offers a very wide choice of colors and color combinations in both glossy and matte finish. Collet knobs are available in light gray, black, red and ruby. Caps and pointers are available in light gray, gray, white, black, red, ruby, blue, blue-gray, yellow and green depending on the program.



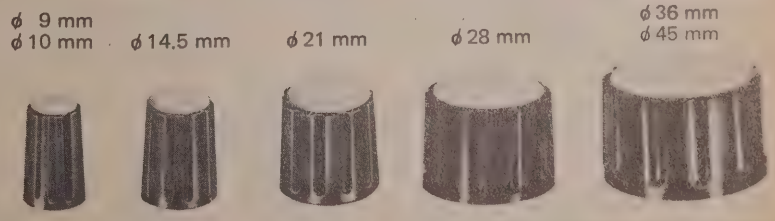
2 Collet Knob Families

Each of the two families offers a full range of sizes and colors. All knob types have attractive and modern styling.



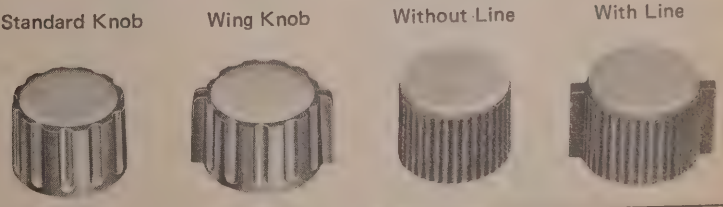
Collet Knob Sizes

All INTERLOK collet knobs are available in diameters of 10 mm, 14.5 mm, 21 mm, 28 mm, 36 mm and 45 mm. An additional 9 mm size can also be supplied in the A series.



Collet Knob Designs

Every INTERLOK knob is available from stock in both conventional and wing versions, each with or without setting line.



Accessories

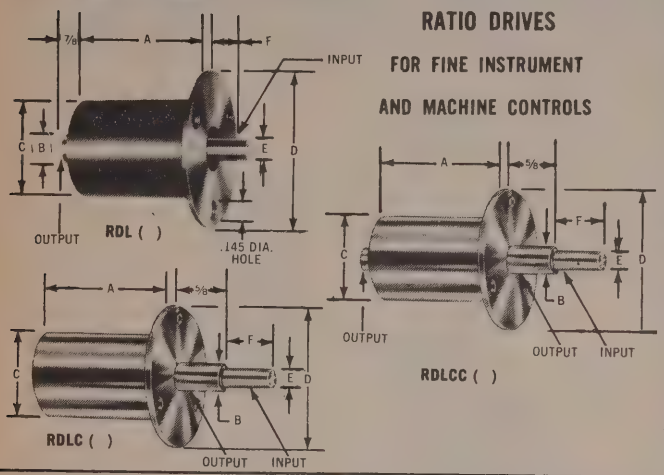
Caps, some with radius line, plus both small and large pointers are available in all sizes and many colors.
Many printed dials are available in various sizes.

For complete information write for our Bulletin No. 7.

JAN HARDWARE
MANUFACTURING COMPANY INC.
47-27 36th STREET • LONG ISLAND CITY, NEW YORK 11101 • TEL: (212) 361-0800

QUALITY
RELIABILITY
ECONOMY

RATIO DRIVES
FOR FINE INSTRUMENT AND MACHINE CONTROLS



BALL BEARING TYPES — Compact, Durable, Exceptionally Smooth Action

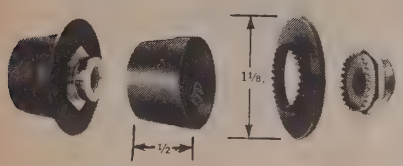
These unique ratio drives employ precision ball bearings. Used for rotary control of components in instruments, they provide unexcelled smooth motion. Ruggedly built, permanently sealed and lubricated, JAN Ratio Drives accommodate applications where miniaturization is essential.

Input and output snafts of these units operate in the SAME DIRECTION. Type "RDL" provides "in-line" input-output shafts. Type "RDLC" is supplied with **concentric** shafts whereby the output envelopes the input shaft. An added feature of Type "RDLCC" is the output shaft in the rear.

Cat. No.	Ratio	A	B O.D.	B I.D.	C	D	Input Shaft E	F	Bolt-Mtg. Dia.
RDL-1	2.6:1	1	3/8	1/4	1 1/8	1 13/16	1/4	3/4	1 15/32
RDL-2	7.0:1	1 13/32	3/8	1/4	1 1/8	1 13/16	1/4	3/4	1 15/32
RDL-3	17.0:1	1 13/16	3/8	1/4	1 1/8	1 13/16	1/4	3/4	1 15/32
RDLC-1	2.6:1	1	3/8	1/4	1 1/8	1 13/16	1/4	1 1/2	1 15/32
RDLC-2	7.0:1	1 13/32	3/8	1/4	1 1/8	1 13/16	1/4	1 5/64	1 15/32
RDLC-3	17.0:1	1 13/16	3/8	1/4	1 1/8	1 13/16	1/4	2 23/32	1 15/32
RDLCC-1	2.6:1	1 13/32	3/8	1/4	1 1/8	1 13/16	1/4	1 5/64	1 15/32
RDLCC-3	17.0:1	2 43/64	3/8	1/4	1 1/8	1 13/16	1/4	1 1/16	1 15/32
RDL-4	45.0:1	2 7/32	3/8	1/4	1 1/8	1 13/16	1/4	2 23/32	1 15/32
RDL-5	120.0:1	2 23/32	3/8	1/4	1 1/8	1 13/16	1/4	1 5/64	1 15/32
RDL-6	300.0:1	3 7/32	3/8	1/4	1 1/8	1 13/16	1/4	1 1/16	1 15/32

All Ratios are ±10%.

KNOB RATIO DRIVE



9 to 1 ratio (to dial skirt).
1:1 to potentiometer.

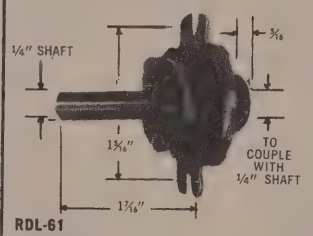
Cat. No. KRD-11 (Plain Gripping Surface)
Cat. No. KRD-12 (Knurled Gripping Surface)

Exploded view shows engineered miniature gear system, to permit precise, fine tuning of controls. As shown, 9 to 1 ratio (to dial skirt). 1:1 to potentiometer. Other ratios designed to specifications.

Brass gears; black anodized aluminum knob and dial. Available with knurled or non-knurled outside knob.

Available for 1/8" shafts. 1/4" on special order.

Now! Corrosion Resistant! IN-LINE RATIO DRIVE — 6.3:1

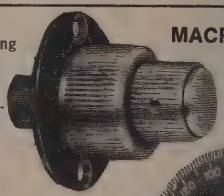


RDL-61

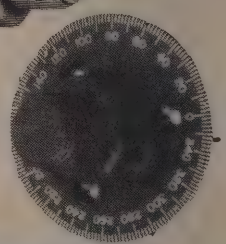
Variations Available to Customers Specifications

For smooth rotary control of components requiring Vernier adjustments. Suitable for use where panel space is at a premium. Durable, ruggedized ball bearing mechanism.

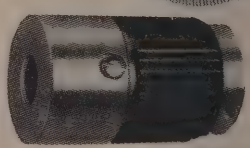
MACROVERNIER CONTROL KNOBS



KRD-1546
Macrovernier Knob, featuring drive mechanism built into the larger dia. knob (1:1 direct drive and 10:1 fine adjusting knob). Also available with non-rotation pins for mounting directly to panel and component.



K-1320-2
Macrovernier Knob.
Flange mounts to front panel. Provisions for Dial mounting. Vernier ratios from 6:1 to 18:1 available on special order. Available with integral dial as required.



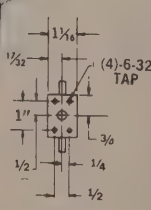
KRD-1549
Macrovernier Knob, featuring ability to mount directly to the panel with panel bearing assembly. Available 10:1 only (or 1:1 direct drive and 10:1 fine adjusting knob).

RIGHT ANGLE RATIO DRIVES — Versatile, Miniaturized, Right Angle Rotary Controls

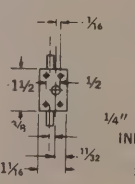
Featuring dual output stainless steel shafts at right angles to input, these engineered drives provide ideal type instrument control. Available with matched bevel worm gears covering a wide range of ratios.

JAN's Right Angle Drives are especially useful for handling spring or gravity-loaded components since the output shaft automatically locks in any desired position yet remains free for smooth adjustment by the input shaft. Assembled in dust-proof housings, the gears are permanently pinned in place on stainless-steel shafts mounted in oilite bearings and held under constant pressure.

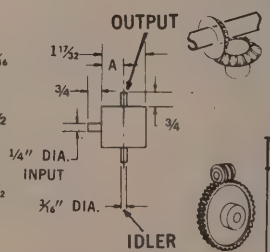
RAWG ( )
RABG ( )



RABG



RAWG



BEVEL GEAR RIGHT ANGLE DRIVES

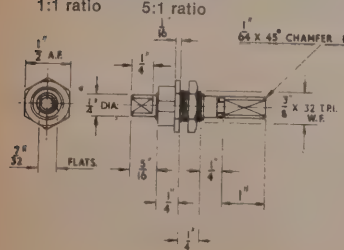
Cat. No.	Ratio	"A"
RABG-1	1:1	7/8
RABG-2	2:1	7/8
RABG-3	3:1	7/8

WORM GEAR RIGHT ANGLE DRIVES

Cat. No.	Ratio	"A"
RAWG-1	5.1	3/4
RAWG-2	10:1	3/4
RAWG-22	12:1	3/4
RAWG-3	20:1	3/4

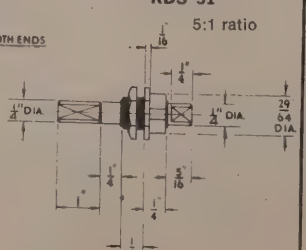
DIRECT DRIVE, REVERSE VERNIER RDS - R 51

1:1 ratio 5:1 ratio

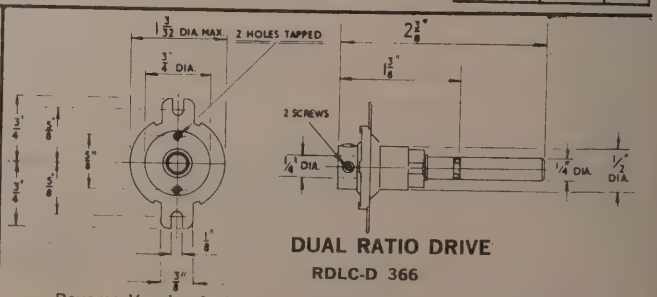


CONTINUOUS DRIVE RDS 51

5:1 ratio



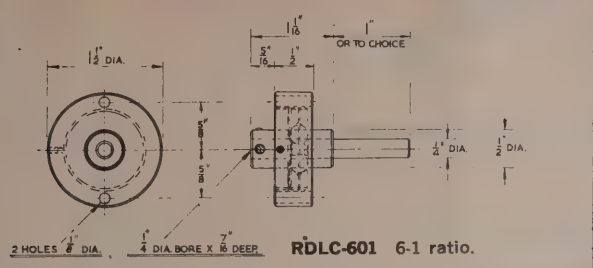
*OTHER LENGTHS AVAILABLE



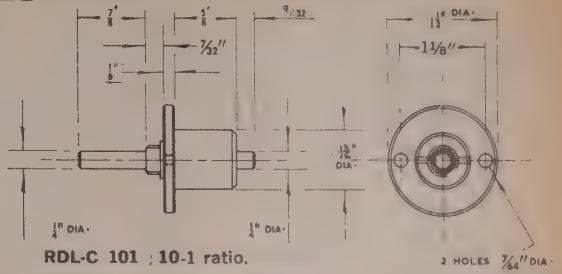
DUAL RATIO DRIVE
RDLC-D 366

Reverse Vernier Action with 36-1 ratio and Fast Drive of 6-1 ratio.
Also available with flange bushing P/N RDLC-D 366-F

RATIO DRIVES



RDLC-601 6-1 ratio.

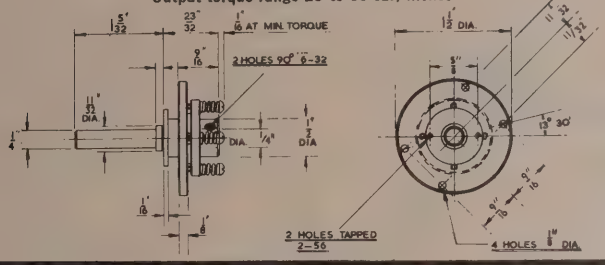


RDL-C 101 ; 10-1 ratio.

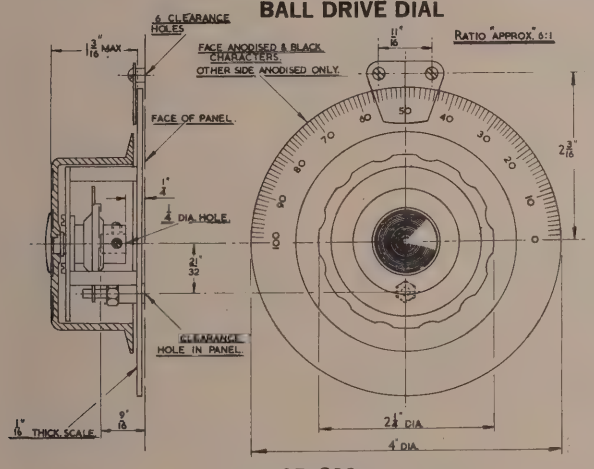
ADJUSTABLE TORQUE BALL DRIVE

RDLA-601 6-1 ratio

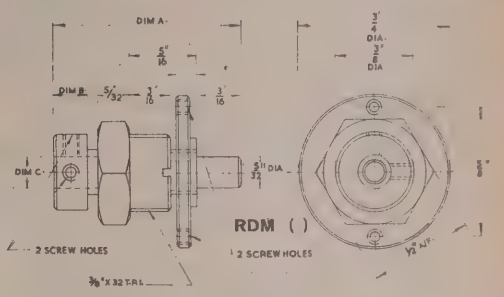
Output torque range 20 to 60 oz./inches



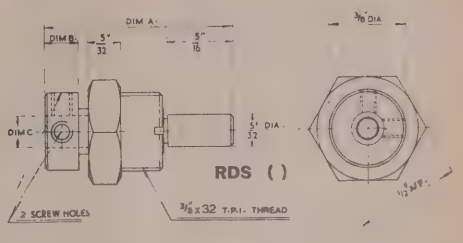
BALL DRIVE DIAL



DAD 600 6-1 ratio.



10-1 ratio.



10-1 ratio.

PART NO.	PART NO.	DIM A	DIM B	DIM C
RDS 101-1	RDM 101-1	29/32"	5/32"	5/32"
RDS 101-2	RDM 101-2	15/16"	13/64"	15/64"
RDS 101-3	RDM 101-3	15/16"	13/64"	1/4"

LIMIT STOP COMPONENTS

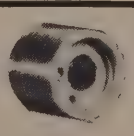
Designers can now consider the limit stop as a component to design with, such as potentiometers, capacitors, or other standard units. The simplicity of adjustment and the large number of available turns enables the stop range to be set with extreme precision. Conveniently located dual locking screws maintain settings under all conditions of shock and vibration.

Available for 1/4" and 3/16" Shafts
Specify — (3) for 3/16"
— (4) for 1/4"

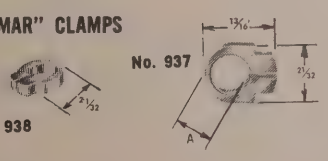
Can be designed internally into JANSET knobs.

MINIATURIZED SLIP CLUTCH

Couples 1/8, 3/16 or 1/4" input - output 'D' shafts (no set screws). Torques: 2 to 50 oz/in. Steel to steel elements (no fibre, plastic, rubber or lubricants). 5/8" dia. x 5/8" long.



"NO-MAR" CLAMPS



Set screw does not touch shaft. Ideal for knob and gear applications. Variety of sizes available.

Cat. No.	A Dimensions in Inches -2	-3	-4	-5	-6	-7	-8
937	1/8	3/16	1/4	5/16	3/8	13/32	7/16
938	1/8	3/16	1/4	5/16	3/8	13/32	

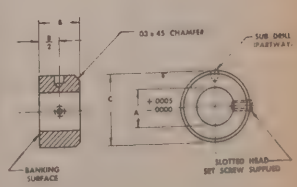
PRECISION SET SCREW COLLARS

Material: 303 Stainless Steel
Finish: Clear Passivate

3/64 to 1/2 Bores

Shaft Size	A	B	C	Set Screw	Part No.
3/64	.0779	.12	7/32	#0-80	SC7-07
5/32	.0935	.12	1/4	#0-80	SC8-09
.12	.1200	.18	5/16	#2-56	SC10-120
1/8	.1248	.18	5/16	#2-56	SC10-124
5/32	.1560	.18	5/16	#2-56	SC10-15
3/16	.1873	.22	3/8	#4-40	SC12-18
.24	.2405	.25	1/2	#6-32	SC16-240
1/4	.2498	.25	1/2	#6-32	SC16-249
5/16	.3123	.28	9/16	#6-32	SC18-31
3/8	.3748	.37	3/4	#10-32	SC24-37
1/2	.4998	.50	1	1/4-20	SC32-49

Special Collars Available on Request.



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MANUFACTURING COMPANY INC.
47-27 36th STREET • LONG ISLAND CITY, NEW YORK 11101 • TEL: (212) 361-0800
QUALITY
RELIABILITY
ECONOMY

POTENTIOMETERS / PRECISION WIRE WOUND

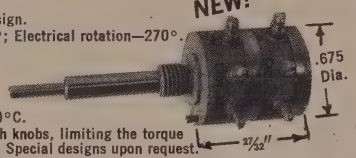
- LINEAR AND NON-LINEAR • SINGLE AND MULTI-TURN
- PENDULUM OPERATED • SECTORS AND GYRO PICKOFFS • SWITCHES

Reliable, competitively priced wire-wound potentiometers for commercial, industrial and military electronic equipment manufacturers.

- **EXCELLENT LINEARITY:** 0.03% available in single turn 5″ diameter unit.
- **LONG LIFE:** Over two million revolutions with base metal windings.
- **WIDE TEMPERATURE RANGE:** Available for operation from −55°C to +125°C.
- **MAXIMUM STORAGE LIFE:** Platinum alloy winding also insures low noise level.
- **RELIABILITY:** Welded taps for better mechanical and electrical connections.
- **HIGH RESOLUTION:** Wire as fine as 0.0003″ diameter can be used.
- **CUSTOM DESIGNS:** Fast prototype delivery on special linear or non-linear units.
- **PRECISION CONSTRUCTION:** Anodized aluminum housings and polished steel shafts.
- **ACCURATE FUNCTIONS:** Welded taps to a single turn of wire eliminates shorted sections of winding at intermediate taps.
- **RUGGEDNESS:** Meets all applicable MIL Specs.
- **LOW NOISE** Maintained over long life and extreme environments by unique wiper designs compatible with winding configurations.

RESISTOR, VARIABLE. Single and Dual gang.

NEW!

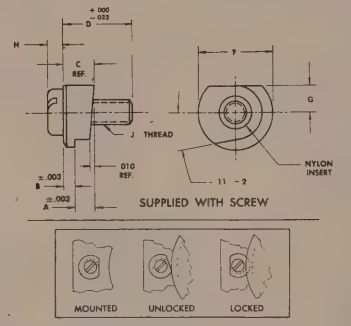


Conforms to MIL-R-12934. Resistance values as required. Linear design.
Power: 1 watt continuously, up to 70°C.; Mechanical rotation—300°; Electrical rotation—270°.
Noise level less than 1% of total resistance.
Operating torque: 4.0 to 6.0 oz. in., detent where specified.
Detent torque: 5 oz. in. above operating torque, or 6.0 to 14.0 oz. in. including unit operating torque.
Min. rotational life: 25,000 cycles. Operating Temp.: —65°C to 150°C.
Clutch Knobs: These potentiometers must be adjusted solely by clutch knobs, limiting the torque exerted on shafts beyond their rotational limits. See Jan catalog. Special designs upon request.

MOTOR MOUNT CLEATS

Type Mount	A	B	C	D	E	F	G	H	J	Part No.
Flush & Recess	.031	.040	.071	.312						SMFR3-1
Flush	.062	.040	.102	.312						SMF3-2
Flush	.062	.050	.112	.375						SMS3-3
Flush	062	.063	.125	.375						SMS3-4
Flush	.078	.063	.141	.375						SMS3-5
Flush	.093	.040	.133	.375	.135	.390	.125	.068	#4-40	SMS3-6
Flush	.093	.050	.143	.375		.385		Max.		SMS3-7
Flush	.093	.063	.156	.375						SMF3-8
Step	.125	.050	.175	.375						SMS3-9
Step	.156	.040	.196	.375						SMS3-10
Step	.225	.063	.288	.437						SMS3-11
Flush	.250	.063	.312	.625						SMF3-12
Flush & Recess	.031	.040	.071	.250						SMFR3-20
Flush	.047	.040	.087	.250	.096	.265	.091	.053	#2-56	SMF3-21
Flush	.062	.040	.102	.250		.260		Max.		SMF3-22
Flush	.093	.040	.133	.312						SMF3-23
Step	.125	.040	.165	.312						SMS3-24
Reverse	.062	.063	.125	*	.135	.390	.125	*	#4-40	SMRV3-30
Reverse	.093	.063	.156	*		.385		*		SMRV3-31

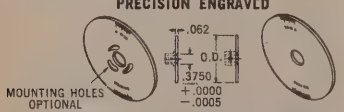
* Reverse type cleat supplied less screw.



PRECISION DISC DIALS

Clockwise and Counter Clockwise

PRECISION ENGRAVED



Material: Aluminum 24ST Black Anodized

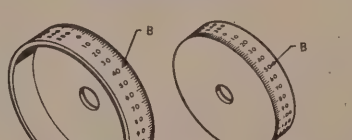
Cat. No.	Range	O.+.000 D.−.003	Steps in Degrees	Graduations
DA-01	—		—	BLANK
DA-02	0-360		2°	180
DA-03	0-100		3°-36′	100
DA-04	0-60	1.500	6°	60
DA-05	0-50		7°-12′	50
DA-06	0-25		14°-24′	25
DA-07	0-10		36°	10
DA-08	—		—	BLANK
DA-09	0-360		2°	180
DA-010	0-120		3°	120
DA-011	0-100		3°-36′	100
DA-012	0-72	2.000	5°	72
DA-013	0-60		6°	60
DA-014	0-50		7°-12′	50
DA-015	0-25		14°-24′	25
DA-016	0-10		36°	10
DA-017	—		—	BLANK
DA-018*	0-360		1°	360
DA-019*	0-360		2°	180
DA-020	0-200		1°-48′	200
DA-021	0-180	3.000	2°	180
DA-022	0-120		3°	120
DA-023*	0-100		3°-36′	100
DA-024	0-72		5°	72
DA-025	0-50		7°-12′	50
DA-026	0-10		36°	10
DA-027	—		—	BLANK
DA-028*	0-360		1°	360
DA-029*	0-360		2°	180
DA-030	0-200	4.000	1°-48′	200
DA-031	0-180		2°	180
DA-032	0-100		3°-36′	100
DA-033	0-50		7°-12′	50
DA-034	0-10		36°	10

*Available counter clockwise. To order, use prefix DC in place of DA.

PRECISION DRUM DIALS

Clockwise and Counter Clockwise

PRECISION ENGRAVED

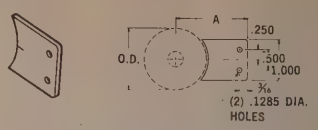


Material: Aluminum 24ST Black Anodized

Cat. No.	A	B	C	Range	Steps in Degrees
DB-1		—		BLANK	—
DB-2	⅜	100	.990	0-100	3°-36′
DB-3		180		0-360	2°
DB-4		—		BLANK	—
DB-5	⅜	60	1.490	0-60	6°
DB-6		100		0-100	3°-36′
DB-7		180		0-360	2°
DB-8		—		BLANK	—
DB-9		50		0-50	7°-12′
DB-10	⅜	25	1.990	0-25	14′-24°
DB-11		10		0-10	36°
DB-12		180		0-180	2°
DB-13		180		0-360	2°
DB-14		—		BLANK	—
DB-15		200		0-200	1°-48′
DB-16	½	180	2.490	0-180	2°
DB-17*		180		0-360	2°
DB-18*		360		0-360	1°
DB-19		100		0-100	3°-36′
DB-20		—		BLANK	—
DB-21		180		0-180	2°
DB-22	½	100	2.990	0-100	3°-36′
DB-23		10		0-10	36°
DB-24*		360		0-360	1°
DB-25*		180		0-360	2°

*Available counter clockwise. To order, use prefix DD in place of DB.

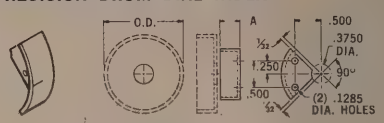
PRECISION DISC DIAL INDEX



Material: Aluminum 24ST Black Anodized
Note: Use with "DA" and "DC" Type Disc Dials

Cat. No.	A	O.D. of Dial
DG-1	1.760	1.500
DG-2	2.010	2.000
DG-3	2.510	3.000
DG-4	3.010	4.000

PRECISION DRUM DIAL INDEX

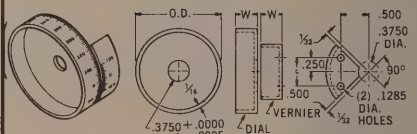


Material: Aluminum 24ST Black Anodized
Note: Use with "DB" and "DD" Type Drum Dials

Cat. No.	A	O.D. of Drum
DF-1	.375	1.490
DF-2	.375	1.990
DF-3	.500	2.490
DF-4	.500	2.999

VERNIER AND DRUM DIAL SETS

PRECISION ENGRAVED



Material: Aluminum 24ST Black Anodized
Note: Special Sets Available on Request
For Additional Information See Technical Section

Cat. No.	O.+.005 D.−.005	W	Dial Graduations	Dial Range	Vernier Reading
DJ-1	1.490	.375	360° in		12′
DJ-2	1.990	.375	2° Steps	0°-360°	12′
DJ-3	2.490	.500	360° in		6′
DJ-4	2.990	.500	1° Steps		6′

PRECISION INDEX

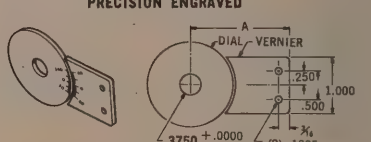
No. 1341 POINTER, DIAL
⅜″W. x ⅜″H. x ⅛″D. Pointer Section thickness .025.

Two .078 Dia. Holes 9/16″ Apart.

Cat. No.	Material
DE-1	Clear Plexiglass
DE-2	Aluminum 24ST Black Anodized

VERNIER AND DISC DIAL SETS

PRECISION ENGRAVED



Material: Aluminum 24ST Black Anodized
Note: Special Sets Available on Request
For Additional Information See Technical Section

Cat. No.	O.+.000 D.−.005	A	Dial Graduations	Dial Range	Vernier Reading
DH-1	1.500	1.760	360° in		12′
DH-2	2.000	2.010	2° Steps	0°-360°	12′
DH-3	3.000	2.510	360° in		6′
DH-4	4.000	3.010	1° Steps		6′

We invite your inquiries for special dials and drums. Also available from stock — precision ground shafts.

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HI-VOLTAGE INSULATED COUPLINGS U.S. PATENT NO. 2,681,387

MEETS MILITARY SPECIFICATIONS — TEMPERATURE - HUMIDITY - SHOCK - VIBRATION - FUNGUS

HI-VOLTAGE INSULATED COUPLINGS

15 KV Breakdown — 10 inch pounds torque
Series No. AK-5079 and No. AK-5164

Engineered with stainless steel shaft and precision, screwdriver tip molded-integrally with Diallyl Phthalate Material in accordance with Military Specifications. Completely shock, vibration and fungus proof, they operate with ease over an ambient temperature range of —75°C to +175°C. Supplied complete with nickel plated mounting hardware.
Stainless steel screwdriver tip fits all standard slotted shafts (potentiometer, etc.) without need for further machining. Ideally suited to adjust high voltage controls thus protecting operating personnel against danger. They are also used to reduce ground capacitance on other types of sensitive instrument controls.

For Commercial Instrument Applications . . .
These couplings are available in general purpose Black Bakelite.
Cat. No. 6164-(X or B)-( ) For Standard Type
Cat. No. 6079-(X or B)-( ) with Locking Type Bushing.
Dimensions are identical with 5000 Series, in chart below.

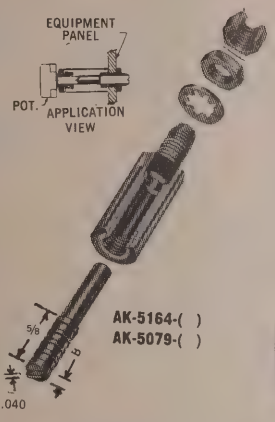
STANDARD TYPE

Cat. No.	Dimensions in Inches "A"	"B"	Shaft	"C"
AK-5164-X-1	3/8	3/16	Slotted	5/16
AK-5164-B-1	3/8	1/16	Slotted	5/16
AK-5164-X-2	3/8	3/16	Slotted	13/32
AK-5164-B-2	3/8	1/16	Slotted	13/32
AK-5164-X-3	3/8	3/16	No Slot	15/16
AK-5164-B-3	3/8	1/16	No Slot	15/16
AK-5164-X-4	3/8	3/16	No Slot	17/16
AK-5164-B-4	3/8	1/16	No Slot	17/16
AK-5164-X-5	3/8	3/16	Slotted	Minus 1/16
AK-5164-B-5	3/8	1/16	Slotted	Minus 1/16

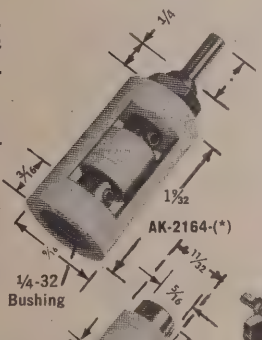
WITH LOCKING TYPE BUSHING

AK-5079-X-1	5/16	3/16	Slotted	1/8
AK-5079-B-1	5/16	1/16	Slotted	1/8
AK-5079-X-2	5/16	3/16	Slotted	9/32
AK-5079-B-2	5/16	1/16	Slotted	9/32

Note: (3/16") to be used with 1/8" long shaft.
(1/16") to be used with 1/4" long shaft.

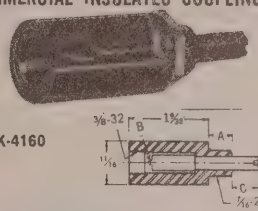


HI-VOLTAGE INSULATED COUPLINGS FOR 1/8" SHAFTS
Cycalac material. Voltage rating: 6000 VDC.
Hubs — Brass, Nickel Plated; Shafts — St. Steel.
*Insert letter "S" or "N" followed by first two numbers of decimal equivalent, for fractional length of shaft beyond bushing.
"S" = with slot. "N" = no slot.
Typical Part Number: AK-2164-N31 =
3/16" long shaft beyond bushing (standard), no slot.
If length is 1" use "X".
Typical Part Number: AK-2164-SX =
1" long shaft beyond bushing, slotted.
If length exceeds 1", use "X" and decimal equivalent for balance of number.
Typical Part Number: AK-2164-NX31 =
1 3/16" long shaft beyond bushing, no slot.



COMMERCIAL INSULATED COUPLINGS

30 KV Breakdown
10 inch pounds torque



STANDARD TYPE

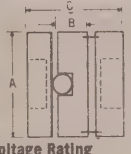
Cat. No.	Dimensions in Inches "A"	"B"	Shaft	"C"
AK-4160-X-1	3/8	3/16	Slotted	1/8
AK-4160-B-1	3/8	3/16	Slotted	1/8
AK-4160-X-2	3/8	3/8	No Slot	1/2
AK-4160-B-2	3/8	3/16	No Slot	1/2

Series No. AK-4160
For TV and Industrial Applications

These handy couplings, capable of withstanding 30 KV, are made of high grade Bakelite throughout except for the stainless steel screwdriver tip molded within the drive shaft. Mounting hardware supplied.

AUTOLINEAR (INSULATED) SHAFT COUPLINGS

2.5-5 KV Breakdown Universal, Miniature, Self-aligning



Part No.	Dia. Hole	Dimensions in Inches "A"	"B"	"C"
AP-1530-2	1/8	1/2	15/64	59/64 ± 1/32
AP-1530-3	3/16	1/2	15/64	59/64 ± 1/32
AP-1530-4	1/4	1/2	15/64	59/64 ± 1/32
AP-1538-2	1/8	1/2	27/64	1 7/64 ± 1/32
AP-1538-3	3/16	1/2	27/64	1 7/64 ± 1/32
AP-1538-4	1/4	1/2	27/64	1 7/64 ± 1/32

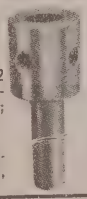
Typical Part No.'s
AP-1530-34
AP-1538-22

Voltage Rating
AP-1530, 2500 V
AP-1538, 5000 V

Cat. No. AP-1530 and AP-1538

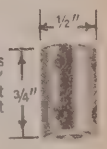
A unique series of shaft couplers that accommodate either similar or dissimilar 1/8", 3/16" or 1/4" shafts. Permits offset misalignment to 1/16" and 5° angle. Operates free of backlash. Self-extinguishing low water absorption characteristic plastic insulator between precision cast aluminum hubs. Each hub has 2 set screws for firm attachment. Alodine finish.

1/4" SHAFT COUPLING EXTENDER



Cat. No. AP-1010
Nickel plated brass with 2 set screws for firm attachment to shaft. 1/2" O.D.; 1 3/4" overall length.
Cat. No. AP-1324
Same as above, except extends 1/4" shaft to 1/8", overall length 2 1/2".

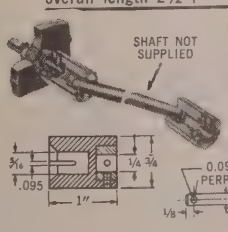
SHAFT COUPLING



Cat. No. AP-15150
A rugged, nickel plated brass coupling for joining two 1/4" shafts. Supplied with 4 set screws for firm attachment to shafts.
Cat. No. AP-15151
Same as above, 2 set screws.

OFFSET-SHAFT (INSULATED) COUPLINGS

10 KV Breakdown ±30° Offset Cat. No. AP-15299



Highly versatile, durable, insulated couplings made with single-unit, molded Nylon-to-metal insert construction. Application requires two couplings — permits smooth control for two parallel shafts offset from each other up to 30° at separations greater than 3". Secured to component and control shafts by 2 set screws.

Note: Coupling is accomplished with a 1/4" shaft of any length (not furnished). Coupling shaft keyed to coupler by steel drive pins supplied.

AK5610 INSULATED COUPLING

For 1/4" shaft. Permits linear and angular misalignment up to .005" and/or 10°.
Breakdown voltage 3KV
3/4" dia. x 5/8" overall length.

REDUCER INSERT BUSHING Cat. No. AK771

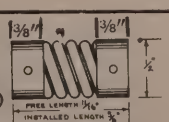
Used as an adapter with high voltage insulated couplings to accommodate miniature (1/8" shaft) potentiometers. External thread 3/8x32. Internal thread 1/4x32.

UNITWIST JAN UNIVERSAL

(shoulder screws supplied)

Specify:
1. Torque Requirement
2. Shaft Diameters (D) in Increments of 1/16"
3. Distance "L" in increments of 1/16"
4. Not available for 1/8" shafts.

SHAFT COUPLING Cat. No. AP 1441-( )



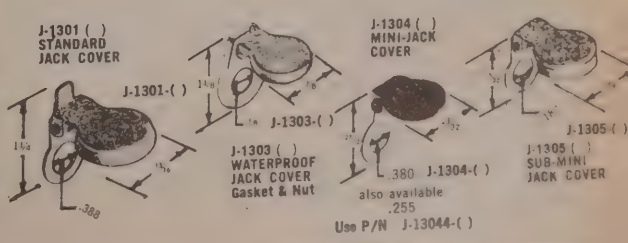
Accommodates either similar or dissimilar 1/8", 3/16", or 1/4" shafts, round or "D" flatted. Torque capacity 12 to 16 oz. in. Other drive torques and sizes available on request.
—(2) 1/8" shaft —(B) 1/8" D flatted
—(3) 3/16" shaft —(D) 1/4" D flatted
—(4) 1/4" shaft
Typical Part Nos.
AP1441-24 couples 1/8" shaft to 1/4" shaft.
AP1441-2D couples 1/8" shaft to 1/4" D flatted.

JACK COVERS (TRIMMER COVERS)

These sturdy Jack Covers fit jack or panel bushings and are used to keep out dust and moisture as well as to prevent inadvertent disturbance of control settings. Outer surfaces are finished in standard colors of baked enamel.

To Order Colors Specify:
(-1) Black Wrinkle; (-2) Smooth Gray; (-3) Smooth Olive; (-4) Smooth Black. Other colors on request.

Example: Jack cover, color black wrinkle, order as **J-1301 (-1)**



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MANUFACTURING COMPANY INC.
47-27 36th STREET • LONG ISLAND CITY, NEW YORK 11101 • TEL: (212) 361-0800

QUALITY
RELIABILITY
ECONOMY

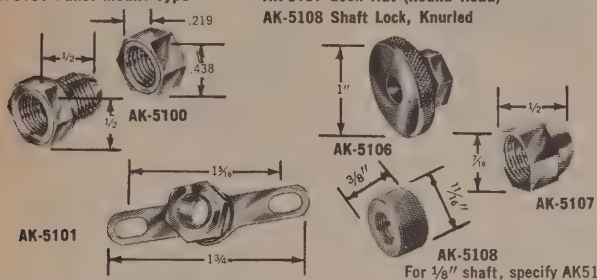
SHAFT LOCKS

Cat. No. AK-5100 thru No. AK-5107 — Split-Bushing, Collet Type Locks

Used to securely hold the shaft of volume controls, capacitors, switches, etc. In position. Body and lock nut are brass — nickel plated. Supplied with nickel plated internal tooth lock washers, upon request.

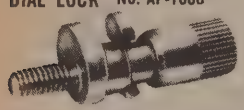
SPLIT BUSHING TYPE — For ¼" Shafts ⅜-32 bushing

AK-5100 Standard Lock Nut
AK-5101 Panel Mount Type
AK-5106 Knurled Shaft Lock (1" O.D. Knurl)
AK-5107 Lock Nut (Round Head)
AK-5108 Shaft Lock, Knurled



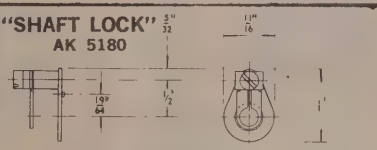
For ⅛" shaft, specify AK5109. (¼-28 thd. 7/32" long. x 5/16" dia.)

DIAL LOCK No. AP-1060



Supplied completely assembled. Securely locks dial in position. Nickel plated on brass. Knurled head. 1⅜" overall length.

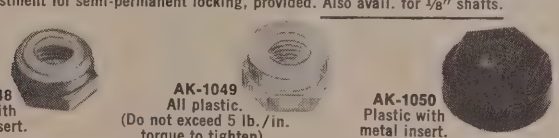
"SHAFT LOCK" AK 5180



FITS OVER ⅜" BUSHING FOR ¼" SHAFT

NEW ITEMS! SHAFT LOCKS

One-piece; fits standard ⅜"-32 thread of shaft bushing. Friction grip holds ¼" shaft to prevent accidental or vibrational disturbance of control settings. Adjustment for semi-permanent locking, provided. Also avail. for ⅛" shafts.



AK-1048 Metal with plastic insert.

AK-1049 All plastic. (Do not exceed 5 lb./in. torque to tighten).

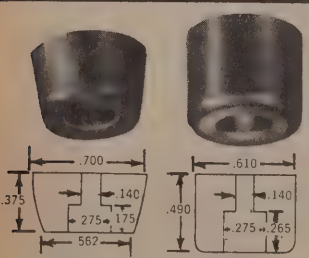
AK-1050 Plastic with metal insert.

SHAFT KNOB LOCK

Cat. No.
AK-1057-2 (*) (⅛" shaft)
AK-1057-4 (*) (¼" shaft)
(Used with 71 Series Knob)
AK-1059-4 (*) (¼" shaft)
(Used with 91 Series Knob)
*Specify "M" or "G" for matte or glossy finish.

Prevents movement of controls due to shock, vibration, or accidental manual contact. Available in matte or glossy finish, for commercial or military applications.

Typical Part Numbers: **AK-1057-2MA = For ⅛" Shaft/matte finish/Black**
AK-1059-4GA = For ¼" Shaft/glossy finish/Black



CHASSIS AND CABINET BUMPERS

Durable, low-friction polyethylene. Guards against scuffing. Supplied in either black or russet brown, with recessed hole for screw or bolt usage.

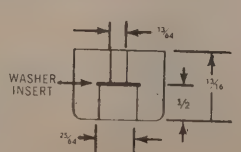
To Order Colors: Black, specify (4); Brown, specify (7). Other colors on request.

AK-574 also available in white nylon; thru hole .187 dia., C bore ⅜". Specify No. AK-577-8

NO. AK-576-4 HEAVY DUTY CHASSIS AND CABINET BUMPER

(WITH STEEL WASHER INSERT)

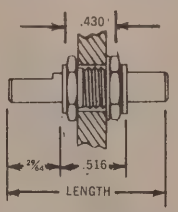
Molded neoprene. 1" diameter, 13/16" high. Configuration similar to AK-574 above. Color: Black. Other colors on request.



PANEL BEARING AND SHAFT ASSEMBLIES

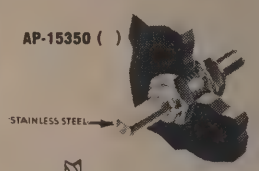
Cat. No. AP-15350 Series

Used for rotary control of components. Passivated stainless steel shaft is ¼" dia. with one end flattened for attaching to knob control by set screws. Supplied completely assembled with two retaining rings, jam nut with lock washer and nickel plated, brass panel bearing. Fits panels up to 3/16" thick; mounts in 13/32" dia. hole.



AP-15350

AP-15350 ( )

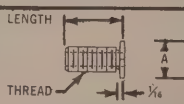


Cat. No.	Item	"L" Shaft Length
AP-15350	Panel Bearing	—
AP-15350-1	Panel Bearing &	1 5/16"
AP-15350-2	Shaft Assembly	3"
AP-15350-3		6"

Also available as Nylon Panel Bearing.

Cat. No. AK-5511 Panel Bearing Assembly
Shafts available on special order.

PANEL BUSHING FOR ¼ AND ⅛ SHAFT



EXAMPLE (TO ORDER)
Pt. No. PB 60814-B = ¼-28 Thd., ½ Lg. Panel Bushing-Brass w/.127 Hole.

Bushing can be supplied with Mtg. nut and int. tooth lockwasher. Can be made to order with special nylon bearings.

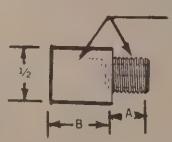
Lgth.	A=⅜ ¼-28 Thread	A=½ ⅜-32 Thread
⅜	PB 60614	PB 80638
7/16	PB 60714	PB 80738
½	PB 60814	PB 80838
⅝	PB 61014	PB 81038
¾	PB 61214	PB 81238
⅞	PB 61414	PB 81438

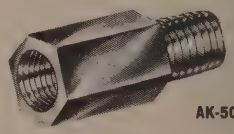
Thread	"C" Dia.
¼-28	.127
⅜-32	.252

BUSHING EXTENDERS Cat. No. AK-5075-1 thru AK-5075-11

Permit staggered mounting of components having ¼" shafts, behind a panel. Useful in meeting problems of space economy. Supplied in nickel plated brass.

Note:
Extender AK-5075-9 is a locking (collet) type and is supplied by JAN with lock nut.





AK-5075 ( )

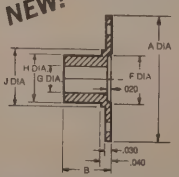
Dimensions in Inches

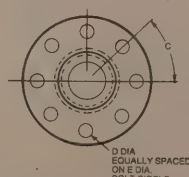
Cat. No.	"B"	"A"
AK-5075-1	5/8	⅜
AK-5075-2	5/8	¼
AK-5075-3	5/8	3/16
AK-5075-4	¾	¼
AK-5075-5	2¼	¼
AK-5075-6	1⅝	¼
AK-5075-7	1 3/16	3/16
AK-5075-8	1 1/16	¼
AK-5075-9	1 1/16	½
AK-5075-10	1 23/64	7/16
AK-5075-11	55/64	7/16

GROUND STUDS Multi-termination ground lugs.
Electrically Sound • Easily Installed • Space Saving

- Provides equipotential chassis termination for ground leads.
- Minimizes resistance between circuit contacts and ground point.
- Diminishes noise, pick-up and regenerative feedback.
- Eliminates the need for buss bars or stacks of lugs.
- Can be use as "Floating Ground" with proper insulation.

NEW!





Material: Brass, Half Hard
Finish: Tin Plate

Part No.	A	B	C	D	E	F	G	H	J
G 1001	¾"	5/16"	30°	1/16" Dia. 12 Holes	3/16"	21/64"	3/16"	5/16"	23/64"
G 5008	¾"	¼"	36°	5/64" Dia. 10 Holes	3/16"	21/64"	3/16"	5/16"	23/64"
G 7004	½"	9/32"	45°	1/16" Dia. 8 Holes	25/64"	17/64"	5/32"	7/32"	13/64"

Add Dept. EM to address to tell them you saw it in eem

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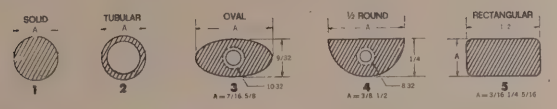
QUALITY
RELIABILITY
ECONOMY

EQUIPMENT HANDLES

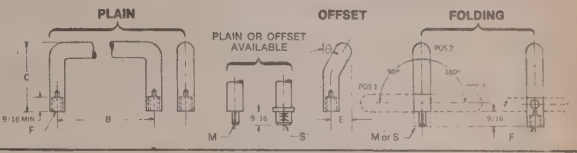
MATERIAL
A — ALUMINUM
B — BRASS
S — COLD ROLLED STEEL
SS — STAINLESS STEEL

FINISH
A — BLACK ANODIZE
B — OPTICAL BLACK
C — CLEAR ANODIZE
E — SATIN ETCH
N — NICKEL PLATE
X — BLACK OXIDE
P — PASSIVATE
O — NO FINISH

SHAPE



TYPE



HOW TO SPECIFY

TYPE OF HANDLE

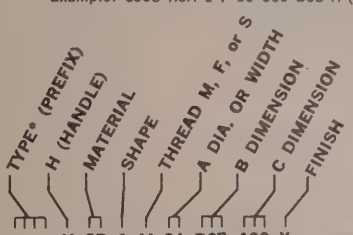
*TYPE	PREFIX	DESCRIPTION
PLAIN	NONE	———
OFFSET	ϕ, E	———
FOLDING	A	A = FREE 180°
	B	B = 2 POS., DETENT, 90°
	C	C = 3 POS., DETENT, 90°

A DIA.	5/16	1/4	5/16	3/8	7/16	1/2
M, F	4-40	8-32	10-32	10-32	10-32	10-32
S	10-32	1/4-28	5/16-24	3/8-24	3/8-24	3/8-24

RECOMMENDED CARRYING LOAD (lbs.) BASED ON HUMAN ENGINEERING FACTORS

A DIA.	1/4	3/8	1/2	5/8	3/4
JAN STD. (lbs.)	10-15	15-20	20-30	30-40	40-50
MIL STD. 1472 (lbs. max.)	15	—	20	—	40

NOTE: For special designs, identify differences from standard in ( ) after Part No.
Example: 3008 H0A 1 F 10 C09 B08 A (F = 6-32 x ¾" deep).



DIMENSION:
θ Specify in Degrees
A, E Specify in 1/16 increments
C, B Specify with Letter + Fraction in 1/16 increments

LETTER VALUE:
A thru Z = 1 thru 26. When Specifying dimension in 1/16 increments, use numerator of fraction for Part No. See Examples.

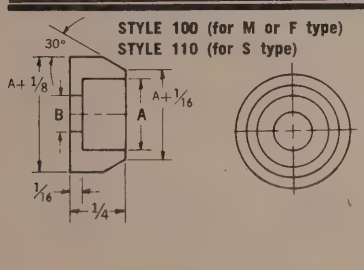
TYPICAL PART NUMBER

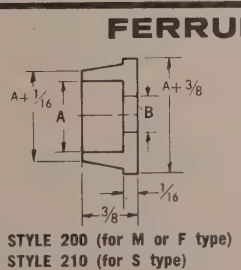
H 0B 1 M 04 D03 A02 X ... Plain Handle Brass, Shape 1, Male Thd., A = ¼ O.D., B = 4¾6, C = 1⅛, Black Oxide Finish.

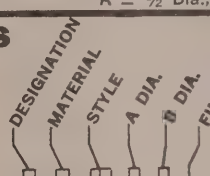
3008 H 0A 1 F 10 C09 B08 A ... 30°, Offset, E = ½, Aluminum, Shape 1. Female Thd,. A = ⅝ O.D., B = 3¾6, C = 2½, Blk. Anodized.

A H SS 2 S 08 D00 A08 P ... Folding Handle, 180°, Free. Stainless Steel, Shape 2. A = ½ Dia., B = 4", C = 1½, Passivate, ⅜-24 thd.

FERRULES







NOTES: "A" dimension is specified in 1/16 increments using numerator of fraction for part No.
"B" Dia. is clearance hole. For thd., see table. For material and finish, see above. See examples.

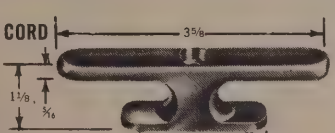
HF OB 100 05 10 X — Ferrule Brass, Style 100, A = 5/16 Dia. B = clearance for 10-32, Black Oxide

HF OA 200 08 10 A — Ferrule Aluminum, Style 200, A = ½ Dia. B = clearance for 10-32, Black Anodized.

Thd. Size	4-40	6-32	8-32	10-32	1/4-24	3/8-24
B	04	06	08	10	25	38

HANDLE, CORD

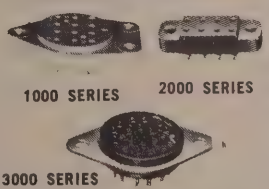
Cat. No. H-692-1



Colors:
(-1) Grey
(-2) Black
Special colors on request.

This durable, die-cast aluminum handle is designed for use on small instrument panels. Single integral hole accepts No. 10 screw.

RELAY SOCKETS WITH FIXED OR REMOVABLE CONTACTS!

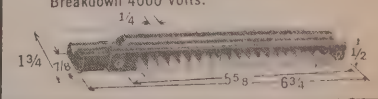


MS No.	JAN Part No.
MS-25322	No. 1010
MS-25324	No. 1020
MS-25326	No. 1030
MS-25328	No. 1040
MS-25330	No. 1050
MS-25456	No. 1060
MS-25458	No. 1070
MS-25460	No. 1080
MS-25462	No. 1090
MS-25464	No. 1100

"FEED THROUGH" TERMINAL BOARDS

No. T-746. Molded of wood-filled melamine per MIL-M-14E.

Avoid expensive tooling. Design around this integrally-molded 20 feed-through terminal board. Equally-spaced terminals can be used for wrap around and/or solder connections. Voltage Breakdown 4000 Volts.



JOLTA SHOCK TEST MACHINES

For Reproducible Impact-Shock Test Pulses

Four Models Engineered to Reproduce the Entire Spectrum of All Significant Impact Shock Waves

JOLTA Bench Model No. 1001 — Produced to meet JAN-S-44 and Mil-Std. 202 (202A). Standard model range 30-120G. Accessory plate springs available for test pulses to 500 G.

JOLTA Bench Model No. M-500 — Produced to meet Mil-T-12679A (Sig. C) and Mil-T-19500A. Standard model range —200 to 1000 G at 1.0 millisecs. Alternate anvil and pad kits available to order.

JOLTA Floor Model Nos. F-3003-C1, C2, C3 — Designed for high impact shock testing for small and moderate-sized components.

SPECIFICATIONS — JOLTA SHOCK TESTERS

Model No.	Carriage Volume	Test Weight	"G" Ranges
1001	4"x4"x5"	0-12 lbs.	25-500
M-500	3" cube	0-2.0 lbs.	100-1000
F-3003-C-1	5" cube	0-12 lbs.	50-1500
F-3003-C-2	5" cube	0-4.0 lbs.	350-5000

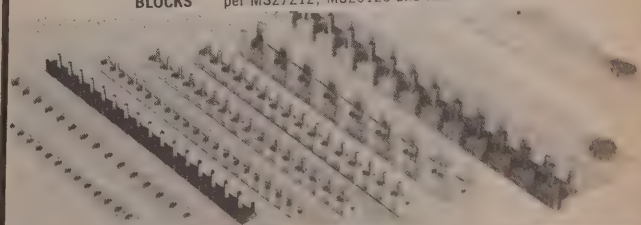
- Economical
- Simple to Operate
- Rugged
- Uniformly Accurate

For Production Testing, Can Be Automated for Continuous Operation

Note:
New design allows for quick changeovers of accessories.

TERMINAL BLOCKS

A complete line of Terminal Blocks per MS27212, MS25123 and NAS 191.

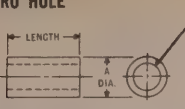


Covers and Nuts per MS18029 and MS25046.

Studs per MS25123

STANDOFFS

SPACER-THRU HOLE



Clearance Hole	Code
.091 Dia. (No. 2 Screw)	1
.116 Dia. (No. 4 Screw)	2
.141 Dia. (No. 6 Screw)	3
.171 Dia. (No. 8 Screw)	4
.194 Dia. (No. 10 Screw)	5
.219 Dia. (No. 12 Screw)	6
.257 Dia. (No. ¼ Screw	7
.312 Dia.	8

Length	A=1/8	A=3/16	A=1/4	Length	A=3/16	A=1/4
1/16	SP 021	SP 031		1 1/16	SP 0311	SP 0411
1/8	SP 022	SP 032	SP 042	3/4	SP 0312	SP 0412
3/16	SP 023	SP 033	SP 043	7/8	SP 0314	SP 0414
1/4	SP 024	SP 034	SP 044	1 5/16	SP 0315	SP 0415
5/16	SP 025	SP 035	SP 045	1	SP 0316	SP 0416
3/8	SP 026	SP 036	SP 046	1 1/8		SP 0418
7/16	SP 027	SP 037	SP 047	1 1/4		SP 0420
1/2	SP 028	SP 038	SP 048	1 3/8		SP 0422
9/16	SP 029	SP 039	SP 049	1 1/2		SP 0424
5/8		SP 0310	SP 0410			

EXAMPLE (TO ORDER) Pt. No. SP 035-2-B = 3/16 Dia. x 3/8 Lg. Spacer-Brass w/.116 Clearance Hole for #4 Screw.

Length	A=3/16	A=3/8	A=1/2	Length	A=5/16	A=3/8	A=1/2
1/8	SP 052	SP 062	SP 082	7/8	SP 0514	SP 0614	SP 0814
3/16	SP 053	SP 063	SP 083	15/16	SP 0515	SP 0615	SP 0815
1/4	SP 054	SP 064	SP 084	1	SP 0516	SP 0616	SP 0816
5/16	SP 055	SP 065	SP 085	1 1/8	SP 0518	SP 0618	SP 0818
3/8	SP 056	SP 066	SP 086	1 1/4	SP 0520	SP 0620	SP 0820
7/16	SP 057	SP 067	SP 087	1 3/8	SP 0522	SP 0622	SP 0822
1/2	SP 058	SP 068	SP 088	1 1/2	SP 0524	SP 0624	SP 0824
9/16	SP 059	SP 069	SP 089	1 5/8		SP 0626	SP 0826
5/8	SP 0510	SP 0610	SP 0810	1 3/4		SP 0628	SP 0828
11/16	SP 0511	SP 0611	SP 0811	1 7/8		SP 0630	SP 0830
3/4	SP 0512	SP 0612	SP 0812	2		SP 0632	SP 0832

EXAMPLE (TO ORDER) Pt. No. SP 064-3-PH = 3/8 Dia. x 1/4 Lg. Spacer-Phenolic w/.141 Clearance Hole for #6 Screw.

MATERIALS B = Brass A = Aluminum SS = Stainless Steel PH = Phenolic

STANDOFF — RIVET

— HEX AND ROUND

Code	Board Thickness	Shank B
1	1/32	.075
2	1/16	.105
3	3/32	.135
4	1/8	.165
5	3/16	.230
6	1/4	.290

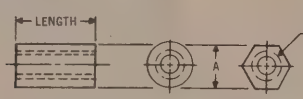
Length	A=1/8 Dia. 0-80 Thread Round	A=1/8 Dia. 0-80 Thread Hex	A=1/4 Dia. 2-56 Thread Round	A=1/4 Dia. 2-56 Thread Hex	A=5/16 Dia. 4-40 Thread Round	A=5/16 Dia. 4-40 Thread Hex	A=3/8 Dia. 6-32 Thread Round	A=3/8 Dia. 6-32 Thread Hex
1/8	RR 202	RH 202	RR 4022	RH 4022	RR 5024	RH 5024	RR 6026	RH 6026
3/16	RR 203	RH 203	RR 4032	RH 4032	RR 5034	RH 5034	RR 6036	RH 6036
1/4	RR 204	RH 204	RR 4042	RH 4042	RR 5044	RH 5044	RR 6046	RH 6046
5/16	RR 205	RH 205	RR 4052	RH 4052	RR 5054	RH 5054	RR 6056	RH 6056
3/8	RR 206	RH 206	RR 4062	RH 4062	RR 5064	RH 5064	RR 6066	RH 6066
7/16	RR 207	RH 207	RR 4072	RH 4072	RR 5074	RH 5074	RR 6076	RH 6076
1/2	RR 208	RH 208	RR 4082	RH 4082	RR 5084	RH 5084	RR 6086	RH 6086
9/16	RR 209	RH 209	RR 4092	RH 4092	RR 5094	RH 5094	RR 6096	RH 6096
5/8	RR 210	RH 210	RR 4102	RH 4102	RR 5104	RH 5104	RR 6106	RH 6106
11/16	RR 211	RH 211	RR 4112	RH 4112	RR 5114	RH 5114	RR 6116	RH 6116
3/4	RR 212	RH 212	RR 4122	RH 4122	RR 5124	RH 5124	RR 6126	RH 6126
7/8	RR 214	RH 214	RR 4142	RH 4142	RR 5144	RH 5144	RR 6146	RH 6146
1	RR 216	RH 216	RR 4162	RH 4162	RR 5164	RH 5164	RR 6166	RH 6166

EXAMPLE (TO ORDER) Pt. No. RR 4052-2-B = 1/4 Dia. x 5/8 Lg. Round, Rivet Stand-off-Brass w/2-56 Thread Shank = .105 for 1/16 Board.

MATERIALS B = Brass A = Aluminum SS = Stainless Steel PH = Phenolic

STANDOFF — THREADED

— HEX & ROUND



MATERIALS B = Brass A = Aluminum SS = Stainless Steel PH = Phenolic

SPECIAL SIZES AND MATERIALS/MANUFACTURED TO ORDER

Lgth.	A=1/8 Dia. 0-80 Thread Round	A=1/8 Dia. 0-80 Thread Hex	A=3/16 Dia. 2-56 Thread Round	A=3/16 Dia. 2-56 Thread Hex	A=3/16 Dia. 4-40 Thread Round	A=3/16 Dia. 4-40 Thread Hex
1/16	SR 201	SH 201	SR 3012	SH 3012	SR 3014	SH 3014
1/8	SR 202	SH 202	SR 3022	SH 3022	SR 3024	SH 3024
3/16	SR 203	SH 203	SR 3032	SH 3032	SR 3034	SH 3034
1/4	SR 204	SH 204	SR 3042	SH 3042	SR 3044	SH 3044
5/16	SR 205	SH 205	SR 3052	SH 3052	SR 3054	SH 3054
3/8	SR 206	SH 206	SR 3062	SH 3062	SR 3064	SH 3064
7/16	SR 207	SH 207	SR 3072	SH 3072	SR 3074	SH 3074
1/2	SR 208	SH 208	SR 3082	SH 3082	SR 3084	SH 3084
9/16	SR 209	SH 209	SR 3092	SH 3092	SR 3094	SH 3094
5/8	SR 210	SH 210	SR 3102	SH 3102	SR 3104	SH 3104
3/4	SR 212	SH 212	SR 3122	SH 3122	SR 3124	SH 3124
1			SR 3162	SH 3162	SR 3164	SH 3164

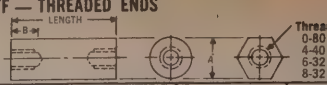
EXAMPLE (TO ORDER) Pt. No. SR 3032-A = 3/16 Dia. x 3/8 Lg. Round Standoff-Aluminum w/2-56 Threaded Hole.

Lgth.	A=1/4 Dia. 4-40 Thread Round	A=1/4 Dia. 4-40 Thread Hex	A=1/4 Dia. 6-32 Thread Round	A=1/4 Dia. 6-32 Thread Hex	A=1/4 Dia. 8-32 Thread Round	A=1/4 Dia. 8-32 Thread Hex	A=1/4 Dia. 10-32 Thread Round	A=1/4 Dia. 10-32 Thread Hex
1/8	SR 4024	SH 4024	SR 4026	SH 4026	SR 4028	SH 4028	SR 40210	SH 40210
3/16	SR 4034	SH 4034	SR 4036	SH 4036	SR 4038	SH 4038	SR 40310	SH 40310
1/4	SR 4044	SH 4044	SR 4046	SH 4046	SR 4048	SH 4048	SR 40410	SH 40410
5/16	SR 4054	SH 4054	SR 4056	SH 4056	SR 4058	SH 4058	SR 40510	SH 40510
3/8	SR 4064	SH 4064	SR 4066	SH 4066	SR 4068	SH 4068	SR 40610	SH 40610
7/16	SR 4074	SH 4074	SR 4076	SH 4076	SR 4078	SH 4078	SR 40710	SH 40710
1/2	SR 4084	SH 4084	SR 4086	SH 4086	SR 4088	SH 4088	SR 40810	SH 40810
9/16	SR 4094	SH 4094	SR 4096	SH 4096	SR 4098	SH 4098	SR 40910	SH 40910
5/8	SR 4104	SH 4104	SR 4106	SH 4106	SR 4108	SH 4108	SR 41010	SH 41010
3/4	SR 4124	SH 4124	SR 4126	SH 4126	SR 4128	SH 4128	SR 41210	SH 41210
7/8	SR 4144	SH 4144	SR 4146	SH 4146	SR 4148	SH 4148	SR 41410	SH 41410
1	SR 4164	SH 4164	SR 4166	SH 4166	SR 4168	SH 4168	SR 41610	SH 41610

EXAMPLE (TO ORDER) Pt. No. SH 4086-B = 1/4 Dia. x 1/2 Lg. Hex Standoff-Brass w/6-32 Threaded Hole.

STANDOFF — THREADED ENDS

— HEX & ROUND



Thread	Depth B
0-80	3/16
4-40	1/4
6-32	3/8
8-32	7/16

Length	A=1/8 Dia. 0-80 Thread Round	A=1/8 Dia. 0-80 Thread Hex	A=1/4 Dia. 4-40 Thread Round	A=1/4 Dia. 4-40 Thread Hex	A=1/4 Dia. 6-32 Thread Round	A=1/4 Dia. 6-32 Thread Hex	A=1/4 Dia. 8-32 Thread Round	A=1/4 Dia. 8-32 Thread Hex
1 1/16	DR 217	DH 217	DR 4174	DH 4174	DR 4176	DH 4176	DR 4178	DH 4178
1 1/8	DR 218	DH 218	DR 4184	DH 4184	DR 4186	DH 4186	DR 4188	DH 4188
1 3/16	DR 219	DH 219	DR 4194	DH 4194	DR 4196	DH 4196	DR 4198	DH 4198
1 1/4	DR 220	DH 220	DR 4204	DH 4204	DR 4206	DH 4206	DR 4208	DH 4208
1 5/16	DR 221	DH 221	DR 4214	DH 4214	DR 4216	DH 4216	DR 4218	DH 4218
1 3/8	DR 222	DH 222	DR 4224	DH 4224	DR 4226	DH 4226	DR 4228	DH 4228
1 7/16	DR 223	DH 223	DR 4234	DH 4234	DR 4236	DH 4236	DR 4238	DH 4238
1 1/2	DR 224	DH 224	DR 4244	DH 4244	DR 4246	DH 4246	DR 4248	DH 4248
2			DR 4324	DH 4324	DR 4326	DH 4326	DR 4328	DH 4328
2 1/8			DR 4344	DH 4344	DR 4346	DH 4346	DR 4348	DH 4348
2 3/4			DR 4444	DH 4444	DR 4446	DH 4446	DR 4448	DH 4448
3			DR 4484	DH 4484	DR 4486	DH 4486	DR 4488	DH 4488

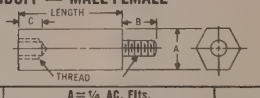
EXAMPLE (TO ORDER) Pt. No. DH 219-B = 1/8 Dia. x 1 3/16 Lg. Hex Standoff-Tapped Both Ends Brass w/o-80 x 3/16 Hole.

Lgth.	A=3/16 Dia. 6-32 Thread Round	A=3/16 Dia. 6-32 Thread Hex	A=3/8 Dia. 6-32 Thread Round	A=3/8 Dia. 6-32 Thread Hex	A=3/8 Dia. 8-32 Thread Round	A=3/8 Dia. 8-32 Thread Hex	A=1/2 Dia. 8-32 Thread Round	A=1/2 Dia. 8-32 Thread Hex
1 1/16	DR 5176	DH 5176	DR 6176	DH 6176	DR 6178	DH 6178	DR 8178	DH 8178
1 1/8	DR 5186	DH 5186	DR 6186	DH 6186	DR 6188	DH 6188	DR 8188	DH 8188
1 3/16	DR 5196	DH 5196	DR 6196	DH 6196	DR 6198	DH 6198	DR 8198	DH 8198
1 1/4	DR 5206	DH 5206	DR 6206	DH 6206	DR 6208	DH 6208	DR 8208	DH 8208
1 5/16	DR 5216	DH 5216	DR 6216	DH 6216	DR 6218	DH 6218	DR 8218	DH 8218
1 3/8	DR 5226	DH 5226	DR 6226	DH 6226	DR 6228	DH 6228	DR 8228	DH 8228
1 7/16	DR 5236	DH 5236	DR 6236	DH 6236	DR 6238	DH 6238	DR 8238	DH 8238
1 1/2	DR 5246	DH 5246	DR 6246	DH 6246	DR 6248	DH 6248	DR 8248	DH 8248
1 3/4	DR 5286	DH 5286	DR 6286	DH 6286	DR 6288	DH 6288	DR 8288	DH 8288
2	DR 5326	DH 5326	DR 6326	DH 6326	DR 6328	DH 6328	DR 8328	DH 8328
2 1/4	DR 5366	DH 5366	DR 6366	DH 6366	DR 6368	DH 6368	DR 8368	DH 8368
2 1/2	DR 5406	DH 5406	DR 6406	DH 6406	DR 6408	DH 6408	DR 8408	DH 8408
3	DR 5486	DH 5486	DR 6486	DH 6486	DR 6488	DH 6488	DR 8488	DH 8488
3 1/2	DR 5566	DH 5566	DR 6566	DH 6566	DR 6568	DH 6568	DR 8568	DH 8568
4	DR 5646	DH 5646	DR 6646	DH 6666	DR 6648	DH 6648	DR 8648	DH 8648

EXAMPLE (TO ORDER) Pt. No. DR 6186-A = 3/8 Dia. x 1 1/8 Lg. Round Standoff-Aluminum-Tapped Both Ends w/6-32 x 3/8 Thread.

MATERIALS B = Brass A = Aluminum SS = Stainless Steel PH = Phenolic

STANDOFF — MALE-FEMALE



Thread	B	C
4-40	3/16	1/4
6-32	1/4	3/8
8-32	3/8	7/16
10-32	3/8	1/2

Lgth.	A=1/4 AC. Flts. 4-40	A=1/4 AC. Flts. 6-32	A=1/4 AC. Flts. 8-32	A=1/4 AC. Flts. 10-32	A=3/8 AC. Flts. 4-40	A=3/8 AC. Flts. 6-32	A=3/8 AC. Flts. 8-32	A=3/8 AC. Flts. 10-32
1/4	MF 4044	MF 4046	MF 4048	MF 40410	MF 6044	MF 6046	MF 6048	MF 60410
3/8	MF 4064	MF 4066	MF 4068	MF 40610	MF 6064	MF 6066	MF 6068	MF 60610
1/2	MF 4084	MF 4086	MF 4088	MF 40810	MF 6084	MF 6086	MF 6088	MF 60810
5/8	MF 4104	MF 4106	MF 4108	MF 41010	MF 6104	MF 6106	MF 6108	MF 61010
3/4	MF 4124	MF 4126	MF 4128	MF 41210	MF 6124	MF 6126	MF 6128	MF 61210
7/8	MF 4144	MF 4146	MF 4148	MF 41410	MF 6144	MF 6146	MF 6148	MF 61410
1	MF 4164	MF 4166	MF 4168	MF 41610	MF 6164	MF 6166	MF 6168	MF 61610
1 1/8	MF 4184	MF 4186	MF 4188	MF 41810	MF 6184	MF 6186	MF 6188	MF 61810
1 1/4	MF 4204	MF 4206	MF 4208	MF 42010	MF 6204	MF 6206	MF 6208	MF 62010
1 3/8	MF 4224	MF 4226	MF 4228	MF 42210	MF 6224	MF 6226	MF 6228	MF 62210
1 1/2	MF 4244	MF 4246	MF 4248	MF 42410	MF 6244	MF 6246	MF 6248	MF 62410
1 5/8	MF 4264	MF 4266	MF 4268	MF 42610	MF 6264	MF 6266	MF 6268	MF 62610
1 3/4	MF 4284	MF 4286	MF 4288	MF 42810	MF 6284	MF 6286	MF 6288	MF 62810
2	MF 4324	MF 4326	MF 4328	MF 43210	MF 6324	MF 6326	MF 6328	MF 63210
2 1/2	MF 4404	MF 4406	MF 4408	MF 44010	MF 6404	MF 6406	MF 6408	MF 64010
3	MF 4484	MF 4486	MF 4488	MF 44810	MF 6484	MF 6486	MF 6488	MF 64810

EXAMPLE (TO ORDER) Pt. No. MF 4146-B = 1/4 AC. Flts. Standoff-Brass 6-32 Male-Female Threads.

MATERIALS B =Brass A = Aluminum SS = Stainless Steel

STANDOFF — THREADED

Lgth.	A=3/16 Dia. 4-40 Thread Round	A=3/16 Dia. 4-40 Thread Hex	A=3/16 Dia. 6-32 Thread Round	A=3/16 Dia. 6-32 Thread Hex	A=3/16 Dia. 8-32 Thread Round	A=3/16 Dia. 8-32 Thread Hex	A=3/16 Dia. 10-32 Thread Round	A=3/16 Dia. 10-32 Thread Hex
1/8	SR 5024	SH 5024	SR 5026	SH 5026	SR 5028	SH 5028	SR 50210	SH 50210
3/16	SR 5034	SH 5034	SR 5036	SH 5036	SR 5038	SH 5038	SR 50310	SH 50310
1/4	SR 5044	SH 5044	SR 5046	SH 5046	SR 5048	SH 5048	SR 50410	SH 50410
5/16	SR 5054	SH 5054	SR 5056	SH 5056	SR 5058	SH 5058	SR 50510	SH 50510
3/8	SR 5064	SH 5064	SR 5066	SH 5066	SR 5068	SH 5068	SR 50610	SH 50610
7/16	SR 5074	SH 5074	SR 5076	SH 5076	SR 5078	SH 5078	SR 50710	SH 50710
1/2	SR 5084	SH 5084	SR 5086	SH 5086	SR 5088	SH 5088	SR 50810	SH 50810
9/16	SR 5094	SH 5094	SR 5096	SH 5096	SR 5098	SH 5098	SR 50910	SH 50910
5/8	SR 5104	SH 5104	SR 5106	SH 5106	SR 5108	SH 5108	SR 51010	SH 51010
3/4	SR 5124	SH 5124	SR 5126	SH 5126	SR 5128	SH 5128	SR 51210	SH 51210
7/8	SR 5144	SH 5144	SR 5146	SH 5146	SR 5148	SH 5148	SR 51410	SH 51410
1	SR 5164	SH 5164	SR 5166	SH 5166	SR 5168	SH 5168	SR 51610	SH 51610

EXAMPLE (TO ORDER) Pt. No. SR 5146-PH = 5/16 Dia. x 7/8 Lg. Round Standoff-Phenolic w/6-32 Threaded Hole.

Lgth.	3/8 Dia. 6-32 Thread Round	3/8 Dia. 6-32 Thread Hex	3/8 Dia. 8-32 Thread Round	3/8 Dia. 8-32 Thread Hex	3/8 Dia. 10-32 Thread Round	3/8 Dia. 10-32 Thread Hex
1/8	SR 6026	SH 6026	SR 6028	SH 6028	SR 60210	SH 60210
3/16	SR 6036	SH 6036	SR 6038	SH 6038	SR 60310	SH 60310
1/4	SR 6046	SH 6046	SR 6048	SH 6048	SR 60410	SH 60410
5/16	SR 6056	SH 6056	SR 6058	SH 6058	SR 60510	SH 60510
3/8	SR 6066	SH 6066	SR 6068	SH 6068	SR 60610	SH 60610
7/16	SR 6076	SH 6076	SR 6078	SH 6078	SR 60710	SH 60710
1/2	SR 6086	SH 6086	SR 6088	SH 6088	SR 60810	SH 60810
9/16	SR 6096	SH 6096	SR 6098	SH 6098	SR 60910	SH 60910
5/8	SR 6106	SH 6106	SR 6108	SH 6108	SR 61010	SH 61010
3/4	SR 6126	SH 6126	SR 6128	SH 6128	SR 61210	SH 61210
7/8	SR 6146	SH 6146	SR 6148	SH 6148	SR 61410	SH 61410
1	SR 6166	SH 6166	SR 6168	SH 6168	SR 61610	SH 61610

EXAMPLE (TO ORDER) Pt. No. SH 6068-B = 3/8 Dia. x 3/8 Lg. Hex Standoff-Brass w/8-32 Threaded Hole.

Lgth.	A=1/2 Dia. 8-32 Thread Round	A=1/2 Dia. 8-32 Thread Hex	A=1/2 Dia. 10-32 Thread Round	A=1/2 Dia. 10-32 Thread Hex	A=1/2 Dia. 12-24 Thread Round	A=1/2 Dia. 12-24 Thread Hex	A=1/2 Dia. 1/4-20 Thread Round	A=1/2 Dia. 1/4-20 Thread Hex
1/8	SR 8028	SH 8028	SR 80210	SH 80210	SR 80212	SH 80212	SR 80214	SH 80214
3/16	SR 8038	SH 8038	SR 80310	SH 80310	SR 80312	SH 80310	SR 80314	SH 80314
1/4	SR 8048	SH 8048	SR 80410	SH 80410	SR 80412	SH 80412	SR 80414	SH 80414
5/16	SR 8058	SH 8058	SR 80510	SH 80510	SR 80512	SH 80512	SR 80514	SH 80514
3/8	SR 8068	SH 8068	SR 80610	SH 80610	SR 80612	SH 80612	SR 80614	SH 80614
7/16	SR 8078	SH 8078	SR 80710	SH 80710	SR 80712	SH 80712	SR 80714	SH 80714
1/2	SR 8088	SH 8088	SR 80810	SH 80810	SR 80812	SH 80812	SR 80814	SH 80814
9/16	SR 8098	SH 8098	SR 80910	SH 80910	SR 80912	SH 80912	SR 80914	SH 80914
5/8	SR 8108	SH 8108	SR 81010	SH 81010	SR 81012	SH 81012	SR 81014	SH 81014
3/4	SR 8128	SH 8128	SR 81210	SH 81210	SR 81212	SH 81212	SR 81214	SH 81214
7/8	SR 8148	SH 8148	SR 81410	SH 81410	SR 81412	SH 81412	SR 81414	SH 81414
1	SR 8168	SH 8168	SR 81610	SH 81610	SR 81612	SH 81612	SR 81614	SH 81614

EXAMPLE (TO ORDER) Pt. No. SR 80910-A = 1/2 Dia. x 3/4 Lg. Round Standoff-Aluminum w/10-32 Threaded Hole.

SPECIAL SIZES AND MATERIALS MANUFACTURED TO ORDER *NOTE: Ceramic and Steatite spacers and standoffs also available.*

JAN HARDWARE
MANUFACTURING COMPANY INC.
47-27 36th STREET • LONG ISLAND CITY, NEW YORK 11101 • TEL: (212) 361-0800
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RELIABILITY
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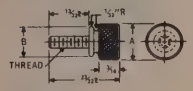
THUMB SCREW

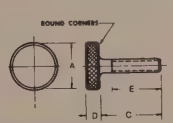


Thread	A Dia.	B Dia.	Pt. No.
6-32	3/8	5/16	TS 6056
	7/16	3/8	TS 7066
	1/2	7/16	TS 8076
8-32	3/8	5/16	TS 6058
	7/16	3/8	TS 7068
	1/2	7/16	TS 8078
10-32	3/8	5/16	TS 60510
	7/16	3/8	TS 70610
	1/2	7/16	TS 80710

EXAMPLE (TO ORDER)
Pt. No. TS 6058-B = 8-32 x 1 3/32 Lg. Thread, Thumb Screw- Brass.

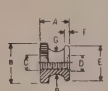
KNURLED THUMB SCREWS

Material: 303 Stainless Steel



Thread	A	C	D	E	Part No.
#4-40	1/4	3/8	1/8	3/16	ST4010
	1/4	1/2	1/2	7/16	ST4011
	1/4	3/4	1/2	5/8	ST4012
	3/8	3/8	1/8	3/16	ST4013
	3/8	1/2	1/8	7/16	ST4014
#6-32	1/4	1/2	1/2	7/16	ST6015
	1/4	3/4	1/2	5/8	ST6016
	1/4	1	1/2	13/16	ST6017
	3/8	3/8	1/8	7/16	ST6018
	3/8	1/2	1/8	3/8	ST6019
#8-32	1/4	1/2	1/2	7/16	ST8020
	1/4	3/4	1/2	5/8	ST8021
	1/4	1	1/2	13/16	ST8022
	3/8	3/8	1/8	7/16	ST8023
	3/8	1/2	1/8	3/8	ST8024
#10-24	3/8	1/2	3/16	7/16	ST11025
	3/8	3/4	3/16	5/8	ST11026
	3/8	1	3/16	13/16	ST11027
	3/8	1 1/4	3/16	1	ST11028
	1/2	3/4	3/16	5/8	ST11029
	1/2	1	3/16	13/16	ST11030
	1/2	1 1/4	3/16	1	ST11031
	1/2	1 1/2	3/16	1 1/4	ST11032
	3/4	3/4	3/16	5/8	ST11033
	3/4	1	3/16	13/16	ST11034
#10-24	3/4	1 1/4	3/16	1	ST11035
	3/4	1 1/2	3/16	1 1/4	ST11036
#10-32	3/8	1/2	3/16	7/16	ST10037
	3/8	3/4	3/16	5/8	ST10038
	3/4	1	3/16	13/16	ST10039
	3/8	1 1/4	3/16	1	ST10040
	1/2	3/4	3/16	5/8	ST10041
	1/2	1	3/16	13/16	ST10042
	1/2	1 1/4	3/16	1	ST10043
	1/2	1 1/2	3/16	1 1/4	ST10044
	3/4	3/4	3/16	5/8	ST10045
	3/4	1	3/16	13/16	ST10046
	3/4	1 1/4	3/16	1	ST10047
	3/4	1 1/2	3/16	1 1/4	ST10048
1/4-20	3/4	3/4	3/16	5/8	ST14049
	3/4	1	3/16	13/16	ST14050
	3/4	1 1/4	3/16	1	ST14051
	3/4	1 1/2	3/16	1 1/4	ST14052
	3/4	2	3/16	1 5/8	ST14053
	1	3/4	3/16	5/8	ST14054
	1	1	3/16	13/16	ST14055
	1	1 1/4	3/16	1	ST14056
	1	1 1/2	3/16	1 1/4	ST14057
	1	2	3/16	1 5/8	ST14058

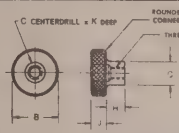
THUMB NUT KNURLED



Thread	A	B Dia.	C Dia.	D Dia.	E Dia.	F	G	R Rad.	Part No.
4-36	1/4	3/8	1/8	.147	3/16	3/64	7/32	3/64	KN 436
4-40	1/4	3/8	1/8	.147	3/16	3/64	7/32	3/64	KN 440
6-32	1/4	3/8	5/64	.169	3/16	3/64	7/32	3/64	KN 632
6-32	5/32	13/32	5/64	13/64	13/32	3/64	7/32	1/16	KN 6321
8-32	5/16	7/16	13/64	15/64	3/8	1/64	1/4	1/16	KN 832
10-24	21/64	1/2	13/64	17/64	7/16	1/16	9/32	.070	KN 124
10-32	21/64	1/2	13/64	17/64	7/16	1/16	9/32	.070	KN 132
12-24	11/32	5/16	7/32	19/64	1/2	1/16	21/64	.070	KN 224
1/4-20	3/8	5/8	17/64	23/64	5/16	1/16	23/64	3/64	KN 420

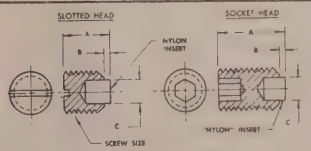
KNURLED THUMB NUTS

Material: 303 Stainless Steel



Thread	B Dia.	C Dia.	H	I	J	K	Part No.
#4-40	1/2	1/8	1/4	1/4	1/8	1/8	NK4070
	1/2	1/8	1/2	1/4	1/8	3/8	NK4071
	3/4	1/8	1/4	1/4	1/8	1/8	NK4072
	3/4	1/8	1/2	1/4	1/8	3/8	NK4073
#6-32	1/2	#26	1/4	1/4	1/8	3/32	NK4074
	1/2	#26	1/2	1/4	1/8	11/32	NK4075
	3/4	#26	1/4	1/4	1/8	3/32	NK4076
	3/4	#26	1/2	1/4	1/8	11/32	NK4077
#8-32	1/2	—	1/4	5/16	1/8	—	NK4078
	1/2	#15	1/2	5/16	1/8	1/4	NK4079
	3/4	—	1/4	5/16	1/8	—	NK4080
	3/4	#15	1/2	5/16	1/8	1/4	NK4081
#10-24	1/2	—	1/4	3/8	3/16	—	NK4082
	1/2	13/64	1/2	3/8	3/16	1/4	NK4083
	1		1/4	3/8	3/16	—	NK4084
	1	13/64	1/2	3/8	3/16	1/4	NK4085
#10-32	1/2	—	1/4	3/8	3/16	—	NK4086
	1/2	13/64	1/2	3/8	3/16	1/4	NK4087
	1	—	1/4	3/8	3/16	—	NK4088
	1	13/64	1/2	3/8	3/16	1/4	NK4089
1/4-20	3/4	—	1/4	1/2	1/4	—	NK4090
	3/4	17/64	1/2	1/2	1/4	1/4	NK4091
	1	—	1/4	1/2	1/4	—	NK4092
	1	17/64	1/2	1/2	1/4	1/4	NK4093
	1	17/64	3/4	1/2	1/4	1/2	NK4094

SET SCREWS



Material: Screw — Stainless Steel; Insert — Nylon Protective Tip

SLOTTED HEAD

Screw Size	A	B	C	Part No.	Screw Size	A	B	C	Part No.
#2-56	5/32	1/32	1/32	SSN-D-1	#10-24	13/64	3/64	3/32	SSN-D-5
#4-40	3/32	1/32	1/16	SSN-D-2	#10-32	13/64	3/64	3/32	SSN-D-6
#6-32	3/32	1/32	1/16	SSN-D-3	1/4-20	5/16	1/16	1/8	SSN-D-7
#8-32	15/64	3/64	1/16	SSN-D-4					

SOCKET HEAD

Screw Size	A	B	C	Part No.	Screw Size	A	B	C	Part No.
#2-56	5/32	1/32	1/32	SSN-T-8	#10-32	13/64	3/64	3/32	SSN-T-29
	5/32	1/32	1/32	SSN-T-24		5/16	1/16	1/8	SSN-T-14
#4-40	3/32	1/32	1/16	SSN-T-9	1/4-20	5/16	1/16	1/8	SSN-T-19
	3/32	1/32	1/16	SSN-T-25		13/64	1/16	1/8	SSN-T-30
	1/32	1/32	1/16	SSN-T-26		1 1/16	1/16	1/8	SSN-T-31
#6-32	3/32	1/32	1/16	SSN-T-10	1/4-28	7/16	1/16	1/8	SSN-T-20
	5/32	1/32	1/16	SSN-T-15	5/16-18	15/32	3/32	3/16	SSN-T-21
	1/32	1/32	1/16	SSN-T-27		7/32	3/32	3/16	SSN-T-32
#8-32	13/64	3/64	3/32	SSN-T-11		1 3/32	3/32	3/16	SSN-T-33
	7/64	3/64	3/32	SSN-T-16	3/8-16	15/32	3/32	3/16	SSN-T-22
	5/64	3/64	3/32	SSN-T-28		7/32	3/32	3/16	SSN-T-34
#10-24	13/64	3/64	3/32	SSN-T-12		1 3/32	3/32	3/16	SSN-T-35
	7/64	3/64	3/32	SSN-T-17					
#10-32	13/64	3/64	3/32	SSN-T-13	1/2-13	3/8	1/8	1/4	SSN-T-23
	7/64	3/64	3/32	SSN-T-18		1 1/8	1/8	1/4	SSN-T-36

SET SCREWS

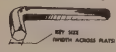
Material: Steel (Nickel Plated)

CUP POINT STAINLESS

SLOTTED HEAD — Class 2A Thread

Screw Size	L	Part No.
#0-08	1/8	SS-D-15
#0-80	3/16	SS-D-16
#2-56	1/8	SS-D-1-A
#4-40	1/8	SS-D-2-A
#6-32	1/8	SS-D-3-A

SOCKET HEAD KEYS & SETS



Set of Hex Socket Head Keys Containing 8 Keys from .050 to 5/32 Key Size — in case. Order SS-K-50

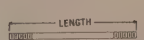
Screw Size	Key Size	Part No.
#2	.035	SS-K-40
#4	.050	SS-K-41
#6	1/16	SS-K-42
#8	5/64	SS-K-43
#10	3/32	SS-K-44
1/4	1/8	SS-K-45
5/16	5/32	SS-K-46
3/8	3/16	SS-K-47
1/2	1/4	SS-K-48

SOCKET HEAD — Class 3A Thread Stainless Steel

Screw Size	L	Part No.
#0-80	1/8	SS-T-1
	3/16	SS-T-2
#2-56	1/8	SS-T-3
	3/16	SS-T-4
	1/4	SS-T-5
#4-40	1/8	SS-T-6
	3/16	SS-T-7
	1/4	SS-T-8
#6-32	1/8	SS-T-9
	1/4	SS-T-10
	3/8	SS-T-11
	1/2	SS-T-12
#8-32	1/4	SS-T-13
	3/8	SS-T-14
	1/2	SS-T-15
	5/8	SS-T-16
#10-32	1/4	SS-T-17
	1/2	SS-T-18
	3/4	SS-T-19
	1	SS-T-20
1/4-20	1/4	SS-T-21
	1/2	SS-T-22
	3/4	SS-T-23
	1	SS-T-24
	1 1/4	SS-T-25

THREADED ROD

— 1/4-20 THREAD — 2" EACH END

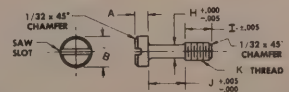


Lgth.		Lgth.		Lgth.		Lgth.		Lgth.		Lgth.	
4 1/2	TR 1445	7	TR 1470	9 1/2	TR 1495	12	TR 14120	14 1/2	TR 14145	17 1/2	TR 14175
5	TR 1450	7 1/2	TR 1475	10	TR 14100	12 1/2	TR 14125	15	TR 14150	18	TR 14180
5 1/2	TR 1455	8	TR 1480	10 1/2	TR 14105	13	TR 14130	15 1/2	TR 14155	18 1/2	TR 14185
6	TR 1460	8 1/2	TR 1485	11	TR 14110	13 1/2	TR 14135	16	TR 14160	19	TR 14190
6 1/2	TR 1465	9	TR 1490	11 1/2	TR 14115	14	TR 14140	16 1/2	TR 14165	19 1/2	TR 14195
								17	TR 14170	20	TR 14200

MATERIALS B = Brass A = Aluminum SS = Stainless Steel

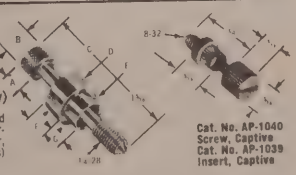
CAPTIVE SCREWS

Material: 303 Stainless Steel



Thickness For Panel	A	B	H	I	J	K Thread	Part No.
1/16	1/8	1/4	.072	.187	.281	#4-40	CS4-1
1/8	1/8	1/4	.072	.187	.343		CS4-2
1/16	1/8	5/32	.086	.218	.312	#6-32	CS6-1
1/8	1/8	5/32	.086	.218	.375		CS6-2
3/16	1/8	5/32	.086	.218	.437		CS6-3
1/8	3/16	3/16	.114	.250	.406	#8-32	CS8-2
3/16	3/16	5/32	.114	.250	.468		CS8-3
1/4	3/16	5/32	.114	.250	.531		CS8-4
3/16	3/16	3/8	.136	.312	.531	#10-32	CS10-3
1/4	3/16	3/8	.136	.312	.593		CS10-4

CAPTIVE SCREW AND NUT ASSEMBLY



No. CS-711-(1)
No. CS-711-(2) (screw only)

Consists of slotted, knurled thumb screws made of corrosion resistant steel bar, and nickel-plated (on brass) panel inserts.

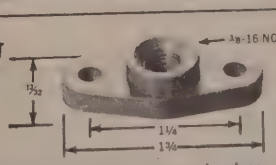
Cat. No. AP-1040 Screw, Captive
Cat. No. AP-1039 Insert, Captive

	A	B	C	D	E	F	G	J Thd.
—1	1/4	3/8	15/16	5/16	13/32	5/16	9/8	1/4-28
—2	1/4	29/64	1 7/16	5/16	13/32	5/16	3/8	8-32

Cat. No. AP-1197 Screw, Captive
1/4" slotted knurled head (7/8" O.D.) 1 1/4" overall length; 8-32 thread.

RETAINER NUT

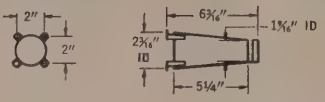
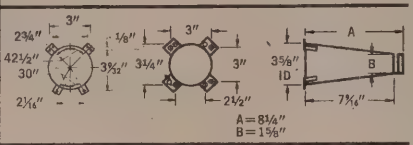
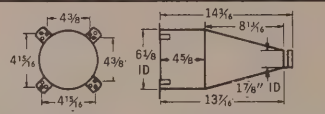
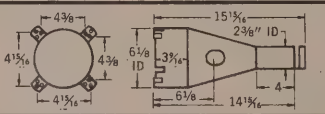
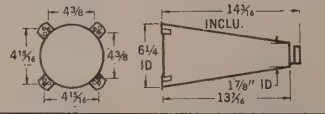
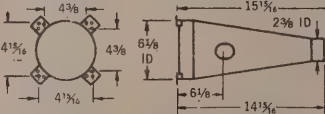
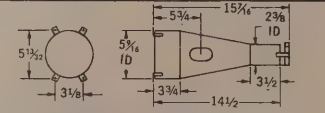
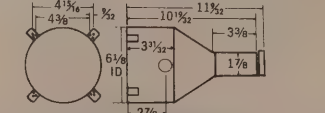
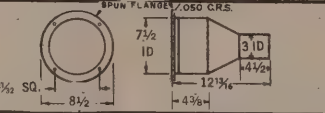
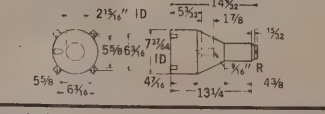
Cat. No. R-1030



Used in conjunction with captive screw and nut assemblies. Die casting. Can be painted. Other thread sizes available upon special order.

SHIELDS

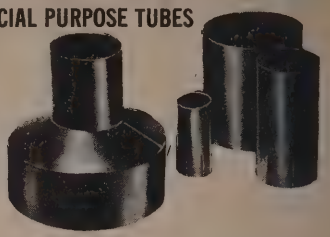
JAN's Magnetic Shields are made of MU-Metal or equal and are hydrogen annealed by a special process to assure optimum orientation of the molecular structure of the alloy for best magnetic shielding. JAN's Magnetic Shields prevent distortion and intensify modulation of the electron beam due to stray magnetic fields. In addition, the use of these shields protect personnel against the dangers of accidental tube breakage. Mounting holes are tapped for No. 6-32 screws as shown. These shields are designed to fit JAN's standard bezels as listed below. See following page for specifications on JAN's Bezel Assemblies.

Shield Cat. No.	For Use With C.R.T. No.	Matching JAN Bezel	
S-2001 S-2001-1	902 2AP 2BP	CP-1110P2 CP-1120P2	
S-3001 adaptable for edge-lighting graticule using S-3010 with Bezel CP-1428*	3RP 3RPA	CP-1328-P1 CP-1427-1 CP-1429-1 CP-1328-P2 CP-1427-2 CP-1429-2 CP-3430-1 CP-3430-2	
S-3003 S-3003-1	3KP 908A 3AP	CP-1328-P1 CP-1427-1 CP-1429-1	Same type as S-3001, except A=10⅛ B=2
S-3004 — 12 (less anode hole) — 22 (with anode hole) adaptable for edge-lighting graticule using S-3012 with Bezel CP-1428*	3BP 3JP 3ACP	Same as S-3003 Same as S-3005	Same type as S-3001, except A=8⅝ B=2⅜
S-3005 adaptable for edge-lighting graticule using S-3008 with Bezel CP-1428*	3WP	CP-1328-P2 CP-1427-2 CP-1429-2	Same type as S-3001, except A=10⅝ B=1⅞
S-5001	5UP	CP-1465 CP-13584-1 CP-13549-1 CP-13595-1 CP-19495-1 CP-446-11 CP-446-22	
S-5002 adaptable for Edge-lighting	5BP 5CP 5ABP 5ADP	Same as S-5001 Same as S-5006	
S-5003	5UP	CP-1465 CP-13584-1 CP-13549-1 CP-13595-1 CP-19495-1	
S-5005 adaptable for edge-lighting	5AQP 5ABP 5ADP	CP-1465-2 CP-13549-2 CP-13584-2 CP-13595-2 CP-19495-2 CP-446-11 CP-446-22	
S-5017 adaptable for edge-lighting	5ABP 5ADP	CP-1465-2 CP-19636-2	
S-5027	5BTP	CP-19495-2	
S-7001	7GP 7JP 7VP	CP-7330 CP-7445 CP-7331 CP-7550 CP-7420	
S-7006	7AEP	CP-7330 CP-7445 CP-7331 CP-7550 CP-7420	

All Shields are Fabricated with Overlapped and Spot Welded Construction.
*See mounting hole arrangement illustrated with S-3001 edge-lit dimension drawing.

When ordering, be sure to specify CRT type number. Anode openings provided, where required. Shielding for EMC, RFI, and EMI now available, as bezels, shields, cushions, gaskets . . . in strip, sheet, formed, and molded.

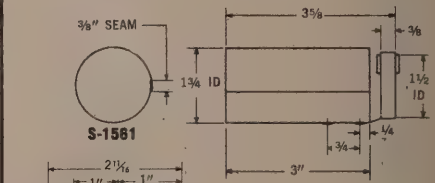
MAGNETIC SHIELDS FOR PHOTO-MULTIPLIER AND SPECIAL PURPOSE TUBES



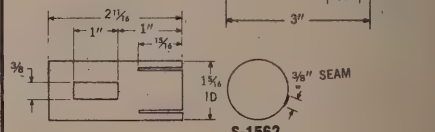
Shield	Tube
S-1091	ICP1
	929
	930
S-1181	5581
	5653
	IP39
	IP40
S-1500	6291
	4440
S-1561	6199
	7102
	931
	4471
	4472
S-1562	4473
	6323
	6328
	7117

Shield	Tube
	IP21
S-1562	IP22
	IP28
S-1563	1EP1
	2002
	6810
S-2002	7264
	7265
	7326
S-2003	6903
	2020
	4463
	5819
	6292
S-2004	6342
	6571
	6655
	7746
	8053

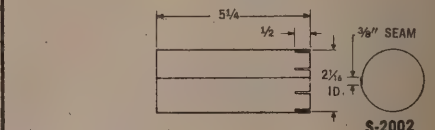
Shield	Tube
S-2005	6372
S-2007	7850
S-2008	4459
	6217
S-3015	1197
	6363
S-5013	1112
S-5018	1198
	6364
S-7009	1238
	1287



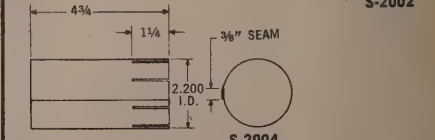
S-1561



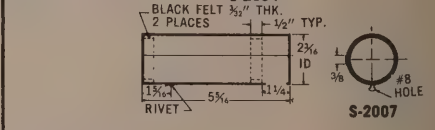
S-1562



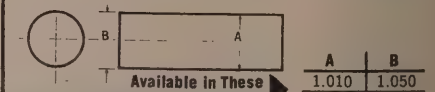
S-2002



S-2004



S-2007

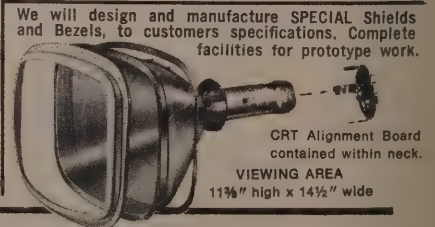


Available in These Seamless Tubing Dimensions

A	B
1.010	1.050
.948	.998
.740	.783
.632	.663

Can be supplied cut to your length, with holes and/or cut-outs to your specifications.

We will design and manufacture SPECIAL Shields and Bezels, to customers specifications. Complete facilities for prototype work.



CRT Alignment Board contained within neck.
VIEWING AREA
11⅜" high x 14½" wide

JAN HARDWARE
MANUFACTURING COMPANY INC.
47-27 36th STREET • LONG ISLAND CITY, NEW YORK 11101 • TEL: (212) 361-0800
QUALITY
RELIABILITY
ECONOMY

BEZELS

JAN's Bezels enhance the appearance of the instruments on which they are used. These units are functionally designed to provide OPTIMUM UTILIZATION OF THE C.R.T. SCREEN, as well as safety against tube breakage and danger to operating personnel.

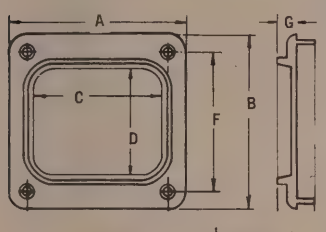
JAN Bezel Assemblies are supplied with a **bezel, calibrated graticule,** (where applicable) **light filter** and **C.R.T. cushion.** Bezels are finished in a smooth dull black non-reflecting surface. These units fit JAN Mu-Metal Shields.

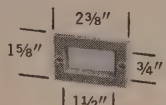
Edge-lit Bezels (E.L.B.A.)**
These Bezels are designed to provide edge lighting of the engraved scale-calibrated graticule by means of pilot lights.

Camera Mount Bezel
These units provide an integral cast mounting flange that fits all standard 3″, 5″ and 7″ C.R.T. cameras.

Cat. No.	C.R.T. Face	Material	Type	Dimensions in Inches: Panel Opening	A Overall Width	B Overall Ht.	C Visible Area (Bezel) Width	D Visible Area (Bezel) Ht.	E Mtg. Holes Width	F Mtg. Holes Ht.	G (Face Only)	H (Incl. Flange)	Visible Area (Cushion) Ht.	Visible Area (Cushion) Width
BEZELS FOR 2″ C.R.T.														
CP-1110-P-2	Flat	Plastic*	Standard	2 3/16	2 5/8	2 5/8	1 3/4	1 3/4	2	2	5/16	7/16	1 3/4	1 3/4
BEZELS FOR 3″ C.R.T.														
CP-1220-P‡	Curved or Flat	Plastic*	Camera Mount	—	4 7/8	3 1/4	2 3/4	2 1/4	4	2 1/2	5/16	1 1/16	—	
CP-1328-P-1 CP-1328-P-2	Curved Flat	Plastic*	Standard	3 33/64	3 3/4	3 3/4	2 5/8	2 3/16	3	3	3/8	45/64	2 1/2	2 1/16
CP-1427-1 CP-1427-2	Curved Flat	Aluminum	Camera Mount	3 17/64	4	4	2 3/4 Dia.		3	3	9/16	27/32	2 25/32 Dia.	
CP-1428-1** CP-1428-2**	Curved Flat	Aluminum	Camera Mount E.L.B.A.**	3 17/64	4	4	2 3/4 Dia.		3	3	9/16	27/32	2 25/32 Dia.	
CP-1429-1 CP-1429-2	Curved Flat	Aluminum	Camera Mount	3 17/64	4	4	2 3/4 Dia.		3	3	9/16	27/32	2 25/32 Dia.	
CP-3430-1 CP-3430-2	Curved Flat	Steel	Standard	—	4 1/16 Dia.		3 3/8 Dia.		3 3/4	3 3/4	1 41/64	1 41/64	2 25/32 Dia.	
BEZELS FOR 4″ C.R.T.														
CP-1533-P‡	—	Plastic*	Camera Mount	3 1/32	4 3/64	3 61/64	3	3	4	—	1 3/32	1 3/32	No Cushion	
BEZELS FOR 5″ C.R.T.														
CP-13549-1 CP-13549-2	Curved Flat	Aluminum	Standard	6.0	6 1/4	6 1/4	4 7/8	3 3/4	4 15/16	4 15/16	17/32	1 3/32	4 1/4	3 3/16
CP-13584-1 CP-13584-2	Curved Flat	Aluminum	Camera Mount	6.0	6 1/4	6 1/4	4 7/8	3 3/4	4 15/16	4 15/16	1 5/32	1 23/32	4 1/4	3 3/16
CP-13595-1** CP-13595-2**	Curved Flat	Aluminum	Standard E.L.B.A.**	5 7/16	6 1/4	6 1/4	4 7/8	3 3/4	4 15/16	4 15/16	17/32	—	4 3/4 Dia.	
CP-1465 CP-1465-2	Curved or Flat Flat	Steel	Camera Mount	5 9/16 5 17/32	6 3/8 Dia.		5 35/64 Dia.		6	6	7/8	7/8	No Cushion 4 1/2 Dia.	
CP-19495-1** CP-19495-2**	Curved Flat	Aluminum	Camera Mount E.L.B.A.**	5 7/16	6 1/4	6 1/4	5 1/4 Dia.		4 15/16	4 15/16	1 5/32	—	4 3/4 Dia.	
CP-19636-2**	Flat	Aluminum	Camera Mount E.L.B.A.**	5 5/8	5 7/8	5 7/8	4 1/2 Dia.	3	4 7/8	4 7/8	1 1/4	—	4 1/2 Dia.	
CP-446-11 CP-446-22	Flat	Steel	Camera Mount	—	6 9/16 Dia.		5 9/16 Dia.		6 5/32 6 1/8	6 5/32 6 1/8	1	1 19/64 1 3/16	4 1/2 Dia.	
CP-545	Curved or Flat	Aluminum	Camera Mount	5	5 27/32	5 27/32	4 25/32 Dia.		5	5	25/32	—	—	
BEZELS FOR 7″ C.R.T.														
CP-7330-1 CP-7331-2**	Curved Flat	Plastic*	Standard E.L.B.A.**	7 13/32	7 13/16	7 13/16	6 5/16 Dia.		6 3/16	6 3/16	3/4	3/4	6 3/8 Dia.	
CP-7375-1** CP-7375-2**	Curved Flat	Aluminum	E.L.B.A.**	7 13/32	8	8	4 1/2	4 1/2	6 3/16	6 3/16	1 17/32	2 29/32	1 1/2	4 1/2
CP-7420-1** CP-7420-2**	Curved or Flat	Plastic*	Camera Mount	7 13/32	7 13/16	7 13/16	6 15/16 Dia.		6 3/16	6 3/16	3/4	1 3/8	6 3/8 Dia.	
CP-7550	Curved or Flat	Aluminum	Camera Mount	4 25/32	7 3/8	6 1/4	4 3/4	4 3/4	6 1/4	5 1/8	1 3/16	1 3/16	No Cushion	
BEZEL FOR 10″ C.R.T.														
CP-10860	Curved or Flat	Aluminum	Standard	11 1/32	12 1/4 Dia.		8 1/16	6 1/4	11 1/2 B.O.		1 1/16	1 3/16	No Cushion	

*All Plastic Bezels are furnished in shock resistant plastic, per MIL-P-3414. **Edge Lit Bezel Assemblies. ‡Rectangular C.R.T.



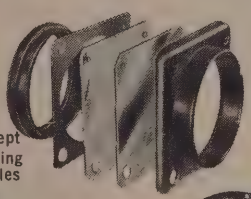


CP-1393

CP-1110P2
(with 4 mounting holes)
CP-1120P2
(same as above, but with 2 mounting holes, in diagonal corners)

CP-1220-P

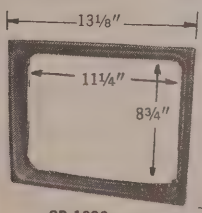
CP-1328-P-( )



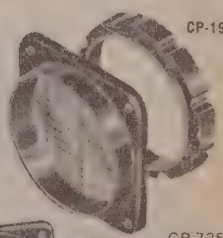
CP-1428-( )

CP-1427, CP-1429 } Same as 1428, except for mounting holes

CP13549-( )



CP-1396

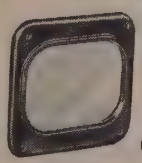


CP-19495-(

CP-1533-P

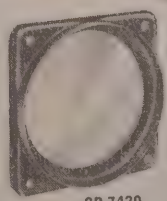
CP-1465

CP-13584-( )



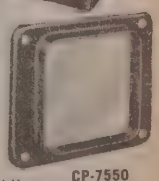
CP-13595-( )

CP-7330

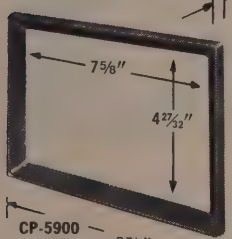


CP-7420

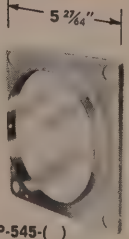
CP-725



CP-7550



CP-5900



CP-545-( )

DISTINCTIVE FEATURES

- Engineered for 2″, 3″, 4″, 5″, 7″, 8″, 10″ C.R.T.
- Maximum display area
- Precision engraved, scale-calibrated graticules; standard or to customer's specifications
- Materials and finish to "Mil Spec"
- Heavy buna-S shock cushion
- Models for edge-lighting
- Phosphor-matched light filters
- Non-reflecting matte surfaces
- Rugged camera mounts
- Models for curved and flat-faced C.R.T.

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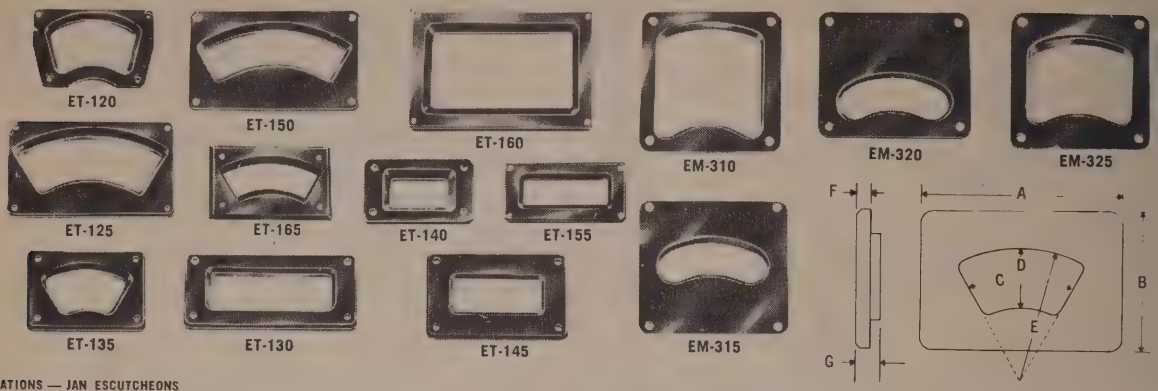
QUALITY
RELIABILITY
ECONOMY

ESCUTCHEON PLATES FOR ELEGANT FRAMING OF PANEL OPENINGS



SPECIFICATIONS — JAN ESCUTCHEONS

Escutcheon Cat. No.	A Overall Width	B Overall Height	C Window Width	D Window Height	E Effective Outer Dial Radius	Thickness F=Face Only	Thickness G=Incl. Flange	Panel Opening Width	Panel Opening Height	Mounting Holes Width	Mounting Holes Height	Type of Dial	Material
ET-128*	2 27/32	1 7/8	1 3/4	1	1 27/32	3/16	3/16	2 11/32	1 3/8	2 3/16 top 2 1/16 bottom	1 3/16		Injection Molded Tenite II, Black Matte Finish
ET-125*	3 7/8	2 13/16	2 7/8	1	3 1/4	3/16	3/16	3 1/2	1 1/2	3 1/2	1 13/16		
ET-135*	2 3/4	1 7/8	1 1/2	7/8	1 7/8	3/16	1/4	1 31/32	1 7/32	2 1/4	1 3/8	Circular	
ET-150*	3 7/8	2 5/16	2 7/8	3/4	3 1/8	3/16	5/16	3 5/32	1 7/32	3 1/2	1 13/16		
ET-165*	2 5/8	1 5/8	1 49/64	5/8	2 5/32	1/8	1/4	2 7/16	1 1/2	2 1/4	1 1/4		
ET-130*	4	1 13/16	2 3/4	1 3/16	—	3/16	1/4	2 13/32	1 11/32	3 1/2	1 3/16	Flexible Tape,	Injection Molded Tenite II, Black Matte Finish
ET-140*	2 1/2	1 1/2	1 1/4	5/8	—	1/8	5/16	1 17/32	1 1/32	[illegible]	1	Digital	
ET-145*	3 1/4	2 1/16	1 13/16	3/4	—	5/32	5/32	2 13/32	1 5/32	2 3/4	1 5/16	Counter,	
ET-155*	2 1/2	1 3/16	1 11/16	1/2	—	5/32		2 1/32	2 5/32	2 1/4	13/16	Cylinder or	
ET-160*	3 7/8	2 1/2	2 15/16	15/16	—	1/8	1/8	3	2 5/32	3 5/8	2 1/4	Drum	
EM-310	3	3	2 5/16	1 13/16	2 5/16	1/32	1/4	3 11/32	2 1/2	2 1/2	2 1/2	Helical	Soft Aluminum with Black Matte Enamel Finish
EM-315	3 1/4	3	2 1/4	5/8	2 1/4	1/32	1/8	2 15/32	1 3/4	2 3/4	2 5/8	Circular	
EM-320	3 1/4	2 3/4	2 1/4	5/8	2 1/16	1/32	1/8	2 29/64	1 3/4	2 3/4	2 1/4	Circular	
EM-325	3	3	2 1/16	1 1/2	2 5/16	1/32	1/4	2 1/32	1 49/64	2 1/2	2 1/2	Helical	

*To Order Specify: (1) frame only; (2) frame with clear window; (3) frame with clear window scribed with a center line.

JAN's molded, black, shock-resistant plastic escutcheons are available in an exceptionally wide variety of different types and sizes. They provide a pleasing window to frame dial plates mounted behind the panel.

Plastic escutcheons are available in the following ways: frame only; frame with clear windows; frame with clear window scribed with a center line.

For especially large working areas, stamped aluminum escutcheons, finished in dull black are available to meet the needs for space economy. Withstands temp. shock −65°C to +80°C. NON INFLAMMABLE.

VIEWING HOODS

Cat No. H-465 AND/OR ADAPTER
Can be used as viewing hood, on 2¾" dia. bezels. (#1427; 1428; 1429). Also serves as adapter to permit use of face fitting neoprene rubber viewing hoods (see above). All aluminum. Has dull black enamel finish.

Cat. No. H-689-1 (5⅝" I.D.)
Black neoprene rubber, contour-molded, fits the shape of face. Keeps out ambient light when viewing scope.
Used with following Jan Bezels; 19636; 19495; 13584; 1465.

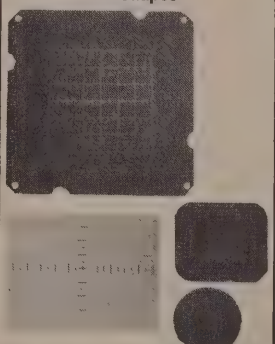
No. H-689-2 (4⅞" I.D.)
Used with JAN Bezel #545

Cat. No. H-1008 TO FIT RETANGULAR BEZELS
Black, contour molded neoprene rubber. Keeps ambient light out, when viewing scope. Fits shape of face. Can be adapted for smaller I.D.'s.
Can be used with JAN Bezel CP-1328P. Can be adapted for #1533-P.

Cat. No. H-1063
Black, contour molded neoprene rubber. Keeps ambient light out, when viewing scope. Fits shape of face. Flanges provided for hand access to PPI settings.

Cat. No. H-1361
Black neoprene rubber, contour-molded, fits the shape of face. Keeps out ambient light when viewing scope.

GRATICULES/FILTERS CUSHIONS
Assorted Sizes and Shapes



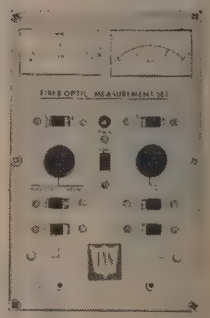
New! Non-reflective filter material.
Matte 1 side. Grey or Blue. Other colors on special order.

NEW!
JAN FIBER OPTIC MEASUREMENT SET

A self-contained unit for investigating the properties of fiber optic cables, connectors, splices and accessories. Features internal light source (670 nm) with an internal 1 MHz square-wave generator; Pin diode detector and metering system with 30 db functional range and 3 MHz bandwidth.

Can be externally modulated at rates up to 3 MHz. When operating on its internal generator a TTL synchronizing signal is available at the panel. Detector side offers either linear or TTL output, with continuous metering.

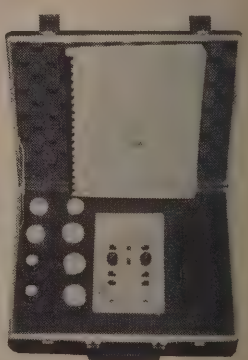
The set features the newly-developed JAN Fiber Optic connectors.



NEW!
JAN FIBER OPTIC MEASUREMENT KIT

Complete package of the JAN Fiber Optic Measurement Set, splices, connectors, fiber optic cable, epoxy and all materials needed to make experimental fiber optic cables with connectors and splices. Included: couplings, bulkhead adapters and the **JAN Fiber Optic Handbook;** a complete introduction to fiber optic technology, with chapters applied to theory, practice, measurement, techniques, specifications and instructions for the **JAN** fiber optic products.

Entire kit contained in a portable case, 5"x11"x15" weighing ten pounds. Battery-operated measurement set has self-contained signal source and complete metering, TTL-compatible inputs and outputs.



JAN HARDWARE
MANUFACTURING COMPANY INC.
47-27 36th STREET • LONG ISLAND CITY, NEW YORK 11101 • TEL: (212) 361-0800
QUALITY
RELIABILITY
ECONOMY

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ECONOMY

MOLDED PLASTIC KNOBS WITH METAL INSERTS

K1257 For 3/64" shaft. Hole for pinning to shaft. 13/16" h. x 7/16" w.

K1280 For 13/64" shaft. 3/16" h. x 7/8" l. x 11/16" w.

K1334 For 1/8" shaft. Twin set screws. 5/8" high x 3/4" dia. Notch: 3/32" w. x 3/32" d.

K1345 For 3/16" shaft. Single set screw — 3/4" w. x 3/4" dia. (Shaft mounts in side hole, screw at bottom).

K1349 For 3/16" shaft with .130 across flat. Twin set screws. 11/16" high x 3/4" dia.

K1354 For 3/16" shaft with .281 across flat. Twin set screws. 45/64" high x 3/4" dia.

K1331 For 3/16" shaft. Twin set screws. 3/4" high x 1 1/64" dia.

K1335 For 3/32" D flatted shaft. 11/32" high x 21/32" dia.

K1346 For 1/4" shaft with .222 across flat. Twin set screws. 11/16" high x 11/16" dia.

K1350 For 1/8" shaft with .107 across D flat. Twin set screws. 7/8" high x 7/8" dia.

K1355 For 3/16" shafts. Twin set screws. 5/8" h. Base size 13/32 x 13/32".

K1332 For 3/16" shaft. Twin set screws. 25/32" high x 1 3/8" dia. Notch: 1/8" w. x 3/16" d.

K1343 For 5/32" shaft with .250 across D flat. Twin set screws. 25/32" high x 7/8" dia.

K1347 For 3/32" shaft. with .130 across flat. Twin set screws. 1/2" high x 3/4" dia.

K1351 For 1/8" round with .096 across flat. Twin set screws. 3/4" high x 5/8" dia.

K1368 For 1/4" D flatted shaft. Twin set screws. 11/16" high x 1 1/16" dia.

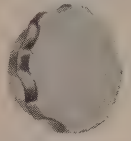
K1333 For 3/16" shaft. Twin set screws. 5/8" high x 3/4" dia.

K1344 For 3/32" shaft with .130 across flat Twin set screws 7/8" high x 7/8" dia.

K1348 For 5/32" round or 3/32" D flatted shaft. Twin set screws. 1/2" high x 3/4" dia.

K1352 For 1/8" shaft with .112 across flat. Twin set screws. 1 1/16" high x 1/2" dia.

K1353 For 5/16-32 threaded shaft. 59/64" high x 1/2" dia.

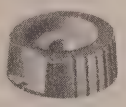


K1398/WD For 3/8" shaft. Twin set screws. 1 1/16" high x 2 3/8" dia.

K1407-(1) White dot. 5/16" high x 23/64" O.D. shaft hole dia. .083 with .48 flat. Screwdriver slot on top.

K1407-(2) 1/2" high, shaft hole dia. 1/8" w/.083 flat.

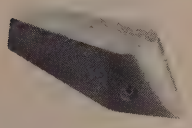
K1440 7/8" high x 3/4" dia. Special mounting. Adaptable for other mounting.



K1462 For 17/64" shaft. Twin set screws. 21/64" high x 1" OD.

K1464 For 1/8" D flatted shaft. Twin set screws. 11/64" high x 1/2" OD.

K1468 For 1/4" shaft. Single set screw. 25/32" high x 1 5/16" dia



K1471 For 1/4" shaft. Twin set screws. 3/4" high x 25/64" l. x 3/4" w. Center of shaft hole to pointer end, 4 3/64".

K1472 For 1/4" shaft. Twin set screws. 21/32" high x 1 15/32" l. x 3/4" w. Center of shaft hole to pointer end, 2 7/64".

Black or Grey. Can be supplied for other round and "D" flat shafts.

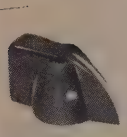
K1481 "Pull" Knob
K1481-2 (for 1/8" shaft)
-4 (for 1/4" shaft)
Twin set screws
39/64" high x 25/32" dia. x 27/32.
Note: Basic configuration of knob is MS91528-1GG.

K1492 For 1/4" shaft. Single set screw.

K1493 For 3/16" shaft. Twin set screws.

K1494 For 1/4" shaft. Twin set screws.

K1577 For 1/4" flatted shaft Single set screw. 7/8" high x 3/4" dia. Skirt dia. 1 1/4". Can be supplied with other markings and/or less skirt



K1573 For 1/4" flatted shaft. 1 15/32" l. x 1 3/16" body dia. Twin set screws.

K936-5 Black phenolic molded knob, with beveled aluminum skirt, black anodized finish. Deeply etched and filled contrasting markings. Accurately centered brass insert, for 5/16" shafts. Knob dia. 1 1/8"; Skirt dia. 1 1/2"; overall height 1 31/32".

K936-4 (1/4" shaft)

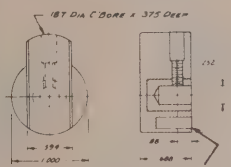
KNOB ONLY

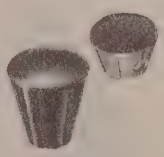
K929-5 (5/16" shaft) Same as above, less skirt.

K929-4 (1/4" shaft)

Variations on shaft sizes and markings available in production quantities.

K783 BAR KNOB
Single set screw.
Finished to specifications.





K1445 For 1/4" shaft. 1" high x 7/8" diameter. Single set screw. Plastic, no insert.

K1575 For 1/4" shaft 1/2" high x 3/4" OD. Single set screw.

K706 For 1 1/4" double flatted shaft (mounts on top of knob). Plastic, no insert.

TRANSILLUMINATED (BACK-LIT) MOLDED PLASTIC KNOBS WITH METAL INSERTS

Precision molded of JAN's transparent plastic material to military specs, with dull finish. Transilluminated pointers permit easy reading under subdued lighting conditions. For use on instrument panels, switchboards, electrical and electronic apparatus. Can be supplied without transillumination, and for other size shafts.

Cat. No. LM
USED ON LUNAR MODULES!
Precision aluminum casting. Adaptable for back lighting. With slip clutch features similar to K1375

MS91528

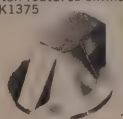
NAS 539-1B
NAS 539-1C

K1338

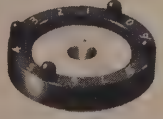
K1339

K1103 For 1/4" flatted shaft. Single set screw Line is for back lighting 13/64" high x 1 5/8" dia

OTHER SPECIAL VARIATIONS AVAILABLE

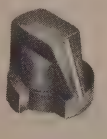


MS25165-1



K1456 For 3/16" flatted shaft. 1/2" high x 1 13/32" dia. Backlited numbers.

K1428 For 1/8" or 1/8" shaft. Twin set screws. 5/8" high x 3/4" dia. Can be supplied with backlited indicator line or dot.



K1430 For 1/8" or 1/4" shaft. One set screw. 5/8" high x 3/4" dia.

K1435 For 1/4" shaft. One set screw. 7/8" high x 1 1/32" dia.

MS25166-1 For 1/4" flatted shaft. 27/32" high, 1 1/2" dia. skirt. Single set screw.

MS25167-P2B For 1/4" flatted shaft 23/32" high, 1 1/4" dia. skirt. Single set screw. Knob body 5/8" dia. Also avail. w/o skirt.

MS25168-P2B For 1/4" flatted shaft 25/32" high, 1 1/2" dia. skirt. Single set screw. Knob body 1" dia

MS25169-P1B For 1/4" flatted shaft. 1 1/16 high, knob body .875" dia. Single set screw.

MS25170-P2A For 1/4" flatted shaft. 23/32" high. Skirt dia. 1 1/2"; knob body .875" dia. Single set screw.

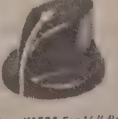
K1486 For 1/4" shaft. Aluminum with backlighted skirt Knob 3 3/4" high x 3/4" x 1/4". 1 1/4" dia. skirt. Twin set screws. Also avail. w/o skirt.

K1500 For 1/8" round or flatted shaft; twin set screws. 3/8" dia. x 5/8" h.

K1501 For 1/8" flatted shaft; twin set screws. 3/8" h. x 7/8" dia.

K1502 For 1/8" flatted shaft; twin set screws. 1 3/64" l. x 23/32" h.

K1503 For 1/8" flatted shaft: twin set screws. 1" dia., 3/4" h. x 1 1/8" l. 1" OD x 3/4" h



K1504 For 1/8" flatted shaft; twin set screws.

USAF 61D 404 74
Cat. No. K-977

CAST ALUMINUM KNOBS

K1387 For 3/32" shaft. Twin set screws. 1/4" high x 23/32" dia.

K1389 For 1/4" shaft. Twin set screws. 21/32" high x 13/16" dia.

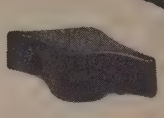
K1390 For 3/16" shaft. Single set screw. 11/16" high x 3/16" dia.

K1391 For 1/8" shaft. Twin set screws. 43/64" high x 5/16" dia. White-filled line.

K1392 For 3/16" shaft. Two set screws. 25/32" high x 11/16" dia. (Bar is 15/16" long).

K1394 For 1/8" shaft. Two set screws. 7/8" high x 1/2" dia.

K1429 For 1/4" shaft. One set screw and pinning hole 15/32" h. x 27/32" l. Magnesium Casting.



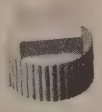
K1431 For 3/32" shaft. 1/2" x 1 1/2" wide. Must be pinned to shaft.

K1432 For 3/16" shaft. 1 1/4" x 1 7/8" across wing. Must be pinned to shaft.

K1447 For 1/4" shaft. 1 1/4" h. x 13/16" dia. x 3/32" l. Twin set screws. Tactile "Bar" Top.

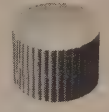
K1448 For 1/4" shaft. 1 1/16" h. x 15/16" dia. x 3/32" l. Twin set screws. Tactile "Sphere" Top.

K1449 For 1/4" shaft. 1 1/16" h. x 15/16" dia. x 3/32" l. Twin set screws. Tactile "Edge" Top.

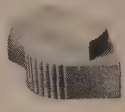


K1450 For 1/4" shaft. 1 1/16" high x 15/16" dia. Twin set screws. Tactile "Square" Top.

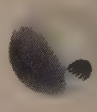
K1451 For 1/4" shaft. 1 1/16" high x 1 3/16" skirt dia. Tactile "Triangle" Top.



K1452 For 1/4" shaft. 1 1/16" high x 1 3/16" dia. Twin set screws. Tactile "Round Ribbed" Top.



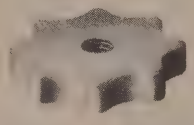
K1453 For 1/4" shaft. 1 1/16" h. x 1 1/2 l. x 1 3/16" dia. Twin set screws. Tactile Top.



K1459 (Screw on type). For 5/16-18 thd'd. shaft. 1/2" long x 1" dia. (Red anodize)

K1460 For 1/4" shaft. Twin set screws. 15/32" high x 7/8" OD.

K1461 For 1/4" shaft. Single set screw. 1 1/8" high x 3/4" OD. (Overall width incl. bar, 15/16"). Available with skirt.



K1484 For 5/16-24 threaded shaft. 5/8" h. x 1 5/8 OD. Partial pin hoies supplied for pinning to shaft.

K1487 For 1/4" double 'D' shaft. Mounts from top. 27/32" dia. x 1 3/16" l. x 25/64 h.

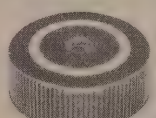
K1490 For 3/8" shaft. 1 1/4" l. x 43/64" h. x 1/4" hub. Twin set screws. Can be supplied with holes on bottom for mounting skirt.

K1047 For 1/8" shaft with .095 across flats. (Double D). 7/8" high x 1 1/8" diameter.

K1124 For 1/8" shaft. 5/8" high x 1 1/16" dia. One set screw.

K1126 For 1/4" Double D shaft 15/32" high x 23/32" dia. Mounts from top.

K1127 For 1/8" shaft. 15/32" high x 23/32" dia. Two set screws.



SCB-41848 For 1/4" shaft. 3/8" high x 1 31/64" dia.

SMD500502

BK-1080 1/8" flatted shaft. Cast aluminum. Twin set screws. 5/16" high x 1 1/2" OD.

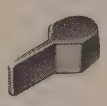
K1328 For 1/4" shaft. Precision cast aluminum. 13/16" high x 1 1/4" dia. Twin set screws.

K243 TUNING KNOB For 3/16" shaft. Use no-mar clamp (Cat. No. 937-8) for mounting. (Not supplied). 1 1/4" high x 2 3/4" dia.

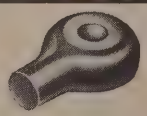
CAST ALUMINUM BAR KNOBS

K1325 For 1/4" shaft. Twin set screws. 1" lever arm for heavy load switching. 1 17/32" long x 5/8" high x 3/4" body diameter.

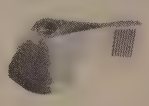
K1327 For 1/4" shaft. Twin set screws. 1" high x 11/16" body dia.



K1337 For 1/4" shaft. Twin set screws. 1 1/8" long x 3/8" high x 1/2" body diameter.



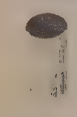
K1342 Knob switch. For 1/4" D flatted shaft. 1 1/2" long x 7/8" high. 1" body dia., 7/16" bar dia.



K1408 Fits shaft 5/16" rd. x 13/64" flat. 1 25/32" long x 1 13/16" high.

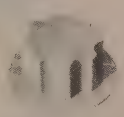
K981 For 1/4" shaft. Twin set screws. 2 1/32" long x 5/16" high. 1 1/4" body dia.

MACHINED METAL KNOBS



K-1006-(2)-(3) 3/8" high x 3/8" dia

K-1007-(2)-(4) 3/4" high x 3/4" OD.



K1105 For 1/4" shaft. Twin set screws. Aluminum. 5/8" high x 1.4" OD.

K1130 For 6-32 thd'd. shaft. 3/8" l. x 1/2" h. x 1/2" OD. Brass, nickel plated (screw-on type).

AK-1326 For 1/4" shaft. Aluminum. Also available with plain top. 11/32" high x 5/16" OD.

K1329 For 1/4" shaft. Machined Aluminum. Knurled edge for easy turning. Twin set screws. 23/32" high x 5/8" dia.

K1330 For 1/8" shaft. Alumin. Can be used for printed circuit boards. Gives both finger and screwdriver adjustment. 1/2" high x 5/8" dia. One set screw.

K1336 Aluminum locking knob. 13/32" high, 1/2" knurled OD. For 8-32 threaded shaft.

K1409 For 3/16" shaft 1 set screw and 1 spot-drill hole for pinning. 11/32" high, 3/8" head dia., 7/16" shank dia. Can be supplied without marking.

K1434 For 1/4" shaft. One set screw. 9/16" high x 3/4" dia. Aluminum.

K1436 For 1/4" shaft. Twin set screws. 3/4" high x 13/16" dia. Aluminum.

K1446-(2) For 1/8" shaft. -(4) For 1/4" shaft. Twin set screws; machine 1/4" high x 3/4" diameter.

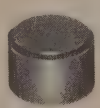
K1485 For 1/8" shaft. Twin set screws. 13/16" high x 1/4" OD. Alum.

K1488 For 3/16" shaft. 11/16" high x 3/8" dia. Clearance hole for attaching to end of shaft with a screw. Aluminum.

K897 For 1/4" shaft. Singlet set screw. 3/4" high x 3/4" dia. Brass. Avail. in other finishes.

K1433 Same as K897 except aluminum. For 1/8" shaft. (Can also be supplied for 1/4" shaft).

K1570 For 3/16" shaft Machined Alumin. Twin set screws Black anodized. 21/32" l. x 5/8" w. x 29/64" h.

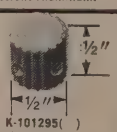


K1571 For 1/4" shaft. Machined Aluminum. Twin set screws. Painted black. 3/8" high x 1" dia.

K1572 For 1/8" shaft. Machined Aluminum. Twin set screws. Black anodized, with or w/o white filled line. 7/8" high x 3/4" dia.

K1574 For 1/8" shaft. Machined Aluminum. Twin set screws. Painted black, with or w/o markings. 1/2" h. x 1/2" dia.

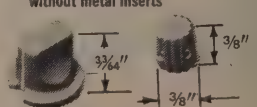
K1576 For 1/8" shaft. Machined brass. Twin set screws. Painted black, with or w/o white dot. 1/4" high x 3/4" dia.



K-101295( ) -1 w/white dot -2 plain

For 1/8" flatted shaft. Can also be supplied with 1/8" round shafts.

PLASTIC MINIATURE KNOBS without metal inserts



K-101294( ) -1 1/4" skirt dia. -2 3/4" skirt dia.

K-101297

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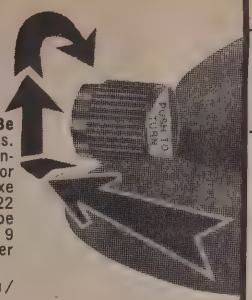
SAFETY KNOBS

"PUSH-TO-TURN" KNOBS

FOR LOW TORQUE APPLICATIONS

Knobs spin freely . . . and **Must Be Pressed-In** while making changes. Developed specifically to prevent inadvertent changing of settings. For basic dimensions, see our "Deluxe Instrument Knobs" (9, 12, 17 and 22 body dia. series). When ordering, be sure to substitute prefix "I" for 9 Series and "Q" for 17 Series, as per typical part numbers.

IIC4GA = .90 Dia./Press-to-Turn/Round/Dial/¼"/Glossy/Black



Cat. No. K-1125
SPINNER KNOB
For Limited Space Applications

Other shaft dia on request.

SLIP-CLUTCH KNOB with Spinners

Cat. Nos. K-1375 & K-1376 (For ¼" Shafts)

For driving devices such as variable capacitors, inductors, potentiometers, etc., the "slip-clutch"* automatically disengages and slips when the pre-determined torque has been exceeded. Knobs are fluted, and are equipped with either fixed or retractable spinner for fast turning. Backlash-free units safeguard delicate and costly instruments against careless or inadvertent cranking beyond their normal stops.

*Normally set for 3-6" lbs. Can be modified for other requirements.

Model No. K-1376 is identical with No. K-1375 but has the additional feature of a retractable spinner. Spring loading provides positive, toggle-type action to lock spinner in either open or closed position. Model No. K-1376 is designed for use where economy of space is essential.

Cat. Nos. K-1275 & 1276 (For ¼" shafts)

In appearance, these knobs are identical with No. K-1375 and No. K-1376 but without JAN's Slip-Clutch mechanism. Made with single-unit, molded Bakelite-to-metal-insert construction, with two set screws for firm attachment to shafts.

SPINNER KNOBS

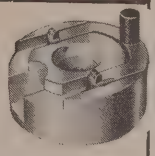
With Fixed or Retractable Spinners — **Standard: Glossy finish. (Matte finish avail. on special order)**

Cat. No.
MS-91522 1
CRANK KNOB
Retractable Spinner

Aluminum Olive Drab. For ¼" shaft. Other colors and shaft diameters on request. 2⅝" minimum clearance required with handle in open position.

Cat. No. K1622
Retractable Spinner CRANK KNOB

Modified version to replace MS91522. Incorporates brake mechanism to lock control in position.

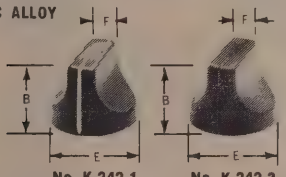


Cat. No. K1358
MINIATURE SPINNER KNOB

Nylon. 19/32" High x ¾" Wide. Spinner section diameter ⅜". Accepts ⅛" shaft or smaller.

SIGNAL CORPS DIE CAST KNOBS

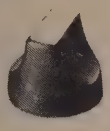
ZINC ALLOY



No. K-242-1 & K-242-2 — **No. K-242-3**

Cat. No.	B	E	F	Marking
K-242-1	¾"	15/16"	5/16"	White
K-242-2	⅞"	1⅛"	⅜"	White
K-242-3	¾"	15/16"	5/16"	None

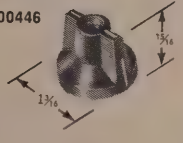
ALUMINUM



No. K-984
Dimensions as per 242-3 No markings. Aluminum. .257 tear drop shaft hole.

SCB35862-1

100446



CAST ALUMINUM KNOBS

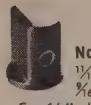
Available in black. Other colors on request. Specify shaft hole size required.

No. K-1023
Flat Back Round Skirt ¼" hole x 1 1/32" high x 15/16" base dia. (2 5/32" to flat back)

No. K-1022
Full Round Skirt ¼" hole x 1 1/32" high x 15/16" base dia.

No. K-1024
With Cam Shape Cut-out ¼" hole x 1 1/32" high x 15/16" base dia.

No. K-1005
Available with or without skirt.



No. K-1020
1 1/16" high x 9/16" bas dia.

No. K-1021
1 1/16" high x 1" base dia.

For ¼" shaft.
Other shaft diameters on request.

Cat. No. K1357
SLIP CLUTCH KNOB

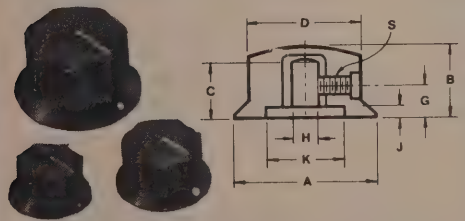
Straight knurl aluminum knob. Twin set screws. For ¼" shaft. Other sizes available. 1⅜" dia. skirt, tapers to 1" dia. at top. Height, 1" Std. Torque 1 to 3 lbs/in Available from ½ in/oz. to 48 in./oz.

For additional slip clutch knobs, see JANSET KNOBS

MS & SIGNAL CORPS ALUMINUM CONTROL KNOBS

Please request catalog for a more complete showing of government knobs manufactured by JAN.

INSTRUMENT KNOBS



PART NO.					DIMENSIONS A	B	C	D	G	H	J	K	S
6	1	C			¾	7/16	⅜	⅝	7/32	¼	1/16	9/16	6-32
8	1	C			1	19/32	½	13/16	9/32	¼	3/32	11/16	8-32
10	1	C			1¼	21/32	½	1	9/32	¼	3/32	11/16	8-32
13	1	C			1½	¾	5/16	1¼	11/32	¼	5/32	31/32	8-32
16	1	C			2	⅞	21/32	1⅝	13/32	¼	3/32	13/16	8-32

SPECIFY AS REQUIRED

Body Dia.
6=⅝"
8=13/16"
10=1"
13=1¼"
16=1⅝"

Body Style
1=Round

Skirt
C=Skirt w/ Indicator Marker

Shaft Hole Dia.
2=⅛"
4=¼"
(Standard—with metal insert. "O" preceding number means without metal insert)

(Other shaft holes to order)

Finish
G=Glossy (Standard)
M=Matte

Color
A=Black
Other Colors on Special Order

TYPICAL PART NUMBERS

81C4GB= 13/16" Dia./Round/Skirt w/indicator marker/¼" Shaft Hole Dia./Glossy/Red

101C4MA= 1" Dia./Round/Skirt w/indicator marker/¼" Shaft Hole Dia./Matte/Black

101C04MA= 1" Dia./Round/Skirt w/indicator marker/¼" Shaft Hole Dia. without metal insert/Matte/Black

Available with Metal Tops

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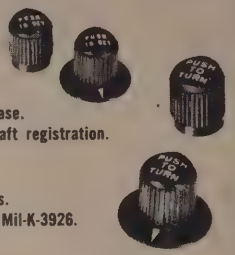
JANSET® KNOBS

U.S. Patent #4,012,966. other Patents Pending

"PUSH-TO-SET" or "PUSH-TO-TURN"



JANSET® Knobs are precision engineered and are completely integral with its mechanism totally enclosed within the knob body configuration. They protect control settings against accidental change due to shock or vibration. Only when they are depressed can the setting be altered. The knob provides infinite resolution with zero backlash such that registration to indicators (illuminated arrow, dot, cutouts etc.) is maintained throughout a full excursion. To use for existing or new designs JANSET® KNOBS REQUIRE NO MODIFICATION TO PANEL DESIGN.

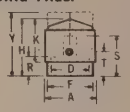
Available from ½" to 2¼" diameters with ring or dial skirts; with or without indicator markings. Fits all ¼" or ⅜" panel bushing and ⅛" thru ¼" shafts. (Except ½" diameter knob which is not available for use with ¼" shaft.)

Distinctive Features

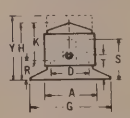
- **Knob locks automatically upon release.**
- **Infinite resolution with absolute shaft registration.**
- **Guards critical settings.**
- **Completely integral assembly.**
- **Installation same as standard knobs.**
- **Configuration meets MS-91528 and Mil-K-3926.**

FOR TACTILE SHAPE CONTROL CAPS, SEE INFORMATION ON PRECEDING PAGE.

PLAIN SKIRT



DIAL SKIRT



PUSH-TO-SET or PUSH-TO-TURN DIMENSIONS

PART NO.	A	D	F	G	H	K	R	S	T	Y
5 1 B	.505	.435	.450		.660	.509	.181	.563	.355	
7 1 B	.708	.486	.670		.805	.626	.188	.587	.406	1.100
9 1 B	.911	.654	.826		1.027	.798	.323	.812	.410	1.399
12 1 B	1.255	.974	1.155		.870	.703	.262	.605	.406	1.399
17 1 B	1.755	1.465	1.666		1.088	.854	.338	.740	.480	
22 1 B	2.255	1.870	2.153		1.114	.885	.333	.740	.480	
5 1 C	.505	.435		.885	.660	.509	.181	.587	.355	
7 1 C	.708	.486		1.135	.805	.626	.183	.602	.406	1.100
9 1 C	.911	.645		1.510	1.027	.798	.323	.730	.410	1.399
12 1 C	1.255	.974		1.822	.870	.703	.262	.605	.406	1.399
17 1 C	1.755	1.465		2.453	1.088	.854	.333	.740	.480	
22 1 C	2.255	1.870		3.005	1.114	.885	.333	.740	.480	

Marking Cap — SPECIFY AS REQUIRED — SPECIFY AS REQUIRED

PREFIX
PS = PUSH-TO-SET
PT = PUSH-TO-TURN
PN = NO MARKING

TYPICAL PART NUMBERS
PS91C4GA = Marking Push-To-Set/.90 Dia./Round/Dial/¼"/Glossy/Black.
PTBT71B4MA = Marking Push-To-Turn/Standard Top Red/.72/Round/Plain/¼"/Matte/Black.

(1) CAP STYLE
(Color of Tactile)
O = NO TOP — Shaft Hole Drilled Thru
A = (INTENSITY - Blue)
B = (TUNE - Orange)
C = (DIMMER - White)
D = (GAIN - Red)
E = (FOCUS - Violet)
F = (RANGE - Yellow)
M = ALUM ANODIZED TOP
T = STANDARD TOP (prefix not required) Use letter 'T' only when color of standard shape top is different than body color. Precede T by color code from Column 7 (BT— would mean standard shape RED top).

(2) BODY DIA.
5 = .51
7 = .71
9 = .90
12 = 1.25
17 = 1.75
22 = 2.25

(3) BODY STYLE
1 = ROUND
2 = POINTER
3 = HEX SHAPE

(4) SKIRT
B = PLAIN
C = DIAL W/POINTER
D = DIAL W/O POINTER
H = Slot

(5) SHAFT HOLE DIA.
2 = .128
3 = .190
4 = .253
5 = .312
6 = .375
7 = .268
"D" FLAT SHAFT HOLES
B = .107 (⅛")
D = .222 (¼")

(6) FINISH
M = MATTE
G = GLOSSY

(7) COLOR
A = BLACK
B = RED
C = GREY
D = GREEN
E = YELLOW
F = PURPLE
G = BLUE
H = WHITE
J = ORANGE
K = BROWN

(8) MARKING
/WD = WHITE DOT
/FD = FLUORESCENT DOT
/PD = PHOSPHORESCENT DOT
/FA = FLUORESCENT ARROW
/PA = PHOSPHORESCENT ARROW
/BL = BACKLIGHTED
/WL = WHITE LINE
/BD = BLACK DOT
/WB = WHITE BULLSEYE ON TOP OF KNOB
For no marking, leave blank

"PUSH-TO-SET" with Overriding Clutch.

Knob can be rotated (if not pushed in) without changing shaft settings.
To specify, use part number system shown above, except use prefix PSC, PTC & PNC.
For use with other than standard top, use prefix PSCO and then specify as above.

INCREMENTAL KNOBS.

Knob locks automatically at exact point, with zero backlash. Easily provide precise setting to pre-determined positions. Equipment can now be tuned repeatedly with finite exactness to as many as 32 or as few as a single specific position.

Cap — SPECIFY AS REQUIRED — SPECIFY AS REQUIRED

PART NO.
EE 1 B
GG 1 B
II 1 B
LL 1 B
QQ 1 B
VV 1 B
EE 1 C
GG 1 C
II 1 C
LL 1 C
QQ 1 C
VV 1 C

FOR DIMENSIONS SEE TABLE ABOVE (Columns A - Y)

(9) NO. OF INCREMENTAL POSITIONS.
SPECIFY 1 THRU 32.

(10) INCREMENT ANGLES
E = Equal Angles
N = Unequal Angles*
*Supply table of angular increments in degrees and minutes. See Table.

*SAMPLE OF TYPICAL TABLE (to be supplied)

Position	Increment Angle	Total Angle
1	0	0
2	5	5
3	4	9
4	25	34
5	266	300

(11) TOTAL ANGULAR ROTATION IN DEGREES AND MINUTES
SPECIFY 0° to 360°

FOR SPECIAL KNOBS — GIVE FULL DESCRIPTION OR SKETCH WITH ORDER.

TYPICAL PART NUMBERS
IIB4MA/WD (17E 180°) = Std. Top/.90 Dia./Round/Plain/.253 Dia. Shaft Hole/Matte/Black/White Dot/17 Incremental Positions/Equally Spaced, in 180° Rotation.
MLL1C4GB (5N 300°) = Alum. Anodized Top/1.25 Dia./Round/Dial with Pointer/.253 Dia. Shaft Hole/Glossy/Red/5 Incremental Positions/ Unequally Spaced, in 300° Rotation (See Table).

New Products!

Slip clutch knob.
Knob driving torque in detented position, 0.7 min. to 1.5 max. lb.-in. Four detented positions in 360°; functions as standard knob between limit stops. When limit stop has been reached and knob rotation continues in same direction, clutch mechanism overrides the stop without applying torque to shaft in excess of that specified.
To specify, use prefix S. (See ▲ note and use table on bottom of next page.)

Spin free push-to-engage knob with skirt registration.
Recommended where component shaft torque exceeds 4 oz.-in.
To specify, use prefix PTN.

Spin free push-to-engage knob with shaft friction clutch and skirt registration.
Recommended where component shaft torque is less than 4 oz.-in. and/or where minor excursions of shock and vibration are anticipated.
To specify, use prefix PTCN.

Torque knob, with shaft friction clutch.
Recommended where positive feel is desired and/or where minor excursions of shock and vibration are anticipated. *To specify, use prefix TC.*

Pull to lock knob.
Similar to push to turn series except knob must be pulled back to lock shaft. Available for spinner type knobs. *To specify, use prefix PL.*

Limit stop knob.
Up to 10 turn stops are available within the knob body, accurate within 5°. Available with or without overriding clutch. Specify/suffix (required angle 0-3600°) Precision stops available on request. *To specify, use prefix LS, LSC.*

Automatic reset knob.
Rotates shaft up to 160 degrees in either direction. When knob is released, mechanism returns shaft to its zero (nominal) position, without use of an outside force. *To specify, use prefix AR.*

***A note to our Customers:** If you cannot afford the space behind the panel, we can provide the function within the knob body.*

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QUALITY
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DELUXE INSTRUMENT KNOBS

MEETS PERFORMANCE OF MIL-STD-242D (SHIPS) & MS 91528D

Molded of polycarbonate, these knobs will withstand the extreme environmental conditions of MIL-E-16400.

QPL #3926 — T.R. #J101

TACTILE SHAPE CONTROL CAPS

Expressly made for both visual and tactile function identification. Each Tactile Knob is produced in the standard recognizable color identified with its configuration. Available in other colors on special order. See column below for applicable tactile shape.

M

SUPER DELUXE Aluminum Anodized Top (Number as below)

NO SKIRT

PLAIN SKIRT

*'Y' dimension applies when A thru F caps (shown above) are used.

DIAL SKIRT

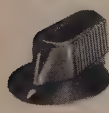
RANGE (Yellow) G

POINTER

'Y' dimension applies when G cap is used.

POINTER WITH SKIRT

730



75c

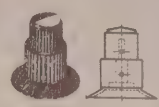
76A

77A

T = STANDARD TOP (prefix not required). Use letter 'T' only when color of standard shape top is different than body color. Precede T by color code from Column 7 (BT — would mean standard shape RED top).

Dual Knobs for Concentric Controls

APPROVED FOR USE MIL-STD-242D & MS-91528C



Molded of polycarbonate plastic, these "piggy-back" knobs are used with dual concentric potentiometers and in other similar applications. Meet performance of military specs above. See diagrams below for dimensions of each knob.

DIMENSIONS

PART NO.	A	D	F	G	H	K	M	N	P	R	S	T	Y
5 1 A	.505	.435				.509	.158	.026	.408				
7 1 A	.708	.486				.626	.187	.026	.406				.915
9 1 A	.911	.645				.798	.255	.114	.521				1.171
12 1 A	1.255	.974				.703	.260	.115	.458				1.220
17 1 A	1.755	1.465				.854	.255	.114	.521				
22 1 A	2.255	1.870				.885	.255	.114	.521				
5 1 B	.505	.435	.450		.660	.509				.181	.563	.324	
7 1 B	.708	.486	.670		.805	.626				.188	.568	.340	1.100
9 1 B	.911	.654	.826		1.027	.798				.323	.730	.484	1.399
12 1 B	1.255	.974	1.155		.870	.703				.262	.605	.427	1.399
17 1 B	1.755	1.465	1.666		1.088	.854				.338	.740	.489	
22 1 B	2.255	1.870	2.153		1.114	.885				.333	.740	.489	
5 1 C	.505	.435		.885	.660	.509				.181	.563	.324	
7 1 C	.708	.486		1.135	.805	.626				.183	.568	.340	1.100
9 1 C	.911	.645		1.510	1.027	.798				.323	.730	.484	1.399
12 1 C	1.255	.974		1.822	.870	.703				.262	.605	.427	1.399
17 1 C	1.755	1.465		2.453	1.088	.854				.333	.740	.489	
22 1 C	2.255	1.870		3.005	1.114	.885				.333	.740	.489	

SPECIFY AS REQUIRED

POINTER KNOBS

PART NO	A	D	E	F	H	K	M	N	P	R	S	T	Y
5 2 A	.750	.406	.510			.505	.158	.026	.402				
7 2 A	1.038	.486	.690			.619	.187	.026	.406				.918
9 2 A	1.344	.645	.895			.796	.255	.114	.555				1.171
5 2 B	.750	.406	.510	.669	.655	.505			.402	.177	.563	.324	
7 2 B	1.038	.486	.690	.940	.791	.619			.406	.193	.573	.364	1.100
9 2 B	1.344	.645	.895	1.251	1.051	.796			.555	.328	.796	.479	1.400

SPECIFY AS REQUIRED

PART NO.	A	D	F	G	H	K	M	N	P	R	S	T
7 3 A	1.150	.486				.610	.187	.026	.406			
7 3 B	1.150	.486	.680		.782					.183	.568	.364
7 3 D	1.150	.486		1.135	.782					.183	.568	.364

SPECIFY AS REQUIRED

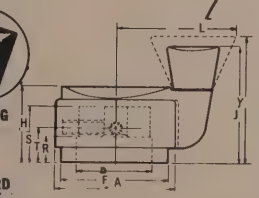
PART NO.	A	D	E	G	H	K	M	N	P	R	S	T
7 5 A	1.515	.515	.575			.645	.250	.110	.445			
7 5 C	1.720	.515	.780	1.520	.815					.266	.590	.435
7 6 A	1.855	.595	.900			.645	.250	.110	.445			
7 7 A	2.552	.562	1.290			.869	.348	.177	.739			

SPECIFY AS REQUIRED

CRANK KNOBS

PART NO.	A	D	F	H	J	L	R	S	T	Y
12 4 B	1.250	0.685	1.185	.850	1.350	1.275	.250	.605	.427	1.475
17 4 B	1.750	0.685	1.666	1.070	1.758	1.735	.320	.740	.489	1.940
22 4 B	2.250	0.685	2.185	1.095	1.782	1.970	.320	.740	.489	1.970

SPECIFY AS REQUIRED



1 — TOP
(Color of Tactile)
O = NO TOP —
Shaft Hole Drilled Thru
A = (INTENSITY - Blue)
B = (TUNE - Orange)
C = (DIMMER - White)
D = (GAIN - Red)
E = (FOCUS - Violet)
F = (RANGE - Yellow)
M = ALUM ANODIZED TOP
H = (MARKER - Green)†
J = (BEARING - Grey)†

2 — BODY DIA.
5 = .51
7 = .71
9 = .90
I = .90 Press-to-Turn*
12 = 1.25
L = 1.25 Press-to-Turn*
17 = 1.75
Q = 1.75 Press-to-Turn*
22 = 2.25
V = 2.25 Press-to-Turn*

3 — BODY STYLE
1 = ROUND
2 = POINTER
3 = BAR, ROUND
4 = SPINNER
5 = BAR, SHORT
6 = BAR,LONG
7 = BAR—HIGH TORQUE
8 = HEX SHAPE

*For Press-to-Turn Knobs see "SAFETY & SPECIAL PURPOSE KNOBS" section.

4 — SKIRT
A = NONE
B = PLAIN
C = DIAL W/POINTER
D = DIAL W/O POINTER
H = Slot

5 — SHAFT HOLE DIA.
2 = .128
3 = .190
4 = .253
5 = .312
6 = .375
7 = .268 "D" FLAT SHAFT HOLES
B = .107 (⅛")
D = .222 (¼")

6 — FINISH
M = MATTE
G = GLOSSY

7 — COLOR
A = BLACK
B = RED
C = GREY
D = GREEN
E = YELLOW
F = PURPLE
G = BLUE
H = WHITE
J = ORANGE
K = BROWN

8 — MARKING
/WD = WHITE DOT
/FD = FLUORESCENT DOT
/PD = PHOSPHORESCENT DOT
/FA = FLUORESCENT ARROW
/PA = PHOSPHORESCENT ARROW
/BL = BACKLIGHTED
/WL = WHITE LINE
/BD = BLACK DOT
/WB = WHITE BULLSEYE ON TOP OF KNOB
For no marking, leave blank

TYPICAL PART NUMBERS

91C4GA = .90 Dia./Round/Dial/¼"/Glossy/Black.
T1C4GA = .90 Dia/Press-to-Turn/Round/Dial/¼"/Glossy/Black.
A71B4MA = Triangle Top Blue/.72/Round/Plain/¼"/Matte/Black.
124B4MA = 1.25 dia./Crank (Spinner)/Plain/¼"/Matte/Black.
BT71B4MA = Standard Top Red/.72/Round/Plain/¼"/Matte/Black.
****071B4MA** = No Top, Shaft hole drilled thru/.72/Round/Plain/¼"/Matte/Black.

** — Specify if .127, .190, .250 hole is required for dual mounting.

NOTE: *T — Preceded by color code (BT — would mean Standard RED top).

FOR SPECIAL KNOBS — GIVE FULL DESCRIPTION OR SKETCH WITH ORDER.

▲To order slip-clutch mechanism, prefix part no. with letter 'S' and add torque requirement in brackets. e.g. S 124B4MA (2 lbs.-in. ±0.5).

JAN HARDWARE MANUFACTURING COMPANY INC.
QUALITY RELIABILITY
47-27 36th STREET • LONG ISLAND CITY, NEW YORK 11101 • TEL: (212) 361-0800

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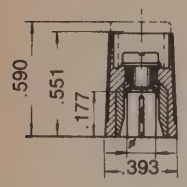
RCL Electronics

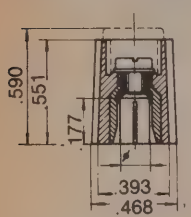
VISE GRIP COLLET KNOBS AND ACCESSORIES .400 (10mm)

KNOBS



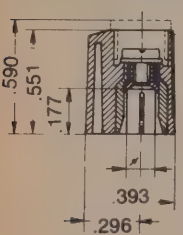
	STANDARD	WITH LINE
3mm	20 10 30	21 10 30
⅛"	20 10 31	21 10 31
4mm	20 10 40	21 10 40

WING KNOBS



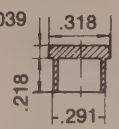
	STANDARD	WITH LINE
3mm	22 10 30	21 10 30
⅛"	22 10 31	21 10 31
4mm	22 10 40	21 10 40

ARROW KNOBS



	STANDARD	WITH LINE
3mm	18 10 30	19 10 30
⅛"	18 10 31	19 10 31
4mm	18 10 40	19 10 40

CAPS



STANDARD
30 10 00

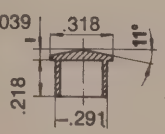
WITH ARROW
30 10 03

WITH LINE
30 10 01

CURVED ARROW
30 01 02

NOTE: Following Caps Not Available In Aluminum Finish:
30 10 02 30 10 03
31 10 00 31 10 04

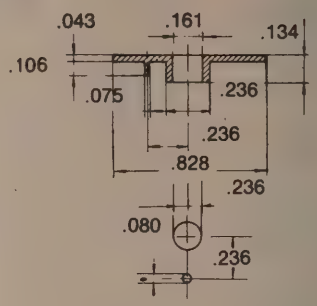
PEAKED CAPS



PEAKED CAP
31 10 00

WITH DOT
31 10 04

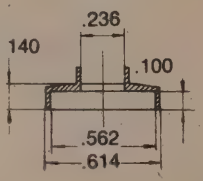
STATORS



47 10 01

47 10 02

NUT COVERS

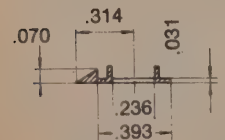


STANDARD
48 10 00

WITH LINE
48 10 01

FOR WING KNOB WITH LINE MARKING
48 10 02

POINTERS



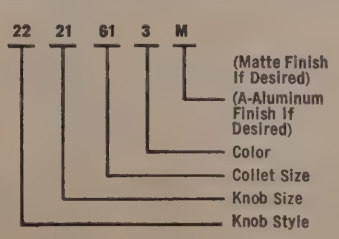
40 10 00

DIAL PLATE POINTERS

45 10 01

	30°	30°	36°	36°	60°		
46 10 00 0	0–11 46 10 01 0	1–12 46 10 02 0	0–9 46 10 03 0	1–10 46 10 04 0	0–5 46 10 05 0	46 10 10 0	

ORDERING INFORMATION FOR CONCENTRIC KNOBS



MATERIAL

With the exception of the transparent figure dials, all mouldings of the collet knob range are produced from polyamide. The transparent dials are made of luran.

Brass 58 is used for the collets, sleeves and nuts, while steel is used for the screws and washers.

TEMPERATURE STABILITY

With normal mechanical stresses: −20°C to +70°C.

For further information please contact our closest distributor, representative or RCL direct. We can also provide special types of knobs and accessories and custom color matching at the lowest price, with fastest delivery.

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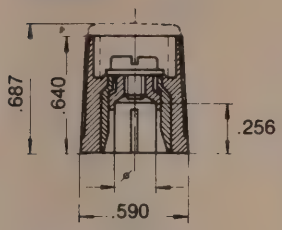
RCL Electronics

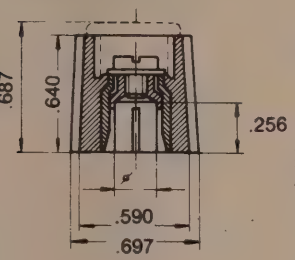
VISE GRIP COLLET KNOBS AND ACCESSORIES .593 (15mm)

KNOBS



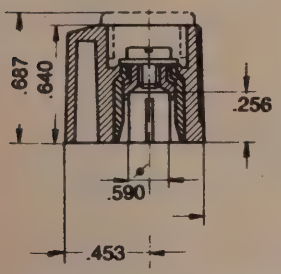
	STANDARD	WITH LINE
3mm	20 15 30	21 15 30
1/8"	20 15 31	21 15 31
4mm	20 15 40	21 15 40

WING KNOBS



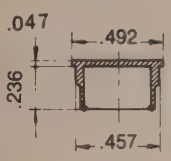
	STANDARD	WITH LINE
3mm	22 15 30	23 15 30
1/8"	22 15 31	23 15 31
4mm	22 15 40	23 15 40

ARROW KNOBS



	STANDARD	WITH LINE
3mm	18 15 30	19 15 30
1/8"	18 15 31	19 15 31
4mm	18 15 40	19 15 40

CAPS



STANDARD
30 15 00

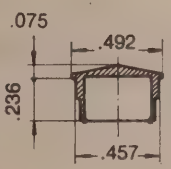
WITH ARROW
30-15-03

WITH LINE
30 15 01

CURVED ARROW
30 15 02

NOTE: Following Caps Not Available In Aluminum Finish:
30 15 02 30 15 03
31 15 00 31 15 04

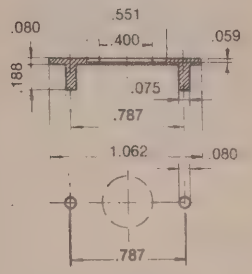
PEAKED CAPS



PEAKED CAP
31 15 00

WITH DOT
31 15 04

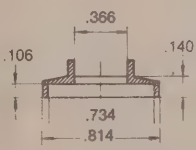
STATORS



47 15 01

47 15 02

NUT COVERS

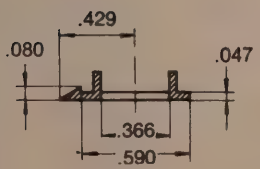


STANDARD
46 15 00

WITH LINE
48 15 01

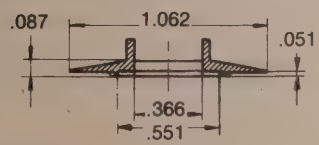
FOR WING KNOB WITH LINE MARKING
48 15 02

POINTERS



40 15 00

DIAL PLATE POINTERS



45 15 01

30°	30°	36°	36°	60°	
	0–11	1–12	0–9	1–10	0–5	
46 15 00 0	46 15 01 0	46 15 02 0	46 15 03 0	46 15 04 0	46 15 05 0	46 15 10 0

PRODUCT NOTE:
For knobs used on concentric shaft components see page 2

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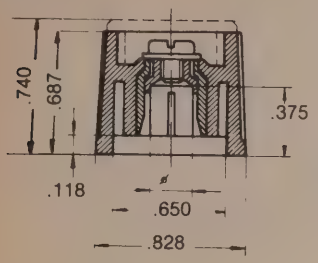
RCL Electronics

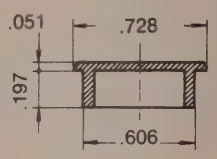
VISE GRIP COLLET KNOBS AND ACCESSORIES .820 (21mm)

KNOBS



	STANDARD	WITH LINE
3mm	20 21 30	21 21 30
⅛"	20 21 31	21 21 31
4mm	20 21 40	21 21 40

CAPS



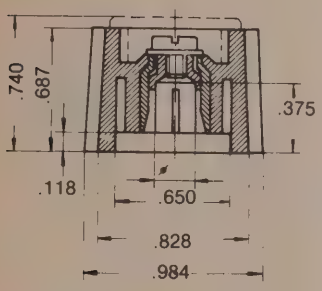
STANDARD 30 21 00

WITH LINE 30 21 01

WITH ARROW .30 21 03

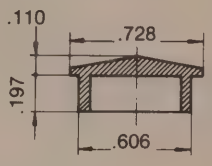
CURVED ARROW 30 21 02

WING KNOBS



	STANDARD	WITH LINE
3mm	22 21 30	23 21 30
⅛"	22 21 31	23 21 31
4mm	22 21 40	23 21 40

PEAKED CAPS

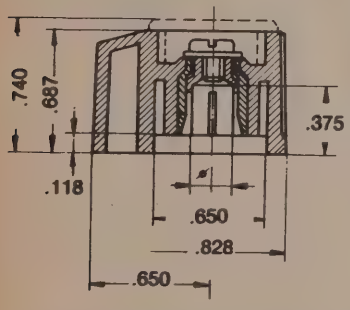


PEAKED CAP 31 21 00

WITH DOT 31 21 04

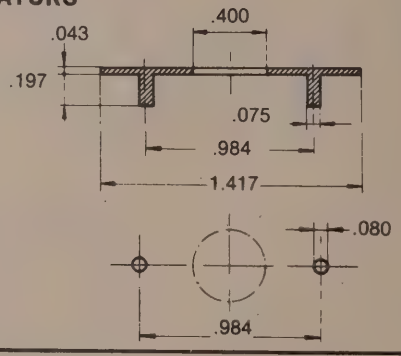
NOTE: Following Caps Not Available In Aluminum Finish:
30 21 02 30 21 03 31 21 00 31 21 04

ARROW KNOBS



	STANDARD	WITH LINE
3mm	18 21 30	19 21 30
⅛"	18 21 31	19 21 31
4mm	18 21 40	19 21 40

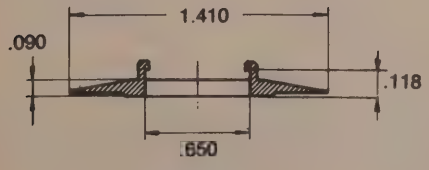
STATORS



47 21 01

47 21 02

DIAL PLATE POINTERS



45 21 01

46 21 00 0	30° 0–11 46 21 01 0	30° 1–12 46 21 02 0	36° 0–9 46 21 03 0	36° 1–10 46 21 04 0	46 21 10 0

VISE GRIP COLLET KNOBS AND ACCESSORIES ALSO AVAILABLE IN 1.102 (28mm) AND 1.417 (36mm) SIZES

RAYTHEON

CONTROL KNOBS

See other Raytheon Products in EEM

Opto-electronics—Section 3700
Switches—Section 5100
Test Jacks—Section 2100
Hardware—Section 2800

STANDARD SERIES

Raytheon Standard Series Control Knobs feature top quality and lend distinctive customer appeal to your products. All knobs have a common motif, resulting in uniform appearance regardless of function. Standard Series includes hundreds of knobs in many functional shapes, sizes and colors meeting MIL-K-3926 and MS91528. All are molded from high-impact polycarbonate with corrosion-resistant aluminum inserts for maximum strength.

DESIGNER SERIES

Give your product a fine, custom appearance with these Designer Series Knobs. Contrasting with the black bases, the aluminum caps, protected by baked-on epoxy coating, give a sunburst effect which is modern, aesthetically pleasing and implies quality. Knob bases are molded of high quality polycarbonate. Set screws, inserts same as for Standard Series. Colors or other modifications available on special order.

REGENCY SERIES

Regency Series Control Knobs offer the combination of fine quality and a custom appearance at a **modest cost**, with the choice of spun aluminum cupped caps (RS Series) or flat inlaid discs (RSF Series), protected by an epoxy coating. These knobs are particularly suited for use in industrial and instrumentation applications.

400 SERIES

To complement or contrast with the color and design of your products. The 400 Series Knobs are made of durable, high-impact acrylonitrite—butadiene—styrene (ABS) with a lusterless finish. All contain metal bushings and two set screws.

PANELRAMA SERIES

These knobs, molded of durable, high-impact acrylonitrite-butadiene-styrene (ABS), have a black matte finish capped with an epoxy-coated aluminum disk. All contain circular shaft metal inserts with two 6-32 UNC-3A set screws.

SELF-LOCKING

Designed for applications in which control settings must be maintained under conditions of shock and vibration. The setting can not be changed accidentally, since the knob must be depressed before movement. Zero backlash allows the operator infinite resolution of setting, yet prevents control shaft from rotating when released. Design is identical to Raytheon's standard line of control knobs, allowing uniformity of panel design when used in conjunction with other types.

FOR SPECIFICATIONS SEE PAGE 6

ORDERING INFORMATION

Catalog numbers published here are for stocked items. For other variations, contact factory. The derivation of the catalog numbers for each series is shown below. This does not imply that all combinations are available. Mirror finish is specified on most Standard and Designer Series Catalog numbers listed. Where matte (dull) finish is specified the suffix G is added. Note 400 and Panelrama Series have a matte finish.

Raytheon knobs are available through franchised distributor. See listing of representatives in yellow pages to call for location of your nearest distributor.

Sample knobs are available for your evaluation, write Raytheon Distributor Products Operation, Fourth Ave., Burlington, Mass. 01803, Dept. EEM.

STANDARD AND DESIGNER SERIES AND REGENCY SERIES

Series
DS—Designer
None—Standard
Regency Series
RS—Cupped Cap
RSF—Flat Inlaid Cap

Approx. Diameter
50 = ½"
70 = ¾"
90 = 1"
125 = 1¼"
175 = 1¾"
225 = 2¼"

Color
None—Black Knob
G—Gray Knob
R—Red Knob

Bar Knob
B—Bar knob
None—Other Styles

Style
BL—Backlighted Skirt
CB—Concentric Base
LK—Knob Lock Pointer Knob
NP—No Pointer Mark
WD—White Dot
WL—White Line
Regency Styles
BD—Blackdot
BL—½ Black Line

Type
1. Plain round
2. Skirted round
3. Dial Skirted Round
4. Unskirted Pointer
5. Skirted Pointer
6. Crank
7. Plain Bar Pointer
8. Dial Skirted Bar Pointer

Shaft Hole Size
1 = .127"
2 = .252"
3 = .190"
4 = .267"
5 = .377"

Finish
None—Mirror Finish
G—Matte Finish

400 AND PANELRAMA SERIES

Approx. Dia. and Series Panelrama
PS6—5/8"
PS7—3/4"
PS12—1-1/4"
400 Series
407—3/4"
409—7/8"
412—1-1/4"

Style
D—Round/Dial Skirt
P—Pointer
PD—Pointer/Dial Skirt
R—Round

Shaft hole size
1—1/8"
2—1/4"

Note: Panelrama available only in K1R black with aluminum cap

Color
K1—Black
K3—Beige
K7—Blue-Gray
K1R—See note

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RAYTHEON CONTROL KNOBS/STANDARD AND DESIGNER SERIES

ROUND

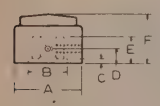
Standard

Designer

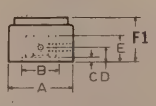
SELECTION GUIDE

Knob Dia. (Appx.)	Shaft Dia.	Knob Height (Appx.)	Dimension Dwg. Ref.	Stocked Catalog Numbers			
				Standard		Designer	
				Black Plain	White Dot	Black Plain	Black Dot
1/2"	1/8"	1/2"	Series 50	50-1-1	50-1WD-1	—	—
3/4"	1/8"	5/8"	Series 70	70-1-1	70-1WD-1	DS70-1-1	DS70-1BD-1
3/4"	3/16"	5/8"	Series 70	70-1-3	—	DS70-1-3	DS70-1BD-3
3/4"	1/4"	5/8"	Series 70	70-1-2	70-1WD-2	DS70-1-2	DS70-1BD-2
1"	1/8"	3/4"	Series 90	90-1-1G	90-1WD-1G	DS90-1-1	DS90-1BD-1G
1"	3/16"	3/4"	Series 90	90-1-3	—	DS90-1-3	DS90-1BD-3
1"	1/4"	3/4"	Series 90	90-1-2	90-1WD-2	DS90-1-2	DS90-1BD-2
1-1/4"	1/4"	5/8"	Series 125	125-1-2	125-1WD-2G	DS125-1-2	—
1-3/4"	1/4"	7/8"	Series 175	175-1-2	—	—	—
2-1/4"	1/4"	7/8"	Series 225	225-1-2	—	—	—

Standard



Designer



Series	A +.030 −.010	B min.	C min.	D max.	E min.	F ±.030	F1 ±.030
50	.500	.435	.026	.158	.405	.510	—
70	.700	.485	.026	.187	.405	.610	.590
90	.900	.640	.114	.260	.520	.790	.735
125	1.250	.750	.114	.260	.455	.700	.620
175	1.750	.750	.114	.260	.520	.850	—
225	2.250	.750	.114	.260	.520	.875	—

ROUND/RING SKIRT

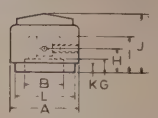
Standard

Designer

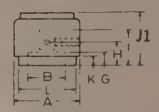
SELECTION GUIDE

Knob Dia. (Appx.)	Shaft Dia.	Knob Height (Appx.)	Dimension Dwg. Ref.	Stocked Catalog Numbers			
				Standard		Designer	
				Black Plain	White Dot	Black Plain	Black Dot
1/2"	1/8"	5/8"	Series 50	50-2-1	50-2WD-1	—	—
3/4"	1/8"	3/4"	Series 70	70-2-1	70-2WD-1	DS70-2-1	DS70-2BD-1
3/4"	1/4"	3/4"	Series 70	70-2-2	70-2WD-2	DS70-2-2	DS70-2BD-2
1"	1/8"	1"	Series 90	90-2-1G	—	—	—
1"	1/4"	1"	Series 90	90-2-2	90-2WD-2	DS90-2-2	DS90-2BD-2
1-1/4"	1/4"	3/4"-7/8"	Series 125	125-2-2	—	DS125-2-2	—
1-3/4"	1/4"	1"	Series 175	175-2-2	—	—	—
2-1/4"	1/4"	1"	Series 225	225-2-2	—	—	—

Standard



Designer



Series	A +.030 −.010	B min.	H max.	I min.	J ±.030	J1 ±.030	K max.	L max.
50	.500	.435	.325	.560	.655	—	.175	.460
70	.700	485	.369	568	.782	780	187	.680
90	.900	.640	.484	.730	1.010	.980	.235	.845
125	1.250	.750	.427	.605	.850	.785	.175	1.185
175	1.750	.750	.489	.740	1.070	—	.240	1 690
225	2.250	.750	.489	.740	1.095	—	240	2.185

Note: Two set screws are provided.

ROUND/ DIAL SKIRT

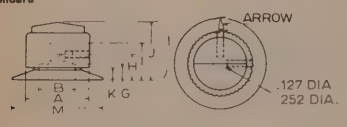
Standard

Designer

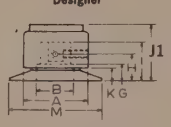
SELECTION GUIDE

Knob Dia. (Appx.)	Dial Skirt Dia. (Appx.)	Shaft Dia.	Knob Hght. (Appx.)	Dimension Dwg. Ref.	Stocked Catalog Numbers		
					Standard Pointer Arrow		Designer Pointer Arrow
					Black	Black Matte Back Lighted Arrow	Black
1/2"	1"	1/8"	5/8"	Series 50	50-3-1	50-3BL-1G	—
3/4"	1-1/8"	1/8"	3/4"	Series 70	70-3-1	—	DS70-3-1
3/4"	1-1/8"	1/4"	3/4"	Series 70	70-3-2	70-3BL-2G	DS70-3-2
1"	1-1/2"	1/8"	1"	Series 90	90-3-1G	—	—
1"	1-1/2"	1/4"	1"	Series 90	90-3-2	90-3BL-2G	DS90-3-2
1-1/4"	1-7/8"	1/4"	3/4"-7/8"	Series 125	125-3-2	125-3BL-2G	DS125-3-2
1-3/4"	2-1/2"	1/4"	1"	Series 175	175-3-2	175-3BL-2G	—
2-1/4"	3"	1/4"	1"	Series 225	225-3-2	—	—

Standard

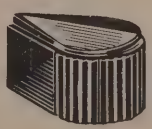


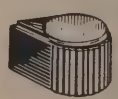
Designer



Series	A +.030 −.010	B min.	G min.	H max.	I min.	J ±.030	J1 ±.030	K max.	M max.
50	.500	.435	.177	.325	.560	.655	—	.175	.900
70	.700	.485	.188	.369	.568	.782	.780	.187	1.150
90	.900	640	320	.484	730	1.010	.980	.235	1.525
125	1.250	750	250	.427	.605	.850	.785	.175	1.837
175	1.750	.750	.320	489	.740	1.070	—	240	2.468
225	2 250	.750	.320	489	.740	1 095	—	.240	3 020

POINTER

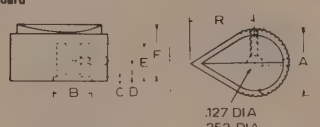

Standard


Designer

SELECTION GUIDE

Knob Dia. (Appx.)	Pointer Radius (Appx.)	Shaft Dia.	Knob Hght. (Appx.)	Dimension Dwg. Ref.	Stocked Catalog Numbers	
					Standard	Designer
					Black	Black
1/2"	1/2"	1/8"	1/2"	Series 50	50-4-1	—
3/4"	5/8"	1/8"	5/8"	Series 70	70-4-1	—
3/4"	5/8"	1/4"	5/8"	Series 70	70-4-2	DS70-4-2
1"	7/8"	1/8"	1"	Series 90	90-4-1G	—
1"	7/8"	1/4"	1"	Series 90	90-4-2	DS90-4-2

Standard



Designer

Series	A +.030 −.010	B min.	C min.	D max.	E min.	F ±.030	F1 ±.030	R +.025 −.005
50	500	435	.026	.158	405	.510	—	.490
70	.700	485	026	.187	405	.610	.590	.680
90	.900	640	114	260	520	.790	735	885

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RAYTHEON CONTROL KNOBS/STANDARD & DESIGNER SERIES

POINTER/RING SKIRT

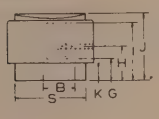
Standard

Designer

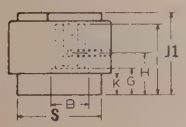
SELECTION GUIDE

Knob Dia. (Appx.)	Pointer Radius (Appx.)	Shaft Dia.	Knob Hght. (Appx.)	Dimension Dwg. Ref.	Stocked Catalog Numbers	
					Standard	Designer
					Black	Black
1/2"	1/2"	1/8"	1/2"	Series 50	50-5-1	—
3/4"	5/8"	1/8"	5/8"	Series 70	70-5-1	DS70-5-1
3/4"	5/8"	1/4"	5/8"	Series 70	70-5-2	—
1"	7/8"	1/8"	1"	Series 90	—	—
1"	7/8"	1/4"	1"	Series 90	90-5-2	DS90-5-2

Standard



Designer



Series	A +.030 −.010	B min.	G min.	H max.	I min.	J ±.030	J1 ±.030	K max.	R +.025 −.005	S max.
50	.500	.435	.177	.325	.560	.655	—	.175	.490	.690
70	.700	.485	.188	.369	.568	.782	.765	.187	.680	1.000
90	.900	.640	.320	.484	.730	1.010	.970	.235	.885	1.345

Note: Two set screws are provided.

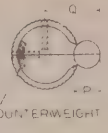
CRANK

Standard

Designer

Knob Dia. (Appx.)	Crank Radius (Appx.)	Shaft Dia.	Crank Hght. (Appx.)	Dimension Dwg. Ref.	Stocked Catalog Numbers	
					Standard	Designer
					Black	Black
1-1/4"	1-1/8"	1/4"	1-3/8"	Series 125	125-6-2	DS125-6-2
1-3/4"	1-1/2"	1/4"	1-3/4"	Series 175	175-6-2	DS175-6-2G
2-1/4"	1-3/4"	1/4"	1-3/4"	Series 225	225-6-2	—

Standard and Designer



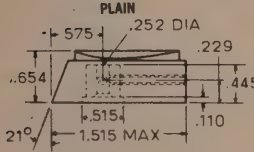
Aluminum handle (Designer Series)

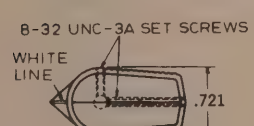
Series	A +.030 −.010	B min.	H max.	I min.	J ±.030	L max.	N ±.050	P ±.025	Q max.
125	1.250	.750	.427	605	850	1.185	1.350	580	1.189
175	1.750	.750	.489	740	1.070	1.690	1.758	780	1.527
225	2.250	750	489	740	1.095	2.185	1.782	780	1.707

BAR POINTERS/STANDARD SERIES

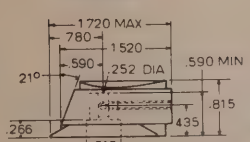
1-1/2" BAR—70 SERIES

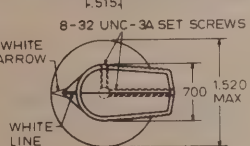
PLAIN





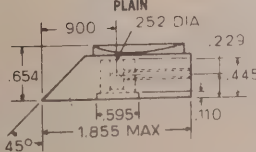
DIAL SKIRT

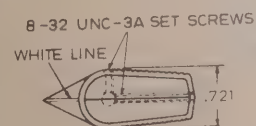




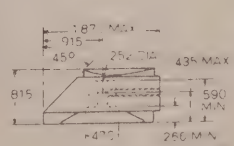
1-7/8" BAR—90 SERIES

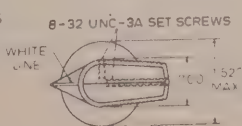
PLAIN





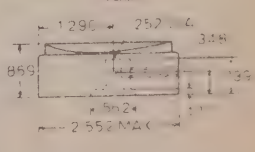
DIAL SKIRT

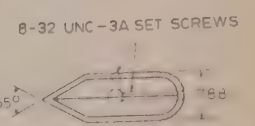




2-1/2" BAR—125 SERIES

PLAIN





Bar Lgth. (Appx.)	Shaft Dia.	Bar Wdth. (Appx.)	Style	Stocked Catalog Numbers				
				Plain			Dial Skirt	
				Black	With White Line		With White Line	
					Black	*Gray	Black	Gray
1-1/2"	1/4"	3/4"	Series 70	—	70-7WL-2	G70-7WL-2G	70-8WL-2	G70-8WL-2
1-7/8"	1/4"	3/4"	Series 90	—	90-7WL-2	G90-7WL-2G	90-8WL-2	*G90-8WL-2G
2-1/2"	1/4"	3/4"	Series 125	125-7-2	—	—	—	—

*Matte Finish

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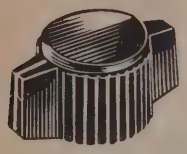
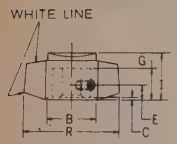
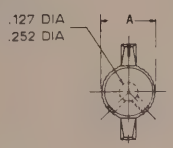
RAYTHEON CONTROL KNOBS/STANDARD & DESIGNER SERIES

BAR KNOBS—STANDARD SERIES

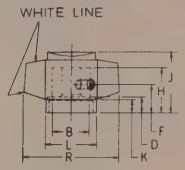
ROUND

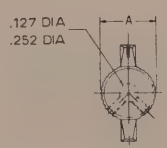




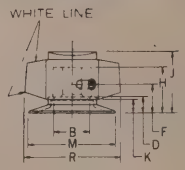


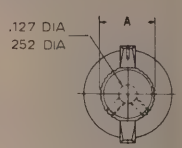
RING SKIRT





DIAL SKIRT





A +.030 −.010	.700	H min.	.568
B min.	.485	I ±.030	.610
C min.	.026	J ±.030	.782
D min.	.188	K max.	.187
E max	.187	L max.	.680
F max.	.369	M max.	1.150
G min.	.405	R ±.025	1.150

SELECTION GUIDE

Knob Dia. (Appx.)	Bar Lgth. (Appx.)	Shaft Dia.	Knob Hght. (Appx.)	Stocked Catalog Numbers Black with White Line		
				Round	Ring Skirt	Dial Skirt
3/4"	1-1/8"	1/8"	3/4"	—	—	70B-3-1
3/4"	1-1/8"	1/4"	3/4"	—	70B-2-2	70B-3-2
3/4"	1-1/8"	1/4"	5/8"	70B-1-2	—	—

SELF-LOCKING KNOBS—Standard Series

Knob must be depressed **before** shaft can be turned. Available in two styles.

PT Series: For applications where relationship between knob rotation and shaft rotation **must** be maintained. Both knob and shaft are locked until knob is depressed.

PTE Series: For applications where knob-to-shaft rotation relationship does not need to be maintained. Knob is free to rotate while shaft is locked until knob is depressed.

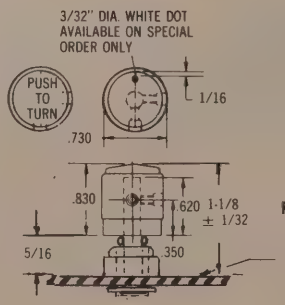
ROUND—RING SKIRT

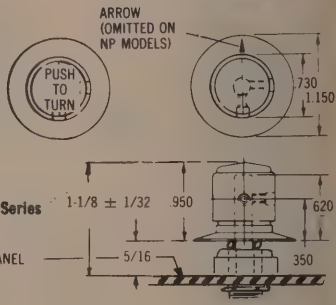
ROUND—DIAL SKIRT

SELECTION GUIDE

Knob Dia. (Appx.)	Shaft Dia.	Series No.	PTE Series Stocked Catalog Numbers Round-Ring Skirt Gray*	Round-Ring Skirt Black*	Round-Dial Skirt Gray with Arrow*	Round-Dial Skirt Black with Arrow*
3/4"	1/8"	70	PTEG70-2-1	PTE70-2-1	—	PTE70-3-1
3/4"	1/4"	70	PTEG70-2-2	PTE70-2-2	PTEG70-3-2	PTE70-3-2

*Numbers shown are for mirror finish. Add suffix G for matte (dull) finish



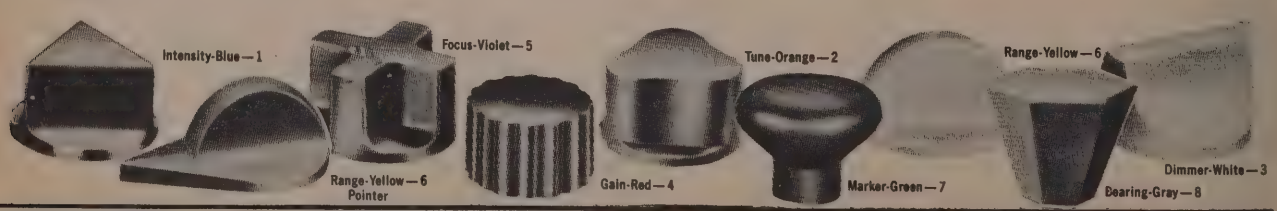


PT Series			Round-Ring Skirt Black*	Round-Dial Skirt Black with Arrow*	Round-Dial Skirt Black No Arrow
3/4"	1/8"	70	PT70-2-1	PT-70-3-1	PT70-3NP-1
3/4"	1/4"	70	PT70-2-2	PT70-3-2	PT70-3NP-2

*Numbers shown are for mirror finish. Add suffix G for matte (dull) finish.
Note: Two 4-40 UNC-3A set screws provided.

TACTILE KNOBS

These tactile-shaped and colored tops may be combined with all standard knobs except bar pointer.
Order by adding suffix number. e.g., 70-2-2G-1



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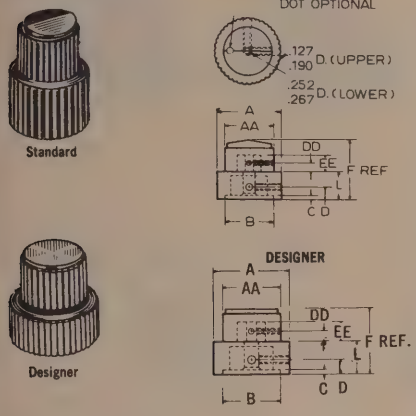
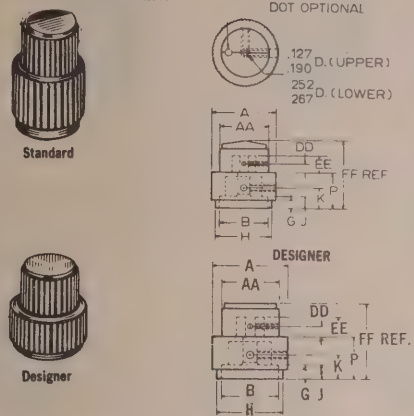
RAYTHEON CONTROL KNOBS/STANDARD & DESIGNER SERIES

CONCENTRIC KNOBS

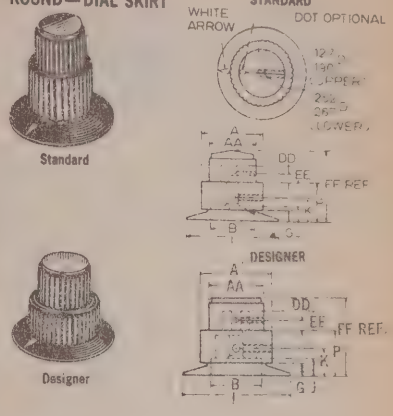
ROUND—ROUND



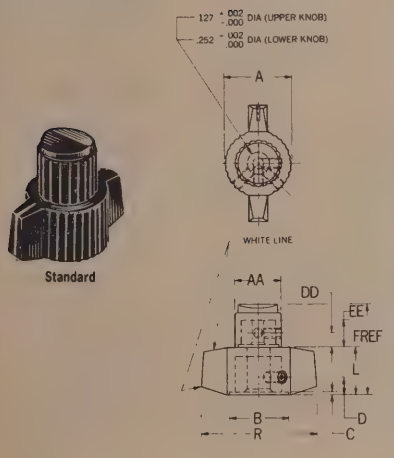
ROUND—RING SKIRT



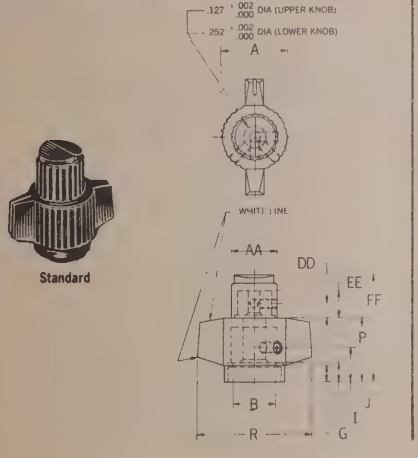
ROUND—DIAL SKIRT



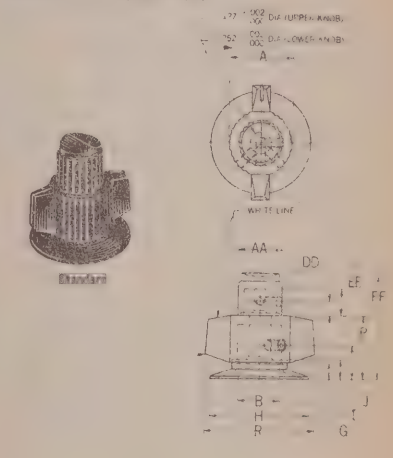
ROUND—ROUND BAR



ROUND—RING SKIRT BAR



ROUND—DIAL SKIRT BAR



DIMENSIONS FOR ALL CONCENTRICS

Standard and Designer Series	A +.030 −.010	AA +.030 −.−.010	B min.	C min.	D max.	DD max.	EE min.	F ref.	FF ref.	G max.	H max.	I max.	J max.	K max.	L ±.015	P ±.025	R ±.025
50/70	.700	.500	.485	.026	.187	.158	.405	1.065	1.255	187	.680	1.150	188	369	510	690	1 160
70/90	.900	.700	.640	.114	.260	.187	.405	1.310	1.550	.235	845	1.525	320	484	655	885	—
90/125	1.250	.900	.750	.114	.260	.260	.520	1.365	1.545	.175	1 185	1.837	250	427	530	700	—

SELECTION GUIDE ROUND TYPES ONLY

Knob Dia's. Upper/Lower (Approx.)	Shaft Dia's. Upper/Lower	Knob Color Upper/Lower	Style Series	Stocked Catalog Numbers — Concentric Styles — Round—Round Upper/Lower	Round—Ring Skirt Upper/Lower	Round-Dial Skirt Upper/Lower
STANDARD SERIES ROUND TYPES ONLY						
1/2"/3/4"	1/8"/1/4"	Black/Black	50/70	—	—	50-1-1/70-3CB-2
1/2"/3/4"	1/8"/1/4"	Black White Dot/Black	50/70	—	—	50-1WD-1/70-3CB-2
3/4"/1"	1/8"/1/4"	Black/Black	70/90	70-1-1/90-1CB-2	70-1-1/90-2CB-2	70-1-1/90-3CB-2
3/4"/1"	1/8"/1/4"	Black White Dot/Black	70/90	70-1WD-1/90-1CB-2	70-1WD-1/90-2CB-2	70-1WD-1/90-3CB-2
3/4"/1"	3/16"/.267	Black/Black	70/90	70-1-3/90-1CB-4	—	70-1-3/90-3CB-4
1"/1.25"	3/16"/1/4"	Black/Black	90/125	—	—	90-1-3/125-3CB-2
DESIGNER SERIES ROUND TYPES ONLY						
3/4"/1"	1/8"/1/4"	Alum./Black	70/90	DS70-1-1/90-1CB-2	DS70-1-1/90-2CB-2	DS70-1-1/90-3CB-2
3/4"/1"	1/8"/1/4"	Alum. Black Dot/Black	70/90	DS70-1BD-1/90-1CB-2	DS70-1BD-1/90-2CB-2	DS70-1BD-1/90-3CB-2
3/4"/1"	3/16"/.267	Alum./Black	70/90	DS70-1-3/90-1CB-4	—	DS70-1-3/90-3CB-4
3/4"/1"	3/16"/.267	Alum. Black Dot/Black	70/90	—	—	—
1"/1.25"	1/8"/1/4"	Alum. Black Dot/Black	90/125	—	—	DS90-1BD-1-125-3CB-2
1"/1.25"	3/16"/1/4"	Alum./Black	90/125	—	—	DS90-1-3/125-3CB-2
STANDARD SERIES BAR TYPES ONLY						
1/2"/3/4"	1/8"/1/4"	Black/Black White Line	50/70	50-1-1/70B-1CB-2	50-1-1/70B-2CB-2	50-1-1/70B-3CB-2

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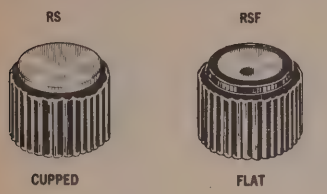
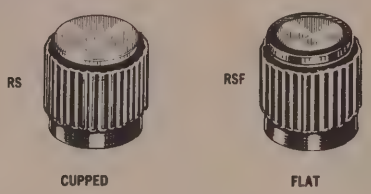
RAYTHEON CONTROL KNOBS/REGENCY SERIES

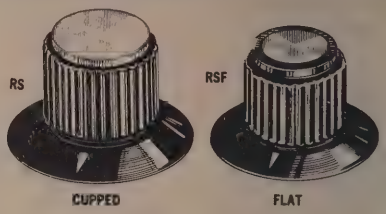
ROUND



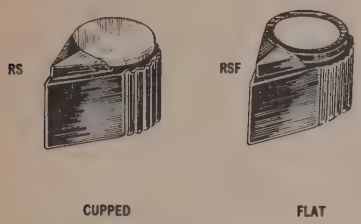
ROUND/RING SKIRT



ROUND/DIAL SKIRT



POINTER



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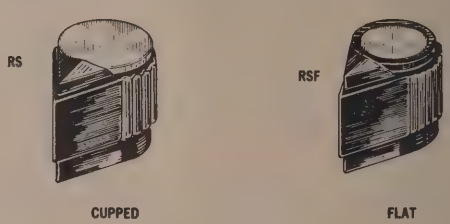
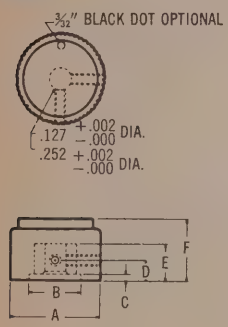
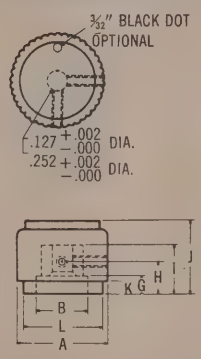


DIMENSIONS REGENCY SERIES

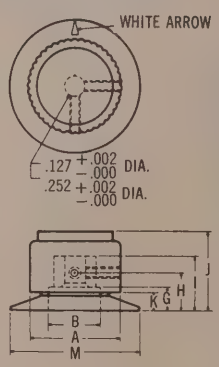
ROUND



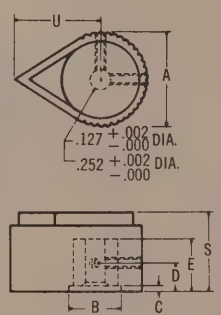
ROUND/RING SKIRT



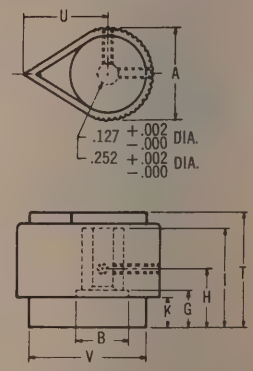
ROUND/DIAL SKIRT



POINTER



POINTER/RING SKIRT



SPECIFICATIONS FOR ALL SERIES

STANDARD SERIES

- **A.** Material and performance per MIL-K-3926
- **B.** Dimensions per MS91528
- **C.** Colors per FED-STD-595. Black No. 37038 (matte): 17038 (mirror). Gray No. 36231 (matt); 16231 (Mirror).
- **D.** Moisture Resistance: 10 days, method 106 MIL-STD-202.
- **E.** Salt Spray: 48 hours, method 101, Cond. B of MIL-STD-202.
- **F.** Temperature: −65° to +125°C.
- **G.** Torque: 15 pound inches with 4-40 set screws, maximum diameter ¾" 30 lb. inches with 8-32 set screw and larger diameters.
- **H.** Set Screws: Corrosion treated steel with hex heads, cup points. Fluted socket and stainless steel types available.
- **J.** Flammability: self extinguishing.

DESIGNER SERIES

Moisture Resistance: 10 days
Temperature: −65° to +125°C
Torque: 15 pound inches with 4-40 set screws, maximum diameter ¾", 30 lb. inches with 8-32 set screw and larger diameters.
Set Screws: Corrosion treated steel with hex heads, cup points. Fluted socket and stainless steel types available.

REGENCY SERIES

Molded parts in accordance with MIL-K-3926.
Color per FED-STD-595.
Black number 37038 (MATTE), 10738 (MIRROR).
Flammability: self extinguishing.
Set screws: per FFS200, corrosion-treated steel with hex heads and cup points.

See other Raytheon Products in EEM

Opto-electronics—Section 3700
Switches—Section 5100
Test Jacks—Section 2100
Hardware—Section 2800

NOTES:

Standard Series

(a) Two set screws are provided:
4-40 UNC-3A on all 50 & 70 series and all 1/8" shaft models
8-32 UNC-3A on all others
(b) Custom skirt or body marking available on special order
(c) Some sizes available from stock in gray or red. Other colors on special order
(d) Reducing bushings available to reduce 1/4" shaft to 1/8" or 3/16" (RB-100=1/8") (RB-200=3/16")

Designer Series

(a) Two set screws are provided:
4-40 UNC-3A on all 70 series and 1/8" shaft models
8-32 UNC-3A on all others

400 and Panelrama Series

(a) Two set screws are provided:
4-40 UNC-3A on all 1/8" shaft models
6-32 UNC-3A on all others

Regency Series

(a) Two set screws are provided:
4-40 UNC-3A on all 1/8" shaft models
8-32 UNC-3A on 1/4" shaft models

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RAYTHEON CONTROL KNOBS/REGENCY SERIES

DIMENSIONS

Series	A +.030 −.010	B min.	C min.	D max.	E min.	F ±.030	G min.	H max.	I min.	J ±.030	K max.	L max.	M ±.050	S ±.030	T ±.030	U +.025 −.005	V max.
RS/RSF50	.500	.300	.026	.158	.405	.470	.177	.325	.560	.625	.175	460	900	—	—	—	—
RS/RSF70	.700	.485	.026	.187	.405	.590	.188	.369	.568	780	187	680	1 150	590	765	680	1 000
RS/RSF90	.900	.640	.114	.260	.520	.735	.320	484	.730	.980	.235	.845	1 525	735	970	885	1 345
RS/RSF125	1.250	.750	.114	.260	.455	.620	.250	.427	.605	.785	.175	1 185	1.837	—	—	—	—

*RS70, RS90, RSF70 and RSF90 series knobs available with 0.127 hole for 1/8" shafts at slight additional cost.
Note: Two set screws are provided:
4-40 UNC-3A on all 50 & 70 Series and 1/8" shaft models
8-32 UNC-3A on all others

SELECTION GUIDE

Style	Finish: Matte	Finish: Mirror	Knob Dia. (Inches Approx.)	*Shaft Dia. (Inches)	Knob Height (Inches Approx.)	Dial Skirt Dia. (Inches Approx.)	Pointer Radius (Inches Approx.)	Dimension Drawing Reference	STOCKED CATALOG NO. Cupped RS Series: Plain	Cupped RS Series: Black Dot	Cupped RS Series: Black 1/2 Line	Flat RSF Series: Plain	Flat RSF Series: Black Dot	Flat RSF Series: Black 1/2 Line
Round	—	X	1/2	1/8	1/2	—	—	50	—	—	—	RSF50-1-1	RSF50-1BD-1	RSF50-1BL-1
	X	—	1/2	1/8	1/2	—	—	50	—	—	—	RSF50-1-1G	RSF50-1BD-1G	RSF50-1BL-1G
	—	X	3/4	1/4	5/8	—	—	70	RS70-1-2	RS70-1BD-2	—	—	RSF70-1BD-2	RSF70-1BL-2
	X	—	3/4	1/4	5/8	—	—	70	RS70-1-2G	RS70-1BD-2G	—	—	RSF70-1BD-2G	RSF70-1BL-2G
	—	X	1	1/4	3/4	—	—	90	—	—	—	RSF90-1-2	RSF90-1BD-2	RSF90-1BL-2
	X	—	1	1/4	3/4	—	—	90	—	RS90-1BD-2G	—	RSF90-1-2G	RSF90-1BD-2G	RSF90-1BL-2G
	—	X	1-1/4	1/4	5/8	—	—	125	RS125-1-2	—	—	RSF-125-1-2	RSF125-1BD-2	—
	X	—	1-1/4	1/4	5/8	—	—	125	—	—	—	—	RSF125-1BD-2G	RSF125-1BL-2G
Round with Ring Skirt	—	X	1/2	1/8	5/8	—	—	50	—	RS50-2BD-1	—	RSF50-2-1	RSF50-2BD-1	RSF125-2BL-1
	X	—	1/2	1/8	5/8	—	—	50	RS50-2-1G	—	RS50-2BL-1G	—	RSF50-2BD-1G	RSF50-2BL-1G
	—	X	3/4	1/4	3/4	—	—	70	RS70-2-2	RS70-2BD-2	—	RSF70-2-2	RSF70-2BD-2	RSF70-2BL-2
	X	—	3/4	1/4	3/4	—	—	70	RS70-2-2G	RS70-2BD-2G	RS70-2BL-2G	RS70-2-2G	RSF70-2BD-2G	RSF70-2BL-2G
	—	X	1	1/4	1	—	—	90	RS90-2-2	—	—	RSF90-2-2	RSF90-2BD-2	RSF90-2BL-2
	X	—	1	1/4	1	—	—	90	—	—	—	RSF90-2-2G	RSF90-2BD-2G	RSF90-2BL-2G
	—	X	1-1/4	1/4	3/4	—	—	125	—	—	—	—	RSF125-2BD-2	—
	X	—	1-1/4	1/4	3/4	—	—	125	—	—	—	—	RSF125-2BD-2G	RSF125-2BL-2G
Round with Dial Skirt	—	X	1/2	1/8	5/8	1	—	50	RS50-3-1	—	—	RSF-50-3-1	—	—
	X	—	1/2	1/8	5/8	1	—	50	RS50-3-1G	—	—	RSF-50-3-1	—	—
	—	X	3/4	1/4	3/4	1-1/8	—	70	RS70-3-2	—	—	—	—	—
	X	—	3/4	1/4	3/4	1-1/8	—	70	RS70-3-2G	—	—	—	—	—
	—	X	1	1/4	1	1-1/2	—	90	RS90-3-2	—	—	RSF-90-3-2	—	—
	X	—	1	1/4	1	1-1/2	—	90	RS90-3-2G	—	—	RSF-90-3-2G	—	—
Pointer	—	X	3/4	1/4	1/2	—	5/8	70	RS70-4-2	—	—	RSF 70-4-2	—	—
	X	—	3/4	1/4	1/2	—	5/8	70	RS70-4-2G	—	—	RSF 70-4-2G	—	—
	—	X	1	1/4	3/4	—	7/8	90	—	—	—	RS—90-4-2	—	—
	X	—	1	1/4	3/4	—	7/8	90	RS90-4-2G	— —	—	RSF-90-4-2G	—	—
Pointer with Ring Skirt	—	X	3/4	1/4	3/4	—	5/8	70	RS70-5-2	—	—	RSF-70-5-2	—	—
	X	—	3/4	1/4	3/4	—	5/8	70	RS70-5-2G	—	—	RSF-70-5-2G	—	—
	—	X	1	1/4	1	—	7/8	90	RS90-5-2	—	—	RSF 90-5-2	—	—
	X	—	1	1/4	1	—	7/8	90	RS90-5-2G	—	—	RSF 90-5-2G	—	—

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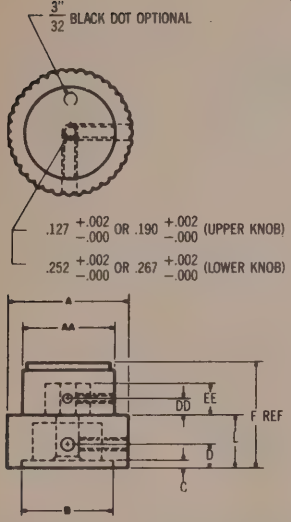
RAYTHEON CONTROL KNOBS/REGENCY SERIES/CONCENTRIC

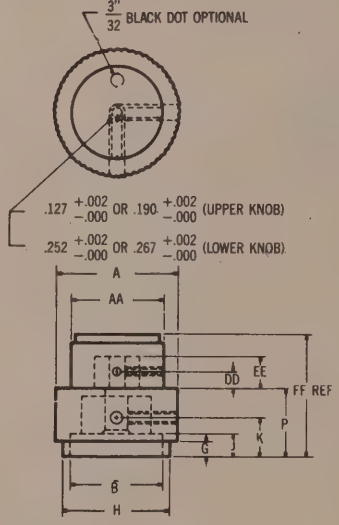
ROUND—ROUND

CUPPED STYLE SHOWN.



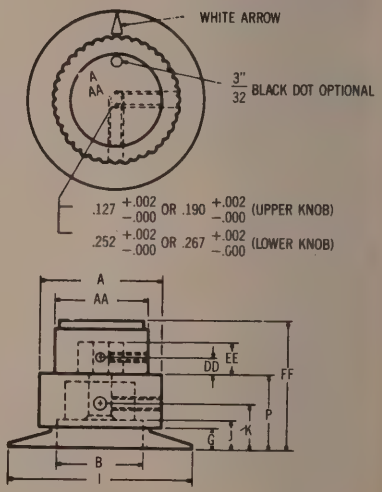
ROUND—RING SKIRT

CUPPED STYLE SHOWN.



ROUND—DIAL SKIRT

CUPPED STYLE SHOWN.



EXPLANATION OF CATALOG DESIGNATIONS FOR CONCENTRIC KNOBS

Concentric knobs bear a dual designation, those at the left of the slash mark describe the upper round knob (1) the series, (2) the diameter, (3) the cap marking if any. The designations to the right of the slash mark describe for the lower concentric knob (1) the diameter, (2) the type, (3) the through shaft hole size and (4) the finish of both upper and lower knobs.

Note: Two set screws are provided:
4-40 UNC-3A on all 1/8" shaft models
8-32 UNC-3A on 1/4" shaft models

DIMENSIONS

Series	A +.030 −.010	AA +.030 −.010	B min.	C min.	D max.	DD max.	EE min.	F ref.	FF ref.	G max.	H max.	I min.	J max.	K max.	L ±.015	P ±.025
RS/RSF50/70	.700	.500	.485	.026	.187	.158	.405	.980	1.309	.187	.680	1.150	.188	.369	.510	.690
RS/RSF70/90	.900	B 700	.640	.114	.260	.187	.405	1.310	1.550	.235	.845	1.525	.320	.484	.655	.885
RS/RSF90/125	1.250	.900	.750	.114	.260	.260	.520	1.365	1.545	.175	1.185	1.837	.250	.427	.530	.700

Style	Finish Upper and Lower: Matte	Finish Upper and Lower: Mirror	Knob Dia. (Inches Approx.): Upper	Knob Dia. (Inches Approx.): Lower	Overall Height (Inches Approx.)	Shaft Dia. (Inches): Upper	Shaft Dia. (Inches): Lower	Dial Skirt (Inches Approx.) Lower Only	Dimension Drawing Reference	STOCKED CATALOG NUMBERS: Cupped RS Series Upper Knob: Plain	Cupped RS Series Upper Knob: Black Dot	Cupped RS Series Upper Knob: Black 1/2 Line	Flat RSF Series Upper Knob: Plain	Flat RSF Series Upper Knob: Black Dot	Flat RSF Series Upper Knob: Black 1/2 Line
Round Round	—	X	1/2	3/4	1	1/8	1/4	—	50/70	RS50/70-1-2	—	—	RSF50/70-1-2	—	—
	X	—	1/2	3/4	1	1/8	1/4	—	50/70	RS50/70-1-2G	RS50BD/70-1-2G	RS50BL/70-1-2G	RSF50/70-1-2G	RSF50BD/70-1-2G	RSF50BL/70-1-2G
	—	X	3/4	1	1-3/8	1/8	1/4	—	70/90	RS70/90-1-2	RS70BD/90-1-2	RS70BL/90-1-2	RSF70/90-1-2	RSF70BD/90-1-2	RSF70BL/90-1-2
	X	—	3/4	1	1-3/8	1/8	1/4	—	70/90	RS70/90-1-2G	RS70BD/90-1-2G	RS70BL/90-1-2G	RSF70-90-1-2G	RSF70BD/90-1-2G	RSF70BL/90-1-2G
	—	X	1	1-1/4	1-3/8	1/8	1/4	—	90/125	RS90/125-1-2	RS90BD/125-1-2	RS90BL/125-1-2	RSF90/125-1-2	RSF90BD/125-1-2	RSF90BL/125-1-2
	X	—	1	1-1/4	1-3/8	1/8	1/4	—	90/125	RS90/125-1-2G	RS90BD/125-1-2G	RS90BL/125-1-2G	RSF90/125-1-2G	RSF90BD/125-1-2G	RSF90BL/125-1-2G
Round Ring Skirt	—	X	1/2	3/4	1-1/4	1/8	1/4	—	50/70	RS50/70-2-2	—	RS50BL/70-2-2	RSF50/70-2-2	RSF50BD/70-2-2	RSF50BL/70-2-2
	X	—	1/2	3/4	1-1/4	1/8	1/4	—	50/70	RS50/70-2-2G	RS50BD/70-2-2G	RS50BL/70-2-2G	RSF50/70-2-2G	RSF40BD/70-2-2G	RSF50BL/70-2-2G
	—	X	3/4	1	1-1/2	1/8	1/4	—	70/90	RS70/90-2-2	RS70BD/90-2-2	RS70BL/90-2-2	RSF70/90-2-2	RSF70BD/90-2-2	RSF70BL/90-2-2
	X	—	3/4	1	1-1/2	1/8	1/4	—	70/90	RS70/90-2-2G	RS70BD/90-2-2G	RS70BL/90-2-2G	RSF70/90-2-2G	RSF70BD/90-2-2G	RSF70BL/90-2-2G
	—	X	1	1-1/4	1-1/2	1/8	1/4	—	90/125	RS90/125-2-2	RS90BD/125-2-2	RS90BL/125-2-2	RSF90/125-2-2	RSF90BD/125-2-2	RSF90BL/125-2-2
	X	—	1	1-1/4	1-1/2	1/8	1/4	—	90/125	RS90/125-2-2G	RS90BD/125-2-2G	RS90BL/125-2-2G	RSF90/125-2-2G	RSF90BD/125-2-2G	RSF90BL/125-2-2G
Round Dial Skirt	—	X	1/2	3/4	1-3/8	1/8	1/4	1-1/8	50/70	—	—	—	RSF50/70-3-2	RSF50BD/70-3-3	RSF50BL/70-3-2
	X	—	1/2	3/4	1-3/8	1/8	1/4	1-1/8	50/70	RS50/70-3-2G	RS50BD/70-3-2G	RS50BL/70-3-2G	RSF50/70-3-2G	RSF50BD/70-3-2G	RSF50BL/70-3-2G
	—	X	3/4	1	1-1/2	1/8	1/4	1-1/2	70/90	RS70/90-3-2	RS70BD/90-3-2	RS70BL/90-3-2	RSF70/90-3-2	RSF70BD/90-3-2	RSF70BL/90-3-2
	X	—	3/4	1	1-1/2	1/8	1/4	1-1/2	70/90	RS70/90-3-2G	RS70BD/90-3-2G	RS70BL/90-3-2G	RSF70/90-3-2G	RSF70BD/90-3-2G	RSF70BL/90-3-2G
	—	X	1	1-1/4	1-1/2	1/8	1/4	1-7/8	90/125	RS90/125-3-2	RS90BD/125-3-2	RS90BL/125-3-2	RSF90/125-3-2	RSF90BD/125-3-2	RSF90BL/125-3-2
	X	—	1	1-1/4	1-1/2	1/8	1/4	1-7/8	90/125	RS90-125-3-2G	RS90BD/125-3-2G	RS90BL/125-3-2G	RSF90/125-3-2G	RSF90BD/125-3-2G	RSF90BL/125-3-2G

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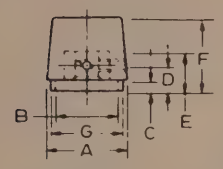
RAYTHEON CONTROL KNOBS/400 & PANELRAMA SERIES

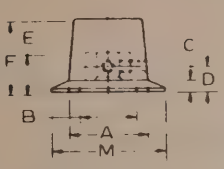
ROUND

400 SERIES PANELRAMA

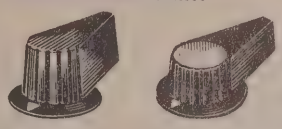


ROUND/DIAL SKIRT

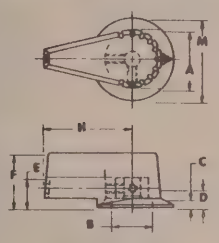
400 SERIES PANELRAMA



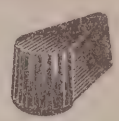
POINTER/DIAL SKIRT



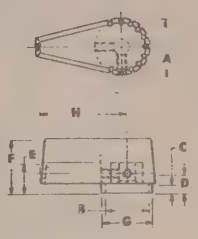
400 SERIES PANELRAMA



POINTER



400 SERIES



DIMENSIONS 400 SERIES AND PANELRAMA

Series No. 400 Series	Series No. Panel Rama	A +.025 −.005	B min.	C min.	D max.	E min.	F ±.030	G max.	H max.	J max.	K max.	M max.
—	PS6	.625	.458	.120	.290	625	.813	.558	910	—	—	925
407	PS7	.720	.520	.120	.290	.625	.813	640	1.120	—	—	1.050
409	—	.875	.660	.120	.290	.625	.813	.800	1.375	1.540	.500	1.270
412	PS12	1.250	1.041	.120	.290	.625	.813	1.170	2.000	1.540	.500	1.710

SELECTION GUIDE 400 SERIES AND PANELRAMA

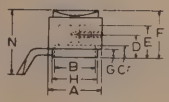
Knob Dia. Panel End (Appx.)	Shaft Size	Knob Hght. (Appx.)	Dial Skirt Dia. (Appx.)	Pointer Radius (Appx.)	Dimension Series Ref.	STOCKED CATALOG NUMBERS											
						Round				Round/Dial Skirt				Pointer/Dial Skirt			Pointer
						400 Series			Panelrama	400 Series			Panelrama	400 Series		Panelrama	400 Series
						Black	Beige	Blue Gray	Black	Black	Beige	Blue Gray	Black	Black	Beige	Black	Black	Beige
5/8"	1/4"	13/16"	1"	—	PS6	—	—	—	—	—	—	—	PS6D2K1R	—	—	—	—	—
3/4"	1/8"	13/16"	1"	—	407	407R1K1	—	—	—	407D1K1	—	—	—	—	—	—	—	—
3/4"	1/4"	13/16"	1-1/16"	1-1/8"	PS7/407	407R2K1	407R2K3	407R1K7	PS7R2K1R	407D2K1	407D2K3	407D2K7	PS7D2K1R	407PD2K1	407PD2K3	PS7PD2K1R	407P2K1	—
7/8"	1/4"	13/16"	1-1/4"	1-3/8"	409	409R2K1	409R2K3	—	—	409D2K1	409D2K3	—	—	409PD2K1	409PD2K3	—	409P2K1	—
1-1/4"	1/4"	13/16"	1-11/16"	2"	PS12/412	412R2K1	412R2K3	—	—	412D2K1	412D2K3	—	PS12DK1R	412PD2K1	—	—	412P2K1	412P2K3

KNOB LOCKS – STANDARD SERIES

POINTER

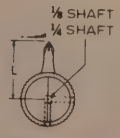
SELECTION GUIDE KNOB LOCK POINTER

Knob Dia. (Appx.)	Shaft Dia.	Dimension Dwg. Series	Stocked Catalog No. Knob Lock Pointer Black
3/4"	1/4"	70	50-1LK-2
1"	1/4"	90	90-1LK-2
1-1/4"	1/4"	125	125-1LK-2



KNOB LOCK POINTER DIMENSIONS

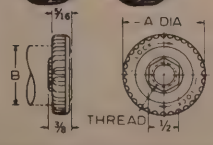
Series	A +.030 −.010	B min.	C min.	D max.	E min.	F ±.030	G max.	H max.	L max.	N max.
70	.700	.560	.188	.369	.568	.782	.187	.680	.812	1.154
90	.905	.640	.320	.437	.680	.958	.235	.845	.968	1.310
125	1.250	1.000	.250	.442	.605	.862	.175	1.185	1.125	1.215



KNOB LOCK

SELECTION GUIDE KNOB LOCKS

Knob Dia. (Appx.)	Thread	Dimension Series No.	Stocked Catalog Numbers Knob Locks Black Standard	Knob Locks Splash Proof
3/4"	3/8-32	70	KL701	KL703
3/4"	1/4-32	70	KL702	—
1"	3/8-32	90	KL901	KL902
1-1/4"	3/8-32	125	KL1251	KL1252

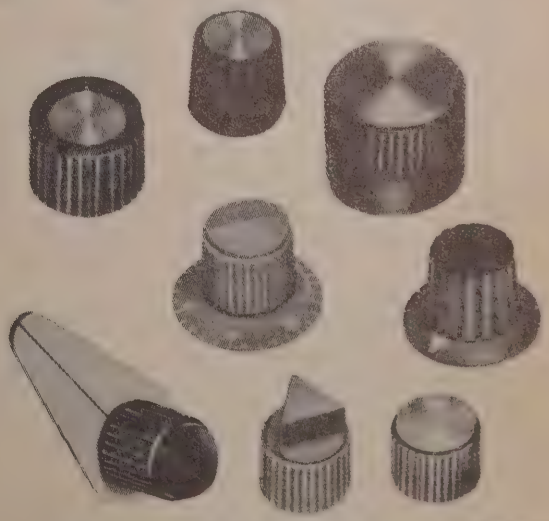


KNOB LOCK DIMENSIONS

Series	A	B
70	1	.721
90	1-5/16	.928
125	1-5/8	1.269

CUSTOM CONTROL KNOBS

Increase the sales appeal of your equipment by coordinating its front panel design. Control Knobs don't have to be just functional "add-on" accessories; you can design your knobs to enhance the appearance of panels and instruments. Our product specialist will assist you in your design efforts by selecting the exact color, size, shape and materials to fully satisfy your requirements.



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RAYTHEON BINDING POSTS/SHAFT LOCKS

5-WAY BINDING POST

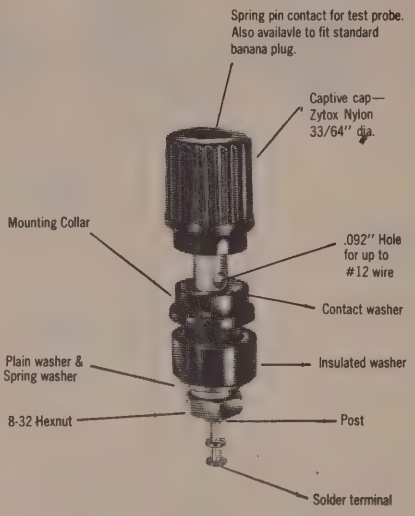
The only 5-way binding post available in two models, for plug-in of either banana plug or a standard .080" test prod, this new unit features the exclusive Raytheon spring pin contact, providing a smooth comsistent, hard-gripping spring action. A tough nylon insulator provides complete insulation from ground.

The following types of connecitons may be made:

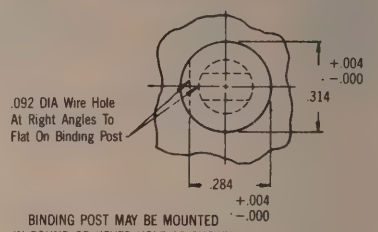
1. Wire looped around shaft and clamped.
2. Wire (up to #12) inserted through hole in shaft and clamped.
3. Alligator or clip lead fastened to shaft.
4. Spade lug inserted around shaft and clamped.
5. Either banana plug or .080" test prod (depending on model used) plugged into post at the top of the fluted cap.

The solder terminal is tin plated to provide for instant soldering. A flat on one side of the nylon mounting collar permits mounting in a punched "D" hole to prevent rotation.

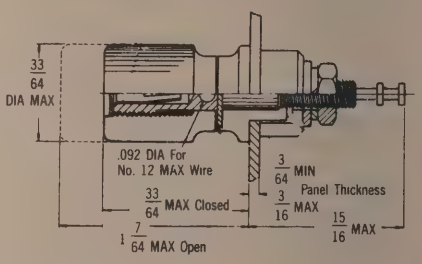
All metal parts are plated to withstand a 50-hour salt spray test. The unit has passed a 250-hour, 95 per cent relative humidity test at 40°C with no adverse effects.


Spring pin contact for test probe. Also availavle to fit standard banana plug.
Captive cap—Zytox Nylon 33/64" dia.
Mounting Collar
.092" Hole for up to #12 wire
Contact washer
Plain washer & Spring washer
Insulated washer
8-32 Hexnut
Post
Solder terminal

MOUNTING HOLE DIMENSIONS



BINDING POST MAY BE MOUNTED IN ROUND OR KEYED HOLE AS SHOWN



SPECIFICATIONS

Electrical Rating: Current Capacity: 30 amperes. Operating voltage: 1000 volts RMS. Capacitance to ground: 1.9 mmf (mounted on a 1/8" panel) with a dissipation factor of .0053 at 1000 cps.
Panel thickness range: 3/64 min. to 3/16 max.

ORDERING DATA

CATALOG NUMBERS		
Color	For .080 Test Prod	For Banana Plug
Black	BP-100B	BP-105B
Red	BP-101B	BP106R

Other colors available on special order

SHAFT LOCKS

Raytheon Shaft Locks prevent control shafts from rotating under conditions of shock, vibration, or accidental contact. They form a dust and waterproof seal at the shaft and also at the panel surface. One-piece construction, they are simple, effective, and inexpensive.

The Shaft Lock's tapered nylon collar grips the control shaft tightly forming a dust and water-tight seal and exerting an even frictional drag which resists accidental rotation. A molded lip at the outer edge of the base compresses against the panel surface to complete the sealing function of the device. To adjust the control smoothly and accurately, merely insert a screwdriver and turn—no unlocking and relocking required. Tests have demonstrated no significant change in locking torque and water sealing even after 10,000 full on-full off cycles.

Shaft Locks mount directly to the threaded bushing found on most potentiometers and other variable controls. Simply discard the nuts and washers supplied with the control, slip on the Shaft Lock, and tighten with any type of standard 1/2 inch wrench. Once in place, the Shaft Lock need never be loosened—a distinct advantage over conventional two-piece metal split bushing types.

The Knob Lock, Model SL-110B, fits underneath the 90 Series knob and is completely out of sight. It is often a replacement for more expensive and complicated locking devices and provides the same high quality performance as the regular models.

SPECIFICATIONS

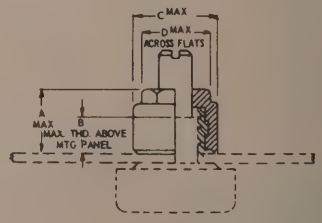
Nylon—MIL-M-20693
Insert—Brass per QQ-B-626 Nickel plated per QQ-N-290, Class I, Type V
Shock—50 g's
Vibration—5 hours at 10 to 55 cps with amplitude of 0.06"
Water Immersion—50 hours under 3 ft. head of water. Control shaft rotated every 10 hours.
Temperature Shock—Five cycles of 30 munutes at each extreme, −55°C and +85°C
Humidity—150 hours at 95% relative lhumidity 40°C
Life Wear—10,000 complete cycles

ORDERING DATA

	Catalog No.	For Shaft Size	Control Bushing Thread Size	Color
Shaft Lock Models	SL-100B	1/4"	3/8-32 NEF-2	Black
	SL-101R	1/4"	3/8-32NEF-2	Red
	SL-105B	1/8"	1/4-32 NEF-2	Black
Knob Locking Model*	SL-110B	1/4"	3/8-32 NEF-2	Black

*Use with any 90 Series, or larger, ring or dial skirted round, skirted pointer, or crank knob. See also page 11 for other knob locks.

Shaft Lock Knob Lock



DIMENSIONS

MODEL	A	B	C	D
SL-100B	.480	.348	.630	.505
SL-101R	.480	.348	.630	.505
SL-105B	.317	.223	.455	.380
SL-110B	.286	.187	.630	.505

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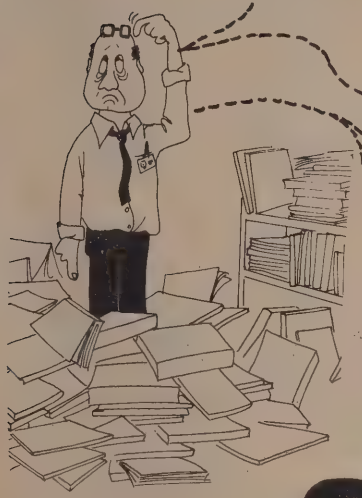
What system makes filing or retrieving manufacturers' catalogs fast and easy?



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ALUMINUM KNOBS

STANDARD SERIES
CONTEMPORARY SERIES

- Clear or Black Anodized Finish
- For Commercial and Military Equipment
- Available From Stock
- Rugged, Functional Design
- Distinctive Appearance
- One-Piece Construction
- All Knobs Come With Two Socket Set Screws
- Engraved Knobs to Your Specifications Available on Short Notice

SPECIAL ORDERS
ON SHORT NOTICE

HOW TO ORDER

02-1022 - 1 - 2 - 0 - 2

Basic Part No.
Shaft Size
Finish
Insert Color†
Index

Example orders a Plain Style Standard Size machined knob for a 1/8" dia. shaft. Finish is black anodize. Knob has a white-filled index dot.

† Only available with Contemporary Knobs
* 1/8" shaft only
‡ 1/4" shaft only

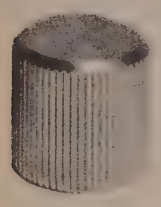
Shaft Size	Suffix
1/8" Dia.	-1
3/16" Dia.	-2
1/4" Dia.	-3
Special	-4
Finish	**Suffix**
None	-0
Clear Anodize	-1
Black Anodize	-2
Other	-3

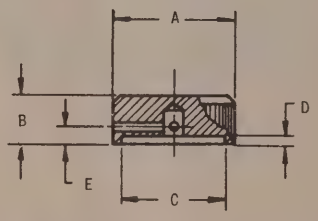
Insert Color	Suffix
None	-0
Spun Silver	-1
Gray	-2
Red	-3
Blue	-4
Amber	-5
White	-6
Green	-7
Black	-8
Special	-9

Index	Suffix
No dot or engraving	-0
Dot, no fill	-1
Dot, white fill	-2
Line, no fill	-3
Line, white fill	-4
Special engraving	-5

STANDARD SERIES

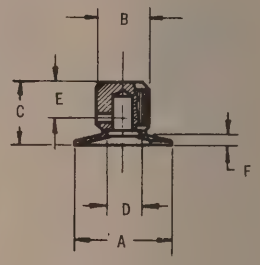
PLAIN 1000





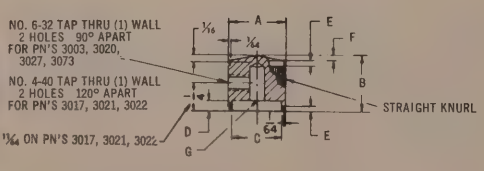
Basic Part No.	A	B	C	D	E
02-1022*	3/8	1/2	9/32	3/32	11/64
02-1021	1/2	11/16	7/16	3/32	11/64
02-1017	1/2	1/2	7/16	3/32	11/64
02-1003	5/8	5/8	9/16	3/32	1/4
02-1020	3/4	5/8	9/16	3/32	1/4
02-1027	15/16	3/4	9/16	1/8	1/4
02-1073	1 1/4	3/4	9/16	1/8	1/4
02-1014	1 3/4	11/16	1 1/2	1/8	1/4

DIAL SKIRT 1000



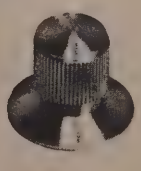
Basic Part No.	A	B	C	D	E	F
02-1009*	5/8	3/8	19/32	9/32	3/8	3/32
02-1004*	1/2	3/8	9/16	9/32	3/8	3/32
02-1016	5/8	1/2	5/8	3/8	3/8	3/32
02-1015	7/8	1/2	11/16	3/8	3/8	5/32
02-1002	1	5/8	13/16	3/8	7/16	5/32
02-1019	1 1/8	3/4	13/16	9/16	1/2	3/16
02-1001	1 3/8	5/8	7/8	3/8	7/16	3/16
02-1018	1 3/8	3/4	7/8	9/16	1/2	3/16

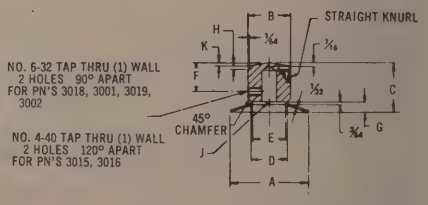
PLAIN 3000



Basic Part No.	A	B	C	D	E	F
02-3022*	3/8	1/2	9/32	3/32	1/16	3/64
02-3017	1/2	1/2	7/16	3/32	3/64	3/64
02-3021	1/2	11/16	7/16	3/32	1/16	3/64
02-3003	5/8	5/8	37/64	3/32	3/64	3/64
02-3020	3/4	5/8	19/32	3/32	1/16	1/16
02-3027	15/16	3/4	19/32	1/8	1/16	1/16
02-3073	1 1/4	3/4	19/32	1/8	1/16	3/32

DIAL SKIRT 3000





Basic Part No.	A	B	C	D	E	F	G	H	K
02-3009*	5/8	3/8	9/16	21/64	9/32	3/16	3/32	1/32	1/32
02-3004*	1/2	3/8	9/16	3/8	9/32	3/8	3/32	3/64	3/64
02-3016	5/8	1/2	5/8	7/16	3/8	3/8	1/8	3/64	3/64
02-3015	7/8	1/2	11/16	7/16	3/8	3/8	3/16	3/64	3/64
02-3002	1	5/8	13/16	1/2	3/8	7/16	5/32	3/64	3/64
02-3019	1 1/8	3/4	13/16	5/8	37/64	1/2	3/16	1/16	1/16
02-3001	1 3/8	5/8	7/8	1/2	3/8	7/16	3/16	3/64	1/16
02-3018	1 3/8	3/4	7/8	5/8	37/64	1/2	3/16	1/16	1/16

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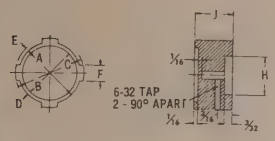
ALUMINUM KNOBS

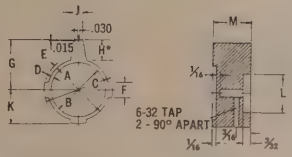
CONTEMPORARY SERIES

PLAIN



Basic Part No.	A	B	C	D	E	F	H	J
01-1100‡	1	57/64	17/64	1/16	1/16	1/4	19/32	3/4
01-1750‡	3/4	21/32	27/32	3/64	3/64	7/32	19/32	5/8
01-1620	5/8	35/64	45/64	3/64	3/64	3/16	37/64	5/8
01-1500	1/2	7/16	9/16	1/32	1/32	5/32	7/64	1/2
01-1370*	3/8	5/16	7/16	1/32	1/32	9/64	9/32	1/2

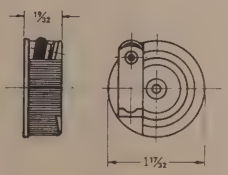
POINTER



Basic Part No.	A	B	C	D	E	F	G	H	J	K	L	M
01-3100‡	1	57/64	17/64	1/16	1/16	1/4	13/16	21/64	1/8	35/64	19/32	3/4
01-3750‡	3/4	21/32	27/32	3/64	3/64	7/32	41/64	17/64	1/8	27/64	19/32	5/8
01-3620	5/8	35/64	45/64	3/64	3/64	3/16	35/64	15/64	3/32	23/64	37/64	5/8
01-3500	1/2	7/16	9/16	1/32	1/32	5/32	15/32	13/64	3/32	9/32	7/16	1/2
01-3370*	3/8	5/16	7/16	1/32	1/32	9/64	23/64	11/64	5/64	7/32	9/32	1/2

- Meets all applicable military specifications.
- Aluminum knobs, X24087 Olive Drab Paint.
- Other colors available on request.
- Groove filled with fluorescent green paint.
- Also available in blue fluorescent paint.

03-0221/MS91522



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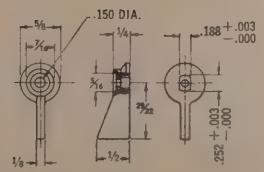
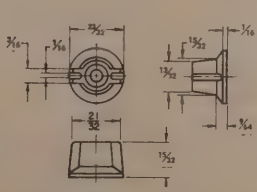
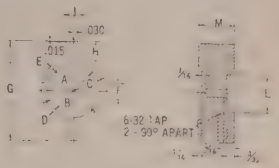


03-0241/MS91524*

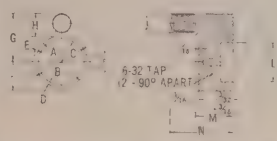


BAR



Basic Part No.	A	B	C	D	E	F	G	H	J	L	M
01-2100‡	1	57/64	17/64	1/16	1/16	1/4	1 41/64	21/64	1/8	19/32	3/4
01-2750‡	3/4	21/32	27/32	3/64	3/64	7/32	1 3/32	17/64	1/8	19/32	5/8
01-2620	5/8	35/64	45/64	3/64	3/64	3/16	1 3/32	15/64	3/32	37/64	5/8
01-2500	1/2	7/16	9/16	1/32	1/32	5/32	25/32	13/64	3/32	7/16	1/2
01-2370*	3/8	5/16	7/16	1/32	1/32	9/64	47/64	11/60	5/64	9/32	1/2

CRANK



Basic Part No.	A	B	C	D	E	F	G	H	J	K	L	M	N
01-4100	1	57/64	17/64	1/16	1/16	1/4	59/64	27/64	3/8	35/64	19/32	3/8	1 1/4
01-4750	3/4	21/32	27/32	3/64	3/64	7/32	57/64	23/64	3/8	27/64	19/32	3/8	1 1/4

CONCENTRIC AVAILABLE

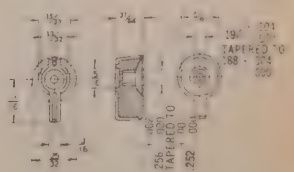
COLOR INSERTS

MILITARY KNOBS

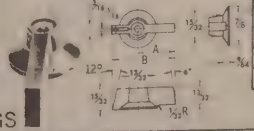
HOW TO ORDER 03-0231 - 4 - 3 - 0 - 5

- Basic Part No.
- Special Shaft Size
- Special Finish
- Special Engraving
- No Insert

03-0242/SMC91018‡



03-025/MS91525†



Part No.	A	B	Vemaline
MS 91525-1	13/32	13/16	NO: 03-0251
MS 91525-2	27/32	1 7/16	NO: 03-0252
MS 91525-3	1 11/32	1 15/16	NO: 03-0253
MS 91525-4	1 31/32	2 9/16	NO: 03-0254

LISTINGS

03-0241*	03-0242‡	03-0251†	03-0252	03-0253	03-0254
SMD113935 SMC108876 SCB40859 SMB143975 5355-667-9004	5355-508 SMC347741 SMC344709 SMC344708 SMB344847 SMB345388 SDC345389 SMC447052 225822-487	SMC108875 3CB40860 SMB-144318 SMB-144358 SMB-169129 SCB16552 SMC328371 5355-577-4084	SCB40771 SMC108874 SCB-16505 SM-D-415161 SMC447226 SCB16505 SMD-415161 SMD-416222 5355-689-3425	SM-D-415160 SC-B-16532 SCB-72687 SMB-169131 SMC-108951 SMB-134957	SCB-82716 SM-D-415223 SMB-144319

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PLANETARY DRIVES

FEATURES

Zero Backlash — (dial to output shaft), Initial output torque 15-20 In. Oz. (higher torques available). Can be custom modified. Various stock and special dials available with stops and dial locks. Ready to install.

Ultra smooth precision ball driven planetary dial for Indicator or Rotary components. (Tol: on ratio ±½ to 1 turn).

Available with "O" Ring grooves. RFI Proof Grounded. Environmental MIL-E-4970(USAF) & MIL-E-16400. Can withstand shock 100G in all planes. ±1 minute accuracy. Excellent Readability. Direct Reading.

HOW TO ORDER (4020 and 5020)

C FS 4020 - 1 - B - 1¾"

- C — Flexible coupling output shaft
- FS — 4020: FS = ⅞" dia. fast approach, FL = 1¼" dia. fast approach; 5020: F = FS Knob Set, L = Dial Lock
- 4020 / 5020
- 1 — Knob Style: 1 = Standard Knob & Dial, 2 = No Knob or Dial, 3 = Special Knob & Dial, 4 = With Dial, No Knob. Ratio 5:1 (other ratios available)
- B — Dial choice see table
- 1¾" — Dial size see table

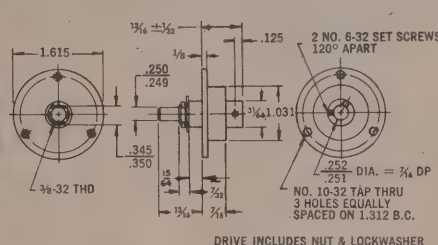
HOW TO ORDER (4535 and 5535)

C FS 4535 - 11 - .090 - B - 1¾"

- C — Flexible coupling output shaft
- FS — 4535: FS = ⅞" dia. fast approach, FL = 1¼" dia. fast approach; 5535: F = FS Knob Set, L = Dial Lock
- 4535 / 5535
- 11 — Synchro Size: 8, 10, 11, 15, 23. Ratio 10:1 (other ratios available)
- .090" — Shaft Dia.: .090", .12", .125", .187", .250"
- B — Dial choice see table
- 1¾" — Dial size see table

MANY OTHER STYLES AVAILABLE CONSULT FACTORY

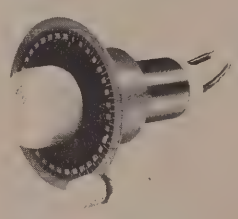
4020

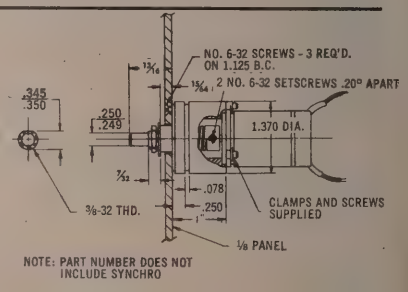


DRIVE INCLUDES NUT & LOCKWASHER

4020-☐-☐ SERIES 5:1 RATIO
4025-☐-☐ SERIES 15:1 RATIO
4035-☐-☐ SERIES 10:1 RATIO
4067-☐-☐ SERIES 3:1 RATIO
4060-☐-☐ SERIES 20:1 RATIO

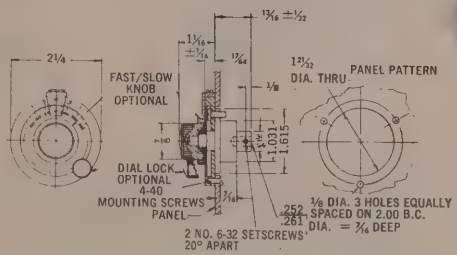
4535





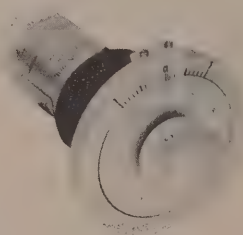
NOTE: PART NUMBER DOES NOT INCLUDE SYNCHRO

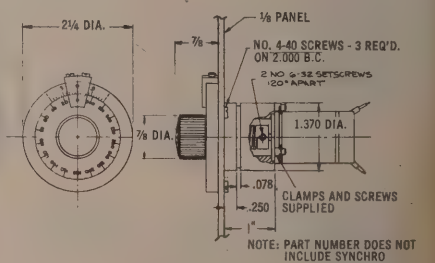
5020



5020-☐-☐ SERIES 5:1 RATIO
5025-☐-☐ SERIES 15:1 RATIO
5035-☐-☐ SERIES 10:1 RATIO
5060-☐-☐ SERIES 20:1 RATIO

5535

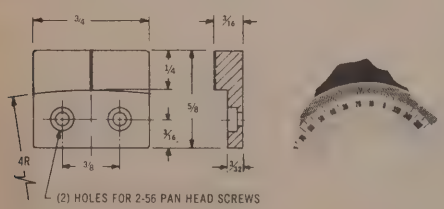




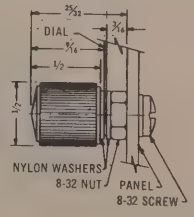
NOTE: PART NUMBER DOES NOT INCLUDE SYNCHRO

Synchro Dial Assemblies feature a special Floating Misalignment Eliminator to give the "precision feel" and cannot bind up.
Many variations, including special dials are available.

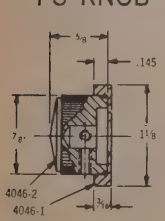
4020-11 DIAL POINTER



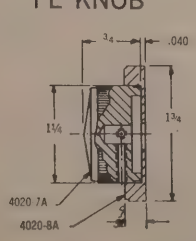
4037 DIAL LOCK



FS KNOB



FL KNOB



DIAL CHOICE TABLE

Add appropriate suffix to the part numbers. 5535 & 5020 will accept only 1¾ in. dia. dials. 4020 & 4535 can have 1¾ in., 2¾ in. or 4 in. dia. dials.

- A = Blank
- B = CAL. CCW 0-100 (180° ROT.)
- C = CAL. CW 0-100 (180° ROT.)
- D = CAL. CCW 0-360 (360° ROT.)
- E = CAL. CW 0-360 (360° ROT.)
- F = CAL. CCW 0-100 (360° ROT.)
- G = CAL. CW 0-100 (360° ROT.)

Note: Dial rotates in same direction as knob.

PLANETARY DRIVES MATERIAL SPECS.

Housing — Aluminum 11 ST. Federal Spec: QQA-225/3B
FINISH: Blue Anodize 8625 Mil-A-Type 2
Bushing — Brass ½ Hard. Federal Spec: QQB-626 Composition 22 or 11
FINISH: Cad. Bronze Chromate per spec AA-P-416-CL2-Type 2
Racer — Stainless Steel T-301 Spring Temper Mil Spec: 5050-8A
Shaft—Stainless Steel Type -303 Federal Spec: QQS-763 ANS-5640E Tumble soap & water - Passivate
Retaining Nut — Aluminum 11 ST Federal Spec: QQA-225/3B
FINISH: Irridite
Ball — Stainless Steel Federal Spec: QQS-763A-(-3) Class 440C 3 Micro inch or better
Nut — Brass ½ Hard Federal Spec: QQB-626 Composition 22 or 11
FINISH: Cad. Bronze Chromate per spec AA-P-416-CL12-Type 2
Lockwasher — Internal Tooth .024 Ph. Bronze Federal Spec: QQB-746 Composition A Hard
FINISH: Cad. Bronze AA-P-416-CL2-Type 2

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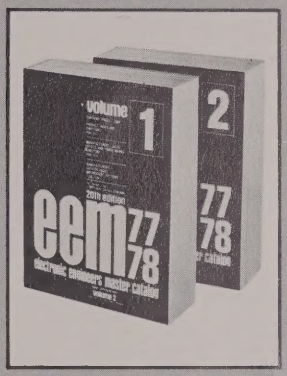

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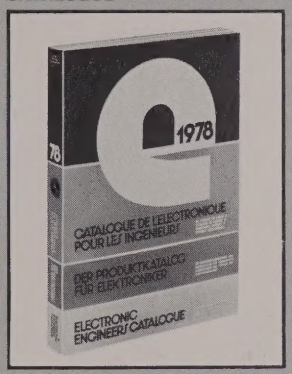

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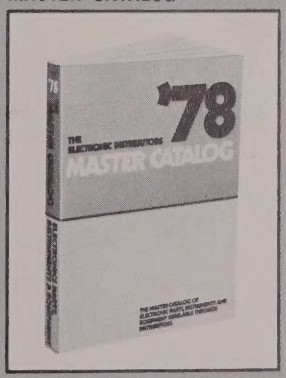

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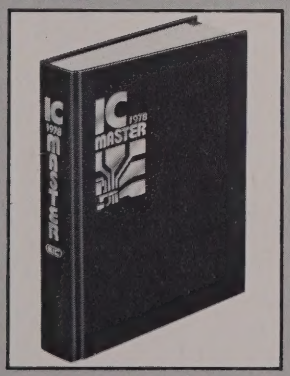

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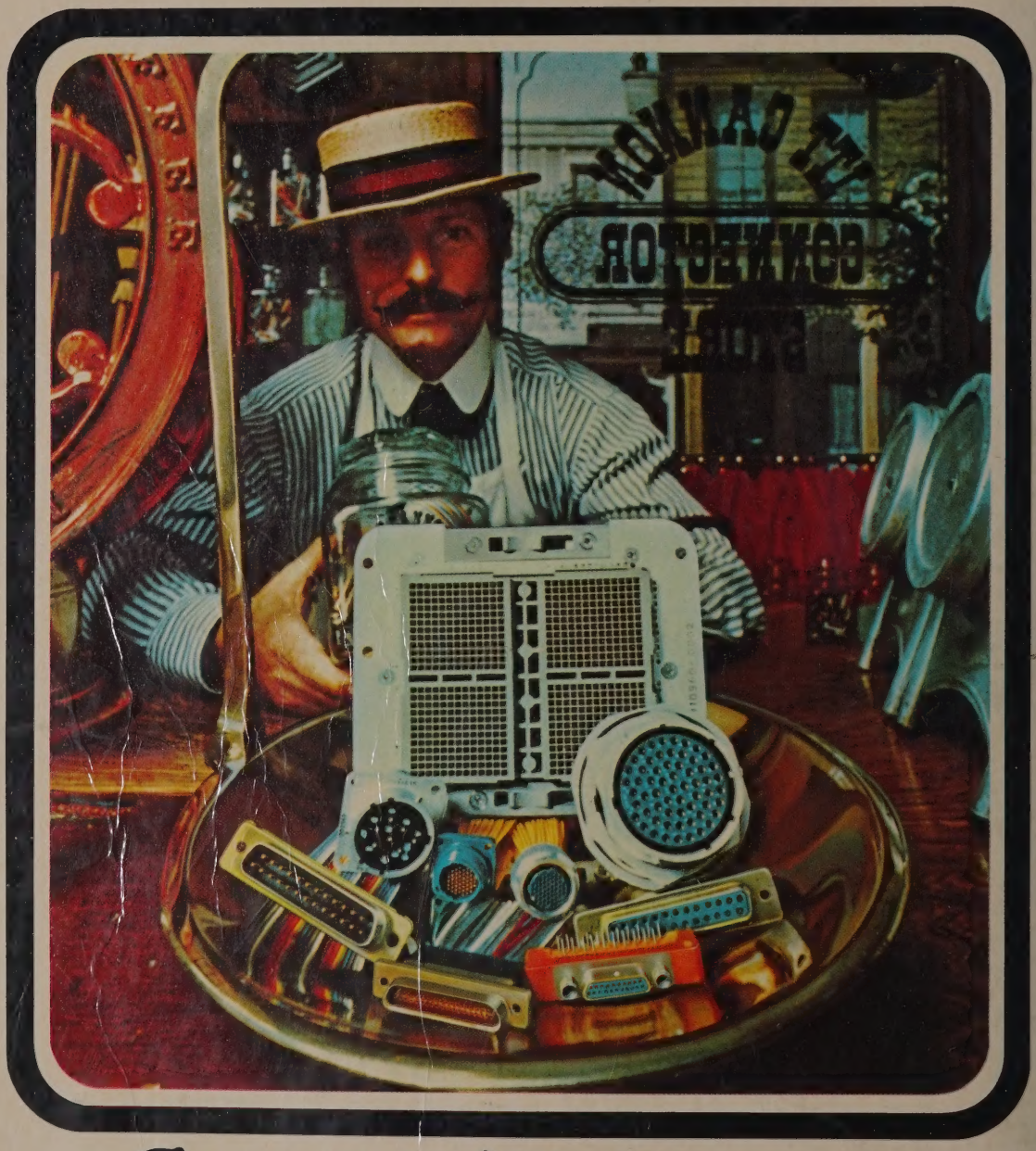

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